pRack pR100

Compressor rack controller

ENG User manual

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Integrated Control Solutions & Energy Savings

CAREL

ENG

IMPORTANT

CAREL bases the development of its products on decades of experience in HVAC, on the continuous investments in technological innovations to products, procedures and strict quality processes with in-circuit and functional testing on 100% of its products, and on the most innovative production technology available on the market. CAREL and its subsidiaries nonetheless cannot guarantee that all the aspects of the product and the software included with the product respond to the requirements of the final application, despite the product being developed according to start-of-the-art techniques.
The customer (manufacturer, developer or installer of the final equipment) accepts all liability and risk relating to the configuration of the product in order to reach the expected results in relation to the specific final installation and/or equipment.
CAREL may, based on specific agreements, act as a consultant for the positive commissioning of the final unit/application, however in no case does it accept liability for the correct operation of the final equipment/system.

The CAREL product is a state-of-the-art product, whose operation is specified in the technical documentation supplied with the product or can be downloaded, even prior to purchase, from the website www.CAREL.com.
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Only qualified personnel may install or carry out technical service on the product.
The customer must only use the product in the manner described in the documentation relating to the product.

In addition to observing any further warnings described in this manual, the following warnings must be heeded for all CAREL products:

- Prevent the electronic circuits from getting wet. Rain, humidity and all types of liquids or condensate contain corrosive minerals that may damage the electronic circuits. In any case, the product should be used or stored in environments that comply with the temperature and humidity limits specified in the manual.
- Do not install the device in particularly hot environments. Too high temperatures may reduce the life of electronic devices, damage them and deform or melt the plastic parts. In any case, the product should be used or stored in environments that comply with the temperature and humidity limits specified in the manual.
- Do not attempt to open the device in any way other than described in the manual.
- Do not drop, hit or shake the device, as the internal circuits and mechanisms may be irreparably damaged.
- Do not use corrosive chemicals, solvents or aggressive detergents to clean the device.
- Do not use the product for applications other than those specified in the technical manual.

All of the above suggestions likewise apply to the controllers, serial boards, programming keys or any other accessory in the CAREL product portfolio.
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The technical specifications shown in the manual may be changed without prior warning.

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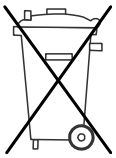
DISPOSAL



INFORMATION FOR USERS ON THE CORRECT HANDLING OF WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)

In reference to European Union directive 2002/96/EC issued on 27 January 2003 and the related national legislation, please note that:

- WEEE cannot be disposed of as municipal waste and such waste must be collected and disposed of separately;
- the public or private waste collection systems defined by local legislation must be used. In addition, the equipment can be returned to the distributor at the end of its working life when buying new equipment;
- the equipment may contain hazardous substances: the improper use or incorrect disposal of such may have negative effects on human health and on the environment;
- the symbol (crossed-out wheeled bin) shown on the product or on the packaging and on the instruction sheet indicates that the equipment has been introduced onto the market after 13 August 2005 and that it must be disposed of separately;
- in the event of illegal disposal of electrical and electronic waste, the penalties are specified by local waste disposal legislation.

KEY TO THE ICONS

	NOTE: to bring attention to a very important subject; in particular, regarding the practical use of the various functions of the product.
	IMPORTANT: to bring critical issues regarding the use of the pRack PR100 to the attention of the user.
	TUTORIAL: some simple examples to accompany the user in configuring the most common settings.

CONTENTS

1. INTRODUCTION

1.1 Main features

List of functions:

Main characteristics	Up to 2 suction lines and 2 condenser lines
	Management of scroll, piston, digital scroll, screw compressors
	Up to 12 scroll or piston compressors per line
	Up to 2 screw compressors per line, maximum one line with screw compressors
	Up to 16 fans per line
	Inverter on suction and condenser lines
	Generic functions configurable by the user (ON/OFF, modulation, alarms, time bands)
	Heat recovery
Hardware	Compact, S, M, L, XL versions
	Built-in or external pGD1
Languages	Italian
	English
Unit of measure	Temperature: °C, °F
	Pressure: barg, psig (all pressure values are also converted to temperature)
	Date format settable between: dd/mm/yy, mm/dd/yy, yy.mm.dd
Control	Proportional band (P, PI) available for compressors and fans
	Dead zone available for compressors and fans
Compressor rotation	FIFO
	LIFO
	Timed
	Fixed (the on/off order can be set as required)
Scheduling by calendar	Scheduling available: heating/cooling, 4 daily time bands, 5 special periods (e.g.: closing period), 10 special days (e.g.: holidays)
	Schedulable functions: set point compensation for compressors and fans, split condenser (heating/cooling only), anti noise, heat recovery, generic functions
Set point	Compensation from digital input, from scheduling, floating based on supervisor parameter (compressors) or outside temperature (fans)
Prevention	High pressure, including activation of heat recovery or ChillBooster
Alarms	Automatic and manual management
	Configurable compressor alarms
	Double signal on digital outputs for high or low priority alarms
	Log from application
Supervisor protocol	Carel
	Modbus

1.2 Components and accessories

pRack pR100 is available in 5 hardware sizes, listed in the table (for the detailed description of each size, the electrical specifications and installation see Chapter 2.):

Hardware sizes:

Size	Analogue inputs available	Digital inputs available	Analogue outputs available	Digital outputs available
Compact	2 + 6 (*)	2	1 (PWM) + 1 (0-10 Vdc)	5 + 2 (SSR)
Small	3 + 2 (*)	8	4 (0-10 Vdc)	6 + 2 (SSR)
Medium	6 + 2 (*)	12 (24 V) + 2 (230 V)	4 (0-10 Vdc)	11 + 2 (SSR)
Large	6 + 4 (*)	14 (24 V) + 4 (230 V)	6 (0-10 Vdc)	14 + 4 (SSR)
Extra large NO	6 + 2 (*)	12 (24 V) + 2 (230 V)	4 (0-10 Vdc)	25 + 4 (SSR)

(*) can also be used as digital inputs

The following versions are available for each size:

- with built-In or external PGD1 terminal, white background , without terminal
- with RS485 serial interface incorporated, without serial interface

All models of pRack pR100 come with:

- optically-isolated pLAN
- black plastic cover
- maximum number of SSR relays available
- connector kit

Below are the codes of the models with RS485 serial, without RS485 serial, the spare parts and accessories.

Models with RS485 serial:

Size	Code	Description
Compact	PRK100X3B0	pRack pR100 compact, built-in white pGD1, RS485, connector kit
	PRK100X3BK	pRack pR100 compact, external white pGD1 with connection cable, RS485, connector kit.
Small	PRK100S3B0	pRack pR100 small, built-in white pGD1, RS485, connector kit
	PRK100S3BK	pRack pR100 small, external white pGD1 with connection cable, RS485, connector kit
Medium	PRK100M3B0	pRack pR100 medium, built-in white pGD1, RS485, connector kit
	PRK100M3BK	pRack pR100 medium, external white pGD1 with connection cable, RS485, connector kit
Large	PRK100L3B0	pRack pR100 large, built-in white pGD1, RS485, connector kit
	PRK100L3BK	pRack pR100 large, external white pGD1 with connection cable, RS485, connector kit
Extra large NO	PRK100Z3B0	pRack pR100 XL NO, built-in white pGD1, RS485, connector kit
	PRK100Z3BK	pRack pR100 XL NO, external white pGD1 with connection cable, RS485, connector kit

	PRK100S3AK	pRack pR100 XL NO, external white pGD1 with connection cable, RS485, connector kit

Models without RS485 serial:

Size	Code	Description
Small	PRK100S3A0	pRack pR100 small, built-in white pGD1, connector kit
	PRK100S3AK	pRack pR100 small, external white pGD1 with connection cable, connector kit
Medium	PRK100M3A0	pRack pR100 medium, built-in white pGD1, connector kit
	PRK100M3AK	pRack pR100 medium, external white pGD1 with connection cable, connector kit
Large	PRK100L3A0	pRack pR100 large, built-in white pGD1, connector kit
	PRK100L3AK	pRack pR100 large, external white pGD1 with connection cable, connector kit
Extra large NO	PRK100Z3A0	pRack pR100 XL NO, built-in white pGD1, connector kit
	PRK100Z3A0	pRack pR100 XL NO, external white pGD1 with connection cable, connector kit

Spare parts:

Code	Description
PRK100X0B0	pRack pR100 compact, without terminal, RS485, connector kit
PRK100S0A0	pRack pR100 small, without terminal, connector kit.
PRK100M0A0	pRack pR100 medium, without terminal, connector kit.
PRK100L0A0	pRack pR100 large, without terminal, connector kit.
PRK100Z0A0	pRack pR100 XL, without terminal, connector kit.

Accessories:

Code	Description
PGD1RK0FX0	PGD1 user terminal for pRack pR100
CONV0/10A0	Module for converting a PWM output to a linear 0 to 10 V and 4 to 20 mA analogue output
CONVONOFF0	Module for converting a 0 to 10 V analogue output to an SPDT digital output
PCOS004850	RS485 serial connection card
CVSTDUTLF0	USB/RS485 serial converter with telephone connector
CVSTDUMOR0	USB/RS485 serial converter with 3 pin terminal
PCOSO0AKY0	Smart key (programming key)
PCOSO0AKC0	PC Smart Key USB converter
S90CONN002	Terminal connection cable l=0.8 m
S90CONN000	Terminal connection cable l=1.5 m
S90CONN001	Terminal connection cable l=3 m
SPKT*R* e SPKC00*	0 to 5 Vdc ratiometric pressure probes
SPK*C*, SPK1*, SPK2*, SPK3*	4 to 20 mA active pressure probes
NTC*	NTC temperature probes -50T90°C
NTC*HT*	NTC temperature probes -0T150°C

1.3 System configurations and input and output configuration

pRack pR100 manages 35 possible system configurations, with up to 2 suction lines and up to 2 condenser lines, on individual boards or on more than one board connected in a pLAN network.
The configuration of the inputs and outputs therefore varies according to the selected system configuration.

Note: Each input/output can be fully configured, with the only limits being set by the system configuration; for example, the suction pressure probe on line 1 can be configured on any one of the analogue inputs that is compatible with the type of probe on the pLAN board with address 1.

pRack pR100 also provides fourteen configurations pre-loaded in the software. These configurations are complete with all the parameters need to start the unit. For the details on the pre-configurations available, see the Quick Guide +040000070.

For further details on selecting the system configuration and the pre-configurations see Chapter 4.

1.3.1 System configurations available

pRack pR100 can manage system configurations with up to 2 suction lines (maximum 12 scroll or piston compressors or 6 screw compressors per line) and up to 2 condenser lines (maximum 16 fans per line). When there are two suction lines, the lines can be managed by the same pRack board or by separate boards. The condenser lines can be managed by the board that manages the suction line, or by separate boards, in accordance with the number of inputs/outputs available.

For each line, both suction and condensing, pRack pR100 can manage a modulating device (inverter, Digital Scroll® compressor or compressor with continuous control).

pRack pR100 manages up to 1 line with screw compressors and each board can control up to 2 compressors.

Some examples of the system configurations managed are shown below, while for the complete list of the configurations and the related features, see Appendix A1.

Example 1: 1 suction line with scroll or piston compressors, 1 condenser line:

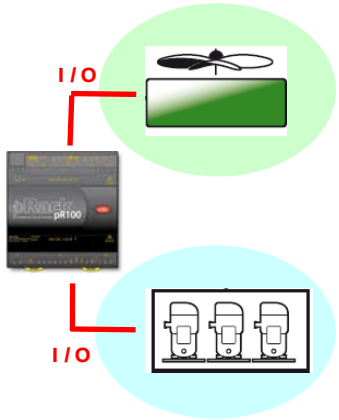


Fig. 1.a

Example 2: 2 suction lines on the same board with scroll or piston compressors, 1 condenser line:

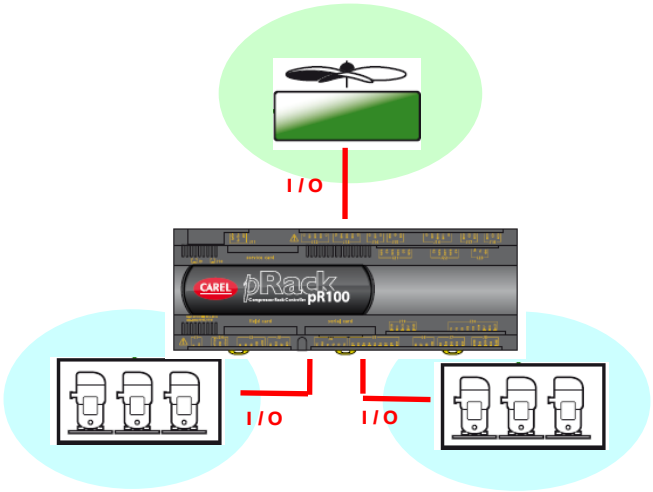


Fig. 1.b

Example 3: 2 suction lines on the same board with scroll or piston compressors, 2 condenser lines on the same board:

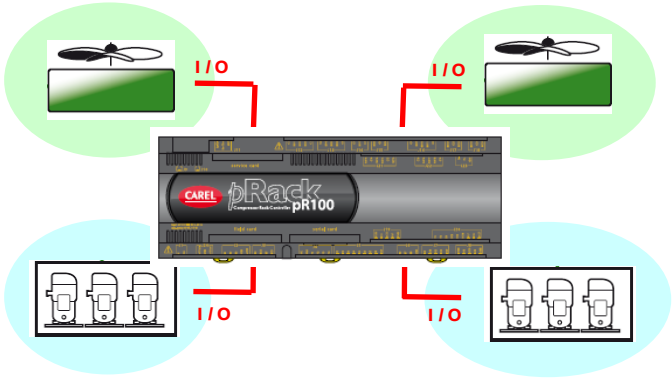


Fig. 1.c

Example 4: 2 suction lines on separate boards (scroll or piston compressors), 2 condenser lines (one for each suction line board)

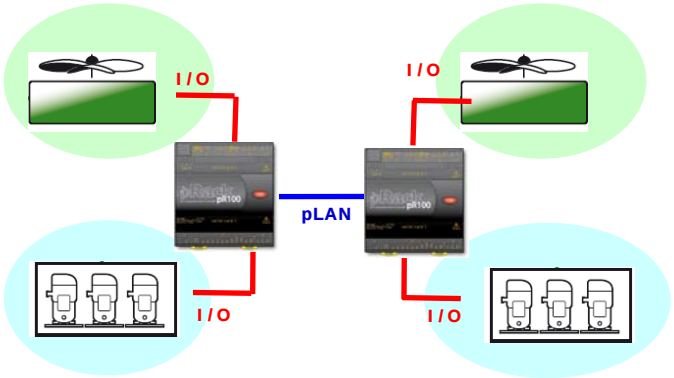


Fig. 1.d

Example 5: 2 suction lines on separate boards with scroll or piston compressors, 2 condenser lines on separate boards:

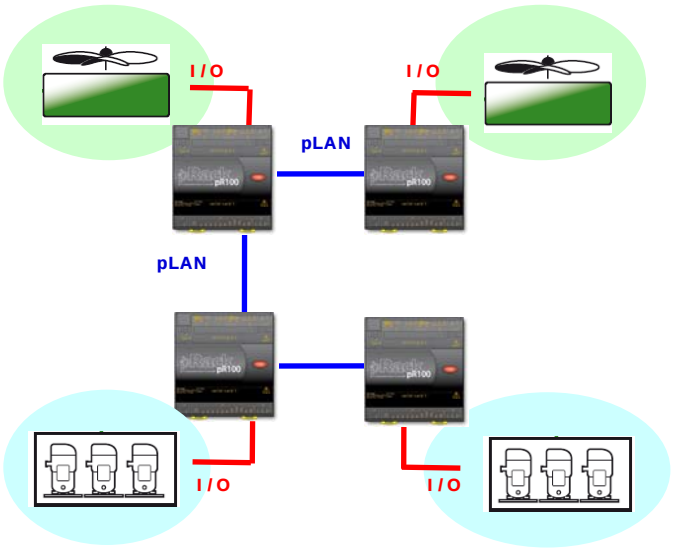


Fig. 1.e

2. HARDWARE FEATURES AND INSTALLATION

2.1 Description of the pRack pR100 Compact

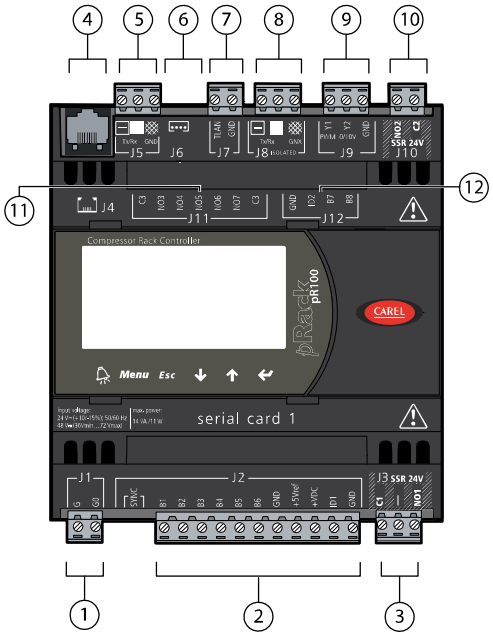


Fig. 2.a

Description of the pRack pR100 Compact board **Key**

1	power supply connector (G+, G0-) 24 Vac or 36 Vmin to 72 Vmax
2	"SYNC" synchronicity inputs for phase control; NTC, 0 to 1 V, 0 to 5 V, 0 to 20 mA, 4 to 20 mA analogue inputs ; +5 Vref to supply 5 V ratiometric probes; + VDC (+21 Vdc) for power to active probes; digital input
3	SSR digital output 24 Vac/Vdc
4	connector for pGD1 terminal and for downloading the application program
5	pLAN network connector
6	connector for pLD terminals (not used)
7	tLAN network connector (not used)
8	optically-isolated "Field-bus" serial connector
9	0 to 10 V analogue and PWM phase control outputs
10	SSR digital output 24 Vac/Vdc
11	5 A SPST digital output
12	NTC analogue inputs and digital input

2.1.1 Meaning of the inputs/outputs on the pRack pR100 Compact board

connector	signal	description
J1-1	G	24 Vac or 36/72 Vdc power supply
J1-2	G0	power supply reference
J2-1	SYNC	synchronicity input for phase control (G0 is the reference)
J2-2	B1	universal analogue input 1 (NTC, 0 to 1 V, 0 to 5 V ratiometric, 0 to 10 V, 0 to 20 mA, 4 to 20 mA)
J2-3	B2	universal analogue input 2 (NTC, 0 to 1 V, 0 to 5 V ratiometric, 0 to 10 V, 0 to 20 mA, 4 to 20 mA)
J2-4	B3	universal analogue input 3 (NTC, 0/1 V, PT1000)
J2-5	B4	universal analogue input 4 (NTC, 0/1 V, PT1000)
J2-6	B5	universal analogue input 5 (NTC, 0 to 1 V, 0 to 5 V ratiometric, 0 to 10 V, 0 to 20 mA, 4 to 20 mA, ON/OFF)
J2-7	B6	universal analogue input 6 (NTC, 0 to 1 V, 0 to 5 V ratiometric, 0 to 10 V, 0 to 20 mA, 4 to 20 mA, ON/OFF)
J2-6	GND	analogue input reference
J2-8	+5Vref	power supply for 0/5 V ratiometric probes
J2-9	+VDC	21 Vdc power supply for active probes
J2-10	ID1	digital input no. 1
J2-11	GND	common for digital inputs and analogue inputs
J3-1	C1	common for relay: 1
J3-2	---	Not used
J3-3	NO1	normally open contact, relay no. 1 SSR 24 Vac/Vdc
J4		6-pin telephone connector for connecting the standard user terminal
J5-1	RX-/TX-	RX-/TX- connector for RS485 connection to the pLAN network
J5-2	RX+/TX+	RX+/TX+ connector for RS485 connection to the pLAN network
J5-3	GND	reference for RS485 connection to the pLAN network
J6		4-pin connector for connecting the user terminal pLD (not used)
J7-1	TLAN	tLAN network connector
J7-2	GND	tLAN network connection reference
J8-1	RX-/TX-	RX-/TX- connector for RS485 connection to the optically-isolated "Field-bus" network
J8-2	RX+/TX+	RX+/TX+ connector for RS485 connection to the optically-isolated "Field-bus" network
J8-3	GND	reference for RS485 connection to the optically-isolated "Field-bus" network
J9-1	Y1	analogue output no. 1 PWM (for phase cutting speed controllers)
J9-2	Y2	analogue output no. 2 0/10 V
J9-3	GND	analogue output reference
J10-1	NO2	normally open contact, relay no. 2 SSR 24 Vac/Vdc
J10-2	C2	common for relay: 2
J11-1	C3	common for relays: 3, 4, 5, 6, 7
J11-2	NO3	normally open contact, relay no. 3
J11-3	NO4	normally open contact, relay no. 4
J11-4	NO5	normally open contact, relay no. 5
J11-5	NO6	normally open contact, relay no. 6
J11-6	NO7	normally open contact, relay no. 7
J11-7	C3	common for relays: 3, 4, 5, 6, 7
J12-1	GND	common for digital inputs and analogue inputs
J12-2	B7	passive analogue input 7 (NTC, ON/OFF)
J12-3	B8	passive analogue input 8 (NTC, ON/OFF)

2.1.2 Technical specifications of the pRack pR100 Compact board

Analogue inputs

Analogue conversion	10-bit A/D converter embedded in CPU
Maximum number	8
	Universal: **2 (inputs B1, B2)** - CAREL NTC (-50T90°C; R/T 10 kΩ±1% at 25°C), NTC HT0T150 °C - Voltage 0 to 1 Vdc, 0 to 10 Vdc, 0 to 5 Vdc ratiometric - Current 0 to 20 mA or 4 to 20 mA. Input resistance: 100 Ω ***Universal:*** **2 (inputs B3, B4)** - CAREL NTC (-50T90°C; R/T 10 kΩ±1% at 25°C) NTC HT0T150 °C - Voltage 0 to 1 Vdc - PT1000 (-100T200 °C; R/T 1000 Ω at 0°C) ***Universal:*** **2 (inputs B5, B6)** - CAREL NTC (-50T90°C; R/T 10 kΩ±1% at 25°C) NTC HT0T150 °C - Voltage 0 to 1 Vdc, 0 to 10 Vdc, 0 to 5 Vdc ratiometric - Voltage-free digital inputs, 5 mA ***Passive:*** **2 (inputs B7, B8)** -CAREL NTC (-50T90°C; R/T 10kΩ±1% at 25°C) NTC HT0T150 °C - Voltage-free digital inputs, 5 mA
Type	Selectable via software
Time constant	0.5 s
Input precision	± 0.3 % of full scale
Classification of the measurement circuits	Category 1 (IEC EN 61010-1)

Important: the 21 Vdc available at terminal +VDC (J2) can be used to power any active probes. The maximum current is Imax=60 mA, thermally protected against short-circuits. To power the 0 to 5 Vdc ratiometric probes, use the 5V available at terminal +5Vref (J2). The maximum current is Imax=60 mA, thermally protected against short-circuits.

Digital inputs

Type	Not optically-isolated, voltage-free contact	
Maximum number	6: 2 + 4 multifunction analogue inputs	
Minimum digital input impulse detection time	*Normally open* (open-closed-open)	250 ms
	Normally closed (closed-open-closed)	250 ms
Power supply	internal	

Analogue outputs

Type	Not optically-isolated	
Maximum number	2: 1 PWM phase control output (Y1) with 5V pulse of programmable duration and 1 x 0 to 10 Vdc output (Y2)	
Power supply	internal	
Precision	± 2% of full scale on Y2	
Resolution	8 bit	
Settling time	2 s on Y2	
Maximum load	1 kΩ (10 mA) for 0 to 10 Vdc and 470 Ω (10 mA) for PWM	

Note: the synchronicity for the PWM phase control output is taken from the SYNC input and G0 (J2).

Digital outputs

Important: The outputs can be divided into groups, depending on the insulation distance. The relays belonging to the same group have basic insulation between each other and therefore must have the same power supply (24 Vac or 110 to 230 Vac). Between groups there is double insulation and consequently these may have different voltages.

		Group 1 (J3)	Group 2 (J10)	Group 3 (J11)
Makeup of the groups	Type of relay	Type A Available with NC and NO contacts	Type A Available with NO contacts	Type B Available with NO contacts
Features		MOSFET photovoltaic relay Operating voltage 24 Vac/Vdc Maximum power 10 W.	MOSFET photovoltaic relay Operating voltage 24 Vac/Vdc Maximum power 10 W.	SPST, 1250 VA, 250 Vac, 5 A resistive. Approval available: **UL873**: 1 A resistive, 1 A FLA, 6 A LRA, 250 Vac, D300 pilot duty (30,000 cycles). **EN 60730-1**: 1 A resistive, 1 A inductive, cosφ=0.6, 1(1) A (100,000 cycles).
Maximum number	7			
Number of changeover contacts	1 (J3)			
Number of SSR outputs	2: outputs NO1 and NO2 (J3 and J10);			

Important: the groups that the digital outputs are divided into have two common pole terminals to simplify wiring. Make sure that the current running through the common terminals does not exceed the rated current of an individual terminal, that is, 8 A.
To connect the digital outputs use a cable with minimum cross-section of 1.5 mm^2.

Important: the SSR digital outputs must be powered at 24 Vac/Vdc, with a maximum power of 10 W, otherwise they may be damaged.

2.1.3 Electrical specifications of the pRack pR100 Compact board

Isolated power supply	24 Vac +10/-15 % 50/60 Hz and 48 Vdc (36 Vmin to 72 Vmax)
Maximum current	P=11 W, P=14 VA, Imax=700 mA
Terminal block	with male/female plug-in connectors (250 Vac max, 8 A max)
Cable cross-section	min 0.5 mm^2 – max 2.5 mm^2
CPU	H8SX/1651 32 bit, 50 MHz
Program memory (FLASH)	2+2 MByte
Data memory (SRAM)	512 Kbyte at 16 bit
Parameter data memory (EEPROM)	13 Kbyte +32 kB
NAND FLASH memory	32 MByte
Working cycle duration	0.3 s (application of average complexity)
Clock with battery	Available as standard and integrated into main board
Battery	Lithium button battery, code CR2430, voltage 3 Vdc, dimensions 24x3 mm

2.1.4 Mechanical specifications of the pRack pR100 Compact board

Physical dimensions		6 DIN modules: 105x110x60 mm
	Assembly	Fitted on DIN rail as per DIN 43880 and IEC EN 50022
	Material	technopolymer
	Flame retardance	V2 (UL94) and 960°C (IEC 695)
	Ball pressure test	125 °C
	Resistance to creeping current	≥ 250 V
Plastic case	Colour	Grey RAL7016

2.1.5 Other specifications of the pRack pR100 Compact board

Operating conditions	-10T60 °C, 90% RH non-condensing	
Storage conditions	-20T70 °C, 90% RH non-condensing	
Index of protection	IP20, IP40 on the front panel only	
Environmental pollution	2	
Class according to protection against electric shock	to be integrated into Class 1 and/or 2 appliances	
Period of stress across the insulating parts	long	
Type of action	1C	
Type of disconnection or microswitching	microswitching	
Category of resistance to heat and fire	Category D (UL94-V0)	
Immunity against voltage surges	Category 1I	
Ageing characteristics (operating hours)	80,000	
No. of automatic operating cycles	100,000 (EN 60730-1); 30,000 (UL 873)	
Software class and structure	Class A	
Category of immunity to voltage surges (IEC EN 61000-4-5)	Category 2 (IEC EN 61000-4-5)	
Clock	Error at 25°C	±5.3 min/year
	Error in the temperature range –10T60 °C	±27 min/year
	Ageing	< ± 5ppm (±2.7min/year)
	Battery duration	typically 6 months (8 months maximum)
	Recharge time	typically 5 hours (< 8 hours maximum)

2.1.6 pRack pR100 Compact dimensions

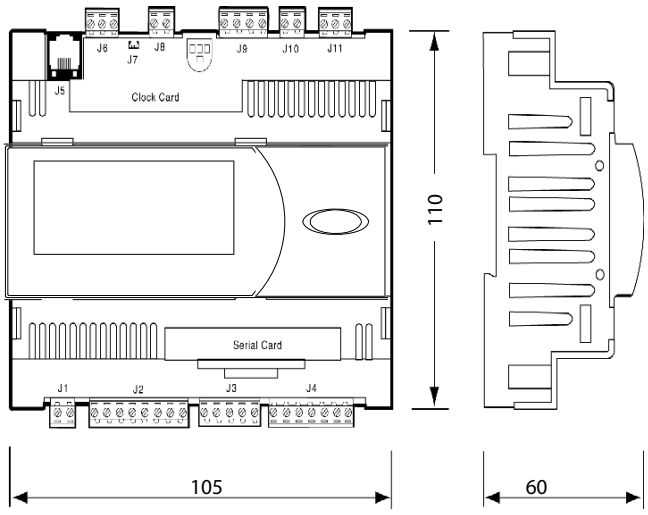


Fig. 2.b

2.1.7 pRack pR100 Compact product certification

UL 873 and C22.2 No. 24-93: "Temperature-indicating and regulating equipment".

2.2 Description of the pRack pR100 S, M, L, XL boards

pRack pR100 S:

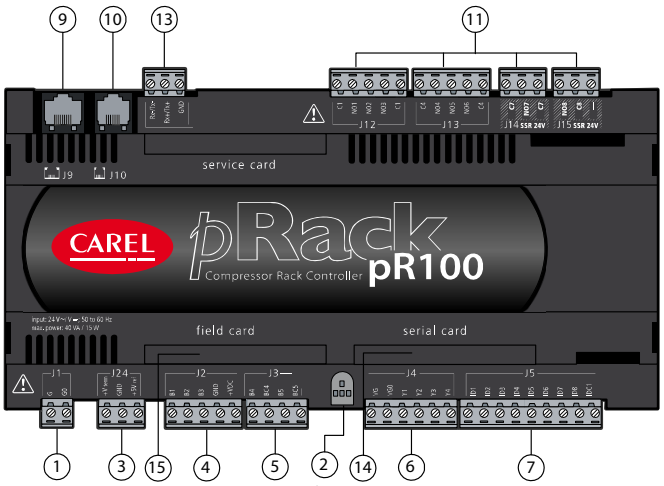


Fig. 2.c

Key	
1	power supply connector (G+, G0-)
2	yellow power LED and 3 status LEDs;
3	additional power supply for the terminal and 0 to 5 V ratiometric probes;
4	universal NTC, 0 to 1 V, 0 to 5 V - ratiometric, 0 to 10 V, 0 to 20 mA, 4 to 20 mA analogue inputs;
5	passive NTC, PT1000, ON/OFF analogue inputs;
6	0 to 10 V analogue outputs;
7	24 Vac/Vdc digital inputs;
8	230 Vac or 24 Vac/Vdc digital inputs;
9	display terminal connector (not used);
10	connector for pGD1 terminal and for downloading the application program
11	relay digital outputs;
12	I/O expansion board connector (not used);
13	pLAN network connector;
14	cover for inserting the supervisor and telemaintenance option (available on models PRK100*3B*);
15	cover for inserting the field card option;

pRack pR100 M:

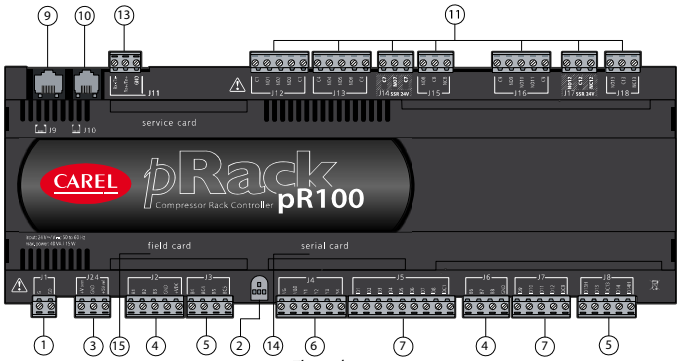


Fig. 2.d

pRack pR100 L:

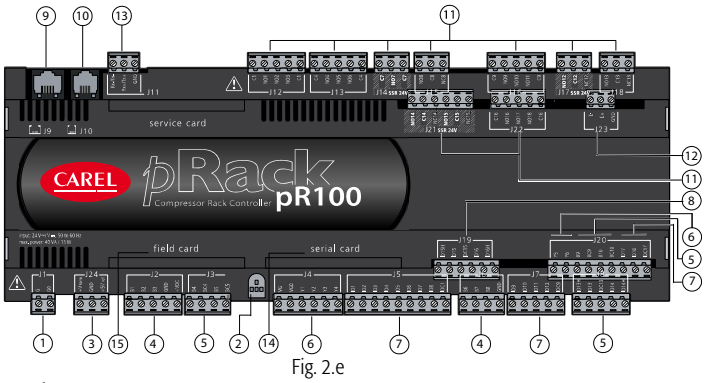


Fig. 2.e

pRack pR100 XL

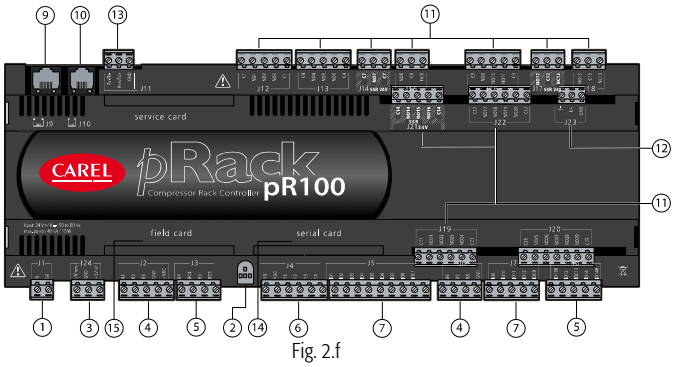


Fig. 2.f

2.2.1 Meaning of the inputs/outputs on the pRack pR100 S, M, L, XL boards

Version	Connector	Signal	Description
	J1-1	G	+24 Vdc or 24 Vac power supply
	J1-2	G0	power supply reference
	J2-1	B1	universal analogue input 1 (NTC, 0 to 1 V, 0 to 5 V ratiometric, 0 to 10 V, 0 to 20 mA, 4 to 20 mA)
	J2-2	B2	universal analogue input 2 (NTC, 0 to 1 V, 0 to 5 V ratiometric, 0 to 10 V, 0 to 20 mA, 4 to 20 mA)
	J2-3	B3	universal analogue input 3 (NTC, 0 to 1 V, 0 to 5 V ratiometric, 0 to 10 V, 0 to 20 mA, 4 to 20 mA)
	J2-4	GND	common for analogue inputs
	J2-5	+VDC	21 Vdc power supply for active probes (maximum current 200 mA)
	J3-1	B4	passive analogue input 4 (NTC, PT1000, ON/OFF)
	J3-2	BC4	common for analogue input 4
	J3-3	B5	passive analogue input 5 (NTC, PT1000, ON/OFF)
	J3-4	BC5	common for analogue input 5
	J4-1	VG	power to optically-isolated analogue output, 24 Vac/Vdc
	J4-2	VG0	power to optically-isolated analogue output, 0 Vac/Vdc
	J4-3	Y1	analogue output no. 1, 0 to 10 V
	J4-4	Y2	analogue output no. 2, 0 to 10 V
	J4-5	Y3	analogue output no. 3, 0 to 10 V
	J4-6	Y4	analogue output no. 4, 0 to 10 V
	J5-1	ID1	digital input no. 1, 24 Vac/Vdc
	J5-2	ID2	digital input no. 2, 24 Vac/Vdc
	J5-3	ID3	digital input no. 3, 24 Vac/Vdc
	J5-4	ID4	digital input no. 4, 24 Vac/Vdc
	J5-5	ID5	digital input no. 5, 24 Vac/Vdc
	J5-6	ID6	digital input no. 6, 24 Vac/Vdc
	J5-7	ID7	digital input no. 7, 24 Vac/Vdc
	J5-8	ID8	digital input no. 8, 24 Vac/Vdc
	J5-9	IDC1	common for digital inputs from 1 to 8 (negative pole for DC power supply)
	J6-1	B6	universal analogue input 6 (NTC, 0 to 1 V, 0 to 5 V ratiometric, 0 to 10 V, 0 to 20 mA, 4 to 20 mA)
	J6-2	B7	universal analogue input 7 (NTC, 0 to 1 V, 0 to 5 V ratiometric, 0 to 10 V, 0 to 20 mA, 4 to 20 mA)
	J6-3	B8	universal analogue input 8 (NTC, 0 to 1 V, 0 to 5 V ratiometric, 0 to 10 V, 0 to 20 mA, 4 to 20 mA)
	J6-4	GND	common for analogue inputs
S, M, L, XL	J7-1	ID9	digital input no. 9, 24 Vac/Vdc
	J7-2	ID10	digital input no. 10, 24 Vac/Vdc
	J7-3	ID11	digital input no. 11, 24 Vac/Vdc
	J7-4	ID12	digital input no. 12, 24 Vac/Vdc
	J7-5	IDC9	common for digital inputs from 9 to 12 (negative pole for DC power supply)
	J8-1	ID13H	digital input no. 13, 230 Vac
	J8-2	ID13	digital input no. 13, 24 Vac/Vdc
	J8-3	IDC13	common for digital inputs 13 and 14 (negative pole for DC power supply)
	J8-4	ID14	digital input no. 14, 24 Vac/Vdc
	J8-5	ID14H	digital input no. 14, 230 Vac
	J9		8-pin telephone connector for connecting a display terminal (not used)
	J10		6-pin telephone connector for connecting the standard pGD1 user terminal
	J11-1	RX-/TX-	RX-/TX- connector for RS485 connection to the pLAN network
	J11-2	RX+/TX+	RX+/TX+ connector for RS485 connection to the pLAN network
	J11-3	GND	GND connector for RS485 connection to the pLAN network
	J12-1	C1	common for relays: 1, 2, 3
	J12-2	NO1	normally open contact, relay no. 1
	J12-3	NO2	normally open contact, relay no. 2
	J12-4	NO3	normally open contact, relay no. 3
	J12-5	C1	common for relays: 1, 2, 3
	J13-1	C4	common for relays: 4, 5, 6
	J13-2	NO4	normally open contact, relay no. 4
	J13-3	NO5	normally open contact, relay no. 5
	J13-4	NO6	normally open contact, relay no. 6
	J13-5	C4	common for relays: 4, 5, 6
	J14-1	C7	common for relay no. 7
	J14-2	NO7	normally open contact, relay no. 7 SSR 24 Vac/Vdc
	J14-3	C7	common for relay no. 7
	J15-1	NO8	normally open contact, relay no. 8 (SSR 24 Vac/Vdc, only S board)
	J15-2	C8	common for relay no. 8
	J15-3	NC8/---	normally closed contact, relay no. 8 (not used, only S board)
M, L, XL	J16-1	C9	common for relays: 9, 10, 11
	J16-2	NO9	normally open contact, relay no. 9
	J16-3	NO10	normally open contact, relay no. 10
	J16-4	NO11	normally open contact, relay no. 11
	J16-5	C9	common for relays: 9, 10, 11
	J17-1	NO12	normally open contact, relay no. 12 SSR 24 Vac/Vdc
	J17-2	C12	common for relay no. 12
	J17-3	---	not used

	J18-1	NO13	normally open contact, relay no. 13
	J18-2	C13	common for relay no. 13
	J18-3	NC13	normally closed contact, relay no. 13
L	J19-1	ID15H	digital input no. 15, 230 Vac
	J19-2	ID15	digital input no. 15, 24 Vac/Vdc
	J19-3	IDC15	common for digital inputs 15 and 16 (negative pole for DC power supply)
	J19-4	ID16	digital input no. 16, 24 Vac/Vdc
	J19-5	ID16H	digital input no. 16, 230 Vac
	J20-1	Y5	analogue output no. 5, 0 to 10 V
	J20-2	Y6	analogue output no. 6, 0 to 10 V
	J20-3	B9	passive analogue input 9 (NTC, PT1000, ON/OFF)
	J20-4	BC9	common for analogue input 9
	J20-5	B10	passive analogue input 10 (NTC, PT1000, ON/OFF)
	J20-6	BC10	common for analogue input 10
	J20-7	ID17	digital input no. 17, 24 Vac/Vdc
	J20-8	ID18	digital input no. 18, 24 Vac/Vdc
	J20-9	IDC17	common for digital inputs 17 and 18 (negative pole for DC power supply)
	J21-1	NO14	normally open contact, relay no. 14 SSR 24 Vac/Vdc
	J21-2	C14	common for relay no. 14
	J21-3	---	not used
	J21-4	NO15	normally open contact, relay no. 15 SSR 24 Vac/Vdc
	J21-5	C15	common for relay no. 15
	J21-6	---	not used
	J22-1	C16	common for relays: no. 16, 17, 18
	J22-2	NO16	normally open contact, relay no. 16
	J22-3	NO17	normally open contact, relay no. 17
	J22-4	NO18	normally open contact, relay no. 18
	J22-5	C16	common for relays: no. 16, 17, 18
	J23-1	E-	terminal E- for RS485 connection to the I/O expansion modules (not used)
	J23-2	E+	terminal E+ for RS485 connection to the I/O expansion modules (not used)
	J23-3	GND	GND terminal for RS485 connection to the I/O expansion modules (not used)
XL	J19-1	C21	common for relays: no. 21, 22, 23, 24
	J19-2	NO21	normally open contact, relay no. 21
	J19-3	NO22	normally open contact, relay no. 22
	J19-4	NO23	normally open contact, relay no. 23
	J19-5	NO24	normally open contact, relay no. 24
	J19-6	C21	common for relays: no. 21, 22, 23, 24
	J20-1	C25	common for relays: no. 25, 26, 27, 28, 29
	J20-2	NO25	normally open contact, relay no. 25
	J20-3	NO26	normally open contact, relay no. 26
	J20-4	NO27	normally open contact, relay no. 27
	J20-5	NO28	normally open contact, relay no. 28
	J20-6	NO29	normally open contact, relay no. 29
	J20-7	C25	common for relays: no. 25, 26, 27, 28, 29
	J21-1	C14	common for relays: no. 14, 15, 16
	J21-2	NO14	normally open contact, relay no. 14
	J21-3	NO15	normally open contact, relay no. 15
	J21-4	NO16	normally open contact, relay no. 16
	J21-5	C14	common for relays: no. 14, 15, 16
	J22-1	C17	common for relays: no. 17, 18, 19, 20
	J22-2	NO17	normally open contact, relay no. 17
	J22-3	NO18	normally open contact, relay no. 18
	J22-4	NO19	normally open contact, relay no. 19
	J22-5	NO20	normally open contact, relay no. 20
	J22-6	C17	common for relay: no. 17, 18, 19, 20
L, XL	J23-1	E-	terminal E- for RS485 connection to the I/O expansion modules (not used)
	J23-2	E+	terminal E+ for RS485 connection to the I/O expansion modules (not used)
	J23-3	GND	GND terminal for RS485 connection to the I/O expansion modules (not used)
S, M, L, XL	J24-1	+V term	additional power supply terminal Aria (not used)
	J24-2	GND	power supply common
	J24-3	+5 Vref	power supply for 0/5 V ratiometric probes

2.2.2 Technical specifications of the pRack pR100 S, M, L, XL boards

Analogue inputs

Analogue conversion	10-bit A/D converter embedded in CPU		
	pRack pR100 S	pRack pR100 M, XL	pRack pR100 L
Maximum number	5	8	10

Type	***Universal:*** **6 (inputs B1, B2, B3, B6, B7, B8)** -CAREL NTC (-50T90°C; R/T 10 kΩ±1% at 25°C) or HT NTC(0T150°C) -Voltage: 0 to 1 Vdc, 0 to 5 Vdc ratiometric or 0 to 10 Vdc -Current: 0 to 20 mA or 4 to 20 mA. Input resistance: 100 Ω ***Passive:*** **4 (inputs B4, B5, B9, B10)** -CAREL NTC (-50T90°C; R/T 10kΩ ±1% at 25°C), -PT1000 (-100T200°C; R/T 1 kΩ at 0 °C) or digital input from voltage-free contact **Selectable via software.**	
Minimum normally-open voltage-free digital input detection time	*Normally open* (open-closed-open)	250 ms
	Normally closed (closed-open-closed)	250 ms
NTC input precision	± 0.5 °C	
PT1000 input precision	± 1 °C	
0-1 V input precision	± 3 mV	
0-10 V input precision	± 30 mV	
0-5 V input precision	± 15 mV	
0-20 mA input precision	± 0.06 mA	

Important: the 21 Vdc available at terminal +VDC (J2) can be used to power any active probes. The maximum current is 150 mA, thermally protected against short-circuits. To power the 0/5 V ratiometric probes use the 5 V available at terminal +5Vref (J24). The maximum current is 60 mA.

Digital inputs

Type	optically-isolated			
Maximum number		no. of 24 Vac 50/60 Hz or 24 Vdc optically-isolated inputs	no. of 24 Vac 50/60 Hz or 230 Vac 50/60 Hz optically-isolated inputs	Total
	pRack pR100 S	8	0	8
	pRack pR100 M, XL	12	2	14
	pRack pR100 L	14	2+2	18
Minimum digital input impulse detection time	*Normally open* (open-closed-open)		200 ms	
	Normally closed (closed-open-closed)		400 ms	
Power supply to the inputs	External	230 Vac or 24 Vac (50/60 Hz)	+10/-15 %	
		24 Vdc	+10/-20 %	
Classification of the measurement circuits (IEC EN 61010-1)	Category 1 24 Vac/Vdc Category 2 230 Vac			

Important: the 2 inputs, 230 Vac or 24 Vac/Vdc, present at terminals J8 (ID13, ID14) have the same common pole and therefore must be set to the same voltage (230 Vac or 24 Vac/Vdc). There is basic insulation between the 2 inputs. The same is true for J19 (ID15, ID16).

Important: in the event of direct current (24 Vdc), connect the negative pole to the common terminal.

Analogue outputs

Type	optically-isolated	
Maximum number	pRack pR100 S, M, XL	4 x 0 to 10 Vdc outputs (Y1-Y4)
	pRack pR100 L	6 x 0 to 10 Vdc outputs (Y1-Y6)
Power supply	external	24 Vac/Vdc
Precision	outputs Y1-Y4	± 2 % of full scale
	outputs Y5-Y6	-2/+5 % of full scale
Resolution	8 bit	
Settling time	outputs Y1-Y4	2 s
	outputs Y5-Y6	2 s or 15 s (selectable via software)
Maximum load	1 kΩ (10 mA)	

Digital outputs

Important: The outputs can be divided into groups, depending on the insulation distance. The relays belonging to the same group have basic insulation between each other and therefore must have the same power supply (24 Vac or 230 Vac). Between groups there is double insulation and consequently these may have different voltages.

		Reference for relays with the same insulation						
		Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
Makeup of the groups	**pRack pR100 S**	1-7	8					
	Type of relay	Type A	Type A					
	pRack pR100 M	1-7	8	9-13				
	Type of relay	Type A	Type A	Type A				
	pRack pR100 L	1-7	8	9-13	14-18			
	Type of relay	Type A	Type A	Type A	Type A			
	pRack pR100 XL	1-7	8	9-13	14-16	17-20	21-24	25-29
	Type of relay	Type A	Type A	Type A	Type B	Type B	Type B	Type B

Number of changeover contacts	pRack pR100 S: 1 (output 8: J15); pRack pR100 M, XL: 3 (outputs 8, 12 and 13: J15, J17, J18); pRack pR100 L: 5 (outputs 8, 12, 13, 14 and 15: J15, J17, J18, J21)			
Switchable power	Relay type A	Relay ratings	SPDT, 2000 VA, 250 Vac, 8 A resistive	
		Approval	UL873	2.5 A resistive, 2 A FLA, 12 A LRA, 250 Vac, C300 pilot duty (30,000 cycles)
			EN 60730-1	2 A resistive, 2 A inductive, cosφ=0.6, 2(2)A (100,000 cycles)
	Relay type B	Relay ratings	SPDT, 1250 VA, 250 Vac, 5 A resistive	
		Approval	UL873	2.5 A resistive, 2 A FLA, 12 A LRA, 250 Vac, C300 pilot duty (30,000 cycles)
			EN 60730-1	2 A resistive, 2 A inductive, cosφ=0.6, 2(2)A (100,000 cycles)
Number of SSR outputs	pRack pR100 S: 2 (outputs 7 and 8); pRack pR100 M: 2 (outputs 7 and 12); pRack pR100 L, XL: 4 (outputs 7, 12, 14 and 15)			
SSR contact specifications	Operating voltage 24 Vac/Vdc Maximum power 10 W.			

Important: the groups that the digital outputs are divided into have two common pole terminals to simplify wiring. Make sure that the current running through the common terminals does not exceed the rated current of an individual terminal, that is, 8 A.
To connect the digital outputs use a cable with minimum cross-section of 1.5 mm^2.

Important: the SSR digital outputs must be powered at 24 Vac/Vdc, with a maximum power of 10 W, otherwise they may be damaged.

2.2.3 Electrical specifications of the pRack pR100 S, M, L, XL boards

Power supply	24 Vac +10/-15 % 50/60 Hz and 28-36 Vdc +10/-20 %
Maximum current with terminal connected	40 VA (Vac) / 15 W (Vdc)
Type of insulation of power supply from the rest of the controller	-
Terminal block	with male/female plug-in connectors (250 Vac max, 8 A max)
Cable cross-section	min 0.5 mm^2 – max 2.5 mm^2
CPU	H8S2320, 16 bit, 24 MHz
Program memory (FLASH)	2+2MByte (Dual Bank) organised to 16 bit
Data memory (RAM)	512 Kbyte at 16 bit
Parameter data memory (EEPROM)	13 Kbyte + 32KByte
Working cycle duration	0.2 s (application of average complexity)
Clock with battery	standard

2.2.4 Mechanical specifications of the pRack pR100 S, M, L, XL boards

Physical dimensions:	pRack pR100 S	13 DIN modules	110x227.5x60 mm
	pRack pR100 M, L, XL	18 DIN modules	110x315x60 mm
Plastic case:			
Assembly	Fitted on DIN rail as per DIN 43880 and IEC EN 50022		
Material	Technopolymer		
Flame retardance	V0 (UL94) and 960 °C (IEC 695)		
Ball pressure test	125 °C		
Resistance to creeping current	≥ 250 V		
Colour	Grey RAL7016		

2.2.5 Other specifications of the pRack pR100 S, M, L, XL boards

Operating conditions	-25T70°C, 90 % RH non-condensing	
Storage conditions	-40T70°C, 90 % RH non-condensing	
Index of protection	IP20, IP40 on the front panel only	
Environmental pollution	2	
Class according to protection against electric shock	to be integrated into Class 1 and/or 2 appliances	
PTI of the insulating materials	250 V	
Period of stress across the insulating parts	long	
Type of action	1C	
Type of disconnection or microswitching	microswitching, for all relay outputs	
Category of resistance to heat and fire	Category D	
Immunity against voltage surges	Category 1	
Ageing characteristics (operating hours)	80,000	
No. of automatic operating cycles	100,000 (EN 60730-1); 30,000 (UL 873)	
Software class and structure	Class A	
Category of immunity to voltage surges (IEC EN 61000-4-5)	Category 2	
Clock	Error at 25°C	±5.3 min/year
	Error in the temperature range –10T60 °C	±27 min/year
	Ageing	< ± 5ppm (±2.7min/year)
	Battery duration	typically 6 months (8 months maximum)
	Recharge time	typically 5 hours (< 8 hours maximum)

2.2.6 pRack pR100 S board dimensions

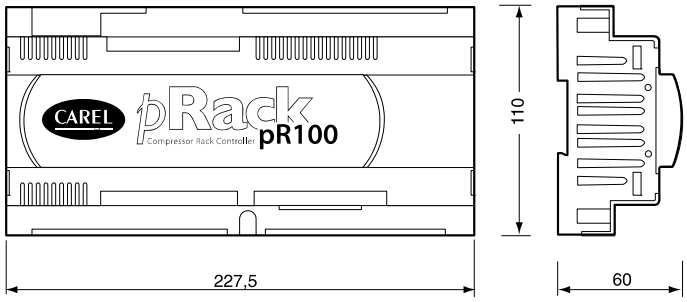


Fig. 2.g

2.2.7 pRack pR100 M, L, XL board dimensions

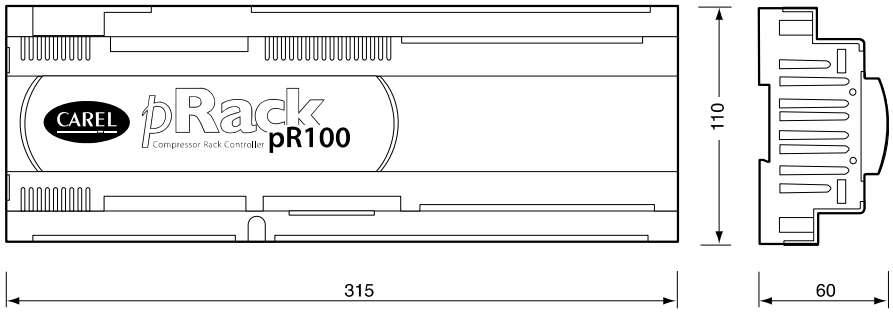


Fig. 2.h

2.2.8 pRack pR100 S, M, L, XL product certification

IEC EN 50155: "Railway applications • Electronic equipment used on rolling stock";
UL 873 and C22.2 No. 24-93: "Temperature-indicating and regulating equipment";
EC regulations 37/2005 of 12 January 2005; in particular, if the electronic controller is fitted with standard Carel NTC probes, it is compliant with standard EN13485 on "Thermometers for measuring the air temperature in applications on units for the conservation and sale of refrigerated, frozen and deep-frozen food and ice cream".

Note: for further details on the pRack boards, see the pCO sistema manual, code +030220335.

3. INSTALLATION

3.1 General installation instructions

3.1.1 Installation procedure

Environmental conditions

Avoid assembling the pRack pR100 and the terminal in environments with the following characteristics:

- temperature and humidity that do not conform to the rated operating data of the product;
- strong vibrations or knocks;
- exposure to aggressive and polluting atmospheres(e.g.: sulphur and ammonia fumes, saline mist, smoke) so as to avoid corrosion and/or oxidation;
- strong magnetic and/or radio frequency interference (therefore avoid installing the units near transmitting antennae);
- exposure of the pRack pR100 to direct sunlight and to the elements in general;
- large and rapid fluctuations in the room temperature;
- environments containing explosives or mixes of flammable gases;
- exposure to dust (formation of corrosive patina with possible oxidation and reduction of insulation).

Positioning the instrument inside the panel

The position of the instrument in the electrical cabinet must be chosen so as to guarantee correct physical separation of the instrument from the power components (solenoids, contactors, actuators, inverters, ...) and the connected cables. Proximity to such devices/cables may create random malfunctions that are not immediately evident.

The structure of the panel must allow the correct flow of cooling air.

3.1.2 Wiring procedure

When laying the wiring, "physically " separate the power part from the control part. The proximity of these two sets of wires will, in most cases, cause problems of induced disturbance or, over time, malfunctions or damage to the components. The ideal solution is to house these two circuits in two separate cabinets. Sometimes this is not possible, and therefore the power part and the control part must be installed inside the same panel. For the control signals, it is recommended to use shielded cables with twisted wires.

If the control cables have to cross over the power cables, the intersections must be as near as possible to 90 degrees, always avoiding running the control cables parallel to the power cables.

- Use cable ends suitable for the corresponding terminals. Loosen each screw and insert the cable ends, then tighten the screws. When the operation is completed, slightly tug the cables to check they are sufficiently tight;
- separate as much as possible the sensor signal, digital input and serial line cables from the cables carrying inductive loads and power cables to avoid possible electromagnetic disturbance. Never insert power cables (including the electrical cables) and probe signal cables in the same conduits. Do not install the sensor cables in the immediate vicinity of power devices (contactors, circuit breakers or similar);
- reduce the path of the sensor cables as much as possible, and avoid spiral paths that enclose power devices;
- avoid touching or nearly touching the electronic components fitted on the boards to avoid electrostatic discharges (extremely damaging) from the operator to the components;
- if the power transformer secondary is earthed, check that the earth wire corresponds to the wire that runs to the controller and enters terminal G0; this applies to all the devices connected to the pRack pR100;
- do not secure the cables to the terminals by pressing the screwdriver with excessive force, to avoid damaging the pRack pR100;
- for applications subject to considerable vibrations (1.5 mm pk-pk 10/55 Hz), secure the cables connected to the pRack pR100around 3 cm from the connectors using clamps;
- if the product is installed in industrial environments (application of the EN 61000-6-2 standard) the length of the connections must be less than 30 m;
- all the very low voltage connections (analogue and 24 Vac/Vdc digital inputs, analogue outputs, serial bus connections, power supplies) must have reinforced or double insulation from the mains network;
- in residential environments, the connection cable between the pRack pR100and the terminal must be shielded;
- there is no limit to the number of cables that can be connected to an individual terminal. The only limitation concerns the maximum current crossing each terminal: this must not exceed 8 A;
- the maximum cross-section of the cable that connected to a terminal is 2.5 mm^2 (12 AWG);
- the maximum value of the twisting torque to tighten the screw on the terminal (torque tightening) is 0.6 Nm;

Important:

- Installation must be performed according to the standards and legislation in force in the country where the device is used;
- for safety reasons the equipment must be housed inside an electrical panel, so that the only accessible part is the display and the keypad;
- in the event of malfunctions, do not attempt to repair the device, but rather contact the CAREL service centre;
- the connector kit also contains the stick-on labels.

3.1.3 Anchoring the pRack pR100

The pRack pR100is installed on a DIN rail. To fasten the unit to the DIN rail, press it lightly against the rail. The rear tabs will click into place, locking the unit to the rail. Removing the unit is just as simple, using a screwdriver through the release slot to lever and lift the tabs. The tabs are kept in the locked position by springs.

3.2 Power supply

Power supply to the pRack pR100 S, M, L, XL (controller with terminal connected)	28-36 Vdc +10/-20% or 24 Vac +10/-15% 50 to 60 Hz;
	Maximum current P= 15 W (power supply Vdc). P=40 VA (Vac)
	DC power supply: 48 Vdc (36 Vmin to 72 Vmax) AC power supply: 24 Vac +10/-15 %, 50/60 Hz
Power supply to the pRack pR100 Compact	Maximum current P=11W, P=14VA, Imax=700mA

Important:

- power supplies other than those specified seriously damage the system;
- a Class 2 safety transformer, rating 50 VA, must be used in the installation to supply just one pRack pR100 controller;
- the power supply to the pRack pR100 controller and terminal (or pRack pR100 controllers and terminals) should be separated from the power supply to the other electrical devices (contactors and other electromechanical components) inside the electrical panel;
- if the power transformer secondary is earthed, check that the earth wire corresponds to the wire that runs to the controller and enters terminal G0. This applies to all the devices connected to the pRack pR100;
- a yellow LED indicates that power is connected to the pRack pR100.

3.3 Connecting the analogue inputs

The analogue inputs on the pRack pR100 can be configured for the most common sensors on the market: 0 to 1 V, 0 to 10 V, 0 to 20 mA, 4 to 20 mA. The different types of sensors can be selected by setting a parameter on the user terminal.

3.3.1 Connecting universal NTC temperature sensors

The analogue inputs are compatible with 2-wire NTC sensors.
The inputs must be set for NTC signals from the user terminal or using the default value installation procedure.
The connection diagram is shown below:

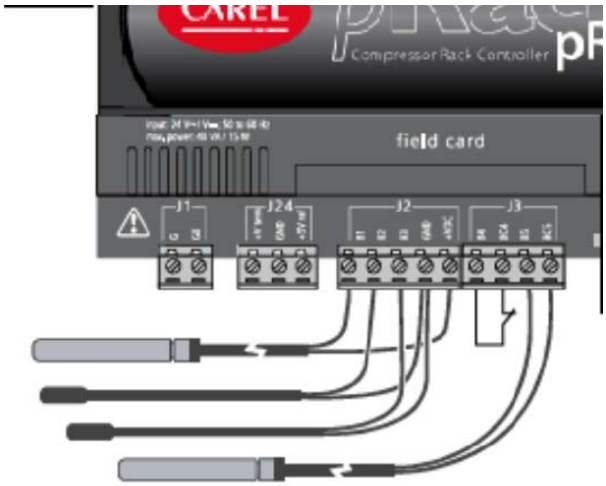


Fig. 3.a

Hardware version	Terminals	NTC probe cable
Compact	GND	1
	B1, B2, B3, B4, B5, B6, B7, B8	2
S	GND, BC4, BC5	1
	B1, B2, B3, B4, B5	2
M, XL	GND, BC4, BC5	1
	B1, B2, B3, B4, B5, B6, B7, B8	2
L	GND, BC4, BC5, BC9, BC10	1
	B1, B2, B3, B4, B5, B6, B7, B8, B9, B10	2

Note: the two wires of the NTC sensors are equivalent, as they have no polarity, therefore it is not necessary to follow any specific order when connecting to the terminal block.

3.3.2 Connecting PT1000 temperature sensors

The pRack pR100 can be connected to 2-wire PT1000 sensors for all high temperature applications; the operating range is: -100 to 200 °C.
The inputs must be pre-configured for PT1000 signals from the user terminal or using the default value installation procedure.
The connection diagram is shown below:

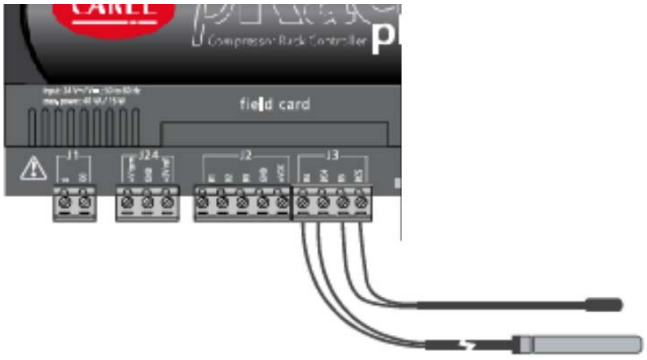


Fig. 3.b

Hardware version	Terminals	PT1000 probe cable
Compact	GND	1
	B3, B4	2
S, M, XL	BC4, BC5	1
	B4, B5	2
L	BC4, BC5, BC9, BC10	1
	B4, B5, B9, B10	2

Important: for correct measurements using the PT1000 sensor, each sensor wire must be connected to an individual terminal, as shown in the figure.

Note: the two wires of the PT1000 sensors are equivalent, as they have no polarity, therefore it is not necessary to follow any specific order when connecting to the terminal block.

3.3.3 Connecting current pressure probes

pRack pR100 can be connected to all CAREL SPK* series active pressure probes or any other pressure sensors available on the market with 0 to 20 mA or 4 to 20 mA signal.
The inputs must be set for 0 to 20 mA or 4 to 20 mA signals from the user terminal or using the default value installation procedure.
The connection diagram is shown below:

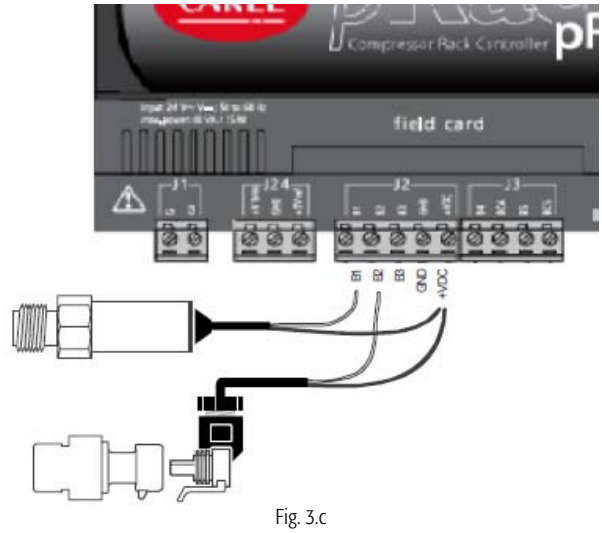


Fig. 3.c

Hardware version	Terminals	Probe wire colour	Description
Compact	+VDC	brown	power supply
	B1, B2, B5, B6	white	signal
S, M, L, XL	+VDC	brown	power supply
	B1, B2, B3, B6, B7, B8	white	signal

3.3.4 Connecting 0 to 5 V ratiometric pressure probes

pRack pR100 can be connected to any other pressure probes available on the market with 0 to 5 V ratiometric sensor.
The inputs must be set for 0 to 5 V signals from the user terminal or using the default value installation procedure.
The connection diagram is shown below:

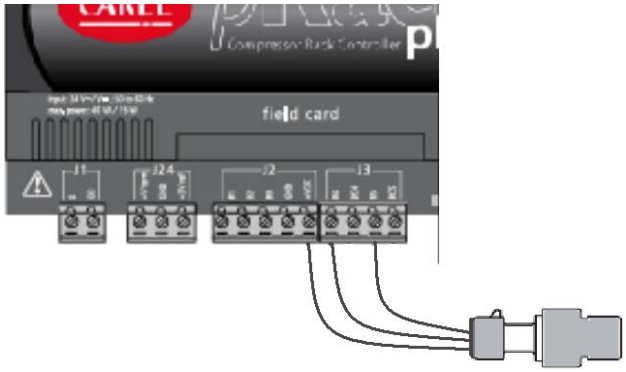


Fig. 3.d

Hardware version	Terminals	Probe wire colour	Description
Compact	+5Vref	black	power supply
	GND	green	power supply reference
	B1, B2, B5, B6	white	signal
S, M, L, XL	+5 Vref	black	power supply
	GND	green	power supply reference
	B1, B2, B3, B6, B7, B8	white	signal

3.3.5 Connecting 0 to 10 V active probes

PRack pR100 can be connected to 0 to 10 V sensors.
The inputs must be set for 0 to 10 V signals from the user terminal or using the default value installation procedure.
The connection diagram is shown below:

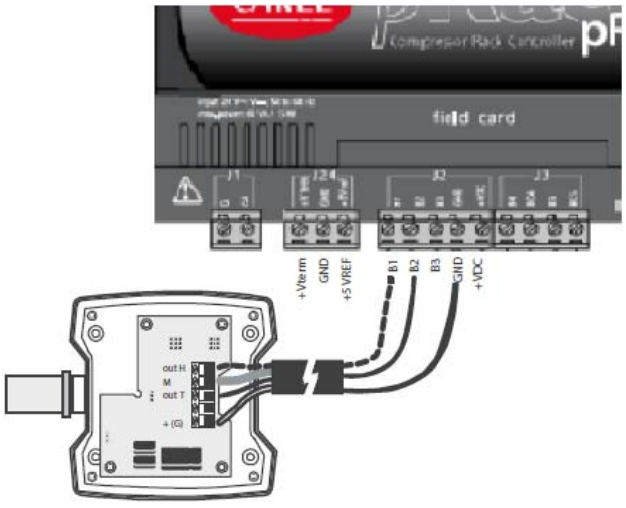


Fig. 3.e

Hardware version	Terminals	Probe wire colour	Description
Compact	+VDC	brown	power supply (any)
	GND	-	reference
	B1, B2, B5, B6	-	signal
S, M, L, XL	+VDC	brown	power supply (any)
	GND	-	reference

3.3.6 Connecting the analogue inputs selected as ON/OFF

The pRack pR100 allows some analogue inputs to be configured as voltage-free digital inputs.
The inputs must be pre-configured as voltage-free digital inputs from the user terminal or using the default value installation procedure.

Fig. 3.f

Hardware version	Terminals	Digital input wire
Compact	GND	1
	B5, B5	2
S, M, XL	BC4, BC5	1
	B4, B5	2
S, M, L, XL	BC4, BC5, BC9, BC10	1
	B4, B5, B9, B10	2

Important: the maximum current available at the digital input is 5 mA (thus the rating of the external contact must be at least 5 mA). These inputs are not optically isolated.

3.3.7 Remote connection of the analogue inputs

The sizes of the cables for the remote connection of the analogue inputs are shown in the following table:

type of input	size (mm^2) for length up to 50 m	size (mm^2) for length up to 100 m
NTC	0.5	1.0
PT1000	0.75	1.5
current	0.25	0.5
voltage	0.25	0.5

If the product is installed in industrial environments (application of the EN 61000-6-2 standard) the length of the connections must be less than 30 m. This length shouldn't be exceeded in any case, to avoid measurement errors.

3.4 Connecting the digital inputs

The pRack pR100 features digital inputs for connecting safety devices, alarms, device status and remote switches. These inputs are all optically isolated from the other terminals. They can work at 24 Vac, 24 Vdc and some at 230 Vac.

Note: separate the sensor signal and digital input cables as much as possible from the inductive load and power cables, to avoid possible electromagnetic disturbance.

Important: if the control voltage is drawn in parallel with a coil, fit a dedicated RC filter in parallel with the coil (the typical ratings are 100 Ω, 0.5 µF, 630 V).

Important: If connecting the digital inputs to safety systems (alarms), remember that: the presence of voltage across the contact must be the normal operating condition, while no voltage must represent an alarm situation. This will ensure that any interruption (or disconnection) of the input will also be signalled. Do not connect the neutral in place of an open digital input. Always interrupt the phase. The 24 Vac/Vdc digital inputs have a resistance of around 5 kΩ.

3.4.1 Digital input connections

The following figure represents one of the most common diagrams for connecting the 24 Vac and 24 Vdc digital inputs.

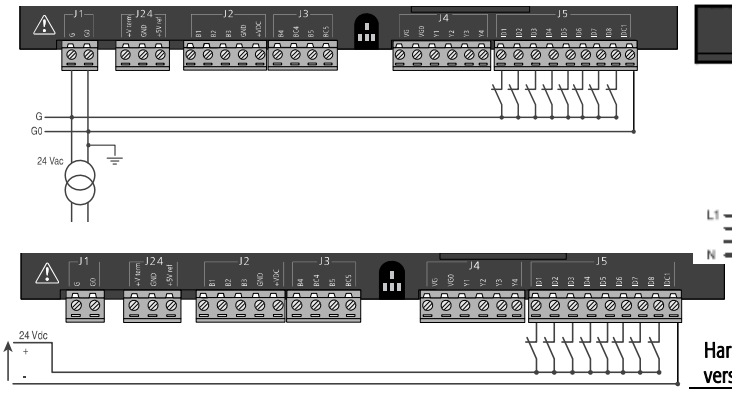


Fig. 3.g

To maintain the optical isolation of the digital inputs, a separate power supply must be used just for the digital inputs
The connection diagrams shown in these figures, which while being the more common and the more convenient, do not exclude the possibility of powering the digital inputs independently from the power supply to the pRack pR100.
In any case, the inputs only have functional insulation from the rest of the controller.

3.4.2 Remote connection of the digital inputs

Important note: do not connect other devices to the IDn inputs.
The sizes of the cables for the remote connection of the digital inputs are shown in the following table:

size (mm²) for length up to 50 m	size (mm²) for length until 100 m
0.25	0.5

If the product is installed in industrial environments (application of the EN 61000-6-2 standard) the length of the connections must be less than 30 m. This length shouldn't be exceeded in any case, to avoid measurement errors.

3.5 Connecting the analogue outputs

3.5.1 Connecting 0 to 10 V analogue outputs

The pRack pR100 provides 0 to 10 V optically-isolated analogue outputs, powered externally at 24 Vac/Vdc.
The figure below shows the electrical connection diagram; the 0V (zero) of the power supply is also the reference for the output voltage:

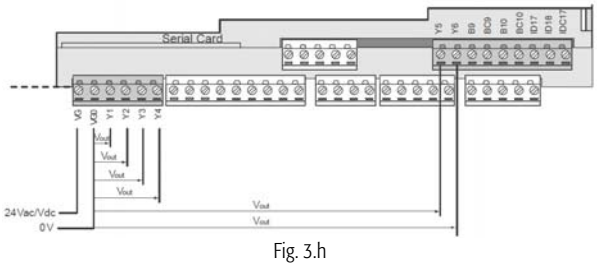


Fig. 3.h

Hardware version	Terminals	Reference
Compact	Y2	G0
S, M, XL	Y1, Y2, Y3, Y4	VG0
L	Y1, Y2, Y3, Y4, Y5, Y6	VG0

3.5.2 Connecting PWM analogue outputs

The pRack pR100 Compact version provides a PWM analogue output (5 V pulses) for phase cutting speed controllers. The following figure shows a connection example:

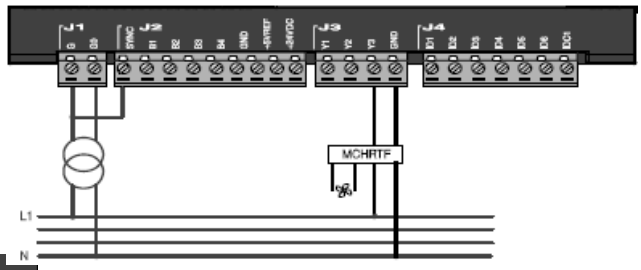


Fig. 3.i

Hardware version	Terminals	Reference
Compact	Y1	G0
S, M, L, XL	Non available	

Note: the power supply to the circuit measuring the zero crossing is at terminal SYNC on the pRack pR100 Compact and must be 24 Vac, in phase with the power supply to the actuator: for three-phase power supply, use the same phase to power the pRack pR100 Compact and the actuator.

3.5.3 Optional modules

Module for converting a PWM analogue output to a linear 0 to 10 V and 4 to 20 mA analogue output (code CONV0/10A0)
The module is used to convert a PWM output (5 V pulses) to a linear 0 to 10 V and 4 to 20 mA analogue output (code CONV0/10A0).
The control signal (at the input terminals optically-isolated from the rest of the module) must have a maximum amplitude of 5V and a period between 8 ms and 200 ms. The 0 to 10 V output voltage can be connected to a maximum load of 2 kΩ, with a maximum ripple of 100 mV.
The 4 to 20 mA current output can be connected to a maximum load of 280 Ω, with maximum overshoot of 0.3 mA.
The mechanical dimensions of the module are 87x36x60 mm (2 DIN modules) with IP20 index of protection.

Module for converting a 0 to 10 V analogue output to an SPDT digital output (code CONVONOFF0)
The module is used to convert a 0 to 10 V analogue output to an ON/OFF relay output. The control signal (at the input terminals, optically-isolated from the rest of the module), to ensure the switching of the relay from OFF to ON, must have a maximum amplitude of 3.3 V. The relay is SPDT, with max current of 10 A and max inductive load of 1/3 HP. The mechanical dimensions of the module are 87x36x60 mm (2 DIN modules) with IP20 index of protection.

3.6 Connecting the digital outputs

3.6.1 Electromechanical relay digital outputs

The pRack pR100 features digital outputs with electromechanical relays. For ease of installation, the common terminals of some of the relays have been grouped together. If the following diagram is used, the current at the common terminals must not exceed the rating (nominal current) of a single terminal (8 A).

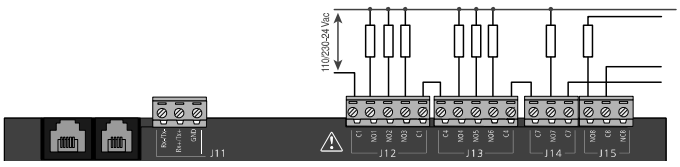


Fig. 3.j

The relays are divided into groups, according to the degree of insulation. Inside each group, the relays have just basic insulation and thus must have the same voltage (generally 24V ac or 110 to 230 Vac).

Between the groups there is double insulation and thus the groups can have different voltages. There is also double insulation from the rest of the controller.

Changeover outputs

Some relays feature changeover outputs:

Hardware version	Changeover relay reference	Terminal
Compact	1	J3
S	8	J15
M, XL	8, 12, 13	J15, J17, J18
L	8, 12, 13, 14, 15	J15, J17, J18, J21

3.6.2 Solid state relay (SSR) digital outputs

The pRack pR100 also features a version with solid state relays (SSR) for controlling devices that require an unlimited number of switching cycles and thus would not be supported by electromechanical relays (e.g. screw compressor valves). They are dedicated to loads powered at 24 Vac/Vdc with a maximum power Pmax = 10 W.

Fig. 3.k

Hardware version	SSR relay reference	Terminal
Compact	1, 2	J3
S	7, 8	J14, J15
M	7, 12	J14, J15
L, XL	7, 12, 14, 15	J14, J15, J21

Important: the SSR relay load is powered at 24 Vac/Vdc, thus all the other terminals in the group must be powered at 24 Vac/Vdc due to the absence of double insulation within the group. Moreover, the other terminals of the group can be powered at 110-230 Vac using a safety transformer (Class 2).

3.6.3 Summary table of digital outputs according to the versions available

Hardware version	NO contacts	NC contacts	changeover contacts	total no. of outputs	SSR relays
Compact	6	-	1 (1)	7	2 (1, 2)
S	7	-	1 (8)	8	2 (7, 8)
M	10	-	3 (8, 12, 13)	13	2 (7, 12)
L	13	-	5 (8, 12, 13, 14, 15)	18	4 (7, 12, 14, 15)
XL	26	-	3 (8, 12, 13)	29	4 (7, 12, 14, 15)

3.6.4 Remote connection of the digital outputs

The sizes of the cables for the remote connection of the digital outputs are shown in the following table:

AWG	Size (mm^2)	Current
20	0.5	2 A
15	1.5	6 A
14	2.5	8 A

If the product is installed in industrial environments (application of the EN 61000-6-2 standard) the length of the connections must be less than 30 m. This length shouldn't be exceeded in any case, to avoid measurement errors.

3.7 pLAN electrical connections

If the selected system configuration involves the connection of more than one pRack pR100 board in a pLAN, AWG20/22 twisted pair shielded cable must be used, with capacitance between the wires less than 90 PF/m.
The maximum length of the pLAN network is 500 m with AWG22 twisted pair shielded cable.
The boards should be connected in parallel with reference to plug-in connector J5 (pRack Compact) or J11 (versions S, M, L, XL).

Important: follow the network polarity: RX/TX+ on one board must be connected to RX/TX+ on the other boards; the same applies to RX/TX-.
The figure shows the diagram for more than one board connected in a pLAN network powered by the same transformer; this is a typical application with more than one board connected inside the same electrical panel.

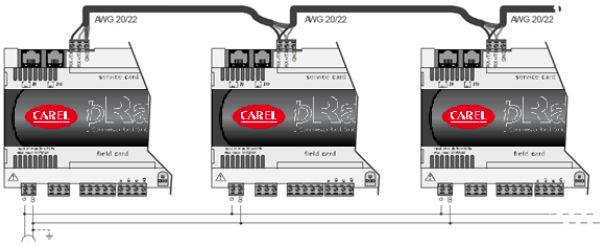


Fig. 3.l

Important: pLAN connections are also possible with multiple boards powered by different transformers, for further details see the pCO sistema manual, code: +030220335.

4. START UP

4.1 Starting the first time

After having correctly installed pRack, a number of preliminary operations are required to configure the installation.

Tutorial: pRack pR100 is ready to be configured immediately with system configurations that feature just one board and up to one terminal, by simply powering the board and connecting the terminal (if not built-in). Only for more complex configurations (e.g. more than one board in pLAN or multiple terminals) do additional operations need to be performed before switching on pRack pR100, as described in Appendix A.2.

The procedure for configuring an installation described below is the same for all system configurations that feature just one pRack pR100 board, and for system configurations with more than one board connected in a pLAN.

When first starting the pRack pR100 board, after waiting around 1 minute, a screen is shown for choosing the language used to display the program (English or Italian).
Press ENTER (↵) to select the language displayed.

Note: If no option is chosen within a time set by parameter and visible on the screen, the current language remains selected.

After having selected the user interface language, the pRack pR100 software shows a screen for choosing between three possible system configuration solutions, as follows:

- Pre-configurations
- Wizard
- Advanced configuration

Note: after having selected a type of system configuration, it can be modified by repeating the same procedure.

4.1.1 Pre-configurations

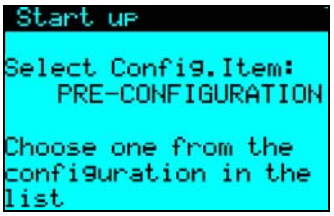


Fig. 4.a

This option is used to choose between fourteen configurations pre-loaded in the pRack pR100 software. For the description of the pre-configurations see the table below, while for the complete description of each configuration see Appendix A1.

Summary of pre-configurations

			compressors					fans		
No.	index	lines	type	No.	capacity steps	modulation	No. of comp. alarms	No.	inverter	pRack pR100 version
1	RS2	1	Piston - Scroll	2	-	-	1	2	-	Compact
2	RS3	1	Piston - Scroll	3	-	-	1	3	-	Small
3	RS3p	1	Piston - Scroll	3	1	-	2	1	Inverter	Medium
4	RS3i	1	Piston - Scroll	3		Inverter	3	1	Inverter	Medium
5	RS4	1	Piston - Scroll	4	-	-	2	4	-	Medium
6	RS4i	1	Piston - Scroll	4	-	Inverter	3	1	Inverter	Large
7	SL3d	1	Scroll	3	-	Digital	1	2	-	Medium
8	SL5d	1	Scroll	5	-	Digital	1	1	Inverter	Medium
9	SW1	1	Screw	1	2	-	2	2	-	Small
10	SW2	1	Screw	2	2	-	2	1	Inverter	Small
11	SW3	1	Screw	4	2	Stepless	2	1	Inverter	Medium+Small
12	d-RS2	2	Piston - Scroll	2	-	-	1	2	-	Medium
				2	-	-	1			
13	d-RS3	2	Piston - Scroll	3	-	-	1	3	-	Large
				3	-	-	1	3	-	
14	d-RS4	2	Piston - Scroll	4	-	Inverter	3	1	Inverter	Medium + Medium
				4	-	Inverter	3	1	Inverter	

4.1.2 Wizard

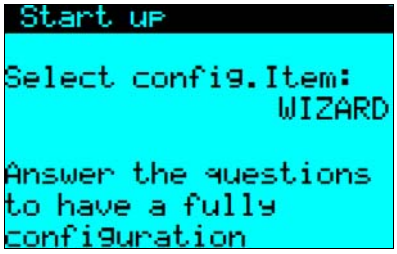


Fig. 4.b

This is used to obtain the recommended configuration for the specific installation. By responding to a series of questions, screen by screen, the user is guided through the selection of the devices present.
Once the procedure for selecting the various factors that affect the final configuration has been completed, the end result (report) is shown, and if the configuration is suitable the parameters to start operation of the pRack pR100 can be installed directly.

Note: after having configured the parameters using the Wizard, the configuration can be modified manually, within the context of the selected system configuration.

Important: before starting the pRack pR100, carefully check the settings made automatically by the software.

4.1.3 Advanced configuration

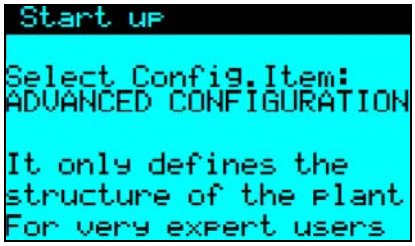


Fig. 4.c

This is used to establish the configuration of the pLAN structure required for correct system operation.
Once the procedure for selecting the various factors that affect the final configuration has been completed, the pRack pR100 software verifies whether the pLAN configuration is exact and prepares the user interface for configuration of the parameters that need to be set manually by the user.

Important: this configuration solution is only recommended for expert users, as all the system parameters need to be set manually.

4.1.4 Associating the inputs and outputs

When using pre-configurations and the wizard, pRack PR100 automatically associates the inputs and outputs on the board to the various functions.

The association criteria used are described below.

Digital outputs
pRack PR100 assigns in order:

- Compressor outputs: first the SSR for screw or Digital Scroll™ then the starting outputs, the capacity control valves and the inverter, if present
- Fan outputs
- Global alarm

Digital inputs
pRack PR100 assigns in order:

- High and low pressure switches (HP and LP)
- Compressor alarms
- Fan alarms

Note: pRack PR100 can also use certain analogue inputs as digital inputs, nonetheless the common HP and LP pressure switches are always associated with actual digital inputs.

Analogue inputs
pRack PR100 assigns in order:

- Pressure or temperature control probes for 1 or 2 lines, according to the settings made. The types of probe assigned as default are 4 to 20 mA or 0 to 5 V (first 4 to 20 mA, then 0 to 5 V if necessary) for the pressure probes, NTC for the suction temperature probes and HTNTC for the condensing temperature probes
- Suction temperature probe on line 1: if possible this is associated with input B3, otherwise the first free input
- Discharge temperature probe on line 1
- Suction temperature probe on line 2
- Discharge temperature probe on line 2

Analogue outputs
pRack PR100 assigns in order:

- Compressor inverters for 1 or 2 lines
- Fan inverters for 1 or 2 lines

5. USER INTERFACE

5.1 Graphic terminal

The pRack pR100 user interface is represented by the pGD1 terminal, in the wall, panel or built-in versions.

The functions associated with the 6 buttons on the pGD1 terminal are described in the table below.

Functions of the 6 main buttons

Button	Function associated
- (Alarm)	displays the list of active alarms and accesses the alarm log
Menu	used to enter the main menu tree
Esc	returns to the higher level screen
- (Up)	scrolls a list upwards or increases the value highlighted by the cursor
- (Down)	scrolls a list downwards or decreases the value highlighted by the cursor
- (Enter)	enters the selected submenu or confirms the set value.

The LEDs associated with the buttons have the following meanings.

Meaning of the LEDs

LED	Meaning
Red	Flashing: active alarms present and not acknowledged Steady: alarms present and acknowledged
Yellow	pRack pR100 on
Green	pRack pR100 powered

5.2 Description of the display

There are three fundamental types of screens shown to the user:

- Main screen
- Menu screen
- Screen for displaying/setting the parameters

Main screen

The software on board pRack pR100 automatically returns to the main screen 5 minutes after the last button was pressed.

An example of the main screen is shown in the figure, highlighting the fields and icons used:

Fig. 5.a

1- Time and date
2- Main values.
3- Unit status (unit off) or compressor and fan status (unit on)
4- Active alarm signal and manual operation
5- Access further information screens (menu branch A.a) by pressing button .

Note: The information shown on the main screen varies according to the system configuration (one line, two lines, two lines with shared condenser) and the type of control value used (pressure or temperature). For two line systems, a parameter is used to select which line is shown first.

Note: The other information shown in menu branch A.a. varies according to the system configuration. For two line systems, pressing from the main screen accesses a different screen based on the starting point (line 1, line 2).

Menu screen

An example of a menu screen is shown in the figure below:

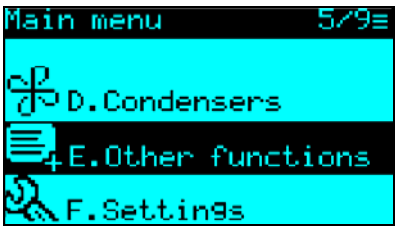


Fig. 5.b

The top right corner shows the selected item and the current password level (for details see the following paragraph). The and buttons are used to select the desired menu item, while accesses the selected item.

Screen for displaying/setting the parameters

An example of a screen for displaying/setting the parameters is shown in the figure, also highlighting the fields and icons used:

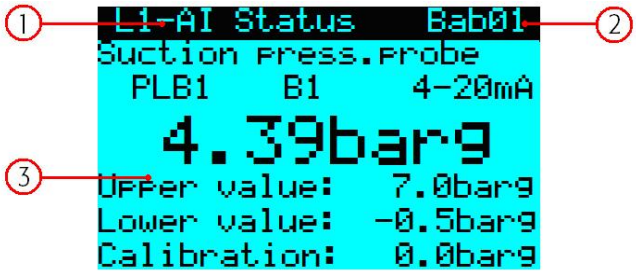


Fig. 5.c

1- Menu branch identifier
2- Screen identifier
3- Parameters

The screen identifier uniquely identifies the menu branch and the screen: the first characters indicate the menu branch, while the last two alphanumeric digits identify the order of the screen inside the menu, for example screen Bab01 is the first screen in menu B.a.b.

Note: The information on the screens may vary according to the password level used to access the menu.

5.3 Password

pRack pR100 manages three levels of password:

- User
- Maintenance
- Manufacturer

Each level includes the same rights as the lower levels, that is, the Manufacturer can access all the screens and parameters, the Maintenance can access the screens and parameters available in the Maintenance and User levels, while the User can only access the screens and parameters available in the User level.

Note: All levels display the main screens and the other information screens.

When pressing Menu a prompt is shown to enter the password, which remains active for 5 minutes after the last button is pressed.

The menu screens show their own password level using an icon at the top right: 1 line: user, 2 lines: maintenance, 3 lines: manufacturer.

The password level can be changed from menu branch F.d. at any time. The password can also be changed in the corresponding menu branch.

5.4 Description of the menu

Main menu – Function tree

The following general rules apply to the user interface:

- The parameters are grouped by functions and where necessary repeated, for example the status of the compressors inputs/outputs is visible in both branch C.a.a, and in branch B.a
- The parameters are grouped by type of access, first User then Maintenance then Manufacturer
- The most frequently used parameters are indicated first, the less frequently used are last
- Each user only sees the parameters and menu items that are available for that access level
- Only the screens and parameters corresponding to the selected system configuration are visible, that is, corresponding to the devices configured. The exception to this rule involves the screens relating to functions that can be enabled/disabled (e.g. set point compensation), which are visible even when disabled.

Regardless of the current screen displayed, pressing the Menu button accesses the main menu, as shown below:

A.Unit status	a.Main info		
	b.Set point		
	c.On/Off		
B.In/Out	a.Status	a.Digital in	
		b.Analog in	
		c.Digital out	
		d.Analog out	
	b.Manual op.	a.Digital out	
		b.Analog out	
	c.Test	a.Digital out	
		b.Analog out	
C.Compressors	a.Line 1 (*)	a.I/O status	
		b.Control	
		c.Op. hours	
		d.Energy saving	
		e.Alarms	
		f.Config.	
		g.Advanced	
	b.Line 2 (*)	....	
D.Condensers	a.Line 1 (*)	a.I/O status	
		b.Control	
		c.EEV	
		d.Energy saving	
		e.Alarms	
		f.Config.	
		g.Advanced	
	b.Line 2 (*)	....	
E.Other func.	a.Oil	a.Line 1 (*)	a.I/O status
			b.Settings
		b.Line 2 (*)	....
	b.Subcool	a.Line 1 (*)	a.I/O status
			b.Settings
			c.EEV
		b.Line 2 (*)	....
	c.Economiser	a.Line 1 (*)	a.I/O status
			b.Settings
			c.EEV
		b.Line 2 (*)	....
	d.Liquid inj.	a.Line 1 (*)	a.I/O status
			b.Settings
		b.Line 2 (*)	....
	e.Heat recovery	a.Line 1 (*)	a.I/O status
			b.Settings
		b.Line 2 (*)	....

	f.Generic func.	a.Stages	
		b.Modulation	
		c.Alarms	
		d.Time bands	
		e.I/O status	
	g.ChillBooster	a.Line 1 (*)	a.I/O status
			b.Settings
		b.Line 2 (*)	....
	h.DSS (*)	a.I/O status	
		b.Settings	
F.Settings	a.Clock	a.Line 1 (*)	a.Time bands
			b.Adjust
		b.Line 2 (*)	a.Time bands
	b.Languages		
	c.BMS	a.Line 1 (*)	
		b.Line 2 (*)	
	d.Password		
G.Safety	a.Log		
	b.Prevent	a.Line 1 (*)	
		b.Line 2 (*)	
	c.Aalarm config.	a.Line 1 (*)	
		b.Line 2 (*)	
H.Info			
I.Setup	a.Pre-configurations		
	b.Wizard		
	c.Advanced config.		
	d.Default		

(*) this menu level is only visible for system configurations with two lines.

Note: The figure illustrates the maximum menu configuration visible with the Manufacturer password. If accessing with the User or Maintenance password, only the menu items available are visible.

Note: For some menu items, access is possible with different password levels (e.g. I/O status), but the information available on the screens changes.

6. FUNCTIONS

pRack PR100 can manage up to 2 suction lines and 2 condenser lines. Many of the functions described in this chapter apply in the same way to all the lines (e.g.: control, rotation), while others apply in the same way to the suction lines (e.g.: oil management). The exception involves the generic functions that apply, irrespective of line, suction or condenser, to pRack boards with pLAN addresses from 1 to 4.

Where not expressly indicated or where it is clear that the description refers to one specific line rather than another (e.g.: compressor or fan management), the descriptions are considered as being common to all lines; any specific situations are described on a case-by-case basis.

Below is a chart of the main functions described and their field of application:

	Function	L1 suction	L2 suction	L1 cond.	L2 cond..
	Unit On-Off	☑	☑	☑	☑
Control	P+I control	☑	☑	☑	☑
	Control in dead zone	☑	☑	☑	☑
	Modulation in dead zone	☑	☑	☑	☑
	Control with backup probes	☑	☑	☑	☑
	Rotation	☑	☑	☑	☑
	Modulation device	☑	☑	☑	☑
Compressors	Screw compressors	☑	-	-	-
	Reciprocating and scroll compressors	☑	☑	-	-
	Digital Scroll™ compressors	☑	☑	-	-
	Fan management	-	-	☑	☑
Energy saving	Set point compensation	☑	☑	☑	☑
	Floating set point	☑	☑	☑	☑
Accessory functions	Oil management	☑	☑	-	-
	Subcooling	☑	☑	-	-
	Economizer	☑	☑	-	-
	Liquid injection	☑	☑	-	-
	Heat recovery	-	-	☑	☑
	Generic functions (*)	☑	☑	☑	☑
	ChillBooster	-	-	☑	☑
	DSS	☑	☑	-	-

(*) not linked to lines, but rather the pLAN address of the boards

The functions are described in detail in the following paragraphs.

6.1 Unit On-Off

The unit can be switched on and off from:

- User terminal
- Supervisor
- Digital input

On-off from the user terminal and the configuration parameters are available under the main menu, branch A.c, and are differentiated based on the access level; the User password allows display only.

On-off from the supervisor and from the digital input and start-up after a blackout (with specific delay, to avoid continuous starts and stops in the event of instability in the power supply) must be enabled using the parameters visible only with the Manufacturer password.

On-off from the digital input is equivalent to an enabling signal, that is, if the digital input is Off the unit cannot be switched on in any other way, while if is On, the unit can be switched on or off in any other way, with the same priority (the most recent control has precedence, whatever the origin), as shown in the figure:

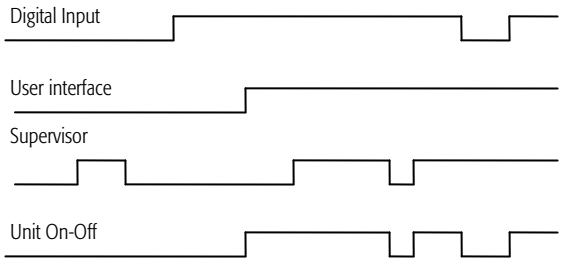


Fig. 6.1.a

When there are two suction and condenser lines, on-off is independent for each line, while when there are two suction lines and one condenser line, it is independent for the suction lines, while the condenser line stops when both suction lines are off, and starts when at least one suction line is on.

Note: Certain special conditions or functions in the pRack software cause the unit to shutdown:

- Configuration of some parameters: e.g. inputs/outputs, configuration of compressors, inverter parameters.
- Installation of default parameters
- Manual management

6.2 Control

pRack PR100 can manage two types of control:

- Proportional band (P, P+I)
- Dead zone (fixed times, variable times)

Both types of control can be applied to both compressors and condensers, according to the settings defined during start-up or in main menu branches C.a.b/C.b.b and D.a.b/D.b.b.

The type of control chosen is independent for each line present, either suction or condenser.

In addition, pRack PR100 can use as the reference for control either the pressure or the converted temperature, or the temperature read by probe if there is no pressure probe, even if reference is only made to pressure below.

The control set point can be compensated by an offset linked to digital inputs, probes, supervisor or time bands, for details see paragraph 6.5 relating to compressor and fan energy saving.

Both types of control are described below, and are valid for both control of suction pressure and condensing pressure, and operation with backup probes and/or probes not working.

6.2.1 Proportional band

The operating principle is normal proportional or proportional + integral control (P, P+I).

The control set point is central, consequently - for proportional control only - operation is schematised in the following figure:

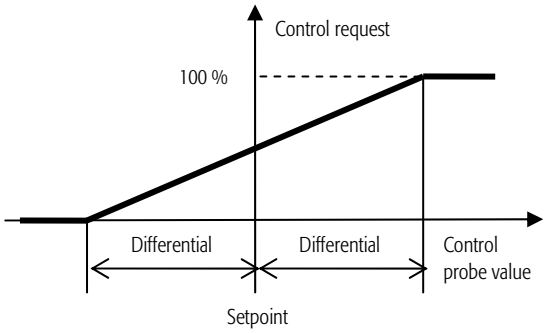


Fig. 6.2.a

For example, for 4 devices with the same capacity and proportional only control, start-up occurs as shown in the figure:

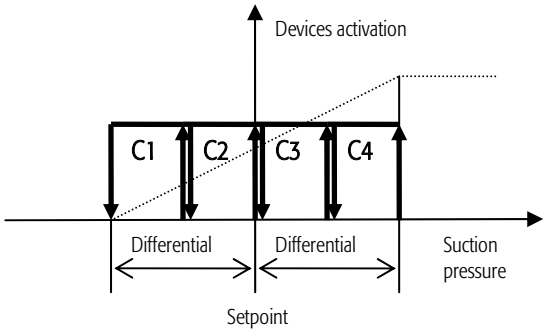


Fig. 6.2.b

With P+I control, added to the effect of the proportional action described above is the integral action, used to achieve a null control error in steady operation, as shown in the figure:

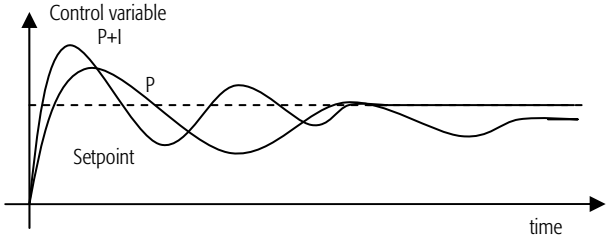


Fig. 6.2.c

The integral action depends on the time and modifies the control request in proportion to the deviation from the set point. The higher is the deviation, the more intense the integral action; in addition, the lower the value of the integral time, the more intense the action. It is recommended to not set a value that is too low for the integral time, to avoid instability.

Note: the set point is in the centre of the activation band, therefore when reaching the set point some devices are on, even with purely proportional control.

6.2.2 Dead zone

The operating principle is schematised in the following figure:

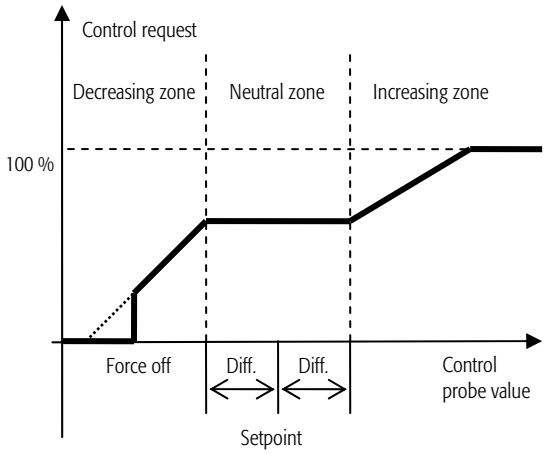


Fig. 6.2.d

Inside the dead zone the capacity request sent by the controller is constant (except when there is a modulation device and modulation is enabled inside the dead zone, as described in the following paragraph) and the value satisfies the temperature control request in those specific operating conditions, which means that the value of the control request changes according to how the controlled value enters the dead zone.

In the decrease zone, the request also decreases at a rate that depends on the deviation from the set point, and vice-versa in the increase zone the request increases proportionally to the deviation.

For the increase and decrease zones, the following can be used:

- Fixed times: the request decreases or increases constantly as time elapses.
- Variable times: the request decreases or increases more quickly (according to the settings) as the deviation from the set point increases.

Note: The previous figure shows the increase and decrease with fixed times.

For control in dead zone, the parameters shown in the figure must be set:

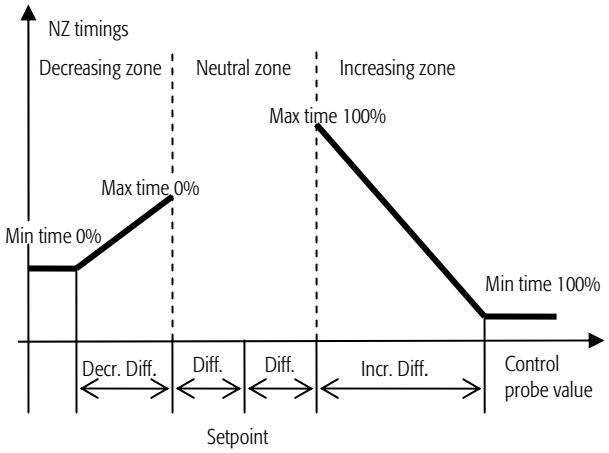


Fig. 6.2.e

As well as the decrease and increase differentials, 4 times need to be set, two for each zone, which represent the maximum and minimum time to reach the request, equal to 0% or 100%, for the decrease and increase respectively. In the situation shown in the figure, the request sent by the controller decreases/increases slowly as soon as the controlled value is outside of the dead zone, while it decreases/increases quickly the further the controlled value moves away from the dead zone; in this way the response of the system is faster when further from steady conditions.

Note: When using fixed times, the maximum and minimum must be set to the same value. In this case, the request sent by the controller decreases/increases constantly inside the deactivation/activation differential.

TUTORIAL: the decrease/increase times (minimum and maximum) represent the time needed to change from maximum to minimum capacity and vice-versa, and not the time between the deactivation/activation of the individual device. For example, in the case of 4 devices with the same capacity, an increase time of 180 seconds means that one device is activated every 45 seconds.

6.2.3 Modulation in dead zone

pRack PR100 can activate a specific function inside the dead zone if modulating devices are used (e.g.: inverters).

This function can be enabled in main menu branch C.a.g/C.b.g or D.a.g/D.b.g.

Modulation in dead zone is used to vary the request sent by the controller inside the dead zone proportionally so as to enter the decrease zone with the minimum request and the increase zone with the maximum request, meaning a device can be immediately deactivated/activated when exiting the dead zone.

An example of this operation is shown in the figure:

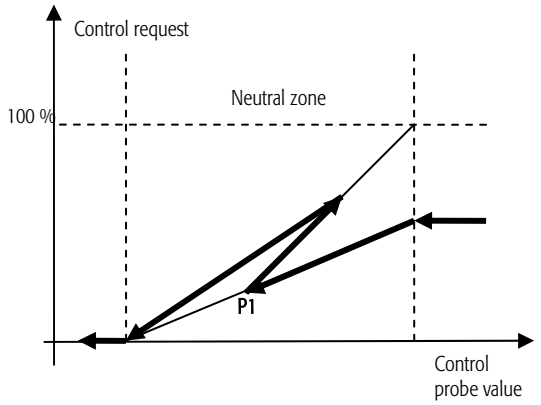


Fig. 6.2.f

When entering the dead zone, the pRack PR100 software calculates how the request needs to change in order to exit the dead zone at minimum or maximum output, and applies one of the two values according to the trend in variation in the control variable. For example, at point P1 in the figure, the trend of the two requests is represented by the segments with thin lines, and the request 'reverses' because at that point the control variable has started increasing in value again.

Note: When exiting the dead zone, it is possible that the request is not at the minimum or maximum value, where limitation is enabled for the modulating device.

6.2.4 Control with backup probes and/or probes not working

pRack PR100 can use backup control probes that are activated when the normal control probes are not working.

The backup probes must be enabled in main menu branch C.a.g/C.b.g or D.a.g/D.b.g.

When different pRack boards are used to manage the suction and condenser lines, the backup suction pressure probe must be connected to the board that manages the suction line, while the backup condensing pressure probe can be connected either to the board that manages the suction line or the board that manages the condenser line.

If the main control probes are not working and no backup probes are fitted, or the backup probes are also not working, fixed values are used for the control request, set in main menu branch C.a.g/C.b.g or D.a.g/D.b.g.

6.3 Compressors

pRack PR100 can manage up to 2 suction lines with different types of compressors and capacity modulation devices, applying common types of device rotation and controlling both the start mode and the safety times for each type of compressor, as well as a number of accessory functions.

These features are described in detail in the following paragraphs.

6.3.1 Possible compressor configurations

pRack PR100 can manage different types of compressors:

- Reciprocating
- Scroll
- Screw

Moreover, a capacity modulation device is allowed for each suction line, which may be one of the following, according to the type of compressor:

Compressors and modulation devices

Compressor	Modulation devices
Reciprocating	Inverter
Scroll	Inverter Digital Scroll™
Screw	Inverter Continuous capacity control

Note: The same modulation device is used on each line.

The maximum number of compressors and load stages per line varied according to the type of compressor:

Compressors and modulation devices

Compressor	Maximum number	Load stages
Reciprocating	12	24 total
Scroll	12	24 total
Screw	2	4

Note: Screw compressors can only be configured on line 1.

The compressors can have a maximum of 4 different capacities and a different number of load stages, but compressors of the same capacity must have the same number of load stages. The only exception is when the compressors all have the same capacity, some with load stages and some without load stages.

TUTORIAL: Below are examples of some possible configurations:

- One line, 4 reciprocating compressors of the same capacity, the first with inverter
- One line, 4 scroll compressors of the same capacity, the first Digital Scroll™
- One line, 4 reciprocating compressors of the same capacity, the first two with 4 load stages, the two other not capacity-controlled.
- One line, 4 reciprocating compressors of the same capacity, with 4 load stages each.
- Two lines, line 1 with 2 screw compressors of the same capacity, the first with continuous modulation, line 2 with 4 reciprocating compressors in two different capacities, the first two of the same capacity T1 with 4 load stages, the two other capacity T2 with 2 load stages.
- Two lines, line 1 with 4 scroll compressors, the first Digital Scroll™, line 2 with 4 reciprocating compressors the first with inverter

6.3.2 Rotation

pRack PR100 can manage different types of device rotation:

- FIFO (First In First Out): the first device to start is also the first to stop
- LIFO (Last In First Out): the last device to start is the first to stop
- By time: the device with the least number of operating hours starts and the device with highest number of operating hours stops
- Custom: the on/off sequences are defined by the user

Note: Different sizes of compressors can only be managed with Custom rotation.

The type of rotation is selected and the corresponding parameters set during the start-up procedure or in main menu branch C.a.f/C.b.f.

The activation thresholds are calculated differently depending on whether FIFO, LIFO, time or Custom rotation is used:

Device activation threshold calculation

Rotation	Threshold calculation
FIFO LIFO By time	Static: the range of variation of the control request is divided equally between the number of stages available
Custom	Dynamic: the thresholds are calculated depending on the capacity effectively available

Example 1: FIFO rotation, 4 compressors of the same capacity without load stages.
The activation thresholds are 25, 50, 75 and 100 %.

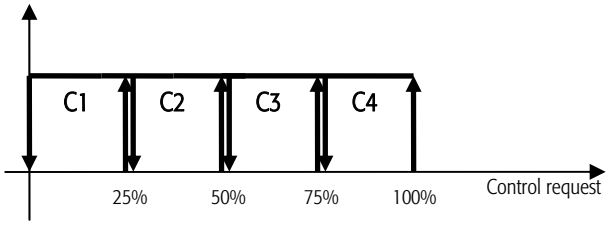


Fig. 6.2.f

Example 2: Custom rotation, 4 compressors with capacities of 10, 20, 30 and 40 kW.
The activation thresholds with all the compressors available are 10, 30, 60, 100 %.

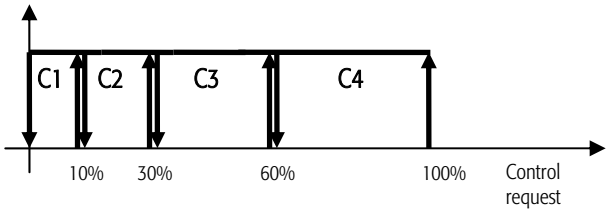


Fig. 6.2.h

If an alarm is active on compressor 3, the recalculated activation thresholds are 10, 30, 70 %

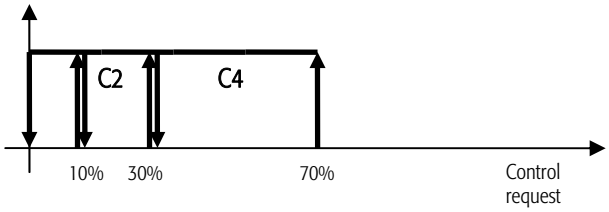


Fig. 6.2.i

Activation of the compressors and load stages may be:

- Grouped (CpppCppp): first all the load stages are activated on one compressor before starting the next one
- Balanced (CCpppppp): first all the compressors are started at minimum capacity and then the corresponding load stages are activated, one for each compressor, in sequence.

6.3.3 Rotation with modulation devices

pRack PR100 can also manage compressor rotation when a capacity modulation device is fitted (inverter, Digital Scroll™ or continuous control).

The type of modulating device is selected and the corresponding parameters set during the start-up procedure or in main menu branch C.a.f/C.b.f and C.a.g/C.b.g

The modulating device is always the first to start and the last to stop, the other devices start or stop according to the type of rotation selected.

Note: The compressor with modulation device is also assumed to be the first.

The trend in capacity delivered by the modulation device depends on the capacity of the compressor with the modulating device compared to the other compressors available.

Three cases can be identified:

- compressors all with the same capacity and range of capacity variation of the modulating device greater than or equal to the capacity of the compressors
- compressors all with the same capacity and range of capacity variation of the modulating device less than the capacity of the compressors
- compressors with different capacities

In the first case, the modulating device manages to continuously cover the range of variation of the control request, while in the second case some discontinuous variations remain. The behaviour in the third case varies according to the capacities involved, and in any case reflects one of the two previous cases.

To configure the compressor capacity when an inverter is used, the minimum and maximum operating frequencies need to be set relating to the minimum and maximum value of the analogue output and the rated capacity delivered at rate frequency, so that the pRack PR100 software can calculate the capacity the compressor can deliver with the inverter and use this value for control. In addition, for inverters the variation in capacity delivered can be limited by setting the increase and decrease times. If these times have already been configured on the inverter, the higher time set has priority.

Example 1: two compressors without capacity control, with the same capacity, 20 kW each, modulating device with variable capacity between 30 and 60 kW.
The figure shows the trend when the request sent by the controller increases and then decreases continuously between 0 and 100 %.

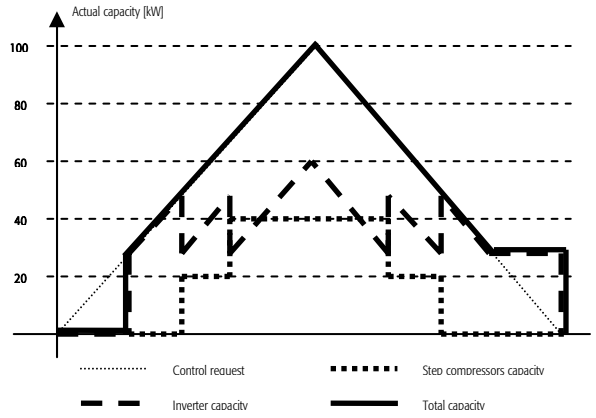


Fig. 6.3.a

Example 2: two compressors without capacity control, with the same capacity, 30 kW each, modulating device with variable capacity between 20 and 40 kW.

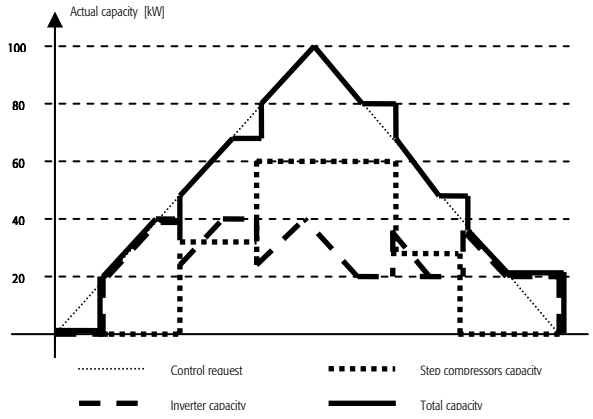


Fig. 6.3.b

Example 3: two compressors without capacity control, capacities 15 kW and 25 kW, modulating device with variable capacity between 10 and 30 kW.

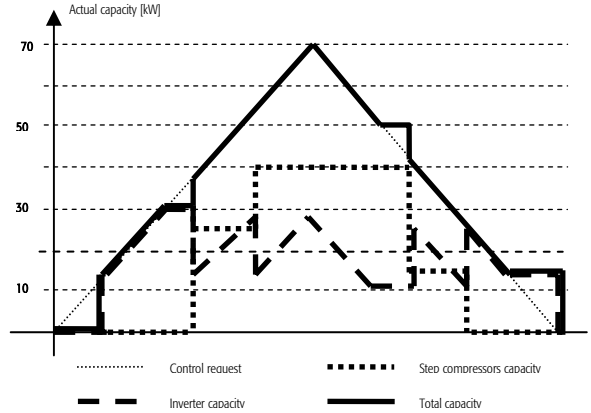


Fig. 6.3.c

6.3.4 Starting

pRack PR100 can manage different types of compressor starting:

- Direct
- Part-winding
- Star/delta

The type of starting can be selected and the related parameters set in main menu branch C.a.f/C.b.f.

For part-winding starting, the delay in activating the digital output that controls the second winding needs to be set:

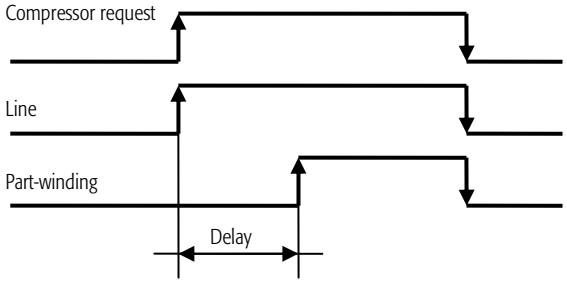


Fig. 6.3.d

For star/delta starting, the star time, the delay between the activation of the line and star digital input, and between the delta and star digital input all need to be set, as shown in the figure:

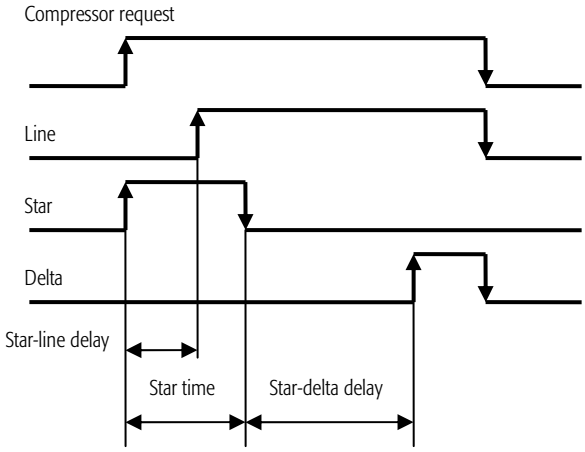


Fig. 6.3.e

6.3.5 Safety times

pRack PR100 can manage common safety times for each compressor:

- Minimum on time
- Minimum off time
- Minimum time between consecutive starts

In addition, pRack PR100 can manage the specific times for Digital Scroll™ compressors and screw compressors; for the descriptions see paragraphs 6.3.10 and 6.3.11.

The related parameters can be set in main menu branch C.a.f/C.b.f.

Note: for two lines, a further delay can be set between starts of the compressors on different lines, so as to avoid simultaneous starts. See paragraph 6.6.6 for the detailed description of the synchronisation function for two lines.

6.3.6 Balancing

pRack PR100 can control any balance valves in parallel with the compressors.
This function can be used to activate a communicating solenoid valve between compressor suction and discharge, for a set time, before each individual compressor starts. In this way, the suction and discharge pressure can be balanced and the compressor can be started in more favourable conditions.

The balancing function can be enabled and the related activation time set in main menu branch C.a.f/C.b.f.

6.3.7 Economizer

pRack PR100 can activate the economizer function to boost compressor efficiency by injecting vapour. Some of the liquid is taken from the condenser, expanded through an expansion valve and then sent to a heat exchanger to cool the liquid leaving the condenser. The resulting superheated vapour is injected into a special section of the compressor.
The function can be enabled and the related parameters set in main menu branch C.a.f.
The economizer is only efficient for high compressor activation capacities, typically over 75 %, therefore the economizer function control valve is only activated when exceeding a set threshold.
As the economizer tends to increase the condensing pressure, this needs to be controlled to ensure the high condensing pressure alarm is not generated. In addition, the injection of vapour decreases the discharge temperature and so this value also needs to be monitored.
Consequently, the three conditions for activation of the economizer function are:

- Capacity above a set threshold
- Condensing pressure below a set threshold (with reset differential)
- Discharge temperature above a set threshold (with reset differential)

6.3.8 Liquid injection

As an alternative to the economizer, pRack PR100 can manage the injection of liquid into the compressors (the two functions are alternative, as the point of vapour injection into the compressor is the same).

The function can be enabled and the related parameters set in main menu branch E.d.a.b/E.d.b.b.

Liquid injection is used to protect the compressor, and in fact decreases the discharge temperature.
Operation is similar to the economizer function, with the difference that the expanded liquid is not sent to a heat exchanger, but rather directly into the compressor. The function is only activated when the compressor is on and the discharge temperature exceeds a set threshold (with differential).

Note: the function can be activated on a maximum of 6 compressors.

6.3.9 Manual operation

pRack PR100 can manage 3 different compressor manual operating modes:

- Enabling
- Manual management
- Output test

Enabling is managed in main menu branch C.a.f/C.b.f., while manual management and the output test can be activated in main menu branch B.b or B.c.
Enabling is used to temporarily exclude the compressors from operation, to allow, for example, repair or replacement. The disabled compressors are also excluded from rotation.

Note: enabling is the only compressor manual operating mode that can be activated when the unit is on.

Both manual management and the output test are enabled and remain active for a set time after the last button is pressed, after which the unit returns to normal operating mode.

Manual management is used to switch the compressors on or off without observing the control needs, however still considering any safety devices (alarms, safety times, starting procedures) and respecting the set configuration of the inputs/outputs.

The activation screen resembles the one shown in the figure and is used to override the outputs relating to the operation of the selected device, e.g. compressor 1:

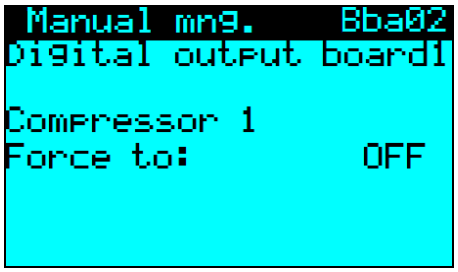


Fig. 6.3.f

The output test is used to activate or deactivate the outputs (where necessary setting an output percentage for the analogue outputs), without observing any type of safety feature.
The activation screen resembles the one shown in the figure and is used to override the outputs on the pRack boards, in the order they physically appear on the board (without links to the devices):

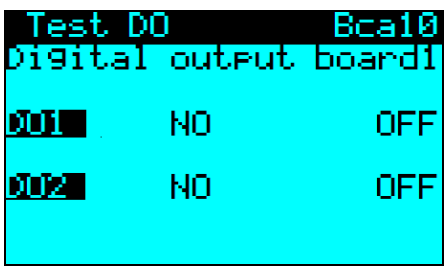


Fig. 6.3.g

Important: manual mode and the output test can only be activated with the unit off.
Both manual mode and above all the output test must be used with special care and by expert personnel to avoid damage to the devices.

6.3.10 Digital Scroll™ compressors

pRack PR100 can use a Digital Scroll compressor™ as the modulating device for suction lines (one for each line). This type of compressor features special operation, and is controlled by pRack PR100 as follows.

The related parameters can be set in main menu branch C.a.f/C.b.f.

The capacity is modulated by opening/closing a valve with PWM; when the valve is ON the compressor delivers minimum capacity, while when the valve is off the compressor delivers maximum capacity. In the following description and figure, ON and OFF refer to the status of the compressor, while operation of the valve is the exact opposite:

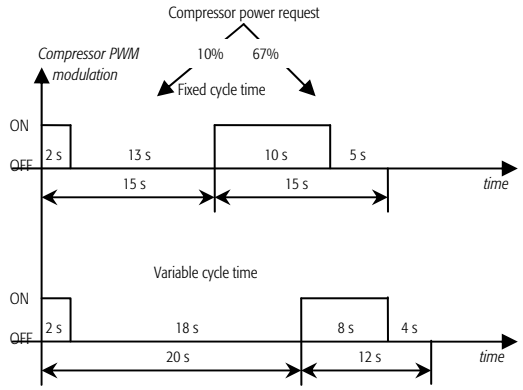


Fig. 6.3.h

The following data are provided by the manufacturer of the compressor:

- minimum ON time 2 s
- maximum cycle time 30 s
- optimum cycle time 12 s

There are three possible operating modes:

- Fixed cycle time
- Variable cycle time
- Optimised cycle time

Based on the operating mode selected, pRack PR100 calculates the valve activation percentage that satisfies the required capacity.

Fixed cycle time

The compressor ON time is calculated as the percentage of the cycle time corresponding to the required capacity:

$$T_{ON} = \% \text{ Request} * \text{Cycle time}$$

The cycle time can be set to the optimum value suggested by the manufacturer to achieve maximum COP, or to a higher value to increase resolution of the capacity delivered (a higher cycle time implies greater continuity in the effective capacity that can be delivered).

Variable cycle time

The compressor ON time is set to 2 s and the cycle time is calculated based on the required capacity:

$$T_{CYCLE} = T_{ON} / \% \text{ Request}$$

Optimised cycle time

The compressor ON time is set to 2 s and the cycle time is calculated based on the required capacity for capacities less than 17 %, after which the cycle time is set to 12 s and the ON time varies. In essence, this mode is a combination of the previous two.
This guarantees the maximum possible COP and control rate (obtained with the 12 s cycle time) and the maximum control range (starting from 6.7 %).

Note: the minimum capacity that can be delivered by Digital Scroll™ compressors is Minimum ON time/Maximum cycle time = 2/30 = 6.7 %, which

also depends on the selected control mode (for example, in the first case shown in the figure the minimum capacity delivered is Minimum ON time/Cycle time = 2/15 = 13%).

Note: if high pressure prevention is enabled with activation/deactivation of the devices, the Digital Scroll™ compressor delivers the minimum possible capacity.

Starting procedure

pRack PR100 can manage the specific starting procedure for Digital Scroll™ compressors, as represented as in the following figure:

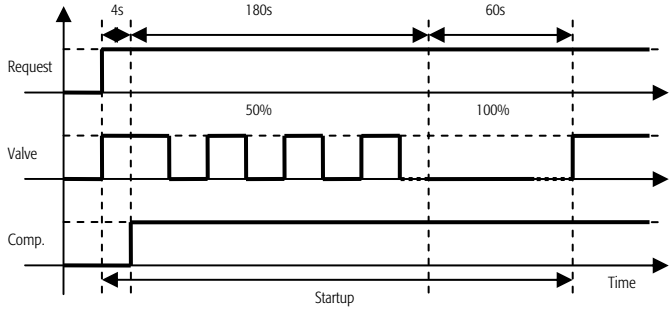


Fig. 6.3.i

There are three stages:

1. balance: the PWM valve is activated for 4 s, so that the compressor delivers minimum capacity
2. compressor activation with 50 % capacity for 3 minutes
3. forced operation at 100 % for 1 minute

During the starting procedure, the request sent by the controller is ignored and only at the end of the procedure does the capacity delivered start reflecting the request. If the request is cancelled during the starting procedure, the compressor stops at the end, then the minimum ON time for these types of compressors is set to 244 s.

Note: the safety times for Digital Scroll™ compressors are established by the manufacturer, and are as follows:

- Minimum ON time: 244 s (starting procedure)
- Minimum OFF time: 180 s
- Minimum time between restarts: 360 s

Alarms

pRack PR100 can manage, in addition to the common alarms for all types of compressors (see chapter 8 for details), some specific alarms for Digital Scroll™ compressors:

- high oil temperature
- oil dilution
- high discharge temperature

These alarms are managed as specified by the manufacturer of the compressor, and therefore pRack PR100 can only enable or disable them.
Activation of these alarms requires an oil temperature probe, which can also be the common probe (see the paragraph relating to oil management) and the compressor discharge temperature probe.

Note: pRack PR100 does not manages the envelope for Digital Scroll™ compressors and consequently there is no corresponding alarm when operating outside the envelope.

6.3.11 Screw compressors

pRack PR100 can manage up to two screw compressors, with control in stages or continuous control (only the first compressor with continuous control, used as modulation device for the suction line), which can be a generic device or pre-configured in accordance with the most common devices supplied by the main manufacturers.
Advanced functions are also available, for example envelope control, described further on.

The parameters relating to screw compressors can be set in main menu branch C.a.f/C.b.f.

Screw compressors are fitted with up to 4 capacity control valves (hereinafter V1, V2, V3, V4), which can have 4 types of behaviour:

- ON: the valve is open
- OFF: the valve is closed
- Intermittent: the valve is open/closed alternatively (around 10 to 15 s)
- Pulsating: the valve is open/closed alternatively with very short opening/closing times (around 1 to 2 s)

Important: pulsating valves must be associated with an SSR relay output, to avoid damage.

V1, V2, V3 and V4 can be managed to obtain stage or continuous compressor control.

Stage control

For the control in stages, normally involving four load stages, 25, 50, 75, 100 %, a table needs to be created that shows the behaviour of each valve in the different conditions (starting, 25 %, 50 %, 75 %, 100 %). The figure shows one possible example (see the documents supplied by the manufacturer of the compressor for how to complete the table):

	V1	V2	V3	V4
Start	○	○	○	○
25%	○	●	●	○
50%	●	○	●	●
75%	○	○	●	○
100%	○	○	○	○

If intermittent valves are used, the cycle time also needs to be set.

Note: normally operation at minimum capacity (25 %) is only possible for a limited time, after which the compressor must switch to the next stage. This function can be enabled and the corresponding time can be set.

Continuous control

For continuous control, a table needs to be created that shows the behaviour of each valve in the different conditions (start/stop, increase, decrease, standby).
The figure shows one possible example:

	V1	V2
Start/Stop	○	○
Increase (25 to 100%)	●	◪
Decrease (25 to 100%)	◉	●
Standby	●	○

If intermittent/pulsating valves are used, the cycle time also needs to be set. Intermittent valves are opened/closed for 50 % of the set time, while for pulsating valves the opening and closing time in theory depend on the difference between the position of the slide and the capacity request. As the position of the slide is generally not measurable, the variation in the request is used to calculate the times for pulsating valves.

Note: in continuous control, operation is normally only allowed for an undetermined time when the capacity exceeds 50 %.

Starting procedure

pRack PR100 can manage the starting procedure for the screw compressors by considering, following the star/delta or part-winding starting selected, a further time of operation at minimum capacity, established by the manufacturer or set to 60 s for generic compressors.

Once the starting procedure has ended, the compressor starts varying the capacity according to the control request and if necessary considering the duration at minimum capacity.

Series of compressors supported

pRack PR100 can manage several series of screw compressors made by the main manufacturers, (Bitzer, Refcomp, Hanbell, …) which come with the parameters described above already set.
For manufacturers or series of compressors that are not supported, the generic type can be used and the corresponding parameters set as described previously.

Note: for further details on the series of compressors supported and the related pre-configured parameters, contact Carel.

Envelope

For screw compressors, pRack PR100 can manage control of the envelope, which can either be pre-set or defined by the user. pRack PR100 accepts the envelope control settings for the Bitzer CSH series compressors, and these simply need to be enabled in main menu branch C.a.g.
For all other series of compressors, the envelope can be managed by enabling and setting all the related parameters in main menu branch C.a.g.

The following parameters need to be set in order to manage the envelope:

- Definition of the points (maximum 30)
- Definition of the zone (maximum 12). Each zone can be made up of one or more polygons (total maximum 14, which must be closed and convex)
- Definition of the behaviour of the compressor in the different zones (capacity and duration)

The meaning of the parameters is shown in the figure:

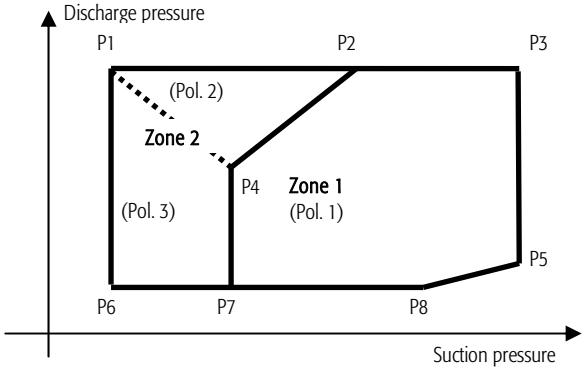


Fig. 6.3.j

pRack PR100 can also manage the variation in the envelope as the capacity delivered changes, for example in the case of variation in frequency for inverter-driven compressors.

Note: for further details on configuration of the envelope, contact Carel.

6.4 Fans

pRack PR100 can manage up to 2 condenser lines with up to 16 fans and one speed modulation device each, applying common types of device rotation and controlling both the starting mode and some accessory functions.
The modulation device may be an inverter or a phase fired controller.
The functions are described in detail below.

6.4.1 Control

pRack PR100 can manage – as described in paragraph 6.2 – proportional band and dead zone control, by pressure or temperature.

For details on the control modes, see the corresponding paragraph, while below is the description only of the features relating to the fans.

Fan operation depending on the compressors

The operation of the fans can be bound to the operation of the compressors by setting a parameter in main menu branch D.a.b/D.b.b, in this case the fans only start if at least one compressor is on. This setting is ignored if the fans are controlled by a dedicated pRack PR100 board and the pLAN network is disconnected.

Cut-off

pRack PR100 can manage a control cut-off for the fans, as shown in the figure:

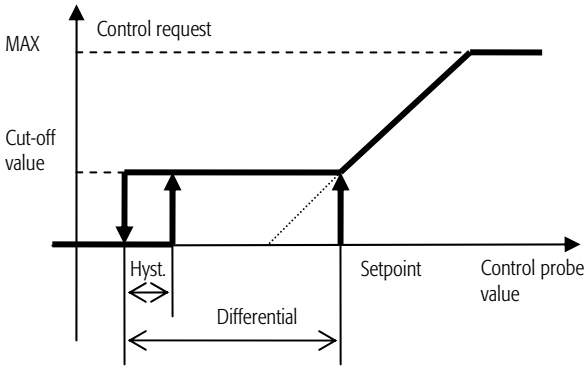


Fig. 6.3.k

The function can be enabled and the related parameters set in main menu branch D.a.b/D.b.b

For the cut-off a percentage value, a set point, a differential and hysteresis can be set.

6.4.2 Rotation

pRack PR100 can manage rotation of the fans, much in the same way as described for the compressors, therefore:

- LIFO, FIFO, time, Custom rotation
- Management of a modulation device on each line

The substantial difference compared to the compressors concerns the possibility to manage different capacities and load stages, which are obviously not featured for the fans. In addition, pRack PR100 can specially manage inverter driven fans. In fact, a multiple number of inverter driven fans can be set.
If there is more than one fan, however the number of inverter driven fans is set to 1, the fans are started and stopped at the same time, and the fans will always all be at the same power.
If there is more than one inverter driven fan, as well as being able to use an alarm digital input for each, it is assumed that the weight of the modulating device is proportional to the number of fans, therefore the first case is applied, as described in paragraph 6.3.3.

Example 1: six fans, three of which inverter driven fans, correspond to four fans in which the first has triple the power of the others.

Note: some fans can be excluded from the rotation, for example in the winter; to do this use the split condenser function described in paragraph 6.4.5.

6.4.3 Fast start (speed up)

pRack PR100 can manage the fast start function (speed up), used to overcome the initial inertia of the fans.

The function can be enabled and the related parameters set in main menu branch D.a.g/D.b.g

If speed up is enabled, a start time can be set in which the fan speed is forced to 100%. If the outside temperature sensor is used, moreover, a threshold can be set (with reset differential) below which speed up is disabled, so as to not drastically lower the condensing pressure at start-up.

Note: speed up has lower priority than the silencer function (see the following paragraph for the details), therefore if the silencer function is active, this is disabled.

6.4.4 Silencer

pRack PR100 can manage the silencer function, used to limit fan speed at certain times of the day or in specific conditions, enabled by digital input.

The function can be enabled and the related parameters set in main menu branch D.a.g/D.b.g.

Enabling fan speed limitation from the digital input or based on time bands is independent, consequently the speed is limited to the set value when at least one of the two conditions is active.

Up to 4 activation bands can be set for each day of the week.

6.4.5 Split condenser

pRack PR100 can manage the possibility to exclude some fans from operation, for example to reduce condenser operation in winter, using the split condenser function.

The function can be enabled and the related parameters set in main menu branch D.a.g/D.b.g.

Split condenser can be used to exclude from rotation fans whose index is:

- even
- odd
- higher than a settable value
- lower than a settable value

The function can be activated by:

- time bands (winter/summer seasons)
- digital input
- supervisor
- outside temperature (set threshold and differential)

Note: the split condenser function can be disabled by parameter if the high pressure prevention function is activated (see paragraph 8.3.3). If split condenser is disabled due to activation of the high pressure prevention function, it remains disabled for a set time, after which it is reactivated.

Note: split condenser cannot be enabled if there is a speed modulation device that controls all the fans.

6.4.6 Manual operation

pRack PR100 can also manage the same three manual operating modes for the fans as described for the compressors:

- Enabling
- Manual management
- Output test

Enabling is managed in main menu branch D.a.f/D.b.f., while manual management and the output test can be activated in main menu branch B.b or B.c.

For the detailed description of the three modes, see paragraph 6.3.9.

6.4.7 Alarms

pRack PR100 can manage both a common alarm for the fans and separate alarms for each fan.

When the common alarm is active the alarm is signalled, but no fan is stopped, while for separate alarms the fan that the alarm refers to is stopped.

For details on the fan alarms, see Chapter 8.

6.5 Energy saving

pRack PR100 can activate energy saving functions by adjusting the suction and condensing pressure set points.

The suction and condensing pressure set points can be applied with two different offsets, one for the closing period and one for the winter period, activated by:

- Digital input
- Time band
- Supervisor

As well as set point compensation, two further energy saving functions are available, and involve floating suction and condensing pressure set point. While compensation is similar for the suction and condensing pressure, floating set point works differently (see the description in the following paragraphs).

The effects of compensation and floating set points are independent.

The functions can be enabled and the related parameters set in main menu branch C.a.d/C.b.d and D.a.d/D.b.d.

6.5.1 Set point compensation

The following description applies to both the suction and condensing pressure set points.

Two different offsets can be defined, which apply to:

- Closing periods, defined by the scheduler, activation of a digital input or supervisor
- Winter period, defined by the scheduler

The two offsets add to the set point defined by the user when the corresponding condition is active.

Example 1: closing offset 0.3 barg, winter offset 0.2 barg, suction pressure compensation from scheduler and from digital input activated. When the digital input is activated, for example with a day/night function, 0.3 barg is added to the operating set point, and when the winter period is in progress a further 0.2 barg is added. The operation can be schematised in the following figure:

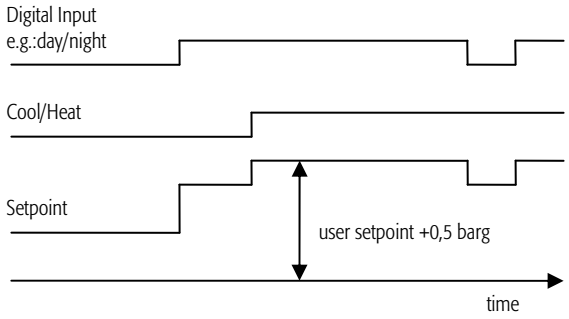


Fig. 6.5.a

Note: the same digital input is used for set point compensation on each line, so if suction and condensing pressure set point compensation is activated by digital input, both compensation functions are active at the same time.

6.5.2 Floating suction pressure set point

For the suction line, the floating set point is managed by the supervisor.

The suction pressure set point set by the user is changed by the supervisor in range between a settable minimum and maximum. The operation is illustrated in the following figure:

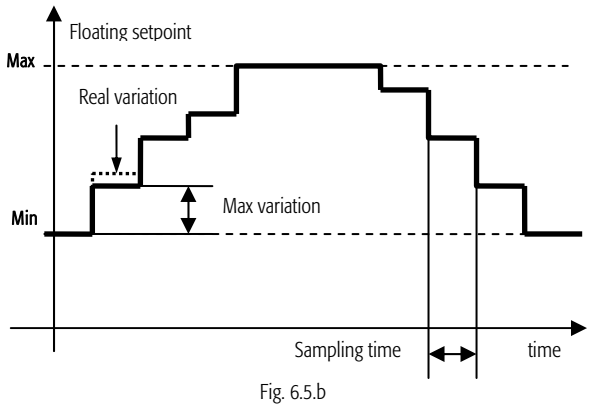


Fig. 6.5.b

The set point is calculated by the supervisor and acquired by the pRack PR100 controller at set intervals, the maximum variation allowed for the set point in each sampling period can also be set; if the value acquired differs from the previous value by more than the maximum variation allowed, the variation is limited to the maximum value.

If the supervisor is disconnected, after 10 minutes (fixed) the pRack PR100 controller starts decreasing the set point with variations equal to the maximum variation allowed each sampling period, until reaching the minimum set point allowed with floating condensing pressure.

Note: if set point compensation is also active, the floating set point is the value that the variation is applied to, that is, the two effects are summed.

6.5.3 Floating condensing pressure set point

For the condenser line, the floating set point is managed by the supervisor.

The floating condensing pressure set point is achieved by adding a constant programmable value to the outside temperature and limiting the resulting value between a settable minimum and maximum, as shown in the figure:

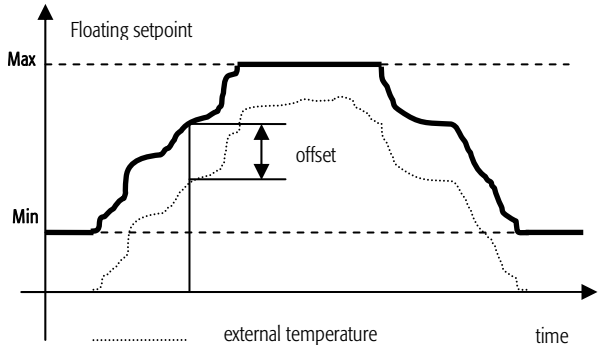


Fig. 6.5.c

Note: if set point compensation is also active, the floating set point is the value that the variation is applied to, that is, the two effects are summed.

6.6 Accessory functions

pRack PR100 can manage several accessory functions. Of these, the economizer and liquid injection have already been described in paragraph 6.3 on compressor operation, while the others are described below.

6.6.1 Oil management

pRack PR100 features oil management for the individual compressors, as well as common management for each line:

- Individual compressor: oil alarm, high oil temperature, and, for screw compressors only, oil warning, oil cooling and oil level
- Line: common oil alarm, high oil temperature warning, oil cooling

The function can be enabled and the related parameters set in main menu branch E.a.a/E.a.b or C.a.e/C.b.e (for the individual compressor alarms).

Individual compressor oil management

For the description of the oil alarm and warning corresponding to the individual compressor see Chapter 8.

For screw compressors, an oil cooler can be managed for each compressor, made up of a heat exchanger, a fan and 1 or 2 pumps.
The operation of the cooler varies according to the setting of the output, which may be:

- Analogue: one pump only
- Digital: 1 or 2 pumps

The control probe is the compressor oil temperature probe, and the following need to be set: set point, differential and, for 2 pumps only, an activation delay for the second pump.
The operation of the cooler when using an analogue output is shown in the figure:

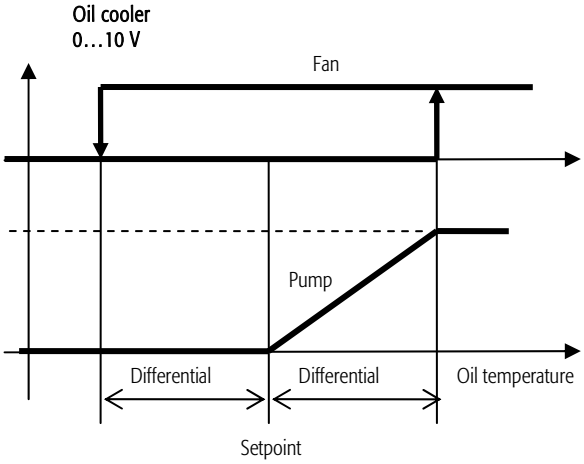


Fig. 6.5.d

If a digital output and just one pump is used, the fan and the pump are activated/deactivated at the same time:

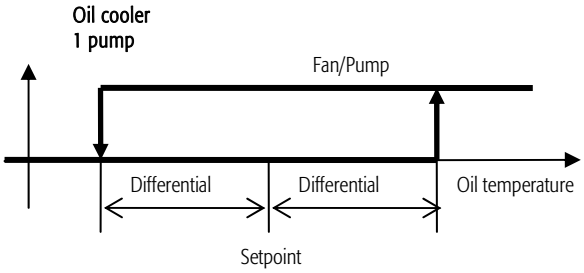


Fig. 6.5.e

If a digital output and two pumps are used, the operation of the fan and the first pump is similar to the previous case, while the second pump is activated when the oil temperature is greater than the set point + differential for a time at least equal to the delay, and is deactivated when the oil temperature falls back below the set point minus the differential.

The oil level can be managed for the first 6 compressors on each suction line.
If a compressor alarm is configured as an oil alarm, this alarm can be associated with oil level management, enabling the function and setting the compressor alarm number to be used: when the digital input associated with the alarm is activated (this thus signals the low oil level), a valve is activated with intermittent operation to restore the level, with opening and closing times that can be set. If after a set time, the digital input is still active, that is, the minimum level has not been reached, pRack PR100 signals an alarm and stops the compressor.

Line oil management

pRack PR100 features an alarm digital input for each line; this is with signal only, that is, has no effect on the operation of the devices.
For details on this alarm see chapter 8.

For all types of compressors, a common oil cooler can be managed for each line; the operation of this is similar to the cooler for each individual compressor described previously.

Note: for screw compressors, if common cooling is selected, cooling for each compressor cannot be activated.

6.6.2 Subcooling

pRack PR100 can control subcooling in two different ways:

- with the condensing temperature and the liquid temperature
- with the liquid temperature only

In the first case, subcooling is calculated as the difference between the condensing temperature (obtained by converting the condensing pressure) and the liquid temperature measured after the exchanger.
The corresponding output is activated below a set threshold, with fixed differential.

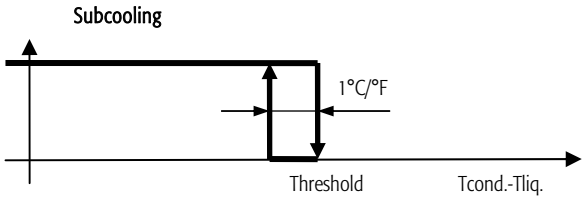


Fig. 6.5.f

In the second case, the output is active for liquid temperature values greater than a threshold, with fixed differential.

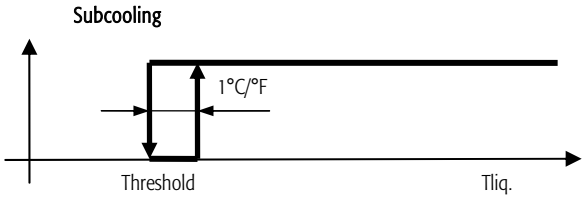


Fig. 6.5.g

The subcooling function can be enabled and the related parameters set in main menu branch E.b.a/E.b.b.

Note: the subcooling function is active when at least one compressor is on.

6.6.3 Heat recovery

pRack PR100 can manage heat recovery for types of system with heat recovery in series with the main condenser.

Heat recovery can be activated by:

- Probe
- Time bands
- Supervisor

The heat recovery function can be enabled and the related parameters set in main menu branch E.e.a/E.e.b.

A digital input is managed that acts as a trigger for activating the function. When the digital input is not active, heat recovery is not operating, while when the digital input is active heat recovery is operating when at least one of the other conditions is true, as shown in the figure:

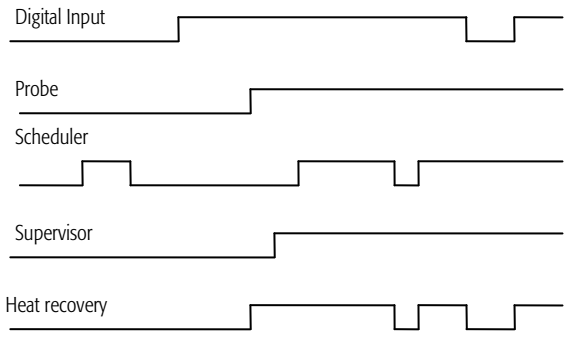


Fig. 6.6.a

If the digital input is not configured, only the other conditions are taken into consideration.

When the heat recovery function is active, a digital output is activated to trigger the pump and a digital or analogue output for an On/Off or modulating 3-way valve.

For activation by probe, the operation of the On/Off or modulating 3-way valve and the pump is shown in the figure, where the temperature considered is the heat recovery exchanger outlet temperature:

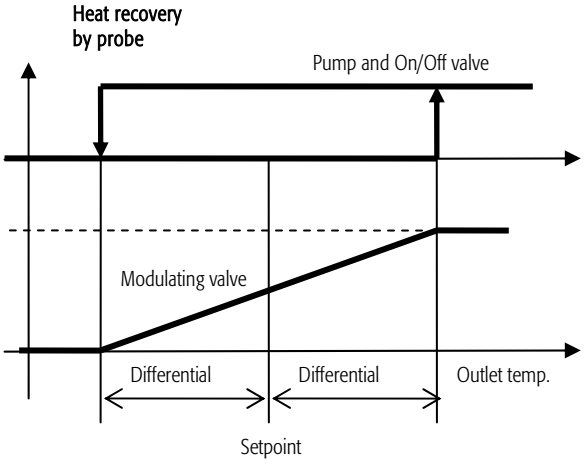


Fig. 6.6.b

If the probe is not working, pRack PR100 considers the other conditions, without signalling further alarms in addition to the probe alarm.

As regards activation from time bands, heat recovery does not consider the operating seasons, and links can be set to special days and closing periods so that heat recovery is only active based on the daily bands set.

Note: a settable bottom limit is available for the condensing pressure, below which heat recovery is deactivated.

Note: condensing pressure set point compensation can be disabled when heat recovery is active.

Heat recovery as the first stage in high pressure prevention

Heat recovery can be used to prevent high condensing pressure.

The parameters relating to this function can be set in branch G.b.a/G.b.b of the main menu, after having enabled the heat recovery function.

For details on operation of the prevent function, see paragraph 8.3.3.

Heat recovery operation as the first stage in high pressure prevention is shown in the figure:

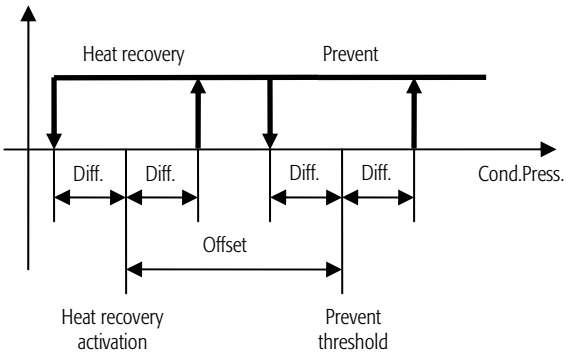


Fig. 6.6.c

The function must be enabled and an offset must be set in relation to prevent threshold, while the differential is the same set for the prevent function.

6.6.4 Generic functions

pRack PR100 can use the free inputs /outputs and certain internal variables for generic functions.

Important: The generic functions are available on pRack PR100 boards with pLAN addresses from 1 to 4, that is, on all boards that manage a suction or condensing line, nonetheless only the parameters corresponding to the functions managed by boards 1 and 2 are sent to the supervisory system.

The following generic functions are available for each board:

- 5 stages
- 2 modulations
- 2 alarms
- 1 scheduler

Each function can be enabled/disabled by digital input and from the user interface.

The generic functions can be enabled and the related parameters set in main menu branch E.f.

To be able to use the free inputs, these must be configured as generic probes from A to E (analogue inputs) and generic inputs from F to J (digital inputs), consequently a maximum of 5 analogue and 5 digital inputs can be used. After having configured the generic probes, the associated variables can be used as control variables and the digital inputs as enabling variables.

As well as the generic probes and inputs, pRack PR100 software internal variables can be used, depending on the system configuration. Some examples are, for analogue variables:

- Suction pressure
- Condensing pressure
- Saturated suction temperature
- Saturated condensing temperature
- % of compressors active
- % of fans active
- Superheat

And for the digital variables:

- High suction pressure alarm
- Low suction pressure alarm
- High condensing pressure alarm
- Low suction pressure alarm
- Sign of life

Each generic function can be associated with a unit of measure and a description.

Below is a description of the operation of four types of generic functions.

Stages

pRack PR100 can manage up to 5 stage functions, with either direct or reverse operation.
In both cases, a set point and a differential can be set; the operation of the corresponding output is shown in the figure for both cases:

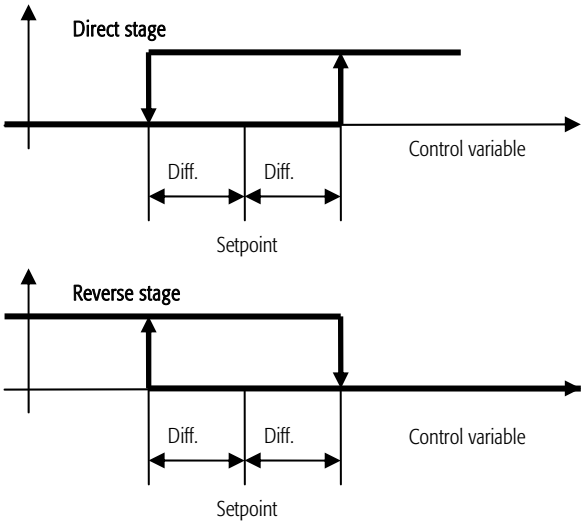


Fig. 6.6.d

If an enabling variable has been set, the corresponding output is active if the enabling is also active.

For each stage, a high alarm threshold and a low alarm threshold can be set, and are absolute. For each alarm, the activation delay and priority can be set. See chapter 8 for details on the alarms.

One example of using the generic stage functions may be activation of the fans on the room units based on the temperature.

Modulation

pRack PR100 can manage up to 2 modulation functions, with either direct or reverse operation.

In both cases, a set point and a differential can be set; the operation of the corresponding output is shown in the figure for direct mode, with the cut-off function also enabled:

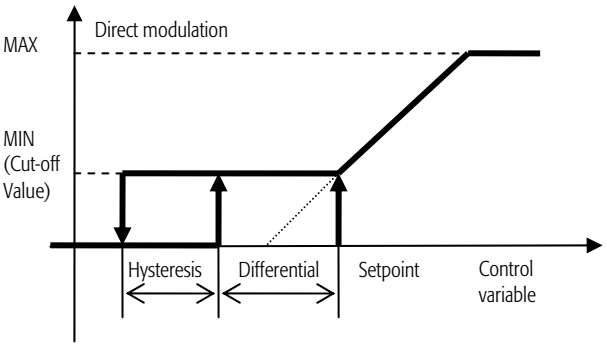


Fig. 6.6.e

If an enabling variable has been set, the corresponding output is active if the enabling is also active.

For each modulation, a high alarm threshold and a low alarm threshold can be set, and are absolute. For each alarm, the activation delay and priority can be set. See chapter 8 for details on the alarms.

For modulation a minimum and maximum value can also be set for the output, and the cut-off function can be enabled, with operation as shown in the previous figure.

Alarms

pRack PR100 can manage up to 2 alarm functions, with settable digital variable to be monitored, activation delay, priority and description.

One example of using the generic alarm functions involves detecting gas leaks.

Scheduler
pRack PR100 can manager a generic scheduler that activates a digital output at certain time bands.
Up to 4 daily time bands can be set for each day of the week, in addition operation of the generic scheduler can be linked to the common scheduler, and consequently the output activated based on:

- summer/winter
- up to 5 closing periods
- up to 10 special days

See paragraph 6.7.2 for details on the time bands.

6.6.5 ChillBooster

pRack PR100 can control the Carel ChillBooster, a device used to adiabatically cool the air that flows through the condenser.

ChillBooster can be enabled and the related parameters set in main menu branch E.g.

ChillBooster is activated when two conditions exist:

- the outside temperature exceeds a set threshold
- the fan control request is at the maximum for at least a settable number of minutes

The maximum request time starts counting again whenever the request decreases, therefore the request must remain at the maximum for at least the set time.
Activation ends when the request falls below a set threshold.

pRack PR100 can manage an alarm digital input from ChillBooster, the effect of which is to deactivate the device. For details see Chapter 8.

As the number of operating hours of ChillBooster is critical as regards formation of scale on the condenser, pRack PR100 can manage the operating hour threshold, which should be set to 200 hours.

Hygiene procedure
To avoid water stagnation in the pipes, a hygiene procedure can be enabled that activates ChillBooster every day for a set time, if the outside temperature is greater than a threshold.

Note: if the outside temperature probe is not configured or is configured but is not working, ChillBooster operates based solely on the control request, and the hygiene procedure can still be activated.
The only difference between probe not configured and probe not working concerns the ChillBooster operating without temperature probe alarm, which is only generated when the probe is configured but not working.

ChillBooster as the first stage in high pressure prevention
ChillBooster can be used to prevent high condensing pressure.

The parameters relating to this function can be set in branch G.b.a/G.b.b in the main menu, after having enabled the ChillBooster function.

For details on the prevent function see paragraph 8.3.3.

Operation of ChillBooster as the first stage in high pressure prevention is similar to the heat recovery function described in paragraph 6.6.3.

The function must be enabled and an offset must be set in relation to the prevent threshold, while the differential is the same as set for the prevent function.

6.6.6 Double line synchronisation (DSS)

pRack PR100 can manage, for two line configurations, several synchronisation functions between the two lines:

- Disable simultaneous starts
- Force the medium temperature line on if the low temperature line is activated
- Shutdown the low temperature line if the medium temperature line has a serious alarm

The three DSS functions can be enabled independently and are useful for booster or CO_2 cascade system configurations:

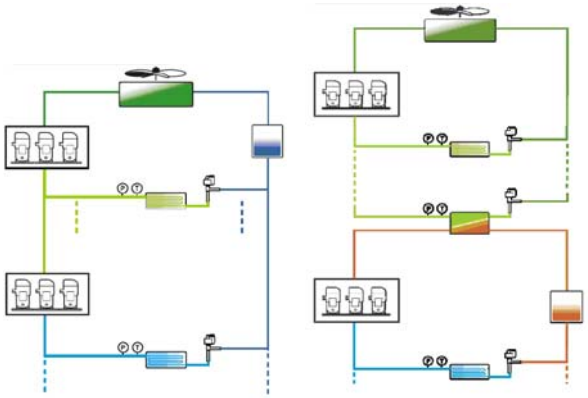


Fig. 6.6.f

Important: in the pRack PR100 software assumes that the medium temperature line is line L1, while the low temperature line is line L2.

DSS can be enabled and the related parameters set in main menu branch E.h.

Disable simultaneous starts
Disabling simultaneous starts may be useful for all system configurations with two separate lines and in cascade system configurations.

The function to avoid simultaneous starts can be enabled, setting a delay time between the starts of compressors on different lines.

Forcing the medium temperature line
Forcing the medium temperature line may be useful for cascade system configurations and involves, once enabled, forcing at least one compressor on medium temperature line L1 to start at minimum capacity, if at least one compressor on low temperature line L2 is running. This means that before the low temperature line starts, the DSS function forces at least one of the compressors on medium temperature line L1 to start.
The low temperature line L2 thus has higher priority than the control request for medium temperature line L1.

Shutdown the low temperature line
The low temperature line is shutdown by the DSS function if a serious alarm is activated on the medium temperature line.

Note: in the event of pLAN network faults, DSS is disabled.

6.6.7 Unit of measure

pRack PR100 can manage two units of measure, the international system and Imperial.

Note: the temperature and pressure units of measure can be changed from °C, barg to °F, psig only during start-up; mixed configurations are not allowed, for example °F and barg.

6.6.8 Sign of life

pRack PR100 can manage a digital output acting as a sign of life, activated when pRack PR100 is powered up.
This output remains active while the controller is working correctly and highlights any hardware faults.

The signal can be configured in main menu branch B.a.c.

6.6.9 Liquid non-return

pRack PR100 can manage a digital output with the meaning of liquid non-return.

The output is activated when all the compressors are off and no compressor can be started due to alarms or safety times, despite the control request being present. As soon as at least one compressor is enabled to start, the output is deactivated, allowing management of a liquid non-return valve.

The function can be configured in main menu branch C.a.g/C.b.g.

6.7 Settings

6.7.1 Clock

pRack PR100 features an internal clock with backup battery that keeps the time and date for all related functions (see Chapter 2 for details).

The date on pRack PR100 can be set as follows:

- day, month, year (dd/mm/yy)
- month, day, year (mm/dd/yy)
- year, month, day (yy/mm/dd)

The current date and time can be set, the day of the week corresponding to set date displayed, plus changeover to daylight saving can be enabled by setting the changeover date and the deviation.

The related parameters can be set during start-up or in main menu branch F.a.

Note: the date and time are managed on pRack boards with addresses 1 and 2; on power-up and whenever the pLAN network is reconnected, the software on pRack synchronises the settings on board 2, sending the date and time set on board 1.

If the clock card is not operating, an alarm is generated and the functions relating to the time bands described in the following paragraph are not available.

6.7.2 Time bands

pRack PR100 allows the operating seasons, the closing periods and weekends to only be set once, and consequently these are common to all the system functions.

As well as these settings, each function can be associated with a weekly scheduler, setting up to 4 different daily activation bands for each day of the week. For each time band, the start and end time can be set and settings made can be copied to the others days of the week.

The priority, from lowest to highest, is:

- weekly scheduler
- closing periods
- special days

For example, if the weekly scheduler requires activation of a function, yet a closing period is in progress, and requires deactivation of the same function, then the function is deactivated.

The following functions allow the setting of time bands:

- Split-condenser: the function is active only based on the operating seasons, and consequently special days, closing periods and daily time bands are ignored.
- Silencer: the function is only active with daily time bands, there is no link to operating seasons, special days and closing periods
- Heat recovery: the function is active with daily time bands, special days and closing periods, no link to operating seasons. The link to the general scheduler can be disabled, considering the time bands only.
- Set point compensation: active with operating seasons, special days, closing periods and daily time bands (two different offsets).
- Generic functions: the generic scheduling function is active with the operating seasons, special days, closing periods and daily time bands. Operation of the generic functions can be separated from the generic scheduler, considering the daily time bands only.

For details on the functions that use time bands, see the corresponding paragraphs.

6.8 Managing the default values

pRack PR100 can manage two different sets of default values:

- user defaults
- Carel defaults

The two functions can be activated in main menu branch I.d.

Important: after having reset the default values, the pRack pR100 board need to be switched off and on again.

6.8.1 Saving and resetting the user default values

pRack PR100 can save the exact configuration set by the user inside the instrument, allowing it to be recalled at any time.

All the set values are saved, therefore loading user defaults restores the exact same conditions that the pRack PR100 controller was in when the data were saved.

Note: only one user default configuration can be saved, therefore when the data is next saved, this overwrites the previous data.

Important: the Carel default reset procedure totally deletes the pRack PR100 permanent memory, and consequently is an irreversible operation.

Important: The user values cannot be reset after updating the software on the pRack PR100, nonetheless see Chapter 10 for details on how to save the parameters for versions different of the software.

6.8.2 Resetting the Carel default values

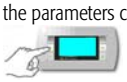
The Carel default values are shown in the Parameters table in Chapter 7.

The values pre-set by Carel can be installed at any time, restoring the pRack PR100 default settings, and requiring the startup procedure described in Chapter 4 to be repeated.

Important: the Carel default reset procedure totally deletes the pRack PR100 permanent memory, and consequently is an irreversible operation; nonetheless, the user settings can still be restored if these have already been saved. Given that pRack PR100, following the installation of the Carel default values requires the startup procedure to be repeated, select the first pre-configuration and then restore the user defaults.

7. PARAMETERS TABLE

"Mask index": indicates the unique address of each screen and consequently the path needed to reach the parameters available on this screen; for example, to reach the parameters corresponding to the suction pressure probe with mask index Bab01, proceed as follows:


Main menu → I/O B.In./Out. → a.Status → b.Analog.in.

Below is the table of the parameters that can be displayed on the terminal.
The values indicated with '---' are not significant or are not set, while the values indicated with '…' may vary according to the configuration, with the possible options visible on the user terminal. A row of '…' means that there are a series of parameters similar to the previous ones.

Note: Not all the screens and parameters shown in the table are always visible or can be set, the screens and parameters that are visible or can be set depend on the configuration and the access level.

Mask index	Display description	Description	Default	UOM	Values
---	Insert password	Password for access level management	0000 (User) 1234 (Service) 1234 (Manufacturer)0	---	0….9999
A.Unit status					
Ab12	Setpoint	Setpoint without compensation (suction line 1)	3.5 barg	…	…(**)
Ab13	Setpoint	Setpoint without compensation (condensing line 1)	12.0 barg	…	…(**)
Ab14	Setpoint	Setpoint without compensation (suction line 2)	3.5 barg	…	…(**)
Ab15	Setpoint	Setpoint without compensation (condensing line 2)	12.0 barg	…	…(**)
Ac01	Status (only visualization)	Unit status	Off from keypad	---	Waiting.. Unit On/ Off from alarm Off from blackout Off from BMS Off by default Off by DIN Off from keypad Manual oper. Prevent HP
	---	Keypad on-off (line 1)	OFF	---	OFF ON
Ac02	---	Unit status (display only)	Off from keypad	---	…(See above)
	---	Keypad on-off (line 1)	OFF	---	OFF ON
	---	Keypad on-off (line 2)	OFF	---	OFF ON
Ac03	Enable of unit OnOff By digit input	Enable unit On/Off from digit input (line 1)	NO	---	NO YES
	By supervisor	Enable unit On/Off from supervisor (line 1)	NO	---	NO YES
	By black out	Enable unit On/Off from black out (line 1)	NO	---	NO YES
Ac04	Unit on delay after blackout	System on delay after black out (line 1)	0	s	0…999
Ac05	DI	Unit On/Off DI position (line 1)	---	---	---, 01…18, B1…B10
	Status (only visualization)	Status of unit on/off DI (line 1)	---	---	Closed Open
	Logic	Logic of unit On/Off DI (line 1)	NC	---	NC NO
	Function (only visualization)	Unit On/Off by DI function status (line 1)	---	---	Not active Active
Ac06	Enable of unit OnOff By digit input	Enable unit On/Off by digit input (line 2)	NO	---	NO YES
…	…	…	…	…	…
Ac08	Function (only visualization)	Unit On/Off by DI function status (line 2)	---	---	Not active Active
I/O B.Input/Output *(See Paragraph A3 of the User Manual for the complete list of inputs and outputs available, the following are only examples)*					
Baa02	DI	Alarm 1 for compressor 1 DI position (line 1)	03	---	---, 01…18, B1…B10 (****)
	Status (only visualization)	Status of alarm 1 for compressor 1 DI (line 1)	---	---	Closed Open
	Logic	Logic of alarm 1 for compressor 1 DI (line 1)	NC	---	NC NO
	Function (only visualization)	Alarm 1 for compressor 1 function status (line 1)	---	---	Not active Active
…	…	…	…	…	…

Mask index	Display description	Description	Default	UOM	Values
Bab01	---	Suction pressure probe position (line1)	B1	---	---, B1…B10 (****)
	---	Suct pressure probe type (line 1)	4-20mA	---	---- 0-1V 0-10V 4-20mA 0-5V
	--- (only visualization)	Suction pressure value (line 1)	---	…	…(**)
	Upper value	Suct pressure maximum value (line 1)	7.0 barg	…	…(**)
	Lower value	Suct pressure minimum value (line 1)	-0.5 barg	…	…(**)
	Calibration	Suction pressure probe adjustment (line 1)	0.0 barg	…	…(**)
…	…	…	…	…	…
Bac02	Line relay DO	Compressor 1 line DO position and status (On/Off) display (line 1)	…	---	---, 01…29 (****)
	Part winding DO/ Star relay DO (*)	Compressor 1 part winding or star DO position and status (On/Off) display (line 1)	…	---	---, 01…29 (****)
	---/ Delta relay DO (*)	Compressor 1 delta DO position and status (On/Off) display (line 1)	…	---	---, 01…29 (****)
Bac03	DO	Compressor 1 unloader 1 DO position (line 1)	…	---	---, 01…29 (****)
	Status (only visualization)	Status for compressor 1 unloader 1 DO (line 1)	---	---	Closed Open
	Logic	Logic for compressor 1 unloader 1 DO (line 1)	NO	---	NC NO
	Function (only visualization)	Compressor 1 unloader 1 function status (line 1)	---	---	Not active Active
…	…	…	…	…	…
Bad01	AO	Compressor modulating device AO position (line 1)	0	---	---, 01…06 (****)
	Status (only visualization)	Modulating device output value (line 1)	0	%	0.0…100.0
…	…	…	…	…	…
Bb01	Suction L1	Suction line 1 in manual mode	DIS	---	DIS EN
	Suction L2	Suction line 2 in manual mode	DIS	---	DIS EN
	Discharge L1	Condenser line 1 in manual mode	DIS	---	DIS EN
	Discharge L2	Condenser line 2 in manual mode	DIS	---	DIS EN
	Timeout	Manual mode duration after last key pressed	10	min	0…500
Bba02	Compressor 1 Force to	Manual stages request for compressor 1 (line 1)	OFF	---	OFF ON 2 STAGES (*) 3 STAGES (*) 4 STAGES (*)
…	…	…	…	…	…
Bbb05	Compressor 1 Force to	Manual request for continuous capacity for compressor 1 (line 1)	0.0	%	0.0…100.0
….	….	…	…	…	…
Bc01	Test Dout	Enable DO test mode	NO	---	NO YES
	Timeout	Duration of test mode after last key pressed	10	min	0…500
Bc02	Test Aout	Enable AO test mode	NO	---	NO YES
	Timeout	Duration of test mode after last key pressed	10	min	0…500
Bca10	DO1	DO 1 test logic	NO	---	NO NC
	---	DO 1 test value	OFF	---	OFF ON
…	…	…	…	…	…
Bcb10	AO1	AO 1 test value	0.0	---	0.0…100.0
…	…	…	…	…	…
C.Compressors (*)					
Caa01	DI	Alarm 1 for compressor 1 DI position (line 1)	03	---	---, 01…18, B1…B10 (****)
	Status (only visualization)	Status of alarm 1 for compressor 1 DI (line 1)	---	---	Closed Open
	Logic	Logic of alarm 1 for compressor 1 DI (line 1)	NC	---	NC NO
	Function (only visualization)	Alarm 1 for compressor 1 function status (line 1)	---	---	Not active Active
…	…	…	…	…	…
Caa08	Line relay DO	Compressor 1 part winding or star DO position and status (On/Off) display (line 1)	…	---	---, 01…29 (****)

Mask index	Display description	Description	Default	UOM	Values
	Part winding DO/ Star relay DO (*)	Compressor 1 delta DO position and status (On/Off) display (line 1)	…	---	---, 01…29 (****)
	---/ Delta relay DO (*)	Compressor 1 line DO position and status (On/Off) display (line 1)	…	---	---, 01…29 (****)
…	…	…	…	…	…
Caa09	DO	Unloader 1 for compressor 1 DO position (line 1)	…	---	---, 01…29 (****)
	Status (only visualization)	Status of unloader 1 for compressor 1 DI (line 1)	---	---	Closed Open
	Logic	Logic of unloader 1 for compressor 1 DI (line 1)	NC	---	NC NO
	Function (only visualization)	Unloader 1 for compressor 1 function status (line 1)	---	---	Not active Active
…	…	…	…	…	…
Caa14	AO	Compressor modulating device AO position (line 1)	0	---	---, 01…06 (****)
	Status (only visualization)	Modulating device output value (line 1)	0	%	0.0…100.0
…	…	…	…	…	…
Caaa1	---	Suction pressure probe position (line1)	B1	---	---, B1…B10 (****)
	---	Suct pressure probe type (line 1)	4-20mA	---	---- 0-1V 0-10V 4-20mA 0-5V
	--- (only visualization)	Suction temperature value (line 1)	---	…	…(**)
	Upper value	Suct pressure maximum limit (line 1)	7.0 barg	…	…(**)
	Lower value	Suct pressure minimum limit (line 1)	-0.5 barg	…	…(**)
	Calibration	Suction pressure probe adjustment (line 1)	0.0 barg	…	…(**)
…	…	…	…	…	…
Cab01	Regulation by	Compressor control by temperature or pressure (line 1)	PRESSURE	---	PRESSURE TEMPERATURE
	Regulation type	Compressor control type (line 1)	DEAD ZONE	---	PROPORTIONAL BAND DEAD ZONE
Cab02	Minimum	Compressor setpoint lower limit (line 1)	…(**)	…	…(**)
	Maximum	Compressor setpoint higher limit (line 1)	…(**)	…	…(**)
Cab03	Setpoint	Compressor setpoint (line 1)	…(**)	…	…(**)
Cab04/Cab6 (**)	Reg.type	Type for proportional control (line 1)	PROPORTIONAL	---	PROPORTIONAL PROP.+INT.
	Integral time	Integral time for proportional control (line 1)	300	s	0…999
Cab05/Cab7 (**)	Differential	Differential for proportional control (line 1)	…(**)	…	…(**)
Cab08/Cab10 (**)	NZ diff.	Dead zone control differential (line 1)	…(**)	…	…(**)
	Activ.diff.	Dead zone control differential for device activation (line 1)	…(**)	…	…(**)
	Deact.diff.	Dead zone control differential for device deactivation (line 1)	…(**)	…	…(**)
Cab09/Cab11 (**)	En.force off power	Enable capacity immediate decreasing to 0 (line 1)	NO	---	NO YES
	Setp.for force off	Threshold for capacity decreasing to 0 (line 1)	…(**)	…	…(**)
Cab12	Power load to 100% min time	Minimum time to increase capacity request to 100%, dead zone control (suction line 1)	15	s	0…9999
	Power load to 100% max time	Maximum time to increase capacity request to 100%, dead zone control (suction line 1)	90	s	0…9999
Cab13	Power unload to 0% min time	Minimum time to decrease capacity request to 0%, dead zone control (suction line 1)	30	s	0…9999
	Power unload to 0% max time	Maximum time to decrease capacity request to 0%, dead zone control (suction line 1)	180	s	0…9999
Cac01	Compressor 1 Working hours	Compressor 1 operating hours (line 1)	---	---	0…999999
	(Check in …)	Compressor 1 remaining operating hours (line 1)	…	---	0…999999
…	…	…	…	…	…
Cac13	Compressor threshold Working hours	Compressor maintenance threshold hours (line 1)	88000	---	0…9999999
Cac14	Compressor hours reset	Reset compressor operating hours (line 1)	N	---	N Y
Cad01	Enable suction setpoint compensation	Enable setpoint compensation (suction line 1)	NO	---	NO YES
Cad02	Winter offset	Offset applied for Winter period	0.0	…	-999.9…999.9
	Closing offset	Offset applied for closing period	0.0	…	-999.9…999.9
Cad03	Enable setpoint compensation by	Enable scheduler setpoint compensation (suction line 1)	NO	---	NO YES

Mask index	Display description	Description	Default	UOM	Values
	scheduler				
Cad04	TB1: --:-- -> --:--	Time band 1 enabling and definition: start hour and minute, end hour and minute (suction line 1)	---	…	…
	…	…	…	…	…
	TB4: --:-- -> --:--	Time band 4 enabling and definition: start hour and minute, end hour and minute (suction line 1)	---	…	…
	Changes	Time band change action	---	---	--- CONFIRM&SAVE LOAD PREVIOUS CLEAR ALL
	Copy to	Copy settings to other days	0	---	MONDAY...SUNDAY; MON-FRI; MON-SAT; SAT&SUN; ALL DAYS
Cad05	Change set by DI	Enable setpoint compensation by digital input (suct/cond line 1)	NO	---	NO YES
Cad08	Enable floating suction setpoint	Enable floating setpoint (suction line 1)	NO	---	NO YES
Cad09	Maximum floating setpoint	Max compressor floating setpoint settable (line 1)	…(**)	…	…(**)
	Minimum floating setpoint	Minimum compressor floating setpoint settable (line 1)	…(**)	…	…(**)
Cad10	Max.setpoint variation accepted	Maximum delta admitted for floating setpoint (suction line 1)	…(**)	…	…(**)
	Offline decreasing time	Reduction time when supervisor is offline for floating setpoint (suction line 1)	0	min	0…999
Cae01	Number of alarms for each compressor	Number of alarms for each compressor (line 1)	1/4 (*)	---	0…4/7 (*)
Cae02	Alarm1 description	Selection of the first compressor alarm description: Generic, Overload, High pressure, Low pressure, Oil (line 1)	…	---	☒ (Not available) ☐ (Not selected) ☑ (Selected)
Cae03	Alarm1 description (*)	Selection of the first compressor alarm description: Rotation, Oil warning (line 1)	…	---	☒ (Not available) ☐ (Not selected) ☑ (Selected)
Cae04	Activ.delay	Activation delay for compressor alarm 1 during working (line 1)	0	s	0…999
	Start up delay	Activation delay for compressor alarm 1 at start up (line 1)	0	s	0…999
	Reset	Type of reset for compressor alarm 1 (line 1)	AUT.	---	AUT. MAN.
	Priority	Type of priority for compressor alarm 1 (line 1)	SERIOUS	---	LIGHT SERIOUS
…	…	…	…	…	…
Cae24	High alarm	High suction pressure alarm threshold	…(**)	…	…(**)
	Alarm diff.	High suction pressure alarm differential	…(**)	…	…(**)
Cae25	Suction pressure high alarm	Type of high suction pressure alarm threshold	ABSOLUTE	---	ABSOLUTE RELATIVE
	Alarm delay	High suction pressure alarm delay	120	s	0…999
Cae26	Low alarm	Low suction pressure alarm threshold	…(**)	…	…(**)
	Alarm diff.	Low suction pressure alarm differential	…(**)	…	…(**)
Cae27	Suction pressure low alarm	Type of low suction pressure alarm threshold	ABSOLUTE	---	ABSOLUTE RELATIVE
	Alarm delay	Low suction pressure alarm delay	30	s	0…999
Cae28	Enable oil temperature alarm management (*)	Enable Digital Scroll™ oil temperature alarm (line 1)	NO	---	NO YES
	Enable discharge temp. alarm management (*)	Enable Digital Scroll™ discharge temperature alarm (line 1)	NO	---	NO YES
Cae29	Low superheat alarm threshold	Threshold for low superheat alarm (line 1)	3.0	K	0.0…99.9
	Alarm diff.	Low superheat alarm differential (line 1)	1.0	K	0.0…9.9
	Alarm delay	Low superheat alarm delay (line 1)	30	s	0…999
Cae30	Time of semi-automatic alarm evaluation	Time of semi-automatic alarm evaluation for screw compressors out of envelope (line 1)	2	min	0…999
	N° of retries before alarms becomes manual	Number of retries before alarm becomes manual (line 1)	3	---	0…9
Caf02	Compressors type	Type of compressors (line 1)	RECIPROCATING	---	RECIPROCATING SCROLL SCREW
	Compressors number	Number of compressors (line 1)	2/3 (*)	---	1…6/12 (*)
Caf03	Cmp1,…	Enable compressors (line 1)	EN	---	EN DIS

Mask index	Display description	Description	Default	UOM	Values
Caf04	Refrigerant type	Type of refrigerant (suction Line 1)	R404A	---	R22 R134a R404A R407C R410A R507A R290 R600 R600a R717 R744 R728 R1270 R417A R422D
Caf05	Min on time	Minimum compressor on time (line 1)	30	s	0…999
	Min off time	Minimum compressor off time (line 1)	120	s	0…999
	Min time to start same compressor	Minimum time between same compressor starts (line 1)	360	s	0…999
Caf06	Ignition type	Type of compressors start up	DIRECT	---	DIRECT PART WINDING STAR DELTA
Caf07	Star time	Star relay run time	0	ms	0…9999
	Star line delay	Delay between star and line relay	0	ms	0…9999
	Star delta delay	Delay between star and delta relay	0	ms	0…9999
Caf08	Partwinding delay	Partwinding delay	0	ms	0…9999
Caf09	Equalization	Enable compressors equalization at start up	NO	---	NO YES
	Equalizat.time	Equalization duration	0	s	0…999
Caf10	Devices rotation type	Type of rotation	FIFO	---	------ FIFO LIFO TIME CUSTOM
Caf11	Dev.unload sequence	Unloader sequence in relation to compressor activation (C=compressor, p=unloader)	CpppCppp	---	-------- CCpppppp CpppCppp
Caf12	Load up time	Delay between different compressor starts	10	s	0…999
	Load down time	Delay between different compressor stops	0	s	0…999
	Unloader delay	Delay between stages	0	s	0…999
Caf13	Custom rotation ON order	Order of switch ON for compressor custom rotation	1	---	1…16
Caf14	Custom rotation OFF order	Order of switch OFF for compressor custom rotation	1	---	1…16
Caf15	Modulate speed device	Compressor driver type (line 1)	NONE	---	NONE INVERTER DIGITAL SCROLL STEPLESS SCREW
Caf16	Min.frequency	Minimum inverter frequency	30	Hz	0…150
	Max.frequency	Maximum inverter frequency	60	Hz	0…150
Caf17	Min on time	Compressor controlled by inverter minimum ON time (line 1)	30	s	0…999
	Min off time	Compressor controlled by inverter minimum OFF time (line 1)	60	s	0…999
	Min time to start same compressor	Compressor controlled by inverter minimum time between same compressor starts (line 1)	180	s	0…999
Caf18	Digital scroll comp. valve regulation	Digital Scroll™ comp. valve control type (line 1)	OPTIMISED CONTROL	---	OPTIMISED CONTROL CHANGEABLE CYCLE TIME CONSTANT CYCLE TIME
	Cycle time	Cycle time value (line 1)	13	s	12…20
Caf19	Oil dilution	Digital Scroll™, enable oil temperature alarm (line 1)	ENABLE	---	DISABLE ENABLE
	Disch.temper.	Digital Scroll™, enable discharge temperature alarm (line 1)	ENABLE	---	DISABLE ENABLE
Caf20	Compr.Manufacturer	Compressor manufacturer for screw compressors	GENERIC	---	GENERIC BITZER REFCOMP HANBELL
	Compressor series	Compressor series	…(***)	---	…(***)
Caf21	Number of valves	Number of valves used for capacity control	3	---	1…4
	Stages configuration	Stage configuration	25/50/75/100	%	100; 50/100; 50/75/100; 25/50/75/100; 33/66/100
Caf22	Common time	Enable common delay time (from one stage to the following)	DISABLE	---	DISABLE ENABLE
	Common time	Common delay time (from one stage and the following)	0	s	0…999
	From…to…	Minimum compressor delay time in order to reach each capacity stage from previous	…	s	0…999

Mask index	Display description	Description	Default	UOM	Values
Caf23	Intermittent valve time	Intermittent on/off time for capacity control valves	10	s	0…99
Caf24	Valve conf.	Configuration of the behaviour of the valves during start/stop and stages	…	---	O (ON) X (OFF) I (Intermittent) P (Pulsing)
Caf25	Limit comp.permanence at min power	Enable time limit at minimum capacity	ENABLE	---	DISABLE ENABLE
	Max.perman.time	Max time for compressor operation at minimum capacity	60	s	0…9999
	Lower limit for	Time to return to minimum after the compressor was forced to second stage after staying at minimum for maximum time	0	s	0…9999
Caf26	Min.output power	Minimum compressor capacity in case of high capacity range (usually 25%), only for continuous compressors	25	%	0…100
Caf27	Compressor start-up phase duration	Start-up phase time (after electric start-up)	10	s	0…999
	Maximum power	Maximum time in order to reach maximum compressor capacity (continuous capacity control)	120	s	0…999
	Minimum power	Minimum time in order to reach minimum compressor capacity (continuous capacity control)	120	s	0…999
Caf28	Intermittent	Intermittent on/off time for capacity control valves	10	s	0…99
	Puls.Period	Pulsing period for valves (for continuous compressors)	3	s	1…10
	Min.Puls.Incr.	Minimum pulse time for increase capacity (valves control)	0.5	s	0.0…9.9
	Max.Puls.Incr.	Maximum pulse time for increase capacity (valves control)	1.0	s	0.0…9.9
	Min.Puls.Decr.	Minimum pulse time for decrease capacity (valves control)	0.5	s	0.0…9.9
	Max.Puls.Decr.	Maximum pulse time for decrease capacity (valves control)	1.0	s	0.0…9.9
Caf29	Valve conf.	Configuration of the behaviour of the valves during start/stop, incr.min% to 100%, decr.100% to min%, standby, decr.100% to 50%	…	---	O (ON) X (OFF) I (Intermittent) P (Pulsing)
…	…	…	…	…	…
Caf90	Different sizes	Enable compressors of different sizes (line 1)	NO	---	NO/YES
	Different number of valves	Enable compressor capacity control (line 1)	NO	---	NO/YES
Caf91	S1	Enable size and size for compressor group 1 (line 1)	YES 10.0	--- kW	NO/YES. 0.0…500.0
	…	…	…	…	…
	S4	Enable size and size for compressor group 4 (line 1)	NO ---	--- kW	NO/YES. 0.0…500.0
Caf92	S1	Enable stages and stages for compressor group 1 (line 1)	YES 100	--- %	NO/YES. 100; 50/100; 50/75/100; 25/50/75/100; 33/66/100
	…	…	…	…	…
	S4	Enable stages and stages for compressor group 4 (line 1))	NO ---	--- kW	NO/YES. S1…S4
Caf93	C01	Size group for compressor 1 (line 1) or presence of inverter	S1	---	S1…S4/INV
	…	…	…	…	…
	C12	Size group for compressor 6 (line 1)	S1	---	S1…S4
Cag01	Minimum voltage	Voltage corresponding to the minimum capacity of the inverter (line 1)	0.0	Hz	0.0…10.0
	Maximum voltage	Voltage corresponding to the maximum capacity of the inverter (line 1)	10.0	Hz	0.0…10.0
	Nominal freq.	Nominal frequency (nominal capacity at nominal frequency) (line 1)	50	Hz	0…150
	Nominal power	Nominal capacity for compressor managed by inverter at nominal frequency (line 1)	10.0	kW	0.0…500.0
Cag02	Rising time	Time to pass from min capacity to max capacity for modulating device (line 1)	00	s	0…600
	Falling time	Time to pass from max capacity to min capacity for modulating device (line 1)	30	s	0…600
Cag03	Enable compressor modulation inside neutral	Enable compressor 1 modulation inside dead zone (line 1)	YES	---	NO YES

Mask index	Display description	Description	Default	UOM	Values
	zone				
Cag04	Enable suction press.backup probe	Enable screens for suction pressure backup probe configuration (line 1)	NO	---	NO YES
Cag05	Regulation value in case of probe fault	Compressor forcing value in case of suction probes fault (line 1)	50.0	%	0.0…100.0
Cag06	Enable anti return of liquid	Enable liquid non return function (line 1)	NO	---	NO YES
Cag07	Enable compressor envelop management (*)	Enable compressor envelope management	NO	---	NO YES
The following parameters refer to line 2, for details see the corresponding parameters for line 1 above					
Cba01	DI	Alarm 1 for compressor 1 DI position (line 2)	03	---	---, 01…18, B1…B10 (****)
	Status (only visualization)	Status of alarm 1 for compressor 1 DI (line 2)	---	---	Closed Open
	Logic	Logic of alarm 1 for compressor 1 DI (line 2)	NC	---	NC NO
	Function (only visualization)	Alarm 1 for compressor 1 function status (line 2)	---	---	Not active Active
…	…	…	…	…	…
Cbb01	Regulation by	Compressor control by temperature or pressure (line 2)	PRESSURE	---	PRESSURE TEMPERATURE
	Regulation type	Compressor control type (line 2)	DEAD ZONE	---	PROPORTIONAL BAND DEAD ZONE
…	…	…	…	…	…
Cbc01	Compressor 1 Working hours	Compressor 1 max operating hours (line 2)	0	---	0…999999
…	…	…	…	…	…
Cbd01	Enable suction setpoint compensation	Enable setpoint compensation (suction line 2)	NO	---	NO YES
…	…	…	…	…	…
Cbe01	Number of alarms for each compressor	Number of alarms for each compressor (line 2)	0	---	0…7 (*)
…	…	…	…	…	…
Cbf02	Compressors type	Type of compressors (line 1)	RECIPROCATING	---	RECIPROCATING SCROLL SCREW
	Compressors number	Number of compressors (line 1)	2/3 (*)	---	1…6/12 (*)
…	…	…	…	…	…
Cbg01	Mininum voltage	Voltage corresponding at the minimum capacity of the inverter (line 1)	0.0	Hz	0.0…10.0
	Maximum voltage	Voltage corresponding at the maximum capacity of the inverter (line 1)	10.0	Hz	0.0…10.0
	Nominal freq.	Nominal frequency (nominal capacity at nominal frequency) (line 1)	50	Hz	0…150
	Nominal power	Nominal capacity for compressor managed by inverter at nominal frequency (line 1)	10.0	kW	0.0…500.0
…	…	…	…	…	…
D.Condensers					
Daa01	DI	Fan 1 overload DI position (line 1)	…	---	---, 01…18, B1…B10 (****)
	Status (only visualization)	Status of fan 1 overload DI (line 1)	---	---	Closed Open
	Logic	Logic of fan 1 overload DI (line 1)	NC	---	NC NO
	Function (only visualization)	Fan 1 overload function status (line 1)	---	---	Not active Active
…	…	…	…	…	…
Daa18	---	Condensing pressure backup probe position (line1)	B1	---	---, B1…B10 (****)
	---	Condensing pressure backup probe type (line 1)	4-20mA	---	---- 0-1V 0-10V 4-20mA 0-5V
	--- (only visualization)	Condensing pressure backup probe value (line 1)	---	…	…(**)
	Upper value	Cond. pressure backup probe max. limit (line 1)	30.0 barg	…	…(**)
	Lower value	Cond. pressure backup probe min. limit (line 1)	0.0 barg	…	…(**)
	Calibration	Cond. pressure backup probe adjustment (line 1)	0.0 barg	…	…(**)
…	…	…	…	…	…
Daa21	DO	Fan 1 DO position (line 1)	03	---	---, 01…29 (****)

Mask index	Display description	Description	Default	UOM	Values
	Status (only visualization)	Status of fan 1 DO (line 1)	---	---	Closed Open
	Logic	Logic of fan 1 DO (line 1)	NC	---	NC NO
	Function (only visualization)	Fan 1 function status (line 1)	---	---	Not active Active
…	…	…	…	…	…
Daa38	AO	Inverter fan AO position (line 1)	0	---	---, 01…06 (****)
	Status (only visualization)	Inverter fan output value (line 1)	0	%	0.0…100.0
…	…	…	…	…	…
Dab01	Regulation by	Condenser control by temperature or pressure (line 1)	PRESSURE	---	PRESSURE TEMPERATURE
	Regulation type	Condenser control type (line 1)	PROPORTIONAL BAND	---	PROPORTIONAL BAND DEAD ZONE
Dab02	Minimum	Condenser setpoint lower limit (line 1)	…(**)	…	…(**)
	Maximum	Condensers setpoint higher limit (line 1)	…(**)	…	…(**)
Dab03	Setpoint	Condenser setpoint (line 1)	…(**)	…	…(**)
Dab04	Fan woks only when at least on compressor works	Enable fan operation linked to compressor operation	NO	---	NO YES
Dab05	Cut-Off enable	Enable fan cut-off function	NO	---	NO YES
	Cut-Off request	Cut-off value	0.0	%	0.0…100.0
Dab6/ Dab8 (**)	Reg.type	Type for proportional control (condensing line 1)	PROPORTIONAL	---	PROPORTIONAL PROP.+INT.
	Integral time	Integral time for prop. control (cond. line 1)	300	s	0…999
Dab7/ Dab9 (**)	Differential	Differential for proportional control (cond. line 1)	…(**)	…	…(**)
Dab10/Da b11 (**)	NZ diff.	Dead zone control differential (line 1)	…(**)	…	…(**)
	Activ.diff.	Dead zone control differential for device activation (line 1)	…(**)	…	…(**)
	Deact.diff.	Dead zone control differential for device deactivation (line 1)	…(**)	…	…(**)
Dab12/Da b13 (**)	En.force off power	Enable capacity immediate decreasing to 0 (line 1)	NO	---	NO YES
	Setp.for force off	Threshold for capacity decreasing to 0 (line 1)	…(**)	…	…(**)
Dab14	Power load to 100% min time	Minimum time to increase capacity request to 100%, dead zone control (condensing line 1)	15	s	0…9999
	Power load to 100% max time	Maximum time to increase capacity request to 100%, dead zone control (condensing line 1)	90	s	0…9999
Dab15	Power unload to 0% min time	Minimum time to decrease capacity request to 0%, dead zone control (condensing line 1)	30	s	0…9999
	Power unload to 0% max time	Maximum time to decrease capacity request to 0%, dead zone control (condensing line 1)	180	s	0…9999
Dad01	Enable condensing setpoint compensation	Enable setpoint compensation (condensing line 1)	NO	---	NO YES
Dad02	Winter offset	Enable setpoint compensation (condensing line 1)	0.0	…	-999.9…999.9
	Closing offset	Offset applied for Winter period	0.0	…	-999.9…999.9
Dad03	Enable setpoint compensation by scheduler	Enable scheduler setpoint compensation (condensing line 1)	NO	---	NO YES
Dad04	TB1: --:-- -> --:--	Time band 1 enabling and definition: start hour and minute, end hour and minute (suction line 1)	---	…	…
	…	…	…	…	…
	TB4: --:-- -> --:--	Time band 4 enabling and definition: start hour and minute, end hour and minute (suction line 1)	---	…	…
	Changes	Time band changes action	---	---	--- CONFIRM&SAVE LOAD PREVIOUS CLEAR ALL
	Copy to	Copy settings to other days	0	---	MONDAY...SUNDAY; MON-FRI; MON-SAT; SAT&SUN; ALL DAYS
Dad05	Enable floating condensing setpoint	Enable floating setpoint (condensing line 1)	NO	---	NO YES
Dad06	Offset for external temperature	Temperature delta for floating setpoint (condensing line 1)	0.0	…	-9.9…9.9
Dad07	Change set by digital input	Enable setpoint compensation by digital input (suct/cond line 1)	NO	---	NO YES
Dae01	Cond.pressure high alarm	Condenser high pressure threshold (line 1)	24.0 barg	…	…(**)

Mask index	Display description	Description	Default	UOM	Values
	Alarm diff.	Condenser high pressure differential (line 1)	1.0 barg	…	…(**)
Dae02	Cond.pressure high alarm	Type of alarm threshold for high condensing pressure (line 1)	ABSOLUTE	---	ABSOLUTE RELATIVE
	Alarm delay	High condensing pressure alarm delay (line 1)	60	s	0…999
Dae03	Cond.pressure low alarm	Condenser low pressure threshold (line 1)	7.0 barg	…	…(**)
	Alarm diff	Condenser low pressure differential (line 1)	1.0 barg	…	…(**)
Dae04	Cond.pressure low alarm:	Type of alarm threshold for low condensing pressure (line 1)	ABSOLUTE	---	ABSOLUTE RELATIVE
	Alarm delay	Low condensing pressure alarm delay (line 1)	30	s	0…999
Dae05	Common fan overload	Common fan overload (line 1)	YES	---	NO YES
Daf01	Number of present fans	Number of fans (line 1)	3	---	0…16
Daf02	Fan1	Enable fan 1 (line 1)	EN	---	DIS EN
…	…	…	…	…	…
Daf03	Fan16	Enable fan 16 (line 1)	---	---	DIS EN
Daf04	Refrigerant type	Type of refrigerant (condensing line 1)	R404A	---	R22 R134a R404A R407C R410A R507A R290 R600 R600a R717 R744 R728 R1270 R417A R422D
Daf05	Devices rotation type	Type of rotation devices (condensing line 1)	FIFO	---	------ FIFO LIFO TIME CUSTOM
Daf07, Daf08	Custom rotation ON order	Switch ON order for fans with custom rotation (condensing line 1)	1	---	1…16
Daf09, Daf10	Custom rotation OFF order	Switch OFF order for fans with custom rotation (condensing line 1)	1	---	1…16
Dag01	Modulate speed device	Fan driver type (line 1)	NONE	---	NONE INVERTER PHASE CONTROL
Dag02	Standby zone reg.	Fan control also inside dead zone (line 1)	NO	---	NO YES
	Min out value	Minimum voltage for compressor inverter (line 1)	0.0	V	0.0…9.9
	Max out value	Maximum voltage for compressor inverter (line 1)	10.0	V	0.0…99.9
	Min.power refer.	Minimum capacity of fan modulating device (line 1)	60	%	0…100
	Max.power refer.	Maximum capacity of fan modulating device (line 1)	100	%	0…999
Dag03	Rising Time	Time to pass from min capacity to max capacity for fan modulating device (line 1)	1200	s	0…32000
	Falling Time	Time to pass from max capacity to min capacity for fan modulating device (line 1)	1200	s	0…32000
	Num.control.fans	Number of fans under inverter (only for alarm enabling)	1	---	0…16
Dag04	Split Condenser	Enable split condenser (line 1)	NO	---	NO YES
	-Digital input	Split Condenser controlled by digital input (line 1)	---	---	NO YES
	-External temp.	Split Condenser controlled by outside temperature (line 1)	---	---	NO YES
	-Scheduler	Split Condenser controlled by scheduler (line 1)	---	---	NO YES
Dag05	Ext.Temp.Thr	Split condenser by outside temperature management setpoint (line 1)	10.0 °C	…	-99.9…99.9
	Ext.Temp.Diff	Split condenser by outside temperature management differential (line 1)	2.5 °C	…	-99.9…99.9
Dag06	Split Condenser Type	Fans enabled with split condenser (line 1)	CUSTOM	---	CUSTOM ODD EVEN GREATER THAN LESS THAN

Mask index	Display description	Description	Default	UOM	Values
	---	Only when enabling type is GREATER THAN or LESS THAN, number of fans to consider for splitting (line 1)	0	---	0…16
Dag08	TB1: --:-- -> --:--	Time band 1 enabling and definition: start hour and minute, end hour and minute (condensing line 1)	---	…	…
	…	…	…	…	…
	TB4: --:-- -> --:--	Time band 4 enabling and definition: start hour and minute, end hour and minute (condensing line 1)	---	…	…
	Changes	Time band changes action	---	---	--- CONFIRM&SAVE LOAD PREVIOUS CLEAR ALL
	Copy to	Copy settings to other days	0	---	MONDAY...SUNDAY; MON-FRI; MON-SAT; SAT&SUN; ALL DAYS
Dag09	Disable split condenser as first stage of HP pressostat	Disable split condenser when high condensing pressure prevent occurs (line 1)	NO	---	NO YES
	for	Duration of split condenser deactivation for high condensing pressure prevent (line 1)	0	h	0…24
Dag10	Anti-noise	Enable silencer (line 1)	DISABLED	---	DISABLED ENABLED
	Max output	Maximum request allowed when silencer function is active (line 1)	75.0 %	%	0.0…100.0
	-Digital input	Silencer controlled by digital input (condensing line 1)	NO	---	NO YES
	-Scheduler	Silencer controlled by scheduler (condensing line 1)	NO	---	NO YES
Dag12	TB1: --:-- -> --:--	Time band 1 enabling and definition: start hour and minute, end hour and minute (condensing line 1)	---	…	…
	…	…	…	…	…
	TB4: --:-- -> --:--	Time band 4 enabling and definition: start hour and minute, end hour and minute (condensing line 1)	---	…	…
	Changes	Time band changes action	---	---	--- CONFIRM&SAVE LOAD PREVIOUS CLEAR ALL
	Copy to	Copy settings to other days	0	---	MONDAY...SUNDAY; MON-FRI; MON-SAT; SAT&SUN; ALL DAYS
Dag13	Speed Up	Enable speed up (condensing line 1)	YES	---	NO YES
	Speed Up time	Speed up time (condensing line 1)	5	s	0…60
	Ext.Temp.Manage	Enable speed up management by outside temperature (condensing line 1)	DIS	---	DIS EN
	Ext.Temp.Thr.	Outside temperature threshold for speed up management (condensing line 1)	25.0 °C	…	-99.9…99.9
	Ext.Temp.Diff.	Outside temperature differential for speed up management (condensing line 1)	2.5 °C	…	-99.9…99.9
Dag14	Enable Condensing press.backup probe	Enable the screens for condensing pressure backup probe configuration (condensing line 1)	NO	---	NO YES
Dag15	Regulation value in case of probe fault	Value of fans forcing in case of condensing probes fault (line 1)	50.0	%	0.0…100.0
The following parameters refer to line 2, for details see the corresponding parameters for line 1 above					
Dba01	DI	Fan 1 overload DI position (line 1)	…	---	---, 01…18, B1…B10 (****)
	Status (only visualization)	Status of fan 1 overload DI (line 1)	---	---	Closed Open
	Logic	Logic of fan 1 overload DI (line 1)	NC	---	NC NO
	Function (only visualization)	Fan 1 overload function status (line 1)	---	---	Not active Active
…	…	…	…	…	…
Dbb01	Regulation by	Condenser control by temperature or pressure (line 1)	PRESSURE	---	PRESSURE TEMPERATURE
	Regulation type	Condenser control type (line 1)	PROPORTIONAL BAND	---	PROPORTIONAL BAND DEAD ZONE
…	…	…	…	…	…
Dbd01	Enable condensing setpoint compensation	Enable setpoint compensation (condensing line 1)	NO	---	NO YES
…	…	…	…	…	…
Dbe01	Cond.pressure high alarm	Condenser high pressure threshold (line 1)	24.0 barg	…	…(**)

Mask index	Display description	Description	Default	UOM	Values
	Alarm diff.	Condenser high pressure differential (line 1)	1.0 barg	…	…(**)
…	…	…	…	…	…
Dbf01	Number of present fans	Number of fans (line 1)	3	---	0…16
…	…	…	…	…	…
Dbg01	Modulate speed device	Fan driver type (line 1)	NONE	---	NONE INVERTER PHASE CONTROL
…	…	…	…	…	…
E.Other funct.					
Eaaa04	---	Oil temperature probe position (line1)	B1	---	---, B1…B10 (****)
	---	Oil temperature probe type (line 1)	4-20mA	---	--- NTC PT1000 0-1V 0-10V 4-20mA 0-5V HTNTC
	--- (only visualization)	Oil temperature probe value (line 1)	---	…	…(**)
	Upper value	Oil temperature probe max. limit (line 1)	30.0 barg	…	…(**)
	Lower value	Oil temperature probe min. limit (line 1)	0.0 barg	…	…(**)
	Calibration	Oil temperature probe adjustment (line 1)	0.0 barg	…	…(**)
…	…	…	…	…	…
Eaab04	Oil pumps number	Number of oil pumps for common oil cooler (line 1)	0	---	0…1 (analogue output) 0…2 (digital output)
	Enable Aout pump	Enable AO of common oil cooler pump (line 1)	YES	---	NO (digital output) YES (analogue output)
Eaab05	Setpoint	Common oil cooler setpoint (line 1)	0.0 °C	…	…(**)
	Differential	Common oil cooler differential (line 1)	0.0 °C	…	-9.9…9.9
Eaab06	Pump start delay	Time delay before the start-up of pump 2 after pump1 turns on (line 1)	0	s	0…999
Eaab07	Oil pumps number	Screw compressors: number of oil cooler pumps enabled (line1)	0	---	0…1 (analogue output) 0…2 (digital output)
	Enable Aout pump	Screw compressors: enable AO for oil cooler pump (line 1)	YES	---	NO (digital output) YES (analogue output)
Eaab08	Setpoint	Screw compressors: oil temperature setpoint (line 1)	0.0	°C/°F	…
	Differential	Screw compressors: oil temperature differential (line 1)	0.0	°C/°F	…
Eaab09	Threshold	Common oil high temperature alarm threshold (line 1)	100.0 °C	°C/°F	…
	Differential	Common oil high temperature alarm differential (line 1)	10.0 °C	°C/°F	…
	Delay	Common oil high temperature alarm delay (line 1)	120.0 °C	s	0…32767
Eaab10	En.oil lev.manag.	Enable oil level management (line 1)	NO	---	NO YES
	Num.alarm oil level	Number of compressor alarm associated with oil level (line 1)	0	---	0…4/7 (*)
Eaab11	Time open	Opening time of the valve for oil level (line 1)	0	s	0…999
	Time close	Closing time of the valve for oil level (line 1)	0	s	0…999
	Time max	Maximum time allowed to reach oil level (line 1)	0	s	0…999
Ebaa01	DO	Subcooling valve DO position (line 1)	…	---	---, 01…29 (****)
	Status (only visualization)	Status of subcooling valve DO (line 1)	---	---	Closed Open
	Logic	Logic of subcooling valve (line 1)	NO	---	NC NO
	Function (only visualization)	Subcooling valve function status (line 1)	---	---	Not active Active
Ebab01	Subcooling contr.	Enable subcooling function (line 1)	NO	---	NO YES
	---	Subcooling control type (line 1)	BY COND&LIQUID. TEMP.	---	BY COND&LIQUID.TEMP. ONLY BY LIQUID TEMP.
	Threshold	Threshold for subcooling control (line 1)	0.0 °C	…	-9999.9…9999.9
	Subcooling (only visualization)	Subcooling value (line 1)	0.0 °C	…	-999.9…999.9
Ecab04 (*)	Economizer	Enable economizer function (line 1)	NO	---	NO YES
	Compr.Power Thr.	Capacity percentage threshold for economizer activation (line 1)	0	%	0…100

Mask index	Display description	Description	Default	UOM	Values
	Cond.Temp.Thr.	Condensing temperature threshold for economizer activation (line 1)	0.0 °C	…	-999.9…999.9
	Disch.Temp.Thr.:	Discharge temperature threshold for economizer activation (line 1)	0.0 °C	…	-999.9…999.9
Ecab05 (*)	Economizer	Enable economizer function for screw compressor 1 (line 1)	NO	---	NO SI
	Setpoint	Setpoint for economizer function with discharge temperature for screw compressor 1	…(**)	…	…(**)
	Differential	Differential for economizer function with discharge temperature for screw compressor 1	…(**)	…	…(**)
Ecab06 (*)	Pot.min.attivaz.	Minimum screw compressor 1 capacity for economizer activation	75	%	0; 25; 50; 75; 100
	Contr.press.cond.	Enable economizer function with condensing temperature for screw compressor 1	DIS	---	DIS AB
	Setpoint	Setpoint for economizer function with condensing temperature for screw compressor 1	60.0	°C/°F	…
	Differenz.	Differential for economizer function with condensing temperature for screw compressor 1	5.0	°C/°F	…
…	…	…	…	…	…
Edaa01	---	Compressor 1 discharge temperature probe position (line1)	B1	---	---, B1…B10 (****)
	---	Compressor 1 discharge temperature probe type (line 1)	4-20mA	---	--- NTC PT1000 0-1V 0-10V 4-20mA 0-5V HTNTC
	--- (only visualization)	Compressor 1 discharge temperature probe value (line 1)	---	…	…(**)
	Upper value	Compressor 1 discharge temperature probe max. limit (line 1)	30.0 barg	…	…(**)
	Lower value	Compressor 1 discharge temperature probe min. limit (line 1)	0.0 barg	…	…(**)
	Calibration	Compressor 1 discharge temperature probe adjustment (line 1)	0.0 barg	…	…(**)
…	…	…	…	…	…
Edaa07	DO	Compressor 1 injection valve DO position (line 1)	…	---	---, 01…29 (****)
	Status (only visualization)	Status of compressor 1 injection valve DO (line 1)	---	---	Closed Open
	Logic	Logic of compressor 1 injection valve (line 1)	NO	---	NC NO
	Function (only visualization)	Compressor 1 injection valve function status (line 1)	---	---	Not active Active
Edab01	Liquid Injection	Select valve function	NONE	---	NONE LIQUID INJECTION ECONOMIZER
	Setpoint	Setpoint to manage liquid injection (line 1)	…(**)	…	…(**)
	Differential	Differential to manage liquid injection (line 1)	…(**)	…	…(**)
Edab02	Alarm setp.	Discharge temperature alarm threshold (line 1)	85.0 °C	…	… (**)
	Differential	Discharge temperature alarm differential (line 1)	5.0	…	… (**)
Eeaa02	Din position	Heat recovery from digital input DI position (line 1)	…	---	---, 01…18, B1…B10 (****)
	Status	Status of heat recovery DI (line 1)	---	---	Closed Open
	Logic	Logic of heat recovery DI (line 1)	NC	---	NC NO
	Function	Status of heat recovery from digital input DI function (line 1)	---	---	Not active Active
Eeaa03	DO	Heat recovery pump DO position (line 1)	---	---	---, 01…29
	…	…	…	…	…
	Function	Status of heat recovery pump (line 1)	---	---	Not active Active
Eeaa04	AO	Heat recovery damper DO position (line 1)	---	---	---, 01…29
	…	…	…	…	…
	Status	Heat recovery damper output (line 1)	---	---	Not active Active
Eeab01	Enable Heat Reclaim	Enable heat recovery function (line 1)	NO	---	NO YES

Mask index	Display description	Description	Default	UOM	Values
Eeab02	Condensing Pressure Lower Limit	Condensing pressure lower limit for heat recovery (line 1)	0.0 barg	…	… (**)
Eeab03	Modulation by temperature	Enable heat recovery control by discharge temperature (line 1)	NO	---	NO YES
Eeab04	Setpoint	Heat recovery: discharge temperature setpoint (line 1)	0.0 °C	…	… (**)
	Differential	Heat recovery: discharge temperature differential (line 1)	0.0 °C	…	0.0…99.9
Eeab05	Enable activation by Scheduler	Enable heat recovery control by scheduler (line 1)	NO	---	NO YES
Eeab06	TB1: --:-- -> --:--	Time band 1 enabling and definition: start hour and minute, end hour and minute (condensing line 1)	---	…	…
	…	…	…	…	…
	TB4: --:-- -> --:--	Time band 4 enabling and definition: start hour and minute, end hour and minute (condensing line 1)	---	…	…
	Changes	Time band changes action	---	---	--- CONFIRM&SAVE LOAD PREVIOUS CLEAR ALL
	Copy to	Copy settings to other days	0	---	MONDAY...SUNDAY; MON-FRI; MON-SAT; SAT&SUN; ALL DAYS
Efa05	Gen.Funct.1	Enable generic stage function 1	DISABLE	---	DISABLE ENABLE
	…	..	…	…	…
	Gen.Funct.5	Enable generic stage function 5	DISABLE	---	DISABLE ENABLE
Efa06	Regulation variable	Control variable for generic stage function 1	---	---	…
	Mode	Direct or reverse control	DIRECT	---	DIRECT REVERSE
Efa07	Enable	Enabling variable for generic stage function 1	---	---	…
	Description:	Enable description change	SKIP	---	SKIP CHANGE
	----------	Description	---	---	…
Efa08	Setpoint	Setpoint for generic stage function 1	0.0 °C	…	… (**)
	Differential	Differential for generic stage function 1	0.0 °C	…	… (**)
Efa09	High alarm	High alarm enabling for generic stage function 1	DISABLE	---	DISABLE ENABLE
	High alarm	High alarm threshold for generic stage function 1	0.0 °C	…	… (**)
	Delay time	High alarm delay for generic stage function 1	0	s	0…9999
	Low alarm	Low alarm enabling for generic stage function 1	DISABLE	---	DISABLE ENABLE
	Low alarm	Low alarm threshold for generic stage function 1	0.0 °C	…	… (**)
	Delay time	Low alarm delay for generic stage function 1	0	s	0…9999
…	…	…	…	…	…
Efb05	Gen.Modulat.1	Enable generic modulating function 1 management	DISABLE	---	DISABLE ENABLE
	Gen.Modulat.2	Enable generic modulating function 2 management	DISABLE	---	DISABLE ENABLE
Efb06	Regulation variable	Control variable for generic modulating function 1	---	---	…
	Mode	Direct or reverse modulation	DIRECT	---	DIRECT REVERSE
Efb07	Enable	Enabling variable for generic modulating function 1	---	---	…
	Description	Enable description change	SKIP	---	SKIP CHANGE
	----------	Description	---	---	…
Efb08	Setpoint	Setpoint for generic modulating function 1	0.0 °C	…	… (**)
	Differential	Differential for generic modulating function 1	0.0 °C	…	… (**)
Efb09	High alarm	High alarm enabling for generic modulating function 1	DISABLE	---	DISABLE ENABLE
	High alarm	High alarm threshold for generic modulating function 1	0.0 °C	…	… (**)
	Delay time	High alarm delay for generic modulating function 1	0	s	0…9999
	Low alarm	Low alarm enabling for generic modulating function 1	DISABLE	---	DISABLE ENABLE

Mask index	Display description	Description	Default	UOM	Values
	Low alarm	Low alarm threshold for generic modulating function 1	0.0 °C	…	… (**)
	Delay time	Low alarm delay for generic modulating function 1	0	s	0…9999
Efb010	Out upper limit	Output upper limit for generic modulating function 1	100.0	%	0…100
	Out lower limit	Output lower limit for generic modulating function 1	0.0	%	0…100
	Enable cutoff	Enable cut off function for generic modulating function 1	NO	---	NO YES
	Cutoff diff	Cut off differential for generic modulating function 1	0.0 °C	…	… (**)
	Cutoff hys.	Cut off hysteresis for generic modulating function 1	0.0 °C	…	… (**)
…	…	…	…	…	…
Efc05	Gen.Alarm 1	Enable generic alarm function 1 management	DISABLE	---	DISABLE ENABLE
	Gen.Alarm 2	Enable generic alarm function 2 management	DISABLE	---	DISABLE ENABLE
Efc06	Regulation variable	Monitored variable for generic alarm function 1	---	---	…
	Enable	Enabling variable for generic alarm function 1	---	---	…
	Description	Enable description change	SKIP	---	SKIP CHANGE
	----------	Description	---	---	…
Efc07	Alarm type	Alarm type for generic alarm function 1	NORMAL	---	NORMAL SERIOUS
	Delay time	Delay for generic alarm function 1	0	s	0…9999
…	…	…	…	…	…
Efd05	Generic function scheduler	Enable generic scheduler function	DISABLE	---	DISABLE ENABLE
	Gen.func.scheduling connected to global scheduling	Generic scheduler function considers the same special days and periods of global scheduler	NO	---	NO YES
Efd06	Enable	Enabling variable for generic scheduler function	---	---	…
Efd07	TB1: --:-- -> --:--	Time band 1 enabling and definition: start hour and minute, end hour and minute (suction line 1)	---	…	…
	…	…	…	…	…
	TB4: --:-- -> --:--	Time band 4 enabling and definition: start hour and minute, end hour and minute (suction line 1)	---	…	…
	Changes	Time band changes action	---	---	--- CONFIRM&SAVE LOAD PREVIOUS CLEAR ALL
	Copy to	Copy settings to other days	0	---	MONDAY...SUNDAY; MON-FRI; MON-SAT; SAT&SUN; ALL DAYS
Efe05	Gen.A Measure	Generic analogue input A unit of measure selection	°C	---	°C; °F; barg; psig; %; -
	…	…	…	…	…
Efe06/Efe 07 (**)	---	Generic probe A position	B1	---	---, B1…B10 (****)
	---	Generic probe A type	4-20mA	---	…(**)
	--- (only visualization)	Generic probe A value	---	…	…(**)
	Upper value	Generic probe A max. limit	30.0 barg	…	…(**)
	Lower value	Generic probe A min. limit	0.0 barg	…	…(**)
	Calibration	Generic probe A adjustment	0.0 barg	…	…(**)
…	...	...	…	…	…
Eeaa02	DI	Generic digital input F DI position	---	---	---, 01…18, B1…B10 (****)
	Status	Status of generic digital input F DI	---	---	Closed Open
	Logic	Logic of generic digital input F DI	NC	---	NC NO
	Function	Status of generic digital input F DI	---	---	Not active Active
…	...	...	…	…	…
Efe21	DO	Generic stage 1 DO position	…	---	---, 01…29 (****)
	Status (only visualization)	Status of generic stage 1 DO	---	---	Closed Open
	Logic	Logic of generic stage 1 DO	NO	---	NC NO

Mask index	Display description	Description	Default	UOM	Values
	Function (only visualization)	Generic stage 1 DO function status	---	---	Not active Active
…	…	…	…	…	…
Efe29	Modulating1	Generic modulating 1 AO position	0	---	---, 01…06 (****)
	Status (only visualization)	Generic modulating 1 output value	0	%	0.0…100.0
…	…	…	…	…	…
Egaa01	DI	ChillBooster fault DI position (line 1)	---	---	---, 01…18, B1…B10 (****)
	Status	Status of ChillBooster fault DI (line 1)	---	---	Closed Open
	Logic	Logic of ChillBooster fault DI (line 1)	NC	---	NC NO
	Function	Status of ChillBooster fault (line 1)	---	---	Not active Active
Egaa02	DO	ChillBooster DO position (line 1)	…	---	---, 01…29 (****)
	Status (only visualization)	Status of ChillBooster DO (line 1)	---	---	Closed Open
	Logic	Logic of ChillBooster DO (line 1)	NO	---	NC NO
	Function (only visualization)	Status of ChillBooster function (line 1)	---	---	Not active Active
Egab01	Device present	Enable ChillBooster function (line 1)	NO	---	NO YES
	Deactivation when fans power falls under	Fan capacity under which ChillBooster is deactivated (line 1)	95	%	0…100
Egab02	Before the activation, fans at max for	Fans work at maximum capacity at least for this time before ChillBooster activation (line 1)	5	min	0…300
	Ext.Temp.Thr	Outside temperature threshold for ChillBooster activation (line 1)	30.0 °C	…	…(**)
Egab03	Sanitary proc.	Enable hygiene procedure (line 1)	DISABLE	---	DISABLE ENABLE
	Start at	Hygiene procedure starting time (line 1)	00:00	---	…
	Duration	Hygiene procedure duration (line 1)	0	min	0…30
	Ext.temp.thr	Outside temperature threshold for hygiene procedure activation (line 1)	5.0 °C	…	…(**)
Egab04	Chillbooster requires maintenance after	ChillBooster maximum running time (line 1)	200	h	0…999
	Reset maintenance time	ChilllBooster maintenance time reset (line 1)	NO	---	NO YES
Ehb01	Avoid simultaneous pulse betw. lines	Enable simultaneous compressor start up inhibition	NO	---	NO YES
	Delay	Delay between start up for compressors on different lines	0	s	0…999
Ehb03	Force off L2 Comp.s for line 1 fault	Enable line 2 compressor switch OFF due to line 1 compressor fault	NO	---	NO YES
	Delay	Delay for line 2 compressor switch off after serious alarm on line 1 compressors	0	s	0…999
Ehb04	Switch on L1 Comp.s for L2 activation	Enable line 1 compressor switch ON due to line 2 compressor switch ON	NO	---	NO YES
	Delay	Delay for line1 compressor switch on for line 2 compressor switch on	0	s	0…999
The following parameters refer to line 2, for details see the corresponding parameters for line 1 above					
Eaba04	---	Oil temperature probe position (line 2)	B1	---	---, B1…B10 (****)
	---	Oil temperature probe type (line 2)	4-20mA	---	--- NTC PT1000 0-1V 0-10V 4-20mA 0-5V HTNTC
	--- (only visualization)	Oil temperature probe value (line 2)	---	…	…(**)
	Upper value	Oil temperature probe max. limit (line 2)	30.0 barg	…	…(**)
	Lower value	Oil temperature probe min. limit (line 2)	0.0 barg	…	…(**)
	Calibration	Oil temperature probe adjustment (line 2)	0.0 barg	…	…(**)
…	…	…	…	…	…
Eabb04	Oil pumps number	Number of oil pumps for common oil cooler (line 2)	0	---	0…1 (analogue output) 0…2 (digital output)
	Enable Aout pump	Enable AO of common oil cooler pump (line 2)	YES	---	NO (digital output) YES (analogue output)
…	…	…	…	…	…
Ebba01	DO	Subcooling valve DO position (line 1)	…	---	---, 01…29 (****)

Mask index	Display description	Description	Default	UOM	Values	
	Status (only visualization)	Status of subcooling valve DO (line 1)	---	---	Closed Open	
	Logic	Logic of subcooling valve (line 1)	NO	---	NC NO	
	Function (only visualization)	Subcooling valve function status (line 1)	---	---	Not active Active	
…	…	…	…	…	…	..
Ebbb01	Subcooling contr.	Enable subcooling function (line 1)	NO	---	NO YES	
	---	Subcooling control type (line 1)	BY COND&LIQUID. TEMP.	---	BY COND&LIQUID.TEMP. ONLY BY LIQUID TEMP.	
	Threshold	Threshold for subcooling control (line 1)	0.0 °C	…	-9999.9…9999.9	
	Subcooling (only visualization)	Value of subcooling (line 1)	0.0 °C	…	-999.9…999.9	
…	…	…	…	…	…	..
Ecbb04	Economizer	Enable economizer function (line 2)	NO	---	NO YES	
	Compr.Power Thr.	Capacity percent threshold for economizer activation (line 2)	0	%	0…100	
	Cond.Temp.Thr.	Condensing temperature threshold for economizer activation (line 2)	0.0 °C	…	-999.9…999.9	
	Disch.Temp.Thr.:	Discharge temperature threshold for economizer activation (line 2)	0.0 °C	…	-999.9…999.9	
…	…	…	…	…	…	..
Edba01	---	Compressor 1 discharge temperature probe position (line 2)	B1	---	---, B1…B10 (****)	
	---	Compressor 1 discharge temperature probe type (line 2)	4-20mA	---	--- NTC PT1000 0-1V 0-10V 4-20mA 0-5V HTNTC	
	--- (only visualization)	Compressor 1 discharge temperature probe value (line 2)	---	…	…(**)	
	Upper value	Compressor 1 discharge temperature probe max. limit (line 2)	30.0 barg	…	…(**)	
	Lower value	Compressor 1 discharge temperature probe min. limit (line 2)	0.0 barg	…	…(**)	
	Calibration	Compressor 1 discharge temperature probe adjustment (line 2)	0.0 barg	…	…(**)	
…	…	…	…	…	…	
Edbb01	Liquid Injection	Enable liquid injection function (line 2)	DIS	---	DIS EN	
	Threshold	Liquid injection setpoint (line 2)	70.0 °C	…	… (**)	
	Differential	Liquid injection differential (line 2)	5.0	…	… (**)	
…	…	…	…	…	…	
Eeba02	Din position	Heat recovery from digital input DI position (line 2)	…	---	---, 01…18, B1…B10 (****)	
	Status	Status of heat recovery DI (line 2)	---	---	Closed Open	
	Logic	Logic of heat recovery DI (line 2)	NC	---	NC NO	
	Function	Status of heat recovery from digital input DI function (line 2)	---	---	Not active Active	
Eebb01	Enable Heat Reclaim	Enable heat recovery function (line 2)	NO	---	NO YES	
…	…	…	…	…	…	
Egba01	DI	ChillBooster fault DI position (line 2)	---	---	---, 01…18, B1…B10 (****)	
	Status	Status of ChillBooster fault DI (line 2)	---	---	Closed Open	
	Logic	Logic of ChillBooster fault DI (line 2)	NC	---	NC NO	
	Function	Status of ChillBooster fault DI (line 21)	---	---	Not active Active	
…	…	…	…	…	…	
Egbb01	Device present	ChillBooster function enable (line 2)	NO	---	NO YES	

Mask index	Display description	Description	Default	UOM	Values
	Deactivation when fans power falls under	Fans capacity under which ChillBooster is deactivated (line 2)	95	%	0…100
…	…	…	…	…	…
F.Settings					
Faaa01	Summer/Winter	Enable Summer/Winter period management (line 1)	NO	---	NO YES
	Special days	Enable special days management (line 1)	NO	---	NO YES
	Holiday periods	Enable holiday period management (line 1)	NO	---	NO YES
Faaa02	Begin	Summer period beginning date (line 1)	---	---	01/JAN…31/DEC
	End	Summer period end date (line 1)	---	---	01/JAN…31/DEC
Faaa03	Day 01	Special day 1 date (line 1)	---	---	01/JAN…31/DEC
…	…	…	…	…	…
Faaa04	Day 10	Special day 10 date (line 1)	---	---	01/JAN…31/DEC
Faaa05	P1	Holiday period P1 beginning date (line 1)	---	---	01/JAN…31/DEC
	---	Holiday period P1 end date (line 1)	---	---	01/JAN…31/DEC
	…	…	…	…	…
	P5	Holiday period P5 beginning date (line 1)	---	---	01/JAN…31/DEC
	---	Holiday period P5 end date (line 1)	---	---	01/JAN…31/DEC
Faab01	Date format	Date format	dd/mm/yy	---	---- dd/mm/yy mm/dd/yy yy/mm/dd
Faab02/Faab03/Faab04	Hour	Hour and minute	…	…	…
	Date	Date	…	…	…
	Day (only visualization)	Day of the week calculated from current date	…	…	Monday… Sunday
Faab05	Daily saving time	Enable daylight saving time	ENABLE	---	DISABLE ENABLE
	Transition time	Offset time	60	---	0…240
	Start	Starting week, day and month and hour for daylight saving time	…	…	…
	End	End week, day and month and hour for daylight saving time	…	…	…
Fb01	Language	Current language	ENGLISH	---	ENGLISH, ITALIANO
Fb02	Disable language mask at start-up	Disable the change language screen at start-up	YES	---	NO YES
	Countdown	Starting value for countdown, time change language screen active.	60	s	0…60
Fb03	Main mask selection	Main screen selection	LINE 1	---	LINE 1 LINE 2 DOUBLE SUCT. DOUBLE COND.
Fca01	Address	Address of the controller in a supervisory system network (line 1)	196	---	0…207
	Protocol	Supervisor communication protocol (line 1)	pRACK MANAGER	---	-- CAREL SLAVE LOCAL CAREL SLAVE REMOTE MODBUS SLAVE pRACK MANAGER CAREL SLAVE GSM
	Baudrate	Supervisor communication baud rate (line 1)	19200	---	1200…19200
Fd01	Insert password	Password	0000	---	0…9999
Fd02	Logout	Logout	NO	---	NO YES
Fd03	User	User password	0000	---	0…9999
	Service	Service password	1234	---	0…9999
	Manufacturer	Manufacturer password	1234	---	0…9999
The following parameters refer to line 2, for details see the corresponding parameters for line 1 above					
Faaa01	Summer/Winter	Enable summer/winter period management (line 2)	NO	---	NO YES
	Special days	Enable special days management (line 2)	NO	---	NO YES
	Holiday periods	Enable holiday period management (line 2)	NO	---	NO YES
…	…	…	…	…	…
Fcb01	Address	Address of the controller in a supervisory system network (line 2)	196	---	0…207

Mask index	Display description	Description	Default	UOM	Values
	Protocol	Supervisor communication protocol (line 2)	pRACK MANAGER	---	-- CAREL SLAVE LOCAL CAREL SLAVE REMOTE MODBUS SLAVE pRACK MANAGER CAREL SLAVE GSM
	Baudrate	Supervisor communication baud rate (line 2)	19200	---	1200…19200
G.Safety					
Gba01	Prevent enable	Enable condensing pressure prevent (line 1)	NO	---	NO YES
Gba02	Setpoint	Condensing pressure prevent threshold (line 1)	0.0 barg	…	… (**)
	Differential	Condensing pressure prevent differential (line 1)	0.0 barg	…	0.0…99.9
	Decrease compressor power time	Decreasing capacity time (line 1)	0	s	0…999
Gba03	Enable Heat Reclaim as first prevent step	Enabling heat recovery as first stage for condensing HP prevent (line 1)	NO	---	NO YES
	Offset HeatR.	Offset between heat recovery and prevent setpoint (line 1)	0.0 barg	…	0.0…99.9
Gba04	Enable ChillBooster as first prevent step	Enable ChillBooster as first stage for condensing HP prevent (line 1)	NO	---	NO YES
	Offset Chill.	Offset between ChillBooster and prevent setpoint (line 1)	0.0 barg	…	0.0…99.9
Gba05	Prevent max.num	Maximum number of prevent allowed before locking compressor (line 1)	3	---	1…5
	Prevent max.number evaluation time	Prevent maximum number evaluation time	60	h	0…999
	Reset automatic prevent	Reset number of prevent (line 1)	NO	---	NO YES
Gca01	Common HP delay	High common condensing pressure delay (line 1)	10	s	0…999
	Common HP type	Type of reset for common HP alarm (line 1)	AUTO	---	AUTO MAN
Gca02	Common LP start delay	Low common condensing pressure delay at start up (line 1)	60	s	0…999
	Common LP delay	Low common condensing pressure delay during operation (line 1)	20	s	0…999
Gca03	Time of semi-automatic alarm evaluation	Period of LP evaluation (line 1)	120	min	0…999
	N° of retries before alarm becomes manual	Number of LP in period after which the alarm becomes manual (line 1)	5	---	0…999
Gca04	Liquid alarm delay	Liquid level alarm delay (line 1)	0	s	0…999
	Oil alarm delay	Common oil alarm delay (line 1)	0	s	0…999
The following parameters refer to line 2, for details see the corresponding parameters for line 1 above					
Gbb01	Prevent enable	Enable condensing pressure prevent (line 2)	NO	---	NO YES
…	…	…	…	…	…
Gcb01	Common HP delay	High common condensing pressure delay (line 2)	0	s	0…999
	Common HP type	Type of reset for common HP alarm (line 2)	AUTO	---	AUTO MAN
…	…	…	…	…	…
H.Info *(No parameters under this section)*					
I.Setup					
Ia01	Pre-configuration	Pre-configuration selected	01. RS2	---	–NOT USED– 01. RS2 02. RS3 03. RS3p 04. RS3i 05. RS4 06. RS4i 07. SL3d 08. SL5d 09. SW1 10. SW2 11. SW3 12. d-RS2 13. d-RS3 14. d-RS4
Ib01	Type of Installation	Type of system	SUCTION & CONDENSER	---	SUCTION CONDENSER SUCTION & CONDENSER
Ib02	Measure Units	Unit of measure	°C/barg	---	°C/barg °F/psig
Ib03	Compressors type	Type of compressors (line 1)	RECIPROCATING	---	RECIPROCATING SCROLL SCREW
	Compressors number	Number of compressors (line 1)	2/3 (*)	---	1…6/12 (*)

Mask index	Display description	Description	Default	UOM	Values
Ib04	Number of alarms for each compressor	Number of alarms for each compressor (line 1)	1	---	0…4/7 (*)
Ib05	Modulate speed device	Modulating speed device for first compressor (line 1)	NONE	---	NONE INVERTER ---/DIGITAL SCROLL (*) ---/STEPLESS (*)
Ib30	Compressors sizes	Compressors sizes (line 1)	SAME CAPACITY & SAME STAGE CONF.	---	SAME CAPACITY & SAME STAGE CONF. SAME CAPACITY & DIFF. STAGE CONF. DEFINE SIZES
Ib34	S1	Enable size and size for compressor group 1 (line 1)	YES 10.0	--- kW	NO/YES. 0.0…500.0
	…	…	…	…	…
	S4	Enable size and size for compressor group 4 (line 1)	NO ---	--- kW	NO/YES. 0.0…500.0
Ib35	S1	Enable stages and stages for compressor group 1 (line 1)	YES 100	--- %	NO/YES. 100; 50/100; 50/75/100; 25/50/75/100; 33/66/100
	…	…	…	…	…
	S4	Enable stages and stages for compressor group 4 (line 1))	NO ---	--- kW	NO/YES. S1…S4
Ib36	C01	Size group for compressor 1 (line 1) or presence of inverter	S1	---	S1…S4/INV
	…	…	…	…	…
	C12	Size group for compressor 12 (line 1)	S1	---	S1…S4
Ib10	Compr.Manufacturer	Compressor manufacturer for screw compressors	GENERIC	---	GENERIC BITZER REFCOMP HANBELL
	Compressor series	Compressor series	…(***)	---	…(***)
Ib11	Compressors sizes	Compressor sizes (line 1)	SAME CAPACITY	---	SAME CAPACITY DEFINE SIZES
Ib16	S1	Enable size and size for compressor group 1 (line 1)	YES 10.0	--- kW	NO/YES. 0.0…500.0
	…	…	…	…	…
	S4	Enable size and size for compressor group 4 (line 1)	NO ---	--- kW	NO/YES. 0.0…500.0
Ib17	C01	Size group for compressor 1 (line 1) or presence of inverter	S1	---	S1…S4/INV
	…	…	…	…	…
	C06	Size group for compressor 12 (line 1)	---	---	S1…S4
Ib20	Compressors sizes	Compressors sizes (line 1)	SAME CAPACITY	---	SAME CAPACITY DEFINE
Ib21	S1	Enable size and size for compressor group 1 (line 1)	YES 10.0	--- kW	NO/YES. 0.0…500.0
	…	…	…	…	…
	S4	Enable size and size for compressor group 4 (line 1)	NO ---	--- kW	NO/YES. 0.0…500.0
Ib22	C01	Size group for compressor 1 (line 1) or presence of inverter	S1	---	S1…S4/INV
	…	…	…	…	…
	C12	Size group for compressor 6 (line 1)	S1	---	S1…S4
Ib40	Regulation by	Compressor control by temperature or pressure (line 1)	PRESSURE	---	PRESSURE TEMPERATURE
	Measure unit	Unit of measure (line 1)	barg	---	…
	Refrigerant	Type of refrigerant (suction Line 1)	R404A	---	R22 R134a R404A R407C R410A R507A R290 R600 R600a R717 R744 R728 R1270 R417A R422D
Ib41	Regulation type	Compressor control type (line 1)	DEAD ZONE	---	PROPORTIONAL BAND DEAD ZONE
	Enable integral time action	Enable integral time for proportional suction line control (line 1)	NO	---	NO YES
Ib42	Setpoint	Setpoint without compensation (suction line 1)	3.5 barg	…(**)	…(**)
	Differential	Differential (suction line 1)	0.3 barg	…(**)	…(**)
Ib43	Configure another suction line?	Second suction line configuration	NO	---	NO YES

Mask index	Display description	Description	Default	UOM	Values
lb45	Dedicated pRack board for suction line	Suction lines on different boards	NO	---	NO YES
lb50	Compressors type	Type of compressors (line 2)	RECIPROCATING	---	RECIPROCATING SCROLL
	Compressors number	Number of compressors (line 2)	3	---	1…12
lb51	Number of alarms for each compressor	Number of alarms for each compressor (line 2)	1	---	0…4
lb52	Modulate speed device	Modulating speed device for first compressor (line 2)	NONE	---	NONE INVERTER ---/DIGITAL SCROLL (*)
lb70	Compressors sizes	Compressors sizes (line 1)	SAME CAPACITY & SAME STAGE CONF.	---	SAME CAPACITY & SAME STAGE CONF. SAME CAPACITY & DIFF. STAGE CONF. DEFINE SIZES
lb74	S1	Enable size and size for compressor group 1 (line 1)	YES 10.0	--- kW	NO/YES. 0.0…500.0
	…	…	…	…	…
	S4	Enable size and size for compressor group 4 (line 1)	NO ---	--- kW	NO/YES. 0.0…500.0
lb75	S1	Enable stages and stages for compressor group 1 (line 1)	YES 100	--- %	NO/YES. 100; 50/100; 50/75/100; 25/50/75/100; 33/66/100
	…	…	…	…	…
	S46	Enable stages and stages for compressor group 4 (line 1))	NO ---	--- kW	NO/YES. S1…S4
lb76	C01	Size group for compressor 1 (line 1) or presence of inverter	S1	---	S1…S4/INV
	…	…	…	…	…
	C12	Size group for compressor 6 (line 1)	S1	---	S1…S4
lb60	Compressors sizes	Compressors sizes (line 1)	SAME CAPACITY	---	SAME CAPACITY DEFINE
lb61	S1	Enable size and size for compressor group 1 (line 1)	YES 10.0	--- kW	NO/YES. 0.0…500.0
	…	…	…	…	…
	S4	Enable size and size for compressor group 4 (line 1)	NO ---	--- kW	NO/YES. 0.0…500.0
lb62	C01	Size group for compressor 1 (line 1) or presence of inverter	S1	---	S1…S4/INV
	…	…	…	…	…
	C12	Size group for compressor 6 (line 1)	S1	---	S1…S4
lb80	Regulation by	Compressor control by temperature or pressure (line 1)	PRESSURE	---	PRESSURE TEMPERATURE
	Measure unit	Unit of measure (line 1)	barg	---	…
	Refrigerant	Type of refrigerant (suction Line 1)	R404A	---	R22 R134a R404A R407C R410A R507A R290 R600 R600a R717 R744 R728 R1270 R417A R422D
lb81	Regulation type	Compressor control type (line 1)	DEAD ZONE	---	PROPORTIONAL BAND DEAD ZONE
	Enable integral time action	Enable integral time for proportional suction line control (line 2)	NO	---	NO YES
lb82	Setpoint	Setpoint without compensation (suction line 2)	3.5 barg	…(**)	…(**)
	Differential	Differential (suction line 2)	0.3 barg	…(**)	…(**)
lb90	Dedicated pRack board for condenser line	Suct.line(s) and cond.line(s) on different boards, that is, condensing line(s) on dedicated board	NO	---	NO YES
lb91	Fans number	Number of fans (line 1)	3	---	0…16
lb54	Modulate speed device	Fan modulating speed device (line 1)	NONE	---	NONE INVERTER PHASE CONTROL
lb93	Regulation by:	Fans control by temperature or pressure value (line 1)	PRESSURE	---	PRESSURE TEMPERATURE
	Measure unit	Unit of measure (line 1)	barg	---	…

Mask index	Display description	Description	Default	UOM	Values
	Refrigerant	Type of refrigerant (condensing line 1)	R404A	---	R22 R134a R404A R407C R410A R507A R290 R600 R600a R717 R744 R728 R1270 R417A R422D
Ib94	Regulation type	Fan control type (line 1)	PROPORTIONAL BAND	---	PROPORTIONAL BAND DEAD ZONE
	Enable integral time action	Enable integral time for proportional band control	NO	---	NO YES
Ib95	Setpoint	Setpoint without compensation (condensing line 1)	12.0 barg	…(**)	…(**)
	Differential	Differential (condensing line 1)	2.0 barg	…(**)	…(**)
Ib96	Configure another condensing line?	Second condensing line configuration	NO	---	NO YES
Ib1a	Fans number	Number of fans (line 2)	3	---	0…16
…	…	…	…	…	…
Ib1e	Differential	Differential (condensing line 2)	2.0 barg	…(**)	…(**)
Ic01	Type of Installation	Type of plant	SUCTION & CONDENSER	---	SUCTION CONDENSER SUCTION & CONDENSER
Ic02	Measure Units	Unit of measure	°C/barg	---	°C/barg °F/psig
Ic03	Number of suction lines	Number of suction lines	1	---	0…2
Ic04	Dedicated pRack board for suction line	Suction lines are on different boards	NO	---	NO YES
Ic05	Compressors type	Type of compressors (line 1)	RECIPROCATING	---	RECIPROCATING SCROLL SCREW
	Compressors number	Number of compressors (line 1)	4	---	1…6/12 (*)
Ic06	Compressors type	Type of compressors (line 2)	RECIPROCATING	---	RECIPROCATING SCROLL SCREW
	Compressors number	Number of compressors (line 2)	0	---	1…6
Ic07	Number of condensing line	Number of condensing lines in the system	1	---	0…2
Ic08	Line1	Number of fans (line 1)	4	---	0…16
	Line2	Number of fans (line 2)	0	---	0…16
Ic09	Dedicated pRack board for condenser line	Condenser lines are on different boards	NO	---	NO YES
Id01	Save configuration	Save Manufacturer configuration	NO	---	NO YES
	Load configuration	Manual installation of Manufacturer configuration	NO	---	NO YES
Id02	Restore default	Manual installation of Carel default values	NO	---	NO YES

(*) Depending on the type of compressor
(**)Depending on the unit of measure selected
(***)Depending on the compressor manufacturer
(****)Depending on the hardware size

8. ALARMS

pRack PR100 can manage both alarms relating to the status of the digital inputs and to operation of the system. For each alarm, the following are controlled:

- The actions on the devices, if necessary
- The output relays (one global and two with different priorities, if configured)
- The red LED on the terminal and the buzzer, where present
- The type of acknowledgement (automatic, manual, semiautomatic)
- Any activation delay

The complete list of alarms, with the related information as described above, is available in Appendix A.4.

8.1 Alarm management

All alarms feature the following behaviour:

- When an alarm is activated, the red LED flashes and the buzzer is activated (where present); the output relays corresponding to the global alarm and to any alarms with priority are activated (if configured)
- Pressing the (Alarm) button, the red LED stays on steady, the buzzer is muted and the alarm screen is shown
- If there is more than one active alarm, these can be scrolled using (Up) (Down). This condition is signalled by an arrow at the bottom right of the screen
- Pressing the (Alarm) button again for at least 3 seconds acknowledges the alarms manually, and these are cleared from the display unless others are active (they are saved in the log)

8.1.1 Priority

For certain alarms, the alarm output relay can be set with two types of priority:

- R1: serious alarm
- R2: normal alarm

The corresponding relays, once configured, are activated when an alarm with the corresponding priority occurs.
For the other alarms, the priority is fixed and is associated by default with one of the two relays.

8.1.2 Acknowledgement

The alarms can have manual, automatic or semiautomatic acknowledgement:

- Manual: the alarm is acknowledged by pressing the (Alarm) button twice, the first time displays the corresponding alarm screen and mutes the buzzer, the second (extended, for at least 3 seconds) cancels the alarm (which is saved in the log). If the alarm is still active, acknowledgement has no effect and the signal is shown again.
- Automatic: when the alarm condition ceases, the alarm is automatically reset, the LED comes on steady and the corresponding screen remains displayed until the (Alarm) button is pressed and held; the alarm is saved in the log.
- Semiautomatic: acknowledgement is automatic, until a maximum number of activations in set time. If the number reaches the maximum set, acknowledgement becomes manual.

8.1.3 Log

The alarm log can be accessed:

- from branch G.a of the main menu
- by pressing the (Alarm) button and then (Enter) when there are no active alarms
- by pressing (Enter) after having scrolled all the alarms.

The alarm log screens show:

1. Order of activation (no. 01 is the oldest alarm)
2. Hour and date the alarm was activated
3. Short description
4. Main values recorded at the moment the alarm was activated (suction pressure and condensing pressure)

Note: A maximum of 50 alarms can be logged; after this limit any new events overwrite the oldest ones, which are therefore deleted.

8.2 Compressor alarms

The number of alarms for each compressor can be set during the configuration phase using the Wizard or subsequently from branch C.a.e/C.b.e of the main menu. The number is the same for all the compressors on the same line.

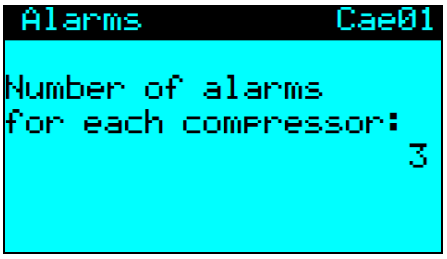


Fig. 8.a

Note: The maximum number of alarms that can be configured for each compressor depends not only on the type of compressor, but also on the size of pRack and the number of compressors fitted.

After having selected the number of alarms (maximum 4 for the reciprocating or scroll compressors and 7 for screw compressors), the settings can be configured for each alarm, choosing a description from the options shown in the table, the output relay, the type of reset, delay and priority. The effect of the alarm on the devices is set and involves stopping the compressor, except for the oil warning.

Possible descriptions for compressor alarms

Reciprocating or scroll	Screw
Generic	Generic
Overload	Overload
High pressure	High pressure
Low pressure	Low pressure
Oil	Oil
	Screw rotation
	Oil warning (Filter Blocked)

An example of a screen for selecting the description of the alarm is shown in the figure:

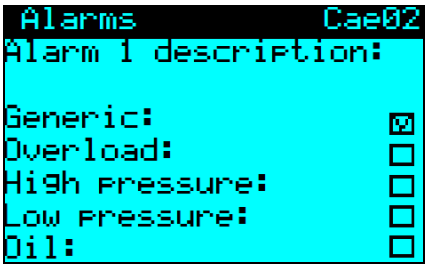


Fig. 8.b

After having selected the 'generic' description, no other description can be selected. In general, the descriptions are divided into four groups:

- generic
- others (overload, oil, high pressure , low pressure)
- screw rotation
- oil warning

After a description has been selected for a certain group, descriptions from a different group can not be selected for that alarm.
For example, generic only, or overload + oil, or rotation only or overload + high pressure., etc. can be selected.

Each alarm will have one alarm screen, which will show all the descriptions associated to that alarm.

Based on the number of alarms selected, the descriptions associated by default are shown in the table below

Default descriptions based on the number of alarms

Number of alarms	Descriptions
1	Generic
2	Overload
	HP-LP
3	Overload
	HP-LP
	Oil
4	Overload
	HP
	LP
	Oil
5	Overload
	HP
	LP
	Oil
	Oil warning
6	Overload
	HP
	LP
	Oil
	Oil warning
	Rotation
7	Overload
	HP
	LP
	Oil
	Oil warning
	Rotation
	Generic

Note: for oil alarms, special management is available whereby the alarm is interpreted as an oil level alarm. When the alarm is activated, a number of attempts are made to restore the level for a set time before the alarm is signalled and the compressor stopped; see paragraph 6.6.1 for details.

If a modulating device is used for the compressors, further alarms become available:

- compressor inverter warning, common for the entire suction line, when the device is an inverter
- oil sump temperature alarm, high discharge temperature and oil dilution, for Digital Scroll™ compressors

For each compressor, two alarm variables are sent to the supervisor, one for each priority. As well as the alarm signal, the description of the alarm is also sent to the supervisor, using the values shown in the table:

Description of alarms sent to the supervisor

Description value	Meaning
1	Generic
2	Overload
4	High pressure
6	Overload + high pressure
8	Low pressure
10	Overload + low pressure
16	Oil
18	Overload + oil
20	High pressure + oil
22	Overload + high pressure + oil
24	Low pressure + oil
26	Overload + low pressure + oil
32	Rotation (screw compressors only)
64	Oil warning (screw compressors only)

8.3 Pressure and prevent alarms

pRack PR100 can manage pressure alarms from a pressure switch or probe, according to the following diagram.

Alarms from pressure switch:

- Low suction pressure
- High condensing pressure

Alarms from probe:

- Low suction pressure
- High suction pressure
- Low condensing pressure
- High condensing pressure

One possible example for the low pressure alarms is shown in the figure:

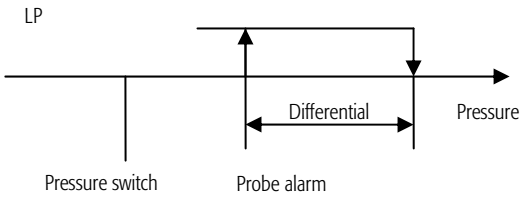


Fig. 8.c

In addition, the high pressure alarm features a prevent function, also available using additional functions, such as heat recovery and ChillBooster.

8.3.1 Pressure alarms from pressure switch

The parameters corresponding to these alarms can be set in branch G.c.a/G.c.b of the main menu.

Low suction pressure from pressure switch

This alarm features semiautomatic reset, and both the monitoring time and the number of activations in the specified period can be set. If the number of activations is higher, reset becomes manual.
In addition, the delay after which the alarm is activated on both start-up and during operation can be set.
The delay at start-up only applies to unit start-up and not compressor power-up.

The low suction pressure alarm from pressure switch has the effect of stopping all the compressors, ignoring the times.

High condensing pressure from pressure switch

This alarm features manual or automatic reset, as configured by the user.
The delay after which the alarm is activated can also be set.

The high condensing pressure alarm from pressure switch has the effect of stopping all the compressors, ignoring the times and forcing the fans on at maximum speed.

8.3.2 Pressure alarms from probe

The parameters corresponding to these alarms can be set in branch C.a.e/C.b.e of the main menu for the suction pressure and D.a.e/D.b.e for the condensing pressure.

For these types of alarms, reset is automatic and the activation threshold and differential can be set, as well as the type of threshold, which may be absolute or relative to the control set point. The figure shows an example of setting the threshold to relative.

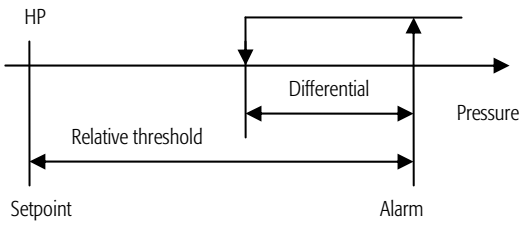


Fig. 8.d

Low suction pressure from probe

The low suction pressure alarm from probe has the effect of stopping all the compressors, ignoring the times.

High suction pressure from probe
The high suction pressure alarm from probe has the effect of forcing all the compressors on, ignoring the control times, but observing the compressor protection times.

Low condensing pressure from probe
The low condensing pressure alarm from probe has the effect of stopping all the fans, ignoring the times.

High condensing pressure from probe
The high condensing pressure alarm from probe has the effect of forcing all the fans on and stopping all the compressors, ignoring the times.

8.3.3 High pressure prevention

pRack PR100 can manage 3 types of high condensing pressure prevention actions, involving:

- overriding the compressors and fans
- activating heat recovery
- activating ChillBooster

Prevent by overriding the compressors and fans
The parameters relating to this function can be set in branch G.b.a/G.b.b of the main menu.

The effect of this type of prevent action is to force all the fans on and switch all the compressors off (except the minimum capacity stage), ignoring the control times but observing the compressor protection times.

As well as the activation threshold, which is always absolute, and the activation differential, a compressor deactivation time can be set, corresponding to the time needed to switch off all the compressors, except for the minimum capacity stage.

In addition, both the monitoring time and the number of activations in the specified period can be set. If the number of activations is higher, reset becomes manual.

Prevent by activating heat recovery
The parameters relating to this function can be set in branch G.b.a/G.b.b of the main menu, if the heat recovery function is present.

As well as enabling the function, an offset from the activation threshold for the prevent by overriding devices function must be set. The activation differential for this function is the same as set for the prevent by overriding devices function.

When reaching the threshold, pRack PR100 activates the heat recovery function, if the conditions allow; see paragraph 6.6.3 for details.

Prevent by activating ChillBooster
The parameters relating to this function can be set in branch G.b.a/G.b.b of the main menu, if the ChillBooster function is present.

As well as enabling the function, an offset from the activation threshold for the prevent by overriding devices function must be set. The activation differential for this function is the same as set for the prevent by overriding devices function.

When reaching the threshold, pRack PR100 force activates the ChillBooster, if the conditions allow; see paragraph 6.6.5 for details.

The following figure illustrates the activation thresholds for the prevent function and the safety devices:

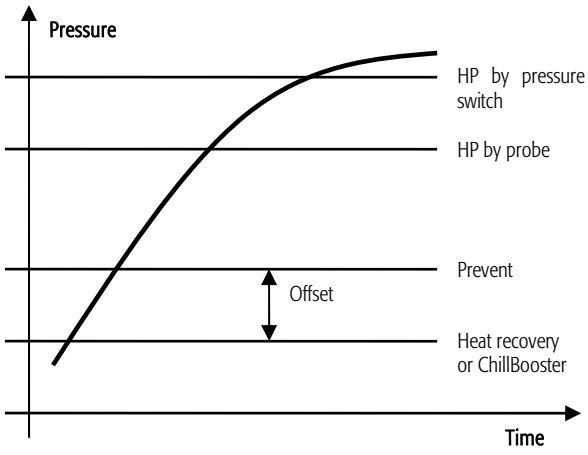


Fig. 8.e

9. SUPERVISORY AND COMMISSIONING SYSTEMS

pRack pR100 can be connected to various supervisory systems, specifically the Carel and Modbus communication protocols can be used. For the Carel protocol, the PlantVisor PRO and PlantWatch PRO models are available.

In addition, pRack pR100 can be connected to the pRack Manager commissioning software.

9.1.1 PlantVisor PRO and PlantWatch PRO supervisory systems

Connection to Carel PlantVisor PRO and PlantWatch PRO supervisor systems uses the RS485 card already fitted on some models of pRack pR100. For details on the models of card available, see Chapter 1.

Note: In general, the pRack boards that manage the suction lines must be fitted with the supervisor connection card, consequently boards with pLAN address 1 or 2.

Three different models of PlantVisor PRO and PlantWatch PRO are available, used to supervise system configurations with one or two lines:

- L1 – one line: can be used for system configurations with just one suction and/or condenser line.
- L2 – one line: can be used for system configurations with two suction and/or condenser lines, and the two suction lines are managed by separate boards.
- Two lines: can be used for system configurations with two suction and/or condenser lines, and the two suction lines are managed by the same board.

Important: model L2 – One line must be used only in association with model L1 – One line. For supervision of system configurations with just one line only model L1 – One line can be used.

Some examples of using PlantVisor PRO and PlantWatch PRO are illustrated in the figure below.

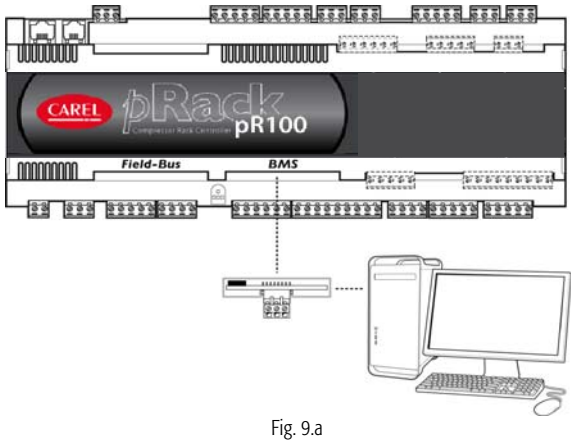


Fig. 9.a

The complete list of supervisor variables, with the corresponding addresses and descriptions, can be supplied upon request.

9.1.2 Commissioning software

pRack Manager is configuration and real-time monitoring software used to check the operation of pRack pR100, for commissioning, debug and maintenance operations.

The software is available on the internet at http://ksa.CAREL.com in the section "download → support → software utilities".The installation includes, in addition to the program, the user manual and the necessary drivers.

pRack Manager can be used to set the configuration parameters, modify the values of volatile and permanent variables, save graphs of the main system values to file, manually manage the unit I/Os using simulation files and monitor/reset alarms on the unit where the device is installed.

pRack pR100 is able to virtualise all the inputs and outputs, both digital and analogue, therefore each input and output can be overridden by pRack Manager.

pRack Manager manages <file name>.DEV files that contain the user parameter configurations and that can be downloaded from the pRack pR100 board and then subsequently uploaded.

To use the pRack Manager program, a serial converter output RS485 with CVSTDUTLF0 (telephone connector) or CVSTDUMOR0 (3 pin terminal) must be connected to the board.
The connection to pRack Manager can be made:

1. Via the RS485 serial port used for the "pLAN" connection
2. Via the BMS serial port with RS485 serial card and activating the pRack Manager protocol by parameter on screen Fca01 or connecting pRack Manager and selecting SearchDevice = Auto (BMS or FB) on the "Connection settings" tab. In this case, the connection is established after around 15-20 seconds.

The following figure shows an example of connection to the PC via the RS485 serial port used for the "pLAN" connection

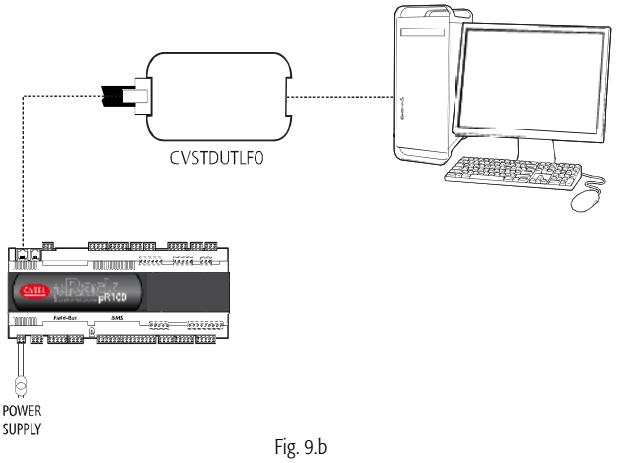


Fig. 9.b

Note: for further details see the pRack Manager program online help.

10. UPDATING THE SOFTWARE

The pRack PR100 boards are supplied with the software already loaded. If an update is required, the following can be used:

- pRack Manager
- SmartKey programming key

10.1.1 Updating using pRack Manager

The software resident in the pRack pR100 boards can be updated from a PC.

For the connection procedure see Chapter 9, while for further details see the pRack Manager program online help.

Note: The pRack PR100 software is protected by digital signature and cannot be loaded onto hardware other than pRack PR100 (e.g. pCO3), otherwise after 5 minutes of operation the software locks up, all the relays open and the warning "INVALID OEM IDENTIFIER" is shown.

Note: The pCOLoad program can also be used to update the pRack pR100 software, however Winload cannot be used.

10.1.2 Updating using SmartKey

The SMARTKEY programming key can copy the contents of one pRack pR100 board to another identical board, using the telephone connector on the terminal (the pLAN must be disconnected).

From a PC, with the SmartKey Programmer software running, the key can be configured to perform specific operations: acquire log files, program applications, etc.
The SmartKey Programmer software is installed together with pRack Manager.
The following figure shows the connection of the SmartKey to the PC using the PCOSO0AKY0 converter.

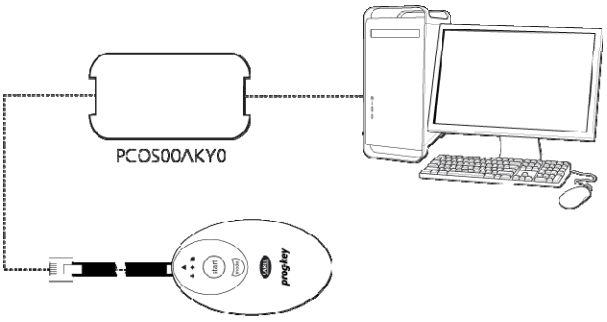


Fig. 10.a

Note: for further details on using the SmartKey, see the corresponding instruction sheet. For details on the SmartKey Programmer see the online manual.

10.1.3 Saving parameters between different software versions

The configuration parameters can be saved and loaded after having updated the software, using the following procedure (for details see the pRack Manager online manual):

1. Connect pRack Manager
2. From Commissioning/Settings select the .2cf file relating to the current version on pRack PR100, e.g. 1.0
3. From Device Configuration, read all the variables and save them to an .xls file (required).
4. Update the software version on pRack PR100
5. Reconnect pRack Manager
6. From Commissioning/Settings select the .2cf file relating to the new software version on pRack PR100, e.g. 1.1
7. From Device Configuration, import the .xls file saved previously.

11. APPENDIX

A.1 System configurations available

The system configurations available are shown in the table:

System configurations:

Configuration number	Description	Suction lines	Condenser lines	Compressors L1/L2	Maximum number of compressors per line L1/L2	Units present in pLAN (in addition to the terminal)	Reference diagram
1	No suction line, one condenser line	0	1	-	-	1	a
2	No suction line, two condenser lines	0	2	-	-	1	a
3	1 suction line (scroll or piston compressors), no condenser line	1	0	scroll, piston	12	1	a
4	1 suction line (scroll or piston compressors), 1 condenser line	1	1	scroll, piston	12	1	a
5	1 suction line (scroll or piston compressors), 1 condenser line on a separate board	1	1	scroll, piston	12	1, 3	b
6	2 suction lines on the same board (scroll or piston compressors), no condenser line	2	0	scroll, piston/scroll, piston	12	1	c
7	2 suction lines on the same board (scroll or piston compressors), 1 condenser line	2	1	scroll, piston/scroll, piston	12	1	c
8	2 suction lines on the same board (scroll or piston compressors), 1 condenser line on a separate board	2	1	scroll, piston/scroll, piston	12	1, 3	e
9	2 suction lines (scroll or piston compressors), 2 condenser lines on the same board	2	2	scroll, piston/scroll, piston	12	1	f
10	2 suction lines on the same board (scroll or piston compressors), 2 condenser lines on separate boards	2	2	scroll, piston/scroll, piston	12	1, 3	g
11	2 suction lines on separate boards (scroll or piston compressors), 1 condenser line on suction line 1 board	2	1	scroll, piston/scroll, piston	12	1, 2	h
12	2 suction lines on separate boards (scroll or piston compressors), 1 condenser line on a separate board	2	1	scroll, piston/scroll, piston	12	1, 2 .3	d
13	2 suction lines on separate boards (scroll or piston compressors), 2 condenser lines (one for each suction line board)	2	2	scroll, piston/scroll, piston	12	1, 2	h
14	2 suction lines on separate boards (scroll or piston compressors), 2 condenser lines on separate boards	2	2	scroll, piston/scroll, piston	12	1, 2, 3, 4	i
15	1 suction line (up to 2 screw compressors), no condenser line	1	0	screw	2	1	a
16	1 suction line (up to 2 screw compressors), 1 condenser line	1	1	screw	2	1	a
17	1 suction line (up to 2 screw compressors), 1 condenser line on a separate board	1	1	screw	2	1, 3	b
18	2 suction lines on separate boards (up to 2 screw compressors on line 1 and scroll or piston compressors on line 2), 1 condenser line on suction line 1 board	2	1	screw/scroll, piston	2/ 12	1, 2	h
19	2 suction lines on separate boards (up to 2 screw compressors on line 1 and scroll or piston compressors on line 2), 1 condenser line on a separate board	2	1	screw/scroll, piston	2/ 12	1, 2, 3	d
20	2 suction lines on separate boards (up to 2 screw compressors on line 1 and scroll or piston compressors on line 2), 2 condenser lines (one for each suction line board)	2	2	screw/scroll, piston	2/ 12	1, 2	h
21	2 suction lines on separate boards (up to 2 screw compressors on line 1 and scroll or piston compressors on line 2), 2 condenser lines on separate boards	2	2	screw/scroll, piston	2/ 12	1, 2, 3, 4	i
22	1 suction line (up to 4 screw compressors), no condenser line	1	0	screw	4	1, 5	a
23	1 suction line (up to 4 screw compressors), 1 condenser line	1	1	screw	4	1, 5	a
24	1 suction line (up to 4 screw compressors), 1 condenser line on a separate board	1	1	screw	4	1, 3, 5	b

25	2 suction lines on separate boards (up to 4 screw compressors on line 1 and scroll or piston compressors on line 2), 1 condenser line on suction line 1 board	2	1	screw/scroll, piston	4/ 12	1, 2, 5	h
26	2 suction lines on separate boards (up to 4 screw compressors on line 1 and scroll or piston compressors on line 2), 1 condenser line on a separate board	2	1	screw/scroll, piston	4/ 12	1, 2, 3, 5	d
27	2 suction lines on separate boards (up to 4 screw compressors on line 1 and scroll or piston compressors on line 2), 2 condenser lines (one for each suction line board)	2	2	screw/scroll, piston	4/ 12	1, 2, 5	h
28	2 suction lines on separate boards (up to 4 screw compressors on line 1 and scroll or piston compressors on line 2), 2 condenser lines on separate boards	2	2	screw/scroll, piston	4/ 12	1, 2, 3, 4, 5	i
29	1 suction line (up to 6 screw compressors), no condenser line	1	0	screw	6	1, 5, 7	a
30	1 suction line (up to 6 screw compressors), 1 condenser line	1	1	screw	6	1, 5, 7	a
31	1 suction line (up to 6 screw compressors), 1 condenser line on a separate board	1	1	screw	6	1, 3, 5, 7	b
32	2 suction lines on separate boards (up to 6 screw compressors on line 1 and scroll or piston compressors on line 2), 1 condenser line on suction line 1 board	2	1	screw/scroll, piston	6/ 12	1, 2, 5, 7	h
33	2 suction lines on separate boards (up to 6 screw compressors on line 1 and scroll or piston compressors on line 2), 1 condenser line on a separate board	2	1	screw/scroll, piston	6/ 12	1, 2, 3, 5, 7	d
34	2 suction lines on separate boards (up to 6 screw compressors on line 1 and scroll or piston compressors on line 2), 2 condenser lines (one for each suction line board)	2	2	screw/scroll, piston	6/ 12	1, 2, 5, 7	h
35	2 suction lines on separate boards (up to 6 screw compressors on line 1 and scroll or piston compressors on line 2), 2 condenser lines on separate boards	2	2	screw/scroll, piston	6/ 12	1, 2, 3, 4, 5, 7	i

The system configurations available refer to the following diagrams:

Note: For screw compressors, each pRack pR100 board can manage up to two compressors, consequently in the following diagrams one board can be used for each pair of compressors. a) up to 1 suction line (scroll or piston compressors) and up to 1 condenser line on just one pRack pR100 board:

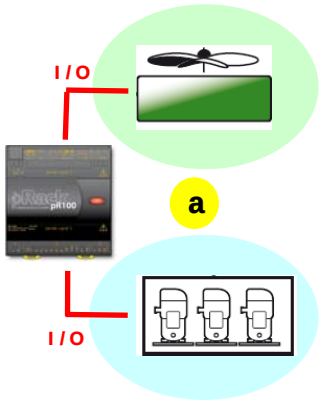


Fig. A1.a

b) 1 suction line (scroll or piston compressors) and 1 condenser line on a separate board:

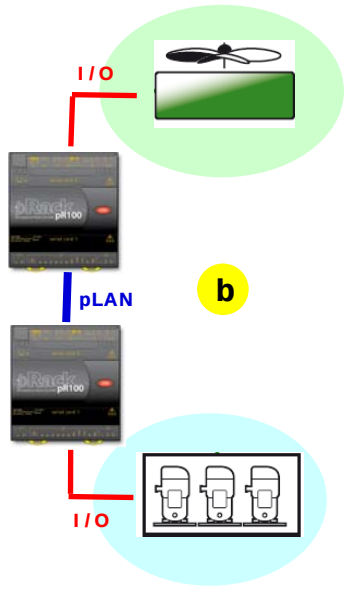


Fig. A1.b

c) 2 suction lines on the same board (scroll or piston compressors) and up to 1 condenser line:

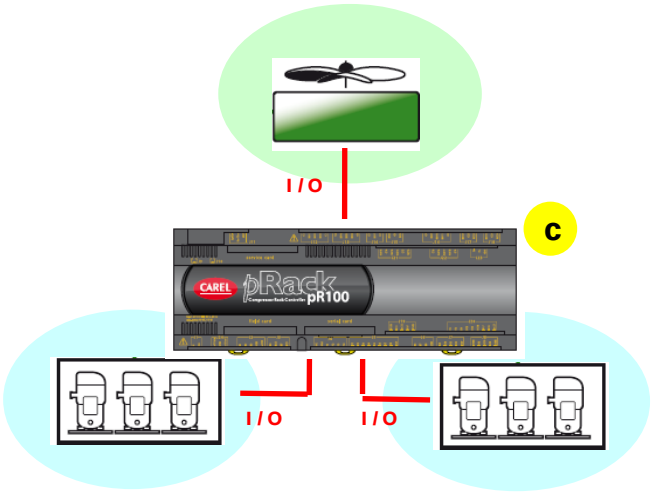


Fig. A1.c

d) 2 suction lines on separate boards (up to 2 screw compressors on line 1 and scroll or piston compressors on line 2), 1 condenser line on a separate board:

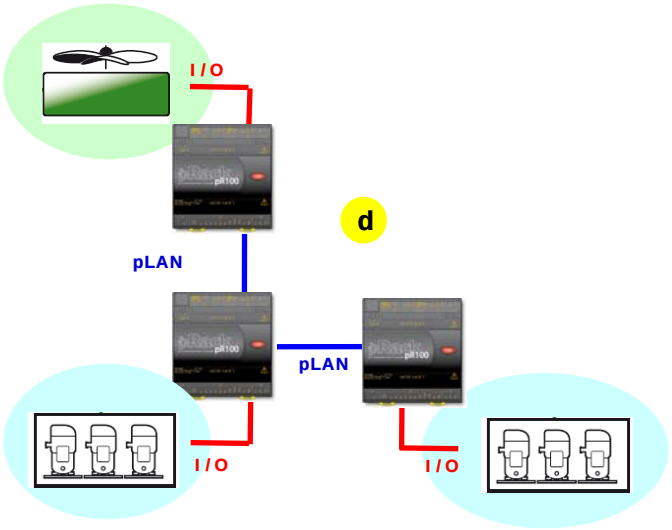


Fig. A1.d

e) 2 suction lines on the same board (scroll or piston compressors), 1 condenser line on a separate board:

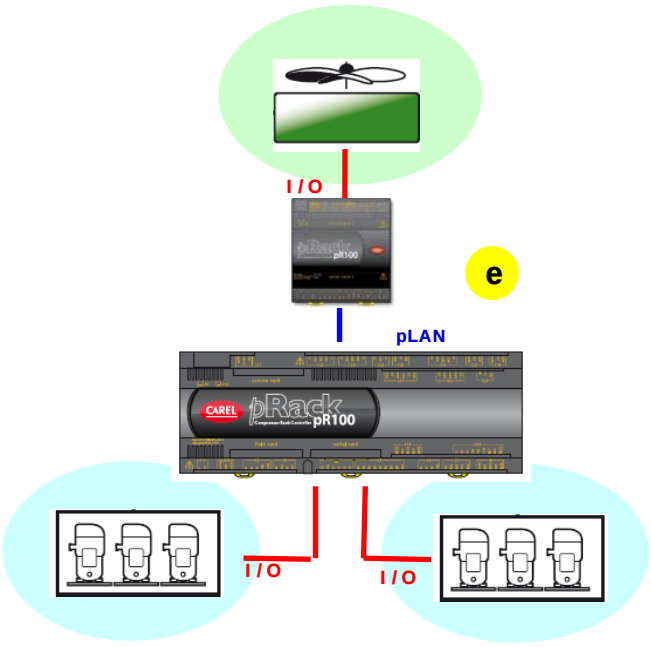


Fig. A1.e

f) 2 suction lines (scroll or piston compressors), 2 condenser lines on the same board:

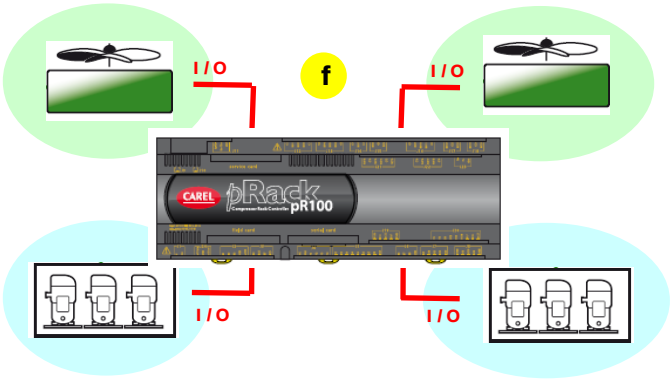


Fig. A1.f

g) 2 suction lines on the same board (scroll or piston compressors), 2 condenser lines on separate boards:

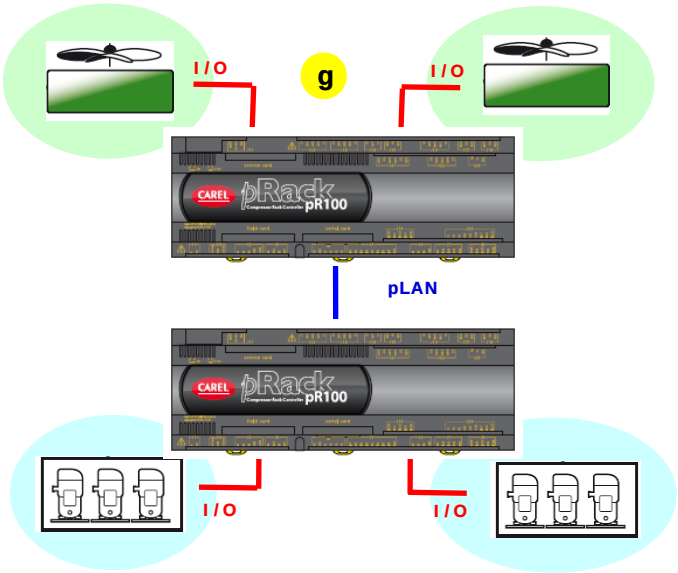


Fig. A1.g

h) 2 suction lines on separate boards (scroll or piston compressors), 2 condenser lines (one for each suction line board)

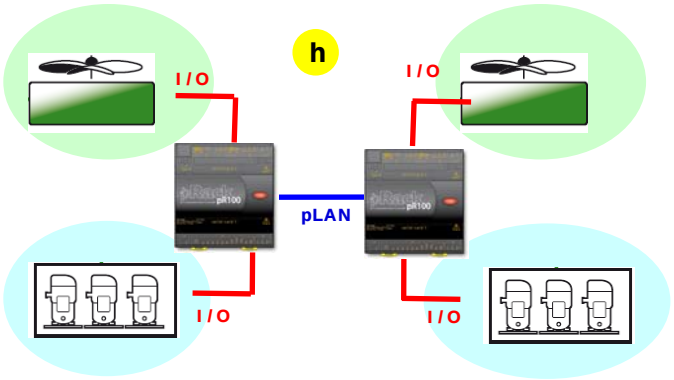


Fig. A1.h

i) 2 suction lines on separate boards (scroll or piston compressors), 2 condenser lines on separate boards

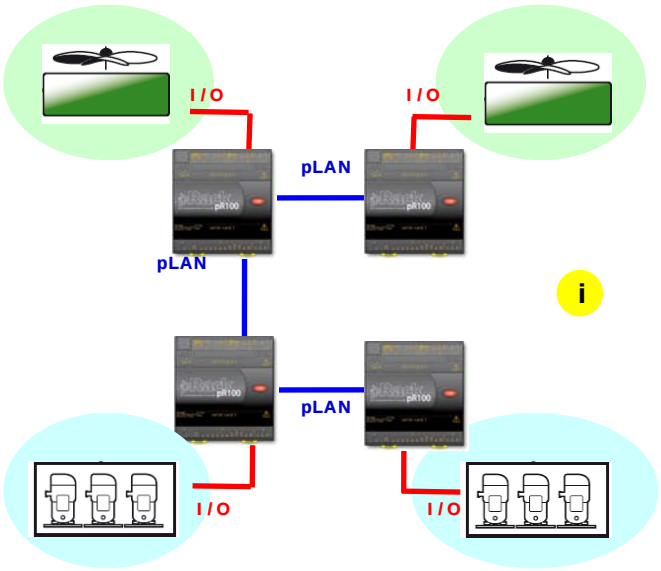


Fig. A1.i

A.2 System configurations with more than one pLAN board

If the system configuration involves the connection of more than one board in a pLAN, the addresses must be set correct before select a solution of configuration.

For the addresses to be assigned to the pRack pR100 boards see Appendix A.1.

pRack pR100 can use two user terminals (as well as a built-in terminal) with addresses 31 and 32. The default user terminal address is 32, so only if a second terminal is required must the address of this be set to 31, as described below.

The address of the terminal is also required when having to set the address of the pRack pR100 boards, when multiple boards are connected to the pLAN.

After having correctly connected and configured the pLAN network of pRack pR100 boards, the system can be configured as described in paragraph 4.1.

11.2.1 Setting the address of the terminal

The pRack pR100 user terminal is supplied with the default address 32, allowing the terminal to be used without requiring any additional operations; nonetheless, in order to use an additional terminal or configure the pLAN address of the boards, it needs to be changed according to the following procedure:

1. power the terminal via the special telephone connector;
2. press the 3 buttons, ↑, ↓ and ↵ together for at least 5 seconds; the terminal will display a screen similar to the one below, with the cursor flashing in the top left corner:

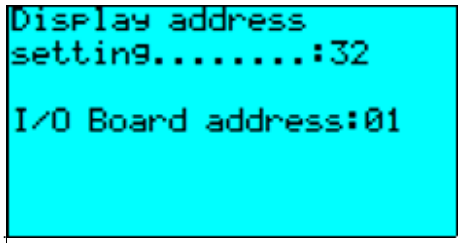


Fig. A2.a

3. press ↵ once: the cursor will move to the "Display address setting" field;
4. select the desired value using ↑ and ↓, and confirm by pressing ↵ again; if the value selected is different from the value saved, the following screen will be displayed and the new value will be saved to the display's permanent memory.

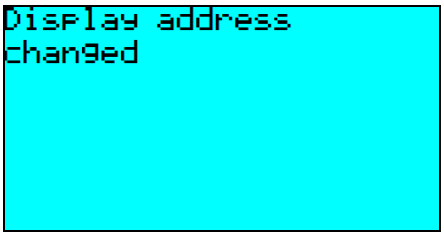


Fig. A2.b

Note: if the address field is set to 0, the "I/O Board address" field is no longer displayed, as it has no meaning.

Important: if the settings are not made correctly, the text and the images on the display will be displayed incorrectly and out of order.

Important: if during this operation the terminal detects inactivity of the pRack board whose output is being displayed, the display is cleared and a message similar to the one below is shown.

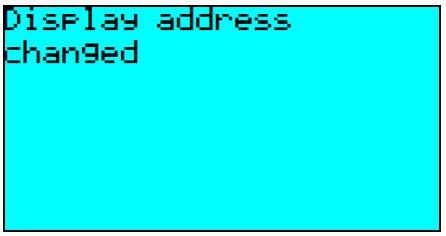


Fig. A2.b

If the terminal detects inactivity of the entire pLAN network, that is, it does not receive any messages from the network for 10 seconds consecutively, it clears the display and shows the following message:

Fig. A2.d

11.2.2 Setting the address of the pRack pR100 board

The pLAN address of the pRack boards can be set from any pGD1 terminal, using the following procedure:

1. set address 0 on the terminal (see the previous paragraph for details on how to set this address);
2. power down the pRack pR100 board;
3. disconnect any pLAN connections to other boards from the pRack pR100 board;
4. connect the terminal to the pRack pR100 board;
5. power up the pRack pR100 board, while pressing the ↑ and 🔔 buttons on the terminal together. After a few seconds the pRack pR100 board begins the start-up sequence and the display shows a screen similar to the one below:

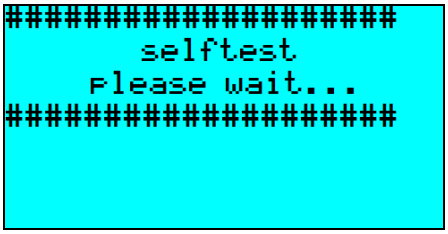


Fig. A2.e

6. when this screen is displayed, wait 10 seconds and then release the buttons;
7. the pRack pR100 board interrupts the start-up sequence and shows a configuration screen, similar to the one below:

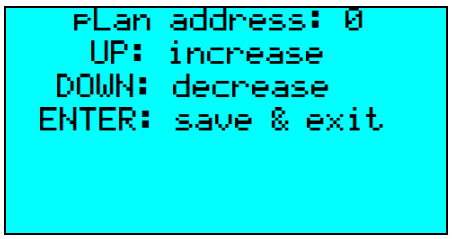


Fig. A2.f

Then set the pLAN address using the ↑ and ↓ buttons on the terminal.

8. Confirm the address by pressing ↵: the pRack pR100 board completes the start-up sequence and uses the set address.

A.3 Example of configuring a system with 2 suction and condenser lines using the Wizard

Below is a possible example of using the Wizard to configure a typical system like the one shown in the figure, with 2 suction lines and 2 condenser lines on different boards:

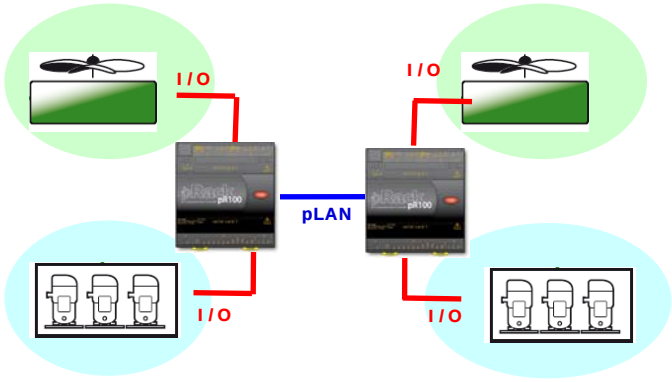


Fig. A3.a

The preliminary operations to be completed before configuration are as follows:

1. with the boards not connected in the pLAN, power up the second pRack board and set the pLAN address to 2 (for details see Appendix A.2)
2. power down and connect the two boards in the pLAN, plus any terminals, as described in paragraph 3.7
3. power up the boards and wait for the Wizard selection screen to be displayed

Then select the type of system as SUCTION & CONDENSER:

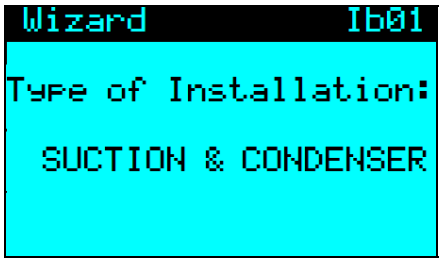


Fig. A3.b

Set the type of compressors and control for suction line 1, answering the questions prompted by the pRack PR100 software, e.g.:

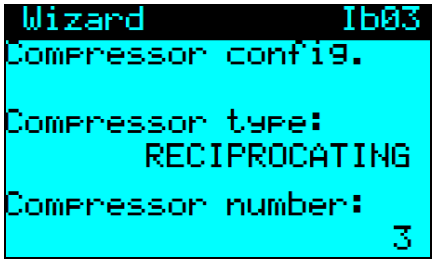


Fig. A3.c

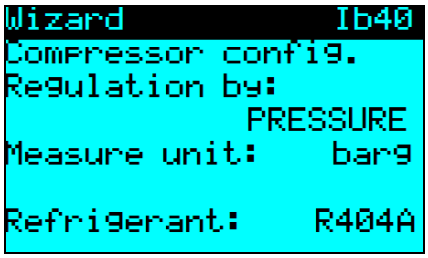


Fig. A3.d

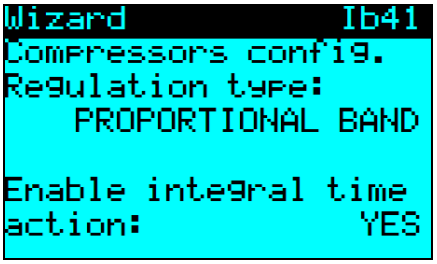


Fig. A3.e

After having configured suction line 1, a prompt will be shown to configure another suction line, obviously the answer is YES:

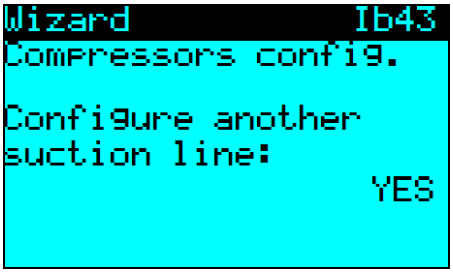


Fig. A3.f

To the next question, which prompts if there is a pRack board dedicated to the second line, answer YES; in this way, the pRack PR100 software prepares to configure the board with address 2 in the pLAN:

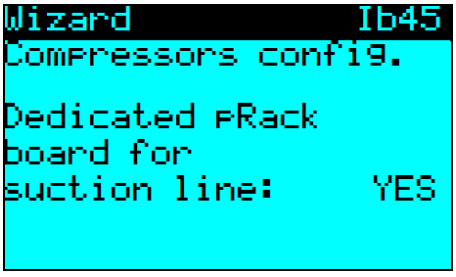


Fig. A3.g

After having answered the questions for the configuration of the second suction line, the software then asks if there is a pLAN board dedicated to condenser line 1. In the case shown in the example, answer NO.

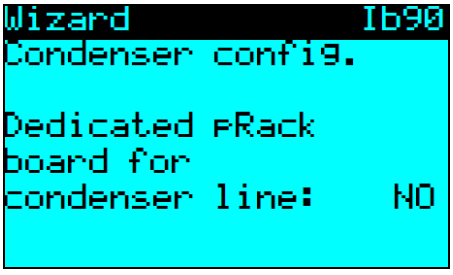


Fig. A3.h

After having configured condenser line 1, the software asks if condenser line 2 is used; answer YES:

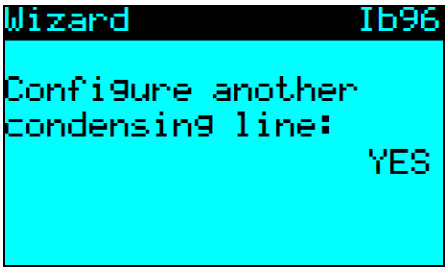


Fig. A3.i

After having also configured the second condenser line, the software asks if a summary should be displayed of the settings made:

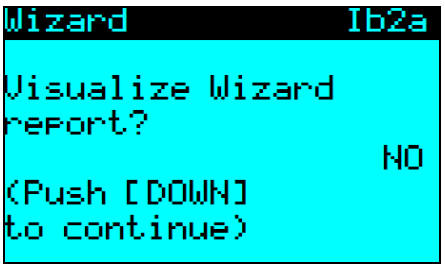


Fig. A3.j

If the settings are correct, the set values can be installed:

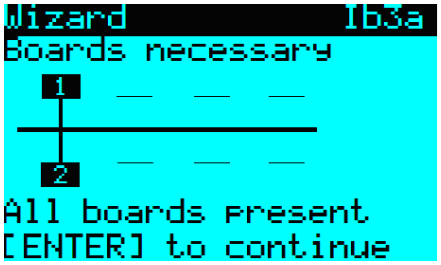


Fig. A3.k

After waiting a few seconds, the unit can be started.

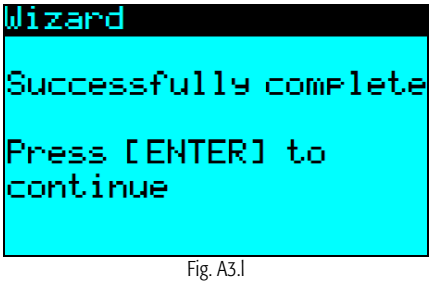


Fig. A3.l

A.4 Alarm table

Code	Description	Reset	Delay	Alarm relay	Action
ALA01	Discharge temperature probe malfunction	Automatic	60s	R2	Related functions disabled
ALA02	Condensing pressure probe malfunction	Automatic	60s	R1	Related functions disabled
ALA03	Outside temperature probe malfunction	Automatic	60s	R2	Related functions disabled
ALA04	Generic probe malfunction A, PLB1	Automatic	60s	R2	Related functions disabled
ALA05	Generic probe malfunction B, PLB1	Automatic	60s	R2	Related functions disabled
ALA06	Generic probe malfunction C, PLB1	Automatic	60s	R2	Related functions disabled
ALA07	Generic probe malfunction D, PLB1	Automatic	60s	R2	Related functions disabled
ALA08	Generic probe malfunction E, PLB1	Automatic	60s	R2	Related functions disabled
ALA09	Generic probe malfunction A, PLB2	Automatic	60s	R2	Related functions disabled
ALA10	Generic probe malfunction B, PLB2	Automatic	60s	R2	Related functions disabled
ALA11	Generic probe malfunction C, PLB2	Automatic	60s	R2	Related functions disabled
ALA12	Generic probe malfunction D, PLB2	Automatic	60s	R2	Related functions disabled
ALA13	Generic probe malfunction E, PLB2	Automatic	60s	R2	Related functions disabled
ALA14	Generic probe malfunction A, PLB3	Automatic	60s	R2	Related functions disabled
ALA15	Generic probe malfunction B, PLB3	Automatic	60s	R2	Related functions disabled
ALA16	Generic probe malfunction C, PLB3	Automatic	60s	R2	Related functions disabled
ALA17	Generic probe malfunction D, PLB3	Automatic	60s	R2	Related functions disabled
ALA18	Generic probe malfunction E, PLB3	Automatic	60s	R2	Related functions disabled
ALA19	Generic probe malfunction A, PLB4	Automatic	60s	R2	Related functions disabled
ALA20	Generic probe malfunction B, PLB4	Automatic	60s	R2	Related functions disabled
ALA21	Generic probe malfunction C, PLB4	Automatic	60s	R2	Related functions disabled
ALA22	Generic probe malfunction D, PLB4	Automatic	60s	R2	Related functions disabled
ALA23	Generic probe malfunction E, PLB4	Automatic	60s	R2	Related functions disabled
ALA24	Suction pressure probe malfunction	Automatic	60s	R1	Related functions disabled
ALA25	Suction temperature probe malfunction	Automatic	60s	R2	Related functions disabled
ALA26	Room temperature probe malfunction	Automatic	60s	R2	Related functions disabled
ALA27	Condensing pressure probe malfunction, line 2	Automatic	60s	R1	Related functions disabled
ALA28	Discharge temperature probe malfunction, line 2	Automatic	60s	R2	Related functions disabled
ALA29	Suction pressure probe malfunction, line 2	Automatic	60s	R1	Related functions disabled
ALA30	Suction temperature probe malfunction, line 2	Automatic	60s	R2	Related functions disabled
ALA31	Condensing pressure backup probe malfunction	Automatic	60s	R2	Related functions disabled
ALA32	Condensing pressure backup probe malfunction, line 2	Automatic	60s	R2	Related functions disabled
ALA33	Suction pressure backup probe malfunction	Automatic	60s	R2	Related functions disabled
ALA34	Suction pressure backup probe malfunction, line 2	Automatic	60s	R2	Related functions disabled
ALA35	Common oil temperature probe malfunction	Automatic	60s	R2	Related functions disabled
ALA36	Common oil temperature probe malfunction, line 2	Automatic	60s	R2	Related functions disabled
ALA39	Discharge temperature probe malfunction, compressors 1 to 6	Automatic	60s	R2	Related functions disabled
ALA40	Discharge temperature probe malfunction, compressors 1 to 6, line 2	Automatic	60s	R2	Related functions disabled
ALA41	Oil temperature probe malfunction compressors 1 to 6, line 1	Automatic	60s	R2	Related functions disabled
ALA42	Oil temperature probe malfunction compressor 1, line 2	Automatic	60s	R2	Related functions disabled
ALB01	Low suction pressure from pressure switch	Semiautomatic	Settable	R1	Shutdown compressor
ALB02	High condensing pressure from pressure switch	Manual/automatic	Settable	R1	Shutdown compressor
ALB03	Low condensing pressure from probe	Automatic	Settable	R1	-
ALB04	High condensing pressure from probe	Automatic	Settable	R1	-
ALB05	Liquid level	Automatic	Settable	R2	-
ALB06	Common oil differential	Automatic	Settable	R2	-
ALB07	Common fan circuit breaker	Automatic	Settable	Settable	-
ALB08	Low suction pressure from pressure switch, line 2	Semiautomatic	Settable	R1	Shutdown compressors, line 2
ALB09	High condensing pressure from pressure switch, line 2	Manual/automatic	Settable	R1	Shutdown compressors, line 2
ALB10	Low condensing pressure from probe, line 2	Automatic	Settable	R1	-
ALB11	High condensing pressure from probe, line 2	Automatic	Settable	R1	-
ALB12	Liquid level, line 2	Automatic	Settable	R2	-
ALB13	Common oil differential, line 2	Automatic	Settable	R2	-
ALB14	Common fan circuit breaker, line 2	Automatic	Settable	Settable	-
ALB15	High suction pressure from probe	Automatic	Settable	R1	-
ALB16	Low suction pressure from probe	Automatic	Settable	R1	-
ALB17	High suction pressure from probe, line 2	Automatic	Settable	R1	-
ALB18	Low suction pressure from probe, line 2	Automatic	Settable	R1	-
ALB21	Shutdown to prevent high pressure	Manual	Settable	R1	Shutdown compressor
ALB22	Shutdown to prevent high pressure, line 2	Manual	Settable	R1	Shutdown compressors, line 2
ALC01	Alarm 1, compressor 1	Manual/automatic	Settable	Settable	Shutdown compressor 1
ALC02	Alarm 2, compressor 1	Manual/automatic	Settable	Settable	Shutdown compressor 1
ALC03	Alarm 3, compressor 1	Manual/automatic	Settable	Settable	Shutdown compressor 1
ALC04	Alarm 4, compressor 1	Manual/automatic	Settable	Settable	Shutdown compressor 1
ALC05	Alarm 5, compressor 1	Manual/automatic	Settable	Settable	Shutdown compressor 1
ALC06	Alarm 6, compressor 1	Manual/automatic	Settable	Settable	Shutdown compressor 1

Code	Description	Reset	Delay	Alarm relay	Action
ALC07	Alarm 7, compressor 1	Manual/automatic	Settable	Settable	Shutdown compressor 1
ALC08	Alarm 1, compressor 2	Manual/automatic	Settable	Settable	Shutdown compressor 2
ALC09	Alarm 2, compressor 2	Manual/automatic	Settable	Settable	Shutdown compressor 2
ALC10	Alarm 3, compressor 2	Manual/automatic	Settable	Settable	Shutdown compressor 2
ALC11	Alarm 4, compressor 2	Manual/automatic	Settable	Settable	Shutdown compressor 2
ALC12	Alarm 5, compressor 2	Manual/automatic	Settable	Settable	Shutdown compressor 2
ALC13	Alarm 6, compressor 2	Manual/automatic	Settable	Settable	Shutdown compressor 2
ALC14	Alarm 7, compressor 2	Manual/automatic	Settable	Settable	Shutdown compressor 2
ALC15	Alarm 1, compressor 3	Manual/automatic	Settable	Settable	Shutdown compressor 3
ALC16	Alarm 2, compressor 3	Manual/automatic	Settable	Settable	Shutdown compressor 3
ALC17	Alarm 3, compressor 3	Manual/automatic	Settable	Settable	Shutdown compressor 3
ALC18	Alarm 4, compressor 3	Manual/automatic	Settable	Settable	Shutdown compressor 3
ALC19	Alarm 5, compressor 3	Manual/automatic	Settable	Settable	Shutdown compressor 3
ALC20	Alarm 6, compressor 3	Manual/automatic	Settable	Settable	Shutdown compressor 3
ALC21	Alarm 7, compressor 3	Manual/automatic	Settable	Settable	Shutdown compressor 3
ALC22	Alarm 1, compressor 4	Manual/automatic	Settable	Settable	Shutdown compressor 4
ALC23	Alarm 2, compressor 4	Manual/automatic	Settable	Settable	Shutdown compressor 4
ALC24	Alarm 3, compressor 4	Manual/automatic	Settable	Settable	Shutdown compressor 4
ALC25	Alarm 4, compressor 4	Manual/automatic	Settable	Settable	Shutdown compressor 4
ALC26	Alarm 5, compressor 4	Manual/automatic	Settable	Settable	Shutdown compressor 4
ALC27	Alarm 6, compressor 4	Manual/automatic	Settable	Settable	Shutdown compressor 4
ALC28	Alarm 7, compressor 4	Manual/automatic	Settable	Settable	Shutdown compressor 5
ALC29	Alarm 1, compressor 5	Manual/automatic	Settable	Settable	Shutdown compressor 5
ALC30	Alarm 2, compressor 5	Manual/automatic	Settable	Settable	Shutdown compressor 5
ALC31	Alarm 3, compressor 5	Manual/automatic	Settable	Settable	Shutdown compressor 5
ALC32	Alarm 4, compressor 5	Manual/automatic	Settable	Settable	Shutdown compressor 5
ALC33	Alarm 6, compressor 5	Manual/automatic	Settable	Settable	Shutdown compressor 5
ALC34	Alarm 7, compressor 5	Manual/automatic	Settable	Settable	Shutdown compressor 5
ALC35	Alarm 7, compressor 5	Manual/automatic	Settable	Settable	Shutdown compressor 5
ALC36	Alarm 1, compressor 6	Manual/automatic	Settable	Settable	Shutdown compressor 6
ALC37	Alarm 2, compressor 6	Manual/automatic	Settable	Settable	Shutdown compressor 6
ALC38	Alarm 3, compressor 6	Manual/automatic	Settable	Settable	Shutdown compressor 6
ALC39	Alarm 4, compressor 6	Manual/automatic	Settable	Settable	Shutdown compressor 6
ALC40	Alarm 5, compressor 6	Manual/automatic	Settable	Settable	Shutdown compressor 6
ALC41	Alarm 6, compressor 6	Manual/automatic	Settable	Settable	Shutdown compressor 6
ALC42	Alarm 7, compressor 6	Manual/automatic	Settable	Settable	Shutdown compressor 6
ALC43	Alarm 1, compressor 7	Manual/automatic	Settable	Settable	Shutdown compressor 7
ALC44	Alarm 2, compressor 7	Manual/automatic	Settable	Settable	Shutdown compressor 7
ALC45	Alarm 1, compressor 8	Manual/automatic	Settable	Settable	Shutdown compressor 8
ALC46	Alarm 2, compressor 8	Manual/automatic	Settable	Settable	Shutdown compressor 8
ALC47	Alarm 1, compressor 9	Manual/automatic	Settable	Settable	Shutdown compressor 9
ALC48	Alarm 2, compressor 9	Manual/automatic	Settable	Settable	Shutdown compressor 9
ALC49	Alarm 1, compressor 10	Manual/automatic	Settable	Settable	Shutdown compressor 10
ALC50	Alarm 1, compressor 11	Manual/automatic	Settable	Settable	Shutdown compressor 11
ALC51	Alarm 1, compressor 12	Manual/automatic	Settable	Settable	Shutdown compressor 12
ALC52	Alarm 1, compressor 1, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 1, line 2
ALC53	Alarm 2, compressor 1, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 1, line 2
ALC54	Alarm 3, compressor 1, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 1, line 2
ALC55	Alarm 4, compressor 1, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 1, line 2
ALC56	Alarm 5, compressor 1, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 1, line 2
ALC57	Alarm 6, compressor 1, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 1, line 2
ALC58	Alarm 7, compressor 1, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 1, line 2
ALC59	Alarm 1, compressor 2, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 2, line 2
ALC60	Alarm 2, compressor 2, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 2, line 2
ALC61	Alarm 3, compressor 2, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 2, line 2
ALC62	Alarm 4, compressor 2, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 2, line 2
ALC63	Alarm 5, compressor 2, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 2, line 2
ALC64	Alarm 6, compressor 2, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 2, line 2
ALC65	Alarm 7, compressor 2, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 2, line 2
ALC66	Alarm 1, compressor 3, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 3, line 2
ALC67	Alarm 2, compressor 3, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 3, line 2
ALC68	Alarm 3, compressor 3, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 3, line 2
ALC69	Alarm 4, compressor 3, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 3, line 2
ALC70	Alarm 5, compressor 3, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 3, line 2
ALC71	Alarm 6, compressor 3, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 3, line 2
ALC72	Alarm 7, compressor 3, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 3, line 2
ALC73	Alarm 1, compressor 4, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 4, line 2
ALC74	Alarm 2, compressor 4, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 4, line 2
ALC75	Alarm 3, compressor 4, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 4, line 2
ALC76	Alarm 4, compressor 4, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 4, line 2
ALC77	Alarm 5, compressor 4, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 4, line 2

Code	Description	Reset	Delay	Alarm relay	Action
ALC78	Alarm 6, compressor 4, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 4, line 2
ALC79	Alarm 7, compressor 4, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 4, line 2
ALC80	Alarm 1, compressor 5, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 5, line 2
ALC81	Alarm 2, compressor 5, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 5, line 2
ALC82	Alarm 3, compressor 5, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 5, line 2
ALC83	Alarm 4, compressor 5, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 5, line 2
ALC84	Alarm 5, compressor 5, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 5, line 2
ALC85	Alarm 6, compressor 5, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 5, line 2
ALC86	Alarm 7, compressor 5, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 5, line 2
ALC87	Alarm 1, compressor 6, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 6, line 2
ALC88	Alarm 2, compressor 6, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 6, line 2
ALC89	Alarm 3, compressor 6, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 6, line 2
ALC90	Alarm 4, compressor 6, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 6, line 2
ALC91	Alarm 5, compressor 6, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 6, line 2
ALC92	Alarm 6, compressor 6, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 6, line 2
ALC93	Alarm 7, compressor 6, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 6, line 2
ALC94	Alarm 1, compressor 7, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 7, line 2
ALC95	Alarm 2, compressor 7, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 7, line 2
ALC96	Alarm 1, compressor 8, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 8, line 2
ALC97	Alarm 2, compressor 8, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 8, line 2
ALC98	Alarm 1, compressor 9, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 9, line 2
ALC99	Alarm 2, compressor 9, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 9, line 2
ALCaa	Alarm 1, compressor 10, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 10, line 2
ALCab	Alarm 1, compressor 11, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 11, line 2
ALCac	Alarm 1, compressor 12, line 2	Manual/automatic	Settable	Settable	Shutdown compressor 12, line 2
ALCad	High oil sump temperature, Digital Scroll™	Manual/automatic	Settable	R2	Shutdown compressor
ALCae	High discharge temperature, Digital Scroll™	Manual/automatic	Settable	R2	Shutdown compressor
ALCaf	High oil dilution, Digital Scroll™	Manual/automatic	Settable	R2	Shutdown compressor
ALCag	High oil sump temperature, Digital Scroll™, line 2	Manual/automatic	Settable	R2	Shutdown compressor
ALCah	High discharge temperature, Digital Scroll™, line 2	Manual/automatic	Settable	R2	Shutdown compressor
ALCai	High oil dilution, Digital Scroll™, line 2	Manual/automatic	Settable	R2	Shutdown compressor
ALCal	High discharge temperature compressors 1 to 6	Automatic	60s	R2	Related functions disabled
ALCam	High discharge temperature compressors 1 to 6, line 2	Automatic	60s	R2	Related functions disabled
AlCan	Compressor envelope	Manual	Settable	R1	Shutdown compressor
ALCao	High compressor oil temperature, line 1	Automatic	Settable	R2	-
AlCap	High compressor oil temperature, line 2	Automatic	Settable	R2	-
ALF01	Fan circuit breaker	Manual/automatic	Settable	R2	Shutdown fans
ALF02	Fan circuit breaker, line 2	Manual/automatic	Settable	R2	Shutdown fans
ALG01	Clock error	Automatic	-	R2	Related functions disabled
ALG02	Extended memory error	Automatic	-	R2	Related functions disabled
ALG11	Generic high temperature alarms 1 to 5, PLB1	Manual/automatic	Settable	Settable	-
ALG12	Generic high temperature alarms 1 to 5, PLB2	Manual/automatic	Settable	Settable	-
ALG13	Generic high temperature alarms 1 to 5, PLB3	Manual/automatic	Settable	Settable	-
ALG14	Generic high temperature alarms 1 to 5, PLB4	Manual/automatic	Settable	Settable	-
ALG15	Generic low temperature alarms 1 to 5, PLB1	Manual/automatic	Settable	Settable	-
ALG16	Generic low temperature alarms 1 to 5, PLB2	Manual/automatic	Settable	Settable	-
ALG17	Generic low temperature alarms 1 to 5, PLB3	Manual/automatic	Settable	Settable	-
ALG18	Generic low temperature alarms 1 to 5, PLB4	Manual/automatic	Settable	Settable	-
ALG19	Generic high modulation alarms 6 and 7, PLB1	Manual/automatic	Settable	Settable	-
ALG20	Generic high modulation alarms 6 and 7, PLB2	Manual/automatic	Settable	Settable	-
ALG21	Generic high modulation alarms 6 and 7, PLB3	Manual/automatic	Settable	Settable	-
ALG22	Generic high modulation alarms 6 and 7, PLB4	Manual/automatic	Settable	Settable	-
ALG23	Generic low modulation alarms 6 and 7, PLB1	Manual/automatic	Settable	Settable	-
ALG24	Generic low modulation alarms 6 and 7, PLB2	Manual/automatic	Settable	Settable	-
ALG25	Generic low modulation alarms 6 and 7, PLB3	Manual/automatic	Settable	Settable	-
ALG26	Generic low modulation alarms 6 and 7, PLB4	Manual/automatic	Settable	Settable	-
ALG27	Normal alarm generic functions 8/9, PLB1	Manual/automatic	Settable	Settable	-
ALG28	Serious alarm generic functions 8/9, PLB1	Manual/automatic	Settable	Settable	-
ALG29	Normal alarm generic functions 8/9, PLB2	Manual/automatic	Settable	Settable	-
ALG30	Serious alarm generic functions 8/9, PLB2	Manual/automatic	Settable	Settable	-
ALG31	Normal alarm generic functions 8/9, PLB3	Manual/automatic	Settable	Settable	-
ALG32	Serious alarm generic functions 8/9, PLB3	Manual/automatic	Settable	Settable	-
ALG33	Normal alarm generic functions 8/9, PLB4	Manual/automatic	Settable	Settable	-
ALG34	Serious alarm generic functions 8/9, PLB4	Manual/automatic	Settable	Settable	-
ALH01	ChillBooster fault	Automatic	Settable	R2	Disable ChillBooster
ALH02	ChillBooster fault, line 2	Automatic	Settable	R2	Disable ChillBooster
ALO02	pLAN malfunction	Automatic	60s	R1	Shutdown unit
ALT01	Compressor maintenance request	Manual	-	Not featured	-
ALT02	Compressor maintenance request, line 2	Manual	-	Not featured	-
ALT03	ChillBooster maintenance request	manual	0s	Not featured	-
ALT04	ChillBooster maintenance request, line 2	manual	0s	Not featured	-

Code	Description	Reset	Delay	Alarm relay	Action
ALU01	Configuration not allowed	Automatic	Not featured	Not featured	Shutdown unit
ALU02	Control probes missing	Automatic	Not featured	Not featured	Shutdown unit
ALW01	High pressure prevent warning	Automatic	Settable	Not featured	Shutdown compressor, except minimum load stage
ALW02	High pressure prevent warning, line 2	Automatic	Settable	Not featured	Shutdown compressor line 2, except minimum load stage
ALW03	Compressor inverter warning	Automatic	Not featured	Not featured	-
ALW04	Compressor inverter warning, line 2	Automatic	Not featured	Not featured	-
ALW05	Fan inverter warning	Automatic	Not featured	Not featured	-
ALW06	Fan inverter warning, line 2	Automatic	Not featured	Not featured	-
ALW07	Envelope warning: refrigerant not compatible with compressor series	Automatic	Not featured	Not featured	-
ALW08	Envelope warning: custom envelope not configured	Automatic	Not featured	Not featured	-
ALW09	Envelope warning: suction or condensing probes not configured	Automatic	Not featured	Not featured	-
ALW10	Low superheat warning	Automatic	Not featured	Not featured	-
ALW11	Low superheat warning, line 2	Automatic	Not featured	Not featured	-
ALW12	Warning, ChillBooster operating without outside sensor	Automatic	0s	Not featured	-
ALW13	Warning, ChillBooster operating without outside sensor, line 2	Automatic	0s	Not featured	-
ALW14	Warning, probe type configured not allowed	Automatic	Not featured	Not featured	-
ALW15	Warning, error during self-configuration	Automatic	Not featured	Not featured	-

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+0300011EN pRack pR100– rel 1.0 – 10/02/2010