

LCA - LCW - LCR

Water chillers and heat pumps USER MANUAL

GB



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1 Introduction

"μchiller" is a Carel's regulator that integrates into just one case all the control functions required by an air-conditioning unit. "μchiller" is a complete, reliable and solid instrument. Thanks to its modular structure it provides a wide range of flexible applications.

"μchiller" has been specifically designed to control and regulate air/air units (also air-conditioning unit with two heating steps, two cooling steps and dead zone), chillers and chillers with single-compressor heat pump, single-compressor units with one capacity controlled routine or two-compressor units. Regulation of condensation fans can be either temperature or pressure based, with ON/OFF regulation mode or with continuous rotation speed variation.

Today using "μchiller", can be even easier thanks to the remote control unit that allows to easily and quickly select all the operating parameters. The μchiller control board can be entirely programmed for specific uses by means of a programmable and removable 'hardware key' to allow easy and rapid on-site operations.

For Customers requiring absolute security, "μchiller" can be connected with a removable User Interface. Since the regulator includes two different, separate parts - User Interface and power section - it is now possible to take away the User Interface once the unit has been programmed, so as to prevent unauthorized access to the selected parameters.

The additional use of an optional electronic serial card makes it possible to be linked to a centralized computer so as to obtain remote supervisory and/or telemaintenance services.

2 General Description

2.1 Functions

"μchiller" is a multi-processor system designed for the control of:

- air/water chillers
- air/water heat pumps
- water/water chillers
- water/water heat pumps with gas reversibility
- water/water motoevaporating units

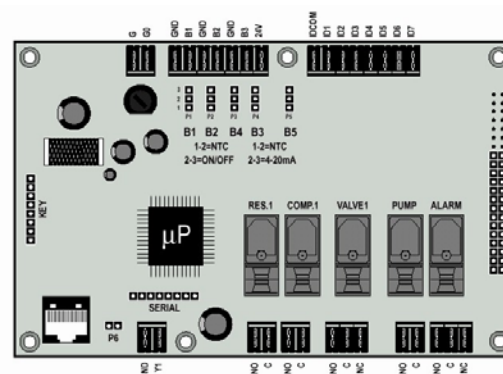
"μchiller" is based on two integrated systems (the 'Base' section including controller, inputs and outputs, and the terminal section with User Interface functions). The Base and Terminal components can be enhanced by adding optional boards allowing further auxiliary functions.

2.2 Main Board

The main board represents the core of the system, where the signals coming from the probes are processed. The modular structure of the microprocessor board allows to get great flexibility and high performance. The compressor board can be upgraded by adding a module for the regulation of the capacity-controlled routine of the compressor or for the management of a second circuit and compressor.

On this board you can locate clockwise the following connection "areas":

- G and G0 terminals for power source connection (24Vac)
- analog inputs (from B1 to B3) for probe connection
- 24V terminal (with D.C.) for the supply of pressure probes
- digital inputs (from ID1 to ID7) for alarm connection
- jumper connector for expansion board connection
- digital relay outputs to manage any controlled device
- the Y1 GND analog output for the connection of the optional boards for the management of condensation fans (ON/OFF regulation mode or with continuous rotation speed variation)
- telephone connector for user terminal connection



Within the board itself you can also locate other four important areas:

- the SERIAL jumper for connection of an optional serial board for the interfacing to a supervisory and/or telemaintenance centralized system
- the KEY jumper for connection of the optional board removable hardware key for the immediate on site programming of all data
- P1÷P5 pin-strips for the function mode selection of the analog inputs (B1÷B5)
- P6 pin-strip relative to the Y1 analog output (to be normally left open, except in particular situations - see parameters F3 and F4).

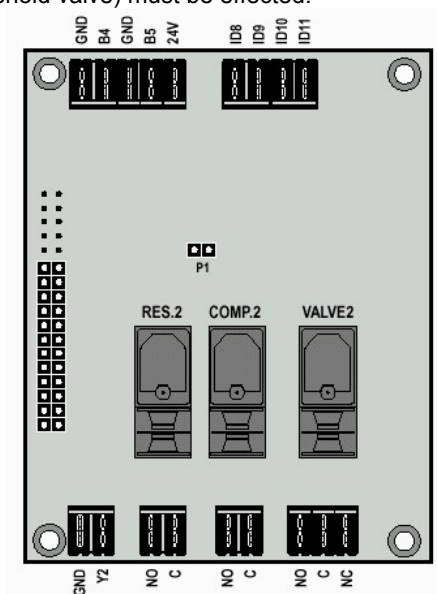
The single compressor board has been designed so as to support two connected terminals, allowing therefore data access from two different points; it can also work without any connected terminal, ensuring this way a total safety to the data.

2.3 Second compressor board

It represents an expansion of the main board, which proves to be useful for the management of a second compressor unit; in this case only the “COMP.2” terminal connection (used to manage the relative solenoid valve) must be effected.

The connection areas are the following (clockwise):

- analog inputs (B4 and B5) for the probes connection (relative to the second circuit);
- 24V terminal (with D.C.) for the supply of any pressure probe;
- digital inputs (from ID8 to ID11) for safety connections (relative to the second circuit);
- digital relay outputs to manage any controlled device;
- the Y2 GND analog output for the connection of the optional boards for the management of condensation fans (ON/OFF regulation mode or with continuous rotation speed variation);
- the flat cable for the connection to the single compressor main board;
- P1 pin-strip relative to the Y2 analog output (to be normally left open, except in particular situations - see parameters F3 and F4).



3 User Interface (Terminal)

The terminal allows the access to the data of the unit.

The terminal can be supplied either in panel-mounting version or, for remote connection, in wall-mounting version .

On the terminal there are 5 LED indicators to indicate the status of the unit (Cooling/Heating), the status of the compressors (ON/OFF) and the timer for compressors/pump after 100 operating hours. The wall-mounted version, moreover, can be remoted up to 150m through an optional board to be placed near the single compressor board.

An internal buzzer (which can be excluded in both versions via dip-switch or via dedicated parameter) signals any alarm in the unit.

Display

The display consists of 3 digits, with the automatic display of the decimal point between -19.9 and + 19.9°C; outside this measurement range, the value is automatically displayed without decimal - e.g. 21 - (although in its inside the machine is always operating by taking into account the decimal part). During the normal operation, the displayed value corresponds to the temperature being read by the probe B1, that is the evaporator water in-let temperature.



Figura 1 Panel mounting terminal



Figura 2 Wall mounting terminal

3.1 Status of the unit

The User is informed of the status of the unit by means of five LED indicators on the terminal display and two LED indicators (yellow and green) placed on the main board.

Meaning of LED indicators in single-compressor units

LED	Flashing	Steady
Comp. (left)	Not used	Not used
Comp. (right)	Request for compres. 1	Compressor 1 actuated
Cooling	-	Cooling
Heating	-	Heating
x100	-	Value x100

Meaning of LED indicators in two-compressor units

LED	Flashing	Steady
Comp. (left)	Request for compres. 1	Compressor 1 actuated
Comp. (right)	Request for compres. 2 or Request for compres. 1 at 100%	Compressor 2 actuated or Compressor 1 actuated at 100%
Cooling	-	Cooling
Heating	-	Heating
x100	-	Value x100

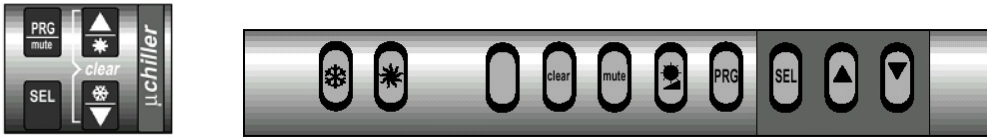
Yellow and green LED indicators on the main board.

The yellow LED indicator informs the User of the correct operating of the unit. During normal operation it blinks every 1 second. In case of alarm condition it flashes more rapidly (about 2 times per second). In case of LED off the unit is disconnected from power supply.

The green LED indicates that communication between unit and remote terminal is OK. In case of communication failure, the green LED turns off (usually due to a problem with the cable or to a not good contact between the cable and its relative female telephone connector on the main board or on the terminal).

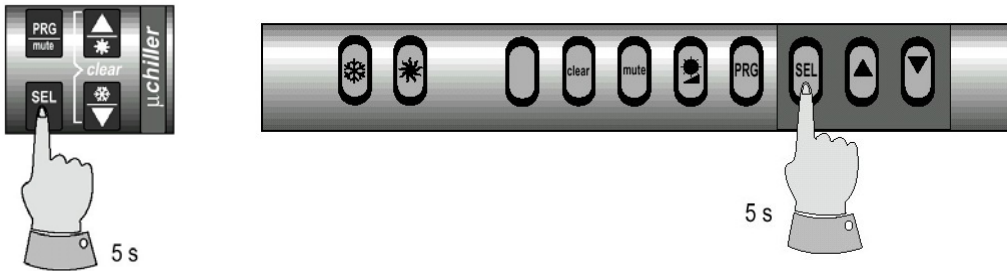
3.2 Keypad

The keypad allows to set the function parameters of the unit. In the wall-mounting remote version, it is composed of several buttons to easy the use. The performance functions of each button will be indicated here below.



3.3 Buttons and relative messages on display

Setting and displaying the set point and the main control parameters (DIRECT parameters).

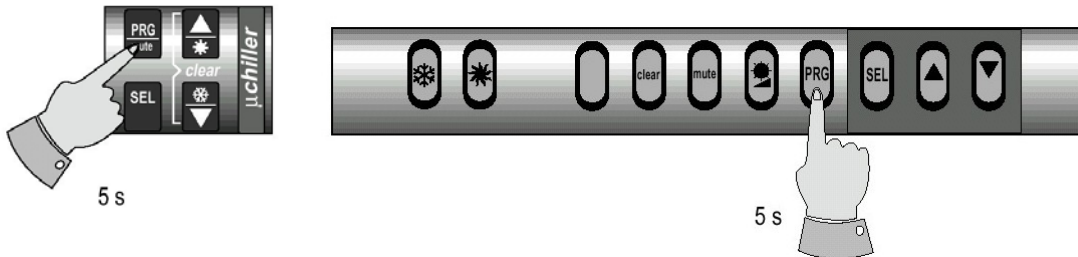


The DIRECT parameters are set-points (Cooling and Heating) and main control parameters of the unit (Cooling and Heating differentials, 1 and 2 circuit water temperature, 1 and 2 circuit condensation temperature/pressure). If you press SEL for more than 5 seconds the display shows the code of the first parameter - the Cooling set-point - that can be modified.

Pressing the and buttons allows to scroll all direct parameters. Press SEL again to display the required DIRECT parameter and modify its value (with the and buttons). Press PRG to store the modified parameters and exit the procedure, while the SEL button allows to return to the DIRECT parameters menu. On setting the parameters, the display will automatically flash after a few seconds if no buttons are pressed.

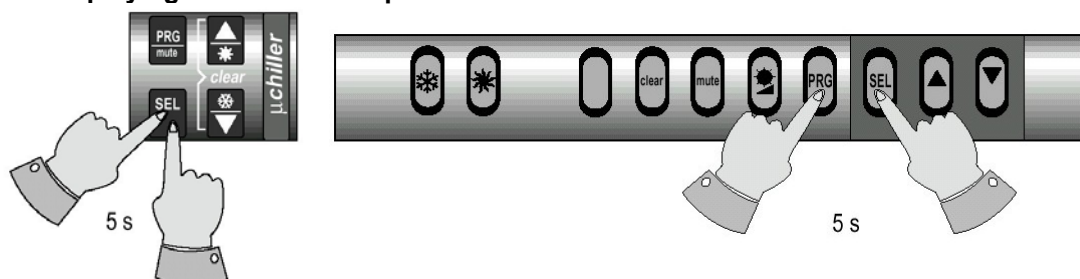
If you do not press any button within 60 seconds after having entered this procedure, the unit will return to normal operation without storing the values of the modified parameters.

Setting and displaying USER parameters



These "working" parameters are protected by a password (22) to prevent any unauthorized access to the data. Press PRG for more than 5 seconds (the buzzer must be off) to enter the USER parameters (the unit "operating" parameters) menu. Setting the password: "00" blinks on the display. Use the and buttons to select the password value, or, if the password is correct (22), press SEL to enter the USER parameter section. On setting the password, the display will automatically flash after a few seconds if no buttons are pressed. USER parameters selection: the display shows the code of the User parameter that can be modified. Pressing the and buttons allows to scroll all User parameters. Press SEL again to display the required User parameter and modify its value (with the and buttons). Press PRG to store the modified parameters and exit the procedure, while the SEL button allows to return to the User parameters menu. On setting the parameters, the display will automatically flash after a few seconds if no buttons are pressed. If you do not press any button within 60 seconds after having entered this procedure, the unit will return to normal operation without storing the values of the modified parameters.

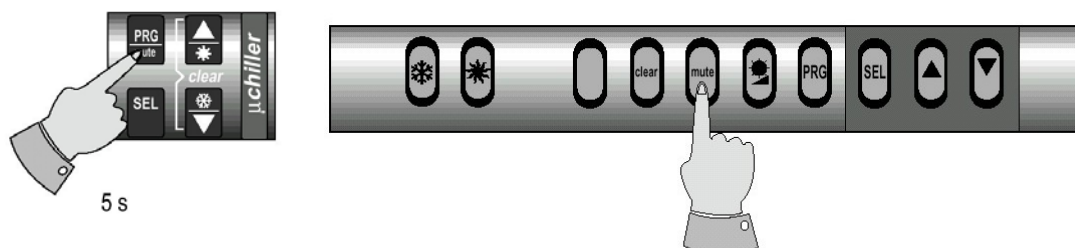
Setting and displaying FACTORY-SET parameters



Factory-set parameters are configuration parameters and so they are protected by a password to prevent any unauthorized access to the data. Press PRG and SEL simultaneously for more than 5 seconds to enter the factory-set parameters (unit configuration parameters) menu. This section is protected by a code (password), which is different from the User one, to prevent any unauthorized access to the data. Setting the password: "00" flashes on the display. Pressing the ▲ and ▼ buttons will allow you to stop the blinking effect for a few seconds and select the password value; then press SEL to directly enter the factory-set parameters section. On setting the password, the display will automatically flash after a few seconds if no buttons are pressed. FACTORY-set parameters selection: the display shows the code of the factory-set parameter that can be modified. Pressing ▲ and ▼ allows to scroll all factory-set parameters. Press SEL again to display the required Factory parameter and modify its value (with the ▲ and ▼ buttons).

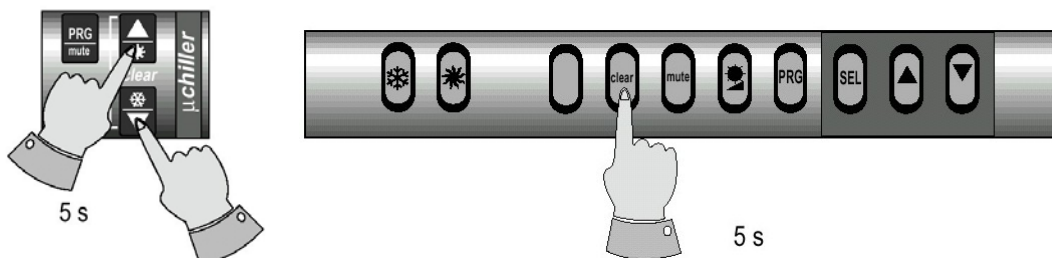
Press PRG to store the modified parameters and exit the procedure, while the SEL button allows to return to the Factory parameters menu. On setting the parameters, the display will automatically flash after a few seconds if no buttons are pressed. If you do not press any button within 60 seconds after having entered this procedure, the unit will return to normal operation without storing the values of the modified parameters.

Muting the BUZZER



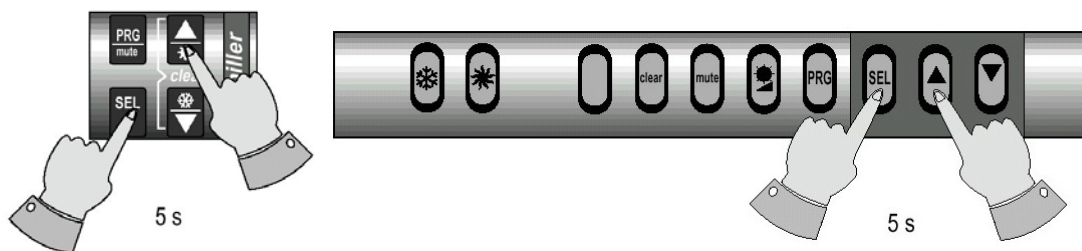
Press the MUTE button to silence the buzzer.

Resetting ALARMS



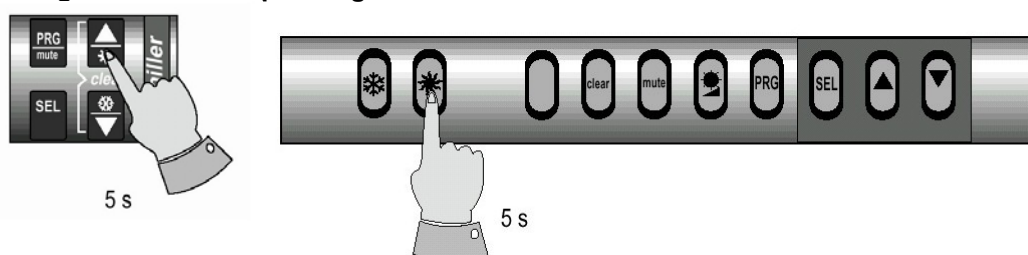
Press ▲ and ▼ for more than 5 seconds to reset any alarm condition (manual reset). The relative LED light will turn off and the alarm relay will be switched off. In wall-mounting versions, you only have to press CLEAR for 5 seconds.

Forcing a DEFROSTING CYCLE (only Air/Water Heat Pumps)



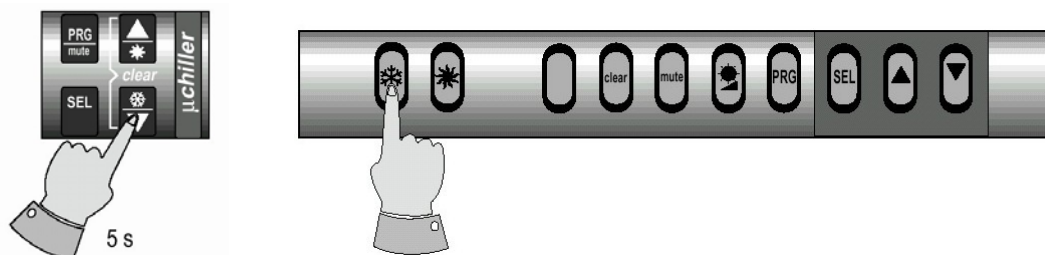
To force a defrosting cycle press the SEL and buttons for more than 5 seconds (if the temperature/pressure values of the outdoor exchanger are lower than the values set for the end of defrosting). In units with 2 Circuits the defrosting cycles will be simultaneous.

Enabling/disabling of COOLING operating mode



The cooling operating mode can be enabled/disabled by pressing the button (in panel-mounted versions) for more than 5 s (see, if necessary, the param. P6). It is not possible to directly pass from the heating to the cooling operating mode: if the unit is actually operating in the heating mode, pressing the UP button will not swap the current mode.

Enabling/disabling of HEATING operating mode

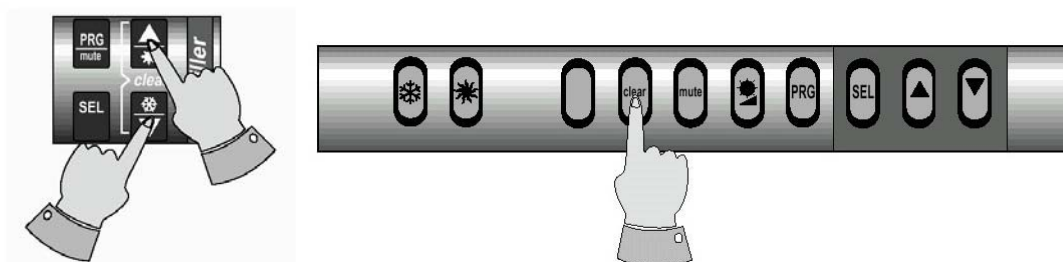


The Heating operating mode can be enabled/disabled by pressing the button (in panel-mounted versions) for more than 5 seconds (see, if necessary, the parameter P6). It is not possible to directly pass from the Cooling to the Heating operating mode: if the unit is actually operating in the Cooling mode, pressing the UP button will not swap the current mode; it is necessary to inhibit the Cooling mode.

Stand-by

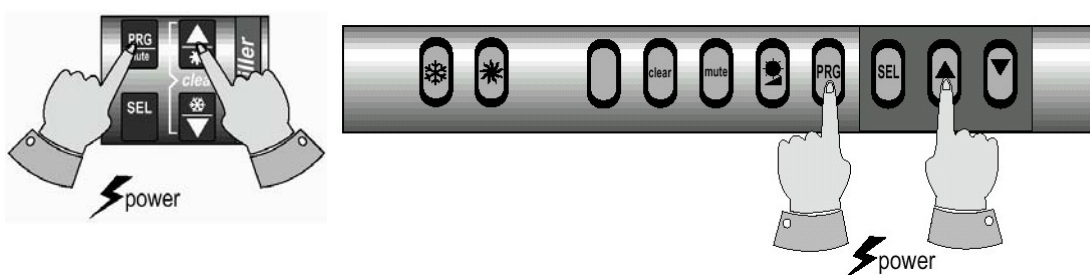
To turn off the unit, deactivate the current operating mode (Cooling or Heating). When the μ chiller is turned off, it maintains the 4-way valves in the previous position for a period equal to the parameter c8 (pump OFF delay after the compressor is OFF).

Reset timers



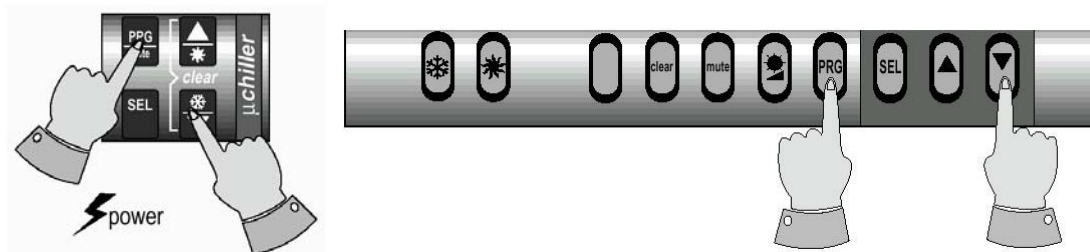
When the display shows the operating hours of the compressor or of the pump (parameters c9, cA and cC), you can reset the timer by pressing the and buttons (and the CLEAR button in wall-mounted versions). In this case the unit will not prompt the relative compressors maintenance message.

Copying the KEY in the unit's EEprom



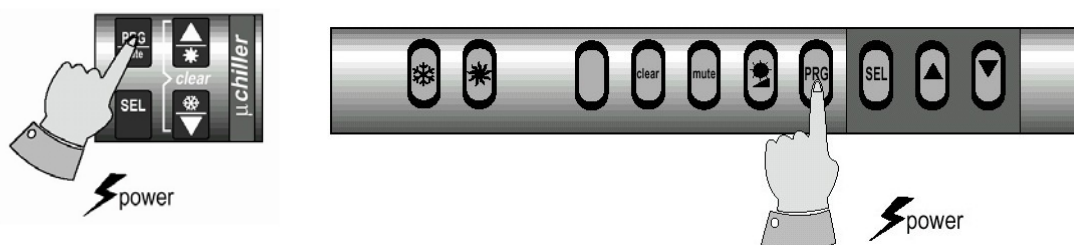
Press PRG and at μ chiller start-up to copy the removable hardware key (optional) into the EEprom of the unit. When the procedure is over, the display will show 'CE' to confirm the operation.

Copying the unit's EEprom in the key



Press PRG and at μ chiller start-up to copy the unit's EEprom into the removable hardware key (option). When the procedure is over, the display will show 'EC' to confirm the operation.

Setting DEFAULT PARAMETERS

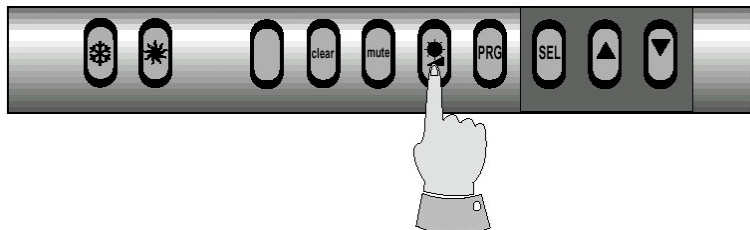


Press the PRG button at μ chiller start-up to set default parameters (parameters set by Factory). Default parameters are based on factory-set parameters and refer to DIRECT and USER parameters only. When the procedure is over, the display will show dF to confirm the operation.

Regulating the contrast on the display

(This procedure can be effected only on Remote terminals for wall-mounted versions - optional).

Press the button as shown in the picture to regulate the contrast of the display on three different levels (in a cyclic way).



3.4 Functions of the buttons (for panel-mounted versions)









The table below shows the meaning and functions of the buttons.

Button	Status of the unit	Effect after pressing the button
SEL	Normal operating condition	after 5" DIRECT parameters appear
	List of codes	displays values
	Displays values	displays list of codes
PRG	Normal operating condition	after 5" password for USER parameters
	List of codes	stores parameters in EEprom, then displays temperature value of sensor B1
	Displays values	stores parameters in EEprom, then displays temperature value of sensor B1
	Buzzer sounds	silences the buzzer
▲	Normal operating condition	after 5" enables/inhibits Cooling mode
	List of codes	displays the codes of the parameters
	Displays values	increases value
▼	Normal operating condition	after 5" enables/inhibits Heating mode
	List of codes	displays the codes of the parameters
	Displays values	decreases value
PRG + SEL	Normal operating condition	after 5" password for FACTORY parameters
SEL + ▲	Normal operating condition (temperature/pressure conditions permitting)	after 5" forces a manual defrosting cycle
▲ + ▼	Normal operating condition	after 5" manual alarm reset
	Hour counter	zeroes down immediately
PRG	At start up	default parameters
PRG + ▲	At start up	copies key on the unit's EEprom
PRG + ▼	At start up	copies key on the unit's EEprom

3.5 Functions of the buttons (wall-mounted units)

The table below sums up the action of each button.

Button	Status of the unit	Effect after pressing the button
SEL	Normal operating condition	after 5" DIRECT parameters appear
	List of codes	displays values
	Displays values	displays list of codes
PRG	Normal operating condition	after 5" password for USER parameters
	List of codes	stores parameters in EEprom, then displays temperature value of sensor B1
	Displays values	stores parameters in EEprom, then displays temperature value of sensor B1

Button	Status of the unit	Effect after pressing the button
	List of codes	displays the codes of the parameters
	Displays values	increases value
	List of codes	displays the codes of the parameters
	Displays values	decreases value
PRG + SEL	Normal operating condition	after 5" password for FACTORY parameters
SEL + 	Normal operating condition	after 5" forces a manual defrosting cycle
CLEAR	Normal operating condition	deletes alarms, if any
	Hour counter	hour counter reset immediately
PRG	At start up	default parameters
PRG + 	At start up	copies key on the unit's EEPROM
PRG + 	At start up	copies key on the unit's EEPROM
	Normal operating condition	selects heating mode (Heating)
	Normal operating condition	selects cooling mode (Cooling)
	Always	adjusts display contrast
MUTE	Always	silences the buzzer

3.6 Inputs and Outputs

Here below you will find the list of inputs/outputs with their relative connectors.

Connector	Meaning
B1-GND	Evaporator inlet water temperature probe (water-water units) Ambient air temperature probe (air-air units)
B2- GND	Evaporator outlet water temperature probe circuit1 (antifreeze) Supporting heaters control probe (air-air units)
B3- GND	Condensation control probe circuit1 (for fans speed regulation in chiller mode or for the control of defrosting in heat pump mode)
B4- GND	Evap. outlet water temp. probe circuit 2 (antifreeze)
B5- GND	Condensation control probe circuit 2 (for fan speed regulation in chiller mode or for the control of defrosting in heat pump mode)
ID1-IDCOM	High pressure circuit 1
ID2-IDCOM	Low pressure circuit 1
ID3-IDCOM	Compressor overload circuit 1
ID4-IDCOM	Overload condenser fan circuit 1 Circuit 1 defrost end
ID5-IDCOM	Water flow detector (in water chillers) Inlet fan overload (air-air)
ID6-IDCOM	Remote ON/OFF
ID7-IDCOM	Remote Cooling/Heating selection
ID8-IDCOM	High pressure circuit 2
ID9-IDCOM	Low pressure circuit 2
ID10-IDCOM	Compressor overload circuit 2
ID11-IDCOM	Overload condensation- fan circuit 2 Circuit 2 defrost end
Y1-GND	PWM analog output for condensation-removal fan circuit 1
Y2-GND	PWM analog output for condensation-removal fan circuit 2
RES.1	Antifreeze heater circuit1 (water chillers) Supporting heater / heating no.1 (air-air) Compressor Tandem 2
COMP.1	Compressor circuit 1
VALVE 1	Reverse cycle valve circuit 1
PUMP	Water pump (water chillers) Inlet air fan (air-air)
ALARM	General alarm remote signal
RES.2	Antifreeze heater circuit 2 (water chillers) Supporting heater / heating no. 2 (air-air)
COMP.2	Compressor circuit 2
VALVE 2	Reverse cycle valve circuit 2

4 Parameters

There are 3 groups of parameters:

DIRECT (D): directly accessible

USER (U): accessible via password (22)

FACTORY (F): accessible via factory-set password

The presence of certain parameters in the various groups (probe, controller, compressor, etc.) depends on the type of the controller and on the value given to some specific parameters:

controller for two-compressor units	(B= in two-compressor units only)
presence of condensation probe/s	(S= if condensation probe/s are enabled; /3<>0)
current input/s	(C= only if the unit has current input/s; /3=2)
presence of fan/s	(V= only in units equipped with fan control; F1<>0)
defrosting	(D= only when the defrosting function has been selected; d1=1)

	Probe	Type	Min.	Max	M.U.	Variation	Galletti Default	Presence
/1	Type of probe at evaporator water inlet ambient air - B10=On/Off 1=NTC Carel	F	0	1	flag	1	1	----
/2	Type of probe evaporator outlet water, B2 e B40=On/Off 1=NTC Carel	F	0	1	flag	1	1	----
/3	Type of condensation probe circuit 1 and 2 1=NTC Carel 2=pressure 4=20mA	F	0	2	flags	1	2	----
/4	Min. value current input	F	0	/5	bar	1	0	--CS-
/5	Max. value current input	F	/4	35	bar	1	30	--CS-
/6	Probe at evaporator water inlet/ambient air probe B1 calibration	U	-6.0 -10.8	6.0 10.8	°C °F	0.1	0	----
/7	Probe outlet water circuit 1 B2 calibration	U	-6.0 -10.8	6.0 10.8	°C °F	0.1	0	----
/8	Defrosting probe circuit 1 B3 calibration	U	-6.0 -10.8	6.0 10.8	°C F	0.1	0	---S-
/9	Outlet water probe circuit 2 B4 calibration	U	-6.0 -10.8	6.0 10.8	°C/bar °F	0.1	0	---B
/A	Condensing probe circuit 2 B5 calibration	U	-6.0 -10.8	6.0 10.8	°C/bar °F	0.1	0	---SB
/b	Digital filter	U	1	15	-	1	4	----
/C	Input limitation	U	1	15	-	1	8	----
/d	Measurement Unit 0=°C 1=°F	U	0	1	flag	1	0	----

	Regulator	Type	Min.	Max	M.U.	Variation	Galletti Default	Presence
r1	Cooling set-point	D	rA	rb	°C/°F	0.1	12.0	----
r2	Cooling differential	D	0.1 0.1	11.019.8	°C °F	0.1	3.0	----
r3	Heating set-point	D	rC	rd	°C/°F	0.1	40.0	----
r4	Heating set-point	D	0.1 0.1	11.019.8	°C °F	0.1	2.0	----
r5	Compressor rotation 0=yes 1=no	F	0	1	flag	1	0	----B

	Regulator	Type	Min.	Max	M.U.	Variation	Galletti Default	Presence
r6	Water temp. at output circuit 1 evap. (B2)	D	-	-	°C/°F	-	-	----
r7	Water temp. at output circuit 2 evap. (B4)	D	-	-	°C/°F	-	-	----B
r8	Defrosting temperature/pressure (B3) 1	D	-	-	°C/°F	-	-	---S-
r9	Defrosting temperature/pressure (B5) 2	D	-	-	°C/°F	-	-	---SB
rA	Min. Cooling set-point	U	-40	rb	°C/°F	1	10	----
rb	Max. Cooling set-point	U	rA rA	90 194	°C °F	1	20	----
rC	Min. Heating set-point	U	-40	rd	°C/°F	1	20	----
rd	Max. Heating set-point	U	rC rC	90 194	°C °F	1	45	----

	Compressor	Type	Min.	Max	M.U.	Variation	Galletti Default	Presence
c1	Min. running time	U	0	150	sec	1	60	----
c2	Min. stopping time	U	0	90	10 sec	1	6	----
c3	Time-interval between 2 starts	U	0	90	10 sec	1	36	----
c4	Time-delay between starts of the two compr.s when starting the capacity-controlled routine	U	0	150	sec	10	150	----B
c5	Time-delay between turning OFF the two compressor /before ending the capacity controlled routine	U	0	15	sec	1	0	----B
c6	Time delay at start-up	U	0	150	sec	10	0	----
c7	Delay in switching on compressor after switching on the pump	U	0	150	sec	1	20	----
c8	Delay in switching OFF compressor after switching OFF the pump	U	0	150	min	1	20	----
c9	Timer compressor 1	D	0	19900	ore	-	-	----
cA	Timer compressor 2	D	0	19900	ore	-	-	----B
cb	Timer threshold for maintenance alarm	U	0	100	ore	1	0	----
cC	Pump/inlet fan timer	D	0	19900	ore	-	-	----

	Fan	Type	Min.	Max.	M.U.	Var.	Galletti Def.	Presence
F1	Fans Output 0=no 1=yes	F	0	1	flag	1	0	----
F2	Fans operating mode 0=always ON 1=on when the compressor is ON 2=comp+ON/OFF reg. 3=comp+speed regulator	U	0	3	flags	1	0	-V---
F3	Min. tension threshold for Triac	F	0	F4	step	1	0	-V-S-
F4	Max. tension threshold for Triac	F	F3	166 138	step		0	-V-S-
F5	- Temp. value for min Summer speed - Pressure value for min Summer speed	U	0 32 /4	F6 F6 F6	°C °F bar	0.1 0.1	0 0	-V-S-
F6	- Temperature value for max Summer speed - Pressure value for max Summer speed	U	F5 F5 F5	50 122 /5	°C °F bar	0.1 0.1	0 0	-V-S-

	Fan	Type	Min.	Max.	M.U.	Var.	Galletti Def.	Presence
F7	- Temperature value for min Winter speed - Pressure value for min Winter speed	U	F8 F8 F8	50 122 /5	°C °F bar	0.1 0.1	0 0	-V-S-
F8	- Temperature value for max Winter speed - Pressure value for max Winter speed	U	0 32 /4	F7 F7 F7	°C °F bar	0.1 0.1	0 0	-V-S-
F9	- Temp. to turn OFF the fan in Summer - Pressure to turn OFF the fan in Summer	U	0 32 /4	F5 F5 F5	°C °F bar	0.1 0.1	0 0	-V-S-
FA	- Temp. to turn OFF the fan in Winter - Pressure to turn OFF the fan in Winter	U	F7 F7 F7	50 122 /5	°C °F bar	0.1 0.1	0 0	-V-S-
Fb	Starting time of fans	U	0	15	4 sec	1	0	-V-S-

	Regulator	Type	Min.	Max	M.U.	Variation	Galletti Default	Presence
d1	Defrosting cycle /Condensation antifreeze 0=no 1=yes	U	0	1	flag	1	0	---S-
d2	Time-or temperature-based defrosting 0=time1=temperature	U	0	1	flag	1	0	D--S-
d3	- Start defrosting temperature - Condensation antifreeze alarm set point - Start defrosting pressure	U	-30 -22 /4	d4 d4 d4	°C °F bar	0.1 0.1	0 0	D--S-
d4	- End-defrosting temperature - End-defrosting pressure	U	d3 d3 d3	50 122 /5	°C °F bar	0.1 0.1	0 0	D--S-
d5	Min. time-interval to start a defrosting cycle	U	10	150	sec	10	0	D--S-
d6	Min. duration of a defrosting cycle	U	0	150	sec	10	0	D--S-
d7	Max. duration of a defrosting cycle	U	1	15	min	1	0	D--S-
d8	Time-delay between 2 defrosting cycles within the same circuit	U	10	150	min	10	0	D--S-
d9	Defrosting time-interval between the 2 circuits	U	0	150	min	10	0	D--SB
dA	Defrost end by external contact	F	0	1	flag	1	0	D--S-
db	Antifreeze heaters activated while defrosting	U	0	1	flag	1	0	D--S-
dc	Delay before defrosting	F	0	3	min	1	0	D--S-
dd	Delay after defrosting	F	0	3	min	1	0	D--S-
dE	End defrosting with 2 refrigerating circuits and 1 removal fan	F	0	1	flag	1	0	D--SB

	Antifreeze	Type	Min.	Max	M.U.	Variation	Galletti Def.	Presence
A1	Antifreeze	U	-30 -22	A4 A4	°C °F	0.1	4.0	----
A2	Differential for antifreeze	U	0.1 0.1	11.0 19.8	°C °F	0.1	2.0	----
A3	Bypass time for antifreeze alarm	U	0	150	sec	10	10	----
A4	Set point for the activation of antifreeze heater	U	A1	rd	°C/°F	0.1	0	----
A5	Diff. for antifreeze heater	U	0.1	11.0	°C	0.1	0	----

	Antifreeze	Type	Min.	Max	M.U.	Variation	Galletti Def.	Presence
			0.1	19.8	°F			
A6	Supporting heaters probe	F	0	1	flag	1	0	----

	Alarm	Type	Min.	Max	M.U.	Variation	Galletti Def.	Presence
P1	Flow switch alarm delayed when starting the pump	U	0	150	sec	10	10	----
P2	Flow switch alarm delayed during normal operating	U	0	90	sec	1	5	----
P3	Low pressure alarm delayed at compr. start-up	U	0	150	sec	1	120	----
P4	Buzzer ON	U	0	15	min	1	1	----
P5	Reset of alarms	F	0	1	flag	1	0	----
P6	2nd set of param.	F	0	1	flag	1	0	----
P7	Low pressure alarm with pressure probes	F	0	1	flag	1	0	--CS-

	Others	Type	Min.	Max	M.U.	Variation	Galletti Def.	Presence
H1	Instrument model 0=AIR/AIR unit (<i>not applicable</i>) 1=AIR/AIR heat pump (<i>not applicable</i>) 2=AIR/WATER chiller 3=AIR/WATER heat pump 4=WATER/WATER chiller 5=WATER/WATER heat pump with gas reversibility 6=WATER/WATER heat pump with water reversibility	F	0	6	flag	1	4	----
H2	Number of ventilating circuits 0=1 ventilating circuit 1=2 ventilating circuits	F	0	1	flag	1	0	-V-SB
H3	Number of evaporators 0=1 evaporator 1=2 evaporators	F	0	1	flag	1	1	----B
H4	Compressor with capacity-controlled valve /Compr.s operating in parallel 0=no 1=yes	F	0	1	flag	1	0	----
H5	Working logic of pump/inlet fan (AIR-AIR) 0=not present 1=always ON 2=ON when regulator requires it	F	0	2	flag	1	1	----
H6	Cooling/Heating digital input 0=no1=yes	U	0	1	flag	1	0	----
H7	ON/OFF digital input 0=no 1=yes	U	0	1	flag	1	1	----
H8	Number of terminals 0=1 1=2	F	0	1	flag	1	0	----
H9	Keyboard lock-up	U	0	3	flag	1	1	----
HA	Serial address	U	1	16	-	1	1	----
Hb	Infrared remote unit password	U	0	15	-	1	0	----

4.1 Parameters description

Password

USER:

To gain access to the USER parameters, press the PRG button for 5 seconds. Then, insert the USER password (22) and finally press SEL.

FACTORY:

To gain access to the FACTORY-set parameters press PRG and SEL together for 5 seconds. Digit the password (available on request), then press SEL.

Probe (parameters "/")

/1: Type of probe at evaporator inlet, B1

This parameter indicates the type of temperature probe to be placed at the evaporator inlet. It is possible to use either a Carel NTC probe or a ON/OFF contact operated by a thermostat. **It is necessary to have a software and a hardware compatible.** If you are using a NTC probe, bridge terminal 1 and 2 on pin strip P1. With an ON/OFF probe (P1 with terminal 2 and 3 bridged) inputs - detected as closed - require the activation of outputs both in the Cooling and in the Heating operating modes; the message "On" will be displayed to indicate the unit is operating ("OF" means input detected open). In AIR-AIR units with two compressors, if the B1 ambient air probe is selected in ON/OFF mode, the B4 probe will be automatically selected in ON/OFF mode so as to allow the control of both compressors through an ambient thermostat with 2 Contacts (Condensing unit function mode).

/2: Type of probe at 1st and 2nd evap. outlet, B2 and B4

This parameters indicates the type of probe to measure water temperature at the evaporator outlet (B2 and B4). It is possible to use either a Carel NTC probe or a ON/OFF contact operated by a thermostat. **It is necessary to have a software and a hardware compatible.** If you are using a NTC probe, bridge terminals 1 and 2 on pin strips P2 and P3; bridge terminals 2 and 3 for accepting ON/OFF signals.

If you are using an ON/OFF contact and inputs are detected open:

- antifreeze heaters will be activated
- antifreeze alarm will be activated after any delay on start up (A3 parameter)

/3: Type of condensation probe for circuit no. 1 and 2, B3 and B5

This parameter indicates the operating logic of the analog inputs relative to the condenser probes meant to control defrosting and fans. You can use NTC Carel probes, pressure transducers (4÷20mA current inputs) or no probes at all. For NTC Carel probes bridge terminals 1 and 2 on pin strips P4 and P5. In order to accept 4÷20mA probes, bridge terminals 2 and 3 on pin strips P4 and P5. **If no sensors are used at all, bridge the analog and set P4 and P5 in 1-2 position; the defrosting procedure will be disabled as well as the use of the condensation-removal fans. In water /water heat pumps with gas reversibility, the antifreeze condensation function will be disabled as well.** If NTC Carel probes are used, on compressor start-up the fans will be actuated for a time-lapse equal to Fb, independently of the condensation temperature; this allows to anticipate the action of the compressor and improve the condensation regulation.

/4: Minimum current input

This parameter allows to set 4mA as the pressure value for the pressure probe.

/5: Maximum current input

This parameter allows to set 20mA as the pressure value for the pressure probe.

/6: Calibration of evaporator inlet water probe, B1

It allows to add an offset to the value measured by B1.

/7: Calibration of evaporator outlet water probe at circuit no. 1, B2

It allows to add an offset to the value measured by B2.

/8: Calibration of condensation probe circuit no.1, B3

It allows to add an offset to the value measured by B3.

/9: Calibration of evaporator outlet water probe at circuit no.2, B4

It allows to add an offset to the value measured by B4.

/A: Calibration of condensation probe circuit no. 2, B5

It allows to add an offset to the value measured by B5.

/b: Digital filter

It allows to calculate the coefficient relative to the digital filter of the measured value. Give this parameter a high value (recommended 4) so as to eliminate any noise at analog input lines; they however decrease the sensitiveness of the probe).

/C: Input limitation

This parameter allows to set the max. variation in the value detected by the probes during any cycle of the unit. The measure variation range is 0.1÷1.5 units (bar, °C or F according to the probe and the measurement scale) about every second. Giving this parameter low values allows to limit impulsive noise effects. Recommended value: 8.

/d: Measurement scale

It allows to set the operating mode either in degrees Centigrade or Fahrenheit. As the parameter varies, "µchiller" automatically turns the values into the new measurement scale.

Regulator (parameters "r")

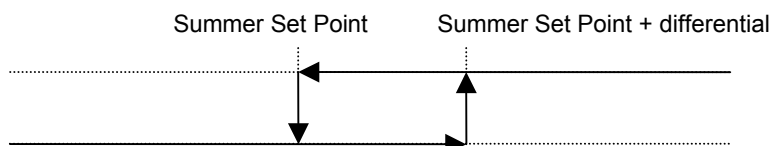
r1: Cooling Set-Point

It allows to set the Cooling set-point value (direct).

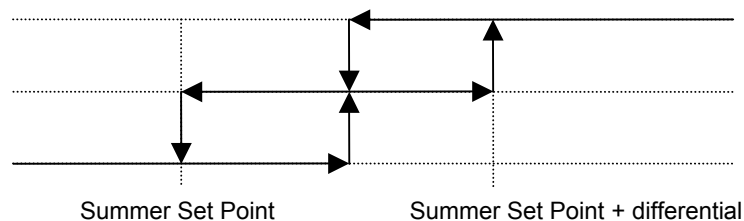
r2: Cooling differential

It allows to set the Cooling differential.

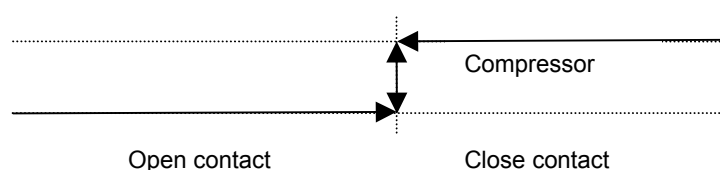
Cooling functioning mode – 1 compressor



Cooling functioning mode – 2 compressor or capacity-controlled compressor



Cooling functioning mode width ON/OFF – probe



In capacity-controlled compressors, the functioning logic is as follows:

Request	Compressor contactor	Partialization solenoid valve
Start-up:		
OFF	disenergized	disenergized
Capacity-controlled	energized	energized
Full load	energized	disenergized
OFF routine:		
Full load	energized	disenergized
Capacity-controlled	energized	energized
OFF	disenergized	disenergized

Upon request of full load start-up, the capacity-controlled solenoid valve energizes; after 2 seconds the compressor relay will be actuated. When the "c4" time-delay has passed (time-interval between compressor activation and relative capacity-controlled routine) the solenoid valve will disenergize.

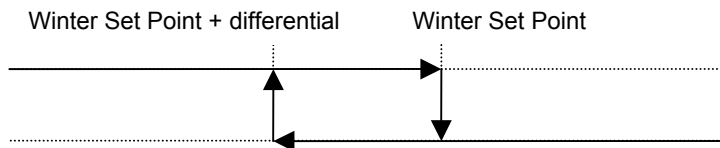
r3: Heating set-point

It allows to set the Heating set-point (reverse).

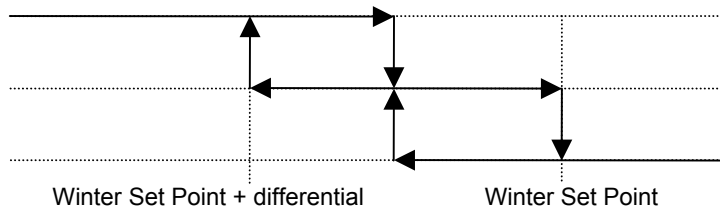
r4: Heating differential

It allows to set the Heating differential.

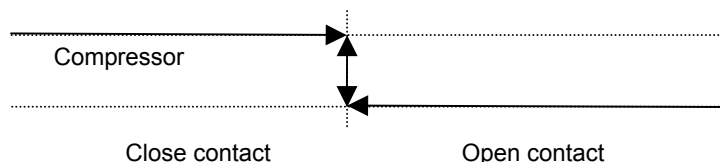
Heating functioning mode -1 compressor



Cooling functioning mode – 2 compressors or capacity-controlled routine



Cooling functioning mode ON/OFF probe



r5: Compressors rotation

This function makes it possible to activate the compressors so as to balance their operating hours. They are actuated according to a "FIFO" (first in first out) logic, both at start-up and when the compressor turns off (the first to be turned on will be the first to be turned OFF. The first to be turned OFF will be the first to be turned on).

r6: Water temperature @ evaporator output circuit no.1, B2

It displays the temperature at evaporator outlet in circuit no. 1 (B2).

r7: Water temperature @ evaporator output circuit no. 2, B4

It displays the temperature at evaporator outlet in circuit no. 2 (B4).

r8: Temperature/pressure defrosting 1, B3

It displays temperature or pressure of the condenser of circuit no. 1 (B3).

r9: Temperature/pressure defrosting 2, B5

It displays temperature or pressure of the condenser of circuit no. 2 (B5).

rA: Min. Cooling set point

It is the minimum value for the Cooling set point.

rb: Max. Cooling set point

It allows to set the maximum Cooling set point.

rC: Min. Heating set point

It allows to set the minimum Heating set point.

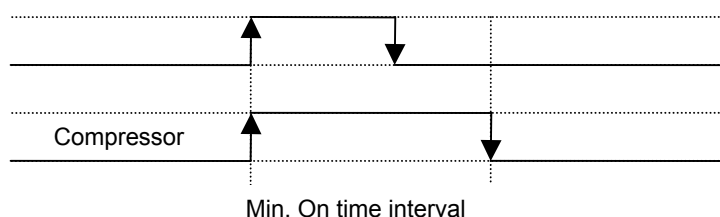
rd: Max. Heating set point

It allows to set the maximum Heating set point.

Compressor (parameters "c")

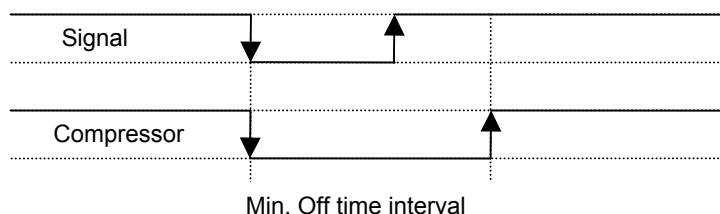
c1: Minimum ON time

It sets the time-interval when the compressor must go on operating after it has been turned ON, even if there is no more request for it.



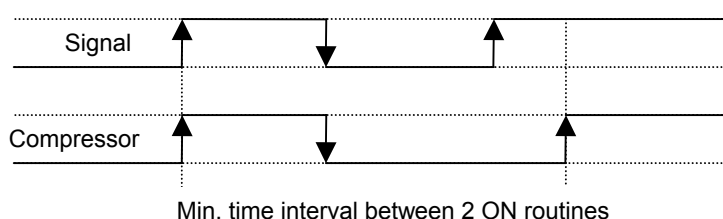
c2: Minimum stopping time

It sets the time-interval when the compressor must remain OFF after it has been turned OFF, even if there is a request for its turning on. During this phase the LED relative to the compressor blinks.



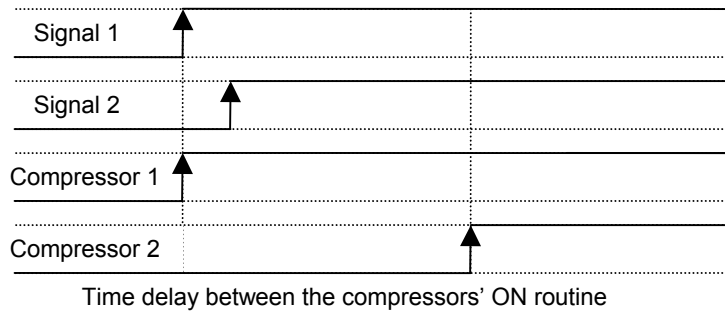
c3: Time-interval between two successive ON routines

It sets the minimum off time-interval between two successive ON routines of the same compressor (it indicates the maximum number of ON routines per hour). During this phase the LED relative to the compressor blinks.



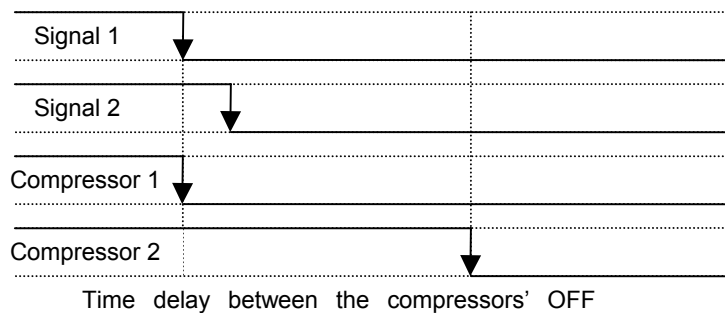
c4: Time-delay between the ON routines of the compressors/time-delay of the capacity-controlled routine

It allows to set the minimum time-interval between the ON routines of the two compressors so as to reduce inrush consumption. In a capacity-controlled compressor, this parameter indicates the time-delay before the actuation of the capacity-controlled routine. During this phase the LED relative to the compressor blinks.



c5: Time-delay before the OFF routines of the 2 Compr. / Time-delay before the capacity-controlled routine

It allows to set the minimum time-interval between the two compressors OFF routines. In a capacity-controlled compressor this parameter indicates the time-delay before stopping the capacity-controlled routine.

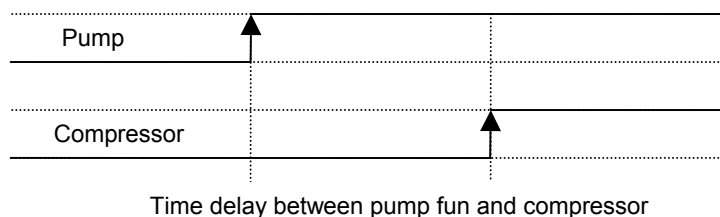


c6: Delay at start-up

This parameter allows to set a time-delay at the compressors start-up so as to balance current absorption and to protect the compressor/s from repeated start-ups when there is some interruption in the power supply.

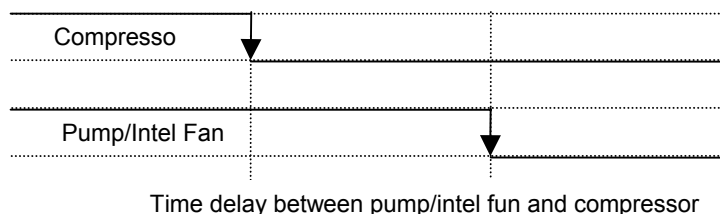
c7: Delay in switching ON compressor after switching ON the pump/inlet fan (AIR-AIR)

Both in the Cooling and Heating operating mode, with the pump actuated upon request of the controller (parameter H5=2), if the compressors activation is required, the controller will first actuate the pump and then the compressors. If the pump/inlet fan is always on (H5=1), it will start only when you start the unit (when you select Cooling/ Heating) and the time-delay will never be enabled.





c8: Delay in switching OFF compressor after



Switching OFF the pump. Both in the Cooling and Heating operating mode, with the pump (or inlet fan) actuated upon request of the controller (parameter H5=2), if the compressors deactivation is required, the controller will first deactivate the compressors and then the pump (inlet fan in air-air units). If the pump (or inlet fan) is always on (H5=1), turning OFF the unit will automatically stop the pump.



c9: Timer of compressor no. 1

It indicates the operating hours of the first compressor. When the value is being displayed, press simultaneously  and  to reset the timer. In this way the controller will not prompt the maintenance message.



cA: Timer of compressor no. 2

It indicates the operating hours of the second compressor. When the value is being displayed, press simultaneously  and  to reset the timer. In this way request for maintenance will not appear.

cb: Timer threshold during normal operation

It allows to set a threshold (operating hours of the compressor) after which the controller will prompt a request for maintenance. If cb=0, this function will be ignored.

cC: Timer of pump/Inlet fan (AIR-AIR)

It allows to set a threshold (operating hours) for the pump or the inlet fan. When the value is being displayed, press simultaneously  and  to reset the timer.

Fans (parameters "F")

F1: Fans output

Determines the operating logic of the fans:

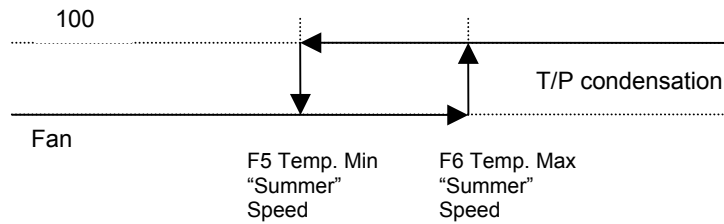
- = 0 no fans (no control action relative to fan overload)
- = 1 system with fans. This selection requires the presence of the optional boards for the management of fans (ON/OFF or speed variation)

F2: Operating logic of the fans

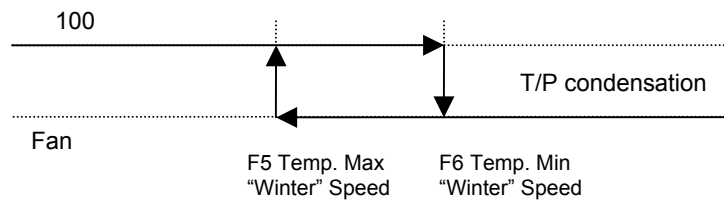
It sets the operating modes of the fans. They can be:

- = 0 always ON independently of the compressors (unless the unit is on a stand-by situation)
- = 1 ON when the relative compressor is ON (parallel operating mode)
- = 2 ON when the relative compressor is ON, with ON/OFF regulation according to the min. and max. temperature affecting speed (parameters F5, F6, F7 and F8). When the compressors are turned OFF, the relative fans are deactivated independently of the condensation temperature/pressure.
- = 3 ON when the relative compressor is ON plus speed regulation. When the compressors are turned OFF, the relative fans are deactivated independently of the condensation temperature/pressure.

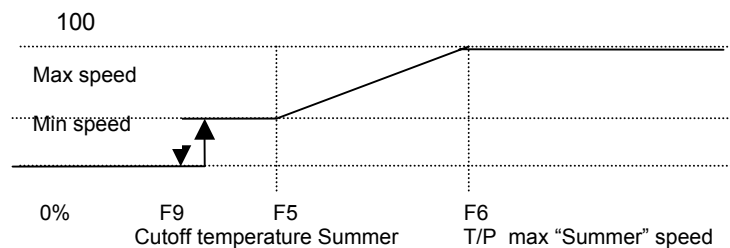
Example of F2=2 Cooling mode



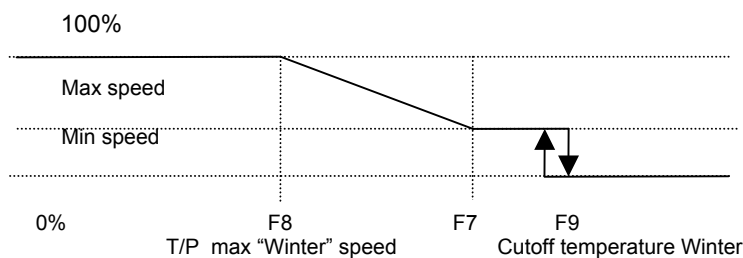
Example of F2=2 Heating mode



Example of F2=3 Cooling mode



Example of F2=3 Heating mode



If F2=3 and the condensation probes are of NTC type, when the compressor is being started, the fans operate at the max. speed for the Fb period, independently of the measured temperature.

F3: Minimum tension threshold for Triac

With fans speed regulation, phase-cut optional board is required. In this case it is necessary to specify the tension delivered by the Triac to the electrical motor of the fan corresponding to the min. speed. The selected value does not correspond to the real tension applied, but to an internal variable within the μ chiller. See page 60 to find the value of F3. If either the ON/OFF converter (code CONV0NOFF0) or the PWM/0=10V converter (code CONV0/10A0) are used we recommend to set this parameter to "0" and close the jumpers P1 and P6 located in the single compressor board and in the expansion for control of the second compressor.

F4: Maximum tension threshold for Triac

With fans speed regulation, phase-cut optional board is required. In this case it is necessary to specify the tension delivered by the Triac to the electrical motor of the fan corresponding to the max. speed. The selected value does not

correspond to the real tension applied, but to an internal variable within the µchiller. See page 60 to find the value of F4. If either the ON/OFF converter (code CONV0NOFF0) or the PWM/0÷10V converter (code CONV0/10A0) are used we recommend to set this parameter to its maximum value (166 in case of mains frequency of 50 Hz, 138 if it is equal to 60Hz) and close the jumpers P1 and P6 located in the single compressor board and in the expansion for control of the second compressor.

F5: Temperature/pressure for minimum “Summer” speed (cooling mode).

It indicates the temperature or pressure below which the fans are activated at minimum speed. In ON/OFF regulation models, this parameter indicates the temperature or pressure below which the fans are stopped.

F6: Temperature/pressure for maximum “Summer” speed (cooling mode)

It indicates the temperature or pressure above which the fans must be activated at maximum speed. In models with ON/OFF regulation, this parameter indicates the temperature or pressure above which the fans are actuated.

F7: Temperature/pressure for minimum “Winter” speed (heating mode)

It indicates the temperature or pressure above which the fans are activated at minimum speed. In ON/OFF regulation models, this parameter indicates the temperature or pressure above which the fans are stopped.

F8: Temperature/pressure for maximum “Winter” speed (heating mode)

It indicates the temperature or pressure below which the fans must be activated at maximum speed. In with ON/OFF regulation models, this parameter indicates the temperature or pressure below which the fans are actuated.

F9: Temperature/pressure at which the fans turn OFF (Cooling mode)

If the system includes a speed regulator to control the fans, this parameter allows to set the temperature or pressure below which the fans are turned OFF. For Cooling activation there is a post-differential with respect to the set point of 1°C when using NTC probes (B3 and B5) and of 0.5Bar, when using pressure probes.

FA: Temperature/pressure at which the fans turn OFF (Heating mode)

If the system includes a speed regulator to control the fans, this parameter allows to set the temperature or pressure above which the fans are turned OFF in order to avoid overload for the compressor due to high evaporating temperatures.. For Heating activation there is a pre-differential with respect to the set point of 1°C when using NTC probes for the control of condensation (B3 and B5) and of 0.5Bar when using pressure probes.

Fb: Fans starting time

It allows to set the max. speed of the fans during starting, in order to overcome the mechanical inertia of the motor. If Fb=0 this function is ignored, that is the fans are activated at the minimum speed and then controlled according to the condensing temperature/pressure. The same timing is respected when the compressor is turned on (independently of the condenser temperature/ pressure), if the NTC probes for the control of condensation have been selected and the speed regulation has been enabled (F2=2), so as to prevent the sudden increase in pressure (that does not necessary correspond to an increasing of the temperature in the place where the probe is located) and improve the control action.

Defrosting (parameters “d”)

d1: Defrosting ON / condensation antifreeze

For heat pumps with air condensation (H1=1, 3), it sets whether a defrosting control in the outdoor coil must be effected (evaporator in Heating operating mode). With water/water heat pump with gas reversibility (H1=5), this parameter indicates the control action against freezing effects in the heat exchanger used as evaporator in heating mode.

d2: Timed or temperature-based defrosting

It sets a timed defrosting (fixed time-interval) or a temperature-based cycle (defrosting will stop as soon as the condensation probe reaches the end-defrosting temperature or pressure set by the USER or if the contacts for the end of defrosting are detected open with dA=1).

d3: Temperature/pressure starting the defrosting cycle or condensation antifreeze alarm set point

With heat pumps with air condensation (H1=1, 3), it sets the temperature or pressure threshold under which a defrosting cycle occurs. In order to activate a defrosting cycle such a condition must persist for a specific period of time (see parameter d5). For water/water heat pump with gas reversibility (H1=5), this parameter defines the set point relative to the antifreeze alarm in the heat exchanger used as evaporator in heating mode

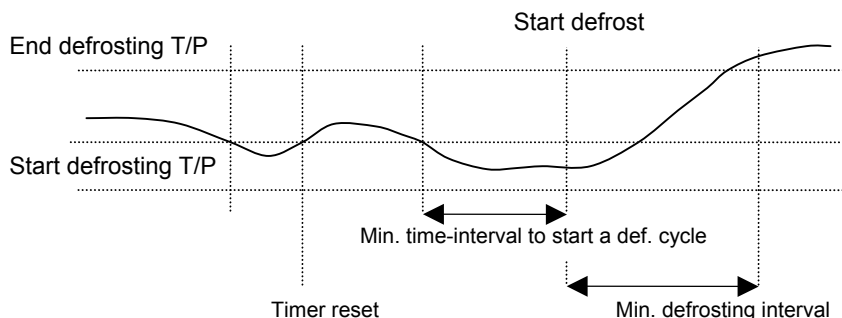
d4: End-defrosting temperature/pressure

It indicates the temperature or pressure threshold which makes the defrosting cycle end.

d5: Minimum time-interval before starting a defrosting cycle

It indicates the time-interval necessary to carry out the d3 condition, before a defrosting cycle is started (the compressor must be ON).

Temperature-based defrosting (d2=1)



d6: Minimum defrosting time

Minimum duration of the defrosting cycle (defrosting continues even if the condensation probe measures values higher than the defrosting temperature/pressure end). Set d6 = 0 to ignore this function.

d7: Maximum defrosting time

With a time-based defrosting (d2=0), it represents the actual duration of defrosting; if, on the contrary, a temperature/pressure-based defrosting has been selected, this parameter will indicate the maximum duration of defrosting (an alarm message will appear on the display).

d8: Time-interval between two defrosting cycles in the same circuit

Minimum time-interval between two successive cycles in the same circuit.

d9: Defrosting time-interval between the two circuits

It indicates the time-interval between the defrosting cycles of the two circuits. If d9 = 0, defrosting in the two circuits will be performed at the same time.

dA: Defrost end detected by an external digital contact

It activates the end of defrosting cycle from digital contact (for example a pressostat). The contacts are to be connected in the place of the condensation-removal fan overload (ID4 for circuit1 and ID11 for circuit2). By enabling the end of defrosting from digital input (dA=1), the defrost procedure starts normally (by condenser temp/press threshold) plus a control for the closed status of the defrost end digital input; the end of defrosting is detected with an OPEN contact.

Value	Selection
0	end of defrosting detected by a NOT enabled external contact
1	end of defrosting detected by an enabled external contact

db: Defrosting of antifreeze/support heaters

The parameter sets if, during defrosting, the antifreeze/ support heaters must be activated so as to limit the flow of cold water/air in the environment. With a two-compressor unit, the heaters to be activated are those relative to the circuit which is effecting the defrosting. The meaning of this parameter is as follows:

Value	Selection
0	antifreeze/support heaters NOT activated during defrost
1	antifreeze/support heaters activated during defrost

dc: Delay before defrosting

When the defrosting condition has been detected, but before the real activation of the cycle, the unit stops the compressor for a time-interval dc (selectable from 0 to 3 minutes). After the compressor stops, the 4-way valves will rotate after a time-lapse of dc/2; such an interval allows pressures to be balanced before the defrosting cycle is activated. With this procedure, the timing of the compressor protection is not respected; therefore the compressor stops and starts immediately. If dc=0, such a procedure is not effected and the reverse-cycle valve is immediately rotated as usual.

dd: Delay after defrosting

When the defrosting cycle is over, the unit will stop the compressor for a time-interval dd (selectable from 0 to 3min.). After the compressor stops, the 4-way valves will rotate after a time-lapse of dd/2; such an interval allows pressures to be balanced and, in case, a dripping of the external exchanger. With this procedure the timing of the compressor protection is not respected; therefore the compressor stops and starts immediately. If dd=0, such a procedure is not effected and the reverse-cycle valve is immediately rotated as usual.

dE: End defrosting with 2 gas circuits and 1 air circuit

The parameter dE allows the selection of the end of defrosting in the machines with 2 refrigerating circuits and 1 air circuit.

Value	Selection
0	when both the circuits have reached the end of defrosting
1	when one of the circuits has reached the end of the defrosting

Antifreeze (parameters "A")

A1: Antifreeze

It indicates the water temperature at the evaporator outlet below which the unit prompts an antifreeze alarm. In the event of antifreeze alarm the compressor will be stopped but the pump remains ON. The reset is manual and takes place only when the water temperature returns within the operating limits (that is when it exceeds the value A1+A2). this alarm, activated according to B1 or B2 probes (with the variation of parameter A6), cause just a message in the display and is automatically reset.

A2: Differential for antifreeze

It indicates the differential for the antifreeze alarm; the alarm condition can not be reset until the temperature exceeds the "set point+differential" value (A1+A2).

A3: Time to bypass the antifreeze/low ambient temperature alarm at start-up in Winter operating mode

In the event of an antifreeze alarm condition, this parameter allows to turn on the unit for a specific time-interval (only in Winter operating mode, since the unit heats water/air). Should the alarm persists after the A3 time has passed, the unit will automatically turn OFF.

A4: Set point for the activation of antifreeze/ supporting heaters

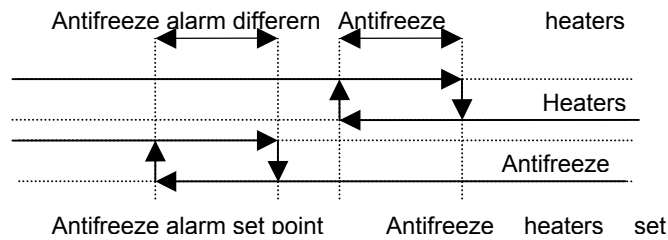
Indicates the threshold below which the antifreeze heater will be activated (also when the unit is in stand-by). With ON/OFF B2 and B4 inputs, the antifreeze alarm and the heaters will be activated through an open contact.

In 2-compressor units or in units with 1 compressor with capacity-controlled routine, 2 steps have been devised for the activation of support heaters, each with a width equal to one half of the differential (A5); with ON/OFF B1 and B2 inputs (and with the variation of parameter A6), the low ambient temperature alarm and the support heaters will be activated through an open contact.

A5: Antifreeze

It indicates the differential controlling the ON/OFF status of the antifreeze heaters.

Carel NTC Probes



A6: Support heater probe

It indicates the probe to be used (B1 or B2) for the control of support heaters. The meaning of the parameter is as follows:

Value	Selection
0	B1
1	B2

Alarms (parameters "P")

P1: Delayed flow-switch alarm at pump start-up

It allows to set a time-delay to elapse before showing the flow switch alarm at pump start-up (the flow rate needs a certain time to settle, so the delay is meant to avoid any unstable signal from the sensor. This function allows to avoid to stop the unit in case of presence of double pump group and a possible automatic rotation after a failure in one of this).

P2: Delayed flow-switch alarm during normal operating

It indicates a time-delay which is to elapse before showing the flow-switch alarm during normal operation. The alarm, in fact, might be due to capacity variations or air bubbles in the water circuit and this function allows to avoid to stop the unit in case of presence of double pump group and a possible automatic rotation after a failure in one of this.

P3: Delayed low pressure alarm at compressor start-up

It indicates a time-delay which is to elapse before showing the low pressure alarm at compressor start-up so as to reach a normal flow rate, avoiding any unstable signal from the sensor.

P4: Buzzer

It indicates how long the buzzer will sound in the event of an alarm situation:

- if P4 = 0, the buzzer remains always OFF.
- with a range between 1 and 14 minutes, the buzzer automatically silences after the selected P4 time
- if you set P4 = 15, the buzzer will not stop until the alarm condition disappears.

P5: Reset alarms

It allows to enable an automatic reset for all those alarms which normally have a manual reset (high pressure, low pressure, flows witch and antifreeze) according to the table here below:

Value	Selection
0 (default)	High pressure, low pressure and antifreeze (low temperature) with manual reset
1	All alarms with automatic reset

P6: Second set of parameters

If P6=1, it allows to activate a second set of DIRECT, USER and FACTORY parameters; in such a situation the following parameters turn from U level (as indicated in the table of parameters in this manual) to F level, which is accessible through user password:

- parameters "r"; from /6 to /C (included)
- parameters "r"; from rA to rd (included)
- parameters "c"; from c1 to c3 (included)
- parameters "F"; they all turn to F level
- parameters "d"; they all turn to F level
- parameters "A"; they all turn to F level
- parameters "P"; from P1 to P3 (included)
- parameters "H"; remain unaltered

If P6=1 the operating logic of the cooling/heater selection is reversed (both by keypad, infrared remote controller and digital input).

Symbol	P6=0	P6=1
*	Cooling (chiller)	Heating (heat pump)
❄	Heating (heat pump)	Cooling (chiller)

P7: Low pressure alarm with pressure probe

If P7=1 with the heat pump selection lower than 1bar (obviously the presence of the condenser-pressure probes must be enabled, parameter /3) and the low pressure alarm is activated (by maintaining in any case the possible delay P3). If P7=0 such operating is disabled.

General parameters (“H”)

H1: Machine model

It allows to select the type of machine to be controlled:

Value	Unit
0	AIR/AIR unit (only cooling) <i>(not applicable)</i>
1	AIR/AIR heat pump <i>(not applicable)</i>
2	AIR/WATER chiller
3	AIR/WATER heat pump
4	WATER/WATER chiller
5	WATER/WATER heat pump with gas reversibility
6	WATER/WATER heat pump with water reversibility
7	Motocondensing unit
8	Motocondensing unit with reversing refrigerant cycle

H2: Number of ventilating circuits

It indicates the number of fan circuits in two-compressor configurations. When there is 1 fan circuit selected, the unit will activate the control of fans on the basis of the higher temperature/pressure in the 2 circuits. The Y1 output is managed in parallel with Y2; therefore, it is possible to connect two fan regulation boards increasing the “size” of the fans that can be managed by μ chiller.

H3: Number of evaporators

It indicates the number of evaporators in two-compressor configurations. When there is one evaporator, heaters management and antifreeze control will be performed only by B2.

H4: Capacity-controlled/Compressors in parallel mode

In two-compressor units, this parameter allows to set two compressors or one compressor with capacity-controlled routine. When using one capacity-controlled compressor, the alarm inputs relative to the second compressor will not be used and B4 and B5 measurement will not be detected. Rotation is disabled.

In single-compressor units (the expansion board must not be installed) the H4 parameter is used to enable the control of possible Tandem compressors (operating in parallel in the same circuit). With this configuration:

- the pump output (PUMP silk screened directly on the board) is activated, besides in the typical modes indicated in H5 parameter, also when activating the antifreeze heaters (both in normal operating and in stand by)
- the output RES1 is used to manage the second compressor.

In Tandem units compressors are activated as in normal operating mode (at 50% and at 100% of the differential) with a time-based rotation (every 30 seconds the activation priority is inverted); in case of defrost the activation of both compressors is forced.

The rest of features performed is as equal as the standard algorithm followed for 2 Compressor machines.

H5: Operating logic of the Pump

It sets the operating logic of the water circulation pump . The pump can be disabled, always ON or ON upon a call from the regulator (in this case the pump will be the first device to start, followed by the compressors). With disabled pump the flow switch alarm will not be present although the Pump Relay will be normally activated.

H6: Cooling/Heating digital input

This parameter enables the Cooling/Heating selection from digital input. If enabled, this function is prior to any keyboard command (the Cooling/Heating command on the keyboard is disabled). With enabled selection (H6=1), the “open” status forces the unit to function in Cooling mode.

H7: ON/OFF digital input

This parameter enables the ON/OFF selection from digital input. If enabled, this function is prior to any keyboard command. With enabled selection (H7=1), the “open” status forces the unit to switch OFF.

H8: Number of terminals

It indicates the number of terminals connected to the unit (max. 2).

H9: Lock of direct parameters modification

This parameter allows to disable the procedure through which can modify DIRECT and USER parameters through keyboard or through remote control. In this way you will be able to display the parameter but not to modify them. The following functions will also be disabled: Cooling/Heating selection, forced defrosting and timers reset.

The table below shows how to set the parameter:

Value	Remote control	Keyboard
0	enabled	disabled
1(default)	enabled	enabled
2	disabled	disabled
3	disabled	enabled

HA: Serial address

It indicates the address of the instrument used to carry out serial connection by means of the RS485 serial board to a supervisory and/or telemaintenance computer.



Hb: Remote control unit password

This parameter indicates the address of the instrument for the data transmission via remote control; if several units are placed within the effective range of the remote control, the modified parameters can be transmitted, in facts, simultaneously to all the units or only to a specific unit. If the password value is 00, transmission is immediate; any value different from 0 implies that the user will have to type that number on the remote control as access code any time he programs the unit.

5 Alarms and messages

Any time an alarm condition is detected, the controller will prompt the following actions:

- the buzzer sounds (if previously enabled - see P4 parameter and dip-switch no.3 on the terminal - and if the machine is not in stand-by)
- the alarm relay energizes
- the temperature value blinks on display
- the yellow LED on the single-compressor main board will blink with increased frequency
- the alarm code appears on the LCD alternatively with the temperature value.

After the alarms have been cleared either with automatic reset or by pressing the  and  keys simultaneously for 5s. (for alarms with manual reset), the controller will restore normal operating conditions:

- the buzzer turns off
- the alarm relay is disenergized
- the temperature value blinks no longer
- the yellow LED blinks at normal frequency
- the alarm code disappears from the LCD.

If the alarm condition persists, the actions described above will be performed again.

External digital alarms

"µchiller" has 9 alarms detected by means of external digital contacts (24Vac); such external alarms are not detected with the unit in stand-by and, with parameter P5 set to 1, and all have a manual reset.

Type	Digital input	Alarm	Delay	Reset	Message on display
High pressure circuit 1	1	open	--	manual (automatic. with P5=1)	H1
Low pressure circuit 1	2	open	P3	manual (automatic. with P5=1)	L1
Compressor 1 overload	3	open	--	automatic	C1
Fan overload circuit 1 (*)	4	open	--	automatic	F1
Flow switch	5	open	P1 e P2	manual (automatic with P5=1)	FL
High pressure circuit 2	8	open	--	manual (automatic. with P5=1)	H2
Low pressure circuit 2	9	open	P3	manual (automatic. with P5=1)	L2
Compressor 2 overload	10	open	--	automatic	C2
Fan overload circuit 2 (*)	11	open	--	automatic	F2

(*) Active if the defrost end by external contact is not enabled (dA=0).

High pressure

The alarm condition is detected independently of the status of the pump and compressors. The compressors are immediately forced into the OFF mode (previously set protection time-intervals are ignored) and at the same time the buzzer, the alarm relay and the lighting of the display are activated. Fans are activated at max. speed for 60s to face the alarm situation. After this period they are stopped (in case of two compressor units with only one fan circuit, after 60s the fans do not stop but are managed according to the circuit temperature/pressure where the alarm condition is not present

Low pressure

The alarm condition is detected only if the relative compressor is ON, independently of the status of the pump. The compressors are forced into the OFF mode immediately (previously set protection time-intervals are ignored) and at the same time the buzzer, the alarm relay and the lighting of the display are activated. The parameter P7 allows the activation of the low pressure alarm if the measured pressure is less than 1bar (after the P3 delay).

Compressor overload

The alarm condition is detected independently of the status of the pump and of the compressors. The compressors are forced into the OFF mode (previously set protection time-intervals are ignored) and at the same time the buzzer, the alarm relay and the lighting of the display are activated.

Condenser fan overload

The alarm condition is detected independently of the status of the pump and of the compressors. The fan and the compressor are forced into the OFF mode (previously set protection time-intervals for the compressor are ignored) and at the same time the buzzer, the alarm relay and the lighting of the display are activated. The control of units with air-condensation (H1=0, 1, 2 or 3), the condensation probes (/3 _0) as well as the condensation-removal fans (F1=1) must be enabled.

Water Flow switch

The alarm condition is detected only if the pump is ON, independently of the status of the compressor. All the outputs disenergize: pump, compressor (previously set OFF routines are ignored), condensation-removal fan) and at the same time the buzzer, the alarm relay and the lighting of the display are activated. The control of water chillers (H1_0, 1) as well as the water pump (H5_0) must be enabled.

Antifreeze alarm – Water outlet from evaporator

Type	Delay	Reset	Signal
Antifreeze 1	A3	manual (automatic if P5=1)	A1
Antifreeze 2	A3	manual (automatic if P5=1)	A2

The alarm condition is detected only in water chillers (H1=2, 3, 4, 5, or 6) by water probes at evaporator outlet (B2 and, in case, B4). The compressor and the condensation- fan are immediately forced into the OFF mode and at the same time the buzzer, the alarm relay and the lighting of the display are activated.

If the temperature exceeds the set threshold, the heater turns OFF and all the other controlled devices remain OFF until the alarm reset procedure takes place (▲ + ▼ keys pressed simultaneously for 5 seconds in the panel-mounted terminal; CLEAR key pressed for 5 seconds in the wall-mounted terminal).

The antifreeze alarm appears either when the unit is in the Cooling operating mode or in the Heating operating mode (in this case only after the time-delay at start-up has passed). In the stand by status, "µchiller" does not detect the alarm but it controls and manages the water heaters (optional).

In the direct-expansion units (H1=0, 1), alarm is used to detect any low ambient temperature by means of probes B1 or B2 (according to the parameter A6, support-heater control probe). The low ambient temperature alarm appears either when the unit is in the Cooling operating mode or in the Heating operating mode (in Heating operating only if the time-delay at start-up has passed); this alarm activates the buzzer, the alarm relay and the lighting of the display but it is not detected when the unit is in stand-by.

Type	Delay	Reset	Signal
Low ambient temperature	A3	manual	LO

5.1 Other alarms

Probe Alarms

Type	Reset	Signal
Probe B1 - Water temperature at evaporator input	automatic	E1
Probe B2 - Water temperature at evaporator output circuit 1	automatic	E2
Probe B3 - Condensation temperature/pressure circuit 1	automatic	E3
Probe B4 - Water temperature at evaporator output circuit 2	automatic	E4
Probe B5 - Condensation temperature/pressure circuit 2	automatic	E5

They are detected also with the unit in stand-by.

As a result of a probe alarm, the compressors and the condensation fans and the pump are forced into the OFF mode.

The alarms E2 and E4 (E3 and E5 with unit model no.5) in water chillers activate the corresponding antifreeze heater.

Faulty EEprom alarm

Type	Input	Alarm	Delay	Reset	Error
Faulty EEprom	-	-	-	automatic	EE

It indicates a problem in the storing of data in the non-volatile memory of the unit (EEprom); the regulation process continues on the basis of the data stored in the RAM. In case of power failure in the unit, the configuration is lost. To overcome this problem, enter through password the "F" level, then return to normal operation by pressing PRG, so as to force the storing of all parameters of the RAM in the EEprom. Neither the buzzer nor the alarm relay will be activated.

Defrosting indications, defrosting errors, communication errors and compressors maintenance

Type	Reset	Signal
Circuit no. 1 defrosting	automatic	d1
Circuit no. 2 defrosting	automatic	d2
Circuit 1 defrosting error	automatic/manual	r1
Circuit 2 defrosting error	automatic/manual	r2
Error in communication with terminal	automatic	cN
Compressor no. 1 maintenance	manual	n1
Compressor no. 2 maintenance	manual	n2

Defrosting circuit no.1 and no. 2

Any time a defrosting cycle occurs, the display will show 'd1' or 'd2'. In this case, since it indicates a operating status, neither the buzzer nor the alarm relay will activate; the yellow LED will not increase its blinking frequency. The temperature value will blink alternatively to the defrosting indication.

Defrosting error on circuit no.1 and no. 2

If a defrosting cycle ends for time-out, but instead an end has been selected for the defrosting cycle when the threshold is reached or from an external contact, the unit will display 'r1' or 'r2'. This message can be cleared through the alarm reset procedure or by carrying out a new defrosting cycle correctly. In this case neither the buzzer nor the alarm relay will activate; the yellow LED on the board will go on blinking at normal frequency. The temperature value will blink alternatively to the defrosting error indication.

Error in the communication with the terminal

In case of failed communication between the single-compressor board and the terminal (both a local terminal and a remote one) the unit will display 'Cn'; check the cable and the correct connection between cable and female connectors on the board. Neither the buzzer nor the alarm relay will activate. The yellow LED will blink at normal frequency. The display will constantly show the message Cn.

Maintenance of 1st/2nd compressor

When the compressor exceeds a selected operating hours threshold (factory-set value = 0 hour, therefore the control is disabled) a message prompting maintenance will appear on the display. Neither the buzzer nor the alarm relay will activate. The yellow LED will blink at normal frequency as well as the temperature value on display alternatively to the maintenance indication.

5.2 Unit indication sequences

The unit displays messages every 32 seconds. When "µchiller" is in stand-by and there is at least one active alarm condition, all the LED indicators will remain active except the buzzer. When in stand-by, however, "µchiller" detects probe and eeprom alarms only; alarms from digital inputs will not be managed.

N°	Error mess.	Yellow LED located on singol compressor board	Display	Buzzer	Alarm Relay		
1 2 3 4 5	E1 E2 E3 E4 E5	blinks faster (1)	Flashes	ON (2)	Energized		
6	EE	blinks at normal frequency					
7 8 9 10 11 12	FL H1 L1 C1 F1 A1	blinks faster (1)					
13 14 15	d1 r1 n1	blinks at normal frequency				OFF	Disenergized
16 17 18 19 20	H2 L2 C2 F2 A2	blinks faster (1)				ON (2)	Energized
21 22 23 24	d2 r2 n2 Cn	blinks at normal frequency		cn flashing	OFF	Disenergized	
25	LO	blinks faster (1)		Flashes	ON (2)	Energized	

(1) about twice a second

(2) whenever enabled

6 Infrared remote control unit

"µchiller" can be programmed via an optional infrared remote controller. Since each button on the remote control unit has got a specific function, programming the controller is now a totally straightforward process.



Pressing either the - or + button will allow you to display the code of a specific parameter; press the same button/s once again to display the value of the selected parameter, which can be modified by pressing + and - once again. 10 seconds after you have modified the parameter value, the unit will automatically display the code of the modified parameter.

When programming "µchiller" via remote controller, the dedicated LED on the display (see the chapters 3 and 3.3) will blink. If you do not press any button within 50 seconds after having started the programming procedure via remote control unit, the unit exits the configuration procedure without storing the modified data.

Example of programming

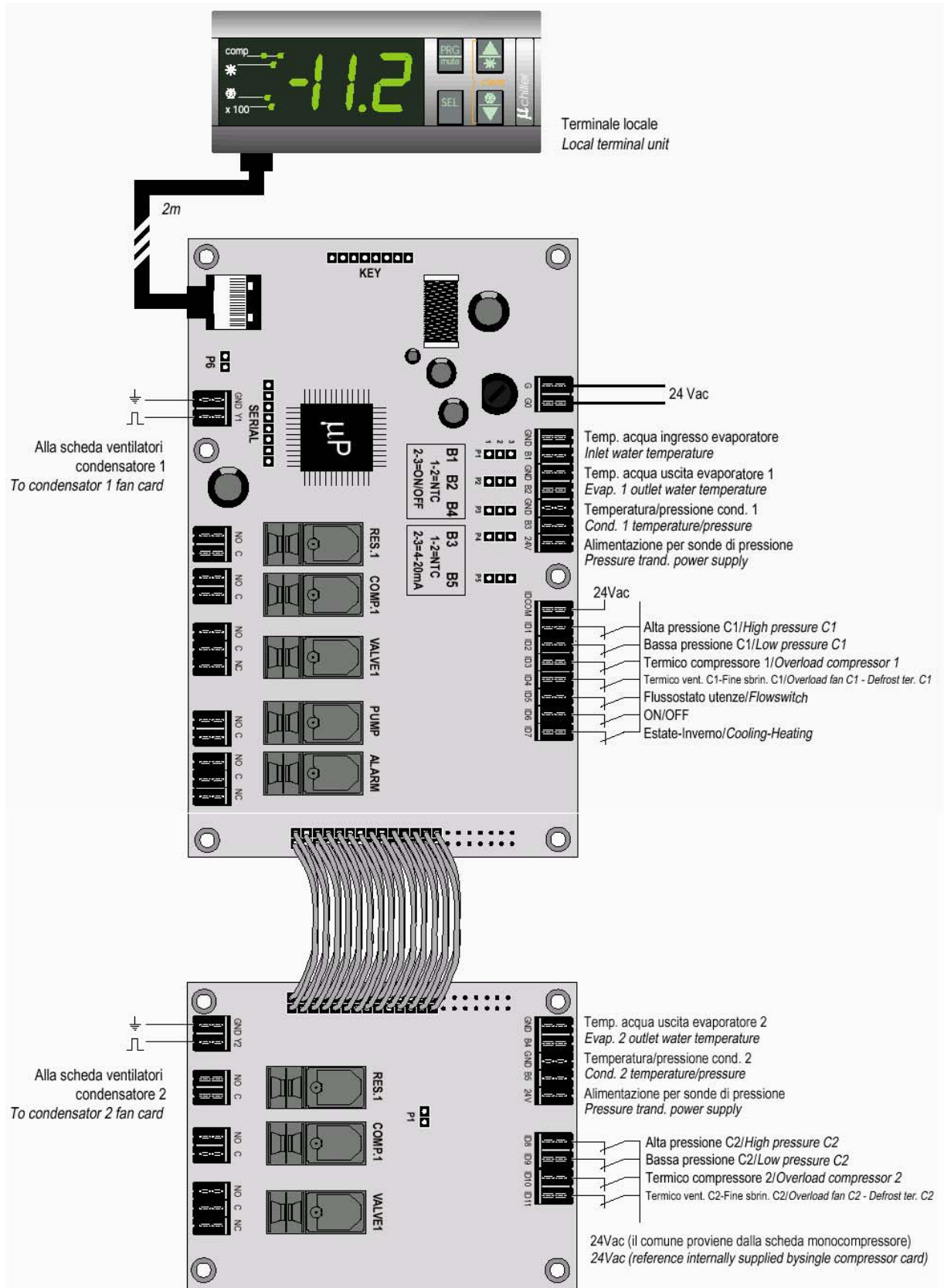
It is necessary to modify the heating differential (r4)

1. press ENABLE button to operate the remote control unit; first parameter "/6" will be displayed;
2. press once either "+" or "-" relative to the heating differential; its code "r4" will be displayed;
3. press once again either "+" or "-" relative to the heating differential; the existing value of the parameter will be displayed;
4. press once again either "+" or "-" to increase/decrease the value until you reach the desired value;
5. save the modified value pressing PRG button; inlet water temperature will be displayed.

Whenever necessary, it is possible to stop the programming procedure pressing ESC button; once activated communication from remote control unit (point 1), it is possible to view every parameter using  and  buttons and to modify it using SEL button.

7 Wiring connection

The drawings below show the wiring connection of the unit and of the remote terminal.



If 2 terminals (local or remote) are connected to the same single compressor board, they need to be addressed; therefore, set the two deep-switches called "address" placed on the terminals to 01 (the dip-switch which is placed in the more external side of the electronic component must be set in ON position; this procedure must be effected only in one of the 2 terminals). Remember to set parameter H8=1 as well.

Meaning of dip-switches located on the rear side of terminal

On the rear side of terminal there are 4 dip-switches for managing particular functions, as follows:

Address=0: 1 terminal connected to the single compressor board - default

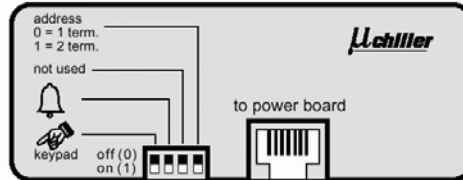
Address=1: if 2 terminals are connected to the single compressor board, set one of the two dip-switches as follows:

- = 0: buzzer always inhibited
- = 1: buzzer enabled

(see parameter P4) - default

Keypad=0: terminal inhibited

Keypad=1: terminal enabled - default



Pressure probes

The inputs for the control of condensation (B3 and B5) can be arranged so as to accept either Carel NTC temperature probes or pressure transducers with 4÷20mA (in this case by suitably setting parameter /3 and pin-strips P4 and P5 located on the main board). The pressure transducers has to be connected to boards with 24V terminal.

8 Optional boards

8.1 Serial card RS485

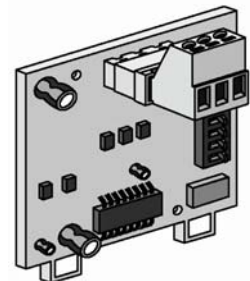
The Serial card RS485 allows you to interface the µchiller to a supervisory network in RS485 standard (asynchronous). The card has 4 dip switches that enables you to extend the µchiller addressing up to 199 units.

Mounting

Operations to be carried out for correct mounting:

1. Disconnect power supply from the µchiller;
2. Insert the RS485 card on the SERIAL connector of the main board;
3. When making the connection of the serial line, pay attention to polarities as shown.

The serial line must be closed by means of a 120 - 1/4W resistance, placed between the TX/RX+ and TX/RX- terminals of the µchiller at the end line of the network.



Set up

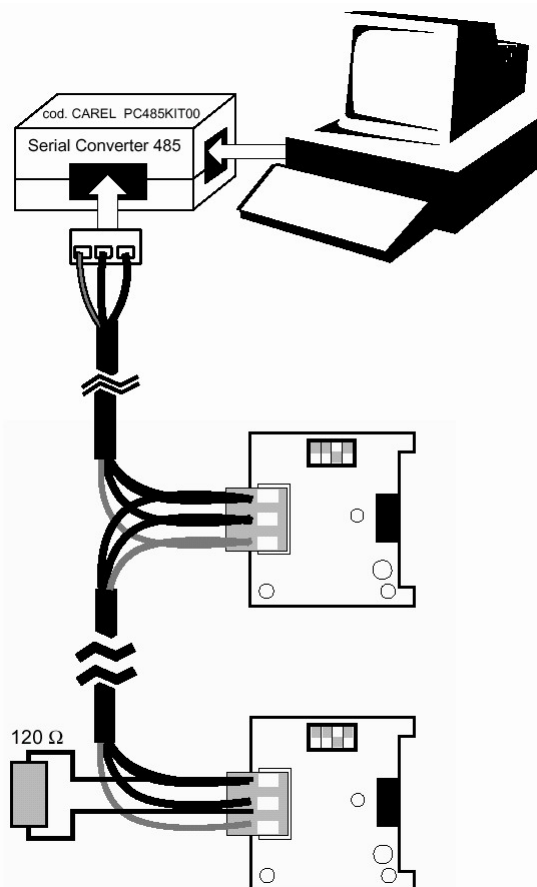
The network address of the µchiller is selected through the HA parameter and dip switch bank present in the card. The actual address is obtained by adding HA to the offset obtained from the following table:

Offset	Dip 1	Dip 2	Dip 3	Dip 4
0	off	off	off	off
16			ON	off
32			ON	off
48		ON	off	off
64				ON
80				ON
96	ON	ON	off	
112			ON	
128			ON	
144	ON	off	off	off
160			ON	off

For example, if the HA value is 12 and the dip 1 is in the ON state, the address value is: 12 + 128=140.

RS485 serial board technical characteristics	
Power supply voltage:	5Vdc \pm 10% from the μ chiller through plug-in connector
Absorbed current:	70 mA
Storage conditions:	-10T70 (-10 \div 70°C), rH <90% not condensing
Operating conditions:	T65 (0 \div 65°C), rH <90% not condensing
Card dimensions:	50x50 mm
Protection index:	IP00
Environmental pollution:	normal
Surface temperature limits:	as for operating temperature
Classif. according to the protection against the electric shocks:	to be incorporated into Class I or II equipment
Categ. of heat and fire resistance:	D
PTI of the of the insulating materials:	250V
Class and structure of the software:	A
Serial output:	Connector 3-way screw terminals for cables with 0.2mm ² min. section and 1.5mm ² max. section Optoinsulated asynchronous RS485 Transfer rate: 19200 baud Device maximum number: 199 Max. distance from the supervisor: 1 Km Cable to be utilized: 1 shielded and braided couple AWG20/22
Protection against the electric shocks:	The device assures only a functional insulation between the μ chiller supply source and the serial line; therefore the supply transformer of the μ chiller must be of the safety type.

Example of μ chiller network:



9 Technical specifications

Single compressor board

Power source: 24Vac +10% -15% at 50/60Hz, protected with a fuse located on the board (250Vac, 2A delayed).

Number of cards	Min. power supply required
1 compressor	17VA
1+2 compr.s	25VA
1 compr. + terminal	19VA
1+2 compr.s + terminal	27VA
1 compr. +2 terminals	22VA
1+2 compr.s +2 terminals	30VA

Analog inputs

- no.3 (B1/B2 and B3) selectable to accept either Carel NTC probes (range -40°C/+90°C) or ON/OFF contacts
- no.2 (B4 and B5) selectable to accept either Carel NTC probes or 4+20mA pressure transducers.

Digital inputs

- no.7 (on single compressor board) + no.4 (on expansion board) optoinsulated at 24Vac, with "Normally Close" logic (alarm detected when input found open). The power supply must be different from the one of the controller to get a real optoinsulation.

Analog outputs

- no.1 (on single compressor board) + no.1 (on expansion board) for managing the fan speed board; pulse width modulation signal (PWM).

Digital outputs

- no.5 (on single compressor board) + no.3 (on expansion board); no.3 of them (reversing valve circuit 1 and 2 and alarm relay) with double terminal, the others with "Normally Open" logic.
- Switching power: 10 A res. at 250V (AC3 class, with $\cos \varphi = 0.7$ maximum load of 1/3 HP)

Technical specifications	
Working temperature:	-10T65°C
Storage temperature:	-20T70°C
Working humidity:	90%rH (not condensing)
Storage humidity:	like operating humidity
Limits of surface temp.:	like operating temperature
Mounting:	in electrical panel with metallic mounting hardware connected to earth (minimum distance from any surrounding element=10mm)
Protection index:	PCB (installator's care)
Environmental pollution:	normal

Terminal for panel mounting

Technical specifications	
Power supply:	from the single compressor main board
Connections:	via 8-way telephone cable
Maximum distance:	3m from the single compressor main board
Working temperature:	-10=65°C
Storage temperature:	-20=70°C
Working humidity:	90%rH (not condensing)
Storage humidity:	like operating humidity
Limits of surface temp.:	like operating temperature
Max number:	2
Mounting:	panel-mounted through plastic clips supplied with the unit
Protection index:	IP55
Environmental pollution:	normal

Terminal for wall mounting

Technical specifications	
Power supply:	from the single compressor. main board
Connections:	via 8-way telephone cable
Max distance:	3m from the single compressor main board
Working temperature:	0÷50°C
Storage temperature:	-10÷70°C
Working humidity:	90%rH (not condensing)
Storage humidity:	like operating humidity
Limits of surface temp.:	like operating temperature
Max number:	2
Mounting:	wall-mounted (minimum distance from any surrounding frontal or lateral element=10mm)
Environmental pollution:	normal
<i>N.B.: model available only for the foreign market</i>	

Protection against electrical high voltage shock

The system composed of the single compressor main board, any expansion board for the 2nd compressor the local and the remote terminals, the driver board and the other optional boards is a command device to be integrated.

The class regarding the protection against the electric shock depends on how the integration of the driving-device realized by the manufacturer is being carried out.

The board-mounting of the system must provide the earthing of the metallized fastening holes and of the conductor connected to the terminal G0, in order to meet the provisions established by the European standards as to the electromagnetic emission and immunity.

The terminal has a functional insulation among the parts at very low voltage and every part accessible to the user. Therefore, it is possible to make a machine with principal insulation and protection conductor connected to the ground (Class 1), by using, to supply the system, a transformer equipped with principal insulation, earthed secondary, and safety conductor in order to ensure the required protection against electric shocks.

Before operating on the board during the mounting, maintenance and replacement operations, cut off the power supply. The protection against the short circuits, due to faulty wiring, must be guaranteed by the manufacturer of the apparatus within which the driving-device is being integrated.

Note on the number of terminals that can be connected

It is possible to connect two energized terminals at most (address 0 and 1), all the others must be pre-arranged as passive. The maximum number of terminals at 150m is 2. The total maximum number of terminals is 3.

All of the above mentioned boards comply to the following characteristics:

Technical specifications	
Min. cable section (screw terminal power boards):	0.2mm ²
Max. cable section (screw terminal power boards):	2.5mm ²
Min. cable section (only remoting modules):	0.2mm ²
Max. cable section (only remoting modules):	1.5mm ²
Class of control according to protection against electric shock:	class I or II
No. of automatic cycles (A) for each automatic action:	100,000
Ageing period:	60,000h
Type of the action/disconnection provided by each circuit:	1B
PTI of materials used for insulation:	250volt
Period of electric stress across insulating parts:	long
Minimum and/or max. rates of change of activating quantity:	35s in ventilated air
Electronic control:	to be supplied to manufacturers, installers, maintenance service
Heat and fire resistance category:	D
Type of wave output:	modulating signal with open collector 20mA 5V
Surge immunity:	category 1
Classe e struttura del software:	class A





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