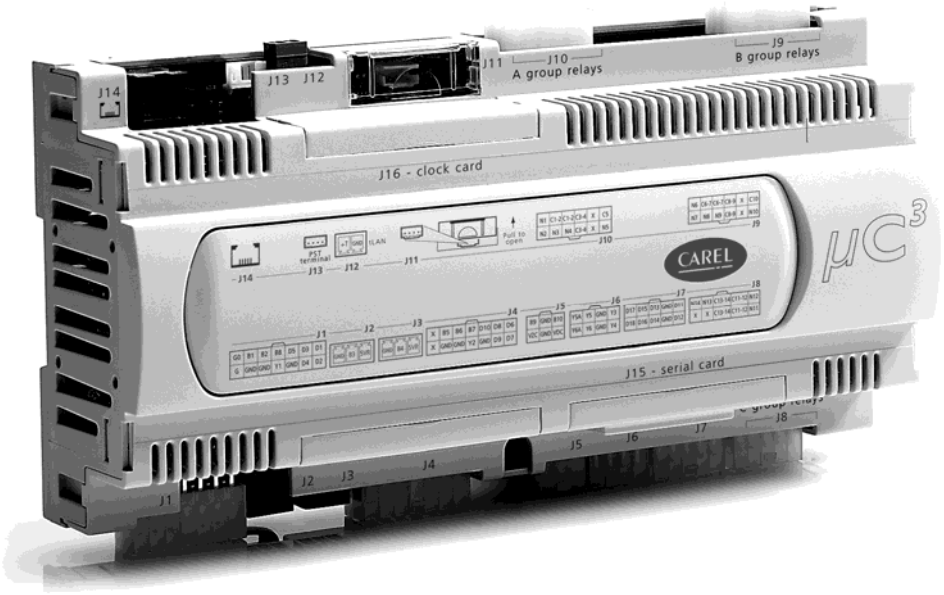
µchiller 3

CAREL



ENG

User manual

LEGGI E CONSERVA QUESTE ISTRUZIONI

READ AND SAVE THESE INSTRUCTIONS

Technology & Evolution

LEGGI E CONSERVA QUESTE ISTRUZIONI

READ AND SAVE THESE INSTRUCTIONS

We wish to save you time and money!
We can assure you that the thorough reading of this manual will guarantee correct installation and safe use of the product described.

IMPORTANT WARNINGS

BEFORE INSTALLING OR HANDLING THE DEVICE PLEASE CAREFULLY READ AND FOLLOW THE INSTRUCTIONS DESCRIBED IN THIS MANUAL.

This device has been manufactured to operate risk-free for its specific purpose, as long as:
it is installed, operated and maintained according to the instructions contained in this manual;
the environmental conditions and the voltage of the power supply correspond to those specified.
All other uses and modifications made to the device that are not authorised by the manufacturer are considered incorrect.
Liability for injury or damage caused by the incorrect use of the device lies exclusively with the user.
Please note that this unit contains powered electrical devices and therefore all service and maintenance operations must be performed by specialist and qualified personnel who are aware of the necessary precautions.
Disconnect the unit from the mains power supply before accessing any internal parts.

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:

1. WEEE cannot be disposed of as municipal waste and such waste must be collected and disposed of separately;
2. 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.
3. 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;
4. 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;
5. In the event of illegal disposal of electrical and electronic waste, the penalties are specified by local waste disposal legislation.

CONTENTS

1. Introduction

1.1 General description

The µC³ is a new compact CAREL electronic controller, measuring the size of a normal thermostat, for the complete management of chillers and heat pumps: it can control air-air, air-water, water-water and condensing units.

Main functions

- Temperature control for air/air units, air/water-cooled chillers/heat pumps, with two circuits and up to 6 steps, with and without reversal on the water/refrigerant circuit;
- condenser control in two circuits with up to 6 steps on air/water-cooled units, with and without reversal on the water/refrigerant circuit;
- defrost management by time and/or by temperature or pressure;
- fan speed control;
- complete alarm management;
- time band management;

Advanced functions

- sliding defrost
- functions to prevent high condensing pressure/temperature, low evaporator pressure/temperature, antifreeze
- control
- management of tandem, trio and semi-hermetic compressors
- pump-down
- part-winding start

Driver functions

- Electronic expansion valve management.

Devices controlled

- Compressor;
- condenser fans;
- evaporator fan (air-source units)
- reversing valve;
- water pumps for the evaporator and/or condenser (water-source units);
- outlet fan (air-air);
- antifreeze heater;
- support heaters;
- alarm signal device;

Programming

CAREL offers the possibility to configure all the unit parameters not only from the keypad on the front panel, but also using a hardware key or via a serial line.

1.2 User interface

pLD large terminal

The display has 4 digits plus decimal point. In normal operation, the value shown on the display corresponds to the temperature read by the control probe, for example the evaporator water inlet temperature (on water chillers) or alternatively the room temperature, on direct expansion units.

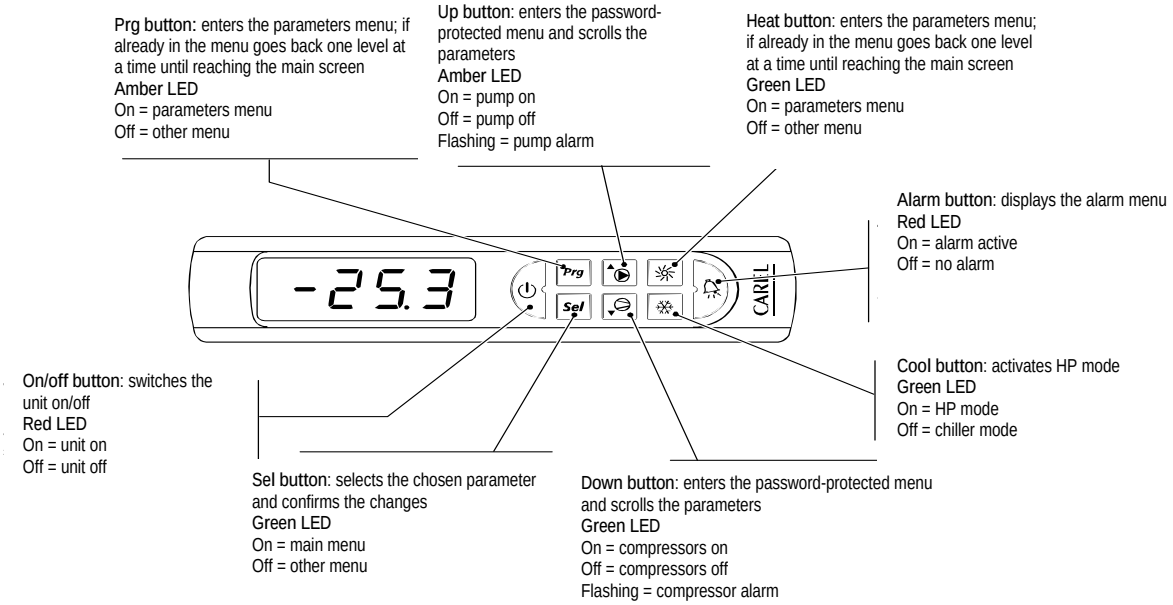


Fig. 1.a

1.3 Programming procedure

1) press up or down
2) press Sel
3) enter the password using up or down
4) press Sel to confirm

If the password is correct, the parameters menu automatically appears; if the password is wrong, the value 0 is displayed.

Repeat the operation by repeating the procedure or press Prg to exit.

2. pGD0 terminal

The display covers 4 rows by 20 characters. In normal operation, the display shows the evaporator inlet and outlet temperatures, the unit status (ON/OFF) and the mode (cooling/heating).
The up and down buttons can be used to immediately enter in the user menu, set point, ON/OFF and COOLING/HEATING mode.
Entering the password in the screen following is possible enter in programming of all the parameters.

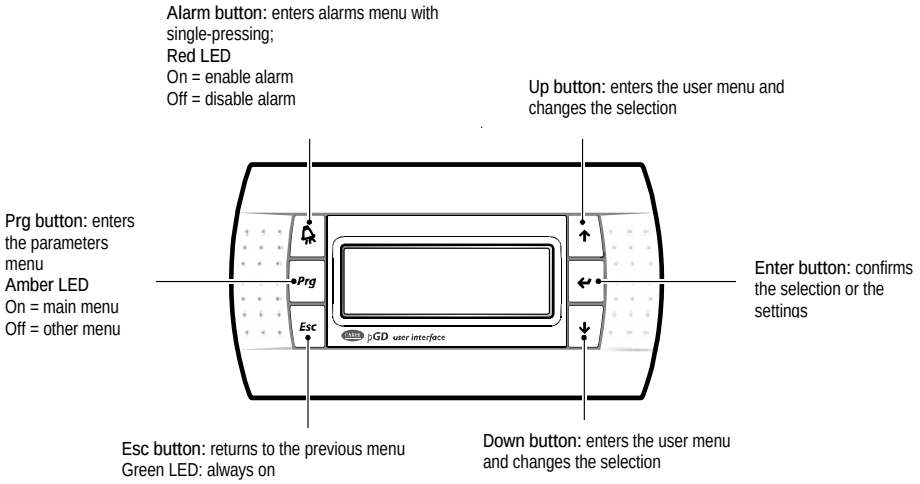


Fig. 1.b

2.1 Passwords and levels of access

The user interface has the parameters organised into three distinct levels of access, each of which containing a different number of visible parameters:
free access: access to the screens displaying the inputs and outputs, unit on/off, set point, enter password to access the protected parameters.
user level: (password 22), all the free access parameters plus the main control parameters, maintenance parameters, alarms.
manufacturer level: (password 66), complete access to the unit configuration parameters, from the type of devices controlled to the definition of the control parameters.

The parameters are organised by uniform groups accessible from specific sliding menus.
The following diagram shows the method for accessing the various groups of parameters and their layout.
From inside a group of parameters, pressing [Esc] moves the cursor to the sliding menu for selecting the parameters, pressing [Prog] moves to the main menu.

2.2 Type of connectors

The connectors and the cables can be purchased separately from CAREL (MCH3CON**) or directly from the manufacturers, Molex and Phoenix. For the crimping of the contacts use the special Molex tool code 69008-0724.

Mini-fit terminals

Number of connectors	Molex code of the connector	Number of pins	Molex code of the contact	Cable cross-section allowed in AWG	Cable cross-section allowed in mm2
2	39-01-2140	14	39-00-0038 39-00-0046	AWG18 to 24 AWG22 to 28	1.00 to 0.21 0.5 to 0.10
1	39-01-2060	6			
1	39-01-2080	8			
1	39-01-2100	10			
1	39-01-2100	10	39-00-0077	AWG16	1.50
2	39-01-2120	12	39-00-0077	AWG16	1.50

Plug-in terminals

Number of connectors	Phoenix code of the connector	Number of pins	Cable cross-section allowed in AWG	Cable cross-section allowed in mm2
2	MC 1,5/3-ST-3,81	3	AWG18-24	1.00 to 0.21
1	MC 1,5/2-ST-3,81	2	AWG18-24	1.00 to 0.21

3. Applications

3.1 AIR/AIR units, single circuit

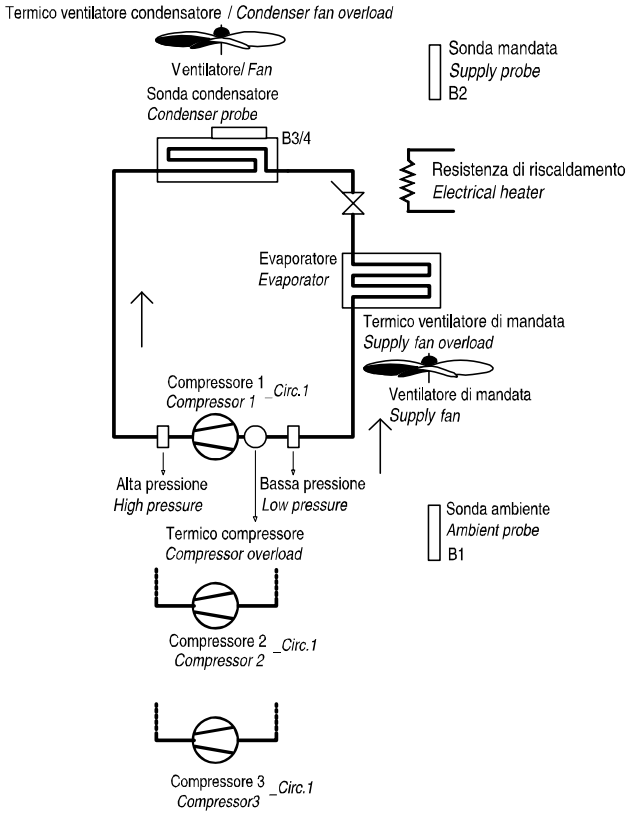


Fig. 3.a.a

3.2 AIR/AIR units, two circuits

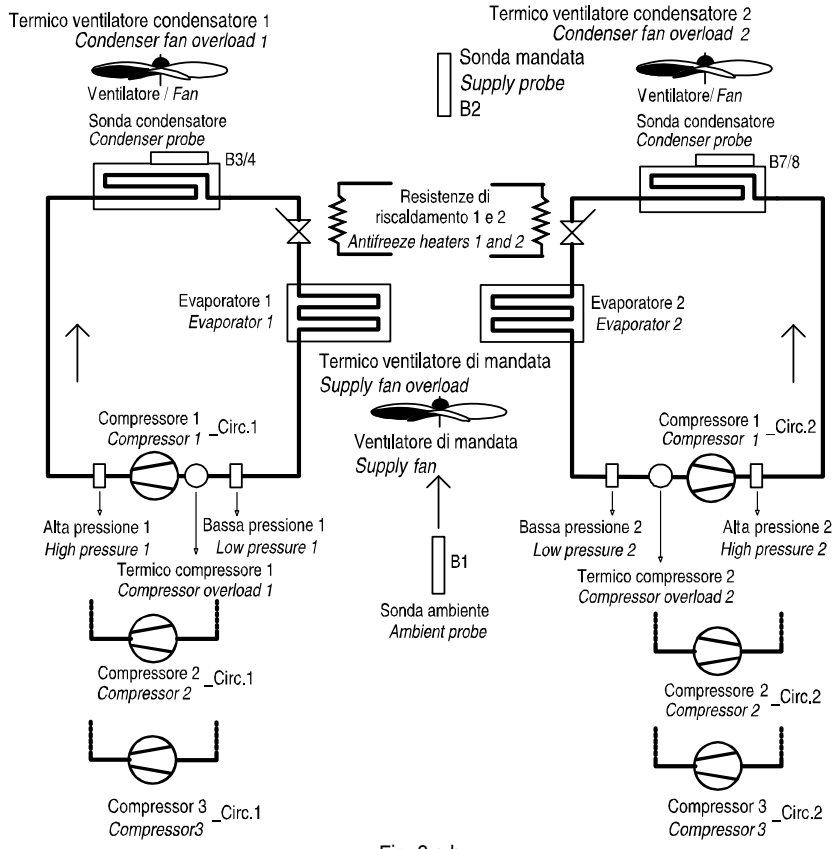


Fig. 3.a.b

3.3 AIR/AIR units, two circuits, 1 condenser fan circuit

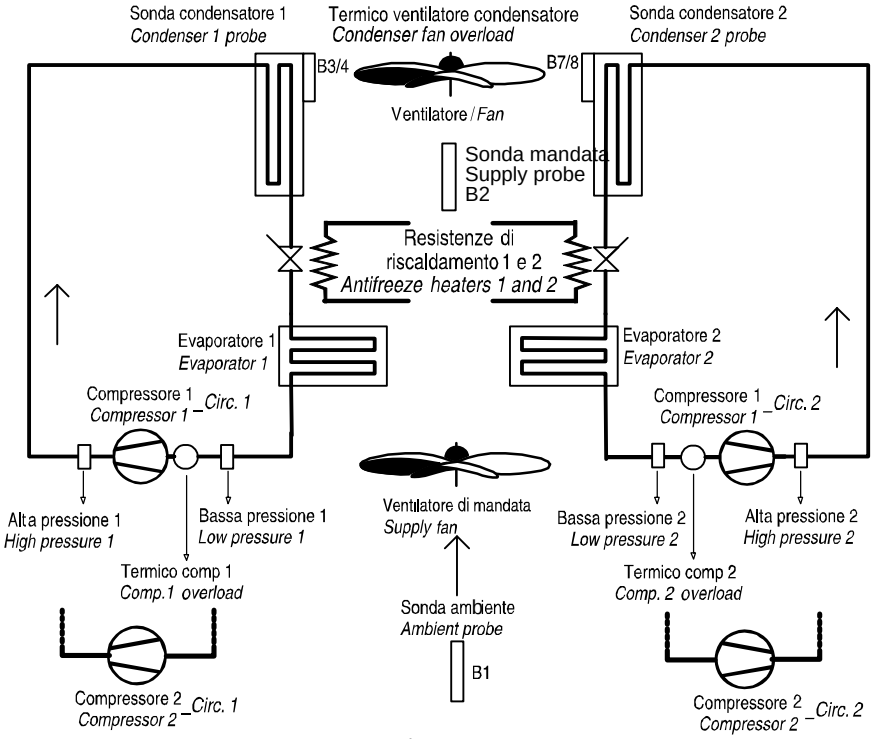


Fig. 3.a.c

3.4 AIR/AIR heat pumps, single circuit

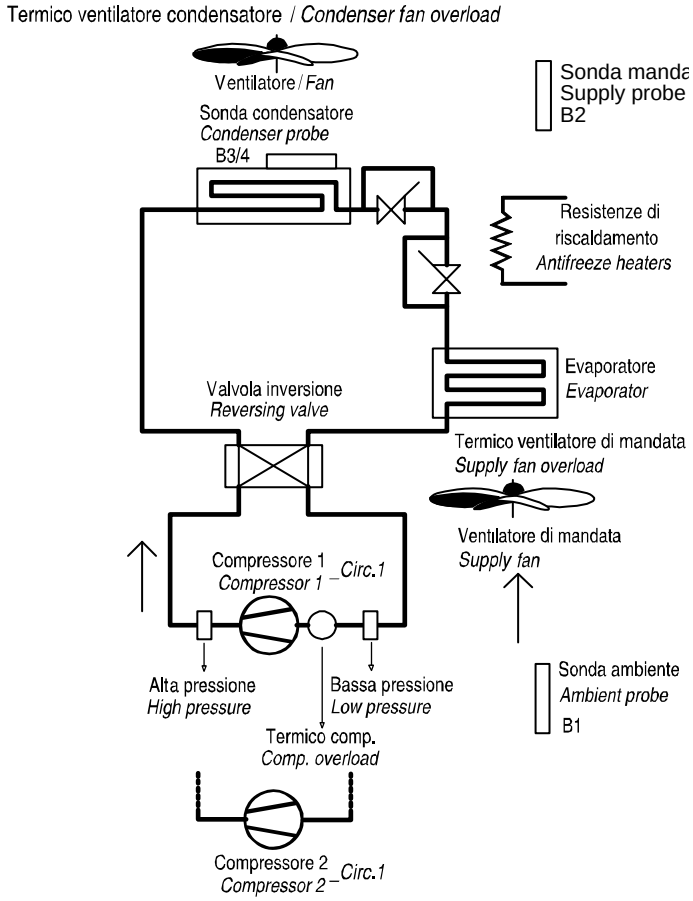


Fig. 3.a.d

3.5 AIR/AIR heat pumps, two circuits

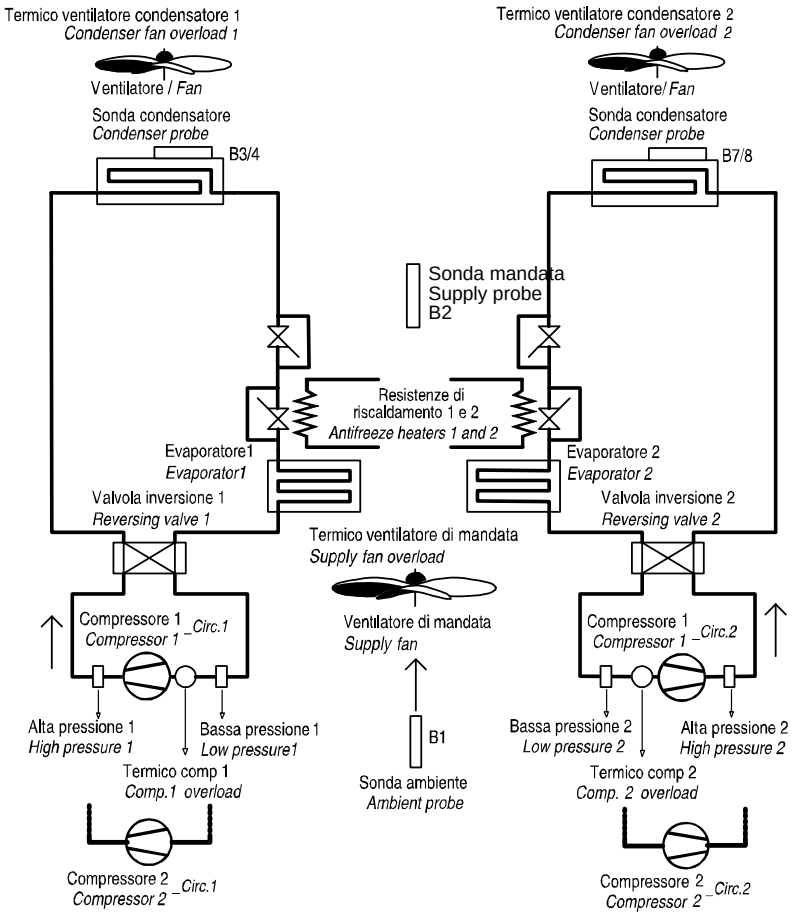


Fig. 3.a.e

3.6 AIR/AIR heat pumps, two circuits, 1 condenser fan circuit

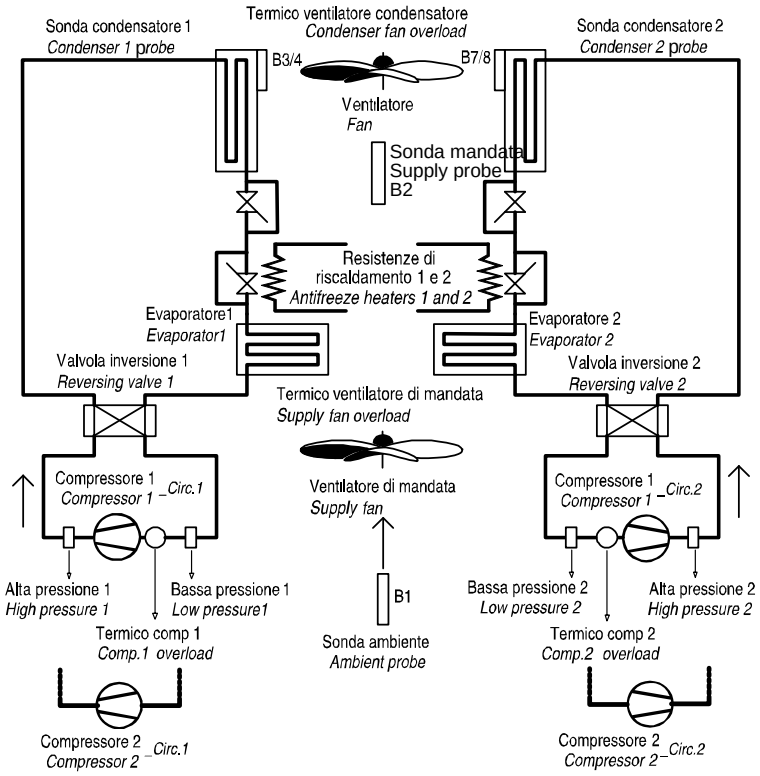


Fig. 3.a.f

3.7 AIR/AIR chillers, single circuit

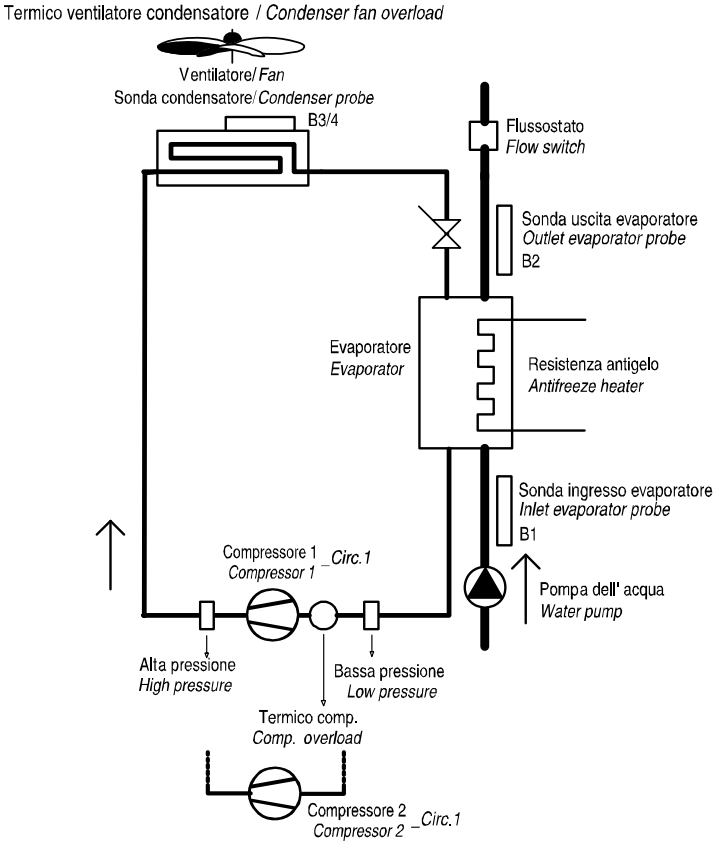


Fig. 3.a.g

3.8 AIR/AIR chillers, two circuits, 2 condenser fan circuits and 2 evaporators

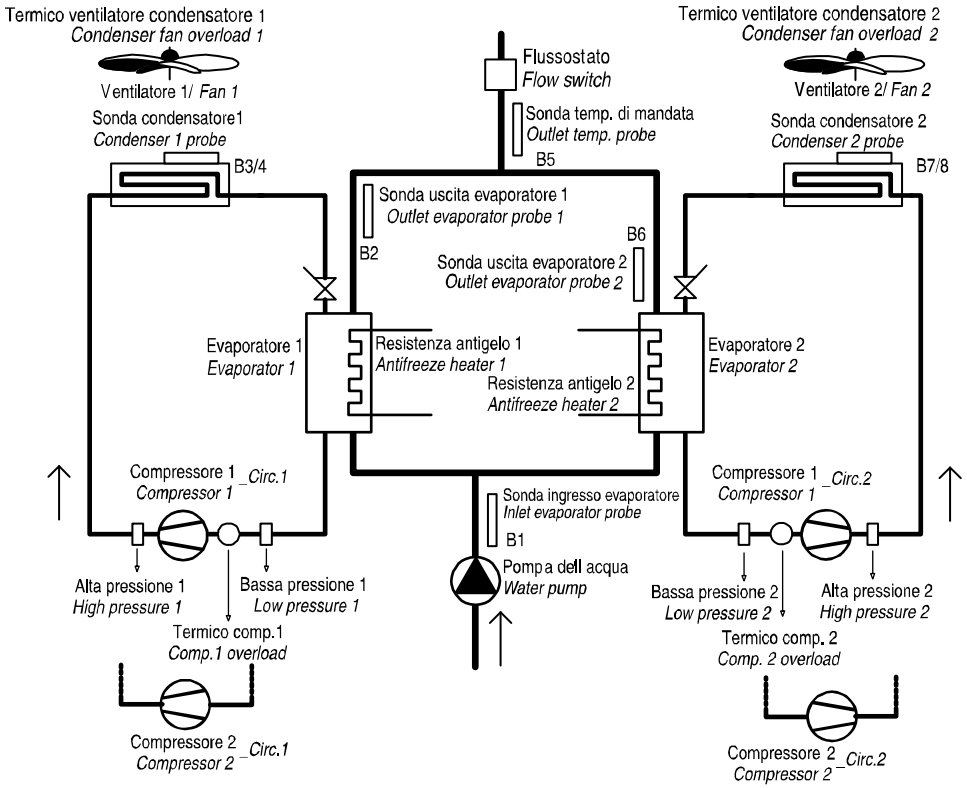


Fig. 3.a.h

3.9 AIR/WATER chillers, two circuits, 1 condenser fan circuit

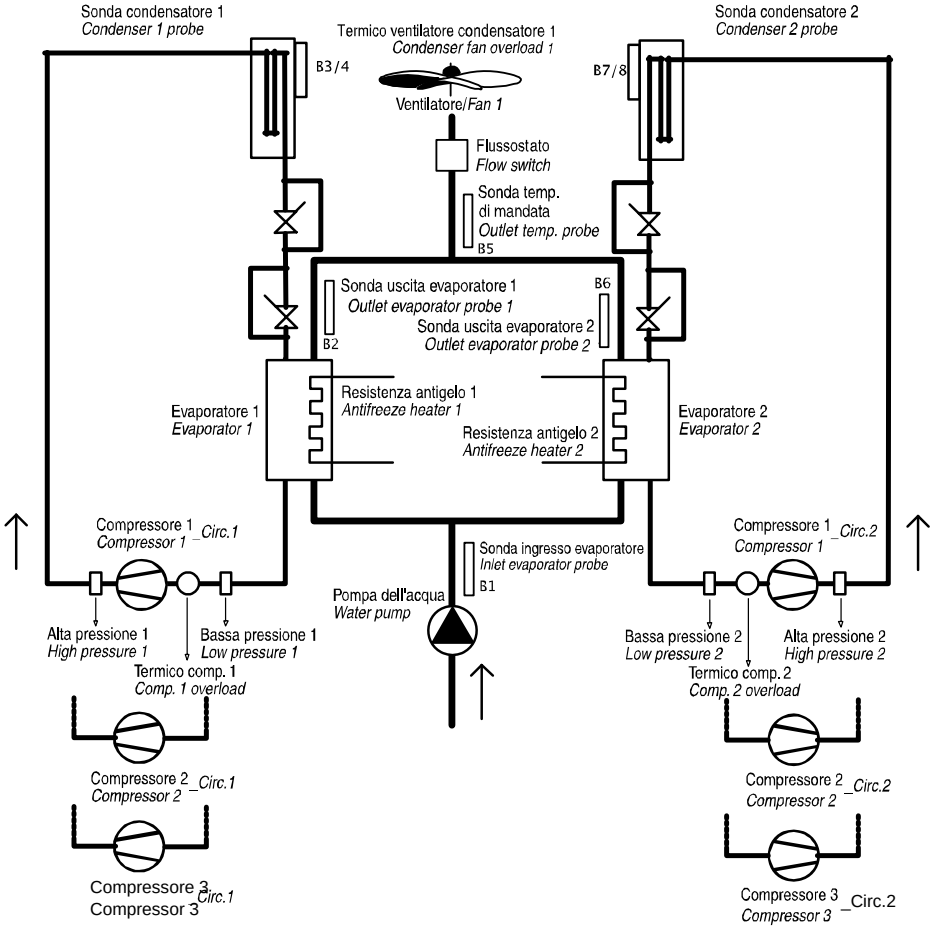


Fig. 3.a.i

3.10 AIR/WATER heat pumps, single circuit

Fig. 3.a.l.

3.11 AIR/WATER heat pumps, 2 condenser fan circuits

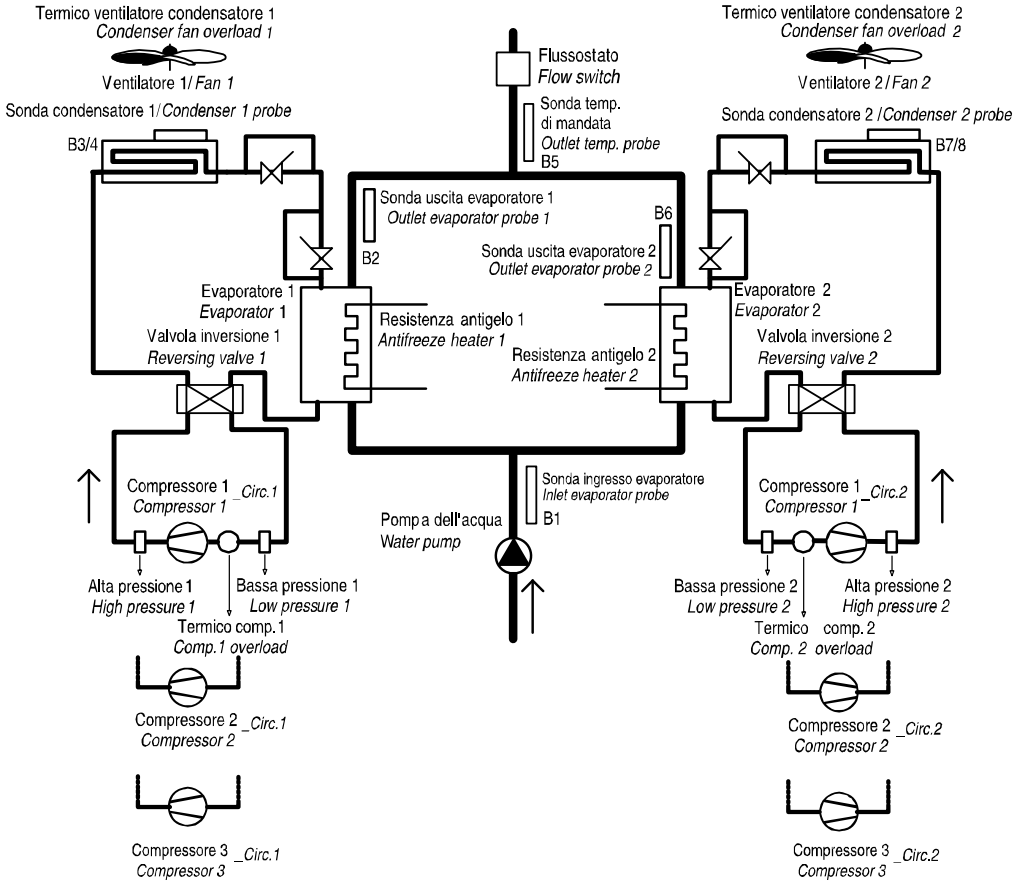


Fig. 3.a.m.

3.12 AIR/WATER heat pumps, two circuits, 1 condenser fan circuit

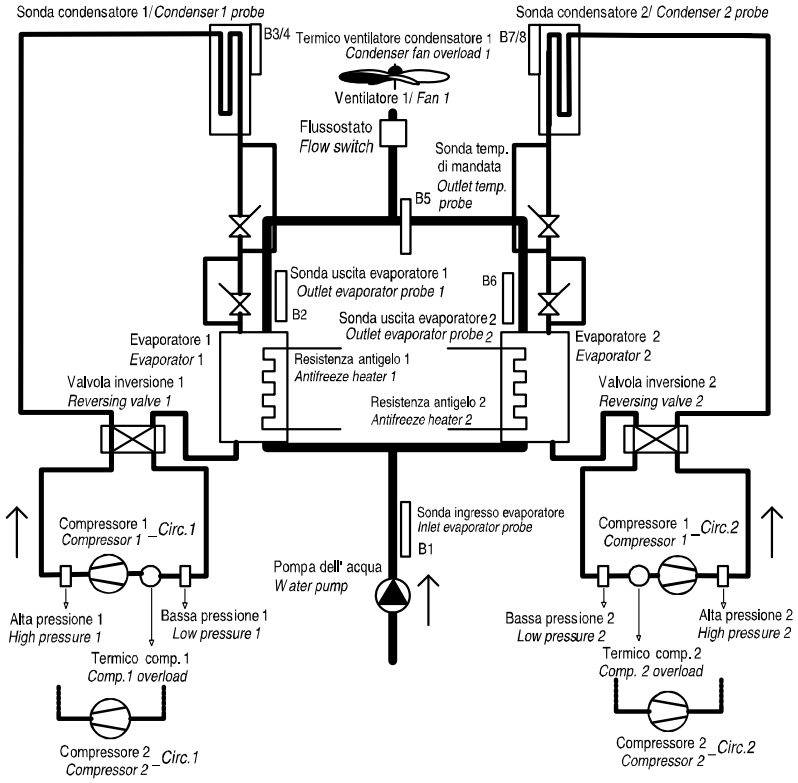


Fig. 3.a.n

3.13 WATER/WATER chillers, single circuit

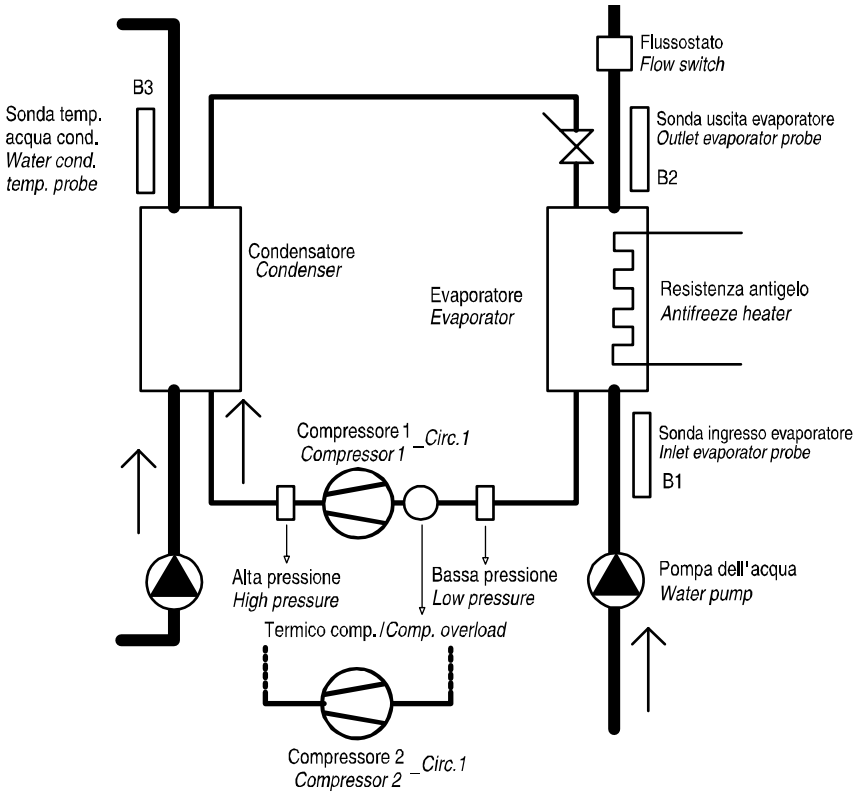


Fig. 3.a.o.

3.14 WATER/WATER chillers, two circuits

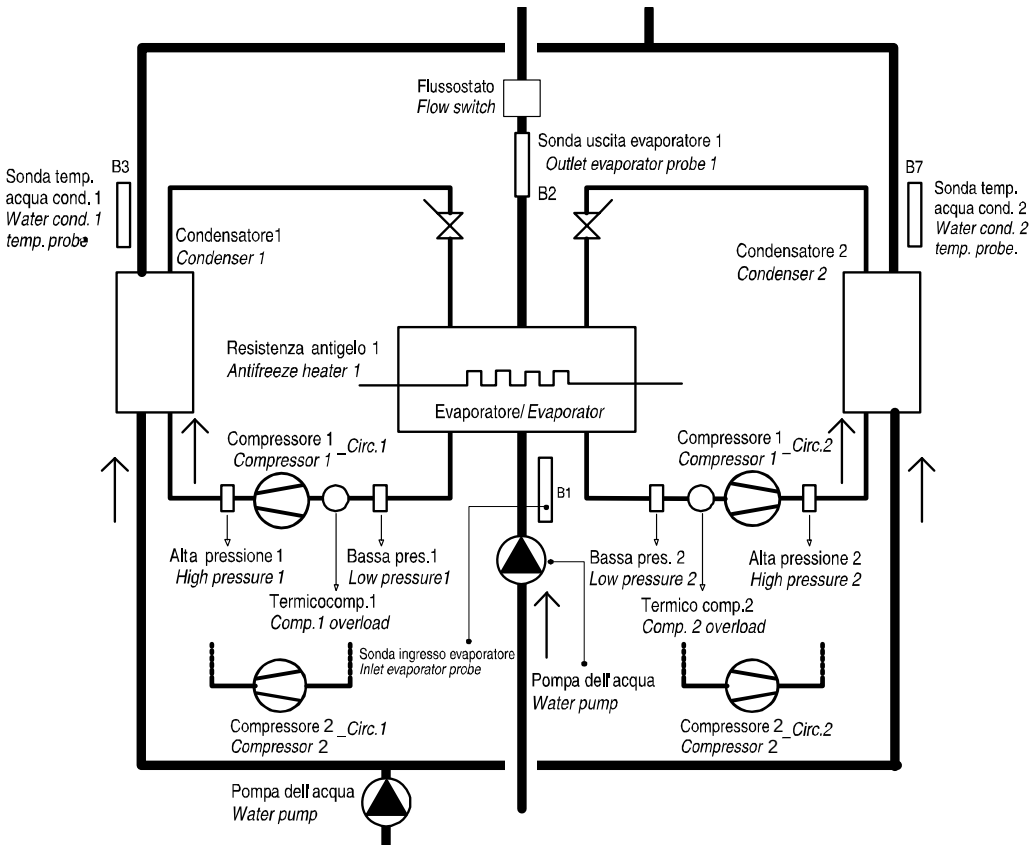


Fig. 3.a.p.

3.15 WATER/WATER chillers, two circuits, 2 evaporators

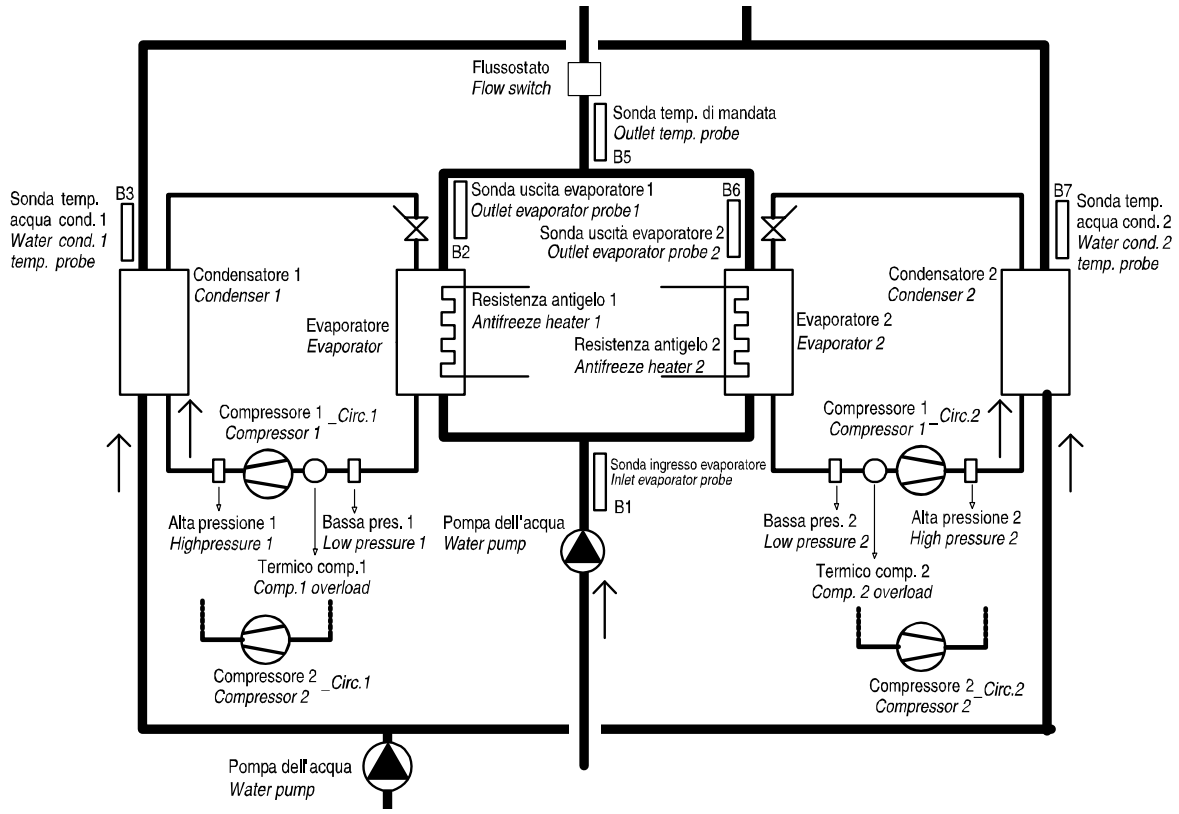


Fig. 3.a.q.

3.16 WATER/WATER heat pumps with reversal on the refrigerant circuit, single circuit

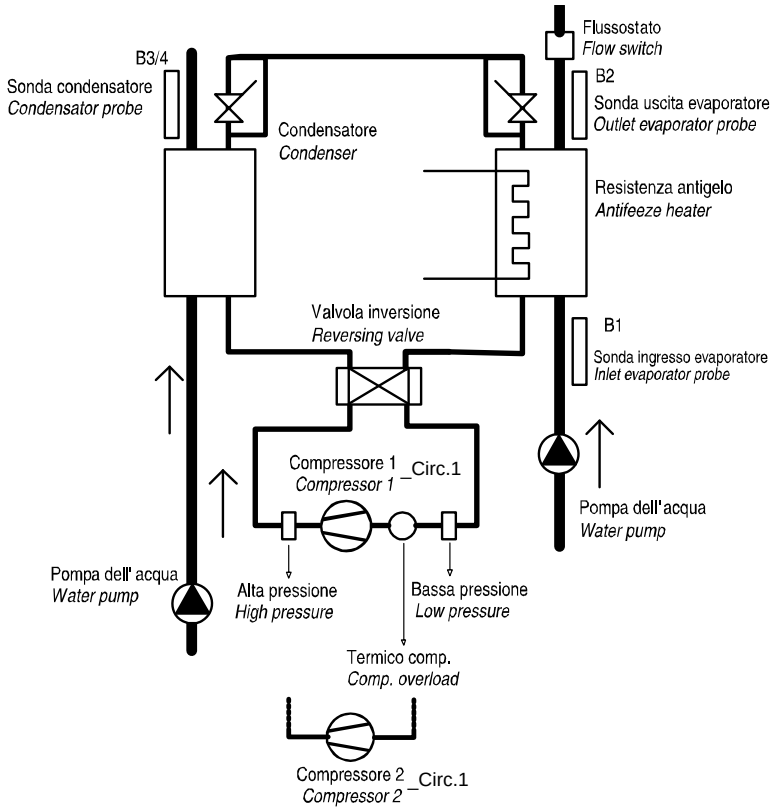


Fig. 3.a.r.

3.17 WATER/WATER heat pumps with reversal on the refrigerant circuit, two circuits

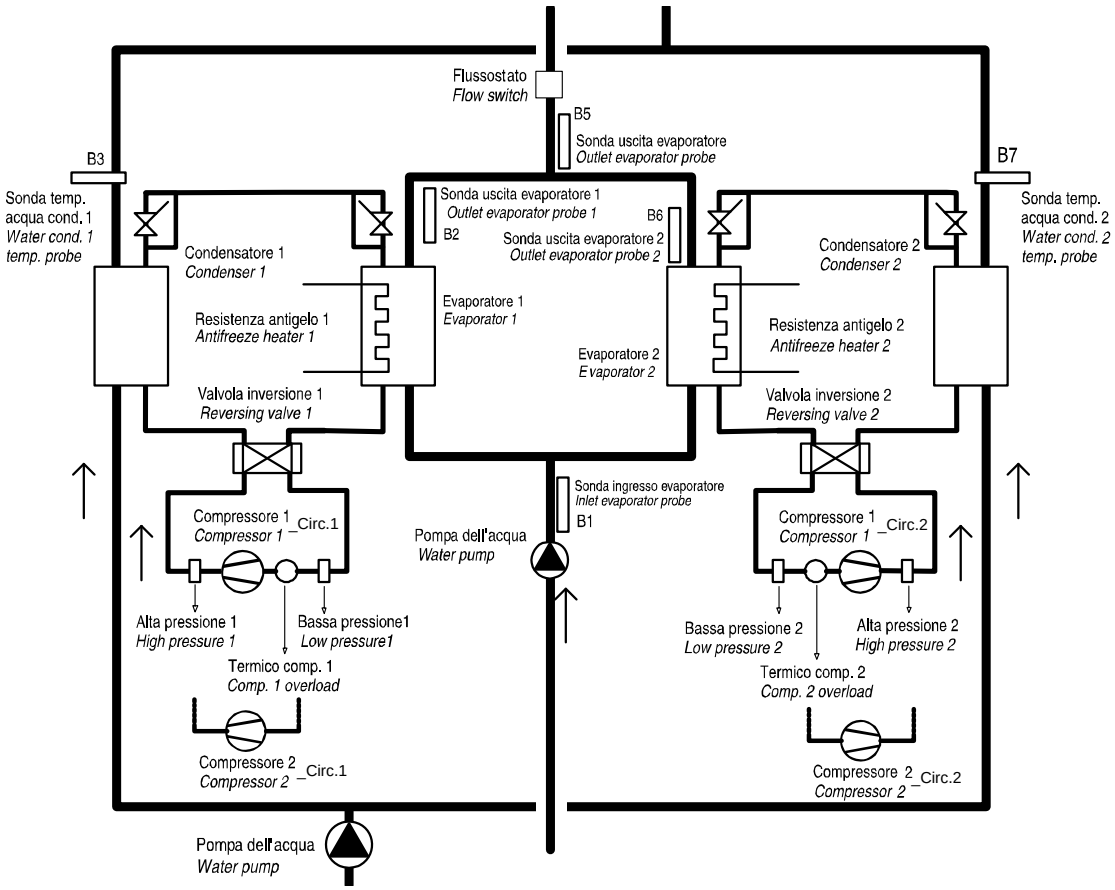


Fig. 3.a.s.

3.18 WATER/WATER heat pumps with reversal on the refrigerant circuit, two circuits, 1 evaporator

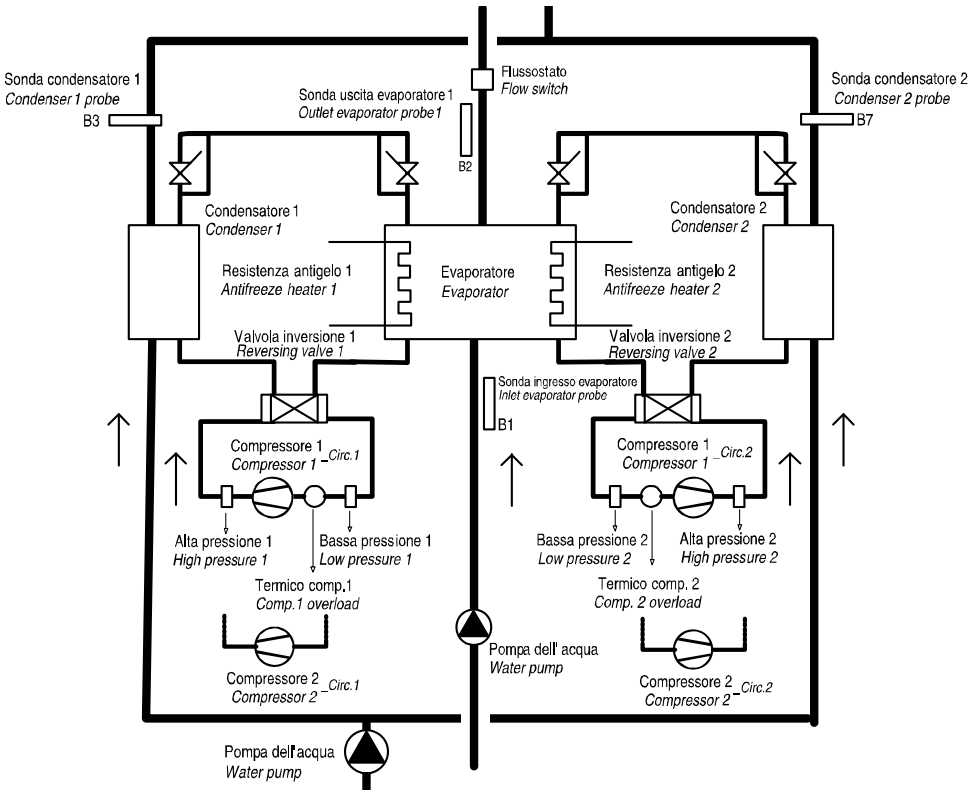


Fig. 3.a.t.

3.19 WATER/WATER heat pumps with reversal on the water circuit, single circuit

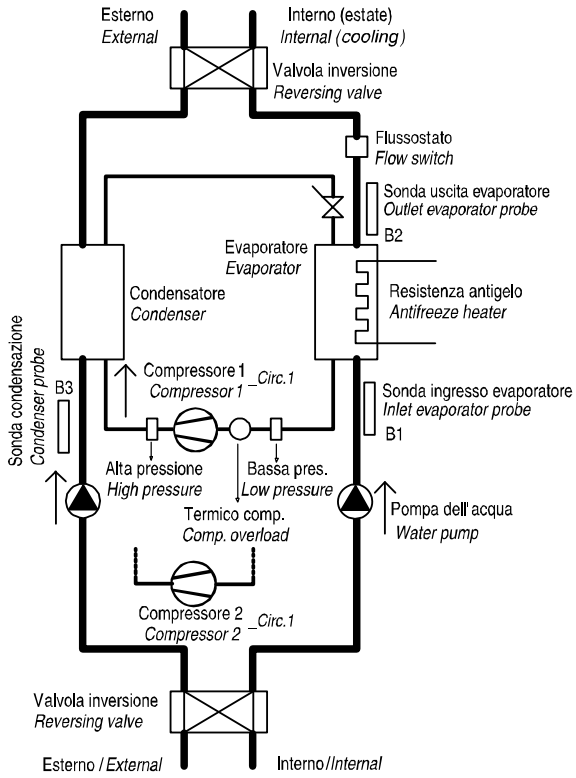


Fig. 3.a.u.

3.20 WATER/WATER heat pumps with reversal on the water circuit, two circuits, H02= 1 and H21= 4

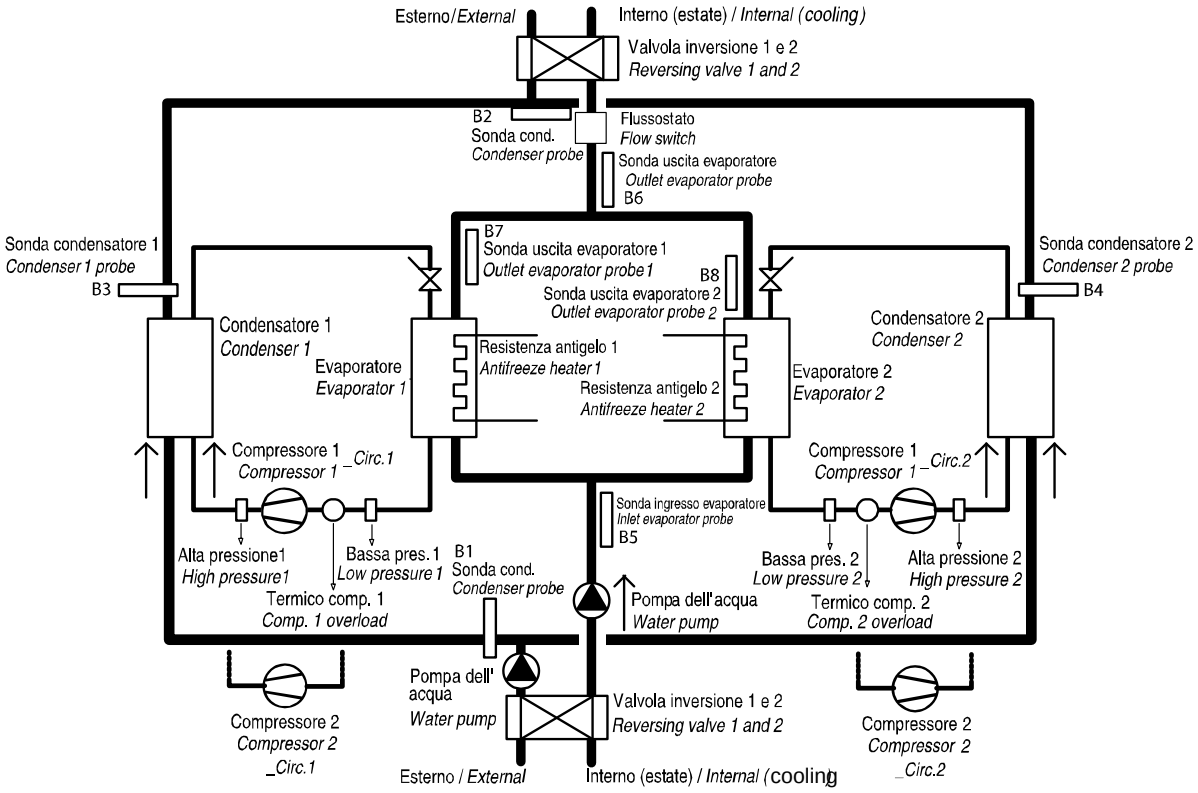


Fig. 3.a.v.

3.21 WATER/WATER heat pumps with reversal on the water circuit, two circuits, 1 evaporator H02= 1 and H21= 4

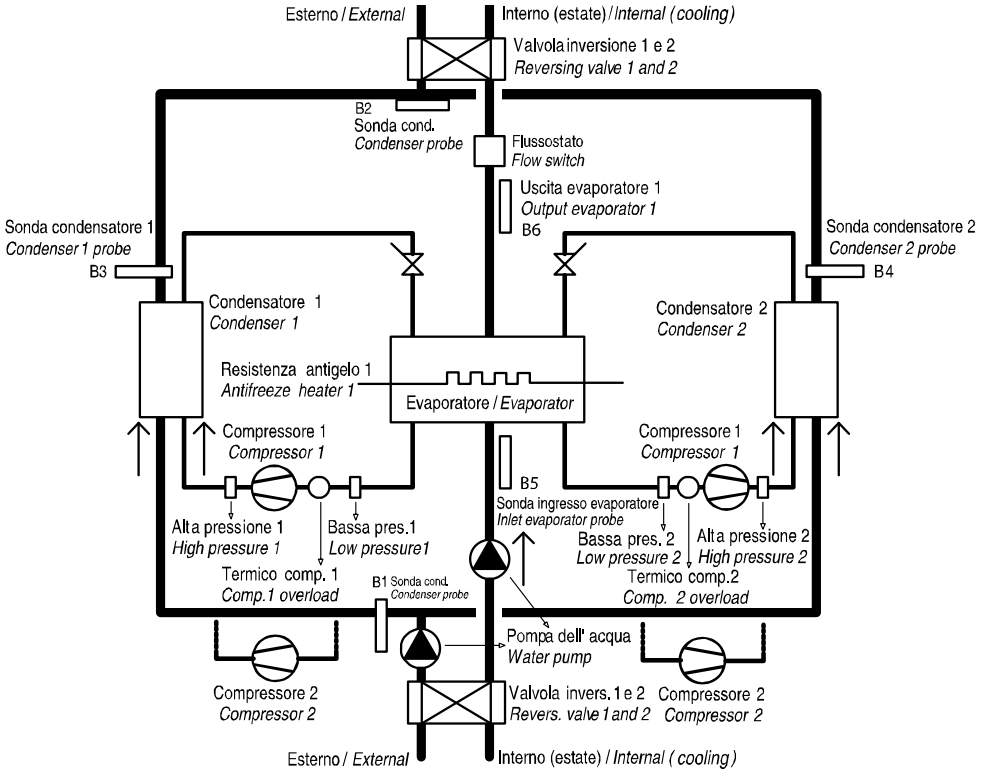


Fig. 3.a.z.

3.22 Air-cooled condensing unit without reverse cycle, single circuit

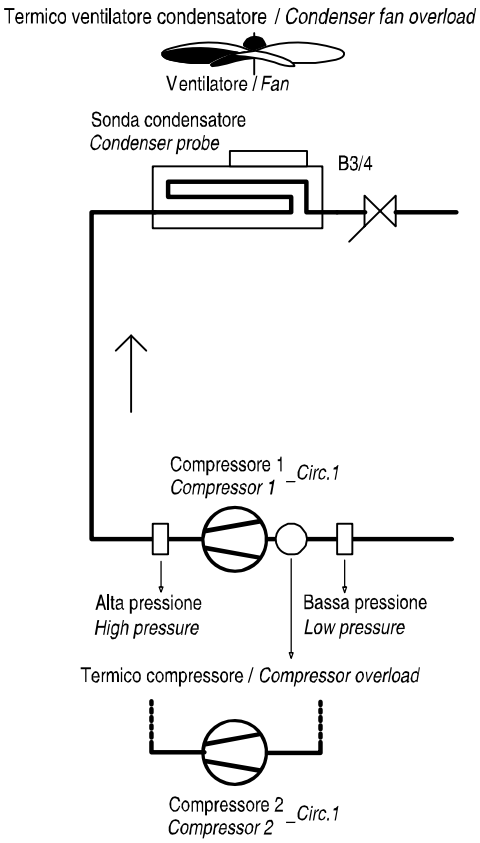


Fig. 3.b.a.

3.23 Air-cooled condensing unit without reverse cycle, two circuits

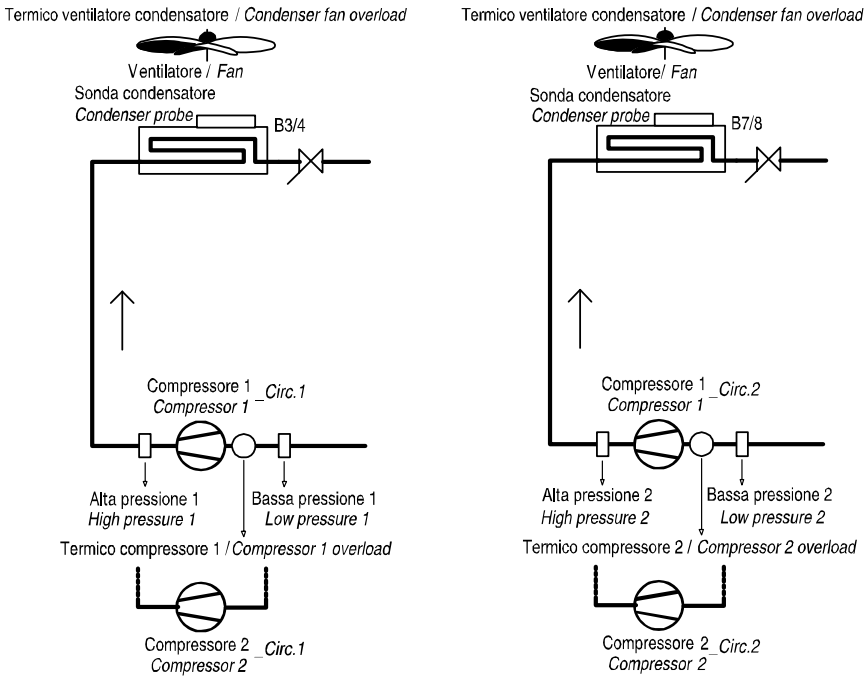


Fig. 3.b.b.

3.24 Reverse-cycle air-cooled condensing unit, single circuit

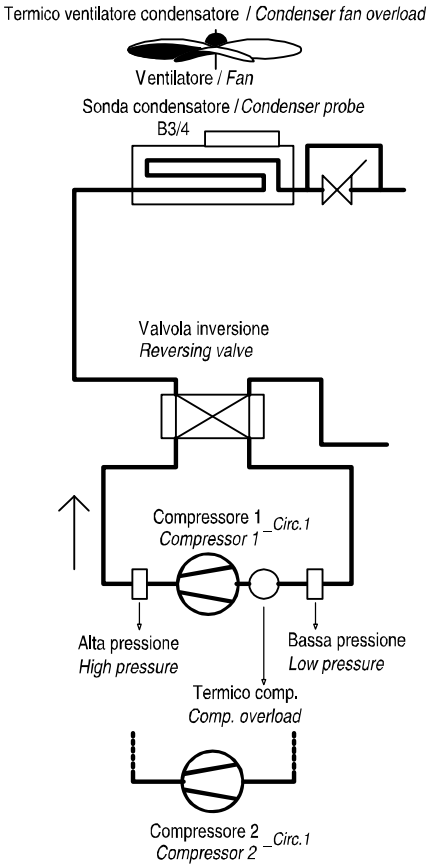


Fig. 3.b.c.

3.25 Reverse-cycle air-cooled condensing unit, two circuits with condenser fan circuit

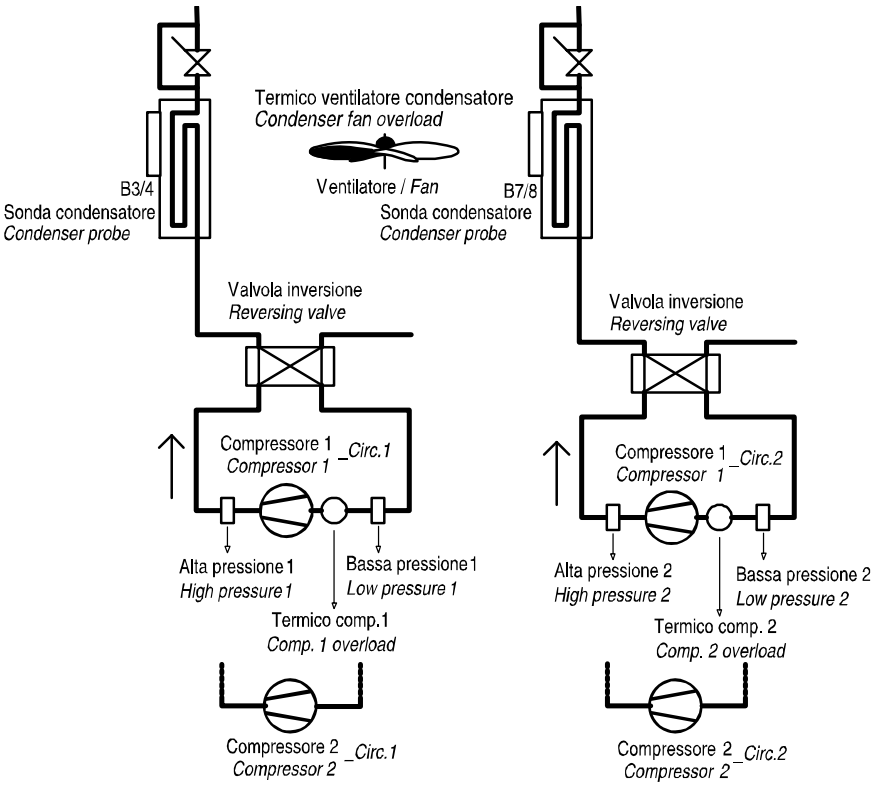


Fig. 3.b.d.

3.26 Water-cooled condensing unit without reverse cycle, single circuit

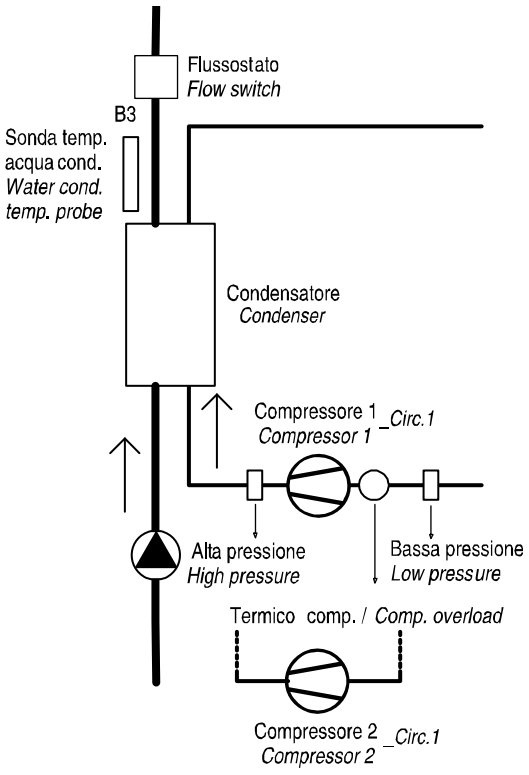


Fig. 3.b.e.

3.27 Water-cooled condensing unit without reverse cycle, two circuits

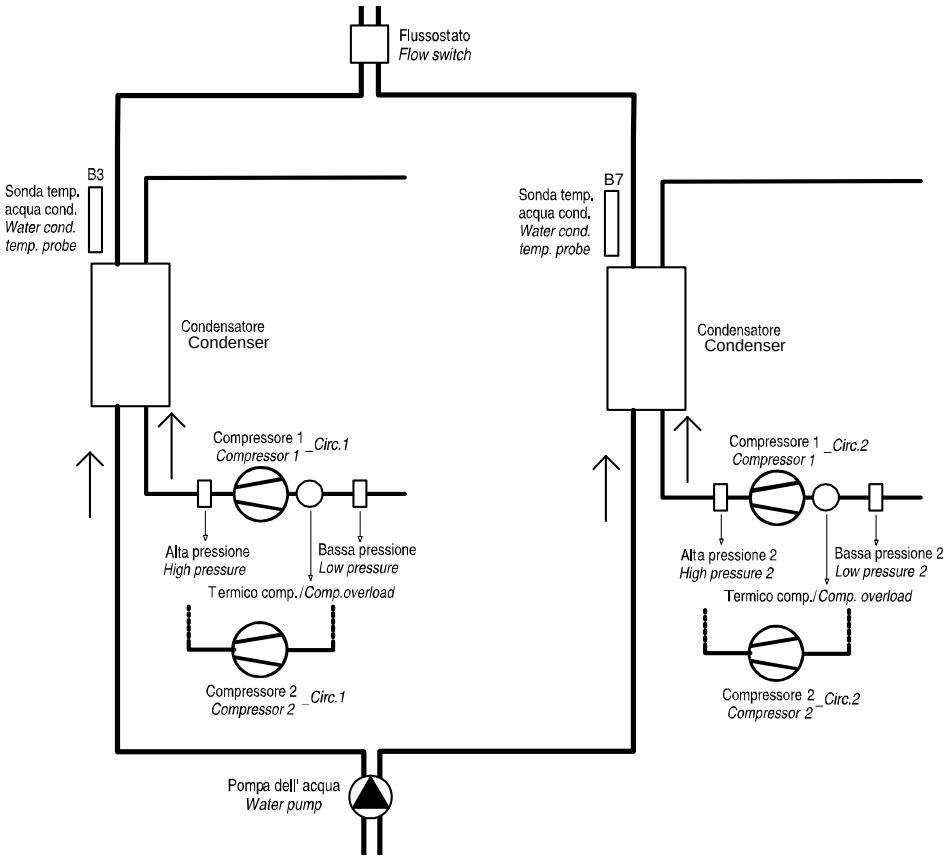


Fig. 3.b.f.

3.28 Reverse-cycle water-cooled condensing unit, single circuit

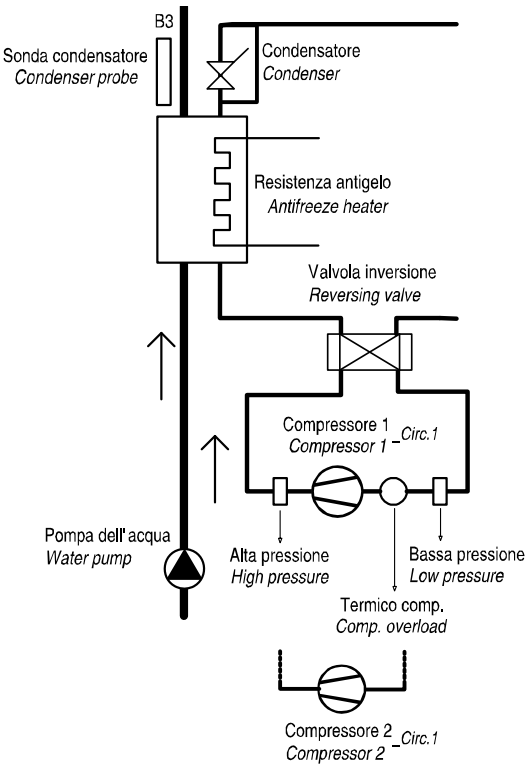


Fig. 3.b.g.

3.29 Reverse-cycle water-cooled condensing unit, two circuits

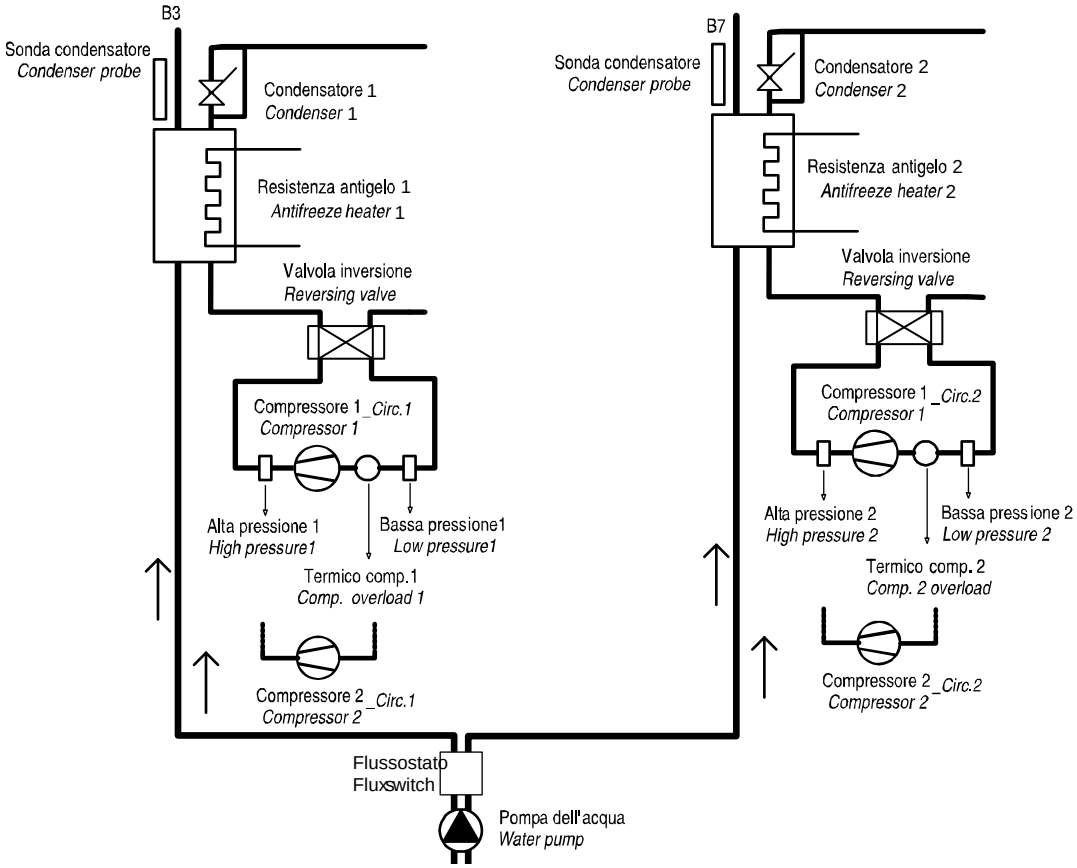


Fig. 3.b.h.

4. Parameters

4.1 Menu layout

Livello *Level*	Nome Livello *Level name*	Password
_d_	Direct	No password
_U_	User	22
_F_	Factory	66

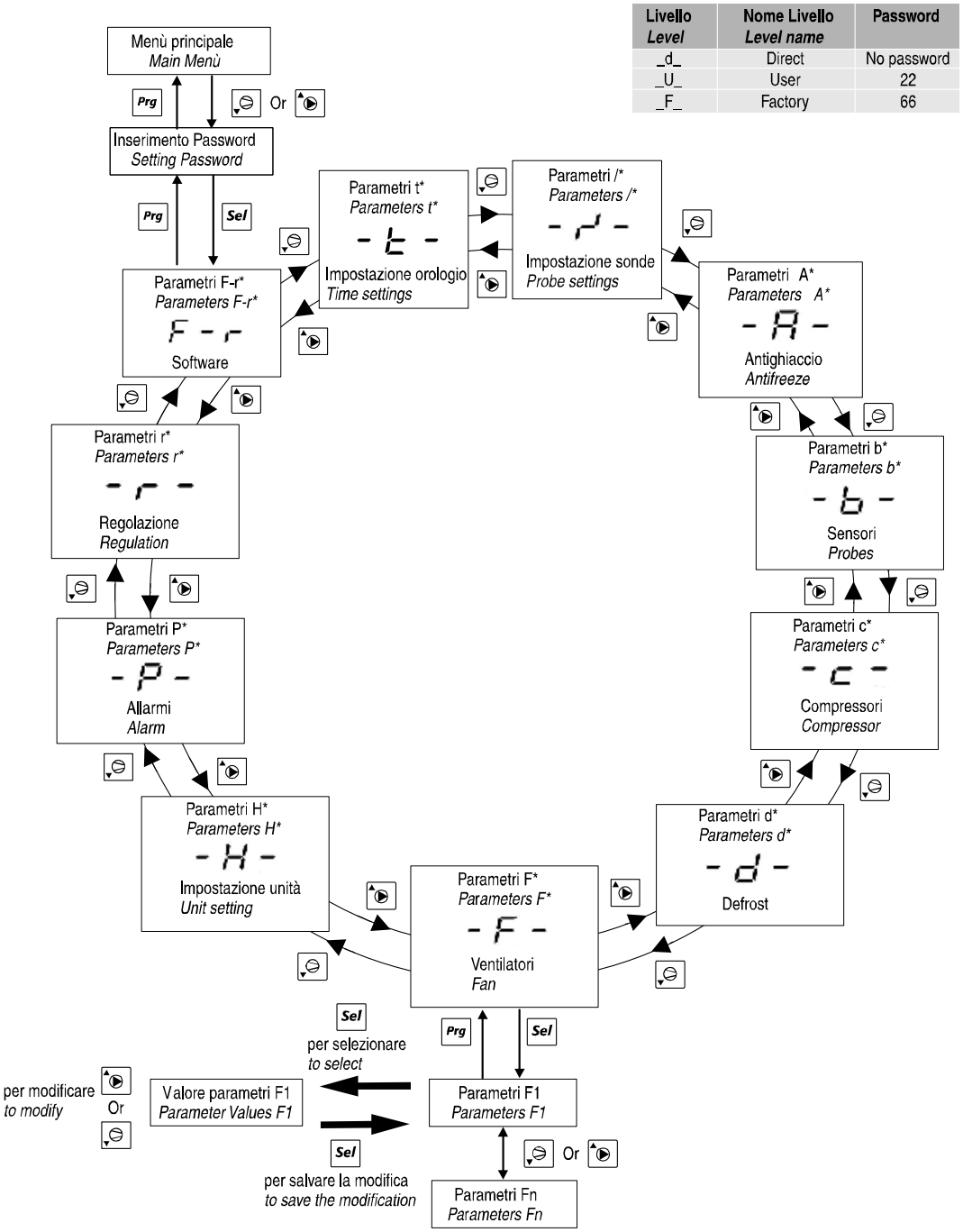


Fig. 4.a

- / - Probe configuration
- A - Antifreeze
- B - Input – Output
- C - Compressors
- d - Defrost
- F - Condenser
- H - Unit configuration
- P - Alarm configuration
- r - Control parameters

F-r Software version

- t - Clock

EVD Electronic valve driver

The various functions of the units are described below, with specific references to the parameters in the table according to the program menu codes.

4.2 List of parameters with the pLD user interface

pLD	Extended description	Min/max limits	Unit of measure	Default	Access
	/* parameters: probe settings				
/1	Calibration offset for analogue input B1	-9.9 to 9.9	°C/bar	0	user
/2	Calibration offset for analogue input B2	-9.9 to 9.9	°C/bar	0	user
/3	Calibration offset for analogue input B3	-9.9 to 9.9	bar	0	user
/4	Calibration offset for analogue input B4	-9.9 to 9.9	bar	0	user
/5	Calibration offset for analogue input B5	-9.9 to 9.9	°C	0	user
/6	Calibration offset for analogue input B6	-9.9 to 9.9	°C	0	user
/7	Calibration offset for analogue input B7	-9.9 to 9.9	°C	0	user
/8	Calibration offset for analogue input B8	-9.9 to 9.9	%/°C	0	user
/9	Calibration offset for analogue input B9	-9.9 to 9.9	°C	0	user
/10	Calibration offset for analogue input B10	-9.9 to 9.9	°C	0	user
	A* parameters: antifreeze				
A1	Antifreeze alarm set point (chiller units) low room temperature (air/air units)	-99.9 to 99.9	°C	3.0	user
A2	Antifreeze alarm differential (chiller units) Low room temperature (air/air units)	-99.9 to 99.9	°C	1.0	user
A3	Antifreeze heater set point	-99.9 to 99.9	°C	5.0	user
A4	Antifreeze heater differential	-99.9 to 99.9	°C	1.0	user
A5	Support heater set point in cooling mode	-99.9 to 99.9	°C	30.0	user
A6	Heater differential support in cooling mode	-99.9 to 99.9	°C	1.0	user
A7	Support heater 1 set point in heating mode	15.0 to 50.0	°C	25.0	user
A8	Support heater 1 differential in heating mode	0.0 to 10.0	°C	5.0	user
A9	Support heater 2 set point in heating mode	15.0 to 50.0	°C	24.0	user
A10	Support heater 2 differential in heating mode	0.0 to 10.0	°C	5.0	user
A11	Support heater activation delay in heating	0 to 60	min	15	user
A12	Device start-up mode in antifreeze with unit off	DISABLED HEAT & PUMP ON HEAT & UNIT ON HEATER ONLY ON		DISABLED	user
	b* parameters: sensors				
B1	Value of analogue input B1	-99.9 to 99.9	°C/bar		
B2	Value of analogue input B2	-99.9 to 99.9	°C/bar		
B3	Value of analogue input B3	-99.9 to 99.9	bar		
B4	Value of analogue input B4	-99.9 to 99.9	bar		
B5	Value of analogue input B5	-99.9 to 99.9	°C		
B6	Value of analogue input B6	-99.9 to 99.9	°C		
B7	Value of analogue input B7	-99.9 to 99.9	°C		
B8	Value of analogue input B8	-99.9 to 99.9	%/°C		
B9	Value of analogue input B9	-99.9 to 99.9	°C		
B10	Value of analogue input B10	-99.9 to 99.9	°C		
B11	Status of digital input 1				
B12	Status of digital input 2				
B14	Status of digital input 4				
B15	Status of digital input 5				
B16	Status of digital input 6				
B17	Status of digital input 7				
B18	Status of digital input 8				
B19	Status of digital input 9				
B20	Status of digital input 10				
B21	Status of digital input 11				
B22	Status of digital input 12				
B23	Status of digital input 13				
B24	Status of digital input 14				
B25	Status of digital input 15				
B26	Status of digital input 16				
B27	Status of digital input 17				
B28	Status of digital input 18				
B29	Status of digital output 1				
B30	Status of digital output 2				
B31	Status of digital output 3				
B32	Status of digital output 4				
B33	Status of digital output 5				
B34	Status of digital output 6				
B35	Status of digital output 7				
B36	Status of digital output 8				
B37	Status of digital output 9				
B38	Status of digital output 10				
B39	Status of digital output 11				
B40	Status of digital output 12				
B41	Status of digital output 13				direct
B42	Status of digital output 14				
B43	Status of analogue output 1	0.0	V		
B44	Status of analogue output 2	0.0	V		
B45	Status of analogue output 5	0.0	V		
	c* parameters: compressors				
c1	Condenser pump operating hours x 1000	0 to 999	h		
c2	Condenser pump operating hours	0 to 999	h		
c3	Evaporator pump / main fan operating hours x 1000	0 to 999	h		
c4	Evaporator pump / main fan operating hours	0 to 999	h		
c5	Evaporator pump 2 operating hours x 1000	0 to 999	h		
c6	Evaporator pump 2 operating hours	0 to 999	h		
c7	Compressor 1 operating hours circuit 1 x 1000	0 to 999	h		
c8	Compressor 1 operating hours circuit 1	0 to 999	h		
c9	Compressor 2 operating hours circuit 1 x 1000	0 to 999	h		
c10	Compressor 2 operating hours circuit 1	0 to 999	h		
c11	Compressor 3 operating hours circuit 1 x 1000	0 to 999	h		
c12	Compressor 3 operating hours circuit 1	0 to 999	h		
c13	Compressor 1 operating hours circuit 2 x 1000	0 to 999	h		
c14	Compressor 1 operating hours circuit 2	0 to 999	h		

pLD	Extended description	Min/max limits	Unit of measure	Default	Access
c15	Compressor 2 operating hours circuit 2 x 1000	0 to 999	h		
c16	Compressor 2 operating hours circuit 2	0 to 999	h		
c17	Compressor 3 operating hours circuit 2 x 1000	0 to 999	h		
c18	Compressor 3 operating hours circuit 2	0 to 999	h		
c19	Manually force compressor 1 circuit 1	N / Y		N	user
c20	Manually force compressor 2 circuit 1	N / Y		N	user
c21	Manually force compressor 3 circuit 1	N / Y		N	user
c22	Manually force compressor 1 circuit 2	N / Y		N	user
c23	Manually force compressor 2 circuit 2	N / Y		N	user
c24	Manually force compressor 3 circuit 2	N / Y		N	user
	d* parameters: defrost				
d1	Start defrost threshold	-99.9 to 99.9	°C/bar	2.0	user
d2	End defrost threshold	-99.9 to 99.9	°C/bar	12.0	user
d3	Enable sliding defrost function	N / Y		N	user
d4	Minim. set point to start defrost accessible with sliding defrost function	0.0 to 99.9	°C/bar	0.5	user
d5	Outside temperature threshold to start sliding defrost action	-99.9 to 99.9	°C	0.0	user
d6	Outside temperature threshold for maximum sliding defrost action	-99.9 to 99.9	°C	0.0	user
	F* parameters: fans				
F1	Start hour for low-noise operation	0 to 23	h	0	user
F2	Start minutes for low-noise operation	0 to 59	min	0	user
F3	End hour for low-noise operation	0 to 23	h	0	user
F4	End minutes for low-noise operation	0 to 59	min	0	user
F5	Low-noise set point in cooling	0.0 to 99.9	°C/bar	0.0	user
F6	Low-noise set point in heating	0.0 to 99.9	°C/bar	0.0	user
	H* parameters: unit configuration				
H1	Enable unit ON/OFF from digital input	N / Y		N	user
H2	Enable cooling/heating selection from digital input	N / Y		N	user
H3	Enable unit ON/OFF from supervisor	N / Y		N	user
H4	Enable cooling/heating selection from supervisor	N / Y		N	user
H5	Select type of serial protocol for supervisory network	CAREL MODBUS LONWORKS Rs232 MODEM ANALOGUE. GSM MODEM		CAREL	user
H6	Serial port communication speed for supervisory network	1200 (RS485/RS422) 2400 (RS485/RS422) 4800 (RS485/RS422) 9600 (RS485/RS422) 19200 (ONLY RS485)		19200 (ONLY RS485)	user
H7	Serial identification number for supervisory network	0 to 200		1	user
	P* parameters: alarms				
P1	Evaporator flow switch alarm delay at start-up	0 to 999	s	15	user
P2	Evaporator flow switch alarm delay in steady operation	0 to 999	s	3	user
P3	Condenser flow switch alarm delay at start-up	0 to 999	s	15	user
P4	Condenser flow switch alarm delay in steady operation	0 to 999	s	3	user
	r* parameters: control				
r1	Active set point		°C		direct
r2	Current outside temperature compensation value (B7)		°C		direct
r3	Current set point from analogue input B8		°C		
r4	Cooling set point	-99.9 to 99.9	°C	12.0	direct
r5	Heating set point	-99.9 to 99.9	°C	45.0	direct
r6	Minimum set point value from probe B8 (cooling)	-99.9 to 99.9	°C	7.0	direct
r7	Maximum set point value from probe B8 (cooling)	-99.9 to 99.9	°C	17.0	direct
r8	Minimum set point value from probe B8 (heating)	-99.9 to 99.9	°C	40.0	direct
r9	Maximum set point value from probe B8 (heating)	-99.9 to 99.9	°C	50.0	
r10	Temperature control band	0 to 99.9	°C	3.0	user
r11	Enable set point compensation	N / Y		N	user
r12	Maximum compensation value	-99.9 to 99.9	°C	5.0	user
r13	Minimum outside temperature for compensation in cooling	-99.9 to 99.9	°C	25.0	user
r14	Maximum outside temperature for compensation in cooling	-99.9 to 99.9	°C	35.0	user
r15	Minimum outside temperature for compensation in heating	-99.9 to 99.9	°C	10.0	user
r16	Maximum outside temperature for compensation in heating	-99.9 to 99.9	°C	0.0	user
r17	Outside temperature set point limit	-99.9 to 99.9	°C	-10.0	user
r18	Outside temperature differential limit	-9.9 to 9.9	°C	2.0	user
	F-r* parameters: software				
F1	Software version, first digit				direct
F1	Software version, second digit				
F3	Software version day				
F4	Software version month				
F5	Software version year				
	t* parameters: clock setting				
t1	Hour setting	0 to 23	h		
t2	Minutes setting	0 to 59	min		
t3	Day setting	1 to 31	day		
t4	Month setting	1 to 12	month		
t5	Year setting	0 to 99	year		

4.3 List of parameters with the pGD user interface

Menu description	Extended description	Min/max limits	Unit of measure	Default	Access	Ana/Int/Dig	Supervisor address	R / R-W
Hour	System hours		h			INT	77	R
Minutes	System minutes		m			INT	76	R
Day	System day							
Month	System month							
Year	System year							
In. air t. In. evap.t. In. cond.t. In. diff.t.	Ambient air temperature (air/air units) Evaporator water inlet temperature Condenser water inlet temperature (water/water units) Differential between evaporator inlet temperature and outside temperature		°C					
	Air outlet temperature (air/air units) Evaporator water outlet temperature Condenser water outlet temperature (water/water units) Differential between evaporator outlet temperature and outside temperature		°C					
Ext.control	External temp. control request percentage (condensing units)		%			INT	51	R
	Unit status	UNIT ON OFF FROM ALARM OFF FROM SUPERV. OFF FROM BANDS OFF FROM DIG.IN. OFF FROM BUTTON ANTIFREEZE PROBE P/LOAD PREVENT HP DEFROST CIRC.1 DEFROST CIRC.2				INT	50	R
CH HP	Active operating mode (chiller/heat pump)					DIG	46	R
On/Off unit	Unit ON/OFF from panel	UNIT OFF UNIT ON						
Running mode	Cooling/Heating from panel	COOLING HEATING						
Insert password	User / Manufacturer access password	0 to 9999						
Current language: ENGLISH press [↵] for change	Select pGD user interface language	ITALIANO ENGLISH ESPAÑOL		ENGLISH				
Probe offset B1:	Calibration offset for analogue input B1	-9.9 to 9.9	°C/bar	0	user			
Probe offset B2:	Calibration offset for analogue input B2	-9.9 to 9.9	°C/bar	0	user			
Probe offset B3:	Calibration offset for analogue input B3	-9.9 to 9.9	bar	0	user			
Probe offset B4:	Calibration offset for analogue input B4	-9.9 to 9.9	bar	0	user			
Probe offset B5:	Calibration offset for analogue input B5	-9.9 to 9.9	°C	0	user			
Probe offset B6:	Calibration offset for analogue input B6	-9.9 to 9.9	°C	0	user			
Probe offset B7:	Calibration offset for analogue input B7	-9.9 to 9.9	°C	0	user			
Probe offset B8:	Calibration offset for analogue input B8	-9.9 to 9.9	%/°C	0	user			
Probe offset B9:	Calibration offset for analogue input B9	-9.9 to 9.9	°C	0	user			
Probe offset B10:	Calibration offset for analogue input B10	-9.9 to 9.9	°C	0	user			
Enable probe B1: Tank temp. B1: T.condens.1 B1: P.evapor.1 B1: T.in.cond	Enable analogue input B1 Boiler temperature Condensing temperature 1 Evaporation pressure 1 Condenser inlet temperature (water/water units)	N / Y		N	manufacturer	DIG	11	RW
Enable probe B2: Not used B2: T.condens.2 B2: P.evapor.2 B2: T.out.cond	Enable analogue input B2 Condensing temperature 2 Evaporation pressure 2 Condenser outlet temperature (water/water units)	N / Y		N	manufacturer	DIG	12	RW
Enable probe B3: P.condens.1	Enable analogue input B3 Condensing pressure 1	N / Y		N	manufacturer	DIG	13	RW
Enable probe B4: P.condens.2	Enable analogue input B4 Condensing pressure 2	N / Y		N	manufacturer	DIG	14	RW
Enable probe B5: Room temp. B5: T.in.evap B5: Not used	Enable analogue input B5 Room temperature (air/air units) Evaporator water inlet temperature (chiller units)	N / Y		Y	manufacturer	DIG	15	RW
Enable probe B6: T.out.air B6: T.out.water B6: Not used	Enable analogue input B6 Evaporator air outlet temperature Evaporator water outlet temperature	N / Y		Y	manufacturer	DIG	16	RW
Enable probe B7: External temp.	Enable analogue input B7 Outside air temperature	N / Y		N	manufacturer	DIG	17	RW
Enable probe B8: External set B8: Ext.contr.	Enable analogue input B8 External set point External control unit (condensing units)	N / Y		N	manufacturer	DIG	18	RW
Enable probe B9: T.out.ev.1 B9: Not used	Enable analogue input B9 Evaporator 1 outlet temperature	N / Y		N	manufacturer	DIG	19	RW
Enable probe B10: T.out.ev.2 B10: Not used	Enable analogue input B10 Evaporator 2 outlet temperature	N / Y		N	manufacturer	DIG	20	RW
B1 probe config. Min.value	Minimum end scale configuration for analogue input B1	-30.0 to 150.0	bar	-0.5	manufacturer			

Menu description	Extended description	Min/max limits	Unit of measure	Default	Access	Ana/Int/Dig	Supervisor address	R / R-W
B1 probe config. Max.value	Maximum end scale configuration for analogue input B1	0.0 to 150.0	bar	7.0	manufacturer			
B2 probe config. Min.value	Minimum end scale configuration for analogue input B2	-30.0 to 150.0	bar	-0.5	manufacturer			
B2 probe config. Max.value	Maximum end scale configuration for analogue input B2	0.0 to 150.0	bar	7.0	manufacturer			
B3 probe config. Min.value	Minimum end scale configuration for analogue input B3	-30.0 to 150.0	bar	0.0	manufacturer			
B3 probe config. Max.value	Maximum end scale configuration for analogue input B3	0.0 to 150.0	bar	30.0	manufacturer			
B4 probe config. Min.value	Minimum end scale configuration for analogue input B4	-30.0 to 150.0	bar	0.0	manufacturer			
B4 probe config. Max.value	Maximum end scale configuration for analogue input B4	0.0 to 150.0	bar	30.0	manufacturer			
B8 probe config. Min.value	Minimum end scale configuration for analogue input B8	-30.0 to 150.0	%/°C	0.0	manufacturer			
B8 probe config. Max.value	Maximum end scale configuration for analogue input B8	0.0 to 150.0	%/°C	100.0	manufacturer			
Analog inputs 1 & 2 configuration	Configuration of analogue inputs B1 and B2	BOILER TEMP. CONDENSE TEMP. EVAP. PRESS.		BOILER TEMPERATURE	manufacturer	INT	1	RW
Reciprocating comp.	Type of semi-hermetic compressors controlled	PART LOAD ONLY WITH PUMP DOWN WITH PARTWINDING		PART LOAD ONLY.	manufacturer			
Maximum time	Maximum pumpdown duration	1 to 999	s	60	manufacturer	INT	2	RW
PW time	Part-winding time	1 to 999	ms	1	manufacturer	INT	3	RW
Pump down config. End from:	Select end pumpdown mode	PRESS. SWITCH PRESSURE PROBE		PRESS. SWITCH	user			
End set:	End pumpdown pressure (from low pressure transducer)	-99.9 to 99.9	bar	0.0	user	ANA	3	RW
Unload enabled	Enable compressor capacity control	N / Y		N	manufacturer			
Type:	Configure compressor capacity-control relay operating logic	N.C. N.O.		N.C.	manufacturer			
Unload time	Compressor capacity control deactivation delay	1 to 999	s	5	manufacturer	INT	4	RW
Compressors min. time ON	Minimum compressor on time	0 to 9999	s	60	manufacturer	INT	5	RW
Compressors min. time OFF	Minimum compressor off time	0 to 9999	s	360	manufacturer	INT	6	RW
Time between diff. comp.starts	Minimum time between starts of different compressors	0 to 9999	s	10	manufacturer	INT	7	RW
Time between same comp.starts	Minimum time between starts of the same compressor	0 to 9999	s	450	manufacturer	INT	8	RW
Min.time between pump/fan and compressors starting	Delay between start of pump/main fan and compressors	0 to 999	s	5	manufacturer	INT	107	
Delay OFF main pump/fan	Delay for stopping the pump/main fan	0 to 999	s	5	manufacturer	INT	108	
Hour meter Cond.pump	Condenser pump operating hours x 1000	0 to 999	h			INT	62	R
Hour meter Cond.pump	Condenser pump operating hours	0 to 999	h			INT	63	R
Hour meter Main pump Main fan	Evaporator pump / main fan operating hours x 1000	0 to 999	h			INT	58	
Hour meter Main pump Main fan	Evaporator pump / main fan operating hours	0 to 999	h			INT	59	
Hour meter Main pump 2	Evaporator pump 2 operating hours x 1000	0 to 999	h			INT	60	
Hour meter Main pump 2	Evaporator pump 2 operating hours	0 to 999	h			INT	61	
Hour meter Comp.1 circ.1	Compressor 1 operating hours circuit 1 x 1000	0 to 999	h			INT	64	
Hour meter Comp.1 circ.1	Compressor 1 operating hours circuit 1	0 to 999	h			INT	65	
Hour meter Comp.2 circ.1	Compressor 2 operating hours circuit 1 x 1000	0 to 999	h			INT	66	
Hour meter Comp.2 circ.1	Compressor 2 operating hours circuit 1	0 to 999	h			INT	67	
Hour meter Comp.3 circ.1	Compressor 3 operating hours circuit 1 x 1000	0 to 999	h			INT	68	
Hour meter Comp.3 circ.1	Compressor 3 operating hours circuit 1	0 to 999	h			INT	69	
Hour meter Comp.1 circ.2	Compressor 1 operating hours circuit 2 x 1000	0 to 999	h			INT	70	
Hour meter Comp.1 circ.2	Compressor 1 operating hours circuit 2	0 to 999	h			INT	71	
Hour meter Comp.2 circ.2	Compressor 2 operating hours circuit 2 x 1000	0 to 999	h			INT	72	
Hour meter Comp.2 circ.2	Compressor 2 operating hours circuit 2	0 to 999	h			INT	73	
Hour meter Comp.3 circ.2	Compressor 3 operating hours circuit 2 x 1000	0 to 999	h			INT	74	

Menu description	Extended description	Min/max limits	Unit of measure	Default	Access	Ana/Int/Dig	Supervisor address	R / R-W
Hour meter Comp.3 circ.2	Compressor 3 operating hours circuit 2	0 to 999	h			INT	75	
Pump/Fan hour meter Threshold	Pump/main fan operating hour threshold alarm x 1000	0 to 999	h	10	user			
Reset	Reset pump/main fan operating hours	0 to 1			user			
	Evaporator pump / main fan operating hours x 1000	0 to 999	h		user	INT	58	R
	Evaporator main pump fan operating hours	0 to 999	h		user	INT	59	R
Pump 2 hour meter Threshold	Pump 2 operating hour threshold alarm x 1000	0 to 999	h	10	user			
Reset	Reset pump 2 operating hours	0 to 1			user			
	Evaporator pump 2 operating hours x 1000	0 to 999	h		user	INT	60	R
	Evaporator pump 2 operating hours	0 to 999	h		user	INT	61	R
Condenser pump hour meter Threshold	Condenser pump operating hour threshold alarm x 1000	0 to 999	h	10	user			
Reset	Reset condenser pump operating hours	0 to 1			user			
	Condenser pump operating hours x 1000	0 to 999	h		user	INT	62	R
	Condenser pump operating hours	0 to 999	h		user	INT	63	R
Comp.1 circ.1 hour meter Threshold	Operating hour threshold alarm, compressor 1 circuit 1 x 1000	0 to 999	h	10	user			
Reset	Reset compressor 1 operating hours circuit 1	0 to 1			user			
	Compressor 1 operating hours circuit 1 x 1000	0 to 999	h		user	INT	64	R
	Compressor 1 operating hours circuit 1	0 to 999	h		user	INT	65	R
Comp.2 circ.1 hour meter Threshold	Operating hour threshold alarm, compressor 2 circuit 1 x 1000	0 to 999	h	10	user			
Reset	Reset compressor 2 operating hours circuit 1	0 to 1			user			
	Compressor 2 operating hours circuit 1 x 1000	0 to 999	h		user	INT	66	R
	Compressor 2 operating hours circuit 1	0 to 999	h		user	INT	67	R
Comp.3 circ.1 hour meter Threshold	Operating hour threshold alarm, compressor 3 circuit 1 x 1000	0 to 999	h	10	user			
Reset	Reset compressor 3 operating hours circuit 1	0 to 1			user			
	Compressor 3 operating hours circuit 1 x 1000	0 to 999	h		user	INT	68	R
	Compressor 3 operating hours circuit 1	0 to 999	h		user	INT	69	R
Comp.1 circ.2 hour meter Threshold	Operating hour threshold alarm, compressor 1 circuit 2 x 1000	0 to 999	h	10	user			
Reset	Reset compressor 1 operating hours circuit 2	0 to 1			user			
	Compressor 1 operating hours circuit 2 x 1000	0 to 999	h		user	INT	70	R
	Compressor 1 operating hours circuit 2	0 to 999	h		user	INT	71	R
Comp.2 circ.2 hour meter Threshold	Operating hour threshold alarm, compressor 2 circuit 2 x 1000	0 to 999	h	10	user			
Reset	Reset compressor 2 operating hours circuit 2	0 to 1			user			
	Compressor 2 operating hours circuit 2 x 1000	0 to 999	h		user	INT	72	R
	Compressor 2 operating hours circuit 2	0 to 999	h		user	INT	73	R
Comp.3 circ.2 hour meter Threshold	Operating hour threshold alarm, compressor 3 circuit 2 x 1000	0 to 999	h	10	user			
Reset	Reset compressor 3 operating hours circuit 2	0 to 1			user			
	Compressor 3 operating hours circuit 2 x 1000	0 to 999	h		user	INT	74	R
	Compressor 3 operating hours circuit 2	0 to 999	h		user	INT	75	R
Rotation time with tandem/trio compressors:	Tandem/trio compressor rotation delay in part load operation	1 to 180	min	20	user			
Compressors enabled C1/1	Enable operation of compressor 1 circuit 1	N / Y		Y	user	DIG	5	RW
Compressors enabled C2/1	Enable operation of compressor 2 circuit 1	N / Y		Y	user	DIG	6	RW
Compressors enabled C3/1	Enable operation of compressor 3 circuit 1	N / Y		Y	user	DIG	7	RW
Compressors enabled C1/2	Enable operation of compressor 1 circuit 2	N / Y		Y	user	DIG	8	RW
Compressors enabled C2/2	Enable operation of compressor 2 circuit 2	N / Y		Y	user	DIG	9	RW
Compressors enabled C3/2	Enable operation of compressor 3 circuit 2	N / Y		Y	user	DIG	10	RW
1-2 analog inputs: Tank temp. T.condens.1 P.evapor.1 T.in.cond	Value of analogue input B1 Boiler temperature Condensing temperature 1 Evaporation pressure 1 Condenser inlet temperature (water/water units)	-99.9 to 99.9	°C/bar			ANA	43	R

Menu description	Extended description	Min/max limits	Unit of measure	Default	Access	Ana/Int/Dig	Supervisor address	R / R-W
1-2 analog inputs: Not used T.condens.2 P.evapor.2 T.out.cond	Value of analogue input B2 Condensing temperature 2 Evaporation pressure 2 Condenser outlet temperature (water/water units)	-99.9 to 99.9	°C/bar			ANA	44	R
3-4 analog inputs: P.condens.1	Value of analogue input B3 Condensing pressure 1	-99.9 to 99.9	bar			ANA	45	R
3-4 analog inputs: P.condens.2	Value of analogue input B4 Condensing pressure 2	-99.9 to 99.9	bar			ANA	46	R
5-6 analog inputs: Room temp. T.in.evap. Not used	Value of analogue input B5 Room temperature (air/air units) Evaporator water inlet temperature	-99.9 to 99.9	°C			ANA	47	R
5-6 analog inputs: T.out air T.out.evap. Not used	Value of analogue input B6 Air outlet temperature (air/air units) Evaporator water outlet temperature	-99.9 to 99.9	°C			ANA	48	R
7-8 analog inputs: Ext.temp.	Value of analogue input B7 Outside air temperature	-99.9 to 99.9	°C			ANA	49	R
7-8 analog inputs: External set Ext.contr.	Value of analogue input B8 External set point External control value (condensing units)	-99.9 to 99.9	%/°C			ANA	50	R
9-10 analog inputs: T.out.ev.1 Not used	Value of analogue input B9 Evaporator 1 water outlet temperature	-99.9 to 99.9	°C			ANA	51	R
9-10 analog inputs: T.out.ev.2 Not used	Value of analogue input B10 Evaporator 2 water outlet temperature	-99.9 to 99.9	°C			ANA	52	R
1-3 dig.inputs: Serious alarm Remote On/Off	Status of digital input 1 Serious alarm from digital input ON/OFF from digital input (condensing units with control from digital inputs)					DIG	41	R
1-3 dig.inputs: Air flow state Evap.flow state Control step 1 Not used	Status of digital input 2 Air flow switch (air/air units) Evaporator water flow switch Condensing unit digital control 1					DIG	42	R
1-3 dig.inputs: Remote On/Off Control step 2	Status of digital input 3 Remote On/Off Condensing unit digital control 2					DIG	43	R
4-6 dig.inputs: Overload main fan Overload ev.pump Not used	Status of digital input 4 Main fan thermal overload Evaporator pump 1 thermal overload Condensing unit digital control 3					DIG	44	R
4-6 dig.inputs: Pressost.L.press.1	Status of digital input 5 Low pressure switch circuit 1					DIG	45	R
4-6 dig.inputs: Pressost.H.press.1	Status of digital input 6 High pressure switch circuit 1					DIG	46	R
7-9 dig.inputs: Over.comp.1 circ.1	Status of digital input 7 Compressor 1 thermal overload circuit 1					DIG	47	R
7-9 dig.inputs: Over.comp.2 circ.1	Status of digital input 8 Compressor 2 thermal overload circuit 1					DIG	48	R
7-9 dig.inputs: Overl.fan 1 Circ.1 Overload cond.pump	Status of digital input 9 Condenser fan 1 thermal overload circuit 1 Condenser pump thermal overload					DIG	49	R
10-12 dig.inputs: Pressost.L.press.2	Status of digital input 10 Low pressure switch circuit 2					DIG	50	R
10-12 dig.inputs: Pressost.H.press.2	Status of digital input 11 High pressure switch circuit 2					DIG	51	R
10-12 dig.inputs: Over.comp.1 circ.2	Status of digital input 12 Compressor 1 thermal overload circuit 2					DIG	52	R
13-15 dig.inputs: Over.comp.2 circ.2	Status of digital input 13 Compressor 2 thermal overload circuit 2					DIG	53	R
13-15 dig.inputs: Overl.fan 2 Circ.1 Overl.fan 1 Circ.2 Cond. flow state	Status of digital input 14 Condenser fan 2 thermal overload circuit 1 (1 condenser) Condenser fan 1 thermal overload circuit 2 (2 condensers) Condenser water flow switch(water/water units)					DIG	54	R
13-15 dig.inputs: Not used Summer/Winter	Status of digital input 15 Select cooling/heating from digital input					DIG	55	R
16-18 dig.inputs: Not used Overl.fan 2 Circ.1 Over.comp.3 circ.1	Status of digital input 16 Condenser fan 2 thermal overload circuit 1 (2 condensers, 4 fans) Compressor 3 thermal overload circuit 1 (units with trio compressors)					DIG	56	R
16-18 dig.inputs: Not used Overl.fan 2 Circ.2 Over.comp.3 circ.2	Status of digital input 17 Condenser fan 2 thermal overload circuit 2 (2 condensers, 4 fans) Compressor 3 thermal overload circuit 2 (units with trio compressors)					DIG	57	R

Menu description	Extended description	Min/max limits	Unit of measure	Default	Access	Ana/Int/Dig	Supervisor address	R / R-W
16-18 dig.inputs: Not used Overload pump 2 Control step 4	Status of digital input 18 Evaporator pump 2 thermal overload Condensing unit digital control 4					DIG	58	R
1-3 dig.outputs: Comp.1 circ.1 Winding A comp.1	Status of digital output 1 Compressor 1 circuit 1 Winding A compressor 1					DIG	25	R
1-3 dig.outputs: Comp.2 circ.1 Unload comp.1 Winding B comp.1	Status of digital output 2 Compressor 2 circuit 1 Compressor 1 capacity control Winding B compressor 1					DIG	26	R
1-3 dig.outputs: Not used Cond.fan 2 circ.1 Comp.3 circ.1 Solenoid circ.1 Unload comp.1	Status of digital output 3 Fan 2 circuit 1 Compressor 3 circuit 1 Liquid solenoid circuit 1 Compressor 1 capacity control (if Part-Winding enabled)					DIG	27	R
4-6 dig.outputs: Cond.fan 1 circ.1 Not used Defrost res.circ.1	Status of digital output 4 Fan 1 circuit 1 Defrost heater circuit 1					DIG	28	R
4-6 dig.outputs: Main fan Evaporator pump Not used	Status of digital output 5 Main fan (air/air units) Evaporator pump 1					DIG	29	R
4-6 dig.outputs: Comp.1 circ.2 Winding A comp.2	Status of digital output 6 Compressor 1 circuit 2 Winding A compressor 2					DIG	30	R
7-9 dig.outputs: Comp.2 circ.2 Unload comp.2 Winding B comp.2	Status of digital output 7 Compressor 2 circuit 2 Compressor 2 capacity control Winding B compressor 2					DIG	31	R
7-9 dig.outputs: Not used Evaporator pump 2 Cond.fan 2 circ.2 Comp.3 circ.2 Solenoid circ.2 Unload comp.2	Status of digital output 8 Evaporator pump 2 Fan 2 circuit 2 Compressor 3 circuit 2 Liquid solenoid circuit 2 Compressor 2 capacity control (if Part-Winding enabled)					DIG	32	R
7-9 dig.outputs: Cond.fan 2 circ.1 Cond.fan 1 circ.2 Not used Defrost res.circ.2	Status of digital output 9 Fan 2 circuit 1 (single condenser) Fan 1 circuit 2 (2 condensers) Defrost heater circuit 2					DIG	33	R
10-12 dig.outputs: General alarm	Status of digital output 10 Generic alarm					DIG	34	R
10-12 dig.outputs: Antifreeze heater1 Not used	Status of digital output 11 Heater 1					DIG	35	R
10-12 dig.outputs: Antifreeze heater2 Not used	Status of digital output 12 Heater 2					DIG	36	R
13-14 dig.outputs: Not used Valve 4way circ.1 Water inv.valve	Status of digital output 13 4-way valve for reversing the refrigerant circuit in circuit 1 4-way valve for reversing the water circuit (water/water units)					DIG	37	R
13-14 dig.outputs: Not used Valve 4way circ.2 Condenser pump	Status of digital output 14 4-way valve for reversing the refrigerant circuit in circuit 2 Condenser pump (water/water units)					DIG	38	R
Analog outputs: Fan circuit 1	Status of analogue output 1 Condenser fans circuit 1		V			ANA	55	R
Analog outputs: Fan circuit 2	Status of analogue output 2 Condenser fans circuit 2		V			ANA	56	R
Analog outputs: Evap.pump 2	Status of analogue output 5 Evaporator pump 2		V					
Driver1 mode:	Active operating mode circuit 1	COOLING HEATING DEFROST			direct	INT	105	R
EEV Mode	Activate manual control, driver 1 (reading)	0 to 1				DIG	160	RW
EEV Position	Read position of valve 1	0 to 9999				INT	97	R
Power request	Read capacity request for driver 1	0 to 100	%			INT	101	R
Driver2 mode:	Active operating mode circuit 1	COOLING HEATING DEFROST				INT	105	R
EEV Mode	Activate manual control, driver 2 (reading)	0 to 1				DIG	161	RW
EEV Position	Read position of valve 2	0 to 9999				INT	98	R
Power request	Read capacity request for driver 2	0 to 100	%			INT	102	R
Driver3 mode:	Active operating mode circuit 2	COOLING HEATING DEFROST				INT	106	R
EEV Mode	Activate manual control, driver 3 (reading)	0 to 1				DIG	162	RW
EEV Position	Read position of valve 3	0 to 9999				INT	99	R
Power request	Read capacity request for driver 3	0 to 100	%			INT	103	R

Menu description	Extended description	Min/max limits	Unit of measure	Default	Access	Ana/Int/Dig	Supervisor address	R / R-W
Driver4 mode:	Active operating mode circuit 2	COOLING HEATING DEFROST				INT	106	R
EEV Mode	Activate manual control, driver 4 (reading)	0 to 1				DIG	163	RW
EEV Position	Read position of valve 4	0 to 9999				INT	100	R
Power request	Read capacity request for driver 4	0 to 100	%			INT	104	R
Driver 1	Type of gas used	None R22 R134a R404a R407c R410a R507c R290 R600 R600a R717 R744				INT	81	RW
SuperHeat	SuperHeat measured by driver 1	-999.9 to 999.9	°C			ANA	60	R
Satured Temp.	Saturation temperature measured by driver 1	-999.9 to 999.9	°C			ANA	64	R
Suction Temp.	Suction temperature measured by driver 1	-999.9 to 999.9	°C			ANA	68	R
Driver 2	Display type of gas used in the refrigerant circuit	See Driver 1				INT	81	RW
SuperHeat	SuperHeat measured by driver 2	-999.9 to 999.9	°C			ANA	61	R
Satured Temp.	Saturation temperature measured by driver 2	-999.9 to 999.9	°C			ANA	65	R
Suction Temp.	Suction temperature measured by driver 2	-999.9 to 999.9	°C			ANA	69	R
Driver 3	Display type of gas used in the refrigerant circuit	See Driver 1				INT	81	RW
SuperHeat	SuperHeat measured by driver 3	-999.9 to 999.9	°C			ANA	62	R
Satured Temp.	Saturation temperature measured by driver 3	-999.9 to 999.9	°C			ANA	66	R
Suction Temp.	Suction temperature measured by driver 3	-999.9 to 999.9	°C			ANA	70	R
Driver 4	Display type of gas used in the refrigerant circuit	See Driver 1				INT	81	RW
SuperHeat	SuperHeat measured by driver 4	-999.9 to 999.9	°C			ANA	63	R
Satured Temp.	Saturation temperature measured by driver 4	-999.9 to 999.9	°C			ANA	67	R
Suction Temp.	Suction temperature measured by driver 4	-999.9 to 999.9	°C			ANA	71	R
Driver 1	Display type of gas used in the refrigerant circuit	None R22 R134a R404a R407c R410a R507c R290 R600 R600a R717 R744				INT	81	RW
Evap.press.	Evaporation pressure measured by driver 1	-99.9 to 99.9	barg			ANA	64	R
Evap.temp.	Evaporation temperature measured by driver 1	-99.9 to 99.9	°C			ANA	72	R
Cond.temp.	Condensing temperature measured by driver 1	-99.9 to 99.9	°C			ANA	76	R
Driver 2	Display type of gas used in the refrigerant circuit	See Driver 1				INT	81	RW
Evap.press.	Evaporation pressure measured by driver 2	-99.9 to 99.9	barg			ANA	65	R
Evap.temp.	Evaporation temperature measured by driver 2	-99.9 to 99.9	°C			ANA	73	R
Cond.temp.	Condensing temperature measured by driver 2	-99.9 to 99.9	°C			ANA	77	R
Driver 3	Display type of gas used in the refrigerant circuit	See Driver 1				INT	81	RW
Evap.press.	Evaporation pressure measured by driver 3	-99.9 to 99.9	barg			ANA	66	R
Evap.temp.	Evaporation temperature measured by driver 3	-99.9 to 99.9	°C			ANA	74	R
Cond.temp.	Condensing temperature measured by driver 3	-99.9 to 99.9	°C			ANA	78	R
Driver 4	Display type of gas used in the refrigerant circuit	See Driver 1				INT	81	RW
Evap.press.	Evaporation pressure measured by driver 4	-99.9 to 99.9	barg			ANA	67	R
Evap.temp.	Evaporation temperature measured by driver 4	-99.9 to 99.9	°C			ANA	75	R
Cond.temp.	Condensing temperature measured by driver 4	-99.9 to 99.9	°C			ANA	79	R
EVD1 version	Firmware version H driver 1	0 to 999						
EVD1 version	Firmware version L driver 1	0 to 999						
EVD2 version	Firmware version H driver 2	0 to 999						
EVD2 version	Firmware version L driver 2	0 to 999						
EVD3 version	Firmware version H driver 3	0 to 999						
EVD3 version	Firmware version L driver 3	0 to 999						
EVD4 version	Firmware version H driver 4	0 to 999						
EVD4 version	Firmware version L driver 4	0 to 999						
Antifreeze Low room temperature alarm Setpoint	Antifreeze alarm set point (chiller units) low room temperature (air/air units)	-99.9 to 99.9	°C	3.0	user	ANA	13	RW
Antifreeze Low room temperature alarm Diff.	Antifreeze alarm differential (chiller units) Low room temperature (air/air units)	-99.9 to 99.9	°C	1.0	user	ANA	14	RW
Antifreeze alrm Low room temperature setpoint limits Low	Minimum set point limit antifreeze/low room temperature	-99.9 to 99.9	°C	0.0	manufacturer		5	
Antifreeze alrm Low room temperature setpoint limits High	Maximum set point limit antifreeze/low room temperature	-99.9 to 99.9	°C	12.0	manufacturer			
Antifreeze alarm Reset	Type of antifreeze alarm reset	MANUAL AUTOMATIC		MANUAL	user			
Antifreeze alarm Delay	Antifreeze alarm delay when starting (manual reset)	0 to 540	min	0	user	INT	9	RW

Menu description	Extended description	Min/max limits	Unit of measure	Default	Access	Ana/Int/Dig	Supervisor address	R / R-W
Antifreeze heaters Setpont	Antifreeze heater set point	-99.9 to 99.9		5.0	user	ANA	15	RW
Antifreeze heaters Diff.	Antifreeze heater differential	-99.9 to 99.9		1.0	user	ANA	16	RW
Auxiliary heater in cooling mode Setpoint	Support heater set point in cooling mode	-99.9 to 99.9		30.0	user	ANA	17	RW
Auxiliary heater in cooling mode Diff.	Heater differential support in cooling mode	-99.9 to 99.9		1.0	user	ANA	18	RW
Auxiliary heater in heating mode Setpoint	Support heater 1 set point in heating mode	15.0 to 50.0		25.0	user	ANA	19	RW
Auxiliary heater in heating mode Diff.	Support heater 1 differential in heating mode	0.0 to 10.0		5.0	user	ANA	20	RW
Auxiliary heater in heating mode (2) Setpoint	Support heater 2 set point in heating mode	15.0 to 50.0		24.0	user	ANA	21	RW
Auxiliary heater in heating mode (2) Diff.	Support heater 2 differential in heating mode	0.0 to 10.0		5.0	user	ANA	22	RW
Aux.heater HP mode enable by tank Setpoint	Boiler temperature set point to enable support heater	-3.0 to 50.0	°C	10.0	user			
Aux.heater HP mode enable by tank Diff.	Boiler temperature differential to enable support heater	0.0 to 10.0	°C	2.0	user			
Aux.heater HP mode enable by ext.temp. Setpoint	Outside air set point to enable support heater	-30.0 to 30.0	°C	-7.0	user			
Aux.heater HP mode enable by ext.temp. Diff.	Outside air differential to enable support heater	0.0 to 10.0	°C	2.0	user			
Auxiliary heater activation delay on heating mode	Support heater 2 differential in heating mode	0 to 60	min	15	user	INT	10	RW
Antifreeze Probe:	Select probe for cooling support control in air/air units	OUTLET TEMP. ROOM TEMP.		OUTLET TEMP.	user			
Automatic turn ON in antifreeze	Device start-up mode in antifreeze with unit off	DISABLED ON RES.& PUMP ON RES.& UNIT ONLY RESISTANCE ON		DISABLED	user	INT	11	RW
Defrost config. Start/End:	Select values for the start and end defrost control	TEMPERATURE PRESSURE EXTERNAL CONTACT PRESSURE/TEMP.		TEMPERATURE	user	INT	12	RW
Defrost config. Type:	Type of defrost between circuits	SIMULTANEOUS SEPARATE		SIMULTANEOUS	user			
Defrost end by threshold	Select end defrost mode	TIME TEMP/PRESSURE		TIME	user			
Defrost Delay	Defrost activation delay	1 to 32000	s	1800	user	INT	13	RW
Defrost Start	Start defrost threshold	-99.0 to 99.9	°C/bar	2.0	user	ANA	5	RW
Defrost End	End defrost threshold	-99.0 to 99.9	°C/bar	12.0	user	ANA	6	RW
Defrost Max.time	Maximum defrost duration	0 to 32000	s	300	user	INT	14	RW
Defrost Min.time	Minimum defrost duration	0 to 32000	s	0	user	INT	15	RW
Delay between defrost same circuit	Delay between defrosts in the same circuit	0 to 32000	s	0	user	INT	16	RW
Delay between defrost differ.circ.	Delay between defrosts in different circuits	0 to 32000	s	0	user	INT	17	RW
Defrost Compressor force OFF on start/end defrost	Forced compressor off time at start and end defrost	0 to 999	s	60	manufacturer	INT	18	RW
Defrost Reversal cycle delay	Delay in reversing refrigerating cycle for defrost	0 to 999	s	30	manufacturer	INT	19	RW
Sliding defrost Enable:	Enable sliding defrost function	N / Y		N	user			
Sliding defrost Defrost start min. Set point	Minimum set point to start defrost accessible with sliding defrost function	0.0 to 99.9	°C/bar	0.5	user	ANA	23	RW
Sliding defrost External temperature Start	Outside temperature threshold to start sliding defrost action	-99.9 to 99.9	°C	0.0	user			
Sliding defrost External temperature End	Outside temperature threshold for maximum sliding defrost action	-99.9 to 99.9	°C	0.0	user			
Manual defrost	Enable manual defrost operation	DISABLED ENABLED		DISABLED	user			
Circuit 1:	Request forced defrost in circuit 1	OFF START		OFF	user			
Circuit 2:	Request forced defrost in circuit 2	OFF START		OFF	user			
Transducer high pressure alarm Se tpoint	High pressure alarm set point from transducer	0 to 99.9	bar	21.0	manufacturer	ANA	24	RW
Transducer high pressure alarm Diff.	High pressure alarm differential from transducer	0 to 99.9	bar	2.0	manufacturer	ANA	25	RW

Menu description	Extended description	Min/max limits	Unit of measure	Default	Access	Ana/Int/Dig	Supervisor address	R / R-W
Low pressure alarm Summer set	Low pressure alarm set point from transducer (cooling)	0 to 99.9	bar	2.0	manufacturer			
Low pressure alarm Winter set	Low pressure alarm set point from transducer (heating)	0 to 99.9	bar	0.5	manufacturer			
Low pressure alarm Defrost set	Low pressure alarm set point from transducer (defrost)	0 to 99.9	bar	1.0	manufacturer			
LP delay switch-on Summer	Low pressure alarm delay when starting the compressors (cooling)	0 to 999	s	40	user	INT	20	RW
LP delay switch-on Winter	Low pressure alarm delay when starting the compressors (heating)	0 to 999	s	40	user	INT	21	RW
LP delay switch-on Defrost	Low pressure delay when starting the compressors (defrost)	0 to 999	s	40	user	INT	22	RW
Low pressure alarm Regime delay	Low pressure alarm delay in steady operation	0 to 999	s	0.0	user	INT	23	RW
Low pressure alarm Diff.	Low pressure alarm differential from transducer	0 to 99.9	bar	2.0	user			
Evaporator flow alarm Start delay	Evaporator flow switch alarm delay at start-up	0 to 999	s	15	user	INT	24	RW
Evaporator flow alarm Regime delay	Evaporator flow switch alarm delay in steady operation	0 to 999	s	3	user	INT	25	RW
Condenser flow alarm Start delay	Condenser flow switch alarm delay at start-up	0 to 999	s	15	user	INT	26	RW
Condenser flow alarm Regime delay	Condenser flow switch alarm delay in steady operation	0 to 999	s	3	user	INT	27	RW
Automatic alarms reset Events n.	Number of alarm events to switch from automatic to manual reset	0 to 4		1	user	INT	28	RW
Automatic alarms reset Time	Period of repeated alarm events to switch from automatic to manual reset	1 to 99	min	60	user	INT	29	RW
Alarms reset selection Comp.overload	Select type of compressor thermal overload alarm reset	0 to 1		0	user			
Alarms reset selection Fans overload	Select type of fan thermal overload alarm reset	0 to 1		0	user			
Alarms reset selection Low pressure	Select type of low pressure alarm reset	0 to 1		0	user			
Alarms reset selection High pressure	Select type of high pressure alarm reset	0 to 1		0	user			
Configuration	Configure type of unit	AIR/AIR CHILLER AIR/AIR CHILLER+HEAT P. WATER/AIR CHILLER WATER/AIR CHILLER+HEAT P. WATER/WATER CHILLER WATER/WATER CHILLER+HEAT P. WATER/AIR CONDENSING WATER/AIR CONDENSING+HEAT P.		AIR/AIR CHILLER	manufacturer			
	Type of condensing unit control	ANALOGUE CONTROL DIGITAL CONTROL		ANALOGUE CONTROL	manufacturer			
Inv.selection:	Select type of reverse cycle for water/water units	WATER GAS		WATER	manufacturer			
Comp./circuits number:	Total number of compressors / number of refrigerant circuits on unit	1/1 2/1 3/1 2/2 4/2 6/2		1/1	manufacturer			
Rotation	Select type of compressor / refrigerant circuit rotation	L.I.F.O. F.I.F.O. TIME		L.I.F.O.	manufacturer	INT	30	RW
Evaporator number:	Select number of evaporators	1 2		1	manufacturer			
Remote compressor control management Type	Select type of condensing unit control from analogue input	STEPS PROPORTIONAL		STEPS	manufacturer			
EVD400 drivers number:	Number of EVD400 drivers connected	0 to 4		0	manufacturer	INT	31	RW
Reversal cycle valve logic	4-way valve operating logic for the reversal of the refrigerant/water circuit	N.C. N.O.		N.O.	manufacturer	DIG	4	RW
Pumps number:	Number of evaporator pumps	1 to 2		1	manufacturer			
Rotation type	Select type of evaporator pump rotation	STARTS TIME		STARTS	manufacturer			

Menu description	Extended description	Min/max limits	Unit of measure	Default	Access	Ana/Int/Dig	Supervisor address	R / R-W
Pumps/Fan running mode	Evaporator pump/main fan operating mode	ALWAYS OFF ALWAYS ON ON WITH COMP.ON ON/OFF BURST		ALWAYS ON	manufacturer	INT	32	RW
Condenser pump running mode	Condenser pump operating mode	ALWAYS OFF ALWAYS ON ON WITH COMP.ON		ALWAYS ON	manufacturer			
Pumps/Fan burst running Time ON:	ON time in burst operation	0 to 9999	s	60	user	INT	33	RW
Pumps/Fan burst running Time OFF:	OFF time in burst operation	0 to 9999	s	60	user	INT	34	RW
Pump rotation every (hours):	Operating hour threshold for the rotation of the evaporator pumps	0 to 9999	h	12	user	INT	35	RW
Enable on/off by digital input	Enable unit ON/OFF from digital input	N / Y		N	user			
Enable sum/win by digital input	Enable cooling/heating selection from digital input	N / Y		N	user			
Enable on/off by supervisor	Enable unit ON/OFF from supervisor	N / Y		N	user	INT	55	RW
Enable sum/win by supervisor	Enable cooling/heating selection from supervisor	N / Y		N	user	INT	45	RW
Auto revers.running mode delay (summer/winter)	Force-off time device for change working mode (CH-HP)	0 to 999	s	0	user	INT	36	RW
Supervisor protocol type	Select type of serial protocol for supervisory network	CAREL MODBUS LONWORKS Rs232 MODEM ANALOGUE. GSM MODEM		CAREL	user			
Supervisor baud rate	Serial port communication speed for supervisory network	1200 (RS485/RS422) 2400 (RS485/RS422) 4800 (RS485/RS422) 9600 (RS485/RS422) 19200 (ONLY RS485)		19200 (ONLY RS485)	user			
Supervisor Ident N.:	Serial identification number for supervisory network	0 to 200		1	user			
Max.phone n.:	Phone book capacity (number of telephone numbers saved)	1 to 4		1	user			
Phone book number:	Active telephone number in phone book	1 to 4			user			
	Digits that make up the telephone number	0 1 2 3 4 5 6 7 8 9 # * , @ ^			user			
Modem password:	Modem password	0 to 9999		0	user			
Modem rings:	Number of rings	0 to 9		3	user			
Modem type:	Type of modem	Tone Pulse		Tone	user			
SMS send test:	Send test SMS (an SMS is sent with a test message)	N / Y			user			
SMS send enable:	Enable send SMS in response to an alarm	N / Y		Y	user			
EXTERNAL MODEM GSM MODEM Status:	Status of the modem	Ext. modem standby Initialisation Search GSM network Modem standby Modem alarm Init. error Enable PIN GSM network not found SMS saturation Send SMS… Modem connected… Modem calling...						
Field:	Percentage of signal reception for the GSM modem	0 to 100	%					
	Temporary modem error	Temp. error						
	Permanent modem error	Perm. error						
Time next call	Waiting time for new call after failed attempt	0	s	0				
Language mask visualization on start	Enable display of change language screen when starting unit	N / Y		Y	user			
Reset eventi SMS	Delete list of SMS messages sent or to be sent	N / Y		N	manufacturer			

Menu description	Extended description	Min/max limits	Unit of measure	Default	Access	Ana/Int/Dig	Supervisor address	R / R-W
Restore default values	Start board memory delete procedure and restore default values	N / Y		N	manufacturer			
Condensation Regulation type	Type of condenser control	CIRC.ON/OFF STATUS PRESSURE TEMPERATURE		PRESSURE	manufacturer	INT	37	RW
Condensation Condenser number	Number of condensers installed	1 2		1	manufacturer	DIG	3	RW
Condensation Devices type	Type of condensing devices controlled	INVERTER FANS		INVERTER	manufacturer	DIG	21	RW
Condensation Fans number	Total number of fans installed	1 to 4		1	manufacturer			
Fans type Frequency	Frequency of power supply for fan control by inverter	50 60	Hz	50	manufacturer			
Cond.fan forcing time on start	Forcing time when starting the condenser (temperature control)	0 to 999	s	0	manufacturer	INT	38	RW
PWM Phase cut Triac max.:	Maximum voltage threshold for Triac	0 to 100	%	75	manufacturer			
PWM Phase cut Triac min.:	Minimum voltage threshold for Triac	0 to 100	%	25	manufacturer			
PWM Phase cut Range wave:	Amplitude impulse for phase control	0.0 to 10.0	ms	2.5	manufacturer			
Fan parameters summer Setpoint	Condensing set point (cooling)	0.0 to 99.9	°C/bar	14.0	user	ANA	11	RW
Fan parameters summer Diff.	Condenser differential (cooling)	-99.9 to 99.9	°C/bar	2.0	user	ANA	12	RW
Fan parameters winter Setpoint	Evaporation set point (heating)	0.0 to 99.9	°C/bar	14.0	user			
Fan parameters winter Diff.	Evaporation differential (heating)	-99.9 to 99.9	°C/bar	2.0	user			
Fan minimum speed diff.	Differential for fan operation at minimum speed	-99.9 to 99.9	°C/bar	5.0	user			
Inverter Max.speed	Maximum fan speed with inverter	0.0 to 10.0	V	10.0	manufacturer			
Inverter Min.speed	Minimum fan speed with inverter	0.0 to 10.0	V	0.0	manufacturer			
Inverter Speed-up time	Speed-up time with inverter	0 to 999	s	30	manufacturer	INT	39	RW
HP prevent Enabled	Enable high pressure prevent	N / Y		N	manufacturer			
HP prevent Probe	Select the prevent probe	PRESSURE TEMPERATURE		PRESSURE	manufacturer			
HP prevent (cooling mode) Setpoint	High pressure prevent set point (cooling)	-99.9 to 99.9	°C/bar	20.0	user			
HP prevent (cooling mode) Diff.	High pressure prevent differential (cooling)	0 to 99.9	°C/bar	2.0	user			
LP prevent (heating mode) Setpoint	Low pressure prevent set point (heating)	-99.9 to 99.9	°C/bar	3.0	user			
LP prevent (heating mode) Diff.	Low pressure prevent differential (heating)	0 to 99.9	°C/bar	2.0	user			
Fan run with condensation probe fault	Condenser operating mode in the event of probe fault	FORCE OFF FORCE ON WITH COMP ON		FORCE ON WITH COMP ON	user	INT	40	RW
Prevent output delay	Delay to exit the prevent function	0 to 999	s	0	user	INT	41	RW
Low-noise Start hour	Start hour for low-noise operation	0 to 23	h	0	user			
Low-noise Start hour	Start minutes for low-noise operation	0 to 59	min	0	user			
Low-noise End hour	End hour for low-noise operation	0 to 23	h	0	user			
Low-noise End hour	End minutes for low-noise operation	0 to 59	min	0	user			
Low-noise Setpoint Summer	Low-noise set point in cooling	0.0 to 99.9	°C/bar	0.0	user			
Low-noise Setpoint Winter	Low-noise set point in heating	0.0 to 99.9	°C/bar	0.0	user			
Actual setpoint	Active set point		°C		direct	ANA	57	R
Compens.B7	Current outside temperature compensation value (B7)		°C		direct	ANA	58	R
Ext.set.B8	Current set point from analogue input B8		°C			ANA	59	R
Summer setpoint	Cooling set point	-99.9 to 99.9	°C	12.0	direct	ANA	1	RW
Winter setpoint	Heating set point	-99.9 to 99.9	°C	45.0	direct	ANA	2	RW
B8 external setpoint Summer min	Minimum set point value from probe B8 (cooling)	-99.9 to 99.9	°C	7.0	direct			

Menu description	Extended description	Min/max limits	Unit of measure	Default	Access	Ana/Int/Dig	Supervisor address	R / R-W
B8 external setpoint Summer max	Maximum set point value from probe B8 (cooling)	-99.9 to 99.9	°C	17.0	direct			
B8 external setpoint Winter min	Minimum set point value from probe B8 (heating)	-99.9 to 99.9	°C	40.0	direct			
B8 external setpoint Winter max	Maximum set point value from probe B8 (heating)	-99.9 to 99.9	°C	50.0				
Temperature regulation band	Temperature control band	0 to 99.9	°C	3.0	user	ANA	4	RW
Summer temperature setpoint limits Low	Minimum limit for setting the set point in cooling	-99.9 to 99.9	°C	-12.2	user	ANA	7	RW
Summer temperature setpoint limits High	Maximum limit for setting the set point in cooling	-99.9 to 99.9	°C	48.9	user	ANA	8	RW
Winter temperature setpoint limits Low	Minimum limit for setting the set point in heating	-99.9 to 99.9	°C	10.0	user	ANA	9	RW
Winter temperature setpoint limits High	Maximum limit for setting the set point in heating	-99.9 to 99.9	°C	93.0	user	ANA	10	RW
Setpoint compensation enabled	Enable set point compensation	N / Y		N	user			
Maximum compensation	Maximum compensation value	-99.9 to 99.9	°C	5.0	user	ANA	26	RW
Summer compens. Start temp.	Minimum outside temperature for compensation in cooling	-99.9 to 99.9	°C	25.0	user	ANA	27	RW
Summer compens. End temp.	Maximum outside temperature for compensation in cooling	-99.9 to 99.9	°C	35.0	user	ANA	28	RW
Winter compens. Start temp.	Minimum outside temperature for compensation in heating	-99.9 to 99.9	°C	10.0	user	ANA	29	RW
Winter compens. End temp.	Maximum outside temperature for compensation in heating	-99.9 to 99.9	°C	0.0	user	ANA	30	RW
Temperature regulation type	Type of temperature control	INLET (PROP.) OUTLET (DEAD ZONE)		INLET (PROP.)	manufacturer			
Inlet Regulation Type	Proportional or proportional + integral inlet control	P P+I		P	manufacturer			
Inlet Regulation Integr.time	Integral time for proportional + integral control	0 to 9999	s	600	manufacturer	INT	42	RW
Outlet regulation Max.time ON	Maximum time between starts with outlet control	0 to 9999	s	20	manufacturer	INT	43	RW
Outlet regulation Min.time ON	Minimum time between starts with outlet control	0 to 9999	s	20	manufacturer	INT	44	RW
Outlet regulation Max.time OFF	Maximum time between stops with outlet control	0 to 9999	s	10	manufacturer	INT	45	RW
Outlet regulation Min.time OFF	Minimum time between stops with outlet control	0 to 9999	s	10	manufacturer	INT	46	RW
Outlet regulation Request time variation differential	Differential for calculating the time between steps with outlet control	-99.9 to 99.9	°C	2.0	manufacturer	ANA	31	RW
Temperature regulation type	Select reference value for temperature control	CONTROL PROBE OUTSIDE TEMP. CONTROL		CONTROL PROBE	manufacturer	INT	47	RW
Force OFF outlet regulation Summer	Forced shutdown threshold with outlet control (cooling)	-99.9 to 99.9	°C	5.0	manufacturer	ANA	32	RW
Force OFF outlet regulation Winter	Forced shutdown threshold with outlet control (heating)	-99.9 to 99.9	°C	47.0	manufacturer			
External temp.limit Setpoint	Outside temperature set point limit	-99.9 to 99.9	°C	-10.0	user	ANA	33	RW
External temp.limit Differential	Outside temperature differential limit	-9.9 to 9.9	°C	2.0	user	ANA	34	RW
Clock config. Hour	Hour setting	0 to 23	h			INT	49	RW
Clock config. Hour	Minutes setting	0 to 59	min			INT	48	RW
Clock config. Date	Day setting	1 to 31	day					
Clock config. Date	Month setting	1 to 12	month					
Clock config. Date	Year setting	0 to 99	year					
Time-zones On-off unit	Enable unit ON-OFF time bands	0 to 1		0	user			
Time-zones Temp.setpoint	Enable set point time bands	0 to 1		0	user			
On-off unit F1-1 ON	Band 1. First on hour in the day	0 to 23	h	0	user			

Menu description	Extended description	Min/max limits	Unit of measure	Default	Access	Ana/Int/Dig	Supervisor address	R / R-W
On-off unit F1-1 ON	Band 1. First on minutes in the day	0 to 59	min	0	user			
On-off unit F1-1 OFF	Band 1. First off hour in the day	0 to 23	h	0	user			
On-off unit F1-1 OFF	Band 1. First off minutes in the day	0 to 59	min	0	user			
On-off unit F1-2 ON	Band 1. Second on hour in the day	0 to 23	h	0	user			
On-off unit F1-2 ON	Band 1. Second on minutes in the day	0 to 59	min	0	user			
On-off unit F1-2 OFF	Band 1. Second off hour in the day	0 to 23	h	0	user			
On-off unit F1-2 OFF	Band 1. Second off minutes in the day	0 to 59	min	0	user			
On-off unit F2 ON	Band 2. On hour in the day	0 to 23	h	0	user			
On-off unit F2 ON	Band 2. On minutes in the day	0 to 59	min	0	user			
On-off unit F2 OFF	Band 2. Off hour in the day	0 to 23	h	0	user			
On-off unit F2 OFF	Band 2. Off minutes in the day	0 to 59	min	0	user			
On-off unit Lun:	Select band F1, F2, F3 or F4 for Monday	F1 F2 F3 F4		0	user			
On-off unit Tue:	Select band F1, F2, F3 or F4 for Tuesday	F1,F2,F3,F4		0	user			
On-off unit Wed:	Select band F1, F2, F3 or F4 for Wednesday	F1, F2, F3, F4		0	user			
On-off unit Thu:	Select band F1, F2, F3 or F4 for Thursday	F1, F2, F3, F4		0	user			
On-off unit Fri:	Select band F1, F2, F3 or F4 for Friday	F1, F2, F3, F4		0	user			
On-off unit Sat:	Select band F1, F2, F3 or F4 for Saturday	F1, F2, F3, F4		0	user			
On-off unit Sun:	Select band F1, F2, F3 or F4 for Sunday	F1, F2, F3, F4		0	user			
Setpoint temp. Start Time-Z 1	Start hour for set point band 1	0 to 23	h	0	user			
Setpoint temp. Start Time-Z 1	Start minutes for set point band 1	0 to 59	min	0	user			
Setpoint temp. Summer	Cooling set point in band 1	-99.9 to 99.9	°C	0	user	ANA	35	RW
Setpoint temp. Winter	Heating set point in band 1	-99.9 to 99.9	°C	0	user	ANA	36	RW
Setpoint temp. Start Time-Z 2	Start hour for set point band 2	0 to 23	h	0	user			
Setpoint temp. Start Time-Z 2	Start minutes for set point band 2	0 to 59	min	0	user			
Setpoint temp. Summer	Cooling set point in band 2	-99.9 to 99.9	°C	0	user	ANA	37	RW
Setpoint temp. Winter	Heating set point in band 2	-99.9 to 99.9	°C	0	user	ANA	38	RW
Setpoint temp. Start Time-Z 3	Start hour for set point band 3	0 to 23	h	0	user			
Setpoint temp. Start Time-Z 3	Start minutes for set point band 3	0 to 59	min	0	user			
Setpoint temp. Summer	Cooling set point in band 3	-99.9 to 99.9	°C	0	user	ANA	39	RW
Setpoint temp. Winter	Heating set point in band 3	-99.9 to 99.9	°C	0	user	ANA	40	RW
Setpoint temp. Start Time-Z 4	Start hour for set point band 4	0 to 23	h	0	user			
Setpoint temp. Start Time-Z 4	Start minutes for set point band 4	0 to 59	min	0	user			
Setpoint temp. Summer	Cooling set point in band 4	-99.9 to 99.9	°C	0	user	ANA	41	RW
Setpoint temp. Winter	Heating set point in band 4	-99.9 to 99.9	°C	0	user	ANA	42	RW
Enable clock board	Enable control of the clock board	N / Y		N	manufacturer			
EVD type	Type of EVD 400 driver connected to the uChiller3 board	EVD400 pLAN EVD400 tLAN		EVD400 tLAN	manufacturer	INT	78	RW
EVD probes type	Type of probes connected to the driver	Not selected SHeat NTC-P(4-20)mA SHeat NTC-P(rat) SHeat NTC-NTC SHeat Pt1000-P SHeat NTCht-P(rat) PID Press PID NTC PID NTC HT PID Pt1000		Not selected	manufacturer	INT	79	RW
PID direction	Direction of PID control (direct or reverse)	DIR REV		DIR	manufacturer	DIG	164	RW
step	Maximum number of steps displayed for the type of valve selected				manufacturer			

Menu description	Extended description	Min/max limits	Unit of measure	Default	Access	Ana/Int/Dig	Supervisor address	R / R-W
Valve type	Type of valve selectable	Not selected ALCO EX5 ALCO EX6 ALCO EX7 ALCO EX8 SPORLAN 0.5-20tons SPORLAN 25-30tons SPORLAN 50-250tons CAREL E2V**P CAREL E2V**A DANFOSS ETS50 AST-g DANFOSS ETS100 AST-g CUSTOM		Not selected	manufacturer	INT	80	RW
Bi flow valve:	Enable bi-directional valve (chiller/heat pump operation on the same valve/driver)	N / Y		N	manufacturer	DIG	165	RW
Refrigerant	Set type of gas used	----- R22 R134a R404a R407c R410a R507c R290 R600 R600a R717 R744		-----	manufacturer	INT	81	RW
Custom valve config. Minimum steps	Minimum number of steps for custom valve	0 to 8100		0	manufacturer			
Custom valve config. Maximum steps	Maximum number of steps for custom valve	0 to 8100		0	manufacturer			
Custom valve config. Closing steps	Total number of steps for custom valve	0 to 8100		0	manufacturer			
Custom valve config. Opening EXTRAs	Use extra opening step on custom valve	N / Y		N	manufacturer	DIG	166	RW
Custom valve config. Closing EXTRAs	Use extra closing step on custom valve	N / Y		N	manufacturer	DIG	167	RW
Custom valve config. Phase current	Operating current of the custom valve	0 to 1000	mA	0	manufacturer			
Custom valve config. Still current	Holding current of the custom valve	0 to 1000	mA	0	manufacturer			
Custom valve config. Step rate	Impulse frequency of the custom valve	32 to 501	Hz	0	manufacturer			
Custom valve config. Duty-cycle	Duty cycle of the custom valve	0 to 100	%	0	manufacturer			
EEV stand-by steps EEV position with 0% power demand	Position valve with capacity request equal to 0%	0 to 8100		0	manufacturer	INT	82	RW
S1 probe limits pressure limits Min value	Minimum end scale of pressure probe S1	-9.9 to 99.9	barg	-1.0	manufacturer	ANA	80	RW
S1 probe limits pressure limits Max value	Maximum end scale of pressure probe S1	0.0 to 99.9	barg	9.3	manufacturer	ANA	81	RW
Alarms delay Low SuperHeat	Low SuperHeat alarm delay	0 to 3600	s	120	manufacturer	INT	83	RW
Alarms delay High SuperHeat	High SuperHeat alarm delay	0 to 500	min	20	manufacturer	INT	84	RW
Alarms delay LOP	LOP alarm delay	0 to 3600	s	120	manufacturer	INT	85	RW
Alarms delay MOP	MOP alarm delay	0 to 3600	s	0	manufacturer	INT	86	RW
Alarms delay Delay probe error	Probe alarm signal delay	0 to 999	s	10	manufacturer	INT	87	RW
CH-Circuit/EEV Ratio Auto	Percentage of EEV opening from autosetup		%		manufacturer			
CH-Circuit/EEV Ratio	Settable percentage of EEV opening in chiller mode	0 to 100	%		manufacturer			
CH-Proportional gain Auto	Proportional gain from autosetup				manufacturer			
CH-Proportional gain	Settable proportional gain in chiller mode	0 to 99.9			manufacturer			
CH-Integral time Auto	Integral time from autosetup in chiller mode		s		manufacturer			
CH-Integral time	Settable integral time in chiller mode	0 to 999	s		manufacturer			
CH-SuperHeat set C1 Auto	SuperHeat set point from autosetup		°C		manufacturer			
CH-SuperHeat set C1	Settable SuperHeat set point in chiller mode circuit 1	2.0 to 50.0	°C		manufacturer			
CH-Low SuperHeat C1 Auto	Low SuperHeat from autosetup		°C		manufacturer			
CH-Low SuperHeat C1	Settable low SuperHeat in chiller mode circuit 1	-4.0 to 21.0	°C		manufacturer			
CH-SuperHeat set C2 Auto	SuperHeat set point from autosetup		°C		manufacturer			
CH-SuperHeat set C2	Settable SuperHeat set point in chiller mode circuit 2	2.0 to 50.0	°C		manufacturer			
CH-Low SuperHeat C2 Auto	Low SuperHeat from autosetup		°C		manufacturer			

Menu description	Extended description	Min/max limits	Unit of measure	Default	Access	Ana/Int/Dig	Supervisor address	R / R-W
CH-Low SuperHeat C2	Settable low SuperHeat in chiller mode circuit 2	-4.0 to 21.0	°C		manufacturer			
HP-Circuit/EEV Ratio Auto	Percentage of EEV opening from autosetup		%		manufacturer			
HP-Circuit/EEV Ratio	Settable percentage of EEV opening in heat pump mode	0 to 100	%		manufacturer			
HP-Proportional gain Auto	Proportional gain from autosetup				manufacturer			
HP-Proportional gain	Settable proportional gain in heat pump mode	0 to 99.9			manufacturer			
HP-Integral time Auto	Integral time from autosetup in heat pump mode		s		manufacturer			
HP-Integral time	Settable integral time in heat pump mode	0 to 999	s		manufacturer			
HP-SuperHeat set C1 Auto	SuperHeat set point from autosetup		°C		manufacturer			
HP-SuperHeat set C1	Settable SuperHeat set point in heat pump mode circuit 1	2.0 to 50.0	°C		manufacturer			
HP-Low SuperHeat C1 Auto	Low SuperHeat from autosetup		°C		manufacturer			
HP-Low SuperHeat C1	Settable low SuperHeat in heat pump mode circuit 1	-4.0 to 21.0	°C		manufacturer			
HP-SuperHeat set C2 Auto	SuperHeat set point from autosetup		°C		manufacturer			
HP-SuperHeat set C2	Settable SuperHeat set point in heat pump mode circuit 2	2.0 to 50.0	°C		manufacturer			
HP-Low SuperHeat C2 Auto	Low SuperHeat from autosetup		°C		manufacturer			
HP-Low SuperHeat C2	Settable low SuperHeat in heat pump mode circuit 2	-4.0 to 21.0	°C		manufacturer			
DF-Circuit/EEV Ratio Auto	Percentage of EEV opening from autosetup		%		manufacturer			
DF-Circuit/EEV Ratio	Settable percentage of EEV opening in defrost mode	0 to 100	%		manufacturer			
DF-Proportional gain Auto	Proportional gain from autosetup				manufacturer			
DF-Proportional gain	Settable proportional gain in defrost mode	0 to 99.9			manufacturer			
DF-Integral time Auto	Integral time from autosetup in defrost mode		s		manufacturer			
DF-Integral time	Settable integral time in defrost mode	0 to 999	s		manufacturer			
DF-SuperHeat set C1 Auto	SuperHeat set point from autosetup		°C		manufacturer			
DF-SuperHeat set C1	Settable SuperHeat set point in defrost mode circuit 1	2.0 to 50.0	°C		manufacturer			
DF-Low SuperHeat C1 Auto	Low SuperHeat from autosetup		°C		manufacturer			
DF-Low SuperHeat C1	Settable low SuperHeat in defrost mode circuit 1	-4.0 to 21.0	°C		manufacturer			
DF-SuperHeat set C2 Auto	SuperHeat set point from autosetup		°C		manufacturer			
DF-SuperHeat set C2	Settable SuperHeat set point in defrost mode circuit 2	2.0 to 50.0	°C		manufacturer			
DF-Low SuperHeat C2 Auto	Low SuperHeat from autosetup		°C		manufacturer			
DF-Low SuperHeat C2	Settable low SuperHeat in defrost mode circuit 2	-4.0 to 21.0	°C		manufacturer			
SHeat dead zone +/- Auto	SuperHeat dead zone from autosetup		°C		manufacturer			
SHeat dead zone +/-	Settable SuperHeat dead zone	0.0 to 9.9	°C		manufacturer			
Derivative time Auto	Derivative time from autosetup		s		manufacturer			
Derivative time	Settable derivative time	0 to 999	s		manufacturer			
Low SHeat int.time Auto	Low SuperHeat integral time from autosetup		s		manufacturer			
Low SHeat int.time	Settable integral time low SuperHeat	0.0 to 30.0	s		manufacturer			
LOP integral time Auto	LOP integral time from autosetup		s		manufacturer			
LOP integral time	Settable LOP integral time	0.0 to 25.5	s		manufacturer			
MOP integral time Auto	MOP integral time from autosetup		s		manufacturer			
MOP integral time	Settable MOP integral time	0.0 to 25.5	s		manufacturer			
MOP startup delay Auto	Start MOP delay from autosetup		s		manufacturer			
MOP startup delay	Settable start MOP delay	0 to 500	s		manufacturer			
Dynamic proportional gain?	Select dynamic proportional control mode	0 to 1			manufacturer	DIG	168	RW
Blocked valve check Auto	EEV stop control from autosetup		s		manufacturer			
Blocked valve check	Settable EEV stop control	0 to 999	s		manufacturer			
Hi TCond.protection Auto	High condensing temperature alarm from autosetup		°C		manufacturer			
Hi TCond.protection	Settable high condensing temperature alarm	0.0 to 99.9	°C		manufacturer			
Hi TCond.int.time Auto	Condensing temperature integral time from autosetup		s		manufacturer			
Hi TCond.int.time	Settable condensing temperature integral time	0.0 to 25.5	s		manufacturer			

Menu description	Extended description	Min/max limits	Unit of measure	Default	Access	Ana/Int/Dig	Supervisor address	R / R-W
Manual mng.driver 1 EEV Mode	Driver 1 management mode (automatic or manual)	AUTO MAN.			manufacturer	DIG	160	RW
Manual mng.driver 1 Requested steps	Settable steps required with manual management on driver 1	0 to 8100			manufacturer			
Manual mng.driver 1 EEV Position	Current position read for valve 1				manufacturer	INT	97	R
Manual mng.driver 2 EEV Mode	Driver 2 management mode (automatic or manual)	AUTO MAN.			manufacturer	DIG	161	RW
Manual mng.driver 2 Requested steps	Settable steps required with manual management on driver 2	0 to 8100			manufacturer			
Manual mng.driver 2 EEV Position	Current position read for valve 2				manufacturer	INT	98	R
Manual mng.driver 3 EEV Mode	Driver 3 management mode (automatic or manual)	AUTO MAN.			manufacturer	DIG	162	RW
Manual mng.driver 3 Requested steps	Settable steps required with manual management on driver 3	0 to 8100			manufacturer			
Manual mng.driver 3 EEV Position	Current position read for valve 3				manufacturer	INT	99	R
Manual mng.driver 4 EEV Mode	Driver 4 management mode (automatic or manual)	AUTO MAN.			manufacturer	DIG	163	RW
Manual mng.driver 4 Requested steps	Settable steps required with manual management on driver 4	0 to 8100			manufacturer			
Manual mng.driver 4 EEV Position	Current position read for valve 4				manufacturer	INT	100	R
Driver 1 status System waiting for	Go ahead active, driver 1 status	NO FAULT VALVE NOT CLOSED BATT. CHARGING EEPROM ERROR			manufacturer	INT	93	RW
Go ahead?	Ignore driver 1 status	0 to 1			manufacturer	DIG	169	RW
Driver 2 status System waiting for	Go ahead active, driver 2 status	NO FAULT VALVE NOT CLOSED BATT. CHARGING EEPROM ERROR			manufacturer	INT	94	RW
Go ahead?	Ignore driver 2 status	0 to 1			manufacturer	DIG	170	RW
Driver 3 status System waiting for	Go ahead active, driver 3 status	NO FAULT VALVE NOT CLOSED BATT. CHARGING EEPROM ERROR			manufacturer	INT	95	RW
Go ahead?	Ignore driver 3 status	0 to 1			manufacturer	DIG	171	RW
Driver 4 status System waiting for	Go ahead active, driver 4 status	NO FAULT VALVE NOT CLOSED BATT. CHARGING EEPROM ERROR			manufacturer	INT	96	RW
Go ahead?	Ignore driver 4 status	0 to 1			manufacturer	DIG	172	RW
Drv 1 probes offset S1	Probe S1 offset, driver 1	-9.9 to 9.9	°C/barg		manufacturer			
Drv 1 probes offset S2	Probe S2 offset, driver 1	-9.9 to 9.9	°C/barg		manufacturer			
Drv 1 probes offset S3	Probe S3 offset, driver 1	-9.9 to 9.9	°C/barg		manufacturer			
Drv 2 probes offset S1	Probe S1 offset, driver 2	-9.9 to 9.9	°C/barg		manufacturer			
Drv 2 probes offset S2	Probe S2 offset, driver 2	-9.9 to 9.9	°C/barg		manufacturer			
Drv 2 probes offset S3	Probe S3 offset, driver 2	-9.9 to 9.9	°C/barg		manufacturer			
Drv 3 probes offset S1	Probe S1 offset, driver 3	-9.9 to 9.9	°C/barg		manufacturer			
Drv 3 probes offset S2	Probe S2 offset, driver 3	-9.9 to 9.9	°C/barg		manufacturer			
Drv 3 probes offset S3	Probe S3 offset, driver 3	-9.9 to 9.9	°C/barg		manufacturer			
Drv 4 probes offset S1	Probe S1 offset, driver 4	-9.9 to 9.9	°C/barg		manufacturer			
Drv 4 probes offset S2	Probe S2 offset, driver 4	-9.9 to 9.9	°C/barg		manufacturer			
Drv 5 probes offset S3	Probe S3 offset, driver 4	-9.9 to 9.9	°C/barg		manufacturer			
Circuit/EEV Ratio for startup opening	Valve opening percentage when starting	0 to 100	%		manufacturer	INT	88	RW
Compressor or Unit	Type of compressor/unit	Not selected RECIPROCATING SCREW SCROLL QUICK CASE/COLD RM. CASE/COLD ROOM			manufacturer	INT	89	RW
Capacity control	Type of capacity-control (if present)	Not selected NO/STEPS SLOW CONTINUOUS FAST CONTINUOUS			manufacturer	INT	90	RW
Evaporator type Cool	Type of evaporator used in chiller mode	Not selected FINS PLATES/TUBES FAST FINNED SLOW FINNED			manufacturer	INT	91	RW

Menu description	Extended description	Min/max limits	Unit of measure	Default	Access	Ana/Int/Dig	Supervisor address	R / R-W
Evaporator type Heat	Type of evaporator used in heat pump mode	Not selected FINS PLATES/TUBES FAST FINNED SLOW FINNED			manufacturer	INT	92	RW
Minimum satured temp Cool mode	Minimum saturated temperature in chiller mode	-70.0 to 50.0	°C		manufacturer	ANA	82	RW
Minimum satured temp Heat mode	Minimum saturated temperature in heat pump mode	-70.0 to 50.0	°C		manufacturer	ANA	83	RW
Minimum satured temp Defr.Mode	Minimum saturated temperature in defrost mode	-70.0 to 50.0	°C		manufacturer	ANA	84	RW
Maximum satured temp Cool mode	Maximum saturated temperature in chiller mode	-50.0 to 90.0	°C		manufacturer	ANA	85	RW
Maximum satured temp Heat mode	Maximum saturated temperature in heat pump mode	-50.0 to 90.0	°C		manufacturer	ANA	86	RW
Maximum satured temp Defr.Mode	Maximum saturated temperature in defrost mode	-50.0 to 90.0	°C		manufacturer	ANA	87	RW
High SuperHeat alarm threshold Auto	Current high SuperHeat alarm threshold		°C		manufacturer			
High SuperHeat alarm threshold	Settable high SuperHeat alarm threshold	0.0 to 100.0	°C		manufacturer	ANA	88	RW

5. Connections

Assembly instructions
Maximum NTC/ratiometric probe connection cable length: 10 m
Maximum digital input connection cable length: 10 m
Maximum power output connection cable length: 5 m
Maximum fan control output connection cable length: 5 m
Maximum power cable length: 3 m

Power supply
A Class II safety transformer with a minimum rating of 50 VA must be used in the installation to supply just one µchiller[3]. The power supply to the µchiller[3P] controller (or µchiller[3] controllers) should be separated from the power supply to the other electrical devices (contactors and other electromechanical components) inside the electrical panel. If the secondary of the transformer is earthed, make sure that the earth wire is connected to terminal G0. This is true for all the devices connected to the µchiller[3P].

IMPORTANT
A fuse must be fitted in series with the power supply, with the following characteristics: 250 Vac 2 A slow-blow (2 AT).

*Direct current connection
Warning, for DC power supply, follow the instructions as shown in the following figure:

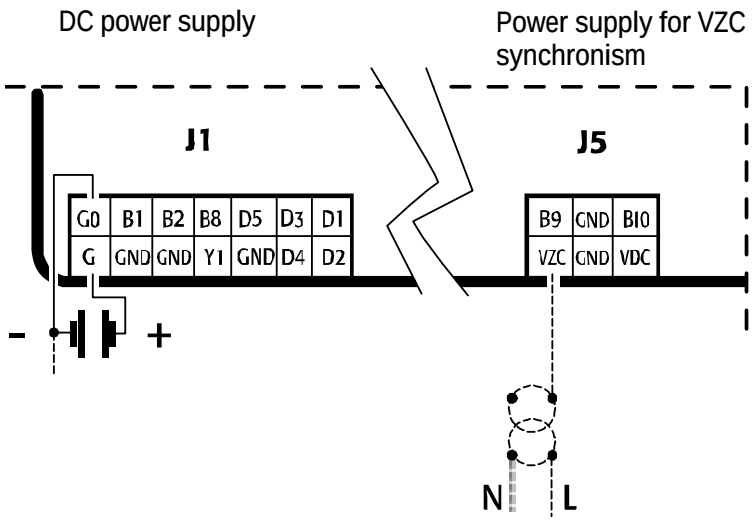
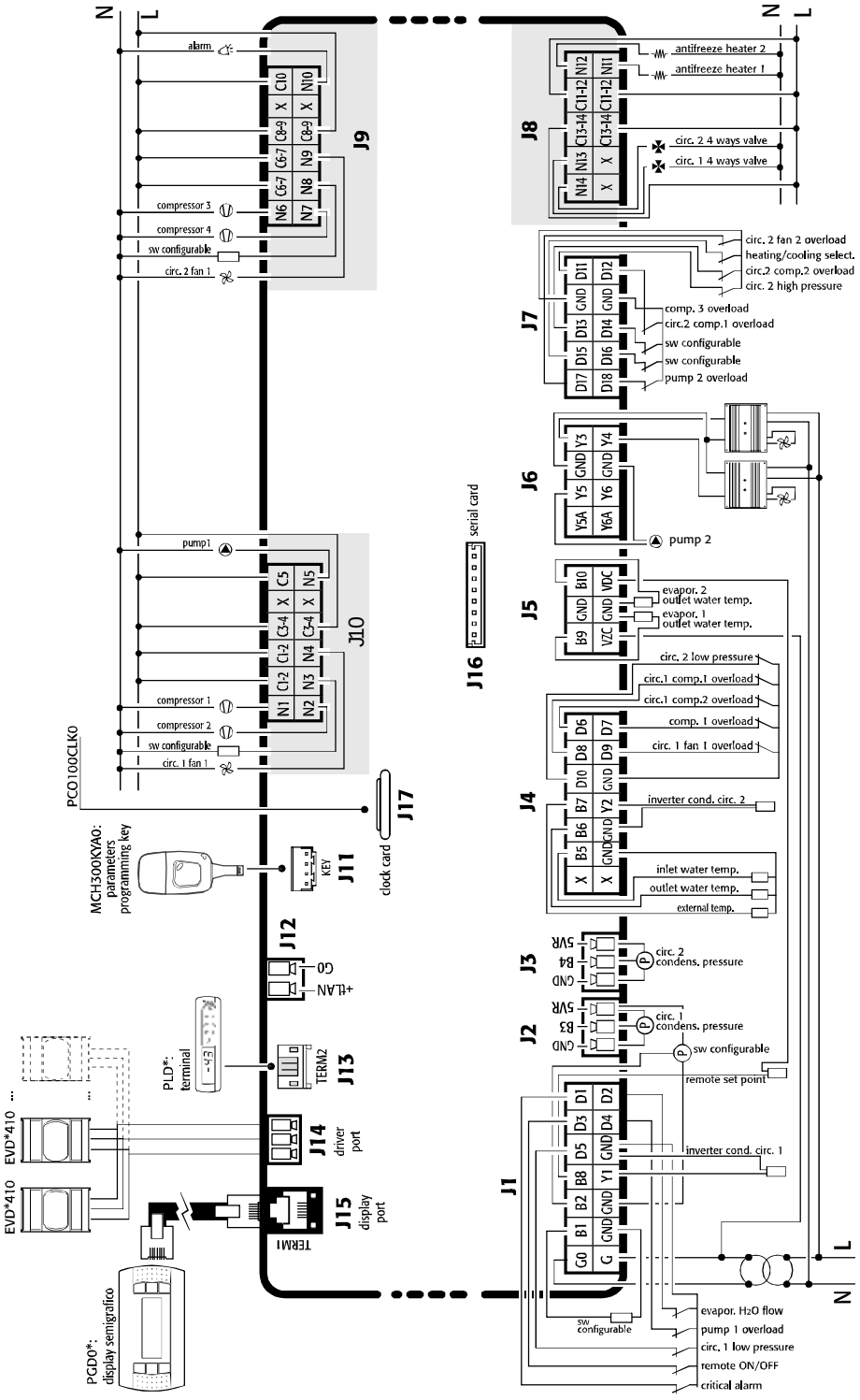


Fig. 5.a

WARNINGS
• when programming the parameters with the key, the controller must be disconnected form the power supply and any other devices;
• the 24 Vdc available at the Vdc terminal can be used to supply an 4 to 20 mA active probe; the maximum current is 100 mA. The 5 Vdc available at the 5VR terminals can be used to supply to the 0 to 5 V active ratiometric probes; the maximum total current is 50 mA;
• for applications subject to strong vibrations (1.5 mm pk-pk 10/55 Hz), secure the cables connected to the µchiller[3] using clamps placed around 3 cm from the connectors;
• for operation in domestic environments, shielded cables must be used (one wire + shield) for the tLAN connections (EN 55014-1);
• if a single power transformer is used for the µchiller[3]and the options, to avoid damaging the controller, all the G0 pins on the various controllers or the boards must be connected to the same terminal on the secondary, and all the G pins to the other terminal on the secondary, resetting the polarity of G and G0 for all the terminals;
• the system made up of the control board and the other optional boards represents a control device to be incorporated into class I or class II appliances.

Example of connection, as proposed by the default configuration.



Y5A e Y6A: non collegate

Fig. 5.bErrore.

Assembly for the version without the plastic case

The µchiller[3] should be installed on a 0.5 to 2 mm thick metal panel using the special spacers.
The electrical damage that occurs to electronic components is almost always due to electrostatic discharges caused by the operator. Consequently, suitable precautions must be taken when handling these components, in particular:
• before handling any electronic component or board, touch an earthed object (avoiding contact with a component is not sufficient, as a 10,000 V discharge, a voltage that can easily be reached by static electricity, creates an arc of around 1 cm);
• the materials must remain as long as possible inside their original packages. If necessary, remove the board from the packing and then place the product in antistatic packaging without touching the rear of the board;
• always avoid using plastic, polystyrene or non-antistatic materials;
• always avoid passing the board between operators (to avoid the phenomena of electrostatic induction and consequent discharges).
• special care must be taken when fitting the optional boards on the main board, so as to avoid causing irreparable damage to the boards. Consequently, it is recommended to first secure the connection cables to the optional boards (using the plug-in terminals), and then insert the boards in the corresponding slots and finally secure the connection cables using cable clamps.

DRIVER ADRESSING IN pLAN NETWORK
The addressing of the EVD400 driver units that can be connected to the pLAN network must be set as following:
ADDRESS 2 -- > Circuit 1 Chiller Driver or Circuit 1 Bidirectional Driver
ADDRESS 3 -- > Circuit 1 Heat Pump Driver
ADDRESS 4 -- > Circuit 2 Chiller Driver or Circuit 2 Bidirectional Driver
ADDRESS 5 -- > Circuit 2 Heat Pump Driver
The driver should be configured using the serial addressing tool EVD4_UI Address that can be downloaded from CAREL website http: // ksa . carel . com/ .
For further details on the use of the Driver and its configuration please refer to the manual code +030220225.pdf (EVD4 – User manual)

6. Description of the main functions

6.1 Control set point

Inputs used
- Outside air temperature [B7]
- External set point [B8]
- Select cooling/heating from digital input [B25]

Parameters used
- Active operating mode (chiller/heat pump) [main]
- Cooling set point [r4]
- Heating set point [r5]
- Enable analogue probe 8 - External set point [-/-]
- Minimum set point value from probe B8 (cooling) [r6]
- Maximum set point value from probe B8 (cooling) [r7]
- Minimum set point value from probe B8 (heating) [r8]
- Maximum set point value from probe B8 (heating) [r9]
- Enable control of the clock board [t6]
- Enable set point time bands [-t-]
- Cooling set point in band 1 [-t-]
- Heating set point in band 1 [-t-]
- Cooling set point in band 2 [-t-]
- Heating set point in band 2 [-t-]
- Cooling set point in band 3 [-t-]
- Heating set point in band 3 [-t-]
- Cooling set point in band 4 [-t-]
- Heating set point in band 4 [-t-]
- Enable set point compensation [r11]
- Enable analogue probe 7 for outside air temperature [-/-]
- Maximum compensation value [r12]
- Minimum outside temperature for compensation in cooling [r13]
- Maximum outside temperature for compensation in cooling [r14]
- Minimum outside temperature for compensation in heating [r15]
- Maximum outside temperature for compensation in heating [r16]

Outputs used

Setting the control set point from the screen
The control set point can be set from the screen on the user interface.
Two distinct values need to be set, respectively for cooling and heating operation, if the unit features operation in chiller or heat pump mode.

Setting the remote analogue input set point
When enabling control of input B8 for the management of the remote set point, the setting made on the screen can be replaced with a set point calculated based on the 4 to 20 mA signal at the input to the board.
The lower and upper limits must be set for calculating the remote set point in cooling and/or heating operation.
Based on the 4 to 20 mA input signal, linear conversion will be performed between the end values set.

Remote set point for analogue input B8
The limits for calculating the remote set point will be the minimum and maximum values set for the corresponding password-protected parameter on set point screen.

MaxSTP Maximum remote set point limit
MinSTP Minimum remote set point limit

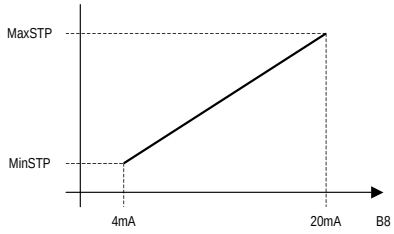


Fig. 6.a

Time bands for varying the set point

By enabling control of the clock board, the management of 4 daily set point time bands can be configured.
Each time band features the start and end time and the associated set point.
When the time band starts, the active set point is replaced by the value set for the active time band, irrespective of whether the analogue input for the remote set point is activated.

Set point compensation for outside air temperature

The working set point can be adjusted according to the outside air temperature.
Normally this function is used in installations where greater priority is given to comfort; for example, in a shop where people enter and exit frequently, an excessive temperature difference between the inside and outside may be annoying to users and negative to their health.

This function increases or decreases the unit set point according to the outside temperature measured, adding an offset to set point set as described above that is directly proportional to the difference between the minimum and maximum limits.

The parameters for setting the operating limits are different for cooling and heating operation, without any restrictions regarding the setting of the limits for calculating the compensation offset.

6.1.1 Minimum outside temperature limit

Inputs used

- Outside air temperature [B7]

Parameters used

- Enable analogue probe 7 Outside air temperature [-/-]
- Outside temperature set point limit [r17]
- Outside temperature differential limit [r18]

Outputs used

- Compressor 1 circuit 1
Winding A compressor 1 [B29]
- Compressor 2 circuit 1
Winding B compressor 1 [B30]
- Compressor 3 circuit 1 [B31]
- Compressor 1 circuit 2. Winding A compressor 2 [B34]
- Compressor 2 circuit 2. Winding B compressor 2 [B35]
- Compressor 3 circuit 2 [B36]

If the probe for measuring the outside air temperature is enabled, a temperature threshold is activated below which the compressors are forced off. Temperature control only starts again when the outside air temperature is above the set point + a differential.
On units in chiller operation, this is done to prevent the operation of the unit in ambient conditions that would cause an excessively low condensing pressure.
On units in heat pump operation, this is done to prevent the operation of the unit in ambient conditions that would cause the rapid formation of frost on the outdoor exchanger. To disable the function, simply set the value of the control differential to 0.

6.2 Inlet-room temperature control

Inputs used

- Room temperature (air/air units)
Evaporator water inlet temperature [B5]

Parameters used

- Active operating mode (chiller/heat pump) [main]
- Configure type of unit [-H-]
- Total number of compressors / number of refrigerant circuits on unit [-H-]
- Enable compressor capacity control [-c-]
- Type of temperature control [-r-]
- Active set point [r1]
- Temperature control band [r10]
- Proportional or proportional + integral · Inlet control [-r-]
- Integral time for proportional + integral control [-r-]

Outputs used

- Liquid solenoid circuit 1 [B31]
- Liquid solenoid circuit 2 [B36]
- Compressor 1 circuit 1. Winding A compressor 1 [B29]
- Compressor 2 circuit 1. Compressor 1 capacity control. Winding B compressor 1 [B30]
- Compressor 3 circuit 1. Compressor 1 capacity control (if Part-Winding enabled) [B31]
- Compressor 1 circuit 2. Winding A compressor 2 [B34]
- Compressor 2 circuit 2. Compressor 2 capacity control
Winding B compressor 2 [B35]
- Compressor 3 circuit 2. Compressor 2 capacity control (if Part-Winding enabled) [B36]

7. Description of operation

Temperature control proportional to the reading of the evaporator inlet probe

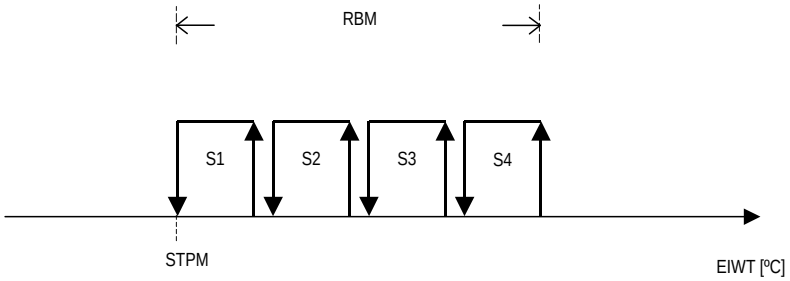


Fig. 7.a

STPM Control set point
RBM Control band
EIWT Evaporator water inlet temperature
S 1…4 Control steps

The temperature control depends on the values measured by the temperature probe located at the evaporator inlet (air/water – water/water units), or by the room probe (air/air units), and follows proportional logic.
Depending on the total number of compressors configured and the number of load steps per compressor, the control band set will be divided into a number of steps of the same amplitude.
When the various thresholds are exceeded, a compressor or load step will be activated.
The following relationships are applied to determine of the activation thresholds:

Total number of control steps = Number of compressors + (Number of compressors * Number load steps/compressor).
Proportional step amplitude = Proportional control band / Total number of control steps
Step activation threshold = Control set point + (Proportional step amplitude * Progressive step [1,2,3,…]).

EXAMPLE OF TEMPERATURE CONTROL ON CHILLER UNITS WITH 4 COMPRESSORS

Semi-hermetic compressors with proportional control

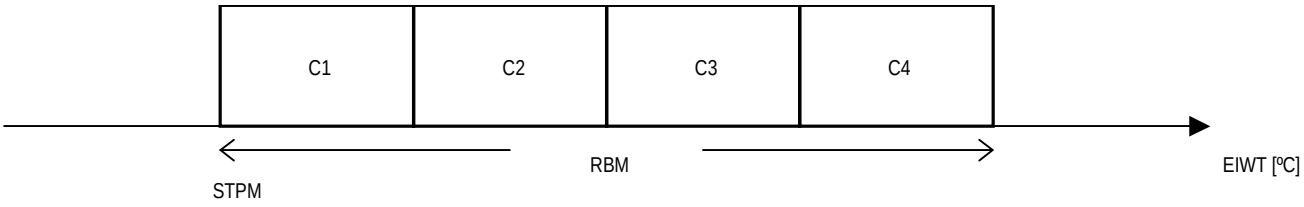


Fig. 7.b

STPM Control set point
RBM Control band
EIWT Evaporator water inlet temperature
C 1…4 Compressor steps

7.1 Outlet temperature control

Inputs used

- Evaporator water outlet temperature [B6]

Parameters used

- Active operating mode (chiller/heat pump) [main]
- Configure type of unit [-H-]
- Total number of compressors / number of refrigerant circuits on unit [-H-]
- Enable compressor capacity control [-c-]
- Type of temperature control [-r-]
- Active set point [r1]
- Temperature control band [r10]
- Maximum time between starts with outlet control [-r-]
- Minimum time between starts with outlet control [-r-]
- Maximum time between stops with outlet control [-r-]
- Minimum time between stops with outlet control [-r-]
- Differential for calculating the time between steps with outlet control [-r-]
- Forced shutdown threshold with outlet control (cooling) [-r-]
- Forced shutdown threshold with outlet control (heating) [-r-]

Outputs used

- Liquid solenoid circuit 1 [B31]
- Liquid solenoid circuit 2 [B36]
- Compressor 1 circuit 1 [B29]
  Winding A compressor 1
- Compressor 2 circuit 1 [B30]
  Compressor 1 capacity control
  Winding B compressor 1
- Compressor 3 circuit 1 [B31]
  Compressor 1 capacity control (if Part-Winding enabled)
- Compressor 1 circuit 2 [B34]
  Winding A compressor 2
- Compressor 2 circuit 2 [B35]
  Compressor 2 capacity control
  Winding B compressor 2
- Compressor 3 circuit 2 [B36]
  Compressor 2 capacity control (if Part-Winding enabled)

EXAMPLE OF CONTROL IN THE DEAD ZONE ON CHILLER UNITS

Temperature control with dead zone based on the reading of the outlet probe

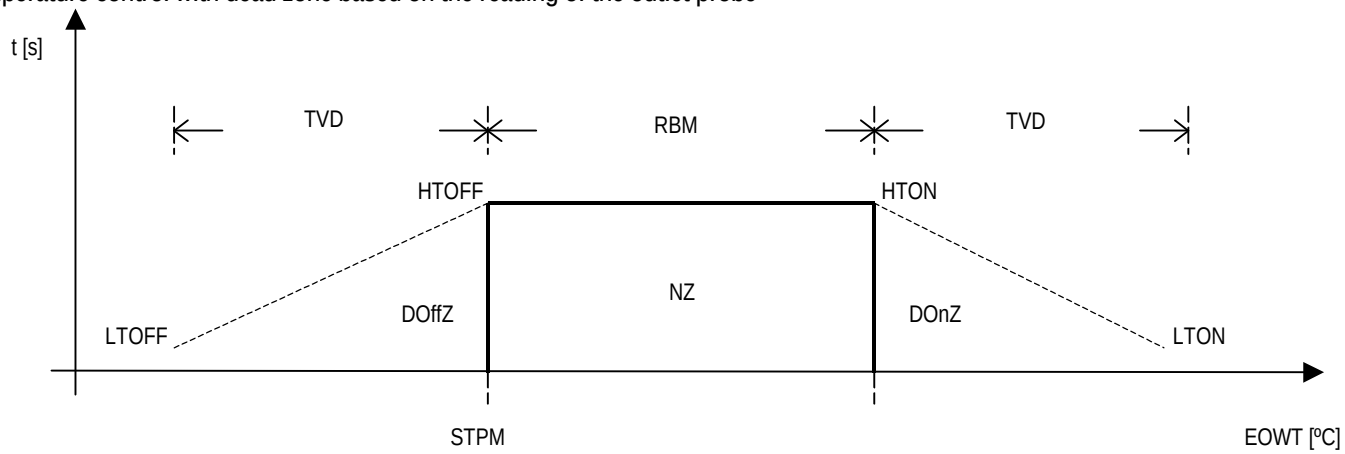


Fig. 7.c

STPM	Control set point
RBM	Control band
NZ	Dead zone
TVD	Time variation differential for activation/deactivation steps
EOWT	Evaporator water outlet temperature
t	Time
DonZ	Device start zone
HTON	Maximum time delay for activation of steps
LTON	Minimum time delay for activation for steps
DoffZ	Device stop zone
HTOFF	Maximum time delay for deactivation of steps
LTOFF	Minimum time delay for deactivation for steps

Temperature control is based on the temperature measured by probe B6 on units with one or two evaporators; in the latter the water temperature of mixture is used.
A temperature dead band is identified based on the set point and band.
Temperature values between the set point and set point + band (STPM < Temperature < STPM+RBM) will not switch any compressors On/Off.
Temperature values above set point + band (Temperature > STPM+RBM) will activate the compressors
Temperature values below the set point (Temperature < STPM) will deactivate the compressors
The compressor start/stop procedures are controlled by variable delay times.
With a differential set for calculating the delay time, the activation/deactivation of the devices is modulated according to the temperature measured.
Setting to 0 the minimum delay times upon an increase and/or decrease in the demand, disables the corresponding calculation functions.
A temperature threshold is envisaged, for both cooling operation and heating operation, below/above which the devices installed will in any case be stopped, in order to avoid excessive cooling/heating output produced by the unit.

7.2 Differential Temperature Control

Inputs used
- Evaporator inlet temperature
- Evaporator outlet temperature
- Outside air temperature
- Room temperature (acqua terminal)

Parameters used
- Type of unit
- Total number of compressors
- Number of load steps
- Type of temperature control
- Proportional band for inlet control or Dead zone for outlet control
- Temperature difference (delta) between reference and controlled value.

Outputs used
- Liquid solenoid
- Compressor start relay
- Compressor capacity control relay

Description of operation

The temperature control differential is based on the difference between a reference temperature and a controlled temperature.

Δ calculated = Reference temperature – Controlled temperature

The value calculated in this way is compared against the rated value.
Depending on the unit operating mode, cooling or heating, the following situations may occur.

	Cooling	Heating
Δ calculated $\geq$ rated Δ	---	Compressors On
Δ calculated $\leq$ rated Δ	Compressors On	---

The purpose of this function is to maintain a constant temperature difference between two components in a system, with different thermal inertia, by acting on only one of the values measured.
The controlled temperature is defined as the component with the lower thermal inertia.
The reference temperature is defined as the component with the higher thermal inertia.

As the unit can operate in cooling or heating mode as selected from the screen on the user interface or by the digital input, if the reference temperature equals or exceeds the controlled temperature (i.e. opposite to the unit operating mode), the operation of the controller switches from error correction to amplification; consequently, the application of this type of control is designed for systems in which the variation in controlled values occurs within certain limits dictated by the operating mode of the active unit.

Control is proportional, according to the control band set.
The proportional control band is divided into a number of uniform steps, equal to the total number of compressors and load steps installed (as for inlet temperature control). The control set point is the rated temperature difference set.
The value controlled is the difference calculated between the reference temperature and the controlled temperature.

To select this type of control, a special parameter is provided that indicates which signal is used by the temperature control functions:
- Evaporator inlet-outlet control probe
- Reference temperature– Controlled temperature

7.3 Condensing unit control

Inputs used
- External control value (condensing units) [B8]
- Condensing unit digital control 1 [B12]
- Condensing unit digital control 2 [B13]
- Condensing unit digital control 3 [B14]
- Condensing unit digital control 4 [B28]

Parameters used
- Configure type of unit [-H-]
- Type of condensing unit control [-H-]
- Select proportional or step condensing unit control [-H-]

Outputs used
- Compressor 1 circuit 1. Winding A compressor 1 [B29]
- Compressor 2 circuit 1. Compressor 1 capacity control. Winding B compressor 1 [B30]

- Compressor 3 circuit 1. Liquid solenoid circuit 1. [B31]
  Compressor 1 capacity control (if Part-Winding enabled)
- Compressor 1 circuit 2. Winding A compressor 2 [B34]
- Compressor 2 circuit 2. Compressor 2 capacity control [B35]
  Winding B compressor 2
- Compressor 3 circuit 2. Liquid solenoid circuit 2 [B36]
  Compressor 2 capacity control (if Part-Winding enabled)

Description of operation

Condensing unit control involves the devices being called by a proportional voltage or current signal supplied by an external controller, or alternatively a series of electromechanical contacts via digital input. As the compressors are called by an external controller, the corresponding control probes and parameters are not used.

Control with analogue input

The signal acquired by analogue input B8 is 4 to 20mA.
There are two control modes: proportional or steps, these can be selected via the dedicated user parameter.

Proportional control

Below is a description of the operation of proportional control when a 4 to 20 mA analogue input is used.
The compressor requests depend on the analogue input B8, with continuous variation of the input signal, the board calculates the number of steps required based on the value of the signal:

Analogue input 4mA 0% request (no compressor on)
Analogue input 20mA 100% request (all the compressors on)

EXAMPLE OF CONTROL ON A UNIT WITH 6 HERMETIC COMPRESSORS:

Condensing units with proportional control

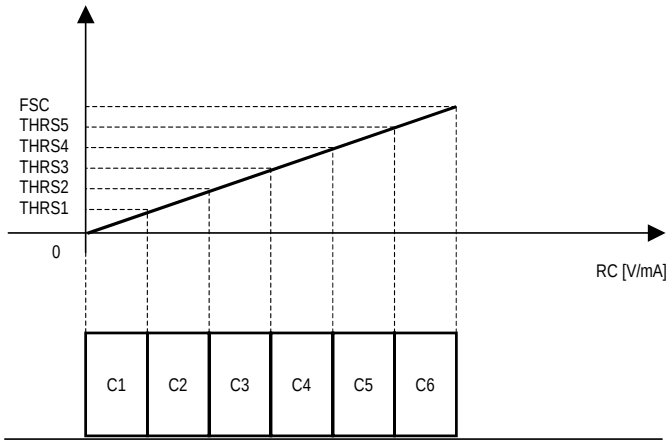


Fig. 7.d

FSC Analogue input end scale
THR S1…5 Activation threshold for step 1 to 5
RC Remote control signal
C 1…6 Compressor steps
Total number of compressors = 6
Number of load steps per compressor = 0

Total number of steps = Total number of compressors + (Total number of compressors * Number of load steps per compressor) = 6 + 6 * 0 = 6
Amplitude of each step = Operating current range / Total number of steps = (20 – 4) / 6 = 2.666 mA

If the analogue input B8 measures 9.35 mA, two steps will be requested, therefore two compressors will be activated.
Two safety thresholds are calculated for the total activation or deactivation of the compressors, if exceeded.
These thresholds are calculated according to the following relationships.
Forced shutdown threshold = (Amplitude of each step / 2) + Analogue input lower end scale = (2.666 / 2) + 4 = 1.333 mA ➔ 5.3 mA
Forced start threshold = Analogue input upper end scale – Forced shutdown threshold = 20 – 1.333 = 18.667 mA ➔ 18.6 mA
If the reading of the analogue input B8 is less than the value of the forced shutdown threshold calculated, the devices will be stopped unconditionally.
If the reading of the analogue input B8 is greater than the value of the forced start threshold calculated, the devices will be started unconditionally.

Stepped control

Below is a description of the operation of stepped control steps when a 4 to 20 mA analogue input is used.
The compressor requests depend on the analogue input B8, using a current divider or equivalent circuit to supply precise signals that correspond to the activation or deactivation of the compressors and the relative load steps.

Analogue input 4 mA 100% request (all compressors on)
Analogue input 20 mA 0% request (no compressor on)

EXAMPLE OF CONTROL ON A UNIT WITH 6 HERMETIC COMPRESSORS:

Condensing units with stepped control

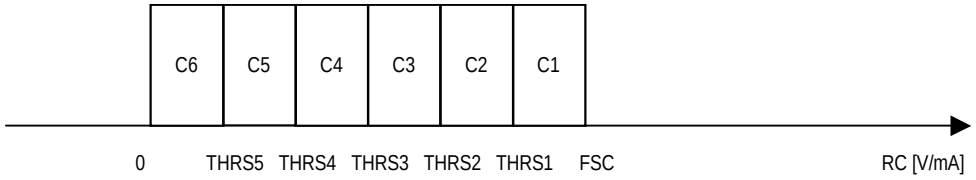


Fig. 7.e

FSC Analogue input end scale
THR S1…5 Activation threshold for step 1 to 5
RC Remote control signal
C 1…6 Compressor steps

Total number of compressors = 6
Number of load steps per compressor = 0
Total number of steps = Total number of compressors + (Total number of compressors * Number of load steps per compressor) = 6 + 6 * 0 = 6
Amplitude of each step = Operating current range / Total number of steps = (20 – 4) / 6 = 2.666 mA.
If analogue input B8 measures 14.65 mA, two steps will be required, and consequently two compressors will be started.

Control with digital inputs

A number of digital inputs equal to the number of compressors installed on the unit are provided to start the devices.
There is no direct correspondence between the digital input and the compressor on, however the number of inputs closed at the same time will determine the number of compressors that are on. The compressor activation sequence is in any case defined according to rotation, as enabled by the corresponding parameter.

Only in the case of units with six compressors in two refrigerant circuits, in trio configuration, is there an exception to the compressor control mode; digital inputs 4 and 18 activate two load steps in response to just one input signal.
Considering this characteristic, the cooling capacity of the unit can still be modulated by uniformly increasing the capacity one step at a time; the digital inputs must be switched in such a way as to ensure that the difference in the number of requests between two consecutive input control sequences is equal to one step.

7.4 Compressor rotation

Inputs used

- Compressor 1 thermal overload circuit 1 [B17
- Compressor 2 thermal overload circuit 1 [B18]
- Compressor 3 thermal overload circuit 1 (units with trio compressors) [B26]
- Compressor 1 thermal overload circuit 2 [B22]
- Compressor 2 thermal overload circuit 2 [B23]
- Compressor 3 thermal overload circuit 2 (units with trio compressors) [B27]

Parameters used

- Configure type of unit [-H-]
- Type of semi-hermetic compressors controlled [-c-]
- Total number of compressors / number of refrigerant circuits on unit [-H-]
- Enable compressor capacity control [-c-]
- Select type of compressor / refrigerant circuit rotation [-H-]
- Enable operation of compressor 1 circuit 1 [-c-]
- Enable operation of compressor 2 circuit 1 [-c-]
- Enable operation of compressor 3 circuit 1 [-c-]
- Enable operation of compressor 1 circuit 2 [-c-]
- Enable operation of compressor 2 circuit 2 [-c-]
- Enable operation of compressor 3 circuit 2 [-c-]
- Manually force compressor 1 circuit 1 [-c-]
- Manually force compressor 2 circuit 1 [-c-]
- Manually force compressor 3 circuit 1 [-c-]
- Manually force compressor 1 circuit 2 [-c-]
- Manually force compressor 2 circuit 2 [-c-]
- Manually force compressor 3 circuit 2 [-c-]

Outputs used

- Liquid solenoid circuit 1 [B31]
- Liquid solenoid circuit 2 [B36]
- Compressor 1 circuit 1 [B29]
  Winding A compressor 1
- Compressor 2 circuit 1. Compressor 1 capacity control [B30]
  Winding B compressor 1

- Compressor 3 circuit 1 [B31]
  Compressor 1 capacity control (if Part-Winding enabled)
- Compressor 1 circuit 2. Winding A compressor 2 [B34]
- Compressor 2 circuit 2. Compressor 2 capacity control Winding B compressor 2 [B35]
- Compressor 3 circuit 2 [B36]
  Compressor 2 capacity control (if Part-Winding enabled)

The compressor calls are rotated so as to balance out the number of operating hours and starts of the devices.
There are three different types of rotation available:

- L.I.F.O.
- F.I.F.O.
- By time

Rotation is only performed between the compressors, and not between the capacity steps.

LIFO rotation
The first compressor to start will be the last to stop. The device activation sequence on a unit with 4 compressors is: C1, C2, C3, C4
The device deactivation sequence on a unit with 4 compressors is: C4, C3, C2, C1
FIFO rotation
The first compressor to start will be the first to stop. The device activation sequence on a unit with 4 compressors is: C1, C2, C3, C4.
The device deactivation sequence on a unit with 4 compressors is: C1, C2, C3, C4
Rotation by time
This type of rotation is based on the count of the device operating hours. The compressor with the least number of operating hours will always start first. The active compressor with the highest number of operating hours will always stop first.

The activation of one or more than one alarm that causes one or more compressors to shutdown requires the activation of an equivalent number of devices, from those available, so as to make up for the variation in active cooling capacity.

7.5 TANDEM – TRIO compressor rotation

Rotation between circuits
In the units with tandem or trio compressors in two refrigerant circuits, the circuit rotation described is incorporated into the rotation between compressors, for the purpose of balancing the quantity of oil in each.
Whenever the unit is started, and the compressors are completely off, rotation is performed that involves the alternating start-up of the two circuits.

Force tandem - trio compressors in FIFO rotation
For these types of compressors, the aim is to avoid the operation of circuits at part load for excessive periods (affecting the operation of the compressors that are off).
A maximum part load operating time has been introduced, after which the active compressor is stopped, and the demand is transferred to another compressor in the same circuit.
If no compressors are available when the exchange in condition occurs, the operation of the circuit remains unchanged.
The activation of an alarm on the compressor being forced on will involve a return to the previous operating conditions.
The count time for forcing the compressor on is reset whenever an alarm occurs in the circuit.

7.6 Compressor safety times

Inputs used

- Compressor 1 thermal overload circuit 1 [B17
- Compressor 2 thermal overload circuit 1 [B18]
- Compressor 3 thermal overload circuit 1 (units with trio compressors) [B26]
- Compressor 1 thermal overload circuit 2 [B22]
- Compressor 2 thermal overload circuit 2 [B23]
- Compressor 3 thermal overload circuit 2 (units with trio compressors) [B27]

Parameters used

- Minimum compressor on time [-c-]
- Minimum compressor off time [-c-]
- Minimum time between starts of different compressors [-c-]
- Minimum time between starts of the same compressor [-c-]

Outputs used

- Liquid solenoid circuit 1 [B31]
- Liquid solenoid circuit 2 [B36]
- Compressor 1 circuit 1. Winding A compressor 1 [B29]
- Compressor 2 circuit 1. Compressor 1 capacity control [B30]
  Winding B compressor 1
- Compressor 3 circuit 1. [B31]
  Compressor 1 capacity control (if Part-Winding enabled)
- Compressor 1 circuit 2. Winding A compressor 2 [B34]
- Compressor 2 circuit 2. Compressor 2 capacity control [B35]
  Winding B compressor 2
- Compressor 3 circuit 2. [B36]
  Compressor 2 capacity control (if Part-Winding enabled)

Minimum compressor on time
This defines a guaranteed minimum ON time for the compressors; once activated, the compressors will operate for this time, irrespective of the temperature control request status. Only the activation of a protector will cause the device to shutdown earlier.

CREQ Compressor request
CMP Compressor status
MONT Minimum compressor on time
t Time

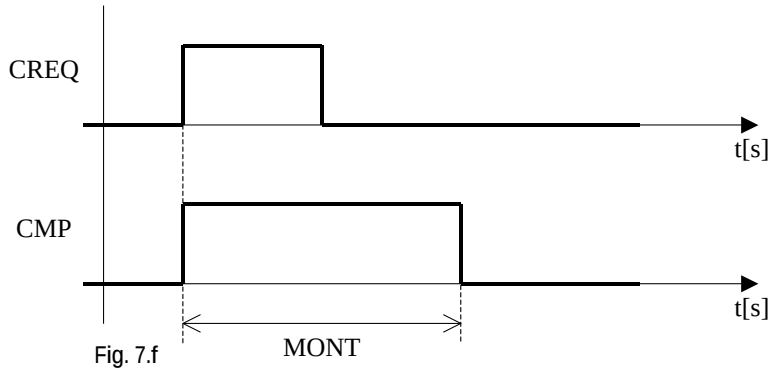


Fig. 7.f

Minimum compressor off time
This defines the minimum guaranteed OFF time for the compressors, in response to any shutdown signal due to the temperature conditions or an alarm. Even if called to start, a compressor cannot be switched on before this time elapses.

CREQ Compressor request
CMP Compressor status
MOFFT Minimum compressor off time
t Time

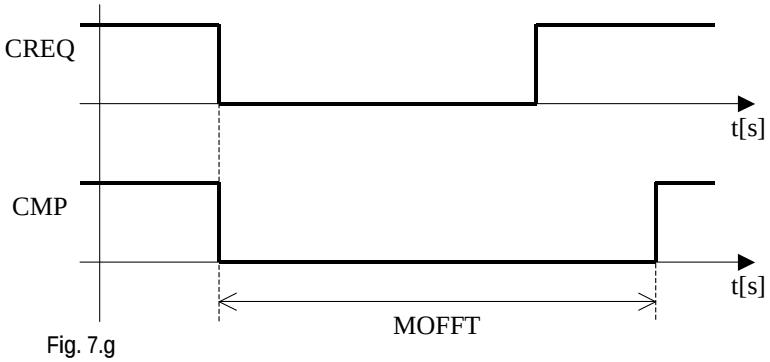


Fig. 7.g

Minimum time between starts of different compressors
This defines the minimum guaranteed time between the starts of two different compressors; this prevents simultaneous starts of multiple devices

C1REQ Compressor 1 request
C2REQ Compressor 2 request
CMP1 Compressor 1 status
CMP2 Compressor 2 status
CMPST Minimum time between starts of different compressors
t Time

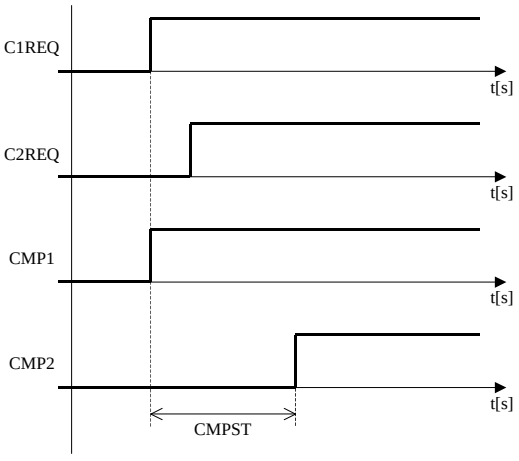


Fig. 7.h

Minimum time between starts of the same compressor
This defines the minimum guaranteed time between two successive starts of the same compressor.
Even if called to start, the compressor will not be able to switch on before this times elapses.
Setting this parameter suitably can limit the number of starts/hour according to the specific instructions of the manufacturer of the compressor.

CREQ Compressor request
CMP Compressor status
CST Minimum time between starts of the same compressor
t Time

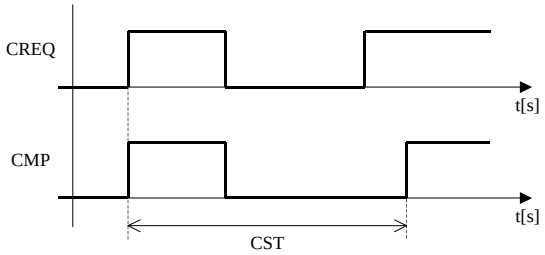


Fig. 7.i

7.7 Pumpdown management

Inputs used
- Low pressure switch circuit 1 [B15]
- Low pressure switch circuit 2 [B20]
- Evaporation pressure 1 [B1]
- Evaporation pressure 2 [B2]
- ON/OFF from digital input (air/air units and chillers) [B13]

Parameters used
- Type of semi-hermetic compressors controlled [-c-]
- Maximum pumpdown duration [-c-]
- Select end pumpdown mode [-c-]
- End pumpdown pressure from probe [-c-]
- Unit ON/OFF from panel [main]
- Unit ON/OFF from supervisor []

Outputs used
- Liquid solenoid circuit 1 [B31]
- Liquid solenoid circuit 2 [B36]
- Winding A compressor 1 [B29]
- Winding B compressor 1 [B30]
- Winding A compressor 2 [B34]
- Winding B compressor 2 [B35]

The pumpdown procedure is performed for the purpose of completely emptying the residual freon from the evaporator in a refrigerant circuit during shutdown.
The following conditions can cause a refrigerant circuit to shutdown:

Remote ON/OFF: unit shutdown from remote contact
ON/OFF from keypad: unit shutdown from display with specific procedure
ON/OFF from supervisor: unit shutdown on signal from supervisory system
Thermostat: circuit shutdown when temperature set point reached

The pumpdown procedure involves the operation of a certain circuit with the liquid solenoid valve de-energised (closed).
The pumpdown procedure ends when:
- the low pressure transducer is activated, according to the set end pumpdown threshold
- the low pressure switch is activated
- the maximum time limit is reached

During the pumpdown procedure, the low pressure alarm, both from transducer and from pressure switch, is disabled.

CMPR Compressor request
PDS Pumpdown status
LP Low pressure
CMPS Compressor status
LPSTOP End due to low pressure
TIMESTOP End on reaching maximum time
t [s] Time

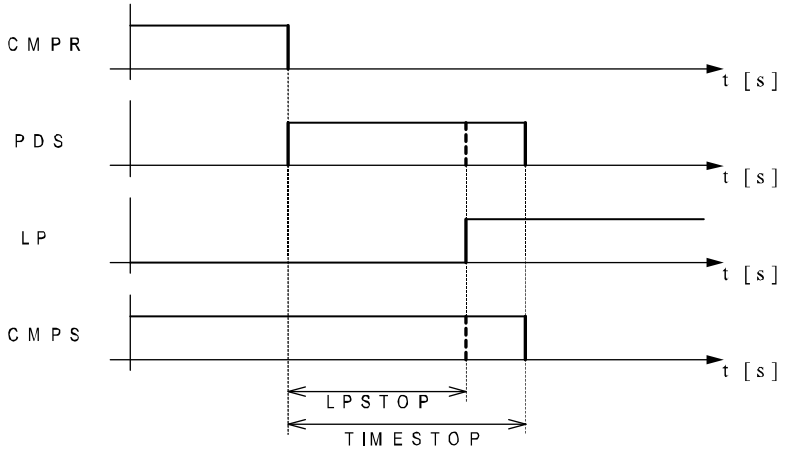


Fig.7.l

7.8 Main pump management

Inputs used
- Evaporator water flow switch [B12]
- Evaporator pump 1 thermal overload [B14]
- Evaporator pump 2 thermal overload [B28]

Parameters used
- Number of evaporator pumps [-H-]
- Evaporator pump/main fan operating mode [-H-]
- Delay between start of pump/main fan and compressors [-c-]
- Delay for stopping the pump/main fan [-c-]
- ON time in burst operation [-H-]
- OFF time in burst operation [-H-]

Outputs used
- Evaporator pump 1 [B33]
- Evaporator pump 2 [B36]

The main circulating pump can be managed in four different operating modes:

- Always on: the pump is activated when the unit is started and remains active while the unit is operating; if there are two pumps, the devices will be rotated according to the specific settings
- On according to the status of the compressor: the pump is on according to the compressor call status; consequently, when the set point has been reached, the circulating pump and compressors, excepting in the case of safety times, are off
- Burst operation: normally the circulating pump is off, and is activated periodically for a set time; the unit temperature conditions are constantly monitored and the compressors are started if necessary; when the control set point is reached the pump is switched off
- Always off: the main circulating pump is not managed, whatever the operating conditions of the unit

Two safety times are observed, respectively a compressor activation delay after the circulating pump starts, and pump shutdown delay after the compressors stop when having reached the control set point or the unit is shutdown.

7.9 Pump rotation

Inputs used
- Evaporator water flow switch [B12]
- Evaporator pump 1 thermal overload [B14]
- Evaporator pump 2 thermal overload [B28]

Parameters used
- Number of evaporator pumps [-H-]
- Select type of evaporator pump rotation [-H-]
- Operating hour threshold for the rotation of the evaporator pumps [-H-]

Outputs used
- Evaporator pump 1 [B33]
- Evaporator pump 2 [B36]

If there are two circulating pumps on the unit, the operation of these can be rotated in the following modes:

- Rotation at start: when the unit is started, the operation of the pumps is rotated, so as to balance the number of starts-stops of the devices
- Rotation by time: a rotation time is established (expressed in hours), which when reached the devices are rotated, so as to balance the number of operating hours of the devices.

Control of the second circulating pump in any case involves forced rotation in the event of an alarm event of one of the devices, to ensure maximum continuity of operation.

Pump thermal overload alarm
If a thermal overload alarm is activated on the active circulating pump, the pump is stopped and the devices are rotated.
A further activation of the thermal overload alarm on the active reserve pump causes the total shutdown of the unit due to no other pump being available on power-up, and a new rotation is forced.

Evaporator flow switch alarm
The activation of the evaporator flow switch alarm forces the rotation of the devices and the activation of the reserve pump; in this condition, the alarm signal delay time in steady operation is re-activated, after which, with the alarm active, the unit is switched off.

Evaporator flow switch alarm/intervention
The evaporator flow switch intervention generates the EVAPORATOR FLOW SWITCH ALARM respecting the following time:

- Evaporator flow switch alarm delay at start-up
- Evaporator flow switch alarm delay in steady operation

If there are 2 evaporator pumps, the intervention of the flow switch causes the startup of the backup pump. If after the " Evaporator flow switch alarm delay at start-up" the flow switch signal is still present, the EVAPORATOR FLOW SWITCH ALARM occurs and the unit is turned off.
The compressors , after the startup of the backup pump, remain still ON for a delay time in steady operation.

7.10 Electric heaters

Inputs used

- Room temperature (air/air units) Evaporator water inlet temperature [B5]
- Air outlet temperature (air/air units) Evaporator water outlet temperature [B6]
- Evaporator 1 water outlet temperature [B9]
- Evaporator 2 water outlet temperature [B10]
- Outside air temperature [B7]
- Boiler temperature [B1]

Parameters used

- Select number of evaporators [-H-]
- Type of temperature control [-r-]
- Enable analogue probe 7 Outside air temperature [-/-]
- Enable analogue probe 1 Boiler temperature [-/-]
- Configuration of analogue inputs 1 and 2 [-/-]
- Antifreeze heater set point [A3]
- Antifreeze heater differential [A4]
- Support heater set point in cooling mode [A5]
- Support heater differential in cooling mode [A6]
- Support heater set point 1 in heating mode [A7]
- Support heater differential 1 in heating mode [A8]
- Support heater set point 2 in heating mode [A9]
- Support heater differential 1 in heating mode [A10]
- Delay in activation of the support heater in heating mode [A11]
- Select probe for cooling support control in air/air units [-A-]
- Outside air set point to enable support heater [-A-]
- Outside air differential to enable support heater [-A-]
- Boiler temperature set point to enable support heater [-A-]
- Boiler temperature differential to enable support heater [-A-]
- Active operating mode (chiller/heat pump) [main]

Outputs used

- Status of digital output 11. Heater 1 [B39]
- Status of digital output 12. Heater 2 [B40]

Antifreeze heater

To prevent the activation of the antifreeze protection one or more electric heaters are used, immersed in the flow of water at the evaporator and controlled based on by a set point and differential. The activation of the antifreeze heater causes the total shutdown of the compressors, or in any case disables the cooling devices, until the temperature returns above the heater set point + differential.

Support heater in cooling

To prevent the activation of the minimum room temperature limit protection in air/air units, an electric heater is activated, immersed in the main air flow, controlled based on a set point and differential.
The activation of the support heater in cooling causes the total shutdown of the compressors, or in any case disables the cooling devices, until the temperature returns above the heater set point + differential.

SUPPORT HEATERS IN HEATING

Heating support function on water/air – water/water units

In units operating in heating mode with reversal on the refrigerant circuit, electric heaters (used in cooling mode as evaporator antifreeze heaters) are used to support the heating function, if the operation of the unit cannot satisfy the thermal load of the installation. These heaters are controlled based on the unit temperature control probe (inlet or outlet, according to the setting made), while two separate set points and differentials are set for the activation of the devices. In the event of control based on the temperature measured at the evaporator outlet, in units with one and two evaporators, the heaters will be controlled based on the values measured by analogue input B6.

Heating support function on air/air units

In units operating in heating mode with reversal on the refrigerant circuit, electric heaters are used to support the heating function, if the operation of the unit cannot satisfy the thermal load of the installation.
The user can set whether the heater is activated based on the room temperature or the outlet temperature.
The support heaters are managed by setting an activation delay time, calculated from when the circulating pump starts, so as to give the unit time to reach steady operation. Enabling the control set point compensation function will also cause the compensation of the heater set point, according to the same temperature difference calculated.

Boiler function

If the reading of analogue input B1 is enabled and configured as the boiler temperature, the operation of the heaters can be managed based on the outside temperature conditions and the water temperature in the storage cylinder.
Once having set a control set point and differential for both readings, the support heaters will be activated based on the control temperature measured (inlet or outlet, according to the specific setting) in reference to specific set points and differentials, only if the outside temperature conditions and boiler conditions allow.

7.11 Selecting the operating mode

Inputs used
- Select cooling/heating from digital input [B25]

Parameters used
- Configure type of unit [-H-]
- Cooling/Heating from panel [main]
- Enable cooling/heating selection from digital input [H2]
- Enable cooling/heating selection from supervisor [H4]
- Select cooling/heating from supervisor
- Logic of the 4-way reversing valve [-H-]
- Force devices OFF for automatic reversal of the refrigerant circuit [-H-]

Outputs used
- 4-way valve for reversing the refrigerant circuit in circuit 1 [B41]
- 4-way valve for reversing the refrigerant circuit in circuit 2 [B42]

In general, if the unit configured features operation in both chiller mode (cooling) and heat pump mode (heating), the operating mode can be changed with the unit on or off, depending on the type of selection.

There are three different ways to change the operating mode:
Keypad: a parameter is set on the menu. The operating mode can only be changed if the unit is off and the circulating pump has stopped
Supervisor: this can be enabled, with a switching signal received from the supervisor serial network. The operating mode can only be changed if the unit is off and the circulating pump has stopped
Digital input: this can be enabled, with the switching of the enabled digital input, by an external controller. A delay must be set for switching the reversing valves in the refrigerant circuit, if equal to zero the mode is switched immediately, otherwise the unit is switched off according to the procedure shown in the figure

Switching Cooling-heating from digital input

SWDIN Status of the digital input for Cooling-heating selection
USTAT Unit operating status
4WAY Operating status of 4 way reversing valves (possibly depending on the operating logic)
SWD Cooling-heating switching delay
t[s] Time

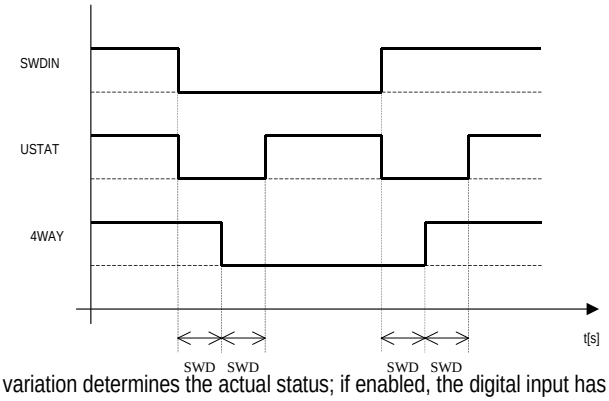


Fig. 7.m

The keypad and supervisor have equal priority in setting the operating mode, the most recent variation determines the actual status; if enabled, the digital input has absolute priority over the other two.

7.12 ON/OFF time bands

Inputs used
- System hours [main]
- System minutes [main]
- System day [main]
- System month [main]
- System year [main]

Parameters used
- Enable control of the clock board [t6]
- Hour setting [t1]
- Minutes setting [t2]
- Day setting [t3]
- Month setting [t4]
- Year setting [t5]
- Enable unit ON-OFF time bands [-t-]
- Enable set point time bands [-t-]
- Configure time band parameters – day [-t-]

Outputs used

ON-OFF time bands
If control of the clock board is enabled, and the board is fitted and operating, the program can control 4 different types of time band, with separate application on each day of the week.
The time bands set only take effect if the unit has been switched on from the button.

Band 1
Four values are set, respectively the start and end times for two periods, within which the unit is on.

Band 2
Two values are set, respectively the start and end time band, within which the unit is on.

Band 3
The unit is forced ON without time limits

Band 4
The unit is forced OFF without time limits

Set point time bands
If control of the clock board is enabled, and the board is fitted and operating, the program can control 4 different types of time band with changes in the set point, applied on each day of the week.
A different cooling and heating set point must be set for each period (total of 8 parameters) plus the start and end times of the bands.
Setting the same start and end times is equivalent to disabling the function for that period of time.

7.13 Antifreeze control

Inputs used
- Evaporator water outlet temperature [B6]
- Evaporator 1 water outlet temperature [B9]
- Evaporator 2 water outlet temperature [B10]

Parameters used
- Enable analogue probe 6. Evaporator water outlet temperature [-/-]
- Antifreeze alarm set point (chiller units) [A1]
- Antifreeze alarm differential (chiller units) [A2]
- Minimum antifreeze/low room temperature set point limit [-A-]
- Maximum antifreeze/low room temperature set point limit [-A-]
- Type of antifreeze alarm reset [-A-]
- Antifreeze alarm delay when starting (manual reset) [-A-]
- Device start mode in antifreeze with unit off [A12]

Outputs used
- Generic alarm [B38]

General information
The antifreeze function is based on the reading made by the temperature probes located on the evaporator outlet.
The function is different for units with one or two water circuits, with the antifreeze control based on the readings of the following inputs respectively:
- B6 single circuit units
- B9-B10 two circuit units

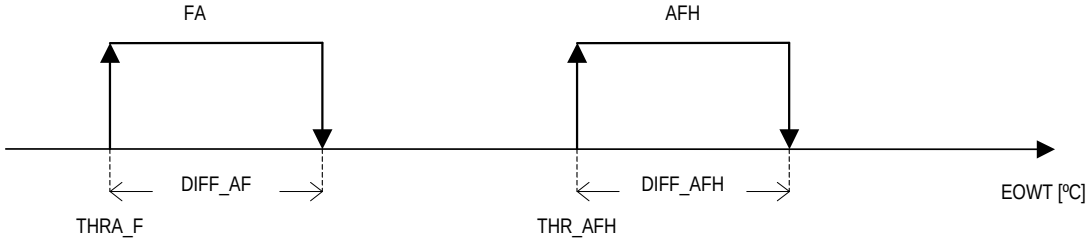


Fig. 7.n

THRA_F	Antifreeze alarm set point
DIFF_AF	Antifreeze alarm differential
FA	Antifreeze alarm
THR_AFH	Antifreeze heater set point
DIFF_AFH	Antifreeze heater differential
AFH	Antifreeze heater
EOWT	Evaporator water outlet temperature

Antifreeze alarm
See the antifreeze alarm in the chapter on the alarms.

7.14 Condenser - evaporator control

Inputs used

- Condensing temperature 1 [B1]
- Condensing temperature 2 [B2]
- Outside air temperature [B7]
- Condensing pressure 1 [B3]
- Condensing pressure 2 [B4]

Parameters used

- Type of condenser control [-F-]
- Number of condensers installed [-F-]
- Type of condensing devices controlled [-F-]
- Total number of fans installed [-F-]
- Forcing time when starting the condenser (control by temperature) [-F-]
- Maximum voltage threshold for Triac [-F-]
- Minimum voltage threshold for Triac [-F-]
- Amplitude impulse for phase control [-F-]
- Condenser control set point (cooling) [-F-]
- Condenser differential (cooling) [-F-]
- Evaporator set point (heating) [-F-]
- Evaporator differential (heating) [-F-]
- Fan operation differential at minimum speed [-F-]
- Maximum fan speed with inverter [-F-]
- Minimum fan speed with inverter [-F-]
- Speed-up time with inverter [-F-]
- Enable high pressure prevent [-F-]

[-F-] [-F-]

- High pressure prevent set point(cooling) [-F-]
- High pressure prevent differential(cooling) [-F-]
- Low pressure prevent set point(heating) [-F-]
- Low pressure prevent differential(heating) [-F-]
- Condenser operating mode in the event of probe fault [-F-]
- End prevent delay [-F-]
- Start hour for low-noise operation [F1]
- Start minutes for low-noise operation [F2]
- End hour for low-noise operation [F3]
- End minutes for low-noise operation [F4]
- Low-noise set point in cooling [F5]
- Low-noise set point in heating [F6]
- Enable control of the clock board [t6]
- Active operating mode (chiller/heat pump) [main]

Outputs used

- Fan 1 circuit 1 [B32]
- Fan 2 circuit 1 [B31]
- Fan 2 circuit 1 (1 condenser) [B37]
- Fan 1 circuit 2 (2 condensers) [B37]
- Fan 2 circuit 2 [B36]
- Status of analogue output 1 [B43]
  Condenser fans circuit 1
- Status of analogue output 2 [B44]
  Condenser fans circuit 2

Condenser-evaporator on/off linked to compressor operation

The operation of the fans will be slaved exclusively to the operation of the compressors:
Compressor off = fan off
Compressor on = fan on
No pressure or temperature transducers need to be installed

On/off condenser-evaporator operation linked to the pressure or temperature sensor reading

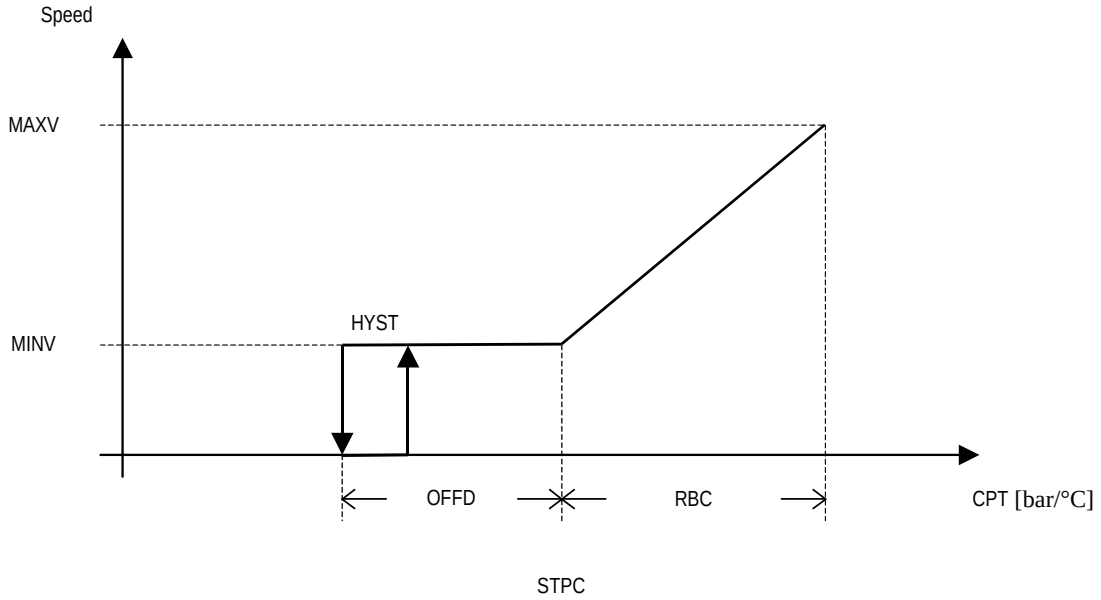
The operation of the fans will be slaved to the operation of the compressors and the value read by the pressure or temperature sensors, according to a set point and band, with proportional control.
In cooling operation, when the pressure/temperature is less than or equal to the set point, all the fans will be off; when the pressure/temperature rises to the set point + band, all the fans will be on.
In heating operation, when the pressure/temperature is greater than or equal to the set point, all the fans will be off; when the pressure/temperature falls to the set point - band, all the fans will be on.
The control band is divided into a uniform number of steps, equal to the number of fans installed for the circuit in question.
Single or separate condensers/evaporators can be chosen; with single coils, the fans will be controlled by the higher/lower pressure/temperature, with the second separate coil, each pressure sensor/temperature controls its own fan or group of fans.

Modulating condenser-evaporator operation linked to the pressure or temperature sensor reading

The fans will be controlled by a 0 to 10 V or PWM analogue output, in proportion to the request from the pressure / temperature sensors.
Single or separate condensers/evaporators can be chosen; with single coils, the fans will be controlled by the higher/lower pressure/temperature, with the second separate coil, each pressure sensor/temperature controls its own fan or group of fans.

Condenser fan control in chiller operation

Fig. 7.o Condenser control devices and alarms



STPC Condenser control set point
RBC Condenser control band
OFFD Deactivation differential
HYST Deactivation hysteresis (0.5bar/1°C)
MINV Minimum fan speed threshold
MAXV Maximum fan speed threshold
CPT Condensing pressure / temperature

With reference to the previous graph:

- pressure/temperature values between STPC and STPC+RBC cause the modulation of the condenser fan speed with proportional control between the minimum and maximum voltage set
- pressure/temperature values between STPC and STPC-OFFD cause the operation of the condenser fans at the minimum speed set
- pressure/temperature values below STPC-OFFD cause the total shutdown of the fans and the analogue output signal is set to 0 Volt. A fixed hysteresis of 0.5 bar or 1.0°C is featured to prevent swings in the controlled value around the threshold STPC-OFFD from causing repeated starts and stops of the controlled devices.

In the activation phase with increasing pressure/temperature, as soon as the value exceeds the threshold STPC-OFFD, the fan is operated at maximum speed for a period equal to the set speed-up time.

If condenser control is based on the condenser temperature reading, when the liquid solenoid valve opens (refrigerant circuit activated), if the outside air temperature is above STPC-OFFD, the fan is operated at maximum speed for a period equal to the set speed-up time.
This function aims to prevent high pressure in the refrigerant circuit when starting the compressors, caused by an incorrect measurement of the condenser temperature due to the thermal inertia of the control probe.

Evaporator fan control in heat pump operation

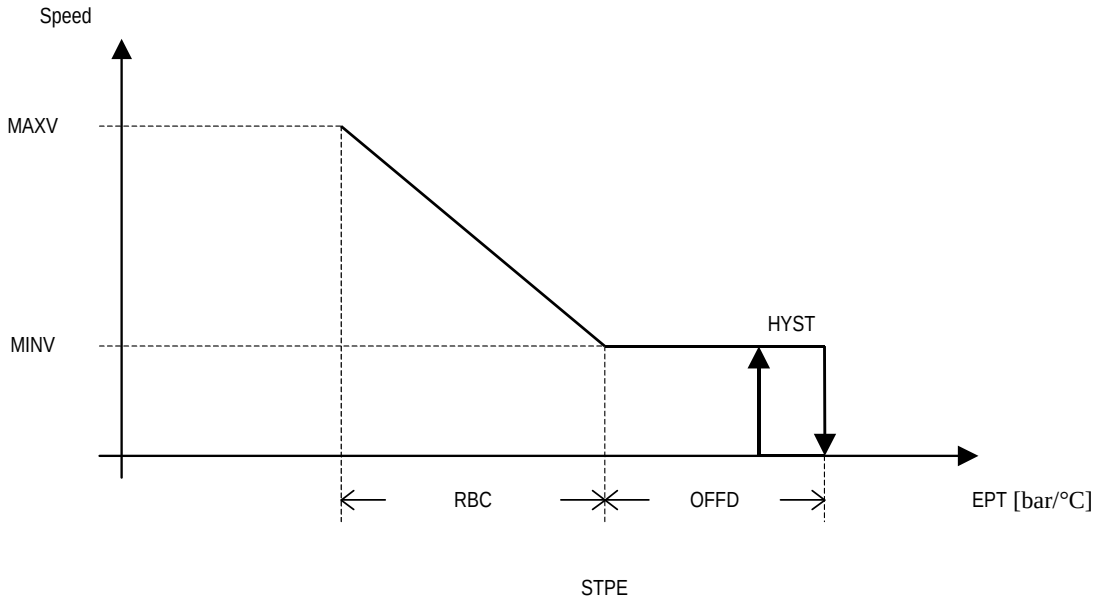


Fig. 7.p Condenser control devices and alarms

STPC Evaporator control set point
RBC Evaporator control band
OFFD Deactivation differential
HYST Deactivation hysteresis (0.5bar/1°C)
MINV Minimum fan speed threshold
MAXV Maximum fan speed threshold
CPT Evaporation pressure / temperature

In heat pump operation, the previous observations concerning cooling operation are still valid; the function simply operates in the diametrically opposite manner, given the different unit operating mode.

7.15 Prevent function

This function can be enabled in the manufacturer branch, and prevents the circuits from being shutdown due to a high pressure alarm. When the compressors are on, once reaching the set threshold, the capacity of the compressor is controlled until the pressure returns below or above the set point by a set differential, in cooling or heating mode respectively.
When the compressors are off, once having reached the set threshold, the fans are started at maximum speed until the pressure returns to acceptable values for the operation of the unit.
In units with tandem or trio hermetic compressors, the prevent function stops one of the active compressors, performing a rotation so as to shutdown a different device each time.
The compressor shutdown procedure is repeated whenever the pressure/temperature exceeds the set prevent threshold, or alternatively waits a fixed time of 10 seconds with high/low pressure before repeating the shutdown. The procedure stops when reaching the minimum number of devices on per circuit. In units with capacity-controlled semi-hermetic compressors, the prevent function activates the load steps, with the aim of preventing the compressor from shutting down.

7.16 Low noise function

This function is used to reduce the noise generated by the unit, due to the condenser/evaporator fans, at specific times.
Once the start and end times have been defined for the Low Noise function, the unit control set point will be modified in such period by a set value.
A set point is defined for cooling operation and another for heating operation, applied according to the set time band, in relation to the operating mode that is active on the unit.
Setting the same start and end times disables the function.

7.17 Start with hot condenser

This function only applies to air/water units in cooling operation with condenser control based on the temperature of the coil.
When activating a refrigerant circuit, if the temperature measured at the condenser is above 20.0°C (when starting, the condenser temperature corresponds to the outside air temperature), the condenser fans are forced on at the maximum speed for a time equal to the set forcing time when starting.

7.18 Defrost control in air/water – Air/air units

Inputs used

- Condensing temperature 1 [B1]
- Condensing temperature 2 [B2]
- Outside air temperature [B7]
- Condensing pressure 1 [B3]
- Condensing pressure 2 [B4]

Parameters used

- Select values for start and end defrost control [-d-]
- Type of defrost between circuits [-d-]
- Select end defrost mode [-d-]
- Start defrost threshold [d1]
- End defrost threshold [d2]
- Defrost activation delay [-d-]
- Maximum defrost duration [-d-]
- Minimum defrost duration [-d-]
- Delay between defrosts on same circuit [-d-]
- Delay between defrosts on different circuits [-d-]
- Forced compressor off time at start and end defrost [-d-]
- Delay in reversing refrigerant circuit for defrost [-d-]
- Enable sliding defrost function [d3]
- Minimum start defrost set point allowed with sliding defrost function [d4]
- Outside temperature threshold to start sliding defrost action [d5]
- Outside temperature threshold for maximum sliding defrost action [d6]
- Enable manual defrost actuator [-d-]
- Manual defrost on circuit 1 [-d-]
- Manual defrost on circuit 2 [-d-]

Outputs used

- Compressor 1 circuit 1 [B29]
  Winding A compressor 1
- Compressor 2 circuit 1 [B30]
  Winding B compressor 1
- Compressor 3 circuit 1 [B31]
- Compressor 1 circuit 2 [B34]
  Winding A compressor 2
- Compressor 2 circuit 2 [B35]
  Winding B compressor 2
- Compressor 3 circuit 2 [B36]
- 4-way reversing valve circuit 1 [B41]
- 4-way reversing valve circuit 2 [B42]
- Fan 1 circuit 1 [B32]
- Fan 2 circuit 1 [B31]
- Fan 2 circuit 1 (single condenser) [B37]
- Fan 1 circuit 2 (2 condensers) [B37]
- Fan 2 circuit 2 [B36]
- Analogue output 1 status [B43]
  Condenser fans circuit 1
- Analogue output 2 status [B44]
  Condenser fans circuit 2

7.19 Types of defrost

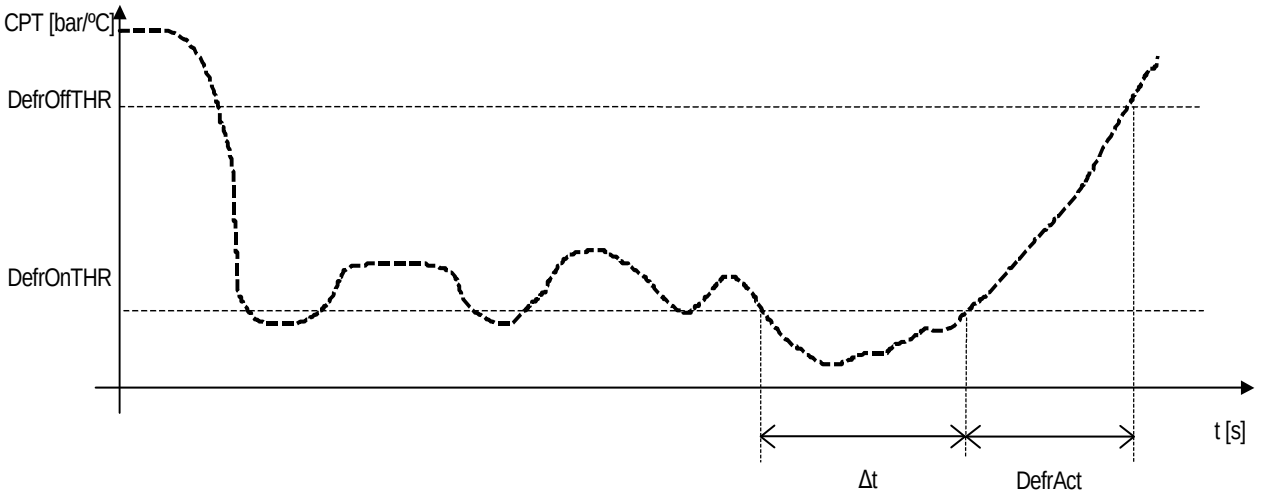
Simultaneous

Only one circuit needs a defrost request (temperature/pressure below the start defrost threshold) for all the circuits to be forced to defrost. The circuits which do not require defrosting (temperature/pressure above the end defrost threshold) stop and go to standby; as soon as all the circuits end their defrost cycle the compressors can start again in heat pump operation.

Separate

The circuits are defrosted separately by the circuits. The first circuit that requires defrosting starts the procedure, while the others wait for the end defrost (heat pump operation) before reversing the cycle and sequentially performing the defrost.

7.20 Defrosting a circuit with time / temperature control



DefrOffTHR	End defrost threshold
DefrOnTHR	Start defrost threshold
CPT	Condensing pressure/temperature
Δt	Duration of the pressure/temperature inside the defrost activation zone
DefrAct	Defrost active
t	Time

Fig. 7-1 Defrost control

7.20.1 Description of operation

If the temperature/pressure of a coil remains continuously below the start defrost threshold for the defrost delay time set, the circuit in question will start a defrost cycle:

- the compressor/compressors in the circuit stop for a set time
- the refrigerant circuit is reversed using the 4-way valve after a set delay
- the fan in question is switched off (if the pressure probes are present, the high condensing pressure prevention function will be active)

If the compressor off time at start and end defrost is set to 0, then the 4-way reversing valve is switched with the compressors on.

The circuit exits the defrost cycle if the temperature/pressure exceeds the end defrost threshold, or after a maximum time, if the defrost cycle exceeds the maximum set threshold time.

7.20.2 Start defrost threshold automatic (sliding defrost)

In the event of very low outside temperatures, the pressure or temperature of the evaporator (outdoor exchanger) may fall below the start defrost threshold, even when there is no actual frost on the heat exchanger. In this case, a procedure has been implemented for automatically calculating the start defrost threshold, based on the outside air temperature probe reading.
The purpose of this function is to avoid unneeded defrosts due to outside conditions that are nonetheless favourable for heat pump operation, despite the low air temperature.
The user can thus set, in addition to the start defrost set point, an even lower threshold can be set that corresponds to the minimum temperature or pressure value for performing the defrost, thus avoiding the unit stopping due to low pressure. Within this interval, the start defrost threshold varies depending on the outside temperature, compensated proportionally. In this case too, a start compensation threshold and a limit threshold (minimum allowed) are used to lower the start defrost threshold within acceptable values and according to a certain proportionality.

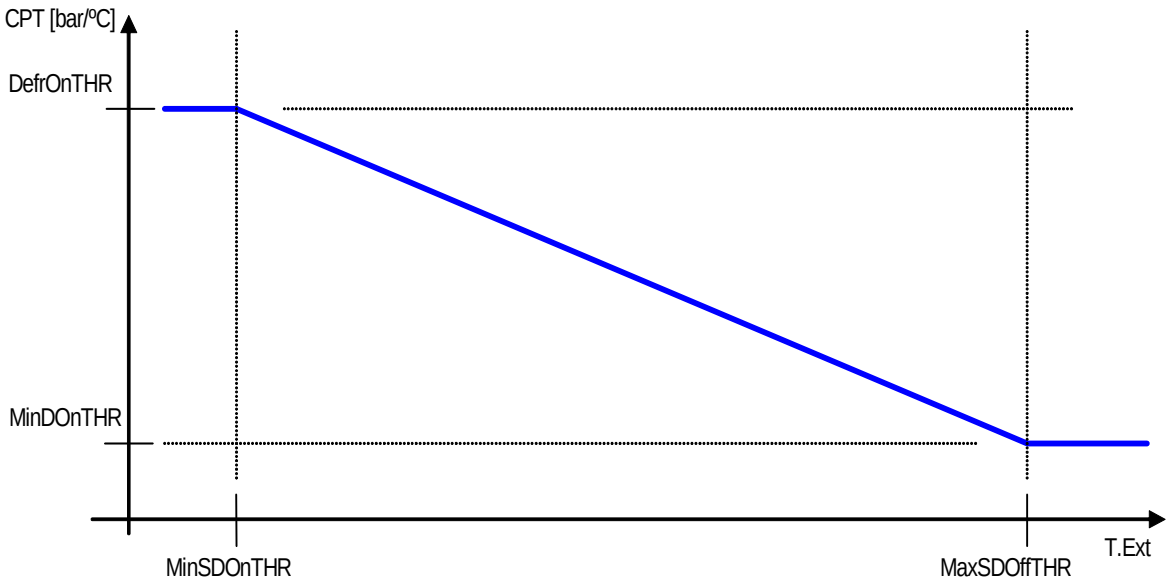


Fig. 7-2 Sliding defrost

CPT	Condensing pressure/temperature
T.Ext	Outside temperature
DefrOnTHR	Start defrost threshold
MinDOnTHR	Minimum start defrost threshold
MinSDOnTHR	Sliding Defrost start threshold
MaxSDOffTHR	Sliding Defrost limit threshold

7.20.3 Start and end defrost mode

Two distinct start and end defrost modes can be defined by suitably combining the settings of two parameters.
In particular, the values that determine the start and end defrost can be selected:

- *Start-end by temperature*: condenser temperature probe readings
- *Start-end by pressure*: condensing pressure probe readings
- *Start by pressure – end by temperature*: condenser temperature probe reading for start defrost and fan control throughout the defrost phase, condenser temperature probe reading to end the procedure

The end defrost can also be selected as follows:

- *Time* : the defrost only ends when reaching the maximum time
- *Pressure/temperature* : the defrost ends when reaching the set end defrost thresholds, or alternatively after the maximum time

7.20.4 Dripping

The coil dripping phase is the period in which, with the refrigerant circuit in heating mode and the compressors off, the heat of the accumulated on the exchanger is exploited to remove any condensate.
This phase occurs at the end of the defrost cycle, from when the compressors stop to when the 4-way reversing valve switches to heat pump mode.

7.21 Defrosting a circuit with control from external contact

The activation / deactivation of the defrost cycle depends on the status an external contact, controlled by a differential pressure switch or outside temperature thermostat for the circuit in question.
For this purpose, the analogue input used to measure the temperature of the condenser coil will be used as a digital input for reading of the status of the pressure switch.
A voltage-free contact is thus required, which, if open, starts the defrost procedure, vice-versa if closed.
For this type of procedure the duration is also monitored and compared against the maximum time set.

7.22 Manual defrost

A circuit can also be defrosted manually using of a specific parameter with manufacturer password protection.
Based on the type of defrost configured (simultaneous or separate), the circuits can be defrosted at the same time or separately.
The manual defrost follows the settings of the normal defrost, as described in the previous paragraphs.

7.23 Defrost control ON REVERSE-CYCLE water/water units

Inputs used

- Condensing temperature 1 [B1]
- Condensing temperature 2 [B2]
- Outside air temperature [B7]
- Condensing pressure 1 [B3]
- Condensing pressure 2 [B4]

Parameters used

- Select values for start and end defrost control [-d-]
- Type of defrost between circuits [-d-]
- Select end defrost mode [-d-]
- Start defrost threshold [d1]
- End defrost threshold [d2]
- Defrost activation delay [-d-]
- Maximum defrost duration [-d-]
- Minimum defrost duration [-d-]
- Delay between defrosts on same circuit [-d-]
- Delay between defrosts on different circuits [-d-]
- Enable sliding defrost function [d3]
- Minimum start defrost set point allowed with sliding defrost function [d4]
- Outside temperature threshold to start sliding defrost action [d5]
- Outside temperature threshold for maximum sliding defrost action [d6]
- Enable manual defrost actuator [-d-]
- Manual defrost on circuit 1 [-d-]
- Manual defrost on circuit 2 [-d-]

Outputs used

- Defrost heater circuit 1 [B32]
- Defrost heater circuit 2 [B37]

Operation
On reverse-cycle water/water units, the defrost is performed using electric heaters immersed in the flow of water in the cooling coil.

7.24 Activating a defrost cycle

A configuration parameter is available for setting the measurement used to control the activation of the defrost, temperature or pressure; the threshold below which the defrost procedure starts then needs to be set.
The temperature or pressure must remain below this threshold for a continuous time equal to set defrost activation delay before the procedure can start.
In the event of consecutive defrosts on the same refrigerant circuit, the times between defrosts on the same circuit and between different circuits are also monitored, the latter applied only in the event of separate defrosts.

7.25 Running a defrost

The defrost phase is performed by switching off the compressors and activating the defrost heaters with the circulating pump on. The duration of the defrost cycle is monitored from the activation of the heaters and compared against the minimum threshold set; irrespective of pressure or temperature values measured, the defrost cannot end before the set time.

7.26 Ending a defrost cycle

Two parameters are available for setting the type of measurement controlled and the end defrost mode.
Based on the selection, pressure or temperature, a threshold must be set above which the defrost procedure ends.
The end defrost can be selected by maximum time or maximum time and temperature/pressure; in the latter mode the duration of the defrost cycle is monitored and compared against the maximum value set, once the maximum time threshold is exceeded the defrost ends immediately.

8. Map of outputs

8.1 Air / air units

8.1.1 Cooling only

DIGITAL INPUTS

ID 1	Serious alarm
ID 2	Air flow switch
ID 3	Remote ON/OFF
ID 4	Main fan thermal overload
ID 5	Low pressure switch circuit 1
ID 6	High pressure switch circuit 1
ID 7	Compressor 1 thermal overload circuit 1
ID 8	Compressor 2 thermal overload circuit 1
ID 9	Condenser fan 1 thermal overload circuit 1
ID10	Low pressure switch circuit 2
ID11	High pressure switch circuit 2
ID12	Compressor 1 thermal overload circuit 2
ID13	Compressor 2 thermal overload circuit 2
ID14	Condenser fan 1 thermal overload circuit 2
ID15	
ID16	Compressor 3 thermal overload circuit 1 / Condenser fan 2 thermal overload circuit 1
ID17	Compressor 3 thermal overload circuit 2 / Condenser fan 2 thermal overload circuit 2
ID18	

ANALOGUE INPUTS

B1	Condensing temperature circuit 1/ Evaporation pressure circuit 1/ External water storage temperature
B2	Condensing temperature circuit 2 / Evaporation pressure circuit 2
B3	Condensing pressure circuit 1
B4	Condensing pressure circuit 2
B5	Room temperature
B6	Air outlet temp.
B7	Outside temperature
B8	Remote set point
B9	
B10	

DIGITAL OUTPUTS

NO1	Compressor 1 circuit 1 / Winding A compressor 1 circuit 1
NO2	Compressor 2 circuit 1 / Winding B compressor 1 circuit 1 / Part load compressor 1 circuit 1
NO3	Liquid solenoid circuit 1 / Compressor 3 circuit 1/ Part load compressor 1 circuit 1 / Condenser fan 2 circuit 1
NO 4	Condenser fan 1 circuit 1
NO 5	Circulating fan
NO 6	Compressor 1 circuit 2 / Winding A compressor 1 circuit 2
NO 7	Compressor 2 circuit 2 / Winding B compressor 1 circuit 2 / Compressor 1 capacity control circuit 2
NO 8	Liquid solenoid circuit 2 / Compressor 3 circuit 2/ Compressor 1 capacity control circuit 2 / Condenser fan 2 circuit 2
NO 9	Condenser fan 1 circuit 2 / Condenser fan 2 circuit 1
NO10	General alarm
NO11	Antifreeze heater circuit 1
NO12	Antifreeze heater circuit 2
NO13	
NO14	

ANALOGUE OUTPUTS

Y1	0 to 10 V condenser fan inverter circuit 1
Y2	0 to 10 V condenser fan inverter circuit 2
Y3	PWM condenser fan inverter circuit 1
Y4	PWM condenser fan inverter circuit 2
Y5	
Y6	

Important:
If using a single condenser, with 2 fans configured and 3 compressors configured, in the event of step control, the dedicated outputs will be number 4 and number 9.

8.1.2 Cooling + Heat pump

DIGITAL INPUTS

ID 1	Serious alarm
ID 2	Air flow switch
ID 3	Remote ON/OFF
ID 4	Main fan thermal overload
ID 5	Low pressure switch circuit 1
ID 6	High pressure switch circuit 1
ID 7	Compressor 1 thermal overload circuit 1
ID 8	Compressor 2 thermal overload circuit 1
ID 9	Condenser fan 1 thermal overload circuit 1
ID10	Low pressure switch circuit 2
ID11	High pressure switch circuit 2
ID12	Compressor 1 thermal overload circuit 2
ID13	Compressor 2 thermal overload circuit 2
ID14	Condenser fan 1 thermal overload circuit 2
ID15	
ID16	Compressor 3 thermal overload circuit 1 / Condenser fan 2 thermal overload circuit 1
ID17	Compressor 3 thermal overload circuit 2 / Condenser fan 2 thermal overload circuit 2
ID18	

ANALOGUE INPUTS

B1	Condensing temperature circuit 1/ Evaporation pressure circuit 1/ External water storage temperature
B2	Condensing temperature circuit 2 / Evaporation pressure circuit 2
B3	Condensing pressure circuit 1
B4	Condensing pressure circuit 2
B5	Room temperature
B6	Air outlet temp.
B7	Outside temperature
B8	Remote set point
B9	
B10	

DIGITAL OUTPUTS

NO1	Compressor 1 circuit 1 / Winding A compressor 1 circuit 1
NO2	Compressor 2 circuit 1 / Winding B compressor 1 circuit 1 / Part load compressor 1 circuit 1
NO3	Liquid solenoid circuit 1 / Compressor 3 circuit 1/ Part load compressor 1 circuit 1 (if PART-WINDING enabled) / condenser fan 2 circuit 1
NO 4	Condenser fan 1 circuit 1
NO 5	Circulating fan
NO 6	Compressor 1 circuit 2 / Winding A compressor 1 circuit 2
NO 7	Compressor 2 circuit 2 / Winding B compressor 1 circuit 2 / Compressor 1 capacity control circuit 2
NO 8	Liquid solenoid circuit 2 / Compressor 3 circuit 2/ Compressor 1 capacity control circuit 2 Condenser fan 2 circuit 2
NO 9	Condenser fan 1 circuit 2/ Condenser fan 2 circuit 1
NO10	General alarm
NO11	Antifreeze heater circuit 1
NO12	Antifreeze heater circuit 2/ Support heater in heating operation
NO13	4-way valve circuit 1
NO14	4-way valve circuit 2

ANALOGUE OUTPUTS

Y1	0 to 10 V condenser fan inverter circuit 1
Y2	0 to 10 V condenser fan inverter circuit 2
Y3	PWM condenser fan inverter circuit 1
Y4	PWM condenser fan inverter circuit 2
Y5	
Y6	

Important:
If using a single condenser, with 2 fans configured and 3 compressors configured, in the event of step control, the dedicated outputs will be number 4 and number 9.

8.2 Air / water units

8.2.1 Cooling only

DIGITAL INPUTS

ID 1	Serious alarm
ID 2	Evaporator flow switch
ID 3	Remote ON/OFF
ID 4	Main pump thermal overload
ID 5	Low pressure switch circuit 1
ID 6	High pressure switch circuit 1
ID 7	Compressor 1 thermal overload circuit 1
ID 8	Compressor 2 thermal overload circuit 1
ID 9	Condenser fan 1 thermal overload circuit 1
ID10	Low pressure switch circuit 2
ID11	High pressure switch circuit 2
ID12	Compressor 1 thermal overload circuit 2
ID13	Compressor 2 thermal overload circuit 2
ID14	Condenser fan 1 thermal overload circuit 2
ID15	
ID16	Compressor 3 thermal overload circuit 1 / Condenser fan 2 thermal overload circuit 1
ID17	Compressor 3 thermal overload circuit 2 /Condenser fan 2 thermal overload circuit 2
ID18	Evaporator pump 2 thermal overload

ANALOGUE INPUTS

B1	Condensing temperature circuit 1/Evaporation pressure circuit 1/ External water storage temperature
B2	Condensing temperature circuit 2 /Evaporation pressure circuit 2
B3	Condensing pressure circuit 1
B4	Condensing pressure circuit 2
B5	Evaporator water inlet temperature
B6	Water outlet temperature
B7	Outside temperature
B8	Remote set point
B9	Evaporator 1 water outlet temperature
B10	Evaporator 2 water outlet temperature

DIGITAL OUTPUTS

NO1	Compressor 1 circuit 1 / Winding A compressor 1 circuit 1
NO2	Compressor 2 circuit 1 / Winding B compressor 1 circuit 1 / Part load compressor 1 circuit 1
NO3	Liquid solenoid circuit 1 / Compressor 3 circuit 1/ Part load compressor 1 circuit 1 / Condenser fan 2 circuit 1
NO 4	Condenser fan 1 circuit 1
NO 5	Pump
NO 6	Compressor 1 circuit 2 / Winding A compressor 1 circuit 2
NO 7	Compressor 2 circuit 2 / Winding B compressor 1 circuit 2 / Compressor 1 capacity control circuit 2
NO 8	Liquid solenoid circuit 2 / Compressor 3 circuit 2/ Compressor 1 capacity control circuit 2 / Condenser fan 2 circuit 2
NO 9	Condenser fan 1 circuit 2/ Condenser fan 2 circuit 1
NO10	General alarm
NO11	Antifreeze heater circuit 1
NO12	Antifreeze heater circuit 2
NO13	
NO14	

ANALOGUE OUTPUTS

Y1	0 to 10 V condenser fan inverter circuit 1
Y2	0 to 10 V condenser fan inverter circuit 2
Y3	PWM condenser fan inverter circuit 1
Y4	PWM condenser fan inverter circuit 2
Y5	Pump 2
Y6	

Important:
If using a single condenser, with 2 fans configured and 3 compressors configured, in the event of step control, the dedicated outputs will be number 4 and number 9.

8.2.2 Cooling + Heat pump

DIGITAL INPUTS

ID 1	Serious alarm
ID 2	Evaporator flow switch
ID 3	Remote ON/OFF
ID 4	Main pump thermal overload
ID 5	Low pressure switch circuit 1
ID 6	High pressure switch circuit 1
ID 7	Compressor 1 thermal overload circuit 1
ID 8	Compressor 2 thermal overload circuit 1
ID 9	Condenser fan 1 thermal overload circuit 1
ID10	Low pressure switch circuit 2
ID11	High pressure switch circuit 2
ID12	Compressor 1 thermal overload circuit 2
ID13	Compressor 2 thermal overload circuit 2
ID14	Condenser fan 1 thermal overload circuit 2
ID15	Select cooling/heating
ID16	Compressor 3 thermal overload circuit 1 / Condenser fan 2 thermal overload circuit 1
ID17	Compressor 3 thermal overload circuit 2 /Condenser fan 2 thermal overload circuit 2
ID18	Evaporator pump 2 thermal overload

ANALOGUE INPUTS

B1	Condensing temperature circuit 1/Evaporation pressure circuit 1/ External water storage temperature
B2	Condensing temperature circuit 2 /Evaporation pressure circuit 2
B3	Condensing pressure circuit 1
B4	Condensing pressure circuit 2
B5	Evaporator water inlet temperature
B6	Water outlet temperature
B7	Outside temperature
B8	Remote set point
B9	Evaporator 1 water outlet temperature
B10	Evaporator 2 water outlet temperature

DIGITAL OUTPUTS

NO1	Compressor 1 circuit 1 / Winding A compressor 1 circuit 1
NO2	Compressor 2 circuit 1 / Winding B compressor 1 circuit 1 / Part load compressor 1 circuit 1
NO3	Liquid solenoid circuit 1 / Compressor 3 circuit 1/ Part load compressor 1 circuit 1 condenser fan 2 circuit 1
NO 4	Condenser fan 1 circuit 1
NO 5	Pump
NO 6	Compressor 1 circuit 2 / Winding A compressor 1 circuit 2
NO 7	Compressor 2 circuit 2 / Winding B compressor 1 circuit 2 / Compressor 1 capacity control circuit 2
NO 8	Liquid solenoid circuit 2 / Compressor 3 circuit 2/ Compressor 1 capacity control circuit 2Condenser fan 2 circuit 2 / Pump 2
NO 9	Condenser fan 1 circuit 2 / Condenser fan 2 circuit 1
NO10	General alarm
NO11	Antifreeze heater circuit 1
NO12	Antifreeze heater circuit 2 / Support heater in heating operation
NO13	4-way valve circuit 1
NO14	4-way valve circuit 2

ANALOGUE OUTPUTS

Y1	0 to 10 V condenser fan inverter circuit 1
Y2	0 to 10 V condenser fan inverter circuit 2
Y3	PWM condenser fan inverter circuit 1
Y4	PWM condenser fan inverter circuit 2
Y5	Pump 2
Y6	

Important:
If using a single condenser, with 2 fans configured and 3 compressors configured, in the event of step control, the dedicated outputs will be number 4 and number 9.

8.3 Water / water units

8.3.1 Cooling only

DIGITAL INPUTS

ID 1	Serious alarm
ID 2	Evaporator flow switch
ID 3	Remote ON/OFF
ID 4	Main pump thermal overload
ID 5	Low pressure switch circuit 1
ID 6	High pressure switch circuit 1
ID 7	Compressor 1 thermal overload circuit 1
ID 8	Compressor 2 thermal overload circuit 1
ID 9	Condenser pump thermal overload
ID10	Low pressure switch circuit 2
ID11	High pressure switch circuit 2
ID12	Compressor 1 thermal overload circuit 2
ID13	Compressor 2 thermal overload circuit 2
ID14	Condenser flow switch
ID15	
ID16	Compressor 3 thermal overload circuit 1
ID17	Compressor 3 thermal overload circuit 2
ID18	Evaporator pump 2 thermal overload

ANALOGUE INPUTS

B1	Condensing temperature circuit 1/Evaporation pressure circuit 1
B2	Condensing temperature circuit 2 /Evaporation pressure circuit 2
B3	Condensing pressure circuit 1
B4	Condensing pressure circuit 2
B5	Evaporator water inlet temperature
B6	Water outlet temperature
B7	Outside temperature
B8	Remote set point
B9	Evaporator 1 water outlet temperature
B10	Evaporator 2 water outlet temperature

DIGITAL OUTPUTS

NO1	Compressor 1 circuit 1 / Winding A compressor 1 circuit 1
NO2	Compressor 2 circuit 1 / Winding B compressor 1 circuit 1 / Part load compressor 1 circuit 1
NO3	Liquid solenoid circuit 1 / Compressor 3 circuit 1/ Part load compressor 1 circuit 1
NO 4	
NO 5	Pump
NO 6	Compressor 1 circuit 2 / Winding A compressor 1 circuit 2
NO 7	Compressor 2 circuit 2 / Winding B compressor 1 circuit 2 / Compressor 1 capacity control circuit 2
NO 8	Liquid solenoid circuit 2 / Compressor 3 circuit 2 / Compressor 1 capacity control circuit 2 / Pump 2
NO 9	
NO10	General alarm
NO11	Antifreeze heater circuit 1
NO12	Antifreeze heater circuit 2
NO13	
NO14	Condenser pump

ANALOGUE OUTPUTS

Y1	
Y2	
Y3	
Y4	
Y5	Pump 2
Y6	

8.3.2 Cooling + Heat pump with reversal on the water circuit

DIGITAL INPUTS

ID 1	Serious alarm
ID 2	Evaporator flow switch
ID 3	Remote ON/OFF
ID 4	Main pump thermal overload
ID 5	Low pressure switch circuit 1
ID 6	High pressure switch circuit 1
ID 7	Compressor 1 thermal overload circuit 1
ID 8	Compressor 2 thermal overload circuit 1
ID 9	Condenser pump thermal overload
ID10	Low pressure switch circuit 2
ID11	High pressure switch circuit 2
ID12	Compressor 1 thermal overload circuit 2
ID13	Compressor 2 thermal overload circuit 2
ID14	Condenser flow switch
ID15	Cooling/ heating selection
ID16	Compressor 3 thermal overload circuit 1
ID17	Compressor 3 thermal overload circuit 2
ID18	Evaporator pump 2 thermal overload

ANALOGUE INPUTS

B1	Condenser inlet temperature
B2	Condenser outlet temperature
B3	Condensing pressure circuit 1
B4	Condensing pressure circuit 2
B5	Evaporator water inlet temperature
B6	Water outlet temperature
B7	Outside temperature
B8	Remote set point
B9	Evaporator 1 water outlet temperature
B10	Evaporator 2 water outlet temperature

DIGITAL OUTPUTS

NO1	Compressor 1 circuit 1 / Winding A compressor 1 circuit 1
NO2	Compressor 2 circuit 1 / Winding B compressor 1 circuit 1 / Part load compressor 1 circuit 1
NO3	Liquid solenoid circuit 1 / Compressor 3 circuit 1 Part load compressor 1 circuit 1
NO 4	
NO 5	Pump
NO 6	Compressor 1 circuit 2 / Winding A compressor 1 circuit 2
NO 7	Compressor 2 circuit 2 / Winding B compressor 1 circuit 2 / Compressor 1 capacity control circuit 2
NO 8	Liquid solenoid circuit 2 / Compressor 3 circuit 2/ Compressor 1 capacity control circuit 2 / Pump 2
NO 9	
NO10	General alarm
NO11	Antifreeze heater circuit 1
NO12	Antifreeze heater circuit 2 / Support heater in heating operation
NO13	Reversing valve
NO14	Condenser pump

ANALOGUE OUTPUTS

Y1	
Y2	
Y3	
Y4	
Y5	Pump 2
Y6	

8.3.3 Cooling + Heat pump with reversal on the refrigerant circuit

DIGITAL INPUTS

ID 1	Serious alarm
ID 2	Evaporator flow switch
ID 3	Remote ON/OFF
ID 4	Main pump thermal overload
ID 5	Low pressure switch circuit 1
ID 6	High pressure switch circuit 1
ID 7	Compressor 1 thermal overload circuit 1
ID 8	Compressor 2 thermal overload circuit 1
ID 9	Condenser pump thermal overload
ID10	Low pressure switch circuit 2
ID11	High pressure switch circuit 2
ID12	Compressor 1 thermal overload circuit 2
ID13	Compressor 2 thermal overload circuit 2
ID14	Condenser flow switch
ID15	Cooling/ heating selection
ID16	Compressor 3 thermal overload circuit 1
ID17	Compressor 3 thermal overload circuit 2
ID18	Evaporator pump 2 thermal overload

ANALOGUE INPUTS

B1	Condensing temperature circuit 1/Evaporation pressure circuit 1
B2	Condensing temperature circuit 2 /Evaporation pressure circuit 2
B3	Condensing pressure circuit 1
B4	Condensing pressure circuit 2
B5	Evaporator water inlet temperature
B6	Water outlet temperature
B7	Outside temperature
B8	Remote set point
B9	Evaporator 1 water outlet temperature
B10	Evaporator 2 water outlet temperature

DIGITAL OUTPUTS

NO1	Compressor 1 circuit 1 / Winding A compressor 1 circuit 1
NO2	Compressor 2 circuit 1 / Winding B compressor 1 circuit 1 / Part load compressor 1 circuit 1
NO3	Liquid solenoid circuit 1 / Compressor 3 circuit 1 Part load compressor 1 circuit 1
NO 4	Defrost heater circuit 1
NO 5	Pump
NO 6	Compressor 1 circuit 2 / Winding A compressor 1 circuit 2
NO 7	Compressor 2 circuit 2 / Winding B compressor 1 circuit 2 / Compressor 1 capacity control circuit 2
NO 8	Liquid solenoid circuit 2 /Compressor 3 circuit 2/ Compressor 1 capacity control circuit 2 Pump 2
NO 9	Defrost heater circuit 2
NO10	General alarm
NO11	Antifreeze heater circuit 1
NO12	Antifreeze heater circuit 2 / Support heater in heating operation
NO13	Reversing valve
NO14	Condenser pump

ANALOGUE OUTPUTS

Y1	
Y2	
Y3	
Y4	
Y5	Pump 2
Y6	

8.4 Air-cooled condensing units

8.4.1 Cooling only

DIGITAL INPUTS

ID 1	Serious alarm / Remote ON/OFF (with digital controls). Serious alarm (with analogue control)
ID 2	Compressor 1 control (with digital controls) Not used (with analogue control)
ID 3	Compressor 2 control (with digital controls) Remote ON/OFF (with analogue control)
ID 4	Compressor 3 control (with tandem circuits and with digital controls) Compressor 3 and 4 control (with trio circuits and with digital controls) Not used (with analogue control)
ID 5	Low pressure switch circuit 1
ID 6	High pressure switch circuit 1
ID 7	Compressor 1 thermal overload circuit 1
ID 8	Compressor 2 thermal overload circuit 1
ID 9	Condenser fan 1 thermal overload circuit 1
ID10	Low pressure switch circuit 2
ID11	High pressure switch circuit 2
ID12	Compressor 1 thermal overload circuit 2
ID13	Compressor 2 thermal overload circuit 2
ID14	Condenser fan 1 thermal overload circuit 2
ID15	
ID16	Compressor 3 thermal overload circuit 1 / Condenser fan 2 thermal overload circuit 1
ID17	Compressor 3 thermal overload circuit 2 /Condenser fan 2 thermal overload circuit 2
ID18	Compressor 4 control (with tandem circuits and with digital controls) Compressor 5 and 6 control (with trio circuits and with digital controls) Not used (with analogue control)

ANALOGUE INPUTS

B1	Condensing temperature circuit 1/Evaporation pressure circuit 1
B2	Condensing temperature circuit 2 /Evaporation pressure circuit 2
B3	Condensing pressure circuit 1
B4	Condensing pressure circuit 2
B5	
B6	
B7	Outside temperature
B8	Remote set point
B9	
B10	

DIGITAL OUTPUTS

NO1	Compressor 1 circuit 1 / Winding A compressor 1 circuit 1
NO2	Compressor 2 circuit 1 / Winding B compressor 1 circuit 1 / Part load compressor 1 circuit 1
NO3	Liquid solenoid circuit 1 / Compressor 3 circuit 1/ Part load compressor 1 circuit 1 / Condenser fan 2 circuit 1
NO 4	Condenser fan 1 circuit 1
NO 5	
NO 6	Compressor 1 circuit 2 / Winding A compressor 1 circuit 2
NO 7	Compressor 2 circuit 2 / Winding B compressor 1 circuit 2 / Compressor 1 capacity control circuit 2
NO 8	Liquid solenoid circuit 2 / Compressor 3 circuit 2/ Compressor 1 capacity control circuit 2 / Condenser fan 2 circuit 2
NO 9	Condenser fan 1 circuit 2 / Condenser fan 2 circuit 1
NO10	General alarm
NO11	
NO12	
NO13	
NO14	

ANALOGUE OUTPUTS

Y1	0 to 10 V condenser fan inverter circuit 1
Y2	0 to 10 V condenser fan inverter circuit 2
Y3	PWM condenser fan inverter circuit 1
Y4	PWM condenser fan inverter circuit 2
Y5	
Y6	

Important:

If using a single condenser, with 2 fans configured and 3 compressors configured, in the event of step control, the dedicated outputs will be number 4 and number 9.

8.4.2 Cooling + Heat pump

DIGITAL INPUTS

ID 1	Serious alarm / Remote ON/OFF (with digital controls) Serious alarm (with analogue control)
ID 2	Compressor 1 control (with digital controls) Not used (with analogue control)
ID 3	Compressor 2 control (with digital controls) Remote ON/OFF (with analogue control)
ID 4	Compressor 3 control (with tandem circuits and with digital controls) Compressor 3 and 4 control (with trio circuits and with digital controls) Not used (with analogue control)
ID 5	Low pressure switch circuit 1
ID 6	High pressure switch circuit 1
ID 7	Compressor 1 thermal overload circuit 1
ID 8	Compressor 2 thermal overload circuit 1
ID 9	Condenser fan 1 thermal overload circuit 1
ID10	Low pressure switch circuit 2
ID11	High pressure switch circuit 2
ID12	Compressor 1 thermal overload circuit 2
ID13	Compressor 2 thermal overload circuit 2
ID14	Condenser fan 1 thermal overload circuit 2
ID15	Cooling / heating selection
ID16	Compressor 3 thermal overload circuit 1 / Condenser fan 2 thermal overload circuit 1
ID17	Compressor 3 thermal overload circuit 2 /Condenser fan 2 thermal overload circuit 2
ID18	Compressor 4 control (with tandem circuits and with digital controls) Compressor 5 and 6 control (with trio circuits and with digital controls) Not used (with analogue control)

ANALOGUE INPUTS

B1	Condensing temperature circuit 1/Evaporation pressure circuit 1
B2	Condensing temperature circuit 2 /Evaporation pressure circuit 2
B3	Condensing pressure circuit 1
B4	Condensing pressure circuit 2
B5	
B6	
B7	Outside temperature
B8	Remote set pointl
B9	
B10	

DIGITAL OUTPUTS

NO1	Compressor 1 circuit 1 / Winding A compressor 1 circuit 1
NO2	Compressor 2 circuit 1 / Winding B compressor 1 circuit 1 / Part load compressor 1 circuit 1
NO3	Liquid solenoid circuit 1 / Compressor 3 circuit 1/ Part load compressor 1 circuit 1 condenser fan 2 circuit 1
NO 4	Condenser fan 1 circuit 1
NO 5	
NO 6	Compressor 1 circuit 2 / Winding A compressor 1 circuit 2
NO 7	Compressor 2 circuit 2 / Winding B compressor 1 circuit 2 / Compressor 1 capacity control circuit 2
NO 8	Liquid solenoid circuit 2 / Compressor 3 circuit 2/ Compressor 1 capacity control circuit 2 Condenser fan 2 circuit 2
NO 9	Condenser fan 1 circuit 2 / Condenser fan 2 circuit 1
NO10	General alarm
NO11	
NO12	
NO13	4-way valve circuit 1
NO14	4-way valve circuit 2

ANALOGUE OUTPUTS

Y1	0 to 10 V condenser fan inverter circuit 1
Y2	0 to 10 V condenser fan inverter circuit 2
Y3	PWM condenser fan inverter circuit 1
Y4	PWM condenser fan inverter circuit 2
Y5	
Y6	

Important:
If using a single condenser, with 2 fans configured and 3 compressors configured, in the event of step control, the dedicated outputs will be number 4 and number 9.

Note
Part Winding management has been added to all unit configurations, together with the management of semi hermetic compressors with a single unloader valve.

9. ALARMS

9.1 Table of alarms

The following table describes all the alarms managed by the unit, indicating the type of devices disabled for each.

Code: this is the alarm ID code, which is shown cyclically on the PLD display
Description: this is the description of the type of alarm activated, as shown in the alarm log on the PGD0 display
Type: this indicates the source of the alarm
- DIN = digital input
- AIN = analogue input
- SYS = system
- DRV = electronic expansion valve driver

Reset: this indicates the type of reset featured for the alarm
- A = automatic
- M = manual
- S = selectable

Code	Description	Type	Reset	Delay	Compressors	Pump/ Fan	Fans	Notes
A001	Antifreeze alarm 1	DIN	M	/	X	X	X	
A002	Antifreeze alarm 2	AIN	S	/	X			
A003	Evaporator pump thermal overload	DIN	M	/	X(*)	X	X(*)	(*) If alarm on all the pumps
A004	Condenser pump thermal overload	DIN	M	/	X	X	X	
A005	Evaporator flow switch alarm	DIN	M	Start Steady operation	X(*)	X	X(*)	(*) If alarm on all the pumps
A006	Condenser flow switch alarm	DIN	M	Start Steady operation	X	X	X	Total unit shutdown due to serious alarm
A007	Main fan thermal overload	DIN	M	/				
A008	Evaporator pump 2 thermal overload	DIN	M	/	X(*)	X	X(*)	(*) If alarm on all the pumps
A009	Low pressure circ.1 (Pressure switch)	DIN	S	Start Steady operation	X			
A010	Low pressure circ. 2 (Pressure switch)	DIN	S	Start Steady operation	X			
A011	High pressure circ.1 (Pressure switch)	DIN	S	/	X			
A012	High pressure circ. 2 (Pressure switch)	DIN	S	/	X			
A013	Compressor 1 thermal overload circuit 1	DIN	S	/	X			
A014	Compressor 2 thermal overload circuit 1	DIN	S	/	X			
A015	Compressor 3 thermal overload circuit 1	DIN	S	/	X			
A016	Compressor 1 thermal overload circuit 2	DIN	S	/	X			
A017	Compressor 2 thermal overload circuit 2	DIN	S	/	X			
A018	Compressor 3 thermal overload circuit 2	DIN	S	/	X			
A019	Fan 1 thermal overload circuit 1	DIN	S	/	X(*)		X	(*) If alarm on all the fans
A020	Fan 2 thermal overload circuit 1	DIN	S	/	X(*)		X	(*) If alarm on all the fans
A021	Fan 1 thermal overload circuit 2	DIN	S	/	X(*)		X	(*) If alarm on all the fans
A022	Fan 2 thermal overload circuit 2	DIN	S	/	X(*)		X	(*) If alarm on all the fans
A023	High pressure circ. 1 (Transducer)	AIN	M	/	X		X(*)	(*) If high pressure prevent disabled
A024	High pressure circ. 2 (Transducer)	AIN	M	/	X		X(*)	(*) If high pressure prevent disabled
A025	Probe B1 faulty or disconnected	AIN	M	60s	X(*)		X(*)	(*) Operating mode can be configured if used as condensing temperature
A026	Probe B2 faulty or disconnected	AIN	M	60s	X(*)		X(*)	(*) Operating mode can be configured if used as condensing temperature
A027	Probe B3 faulty or disconnected	AIN	M	60s			X(*)	(*) Operating mode can be configured
A028	Probe B4 faulty or disconnected	AIN	M	60s			X(*)	(*) Operating mode can be configured
A029	Probe B5 faulty or disconnected	AIN	M	60s	X	X	X	
A030	Probe B6 faulty or disconnected	AIN	M	60s	X	X	X	
A031	Probe B7 faulty or disconnected	AIN	M	60s	X(*)		X(*)	
A032	Probe B8 faulty or disconnected	AIN	M	60s	X(*)		X(*)	(*) In condensing units if used as control input
A033	Probe B9 faulty or disconnected	AIN	M	60s				
A034	Probe B10 faulty or disconnected	AIN	M	60s				
A035	Fan/main pump operating hour threshold	SYS	M	/				
A036	Compressor 1 operating hour threshold circuit 1	SYS	M	/				
A037	Compressor 2 operating hour threshold circuit 1	SYS	M	/				
A038	Compressor 3 operating hour threshold circuit 1	SYS	M	/				
A039	Compressor 1 operating hour threshold circuit 2	SYS	M	/				
A040	Compressor 2 operating hour threshold circuit 2	SYS	M	/				
A041	Compressor 3 operating hour threshold circuit 2	SYS	M	/				
A042	Main pump 2 operating hour threshold	SYS	M	/				
A043	Clock board broken or not connected	SYS	S	5m (approx.)				Disables all the functions relating to the system clock

A044	Low pressure circ. 1 (Transducer)	AIN	S	Start(*) Steady operation	X		X	(*)Different delays and thresholds for chiller- heat pump- defrost
A045	Low pressure circ. 2 (Transducer)	AIN	S	Start(*) Steady operation	X		X	(*)Different delays and thresholds for chiller- heat pump- defrost
A046	Low room temperature alarm	AIN	M					
A047	Condenser pump operating hour threshold	SYS	M					
A048	Serious alarm from digital input	DIN	M	/	X	X	X	
A059	Test SMS on alarm sent successfully	SYS	M					
A060	Driver 1 EEPROM error	DRV	M	/	X		X	Prevents the corresponding circuit from starting
A061	Driver 2 EEPROM error	DRV	M	/	X		X	Prevents the corresponding circuit from starting
A062	Driver 3 EEPROM error	DRV	M	/	X		X	Prevents the corresponding circuit from starting
A063	Driver 4 EEPROM error	DRV	M	/	X		X	Prevents the corresponding circuit from starting
A064	Driver 1 EEV motor error	DRV	M	10s	X			Prevents the corresponding circuit from starting
A065	Driver 2 EEV motor error	DRV	M	10s	X			Prevents the corresponding circuit from starting
A066	Driver 3 EEV motor error	DRV	M	10s	X			Prevents the corresponding circuit from starting
A067	Driver 4 EEV motor error	DRV	M	10s	X			Prevents the corresponding circuit from starting
A068	Driver 1 MOP timeout	DRV	M	Settable	X			Stops the corresponding circuit
A069	Driver 2 MOP timeout	DRV	M	Settable	X			Stops the corresponding circuit
A070	Driver 3 MOP timeout	DRV	M	Settable	X			Stops the corresponding circuit
A071	Driver 4 MOP timeout	DRV	M	Settable	X			Stops the corresponding circuit
A072	Driver 1 LOP timeout	DRV	M	Settable	X			Stops the corresponding circuit
A073	Driver 2 LOP timeout	DRV	M	Settable	X			Stops the corresponding circuit
A074	Driver 3 LOP timeout	DRV	M	Settable	X			Stops the corresponding circuit
A075	Driver 4 LOP timeout	DRV	M	Settable	X			Stops the corresponding circuit
A076	Driver 1 low superheat	DRV	M	Settable	X			Stops the corresponding circuit
A077	Driver 2 low superheat	DRV	M	Settable	X			Stops the corresponding circuit
A078	Driver 3 low superheat	DRV	M	Settable	X			Stops the corresponding circuit
A079	Driver 4 low superheat	DRV	M	Settable	X			Stops the corresponding circuit
A080	Driver 1 EEV not closed when power OFF	DRV	M	/	X			Prevents the corresponding circuit from starting
A081	Driver 2 EEV not closed when power OFF	DRV	M	/	X			Prevents the corresponding circuit from starting
A082	Driver 3 EEV not closed when power OFF	DRV	M	/	X			Prevents the corresponding circuit from starting
A083	Driver 4 EEV not closed when power OFF	DRV	M	/	X			Prevents the corresponding circuit from starting
A084	Driver 1 high superheat	DRV	M	Settable	X			Stops the corresponding circuit
A085	Driver 2 high superheat	DRV	M	Settable	X			Stops the corresponding circuit
A086	Driver 3 high superheat	DRV	M	Settable	X			Stops the corresponding circuit
A087	Driver 4 high superheat	DRV	M	Settable	X			Stops the corresponding circuit
A088	Driver 1 probe S1 fault	DRV	M	/	X			Stops the corresponding circuit
A089	Driver 2 probe S1 fault	DRV	M	/	X			Stops the corresponding circuit
A090	Driver 3 probe S1 fault	DRV	M	/	X			Stops the corresponding circuit
A091	Driver 4 probe S1 fault	DRV	M	/	X			Stops the corresponding circuit
A092	Driver 1 probe S2 fault	DRV	M	/	X			Stops the corresponding circuit
A093	Driver 2 probe S2 fault	DRV	M	/	X			Stops the corresponding circuit
A094	Driver 3 probe S2 fault	DRV	M	/	X			Stops the corresponding circuit
A095	Driver 4 probe S2 fault	DRV	M	/	X			Stops the corresponding circuit
A096	Driver 1 probe S3 fault	DRV	M	/	X			Stops the corresponding circuit
A097	Driver 2 probe S3 fault	DRV	M	/	X			Stops the corresponding circuit
A098	Driver 3 probe S3 fault	DRV	M	/	X			Stops the corresponding circuit
A099	Driver 4 probe S3 fault	DRV	M	/	X			
A100	Driver 1 Go Ahead request	DRV	M	/	X			Prevents the corresponding circuit from starting
A101	Driver 2 Go Ahead request	DRV	M	/	X			Prevents the corresponding circuit from starting
A102	Driver 3 Go Ahead request	DRV	M	/	X			Prevents the corresponding circuit from starting
A103	Driver 4 Go Ahead request	DRV	M	/	X			Prevents the corresponding circuit from starting
A104	Driver 1 LAN disconnected	SYS	M	30s	X		X	Stops the corresponding circuit
A105	Driver 2 LAN disconnected	SYS	M	30s	X		X	Stops the corresponding circuit
A106	Driver 3 LAN disconnected	SYS	M	30s	X		X	Stops the corresponding circuit
A107	Driver 4 LAN disconnected	SYS	M	30s	X		X	Stops the corresponding circuit
A108	Driver 1 autosetup not completed	SYS	M	/				
A109	Driver 2 autosetup not completed	SYS	M	/				
A110	Driver 3 autosetup not completed	SYS	M	/				
A111	Driver 4 autosetup not completed	SYS	M	/				

9.2 Type of alarm reset

The reset mode can be set for some of the alarms listed in the table, choosing between automatic and manual:

- Compressor thermal overload
- Fan thermal overload
- Low pressure from transducer and/or pressure switch
- High pressure from transducer and/or pressure switch

If automatic reset is selected, a maximum number of events with automatic reset and maximum period of validity can be set, with the time counted from the activation of the first alarm.
If after this period the maximum number of repeats of a certain event is not reached, the timer is reset and the next alarm will start a new count.
If the maximum number N of repeats set is reached within the set time, then the next event (N+1) will be with manual reset, requiring the operator to intervene to restore the operation of the unit.
If manual reset is set, then each alarm event requires the intervention of the operator to restore the operation of the unit.

9.3 Alarm log

The alarm log is included to save the fundamental unit operating values in response to certain events.

9.4 Flow switch alarm

Inputs used

- Air flow switch (air/air units) [B12]
  Evaporator water flow switch

Parameters used

- Number of evaporator pumps [-H-]
- Evaporator flow switch alarm delay at start-up [P1]
- Evaporator flow switch alarm delay in steady operation [P2]

Outputs used

- Evaporator pump 1 [B33]
- Evaporator pump 2 [B36]
- Generic alarm [B38]

The evaporator flow switch alarm disables the operation of the unit if there is no water or air in the main exchanger, so as to prevent dangerous operating conditions with the compressors on and no water or air flow.

In Air/water or Water/water units, if control of the second circulating pump is enabled, as the flow switch alarm will cause the rotation of the pump in operation, the program will attempt to recover the situation by starting the reserve device.
The alarm management features two delay times before activation:

- when the water circuit is first started
- when the unit is in steady operation

The activation of the reserve pump to restore an alarm situation resets the delay in steady operation, after which any new alarm condition will cause the unit to shut down due to a serious water flow problem.
In general, with the reserve circulating pump enabled, the flow switch alarm can be activated two times in a row, after which the unit is switched off due to the alarm.

9.5 Circulating pump thermal overload alarm

Inputs used
- Evaporator pump 1 thermal overload [B14]
- Evaporator pump 2 thermal overload [B28]

Parameters used
- Number evaporator pumps [-H-]

Outputs used
- Evaporator pump 1 [B33]
- Evaporator pump 2 [B36]
- Generic alarm [B38]

The circulating pump thermal overload alarm disables the operation of the device, causing the unit to shutdown immediately, so as to prevent dangerous operating conditions with the compressors on and no water flow.
If control of the second circulating pump is enabled, as the thermal alarm will cause the rotation of the pump in operation, the program will attempt to recover the situation by starting the reserve device. Should there also be a thermal overload alarm on this device too, the unit will shutdown immediately.
In general, if in response to a thermal overload alarm a different pump cannot be started as support, the unit is switched off.

9.6 Condenser fan thermal overload alarm

Inputs used
- Condenser fan 1 thermal overload circuit 1 [B19]
- Condenser fan 2 thermal overload circuit 1 (1 condenser) [B24]
- Condenser fan 2 thermal overload circuit 1 (2 condensers, 4 fans) [B26]
- Condenser fan 1 thermal overload circuit 2 (2 condensers) [B24]
- Condenser fan 2 thermal overload circuit 2 (2 condensers, 4 fans) [B27]

Parameters used
- Number of condensers installed [-F-]
- Total number of fans installed [-F-]

Outputs used
- Fan 1 circuit 1 [B32]
- Fan 2 circuit 1 [B31]
- Fan 2 circuit 1 (single condenser) [B37]
- Fan 1 circuit 2 (2 condensers) [B37]
- Fan 2 circuit 2 [B36]

The purpose of an individual thermal overload alarm is to prevent the operation of the corresponding device.
The alarm affects the operation of the refrigerant circuit in different ways.
In general, if in a certain refrigerant circuit, due to one or more alarms the condenser fans are no longer available, then the compressors are also switched off, thus stopping the circuit, so as to avoid dangerous situations of high pressure in the condenser.

9.7 Antifreeze alarm

The activation of the antifreeze alarm is based on a set point and differential; if the water temperature falls below the set point, the compressors are stopped immediately, while the pump remains on to prevent the formation of ice.
The devices can only be restarted if the water temperature rises above the alarm set point + differential.
The set point for the antifreeze alarm is limited by minimum and maximum values, protected by manufacturer password, so as to prevent the values being set at dangerous extreme unit operating conditions.

The alarm reset can be defined as manual or automatic:
Manual reset: the activation of the antifreeze protection is delayed by a set time (in minutes) from when the unit starts, to allow the unit time to move the water and reach steady operation; the alarm causes the devices to shutdown as described and requires the operator to reset the unit from the user terminal; the unit will only restart if the temperature has returned above the alarm set point + differential.
Automatic reset: the activation of the antifreeze protection causes the devices to shutdown as described, and does not require any action by the operator to reset the operation of the unit; as soon as the temperature rises above the alarm set point + differential, the unit will restart automatically.

A start-up configuration can be defined for the devices in the event of antifreeze alarms when the unit is off.
This function applies only to air/water and water/water units, with the following options:

DISABLED: the function is disabled, consequently no load switches in response to an antifreeze alarm, except for the alarm relay
HEAT & PUMP ON: in response to an antifreeze alarm, the antifreeze heater and the circulating pump are started
HEAT & UNIT ON: in response to an antifreeze alarm, the antifreeze heater and the entire unit are started in heat pump mode, if operation in heating mode is featured
HEATER ONLY ON: in response to an antifreeze alarm, the antifreeze heater/heaters are started.

10. Connections, accessories and options

Dimensioni (mm) / Dimensions (mm)

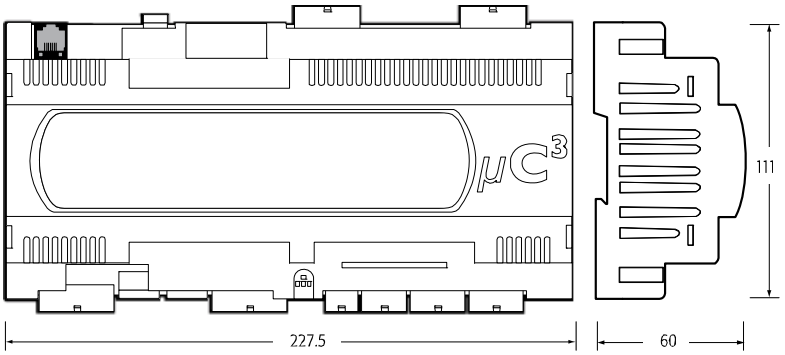


Fig. 1

Dima di foratura (mm)
Drilling template (mm)

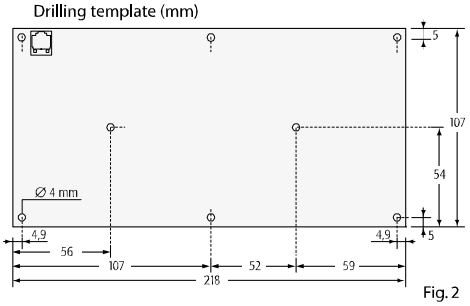


Fig. 2

Distanziatore plastico
Plastic spacer

A	12,7 mm
B	10,2 mm
C	5,6 mm
Ø	4,75 mm

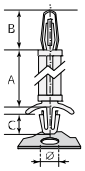


Fig. 3

11. Codes

Code accessories

µC3 in plastic case, complete (single package)	MCH3010020
µC3 without plastic case (multiple packs of 18 boards)	MCH3010001
µC3 connector kit (single package)	MCH3CON000
µC3 connector kit (multiple packs of 18 boards)	MCH3CON001
µC3 cable kit 2 m (single package)	MCH300CAB0
parameter programming key with external power supply	MCH300KYA0
clock board	PCO100CLK0
optically-isolated RS485 serial board	PCOS004850
RS232 serial board for modems	PCO100MDM0
LON FTT10 STD serial board with LonMark chiller profile	PCO10001F0
120x32 semi-graphic terminal, panel installation	PGD0000F00

12. Technical specifications

Plastic case material	technopolymer
flame retardancy	V0 (UL94) and 960°C (IEC 695)
ball pressure test	125°C
resistance to creeping current	≥250 V
colour	grey RAL7035
type of assembly	mounted on DIN rail, as per DIN 43880 and CEI EN 50022 standards

Electrical specifications

Power supply (controller with standard terminal connected): 22 to 38 Vdc or 24 Vac ±15% 50/60 Hz - Maximum power input P= 14 W.

Analogue inputs

analogue conversion	10-bit A/D converter, built-in CPU
type	5 inputs: B5, B6, B7, B9 and B10; CAREL NTC temperature sensors (-50T90°C; R/T 10 kΩ 25°C) 2 inputs: B3 and B4; sensors with 0 to 5 Vdc ratiometric signal 1 input: B8; sensor with 4 to 20 mA current signal 2 inputs: B1 and B2; NTC or 0 to 5 V, can be configured by software
maximum number	10
input time constant	1 s
internal resistance of 4 to 20 mA inputs	100 Ω

Analogue outputs

type and max. no.	4 x 0 to 10 Vdc outputs (Y1, Y2, Y5 and Y6); 2 PWM phase control outputs (Y3 and Y4) with a 5 V impulse of programmable duration;
resolution	8 bit
maximum load	1 kΩ (10 mA) for 0 to 10 V and 470 Ω (10 mA) for PWM

Digital outputs

maximum number	14 (electromechanical relays)	
	N1, N2, N3, N4	GROUP A: C1-2, C3-4
	N5	Signal relay 1: C5
	N6, N7, N8, N9	GROUP B: C6-7, C8-9
	N10	Signal relay 2: C10
	N11, N12, N13, N14	GROUP C: C11-12, C13-14
current limits	max current 2A for each relay output, extendable to 3A for a single output	

Some outputs are grouped in twos, with two common terminals so as to ensure easy assembly of the common pins. Make sure that the current running through the common terminals does not exceed the rated current of each individual terminal, that is: 6 A for the Mini-fit terminals.

Type of relay	1250 VA, 250Vac, 5 A resistive
EN approval	EN60730: 3 A resistive, 2 A inductive, 3(2) A (100,000 cycles)
UL approval	UL: 3 A resistive, 1 A FLA, 6 A LRA, 250 Vac, cosφ= 0.4, C300 (30,000 cycles)

All the relays must have the common in the same group [C1-2, C3-4], [C6-7, C8-9], [C11-12, C13-C14] connected together externally.

Power

G(+), G0(-)	Power supply to µchiller3 +24 Vdc/Vac
VDC	Power output for 24 Vdc active probes
5VR	Power output for 5 Vdc ratiometric probes
VZC	24 Vac zero crossing for the PWM phase control analogue outputs

The use of some inputs/outputs depends on the configuration of the parameters.

Other specifications

storage conditions	-20T70, 90 % RH non-condensing
operating conditions	-10T55, 90 % RH non-condensing
index of protection	IP20 or IP00 (version without plastic case)
environmental pollution	normal
class of protection against electric shock	to be integrated in Class I and/or II 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
category of resistance to heat and fire	category D (UL94 - V0)
immunity against voltage surges	category 1
no. of automatic operating cycles	100,000 (EN 60730-1); 30,000 (UL 873)
software class and structure	Class A

The device is not designed to be he-held.

WARNINGS

• when programming the parameters with the key, the controller must be disconnected form the power supply and any other devices;
• the 24 Vdc available at the Vdc terminal can be used to supply an 4 to 20 mA active probe; the maximum current is 100 mA. The 5 Vdc available at the 5VR terminals can be used to supply to the 0 to 5 V active ratiometric probes; the maximum total current is 50 mA;
• for applications subject to strong vibrations (1.5 mm pk-pk 10/55 Hz), secure the cables connected to the µchiller3 using clamps placed around 3 cm from the connectors;
• for operation in domestic environments, shielded cables must be used (one wire + shield) for the tLAN connections (EN 55014-1);
• If a single power transformer is used for the µchiller3 and the options, to avoid damaging the controller, all the G0 pins on the various controllers or the boards must be connected to the same terminal on the secondary, and all the G pins to the other terminal on the secondary, resetting the polarity of G and G0 for all the terminals;
• the system made up of the control board and the other optional boards represents a control device to be incorporated into class I or class II appliances.

CAREL

Cod. +030220431 Rel. 1.6 – 16/11/10