



Installation, operating and maintenance

@DNOVA - pCO3 Microprocessor



- Providing IT Climate Technology



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1 GENERAL DESCRIPTION OF THE APPLICATION

This program manages air-conditioning units of modern small and medium-sized telephone shelters (Telecom units) and the main features of the application program (Software name TLC_VV_RR where VV = version and RR = revision) are described below.

a. Program main functions

The program main functions are:

- control of temperature and humidity inside technological environments
- management of scroll compressor
- management of electrical heaters
- dehumidification (only on request)
- external humidifier with immersed electrodes (only on request)
- on-off or modulated condensing fans, pressure-controlled
- outlet temperature control
- alarms management, alarm data logging, devices timing, warnings
- complete management of devices timing
- connection with local and BMS supervisory networks (Carel, Modbus, LonWorks, ...)
- automatic air flow control

b. LCD user interface

The LCD user interface displays the following data:

- measurement of connected probes and calibration, if required
- unit start and stop
- alarms detection
- programming of configuration and operative parameters with access protected by password
- controlled devices working hours and time bands with access protected by password
- programming of clock and time bands with access protected by password
- language selection among the available options (English, Italian, German, French, Dutch)

c. LAN network connections

The connection with LAN network allows the program to manage the following functions as well:

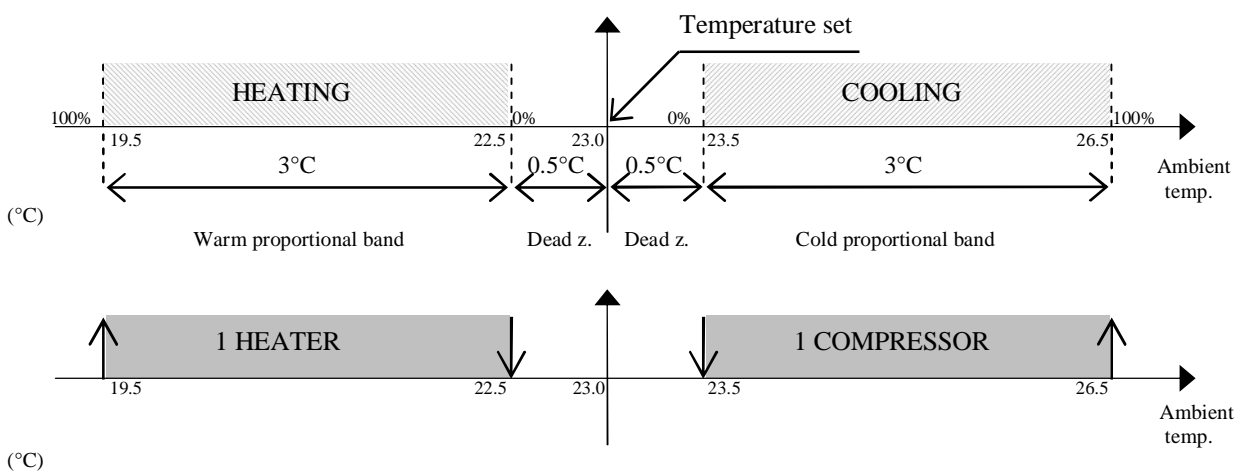
- automatic time or event rotation among up to 8 units
- control of temperature and humidity of max. 8 units, taking the probes of unit no. 1 as a reference
- use of only one LCD display for controlling up to 8 units

2 REGULATION LOGIC

a. Temperature control

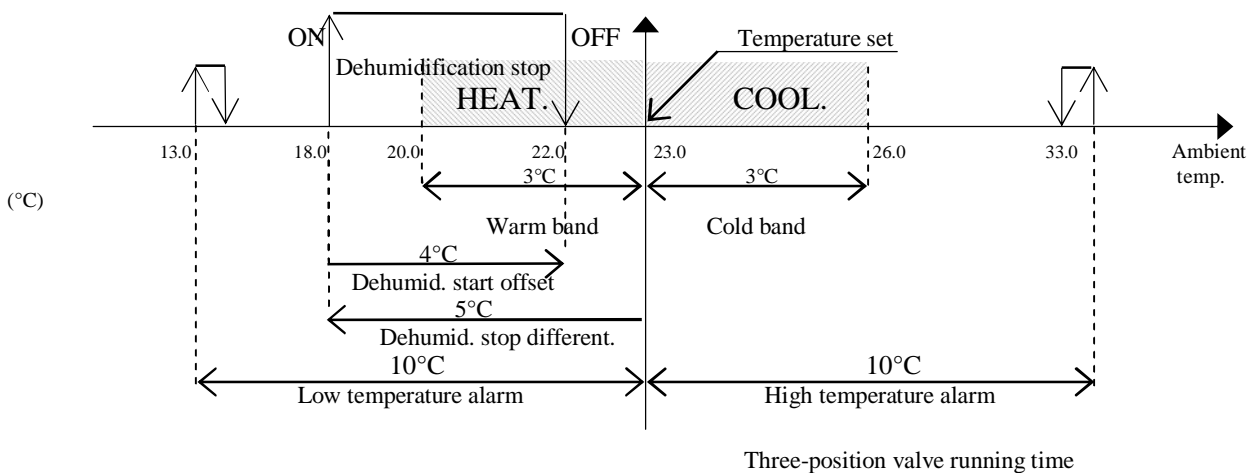
The heating and cooling devices are managed based on the temperature value measured by the ambient (or room temperature) probe. The measured temperature is compared to the set temperature (set point); the devices are enabled based on the difference between the two values. The proportional band identifies the air-conditioning unit working range and can take different values in heating and cooling mode. The dead zone identifies the devices non-action zone round the set point. The following diagrams show the action of the heating and cooling devices. The percentage values indicate the modulating valves opening range. The warm and cold valves start and end opening parameters correspond to 0% and 100% respectively (default values) and are different for the two valves; if need be, the values may be modified to delay opening start and bring complete opening forward.

I. Temperature regulation diagram



II. Other temperature functions

The high and low temperature alarms cause alarm screen signalling and have modifiable delay time. The dehumidification stop differential establishes the minimum temperature below which dehumidification is interrupted. Dehumidification can start again if temperature returns above the value established by the humidification start offset; differential and offset are modifiable.



b. Humidity control (only on request)

The humidification and dehumidification devices are managed based on the humidity value measured by the ambient (or room temperature) probe. The measured humidity is compared to the set humidity (set point); the devices are enabled based on the difference between the two values. The proportional band identifies the air-conditioning unit working range and can take different values in humidification and dehumidification mode. The 0.2% fixed dead zone identifies the devices non-action zone round the set point.

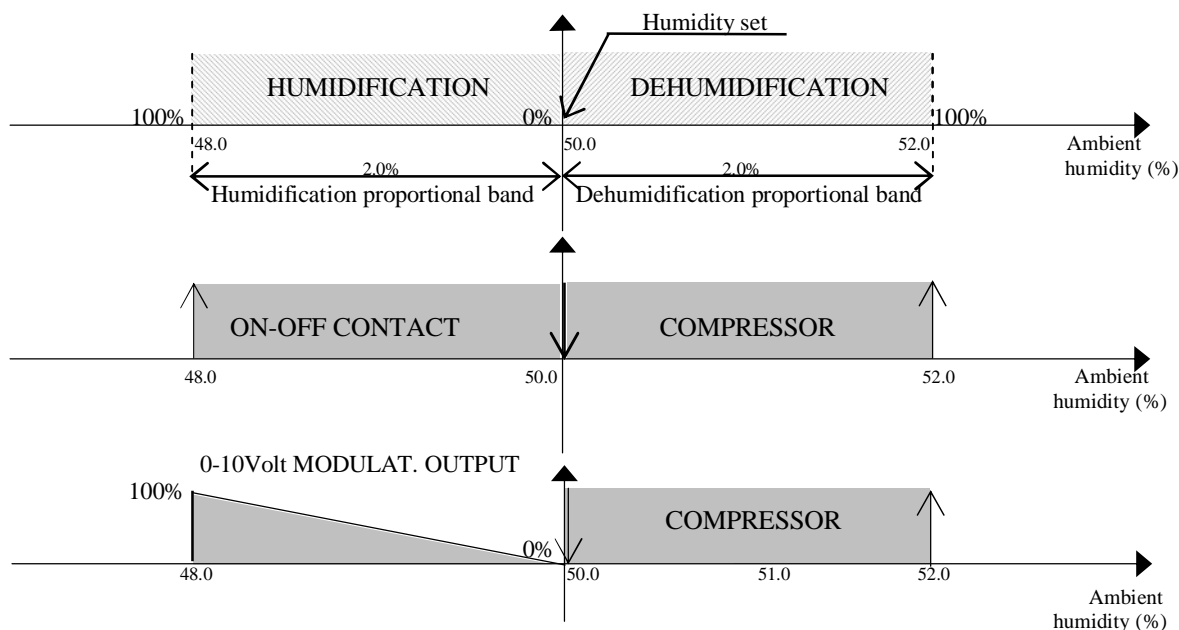
Dehumidification enables the available cooling devices and a contact for an external dehumidifier or for reducing the outlet fan speed.

Dehumidification can be executed as follows:

- On-Off contact for an external dehumidifier or for reducing the outlet fan speed
- compressors enabling (active capacity controls included, if any)

The dehumidification On-Off free contact is always managed, whereas the cooling devices depend on unit configuration and User selection. The 0-10Volt modulating output of the dehumidification outlet fan is automatically reduced by 50% (modifiable); with On-Off fan, use the digital contact for reducing speed.

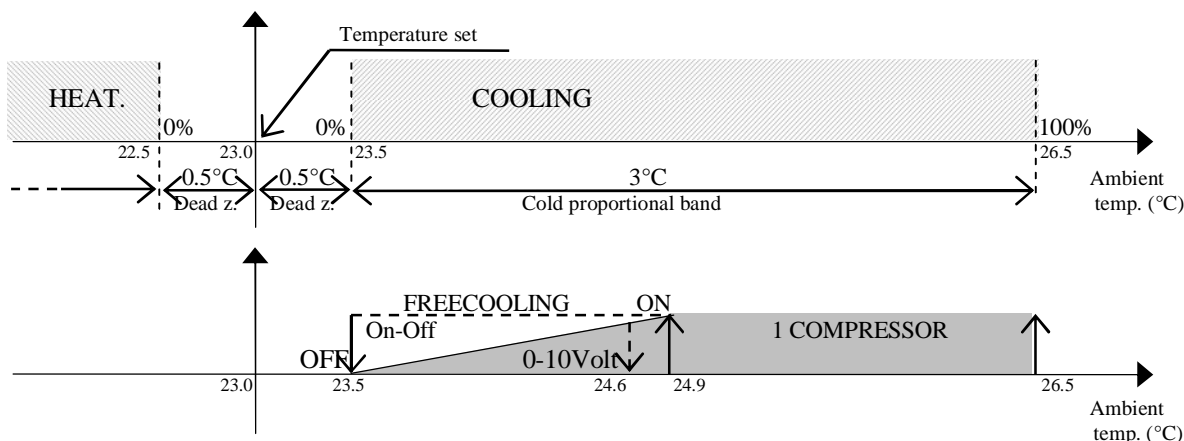
The following diagrams show the humidification and dehumidification devices action. The percentage values indicate the modulating valves opening range.



c. Freecooling damper

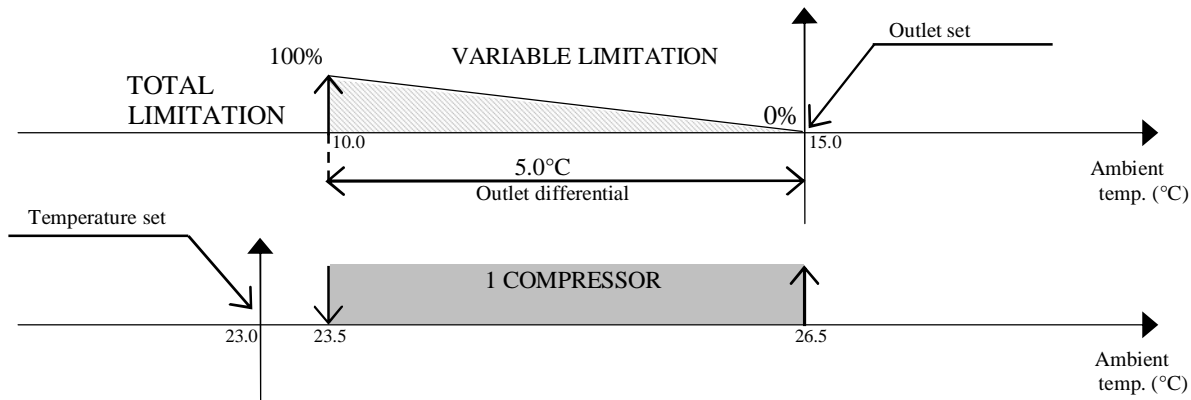
The Freecooling is an optional function: an additional mechanical damper using water coming from an external source (i.e., evaporation tower) is enabled if the temperature of water running inside it is quite low. This allows saving on the system management costs. The damper is enabled by On-Off contact or 0-10Volt modulating signal.

The following diagram shows the freecooling damper enabling conditions:

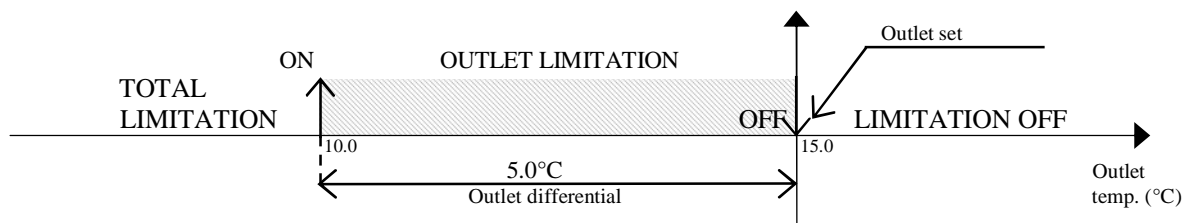


d. Outlet temperature limit

This function prevents too cold air from circulating in the environment, thus safeguarding health of any exposed person. A temperature probe must be positioned on the air-conditioning unit outlet and parameters "Outlet set point" and "Outlet differential" shall be set. Such parameters identify a limiting zone, as shown in the following diagram:

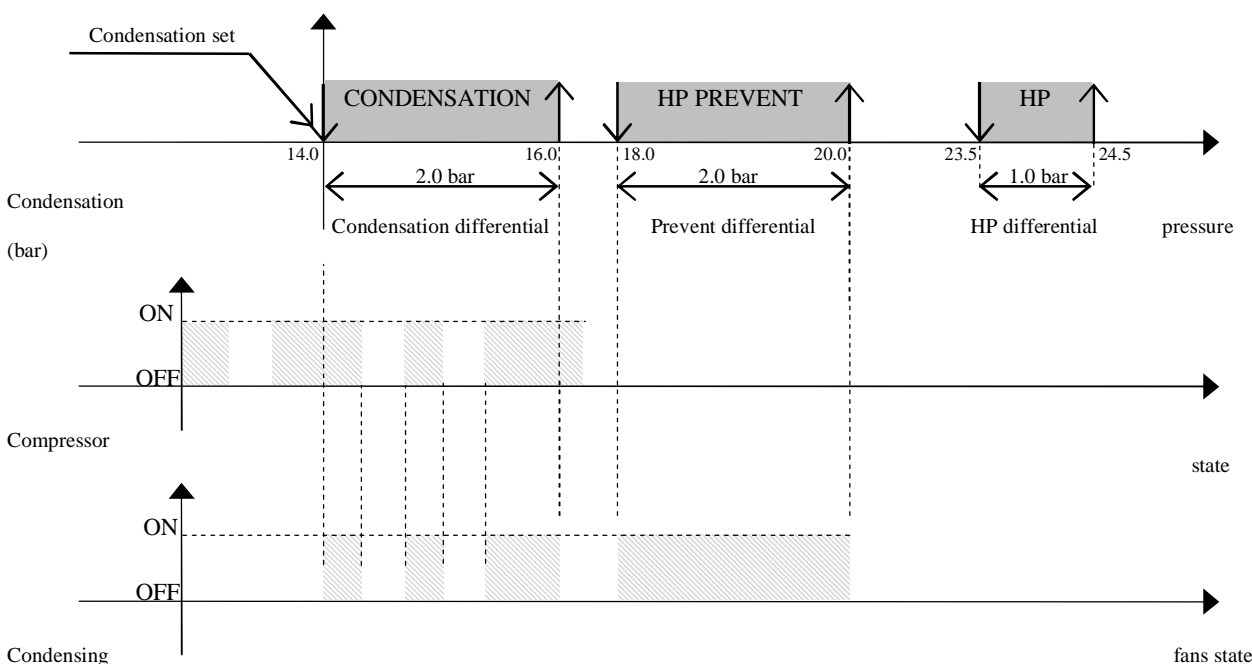


As shown in the diagram, if outlet temperature ranges between outlet set point and outlet differential, the cooling devices are limited only partially; the more temperature decreases the more limitation increases. As regards dehumidification limitation, the modulation zone is by-passed since dehumidification always needs the cooling devices maximum capacity. In practice, the devices are switched off only if outlet temperature is lower than differential; the devices are then switched on again if outlet temperature reaches the outlet set point, as shown in the following diagram:

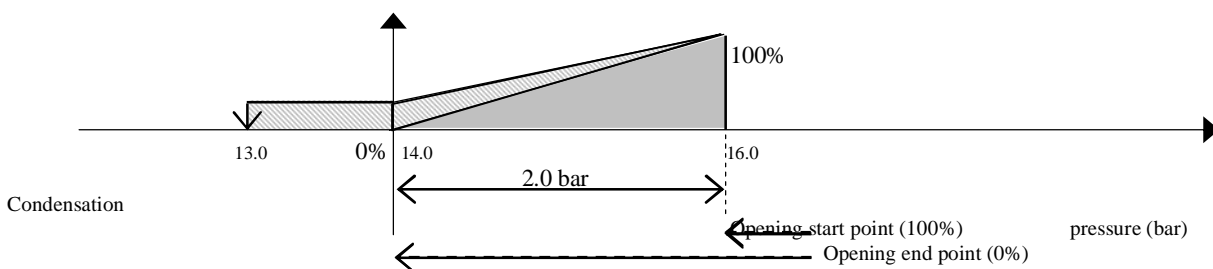


e. Condensers fans

Condensing pressure control is available on DX type units, in which fans are managed based on condensing coil pressure and compressors state. Fans are enabled by 0-10V modulating or digital outputs. Control is based on the condensation set point and differential, as shown in the following diagram:



The following diagram shows fans operation with modulating outputs:



The maximum and minimum speeds of 0-10V outputs can be set; in case the set minimum speed is higher than 0V, the fan is operated at minimum speed 1.0 bar below the condensation set point before switching off, as indicated in the diagram above.

I. Condensing pressure probes

Foreword: besides the values read by the probes, fans enabling always considers the compressors state. In case of single probe and separated coils, fans enabling is based on the probe value for both circuits. In case of two probes and single coil, fans enabling is based on the highest probes value. In case of two probes and separated coils, fans enabling is based on the probe value of the relevant circuit. In case no probe is present, fans are enabled simultaneously with the compressors; in case of single coil, fans are enabled when at least one compressor is on; in case of separated coils, each compressor controls the fans of its own circuit.

II. Prevent function

High pressure alarm prevention with compressors stopped. Normally, the condensing fans turn on only if compressors are enabled, but in this case they are forced so as to decrease pressure and try to prevent the high pressure alarm, which would cause unit shutdown. Pressure increase with compressors stopped may be due to radiance on the coil. In case of 0-10V modulating fans, modulation is by-passed.

III. Speed-up function

To overcome inertia at high-power modulating fans peak, they may be started at maximum speed for some seconds, then speed decreases to the required value and modulation starts.

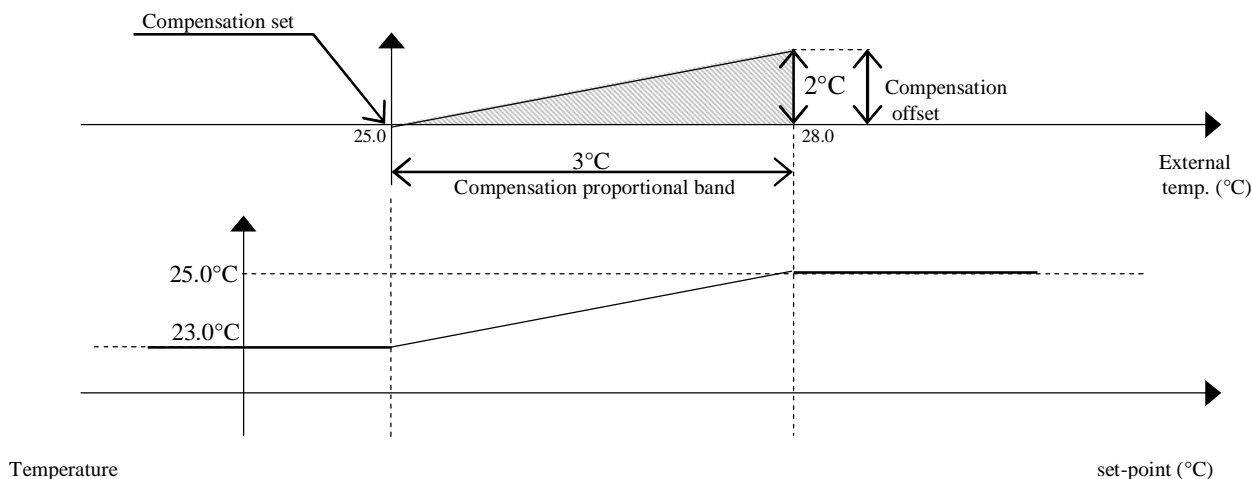
IV. Pressure – temperature conversion

Both pressure and temperature probes can be selected. In case of pressure probes, branch I/O screens display the temperature value corresponding to the pressure of each probe, based on the coolant type (to be selected in the Manufacturer branch).

f. Temperature set point compensation

The temperature set point can be “compensated” automatically for comfort reasons; for example, think about a commercial concern in which people frequently enter and go out: if internal temperature is 10°C lower than the external one, the thermal rush may annoy people and could be prejudicial to their health. The maximum difference between internal and external temperatures should not exceed 6°C in order to obtain optimum comfort. In this case, the compensation function increases the set point by 4°C, consequently increasing the ambient temperature; this function prevents the difference between internal and external temperature from exceeding 6°C.

Compensation requires a temperature probe to be installed at the exterior. The function is managed based on the values of compensation set point, differential and offset parameters, as shown in the following diagram:



g. Compressors

Compressors are managed in ON-OFF mode. Maximum 2 compressors can be present.

g. Rotation

Compressors rotation follows the F.I.F.O. (first in, first out) logic. The first compressor turned on is the first to turn off, the first compressor turned off is the last to turn on. This logic allows comparing the compressors working hours and obtaining the same ageing. The rotation can be disabled.

II. Timing

START MINIMUM TIME

It represents the compressors start minimum time (in seconds) after they have been enabled. If a stop request arises, compressors are disabled only after the established time has elapsed.

STOP MINIMUM TIME

It represents the compressors stop minimum time (in seconds) after they have been disabled. If a start request arises, compressors are enabled only after the established time has elapsed.

MINIMUM TIME BETWEEN DIFFERENT COMPRESSORS STARTS

It represents the minimum time interval (in seconds) between start of a device and the following one. This interval allows preventing contemporary peaks, which would cause a high energy absorption.

MINIMUM TIME BETWEEN COMPRESSOR STARTS

It represents the minimum time interval (in seconds) between two starts of the same device. This parameter allows limiting the number of starts per hour. If, for example, the maximum number of starts per hour allowed by the default values is 10, this limit can be respected by setting a 360-second time interval.

III. Compressor alarms

Compressors alarms are distributed in two digital inputs, the alarms mean Thermal alarm / High and Low pressure alarm.

HIGH PRESSURE – THERMAL ALARM

Immediate alarm originated by external pressure switch or compressor overload; the digital input switches from closed to open and compressor is immediately stopped. To start the compressor again, the user has to rearm the alarm manually by pushing the display Alarm button, provided that the pressure switch or

compressor overload have rearmed energising the digital input. After the compressor has turned off, timing is enabled; for this reason, after alarm rearming, the compressor could not immediately turn on again.

LOW PRESSURE ALARM

Delayed alarm originated by an external pressure switch. When opening, the digital input enables two timers; if, when the timers delay time (programmable by screen) elapses, the contact is open, the compressor turns off and the alarm goes off. On the contrary, if the contact closes before delay time elapses, the alarm does not go off and timers reset. Timers are: running compressor delay time and compressor start delay time. Running delay is always counted, whereas compressor start delay is counted only if the input opens immediately after compressor start and allows for fluid stabilisation. The two timers are counted in sequence.

To start the compressor again, the user has to rearm the alarm manually by pushing the display Alarm button, provided that the pressure switch has rearmed energising the digital input. After the compressor has turned off, timing is enabled; for this reason, after alarm rearming, the compressor could not immediately turn on again.

GENERIC ALARM

Alarm including all compressor safety devices in a single digital input, used on two-compressor small boards. This alarm goes off immediately when opening the digital input and locks the compressor. To start the compressor again, the user has to rearm the alarm manually by pushing the display Alarm button, provided that the digital input has been energised. After the compressor has turned off, timing is enabled; for this reason, after alarm rearming, the compressor could not immediately turn on again.

h. Electrical heater

The electrical heater is managed as simple ON-OFF load.

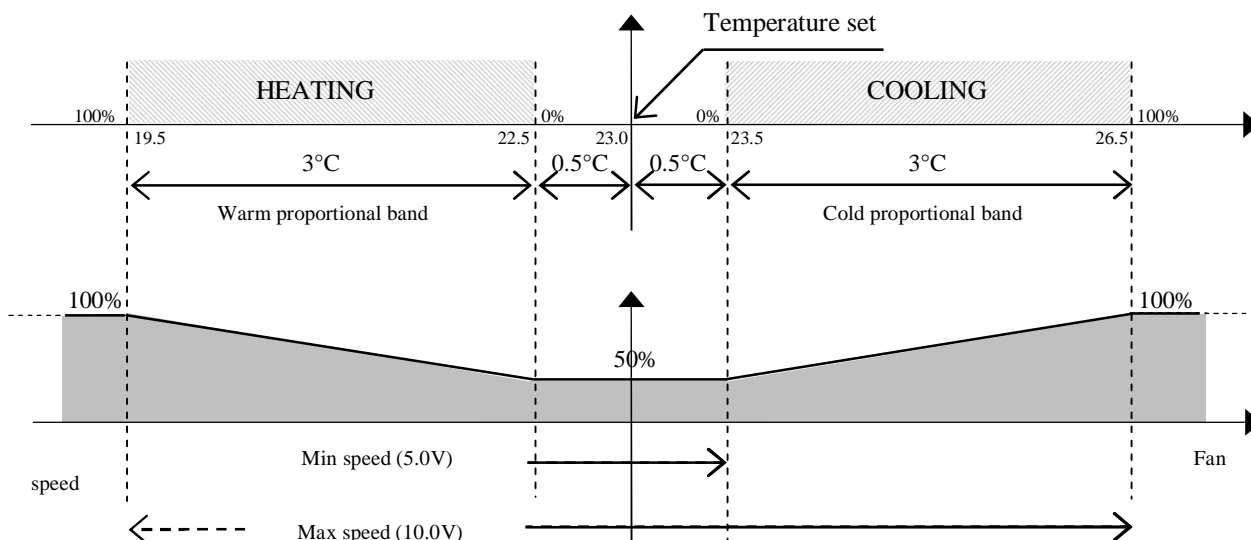
i. Heater alarms

Each heater is provided with a digital input to be connected with a thermal sensor for signalling any failure.

Immediate alarm originated when the digital input switches from closed to open; the heater is immediately disabled. To enable the heaters again, the user has to rearm the alarm manually by pushing the display Alarm button, provided that the thermal sensor have rearmed energising the digital input.

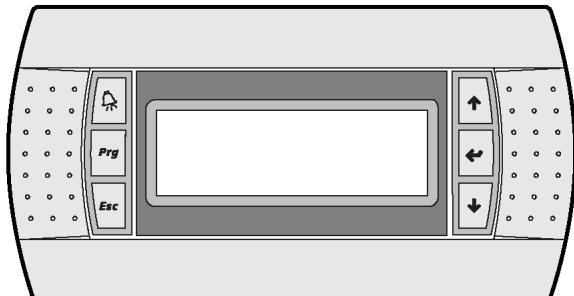
i. Outlet fan

With unit enabled, the outlet fan keeps switched on. It can be managed with On-Off or modulating output. The fan is provided with a thermal alarm and an air flow controller alarm, which lock the unit setting it to OFF state; thermal alarm requires manual rearm, whereas air flow controller alarm is rearmed automatically. Description of modulating management:

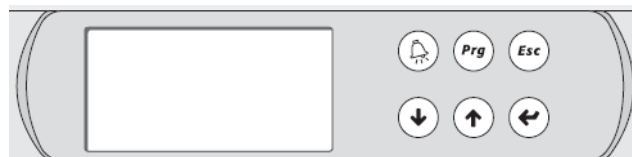


3 THE USER INTERFACE

The unit can be provided with the PGD user interface or with the builtin display. Both are equipped with a LCD display (4 rows x 20 columns). and with 6 keys. It allows carrying out all program operations. The user interface allows displaying the unit working conditions at any time and modifying the parameters; furthermore, it may also be disconnected from the main board, as its presence is not strictly necessary.








PGD user interface



Builtin user interface

a. Keyboard description

The PGD user interface has 6 keys and their use is describe in the following table.

| | Keys | Description |
|--|--------------------|---|
|  | ALARM key | Press ALARM key to enter the alarm menu and to reset the alarms. When an alarm is present the button is illuminated. |
| Prg | PROGRAM key | Press PROGRAM key to enter the main menu where is possible to select the items: MAINTENANCE, PRINTER, INPUT/OUTPUT, CLOCK, SETPOINT, USER, MANUFACTURER |
| Esc | ESC key | Press ESC key to go out from a menu and come back into the main screen. |
|  | UP key | Press UP key to move into the next screen or to increment the value of a parameter. |
|  | ENTER key | Press ENTER key to move into the next modifiable parameter field and confirm the modification |
|  | DOWN key | Press DOWN key to move into the previous screen or to decrement the value of a parameter. |
| Prg + Esc | PROGRAM + ESC keys | Press simultaneously PROGRAM and ESC keys to enter directly the MANUFACTURER menu. |
| Esc +  | ESC + ENTER keys | Press simultaneously for 5 seconds, ESC and ENTER keys to enter into the screen where you can press ENTER to switch ON/OFF the unit |

I. Switch ON/OFF of the unit

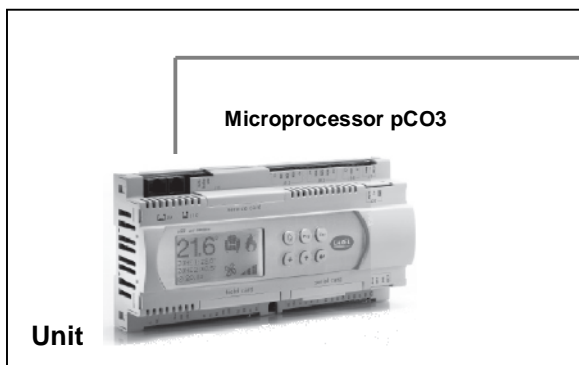
The unit is switch On/Off by pressing Esc + Enter keys simultaneously for 5 seconds; after, the displayed screen allows executing the required operation by using Enter key.

II. Screen loop

Press PROGRAM key to display the main menu; then, by using the arrow buttons, move the cursor on the selected item and press Enter to access it.

b. Remote user interface

I. With built-in local display



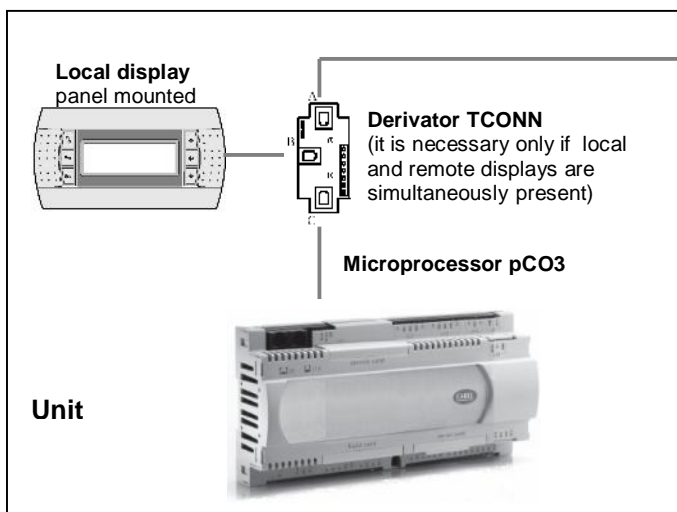
Remote display cable:
6 wires, with RJ11 connectors.

NOTE:
the cable is different from the standard telephone cable because in the remote display cable the connectors are reversed.



Remote display
wall mounted

II. With PGD local display



Remote display cable:
6 wires, with RJ11 connectors.

NOTE:
the cable is different from the standard telephone cable because in the remote display cable the connectors are reversed.



Remote display
wall mounted

4 BOARD CONFIGURATION AND CONNECTION

The LAN network identifies a physical connection between the microprocessor, the display and the drivers for the electronic expansion valves. This connection allows exchanging variables from a board to another, according to a logic established by the software, to make them work together in a functional way. The address of the boards must be configure even in stand alone unit.

a. Address configuration

I. Address configuration of the microprocessor (pCO3)

For the configuration of the address of the pCO3 follow these steps:

- connected the pCO3 with a display PGD wich the address configure to 0. (See Address configuration of the PGD)
- switch ON the power supply pressing simultaneously the ALARM and the UP keys.
- press UP or DOWN key to set the address.
- press ENTER key to save and exit from this procedure.

II. Address configuration of the PGD

For the configuration of the address of the PGD follow these steps:



- press UP+ENTER+DOWN for few seconds
- press ENTER and then press UP or DOWN key to set the address.
- press ENTER key to save and exit from this procedure.

NOTES:

- If the addresses of the microprocessor or of the PDG are non corrected, the functioning of the unit is not guaranteed, and the PDG can displays nothing.
- after the address configuration of the PGD, it can display the notice "NO LINK" for some seconds.

III. Address configuration of the E2V electronic expansion valve's driver (EVD)

For the configuration of the driver (EVD) is necessary to set the dip-switch (using a binary logic) that are present inside of the driver, under the frontal box.:

| | Address | Dip-switch |
|----------------------|---------|---|
| Driver for circuit 1 | 9 |  |
| Driver for circuit 2 | 10 |  |

b. Boards connection

The electrical connection among boards is executed using the following two type of cables:

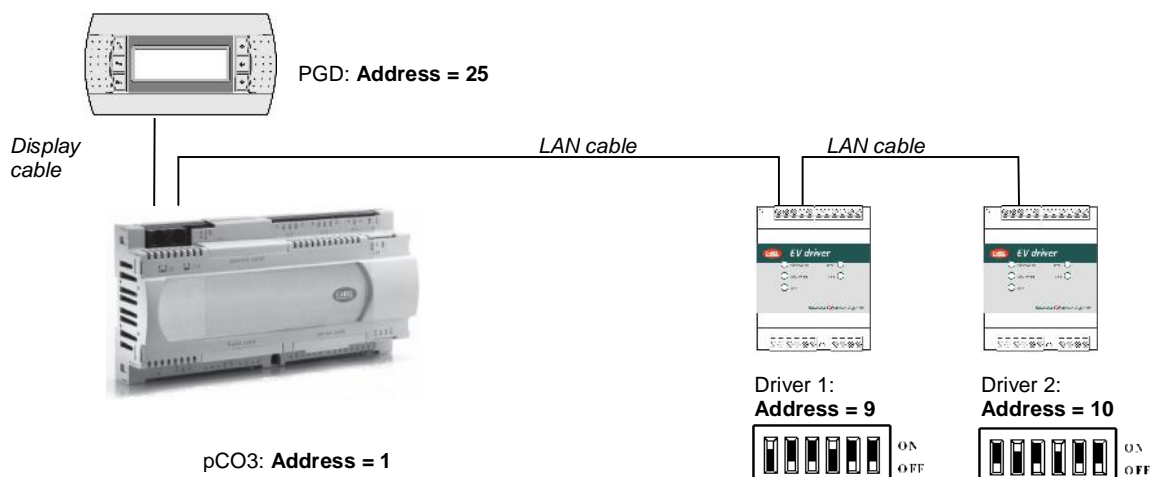
Display connection

For the connection of the display is necessary to use a cable with 6 wires and RJ11 connectors; the cable is different from the standard telephone cable because in the display cable the connectors are reversed.

LAN connection

For the LAN connection is necessary to use a cable with 2 wires plus shield, from unit to unit, by using the terminal strip in the electrical panel (see the specific electrical diagram); the data are sent through Rs485 logic; no additional device is required.

I. Stand alone unit (with PGD display)



II. Units connected in LAN (max. 8 units)

The units can be connected to the other units in LAN (local area network) for a maximum of 8 units. Each unit can be connected (inside of it) to one or two drivers (EVD) for the management of the electronic valves and to one display for user interface. In the following table are listed the addresses of the microprocessor, of the drivers (EVD) and of the display.

| List of addresses | | | | | | |
|-------------------|----------------------------|------------------------------|-------------------------|------------------------------|--------------------|---------------------------|
| | Address of Microproc. pCO3 | Address of EVD Driver 1 | Address of EVD Driver 2 | Address of EVD Driver 2 | Address of Display | |
| | <i>Config. by display</i> | <i>Config. by dip-switch</i> | | <i>Config. by dip-switch</i> | | <i>Config. by display</i> |
| Unit 1 | 1 | 9 | | 10 | | 25 |
| Unit 2 | 2 | 11 | | 12 | | 26 |
| Unit 3 | 3 | 13 | | 14 | | 27 |
| Unit 4 | 4 | 15 | | 16 | | 28 |
| Unit 5 | 5 | 17 | | 18 | | 29 |
| Unit 6 | 6 | 19 | | 20 | | 30 |
| Unit 7 | 7 | 21 | | 22 | | 31 |
| Unit 8 | 8 | 23 | | 24 | | 32 |

The address of the microprocessor can be read from the main screen in the lower right corner.

The **display with address 32** allows controlling all boards without requiring other displays or in addition to the other displays; as a matter of fact, the program allows display with address 32 to access the parameters of all connected boards, one by one. Passage among the boards can be executed by simply pushing button ESC + DOWN.

III. LAN status

When starting the system, the LAN network could undergo some problems (failed boards and displays start-up) due to improper electrical connections or to the fact that incorrect addresses have been assigned. By means of a special screen, the LAN network state can be displayed in real time, thus

identifying which devices (boards and displays) are properly connected and addressed. To display the special screen, push buttons Up-Down-Enter of any network display simultaneously for at least 10 sec. After the first 5 seconds, a screen is displayed; continue for another 5 seconds until the following screen is displayed:

| | | | | |
|---------|----|-------------------------------------|-----------|----|
| NetSTAT | 1 | <input type="checkbox"/> | _ _ _ _ _ | 8 |
| T: 25 | 9 | | _ _ _ _ _ | 16 |
| Enter | 17 | | _ _ _ _ _ | 24 |
| To Exit | 25 | <input checked="" type="checkbox"/> | _ _ _ _ _ | 32 |

As it can be seen, network addresses from 1 to 32 are displayed, together with a symbol indicating if a display (small rectangle) or a board / valve driver (big rectangle) is concerned. The dash indicates that the board / display has incorrect address or is connected improperly. In case the symbols appear and disappear, it means that LAN is unstable or, more probably, that repeated addresses are present. The number following T indicates the address of the display being used. The example indicates that the network consists of one boards or valves drivers with address 1 and of one display with address 25. After the screen is checked, if there is some trouble cut network power off, verify connections and addresses and power the system again.

c. Software update

If is necessary a software update the boards shall be programmed by DOWNLOADING the application program to the Flash buffer memory; this operation can be performed either using a computer.

i. Program download from computer

Use the the converter (RS232/RS485) and the WinLOAD 32 program, proceeding as follows:

1. Connect the converter (RS232/RS485) to the mains using the transformer provided in the kit.
2. Connect the converter to a free serial port on the PC, using the serial cable provided in the kit.
3. Connect the converter to connector J10 on the pCO3 using a telephone cable.
4. Install Winload, if Winload is not already installed on the PC.
5. Run WinLOAD32 on the PC, with the board off.
6. Enter in the number of the PC serial port in the field "COMM" (1 for COM1, 2 for COM2).
7. Enter "0" in the field "pCO ADD."
8. Switch the board on.
9. Wait 30 seconds until the message "OFF LINE" becomes "ON LINE" in the WinLOAD32 program, in the lower left, or until the yellow LED next to the dipswitch on the board starts flashing; now enter the actual board LAN address value in the field "pCO² ADD"; a blue light in the Winload program, in the bottom centre of the window, will start flashing.
10. In WinLOAD32, select "Upload" and then "Application".
11. Select the folder containing the application program source files.
12. Use CTRL to select a series of *.iup files, if needing to load a series of languages to the pCO3. Also select the *.blb files (for non-LAN applications) or the flash1.bin file in the program being loaded (for LAN applications).
13. Click "UPLOAD" to start the file download procedure, which will take approximately 1 to 5 minutes, depending on the number of *.iup files selected and the size of the various files.
14. Wait until the message "Upload OK" appears in the progress bar.
15. Disconnect the telephone cable between the board and converter; connect the external display (if featured), then switch the board off and on again.

NOTE: if a LAN network with a series of boards is used, the program can be installed on the other boards without repeating the operations: after installing the program on the first board, simply repeat steps from 8 to 14, entering the new board addresses each time in the field "pCO ADD" in the WinLOAD32 program.

II. Restore the default parameters

Default parameters are the values assigned by manufacturer to the application program main operative parameters. Parameters are assigned automatically when executing the DOWNLOAD operation as described above. Parameters indicate timing, set points, differentials, etc... (refer to the complete list of default values).

After installing default values, the parameters must be modified following the special parameter list with the specific parameter of the installed unit.

Operations to be carried out for default parameters manual installation:

1. Push buttons PRG + ESC keys and type the Manufacturer password, then push Enter.
2. By pushing button Down three times, move the cursor on "INITIALIZATION" (last row), then push ENTER.
3. The parameters installation screen is displayed; to install, push ENTER and type the Manufacturer password.
4. **WARNING:** we recommend extreme care since this operation deletes all the installed parameters from the memory and replaces them by the default parameters – after this operation, parameters cannot be restored.
5. After pushing ENTER, message "PLEASE WAIT" is displayed for some seconds.
6. Switch off and then switch on the power supply.

III. Language selection

English is the language automatically selected, but it can be changed into: Italian, French, German, English and Dutch. To modify the language, operate as follows:

1. Press the PROGRAM key, select the MAINTENANCE item and press ENTER
2. Press ENTER in the screen A0b till you reach the wanted language
3. Press UP or DOWN or ESC to continue

5 ALARMS

The alarms managed by the program safeguard soundness of the connected devices and provide signals in case the control parameters have exceeded the normal values or the board is faulty. The alarms originate from alarm digital inputs, probes or board. Their effect ranges from the simple block signalling of one or more devices to the air-conditioning unit stop. Many alarms are subject to programmable delay times.

When an alarm state is identified, the following signals occur:

- the red LED under button ALARM turns on
- abbreviation AL starts blinking on the Menu screen

Pushing button Alarm, the buzzer switches off and the alarm screen is displayed. If more alarms are active, the screen of the first alarm is displayed; the other alarms can be displayed by using the arrow buttons. If other buttons are pressed, the alarm screens are left but they keep stored and are displayed again whenever the Alarm button is pressed.

To rearm the alarms and delete the message manually, simply move the cursor on the alarm screens and push button Alarm again; if the alarm causes have disappeared (digital inputs rearmed, temperature within the normal values, etc...), the screens disappear, the red led switches off and message "NO ALARM ACTIVE" is displayed. If the cause of one or more alarms is still active, the disabled alarms only disappear, whereas the other alarms keep displayed and the buzzer and the red led switch on again.

Alarms are divided into two categories: manually-rearmed alarms or automatically-rearmed alarms.

The manually-rearmed alarms require alarm screen deleting (as described above) to restart the devices or the air-conditioning unit. The automatically-rearmed alarms unlock the device or restart the air-conditioning unit after the cause has disappeared, but the alarm screen keeps stored in the memory.

a. Table of alarms

| ALARM CODE | SUPERV. ADDRESS | ALARM DESCRIPTION | DELAY |
|------------|-----------------|--|----------------|
| A01 | 28 | Circuit 1 general alarm | - |
| A02 | 29 | Circuit 2 general alarm | - |
| A03 | 30 | Low pressure circuit 1 | T2-1 / T2-2 |
| A04 | 31 | Low pressure circuit 2 | T2-1 / T2-2 |
| A05 | 32 | Air flow alarm | T4-1 |
| A06 | 33 | Evaporating fan overload alarm | 20 sec (fixed) |
| A07 | 34 | Overload electrical heater 1 | - |
| A08 | 35 | Overload electrical heater 2 | - |
| A09 | 36 | Smoke / Fire detection alarm | - |
| A10 | 37 | Dirty filter alarm | - |
| A11 | 38 | High temperature alarm | T2-3 |
| A12 | 39 | Low temperature alarm | T2-3 |
| A13 | 40 | High humidity alarm | T2-3 |
| A14 | 41 | Low humidity alarm | T2-3 |
| A15 | 42 | Working hours of compressor 1 alarm | - |
| A16 | 43 | Working hours of compressor 2 alarm | - |
| A17 | 44 | Evaporating fan working hours alarm | - |
| A18 | 45 | Room temperature probe fault or offline | 60 sec (fixed) |
| A19 | 46 | Water inlet temperature probe fault or offline | 60 sec (fixed) |
| A20 | 47 | External air temperature probe fault or offline | 60 sec (fixed) |
| A21 | 48 | Supply air temperature probe fault or offline | 60 sec (fixed) |
| A22 | 49 | Room humidity probe fault or offline | 60 sec (fixed) |
| A23 | 50 | Condensing pressure probe of circuit 1 fault or offline | 60 sec (fixed) |
| A24 | 51 | Condensing pressure probe of circuit 2 fault or offline | 60 sec (fixed) |
| A25 | 52 | Condensing temperature probe of circuit 1 fault or offline | 60 sec (fixed) |
| A26 | 53 | Condensing temperature probe of circuit 2 fault or offline | 60 sec (fixed) |
| A27 | 54 | High current alarm in the humidifier | - |
| A28 | 55 | Lack water alarm in the humidifier | - |
| A29 | 56 | Low current alarm in the humidifier | - |
| A30 | 57 | Clock card alarm | - |
| A31 | 58 | High pressure circuit 1 | - |
| A32 | 59 | High pressure circuit 2 | - |

| | | | |
|-----|-----|--|----------------|
| A33 | 60 | Water detector alarm | - |
| A34 | 61 | Auxiliary alarm | - |
| A35 | 62 | Overload or high pressure alarm of circuit 1 | - |
| A36 | 63 | Working hours of humidifier alarm | - |
| A37 | 64 | Overload or high pressure alarm of circuit 2 | - |
| A38 | 65 | Condensing fan 1 overload alarm | - |
| A39 | 66 | Condensing fan 2 overload alarm | - |
| A40 | 67 | Water flow alarm | T4-2 |
| A41 | 124 | pLAN disconnected | 60 sec (fixed) |
| A42 | 125 | Driver 1 alarm, probes fault or offline | - |
| A43 | 126 | Driver 1 EEPROM error | - |
| A44 | 127 | Driver 1 step motor error | - |
| A45 | 128 | Driver 1 battery error | - |
| A46 | 129 | Driver 1 high evaporation pressure (MOP) | Fj-2 |
| A47 | 130 | Driver 1 low evaporation pressure (LOP) | Fj-1 |
| A48 | 131 | Driver 1 low superheat | Fi-1 |
| A49 | 132 | Driver 1 valve not closed during power OFF | - |
| A50 | 133 | Driver 1 high suction temperature | Fi-2 |
| A51 | 134 | Driver 2 alarm, probes fault or offline | - |
| A52 | 135 | Driver 2 EEPROM error | - |
| A53 | 136 | Driver 2 step motor error | - |
| A54 | 137 | Driver 2 battery error | - |
| A55 | 138 | Driver 2 high evaporation pressure (MOP) | Fj-2 |
| A56 | 139 | Driver 2 low evaporation pressure (LOP) | Fj-1 |
| A57 | 140 | Driver 2 low superheat | Fi-1 |
| A58 | 141 | Driver 2 valve not closed during power OFF | - |
| A59 | 142 | Driver 2 high suction temperature | Fi-2 |
| A60 | 143 | High conductivity in the humidifier alarm | 1 hour (fixed) |
| A61 | 144 | High conductivity in the humidifier pre-alarm | 1 hour (fixed) |
| A62 | 145 | Low production of steam in the humidifier | - |
| A63 | 146 | Water drain alarm in the humidifier | - |
| A64 | 147 | Cylinder full alarm in the humidifier | - |
| A65 | 148 | Cylinder pre-exhaustion warning in the humidifer | - |
| A66 | 149 | Presence of foam warning in the humidifier | - |
| A67 | 150 | Cylinder exhaustion warning in the humidifer | - |
| A68 | 151 | Working hours of the humidifier pre-alarm | - |
| A69 | 152 | Working hours of the humidifier alarm | - |
| A70 | 153 | Expansion card connection alarm | Cr-3 |
| A71 | 154 | Coil probe fault or offline | 60 sec (fixed) |
| A72 | 155 | Freecooling coil antifreeze alarm | Gu-3 |
| A73 | 156 | Dry-cooler alarm | - |
| A74 | 157 | External fan overload alarm | - |
| A75 | 158 | Phase sequence alarm | - |
| A76 | 159 | Air differential pressure probe fault or offline | 60 sec (fixed) |
| A77 | 160 | High inlet water temperature alarm | Ta-1 |
| A78 | 161 | Dual cooling: normal mode alarm | - |
| A79 | 162 | Dual cooling: emergency activation warning | - |
| A80 | 163 | Compressor inverter alarm | Tb-1 / Tb-2 |

b. Alarms data logging

Alarms data logging allows storing the air-conditioning unit working state whenever an alarm goes off or under particular conditions. Any storing operation becomes an event, which can be displayed as any other event available in the memory. As it functions as a device for “taking photographs” of the system whenever any alarm goes off, data logging is extremely useful for suggesting possible causes and solving system malfunctions and failures. The program is provided with a MAIN and a DEVELOPED data logging.

c. Main log

Events can be stored thanks to the boards very large buffer memory. The MAIN data logging can be enabled by parameter; if the clock card (optional) is not available, neither the MAIN data logging is available. No additional optional card is required.

The maximum number of storable events is 100; after the last space available in the memory (alarm no. 100) is used, next alarm will be overwritten on the first alarm stored (001), which will be automatically deleted. This procedure applies to all following events. The user cannot delete the stored events except at the default values installation. The MAIN data logging screen can be accessed by pushing button ALARM when screen E4 is displayed and can be left by pushing button Esc. The screen is displayed as follows:

```

                HISTORY_ALARMS
      +-----+
      |Alarms historic H025|
      |Resistor 1 overload |
      |12:34           01/08/01|
      +-----+
  
```

Whenever an alarm goes off, the following air-conditioning unit data are stored for each alarm:

- alarm description
- time
- date
- event chronological number (0-100)

The event chronological number, displayed in the upper right corner, indicates the event “stay time” compared to the 100 available memory spaces. Alarm no. 001 represents the first alarm gone off after MAIN data logging enabling.

Moving the cursor on the chronological number and using the arrow buttons, the alarms “history” can be scrolled from 1 to 100.

In position 001 and pushing the down arrow, the alarms cannot be scrolled.

If, for example, 15 alarms have been stored and the cursor is in position 015, pushing the up arrow, the alarms cannot be scrolled.

6 SCREENS

The screens are divided into these categories:

MAINTENANCE: checking the devices periodically, calibrating the connected probes, modifying the working hours and managing the devices manually. PASSWORD = 105

PRINTER: printing the list of parameter only with a special version of display. NO PASSWORD

INPUT/OUTPUT: allow to show the digital and analog input/output values. NO PASSWORD

CLOCK: allow setting and enabling the temperature and humidity time bands. PASSWORD = 108

SETPOINT: allow setting the temperature and humidity set points and regulating the clock. NO PASSWORD

USER: allow setting the main functions (timing, sets, differentials) of the connected devices; PASSWORD = 108

MANUFACTURER: allow configuring the telecom unit, enabling the main functions and selecting the connected devices. PASSWORD = available on request. This menu is divided into these categories:

- **CONFIGURATION**
- **PARAMETERS**
- **CAREL EXV DRIVERS**
- **TIMING**
- **INITIALIZATION**

7 LIST OF PARAMETERS AND DEFAULT VALUES

The table below lists the parameters in the program, together with the following information: screen code (the screen code is displayed at the top right) to assist the identification of the parameter, the default value, the minimum and maximum limits (range), and the unit of measure.

To find a specific parameter on the display, proceed as follows:

- Identify the parameter in the table below and the corresponding screen code
- Using the list of the screens (following paragraph) and the screen code, access the screen on the display

| Scr. | Par. | Description | Default | Special value | Range | UOM |
|------|------|--|---------|---------------|---|--------------|
| | | Maintenance | | | | |
| A0b | 1 | Change language pressing ENTER key | English | | English, Italian, French, German, Dutch | |
| A5 | 1 | Enter password | ---- | | 0-9999 | |
| A6 | 1 | Modify compressor circuit 1 operating hours | 0 | | 0-99 . 0-999 | hours |
| A6 | 2 | Modify compressor circuit 2 operating hours | 0 | | 0-99 . 0-999 | hours |
| A7 | 1 | Modify main fan operating hours | 0 | | 0-99 . 0-999 | hours |
| A7 | 2 | Humidifier operating hours reset | No | | No-Yes | |
| A8 | 1 | Device operating hour threshold: mainfan | 99 | | 0-99 | hours x 1000 |
| A8 | 2 | Device operating hour threshold: compr. Circuit 1 | 99 | | 0-99 | hours x 1000 |
| A8 | 3 | Device operating hour threshold: compr. Circuit 2 | 99 | | 0-99 | hours x 1000 |
| A9 | 1 | Humidity probe calibration | 0 | | -9.9 – 9.9 | %RH |
| A9 | 2 | Condensing pressure probe 1 calibration | 0 | | -9.9 – 9.9 | bar |
| A9 | 3 | Condensing pressure probe 2 calibration | 0 | | -9.9 – 9.9 | bar |
| Aa | 1 | Room temperature probe calibration | 0 | | -9.9 – 9.9 | °C / °F |
| Aa | 2 | External temperature probe calibration | 0 | | -9.9 – 9.9 | °C / °F |
| Aa | 3 | Supply temperature probe calibration | 0 | | -9.9 – 9.9 | °C / °F |
| Ab | 1 | Manual procedure setting: inlet temperature (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ab | 2 | Manual procedure value: inlet temperature (with Ck-1=Yes) | 0 | | -999.9 – 999.9 | °C / °F |
| Ab | 3 | Manual procedure setting: outlet temperature (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ab | 4 | Manual procedure value: outlet temperature (with Ck-1=Yes) | 0 | | -999.9 – 999.9 | °C / °F |
| Ab | 5 | Manual procedure setting: supply temperature (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ab | 6 | Manual procedure value: supply temperature (with Ck-1=Yes) | 0 | | -999.9 – 999.9 | °C / °F |
| Ab2 | 1 | Manual procedure setting: pressure circuit 1 (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ab2 | 2 | Manual procedure value: pressure circuit 1 (with Ck-1=Yes) | 0 | | -999.9 – 999.9 | bar |
| Ab2 | 3 | Manual procedure setting: pressure circuit 2 (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ab2 | 4 | Manual procedure value: pressure circuit 2 (with Ck-1=Yes) | 0 | | -999.9 – 999.9 | bar |
| Ab2 | 5 | Manual procedure setting: inlet humidity (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ab2 | 6 | Manual procedure value: inlet humidity (with Ck-1=Yes) | 0 | | -999.9 – 999.9 | %RH |
| Ac | 1 | Manual procedure setting: digital output 1 (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ac | 2 | Manual procedure value: digital output 1 (with Ck-1=Yes) | Off | | Off – On | |
| Ac | 3 | Manual procedure setting: digital output 2 (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ac | 4 | Manual procedure value: digital output 2 (with Ck-1=Yes) | Off | | Off – On | |
| Ac | 5 | Manual procedure setting: digital output 3 (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ac | 6 | Manual procedure value: digital output 3 (with Ck-1=Yes) | Off | | Off – On | |
| Ad | 1 | Manual procedure setting: digital output 4 (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ad | 2 | Manual procedure value: digital output 4 (with Ck-1=Yes) | Off | | Off – On | |
| Ad | 3 | Manual procedure setting: digital output 5 (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ad | 4 | Manual procedure value: digital output 5 (with Ck-1=Yes) | Off | | Off – On | |
| Ad | 5 | Manual procedure setting: digital output 6 (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ad | 6 | Manual procedure value: digital output 6 (with Ck-1=Yes) | Off | | Off – On | |
| Ae | 1 | Manual procedure setting: digital output 7 (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ae | 2 | Manual procedure value: digital output 7 (with Ck-1=Yes) | Off | | Off – On | |
| Ae | 3 | Manual procedure setting: digital output 8 (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ae | 4 | Manual procedure value: digital output 8 (with Ck-1=Yes) | Off | | Off – On | |
| Af | 1 | Manual procedure setting: digital output 1 of pCOE (with Ck-1=Yes) | AUT | | AUT-MAN | |

| | | | | | | |
|-----|---|--|------------------|--|-------------|---------|
| Af | 2 | Manual procedure value: digital output 1 of pCOE (with Ck-1=Yes) | Off | | Off – On | |
| Af | 3 | Manual procedure setting: digital output 2 of pCOE (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Af | 4 | Manual procedure value: digital output 2 of pCOE (with Ck-1=Yes) | Off | | Off – On | |
| Af2 | 1 | Manual procedure setting: digital output 3 of pCOE (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Af2 | 2 | Manual procedure value: digital output 3 of pCOE (with Ck-1=Yes) | Off | | Off – On | |
| Af2 | 3 | Manual procedure setting: digital output 4 of pCOE (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Af2 | 4 | Manual procedure value: digital output 4 of pCOE (with Ck-1=Yes) | Off | | Off – On | |
| Ag | 1 | Manual procedure setting: analog output 1 (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ag | 2 | Manual procedure value: analog output 1 (with Ck-1=Yes) | 0 | | 0-10.0 | Volt |
| Ag | 3 | Manual procedure setting: analog output 2 (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ag | 4 | Manual procedure value: analog output 2 (with Ck-1=Yes) | 0 | | 0-10.0 | Volt |
| Ah | 1 | Manual procedure setting: analog output 3 (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ah | 2 | Manual procedure value: analog output 3 (with Ck-1=Yes) | 0 | | 0-10.0 | Volt |
| Ah | 3 | Manual procedure setting: analog output 4 (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ah | 4 | Manual procedure value: analog output 4 (with Ck-1=Yes) | 0 | | 0-10.0 | Volt |
| Ah2 | 1 | Manual procedure setting: analog output 1 of pCOE (with Ck-1=Yes) | AUT | | AUT-MAN | |
| Ah2 | 2 | Manual procedure value: analog output 1 of pCOE (with Ck-1=Yes) | 0 | | 0-10.0 | Volt |
| Aj | 1 | Driver 1 valve control mode | Automatic | | Auto-Man. | |
| Aj | 2 | Driver 1 valve manual opening steps | 0 | | 0-9999 | Steps |
| Ak | 1 | Driver 2 valve control mode | Automatic | | Auto-Man. | |
| Ak | 2 | Driver 2 valve manual opening steps | 0 | | 0-9999 | Steps |
| Al | 1 | Driver 1 manual release on start-up | No | | No-Yes | |
| Am | 1 | Driver 2 manual release on start-up | No | | No-Yes | |
| An | 1 | Enter new Maintenance password | ---- | | 0-9999 | |
| | | | | | | |
| | | Clock | | | | |
| K0 | 1 | Hour setting | current hour | | 0-23 | hours |
| K0 | 2 | Minute setting | current minutes | | 0-59 | minutes |
| K0 | 3 | Day setting | current day | | 1-31 | |
| K0 | 4 | Month setting | current month | | 1-12 | |
| K0 | 5 | Year setting | current year | | 0-99 | |
| K1 | 1 | Enter Clock password | ---- | | 0-9999 | |
| K2 | 1 | Enable temperature / humidity / On-Off time bands | No / No / No | | No-Yes | |
| K3 | 1 | Start and end hour for On-Off time bands F1-1 and F1-2 | 9 / 13 / 14 / 21 | | 0-23 | hours |
| K3 | 2 | Start and end min. for On-Off time bands F1-1 and F1-2 | 0 / 0 / 0 / 0 | | 0-59 | minutes |
| K4 | 1 | Start and end hour for On-Off time band F2 | 14 / 21 | | 0-23 | hours |
| K4 | 2 | Start and end minutes for On-Off time band F2 | 0 / 0 | | 0-59 | minutes |
| K5 | 1 | Select On-Off time bands (F1,F2,F3,F4) for each day | F3 | | F1-F2-F3-F4 | |
| K6 | 1 | Start hour temperature bands 1 and 2 | 0 / 6 | | 0-23 | hours |
| K6 | 2 | Start minutes temperature bands 1 and 2 | 0 / 0 | | 0-59 | minutes |
| K6 | 3 | Set point temperature bands 1 and 2 | 23.0 / 23.0 | | see P1 | °C / °F |
| K7 | 1 | Start hour temperature bands 3 and 4 | 12 / 18 | | 0-23 | hours |
| K7 | 2 | Start minutes temperature bands 3 and 4 | 0 / 0 | | 0-59 | minutes |
| K7 | 3 | Set point temperature bands 3 and 4 | 23.0 / 23.0 | | see P1 | °C / °F |
| K8 | 1 | Start hour humidity bands 1 and 2 | 0 / 6 | | 0-23 | hours |
| K8 | 2 | Start minutes humidity bands 1 and 2 | 0 / 0 | | 0-59 | minutes |
| K8 | 3 | Set point humidity bands 1 and 2 | 50.0 / 50.0 | | see P2 | %RH |
| K9 | 1 | Start hour humidity bands 3 and 4 | 12 / 18 | | 0-23 | hours |
| K9 | 2 | Start minutes humidity bands 3 and 4 | 0 / 0 | | 0-59 | minutes |
| K9 | 3 | Set point humidity bands 3 and 4 | 50.0 / 50.0 | | see P2 | %RH |
| Ka | 1 | Enter new Clock password | ---- | | | |
| | | | | | | |
| | | Setpoint Menu | | | | |

| | | | | | | |
|-----|---|--|----------------------------------|--|--|---------|
| S1 | 1 | Temperature set point | 23.0 | | see P1 | °C / °F |
| S1 | 2 | Humidity set point | 50.0 | | see P2 | %RH |
| S2 | 1 | Emergency temperature set point for dual cooling | 28.0 | | see P1 | °C / °F |
| S3 | 1 | Air flow setpoint (AFC = air flow control) | 15000 | | 0-40000 | m³/h |
| | | User Menu | | | | |
| P0 | 1 | Enter user password | ---- | | 0-9999 | |
| P1 | 1 | Minimum and maximum temperature set point limits | 20.0 / 30.0 | | -999.9-999.9 | °C / °F |
| P2 | 1 | Minimum and maximum humidity set point limits | 40.0 / 60.0 | | 0.0-100.0 | %RH |
| P3 | 1 | Differential in Cooling and Heating | 3.0 / 3.0 | | 0.0-100.0 | °C / °F |
| P3 | 2 | Temperature dead zone | 0.5 | | 0.0-99.9 | °C / °F |
| P4 | 1 | Differential in Humidification and Dehumidification | 2.0 / 2.0 | | 0.0-99.9 | %RH |
| P4 | 2 | Dehumidification / Humidification dead zone | 0.5 | | 0.0-99.9 | %RH |
| P5 | 1 | Show language screen at start-up | No | | No-Yes | |
| P5 | 2 | Switch unit off from button | Yes | | No-Yes | |
| P5 | 3 | Enable remote On-Off digital input | Yes | | No-Yes | |
| P6 | 1 | Freecooling setpoint (delta T) | 3.0 | | 0-99.9 | °C / °F |
| P6 | 2 | Freecooling differential | 2.0 | | 0-99.9 | °C / °F |
| P7 | 1 | Freecooling restart config.(with G0-1=no): setpoint (delta T) | 10.0 | | 0-99.9 | °C / °F |
| P7 | 2 | Freecooling restart config.(with G0-1=no): differential | 4.0 | | 0-99.9 | °C / °F |
| P8 | 1 | Enable compensation function | No | | No-Yes | |
| P8 | 2 | Outside air compensation set point | 25.0 | | -999.9-999.9 | °C / °F |
| P8 | 3 | Outside air compensation differential | 3.0 | | -999.9-999.9 | °C / °F |
| P8 | 4 | Offset maximum of compensation of the set of temperature | 2.0 | | -999.9-999.9 | °C / °F |
| P9 | 1 | High and low room temperature alarms offset respect the setpoint | 10.0 / 10.0 | | -999.9-999.9 | °C / °F |
| Pa | 1 | High and low room humidity alarms offset respect the setpoint | 20.0 / 30.0 | | 0-100.0 | %RH |
| Pb | 1 | Enable supply limit function | No | | No-Yes | |
| Pb | 2 | Supply air set point for the limitation function | 15.0 | | -999.9-999.9 | °C / °F |
| Pb | 3 | Supply air differential for the limitation function | 5.0 | | -999.9-999.9 | °C / °F |
| Pc | 1 | Assign type of alarm Serious/Not serious AL01-AL20 | SSSSS SNNNS NNNNN NNNNN | | N-S | |
| Pd | 1 | Assign type of alarm Serious/Not serious AL21-AL40 | NNNNN NNNNN SSSNS NSNNS | | N-S | |
| Pe | 1 | Assign type of alarm Serious/Not serious AL41-AL60 | NNNNN NNNNN NNNNN NNNNN | | N-S | |
| Pf | 1 | Assign type of alarm Serious/Not serious AL61-AL80 | NNNNN NNNNN NNSNN NNNNN | | N-S | |
| Pg | 1 | Configuration of digital output 4 | Not used | | Not used, AL0...AL80, Not Serious al., Serious al., General al. | |
| Pg | 2 | Configuration of digital output 5 | Not used | | Not used, AL0...AL80, Not Serious al., Serious al., General al. | |
| Ph | 1 | Configuration of digital output 6 | Not used | | Not used, AL0...AL80, Not Serious al., Serious al., General al. | |
| Ph | 2 | Configuration of digital output 8 | General alarm | | Not used, AL0...AL80, Not Serious al., Serious al., General al. | |
| Ph1 | 1 | Configurable digital outputs (NO4-NO5-NO6-NO8) logic type | N.O. | | N.O. - N.C. | |
| Ph2 | 1 | Power failure alarm reset type | AUTO | | AUTO - MAN | |

| | | | | | | |
|----|---|---|---|--|--|---------|
| Pi | 1 | Board identification number for supervisory network | 1 | | 0-200 | |
| Pi | 2 | Board communication speed for supervisory network | 1200 | | 1200-19200 | Bps |
| Pi | 3 | Serial communication protocol | Carel | | Carel, Modbus, Lon, RS232, Gsm | |
| Pj | 1 | Number of rings for GSM modem | 0 | | 0-9 | |
| Pj | 2 | Enter mobile number with GSM modem | 0 | | 0...9,#,*,@,^ | |
| Pj | 3 | GSM modem password | 0 | | 0-9999 | |
| Pj | 1 | Max. telephone numbers with analogue modem | 0 | | 0-9 | |
| Pj | 2 | Telephone book number with analogue modem | 0 | | 0-Pg 1 | |
| Pj | 3 | Enter telephone number with analogue modem | - | | 0...9,#,*,@,^ | |
| Pj | 4 | Modem password | 0 | | 0-9999 | |
| Pk | 1 | Number of rings for analogue modem | 0 | | 0-9 | |
| Pk | 2 | Type of analogue modem | Tone | | Tone-Pulse | |
| Pl | 1 | Enter new user password | ---- | | 0-9999 | |
| | | | | | | |
| | | Manufacturer -> Configuration | | | | |
| C0 | 1 | Enable BMS | No | | No-Yes | |
| C0 | 2 | Enable printer | No | | No-Yes | |
| C0 | 3 | Select unit of measure for temperature probes and parameters | °C | | °C-°F | |
| C1 | 1 | Select refrigerant | R407C | | R22, R134a, R404a, R407C, R410A | |
| C2 | 1 | Number of compressors | 1 | | 1-2 | |
| C2 | 2 | Number of heaters | 0 | | 0-1-2-Binary | |
| C3 | 1 | Digital input 6 configuration | Al. Fire/Smoke | | Al. Fire/Smoke, Al.water flood, Human comfort switch | |
| C3 | 2 | Switch off unit with the alarm (with C3-1=Al. Fire/Smoke or Al.water flood) | Yes | | No-Yes | |
| C3 | 3 | Input type (with C3-1=Human comfort switch) | N.C. | | N.C. - N.O. | |
| C4 | 1 | Enable condensation function | No | | No-Yes | |
| C4 | 2 | Type of condenser | Single | | Single-Separat. | |
| C4 | 3 | Condensing output type | Inverter | | Inverter-Steps | |
| C4 | 4 | Select number of condensing fans | 1 | | 1-2 | |
| C5 | 1 | Logic of the dehumidification contact | NO | | NO-NC | |
| C5 | 2 | Number of compressors enabled for dehumidification | 0 | | 0-2 | |
| C7 | 1 | Enable humidity probe | No | | No-Yes | |
| C7 | 2 | Minimum and maximum value measured by the humidity probe | 10.0 / 90.0 | | 0-100.0 | %RH |
| C8 | 1 | Enable pressure probe 1 | No | | No-Yes | |
| C8 | 2 | Type of signal pressure probe 1 | Current | | 0-5V, 4-20mA | |
| C8 | 3 | Minimum and maximum value pressure probe 1 | 0.0 / 30.0 | | -20.0 - 50.0 | Bar |
| C9 | 1 | Enable pressure probe 2 | No | | No-Yes | |
| C9 | 2 | Type of signal pressure probe 2 | Current | | 0-5V, 4-20mA | |
| C9 | 3 | Minimum and maximum value pressure probe 2 | 0.0 / 30.0 | | -20.0 - 50.0 | Bar |
| Ca | 1 | Room temperature probe type | NTC | | NTC-PT1000 | |
| Ca | 2 | Supply air temperature probe enable | Yes | | No-Yes | |
| Ca | 3 | Supply air temperature probe type | NTC | | NTC-PT1000 | |
| Cb | 1 | External air temperature probe enable | No | | No-Yes | |
| Cb | 2 | External air temperature probe type | NTC | | NTC-PT1000 | |
| Cc | 1 | LAN unit configuration Unit 1 (U1) | Present/No rotat. | | Present/Rotation, Present/No rotat., Not present | |
| Cc | 2 | LAN unit configuration Unit 2 - 3 (U2 - U3) | Not present Not present | | Present/Rotation, Present/No rotat., Not present | |
| Cd | 1 | LAN unit configuration Unit 4 - 5 - 6 (U4 - U5 - U6) | Not present Not present Not present | | Present/Rotation, Present/No rotat., Not present | |
| Ce | 1 | LAN unit configuration Unit 7 - 8 (U7 - U8) | Not present Not present | | Present/Rotation, Present/No rotat., Not present | |
| Cf | 1 | Enable expansion card | No | | No-Yes | |
| Cf | 2 | Enable expansion card alarm | No | | No-Yes | |
| Cf | 3 | Expansion card alarm delay | 120 | | 0-999 | Seconds |

| | | | | | | |
|-----|---|---|------------|--|---|----------|
| Cg | 1 | Freecooling system enable | No | | No-Yes | |
| Cg | 2 | Freecooling damper running time | 60 | | 0-999 | Seconds |
| Ch | 1 | Enable air flow control (AFC = Air Flow Control) | No | | No-Yes | |
| Ch | 2 | Main fan number | 1 | | No-Yes | |
| Ch | 3 | Main fan type | R3G500 | | R4E310 - R4E355 - R3G450 - R3G500 - R3G560 - R3G630 | |
| Ci | 1 | Differential pressure probe config. min. input | 3200 | | 0-32767 | |
| Ci | 2 | Differential pressure probe config. max. input | 16000 | | 0-32767 | |
| Ci | 3 | Differential pressure probe config. min. output | 0 | | 0-32767 | |
| Ci | 4 | Differential pressure probe config. max. output | 10000 | | 0-32767 | |
| Cj | 1 | Enable inverter presence | No | | No-Yes | |
| Ck | 1 | Enable manual procedure (activated in maintenance menu) | No | | No-Yes | |
| Cl | 1 | Enable UPS power supply | No | | No-Yes | |
| | | Manufacturer -> Parameters | | | | |
| G0 | 1 | Enable compressors together with freecooling damper | No | | No-Yes | |
| G1 | 1 | Enable FIFO compressor rotation | Yes | | No-Yes | |
| G1 | 2 | Temperature regulation type | Prop. | | Prop. - P+I | |
| G6 | 1 | Starting and end point to open modulating damper-valve in freecooling | 0.0 / 50.0 | | 0.0-100.0 | % |
| G7 | 1 | Minimum and maximum main fan speed | 7.0 / 7.0 | | 0.0-10.0 | Volt |
| G7 | 2 | Main fan speed during dehumidification / alarm with AFC | 7.0 | | 0.0-10.0 | Volt |
| G9 | 1 | Temperature differential to stop dehumidification | 5.0 | | 0-99.9 | °C / °F |
| G9 | 2 | Temperature offset to restart dehumidification | 4.0 | | 0-99.9 | °C / °F |
| Gd | 1 | High pressure alarm set point | 26.5 | | -99.9 - 99.9 | Bar |
| Gd | 2 | High pressure alarm differential | 1.0 | | -99.9 - 99.9 | Bar |
| Ge | 1 | Condensing pressure set point | 15.0 | | -99.9 - 99.9 | Bar |
| Ge | 2 | Condensing pressure differential | 5.0 | | -99.9 - 99.9 | Bar |
| Ge | 3 | Modulating condensing fan speed-up time | 2 | | 0-999 | Seconds |
| Gg | 1 | Maximum mod. cond. fan speed | 8.0 | | 0-10,0 | Volt |
| Gg | 2 | Minimum mod. cond. fan speed | 2.0 | | 0-10,0 | Volt |
| Gh | 1 | Enable high pressure alarm Prevent function | Yes | | No-Yes | |
| Gh | 2 | Prevent function set point (pressure) | 20.0 | | -99.9 - 99.9 | Bar |
| Gh | 3 | Prevent function differential (pressure) | 2.0 | | -99.9 - 99.9 | Bar |
| Gi2 | 1 | Overpressure function enable | No | | No-Yes | |
| Gi2 | 2 | Overpressure function fan speed | 2.0 | | 0-10.0 | Volt |
| Gj | 1 | Enable Master Control function | No | | No-Yes | |
| Gk | 1 | Rotation mode for units in pLAN network | Automatic | | Automatic, Timezones, Running hours | |
| Gk | 2 | Number of units set in Standby mode | 0 | | 0-Number of unit in Present/Rotat. mode | |
| Gk | 3 | Stand-by units step in Standby mode | 1 | | 1-2 | |
| Gk | 4 | Automatic rotation period for units in pLAN | 24 | | 1-240 | Hours |
| Gl | 1 | Timezones rotation hour for units in pLAN network | 22 | | 0-23 | Hours |
| Gl | 2 | Timezones rotation minutes for units in pLAN network | 0 | | 0-59 | Minutes |
| Gl | 3 | Interval in days for timezones rotation in pLAN network | 3 | | 1-7 | Days |
| Gm | 1 | Enable Force units by temperature in pLAN network | No | | No-Yes | |
| Gm | 2 | Forcing delay for low and high ambient temperature | 3 / 3 | | 0-999 | Minutes |
| Gn | 1 | Low ambient temp. diff. for forcing units in network | 8 | | 0-99.9 | °C / °F |
| Gn | 2 | Low ambient temp. offset for forcing units in network | 4 | | 0-99.9 | °C / °F |
| Go | 1 | High room temp. diff. for forcing units in network | 8 | | 0-99.9 | °C / °F |
| Go | 2 | High room temp. offset for forcing units in network | 4 | | 0-99.9 | °C / °F |
| Gw | 1 | Air flow control PID: proportional | 2000 | | 0-32767 | |
| Gw | 2 | Air flow control PID: integral time | 60 | | 0-32767 | Seconds |
| Gw | 3 | Air flow control PID: derivative time | 0 | | 0-200 | Seconds |
| Gx | 1 | Air flow control PID: input selection | FILTERED | | MEDIUM-FILTERED | |
| Gx | 2 | Air flow control PID: dead zone | 0 | | 0-1000 | |
| Gx | 3 | Air flow control PID: period | 1000 | | 0-10000 | Mseconds |
| Gy | 1 | Air flow control: PID filter enable | No | | No-Yes | |
| Gy | 2 | Air flow control: PID filter maximum step Q1 | 10 | | 1-100 | |
| Gy | 3 | Air flow control: PID filter minimum step Q1 | 1 | | 1-100 | |
| Gy | 4 | Air flow control: Fan out filter enable | Yes | | No-Yes | |

| | | | | | | |
|----|---|--|--------------|--|--------------|---------|
| Gy | 5 | Air flow control: Fan out maximum step Q1 | 10 | | 1-100 | |
| Gy | 6 | Air flow control: Fan out minimum step Q1 | 1 | | 1-100 | |
| Gz | 1 | Air flow control: Probe filter enable | Yes | | No-Yes | |
| Gz | 2 | Air flow control: Probe filter maximum step Q1 | 100 | | 1-100 | |
| Gz | 3 | Air flow control: Probe filter minimum step Q1 | 1 | | 1-100 | |
| Gz | 4 | Air flow control: Input average of probe | 5 | | 1-9 | |
| Gz | 5 | Air flow control: Set for change between Q1 and Q2 | 50 | | 0-20000 | |
| Gz | 6 | Air flow control: Differential for change between Q1 and Q2 | 20 | | 0-20000 | |
| H1 | 1 | Minimum frequency from inverter | 30.0 | | 0-999.9 | Hz |
| H1 | 2 | Maximum frequency from inverter | 110.0 | | 0-999.9 | Hz |
| H1 | 3 | Maximum frequency to inverter | 90.0 | | 0-999.9 | % |
| H2 | 1 | Inverter config.: startup frequency | 45.0 | | 0-999.9 | Hz |
| H2 | 2 | Inverter config.: startup period | 60 | | 0-999 | Seconds |
| H3 | 1 | Enable automatic compressor oil drain fuction | Yes | | No-Yes | |
| H3 | 2 | Automatic compressor oil drain fuction: activation period | 5 | | 0-9999 | Minutes |
| H3 | 3 | Automatic compressor oil drain fuction: drain period | 10 | | 0-999 | Seconds |
| H4 | 1 | Inverter alarm enable | Yes | | No-Yes | |
| H4 | 2 | Inverter alarm logic type | N.O | | N.C.-N.O | |
| | | | | | | |
| | | Manufacturer -> Carel EXV driver | | | | |
| F0 | 1 | Number of drivers connected | 0 | | 0-2 | |
| F0 | 2 | Enable backup battery driver 1 | No | | No-Yes | |
| F0 | 3 | Enable backup battery driver 1 | No | | No-Yes | |
| F1 | 1 | Type of valve circuit 1 | Carel E2V**A | | 0-11 | |
| F1 | 2 | Superheating set point circuit 1 | 6.0 | | 2.0-50.0 | °C |
| F1 | 3 | Dead zone circuit 1 | 0 | | 0-9.9 | °C |
| F2 | 1 | Type valve circuit 2 | Carel E2V**A | | 0-11 | |
| F2 | 2 | Superheating set point circuit 2 | 6.0 | | 2.0-50.0 | °C |
| F2 | 3 | Dead zone circuit 2 | 0 | | 0-9.9 | °C |
| F3 | 1 | PID control – proportional gain circuit 1 | 2.5 | | 0.0-99.9 | |
| F3 | 2 | PID control – integration time circuit 1 | 30 | | 0-999 | Seconds |
| F3 | 3 | PID control – derivative time circuit 1 | 5.0 | | 0.0-99.9 | Seconds |
| F4 | 1 | PID control – proportional gain circuit 2 | 2.5 | | 0.0-99.9 | |
| F4 | 2 | PID control – integration time circuit 2 | 30 | | 0-999 | Seconds |
| F4 | 3 | PID control – derivative time circuit 2 | 5.0 | | 0.0-99.9 | Seconds |
| F5 | 1 | Threshold for low superheat protection circuit 1 | 4.0 | | -4.0 - 10.0 | °C |
| F5 | 2 | Prot. threshold integration time, low superheat circuit 1 | 1.0 | | 0-25.5 | Seconds |
| F6 | 1 | Threshold for low superheat protection circuit 2 | 4.0 | | -4.0 - 10.0 | °C |
| F6 | 2 | Prot. threshold integration time, low superheat circuit 2 | 1.0 | | 0-25.5 | Seconds |
| F7 | 1 | Percentage ratio between cooling capacity and Driver capacity C1 | 30 | | 0-100 | % |
| F7 | 2 | Percentage ratio between cooling capacity and Driver capacity C2 | 30 | | 0-100 | % |
| F8 | 1 | LOP threshold | -40.0 | | -70.0 - 50.0 | °C |
| F8 | 2 | LOP threshold integration time | 4.0 | | 0-25.5 | Seconds |
| F9 | 1 | MOP start delay | 30 | | 0-500 | Seconds |
| F9 | 2 | MOP threshold | 16.0 | | -50.0 - 99.9 | °C |
| F9 | 3 | MOP threshold integration time | 4.0 | | 0-25.5 | Seconds |
| Fa | 1 | High condensing temp. protection threshold | 63.0 | | 0-99.9 | °C |
| Fa | 2 | Integration time for high condensing temp. threshold | 4.0 | | 0-25.5 | Seconds |
| Fb | 1 | High suction temperature threshold | 30.0 | | 0-100.0 | °C |
| Fc | 1 | Custom Valve: minimum steps | 0 | | 0-8100 | |
| Fc | 2 | Custom Valve: maximum steps | 1600 | | 0-8100 | |
| Fd | 1 | Custom Valve: closing steps | 3600 | | 0-8100 | |
| Fd | 2 | Custom Valve: return steps | 0 | | 0-8100 | |
| Fe | 1 | Custom Valve: enable extra step in opening | No | | No-Yes | |
| Fe | 2 | Custom Valve: enable extra step in closing | No | | No-Yes | |
| Ff | 1 | Custom Valve: operating current | 250 | | 0-1000 | mA |
| Ff | 2 | Custom Valve: holding current | 100 | | 0-1000 | mA |
| Fg | 1 | Custom Valve: frequency | 100 | | 32-330 | Hertz |
| Fg | 2 | Custom Valve: duty cycle | 50 | | 0-100 | % |
| Fh | 1 | Minimum evaporation pressure probe value | 0.0 | | -9.9 - 10.0 | Bar |
| Fh | 2 | Maximum evaporation pressure probe value | 30.0 | | 3.5 - 40.0 | Bar |

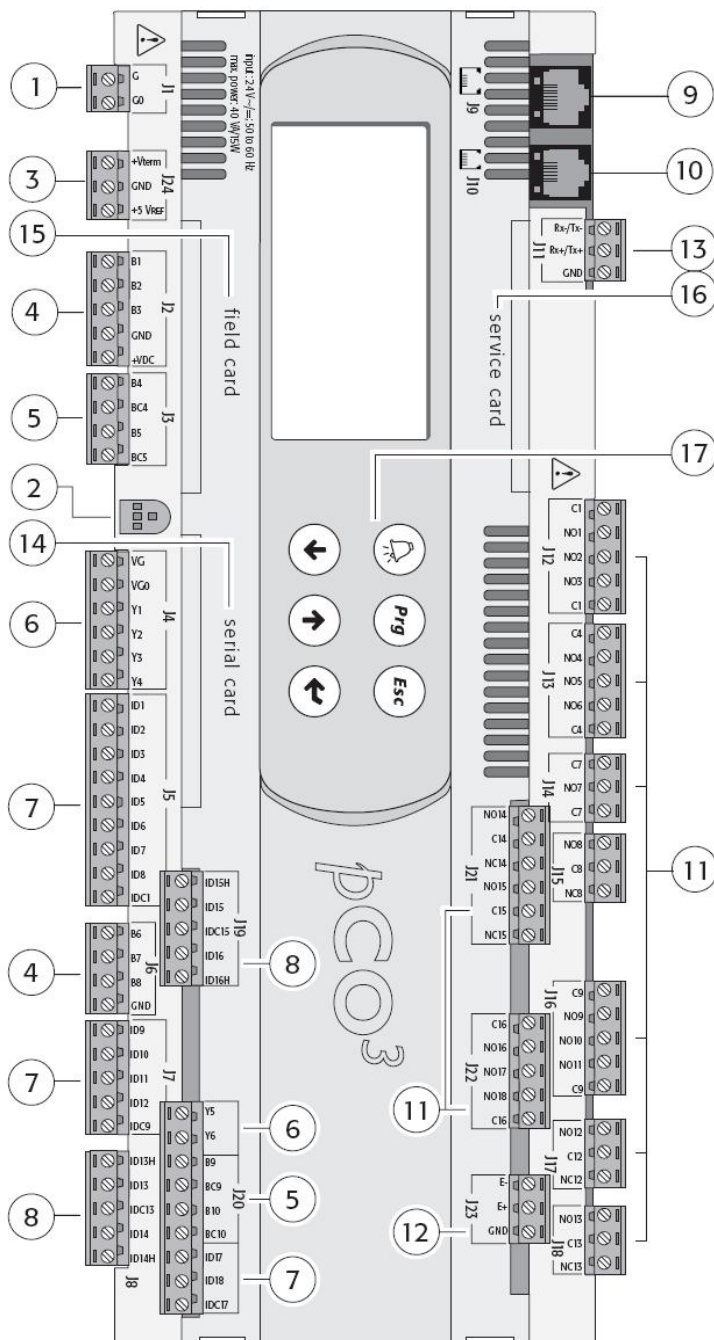
| | | | | | |
|--|---|---|---------|--------|---------|
| Fi | 1 | Low superheating alarm delay | 0 | 0-3600 | Seconds |
| Fi | 2 | High suction temperature alarm delay | 0 | 0-3600 | Seconds |
| Fj | 1 | LOP alarm delay | 0 | 0-3600 | Seconds |
| Fj | 2 | MOP alarm delay | 0 | 0-3600 | Seconds |
| Manufacturer -> Timing | | | | | |
| T0 | 1 | Supply fan start and stop delay | 10 / 20 | 0-999 | Seconds |
| T0b | 1 | Delay time among fan digital and analog output | 0 | 0-999 | Seconds |
| T1 | 1 | Integration time for P+I temperature control | 600 | 0-999 | Seconds |
| T2 | 1 | Low pressure alarm delay: at startup | 180 | 0-999 | Seconds |
| T2 | 2 | Low pressure alarm delay: running | 60 | 0-999 | Seconds |
| T2 | 3 | High-low temperature-humidity alarm delays | 600 | 0-9999 | Seconds |
| T3 | 1 | Serious alarm activation delay | 0 | 0-9999 | Seconds |
| T3 | 2 | Not serious alarm activation delay | 0 | 0-9999 | Seconds |
| T4 | 1 | Air flow switch alarm delay | 20 | 0-9999 | Seconds |
| T5 | 1 | Minimum compressor off time | 180 | 0-9999 | Seconds |
| T5 | 2 | Minimum compressor on time | 60 | 0-9999 | Seconds |
| T6 | 1 | Delay between compressor starts | 360 | 0-9999 | Seconds |
| T6 | 2 | Minimum delay between starts of different compressors | 10 | 0-999 | Seconds |
| T8 | 1 | Heater start among electrical heaters | 3 | 0-9999 | Seconds |
| T9 | 1 | Start delay between fan and other devices | 0 | 0-999 | Seconds |
| Tb | 1 | Start Inverter alarm delay | 20 | 0-999 | Seconds |
| Tb | 2 | Running Inverter alarm delay | 20 | 0-999 | Seconds |
| Manufacturer -> Initialization | | | | | |
| V0 | 1 | Enter password to install the default values | ---- | 0-9999 | |
| V1 | 1 | Set to Yes to erase the alarm history | No | No-Yes | |
| V2 | 1 | Enter new manufacturer password | ---- | 0-9999 | |

8 ARCHITECTURE OF THE CONTROL SYSTEM

a. Microprocessor layout

Connector description

1. power supply connector [G (+), G0 (-)];
2. yellow power LED and 3 LEDs for the pLAN networks;
3. additional power supply (max. 200 mA) for the terminal and 0 to 5 V ratiometric probes;
4. universal NTC, 0 to 1 V, 0 to 5 V ratiometric, 0 to 10 V, 0 to 20 mA, 4 to 20 mA analogue inputs;
5. passive NTC, PT1000, ON/OFF analogue inputs;
6. 0 to 10 V analogue outputs;
7. 24 Vac/Vdc digital inputs;
8. 230 Vac or 24 Vac/Vdc digital inputs;
9. connector for terminal display (external panel with direct signals);
10. connector for all the standard pCO series terminals and for downloading the application software;
11. digital relay outputs;
12. connector for the I/O board expansion;
13. pLAN connector;
14. cover for inserting the optional supervisor serial board;
15. cover for inserting the optional field board;
16. cover for inserting the optional service board;
17. Built-In terminal (LCD, buttons and LEDs).



b. Input / Output list

The small version of the pCO3 boards allow managing the main devices of the telecom units. In some cases is necessary to add an expansion board (pCOE) with the following input / output list:

- **Hardware:** pCO3 small



| Conn. | Label | Signal | Description |
|-----------------------|-------|---------------|---|
| Analog Input | | | |
| J2 | B1 | 4-20mA / 0-5V | Condensing pressure sensor (4-20mA with current sensor or 0-5V with raziometric sensor) |
| | B2 | 4-20mA | Air flow sensor [with Air flow control option] |
| | B3 | NTC | Room temperature sensor |
| J3 | B4 | NTC | Outlet temperature sensor |
| | B5 | NTC | External temperature sensor [with Freecooling option] |
| Analog Output | | | |
| J4 | Y1 | 0-10 Vdc | Evaporating fan speed |
| | Y2 | 0-10 Vdc | Condensing fan speed |
| | Y3 | 0-10 Vdc | Freecooling damper [with freecooling option] |
| | Y4 | 0-10 Vdc | Inverter control [with inverter option] |
| Digital Input | | | |
| J5 | ID1 | - | High pressure alarm |
| | ID2 | - | Low pressure alarm |
| | ID3 | - | Air flow alarm |
| | ID4 | - | Dirty filter alarm |
| | ID5 | - | No power - phase sequence alarm |
| | ID6 | - | Fire-smoke alarm / Flooding alarm / Human comfort switch (set by parameter) |
| | ID7 | - | Electrical heater overload alarm |
| | ID8 | - | Remote On-Off |
| Digital Output | | | |
| J12 | NO1 | - | Compressor On-Off |
| | NO2 | - | Condensing fan On-Off |
| | NO3 | - | Electrical heater On-Off |
| J13 | NO4 | - | Configurable digital output (set by parameter) |
| | NO5 | - | Configurable digital output (set by parameter) |
| | NO6 | - | Configurable digital output (set by parameter) |
| J14 | NO7 | - | Evaporating fan On-Off |
| J15 | NO8 | - | General alarm (set by parameter) |

- Hardware: pCOE TLAN address = 3



| Conn. | Label | Signal | Description |
|-----------------------|-------|--------|--|
| Analog Input | | | |
| J9 | B1 | 4-20mA | Room humidity sensor [with dehumidification option] |
| | B2 | 4-20mA | Condensing pressure 2 sensor (4-20mA with current sensor) [with 2 circuits option] |
| J10 | B3 | 0-5V | Inverter frequency input [with inverter option] |
| | B4 | 0-5V | Condensing pressure 2 sensor (0-5V with raziometric sensor) [with 2 circuits option] |
| Digital Input | | | |
| J4 | ID1 | - | Inverter alarm [with inverter option] |
| | ID2 | - | Electrical heater 2 overload alarm [with 2 electrical heaters option] |
| | ID3 | - | High pressure alarm circuit 2 [with 2 circuits option] |
| | ID4 | - | Low pressure alarm circuit 2 [with 2 circuits option] |
| Analog Output | | | |
| J2 | Y1 | 0-10 V | Condensing fan speed circuit 2 [with 2 circuits option] |
| Digital Output | | | |
| J5 | NO1 | - | Dehumidification On-Off [with dehumidification option] |
| | C1 | - | |
| | NC1 | - | |
| J6 | NO2 | - | Compressor 2 On-Off [with 2 circuits option] |
| | C2 | - | |
| | NC2 | - | |
| J7 | NO3 | - | Electrical heater 2 On-Off [with 2 electrical heaters option] |
| | C3 | - | |
| | NC3 | - | |
| J8 | NO4 | - | Compressor oil drain [with inverter option] |
| | C4 | - | |
| | NC4 | - | |

c. Accessories

I. Electronic expansion valve

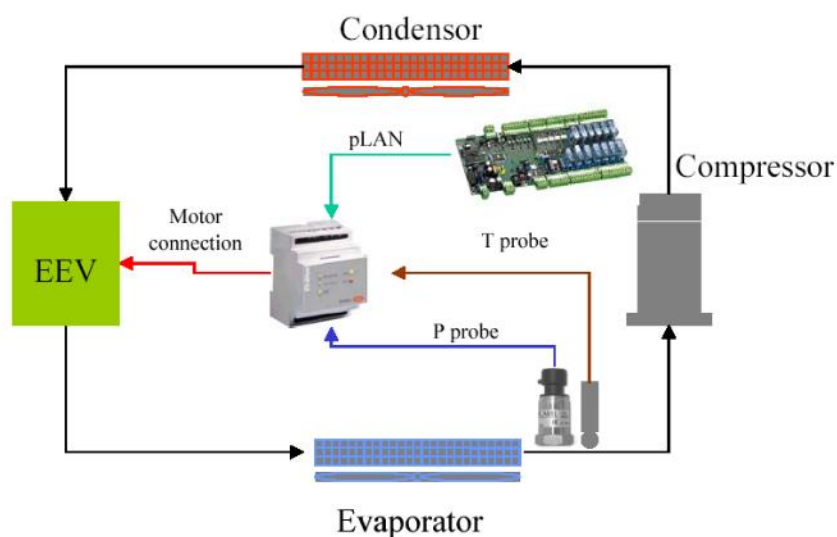
The EVDriver module for the control of the electronic expansion valves (EEV) for LAN network allows the inlet overheating control for amore efficient and versatile operation of the refrigerating unit.

Efficient because the optimisation and the stabilization of the refrigerant flow to the evaporator increase the performance of the installation assuring at the same time the safety (less activations of the low pressure switch, less backflows of the refrigerant to the compressor,...).

Moreover, if the EEV has been properly dimensioned, using the floating or low setpoint condensation (and evaporation) pressure increase remarkably the efficiency of the installation allowing less energy consumption and a better refrigerating yield.

Versatile because using the electronic expansion valve implies the possibility to manage refrigerating units with very different capacities and in different operating conditions.

The use of the electronic expansion valve implies the installation not only of the EVDriver or the expansion valve themselves, but also of a temperature sensor and a pressure transducer, both of them placed at the end of the evaporator on the refrigerant side (on the compressor inlet pipe). Refer to the following diagram for a better understanding of the typical installation layout.



The base principle of the new control algorithm aims at the installation stability combined with, when possible, a quick achievement of the overheating steady state.

In this sense, the priorities to be considered for an optimum control of the refrigerating installation are a high and constant refrigerating yield rather than an extremely low and stable overheating.

The heart of the control is a PID controller that features coefficients that can be set for the overheating.

The additional controls are:

- LOW (Low overheating with integral time and adjustable threshold)
- LOP (Low evaporation pressure, operating actually only on transients, with integral time and adjustable threshold)
- MOP (High evaporation pressure, with integral time and adjustable threshold)
- HiTcond (High condensation pressure that can be activated only by condensation pressure probe read by pCO, with integral time and adjustable threshold).

In the parameter table, the control parameters, with the thresholds and the default values, are described.

9 LAN CONNECTION

A maximum number of 8 units can be connected in lan to manage the following functions as well:

- automatic time or event rotation among
- control of temperature and humidity of the connected units, taking the probes of unit no. 1 as a reference
- use of only one LCD display for controlling the connected units

a. Description

The connection of pCO3 boards in LAN network allows for the following functions:

1. balancing air-conditioning units working hours by spare units (in stand-by mode) rotation.
2. spare units start-up in case other units stop due to serious alarms or black-out.
3. spare units start-up to compensate for the excessive thermal load.
4. controlling up to 8 air-conditioning units by a single external LCD display.
5. operation of all air-conditioning units according to Master air-conditioning unit probes to adjust units operation.
6. managing alarms printing and probes values by shared external display.

Connection in LAN network allows configuring a wide range of systems. The following list includes the main system types to be possibly created, in order of complexity, and provides suggestions for executing connections:

1. one or more independent air-conditioning units (board(s) with LAN address 1 + external display(s), if any, with LAN address 25);
2. two or more air-conditioning units and one external display (boards with LAN addresses 1-8 connected with Rs485 via J11, display with LAN address 32 connected with one of the boards); this connection allows for the functions listed in the previous paragraph;
3. two or more air-conditioning units in LAN network, each provided with private display (boards with LAN addresses 1-8 connected with Rs485 via J11, displays with LAN addresses 25-32 connected with the relevant board); this connection allows for the functions listed in the previous paragraph.

Networks in which boards are connected with the LAN allow selecting the units involved in the Rotation functions, thus obtaining a mixed network with interacting and independent units.

LAN connection among the boards allows using a shared external display (add. 32) in addition to the boards private displays; this solution is adopted where private displays are assembled on the air-conditioning units and the shared display is installed inside a room.

IMPORTANT: if only one board is being used, it must have LAN address 1; no LAN electric connection is required and the external display, if any, must have LAN address 25.

b. Automatic start and stand-by units

The boards connected with LAN network may be managed directly by the program under “critical situations”, that is in case of failure (alarms, black-out...) or due to “Rotation” and “Forcing” functions.

The program acts based on some parameters that can be displayed and modified on the board with LAN address 1:

- Boards mode operation: Not present, Present/No Rotation, Present/Rotation. These are 8 parameters, one for each board. Not present: unit not connected. Present/No Rotation: unit physically connected with LAN network but not involved in the rotation function (however, unit can manage the shared display, printing and Master Control function). Present/Rotation: unit involved in Rotation too.
- Number of units in stand-by mode: this parameter establishes the number of units, among the ones selected in Present/Rotation mode, that must be set to stand-by mode (turned off, waiting for enabling) when starting the unit by button. The parameter is automatically included between 0 and the total number of Present/Rotation units minus one, to ensure start-up of at least one unit.

IMPORTANT. The following functions cannot be executed if:

- at least two units selected in Present/controlled mode are not present
- the stand-by units set number is 0

The board with LAN address 1 provides for functions management; if the board is disconnected from LAN network or it shuts down due to a black-out, the stand-by boards enable and the functions will be suspended until unit 1 is reset. On the contrary, unit 1 stop by On-off or remote On-off button does not interrupt network functions execution.

I. Critical situations

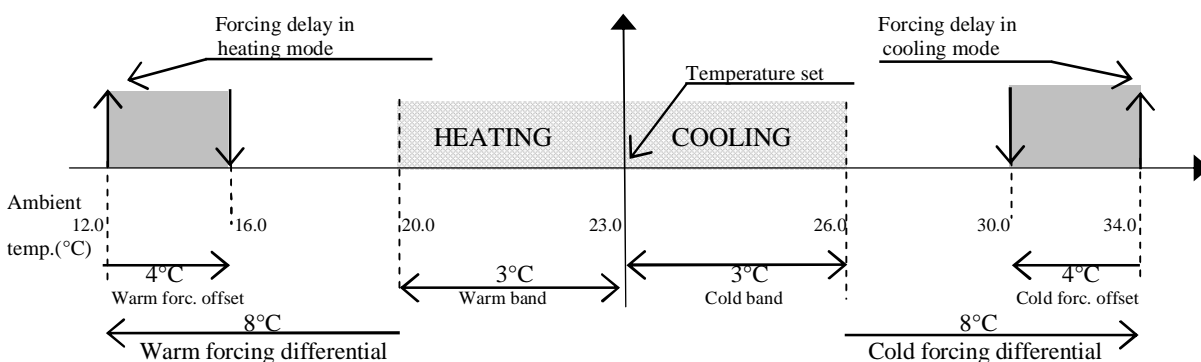
Units in Present/Rotation and stand-by modes are enabled in any of the following critical situations concerning the running boards:

- one of the boards has power cut off (black-out).
- one of the boards signals a Serious alarm that enables alarm relay no. 8 (each alarm can be programmed as serious or non-serious).
- one of the boards disconnects from LAN network due to Rs485 line disconnection.
- one of the boards is shut down by button or remote On-off digital input.
- one of the boards is shut down due to a serious alarm (refer to alarms table).

In case a running unit is involved in any of the listed situations, a stand-by board is automatically enabled to reset the number of running units. If, for example, two running units break or disconnect, the program enables two stand-by units; when one of the units under critical situation resets, it is started again and the spare unit returns to stand-by mode. If a critical situation involves the stand-by units, no LAN action occurs, with the exception of alarm signalling on the involved unit.

II. Forcing

Units in Present/Rotation and stand-by modes are enabled automatically in case a running unit does not reach the temperature set point for a certain time interval due to an excessive thermal load. Each unit running in such a situation can require enabling of a stand-by unit. The parameters to be set for forcing are Differential, Offset and Delay time, different for heating and cooling. The following diagram shows the forcing function:



III. Fixed-hour rotation

A system consisting of both running and stand-by units is subject to unbalance in the working hours, causing running units to age faster than stand-by ones. To obviate this problem, LAN network can provide for units rotation, favouring balancing in the working hours. In practice, rotation sets a running unit to stand-by mode and starts a stand-by unit.

The fixed-hour rotation is based on a parameter establishing the rotations time interval. The programmable minimum time is 0h; in this case, automatic rotation enables every 5 minutes as a test. The maximum time is 240h (10 days). Time is counted from start-up of the unit with LAN address 1 that manages rotation. Rotation can be executed following the LAN addresses logic or the units working hours.

Selecting the addresses logic, the unit with highest address (among the running ones) switches from on to stand-by mode, whereas the unit with lowest address switches from stand-by mode to on.

Selecting the working hours logic, the unit with highest working hours (among the running ones) switches from on to stand-by mode, whereas the unit with lowest working hours switches from stand-by mode to on.

IV. Fixed-day rotation

The clock card (optional) allows setting the hour and the days interval (max. 7) for units rotation. Logic is the same as the fixed-hour rotation, but in this case the rotation interval can be programmed for a determined day and hour.

V. Rotation based on working hours

This type of rotation involves the units with highest and lowest working hours, switching the former to stand-by mode and the latter to On mode. The reference working hours for this type of rotation are the same as the outlet fan ones; due to practical reasons, they can be modified in screens E6 and E7 of branch Maintenance.

c. Master control

The “master” unit temperature and humidity probes must be located in an “intermediate” position inside the controlled environment. The “master” unit drives the logic to be adopted from all connected units. That’s important to avoid situations like units in dehumidification and units in humidification at the same time and in the same environment. The “Master” unit modifies the working logic in case the measured temperature or humidity exceed the set point, even by few decimal points. In case of black-out or “master” unit disconnection from LAN network, the connected units start functioning independently based on the their own probes only.

The units connected with LAN network and in Present/... mode follow the working logic of the unit with LAN address 1, functioning as a “driver” unit so that the system can work with the same logic. This precaution prevents units from having opposite logic, something that may occur in wide environments with different temperatures or humidity areas. In such environments, each unit could follow the indications of the relevant probe, causing the uncontrolled start of humidification, dehumidification, heating or cooling. This would nullify their effect and cause energy waste.

WARNING: the “driver” unit temperature and humidity probes must be located in an “intermediate” position inside the controlled environment.

The “driver” unit sends the information concerning the logic to be adopted to the LAN network. Therefore, the network units found devices enabling on both reading of the relevant probes and “driver” unit order, so that devices can turn on in case the two factors coincide.

The “driver” unit modifies the working logic in case the measured temperature or humidity exceed the set point, even by few decimal points.

In case of black-out or “driver” unit disconnection from LAN network, the network units start functioning independently again based on the relevant probes only.

10 SUPERVISION

pCO3 can be connected with a local or remote supervisory PC, a GSM or traditional modem and the most spread BMS (Modbus, Bacnet, Lonworks). To be used, the listed functions require the installation of optional cards (RS485, RS232, LON) or Gateways (devices able to interpret different communication protocols).

a. Main parameters

The configuration of the supervision logic can be set from the *User menu* and involves defining:

- communication protocol
- communication speed
- serial address of the unit

You can select from among the following Communication Protocols:

- Carel RS485 (Local Supervisor Protocol for communication with Carel supervision systems)
- Modbus
- LonWorks
- RS232 (analog modem)
- GSM (GSM modem)

Communication Speed (baud rate)

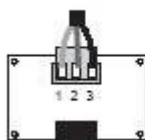
- 1200 baud
- 2400 baud
- 4800 baud (only speed possible with LonWorks network)
- 9600 baud
- 19200 baud

Address of peripheral unit in the network

- 1..200

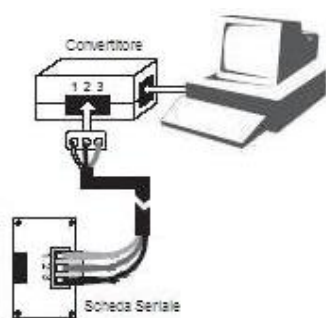
b. Connection with CAREL / MODBus protocol

The connection for supervision with the Carel or Modbus protocol is achieved via an RS485 serial card, available on request in the pCO controller

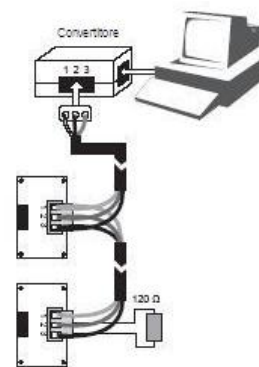


| pin | significato meaning |
|-----|------------------------|
| 1 | GND |
| 2 | RX+/TX+ |
| 3 | RX-/TX- |

In order to make a connection to the supervisor terminal, the unit must be connected to an RS485/RS232 converter (or similar device) using a suitable cable (2 wires + shield AWG22-24) and then from the converter to the computer itself.



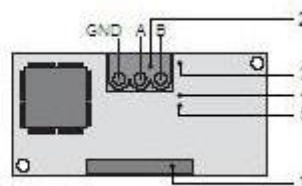
1 unit under supervision



2 or more units under supervision

c. Connection with LONWORKS protocol

A connection can be made to the LonWorks network using the connector with extractable terminals, provided on request on the circuit board as an alternative to the one used for the Carel and Modbus protocols:



- 1 connector for connection to pCO;
- 1. terminals for connection to LonWorks (GND, A, B);
- 2. service pin;
- 3. Green service LED;
- 4. Red fault warning LED.

To activate the service pin it is sufficient to short circuit the two pins for an instant using the tip of a screwdriver or similar means. Activation will be signalled by the lighting up of the service LED.

The service LED:

- signals the status of the node as per the LonWorks protocol;
- remains lit during activation of the service pin;
- remains lit for one second on receiving a WINK command from the network.

The fault warning LED signals the impossibility of connecting on the pCO side. If the red fault warning LED lights up, check whether the baud rate of the serial communication with the pCO is set on 4800.

The physical connection to the LonWorks network must be made as per LonWorks instructions and specifications.

d. GSM protocol

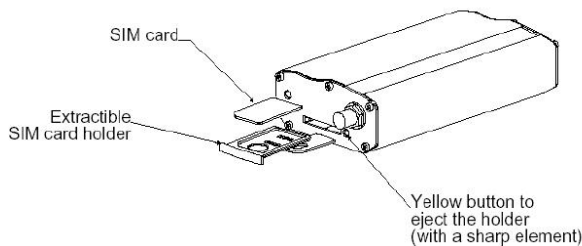
By selecting the GSM protocol, SMS (text) messages can be sent to and from GSM phones, using a GSM modem. The pCO3 sends a message to the phone in the event of alarms, and can receive messages from the telephone at any time; the user can in fact use a GSM phone to modify some of the unit's parameters, as listed below:

I. GSM modem: WAVECOM Fastrack



II. SIM card

- Disable the PIN request of your SIM card using a std. mobile phone.
- Delete all the messages which are present in the SMS memory.
- Insert the SIM card in the proper holder in the GSM Modem.



III. Protocol configuration

- Configure in the user menu
 - The GSM protocol
 - The baud rate set to 9600

IV. Receiving SMS

The GSM modem can send an SMS if there is an alarm in the unit. Is necessary to input the telephone number (only 1 number) which will be called. (screen Pg)

Example:

SMS text: Std Telecom V:TLC_01_02 T.025.1C ST.022.0Chum.48.0%SH.50.0%Alarm Unit:01Water under floor 20:30 01/03/05

Description of the SMS: At 20.30 on 01/03/05 is happen the Water flood alarm in the unit 01; the unit status is: Room temperature = 22.0°C, Room setpoint = 22.0°C, Room Humidity = 48.0%, Room Humidity setpoint = 50.0%. The software version installed is TLC_01_02.

V. Sending SMS

The messages sent must strictly comply with the following format:

.pCO2.PWD.Type1.Index1.Value1.....TypeN.IndexN.ValueN& with N<=11

where:

pCO2 = Message header.

PWD = Access password: this must be composed of 4 ASCII characters and coincide with the remote access password, set in the screen Pg. If the password is 0001, PWD will be '0001'.

Typei = Type of i-th variable to be set: it is represented by one of the following characters 'A', 'I' and 'D', respectively for Analog, Integer or Digital variable.

Indexi = Index of the i-th variable to be set: it must be composed of 3 consecutive digits '0'...'9'. If, for example, the variable index is 132, the Index will be '132'.

Valuei = Desired value to set the i-th variable to: this must be always be composed of 6 characters, where the first is the sign, and the others are composed the digits '0'...'9'. For example, if the variable value is 12, Value will be '000012' or '+00012'. If, on the contrary, the variable value is -243, Value will be '-00243'. As for the analog variables, the value sent is the actual variable value multiplied by 10. For example, the '-00243' value will correspond to -24,3. For the digital variables, the possible values are '000000' or '000001'.

N = represents the number of variables to be set with only one SMS message. The maximum number is 11, so as to avoid exceeding the threshold of 160 characters.

Warnings

- No spaces must be present in the SMS message.
- The message begins with a dot.
- The fields of the message are mutually separated by a dot.
- The message ends with the character '&', not preceded by a dot.

Examples

For resetting the digital variable with index 5 in a pCO2 with password = 1234, the SMS message must be as follows:

.pCO2.1234.D.005.000000&

To set the analog variable with index 1 to the value -22.4, the integer variable with index 123 to 15 and the digital variable with index 21 to the value 1 in just one SMS message, this must be as follows:

.pCO2.1234.A.001.-00224.I.123.000015.D.021.000001&

VI. Variable table

| Parameter | Unit 1 | Unit 2 | Unit 3 | Unit 4 | Unit 5 | Unit 6 | Unit 7 | Unit 8 |
|---|---------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Temperature set point | analogue 1 | analogue 10 | analogue 19 | analogue 28 | analogue 37 | analogue 46 | analogue 55 | analogue 64 |
| Humidity set point | analogue 2 | analogue 11 | analogue 20 | analogue 29 | analogue 38 | analogue 47 | analogue 56 | analogue 65 |
| Freecooling set point | analogue 3 | analogue 12 | analogue 21 | analogue 30 | analogue 39 | analogue 48 | analogue 57 | analogue 66 |
| Compensation set point | analogue 4 | analogue 13 | analogue 22 | analogue 31 | analogue 40 | analogue 49 | analogue 58 | analogue 67 |
| Low temperature alarm threshold offset | analogue 5 | analogue 14 | analogue 23 | analogue 32 | analogue 41 | analogue 50 | analogue 59 | analogue 68 |
| High temperature alarm threshold offset | analogue 6 | analogue 15 | analogue 24 | analogue 33 | analogue 42 | analogue 51 | analogue 60 | analogue 69 |
| Low humidity alarm threshold offset | analogue 7 | analogue 16 | analogue 25 | analogue 34 | analogue 43 | analogue 52 | analogue 61 | analogue 70 |
| High humidity threshold offset | analogue 8 | analogue 17 | analogue 26 | analogue 35 | analogue 44 | analogue 53 | analogue 62 | analogue 71 |
| Outlet air limit set point | analogue 9 | analogue 18 | analogue 27 | analogue 36 | analogue 45 | analogue 54 | analogue 63 | analogue 72 |
| Unit On-off | digital 1 | digital 2 | digital 3 | digital 4 | digital 5 | digital 6 | digital 7 | digital 8 |

N.B. When the GSM protocol is active, the remote supervisor cannot make a remote connection to the pCO3 board.



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