PROGRAMMABLE CONTROLLERS FOR SINGLE CIRCUIT, DUAL CIRCUIT AND TRIPLE CIRCUIT

COMPRESSOR PACKS
UP TO 8/12 COMPRESSORS

APPLICATION MANUAL

CODE 144RACKMGE04

Important

Please read these instructions carefully prior to installation and use, and follow all the precautions for installation and electrical connections; keep these instructions with the device for future consultation.

The device must be disposed of in accordance with local regulations pertaining to the collection of electrical and electronic appliances.

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1 GENERAL INFORMATION

1.1 Description

This application uses C-PRO MEGA and C-PRO GIGA controllers to manage a compressor packs composed of one, two or three circuits with a maximum number of 8 compressors (if using C-PRO MEGA controllers) or 12 compressors (if using C-PRO GIGA controllers).
A compressor packs control system is required to manage the compressors in order to maintain the evaporation pressure at the desired value; more specifically, it must guarantee the production of cold, for example for the preservation of foodstuffs.
Continuous generation of cold is required for this, using a process which must continue without any interruptions, except for normal maintenance operations.
The C-PRO MEGA and C-PRO GIGA controllers are dedicated to this process, managing all the components of the refrigeration circuit, maintaining the required conditions with the greatest possible efficiency (greater output = lower running costs), with optimal handling of mechanical components in order to reduce breakdowns (for example, fewer start-ups = less mechanical stress).
Two types of regulation may be selected for controlling pressure or temperature:

- Side Band
- Neutral Zone

Safety devices are managed for each circuit so as to promptly detect any malfunctions. Each safety device is associated with a particular alarm, which will be triggered in order to identify the type of fault. The outcome of certain alarms will be to shutdown the relevant mechanical devices, in order to avoid further faults; others will only indicate the fault, without having any effect on the operation of the machine.
The application has a navigable user interface, by means of which it is possible to define and set all configuration and operational parameters. The user interface is subdivided into four main levels:

- User
- Service
- Installer
- System builder

Each level is protected by a separate password. At the system builder level, the user interface displays a series of modifiable configuration screens (wizards) allowing easy setting of the number of circuits, compressors, fans and the corresponding safety devices used for the protection of the mechanical devices. There are also several free-access pages, not password protected, for checking the operational status of the system at that particular time.
In addition to the aforementioned four levels, there is also a Clock menu (for setting the parameters associated with the system RTC, such as for example those related to management of the time bands for variation of the setpoints).
The versions have an integrated 4 x 20 character alphanumeric display, keypad and warning LEDs.
Each version has an optoisolated RS-485 port (for connection to the RICS or other BMS supervision system) and a non-optoisolated CAN port (for connection to I/O expansion unit).

C-PRO MEGA

C-PRO GIGA

2 APPLICATIONS

Using the CAN protocol, it is possible to connect an 8 relay (C-PRO EXP MEGA) or 13 relay (C-PRO EXP GIGA) expansion module to the controllers.

Management of four different types of control unit is envisaged:

1) **Application 1: C-PRO MEGA RACK (for single circuit control units; C-PRO MEGA RACK preset configuration)**
   Total No. of digital outputs = 8
   Total No. of digital inputs = 10
   Total No. of analogue inputs = 8
   Total No. of analogue outputs = 4

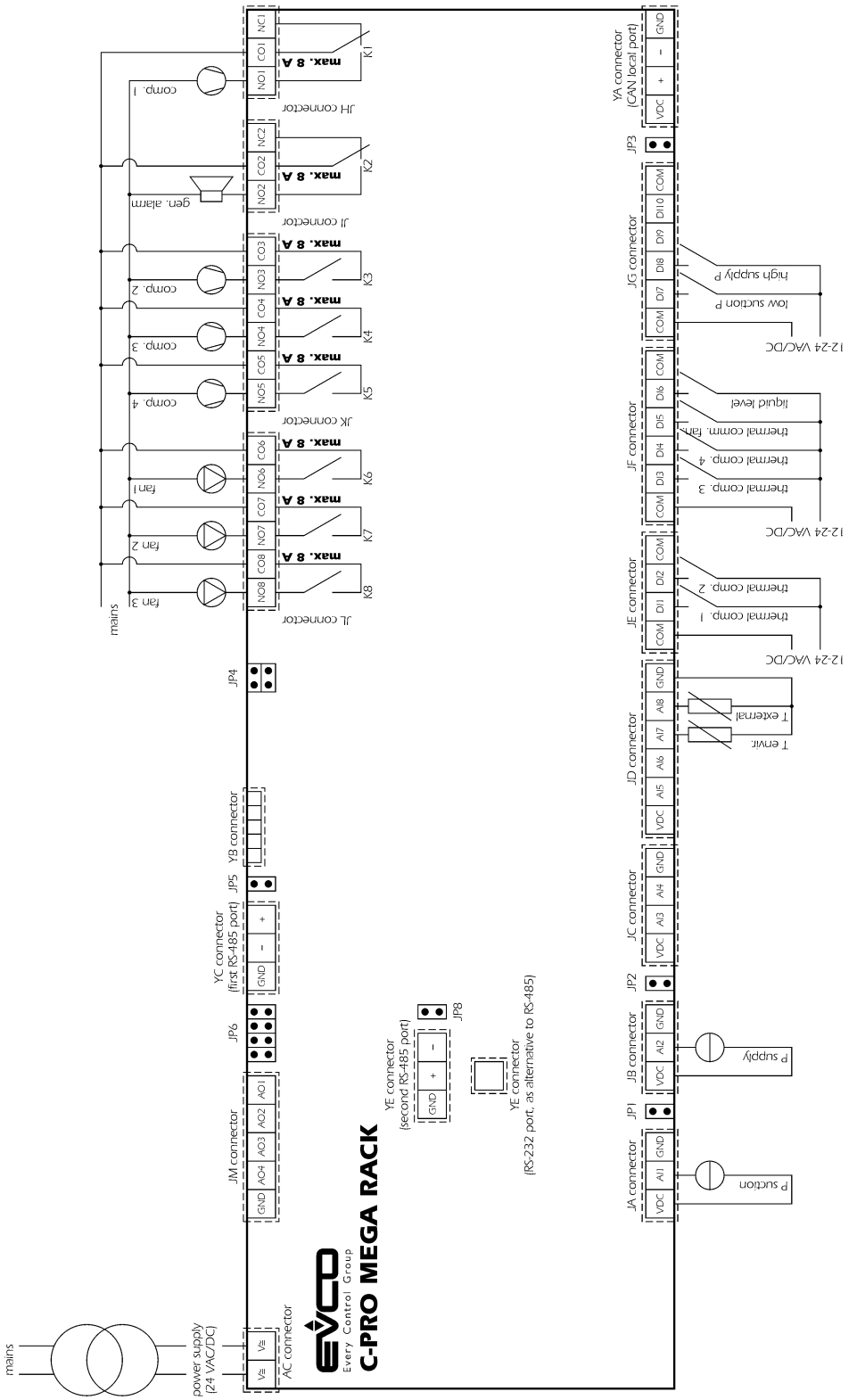
2) **Application 2: C-PRO GIGA RACK (for dual circuit control units; preset configuration)**
   Total No. of digital outputs = 13
   Total No. of digital inputs = 12
   Total No. of analogue inputs = 8
   Total No. of analogue outputs = 4

3) **Application 3: C-PRO MEGA RACK + C-PRO EXP MEGA (*e.g.* for dual circuit control units)**
   Total No. of digital outputs = 8 + 8 = 16
   Total No. of digital inputs = 10 + 8 = 18
   Total No. of analogue inputs = 8 +4 = 12
   Total No. of analogue outputs = 4

4) **Application 4: C-PRO GIGA RACK + C-PRO EXP GIGA (*e.g.* for dual circuit control units)**
5) Total No. of digital outputs = 13 +13 = 26
   Total No. of digital inputs = 12 +10 = 22
   Total No. of analogue inputs = 8 +4 = 12
   Total No. of analogue outputs = 4

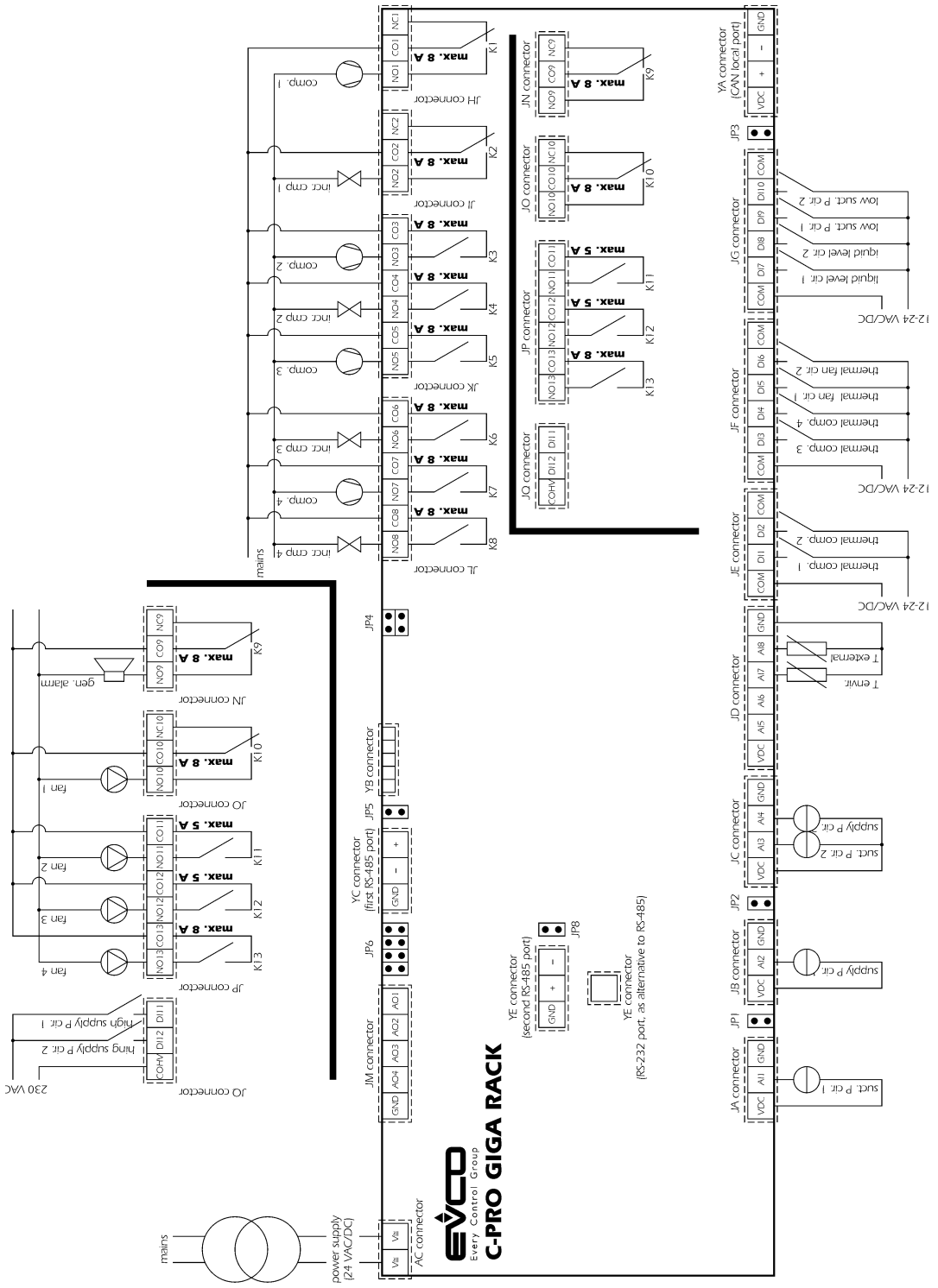
2.1 Application 1: use of the C-PRO MEGA RACK (single circuit control unit)

As a preset configuration, the C-PRO MEGA RACK is configured to manage single circuit compressor packs; the services mentioned in the figure below refer specifically to the preset configurations.



2.2 Application 2: use of the C-PRO GIGA RACK (dual circuit control unit with separate condensation)

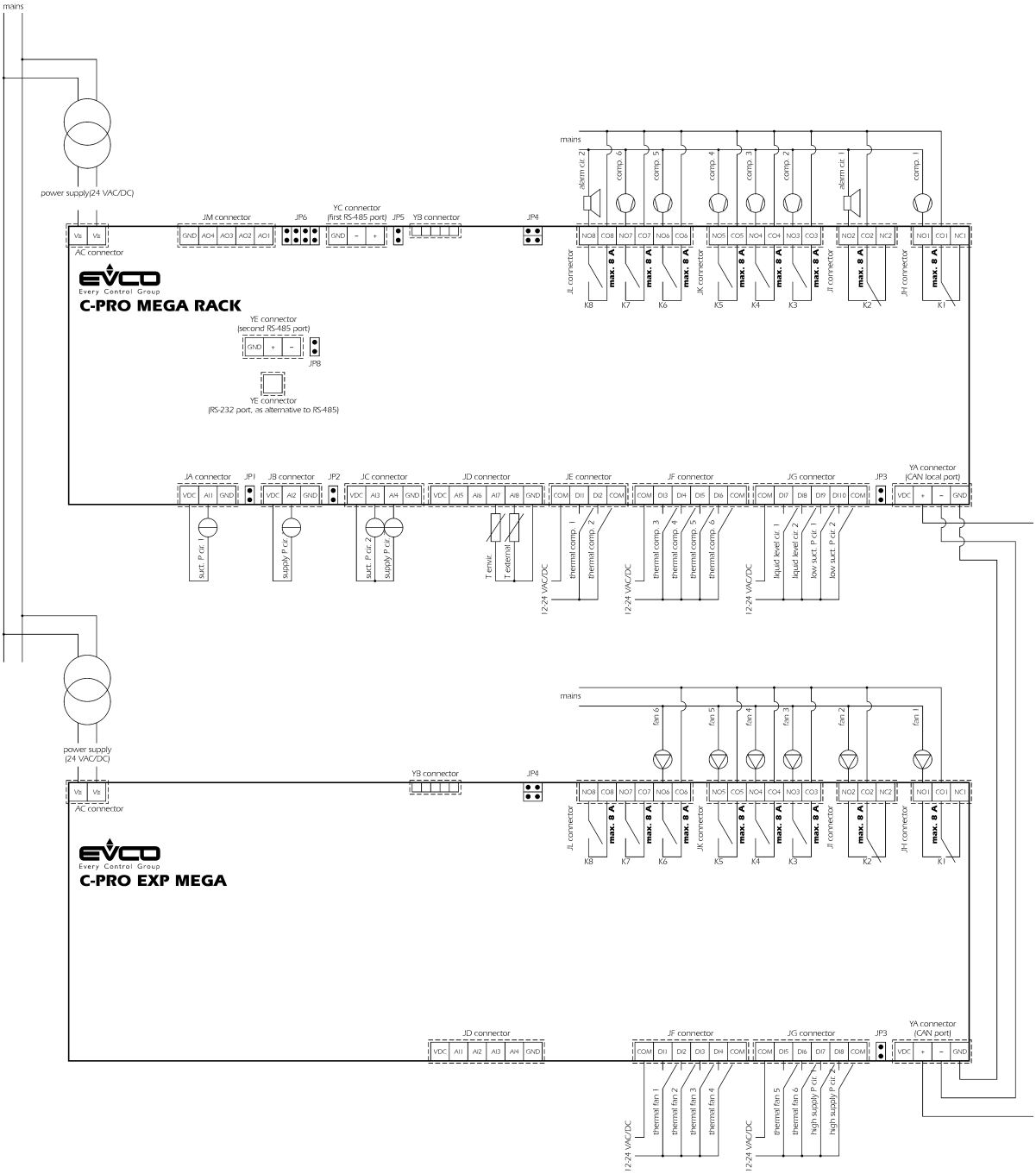
The C-PRO GIGA RACK is pre-configured to control dual circuit compressor packs; the services mentioned in the figure below refer precisely to the preset configurations.



Compressors 1 and 2 (and related load increments) appertain to circuit 1; compressors 3 and 4 (and related load increments) appertain to circuit 2.
Fans 1 and 2 appertain to circuit 1; fans 3 and 4 appertain to circuit 2.

2.3 Application 3: use of the C-PRO MEGA RACK with the C-PRO EXP MEGA I/O expansion unit (dual circuit control unit with separate condensation)

The C-PRO MEGA RACK is pre-configured to control single circuit compressor packs; the services mentioned in the figure below refer to an example of a dual circuit control unit with separate condensation.

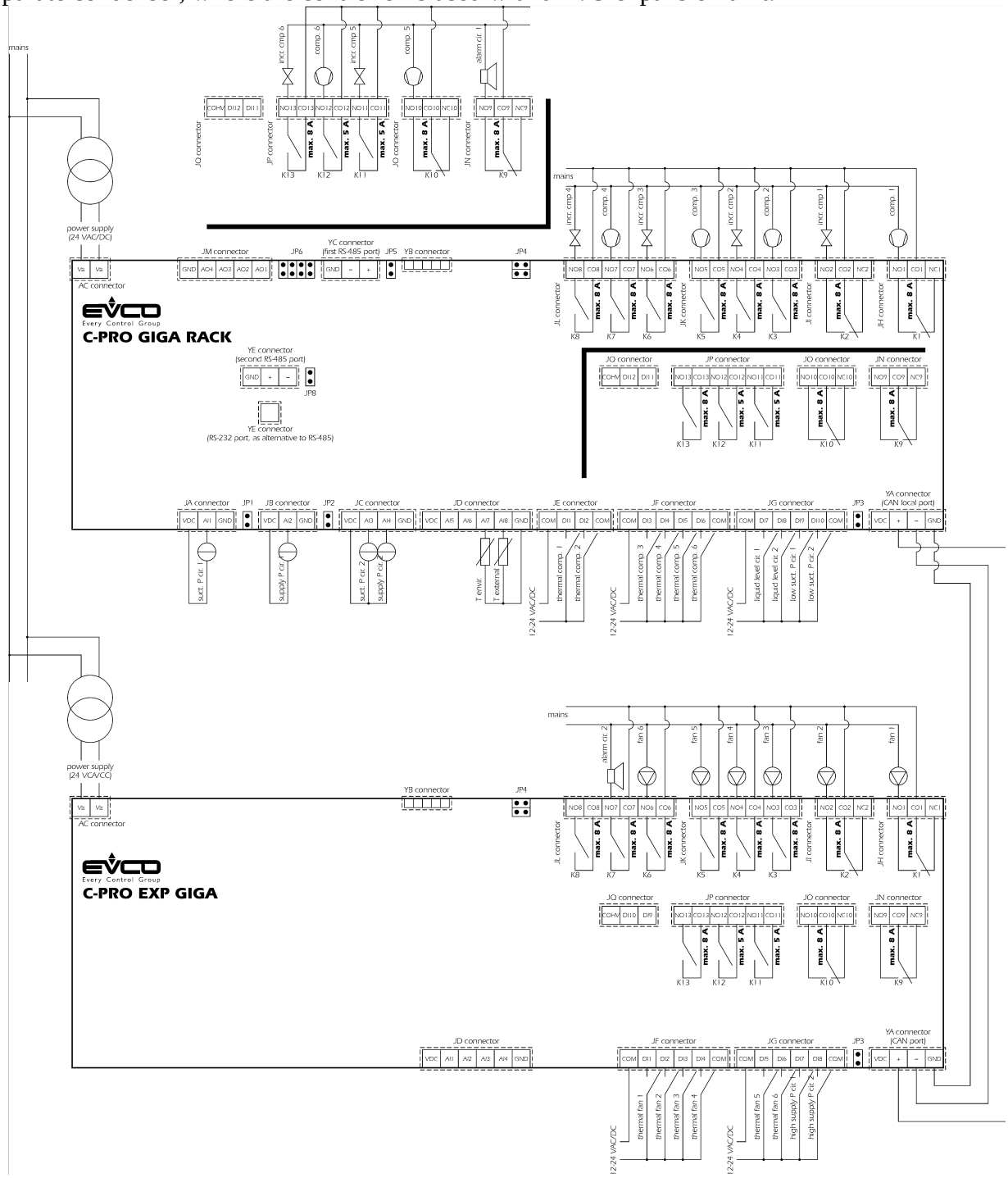


Compressors 1, 2 and 3 appertain to circuit 1; compressors 4, 5 and 6 appertain to circuit 2.
Fans 1, 2 and 3 appertain to circuit 1; fans 4, 5 and 6 appertain to circuit 2.

The C-PRO MEGA RACK and C-PRO EXP MEGA power supplies must be galvanically isolated from one another.

2.4 Application 4: use of the C-PRO GIGA RACK with the C-PRO EXP GIGA I/O expansion unit (dual circuit control unit with separate condensation)

The C-PRO GIGA RACK is factory pre-configured to control dual circuit compressor packs; the services mentioned in the figure below refer to an example of a dual circuit control unit with separate condenser, where the controller is used with an I/O expansion unit.



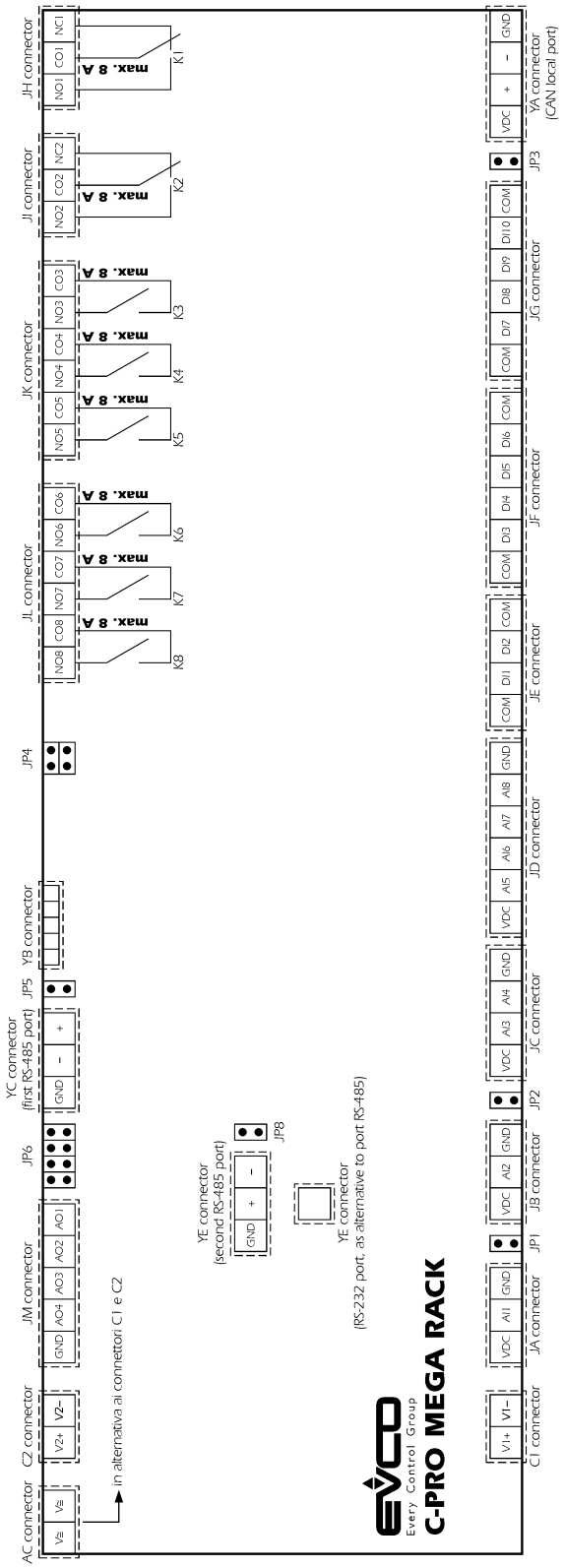
Compressors 1, 2 and 3 appertain to circuit 1; compressors 4, 5 and 6 appertain to circuit 2.
Fans 1, 2 and 3 appertain to circuit 1; fans 4, 5 and 6 appertain to circuit 2.

The C-PRO GIGA RACK and C-PRO EXP GIGA power supplies must be galvanically isolated from one another.

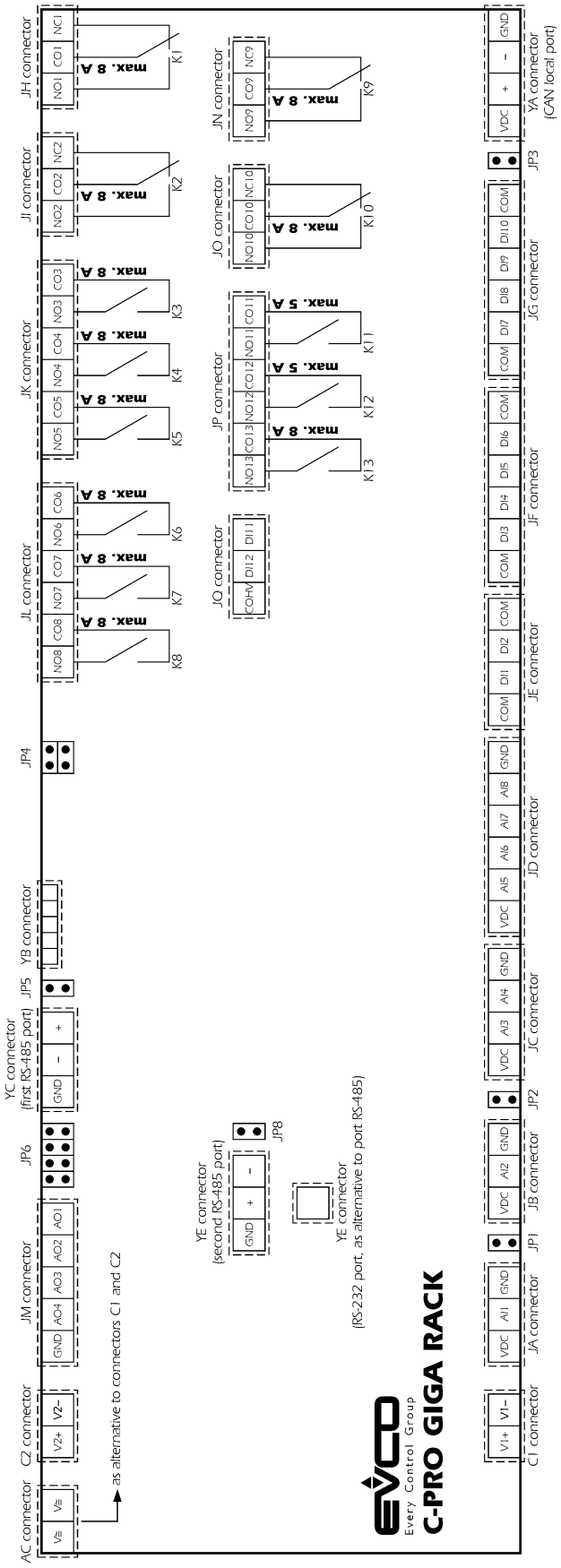
2.5 Controller electrical connections

The layout relating to the controllers electrical connections is shown below, with tables listing the meanings of the inputs and outputs.

2.5.1 C-PRO MEGA RACK electrical connections



2.5.2 C-PRO GIGA RACK electrical connections



2.5.3 Input and output identification tables

Card with 12 VDC + 12 VDC dual power supplies

Conn.	Abbrev.	Description
C1-1	VCC	main card power supply input (+13 VDC)
C1-2	GND	main power supply reference
JA-1	VDC	active probe power supply (*1)
JA-2	AI 1	No.1 universal analogue input (NTC, PTC, 0..5V, 0..10V, 0..20 mA, 4..20 mA)
JA-3	GND	analogue input common ground
JB-1	VDC	active probe power supply (*1)
JB-2	AI 2	No.2 universal analogue input (NTC, PTC, 0..5V, 0..10V, 0..20 mA, 4..20 mA)
JB-3	GND	analogue input common ground
JC-1	VDC	active probe power supply (*1)
JC-2	AI 3	No.3 configurable analogue input (NTC, 0..20 mA, 4..20 mA)
JC-3	AI 4	No.4 configurable analogue input (NTC, 0..20 mA, 4..20 mA)
JC-4	GND	analogue input common ground
JD-1	VDC	active probe power supply (*1)
JD-2	AI 5	No.5 configurable analogue input (NTC, 0..20 mA, 4..20 mA)
JD-3	AI 6	No.6 configurable analogue input (NTC, 0..20 mA, 4..20 mA)
JD-4	AI 7	No.7 configurable analogue input (NTC, 0..20 mA, 4..20 mA)
JD-5	AI 8	No.8 configurable analogue input (NTC, 0..20 mA, 4..20 mA)
JD-6	GND	analogue input common ground
JE-1	COM	digital input common connection
JE-2	DI 1	No.1 digital input 12-24 VAC/DC
JE-3	DI 2	No.2 digital input 12-24 VAC/DC
JE-4	COM	digital input common connection
JF-1	COM	digital input common connection
JF-2	DI 3	No.3 digital input 12-24 VAC/DC
JF-3	DI 4	No.4 digital input 12-24 VAC/DC
JF-4	DI 5	No.5 digital input 12-24 VAC/DC
JF-5	DI 6	No.6 digital input 12-24 VAC/DC
JF-6	COM	digital input common connection
JG-1	COM	digital input common connection
JG-2	DI 7	No.7 digital input 12-24 VAC/DC
JG-3	DI 8	No.8 digital input 12-24 VAC/DC
JG-4	DI 9	No.9 digital input 12-24 VAC/DC
JG-5	DI 10	No.10 digital input 12-24 VAC/DC
JG-6	COM	digital input common connection
YA-1	VDC	power supply output connector (12 VDC)
YA-2	CAN1+	connector for connecting the LOCAL CAN serial port (CAN+)
YA-3	CAN1-	connector for connecting the LOCAL CAN serial port (CAN-)
YA-4	GND	power supply reference output connector (ground)
JH-1	NC 1	relay No. 1 contact normally closed
JH-2	COM 1	relay No. 1 common connection
JH-3	NO 1	relay No. 1 contact normally open
JI-1	NC 2	relay No. 2 contact normally closed
JI-2	COM 2	relay No. 2 common connection
JI-3	NO 2	relay No. 2 contact normally open
JK-1	COM 3	relay No. 3 common connection
JK-2	NO 3	relay No. 3 contact normally open

Conn.	Abbrev.	Description
JK-3	COM 4	relay No. 4 common connection
JK-4	NO 4	relay No. 4 contact normally open
JK-5	COM 5	relay No. 5 common connection
JK-6	NO 5	relay No. 5 contact normally open
JL-1	COM 6	relay No. 6 common connection
JL-2	NO 6	relay No. 6 contact normally open
JL-3	COM 7	relay No. 7 common connection
JL-4	NO 7	relay No. 7 contact normally open
JL-5	COM 8	relay No. 8 common connection
JL-6	NO 8	relay No. 8 contact normally open
YB	PRG	not used
YC-1	RS485+	connector for connecting the RS485 serial port (RS485+)
YC-2	RS485-	connector for connecting the RS485 serial port (RS485-)
YC-3	GND	connector for connecting the RS485 serial port (ground)
JM-1	AO 1	No. 1 analogue output (0,5 .. 10 V / 0 .. 20 mA / 4 .. 20 mA)
JM-2	AO 2	No. 2 analogue output (0,5 .. 10 V / 0 .. 20 mA / 4 .. 20 mA)
JM-3	AO 3	No. 3 analogue output (0,5 .. 10 V / 0 .. 20 mA / 4 .. 20 mA)
JM-4	AO 4	No. 4 analogue output (0,5 .. 10 V / 0 .. 20 mA / 4 .. 20 mA)
JM-5	GND	analogue output common ground
C2-1	VCC*	serial port and optoisolated analogue output secondary power supply input (+15 VDC)
C2-2	GND*	secondary power supply reference

* VDC=12.5 V Imax=200 mA (as the sum of the current for all VDC terminals).

Card with 24 VAC/DC power supply

Conn.	Abbrev.	Description
CA-1	VCC	main card power supply input (23 V AC/DC)
CA-2	VCC	main card power supply input (23 V AC/DC)

Warning:

With reference to the “Power supply” entries, the secondary power supply feeds the following services:

- the analogue outputs
- the standard RS-485 port
- the optional RS-485 port (or RS-232 port).

So that these services are optoisolated, the main power supply and the secondary power supply must be galvanically isolated from one another.

If the controller is powered with 24 VAC/DC (*i.e.* by means of the connector hereinafter referred to as CA), the following services will not be optoisolated:

- the analogue outputs
- the standard RS-485 port
- the optional RS-485 port (or RS-232 port).

Other connectors (not present on the C-PRO MEGA RACK controller)

Conn.	Abbrev.	Description
JN-1	NC 9	relay No. 9 contact normally closed
JN-2	COM 9	relay No. 9 common connection
JN-3	NO 9	relay No. 9 contact normally open
JO-1	NC 10	relay No. 10 contact normally closed
JO-2	COM10	relay No. 10 common connection
JO-3	NO 10	relay No. 10 contact normally open
JP-1	COM11	relay No. 11 common connection
JP-2	NO 11	relay No. 11 contact normally open
JP-3	COM12	relay No. 12 common connection
JP-4	NO 12	relay No. 12 contact normally open
JP-5	COM13	relay No. 13 common connection
JP-6	NO 13	relay No. 13 contact normally open
JQ-1	DI11	No. 11 digital input 230 VAC
JQ-2	DI12	No. 12 digital input 230 VAC
JQ-3	CONHV	digital input common connection 230 VAC

Second RS-485 port (on request)

Conn.	Abbrev.	Description
YE-1	RS485-	RS 485 - connector for connecting to supervision system
YE-2	RS485+	RS 485 + connector for connecting to supervisor system
YE-3	GND	GND connector for connecting to supervision system, via RS485

RS-232 port (available on request, as an alternative to the second RS-485 port)

Conn.	Abbrev.	Description
YF-1	5Vdc	RS 232 9 pole connector -
YF-2	Tx	RS 232 9 pole connector - Transmission Signal
YF-3	Rx	RS 232 9 pole connector - Reception Signal
YF-4	DTR/DSR	RS 232 9 pole connector -
YF-5	GND	RS 232 9 pole connector -
YF-6	DTR/DSR	RS 232 9 pole connector -
YF-7	RTS	RS 232 9 pole connector -
YF-8	CTS	RS 232 9 pole connector -

Jumper and LED meanings

JMP1	AI1 analogue input selection	
	Jumper not inserted	0 – 10 V input
	Jumper inserted	0 – 5 V, 0 – 20 mA, 4 – 20 mA, NTC, PTC input

JMP2	AI2 analogue input selection	
	Jumper not inserted	0..10 V input
	Jumper inserted	0 – 5 V, 0 – 20 mA, 4 – 20 mA, NTC, PTC input

JMP3	CAN terminator	
	Jumper not inserted	Termination (120?) not inserted
	Jumper inserted	Termination (120?) inserted

JMP4	Local CAN serial port baud rate selection	
 A  B	Jumper A inserted Jumper B inserted	Baud rate = 20K
 A  B	Jumper A inserted Jumper B not inserted	Baud rate = 50K
 A  B	Jumper A not inserted Jumper B inserted	Baud rate = 125K
 A  B	Jumper A not inserted Jumper B not inserted	Baud rate = 500K

JMP5	RS-485 terminator	
	Jumper not inserted	Termination (120?) not inserted
	Jumper inserted	Termination (120?) inserted

JMP6	Analogue output selection	
 A  B  C  D	Jumper A inserted Jumper B inserted Jumper C inserted Jumper D inserted	Output AO1 under current Output AO2 under current Output AO3 under current Output AO4 under current
 A  B  C  D	Jumper A not inserted Jumper B not inserted Jumper C not inserted Jumper D not inserted	Output AO1 under tension Output AO2 under tension Output AO3 under tension Output AO4 under tension

PLEASE NOTE:

It is not sufficient to merely set the jumper to configure the signal distributed by the analogue output, the controller machine parameters must also be set (see the chapter “Configuration of the signal distributed by the analogue output” in the Hardware Manual).

2.6 Preset configurations

The controller preset configurations are reported below.

2.6.1 C-PRO MEGA RACK preset configurations (single circuit compressor packs)

Analogue inputs	Digital outputs	Digital inputs
Suction probe	4 Compressors	4 compressor thermals
Supply probe	3 Fans	Fan thermal common connections
	1 global alarm relay	Fluid level
		Low pressure pressure-switch
		High pressure pressure-switch

Input/output configuration

Terminal	Analogue input	Description
AI1	No. 1 analogue input (4..20 mA)	Suction probe
AI2	No. 2 analogue input (4..20 mA)	Supply probe

Terminal	Analogue output	Description
By default – not configured		

Terminal	Digital input	Description
DI1	No. 1 digital input	Compressor 1 thermal
DI2	No. 2 digital input	Compressor 2 thermal
DI3	No. 3 digital input	Compressor 3 thermal
DI4	No. 4 digital input	Compressor 4 thermal
DI5	No. 5 digital input	Fan thermal common connection
DI6	No. 6 digital input	Fluid level
DI7	No. 7 digital input	Low pressure (suction) pressure-switch
DI8	No. 8 digital input	High pressure (supply) pressure-switch

Terminal	Digital output	Description
DO1	No. 1 digital output	Compressor 1
DO2	No. 2 digital output	Global alarm relay
DO3	No. 3 digital output	Compressor 2
DO4	No. 4 digital output	Compressor 3
DO5	No. 5 digital output	Compressor 4
DO6	No. 6 digital output	Fan 1
DO7	No. 7 digital output	Fan 2
DO8	No. 8 digital output	Fan 3

2.6.2 C-PRO GIGA RACK preset configurations (dual circuit compressor packs)

Analogue inputs	Digital outputs	Digital inputs
Suction probe C1	2 Compressors C1	4 compressor thermals
Supply probe C1	2 Compressors C2	Fan thermal common connection C1
Suction probe C2	1 compressor increment	Fan thermal common connection C2
Supply probe C2	2 Fans C1	Fluid level C1
	2 Fans C2	Fluid level C2
	1 global alarm relay	Low pressure pressure-switch C1
		Low pressure pressure-switch C2
		High pressure pressure-switch C1
		High pressure pressure-switch C2

Input/output configuration

Terminal	Analogue input	Description
AI 1	No. 1 analogue input (4..20 mA)	Suction probe C1
AI 2	No. 2 analogue input (4..20 mA)	Supply probe C1
AI 3	No. 3 analogue input (4..20 mA)	Suction probe C2
AI 4	No. 4 analogue input (4..20 mA)	Supply probe C2

Terminal	Analogue output	Description
By default – not configured		

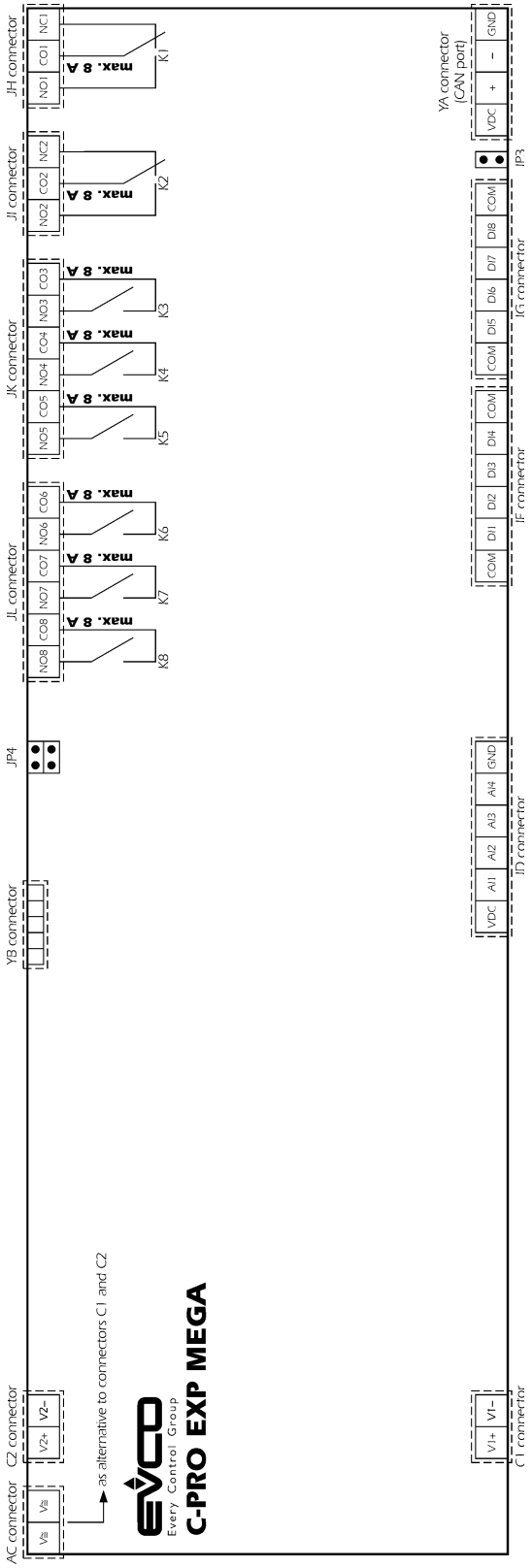
Terminal	Digital input	Description
DI 1	No. 1 digital input	Compressor 1 thermal
DI 2	No. 2 digital input	Compressor 2 thermal
DI 3	No. 3 digital input	Compressor 3 thermal
DI 4	No. 4 digital input	Compressor 4 thermal
DI 5	No. 5 digital input	Fan thermal common connection C1
DI 6	No. 6 digital input	Fan thermal common connection C2
DI 7	No. 7 digital input	Fluid level C1
DI 8	No. 8 digital input	Fluid level C2
DI 9	No. 9 digital input	Low pressure (suction) pressure-switch C1
DI 10	No. 10 digital input	Low pressure (suction) pressure-switch C2
DI 11	No. 11 digital input	High pressure (supply) pressure-switch C1
DI 12	No. 12 digital input	High pressure (supply) pressure-switch C2

Terminal	Digital output	Description
DO 1	No. 1 digital output	Compressor 1
DO 2	No. 2 digital output	Increment 1 compressor 1
DO 3	No. 3 digital output	Compressor 2
DO 4	No. 4 digital output	Increment 1 compressor 2
DO 5	No. 5 digital output	Compressor 3
DO 6	No. 6 digital output	Increment 1 compressor 3
DO 7	No. 7 digital output	Compressor 4
DO 8	No. 8 digital output	Increment 1 compressor 4
DO 9	No. 9 digital output	Global alarm relay
DO 10	No. 10 digital output	Fan 1
DO 11	No. 11 digital output	Fan 2
DO 12	No. 12 digital output	Fan 3
DO 13	No. 13 digital output	Fan 4

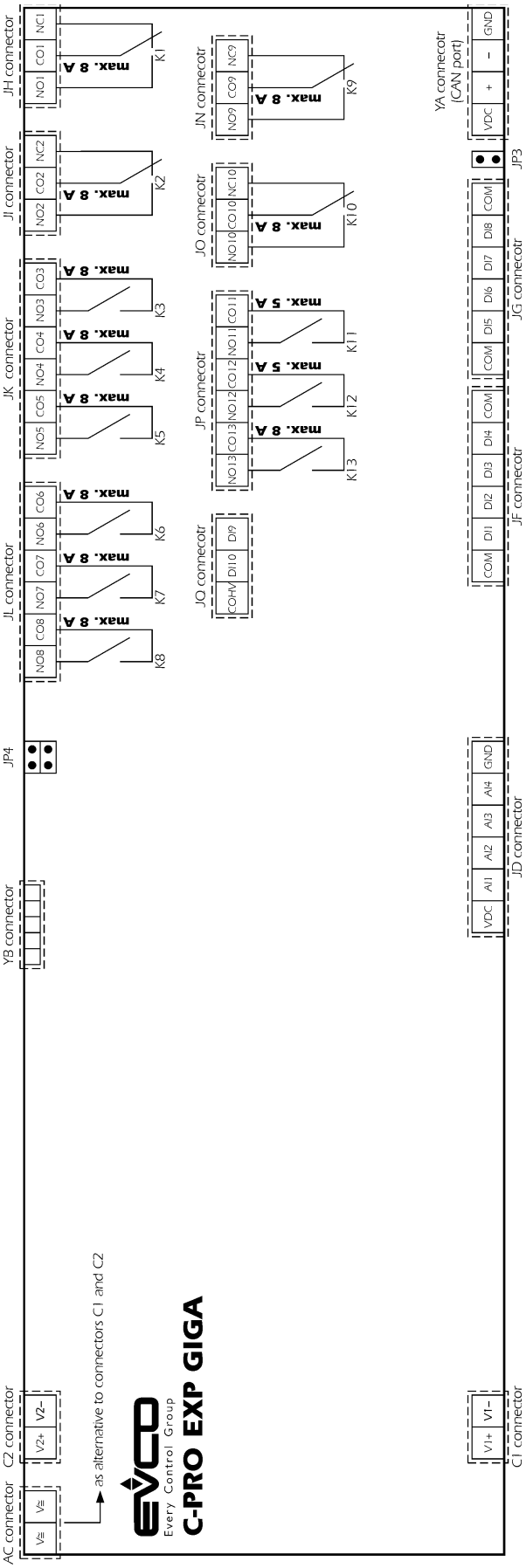
2.7 I/O expansion unit electrical connections

The layout relating to the expansion unit electrical connections is shown below, with tables listing the meanings of the inputs and outputs.

2.7.1 C-PRO EXP MEGA electrical connections



2.7.2 C-PRO EXP GIGA electrical connections



2.7.3 Input and output identification tables

Card with 12 VDC power supply

Conn.	Abbrev.	Description
C1-1	VCC	card power supply input (+13 V DC)
C1-2	GND	power supply reference
JD-1	VDC	active probe power supply (*1)
JD-2	AI1	No.1 configurable analogue input (NTC, 0..20 mA, 4..20 mA)
JD-3	AI2	No.2 configurable analogue input (NTC, 0..20 mA, 4..20 mA)
JD-4	AI3	No.3 configurable analogue input (NTC, 0..20 mA, 4..20 mA)
JD-5	AI4	No.4 configurable analogue input (NTC, 0..20 mA, 4..20 mA)
JD-6	GND	analogue input common ground
JF-1	COM	digital input common connection
JF-2	DI1	No.1 digital input 12-24 VAC/DC
JF-3	DI2	No.2 digital input 12-24 VAC/DC
JF-4	DI3	No.3 digital input 12-24 VAC/DC
JF-5	DI4	No.4 digital input 12-24 VAC/DC
JF-6	COM	digital input common connection
JG-1	COM	digital input common connection
JG-2	DI5	No.5 digital input 12-24 VAC/DC
JG-3	DI6	No.6 digital input 12-24 VAC/DC
JG-4	DI7	No.7 digital input 12-24 VAC/DC
JG-5	DI8	No.8 digital input 12-24 VAC/DC
JG-6	COM	digital input common connection
YA-1	VDC	power supply output connector (12 VDC)
YA-2	CAN1+	connector for connecting the CAN serial port (CAN+)
YA-3	CAN1-	connector for connecting the CAN serial port (CAN-)
YA-4	GND	power supply output reference connector (ground)
JH-1	NC 1	relay No. 1 contact normally closed
JH-2	COM 1	relay No. 1 common connection
JH-3	NO 1	relay No. 1 contact normally open
JI-1	NC 2	relay No. 2 contact normally closed
JI-2	COM 2	relay No. 2 common connection
JI-3	NO 2	relay No. 2 contact normally open
JK-1	COM 3	relay No. 3 common connection
JK-2	NO 3	relay No. 3 contact normally open
JK-3	COM 4	relay No. 4 common connection
JK-4	NO 4	relay No. 4 contact normally open
JK-5	COM 5	relay No. 5 common connection
JK-6	NO 5	relay No. 5 contact normally open
JL-1	COM 6	relay No. 6 common connection
JL-2	NO 6	relay No. 6 contact normally open
JL-3	COM 7	relay No. 7 common connection
JL-4	NO 7	relay No. 7 contact normally open
JL-5	COM 8	relay No. 8 common connection
JL-6	NO 8	relay No. 8 contact normally open
YB	PRG	not used
C2-1	VCC	not used
C2-2	GND	not used

* VDC=12.5 V Imax = 200 mA (as the sum of the current values for all VDC terminals).

Card with 24 V AC/DC power supply

Conn.	Abbrev.	Description
CA-1	VCC	card power supply input (24 VAC/DC)
CA-2	VCC	card power supply input (24 VAC/DC)

Other connectors (not present on the C-PRO EXP MEGA expansion unit)

Conn.	Abbrev.	Description
JN-1	NC 9	relay No. 9 contact normally closed
JN-2	COM 9	relay No. 9 common connection
JN-3	NO 9	relay No. 9 contact normally open
JO-1	NC 10	relay No. 10 contact normally closed
JO-2	COM10	relay No. 10 common connection
JO-3	NO 10	relay No. 10 contact normally open
JP-1	COM11	relay No. 11 common connection
JP-2	NO 11	relay No. 11 contact normally open
JP-3	COM12	relay No. 12 common connection
JP-4	NO 12	relay No. 12 contact normally open
JP-5	COM13	relay No. 13 common connection
JP-6	NO 13	relay No. 13 contact normally open
JQ-1	DI9	No. 9 digital input 230 VAC
JQ-2	DI10	No. 10 digital input 230 VAC
JQ-3	CONHV	digital input common connection 230 VAC

Jumper and LED meanings

JMP3	CAN terminator	
	Jumper not inserted	Termination (120?) not inserted
	Jumper inserted	Termination (120?) inserted

JMP4	Local CAN serial port baud rate selection	
 A  B	Jumper A inserted Jumper B inserted	Baud rate = 20K
 A  B	Jumper A inserted Jumper B not inserted	Baud rate = 50K
 A  B	Jumper A not inserted Jumper B inserted	Baud rate = 125K
 A  B	Jumper A not inserted Jumper B not inserted	Baud rate = 500K

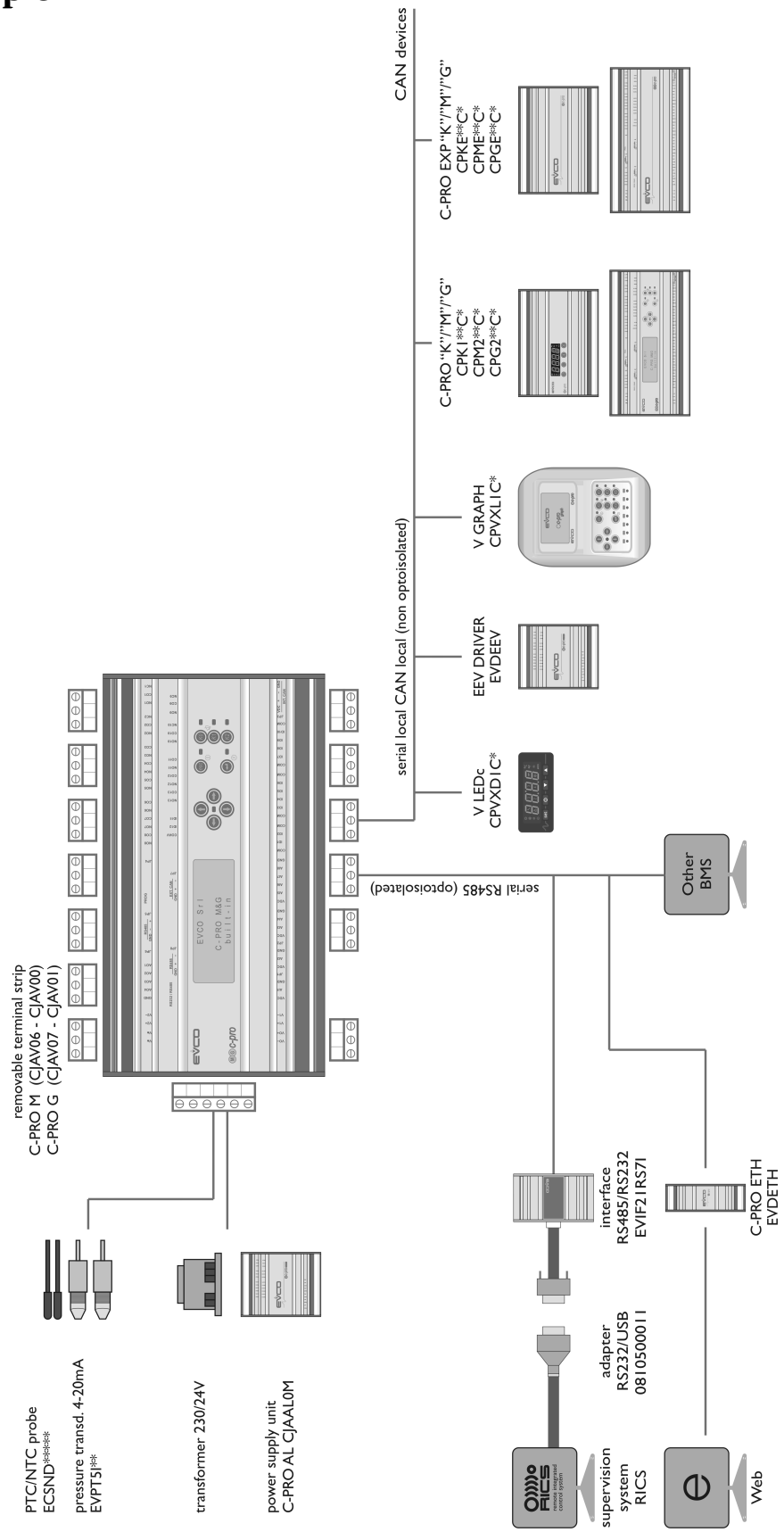
PLEASE NOTE:

The C-PRO MEGA RACK and the C-PRO GIGA RACK are configured by default to be able to work with an expansion unit (with standard configuration) and with a user interface (with standard

configuration) by simply connecting the network components. For further information please refer to the chapter “CAN connection” in the Hardware Manual.

3 COMPONENT NETWORK AND ACCESSORIES

3.1 Example



4 USER INTERFACE

4.1 Display and keypad

For the application there is an interface integrated with the controller (hereinafter referred to as "built-in").
It has a 4x20 character alphanumeric display, offer a range of keys for navigation/editing pages and several LEDs for viewing certain associated events.

The keypad has 6 page navigation and value editing keys with the following functions:

- UP and DOWN: alters the parameters in editing mode; otherwise, it is used for moving the cursor

- LEFT and RIGHT: displays the screens in succession

- ENTER: confirms the value displayed in editing mode; otherwise, it runs any commands associated with the text at the cursor point. If pressed for approx. 2 seconds while viewing an alarm page, it allows the alarm to be reset. If viewing the alarm pages, each press scrolls through the active alarms.

- ESC: cancels the present value if in editing mode; otherwise, it recalls any default page associated with the current page. If the ESC key is pressed and held for approx. 2 seconds, it allows the machine to be switched on/off.

There are also an additional 3 function keys:

- K0 = ALL: enters the alarm pages if pressed and held for approx. 2 seconds. Pressing mutes the buzzer.

- K1: not used

- K2: enters the application clock menu.

There are also 3 LEDs:

- L0 — associated with the K0 key, identifies whether there are any alarms.
  Off: there are no alarms.
  Flashing slowly: indicates the presence of new alarms
  Flashing rapidly: indicates that alarm pages are being viewed.
  On: all active alarms have been viewed

- L2 — associated with the K2 key, identifies the status of the RTC and the time bands:
  Off: no signals.
  Flashing rapidly: indicates there is an ERTC clock alarm.
  Flashing slowly: indicates that the compressor or fan setpoint is changed within the time bands.
  On: indicates that the compressor and fan setpoint are both changed within the time bands.

- LEsc — associated with the ESC key, identifies the status of the machine:
  Off: machine off
  On: machine on
  Flashing slowly: machine switched off by digital input
  Flashing rapidly: machine switched off by supervisor system.

4.2 Page list

This section will introduce the application's main pages and menus. As already mentioned, the main menu is subdivided into four levels: user, service, installer and system builder, plus a menu for managing the functions associated with the system clock and certain free-access pages.
The menu structure is as follows:

- Clock menu
- General menu
  - User menu (Level 1, level 1 password)
  - Service menu (Level 2, level 2 password)
    - Service menu – operations branch
    - Service menu – manual branch
    - Service menu - input/output branch
  - Installer menu (Level 3, level 3 password)
    - Installer menu - settings branch
    - Installer menu – compressor branch
    - Installer menu fans branch
    - Installer menu - safety devices branch
    - Installer menu - miscellaneous branch
  - System builder menu (Level 4, level 4 password)
    - System builder menu – systems branch (configuration wizards)
    - System builder menu – hardware branch
    - Installer menu – parameters branch

Password

Each menu (besides the clock menu which is always accessible) is associated with a level which affects accessibility.
Each level also has an associated password allowing access to the various functions present in that specific menu. Once the correct password has been entered, the protected functions will be accessible. Correctly entering a password has two effects:

- it unlocks the associated level
- it unlocks the sub-levels

Each level password may be altered from the level itself or from superior levels. For example, from the system builder level, all the passwords for the underlying levels will be modifiable by using the appropriate page.
Here is an example from the system builder menu password page.

The range of permissible values for passwords is: -999 / 9999.
If no actions are executed within the current page, then after 4 minutes, the inserted password expires, and it is necessary to insert it once more.

Clock menu

This menu contains the functions associated with the system RTC:

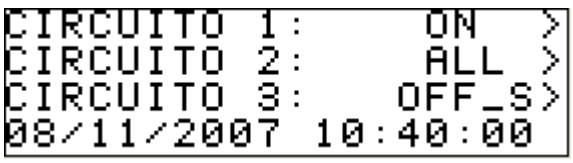
- setting the clock
- enabling the compressor/fan time bands
- setting the time bands
- setting the offsets to the main setpoints for each time band

This menu is not password-protected, and may be accessed by pressing the K2 key on the user interface for approx. 2 seconds.

Status pages

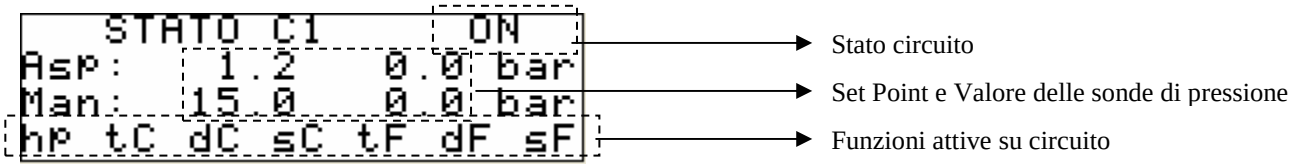
There are pages that are not password-protected and may accessed and browsed by simply using the LEFT and RIGHT keys.
These pages display the status of the circuits, compressors, inverters, probes, the power supplied and requested, and other general information. These pages cannot be edited.

When the machine is on and running, the main page is the following:



from which it is possible to access the status pages for the individual circuits, by pressing ENTER at the ">" for the corresponding circuit, or by navigating using the LEFT and RIGHT keys, it is possible to view the status of the compressors, fans and inverters.

The first page for each circuit:



contains information on the circuit's current status and active functions:

hp:	refrigeration power increments
tC:	Compressor time band function
dC:	Compressor set point variation from a digital input
sC:	Compressor set point variation by supervisor system
tF	Fan time band function
dF:	Fan set point variation from a digital input
sF:	Fan set point variation by supervisor system

The function is active if the relevant code is visible on the page.

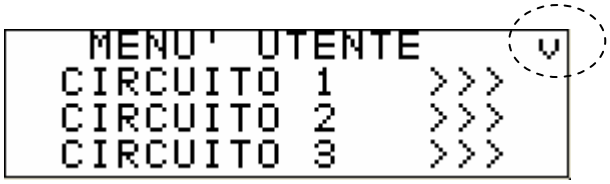
General menu

The general menu has no level, and is the access point for all other system menus.

It is possible to view this menu, from any point within the user interface, by pressing and holding the ENTER key for approx. 2 seconds. From this page, it is possible to select into which menu to move by moving the "screen highlight" above the indicators ">>>" and pressing the ENTER key for conformation.
Pressing the ESC key within this menu returns to the default start page if the machine is on, or the OFF page if the machine is switched off.

User menu

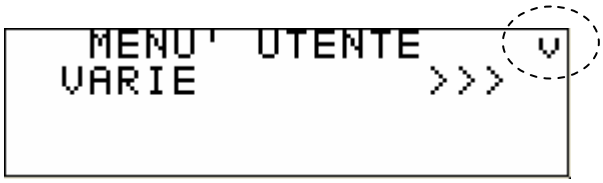
The user menu is a level 1 menu, *i.e.* it is necessary to insert the user level password, or higher, in order to be able to view/modify the parameters in this branch.



It is possible to select which circuit to access in order to modify the setpoints and the secondary setpoint offset, or to set several general configuration parameters in the "Miscellaneous" section.

Within this page, as may be seen from the figure, a **"v"** character is displayed in the top right of the screen. This is not an error, but a sign to indicate to the user that the page information continues, *i.e.* pressing the DOWN (or UP depending on where the screen highlight is) key moves to the content

not yet visible on the page itself. In this specific case, once the screen highlight is on the third circuit line, pressing DOWN moves the display to the next screen:



Service menu

The user menu is a level 2 menu, *i.e.* it is necessary to insert the service level password, or higher, in order to be able to view/modify the parameters in this branch.

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

Entering the *OPERATION* menu displays/enables features relating to compressor and fan operation. For example, the operation times, the status of the relevant alarms and the maximum acceptable time threshold.

In the *MANUAL* menu, it is possible to manually/automatically set the compressors and fans and whether outputs can be forced in order to test functionality

In the *I/O STATUS* menu it is possible to view all the properties involved with the application inputs and outputs:

- digital input/output status
- analogue output status
- probe calibration…

Installer menu

The installer menu is a level 3 menu, *i.e.* it is necessary to insert the installer or system builder password in order to be able to view/modify the parameters in this branch.

The installer menu contains all the parameters pertaining to the configuration of all the machine functions (alarms, settings, logic, type of rotation,…).

In the *REGULATION* menu it is possible to set/view the parameters relating to the side band and neutral zone thermoregulations for compressors, fans and any inverters, for each circuit:

- type of regulation
- setpoints
- differentials
- times
- offsets

In the *COMPRESSORS and FANS* menu it is possible to set the parameters pertaining to device management:

- power of the individual compressors (if used)
- type of rotation
- increment logic
- times
- floating condensation parameters
- high pressure pressure-switch alarm prevention parameters

The *SAFETY DEVICES* menu contains all the parameters pertaining to the alarms and management of the safety devices for the compressors and fans

- enabling
- signal delays
- reset type…

The *MISCELLANEOUS* menu contains other general parameters:

- full-scale values for the transducers
- Modbus communication
- activations On/Off.
- temperature probe activation
- digital input and supervisor system secondary setpoint activation
- analogue input type
- refrigerant gas (when using temperature probes)
- suction line compensation
- password

From the *DEFAULTS* menu it is possible to restore the default values for all the application parameters. This menu is only accessible with the machine switched off.

System builder menu

The system builder menu is a level 4 menu, *i.e.* it is necessary to insert the system builder level password in order to be able to view/modify the parameters in this branch. Furthermore, this menu is only accessible with the machine switched off.

This menu contains all the machine configuration parameters that decide the mode of operation and which functions to activate, or restrict, depending on the system builder's needs.

The *SYSTEM* menu contains a system configuration "Wizard" for configuring a number of circuits, activating unique condensation, the use of inverters, the number of compressors and increments, the number of fans, the number of safety devices to be used and the use of any expansion units. A page summarising the relays and selected digital inputs is presented for configuration purposes, indicating whether an expansion unit should be used, if selected.

The *HARDWARE* menu contains all the parameters for setting the positions to which the various devices are connected.

- Compressor digital output position
- Fan digital output position
- Alarm digital input/output position

Such characteristics are collected in a separate submenu in order to distinguish compressors, fans and safety devices.

Setting the positions of the various alarm inputs also enables their operation. Indeed, an alarm is only enabled if the parameter, identifying its physical position on the terminal, is set and is other than zero. If it is desired not to use an alarm, simply leave the corresponding parameter at the value zero.
The same management is used to manage the four alarm relays. If the position parameters are equal to zero, then the relays are disabled.

The *PARAMETERS* menu contains other machine configuration parameters:

- type of control unit (only for viewing on the pages)
- home page
- passwords for all four levels

Firmware version

Keep pressed the UP+DOWN buttons for 2 seconds and enter in to the section info page.

Proj (Project)		**Firmware**	
No.	291	No.	1008
Version	4	Version	7
Release	0	Release	0

4.3 Conditioned visibility

Conditioned visibility allows hiding certain parameters and status information on the basis of the configuration of certain parameters. For example, by setting *neutral zone* type regulation, the side band regulation parameters will be automatically hidden when viewing the pages, or, even more importantly, by setting a single circuit machine, all the parameters for the second and third circuit will no longer be visible. At the user interface level, all the parameters and status information that is not of interest will be replaced by dots "…." On the 4 x 20 character alphanumeric display, and will not be editable.
This feature makes configuration, maintenance and use of the machine simpler. During configuration, once the system type and characteristics are selected, the unused parameters will no longer be accessible. During maintenance, it will be possible to test the functions of the devices effectively configured in the system. During normal use, the number of parameters and the status information to be displayed by means of the user interface is significantly less than the total that can be configured; this all makes the user interface more legible, speeds up setting or finding the correct parameter, and above all prevents the user from setting parameters that might cause malfunctions.
The configuration parameter table shows the parameters subject to conditioned visibility, along with the conditions deciding their exclusion.

5 CONFIGURATION PARAMETERS

All the parameters managed by the application are listed below. For each parameter there is also a brief description, the range of values admissible, the units of measurement, the recommended default value and the menu in which it may be found. The menus are structured according to the following logic:

- OR : clock menu
- UT : user menu
- MA: service menu
  - MA-F: service menu – operations branch
  - MA-M: service menu – manual branch
  - MA-IO: service menu - input/output branch
- IS : installer menu
  - IS-RC: installer menu – compressor settings branch
  - IS-RF: installer menu – fan settings branch
  - IS-C: installer menu – compressor branch
  - IS-F: installer menu - fans branch
  - IS-S: installer menu - safety devices branch
  - IS-V: installer menu - miscellaneous branch
- CO : system builder menu
  - CO-W: system builder menu – systems branch (configuration wizards)
  - CO-Hw: system builder menu – hardware branch
  - CO-Pa: installer menu – parameters branch

Parameters table

Code	Parameter	Description	Default	Min	Max	UoM	Menu	Notes
CLOCK MENU PARAMETERS – Time band management								
PT00	Enable compressor time bands	Enables compressor time band management	NO	NO (0)	YES (1)		OR	
PT01..04	Comp. time band (1..4)	Sets the four compressor time bands					OR	
PT11..14	Compressor time band offset (1..4) Circuit 1	Sets the offsets to the compressor setpoints in relation to the 4 time bands. Circuit 1	0.0	PC12	PC13	Bar	OR	
PT21..24	Compressor time band offset (1..4) Circuit 2	Sets the offsets to the compressor setpoints in relation to the 4 time bands. Circuit 2	0.0	PC32	PC33	Bar	OR	Visible if PG01 > 1
PT31..34	Compressor time band offset (1..4) Circuit 3	Sets the offsets to the compressor setpoints in relation to the 4 time bands. Circuit 3	0.0	PC52	PC53	Bar	OR	Visible if PG01 > 2
PT50	Enable fan time bands	Enables fan time band management	NO	NO (0)	YES (1)		OR	
PT51..54	Fan time band (1..4)	Sets the four fan time bands					OR	
PT61..64	Fan time band offset (1..4)	Sets the offsets to the fan setpoints in relation to the 4	0.0	PF12	PF13	Bar	OR	

	Circuit 1	time bands. Circuit 1						
PT71..74	Fan time band offset (1..4) Circuit 2	Sets the offsets to the fan setpoints in relation to the 4 time bands. Circuit 2	0.0	PF32	PF33	Bar	OR	Visible if PG01 > 1 and PG30 = 0
PT81..84	Fan time band offset (1..4) Circuit 3	Sets the offsets to the fan setpoints in relation to the 4 time bands. Circuit 3	0.0	PF52	PF53	Bar	OR	Visible if PG01 > 2 and PG30 = 0
USER MENU PARAMETERS								
SPC1	Compressor setpoint Circuit 1	Sets the setpoint value for the compressor suction probe	1.0	PC12	PC13	Bar	UT	
PUC1	Comp. DI secondary setpoint offset Circuit 1	Sets the offset value for use of secondary setpoint from the compressor digital input	0.0	-20.0	20.0	Bar	UT	
PUC4	Comp. sup. Secondary setpoint offset Circuit 1	Sets the offset value for use of secondary setpoint from compressor supervisor	0.0	-20.0	20.0	Bar	UT	
SPC2	Compressor setpoint Circuit 2	Sets the setpoint value for the compressor suction probe	1.0	PC32	PC33	Bar	UT	Visible if PG01 > 1
PUC2	Comp. DI secondary setpoint offset Circuit 2	Sets the offset value for use of secondary setpoint from the compressor digital input	0.0	-20.0	20.0	Bar	UT	Visible if PG01 > 1
PUC5	Comp. sup. Secondary setpoint offset Circuit 2	Sets the offset value for use of secondary setpoint from compressor supervisor	0.0	-20.0	20.0	Bar	UT	Visible if PG01 > 1
SPC3	Compressor setpoint Circuit 3	Sets the setpoint value for the compressor suction probe	1.0	PC52	PC53	Bar	UT	Visible if PG01 > 2
PUC3	Comp. DI secondary setpoint offset Circuit 3	Sets the offset value for use of secondary setpoint from the compressor digital input	0.0	-20.0	20.0	Bar	UT	Visible if PG01 > 2
PUC6	Comp. sup. Secondary setpoint offset Circuit 3	Sets the offset value for use of secondary setpoint from compressor supervisor	0.0	-20.0	20.0	Bar	UT	Visible if PG01 > 2
SPF1	Fan setpoint Circuit 1	Sets the setpoint value for the fan supply probe	15.0	PF12	PF13	Bar	UT	
PUF1	Fan secondary setpoint offset Circuit 1	Sets the offset value for use of secondary setpoint from fan digital input	0.0	-20.0	20.0	Bar	UT	
PUF4	Fan sup. secondary setpoint offset Circuit 1	Sets the offset value for use of secondary setpoint from fan supervisor	0.0	-20.0	20.0	Bar	UT	
SPF2	Fan setpoint Circuit 2	Sets the setpoint value for the fan supply probe	15.0	PF32	PF33	Bar	UT	Visible if PG01 > 1 and PG30 = 0

PUF2	Fan secondary setpoint offset Circuit 2	Sets the offset value for use of secondary setpoint from fan digital input	0.0	-20.0	20.0	Bar	UT	Visible if PG01 > 1 and PG30 = 0
PUF5	Fan sup. secondary setpoint offset Circuit 2	Sets the offset value for use of secondary setpoint from fan supervisor	0.0	-20.0	20.0	Bar	UT	Visible if PG01 > 1 and PG30 = 0
SPF3	Fan setpoint Circuit 3	Sets the setpoint value for the fan supply probe	15.0	PF52	PF53	Bar	UT	Visible if PG01 > 2 and PG30 = 0
PUF3	Fan secondary setpoint offset Circuit 3	Sets the offset value for use of secondary setpoint from fan digital input	0.0	-20.0	20.0	Bar	UT	Visible if PG01 > 2 and PG30 = 0
PUF6	Fan sup. secondary setpoint offset Circuit 3	Sets the offset value for use of secondary setpoint from fan supervisor	0.0	-20.0	20.0	Bar	UT	Visible if PG01 > 2 and PG30 = 0
PSd1	User PSd	User level password	0	-999	9999		UT	
SERVICE MENU PARAMETERS								
PM00	Compressor operational time alarm threshold	Sets the maximum compressor operation time limit. Beyond this limit, the relevant alarm will be tripped	20000	0	500000	Hours	MA-F	
PM01..10	Compressor operation time (1..10)	Operation times for each compressor	0	0	500000	Hours	MA-F	Compressors 1 to 10; Visibility *1
PM31 PM32	Compressor operation time (11-12)	Operation times for each compressor	0	0	500000	Hours	MA-F	Compressors 11 and 12; Visibility *1
PM40	Fan operational time alarm threshold	Sets the maximum fan operation time limit. Beyond this limit, the relevant alarm will be tripped	20000	0	500000	Hours	MA-F	
PM41..50	Fan operation time (1..10)	Operation times for each fan	0	0	500000	Hours	MA-F	Fans 1 to 10; Visibility *2
PM71 PM72	Fan operation time (11-12)	Operation times for each fan	0	0	500000	Hours	MA-F	Fans 11 and 12; Visibility *2
PM90	Last maintenance date	Sets the last date on which system maintenance was carried out					MA-F	
PSd2	Service PSd	Service level password	0	-999	9999		MA-F	
PM11..20	Enable compressor (1..10)	Enables manual/automatic operation of each compressor: M: manual A: normal operation	A	A (0)	M (1)		MA-M	Compressors 1 to 10; Visibility *1

PM21..30	Compressor forcing (1..10)	In manual operation, this sets the number of forced compressor steps	0	0	4		MA-M	Compressors 1 to 10; Visibility *1
PM33 PM34	Enable compressor (11-12)	Enables manual/automatic operation of each compressor: M: manual A: normal operation	A	A (0)	M (1)		MA-M	Compressors 11 and 12; Visibility *1
PM35 PM36	Compressor forcing (11-12)	In manual operation, this sets the number of forced compressor steps	0	0	4		MA-M	Compressors 11 and 12; Visibility *1
PM37	Comp. inverter forcing Circuit 1	In manual operation, this forces the compressor with the circuit 1 inverter	0	0	100.0	%	MA-M	
PM38	Comp. inverter forcing Circuit 2	In manual operation, this forces the compressor with the circuit 2 inverter	0	0	100.0	%	MA-M	
PM39	Comp. inverter forcing Circuit 3	In manual operation, this forces the compressor with the circuit 3 inverter	0	0	100.0	%	MA-M	
PM51..60	Enable fan (1..10)	Enables manual/automatic operation of each fan: M: manual A: normal operation	A	A (0)	M (1)		MA-M	Fans 1 to 10; Visibility *2
PM61..70	Fan forcing (1..10)	In manual operation, this forces the fans to be switched on and off: S: fan off A: fan on	S	S (0)	A (1)		MA-M	Fans 1 to 10; Visibility *2
PM73 PM74	Enable fan (11-12)	Enables manual/automatic operation of each fan: M: manual A: normal operation	A	A (0)	M (1)		MA-M	Fans 11 and 12; Visibility *2
PM75 PM76	Fan forcing (11-12)	In manual operation, this forces the fans to be switched on and off: S: fan off A: fan on	S	S (0)	A (1)		MA-M	Fans 11 and 12; Visibility *2
PM77	Circuit 1 inverter fan forcing	In manual operation, this forces the fan with the circuit 1 inverter	0	0	100.0	%	MA-M	
PM78	Circuit 2 inverter fan forcing	In manual operation, this forces the fan with the circuit 2 inverter	0	0	100.0	%	MA-M	
PM79	Circuit 3 inverter fan forcing	In manual operation, this forces the fan with the circuit 3 inverter	0	0	100.0	%	MA-M	
PM81	Suction probe 1 calibration	Circuit 1 suction probe calibration	0.0	-9.9	9.9	Bar	MA-IO	
PM82	Suction probe 2 calibration	Circuit 2 suction probe calibration	0.0	-9.9	9.9	Bar	MA-IO	Visible if PG01 > 1

PM83	Suction probe 3 calibration	Circuit 3 suction probe calibration	0.0	-9.9	9.9	Bar	MA-IO	Visible if PG01 > 2
PM84	Supply probe 1 calibration	Circuit 1 supply probe calibration	0.0	-9.9	9.9	Bar	MA-IO	
PM85	Supply probe 2 calibration	Circuit 2 supply probe calibration	0.0	-9.9	9.9	Bar	MA-IO	Visible if PG01 > 1 and PG30 = 0
PM86	Supply probe 3 calibration	Circuit 3 supply probe calibration	0.0	-9.9	9.9	Bar	MA-IO	Visible if PG01 > 2 and PG30 = 0
PM87	Environment temperature probe calibration	Calibration of the environment temperature probe	0.0	-9.9	9.9	Bar	MA-IO	
PM88	External temperature probe calibration	Calibration of the external temperature probe	0.0	-9.9	9.9	Bar	MA-IO	
INSTALLER MENU PARAMETERS								
PC12	Compressor min. setpoint Circuit 1	Minimum suction setpoint value pertaining to the compressors of circuit 1	0.1	PH01	SPC1	Bar	IS-RC	
PC13	Compressor max. setpoint Circuit 1	Maximum suction setpoint value pertaining to the compressors of circuit 1	2.5	SPC1	PH02	Bar	IS-RC	
PC14	Compressor regulation Circuit 1	Sets the type of regulation for controlling the circuit 1 compressors	Neutral Zone (1)	Side Band (0)	Neutral Zone (1)		IS-RC	
PC16	Compressor integral time Circuit 1	Integral time Ti for side band regulation of circuit 1 compressors	600	0	999	Sec	IS-RC	Visible if PC14 = 0
PC17	Compressor proportional band. Circuit 1	Proportional band Bp for side band regulation of circuit 1 compressors	0.5	0	20.0	Bar	IS-RC	Visible if PC14 = 0
PC18	Comp. zone Circuit 1	Zone value for neutral zone regulation of circuit 1 compressors	0.5	0	20.0	Bar	IS-RC	Visible if PC14 = 1
PC19	Comp. zone differential Circuit 1	Differential, for neutral zone regulation, within which the calculation for the insertion/release time of the subsequent step varies. Circuit 1	0.5	0	20.0	Bar	IS-RC	Visible if PC14 = 1
PC20	Compressor TOnMin Circuit 1	Minimum insertion time for subsequent compressor step (circuit 1 neutral zone reg.)	20	0	PC21	Sec	IS-RC	Visible if PC14 = 1
PC21	Compressor TOnMax Circuit 1	Maximum insertion time for subsequent compressor step (circuit 1 neutral zone reg.)	60	PC20	999	Sec	IS-RC	Visible if PC14 = 1
PC22	Compressor TOffMin Circuit 1	Minimum release time for subsequent compressor step (circuit 1 neutral zone reg.)	10	0	PC23	Sec	IS-RC	Visible if PC14 = 1
PC23	Compressor TOffMax Circuit 1	Maximum release time for subsequent compressor step (circuit 1 neutral zone reg.)	60	PC22	999	Sec	IS-RC	Visible if PC14 = 1
PC24	Comp. inverter diff. Circuit 1	Differential for compressor regulation with circuit 1 inverter	0.5	0.0	20.0	Bar	IS-RC	Visible if PG12 = 1
PC25	Compressor inverter SP	Suction setpoint offset for circuit 1 inverter regulation	0.0	-20.0	20.0	Bar	IS-RC	Visible if PG12 = 1

	offset. Circuit 1	of the compressor.						
PC26	Inverter comp. min. Circuit 1	Minimum compressor value with circuit 1 inverter	0.0	0.0	100.0	%	IS-RC	Visible if PG12 = 1
PC27	Inverter comp. speedup Circuit 1	Compressor speedup time with circuit 1 inverter	0	0	999	Sec	IS-RC	Visible if PG12 = 1
PC28	Inverter compressor time Circuit 1	Inverter ramp. Time taken for the inverter to go from the minimum value to the maximum value (circuit 1 neutral zone reg.)	10	0	999	Sec	IS-RC	Visible if PG12 = 1
PC32	Compressor min. setpoint Circuit 2	Minimum suction setpoint value pertaining to the compressors of circuit 2	0.1	PH01	SPC2	Bar	IS-RC	Visible if PG01 > 1
PC33	Compressor max. setpoint Circuit 2	Maximum suction setpoint value pertaining to the compressors of circuit 2	2.5	SPC2	PH02	Bar	IS-RC	Visible if PG01 > 1
PC34	Compressor regulation Circuit 2	Sets the type of regulation for controlling the circuit 2 compressors	Neutral Zone (1)	Side Band (0)	Neutral Zone (1)		IS-RC	Visible if PG01 > 1
PC36	Compressor integral time Circuit 2	Integral time Ti for side band regulation of circuit 2 compressors	600	0	999	Sec	IS-RC	Visible if PG01 > 1 and PG34 = 0
PC37	Compressor proportional band. Circuit 2	Proportional band Bp for side band regulation of circuit 2 compressors	0.5	0	20.0	Bar	IS-RC	Visible if PG01 > 1 and PG34 = 0
PC38	Comp. zone Circuit 2	Zone value for neutral zone regulation of circuit 2 compressors	0.5	0	20.0	Bar	IS-RC	Visible if PG01 > 1 and PG34 = 1
PC39	Comp. zone differential Circuit 2	Differential, for neutral zone regulation, within which the calculation for the insertion/release time of the subsequent step varies. Circuit 2	0.5	0	20.0	Bar	IS-RC	Visible if PG01 > 1 and PG34 = 1
PC40	Compressor TOnMin Circuit 2	Minimum insertion time for subsequent compressor step (circuit 2 neutral zone reg.)	20	0	PC41	Sec	IS-RC	Visible if PG01 > 1 and PG34 = 1
PC41	Compressor TOnMax Circuit 2	Maximum insertion time for subsequent compressor step (circuit 2 neutral zone reg.)	60	PC40	999	Sec	IS-RC	Visible if PG01 > 1 and PG34 = 1
PC42	Compressor TOffMin Circuit 2	Minimum release time for subsequent compressor step (circuit 2 neutral zone reg.)	10	0	PC43	Sec	IS-RC	Visible if PG01 > 1 and PG34 = 1
PC43	Compressor TOffMax Circuit 2	Maximum release time for subsequent compressor step (circuit 2 neutral zone reg.)	60	PC42	999	Sec	IS-RC	Visible if PG01 > 1 and PG34 = 1
PC44	Comp. inverter diff. Circuit 2	Differential for compressor regulation with circuit 2 inverter	0.5	0.0	20.0	Bar	IS-RC	Visible if PG01 > 1 and PG16 = 1
PC45	Compressor inverter SP offset. Circuit 2	Suction setpoint offset for circuit 2 inverter regulation of the compressor.	0.0	-20.0	20.0	Bar	IS-RC	Visible if PG01 > 1 and PG16 = 1
PC46	Inverter comp. min. Circuit 2	Minimum compressor value with circuit 2 inverter	0.0	0.0	100.0	%	IS-RC	Visible if PG01 > 1 and PG16 = 1
PC47	Inverter comp. speedup Circuit 2	Compressor speedup time with circuit 2 inverter	0	0	999	Sec	IS-RC	Visible if PG01 > 1 and PG16 = 1
PC48	Inverter compressor time	Inverter ramp. Time taken for the inverter to go from	10	0	999	Sec	IS-RC	Visible if PG01 > 1 and PG16 =

	Circuit 2	the minimum value to the maximum value (circuit 2 neutral zone reg.)						1
PC52	Compressor min. setpoint Circuit 3	Minimum suction setpoint value pertaining to the compressors of circuit 3	0.1	PH01	SPC3	Bar	IS-RC	Visible if PG01 > 2
PC53	Compressor max. setpoint Circuit 3	Maximum suction setpoint value pertaining to the compressors of circuit 3	2.5	SPC3	PH02	Bar	IS-RC	Visible if PG01 > 2
PC54	Compressor regulation Circuit 3	Sets the type of regulation for controlling the circuit 3 compressors	Neutral Zone (1)	Side Band (0)	Neutral Zone (1)		IS-RC	Visible if PG01 > 2
PC56	Compressor integral time Circuit 3	Integral time Ti for side band regulation of circuit 3 compressors	600	0	999	Sec	IS-RC	Visible if PG01 > 2 and PC54 = 0
PC57	Compressor proportional band. Circuit 3	Proportional band Bp for side band regulation of circuit 3 compressors	0.5	0	20.0	Bar	IS-RC	Visible if PG01 > 2 and PC54 = 0
PC58	Comp. zone Circuit 3	Zone value for neutral zone regulation of circuit 3 compressors	0.5	0	20.0	Bar	IS-RC	Visible if PG01 > 2 and PC54 = 1
PC59	Comp. zone differential Circuit 3	Differential, for neutral zone regulation, within which the calculation for the insertion/release time of the subsequent step varies. Circuit 3	0.5	0	20.0	Bar	IS-RC	Visible if PG01 > 2 and PC54 = 1

PC60	Compressor TOnMin Circuit 3	Minimum insertion time for subsequent compressor step (circuit 3 neutral zone reg.)	20	0	PC61	Sec	IS-RC	Visible if PG01 > 2 and PC54 = 1
PC61	Compressor TOnMax Circuit 3	Maximum insertion time for subsequent compressor step (circuit 3 neutral zone reg.)	60	PC60	999	Sec	IS-RC	Visible if PG01 > 2 and PC54 = 1
PC62	Compressor TOffMin Circuit 3	Minimum release time for subsequent compressor step (circuit 3 neutral zone reg.)	10	0	PC63	Sec	IS-RC	Visible if PG01 > 2 and PC54 = 1
PC63	Compressor TOffMax Circuit 3	Maximum release time for subsequent compressor step (circuit 3 neutral zone reg.)	60	PC62	999	Sec	IS-RC	Visible if PG01 > 2 and PC54 = 1
PC64	Comp. inverter diff. Circuit 3	Differential for compressor regulation with circuit 3 inverter	0.5	0.0	20.0	Bar	IS-RC	Visible if PG01 > 2 and PG22 = 1
PC65	Compressor inverter SP offset. Circuit 3	Suction setpoint offset for circuit 3 inverter regulation of the compressor.	0.0	-20.0	20.0	Bar	IS-RC	Visible if PG01 > 2 and PG22 = 1
PC66	Inverter comp. min. Circuit 3	Minimum compressor value with circuit 3 inverter	0.0	0.0	100.0	%	IS-RC	Visible if PG01 > 2 and PG22 = 1
PC67	Inverter comp. speedup Circuit 3	Compressor speedup time with circuit 3 inverter	0	0	999	Sec	IS-RC	Visible if PG01 > 2 and PG22 = 1
PC68	Inverter compressor time Circuit 3	Inverter ramp. Time taken for the inverter to go from the minimum value to the maximum value (circuit 3 neutral zone reg.)	10	0	999	Sec	IS-RC	Visible if PG01 > 2 and PG22 = 1
PC01	Compressor rotation	Type of rotation used for compressor management: 0: FIFO 1: LIFO 2: FIFO+HR 3: LIFO+HR	FIFO	FIFO (0)	LIFO + HR (3)		IS-C	
PC02	Increment trigger	Sets the increment trigger mode: 0: CpCp_pCpC 1: CCpp_ppCC 2: CpCp_ppCC 3: CCpp_pCpC	CpCp_pCpC	CpCp_pCpC (0)	CCpp_pCpC (3)		IS-C	
PC03	Increment logic	Sets the relay logic used for the compressor increments: 0: NC = normally closed (*e.g.* Copeland) 1: NO = normally open (e.g. Feeders)	NO	NC (0)	NO (1)		IS-C	

PC04	TMinOn	Minimum time for which the compressor must remain on, even if switching off requested	10	0	999	Sec	IS-C	
PC05	TMinOff	Minimum time for which the compressor must remain off, even if switching on requested	120	0	999	Sec	IS-C	
PC06	TOnOn	Minimum time that must elapse before the same compressor can be switched on.	360	0	999	Sec	IS-C	
PC07	TOnOther	Minimum time that must elapse before another compressor can be switched on	20	0	999	Sec	IS-C	
PC08	TOffOther	Minimum time that must elapse before another compressor can be switched off	20	0	999	Sec	IS-C	
PC09	TOnParz	Minimum time between switching on of increments	20	0	999	Sec	IS-C	
PC10	TOffParz	Minimum time between switching off of increments	20	0	999	Sec	IS-C	
PC11	Comp. probe error Circuit 1	Number of compressors that will be forced if an alarm occurs on the circuit 1 suction probe	1	0	PG11		IS-C	
PC31	Comp. probe error Circuit 2	Number of compressors that will be forced if an alarm occurs on the circuit 2 suction probe	1	0	PG15		IS-C	Visible if PG01 > 1
PC51	Comp. probe error Circuit 3	Number of compressors that will be forced if an alarm occurs on the circuit 3 suction probe	1	0	PG21		IS-C	Visible if PG01 > 2
PC69	TRestart	Minimum compressor switch on wait time following a system reset/black-out	0	0	999	Sec	IS-C	
PC70	Enable HP prevention	Enable compressor increments at high pressure 0: NO 1: YES	0 (NO)	0 (NO)	1 (SI)		IS-C	
PC71	HP prevention C1 limit SP	Set compressor increment pressure (circuit 1)	22.0	PH03	PH04	Bar	IS-C	
PC72	HP prevention C2 limit SP	Set compressor increment pressure (circuit 2)	22.0	PH03	PH04	Bar	IS-C	Visible if PG01 > 1

PC73	HP prevention C3 limit SP	Set compressor increment pressure (circuit 3)	22.0	PH03	PH04	Bar	IS-C	Visible if PG01 > 2
PC74	HP prevention differential	Comp. increment pressure differential	4.0	0.1	10.0	Bar	IS-C	
PC75	HP prevention hold time	Minimum comp. increment hold time	0	0	999	Min	IS-C	
PC76	HP prevention percentage	Increment percentage	50	0	100	%	IS-C	
PC78	Side band step overlap	Compressor side band step overlap factor	0	0	100	%	IS-C	
PC81	Comp. 1 power	Compressor 1 power output	1	0	5000	kW	IS-C	Visible if PG03 = 1; Visibility *1
PC82	Comp. 2 power	Compressor 2 power output	1	0	5000	kW	IS-C	Visible if PG03 = 1; Visibility *1
PC83	Comp. 3 power	Compressor 3 power output	1	0	5000	kW	IS-C	Visible if PG03 = 1; Visibility *1
PC84	Comp. 4 power	Compressor 4 power output	1	0	5000	kW	IS-C	Visible if PG03 = 1; Visibility *1
PC85	Comp. 5 power	Compressor 5 power output	1	0	5000	kW	IS-C	Visible if PG03 = 1; Visibility *1
PC86	Comp. 6 power	Compressor 6 power output	1	0	5000	kW	IS-C	Visible if PG03 = 1; Visibility *1
PC87	Comp. 7 power	Compressor 7 power output	1	0	5000	kW	IS-C	Visible if PG03 = 1; Visibility *1
PC88	Comp. 8 power	Compressor 8 power output	1	0	5000	kW	IS-C	Visible if PG03 = 1; Visibility *1
PC89	Comp. 9 power	Compressor 9 power output	1	0	5000	kW	IS-C	Visible if PG03 = 1; Visibility *1
PC90	Comp 10 power	Compressor 10 power output	1	0	5000	kW	IS-C	Visible if PG03 = 1; Visibility *1
PC91	Comp 11 power	Compressor 11 power output	1	0	5000	kW	IS-C	Visible if PG03 = 1; Visibility *1
PC92	Comp. 12 power	Compressor 12 power output	1	0	5000	kW	IS-C	Visible if PG03 = 1; Visibility *1
PF12	Fan min. setpoint Circuit 1	Minimum supply setpoint value pertaining to the circuit 1 fans	1.0	PH03	SPF1	Bar	IS-RF	

PF13	Fan max, setpoint Circuit 1	Maximum supply setpoint value pertaining to the circuit 1 fans	25.0	SPF1	PH04	Bar	IS-RF	
PF14	Fan regulation Circuit 1	Sets the type of regulation for controlling the circuit 1 fans	Side Band (0)	Side Band (0)	Neutral Zone (1)		IS-RF	
PF16	Fan integral time Circuit 1	Integral time Ti for side band regulation of circuit 1 fans	600	0	999	Sec	IS-RF	Visible if PF14 = 0
PF17	Fan proportional band. Circuit 1	Proportional band Bp for side band regulation of circuit 1 fans	0.5	0	20.0	Bar	IS-RF	Visible if PF14 = 0
PF18	Fan zone Circuit 1	Zone value for neutral zone regulation of circuit 1 fans	1.0	0	20.0	Bar	IS-RF	Visible if PF14 = 1
PF20	Fan TOn/TOff Circuit 1	Next fan insertion/release time (circuit 1 neutral zone reg.)	10	0	999	Sec	IS-RF	Visible if PF14 = 1
PF24	Fan inverter differential Circuit 1	Differential for fan regulation with circuit 1 inverter	0.5	0.0	20.0	Bar	IS-RF	Visible if PG42 = 1
PF25	Fan inverter SP offset. Circuit 1	Suction setpoint offset for circuit 1 inverter regulation of the fan.	0.0	-20.0	20.0	Bar	IS-RF	Visible if PG42 = 1
PF26	Fan inverter minimum Circuit 1	Minimum fan value with circuit 1 inverter	0.0	0.0	100.0	%	IS-RF	Visible if PG42 = 1
PF27	Fan inverter speedup Circuit 1	Fan speedup time with circuit 1 inverter	2	0	999	Sec	IS-RF	Visible if PG42 = 1
PF28	Fan inverter time Circuit 1	Inverter ramp. Time taken for the inverter to go from the minimum value to the maximum value (circuit 1 neutral zone reg.)	10	0	999	Sec	IS-RF	Visible if PG42 = 1
PF32	Fan min. setpoint Circuit 2	Minimum supply setpoint value pertaining to the circuit 2 fans	1.0	PH03	SPF2	Bar	IS-RF	Visible if PG01 > 1 and PG30 = 0
PF33	Fan max, setpoint Circuit 2	Maximum supply setpoint value pertaining to the circuit 2 fans	25.0	SPF2	PH04	Bar	IS-RF	Visible if PG01 > 1 and PG30 = 0
PF34	Fan regulation Circuit 2	Sets the type of regulation for controlling the circuit 2 fans	Side Band (0)	Side Band (0)	Neutral Zone (1)		IS-RF	Visible if PG01 > 1 and PG30 = 0
PF36	Fan integral time Circuit 2	Integral time Ti for side band regulation of circuit 2 fans	600	0	999	Sec	IS-RF	Visible if PG01 > 1 and PG30 = 0 and PF34 = 0
PF37	Fan proportional band. Circuit 2	Proportional band Bp for side band regulation of circuit 2 fans	0.5	0	20.0	Bar	IS-RF	Visible if PG01 > 1 and PG30 = 0 and PF34 = 0

PF38	Fan zone Circuit 2	Zone value for neutral zone regulation of circuit 2 fans	1.0	0	20.0	Bar	IS-RF	Visible if PG01 > 1 and PG30 = 0 and PF34 = 1
PF40	Fan TOn/TOff Circuit 2	Next fan insertion/release time (circuit 2 neutral zone reg.)	10	0	999	Sec	IS-RF	Visible if PG01 > 1 and PG30 = 0 and PF34 = 1
PF44	Fan inverter differential Circuit 2	Differential for fan regulation with circuit 2 inverter	0.5	0.0	20.0	Bar	IS-RF	Visible if PG01 > 1 and PG30 = 0 and PG46 = 1
PF45	Fan inverter SP offset. Circuit 2	Suction setpoint offset for circuit 2 inverter regulation of the fan.	0.0	-20.0	20.0	Bar	IS-RF	Visible if PG01 > 1 and PG30 = 0 and PG46 = 1
PF46	Fan inverter minimum Circuit 2	Minimum fan value with circuit 2 inverter	0.0	0.0	100.0	%	IS-RF	Visible if PG01 > 1 and PG30 = 0 and PG46 = 1
PF47	Fan inverter speedup Circuit 2	Fan speedup time with circuit 2 inverter	2	0	999	Sec	IS-RF	Visible if PG01 > 1 and PG30 = 0 and PG46 = 1
PF48	Fan inverter time Circuit 2	Inverter ramp. Time taken for the inverter to go from the minimum value to the maximum value (circuit 2 neutral zone reg.)	10	0	999	Sec	IS-RF	Visible if PG01 > 1 and PG30 = 0 and PG46 = 1
PF52	Fan min. setpoint Circuit 3	Minimum supply setpoint value pertaining to the circuit 3 fans	1.0	PH03	SPF3	Bar	IS-RF	Visible if PG01 > 2 and PG30 = 0
PF53	Fan max, setpoint Circuit 3	Maximum supply setpoint value pertaining to the circuit 3 fans	25.0	SPF3	PH04	Bar	IS-RF	Visible if PG01 > 2 and PG30 = 0
PF54	Fan regulation Circuit 3	Sets the type of regulation for controlling the circuit 3 fans	Side Band (0)	Side Band (0)	Neutral Zone (1)		IS-RF	Visible if PG01 > 2 and PG30 = 0
PF56	Fan integral time Circuit 3	Integral time Ti for side band regulation of circuit 3 fans	600	0	999	Sec	IS-RF	Visible if PG01 > 2 and PG30 = 0 and PF54 = 0
PF57	Fan proportional band. Circuit 3	Proportional band Bp for side band regulation of circuit 3 fans	0.5	0	20.0	Bar	IS-RF	Visible if PG01 > 2 and PG30 = 0 and PF54 = 0
PF58	Fan zone Circuit 3	Zone value for neutral zone regulation of circuit 3 fans	1.0	0	20.0	Bar	IS-RF	Visible if PG01 > 2 and PG30 = 0 and PF54 = 1
PF60	Fan TOn/TOff Circuit 3	Next fan insertion/release time (circuit 3 neutral zone reg.)	10	0	999	Sec	IS-RF	Visible if PG01 > 2 and PG30 = 0 and PF54 = 1

PF64	Fan inverter minimum Circuit 3	Differential for fan regulation with circuit 3 inverter	0.5	0.0	20.0	Bar	IS-RF	Visible if PG01 > 2 and PG30 = 0 and PG52 = 1
PF65	Fan inverter SP offset. Circuit 3	Suction setpoint offset for circuit 3 inverter regulation of the fan.	0.0	-20.0	20.0	Bar	IS-RF	Visible if PG01 > 2 and PG30 = 0 and PG52 = 1
PF66	Fan inverter minimum Circuit 3	Minimum fan value with circuit 3 inverter	0.0	0.0	100.0	%	IS-RF	Visible if PG01 > 2 and PG30 = 0 and PG52 = 1
PF67	Fan inverter speedup Circuit 3	Fan speedup time with circuit 3 inverter	2	0	999	Sec	IS-RF	Visible if PG01 > 2 and PG30 = 0 and PG52 = 1
PF68	Fan inverter time Circuit 3	Inverter ramp. Time taken for the inverter to go from the minimum value to the maximum value (circuit 3 neutral zone reg.)	10	0	999	Sec	IS-RF	Visible if PG01 > 2 and PG30 = 0 and PG52 = 1
PF01	Fan rotation	Type of rotation used for fan management: 0: FIFO 1: LIFO 2: FIFO + time 3: LIFO + time	FIFO	FIFO (0)	LIFO + time (3)		IS-F	
PF02	Enable compressor regulation	If enabled, allows selection of fan regulation, only if at least one compressor is on	NO	NO (0)	YES (1)		IS-F	
PF07	TOnOther	Minimum time that must elapse before another fan can be switched on	2	0	999	Sec	IS-F	
PF08	TOffOther	Minimum time that must elapse before another fan can be switched off	2	0	999	Sec	IS-F	
PF11	Fan probe error Circuit 1	Number of fans that will be forced if an alarm occurs on the circuit 1 supply probe	1	0	PG41		IS-F	
PF31	Fan probe error Circuit 2	Number of fans that will be forced if an alarm occurs on the circuit 2 supply probe	1	0	PG45		IS-F	Visible if PG01 > 1 and PG30 = 0
PF51	Fan probe error Circuit 3	Number of fans that will be forced if an alarm occurs on the circuit 3 supply probe	1	0	PG51		IS-F	Visible if PG01 > 2 and PG30 = 0
PF71	Enable floating condensation	Enables floating condensation for fan management	NO	NO (0)	YES (1)		IS-F	

PF72	Floating condensation offset	Floating condensation temperature variation offset	0.0	-20.0	20.0	°C	IS-F	
PF73	Set floating condensation min.	Minimum floating condensation limit value	30.0	10.0	45.0	°C	IS-F	
PF74	Set floating condensation max.	Maximum floating condensation limit value	40.0	10.0	45.0	°C	IS-F	
PF78	Side band step overlap	Fan side band step overlap factor	0	0	100	%	IS-F	
PH01	Minimum full-scale suction	Sets the minimum full-scale value for the suction probe	-0.5	-10.0	PH02	Bar	IS-V	
PH02	Maximum full-scale suction	Sets the maximum full-scale value for the suction probe	7.0	PH01	45.0	Bar	IS-V	
PH03	Minimum full-scale supply	Sets the minimum full-scale value for the supply probe	0.0	-10.0	PH04	Bar	IS-V	
PH04	Maximum full-scale supply	Sets the maximum full-scale value for the supply probe	30.0	PH03	45.0	Bar	IS-V	
PH05	System ON/OFF from keypad	Enables switching the machine on/off by pressing the ESC key	YES	NO (0)	YES (1)		IS-V	
PH06	Circuit ON/OFF from keypad	Enables switching circuits on/off by pressing the relevant key	NO	NO (0)	YES (1)		IS-V	
PH07	System ON/OFF from DI	Enables switching the machine on/off from the digital input	NO	NO (0)	YES (1)		IS-V	
PH08	Circuits ON/OFF from DI	Enables switching circuits on/off from the relevant digital input	NO	NO (0)	YES (1)		IS-V	
PH09	System ON/OFF from supervisor	Enables switching the machine on/off from the supervisor	NO	NO (0)	YES (1)		IS-V	
PH10	Circuits ON/OFF from supervisor	Enables switching circuits on/off from the supervisor	NO	NO (0)	YES (1)		IS-V	
PH11	Modbus address	Card Modbus address	1	1	247		IS-V	

PH12	Modbus baud rate	Card communication baud rate 0: 1200 KBit 1: 2400 KBit 2: 4800 KBit 3: 9600 KBit 4: 19200 KBit	9600 (3)	1200 (0)	19200 (4)		IS-V	
PH13	Modbus parity	Modbus parity 0: None 1: Odd 2: Even	Even (2)	None (0)	Even (2)		IS-V	
PH14	Modbus stop bit	Modbus stop bit 0: 1 stop bit 1: 2 stop bits	1 (0)	1 (0)	2 (1)		IS-V	
PH15	Restore default parameters	This restores the factory default settings if activated	NO	NO (0)	YES (1)		IS-V	
PH20	Compressors inverter consent logic	Command logic digital output for compressors inverter consent = 0: Energized contact = 1: Energized contact	NO	NO (0)	NC (1)	-	IS-V	
PH21	Fans inverter consent logic	Command logic digital output for fans inverter consent = 0: Energized contact = 1: Energized contact	NO	NO (0)	NC (1)	-	IS-V	
PH23	Enable environment temp. probe	Enables the probe (AI07) for measuring environment temperature	NO	NO (0)	YES (1)		IS-V	
PH24	Enable external temp. probe	Enables the probe (AI08) for measuring the external temperature	NO	NO (0)	YES (1)		IS-V	
PH25	Enable secondary setpoint from DI	Enables the secondary setpoint function from the digital input	NO	NO (0)	YES (1)		IS-V	
PH26	Enable secondary setpoint from supervisor	Enables the secondary setpoint function from the supervisor	NO	NO (0)	YES (1)		IS-V	
PH31	Refrigerant	Sets the type of refrigerant used (temperature-pressure conversion) 0: No refrigerant 1: R22 2: R134a 3: R404A 4: R407C 5: R410A 6: R507	3 R404A	0	6		IS-V	
PH32	Temperature UoM	Sets the units of measurement for temperature: 0: °C 1: °F	0 (°C)	0 (°C)	1 (°F)		IS-V	
PH33	Pressure UoM	Sets the units of measurement for pressure: 0: Bar 1: psi	0 (Bar)	0 (Bar)	1 (psi)		IS-V	
PH35	Enable suction load	Enables compensation for loss of load over the suction	0 (NO)	0 (NO)	1 (SI)		IS-V	

	compensation	line (neutral zone) 0: NO 1: YES						

PH36	Suction load compensation offset	Load loss compensation factor	0.2	0.1	5.0	Bar	IS-V	
PH40	Measurement unit	Sets the display for temperature or pressure 0: Pressure 1: Temperature	0 (Pres.)	0 (Pres.)	1 (Temp.)		IS-V	
PH43	AI1 probe type	Sets the type of AI01 analogue input: 2: NTC 3: 0-20mA 4: 4-20mA	4 4-20mA	2	4		IS-V	
PH44	AI2 probe type	Sets the type of AI02 analogue input: 2: NTC 3: 0-20mA 4: 4-20mA	4 4-20mA	2	4		IS-V	
PH45	AI3_4 probe type	Sets analogue input type for AI03 and AI04: 2: NTC 3: 0-20mA 4: 4-20mA	4 4-20mA	2	4		IS-V	Visible if PG01 > 1
PH47	AI5_6 probe type	Sets analogue input type for AI05 and AI06: 2: NTC 3: 0-20mA 4: 4-20mA	4 4-20mA	2	4		IS-V	Visible if PG01 > 2
PH53	Buzzer enable	Enables the buzzer to sound	YES (1)	NO (0)	YES (1)		IS-V	
PSd3	Installer PSd	Installer level password	0	-999	9999		IS-V	
ALARM PARAMETERS								
PH17	DI alarm logic	Sets the digital input alarm logic used for controlling the alarms: 0: Normally open NO 1: Normally closed NC	NC	NO (0)	NC (1)		IS-S	
PH18	DO alarm logic	Sets the logic for the relays used for the alarms 0: Normally open NO 1: Normally closed NC	NO	NO (0)	NC (1)		IS-S	
PH19	Other DI logic	Sets the digital input alarm logic used for controlling the following functions: - Global remote OnOff - Circuit remote OnOff - compressor/fan secondary setpoint 0: Normally open NO 1: Normally closed NC	NO	NO (0)	NC (1)		IS-S	

PA01	Enable compressor operation time alarm	Enables the alarm pertaining to compressor operation times	NO	NO (0)	YES (1)		IS-S	
PA02	Enable fan operation time alarm	Enables the alarm pertaining to fan operation times	NO	NO (0)	YES (1)		IS-S	
PA03	HP suction alarm delay	Sets the suction high pressure alarm activation delay	30	0	999	Sec	IS-S	
PA04	ExPro alarm delay	Sets the expansion unit alarm activation delay	1	0	999	Sec	IS-S	Only in versions with expansion unit
PA05	Fluid level alarm delay	Sets the fluid level alarm activation delay	90	0	999	Sec	IS-S	
PA06	Probe alarm delay	Sets the suction and supply alarm signalling delay	5	0	240	Sec	IS-S	
PA07	Supply LP alarm delay	Sets the supply low pressure alarm activation delay	30	0	999	Sec	IS-S	
PA08	LP suction alarm delay	Sets the suction low pressure alarm activation delay	30	0	999	Sec	IS-S	
PA09	Comp. thermal alarm delay	Sets the compressor thermal alarm activation delay	0	0	999	Sec	IS-S	
PA10	Oil differential alarm delay	Sets the common oil differential and compressor alarm activation delay	10	0	999	Sec	IS-S	
PA11	Supply pressure switch alarm reset	Sets the type of reset for the supply pressure-switch alarm	M	A (0)	M (1)		IS-S	M:manual A: automatic
PA12	Comp. thermal alarm reset	Sets the compressor thermal alarm reset type	M	A (0)	M (1)		IS-S	M: manual A: automatic
PA13	Comp. pressure-switch alarm reset	Sets the compressor pressure-switch alarm reset type	M	A (0)	M (1)		IS-S	M: manual A: automatic
PA14	Oil diff. alarm reset	Sets the compressor oil differential alarm reset type .	M	A (0)	M (1)		IS-S	M: manual A: automatic
PA23	Fan thermal alarm reset	Sets the fan thermal alarm reset type	M	A (0)	M (1)		IS-S	M: manual A: automatic
PA15	C1 suction LP alarm setpoint	Circuit 1 suction probe low pressure alarm setpoint	0.5	PH01	PA17	Bar	IS-S	
PA16	C1 suction LP alarm diff.	Circuit 1 suction probe low pressure alarm differential	0.5	0.0	20.0	Bar	IS-S	
PA17	C1 suction HP alarm setpoint	Circuit 1 suction probe high pressure alarm setpoint	4.0	PA15	PH02	Bar	IS-S	
PA18	C1 suction HP alarm diff.	Circuit 1 suction probe high pressure alarm differential	0.5	0.0	20.0	Bar	IS-S	
PA19	C1 supply LP alarm setpoint	Circuit 1 supply probe low pressure alarm setpoint	2.0	PH03	PA21	Bar	IS-S	
PA20	C1 supply LP alarm diff.	Circuit 1 supply probe low pressure alarm differential	0.5	0.0	20.0	Bar	IS-S	
PA21	C1 supply HP alarm setpoint	Circuit 1 supply probe high pressure alarm setpoint	20.0	PA19	PH04	Bar	IS-S	
PA22	C1 supply HP alarm diff.	Circuit 1 supply probe high pressure alarm differential	1.0	0.0	20.0	Bar	IS-S	
PA25	C2 suction LP alarm setpoint	Circuit 2 suction probe low pressure alarm setpoint	0.5	PH01	PA27	Bar	IS-S	Visible if PG01 > 1
PA26	C2 suction LP	Circuit 2 suction probe low	0.5	0.0	20.0	Bar	IS-S	Visible if PG01

	alarm diff.	pressure alarm differential						> 1
PA27	Circuit 2 suction HP alarm setpoint .	Circuit 2 suction probe high pressure alarm setpoint	4.0	PA25	PH02	Bar	IS-S	Visible if PG01 > 1
PA28	C2 suction HP alarm diff.	Circuit 2 suction probe high pressure alarm differential	0.5	0.0	20.0	Bar	IS-S	Visible if PG01 > 1
PA29	C2 supply LP alarm setpoint	Circuit 2 supply probe low pressure alarm setpoint	2.0	PH03	PA31	Bar	IS-S	Visible if PG01 > 1 and PG30 = 0
PA30	C2 supply LP alarm diff.	Circuit 2 supply probe low pressure alarm differential	0.5	0.0	20.0	Bar	IS-S	Visible if PG01 > 1 and PG30 = 0
PA31	C2 supply HP alarm setpoint	Circuit 2 supply probe high pressure alarm setpoint	20.0	PA29	PH04	Bar	IS-S	Visible if PG01 > 1 and PG30 = 0
PA32	Circuit 2 supply HP alarm diff. .	Circuit 2 supply probe high pressure alarm differential	1.0	0.0	20.0	Bar	IS-S	Visible if PG01 > 1 and PG30 = 0
PA35	C3 suction LP alarm setpoint	Circuit 3 suction probe low pressure alarm setpoint	0.5	PH01	PA37	Bar	IS-S	Visible if PG01 > 2
PA36	C3 suction LP alarm diff.	Circuit 3 suction probe low pressure alarm differential	0.5	0.0	20.0	Bar	IS-S	Visible if PG01 > 2
PA37	C3 suction HP alarm setpoint	Circuit 3 suction probe high pressure alarm setpoint	4.0	PA35	PH02	Bar	IS-S	Visible if PG01 > 2
PA38	C3 suction HP alarm diff.	Circuit 3 suction probe high pressure alarm differential	0.5	0.0	20.0	Bar	IS-S	Visible if PG01 > 2

PA39	C3 supply LP alarm setpoint	Circuit 3 supply probe low pressure alarm setpoint	2.0	PH03	PA41	Bar	IS-S	Visible if PG01 > 2 and PG30 = 0
PA40	C3 supply LP alarm diff.	Circuit 3 supply probe low pressure alarm differential	0.5	0.0	20.0	Bar	IS-S	Visible if PG01 > 2 and PG30 = 0
PA41	C3 supply HP alarm setpoint	Circuit 3 supply probe high pressure alarm setpoint	20.0	PA39	PH04	Bar	IS-S	Visible if PG01 > 2 and PG30 = 0
PA42	C3 supply HP alarm diff.	Circuit 3 supply probe high pressure alarm differential	1.0	0.0	20.0	Bar	IS-S	Visible if PG01 > 2 and PG30 = 0
PH16	Compressor safety device type	Sets the type of safety devices used for the compressors: 0: None 1: Thermal 2: Thermal + pressure-switch 3: Thermal + oil diff. 4: All	Thermal	None (0)	All (4)		IS-S	
SYSTEM BUILDER MENU PARAMETERS								
PG01	Circuit number	Sets the number of circuits for the machine	2	1	3		CO-W	*Default = 1* on C-PRO MEGA RACK
PG02	Enable expansion	Enables the expansion unit and the corresponding alarms	NO	NO (0)	YES (1)		CO-W	
PG03	Enable differently powered compressors	Enables the management of compressors with different nominal power ratings	NO	NO (0)	YES (1)		CO-W	
PG04	Number of increments per compressor	Sets the number of increments for each compressor	1	0	3		CO-W	*Default = 0* on C-PRO MEGA RACK
PG05	Number of safety devices per compressor	Sets the number of safety devices for each compressor	1	0	3		CO-W	
PG11	Number of compressors for Circuit 1	Sets the number of compressors for circuit 1	2	0	12		CO-W	*Default = 4* *Max = 8* on C-PRO MEGA RACK
PG12	Circuit 1 inverter comp. enable	Enables the compressor with circuit 1 inverter	NO	NO (0)	YES (0)		CO-W	
PG15	Number of compressors for Circuit 2	Sets the number of compressors for circuit 2	2	0	12		CO-W	*Default = 0* *Max = 8* on C-PRO MEGA RACK; Visible if PG01 > 1
PG16	Circuit 2 inverter comp. enable	Enables the compressor with circuit 2 inverter	NO	NO (0)	YES (0)		CO-W	Visible if PG01 > 1
PG21	Number of compressors for Circuit 3	Sets the number of compressors for circuit 3	0	0	12		CO-W	*Max = 8* on C-PRO MEGA RACK; Visible if PG01 > 2

PG22	Circuit 3 inverter comp. enable	Enables the compressor with circuit 3 inverter	NO	NO (0)	SO (0)		CO-W	Visible if PG01 > 2
PG30	Enable unique condensation	Sets unique condensation for the fan unit	NO	NO (0)	YES (1)		CO-W	Dual – triple circuits only
PG32	Fan safety device	Enables the fan thermal safety device	YES	NO (0)	YES (1)		CO-W	
PG41	Number of fans for Circuit 1	Sets the number of fans for circuit 1	2	0	12		CO-W	*Default = 3* *Max = 8* on C-PRO MEGA RACK
PG42	Circuit 1 fan inverter enable	Enables the fan with circuit 1 inverter	NO	NO (0)	YES (0)		CO-W	
PG45	Number of fans for Circuit 2	Sets the number of fans for circuit 2	2	0	12		CO-W	*Default = 0* *Max = 8* on C-PRO MEGA RACK; Visible if PG01 > 1 and PG30 = 0
PG46	Circuit 2 fan inverter enable	Enables the fan with circuit 2 inverter	NO	NO (0)	YES (0)		CO-W	Visible if PG01 > 1 and PG30 = 0
PG51	Number of fans for Circuit 3	Sets the number of fans for circuit 3	0	0	12		CO-W	*Max = 8* on C-PRO MEGA RACK; Visible if PG01 > 2 and PG30 = 0
PG52	Circuit 3 fan inverter enable	Enables the fan with circuit 3 inverter	NO	NO (0)	YES (0)		CO-W	Visible if PG01 > 2 and PG30 = 0
PH20	Circuit 1 system type or control unit type	Sets the type of control unit for the first circuit*: 0: - 1: BT 2: TN 3: AT	-	- (0)	AT (3)		CO-Pa	* In the case of a single circuit system the parameter sets the system type
PH21	Circuit 2 control unit type	Sets the type of control unit for the second circuit: 0: - 1: BT 2: TN 3: AT	-	- (0)	AT (3)		CO-Pa	Visible if PG01 > 1
PH22	Circuit 3 control unit type	Sets the type of control unit for the third circuit: 0: - 1: BT 2: TN 3: AT	-	- (0)	AT (3)		CO-Pa	Visible if PG01 > 2
PH27	Home page	Selects the home page to be displayed at machine startup: 0: Global 1: Circuit1 2: Circuit 2* 3: Circuit 3*	Global (0)	Global (0)	Circuit 3 (3)		CO-Pa	* If PH27=2.3 and the relevant circuit is not enabled, assume a default value of "0"
PSd4	System builder PSd	System builder level password	0	-999	9999		CO-Pa	
SYSTEM BUILDER MENU PARAMETERS – Compressor and fan digital output positions								

HC01	C1 comp. DO position	Sets the position of the digital output for compressor 1 Or compressor inverter consent position	1	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC11	C1 increment 1 DO position	Sets the position of the increment 1 digital output for compressor 1	2	0	13 (26)		CO-Hw	*Default = 0* *Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC21	C1 increment 2 DO position	Sets the position of the increment 2 digital output for compressor 1	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC31	C1 increment 3 DO position	Sets the position of the increment 3 digital output for compressor 1	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC02	Compressor C2 DO position	Sets the position of the digital output for compressor 2 Or compressor inverter consent position	3	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC12	C2 increment 1 DO position	Sets the position of the increment 1 digital output for compressor 2	4	0	13 (26)		CO-Hw	*Default = 0* *Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC22	C2 increment 2 DO position	Sets the position of the increment 2 digital output for compressor 2	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC32	C2 increment 3 DO position	Sets the position of the increment 3 digital output for compressor 2	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC03	Compressor C3 DO position	Sets the position of the digital output for compressor 3 Or compressor inverter consent position	5	0	13 (26)		CO-Hw	*Default = 4* *Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC13	C3 increment 1 DO position	Sets the position of the increment 1 digital output for compressor 3	6	0	13 (26)		CO-Hw	*Default = 0* *Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC23	C3 increment 2 DO position	Sets the position of the increment 2 digital output for compressor 3	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC33	C3 increment 3 DO position	Sets the position of the increment 3 digital output for compressor 3	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]

HC04	Compressor C4 DO position	Sets the position of the digital output for compressor 4 Or compressor inverter consent position	7	0	13 (26)		CO-Hw	*Default = 5* *Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC14	C4 increment 1 DO position	Sets the position of the increment 1 digital output for compressor 4	8	0	13 (26)		CO-Hw	*Default = 0* *Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC24	C4 increment 2 DO position	Sets the position of the increment 2 digital output for compressor 4	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC34	C4 increment 3 DO position	Sets the position of the increment 3 digital output for compressor 4	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC05	Compressor C5 DO position	Sets the position of the digital output for compressor 5 Or compressor inverter consent position	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC15	C5 increment 1 DO position	Sets the position of the increment 1 digital output for compressor 5	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC25	C5 increment 2 DO position	Sets the position of the increment 2 digital output for compressor 5	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC35	C5 increment 3 DO position	Sets the position of the increment 3 digital output for compressor 5	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC06	Compressor C6 DO position	Sets the position of the digital output for compressor 6 Or compressor inverter consent position	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC16	C6 increment 1 DO position	Sets the position of the increment 1 digital output for compressor 6	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC26	C6 increment 2 DO position	Sets the position of the increment 2 digital output for compressor 6	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC36	C6 increment 3 DO position	Sets the position of the increment 3 digital output for compressor 6	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC07	Compressor C7 DO position	Sets the position of the digital output for compressor 7 Or compressor inverter consent position	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[1]
HC17	C7 increment 1 DO position	Sets the position of the increment 1 digital output	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO

		for compressor 7						MEGA RACK; Visibility *1
HC27	C7 increment 2 DO position	Sets the position of the increment 2 digital output for compressor 7	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC37	C7 increment 3 DO position	Sets the position of the increment 3 digital output for compressor 7	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC08	Compressor C8 DO position	Sets the position of the digital output for compressor 8 Or compressor inverter consent position	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC18	C8 increment 1 DO position	Sets the position of the increment 1 digital output for compressor 8	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC28	C8 increment 2 DO position	Sets the position of the increment 2 digital output for compressor 8	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC38	C8 increment 3 DO position	Sets the position of the increment 3 digital output for compressor 8	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC09	Compressor C9 DO position	Sets the position of the digital output for compressor 9 Or compressor inverter consent position	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC19	C9 increment 1 DO position	Sets the position of the increment 1 digital output for compressor 9	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC29	C9 increment 2 DO position	Sets the position of the increment 2 digital output for compressor 9	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC39	C9 increment 3 DO position	Sets the position of the increment 3 digital output for compressor 9	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC10	Compressor C10 DO position	Sets the position of the digital output for compressor 10 Or compressor inverter consent position	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC20	C10 increment 1 DO position	Sets the position of the increment 1 digital output for compressor 10	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC30	C10 increment 2 DO position	Sets the position of the increment 2 digital output for compressor 10	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1

HC40	C10 increment 3 DO position	Sets the position of the increment 3 digital output for compressor 11	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC50	Compressor C11 DO position	Sets the position of the digital output for compressor 11 Or compressor inverter consent position	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC51	C11 increment 1 DO position	Sets the position of the increment 1 digital output for compressor 11	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC52	C11 increment 2 DO position	Sets the position of the increment 2 digital output for compressor 11	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC53	C11 increment 3 DO position	Sets the position of the increment 3 digital output for compressor 11	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC60	Compressor C12 DO position	Sets the position of the digital output for compressor 12 Or compressor inverter consent position	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC61	C12 increment 1 DO position	Sets the position of the increment 1 digital output for compressor 12	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC62	C12 increment 2 DO position	Sets the position of the increment 2 digital output for compressor 12	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HC63	C12 step 3 DO position	Sets the position of the step 3 digital output for compressor 12	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *1
HF01	Fan 1 DO position	Sets the position of the digital output for fan 1 Or fan inverter consent position	10	0	13 (26)		CO-Hw	*Default = 6* *Max = 8(16)* on C-PRO MEGA RACK; Visibility *2
HF02	Fan 2 DO position	Sets the position of the digital output for fan 2 Or fan inverter consent position	11	0	13 (26)		CO-Hw	*Default = 7* *Max = 8(16)* on C-PRO MEGA RACK; Visibility *2
HF03	Fan 3 DO position	Sets the position of the digital output for fan 3 Or fan inverter consent position	12	0	13 (26)		CO-Hw	*Default = 8* *Max = 8(16)* on C-PRO MEGA RACK; Visibility *2

HF04	Fan 4 DO position	Sets the position of the digital output for fan 4 Or fan inverter consent position	13	0	13 (26)		CO-Hw	*Default = 0* *Max = 8(16)* on C-PRO MEGA RACK; Visibility *[2]
HF05	Fan 5 DO position	Sets the position of the digital output for fan 5 Or fan inverter consent position	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[2]
HF06	Fan 6 DO position	Sets the position of the digital output for fan 6 Or fan inverter consent position	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[2]
HF07	Fan 7 DO position	Sets the position of the digital output for fan 7 Or fan inverter consent position	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[2]
HF08	Fan 8 DO position	Sets the position of the digital output for fan 8 Or fan inverter consent position	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[2]
HF09	Fan 9 DO position	Sets the position of the digital output for fan 9 Or fan inverter consent position	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[2]
HF10	Fan 10 DO position	Sets the position of the digital output for fan 10 Or fan inverter consent position	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[2]
HF11	Fan 11 DO position	Sets the position of the digital output for fan 11 Or fan inverter consent position	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[2]
HF12	Fan 12 DO position	Sets the position of the digital output for fan 12 Or fan inverter consent position	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visibility *[2]
HA01	Global alarm DO position	Sets the position of the global alarm relay	9	0	13 (26)		CO-Hw	*Default = 2* *Max = 8(16)* on C-PRO MEGA RACK
HA11	Circuit 1 alarm DO pos.	Sets the position of alarm relay for circuit 1	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK
HA21	Circuit 2 alarm DO pos.	Sets the position of alarm relay for circuit 2	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visible if PG01 > 1
HA31	Circuit 3 alarm DO pos.	Sets the position of alarm relay for circuit 3	0	0	13 (26)		CO-Hw	*Max = 8(16)* on C-PRO MEGA RACK; Visible if PG01 > 2

SYSTEM BUILDER MENU PARAMETERS – Other hardware digital input/output positions								
Hd01	Global OnOff DI position	Sets the position of the system global on/off digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK
Hd02	Comp. sec. setP DI position	Sets the position for compressor management secondary setpoint digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK
Hd03	Fan sec. setP DI position	Sets the position for fan management secondary setpoint digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK
Hd11	C1 OnOff DI position	Sets the position of the circuit 1 on/off digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK
Hd12	C1 fluid level alarm DI pos.	Sets the position of the circuit 1 fluid level alarm digital input	7	0	12 (22)		CO-Hw	*Default = 6* *Max =10(18)* on C-PRO MEGA RACK
Hd13	C1 suction LP alarm DI pos.	Sets the position of the circuit 1 suction pressure-switch low pressure alarm digital input	9	0	12 (22)		CO-Hw	*Default = 7* *Max =10(18)* on C-PRO MEGA RACK
Hd14	C1 supply HP alarm DI pos.	Sets the position of the circuit 1 supply pressure-switch high pressure alarm digital input	11	0	12 (22)		CO-Hw	*Default = 8* *Max =10(18)* on C-PRO MEGA RACK
Hd15	C1 comp. oil diff. alarm DI pos.	Sets the position of the circuit 1 compressor oil differential alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK
Hd16	C1 comp. fan thermal alarm DI pos.	Sets the position of the circuit 1 common fan thermal alarm digital input	5	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK
Hd21	C2 OnOff DI position	Sets the position of the circuit 2 on/off digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visible if PG01 > 1
Hd22	C2 fluid level alarm DI pos.	Sets the position of the circuit 2 fluid level alarm digital input	8	0	12 (22)		CO-Hw	*Default = 0* *Max =10(18)* on C-PRO MEGA RACK; Visible if PG01 > 1
Hd23	C1 suction LP alarm DI pos.	Sets the position of the circuit 2 suction pressure-switch low pressure alarm digital input	10	0	12 (22)		CO-Hw	*Default = 0* *Max =10(18)* on C-PRO MEGA RACK; Visible if PG01 > 1

Hd24	C2 supply HP alarm DI pos.	Sets the position of the circuit 2 supply pressure-switch high pressure alarm digital input	12	0	12 (22)		CO-Hw	*Default = 0* *Max =10(18)* on C-PRO MEGA RACK; Visible if PG01 > 1 and PG30 = 0
Hd25	C2 comp. oil diff. alarm DI pos.	Sets the position of the circuit 2 compressor oil differential alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visible if PG01 > 1
Hd26	C2 comp. fan thermal alarm DI pos.	Sets the position of the circuit 2 common fan thermal alarm digital input	6	0	12 (22)		CO-Hw	*Default = 0* *Max =10(18)* on C-PRO MEGA RACK; Visible if PG01 > 1 and PG30 = 0
Hd31	C3 OnOff DI position	Sets the position of the circuit 3 on/off digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visible if PG01 > 2
Hd32	C3 fluid level alarm DI pos.	Sets the position of the circuit 3 fluid level alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visible if PG01 > 2
Hd33	C3 suction LP alarm DI pos.	Sets the position of the circuit 3 suction pressure-switch low pressure alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visible if PG01 > 2
Hd34	C3 supply HP alarm DI pos.	Sets the position of the circuit 3 supply pressure-switch high pressure alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visible if PG01 > 2 and PG30 = 0
Hd35	C3 comp. oil diff. alarm DI pos.	Sets the position of the circuit 3 compressor oil differential alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visible if PG01 > 2
Hd36	C3 comp. fan thermal alarm DI pos.	Sets the position of the circuit 3 common fan thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visible if PG01 > 2 and PG30 = 0
Hd41	Comp. 1 thermal DI pos.	Sets the position of the compressor 1 thermal alarm digital input	1	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *[1]

Hd42	Comp. 2 thermal DI pos.	Sets the position of the compressor 2 thermal alarm digital input	2	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *[1]
Hd43	Comp. 3 thermal DI pos.	Sets the position of the compressor 3 thermal alarm digital input	3	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *[1]
Hd44	Comp. 4 thermal DI pos.	Sets the position of the compressor 4 thermal alarm digital input	4	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *[1]
Hd45	Comp. 5 thermal DI pos.	Sets the position of the compressor 5 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *[1]
Hd46	Comp. 6 thermal DI pos.	Sets the position of the compressor 6 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *[1]
Hd47	Comp. 7 thermal DI pos.	Sets the position of the compressor 7 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *[1]
Hd48	Comp. 8 thermal DI pos.	Sets the position of the compressor 8 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *[1]
Hd49	Comp. 9 thermal DI pos.	Sets the position of the compressor 9 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *[1]
Hd50	Comp. 10 thermal DI pos.	Sets the position of the compressor 10 thermal	0	0	12 (22)		CO-Hw	*Max =10(18)* on

		alarm digital input						C-PRO MEGA RACK; Visibility *1
Hd51	Comp. 11 thermal DI pos.	Sets the position of the compressor 11 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *1
Hd52	Comp. 12 thermal DI pos.	Sets the position of the compressor 12 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *1
Hd61	Compressor 1 pressure-switch DI pos.	Sets the position of the compressor 1 pressure-switch alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *1
Hd62	Compressor 2 pressure-switch DI pos.	Sets the position of the compressor 2 pressure-switch alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *1
Hd63	Compressor 3 pressure-switch DI pos.	Sets the position of the compressor 3 pressure-switch alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *1

Hd64	Compressor 4 pressure-switch DI pos.	Sets the position of the compressor 4 pressure-switch alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *1
Hd65	Compressor 5 pressure-switch DI pos.	Sets the position of the compressor 5 pressure-switch alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *1
Hd66	Compressor 6 pressure-switch DI pos.	Sets the position of the compressor 6 pressure-switch alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *1
Hd71	Compressor 1 oil diff. DI pos.	Position of the compressor 1 oil differential alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *1
Hd72	Compressor 2 oil diff. DI pos.	Position of the compressor 2 oil differential alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *1
Hd73	Compressor 3 oil diff. DI pos.	Position of the compressor 3 oil differential alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *1
Hd74	Compressor 4 oil diff. DI pos.	Position of the compressor 4 oil differential alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *1
Hd75	Compressor 5 oil diff. DI pos.	Position of the compressor 5 oil differential alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *1
Hd76	Compressor 6 oil diff. DI pos.	Position of the compressor 6 oil differential alarm digital	0	0	12 (22)		CO-Hw	*Max =10(18)* on

		input						C-PRO MEGA RACK; Visibility *1
Hd81	Fan 1 thermal DI pos.	Sets the position of the fan 1 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *2
Hd82	Fan 2 thermal DI pos.	Sets the position of the fan 2 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *2
Hd83	Fan 3 thermal DI pos.	Sets the position of the fan 3 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *2
Hd84	Fan 4 thermal DI pos.	Sets the position of the fan 4 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *2
Hd85	Fan 5 thermal DI pos.	Sets the position of the fan 5 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *2

Hd86	Fan 6 thermal DI pos.	Sets the position of the fan 6 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *[2]
Hd87	Fan 7 thermal DI pos.	Sets the position of the fan 7 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *[2]
Hd88	Fan 8 thermal DI pos.	Sets the position of the fan 8 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *[2]
Hd89	Fan 9 thermal DI pos.	Sets the position of the fan 9 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *[2]
Hd90	Fan 10 thermal DI pos.	Sets the position of the fan 10 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *[2]
Hd91	Fan 11 thermal DI pos.	Sets the position of the fan 11 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *[2]
Hd92	Fan 12 thermal DI pos.	Sets the position of the fan 12 thermal alarm digital input	0	0	12 (22)		CO-Hw	*Max =10(18)* on C-PRO MEGA RACK; Visibility *[2]

Once machine parameters are configured, and every time configuration parameters are modified, it is recommended the system be switched off and restarted in order to allow the card to configure itself correctly.

NOTES:

(*[1]) Compressor visibility conditional.

Parameter visible if the compressor is configured: *i.e.* if the sum of the parameters indicating the number of compressors per circuit (enabled) PG11, PG15, PG21 is greater than or equal to the compressor in question.

(*[1]) Fan visibility conditional.

Parameter visible if the fan is configured: *i.e.* if the sum of the parameters indicating the number of fans per circuit (enabled) PG41, PG45, PG51 is greater than or equal to the fan in question.

The *Default* values for certain parameters vary depending on which controller is being used; the differences are highlighted in the parameter table *Notes* field.

6 REGULATIONS

6.1 Machine configuration

A *Wizard* (System builder menu) allows assisted configuration of the machine. The first choice refers to the number of circuits (1, 2 or 3) by means of parameter *PG01*; in the case of dual and triple circuit machines, the selection of the type of condensation, single or separate, (*PG30*) and the presence, or otherwise, of an expansion unit (*PG02*) are also important. These 3 parameters define the type of machine and the hardware supported, in accordance with the following table:

Machine type	**Single-circuit**	**Dual-circuit**		**Triple-circuit**	
Single condensation	n.r.	NO	YES	NO	YES
Probe AI 1	Suction pressure*3	C1 suction pressure*3	C1 suction pressure*3	C1 suction pressure*3	C1 suction pressure*3
Probe AI 2	Supply pressure*3	C1 supply pressure*3	Supply pressure*3	C1 supply pressure*3	Supply pressure*3
Probe AI 3	-	C2 suction pressure*3	C2 suction pressure*3	C2 suction pressure*3	C2 suction pressure*3
Probe AI 4	-	C2 supply pressure*3	-	C2 supply pressure*3	-
Probe AI 5	-	-	C3 suction pressure*3	C3 suction pressure*3	C3 suction pressure*3
Probe AI 6	-	-	-	C3 supply pressure*3	-
Probe AI 7	Environment temperature	Environment temperature	Environment temperature	Environment temperature	Environment temperature
Probe AI 8	External temperature	External temperature	External temperature	External temperature	External temperature
Analogue output AO 1	Compressor with inverter	Compressor with inverter C1	Compressor with inverter C1	Compressor / Fan with inverter C1 *2	Compressor / Fan with inverter C1 *2
Analogue output AO 2	-	Compressor with inverter C2	Compressor with inverter C2	Compressor / Fan with inverter C2 *2	Compressor with inverter C2 *2
Analogue output AO 3	Fan with inverter	Fan with inverter C1	Fan with inverter C1	Compressor / Fan with inverter C3 *2	Compressor with inverter C3 *2
Analogue output AO 4	-	Fan with inverter C2	-	-	Fan with inverter
Number of digital inputs	12 (22)*1	12 (22)*1	12 (22)*1	12 (22)*1	12 (22)*1
Number of digital outputs	13 (26)*1	13 (26)*1	13 (26)*1	13 (26)*1	13 (26)*1

(*1) If there is an expansion unit, the number of digital inputs and outputs increases, and it is possible
to configure more hardware, depending on requirements.

(*2) In triple-circuit machines, inverter use is exclusively between compressors and fans.

(*3) The probes can also measure temperature by changing the relevant driver parameters: PH43, PH44, PH45, PH47. Temperature is transformed into pressure by selecting the type of refrigerant gas used (parameter PH31).

The same wizard also sets the number of compressors and fans for each circuit, the presence of an inverter, compressors and fans, the number of increments and compressor safety devices and enables fan safety devices.

Note: Enabling the inverter for the compressors regulation, the FIRST compressor will be that commanded by the inverter, the other following compressors will be hermetic type (without capacity stages) and will be commanded by a relay digital output.
Likewise, enabling the inverter for the fans regulation, the FIRST fan will be that commanded by the inverter, the other following fans will be commanded by a relay digital output.
For each inverter in necessary to configure the digital outputs position for the consent at device activation.

6.2 Machine and individual circuit status

There are several procedures for switching the unit or individual circuits on/off:

1) Using the relevant **On/Off key** (parameter enabled function)
   Machine/circuit on: press and hold the relevant key for approx. 2 seconds: if all other enabled conditions are present, the machine or individual circuit will be switched “ON”.
   Machine/circuit off: press and hold the relevant key for approx. 2 seconds: the machine or individual circuit will be switched “OFF”.
2) Using the **digital input On/Off** command (parameter enabled function)
   Machine/circuit on: close the remote On/Off contact: if all other enabled conditions are present, the machine or individual circuit will be switched “ON”.
   Machine/circuit off: if the remote On/Off contact is open, the machine or individual circuit is switched “OFF by digital input” (indicated by the wording “OFF_D” for the individual circuit status).
3) By means of the **supervision protocol** (parameter enabled function)
   Machine/circuit on: activate the on state by means of the protocol: if all other enabled conditions are present, the machine or individual circuit will be switched “ON”.
   Machine/circuit off: if the on state is deactivated from the protocol, the machine or individual circuit is switched “OFF by supervision protocol” (indicated by the wording “OFF_S” for the individual circuit status).

The status of “On/Off by key” overrides the other two, indeed, the “On/Off by digital input and supervision protocol” statuses can only be achieved when the machine is switched on using the appropriate key.

A machine that is **switched off by digital input** can:
- be switched to the OFF status by key (by pressing the ESC key).
- be switched to the OFF by supervisor state if fulfilling the “OFF by digital input” conditions, and the “OFF by supervisor” status is set.
- be switched to the ON state if fulfilling the “OFF by digital input” conditions, and the “OFF by supervisor” status is not set.

A machine that is **switched off by supervision protocol** can:
- be switched to the OFF status by key (by pressing the ESC key).
- be switched to the “OFF by digital input state” if fulfilling the “OFF by supervisor” conditions, and the “OFF by digital input” status is tripped.

- be switched to the ON state if fulfilling the “OFF by supervisor” conditions, and the “OFF by digital input” condition is not met.

The machine On/Off key is the ESC key, pressed for approx. 2 seconds.
The remote On/Off inputs (if present) are configured by means of the relevant parameters.

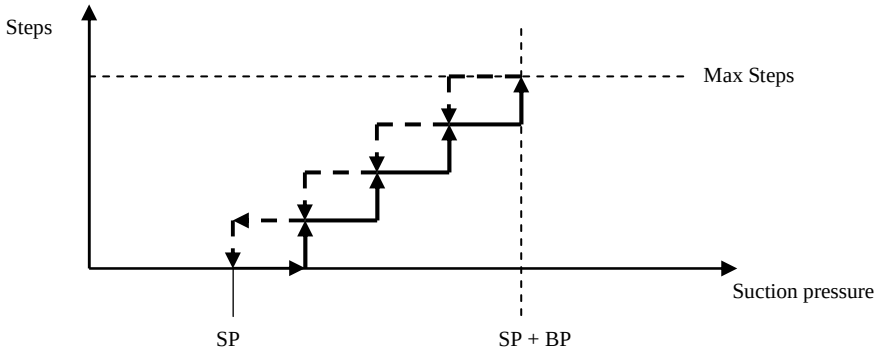
6.3 Compressor regulation

Control of compressor suction pressure envisages the management of the latter in order to reach and maintain a defined working pressure value: depending on the type of control (side band or neutral zone) and the use, or otherwise, of inverters for fine adjustment, four types of regulation are envisaged.

6.3.1 Side band regulation

Side band control exploits the characteristics of PI (proportional and integral) or P (proportional) regulators to establish when to insert or disengage the compressors used, so as to regularise, within the differential band, the switching on and off of the various devices. The purpose of PI regulation is to have no error in full operation.
The parameters defining this regulation are as follows:

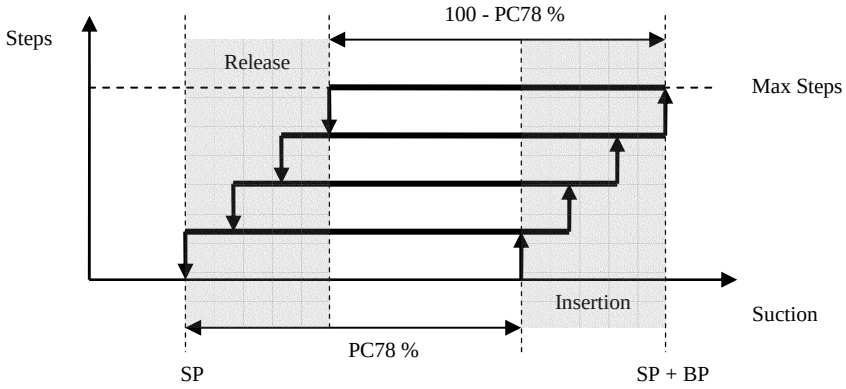
- Integral time (IT)
- Proportional band (PB)
- Side band suction SetPoint (SP)



The above figure shows the behaviour of band regulation (SP, SP + PB). Depending on the suction pressure value, regulation adds or removes the number of steps to request from the compressors. Under such regulation, the band is displaced above the setpoint.

It is possible to select whether control will refer to PI or just P regulation, by either setting the parameter for integral action, namely the integration time (TI), or otherwise. In the specific case where this parameter is set to the value zero, regulation is proportional only, otherwise, it is also integral. Ti corresponds to the time necessary for integral action, assuming constant error, to equalise the proportional action: the speed of this action is proportional to the integration time value. The default parameter is greater than zero, hence, by default, regulation exploits the proportional-integral characteristic.

The *PC78 Sideband step overlap* parameter allows improvements in the behaviour of this type of regulation, which requires broad proportional bands in order to be stable, thus modifying the subdivision of the regulation band between steps:



The insertion of steps occurs at *PC78%* of the proportional band, while release occurs at *100 – PC78%* of the band; if for example *PC78 = 60%*, steps are inserted between 60% and the maximum value (100%) of the proportional band PB, and in the same way released between 40% and the minimum value (0%) of the same band PB.
It is obvious that by using step division, as indicated in the figure, the activity interval of each individual step is greater with respect to standard geometric division, with the obvious advantage that the proportional band may be reduced, in favour of greater regulation accuracy, and/or the activation of the steps occurs with reduced frequency, or reduced compressor start-ups, to the benefit of the mechanical lifespan of the same.

6.3.2 Neutral zone regulation

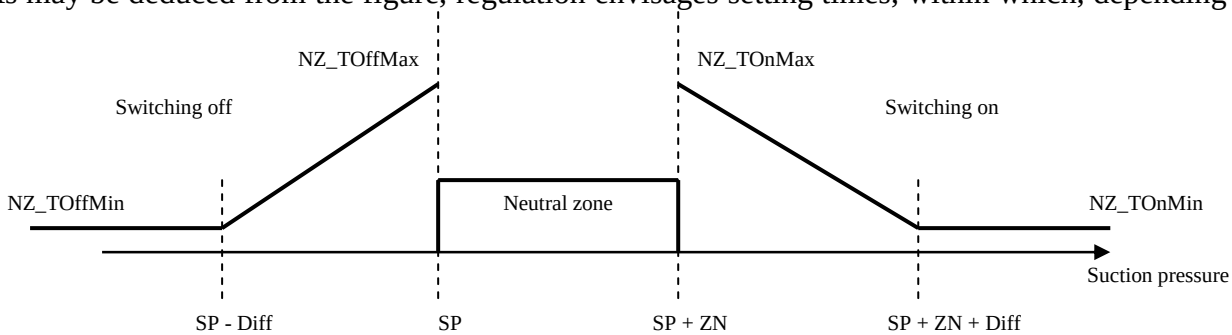
This type of regulation envisages the definition of a neutral zone, within which no activation or deactivation decision will be taken, *i.e.* startup operations will not be requested for any of the devices.
The parameters defining this regulation are as follows:

- Neutral zone (NZ)
- Out of zone differential (Diff)
- Side band suction SetPoint (SP)

Outwith said neutral zone, device on or off requests for the various steps provided by the compressors will follow this logic:

- Switch on : When the suction pressure exceeds the setPoint + Neutral Zone threshold
- Switch off : when the pressure drops below the setPoint

In this type of regulation, the neutral zone is displaced to the right of the setPoint.
As may be deduced from the figure, regulation envisages setting times, within which, depending on



the zone, the on and off requests for the various steps must be timed. The relevant parameters are as follows:

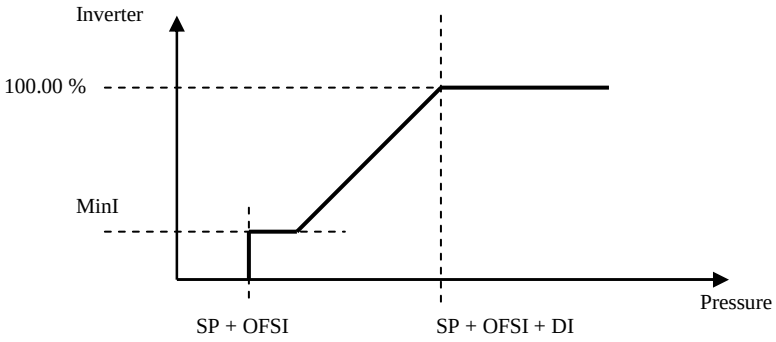
- Minimum switch-on time (NZ_TOnMin)
- Maximum switch-on time (NZ_TOnMax)
- Minimum switch-off time (NZ_TOffMin)
- Maximum switch-off time (NZ_TOffMax)

On the basis of the suction pressure value approaching the reference value, the times will vary proportionally according to the values set. Depending on the circumstances, the reference value mentioned represents the right and left limit of the neutral zone with the addition of a further differential (settable by means of a parameter) within which will be the proportional variation for the time in question.
At the regulation limits, the on and off time values are the maximum and minimum times set by the parameter. To make the request time constant during switching on, simply set parameters NZ_TOnMin and NZ_TOnMax to the same value. The same applies for switching off.

6.3.3 Side band regulation with inverter

This type of control introduces inverter control to normal side band control, and in order to do this it is essential to set several parameters relating to the inverter device it is intended to use, in addition to enabling its use. The parameters in question are the following:

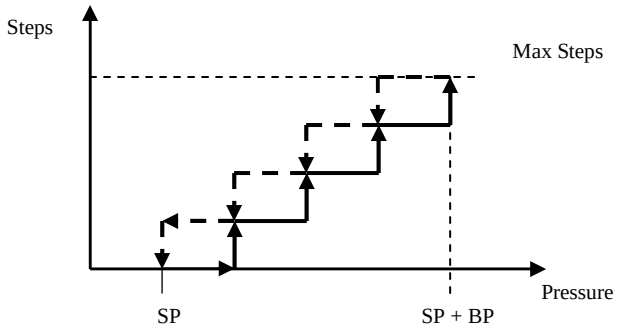
- Inverter differential (ID)
- Inverter enabling
- Inverter offset with respect to the suction setPoint (OFSI)
- Minimum inverter value (MinI)
- SpeedUp time
- Side band suction SetPoint (SP)



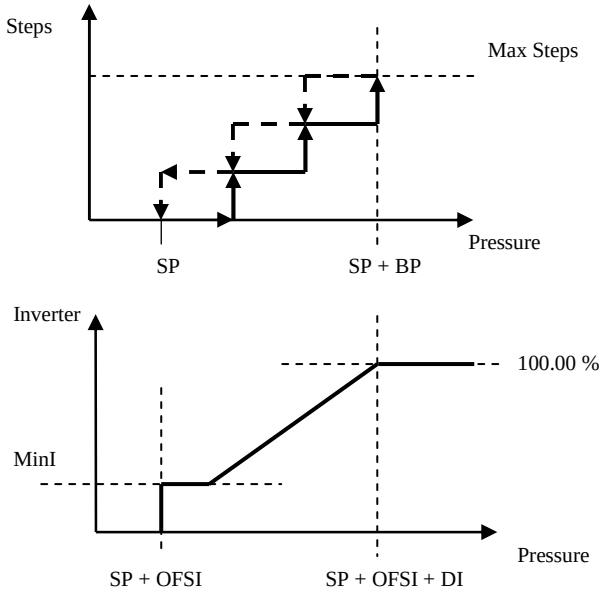
The regulator output will assume different values depending on the value measured by the suction probe.
If the value measured by the probe is less than or equal to the value of SP + OFSI, the regulator output assumes the value 0.
If the value measured by the probe is between the value of SP + OFSI and the value of SP + OFSI + ID, the regulator output will assume a value proportional to the suction probe value.
In the case where the suction probe assumes a value greater than or equal to the value of SP + OFSI + ID, the inverter output will assume the maximum value.
In the case where the parameter MinI has been set, then with each switching on, the inverter will maintain that value as the starting value.
Where the speedUp time parameter is greater than zero, with each startup, the inverter will assume the maximum value for the number of seconds set by this parameter.

The range of values the inverter output may assume is comprised of between 0 and 100 percentage points, with two decimal places.
By enabling the inverter, for a given number of compressors, one step is lost, which will be replaced by regulation with inverter on the first compressor.
Below is given an example of how to change regulation with the presence of an inverter.

Example: 4 compressors w/o inverter



Example: 4 compressors with 1 inverter



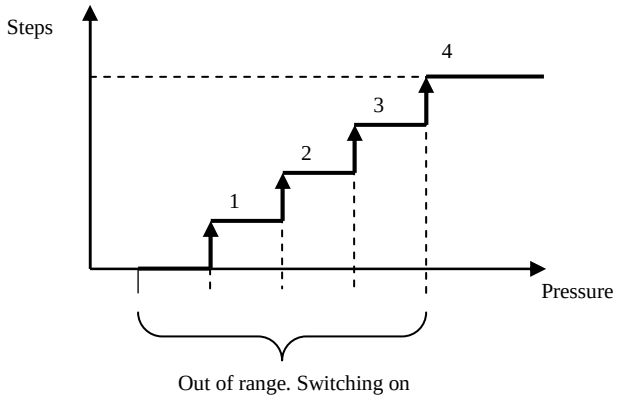
6.3.4 Neutral zone regulation with inverter

This type of control introduces inverter control to normal neutral zone control, and in order to do this it is essential to set several parameters relating to the inverter device it is intended to use, in addition to enabling its use. The parameters in question are the following:

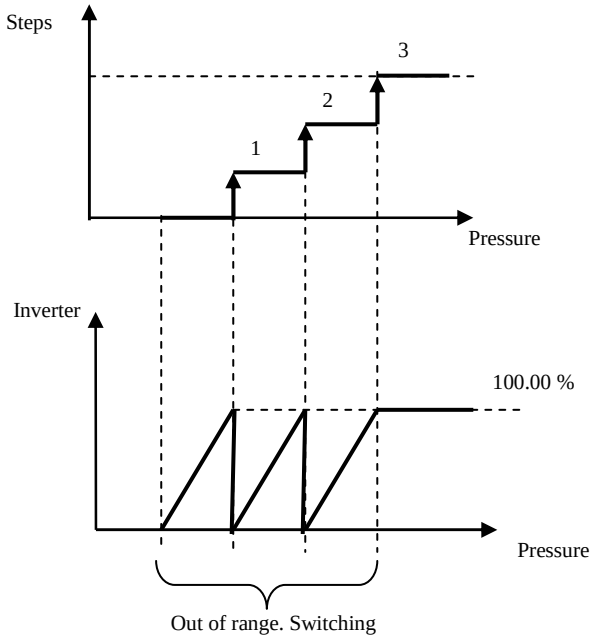
- Inverter enabling
- Minimum inverter value (MinI)
- Inverter time (IT)
- SpeedUp time
- neutral zone suction setPoint

Regulation varies according to the zone (neutral, on or off) in which the regulator is located.

Example: 4 compressors w/o inverter



Example: 4 compressors with 1 inverter



In the neutral zone, the inverter undergoes no changes and the compressors are neither switched on or off.
In the on zone:

- the inverter is activated as soon as requested.
- the inverter value varies according to the time TI set by the parameter. This represents the time required for the inverter ramp to change from the minimum value to the maximum when the inverter reaches the maximum value another compressor is requested
- on completion, the inverter value is reset to the minimum value (MinI if other than zero)
- In the case where the on zone is still ongoing, the cycle is restarted once more.

If the on request remains ongoing, one or all of the compressors are switched on and the inverter value finally reaches its maximum.
In the off zone:

- as soon as requested, the inverter output is adjusted, according to TI, to the minimum value.
- when the inverter reaches the minimum value, switching off another compressor is required
- having completed the request, in the case where the off zone remains, the inverter value is restored to the maximum value and the cycle restarted once more.

If the switch off request remains ongoing, one or all of the compressors are switched off and the inverter value finally reaches zero.
In the case where the parameter MinI has been set, then with each switching on, the inverter will maintain that value as the starting value.
Where the speedUp time parameter is greater than zero, the inverter assumes the maximum value for the time in seconds described by said parameter, each time the regulation switches from the neutral zone to the switch on zone.

6.4 Compressor management

The program is capable of managing up to a maximum of 12 compressors (8 if a C-PRO MEGA is used) of equal, or different nominal power, divided over three circuits; in the case of equal nominal power, it is also possible to manage up to 3 increment devices per compressor. The safety device

digital inputs and digital outputs for switching on/off and any increment devices, may be associated with each compressor.
The compressors are managed by means of a setPoint and differential that can be set by means of a parameter, and by reading a pressure value from the suction probe. Switching on/off is guaranteed by a thermoregulation device and by certain times settings, protecting the various startup operations.

6.4.1 Compressors per circuit

Depending on machine type, there are precise configurations relating to the compressors to be used for each circuit.

Single-circuit
All 12 (8 if using C-PRO MEGA) compressors can be used without limitations. Indeed the circuit is unique.

Dual-circuit and triple-circuit
The sum of the compressors used in the two/three circuits, including the inverters, must not exceed 12 (8 if using C-PRO MEGA); which is the maximum number of compressors managed by the program.

The digital outputs and inputs assigned to the compressors and the corresponding operation alarms are correctly assigned on the basis of the above guidelines.

Please note. *By enabling the inverter for compressor regulation, the FIRST compressor (for each circuit) will be the one controlled by the inverter, while any other additional compressors will be hermetic in nature (without increment functionality) and will be controlled by digital outputs using relays.*

6.4.2 Compressor status

Each compressor has an associated *compressor state*, which identifies its relative status during system operation.
A compressor can assume *7 different* states:

Disabled: the compressor has not been configured for the system. In this state, the user interface displays the symbol " - ".

1. *Off*: the compressor is off. In this state, the user interface displays the message "*OFF*".

2. *Awaiting switch off*: the compressor is about to be switched off, and is currently waiting protective device waiting times. In this state, the user interface flashes the message "W*OFF*".

3. *On*: the compressor is on. In this state, the user interface displays the message "*ON*".

4. *Awaiting switch on*: the compressor is about to be switched on, and is currently waiting protective device waiting times. In this state, the user interface flashes the message "*WON*".

5. *Alarm*: the compressor is off and in the alarm state. In this state, the user interface displays the message "*ALL*".

6. *Manual*: the compressor is in manual operational mode. In this state, the user interface displays the message "*MAN*".

In any case, a manually functioning compressor is sensitive to any alarms, in this case, the status will be that of *Alarm*.

6.4.3 Compressor rotation

Compressor rotation is a procedure that allows the number of operating hours and start-ups for each compressor to be balanced as much as possible.
Rotation only involves compressors and not the individual increments. It does not involve any compressors in the alarm state or operating manually, and is capable of dynamically switching on other compressors, should one or more of them switch to the alarm state.
In all the rotation types managed, any compressors restored from the alarm state or operating manually, will be inserted at the top of the list of compressors to be switched on. They will have maximum priority with respect to the other compressors, altering the switch on and switch off sequence. Rotation type is set by means of the parameter *Compressor Rotation (PC01).*

The program can manage 4 types of rotation: FIFO, LIFO, FIFO + time, LIFO + time.

1) FIFO

This follows *"First In First Out"* logic, *i.e.* the first compressor switched on will be the first switched off. Initially, this logic might leads to a large difference in operational hours between the various compressors, but after an initial phase, this should more or less balance out.

Example.

Switch on : C1 . C2 . C3 . C4 … . C12
Switch off : C1 . C2 . C3 . C4 … . C12

FIFO rotation has one peculiarity. If, for example, the first compressor is switched on and then off, the next compressor to be switched on will be the second. The last compressor switched off will be remembered so as to then switch on the next in sequence, thus avoiding always using the same and so better exploiting all the configured resources.

Example with 4 compressors:

Switch on : C1 . Switch off : C1 .
Switch on : C2 . C3 . Switch off : C2 . C3 .
Switch on : C4 . C1 . C2 . C3 . Switch off : C4 . C1 . C2 . C3 .

This type of rotation seeks to balance the number of switch on and off operations for the compressors configured.

2) LIFO

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

Example.

Switch on : C1 . C2 . C3 . C4 … . C12

Switch off : C12 . … C4 . C3 . C2 . C1

3) FIFO + time of operation

This type of rotation functions by considering the number of operating hours for each compressor. Startup will switch on the compressor with the least operating hours, while shut down will switch off the compressor with the most operating hours.
In the case where a selection must be made between compressors with the same number of hours, then a FIFO rotation is implemented, so as to thus guarantee rotation of the configured compressors. The same rules described previously are also valid for FIFO rotation.

Example 1

Switch on : C1(3 hours) . C2(3 hours) . C3(3 hours) . C4(3 hours)
Switch off : C1(3 hours) . C2(3 hours) . C3(3 hours) . C4(3 hours)

Example 2

Switch on : C1(1 hour) . C2(3 hours) . C3(3 hours) . C4(5 hours)
Switch off : C4(5 hours) . C2(3 hours) . C3(3 hours) . C1(1 hour)

Time based rotation seeks to balance the number of operating hours of the compressors present in the system.

4) LIFO + time of operation

This type of rotation functions by considering the number of operating hours for each compressor. Startup will switch on the compressor with the least operating hours, while shut down will switch off the compressor with the most operating hours.
In the case where a selection must be made between compressors with the same number of hours, then a LIFO rotation is implemented, so as to thus guarantee rotation of the configured compressors.

Example 1

Switch on : C1(3 hours) . C2(3 hours) . C3(3 hours) . C4(3 hours)
Switch off : C4(3 hours) . C3(3 hours) . C2(3 hours) . C1(3 hours)

Example 2

Switch on : C1(1 hour) . C2(3 hours) . C3(3 hours) . C4(5 hours)
Switch off : C4(5 hours) . C3(3 hours) . C2(3 hours) . C1(1 hour)

Time based rotation seeks to balance the number of operating hours of the compressors present in the system.

Please note. *If the type of rotation is changed with the machine running, it is necessary to switch the machine off and then on in order to avoid malfunctions.*

6.4.4 Increment management

Incrementing a compressor means distributing the overall load over several increments, thus improving operation and reducing the number of startup operations, in order to prolong the lifespan of the mechanical device.
The program is capable of managing up to 12 incremented compressors (with appropriate limitations), or up to 12 non-incremented compressors.

Increment number

By means of the appropriate parameter *(PG04)*, it is possible to select one, two or three equal powered increments for each of the configured compressors.
Each compressor will have the same number of available increments.
Possible configurations for the number of increments per compressor depend on what hardware is being used, and the presence, or otherwise, of an expansion unit.

Example 1 - C-PRO GIGA (13 available relays) :

- From 1 to 3 compressors, maximum of 3 increments
- From 1 to 4 compressors, maximum of 2 increments
- From 1 to 6 compressors, maximum of 1 increment
- From 1 to 12 compressors, no increments

Example 2 - C-PRO GIGA + ExpansionPro 1 (26 available relays) :

- From 1 to 6 compressors, maximum of 3 increments
- From 1 to 8 compressors, maximum of 2 increments
- From 1 to 12 compressors, maximum of 1 increment (or none)

Please note. *If one of the compressor inverters is selected, it will not be possible to use incremented compressors, i.e. the compressor increment parameter is forced to a value of zero.*

Increment logic

If incremented compressors are being used, then it is possible, by means of this parameter *(PC03)*, to select the operational logic of the outputs dedicated to incrementing:

- If set to *NC* the outputs will be normally energised (closed) and will be opened in order to request greater power: Copeland type logic.
- If set to *NO* the outputs will be normally de-energised (open) and will be closed in order to request greater power: Feeders type logic.

Switching on/off mode

In the case where incremented compressors are being used, this parameter *(PC02)* allows the increment switch on/off mode to be set.
If set to “0”:

Switch on : CppCppCpp. The program favours the complete switching on of individual compressors prior to moving to the following compressor.

Switch off : ppCppCppC. The program favours the complete switching off of individual compressors prior to moving to the following compressor.

If set to “1”:

Switch on : CCCppppppp. The program favours first of all switching on all compressors, and only then acting on the increments.

Switch off : ppppppCCC. The program favours first of all switching off all steps and only then finally switching off the compressors.

If set to “2”:

Switch on : CppCppCpp. The program favours the complete switching on of individual compressors prior to moving to the following compressor.

Switch off : ppppppCCC. The program favours first of all switching off all increments and only then finally switching off the compressors.

If set to “3”:

Switch on : CCCppppppp. The program favours first of all switching on all compressors, and only then acting on the increments.

Switch off : ppCppCppC. The program favours the complete switching off of individual compressors prior to moving to the following compressor.

With *CCCppppppp* type switching on and *ppppppCCC* type switching off, the individual step switch on/off logic follows this example (example for 3 compressors):
Compressor switch on : C1 . C2 . C3
Increment switch on : p1C1 . p1C2 .p1C3 / p2C1 . p2C2 . p2C3 / p3C1 . p3C2 . p3C3
Increment switch off : p3C3 . p3C2 .p3C3 / p2C3 . p2C2 . p2C1 / p1C3 . p1C2 . p1C1

6.4.5 Protective device timings

All the timings pertaining to compressor management are listed below

Neutral zone timings

These parameters are used to time the switching on and off requests for the various steps provided by the compressors.
Minimum required switch on time - TOnMin
Maximum required switch on time - TOnMax
Minimum required switch off time - TOffMin
Maximum required switch off time - TOffMax
For these parameters, please refer to the description given in section 2.3.2.

Protective device timings

These times are required to protect the mechanical devices from the various startup operations to which they are subjected.

TMinOn – Minimum compressor switch on time (PC04). Once activated, the compressor will remain on for this amount of time, before being able to be switched off.

TMinOff – Minimum compressor switch off time (PC05). Minimum elapsed time since the last switch off before the compressor can be switched on once more.

TOnOn – Minimum same compressor switch on time (PC06). This establishes the minimum time that must elapse before the same compressor can be switched on.

TOnOther – Minimum different compressor switch on time (PC07). This establishes the minimum time that must elapse before the subsequent compressor can be switched on. If greater than zero, this allows avoiding any simultaneous startup operations.

TOffOther – Minimum different compressor switch off time (PC08). This establishes the minimum time that must elapse before the subsequent compressor can be switched off. If greater than zero, this allows avoiding any simultaneous startup operations.

TOnParz – Minimum step switch on time (PC09). This establishes the minimum switch on time between compressor steps.

TOffParz – Minimum step switch off time (PC10). This establishes the minimum switch off time between compressor steps.

SpeedUp time. If regulation by means of inverter is set, then this parameter, if other than zero, keeps the inverter output at maximum value (100.0%) with each new step switch on request.

6.4.6 Startup delay from reset

By means of the parameter *PC69 – TRestart* in the *Installer ->Compressors* menu, it is possible to delay compressor startup each time the controller is reset; for example, following a black-out caused by a power cut.

6.4.7 Safety device inputs

The program envisages the management of 3 safety devices, with relevant alarms, managed by means of 4 possible combinations. Based on the parameter *safety device number (PG05)* the number of safety devices can be selected, and by means of the parameter *safety device type (PH16)* the appropriate combination for the application can be selected. The three safety devices managed are as follows:

- Compressor thermal
- Compressor oil differential
- Compressor high/low pressure pressure-switch

The four combinations implemented are described in the following table.

Parameter	Type	Delay	Reset
0	None	-	-
1	Thermal	Configurable	Configurable
2	Thermal	Configurable	Configurable
	High/low pressure pressure-switch	Immediate	Configurable
3	Thermal	Configurable	Configurable
	Oil differential	Configurable	Configurable
4	Thermal + oil differential + pressure-switch	-	-

The "*compressor thermal*" safety device manages all 12 compressors and is enabled by setting two parameters:

Safety device number: 1 / 2 / 3
Safety device type: 1 / 2 / 3 / 4

The *"compressor oil differential"* safety device manages up to a maximum of 6 compressors and is enabled by setting two parameters as follows:

Safety device number: 2 / 3
Safety device type: 3 / 4

The *"compressor high/low pressure pressure-switch"* safety device manages up to a maximum of 6 compressors and is enabled by setting two parameters as follows:

Safety device number: 2 / 3
Safety device type: 2 / 4

To enable the alarms associated with these safety devices, besides setting the above-described parameters, it is also essential to set the *positions* where the digital inputs relating to the various alarm types will be connected from within the System builder ->Hardware menu. Where there is no desire to set an alarm, simply set the parameter to the value 0.

The number of safety devices that can be used is limited by the number of available digital inputs (depending on the hardware used) and the number of compressors configured.

Please note. *If the number of safety devices is greater than or equal to 1, then the "compressor thermal" safety device is always selected.*

6.4.8 Inverter configuration

For each inverter used must be selected the digital output position for the command/consent to the inverter start; for the configuration are used the same parameters of the compressors digital outputs, parameters *HC01..HC10, HC50, HC60*. The inverter is virtually the first compressor of each circuit, then according to the quantity of compressors and the quantity of circuits must be set the correct parameter according to this logic.

- *1 circuit:* The inverter (if enabled) is virtually the compressor 1; is necessary to configure the parameter of the first compressor, then must be always configured the parameter HC01.
- *2 circuits:* The inverter of circuit 1 (if enabled) is virtually the compressor 1 (then, must be configured the parameter *HC01*), the inverter of circuit 2 (if enabled) is virtually the first compressor after the circuit 1 compressors.
- *3 circuits:* The inverter of circuit 1 (if enabled) is virtually the compressor 1 (then, must be configured the parameter *HC01*), the inverter of circuit 2 (if enabled) is virtually the first compressor after the circuit 1 compressors, the inverter of circuit 3 (if enabled) is virtually the first compressor after the circuit 1 and 2 compressors.

Note. The parameter *PH20* modifies the logic for the inverter consent.

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 per the inverter command.

2) N°2 circuits (PG01=2), n° 2 compressors for each circuit (PG11=2, PG15=2), both inverter 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 circuit (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
   HC02 = 2 -> digital output per 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 for the circuit 1 inverter command
   HC32 = 2 -> analog output for 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), both inverter enabled (PG12=1, PG16=1). A correct configuration is:
   HC01 = 1 -> digital output for the circuit 1 inverter consent
   HC02 = 2 -> digital output for thr circuit 2 inverter condent
   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 for the circuit 1 inverter command
   HC32 = 2 -> analog output for the circuit 2 inverter command

6.4.9 Compressors of different nominal power

Management of compressors with different nominal power might be useful in order to have more precise regulation in order to establish the final value at the configured setpoint.
In order to use this type of management, it is essential to enable the relevant parameter, *enable compressors of different nominal power (PG03)* and set the parameters representing the nominal power for each of the compressors to be used in the system.
The software calculates the maximum power that can be expressed by the individual nominal power ratings of each of the compressors, and, on the basis of the requests from the regulators, calculates the best combination of compressors in order to provide the requested power. For finer regulation, the resolution within each power step is tripled; this way, with compressors of different nominal power, there are more combinations that can approach the effective power requested by the regulators. With each variation in request, the permutation of compressors is recalculated so as to produce a power output equal to or greater than the request.
In the calculation of the permutation, any compressors that are manually disabled, in alarm states or in waiting times, are not considered.

Please note. *By enabling this function it is not possible to use incremented compressors or compressors with inverters.*

Side band regulation

On the basis of the control parameters, the application will calculate the power necessary to restore the measured pressure/temperature close to the desired setpoint.
The requested power will be calculated on the basis of a proportional or proportional + integral regulator, while the power provided will be given by the combination of compressor power outputs closest to exceeding the request.

Neutral zone regulation

On the basis of the zone in which the regulator is located, a new sequence of compressors to be activated is calculated, in particular:

- *In the neutral zone*: the combination remains unchanged.
- *In the on zone*: the combination of compressors is recalculated in order to guarantee power greater than that provided by the previous combination.
- *In the off zone*: the combination of compressors is recalculated in order to guarantee power less than that provided by the previous combination.

The recalculation of combinations is implemented on the basis of the neutral zone time settings, please refer to section 6.4.5.

Example

Considering 3 compressors of different nominal power ratings and a side band proportional regulation device, with the following parameters:

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

Measured Pressure (bar)	Required Power (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)

Below the setpoint, no power is delivered, above the setpoint plus the band, the power delivered is the maximum available.

6.4.10 Suction line loss of load compensation

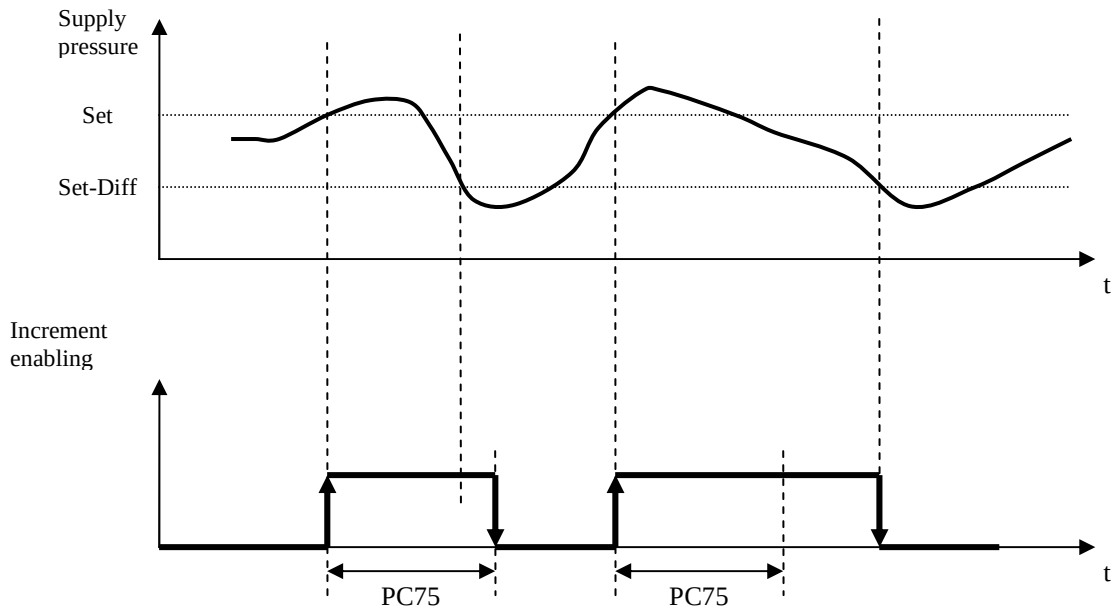
In certain systems, it might become necessary to reduce the suction setpoint with increased refrigerant capacity, in order to compensate for the increased pressure loss along the suction line. In practice, the services, which should operate at constant evaporation pressure, are forced to operate higher pressures when the cold requirement is greater, and *vice versa*. This means that, in order to guarantee cold production at the desired temperature, even with loads approaching the nominal values, it is necessary to work with a significantly lower setpoint even at partial loads, when this should not be necessary. Compensation works by introducing a configurable offset that lowers the setpoint, gradually, with each demand for cold steps: it is clear that this function has the aim of increasing system efficiency, allowing the selection of a higher setpoint at low loads.
The parameter *PH35* enables this function, lowering the setpoint by a compensation factor *(PH36 Suction load compensation offset*) with each step inserted, and raising the same value with each step released.
This function can only be activated with neutral zone regulation.

6.4.11 Refrigeration power incrementing at high pressures

In order to avoid tripping the condensation high pressure pressure-switch, with consequent blocking of cold production, it is possible to reduce the refrigeration power and consequently the power to be exchanged by the condenser, thus reducing condensation pressure. This reduction is only possible with incrementable circuits (with at least two compressors or with one compressor with incrementing devices).

The parameters pertaining to this function are as follows:

- *PC70 = Enable high pressure incrementing*
- *PC71 = Condensation pressure-switch control setpoint limit (Circuit 1)*
- *PC72 = Condensation pressure-switch control setpoint limit (Circuit 2)*
- *PC73 = Condensation pressure-switch control setpoint limit (Circuit 3)*
- *PC74 = Pressure-switch control differential*
- *PC75 = Minimum pressure-switch increment maintenance time*
- *PC76 = Percentage increment value*



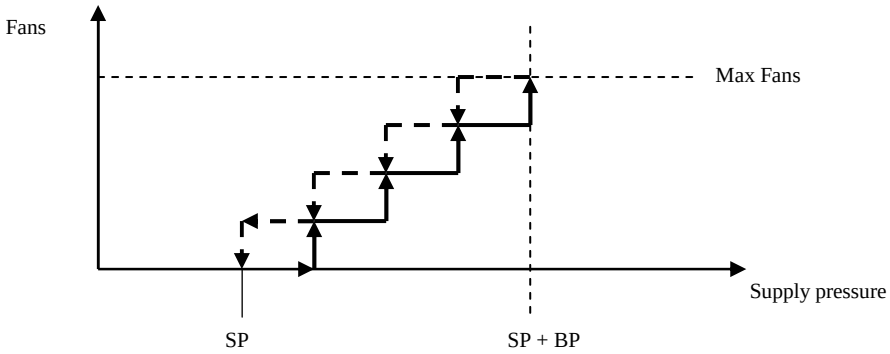
6.5 Condensation regulation

Condensation management envisages control of the supply pressure using the fans: depending on the type of control (side band or neutral zone) and the use, or otherwise, of inverters for fine adjustment, four types of regulation are envisaged.

6.5.1 Side band regulation

Side band control exploits the characteristics of PI (proportional and integral) or P (proportional) regulators to establish when to insert or disengage the fans used, so as to regularise, within the differential band, the switching on and off of the various devices. The purpose of PI regulation is to have no error in full operation.
The parameters defining this regulation are as follows:

- Proportional band (PB)
- Side band supply SetPoint (SP)
- Integral time (IT)



The above figure shows the behaviour of band regulation (SP, SP + PB). Depending on the supply pressure value, regulation adds or removes the number of steps required by the fans. Under such regulation, the band is displaced above the setPoint.

It is possible to select whether control will refer to PI or just P regulation, by either setting the parameter for integral action, namely the integration time (Ti), or otherwise. In the specific case where this parameter is set to the value zero, regulation is proportional only, otherwise, it is also integral. Ti corresponds to the time necessary for integral action, assuming constant error, to equalise the proportional action: the speed of this action is proportional to the integration time value. The default parameter is greater than zero, hence, by default, regulation exploits the proportional-integral characteristic.

Like the case with compressors, by means of the parameter *PF78 Side band increment overlap*, with side band regulation of fans, it is also possible to improve the behaviour of the regulation band.

6.5.2 Neutral zone regulation

This type of regulation envisages the definition of a neutral zone, within which no activation or deactivation decision will be taken, *i.e.* startup operations will not be requested for any of the devices.
The parameters defining this regulation are as follows:

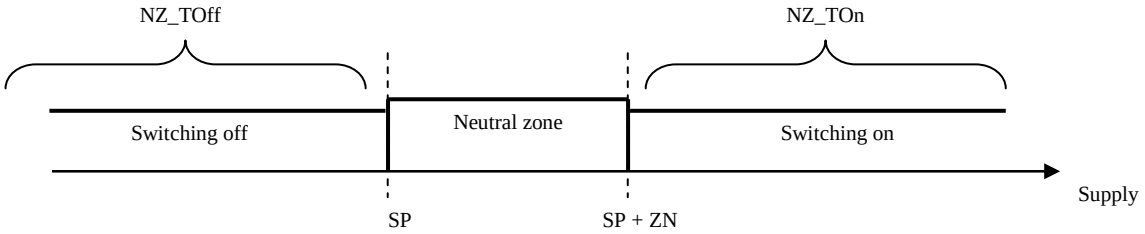
- Neutral zone (NZ)

- Side band suction SetPoint (SP)

Outwith said neutral zone, device on or off requests for the configured fans will follow this logic:

- *Switch on*: when the supply pressure exceeds the setPoint + Neutral Zone threshold
- *Switch off*: when the pressure drops below the setPoint

In this type of regulation, the neutral zone is displaced to the right of the setPoint.



As may be deduced from the figure, regulation envisages setting two times, within which, depending on the zone, the on and off requests for the various steps must be timed. The relevant parameters are as follows:

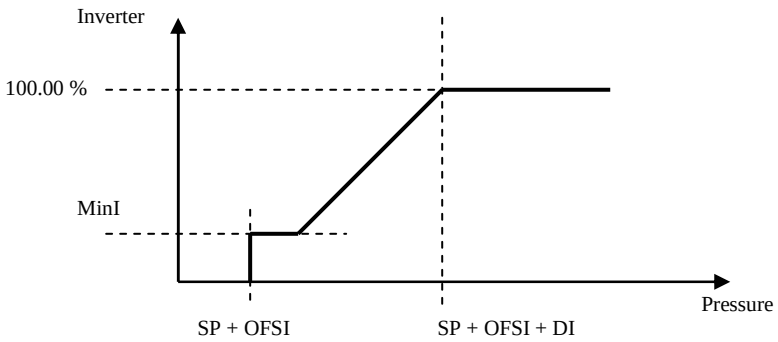
- Switch-on time (NZ_TOn)
- Switch-off time (NZ_TOff)

In the case where the system is in the switch off zone, each switch off request will have to wait for NZ_TOff seconds prior to being fulfilled. While, in the case of the switch on zone, each switch on request will have to wait NZ_TOn seconds prior to being fulfilled.

6.5.3 Side band regulation with inverter

This type of control introduces inverter control to normal side band control, and in order to do this it is essential to set several parameters relating to the inverter device it is intended to use, in addition to enabling its use. The parameters in question are the following:

- Inverter differential (ID)
- Inverter enabling
- Inverter offset with respect to the supply setPoint (OFSI)
- Minimum inverter value (MinI)
- SpeedUp time
- Side band supply SetPoint (Sp)

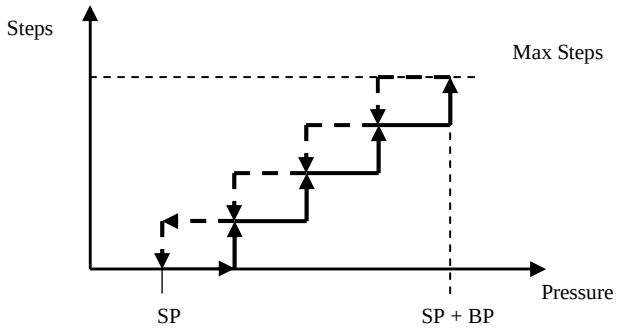


The regulator output will assume different values depending on the value measured by the supply probe.

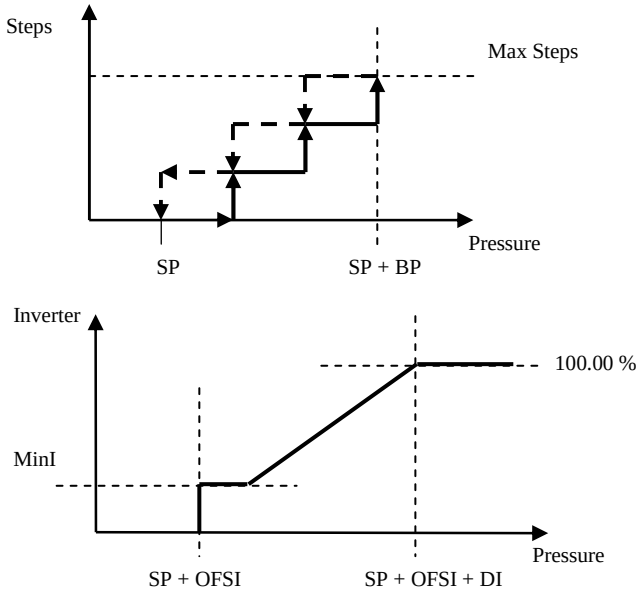
If the value measured by the probe is less than or equal to the value of SP + OFSI, the regulator output assumes the value 0.

If the value measured by the probe is between the value of SP + OFSI and the value of SP + OFSI + ID, the regulator output will assume a value proportional to the supply probe value.
In the case where the supply probe assumes a value greater than or equal to the value of SP + OFSI + ID, the inverter output will assume the maximum value.
In the case where the parameter MinI has been set, then with each switching on, the inverter will maintain that value as the starting value.
Where the speedUp time parameter is greater than zero, with each startup, the inverter will assume the maximum value for the number of seconds described by this parameter.
The range of values the inverter output may assume is comprised of between 0 and 100 percentage points, with two decimal places.
By enabling the inverter, for a given number of fans, one step is lost, which will be replaced by regulation with inverter on the first fan.
Below is given an example of how to change regulation with the presence of an inverter.

Example: 4 fans without inverter



Example: 4 fans with 1 inverter



6.5.4 Neutral zone regulation with inverter

This type of control introduces inverter control to normal neutral zone control, and in order to do this it is essential to set several parameters relating to the inverter device it is intended to use, in addition to enabling its use. The parameters in question are the following:

- Inverter enabling
- Minimum inverter value (MinI)
- Inverter time (IT)
- SpeedUp time
- Neutral zone supply SetPoint

Regulation varies according to the zone (neutral, on or off) in which the regulator is located.
In the neutral zone, the inverter undergoes no changes and the fans are neither switched on or off.
In the on zone:

- the inverter is activated as soon as requested.
- the inverter value varies according to the time TI set by the parameter. This represents the time required for the inverter ramp to change from the minimum value to the maximum.

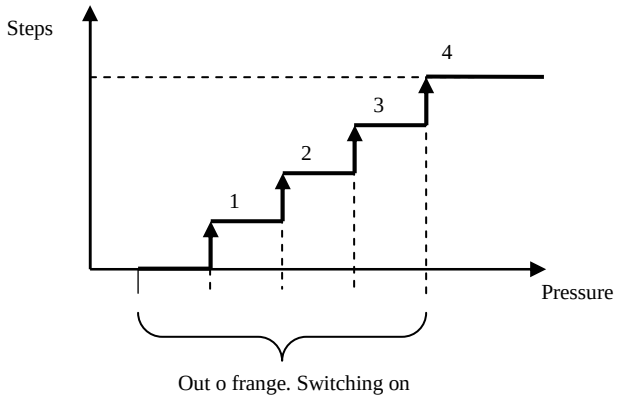
- when the inverter reaches the maximum value one of the other fans is requested.

In the case where the on zone remains ongoing one or all the fans are switched on and the inverter value remains at maximum.
In the off zone:

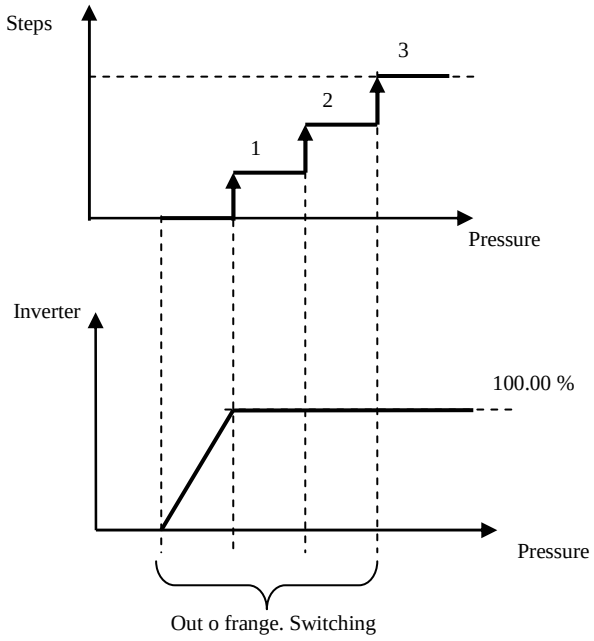
- as soon as requested, the inverter output is adjusted, according to TI, to the minimum value.
- when the inverter reaches the minimum value, switching off another fan is requested

If the switch off request remains ongoing, one or all of the fans are switched off and the inverter value remains at zero.
In the case where the parameter MinI has been set, then with each switching on, the inverter will maintain that value as the starting value.
Where the speedUp time parameter is greater than zero, the inverter assumes the maximum value for the time in seconds described by said parameter, each time the regulation switches from the neutral zone to the switch on zone.
Below is an example of a graph (for the switch on zone) of how regulation varies depending on whether the fan is configured with an inverter or otherwise.

Example: 4 fans without inverter



Example: 4 fans with 1 inverter



6.5.5 Unique condensation (dual/triple circuits only)

Unique condensation allows the fan process to be executed using a single circuit. By setting the parameter *enable unique condensation (PG30)*, the number of fan circuits is forced to one, while the number of circuits selected for compressors remains unchanged.
In any case, in the case where this function is selected, the maximum number of fans that can be used remains the maximum number of fans per circuit. Unique condensation will disable all the features (alarms, fans, inverters, …) pertaining to the second and third fan management circuits.

6.6 Fan management

The program is capable of managing up to a maximum of 12 fans (8 if using C-PRO MEGA) divided according to circuit. A digital input for safety devices and a digital output for switching on/off may be associated with each fan.
The number of fans that can be used is further limited by the number of compressors (and stepped compressors), *i.e.* the number of free digital outputs remaining after the compressors have been configured.
By setting the relevant parameter, it is possible to use a unique condensation device, *i.e.* achieved by means of a single circuit.
The fans are managed by means of a set Point and differential that can be set by means of a parameter, and by reading a pressure value from the supply probe. Switching on/off is guaranteed by a thermoregulation block and by certain time settings, protecting the various startup operations.

6.6.1 Fans per circuit

Depending on machine type, there are precise configurations relating to the fans to be used for each circuit.

Single-circuit
All 12 (8 if using C-PRO MEGA) fans can be used without limitations. Indeed the circuit is unique.

Dual-circuit and triple-circuit
The sum of the fans used in the two/three circuits, including the inverters, must not exceed 12 (8 if using C-PRO MEGA); which is the maximum number of fans managed by the program.

The digital outputs and inputs assigned to the fans and the corresponding operation alarms are correctly assigned on the basis of the above guidelines.

In the case where it is decided to use condensation on a single circuit (*Unique condensation* parameter) the only available and configurable fans will be those of the first circuit.

Please note. *By enabling the inverter for fan regulation, the FIRST fan (for each circuit) will be the one controlled by the inverter, while any other additional fans will be hermetic in nature and will be controlled by digital outputs using relays.*

6.6.2 Fan status

Each fan has an associated *fan state,* which identifies its relative status during system operation.
A fan can assume *7 different* states:

1. *Disabled*: the fan has not been configured for the system. In this state, the user interface displays the symbol " - ".

2. *Off*: the fan is off. In this state, the user interface displays the message "*OFF*".

3. *Awaiting switch off*: the fan is about to be switched off, and is currently waiting protective device waiting times. In this state, the user interface flashes the message "W*OFF*".

4. *On*: the fan is on. In this state, the user interface displays the message "*ON*".

5. *Awaiting switch on*: the fan is about to be switched on, and is currently waiting protective device waiting times. In this state, the user interface flashes the message "*WON*".

6. *Alarm*: the fan is off and in the alarm state. In this state, the user interface displays the message "*ALL*".

7. *Manual*: the fan is in manual operational mode. In this state, the user interface displays the message "*MAN*".

In any case, a manually functioning fan is sensitive to any alarms, in this case, the status will be that of *Alarm*.

6.6.3 Fan rotation

Fan rotation is a procedure that allows the number of operating hours and start-ups for each device to be balanced as much as possible.
Rotation does not involve any fans that are in alarm or manual operation states, and is capable of dynamically switching on others should one or more be switched to the alarm state.
In all the rotation types managed, any compressors restored from the alarm state or operating manually, will be inserted at the top of the list of compressors to be switched on. They will have maximum priority with respect to the other compressors, altering the switch on and switch off sequence. Rotation type is set by means of the parameter *Fan Rotation (PF01)*.

The program can manage 4 types of rotation: FIFO, LIFO, FIFO + time, LIFO + time.

1) FIFO

This follows *"First In First Out"* logic, *i.e.* the first fan switched on will be the first switched off. Initially, this logic might leads to a large difference in operational hours between the various fans, but after an initial phase, this should more or less balance out.

Example.

Switch on : F1 . F2 . F3 . F4 … . F12
Switch off : F1 . F2 . F3 . F4 … . F12

FIFO rotation has one peculiarity. If, for example, the first fan is switched on and then off, the next fan to be switched on will be the second. The last fan switched off will be remembered so as to then switch on the next in sequence, thus avoiding always using the same and so better exploiting all the configured resources.
Example with 4 fans:

Switch on : F1 . Switch off : F1 .
Switch on : F2 . F3 . Switch off : F2 . F3 .
Switch on : F4 . F1 . F2 . F3 . Switch off : F4 . F1 . F2 . F3 .

This type of rotation seeks to balance the number of switch on and off operations for the fans configured.

2) LIFO

This follows *"Last In First Out"* logic, *i.e.* the last fan switched on will be the first to be switched off.

Example.

Switch on : F1 . F2 . F3 . F4 … . F12
Switch off : F12 . … F4 . F3 . F2 . F1

3) FIFO + time of operation

This type of rotation functions by considering the number of operating hours for each fan. Startup will switch on the fan with the least operating hours, while shut down will switch off the fan with the most operating hours.
In the case where a selection must be made between fans with the same number of hours, then a FIFO rotation is implemented, so as to thus guarantee rotation of the configured fans. The same rules described previously are also valid for FIFO rotation.

Example 1

Switch on : F1(3 hours) . F2(3 hours) . F3(3 hours) . F4(3 hours)
Switch off : F1(3 hours) . F2(3 hours) . F3(3 hours) . F4(3 hours)

Example 2

Switch on : F1(1 hour) . F2(3 hours) . F3(3 hours) . F4(5 hours)
Switch off : F4(5 hours) . F2(3 hours) . F3(3 hours) . F1(1 hour)

Time based rotation seeks to balance the number of operating hours of the fans present in the system.

4) LIFO + time of operation

This rotation favours comparing the operating times of the various fans. During startup, the fan with the least operating hours will be favoured, while shut down will favour the fan with the most operating hours.
In the case where a selection must be made between fans with the same number of hours, then a LIFO rotation is implemented, so as to thus guarantee rotation of the configured fans. The same rules described previously are also valid for LIFO rotation.

Example 1

Switch on : F1(3 hours) . F2(3 hours) . F3(3 hours) . F4(3 hours)
Switch off : F4(3 hours) . F3(3 hours) . F2(3 hours) . F1(3 hours)

Example 2

Switch on : F1(1 hour) . F2(3 hours) . F3(3 hours) . F4(5 hours)
Switch off : F4(5 hours) . F3(3 hours) . F2(3 hours) . F1(1 hour)

Time based rotation seeks to balance the number of operating hours of the fans present in the system.

6.6.4 Protective device timings

All the timings pertaining to compressor management are listed below

Neutral zone timings

These parameters are used to time the switching on and off requests for the various condensation devices.

Minimum switch on/off request time - TOn/Off

For these parameters, please refer to the description given in section 2.5.2.

Protective device timings

These times are required to protect the fans from the various startup operations to which they are subjected.

TOnOther – Minimum different fan switch on time (PF07). This establishes the minimum time that must elapse before the subsequent fan can be switched on. If greater than zero, this allows avoiding any simultaneous startup operations.

TOffOther – Minimum different fan switch off time (PF08). This establishes the minimum time that must elapse before the subsequent fan can be switched off. If greater than zero, this allows avoiding any simultaneous startup operations.

SpeedUp time. If regulation by means of inverter is set, then this parameter, if other than zero, keeps the inverter output at maximum value (100.0%) each time another fan switch on is requested.

6.6.5 Safety device inputs

The program envisages the management of a single "*fan thermal*" safety device for each of the fans configured within the application. Enabling or disabling this characteristic is managed by the parameter *enable fan safety device (PG08).*

In order to enable the "*fan thermal*" alarms, besides setting the relevant parameter, it is also essential to set the *positions* where the digital inputs pertaining to the various selected fans will be connected, from within the System builder -> Hardware menu. Where there is no desire to set an alarm, simply set the parameter to the value zero.

6.6.6 Inverter configuration

For each inverter used must be selected a position of the digital output for the command/consent to the inverter start; for the configuration are used the same parameters of the fans digital ouputs, parameters *HF01..HF12*. The inverter is virtually the first fan of each circuit, then, according to the quantity of fans and the quantity of circuit must be set the correct parameter, according to this logic.

- *1 circuit:* The inverter (if enabled) is virtually the fan 1; is necessary to configure the first fan parameter, then must be configured always the parameter *HF01*.
- *2 circuits:* The circuit 1 inverter (if enabled) is virtually the fan 1 (then, must be set the parameter *HF01*), the circuit 2 inverter (if enabled) is virtually the first fan after the circuit 1 fans
- *3 circuits:* The circuit 1 inverter (if enabled) is virtually the fan 1 (then, must be set the parameter *HF01*), the circuit 2 inverter (if enabled) is virtually the first fan after the circuit 1 fans, the inverter of circuit 3 (if enabled) is virtually the first fan after the circuit 1 and circuit 2 fans.

The selection of working modality and function setup of the parameters for the fans inverters is the same for the compressors one, but are used the parameters *PH21, HFxx* (look at paragraph 6.4.8)

6.7 Miscellaneous controls

6.7.1 Inverter configuration (compressors/fans)

If selected, the inverter is always the first compressor in each circuit:

- *1 Circuit*: the inverter (if enabled) is compressor 1
- *2 Circuits*: the circuit 1 inverter (if enabled) is compressor 1, and the circuit 2 inverter (if enabled) is the first compressor configured on the second circuit
- *3 Circuits*: the circuit 1 inverter (if enabled) is compressor 1, the circuit 2 inverter (if enabled) is the first compressor configured on the second circuit, and the circuit 3 inverter (if enabled) is the first compressor configured on the third circuit

The inverter is included in the number of compressors or fans configured by parameter for each circuit.

Example 1
1 Circuit
Compressor inverters YES
5 Compressors
0 Steps
Fan inverters NO
3 Fans

Example 2
1 Circuit
Compressor inverters NO
5 Compressors
2 Steps
Fan inverters NO
3 Fans

Example 1 configuration parameters:

CircuitNumber	1
Enable Circuit 1 Compressor Inverter	YES
Number of Compressors for Circuit 1	6
Number of Compressor Steps	0
Enable Circuit 1 Fan Inverter	NO
Number of Fans for Circuit 1	3

Example 2 configuration parameters:

CircuitNumber	1
Enable Circuit 1 Compressor Inverter	NO
Number of Compressors for Circuit 1	5
Number of Compressor Steps	2
Enable Circuit 1 Fan Inverter	NO
Number of Fans for Circuit 1	3

Depending on the single/dual/triple-circuit version, there are limitations on the use of inverters:

Single-circuit:

- One compressor inverter (Analogue output 1)
- One fan inverter (Analogue output 3)

Dual-circuit:

- Two compressor inverters (Analogue outputs 1 - 2)
- Two fan inverters (Analogue outputs 3 -4)

Triple-circuit:

- Three compressor inverters (Analogue outputs 1 – 2 - 3) or
- Three fan inverters (Analogue outputs 1 – 2 - 3)
- Three compressor inverters (Analogue outputs 1 - 2 - 3) and one fan inverter (Analogue output 4) in the case of unique condensation

In the case of the triple-circuit version, the inverters are exclusive: it is only possible to select those pertaining to compressors, or those pertaining to fans. Management of a combination of both types

is not possible. To correctly configure this feature, simply enable at least one compressor/fan inverter, depending on the type enabled, the other type will be automatically excluded from the analogue outputs.
The only case where it is possible to use both compressor inverters and fan inverters is when the parameter *unique condensation (PG30)* is set; in this case, the last analogue output (AO04) may be used as the sole fan inverter.

Note 1. ***If a compressor inverter is selected, it is not possible to use incremented compressors, and vice versa.***

Note 2. ***If a compressor inverter is selected, it is not possible to use compressors with different nominal power ratings, and vice versa.***

6.7.2 Compressor time bands

By means of the parameter *enable compressor time bands (PT00)* it is possible to enable the time band function. The program provides up to four different bands with related offsets (different for each circuit) to be summed up to the main suction setpoint.
Depending on the time band, on the basis of the current time, the program will automatically sum the circuit offsets to the suction setpoint, outwith the selected bands, the setpoint will remain at the value set by the parameter.

Time band configuration is based on 4 parameters (different for each circuit) for the setpoint offsets and an additional four parameters (general) for the time band settings:

- *Time band 1 start - Circuit band 1 offset (1,2,3)*
- *Time band 2 start - Circuit band 2 offset (1,2,3)*
- *Time band 3 start - Circuit band 3 offset (1,2,3)*
- *Time band 4 start - Circuit band 4 offset (1,2,3)*

Hence, the time bands will be defined thus:

1. Time band 1 start ÷ Time band 2 start
2. Time band 2 start ÷ Time band 3 start
3. Time band 3 start ÷ Time band 4 start
4. Time band 4 start ÷ Time band 1 start

Where less than the four envisaged bands are set, in order to guarantee correct management operation, it is essential to set the remaining band start parameters to the value of the last set band, and obviously set the relevant offset to zero.

Example 1. Four time bands. Assuming a suction setpoint = 1.0 bar

Band start	Offset	Setpoint	Description
02:00:00	+0.3	1.3 bar	From 02:00:00 to 07:15:00
07:15:00	+0.1	1.1 bar	From 07:15:00 to 15:13:00
15:30:00	-0.5	0.5 bar	From 15:30:00 to 23:00:00
23:00:00	-0.2	0.8 bar	From 23:00:00 to 02:00:00

Example 2. Two time bands. Assuming a suction setpoint = 1.0 bar

Band start	Offset	Setpoint	Description
02:00:00	+0.3	1.3 bar	From 02:00:00 to 07:15:00
07:15:00	+0.1	1.1 bar	From 07:15:00 to 02:00:00
07:15:00	0	1.0 bar	-
07:15:00	0	1.0 bar	-

During an ERTC alarm (clock alarm), the time band function is automatically disabled and LED L2 on the display stays on, until the alarm is reset.

When the clock is within a time band, i.e. when the main suction setpoint is altered by the related band offset, LED L2:

- *Flashes rapidly* if there is an ERTC clock alarm.
- *Flashes slowly* if only one of the compressor and fan setpoints is altered.
- *Remains on* if both setpoints are altered by the time bands.
- *Remains off* if there is no condition.

To enter time band management, press and hold display key K2 for approx. 2 seconds.

6.7.3 Fan time bands

By means of the parameter *enable fan time bands (PT50)* it is possible to enable the time band function. The program provides up to four different bands with related offsets (different for each circuit) to be summed up to the main supply setpoint.
Depending on the time band, on the basis of the current time, the program will automatically sum the circuit offsets to the supply setpoint, outwith the selected bands, the setpoint will remain at the value set by the parameter.

Time band configuration is based on 4 parameters (different for each circuit) for the setpoint offsets and an additional four parameters (general) for the time band settings:

- *Time band 1 start - Circuit band 1 offset (1,2,3)*
- *Time band 2 start - Circuit band 2 offset (1,2,3)*
- *Time band 3 start - Circuit band 3 offset (1,2,3)*
- *Time band 4 start - Circuit band 4 offset (1,2,3)*

Hence, the time bands will be defined thus:

1. Time band 1 start ÷ Time band 2 start
2. Time band 2 start ÷ Time band 3 start
3. Time band 3 start ÷ Time band 4 start
4. Time band 4 start ÷ Time band 1 start

Where less than the four envisaged bands are set, in order to guarantee correct management operation, it is essential to set the remaining band start parameters to the value of the last set band, and obviously set the relevant offset to zero.
Management is the same as for compressor time bands, please refer to the previous section for any further clarification.

When the clock is within a time band, i.e. when the main supply setpoint is altered by the related band offset, LED L2:

- *Flashes rapidly* if there is an ERTC clock alarm.

- *Flashes slowly* if only one of the compressor and fan setpoints is altered.
- *Remains on* if both setpoints are altered by the time bands.
- *Remains off* if there is no condition.

To enter time band management, press and hold display key K2 for approx. 2 seconds.

6.7.4 Digital input setpoint alteration

For both compressors and fans, the program envisages the possibility of managing the *compressor DI secondary setPoint offset* and *fan DI secondary setPoint offset* parameters, which, depending on the digital input status (different for compressors and fans) sum an offset to the main setpoint in order to allow variation. It is possible to set the digital input logic by altering the parameter *Other DI logic* (*PH19*, itself a parameter relating to the digital input on/off logic).
To set this function, it is necessary to configure the parameter *DI enabling secondary setpoint (PH25)* and set the *position* where the digital input relating to the compressors and relating to fans will be connected. If this value is not set, the function will remain disabled.

6.7.5 Supervisor setpoint alteration

For both compressors and fans, the program envisages the possibility of managing the *compressor SUP secondary setPoint offset* and *fan SUP secondary setPoint offset* parameters, which, depending on the state of a variable set by the supervision protocol (different for compressors and fans) sum the adjusted offset to the main setpoint in order to allow variation.
To set this function it is necessary to configure the parameter *supervisor secondary setpoint enabling (PH26)* and the status *enable* by means of the exported variable. If this value is not set, the function will remain disabled.

6.7.6 Manual operation

The program allows setting a manual compressor and fan function. In this state, devices do not participate in rotations nor in the calculation of thermoregulation, however, they are sensitive to any alarms.
Manual operation of devices is useful when functional tests must be conducted on the machine, in order to test the integrity and correct operation of the mechanical components.

Compressors

Manual or other operation of the compressors is guaranteed by the parameter *compressor enable*:

- If set to the value "*A*" it defines the normal behaviour of the device
- If set to the value "*M*" it disables the compressor and switches it to manual operation.

A manually functioning compressor does not participate in regulations, and may be forced into the number of steps it is capable of providing (even over its increments, where configured) by setting the parameter *compressor forcing* (found in the Service -> Compressor forcing menu). The number of steps a manually functioning compressor can provide is limited to the number of increments that have been set during machine configuration.
As already mentioned, the compressor is, in any case, sensitive to alarms and the relevant consequences.

To restore the compressor to normal use, it is necessary to reset the parameter *compressor enable* to the value *"A"* (Automatic), otherwise, the compressor in question will continue to operate in manual mode, not fulfilling the switch on and/or off requests calculated by the selected regulation.

Fans

Manual or other operation of the fans is guaranteed by the parameter *fan enable*:

- If set to the value "*A"* it defines the normal behaviour of the device
- If set to the value "*M"* it disables the fan and switches it to manual operation.

A manually functioning fan does not participate in regulations, and may be forced into switching on/off by setting the property *fan forcing* (present in the Service -> Fan forcing menu).
As already mentioned, the fan is, in any case, sensitive to alarms and the relevant consequences.
To restore the fan to normal use, it is necessary to once more restore the parameter *fan enable* to the value *"A"* (Automatic), otherwise, the fan in question will continue to operate in manual mode, not fulfilling the switch on and/or off requests calculated by the selected regulation.

Inverters

In the case where it is desired to manually force an inverter, the procedure is slightly different from that for normal compressors or fans.
If selected, the inverter is virtually the first compressor for each circuit, thus before being able to correctly execute the procedure, it is necessary to set the correct compressor to manual, depending on how the system has been configured.

Once manual enabling has been correctly set, it is possible to force, with a value of between 0.0% and 100.0%, the inverter for each circuit by means of the parameters:

- *circuit 1, circuit 2, circuit 3 compressor inverter forcing*
- *circuit 1, circuit 2, circuit 3 fan inverter forcing*

present in the service menu.

Management and the forcing procedure for fan inverters is the same as that for compressors.

6.7.7 Floating condensation management

This allows modification of the fan operating setpoint on the basis of the external temperature. To enable this function, it is necessary to set (from the installer -> Miscellaneous menu) the parameters:

- *enable external temperature probe (PH24)*
- *enable floating condensation (PF71)*
- *Temperature offset (PF72)*: condensation temperature offset (associated with the type of condenser module used)
- *set floating condensation Min (PF73)*: minimum condensation value, guaranteeing correct lubrication
- *set floating condensation Max (PF74)*: maximum condensation value, in order to avoid modulations with high external temperatures

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

Please note. *By enabling this function, the condensation setpoint parameters of the individual circuits no longer have any effect on condensation regulation, indeed the setpoint used will be a function of delta T and the external temperature.*

6.7.8 Temperature probes

The application is capable of managing up to two auxiliary temperature probes: *environment probe and external probe*.
In order to take advantage of these two temperature transducers, it is necessary to enable (from the installer -> Miscellaneous menu) the parameters:

- *enable environment temperature probe (PH23)*
- *enable external temperature probe (PH24)*

Each of the two probes is associated with a probe alarm, which trips should the probe be disconnected or damaged, and enabling of this alarm is associated with the enabling parameter for the relevant probe; enabling the probes also enables the related alarms. If these are not enabled, a series of dots appears on the displays.

6.7.9 Last maintenance date

In the *service -> Operation* menu there is a page offering the option to store the date of the most recent system maintenance. By pressing "*Update*" the old date will be automatically set to the current date, thus also updating the parameter *PM90* representing precisely the last maintenance date.

6.7.10 Restore default parameters

By means of the *"Restore parameters"* procedure, it is possible to restore all system parameters to the default values. This function may be simply activated by setting the value of the specific parameter *(PH15)*, where, by setting it to "*Yes*" the system will automatically reset all parameters. The parameter will briefly assume the value "*Yes*" and then return to the value "*No*", after this change of state, the parameter reset procedure is complete.
The procedure can only be activated with the machine switched off.

Following this operation, it is necessary switch the machine off and then on again in order to avoid malfunctions, in that inconsistencies in the calculation algorithms might occur.

7 DIAGNOSTICS

The application is capable of managing a series of alarms relating to the system compressors, fans, circuits and functions. Based on the various alarm types, it is possible to configure resets (manual or automatic), possible signalling delays and the actions to be executed in specific cases.
When several alarms are active, display LED L0 flashes (even with the machine off) and the buzzer sounds if the machine is switched on.
In order to view the alarm pages, press and hold key K0 for approx. 2 seconds.
To scroll through the active alarms, simply press the ENTER key, the alarms are shown in order of priority, just as they are listed in the alarm table in section 7.2.
All alarms are monitored, even with the machine switched off, hence, even with the machine off, by using the K0 key, it is possible to view the active alarms, and LED L0 flashes. The buzzer (if parameter enabled) only sounds when the machine is on.

The alarms may only be managed by one of the two interfaces, exclusively. Once the alarm pages have been entered, the controller only accepts commands from the device that initiated the procedure. In any case, the pages are shown simultaneously on both displays.
To inform the user that alarm pages are being displayed on one of the two interfaces, the L0 LED flashes rapidly.
To exit from management of one view and move to another, exit from the alarm pages: press the ESC key, or this will occur after 60 seconds if no other keys have been pressed.
Exiting an alarm page by pressing the ESC key, or by waiting 60 seconds for timeout, returns the user to the main page of the application.

All digital inputs relating to alarms are managed by the parameter *Alarm DI logic (PH17)* which assumes the following significance:

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

7.1 Manual and automatic alarms

The program is capable of managing two types of alarms, those that are manually reset, and those that are automatically reset. Certain alarms have the possibility for setting, by means of a parameter (*alarm reset*), the type of reset best suited to the user's needs.

7.1.1 Manual alarms

In the case where a manual alarm occurs:

- LED L0 begins flashing
- the buzzer begins to sound at a high frequency (if the machine is on)

Pressing and holding the K0 key for approx. 2 seconds enters the description page for the active alarm.
Once the conditions responsible for causing the alarm are resolved it is possible to manually reset the alarm. To do this:

- go to the page for the alarm to be reset
- press and hold the ENTER key for approx. 2 seconds.

At this point, if there are no other alarms, a page will appear indicating “No active alarms”, LED L0 will be switched off and the machine will return to normal operation, or the page relating to the subsequent active alarm will be displayed.
The consequences derived from an active manual alarm remain valid until the user cancels the alarm message.
To silence the buzzer simply press the K0 key.

7.1.2 Automatic alarms

In the case where an automatic alarm occurs:

- LED L0 begins flashing
- the buzzer begins to sound at a high frequency (if the machine is on)

Pressing and holding the K0 key for approx. 2 seconds enters the description page for the active alarm.
Once the conditions causing the alarm are resolved, resetting and cancellation of the alarm message are restored automatically, without requiring any user intervention.
The consequences resulting from an active automatic alarm remain valid until the causes for the tripping of the alarm are resolved.
To silence the buzzer simply press the K0 key.

7.2 Alarm table

A list of all the alarms managed by the application is given below. The order of presentation is the same as the order with which the alarms appear when active.

Code	Alarm description	Type	Consequence	Notes
EN01	Expansion unit communication error	Auto	Display	Configurable delay Only present with an expansion unit
ERTC	RTC – Clock run down or faulty	Manual	Time bands OFF	
ES01	C1 suction probe faulty or disconnected	Auto	- Num. comp. ON configurable - Inverter forced to 100% (if requested and if only comp. on circuit)	Configurable delay
ES02	C1 supply probe faulty or disconnected	Auto	- Num. fan. ON configurable - Inverter forced to 100% (if requested and if only fan on circuit) - OFF Step circuit 1 HP (if enabled)	Configurable delay
ES03	C2 suction probe faulty or disconnected	Auto	- Num. comp. ON configurable - Inverter forced to 100% (if requested and if only comp. on circuit)	Configurable delay
ES04	C2 supply probe faulty or disconnected	Auto	- Num. fan. ON configurable - Inverter forced to 100% (if requested and if only fan on circuit) - OFF Step circuit 2 HP	Configurable delay

			(if enabled)	
ES05	C3 suction probe faulty or disconnected	Auto	- Num. comp. ON configurable - Inverter forced to 100% (if requested and if only comp. on circuit)	Configurable delay
ES06	C3 supply probe faulty or disconnected	Auto	- Num. fan. ON configurable - Inverter forced to 100% (if requested and if only fan on circuit) - OFF Step circuit 3 HP (if enabled)	Configurable delay
AC21	Compressor 1 thermal	Settable	Comp. 1 OFF 1	Configurable delay
AC22	Compressor 2 thermal	Settable	Comp. 2 OFF	Configurable delay
AC23	Compressor 3 thermal	Settable	Comp. 3 OFF	Configurable delay
AC24	Compressor 4 thermal	Settable	Comp. 4 OFF	Configurable delay
AC25	Compressor 5 thermal	Settable	Comp. 5 OFF	Configurable delay
AC26	Compressor 6 thermal	Settable	Comp. 6 OFF	Configurable delay
AC27	Compressor 7 thermal	Settable	Comp. 7 OFF	Configurable delay
AC28	Compressor 8 thermal	Settable	Comp. 8 OFF	Configurable delay
AC29	Compressor 9 thermal	Settable	Comp. 9 OFF	Configurable delay
AC30	Compressor 10 thermal	Settable	Comp. 10 OFF	Configurable delay
AC31	Compressor 11 thermal	Settable	Comp. 11 OFF	Configurable delay
AC32	Compressor 12 thermal	Settable	Comp. 12 OFF	Configurable delay
AC41	Compressor 1 high/low pressure pressure-switch	Settable	Comp. 1 OFF	
AC42	Compressor 2 high/low pressure pressure-switch	Settable	Comp. 2 OFF	
AC43	Compressor 3 high/low pressure pressure-switch	Settable	Comp. 3 OFF	
AC44	Compressor 4 high/low pressure pressure-switch	Settable	Comp. 4 OFF	
AC45	Compressor 5 high/low pressure pressure-switch	Settable	Comp. 5 OFF	
AC46	Compressor 6 high/low pressure pressure-switch	Settable	Comp. 6 OFF	
AC51	Compressor 1 oil differential	Settable	Comp. 1 OFF	Configurable delay
AC52	Compressor 2 oil differential	Settable	Comp. 2 OFF	Configurable delay
AC53	Compressor 3 oil differential	Settable	Comp. 3 OFF	Configurable delay
AC54	Compressor 4 oil differential	Settable	Comp. 4 OFF	Configurable delay
AC55	Compressor 5 oil differential	Settable	Comp. 5 OFF	Configurable delay
AC56	Compressor 6 oil differential	Settable	Comp. 6 OFF	Configurable delay
AC01	Compressor 1 operating time	Manual *1	Display	
AC02	Compressor 2 operating time	Manual *1	Display	
AC03	Compressor 3 operating time	Manual *1	Display	
AC04	Compressor 4 operating time	Manual *1	Display	
AC05	Compressor 5 operating time	Manual *1	Display	
AC06	Compressor 6 operating time	Manual *1	Display	
AC07	Compressor 7 operating time	Manual *1	Display	
AC08	Compressor 8 operating time	Manual	Display	

		*1		
AC09	Compressor 9 operating time	Manual *1	Display	
AC10	Compressor 10 operating time	Manual *1	Display	
AC11	Compressor 11 operating time	Manual *1	Display	
AC12	Compressor 12 operating time	Manual *1	Display	
AF21	Fan 1 thermal	Settable	Fan 1 OFF	
AF22	Fan 2 thermal	Settable	Fan 2 OFF	
AF23	Fan 3 thermal	Settable	Fan 3 OFF	
AF24	Fan 4 thermal	Settable	Fan 4 OFF	
AF25	Fan 5 thermal	Settable	Fan 5 OFF	
AF26	Fan 6 thermal	Settable	Fan 6 OFF	
AF27	Fan 7 thermal	Settable	Fan 7 OFF	
AF28	Fan 8 thermal	Settable	Fan 8 OFF	
AF29	Fan 9 thermal	Settable	Fan 9 OFF	
AF30	Fan 10 thermal	Settable	Fan 10 OFF	
AF31	Fan 11 thermal	Settable	Fan 11 OFF	
AF32	Fan 12 thermal	Settable	Fan 12 OFF	
AF01	Fan 1 operating time	Manual *1	Display	
AF02	Fan 2 operating time	Manual *1	Display	
AF03	Fan 3 operating time	Manual *1	Display	
AF04	Fan 4 operating time	Manual *1	Display	
AF05	Fan 5 operating time	Manual *1	Display	
AF06	Fan 6 operating time	Manual *1	Display	
AF07	Fan 7 operating time	Manual *1	Display	
AF08	Fan 8 operating time	Manual *1	Display	
AF09	Fan 9 operating time	Manual *1	Display	
AF10	Fan 10 operating time	Manual *1	Display	
AF11	Fan 11 operating time	Manual *1	Display	
AF12	Fan 12 operating time	Manual *1	Display	
AL31	C1 supply pressure high	Auto	All fans ON	
AL36	C1 suction pressure high	Auto	All comp. ON	Configurable delay
AL41	C1 supply pressure low	Auto	All fans OFF	- Configurable delay - Only present if the circuit is on
AL46	C1 suction pressure low	Auto	All comp. OFF	- Configurable delay - Only present if the circuit is on
AL11	C1 supply high pressure pressure-switch	Settable	All comp. OFF	
AL21	C1 suction low pressure pressure-switch	Auto	All comp. OFF	Only present if the circuit is on
AL61	C1 fluid level	Manual	Display	Configurable delay

ACC1	C1 common oil differential	Settable	Display	Configurable delay
AFC1	C1 common fan thermal	Manual	Display	
AL32	C2 supply pressure high	Auto	All fans ON	
AL37	C2 suction pressure high	Auto	All comp. ON	Configurable delay
AL42	C2 supply pressure low	Auto	All fans OFF	- Configurable delay - Only present if the circuit is on
AL47	C2 suction pressure low	Auto	All comp. OFF	- Configurable delay - Only present if the circuit is on
AL12	C2 supply high pressure pressure-switch	Settable	All comp. OFF	
AL22	C2 suction low pressure pressure-switch	Auto	All comp. OFF	Only present if the circuit is on
AL62	C2 fluid level	Manual	Display	Configurable delay
ACC2	C2 common oil differential	Settable	Display	
AFC2	C2 common fan thermal	Manual	Display	
AL33	C3 supply pressure high	Auto	All fans ON	
AL38	C3 suction pressure high	Auto	All comp. ON	Configurable delay
AL43	C3 supply pressure low	Auto	All fans OFF	- Configurable delay - Only present if the circuit is on
AL48	C3 suction pressure low	Auto	All comp. OFF	- Configurable delay - Only present if the circuit is on
AL13	C3 supply high pressure pressure-switch	Settable	All comp. OFF	
AL23	C3 suction low pressure pressure-switch	Auto	All comp. OFF	Only present if the circuit is on
AL63	C3 fluid level	Manual	Display	Configurable delay
ACC3	C3 common oil differential	Settable	Display	Configurable delay
AFC3	C3 common fan thermal	Manual	Display	
ES07	Faulty or disconnected environment probe	Auto	Display	
ES08	Faulty or disconnected external probe	Auto	Floating condensation OFF	
AH01	Hardware configuration error	Auto	Display	Appears when the wizard attempts to set a hardware configuration not attainable with the available hardware resources

(*1) *To reset alarms due to compressor/fan operating times it is necessary to zero the operating time for the relevant device from the service menu. Once the times have been zeroed, the alarms relating to the compressors/fans will be reset automatically.*

7.3 Alarm relays

The program has the capacity to manage up to four alarm relays. Each alarm is enabled depending on whether or not the relevant parameter, *Alarm DO position*, has been set. To enable, simply set this to a value other than zero, if the value remains at zero, the alarm relay is not used.
The four relays, with relevant parameters, are listed below:

- General alarm relay - *Global alarm DO position*
- Circuit 1 alarm relay - *Circuit 1 alarm DO position*
- Circuit 2 alarm relay - *Circuit 2 alarm DO position*
- Circuit 3 alarm relay - *Circuit 3 alarm DO position*

By means of the relevant parameter (PH18) it is possible to establish the polarity (NO, or NC) of the various alarm digital outputs.

8 LIST OF MODBUS VARIABLES

It is possible to control the application by means of a supervisor module, using the Modbus protocol. Communication uses an RS485 serial interface, already built in to the controller.
The various parameters exported by the application are reported below

8.1.1 Modbus export table (C-PRO GIGA)

REGISTER VARS LIST						
id	**Name**	**Value**	**Min**	**Max**	**Description**	**Mode**
257	PackedDI1_16	0	0	65535	Bit1=DI01, Bit2=DI02 ... , Bit16=DI16	R/W
258	PackedDI17_22	0	0	65535	Bit1=DI17, Bit2=DI18, ... Bit6=DI22	R/W
385	PackedDO1_16	0	0	65535	Bit1=DO01, Bit2=DO02, ... , Bit16=DO16	R/W
386	PackedDO17_26	0	0	65535	Bit1=DO17, Bit2=DO18, ... , Bit10=DO26	R/W
513	AI01_Pressure_SuctionC1	-	-	-		R/W
514	AI02_Pressure_SupplyC1	-	-	-		R/W
515	AI03_Pressure_SuctionC2	-	-	-		R/W
516	AI04_Pressure_SupplyC2	-	-	-		R/W
517	AI05_Pressure_SuctionC3	-	-	-		R/W
518	AI06_Pressure_SupplyC3	-	-	-		R/W
519	AI07_EnvironmentProbe	-	-	-		R/W
520	AI08_ExternalProbe	-	-	-		R/W
641	AO01_Inv_Circuit1	-	0.00	100.00		R/O
642	AO2_Inv_Circuit2	-	0.00	100.00		R/O
643	AO3_Inv_Circuit3	-	0.00	100.00		R/O
644	AO4_FanInv_OnUniqueCond	-	0.00	100.00		R/O
769	PackedAlarmW1	0	0	65535	Bit1=ES01, Bit2=ES02, Bit3=ES03, Bit4=ES04, Bit7=ES07, Bit8=ES08, Bit15=ERTC, Bit16=EN01	R/W
770	PackedAlarmW2	0	0	65535	Bit1=AF21, Bit2=AF22, Bit3=AF23, Bit4=AF24, Bit5=AF25, Bit6=AF26, Bit7=AF27, Bit8=AF28, Bit9=AF29, Bit10=AF30, Bit11=AF31, Bit12=AF32	R/W
771	PackedAlarmW3	0	0	65535	Bit1=AC21, Bit2=AC22, Bit3=AC23, Bit4=AC24, Bit5=AC25, Bit6=AC26, Bit7=AC27, Bit8=AC28, Bit9=AC29, Bit10=AC30, Bit11=AC31, Bit12=AC32	R/W

772	PackedAlarmW4	0	0	65535	Bit1=AC41, Bit2=AC42, Bit3=AC43, Bit4=AC44, Bit5=AC45, Bit6=AC46, Bit9=AC51, Bit10=AC52, Bit11=AC53, Bit12=AC54, Bit13=AC55, Bit14=AC56	R/W
773	PackedAlarmW5	0	0	65535	Bit1=AC01, Bit2=AC02, Bit3=AC03, Bit4=AC04, Bit5=AC05, Bit6=AC06, Bit7=AC07, Bit8=AC08, Bit9=AC09, Bit10=AC10, Bit11=AC11, Bit12=AC12	R/W
774	PackedAlarmW6	0	0	65535	Bit1=AF01, Bit2=AF02, Bit3=AF03, Bit4=AF04, Bit5=AF05, Bit6=AF06, Bit7=AF07, Bit8=AF08, Bit9=AF09, Bit10=AF10, Bit11=AF11, Bit12=AF12	R/W
775	PackedAlarmW7	0	0	65535	Bit1=AL61, Bit2=AL41, Bit3=AL31, Bit4=AL46, Bit5=AL36, Bit6=AL21, Bit7=AL11, Bit8=ACC1, Bit9=AFC1	R/W
776	PackedAlarmW8	0	0	65535	Bit1=AL62, Bit2=AL42, Bit3=AL32, Bit4=AL47, Bit5=AL37, Bit6=AL22, Bit7=AL12, Bit8=ACC2, Bit9=AFC2	R/W
777	PackedAlarmW9	0	0	65535	Bit1=AL63, Bit2=AL43, Bit3=AL33, Bit4=AL48, Bit5=AL38, Bit6=AL23, Bit7=AL13, Bit8=ACC3, Bit9=AFC3	R/W
1025	OnOffBySuperv	0	0	1		R/W
1026	OnOffBySuperv_Circuit1	0	0	1		R/W
1027	EnSecSP_bySup_Cmp_Circuit1	0	0	1		R/W
1028	EnSecSP_bySup_Fan_Circuit1	0	0	1		R/W
1029	OnOffBySuperv_Circuit2	0	0	1		R/W
1030	EnSecSP_bySup_Cmp_Circuit2	0	0	1		R/W
1031	EnSecSP_bySup_Fan_Circuit2	0	0	1		R/W
1032	OnOffBySuperv_Circuit3	0	0	1		R/W
1033	EnSecSP_bySup_Cmp_Circuit3	0	0	1		R/W
1034	EnSecSP_bySup_Fan_Circuit3	0	0	1		R/W
1281	Clock (Low)	-	0	2147483647		R/W
1282	Clock (High)					
1283	Status_Machine	0	0	3		R/W
1284	StatusCircuit1	0	0	5		R/W
1285	Cmp_actualSetPoint_Circuit1	0.0	-145.0	625.5		R/W
1286	Fan_actualSetPoint_Circuit1	0.0	-145.0	625.5		R/W

1287	CmpInv_actualSet_Circuit1	0.0	-145.0	625.5		R/W
1288	FanInv_actualSet_Circuit1	0.0	-145.0	625.5		R/W
1289	PowerRequested_Circuit1	0	0	100		R/W
1290	PowerSupplied_Circuit1	0	0	100		R/W
1291	StatusCircuit2	0	0	5		R/W
1292	Cmp_actualSetPoint_Circuit2	0.0	-145.0	625.5		R/W
1293	Fan_actualSetPoint_Circuit2	0.0	-145.0	625.5		R/W
1294	CmpInv_actualSet_Circuit2	0.0	-145.0	625.5		R/W
1295	FanInv_actualSet_Circuit2	0.0	-145.0	625.5		R/W
1296	PowerRequested_Circuit2	0	0	100		R/W
1297	PowerSupplied_Circuit2	0	0	100		R/W
1298	StatusCircuit3	0	0	5		R/W
1299	Cmp_actualSetPoint_Circuit3	0.0	-145.0	625.5		R/W
1300	Fan_actualSetPoint_Circuit3	0.0	-145.0	625.5		R/W
1301	CmpInv_actualSet_Circuit3	0.0	-145.0	625.5		R/W
1302	FanInv_actualSet_Circuit3	0.0	-145.0	625.5		R/W
1303	PowerRequested_Circuit3	0	0	100		R/W
1304	PowerSupplied_Circuit3	0	0	100		R/W
1537	PT00_Cmp_EnableTimeBands	0	0	1		R/W
1538	PT01_Cmp_startTB1 (Low)	0	0	86399		R/W
1539	PT01_Cmp_startTB1 (High)					
1540	PT02_Cmp_startTB2 (Low)	0	0	86399		R/W
1541	PT02_Cmp_startTB2 (High)					
1542	PT03_Cmp_startTB3 (Low)	0	0	86399		R/W
1543	PT03_Cmp_startTB3 (High)					
1544	PT04_Cmp_startTB4 (Low)	0	0	86399		R/W
1545	PT04_Cmp_startTB4 (High)					
1546	PT11_Cmp_TBOffset1_Circuit1	0.0	-290.0	290.0		R/W
1547	PT12_Cmp_TBOffset2_Circuit1	0.0	-290.0	290.0		R/W
1548	PT13_Cmp_TBOffset3_Circuit1	0.0	-290.0	290.0		R/W
1549	PT14_Cmp_TBOffset4_Circuit1	0.0	-290.0	290.0		R/W
1550	PT21_Cmp_TBOffset1_Circuit2	0.0	-290.0	290.0		R/W
1551	PT22_Cmp_TBOffset2_Circuit2	0.0	-290.0	290.0		R/W
1552	PT23_Cmp_TBOffset3_Circuit2	0.0	-290.0	290.0		R/W
1553	PT24_Cmp_TBOffset4_Circuit2	0.0	-290.0	290.0		R/W
1554	PT31_Cmp_TBOffset1_Circuit3	0.0	-290.0	290.0		R/W
1555	PT32_Cmp_TBOffset2_Circuit3	0.0	-290.0	290.0		R/W
1556	PT33_Cmp_TBOffset3_Circuit3	0.0	-290.0	290.0		R/W

1557	PT34_Cmp_TBOffset4_Circuit3	0.0	-290.0	290.0		R/W
1558	PT50_Fan_EnableTimeBands	0	0	1		R/W
1559	PT51_Fan_startTB1 (Low)	0	0	86399		R/W
1560	PT51_Fan_startTB1 (High)					
1561	PT52_Fan_startTB2 (Low)	0	0	86399		R/W
1562	PT52_Fan_startTB2 (High)					
1563	PT53_Fan_startTB3 (Low)	0	0	86399		R/W
1564	PT53_Fan_startTB3 (High)					
1565	PT54_Fan_startTB4 (Low)	0	0	86399		R/W
1566	PT54_Fan_startTB4 (High)					
1567	PT61_Fan_TBOffset1_Circuit1	0.0	-290.0	290.0		R/W
1568	PT62_Fan_TBOffset2_Circuit1	0.0	-290.0	290.0		R/W
1569	PT63_Fan_TBOffset3_Circuit1	0.0	-290.0	290.0		R/W
1570	PT64_Fan_TBOffset4_Circuit1	0.0	-290.0	290.0		R/W
1571	PT71_Fan_TBOffset1_Circuit2	0.0	-290.0	290.0		R/W
1572	PT72_Fan_TBOffset2_Circuit2	0.0	-290.0	290.0		R/W
1573	PT73_Fan_TBOffset3_Circuit2	0.0	-290.0	290.0		R/W
1574	PT74_Fan_TBOffset4_Circuit2	0.0	-290.0	290.0		R/W
1575	PT81_Fan_TBOffset1_Circuit3	0.0	-290.0	290.0		R/W
1576	PT82_Fan_TBOffset2_Circuit3	0.0	-290.0	290.0		R/W
1577	PT83_Fan_TBOffset3_Circuit3	0.0	-290.0	290.0		R/W
1578	PT84_Fan_TBOffset4_Circuit3	0.0	-290.0	290.0		R/W
1579	SPC1_Cmp_SetPoint_Circuit1	1.0	-145.0	625.5		R/W
1580	PUC1_Cmp_SecSPOffset_ByDI_Circuit1	0.0	-290.0	290.0		R/W
1581	PUC4_Cmp_SecSPOffset_BySup_Circuit1	0.0	-290.0	290.0		R/W
1582	SPC2_Cmp_SetPoint_Circuit2	1.0	-145.0	625.5		R/W
1583	PUC2_Cmp_SecSPOffset_ByDI_Circuit2	0.0	-290.0	290.0		R/W
1584	PUC5_Cmp_SecSPOffset_BySup_Circuit2	0.0	-290.0	290.0		R/W
1585	SPC3_Cmp_SetPoint_Circuit3	1.0	-145.0	625.5		R/W
1586	PUC3_Cmp_SecSPOffset_ByDI_Circuit3	0.0	-290.0	290.0		R/W
1587	PUC6_Cmp_SecSPOffset_BySup_Circuit3	0.0	-290.0	290.0		R/W
1588	SPF1_Fan_SetPoint_Circuit1	15.0	-145.0	625.5		R/W
1589	PUF1_Fan_SecSPOffset_ByDI_Circuit1	0.0	-290.0	290.0		R/W
1590	PUF4_Fan_SecSPOffset_BySup_Circuit1	0.0	-290.0	290.0		R/W
1591	SPF2_Fan_SetPoint_Circuit2	15.0	-145.0	625.5		R/W
1592	PUF2_Fan_SecSPOffset_ByDI_Circuit2	0.0	-290.0	290.0		R/W
1593	PUF5_Fan_SecSPOffset_BySup_Circuit2	0.0	-290.0	290.0		R/W
1594	SPF3_Fan_SetPoint_Circuit3	15.0	-145.0	625.5		R/W

1595	PUF3_Fan_SecSPOffset_ByDI_Circuit3	0.0	-290.0	290.0		R/W
1596	PUF6_Fan_SecSPOffset_BySup_Circuit3	0.0	-290.0	290.0		R/W
1597	PM00_Cmp_LimitHours (Low)	20000	0	500000		R/W
1598	PM00_Cmp_LimitHours (High)					
1599	PM01a10_31_32_V_HoursCmp[0] (Low)	0	0	500000		R/W
1600	PM01a10_31_32_V_HoursCmp[0] (High)					
1601	PM01a10_31_32_V_HoursCmp[1] (Low)	0	0	500000		R/W
1602	PM01a10_31_32_V_HoursCmp[1] (High)					
1603	PM01a10_31_32_V_HoursCmp[2] (Low)	0	0	500000		R/W
1604	PM01a10_31_32_V_HoursCmp[2] (High)					
1605	PM01a10_31_32_V_HoursCmp[3] (Low)	0	0	500000		R/W
1606	PM01a10_31_32_V_HoursCmp[3] (High)					
1607	PM01a10_31_32_V_HoursCmp[4] (Low)	0	0	500000		R/W
1608	PM01a10_31_32_V_HoursCmp[4] (High)					
1609	PM01a10_31_32_V_HoursCmp[5] (Low)	0	0	500000		R/W
1610	PM01a10_31_32_V_HoursCmp[5] (High)					
1611	PM01a10_31_32_V_HoursCmp[6] (Low)	0	0	500000		R/W
1612	PM01a10_31_32_V_HoursCmp[6] (High)					
1613	PM01a10_31_32_V_HoursCmp[7] (Low)	0	0	500000		R/W
1614	PM01a10_31_32_V_HoursCmp[7] (High)					
1615	PM01a10_31_32_V_HoursCmp[8] (Low)	0	0	500000		R/W
1616	PM01a10_31_32_V_HoursCmp[8] (High)					
1617	PM01a10_31_32_V_HoursCmp[9] (Low)	0	0	500000		R/W
1618	PM01a10_31_32_V_HoursCmp[9] (High)					
1619	PM01a10_31_32_V_HoursCmp[10] (Low)	0	0	500000		R/W
1620	PM01a10_31_32_V_HoursCmp[10] (High)					
1621	PM01a10_31_32_V_HoursCmp[11] (Low)	0	0	500000		R/W
1622	PM01a10_31_32_V_HoursCmp[11] (High)					
1623	PM11a20_33_34_En_Manual_Comp[0]	0	0	1		R/W
1624	PM11a20_33_34_En_Manual_Comp[1]	0	0	1		R/W
1625	PM11a20_33_34_En_Manual_Comp[2]	0	0	1		R/W
1626	PM11a20_33_34_En_Manual_Comp[3]	0	0	1		R/W
1627	PM11a20_33_34_En_Manual_Comp[4]	0	0	1		R/W
1628	PM11a20_33_34_En_Manual_Comp[5]	0	0	1		R/W
1629	PM11a20_33_34_En_Manual_Comp[6]	0	0	1		R/W
1630	PM11a20_33_34_En_Manual_Comp[7]	0	0	1		R/W
1631	PM11a20_33_34_En_Manual_Comp[8]	0	0	1		R/W
1632	PM11a20_33_34_En_Manual_Comp[9]	0	0	1		R/W

1633	PM11a20_33_34_En_Manual_Comp[10]	0	0	1		R/W
1634	PM11a20_33_34_En_Manual_Comp[11]	0	0	1		R/W
1635	PM21a30_35_36_ForzCmp[0]	0	0	4		R/W
1636	PM21a30_35_36_ForzCmp[1]	0	0	4		R/W
1637	PM21a30_35_36_ForzCmp[2]	0	0	4		R/W
1638	PM21a30_35_36_ForzCmp[3]	0	0	4		R/W
1639	PM21a30_35_36_ForzCmp[4]	0	0	4		R/W
1640	PM21a30_35_36_ForzCmp[5]	0	0	4		R/W
1641	PM21a30_35_36_ForzCmp[6]	0	0	4		R/W
1642	PM21a30_35_36_ForzCmp[7]	0	0	4		R/W
1643	PM21a30_35_36_ForzCmp[8]	0	0	4		R/W
1644	PM21a30_35_36_ForzCmp[9]	0	0	4		R/W
1645	PM21a30_35_36_ForzCmp[10]	0	0	4		R/W
1646	PM21a30_35_36_ForzCmp[11]	0	0	4		R/W
1647	PM37_Forz_Cmp_Inverter_C1	0.00	0.00	100.00		R/W
1648	PM38_Forz_Cmp_Inverter_C2	0.00	0.00	100.00		R/W
1649	PM39_Forz_Cmp_Inverter_C3	0.00	0.00	100.00		R/W
1650	PM40_Fan_LimitHours (Low)	20000	0	500000		R/W
1651	PM40_Fan_LimitHours (High)					
1652	PM41a50_71_72_V_HoursFan[0] (Low)	0	0	500000		R/W
1653	PM41a50_71_72_V_HoursFan[0] (High)					
1654	PM41a50_71_72_V_HoursFan[1] (Low)	0	0	500000		R/W
1655	PM41a50_71_72_V_HoursFan[1] (High)					
1656	PM41a50_71_72_V_HoursFan[2] (Low)	0	0	500000		R/W
1657	PM41a50_71_72_V_HoursFan[2] (High)					
1658	PM41a50_71_72_V_HoursFan[3] (Low)	0	0	500000		R/W
1659	PM41a50_71_72_V_HoursFan[3] (High)					
1660	PM41a50_71_72_V_HoursFan[4] (Low)	0	0	500000		R/W
1661	PM41a50_71_72_V_HoursFan[4] (High)					
1662	PM41a50_71_72_V_HoursFan[5] (Low)	0	0	500000		R/W
1663	PM41a50_71_72_V_HoursFan[5] (High)					
1664	PM41a50_71_72_V_HoursFan[6] (Low)	0	0	500000		R/W
1665	PM41a50_71_72_V_HoursFan[6] (High)					
1666	PM41a50_71_72_V_HoursFan[7] (Low)	0	0	500000		R/W
1667	PM41a50_71_72_V_HoursFan[7] (High)					
1668	PM41a50_71_72_V_HoursFan[8] (Low)	0	0	500000		R/W
1669	PM41a50_71_72_V_HoursFan[8] (High)					
1670	PM41a50_71_72_V_HoursFan[9] (Low)	0	0	500000		R/W

1671	PM41a50_71_72_V_HoursFan[9] (High)					
1672	PM41a50_71_72_V_HoursFan[10] (Low)	0	0	500000		R/W
1673	PM41a50_71_72_V_HoursFan[10] (High)					
1674	PM41a50_71_72_V_HoursFan[11] (Low)	0	0	500000		R/W
1675	PM41a50_71_72_V_HoursFan[11] (High)					
1676	PM51a60_73_74_En_Manual_Fan[0]	0	0	1		R/W
1677	PM51a60_73_74_En_Manual_Fan[1]	0	0	1		R/W
1678	PM51a60_73_74_En_Manual_Fan[2]	0	0	1		R/W
1679	PM51a60_73_74_En_Manual_Fan[3]	0	0	1		R/W
1680	PM51a60_73_74_En_Manual_Fan[4]	0	0	1		R/W
1681	PM51a60_73_74_En_Manual_Fan[5]	0	0	1		R/W
1682	PM51a60_73_74_En_Manual_Fan[6]	0	0	1		R/W
1683	PM51a60_73_74_En_Manual_Fan[7]	0	0	1		R/W
1684	PM51a60_73_74_En_Manual_Fan[8]	0	0	1		R/W
1685	PM51a60_73_74_En_Manual_Fan[9]	0	0	1		R/W
1686	PM51a60_73_74_En_Manual_Fan[10]	0	0	1		R/W
1687	PM51a60_73_74_En_Manual_Fan[11]	0	0	1		R/W
1688	PM61a70_75_76_ForzFans[0]	0	0	1		R/W
1689	PM61a70_75_76_ForzFans[1]	0	0	1		R/W
1690	PM61a70_75_76_ForzFans[2]	0	0	1		R/W
1691	PM61a70_75_76_ForzFans[3]	0	0	1		R/W
1692	PM61a70_75_76_ForzFans[4]	0	0	1		R/W
1693	PM61a70_75_76_ForzFans[5]	0	0	1		R/W
1694	PM61a70_75_76_ForzFans[6]	0	0	1		R/W
1695	PM61a70_75_76_ForzFans[7]	0	0	1		R/W
1696	PM61a70_75_76_ForzFans[8]	0	0	1		R/W
1697	PM61a70_75_76_ForzFans[9]	0	0	1		R/W
1698	PM61a70_75_76_ForzFans[10]	0	0	1		R/W
1699	PM61a70_75_76_ForzFans[11]	0	0	1		R/W
1700	PM77_Forz_Fans_Inverter_C1	0.00	0.00	100.00		R/W
1701	PM78_Forz_Fans_Inverter_C2	0.00	0.00	100.00		R/W
1702	PM79_Forz_Fans_Inverter_C3	0.00	0.00	100.00		R/W
1703	PM81_Taratura_AI01	0.0	-19.0	19.0		R/W
1704	PM82_Taratura_AI02	0.0	-19.0	19.0		R/W
1705	PM83_Taratura_AI03	0.0	-19.0	19.0		R/W
1706	PM84_Taratura_AI04	0.0	-19.0	19.0		R/W
1707	PM85_Taratura_AI05	0.0	-19.0	19.0		R/W
1708	PM86_Taratura_AI06	0.0	-19.0	19.0		R/W

1709	PM87_Taratura_AI07	0.0	-19.0	19.0		R/W
1710	PM88_Taratura_AI08	0.0	-19.0	19.0		R/W
1711	PM90_LastMaintainDATE (Low)	0	0	2147483647		R/W
1712	PM90_LastMaintainDATE (High)					
1713	PC01_Cmp_Rotation_Type	0	0	3	0=FIFO, 1=LIFO, 2=FIFO+Hr, 3=LIFO+Hr	R/W
1714	PC02_Cmp_ModeCCpp_Type	0	0	3	0=CpCp_pCpC, 1=CCpp_ppCC, 2=CpCp_ppCC, 3=CCpp_pCpC	R/W
1715	PC03_Cmp_LoadStepsLogic	1	0	1		R/W
1716	PC04_Cmp_TminOn	10	0	999		R/W
1717	PC05_Cmp_TminOff	120	0	999		R/W
1718	PC06_Cmp_TonOn	360	0	999		R/W
1719	PC07_Cmp_TonOther	20	0	999		R/W
1720	PC08_Cmp_ToffOther	20	0	999		R/W
1721	PC09_Cmp_TonLoadStep	20	0	999		R/W
1722	PC10_Cmp_ToffLoadStep	20	0	999		R/W
1723	PC11_Cmp_OnErrorProbe_Circuit1	1	0	12		R/W
1724	PC12_Cmp_MinSetPoint_Circuit1	0.1	-145.0	625.5		R/W
1725	PC13_Cmp_MaxSetPoint_Circuit1	2.5	-145.0	625.5		R/W
1726	PC14_Cmp_RegulationType_Circuit1	1	0	1	0 = Side band, 1 = Neutral zone	R/W
1727	PC16_Cmp_PI_Ti_Circuit1	600	0	999		R/W
1728	PC17_Cmp_PI_Diff_Circuit1	0.5	0.0	290.0		R/W
1729	PC18_Cmp_NZ_Zone_Circuit1	0.5	0.0	290.0		R/W
1730	PC19_Cmp_NZ_DiffOutZone_Circuit1	0.5	0.0	290.0		R/W
1731	PC20_Cmp_NZ_TOnMin_Circuit1	20	0	999		R/W
1732	PC21_Cmp_NZ_TOnMax_Circuit1	60	0	999		R/W
1733	PC22_Cmp_NZ_TOffMin_Circuit1	10	0	999		R/W
1734	PC23_Cmp_NZ_TOffMax_Circuit1	60	0	999		R/W
1735	PC24_Cmp_Inverter_Diff_Circuit1	0.5	0.0	290.0		R/W
1736	PC25_Cmp_Inverter_OffsetSP_Circuit1	0.0	-290.0	290.0		R/W
1737	PC26_Cmp_Min_Inverter_Circuit1	-	0.00	100.00		R/W
1738	PC27_Cmp_Inverter_TSpeedUp_Circuit1	0	0	999		R/W
1739	PC28_Cmp_InverterTime_Circuit1	10	0	999		R/W
1740	PC31_Cmp_OnErrorProbe_Circuit2	1	0	12		R/W
1741	PC32_Cmp_MinSetPoint_Circuit2	0.1	-145.0	625.5		R/W
1742	PC33_Cmp_MaxSetPoint_Circuit2	2.5	-145.0	625.5		R/W
1743	PC34_Cmp_RegulationType_Circuit2	1	0	1	0 = Side band, 1 = Neutral zone	R/W

1744	PC36_Cmp_PI_Ti_Circuit2	600	0	999		R/W
1745	PC37_Cmp_PI_Diff_Circuit2	0.5	0.0	290.0		R/W
1746	PC38_Cmp_NZ_Zone_Circuit2	0.5	0.0	290.0		R/W
1747	PC39_Cmp_NZ_DiffOutZone_Circuit2	0.5	0.0	290.0		R/W
1748	PC40_Cmp_NZ_TOnMin_Circuit2	20	0	999		R/W
1749	PC41_Cmp_NZ_TOnMax_Circuit2	60	0	999		R/W
1750	PC42_Cmp_NZ_TOffMin_Circuit2	10	0	999		R/W
1751	PC43_Cmp_NZ_TOffMax_Circuit2	60	0	999		R/W
1752	PC44_Cmp_Inverter_Diff_Circuit2	0.5	0.0	290.0		R/W
1753	PC45_Cmp_Inverter_OffsetSP_Circuit2	0.0	-290.0	290.0		R/W
1754	PC46_Cmp_Min_Inverter_Circuit2	0.00	0.00	100.00		R/W
1755	PC47_Cmp_Inverter_TSpeedUp_Circuit2	0	0	999		R/W
1756	PC48_Cmp_InverterTime_Circuit2	10	0	999		R/W
1757	PC51_Cmp_OnErrorProbe_Circuit3	1	0	12		R/W
1758	PC52_Cmp_MinSetPoint_Circuit3	0.1	-145.0	625.5		R/W
1759	PC53_Cmp_MaxSetPoint_Circuit3	2.5	-145.0	625.5		R/W
1760	PC54_Cmp_RegulationType_Circuit3	1	0	1	0 = Side band, 1 = Neutral zone	R/W
1761	PC56_Cmp_PI_Ti_Circuit3	600	0	999		R/W
1762	PC57_Cmp_PI_Diff_Circuit3	0.5	0.0	290.0		R/W
1763	PC58_Cmp_NZ_Zone_Circuit3	0.5	0.0	290.0		R/W
1764	PC59_Cmp_NZ_DiffOutZone_Circuit3	0.5	0.0	290.0		R/W
1765	PC60_Cmp_NZ_TOnMin_Circuit3	20	0	999		R/W
1766	PC61_Cmp_NZ_TOnMax_Circuit3	60	0	999		R/W
1767	PC62_Cmp_NZ_TOffMin_Circuit3	10	0	999		R/W
1768	PC63_Cmp_NZ_TOffMax_Circuit3	60	0	999		R/W
1769	PC64_Cmp_Inverter_Diff_Circuit3	0.5	0.0	290.0		R/W
1770	PC65_Cmp_Inverter_OffsetSP_Circuit3	0.0	-290.0	290.0		R/W
1771	PC66_Cmp_Min_Inverter_Circuit3	0.00	0.00	100.00		R/W
1772	PC67_Cmp_Inverter_TSpeedUp_Circuit3	0	0	999		R/W
1773	PC68_Cmp_InverterTime_Circuit3	10	0	999		R/W
1774	PC69_RestartCmp_AfterReset	0	0	999	Sec	R/W
1775	PC70_EnablePart	0	0	1		R/W
1776	PC71_SetPressurePartCircuit1	22.0	-145.0	625.5		R/W
1777	PC72_SetPressurePartCircuit2	22.0	-145.0	625.5		R/W
1778	PC73_SetPressurePartCircuit3	22.0	-145.0	625.5		R/W
1779	PC74_DifftPressurePart	4.0	0.1	10.0		R/W
1780	PC75_MinTimePart	0	0	999		R/W

1781	PC76_PartLimit	50	0	100	%	R/W
1782	PC78_OverloadSteps_Cmp	0	0	100	%	R/W
1783	PC81a92_PowerCmp[0]	1	0	5000	kW	R/W
1784	PC81a92_PowerCmp[1]	1	0	5000	kW	R/W
1785	PC81a92_PowerCmp[2]	1	0	5000	kW	R/W
1786	PC81a92_PowerCmp[3]	1	0	5000	kW	R/W
1787	PC81a92_PowerCmp[4]	1	0	5000	kW	R/W
1788	PC81a92_PowerCmp[5]	1	0	5000	kW	R/W
1789	PC81a92_PowerCmp[6]	1	0	5000	kW	R/W
1790	PC81a92_PowerCmp[7]	1	0	5000	kW	R/W
1791	PC81a92_PowerCmp[8]	1	0	5000	kW	R/W
1792	PC81a92_PowerCmp[9]	1	0	5000	kW	R/W
1793	PC81a92_PowerCmp[10]	1	0	5000	kW	R/W
1794	PC81a92_PowerCmp[11]	1	0	5000	kW	R/W
1795	PF01_Fan_Rotation_Type	0	0	3	0=FIFO, 1=LIFO, 2=FIFO+Hr, 3=LIFO+Hr	R/W
1796	PF02_Fan_EnRegulationByCmp	0	0	1		R/W
1797	PF07_Fan_TOnOther	5	0	999		R/W
1798	PF08_Fan_TOffOther	5	0	999		R/W
1799	PF11_Fan_OnErrorProbe_Circuit1	1	0	12		R/W
1800	PF12_Fan_MinSetPoint_Circuit1	1.0	-145.0	625.5		R/W
1801	PF13_Fan_MaxSetPoint_Circuit1	25.0	-145.0	625.5		R/W
1802	PF14_Fan_RegulationType_Circuit1	0	0	1	0 = Banda Laterale, 1 = Zona Neutra	R/W
1803	PF16_Fan_PI_Ti_Circuit1	600	0	999		R/W
1804	PF17_Fan_PI_Diff_Circuit1	0.5	0.0	290.0		R/W
1805	PF18_Fan_NZ_Zone_Circuit1	0.5	0.0	290.0		R/W
1806	PF20_Fan_NZ_TOnOff_Circuit1	10	0	999		R/W
1807	PF24_Fan_Inverter_Diff_Circuit1	0.5	0.0	290.0		R/W
1808	PF25_Fan_Inverter_OffsetSP_Circuit1	0.0	-290.0	290.0		R/W
1809	PF26_Fan_Min_Inverter_Circuit1	0.00	0.00	100.00		R/W
1810	PF27_Fan_Inverter_TSpeedUp_Circuit1	2	0	999		R/W
1811	PF28_Fan_InverterTime_Circuit1	10	0	999		R/W
1812	PF31_Fan_OnErrorProbe_Circuit2	1	0	12		R/W
1813	PF32_Fan_MinSetPoint_Circuit2	1.0	-145.0	625.5		R/W
1814	PF33_Fan_MaxSetPoint_Circuit2	25.0	-145.0	625.5		R/W
1815	PF34_Fan_RegulationType_Circuit2	0	0	1	0 = Side band, 1 = Neutral zone	R/W
1816	PF36_Fan_PI_Ti_Circuit2	600	0	999		R/W

1817	PF37_Fan_PI_Diff_Circuit2	0.5	0.0	290.0		R/W
1818	PF38_Fan_NZ_Zone_Circuit2	0.5	0.0	290.0		R/W
1819	PF40_Fan_NZ_TOnOff_Circuit2	10	0	999		R/W
1820	PF44_Fan_Inverter_Diff_Circuit2	0.5	0.0	290.0		R/W
1821	PF45_Fan_Inverter_OffsetSP_Circuit2	0.0	-290.0	290.0		R/W
1822	PF46_Fan_Min_Inverter_Circuit2	0.00	0.00	100.00		R/W
1823	PF47_Fan_Inverter_TSpeedUp_Circuit2	2	0	999		R/W
1824	PF48_Fan_InverterTime_Circuit2	10	0	999		R/W
1825	PF51_Fan_OnErrorProbe_Circuit3	1	0	12		R/W
1826	PF52_Fan_MinSetPoint_Circuit3	1.0	-145.0	625.5		R/W
1827	PF53_Fan_MaxSetPoint_Circuit3	25.0	-145.0	625.5		R/W
1828	PF54_Fan_RegulationType_Circuit3	0	0	1	0 = Side band, 1 = Neutral zone	R/W
1829	PF56_Fan_PI_Ti_Circuit3	600	0	999		R/W
1830	PF57_Fan_PI_Diff_Circuit3	0.5	0.0	290.0		R/W
1831	PF58_Fan_NZ_Zone_Circuit3	0.5	0.0	290.0		R/W
1832	PF60_Fan_NZ_TOnOff_Circuit3	10	0	999		R/W
1833	PF64_Fan_Inverter_Diff_Circuit3	0.5	0.0	290.0		R/W
1834	PF65_Fan_Inverter_OffsetSP_Circuit3	0.0	-290.0	290.0		R/W
1835	PF66_Fan_Min_Inverter_Circuit3	0.00	0.00	100.00		R/W
1836	PF67_Fan_Inverter_TSpeedUp_Circuit3	2	0	999		R/W
1837	PF68_Fan_InverterTime_Circuit3	10	0	999		R/W
1838	PF71_EnableFloatingCond	0	0	1		R/W
1839	PF72_FloatingCond_Offset	0.0	-20.0	20.0	°C	R/W
1840	PF73_FloatingCond_SetMin	30.0	10.0	45.0	°C	R/W
1841	PF74_FloatingCond_SetMax	40.0	10.0	45.0	°C	R/W
1842	PF78_OverloadSteps_Fan	0	0	100	%	R/W
1843	PA01_EnManutHourCmp	0	0	1		R/W
1844	PA02_EnManutHourFan	0	0	1		R/W
1845	PA03_HighPressSuction_Delay	30	0	999		R/W
1846	PA04_ExpOffline_Delay	1	0	999		R/W
1847	PA05_LiquidLevel_Delay	90	0	999		R/W
1848	PA06_ProbeError_Delay	5	0	240		R/W
1849	PA07_LowPressSupply_Delay	30	0	999		R/W
1850	PA08_LowPressSuction_Delay	30	0	999		R/W
1851	PA09_ThermalCmp_Delay	0	0	999		R/W
1852	PA10_OilDiffCmp_Delay	10	0	999		R/W
1853	PA11_PressSwitchSupply_ResetType	1	0	1		R/W

1854	PA12_ThermalCmp_ResetType	1	0	1		R/W
1855	PA13_PressSwitchCmp_ResetType	1	0	1		R/W
1856	PA14_OilDiffCmp_ResetType	1	0	1		R/W
1857	PA15_SetPoint_LP_Suction_C1	0.5	-145.0	625.5		R/W
1858	PA16_Diff_LP_Suction_C1	0.5	0.0	290.0		R/W
1859	PA17_SetPoint_HP_Suction_C1	4.0	-145.0	625.5		R/W
1860	PA18_Diff_HP_Suction_C1	0.5	0.0	290.0		R/W
1861	PA19_SetPoint_LP_Supply_C1	2.0	-145.0	625.5		R/W
1862	PA20_Diff_LP_Supply_C1	0.5	0.0	290.0		R/W
1863	PA21_SetPoint_HP_Supply_C1	20.0	-145.0	625.5		R/W
1864	PA22_Diff_HP_Supply_C1	1.0	0.0	290.0		R/W
1865	PA23_ThermalFan_ResetType	1	0	1		R/W
1866	PA25_SetPoint_LP_Suction_C2	0.5	-145.0	625.5		R/W
1867	PA26_Diff_LP_Suction_C2	0.5	0.0	290.0		R/W
1868	PA27_SetPoint_HP_Suction_C2	4.0	-145.0	625.5		R/W
1869	PA28_Diff_HP_Suction_C2	0.5	0.0	290.0		R/W
1870	PA29_SetPoint_LP_Supply_C2	2.0	-145.0	625.5		R/W
1871	PA30_Diff_LP_Supply_C2	0.5	0.0	290.0		R/W
1872	PA31_SetPoint_HP_Supply_C2	20.0	-145.0	625.5		R/W
1873	PA32_Diff_HP_Supply_C2	1.0	0.0	290.0		R/W
1874	PA35_SetPoint_LP_Suction_C3	0.5	-145.0	625.5		R/W
1875	PA36_Diff_LP_Suction_C3	0.5	0.0	290.0		R/W
1876	PA37_SetPoint_HP_Suction_C3	4.0	-145.0	625.5		R/W
1877	PA38_Diff_HP_Suction_C3	0.5	0.0	290.0		R/W
1878	PA39_SetPoint_LP_Supply_C3	2.0	-145.0	625.5		R/W
1879	PA40_Diff_LP_Supply_C3	0.5	0.0	290.0		R/W
1880	PA41_SetPoint_HP_Supply_C3	20.0	-145.0	625.5		R/W
1881	PA42_Diff_HP_Supply_C3	1.0	0.0	290.0		R/W
1882	PH01_Pressure_Min_Suction	-0.5	-145.0	625.5		R/W
1883	PH02_Pressure_Max_Suction	7.0	-145.0	625.5		R/W
1884	PH03_Pressure_Min_Supply	0.0	-145.0	625.5		R/W
1885	PH04_Pressure_Max_Supply	30.0	-145.0	625.5		R/W
1886	PH05_En_OnOffByKey	1	0	1		R/W
1887	PH06_En_OnOffByKey_Circuit	0	0	1		R/W
1888	PH07_En_OnOffByDI	0	0	1		R/W
1889	PH08_En_OnOffByDI_Circuit	0	0	1		R/W
1890	PH09_En_OnOffBySuperv	0	0	1		R/W
1891	PH10_En_OnOffBySuperv_Circuit	0	0	1		R/W

1892	PH11_Modbus_Address	1	1	247		R/W
1893	PH12_Modbus_Baud	3	0	4		R/W
1894	PH13_Modbus_Parity	2	0	2		R/W
1895	PH14_Modbus_StopBit	0	0	1		R/W
1896	PH15_SetDefault_Par	0	0	1		R/W
1897	PH16_Cmp_SecuritiesType	1	0	4		R/W
1898	PH17_Logic_DI_Alarm	0	0	1		R/W
1899	PH18_Logic_DO_Alarm	0	0	1		R/W
1900	PH19_Logic_DI_Other	1	0	1		R/W
1901	PH20_LogicCmdInverter_Comp	0	0	1	PH20=0: 0=0, 1=1; PH20=1: 0=1, 1=0;	R/W
1902	PH21_LogicCmdInverter_com	0	0	1	PH21=0: 0=0, 1=1; PH21=1: 0=1, 1=0;	R/W
1903	Free					
1904	PH23_EnAI07_EnvinromentProbe	0	0	1		R/W
1905	PH24_EnAI08_ExternalProbe	0	0	1		R/W
1906	PH25_En_SecondarySetPoint_DI	0	0	1		R/W
1907	PH26_En_SecondarySetPoint_Sup	0	0	1		R/W
1908	PH27_SelectPageON	0	0	3		R/W
1909	PH31_RefrigerationType	3	0	6	0=none, 1=R22, 2=R134a, 3=R404A, 4=R407C, 5=R410A, 6=R507	R/W
1910	PH32_Temp_UM	0	0	1	0=°C, 1=°F	R/W
1911	PH33_Press_UM	0	0	1	0=Bar, 1=psi	R/W
1912	PH35_EnSuctionCompensation	0	0	1		R/W
1913	PH36_OffsetSuctionCompensation	0.2	0.1	5.0		R/W
1914	PH40_PressureOrTemperature	0	0	1	0=Pressure, 1=Temperature	R/W
1915	PH43_SelectTypeAI01	4	2	4		R/W
1916	PH44_SelectTypeAI02	4	2	4		R/W
1917	PH45_SelectTypeAI03_04	4	2	4		R/W
1918	PH47_SelectTypeAI05_06	4	2	4		R/W
1919	PH53_EnBuzzer	1	0	1		R/W
1920	PG01_CircuitsNumber	2	1	3	*Value=1* on C-PRO MEGA	R/W
1921	PG02_EnableExpansion	0	0	1		R/W
1922	PG03_EnDifferentCapacitiesCmp	0	0	1		R/W
1923	PG04_LoadStepsNumber	1	0	3	*Value=0* on C-PRO MEGA	R/W
1924	PG05_Cmp_SecuritiesNumber	1	0	3		R/W
1925	PG11_CmpNumber_Circuit1	2	0	12	*Value=0* on C-PRO MEGA	R/W
1926	PG12_EnCmpInverter_Circuit1	0	0	1		R/W
1927	PG15_CmpNumber_Circuit2	2	0	12	*Value=0* on C-PRO MEGA	R/W

1928	PG16_EnCmpInverter_Circuit2	0	0	1		R/W
1929	PG21_CmpNumber_Circuit3	0	0	12		R/W
1930	PG22_EnCmpInverter_Circuit3	0	0	1		R/W
1931	PG30_En_UniqueCondenser	0	0	1		R/W
1932	PG32_Fan_EnSecurities	0	0	1		R/W
1933	PG41_FansNumber_Circuit1	2	0	12	*Value=3* on C-PRO MEGA	R/W
1934	PG42_EnFanInverter_Circuit1	0	0	1		R/W
1935	PG45_FansNumber_Circuit2	2	0	12	*Value=0* on C-PRO MEGA	R/W
1936	PG46_EnFanInverter_Circuit2	0	0	1		R/W
1937	PG51_FansNumber_Circuit3	0	0	12		R/W
1938	PG52_EnFanInverter_Circuit3	0	0	1		R/W
1939	HC01a10_50_60_PosDO_Comp[0]	1	0	26	*Max=16* on C-PRO MEGA	R/W
1940	HC01a10_50_60_PosDO_Comp[1]	3	0	26	*Max=16* on C-PRO MEGA	R/W
1941	HC01a10_50_60_PosDO_Comp[2]	5	0	26	*Value=4, Max=16* on C-PRO MEGA	R/W
1942	HC01a10_50_60_PosDO_Comp[3]	7	0	26	*Value=5, Max=16* on C-PRO MEGA	R/W
1943	HC01a10_50_60_PosDO_Comp[4]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1944	HC01a10_50_60_PosDO_Comp[5]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1945	HC01a10_50_60_PosDO_Comp[6]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1946	HC01a10_50_60_PosDO_Comp[7]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1947	HC01a10_50_60_PosDO_Comp[8]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1948	HC01a10_50_60_PosDO_Comp[9]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1949	HC01a10_50_60_PosDO_Comp[10]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1950	HC01a10_50_60_PosDO_Comp[11]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1951	HC11a20_51_61_PosDO_LS1[0]	2	0	26	*Value=0, Max=16* on C-PRO MEGA	R/W
1952	HC11a20_51_61_PosDO_LS1[1]	4	0	26	*Value=0, Max=16* on C-PRO MEGA	R/W
1953	HC11a20_51_61_PosDO_LS1[2]	6	0	26	*Value=0, Max=16* on C-PRO MEGA	R/W
1954	HC11a20_51_61_PosDO_LS1[3]	8	0	26	*Value=0, Max=16* on C-PRO MEGA	R/W
1955	HC11a20_51_61_PosDO_LS1[4]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1956	HC11a20_51_61_PosDO_LS1[5]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1957	HC11a20_51_61_PosDO_LS1[6]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1958	HC11a20_51_61_PosDO_LS1[7]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1959	HC11a20_51_61_PosDO_LS1[8]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1960	HC11a20_51_61_PosDO_LS1[9]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1961	HC11a20_51_61_PosDO_LS1[10]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1962	HC11a20_51_61_PosDO_LS1[11]	0	0	26	*Max=16* on C-PRO MEGA	R/W

1963	HC21a30_52_62_PosDO_LS2[0]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1964	HC21a30_52_62_PosDO_LS2[1]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1965	HC21a30_52_62_PosDO_LS2[2]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1966	HC21a30_52_62_PosDO_LS2[3]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1967	HC21a30_52_62_PosDO_LS2[4]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1968	HC21a30_52_62_PosDO_LS2[5]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1969	HC21a30_52_62_PosDO_LS2[6]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1970	HC21a30_52_62_PosDO_LS2[7]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1971	HC21a30_52_62_PosDO_LS2[8]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1972	HC21a30_52_62_PosDO_LS2[9]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1973	HC21a30_52_62_PosDO_LS2[10]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1974	HC21a30_52_62_PosDO_LS2[11]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1975	HC31a40_53_63_PosDO_LS3[0]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1976	HC31a40_53_63_PosDO_LS3[1]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1977	HC31a40_53_63_PosDO_LS3[2]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1978	HC31a40_53_63_PosDO_LS3[3]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1979	HC31a40_53_63_PosDO_LS3[4]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1980	HC31a40_53_63_PosDO_LS3[5]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1981	HC31a40_53_63_PosDO_LS3[6]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1982	HC31a40_53_63_PosDO_LS3[7]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1983	HC31a40_53_63_PosDO_LS3[8]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1984	HC31a40_53_63_PosDO_LS3[9]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1985	HC31a40_53_63_PosDO_LS3[10]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1986	HC31a40_53_63_PosDO_LS3[11]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1987	HF01a12_PosDO_Fan[0]	10	0	26	*Value=6, Max=16* on C-PRO MEGA	R/W
1988	HF01a12_PosDO_Fan[1]	11	0	26	*Value=7, Max=16* on C-PRO MEGA	R/W
1989	HF01a12_PosDO_Fan[2]	12	0	26	*Value=8, Max=16* on C-PRO MEGA	R/W
1990	HF01a12_PosDO_Fan[3]	13	0	26	*Value=0, Max=16* on C-PRO MEGA	R/W
1991	HF01a12_PosDO_Fan[4]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1992	HF01a12_PosDO_Fan[5]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1993	HF01a12_PosDO_Fan[6]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1994	HF01a12_PosDO_Fan[7]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1995	HF01a12_PosDO_Fan[8]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1996	HF01a12_PosDO_Fan[9]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1997	HF01a12_PosDO_Fan[10]	0	0	26	*Max=16* on C-PRO MEGA	R/W
1998	HF01a12_PosDO_Fan[11]	0	0	26	*Max=16* on C-PRO MEGA	R/W

1999	HA01_11_21_31_PosDO_Alarms[0]	9	0	26	*Value=2, Max=16* on C-PRO MEGA	R/W
2000	HA01_11_21_31_PosDO_Alarms[1]	0	0	26	*Max=16* on C-PRO MEGA	R/W
2001	HA01_11_21_31_PosDO_Alarms[2]	0	0	26	*Max=16* on C-PRO MEGA	R/W
2002	HA01_11_21_31_PosDO_Alarms[3]	0	0	26	*Max=16* on C-PRO MEGA	R/W
2003	Hd01_Pos_DI_Remote_OnOff	0	0	22	*Max=18* on C-PRO MEGA	R/W
2004	Hd02_Pos_DI_CmpSecSP	0	0	22	*Max=18* on C-PRO MEGA	R/W
2005	Hd03_Pos_DI_FanSecSP	0	0	22	*Max=18* on C-PRO MEGA	R/W
2006	Hd11_Pos_DI_Remote_OnOff_C1	0	0	22	*Max=18* on C-PRO MEGA	R/W
2007	Hd12_Pos_DI_LiquidLevel_Circuit1	7	0	22	*Value=6, Max=18* on C-PRO MEGA	R/W
2008	Hd13_Pos_DI_LPPressSwitchSuction_Circuit1	9	0	22	*Value=7, Max=18* on C-PRO MEGA	R/W
2009	Hd14_Pos_DI_HPPressSwitchSupply_Circuit1	11	0	22	*Value=8, Max=18* on C-PRO MEGA	R/W
2010	Hd15_Pos_DI_CommonOilDiff_Circuit1	0	0	22	*Max=18* on C-PRO MEGA	R/W
2011	Hd16_Pos_DI_CommonThermalOverloadFan_Circuit1	5	0	22	*Max=18* on C-PRO MEGA	R/W
2012	Hd21_Pos_DI_Remote_OnOff_C2	0	0	22	*Max=18* on C-PRO MEGA	R/W
2013	Hd22_Pos_DI_LiquidLevel_Circuit2	8	0	22	*Value=0, Max=18* on C-PRO MEGA	R/W
2014	Hd23_Pos_DI_LPPressSwitchSuction_Circuit2	10	0	22	*Value=0, Max=18* on C-PRO MEGA	R/W
2015	Hd24_Pos_DI_HPPressSwitchSupply_Circuit2	12	0	22	*Value=0, Max=18* on C-PRO MEGA	R/W
2016	Hd25_Pos_DI_CommonOilDiff_Circuit2	0	0	22	*Value=0, Max=18* on C-PRO MEGA	R/W
2017	Hd26_Pos_DI_CommonThermalOverloadFan_Circuit2	6	0	22	*Value=0, Max=18* on C-PRO MEGA	R/W
2018	Hd31_Pos_DI_Remote_OnOff_C3	0	0	22	*Max=18* on C-PRO MEGA	R/W
2019	Hd32_Pos_DI_LiquidLevel_Circuit3	0	0	22	*Max=18* on C-PRO MEGA	R/W
2020	Hd33_Pos_DI_LPPressSwitchSuction_Circuit3	0	0	22	*Max=18* on C-PRO MEGA	R/W
2021	Hd34_Pos_DI_HPPressSwitchSupply_Circuit3	0	0	22	*Max=18* on C-PRO MEGA	R/W
2022	Hd35_Pos_DI_CommonOilDiff_Circuit3	0	0	22	*Max=18* on C-PRO MEGA	R/W
2023	Hd36_Pos_DI_CommonThermalOverloadFan_Circuit3	0	0	22	*Max=18* on C-PRO MEGA	R/W
2024	Hd41_52_PosDI_ThermalOverloadCmp[0]	1	0	22	*Max=18* on C-PRO MEGA	R/W
2025	Hd41_52_PosDI_ThermalOverloadCmp[1]	2	0	22	*Max=18* on C-PRO MEGA	R/W
2026	Hd41_52_PosDI_ThermalOverloadCmp[2]	3	0	22	*Max=18* on C-PRO MEGA	R/W
2027	Hd41_52_PosDI_ThermalOverloadCmp[3]	4	0	22	*Max=18* on C-PRO MEGA	R/W
2028	Hd41_52_PosDI_ThermalOverloadCmp[4]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2029	Hd41_52_PosDI_ThermalOverloadCmp[5]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2030	Hd41_52_PosDI_ThermalOverloadCmp[6]	0	0	22	*Max=18* on C-PRO MEGA	R/W

2031	Hd41_52_PosDI_ThermalOverloadCmp[7]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2032	Hd41_52_PosDI_ThermalOverloadCmp[8]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2033	Hd41_52_PosDI_ThermalOverloadCmp[9]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2034	Hd41_52_PosDI_ThermalOverloadCmp[10]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2035	Hd41_52_PosDI_ThermalOverloadCmp[11]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2036	Hd61_66_PosDI_PressureSwitchCmp[0]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2037	Hd61_66_PosDI_PressureSwitchCmp[1]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2038	Hd61_66_PosDI_PressureSwitchCmp[2]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2039	Hd61_66_PosDI_PressureSwitchCmp[3]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2040	Hd61_66_PosDI_PressureSwitchCmp[4]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2041	Hd61_66_PosDI_PressureSwitchCmp[5]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2042	Hd71_76_PosDI_OilDifferentialCmp[0]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2043	Hd71_76_PosDI_OilDifferentialCmp[1]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2044	Hd71_76_PosDI_OilDifferentialCmp[2]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2045	Hd71_76_PosDI_OilDifferentialCmp[3]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2046	Hd71_76_PosDI_OilDifferentialCmp[4]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2047	Hd71_76_PosDI_OilDifferentialCmp[5]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2048	Hd81_92_PosDI_ThermalOverloadFan[0]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2049	Hd81_92_PosDI_ThermalOverloadFan[1]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2050	Hd81_92_PosDI_ThermalOverloadFan[2]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2051	Hd81_92_PosDI_ThermalOverloadFan[3]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2052	Hd81_92_PosDI_ThermalOverloadFan[4]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2053	Hd81_92_PosDI_ThermalOverloadFan[5]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2054	Hd81_92_PosDI_ThermalOverloadFan[6]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2055	Hd81_92_PosDI_ThermalOverloadFan[7]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2056	Hd81_92_PosDI_ThermalOverloadFan[8]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2057	Hd81_92_PosDI_ThermalOverloadFan[9]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2058	Hd81_92_PosDI_ThermalOverloadFan[10]	0	0	22	*Max=18* on C-PRO MEGA	R/W
2059	Hd81_92_PosDI_ThermalOverloadFan[11]	0	0	22	*Max=18* on C-PRO MEGA	R/W

8.1.2 Modbus export table (C-PRO MEGA)

The Modbus export list for the C-PRO MEGA is the same, except that the parameters pertaining to compressor and fan numbers 9, 10, 11, 12 have no significance (since they are not managed by the application). For the same reason, the states pertaining to the digital inputs/outputs should also be ignored since these are not present in the device hardware resources. In order to avoid malfunctions, it is essential these parameters/states are not set by Modbus and are left set to the default values.

Please note. *The default values for certain parameters vary depending on which controller is being used; the differences are highlighted in the Modbus export table Description field.*

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