PROGRAMMABLE CONTROLLERS
FOR SINGLE OR TWIN-CIRCUIT
CHILLERS - HEAT PUMPS
WITH UP TO 6 COMPRESSORS

APPLICATION MANUAL

CODE 144CHILNUE03

Important Notice

This Instruction Manual should be read carefully before installation and before use, and all warnings relating to installation and electrical connections should be observed; the Manual should then be kept for future reference.

All devices must be disposed of in accordance with local regulations governing the disposal of electrical and electronic devices.

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1 General Information

1.1 Description

C-PRO NANO CHIL and C-PRO MICRO CHIL are two new families of innovative programmable controllers, which are both flexible and modular, as well as being capable satisfying all application, technical and cost requirements of modern single and twin-circuit chillers, with capacity from 4 to 450 KW and up to 6 compressors.
The features of the C-PRO NANO and MICRO CHIL controllers – contained size, I/O availability, price, etc. – enable, for the very first time, the use of programmable devices even in low-complexity machines such as chillers - heat pumps with a single circuit, capacity from 4 to 80 KW and up to 3 compressors, where until recently it had only been possible to utilise rigid parameter-based controllers. By connecting to a C-PRO NANO and MICRO CHIL the *C-PRO EXP MICRO* I/O expansion, the advantages in control and price offered by the use of these programmable devices are also extended to twin-circuit units up to 450 KW and 6 compressors.
The display on these products consists of a 4-digit LED display, with function icons, available in both product families.
The C-PRO NANO and MICRO CHIL controllers feature:

- 9 inputs, three of which are analogue inputs (2 for NTC temperature probes and 1 for pressure transducers
  0-20 / 4-20 mA or for ratiometric transducers, 0-5 V), 5 are digital and 1 is analogue/digital (i.e. configurable);
- 9 outputs, of which 3 are analogue (one PWM and two 4-20 mA or 0-10 V) and 6 are digital (electromechanical relays); analogue outputs enable control of inverters for compressors and for phase-cut speed regulators for fans.

Using the *C-PRO EXP MICRO* I/O expansion, I/O is doubled.
Thanks to their design and installation features, these controllers are easily installed – the C-PRO NANO is panel-mounted, while the C-PRO MICRO is DIN-rail-mounted on an electrical board. Using the EVKEY programming key, it is possible to upload/download parameters; in addition, these controllers can be connected to RICS monitoring and supervisory systems.
The application software is created with UNI-PRO and is capable of managing air-to-air, air-to-water, water-to-water and motocondensing units.
The following are only some of the numerous control functions available:

- free-cooling management
- pump-down management
- dynamic set point compensation
- double set-point that can be enabled from external contact
- possibility of managing up to 3 scroll compressors for each circuit
- possibility of managing compressors with inverter and fans with phase-cut module
- control of condensing pressure / linear or stepped evaporation
- operation as heat pump only
- activation of compressors from motocondensing machine input
- operation as heat pump with low external temperature
- version with one, two or no circulating pumps.

C-PRO NANO CHIL

C-PRO MICRO CHIL
Built-in version

C-PRO MICRO CHIL
Blind version

C-PRO MICRO CHIL
Open-frame version

2 Applications

Management of the following unit types is possible:

1) Air-to-air single-circuit chiller units and air-to-air single-circuit chiller units + heat pump, using C-PRO NANO CHIL (or C-PRO MICRO CHIL).
Total number of analogue inputs: 4.
Total number of digital inputs: 5 (*).
Total number of analogue outputs: 1 + 2 optional.
Total number of digital outputs: 6.

2) **Air-to-water single-circuit chiller units and air-to-water single-circuit chiller units + heat pump,** using C-PRO NANO CHIL (or C-PRO MICRO CHIL).
Total number of analogue inputs: 4.
Total number of digital inputs: 5 (*).
Total number of analogue outputs: 1 + 2 optional.
Total number of digital outputs: 6.

3) **Water-to-water single-circuit chiller units and water-to-water single-circuit chiller units + heat pump,** using C-PRO NANO CHIL (or C-PRO MICRO CHIL).
Total number of analogue inputs: 4.
Total number of digital inputs: 5 (*).
Total number of analogue outputs: 1 + 2 optional.
Total number of digital outputs: 6.

4) **Single-circuit motocondensing air-based units and single-circuit motocondensing air-based units with cycle inversion,** using C-PRO NANO CHIL (or C-PRO MICRO CHIL).
Total number of analogue inputs: 4.
Total number of digital inputs: 5 (*).
Total number of analogue outputs: 1 + 2 optional.
Total number of digital outputs: 6.

5) **Single-circuit motocondensing water-based units and single-circuit motocondensing water-based units with cycle inversion,** using C-PRO NANO CHIL (or C-PRO MICRO CHIL).
Total number of analogue inputs: 4.
Total number of digital inputs: 5.
Total number of analogue outputs: 1 + 2 optional.
Total number of digital outputs: 6.

(*) **Note:** The total number of digital inputs is 6, if analogue input AI04 is used as additional digital input (parameter PH44).

6) **Air-to-air single-circuit chiller units and air-to-air single-circuit chiller units + heat pump,** using C-PRO NANO CHIL (or C-PRO MICRO CHIL) and C-PRO EXP MICRO.
Total number of analogue inputs: 8.
Total number of digital inputs: 10 (*).
Total number of analogue outputs: 2 + 2 optional.
Total number of digital outputs: 12.

7) **Air-to-water twin-circuit chiller units and air-to-water twin-circuit chiller units + heat pump,** using C-PRO NANO CHIL (or C-PRO MICRO CHIL) and C-PRO EXP MICRO.

Total number of analogue inputs: 8.
Total number of digital inputs: 10 (*).
Total number of analogue outputs: 2 + 2 optional.
Total number of digital outputs: 12.

8) **Water-to-water twin-circuit chiller units and water-to-water twin-circuit chiller units + heat pump,** using C-PRO NANO CHIL (or C-PRO MICRO CHIL) and C-PRO EXP MICRO.

Total number of analogue inputs: 8.
Total number of digital inputs: 10 (*).
Total number of analogue outputs: 2 + 2 optional.
Total number of digital outputs: 12.

9) **Twin-circuit motocondensing air-based units and twin-circuit motocondensing air-based units with cycle inversion,** using C-PRO NANO CHIL (or C-PRO MICRO CHIL) and C-PRO EXP MICRO.

Total number of analogue inputs: 8.
Total number of digital inputs: 10 (*).
Total number of analogue outputs: 2 + 2 optional.
Total number of digital outputs: 12.

10) **Twin-circuit motocondensing water-based units and twin-circuit motocondensing water-based units with cycle inversion,** using C-PRO NANO CHIL (or C-PRO MICRO CHIL) and C-PRO EXP MICRO.

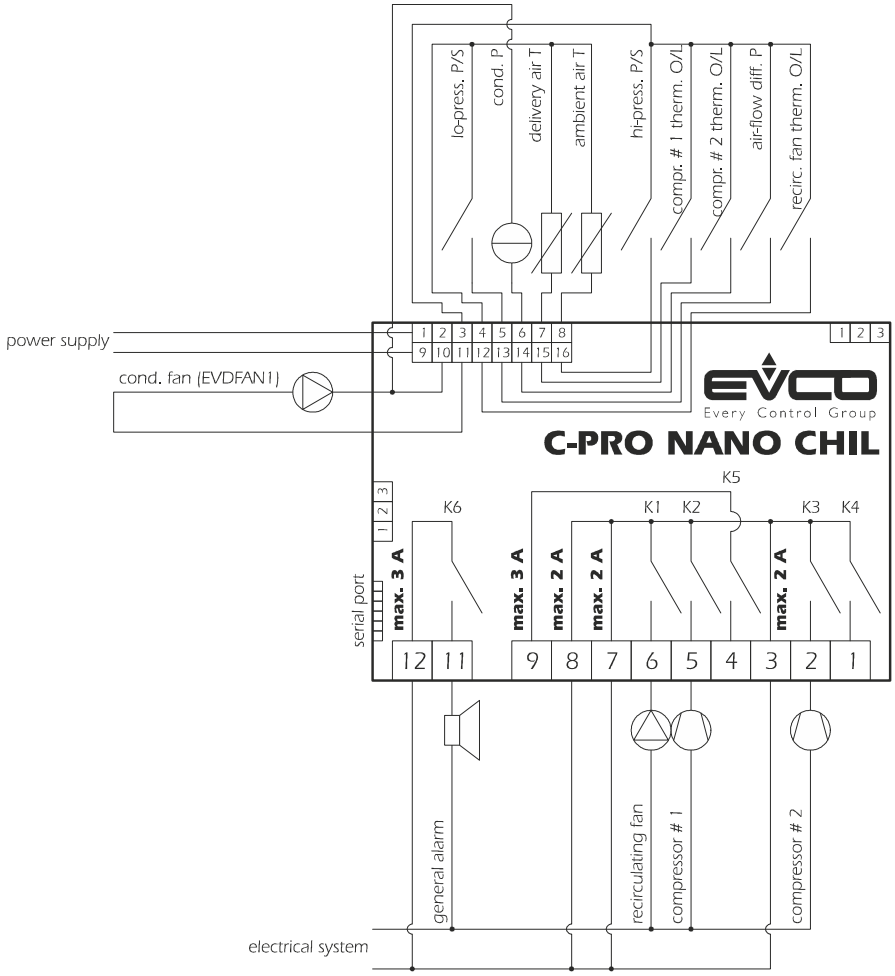
Total number of analogue inputs: 8.
Total number of digital inputs: 10 (*).
Total number of analogue outputs: 2 + 2 optional.
Total number of digital outputs: 12.

(*) **Note:** The total number of digital inputs is 12, if analogue inputs AI04 and AI08 are used as additional digital inputs (parameters PH44, PH45).

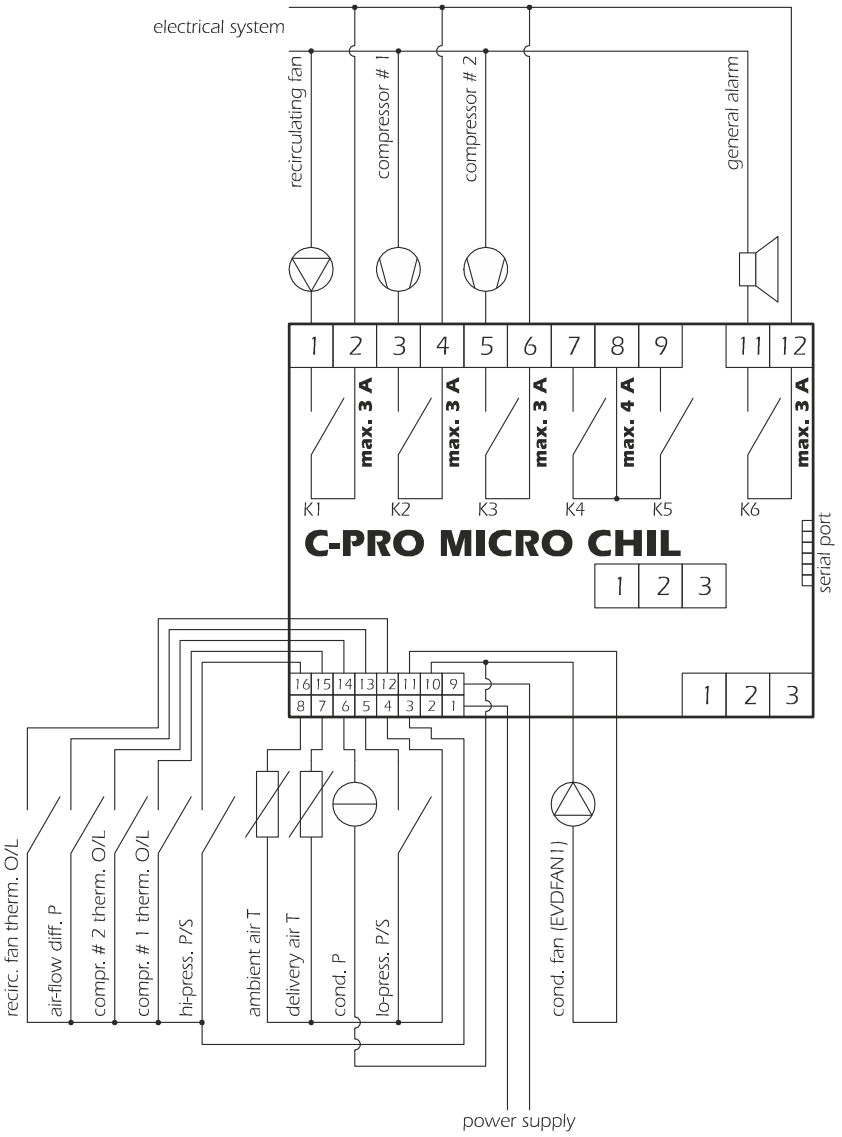
2.1 Air-to-air single-circuit chiller units and air-to-air single-circuit chiller units + heat pump

2.1.1 Air-to-air single-circuit chiller units

Using C-PRO NANO CHIL.

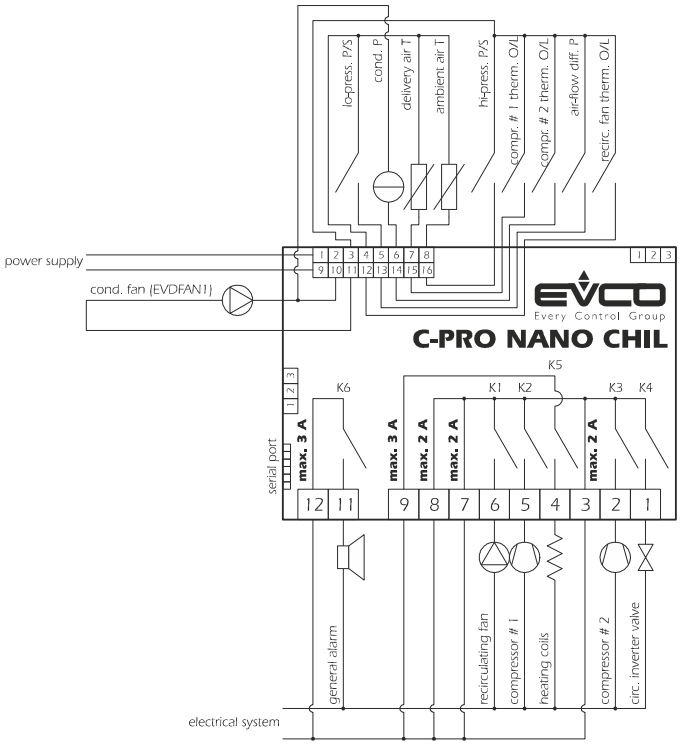


Using C-PRO MICRO CHIL.

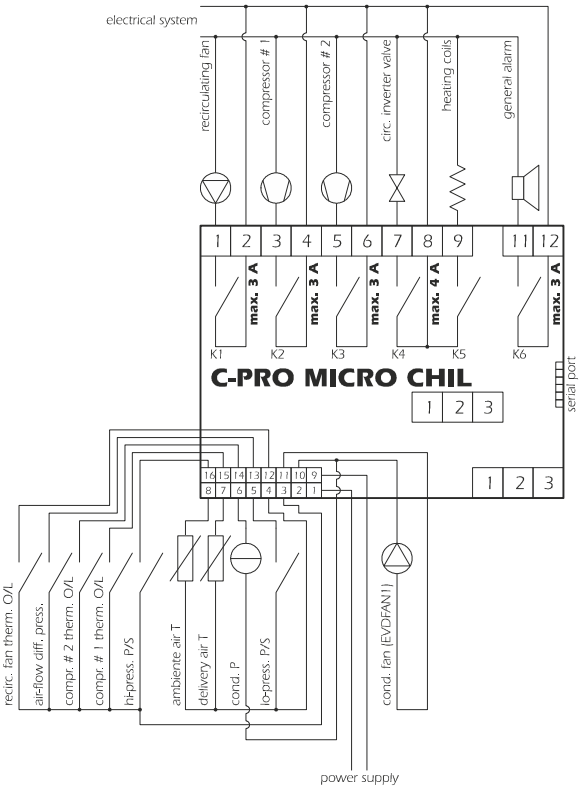


2.1.2 Air-to-air single-circuit chiller units + heat pump

Using C-PRO NANO CHIL.



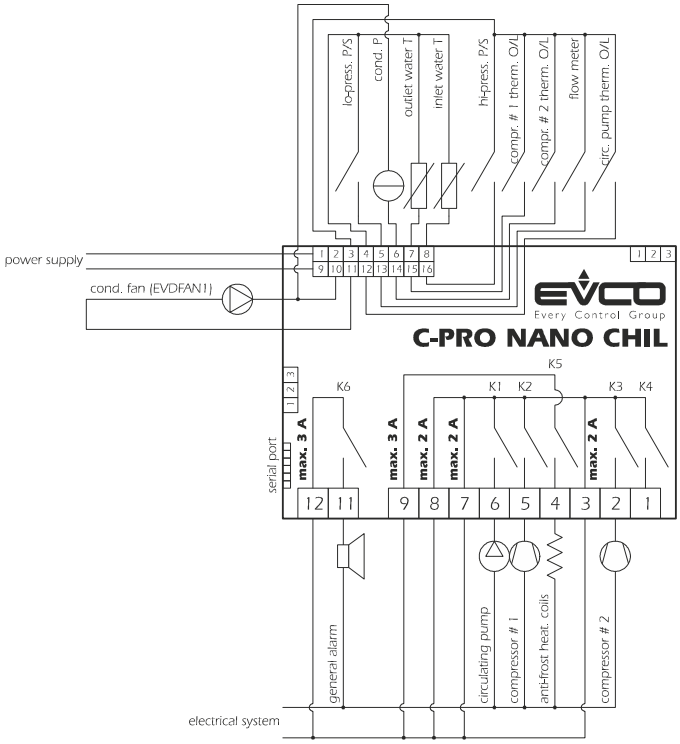
Using C-PRO MICRO CHIL.



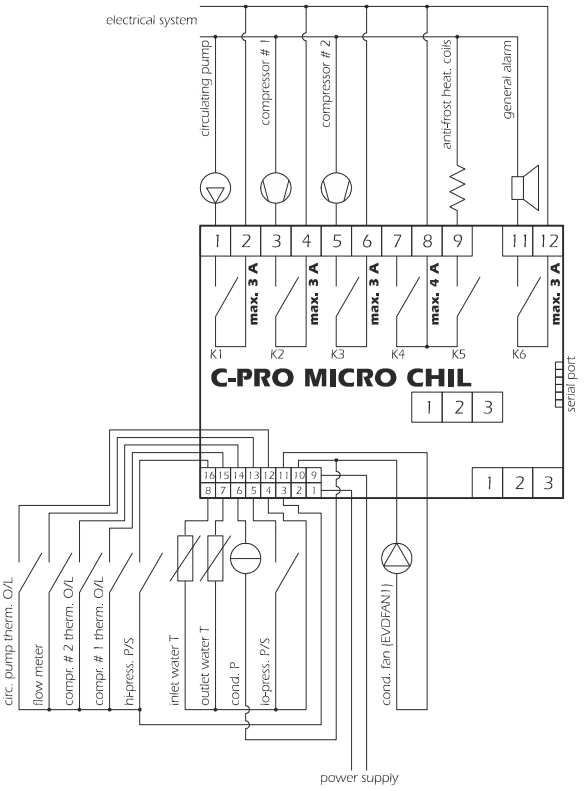
2.2 Air-to-water single-circuit chiller units and air-to-water single-circuit chiller units + heat pump

2.2.1 Air-to-water single-circuit chiller units

Using C-PRO NANO CHIL.

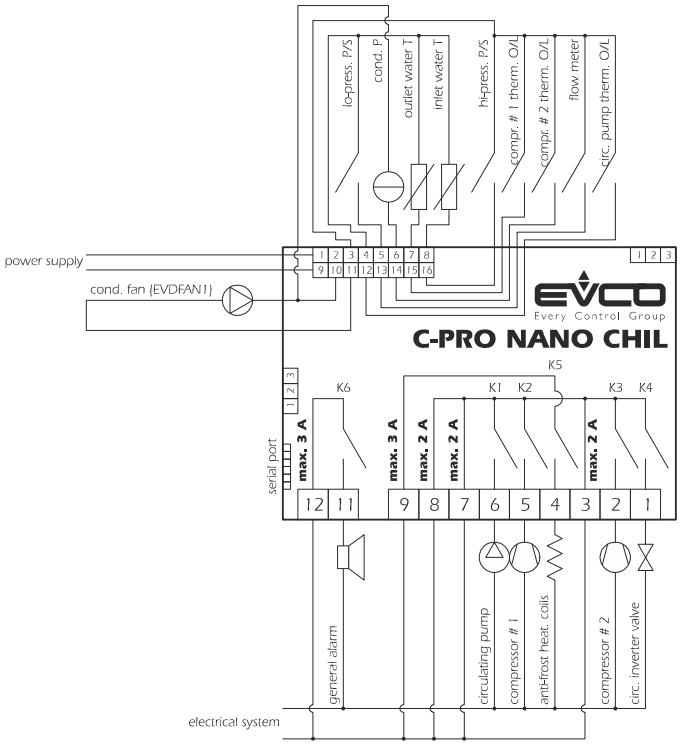


Using C-PRO MICRO CHIL.

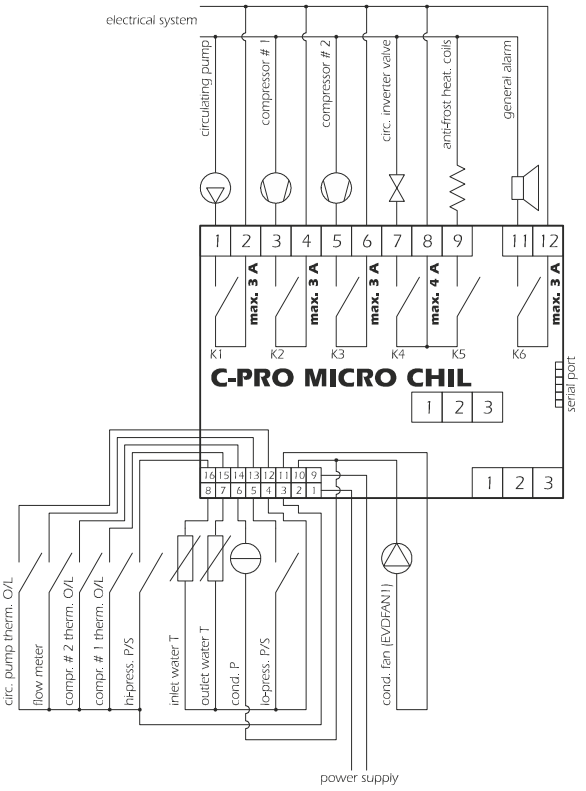


2.2.2 Air-to-water single-circuit chiller units + heat pump

Using C-PRO NANO CHIL.



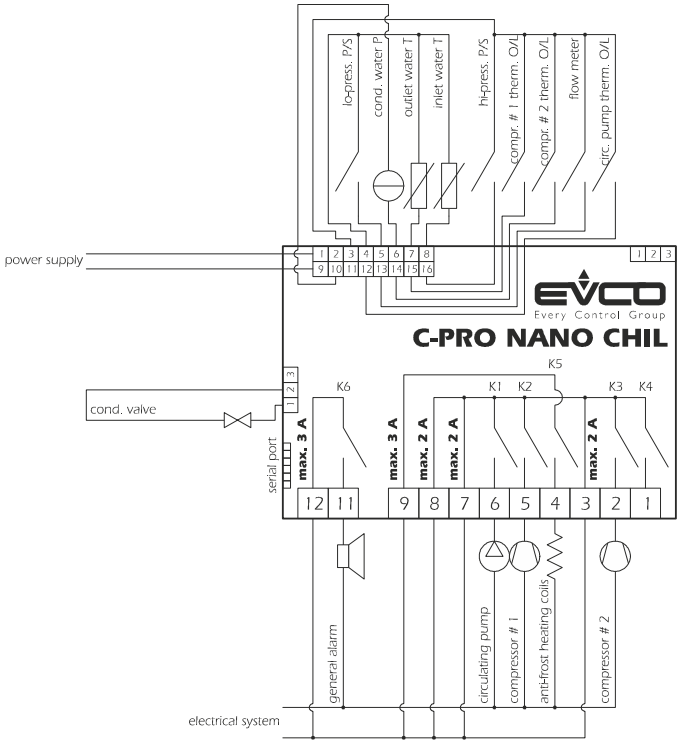
Using C-PRO MICRO CHIL.



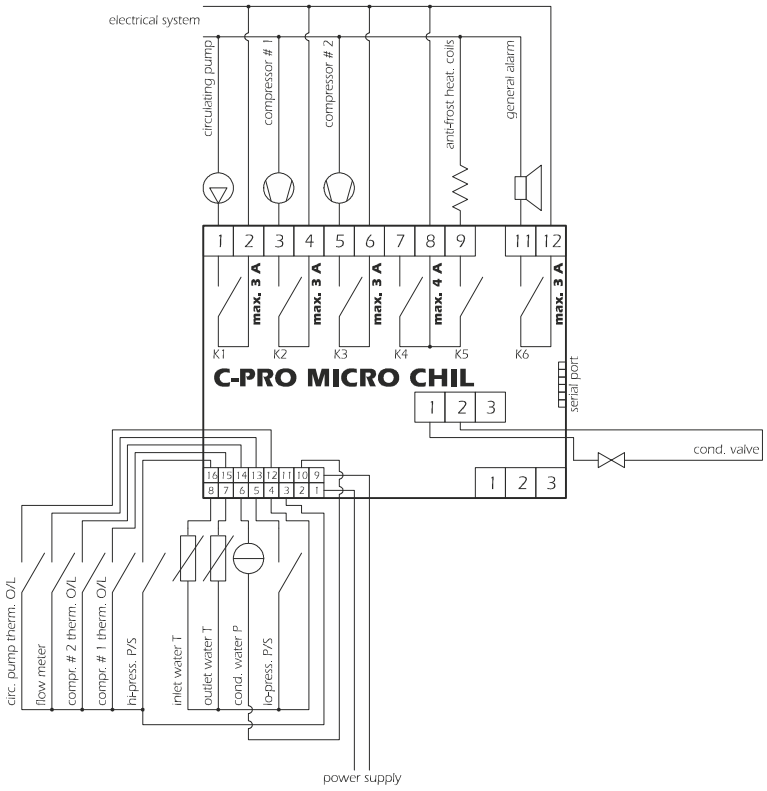
2.3 Water-to-water single-circuit chiller units and water-to-water single-circuit chiller units + heat pump

2.3.1 Water-to-water single-circuit chiller units

Using C-PRO NANO CHIL.

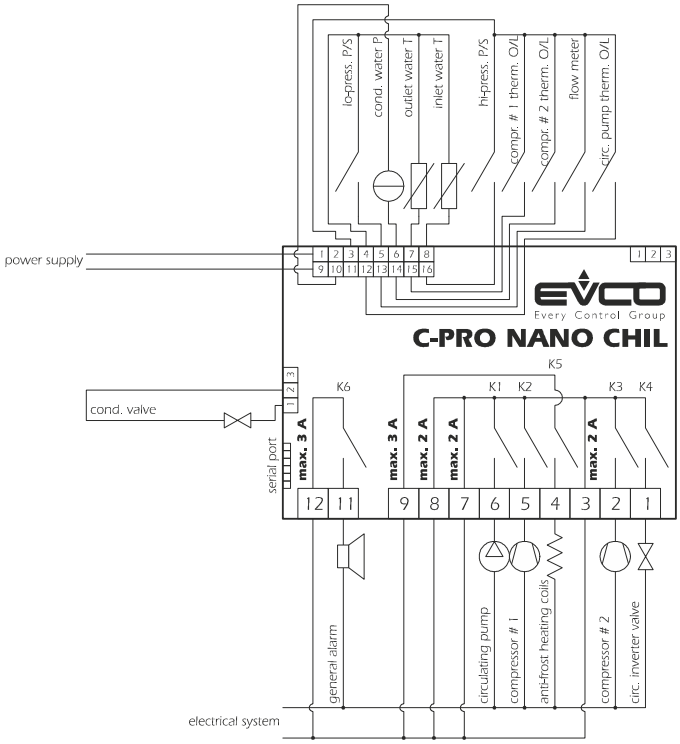


Using C-PRO MICRO CHIL.

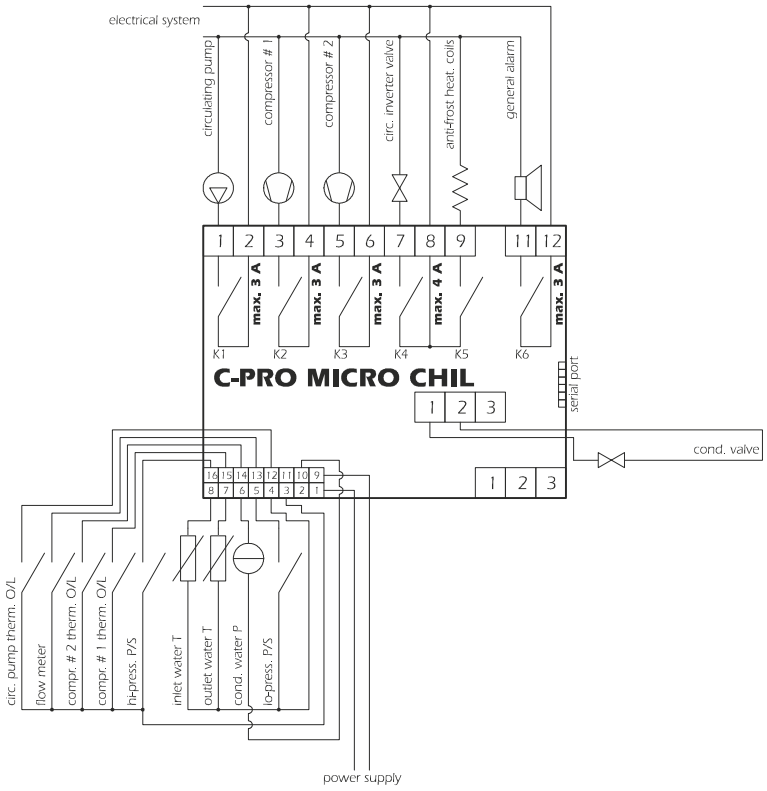


2.3.2 Water-to-water single-circuit chiller units + heat pump

Using C-PRO NANO CHIL.



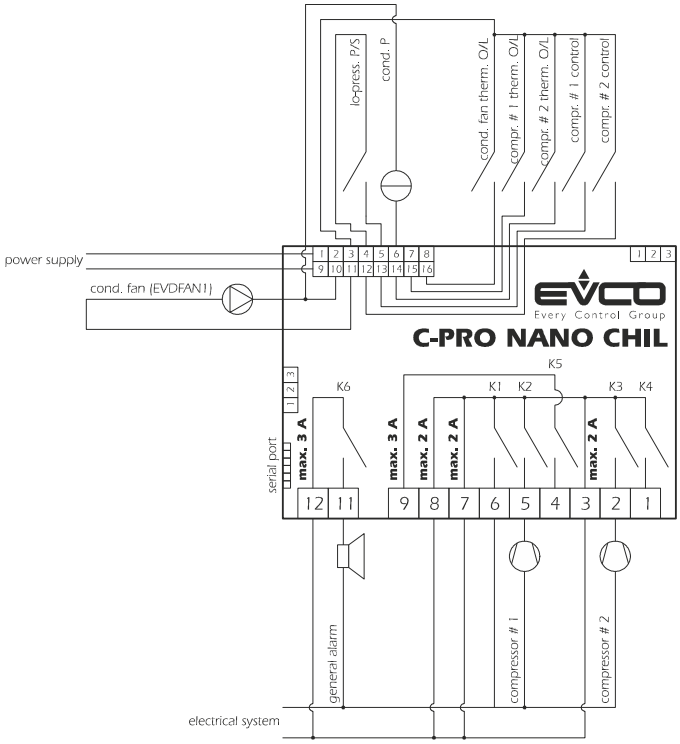
Using C-PRO MICRO CHIL.



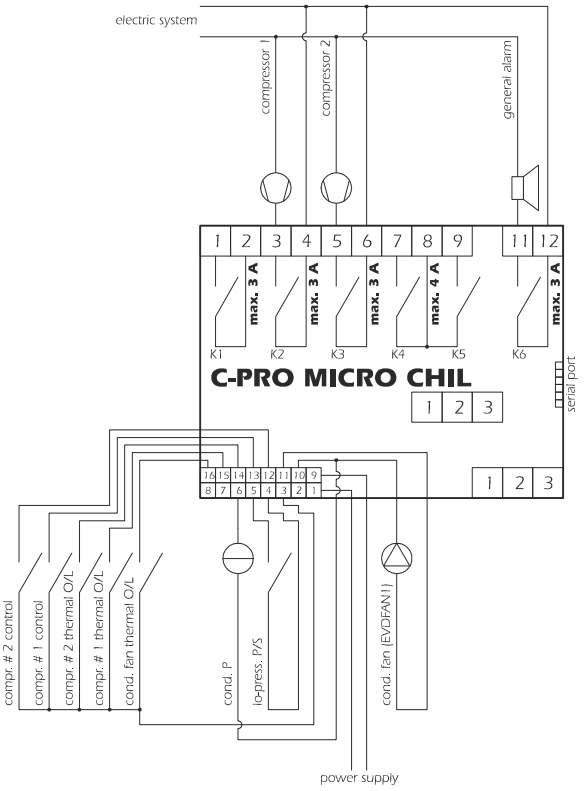
2.4 Single-circuit motocondensing air-based units and single-circuit motocondensing air-based units with cycle inversion

2.4.1 Single-circuit motocondensing air-based units

Using C-PRO NANO CHIL.

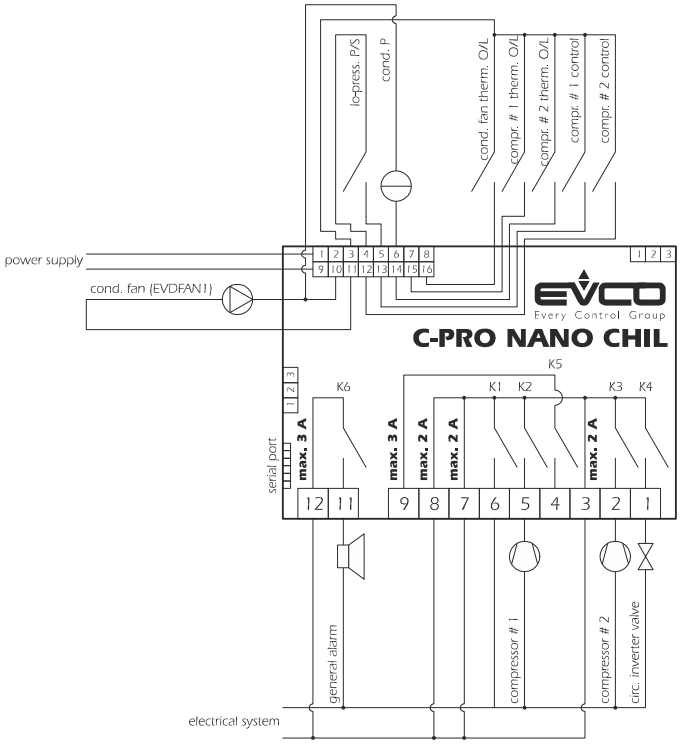


Using C-PRO MICRO CHIL.

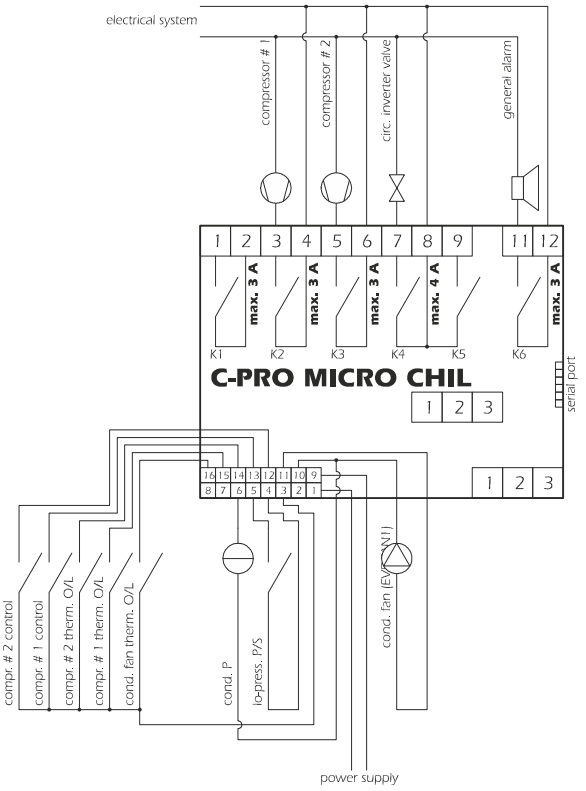


2.4.2 Single-circuit motocondensing air-based units with cycle inversion

Using C-PRO NANO CHIL.



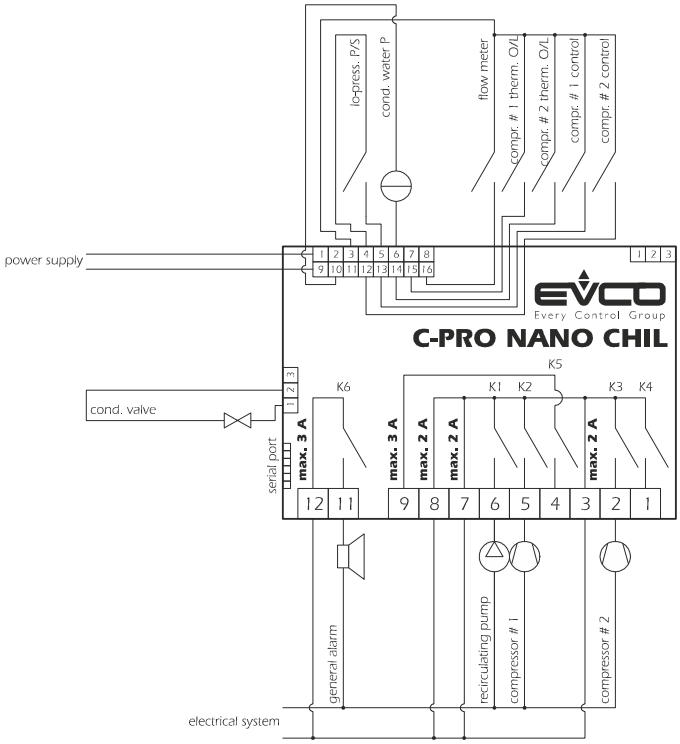
Using C-PRO MICRO CHIL.



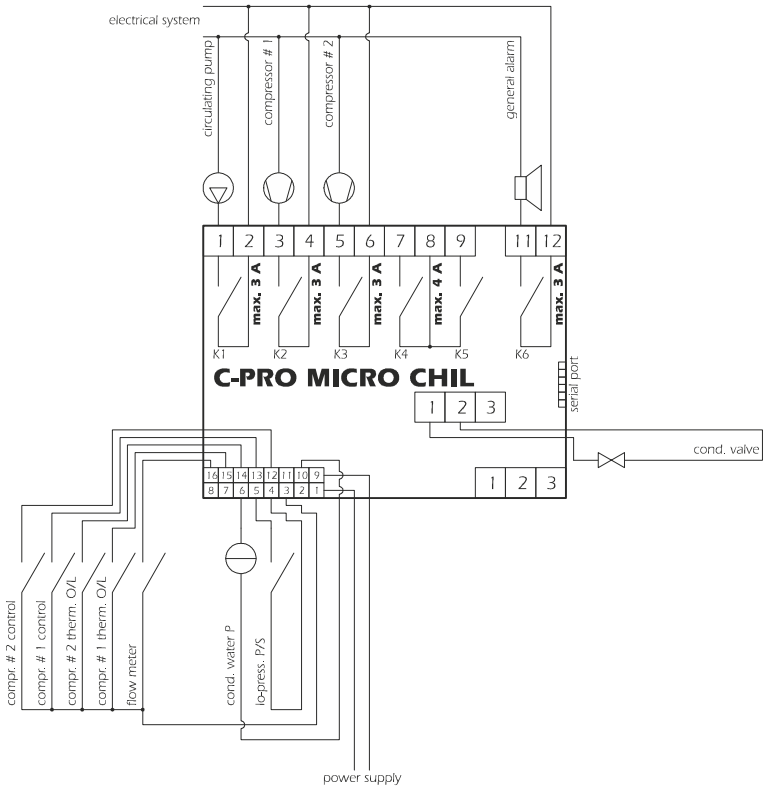
2.5 Single-circuit motocondensing water-based units and single-circuit motocondensing water-based units with cycle inversion

2.5.1 Single-circuit motocondensing water-based units

Using C-PRO NANO CHIL.

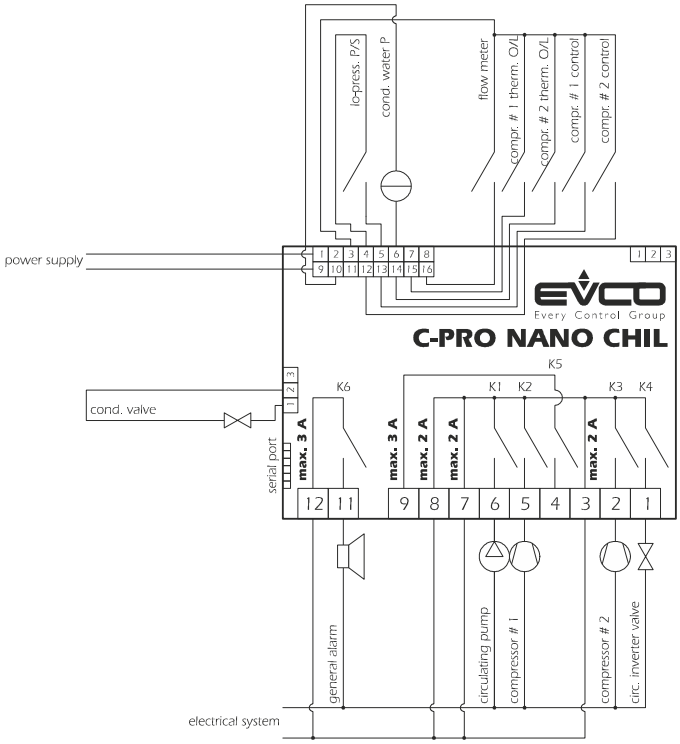


Using C-PRO MICRO CHIL.

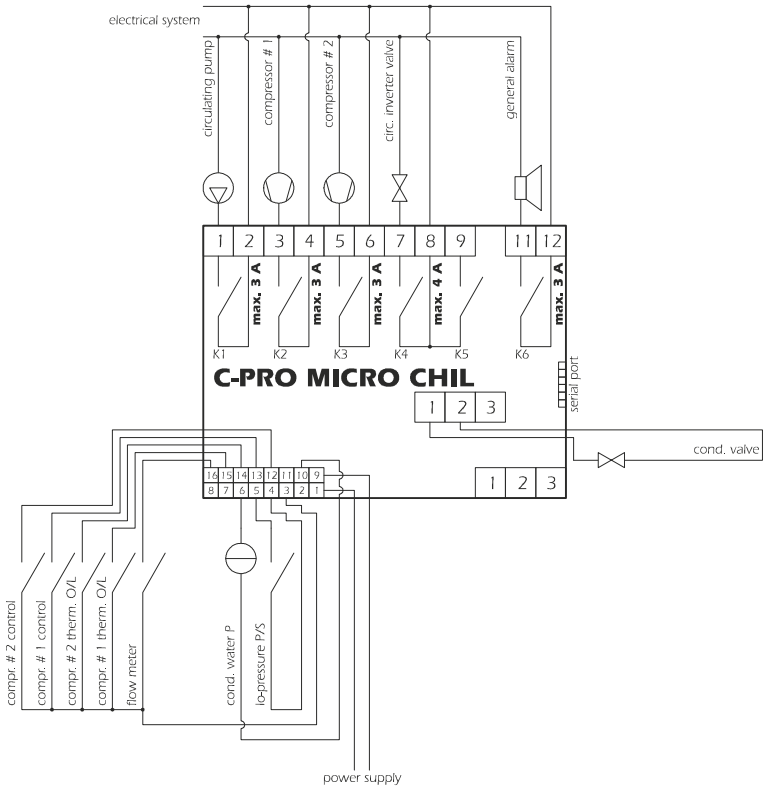


2.5.2 Single-circuit motocondensing water-based units with cycle inversion

Using C-PRO NANO CHIL.



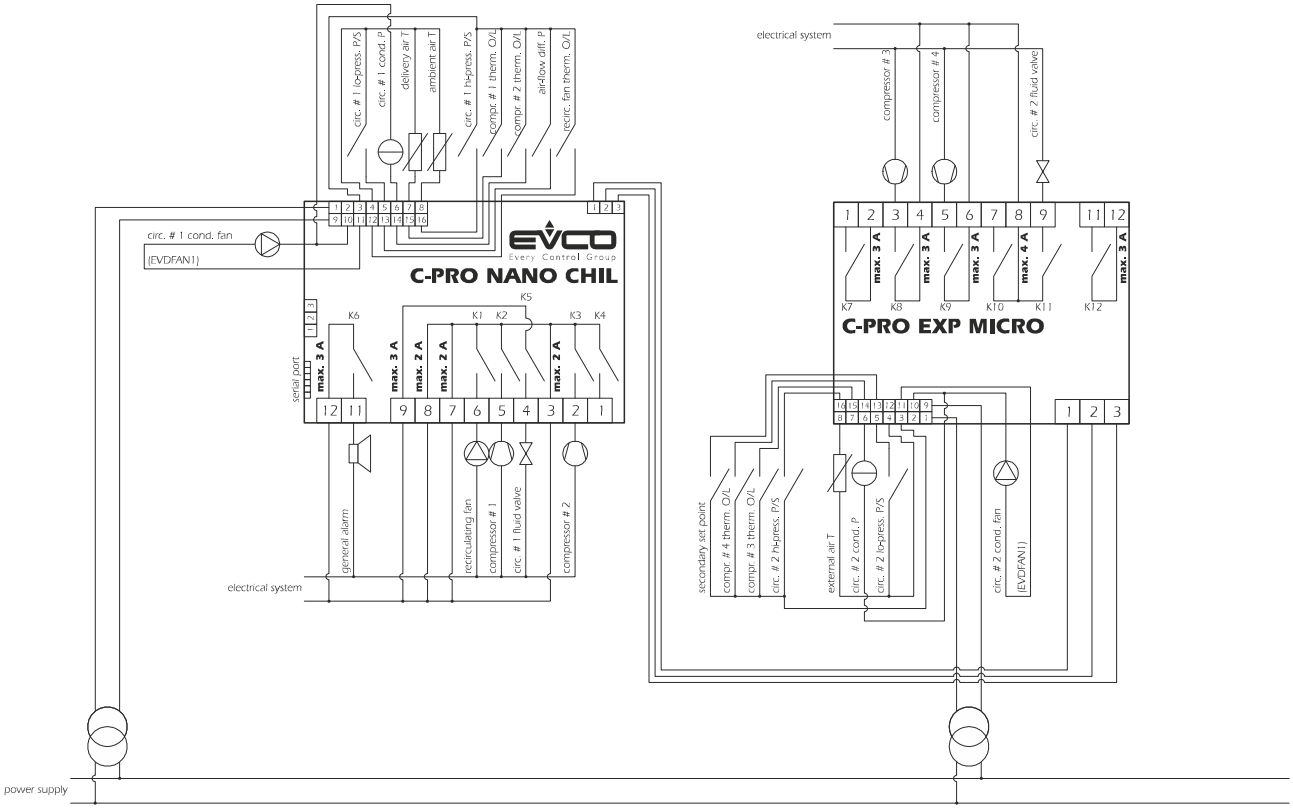
Using C-PRO MICRO CHIL.



2.6 Air-to-air twin-circuit chiller units and air-to-air twin-circuit chiller units + heat pump

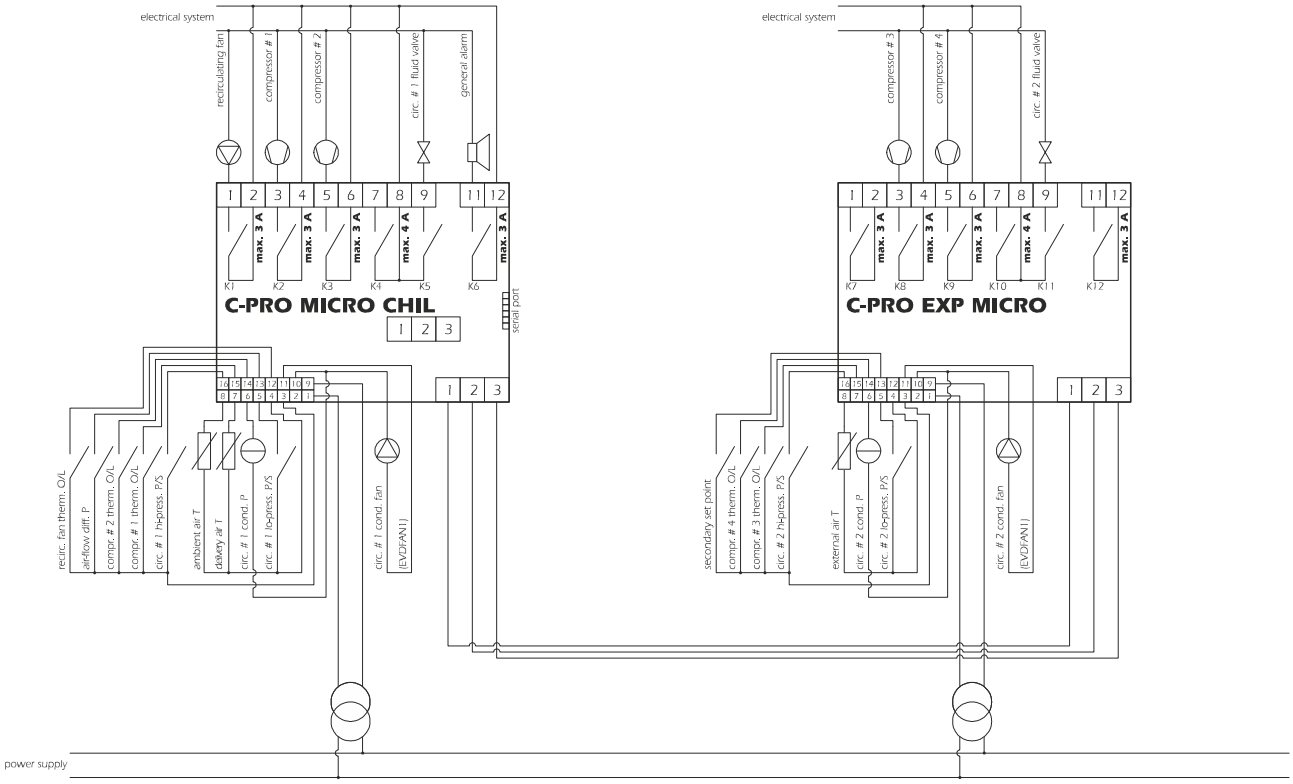
2.6.1 Air-to-air twin-circuit chiller units

Using C-PRO NANO CHIL and C-PRO EXP MICRO.



The power supplies of C-PRO NANO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.

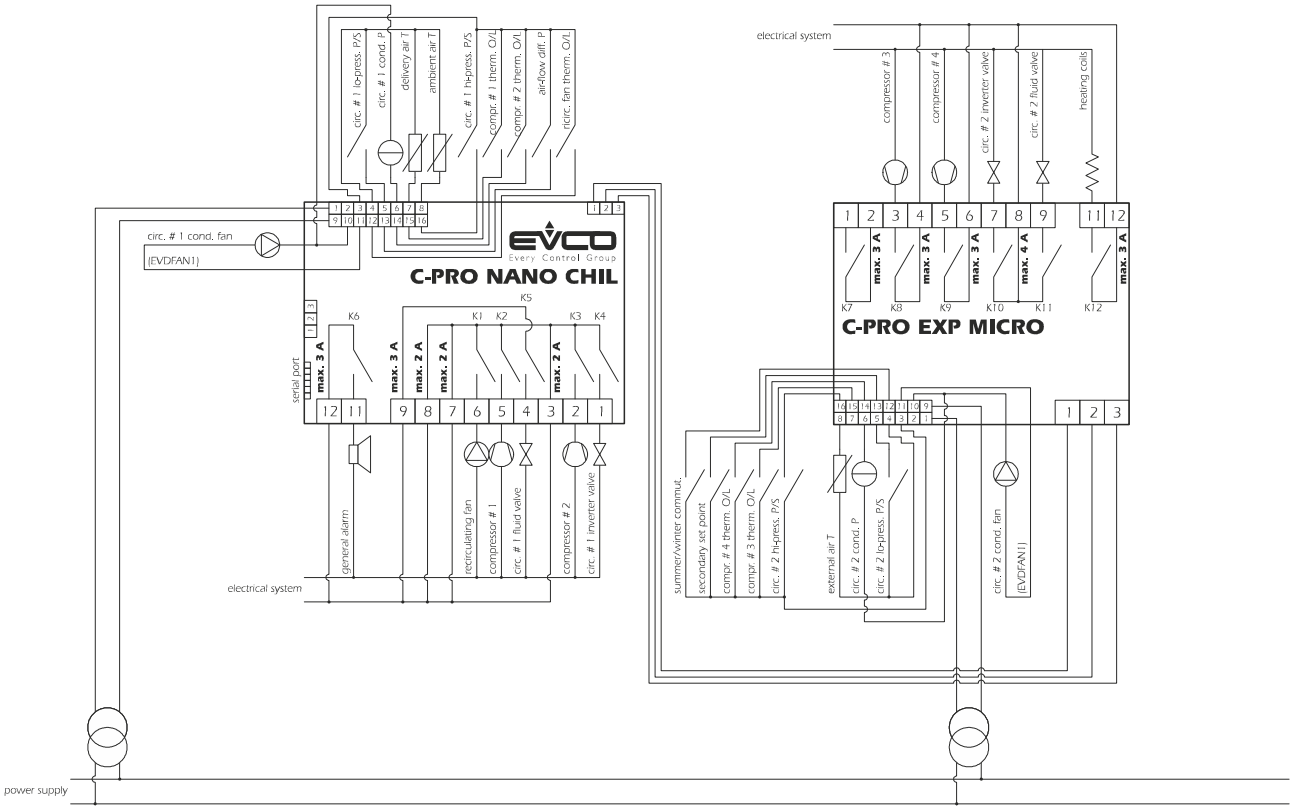
Using C-PRO MICRO CHIL and C-PRO EXP MICRO.



The power supplies of C-PRO MICRO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.

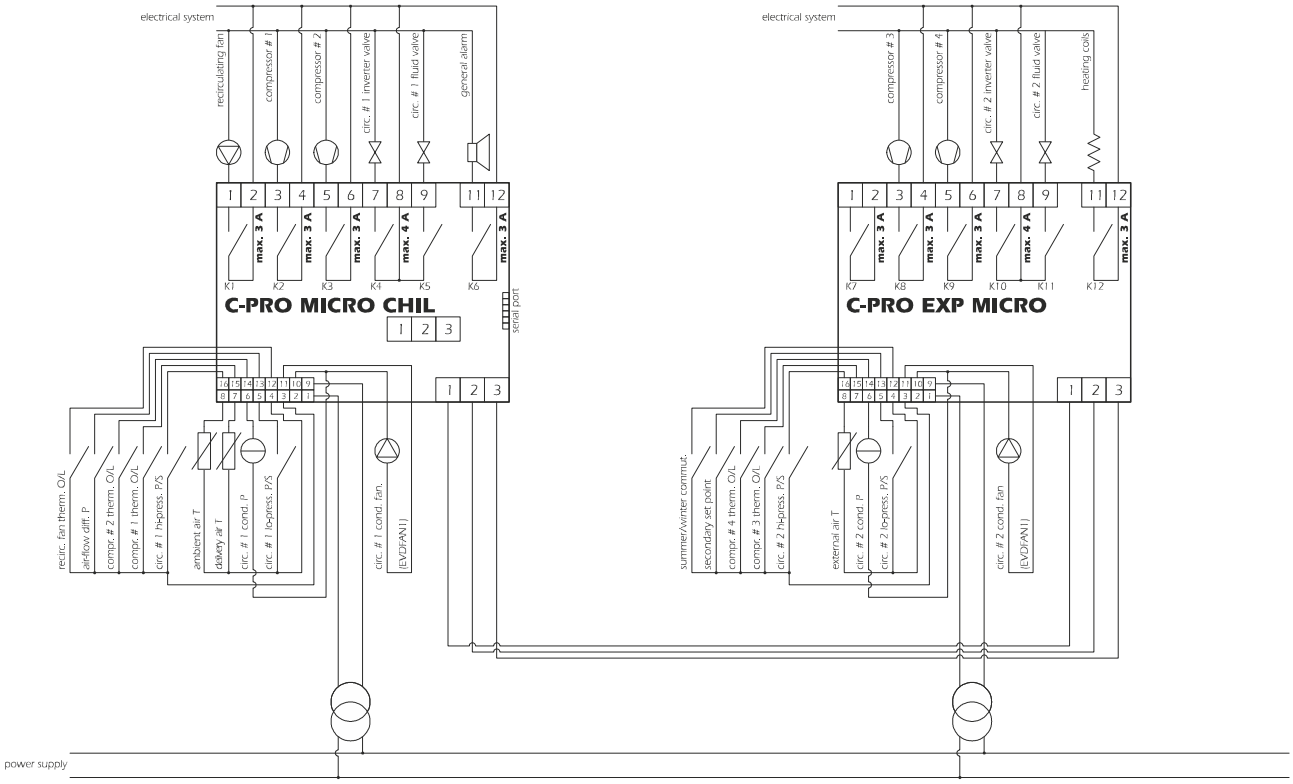
2.6.2 Air-to-air twin-circuit chiller units + heat pump

Using C-PRO NANO CHIL and C-PRO EXP MICRO.



The power supplies of C-PRO NANO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.

Using C-PRO MICRO CHIL and C-PRO EXP MICRO.

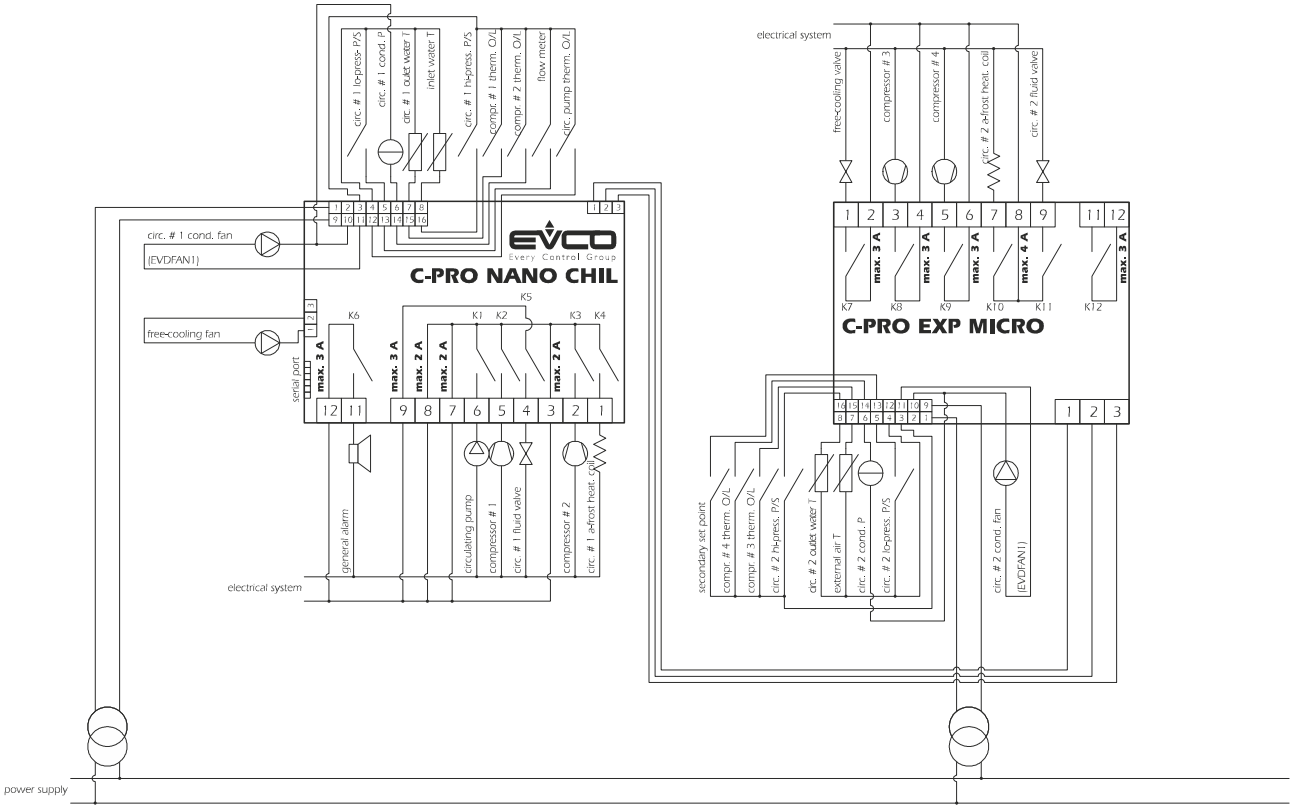


The power supplies of C-PRO MICRO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.

2.7 Air-to-water twin-circuit chiller units and air-to-water twin-circuit chiller units + heat pump

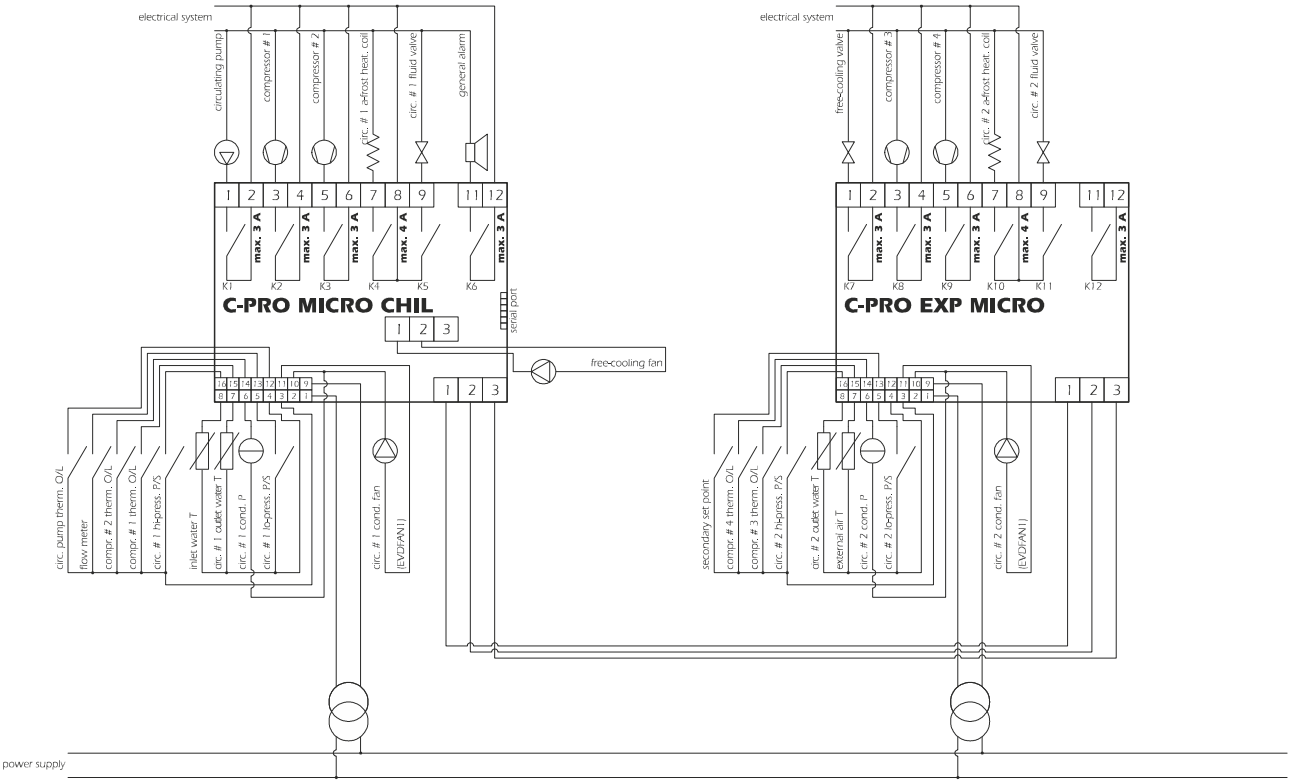
2.7.1 Air-to-water twin-circuit chiller units

Using C-PRO NANO CHIL and C-PRO EXP MICRO.



The power supplies of C-PRO NANO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.

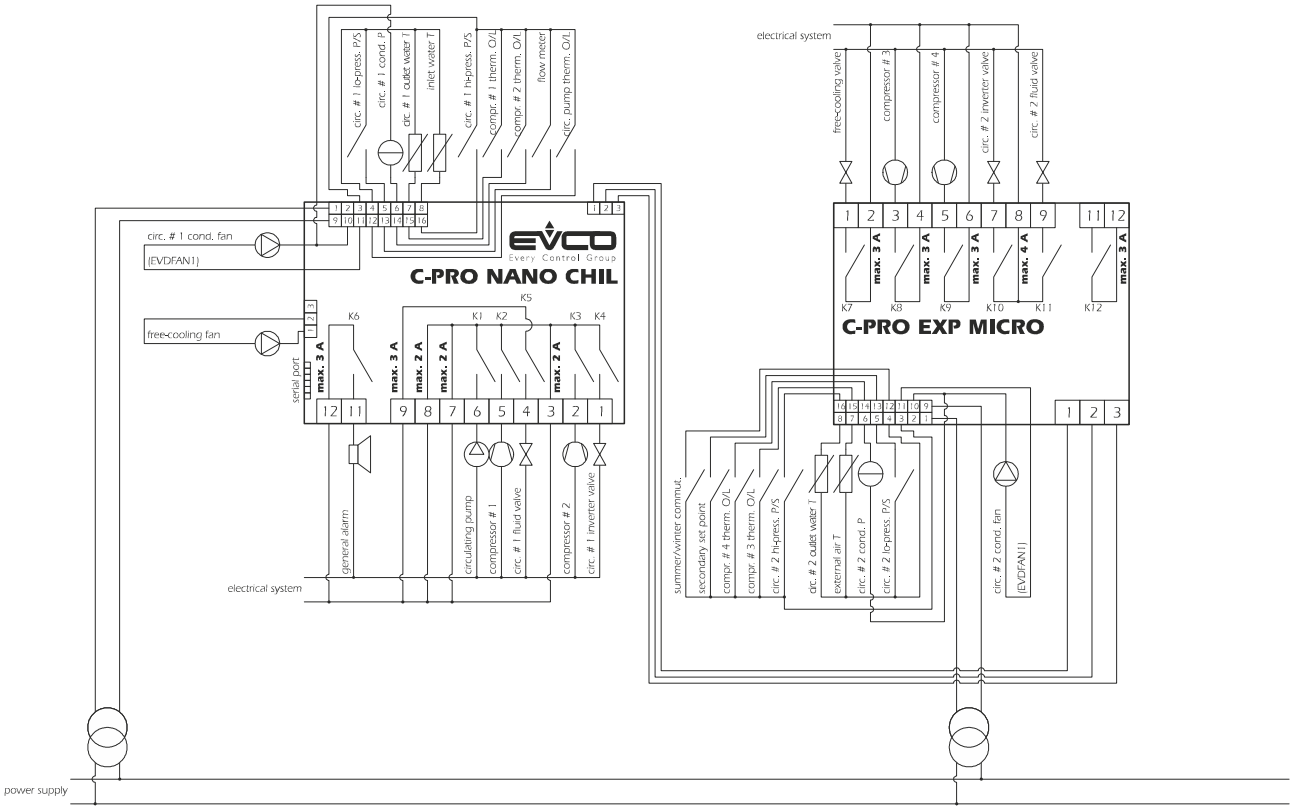
Using C-PRO MICRO CHIL and C-PRO EXP MICRO.



The power supplies of C-PRO MICRO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.

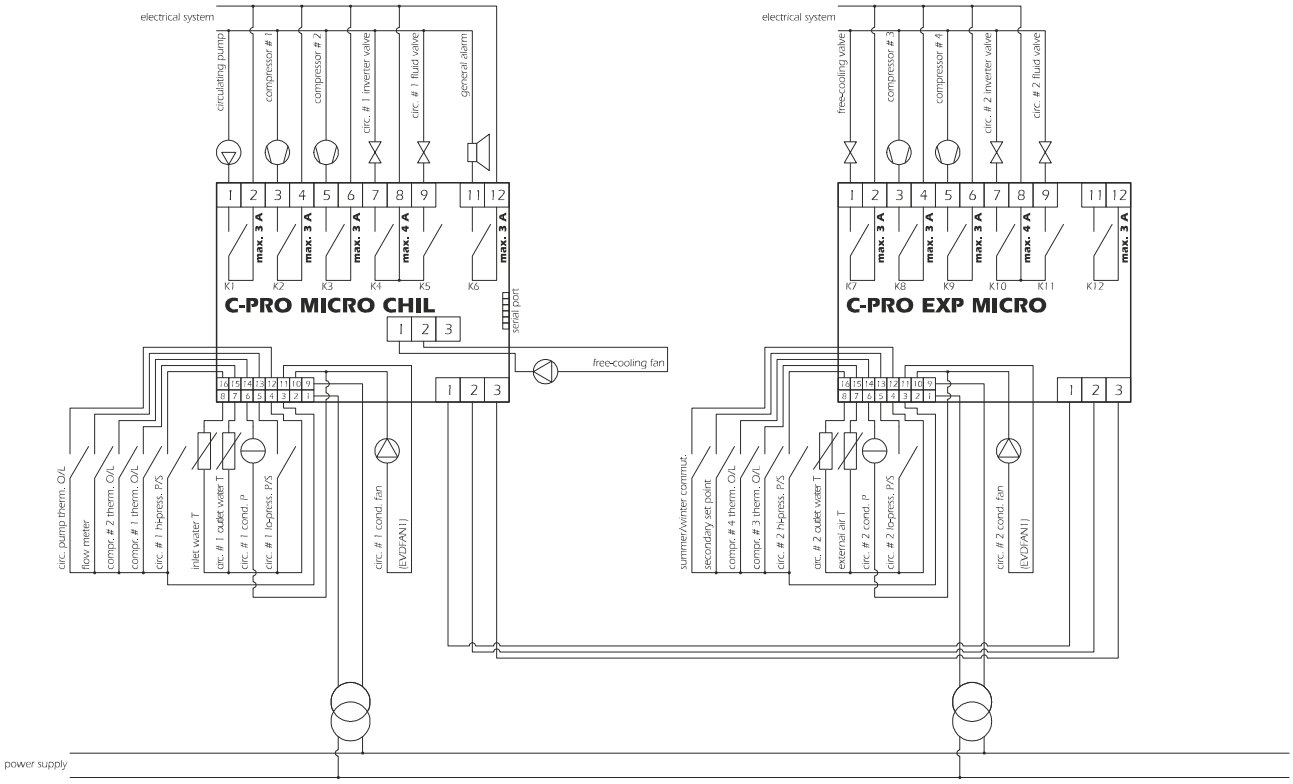
2.7.2 Air-to-water twin-circuit chiller units + heat pump

Using C-PRO NANO CHIL and C-PRO EXP MICRO.



The power supplies of C-PRO NANO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.

Using C-PRO MICRO CHIL and C-PRO EXP MICRO.

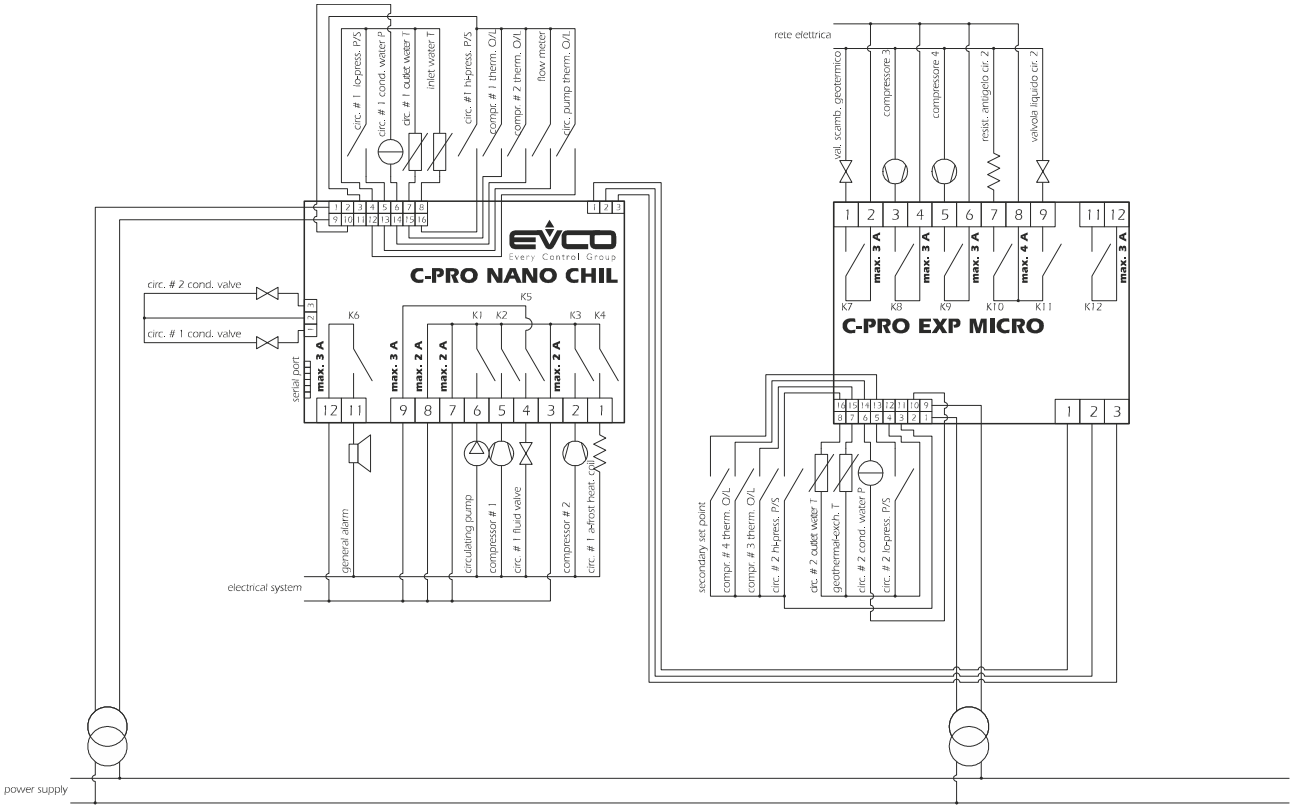


The power supplies of C-PRO MICRO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.

2.8 Water-to-water twin-circuit chiller units and water-to-water twin-circuit chiller units + heat pump

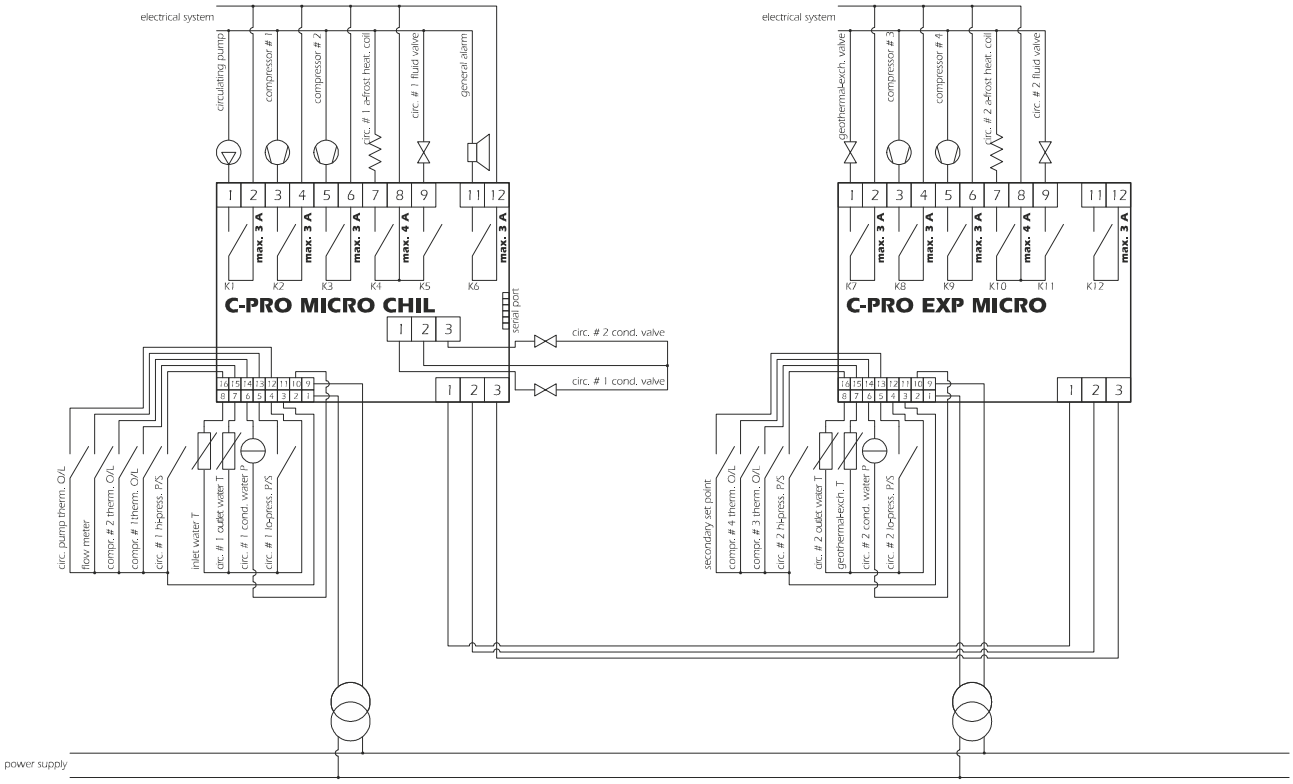
2.8.1 Water-to-water twin-circuit chiller units

Using C-PRO NANO CHIL and C-PRO EXP MICRO.



The power supplies of C-PRO NANO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.

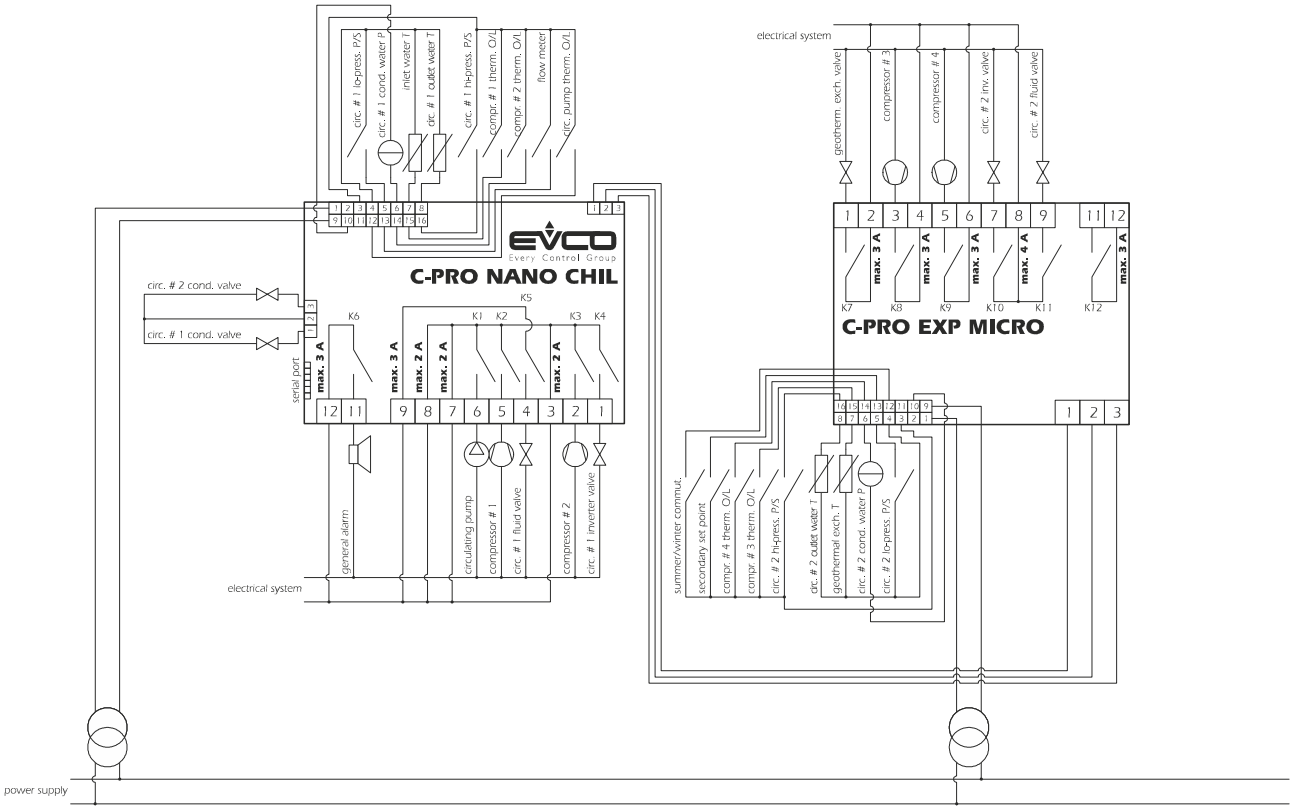
Using C-PRO MICRO CHIL and C-PRO EXP MICRO.



The power supplies of C-PRO MICRO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.

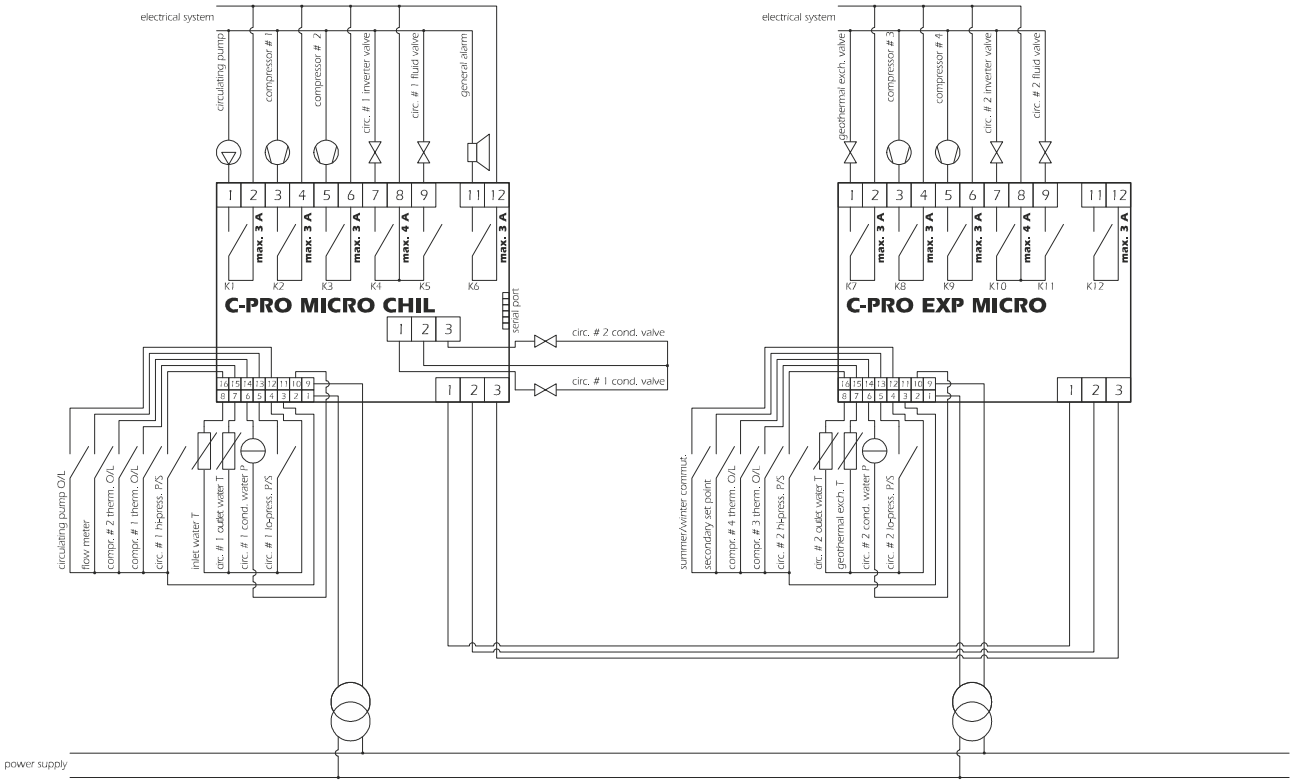
2.8.2 Water-to-water twin-circuit chiller units + heat pump

Using C-PRO NANO CHIL and C-PRO EXP MICRO.



The power supplies of C-PRO NANO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.

Using C-PRO MICRO CHIL and C-PRO EXP MICRO.

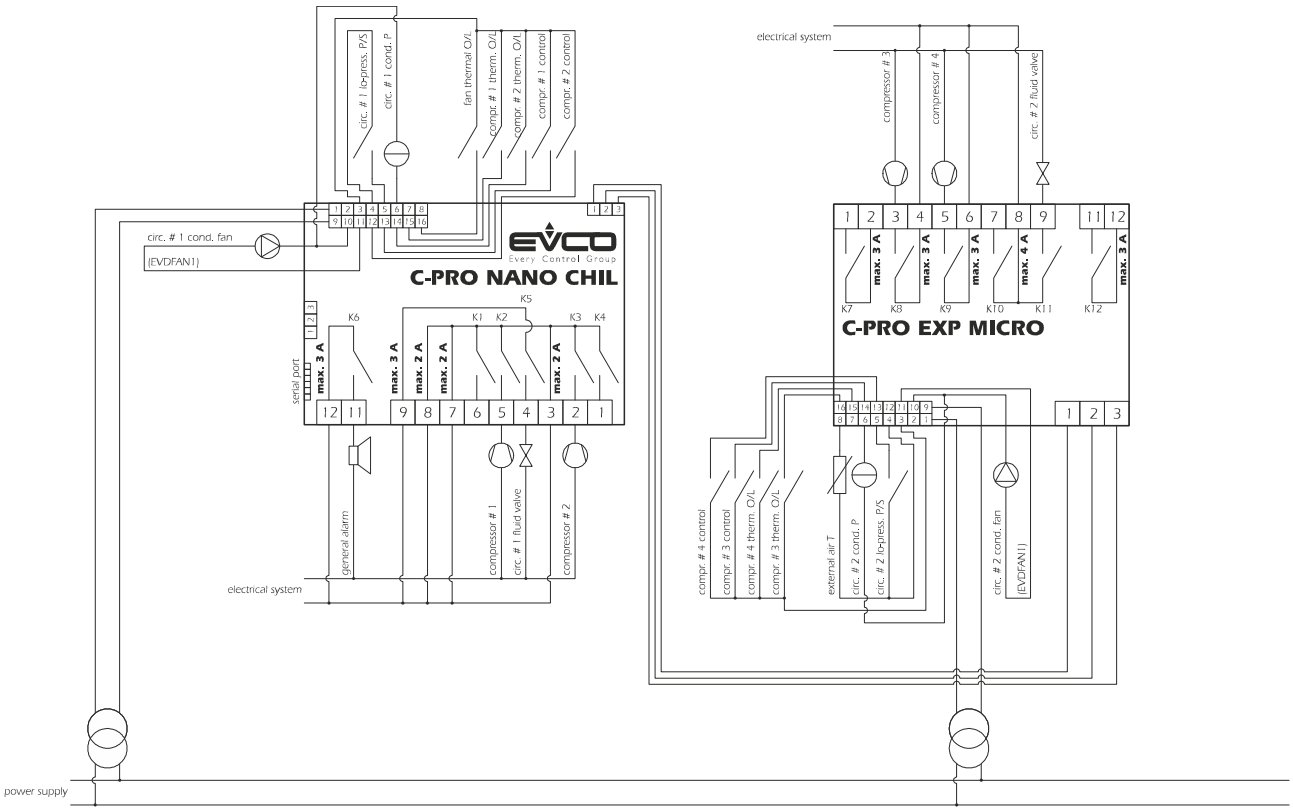


<u>The power supplies of C-PRO MICRO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.</u>

2.9 Twin-circuit motocondensing air-based units and twin-circuit motocondensing air-based units with cycle inversion

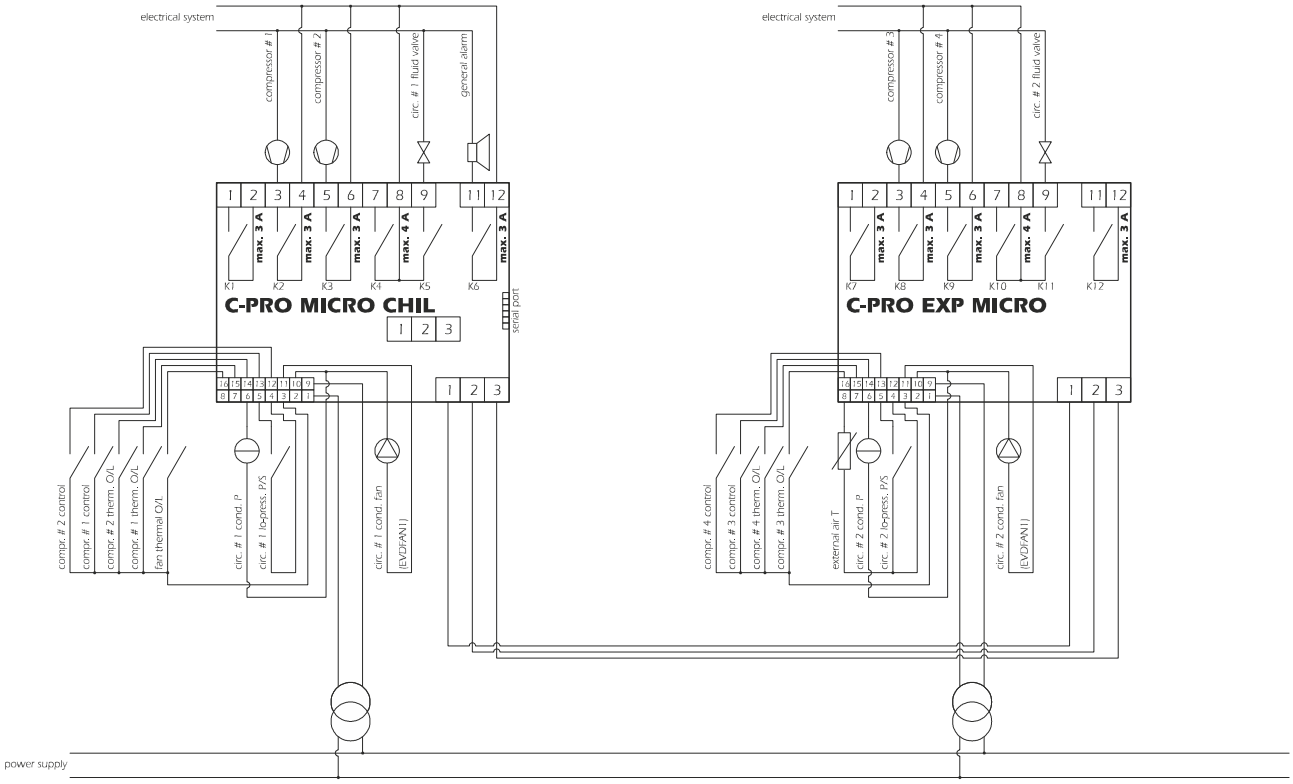
2.9.1 Twin-circuit motocondensing air-based units

Using C-PRO NANO CHIL and C-PRO EXP MICRO.



<u>The power supplies of C-PRO NANO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.</u>

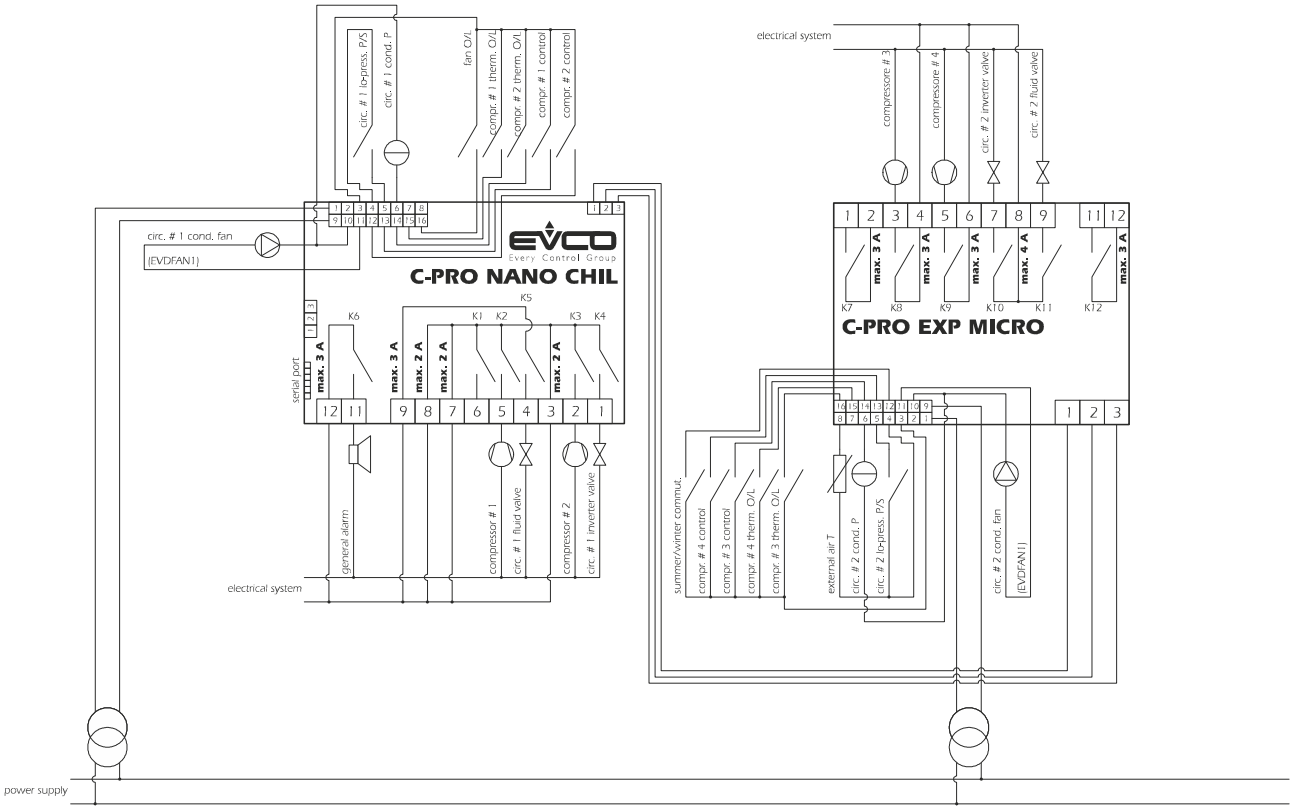
Using C-PRO MICRO CHIL and C-PRO EXP MICRO.



<u>The power supplies of C-PRO MICRO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.</u>

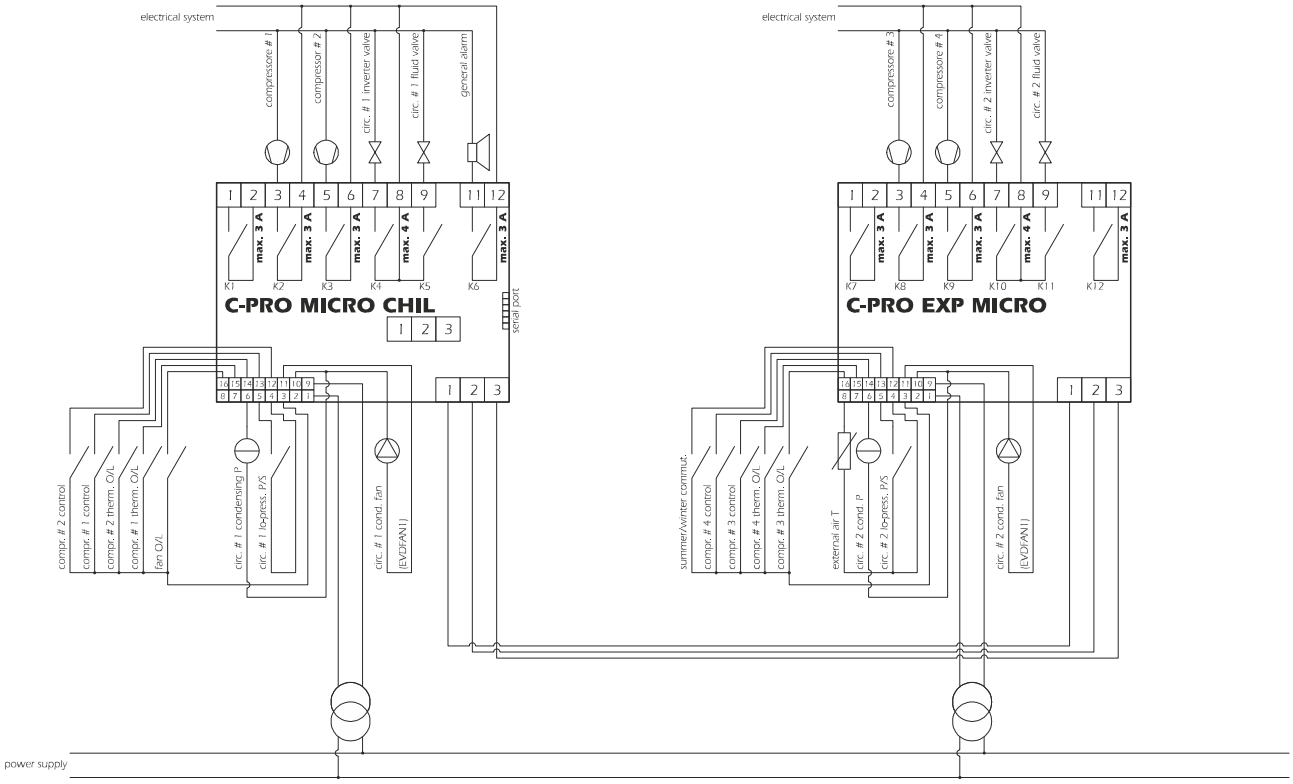
2.9.2 Twin-circuit motocondensing air-based units with cycle inversion

Using C-PRO NANO CHIL and C-PRO EXP MICRO.



The power supplies of C-PRO NANO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.

Using C-PRO MICRO CHIL and C-PRO EXP MICRO.

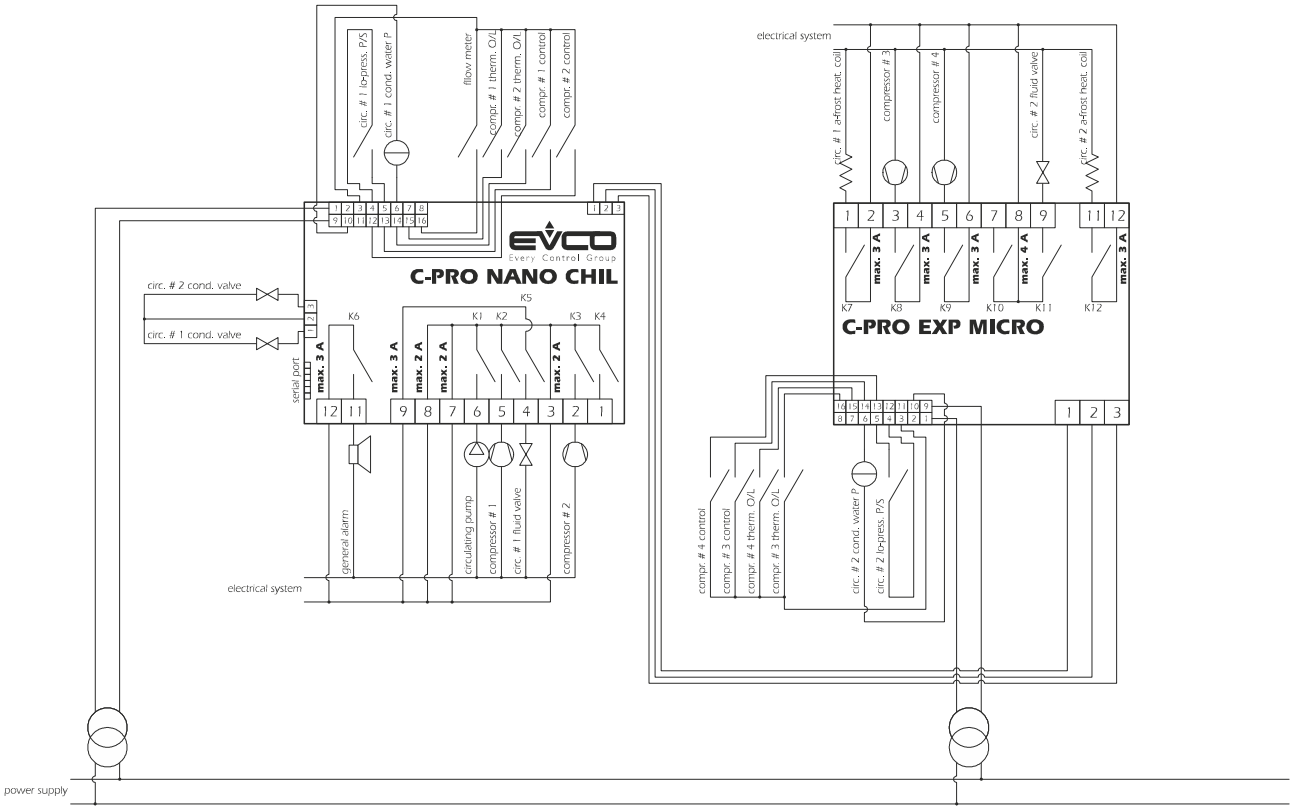


The power supplies of C-PRO MICRO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.

2.10 Twin-circuit motocondensing water-based units and twin-circuit motocondensing water-based units with cycle inversion

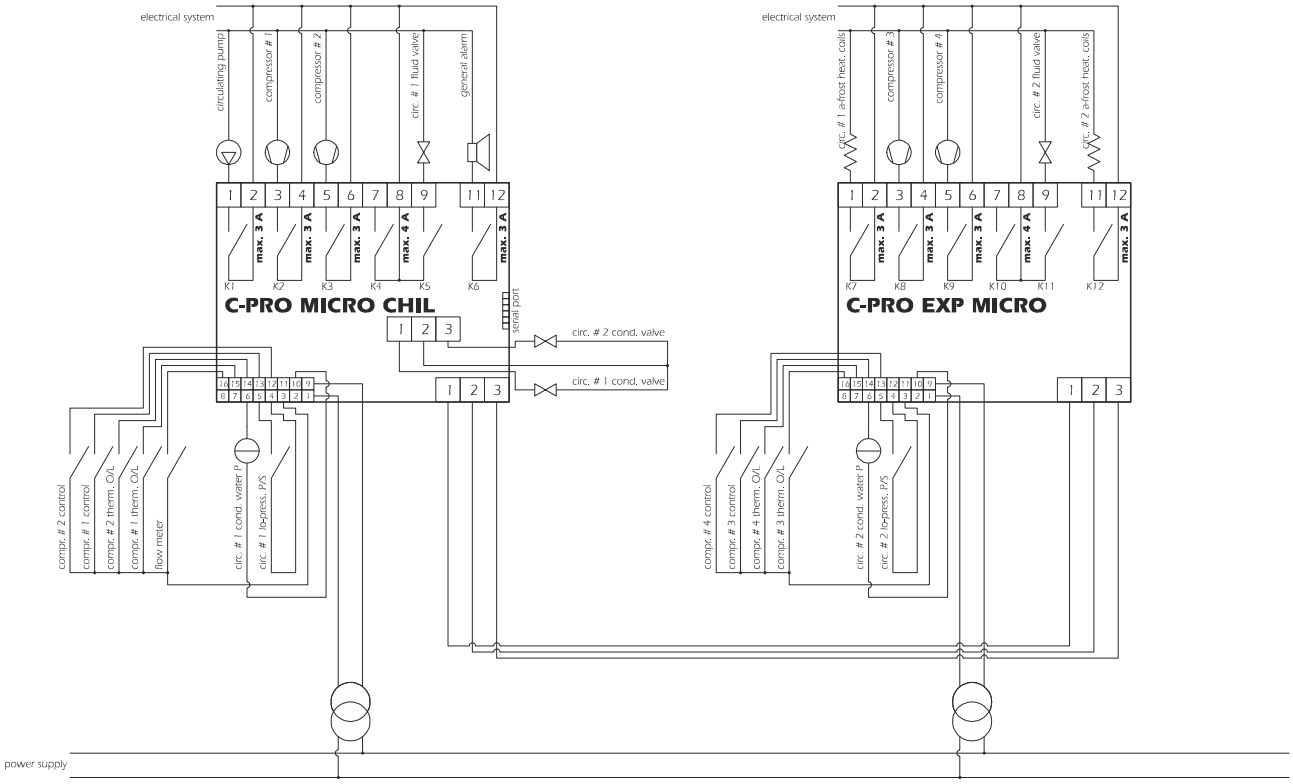
2.10.1 Twin-circuit motocondensing water-based units

Using C-PRO NANO CHIL and C-PRO EXP MICRO.



The power supplies of C-PRO NANO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.

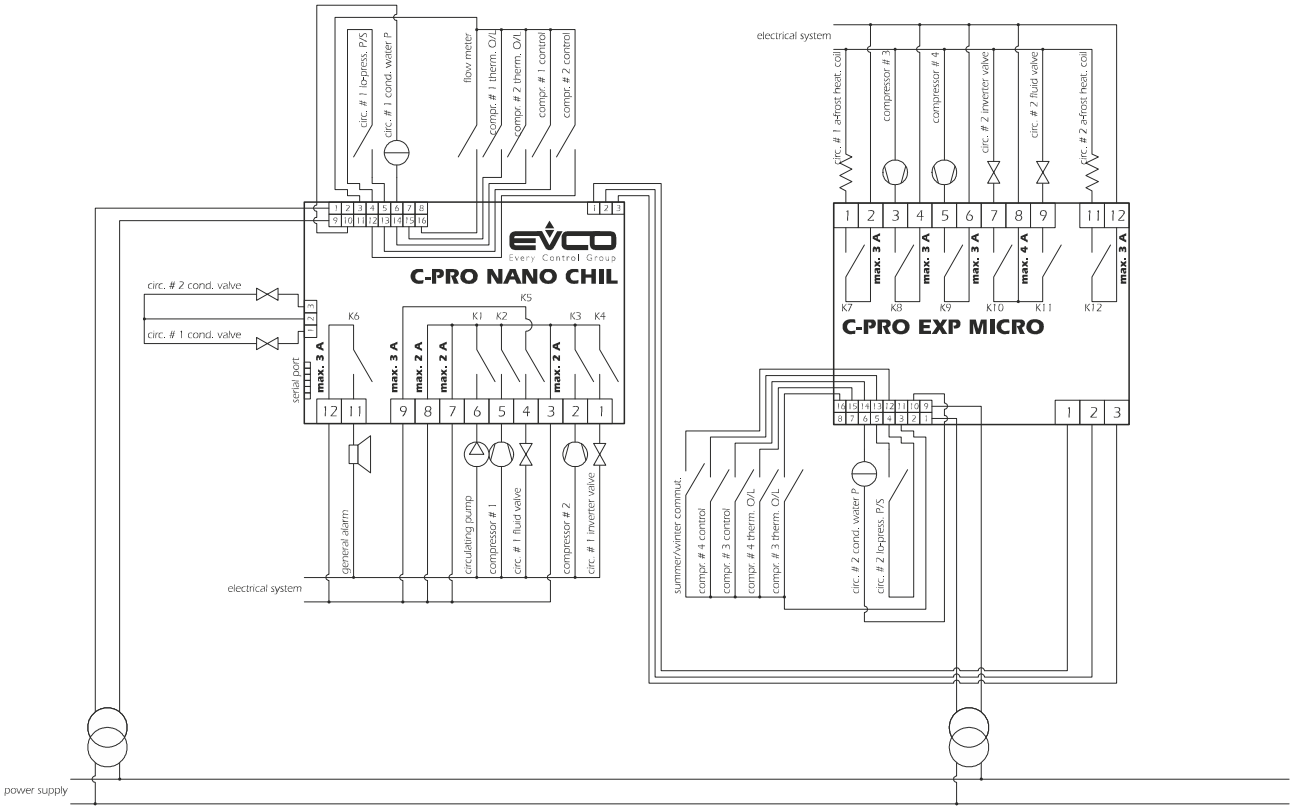
Using C-PRO MICRO CHIL and C-PRO EXP MICRO.



The power supplies of C-PRO MICRO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.

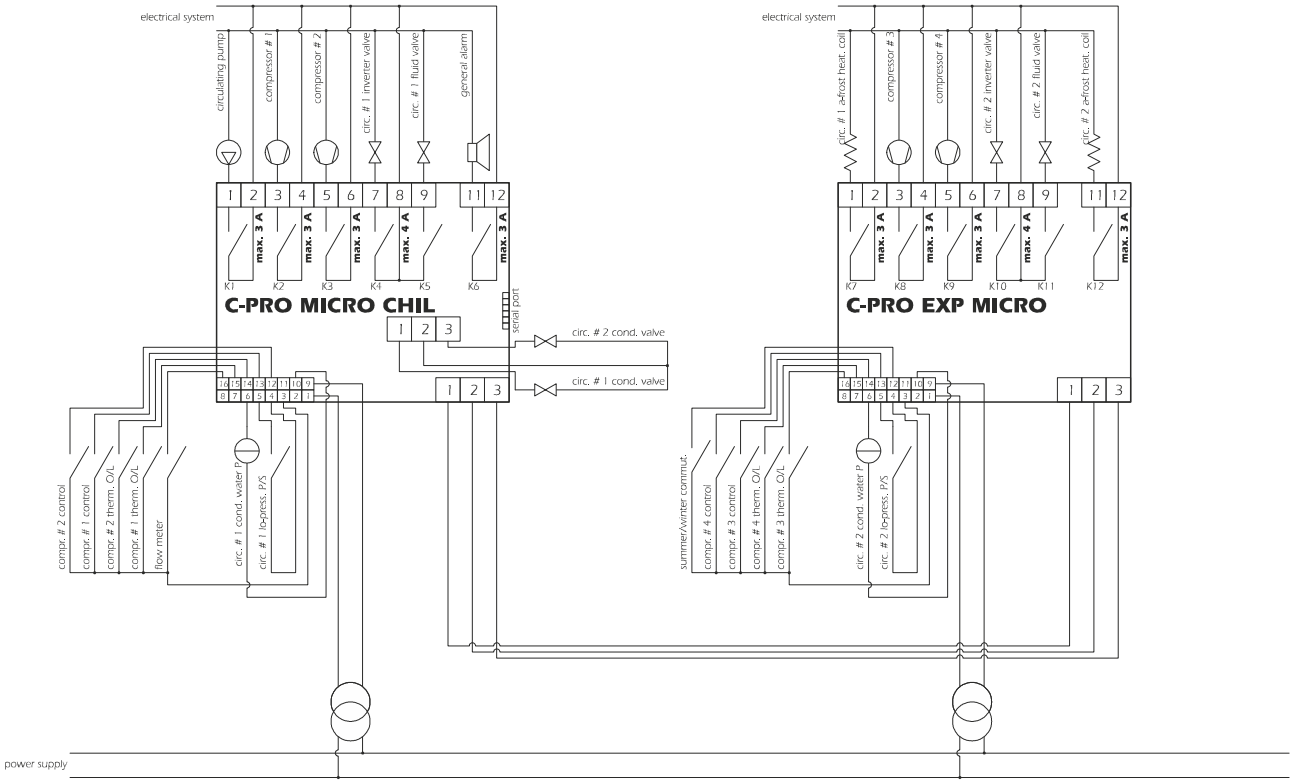
2.10.2 Twin-circuit motocondensing water-based units with cycle inversion

Using C-PRO NANO CHIL and C-PRO EXP MICRO.



The power supplies of C-PRO NANO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.

Using C-PRO MICRO CHIL and C-PRO EXP MICRO.



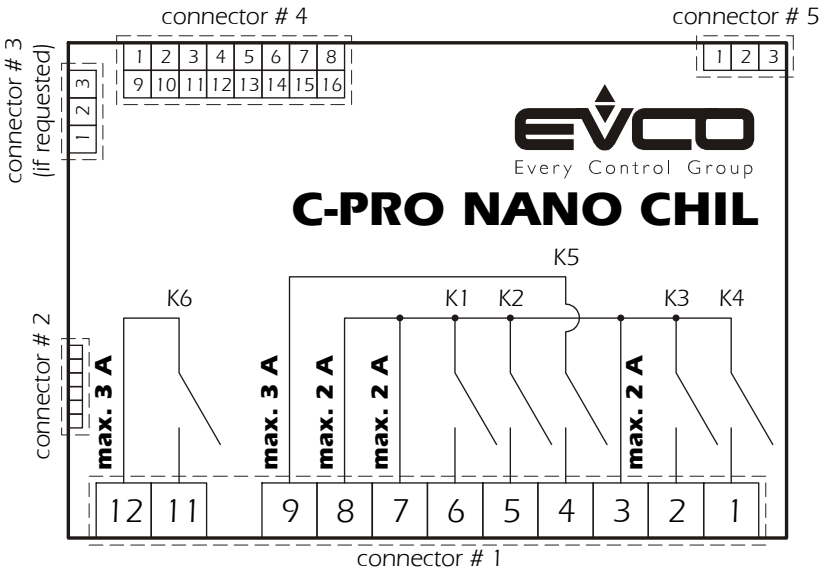
The power supplies of C-PRO MICRO CHIL and C-PRO EXP MICRO must be galvanically isolated from each other.

2.11 Connection Layout of C-PRO MICRO CHIL and C-PRO EXP MICRO

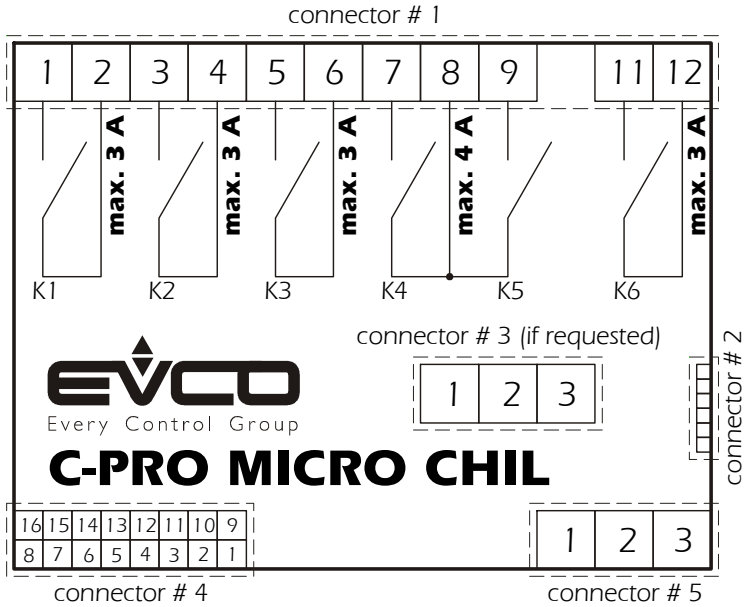
2.11.1 Connection layout of C-PRO NANO CHIL and C-PRO MICRO CHIL

The connection layout of C-PRO NANO CHIL and C-PRO MICRO CHIL is shown below, with related tables explaining the meaning of inputs and outputs.

C-PRO NANO CHIL:



C-PRO MICRO CHIL:



Connector 1: Connection for relay outputs

C-PRO NANO CHIL

Conn.	Label	Description
C1-1	DO4	Normally open contact relay # 4
C1-2	DO3	Normally open contact relay # 3
C1-3	COMMON 1	Common relays # 1, 2, 3, 4
C1-4	DO5	Normally open contact relay # 5
C1-5	DO2	Normally open contact relay # 2
C1-6	DO1	Normally open contact relay # 1
C1-7	COMMON 1	Common relays # 1, 2, 3, 4
C1-8	COMMON 1	Common relays # 1, 2, 3, 4
C1-9	COMMON DO5	Common relay # 5
C1-10		Not in use
C1-11	DO6	Normally open contact relay # 6
C1-12	COMMON DO6	Common relay # 6

C-PRO NANO CHIL

Connector 1: Connection for relay outputs

Conn.	Label	Description
C1-1	DO1	Normally open contact relay # 1
C1-2	COMMON DO1	Common relay # 1
C1-3	DO2	Normally open contact relay # 2
C1-4	COMMON DO2	Common relay # 2
C1-5	DO3	Normally open contact relay # 3
C1-6	COMMON DO3	Common relay # 3
C1-7	DO4	Normally open contact relay # 4
C1-8	COMMON 1	Common relays # 4, 5
C1-9	DO5	Normally open contact relay # 5
C1-10		Not in use
C1-11	DO6	Normally open contact relay # 6
C1-12	COMMON DO6	Common relay # 6

Connector 2: Connection for EVKEY (parameter upload/download key) and output for TTL-RS-485 module.

Connector 3: Connector for optional analogue outputs (AO2 and AO3)

Conn.	Label	Description (Version V+I)
C3-1	OUT1	0-10 V dc
C3-2	GND	Common analogue output
C3-3	OUT2	0(4)-20 mA
		Description (Version I+I)
C3-1	*OUT1*	*0(4)-20 mA*
C3-2	*GND*	*Common analogue output*
C3-3	*OUT2*	*0(4)-20 mA*
		Description (Version V+V)
C3-1	OUT1	0-10 V dc
C3-2	GND	Common analogue output
C3-3	OUT2	0-10 V dc

Connector 4: Connector for low-voltage signals

Conn.	Label	Description
C4-1	12 V AC (power supply)	Instrument power supply (12 V AC/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 # 4 (NTC probe, 0-20 or 4-20 mA transducer)
C4-6	AI3	Analogue input # 3 (NTC probe, 0-20 or 4-20 mA transducer)
C4-7	AI2	Analogue input # 2 (NTC probe)
C4-8	AI1	Analogue input # 1 (NTC probe)
C4-9	12 V AC (power supply)	Instrument power supply (12 V AC/DC)
C4-10	12 V DC	Power supply for current transducers and EVCO's EVDFAN1 phase-cut module (12 V DC)
C4-11	AO1	Output for EVCO's EVDFAN1 phase-cut module
C4-12	DI5	Digital input # 5
C4-13	DI4	Digital input # 4
C4-14	DI3	Digital input # 3
C4-15	DI2	Digital input # 2
C4-16	DI1	Digital input # 1

To enable the use of the EVDFAN1 phase-cut module, the controller must be powered by an alternating current supply; the controller's powering phase must be the same one that supplies the module.

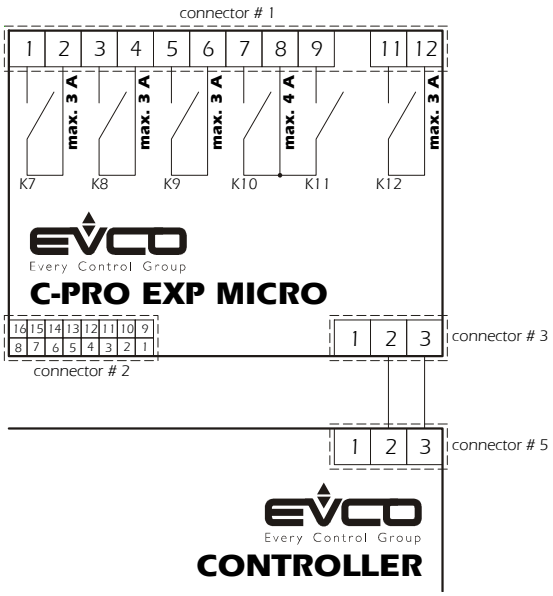
Connector 5: Connector for EVCO remote keyboard / expansion

Conn.	Label	Description
C5-1	12 V DC	Power supply for remote keyboard (12 V DC, 50 mA max.)
C5-2	GND	Common
C5-3	SERIAL	EVCO live serial port

The power supplies of the controller and the expansion must be galvanically isolated from each other.

2.11.2 Connection layout of C-PRO EXP MICRO

The connection layout of C-PRO EXP MICRO is shown below, with related tables explaining the meaning of inputs and outputs.



Connector 1: Connection for relay outputs

Conn.	Label	Description
C1-1	DO7	Normally open contact relay # 7
C1-2	COMMON DO7	Common relay # 7
C1-3	DO8	Normally open contact relay # 8
C1-4	COMMON DO8	Common relay # 8
C1-5	DO9	Normally open contact relay # 9
C1-6	COMMON DO9	Common relay # 9
C1-7	DO10	Normally open contact relay # 10
C1-8	COMMON 1	Common relays # 10, 11
C1-9	DO11	Normally open contact relay # 11
C1-10		Not in use
C1-11	DO12	Normally open contact relay # 12
C1-12	COMMON DO12	Common relay # 12

Connector 2: Connector for low-voltage signals

Conn.	Label	Description
C2-1	12 V AC (power supply)	Instrument power supply (12 V AC/DC)
C2-2	Not connected	Not connected
C2-3	GND	Common analogue and digital inputs
C2-4	GND	Common analogue and digital inputs
C2-5	AI8	Analogue input # 8 (4-20 mA transducer)
C2-6	AI7	Analogue input # 7 (4-20 mA transducer)
C2-7	AI6	Analogue input # 6 (NTC probe)
C2-8	AI5	Analogue input # 5 (NTC probe)

C2-9	12 V AC (power supply)	Instrument power supply (12 V AC/DC)
C2-10	12 V DC	Power supply for current transducers and EVCO's EVDFAN1 phase-cut module (12 V DC)
C2-11	AO4	Output for EVCO's EVDFAN1 phase-cut module
C2-12	DI11	Digital input # 11
C2-13	DI10	Digital input # 10
C2-14	DI9	Digital input # 9
C2-15	DI8	Digital input # 8
C2-16	DI7	Digital input # 7

To enable the use of the EVDFAN1 phase-cut module, the expansion must be powered by an alternating current supply; the expansion's powering phase must be the same one that supplies the module.

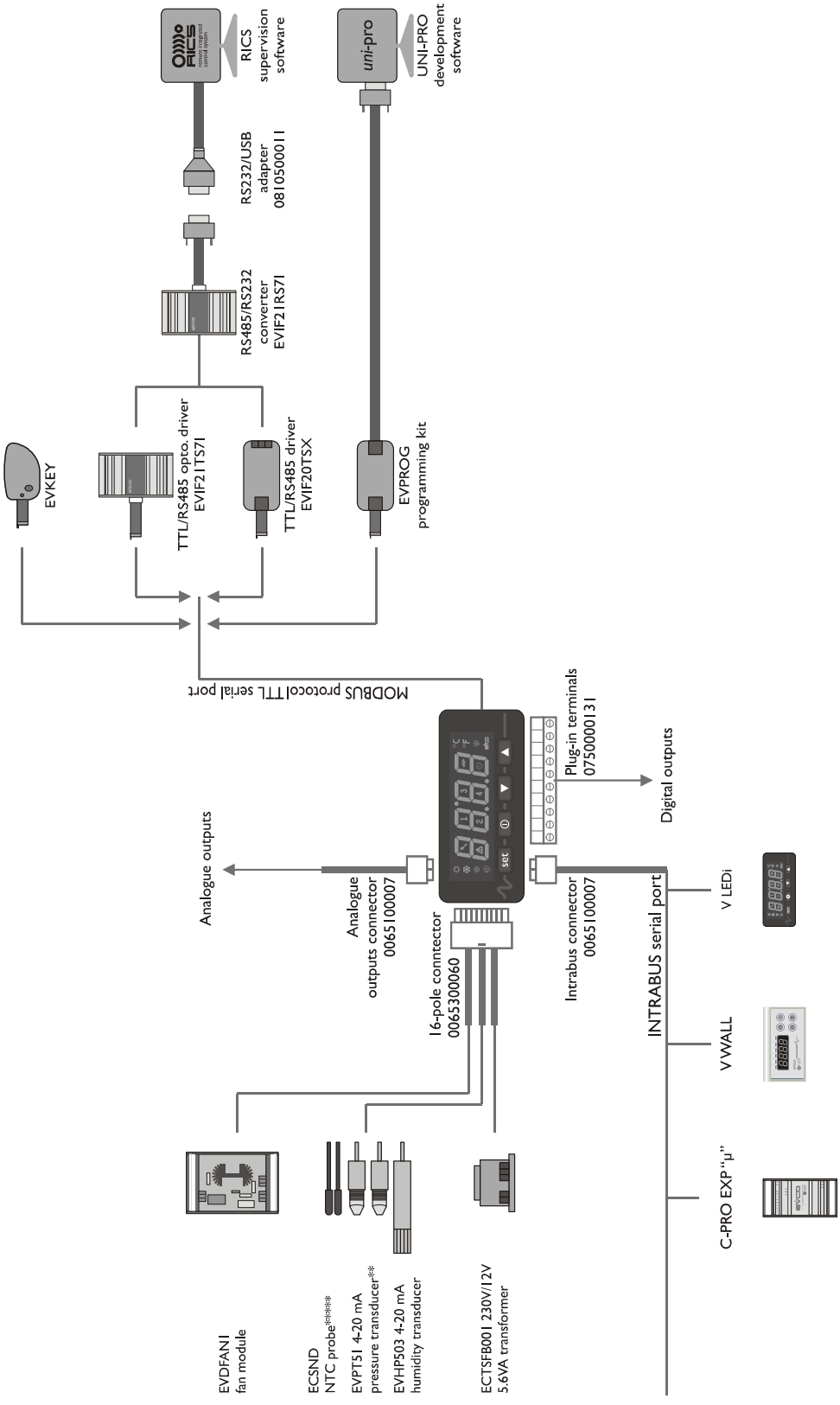
Connector 3: Connector for the controller

Conn.	Label	Description
C3-1	12 V DC	Power supply (12 V DC, 50 mA max.)
C3-2	GND	Common
C3-3	SERIAL	EVCO live serial port

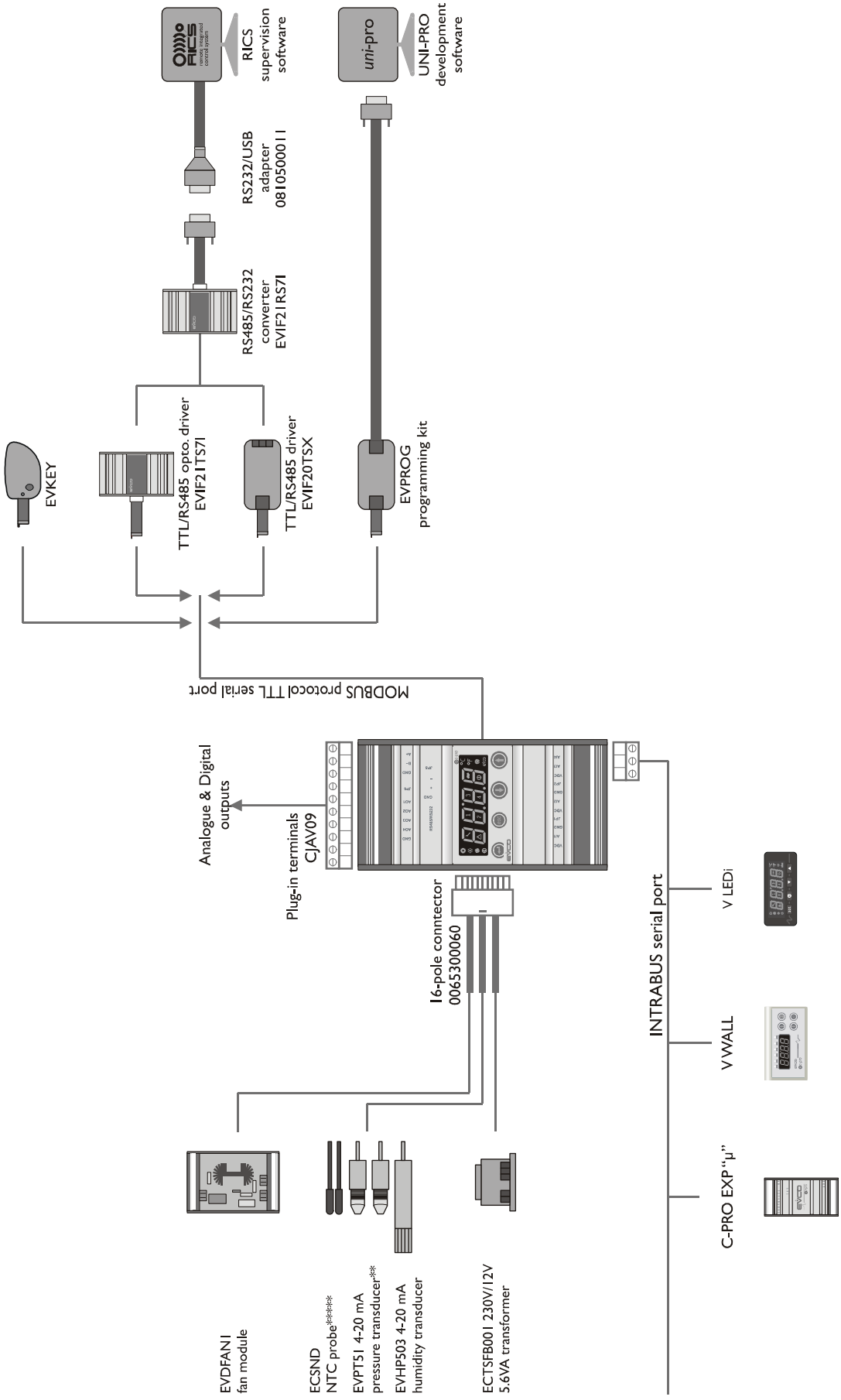
The power supplies of the controller and the expansion must be galvanically isolated from each other.

3 Component Network and Accessories

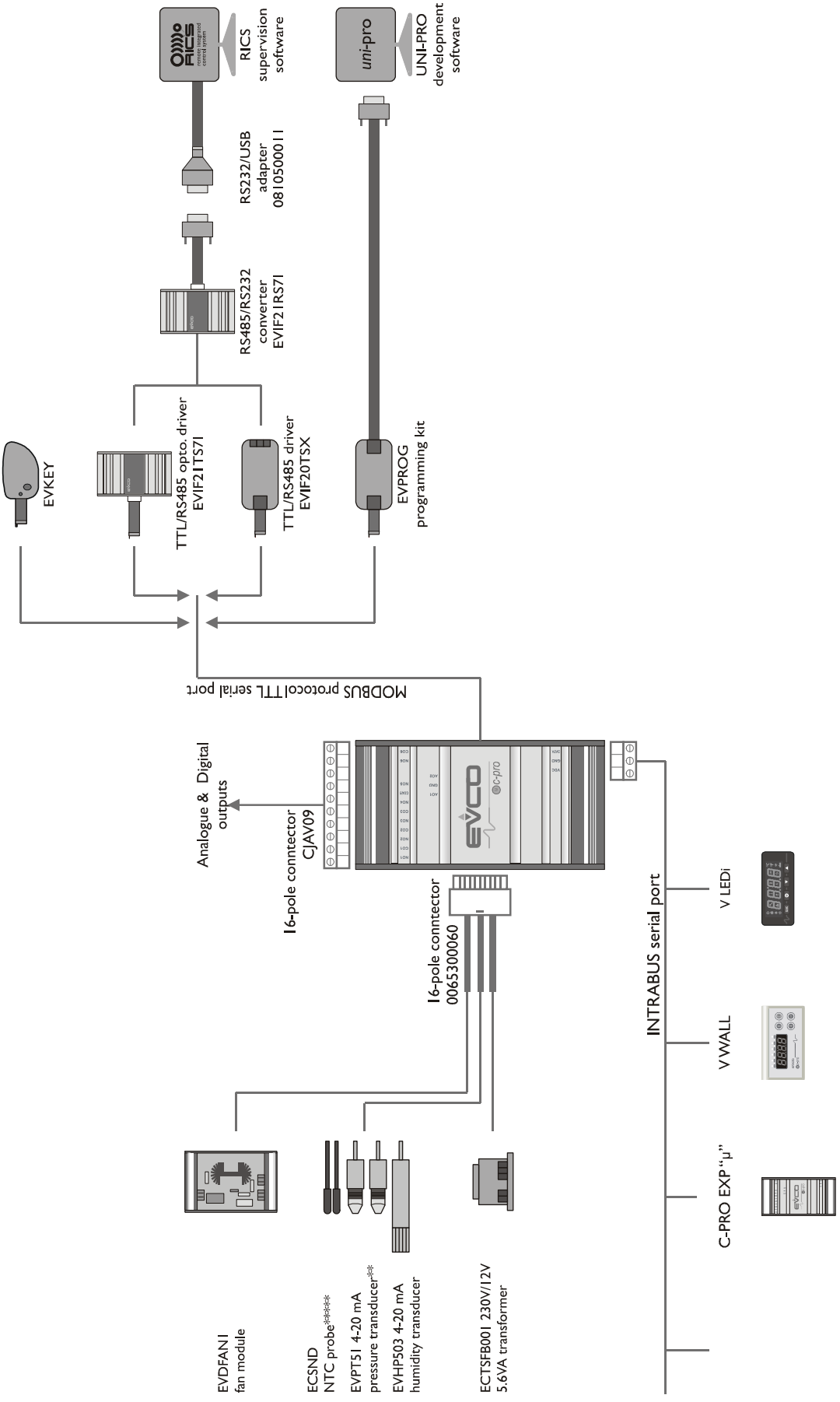
3.1 Example of C-PRO NANO CHIL



3.2 Example of C-PRO MICRO CHIL (built-in version)



3.3 Example of C-PRO MICRO CHIL (blind version)



4 USER INTERFACE

4.1 Displays and Keyboards

For the application, two types of interface are provided:

- a built-in 4-display interface with 7 segments;
- a remote 4-display interface with 7 segments.

Both interfaces feature 4 keys for navigation/page editing, and differ in their display mode of certain associated statuses, i.e. via icons (built-in version) or LED (remote version).

For both versions, a description is provided of the keys and LEDs used by the application; indeed, according to the interface in use, it is possible to manage a different number of keys and LEDs.

Local built-in interface

The built-in interface is integrated into the controller being in use.

C-PRO NANO CHIL

C-PRO MICRO CHIL
(built-in version)

The keyboard features 4 page navigation and value editing keys, which have the following functions:

- UP and DOWN: in editing, it modifies parameters; otherwise, it moves the cursor. If pressed down and held for about 2 seconds during the display of the main page, the UP key enables the display of the other probes, according to the following table.

tin	Inlet temperature probe (---, if disabled)
tou1	Circuit 1 outlet temperature probe (---, if disabled)
PrS1	Circuit 1 condensing pressure probe (---, if disabled)
tou2	Circuit 2 outlet temperature probe (---, if disabled)
PrS2	Circuit 2 condensing pressure probe (---, if disabled)
tEXt	External temperature probe (---, if disabled)
Evp1	Circuit 1 evaporating pressure probe (---, if disabled)
Evp2	Circuit 2 evaporating pressure probe (---, if disabled)
tAcc	Accumulation temperature probe (---, if disabled)

- SET / ENTER: During editing, it confirms the value; otherwise, it sends any commands associated to the text where the cursor is positioned. If pressed down and held for about 2 seconds, the ENTER key enables access to the main menu. If held down during display of an alarm page, this key enables resetting of the alarm. If alarm pages are being displayed, every key press scrolls all active alarms.

- STAND-BY / ESC: During editing, it cancels the value; otherwise, it requests any default page that might be associated with the current page. If pressed down and held for about 2 seconds, the ESC key enables ON/OFF switching of the machine. If pressed in the main page, this key enables access to the list of al active alarms.

In addition , the following icons are also used:

- Summer icon: This identifies the summer operating mode (chiller): if there is a request from the thermoregulator, the icon remains lit, otherwise it flashes (stand-by). When the heat pump is operating, it remains off. Its significance may be exchanged with that of the winter icon, via parameter PH53.

- Winter icon: This identifies the winter operating mode (heat pump): it the thermoregulator requests its, it remains lit, otherwise it flashes (stand-by). When the chiller is operating, it remains off, unless free-cooling is enabled, in which case it flashes rapidly. The significance may be exchanged with the summer icon via the PH53 parameter.

- Fan icon: This identifies the status of fans. If it is lit, at least one fan is on; if it flashes slowly, at least one fan is in alarm condition; if it flashes rapidly, at least one fan is operating in manual mode; otherwise, it remains off.

- Pump icon: This identifies the status of the pump or of the delivery fan. If it is lit, at least one pump is on; if it flashes rapidly, this indicates that a timing is enabled; if it flashes slowly, this indicates that at least in one of the two pumps (or delivery fan) thermal protection has been triggered.

- Maintenance icon: This identifies a maintenance request. If it is lit, at least one compressor or fan is operating manually; if it flashes, at least one compressor or fan has exceeded the number of operating hours; otherwise, it remains off.

- Alarm icon: This identifies the presence of any alarms. If it is lit, alarms are present, otherwise it remains off. If flashing, it indicates the presence of a new alarm that has yet to be displayed. When the machine is shut down, the icon flashes in the presence of any alarms.

- Icons 1, 2 ,3: These identify the status of the individual compressors. If it is lit, the compressor is on; if it flashes slowly, the compressor is in an alarm condition; rapid flashing indicates a current timing for an imminent shutdown or start-up; otherwise, it remains off. In the case of a twin circuit, only icons 1 and 2 are used, to signify the following: lit means that at least one compressor in that circuit is on; slow flashing means that at least one compressor is in alarm condition; rapid flashing means that at least one compressor is operating manually; otherwise, it remains off. These icons are enabled/disabled via the PH51 parameter.

- Anti-frost resistor icon: This identifies the status of setting and of the anti-frost alarm. If it is lit, resistors are enabled; flashing indicates an active alarm; otherwise, it remains off.

- Stand-by icon: This is linked to the ESC key and identifies the machine status.
  Off: The machine is off.
  Lit: The machine is on.
  Slow flashing: The machine has been shut down by a digital input.
  Rapid flashing: The machine has been shut down by a supervisor.

- Defrosting icon: This identifies the defrosting status. If it is lit, a defrosting cycle is in progress; slow flashing indicates a current timing cycle to start defrosting; rapid flashing indicates dripping; otherwise, it remains off.

- °C/°F icon: This indicates the temperature measurement unit of the selected probe.

Remote interface

V LEDi
Panel-mounted version

V WALL
Wall-mounted version

The keyboard features 4 page-navigation and value-editing keys, which have the following functions:

- UP and DOWN: During editing, it modifies parameters; otherwise, it moves the cursor. If pressed down and held for about 2 seconds during the display of the main page, the UP key enables the display of the other probes.

- SET / ENTER: During editing, it confirms the value; otherwise, it sends any commands associated to the text where the cursor is positioned. If pressed down and held for about 2 seconds, the ENTER key enables access to the main menu. If held down during display of an alarm page, this key enables resetting of the alarm. If alarm pages are being displayed, every key press scrolls all active alarms.

- STAND-BY / ESC: During editing, it cancels the value; otherwise, it requests any default page that might be associated with the current page. If pressed and held down for about 2 seconds, the ESC key enables switching on/freezing of the machine; if pressed in the main page, it enables access to the list of all active alarms.

In addition, the following LEDs are also used:

- L1 = Summer LED: This identifies the summer operating mode (chiller): in case of a request from the thermoregulator, it remains lit, otherwise it flashes (stand-by). When the heat pump is operating, it remains off.

- L2 = Defrosting LED: This identifies the status of defrosting. If it is lit, a defrosting cycle is in progress; slow flashing indicates a current timing cycle to start defrosting; rapid flashing indicates dripping; otherwise, it remains off.

- L3 = Winter LED: This identifies the winter operating mode (heat pump): if there is a request from the thermoregulator, it remains lit, otherwise it flashes (stand-by). When the chiller is operating, it remains off, unless free-cooling is enabled, in which case it flashes rapidly.

- L4 = Compressor LED: This identifies the status of compressors. If it is lit, at least one compressor is on; if it flashes slowly, at least one compressor is in alarm condition; if it

flashes rapidly, at least one compressor is operating in manual mode; otherwise, it remains off.

- L5 = Pump LED: This identifies the status of the pump or of the delivery fan. If it is lit, at least one pump is on; if it flashes rapidly, this indicates that a timing is enabled; if it flashes slowly, this indicates that at least in one of the two pumps (or delivery fan) a thermal protection has been triggered.

- L6 = Alarm LED: This identifies the presence of any alarms. If it is lit, alarms are present, otherwise it remains off. If flashing, it indicates the presence of a new alarm that has yet to be displayed. When the machine is switched off, the LED flashes in the presence of any alarms.

4.2 List of Pages

This chapter describes the main pages and menus featured in the application. As already described earlier, the general menu is subdivided into four levels: user, maintenance operator, installation operator, and constructor.

The menu structure is the following:

- General Menu
- User menu (Level 1)
- Maintenance operator menu (Level 2)
  - Operating branch maintenance menu
  - Manual branch maintenance menu
  - Calibration branch maintenance menu
  - Input/output branch maintenance menu
- Installation operator menu (Level 3)
  - Compressor branch installation menu
  - Setting branch installation menu
  - Condensation branch installation menu
  - Defrosting branch installation menu
  - Pump branch installation menu
  - Anti-frost branch installation menu
  - Free-cooling branch installation menu
  - Safety device branch installation menu
  - Miscellaneous branch installation menu
- Constructor menu (Level 4)
  - Plant branch constructor menu (configuration wizard)
  - Hardware branch constructor menu
  - Parameter branch installation menu

Password

Each menu is assigned a level, which affects the accessibility of the various menus.
Each level is assigned a password, which enables access to the various functions featured in that menu; once the correct password has been entered, protected functions become accessible. Entering of the correct password has two consequences:

- unlocking of the related level;

· unlocking of its sublevels.

All level passwords can be modified from the same level or from higher levels. For example, from the constructor level it will be possible to modify all passwords of underlying levels, by using the appropriate page.
The range of values that can be set for a password is -999 / 9999.
After 4 minutes have elapsed without any key being pressed, the password expires and it is necessary to reset it.

Main Page

The main display page varies according to the machine status, i.e. on or off:

- If the machine is switched OFF, **OFF** is displayed, or **OFFd**, if the cause for the shutdown is a lack of consensus from digital input; otherwise **OFFS** is displayed, if the shutdown is due to supervisor.
- If the machine is switched ON, the inlet temperature value is displayed (PC11=0), the outlet value (PC11=1), or the required power (PC11=2), according to the setting type (parameter PC11). In twin-circuit units, the average value of the two outlet temperatures is displayed. If the probe is faulty o disconnected, "**Err**" is displayed.

From this page, by pressing the DOWN key for about 2 seconds, it is possible to display all configured probes. In case of fault status of the probes, the value field of the corresponding probe displays **Err**, or else --- if the probe is disabled.
Pressing the ESC key from this page brings the user back to the main page.

General Menu

The general menu has no levels and represents the access point to all other system menus.

USEr (*USER* Menu)
MAin (*MAINTENANCE* Menu)
InSt (*INSTALLATION* Menu)
CoSt (*CONSTRUCTOR* Menu)
StAt (*MACHINE STATUS* Menu)

This menu can be displayed from any point of the user interface, holding down the ENTER key for about 2 seconds. From this page, it possible to choose which menu to access via the UP and DOWN keys, and then pressing the ENTER key to confirm the choice.
Pressing the ESC key from this menu, the user returns to the initial page, if the machine is switched ON; or else to the OFF page, if the machine is OFF.

StAt Menu

Selecting the *StAt* item from the general menu, the user enters the display of some of the plant's main statuses:

Unit: indicates the machine's current operating status (**OFF**, **ChIL, pdC, dEFr, dRIp, F-C**).
tdF1: accumulated waiting time for a defrosting cycle of circuit # 1.
dFr1: duration time of defrosting of circuit # 1.
tdF2: accumulated waiting time for a defrosting cycle of circuit # 2.
dFr2: duration time of defrosting of circuit # 2.
SEtC: current set point for summer operation.
SEtH: current set point for winter operation.
PREq: power requirement [%]
PSup: power output [%]
CMP1, CMP2 .. CMP6: status of compressors (**dIS, OFF**, **tOn**, **On**, **tOFF**, **ALAr**, **MAnU**).
FAn1, FAn 2: status of fans (**dIS, OFF**, **tOn**, **On**, **tOFF**, **ALAr**, **MAnU**).
InF1,InF2: speed of condensing fans [%]
InFC: value of free-cooling fan [%] (with separate air circuit, otherwise 0).
PMP1, PMP2: status of pumps (**dIS, OFF**, **On**, **ALAr**).

Pressing the ENTER key over the label, the corresponding status value is displayed, while pressing the ESC key the display returns to the general menu. This menu has no password protection.

User Menu

The user menu is a Level 1 menu, i.e. it requires entering of the user level (or higher) password, in order to be able to display/modify the parameters contained in this branch.

MOdE (summer/winter operating mode)
SPC1 (summer set point)
SPH1 (winter set point)
SSC1 (summer set point offset)
SSH1 (winter set point offset)
PSd1 (USER password)

It is possible to modify the various set points and offsets for the secondary set point.

Maintenance Operator Menu

The user menu is a Level 2 menu, i.e. it requires entering of the maintenance operator level (or higher) password, in order to be able to display/modify the parameters contained in this branch.

Func (*OPERATION* menu)
MAnu (*MANUAL* menu)
CAL (*CALIBRATION* menu)
I-O (*I/O STATUS* menu)
PSd2 (*MAINTENANCE OPERATOR* password)

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

In the *OPERATION* menu, it is possible to view/enable the features relating to the operation of compressors, fans and pumps. Some examples of these are the hours of operation, the enabling of the corresponding alarm and the threshold of maximum allowable hours.

In the MANUAL menu, it is possible to set to manual/automatic operation compressors and fans, whose outputs can be forced, in order to test their functionality.

In the *CALIBRATION* menu, it is possible to set the corrections to be applied to analogue inputs, to compensate the offsets due to cabling and probe positioning.

In the *I/O STATUS* menu, it is possible to view directly the card's physical inputs and outputs.

Installation Operator Menu

The installation operator menu is a Level 3 menu, i.e. it requires entering of the installation operator level (or higher) password, in order to be able to display/modify the parameters contained in this branch.

CoMP (*COMPRESSORS* menu)
rEG (*REGULATION* menu)
Cond (*CONDENSATION* menu)
dEFr (*DEFROSTING* menu)
PuMP (*PUMPS* menu)
A-Fr (*ANTI-FROST* menu)
F-C (*FREE-COOLING* menu)
SEcu (*SAFETY DEVICES* menu)
PAr (*VARIOUS PARAMETERS* menu)
MAP (*PARAMETER MAPS* menu)
PSd3 (*INSTALLATION OPERATOR* password)

The installation operator menu contains all the parameters connected with the configuration of all functionalities (alarms, settings, logic, rotation type, etc.) of the machine.
In the *COMPRESSORS* menu, it is possible to set the parameters connected with the management of devices:

- rotation
- timings
- maximum number of start-ups.

In the *REGULATIONS* menu, it is possible to set the parameters connected with lateral-band and neutral-zone thermal regulation of compressors.

In the *CONDENSATION* menu, it is possible to set the parameters connected with the control of condensation pressure, via the fans.

In the *PUMPS* menu, it is possible to set the parameters connected with operation and protection of pumps.

In the *DEFROSTING* menu, it is possible to set the parameters connected with the activation and duration of heat pump defrosting.

In the ANTI-FROST menu, it is possible to set the parameters connected with the thermal regulation of resistors and control of the anti-frost alarm.

In the FREE-COOLING menu, it is possible to set the parameters connected with the enabling, operation and activation of the free-cooling function.

The *SAFETY DEVICES* menu contains all parameters connected with alarms and management of safety devices which protect the refrigerating circuit:

- activations
- reporting delays
- type of resetting …

The *VARIOUS PARAMETERS* menu contains other general parameters connected with the management of Modbus communications, transducer full-scale values and other configurable activations.

The *PARAMETER MAPS* menu is accessible only with the machine in OFF mode. In this menu, it is possible to re-establish factory-set parameters and to save or reload parameters from a programming key. After each operation, it is necessary to switch OFF and then back ON the device.

Constructor Menu

The constructor menu is a Level 4 menu, i.e. it requires entering of the constructor level password, in order to be able to display/modify the parameters contained in this branch. Furthermore, this level is only accessible with the machine in OFF mode.

ConF (*PLANT* menu)
Hard (*INPUT AND OUTPUT HARDWARE* menu)
PSd4 (*CONSTRUCTOR* password)

This menu contains all the machine's configuration parameters, which determine its operation mode and which functionalities are to be enabled or disabled, according to the constructor's requirements.

The *PLANT* menu contains a plant configuration wizard, which is used to set the number of circuits, the number of compressors, the number of fans and the number of protection devices to be used Once the configuration has been completed, a summary page is displayed, showing the configured relays and digital inputs, with an indication of any need to use an expansion.

HARDWARE menus contain all parameters used for setting the positions to which the various devices are to be connected.

- Position of digital outputs of pumps, compressors and fans;
- Position of inverter to be connected to analogue outputs;
- Position of digital inputs/outputs of alarms.

Note: By setting the position of the various alarm inputs, their functionality is also enabled. Indeed, an alarm is only enabled if the parameter which identifies its actual physical position on the terminal has been set and is different from zero. If an alarm is not to be used, it is sufficient to leave its corresponding parameter set to zero.
The same system is used to manage outputs, e.g. those of alarm relays: if position parameters have a zero value, relay commands are disabled.

Project and Firmware Versions

Press simultaneously the UP+DOWN keys for about 2 seconds, then press the ENTER key on the **InFo** label.

Information on the project and controller firmware versions is displayed sequentially, namely:

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

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

5 Parameter List

All parameters managed by the application are listed below. Each parameter is accompanied by a brief description, the range of its admissible values, units of measure, the assigned default value and the menu containing the parameter. Menu are structured on the basis of the following logic:

- **UT : User menu**
- **MA: Maintenance operator menu**
  - MA-F: Operation branch maintenance menu
  - MA-M: Manual branch maintenance menu
  - MA-CA: Calibration branch maintenance menu
  - MA-IO: Input/output branch maintenance menu
- **IS : Installation operator menu**
  - IS-R: Regulation branch installation menu
  - IS-C: Compressor branch installation menu
  - IS-F: Condensing fan branch installation menu
  - IS-D: Defrosting branch installation menu
  - IS-P: Pump branch installation menu
  - IS-A: Anti-frost branch installation menu
  - IS-FC: Free-cooling branch installation menu
  - IS-S: Protection device branch installation menu
  - IS-V: Various parameter branch installation menu
- **CO : Constructor menu**
  - CO-W: Plant branch construction menu
  - CO-Hw: Hardware branch construction menu
  - CO-Pa: Parameter branch installation menu

5.1 List of Configuration Parameters

Code	Parameter Description	Default	Min.	Max.	M.U.	Menu	Notes
USER PARAMETERS							
ModE	It sets the operating mode: 0: CooL, (Chiller/summer) 1: hEAt (Heat pump/winter)	0	0	1		UT	Modifiable only if the units is a chiller + heat pump: (PG00=2,4,6,8,10 e PG08=0)
SPC1	It sets the value of the summer set point (chiller)	8.5	PC21	PC22	°C	UT	
SSC1	It sets the offset value for the utilisation of the secondary summer set point.	0.0	-20.0	20.0	°C	UT	
SPH1	It sets the value of the winter set point (heat pump).	44.0	PC23	PC24	°C	UT	
SSH1	It sets the offset value for the utilisation of the secondary summer set point.	0.0	-20.0	20.0	°C	UT	
PSd1	It modifies the password at User level.	0	-999	9999		UT	
MAINTENANCE PARAMETERS							
PM00	It sets – in tens – the maximum number of operating hours of compressors. When this limit is exceeded, the connected alarm is triggered.	2000	0	9999	hours x 10	MA-F	
PM01 PM02 PM03 PM04 PM05 PM06	It shows – in tens – the number of operating hours of compressors. One parameter for each compressor.	0	0	9999	hours x 10	MA-F	
PM30	It sets – in tens – the maximum number of operating hours of pumps / delivery fan. When this limit is exceeded, the connected alarm is triggered.	2000	0	9999	hours x 10	MA-F	
PM31	It shows – in tens – the number of operating hours of the first pump / delivery fan.	0	0	9999	hours x 10	MA-F	
PM32	It shows – in tens – the number of operating hours of the second pump.	0	0	9999	hours x 10	MA-F	
PM40	It sets – in tens – the maximum number of operating hours of fans. When this limit is exceeded, the connected alarm is triggered.	2000	0	9999	hours x 10	MA-F	
PM41	It shows – in tens – the number of operating hours of the first fan or of the inverter in Circuit # 1.	0	0	9999	hours x 10	MA-F	
PM42	It shows – in tens – the number of operating hours of the second fan or of the inverter in Circuit # 2.	0	0	9999	hours x 10	MA-F	
PM91	It sets the date (year) when the last plant maintenance was carried out.	2007	2007	2060		MA-F«	
PM92	It sets the date (month) when the last plant maintenance was carried out.	1	1	12		MA-F	
PM93	It sets the date (day) when the last plant maintenance was carried out.	1	1	31		MA-F	
PM11 PM12	It enables the manual/automatic operation of the compressor.	0	0	1		MA-M	

PM13 PM14 PM15 PM16	0: Auto – normal operation 1: Manu – manual operation One for each compressor.						
PM21 PM22 PM23 PM24 PM25 PM26	During manual operation, it forces the start-up/shutdown of the compressor. 0: switches the compressor OFF 1: switches the compressor ON One for each compressor.	0	0	1		MA-M	
PM51	It enables the manual/automatic operation of the condensing fan in Circuit # 1. 0: Auto – normal operation 1: Manu – manual operation	0	0	1		MA-M	
PM52	It enables the manual/automatic operation of the condensing fan in Circuit # 2. 0: Auto – normal operation 1: Manu – manual operation	0	0	1		MA-M	
PM61	During manual operation, it forces the value of the condensing fan in Circuit # 1.	0.0	0.0	100.0	%	MA-M	
PM62	During manual operation, it forces the value of the condensing fan in Circuit # 2.	0.0	0.0	100.0	%	MA-M	
PM71	It enables the manual/automatic operation of the free-cooling fan. 0: Auto – normal operation 1: Manu – manual operation	0.0	0.0	100.0	%	MA-M	
PM72	During manual operation, it forces the value of the free-cooling fan.	0.0	0.0	100.0	%	MA-M	
PM81	Calibration of the input (ambient) temperature probe	0.0	-20.0	20.0	°C	MA-CA	
PM82	Calibration of outlet (delivery) temperature probe # 1	0.0	-20.0	20.0	°C	MA-CA	
PM83	Calibration of condensing probe in Circuit # 1	0.0	-20.0	20.0	Bar	MA-CA	
PM84	Calibration of the AI04 probe	0.0	-20.0	20.0	Bar/°C	MA-CA	
PM85	Calibration of the AI05 probe	0.0	-20.0	20.0	°C	MA-CA	
PM86	Calibration of outlet (delivery) temperature probe # 2	0.0	-20.0	20.0	°C	MA-CA	
PM87	Calibration of AI07 pressure probe	0.0	-20.0	20.0	Bar	MA-CA	
PM88	Calibration of AI08 pressure probe	0.0	-20.0	20.0	Bar	MA-CA	
PSd2	It modifies the password at Maintenance Operator level.	0	-999	9999		MA-F	
INSTALLATION OPERATOR PARAMETERS							
COMPRESSOR PARAMETERS							
PC01	Rotation type used for compressor management: 0: FIFO 1: LIFO 2: FIFO + hours 3: LIFO + hours	0	0	3		IS-C	
PC02	Enabling mode of compressors in the two circuits: 0: Circuit balancing 1: Circuit saturation	0	0	1		IS-C	Only on twin circuits
PC04	Min. time for which the compressor must remain ON, even if a shutdown has been requested.	20	0	999	Sec.	IS-C	
PC05	Min. time for which the compressor must remain OFF, even if a start-up has been requested.	120	0	999	Sec.	IS-C	
PC06	Min. time which must elapse between two	360	0	999	Sec.	IS-C	

	start-ups of the same compressor.						
PC07	Min. time which must elapse between start-ups of two different compressors.	10	0	999	Sec.	IS-C	
PC08	Min. time which must elapse between shutdowns of two different compressors.	20	0	999	Sec.	IS-C	
PC09	Max. number of start-ups for every hour (only for adaptive regulation).	8	4	12		IS-C	
PC10	Number of compressors per circuit which will be forced in case of a regulating-probe alarm.	1	0	PG03		IS-C	
PC11	It sets the regulation type for compressor management: 0: Lateral band 1: Neutral zone 2: From digital inputs	1	0	2		IS-R	
PC12	Proportional band for lateral-band regulation of compressors	2.5	1.0	20.0	°C	IS-R	
PC14	Zone value for neutral-zone regulation of compressors	3.0	PC15	PC16	°C	IS-R	
PC15	Min. value of compressor neutral zone	1.0	0.1	10.0	°C	IS-R	
PC16	Max. value of compressor neutral zone	5.0	0.1	10.0	°C	IS-R	
PC17	Enabling/release time for subsequent compressor step outside the neutral zone	20	0	999	Sec.	IS-R	
PC18	Enabling for auto-adaptive control of the compressors' neutral zone	No (0)	No (0)	Yes (1)		IS-R	
PC21	Min. value of summer set point (chiller)	5.0	-15.0	SPC1	°C	IS-R	
PC22	Max. value of summer set point (chiller)	20.0	SPC1	35.0	°C	IS-R	
PC23	Min. value of winter set point (heat pump)	30.0	10.0	SPH1	°C	IS-R	
PC24	Max. value of winter set point (heat pump)	44.0	SPH1	70.0	°C	IS-R	
PC30	Enabling of power limiting from digital input	No (0)	No (0)	Yes (1)		IS-R	
PC31	Power limiting for summer	50	0	100	%	IS-R	
PC32	Power limiting for winter	50	0	100	%	IS-R	
PC35	Enabling of forced shutdown of compressors	No (0)	No (0)	Yes (1)		IS-R	
PC36	Summer forced shutdown set point	3.5	-30.0	23.0	°C	IS-R	
PC37	Winter forced shutdown set point	52.0	26.0	75.0	°C	IS-R	
PC41	Enabling of pump-down 0 : No 1 : Yes, with timing 2 : Yes, with relative threshold	0	0	2		IS-R	
PC42	Compressor shutdown time in pump-down	5	0	240	Sec.	IS-R	
PC43	Relative threshold for pump-down disabling	1.5	0.0	5.0	Bar	IS-R	
PC45	Enabling of high-temperature pressure-switch control (chiller)	No (0)	No (0)	Yes (1)		IS-R	
PC46	Pressure set point for high-temperature pressure-switch control	27.0	0.0	45.0	Bar	IS-R	
PC47	Pressure differential for high-temperature pressure-switch control	2.0	0.0	5.0	Bar	IS-R	
PC48	External high temperature threshold for pressure-switch control	12.0	-30.0	23.0	°C	IS-R	
PC49	Min. time for maintaining pressure-switch partialisation	10	0	99	Min.	IS-R	
PC50	Enabling of low-temperature pressure-switch control (heat pump)	No (0)	No (0)	Yes (1)		IS-R	
PC51		3.2	0.0	10.0	Bar	IS-R	
PC52	Pressure differential for low-temperature pressure-switch control	2.0	0.0	10.0	Bar	IS-R	
PC53	External low temperature threshold for	-5.0	-10.0	5.0	°C	IS-R	

	pressure-switch control						
PC54	Outlet water high-temperature threshold for pressure-switch control	48.0	30.0	70.0	°C	IS-R	
PC61	Summer commutation set point	20.0	PC62	70.0	°C	IS-R	
PC62	Winter commutation set point	10.0	0.0	PC61	°C	IS-R	
PC64	Max. dynamic offset compared to summer set point (chiller)	-10.0	-20.0	20.0	°C	IS-R	
PC65	Compensation start temperature for dynamic summer set point	30.0	-15.0	PC66	°C	IS-R	
PC66	Compensation stop temperature for dynamic summer set point	60.0	PC65	70.0	°C	IS-R	
PC67		10.0	-20.0	20.0	°C	IS-R	
PC68	Compensation start temperature for dynamic winter set point	0.0	-15.0	PC69	°C	IS-R	
PC69	Compensation stop temperature for dynamic winter set point	30.0	PC68	70.0	°C	IS-R	
PC70	Function limit management: 0 = Only heat pump 1 = Activation of auxiliary output as alternative to the heat pump 2 = Activation of auxiliary output and heat pump	0	0	2		IS-R	
PC71	Function limit set point	-7.0	-30.0	30.0	°C	IS-R	
PC72	Function limit differential	4.0	0.1	10.0	°C	IS-R	
PC80	Enabling of control on request	No (0)	No (0)	Yes (1)		IS-R	
PC81	Set point for summer control on request	15.0	-15.0	70.0	°C	IS-R	
PC82	Set point for winter control on request	45.0	-15.0	70.0	°C	IS-R	
PC83	Differential for summer control on request	4.0	0.1	10.0	°C	IS-R	
PC84	Differential for winter control on request	4.0	0.1	10.0	°C	IS-R	
PC85	Delay interval for control on request	5	0	999	Sec.	IS-R	
CONDENSER PARAMETERS							
PF02	It gives the choice to enable fan regulation only if at least one compressor is ON.	No (0)	No (0)	Yes (1)		IS-F	
PF03	It sets whether or not fans must switch OFF during defrosting cycles.	No (0)	No (0)	Yes (1)		IS-F	
PF07	Min. time which must elapse between the start-ups of two different fans.	10	0	999	Sec.	IS-F	
PF08	Min. time which must elapse between the shutdowns of two different fans.	20	0	999	Sec.	IS-F	
PF10	Forcing of fans in case of condensing probe alarm	0.0	0.0	100.0	%	IS-F	
PF11	Condensing regulation set point for summer operation (chiller)	20.0	5.0	45.0	Bar	IS-F	
PF12	Linear regulation band for condensation in summer operation (chiller)	12.0	0.1	15.0	Bar	IS-F	
PF13	Enabling of forcing to maximum in summer operation	Yes (1)	No (0)	Yes (1)		IS-F	
PF14	Max. forcing enabling set point in summer operation (chiller)	26.0	15.0	45.0	Bar	IS-F	
PF15	Disabling differential for max. forcing in summer operation (chiller)	2.0	0.1	5.0	Bar	IS-F	
PF21	Condensing regulation set point in winter operation (heat pump)	9.0	0.5	15.0	Bar	IS-F	
PF22	Linear regulation band for condensation in winter operation (heat pump)	2.0	0.1	15.0	Bar	IS-F	
PF23	Enabling of forcing to maximum in winter operation (inverter)	Yes (1)	No (0)	Yes (1)		IS-F	
PF24	Max. forcing activation set point in winter operation (heat pump, inverter)	3.2	0.5	20.0	Bar	IS-F	
PF25	Max. forcing de-activation differential in	0.5	0.1	5.0	Bar	IS-F	

	winter operation (heat pump, inverter)						
PF26	Min. value for condenser forcing (inverter)	0.0	0.0	100.0	%	IS-F	
PF27	Speed-up time at fan start-up (inverter)	4	0	999	Sec.	IS-F	
PF31	Lower limit for condensing linear regulation (inverter)	30.0	0	PF32	%	IS-F	
PF32	Upper limit for condensing linear regulation (inverter)	100.0	PF31	100.0	%	IS-F	
PF33	Enabling of regulation under the minimum condensing limit (inverter)	Yes (1)	No (0)	Yes (1)		IS-F	
PF34	Switch-off differential under the minimum condensing limit (inverter)	2.0	0.0	5.0	Bar	IS-F	
PF36	Enabling of pre-start of condensing fans for high external temperatures	No (0)	No (0)	Yes (1)		IS-F	
PF37	External temperature threshold for pre-start of condensing fan	30.0	20.0	40.0	°C	IS-F	
PF38	Fan pre-start speed	50.0	0	100.0	%	IS-F	
PF39	Compressor delay from pre-start of condensing fan	5	0	999	Sec.	IS-F	
PF41	Value x1 of fan linearisation table	25.0	0.0	PF42	%	IS-F	
PF42	Value x2 of fan linearisation table	50.0	PF41	PF43	%	IS-F	
PF43	Value x3 of fan linearisation table	75.0	PF42	100.0	%	IS-F	
PF45	Value y1 of fan linearisation table	25.0	0.0	PF46	%	IS-F	
PF46	Value y2 of fan linearisation table	50.0	PF45	PF47	%	IS-F	
PF47	Value y3 of fan linearisation table	75.0	PF46	100.0	%	IS-F	
DEFROSTING PARAMETERS							
Pd01	Pressure set point at defrosting start	6.0	0.0	Pd02	Bar	IS-D	
Pd02	Pressure set point at defrosting stop	12.0	Pd01	45.0	Bar	IS-D	
Pd03	Waiting interval at defrosting start	1200	60	Pd23	Sec.	IS-D	
Pd05	Max. duration of defrosting	300	10	600	Sec.	IS-D	
Pd06	Duration of dripping	120	0	600	Sec.	IS-D	
Pd07	Min. defrost waiting interval after compressor re-start	60	0	600	Sec.	IS-D	
Pd11	Defrosting management via external contact: 0 = Function disabled 1 = *Defrosting start* from external contact 2 = *Defrosting stop* from external contact 3 = *Defrosting start and stop* from external contact	0	0	3		IS-D	
Pd12	Defrosting contact type: 0 = Front 1 = Level	0	0	1		IS-D	
Pd20	Enabling of defrosting cycle compensation	No (0)	No (0)	Yes (1)		IS-D	
Pd21	External temperature set point for defrosting compensation start	5.0	Pd22	70.0		IS-D	
Pd22	External temperature set point for defrosting compensation stop	0.0	-30.0	Pd21		IS-D	
Pd23	Max. waiting interval at defrosting stop	3600	Pd03	9600		IS-D	
PUMP PARAMETERS							
PP01	Pump / recirculating fan operation: 0 = Continuous operation 1 = Operation at thermostat's request 2 = Cyclical operation	0	0	2		IS-P	
PP02	ON time in cyclical operation	120	1	999	Sec.	IS-P	
PP03	OFF time in cyclical operation	120	1	999	Sec.	IS-P	
PP04	Min. interval which must elapse between pump start-up and first compressor / recirculating fan start-up	60	1	999	Sec.	IS-P	
PP05	Min. interval which must elapse between circuit shutdown and pump / recirculating fan shutdown	60	1	999	Sec.	IS-P	

PP07	Shutdown of pump / recirculating fan during defrosting	No (1)	No (0)	Yes (1)		IS-P	
PP08	Difference in operating hours between the two pumps, requiring their being swapped.	4	1	240	Hours	IS-P	
PP09	Pump operating time at low water flow (flow alarm)	15	0	999	Sec.	IS-P	
PP10	Pump operating time at low temperature of outflow water (anti-frost alarm)	15	0	999	Sec.	IS-P	
PP11	Hot start enabling of recirculating fan	Yes (1)	No (0)	Yes (1)	-	IS-P	
PP12	Hot start set point of recirculating fan	36.0	0.0	70.0	°C	IS-P	
PP13	Hot start differential of recirculating fan	4.0	0.1	10.0	°C	IS-P	
ANTI-FROST PARAMETERS							
Pr01	Enabling of anti-frost heating elements	Yes (1)	No (0)	Yes (1)		IS-AF	
Pr02	Anti-frost heating element set point	5.0	Pr11	10.0	°C	IS-AF	
Pr03	Anti-frost heating element differential	2.0	0.1	10.0	°C	IS-AF	
Pr04	Forcing of anti-frost heating elements with probe error	No (0)	No (0)	Yes (1)		IS-AF	
Pr11	Anti-frost alarm threshold	3.0	-30.0	Pr01	°C	IS-AF	
Pr12	Anti-frost alarm differential	2.0	0.1	10.0	°C	IS-AF	
FREE-COOLING PARAMETERS							
PS01	Enabling of free-cooling	No (0)	No (0)	Yes (1)		IS-FC	
PS02	Shutter modulation band	3.0	0.1	20.0	°C	IS-FC	
PS03	Fan minimum speed	0.0	0.0	PS04	%	IS-FC	
PS04	Fan maximum speed	100.0	PS03	100.0	%	IS-FC	
PS11	W/Temp-A/Temp differential for free-cooling activation	3.0	2.0	9.9	°C	IS-FC	
PS13	W/Temp-A/Temp hysteresis for free-cooling activation	2.0	0.5	5.0	°C	IS-FC	
PS14	Free-cooling activation min. time	30	0	240	Sec.	IS-FC	
PS15	ON/OFF valve hysteresis	0.5	0.1	5.0	°C	IS-FC	
PS16	Max. threshold for motor-operated valve opening	2.0	0.1	PS02	°C	IS-FC	
PS21	Enabling of free-cooling when compressors are ON	Yes (1)	No (0)	Yes (1)		IS-FC	
ALARM PARAMETERS							
PA01	Flow alarm delay from machine start-up	10	1	999	Sec.	IS-S	
PA02	Flow alarm by-pass time during normal operation	1	1	999	Sec.	IS-S	
PA03	Number of triggered flow alarms with auto-reset before the alarm becomes manual	3	0	9		IS-S	
PA04	Delay interval for notification of probe error	10	0	240	Sec.	IS-S	
PA05	High-temperature alarm threshold during summer operation (chiller)	30.0	10.0	40.0	°C	IS-S	
PA06	Low-temperature alarm threshold during winter operation (heat pump)	15.0	10.0	40.0	°C	IS-S	
PA07	Triggering delay for temperature alarm	30	1	999	Sec.	IS-S	
PA08	Consequent time for a temperature alarm: 0 = Notification only 1 = Machine stop	0	0	1	Sec.	IS-S	
PA09	Reset differential for temperature alarm	0.5	0.1	10.0	°C	IS-S	
PA10	Temperature alarm inhibition interval from system start-up	15	0	999	Sec.	IS-S	
PA11	Low-pressure alarm threshold during winter operation (heat pump)	3.0	0.1	9.9	Bar	IS-S	
PA12	Low-pressure alarm reset differential during winter operation (heat pump)	1.0	0.1	4.0	Bar	IS-S	
PA13	Low-pressure alarm by-pass interval from start-up of first compressor	120	0	999	Sec.	IS-S	
PA14	Number of triggered low-pressure alarms with auto-reset before the alarm becomes manual	3	0	5		IS-S	

PA16	Enabling of low-pressure control at start-up and at low temperatures	Yes (1)	No (0)	Yes (1)		IS-S	
PA17	Low-pressure alarm threshold at start-up and at low temperatures	1.0	0.1	9.9	Bar	IS-S	
PA18	Low-pressure alarm reset differential at start-up and at low temperatures	0.5	0.1	4.0	Bar	IS-S	
PA19	Control duration at triggering of low-pressure alarm at low temperatures	120	10	PA13	Sec.	IS-S	
PA20	Min. duration of alarm delay for triggering of low-pressure alarm at compressor start-up	240	0	999	Sec.	IS-S	
PA21	High-pressure alarm threshold	28.0	0.0	45.0	Bar	IS-S	
PA22	High-pressure alarm reset differential	5.0	0.1	30.0	Bar	IS-S	
PA25	Enabling of primary exchanger efficiency alarm	No (0)	No (0)	Yes (1)		IS-S	
PA26	Min. difference threshold for primary exchanger	2.0	0.1	20.0	°C	IS-S	
PA27	By-pass time for primary exchanger efficiency alarm	120	0	999	Sec.	IS-S	
PA40	It enables the alarm connected with operating hours of compressors	Yes (1)	No (0)	Yes (1)		IS-S	
PA41	It sets the triggering delay connected with the compressor thermal alarm	10	0	999	Sec.	IS-S	
PA42	It sets the type of reset for the compressor thermal alarm 0: A - Automatic 1: M – Manual	M	A (0)	M (1)		IS-S	
PA60	It enables the alarm connected with operating hours of pumps	Yes (1)	No (0)	Yes (1)		IS-S	
PA62	It sets the type of reset for the pumps / delivery fan thermal alarm 0: A - Automatic 1: M – Manual	M	A (0)	M (1)		IS-S	
PA80	It enables the alarm connected with operating hours of condensing fans	Yes (1)	No (0)	Yes (1)		IS-S	
PA81	It sets the triggering delay connected with the condensing fan thermal alarm	10	0	999	Sec.	IS-S	
PA82	It sets the type of reset for the condensing fan thermal alarm 0: A - Automatic 1: M – Manual	M	A (0)	M (1)		IS-S	
PA99	Notification delay interval for expansion alarm	5	0	999	Sec.	IS-S	
OTHER PARAMETERS							
PH01	It sets the minimum full-scale value for the condensing probe.	0.0	-10.0	PH02	Bar	IS-V	
PH02	It sets the maximum full-scale value for the condensing probe.	30.0	PH01	45.0	Bar	IS-V	
PH04	It sets the probe for the change of summer/winter operating mode: automatic change-over 0: External air temperature 1: Ambient air temperature	0	0	1		IS-V	
PH05	It enables the start-up/shutdown of the machine by pressing the ESC/Stand-By key.	Yes (1)	No (0)	Yes (1)		IS-V	
PH06	It enables the change of summer/winter operating mode: automatic change-over.	No (0)	No (0)	Yes (1)		IS-V	
PH07	It enables the start-up/shutdown of the machine from a digital input.	No (0)	No (0)	Yes (1)		IS-V	
PH08	It enables the change of summer/winter operating mode from digital input.	No (0)	No (0)	Yes (1)		IS-V	

PH09	It enables the start-up/shutdown of the machine by supervisor.	No (0)	No (0)	Yes (1)		IS-V	
PH10	It enables the change of summer/winter operating mode via supervisor.	No (0)	No (0)	Yes (1)		IS-V	
PH11	Card Modbus address	1	1	247		IS-V	
PH12	Card communication baud rate (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	Modbus stop bit (0=1 bit, 1=2 bits)	0	0	1		IS-V	
PH15	It resets the factory-set parameter defaults.	No (0)	No (0)	Yes (1)		IS-V	Wait for the 0 value to be re-read at the end of resetting.
PH16	It sets the logic used for the inverting valve. 0: NO – Normally open 1: NC – Normally closed	NO	NO (0)	NC (1)		IS-V	
PH17	It sets the logic of digital inputs used in alarm management. 0: NO – Normally open 1: NC – Normally closed	NC	NO (0)	NC (1)		IS-V	
PH18	It sets the logic of the relay used for alarms. 0: NO – Normally open 1: NC – Normally closed	NO	NO (0)	NC (1)		IS-V	
PH19	It sets the logic of the digital input used for the summer/winter commutation. 0: NO – Normally open 1: NC – Normally closed	NO	NO (0)	NC (1)		IS-V	
PH20	It sets the logic of the digital input used for flow control. 0: NO – Normally open 1: NC – Normally closed	NO	NO (0)	NC (1)		IS-V	
PH21	It sets the enabling of the probe for ambient temperature detection (incoming).	Yes (1)	No (0)	Yes (1)		IS-V	
PH22	It sets the enabling of the probe for delivery temperature detection (outgoing) in Circuit # 1.	Yes (1)	No (0)	Yes (1)		IS-V	
PH23	It sets the enabling of the probe for delivery temperature detection (outgoing) in Circuit # 2.	Yes (1)	No (0)	Yes (1)		IS-V	
PH24	It sets the enabling of the probe for external temperature detection.	No (0)	No (0)	Yes (1)		IS-V	
PH25	It sets the enabling of the secondary set point function from digital input.	No (0)	No (0)	Yes (1)		IS-V	
PH26	It sets the enabling of the secondary set point function by a supervisor.	No (0)	No (0)	Yes (1)		IS-V	
PH27	It sets the enabling of the dynamic set point function.	No (0)	No (0)	Yes (1)		IS-V	
PH29	It sets the logic of the digital inputs used for compressor activation: 0: NO – Normally open 1: NC – Normally closed	NO	NO (0)	NC (1)		IS-V	
PH31	It sets the type of refrigerant used (temperature-pressure conversion). 0: No refrigerant 1: R22 2: R134a 3: R404A 4: R407C 5: R410A 6: R507	3 R404A	0	6		IS-V	
PH32	It sets the temperature measurement unit:	0 (°C)	0	1		IS-V	

	0: ° Celsius 1: ° Fahrenheit						
PH33	It sets the pressure measurement unit: 0: Bar 1: psi	0 (Bar)	0	1		IS-V	
PH43	It sets the type of universal analogue input AI3 for the condensing probe. 2: NTC 3: 0-20 mA 4: 4-20 mA	4	2	4		IS-V	
PH44	It sets the type of universal analogue input AI4. 0: Probe disabled 1: used as DI06 2: NTC external temperature 3: NTC accumulation temperature 4: Pressure 4-20 mA (Evaporation C1)	1 DI06	0	4		IS-V	
PH45	It sets the type of analogue input AI8. 0: Probe disabled 1: used as DI12 2: Pressure 4-20 mA (Evaporation C2)	1 DI12	0	2		IS-V	
PH48	It sets the single or separate transducer to summer condensing and winter defrosting. 0: Single (condensing probes) 1: Separate (condensing probes / evaporation probes)	0	0	1		IS-V	
PH50	It sets displaying with icons only. 0 : No 1: Yes	No (0)	No (0)	Yes (1)		IS-V	
PH51	It sets the display of numeric icons. 0 : No 1: Yes	Yes (1)	No (0)	Yes (1)		IS-V	
PH52	It sets the display of EVCO icon. 0 : No 1: Yes	Yes (1)	No (0)	Yes (1)		IS-V	
PH53	It sets the meaning of the Summer and Winter icons. 0: Summer = Cooling (chiller mode) Winter = Heating (heat pump mode) 1: Summer = Heating (heat pump mode) Winter = Cooling (chiller mode)	0	0	1		IS-V	
PH61	It sets the logic of the digital input used for remote ON/OFF control. 0: NO – Normally open 1: NC – Normally closed	NO	NO (0)	NC (1)		IS-V	
PH62	It sets the logic of the digital input used for the secondary set. 0: NO – Normally open 1: NC – Normally closed	NO	NO (0)	NC (1)		IS-V	
PH63	It sets the logic of the digital input used for power limiting. 0: NO – Normally open 1: NC – Normally closed	NO	NO (0)	NC (1)		IS-V	
PH64	It sets the logic of the digital input used for remote defrosting. 0: NO – Normally open 1: NC – Normally closed	NO	NO (0)	NC (1)		IS-V	
PSd3	It sets the Installation Operator level password.	0	-999	9999		IS-V	
CONSTRUCTOR PARAMETERS							

PG00	It sets the unit type: 1: Air-to-air chiller 2: Air-to-air chiller + heat pump 3: Air-to-water chiller 4: Air-to-water chiller + heat pump 5: Air-to-water chiller 6: Air-to-water chiller + heat pump 7: Air-based motocondensing 8: Air-based motocondensing with inverter 9: Water-based motocondensing 10: Water-based motocondensing with inverter	3	1	10		CO-W	
PG01	Number of circuits	2	1	2		CO-W	
PG02	It enables the presence of the expansion.	Yes (1)	No (0)	Yes (1)		CO-W	
PG03	It sets the number of compressors per circuit.	2	1	3		CO-W	
PG08	It enables operation with heat pump only.	No (0)	No (0)	Yes (1)		CO-W	
PG09	It sets the number of pumps.	1	0	2		CO-W	
PG11	It enables unique condensing: 0: No (2 fans) 1: Yes (1 fan)	No (0)	No (0)	Yes (1)		CO-W	
PG13	It sets the type of free-cooling air circuit: 0: Unique with condensing 1: Separate	0	0	1		CO-W	
HARDWARE CONFIGURATION PARAMETERS							
HA01	It sets the position of the digital output linked to notification of the global alarm.	6	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
HA02	It sets the position of the digital output linked to the anti-frost heating elements of Circuit # 1.	5	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
HA03	It sets the position of the digital output linked to the anti-frost heating elements of Circuit # 2.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
HA04	It sets the position of the digital output for the auxiliary relay dedicated to the Operating Limit function.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
HA05	It sets the position of the digital output linked to the circuit inverter valve. 1	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
HA06	It sets the position of the digital output linked to the circuit inverter valve. 2	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
HA07	It sets the position of the digital output linked to the liquid solenoid valve # 1.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
HA08	It sets the position of the digital output linked to the liquid solenoid valve # 2.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
HA09	It sets the position of the digital output linked to the free-cooling ON/OFF valve.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
HA19	It sets the position of the digital output linked to the free-cooling motor-operated valve.	0	0	3 (4)		CO-Hw	Outputs 2 and 3 require the AO expansion. (4 if expansion has been enabled)
HC01	It sets the position of the digital output for compressor # 1.	2	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
HC02	It sets the position of the digital output for	3	0	6 (12)		CO-Hw	(12 if expansion

	compressor # 2.						has been enabled)
HC03	It sets the position of the digital output for compressor # 3.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
HC04	It sets the position of the digital output for compressor # 4.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
HC05	It sets the position of the digital output for compressor # 5.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
HC06	It sets the position of the digital output for compressor # 6.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
HF31	It sets the position of the analogue output of the condensing fan in Circuit # 1.	1	0	3 (4)		CO-Hw	Outputs 2 and 3 require the AO expansion. (4 if expansion has been enabled)
HF32	It sets the position of the analogue output of the condensing fan in Circuit # 2.	0	0	3 (4)		CO-Hw	Outputs 2 and 3 require the AO expansion. (4 if expansion has been enabled)
HF34	It sets the position of the analogue output linked to the free-cooling fan output (in case it is separated from the condensing fan).	0	0	3 (4)		CO-Hw	Outputs 2 and 3 require the AO expansion. (4 if expansion has been enabled)
HP01	It sets the position of the digital output for pump # 1 / recirculating fan.	1	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
HP02	It sets the position of the digital output for pump # 2.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd01	It sets the position of the digital input for the global ON/OFF.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd02	It sets the position of the digital input linked to the secondary set point for compressor management.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd05	It sets the position of the digital input linked to the summer/winter operating mode.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd06	It sets the position of the digital input linked to flow detection.	4	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd07	It sets the position of the digital input linked to the power-limiting command.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd09	It sets the position of the digital input linked to the defrosting command from external contact.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd11	It sets the position of the digital input linked to the first step of compressor regulation. (In motocondensing units, compressor activation is via DI.)	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd12	It sets the position of the digital input linked to	0	0	6 (12)		CO-Hw	(12 if expansion

	the second step of compressor regulation. (In motocondensing units, compressor activation is via DI.)						has been enabled)
Hd13	It sets the position of the digital input linked to the third step of compressor regulation. (In motocondensing units, compressor activation is via DI.)	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd14	It sets the position of the digital input linked to the fourth step of compressor regulation. (In motocondensing units, compressor activation is via DI.)	0	0	6(12)		CO-Hw	(12 if expansion has been enabled)
Hd15	It sets the position of the digital input linked to the fifth step of compressor regulation. (In motocondensing units, compressor activation is via DI.)	0	0	6(12)		CO-Hw	(12 if expansion has been enabled)
Hd16	It sets the position of the digital input linked to the sixth step of compressor regulation. (In motocondensing units, compressor activation is via DI.)	0	0	6(12)		CO-Hw	(12 if expansion has been enabled)
Hd20	It sets the position of the digital input linked to the low-pressure alarm on the pressure switch of Circuit # 1.	6	0	6(12)		CO-Hw	(12 if expansion has been enabled)
Hd21	It sets the position of the digital input linked to the high-pressure alarm on the pressure switch of Circuit # 1.	1	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd22	It sets the position of the digital input linked to the low-pressure alarm on the pressure switch of Circuit # 2.	6	0	6(12)		CO-Hw	(12 if expansion has been enabled)
Hd23	It sets the position of the digital input linked to the high-pressure alarm on the pressure switch of Circuit # 2.	1	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd41	It sets the position of the digital input linked to the thermal alarm of compressor # 1.	2	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd42	It sets the position of the digital input linked to the thermal alarm of compressor # 2.	3	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd43	It sets the position of the digital input linked to the thermal alarm of compressor # 3.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd44	It sets the position of the digital input linked to the thermal alarm of compressor # 4.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd45	It sets the position of the digital input linked to the thermal alarm of compressor # 5.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd46	It sets the position of the digital input linked to the thermal alarm of compressor # 6.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd81	It sets the position of the digital inputs linked to the thermal alarm of fan # 1.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd82	It sets the position of the digital inputs linked to the thermal alarm of fan # 2.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd91	It sets the position of the digital inputs linked to the thermal alarm of pump # 1.	5	0	6 (12)		CO-Hw	(12 if expansion has been enabled)
Hd92	It sets the position of the digital inputs linked to the thermal alarm of pump # 2.	0	0	6 (12)		CO-Hw	(12 if expansion has been enabled)

PSd4	Constructor level password	0	-999	9999		CO-Pa	

Note: Once the machine parameters have been configured, and every time the configuration parameters are modified, it is advisable to shut down the machine and restart the plant, to enable the card to reconfigure itself correctly.

6 REGULATIONS

6.1 Machine Status

Several procedures exist for switching the unit ON and OFF:

1) Using the dedicated **ON/OFF key** (this function is enabled via parameter *PH05*).
   Switching ON – Press the dedicated key for about 2 seconds: if all other enabled functions are present, the machine switches itself ON.
   Switching OFF – Press the dedicated key for about 2 seconds: the machine switches itself OFF.

2) Using the **ON/OFF** command from **digital input** (this function is enabled via parameter *PH07*).
   Switching ON – Close the remote ON/OFF contact: if all other enabled functions are present, the machine switches itself ON.
   Switching OFF – If the remote ON/OFF contact reveals itself to be open, the machine switches itself "OFF from digital input", which is indicated by "OFF D".

3) Using a **supervisory protocol** (this function is enabled via parameter *PH09*).
   Switching ON – Activate via protocol the switching ON status: if all other enabled functions are present, the machine switches itself ON.
   Switching OFF – If the ON status is disabled via protocol, the machine switches itself "OFF by supervisory protocol", which is indicated by "OFF S".

The ON/OFF status from key press has priority over the two others; indeed, OFF statuses from digital input and supervisory protocol are only accessible if the machine has been enabled by key press.

A machine that has been **switched OFF by digital input** can:
- switch to *key-press OFF status* (by pressing the dedicated key);
- switch to *supervisory OFF status* (if the digital input is open and the supervisory OFF status has been set);
- switch itself ON (if the digital input is closed and the supervisory OFF status has not been set).

A machine that has been **switched OFF by supervisory protocol** can:
- switch to *key-press OFF status* (by pressing the dedicated key);
- switch to *digital-input OFF status* (if set via supervisor and if the digital input is open);
- switch itself ON (if the digital input is closed and the supervisory OFF status has not been set).

The machine ON/OFF key is the ESC key.
The remote ON/OFF input (if present) is configured via the linked parameter *Hd01*.

6.2 Unit Type

With the machine in OFF status, using the ***PG00*** parameter from the CONSTRUCTOR menu (*CoSt -> ConF*), it is possible to select the unit type to be used, and, via the ***PG01*** parameter, it is then possible to set up the number of circuits. Based on parameter values, several defaults are loaded for the positions of inputs and outputs. Regulation and other parameters corresponding to the various functions must be manually modified according to user requirements.
Managed machines are listed below, together with their respective input and output configurations.

SINGLE-CIRCUIT VERSIONS (PG01=1)

6.2.1 Single-circuit air-to-air units

PG01 = 1 **Single-circuit**	**PG00 = 1** **Air-to-air chiller**	**PG00 = 2** **Air-to-air chiller + heat pump**
Analogue inputs		
AI 1 (NTC)	Ambient air temperature	Ambient air temperature
AI 2 (NTC)	Delivery air temperature	Delivery air temperature
AI 3 (NTC / 4..20 mA)	Condensing pressure	Condensing pressure
AI 4 (NTC / 4.20 mA / DI)	Used as DI 6	Used as DI 6
Digital inputs		
DI 1	High-pressure pressure switch	High-pressure pressure switch
DI 2	Thermal overload switch compressor # 1	Thermal overload switch compressor # 1
DI 3	Thermal overload switch compressor # 2	Thermal overload switch compressor # 2
DI 4	Air-flow differential pressure switch	Air-flow differential pressure switch
DI 5	Recirculating fan thermal switch	Recirculating fan thermal switch
DI 6 (*)	Low-pressure pressure switch	Low-pressure pressure switch
Digital outputs		
DO 1	Recirculating fan	Recirculating fan
DO 2	Compressor # 1	Compressor # 1
DO 3	Compressor # 2	Compressor # 2
DO 4	-	Circuit inverter valve
DO 5	-	Defrosting-support heating coil
DO 6	General alarm	General alarm
Analogue outputs		
AO 1 (PWM)	Condensing fan	Condensing fan
AO 2 (0..10 V / 4..20 mA)	-	-
AO 3 (0..10 V / 4..20 mA)	-	-

By selecting these units, default values for parameters PC11=1 and PH44=1 are automatically set, while a “0” value is set for all input/output position parameters not specified in this configuration.

(*) Digital input derived from analogue input (parameter *PH44*).

6.2.2 Single-circuit air-to-water units

PG01 = 1 **Single-circuit**	**PG00 = 3** **Air-to-water chiller**	**PG00 = 4** **Air-to-water chiller + heat pump**
Analogue inputs		
AI 1 (NTC)	Inlet water temperature	Inlet water temperature
AI 2 (NTC)	Outlet water temperature	Outlet water temperature
AI 3 (NTC / 4..20 mA)	Condensing pressure	Condensing pressure
AI 4 (NTC / 4.20 mA / DI)	Used as DI 6	Used as DI 6
Digital inputs		
DI 1	High-pressure pressure switch	High-pressure pressure switch
DI 2	Thermal overload switch compressor # 1	Thermal overload switch compressor # 1
DI 3	Thermal overload switch compressor # 2	Thermal overload switch compressor # 2
DI 4	Flow meter	Flow meter
DI 5	Thermal overload switch pump # 1	Thermal overload switch pump # 1
DI 6 (*)	Low-pressure pressure switch	Low-pressure pressure switch
Digital outputs		
DO 1	Circulating pump	Circulating pump
DO 2	Compressor # 1	Compressor # 1
DO 3	Compressor # 2	Compressor # 2
DO 4	-	Circuit inverter valve
DO 5	Anti-frost heating coil	Anti-frost heating coil
DO 6	General alarm	General alarm
Analogue outputs		
AO 1 (PWM)	Condensing fan	Condensing fan
AO 2 (0..10 V / 4..20 mA)	-	-
AO 3 (0..10 V / 4..20 mA)	-	-

By selecting these units, default values for parameters PC11=1 and PH44=1 are automatically set, while a “0” value is set for all input/output position parameters not specified in this configuration.

(*) Digital input derived from analogue input (parameter *PH44*).

6.2.3 Single-circuit water-to-water units

PG01 = 1 **Single-circuit**	**PG00 = 5** **Water-to-water chiller**	**PG00 = 6** **Water-to-water chiller + heat pump**
Analogue inputs		
AI 1 (NTC)	Inlet water temperature	Inlet water temperature
AI 2 (NTC)	Outlet water temperature	Outlet water temperature
AI 3 (NTC / 4..20 mA)	Condensing pressure/temperature	Condensing pressure/temperature
AI 4 (NTC / 4.20 mA / DI)	Used as DI 6	Used as DI 6
Digital inputs		
DI 1	High-pressure pressure switch	High-pressure pressure switch
DI 2	Thermal overload switch compressor # 1	Thermal overload switch compressor # 1
DI 3	Thermal overload switch compressor # 2	Thermal overload switch compressor # 2
DI 4	Flow meter	Flow meter
DI 5	Thermal overload switch pump # 1	Thermal overload switch pump # 1
DI 6 (*)	Low-pressure pressure switch	Low-pressure pressure switch
Digital outputs		
DO 1	Circulating pump	Circulating pump
DO 2	Compressor # 1	Compressor # 1
DO 3	Compressor # 2	Compressor # 2
DO 4	-	Circuit inverter valve
DO 5	Anti-frost heating coil	Anti-frost heating coil
DO 6	General alarm	General alarm
Analogue outputs		
AO 1 (PWM)	-	-
AO 2 (0..10 V / 4..20 mA)	Condensing valve control	Condensing valve control
AO 3 (0..10 V / 4..20 mA)	-	-

By selecting these units, default values for parameters PC11=1 and PH44=1 are automatically set, while a “0” value is set for all input/output position parameters not specified in this configuration.

(*) Digital input derived from analogue input (parameter *PH44*).

6.2.4 Single-circuit motocondensing air-based units

PG01 = 1 **Single-circuit**	**PG00 = 7** **Motocondensing, air-based**	**PG00 = 8** **Motocondensing, air-based, with cycle inversion**
Analogue inputs		
AI 1 (NTC)	-	-
AI 2 (NTC)	-	-
AI 3 (NTC / 4..20 mA)	Condensing pressure	Condensing pressure
AI 4 (NTC / 4.20 mA / DI)	Used as DI 6	Used as DI 6
Digital inputs		
DI 1	Fan thermal switch	Fan thermal switch
DI 2	Thermal switch compressor # 1	Thermal switch compressor # 1
DI 3	Thermal switch compressor # 2	Thermal switch compressor # 2
DI 4	Compressor 1st step control	Compressor 1st step control
DI 5	Compressor 2nd step control	Compressor 2nd step control
DI 6 (*)	Low-pressure pressure switch	Low-pressure pressure switch
Digital outputs		
DO 1	-	-
DO 2	Compressor # 1	Compressor # 1
DO 3	Compressor # 2	Compressor # 2
DO 4	-	Circuit inverter valve
DO 5	-	-
DO 6	General alarm	General alarm
Analogue outputs		
AO 1 (PWM)	Condensing fan	Condensing fan
AO 2 (0..10 V / 4..20 mA)	-	-
AO 3 (0..10 V / 4..20 mA)	-	-

By selecting these units, default values for parameters PC11=2 and PH44=1 are automatically set, while a “0” value is set for all input/output position parameters not specified in this configuration.

(*) Digital input derived from analogue input (parameter *PH44*).

6.2.5 Single-circuit motocondensing water-based units

PG01 = 1 **Single-circuit**	**PG00 = 9** **Motocondensing, water-based**	**PG00 = 10** **Motocondensing, water-based, with cycle inversion**
Analogue inputs		
AI 1 (NTC)	-	-
AI 2 (NTC)	-	-
AI 3 (NTC / 4..20 mA)	Condensing water pressure/temperature	Condensing water pressure/temperature
AI 4 (NTC / 4.20 mA / DI)	Used as DI 6	Used as DI 6
Digital inputs		
DI 1	Flow meter	Flow meter
DI 2	Thermal overload switch compressor # 1	Thermal overload switch compressor # 1
DI 3	Thermal overload switch compressor # 2	Thermal overload switch compressor # 2
DI 4	Compressor 1st step control	Compressor 1st step control
DI 5	Compressor 2nd step control	Compressor 2nd step control
DI 6 (*)	Low-pressure pressure switch	Low-pressure pressure switch
Digital outputs		
DO 1	Circulating pump	Circulating pump
DO 2	Compressor # 1	Compressor # 1
DO 3	Compressor # 2	Compressor # 2
DO 4	-	Circuit inverter valve
DO 5	-	-
DO 6	General alarm	General alarm
Analogue outputs		
AO 1 (PWM)	-	-
AO 2 (0..10 V / 4..20 mA)	Condensing valve control	Condensing valve control
AO 3 (0..10 V / 4..20 mA)	-	-

By selecting these units, default values for parameters PC11=2 and PH44=1 are automatically set, while a “0” value is set for all input/output position parameters not specified in this configuration.

(*) Digital input derived from analogue input (parameter *PH44*).

TWIN-CIRCUIT VERSIONS (PG01=2)

6.2.6 Twin-circuit air-to-air units

PG01 = 2 **Twin-circuit**	**PG00 = 1** **Air-to-air chiller**	**PG00 = 2** **Air-to-air chiller + heat pump**
Analogue inputs		
AI 1 (NTC)	Ambient air temperature	Ambient air temperature
AI 2 (NTC)	Delivery air temperature	Delivery air temperature
AI 3 (NTC / 4..20 mA)	Condensing pressure Circuit # 1	Condensing pressure Circuit # 1
AI 4 (NTC / 4.20 mA / DI)	Used as DI6	Used as DI6
AI 5 (NTC)	External air temperature	External air temperature
AI 6 (NTC)	-	-
AI 7 (4..20 mA)	Condensing pressure Circuit # 2	Condensing pressure Circuit # 2
AI 8 (4..20 mA / DI)	Used as DI12	Used as DI12
Digital inputs		
DI 1	High-pressure pressure switch Circ. # 1	High-pressure pressure switch Circ. # 1
DI 2	Thermal overload switch compressor # 1	Thermal overload switch compressor # 1
DI 3	Thermal overload switch compressor # 2	Thermal overload switch compressor # 2
DI 4	Air-flow differential pressure switch	Air-flow differential pressure switch
DI 5	Recirculating fan thermal switch	Recirculating fan thermal switch
DI 6 (*[1])	High-pressure pressure switch Circ. # 1	High-pressure pressure switch Circ. # 1
DI 7	High-pressure pressure switch Circ. # 2	High-pressure pressure switch Circ. # 2
DI 8	Thermal switch compressor # 3	Thermal switch compressor # 3
DI 9	Thermal switch compressor # 4	Thermal switch compressor # 4
DI 10	Secondary set point	Secondary set point
DI 11	-	Summer/winter commutation
DI 12 (*[2])	High-pressure pressure switch Circ. # 2	High-pressure pressure switch Circ. # 2
Digital outputs		
DO 1	Recirculating fan	Recirculating fan
DO 2	Compressor # 1	Compressor # 1
DO 3	Compressor # 2	Compressor # 2
DO 4	-	Inverter valve Circuit # 1
DO 5	Fluid solenoid valve Circuit # 1	Fluid solenoid valve Circuit # 1
DO 6	General alarm	General alarm
DO 7	-	-
DO 8	Compressor # 3	Compressor # 3
DO 9	Compressor # 4	Compressor # 4
DO 10	-	Inverter valve Circuit # 2
DO 11	Fluid solenoid valve Circuit # 2	Fluid solenoid valve Circuit # 2
DO 12	-	Defrosting-support heating coil
Analogue outputs		
AO 1 (PWM)	Condensing fan Circuit # 1	Condensing fan Circuit # 1
AO 2 (0..10 V / 4..20 mA)	-	-
AO 3 (0..10 V / 4..20 mA)	-	-
AO 4 (PWM)	Condensing fan Circuit # 2	Condensing fan Circuit # 2

By selecting these units, default values for parameters PC11=1, PH44=1 and PH45=1 are automatically set, while a “0” value is set for all input/output position parameters not specified in this configuration.

(*1) Digital input derived from analogue input (parameter *PH44*).
(*2) Digital input derived from analogue input (parameter *PH45*).

6.2.7 Twin-circuit air-to-water units

PG01 = 2 **Twin-circuit**	**PG00 = 3** **Air-to-water chiller**	**PG00 = 4** **Air-to-water chiller + heat pump**
Analogue inputs		
AI 1 (NTC)	Inlet water temperature	Inlet water temperature
AI 2 (NTC)	Outlet water temperature Circuit # 1	Outlet water temperature Circuit # 1
AI 3 (NTC / 4..20 mA)	Condensing pressure Circuit # 1	Condensing pressure Circuit # 1
AI 4 (NTC / 4.20 mA / DI)	Used as DI6	Used as DI6
AI 5 (NTC)	External air temperature	External air temperature
AI 6 (NTC)	Outlet water temperature Circuit # 2	Outlet water temperature Circuit # 2
AI 7 (4..20 mA)	Condensing pressure Circuit # 2	Condensing pressure Circuit # 2
AI 8 (4..20 mA / DI)	Used as DI12	Used as DI12
Digital inputs		
DI 1	High-pressure pressure switch Circ. # 1	High-pressure pressure switch Circ. # 1
DI 2	Thermal overload switch compressor # 1	Thermal overload switch compressor # 1
DI 3	Thermal overload switch compressor # 2	Thermal overload switch compressor # 2
DI 4	Flow meter	Flow meter
DI 5	Thermal overload switch pump # 1	Thermal overload switch pump # 1
DI 6 (*[1])	High-pressure pressure switch Circ. # 1	High-pressure pressure switch Circ. # 1
DI 7	High-pressure pressure switch Circ. # 2	High-pressure pressure switch Circ. # 2
DI 8	Thermal overload switch compressor # 3	Thermal overload switch compressor # 3
DI 9	Thermal overload switch compressor # 4	Thermal overload switch compressor # 4
DI 10	Secondary set point	Secondary set point
DI 11	-	Summer/winter commutation
DI 12 (*[2])	High-pressure pressure switch Circ. # 2	High-pressure pressure switch Circ. # 2
Digital outputs		
DO 1	Circulating pump # 1	Circulating pump # 1
DO 2	Compressor # 1	Compressor # 1
DO 3	Compressor # 2	Compressor # 2
DO 4	Anti-frost heating coil # 1	Inverter valve Circuit # 1
DO 5	Fluid solenoid valve Circuit # 2	Fluid solenoid valve Circuit # 2
DO 6	General alarm	General alarm
DO 7	Free-cooling solenoid valve	Free-cooling solenoid valve
DO 8	Compressor # 3	Compressor # 3
DO 9	Compressor # 4	Compressor # 4
DO 10	Anti-frost heating coil # 2	Inverter valve Circuit # 2
DO 11	Fluid solenoid valve Circuit # 2	Fluid solenoid valve Circuit # 2
DO 12	-	-
Analogue outputs		
AO 1 (PWM)	Condensing fan Circuit # 1	Condensing fan Circuit # 1
AO 2 (0..10 V / 4..20 mA)	Free-cooling solenoid valve	Free-cooling solenoid valve
AO 3 (0..10 V / 4..20 mA)	-	-
AO 4 (PWM)	Condensing fan Circuit # 2	Condensing fan Circuit # 2

By selecting these units, default values for parameters PC11=1, PH44=1 and PH45=1 are automatically set, while a “0” value is set for all input/output position parameters not specified in this configuration.

(*1) Digital input derived from analogue input (parameter *PH44*).
(*2) Digital input derived from analogue input (parameter *PH45*).

6.2.8 Twin-circuit water-to-water units

PG01 = 2 **Twin-circuit**	**PG00 = 5** **Water-to-water chiller**	**PG00 = 6** **Water-to-water chiller + heat pump**
Analogue inputs		
AI 1 (NTC)	Inlet water temperature	Inlet water temperature
AI 2 (NTC)	Outlet water temperature Circuit # 1	Outlet water temperature Circuit # 1
AI 3 (NTC / 4..20 mA)	Condensing pressure/temperature Circuit # 1	Condensing pressure/temperature Circuit # 1
AI 4 (NTC / 4.20 mA / DI)	Used as DI6	Used as DI6
AI 5 (NTC)	Geothermal heat exchanger temperature	Geothermal heat exchanger temperature
AI 6 (NTC)	Outlet water temperature Circuit # 2	Outlet water temperature Circuit # 2
AI 7 (4..20 mA)	Condensing pressure/temp. Circuit # 2	Condensing pressure/temp. Circuit # 2
AI 8 (4..20 mA / DI)	Used as DI12	Used as DI12
Digital inputs		
DI 1	High-pressure pressure switch Circuit # 1	High-pressure pressure switch Circuit # 1
DI 2	Thermal overload switch compressor # 1	Thermal overload switch compressor # 1
DI 3	Thermal overload switch compressor # 2	Thermal overload switch compressor # 2
DI 4	Flow meter	Flow meter
DI 5	Thermal overload switch pump # 1	Thermal overload switch pump # 1
DI 6 (*[1])	Low-pressure pressure switch Circuit # 1	Low-pressure pressure switch Circuit # 1
DI 7	High-pressure pressure switch Circuit # 2	High-pressure pressure switch Circuit # 2
DI 8	Thermal overload switch compressor # 3	Thermal overload switch compressor # 3
DI 9	Thermal overload switch compressor # 4	Thermal overload switch compressor # 4
DI 10	Secondary set point	Secondary set point
DI 11	-	Summer/winter commutation
DI 12 (*[2])	Low-pressure pressure switch Circuit # 2	Low-pressure pressure switch Circuit # 2
Digital outputs		
DO 1	Circulating pump # 1	Circulating pump # 1
DO 2	Compressor # 1	Compressor # 1
DO 3	Compressor # 2	Compressor # 2
DO 4	Anti-frost heating coil # 1	Inverter valve Circuit # 1
DO 5	Fluid solenoid valve Circuit # 1	Fluid solenoid valve Circuit # 1
DO 6	General alarm	General alarm
DO 7	Geothermal by-pass solenoid valve	Geothermal by-pass solenoid valve
DO 8	Compressor # 3	Compressor # 3
DO 9	Compressor # 4	Compressor # 4
DO 10	Anti-frost heating coil # 2	Inverter valve Circuit # 2
DO 11	Fluid solenoid valve Circuit # 2	Fluid solenoid valve Circuit # 2
DO 12	-	-
Analogue outputs		
AO 1 (PWM)	-	-
AO 2 (0..10 V / 4..20 mA)	Condensing valve # 1 control	Condensing valve # 1 control
AO 3 (0..10 V / 4..20 mA)	Condensing valve # 2 control	Condensing valve # 2 control
AO 4 (PWM)	-	-

By selecting these units, default values for parameters PC11=1, PH44=1 and PH45=1 are automatically set, while a “0” value is set for all input/output position parameters not specified in this configuration.

(*1) Digital input derived from analogue input (parameter *PH44*).
(*2) Digital input derived from analogue input (parameter *PH45*).

6.2.9 Twin-circuit motocondensing air-based units

PG01 = 2 **Twin-circuit**	**PG00 = 7** **Motocondensing, air-based**	**PG00 = 8** **Motocondensing, air-based, with cycle inversion**
Analogue inputs		
AI 1 (NTC)	-	-
AI 2 (NTC)	-	-
AI 3 (NTC / 4..20 mA)	Condensing pressure Circuit # 1	Condensing pressure Circuit # 1
AI 4 (NTC / 4.20 mA / DI)	Used as DI6	Used as DI6
AI 5 (NTC)	External temperature	External temperature
AI 6 (NTC)	-	-
AI 7 (4..20 mA)	Condensing pressure Circuit # 2	Condensing pressure Circuit # 2
AI 8 (4..20 mA / DI)	Used as DI12	Used as DI12
Digital inputs		
DI 1	Fan thermal switch	Fan thermal switch
DI 2	Thermal switch compressor # 1	Thermal switch compressor # 1
DI 3	Thermal switch compressor # 2	Thermal switch compressor # 2
DI 4	Compressor 1st step control	Compressor 1st step control
DI 5	Compressor 2nd step control	Compressor 2nd step control
DI 6 (*1)	Low-pressure pressure switch Circuit # 1	Low-pressure pressure switch Circuit # 1
DI 7	Thermal overload switch compressor # 3	Thermal overload switch compressor # 3
DI 8	Thermal overload switch compressor # 4	Thermal overload switch compressor # 4
DI 9	Compressor 3rd step control	Compressor 3rd step control
DI 10	Compressor 4th step control	Compressor 4th step control
DI 11	-	Summer/winter commutation
DI 12 (*2)	Low-pressure pressure switch Circuit # 2	Low-pressure pressure switch Circuit # 2
Digital outputs		
DO 1	-	-
DO 2	Compressor # 1	Compressor # 1
DO 3	Compressor # 2	Compressor # 2
DO 4	-	Inverter valve Circuit # 1
DO 5	Fluid solenoid valve Circuit # 1	Fluid solenoid valve Circuit # 1
DO 6	General alarm	General alarm
DO 7	-	-
DO 8	Compressor # 3	Compressor # 3
DO 9	Compressor # 4	Compressor # 4
DO 10	-	Inverter valve Circuit # 2
DO 11	Fluid solenoid valve Circuit # 2	Fluid solenoid valve Circuit # 2
DO 12	-	-
Analogue outputs		
AO 1 (PWM)	Condensing fan Circuit # 1	Condensing fan Circuit # 1
AO 2 (0..10 V / 4..20 mA)	-	-
AO 3 (0..10 V / 4..20 mA)	-	-
AO 4 (PWM)	Condensing fan Circuit # 2	Condensing fan Circuit # 2

By selecting these units, default values for parameters PC11=2, PH44=1 and PH45=1 are automatically set, while a “0” value is set for all input/output position parameters not specified in this configuration.

(*1) Digital input derived from analogue input (parameter *PH44*).
(*2) Digital input derived from analogue input (parameter *PH45*).

6.2.10 Twin-circuit motocondensing water-based units

PG01 = 2 **Twin-circuit**	**PG00 = 9** **Motocondensing, water-based**	**PG00 = 10** **Motocondensing, water-based, with cycle inversion**
Analogue inputs		
AI 1 (NTC)	-	-
AI 2 (NTC)	-	-
AI 3 (NTC / 4..20 mA)	Condensing water pressure/temp. Circ. # 1	Condensing water pressure/temp. Circ. # 1
AI 4 (NTC / 4.20 mA / DI)	Used as DI6	Used as DI6
AI 5 (NTC)	-	-
AI 6 (NTC)	-	-
AI 7 (4..20 mA)	Condensing water pressure/temp. Circ. # 2	Condensing water pressure/temp. Circ. # 2
AI 8 (4..20 mA / DI)	Used as DI12	Used as DI12
Digital inputs		
DI 1	Flow meter	Flow meter
DI 2	Thermal overload switch compressor # 1	Thermal overload switch compressor # 1
DI 3	Thermal overload switch compressor # 2	Thermal overload switch compressor # 2
DI 4	Compressor 1st step control	Compressor 1st step control
DI 5	Compressor 2nd step control	Compressor 2nd step control
DI 6 (*1)	Low-pressure pressure switch Circuit # 1	Low-pressure pressure switch Circuit # 1
DI 7	Thermal overload switch compressor # 3	Thermal overload switch compressor # 3
DI 8	Thermal overload switch compressor # 4	Thermal overload switch compressor # 4
DI 9	Compressor 3rd step control	Compressor 3rd step control
DI 10	Compressor 4th step control	Compressor 4th step control
DI 11	-	Summer/winter commutation
DI 12 (*2)	Low-pressure pressure switch Circuit # 2	Low-pressure pressure switch Circuit # 2
Digital outputs		
DO 1	Circulating pump	Circulating pump
DO 2	Compressor # 1	Compressor # 1
DO 3	Compressor # 2	Compressor # 2
DO 4	-	Inverter valve Circuit # 1
DO 5	Fluid solenoid valve Circuit # 1	Fluid solenoid valve Circuit # 1
DO 6	General alarm	General alarm
DO 7	Anti-frost heating coil # 1	Anti-frost heating coil # 1
DO 8	Compressor # 3	Compressor # 3
DO 9	Compressor # 4	Compressor # 4
DO 10	-	Inverter valve Circuit # 2
DO 11	Fluid solenoid valve Circuit # 2	Fluid solenoid valve Circuit # 2
DO 12	Anti-frost heating coil # 2	Anti-frost heating coil # 2
Analogue outputs		
AO 1 **(PWM)**	-	-
AO 2 **(0..10 V / 4..20 mA)**	Condensing valve # 1 control	Condensing valve # 1 control
AO 3 **(0..10 V / 4..20 mA)**	Condensing valve # 2 control	Condensing valve # 2 control
AO 4 **(PWM)**	-	-

By selecting these units, default values for parameters PC11=2, PH44=1 and PH45=1 are automatically set, while a "0" value is set for all input/output position parameters not specified in this configuration.

(*1) Digital input derived from analogue input (parameter *PH44*).
(*2) Digital input derived from analogue input (parameter *PH45*).

CAUTION! When the machine type is changed (by modifying parameter PG00 or PG01), it is necessary to switch OFF and then back ON the plant, to enable the unit to reconfigure itself correctly; to allow the card to assign all affected parameters, it is advisable to wait for a few seconds (3 seconds are more than ample time), before interrupting the unit's power supply.

6.3 Configuration of Circuits

When dealing with units comprising two circuits (*twin-circuit* units, *PG01=2*), some basic features need to be defined:

1) Single or separate condensing (parameter *PG11*)
   This configuration has an effect:
   - On condensing regulation, which, in the case of a single fan, is carried out on the highest of the acquired values of condensing pressure/temperature;
   - On heat pump units, during defrosting, since in the case of a single fan it is not possible to carry out separate defrosting of each circuit (while the other one continues to operate, thus partly compensating water cooling, as a consequence of inverted-cycle operation of the circuit being defrosted);
   - On free-cooling operation, where the same fan splits into condensing regulation and free-cooling regulation (in case of a single air circuit, *PG13=0*).

2) In the case of NEUTRAL ZONE regulation (*PC11=1*), compressor regulation is based on the average value of the two outlet temperature probes. Via parameter *PC02*, it is possible to select the distribution of the chilling steps required by thermoregulation on the two compressor circuits; *PC02=0* requirements are balanced between the two circuits, whereas *PC02=1* saturates the steps of one circuit, before requesting any of the other.

3) Which circuit must start delivering chilling is decided on the basis of the two outlet temperature values. In the case of *mode=Cool (chiller)*, the circuit from which the chilling request starts is the one with the higher outlet temperature, whereas in the case of *mode=hEAt (heat pump)*, the first circuit to turn on user loads is the one with the lower temperature. The selection of the circuit on which regulation is to be started is only carried out in the absence of chilling requests from both circuits, i.e. when the total number of chilling steps is zero.

4) Position of pressure sensors on heat pump units (*PH48*)
   On air-to-water heat pump units, during winter operation, defrosting control can be carried out by reading the pressure value of the same transducer used to control condensing pressure during summer operation. In this case, the transducers is normally positioned close to the finned heat exchanger, i.e. after the cycle-inverter valve. A more rigorous control can be achieved by using two separate transducers (one on the defrosting compressor air-delivery piping and one on the condensing delivery piping). Parameter *PH48* specifies whether the same transducer is to function in both summer and winter operating mode.

6.4 Operating Mode Control

The operating mode can take on the following values:

"MOdE" parameter	*Operating mode*	*Description*
0=CooL	***Chiller***	***Summer operation***
1=hEAt	***Heat pump (*)***	***Winter operation***

(*) Heat pump operation is only possible if the machine has been configured as c*hiller + heat pump (parameter PG00=2,4,6,8,10).*

If the machine has only been configured as chiller *(parameter PG00=1,3,5,7,9)*, the *MOdE* parameter is no longer modifiable, thus the operating mode is fixed at 0 (i.e. **CooL**).

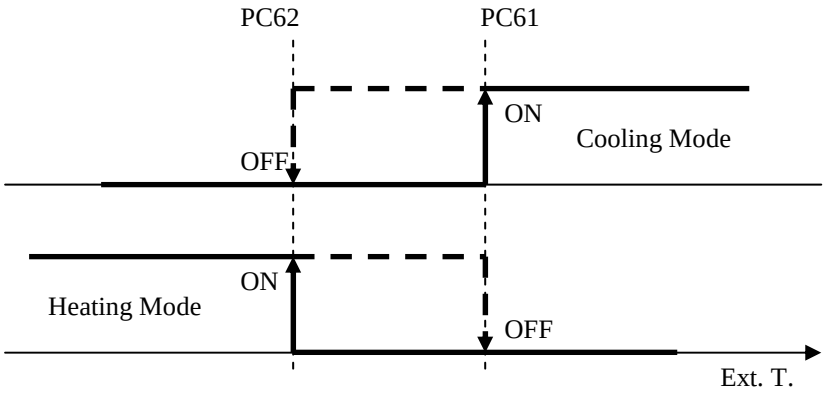
There are several procedures which enable configuration of the machine's operating mode:

1) Via the *MOdE* **parameter**, accessible from the User menu.
   Setting – Go to the parameter, then, pressing the ENTER key, modify the value using the UP and DOWN keys. Confirm by pressing ENTER once more: the corresponding icon will confirm that modification has been successful.

2) Via the command **Summer/winter from digital input** (this function is enabled by parameters *PH08* and *Hd05*, to determine the position of the associated digital input).
   Setting – With open contact, the unit is set for winter operation, whereas with closed contact it is set for summer operation. Commutation of the digital input switches the unit OFF, changes its operating mode, and then switches the unit back ON.

3) Using a **supervisory protocol** (this function is enabled via parameter *PH10*).
   Setting – Send from protocol the operating-mode change command: the corresponding operating mode icon will confirm that modification has been successful.

4) Via the automatic **Change-over** function (this function is enabled via parameter *PH06*).
   Setting – When the external temperature value exceeds the *Summer Commutation Set Point PC61*, the unit commutates to summer operating mode. Conversely, when the external temperature value falls below the *Winter Commutation Set Point PC62*, the unit commutates to winter operating mode.



In order to enable this function, the external temperature probe (*PH24*) must also be enabled.

WARNING – Operating mode change-over can also happen while the machine is ON: in this case, the machine switches itself OFF – complying with all its timings – then commutates, and thereafter switches itself back ON automatically.

Note: During commutation, high and low-temperature controls are enabled.

Note: Commutation is disabled during defrosting cycles.

6.4.1 Heat-pump-only mode

If the machine has been configured as *chiller + heat pump*, by setting parameter *PG08 = 1* it is possible to choose to make it operate as a heat pump only. This configuration forces the *MOdE* parameter to the value 1 (**hEAt**), and can exclude from normal operation the use of outlet temperature and anti-frost probes, together with their associated alarms:

- To disable the outlet temperature probes, alarm and connected consequences, set parameter *PH22=0*.
- To disable anti-frost, alarm and connected consequences, set parameter *Pr01=0*.

Note: The *PG08* parameter can only be modified while the machine is in OFF mode.

6.4.2 Geothermal heat pumps

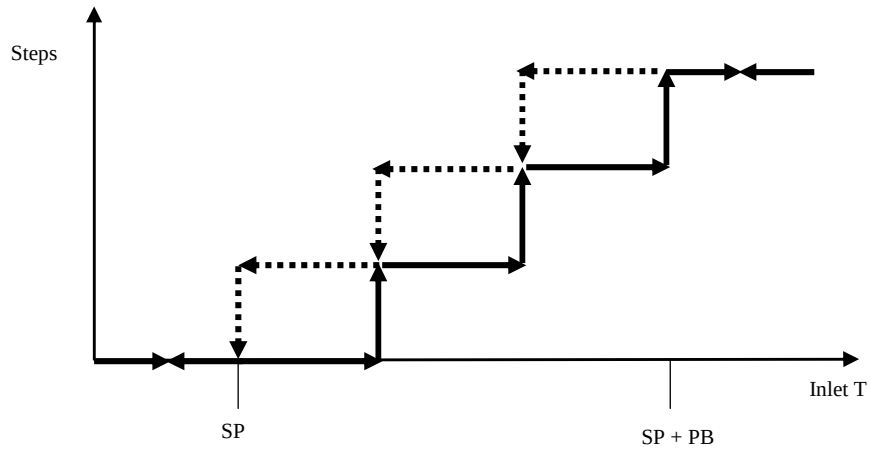
So-called “geothermal” heat pumps are peculiar water-to-water units, which exchange heat with the subsoil, via a buried piping system in which a water-glycol solution circulates.
An alternative to the simple winter heat pump is that of exploiting the “low” temperature of the subsoil for summer chilling, when combined with a system of floor-mounted or other type of radiating panels: given the vast heat-exchange surface, a thermal jump of only few degrees is sufficient to produce summer chilling. In this case, it is necessary to provide between the geothermal circuit and user loads the activation of a by-pass element, which can be a pump or motor-operated valve.

6.5 Compressor Regulation

The control of air temperature (air-to-air machines) or of water temperature (air-to-water or water-to-water machines) is carried out via the control of mechanical components, i.e. compressors and/or fans. Two types of regulation are provided for: lateral-band regulation on inlet temperature and neutral-zone regulation on outlet temperature.

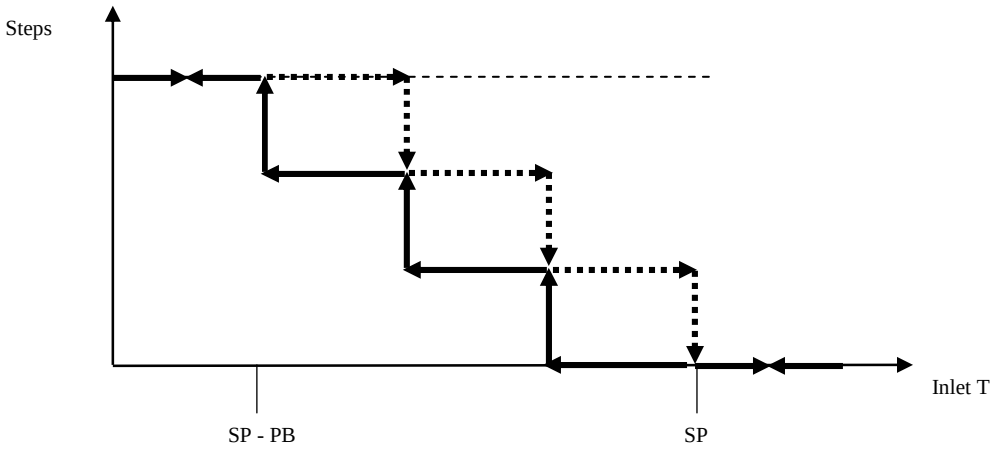
6.5.1 Lateral-band (LB) regulation

Lateral-band regulation avails itself of proportional control, in order to establish when to cut in or out the compressors in use, thus regularising – within the proportional band – the switching ON or OFF of the various devices.
The following figure illustrates the behaviour of band regulation (Set point, Set point + Proportional band) in the case of summer operation (chiller). According to the inlet temperature value, regulation increases or decreases the number of steps to be required of the compressors. In this particular regulation, the entire band is shifted beyond the set point.



- *Mode = Operating mode* (0 = Summer)
- *SPC1 = LB summer set point*
- *PC11 = Regulation type* (0 = Lateral band)
- *PC12 = Regulation band*
- *PC21 = Chiller set point lower limit*
- *PC22 = Chiller set point upper limit*

Conversely, in winter operating mode (heat pump), the entire band is shifted below the set point:

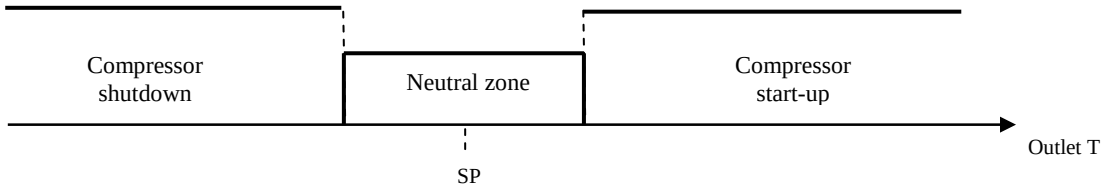


- *Mode = Operating mode* (1 = Winter)
- *SPH1 = LB winter set point*
- *PC11 = Regulation type* (0 = Lateral band)
- *PC12 = Regulation band*
- *PC23 = Heat pump set point lower limit*
- *PC24 = Heat pump set point upper limit*

6.5.2 Neutral-zone (NZ) regulation

This regulation requires the definition of a neutral zone (NZ) around the set point, within which no decision will be taken as to the activation or de-activation of compressors in use at the time.
If the outlet temperature is found to be outside the neutral zone, the compressors are activated/de-activated, in order to bring the temperature value back within the neutral zone.
The requests for switching ON/OFF for the various power steps provided by compressors in summer operating mode (chiller) will follow this logic:

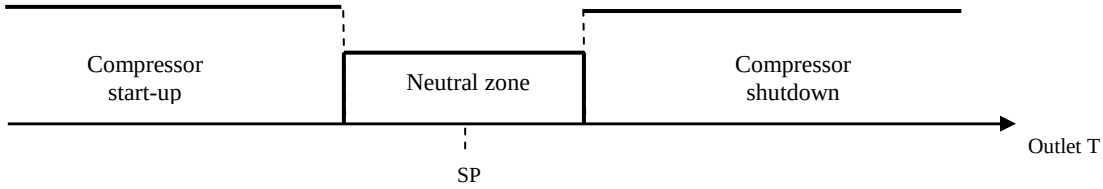
- Switching ON: when the outlet temperature exceeds the neutral zone.
- Switching OFF: when the outlet temperature falls below the neutral zone.



- *Mode = Operating mode* (0 = Summer)
- *SPC1 = NZ summer set point*
- *PC11 = Regulation type* (1 = Neutral zone)
- *PC14 = Neutral zone*
- *PC17 = Extra time for out-of-zone request*
- *PC21 = Chiller set point lower limit*
- *PC22 = Chiller set point upper limit*

The requests for switching ON/OFF for the various power steps provided by compressors in winter operating mode (heat pump) will follow this logic:

- Switching ON: when the outlet temperature falls below the neutral zone.
- Switching OFF: when the outlet temperature exceeds the neutral zone.



- *Mode = Operating mode* (1 = Winter)
- *SPH1 = NZ winter set point*
- *PC11 = Regulation type* (1 = Neutral zone)
- *PC14 = Neutral zone*
- *PC17 = Extra time for out-of-zone request*
- *PC23 = Heat pump set point lower limit*
- *PC24 = Heat pump set point upper limit*

If the outlet temperature still remains outside the neutral zone, even after the extra-time interval set in parameter PC17 has elapsed, the switching ON or OFF of a further power step will be requested.
The setting of parameter *PC18 = 1* activates an output-temperature auto-adaptive regulation function, in which the neutral zone is calculated in such a way as to take into account the dynamic properties of the plant and load variations. In particular, the neutral zone can vary taking into account compressor timings and the number of start-ups per hour. In this case, the value of parameter PC14 (neutral zone) only makes sense at unit start-up, whereas it will be recalculated – within the minimum PC15 limit and maximum PC16 limit – to "adapt" to an intermediate operating situation, as compared with the maximum number of hourly start-ups (parameter PC09).

Note: In the case of a twin-circuit system (*PG01=2*), regulation is carried out *on the average value of the two output-temperature probes*.
If there should be an error in one of the two probes, regulation is carried out on the other, functioning probe. If the presence of an error on both probes, regulation is no longer feasible, and the number of compressors to be activated for each circuit can then be selected via parameter *PC10*.

6.5.3 Compressor activation from digital input

On MOTOCONDENSING units, instead of using thermostat regulation on input or outlet temperature, compressors are activated according to the status of an input contact (one for each step). By setting parameter *PC11 (Regulation type)* to the value 2, this regulation is activated; it maintains unaltered both the relative ON/OFF timings of compressors and their rotation functions among themselves. In order to correctly configure this regulation, the following parameters must be set:

- *PC11 = Regulation type*
- *Hd11 = Digital input position for 1st step*
- *Hd12 = Digital input position for 2nd step*
- *Hd13 = Digital input position for 3rd step*
- *Hd14 = Digital input position for 4th step*
- *Hd15 = Digital input position for 5th step*
- *Hd16 = Digital input position for 6th step*
- *PH29 = Digital input logic*

6.6 Compressor Management

The program is capable of managing up to a maximum of 3 compressors of the same power for each circuit, thus 6 compressors in total. To each compressor digital inputs for protection devices can be associated, as well as digital outputs for ON/OFF switching.
Switching ON/OFF is guaranteed by lateral-band or neutral-zone thermal regulation (see previous chapter) and by some timings which protect the various starting points.

6.6.1 Compressor statuses

To each compressor, an operating status is associated, which is visible from the relative LED or in the status template from the main menu. A compressor can take on the following statuses:

- *Disabled*: The compressor has not been configured, the display shows "**dIS**".
- *On*: The status display shows **"On"**.
- *Waiting to switch ON*: The compressor is waiting for protection timings, before switching ON. The status display shows **"tOn"**.
- *Off*: The status display shows **"Off"**.
- *Waiting to switch OFF*: The compressor is waiting for protection timings, before switching OFF. The status display shows **"tOFF"**.
- *Alarm*: The compressor is in alarm status. The status display shows **"ALAr"**.
- *Manual*: The compressor is in manual operating mode. The status display shows **"MAnU"**.

In the maintenance operator menu, via parameters *PM01, PM02, PM03, PM04, PM05 and PM06*, it is possible to read the number of operating hours of the corresponding compressors. To zero these hours when required, it is sufficient to enter a "0" value using the ENTER key.

6.6.2 Rotation of compressors

Rotation of compressors is a procedure which enables balancing – as far as possible – of the number of operating hours and start-ups of each compressor.
In the case of twin circuits, rotation must manage – whenever possible – the distribution of circuit compressor requests in such a way as to privilege a balanced operation of both circuits.
Rotation does not affect any compressors in alarm status or manual operation mode, and is capable of dynamically switching ON other compressors, in case one or more of them should be in alarm status.
Via parameter *PC01*, the program is capable of managing 4 types of rotation: FIFO, LIFO, FIFO + number of hours, LIFO + number of hours.

1) FIFO

This method follows the *"First In First Out"* logic, i.e. the first compressor to be switched on will have to be the first to be switched OFF again. This operating logic could initially lead to a great difference in the number of operating hours between the various compressors, but, after the initial phase, the hours should more or less equalise.
This type of rotation has a peculiarity in cases where not all configured compressors within the plant are switched ON; indeed, if for example the first compressor is switched ON and then OFF again, the next compressor to be switched ON will be the second one. The last compressor to be switched OFF is stored in memory, then the next compressor in the sequence is switched ON, so as to avoid always using the same compressor, thus exploiting in a better manner all configured elements.

2) **LIFO**

This method follows the *"Last In First Out"* logic, i.e. the last compressor to be switched ON will be the first to be switched OFF.

3) **FIFO + number of operating hours**

This type of rotation favours a comparison of the number of operating hours of the various compressors. At switching ON, the compressor with the least number of operating hours will be privileged, whereas at switching OFF priority will be given to the compressor with the greatest number of hours.
In case of having to choose between compressors with the same number of operating hours, a FIFO rotation is triggered, so as to guarantee a rotation anyway, even in the presence of the same number of hours (see the previous FIFO case).

4) **LIFO + number of operating hours**

This type of rotation favours a comparison of the number of operating hours of the various compressors. At switching ON, the compressor with the least number of operating hours will be privileged, whereas at switching OFF priority will be given to the compressor with the greatest number of hours.

In case there needs to be a choice between compressors having the same number of operating hours, a classic LIFO rotation is triggered.

On twin-circuit machines, it is possible to decide – based on parameter *PC02* – how the steps requested by thermal regulation are to be shared between the two circuits:
PC02 = 0. Circuit balancing: the system requests alternatively a step per circuit, so as to balance loads between the two circuits, provided no alarms have been activated.
PC02 = 1. Circuit saturation: the system requests all available steps from the first circuit, and then all those available from the second circuit, so as to always have one circuit under full load, provided no alarms have been activated.

6.6.3 Pump-down switch-OFF procedure

On machines with power above a certain limit and where there is a substantial amount of refrigerant, the pump-down procedure is necessary to partially empty the evaporator of excess refrigerant. Therefore, the solenoid valve situated upstream from the related evaporator is controlled in such a way that the compressor remains ON for the time interval *Compressor switch-OFF delay in pump-down* (parameter *PC42*). At compressor start-up, the solenoid valve is opened at the precise same instant. In order to enable this function, the following parameters must be set:

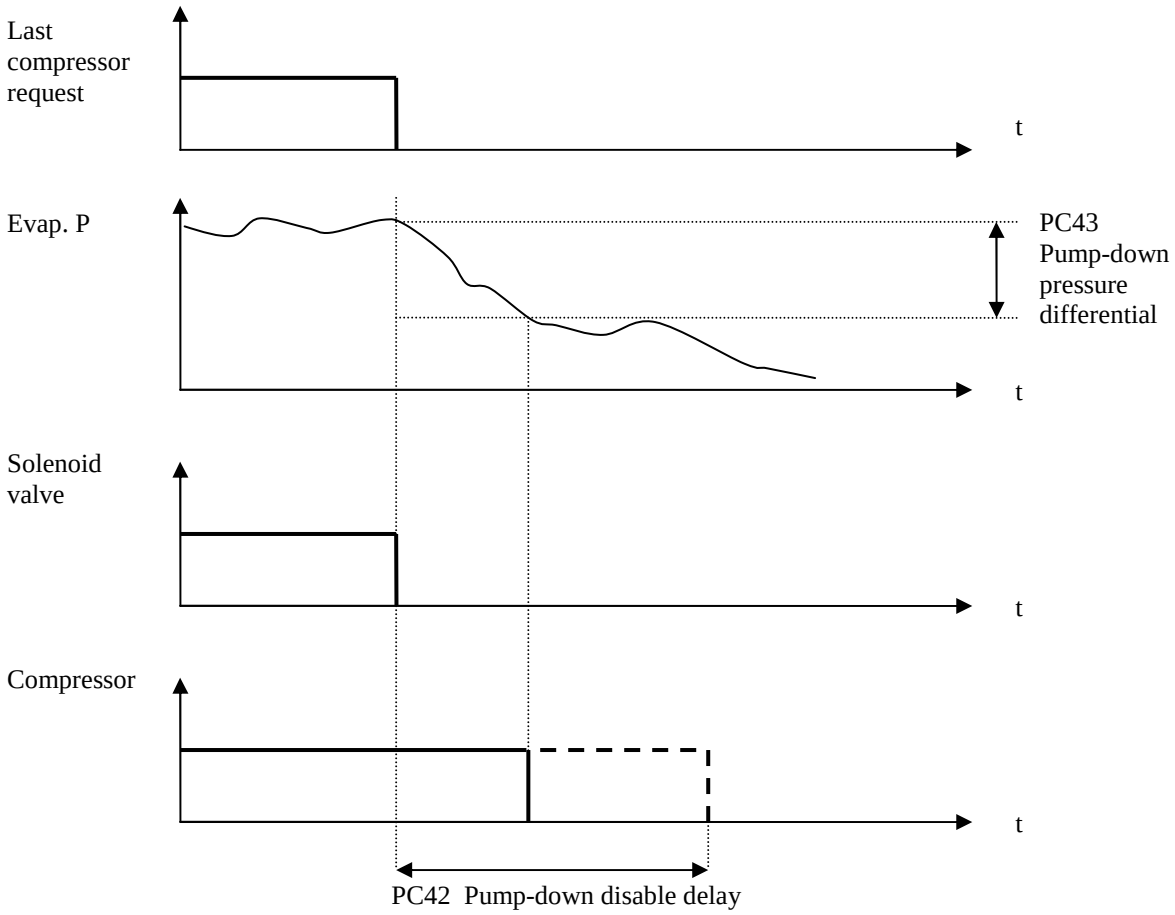
- PC41 = 1: Function enable
- PC42: Pump-down time
- HA07: Position of solenoid valve digital output, Circuit # 1
- HA08: Position of solenoid valve digital output, Circuit # 2

Note: In case of alarm, the system must ignore the compressor switch-OFF delay.

6.6.4 Relative-threshold pump-down

If low-pressure transducers are available, it is possible to carry out the pump-down procedure leaving the compressor ON only for the time necessary to empty a correct part of refrigerant. At the end of the request by the last compressor to be ON from the affected evaporator, the evaporation

pressure value is stored, the fluid solenoid valve is disabled, and, once the evaporation pressure value has fallen by the *Pump-down pressure differential PC43*, the compressor is switched OFF.



Anyway, there is always the Compressor switch-OFF delay in pump-down, should the switch-OFF pressure threshold not be reached, or should evaporation probes be faulty.

In order to enable this function, the following parameters must be set:

- PC41 = 2: Function enable
- PC42: Pump-down time
- PC43: Pump-down differential
- HA07: Position of solenoid valve digital output, Circuit # 1
- HA08: Position of solenoid valve digital output, Circuit # 2
- PH44 = 4: Enabling of evaporation probe, Circuit # 1
- PH45 = 2: Enabling of evaporation probe, Circuit # 2

Note: In case of alarm, the system must ignore the compressor shutdown delay.

6.6.5 Protection timings

There now follows a list of all timings connected with the management of compressors.

Protection timings

The purpose of these timings is that of protecting mechanical units from the various start-up stresses to which they are subjected.

PC04 = Compressor minimum ON time. Once it has been activated, a compressor must remain ON for this time interval, before it can be switched OFF again.

PC05 = Compressor minimum OFF time. This is the minimum time interval that must elapse from the last switching-OFF, before the compressor can be switched back ON again.

PC06 = Minimum time between switchings-ON of the same compressor. It determines the minimum time which must elapse between two switchings-ON of the same compressor.

PC07 = Minimum time between switchings-ON of different compressors. It determines the minimum time which must elapse between the switching-ON of a compressor and that of the next one.

PC08 = Minimum time between switchings-OFF of different compressors. It determines the minimum time which must elapse between the switching-OFF of a compressor and that of the next one.

PC09 = Maximum number of compressor start-ups within one hour. This determines the maximum number of switchings-ON within the time span of one hour: should this limit be reached, the regulator will wait until conditions are present, before switching that compressor ON again.

Neutral-zone timings

These parameters are used to time the request for switching ON/OFF the various compressors.

PC17 = Extra time for ON/OFF switching request

6.6.6 Thermal protection inputs

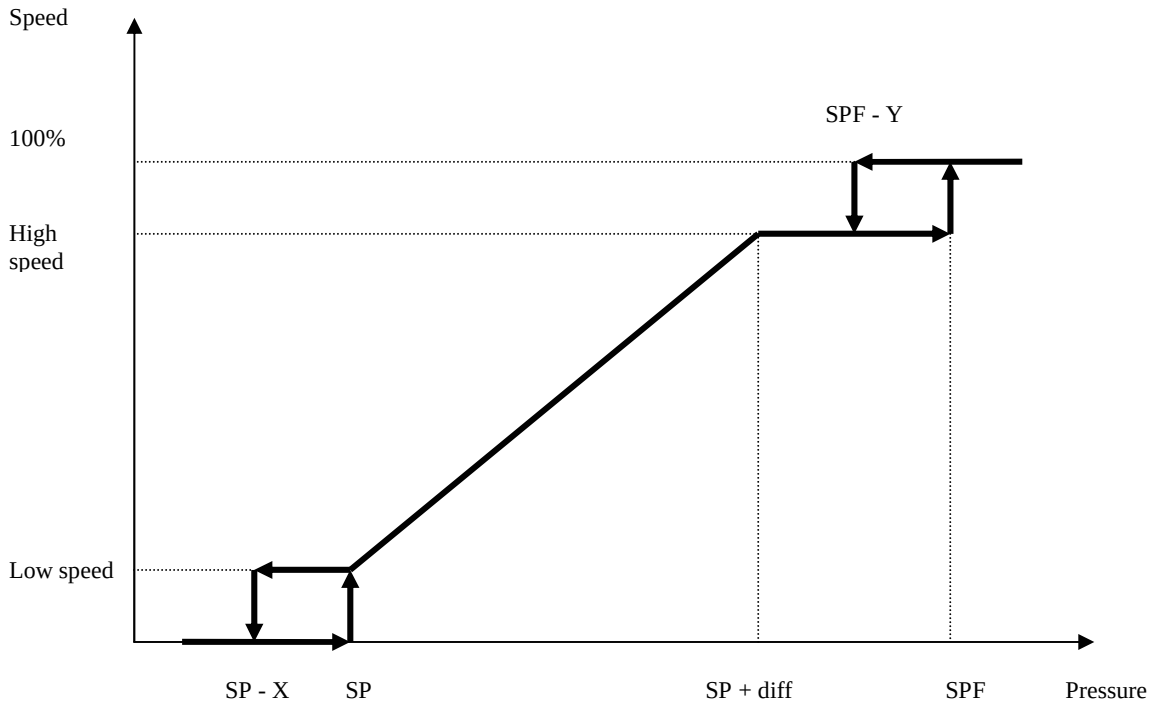
The program provides for the management of a compressor thermal safety switch input for each compressor. For this input, it is possible to set, via parameters, the type of reset (manual or automatic), as well as the triggering delay.
In order to enable the alarms connected with these thermal protections, in addition to setting the aforementioned parameters, it is also necessary to set, in the *CoSt->HArd* menu, the *position* in which the digital inputs pertaining to these alarms are to be connected. If no alarm is to be set, it is sufficient to set the above parameter to 0.

6.7 Condensation Regulation

Condensation management provides for fan control of condensing pressure: this can be achieved using an analogue output (inverter or phase-cut) for each circuit.
If parameter *PF02* is set to 0, regulation will be independent of thermoregulation; otherwise, fans will be activated only if the thermoregulator requests the switching ON of at least one compressor.

6.7.1 Fan linear regulation

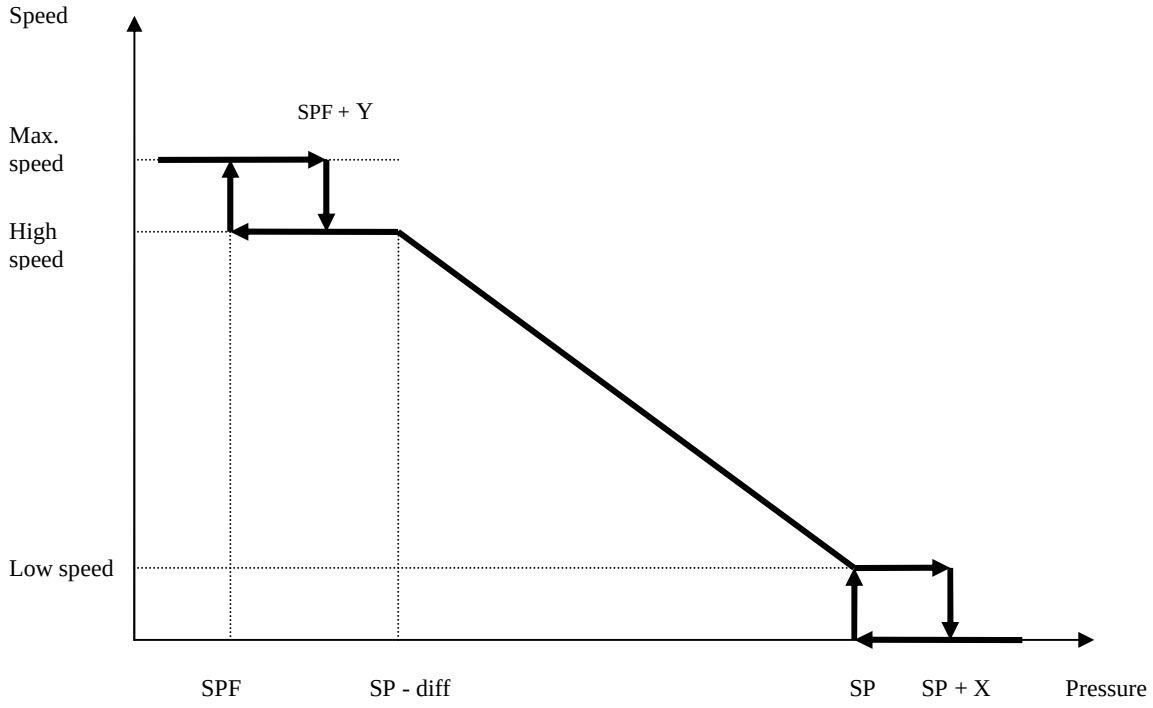
Thanks to the continuous regulation of fans, a proportional linear control of condensation is performed, via an inverter (output A02, 0-10 V type; or A03, 4-20 mA type), or via a phase-cut module (pulsed output A01).
Fan speed regulation provides for a minimum speed value, to manage start-ups in such a way as to avoid operating fan motors at an excessively low rpm rate. In addition, it is possible to set a *Speed-up time PF27* at start-up, during which the fan will reach maximum speed.
The possibility is provided for, of maintaining the fans at minimum speed, even below the set point value. Should pressure decrease further below the set point of a given threshold, fan switching OFF is forced.
There is, in addition, a high-speed value beyond which velocity remains constant. If maximum forcing has been enabled, should pressure increases further, exceeding a given threshold, fan speed will be forced to 100%.
The following figure illustrates the behaviour of continuous regulation in the case of summer operation (chiller). In this particular regulation, the proportional band is completely shifted above the set point.



- *Mode = Operating mode* (0 = Summer)
- *PF11 = Summer condensation regulation set point (SP)*
- *PF12 = Summer condensation regulation differential*
- *PF13 = Summer maximum speed forcing enable*
- *PF14 = Summer maximum speed forcing set point (SPF)*

- *PF15 = Summer maximum speed forcing differential (Y)*
- *PF26 = Inverter forcing minimum value*
- *PF27 = Speed-up time*
- *PF31 = Fan low-speed limit*
- *PF32 = Fan high-speed limit*
- *PF33 = Fan regulation enable below set point*
- *PF34 = Fan switching OFF differential below set point (X)*

The following figure illustrates the behaviour of continuous regulation in the case of winter operation (heat pump). In this particular regulation, the proportional band is completely shifted below the set point.



- *Mode = Operating mode* (1 = Winter)
- *PF21 = Winter condensation regulation set point (SP)*
- *PF22 = Winter condensation regulation differential*
- *PF23 = Winter maximum speed forcing enable*
- *PF24 = Winter maximum speed forcing set point (SPF)*
- *PF25 = Winter maximum speed forcing differential (Y)*
- *PF26 = Inverter forcing minimum value*
- *PF27 = Speed-up time*
- *PF31 = Fan low-speed limit*
- *PF32 = Fan high-speed limit*
- *PF33 = Fan regulation enable above set point*
- *PF34 = Fan switching OFF differential above set point (X)*

In order to select this regulation, it is also necessary to set the parameters associated with the analogue outputs of condensing fans:

- *HF31*: Position of condensing fan analogue output, Circuit # 1

- *HF32*: Position of condensing fan analogue output, Circuit # 2

6.7.2 Condensing valve regulation

On water-to-water machines, during summer operation, the water feeding the condensing circuit is controlled according to condensing pressure, via a valve (this can be a two-way solenoid or motor-operated pressure-switch valve, modulating with a 0-10 V control-generated signal). Condensation control is performed in similar fashion to fan speed control.

6.7.3 Condensing fan pre-start at high external temperatures

By enabling this function (PF36=1), when the external temperature exceeds a configurable external temperature threshold (PF37), upon the request for the step that activates the first compressor of the relevant condensing circuit, a fan pre-start is triggered at 50% (modifiable via parameter PF38) of rotational rpm, and after 5 seconds (default parameter PF39) the compressor is started. Fan pre-start remains activated until the condensing pressure regulation ramp exceeds 50%, then it is disabled, and speed regulation follows as standard the behaviour of the condensing pressure. In order to enable this function, the external temperature probe (*PH24*) must also be enabled.

Note 1. Anyway, pre-start takes into account protection timings of the two fans; the fan requesting pre-start will only start after its protection delay (if any) has elapsed, therefore requests to compressors in that circuit will also be delayed.

Note 2. When condensation management depends on the compressors (PF02=1), the pre-start function is inhibited.

6.7.4 Single condensation

On twin-circuit machines, it is possible to choose to use only one circuit to manage condensation. In order to enable this function, it is necessary to set *PG11=1*. Condensing is performed by the fan in Circuit # 1, using the highest of the condensing pressure/temperature values acquired from the respective transducers.
The activated analogue output is always the one related to Circuit # 1, i.e. the one that is configured in parameter *HF31*.

6.8 Fan Management

The program is capable of managing up to 2 fans, i.e. one for each circuit. It is possible to associate to each fan a safety digital input and an analogue output for ON/OFF switching.

6.8.1 Fan status

Each fan has an associated operating status in the status template of the main menu. A fan can take on the following statuses:

- *Disabled*: The fan has not been configured, the status display shows "**dIS**".
- *On*: The status display shows **"On"**.
- *Waiting to switch ON*: The fan is waiting for protection timings, before switching ON. The status display shows **"tOn"**.
- *Off*: The status display shows **"Off"**.
- *Waiting to switch OFF*: The fan is waiting for protection timings, before switching OFF. The status display shows **"tOFF"**.
- *Alarm*: The fan is in alarm status. The status displays shows **"ALAr"**.
- *Manual*: The fan is in manual operating mode. The status display shows **"MAnU"**.

In the Maintenance Operator menu, via parameters *PM41* and *PM42*, it is possible to read the number of operating hours of the two fans. To zero these hours when required, it is sufficient to enter a "0" value, using the ENTER key.

6.8.2 Fan timings

There now follows a list of all timings connected with the management of fans.

Protection Timings

The purpose of these delays is that of protecting fans from the various start-up stresses to which they are subjected and of avoiding simultaneous start-ups.

PF07 = Minimum time between start-ups of different fans. It determines the minimum time which must elapse between the start-up of a fan and that of the next one.

PF08 = Minimum time between shutdowns of different fans. It determines the minimum time which must elapse between the shutdown of a fan and that of the next one.

6.8.3 Thermal Protection Inputs

The program provides for the management of a single fan thermal protection for each of the fans configured within the application.
In order to enable thermal safety switch alarms, in addition to setting the pertinent parameter, it is also necessary to configure from the *CoSt->HArd* menu the *positions* to which the digital inputs related to the various selected fans are to be connected. If no alarm is to be set, it is sufficient to set the parameter to 0.

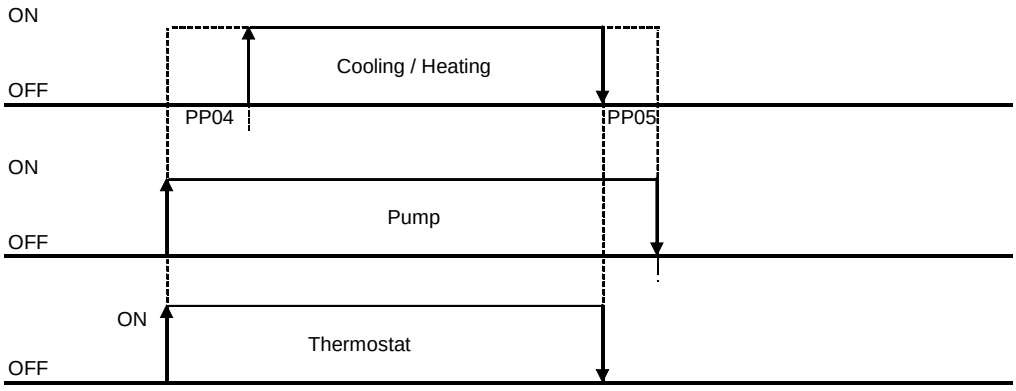
6.9 Circulating Pump Management

On AIR-TO-WATER or WATER-TO-WATER machines, the water-circulating pump is to be controlled; in this case, at least one pump needs to be configured (*PG09* > 0). The *Pump operation PP01* parameter defines how the pump is to operate:

- *PP01 = 0 : Continuous operation*
- *PP01 = 1 : Operation at thermostat's request*
- *PP01 = 2 : Cyclical operation*

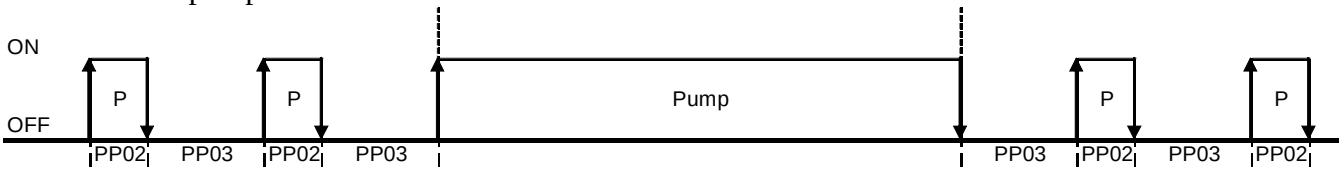
In *continuous operation*, pump control outputs must activate when the unit switches ON, and a delay interval (parameter *PP04*) must elapse, before compressors are switched ON; vice versa, at unit switch-OFF command, first any active compressors must switch OFF, and then a delay must elapse (parameter *PP05*), before the pump can be switched OFF.

In *operation at thermostat's request,* the pump is operated as a result of a request for heat or cold. Upon such a request, first the pump output is activated and then – after delay PP04 – the chilling/heating compressor is switched ON.



In similar fashion, upon a thermostat's switch-OFF request, the compressor switches OFF, whereas the pump remains ON for the duration of PP05.

In *cyclical operation*, the pump is controlled by the definition of start-up/shutdown times: if during the pump activation time the thermostat function triggers a chilling or heating request, the pump remains activated for the whole duration of this request, plus any delay interval between compressor shutdown and pump shutdown.



PP02 = Pump ON cycle time.

PP03 = Pump OFF cycle time.

Parameter PP07 defines the pump's behaviour during a defrosting cycle. Parameters PP01 and PP07 may only be modified while the machine is switched OFF.

It two pumps have been configured (*PG09* = 2), both their operating hours must be equalised. Therefore, every *PP08* number of operating hours, shutdown is ordered for the active pump and start-up of the other pump.
In case of thermal alarm on one of the pumps, the control must activate the second pump. On the other hand, if both pumps are faulty, or if the only configured pump is faulty, the alarm stops the unit.
If NO pumps are configured (*PG09* = 0), as is the case with MOTOCONDENSING machines, the entire pump management must be bypassed: compressors are immediately switched ON and the unit is immediately switched OFF, i.e. without waiting for delay intervals. In addition to this, thermal protection alarms are ignored.

6.9.1 Pump Status

To each pump, an operating status is associated, which is visible from the associated LED or in the status template from the main menu. Each pump can take on the following statuses:

- *Disabled*: The pump has not been configured, the status display shows "**dIS**".
- *On*: The status display shows **"On"**.
- *Off*: The status display shows **"Off"**.
- *Alarm*: The pump is in alarm status. The status display shows **"ALAr"**.

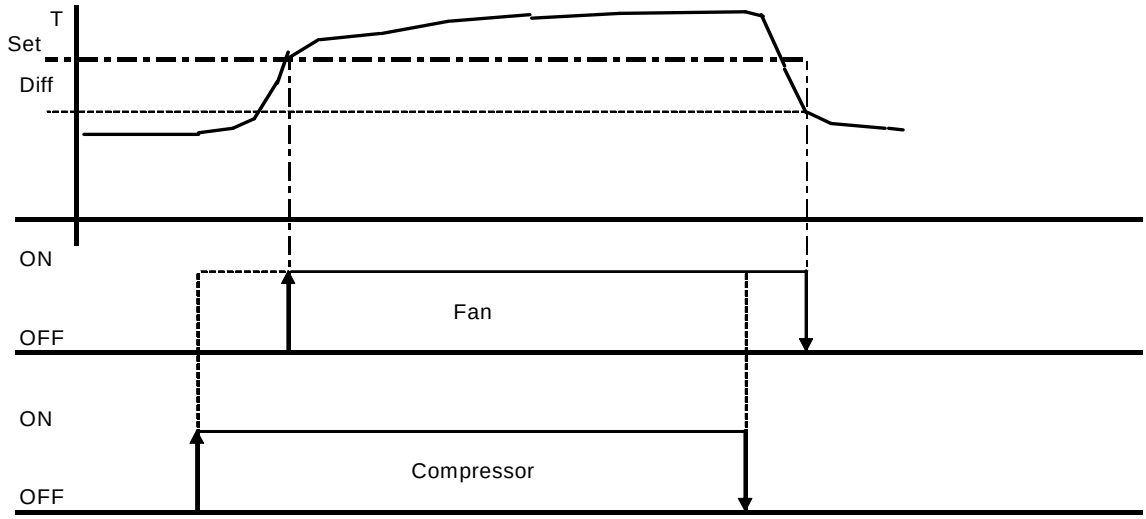
In the Maintenance Operator menu, via parameters *PM31* and *PM32*, it is possible to read the number of operating hours of the corresponding pumps. To zero these hours when required, it is sufficient to enter a "0" value, using the ENTER key.

6.10 Internal Fan Management

On AIR-TO-AIR machines, the air-circulating fan is controlled, as an alternative to pump control; in this case, the fan must be configured (*PG09 = 1*). The *Pump operation PP01* parameter defines how the pump is to operate.

6.10.1 Hot-start function

As an alternative to operation as defined by parameter *PP01*, start-up of the internal fan is provided for only when the exchanger is hot, in order to avoid unpleasant shots of cold air; in this case, an outlet temperature sensor checks that, with the compressor ON, air temperature is above the *Hot-start set point PP12*. The fan remains activated until the compressor is switched OFF and until the temperature falls below the set point by a *Hot-start differential PP13*.
Enabling of this function is done via parameter *Hot-start enable PP11*.



In order to enable this function, the external temperature probe (*PH24*) must also be enabled. In case the probe is not correctly configured, or is faulty, the fan is always switched ON, so as to guarantee its operation anyway, and to prevent potential damage to the plant.

6.10.2 Recirculating fan status

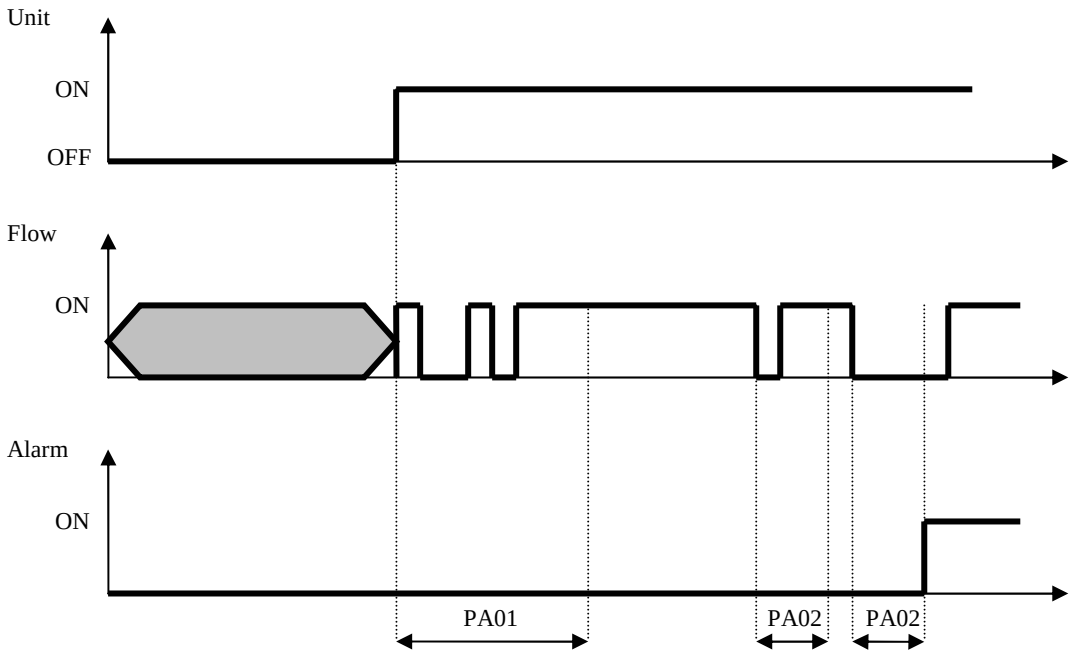
To each fan, an operating status is associated, which is visible from the associated LED or in the status template from the main menu. A fan can take on the following statuses:

- *Disabled*: The fan has not been configured, the status display shows "**dIS**".
- *On*: The status display shows **"On"**.
- *Off*: The status display shows **"Off"**.
- *Alarm*: The fan is in alarm status. The status display shows **"ALAr"**.

In the Maintenance Operator menu, via parameter *PM31*, it is possible to read the number of operating hours of the delivery fan. To zero these hours when required, it is sufficient to enter a "0" value, using the ENTER key.

6.11 Flow Meter Management

The flow meter is managed after the initial start-up phase of the unit and after the *Flow meter start delay PA01*; once this interval has elapsed, if the contact signals a lack of flow, the associated alarm is immediately triggered, thus inhibiting the starting of compressors.
During normal operation, the flow sensor is constantly monitored; if the contact signals a lack of flow for a period exceeding the value of parameter *Flow-meter alarm by-pass PA02*, the associated alarm is immediately triggered, and any active compressors are switched OFF.



If the alarm should persist for a time equal to the value of parameter *Pump operating time at low water level PP09*, the pump is also switched OFF, and the alarm becomes a manual reset. The pump is thus protected against potential operation without water. The pump is then restarted when the alarm is reset.
The flow-meter alarm is an automatic-reset alarm, unless it exceeds a given number of events within one hour (*Max. number of flow alarms with auto-reset PA03*), in which case it becomes a manual reset.

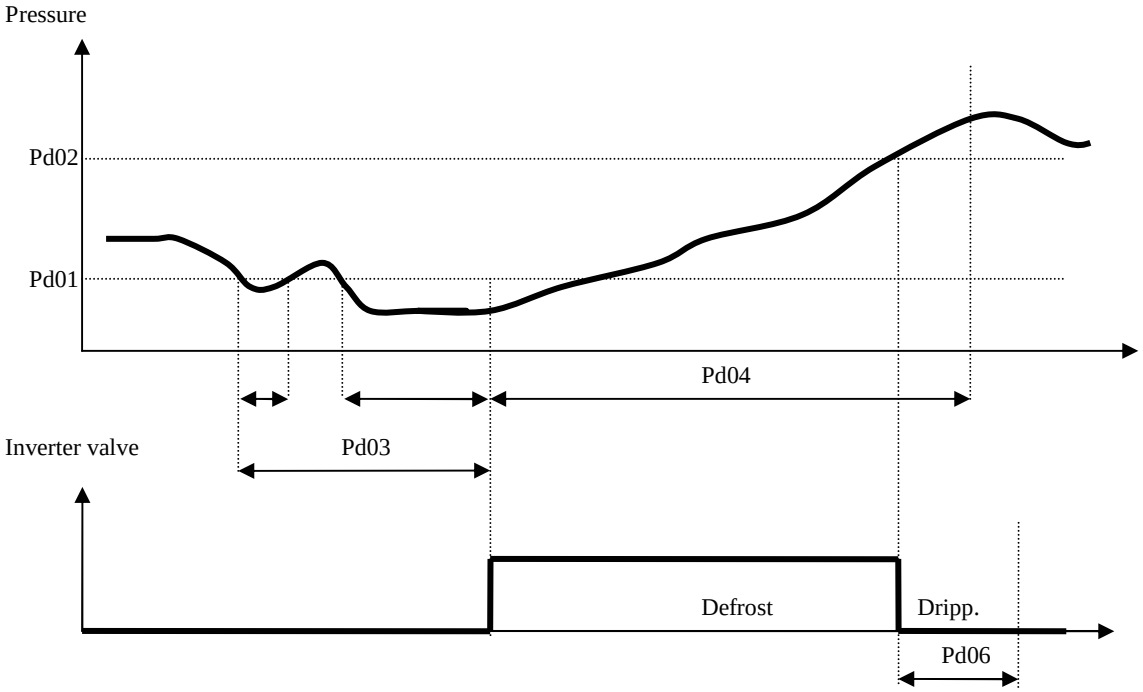
6.12 Defrosting Management

This procedure is only activated in winter operating mode (heat pump), and when at least one compressor is switched ON. Defrosting is performed by intervening on the refrigerating-circuit inverter valve.

If evaporation pressure/temperature remains (even if not continuously), for a time interval equal to the value of parameter *Defrosting enable delay Pd03*, below the threshold of the *Defrosting start set point Pd01* and at least one compressor is in operation, the inverter valve is commutated and the defrosting cycle is started. During this phase, compressors are forced to maximum power, and the low-pressure alarm is bypassed.
Defrosting is interrupted for one of the following causes:

- When pressure reaches the *End of defrosting set point Pd02*;
- When the *Defrosting duration max. time Pd05* has elapsed;
- When machine or circuit alarms have been triggered;
- When the unit has been switched OFF.

At the end of the defrosting cycle, the unit remains stationary for the whole duration of *Dripping time Pd06*.



In order to avoid the immediate start of a defrosting cycle after all compressors have been stopped, a *Minimum circuit restart delay Pd07* is used, which guarantees at least a period of heat-pump operation, before entering the defrosting cycle.

Note: In the case of twin-circuit units, defrosting cannot be simultaneous; thus, if one circuit is defrosting, the other circuit cannot start a defrosting cycle until the defrosting circuit has completely finished its cycle.

6.12.1 Defrosting management via external contact

This function is typically used to make it possible to start or end defrosting via an external thermostat/pressure switch, which is connected to the digital input assigned to this function. In this case, defrosting timings as an alternative to the external contact function are ignored. By setting parameter *Defrosting management via external contact Pd11* to a value different from zero, the following operating modes are available:

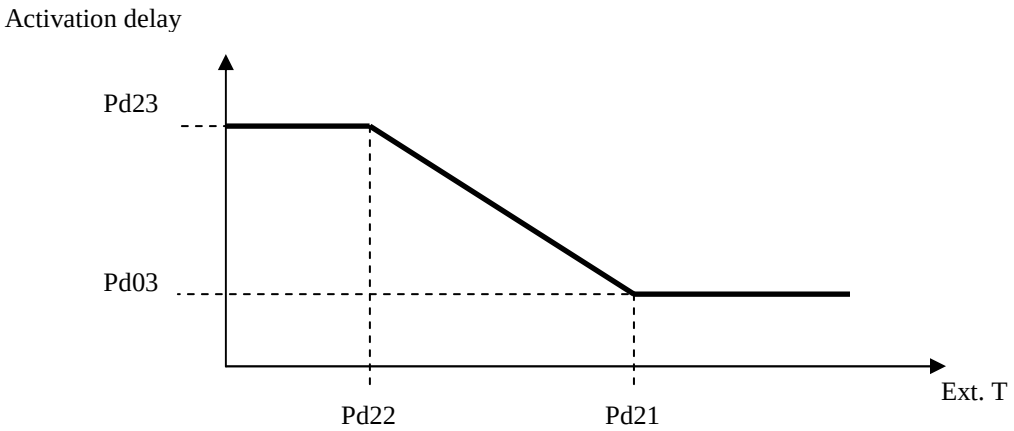
- *Pd11 = 0 – Normal operation*
- *Pd11 = 1 – Defrosting start by external contact*: opening of the contact enables defrosting start; with a closed contact, defrosting follows the normal procedure.
- *Pd11 = 2 – Defrosting stop by external contact*: opening of the contact enables defrosting stop; with a closed contact, defrosting follows the normal procedure.
- *Pd11 = 3 - Defrosting start/stop by external contact*: if the value of parameter *Defrosting contact type Pd12* is "0" (*Front*) opening of the contact enables defrosting start/stop; with a closed contact, defrosting follows the normal procedure; but if *Pd12* = 1 (*Level*), opening of the contact enables defrosting start, whereas closing enables defrosting stop.

A request for defrosting start is always accepted, unless the dripping process is taking place.
A request for defrosting stop is only accepted when a defrosting cycle is activated.
In order to enable this function, parameter *Defrosting digital input position Hd09* must be set to a value greater than zero, as it is otherwise impossible to utilise the associated digital input.

Note: On twin-circuit machines, defrosting start by external contact is managed by alternating the two circuits. When the defrosting start event is detected by the associated digital input, the defrosting circuit will be the one that has not defrosted at the previous request.
When a request if for defrosting stop by external contact, this ends the current cycle on the associated circuit.

6.12.2 Defrosting cycle compensation

With the decreasing of the external temperature, the water vapour content in the air (which causes the formation of frost on the evaporation battery, thus creating a need for defrosting) decreases, and it may therefore be advantageous to increase the defrosting-activation delay in relation to the decrease in the external temperature, to improve the overall efficiency of the system. If enabled by parameter *Pd20*, this function is activated at an *External temperature set point for defrosting compensation start Pd21*, below which set point compensation starts, with the increment of the defrosting activation delay, up to a maximum value (*Maximum defrosting delay Pd23*) on reaching the *External temperature set point for defrosting compensation stop Pd22*.



In order to enable this function, the external temperature probe (*PH24*) must also be enabled.

6.12.3 Defrosting heating coil

On heat pumps which do not possess the necessary thermal inertia of the recirculation mass (e.g. air-to-air units), defrosting causes a rapid fall in ambient temperature, and it is therefore advisable – to ensure greater comfort – to provide for the control of a defrosting-support heating coil.

6.13 Anti-frost management / Chilling-support heating coils

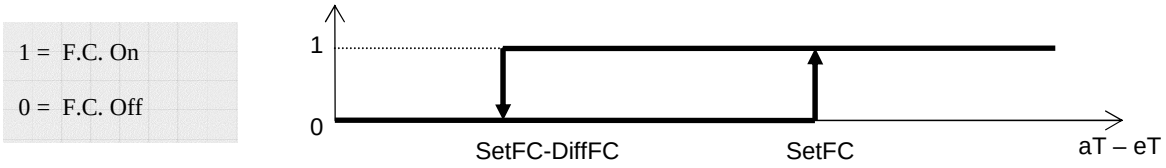
On air-to-water or water-to-water machines, anti-frost control is active even when the machine is switched OFF, whereas on air-to-air machines heating coils only intervene when the machine is ON.
Two thresholds are provided for, with their related differential: one is used to activate the heating coils and the other one to signal the alarm and stop compressors within the associated circuit.
If the anti-frost alarm should persist for the duration of the *Pump operation time at low temperature PP10*, the pump will be switched OFF until the next alarm reset.
In the case of anti-frost, in OFF status, only the heating coils are activated, whereas the alarm is not notified.
In order to enable the heating coils, in addition to setting the associated parameter (*Pr01=1*), it is also necessary to set from the *CoSt->HArd* menu the *positions* (*HA02*, *HA03*) of the digital outputs corresponding to the two heating coils in use.

6.14 Free-Cooling Management

In order to achieve substantial energy savings in plant management, the chiller has the capability of using external air – when this has favourable thermal properties – to exploit its energy content and to obtain the cost-free chilling which is known as “free-cooling”.
On free-cooling machines, a water battery is usually mounted in front of the condensing battery, so that the air first travels through this battery and then through the condensing battery. When the external air temperature is lower than the water temperature (thus making it possible to cool the water at the expense of the external air), the water (or glycol mixture) which enters the machine is diverted to the water battery via a three-way valve, or via a dedicated pump, before passing through the evaporator.
The possibility also exists of having a separate free-cooling circuit, with dedicated fan (PG13=1); in this case, its is possible to achieve optimum condensation control, even while compressors are ON, simultaneously regulating the free-cooling ventilation.

6.14.1 Free-Cooling Enable

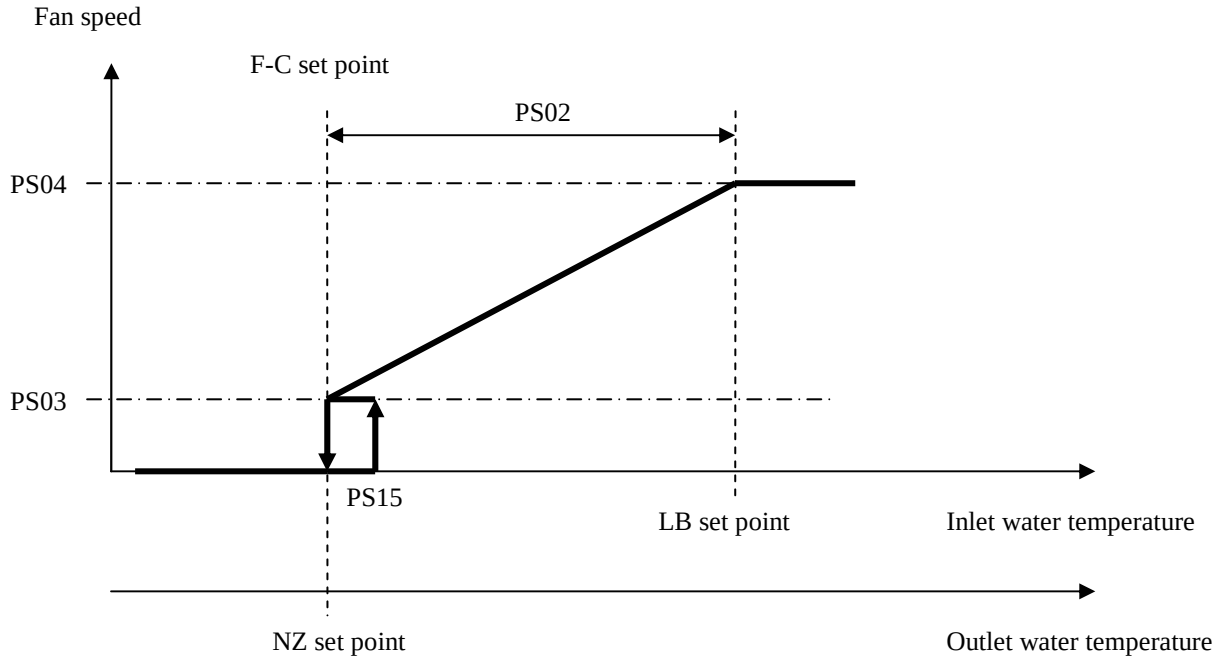
If it has been configured by parameter PS01, the free-cooling function (FC) for cost-free chilling is enabled when the free-cooling ΔT (i.e. the difference between the water temperature [wT] and the external air temperature [aT] that hits the free-cooling exchanger) reaches the set point value (SetFC, parameter *PS11*). In order to avoid the risk of fluctuations in free-cooling enable status, it is also possible to set a differential (DiffFC, parameter *PS13*).



The step condition must persist at least for the *Enable minimum time PS14* (default value = 30 seconds), before enabling/disabling of free-cooling.
In case of a fault in the external temperature probe, free-cooling is disabled and the free-cooling control valve is deactivated.
Free-cooling devices will also be switched OFF in case of intervention of the anti-frost heating coils, and even more so in case of the associated alarm being triggered.
Other system protection devices or events – such as a break in the regulating probe, a break in the anti-frost control probe, an evaporator flow meter alarm, or a circulating pump thermal protection event – cause the unit to be switched OFF, thus also stopping free-cooling control.

6.14.2 Free-cooling regulation

By enabling free-cooling, it is possible to activate proportional regulation of fan speed.
Reference for free-cooling regulation is always the return temperature. Whether compressor regulation is on the input (lateral band) or on the output (neutral zone), the free-cooling set point always corresponds to the set point for user-load regulation.



When the inlet temperature reaches the *FC* set point and remains below for more than *PS14* seconds, free-cooling is disabled; the step, illustrated in the diagram, of hysteresis *PS15* (default = 0.5° C) reactivates free-cooling and the ramp (provided the ON status is maintained for longer than *PS14* seconds).
When free-cooling regulation is on the ramp (i.e. the inlet water temperature is below the set point value FC+FC band), the request of compressor steps is inhibited; once the temperature reaches the upper limit in the proportional band and remains in that status for at least *PS14* seconds, compressor step request is enabled by primary regulation.

According to the way in which parameters *PG13* and *PG11* have been configured, different functional modes are available in free-cooling:

PG13=0: SINGLE AIR CIRCUIT

In case of single condensing *(PG11=1)*, with free-cooling active, the condensing fan will be controlled via the aforementioned regulation, in relation to inlet temperature. If, following a load increase, one proceeds to shutting down the compressors, then fan control will be passed over to condensation control, thus remaining for as long as there is at least one compressor active within the circuit in question.
In this configuration, the fan in use is a single one and the one referred to Circuit # 1, i.e. the one configured in parameter *HF31*. This fan will take care of condensing and free-cooling (any free-cooling battery must be put in this position).

In the case of separate condensing *(PG11=0)*, one circuit regulates condensation in the normal way, while the other condensing fan is controlled by the aforementioned free-cooling regulation.
In this configuration, the fan utilised exclusively for condensing is the fan in Circuit # 2 (i.e. the one configured in parameter *HF32*). The fan in Circuit # 1 will take care of condensing in the same circuit and free-cooling, if conditions for it exist (any free-cooling battery must be put in this position).

PG13=1: SEPARATE AIR CIRCUIT

In the case of single condensation *(PG11=1)*, or of **separate condensation *(PG11=0)***, having two independent air circuits, no distinction is needed, as behaviour is identical. In this situation, it makes sense to use parameter *PS21* (free-cooling enable with compressors):

- *PS21 = 0*. If at least one compressor is switched ON, free-cooling is disabled; otherwise, it follows normal ramp regulation.
- *PS21 = 1*. If at least one compressor is switched ON, the free-cooling ramp is forced to maximum value (100% or other value set in parameter PS04); otherwise, it follows normal ramp regulation.

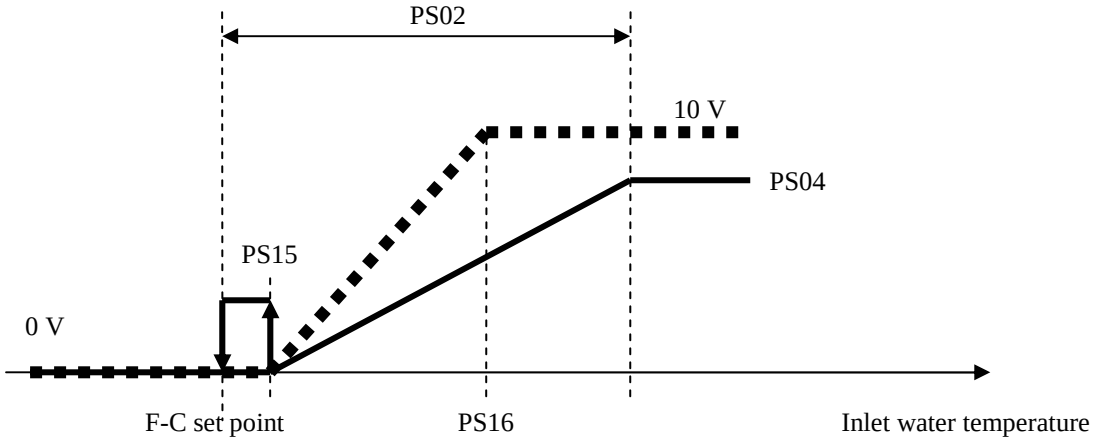
Condensing fans is independent of free-cooling.

In order to activate the fan associated with free-cooling, it is also necessary to set to a value different from 0 the position of the analogue output associated with parameter *HA34*.

6.14.3 Free-cooling control valves

In case the valve is of the ON/OFF type, the activation command will follow the consensus step on FC set point, with hysteresis *PS15*, as previously described.
In order to enable the operation of the ON/OFF valve, it is also necessary to set to a value different from 0 the position of the described digital output associated with parameter *HA09*.

Alternatively, it is possible to use a three-way modulating valve (0-10 V), to enable mixing of evaporator inlet water, for a combined free-cooling action.
In this case, the valve is proportionally controlled, starting from the consensus step and until the valve maximum-aperture threshold, corresponding to a percentage of the FC band (parameter *PS16*).



In order to enable the operation of the valve, it is also necessary to set to a value different from 0 the position of the analogue output associated with parameter *HA19*.

6.15 Temperature Alarm Control

6.15.1 Low and high temperature alarm management

According to operating mode, a check is carried out on the exchanger inlet temperature, triggering an alarm where appropriate.

- In winter operation (heat pump), if the temperature falls below a given threshold for a settable lapse of time, a “low temperature” alarm is generated: ***AL01***.
- In summer operation (chiller), if the inlet temperature exceeds a given threshold for a settable lapse of time, a “high temperature” alarm is generated: ***AL02***

Via a configuration parameter, alarms can be set to be display-only alarms, or to stop the machine.
It is also possible to set a temperature-alarm inhibition delay from system start-up, so as to give the machine a chance to reach full power.

- *PA05 = High-temperature alarm set point*
- *PA06 = Low-temperature alarm set point*
- *PA07 = Temperature alarm enable delay*
- *PA08 = Temperature alarm management mode (display-only / machine stop)*
- *PA09 = Temperature alarm differential*
- *PA10 = System start-up alarm inhibition time*

These alarms are only detected when the machine is switched ON.

6.15.2 Management of primary exchanger efficiency alarm

If this alarm ***AL03*** (and ***AL13*** for Circuit # 2) is enabled (*PA25 = 1*), a check is made as to whether the difference between input and outlet temperatures, situated on the primary exchanger, is below a *Primary exchanger difference minimum threshold PA26* for a *By-pass time for primary exchanger efficiency alarm PA27*.
This alarm is not managed during defrosting, if probes are in alarm status and this alarm is a manual-reset alarm.
This alarm is only detected when the machine is switched ON.

6.16 Pressure Alarm Control

6.16.1 Management of high-pressure pressure-switch alarm

Via a digital input connected to an external pressure switch, it is possible to monitor an excess of maximum condensing pressure. The *high-pressure alarm **AL11*** (and ***AL12*** for Circuit # 2) causes the immediate stopping of the refrigerating circuit, also shutting down any compressors which may be ON, and inhibiting the start-up of others.
This alarm is only detected when the machine is switched ON.
This is a manual-reset alarm.

6.16.2 Management of high-pressure transducer alarm

If condensing pressure exceeds a given threshold, a *high-pressure alarm **AL31*** (and ***AL32*** for Circuit # 2) is generated. The alarm causes the immediate stopping of the refrigerating circuit, also shutting down any compressors which may be ON, and inhibiting the start-up of others.
This alarm is only detected when the machine is switched ON.
This is a manual-reset alarm and it can be reset if in the meantime pressure has fallen below the maximum threshold of a given differential value.

- *PA21 = High-pressure alarm set point*
- *PA22 = High-pressure alarm differential*

6.16.3 Management of low-pressure pressure-switch alarm (chiller mode)

Via a digital input connected to an external pressure switch, it is possible to monitor the presence of a minimum intake pressure in the refrigerating circuit. The *low-pressure alarm **AL41*** (and ***AL42*** for Circuit # 2) causes the immediate stopping of the refrigerating circuit, also shutting down any compressors which may be ON, and inhibiting the start-up of others.
At start-up of the first compressor, the alarm is delayed for a given interval, to enable the compressors to take the refrigerating circuit to full pressure.
The alarm is initially auto-resetting, unless it exceeds a given number of events within one hour (*PA14*), in which case it becomes a manual-reset alarm.

- *PA13 = Low-pressure alarm by-pass time*
- *PA14 = Maximum number of auto-reset low-pressure alarms*

If, with the machine switched ON and in the presence of a request for chill from the thermoregulator, low pressure is detected, compressor start-up is inhibited and a *Start-up low-pressure alarm **AL21*** (and ***AL22*** for Circuit # 2) is displayed. The purpose of this condition is to inhibit compressor start-up in the absence of Freon® gas in the circuit (there could be a refrigerant leak from the piping system).

6.16.4 Management of low-pressure transducer alarm (heat pump mode)

If intake pressure falls below a given threshold, a *low-pressure alarm **AL41*** (and ***AL42*** for Circuit # 2) is generated. The alarm causes the immediate stopping of the refrigerating circuit, also shutting down any compressors which may be ON, and inhibiting the start-up of others.
At start-up of the first compressor, the alarm is delayed for a given interval, to enable the compressors to take the refrigerating circuit to full pressure.

The alarm is initially auto-resetting, unless it exceeds a given number of events within one hour (*PA14*), in which case it becomes a manual-reset alarm, which can be reset if in the meantime pressure has risen above the minimum threshold by a certain differential value.

- *PA11 = Low-pressure alarm set point*
- *PA12 = Low-pressure alarm differential*
- *PA13 = Low-pressure alarm by-pass time*
- *PA14 = Maximum number of auto-reset low-pressure alarms*

In the presence of *low temperatures of external air*, intake pressure could fall below the minimum-pressure threshold, thus inhibiting compressor start-up. In such a situation, it is possible to activate a control, which shifts the alarm-control threshold to a higher value for a given interval from start-up of the first compressor, leaving nevertheless in place all protection devices and pre-start checks.

- *PA16 = Low-pressure control enable at low external temperature*
- *PA17 = Low-pressure alarm set point at low external temperature*
- *PA18 = Low-pressure alarm differential at low external temperature*
- *PA19 = Low-pressure alarm control duration at low external temperature*

This control can only be enabled in heat-pump operating mode.

6.16.5 Low start-up pressure alarm

In a low-pressure condition (pressure switch or transducer-induced) and in the impossibility to activate any of the compressors at the request of the same, there is a *Low-pressure start-up alarm* ***AL51*** (and ***AL52*** for Circuit # 2). This is an auto-reset alarm, and thus should disappear, unless there is a leak of Freon® gas from the circuit.
At compressor shutdown following a low-pressure alarm, this alarm is delayed by a given interval *PA20*, to give the refrigerating circuit the chance to enable compressor start-up.

6.17 Miscellaneous Management

6.17.1 Set point variation

The program provides for the possibility of managing parameters *Secondary summer set point offset (chiller) SSC1* and *Secondary winter set point offset (heat pump) SSH1*, which, according to the status of a digital input, sum an offset to the main set point, to allow the latter to be varied. The digital input logic can be set by acting on parameter *Secondary set DI logic PH62*.
In order to set this function, it is necessary to enable the parameter *Secondary set point enable from digital input PH25* and to set the *position* where the associated digital input is to be connected. If such a value is not set, the function will remain disabled.
The secondary offset can also be exploited from supervision, by enabling the parameter *Secondary set point enable from supervisor PH26* and setting to "1" the associated supervisory variable.

6.17.2 External probe configuration (AI04 / AI05)

According to the machine type in use, the external-temperature probe is positioned on the fourth or fifth (with expansion) analogue input; by intervening on appropriate parameters, it is possible to correctly configure the two transducers.

SINGLE CIRCUIT (PG01=1, PG02=0)

The external temperature probe is positioned on the fourth analogue input (AI04). In order to configure this feature, the following parameters must be set:

- PH24 = 1
- PH44 = 2

Both parameters *PH24* and *PH44* must be set, as otherwise the external probe will not be correctly configured and cannot function.

Note 1. If AI04 is to used as *digital input DI06*, correct configuration is as follows:

- PH24 = 0 (Disables the external probe)
- PH44 = 1

On single-circuit machines, in this configuration all functions connected with the external temperature probe will be inhibited.

Note 2. If AI04 is to used as *accumulation temperature* (see para. 2.17.10), correct configuration is as follows:

- PH24 = 0 (Disables the external probe)
- PH44 = 3

On single-circuit machines, in this configuration all functions connected with the external temperature probe will be inhibited.

TWIN CIRCUITS with expansion (PG01=2, PG02=1)

The external probe is positioned on the 5th analogue input (AI05), thus output AI04 is available for other purposes. In order to correctly configure the external temperature probe, the following parameters must be set:

- PH24 = 2 (Enables the external temperature probe on AI05)
- PH44 must be set to a value other than 2.

Note 1. Parameter P*H44* is linked to operation of the 4th transducer (AI04), with the following meanings:

- PH44 = 0 (Probe figures disabled)
- PH44 = 1 (Probe used as DI06)
- PH44 = 2 (Probe used as NTC external-temperature probe)
- PH44 = 3 (Probe used as NTC accumulation probe)
- PH44 = 4 (Probe used as 4..20 mA for evaporating pressure Circuit # 1)

Note 2. If AI04 is to used as *digital input DI06*, correct configuration is as follows:

- PH44 = 1

Note 3. If AI04 is to used as *accumulation temperature* (see para. 6.17.9), correct configuration is as follows:

- PH44 = 3

6.17.3 Evaporation-probe configuration

If AI04 is to used as *evaporation pressure Circuit # 1*, correct configuration is as follows:

- PH24 = 0 (Disables the external probe)
- PH44 = 4

If AI08 is to used as *evaporation pressure Circuit # 2*, correct configuration is as follows:

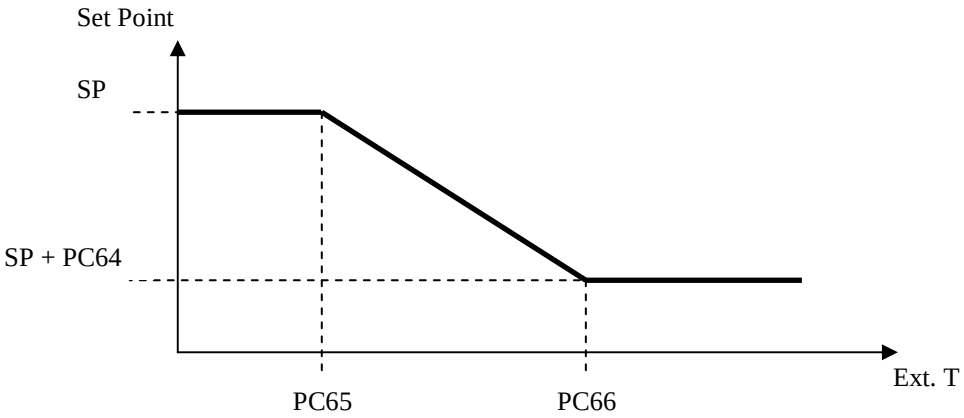
- PH45 = 2
- PG02 = 1 (Expansion enable)

Note: Parameter P*H45* is linked to operation of the 8th transducer (AI08), with the following meanings:

- PH45 = 0 (Probe figures disabled)
- PH45 = 1 (Probe used as DI012)
- PH45 = 2 (Probe used as 4..20 mA for evaporating pressure Circuit # 2)

6.17.4 Dynamic set point

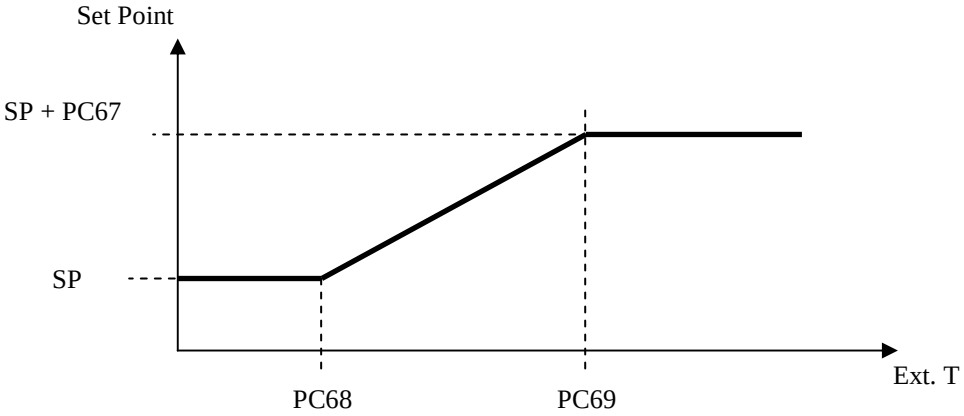
Via parameter *Dynamic set point enable PH27*, it is possible to perform compensation of the dynamic set point on external temperature. In this case, the regulation set point will take on a value between the standard set point (equivalent to the *External-temperature initial threshold*) and the set point **plus** a *Dynamic offset* (equivalent to the *External-temperature final threshold*), both for chiller and heat pump operation. Between the two compensation points, movement is linear, and the curve takes on a different meaning, according to the offset sign.
With offsets of less than zero value, behaviour is as follows:



The parameters referred to this function are the following:

- *PC64 = Maximum dynamic offset for summer operation (chiller)*
- *PC65 = Compensation start temperature for dynamic summer set point*
- *PC66 = Compensation stop temperature for dynamic summer set point*

With offsets greater than zero, behaviour is as follows:



The parameters referred to this function are the following:

- *PC67 = Maximum dynamic offset for winter operation (heat pump)*
- *PC68 = Compensation-start temperature for dynamic winter set point*
- *PC69 = Compensation- stop temperature for dynamic winter set point*

6.17.5 Forced shutdown

This function enables the forced shutdown of all compressors, when outlet temperature falls below the *Summer forced-shutdown set point* (in the case of chiller operation), or exceeds the *Winter forced-shutdown set point* (in the case of heat-pump operation). Compressors can only be restarted when the temperature crosses the set point once again.

- *PC35 = Forced-shutdown enable*
- *PC36 = Summer forced-shutdown set point*
- *PC37 = Winter forced-shutdown set point*

On MOTOCONDENSING units and with PC11=2, this function is disabled.

6.17.6 Power limiting

The power of the refrigerating circuit can be limited according to the status of a digital input, in order to enable preventive management of pressure alarms. The digital input logic can be set by acting on parameter *Power-limiting logic PH63*. According to the number of configured compressors, the power-limiting percentage is calculated on the basis of two parameters:

- *PC31 = Power limiting for summer operation*
- *PC32 = Power limiting for winter operation*

The two parameters are expressed as a percentage value and follow this logic:

- With *PC31* or *PC32* = 0%, power limiting is at maximum level: all steps requested by the regulator are stopped;
- With *PC31* or *PC32* = 100%, there is no power limiting: all steps requested by the regulator are supplied.

In order to set this function, it is necessary to enable the parameter *Power-limiting enable PC30* and to set the *position* where the associated digital input is to be connected. If such a value is not set, the function will remain disabled.

6.17.7 High-pressure partialisation at high temperatures (chiller)

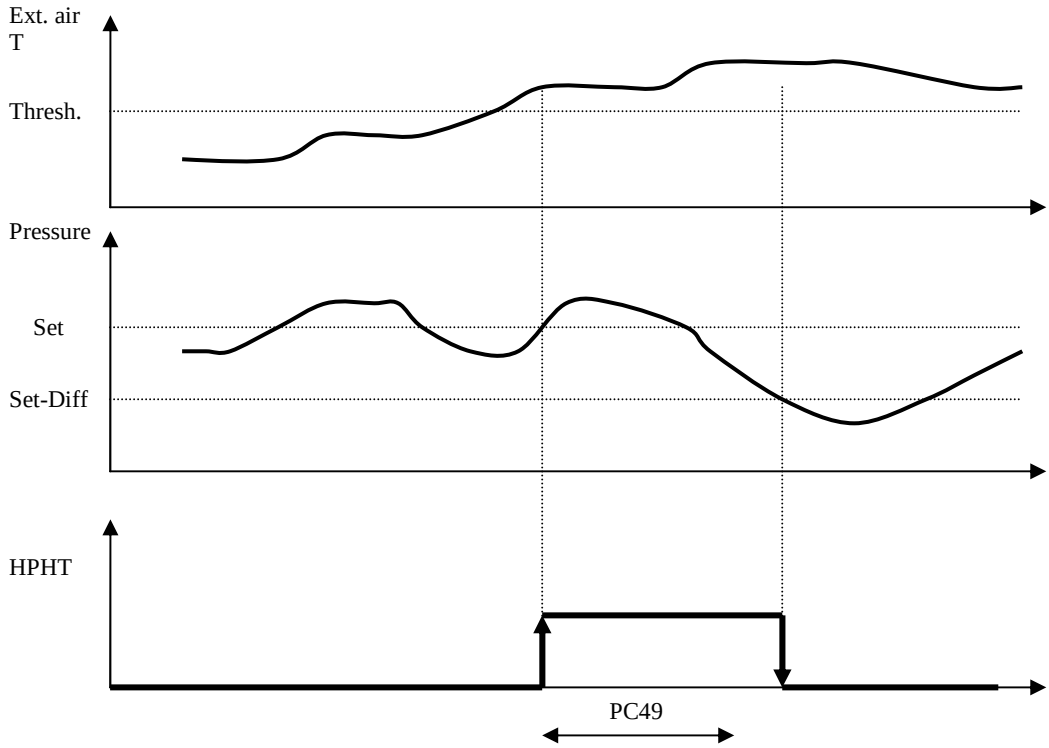
This control makes it possible for the refrigerating circuit to operate even in the presence of high values of external air temperature, by contrasting the triggering of the high-pressure alarm via the partialisation of the circuit's active power.

- *PC45 =Pressure partialisation enable at high temperatures*
- *PC46 = Pressure partialisation set point at high temperatures*
- *PC47 = Pressure-partialisation differential at high temperatures*
- *PC48 = High external air temperature threshold*
- *PC49 = Min. time for maintaining partialisation*

According to the number of configured compressors, the power-limiting percentage is calculated on the basis of this parameter:

- *PC31 = Power limiting for summer operation*

In order to enable this control, the external temperature probe (*PH24*) must also be enabled.



This control can only be enabled in summer operating mode (chiller).

6.17.8 Low-pressure partialisation at low temperatures (heat pump)

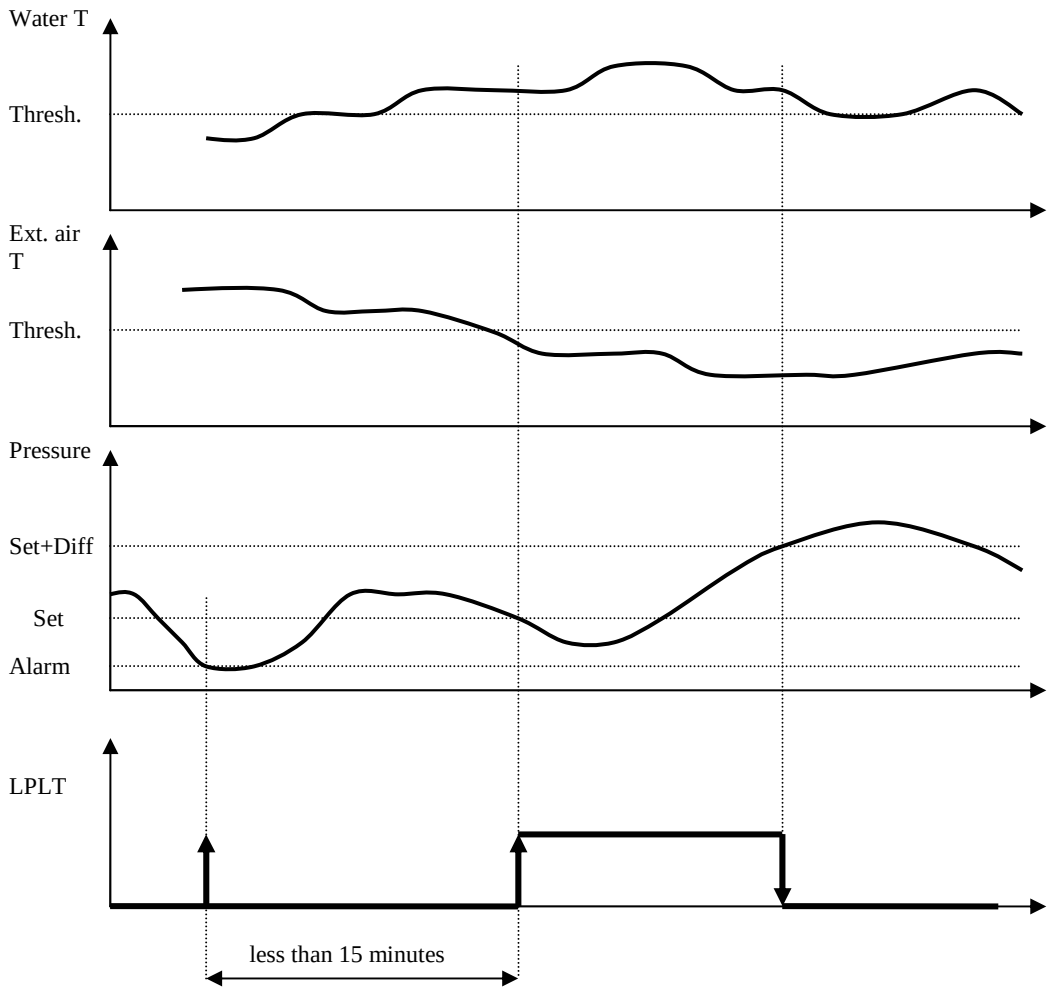
This control makes it possible to partialise the refrigerating circuit power when external temperature and refrigerated water temperature conditions lead to the triggering of minimum-pressure alarms. If *fewer than 15 minutes* have elapsed since the triggering of a minimum-pressure alarm and pressure falls below a given threshold, circuit active-power partialisation is forced, until the pressure climbs back over the threshold by a certain differential.

- *PC50 =Pressure partialisation enable at low temperatures*
- *PC51 =Pressure partialisation set point at low temperatures*
- *PC52 = Pressure partialisation differential at low temperatures*
- *PC53 = Low external air temperature threshold*
- *PC54 = Refrigerated-water high-temperature threshold*

According to the number of configured compressors, the power-limiting percentage is calculated on the basis of this parameter:

- *PC32 = Power limiting for winter operation*

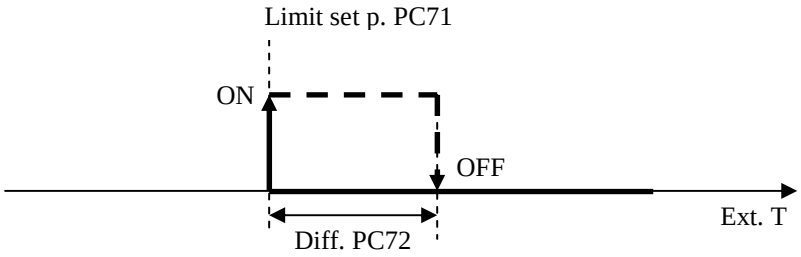
In order to enable this control, the external temperature probe (*PH24*) must also be enabled.



This control can only be enabled in winter operating mode (heat pump).

6.17.9 Operating limit management (heat pump)

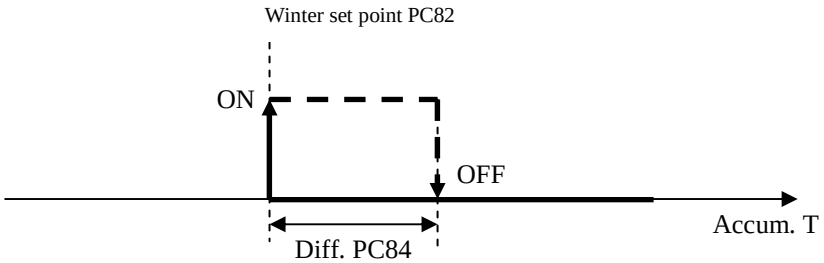
When the external air temperature falls to particularly low levels, it may no longer be convenient or sufficient to heat using the heat pump. The *Limit set point PC17* on external temperature is used to disable the heat pump, enabling instead a relay output for start-up authorisation of a boiler or heating-coil set. Reactivation happens when the external temperature exceeds the *limit set point* plus a configurable *Limit differential PC72*. The parameter *Operating limit management PC70* also offers the choice – once the auxiliary output has been activated – whether to switch OFF the compressors too, or to leave them ON.

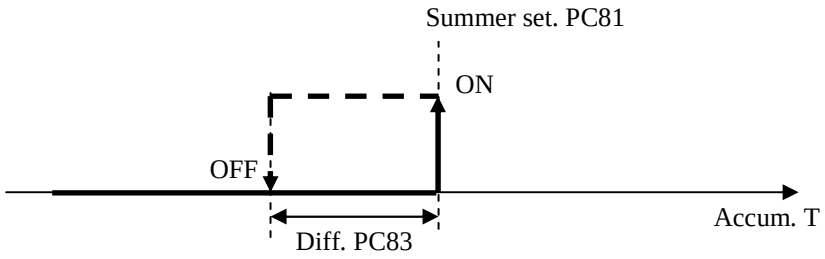


In order to enable this function, the external temperature probe (*PH24*) must also be enabled.
In addition, parameter *Auxiliary relay position for operating limit HA04* also needs to be set to a value other than zero; if zero is left unchanged, the relay is not controlled.

6.17.10Function for chilling/heating on demand

If it has been enabled by parameter *Control-on-demand enable PC80*, this function requires a dedicated remotely-mounted temperature sensor (usually installed inside an accumulation tank); once a given set point has been reached (in chilling operation, *Summer control-on-demand set point PC81; in heating operation, Winter control-on-demand set point PC82*), and after a *Control-on-demand delay PC85*, this function determines the activation of the circulating pump and compressor, to carry out the required function with the typical selected thermoregulation (i.e. return or delivery temperature regulation). The units turns itself OFF once the accumulation tank has been satisfied, i.e. once it has reached the *Summer control-on-demand set point PC81* **minus** a *Summer control-on-demand differential PC83* (if in chilling mode), or the *Winter control-on-demand set point PC82* **plus** a *Winter control-on-demand differential PC84* (if in heating mode).





The accumulation temperature can be measured via the associated probe; in order to enable this function, probe AI04 must be enabled as accumulation probe *(PH44=3)*.

6.17.11Manual operation

The program allows the setting of manual operation for compressors and fans. In this condition, devices are not involved in rotations, nor in thermoregulation calculations, although they do remain sensitive to any alarms.
Manual operation of devices proves useful when functional tests are to be carried out on the machine, to ascertain its integrity and correct functioning.

Compressors

Manual operation of compressors is guaranteed by parameter *Compressor enable PM1x*:

- If set to *Auto*, it defines the normal behaviour of the device;
- If set to *Manu*, it disables the compressor, switching it to manual operation.

A compressor in manual operation mode does not take part in regulations, and can be forced in its number of steps that it can provide, by acting on the property *Compressor forcing PM2x* (present in the *MAin->MAnu* menu).
As already previously mentioned, however, the compressor remains sensitive to any alarms and related consequences.
In order to bring the compressor back to normal operation, parameter *Compressor enable PM1x* must be re-set to *Auto* (Automatic) value; otherwise, the compressor in question would continue to operate manually, thus failing to comply with any start/stop requests calculated by the configured regulation.

Fans

Manual or automatic operation of the two condensing fans is guaranteed by parameters *PM51* (Circuit # 1) and *PM52* (Circuit # 2):

- If set to *Auto*, it defines the normal behaviour of the device;
- If set to *Manu*, it disables the fan, switching it to manual operation.

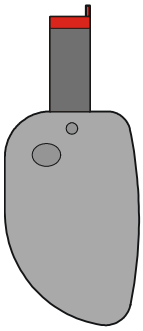
A manually-operated fan does not take part in regulations, and can be forced ON/OFF acting on parameters *PM61* and *PM62* (found in the *MAin->MAnu* menu).
As already previously mentioned, however, the fan remains sensitive to any alarms and related consequences.
In order to bring the fan back to normal operation, parameter *PM51/PM52* must be re-set to *"A"* (Automatic) value; otherwise, the fan in question would continue to operate manually, thus failing to comply with any start/stop requests calculated by the configured regulation.

6.17.12Resetting of default parameters

Using the *"Parameter resetting"* procedure, all system parameters can be reset to their original default values. After entering the *InSt->MAP* menu – which is only accessible while the machine is switched OFF – set parameter PH15=1 and wait for the "0" value to reappear on the display; the system will automatically reset all parameters back to their default values.
After this operation, it is necessary to power down the machine and then power it up again, to avoid the risk of malfunctions.

6.17.13Programming key

The values of all system parameters can be saved on the programming key, to be subsequently copied to one or more compatible devices. The saving or resetting operation can only be carried out while the machine is switched OFF, by connecting the programming key to the programming connector.



To save a given parameter map onto the programming key:

- Enter the *InSt->MAP* menu and select the "Stor" item, using the UP or DOWN key;
- Press the SET (ENTER) key: parameter transfer to the programming key is highlighted by flashing of the associated LED;
- Wait for LED flashing to stop: if it is GREEN now, the operation was successful, otherwise the LED is RED.

To copy a given parameter map from the programming key to a device:

- Enter the *InSt->MAP* menu and select the "rESt" item, using the UP or DOWN key;
- Press the SET (ENTER) key: parameter transfer from the programming key to the device is highlighted by flashing of the associated LED;
- Wait for LED flashing to stop: if it is GREEN now, the operation was successful, otherwise the LED is RED.

Note: Information relating to the product and product version is stored onto the programming key, thus allowing the transfer of parameter maps only between devices which are compatible with one another.

7 DIAGNOSTICS

The application is capable of managing a whole series of alarms, relating to compressors, fans, circuits and plant functions. Depending on the various alarm types, it is possible to configure their resetting (whether manual or automatic), a possible notification delay and any actions to be taken in that specific case.
When one or more alarms are active, the alarm icon flashes on displays.
In order to view the various alarms, the "Alar" menu must be displayed from the main page, using the ESC key, followed by the ENTER key. By pressing the ESC key from an alarm page, or waiting for the 60-second timeout, the user is brought back to the application's main page.
To scroll the various active alarms, the ENTER key must be pressed once more: alarms are listed in order of priority, just as they are listed in the Alarm Table of chapter 7.2.

All digital inputs relating to alarms are managed by an *Alarm Logic* parameter, which takes on the following significance:

- If set to "NO", inputs will normally be de-energised (i.e. *open*): N.O. logic;
- If set to "NC", inputs will normally be energised (i.e. *closed*): N.C. logic.

7.1 Manual and Automatic Alarms

There are two types of alarms: those that are manually reset and those that are automatically reset. These alarms offer the end-user the choice of selecting, via the associated parameter, the resetting mode that better reflects the user's own requirements.

7.1.1 Manual-reset alarms

When a manual-reset alarm is triggered:

- The alarm icon starts flashing.

By pressing the ENTER key from the "Alar" menu, the code of the first active alarm is displayed.
Once the conditions which had triggered the alarm are back to normal, the alarm can be manually reset. To carry out this operation:

- Go to the page of the alarm to be reset;
- Hold the ENTER key pressed down for about 2 seconds.

At this point, in the absence of any further alarms, the page showing "*none*" is displayed, the alarm icon is switched OFF, and the machine goes back to normal operation; otherwise, the code relating to the next active alarm will be displayed.
The consequences deriving from an active manual-reset alarm remain valid as long as the user does not take care of deleting the alarm message.

7.1.2 Automatic-reset alarms

When an auto-reset alarm is triggered:

- The alarm icon starts flashing.

By pressing the ENTER key from the "Alar" menu, the code of the first active alarm is displayed.
Once the conditions that had triggered the alarm are back to normal, resetting and deletion of the alarm message automatically take place, without any need for user intervention.
The consequences deriving from an active auto-reset alarm remain valid as long as the causes that triggered the alarm are not reset.

7.2 Alarm Table

All alarms managed by the application are listed below. The listing order is the same as the one in which alarms are listed when active.

Code	*Alarm description*	*Type*	*Consequence*	*Notes*
AL01	***Input low temperature***	***S/A***	***Notification only or compressors and pump OFF***	***Heat pump only Settable delay***
AL02	***Input high temperature***	***S/A***	***Notification only or compressors and pump OFF***	***Chiller only Settable delay***
AL03	***Primary exchanger efficiency Circuit # 1***	***Manu***	***Keeps all circuit compressors OFF***	***Settable delay***
AL13	***Primary exchanger efficiency Circuit # 2***	***Manu***	***Keeps all circuit compressors OFF***	
AL05	***Evaporator flow meter***	***A/M***	***Compressors OFF Pump ON for T-secs.***	***Settable delay In manual stop, pump OFF***
AL11	***High-pressure pressure switch Circuit # 1***	***Manu***	***All circuit compressors OFF***	
AL12	***High-pressure pressure switch Circuit # 2***	***Manu***	***All circuit compressors OFF***	
AL21	***Low-pressure pressure switch Circuit # 1***	***A/M***	***All circuit compressors and fans OFF***	***Settable start-up delay and rpm***
AL22	***Low-pressure pressure switch Circuit # 2***	***A/M***	***All circuit compressors and fans OFF***	
AL31	***Transducer high pressure Circuit # 1***	***Manu***	***All circuit compressors OFF***	
AL32	***Transducer high pressure Circuit # 2***	***Manu***	***All circuit compressors OFF***	
AL41	***Transducer low pressure Circuit # 1***	***A/M***	***All circuit compressors OFF***	***Settable start-up delay and rpm***
AL42	***Transducer low pressure Circuit # 2***	***A/M***	***All circuit compressors OFF***	
AL51	***Failed start-up for low pressure Circuit # 1***	***Auto***	***Keeps all circuit compressors OFF***	
AL52	***Failed start-up for low pressure Circuit # 2***	***Auto***	***Keeps all circuit compressors OFF***	
AL81	***Evaporator anti-frost Circuit # 1***	***Manu***	***Circuit compressors OFF and Pump ON for T-secs.***	
AL82	***Evaporator anti-frost Circuit # 2***	***Manu***	***Circuit compressors OFF and Pump ON for T-secs.***	
AC21	***Thermal switch compressor # 1***	***A/M***	***Compressor # 1 OFF***	***Settable delay***
AC22	***Thermal switch compressor # 2***	***A/M***	***Compressor # 2 OFF***	
AC23	***Thermal switch compressor # 3***	***A/M***	***Compressor # 3 OFF***	
AC24	***Thermal switch compressor # 4***	***A/M***	***Compressor # 4 OFF***	
AC25	***Thermal switch compressor # 5***	***A/M***	***Compressor # 5 OFF***	
AC26	***Thermal switch compressor # 6***	***A/M***	***Compressor # 6 OFF***	
AP21	***Thermal switch pump # 1***	***A/M***	***Pump # 1 OFF (*¹)***	
AP22	***Thermal switch pump # 2***	***A/M***	***Pump # 2 OFF (*¹)***	
AF21	***Thermal switch fan Circuit # 1***	***A/M***	***Fan # 1 OFF***	***Settable delay***
AF22	***Thermal switch fan Circuit # 2***	***A/M***	***Fan # 2 OFF***	
AC01	***Operating hours compressor # 1***	***Auto***	***Display only***	
AC02	***Operating hours compressor # 2***	***Auto***	***Display only***	
AC03	***Operating hours compressor # 3***	***Auto***	***Display only***	
AC04	***Operating hours compressor # 4***	***Auto***	***Display only***	

AC05	***Operating hours compressor # 5***	***Auto***	***Display only***	
AC06	***Operating hours compressor # 6***	***Auto***	***Display only***	
AP01	***Operating hours pump # 1***	***Auto***	***Display only***	
AP02	***Operating hours pump # 2***	***Auto***	***Display only***	
AF01	***Operating hours fan Circuit # 1***	***Auto***	***Display only***	
AF02	***Operating hours fan Circuit # 2***	***Auto***	***Display only***	
ES01	***Inlet temperature probe faulty or not connected***	***Auto***	***Settable number of ON compressors***	***Settable delay***
ES02	***C1 outlet temperature probe faulty or not connected***	***Auto***	***Settable number of ON compressors (*²)***	
ES03	***Condensing pressure transducer C1 faulty or not connected***	***Auto***	***Settable fan forcing***	
ES04	***AI04 probe faulty or not connected***	***Auto***	***Inhibits functions using it***	
ES05	***AI05 probe faulty or not connected***	***Auto***	***Inhibits functions using it***	
ES06	***C2 outlet temperature probe faulty or not connected***	***Auto***	***Settable number of ON compressors (*²)***	
ES07	***Evaporating pressure transducer C2 faulty or not connected***	***Auto***	***Settable fan forcing***	
ES08	***AI08 probe faulty or not connected***	***Auto***	***Inhibits functions using it***	
EN01	***Expansion communication alarm***	***Auto***	***Display only***	***Settable delay***

Note: *(*¹) If this is the only pump, it switches OFF all compressors and fans; otherwise, it switches ON the other pump.*

*(*²) If* Pr03=1, *the output probe fault alarm on that circuit switches ON the associated anti-frost heating coils.*
S/A = Notification - only or auto-reset alarm (settable via parameter).
A/M = Auto or manual-reset alarm (settable via parameter or by number of events/hour).

7.3 Alarm Relay

The program offers the possibility of managing a cumulative alarm relay. Enabling of this output depends on whether or not the associated parameter *Alarm DO position HA01* has been set. To enable it, it is sufficient to set such value as different from zero; if a zero value is kept, the alarm relay will not be used.
Via parameter *Alarm DO logic-{}- PH18*, it is possible to establish the polarity (NO or NC) of the alarm output.

8 List of Modbus® Variables

The application can be controlled via a supervisor, using the Modbus® protocol. Communication takes place via an RS485 serial interface, which is already incorporated into the controller.
The various statuses/parameters exported by the application are listed below.

ID	Name	Value	Min.	Max.	Description	Mode
257	Packed_DI	0	0	65535	bit00=DI01, bit01=DI02, bit02=DI03, bit03=DI04, bit04=DI05, bit05=DI06, bit06=DI07, bit07=DI08, bit08=DI09, bit09=DI10, bit10=DI11, bit11=DI12	R/W
385	Packed_DO	0	0	65535	bit00=DO01, bit01=DO02, bit02=DO03, bit03=DO04, bit04=DO05, bit05=DO06, bit06=DO07, bit07=DO08, bit08=DO09, bit09=DO10, bit10=DO11, bit11=DO12	R/W
513	AI1_TempIngresso	-	-	-		R/W
514	AI2_TempUscita_C1	-	-	-		R/W
515	AI3_Pressione_C1	-	-	-		R/W
516	SondaEvaporazioneC1	-	-	-		R/W
517	AI6_TempUscita_C2	-	-	-		R/W
518	AI7_Pressione_C2	-	-	-		R/W
519	SondaEvaporazione_C2	-	-	-		R/W
520	SondaEsterna	-	-	-		R/W
521	SondaAccumulo	-	-	-		R/W
641	Inverter_Fan_C1	0.00	0.00	100.00		R/W
642	Inverter_Fan_C2	0.00	0.00	100.00		R/W
643	ventilatoreFC	0.00	0.00	100.00		R/W
644	valvolaFC	0.00	0.00	100.00		R/W
769	PackedAlarm1	0	0	65535	bit00=AL01, bit01=AL02,	R/W

					bit02=AL03, bit03=AL13, bit04=AL05, bit05=AL11, bit06=AL12, bit07=AL21, bit08=AL22, bit09=AL31, bit10=AL32, bit11=AL41, bit12=AL42, bit13=AL51, bit14=AL52, bit15=AL81	
770	PackedAlarm2	0	0	65535	bit00=AL82, bit01=AC21, bit02=AC22, bit03=AC23, bit04=AC24, bit05=AC25, bit06=AC26, bit07=AP21, bit08=AP22, bit09=AF21, bit10=AF22, bit11=AC01, bit12=AC02, bit13=AC03, bit14=AC04, bit15=AC05	R/W
771	PackedAlarm3	0	0	65535	bit00=AC06, bit01=AP01, bit02=AP02, bit03=AF01, bit04=AF02, bit05=ES01, bit06=ES02, bit07=ES03, bit08=ES04, bit09=ES05, bit10=ES06, bit11=ES07, bit12=ES08, bit13=EN01	R/W
1025	OnOffDaSuperv	0	0	1		R/W
1026	ModoFunzDaSuperv	0	0	1		R/W
1027	En_OffsetSetPoint_BySup	0	0	1		R/W
1281	StatoOnOffMacchina	0	0	6		R/W
1282	ModoUnita	0	0	4	0=OFF, 1=Chiller, 2=Heat pump, 3=Defrosting, 4=Dripping, 5=Free-cooling	R/W
1283	ModoFunz	0	0	1	0=Summer	R/W

					Cooling (Chiller), 1=Winter Heating (Heat pump)	
1284	SetpointEstivo_Attuale	8.5	-15.0	23.0		R/W
1285	SetpointInverno_Attuale	44.0	23.0	70.0		R/W
1286	Abilitazione_FC	0	0	1		R/W
1287	abiReg_FC_ValvolaOnOff	0	0	1		R/W
1288	Setpoint_FreeCooling_Attuale	0.0	-15.0	23.0		R/W
1289	StatoSbrinamento_C1	0	0	8	0=OFF. 1..3=WAIT 4..6=Defrosting 7..8=Dripping	R/W
1290	StatoSbrinamento_C2	0	0	8	0=OFF. 1..3=WAIT 4..6=Defrosting 7..8=Dripping	R/W
1291	PowerRequested	0	0	100	[%]	R/W
1292	PowerSupplied	0	0	100	[%]	R/W
1293	StatoCompressori[0]	0	0	6		R/W
1294	StatoCompressori[1]	0	0	6		R/W
1295	StatoCompressori[2]	0	0	6		R/W
1296	StatoCompressori[3]	0	0	6		R/W
1297	StatoCompressori[4]	0	0	6		R/W
1298	StatoCompressori[5]	0	0	6		R/W
1299	StatoFan1	0	0	6	0=Disabled, 1=OFF, 2=Wait ON, 3=ON, 4=Wait OFF, 5=ALL, 6=Manual	R/W
1300	StatoFan2	0	0	6	0=Disabled, 1=OFF, 2=Wait ON, 3=ON, 4=Wait OFF, 5=ALL, 6=Manual	R/W
1301	StatoPompa1_Ventilatore	0	0	3	0=Disabled, 1=OFF, 2=ON, 3=Alarm	R/W
1302		0	0	3	0=Disabled, 1=OFF, 2=ON, 3=Alarm	R/W
1537	MOdE_ModoFunzionamento	0	0	1	0=Cool (Chiller),	R/W

					1=Heat (Heat pump)	
1538	SPC1_SetpointEstate	8.5	-15.0	23.0		R/W
1539	SPH1_SetpointInverno	44.0	23.0	70.0		R/W
1540	SSC1_OffsetSPSecondarioEstate	0.0	-20.0	20.0		R/W
1541	SSH1_OffsetSPSecondarioInverno	0.0	-20.0	20.0		R/W
1542	PM00_Limit_HourCmp (Low)	2000.0	0.0	9999.0	hours x 10	R/W
1543	PM00_Limit_HourCmp (High)					
1544	PM01a06_OreCompressore[0] (Low)	0.0	0.0	9999.0		R/W
1545	PM01a06_OreCompressore[0] (High)					
1546	PM01a06_OreCompressore[1] (Low)	0.0	0.0	9999.0		R/W
1547	PM01a06_OreCompressore[1] (High)					
1548	PM01a06_OreCompressore[2] (Low)	0.0	0.0	9999.0		R/W
1549	PM01a06_OreCompressore[2] (High)					
1550	PM01a06_OreCompressore[3] (Low)	0.0	0.0	9999.0		R/W
1551	PM01a06_OreCompressore[3] (High)					
1552	PM01a06_OreCompressore[4] (Low)	0.0	0.0	9999.0		R/W
1553	PM01a06_OreCompressore[4] (High)					
1554	PM01a06_OreCompressore[5] (Low)	0.0	0.0	9999.0		R/W
1555	PM01a06_OreCompressore[5] (High)					
1556	PM11a16_AbilitaManuale_Comp[0]	0	0	1		R/W
1557	PM11a16_AbilitaManuale_Comp[1]	0	0	1		R/W
1558	PM11a16_AbilitaManuale_Comp[2]	0	0	1		R/W
1559	PM11a16_AbilitaManuale_Comp[3]	0	0	1		R/W
1560	PM11a16_AbilitaManuale_Comp[4]	0	0	1		R/W
1561	PM11a16_AbilitaManuale_Comp[5]	0	0	1		R/W
1562	PM21a26_outCmp[0]	0	0	1		R/W
1563	PM21a26_outCmp[1]	0	0	1		R/W
1564	PM21a26_outCmp[2]	0	0	1		R/W
1565	PM21a26_outCmp[3]	0	0	1		R/W
1566	PM21a26_outCmp[4]	0	0	1		R/W
1567	PM21a26_outCmp[5]	0	0	1		R/W
1568	PM30_Limit_HourPump (Low)	2000.0	0.0	9999.0	hours x 10	R/W
1569	PM30_Limit_HourPump (High)					

1570	PM31_OrePompa1_VentilatoreRicircolo (Low)	0.0	0.0	9999.0		R/W
1571	PM31_OrePompa1_VentilatoreRicircolo (High)					
1572	PM32_OrePompa2 (Low)	0.0	0.0	9999.0		R/W
1573	PM32_OrePompa2 (High)					
1574	PM40_Limit_HourFan (Low)	2000.0	0.0	9999.0	hours x 10	R/W
1575	PM40_Limit_HourFan (High)					
1576	PM41_OreVentilatore1_Or_Inverter (Low)	0.0	0.0	9999.0		R/W
1577	PM41_OreVentilatore1_Or_Inverter (High)					
1578	PM42_OreVentilatore2 (Low)	0.0	0.0	9999.0		R/W
1579	PM42_OreVentilatore2 (High)					
1580	PM51_ManualeVentilatore1	0	0	1		R/W
1581	PM52_ManualeVentilatore2	0	0	1		R/W
1582	PM61_ForzaturaInvFan_C1	0.00	0.00	100.00		R/W
1583	PM62_ForzaturaInvFan_C2	0.00	0.00	100.00		R/W
1584	PM71_ManualeVentilatore_FreeCooling	0	0	1		R/W
1585	PM72_ForzaturaVentilatore_FreeCooling	0.00	0.00	100.00		R/W
1586	PM81_TaraturaTIngresso	0.0	-20.0	20.0	°C	R/W
1587	PM82_TaraturaTUscita_C1	0.0	-20.0	20.0	°C	R/W
1588	PM83_TaraturaSondaPressione_C1	0.0	-290.0	290.0	bar/psi	R/W
1589	PM84_TaraturaSonda4	0	-290.0	290.0	°C	R/W
1590	PM85_TaraturaSonda5	0	-20.0	20.0	°C	R/W
1591	PM86_TaraturaTUscita_C2	0.0	-20.0	20.0	°C	R/W
1592	PM87_TaraturaSondaPressione_C2	0	-290.0	290.0	bar/psi	R/W
1593	PM88_TaraturaSondaPressione_AI08	0	-290.0	290.0	bar/psi	R/W
1594	PM91_Last_maintenanceYEAR	2007	2007	2060		R/W
1595	PM92_Last_maintenanceMONTH	1	1	12		R/W
1596	PM93_Last_maintenanceDAY	1	1	31		R/W
1597	PC01_Cmp_Rotation_Type	0	0	3	0=FIFO, 1=LIFO, 2=FIFO+Hrs, 3=LIFO+Hrs	R/W
1598	PC02_TipoRichiestaCompressori	0	0	1	0=Balancing, 1=Saturation	R/W
1599	PC04_Cmp_TminOn	20	0	999		R/W
1600	PC05_Cmp_TminOff	120	0	999		R/W
1601	PC06_Cmp_TonOn	360	0	999		R/W
1602	PC07_Cmp_TonOther	10	0	999		R/W

1603	PC08_Cmp_ToffOther	20	0	999		R/W
1604	PC09_MassimoNumeroAvviamentiOra	8	4	12		R/W
1605	PC10_CompressoriInErroreSonda	1	0	3		R/W
1606	PC11_TipoRegolazione	1	0	2	0=LB (input), 1=NZ (output), 2=Motocondensing (DI)	R/W
1607	PC12_BandaRegolazioneGradini	2.5	2.0	20.0		R/W
1608	PC14_DeadZone	3.0	0.1	10.0		R/W
1609	PC15_DeadZone_Min	1.0	0.1	10.0		R/W
1610	PC16_DeadZone_Max	5.0	0.1	10.0		R/W
1611	PC17_DeadZoneOutsideTime	20	0	999	Sec.	R/W
1612	PC18_DeadZoneAdaptive	0	0	1		R/W
1613	PC21_LimiteMinimoSetChiller	5.0	-15.0	23.0		R/W
1614	PC22_LimiteMassimoSetChiller	20.0	0.0	23.0		R/W
1615	PC23_LimiteMinimoSetPompaCalore	30.0	23.0	70.0		R/W
1616	PC24_LimiteMassimoSetPompaCalore	44.0	23.0	70.0		R/W
1617	PC30_AbilitazioneLimitazioneDiPotenza	0	0	1		R/W
1618	PC31_LimitazionePotenzaEstate	50	0	100		R/W
1619	PC32_LimitazionePotenzaInverno	50	0	100		R/W
1620	PC35_AbilitazSpegnimentoForzato	0	0	1		R/W
1621	PC36_SpegnimentoForzatoEstivo	3.5	-30.0	23.0		R/W
1622	PC37_SpegnimentoForzatoInvernale	52.0	26.0	75.0		R/W
1623	PC41_AbilitaPumpDown	0	0	2		R/W
1624	PC42_TempoSpegnimentoPumpDown	5	0	240		R/W
1625	PC43_SogliaPumpDown	1.5	0.0	72.5	Bar	R/W
1626	PC45_AbilitazioneHPTC	0	0	1		R/W
1627	PC46_SetpointHPTC	27.0	0.0	625.5	bar/psi	R/W
1628	PC47_DifferenzialeHPTC	2.0	0.0	72.5	bar/psi	R/W
1629	PC48_SogliaAriaEsternaHPTC	12.0	-30.0	23.0		R/W
1630	PC49_TempoMinimoHPTC	10	0	99	Minutes	R/W
1631	PC50_AbilitaControlloPressostaticoBasseTemperature	0	0	1		R/W
1632	PC51_SetControlloPressostaticoBasseTemperature	3.2	0.0	145.0	bar/psi	R/W
1633	PC52_DiffControlloPressostaticoBasseTemperature	2.0	0.0	145.0	bar/psi	R/W
1634	PC53_SetMinimaAriaEsterna	-5.0	-10.0	5.0		R/W
1635	PC54_SetMassimaTemperaturaOut	48.0	30.0	70.0		R/W
1636	PC61_SetCommutazioneEstate	20.0	0.0	70.0		R/W

1637	PC62_SetCommutazioneInverno	10.0	0.0	70.0		R/W
1638	PC64_offsetSetPointDinamico_Estate	-10.0	-20.0	20.0		R/W
1639	PC65_tempInizo_SPDinamico_Estate	30.0	-15.0	70.0		R/W
1640	PC66_tempFine_SPDinamico_Estate	60.0	-15.0	70.0		R/W
1641	PC67_offsetSetPointDinamico_Inverno	10.0	-20.0	20.0		R/W
1642	PC68_tempInizio_SPDinamico_Inverno	0.0	-15.0	70.0		R/W
1643	PC69_tempFine_SPDinamico_Inverno	30.0	-15.0	70.0		R/W
1644	PC70_GestioneLimiteFunzionamento	0	0	2	0=OFF, 1=AuxRelayOnly, 2=Relay+Comp	R/W
1645	PC71_SetPointLimiteFunzionamento	-7.0	-30.0	30.0		R/W
1646	PC72_DifferenzialeLimiteFunzionamento	4.0	0.1	10.0		R/W
1647	PC80_AbilitaControlloaRichiesta	0	0	1		R/W
1648	PC81_SetpointControllo_a_Richiesta_Estate	15.0	-15.0	70.0		R/W
1649	PC82_SetpointControllo_a_Richiesta_Inverno	45.0	-15.0	70.0		R/W
1650	PC83_DiffControllo_a_Richiesta_Estate	4.0	0.1	10.0		R/W
1651	PC84_DiffControllo_a_Richiesta_Inverno	4.0	0.1	10.0		R/W
1652	PC85_RitardoControlloSuRichiesta	5	0	999		R/W
1653	PF02_CondDipDaiCompr	1	0	1		R/W
1654	PF03_StopFan_Defrost	0	0	1		R/W
1655	PF07_Fan_TonOther	10	0	999		R/W
1656	PF08_Fan_ToffOther	20	0	999		R/W
1657	PF10_ForzaturaInErroreSonda	100.00	0.00	100.00		R/W
1658	PF11_SetRegolazioneCond_Chiller	20.0	5.0	625.5	bar/psi	R/W
1659	PF12_DiffRegolazioneCond_Chiller	12.0	0.1	217.5	bar/psi	R/W
1660	PF13_AbiForzaturaMaxCond_Chiller	1	0	1		R/W
1661	PF14_SetForzaturaMaxCond_Chiller	26.0	15.0	625.5	bar/psi	R/W
1662	PF15_DiffForzaturaMaxCond_Chiller	2.0	0.1	72.5	bar/psi	R/W
1663	PF21_SetRegolazioneCond_PdC	9.0	0.5	217.5	bar/psi	R/W
1664	PF22_DiffRegolazioneCond_PdC	2.0	0.1	217.5	bar/psi	R/W
1665	PF23_AbiForzaturaMaxCond_PdC	1	0	1		R/W
1666	PF24_SetForzaturaMaxCond_PdC	3.2	0.5	290.0	bar/psi	R/W
1667	PF25_DiffForzaturaMaxCond_PdC	0.5	0.1	72.5	bar/psi	R/W
1668	PF26_MinVal_InverterFan	0.00	0.00	100.00		R/W
1669	PF27_SpeedUp_InverterFan	4	0	999		R/W

1670	PF31_LimiteMinCondensazioneLineare	30.00	0.00	100.00		R/W
1671	PF32_LimiteMaxCondensazioneLineare	100.00	0.00	100.00		R/W
1672	PF33_AbiRegolazioneSottoLimiteMinCond	1	0	1		R/W
1673	PF34_DiffSpegnimentoSottoLimiteMinCond	2.0	0.0	72.5	bar/psi	R/W
1674	PF36_AbilitaPreavvioVentilatoreCond	0	0	1		R/W
1675	PF37_SetPreavvioVentilatoreCond	30.0	20.0	40.0		R/W
1676	PF38_VelocitaPreavvio	50.00	0.00	100.00		R/W
1677	PF39_TempoAnticipoVentilatoreCond	5	0	999		R/W
1678	PF41_LinInverterFan	25.00	0.00	100.00		R/W
1679	PF42_LinInverterFan	50.00	0.00	100.00		R/W
1680	PF43_LinInverterFan	75.00	0.00	100.00		R/W
1681	PF45_LinInverterFan	25.00	0.00	100.00		R/W
1682	PF46_LinInverterFan	50.00	0.00	100.00		R/W
1683	PF47_LinInverterFan	75.00	0.00	100.00		R/W
1684	Pd01_SetInizioSbrinamento	6.0	0.0	625.5	bar/psi	R/W
1685	Pd02_SetFineSbrinamento	12.0	0.0	625.5	bar/psi	R/W
1686	Pd03_RitardoAttivazioneSbrinamento	1200	60	3600		R/W
1687	Pd05_TempoMaxDurataSbrinamento	300	10	600		R/W
1688	Pd06_TempoSgocciolamento	120	0	600		R/W
1689	Pd07_TempoRipartenzaPrimaDiSbrinare	60	0	600		R/W
1690	Pd11_TipoSbrinamentoDaContattoEsterno	0	0	3	0=Normal, 1=Start, 2=Stop, 3=Start and Stop	R/W
1691	Pd12_TipoContattoSbrinamento	0	0	1	0=Front, 1=Level	R/W
1692	Pd20_AbilitaCompensazioneSbr	0	0	1		R/W
1693	Pd21_SetInizio_Compensazione-{}-Sbr	5.0	-30.0	70.0		R/W
1694	Pd22_SetFine_CompensazioneSbr	0.0	-30.0	70.0		R/W
1695	Pd23_RitardoMassimoFineSbr	3600	0	9600		R/W
1696	PP01_TipoFunzionamentoPompa_Ventilatore	0	0	2	0=Continuous, 1=From thermostat, 2=Cyclical	R/W
1697	PP02_TOnFunzCiclicoPompa_Ventilatore	120	0	999		R/W
1698	PP03_TOffFunzCiclicoPompa_Ventilatore	120	0	999		R/W
1699	PP04_TMinPompe_Ventilatore	60	1	999		R/W
1700	PP05_RitardoSpegnimentoPompe_Ventilatore	60	1	999		R/W

1701	PP07_SpegnimentoPompaInSbrinamento	0	0	1		R/W
1702	PP08_DeltaOreRotazione	4	1	240		R/W
1703	PP09_TempoFunzPompeConBassoQuantitativoAcqua	15	0	999		R/W
1704	PP10_TempoFunzPompeConBassaTemperatura	15	0	999		R/W
1705	PP11_Abilita_HotStart	0	0	1		R/W
1706	PP12_SetPoint_HotStart	36.0	0.0	70.0		R/W
1707	PP13_Diff_HotStart	4.0	0.1	10.0		R/W
1708	Pr01_AbilitaResistenzeAntigelo	1	0	1		R/W
1709	Pr02_SetpointResAntigelo	5.0	-30.0	10.0		R/W
1710	Pr03_DifferenzialeResAntigelo	2.0	0.1	10.0		R/W
1711	Pr04_ForzaResistenzeInErroreSonda	0	0	1		R/W
1712	Pr11_SetpointAllarmeAntigelo	3.0	-30.0	10.0		R/W
1713	Pr12_DifferenzialeAllarmeAntigelo	2.0	0.1	10.0		R/W
1714	PS01_AbilitaFree_Cooling	0	0	1		R/W
1715	PS02_BandaModulazione_SerrandaFC	3.0	0.1	20.0		R/W
1716	PS03_MinimaVelocita_FC	0.00	0.00	100.00		R/W
1717	PS04_MassimaVelocita_FC	100.00	0.00	100.00		R/W
1718	PS11_SetDifferenziale_FC	3.0	2.0	9.9		R/W
1719	PS13_Diff_FC	2.0	0.5	5.0		R/W
1720	PS14_TempoMinimoAbilitazione_FC	30	0	240		R/W
1721	PS15_IsteresiValvolaOnOff_FC	0.5	0.1	5.0		R/W
1722	PS16_SogliaMassimaAperturaValvola_FC	2.0	0.1	20.0		R/W
1723	PS21_AbilitaFree_Cooling_ConCompressori	1	0	1		R/W
1724	PA01_FlowStartup_AlarmDelay	10	1	999		R/W
1725	PA02_FlowRunning_AlarmDelay	1	1	999		R/W
1726	PA03_NumeroInterventiAllarmeFlusso	3	0	9		R/W
1727	PA04_RitardoErroreSonda	10	0	240		R/W
1728	PA05_SetpointAllarmeAltaTemp	30.0	10.0	40.0		R/W
1729	PA06_SetpointAllarmeBassaTemp	15.0	10.0	40.0		R/W
1730	PA07_RitardoAttivazioneAllarmeTemperatura	30	1	999		R/W
1731	PA08_SegnalazioneAllarmeTemperatura	0	0	1		R/W
1732	PA09_DifferenzialeAllarmeTemp	0.5	0.1	10.0		R/W
1733		15	0	999		R/W
1734	PA11_SetAllarmeBassaPressione	3.0	0.1	145.0	bar/psi	R/W

1735	PA12_DiffAllarmeBassaPressione	1.0	0.1	72.5	bar/psi	R/W
1736	PA13_TempoByPassAllarmeBassaPressione	120	0	999		R/W
1737	PA14_NumeroInterventiAllarmeBP	3	0	5		R/W
1738	PA16_AbilitaControlloBassaPressConBassaTemp	1	0	1		R/W
1739	PA17_SetAllarmeBassaPressioneInBassaTemp	1.0	0.1	145.0	bar/psi	R/W
1740	PA18_DiffAllarmeBassaPressioneInBassaTemp	0.5	0.1	72.5	bar/psi	R/W
1741	PA19_TempoAttivazControlloBPconBT	120	10	999		R/W
1742	PA20_RitardoAllarmeBPAvviamentoCmp	240	0	999		R/W
1743	PA21_SetAllarmeAltaPressione	28.0	0.0	625.5	bar/psi	R/W
1744	PA22_DiffAllarmeAltaPressione	5.0	0.0	435.0	bar/psi	R/W
1745	PA25_Abi_ALL_EfficienzaScambiatore	0	0	1		R/W
1746	PA26_Soglia_ALL_EfficenzaScambiatore	2.0	0.1	20.0		R/W
1747	PA27_ByPass_ALL_EfficienzaScambiatore	120	0	999		R/W
1748	PA40_En_Alarm_HourCmp	1	0	1		R/W
1749	PA41_ThermalCmp_Delay	10	0	999		R/W
1750	PA42_ThermalCmp_ResetType	1	0	1		R/W
1751	PA60_En_Alarm_HourPump	1	0	1		R/W
1752	PA62_ThermalPump_ResetType	1	0	1		R/W
1753	PA80_En_Alarm_HourFan	1	0	1		R/W
1754	PA81_ThermalFan_Delay1	10	0	999		R/W
1755	PA82_ThermalFan_ResetType2	1	0	1		R/W
1756	PA99_RitardoAllarmeEspansione	5	0	999		R/W
1757	PH01_Pressure_Min	0.0	-145.0	625.5	bar/psi	R/W
1758	PH02_Pressure_Max	30.0	-145.0	625.5	bar/psi	R/W
1759	PH04_ChangeOver_Probe	0	0	1	0=External 1=Ambient	R/W
1760	PH05_En_OnOffByKey	1	0	1		R/W
1761	PH06_En_ModeByChangeOver	0	0	1		R/W
1762	PH07_En_OnOffByDI	0	0	1		R/W
1763	PH08_En_ModeByDI	0	0	1		R/W
1764	PH09_En_OnOffBySuperv	0	0	1		R/W
1765	PH10_En_ModeBySup	0	0	1		R/W
1766	PH11_Modbus_Address	1	1	247		R/W
1767	PH12_Modbus_Baud	3	0	4	1=2400, 2=4800, 3=9600, 4=19200	R/W

1768	PH13_Modbus_Parity	2	0	2	0=None, 1=Odd, 2=Even	R/W
1769	PH14_Modbus_StopBit	0	0	1	0=1 bit, 1=2 bits	R/W
1770	PH15_RipristinoDefaultParametri	0	0	1		R/W
1771	PH16_Logic_DO_ReverseValve	0	0	1		R/W
1772	PH17_Logic_DI_Alarm	1	0	1		R/W
1773	PH18_Logic_DO_Alarm	0	0	1		R/W
1774	PH19_Logic_DI_Mode	0	0	1		R/W
1775	PH20_Logic_DI_Flow	1	0	1		R/W
1776	PH21_AbilitaSondaTIngresso	1	0	1		R/W
1777	PH22_AbilitaSondaTUscita_C1	1	0	1		R/W
1778	PH23_AbilitaSondaTUscita_C2	1	0	1		R/W
1779	PH24_AbilitaSondaEsterna	1	0	1	0=Disabled	R/W
1780	PH25_En_OffsetSetPoint_ByDig	0	0	1		R/W
1781	PH26_En_OffsetSetPoint_BySup	0	0	1		R/W
1782	PH27_AbilitaSetPointDinamico	0	0	1		R/W
1783	PH29_Logic_DI_StepsCompressori	0	0	1		R/W
1784	PH31_RefrigerationType	3	0	6	0=none, 1=R22, 2=R134a, 3=R404A, 4=R407C, 5=R410A, 6=R507	R/W
1785	PH32_Temp_UM	0	0	1	0=°C, 1=°F	R/W
1786	PH33_Press_UM	0	0	1	0=bar, 1=psi	R/W
1787	PH43_Tipo_AI3	4	2	4	2=NTC, 3=Not used, 4=4..20 mA	R/W
1788	PH44_Tipo_AI4	1	0	4	0=Disabled probe, 1=DI06, 2=External temp., 3=Accumulation temp., 4=Evaporation C1	R/W
1789	PH45_Tipo_AI8	1	0	2	0=Disabled; 1=DI06, 2=Evaporation C2	R/W
1790	PH48_TrasduttoreUnico_Separato_SbrinamentoCondensazione	0	0	1	0=Single, 1=Separate	R/W

1791	PH50_VisualizzaSoloIcone	0	0	1		R/W
1792	PH51_AbilitaIconaNumericheComp	1	0	1		R/W
1793	PH52_EnableEvcoIcon	1	0	1		R/W
1794	PH53_Icone_Cool_Heat	0	0	1	0: Sun = Cooling, Snow = Heating; 1: Sun = Heating, Snow = Cooling	R/W
1795	PH61_Logic_DI_Remote_OnOff	0	0	1		R/W
1796	PH62_Logic_DI_SecSP	0	0	1		R/W
1797	PH63_Logic_DI_DemandLimit	0	0	1		R/W
1798	PH64_Logic_DI_Sbrin	0	0	1		R/W
1799	PG00_TipoUnita	3	1	10	1=Air-to-air chiller, 2=Air-to-air heat pump, 3=Air-to-water chiller, 4=Air-to-water heat pump, 5=Air-to-water chiller, 6=Air-to-water heat pump, 7=Air-based motocondensing, 8=Air-based motocondensing with inverter, 9=Water-based motocondensing, 10=Water-based motocondensing with inverter	R/W
1800	PG01_NumeroCircuiti	2	1	2		R/W
1801	PG02_En_Expansion	1	0	1		R/W
1802	PG03_NumeroCompressori	2	1	3		R/W
1803	PG08_SoloPompaDiCalore	0	0	1		R/W
1804	PG09_NumeroPompe	1	0	2		R/W
1805	PG11_Abilita_CondensazioneUnica	0	0	1	0=Single, 1=Separate	R/W
1806	PG13_CircuitoAria_ComuneSeparato	1	0	1	0=Single, 1=Separate	R/W
1807	HA01_Pos_DO_GlobalAlarm	6	0	12		R/W
1808	HA02_Pos_DO_AntiFreeze_C1	4	0	12		R/W
1809	HA03_Pos_DO_AntiFreeze_C2	10	0	12		R/W

1810	HA04_Pos_DO_LimiteFunzionamento	0	0	12		R/W
1811	HA05_Pos_DO_ReverseValve_C1	0	0	12		R/W
1812	HA06_Pos_DO_ReverseValve_C2	0	0	12		R/W
1813	HA07_Pos_DO_ValvolaPumpDown_C1	5	0	12		R/W
1814	HA08_Pos_DO_ValvolaPumpDown_C2	11	0	12		R/W
1815	HA09_Pos_DO_ValvolaFC	7	0	12		R/W
1816	HA19_Pos_AO_Valvola_FC	2	0	4		R/W
1817	HC01a06_Pos_DO_Comp[0]	2	0	12		R/W
1818	HC01a06_Pos_DO_Comp[1]	3	0	12		R/W
1819	HC01a06_Pos_DO_Comp[2]	8	0	12		R/W
1820	HC01a06_Pos_DO_Comp[3]	9	0	12		R/W
1821	HC01a06_Pos_DO_Comp[4]	0	0	12		R/W
1822	HC01a06_Pos_DO_Comp[5]	0	0	12		R/W
1823	HF31_Pos_AO_InverterCondensatore_C1	1	0	4		R/W
1824	HF32_Pos_AO_InverterCondensatore_C2	4	0	4		R/W
1825	HF34_Pos_AO_Ventilatore_FC	0	0	4		R/W
1826	HP01_Pos_DO_Pump_Fan	1	0	12		R/W
1827	HP02_Pos_DO_Pump2	0	0	12		R/W
1828	Hd01_Pos_DI_Remote_OnOff	0	0	12		R/W
1829	Hd02_Pos_DI_CmpSecSP	10	0	12		R/W
1830	Hd05_Pos_DI_Mode	0	0	12		R/W
1831	Hd06_Pos_DI_Flow	4	0	12		R/W
1832	Hd07_Pos_DI_DemandLimit	0	0	12		R/W
1833	Hd09_Pos_DI_SbrinamentoDaDI	0	0	12		R/W
1834	Hd11a16_Pos_DI_Step1Comp[0]	0	0	12		R/W
1835	Hd11a16_Pos_DI_Step1Comp[1]	0	0	12		R/W
1836	Hd11a16_Pos_DI_Step1Comp[2]	0	0	12		R/W
1837	Hd11a16_Pos_DI_Step1Comp[3]	0	0	12		R/W
1838	Hd11a16_Pos_DI_Step1Comp[4]	0	0	12		R/W
1839	Hd11a16_Pos_DI_Step1Comp[5]	0	0	12		R/W
1840	Hd20_Pos_DI_LowPressSwitch_C1	6	0	12		R/W
1841	Hd21_Pos_DI_HighPressSwitch_C1	1	0	12		R/W
1842	Hd22_Pos_DI_LowPressSwitch_C2	12	0	12		R/W
1843	Hd23_Pos_DI_HighPressSwitch_C2	7	0	12		R/W
1844	Hd41a46_Pos_DI_ThermalOverloadCmp[0]	2	0	12		R/W
1845	Hd41a46_Pos_DI_ThermalOverloadCmp[1]	3	0	12		R/W

1846	Hd41a46_Pos_DI_ThermalOverloadCmp[2]	8	0	12		R/W
1847	Hd41a46_Pos_DI_ThermalOverloadCmp[3]	9	0	12		R/W
1848	Hd41a46_Pos_DI_ThermalOverloadCmp[4]	0	0	12		R/W
1849	Hd41a46_Pos_DI_ThermalOverloadCmp[5]	0	0	12		R/W
1850	Hd81_Pos_DI_ThermalOverloadFan1	0	0	12		R/W
1851	Hd82_Pos_DI_ThermalOverloadFan2	0	0	12		R/W
1852	Hd91_PosDI_TermicoPompa_Ventilatore	5	0	12		R/W

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