µGEO

Electronic controller for heat pumps
with 1/2 compressors, one circuits

CAREL

ENG User manual

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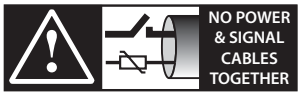
READ AND SAVE THESE INSTRUCTIONS



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Technology & Evolution

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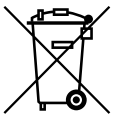

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1. WEEE cannot be disposed of as municipal waste and such waste must be collected and disposed of separately;
2. The public or private waste collection systems defined by local legislation must be used. In addition, the equipment can be returned to 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
5. Sheet indicates that the equipment has been introduced onto the market after 13 August 2005 and that it must be disposed of separately;
6. In the event of illegal disposal of electrical and electronic waste, the penalties are specified by local waste disposal legislation.

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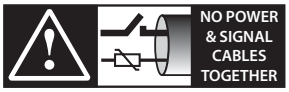
may be affected.



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WARNING

Separate as much as possible the probe and digital input signal cables from the cables carrying inductive loads and power cables to avoid possible electromagnetic disturbance.
Never run power cables (including the electrical panel wiring) and signal cables in the same conduits

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1. INTRODUCTION

1.1 General description

The µGEO is a new compact CAREL electronic controller, the same size as a normal thermostat, for the complete management of heat pumps and chillers. µGEO is destined to applications mono-circuit (1 or 2 compressors) which can control air-water, water-water units. The expansion is indispensable to have all the necessary I/Os.

Controlled devices

- compressors;
- geothermal circuit pump (outlet fan in air water unit);
- reversing valve;
- water pumps for sanitary water and second load (outlet fan in air water unit);
- antifreeze heater;
- 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;
- a serial line.

1.2 List of functions and main features

Main functions

- regulate one circuit with two loads – sanitary water and second load (under-floor heating/swimming pool);
- geothermal heat exchange to save the energy;
- control of the water inlet and outlet heat exchange temperature;
- defrost management by time and/or by temperature or pressure;
- fan/pump speed control;
- complete alarm management;
- connection to serial line for supervision/telemaintenance;
- elimination of the expansion vessel.

Driver function

- Management of electronic expansion valves.

Controlled devices

- compressors;
- geothermal circuit pump (outlet fan in air water unit);
- reversing valve;
- water pumps for sanitary water and second load (outlet fan in air-water unit);
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Programming

CAREL offers the possibility to configure all the unit parameters not only from the keypad on the front panel, but also using:

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2. ELECTRICAL INSTALLATION

2.1 Board wiring connections

General diagram

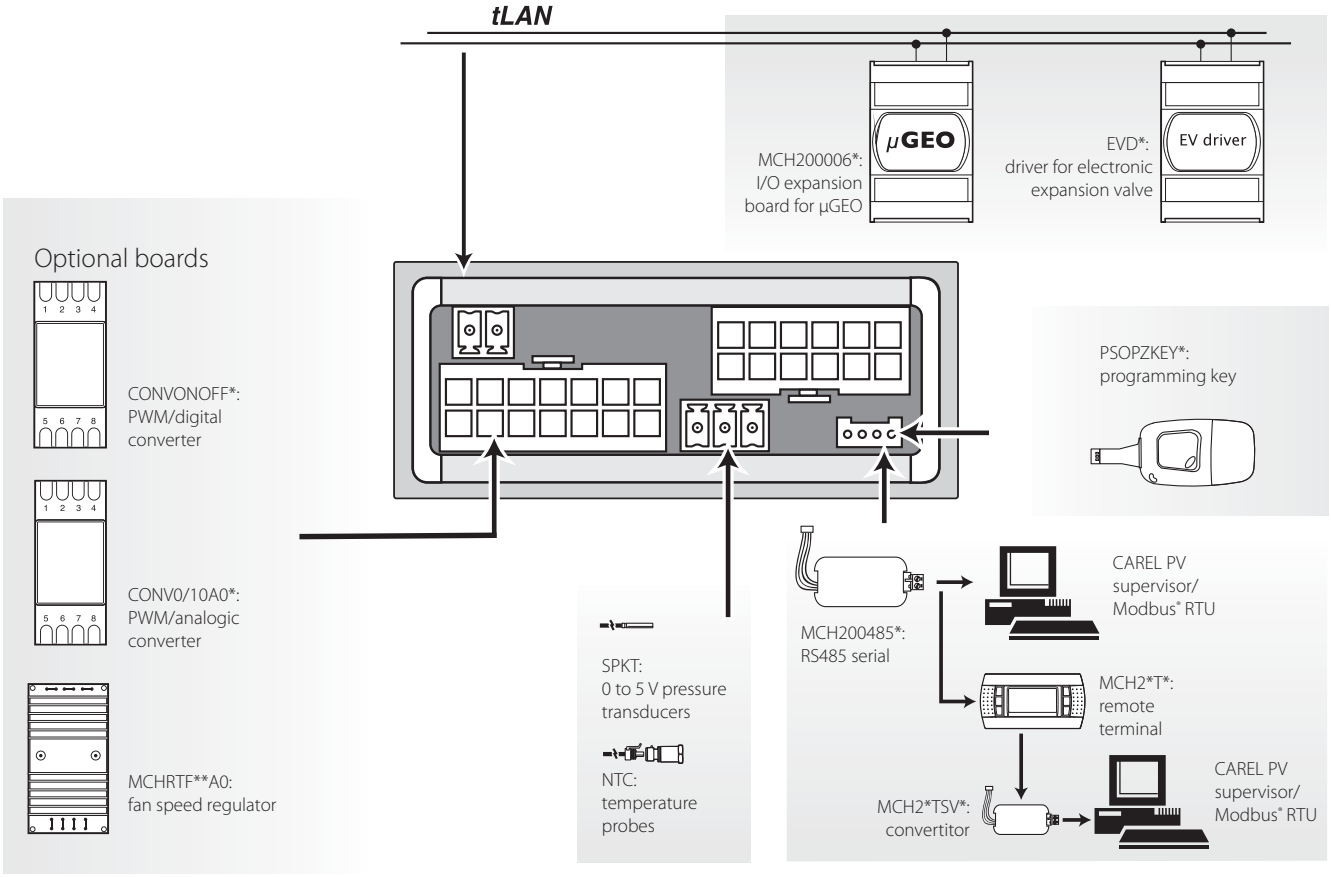

Fig. 2.a

Network layout

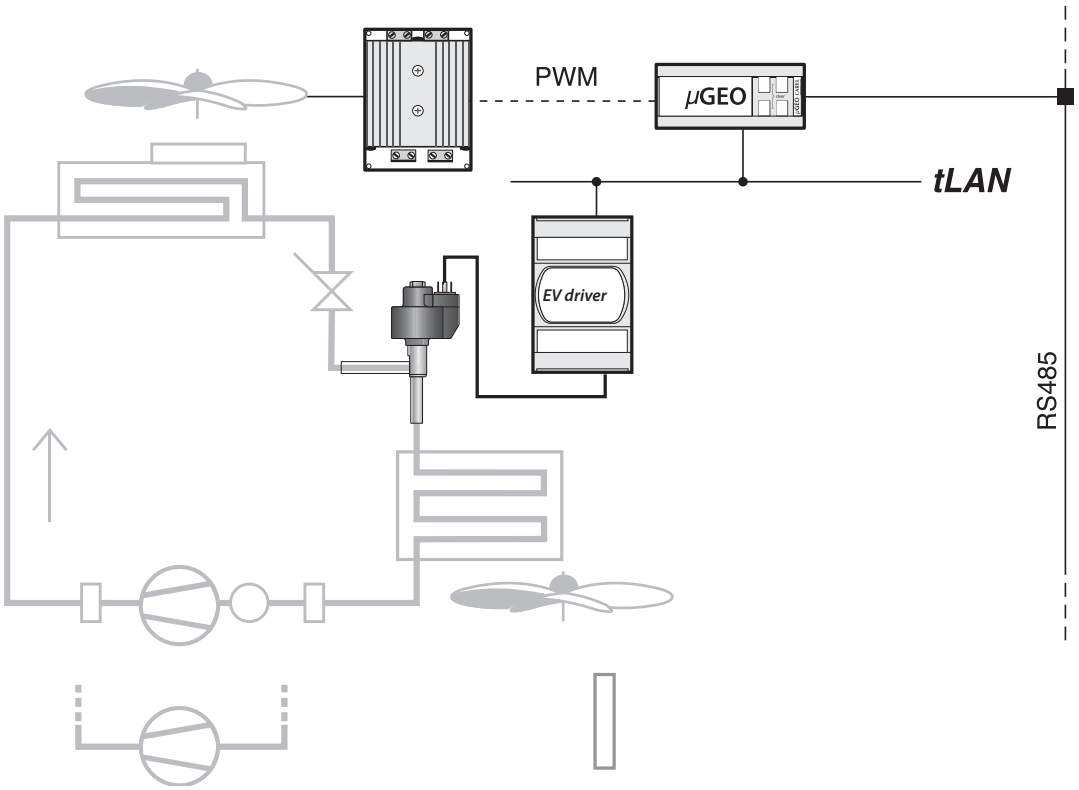

Fig. 2.b

3. USER INTERFACE

3.1 Display

The display features 3 digits, with the display of the decimal point between -99.9 and 99.9. Outside of this range of measurement, the value is automatically displayed without the decimal (even if internally the unit still operates considering the decimal part). In normal operation, the value displayed corresponds to the temperature read by probe B1, that is, the.sanitary water temperature
Fig. 1.a show the symbols present on the display and on the keypad and their meanings.

Symbols on the display

Display with 3 green digits (plus sign and decimal point), amber symbols and red alarm symbols.

Fig. 3.a

symbol	colour	LED on	LED flashing
1; 2	amber	compressor 1 and/or2 on	switch-on request
A	amber	at least one compressor on	
B	amber	air delivery pump/fan on	switch-on request
C	amber	condensation fan activated	
D	amber	defrost active	defrost request
E	amber	resistance activated	
F	red	alarm active	
G	amber	heat pump mode (P6=0)	heat pump mode request (P6=0)
H	amber	chiller mode (P6=0)	chiller mode request (P6=0)

Tab. 3.a

3.2 Keypad and functions

Functions associated with the buttons

Display with 3 green digits (plus sign and decimal point), amber symbols and red alarm symbols.

key	machine state	presure mode
I	Loading of default values	switch-on with key pressed
	Return to upper sub-unit within the programming environment until exit (with variations saved in EEPROM)	single press
	In case of active alarm, deactivate the alarm relay	single press
L	Direct access to parameters	press for 5 secs
	Item selection within the programming environment and displsy of direct parameters value/confirmation of parameter variations	single press
I+L	Programming parameters by means of password introduction	press for 5 secs
J	Upper item selection within the programming environment	single or continuous pressing
	Value increase within the programming environment	single or continuous pressing
	Passage from stand-by to chiller mode (P6=0) and vice versa	press for 5 secs
	Allows immediate access to the pressure and temperature probes of the condenser, evaporator and DTE, DTC1-2	single press
K	Lower item selection within the programming enviroment	single or continuous pressing
	Value decrease	single or continuous pressing
	Passage from stand-by to heat pump mode (P6=0) and vice versa	press for 5 secs
	Allows immediate access to the pressure and temperature probes of the condenser, evaporator and DTE, DTC1-2	single press
J+K	Manual alarm reset	press for 5 secs
	Immediate zeroing of the hour counter (within the programming environment) and DTE, DTC1-2	press for 5 secs
L+J	Manual forced defrosting for both circuits	press for 5 secs

Tab. 3.b

3.3 Setting and editing parameters

1. press "Prog" and "Sel" for 5 seconds;
2. the heating and cooling symbol and the figure "00" are displayed;
3. use "▲" and "▼" to set he password and confirm by pressing "Sel";
4. use "▲" and "▼" to select the parameter menu (S-P) or levels (L-P) and then press "Sel";
5. use "▲" and "▼" to select the parameter group and then press "Sel";
6. use "▲" and "▼" to select the parameter and then press "Sel";
7. after making the changes to the parameter, press "Sel" to confirm or "prog" to cancel the changes;
8. press "prog" to return to the previous menu;
9. to save the modifications, press "prog" repeatedly until reaching the main menu.

Note:

- the parameters that have been modified without being confirmed using the "Sel" button return to the previous value;
- if no operations are performed on the keypad for 60 seconds, the controller exits the parameter modification menu by timeout and the changes are cancelled.

Keypad

The keypad is used to set the unit operating values (see Parameters/ alarms – Keypad combinations).

4. FUNCTIONS

4.1 Probe settings: parameters (/*)

Type of probe: from /01 to /08: enables the reading of the corresponding analogue input.

Functions of the probes

Unit type param. H01	B1	B2	B3	B4	B5	B6	B7	B8
air/water heat pump	sanitary water temp.	Second load outlet temp.	Second load inlet temp.	High pressure	Ext. exchange probe	-	External temp.	Low pressure
water/water heat pump	sanitary water temp.	Second load outlet temp.	Second load inlet temp.	High pressure	Geothermal outlet temp.	Geothermal inlet temp.	External temp.	Low pressure

Tab. 4.a

Min/max voltage and pressure values

From /09 to /12: sets the minimum/maximum voltage and pressure for the ratio metric signal.

Probe calibration

From /13 to /20: calibrates the corresponding sensor (from B1 to B8).

Digital filter

/21: Establishes the coefficient used in the digital filtering of the value measured. High values for this parameter will eliminate any continuous disturbance at the analogue inputs (however decrease the promptness of measurement). The recommended value is 4 (default).

Input limit

/22: Establishes the maximum variation that can be measured by the probes in one unit program cycle; in practice, the maximum variations allowed in the measurement are between 0.1 and 1.5 units (bars, °C or °F, depending on the probe and the unit of measure) approximately every one second. Low values for this parameter will limit the effect of impulsive disturbance. The recommended value is 8 (default).

Unit of measure

/23: Selects the unit of measure as degrees centigrade or Fahrenheit. When the parameter is modified, the µGEO automatically converts the values read by the NTC temperature probes into the new unit of measure; while all the other parameters set (set point, differential etc.) remain unchanged.

4.2 Antifreeze, auxiliary heater: parameters (A*)

Antifreeze alarm set point

A01: when µGEO works on second load, probe B2 represents the temperature (antifreeze set point) of the water at the evaporator outlet below which an antifreeze alarm is activated; in this condition the compressors corresponding to the circuit in question are stopped, while the pump remains on to decrease the possibility of freezing. The alarm is reset manually (or automatically, depending on parameter P05) only when the water temperature returns within the operating limits (that is, above A01+A02).

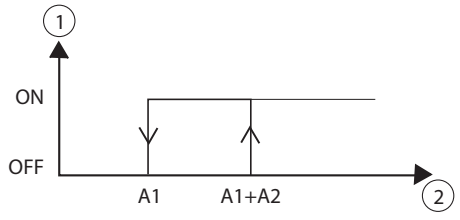

Fig. 4.a

Key:

1 compressor
2 temperature

Antifreeze alarm differential

A02: This represents the differential for the deactivation of the antifreeze alarm; the alarm condition cannot be reset until the temperature exceeds the set point + differential (A01+A02).

Antifreeze alarm by passes time

A03: This represents the delay in the activation of the antifreeze alarm when starting the system.

Set anti-freeze resistance in cooling mode (summer mode)

A04: Determines the threshold below which the support resistances are not used in summer mode. Whenever the resistances are activated, the pump is activated (if present). The set point is considered absolute or relative depending on parameter the anti-freeze resistances are switched-on. The anti-freeze resistance switch-on function is also activated when the machine is in stand-by. The function is not active when the machine is in stand-by. In the air-air heat pump r43.

Anti-freeze resistances differential

A05: Differential for the activation/deactivation of the anti-freeze resistances.
Functioning diagram of the anti-freeze alarm and anti-freeze resistances for air/water, water/water chiller and heat pump modes.

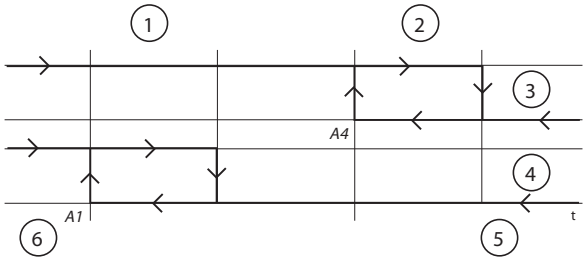

Fig. 4.b

Operating diagram of the antifreeze alarm and the antifreeze heaters for air/water and water/water chillers and heat pumps.

Key:

1. Antifreeze alarm differential (A2)
2. Antifreeze heater differential (A5)
3. Heaters
4. antifreeze alarm
5. antifreeze heater set point (A4)
6. antifreeze alarm set point (A1)

Support resistance probe (only second load)

A06: Determines the probe to use (B3 or B2) to control the support resistances. The parameter means:
A6 = 0 => B3
A6 = 1 => B2
A6 = 2 => B3 (enabled only if B7 < r51)
A6 = 3 => B2 (enabled only if B7 < r51)
The probes are fixed for all other units. See probe operational correspondence.

Probes used for Resistances, Anti-freeze/Defrost, Delivery, Auto Switch-on

The table below shows all of the probes used for the different functions. The table has used probe B3 as the control probe and probe B2 as the anti-freeze probe.

Sanitary water

S/W	H01	Resistances		Antifreeze/ Defrost	Auto-switch-on (A10=1)	
		A06=0	A06=1		A06=0	A06=1
Sum	0	B2<A4	B2<A4	B2<A1	B3<A4	B2<A4
Win		B3<A8	B3<A8	B2<A1	B3<A4	B2<A4
Sum	1	B2<A4	B2<A4	B2<A1	B3<A4	B2<A4
Win		B3<A8	B3<A8	B5<d03	B3<A4	B2<A4

Tab. 4.b

Second load

S/W	H01	Resistances		Antifreeze/ Defrost	Auto-switch-on (A10=1)	
		A06=0	A06=1		A06=0	A06=1
Sum	0	-	-			
Win		B1<A11	B1<A11			
Sum	1	-	-			
Win		B1<A11	B1<A11			

Tab. 4.c

Antifreeze alarm set point limit

A07: Establishes the minimum limit for setting the antifreeze alarm set point (A01).

Support resistance in heating mode for second load

A08: This parameter has value for second load heat pump mode as additional heating for the utility (B3 or B2) and using the same resistance used for the anti-freeze but obviously with a different set, i.e. support. In defrosting mode for air/water unit, the resistance heats the evaporator while it is cooled by the chilling cycle, with a set point (alternative) above A4 (set for the anti-freeze).The set point is considered absolute or relative depending on parameter r43.

Support resistance differential in heating mode

A09: Represents the differential for the activation/deactivation of the support resistance in heating mode.

Automatic start for antifreeze

A10: This function is valid when the unit is in standby.
The operating mode switchover delay times are ignored.

- A10=0: function not enabled
- A10 > 0: In stand-by mode, the system is working in the SL circuit.
  A10=1: Support resistances and pump are switched-on at the same time on the basis of A4
- A10=2: Pump and support resistance switched-on on the basis of the respective set A4 or A8. If the temperature drops below the anti-freeze alarm set A1, the machine is switched-on in heating mode, adjusting the steps (compressors) on the basis of the set A1 and differential A2 in proportional mode.
  This mode ends automatically when the anti-freeze set A1 + the differential A2 are reached (returning to the previous mode); it is however possible to end the operation in advance by modifying the parameters or removing the power supply from the device.
  Defrosting is disabled. In this case the display shows the following:
  Season LED off.

The summer/winter flag does not switch (therefore the supervisor does not detect this mode);
Compressor adjustment becomes proportional with or without dead zone (r7 different from 0).
A10=3: The support resistance is switched-on on the basis of A4 according to the settings of the anti-freeze or support resistances; in the case of 2 evaporators, will be adjusted on the basis of its own probe (B2, B6).

Auxiliary heater in DHW circuit set point

A11: Set point for the DHW circuit heater in heating mode, the control of the auxiliary heaters has been separated, each having its own activation set point (see A08).

Differential for auxiliary heater in DHW circuit

A12: Represents the differential for the activation/deactivation of the antifreeze heater in defrost/auxiliary heater in heating.

A14: Set anti-freeze alarm/low environment temp. for EVD

Represents the temperature of the water (set anti-freeze) detected by EVD probe, under which the machine goes into anti-freeze alarm; the compressors relative to the circuit affected are switched-off in alarm conditions, while the pump remains active to lower the possibility of freezing. The manual reset (or automatic, depending on the parameter) only takes place when the temperature of the water returns within the functioning limits (i.e. it exceeds value A14+A2).

4.3 Probe readings: parameters (B*)

Select probe to be shown on display

b00: Sets the probe reading to be displayed.
0= probe B1 (sanitary water probe)
1= probe B2 (second load outlet probe)
2= probe B3 (second load inlet probe)
3= probe B4 (high pressure probe)
4= probe B5 (Geothermal outlet probe)
5= probe B6 (Geothermal inlet probe)
6= probe B7 (external temperature probe)
7= probe B8 (low pressure probe)
8= set point without compensation
9= dynamic set point with possible compensation
10= remote ON/OFF digital input status

For the list of parameter-probe associations see Table 4.d

Note: probes that are not present cannot be selected.

4.4 Compressor settings: parameters (c*)

Minimum ON time

c01: This establishes the time that the compressor must remain ON for when started, even if the stop signal is sent.

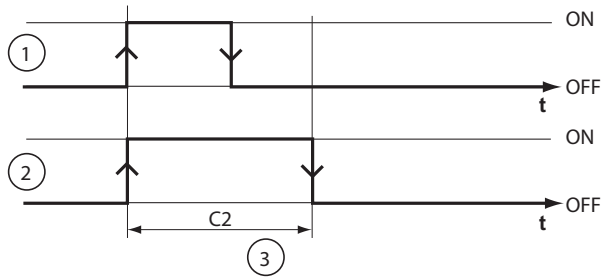

Fig. 4.c

Key:

1 signal
2 compressor
3 min. ON time-interval

Minimum OFF time

c02: This establishes the time that the compressor must remain OFF for when stopped, even if the start
signal is sent. The compressor LED flashes in this phase.

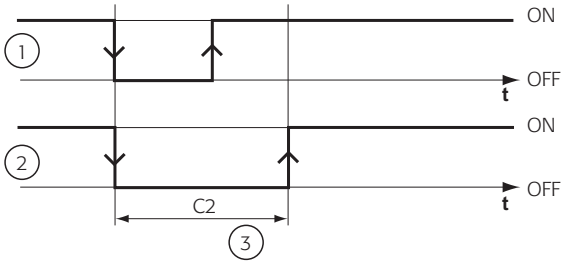

Fig. 4.d

Key:

1 signal
2 compressor
3 minimum off time

Delay between 2 starts of the compressor

c03: This sets the minimum time that must elapse between two successive starts of the same compressor (determines the maximum number of starts per hour for the compressor). The compressor LED flashes in this phase. If by mistake the user enters a value lower than the sum of C01 + C02, this param. will be ignored and only the times C01 and C02 will be considered.

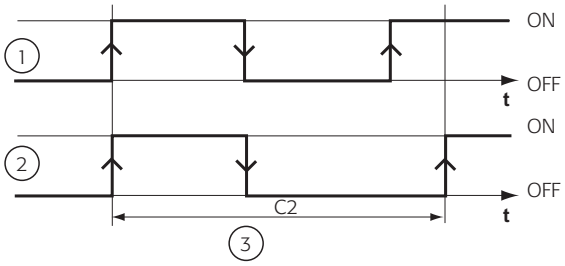

Fig. 4.e

Key:

1 signal
2 compressor
3 min. time-interval between two ON routines

Start delay between compressors

c04: This sets the delay between the starts of the two compressors, so as to reduce the peak power input and make the compressors start more smoothly.
The compressor LED flashes in this phase.

- In the event of capacity control, the delay c04 between compressor and valve becomes c04/2;
- In the event of defrost operation, the delay between compressor and compressor is 3 seconds, and between compressor and valve is 2 seconds.

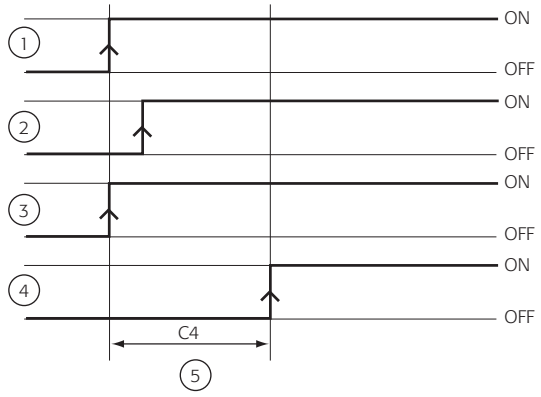

Fig. 4.f

Key:

1 1st signal
2 2nd signal
3 1st compressor
4 2nd compressor
5 delay between starts of two compressors

Stop delay between compressors

c05: This sets the stop delay between the compressors.

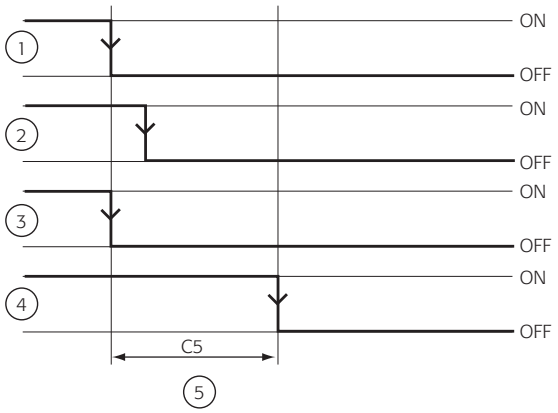

Fig. 4.g

Key:

1 1st signal
2 2nd signal
3 1st compressor
4 2nd compressor
5 delay between stops of two compressors

Delay on power-up (reset power supply)

c06: At power ON (when the controller is physically switched ON) the activation of all the outputs is delayed so as to distribute the power input and protect the compressor against repeated starts in the event of frequent power failures. This means that after the delay time, the controller will start to manage the outputs based on the other times and the other normal functions.

Compressor start delay from pump ON

c07: In cooling and heating operation, if the operation of the pump is subject to the controller (parameter H05/H25 = 2), the compressor is started when required after the set time from the activation of the water pump (or outlet fan in air/air units). If the pump/outlet fan is always ON (H05/H25=1) and consequently does not depend on the control logic, the compressor is started after the set time from when the unit starts.

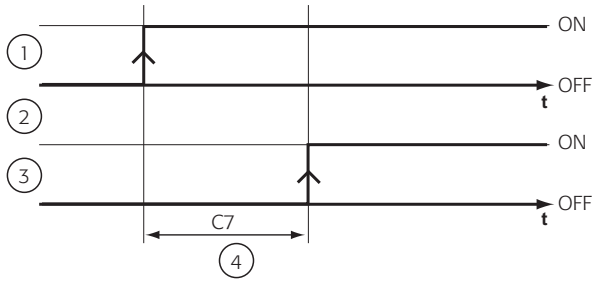

Fig. 4.h

Key:

1 outlet fan
2 pump
3 compressor
4 delay between pump/ outlet fan and compressor

Pump stop delay from compressor OFF

c08: In cooling and heating operation, if the operation of the pump is subject to the controller (parameter H05/H25=2), when the compressor is requested to stop, the control first stops the compressor and the pump. If the pump/outlet fan is always ON (H05/H25=1), it is only stopped in standby mode.

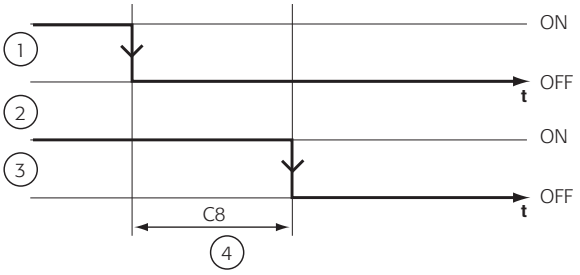

Fig. 4.i

Key:

1 compressor
2 pump
3 delay between pump/ outlet fan and compressor

Maximum tandem compressor operating time

c09: In the case of two compressors in tandem, one compressor should not operate for longer than the time set for c09 while the other compressor in the circuit is OFF. This prevents the oil shared in common from migrating over the allowed limit towards the active compressor, and consequently avoids damage when inactive compressor next starts (FIFO logic) due to poor lubrication. As a result, compressor 1 (or 2), if requested to operate continuously, will actually stop OFF after the time c09 and hand over to compressor 2 (or 1) that was previously OFF.
This function always considers the compressor times. Any value lower than the time set for c03 will be ignored, and the compressors (if the above condition is satisfied) will switch over after the time c03. When C9=0, the function is disabled (the compressors will not switch over).

Hour counter compressor 1-2

c10, c11: These indicate the number of operating hours of compressor 1, 2, expressed in hundreds of hours. Pressing and together, when the hour counter is displayed, resets the hour counter and, consequently, cancels any maintenance requests in progress.
c10= operating hours comp. 1
c11= operating hours comp. 2

Compressor operating hour counter threshold

c14: This sets the number of compressors operating hours, expressed in hundreds of hours, above which the maintenance request signal is sent.
c14= 0: function disabled.

Evaporator pump/fan 1 hour counter

c15: This indicates the number of operating hours for the evaporator pump or fan 1, expressed in hundreds of hours.
Pressing UP and DOWN together, when the hour counter is displayed, resets the hour counter and, consequently, cancels any maintenance requests in progress.

Condenser or backup pump/fan 2 hour counter

c16: This indicates the number of operating hours for the condenser (or backup) pump or fan 2, expressed in hundreds of hours. Pressing UP and DOWN together, when the hour counter is displayed, resets the hour counter and, consequently, cancels any maintenance requests in progress.

Pump off time in burst mode

c17: The diagram below shows an example of the operation of the pump with burst (active when H05/H25=3, see parameter H05/H25).
The dashed areas on the compressor line indicate the pump-compressor and compressor-pump delay times.
Burst mode is disabled in standby and during an alarm when the pump is OFF.
At power ON the delay c17 must elapse before burst can start.

Minimum pump/fan ON time

c18: This represents the minimum time that the pump remains ON for, see Fig. 4.j (active with H05/H25=3 see parameter H05/H25).

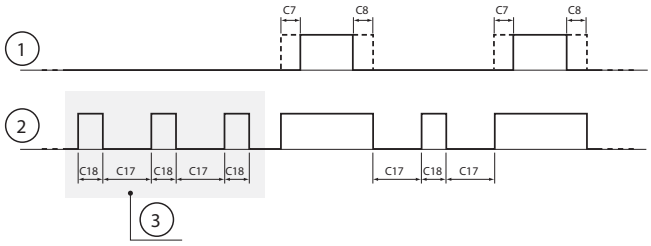

Fig. 4.j

Key:

1 compressor
2 pump
3 burst

Sanitary water regulation ON time

When there're two requests at the same time from sanitary water and second load circuits, µGEO satisfies the request with higher priority firstly. This management is limited by the following timers-c19 and c20.
c19: This timer represents the maximum allowed duration for sanitary water priority. When this timer expires, the priority is switched to the second load. When the set point is satisfied, the timer will be reset.
c19 equal to 0 disable this function.

Second load regulation ON time

c20: This timer represents the maximum allowed duration for second load priority. When this timer expires, the priority is switched to the sanitary water. When the set point is satisfied, the timer will be reset.
c20 equal to 0 disable this function.

Delay in switching from heating to cooling

c21: This time is used to switch from heating to cooling mode and sets a delay while the compressor will be OFF. After C21/2 the reverse in switched OFF.

Delay in switching from cooling to heating

c22: When there is a condition that force to change the state from cooling to heating. a time is applied while the compressors are switched OFF. The four way valve is switched ON after C22/2.

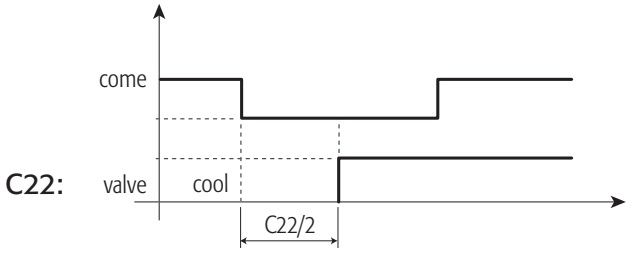

Fig. 4.k

4.5 Defrost settings: parameters (d*)

The defrost has priority over the compressor times. For the defrost function the compressors times are ignored, except for C04 (see C04 description for the exceptions).

Enable condenser defrost/antifreeze

d01: For heat pumps with air-cooled condensers (H01=0), this establishes whether defrost control must be performed on the outdoor exchanger (evaporator in heating mode).
On the other hand, for water/water heat pumps with reversal on the gas circuit (H01=1), it enables antifreeze control on the cooling water for the

outdoor exchanger, which becomes the evaporator in heating mode, see d03.
If the fan is not present, the function is not enabled for air/water units.
d01=0: condenser defrost/antifreeze disabled;
d01=1: condenser defrost/antifreeze enabled.
If defrosting is operating, the relative symbol will be illuminated on the display. During defrosting, all compressors of the circuit in defrost, are made to function at maximum power, respecting times c4-c7.
In the passage from pump to defrost (chiller) and return to heat pump, the evaporator pump must always function (if present).
When the defrosting happens in the Sanitary Water circuit, the system turns to the Second Load circuit immediately.

Type of defrost

d02: establishes the type of defrost.
d02=0: the defrost has a fixed duration that depends on d07
d02=1: the defrost starts and ends according to the temperature or pressure thresholds, see d03 and d04;
d02=2: the pressure transducer and temperature probe are both located on the outside exchanger; the defrost starts when the value read by the pressure transducer is below the threshold d03 and ends when the value read by the temperature probe is above the threshold d04; during the defrost, the pressure probe controls the fan speed, as in chiller mode, so as to limit the pressure, even if the NTC probe, caked by ice, delays the end defrost. In any case, after the maximum time allowed for the defrost, the unit will always exit the defrost procedure.
d02=3: enable sliding defrost.
In the event of low outside temperatures, the evaporator pressure or temperature may fall below the threshold set to start the defrost (d03) even if there is effectively no ice on the coil. This can be corrected by shifting the start of the defrost proportionally to the lowering of the outside temperature. This procedure can be performed based on the temperature or the pressure alone, and not combined. It is disabled if the outside compensation probe is not fitted or is broken. It is performed based on the pressure only if both the pressure probe and temperature probe are configured.

Start defrost temperature/pressure

d03: For heat pumps with air-cooled condensers (H01 = 0), this sets the temperature or pressure below which the defrost cycle starts. To start the defrost cycle, the condition must be valid for the time d05.
If sliding defrost is enabled, the start defrost temperature decreases (starting from d03) proportionally to the outside temperature.

End defrost temperature/pressure

d04: Establishes the temperature or pressure above which the defrost cycle ends.

Minimum start defrost time

d05: Establishes the time that temperature/pressure must remain below the start defrost threshold d03, while the compressor is ON, for the defrost cycle to be activated.

Defrosting by temperature (d2=1)

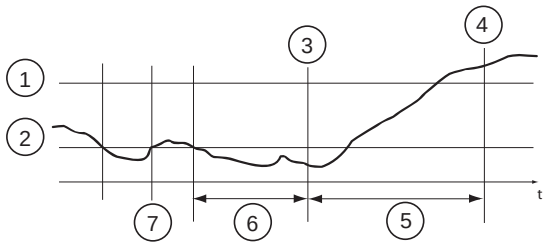

Fig. 4.I

Key:

1	end defrost T/P	5	min. time-interval to start a def. cycle (d6);
2	start defrost T/P	6	min defrost interval (d5)
3	start defrost T	7	timer reset
4	end defrost		

Minimum defrost duration

d06: Represents the minimum duration of the defrost cycle (the defrost continues even if the value read by the condenser probe exceeds the end temperature/pressure). If set to 0, the minimum defrost time function is disabled.
d06=0: control disabled.

Maximum defrost duration

d07: If timed defrost is set (d02=0), this establishes the duration of the cycle. If, on the other hand, the defrost ends at a set temperature/pressure, it represents the maximum duration (being in this case a safety feature, an alarm is signaled, "dF1").

Delay between two defrosting requests in the Second Load circuit

d08: Represents the delay time between two successive defrosting cycles.

Defrost management from external contact

d10: This enables or disables defrost control from an external contact.
This function is typically used to end the defrost based on a signal from a thermostat/pressure switch connected to the corresponding digital input. In this case, the defrost times are ignored.
d10 = 0: function disabled.
Note: for the other settings, the start and end defrost are enabled for temperature and pressure values between the Defrost start and end set points
d10= 1: start defrost from external contact enabled therefore:
- if the contact of the input is open, the start of the defrost is enabled;
- if the contact of the input closed, the defrost follows the normal procedure.

d10= 2: end defrost from external contact enabled therefore:
- if the contact of the input is open, the end of the defrost is enabled;
- if the contact of the input is closed, the defrost follows the normal procedure.

d10= 3: start and end defrost from external contact enabled therefore:
- if the contact of the input is open, the end/start of the defrost is enabled;
- if the contact of the input is closed, the defrost follows the normal procedure.

Antifreeze/auxiliary heaters in defrost

d11: This parameter determines whether, during the defrost cycle, the antifreeze/auxiliary heaters should be activated to limit the flow of cold water/air into the room.
d11 = 0: antifreeze/auxiliary heater not activated in defrost;
d11 = 1: antifreeze/auxiliary heater activated in defrost.

Forced ventilation time at end defrost

d16: If the parameter F13 = 2, as soon as the end defrost temperature or pressure is reached, the fans are activated at maximum speed for the set time, before the change in operating mode. Only at the end of this time will the cycle switch back to heat pump mode, with the normal management of the fans.

Defrost with compressors OFF (Fan Defrost)

d17: This function allows the outside temperature to be exploited, when sufficient, to defrost the external heat exchanger.
In these conditions, the unit, rather than reverse the cycle, simply turns OFF the compressors and activates the fans at maximum speed. The start and end defrost conditions remain unchanged, as does the use of any auxiliary heaters.
The parameter has the following settings: d17=0: function disabled, d17>0: function enabled with relative set point (which represents the minimum defrost temperature set by the manufacturer). Above the set point, the unit performs the Fan Defrost.

Max outside temperature threshold for sliding defrost

d18: This establishes the maximum value of the outside temperature below which sliding defrost is activated.

Maximum temperature/pressure differential deviation for defrost

d19: This value is expressed in °C if the compensation is controlled by temperature, or in bar if controlled by pressure. The value set is subtracted from d03.

Outside temperature differential for compensation saturation

d20: The value set is subtracted for d18.

4.6 Fan settings: Parameters (F*)

Fan/Pump output

F01: Enables the operation of the fans/pumps.
F01=0: fans absent;
F01=1: fans present.
The PWM output requires the presence of the optional fan/pump control cards (ON/OFF for the CONVONOFF module or speed variation for MCHRTF or FCS three-phase).

Fan/pump operating mode

F02: This establishes the operating logic for the geothermal fan/pump;
F18: This establishes the operating logic for the sanitary water pump:
F02/F18=0: always ON at maximum speed, independently from the compressors. The fans/pumps are only switched OFF when the unit is in standby.
F02/F18=1: ON at maximum speed when at least one compressor in the corresponding circuit is ON (parallel operation in each circuit).
F02/F18=2: ON when the corresponding compressor is ON, with ON/OFF control based on the temperature/ pressure settings for the minimum and maximum speed (parameters F05-F06-F08 and F09). When the compressors are stopped, the corresponding fans/pumps are also stopped, irrespective of the condensing temperature/pressure.

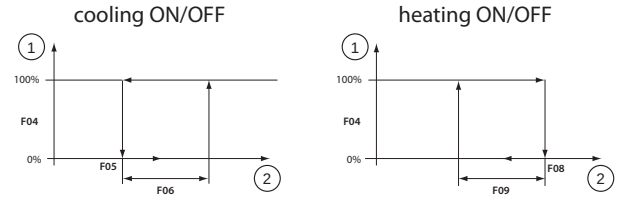

Fig. 4.m.a

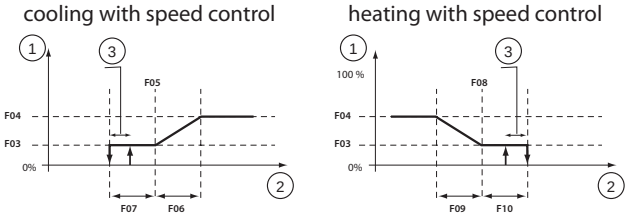

Fig. 4.m.b

F02/F18=3: ON when the corresponding compressor is ON, with speed control. When the compressors are stopped the corresponding fans/pumps are also stopped, irrespective of the condensing temperature/pressure. With F02=3 and an NTC condenser probe, when the compressor starts the fans/pumps are started at maximum speed for the time F11, irrespective of the temperature measured. In the event of a condenser probe fault, the fans/pumps will be switched OFF.

Minmum voltage threshold for Triac

F03: In the event of fan/pump speed control, the optional phase cutting cards (MCHRTF*) are required, fitted with a triac. The voltage delivered by the triac to the electric fan/pump motor corresponding to the minimum speed must be set. The set value does not correspond to the actual voltage in Volts applied, but rather to an internal unit of calculation in the µGEO.
If using FCS controllers, set this parameter to 0.
F03 = Represents the minimum threshold for the triac

Maximum voltage threshold for Triac

F04: In the event of fan/pump speed control, the optional phase cutting cards (MCHRTF*) are required, fitted with a triac. The voltage delivered by the triac to the electric fan/pump motor corresponding to the maximum speed must be set. The set value does not correspond to the actual voltage in Volts applied, but rather to an internal unit of calculation in theµGEO.
If using FCS controllers, set this parameter to 100.
F04 = Represents the maximum threshold for the triac

Temperature/pressure set point for minimum speed in cooling

F05: This represents the temperature or pressure below which the fans/pumps remain ON at minimum speed. In the case of ON/OFF control, it represents the temperature or pressure below which the fans/pumps are switched OFF (Fig. 5.a.k).

Temperature/pressure differential for maximum speed in cooling

F06: This represents the temperature or pressure differential in reference to F05 above which the fans/pumps are started at maximum speed; in the case of ON/OFF control, this represents the differential above which the fans/pumps are started (Fig. 5.a.k).

Temperature/pressure differential for switch-off in summer mode (cooling)

F07: If a speed adjuster is used, it represents the differential, with respect to F5, for the temperature or pressure above which the fans switch-off; Switch-on takes place 1°C "below" if NTC temperature probes are used for the condensation control or 0.5 Bar if pressure probes are used.

Temperature/pressure set point for minimum speed in heating

F08: This represents the temperature or pressure above which the fans are started at minimum speed (Fig 5.a.n).
For ON/OFF control, this represents the temperature or the pressure above which the fans are switched off (Fig 5.a.l).

Temperature/pressure differential for maximum speed in heating)

F09: This represents the temperature or pressure differential referred to F10 above which the fans are started at minimum speed (Fig 5.a.l).
In the case of ON/OFF control, it represents the temperature or pressure above which the fans are switched OFF (Fig.5.a.k). For capacity control for low pressure this represents, subtracted from F08, the pressure limit below which the step disabled during capacity control is re-activated.

Temperature/pressure differential for fans/pumps Off in heating

F10: If fan/pump speed control is used, this represents the temperature or pressure differential in reference to F08 above which the fans/pumps are stopped. The fans/pumps are started 1 °C "lower" if using NTC temperature probes or 0. 5 bars lower if using pressure probes. When using NTC temperature or pressure probes for condenser control, the fans/pumps are started with an hysteresis of 1 ºC or 0. 5 Bar.

Fan/pump start time

F11: This establishes the operating time at maximum speed when the fans/pumps are started, so as to overcome the mechanical inertia of the motor.
The same times are observed in reference to the start of the compressor (irrespective of the condensing temperature/pressure), if NTC temperature probes are used on the condenser and speed control is enabled, F02=3; this is done to bring forward the sudden increase in pressure (which does not necessarily correspond to a likewise rapid increase in temperature in the area where the probe is located) and consequently to improve control
F11=0: the function is disabled, that is, the fans/pumps are activated at the minimum speed and then controlled based on the condensing temperature/pressure.

Triac impulse duration

F12: This represents the duration in milliseconds for the impulse applied to the triac. For induction motors, set the parameter to 2 (default). On the other hand, when using the CONVONOFF0, CONV0/10A0 modules or FCS controllers, set the parameter to 0.

Fan management in defrosting mode

F13: This parameter sets the functioning logic of the condensation fans during defrosting:
F13 = 0: (default) the fans are deactivated.
F13 = 1: the fans are activated as in Chiller mode (cooling) with respect to the temperature or pressure.
F13 = 2: the fans are deactivated, up to defrosting end pressure or temperature, above which, they are switched on at maximum speed for the time set in parameter d16. Only at the end of this time, the cycle will go back to heat pump mode with normal fan management.

Fan enabling for start-up in high condensation temperature

F14 establishes the time the fan/pumps are operated at the maximum speed if starting with a high condensing temperature condition.
F14 = 0: function disabled.
F14 = 1..999: fan time (Sec.).
The function is operational only in chiller mode, if the probe on the condenser is a temperature senor and only for air-cooled units. When the first compressor starts, it is a assumed that the temperature of the environment is close to the temperature of the condenser, if the value read by the condenser probe is higher than the value of F05-F07, as well as starting the compressor, the fan/pump is forced to maximum speed for the time F14.

Activate low noise

F15: This function moves the pressure set point so as to lower the fan/pump speed and consequently reduce noise (specifically at night). If low noise is active in cooling, the condenser control set points are increased by F16. If low noise is active in heating, the set points are reduced by F17.
F15= 0: Low noise deactivated.
F15= 1: Low noise activated in cooling.
F15= 2: Low noise activated in heating.
F15= 3: Low noise activated in cooling and heating.

Note: The variation in the set point is not active during defrost

Cooling set point differential

F16: Differential added to the outdoor heat exchanger control set point when low noise is active (valid for both temperature and pressure control).

Heating set point differential

F17: Differential subtracted from the outdoor heat exchanger control set point when low noise is active (valid for both temperature and pressure control).

Sanitary water pump functioning mode

F18: Establishes the pump functioning logic:
F18=0: always on at maximum speed, independently from the compressors. The pump is only switched-off if the machine is in stand-by, after the sanitary water circuit compressors is switched off.
F18=1: on at maximum speed when at least one compressor in the sanitary water is active (functioning in parallel for each circuit).
The PWM output will be activated when at least 1 compressor is functioning.
F18=2: switched-on when the compressor is active, with On/Off adjustment with respect to the minimum and maximum speed temperatures/pressures (parameters F5, F6, F8 and F9). When the compressors switch-off, the relative fans are deactivated independently of the condensation temperature/pressure.
F18=3: switched-on when the relative compressor is active with speed adjustment.
When the compressors switch off the pump is deactivated independently of the condensation temperature/pressure.

Minimum voltage threshold for Triac (sanitary water)

F19: If pump speed must be adjusted the presence of the optional MCHRTF* phase cutting cards (with Triac) is requested. In this case it is necessary to specify the voltage distributed by Triac to the pump electric motor corresponding to minimum speed.
The value set does not correspond to the effective voltage in Volts applied but to a unit of calculation within the µGEO.

Maximum voltage threshold for Triac (sanitary water)

F20: If pump speed must be adjusted the presence of the optional MCHRTF* phase cutting cards (with Triac) is requested. In this case it is necessary to specify the voltage distributed by Triac to the fan electric motor corresponding to maximum speed.
The value set does not correspond to the effective voltage in Volts applied but to a unit of calculation within the µGEO.

Set minimum speed temperature in winter mode (heating)

F21: Determines the temperature under which the pump remains at minimum speed; in the case of ON/OFF adjustment, it represents the temperature under which the pump is switched off.

Maximum speed temperature differential in winter mode (heating)

F22:If a speed adjuster is used, it represents the differential, with respect to F5, for the temperature above which the pump must be activated at maximum speed; in the case of ON/OFF adjustment, it represents the temperature or pressure above which the pump is switched-on.

Temperature differential for switch-off in winter mode (heating)

F23: If a speed adjuster is used, it represents the differential, with respect to F5, for the temperature above which the pump switch-off; Switch-on takes place 1°C "below" if NTC temperature probes are used for the condensation control.

F24: Select fan probe

Select different types of fan probe
F24=0: Select temperature probe
F24=1: Select pressure probe

4.7 Unit settings: parameters: (H*)

Unit model

H01: Used to select the type of unit being controlled:
H01= 0: air/water heat pump
H01= 1: water/water heat pump with rev. on gas

Number of compressors

H04: This establishes the number of compressors. For further details see Table 4.h.

Sanitary water pump operating mode

H05: This establishes the operating mode for the evaporator water pump.
H05 = 0: pump disabled, (the flow switch alarm is ignored)
H05 = 1: always ON (the alarm is managed)
H05 = 2: ON when called by compressor (the alarm is managed)
H05 = 3: the pump will be started and stopped at regular intervals (independently from the compressors) as per the Burst setting (see parameters c17 and c18).
When the heating or cooling signal is received, first the evaporator pump/ outlet fan starts (always ON), and then the compressor, after the set times (c07, c08). The pump will not be stopped until all the compressors are Off.

Geothermal pump mode / external fan enabled (air/ water unit)

H06: This establishes the operating mode for the evaporator water pump.
H06 = 0: pump disabled, (the flow switch alarm is ignored)
H06 = 1: always ON (the alarm is managed)
H06 = 2: ON when called by compressor (the alarm is managed)
When the heating or cooling signal is received, first the evaporator pump/ outlet fan starts (always ON), and then the compressor, after the set times (c07, c08). The pump will not be stopped until all the compressors are Off.

µGEO network configuration

H08: Establishes the layout of the tLan network.
0= µGEO +EXP.
1= µGEO + EXP. + EVD.

Enable keypad

H09: Used to disable the modification of the DIRECT and USER parameters from the keypad. The value of the parameters can always be displayed. The enable/disable cooling, heating and reset counter functions are also available.
Values:
0: keypad disabled
1: keypad enabled (default)

Serial address

H10: Establishes the address of the instrument for the serial connection, via an optional board, to a PC for supervision and/or telemaintenance.

Capacity-control logic

H12: Specifies the logic for the activation of the capacity-control steps for the compressors and the 4-way reversing valve.
H12 = 0: 4-way reversing valve and capacity-control normally energized
H12 = 1: 4-way reversing valve and capacity-control normally de-energized. Default value.
H12 = 2: 4-way reversing valve normally de- energized and capacity-control normally energized
H12 = 3: 4-way reversing valve normally energized and capacity-control normally de- energized.

Note: in the event of capacity-control, the rotation between compressor and corresponding valve is disabled.

Enable pump down

H13: This function allows the unit to be stopped while avoiding the possible formation of liquid refrigerant inside the evaporator. When the only active compressor is called to stop, the expansion valve is closed so as to depressurize the circuit. Valid only when the driver is installed, as the driver pressure probe is used.

Minimum pump down pressure

H14: Limit pressure below which the compressor is deactivated.

Maximum pump down time

H15: Maximum time after which the compressor is deactivated.

SmartSET "CAREL patent"

H16: Activate smartSET, this function optimises the operation of the unit by calculating the efficiency of the heat exchangers.
In smartSET mode, the following values are saved:

- Only when R06= 0 or 4;
- DTE: Difference between evaporator inlet temperature (B3) and outlet temperature (B2), calculated at full load (all compressors on) when reaching the user set point. Saved to memory on the E2P;
- DTC 1: Difference between outside exchanger temperature (B5/B6) and outside temperature (B7 ...) (this implies the configuration of a dedicated probe, optional setting). It is calculated whenever outdoor fan/pump runs at maximum speed for 30s, irrespective of the status of the compressors;

With proportional inlet control, the dynamic set point (STD) and the corresponding proportional band are adapted according to the DTE.
With outlet control and dynamic logic, that is, dead zone and activation/ deactivation times, the dead zone has a dynamic value.
In this case too, control will be optimized according to the actual DTE measured.

Minimum DTE value allowed

H17: Even if there is not danger involved, beyond the limit a warning is sent ("dEL") to check the water flow-rate, which is perhaps too high or low condenser efficiency.

Maximum DTE value allowed

H18: Maximum value allowed for DTE, above the limit the evaporator risks freezing, the anomalous behavior is signaled by "dEH".

Maximum DTC value allowed

H19: Maximum value allowed for DTC, above this value the condenser may be dirty (chiller) or dirty/frozen (heat pump).

Disable load default values

H22: If this parameter is set to 1, it disables the possibility of restoring the default parameters using the
PRG button at power ON.

Select supervisor protocol

H23: establishes the protocol used for the connection to the supervisor from the serial board RS485
H23 = 0: CAREL protocol (baud rate 19200…)
H23 = 1: Modbus protocol

Select control priority

H24: establishes the priority of regulation on sanitary water or second load If there's no digital input of mode option, the parameter H24 determines the request priority:
H24 = 0: The priority of heat pump is assigned to sanitary water (heating mode). Then, if the set-point of sanitary water is satisfied the control works to regulate the temperature of second load (i.e. under floor heating).
H24 = 1: The priority of heat pump/chiller is assigned to second load. If the set-point is satisfied the control works to regulate the temperature of sanitary water (if necessary).

H25: second load pump functioning mode

Establishes the functioning mode of the water circulation pump in the second load exchanger.
H25 = 0: pump disabled, (the flow meter alarm is ignored)
H25 = 1: always on (the alarm is managed)
H25 = 2: on with call from compressor (the alarm is managed)
H25 = 3: the pump will be activated with regular On and Off intervals (independently from the compressors)

From Burst setting (see parameters C17 and C18). On the request for hot and cold mode the evaporator pump/delivery fan starts first in fixed mode (always On) and then the compressor after the set times (c7, c8).
The pump will not be switched off if all compressors have not been switched-off.

4.8 Alarm settings: parameters (P*)

Flow switch alarm delay when starting pump

P01: Establishes a delay in the recognition of the flow switch alarm when starting the pump (this allows the flow-rate to stabilize). In the event of alarms, the compressors are stopped immediately, ignoring the times.

Flow switch alarm delay in steady operation

P02: Establishes a delay in the recognition of the flow switch alarm in steady operation, so as to filter any variations in flow-rate or air bubbles present in the water circuit. In the event of alarms, the compressors are stopped immediately, ignoring the times.

Low pressure alarm delay at compressor start

P03: Establishes a delay in the recognition of the low pressure alarm when the compressor starts, so as to allow stable operating conditions to be reached. This delay is also counted when reversing the 4-way valve in the refrigerant circuit.

Enabling of high and low pressure capacity step

P04: enable or disable the part load operation of the circuit in high pressure.
The function is valid if the unit is fitted with tandem or capacity controlled compressors and pressure transducers. In the event of high pressure alarms, that is, for values over P18 (hysteresis 0.5 bar), the controller deactivates a load step and waits 10 seconds.
After this interval, if the alarm is still active, the unit is stopped, otherwise it continues to operate in part load mode. In this situation, the display shows the message PC1. This condition remains active until the pressure falls below the value corresponding to the maximum speed of the condenser fans (F05+F06). Below this value, the unit reactivates the load step that had previously been deactivated.

P4 = 0: capacity step disabled.
P4 = 1: capacity step enabled.
P4 = 2: low pressure capacity step activated.
P4 = 3: high and low pressure capacity step activated.

With the unit operating in heat pump mode, due to low outside temperatures or the load the pressure may fall and stop the unit due to the low pressure alarm. If the circuit has 2 compressor steps and the pressure remains below the value of one bar for the time P22, the circuit can operate at part load. This capacity control is not activated when the alarm comes from the digital input. In the event of low pressure, the controller deactivates one step and if the pressure does not return above the threshold in 10 seconds, the alarm is activated and the circuit is stopped. This function is valid for all units with pressure transducers.

Part load in low pressure

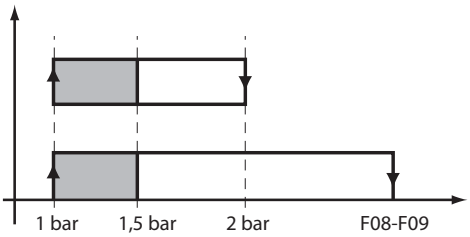

Fig. 4.n

Alarm reset

P05: Enables automatic reset for all those alarms that normally feature manual reset (high pressure, low pressure, antifreeze) as per the following table:
P05= 0: (default) high pressure, low pressure and antifreeze with manual reset;
P05= 1: all the alarms with automatic reset;
P05= 2: high pressure and antifreeze in manual, low pressure automatic;
P05= 3: high pressure manual, low pressure and antifreeze in automatic;
P05= 4: high and low pressure manual, antifreeze in automatic;
P05= 5: high and low pressure manual after the third activation in one hour*, antifreeze in automatic;
P05= 6: high and low pressure manual after the third activation in one hour*, antifreeze in manual.
*: the high and low pressure alarms are managed in the same way both for the transducers and the pressure switches
(digital input); if the unit is in standby the count (3 times in one hour) is reset.

Cooling/Heating logic

P06: If this parameter is set to 1, the operating logic of the Cooling/Heating logic is reversed (from the keypad, the remote control and the digital input).

Symbol	P06=0	P06=1
Sun	Cooling (chiller)	Heating (heat pump)
Ice	Heating (heat pump)	Cooling (chiller)

Tab. 4.d

Low pressure alarm with pressure probes

P07=0: this function is disabled.
P07=1: if the pressure measured by the analogue pressure probes is less than the low pressure threshold, the low pressure alarm is activated (while still considering the delay P03).

Note: P07=1 the LP digital inputs in heat pump are ignored.

Select digital input ID1

P08: Digital input 1 selection
0: not used
P8 = 1: flow meter geothermal pump with manual restore (n.c.)
P8 = 2: flow meter geothermal pump with automatic restores (n.c.)
P8 = 3: flow meter sanitary water pump with manual restore (n.c.)
P8 = 4: flow meter sanitary water pump with automatic restore (n.c.)
P8 = 5: flow meter second load pump with manual restore (n.c.)
P8 = 6: flow meter second load pump with automatic restore (n.c.)
P8 = 7: Thermal switch compressor(s) with manual restore (n.c.)
P8 = 8: Thermal switch compressor(s) with automatic restore (n.c.)
P8 = 9: summer/winter (open = summer; closed = winter)
P8 = 10: Mode Selection(open = standby; closed = on)
P8 = 11: alarm signal with manual restore (n.c.)
P8 = 12: alarm signal with automatic restore (n.c.)
P8 = 13: second Set point from external contact (summer and winter) (normally open)
P8 = 14: defrost end from contact (normally closed)
P8 = 15: defrost start form contact (normally closed)
P8 = 16: External request selection (open = second load; closed = sanitary water)
P8 = 17: high pressure
P8 = 18: low pressure
P8 = 19: sanitary water alarm
P8 = 20: enable second set point by time
P8 = 21: sanitary water thermal switch pump with manual store
P8 = 22: sanitary water thermal switch pump with automatic store
P8 = 23: second load thermal switch pump with manual store
P8 = 24: second load thermal switch pump with automatic store
P8 = 25: µGEO thermal switch pump with manual store
P8 = 26: µGEO thermal switch pump with automatic store
P8 = 27: External Request only for sanitary water(it has the priority to P8 = 16)

Note:

- If the digital input is configured as external request (i.e. P08=16), the control works to satisfy the request selected by digital input:
  0. Sanitary water
  1. Second load
  It a digital inputs is SW circuit only and it is activeted, any after to change in SL is forbidden.
- If P08 is set to 10, the change in state considers the times C21 and C22, and respects the compressor protection times, both from the digital input and the keypad.
- If the digital input is used to switch the unit ON/OFF or change the operating mode, these functions are disabled on the keypad.

Select digital inputs ID2, ID6, ID7, ID10, ID5, ID3, ID4, ID8, and ID9

P09, P10, P11, P12, P34, P40, P41, P42, P43: Configuration of digital inputs ID2, ID6, ID7, ID10, ID5, ID3, ID4, ID8 and ID9 respectively (as per the table above for digital input ID1).

Select low pressure alarm

P15: Used to select whether the low pressure alarm is detected when the compressor is OFF (P15=1) or alternatively only when the compressor is ON (P15=0, default).
When the compressor starts the alarm is in any case ignored for the time P03.

High temperature/high system start-up temperature alarm delay

P16: Represents the high temperature alarm threshold detected by probe B1; the differential is set at 2 °C and the alarm is reset automatically (the warning relay is activated, signal only, and the message "Ht" is shown). When starting the system, this alarm is ignored for the time P17. If the system start-up protection is enabled (see parameter P20) and the alarm is activated, the time P17 is ignored and the alarm has no hysteresis.

High temperature alarm delay on power-up

P17: High temperature alarm delay when the control is switched on (power ON), from the remote ON/OFF contact or from the keypad.

High pressure alarm from transducer set point

P18: Sets the value beyond which the high pressure alarm is generated.
P18= 0: the function is disabled.
For all other values greater than 3.0, due to the hysteresis (3 bars), the alarm is managed according to the set value.

Low system start-up temperature alarm set point

P19: Represents a threshold for the low temperature (measured by probe B3) alarm, without hysteresis; it is reset automatically (the alarm relay is not activated and the display shows the message "ALt").

System start-up protection for high/low temperature

P20: If set to 1, this parameter enables the system protection function when starting, both at power ON and when switching ON from Standby.
In chiller mode (cooling), for values of B3 greater than the set point P19, an alarm is activated and the unit is not started (display "AHt").
In heat pump mode (heating), for values lower than the set point P19, an alarm is activated and the unit is not started (display "ALt").
The alarm is reset automatically.
P20=0: the function is disabled.

Low pressure alarm waiting time in heat pump

P22: Delay in generating the low pressure alarm in heat pump mode
If the pressure remains below 1 bar for the time p22 and the circuit has 2 compressor steps, the circuit can operate at part load (see P04). This preventive capacity control function remains active until the pressure rises above F08-F09.

Low pressure alarm waiting time during defrost

P23: Delay in generating the low pressure alarm in heat pump mode during defrost

Deactivate compressors in capacity control for HP and LP

P24: capacity step logic
P24 = 0: switch-off of comp 1 with capacity step active.
P24 = 1: switch-off of comp 2 with capacity step active.

Select digital outputs 2 ~ 5, 7 ~ 10 and digital output 6

P25 ~ P32 and P37
P25 = 0: none
P25 = 1: Compressor 2
P25 = 2: Resistance for second load
P25 = 3: Valve
P25 = 4: Pump for sanitary water
P25 = 5: Humidification
P25 = 6: Pump/Fan for GEO
P25 = 7: Resistance for sanitary water
P25 = 8: Alarm
P25 = 9: Warning
P25 = 10: Pump for second load
P25 = 11: Compressor 1
P25 = 12: Sanitary water or second load

Low pressure alarm set point from transducer

P33: Sets the value beyond which the low pressure alarm is generated when the unit is operating in heat pump mode. Each circuit will be managed according to its own transducer.
P33= 0 the function is disabled.

Mute alarm relay using "PRg/mute" button

P35=0 the PRG/mute button does not alter the status of the relay, if the alarm is active and in progress.
P35=1 the PRG/mute button alters the status of the relay even if the alarm is active and in progress, as if it were a buzzer or a siren.

High pressure alarm management

P36: the parameter is used to consider the high pressure alarm even when the compressor is off or consider it only when the compressor is on, depending on whether the pressure switch is directly connected to the digital input on the controller or via another circuit.
P36=0: high pressure alarm always considered (pressure switch connected directly to the digital input).
P36=1: high pressure alarm considered 2 seconds after starting the compressor.

Threshold for External geothermical probe error

P38: This parameter is used to set the threshold of alarm for probe 5 and 6.
If the absolute value of difference between the values read from probe 5 and 6 is beyond P38, The alarm for probe 5 and 6 takes place.

Threshold for High Temperature Sanitary Water

P39: this parameter is used to set the threshold beyond which causes the high temperature alarm of sanitary water
If the value read from sanitary water probe (B1) is beyond P39, the alarm for high temperature sanitary water takes place.

4.9 Control settings: parameters (r*)

r1: summer set point second load (cooling)
Included between r13 and r14
r2: summer differential for second load and sanitary water (cooling)
r3: winter set point second load (heating: heat pump)
included between r15 and r16
r4: winter differential for second load and sanitary water (heating)

Compressor rotation

r05: The rotation of the compressors allows the operating hours to be balanced either statistically, using FIFO logic, or absolutely, by counting the effective operating hours. Settings:
r05=0: rotation disabled; The customer can use compressors with different power ratings according to the desired logic or manage the capacity-control functions. The compressors are started/stopped in proportional mode.
r05=1: rotation with FIFO logic (first ON, first OFF, and vice-versa first OFF, first ON); in this mode the operating hours are optimized together with the number of starts, even if the compressor safety times are always respected.
r05=2: rotation with control of operating hours; in this way the compressors will have the same operating hours, as the compressor with the least operating hours is always started first, again observing the safety times. This does not however consider FIFO logic and does not optimize the starts and stops. In the case of capacity controlled compressors, FIFO logic or timed operation will refer to the actual circuit and not the compressor valves. There is no rotation between the compressor and the valve.
When stopping, the valve is managed first and then the actual compressor as a whole. The activation and deactivation of the valves are not subject to timers, but rather only a hysteresis that is equal to the set point and the differential of the step (in fact the valve performs the same function as a hermetic compressor).
r05=3: direct correspondence between the digital inputs and the compressor relays (condensing units only).

Type of compressor control

r06: This parameter is used to set the logic for maintaining the set point:
r06= 0: proportional on inlet
r06= 1: proportional on inlet + dead zone (see Dead zone, below)
r06= 2: proportional on outlet
r06= 3: proportional on outlet with dead zone

DEAD ZONE

The dead zone essentially shifts the proportional band from the set point by the value set for the parameter r07. This parameter is valid in all configurations if enabled (for r07≠0: dead zone set and enabled).

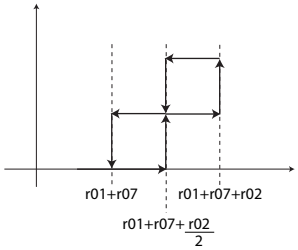

Fig. 4.o

Key:

r06	enable the dead zone (enabled if r06=1 or 3)
r07	dead zone
r01	cooling set point
r02	cooling differential

In chiller (cooling) mode, the dead zone moves the cooling proportional band above the set point by the value r07.

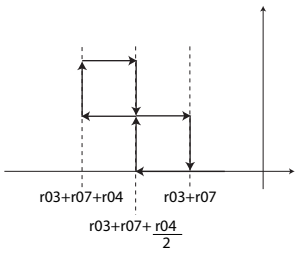

Fig. 4.p

Key:

r06	enable the dead zone (enabled if r06=1 or 3)
r07	dead zone
r03	heating set point
r04	heating differential

In heat pump (heating) mode, the dead zone moves the heating proportional band below the set point by the value r07.

Outlet temperature control by time r06 = 4 (second load only)
This type of control is based on the need to maintain the outlet temperature as constant as possible, despite the load being variable or the reduced inertia of the system. The logic has the aim of keeping the temperature inside the dead zone. Outside the zone, the compressors will be activated with the logic described below, so as to return inside the dead zone, neither too quickly (using an integral or derivative), nor too slowly, with fixed time logic. There are two logical times involved: the activation time and deactivation time.

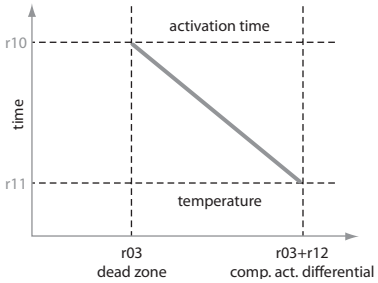

Fig. 4.q

Dead zone differential

r07: (see dead zone)

Minimum Cooling set point

r13: Establishes the minimum limit for setting the Cooling set point.

Maximum Cooling set point

r14: Establishes the maximum limit for setting the Cooling set point.

Minimum heating set point

r15: Establishes the minimum limit for setting the heating set point.

Maximum heating set point

r16: Establishes the maximum limit for setting the heating set point.

Cooling compensation constant (chiller mode):

r17: Sets the coefficient that controls the cooling compensation algorithm. In cooling mode, if r17 is positive, the set point increases as the outside temperature increases (measured by the outside probe); if on the other hand r17 is negative the set point decreases as the outside temperature increases.

This difference in the set point from the set value can have a maximum absolute value equal to the setting of r18. The values for the parameters shown on the graph are: r17=±2, r01=25, r19=32 and r18=5).

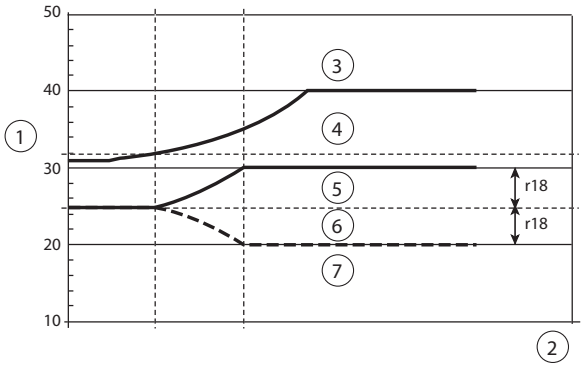

Fig. 4.r

Key:

1 temperature
2 time
3 external temperature (probe B7)
4 comp. start temperature (r19)
5 positive compensation (r17= 2)
6 set point (r1)
7 negative compensation (r17=-2)

Maximum deviation from the set point

r18: Indicates the maximum deviation from the set point beyond which compensation is stopped (maximum and minimum limits in reference to the set point).

Start compensation temperature in cooling (outside probe)

r19: Sets the temperature (measured by the outside probe) above which the compensation function starts (cooling), value between -40 to 80 °C.

Start compensation temperature in heating (outside probe)

r20: Sets the temperature (measured by the outside probe) below which the compensation function starts (heating), the value must be between -40 to 80 °C.

Second cooling set point from external contact

r21: Represents the alternative to r01 if an associated digital input is closed (see parameter P08), between r13 and r14.

Second heating set point from external contact

r22: Represents the alternative to r03 if an associated digital input is closed (see parameter P08), between r15 and r16.

Select automatic changeover probe

r23: Select automatic changeover probe.
r23=0: automatic changeover disabled (to be selected when the µADad is used, as in this case the changeover is managed completely by the terminal)
r23=1: automatic changeover enabled on probe B1
r23=2: automatic changeover enabled on probe B2
r23=3: automatic changeover enabled on probe B3
r23=4: automatic changeover enabled on probe B4
r23=5: automatic changeover enabled on probe B5
r23=6: automatic changeover enabled on probe B6
r23=7: automatic changeover enabled on probe B7
r23=8: automatic changeover enabled on probe B8

Automatic changeover set point

r24: Automatic changeover set point, the change from cooling to heating occurs: by decreasing temperature until reaching the set point r24-r07, observing the reversing times.
The change for heating to cooling occurs: by increasing temperature until reaching the set point r24+r07, observing the reversing times.
Changeover is disabled if the selected probe (r23) is not configured or is a pressure probe. When changeover is enabled, cooling/heating inputs are ignored. If the µAD is used, set point r24 can be set on the terminal.
During defrost, automatic changeover is disabled. Only when the defrost ends the operating mode can be changed. The same is true for the autostart function in antifreeze (see A10).
At power on the controller operates in the previous mode if the probe reading is within the hysteresis 24-r07 and 24+r07, otherwise it starts with the new mode.
If the changeover probe reading is out-of-range the probe alarm is activated and the outputs are deactivated.
If r07= 0 the differential for reversing the cycle is dictated by the first compressor step differential.

Example di changeover for air/water and water/water units

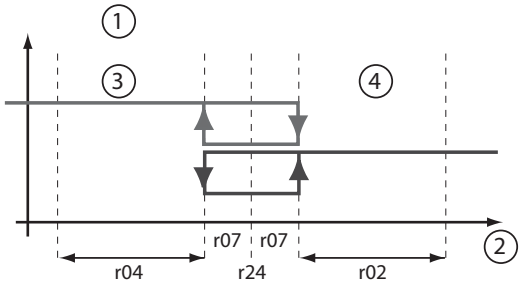

Fig. 4.s

Key:

1	changeover
2	changeover probe (r23)
3	heating
4	cooling

Outside temperature set point to stop compressors

r25: To avoid energy efficiency lower than electrical heating, the compressors are stopped if the outside temperature falls below r25, the differential to start them again is set to 1 degree. The heaters can then be activated according to the corresponding set point. Setting r25 to "-40" (default value) disabled the function.

Example of compressor eactivation due to outside temperature

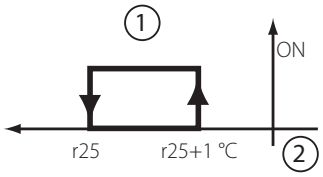

Fig. 4.t

Summer set point in dehumidify mode

r26: Alternative set point to r01 when the dehumidification function is active, as sent to the µGEO by the terminal.
The differential remains the same as for chiller mode (r02).

Buffer tank suppression (low load) on second load

r27: The low load condition is determined when only one compressor is started and then is stopped after operating for less than the time set for parameter r28.
The settings are:
r27=0: the function is disabled;
r27=1: enabled only in chiller mode;
r27=2: enabled only in heat pump mode;
r27=3: enabled in chiller and heat pump modes.

Minimum compressor ON time to determine low load condition

r28: This parameter represents the minimum compressor ON time below which the low load condition is determined. Whenever the compressor stops, the controller analyses the load status.
If already in low load condition, the time considered by the controller for the analysis becomes "r28 x r29: r02" in chiller mode, or "r28 x r30: r04" in heat pump mode.

Differential during the low load condition in chiller mode

r29: This parameter represents the new differential considered by the controller in chiller mode during the low load condition. Specifically, r02 is replaced by r29.

Differential during the low load condition in heat pump mode

r30: This parameter represents the new differential considered by the controller in heat pump mode during the low load condition. Specifically, r04 is replaced by r30.

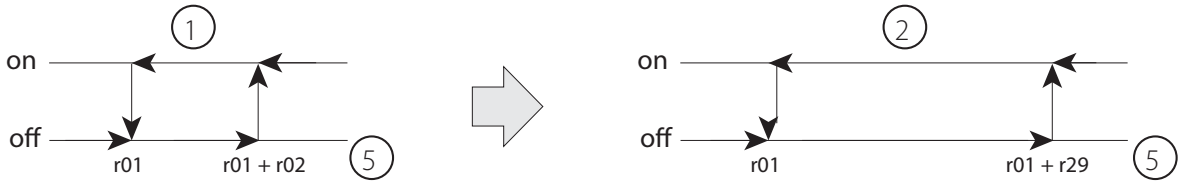

Fig. 4.u.a

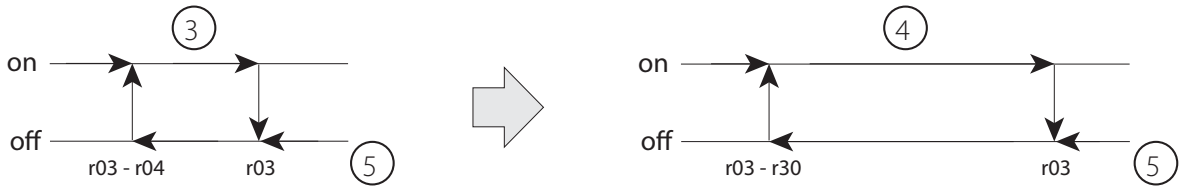

Fig. 4.u.b

Key:

1	chiller	4	heat pump in low load
2	chiller in low load	5	temperature
3	heat pump		

Heating compensation constant (mode Heat pump)

r31: Sets the coefficient that controls the heating compensation algorithm. In heating mode, if r31 is positive, the set point decreases as the outside temperature decreases (measured by the outside probe); if, on the other hand, r31 is negative, the set point increases as the outside temperature decreases.
This maximum deviation of the set point from the set value is equal to parameter r18. See, for example, parameter r17.

Autotuning correction coefficient

r39: when changing the step in autotuning, prevents sudden variations in the controlled values from altering the control logic.

Electric heater set point relationship

r43: defines the relationship between the absolute set point, considered as the activation threshold for the electric heaters, and the relative set point, that is, the activation threshold for the electric heaters referred o a working set point (set point sent by µAD, r01 or r04 or from time band) depending on the various applications and the mode, cooling or heating, and more precise:
r40= 0 electric heater set point A4, A8 and A11 on absolute values
r40= 1 electric heater set point A4 absolute value, A8 and A11 values relative to the working set point
r40= 2 electric heater set point A4 value relative to the working set point, A8 and A11 absolute values
r40= 3 electric heater set point A4, A8 and A11 values relative to the working set point

Set point for Sanitary Water circuit (heating: heat pump)

r45: Set point in the systems with 2 loads, always used for sanitary water set-point.

Balance rate

R46: Represent the percentage between the internal compensation (IC) and external compensation (EC)
µGEO can manage two compensation strategies, according to the indoor temperature (µAD connected) or the outdoor temperature. The r46 parameter can balance the effects of the two strategies as for the following formula:
Offset Compensation = {(EC * r46) + [IC * (100 - r46)]} / 100
Examples situation:
For r46 = 100% it means that the new set-point of HP/chiller depends basically only on the outdoor contribute.
For r46 = 50% it means that the new set-point of HP/chiller is the average of internal and external compensation contribute.
For r46 = 0% it means that the new set-point of HP/chiller depends basically only on the outdoor contribute

Keep set temperature

R49: If this digital is ON and if the uAD is connected and the ambient temperature is satisfied the unit regulates on probe of the Second Load to keep the temperature of the water at the ambient set-point.

Step for compressor

r50: This threshold is used in heating mode to activate the 2nd Compressor Output (only if H4 = 3). If the external temperature is below r50 and the first compressor is ON, the 2nd Compressor Output starts. This Output will stop when the first compressor is OFF.

Steps for electrical heater

r51: This threshold is used in heating mode to activate the "Resistance for Second Load" Output. If the external temperature is below r51 and A6 = 2 or 3, the "Resistance for Second Load" output is enabled to work. When the external temperature is over r51+r52, this Output is forced OFF.
r52: Differential for Steps for electrical heater.

4.10 Firmware parameters: (F-r*)

These parameters cannot be set (display only:
H97: software version of Driver 1;
H98: software version of the expansion;
H99: software version of the µGEO controller.

Functions available with the clock board

The alarm log is only active and operative if the clock board is fitted. The terminal shows whether the clock board is fitted by displaying the following parameters:

RTC hours
t01: RTC hours

RTC minutes
t02: RTC minutes

RTC day

t03: RTC day

RTC month
t04: RTC month

RTC year
t05: RTC year

The alarms are only shown on the local display.
The controller saves the significant events that stop (alarms) or limit (warnings) the operation of the unit.
Up to 25 events can be saved, highlighting:
- Event code;
- Start hours;
- Start minutes;
- Start day;
- Start month;
- End hours;
- End minutes;
- End day;
- End month.

The log is accessed by pressing PRG+SEL for 5s and entering the password 44. The alarms saved are complete, as they include both the start and end of the event. The alarms can be deleted individually by pressing UP and DOWN for 5s when the desired event is displayed. If there are no alarms saved, "noH" is displayed. The table shows the possible alarms that can be saved:

SV	Display	Type
Circ.1 Alarm	HP1	high pressure
Circ.1 Alarm	LP1	low pressure
	TpB	General overload
	TpG	General overload
Gen. Alarm	TpS	General overload
Circ.1 Alarm	tC1	Circuit 1 overload
	FLS	Second load flow alarm
	FLB	Sanitary water flow alarm
Gen. Alarm	FLE	External flow Alarm
Probe Alarm	E1	Probe B1 Alarm
Probe Alarm	E2	Probe B2 Alarm
Probe Alarm	E3*	Probe B3 Alarm
Probe Alarm	E4*	Probe B4 Alarm
Probe Alarm	E5	Probe B5 Alarm
Probe Alarm	E6	Probe B6 Alarm
Probe Alarm	E7*	Probe B7 Alarm
Probe Alarm	E8*	Probe B8 Alarm
Gen. Alarm	ESP	Expansion error
Circ.1 Alarm	A1	Antifreeze alarm outlet limit
Gen. Alarm	EHS	High power supply voltage
Evd 1 Alarm	Ed1	EVD1 Tlan error
OFF	SH1	EVD1 overheating alarm
Evd 1 Alarm	EP1	Eeprom EVD 1 error
Evd 1 Alarm	ES1	EVD 1 probe error
Evd 1 Alarm	EU1	EVD 1 valve open on start-up error
Evd 1 Alarm	Eb1	EVD 1 battery alarm
uAD probe alarm	Et	uAD terminal probe alarm

Tab. 4.e

Start hours for 2nd set point in cooling
t06 (l92): Hour when the second cooling set point starts (r21).

Start minutes for 2nd set point in cooling
t07 (l93): Minutes when the second cooling set point starts (r21).

End hours for 2nd set point in cooling
t08 (l94): Hour when the second cooling set point stops (r21).

End minutes for 2nd set point in cooling
t09 (l95): Minutes when the second cooling set point stops (r21).

Start hours for 2nd set point in heating
t10 (l96): Hours when the second heating set point starts (r22).

Start minutes for 2nd set point in heating
t11 (l97): Minutes when the second heating set point starts (r22).

End hours for 2nd set point in heating
t12 (l98): Hours when the second heating set point stops (r22).

End minutes for 2nd set point in heating
t13 (l99): Minutes when the second heating set point stops (r22).

If a digital input is configured as the second set point from external contact (e.g. p08 = 13) the time bands are ignored. If a digital input is configured as the second cooling set point from external contact and heating set point from time band (e.g. p08 = 14), the cooling time bands are ignored.
The second set point from external contact input has priority over the second cooling set point from external contact and heating set point from time band.

Start hours for low noise in cooling
t14: Start hours for low noise in cooling

Start minutes for low noise in cooling
t15: Start minutes for low noise in cooling

End hours for low noise in cooling
t16: End hours for low noise in cooling

End minutes for low noise in cooling
t17: End minutes for low noise in cooling

Start hours for low noise in heating
t18: Start hours for low noise in heating

Start minutes for low noise in heating
t19: Start minutes for low noise in heating

End hours for low noise in heating
t20: End hours for low noise in heating

End minutes for low noise in heating
t21: End minutes for low noise in heating

5. PARAMETERS TABLE

General parameters

The parameters are divided into 4 different types, according to their level of access by the user (password) and their function.
For each level, only the access to the parameters of the same or lower level can be set.
This means that through "factory" password, accessing the menu "levels" (L-P), it is possible to set the desired level for each parameter.

- Factory parameters: Accessible with the 66 "Factory" password, allow the configuration of all the unit parameters.
- Super User parameters: Accessible with the 11 "Super User" password, allow the configuration of the Super User, User and Direct parameters.
- User parameters: Accessible with password 22, allow the configuration of the parameters that typically can be set by the user (User parameters) and the Direct parameters, consequently relating to the options.
- Direct parameters: Accessible without password, this are used to read the probe measurements and any data, by any user, without compromising the operation of the unit.

Note: The modifications to the parameters regarding the configuration of the unit (type, number of compressors,…) must be performed with the controller in Standby.

Level	Level name	Password
_d_	Direct	No password
_U_	User	22
_S_	Super user	11
_F_	factory	66

Tab. 5.a

Menu structure

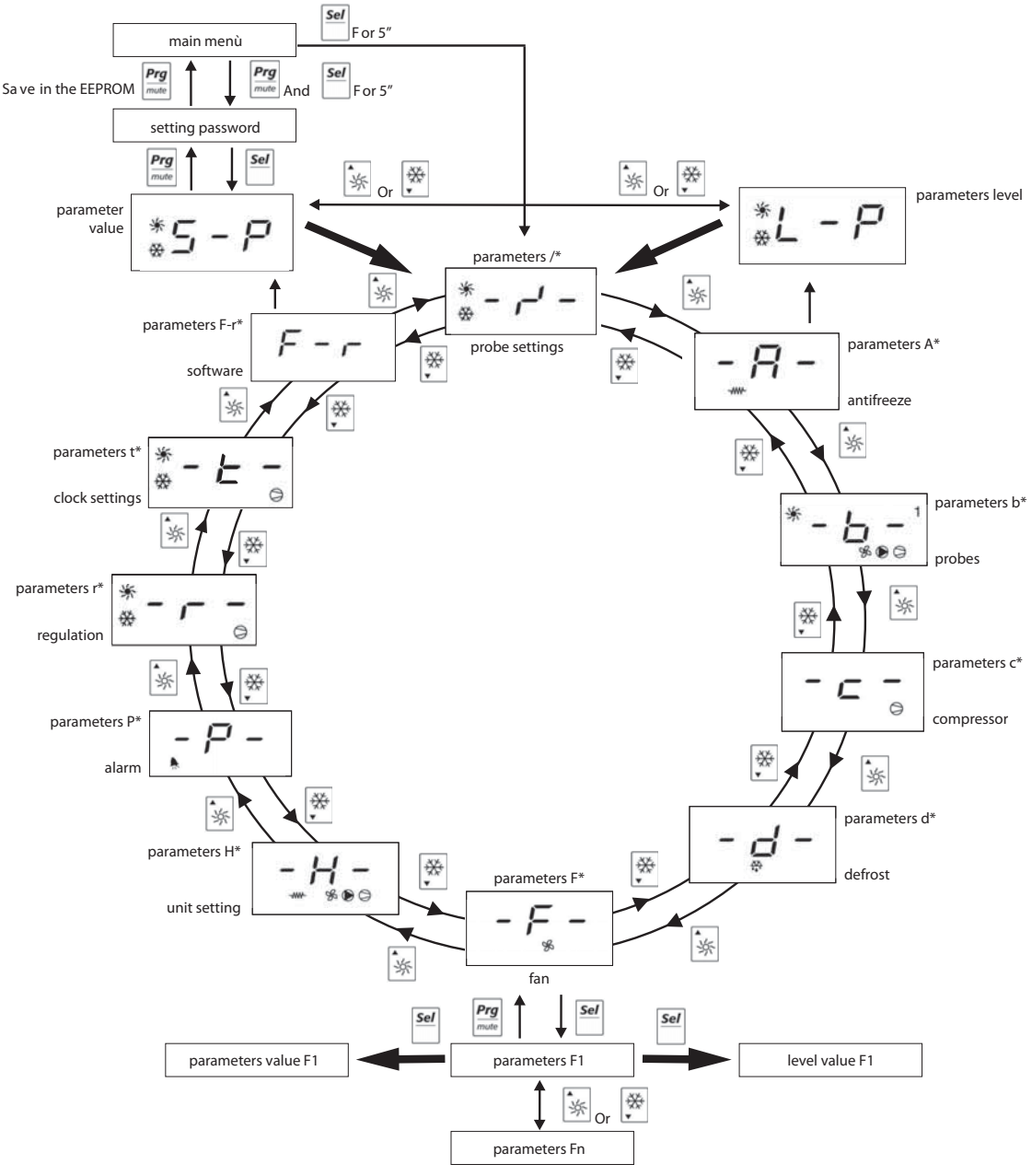

Fig. 5.a

Parameter tables

The following tables show the parameters divided by type/family (e.g. compressor, probes, fans, etc.).

Key to the parameter tables:

Type

S= super user D= direct
F= factory

Visibility:
The visibility of some groups depends on the type of controller and the value of the parameters.

D= defrost (if D01=1) V= driver (if H08 =1)
F= fan (if F01=1) M= pump down (if D17=1)
L= low noise (if F15=1-3) W= watch (if the clock board is fitted)
N= NTC probe (if /04-/08=2) - = always present
P= pressure (if /04-/08=3)

Supervisor variables:

R = supervisor read-only param. R/W = supervisor read/write param.

UOM: unit of measure

Evaporator and condenser temperature and pressure values: (d*)

display code	parameter	type	min	max	UOM	variat.	def.	visibility	superv. variable	Modbus®	variable type
dtE	Value of the current DTE	D	0	0		-	0		99 (R)	99	Analog
dC1	Value of the current DTC1	D	0	0		-	0		100 (R)	100	Analog
dC2	Value of the current DTC2	D	0	0		-	0		101 (R)	101	Analog

Tab. 5.b

Probe setting parameters: (/*)

display code	parameter	type	min	max	UOM	variat.	def.	visibility	superv. Variable	Modbus®	var. type
/01	Probe type B1 0=Not Fitted - 1=Fitted	F	0	1	Flag	1	1	-	1 (R/W)	1	Digital
/02	Probe type B2 0=Not Fitted - 1=Fitted	F	0	1	Flag	1	1	-	2 (R/W)	2	Digital
/03	Probe type B3 0=Not Fitted - 1=Fitted	F	0	1	Flags	1	1	-	12 (R/W)	12	Digital
/04	Probe type B4 0=Not Fitted - 1=Fitted	F	0	1	Int	1	0	-	13 (R/W)	13	Digital
/05	Probe type B5 (expansion) 0=Not Fitted - 1=Fitted	F	0	1	Flag	1	0	X	3 (R/W)	3	Digital
/06	Probe type B6 (expansion) 0=Not Fitted - 1=Fitted	F	0	1	Flag	1	0	X	4 (R/W)	4	Digital
/07	Probe type B7 (expansion) 0=Not present - 1=Fitted	F	0	1	Int	1	0	X	28 (R/W)	28	Digital
/08	Probe type B8 (expansion) 0=Not Fitted - 1=Fitted	F	0	1	Int	1	0	X	29 (R/W)	29	Digital
/09	Minimum input voltage value	F	0	/10	Vdc/100	1	50	P	18 (R/W)	225	Integer
/10	Maximum input voltage value	F	/09	500	Vdc/100	1	450	P	19 (R/W)	226	Integer
/11	Minimum pressure value	F	0	/12	Dbar	0.1	0	P	1 (R/W)	1	Analog
/12	Maximum pressure value	F	/11	999	Dbar	0.1	345	P	2 (R/W)	2	Analog
/13	Calibration of probe B1	F	-120	120	°C/F	0.1	0	-	3 (R/W)	3	Analog
/14	Calibration of probe B2	F	-120	120	°C/F	0.1	0	-	4 (R/W)	4	Analog
/15	Calibration of probe B3	F	-120	120	°C/F	0.1	0	-	5 (R/W)	5	Analog
/16	Calibration of probe B4	F	-120	120	°C/bar/F	0.1	0	-	6 (R/W)	6	Analog
/17	Calibration of probe B5	F	-120	120	°C/F	0.1	0	X	7 (R/W)	7	Analog
/18	Calibration of probe B6	F	-120	120	°C/F	0.1	0	X	8 (R/W)	8	Analog
/19	Calibration of probe B7	F	-120	120	°C/F	0.1	0	X	9 (R/W)	9	Analog
/20	Calibration of probe B8	F	-120	120	°C/bar/F	0.1	0	X	10 (R/W)	10	Analog
/21	Digital filter	U	1	15	-	1	4	-	20 (R/W)	227	Integer
/22	Input limitation	U	1	15	-	1	8	-	21 (R/W)	228	Integer
/23	Unit of measurement 0=°C - 1=°F	U	0	1	Flag	1	0	-	5 (R/W)	5	Digital

Tab. 5.c

Antifreeze/support heater setting parameters: (A*)

display code	parameter	type	min	max	UOM	variat.	def.	visibility	superv. Variable	Modbus®	var. type
A01	Set anti-freeze alarm	U	A07	A04	°C/°F	0.1	30	-	11 (R/W)	11	Analog
A02	Anti-freeze differential	U	3	1220	°C/°F	0.1	50	-	12 (R/W)	12	Analog
A03	Anti-freeze/low environment temperature alarm by pass time on switch-on of the machine in winter	U	0	150	sec	1	0	-	22 (R/W)	229	Integer
A04	Set anti-freeze/support resistance	U	A01	r16	°C/°F	0.1	50	AA	13 (R/W)	13	Analog
A04	Anti-freeze/support resistance set differential	U	0	200	°C/°F	0.1	70	AR	77 (R/W)	77	Analog
A05	Anti-freeze/support resistance differential	U	3	500	°C/°F	0.1	10	-	14 (R/W)	14	Analog
A06	Probe for managing the support heater A6 = 0 => B3 A6 = 1 => B2 A6 = 2 => B3 (enabled only if B7 < r51) A6 = 3 => B2 (enabled only if B7 < r51)	F	0	3		1	0	-	14 (R/W)	221	Integer
A07	Set anti-freeze alarm limits	F	-400	1760	°C/°F	0.1	-400	-	15 (R/W)	15	Analog
A08	Set support resistance in heating mode	U	A01	r16	°C/°F	0.1	250	AA	16 (R/W)	16	Analog
A08	Set anti-freeze/support resistance differential	U	0	200	°C/°F	0.1	70	AR	78 (R/W)	78	Analog
A09	Support resistance in heating mode differential	U	3	500	°C/F	0.1	30	-	17 (R/W)	17	Analog
A10	Anti-freeze automatic switch-on A10 = 0 =>Function disabled A10 = 1 =>Resistances and pumps on at same time on A4 A10 = 2 =>Resistances and pumps on independently on A4 A10 = 3 =>Resistances on on A4	U	0	3		1	0	-	23 (R/W)	230	Integer
A11	Set support resistance 2 in heating mode	U	A01	r16	°C/°F	0.1	250	AA	67 (R/W)	67	Analog
A11	Support resistance 2 in heating mode differential	U	0	200	°C/°F	0.1	70	AR	79 (R/W)	79	Analog
A12	Support resistance in heating mode differential	U	3	500	°C/F	0.1	30	-	82 (R/W)	82	Analog
A14	Set alarm antifreeze/Ambient Low temperature for EVD	U	A07	A04	°C/F	0.1	30	-	86 (R/W)	86	Analog

Tab. 5.d

Probe reading parameters: (b*)

display code	parameter	type	min	max	UOM	variat.	def.	visibility	superv. Variable	Modbus®	var. type
b00	Probe selection for visualisation on display 0=Probe B1 1=Probe B2 2=Probe B3 3=Probe B4 4=Probe B5 5=Probe B6 6=Probe B7 7=Probe B8 8=Set point without compensation 9=Set point (dynamic) with eventual compensation 10=Digital input state ON/OFF remote 11=uAD probe	U	0	11	N	1	0	-	24 (R/W)	231	Integer
b01	Value read by probe B1	D	-999	999	°C/F	-	0	-	102 (R)	102	Analog
b02	Value read by probe B2	D	-999	999	°C/F	-	0	-	103 (R)	103	Analog
b03	Value read by probe B3	D	-999	999	°C/F	-	0	-	104 (R)	104	Analog
b04	Value read by probe B4	D	-999	999	dbar	-	0	-	105 (R)	105	Analog
b05	Value read by probe B5	D	-999	999	°C/F	-	0	-	106 (R)	106	Analog
b06	Value read by probe B6	D	-999	999	°C/F	-	0	-	107 (R)	107	Analog
b07	Value read by probe B7	D	-999	999	°C/F	-	0	-	108 (R)	108	Analog
b08	Value read by probe B8	D	-999	999	dbar	-	0	-	109 (R)	109	Analog
b09	Evaporator Driver 1 Temperature	D	0	0	°C/F	-	0	V	110 (R)	110	Analog
b10	Evaporator Driver 1 Pressure	D	0	0	dbar	-	0	V	111 (R)	111	Analog
b11	Driver 1 Over-heating	D	0	d	°C/F	-	0	V	112 (R)	112	Analog
b12	Driver 1 Saturation Temperature	D	0	0	°C/F	-	0	V	113 (R)	113	Analog
b13	Driver 1 valve position	D	0	1000	%	-	0	V	114 (R)	114	Analog
b19	c1 external heat exchanger output temperature probe	D	0	0	°C/F	-	0	V	115 (R)	115	Analog
b21	Terminal probe (for µAD terminal)	D	-400	800	°C/F	0.1	0		128 (R/W)	128	Analog

Tab. 5.e

Compressor setting parameters: (c*)

display code	parameter	type	min	max	UOM	variat.	def.	visibility	superv. Variable	Modbus®	var. type
c01	Minimum switch-on time	U	0	999	sec	1	60	-	25 (R/W)	232	Integer
c02	Minimum switch-off time	U	0	999	sec	1	60	-	26 (R/W)	233	Integer
c03	Delay between 2 switch-ons of the same compressor	U	0	999	sec	1	360	-	27 (R/W)	234	Integer
c04	Switch-on delay between 2 compressors	U	0	999	sec	1	10	-	28 (R/W)	235	Integer
c05	Switch-off delay between 2 compressors	U	0	999	sec	1	0	-	29 (R/W)	236	Integer
c06	Delay at switch-on	U	0	999	sec	1	0	-	30 (R/W)	237	Integer
c07	Compressor switch-on delay at pump/delivery fan start-up	U	0	999	sec	1	20	-	31 (R/W)	238	Integer
c08	Pump/delivery fan switch off delay on compressor switch-off	U	0	150	min	1	1	-	32 (R/W)	239	Integer
c09	Tempo massimo funzionamento compressore in tandem	U	0	60	min	1	0	-	33 (R/W)	240	Integer
c10	Compr. 1 timer	D	0	8000	100 ore	-	0	-	116 (R)	116	Analog
c11	Compr. 2 timer	D	0	8000	100 ore	-	0	-	117 (R)	117	Analog
c14	Functioning timer threshold	U	0	100	100 Ore	1	0	-	34 (R/W)	241	Integer
c15	Evaporator pump/fan 1 timer	D	0	8000	100 Ore	-	0	-	118 (R)	118	Analog
c16	Condenser pump-backup/fan 2 timer	D	0	8000	100 Ore	-	0	-	119 (R)	119	Analog
c17	Minimum time between two pump switch-ons	U	0	150	Minuti	1	30	-	35 (R/W)	242	Integer
c18	Pump minimum switch-on time	U	0	15	Minuti	1	3	-	36 (R/W)	243	Integer
c19	max time for priority to sanitary water (0=disabled)	D	0	999		1	0	-	116 (R/W)	323	Integer
c20	max time for priority to second load (0=disabled)	D	0	999		1	0	-	117 (R/W)	324	Integer
c21	Heat pump > chiller mode delay	F	0	999	sec	1	0	-	43 (R/W)	250	Integer
c22	Chiller > heat pump mode delay	F	0	999	sec	1	0	-	44 (R/W)	251	Integer

Tab. 5.f

Defrost setting parameters: (d*)

display code	parameter	type	min	max	UOM	variat.	def.	visibility	superv. Variable	Modbus®	var. type
d01	Defrost/anti-freeze execution condensation 0=no 1=si with unified defrosting	U	0	1	Flag	1	0	-	7 (R/W)	7	Digital
d02	Defrosting mode Time-or temperature-based defrosting 0=time 1=temperature or pressure 2 = pressure start, temperature end 3=Sliding defrost activation	U	0	3	Flag	1	0	D	90 (R/W)	297	Integer
d03	Defrost start pressure - Set condensation anti-freeze alarm	U	/11	d04	dbar	0.1	35	DP	18 (R/W)	18	Analog
d03	Defrost start temperature - Set condensation anti-freeze alarm	U	-400	d04	°C/°F	0.1	-50	DN	19 (R/W)	19	Analog
d04	Defrost end temperature	U	d03	/12	dbar	0.1	140	DP	20 (R/W)	20	Analog
d04	Defrost end pressure	U	d03	1760	°C/°F	0.1	200	DN	21 (R/W)	21	Analog
d05	Minimum time for defrost start	U	10	150	sec	1	10	D	37 (R/W)	244	Integer
d06	Minimum defrosting duration	U	0	150	sec	1	0	D	38 (R/W)	245	Integer
d07	Maximum defrosting duration	U	1	150	min	1	5	D	39 (R/W)	246	Integer
d08	Delay between two defrosting requests in the same circuit	U	10	150	min	1	30	D	40 (R/W)	247	Integer
d10	Defrosting from external contact 0=Function disabled 1=Start from external contact 2=End from external contact 3=Start and end from external contact	F	0	3	flag	1	0	D	42 (R/W)	249	Integer
d11	Anti-freeze resistance in defrost mode	U	0	1	flag	1	0	D	9 (R/W)	9	Digital
d16	Forced ventilation time in defrost mode	F	0	360	sec	1	0	D	47 (R/W)	254	Integer
d17	Set / Enabling of light defrost	F	0	800	°C/F	0.1	0	D	22 (R/W)	22	Analog
d18	Max external temperature value (sliding defrost)	F	-400	800	°C/F	0.1	-100	D	62 (R/W)	62	Analog
d19	Defrost start differential (sliding defrost)	F	-400	800	°C/F/bar	0.1	30	D	63 (R/W)	63	Analog
d20	External temperature differential (sliding defrost)	F	0	800	°C/F	0.1	100	D	64 (R/W)	64	Analog

Tab. 5.g

Fan setting parameters: (F*)

display code	parameter	type	min	max	UOM	variat.	def.	visibility	superv. Variable	Modbus®	var. type
F01	Enabling of fan output 0=Not Fitted - 1=Fitted	F	0	1	flag	1	0	-	10 (R/W)	10	Digital
F02	Fan functioning mode 0=always on 1=leinked to compr. (functioning in parallel) 2=linked to compr. with ON/OFF adjustment 3=linked to compr. With speed adjustment	U	0	3	Int	1	0	F	48 (R/W)	255	Integer
F03	Minimum voltage threshold for Triac	F	0	F04	step	1	35	F	49 (R/W)	256	Integer
F04	Maximum voltage threshold for Triac	F	F03	100	step	1	75	F	50 (R/W)	257	Integer
F05	Set point for minimum speed in summer mode (pressure)	U	/11	/12	dbar	0.1	130	FP	23 (R/W)	23	Analog
F05	Set point for minimum speed in summer mode (temperature)	U	-400	1760	°C/°F	0.1	350	FN	24 (R/W)	24	Analog
F06	Differential for max speed in summer mode (pressure)	U	0	300	dbar	0.1	30	FP	25 (R/W)	25	Analog
F06	Differential for max speed in summer mode (temperature)	U	0	500	°C/°F	0.1	100	FN	26 (R/W)	26	Analog
F07	Differential for switch off in summer mode (pressure)	U	0	F05	dbar	0.1	50	FP	27 (R/W)	27	Analog
F07	Differential for switch off in summer mode (temperature)	U	0	500	°C/°F	0.1	150	FN	28 (R/W)	28	Analog
F08	Set point for minimum speed in winter mode (pressure)	U	/11	/12	dbar	0.1	130	FP	29 (R/W)	29	Analog
F08	Set point for minimum speed in winter mode (temperature)	U	-400	1760	°C/°F	0.1	350	FN	30 (R/W)	30	Analog
F09	Differential for max speed in winter mode (pressure)	U	0	F08	dbar	0.1	40	FP	31 (R/W)	31	Analog
F09	Differential for max speed in winter mode (temperature)	U	0	500	°C/°F	0.1	50	FN	32 (R/W)	32	Analog
F10	Differential for switch off in winter mode (pressure)	U	0	300	dbar	0.1	30	FP	33 (R/W)	33	Analog
F10	Differential for switch off in winter mode (temperature)	U	0	F08	°C/°F	0.1	50	FN	34 (R/W)	34	Analog
F11	Fans peak time	U	0	120	sec	1	0	F	51 (R/W)	258	Integer
F12	Triac impulse duration (fans peak)	F	0	10	Sec	1	2	F	52 (R/W)	259	Integer
F13	Fans management in defrost mode 0=Fans deactivated 1=Fans in chiller mode 2=Maximum speed after defrost	F	0	2	Int	1	0	F	53 (R/W)	260	Integer
F14	Ventilation in cond. High temperature on start-up	U	0	999		1	0	FN	91 (R/W)	298	Integer
F15	Low noise activation 0=Deactivated 1=Summer activated 2=Winter activated 3=summer and winter activated	U	0	3		1	0	F	85 (R/W)	292	Integer
F16	Summer low noise differential	F	0	500	°C/F/bar	0.1	0	L	35 (R/W)	35	Analog
F17	Winter low noise differential	F	0	500	°C/°F/bar	0.1	0	L	36 (R/W)	36	Analog
F18	Anitary water pump functioning mode 0=always on 1=leinked to compr. (functioning in parallel) 2=linked to compr. with ON/OFF adjustment 3=linked to compr. With speed adjustment	U	0	3	Int	1	0	F	41 (R/W)	248	Integer
F19	Minimum voltage threshold for Triac - sanitary water	F	0	F04	step	1	35	F	59 (R/W)	266	Integer
F20	Maximum voltage threshold for Triac - sanitary water	F	F03	100	step	1	75	F	57 (R/W)	264	Integer
F21	Set point for minimum speed in winter mode (temperature)	U	-400	1760	°C/°F	0.1	350	F	83 (R/W)	83	Analog
F22	Differential for max speed in winter mode (temperature)	U	0	500	°C/°F	0.1	50	F	84 (R/W)	84	Analog
F23	Differential for switch off in winter mode (temperature)	U	0	F21	°C/°F	0.1	50	F	85 (R/W)	85	Analog
F24	Fan probe selection 0= temperature 1= pressure	F	0	1	flag	1	0	F	14 (R/W)	14	Digital

Tab. 5.h

Unit setting parameters: (H*)

display code	parameter	type	min	max	UOM	variat.	def.	visibility	superv. variable	Modbus®	var. type
H01	Machine model 0= air water heat pump 1= water water heat pump (gas rev)	F	0	1	flag	1	1	-	27 (R/W)	27	Digital
H04	Number of compressors 0= 1 comp. on 1 circuit (mono-circuit) 1= 2 comp. Tandem on 1 circuit (mono-circuit) 2= 1 compressor and one capacity step on one circuit 3= 2 comp. Compressor 2 driven by External Temperature	F	0	2	flag	1	0	-	55 (R/W)	262	Integer
H05	Pump mode 0=absent - 1=always on 2=on at adjuster request 3=on at adjuster request and timed	F	0	3	flag	1	1	-	56 (R/W)	263	Integer
H06	Geothermal Pump mode/ external fan enabled (air/water unit) 0=absent - 1=always on 2=on at adjuster request	F	0	2	flag	1	1	-	75 (R/W)	282	Integer
H08	Network configuration 0= µGeo + Exp - 1= µGeo + Exp + EVD	F	0	1	flag	1	0	-	26 (R/W)	26	Digital
H09	Keyboard lock 0 = disabled keyboard - 1 = enabled keyboard	U	0	1	flag	1	1	-	16 (R/W)	16	Digital
H10	Serial address Value 0= future use as terminal	U	1	200	-	-	1	-	58 (R)	265	Integer
H12	Capacity step logic and inversion valve 0=Both normally closed 1=Both nomally open 2=Inversion valve normally open and capacity step valve normally closed 3=Inversion valve normally closed and capacity step valve normally open	F	0	3	flag	1	1	-	60 (R/W)	267	Integer
H13	Pump down activation	F	0	1		1	0	V	17 (R/W)	17	Digital
H14	Pump down minimum pressure	F	0	500	dbar	0.1	20	-	37 (R/W)	37	Analog
H15	Pump down maximum time	F	0	180	sec	1	30	-	61 (R/W)	268	Integer
H16	Auto tuning activation	F	0	1		1	0	-	22 (R/W)	22	Digital
H17	Minimum allowed DTE value	F	0	1760	°C/°F	0.1	0	-	68 (R/W)	68	Analog
H18	Maximum allowed DTE value	F	0	1760	°C/°F	0.1	800	-	69 (R/W)	69	Analog
H19	Maximum allowed DTC value	F	0	1760	°C/°F	0.1	800	-	70 (R/W)	70	Analog
H22	Disabling of default restore 0=Function disabled 1=Function enabled	F	0	1	flag	1	0	-	18 (R/W)	18	Digital
H23	Enabling Modbus®	F	0	1	flag	1	0	-	11 (R/W)	11	Digital
H24	priority of the control: 0= sanitary water (heating mode). 1= second load.	F	0	1	flag	1	0	-	25 (R/W)	25	Digital
H25	SL Pump mode 0= absent 1= always on 2= ON at adjuster request 3= ON at adjuster request and timed	F	0	3	flag	1	1	-	124 (R/W)	331	Integer

Tab. 5.i

Firmware parameters: (F-r*)

display code	parameter	type	min	max	UOM	variat.	def.	visibility	superv. Variable	Modbus®	var. type
H99	Software version (to display on start-up of the instrument)	D	0	999	int	-	10	-	1 (R)	208	Integer
H98	Expansion software version	D	0	999	int	-	0	X	2 (R)	209	Integer
H97	Driver 1 software version	D	0	999	Int	-	0	V	3 (R)	210	Integer

Tab. 5.j

Alarm setting parameters: (P*)

display code	parameter	type	min	max	UOM	variat.	def.	visibility	superv. variable	Modbus®	var. type
P01	Flow meter alarm delay on pump start-up	U	0	150	sec	1	20	-	63 (R/W)	270	Integer
P02	Flow meter alarm delay in normal running conditions	U	0	120	sec	1	5	-	64 (R/W)	271	Integer
P03	Low pressure alarm delay on compressor start-up	U	0	200	sec	1	40	-	65 (R/W)	272	Integer
P04	Enabling of Comp capacity step in high pressure 0=Capacity stepping deactivated 1=High pressure capacity stepping activated 2=Low pressure capacity stepping activated 3=High and low pressure capacity stepping activated	U	0	3	flag	1	0	P	66 (R/W)	273	Integer
P05	Restore alarms 0=HP/LP/A/Lt manual 1=HP/LP/A/Lt automatic 2=HP/A/Lt manuale; LP1-2 automatic 3=HP manual; LP/A/Lt automatic 4=HP/LP manual; A/Lt automatic 5=HP/LP (3 times in one hour) manual; A/Lt automatic 6=HP/LP (3 times in one hour) manual; A/Lt manual	F	0	6	flag	1	0	-	67 (R/W)	274	Integer
P06	Summer winter logic 0=Chiller; Heat pump - 1=Heat pump; Chiller	F	0	1	flag	1	0	-	19 (R/W)	19	Digital
P07	Low pressure alarm with pressure probe 0=Disabled - 1=Enabled	F	0	1	flag	1	0	P	68 (R/W)	275	Integer
P08	digital input 1 selection 0: none 1: flow meter ground source pump with manual restore (n.c.) 2: flow meter ground source pump with automatic restore (n.c.) 3: flow meter sanitary water pump with manual restore (n.c.) 4: flow meter sanitary water pump with automatic restore (n.c.) 5: flow meter second load pump with manual restore (n.c.) 6: flow meter second load pump with automatic restore (n.c.) 7: compressor(s) circuit breaker with manual restore (n.c.) 8: compressor(s) circuit breaker with automatic restore (n.c.) 9: summer/winter (open = summer closed = winter) 10: Mode Selection (open = standby; closed = on) 11: alarm signal with manual restore (normally closed) 12: alarm signal with automatic restore (normally closed) 13: second Set point from external contact (summer and winter) (normally open) 14: defrost end from contact (normally closed) 15: defrost start from contact (normally closed) 16: External request selection (open = second load; closed = sanitary water) 17: High pressure 18: Low pressure 19: Sanitary water allarm 20: Enable second set point by time 21: Sanitary water pump circuit breaker manual restore 22: Sanitary water pump circuit breaker automatic restore 23: Second load pump circuit breaker manual restore 24: Second load pump circuit breaker automatic restore 25: Ground source pump circuit breaker manual restore 26: Ground source pump circuit breaker automatic restore P8 = 27: External Request only for sanitary water(it has the priority to P8 = 16)	F	0	27	int	1	0	-	69 (R/W)	276	Integer
P09	Digital input 2 selection	F	0	27	int	1	0	-	70 (R/W)	277	Integer
P10	Digital input 6 selection	F	0	27	int	1	0	X	71 (R/W)	278	Integer
P11	Digital input 7 selection	F	0	27	int	1	0	X	72 (R/W)	279	Integer
P12	Digital input 10 selection	F	0	27	int	1	0	X	73 (R/W)	280	Integer
P15	Low pressure alarm selection 0=not active with compressor off 1=active with compressor off	F	0	1	flag	1	0	-	76 (R/W)	283	Integer
P16	Set installation high temperature alarm	U	-400	1760	°C/°F	0.1	800	-	38 (R/W)	38	Analog
P17	High temperature alarm delay on switch-on	U	0	250	sec	1	30	-	77 (R/W)	284	Integer
P18	Set high pressure alarm from transducer	F	P33	999	dbar	0.1	200	P	39 (R/W)	39	Analog
P19	Set installation low temperature alarm	U	-400	1760	°C/°F	0.1	100	-	40 (R/W)	40	Analog
P20	Enable installation start-up alarm 0=Disabled - 1=Enabled	U	0	1	flag	1	0	-	20 (R/W)	20	Digital
P21	Alarm relay output logic 0=normally unexcited - 1=normally excited	F	0	1		1	0	-	8 (R/W)	8	Digital
P22	Low pressure alarm delay on compressor start-up in heat pump mode	U	0	200	sec	1	40	-	86 (R/W)	293	Integer
P23	Low pressure alarm delay on compressor start-up in defrost mode	U	0	999	sec	1	40	-	87 (R/W)	294	Integer
P24	Deactivation of compressors in HP and LP capacity stepping	D	0	1		1	0	P	21 (R/W)	21	Digital

display code	parameter	type	min	max	UOM	variat.	def.	visibility	superv. variable	Modbus®	var. type
P25	Selection of digital output 2: 0 Disable 1 Compressor 2 2 Electrical heater Second Load 3 Reversal Valve 4 Sanitary Water pump 5 Humidification 6 Geothermal pump/external exchanger fan 7 Electrical heater Sanitary Water 8 Alarm 9 Warning 10 Second Load pump 11 Compressor 1 12 Second Load / Sanitary Water	F	0	12	int	1	0	-	108 (R/W)	315	Integer
P26	Selection of digital output 3	F	0	12	int	1	0	-	109 (R/W)	316	Integer
P27	Selection of digital output 4	F	0	12	int	1	0	-	110 (R/W)	317	Integer
P28	Selection of digital output 5	F	0	12	int	1	0	-	111 (R/W)	318	Integer
P29	Selection of digital output 7	F	0	12	int	1	0	X	112 (R/W)	319	Integer
P30	Selection of digital output 8	F	0	12	int	1	0	X	113 (R/W)	320	Integer
P31	Selection of digital output 9	F	0	12	int	1	0	X	114 (R/W)	321	Integer
P32	Selection of digital output 10	F	0	12	int	1	0	X	115 (R/W)	322	Integer
P33	Low pressure alarm threshold	F	0	P18	dbar	0.1	10	P	76 (R/W)	76	Analog
P34	Selection of digital input 5	F	0	27	int	1	0	-	46 (R/W)	253	Integer
P35	Alarm silencing by means of "mute" button 0=no - 1=yes	F	0	1		1	0	-	23 (R/W)	23	Digital
P36	Type of high pressure alarm management 0=always 1=only if an active compressor is present and after 2 seconds from its activation	F	0	1		1	0	-	24 (R/W)	24	Digital
P37	Selezione uscita digitale 6	F	0	12	int	1	0	X	123 (R/W)	330	Integer
P38	External geothermical probe error	U	0	999		0.1	0	-	71 (R/W)	71	Analog
P39	High Temperature Sanitary Water	U	0	999		0.1	600	-	72 (R/W)	72	Analog
P40	Selezione ingr. digitale 3	F	0	27	int	1	0	-	119 (R/W)	326	Integer
P41	Selezione ingr. digitale 4	F	0	27	int	1	0	-	120 (R/W)	327	Integer
P42	Selezione ingr. digitale 8	F	0	27	int	1	0	-	121 (R/W)	328	Integer
P43	Selezione ingr. digitale 9	F	0	27	int	1	0	-	122 (R/W)	329	Integer

Tab. 5.k

Control setting parameters: (r*)

display code	parameter	type	min	max	UOM	variat.	def.	visibility	superv. Variable	Modbus®	var. type
r01	Summer Set Point	D	r13	r14	°C/°F	0.1	120	-	41 (R/W)	41	Analog
r02	Summer Differential	D	3	500	°C/°F	0.1	30	-	42 (R/W)	42	Analog
r03	Winter Set Point	D	r15	r16	°C/°F	0.1	400	-	43 (R/W)	43	Analog
r04	Winter Differential	D	3	500	°C/°F	0.1	30	-	44 (R/W)	44	Analog
r05	Compressors rotation 0=Disabled 1=FIFO - 2=With hour control 3= D.I. and D.O. compressors direct correspondence (only for motor-condensers)	F	0	3	Flag	1	0	-	78 (R/W)	285	Integer
r06	Type of adjustment/compressor use 0 = Proportional input 1 = Proportional input + Neutral zone 2 = Proportional output 3 = Proportional output + Neutral zone 4 = timed output with neutral zone	F	0	4	Flag	1	0	-	79 (R/W)	286	Integer
r07	Neutral zone differential	F	1	500	°C/°F	0.1	20	-	45 (R/W)	45	Analog
r13	Set summer minimum	U	-400	r14	°C/°F	0.1	-400	-	47 (R/W)	47	Analog
r14	Set summer maximum	U	r13	1760	°C/°F	0.1	800	-	48 (R/W)	48	Analog
r15	Set winter minimum	U	-400	r16	°C/°F	0.1	-400	-	49 (R/W)	49	Analog
r16	Set winter maximum	U	r15	1760	°C/°F	0.1	800	-	50 (R/W)	50	Analog
r17	Summer compensation constant	U	-50	50		0.1	0	-	51 (R/W)	51	Analog
r18	Maximum distance from the set point	U	3	200	°C/°F	0.1	3	-	52 (R/W)	52	Analog
r19	Compensation start temperature in summer	U	-400	1760	°C/°F	0.1	300	-	53 (R/W)	53	Analog
r20	Compensation start temperature in winter	U	-400	1760	°C/°F	0.1	0	-	54 (R/W)	54	Analog
r21	Second summer set point from external contact	D	r13	r14	°C/°F	0.1	120	-	55 (R/W)	55	Analog
r22	Second winter set point from external contact	D	r15	r16	°C/°F	0.1	400	-	56 (R/W)	56	Analog
r23	Automatic change over probe selection	D	0	8	flag	1	0	-	84 (R/W)	291	Integer

display code	parameter	type	min	max	UOM	variat.	def.	visibility	superv. Variable	Modbus®	var. type
r24	Automatic change over set point	D	r15	r16	°C/°F	0.1	400	-	61 (R/W)	61	Analog
r25	External temperature set point for compressor deactivation	D	-400	800	°C/°F	0.1	-400	-	65 (R/W)	65	Analog
r26	Summer set point in dehumidify mode	D	r13	r14	°C/°F	0.1	120	-	66 (R/W)	66	Analog
r27	Enabling of water vessel suppression 0=Disabled 1=Enabled in winter 2=Enabled in summer 3=Always enabled	F	0	3	flag	1	0	-	88 (R/W)	295	Integer
r28	Compressor minimum functioning time for low load	F	0	999	s	1	60	-	89 (R/W)	296	Integer
r29	Chiller low load differential	F	10	500	°C/°F	0.1	30	-	58 (R/W)	58	Analog
r30	Heat pump low load differential	F	10	500	°C/°F	0.1	30	-	59 (R/W)	59	Analog
r31	Winter compensation constant	U	-50	50		0.1	0	-	60 (R/W)	60	Analog
r39	Auto tuning corrective co-efficient	F	11	30		0.1	13	-	75 (R/W)	75	Analog
r43	Resistances set point : 0=A4, A8 and A11 absolute values 1=A4 absolute value, A8 and A11 values relative to the set point 2=A4 value relative to the set point, A8 and A11 vabsloute values 3=A4, A8 and A11 values relative to the set point	F	0	3		1	0	-	45 (R/W)	252	Integer
r45	2nd setpoint for sanitary water (only working in heating mode)	D	r15	r16	°C/°F	0.1	550	-	57 (R/W)	57	Analog
r46	Compaensation balance rate	D	0	100		1	100	-	4 (R/W)	211	Integer
r49	With µAD connected, the water set point is switched to the ambient set point when the ambient set point is satisfied	D	0	1		1	0	-	30 (R/W)	30	Digital
r50	Set point for the 2nd compressor related to external temperature	D	-400	1760	°C/°F	0.1	30	-	73 (R/W)	73	Analog
r51	Set point for the electrical heater related to external temperature	D	-400	1760	°C/°F	0.1	30	-	74 (R/W)	74	Analog
r52	Differential for the electrical heater related to external temperature	D	0	200	°C/°F	0.1	20	-	80 (R/W)	80	Analog

Tab. 5.l

Timer setting parameters: (t*)

display code	parameter	type	min	max	UOM	variat.	def.	visibility	superv. Variable	Modbus®	var. type
t01	RTC hour	U	0	23		1	0	W	129 (R/W)	336	Integer
t02	RTC minutes	U	0	59		1	0	W	130 (R/W)	337	Integer
t03	RTC day	U	1	31		1	1	W	131 (R/W)	338	Integer
t04	RTC month	U	1	12		1	1	W	132 (R/W)	339	Integer
t05	RTC year	U	0	99		1	6	W	133 (R/W)	340	Integer
t06	2nd summer set point start hour	U	0	23		1	0	W	92 (R/W)	299	Integer
t07	2nd summer set point start minutes	U	0	59		1	0	W	93 (R/W)	300	Integer
t08	2nd summer set point end hour	U	0	23		1	0	W	94 (R/W)	301	Integer
t09	2nd summer set point end minutes	U	0	59		1	0	W	95 (R/W)	302	Integer
t10	2nd winter set point start hour	U	0	23		1	0	W	96 (R/W)	303	Integer
t11	2nd winter set point start minutes	U	0	59		1	0	W	97 (R/W)	304	Integer
t12	2nd winter set point end houro	U	0	23		1	0	W	98 (R/W)	305	Integer
t13	2nd winter set point end minutes	U	0	59		1	0	W	99 (R/W)	306	Integer
t14	2nd summer low-noise start hour	U	0	23		1	23	W	100 (R/W)	307	Integer
t15	2nd summer low-noise start minutes	U	0	59		1	0	W	101 (R/W)	308	Integer
t16	2nd summer low-noise end hour	U	0	23		1	7	W	102 (R/W)	309	Integer
t17	2nd summer low-noise end minutes	U	0	59		1	0	W	103 (R/W)	310	Integer
t18	2nd winter low-noise start hour	U	0	23		1	23	W	104 (R/W)	311	Integer
t19	2nd winter low-noise start minutes	U	0	59		1	0	W	105 (R/W)	312	Integer
t20	2nd winter low-noise end hour	U	0	23		1	7	W	106 (R/W)	313	Integer
t21	2nd winter low-noise end minutes	U	0	59		1	0	W	107 (R/W)	314	Integer

Tab. 5.m

Supervisor-only variables

display code	parameter	type	min	max	UOM	variat.	def.	visibility	superv. Variable	Modbus®	var. type
	Indica il paramtro macchina (comunicazione SVCAREL)	F	0	250		-	166		54 (R)	261	Integer
	Circuit 1 in alarm	D	0	1		-	0		41 (R)	41	Digital
	EVD 1 valve in alarm	D	0	1		-	0		43 (R)	43	Digital
	General alarm	D	0	1		-	0		45 (R)	45	Digital
	Probes in alarm	D	0	1		-	0		46 (R)	46	Digital
	Compressors warning	D	0	1		-	0		47 (R)	47	Digital
	EVD 1 warning	D	0	1		-	0		48 (R)	48	Digital
	General warning	D	0	1		-	0		50 (R)	50	Digital
	Temperature warning	D	0	1		-	0		51 (R)	51	Digital
	Fan warning	D	0	1		-	0		52 (R)	52	Digital
	DTE/DTC alarm	D	0	1		-	0		77 (R)	77	Digital
	Digital input 1	D	0	1		-	0		53 (R)	53	Digital
	Digital input 2	D	0	1		-	0		54 (R)	54	Digital
	Digital input 3	D	0	1		-	0		55 (R)	55	Digital
	Digital input 4	D	0	1		-	0		56 (R)	56	Digital
	Digital input 5	D	0	1		-	0		57 (R)	57	Digital
	Digital output 1	D	0	1		1	0		59 (R/W)	59	Digital
	Digital output 2	D	0	1		1	0		60 (R/W)	60	Digital
	Digital output 3	D	0	1		1	0		61 (R/W)	61	Digital
	Digital output 4	D	0	1		1	0		62 (R/W)	62	Digital
	Digital output 5	D	0	1		1	0		63 (R/W)	63	Digital
	Stand by/On state 0=Stand by - 1=On	D	0	1		1	0		64 (R/W)	64	Digital
	Summer/winter state: 0=Winter - 1=Summer	D	0	1		1	1		65 (R/W)	65	Digital
	Constant gain for probe 1 calibration	F	0	8000		-	1000		5 (R)	212	Integer
	Constant gain for probe 2 calibration	F	0	8000		-	1000		6 (R)	213	Integer
	Constant gain for probe 3 calibration	F	0	8000		-	1000		7 (R)	214	Integer
	Constant gain for probe 4 calibration	F	0	8000		-	1000		8 (R)	215	Integer
	Offset constant for probe 1 calibration	F	-8000	8000		-	0		9 (R)	216	Integer
	Offset constant for probe 2 calibration	F	-8000	8000		-	0		10 (R)	217	Integer
	Offset constant for probe 3 calibration	F	-8000	8000		-	0		11 (R)	218	Integer
	Offset constant for probe 4 calibration	F	-8000	8000		-	0		12 (R)	219	Integer
	Digital input 6	D	0	1		-	0		66 (R)	66	Digital
	Digital input 7	D	0	1		-	0		67 (R)	67	Digital
	Digital input 8	D	0	1		-	0		68 (R)	68	Digital
	Digital input 9	D	0	1		-	0		69 (R)	69	Digital
	Digital input 10	D	0	1		-	0		70 (R)	70	Digital
	Digital output 6	D	0	1		1	0		72 (R/W)	72	Digital
	Digital output 7	D	0	1		1	0		73 (R/W)	73	Digital
	Digital output 8	D	0	1		1	0		74 (R/W)	74	Digital
	Digital output 9	D	0	1		1	0		75 (R/W)	75	Digital
	Digital output 10	D	0	1		1	0		76 (R/W)	76	Digital

Tab. 5.n

6. ALARMS AND SIGNALS

6.1 Alarms and signals: display, buzzer and relay

Key to the table of alarms:
*: if the probe is set for the compensation function, in the event of probe faults, the unit continues to operate.

ON*: if the expansion card is not present.
EVD 1= EVD400 connected to µGEO

alarm display	alarm type	resetting	compressor	pump	fan	heater	valve	alarm	warning	super. var	superv. variab. description	variab. type
HP1	High pressure	Depends on P05	OFF C1-2	-	ON(60")	-	-	ON	-	41 (R)	Circuit 1 alarm	Digital
LP1	Low pressure	Depends on P05	OFF C1-2	-	OFF 1	-	-	ON	-	41 (R)	Circuit 1 alarm	Digital
tC1	Circuit 1 overload	Depends on P08	OFF C1-2	-	OFF 1	-	-	ON	-	41 (R)	Circuit 1 alarm	Digital
LA	advice	Depends on P08	-	-	-	-	-	ON*	ON	-	General advice	Digital
E1	Probe B1 alarm	Automatic	OFF	OFF	OFF	OFF	-	ON	-	46 (R)	Probe alarm	Digital
E2	Probe B2 alarm	Automatic	OFF	OFF	OFF	OFF	-	ON	-	46 (R)	Probe alarm	Digital
E3*	Probe B3 alarm	Automatic	OFF	OFF	OFF	OFF	-	ON	-	46 (R)	Probe alarm	Digital
E4*	Probe B4 alarm	Automatic	OFF	OFF	OFF	OFF	-	ON	-	46 (R)	Probe alarm	Digital
E5	Probe B5 alarm	Automatic	OFF	OFF	OFF	OFF	-	ON	-	46 (R)	Probe alarm	Digital
E6	Probe B6 alarm	Automatic	OFF	OFF	OFF	OFF	-	ON	-	46 (R)	Probe alarm	Digital
E7*	Probe B7 alarm	Automatic	OFF	OFF	OFF	OFF	-	ON	-	46 (R)	Probe alarm	Digital
E8*	Probe B8 alarm	Automatic	OFF	OFF	OFF	OFF	-	ON	-	46 (R)	Probe alarm	Digital
Hc1-2	Hour warning C1-2	Automatic	-	-	-	-	-	-	ON	-	Compressor advice	Digital
EPr	EEPROM error during operation	Automatic	-	-	-	-	-	-	ON	-	General advice	Digital
ESP	Expansion Error	Automatic	OFF	OFF	OFF	OFF	OFF	ON	-	45 (R)	General alarm	Digital
EL1	Zero cross	Automatic	-	-	100%	-	-	ON*	ON		Fan advice	Digital
dF1	Defrosting error	Automatic	-	-	-	-	-	-	ON	50 (R)	General warning	Digital
d1	Execution and defrost	Automatic	-	-	-	-	-	-	ON	-	Signal on display	-
A1	Frost alarm circ. 1	Depends on P05	OFF C1-2	-	OFF 1	-	-	ON	-	41 (R)	Circuit 1 alarm	Digital
ELS	Low supply voltage	Automatic	-	-	-	-	-	-	ON	50 (R)	General warning	Digital
EHS	High supply voltage	Automatic	OFF	OFF	OFF	OFF	OFF	OFF	OFF	45 (R)	General alarm	Digital
EPb	EEPROM error at the start-up	Automatic	OFF	OFF	OFF	OFF	OFF	OFF	OFF	45 (R)	General alarm	Digital
Ht	High temperature	Automatic	-	-	-	-	-	ON*	ON	-	Temperature advice	Digital
Ed1	EVD 1 tLAN error	Automatic	OFF C1-2	-	OFF	-	-	ON	-	48 (R)	EVD 1 warning	Digital
SH1	EVD 1 superheat alarm	-	OFF C1-2	-	OFF-	-	-	ON	-	48 (R)	EVD 1 warning	Digital
nO1	MOP 1 warning	Automatic	-	-	-	-	-	-	ON	-	EVD 1 advice	Digital
LO1	LOP 1 warning	Automatic	-	-	-	-	-	-	ON	-	EVD 1 advice	Digital
HA1	High inlet temperature warning circ.1	Automatic	-	-	-	-	-	-	ON	-	EVD 1 advice	Digital
EP1	EVD 1 Eeprom error	Automatic	OFF C1-2	-	OFF-	-	-	ON	-	48 (R)	EVD 1 warning	Digital
ES1	EVD 1 probe error	Automatic	OFF C1-2	-	OFF-	-	-	ON	-	48 (R)	EVD 1 warning	Digital
EU1	Open valve EVD 1 error at the start-up	Automatic	OFF C1-2	-	OFF	-	-	ON	-	48 (R)	EVD 1 warning	Digital
Eb1	EVD 1 battery alarm	Automatic	OFF C1-2	-	OFF	-	-	ON	-	48 (R)	EVD 1 warning	Digital
AHt	High temperature at the start-up	Automatic	OFF	-	OFF	OFF	-	-	ON	50 (R)	General warning	Digital
ALt	Low temperature at the start-up	Automatic	OFF	-	OFF	OFF	-	-	ON	50 (R)	General warning	Digital
L	Low load warning	Automatic	-	-	-	-	-	-	-	-	Signal on display	-
PH1	Half power for HP	Automatic	OFF C2	-	-	-	-	-	-	-	Signal on display	-
pL1	Half power for LP	Automatic	OFF C2	-	-	-	-	-	-	-	Signal on display	-
Et	Terminal probe error	Automatic	OFF	OFF	OFF	OFF	-	ON	-		General alarm	Digital
dEL	Low dte	Automatic	-	-	-	-	-	-	-	77 (R)	DTE/DTC alarm	Digital
dEH	High dte	Automatic	-	-	-	-	-	-	-	77 (R)	DTE/DTC alarm	Digital
CH1	High dtc	Automatic	-	-	-	-	-	-	-	77 (R)	DTE/DTC alarm	Digital
CL1	Low dtc	Automatic	-	-	-	-	-	-	-	77 (R)	DTE/DTC alarm	Digital
SH1	Super heat at EVD1											
tEr	Lost of UAD	Automatic	OFF	OFF	OFF	OFF	OFF	ON	-	45 (R)	General alarm	Digital
EpE	External probe error	Automatic	-	-	-	-	-	-	-	-	Geo probe alarm	Digital

alarm display	alarm type	resetting	compressor	pump	fan	heater	valve	alarm	warning	super. var	superv. variab. description	variab. type
Htb	High Temp. Boiler	Manual	OFF	OFF	OFF	OFF	-	ON	-	-	Sanitary water alarm	Digital
FLE	External flow switch alarm	Manual	OFF	OFF	OFF	-	-	ON	-	-	Geo probe alarm	Digital
Alb	Generical Boiler Alarm	Manual	OFF	OFF	OFF	OFF	-	ON	-	-	Sanitary water alarm	Digital
FLS	SL flow alarm	Manual	OFF	OFF	OFF	-	-	ON	-	-	Geo probe alarm	Digital
FLB	SW alarm	Manual	OFF	OFF	OFF	-	-	ON	-	-	Geo probe alarm	Digital
Tps	General overload	Depends on P05	OFF	OFF	OFF	-	-	ON	-	50 (R)	General warning	Digital
Tpb	General overload	Depends on P05	OFF	OFF	OFF	-	-	ON	-	50 (R)	General warning	Digital
TpG	General overload	Depends on P05	OFF	OFF	OFF	-	-	ON	-	50 (R)	General warning	Digital

Tab. 6.a

Note: The warning relay differs from the alarm relay as it is only activated for warnings, that is, signals only, which have no direct effect on the operation of the unit, and the display does not show the alarm symbol (bell).

HP1: High pressure

The alarm is detected irrespective of the status of the pump and the compressors. The compressors corresponding to circuit 1 are immediately stopped (ignoring the set protection times), the buzzer and alarm relay are activated, and the display starts flashing.
The condensing pump/fan is activated at maximum speed for 60 s, so as to oppose the alarm situation, after which it is switched OFF. This alarm may also be generated when the high pressure limit is exceeded (valid only when the pressure transducer is fitted) set by the parameter P18, which to be enabled must be greater than 3.0 bars, due to the corresponding hysteresis.

LP1: Low pressure

The alarm depends on P15, P7 and P3.
P15= 0, P07= 0: the alarm is detected only if the compressors are ON, and after the time P03 from when the compressors started, otherwise it is immediate.
P15= 1, P07= 0: the alarm is detected even if the compressors are off, after the time P03.
P15= 0, P07= 1: the alarm is detected only if the compressors are ON, and after the time P03 from when the compressors started, otherwise it is immediate, and if in heat pump mode, is activated for pressure values less than 1 bar.
P15= 1, P07= 1: the alarm is detected also if the compressors are Off, after the time P03, and if in heat pump mode, is activated for pressure values lower then 1 bar. The hysteresis for this alarm is 1 bar.

PH1: Compressor part load

Indicates the part load due to high pressure. This situation is signaled by the message "PH1" on the display the activation of the warning relay.

tP, tps, Tpb, TpG, tC1: thermal overload

The alarm is detected irrespective of the status of the pump and the compressors. The compressors, the pumps and fans stop (without observing the protection times) or are inhibited from starting, the alarm relay is activated, the display flashes the corresponding message, and the LED flashes. It can be reset either manually or automatically (see par. P08, P09, P10, P11, P12).

LA: generic warning

This represents a generic warning that appears on the display, from digital input, without modifying the operation of the unit.

FL: flow alarm

This alarm is detected only if the pump is ON (excluding the delays when starting P01 and in steady operation P02), irrespective of the status of the compressor. All of the outputs are disabled: pump, compressor (without observing the OFF times), condenser fan/pump, and the buzzer sounds, the alarm relay is activated and the display flashes. The presence of the utility water pump must be enabled (H5≠0). It can be reset either manually or automatically (see P08, P09, P10, P11, P12).

E1 to E8: probe error detected even when the unit is in Standby

The presence of a probe alarm causes the deactivation of the compressor, the condenser fan/pump, the pump and the heaters; the buzzer and alarm relay are activated, and the display starts flashing. If the probe has a compensation function, the unit will continue a operate correctly, with the exception of the corresponding function, and the warning relay will be activated and a message shown on the display, from E1 to E8 for probes from B1 to B8.

Hc1 to Hc2: compressor operating hour limit exceeded warning

When the number of operating hours for the compressor exceeds the maintenance threshold (as default equal to zero, and consequently the function is disabled), the maintenance request signal is activated. The buzzer and the alarm relay are not activated; however the warning relay is activated (with the expansion card fitted).

Epr, EPb: EE PROM error

A problem has occurred when saving the parameters to the unit's non-volatile memory (EEPROM); in the event of an Epr error, the µGEO continues to perform the control functions with the data present in the volatile memory (RAM), where there is a physical copy of all of the data. After the first power failure the configuration will be lost. The buzzer and the alarm relay are not activated. If the occurs when starting the unit, "EPb", the controller will not operate.

ESP: communication error with expansion card

If the controller loses communication with the expansion card, the entire system will be stopped to avoid adversely affecting the unit. The alarm relay is activated and the display will show the message, with the red LED on steady.

EL 1: warning, zero crossing error

If the controller detects errors in the power supply, control may be lost over the fan/pump speed. In this case, the display will show a warning, and the fan/pump will be controlled at maximum speed. The alarm is reset automatically, so as to not affect the operation of the unit. If the expansion card is used, the warning relay is activate)

dF1: warning, end defrost due to maximum time

If the defrost ends after the maximum time when end defrost by temperature or from external contact has been selected, the unit displays the text dF1. The message is cancelled using the delete alarm procedure or when the next correct defrost cycle is completed.

A1: antifreeze alarm outlet limit

The alarm is only detected in water chillers by the evaporator water outlet probe (B2). The compressors and the condenser fan/pump is immediately stopped, the buzzer and alarm relay are activated, and the display starts flashing. If the µGEO is in Standby, the alarm condition is not detected, and only the heaters are managed. Reset depends on parameter P5: in the event of automatic reset, the unit restarts automatically if the temperature is above the value A01 + A02.
In the event of manual reset, the unit can restart manually even if the alarm is active.
After the time A03, if the alarm persists the unit will stop again.

Ht: high temperature warning

This alarm is activated when the threshold is exceeded (read by B3), set for the parameter P16. It is delayed at power ON by the parameter P17 and causes the activation of the alarm relay and the buzzer, without deactivating the outputs. It is reset automatically when conditions that caused the alarm are no longer present.

AHt: high temperature warning when starting the system

The advice does not activate the relay, and displays the message "AHt".

ALt: low temperature warning when starting the system

The advice does not activate the relay, and displays the message "ALt".

ELS/EHS: warning, low/high power supply alarm

If the power supply voltage is too low or too high, the corresponding message is displayed. In these cases, the correct operation of the µGEO is no longer guaranteed. In the low voltage conditions only the requests to deactivate the loads are effected. Any start-up requests remain pending. The high voltage condition involves the deactivation of all the energised relays.

L: Low load warning (second load)

The warning does not activate the relay and displays the message "L"; reset is automatic.

D1: defrost signal

When the defrost is ON, the display shows the message D1.

Driver

All the driver alarms on the µGEO that stop the unit feature automatic reset. Consequently, the possibility to select the automatic resetting of the entire system must be selected for the drivers by setting the corresponding parameters. The µGEO can send the Go Ahead command according to the normal procedure for resetting the alarms from the keypad.

Ed1: tLan communication error with Driver

The alarm is generated after a fixed time (5 s) from when the µGEO loses contact with Driver. In this case, the device is disabled for safety reasons.

SH1: low superheat alarm

The low superheat alarm, after a fixed time (5 s), inhibits the device for safety reasons.
The risk is that the compressors will flood.

nO1: MOP warning (maximum operating pressure)

The warning appears on the display and, the corresponding relay is activated.

LO1: LOP warning (lowest operating pressure)

The warning appears on the display and, the corresponding relay is activated.

HA1: high evaporator temperature warning

The warning appears on the display and, if the expansion card is fitted, the corresponding relay is activated.

EP1: EEPROM error driver

The device is disabled for safety reasons, as the status of Driver is not known.

ES1: probe error driver

The divice is disabled for safety reasons, as the status of Driver is not known.

EU1: EVD error, valve open when starting

If when starting the system the Driver detects that the valve is still open, an alarm is sent to the µGEO that stops the compressors and the fans in the corresponding circuit.

Eb1: EVD battery alarm

The EVD battery alarm stops the compressors from starting so as to prevent the risk of liquid returning to circuit , and disables the corresponding fans.

AHt: high temperature warning on plant start-up.

The alarm does not activate the relay and displays the "AHt" message

ALt: low temperature warning on plant start-up

The alarm does not activate the relay and displays the "ALt" message.

L: low pressure

The low pressure condition is indicated on the display with " L " indicating the LOW PRESSURE and the control will vary the minimum switch-on time of the compressor in order to determine the future low pressure condition or the exit from the procedure with the consequent restoring of the minimum time.

PH1: half power in high pressure

pL1: half power in low pressure

Et: µAD terminal probe alarm

dEH: high DTE warning

Beyond the limit Maximum accepted (H18), the evaporator risks freezing in some points, and it is therefore useful to give the alarm for anomalous behavior "dEH".

dEL: low DTE warning

Minimum accepted (H17), even if not risky, beyond the limit it is useful to give a warning "dEL" to check water flow, perhaps to high or no condenser yield.

CH1: high DTC warning

Maximum accepted (H19), above which it is presumable to think that the condenser is dirty (in chiller mode) or dirty/frozen (in heat pump mode). This is risky, give a warning "CH1" on the basis of the condenser.

CL1: low DTC warning

tEr: Lost of µAD

If there's no response of µAD, the alarm "tEr" will appear to indicate there's communication problem between µGEO and µAD.

EpE: External geothermal probe error

This warning occurs if the difference between B5 and B6 probes is higher than parameter P38 for 30 sec. if the parameter P38 is equal to 0, the warning is disabled.

Htb: High Temperature Sanitary Water (Boiler)

This Alarm occurs if the temperature of B1 rises above P39 threshold. Pump and compressor go off

FLE: External flow alarm

The alarm is only detected if the external pump is switched-on (apart from delays on start-up of P1 and normal running conditions P2), independently from the state of the compressor. All outputs are disabled: pump, compressor (without respecting switch-off times), condensation fan. The alarm relays are activated and the display flashes. Restore is manual.

ALb: Boiler alarm

This rappresent a generical alarm stops the circuit.

FLS: External flow alarm

The alarm is only detected if the external pump is switched-on (apart from delays on start-up of P1 and normal running conditions P2), independently from the state of the compressor. All outputs are disabled: pump, compressor (without respecting switch-off times), condensation fan. The alarm relays are activated and the display flashes. Restore is manual.

FLb: External flow alarm

The alarm is only detected if the external pump is switched-on (apart from delays on start-up of P1 and normal running conditions P2), independently from the state of the compressor. All outputs are disabled: pump, compressor (without respecting switch-off times), condensation fan. The alarm relays are activated and the display flashes. Restore is manual.

7. CONNECTIONS, ACCESSORIES AND OPTIONS

7.1 connection diagram

Below is the connection diagram for mGEO.

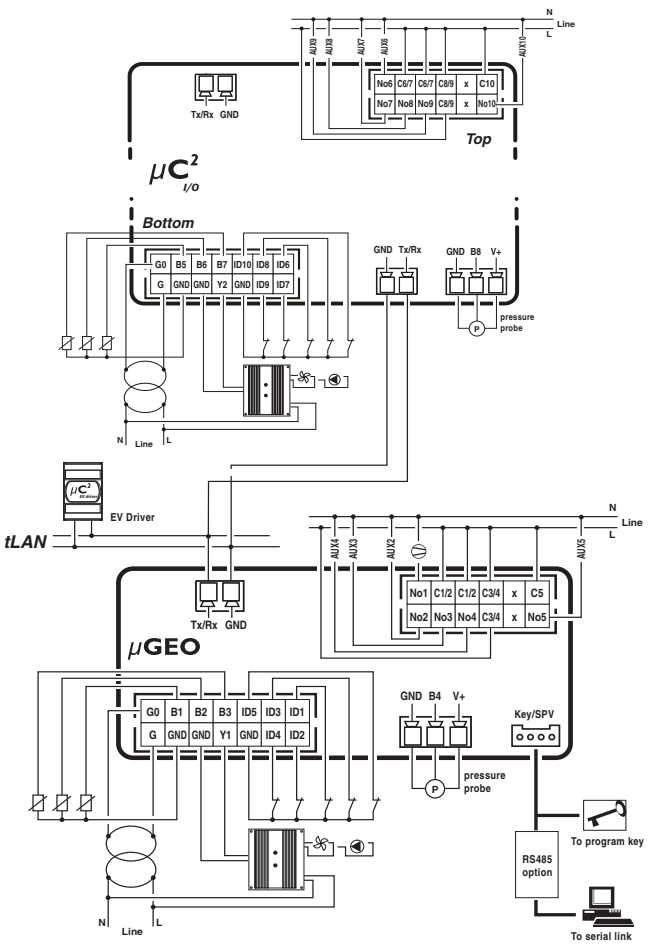

Fig. 7.a

I/O layout

mGEO	description
B1	sanitary water probe
B2	second load outlet probe
B3	second load inlet probe
B4	high pressure probe
ID1...ID5	configured by users
Y1	PWM output for geothermal pump/fan

Tab. 7.a

I/O board	description
B5	geothermal outlet probe
B6	geothermal inlet probe
B7	external temperature probe
B8	low pressure probe
ID6...ID10	configured by users
Y2	PWM output for sanitary water pump

Tab. 7.b

7.2 I/O board

This device allows the µGEO to have all the necessary inputs and outputs.

Note: This device is not an optional board.

7.3 EVD4*: Electronic expansion valve driver

This device is used to control electronic expansion valves. The device is connected to the µGEO via a tLAN serial line. The condensing pressure probe must be connected to the µGEO, which then sends the reading to the driver.

Note: for all other information on the connections, refer to the EVD4* driver manual.

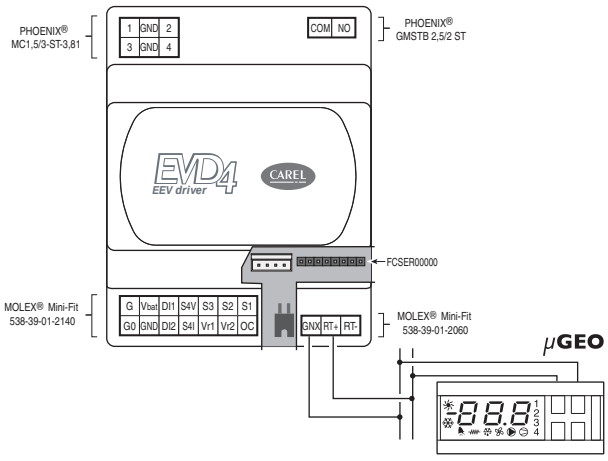

Fig. 7.b

7.4 Fan speed control board (code MCHRTF*)

The phase cutting boards (code MCHRTF****) are used to control the speed of the condenser fans.

IMPORTANT: The power supply to the µGEO and the MCHRTF**** board must be in phase. If, for example, the power supply to the µC²SE system is three-phase, make sure that the primary of the transformer supplying the µC²SE board is connected to the same phase that is connected to terminals N and L on the speed control board; therefore, do not use 380 Vac/24 Vac transformers to supply the controller if the phase and neutral are used to directly power the speed control boards.
Connect the earth terminal (where envisaged) to the earth in the electrical panel.

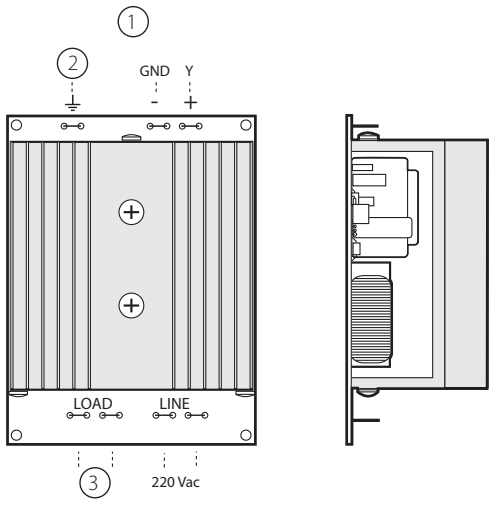

Fig. 7.c

Key:
1. to µGEO;
2. earth;
3. to motor.

7.5 Fan ON/OFF control board (code CONVONOFF0)

The relay boards (code CONVONOFF0) are used for the ON/OFF management of the condenser fans.
The control relay has a switchable power rating of 10 A at 250 Vac in AC1 (1/3 HP inductive).

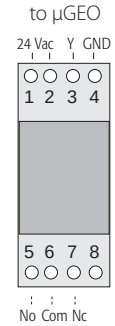

Fig. 7.d

7.6 PWM to 0 to 10 Vdc (or 4 to 20 mA) conversion board for fans (code CONV0/10A0)

The CONV0/10A0 boards convert the PWM signal at terminal Y on the µGEO to a standard 0 to 10 Vdc (or 4 to 20 mA) signal. The FCS series three-phase controllers can be connected to the µGEO without using this module.

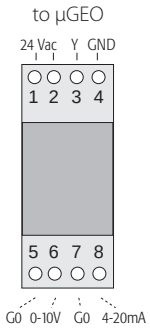

Fig. 7.e

7.7 Minimum and maximum fan speed calculation

This procedure should only be performed when the fan speed control boards are sued (code MCHRTF*).
it must be stressed that if the ON/OFF modules (code CONVONOFF0) or alternatively the PWM to 0 to 10 V converters (code CONV0/10A0) are used, parameter F03 should be set to zero, and parameter F04 to the maximum value.
Given the different types of motors existing on the market, the user must be able to set the voltages supplied by the electronic board corresponding to the minimum and maximum speeds. In this regard (and if the default values are not suitable), proceed as follows:

- set parameter F02= 3 and set F03 and F04 to zero;
- the condenser control set point (evaporator in HP mode) has been modified to take the output signal to the maximum value (PWM);
- increase F04 until the fan operates at a sufficient speed (make sure that, after having stopped it, it can rotate freely when released);
- "copy" this value to parameter F03; this sets the voltage for the minimum speed;
- connect a voltmeter (set for AC, 250V) between the two "L" terminals (the two external contacts);
- increase F04 until the voltage stabilises at around 2 Vac (inductive motors) or 1.6, 1.7 Vac (capacitive motors). Once the value has been found, it will be evident that even when increasing F04 the voltage no longer decreases. In any case do not increase F04 further so as to avoid damaging the motor;
- restore the correct condenser set point (evaporator in HP mode).

The operation is now completed.

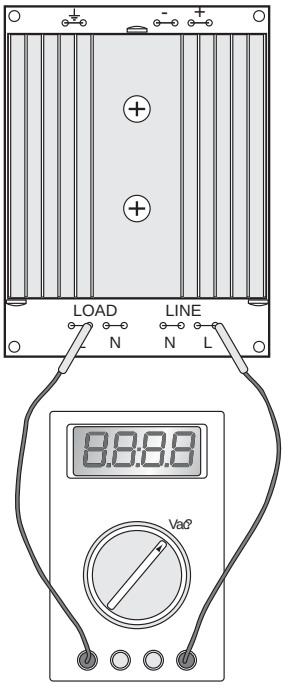

Fig. 7.f

7.8 Programming key (code PSOPZKEYA0)

The programming keys PSOPZKEY00 and PSOPZKEYA0 for CAREL controllers are used for copying the complete set parameters for µGEO.
The keys must be connected to the connector (4 pin AMP) fitted on the controllers, and can work with the instruments ON or OFF, as indicated in the operating instructions for the specific controller.
The two main functions (upload/download) that can be selected through two dip-switches (which are placed under the battery cover). They are:
Loading to the key the parameters of a controller (UPLOAD);
Copying from the key to one or more controllers (DOWNLOAD).

Fig. 7.g.a

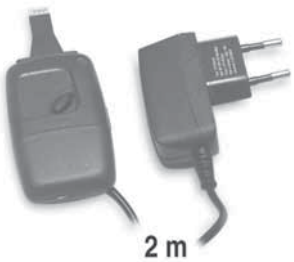

Fig. 7.g.b

Warning: the copying of the parameters is allowed only between instruments with the same code. Data loading operation to the key is always allowed. To make identification of the key easier CAREL has inserted a label on which you can describe the loaded programming or the machine to which you are referring.

Important note: the key can be used only with controllers µGEO that have the same firmware version.

UPLOAD - copying the parameters from an instrument to the key:

- open the rear hatch of the key and place the two dip-switches in the OFF position (see Fig. 7.j.a). Close the hatch;
- connect the key to the connector of the instrument;
- press the button on the key and keep it pressed, checking the LED signal sequence: at first it is red, after a few seconds it becomes green;
- if the sequence of signals is as indicated above, the copying operation has been completed correctly (green LED ON), the button can be released and the key disconnected from the instrument; in case of different signals: if the green LED doesn't turn on or if there are some flashes, there's a problem. Refer to the corresponding table for the meaning of the signals.

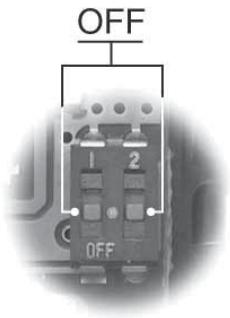

Fig. 7.h.a

DOWNLOAD - copying the parameters from the key to the instrument:

- open the rear hatch of the key and place the dip-switch n. 1 in the OFF position and the dip-switch n. 2 in the ON position (see Fig. 7.j.b). Close the hatch;
- connect the key to the connector of the instrument;
- press the button on the key and keep it pressed, checking the LED signal sequence: at first it is red, after a few seconds it becomes green;
- if the sequence of signals is as indicated above, the copying operation has been completed correctly (green LED ON), the button can be released; after a few seconds the LED turns off and the key can be disconnected from the instrument;
- in case of different signals: if the green LED doesn't turn on or if there are some flashes there's a problem. Refer to the corresponding table for the meaning of the signals.

The operation takes maximum 10 seconds to complete. If after this period the completed operation signal hasn't yet appeared, i.e. the green LED ON, try releasing and pressing the button again. In the event of flashes, refer to the corresponding table for the meaning of the signals.

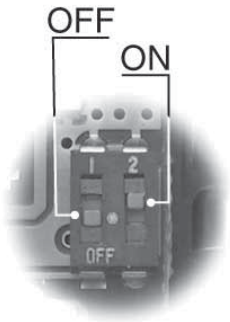

Fig. 7.h.b

LED signal	error	meaning and solution
red LED flashing	Flat batteries at the beginning of the copying	The batteries are flat, the copying cannot be carried out. Replace the battery (only on PSOPZKEY00).
green LED flashing	Flat batteries at the end of the copying (only on PSOPZKEY00)	The copying operation has been carried out correctly but at the end of the operation the voltage of the batteries is low. It is advisable to replace the batteries.
Alternate red/ green LED flashing (orange signal)	Not compatible instrument	The setup of the parameters cannot be copied since the model of the connected parameters is not compatible. Such error happens only with the DOWNLOAD function, check the controller code and make the copy only on compatible codes.
red and green LEDs ON	Copying error	Error in the copied data. Repeat the operation; if the problem persists, check the batteries and the connections of the key.
red LED always ON	Data transmission error	The copying operation hasn't been completed because of serious data transmission or copying errors. Repeat the operation, if the problem persists, check the batteries and the connections of the key.
LEDs OFF	Batteries disconnected	Check the batteries (for the PSOPZKEY00)
	Power supply not connected	Check the power supply (for the PSOPZKEYA0)

Table 7.c

Technical specifications

Power supply to the PSOPZKEY00	- Use three 1.5 V 190 mA batteries (Duracell D357H or equivalent)
	- Maximum current supplied 50 mA max.
Power supply to the PSOPZKEYA0	- switching power supply: Input 100 to 240 V~; (-10%, +10%); 50/60 Hz; 90 mA. Output: 5 Vdc; 650 mA
Operating conditions	0T50°C r.H. <90% non-condensing
Storage conditions	-20T70°C r.H. <90% non-condensing
Case	Plastic, dimensions 42x105x18 mm including prod and connector Figs. 1 and 2

Table 7.d

(Here we have dealt only with the base functions of the instrument. For the remaining specific functions, see the manual of the instrument that is being used).

7.9 RS485 serial options

RS485 serial option for µC²SE panel version (code MCH2004850)

The MCH2004850 serial option is used to connect the µC²SE controller to a supervisor network via a standard RS485 serial line. This option uses the input normally associated with the programming key, which has the dual function of key connector/serial communication port.

Fig. 7.j

7.10 Terminals

The µGEO features the following user interfaces:

µAD
µAD is the µGEO room terminal.
This terminal, fitted with built-in temperature and humidity probes, controls the temperature-humidity conditions in the environment where its is installed, interacting with the units controlled by the µGEO.
The µAD can be used to set time bands, the temperature and humidity set point, switch the system on/off and change operating mode simply and intuitively.

Fig. 7.k

Product code:
ADMA001000: with NTC probe
ADMB001010: with NTC probe, RTC and buzzer
ADMG001010: with NTC and humidity probe, RTC and buzzer
ADMH001010: with NTC and humidity probe, RTC, buzzer and backlighting

For further information see the instruction sheet +05000750 and the manual +030220465.

8. DIMENSIONS

The following are the mechanical dimensionsof each componentin the µGEO controller; all the values are expressed in millimeters.

Note: the dimensions include the free conncectors inserted.

MCH200004* µGEO

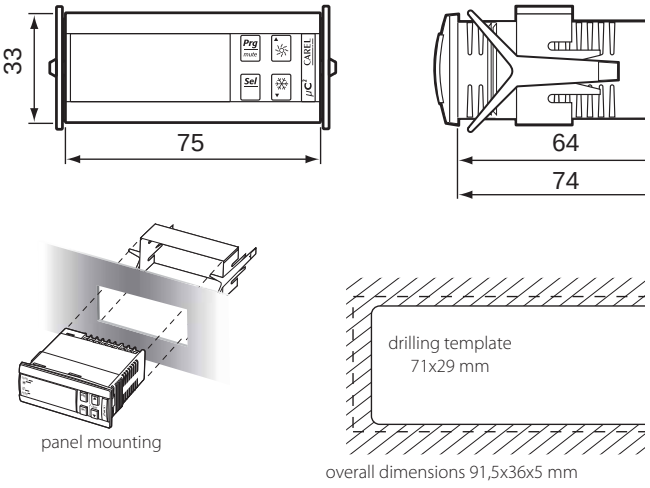

Fig. 8.a

I/O board for µGEO

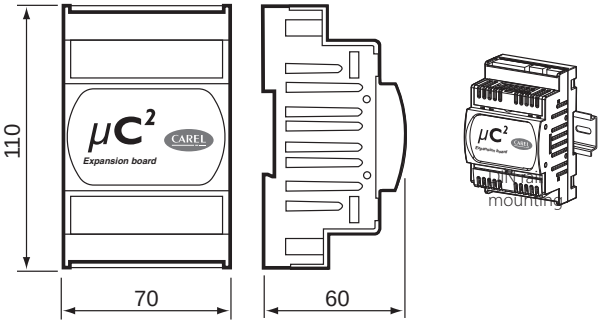

Fig. 8.b

RS485 serial card: cod. MCH2004850

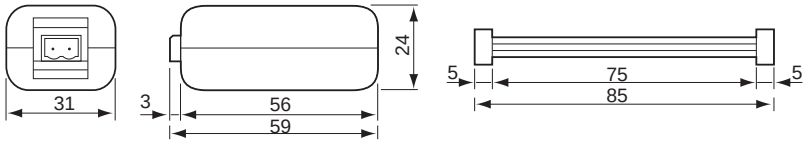

Fig. 8.d

CONVONOFF0 and CONV0/10 A modules

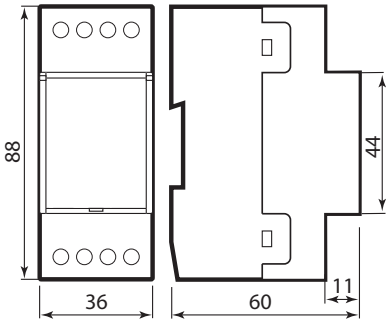

Fig. 8.c

MCHRTF series single-phase speed controllers

Model	A (component side)	B	C	D	E
MCHRTF04C0	43	100	40	50	107
MCHRTF08C0	75	100	58	82	107
MCHRTF12C0	75	100	58	82	107

Tab. 8.a

Note: the version with screw terminal code MCHRTF*D0 is available on request.

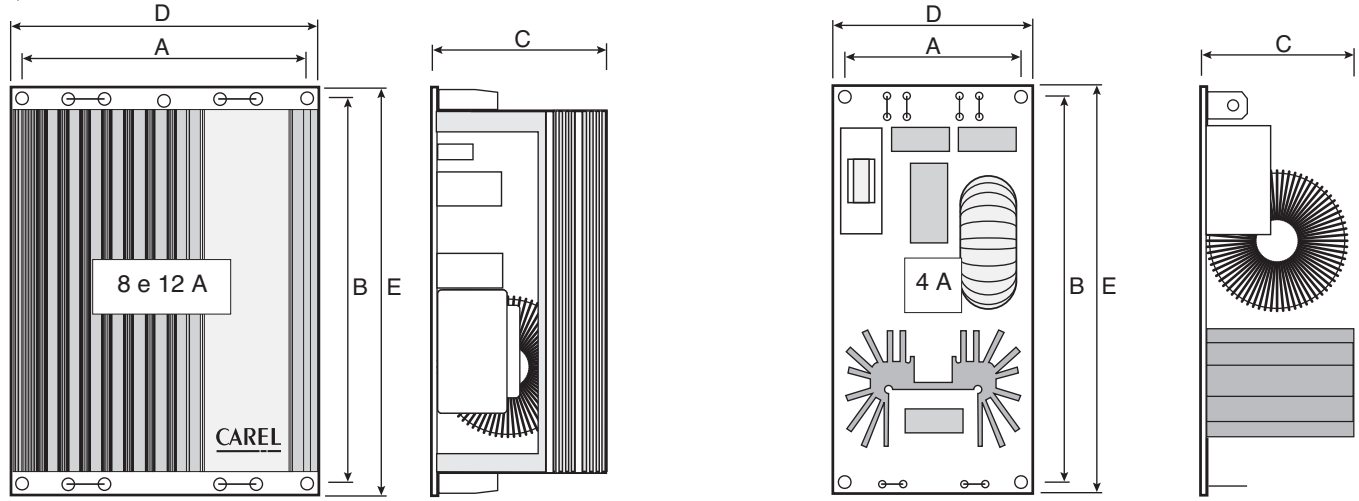

Fig. 8.e

Model
MCHRTF10C0

Tab. 8.b

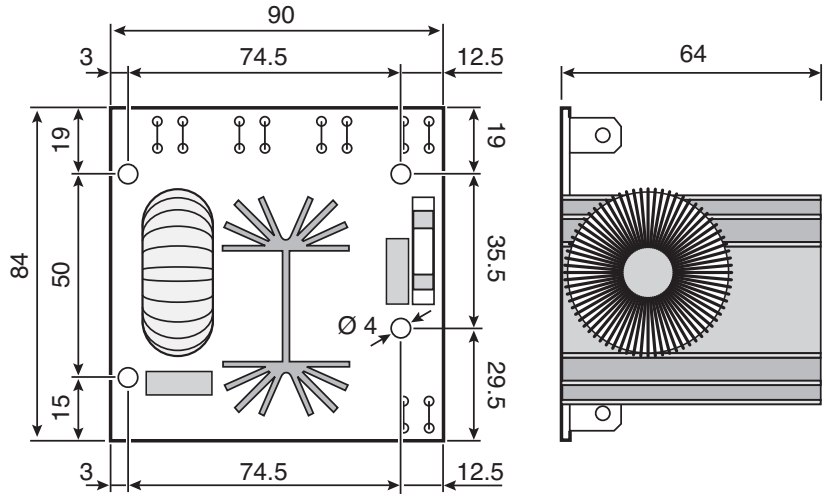

Fig. 8.f

9. CODES

Description	Code
µGEO main board	MCH2000040
µGEO main board (multiple package 10 pcs.)	MCH2000041
RS485 optional board for µGEO	MCH2004850
Programming key for µGEO	PSOPZKEY00
ON/OFF fan card (only screw terminals)	CONVONOFF0
PWM - 0 to 10 V fan card (only screw terminals)	CONV0/10A0
Temperature probes for regulation or condensation control ***depending on the length (015= 1.5 m, 030= 3 m, 060=6 m)	NTC***WP00
Pressure probes for condensing pressure control ** depending on the pressure (13= 150 PSI, 23= 75 PSI, 33= 500 PSI)	SPK*R*
Minifit connectors kit + 1 meter length cable	MCHSMLCAB0
Minifit connectors kit + 2 meter length cable	MCHSMLCAB2
Minifit connectors kit + 3 meter length cable	MCHSMLCAB3
Remote terminal for µGEO	MCH200TP0*
Supervisor serial connection kit for remote terminal	MCH200TSV0
Fan speed PWM 4 A/230 Vac	MCHRTF04C0
Fan speed PWM 8 A/230 Vac	MCHRTF08C0
Fan speed PWM 12 A/230 Vac	MCHRTF12C0
Fan speed PWM 10 A/230 Vac 1 pc. Nor. Ind.	MCHRTF10C0
Fan speed PWM 10 A/230 Vac 10 pcs. Nor. Ind.	MCHRTF10C1

Tab. 9.a

10. TECHNICAL SPECIFICATIONS

"Group A" is defined in the following specifications as the grouping of the following outputs: valve, pump, compressor, heater.

Power supply	24 Vac, range –15% ~ +10%; 50/60 Hz
	Maximum current output: 3 W
	Fuse to be fitted in series with the power supply of the µC2: 315 mAT
12-pin connector	Max current 2 A for each relay output, extendable to 3 A for one output
Relays	Max current at 250 Vac: EN60730: Resistive: 3 A, Inductive: 2 A cos(φ)= 0.4 60000 cycles UL: Resistive 3 A, 1 FLA , 6 LRA cos(φ)= 0.4 30000 cycles
	For further information, refer to the characteristic shown in Fig. 9.a
	Minimum interval between switching cycles (each relay): 12 s (the manufacturer of the unit that the device is built into must ensure the correct configuration to respond to this specification)
	Type of micro-switching of the relay: 1 C
	Insulation between relays in group A: functional Insulation between relays in group A and the very low voltage parts: reinforced Insulation between relays in group A and the signal relay: primary Insulation between the signal relay and the very low voltage parts: reinforced Insulation between relays and the front panel: reinforced
Digital inputs ID1 to ID5, IDB4	Electrical standard: voltage-free contact
	Closing current to ground: 5 mA
	Maximum closing resistance: 50 W
Analogue inputs	B1, B2, B3: CAREL NTC temperature probes (10 kW at 25 °C)
	The response time depends on the component used, typical value 90 s
	B4: CAREL 0 to 5 V or free contact ratiometric pressure probes
Fan output	Control signal for CAREL MCHRTF****, CONVONOFF* and CONV0/10A* modules
	Modulation of impulse position (set amplitude) or modulation of the duty-cycle. Refer to the user manual for the configuration of the parameters
	Loadless voltage: 5V ± 10%
	Short-circuit current: 30 mA
	Minimum output load: 1 kW
Front panel index of protection	IP55
Storage conditions	-10T70°C -- humidity 80% r.H., non-condensing
Operating conditions	-10T50°C - humidity <90% r.H., non-condensing
Degree of pollution	normal
Cat. of resist. to heat and fire	D (UL94 V0)
PTI of the insulating materials	≥ 250 V
Class and structure of the software	A
Period of electrical stress across the insulating parts	long

Tab. 10.a

Note: All the relays must have the commons (C1/2, C3/4) connected together, as shown in Fig. 1.

Electrical specifications of the relay contacts

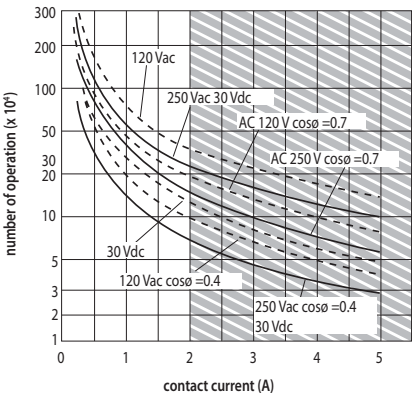

Fig. 8.a

10.1 Functional specifications

Resolution of analogue inputs	Temperature probes: range -40T80°C, 0.1 °C
Temperature measurement error	Range -20T20 °C, ±0.5 °C (excluding probe) Range -40T80 °C, ±1.5 °C (excluding probe)
Pressure measurement error	The voltage % error in the input range of 0.5 to 4.5 Vdc is ± 2% (excluding probe). The error in the converted value may vary according to the setting of the parameters /9, /10, /11, /12 (see user manual)

Tab. 10.b

11. APPENDIXES

11.1 Applications

Air/water heat pump

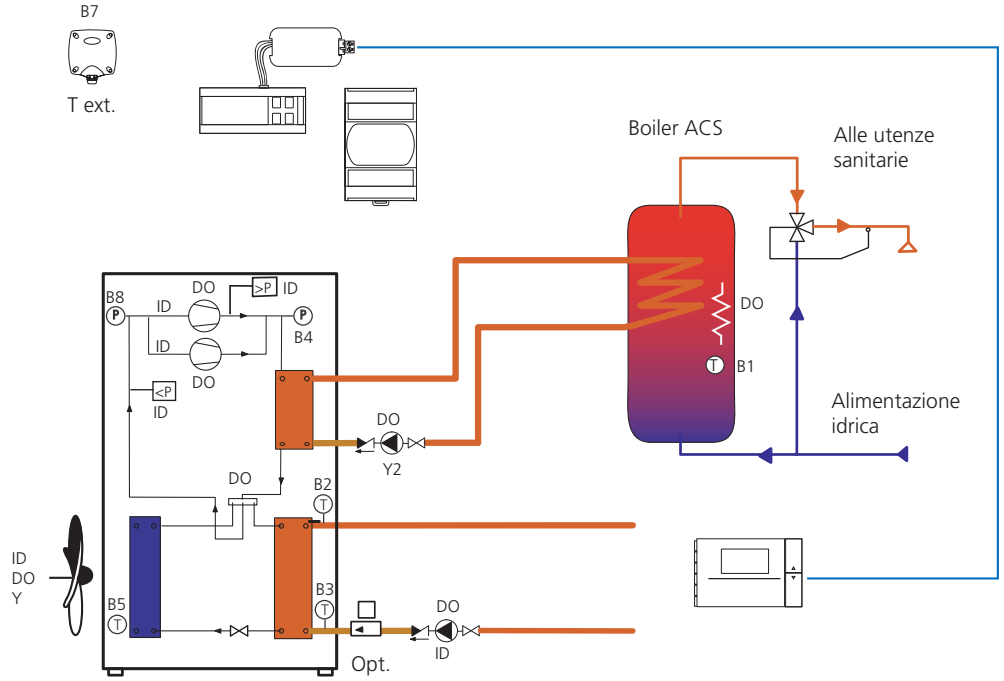

Fig. 11.a

Water/water heat pump

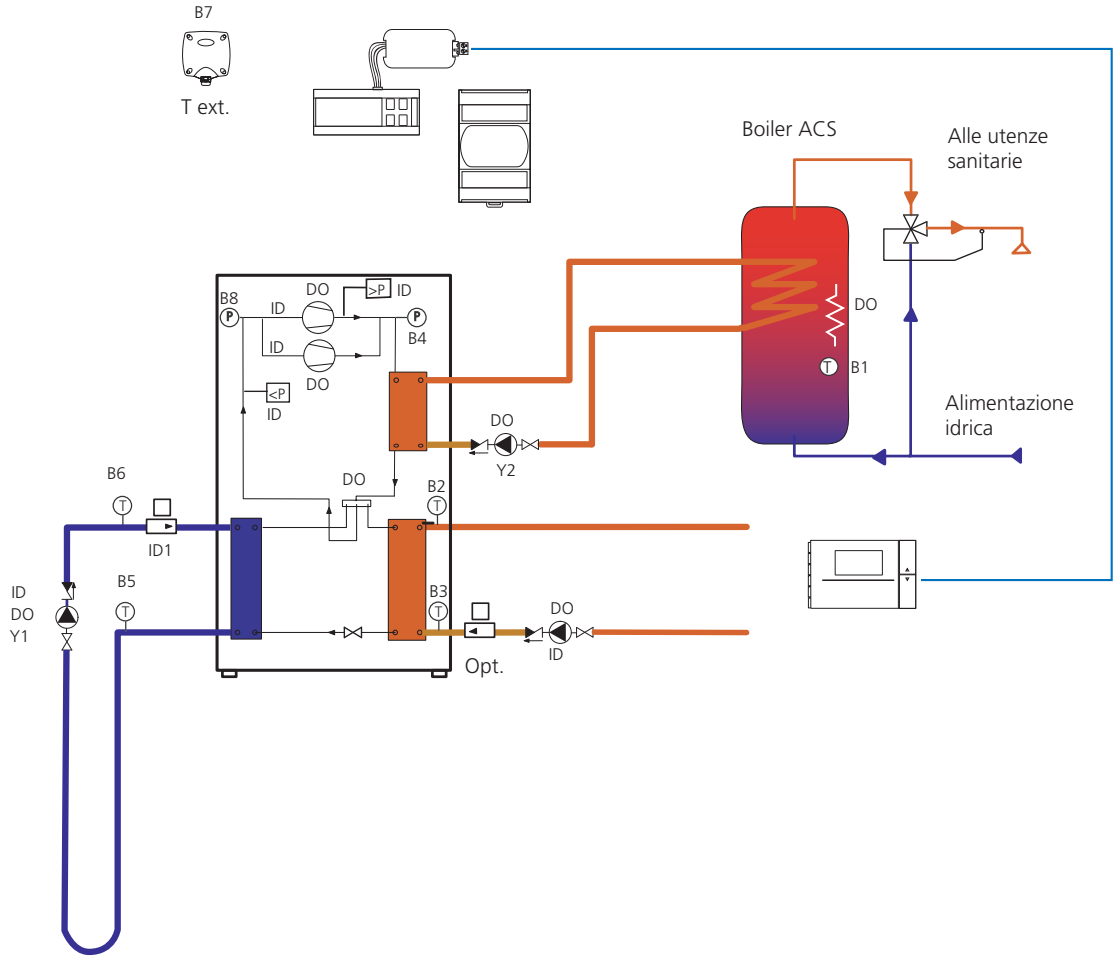

Fig. 11.b

Headquarters

CAREL INDUSTRIES
Via dell'Industria, 11 - 35020 Brugine - Padova (Italy)
Tel. (+39) 0499 716611 - Fax (+39) 0499 716600
carel@carel.com - www.carel.com

Subsidiaries:

CAREL Asia Ltd
Rm. 11, 8/F., Shatin Galleria,
18 Shan Mei St., Fotan, Shatin - Hong Kong
Tel. (+852) 2693 6223 - Fax: (+852) 2693 6199
e-mail: sales@carel-asia.com - www.carelhk.com

CAREL Australia Pty Ltd
PO Box 6809, Silverwater B.C. N.S.W. 1811
Unit 37, 11-21 Underwood Rd Homebush N.S.W. 2140
Tel: (+612) 8762 9200 - Fax: (+612) 9764 6933
e-mail: sales@carel.com.au - www.carel.com.au

CAREL China - CAREL Electronic (Suzhou) Co. Ltd.
No. 26, 369 Lushan Road,
Suzhou City, Jiangsu Province,
215129 P.R. of China
Tel: (+865) 12 66628098 - Fax: (+865) 12 66626631
e-mail: sales@carel-china.com - www.carel-china.com

CAREL Deutschland GmbH
Am Spielacker, 34, 63571 Gelnhausen (Germany)
Tel. (+49) 6051 96290 - Fax (+49) 6051 962924
e-mail: info@carel.de – www.carel.de

CAREL France Sas
32, rue du Champ Dolin - 69800 Saint Priest, France
Tel. (+33) 472 47 88 88 - Fax (+33) 478 90 08 08
e-mail: carelfrance@carelfrance.fr – www.carelfrance.fr

CAREL Ibérica
C/Laureà Miró, 401 Nau 10 -
08980 Sant Feliu de Llobregat (Barcelona)
Tel. (+34) 933 298 700 - Fax. (+34) 933 298 700

DELEGACIÓN MADRID
Nunez de Balboa, 116, 5a pl., Oficina 530
28006 MADRID
tel.(+34) 91 637 59 66 - Fax: (+34) 91 637 32 07
e-mail: info@carel.es - www.carel.es

CAREL Sud America Ltda
Avenida Dourado, 587 - Cep. 13.280-000 Vinhedo – São Paulo (Brasil)
Tel (+55) 19 38 26 25 65 - Fax (+55) 19 38 26 25 54
e-mail: carelsudamerica@carel.com.br – www.carel.com.br

CAREL U.K. Ltd
Unit 6, Windsor Park Industrial Estate, 50 Windsor Avenue
Merton SW19 2TJ, London (United Kingdom)
Tel. (+44) 208 545 9580 - Fax (+44) 208 543 8018
e-mail: careluk@careluk.co.uk – www.careluk.co.uk

CAREL U.S.A. L.L.C
385 South Oak Street
Manheim, PA 17545, Pennsylvania (USA)
Tel. (+1) 717-664-0500 - Fax (+1) 717-664-0449
e-mail: sales@carelusa.com - www.carelusa.com

www.carel.com

Affiliates:

CAREL Korea Co. Ltd.
A-901,Chung Ang Circ. Complex
1258 Kuro Bon-Dong, Kuro-KU,
Seoul-KOREA
Tel: (+82) 02 2068 8001
Fax: (+82) 02 2068 8005
e-mail: info@carel.co.kr - www.carel.co.kr

CAREL Ireland
FarrahVale Controls & Electronics Ltd
28E Ashbourne Business Centre
County Meath – IRELAND
Tel: (+353) 1 8353745
Fax: (+353) 1 8353681
www.carel.com - info@carel.ie

CAREL Spol (Czech and Slovakia) s.r.o.
Prazska 298
250 01 Brandys nad Labem, Czech Republic.
Tel: (+420) 326 377 729
Fax: (+420) 326 377 730
e-mail: carel@carel-cz.cz - www.carel-cz.cz

CAREL Thailand Co., Ltd.
444 4th Floor OlympiaThai Building, Ratchadapisek Road,
Samsennok, Huaykwang, Bangkok 10310 Thailand
Tel: (+66) 2 513 5610
Fax: (+66) 2 513 5611
e-mail: info@carel.co.th - www.carel.co.th

CAREL Turkey
CFM Sogutma ve Otomasyon San. Tic. LTD
1201 Sok. No: 13/Z 21
Izmir – TURKEY
Tel: (+90) 232 4590888
Fax: (+90) 232 4593435
www.cfmsogutma.com - info@cfmsogutma.com

Agenzia / *Agency*:

man. µGEO +030220831 rel. 3.2 - 31.08.2011