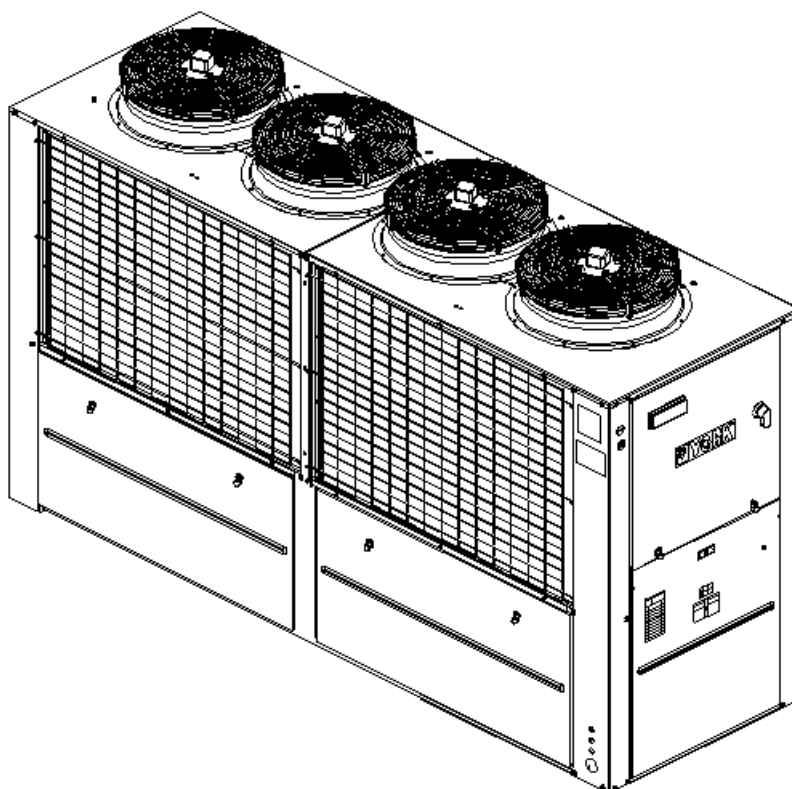




BY JOHNSON CONTROLS

## Air-condensed water chillers and heat pumps YLCA / YLHA 100, 120 and 150



User manual

Ref.: N-40291\_EN 1110



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# User manual

## 1.1 General description of the unit

The YLCA/YLHA units are high-performance air-water chillers and heat pumps using R-410A ecological refrigerant.

These units are designed for air conditioning or industrial applications that require cold or hot water.

They are silent and compact units, equipped with vertical air discharge axial fans, that can be installed directly outdoors.

They are available in two versions: with and without a hydro kit, which includes a buffer tank and a high head pressure pump.

The control system of these units is a specially programmed electronic controller to be used on air-water chillers and heat pumps equipped with tandem compressors. Easy to use and safe, these units precision control the water return temperature of the installation, carry out defrost cycles, modulate fan speeds and control compressor, pump and electric heater start-up. By reading the control sensors and safety elements, the controller protects the entire equipment against malfunctions. The system allows connecting the unit to a standard RS485 monitoring network.

For further information, please see Operating Instructions.

The YLCA/YLHA units are made of proven quality components and manufactured in compliance with standards in force (ISO 9001 certification).

### 1.1.1 Models available and capacities

Cool-only model	YLCA 40	YLCA 50	YLCA 60	YLCA 80	YLCA 100	YLCA 120	YLCA 150
Cooling capacity	39,6	52,1	60,5	77,6	99	119	151

Heat pump model	YLHA 40	YLHA 50	YLHA 60	YLHA 80	YLHA 100	YLHA 120	YLHA 150
Cooling capacity	37,8	52	60,5	72,2	96	114	145
Heating capacity	38,6	52,5	59,6	74,7	104	119,6	150

Cooling capacities in kW for 12/7 °C water input /output temperature and 35°C ambient temperature.

Heating capacities in kW for 40/45 °C water input /output temperature and 7°C ambient temperature.

## 1.1.2 Technical specifications

These units are supplied completely factory-assembled and with all refrigerant tubing and wiring ready for installation on site. After mounting, these units must go through an operational test with water. Refrigerant leaks will also be checked during this process.

### Sheet casing

The units are made of galvanized steel sheeting and anticorrosion nuts and bolts. Panels can be removed for access to internal components. The casing parts are painted with white RAL9001 oven-baked polymerized enamel.

### Compressors

One, two or four hermetic Scroll compressors mounted in tandem on rails and antivibratory supports are used. Compressors are connected for operation with one single cooling circuit. Start-up is carried out by two independent starters. These compressors are equipped with mechanical elements that protect them against high operating temperatures. The crankcase heaters operate only when the compressor is inoperative.

### Water side heat exchanger

Comprises a stainless steel plate exchanger, adequately insulated by a layer of closed-cell elastomer foam. Includes an antifreeze heater monitored by the controller. The refrigerant side of said exchanger accepts an operating pressure of 45 bar, whereas the water side accepts 10 bar. When the unit includes a hydro kit, maximum admissible pressure on the water side is 6 bar (adjustment of the tank safety valve).

### Air side heat exchanger

Made up of two notched aluminium blue fin coils and grooved copper tubing mechanically expanded within the fin assembly.

### Fans

Of the axial and low sound level type. Equipped with single-phase motors with IP54 protection. These motors allow speed control by means of a phase cut-out shifter controlled by the unit controller. This allows unit operation at low ambient temperatures (-10°C). On cool only units with an optional low ambient temperature kit can reach -18°C. On heat pumps, the fan will remain inoperative during defrosting.

### Electrical and control panel

Located at the front of the unit, and with IP44 protection. The operating and control components are factory mounted, wired and tested. The door of this control panel is equipped with a locking isolator that turns power supply off. Inside we find the contactors for compressors and the pump, the transformer, magneto-thermal protectors, controller electronic plates, speed control, connecting strip and the keyboard-display with the unit controls.

### Control keyboard-display

This device is accessible through an external leak-tight plastic cover. This is an easy-to-use control with three access levels: direct, user (password) and factory (password). For further information, please see Operating Instructions.

### Cooling circuit

The cool only unit cooling circuit includes: expansion valve, filter-dryer, liquid sight glass, high and low pressure switches, service valves for isolating the condensing unit, and Schrader valves on the high and low sides. The heat pump model also includes, in addition, a four-way valve (energized in summer cycle and during defrosts), retaining valves, a heat cycle expansion valve and a liquid tank. The suction tubing is coated with closed-cell elastomer.

**Hydro kit (pack)**

These units include a pack assembled with the components of a hydro kit. This assembly is located within the unit frame and does not increase the footprint of same. It includes the following components: Lined buffer tank and with an antifreeze heater, centrifugal pump, expansion vessel charged with nitrogen at 1.5 bar, safety valve set to 6 bar, water circuit, pressure gauge, two air bleed valves, filling valve and drain valve. Also includes a mesh filter for the water circuit. This filter is supplied loose for installation at the most convenient point.

**Flow switch**

Assures sufficient water flow when the unit is in operation.

## Options and accessories

### Units without hydro kit

This includes the elements described in the previously mentioned specifications, less the hydro kit (pack). The water circuit includes an air bleed valve. Connections are ready for on-site installation.

### Two pumps

Accessory available with models 50 to 150 with hydro kit. The second pump becomes operative when the magnetothermal protector of the first pump is activated (models 50, 60 and 80), or through the controller program (models 100, 120 and 150).

### Water filter

Supplied as a standard element on units including the hydro kit. Stainless steel mesh with 1 mm. diameter perforations. Optional on units not including the hydro kit. The warranty of the unit will not be valid if a water filter has not been installed.

### Remote control

Wall-mounted remote control unit with keyboard for cool /heat and ON /OFF functions. Includes power supply, alarm and cool /heat LEDs. Maximum cable length: 50 m.

### Remote terminal

For total access and control of the system by means of the display and buttons. It allows for selection of cool, heat and off functions. Operating parameters can also be modified and the system can also be supervised. Can be installed at a maximum distance of 1040 m.

### BMS connections

By means of a serial board, it is possible to connect the system to a standard RS485 monitoring network.

### Low noise level units (LN)

Include anti-noise covers mounted on the compressors and sound isolating plates, covering the compressor chamber.

### Soft starter

For the soft motor start. Specially designed for Scroll compressors. (Maximum outdoor temperature: 50°C).

### Protecting grids

To protect the coils from possible impacts. Made of steel rods and painted with oven baked polymerized white enamel (RAL9001).

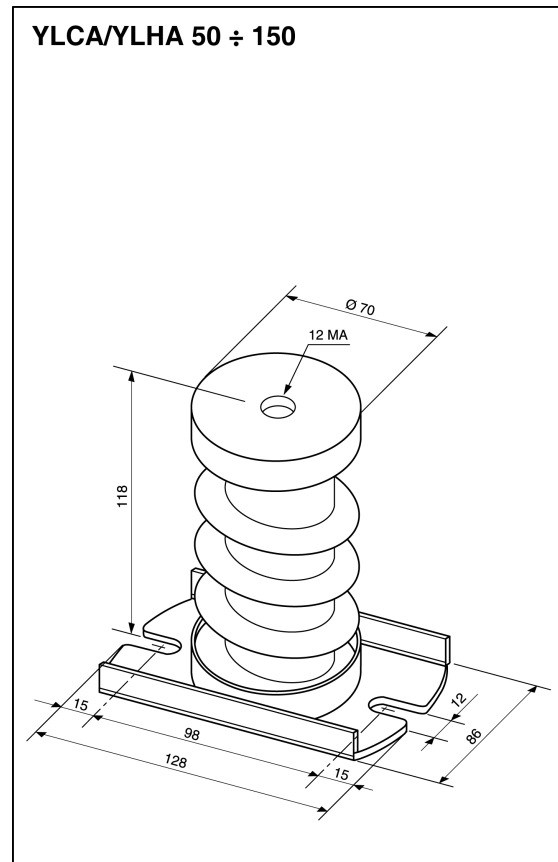
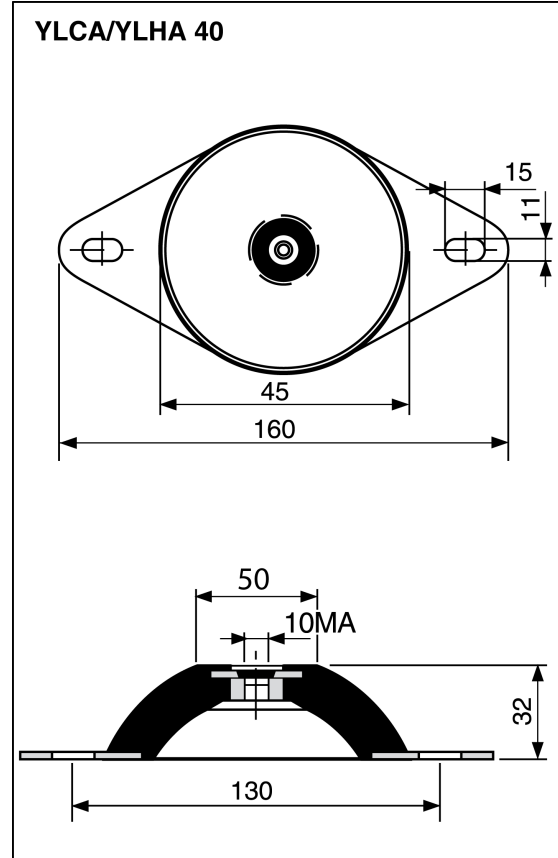
**Antivibratory supports**

Whenever necessary to reduce vibrations and noise produced by the unit to a maximum, a set of steel spring antivibratory supports can be used. These should be installed between the chassis support of the unit and the base or floor on which it is to sit.

This base must be solid and dimensioned in accordance with the load to be supported.

The antivibratory support accessory for models YLCA/YLHA 40, 50 and 60 includes 4 units, whereas for models YLCA/YLHA 80, 100, 120 and 150 includes 6.

These spring supports should be distributed and fastened in the drilled holes at the base of the chiller, the location of which is detailed in the General Dimensions section.





### 1.1.3 Operating instructions $\mu$ C3 (YLCA / YLHA 100, 120 and 150)

This is a specially programmed controller for air-water chillers and heat pumps with four capacity stages. These are divided into two independent cooling circuits equipped with two tandems that act upon a common water circuit. Both systems are equipped with two fans each, the speed of which is controlled by pressure sensors. The controller operates through the following intakes and outlets.

#### Digital inputs

ID1 - J1/8	General protection (PG)
ID2 - J1/1	Flow switch (FS)
ID3 - J1/9	Remote ON/OFF (ROO)
ID4 - J1/2	Pump protector No. 1 (Q5)
ID5 - J1/10	Low-pressure switch circuit 1 (LP1)
ID6 - J4/8	High-pressure switch circuit 1 (HP1)
ID7 - J4/1	Thermal protector compressor 1 (THPC1)
ID8 - J4/9	Thermal protector compressor 2 (THPC2)
ID9 - J4/2	Thermal protector circuit 1 fans (THPF 1-2)
ID10 - J4/10	Low-pressure switch circuit 2 (LP2)
ID11 - J7/6	High-pressure switch circuit 2 (HP2)
ID12 - J7/1	Thermal protector compressor 3 (THPC3)
ID13 - J7/8	Thermal protector compressor 4 (THPC4)
ID14 - J7/3	Thermal protector circuit 2 fans (THPF 3-4)
ID15 - J7/9	Remote COOL/HEAT (RCH)
ID18 - J7/5	Pump protector No. 2 (Q6)

#### Digital outputs

N01/C1-2	Compressor 1 circuit 1 (K1)
N02/C1-2	Compressor 2 circuit 1 (K2)
N05/C5	Pump 1
N06/C6-7	Compressor 3 circuit 2 (K3)
N07/C6-7	Compressor 4 circuit 2 (K4)
N08/C8-9	Pump 2
N010/C10	Alarm
N011/C11-12	Antifreeze heater circuit 1-2
N012/C11-12	Back-up heater
N013/C13-14	4-way valve circuit 1 (V4V1)
N014/C13-14	4-way valve circuit 2 (V4V2)

### Analogue inputs

B3 - J2	Coil pressure circuit 1
B4 - J3	Coil pressure circuit 2
B5 - J4/13	Water temperature at exchanger inlet
B6 - J4/12	Water temperature at exchanger outlet

### Analogue outputs

Y3	Circuit 1 fan speed control (PWM)
Y4	Circuit 2 fan speed control (PWM)

## System components

The system is made up of the following basic components:

- Touch screen
- $\mu$ C3 controller
- Fan speed controllers (FSC1 and FSC2)
- Pressure sensors (B3 and B4)
- NTC sensors (B5 and B6)

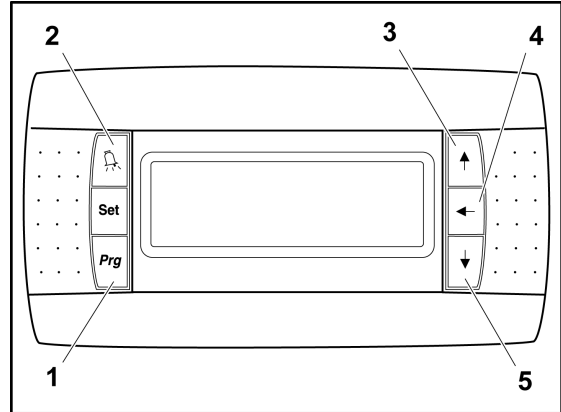
### Touch screen

This consists of a screen and six keys with the following functions:

- Alarm -2-
- Programming -1-
- Esc (Escape)
- Up -3-
- Enter -4-
- Down -5-

The following functions can be selected from this screen:

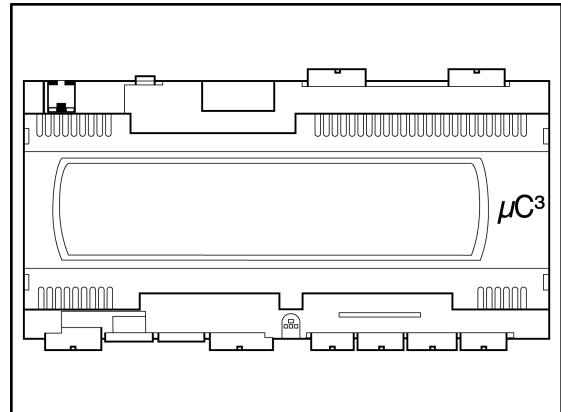
- ON/OFF
- COLD/HEAT
- Read the unit status
- Access the configuration menus (by means of a password)
- Read the alarm messages and reset these alarms
- Read operating pressures and temperatures
- etc...



### $\mu$ C3 controller

This contains the unit software and the entire digital and analogue input and output connector system.

This module is also equipped with connectors the program download key and the serial communication connection to an RS485 monitoring system.



## Sensors and probes

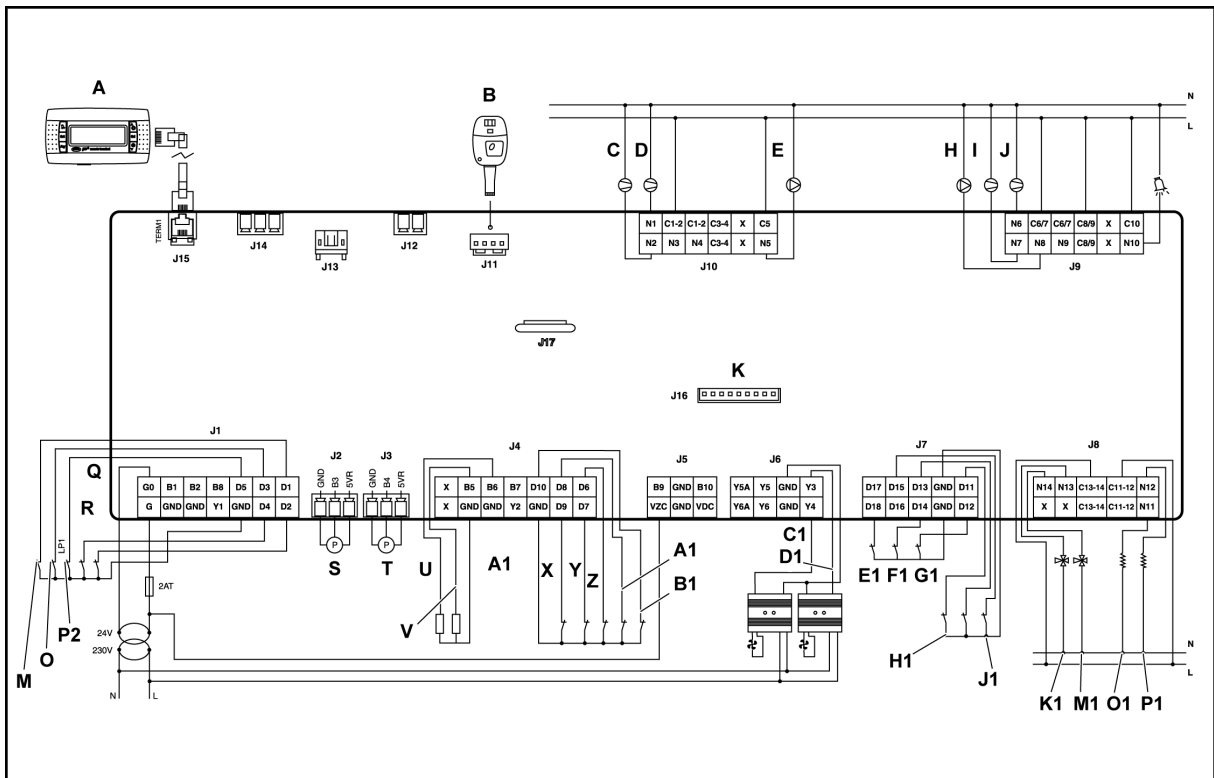
### Pressure sensors (B3 and B4)

One for each cooling circuit and connector to the coil collectors. They provide information to the system for fan speed adjustment in the summer and winter cycles, management of defrosts in the heat pumps, prevent and lockout functions of the system by excessively high pressure.

### NTC probes(B5 and B6)

- B5- For the detection and control of water inlet temperature (cool only and heat pump units).
- B6- For the detection of water outlet temperature. It provides information for antifreeze protection and control of the antifreeze and backup heaters. If required, allows controlling water temperature at the heat exchanger discharge

## General diagram, (YLCA / YLHA 100,120 and 150)



A	Keyboard - display terminal	U	Water outlet
B	Programme download key	V	Water inlet
D/J/C/I	Comp. 1/ Comp. 2 / Comp. 3 / Comp. 4	X	Fan protection 12
E/H	Pump 1/ Pump 2	Y/A1/G1/ I1	Protection comp. 1 / Protection comp. 2 / Protec- tion comp. 3 / Protection comp. 4
K	RS485 serial connection	Z/H1	HP1 / HP2 (High-pressure switch)
L	Phase (board power supply)	C1	Fan 3.4
M	General protection	D1	Fan 1.2
N	Neutral (board power supply)	F1	Fan protection 3.4
O	Remote ON / OFF	J1	Remote COOL / HEAT
P2/B1	LP1 / LP2 (Low-pressure switch)	K1	4-way valve, circuit 1
Q/E1	Pump 1 protection / Pump 2 protection	M1	4-way valve, circuit 2
R	Flow switch	O1	Antifreeze heater
S/T	Circuit 1 pressure sensor / Circuit 2 pressure sensor	P1	Back-up heater

## 1.1 General description of the unit

### Start-up

About 45 seconds after powering the unit, the start-up display is activated.

Default language: English.

#### 1st Display. START-UP

(information on water temperature/unit status)

- Water inlet temperature
- Water outlet temperature
- Unit status (ON/OFF)

Press "down" to access the second display.

#### 2nd Display. STATUS AND OPERATING MODE SELECTION

Status selection **ON/OFF** (with **ENTER**, **Up** and **Down**).

On the heat pump units, select the **COOL/HEAT** operating mode (with **ENTER**, **Up** and **Down**).

Press **ESC** to return to the 1st display.

### SYSTEM CONFIGURATION

(For authorised servicing personnel only)

#### 3rd Display. ENTER PASSWORD

The 3rd Enter password display is accessed by pressing **Up** from the 1st display (**Start-up**), or **Down** from the 2nd display (**Status / operating mode selection**)

- 1 From the **Enter password** display, press **ENTER**.
- 2 Enter the password using the **Up** key.
- 3 Press **ENTER** to access the 4th **Menu** display.

#### 4th Display. MENU

From this display we can access a set of submenus that provide information on the unit or allow for its operating parameters to be configured. These submenus are as follows:

-/-	Sensors	Sensors config.
-A-	Antifreeze	Antifreeze
-B-	Input/output	Input/output
-c-	Compressors	Comps. conf.
-d-	Defrost	Defrost
-F-	Condensation (fans)	Condensation
-H-	Unit configuration	Unit config.
-P-	Alarms	Alarm settings
-r-	Temperature control	Control param.
-Fr-	Software version / language selection	Soft. version
-t-	Time (not available)	Time config.

To enter a submenu:

- 1 Select it using the **Up** or **Down** key and then activate it using the **ENTER** key
- 2 Once the parameters are set with the **ENTER**, **Up** and **Down** keys, press **Prg** to confirm the modification and return to the **MENU** display.
- 3 To exit the **MENU** display, press the **Esc** key.

## -/- Configuration of sensors

Description		Range	Units	Value
Sensor B3 calibration.	Coil pressure circuit 1	-9,9/9,9	bar	0
Sensor B4 calibration.	Coil pressure circuit 2	-9,9/9,9	bar	0
Sensor B5 calibration.	Inlet water temp. to exchanger.	-9,9/9,9	K	0
Sensor B6 calibration.	Outlet water temp. to exchanger.	-9,9/9,9	K	0
Sensor B7 calibration.	Outdoor temperature	-9,9/9,9	K	0
Sensor B8 calibration.	Dynamic set point	-9,9/9,9	%	0
Enabling sensor B1		YES / NO	-	NO
Enabling sensor B2		YES / NO	-	NO
Enabling sensor B3.	Coil pressure circuit 1	YES / NO	-	YES
Enabling sensor B4.	Coil pressure circuit 2	YES / NO	-	YES
Enabling sensor B5.	Inlet water temp. to exchanger.	YES / NO	-	YES
Enabling sensor B6.	Outlet water temp. to exchanger.	YES / NO	-	YES
Enabling sensor B7		YES / NO	-	NO
Enabling sensor B8		YES / NO	-	NO
Enabling sensor B9.		YES / NO	-	NO
Enabling sensor B10.		YES / NO	-	NO
Sensor B3 configuration.	Minimum value	-30/150	bar	0
Sensor B3 configuration.	Maximum value	-30/151	bar	45
Sensor B4 configuration.	Minimum value	-30/152	bar	0
Sensor B4 configuration.	Maximum value	-30/153	bar	45

## -A- Antifreeze

Description	Range	Units	Value
Antifreeze alarm set point	-99,9/99,9	°C	3
Antifreeze alarm set point differential	99,9	°K	5
Lower antifreeze alarm set point limit	-99,9/99,9	°C	3
Upper antifreeze alarm set point limit	-99,9/99,9	°C	5
Antifreeze alarm reset	MANUAL AUTOMATIC	-	MANUAL
Antifreeze alarm delay (If automatic reset has been selected)	0/540	Minutes	0
Antifreeze heater trigger set point	-99,9/99,9	°C	3
Antifreeze heater trigger set point differential	-99,9/99,9	°K	2
Auxiliary heater trigger set point (winter cycle)	-99,9/99,9	°C	25
Auxiliary heater trigger set point differential (winter cycle)	-99,9/99,9	°K	5
Auxiliary heater trigger delay	0/60	Minutes	15
Automatic enabling of the frost protection system with the unit OFF	DISABLED HEATER AND PUMP HEATER AND UNIT HEATER	-	HEATER

## 1.1 General description of the unit

**-C- Compressor configuration**

Description	Range	Units	Value
Min. operating time of a compressor	0 / 9999	Seconds	120
Min. stoppage time of a compressor	0 / 9999	Seconds	60
Start-up time between different compressors	0 / 9999	Seconds	3
Start-up time of one compressor	0 / 9999	Seconds	300
Start-up time between pump and compressor	0 / 999	Seconds	20
Stoppage time between compressor and pump	0 / 999	Seconds	20
Pump 1 operating hours			
Pump 2 operating hours			
Compressor 1 operating hours			
Compressor 2 operating hours			
Compressor 3 operating hours			
Compressor 4 operating hours			
Operating hours for pump maintenance alarm	1000 / 999000	Hours	0 x 1000
Operating hours for compressor 1 / circuit 1 maintenance alarm	1000 / 999000	Hours	0x 1000
Operating hours for compressor 2 / circuit 1 maintenance alarm	1000 / 999000	Hours	0x 1000
Operating hours for compressor 1 / circuit 2 maintenance alarm	1000 / 999000	Hours	0x 1000
Operating hours for compressor 2 / circuit 2 maintenance alarm	1000 / 999000	Hours	0x 1000
Tandem compressor rotation time		Minutes	20
Enabling of compressors C <sup>1/1</sup> , C <sup>2/1</sup> , C <sup>1/2</sup> , C <sup>2/2</sup>	YES / NO		YES
Forced manual compressor operations	YES / NO		NO

**-d- Defrost**

When a defrost cycle is being carried out, the message **DEFROST REQ** appears on the start-up display.

Description	Range	Units	Value
Defrost sensor selection	Pressure temp.	-	Pressure
	Pressure switch		
Separate or simultaneous defrost (contemporaneous)	Separate	-	Separate
	Simultaneous		
End defrost by interval of	Time	-	Temp. / Pressure
	Temp. / Pressure		
Defrost start pressure	-99,8 / 99,9	bar	5,8
Defrost end pressure	-99,8 / 99,9	bar	26
Defrost call delay	1 / 32000	Seconds	180
Max. defrost time	1 / 32000	Seconds	420
Min. defrost time	1 / 32000	Seconds	0
Timing between defrosts of a single circuit	1 / 32000	Seconds	1800
Timing between defrosts of different circuits	1 / 32000	Seconds	300
Forced compressor stoppage time at start and end of defrost	0 / 999	Seconds	0
4-way valve inversion delay	0 / 999	Seconds	0
Manual defrost	Enabled	-	Disabled
	Disabled		



## -F- Condensation (fans)

Description	Range	Units	Value
Type of fan control	Temp. pressure ON/OFF	-	Pressure
No. of condensers	1-2	-	2
Control device	Fans	-	Inverter
	Inverter	-	
Power supply frequency	50 / 60	Hz	50
PWM max. triac cut-off	0 / 100	%	92
PWM min. triac cut-off	0 / 100	%	35
Triac impulse duration	0 / 10	ms	2
Condensing pressure in summer cycle	0 / 99,9	bar	21
Condensing pressure differential in summer cycle	0 / 99,9	bar	5
Evaporating pressure in winter cycle	0 / 99,9	bar	9,5
Evaporating pressure differential in summer cycle	0 / 99,9	bar	1,5
Min. fan speed differential	-99,9 / 99,9	bar	3
Max. inverter speed	0 / 10	V	10
Min. inverter speed	0 / 10	V	1
Inverter speed-up time	0 / 999	Seconds	5
Prevent function activation (HP)	YES / NO	-	YES
Selection of sensor for HP prevention	Pressure	-	Pressure
	Temperature		
HP prevention pressure	-99,9 / 99,9	bar	38
HP prevention pressure differential	0 / 99,9	bar	4
LP prevention pressure	-99,9 / 99,9	bar	3
LP prevention pressure differential	0 / 99,9	bar	1,5
Fan management in case of sensor failure	Fan OFF		Fan OFF
	Fan ON and Compressor ON		
Prevent function timing	0 / 99	Seconds	0

## 1.1 General description of the unit

**-H- Unit configuration**

Description	Range	Units	Value
Unit type	0 - 7	-	2 (COOLER) 3 (HEAT PUMP)
Number of compressors/circuits		-	4 / 2
Compressor rotation	LIFO FIFO PERSONALISED TIME	-	FIFO
No. of evaporators	1 - 2	-	1
Driver number (EVD400)	0-1-2-4	-	0
Cycle inversion valve logic	NO / NC	-	NC
No. of pumps	1 - 2	-	1 (SINGLE PUMP) 2 (TWO-PUMP ACCESSORY)
Pump rotation	START-UP TIME	-	TIME
Pump operation	ON WITH COMP. ON ALWAYS OFF ALWAYS ON SAFETY ON/ OFF		ALWAYS ON
No. of hours for pump rotation	0 - 9999	Hours	12
ON/OFF digital input activation	YES / NO	-	NO
WINTER/SUMMER digital input activation	YES / NO	-	NO
ON/OFF activation with Monitor	YES / NO	-	NO
WINTER/SUMMER activation with Monitor	YES / NO	-	NO
WINTER/SUMMER operation inversion delay		Seconds	10
Monitoring protocol	CAREL GSM MODEM ANALOGUE MODEM RS 232 LONWORKS MODBUS	-	CAREL
Selection of communication speed	1200 2400 4800 9600 19200	Bauds	19200
Monitoring ID number	0 - 200	-	1
Selection of language at start-up	YES / NO	-	YES
Restore default values (Warning!)	YES / NO	-	NO

## -B- Inputs/Outputs

Description	Range	Units	Value
Analogue input 3. Coil pressure circuit 1 (B3)		bar	INSTANT READ OUT
Analogue input 4. Coil pressure circuit 2 (B4)		bar	INSTANT READ OUT
Analogue input 5. Inlet water temperature (B5)		°C	INSTANT READ OUT
Analogue input 6. Outlet water temperature (B6)		°C	0 = OPEN C = CLOSED
Digital input 1. External alarm	O/C		0 = OPEN C = CLOSED
Digital input 2. Flow switch	O/C		0 = OPEN C = CLOSED
Digital input 3. Remote ON/OFF	O/C		0 = OPEN C = CLOSED
Digital input 4. Pump 1 protector	O/C		0 = OPEN C = CLOSED
Digital input 5. Low-pressure switch circuit 1	O/C		0 = OPEN C = CLOSED
Digital input 6. High-pressure switch circuit 1	O/C		0 = OPEN C = CLOSED
Digital input 7. Thermal protector compressor 1 circuit 1	O/C		0 = OPEN C = CLOSED
Digital input 8. Thermal protector compressor 2 circuit 1	O/C		0 = OPEN C = CLOSED
Digital input 9. Fan 1-2 protectors circuit 1	O/C		0 = OPEN C = CLOSED
Digital input 10. Low-pressure switch circuit 2	O/C		0 = OPEN C = CLOSED
Digital input 11. High-pressure switch circuit 2	O/C		0 = OPEN C = CLOSED
Digital input 12. Thermal protector compressor 3 circuit 2	O/C		0 = OPEN C = CLOSED
Digital input 13. Thermal protector compressor 4 circuit 2	O/C		0 = OPEN C = CLOSED
Digital input 14. Fan 3-4 protector circuit 2	O/C		0 = OPEN C = CLOSED
Digital input 15. Remote COOL/HEAT	O/C		0 = OPEN C = CLOSED
Digital input 16. Not used			
Digital input 17. Not used			
Digital input 18. Pump 2 protector			0 = OPEN C = CLOSED
Digital output 1. Compressor 1 circuit 1	O/C		0 = OPEN C = CLOSED
Digital output 2. Compressor 2 circuit 1	O/C		0 = OPEN C = CLOSED
Digital output 3. (Not used)			
Digital output 4. (Not used)			
Digital output 5. Pump 1	O/C		0 = OPEN C = CLOSED
Digital output 6. Compressor 3 circuit 2	O/C		0 = OPEN C = CLOSED
Digital output 7. Compressor 4 circuit 2	O/C		0 = OPEN C = CLOSED
Digital output 8. (Not used)			
Digital output 9. (Not used)			
Digital output 10. External alarm / fuse failure	O/C		0 = OPEN C = CLOSED
Digital output 11. Antifreeze heater	O/C		0 = OPEN C = CLOSED
Digital output 12. Backup heater	O/C		0 = OPEN C = CLOSED
Digital output 13. 4-way valve circuit 1	O/C		0 = OPEN C = CLOSED
Digital output 14. 4-way valve circuit 2	O/C		0 = OPEN C = CLOSED

## 1.1 General description of the unit

**-P- Alarms**

Description	Range	Units	Value
High-pressure alarm set point (transducer B3; B4)	0 / 99,9	bar	41
High-pressure alarm differential (transducer B3; B4)	0 / 99,9	bar	10
Summer low-pressure alarm	0 / 99,9	bar	3
Winter low-pressure alarm	0 / 99,9	bar	2
Defrost low-pressure alarm	0 / 99,9	bar	1
Low-pressure differential	0 / 99,9	bar	1
Low-pressure alarm delay on cold cycle start-up	0 - 999	Seconds	60
Low-pressure alarm delay on heat cycle and defrost	0 - 999	Seconds	0
Water flow control (flow switch) alarm delay on start-up	0 - 999	Seconds	20
Water flow control (flow switch) alarm delay on operating	0 - 9999	Seconds	5
Number of automatic reset alarm stoppages	0 - 4		1
Maximum period for automatic reset alarms	0 - 99	Minutes	60
Alarm selection with automatic reset: compressor thermal breaker	AUTOMATIC / MANUAL		AUTOMATIC
Alarm selection with automatic reset: fan thermal breaker	AUTOMATIC / MANUAL		AUTOMATIC
Alarm selection with automatic reset: low-pressure switch	AUTOMATIC / MANUAL		AUTOMATIC
Alarm selection with automatic reset: high-pressure switch	AUTOMATIC / MANUAL		AUTOMATIC

**-r- Control**

When this submenu is activated, the dynamic **set point** temperature appears (if this function is enabled). Press **Down** to access the configuration menu.

Description	Range	Units	Value
Set point in COOL		°C	12
Set point in HEAT		°C	40
Temperature control adjustment range		°K	3
COOL set point lower limit		°C	6
COOL set point upper limit		°C	20
HEAT set point lower limit		°C	25
HEAT set point upper limit		°C	45
Temperature setting type	INPUT / OUTPUT	-	INPUT
Setting type with input sensor	PROPORTIONAL / P+I		PROPORTIONAL
Integration time in each adjustment P+I	0 / 9999	Seconds	600
Max. increase time of call (output adjustment)	0 / 9999	Seconds	20
Min. increase time of call (output adjustment)	0 / 9999	Seconds	20
Max. decrease time of call (output adjustment)	0 / 9999	Seconds	10
Min. decrease time of call (output adjustment)	0 / 9999	Seconds	10
Temp. differential in which increase and decrease times vary (output adjustment)	-99,9 / 99,9	°C	2
Forced stoppage in COOL cycle (output adjustment)	-99,9 / 99,9	°C	5
Forced stoppage in HEAT cycle (output adjustment)	-99,9 / 99,9	°C	47

## µC3 functions

### F-r. Software version / Language selection

- Read out of the µC3 software version and update date.
- The **Up**, **Down** and **Enter** keys select the language: English or Italian.

### Temperature control

Two different modes (Control Menu):

- 1 Adjustment by water temperature at the heat exchanger inlet (sensor B5).  
This control carries out a proportional type adjustment based on a set point and a proportional band distributed over 4 stages. This is the controller default type.  
It is also possible to carry out a proportional and integral adjustment. In this case, said function must be enabled and the integration time set (**CONTROL MENU**).

Control sensor: B5 ((inlet water temperature to heat exchanger)).

Parameters to be used:

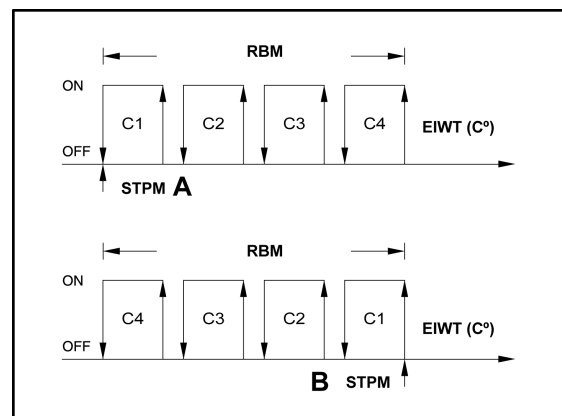
- Set point.
- Proportional band for inlet adjustment.
- Type of adjustment (Proportional or Proportional + Integral)
- Integration time (if the Proportional + Integral adjustment has been enabled).

Control outputs: N1, N2, N6 and N7 (compressor contactors).

Description of the operation:

Temperature control depends upon the value measured by the sensor located at the water inlet to the heat exchanger. It follows a proportional logic in which the proportional band is subdivided into four equal stages that give way to on/off functions of the compressors. In Proportional + Integral operation behaviour is similar, but affected by an algorithm that takes time into account (integration time parameter).

STPM	Set point: A = Cool B = Heat	EWT	Exchanger inlet temperature
RBM	Control band	C1, C2, C3, C4	Compressor stages



- 2 Adjustment by water temperature at the outlet of the heat exchanger.

Thermostatic control is based on the temperature value detected by sensor B6. Based on the set point value (STPM) and the control band (RBM), it defines a neutral temperature zone (NZ).

- The temperature values comprised between the set point and the set point plus the band ( $STP \leq \text{Temperature} \leq STP + RBM$ ) do not cause the on/off function of the compressors.
- Temperature values above the set point plus the band ( $\text{Temperature} > STP + RBM$ ) cause compressor operation.
- Temperature values below the set point ( $\text{Temperature} < STP$ ) cause compressor stoppage.

The on/off process of the compressors is controlled by a variable delay time.

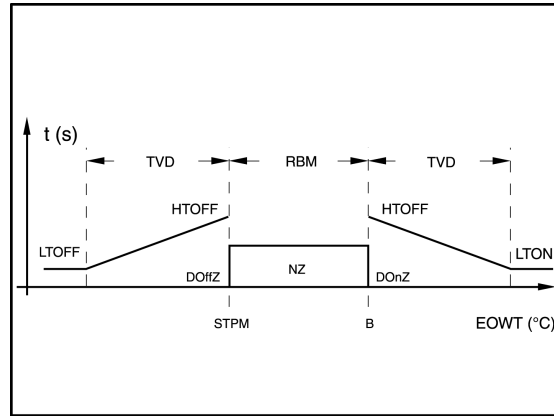
Based on the time differential calculated as the delay, and in accordance with the temperature detected by sensor B6, this control will modulate the on/off process of the compressors.

If set to 0, minimum delay time at increase/decrease of the power demand, this function is disabled.

There is a different temperature differential for the cool/heat cycles (below or above...), as of which there is an unconditional off of the devices installed to avoid excessive cool/heat cycles.

## 1.1 General description of the unit

STP M	Set point	TVD	Phase input/output time variation differential
RBM	Control band	HTON	Stage activation maximum time delay
NZ	Neutral zone	LTON	Stage activation minimum time delay
EOW T	Water temperature at exchanger outlet	HT OFF	Stage deactivation maximum time delay
DonZ	Compressor ON zone	LT OFF	Stage deactivation minimum time delay
DoffZ	Compressor off zone	t	Time

**Compressor rotation**

The controller provides a FIFO type rotation in which the first compressor to go on will also be the first to go off.

Start-up sequence: C1, C2, C3, C4.

Stoppage sequence: C1, C2, C3, C4.

**HP prevent**

When this function is enabled, the controller attempts to avoid the blockage of the unit due to excessively high pressure. When said pressure reaches a preestablished value near the off pressure, the controller speeds up the fans to a maximum (if in cool cycle), or slows them down to a minimum (if in heat cycle). If the operating pressure continues getting close to the HP Prevent pressure, the controller turns off a compressor in the tandem of the affected circuit. The parameters of said function are accessed from the **CONDENSATION** menu.

**Defrost cycle**

If the evaporating pressure of one of the systems remains below the value set for starting defrost during an accumulated period of time equal to the period established as the delay between defrosts, simultaneous defrost of all unit coils is started. The cycle ends once the pressure set as end defrost is reached, or at the end of the time period set as maximum duration of the cycle.

The defrost sequence is as follows:

- 1 Compressor are turned off
- 2 After 15 sec., the 4-way valves are inverted
- 3 After 45 sec., the compressors start with the fans off
- 4 Once defrost is completed, the compressors stop
- 5 After 15 sec., the 4-way valves are inverted
- 6 After 45 sec., the compressors and the fans start

Control sensors: Pressure transducers B3 and B4.

Parameters used:

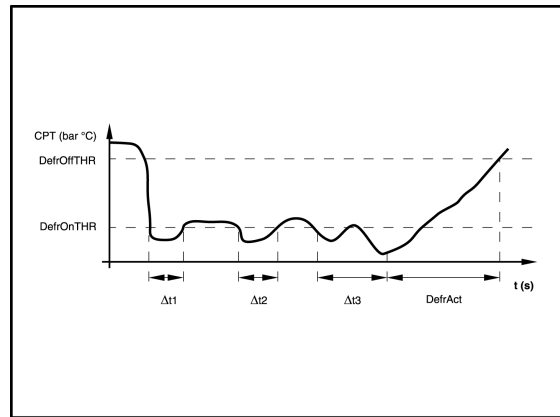
- Simultaneous defrost.
- Defrost start pressure
- Defrost end pressure
- Defrost call delay
- Max. defrost time
- Min. defrost time
- Forced compressor stoppage time due to cycle inversion
- 4-way valve inversion delay

Affected outputs:

- Compressors (N1, N2, N3 and N4)

- 4-way valves (N13 and N14)
- Fans (Y3 and Y4)

DefrOff	Defrost end pressure	DefrAct	Defrost active
DefrOn	Defrost start pressure	t	Time
t 1...3	Partial times remaining in defrost start pressure zone		



### Antifreeze protection

If the B6 temperature sensor (water outlet) detects a temperature below the antifreeze set temperature, the unit is blocked and in a state of alarm (manual reset). Simultaneously, the protecting heaters of the plate heat exchanger (output N11) are connected. If the unit includes a hydro kit, the accumulator tank protection heaters will also be activated.

Said heaters will turn off when the D6 sensor detects a temperature equal to the antifreeze temperature, plus a preestablished differential.

The antifreeze system will operate despite the status and mode of the unit.

Antifreeze protection can also include start-up of the pump and unit (see parameters in the **ANTI-FREEZE** menu).

### Back-up heater

If following a preestablished time period after unit start-up in heat mode the water outlet temperature detected by B6 does not reach the minimum value, backup heater output (N12) is activated. Once the water temperature has reached said value, plus a preestablished differential, said output will be deactivated (see parameters in the **ANTIFREEZE** menu).

### Remote ON/OFF

A digital ON/OFF remote input can be installed between terminals ID3-G0, and enabled with the corresponding parameters of the **H unit config** menu.

If the contact is open, the unit will remain OFF. If the contact is closed, the unit will remain ON.

If the unit is OFF due to said digital input, a message appears on the display indicating as such.

The unit will remain OFF whenever any of its inputs: user keyboard, digital or monitoring input are OFF.

### Remote COOL / HEAT

A digital COOL/HEAT remote input can be installed between terminals ID15-G0, and enabled with the corresponding parameters of the **H** menu.

If the contact is open, the unit will remain in HEAT cycle. If the contact is closed, the unit will remain in COOL cycle.

If the digital COOL/HEAT input is enabled, said selection cannot be made from the user's or supervisor's keyboard.

To change the cycle, either from the digital input, the user's keyboard or the supervisor's keyboard, the unit must be OFF.

If the digital COOL/HEAT input is not enabled, said function can be carried out indifferently from the user's or supervisor's keyboard.

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## 1.1 General description of the unit

### Second pump

A second pump can be enabled by means of the **-H-unit config** menu. To do this, install the contactor (pump 230-1-50) between terminals N8-N, and the corresponding protector (contact NC) between terminals DI18-G0.

This second pump will operate alternately with the first pump, taking into account the number of operating hours or start-up cycles. In the case of a protector failure of one of the two pumps, the available pump will activate immediately.

### Download key

The central C3 module has a connector (J11) for connection of a download key (PSOPZKEYAO) with the unit operational programme.

### Serial connection for monitoring

Controller C3 allows connecting to a monitoring system using an RS485 serial board. It is possible to configure and enable this function from the **-H- unit config** menu. The system has two monitoring protocols: Carel and Modbus.

### AUTO-RESTART

When the unit is turned off by a power shortage, and once this has been restored, the unit retains the same operating mode and status that was present before the shortage.

### Alarm system

When an alarm is triggered, the red key on the upper left corner of the user's keyboard-display lights up. By pressing this key, the cause of the alarm appears on the display. Then press the **Up** or **Down** keys to check for further causes of the failure, which will appear on the display successively. When the alarms are automatically reset, unit operations are restored once the causes of the alarm have disappeared. If the failure is manually reset, and once its cause has disappeared, the **Alarm** key must be pressed to restore unit operations. Then press the **Esc** button to return to the initial display.



## Alarm table

Description	Input	Off circ.1	Off circ.2	Off fan	Off pump	Off sys	Reset	Delay	Notes
Serious alarm FC, PG	ID1	X					MANUAL	-	general Phase control protection
Antifreeze alarm	B6	X	X	X	X	X	MANUAL	-	The pump can be running in OFF mode. See antifreeze menu.
Pump 1 heat switch Q5	ID4	X	X	X	X	X	MANUAL	-	If available, pump 1 starts up. If not, the entire system stops.
Pump 2 heat switch Q6	ID18	X	X	X	X	X	MANUAL	-	If available, pump 1 starts up. If not, the entire system stops.
PDW flow switch, FS	ID2	X	X	X	X	X	MANUAL	Selectable	Delays on start-up and while operating
Circ. 1 fan heat switches THPF1, THPF2	ID9	X	-	Circ. 1	-	-	AUTO/ MANUAL	1st fault within 60' interval, automatic reset	2nd fault within 60' interval, manual reset
Circ. 2 fan heat switches THPF3, THPF4	ID14	-	X	Circ. 2	-	-	AUTO/ MANUAL	2nd fault within 60' interval, automatic reset	2nd fault within 60' interval, manual reset
Compressor 1 A1 heat switches (YCSA/LCA 150, YCSA-H/BRAW 150)	ID7	Comp 1	-	-	-	-	AUTO/ MANUAL	3rd fault within 60' interval, automatic reset	3rd fault within 60' interval, manual reset
Compressor 2 A2 heat switches (YCSA/LCA 150, YCSA-H/BRAW 150)	ID8	Comp 2	-	-	-	-	AUTO/ MANUAL	4th fault within 60' interval, automatic reset	4th fault within 60' interval, manual reset
Compressor 3 A3 heat switches (YCSA/LCA 150, YCSA-H/BRAW 150)	ID12	-	Comp 3	-	-	-	AUTO/ MANUAL	5th fault within 60' interval, automatic reset	5th fault within 60' interval, manual reset
Compressor 4 A4 heat switches (YCSA/LCA 150, YCSA-H/BRAW 150)	ID13	-	Comp 4	-	-	-	AUTO/ MANUAL	6th fault within 60' interval, automatic reset	6th fault within 60' interval, manual reset
Circ. 1 high-pressure switch HP1	ID6	X	-	Circ. 1	-	-	AUTO/ MANUAL		manual reset
Circ. 2 high-pressure switch HP2	ID11	-	X	Circ. 2	-	-	AUTO/ MANUAL		manual reset
Circ. 1 high-pressure switch LP1	ID5	X	-	Circ. 1	-	-	AUTO/ MANUAL		manual reset
Circ. 2 high-pressure switch LP2	ID10	-	X	Circ. 2	-	-	AUTO/ MANUAL		manual reset
Circ. 1 high-pressure switch by transducer	B3	X	-	Circ. 1	-	-	MANUAL		manual reset
Circ. 2 high-pressure switch by transducer	B4	-	X	Circ. 2	-	-	MANUAL		manual reset
B3 sensor faulty	B3	X	X	X	X	X	MANUAL	60'	
B4 sensor faulty	B4	X	X	X	X	X	MANUAL	60'	
B5 sensor faulty	B5						MANUAL	60'	
B6 sensor faulty	B6						MANUAL	60'	
B7 sensor faulty	B7						MANUAL	60'	
B8 sensor faulty	B8						MANUAL	60'	
Pump 1 maintenance	System						MANUAL		Set period in Compressor menu
Pump 2 maintenance	System						MANUAL		Set period in Compressor menu
Compressor 1 maintenance	System						MANUAL		Set period in Compressor menu
Compressor 2 maintenance	System						MANUAL		Set period in Compressor menu

## 1 User manual

## 1.1 General description of the unit

Description	Input	Off circ.1	Off circ.2	Off fan	Off pump	Off sys	Reset	Delay	Notes
Compressor 3 maintenance	System						MANUAL		Set period in Compressor menu
Compressor 4 maintenance	System						MANUAL		Set period in Compressor menu

## Temperature/resistance properties of NTC control sensors (10kOhms)

Temperature [°C]	Resistance [kOhms]	Temperature [°C]	Resistance [kOhms]	Temperature [°C]	Resistance [kOhms]	Temperature [°C]	Resistance [kOhms]	Temperature [°C]	Resistance [kOhms]
-50	329,2	-16	55,95	18	13,08	52	3,8	86	1,41
-49	310,7	-15	53,99	19	12,58	53	3,77	87	1,37
-48	293,3	-14	50,9	20	12,09	54	3,65	88	1,33
-47	277	-13	48,66	21	11,83	55	3,53	89	1,3
-46	261,8	-12	46,48	22	11,2	56	3,42	90	1,26
-45	247,5	-11	44,41	23	10,78	57	3,31	91	1,23
-44	234,1	-10	42,45	24	10,38	58	3,21	92	1,2
-43	221,8	-9	40,56	25	10	59	3,11	93	1,16
-42	209,8	-8	38,76	26	9,63	60	3,02	94	1,13
-41	198,7	-7	37,05	27	9,28	61	2,92	95	1,1
-40	188,4	-6	35,48	28	8,94	62	2,83	96	1,06
-39	178,3	-5	33,89	29	8,82	63	2,75	97	1,05
-38	168,9	-4	32,43	30	8,31	64	2,66	98	1,02
-37	160,1	-3	31,04	31	6,01	65	2,58	99	0,99
-36	151,8	-2	29,72	32	7,72	66	2,51	100	0,97
-35	144	-1	28,47	33	7,45	67	2,43	101	0,94
-34	136,6	0	27,28	34	7,19	68	2,36	102	0,92
-33	129,7	1	26,13	35	6,94	69	2,29	103	0,9
-32	123,2	2	25,03	36	6,69	70	2,22	104	0,87
-31	117,1	3	23,09	37	6,46	71	2,16	105	0,85
-30	111,3	4	22,09	38	6,24	72	2,1	106	0,83
-29	106,7	5	22,05	39	6,03	73	2,04	107	0,81
-28	100,4	6	21,15	40	5,82	74	1,98	108	0,79
-27	95,47	7	20,2	41	5,63	75	1,92	109	0,77
-26	90,8	8	19,48	42	5,43	76	1,87		
-25	86,39	9	18,7	43	5,24	77	1,81		
-24	82,22	10	17,98	44	5,08	78	1,76		
-23	78,29	11	17,24	45	4,91	79	1,71		
-22	74,58	12	16,55	46	4,74	80	1,66		
-21	71,07	13	15,9	47	4,59	81	1,62		
-20	67,74	14	15,28	48	4,44	82	1,57		
-19	64,54	15	14,68	49	4,3	83	1,53		
-18	61,62	16	14,12	50	4,16	84	1,49		
-17	58,66	17	13,57	51	4,02	85	1,45		

### 1.1.4 Regular maintenance activities for which the user is responsible

#### Maintenance Schedule

The air conditioning unit is designed to require as little maintenance as possible. Nevertheless, to ensure smooth operations with a minimal use of electricity, a long working life and compliance with the regulations of each country, regular maintenance inspections must be made.

Johnson Controls Inc. shall not be considered responsible for any damage caused by improper maintenance of the unit, which includes anything inconsistent with that described in this document or others specifically provided with the unit.

To make them easier, maintenance tasks have been grouped by time intervals in a series of tables. *Maintenance responsibilities of the user, see on page 26.*

## Maintenance responsibilities of the user

Like any other machine, the HVAC unit requires regular maintenance, as the wear to which some of its parts are subjected can effect its mechanical reliability and the safety of those responsible for its maintenance.

In compliance with current regulations, the unit must be regularly inspected and the results recorded on the forms provided by the Labour and Health Authorities of the country where the HVAC unit is installed.

Users cannot access this form to perform maintenance and upkeep tasks on the unit.

There is no intent for the user to perform any maintenance tasks on the HVAC unit.



### **DANGER**

***It is strictly prohibited for the user to carry out any maintenance or upkeep tasks on the HVAC unit.***

***This appliance is not destined for use by people (including children) with limited physical, sensorial or mental capacities, or without adequate experience or knowledge, unless they have received instructions or been supervised in the use of the appliance by an individual responsible for their safety.***

***Children must be supervised at all times to ensure that they do not play with the appliance.***

***Only trained Johnson Controls Inc. personnel with the necessary means and tools may carry out maintenance and upkeep work on the unit.***

***Trained personnel must be aware of the health and safety regulations and procedures applicable to HVAC units. They should also be aware of general procedures and those applying specifically to this unit.***

***Contact a Johnson Controls Inc. Authorised Technical Assistance Service for scheduled maintenance on this unit.***

## PRODUCT DISPOSAL

According to Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003, the presence of the symbol on the product or in the documents included with the product indicates that this product is classified, according to current law, as an electrical and electronic device and, therefore, this product cannot be dealt with at the end of its working life as domestic or urban waste.

The product must be taken to collection points for the recycling of waste electrical and electronic equipment.

The appropriate management, reuse, assessment and recycling of these products protect human health and the environment.

