LCS

# pCO ADVANCED MICROPROCESSOR USER MANUAL

GB


CE

COMPANY
WITH QUALITY SYSTEM
CERTIFIED BY DNV
=ISO 9001/2000=

Galletti
AIR CONDITIONING

# Index

# 1. General description of the application

The operation of unit with screw compressor is managed by application software installed in the controller on the unit. The main features of the application software are described below.

## *1.1. Types of units controlled*

The software makes it possible to control air/water single/double-circuit chillers with screw compressors.

## *1.2. Types of regulation*

Proportional regulation on the evaporator input temperature with 4 steps of capacity controlled operation of compressors. Possibility of adjusting the setpoint remotely.

## *1.3. Condensation*

Modulating condensation control device is based on the reading of the pressure probe and it is independent for the two circuits.

## *1.4. Safety devices on the cooling circuit*

- High pressure (pressure switch).
- High pressure alarm from the probe
- High pressure prevention function
- Low pressure (pressure switch).
- General compressor alarm (INT69).
- High delivery temperature prevention function.
- Power limiting function at compressor starting

## *1.5. System safety features*

- Evaporator flow switch
- Pumps thermal switch
- Condensation fan thermal switch
- Remote on/off input
- Probe failure alarms

## *1.6. Optional accessories*

- Local supervision by means of RS485 serial board.
- Remote supervision by means of GSM modem or analog modem and modem board

# 2. Regulation logic

## *2.1. Inlet temperature regulation*

**Inputs used:**
- Evaporator inlet water temperature
- Refrigerant outlet temperature

**Parameters used:**
- Regulation setpoint
- Regulation differential

**Outputs used:**
- Compressor 1 – Compressor 2 On/Off
- Compr. 1 – Compr. 2 CR1 valve On/Off
- Compr. 1 – Compr. 2 CR2 valve On/Off
- Compr. 1 – Compr. 2 CR3 valve On/Off
- Compr. 1 – Compr. 2 CR4 valve On/Off

**Regulation diagram with 1 compressor**

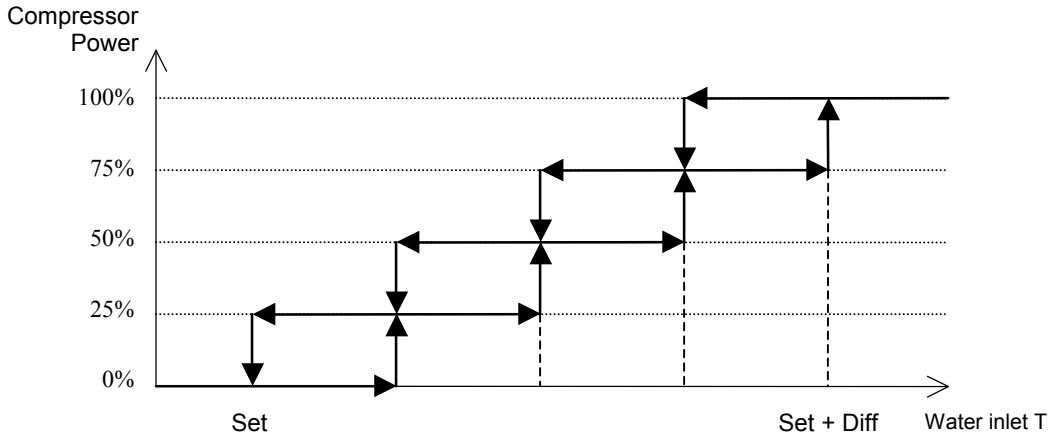



**Figure 1 : Regulation diagram with 1 compressor**

**Regulation diagram with 2 compressors**

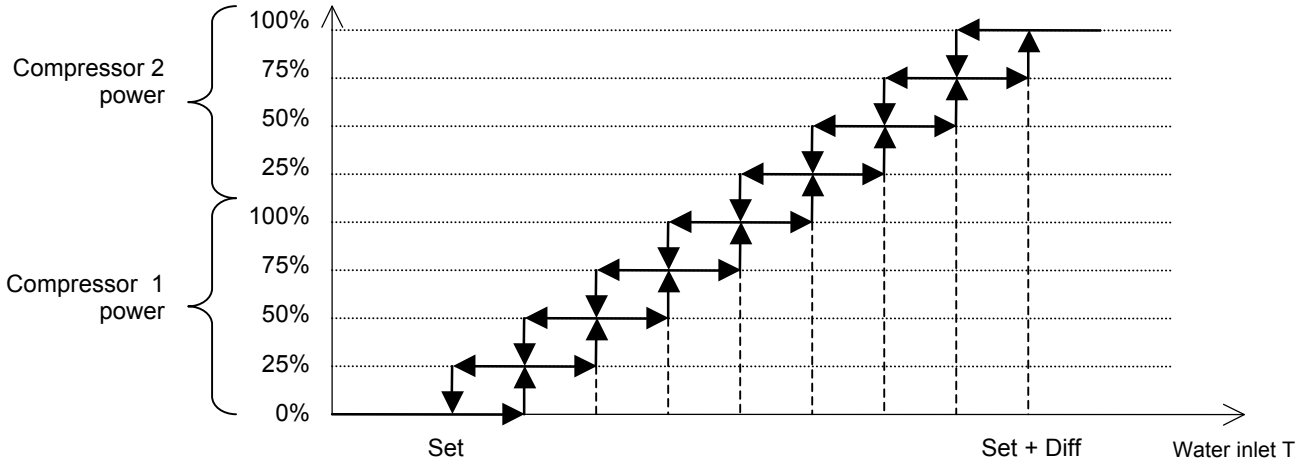



**Figura 2: Regulation diagram with 2 compressors**

**Output power correspondence – CR1 CR2 CR3 and CR4 solenoid valves**

| | CR1 | CR2 | CR3 | CR4 |
|---|---|---|---|---|
| Start/Stop | ○ | ○ | ● | ○ |
| 25% power | ○ | ○ | ● | ◉ |
| 50% power | ○ | ● | ○ | ◉ |
| 75% power | ● | ○ | ○ | ◉ |
| 100% power | ○ | ○ | ○ | ◉ |

○ = solenoid valve cut off
● = solenoid valve cut in
◉ = intermittent solenoid valve (10s Off – 10s On)

## 2.1.1. Setpoint

**Main Setpoint**
From the m_set_01 mask it is possible to set the main setpoint for summer and winter operation modes (heat pump version).

**Remote Setpoint**
From the ID10 digital input it is possible to enable the remote setpoint adjustment function. When contact is open the function is enabled. In this case, the current setpoint is the algebraic sum of the setpoint in the m_set_01 mask and the remote setpoint variation determined at the 4-20mA B1 analog input, converted from a minimum value and a maximum value set in the m_set_02 mask.

```
m_set_02
+--------------------+
|Setpoint variation  |
|from remote:        |
|Min.( 4 mA):  0.0 °C|
|Max.(20 mA):  0.0 °C|
+--------------------+
```

**Setpoint for time periods**

The function for changing the setpoint for programmed time periods may be enabled from the "m_fasce" mask. A time period can be programmed for every day of the week by setting a starting and end time in the masks from "m_fasce_01" to "m_fasce_07". From the two masks "m_fasce_set_01" and "m_fasce_set_02" it is possible to enter the setpoints valid within and outside the programmed time periods.

```
m_fasce_set_01
+--------------------+
|Adjust setpoint     |
|within time band    |
|                    |
|Set.:    00.0 °C    |
+--------------------+
```

```
m_fasce_set_02
+--------------------+
|Adjust setpoint     |
|outside time band   |
|                    |
|Set.:    00.0 °C    |
+--------------------+
```

```
m_fascia_01
+--------------------+
|Monday              |
|Start:  00:00       |
|End  :  00:00       |
|                    |
+--------------------+
```

## 2.1.2. High delivery temperature prevention function.

(ref mask m_tempi_comp_03)
To safeguard the efficiency of the compressor, if the refrigerant outlet temperature exceeds the setpoint entered from the “m_prev_alta_T02” mask, the function for reducing compressor capacity to 25% will be inhibited to improve oil circulation within the compressor itself.
This function can be enabled from the "m_prev_alta_T01" mask.

## 2.2. Compressor times and configuration

The unit enables the control of a screw compressor. Most of the operations performed by the $pCO^2$ are conditioned by programmable delays. Some of them serve to delay the triggering of some alarms or to assure the proper functioning of the compressor, thereby lengthening their lives and guaranteeing system stability.

### 2.2.1. Minimum compressor "ON" time

(ref mask m_tempi_comp_03)

This determines the minimum time (in seconds) the device must continue running: therefore, once activated it must stay on for the set length of time.

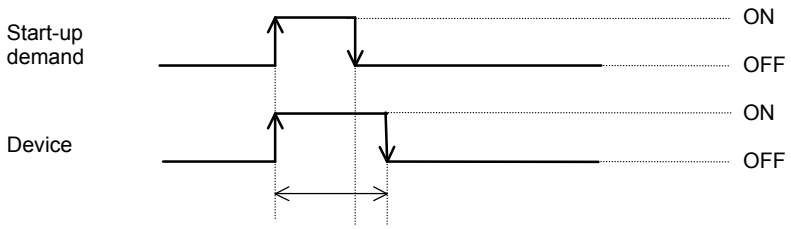



**Figure 3: Minimum compressor "ON" time**

### 2.2.2. Minimum compressor "OFF" time

(ref mask m_tempi_comp_01)

This determines the minimum time the device must remain off. After it is shut off, the compressor cannot start up again until the set time has elapsed.

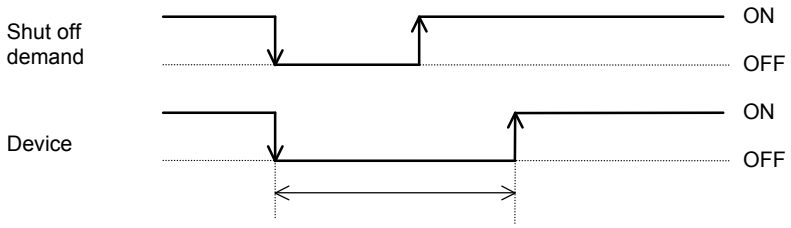



**Figure 4: Minimum compressor "OFF" time**

### 2.2.3. Delay between two successive start-ups of the compressor

(ref mask m_tempi_comp_02)

This establishes the minimum time that must elapse between two starts of the device, irrespective of the read measurement and of the setpoint. This parameter makes it possible to limit the number of starts per hour. If, for instance, the maximum allowed number of starts per hour is 10, setting a value of 360 seconds will ensure that this limit is complied with.

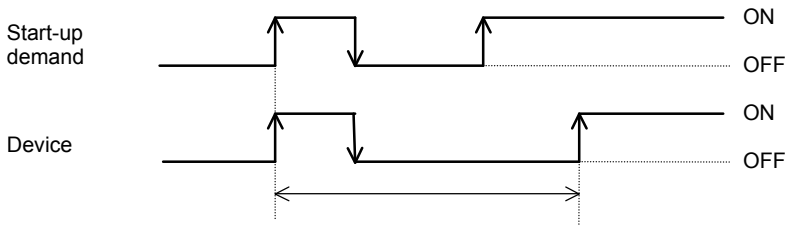



**Figure 5: Delay between two successive start-ups**

### 2.2.4. Power limiting function at compressor starting

When the compressor is started, regardless of the inlet water temperature, an override function will reduce capacity to 25% for an amount of time which may be set from the "m_temp_tempi_03" mask.

## *2.3. Condensation Control*

- The condensation control device is of modulating type, based on the pressure transducer reading.

**Inputs used:**
- High pressure probe of first circuit (B3 analog input)

**Parameters used:**
- Condensation Setpoint
- Condensation Differential
- Enabling of prevent function
- Prevent Setpoint
- Prevent Differential
- Delay in device reactivation after triggering of prevent function
- Output voltage relative to minimum inverter speed
- Output voltage relative to maximum inverter speed

**Outputs used**
- Fan speed regulation (Y1 analog output)

### 2.3.1. Regulation diagram

The condenser fans are adjusted according to the condensation pressure sensed by the transducer, with proportional control within the band width defined by the setpoint and differential, which may be set from the "m_condenser_05" mask, delimited by upper and lower limits (L1 and L2, which may be set in "m_condenser_06"), see Figure .
It is possible to program the condenser fans to start up a certain amount of time before the compressor; this

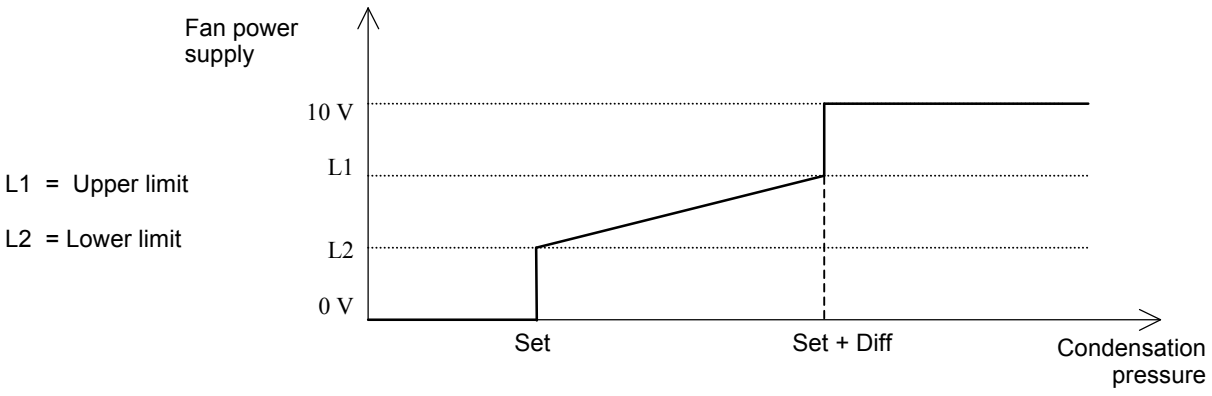



**Figure 6: Condensation control logic**

time as well as the fan speed during the phase prior to compressor start-up can be set respectively from the “m_condenser_02” and “m_condenser_03” masks.

In case of a broken pressure sensor, an override function can bring operating speed to a value which may be set from the "m_condenser_04" mask.

### 2.3.2. High pressure alarm

If the pressure value exceeds the high pressure alarm setpoint selected in the mask an alarm will be signalled and the compressor will be stopped. The alarm will turn off when the pressure drops below the setpoint – differential value.

### 2.3.3. High pressure prevention function

This function is used to prevent the compressor from stopping due to high pressure alarm triggered by the manually reset pressure switch. If the function has been enabled from the "m_hp_prevent_01" mask and the pressure exceeds the setpoint entered in the "m_hp_prevent_02" mask, the 100% compressor capacity control function will be inhibited until the pressure falls below the setpoint – differential

## *2.4. Antifreeze regulation*

**Inputs used**

- Evaporator outlet water temperature probe.

**Parameters used:**

- Antifreeze alarm setpoint;
- Antifreeze alarm differential;

**Outputs used:**

- Antifreeze alarm;

To prevent outgoing water from freezing, an anti-freeze alarm is signalled and compressor operation is inhibited.

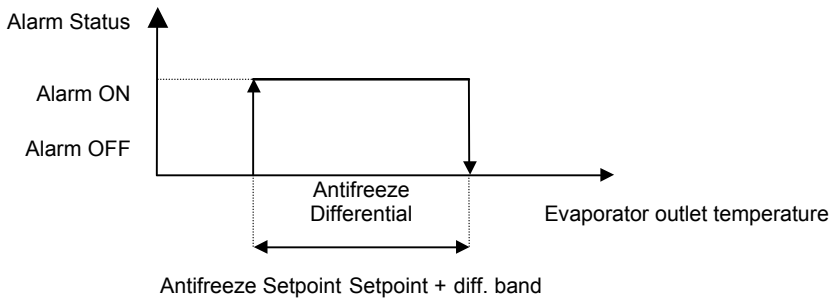



**Figure 7: Antifreeze regulation**

# 3. Start-up and configuration

## *3.1. Terminal with keyboard and display*


**Figure 8: Terminal**

The user *terminal* is shown in the picture. It consists of a 4 line x 20 column LCD, keyboard and LEDs controlled by a microprocessor: from the terminal the user can set the control parameters (setpoint, differential band, alarm thresholds, etc.) and perform fundamental operations.

The following main operations can be performed via the terminal:

- initial machine configuration;
- modification of main operating parameters;
- display of machine status and of all measured data;
- display of the alarms detected and a 'buzzer' (that can be disabled);

The terminal and the $pCO^2$ controller are connected via a 6-way telephone cable.

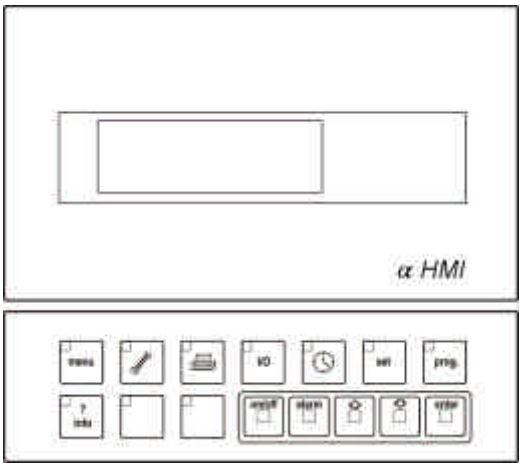
**This connection is not essential for standard controller operation.**

## *3.2. Display*

The display used is of the 4 line x 20 column LCD type. The data and information regarding operation alternate as successive windows called *masks*. It is possible to move around inside the masks using the terminal keys as described below:

## 3.3. Keyboard

The microprocessor features a 4x20 backlit LCD screen (see picture below) for turning on the unit, displaying the status of the devices and configuring the operating parameters.




By pressing  or  the user can view in sequence the masks (display pages) contained in the menus and change the numeric value of parameters. A cursor can be seen in the top left corner.

By pressing  the user can move the cursor into the fields of the modifiable parameters. At the end the cursor will return into its initial position. After setting the desired value using the arrows, the user should press the  key again to store the setting. The cursor will automatically move to the next field.

The  key provides access to the main menu.

The  key provides access to the manufacturer's menu.

The  key provides access to the maintenance menu.

The  key provides access to the I/O menu.

The  key provides access to the clock menu.

The  key provides access to the setpoint menu.

The  key provides access to the alarms menu.

The  key is used to switch the unit on and off.

**NOTE**: The LEDs at the top left light up when the corresponding functions are activated.

## 3.4. Starting up the unit for the first time

When the microprocessor is connected to the power supply, the main menu will be displayed (main). It contains the following information:

```
main
+--------------------+
|00:00       00/00/00|
|Unit status:  OFF   |
|Watertemp IN  00.0°C|
|Watertemp OUT 00.0°C|
+--------------------+
```

- current time and date;
- unit status;
- evaporator inlet water temperature;
- evaporator outlet water temperature;

Pressing the Down key provides access to the following masks:

```
main_01
+--------------------+
|Compr.1 status: OFF |
|Cool capacity : 000%|
|CR1: OFF   CR2: OFF |
|CR3: OFF   CR4: OFF |
+--------------------+
```

In main_01 is displayed:
- the on/off status compressor 1
- the cool capacity of compressor 1
- the on/off status of the solenoid valves CR1, CR2, CR3 and CR4

```
main_02
+--------------------+
|Compr.2 status: OFF |
|Cool capacity : 000 |
|CR1: OFF   CR2: OFF |
|CR3: OFF   CR4: OFF |
+--------------------+
```

In main_02 is displayed:
- the on/off status compressor 2
- the cool capacity of compressor 2
- the on/off status of the solenoid valves CR1, CR2, CR3 and CR4

```
main_03
+--------------------+
|Circ.1 conden.status|
|T.supply:  000.0 °C |
|P.supply:   00.0 bar|
|Cond. fan: 000.0 %  |
+--------------------+
```

In main_03 is displayed the status of the first circuit:
- Supply temperature
- Supply pressure
- Condensing fan speed

```
main_04
+--------------------+
|Circ.2 conden.status|
|T.supply:  000.0 °C |
|P.supply:   00.0 bar|
|Cond. fan: 000.0 %  |
+--------------------+
```

In main_04 is displayed the status of the second circuit:
- Supply temperature
- Supply pressure
- Condensing fan speed

```
main_05
+--------------------+
|Unit  ON/OFF:   OFF |
|Remote consent: YES |
|Pump 1: OFF         |
|Pump 2: OFF         |
+--------------------+
```

In main_05 is displayed:
- Unit on/off:
  Unit ON: if is pressed ON by keyboard and if is enable the remote consent
- Remote consent
- Pumps status

## 3.5. General description of menus

General description of the menus featured in the application; all the masks are shown and described in the Chapter 5 Menu tree structure

**Main menu**

The main menu is displayed when the unit is started up and consists of the masks described in the section 3.4 Starting up the unit for the first time

**Maintenance menu**

The maintenance menu can be accessed by pressing key  . It shows the compressor and pump hour meter as well as the alarm history. It is also possible to set the device hour meter alarm and thresholds,

clear the hour meter, set the current date and time and enable the buzzer. Access is protected by a maintenance password.

### I/O Menu

The I/O menu can be accessed by pressing key  and shows the system's inputs and outputs. Access is protected by means of a maintenance password.

### Clock menu

The clock menu can be accessed by pressing key  and contains the time and date display.

### Setpoint Menu

The Setpoint menu can be accessed by pressing key  and contains the setpoint display. If the user password is entered it will be possible to change the main setpoint, set the remote setpoint variation limits and configure the programmed time periods .

### Manufacturer menu

The Manufacturer menu can be accessed by pressing key  and contains the configuration of manufacturer parameters. It is protected by a manufacturer password.

### Alarm menu

The Alarm menu can be accessed by pressing key  and gives information about the alarms that have been triggered. The red LED, provided in the key  , goes on when an alarm is triggered. If the key is pressed ones the type of alarm triggered is displayed. Pressing the key a second time will reset the alarms . If the cause of alarm persists, the signalling will be displayed again.

# 4. Alarm management

## *4.1. Alarm table*

| Mask name | Code | Description | Problem solution |
|---|---|---|---|
| m_al_probe_01 | AL01 | Probe alarm B1 | Check probe electric wiring or replace probe |
| m_al_probe_02 | AL02 | Probe alarm B2 | Check probe electric wiring or replace probe |
| m_al_probe_03 | AL03 | Probe alarm B3 | Check probe electric wiring or replace probe |
| m_al_probe_04 | AL04 | Probe alarm B4 | Check probe electric wiring or replace probe |
| m_al_probe_05 | AL05 | Probe alarm B5 | Check probe electric wiring or replace probe |
| m_al_probe_06 | AL06 | Probe alarm B6 | Check probe electric wiring or replace probe |
| m_al_probe_07 | AL07 | Probe alarm B7 | Check probe electric wiring or replace probe |
| m_al_probe_08 | AL08 | Probe alarm B8 | Check probe electric wiring or replace probe |
| m_al_probe_09 | AL09 | Probe alarm B9 | Check probe electric wiring or replace probe |
| m_al_probe_10 | AL10 | Probe alarm B10 | Check probe electric wiring or replace probe |
| m_al_hp_ps_1 | AL11 | High pressure alarm circuit 1 | Check condenser fan operation  Clean condenser coil |
| m_al_lp_ps_1 | AL12 | Low pressure alarm circuit 1 | Check evaporator fan operation<br>Check refrigerant level |
| m_al_int69_1 | AL13 | AllarmeINT69 compressore 1 | Check compressor 1 operation |
| m_al_hp_probe_1 | AL14 | High pressure alarm from the probe circuit 1 | Check condenser fan operation Clean condenser coil |
| m_al_t_cond_1 | AL16 | Condenser  fan thermal switch alarm circuit 1 | Check condenser fan operation |
| m_al_man_comp_1 | AL17 | Exceeding compressor 1 operation hour threshold | Check compressor 1 operation |
| m_al_man_pump_1 | AL18 | Exceeding pump 1 operation hour threshold | Check pump 1 operation |
| m_al_ov_pump_1 | AL20 | Pump 1  thermal switch alarm | Check pump 1 operation |
| m_al_antigelo | AL21 | Antifreeze alarm | Check pump operation |
| m_al_flow | AL22 | Flow  switch alarm | Check pump operation |
| m_al_hp_ps_2 | AL23 | High pressure alarm circuit 2 | Check condenser fan operation  Clean condenser coil |
| m_al_lp_ps_2 | AL24 | Low pressure alarm circuit 2 | Check evaporator fan operation<br>Check refrigerant level |
| m_al_int69_2 | AL25 | AllarmeINT69 compressore 2 | Check compressor 2 operation |
| m_al_hp_probe_2 | AL26 | High pressure alarm from the probe circuit 2 | Check condenser fan operation Clean condenser coil |
| m_al_t_cond_2 | AL28 | Condenser  fan thermal switch alarm circuit 2 | Check condenser fan operation |
| m_al_man_comp_2 | AL29 | Exceeding compressor 2 operation hour threshold | Check compressor 2 operation |
| m_al_man_pump_2 | AL30 | Exceeding pump 2 operation hour threshold | Check pump 2 operation |
| m_al_ov_pump_2 | AL31 | Pump 2  thermal switch alarm | Check pump 2 operation |
| m_al_pump | AL33 | All pumps  thermal switch alarm | Check pumps operation |

## *4.2. Alarm history*

Alarms detected by the microprocessor are cumulated according to operation priority and stored in an alarm history file. The maintenance menu shows the alarm history. The progressive number, time, date and code of the last ten alarms are stored according to FIFO logic (first in – first out).

```
al_story_01
+--------------------+
|Alarm history    (1)|
|00:00   00/00/00    |
|code: AL00          |
|                    |
+--------------------+
```

# 5. Menu tree structure

### 5.1.1. Main menu

The main information on the chiller operation is displayed here.

```
main
+--------------------+
|00:00       00/00/00|
|Unit status:  OFF   |
|Watertemp IN  00.0°C|
|Watertemp OUT 00.0°C|
+--------------------+

main_01
+--------------------+
|Compr.1 status: OFF |
|Cool capacity : 000%|
|CR1: OFF   CR2: OFF |
|CR3: OFF   CR4: OFF |
+--------------------+

main_02
+--------------------+
|Compr.2 status: OFF |
|Cool capacity : 000 |
|CR1: OFF   CR2: OFF |
|CR3: OFF   CR4: OFF |
+--------------------+

main_03
+--------------------+
|Circ.1 conden.status|
|T.supply:  000.0 °C |
|P.supply:   00.0 bar|
|Cond. fan: 000.0 %  |
+--------------------+

main_04
+--------------------+
|Circ.2 conden.status|
|T.supply:  000.0 °C |
|P.supply:   00.0 bar|
|Cond. fan: 000.0 %  |
+--------------------+

main_05
+--------------------+
|Unit  ON/OFF:   OFF |
|Remote consent: YES |
|Pump 1: OFF         |
|Pump 2: OFF         |
+--------------------+
```

## 5.1.2. Maintenance menu

```
pw_manutentore
+--------------------+
|  MAINTENANCE MENU  |
|--------------------|
|Insert maintenance  |
|password:      0000 |
+--------------------+
```

The maintenance password is required for viewing the following masks. The password is only available on request

```
m_manutentore
+--------------------+
|  MAINTENANCE MENU  |
|--------------------|
|Press DOWN button   |
|to continue         |
+--------------------+
```

```
ore_comp_1_01
+--------------------+
|Enable alarm        |
|run out limits of   |
|working hours of    |
|compressor?  No     |
+--------------------+
```

From this mask it is possible to enable the alarm function when compressor operation hour threshold has been exceeded.

**Default:**
Enabled = Yes

```
ore_comp_1_02
+--------------------+
|Compr. run time hrs.|
|Hours    :00000 h   |
|Threshold:00000 h   |
|Reset    :No        |
+--------------------+
```

From this mask it is possible to view the operation hours of the compressor, modify the device maintenance threshold value and reset the hour meter following maintenance operations.

**Default:**
Threshold = 1000 h

```
ore_comp_2_01
+--------------------+
|Compr.2 run time hrs|
|Hours    : 00000 h  |
|Threshold: 00000 h  |
|Reset    : No       |
+--------------------+
```

```
ore_pompa_1_01
+--------------------+
|Enable alarm        |
|run out limits of   |
|working hours of    |
|pump?  No           |
+--------------------+
```

From this mask it is possible to enable the alarm function when pump operation hour threshold has been exceeded.

**Default:**
Enabled = Yes

```
ore_pompa_1_02
+--------------------+
|Pump run time hours |
|Hours    : 00000 h  |
|Threshold: 00000 h  |
|Reset    : No       |
+--------------------+
```

From this mask it is possible to view the pump operation hours, to modify the maintenance alarm threshold of the device and to reset the hour meter following maintenance operations.

**Default:**
Threshold = 1000 h

```
ore_pompa_2_01
+--------------------+
|Pump 2 run time hrs |
|Hours    : 00000 h  |
|Threshold: 00000 h  |
|Reset    : No       |
+--------------------+
```

```
pump_conf_01
+--------------------+
|Pump rotation type: |
|           MANUAL   |
|Rotat.time:  000 hrs|
|Select pump:  PUMP2 |
+--------------------+
```

```
set_clock
+--------------------+
|Insert date & hour: |
|  00:00   00/00/00  |
|Insert day:         |
|                    |
+--------------------+
```

From this mask it is possible to set date, time and day of the week

```
buzzer_01
+--------------------+
|Enable buzzer:      |
|                    |
|   disabled         |
|                    |
+--------------------+
```

From this mask it is possible to enable the alarm function when the pump operation hour threshold has been exceeded.

**Default:**
Enabled = Yes

```
m_en_al_story
+--------------------+
|Press PROG. button  |
|in order to show    |
|alarm history.      |
|                    |
+--------------------+
```

From this mask it is possible to enable the alarm history displaying function

```
new_pw_manut
+--------------------+
|New password        |
|                    |
|              0000  |
|                    |
+--------------------+
```

From this mask the maintenance password can be modified

## 5.1.3. I/O Menu

This set of masks provides a complete display of the statuses of the analog and digital inputs and outputs connected to the microprocessor. I/O menu access is protected by a maintenance password. The password is only available on request.

```
pw_inout
+--------------------+
|    IN/OUT MENU     |
|--------------------|
|Insert maintenance  |
|password:      0000 |
+--------------------+
```

```
m_inout_01
+--------------------+
|Digital input    (1)|
|1: C  2: C   3: C   |
|4: C  5: C   6: C   |
|7: C  8: C   9: C   |
+--------------------+
```

```
m_inout_02
+--------------------+
|Digital input    (2)|
|10: C  11: C  12: C |
|13: C  14: C        |
|                    |
+--------------------+
```

```
m_inout_03
+--------------------+
|Analog input     (1)|
|B1:  0000           |
|B2:  0000 B3:  0000|
|B4: 000.0 B5:  000.0|
+--------------------+
```

```
m_inout_04
+--------------------+
|Analog input     (2)|
|B6:  00.0 B7:  00.0 |
|                    |
|                    |
+--------------------+
```

```
m_inout_05
+--------------------+
|Digital Output   (1)|
|1: O   2: O   3: O  |
|4: O   5: O   6: O  |
|7: O   8: O   9: O  |
+--------------------+
```

```
m_inout_06
+--------------------+
|Digital Output   (2)|
|10: O  11: O  12: O |
|13: O  14: O  15: O |
|16: O  17: O  18: O |
+--------------------+
```

```
m_inout_07
+--------------------+
|Analog Output    (1)|
|Y1: 0000            |
|Y2: 0000            |
|Y3: 0000            |
+--------------------+
```

## 5.1.4. Clock menu

```
clock
+--------------------+
|     CLOCK MENU     |
|--------------------|
|  00:00   00/00/00  |
|                    |
+--------------------+
```

## 5.1.5. Setpoint Menu

```
m_set
+--------------------+
|Actual Setpoint:    |
|            00.0 °C |
|                    |
|                    |
+--------------------+
```

By pressing the SET key it is possible to access the following masks to view and set the operation setpoint.

```
pw_utente_01
+--------------------+
|     SET MENU       |
|--------------------|
|Insert user         |
|password:      0000 |
+--------------------+
```

To modify the setpoint and the programmed time periods the user password must be entered.

**User password: 100**

```
m_set_01
+--------------------+
|Adjustment of       |
|principal setpoint: |
|                    |
|Set  :  00.0 °C     |
+--------------------+
```

From this mask it is possible to enter the main regulation setpoint

**Default:**
Set = 12 °C

```
m_set_02
+--------------------+
|Setpoint variation  |
|from remote:        |
|Min.( 4 mA):  0.0 °C|
|Max.(20 mA):  0.0 °C|
+--------------------+
```

From this mask it is possible to set the minimum and maximum remote setpoint variation limits.

**Default:**
Min = 0 °C
Max = 5 °C

```
m_fasce
+--------------------+
|Enable Management   |
|of setpoint on      |
|time band?          |
|                 No |
+--------------------+
```

From this mask it is possible to enable the management of setpoint for programmed time periods

**Default:**
Enabled = NO

```
m_fasce_set_01
+--------------------+
|Adjust setpoint     |
|within time band    |
|                    |
|Set.:    00.0 °C    |
+--------------------+
```

From this mask it is possible to enter the setpoint within the programmed time periods

**Default:**
Set = 12 °C

```
m_fasce_set_02
+--------------------+
|Adjust setpoint     |
|outside time band   |
|                    |
|Set.:    00.0 °C    |
+--------------------+
```

From this mask it is possible to enter the setpoint outside the programmed time periods.

**Default:**
Set = 12 °C

```
m_fascia_01
+--------------------+
|Monday              |
|Start:  00:00       |
|End  :  00:00       |
|                    |
+--------------------+
```

In the next seven masks it is possible to set the start and end of the programmed time period of the indicated day.

**Default:**
Start = 7:00
End = 22.00

```
m_fascia_02
+--------------------+
|Tuesday             |
|Start:  00:00       |
|End  :  00:00       |
|                    |
+--------------------+
```

```
m_fascia_03
+--------------------+
|Wednesday           |
|Start:  00:00       |
|End  :  00:00       |
|                    |
+--------------------+
```

```
m_fascia_04
+--------------------+
|Thursday            |
|Start:  00:00       |
|End  :  00:00       |
|                    |
+--------------------+
```

```
m_fascia_05
+--------------------+
|Friday              |
|Start:  00:00       |
|End  :  00:00       |
|                    |
+--------------------+
```

```
m_fascia_06
+--------------------+
|Saturday            |
|Start:  00:00       |
|End  :  00:00       |
|                    |
+--------------------+
```

```
m_fascia_07
+--------------------+
|Sunday              |
|Start:  00:00       |
|End  :  00:00       |
|                    |
+--------------------+
```

```
new_pw_utente
+--------------------+
|New User password:  |
|                    |
|               0000 |
|                    |
+--------------------+
```

From this mask it is possible to modify the user password

## 5.1.6. Manufacturer menu

Manufacturer menu access is protected by a password . The password is only available on request.

```
pw_costruttore
+--------------------+
|  MANUFACTURER MENU |
|--------------------|
|Insert manufacturer |
|password       0000 |
+--------------------+
```

```
m_raff_4step_01
+--------------------+
|4 steps capacity    |
|control             |
|                    |
|Differential  00.0°C|
+--------------------+
```

From this mask it is possible to enter the setpoint valid within the programmed time periods.

**Default:**
Differential = 4 °C

```
config_02
+--------------------+
|Config. Unit        |
|N. compressors    :0|
|N. partializations:0|
|N. pumps          :0|
+--------------------+
```

```
forzatura_pompe
+--------------------+
|Pump forced in off: |
|                 No |
|                    |
|                    |
+--------------------+
```

From this mask it is possible to activate the override function for turning off the pump. If NO is set, the pump will always run while the unit is ON

**Default:**
Enabled = NO

```
probe_01
+--------------------+
|Enable Management   |
|of probe failure    |
|alarms? No          |
|                    |
+--------------------+
```

From this mask it is possible to enable alarm signalling in case probe failure occurs

**Default:**
Enabled = Yes

```
probe_02
+--------------------+
|Enable alarms from  |
|probe failure    (1)|
|B1: No   B2: No     |
|B3: No   B4: No     |
+--------------------+
```

From this mask it is possible to enable alarm signalling for each probe failure.

**Default:**
B1: No B2: No
B3: No B4: No

```
probe_03
+--------------------+
|Enable alarms from  |
|probe failure    (2)|
|B5: No   B6: No     |
|B7: No   B8: No     |
+--------------------+
```

From this mask it is possible to enable alarm signalling for each probe failure

**Default:**
B5: No B6: No
B7: No B8: No

```
probe_04
+--------------------+
|Enable alarms from  |
|probe failure    (3)|
|B9: No   B10: No    |
|                    |
+--------------------+
```

```
probe_05
+--------------------+
|Alarm delay         |
|probe failure:      |
|             0000 s |
|                    |
+--------------------+
```

From this mask it is possible to set the delay time for probe failure signalling

**Default:**
Delay = 10 s

```
probe_06
+--------------------+
|Offset probe     (1)|
|B3:  00.0 bar       |
|B4:  00.0 bar       |
|                    |
+--------------------+
```

From this mask it is possible to set a probe offset value

**Default:**
B3: 00.0 bar
B4: 00.0 bar

```
probe_07
+--------------------+
|Offset probe     (2)|
|B6:  00.0 bar       |
|B7:  00.0 bar       |
|                    |
+--------------------+
```

From this mask it is possible to set a probe offset value

**Default:**
B6: 00.0 bar
B7: 00.0 bar

```
probe_08
+--------------------+
|Offset probe     (3)|
|B6:  00.0 °C        |
|B7:  00.0 °C        |
|                    |
+--------------------+
```

```
probe_09
+--------------------+
|Offset probe     (4)|
|B8:   00.0 °C       |
|B9:   00.0 °C       |
|B10:  00.0 °C       |
+--------------------+
```

```
probe_10
+--------------------+
|Range Inlet B1      |
|Lower limit : 00.0°C|
|Higher limit: 00.0°C|
|                    |
+--------------------+
```

```
probe_11
+--------------------+
|Range probe B2      |
|Lower limit  00.0bar|
|Higher limit 00.0bar|
|                    |
+--------------------+
```

```
probe_12
+--------------------+
|Range probe B3      |
|Lower limit  00.0bar|
|Higher limit 00.0bar|
|                    |
+--------------------+
```

From this mask it is possible to set operation limits for B3 high pressure probe

**Default:**
Lower: 00.0 bar
Upper: 30.0 bar

```
ain_by_tast_01
+--------------------+
|Analogue input      |
|from keyboard?      |
|              No    |
|                    |
+--------------------+
```

From this mask it is possible to enable keyboard entering of analog inputs for debug operations

**Default:**
Enabled = NO

```
ain_by_tast_02
+--------------------+
|Enable analog. input|
|from keyboard (1)   |
|B1: No   B2: No     |
|B3: No   B4: No     |
+--------------------+
```

From this mask it is possible to enable keyboard entering of individual analog inputs.

**Default:**
B1: No B2: No
B3: No B4: No

```
ain_by_tast_03
+--------------------+
|Enable analog. input|
|from keyboard (2)   |
|B5: No   B6: No     |
|B7: No   B8: No     |
+--------------------+
```

From this mask it is possible to enable keyboard entering of individual analog inputs.

**Default:**
B5: No B6: No
B7: No B8: No

```
ain_by_tast_04
+--------------------+
|Enable analog. input|
|from keyboard (4)   |
|B8: No     B9:No    |
|B10:No              |
+--------------------+
```

```
din_01
+--------------------+
|Enable digital input|
|filter?             |
|                No  |
|                    |
+--------------------+
```

From this mask it is possible to enable the digital input filtering that enters a reading delay of the same.

**Default:**
Enabled = NO

```
din_02
+--------------------+
|Digital input filter|
|                    |
|                00 s|
|                    |
+--------------------+
```

From this mask it is possible to enable the digital input filter function, which introduces a delay in the reading of the inputs themselves.

**Default:**
Time = 5 s

```
din_by_tast_01
+--------------------+
|Digital Input from  |
|keyboard?           |
|                No  |
|                    |
+--------------------+
```

From this mask it is possible to enable keyboard entering of digital inputs for debug operations.

**Default:**
Enabled = NO

```
dout_by_tast_01
+--------------------+
|Digital output      |
|from keyboard?      |
|               No   |
|                    |
+--------------------+
```

From this mask it is possible to enable keyboard entering of digital outputs for debug operations.

**Default:**
Enabled = NO

```
aout_by_tast_01
+--------------------+
|Analogue output     |
|from keyboard?      |
|              No    |
|                    |
+--------------------+
```

From this mask it is possible to enable keyboard entering of analog outputs for debug operations.

**Default:**
Enabled = NO

```
aout_by_tast_02
+--------------------+
|Enable analogue out-|
|put f. keyboard (1) |
|Y1: No              |
|                    |
+--------------------+
```

From this mask it is possible to enable keyboard entering of individual digital inputs for debug operations.

**Default:**
Y1: No

```
m_hp_ps_1_01
+--------------------+
|Enable high pressure|
|alarm from          |
|pressostat?  No     |
|                    |
+--------------------+
```

From this mask it is possible to enable high pressure switch alarm.

**Default:**
Enabled = Yes

```
m_hp_ps_1_02
+--------------------+
|Alarm delay high    |
|pressure from the   |
|pressostat:  0000 s |
|                    |
+--------------------+
```

From this mask it is possible to set the high pressure switch alarm delay

**Default:**
Delay = 0 s

```
m_hp_ps_1_03
+--------------------+
|High pressure alarm |
|Pressostat          |
|                    |
|Reset aut./man.:A   |
+--------------------+
```

From this mask it is possible to set the restoring of high pressure switch alarm.

**Default:**
Restore = M (manual)

```
m_lp_ps_1_01
+--------------------+
|Enable low pressure |
|alarm from          |
|pressostat?  No     |
|                    |
+--------------------+
```

From this mask it is possible to enable the low pressure switch alarm

**Default:**
Enabled = Yes

```
m_lp_ps_1_02
+--------------------+
|Low pressure delay  |
|pressostat          |
|STARTUP: 0000 s     |
|RUNNING: 0000 s     |
+--------------------+
```

From this mask it is possible to set the delay time of high pressure switch alarm at start-up and running condition.

**Default:**
Startup = 60 s
Running = 0 s

```
m_lp_ps_1_03
+--------------------+
|Low pressure alarm  |
|Pressostat          |
|Reset aut./man.:A   |
|                    |
+--------------------+
```

From this mask it is possible to set the restoring of low pressure switch alarm,

**Default:**
Restore = M (manual)

```
m_hp_probe_1_01
+--------------------+
|Enable high pressure|
|alarm from probe?   |
|                 No |
|                    |
+--------------------+
```

From this mask it is possible to enable the probe high pressure

**Default:**
Enabled = NO

```
m_hp_probe_1_02
+--------------------+
|High pressure alarm |
|probe               |
|Set  : 00.0 bar     |
|Diff.: 00.0 bar     |
+--------------------+
```

From this mask it is possible to enter the setpoint and differential of probe high pressure alarm enableing.

**Default:**
Set = 21 bar
Diff = 2 bar

```
m_hp_probe_1_03
+--------------------+
|High pressure alarm |
|probe               |
|Delay  : 000 s      |
|                    |
+--------------------+
```

From this mask it is possible to set the delay time of probe high pressure alarm.

**Default:**
Delay = 0 s

```
m_hp_probe_1_04
+--------------------+
|Al. alta pr. sonda  |
|                    |
|Rip. aut./man.: A   |
|                    |
+--------------------+
```

From this mask it is possible to set the restoring of probe high pressure alarm.

**Default:**
Restore = M (manual)

```
m_lp_probe_1_01
+--------------------+
|Enable low pressure |
|alarm from probe?   |
|                 No |
|                    |
+--------------------+
```

From this mask it is possible to enable the probe low pressure alarm.

**Default:**
Enabled = NO

```
m_lp_probe_1_02
+--------------------+
|Low pressure alarm  |
|probe               |
|Set  : 00.0 bar     |
|Diff.: 00.0 bar     |
+--------------------+
```

From this mask it is possible to enter the setpoint and differential of probe low pressure alarm enableing

**Default:**
Set = 1 bar
Diff = 2 bar

```
m_lp_probe_1_03
+--------------------+
|Delay low pressure  |
|alarm probe         |
|STARTUP: 000 s      |
|RUNNING: 000 s      |
+--------------------+
```

From this mask it is possible to set the delay time of low pressure switch alarm at startup and running condition

**Default:**
Startup = 60 s
Running = 0 s

```
m_lp_probe_1_04
+--------------------+
|Low pressure alarm  |
|probe               |
|Reset aut./man.:A   |
|                    |
+--------------------+
```

From this mask it is possible to set the restoring of the probe low pressure switch alarm.

**Default:**
Restore = M (manual)

```
m_hp_prevent_01
+--------------------+
|Enable prevention   |
|high pressure alarm?|
|                    |
|                 No |
+--------------------+
```

From this mask it is possible to enable the high pressure alarm prevention function.

**Default:**
Enabled = NO

```
m_hp_prevent_02
+--------------------+
|Prevention high     |
|pressure alarm      |
|Set  : 00.0 bar     |
|Diff.: 00.0 bar     |
+--------------------+
```

From this mask it is possible to enter the setpoint and differential of high pressure alarm prevention enableing .

**Default:**
Set = 26 bar
Diff = 2 bar

```
m_hp_prevent_03
+--------------------+
|Prevention high     |
|pressure alarm      |
|                    |
|Delay:       000 s  |
+--------------------+
```

From this mask it is possible to set the delay time of high pressure alarm prevention

**Default:**
Delay = 0 s

```
m_iniez_liq_01
+--------------------+
|Liquid injection    |
|management enabled: |
|                    |
|                 No |
+--------------------+
```

From this mask it is possible to enable the management of liquid injection.

**Default:**
Enabled = No

```
m_iniez_liq_02
+--------------------+
|Liquid injection    |
|config.:            |
|Set.     :   000.0°C|
|Diff.    :   000.0°C|
+--------------------+
```

From this mask it is possible to configure the management of liquid injection.

**Default:**
Set = 105°C
Diff = 15 °C

```
m_iniez_liq_03
+--------------------+
|Liquid injection    |
|solenoid valve logic|
|                    |
|               N.O. |
+--------------------+
```

From this mask it is possible to configure the logic (N.O or N.C) of the solenoid valve for the liquid injection.

**Default:**
Logic = N.O.

```
m_prev_alta_T01
+--------------------+
|Enable prevention   |
|high outlet temp.   |
|                    |
|                No  |
+--------------------+
```

From this mask it is possible to enable the management of high temperature prevention of refrigerant outlet by inhibiting the compressor reduced capacity to 25%

**Default:**
Enabled = Yes

```
m_prev_alta_T02
+--------------------+
|High outlet temp.   |
|prevent             |
|Set.     :   000.0°C|
|Diff.    :   000.0°C|
+--------------------+
```

From this mask it is possible to enter the setpoint and differential of high temperature prevention enableing

**Default:**
Set = 110 °C
Diff = 15 °C

```
m_termico_1_01
+--------------------+
|Enable alarm        |
|INT69 compr.? No    |
|                    |
|                    |
+--------------------+
```

From this mask it is possible to enable INT69 global alarm of compressor

**Default:**
Enabled = Yes

```
m_termico_1_02
+--------------------+
|Alarm delay         |
|INT69 compr.:       |
|Start:       0000 s |
|Running:     0000 s |
+--------------------+
```

From this mask it is possible to set the delay time of INT69 global alarm of compressor at start up and running condition.

**Default:**
Start = 20 s
Running = 0 s

m_termico_1_03

```
+--------------------+
|Alarm INT69         |
|compressor          |
|Reset aut./man.:A   |
|                    |
+--------------------+
```

From this mask it is possible to set the restoring of INT69 global alarm of compressor.

**Default:**
Restore = M (manual)

m_term_cond_1

```
+--------------------+
|Enable therm. switch|
|alarm cond. fan?    |
|                No  |
|                    |
+--------------------+
```

From this mask it is possible to enable the fan condenser thermal switch.

**Default:**
Enabled = Yes

m_term_cond_2

```
+--------------------+
|Thermal switch alarm|
|condenser fan       |
|Delay:   000 s      |
|                    |
+--------------------+
```

From this mask it is possible to set the delay time of fan condenser thermal switch alarm

**Default:**
Delay = 0 s

m_term_cond_3

```
+--------------------+
|Thermal switch alarm|
|condenser fan       |
|Reset aut./man.:A   |
|                    |
+--------------------+
```

From this mask it is possible to set the restoring of fan condenser thermal switch alarm

**Default:**
Restore = M (manual)

m_term_p_1_01

```
+--------------------+
|Enable therm. switch|
|alarm pump?    No   |
|                    |
|                    |
+--------------------+
```

From this mask it is possible to enable the pump thermal switch alarm

**Default:**
Enabled = SI

m_term_p_1_02

```
+--------------------+
|Thermal switch alarm|
|pump                |
|Delay:   000 s      |
|                    |
+--------------------+
```

From this mask it is possible to set the delay time of pump thermal switch alarm

**Default:**
Delay = 0 s

m_term_p_1_03

```
+--------------------+
|Thermal switch alarm|
|pump                |
|Reset aut./man.:A   |
|                    |
+--------------------+
```

From this mask it is possible to set the restoring of pump thermal switch alarm.

**Default:**
Restore = M (manual)

m_antigelo_1

```
+--------------------+
|Enable antifreeze   |
|alarm?    No        |
|                    |
|                    |
+--------------------+
```

From this mask it is possible to enable antifreeze alarm

**Default:**
Enabled = SI

m_antigelo_2

```
+--------------------+
|Antifreeze alarm    |
|                    |
|Set  :  00.0        |
|Diff.:  00.0        |
+--------------------+
```

From this mask it is possible to enter the setpoint and differential of antifreeze alarm activation

**Default:**
Set = 4 °C
Diff = 2 °C

m_antigelo_3

```
+--------------------+
|Antifreeze alarm    |
|                    |
|Delay:   000 s      |
|                    |
+--------------------+
```

From this mask it is possible to set the delay time of antifreeze alarm thermal switch.

**Default:**
Delay = 0 s

m_antigelo_4

```
+--------------------+
|Antifreeze alarm    |
|                    |
|Reset aut./man.:A   |
|                    |
+--------------------+
```

From this mask it is possible to set the restoring of antifreeze alarm thermal switch

**Default:**
Restore = M (manual)

m_flussostato_1

```
+--------------------+
|Enable flow switch  |
|alarm?       No     |
|                    |
|                    |
+--------------------+
```

From this mask it is possible to enable the flow switch alarm

**Default:**
Enabled = Yes

m_flussostato_2

```
+--------------------+
|Delay flow switch   |
|alarm               |
|STARTUP: 000 s      |
|RUNNING: 000 s      |
+--------------------+
```

From this mask it is possible to set the delay time of flow switch alarm at start up and running condition

**Default:**
Startup = 20 s
Running = 0 s

m_flussostato_3

```
+--------------------+
|Flow switch alarm   |
|                    |
|Reset aut./man.:A   |
|                    |
+--------------------+
```

From this mask it is possible to set the restoring of flow switch thermal switch alarm.

**Default:**
Restore = M (manual)

m_tempi_comp_01

```
+--------------------+
|Minimum compressors |
|power-off time 000 s|
|Minimum compressors |
|power-on time  000 s|
+--------------------+
```

From this mask it is possible to set operation times of compressors. The minimum OFF and ON time

**Default:**
T min Off = 10 s
T min On = 10 s

m_tempi_comp_02

```
+--------------------+
|Min time betw. same |
|comp. starts   000 s|
|                    |
|                    |
+--------------------+
```

From this mask it is possible to set the compressor times, the minimum time lapse between two starts of the compressor

**Default:**
Min.T between 2 ON = 360 s

m_tempi_comp_03

```
+--------------------+
|Min. running time   |
|with 25%            |
|              000 s |
|                    |
+--------------------+
```

From this mask it is possible to manage the power limiting function at compressor starting and to set the minimum time of stay at compressor reduced capacity to 25%

**Default:**
Min.T between 2 ON = 360 s

m_pumpdown_01

```
+--------------------+
|Enable pump-down?   |
|                 No |
|                    |
|                    |
+--------------------+
```

From this mask it is possible to enable pump-down function

**Default:**
Enabled = NO

```
m_pumpdown_02
+--------------------+
|Pump-down Management|
|Set  : 00.0 bar     |
|Diff.: 00.0 bar     |
|Time max:  000 s    |
+--------------------+
```

From this mask it is possible to set the operation parameters if pump-down function is enabled, i.e. setpoint, differential and maximum time

**Default:**
Set = 1.5 bar
Diff = 0.5 bar
Max time= 20 s

```
m_pumpdown_03
+--------------------+
|Enable alarm for    |
|overcoming time     |
|max pump-down? No   |
|                    |
+--------------------+
```

From this mask it is possible to enable the maximum pump-down exceeding alarm

**Default:**
Enabled = NO

```
m_condenser_01
+--------------------+
|Enable anticipation |
|condenser before    |
|compressor start?   |
|                No  |
+--------------------+
```

From this mask it is possible to enable the condensation fan to start earlier than the compressor.

**Default:**
Enabled = NO

```
m_condenser_02
+--------------------+
|Anticipation condens|
|fans before         |
|compressor ON: 000 s|
|                    |
+--------------------+
```

From this mask it is possible to set the advance duration, it the condensation fan startup advance is enabled.

**Default:**
Advance duration = 0 s

```
m_condenser_03
+--------------------+
|Condensing control  |
|                    |
|Fan speed antici-   |
|pation:      000.0 %|
+--------------------+
```

From this mask it is possible to set the fan speed during the advance operation, if the condensation fan startup advance is enabled.

**Default:**
Speed = 80 %

```
m_condenser_04
+--------------------+
|Condensing control  |
|Fan speed when air  |
|flow probe failure: |
|            000.0 % |
+--------------------+
```

From this mask it is possible to set fan speed in case of pressure probe failure.

**Default:**
Speed = 100 %

```
m_condenser_05
+--------------------+
|Condensing control  |
|                    |
|Set  : 00.0 bar     |
|Diff.: 00.0 bar     |
+--------------------+
```

From this mask it is possible to set the condensatioan control parameters: setpoint and differential.

**Default:**
Set = 11 bar
Diff. = 10 bar

```
m_condenser_06
+--------------------+
|Condensing control  |
|Out 0 - 10 V        |
|Lower lim.  00.0 V  |
|Higher lim. 00.0 V  |
+--------------------+
```

From this mask it is possible to set condensation control parameters: lower and upper regulation limits.

**Default:**
Lower Lim. . = 0 V
Upper Lim.  = 10 V

```
m_delay_01
+--------------------+
|ON/OFF time delay   |
|pump:   000 s       |
|                    |
|                    |
+--------------------+
```

From this mask it is possible to set the duration of startup advance and the stop delay of pump.

**Default:**
Duration = 20 s

```
m_delay_02
+--------------------+
|Pump switch off     |
|delay on flow alarm:|
|               000 s|
|                    |
+--------------------+
```

From this mask it is possible to set the duration of pump switch off delay on flow alarm

**Default:**
Duration = 30 s

```
m_limiti_set
+--------------------+
|Set-point management|
|                    |
|Set max:  00.0 °C   |
|Set min:  00.0 °C   |
+--------------------+
```

From this mask it is possible to set the maximum and minimum values within which the regulation setpoint can be entered

**Default:**
Set max = 16 °C
Set min = 10 °C

```
on_off_rem
+--------------------+
|Enable remote       |
|on/off?             |
|             No     |
|                    |
+--------------------+
```

From this mask it is possible to enable the digital input remote control function on the electric panel terminal block.

**Default:**
Enabled = NO

```
supervisor_01
+--------------------+
|Protocol type:      |
|                    |
|    ---             |
|                    |
+--------------------+
```

From this mask it is possible to set the protocol communication when a serial board is present. The permitted protocols are: ---, Carel, Modbus, Lon, RS232 (for connection to analog modem) and GSM (for connection to GSM modem)

**Default:**
Protocol = ---

```
supervisor_02
+--------------------+
|Transmission speed: |
|  1200              |
|Serial address:     |
|  000               |
+--------------------+
```

From this mask it is possible to set transmission speed of the serial line.

**Default:**
Protocol= 9600
Serial address = 001

```
default
+--------------------+
|Reset Default       |
|parameters?  No     |
|                    |
|                    |
+--------------------+
```

From this mask it is possible to set the default parameters.

```
new_pw_costrut
+--------------------+
|New manufacturer    |
|password:           |
|               0000 |
|                    |
+--------------------+
```

From this mask it is possible to modify the manufacturer password.

## 5.1.7. Alarm menu

Each mask gives information about a specific alarm situation. The activation of the masks is accompanied by the sounding of the buzzer and tripping of the general alarm signalling relay. By pressing the key once the user can access the first active mask and then scroll all alarms using the or keys. Pressing the a second time will clear the alarm message. Each mask shows the code used in the alarm history to identify the particular event.

```
m_no_alarm
+--------------------+
|     ALARM MENU     |
|--------------------|
|      No alarm      |
|     is present!    |
+--------------------+
```

```
m_al_probe_01
+--------------------+
|AL01                |
| Alarm probe B1     |
|                    |
|                    |
+--------------------+
```

```
m_al_probe_02
+--------------------+
|AL02                |
| Alarm probe B2     |
|                    |
|                    |
+--------------------+
```

```
m_al_probe_03
+--------------------+
|AL03                |
| Alarm probe B3     |
|                    |
|                    |
+--------------------+
```

```
m_al_probe_04
+--------------------+
|AL04                |
| Alarm probe B4     |
|                    |
|                    |
+--------------------+
```

```
m_al_probe_05
+--------------------+
|AL05                |
| Alarm probe B5     |
|                    |
|                    |
+--------------------+
```

```
m_al_probe_06
+--------------------+
|AL06                |
| Alarm probe B6     |
|                    |
|                    |
+--------------------+
```

```
m_al_probe_07
+--------------------+
|AL07                |
| Alarm probe B7     |
|                    |
|                    |
+--------------------+
```

```
m_al_probe_08
+--------------------+
|AL08                |
| Alarm probe B8     |
|                    |
|                    |
+--------------------+
```

```
m_al_probe_09
+--------------------+
|AL09                |
| Alarm probe B9     |
|                    |
|                    |
+--------------------+
```

```
m_al_probe_10
+--------------------+
|AL10                |
| Alarm probe B10    |
|                    |
|                    |
+--------------------+
```

```
m_al_hp_ps_1
+--------------------+
|AL11                |
|High pressure alarm |
|                    |
|                    |
+--------------------+
```

```
m_al_lp_ps_1
+--------------------+
|AL12                |
| Low pressure alarm |
|                    |
|                    |
+--------------------+
```

```
m_al_int69_1
+--------------------+
|AL13                |
|     INT69 alarm    |
|                    |
|                    |
+--------------------+
```

```
m_al_hp_probe_1
+--------------------+
|AL14                |
|High pressure alarm |
|     from probe     |
|                    |
+--------------------+
```

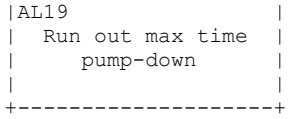
```
m_al_lp_probe_1
+--------------------+
|AL15                |
| Low pressure alarm |
|    from probe      |
|                    |
+--------------------+
```

```
m_al_t_cond_1
+--------------------+
|AL16                |
|Thermal switch alarm|
|   condenser fan    |
|                    |
+--------------------+
```

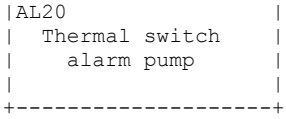
```
m_al_man_comp_1
+--------------------+
|AL17                |
|    Run out time    |
| working hrs compr. |
|                    |
+--------------------+
```

```
m_al_man_pump_1
+--------------------+
|AL18                |
|    Run out time    |
|  working hrs pump  |
|                    |
+--------------------+
```

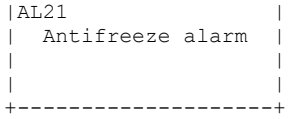
m_al_pumpdown_1



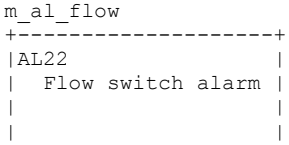

m_al_ov_pump_1



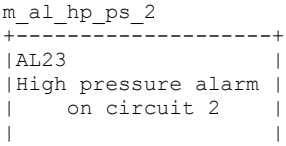

m_al_antigelo



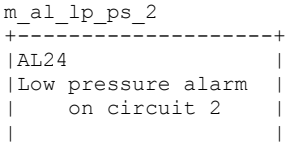

m_al_flow



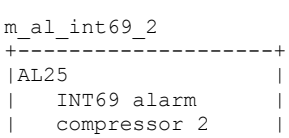

m_al_hp_ps_2



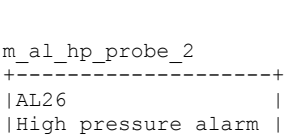

m_al_lp_ps_2



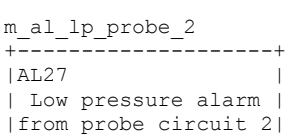

m_al_int69_2



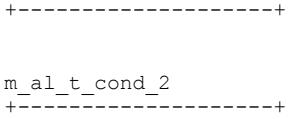

m_al_hp_probe_2



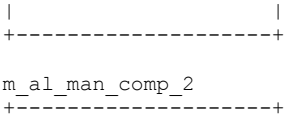

m_al_lp_probe_2



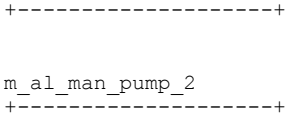

m_al_t_cond_2



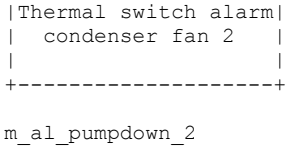

m_al_man_comp_2



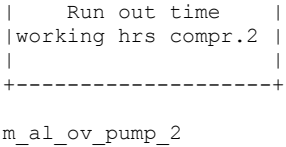

m_al_man_pump_2



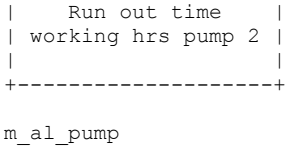

m_al_pumpdown_2




m_al_ov_pump_2




m_al_pump



# 6. Architecture of the control system

## *6.1. Description of inputs and outputs*

| Conn | Initials | Signal | Description |
|---|---|---|---|
| **Analog input** | | | |
| J2-1 | B1 (UNI) | 4..20 mA | Remote setpoint |
| J2-2 | B2 (UNI) | 4..20 mA | Condensing pressure 1 |
| J2-3 | B3 (UNI) | 4..20 mA | Condensing pressure 2 |
| J3-1 | B4 | PT1000 | Compressor supply gas temperature 1 |
| J3-3 | B5 | PT1000 | Compressor supply gas temperature 2 |
| J6-1 | B6 (UNI) | NTC | Evaporator inlet water temperature |
| J6-2 | B7 (UNI) | NTC | Evaporator outlet water temperature |
| J6-3 | B8 (UNI) | NTC | External air temperature |
| J20-3 | B9 | NTC | |
| J20-5 | B10 | NTC | |
| **Digital input** | | | |
| J5-1 | ID1 | 24 Vac/Vdc | Condenser 1 fan thermal switch |
| J5-2 | ID2 | 24 Vac/Vdc | Low pressure switch 1 |
| J5-3 | ID3 | 24 Vac/Vdc | High pressure switch 1 |
| J5-4 | ID4 | 24 Vac/Vdc | INT69 compressor 1 alarm |
| J5-5 | ID5 | 24 Vac/Vdc | Condenser 2 fan thermal switch |
| J5-6 | ID6 | 24 Vac/Vdc | Low pressure switch 2 |
| J5-7 | ID7 | 24 Vac/Vdc | High pressure switch 2 |
| J5-8 | ID8 | 24 Vac/Vdc | INT69 compressor 2 alarm |
| J7-1 | ID9 | 24 Vac/Vdc | Remote On-Off |
| J7-2 | ID10 | 24 Vac/Vdc | Remote setpoint - selector |
| J7-3 | ID11 | 24 Vac/Vdc | |
| J7-4 | ID12 | 24 Vac/Vdc | Flow switch |
| J8-2 | ID13 | 24 Vac/Vdc | Pump 1 thermal switch / external pump interlock |
| J8-4 | ID14 | 24 Vac/Vdc | Pump 2 thermal switch / external pump interlock |
| J19-2 | ID15 | 24 Vac/Vdc | |
| J19-4 | ID16 | 24 Vac/Vdc | |
| **Analog output** | | | |
| J4-3 | Y1 | 0..10 V | Condenser fan revolution regulator 1 |
| J4-4 | Y2 | 0..10 V | Condenser fan revolution regulator 1 (for 2 parallel regulators) |
| J4-5 | Y3 | 0..10 V | Condenser fan revolution regulator 2 |
| **Digital output** | | | |
| J12-2 | NO1 | relè NO | Compressor 1 On/Off |
| J12-3 | NO2 | relè NO | CR1 1 valve On/Off |
| J12-4 | NO3 | relè NO | CR2 1 valve On/Off |
| | | | |
| J13-2 | NO4 | relè NO | CR3 1 valve On/Off |
| J13-3 | NO5 | relè NO | CR4 1 valve On/Off |
| J13-4 | NO6 | relè NO | Pump 1 On/Off |
| | | | |
| J14-2 | NO7 | relè NO | Pump 2 On/Off |
| | | | |
| J15-1 | NO8 | relè NO | Unit On/Off |
| | | | |
| J16-2 | NO9 | relè NO | Liquid solenoid valve 1 |
| J16-3 | NO10 | relè NO | Liquid injection solenoid valve 1 |
| J16-4 | NO11 | relè NO | Liquid solenoid valve 2 |
| | | | |
| J17-1 | NO12 | relè NO | Liquid injection solenoid valve 2 |
| | | | |
| J18-1 | NO13 | relè NO | Failure alarm |
| | | | |
| J21-1 | NO14 | relè NO | Compressor 2 On/Off |
| | | | |
| J21-4 | NO15 | relè NO | CR1 2 valve On/Off |
| | | | |
| J22-2 | NO16 | relè NO | CR2 2 valve On/Off |
| J22-3 | NO17 | relè NO | CR3 2 valve On/Off |
| J22-4 | NO18 | relè NO | CR4 2 valve On/Off |

## 6.2. Optional boards

### 6.2.1. RS485 serial board for supervisory function

The serial connection to a local or remote supervision system requires the installation of an RS485 serial board, available on request (see Figure 0: RS485).

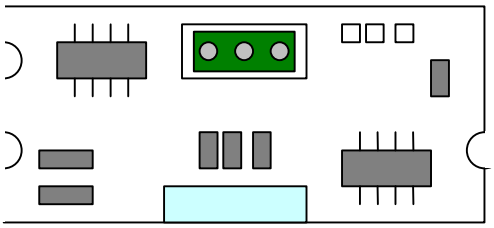


**Figure 0: RS485 serial board**

### Connection to the local supervisor computer

The connection to the local supervisor computer is made via a RS485 serial line and communication takes place via the proprietary Carel protocol. A RS485/RS232 converter is needed for connecting to the serial port of the PC.

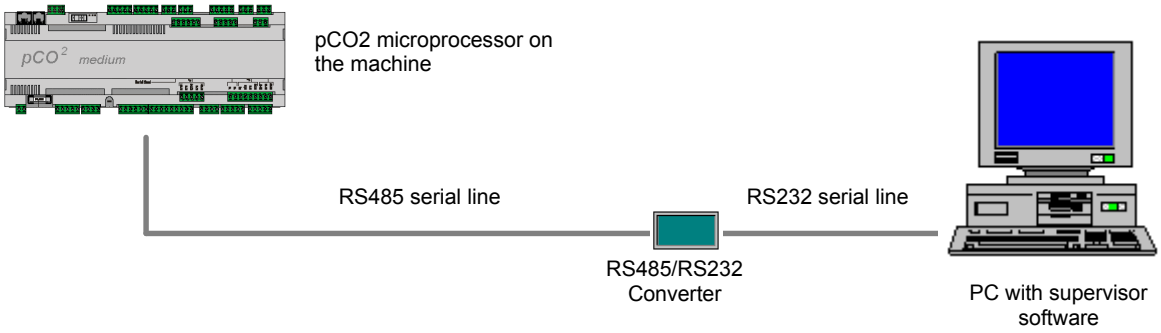



**Figure 1: Connection between microprocessor and local supervisor computer**

## 6.3. Technical data

### General specifications

| | |
|---|---|
| **operating conditions** | -10T60 °C 90% R H not condensing |
| **protection rating** | IP20, IP40 on front panel only |
| **heat and fire resistance class** | class D (UL94 - V0) |
| **Immunity against over voltages** | Class 1 |
| **number of manoeuvring cycles of automatic operations (e.g.: relay)** | 100 000 |
| **Class and structure of software** | Class A |

### Electrical specifications

| | |
|---|---|
| **power supply (controller with connected terminal)** | 22 to 40 Vdc and 24 Vac ±15% 50/60 Hz. Maximum power consumption: 20 W |
| **terminal block** | with extractable male/female connectors<br>maximum voltage: 250 Vac; cable size (2mm): min 0.5 to max 2.5 |
| **CPU** | H8S3002 16 bits 14 MHz |
| **program memory (on FLASH MEMORY)** | 16 bit organisation: 1 MByte (expandable to 6 MByte) |
| **data memory (static RAM)** | 16 bit organisation: 256 kByte (expandable to 1 MByte) |
| **Parameter data memory** | 16 bits organisation 2 kByte<br>(upper limit: 400,000 recordings per memory location) |
| **useful pCO2 cycle with applications of medium complexity** | 0.5 s |

### Analog inputs

| | |
|---|---|
| **number** | 8 |
| **Analog conversion** | A/D converter 10 bit CPU built-in |
| **Type** | *Passive:* NTC, PT1000 or clean contact digital input (5mA), selectable via software (B4-B5)<br>*Universal:* NTC, voltage 0 to 1 Vdc or 0 to 5 Vdc, current 0 to 20 mA or B6 to 20 mA , selectable via dip-switch (B1, B2, B6, B7, B8) |

### Digital inputs

| | |
|---|---|
| **number** | 14 |
| **Type** | - optoisolated inputs at 24 Vac 50/60 Hz or 24 Vdc (ID1 to ID12)<br>- optoisolated inputs at 24 Vac 50/60 Hz or 230 Vac (ID13 to ID14) |

### Analog outputs

| | |
|---|---|
| **number** | 4 |
| **Type** | - 0 – 10 Vdc optoisolated outputs |
| **power supply** | external power supply 24 Vac/Vdc |
| **maximum load** | 1kΩ (10 mA) for 0 -10V |

### Digital outputs

| | |
|---|---|
| **number** | 13 |
| **Type** | with electromechanical relays |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