PROGRAMMABLE CONTROLLERS FOR MONO AND BI-CIRCUIT

COMPRESSOR PACKS
UP TO 4 COMPRESSORS

APPLICATION MANUAL

CODE 144RACKNUE05

Important

Read carefully these instructions before installation and use and follow all the directions for the installation and for the electrical connection; keep these instructions together with the tool for future consultation.

The tool must be disposed of according to the local regulation regarding collection of electrical and electronic equipments.

Contents

1 GENERALITIES

1.1 Description

This application uses control units of C-PRO NANO and C-PRO MICRO line for management of a refrigerator compressor pack composed by one or two circuits with maximum number of 4 compressors.
The function required to a refrigerator compressor pack's control system is the management of the compressors for the maintenance of the evaporation pressure up to the wished value; in deeper words it must assure the production of cold, for example for foodstuffs' conservation.
Therefore it is required the continuous generation of cold through an action that must take place without interruptions, unless for normal maintenance operations.C-PRO NANO and C-PRO MICRO control units are extremely careful to these aspects managing all the circuit's parts with the best possible efficiency (better efficiency output = less operation costs), handling the mechanical tools in the best way, for breakdown reduction (for example less trimming = less mechanical stress). For the control of pressure or temperature it is possible to choose between two setting types:

- Sideband
- Neutral zone

For each circuit the safeties are managed in order to signalize promptly the possible malfunctions. To each safety it is associated a particular alarm that will be signalized in order to identify the type of breakdown. Some alarms will consequently block the mechanical devices in order to avoid further breakdown. Other alarms, as a result, will only signalize without taking any measure over the machine's operation.
The application has a navigable user inteface whereby it is possible defining and setting all the configuration and operation parameters divided into four main levels:

- User
- Maintenance operative
- Installer
- Contructor

Each level is protected by a different password. On contructor's level the user inteface displays a range of editable configuration templates (wizard) that allow to set easily the number of circuits, compressors, fans and the respective safeties that we want to use in order to protect the mechanical devices.
There is always a TTL output for the connection to RICS supervision system (through aTTL/RS-485 user interface) or to other BMS.

C-PRO NANO RACK

C-PRO MICRO RACK
Built-in version

C-PRO MICRO RACK
Blind version

C-PRO MICRO RACK
Open version

2 Applications

It is possible connecting to the control unit a 6 relays expansion through IntraBus proprietor protocol

It is supposed the management of three types of compressor pack:

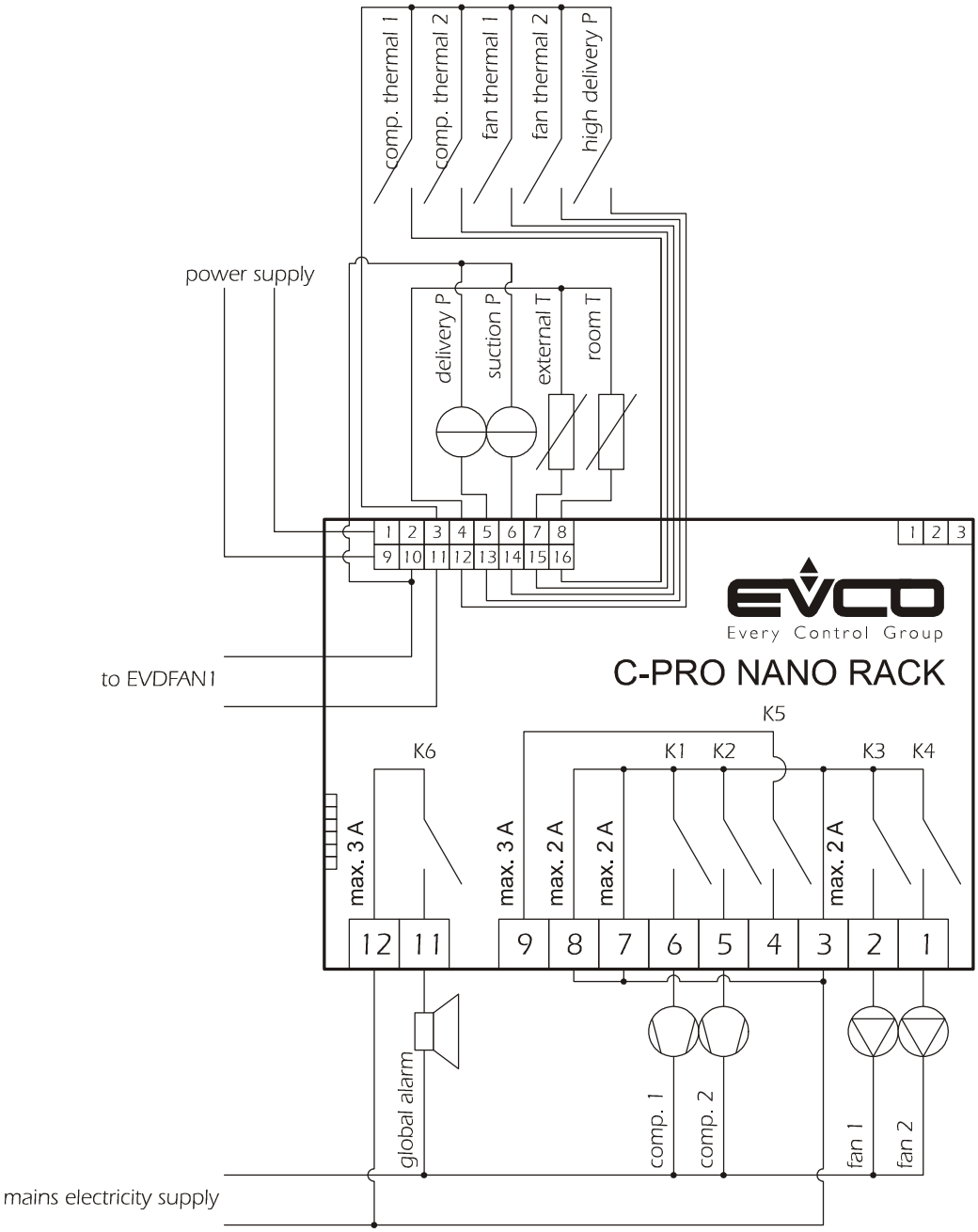
1) **Application 1: C-PRO NANO RACK or C-PRO MICRO RACK (for monocircuit compressor packs)**
   Total of digital outputs = 6
   Total of digital inputs = 5
   Total of analogue inputs = 4
   Total of analogue outputs = 2 PWM (+2 optional ones).

2) **Application 2: C-PRO NANO RACK or C-PRO MICRO RACK + C-PRO EXP MICRO expansion (for bi-circuit compressor packs with single condensation)**
   Total of digital outputs = 12
   Total of digital inputs = 10
   Total of analogue inputs = 8
   Total of analogue outputs = 2 PWM (+2 optional ones) .

3) **Application 3: C-PRO NANO RACK or C-PRO MICRO RACK + C-PRO EXP MICRO expansion (for bi-circuit compressor packs with separated condensation)**
   Total of digital outputs = 12
   Total of digital inputs = 10
   Total of analogue inputs = 8
   Total of analogue outputs = 2 PWM (+2 optional ones).

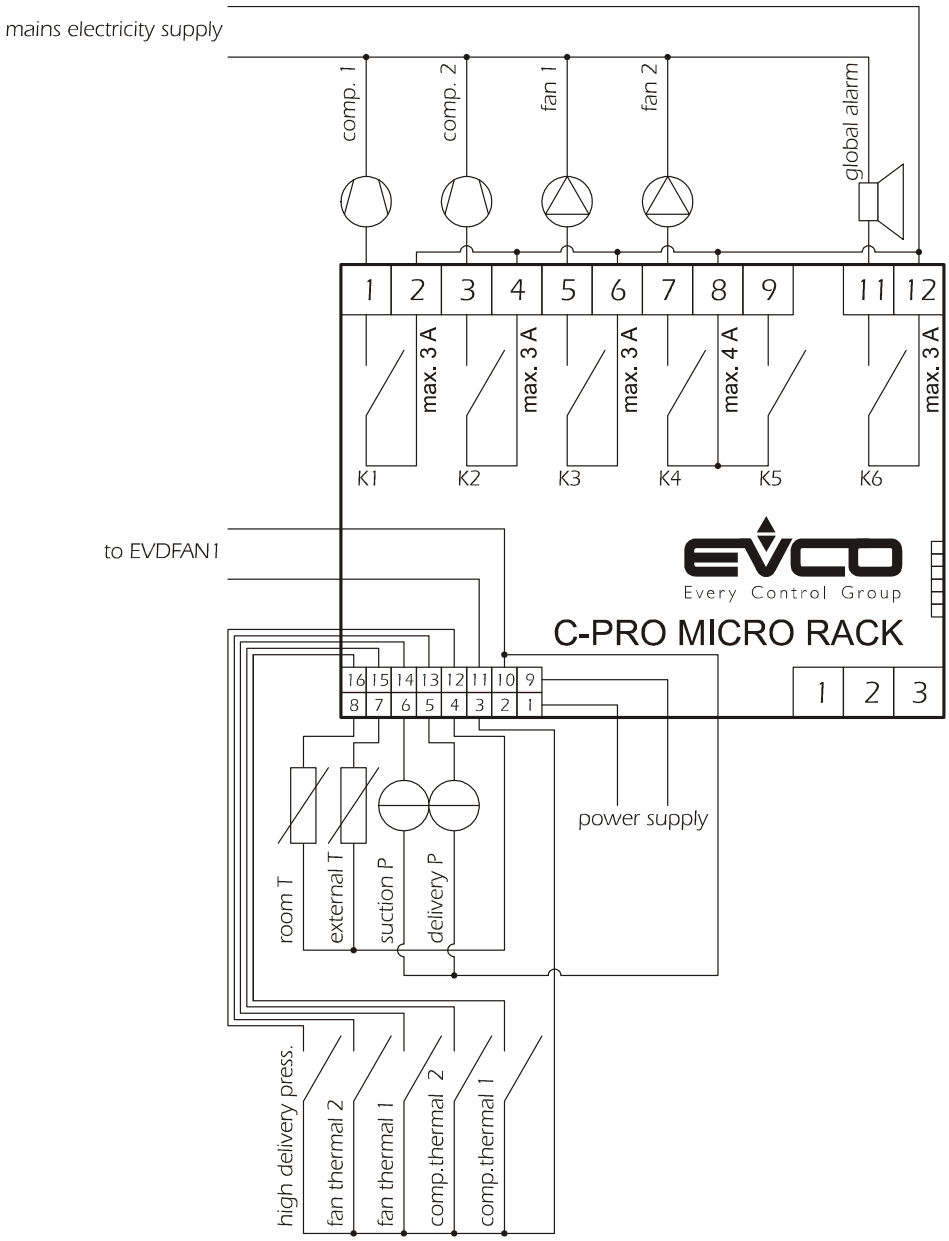
2.1 Application 1a: use of C-PRO NANO RACK (monocircuit compressor pack)

According to default setting, C-PRO NANO RACK is configured to manage monocircuit refrigerator compressor packs; the uses shown in the drawing below just refer to default settings.



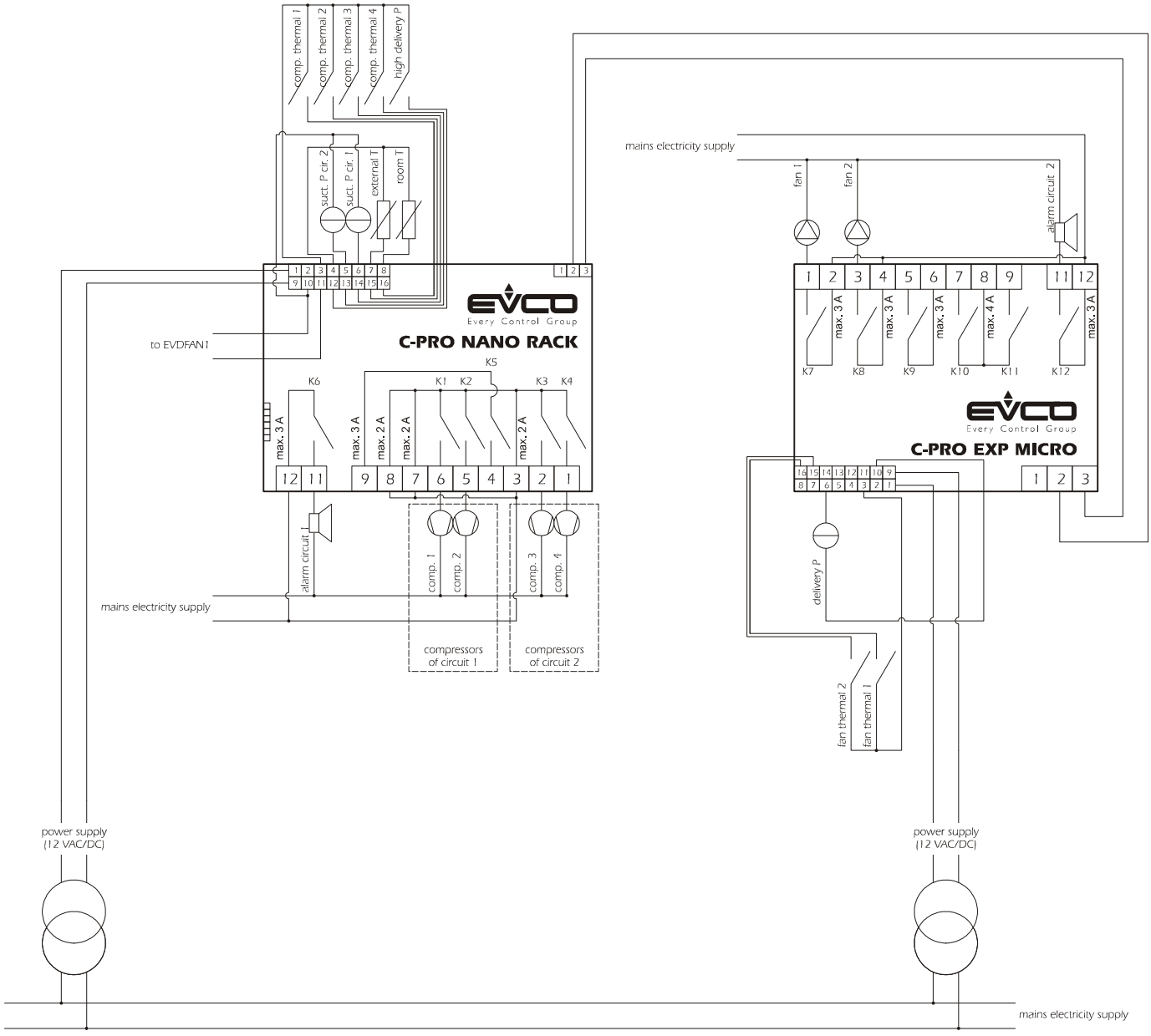
2.2 Application 1b: use of C-PRO MICRO RACK (monocircuit compressor pack)

According to default setting, C-PRO MICRO RACK is configured to manage monocircuit refrigerator compressor packs; the uses shown in the drawing below just refer to default settings.



2.3 Application 2a: use of C-PRO NANO RACK with expansion of I/O C-PRO EXP MICRO (bi-circuit compressor pack with single condensation)

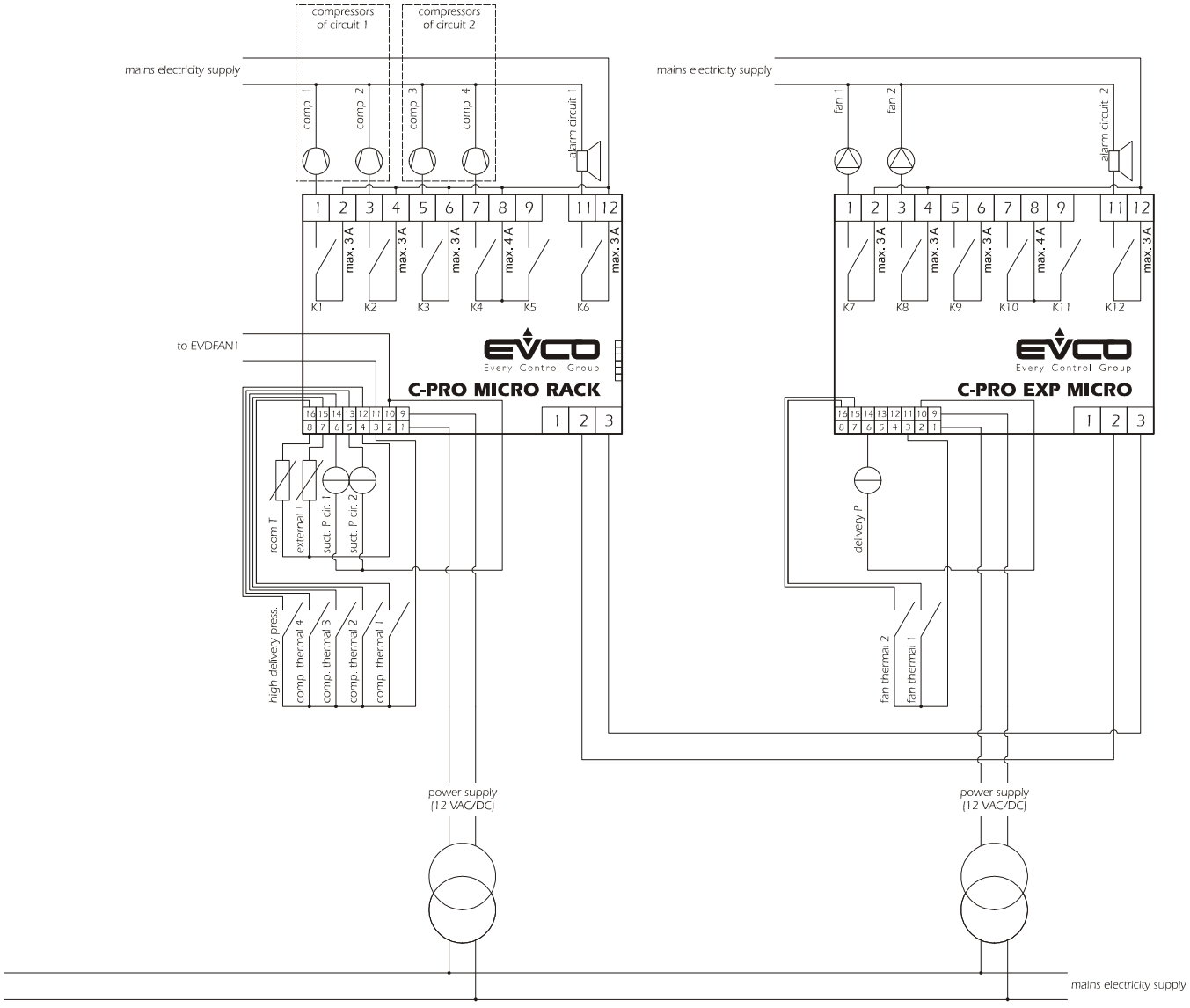
According to default setting, C-PRO NANO RACK is configured to manage monocircuit compressor packs; the uses shown in the drawing below refer to an example of bi-circuit compressor pack with single condensation.



The power supplies of C-PRO NANO RACK and of C-PRO EXP MICRO must be galvanically insulated among them

2.4 Application 2b: use of C-PRO MICRO RACK with expansion of I/O C-PRO EXP MICRO (bi-circuit compressor pack with single condensation).

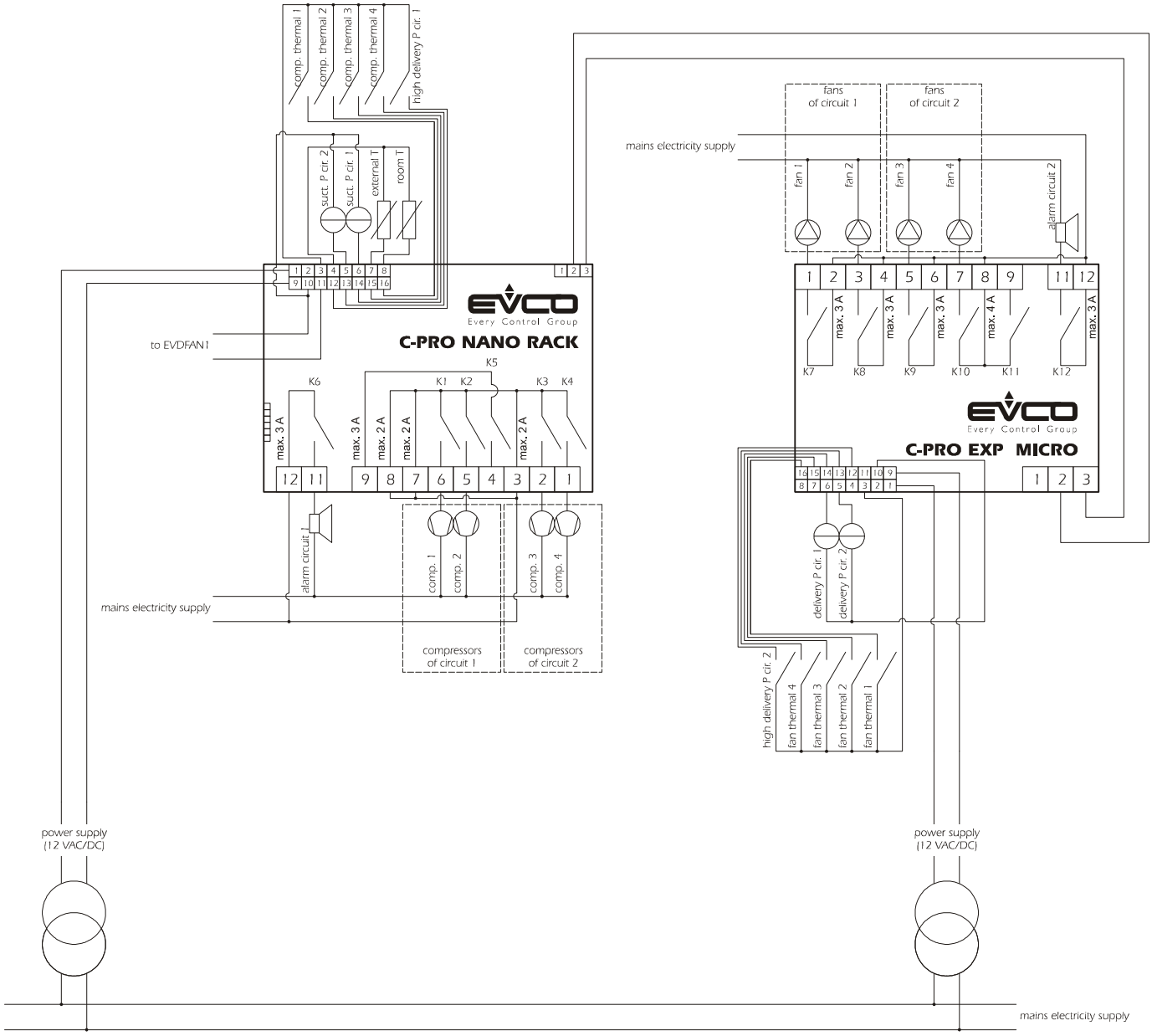
According to default setting, C-PRO MICRO RACK is configured to manage monocircuit compressor packs ; the uses shown in the drawing below refer to an example of bi-circuit compressor pack with single condensation.



<u>The power supplies of C-PRO MICRO RACK and of C-PRO EXP MICRO must be galvanically insulated among them.</u>

2.5 Application 3a: use of C-PRO NANO RACK with expansion of I/O C-PRO EXP MICRO (bi-circuit compressor pack with separated condensation).

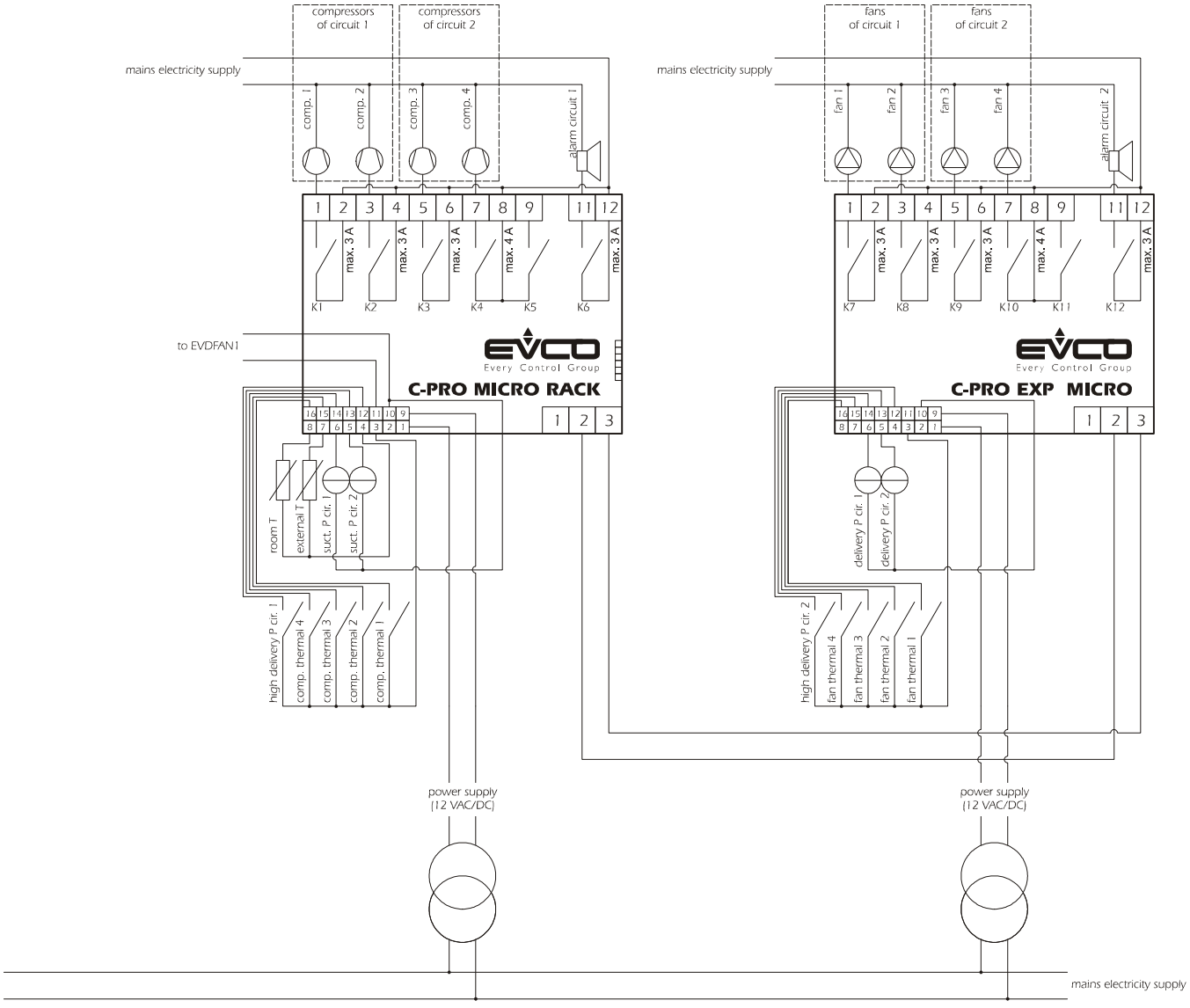
According to default setting, C-PRO MICRO NANO is configured to manage monocircuit compressor packs ; the uses shown in the drawing below refer to an example of bi-circuit compressor pack with separated condensation.



The power supplies of C-PRO NANO RACK and of C-PRO EXP MICRO must be galvanically insulated among them.

2.6 Application 3b: use of C-PRO MICRO RACK with expansion of I/O C-PRO EXP MICRO (bi-circuit compressor pack with separated condensation).

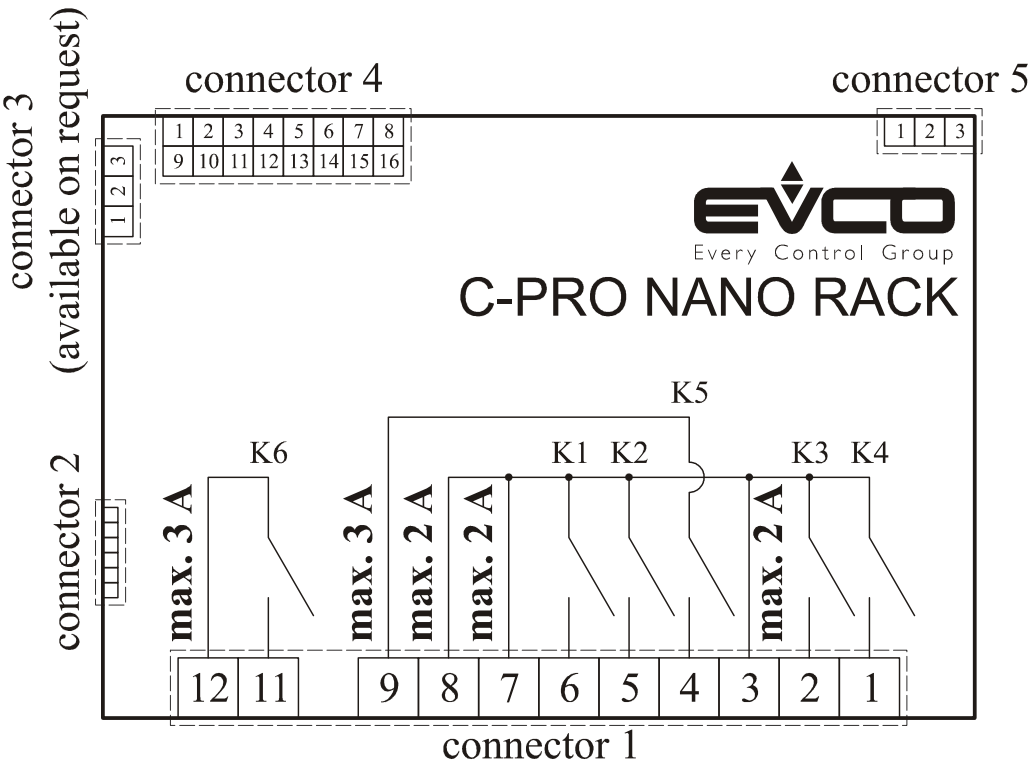
According to default setting, C-PRO MICRO RACK is configured to manage monocircuit compressor packs ; the uses shown in the drawing below refer to an example of bi-circuit compressor pack with separated condensation.



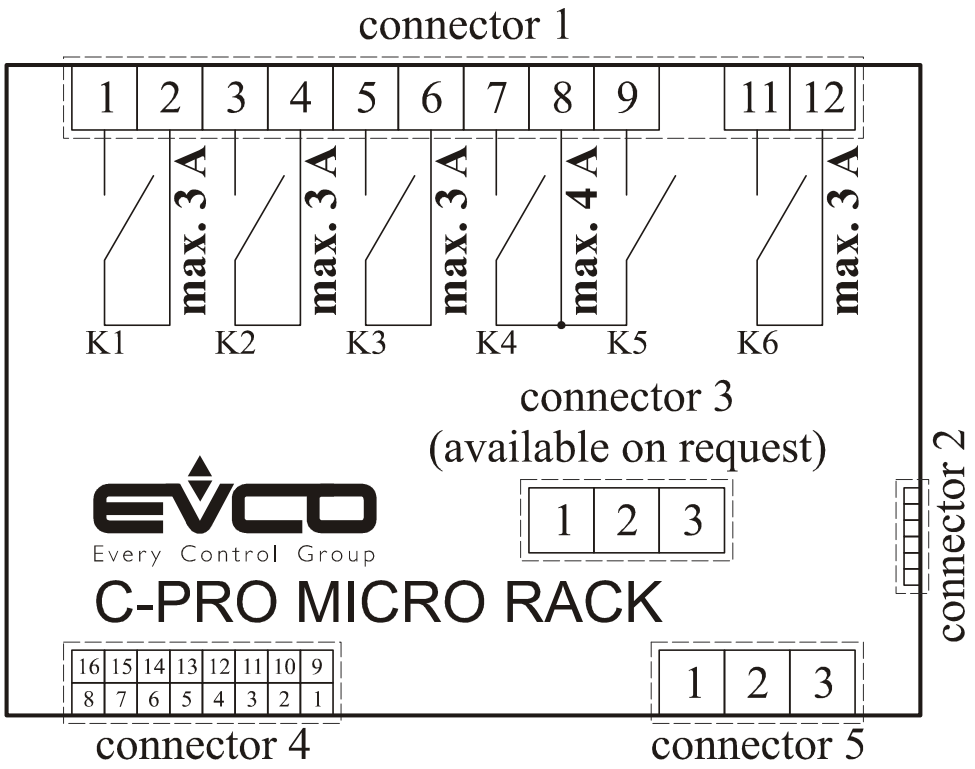
<u>The power supplies of C-PRO MICRO RACK and of C-PRO EXP MICRO must be galvanically insulated among them.</u>

2.7 Electrical connections of control units

Here follows the layout of control units connection with tables concerning the inputs and outputs meaning.



C-PRO NANO RACK connections



C-PRO MICRO RACK connections

Connector 1 of C-PRO NANO RACK: Connection for relay outputs ; in brackets the use that is associated according to default setting		
Conn.	**Abbreviation**	**Description**
C1-1	DO4	Normally open contact relay n.4 (fan 2)
C1-2	D03	Normally open contact relay n. 3 (fan 1)
C1-3	COMMON 1	Common relay n.1,2,3,4
C1-4	DO5	Normally open contact relay n.5
C1-5	DO2	Normally open contact relay n.2 (compressor 2)
C1-6	DO1	Normally open contact relay n.1 (compressor 1)
C1-7	COMMON 1	Common relay n.1,2,3,4
C1-8	COMMON 1	Common relay n.1,2,3,4
C1-9	COMUNE DO5	Common relay n.5 (not used)
C1-10	Not used	Not used
C1-11	DO6	Normally open contact relay n.6 (global alarm)

Connector 1 of C-PRO MICRO RACK: Connection for relay outputs; in brackets the use that is associated according to default setting		
Conn.	**Abbreviation**	**Description**
C1-1	DO1	Normally open contact relay n.1 (compressor 1)
C1-2	COMMON DO1	Common relay n.1
C1-3	DO2	Normally open contact relay n.2 (compressor 2)
C1-4	COMMON DO2	C Common relay n.2
C1-5	DO3	Normally open contact relay n.3 (fan 1)
C1-6	COMMON DO3	Common relay n.3
C1-7	DO4	Normally open contact relay n.4 (fan 2)
C1-8	COMMON DO4, DO5	Common relay n.4,5
C1-9	DO5	Normally open contact relay n 5 (not used)
C1-11	DO6	Normally open contact relay n.6 (global alarm)
C1-12	COMMON DO6	Common relay n.6

Connector 2: Connection for the key of parameters upload/download and/or output for RS485 module

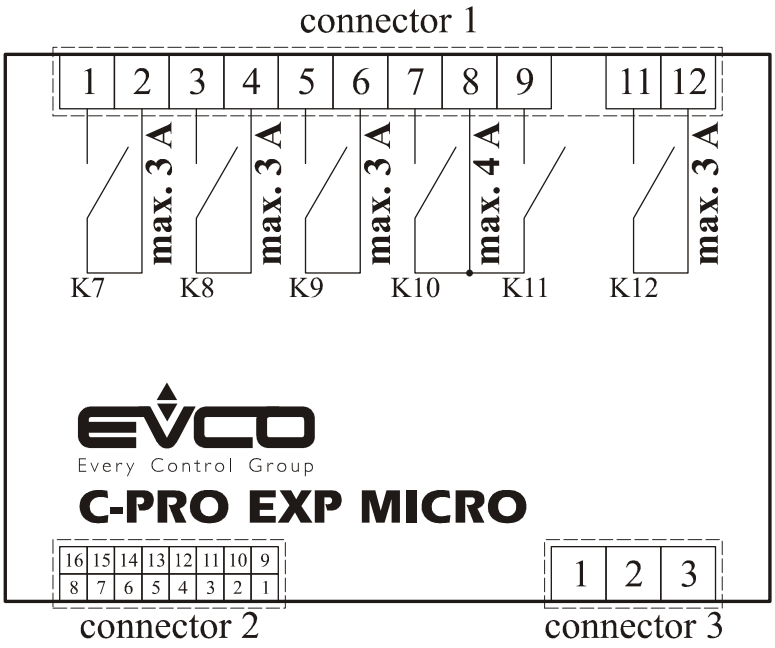
Connector 3: Connector for the anlogical output (optional, not available in the open versions)		
Conn.	**Abbreviation**	**Description(V+I Version)**
C3-1	AO2	0-10Vdc
C3-2	GND	Common analogue output
C3-3	AO3	4-20mA
		Description (I+I Version)
C3-1	*AO2*	*4-20mA*
C3-2	*GND*	*Common analogue output*
C3-3	*AO3*	*4-20mA*
		Description (V+V Version)
C3-1	AO2	0-10Vdc
C3-2	GND	Common analogue output
C3-3	AO3	0-10Vdc

Connector 4: Connector for low tension signals; in brackets the use that is associated according to default setting		
Conn.	**Abbreviation**	**Description**
C4-1	12Vac (Power)	Power supply of the tool (12Vac/dc)
C4-2	Not connected	Not connected
C4-3	GND	Common analogue and digital inputs
C4-4	GND	Common analogue and digital inputs
C4-5	AI4	Analogue input n.4 (input for 0/4-20 mA transducer; discharging pressure)
C4-6	AI3	Analogue input n.3 (input for 0/4-20 mA transducer; suction pressure)
C4-7	AI2	Analogue input n.2 (input for NTC probe; external temperature)
C4-8	AI1	Analogue input n.1 (input for NTC probe; room temperature)
C4-9	12Vac (Power)	Power supply of the tool (12Vac/dc)
C4-10	12Vdc	Current transducer and cut-off module power supply (50 mA max. not protected against short circuits)
C4-11	PWM	Pulses output for phase cut module
C4-12	DI5	Digital input n.5 (high pressure at discharging staus of circuit 1)
C4-13	DI4	Digital input n.4 (thermal protection of fan 2)
C4-14	DI3	Digital input n.3 (thermal protection of fan 1)
C4-15	DI2	Digital input n.2 (thermal protection of compressor 2)
C4-16	DI1	Digital input n.1 (thermal protection of compressor 1)

Connector 5: Connector for the remote keyboard and expansion of I/O		
Conn.	**Abbreviation**	**Description**
C5-1	12Vdc	Power supply of remote keyboard (12 V DC 50 mA max.; not protected against short circuits) (Note: the possible expansion has to be supplied locally)
C5-2	GND	Common
C5-3	DATA	Voltage serial

2.8 C-PRO EXP MICRO electrical connection

Here follows the layout of connection of C-PRO EXP MICRO expansion with tables concerning the inputs and outputs meaning.
Consult the hardware manual for the references about the connection cables' maximum lenght.



C-PRO EXP MICRO connections

Connector 1: Connection for relay outputs		
Conn.	**Abbreviation**	**Description**
C1-1	DO7	Normally open contact relay n.7
C1-2	COMMON DO7	Common relay n.7
C1-3	DO8	Normally open contact relay n.8
C1-4	COMMON DO8	C Common relay n.8
C1-5	DO9	Normally open contact relay n.9
C1-6	COMMON DO9	Common relay n.9
C1-7	DO10	Normally open contact relay n.10
C1-8	COMMON DO10, DO11	Common relay n.10, 11
C1-9	DO11	Normally open contact relay n.11
C1-11	DO12	Normally open contact relay n.12
C1-12	COMMON DO12	Common relay n.12

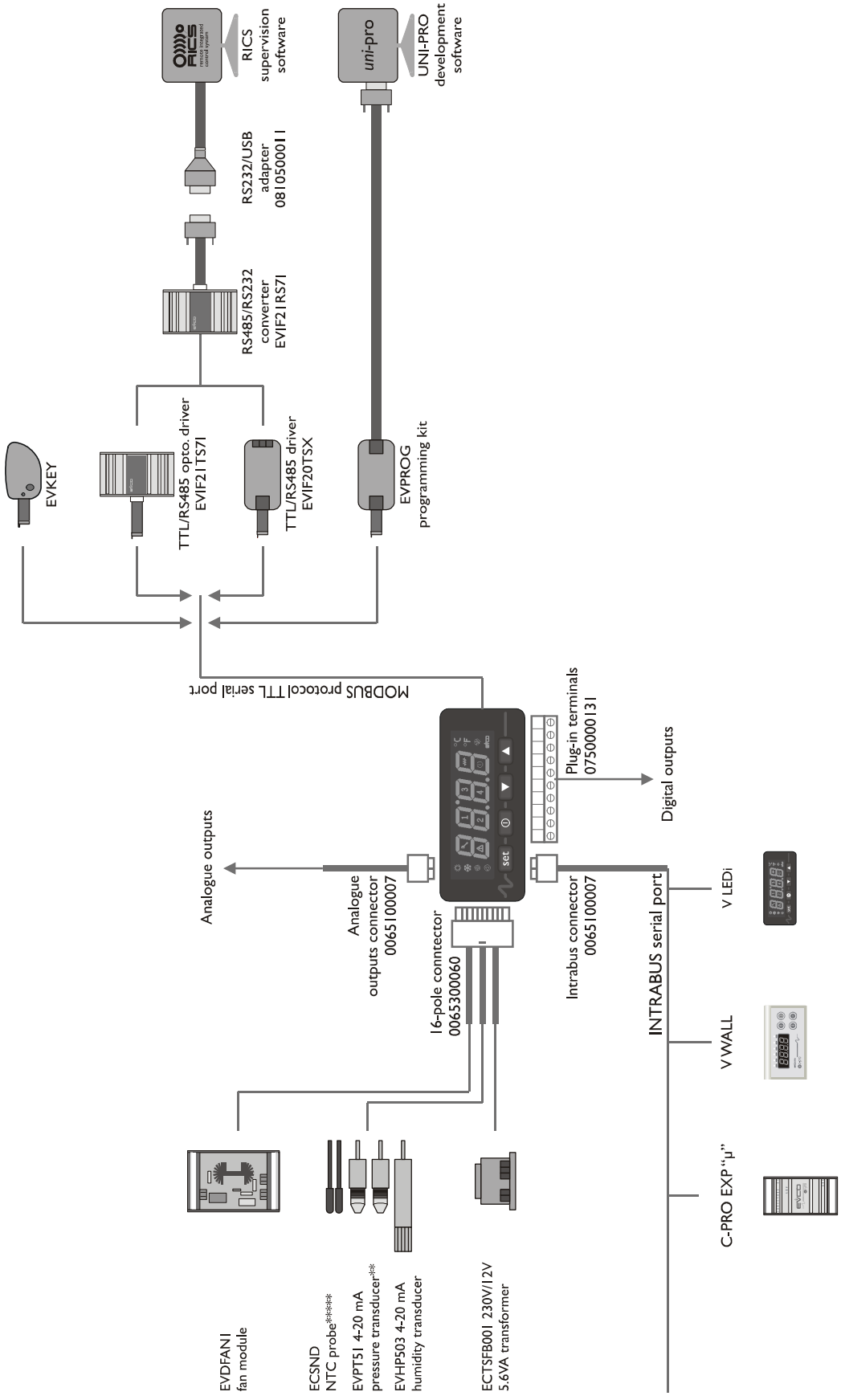
Connector 2: Connector for low tension signals		
Conn.	**Abbreviation**	**Description**
C2-1	12Vac (Power)	Power supply of the tool (12Vac/dc)
C2-2	Not connected	Not connected
C2-3	GND	Common analogue and digital inputs
C2-4	GND	Common analogue and digital inputs
C2-5	AI8	Analogue input n.8 (for 4-20 mA transductors)
C2-6	AI7	Analogue input n.7 (for 4-20 mA transductors)
C2-7	Not connected	Not connected
C2-8	Not connected	Not connected

C2-9	12Vac (Power)	Power supply of the tool (12Vac/dc)
C2-10	12Vdc	Transducers' power supply (50 mA max. not protected against short circuits)
C2-11	PWM	Pulses output for phase cut module
C2-12	DI10	Digital input n.10
C2-13	DI9	Digital input n.9
C2-14	DI8	Digital input n.8
C2-15	DI7	Digital input n.7
C2-16	DI6	Digital input n.6

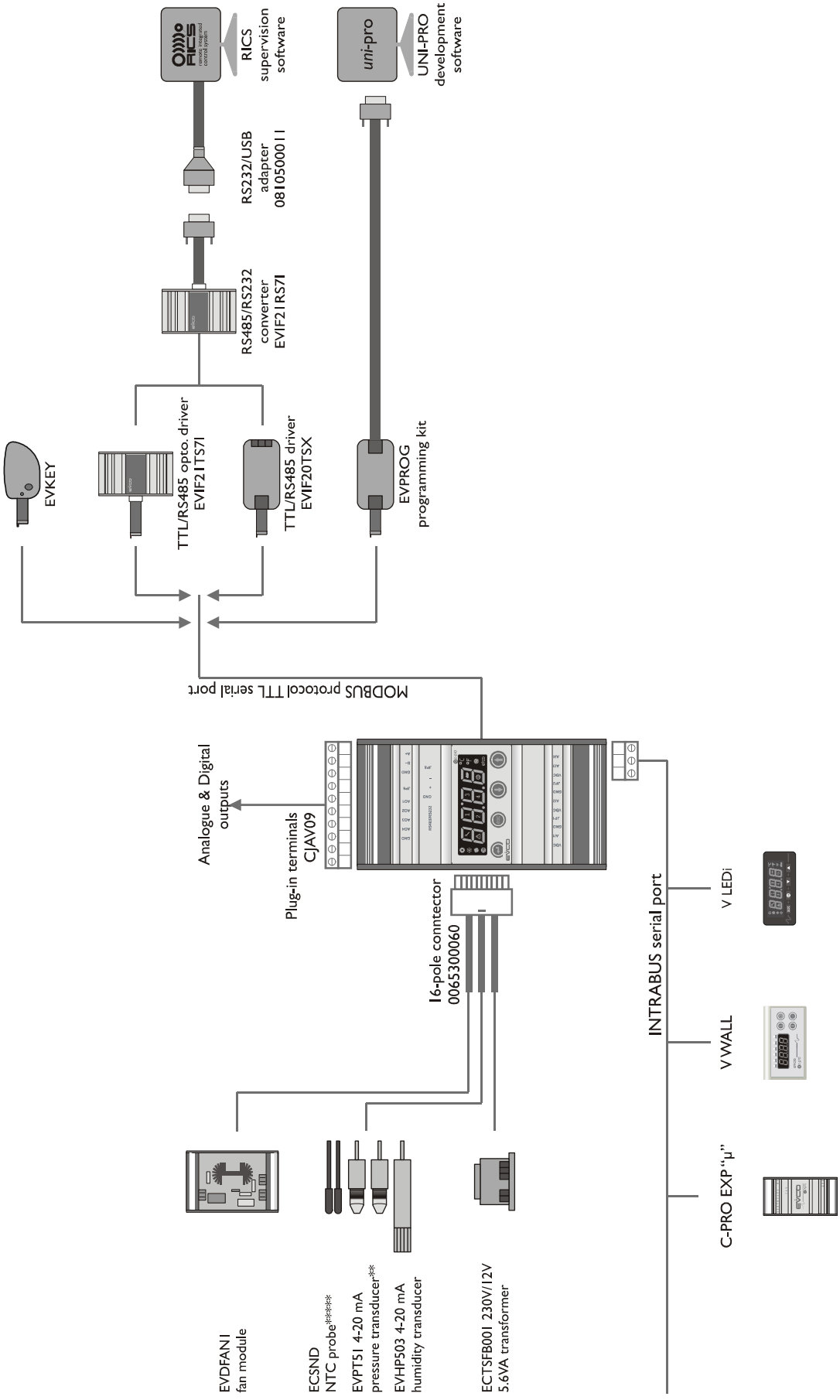
Connettore 3: Connector for control unit device		
Conn.	**Abbreviation**	**Description**
C3-1	12Vdc	Power supply
C3-2	GND	Common
C3-3	DATA	Voltage serial

3 Elements and fittings network

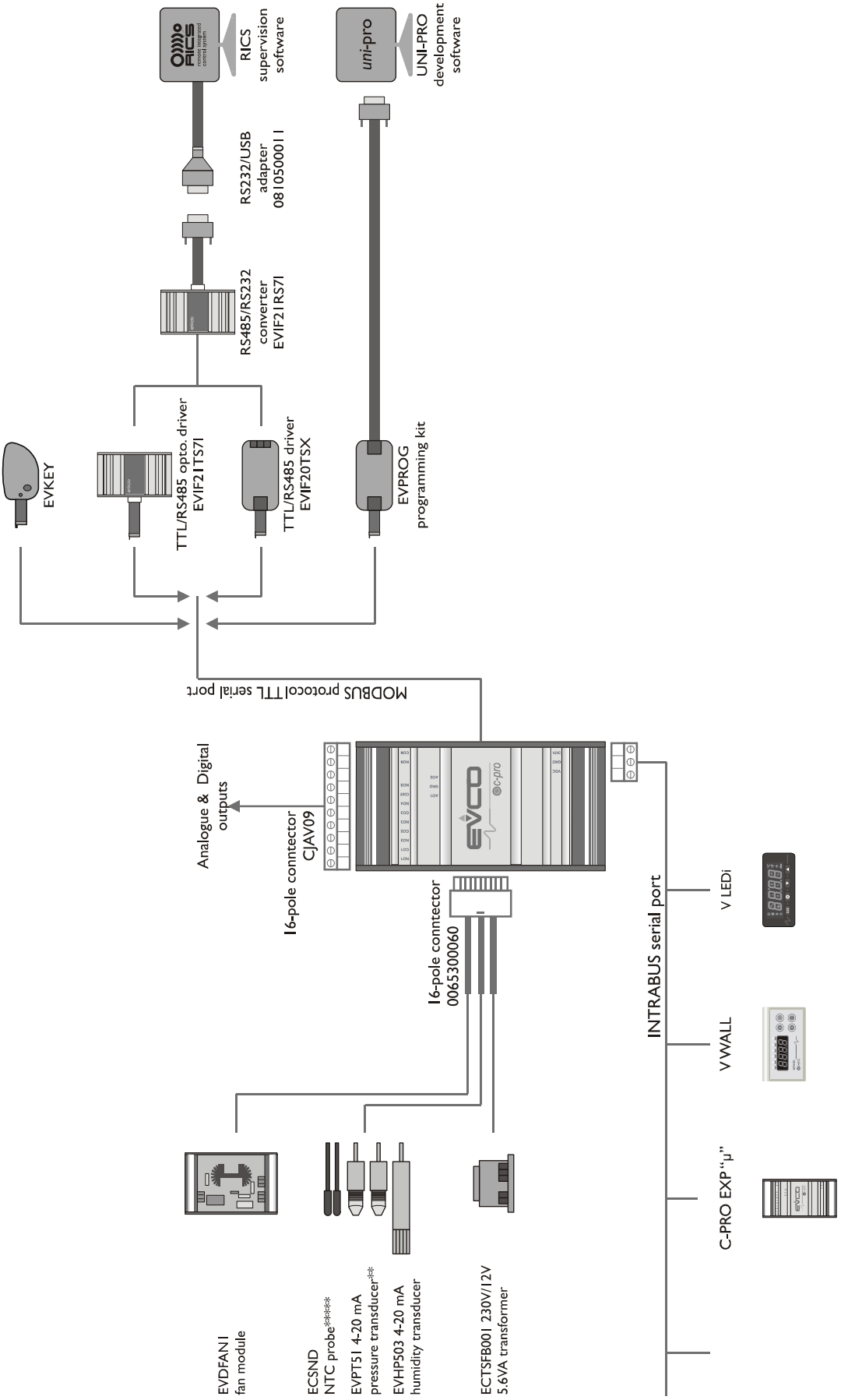
3.1 Example for C-PRO NANO RACK



3.2 Example for built-in versions of C-PRO MICRO RACK



3.3 Example for blind versions of C-PRO MICRO RACK



4 USER INTERFACE

4.1 Display and keyboard

There are two interface typologies for the application:

- a 4 display interface with 7 Built-In segments.
- a remote 4 display interface with 7 segments.

They both have 4 keys for navigation/editing of the pages and they are different in the display through icons (built-in) or in the display through led (remote) of some associated sites.

For both typologies there will be a description of the keys and of the leds used by the application, in fact, according to the interface used, it is possible to manage a different quantity of keys and leds.

Local Built-In interface

The built-In interface is integrated directly in the control unit used.

C-PRO NANO RACK

C-PRO MICRO RACK
Built-in version

In the keyboard there are 4 keys for pages navigation and values editing with the following meaning:

- UP and DOWN: parameters modification in editing; otherwise menu and parameters shift. If we are in alarms pages display mode, everytime we press it, it makes all the active alarms shift, otherwise it shows the “none” default word in order to signalize the absence of alarms.
  Keeping UP pressed when the machine is switched on it is possible to change the probe that we want to be default displayed according to the following chart:

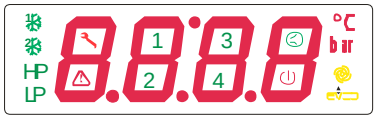
LP (o LP1)	Suction probe (circuit 1)
HP (o HP1)	Discharging probe (circuit 1)
LP2	Suction probe circuit 2
HP2	Discharging probe circuit 2

  If we wanto to change the display, we have to scroll this chart and confirm through SET/ENTER key: the label of the probe selected will flash for a couple of seconds.

- SET / ENTER: confirmation of the value in editing; otherwise entering of controls possibly associated to the text where there is the cursor. ENTER key, if it is kept pressed for about 2 seconds, allows to access the main menu. If we are in display of an alarm page mode, kept pressed for about 2 seconds, it allows the alarm reset.If we are in alarms pages display mode, everytime we press it, it makes all the active alarms shift, otherwise it shows the "none" default word in order to signalize the absence of alarms.

- STAND-BY / ESC: cancellation of the value in editing; otherwise default page request possibly associated to the current page.. ESC key, if kept pressed for about 2 seconds, allows to switch on/off the machine. If we press it in the main page, it allows to enter the list of all the active alarms.

The following icons are also used:



- Alarm icon : it identifies the possible presence of alarms. If it is switched on it means that there are some alarms, otherwise it remains switched off. The flashing light signalizes the presence of a new alarm that has not been viewed yet.

- Stand-by icon: associated to ESC key it identifies the machine status :
  Switched off: macchine switched on
  Switched on: machine switched off
  Flashing slowly: machine switched off by digital input
  Flashing fastly: machine switched off by supervisor

- Circuit 1 icon: it identifies the status of circuit 1 (TN):
  Switched off: circuit switched off or in stand-by mode
  Switched on: the circuit requires power
  Flashing slowly: circuit switched off by digital input
  Flashing fastly: circuit switched off by supervisor
- Circuit 2 icon: it identifies the status of circuit 2 (BT).
  Switched off: circuit switched off or in stand-by
  Switched on: : the circuit requires power
  Flashing slowly: circuit switched off by digital input
  Flashing fastly: circuit switchec off by supervisor

- LP icon: it is active when the value of suction probe is displayed. If it flashes with alarm icon switched on, it indicates the intervention of low pressure alarms on suction circuit or suction probe not-connected.

- HP icon: it is active when the value of discharging probe is displayed. If it flashes with alarm icon switched on, it indicates the intervention of high pressure alarms on discharging circuit or discharging probe not-connected.

- Fans icon: it identifies the fans' status. If it is switched on, it means that at least one fan is switched ton, otherwise it remains switched off. If it flashes it means that at least one fan is switched on in manual function status.

- Compressors icon: it identifies the compressors' status. If it is switched on, it means that at least one compressor is switched on, otherwise it remains switched off. If it flashes it means that at least one compressor is switched on in manual function status. This display is alternative to the one of 1,2,3,4 icons (parameter PH51).

- Maintenance icon: it identifies maintenance request. If it is switched on it means that at least one compressor or one fan has been manually switched on, if it flashes it means that at least one compressor or one fan has overcome the number of operation hours, otherwise it remains switched off.

- °C icon: it identifies the unit of measurement chosen. If it is switched on it indicates the temperature selection.

- Bar icon: it identifies the unit of measurement chosen. If it is switched on it indicates the pressure selection.

- 1,2,3,4 icons : they identify the status of the single compressors. If they are switched on, it means that the compressor is working, if they flash slowly it means that the compressor is in alarm status, if they flash quickly there is a timing signal in progress for the next switching on or off, Otherwise they remain switched off. These icons are enabled to parameter PH51 .

Remote terminals

V LEDi

Panel version

V WALL

Wall version

In the keyboard there are 4 keys for pages navigation and values editing with the following meaning:

- UP and DOWN: parameters modification in editing; otherwise shift of the cursor. UP key, if it is pressed for about 2 seconds during the display of an alarm, allows the alarm reset. If it is pressed it makes all the active alarms shift, otherwise it shows the “none” default word in order to signalize the absence of alarms.

- SET / ENTER: value confirmation in editing; otherwise entering of controls possibly associated to the text where there is the cursor. ENTER key, if it is pressed for about 2 seconds, allows to enter the main menu.

- STAND-BY / ESC: cancellation of the value in editing; otherwise default page request possibly associated to the current page.. ESC key, if kept pressed for about 2 seconds, allows to switch on/freeze the machine. If we press it in the main page, it allows to enter the list of all the active alarms.

The following leds are also used:
:

- L1 = summer led: it identifies the status of circuit 1 (TN).
  Switched off: circuit switched off or in stand-by
  Switched on: the circuit requires power
  Flashing slowly: circuit switched off by digital input
  Flashing fastly: circuit switched off by supervisor

- L3 = winter led: it identifies the status of circuit 2 (BT).
  Switched off: circuit switched off or in stand-by
  Switched on: : the circuit requires power
  Flashing slowly: circuit switched off by digital input
  Flashing fastly: circuit switched off by supervisor

- L4 = compressor leds: it identifies the status of the compressors. If it is switched on it means that at least one compressor is switched on, otherwidse it remains switched off. If it flashes it means that at least one compressor is switched on or in manual function.
- L6 = alarm led: it identifies the possible presence of alarms. If it is switched on, it means that there are alarms, otherwise it remains switched off. The flashing light signalizes the presence of a new alarm that has not been viewed yet.

4.2 Pages list

- In this paragraph there will be a presentation of the main pages and of the menus contained in the application manual. Like previously explained, the general menu is divided into four levels: user, maintenance operative, installer,constructor.

The structure of the menu is the following:

- General Menu
  - User menu (Level 1)
  - Maintenance Operative Menu (Level 2)
    - Maintenance operative menu operation field
    - Maintenance operative menu manual field
    - Maintenance operative menu input/output field
  - Installer Menu (Level 3)
    - Installer menu adjustments field
    - Installer menu compressor field
    - Installer menu fans field
    - Installer menu safeties field
    - Installer menu variety field
  - Constructor Menu (Level 4)
    - Constructor menu plant field (configuration wizard)
    - Constructor menu hardware field
    - Constructor menu parameters field

Password

To each menu it is associated a level that conditions the accessibility to the various menus.
To each level it is associated a password that allows to enter the various features in that particular menu, once the correct password is typed, the protected features will be able to be entered. Typing correctly a password, we have two effects:

- unblocking of the correlated level
- unblocking of the sublevels

Each level password can be modified from the same level or from superior levels. For example from constructor level all the passwords of lower levels will be able to be modified using the proper page.
The range of values that can be set by the password is -999 / 9999.
If no key is pressed after 4 minutes, the password expires and it is necessary to set it again.

Main page

The main screen is different if the machine status is switched on or off:

- if the machine is switched off, the word **OFF** is displayed, or **OFFd** if the cause of the switching off is due to supervision. If the cause of the switching off is the missing consent by digital input or **OFFS** if the cause of switching off is due to supervision
- if the machine is switched on, the value of suction pressure is displayed (or the label **Err** if the probe is damaged or not-connected)

With the machine switched on, through UP/DOWN keys, it is possible to see the values of the various probes.

Besides it is possible to see only the icons.
In case of two-circuit machine, pressing UP key for about two seconds, it is possible to change over to alternate display of suction pressures of the two circuits.

General Menu

The general menu does not have any level and it is the point for entering all the other system's menus.

USEr (*USER* Menu)
MAin (*MAINTENANCE OPERATIVE* Menu)
InSt *(INSTALLER* Menu)
CoSt (*CONSTRUCTOR* Menu)
StAt (Information on power required and supplied)

It is possible to see this menu from any point of the user interface, keeping ENTER key pressed for about 2 seconds. From this page it is possible to choose which menu go to through UP and DOWN keys and pressing ENTER key in order to confirm.
Pressing ESC key from this menu we come back to the initial page if the machine is switched on or to OFF page if the machine is switched off.

User Menu

The user menu is of level 1, it is then necessary to insert the user level or higher level password in order to see/modify the parameters in this branch.

Cir1 (*CIRCUIT 1* Menu)
Cir2 (*CIRCUIT 2* Menu)
PSd1 (USER Password)

It is possible to choose on which circuit we want to modify the setpoints and the offsets for the secondary setpoint.

Maintenance Operative Menu

The maintenance operative menu is of level 2 it is then necessary to insert the maintenance operative level or higher level password in order to see/modify the parameters in this branch.

Func (*OPERATION* Menu)
MAnu (*MANUAL* Menu)
CAL (CALIBRATION Menu)
I-O (*I/O STATUS Menu*)
PSd2 (MAINTENANCE OPERATIVE Menu)

In this menu it is possible to see the status of the various devices, inputs and outputs used by the application. Entering MAINTENANCE OPERATIVE menu it is possible to see/enable characteristics concerning compressors and fans' operation. For example the operation hours, the habilitation of the respective alarm and the maximum limit of acceptable hours.

Under *MANUAL* Menu it is possible to set the compressors and fans in manual/automatic mode and it is possible to force their outputs in order to test their functionality.
In *CALIBRATION* Menu it is possible to set the correction to bring to analogue inputs in order to counterbalance the offsets due to probes' wiring and positioning.
In *I/O STATUS* Menu it is possible to see directly the inputs and the physical outputs of the card.

Installer Menu

The installer menu is of level 3, it is then necessary to insert the installer level or builder password in order to see/modify the parameters in this branch.

reG1 (*CIRCUIT 1 SETTINGS* Menu)
reG2 (*CIRCUIT 2 SETTINGS M*enu)
CoMP (*COMPRESSORS* Menu)
FAn (*FANS* Menu)
SEcu (*SECURITIES* Menu)
Par (*VARIOUS PARAMETERS* Menu)
MAP (*PARAMETERS MAPS* Menu)
PSd3 (*INSTALLER* Password Menu)

In installer menu there are all the parameters concerning the configuration of all the functions (alarms, adjustments, logics, rotation type, …) of the machine.

In *ADJUSTMENTS* it is possible to adjust/see the parameters concerning the sideband and neutral zone thermoregulations for compressors and fans.

In *COMPRESSORS* and *FANS* menu it is possible to set the parameters concerning devices management:

- rotation
- logic of divisions
- times…

In *SECURITIES* menu there are all the parameters regarding the alarms and securities management for compressors and fans

- habilitations
- delays in signalling
- reinforcement type…

In *VARIOUS PARAMETERS* there are other general parameters regarding Modbus communication management, the bottom values for transducers and other habilitations that can be adjusted.

The *PARAMETERS MAPS* menu can be reached only from the machine in OFF status. In this menu it is possible to restore the factory parameters and to save or reload the parameters from a programming flashdrive key. After every operation it is necessary to switch off and switch on again the tool.

Constructor Menu

The constructor menu is of level 4, it is necessary then to insert the constructor level password in order to see/modify the parameters in this branch. Besides it can be reached only from the machine in OFF status.

ConF (*CONFIGURATION* Menu)
Hard (*HARDWARE INPUTS/OUTPUTS* Menu))
PSd4 (*CONSTRUCTOR* Password)

This menu contains all the machine's configuration parameters that decide its operation way and which functions habilitating or inhibiting according to the constructor's needs.

The *CONFIGURATION* menu contains a plant configuration "wizard" to set the number of circuits, the presence of compressors or fans controlled through inverter, the number of compressors and respective divisions, the number of fans and the number of safeties to be used.

HARDWARE menus contain all the parameters for adjustment of positions to which connecting the various devices.

- Compressors' digital outputs position
- Fans' digital outputs position
- Inverter position to be connected to analogue outputs
- Alarms' digital inputs/outputs position

Note: Adjusting the positions of alarm's various inputs, their functionality is set as well. In fact an alarm is enabled only if the parameter that identifies its physical position on the clamp is set and is different from zero. If we do not want to use an alarm, just let the corresponding parameter in zero value.
The same management is used for outputs management, for example of alarm relays: if the parameters are equal to zero, the controls of the relays are disabled.

Firmware and project versions

Press buttons UP and DOWN at the same time 2 s; later, press ENTER when the label **InFo** is shown.
The display will show in succession the information on the project and firmware versions of the controller, as follows:

Project number <-> Project version <-> Project revision <->
Firmware number <-> Firmware version <-> Firmware revision.

To scroll the information, use buttons UP and DOWN. To go back to the application pages, press button ESC.

4.3 Conditioned visibility

The conditioned visibility allows to hide configuration parameters and status according to particular configurations.
For example: if the kind of regulation is Neutral Zone, configuration parameters about Side Band will automatically be hidden.
Another example: if you have set the controller in order to control a mono-circuit compressor pack, all configuration parameters about the second circuit will automatically be hidden.
In other words, all not relevant configuration parameters will not be shown by the user interface.
This function make easier the set up, the maintenance and the use of the controller.
During the configuration, once chosen the kind of compressor pack, not relevant configuration parameters will not be accessible.
During the maintenance, you can test the device really present.

Last but not least, conditioned visibility allows to avoid showing plenty of parameters; the display will only show relevant configuration parameters.
In the configuration parameters table, one has signalled configuration parameters which visibility depends on this function and the condition setting the visibility.

5 Configuration parameters

Here are listed all the parameters managed by the application. For each parameter it is also provided a brief description of the range of values that can be admitted, of units of measurement, of default value in charge and of the menu where it is. Menus are structured according the following logic:

- UT : user menu
  - UT-C1: setpoint section circuit 1
  - UT-C2: setpoint section circuit 2
- MA: maintenance operative menu
  - MA-F: operation section
  - MA-M: manual section
  - MA-CA: calibration section
  - MA-IO: input/output section
- IS : installer menu
  - IS-R1: setting section circuit 1
  - IS-R2: setting section circuit 2
  - IS-C: compressor section
  - IS-F: fans section
  - IS-S: safeties section
  - IS-V: various parameters section
  - IS-D: default maps section
- CO : constructor menu
  - CO-W: plant configuration section (wizard)
  - CO-Hw: hardware configuration section

5.1 Parameters configuration list

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
SPC1	Set the setpoint value for the suction probe of the compressors (circuit 1)	1.0	PC12	PC13	Bar	UT-C1	
PUC1	Set the offset value by digital input for the use of compressors' secondary setpoint (circuit 1)	0.0	-20.0	20.0	Bar	UT-C1	
PUC4	Ses the offset value by supervision for the use of compressors' secondary setpoint (circuit 1)	0.0	-20.0	20.0	Bar	UT-C1	
SPF1	Set the setpoint value for the discharging probe of the fans (circuit 1)	15	PF12	PF13	Bar	UT-C1	
PUF1	It sets the offset value from digital input for the use of fans' secondary setpoint (circuit 1)	0.0	-20.0	20.0	Bar	UT-C1	
PUF4	Set the offset value by supervision for the use of fans' secondary setpoint (circuit 1)	0.0	-20.0	20.0	Bar	UT-C1	
SPC2	Set the setpoint value for the suction probe of the compressors (circuit 2)	1.0	PC32	PC33	Bar	UT-C2	Visibile if PG01 > 1
PUC2	Set the offset value by digital input for the use of compressors' secondary setpoint (circuit 2)	0.0	-20.0	20.0	Bar	UT-C2	Visibile if PG01 > 1
PUC5	Set the offset value by digital input for the use of compressors' secondary setpoint (circuit 2)	0.0	-20.0	20.0	Bar	UT-C2	Visibile if PG01 > 1
SPF2	Set the setpoint value for the discharging probe of the fans (circuit 2)	15	PF32	PF33	Bar	UT-C2	Visibile if PG01 > 1
PUF2	Set the offset value by digital input for the use of fans' secondary setpoint (circuit 2)	0.0	-20.0	20.0	Bar	UT-C2	Visibile if PG01 > 1
PUF5	Set the offset value by digital input for the use of fans' secondary setpoint (circuit 2)	0.0	-20.0	20.0	Bar	UT-C2	Visibile if PG01 > 1
PSd1	Modify the password on User level	0	-999	9999		UT	
PM00	Set in tens the maximum limit of compressors' operation hours. Beyond this limit the respective alarm will go off.	2000	0	9999	hours x 10	MA-F	
PM01 .. .. PM04	Represent in tens the compressors' operation hours. One for each compressor.	0	0	9999	hours x 10	MA-F	Visibility *1
PM40	Set in tens the maximum limit of fans' operation hours. Beyond this limit the respective alarm will go off.	2000	0	9999	hours x 10	MA-F	
PM41 .. .. PM44	Represent in tens the fans' operation hours. One for each fan	0	0	9999	hours x 10	MA-F	Visibility *2
PM91	Set the last date when plant's maintenance has been done	2006	2000	2064	n	MA-F	
PM92	Set the last date when plant's maintenance has been done	1	1	12	n	MA-F	
PM93	Set the last date when plant's maintenance has been done	1	1	31	n	MA-F	
PM11 .. .. PM14	Enable the compressor's manual/automatic operation: Manu: manual Auto: normal function One for each compressor	Auto	Auto (0)	Manu (1)	-	MA-M	Visibility *1
PM21 .. .. PM24	If it is in manual function, it sets the number of steps to be forced to the compressor One for each compressor	0	0	3	n	MA-M	Visibility *1
PM37	If it is in manual function, it forces the compressors' inverter value of circuit 1	0	0	100.0	%	MA-M	Visibile if PG12 = 1
PM38	If it is in manual operation, it forces the	0	0	100.0	%	MA-M	Visibile if

	compressors' inverter value of circuit 2						PG16 = 1 and PG01 > 1
PM51.. .. PM54	Enable the fan's manual/automatic function:(Manu: manual Auto: normal function One for each compressor.	Auto	Auto (0)	Manu (1)	-	MA-M	Visibility *2
PM61.. .. PM64	If it is in Manual function it forces the switch on/off of the fan (0: it switches fan off, 1 : it switches fan on) One for each fan	0	0	1	-	MA-M	Visibility *1
PM77	If it is in manual function, it forces the fans' inverter value of circuit 1	0	0	100.0	%	MA-M	Visibile if PG42 = 1
PM78	If it is in manual function, it forces the fans' inverter value of circuit 2	0	0	100.0	%	MA-M	Visibile if PG46 = 1 and PG01 > 1 and PG30 = 0
PM81	Calibration of circuit 1's suction probe of compressors	0.0	-10.0	10.0	Bar	MA-CA	
PM82	Calibration of circuit 2's suction probe of compressors	0.0	-10.0	10.0	Bar	MA-CA	Visibile if PG01 > 1
PM83	Calibration of circuit 1's suction probe of fans	0.0	-10.0	10.0	Bar	MA-CA	
PM84	Calibration of circuit 2's suction probe of fans	0.0	-10.0	10.0	Bar	MA-CA	Visibile if PG01>1 and PG30 = 0
PM85	Calibration of room temperature suction probe	0.0	-10.0	10.0	°C	MA-CA	
PM86	Calibration of external temperature suction probe	0.0	-10.0	10.0	°C	MA-CA	
PSd2	It modifies the password on Maintenance Operative level	0	-999	9999	n	MA-F	
PC12	Minimum value of suction setpoint of circuit 1 compressors	0.1	PH01	SPC1	Bar	IS-R1	
PC13	Maximum value of suction setpoint of circuit 1	2.5	SPC1	PH02	Bar	IS-R1	
PC14	Set the regulation type for management of circuit 1 compressors	Neutral zone (1)	Sideband (0)	Neutral zone(1)	-	IS-R1	
PC16	Integral time for sideband adjustment of circuit 1 compressors	600	0	999	Sec	IS-R1	Visibile if PC14 = 0
PC17	Proportional band for sideband adjustment of circuit 1 compressors	0.5	0	20.0	Bar	IS-R1	Visibile if PC14 = 0
PC18	Value of the Zone for neutral zone adjustment of circuit 1 compressors	0.5	0	20.0	Bar	IS-R1	Visibile if PC14 = 1
PC19	Differential for neutral zone operation of circuit 1 where the calculation of switching on/off time of a further step varies.	0.5	0	20.0	Bar	IS-R1	Visibile if PC14 = 1
PC20	Minimum time of insertion for the further step of circuit 1 compressors (Neutral zone)	20	0	PC21	Sec	IS-R1	Visibile if PC14 = 1
PC21	Maximum time of insertion for the further step of circuit 1 compressors (Neutral zone)	60	PC20	999	Sec	IS-R1	Visibile if PC14 = 1
PC22	Minimum time of release for the further step of circuit 1 compressors (Neural zone)	10	0	PC23	Sec	IS-R1	Visibile if PC14 = 1
PC23	Maximum time of release for the further step of circuit 1 compressors (Neural zone)	60	PC22	999	Sec	IS-R1	Visibile if PC14 = 1
PC24	Differential for inverter operation of circuit 1 compressors	0.5	0.0	20.0	Bar	IS-R1	Visibile if PG12 = 1
PC25	Offset ,in relation to the suction setpoint, for inverter operation of circuit 1 compressors	0.0	-20.0	20.0	Bar	IS-R1	Visibile if PG12 = 1
PC26	Minimum value of the inverter of circuit 1 compressors	0.0	0.0	100.0	%	IS-R1	Visibile if PG12 = 1

PC27	SpeedUp time for the inverter of circuit 1 compressors	0	0	999	Sec	IS-R1	Visibile if PG12 = 1
PC28	Time within which the inverter changes from minimum value to its maximum value for the neutral zone adjustments of circuit 1 compressors	10	0	999	Sec	IS-R1	Visibile if PG12 = 1
PF12	Minimum value of discharging setpoint of circuit 1 fans	1.0	PH03	SPF1	Bar	IS-R1	
PF13	Maximum value of discharging setpoint of circuit 1 fans	25.0	SPF1	PH04	Bar	IS-R1	
PF14	Set the regulation type for management of circuit 1 fans	Sideband(0)	Sideban d (0)	Neutal zone(1)	-	IS-R1	
PF16	Integral time of the sideband adjustment of circuit 1 fans	600	0	999	Sec	IS-R1	Visibile if PF14 = 0
PF17	Proportional band for the sideband adjustment of circuit 1 fans	0.5	0	20.0	Bar	IS-R1	Visibile if PF14 = 0
PF18	Value of the Zone for neutral zone adjustment of circuit 1 fans	1.0	0	20.0	Bar	IS-R1	Visibile if PF14 = 1
PF20	Insertion / release time for the next fan in neutral zone adjustment	10	0	999	Sec	IS-R1	Visibile if PF14 = 1
PF24	Differential for the inverter adjustment of circuit 1 fans	0.5	0.0	20.0	Bar	IS-R1	Visibile if PG42 = 1
PF25	Offset in relation to the suction setpoint for inverter adjustment of circuit 1 fans	0.0	-20.0	20.0	Bar	IS-R1	Visibile if PG42 = 1
PF26	Minimum value of the inverter of circuit 1 fans	0.0	0.0	100.0	%	IS-R1	Visibile if PG42 = 1
PF27	SpeedUp time for the inverter of circuit 1 fans	2	0	999	Sec	IS-R1	Visibile if PG42 = 1
PF28	Time within which the inverter changes from minimum value to its maximum value for the neutral zone adjustments of circuit 1 fans	10	0	999	Sec	IS-R1	Visibile if PG42 = 1
PC32	Minimum value of suction setpoint of circuit 2 fans	0.1	PH01	SPC2	Bar	IS-R2	Visible if PG01 > 1
PC33	Maximum value of suction setpoint of circuit 2 fans	2.5	SPC2	PH02	Bar	IS-R2	Visible if PG01 > 1
PC34	It sets the regulation type for management of circuit 2 compressors	Neutral zone (1)	Sideban de (0)	Neutral zone (1)	-	IS-R2	Visible if PG01 > 1
PC36	IT integral time of the sideband adjustment of circuit 2 compressors	600	0	999	Sec	IS-R2	Visible if PG01 > 1 and PC34 = 0
PC37	PB proportional band for the sideband adjustment of circuit 2 compressors	0.5	0	20.0	Bar	IS-R2	Visible if PG01 > 1 and PC34 = 0
PC38	Value of the Zone for neutral zone adjustment of circuit 2 compressors	0.5	0	20.0	Bar	IS-R2	Visible if PG01 > 1 and PC34 = 1
PC39	Differential for the neutral zone adjustment of circuit 2, within which the calculation for switching on/off of a further step varies	0.5	0	20.0	Bar	IS-R2	Visible if PG01 > 1 and PC34 = 1
PC40	Minimum time of insertion for the further step of circuit 2 compressors (Neutral zone)	20	0	999	Sec	IS-R2	Visible if PG01 > 1 and PC34 = 1
PC41	Maximum time of insertion for the further step of circuit 2 compressors (Neutral zone)	60	0	999	Sec	IS-R2	Visible if PG01 > 1 and PC34 = 1
PC42	Minimum time of release for the further	10	0	999	Sec	IS-R2	Visible if

	step of circuit 2 compressors (Neutral zone)						PG01 > 1 and PC34 = 1
PC43	Maximum time of release for the further step of circuit 2 compressors (Neutral zone)	60	0	999	Sec	IS-R2	Visible if PG01 > 1 and PC34 = 1
PC44	Differential for the inverter adjustment of circuit 2 compressors	0.5	0.0	20.0	Bar	IS-R2	Visible if PG01 > 1 and PG16 = 1
PC45	Offset in relation to the suction setpoint for inverter adjustment of circuit 2 compressors	0.0	-20.0	20.0	Bar	IS-R2	Visible if PG01 > 1 and PG16 = 1
PC46	Minimum value of the inverter of circuit 2 compressors	0.0	0.0	100.0	%	IS-R2	Visible if PG01 > 1 and PG16 = 1
PC47	SpeedUp time for the inverter of circuit 2 compressors	0	0	999	Sec	IS-R2	Visible if PG01 > 1 and PG16 = 1
PC48	Time within which the inverter changes from minimum value to its maximum value for the neutral zone adjustments of circuit 2 compressors	10	0	999	Sec	IS-R2	Visible if PG01 > 1 and PG16 = 1
PF32	Minimum value of discharging setpoint of circuit 2 fans	1.0	PH03	SPF2	Bar	IS-R2	Visible if PG01 > 1 and PG30 = 0
PF33	Maximum value of discharging setpoint of circuit 2 fans	25.0	SPF2	PH04	Bar	IS-R2	Visible if PG01 > 1 and PG30 = 0
PF34	Set the adjustment type for management of circuit 2 fans	Sideband (0)	Sideband (0)	Neutral zone (1)	-	IS-R2	Visible if PG01 > 1 and PG30 = 0
PF36	IT integral time of the sideband adjustment of circuit 2 fans	600	0	999	Sec	IS-R2	Visible if PG01 > 1 and PG30 = 0 and PF34 = 0
PF37	PB proportional band for the sideband adjustment of circuit 2 fans	0.5	0	20.0	Bar	IS-R2	Visible if PG01 > 1 and PG30 = 0 and PF34 = 0
PF38	Value of the Zone for neutral zone adjustment of circuit 2 fans	1.0	0	20.0	Bar	IS-R2	Visible if PG01 > 1 and PG30 = 0 and PF34 = 1
PF40	Insertion / release time for the next fan in neutral zone adjustment of circuit 2	10	0	999	Sec	IS-R2	Visible if PG01 > 1 and PG30 = 0 and PF34 = 1

PF44	Differential for the inverter adjustment of circuit 2 fans	0.5	0.0	20.0	Bar	IS-R2	Visible if PG01 > 1 and PG46 = 1
PF45	Offset in relation to the suction setpoint for inverter adjustment of circuit 2 fans	0.0	-20.0	20.0	Bar	IS-R2	Visible if PG01 > 1 and PG46 = 1
PF46	Minimum value of the inverter of circuit 2 fans	0.0	0.0	100.0	%	IS-R2	Visible if PG01 > 1 and PG46 = 1
PF47	SpeedUp time for the inverter of circuit 2 fans	2	0	999	Sec	IS-R2	Visible if PG01 > 1 and PG46 = 1
PF48	Time within which the inverter changes from minimum value to its maximum value for the neutral zone adjustments of circuit 2 fans	10	0	999	Sec	IS-R2	Visible if PG01 > 1 and PG46 = 1
PC01	Type of rotation used for compressors management: 0: FIFO 1: LIFO 2: FIFO + hours of operation 3: LIFO + hours of operation	0 = FIFO	0	3	n	IS-C	
PC02	Set the trigger way of the throttlings: 0: CppCpp / ppCppC 1: CCpppp / ppppCC 2: CppCpp / ppppCC 3: CCpppp / ppCppC	0 = Cpp_Cpp	0	3	-	IS-C	
PC03	Set the logic of relays used for the throttlings of the compressors: 0: NC (norm. close). P. es Copeland 1: NO (norm.open). P. es. Feeders	1=NO	0	1	-	IS-C	
PC04	Minimum time during which the compressor must remain switched on even if the switching off is required	10	0	999	Sec	IS-C	
PC05	Minimum time during which the compressor must remain switched off even if the switching on is required	120	0	999	Sec	IS-C	
PC06	Minimum time that must elapse between two switching on of the same compressor	360	0	999	Sec	IS-C	
PC07	Minimum time that must elapse between the switching on of two different compressors	20	0	999	Sec	IS-C	
PC08	Minimum time that must elapse between the switching off of two different compressors	20	0	999	Sec	IS-C	
PC09	Minimum time between the switching on of the throttlings	20	0	999	Sec	IS-C	
PC10	Minimum time between the switching off of the throttlings	20	0	999	Sec	IS-C	
PC11	Number of compressors that will be forced if there is an alarm over the suction probe of circuit 1	1	0	PG11	n	IS-C	
PC31	Number of compressors that will be forced if there is an alarm over the suction probe of circuit 2	1	0	PG15	n	IS-C	Visible if PG01 > 1
PC69	Timeout of compressors'starting from reset mode	0	0	999	sec	IS-C	
PC70	Enable compressors' throttlings at high pressures 0: NO 1: YES	0 (NO)	0	1	-	IS-C	

PC71	Set compressors' throttlings pressure (circuit 1)	22.0	PH03	PH04	Bar	IS-C	
PC72	Set compressors' throttlings pressure (circuit 2)	22.0	PH03	PH04	Bar	IS-C	Visible if PG01 > 1
PC74	Differential of compressors' throttlings pressure	4.0	0.1	10.0	Bar	IS-C	
PC75	Minimum time for compressors' throttlings maintenance	2	0	999	Min	IS-C	
PC76	Throttling percentage value	50	0	100	%	IS-C	
PC78	Compressors' sideband steps overlapping factor (sideband)	0	0	100	%	IS-C	
PC81	Power supplied by compressor 1	0	0	1000	kW	IS-C	Visibile if PG03 = 1 and visibility *1
PC82	Power supplied by compressor 2	0	0	1000	kW	IS-C	Visibile if PG03 = 1 and visibility *1
PC83	Power supplied by compressor 3	0	0	1000	kW	IS-C	Visibile if PG03 = 1 and visibility *1
PC84	Power supplied by compressor 4	0	0	1000	kW	IS-C	Visibile if PG03 = 1 and visibility *1
PF01	Rotation used for fans management: 0: FIFO 1: LIFO 2: FIFO + hours of operation 3: LIFO + hours of operation	0 = FIFO	0	3	n	IS-F	
PF02	Set if fans regulation happens only if at least one compressor is switched on on	0 = No	0	1	-	IS-F	
PF07	Minimum time that must elapse between the switching on of two different fans	2	0	999	Sec	IS-F	
PF08	Minimum time that must elapse between the switching off of two different fans	2	0	999	Sec	IS-F	
PF11	Number of fans that will be forced if there is an alarm over the discharging probe of circuit 1 .	1	0	PG41	N	IS-F	
PF31	Number of fans that will be forced if there is an alarm over the discharging probe of circuit 2.	1	0	PG45	N	IS-F	Visible if PG01 > 1 and PG30 = 0
PF71	Enable floating condensation	0 = No	0	1	-	IS-F	
PF72	Delta of condensation temperature	0.0	-20.0	20.0	°C	IS-F	
PF73	Minimum limit of consensation setpoint	30.0	10.0	PF74	°C	IS-F	
PF74	Maximum limit of consensation setpoint	40.0	PF73	45.0	°C	IS-F	
PF78	Fans' sideband steps overlapping factor (sideband)	0	0	100	%	IS-F	
PH01	Set the minimum value of steps-bottom for the suction probe	-0.5	-10.0	PH02	Bar	IS-V	
PH02	Set the maximum value of steps-bottom for the suction probe	7.0	PH01	45.0	Bar	IS-V	
PH03	Set the maximum value of steps-bottom for the discharging probe	0.0	-10.0	PH04	Bar	IS-V	
PH04	Set the maximum value of steps-bottom for the discharging probe	30.0	PH03	45.0	Bar	IS-V	

PH05	Enable the machine switching on/off pressing ESC/Stand- by key	Si	No (0)	Si (1)	-	IS-V	
PH07	Enable the machine switching on/off from digital output	No	No (0)	Si (1)	-	IS-V	
PH08	Enable the single circuit's switching on/off from respective digital output	No	No (0)	Si (1)	-	IS-V	
PH09	Enable the machine switching on/off from supervisor	No	No (0)	Si (1)	-	IS-V	
PH10	Enable the single circuits' switching on/off by supervisor	No	No (0)	Si (1)	-	IS-V	
PH11	Modbus address of the card	1	1	247	n	IS-V	
PH12	Baud Rate of communication for the card (1=2400, 2=4800, 3=9600, 4=19200)	3	1	4	n	IS-V	
PH13	ModBu parity (0=none, 1=Odd, 2=Even)	2	0	2	n	IS-V	
PH14	StopBit ModBus (0=1bit, 1=2bit)	0	0	1	n	IS-V	
PH15	Restore the default of parametes' factory	No	No (0)	Si (1)	-	IS-D (MAP)	Wait that the value 0 is reread at the end of restoring
PH17	Set the logic of digital inputs used for alarms management: 0: Normally open NO 1: Normally close NC	NC	NO (0)	NC (1)	-	IS-V	
PH18	Set the logic of relays used for alarms 0: Normally openNO 1: Normally close NC	NO	NO (0)	NC (1)	-	IS-V	
PH19	Set the logic of digital inputs used for the management of the following functions: - OnOff Remote global - OnOff Remote circuits - secondary setpoint of compressors -secondary setpoint of fans 0: Normally open NO 1: Normally closet NC	NO	NO (0)	NC (1)	-	IS-V	
PH20	Compressors inverter consent digital output command logic =0: Energized contact-100% consent enabled =1: Energized contact-100% consent disabled	0	0	1	-	IS-V	
PH21	Fans inverter consent digital output command logic =0: Energized contact-100% consent enabled =1: Energized contact-100% consent disabled	0	0	1	-	IS-V	
PH23	Set the habilitation of the probe for detection of room temperature	0 = No	0	1	-	IS-V	
PH24	Set the habilitation of the probe for detection of external temperature	0 = No	0	1	-	IS-V	
PH25	Set the habilitation of secondary setpoint function by digital input	0 = No	0	1	-	IS-V	
PH26	Set the habilitation of secondary setpoint function by supervisor	0 = No	0	1	-	IS-V	
PH31	Set the type of coolant used (temperature-pressure conversion) 0: No coolant 1: R22 2: R134a 3: R404A 4: R407C	3 R404A	0	6	-	IS-V	

	5: R410A 6: R507						
PH32	Set the unit of measurement of temperature: 0: °Celsius 1: °Fahrenheit	0 (°C)	0	1	-	IS-V	
PH33	Set the unit of measurement of pressure: 0: Bar 1: psi	0 (Bar)	0	1	-	IS-V	
PH35	Enable load losses compensation on suction line (neutral zone) 0: NO 1: YES	0 (NO)	0	1	-	IS-V	
PH36	Load losses compensation factor	0.2	0.1	5.0	Bar	IS-V	
PH40	Set the display in pressure or temperature 0: Pressure 1: Temperature	0	0	1	-	IS-V	
PH43	Set the type of A/3 universal analogue input 2: NTC 3: 0-20mA 4: 4-20mA 5: reserved	4 4-20mA	2	5	-	IS-V	
PH44	Set the type of A/4 universal analogue 2: NTC 3: 0-20mA 4: 4-20mA 5: reserved	4 4-20mA	2	5	-	IS-V	
PH50	Set the display with the icons only 0: NO 1: YES	1 (SI)	0	1	-	IS-V	
PH51	Set the display of numeric icons 0: NO 1: YES	1 (SI)	0	1	-	IS-V	
PH52	Set the display of Evco icon 0: NO 1: YES	1 (SI)	0	1	-	IS-V	
PA01	Enable the alarm of compressors' operation hours	No	No (0)	Si (1)	-	IS-S	
PA02	Enable the alarm of fans' operation hours	No	No (0)	Si (1)	-	IS-S	
PA03	Set the activation delay of high pressure suction alarms	1	0	999	Sec	IS-S	
PA04	Set the detection delay of expansion alarm	5	0	999	Sec	IS-S	
PA05	Set the activation delay of liquid level alarm	90	0	999	Sec	IS-S	
PA06	Set the detection delay of the alarms over suction and discharging probes	5	0	240	Sec	IS-S	
PA07	Set the activation delay of low pressure discharging alarm	30	0	999	Sec	IS-S	
PA08	Set the activation delay of low pressure suction alarms	30	0	999	Sec	IS-S	
PA09	Set the activation delay of compressor's thermal alarm	0	0	999	Sec	IS-S	
PA10	Set the activation delay of common diffrerential oil alarm and for compressors	10	0	999	Sec	IS-S	
PA11	Set the rearmament type for high pressure discharging alarm	M	A (0)	M (1)	-	IS-S	
PA12	Set the rearmament type for compressor's thermal alarm	M	A (0)	M (1)	-	IS-S	
PA14	Set the rearmament type for compressor's differential oil	M	A (0)	M (1)	-	IS-S	
PA15	Set the setpoint for low pressure alarm over suction probe of circuit 1	0.5	PH01	PA17	Bar	IS-S	
PA16	Set the differntial for low pressure alarm over suction probe of circuit 1	0.5	0.0	20.0	Bar	IS-S	

PA17	Set the setpoint for high pressure alarm over suction probe of circuit 1	4.0	PA15	PH02	Bar	IS-S	
PA18	Set the differntial for high pressure alarm over suction probe of circuit 1	0.5	0.0	20.0	Bar	IS-S	
PA19	Set the setpoint for low pressure alarm over discharging probe of circuit 1	2.0	PH03	PA21	Bar	IS-S	
PA20	Set the differntial for low pressure alarm over discharging probe of circuit 1	0.5	0.0	20.0	Bar	IS-S	
PA21	Set the setpoint for high pressure alarm over discharging probe of circuit 1	20.0	PA19	PH04	Bar	IS-S	
PA22	Set the differntial for high pressure alarm over discharging probe of circuit 1	1.0	0.0	20.0	Bar	IS-S	
PA23	Set the rearmament type for fan's thermal alarm	M	A (0)	M (1)	-	IS-S	
PA25	Set the setpoint for low pressure alarm over suction probe of circuit 2	0.5	PH01	PA27	Bar	IS-S	Visible if PG01 > 1
PA26	Set the differntial for low pressure alarm over suction probe of circuit 2	0.5	0.0	20.0	Bar	IS-S	Visible if PG01 > 1
PA27	Set the setpoint for high pressure alarm over suction probe of circuit 2	4.0	PA25	PH02	Bar	IS-S	Visible if PG01 > 1
PA28	Set the differntial for high pressure alarm over suction probe of circuit 2	0.5	0.0	20.0	Bar	IS-S	Visible if PG01 > 1
PA29	Set the setpoint for low pressure alarm over discharging probe of circuit 2	2.0	PH03	PA31	Bar	IS-S	Visible if PG01 > 1 and PG30 = 0
PA30	Set the differntial for high pressure alarm over discharging probe of circuit 2	0.5	0.0	20.0	Bar	IS-S	Visible if PG01 > 1 and PG30 = 0
PA31	Set the setpoint for high pressure alarm over discharging probe of circuit 2	20.0	PA29	PH04	Bar	IS-S	Visible if PG01 > 1 and PG30 = 0
PA32	Set the differntial for high pressure alarm over discharging probe of circuit 2	1.0	0.0	20.0	Bar	IS-S	Visible if PG01 > 1 and PG30 = 0
PSd3	Set the password of Installer level	0	-999	9999	n	IS-V	
PG01	Set the number of circuits of the machine	1	1	2	n	CO-W	
PG02	Enable the presence of the expansion	0 = No	No (0)	Si (1)	-	CO-W	
PG03	Enable the management of different compressors with different power	0 = No	No (0)	Si (1)	-	CO-W	
PG04	Set the number of throttlings for each compressor	0	0	2	n	CO-W	
PG05	Set the thermal security of the compressors	1 = Si	0	1	-	CO-W	
PG11	Set the number of compressors of circuit 1	2	0	4	n	CO-W	
PG12	Enable the inverter of compressors of circuit 1	0 = No	No (0)	Si (1)	-	CO-W	
PG15	Set the number of compressors of circuit 2	0	0	4	n	CO-W	Visible if PG01 > 1
PG16	Enable the inverter of compressors of circuit 2	0 = No	No (0)	Si (1)	-	CO-W	Visible if PG01 > 1
PG30	Set the singular condensation for the group of the fans	0 = No	0	1	-	CO-W	
PG32	Enable the thermal security of the fans	1 = Si	0	1	-	CO-W	
PG41	Set the number of fans of circuit 1	2	0	4	n	CO-W	
PG42	Enable the fans' inverter of circuit 1	0 = No	No (0)	Si (1)	-	CO-W	
PG45	Set the number of fans of circuit 2	0	0	4	n	CO-W	Visible if PG01 > 1 and PG30 = 0

PG46	Enable the inverter of fans of circuit 2	0 = No	No (0)	Si (1)	-	CO-W	Visible if PG01 > 1 and PG30 = 0
HC01	Set the digital output position for compressor 1 Or Set the inverter compressor consent position for circuit 1 (if circuit 1 inverter is enabled)	1	0	14	n	CO-Hw	(13) PWM1 Consent (14) PWM2 Consent Visibility *1
HC02	Set the digital output position for compressor 2 Or Set the inverter compressor consent position for circuit 2 (if circuit 2 inverter is enabled)	2	0	6 (12)	n	CO-Hw	
HC03	Set the digital output position for compressor 3 Or Set the inverter compressor consent position for circuit 3 (if circuit 3 inverter is enabled)	0	0	6 (12)	n	CO-Hw	
HC04	Set the digital output position for compressor 4 Or Set the inverter compressor consent position for circuit 4 (if circuit 4 inverter is enabled)	0	0	6 (12)	n	CO-Hw	
HC11	Set the digital output position for the throttling 1 of compr.1	0	0	6 (12)	n	CO-Hw	(12 if expansion is enabled); visibility *1
HC12	Set the digital output position for the throttling 1 of compr. 2	0	0	6 (12)	n	CO-Hw	(12 if expansion is enabled); visibility *1
HC13	Set the digital output position for the throttling 1 of compr.3	0	0	6 (12)	n	CO-Hw	(12 if expansion is enabled); visibility *1
HC14	Set the digital output position for the throttling 1 of compr.4	0	0	6 (12)	n	CO-Hw	(12 if expansion is enabled); visibility *1
HC21	Set the digital output position for the throttling 2 of compr.1	0	0	6 (12)	n	CO-Hw	(12 if expansion is enabled); visibility *1
HC22	Set the digital output position for the throttling 2 of compr.2	0	0	6 (12)	n	CO-Hw	(12 if expansion enabled); visibility *1
HC23	Set the digital output position for the throttling 2 of compr.3	0	0	6 (12)	n	CO-Hw	(12 if expansion is enabled);

							visibility *1
HC24	Set the digital output position for the throttling 2 of compr.4	0	0	6 (12)	n	CO-Hw	(12 if expansion is enabled); visibility *1
HC31	Set the analogue output position that is associated to the inverter of circuit 1's compressors	2	0	3	n	CO-Hw	The 2nd and 3rd outputs need AO expansion; visible if PG12 = 1
HC32	Set the analogue output position that is associated to the inverter of circuit 2''s compressors	0	0	3	n	CO-Hw	The 2nd and 3rd outputs need AO expansion; visible if PG01 > 1 and PG16 = 1
HF01	Set the digital output position for fan 1 Or Set the inverter fan consent position for circuit 1 (if circuit 1 inverter is enabled)	3	0	6 (12)	n	CO-Hw	(13) PWM1 Consent (14) PWM2 Consent Visibility *2
HF02	Set the digital output position for fan 2 Or Set the inverter fan consent position for circuit 2 (if circuit 2 inverter is enabled)	4	0	6 (12)	n	CO-Hw	
HF03	Set the digital output position for fan 3 Or Set the inverter fan consent position for circuit 3 (if circuit 3 inverter is enabled)	0	0	6 (12)	n	CO-Hw	
HF04	Set the digital output position for fan 4 Or Set the inverter fan consent position for circuit 4 (if circuit 4 inverter is enabled)	0	0	6 (12)	n	CO-Hw	
HF31	Set the position of the analogue output associated with fan inverter of circuit 1	1	0	3	n	CO-Hw	The 2nd and 3rd outputs need AO expansion; visible if PG42 = 1
HF32	Set the position of the analogue output associated with fan inverter of circuit 2	0	0	3	n	CO-Hw	The 2nd and 3rd outputs need AO expansion; visible if PG01 > 1 and PG42 = 1 and PG30 = 0
HA01	Set the positions of the digital output associated with the global alarm signal	6	0	6 (12)	n	CO-Hw	(12 if expansion is enabled)
HA11	Set the position of the digital output	0	0	6 (12)	n	CO-Hw	(12 if expansion

	associated with the alarm signals of circuit 1						is enabled)
HA21	Set the position of the digital output associated with the alarm signals of circuit 1	0	0	6 (12)	n	CO-Hw	Visibile if PG01 > 1
Hd01	Set the position of the digital input for the Global On/Off Switch	0	0	5(10)	n	CO-Hw	(10 if expansion is enabled)
Hd02	Set the position of the digital input relative to the secondary setpoint for the management of the compressors	0	0	5(10)	n	CO-Hw	(10 if expansion is enabled)
Hd03	Set the position of the digital input relative to the secondary setpoint for the management of the fans	0	0	5(10)	n	CO-Hw	(10 if expansion is enabled)
Hd11	Set the position of the digital input for the On/Off Switch for Circuit 1	0	0	5(10)	n	CO-Hw	(10 if expansion is enabled))
Hd12	Set the position of the digital input associated with the liquid level alarm of circuit 1	0	0	5(10)	n	CO-Hw	(10 if expansion is enabled)
Hd13	Set the position of the digital input associated with the low pressure alarm on the suction pressure regulator of circuit 1	0	0	5(10)	n	CO-Hw	(10 if expansion is enabled)
Hd14	Set the position of the digital input associated with the high pressure alarm on the discharge pressure regulator of circuit 1	5	0	5(10)	n	CO-Hw	(10 if expansion is enabled)
Hd15	Set the position of the digital input associated with the oil differential alarm for compressors of circuit 1	0	0	5(10)	n	CO-Hw	(10 if expansion is enabled)
Hd16	Set the position of the digital input associated with the common thermal alarm for the fans of circuit 1	0	0	5(10)	n	CO-Hw	(10 if expansion is enabled)
Hd21	Set the position of the digital input for the On/Off Switch for Circuit 2	0	0	5(10)	n	CO-Hw	(10 if expansion is enabled); visibile if PG01 > 1
Hd22	Set the position of the digital input associated with the liquid level alarm of circuit 2	0	0	5(10)	n	CO-Hw	(10 if expansion is enabled); visibile if PG01 > 1
Hd23	Set the position of the digital input associated with the low pressure alarm on the suction pressure regulator of circuit 2	0	0	5(10)	n	CO-Hw	(10 if expansion is enabled);

							visibile if PG01 > 1
Hd24	Set the position of the digital input associated with the high pressure alarm on the discharge pressure regulator of circuit 2	0	0	5(10)	n	CO-Hw	(10 if expansion is enabled); visibile if PG01 > 1
Hd25	Set the position of the digital input associated with the oil differential alarm for compressors alarm of the circuit 2	0	0	5(10)	n	CO-Hw	(10 if expansion is enabled); visibile if PG01 > 1
Hd26	Set the position of the digital input associated with the common thermal alarm for the fans of circuit 2	0	0	5(10)	n	CO-Hw	(10 if expansion is enabled); visibile if PG01 > 1
Hd41	Set the position of the digital input associated with the thermal alarm for compressor 1	1	0	5(10)	n	CO-Hw	(10 if expansion is enabled); visibility *1
Hd42	Set the position of the digital input associated with the thermal alarm for compressor 2	2	0	5(10)	n	CO-Hw	(10 if expansion is enabled); visibility *1
Hd43	Set the position of the digital input associated with the thermal alarm for compressor 3	0	0	5(10)	n	CO-Hw	(10 if expansion is enabled); visibility *1
Hd44	Set the position of the digital input associated with the thermal alarm for compressor 4	0	0	5(10)	n	CO-Hw	(10 if expansion is enabled); visibility *1
Hd81	Set the position of the digital inputs associated with the thermal alarm for fan 1	3	0	5(10)	n	CO-Hw	(10 if expansion is enabled); visibility *2
Hd82	Set the position of the digital inputs associated with the thermal alarm for fan 2	4	0	5(10)	n	CO-Hw	(10 if expansion is enabled); visibility *2
Hd83	Set the position of the digital inputs associated with the thermal alarm for fan 3	0	0	5(10)	n	CO-Hw	(10 if expansion is enabled); visibility *2
Hd84		0	0	5(10)	n	CO-Hw	(10 if

	Set the position of the digital inputs associated with the thermal alarm for fan 4						expansion is enabled); visibility *2
PSd4	Constructor password	0	-999	9999	n	CO-Pa	

Note. Once the parameters of the machine have been configured and at each modification of the configuration parameters, it is advised to shut off and restart the system to allow the motherboard to correctly configure itself..

(*1) Conditioned visibility compressor.
Parameter visible if the compressor has been configured; in other words: if the sum of the parameters indicating the number of compressors for each circuit (enabled) PG11, PG15 is bigger or equal to the compressor indicated.

(*2) Conditioned visibility fan.
Parameter visible if the fan has been configured; in other words: if the sum of the parameters indicating the number of fans for each circuit (enabled) PG41, PG45 is bigger or equal to the fan indicated.

6 ADJUSTMENTS

6.1 Configuration of the machine

Using a wizard (Constructor menu), it is possible to configure the machine with help. The first choice involves the number of circuits (1 or 2) through the parameter PG01; in the case of a bi-circuit, the choice of condensation type, either singular or separate (PG30), becomes important as does the presence or absence of expansion (PG02). These 3 parameters define the type of machine and the hardware that supports it, as is shown in the following table.

Machine type	**Mono-circuit (predefined)**	**Bi-Circuit with singular condensation**		**Bi-Circuit with separate condensation**	
Presence of expansion	NO	NO	YES	NO	YES
AI1	Environment (Room) temperature	* Discharge temperature	Environment (Room) temperature	* Discharge temperature C1	Environment (Room) temperature
AI2	External temperature	External temperature	External temperature	* Discharge temperature C2	External temperature
AI3	Suction pressure	Suction pressure C1	Suction pressure C1	Suction pressure C1	Suction pressure C1
AI4	Discharge pressure	Suction pressure C2	Suction pressure C2	Suction pressure C2	Suction pressure C2
AI7	-	-	Discharge pressure	-	Discharge pressure C1
AI8	-	-	-		Discharge pressure C2
Number of digital outputs	6	6	12	6	12
Number of digital inputs	5	5	10	5	10

(*) Note: Temperature is transformed into pressure by selecting the type of cooling (coolant) gas that is used (parameter PH31).

Using the same wizard, the number of compressors and fans for each circuit are also set, as is the presence of the inverter for the compressors and fans, the number of throttlings and safety measures for the compressors and the activation of the fans. A check will verify whether the necessary hardware resources for the machine type are sufficient or not, generating an eventual AH01 hardware configuration alarm.

Note: Enabling the inverter for the adjustment of the compressors, the FIRST compressor will be the one controlled by the inverter, while any other subsequent compressors will be sealed (without throttlings) and will be controlled by digital relay output.
Similarly, enabling the inverter for the adjustment of the fans, the FIRST fan will be the one controlled by the inverter, while any other subsequent fan with be controlled by digital relay output.
For each inverter it must be configured the position of the device activation consent digital outputs.

6.2 Status of the machine and of the single circuits

There are multiple procedures for turning on/shutting off the unit or the single circuit:

1) By using the appropriate **On/Off button** (function enabled by parameter PH05)
   Turning On – push the ESC button for about 2 seconds: if all other enabled conditions are present, the machine will go to “ON”.
   Shutting Off – push the ESC button for about 2 seconds: the machine will go to “OFF”.
2) By using the **On/Off by digital input** command (function enabled by parameter PH07 for the machine and PH08 for the circuits)
   Turning On – close the remote On/Off contact; if all the other enabled conditions are present, the machine or single circuit will go to “ON”.
   Turning Off – if the remote On/Off contact is open, the machine or single circuit will go to “OFF by digital input”, represented with the saying “OFFd”.
3) Using the **supervision protocol** (function enabled by parameter PH09 for the machine and PH10 for the circuits)
   Turning On – activate the “on” by protocol status: if all the other enabled conditions are present, the machine or single circuit will go to “ON”.
   Turning Off – if the “on” by protocol status is deactivated, the machine or the single circuit will go to “OFF by supervision protocol”, represented with the saying “OFFS”.

The On/Off by button status has the priority over the other two methods, indeed, the Off by digital input and by supervision protocol states can be reached only if the machine is on.

A machine that is **turned off by digital input** will be able to:

1 pass to the Off by button status (by pressing the appropriate button)
2 pass to the Off by supervisor status (if the digital input is open and if the Off by supervisor status is set)
3 turn on (if the digital input is closed and the Off by supervisor status is not set)

A machine that is **turned off by supervision protocol** will be able to:

4 pass to Off by button status (by pressing the appropriate button)
5 pass to the Off by digital input status (if it is set by means of the supervisor and if the digital input is open)
6 turn on (if the digital input is closed and the Off by supervisor status is not set)

The machine’s On/Off button is the ESC button.
The remote On/Off inputs (when they are present) are configured by means of the appropriate parameters:

1 Hd01 = position of remote On/Off digital input for the machine
2 Hd11 = position of remote On/Off digital input for circuit 1
3 Hd21 = position of remote On/Off digital input for circuit 2

6.3 Adjustment of the compressors

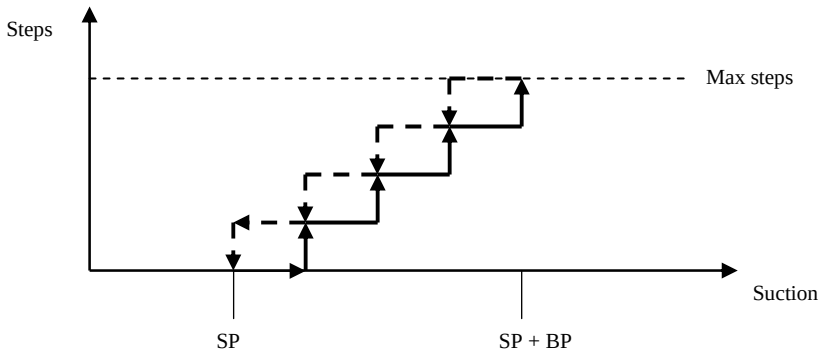
Checking the suction pressure of the compressors implies the management of the compressors to reach and maintain a certain operating pressure value: according to the type of check (sideband adjustment or neutral zone adjustment) and the use or lack thereof of the inverter for a finer adjustment, four types of adjustment are considered.

6.3.1 Sideband adjustment

The sideband check uses the characteristics of the PI regulators (proportional and integral) or of the P regulators (proportional) to establish when to plug in or unplug the compressors being used, in order to regularize, within the differential range, the turning on or off of the various devices.
The parameters relative to the first circuit are the following:

1 SPC1 = Setpoint compressors (SP)
2 PC14 = Type of adjustment = 0
3 PC16 = Integral time (TI)
4 PC17 = Sideband (BP)
5 PG11 = Number of compressors
6 PG04 = Number of throttlings

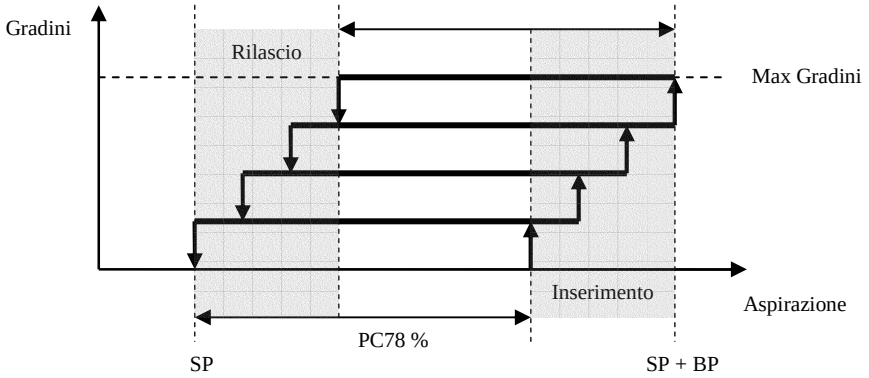
The number of compressors and the number of throttlings supplies the Maximum Number of Steps with which the proportional band is divided.
The purpose of the Proportional +Integral adjustment is to obtain a null error in this type of scheme.



The image above shows the behavior of the proportional band adjustment (SP, SP +BP). Based on the value of the suction pressure, the adjustment adds or subtracts the number of steps that are required of the compressors. In this adjustment, the band is entirely moved above the setpoint.

It is possible to choose whether the check will refer to the PI or only to the P adjustment, by setting the parameter for the integral action, which is the integration time (Ti). Specifically, if this parameter is set to a value of zero, the adjustment is only proportional, otherwise it also becomes integral. The Ti corresponds to the time needed by the integral action to be equal to the proportional action, given the hypothesis of a constant error: the speed of this action is proportionally linked to the value of the integration time. The default parameter is worth 600 seconds, and so the adjustment takes advantage of the proportional + integral characteristic.

Through the *PC78 Sideband steps overlapping factor,* it is possible to improve the behavior of this type of adjustment, which requires wide proportional bands in order to be stable, by modifying the subdivision of the adjustment band of adjustment between the steps:



Steps will be loaded at PC78% of the proportional band; the steps will be unloaded at 100 – PC78% of the proportional band.
If for example PC78 has value 60%, the steps will be loaded between 60% of the proportional band and its maximum value (100%); steps will be unloaded between 40% of the proportional band and its minimum value (0%).
It appears clear that by using such a division of the steps as indicated in the image, the interval of activity of each single step is higher than the classical geometrical division, with the clear advantage that the proportional band may be diminished, to favor a higher precision of adjustment, and/or the activations of the steps occur less frequently, that is, the breakaways of the compressors decrease, favoring the mechanical duration of the compressors themselves.

6.3.2 Neutral zone adjustment

This adjustment implies the definition of a neutral zone in which no decision of activation or deactivation will be made, which means that no breakaways will be required for any device.

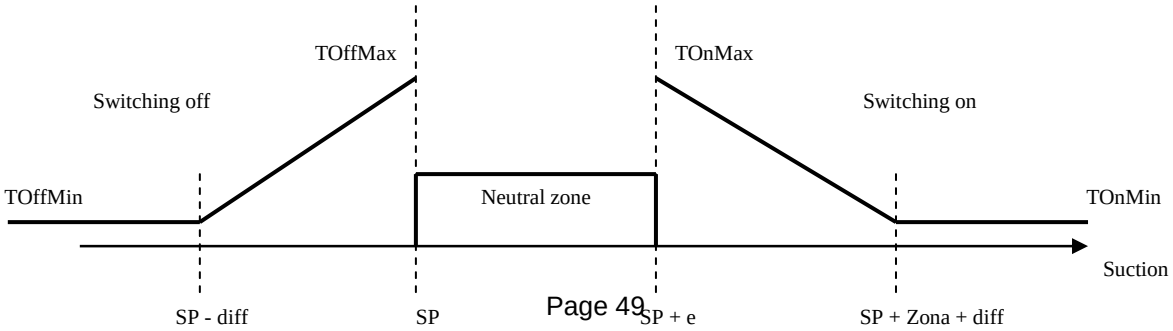
The parameters relative to the first circuit are the following:

7 SPC1 = Setpoint compressors (SP)
8 PC14 = Type of adjustment = 1
9 PC18 = Neutral Zone (NZ)
10 PC19 = Differential outside the neutral zone (diff)
11 PC20 = Minimum time of Turn-on (TOnMin)
12 PC21 = Maximum time of Turn-on (TOnMax)
13 PC22 = Minimum time of shutdown (TOffMin)
14 PC23 = Maximum time of shutdown (TOffMax)

Outside the neutral zone, the turn-on or shutdown requests for the various steps supplied by the compressors will follow this logic:

1 Turn-on: when the pressure of suction exceeds the threshold value setpoint + neutral zone
2 Shutdown: when the pressure goes below the setPoint

In this type of adjustment, the neutral zone is found entirely to the right of the setPoint.



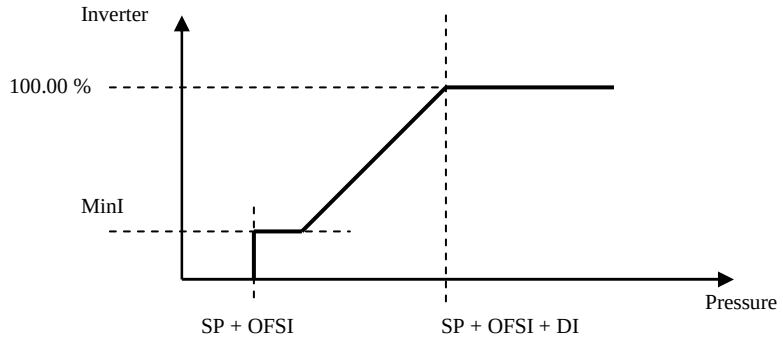
As we can see from the figure, the adjustment foresees the setting of certain timings within which, depending on the zone, the turn-on and shutdown requests for the various steps must be adjusted to work according to established time intervals.
Based on the difference between the actual suction pressure value and the reference value, the times will vary proportionally according to the values set. The reference value mentioned represents, according to the case, the right and left limit of the neutral zone with the addition of another differential (which can be set through a parameter) within which the proportional variation of the time in question will be found.
At the limits of the adjustment, the values of the turn-on and shutdown times are the maximum and minimum times that are established by the parameter. To render the request time constant during the turn-on phase, it is enough to set the NZ TOnMin and the NZ TOnMaz parameters to the same value. The same thing is true for the shutdown phase.

6.3.3 Sideband adjustment with inverter

This check adds an inverter adjustment to the normal sideband adjustment; in order to do this, it is necessary to set some parameters relative to the inverter device that is to be used, besides enabling its use.

The parameters relative to the first circuit are the following:

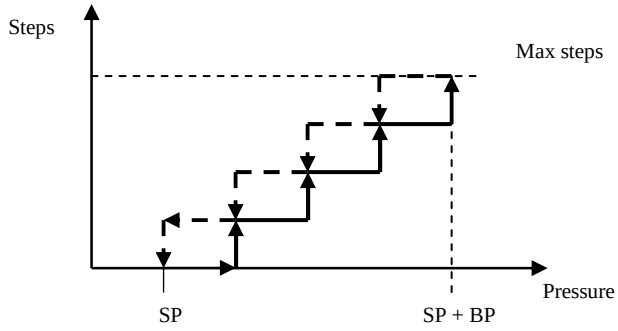
- SPC1 = Setpoint compressors (SP)
- PC14 = Type of adjustment = 0
- PG12 = Activation of the inverter
- PC24 = Inverter differential (DI)
- PC25 = Inverter offset with respect to the suction setPoint (OFSI)
- PC26 = Minimum value of inverter (MinI)
- PC27 = SpeedUp Time



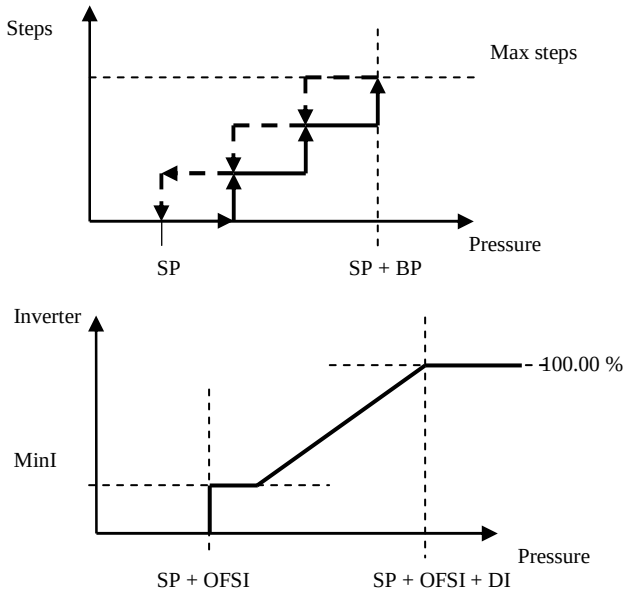
Based on the measured value from the suction probe, the output of the regulator will assume different values.
If the value measures with the probe is less than or equal to the SP + OFSI value, the output of the regulator assumes the value 0.
If the value measured with the probe is between the SP + OFSI value and the SP + OFSI + DI, the output of the regulator will assume a value which is proportional to the value of the suction probe.
If the suction probe assumes a value which is higher than or equal to the SP + OFSI + DI value, the output of the inverter will assume maximum value.
If the MinI parameter has been set, at every turn-on the inverter will maintain that value as a starting value.
If the parameter for the speedUp time has been set, at every breakaway point the inverter will assume maximum value for the seconds described by this parameter.
The range of values that the inverter output can assume lies between 0 and 100 percentage points, with two decimal numbers.

The use of this adjustment on the principal compressor is not linked to the adjustment of the other compressors, since the two functions are independent from each other.

Example: 4 compressors without inverte



Example: 4 compressors with 1 inverter



6.3.4 Neutral zone adjustment with inverter

This check adds an inverter type adjustment to a normal neutral zone adjustment; in order to do this, it is necessary to set some parameters relative to the inverter device that will be used, besides enabling its use.
The parameters relative to the first circuit are the following:

- SPC1 = Setpoint compressors (SP)
- PC14 = Type of adjustment = 1
- PG12 = Activation inverter
- PC26 = Minimum value of inverter (MinI)
- PC27 = SpeedUp Time
- PC28 = Time or ramp of inverter (TI)

The adjustment varies according to the zone (neutral, turn-on or shutdown) in which the regulator is found.
In the neutral zone, the inverter is not subjected to any variation and no compressors are turned on or off.
In the turn-on zone:

- as soon as it is required, the inverter is activated.
- the value of the inverter changes according to the time TI set by the parameter. This represents the time needed by the ramp of the inverter to go from the minimum value to the maximum value.
- when the inverter reaches the required maximum value, another step is required of the compressors.
- once the request is accomplished the value of the inverter is restored to the minimum value (MinI if different from zero)
- If the turn-on zone remains, the cycle restarts.

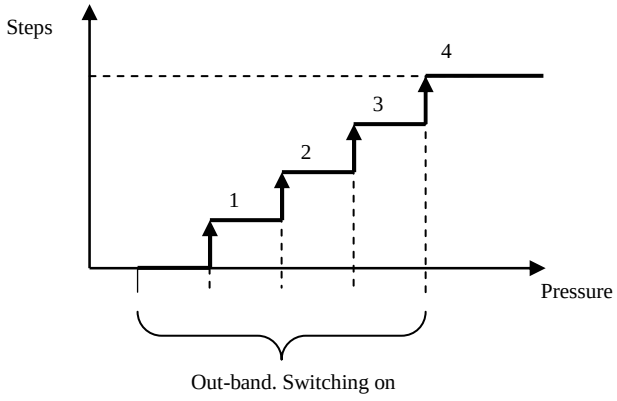
If the turn-on request remains, all the compressors are turned on one by one, and at the end, the value of the inverter is brought to the maximum value.
In the shutdown zone:

- as soon as it is required, the output of the inverter is brought to the minimum value, according to the TI.
- when the inverter reaches the minimum value, the compressors are required to shut down another step.
- once the request for a shutdown is completed, if the shutdown zone remains, the value of the inverter is restored to the maximum value and the cycle restarts.

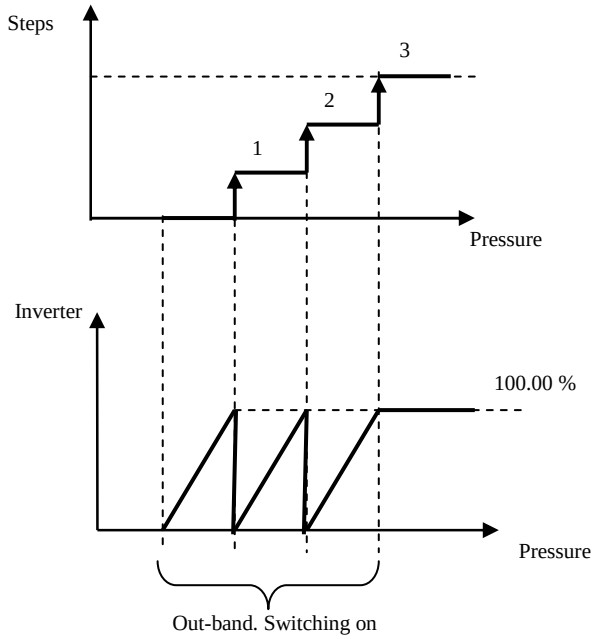
If the request for a shutdown remains, all the compressors are shut down, one by one, and at the end the value of the inverter is brought to zero.

If the MinI parameter has been set, at every turn-on the inverter will keep that value as the starting value.
If the parameter for the speedUp time has been set, at every breakaway the inverter will assume the maximum value for the seconds described by this parameter.

Example: 4 compressors without inverte



Example: 4 compressors with 1 inverter



6.4 Management of the compressors

The program is able to manage up to a maximum of 4 compressors of equal power, divided into circuits and up to 2 throttlings for each compressor. To each compressor, certain digital inputs for safety measures and digital outputs for turn-on/shutdown and for potential throttlings may be associated.

The main configuration parameters are the following:

- PG01 = Circuit number
- PG11 = Number of compressors circuit 1
- PG15 = Number of compressors circuit 2
- PG04 = Number of throttlings
- PG05 = Activation of compressor safety measures

The management of the compressors occurs through a setPoint and a differential that can be set by a parameter and the reading of a pressure on the suction probe. Turn-on/shutdown is ensured by a thermo-adjustment and by certain timings that protect the various breakaways.

6.4.1 Rotation of the compressors

The rotation of the compressors is a procedure that makes it possible to balance as much as possible the number of functioning hours and the number of breakaways for each compressor. The rotation only refers to the compressors and not to the single throttlings, it does not involve potential compressors that have been subject to

an alarm or that are in manual function mode and it is able to dynamically turn on other compressors if one or more are subject to a state of alarm.
Through the PC01 parameter, the program is able to manage 4 types of rotation: FIFO, LIFO, FIFO + hours, LIFO + hours.

1) FIFO

Follows the logic *"First In First Out"*, or in other words, the first compressor that turns on will then be the first that must shut off. This logic could initially lead to a large difference in the hours of operation among the various compressors, but after an initial phase, the hours should approximately be equal.
Example.

Turn-on : C1 . C2 . C3 . C4
Shutdown: C1 . C2 . C3 . C4

This type of rotation has a particular feature in the case where all the compressors configured in the system do not turn on; in fact, if, for example, the first compressor turns on and then shuts off, the next compressor to turn on will be the second. The last compressor that shut off is memorized and the next one in sequence is turned on so that the same compressor is not always used and thus all the configured parts are taken advantage of in the best possible way.

Example with 4 compressors

Turn-on : C1 . C2 . Shutdown: C1 . C2 .
Turn-on : C3. C4. Shutdown: C3. C4.
Turn-on : C1 . C2 . C3. C4. Shutdown: C1 . C2 . C3. C4.

2) LIFO

Follows the logic *"Last In First Out"*, or in other words, the last compressor turned on will be the first to be turned off.
Example.

Turn-on : C1 . C2 . C3 . C4
Shutdown: C4 . C3 . C2 . C1

The turn-on order will always begin with the C1 compressor.

3) FIFO + hours of operation

This rotation promotes the comparison of the hours of operation of the various compressors. During turn-on, the compressor with the least number of hours of operation will be favored, while during shutdown, the compressor with the greatest number of hours will be favored.
In the case where a choice must be made among compressors that have the same number of hours, a FIFO rotation takes effect, in such a way as to in any case guarantee a rotation, even when there are the same number of hours of operation.
Example. 1

Turn-on : C1(3 hours) . C2(3 hours) . C3(3 hours) . C4(3 hours)
Shutdown: C1(3 hours) . C2(3 hours) . C3(3 hours) . C4(3 hours)

Example. 2

Turn-on : C1(1 hour) . C2(3 hours) . C3(3 hours) . C4(5 hours)
Shutdown: C4(5 hours) . C2(3 hours) . C3(3 hours) . C1(1 hour)

4) LIFO + hours of operation

This rotation promotes the comparison of the hours of operation of the various compressors. During turn-on, the compressor with the least number of hours of operation will be favored, while during shutdown, the compressor with the greatest number of hours will be favored.
In the case where a choice must be made among compressors that have the same number of hours, a LIFO rotation takes effect.

Example. 1

Turn-on : C1(3 hours) . C2(3 hours) . C3(3 hours) . C4(3 hours)
Shutdown: C4(3 hours) . C3(3 hours) . C2(3 hours) . C1(3 hours)

Example. 2

Turn-on : C1(1 hour) . C2(3 hours) . C3(3 hours) . C4(5 hours)
Shutdown: C4(5 hours) . C3(3 hours) . C2(3 hours) . C1(1 hour)

6.4.2 Management of throttlings

The program is capable of managing up to 4 throttled compressors.
Throttling a compressor means distributing its total load over various steps, improving its function and decreasing the number of breakaways so as to ensure that the machine lasts longer.

Number of throttlings

It is possible to choose, using the parameter PG04, one or two throttlings of equal power for each compressor. Each compressor will have the same number of throttlings available.
The configurations possible for the number of throttlings per compressor are clearly limited by the number of available digital outputs.

Throttling logic

If compressors subjected to throttling are being used, it is possible, through the use of the PC03 parameter, to choose the logic of operation of the outputs dedicated to throttling:

- If set to zero, the outputs will be normally excited (closed) and will be opened to request more power: NC logic Copeland.
- If set to one, the outputs will normally not be excited (open) and will be closed to request more power: NO logic Feeders.

Turn-on/Shutdown Mode

In the case where compressors subjected to throttling are used, the PC02 parameter makes it possible to set the turn-on/shutdown mode of the throttlings.
If set to zero:

Turn-on: CppCppCpp. The program favors the complete turn-on of the single compressor before passing to the next one.
Shutdown: ppCppCppC. The program favors the compete shutdown of the single compressor before passing to the next one.

If set to one:

Turn-on: CCCppppppp. The program favors first the turn-on of all compressors and only following this, will it act on the throttlings.
Shutdown: ppppppCCC. The program favors first the shutdown of all the throttlings and only at the end will it shut down all the compressors.

Note.
In this last case, the logic in turn-on and shutdown of the single throttlings follows this logic (example with 3 compressors):

Turn-on compressors : C1 . C2 . C3
Turn-on throttlings : p1C1 . p1C2 .p1C3 / p2C1 . p2C2 . p2C3
Shutdown throttlings : p2C3 . p2C2 . p2C1 / p1C3 . p1C2 . p1C1

6.4.3 Protection timings

Below, there is a list of all the timings related to the management of the compressors.

Neutral Zone Timings

These parameters serve to adjust the time intervals of the requests for turn-on and shutdown of the various steps supplied by the compressors:

Minimum time request for turn-ons
Maximum time request for turn-ons
Minimum time request for shutdowns
Maximum time request for shutdowns

For these parameters, refer to the description in paragraph 2.2.2.

Protection timings

These times serve to protect the mechanical instruments from the various breakaways to which they are subjected.

PC04 – *Minimum time turn-on of compressors.* Once activated, the compressor will stay on for this amount of time before it can be shut off.

PC05 – *Minimum time shutdown of compressors.* Minimum amount of time that must pass after the last shutdown before the compressor can be turned on again.

PC06 – *Minimum time between turn-ons of same compressor.* Establishes the minimum amount of time that must pass between two turn-ons of the same compressor.

PC07 – *Minimum time between turn-ons of different compressors.* Establishes the minimum amount of time that must pass between the turn-on of one compressor and the next. If enabled, this serves to avoid simultaneous breakaways.

PC08 – *Minimum time between shutdowns of different compressors.* Establishes the minimum amount of time that must pass between the shutdown of one compressor and the next.

PC09 – *Minimum time turn-on of throttlings.* Establishes the minimum amount of turn-on time between the throttlings of a compressor.

PC10 – *Minimum time shutdown of throttlings.* Establishes the minimum amount of shutdown time between the throttlings of a compressor.

PC27 (PC47) – *speedUp time.* If adjustment with inverter is set, this parameter, if different from zero, allows the inverter output to remain at maximum level (100.00%) at each request for the turn-on of a new step.

6.4.4 Safety inputs

The program foresees the management of 1 safety “thermal compressor” input for each compressor. For this input, it is possible to set the type of reset (automatic or manual) and the intervention delay, through the use of parameters.
To enable the alarms related to these safety measures, besides setting the parameters mentioned above as needed, it is also necessary to set the *positions* in which the digital inputs will be connected relative to the various types of alarm from the menu Constructor -> Hardware. In the case where there is no wish to set the alarm, all that is needed is to set the parameter mentioned above to the value of 0.

6.4.5 Inverter configuration

For each inverter used in the plant must be selected also the related digital output position for the command/consent at the inverter start; For the configuration the same parameters of the compressor digital outputs are used, parameters *HC01, HC02, HC03, HC04*. The inverter is virtually the first compressor of each circuit; this means that, depending of the compressors and circuits number, the right parameter must be set, by following below logic:

- *Signle Circuit*: The inverter (if enabled) is virtually the compressor 1; it is neccessary to configure the parameter of the first compressor, this means that parameter *HC01* must be always configured.
- *Two circuits*: The inverter of circuit 1 (if enabled) is virtually the compressor 1 (this means that parameter *HC01* must be configured), and the circuit 2 inverter (if enabled) is virtually the first compressor after the circuit 1 compressors.

Note. The *PH20* parameter modifies the logic for the inverter consent (managed by relay or by PWM).

Configuration examples.

1) N°1 Circuit (PG01=1), n°2 Compressors (PG11=2), Inverter enabled (PG12=1). A correct configuration is:

HC01 = 1 -> Digital output for the inverter consent
HC02 = 2 -> Digital output for the hermetic compressor command
HC31 = 1 -> Analog output for the inverter command

2) N°2 Circuits (PG01=2), n°2 Compressors for each circuit (PG11=2, PG15=2), Inverters enabled (PG12=1, PG16=1). A correct configuration is:

HC01 = 1 -> Digital output for the circuit 1 inverter consent
HC02 = 2 -> Digital output for the circuit 1 hermetic compressor command
HC03 = 3 -> Digital output for the circuit 2 inverter consent
HC04 = 4 -> Digital output for the circuit 2 hermetic compressor command
HC31 = 1 -> Analog output for the circuit 1 inverter command
HC32 = 2 -> Analog output for the circuit 2 inverter command

3) N°2 Circuits (PG01=2), n°1 Circuit 1 compressor, n°2 Circuit 2 compressors (PG11=1, PG15=3), Only circuit 2 inverter enabled (PG12=0, PG16=1). A correct configuration is:

HC01 = 1 -> Digital output for the circuit 1 first hermetic compressor command
HC02 = 2 -> Digital output for the circuit 2 inverter consent
HC03 = 3 -> Digital output for the circuit 2 first hermetic compressor command
HC04 = 4 -> Digital output for the circuit 2 second hermetic compressor command
HC31 = 1 -> Analog output dor the circuit 1 inverter command
HC32 = 2 -> Analog output dor the circuit 2 inverter command

4) N°2 Circuits (PG01=2), n°1 Circuit 1 compressor, n°3 Circuit 2 compressors (PG11=1, PG15=3), Inverters enabled (PG12=1, PG16=1). A correct configuration is:

HC01 = 1 -> Digital output for the circuit 1 inverter consent
HC02 = 2 -> Digital output for the circuit 2 inverter consent
HC03 = 3 -> Digital output for the circuit 2 first hermetic compressor command
HC04 = 4 -> Digital output for the circuit 2 second hermetic compressor command
HC31 = 1 -> Analog output dor the circuit 1 inverter command
HC32 = 2 -> Analog output dor the circuit 2 inverter command

Inverter consent with PWM

In some applications it can be necessary to command the consent of the inverters with a PWM output configuring 0% or 100%. To use this option is necessary to operate with the same logic used in the previous examples on the parameters *HC0x*, configuring the values according to this rule:

HC01 = 13 -> Defines that the PWM output on the controller is used for the consent of the compressor with inverter of circuit 1

HC0*x* = 14 -> Defines that the PWM output on the controller is used for the consent of the compressor with inverter or circuit 2

Note. Configurino the value 13 or 14, is used the related PWM, this means that the possibile parameters *HC31, HC32, HF31, HF32* should not be configured as PWM.

6.4.6 Compressors with different power

The management of compressors with different power could be useful to be able to more precisely regulate the establishment of the final value compared to the configured setpoint.
To use this management, the related parameter, *enable compressors of different power (PG03)*, must be enabled and the parameters that represent the power of each compressor whose utilization is desired in the system must be set.
The software calculates the maximum power able to be expressed from the single powers of the compressors; according to the requirements of the regulators it calculates the best combination of compressors to deliver the requested power. For a better regulation, the internal resolution of the step is multiplied by three; in this way, by using compressors with different power, there are more combinations that can match the exact power requested by the regulator.
At each variation of the request, the combination of compressors is recalculated in such a way as to produce a power to be delivered that is equal or greater than that requested.
Compressors manually disabled, in alarm and under protections will not take part to the computation.

Note. Enabling this function, compressors subjected to throttling or compressors with inverters are not able to be used.

Sideband Adjustment

Based on the parameters of adjustment (paragraph 2.3.1), the application will calculate the power necessary to return the pressure/temperature detected in the proximity of the desired setpoint.
The required power will be calculated based on the proportional regulator or proportional + integral, while the power supplied will be given by the combination of powers of the compressors that more closely exceeds what is required.

Neutral Zone Adjustment

Based on the zone where the regulator is found, a new sequence of compressors to activate is calculated, and more precisely:

- *In the neutral zone:* the combination remains unchanged.
- *In the turn-on zone:* the combination of compressors is recalculated in order to guarantee a power that is greater than that supplied by the previous combination.
- *In the shutdown zone*: the combination of compressors is recalculated in order to guarantee a power that is inferior to that supplied by the previous combination.

The recalculation of the combinations occurs based on the timings of the neutral zone: refer to paragraph 2.3.2.

Example

Consider 3 compressors of different power and a sideband adjustment of a proportional type, with these parameters:

Setpoint = 0.5 bar
Proportional band = 2.0 bar
Power Compressor 1 = 3 kW
Power Compressor 2 = 5 kW
Power Compressor 3 = 10 kW

Measured Pressure (bar)	*Power Required (kW)*	*Compressor 1 (3 kW)*	*Compressor 2 (5 kW)*	*Compressor 3 (10 kW)*	*Power Delivered (kW)*
0.5	***-***				***0***
0.6	***0.9***	***X***			***3***
1.0	***4.5***		***X***		***5***
1.3	***7.2***	***X***	***X***		***8***
1.6	***9.9***			***X***	***10***
1.7	***10.8***	***X***		***X***	***13***
2.0	***13.5***		***X***	***X***	***15***
2.3	***16.2***	***X***	***X***	***X***	***18***
2.5	***18 (max)***	***X***	***X***	***X***	***18 (max)***

Applying the formula of calculation for the required power, these values are obtained.
Below the setpoint, the power delivered is null, above the setpoint, the power delivered is at the maximum.

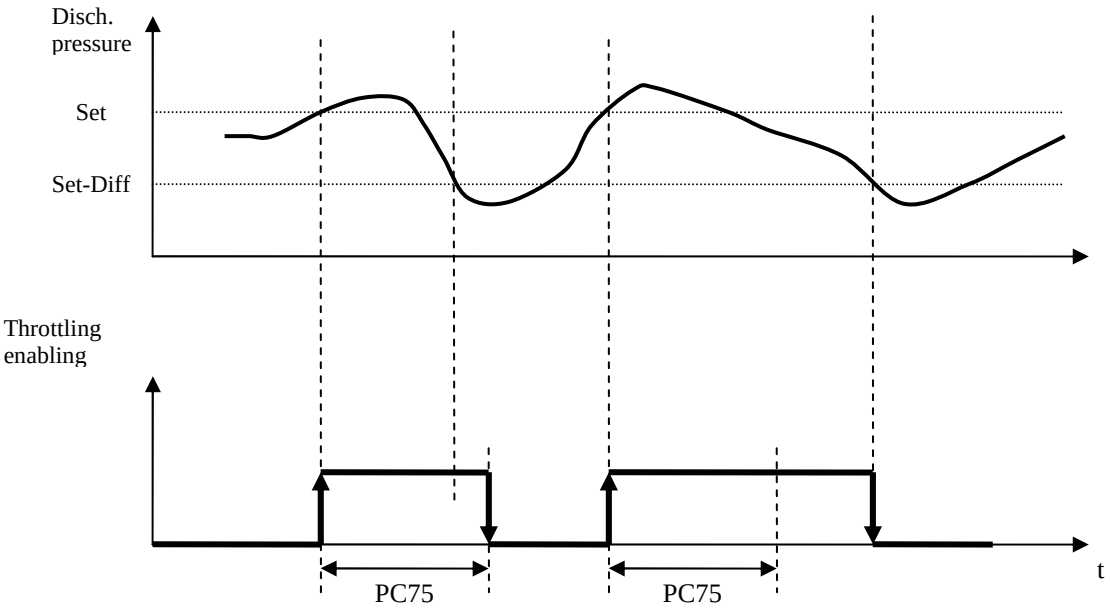
6.4.7 Compensation for load losses on the suction line

In certain systems, it may be necessary to decrease the suction setpoint with the increase in the yield of coolant, to compensate for the losses of pressure along the suction line. Users, which should operate at a constant evaporation pressure, will in essence find themselves working at higher pressures when there is a higher need for cold temperatures, and vice versa. This means that, in order to guarantee the production of coldness at the desired temperature even with loads in the proximity of the nominal values, one must work with a setpoint that is appreciably lower even at partial loads, when it wouldn't be necessary. The compensation works by introducing an offset that is able to be set, which lowers the setpoint gradually at each call of cold steps; it appears evident that this function acts with the intention of increasing the efficiency of the system, making it possible to choose a higher setpoint for lower loads.
Through the *PH35* parameter this function is enabled, which leads to a lowering of the setpoint by a *factor of compensation* for each step inserted and to an increase in the setpoint by the same value for each step released. This function is able to be activated only with adjustment in the neutral zone.

6.4.8 Throttling of the refrigerating power at high pressures

To prevent the intervention of the high condensation pressure regulator and the resultant blockage in cold production, it is possible to reduce the refrigerating power and subsequently the power of exchange at the condenser, lowering in this way the condensation pressure. This reduction is possible only with circuits that are subjected to throttling (with at least two compressors or with a compressor equipped with throttling devices).
The parameters related to the first circuit for this function are the following:

- PC70 = Enables throttling at high pressures
- PC71 = Setpoint limit for pressure regulator check of condensation
- PC74 = Differential for pressure regulator check
- PC75 = Minimum maintenance time for pressure regulator throttling
- PC76 = Percentage value of throttling


Disch.
pressure
Set
Set-Diff
Throttling
enabling
PC75
PC75
t

6.5 Adjustment of condensation

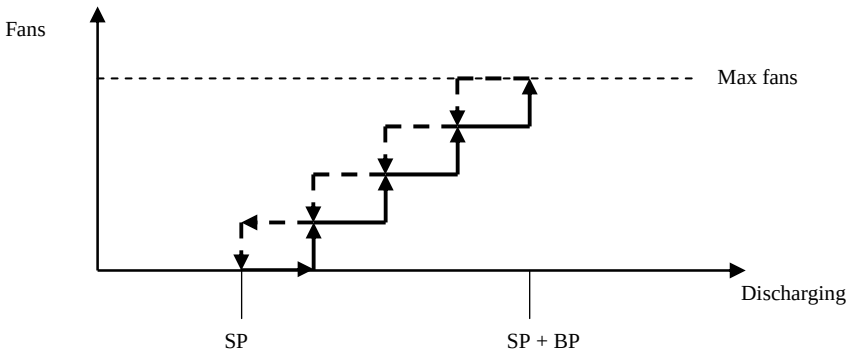
The management of condensation foresees control through discharge pressure fans: according to the type of control (sideband control or neutral zone control) and according to the use or disuse of the inverter for a finer adjustment, four types of adjustment are considered.

6.5.1 Sideband adjustment

Sideband control uses the characteristics of the PI regulators (proportional and integral) or the P regulators (proportional) to establish when to plug in or unplug the fans used, in order to regulate the turn-on or the shutdown of the various devices inside the differential band.
The parameters relative to the first circuit are the following:

- SPF1 = Setpoint fans (SP)
- PF14 = Type of adjustment = 0
- PF16 = Integral time (TI)
- PF17 = Lateral band (BP)
- PG41 = Number of fans

The number of fans supplies the Maximum Number of Steps with which the proportional band is divided.
The purpose of the PI adjustment is to obtain a null error in this scheme.



The above figure shows the behavior of the band adjustment (SP, SP +BP). Based on the value of the discharge pressure, the adjustment adds or subtracts the number of fans to be requested. In this adjustment, the band is found entirely on the setPoint.

It is possible to choose if the control will refer to the PI adjustment or only to the P adjustment, by setting the parameter for the integral action, which is the integration time (Ti). Specifically, if this parameter is set to the value of zero, the adjustment is only proportional, otherwise, it also becomes integral. The Ti corresponds to the time needed by the integral action to become equal to the proportional action, in the hypothesis of a constant error: the speed of such action is proportionally linked to the value of the integration time. The default parameter is 600 seconds, so the adjustment uses the proportional + integral characteristic.

As for the compressors, even with the sideband adjustment of the fans it is possible to improve the behavior of the adjustment band, using the parameter *PF78 Sideband steps overlapping factor.*

6.5.2 Neutral zone adjustment

This adjustment implies the definition of a neutral zone in which no decision of activation or deactivation is made, which means that there will be no requests for breakaways of any devices.

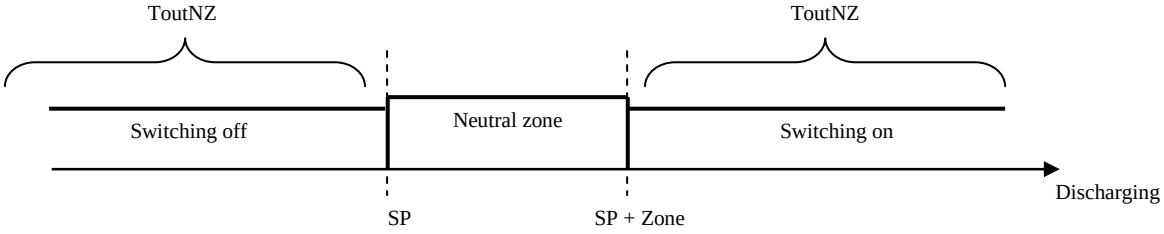
The parameters relative to the first circuit are the following:

- SFC1 = Setpoint fans (SP)
- PF14 = Type of adjustment = 1
- PF18 = Neutral Zone (NZ)
- PF19 = Differential outside the neutral zone (diff)
- PF20 = Time of turn-on/shutdown (ToutNZ)

Outside the neutral zone, the requests for turn-on or shutdown of the configured fans will follow this logic:

- Turn-on: when the discharge pressure exceeds the threshold value setPoint + Neutral Zone
- Shutdown: when the pressure becomes less than the setPoint

In this adjustment, the neutral zone is found entirely to the right of the setPoint.

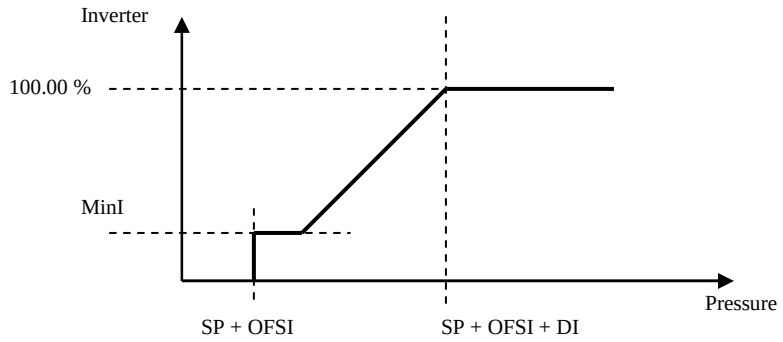


As you can see from the figure, the adjustment implies the setting of two times, within which, depending on the zone, the requests for turn-on and shutdown of the various steps must be managed to ensure the establishment of proper time intervals.
If we are in the shutdown zone, every shutdown request must wait for ToutNZ seconds before it is fulfilled. Instead, in the case of the turn-on zone, every turn-on request will have to wait for ToutNZ seconds before it is fulfilled.

6.5.3 Sideband adjustment with inverter

This check adds an inverter adjustment to the normal sideband adjustment; in order to do this, it is necessary to set some parameters relative to the inverter device that will be used, besides activating its use.
The parameters relative to the first circuit are the following:

- SPF1 = Setpoint fans (SP)
- PF14 = Type of adjustment = 0
- PG42 = Inverter activation
- PF24 = Differential inverter (DI)
- PF25 = Inverter offset with respect to the suction setPoint (OFSI)
- PF26 = Minimum value of inverter (MinI)
- PF27 = Time of speedUp



Based on the value measured by the discharge probe, the output of the regulator will assume different values.
If the value measured by the probe is less than or equal to the value SP + OFSI, the output of the regulator will assume the value of 0.
If the value measured by the probe is between the value SP + OFSI and the value SP + OFSI + DI, the output of the regulator will assume a value that is proportional to the value of the discharge probe.
If the discharge probe assumes a value that is higher than or equal to the value SP + OFSI + DI, the output of the inverter will assume maximum value.
If the MinI parameter has been set, at every turn-on, the inverter will keep that value as the starting value.
If the parameter for the speedUp time has been set, at every breakaway, the inverter will assume the maximum value for the seconds described by this parameter.
The range of the values that the inverter output may assume lies between 0 and 100 percentage points, with two decimal numbers.
The use of this adjustment on the main fan is not linked to the adjustment of the other fans, since the two functions are independent.

6.5.4 Neutral zone adjustment with inverter

This check adds an inverter adjustment to the normal neutral zone adjustment; in order to do this, it is necessary to set some parameters relative to the inverter device that will be used, besides activating its use.
The parameters relative to the first circuit are the following:

31 SPF1 = Setpoint fans (SP)
32 PF14 = Type of adjustment = 1
33 PG42 = Inverter activation
34 PF26 = Minimum value of inverter (MinI)
35 PF27 = Time of speedUp
36 PF28 = Time or ramp of inverter (TI)

The adjustment varies according to the zone (neutral, turn-on or shutdown) in which the regulator is found.
In the neutral zone, the inverter does not go through any change and no fans are turned on or off.
In the turn-on zone:

9 as soon as it is requested, the inverter is activated.
10 the value of the inverter changes according to the time TI set by the parameter. This represents the time needed by the ramp of the inverter to go from the minimum value to the maximum value.
11 when the inverter reaches the maximum value, the other fans are requested one by one.

If the turn-on zone remains, all the fans are turned on, one by one, and the value of the inverter stays at the maximum.
In the shutdown zone:

12 as soon as it is requested, the output of the inverter is brought to the minimum value, depending on the TI.
13 when the inverter reaches the minimum value, the fans are required to turn off, one by one.

If the request for shutdown remains, all the fans are turned off, one by one, and the value of the inverter stays at zero.
If the MinI parameter has been set, at every turn-on, the inverter will keep that value as the starting value.

If the parameter for the speedUp time has been set, at every breakaway, the inverter will assume the maximum value for the seconds described by this parameter.

6.5.5 Single condensation (only bi-circuit)

Single condensation makes it possible to perform the ventilation process through only one circuit. For this input, it is possible to set the type of resetting (automatic or manual) through the parameters.
By setting the parameter PG30 *single condensation activation*, the number of circuits for the fans is forced to one, while the number of circuits chosen for the compressors remains unchanged.
The single condensation will deactivate all the characteristics (alarms, fans, inverter,…) that are relative to the second circuit for the management of the fans.

6.6 Management of the fans

The program is able to manage up to a maximum of 4 fans. To each fan, a digital safety input and a digital turn-on/shutdown output may be associated.

The main configuration parameters are the following:

- PG01 = Number of circuits
- PG41 = Number of fans circuit 1
- PG45 = Number of fans circuit 2
- PG32 = Activation fan safety

The number of fans that are directly controlled by the digital output is further limited by the number of compressors (throttled or not), which means by the number of digital outputs remaining after the configuration of the compressors.
It is possible to use a single condensation, which is a condensation only on one circuit, by setting the relative PG30 parameter.
The management of the fans occurs through a setPoint and a differential that can be set by a parameter and the reading of a pressure on the discharge probe. Turn-on/shutdown is ensured by a thermo-adjustment and by several timings that protect the various breakaways.

6.6.1 Rotation of the fans

The rotation of the fans is a procedure that makes it possible to balance as much as possible the number of hours of operation and of breakaways for every device.
The rotation does not involve any fans in a state of alarm or in manual mode and it makes it possible to dynamically turn on others if one or more of them go into a state of alarm.
Using the PF01 parameter, the program is able to manage 4 types of rotation: FIFO, LIFO, FIFO + hours, LIFO + hours.

1) **FIFO**

It follows the *"First In First Out"* logic, which means the first fan turned on will be the first one that will have to shut down. This logic could initially lead to a large difference in the hours of operation among the various fans, but after an initial phase, these will almost be the same.
Example.

Turn-on : F1 . F2 . F3 . F4
Shutdown: F1 . F2 . F3 . F4

This type of rotation has a peculiarity in the case where all the fans configured in the system do not turn-on; in fact, if, for instance, the first fan is turned on and then it shuts down, the next fan to be turned on will be the second. The last fan turned off is memorized in order to turn on the next fan in the sequence, so that the same fan is not used, taking advantage in this way of all the configured condenser items.

Example with 4 fans.

Turn-on : F1 . F2 . Shutdown: F1 . F2 .
Turn-on : F3. F4. Shutdown: F3. F4.
Turn-on : F1 . F2 . F3. F4. Shutdown: F1 . F2 . F3. F4.

2) LIFO

It follows the *"Last In First Out"* logic, which means that the last fan turned on will be the first one to be shut down.

Example.

Turn-on : F1 . F2 . F3 . F4
Shutdown: F4 . F3 . F2 . F1

The turn-on order will always start from the C1 compressor.

3) FIFO + hours of operation

This rotation favors the confrontation of the hours of operation of the various fans. During turn-on, the one with the fewest number of hours of operation will be favored, while during shutdown, the one with the highest number of hours will be favored.

If it is necessary to choose among fans with the same number of hours, a FIFO rotation is activated so that a rotation is ensured even in the case of similar hours of operation.

Example. 1

Turn-on : F1(3 hours) . F2(3 hours) . F3(3 hours) . F4(3 hours)
Shutdown: F1(3 hours) . F2(3 hours) . F3(3 hours) . F4(3 hours)

Example. 2

Turn-on : F1(1 hours) . F2(3 hours) . F3(3 hours) . F4(5 hours)
Shutdown: F4(5 hours) . F2(3 hours) . F3(3 hours) . F1(1 hour)

4) LIFO + working hours

This rotation favors the confrontation of the hours of operation of the various fans. During the turn-on phase, the one with the fewer number of hours of operation will be favored, while during shutdown, the one with the highest number of hours will be favored.

If it is necessary to choose among fans with the same number of hours, a LIFO rotation is activated, to ensure a rotation even in the case of the same number of hours of operation.

Example. 1

Turn-on : F1(3 hours) . F2(3 hours) . F3(3 hours) . F4(3 hours)
Shutdown: F4(3 hours) . F3(3 hours) . F2(3 hours) . F1(3 hours)

Example. 2

Turn-on : F1(1 hour) . F2(3 hours) . F3(3 hours) . F4(5 hours)
Shutdown: F4(5 hours) . F3(3 hours) . F2(3 hours) . F1(1 hours)

6.6.2 Fan timings

A list of all the timings relative to the management of the compressors is indicated below

Neutral Zone Timings

These parameters are useful to the organize the turn-on and shutdown request for the several condensation devices so as to establish certain time intervals.

Minimum turn-on request time.
Minimum shutdown request time.

For these parameters, refer to the description made in paragraph 2.4.2.

Protection timings

These times serve to protect the fans from the various breakaways to which they are subjected.

PF07 – *Minimum time between turn-ons of different fans.* Establishes the minimum amount of time that must pass between the turn-on of one fan and the next. If it is set, it makes it possible to avoid simultaneous breakaways.

PF08 – *Minimum time between shutdowns of different fans.* Establishes the minimum amount of time that must pass between the shutdown of one fan and the next. If it is set, it makes it possible to avoid simultaneous breakaways.

PF27, PF47 – *speedUp time.* If inverter adjustment is set, this parameter, if different from zero, makes it possible for the inverter output to remain at the maximum value (100.00 %), each time that the turn-on of a new fan is required.

6.6.3 Safety inputs

The program foresees the management of a single "thermal fan" safety measure for each of the fans configured in the application. The activation of this characteristic is managed by the parameter PG32 *enable fan safety*.
To enable the "thermal fan" alarms, besides setting the appropriate parameter, the *positions* in which the digital inputs related to the various fans selected will be connected must also be set using the menu Constructor -> Hardware. If there is no wish to set the alarm, it is sufficient to set the parameter mentioned above to the value of 0.

6.6.4 Inverter configuration

For each inverter used in the plant must be selected also the related digital output position for the command/consent at the inverter start; For the configuration the same parameters of the fans digital outputs are used, parameters *HF01, HF02, HF03, HF04*. The inverter is virtually the first fan of each circuit; this means that, depending of the fans and circuits number, the right parameter must be set, by following below logic:

- *Signle Circuit*: The inverter (if enabled) is virtually the fan 1; it is neccessary to configure the parameter of the first fan, this means that parameter *HF01* must be always configured.
- *Two circuits*: The inverter of circuit 1 (if enabled) is virtually the fan 1 (this means that parameter *HF01* must be configured), and the circuit 2 inverter (if enabled) is virtually the first fan after the circuit 1 fans.

Inverter consent with PWM

In some applications it can be necessary to command the consent of the inverters with a PWM output configuring 0% or 100%. To use this option is necessary to operate with the same logic used in the previous examples on the parameters *HC0x*, configuring the values according this rule:

HC01 = 13 -> Defines that the PWM output on the controller is used for the consent of the fan with inverter circuit 1

HC0*x* = 14 -> Defines that the PWM output on the controller is used for the consent of the fan with inverter circuit 2

Note. Configuring the value 13 or 14, the related PWM is used, this means that the possibile parameters *HC31, HC32, HF31, HF32* should not be configured as PWM.

The choice and the configuration of the fan inverters parameters is the same for the compressors, but the parameters *PH21, HF01, HF02, HF03 and HF04* are used *(look at paragraph 6.4.5)*

6.7 Various management issues

6.7.1 Digital input or supervisor setpoint variation

It is sometimes important to reduce the energy consumption of the compressors or the noise level of the fans (for example at night).
The program foresees, both for compressors and fans, the possibility of managing a parameter, PUC1 (PUC2) *offset secondary setPoint compressors* and PUF1 (PUF2) *offset secondary setPoint fans*, which, based on the state of a digital input (different for compressors and fans), sums an offset to the main setpoint in order to allow it to vary. It is possible to set the logic for the digital input by acting on the parameter PH19 *Logic Other DI* (the same parameter for the logic of the digital input on/off).
To set this function, the parameter PH25 *enable secondary digital input setpoint* must be activated and the *position* in which the digital input related to the compressors and the one related to the fans will be connected must be set. If this value is not set, the function will remain disabled.
Similarly, activating the parameter PH26 *enable secondary supervisor setpoint*, it is possible to use the relative offsets both for the compressors and for the fans.

6.7.2 Manual function

The program makes it possible to set a manual function for compressors and fans. In this state, the devices do not participate either in the rotations or in the calculation of thermo-adjustment, though they are still sensitive to possible alarms.
The manual functioning of the devices is useful when functional tests must be run on the machine to test integrity and proper functioning.

Compressors

The manual functioning or lack thereof of the compressors is guaranteed by the parameter PM1x *enable compressor:*

- If it is set to the *Auto* value, it defines the normal functioning of the device
- If it is set to the *Manu* value, it disables the compressor and leads to manual functioning.

A compressor that is functioning manually does not participate in the adjustments and may be forced into the number of steps that it is able to supply by acting on the property PM2x *compressor forcing* (present in the menu Maintenance -> Forcing of Compressors). The number of steps that a compressor functioning manually can supply is limited to the number of throttlings that have been set in the configuration of the machine.
As was stated previously, the compressor is in any case still sensitive to alarms and related consequences.
To restore the compressor to normal use, the parameter PM1x *enable compressor* must be reset to the *Auto* value, otherwise the compressor in question will continue to function manually and will not heed the turn-on and/or shutdown requests calculated by the adjustment set.

Fans

The manual functioning or lack thereof of the fans is guaranteed by the parameter PM5x *enable fan:*

- If it is set to the *Auto* value, it defines the normal functioning of the device
- If it is set to the *Manu* value, it disables the fan and leads to manual functioning.

A fan that is functioning manually does not participate in the adjustments and may be forced to turn on/shut down by acting on the property PM6x *fan forcing* (present in the menu Maintenance -> Forcing of Fans).
As was stated previously, the fan is in any case still sensitive to alarms and related consequences.
To restore the fan to normal use, the parameter PM5x *enable fan* must be reset to the *Auto* value, otherwise the fan in question will continue to function manually and will not heed the turn-on and/or shutdown requests calculated by the adjustment set.

Inverters

When it is an inverter that must be manually forced, the procedure is slightly different.
Recall that the inverter is virtually the first compressor of each circuit, therefore before being able to correctly perform the procedure, the correct compressor must be changed to manual, in other words:

- *1 Circuit:* The inverter (if enabled) is compressor 1; in order to switch the inverter to manual functioning, it is necessary to switch the first compressor to manual functioning.
- *2 Circuits:* The inverter of circuit 1 (if enabled) is compressor 1 and the inverter of circuit 2 (if enabled) is the first compressor following the compressors of circuit 1; to switch the inverters to manual functioning, it is necessary to switch these compressors to manual functioning.

Once the manual functions have been correctly set, it is possible to force the inverters using the specific parameter: PM37 (PM38) *compressor inverter forcing.*

In order to correctly configure this characteristic, it is sufficient to enable at least one compressor/fan inverter; depending on the type enabled, the other type will be automatically excluded by the analogue outputs.

The management and the forcing procedure of the fan inverters is the same as that for the compressor inverters.

6.7.3 Floating condensation management

Makes it possible to modify the working setpoint of the fans depending on the external temperature. To enable this function, the following parameters must be set in the menu Installer -> Various:

- *enable external temperature probe (PH24)*
- *enable floating condensation (PF71)*
- *delta Condensation temperature (PF72):* offset of condensation temperature (linked to the type of condenser module used)
- *inferior limit Condensation temperature (PF73):* minimum value of the condensation temperature (owing to the need to guarantee a minimum temperature of the lubricating oil)
- *upper limit Condensation temperature (PF74):* maximum value of the condensation value, beyond which the fans no longer modulate and therefore reach the maximum.

The new setpoint will be given by the external temperature summed to the parameter *delta temperature.* The values of this new set, converted to pressure, are in any case limited by the variation range of the condensation setpoint.

Note. By enabling this function, the condensation setpoint parameters of the single circuits no longer have any effect on the adjustment of the condensation; in fact, the setpoint used will be a function of delta T and of the external temperature.

6.7.4 Temperature probes

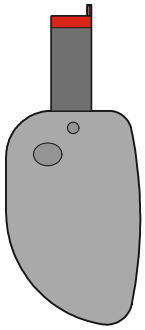
The application is capable of managing a maximum of two auxiliary temperature probes: *environment probe* and *external probe*. To make use of these two temperature transducers, their activation parameters, *enable environment temperature probe* and *enable external temperature probe*, must be set.
Each of the two probes is associated with a probe alarm, which is set off when the probe is disconnected or broken; the activation of this alarm is associated with the parameter of probe activation. By activating the probes, the related alarm is also activated. In the case of no activation, the screens will display the value of 0.

6.7.5 Restoration of default parameters

Through the "*Parameter restoration"* procedure, it is possible to restore all the parameters of the system to the default values. This function is simple to activate by acting on the value of the appropriate parameter PH15 present in the Map menu, accessible only when the machine is turned off; setting it to "1", the system will automatically see to the restoration of all parameters.
Following this operation, it is necessary to unplug the machine and then plug it back in to avoid malfunctions.

6.7.6 Programming key

It is possible to save the value of all system parameters in the programming key and to then to copy this information to one or more compatible instruments. The saving or restoration process may be performed while the machine is on, connecting the key to the programming connector.



To save a particular parameter map in the key:

- access the Map menu and select "Stor" using the UP or DOWN buttons
- Push the SET (ENTER) button: the transfer of the parameters to the key is highlighted by the blinking of the appropriate led
- Wait for the blinking to end; if the led is green, the operation terminated correctly, otherwise the led is red

To copy a parameter map from the key to an instrument:

- access the Map menu and select "rESt" using the UP or DOWN buttons
- Push the SET (ENTER) button: the transfer of the parameters from the key to the instrument is highlighted by the blinking of the appropriate led
- Wait for the blinking to end: if the led is green, the operation terminated correctly, otherwise the led is red

Note: the key is able to save information relating to the product and its related version, in such a way as to allow for the transfer of parameter maps only between instruments that are compatible with each other.

7 DIAGNOSTICS

The application is able to manage a series of alarms related to system compressors, fans, circuits and functions. Depending on the various types of alarm, it is possible to configure their resetting (if manual or automatic), a possible delay in signal and certain actions to perform in specific circumstances.
When one or more alarms are active, the alarm icon on the screens blinks.
To visualize the various alarms, the menu "Alar" must be visualized from the main page using the ESC key and then ENTER must be pressed.
To scroll through the various active alarms, it is necessary to again hit the ENTER key: the alarms will be shown in the order of importance, as they are listed in the table of alarms in paragraph 3.2.
All the digital inputs related to the alarms are managed by the parameter *Alarm Logic* that takes on the following meaning:

- If set to "NO", the inputs will be normally un-excited (open): N.O. logic
- If set to "NC", the inputs will be normally excited (closed): N.C. logic

7.1 Manual and automatic alarms

As mentioned previously, there are two types of alarms, those that are reset manually and those that are reset automatically. With some alarms there is the possibility of setting the type of reset that most suits the needs of the user through a certain parameter (*Alarm reset).*

Manual alarms

In the case that a manual alarm presents itself:

- The alarm icon begins to blink

By hitting the ENTER key in the "Alar" menu, the code of the alarm that was first activated is displayed.
Once the conditions that triggered the alarm are reversed, it is possible to manually reset the alarm. To do this:

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

At this point, if there are no other alarms, the page indicating "none" will appear, the alarm icon will shut off and the machine will return to its normal functioning, or the code of the next alarm that has been activated will be displayed.
The consequences deriving from an active manual alarm will remain valid until the user proceeds to cancel the alarm message.

Automatic alarms

In the case that an automatic alarm presents itself:

- The alarm icon begins to blink

Hitting the ENTER key in the "Alar" menu, the code of the alarm that was first activated is displayed.
Once the conditions that triggered the alarm are reversed, the resetting and the cancellation of the alarm message are restored automatically without the user having to intervene.
The consequences that derive from an active automatic alarm will remain valid until the causes that triggered the alarm are not reversed.

7.2 Alarms Table

A list of all the alarms that are managed by the application is given below. The order of presentation is the same as the order with which the alarms present themselves when they are active.

Code	Description of the alarms	Type	Consequence	Notes
EN01	Communication expansion error	Auto	Visualization	Delay able to be set
ES01	Suction probe C1 broken or disconnected	Auto	- Num. comp. ON able to be set - Inverter forced to 100% (if required and if the only compressor in the circuit)	Delay able to be set
ES02	Discharge probe C1 broken or disconnected	Auto	- Num. fan ON able to be set - Inverter forced to 100% (if required and if the only fan in the circuit) - OFF throttling HP circuit 1 (if enabled)	Delay able to be set
ES03	Suction probe C2 broken or disconnected	Auto	- Num. comp. ON able to be set - Inverter forced to 100% (if required and if the only compressor in the circuit)	Delay able to be set
ES04	Discharge probe C2 broken or disconnected	Auto	- Num. fan ON able to be set - Inverter forced to 100% (if required and if the only fan in the circuit) - OFF throttling HP circuit 2 (if enabled)	Delay able to be set
AC21	Thermal compressor 1	Set	OFF comp. 1	Delay able to be set
AC22	Thermal compressor 2	Set	OFF comp. 2	Delay able to be set
AC23	Thermal compressor 3	Set	OFF comp. 3	Delay able to be set
AC24	Thermal compressor 4	Set	OFF comp. 4	Delay able to be set
AC01	Hours of operation compressor 1	Auto	Visualization	
AC02	Hours of operation compressor 2	Auto	Visualization	
AC03	Hours of operation compressor 3	Auto	Visualization	
AC04	Hours of operation compressor 4	Auto	Visualization	
AF21	Thermal fan 1	Set	OFF fan 1	
AF22	Thermal fan 2	Set	OFF fan 2	
AF23	Thermal fan 3	Set	OFF fan 3	
AF24	Thermal fan 4	Set	OFF fan 4	
AF01	Hours of operation fan 1	Auto	Visualization	
AF02	Hours of operation fan 2	Auto	Visualization	
AF03	Hours of operation fan 3	Auto	Visualization	
AF04	Hours of operation fan 4	Auto	Visualization	
AL31	High discharge pressure C1	Auto	ON all fans	
AL36	High suction pressure C1	Auto	ON all comp.	Delay able to be set
AL41	Low discharge pressure C1	Auto	OFF all fans	Delay able to be set *
AL46	Low suction pressure C1	Auto	OFF all comp.	Delay able to be set *
AL11	High discharge pressure pressure regulator C1	Set	OFF all comp.	
AL21	Low suction pressure pressure regulator C1	Auto	OFF all comp.	Delay able to be set *
AL61	Liquid level C1	Manu	Visualization	Delay able to be set
ACC1	Common oil differential C1	Set	Visualization	Delay able to be set
AFC1	Common thermal fans C1	Set	Visualization	

AL32	High discharge pressure C2	Auto	ON all fans	
AL37	High suction pressure C2	Auto	ON all comp.	Delay able to be set
AL42	Low discharge pressure C2	Auto	OFF all fans	Delay able to be set
AL47	Low suction pressure C2	Auto	OFF all comp.	Delay able to be set
AL12	High discharge pressure pressure regulator C2	Set	OFF all com.	
AL22	Low suction pressure pressure regulator C2	Auto	OFF all comp.	
AL62	Liquid level C2	Manu	Visualization	Delay able to be set
ACC2	Common oil differential C2	Set	Visualization	Delay able to be set
AFC2	Common thermal fans C2	Set	Visualization	
ES07	Environment probe broken or disconnected	Auto	Visualization	
ES08	External probe broken or disconnected	Auto	Visualization	
AH01	Hardware configuration alarm	Auto	Visualization	

(*) The low-pressure alarms are not active when the machine is off, while all the others are.

7.3 Alarm relays

The program has the possibility of managing up to three alarm relays. The activation of each of these devices is linked to the setting or lack thereof of the relative *DO alarm position* parameter. For activation, it is sufficient to set this value to a value that is different than zero; if the zero value is maintained, the alarm relay is not used.
A list of the three relays, with their relative parameter, is presented below:

- A general alarm relay – *Global DO alarm position*
- An alarm relay for circuit 1 - *DO alarm position circuit 1*
- An alarm relay for circuit 2 - *DO alarm position circuit 2*

Through the relative parameter, it is possible to establish the polarity (NO or NC) of the various alarm outputs.

8 List of the MODBUS variables

It is possible to check the application through a supervisor, using the Modbus protocol. The communication occurs through a serial TTL interface, which is already integrated in the controller; we suggest using the external TTL/RS-485 interface (the interface is not supplied with the instrument).
The various parameters that are exported by the application in the three versions of the application are reported below.

Modbus Table

REGISTER VARS LIST						
Id	**Name**	**Value**	**Min**	**Max**	**Description**	**Mode**
257	PackedDI	0	0	65535	bit00=DI01, bit01=DI02, bit02=DI03, bit03=DI04, bit04=DI05, bit05=DI06, bit06=DI07, bit07=DI08, bit08=DI09, bit09=DI10, bit10=free, bit11=free, bit12=free, bit13=free, bit14=free, bit15=free	R/W
385	PackedDO	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, bit12=free, bit13=free, bit14=free, bit15=free	R/W
513	AI_Pressure_SuctionC1	-	-	-	Bar	R/W
514	AI_Pressure_SupplyC1	-	-	-	Bar	R/W
515	AI_Pressure_SuctionC2	-	-	-	Bar	R/W
516	AI_Pressure_SupplyC2	-	-	-	Bar	R/W
517	AI_EnvironmentProbe	-	-	-	_C	R/W
518	AI_ExternalProbe	-	-	-	_C	R/W
641	CmpInverter_Circuit1	0.00	0.00	100.00	%	R/W
642	FanInverter_Circuit1	0.00	0.00	100.00	%	R/W
643	CmpInverter_Circuit2	0.00	0.00	100.00	%	R/W
644	FanInverter_Circuit2	0.00	0.00	100.00	%	R/W
769	PackedAlarm1	0	0	65535	bit00=EN01, bit01=ES01, bit02=ES02, bit03=ES03, bit04=ES04, bit05=free,	R/W

					bit06=free, bit07=free, bit08=AC21, bit09=AC22, bit10=AC23, bit11=AC24, bit12=AC01, bit13=AC02, bit14=AC03, bit15=AC04	
770	PackedAlarm2	0	0	65535	bit00=AF21, bit01=AF22, bit02=AF23, bit03=AF24, bit04=AF01, bit05=AF02, bit06=AF03, bit07=AF04, bit08=A031, bit09=A036, bit10=A041, bit11=A046, bit12=A011, bit13=A021, bit14=A061, bit15=ACC1	R/W
771	PackedAlarm3	0	0	65535	bit00=AFC1, bit01=free, bit02=A032, bit03=A037, bit04=A042, bit05=A047, bit06=A012, bit07=A022, bit08=A062, bit09=ACC2, bit10=AFC2, bit11=free, bit12=ES07, bit13=ES08, bit14=AH01, bit15=free	R/W
1025	OnOffBySuperv	0	0	1		R/W
1026	OnOffBySuperv_Circuit1	0	0	1		R/W
1027	EnableSecSP_bySup_Cmp_Circuit1	0	0	1		R/W
1028	EnableSecSP_bySup_Fan_Circuit1	0	0	1		R/W
1029	OnOffBySuperv_Circuit2	0	0	1		R/W
1030	EnableSecSP_bySup_Cmp_Circuit2	0	0	1		R/W
1031	EnableSecSP_bySup_Fan_Circuit2	0	0	1		R/W
1281	StatusMachine	0	0	3	0=OFF key, 1=OFF dig, 2=OFF sup, 3=ON	R/W
1282	StatusCircuit1	0	0	6	0=disab, 1=OFF, 2=OFF dig, 3=OFF sup, 4=ON, 5=ALL	R/W
1283	Cmp_actualSetPoint_Circuit1	-	-145.0	625.5	Bar	R/W
1284	Fan_actualSetPoint_Circuit1	-	-145.0	625.5	Bar	R/W
1285	CmpInv_actualSet_Circuit1	-	-145.0	625.5	Bar	R/W
1286	FanInv_actualSet_Circuit1	-	-145.0	625.5	Bar	R/W
1287	PowerRequested_Circuit1	0	0	100	%	R/W

1288	PowerSupplied_Circuit1	0	0	100	%	R/W
1289	StatusCircuit2	0	0	6	0=disab, 1=OFF, 2=OFF dig, 3=OFF sup, 4=ON, 5=ALL	R/W
1290	Cmp_actualSetPoint_Circuit2	-	-145.0	625.5	Bar	R/W
1291	Fan_actualSetPoint_Circuit2	-	-145.0	625.5	Bar	R/W
1292	CmpInv_actualSet_Circuit2	-	-145.0	625.5	Bar	R/W
1293	FanInv_actualSet_Circuit2	-	-145.0	625.5	Bar	R/W
1294	PowerRequested_Circuit2	0	0	100	%	R/W
1295	PowerSupplied_Circuit2	0	0	100	%	R/W
1537	SPC1_Cmp_SetPoint_Circuit1	1.0	-145.0	625.5	Bar	R/W
1538	PUC1_Cmp_SPOffset_ByDig_Circuit1	0.0	-290.0	290.0	Bar	R/W
1539	PUC4_Cmp_SPOffset_BySup_Circuit1	0.0	-290.0	290.0	Bar	R/W
1540	SPF1_Fan_SetPoint_Circuit1	15.0	-145.0	625.5	Bar	R/W
1541	PUF1_Fan_SPOffset_ByDig_Circuit1	0.0	-290.0	290.0	Bar	R/W
1542	PUF4_Fan_SPOffset_BySup_Circuit1	0.0	-290.0	290.0	Bar	R/W
1543	SPC2_Cmp_SetPoint_Circuit2	1.0	-145.0	625.5	Bar	R/W
1544	PUC2_Cmp_SPOffset_ByDig_Circuit2	0.0	-290.0	290.0	Bar	R/W
1545	PUC5_Cmp_SPOffset_BySup_Circuit2	0.0	-290.0	290.0	Bar	R/W
1546	SPF2_Fan_SetPoint_Circuit2	15.0	-145.0	625.5	Bar	R/W
1547	PUF2_Fan_SPOffset_ByDig_Circuit2	0.0	-290.0	290.0	Bar	R/W
1548	PUF5_Fan_SPOffset_BySup_Circuit2	0.0	-290.0	290.0	Bar	R/W
1549	PM00_ManutHourCmp (Low)	2000.0	0.0	9999.0	hours x 10	R/W
1550	PM00_ManutHourCmp (High)					
1551	PM0x_HoursCmp[0] (Low)	0.0	0.0	9999.0		R/W
1552	PM0x_HoursCmp[0] (High)					
1553	PM0x_HoursCmp[1] (Low)	0.0	0.0	9999.0		R/W
1554	PM0x_HoursCmp[1] (High)					
1555	PM0x_HoursCmp[2] (Low)	0.0	0.0	9999.0		R/W
1556	PM0x_HoursCmp[2] (High)					
1557	PM0x_HoursCmp[3] (Low)	0.0	0.0	9999.0		R/W
1558	PM0x_HoursCmp[3] (High)					
1559	PM1x_En_Manual_Cmp[0]	0	0	1		R/W
1560	PM1x_En_Manual_Cmp[1]	0	0	1		R/W
1561	PM1x_En_Manual_Cmp[2]	0	0	1		R/W
1562	PM1x_En_Manual_Cmp[3]	0	0	1		R/W
1563	PM2x_V_suppStepsCmp[0]	0	0	3		R/W
1564	PM2x_V_suppStepsCmp[1]	0	0	3		R/W
1565	PM2x_V_suppStepsCmp[2]	0	0	3		R/W
1566	PM2x_V_suppStepsCmp[3]	0	0	3		R/W
1567	PM37_Forz_Cmp_Inverter1	0.00	0.00	100.00	%	R/W
1568	PM38_Forz_Cmp_Inverter2	0.00	0.00	100.00	%	R/W
1569	PM40_ManutHourFan (Low)	2000.0	0.0	9999.0	hours x 10	R/W
1570	PM40_ManutHourFan (High)					
1571	PM4x_HoursFan[0] (Low)	0.0	0.0	9999.0		R/W
1572	PM4x_HoursFan[0] (High)					
1573	PM4x_HoursFan[1] (Low)	0.0	0.0	9999.0		R/W
1574	PM4x_HoursFan[1] (High)					
1575	PM4x_HoursFan[2] (Low)	0.0	0.0	9999.0		R/W
1576	PM4x_HoursFan[2] (High)					
1577	PM4x_HoursFan[3] (Low)	0.0	0.0	9999.0		R/W
1578	PM4x_HoursFan[3] (High)					
1579	PM5x_En_Manual_Fan[0]	0	0	1		R/W
1580	PM5x_En_Manual_Fan[1]	0	0	1		R/W
1581	PM5x_En_Manual_Fan[2]	0	0	1		R/W
1582	PM5x_En_Manual_Fan[3]	0	0	1		R/W
1583	PM6x_V_suppStepsFan[0]	0	0	1		R/W
1584	PM6x_V_suppStepsFan[1]	0	0	1		R/W

1585	PM6x_V_suppStepsFan[2]	0	0	1		R/W
1586	PM6x_V_suppStepsFan[3]	0	0	1		R/W
1587	PM77_Forz_Fans_Inverter1	0.00	0.00	100.00	%	R/W
1588	PM78_Forz_Fans_Inverter2	0.00	0.00	100.00	%	R/W
1589	PM81_Calibration_SuctionC1	0.0	-19.0	19.0	Bar	R/W
1590	PM82_Calibration_SupplyC1	0.0	-19.0	19.0	Bar	R/W
1591	PM83_Calibration_SuctionC2	0.0	-19.0	19.0	Bar	R/W
1592	PM84_Calibration_SupplyC2	0.0	-19.0	19.0	Bar	R/W
1593	PM85_Calibration_EnvProbe	0.0	-19.0	19.0	_C	R/W
1594	PM86_Calibration_ExtProbe	0.0	-19.0	19.0	_C	R/W
1595	PM91_Last_maintenanceYEAR	2006	2006	2070		R/W
1596	PM92_Last_maintenanceMONTH	1	1	12		R/W
1597	PM93_Last_maintenanceDAY	1	1	31		R/W
1598	PC01_Cmp_Rotation_Type	0	0	3	0=FIFO, 1=LIFO, 2=FIFO+Hr, 3=LIFO+Hr	R/W
1599	PC02_Cmp_ModeCCpp_Type	0	0	3	0=CpCp/pCpC, 1=CCpp/ppCC, 2=CpCp/ppCC, 3=CCpp/pCpC	R/W
1600	PC03_Cmp_LoadStepsLogic	1	0	1	0=N.C., 1=N.O.	R/W
1601	PC04_Cmp_TminOn	10	0	999	sec	R/W
1602	PC05_Cmp_TminOff	120	0	999	sec	R/W
1603	PC06_Cmp_TonOn	360	0	999	sec	R/W
1604	PC07_Cmp_TonOther	20	0	999	sec	R/W
1605	PC08_Cmp_ToffOther	20	0	999	sec	R/W
1606	PC09_Cmp_TonLoadStep	20	0	999	sec	R/W
1607	PC10_Cmp_ToffLoadStep	20	0	999	sec	R/W
1608	PC11_Cmp_OnErrorProbe_Circuit1	1	0	4		R/W
1609	PC12_Cmp_MinSetPoint_Circuit1	0.1	-145.0	625.5	Bar	R/W
1610	PC13_Cmp_MaxSetPoint_Circuit1	2.5	-145.0	625.5	Bar	R/W
1611	PC14_Cmp_RegulationType_Circuit1	1	0	1	0 = Sideband, 1 = Neutral Zone	R/W
1612	PC16_Cmp_PI_Ti_Circuit1	600	0	999	Sec	R/W
1613	PC17_Cmp_PI_Diff_Circuit1	0.5	0.0	290.0	Bar	R/W
1614	PC18_Cmp_NZ_Zone_Circuit1	0.5	0.0	290.0	Bar	R/W
1615	PC19_Cmp_NZ_DiffOutZone_Circuit1	0.5	0.0	290.0	Bar	R/W
1616	PC20_Cmp_NZ_TOnMin_Circuit1	20	0	999	Sec	R/W
1617	PC21_Cmp_NZ_TOnMax_Circuit1	60	0	999	Sec	R/W
1618	PC22_Cmp_NZ_TOffMin_Circuit1	10	0	999	Sec	R/W
1619	PC23_Cmp_NZ_TOffMax_Circuit1	60	0	999	Sec	R/W
1620	PC24_Cmp_Inverter_Diff_Circuit1	0.5	0.0	290.0	Bar	R/W
1621	PC25_Cmp_Inverter_OffsetSP_Circuit1	0.0	-290.0	290.0	Bar	R/W
1622	PC26_Cmp_Min_Inverter_Circuit1	-	0.00	100.00	%	R/W
1623	PC27_Cmp_Inverter_TSpeedUp_Circuit1	0	0	999	Sec	R/W
1624	PC28_Cmp_InverterTime_Circuit1	10	0	999	Sec	R/W
1625	PC31_Cmp_OnErrorProbe_Circuit2	1	0	4		R/W
1626	PC32_Cmp_MinSetPoint_Circuit2	0.1	-145.0	625.5	Bar	R/W
1627	PC33_Cmp_MaxSetPoint_Circuit2	2.5	-145.0	625.5	Bar	R/W
1628	PC34_Cmp_RegulationType_Circuit2	1	0	1	0 = Sideband, 1 = Neutral Zone	R/W
1629	PC36_Cmp_PI_Ti_Circuit2	600	0	999	Sec	R/W
1630	PC37_Cmp_PI_Diff_Circuit2	0.5	0.0	290.0	Bar	R/W
1631	PC38_Cmp_NZ_Zone_Circuit2	0.5	0.0	290.0	Bar	R/W
1632	PC39_Cmp_NZ_DiffOutZone_Circuit2	0.5	0.0	290.0	Bar	R/W
1633	PC40_Cmp_NZ_TOnMin_Circuit2	20	0	999	Sec	R/W
1634	PC41_Cmp_NZ_TOnMax_Circuit2	60	0	999	Sec	R/W
1635	PC42_Cmp_NZ_TOffMin_Circuit2	10	0	999	Sec	R/W

1636	PC43_Cmp_NZ_TOffMax_Circuit2	60	0	999	Sec	R/W
1637	PC44_Cmp_Inverter_Diff_Circuit2	0.5	0.0	290.0	Bar	R/W
1638	PC45_Cmp_Inverter_OffsetSP_Circuit2	0.0	-290.0	290.0	Bar	R/W
1639	PC46_Cmp_Min_Inverter_Circuit2	-	0.00	100.00	%	R/W
1640	PC47_Cmp_Inverter_TSpeedUp_Circuit2	0	0	999	Sec	R/W
1641	PC48_Cmp_InverterTime_Circuit2	10	0	999	Sec	R/W
1642	PC69_RestartTimeout	0	0	999	Sec	R/W
1643	PC70_EnablePart	0	0	1		R/W
1644	PC71_SetPressurePartCircuit1	22.0	-145.0	625.5	Bar	R/W
1645	PC72_SetPressurePartCircuit2	22.0	-145.0	625.5	Bar	R/W
1646	PC74_DifftPressurePart	4.0	0.1	10.0	Bar	R/W
1647	PC75_MinTimePart	2	0	999	Min	R/W
1648	PC76_PartLimit	50	0	100	%	R/W
1649	PC78_OverloadSteps_Cmp	0	0	100	%	R/W
1650	PC8x_CmpPower[0]	0	0	5000	kW	R/W
1651	PC8x_CmpPower[1]	0	0	5000	kW	R/W
1652	PC8x_CmpPower[2]	0	0	5000	kW	R/W
1653	PC8x_CmpPower[3]	0	0	5000	kW	R/W
1654	PF01_Fan_Rotation_Type	0	0	3	0=FIFO, 1=LIFO, 2=FIFO+Hr, 3=LIFO+Hr	R/W
1655	PF02_Fan_EnRegulationByCmp	0	0	1	0=CPP_CPP, 1=CC_PPPP	R/W
1656	PF07_Fan_TOnOther	2	0	999	Sec	R/W
1657	PF08_Fan_TOffOther	2	0	999	Sec	R/W
1658	PF11_Fan_OnErrorProbe_Circuit1	1	0	4		R/W
1659	PF12_Fan_MinSetPoint_Circuit1	1.0	-145.0	625.5	Bar	R/W
1660	PF13_Fan_MaxSetPoint_Circuit1	25.0	-145.0	625.5	Bar	R/W
1661	PF14_Fan_RegulationType_Circuit1	0	0	1	0 = Sideband, 1 = Neural Zone	R/W
1662	PF16_Fan_PI_Ti_Circuit1	600	0	999	Sec	R/W
1663	PF17_Fan_PI_Diff_Circuit1	0.5	0.0	290.0	Bar	R/W
1664	PF18_Fan_NZ_Zone_Circuit1	1.0	0.0	290.0	Bar	R/W
1665	PF20_Fan_NZ_TOnOff_Circuit1	10	0	999	Bar	R/W
1666	PF24_Fan_Inverter_Diff_Circuit1	0.5	0.0	290.0	Bar	R/W
1667	PF25_Fan_Inverter_OffsetSP_Circuit1	0.0	-290.0	290.0	Bar	R/W
1668	PF26_Fan_Min_Inverter_Circuit1	-	0.00	100.00	%	R/W
1669	PF27_Fan_Inverter_TSpeedUp_Circuit1	2	0	999	Sec	R/W
1670	PF28_Fan_InverterTime_Circuit1	10	0	999	Sec	R/W
1671	PF31_Fan_OnErrorProbe_Circuit2	1	0	4		R/W
1672	PF32_Fan_MinSetPoint_Circuit2	1.0	-145.0	625.5	Bar	R/W
1673	PF33_Fan_MaxSetPoint_Circuit2	25.0	-145.0	625.5	Bar	R/W
1674	PF34_Fan_RegulationType_Circuit2	0	0	1	0 = Sideband, 1 = Neural Zone	R/W
1675	PF36_Fan_PI_Ti_Circuit2	600	0	999	Sec	R/W
1676	PF37_Fan_PI_Diff_Circuit2	0.5	0.0	290.0	Bar	R/W
1677	PF38_Fan_NZ_Zone_Circuit2	1.0	0.0	290.0	Bar	R/W
1678	PF40_Fan_NZ_TOnOff_Circuit2	10	0	999	Sec	R/W
1679	PF44_Fan_Inverter_Diff_Circuit2	0.5	0.0	290.0	Bar	R/W
1680	PF45_Fan_Inverter_OffsetSP_Circuit2	0.0	-290.0	290.0	Bar	R/W
1681	PF46_Fan_Min_Inverter_Circuit2	-	0.00	100.00	%	R/W
1682	PF47_Fan_Inverter_TSpeedUp_Circuit2	2	0	999	Sec	R/W
1683	PF48_Fan_InverterTime_Circuit2	10	0	999	Sec	R/W
1684	PF71_EnableFloatingCond	0	0	1		R/W
1685	PF72_FloatingCond_Offset	-	-20.0	20.0	_C	R/W
1686	PF73_FloatingCond_SetMin	30.0	10.0	45.0	_C	R/W
1687	PF74_FloatingCond_SetMax	40.0	10.0	45.0	_C	R/W
1688	PF78_OverloadSteps_Fan	0	0	100	%	R/W
1689	PA01_En_Alarm_ManutHourCmp	0	0	1		R/W

1690	PA02_En_Alarm_ManutHourFan	0	0	1		R/W
1691	PA03_HighPressureSuction_Delay	1	0	999	Sec	R/W
1692	PA04_ExpOffline_Delay	5	0	999	Sec	R/W
1693	PA05_LiquidLevel_Delay	90	0	999	Sec	R/W
1694	PA06_ProbeError_Delay	5	0	240	Sec	R/W
1695	PA07_LowPressureSupply_Delay	30	0	999	Sec	R/W
1696	PA08_LowPressureSuction_Delay	30	0	999	Sec	R/W
1697	PA09_ThermalCmp_Delay	0	0	999	Sec	R/W
1698	PA10_OilDiffCmp_Delay	10	0	999	Sec	R/W
1699	PA11_PressureSwitchSupply_ResetType	1	0	1	0=Auto, 1=Man	R/W
1700	PA12_ThermalCmp_ResetType	1	0	1	0=Auto, 1=Man	R/W
1701	PA14_OilDiffCmp_ResetType	1	0	1	0=Auto, 1=Man	R/W
1702	PA15_SetPoint_LP_Suction_C1	0.5	-145.0	625.5	Bar	R/W
1703	PA16_Diff_LP_Suction_C1	0.5	0.0	290.0	Bar	R/W
1704	PA17_SetPoint_HP_Suction_C1	4.0	-145.0	625.5	Bar	R/W
1705	PA18_Diff_HP_Suction_C1	0.5	0.0	290.0	Bar	R/W
1706	PA19_SetPoint_LP_Supply_C1	2.0	-145.0	625.5	Bar	R/W
1707	PA20_Diff_LP_Supply_C1	0.5	0.0	290.0	Bar	R/W
1708	PA21_SetPoint_HP_Supply_C1	20.0	-145.0	625.0	Bar	R/W
1709	PA22_Diff_HP_Supply_C1	1.0	0.0	290.0	Bar	R/W
1710	PA23_ThermalFan_ResetType	1	0	1	0=Auto, 1=Man	R/W
1711	PA25_SetPoint_LP_Suction_C2	0.5	-145.0	625.5	Bar	R/W
1712	PA26_Diff_LP_Suction_C2	0.5	0.0	290.0	Bar	R/W
1713	PA27_SetPoint_HP_Suction_C2	4.0	-145.0	625.5	Bar	R/W
1714	PA28_Diff_HP_Suction_C2	0.5	0.0	290.0	Bar	R/W
1715	PA29_SetPoint_LP_Supply_C2	2.0	-145.0	625.5	Bar	R/W
1716	PA30_Diff_LP_Supply_C2	0.5	0.0	290.0	Bar	R/W
1717	PA31_SetPoint_HP_Supply_C2	20.0	-145.0	625.5	Bar	R/W
1718	PA32_Diff_HP_Supply_C2	1.0	0.0	290.0	Bar	R/W
1719	PH01_Pressure_Min_Suction	-0.5	-145.0	625.5	Bar	R/W
1720	PH02_Pressure_Max_Suction	7.0	-145.0	625.5	Bar	R/W
1721	PH03_Pressure_Min_Supply	0.0	-145.0	625.5	Bar	R/W
1722	PH04_Pressure_Max_Supply	30.0	-145.0	625.5	Bar	R/W
1723	PH05_En_OnOffByKey	1	0	1		R/W
1724	PH07_En_OnOffByDI	0	0	1		R/W
1725	PH08_En_OnOffByDI_Circuit	0	0	1		R/W
1726	PH09_En_OnOffBySuperv	0	0	1		R/W
1727	PH10_En_OnOffBySuperv_Circuit	0	0	1		R/W
1728	PH11_Modbus_Address	1	1	247		R/W
1729	PH12_Modbus_Baud	3	0	4	1=2400, 2=4800, 3=9600, 4=19200	R/W
1730	PH13_Modbus_Parity	2	0	2	0=None, 1=Odd, 2=Even	R/W
1731	PH14_Modbus_StopBit	0	0	1	0=1 bit, 1=2 bit	R/W
1732	PH15_SetDefault_Par	0	0	1		R/W
1733	PH17_Logic_DI_Alarm	1	0	1		R/W
1734	PH18_Logic_DO_Alarm	0	0	1		R/W
1735	PH19_Logic_DI_Other	0	0	1		R/W
1736	PH23_En_EnvironmentProbe	0	0	1		R/W
1737	PH24_En_ExternalProbe	0	0	1		R/W
1738	PH25_En_OffsetSetPoint_FromDig	0	0	1		R/W
1739	PH26_En_OffsetSetPoint_FromSup	0	0	1		R/W
1740	PH31_RefrigerationType	3	0	6	0=none, 1=R22,	R/W

					2=R134a, 3=R404A, 4=R407C, 5=R410A, 6=R507	
1741	PH32_Temp_UM	0	0	1	0=_C, 1=_F	R/W
1742	PH33_Press_UM	0	0	1	0=Bar, 1=psi	R/W
1743	PH35_EnSuctionCompensation	0	0	1		R/W
1744	PH36_OffsetSuctionCompensation	0.2	0.1	5.0	Bar	R/W
1745	PH40_Pressure_or_Temperature	0	0	1		R/W
1746	PH43_Select_UniversalAI3	4	2	5		R/W
1747	PH44_Select_UniversalAI4	4	2	5		R/W
1748	PH50_OnlyIcons	0	0	1		R/W
1749	PH51_EnableNumericIcons	1	0	1		R/W
1750	PH52_EnableEvcoIcon	1	0	1		R/W
1751	PG01_CircuitsNumber	1	1	2		R/W
1752	PG02_En_Expansion	0	0	1		R/W
1753	PG03_DifferentCapacitiesCmp	0	0	1		R/W
1754	PG04_LoadStepsNumber	0	0	2		R/W
1755	PG05_Cmp_SecuritiesNumber	1	0	1		R/W
1756	PG11_CmpNumber_Circuit1	2	0	4		R/W
1757	PG12_Cmp_Enable_Inverter_Circuit1	0	0	1		R/W
1758	PG15_CmpNumber_Circuit2	0	0	4		R/W
1759	PG16_Cmp_Enable_Inverter_Circuit2	0	0	1		R/W
1760	PG30_En_UniqueCondenser	0	0	1		R/W
1761	PG32_Fan_EnSecurities	1	0	1		R/W
1762	PG41_FansNumber_Circuit1	2	0	4		R/W
1763	PG42_Fan_Enable_Inverter_Circuit1	0	0	1		R/W
1764	PG45_FansNumber_Circuit2	0	0	4		R/W
1765	PG46_Fan_Enable_Inverter_Circuit2	0	0	1		R/W
1766	HC0x_Pos_DO_Cmp[0]	1	0	14		R/W
1767	HC0x_Pos_DO_Cmp[1]	2	0	14		R/W
1768	HC0x_Pos_DO_Cmp[2]	0	0	14		R/W
1769	HC0x_Pos_DO_Cmp[3]	0	0	14		R/W
1770	HC1x_Pos_DO_Cmp_LS1[0]	0	0	12		R/W
1771	HC1x_Pos_DO_Cmp_LS1[1]	0	0	12		R/W
1772	HC1x_Pos_DO_Cmp_LS1[2]	0	0	12		R/W
1773	HC1x_Pos_DO_Cmp_LS1[3]	0	0	12		R/W
1774	HC2x_Pos_DO_Cmp_LS2[0]	0	0	12		R/W
1775	HC2x_Pos_DO_Cmp_LS2[1]	0	0	12		R/W
1776	HC2x_Pos_DO_Cmp_LS2[2]	0	0	12		R/W
1777	HC2x_Pos_DO_Cmp_LS2[3]	0	0	12		R/W
1778	HC31_Pos_AO_InvCmp1	2	0	3		R/W
1779	HC32_Pos_AO_InvCmp2	0	0	3		R/W
1780	HF0x_Pos_DO_Fan[0]	3	0	14		R/W
1781	HF0x_Pos_DO_Fan[1]	4	0	14		R/W
1782	HF0x_Pos_DO_Fan[2]	0	0	14		R/W
1783	HF0x_Pos_DO_Fan[3]	0	0	14		R/W
1784	HF31_Pos_AO_InvFan1	1	0	3		R/W
1785	HF32_Pos_AO_InvFan2	0	0	3		R/W
1786	HA01_Pos_DO_GlobalAlarm	6	0	12		R/W
1787	HA11_Pos_DO_AlarmCircuit1	0	0	12		R/W
1788	HA21_Pos_DO_AlarmCircuit2	0	0	12		R/W
1789	Hd01_Pos_DI_Remote_OnOff	0	0	10		R/W
1790	Hd02_Pos_DI_CmpSecSP	0	0	10		R/W
1791	Hd03_Pos_DI_FanSecSP	0	0	10		R/W
1792	Hd11_Pos_DI_Remote_OnOff_C1	0	0	10		R/W
1793	Hd12_Pos_DI_LiquidLevel_Circuit1	0	0	10		R/W
1794	Hd13_Pos_DI_LowPressSwitchSuction_Circuit1	0	0	10		R/W
1795	Hd14_Pos_DI_HighPressSwitchSupply_Circuit1	5	0	10		R/W

1796	Hd15_Pos_DI_CommonOilDiff_Circuit1	0	0	10		R/W
1797	Hd16_Pos_DI_CommonThermalOverloadFan_Circuit1	0	0	10		R/W
1798	Hd21_Pos_DI_Remote_OnOff_C2	0	0	10		R/W
1799	Hd22_Pos_DI_LiquidLevel_Circuit2	0	0	10		R/W
1800	Hd23_Pos_DI_LowPressSwitchSuction_Circuit2	0	0	10		R/W
1801	Hd24_Pos_DI_HighPressSwitchSupply_Circuit2	0	0	10		R/W
1802	Hd25_Pos_DI_CommonOilDiff_Circuit2	0	0	10		R/W
1803	Hd26_Pos_DI_CommonThermalOverloadFan_Circuit2	0	0	10		R/W
1804	Hd4x_Pos_DI_ThermalOverloadCmps[0]	1	0	10		R/W
1805	Hd4x_Pos_DI_ThermalOverloadCmps[1]	2	0	10		R/W
1806	Hd4x_Pos_DI_ThermalOverloadCmps[2]	0	0	10		R/W
1807	Hd4x_Pos_DI_ThermalOverloadCmps[3]	0	0	10		R/W
1808	Hd8x_Pos_DI_ThermalOverloadFans[0]	3	0	10		R/W
1809	Hd8x_Pos_DI_ThermalOverloadFans[1]	4	0	10		R/W
1810	Hd8x_Pos_DI_ThermalOverloadFans[2]	0	0	10		R/W
1811	Hd8x_Pos_DI_ThermalOverloadFans[3]	0	0	10		R/W
1812	PH20_LogicCmdInverter_Comp	0	0	1		R/W
1813	PH21_LogicCmdInverter_Fan	0	0	1		R/W

C-PRO NANO RACK and C-PRO MICRO RACK application manual
1.05 version , February 2011.
Code 144RACKNUE05.
File 144RACKNUE05.pdf.

HEADQUARTERS
Evco
Via Mezzaterra 6, 32036 Sedico Belluno ITALY
Tel. 0437-852468
Fax 0437-83648
info@evco.it
www.evco.it

FOREIGN HEADQUARTERS
Control France
155 Rue Roger Salengro, 92370 Chaville Paris FRANCE
Tel. 0033-1-41159740
Fax 0033-1-41159739
control.france@wanadoo.fr

Latin Evco
Larrea, 390 San Isidoro, 1609 Buenos Aires ARGENTINA
Tel. 0054-11-47351031
Fax 0054-11-47351031
evcolatina@anykasrl.com.ar

Pacific Evco
59 Premier Drive Campbellfield, 3061, Victoria Melbourne, AUSTRALIA
Tel. 0061-3-9357-0788
Fax 0061-3-9357-7638
everycontrol@pacific.com.au

Evco Russia
111141 Russia Moscow 2-oy Proezd Perova Polya 9
Tel. 007-495-3055884
Fax 007-495-3055884
info@evco.ru

Every Control do Brasil
Rua Marino FÈlix 256, 02515-030 Casa Verde S„o Paulo S_O PAULO BRAZIL
Tel. 0055-11-38588732
Fax 0055-11-39659890
info@everycontrol.com.br

Every Control Norden
Cementv‰gen 8, 136 50 Haninge SWEDEN
Tel. 0046-8-940470
Fax 0046-8-6053148
mail2@unilec.se

Every Control Shangai
B 302, Yinhai Building, 250 Cao Xi Road, 200235 Shangai CHINA
Tel. 0086-21-64824650
Fax 0086-21-64824649
evcosh@online.sh.cn

Every Control United Kingdom
Unit 19, Monument Business Park, OX44 7RW Chalgrowe, Oxford, UNITED KINGDOM
Tel. 0044-1865-400514
Fax 0044-1865-400419
info@everycontrol.co.uk