Application program for pCO¹ and pCO²

Standard air-conditioning units

Manual version 1.2 – April 11, 2003

Program code: FLSTDMCZ0E

LEGGI E CONSERVA QUESTE ISTRUZIONI

READ AND SAVE THESE INSTRUCTIONS

CAREL

Technology & Evolution

LEGGI E CONSERVA QUESTE ISTRUZIONI

READ AND SAVE THESE INSTRUCTIONS

To save time and money!

The thorough reading of this manual will ensure proper installation and safe use of the described device.

IMPORTANT WARNINGS

BEFORE INSTALLING OR HANDLING THE APPLIANCE, PLEASE CAREFULLY READ AND FOLLOW THE INSTRUCTIONS CONTAINED IN THIS MANUAL.

The appliance this software is intended for has been expressly designed to ensure safe operation, provided that:

- software is installed, programmed, used and maintained by qualified personnel in full observance of the instructions contained in this manual;
- all conditions specified and contained in the appliance installation and use manual are met.

Any other use and modification to the appliance not expressly authorised by the manufacturer shall be considered as improper.
Liability for injuries or damage caused by improper use lies exclusively with the user.

CONTENTS

1.0 GENERAL INFORMATION 3
1.1 THE PROGRAM 3
1.2 THE USER TERMINAL 3
1.3 pCO1 MAIN BOARD 5
1.4 pCO2 MAIN BOARD 6
1.5 ELECTRONIC EXPANSION VALVE 7
1.6 ACCESSORIES 8
2.0 BUILT-IN HUMIDIFIER 9
2.1 SETTING THE PARAMETERS TO SELECT THE HUMIDIFIER 9
2.3 HUMIDITY AND STEAM PRODUCTION CONTROL 10
3.0 BOARD CONNECTION MANAGEMENT (pLAN) 11
3.1 pLAN PHYSICAL CONNECTIONS 11
3.2 SETTING THE pLAN ADDRESS 11
3.3 HOW TO ASSIGN THE ADDRESSES 11
3.4 pLAN STATUS 12
3.5 CHECK pLAN ADDRESS 12
4.0 FIRST INSTALLATION AND SOFTWARE UPDATING 13
4.1 PROGRAM DOWNLOAD FROM HARDWARE KEY 13
4.2 PROGRAM DOWNLOAD FROM COMPUTER 13
4.3 INSTALLING THE DEFAULT PARAMETERS 13
4.4 LANGUAGE SELECTION 13
5.0 CONFIGURATION LIST 14
5.1 DIGITAL INPUTS 14
5.2 ANALOGUE INPUTS 14
5.4 DIGITAL OUTPUTS 14
5.3 ANALOGUE OUTPUTS 15
5.5 CLOSE CONTR. UNIT WITH COILS CLOSE CONTR. UNIT WITH DIRECT EXPANS. COIL 15
6.0 LIST OF PARAMETERS AND DEFAULT VALUES 16
7.0 ALARMS 21
7.1 ALARM RELAYS 21
7.2 TABLE OF ALARMS 22
8.0 SCREENS 23
8.1 LIST OF THE SCREENS 23
9.0 TEMPERATURE CONTROL 25
9.1 CLOSE CONTROL UNITS WITH DIRECT EXPANSION COIL 25
9.2 OTHER TEMPERATURE FUNCTIONS 26
9.3 CLOSE CONTROL UNITS WITH TWO WATER COILS 26
9.4 CLOSE CONTROL UNITS WITH SINGLE WATER COIL 26
10.0 HUMIDITY CONTROL 27
10.1 CLOSE CONTROL UNITS WITH DIRECT EXPANSION COIL 27
10.2 OTHER HUMIDITY FUNCTIONS 28
10.3 CLOSE CONTROL UNITS WITH WATER COILS 28
11.0 RECOVERY COIL 29
11.1 RECOVERY WITHOUT COOLING DEVICES 29
11.2 RECOVERY WITH COOLING DEVICES ON CLOSE CONTR. UNITS WITH DIRECT EXPAN. COIL 30
11.3 RECOVERY WITH COOLING DEVICES ON CLOSE CONTROL UNITS WITH WATER COILS 30
12.0 OUTLET LIMIT 31
13.0 CONDENSER FANS 32
13.1 SINGLE OR SEPARATE COILS 32
13.2 NUMBER OF PROBES 32
13.3 PREVENT FUNCTION 32
13.4 SPEED-UP FUNCTION 32
13.5 PRESSURE – TEMPERATURE CONVERSION 32
14.0 TEMPERATURE SET POINT COMPENSATION 33
15.0 COMPRESSORS 33
15.1 CAPACITY CONTROL 33
15.2 ROTATION 33
15.3 TIMING 33
15.4 COMPRESSOR ALARMS 34
16.0 HEATERS 34
16.1 HEATER ALARMS 34
17.0 MODULATING VALVES 35
17.1 THREE-POSITION VALVES 35
17.2 0-10Volt VALVES 35
18.0 OUTLET FAN 35

19.0 MANUAL DEVICE MANAGEMENT 35
20.0 ALARM DATA LOGGING 36
20.1 MAIN LOG (pCO1 – pCO2) 36
20.2 ADVANCED LOG (pCO2) 36
21.0 SUPERVISION 37
21.1 CAREL SUPERVISOR 37
21.2 BMS 37
21.3 GSM PROTOCOL 37
21.4 VARIABLE DATABASE 37
22.0 EXAMPLES OF INSTALLATION 40
22.1 SHARED EXTERNAL TERMINAL 41
22.2 AUTOMATIC START AND STAND-BY UNITS 41
23.0 MASTER CONTROL 42
24.0 GLOSSARY OF TERMS 42

1.0 GENERAL INFORMATION

1.1 THE PROGRAM

The "standard air-conditioning units" program can be used with CAREL's pCO1 or pCO2 boards; the program manages "ED" direct expansion or "CW" water coil air-conditioning units.

The program main functions are:
- control of temperature and humidity inside civil or technological environments
- management of 1 to 2 hermetic or semi-hermetic compressors
- management of 1 to 3 heaters
- 0-10Volt and three-position modulating heating valves
- 0-10Volt and three-position modulating cooling valves
- Carel's external or built-in humidifier with immersed electrodes
- on-off or modulated condensing fans, pressure- or temperature-controlled
- outlet temperature control
- alarms management, alarm data logging, devices timing, warnings
- complete management of devices timing
- connection with local and BMS supervisory networks (LonWorks, Bacnet, Modbus…)

The LCD terminal displays the following data, modifiable at any time:
- 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, Spanish)

The connection with CAREL's pLAN 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 terminal for controlling up to 8 units

WARNING: to avoid tampering during device operation, the qualified personnel only shall know the passwords.

1.2 THE USER TERMINAL

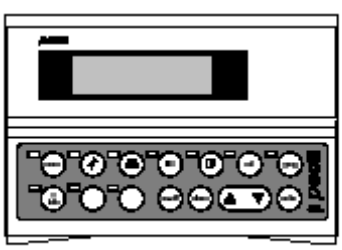
The provided terminal is equipped with LCD display (4 rows x 20 columns) and can be of two types: "built-in" terminal, with 6 buttons only, or external terminal (connected by telephone cable) with 15 buttons. Both terminals allow carrying out all program operations. The user terminal allows displaying 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.

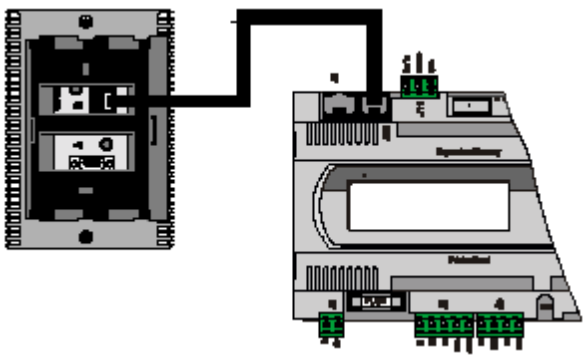
1.2.1 BUTTON LEDS

The EXTERNAL terminal is provided with three LEDS under the rubber buttons; the BUILT-IN terminal is provided with four LEDS. They indicate respectively:

ON/OFF button	(ext. terminal)	green LED – indicates that the unit is ON; the LED blinks if OFF from supervisor, remote digital input and time bands
ENTER button	(ext. terminal)	yellow LED – indicates that the device is correctly powered
ALARM button	(shared term.)	red LED – indicates the presence of alarms
ENTER button	(built-in term.)	yellow LED – see the ON/OFF button (external terminal)
PROG button	(built-in term.)	green LED – indicates that a screen branch other than the Menu branch is being accessed
ESC button	(built-in term.)	green LED – indicates that the Menu branch is being accessed

1.2.2 EXTERNAL TERMINAL

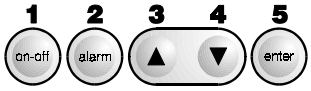




Use of external terminal buttons:

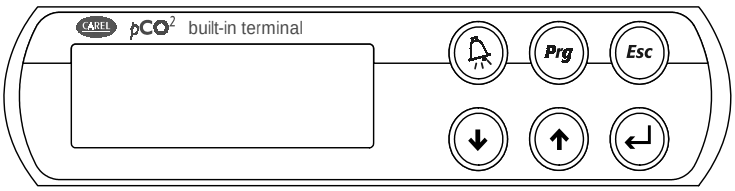
Button		Description
menu	MENU	If pressed in any loop but the Manufacturer loop, returns to the Menu branch (M0) main screen If pressed in the Manufacturer loop, returns to the manufacturer selection screen In the Menu branch displays unit status and control probe readings
	MAINT.	Goes to the first screen in the Maintenance loop (E0) first screen The Maintenance loop is used to check the status of the devices and probes, carry out maintenance and calibration operations, and start the manual procedure
	PRINTER	Goes to the first screen in the Printer loop (B0) The Printer loop is used to set cyclical or immediate prints
I/O	INPUTS/ OUTPUTS	Goes to the first screen in the I/O loop (I0) The I/O loop displays the status of the digital and analogue inputs / outputs
	CLOCK	Goes to the first screen in the Clock loop (L0) The Clock loop is used to display/set the time, date and On-Off, Temperature and Humidity time bands
set	SET POINT	Goes to the screen for setting the temperature and humidity set points (D0) This loop also displays the set points modified by the compensation function, if enabled
prog	PROGRAM	Goes to the screen to enter the user password (S0) The User loop is used to display/set the unit parameters, referred to the devices connected (compressors, valves, probes) and the functions enabled
menu + prog	MENU+PROG	Goes to the screen to enter the manufacturer password (Z0) The Manufacturer loop is used to configure the type of unit (ED/CW) and select the connected devices and the functions enabled
info ?	INFO	Displays the pLAN address of the connected board for a couple of seconds If pressed in Menu loop of the shared terminal, it switches the displayed board
	RED	Temporary display of the pLAN address of the connected board

Use of silicone rubber buttons:



1. **ON/OFF** button: it allows air-conditioning unit start and stop
2. **ALARM** button: it allows alarms display / delete and buzzer switching off
3. **UP ARROW** button: it enables two functions: 1. scrolling the previous screens of the same branch when the cursor is in home position; 2. increasing the value of a setting field when the cursor is on it; in case of a selection field, the up arrow button allows displaying the previous text
4. **DOWN ARROW** button: it enables two functions: 1. scrolling the following screens of the same branch when the cursor is in home position; 2. decreasing the value of a setting field when the cursor is on it; in case of a selection field, the down arrow button allows displaying the following text
5. **ENTER** button: it allows moving the cursor from home position to the setting/selection field; it also allows storing the set parameters after the cursor has left the setting fields.

1.2.3 BUILT-IN TERMINAL

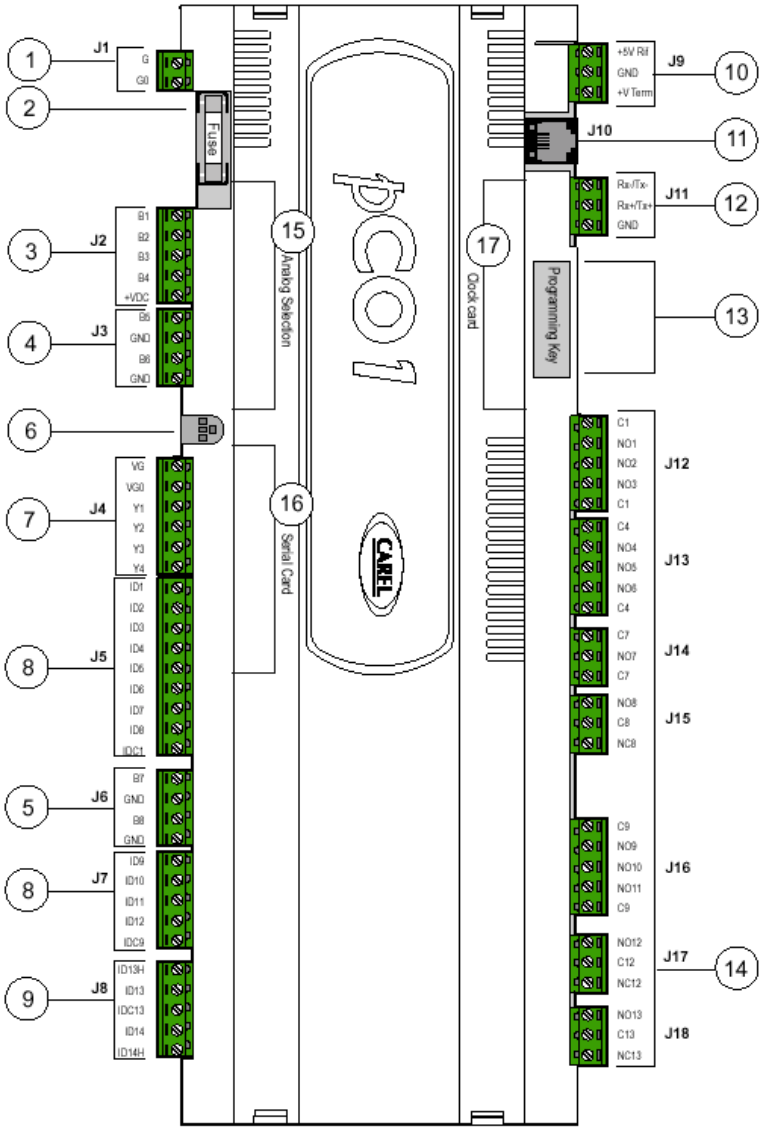


ALARM	**PROG**	**ESC**
UP	**DOWN**	**ENTER**

As for Alarm, Up arrow, Down arrow and Enter buttons use in the built-in terminal, refer to the external terminal.
START: as the built-in terminal is not provided with ON/OFF button, unit is started/stopped by pushing buttons Esc + Enter together for 20 sec.; after pushing, the displayed screen allows executing the required operation by using button Enter.
SCREEN LOOP: as the built-in terminal is not provided with buttons for accessing the screens loop directly, simply push button Prog to display the loops list; then, by using the arrow buttons, move the cursor on the selected loop and push Enter to access it.

1.3 pCO1 MAIN BOARD

The pCO1 board is described below, with reference to the general layout.



Key:

1. –G (+), G0 (-)- power supply connector
2. 250Vac fuse, 2nd delayed (T2 A)
3. NTC, 0/1V, 0/5V, 0/20mA, 4/20mA universal analogue inputs
4. NTC and On-Off passive analogue inputs
5. NTC passive analogue inputs
6. supply voltage yellow LED + 3 signalling LEDS
7. 0/10V analogue outputs and cutting phase PWM outputs
8. 24Vac/Vdc digital inputs
9. 230Vac or 24Vac/Vdc digital inputs
10. connector with Vrif for 5V ratiometric probes feeding and V Term for terminal feeding
11. connector for all pCO* series standard terminals and for application program download
12. pLAN local network connector
13. programming key connector
14. relay digital outputs
15. port for analogue inputs type selection
16. port for serial card insertion (Rs485 for supervisor, Rs232 for modem, Gateway protocol inverter)
17. port for clock card insertion

1.4 pCO2 MAIN BOARD

The pCO2 board is described below, with reference to the general layout.

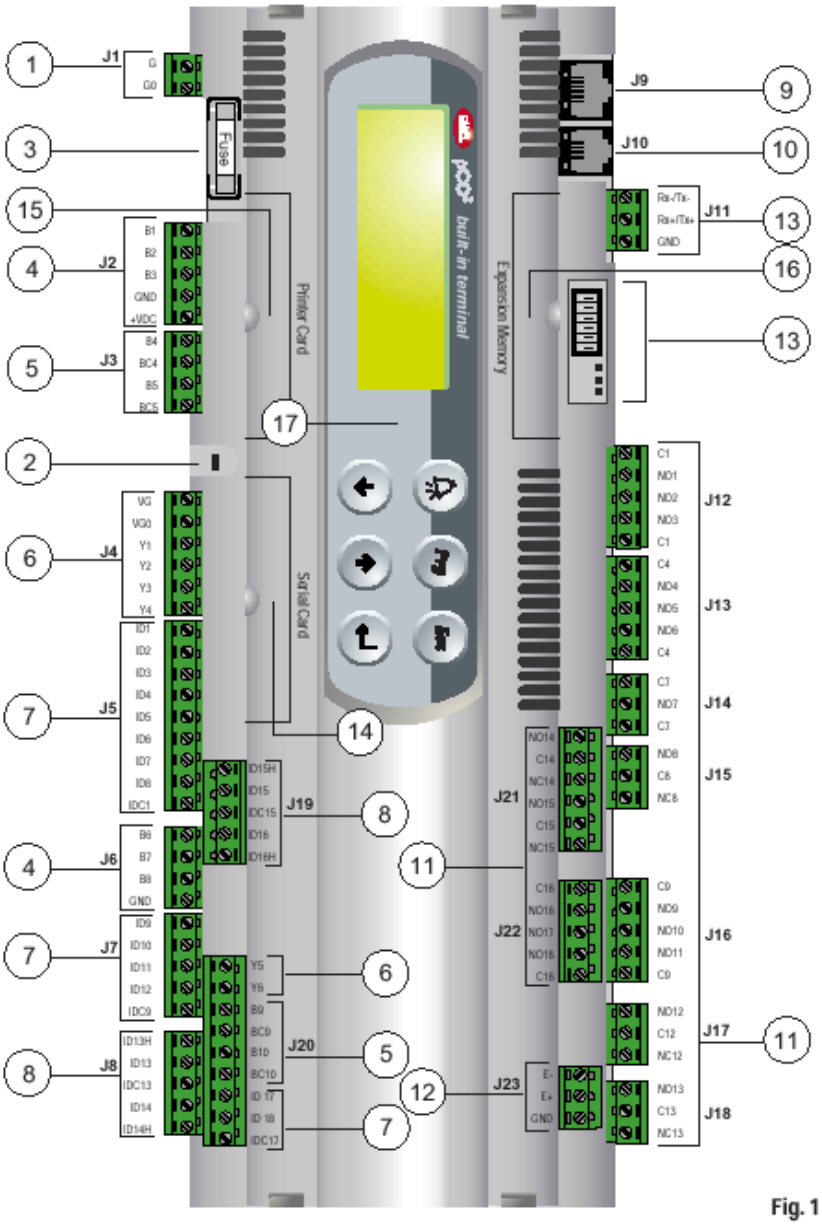


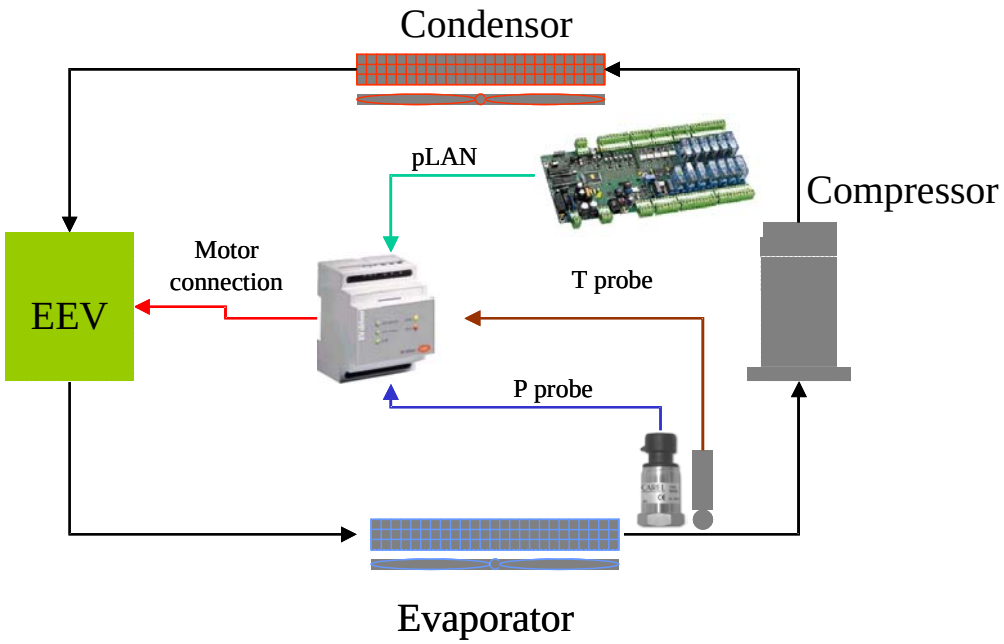
Fig. 1

Key:

1. –G (+), G0 (-)- power supply connector
2. supply voltage yellow LED and overload alarm red LED
3. 250Vac fuse, 2nd delayed (T2 A)
4. NTC, 0/1V, 0/10V, 0/20mA, 4/20mA universal analogue inputs
5. NTC, PT1000, On-Off passive analogue inputs
6. 0/10V analogue outputs
7. 24Vac/Vdc digital inputs
8. 230Vac or 24Vac/Vdc digital inputs
9. synoptic terminal connector (external panel with direct signalling)
10. connector for all pCO* series standard terminals and for application program download
11. relay digital outputs
12. expansion card connector
13. pLAN local network connector, addressing and LED
14. port for serial card insertion (Rs485 for supervision, Rs232 for modem or Echelon interfacing)
15. port for parallel printer connection card insertion
16. port for memory expansion or programming key card insertion
17. built-in terminal (LCD, buttons and LEDS)

1.5 ELECTRONIC EXPANSION VALVE

The EVDriver module for the control of the electronic expansion valves (EEV) for pLAN network allows the inlet overheating control for a more 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. The table below explains the meaning of the parameter VALVE TYPE (see screens F1 – F2):

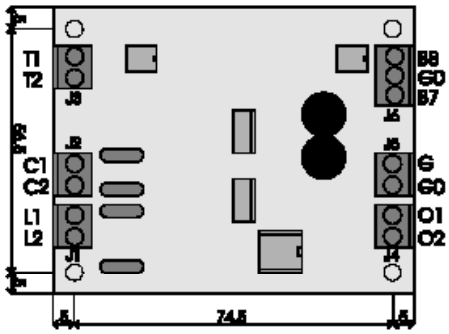
PARAMETER VALUE	CORRESPONDING VALVE TYPE
0	Alco EX5 – EX6
1	Alco EX7
2	Alco EX8
3	Sporlan SEI 0.5 - 11
4	Sporlan SEN 25
5	Sporlan SEN 50 - 250
6	Danfoss ETS 50
7	Danfoss ETS 100
8	---
9	Carel E2V**P
10	---
11	Custom (other valve type)

1.6 ACCESSORIES

1.6.1 PCOUMID000 CARD / PCOUMID200

This interface allows controlling the basic quantities of the OEM humidifiers produced by CAREL, that is level, feedwater conductibility and current absorption. The pCO1 – pCO2 board directly controls all values. The interface transforms the humidifier signals into signals readable by the cards. The cards relays directly control the humidifier functions and devices (water load, water drain and power contactor). As for connections, refer to the instruction sheet.

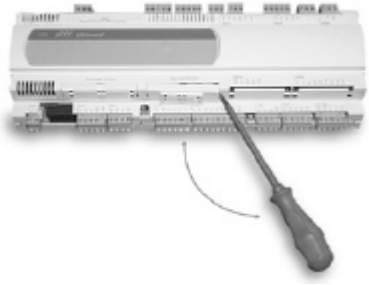
to sensors

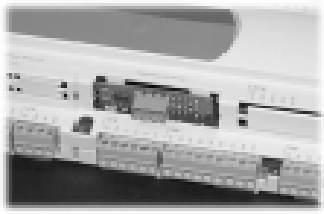


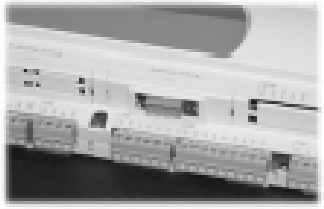
to pCO

1.6.2 pCO2 (PCO2004850) AND pCO1 (PCO1004850) SERIAL CARDS

The Rs485 serial card allows interfacing pCO1 – pCO2 boards directly to a Rs485 network. The maximum available baud-rate corresponds to 19,200 (programmable by parameter). Connection with Rs485 network is executed by connecting the extractible connector to the board terminals. As for connections, refer to the instruction sheet.

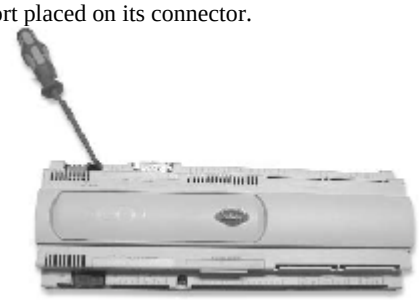






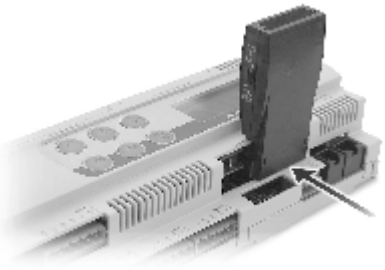
1.6.3 PCO100CLK0 CLOCK CARD FOR pCO1

The clock option card allows managing the hour and date (day, month, year) for functions such as the time bands. The clock card shall be inserted by removing the relevant port placed on its connector.



1.6.4 PCO200KEY0 HARDWARE KEY FOR pCO2 / PCO100KEY0

The hardware key allows downloading the application program to the pCO2 board in the place of the computer; furthermore, it also allows uploading the Flash memory contents to the key.



2.0 BUILT-IN HUMIDIFIER

Integrated management of a Carel immersed electrode humidifier. The pCO1 - pCO2 boards manage all the functions, from the reading of the humidifier parameters to the control of the devices (fill, drain, output) by relay. The humidifier parameters (current, conductivity, level) are not read directly, but rather using an optional card (PCOUMID000 / 200).The built-in humidifier is available for pCO1 - pCO2 medium boards only and replaces the electronic controller normally fitted on the humidifier. The LCD terminal features screens for controlling the humidifier. Humidifiers from 1.5 to 15 kg/h (single cylinder) and 90 kg/h (two cylinders), three-phase or single-phase, with supply voltage from 208 to 575 volts can be managed. The program controls the steam output and the humidifier operating conditions based on the humidifier current and ambient humidity signals; furthermore, it manages and displays all states and alarms.

2.1 SETTING THE PARAMETERS TO SELECT THE HUMIDIFIER

The following parameters are used to configure the humidifier:

- TYPE OF HUMIDIFIER

PARAMETER VALUE	RATED OUTPUT	RATED VOLTAGE	PHASES	POSITION OF THE TAM JUMPER	NUMBER OF TAM COILS
1	1.5 kg/h	208V	single-phase	100	1
2	1.5 kg/h	230V	single-phase	100	2

4	3 kg/h	208V	single-phase	300	2
5	3 kg/h	230V	single-phase	100	1
6	3 kg/h	208V	three-phase	100	1
7	3 kg/h	230V	three-phase	100	1
8	3 kg/h	400V	three-phase	100	2
9	3 kg/h	460V	three-phase	100	2
10					

13	5 kg/h	208V	single-phase	500	2
14	5 kg/h	230V	single-phase	500	2

16	5 kg/h	208V	three-phase	100	1
17	5 kg/h	230V	three-phase	100	1
18	5 kg/h	400V	three-phase	100	1
19	5 kg/h	460V	three-phase	100	2
22	8 kg/h	208V	three-phase	500	2
23	8 kg/h	230V	three-phase	300	2
24	8 kg/h	400V	three-phase	100	1
25	8 kg/h	460V	three-phase	100	1
28	10 kg/h	208V	three-phase	300	1
29	10 kg/h	230V	three-phase	300	1
30	10 kg/h	400V	three-phase	300	1
31	10 kg/h	460V	three-phase	100	1
34	15 kg/h	208V	three-phase	500	1
35	15 kg/h	230V	three-phase	300	1
36	15 kg/h	400V	three-phase	300	1
37	15 kg /h	460V	three-phase	300	1
42	90 kg / h (2*45 kg/h)	400V	three-phase	500	1
43	90 kg / h (2*45 kg/h)	460V	three-phase	500	1
44	90 kg / h (2*45 kg/h)	575 V	three-phase	500	1

Other models of humidifier will be added in the future when available.

- OUTPUT SET POINT: maximum hourly production of steam, between 20% and 100% of rated production
- TYPE OF OPTIONAL BOARD: 2 equivalent models can be chosen:PCOUMID000 and PCOUMID200

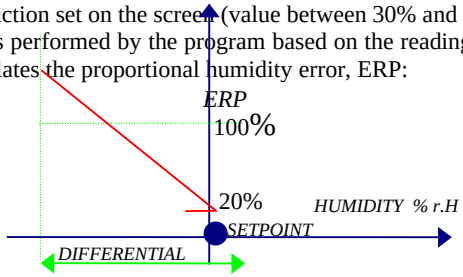
To select the end scale value of the TAM, refer to the rated current of the humidifier, displayed on screen **Ih** in the I/O branch (0= 5A, 1=10A, 2=15A, 3= 30A , 4=50A , 5=70A).

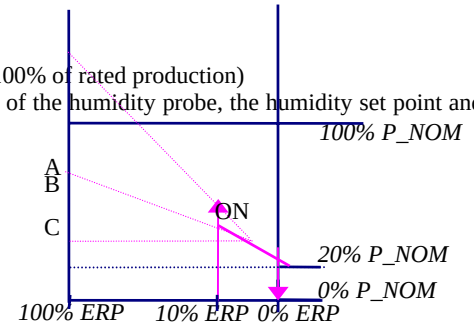
2.3 HUMIDITY AND STEAM PRODUCTION CONTROL

The steam production of the humidifier is controlled according to:

- the humidity
- the production set on the screen (value between 30% and 100% of rated production)

Humidity control is performed by the program based on the reading of the humidity probe, the humidity set point and the humidity differential.
The program calculates the proportional humidity error, ERP:

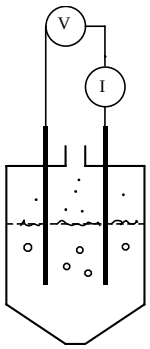




The graph of humidifier production control is based on the rated production, set production and proportional error (ERP):
ERP = proportional humidity error
Set production: A = 100% rated output
B = 75% rated output
C = 45% rated output

The humidifier has a minimum production equal to 20% of the rated output (for technical reasons) when ERP is between 0% and 20%, and increases as the ERP increases until reaching the set production when ERP=100%.

Below is a brief description of the algorithm embedded in the bios for the management of a humidifier with 1 or 2 immersed electrode cylinders.



In this type of humidifier, the steam is produced by boiling the water contained inside the cylinder. This occurs by simply filling the cylinder with water and applying a voltage to the electrodes. According to the Joule effect, the current will tend to heat the water until it boils.

The current that runs through the electrodes in the cylinder depends essentially on the voltage applied to the electrodes, the conductivity of the water inside the cylinder and the level of the water.

The **aim** of the algorithm is to maintain the current that runs through the electrodes at a reference value so as to ensure the percentage of steam production required, according to the readings of the humidity probes and the parameters set by the user.
During evaporation, the level of the water falls, and as the current is directly proportional to the quantity of water present in the cylinder, to keep it constant the cylinder would need to be constantly filled with minute quantities of water.
To avoid this, the current is maintained within a certain range around the reference value, by repeated "**water fill/evaporation**" cycles.

As well as the level of water in the cylinder, the other factor that determines the current level is the **conductivity of the water inside** the cylinder. In fact, during the fill/evaporation cycles, the conductivity of the water will tend to increase, due to the increase in the concentration of salts in the water. The conductivity of the water inside the cylinder is measured indirectly, by calculating the time required for a complete evaporation cycle. This time is then compared against a reference (typical for each cylinder) and, if lower, a certain quantity of water is drained and then the cylinder is topped up with less conductive mains water.

The humidifier also features a **conductivity meter** that measures the conductivity of the mains water entering the appliance during the filling cycles. In the case of high conductivity of the supply water, the control algorithm first signals a **pre-alarm** (that doesn't stop operation) and then, if necessary, an **alarm** (that stops operation). This is essential to avoid the introduction of excessively conductive water into the cylinder, which may compromise the correct operation of the humidifier.

Another fundamental element, installed at the top of the cylinder, is the **high level sensor**, used to detect any water or foam.
The high level electrodes may be activated for one of the following reasons:

- over-filling of water in the boiler – when the unit is off – due to a leak in the fill electrovalve;
- high water level when first filling the cylinder;
- high water level following the depletion of the cylinder due to fouling on the plates;
- formation of foam.

In the first case, when the high level sensor is activated, the algorithm stops operation and signals a **cylinder full alarm**, while in the other three cases the humidifier responds by draining the water so as to decrease the level.
In the event of repeated activations of the high level sensor, the algorithm evaluates the possibility that the causes may be due to the presence of foam. In this case, if after having performed a complete washing cycle (complete emptying-complete refill-complete emptying) the high level sensor continues to be activated, the controller signals a **foam alarm** (that does not stop operation).

A crucial point in the operation of the humidifier is the control of any excess current levels.
In fact, whenever voltage is applied to the electrodes in the cylinder, after a period of inactivity, there may be short but very intense peaks in current.
In the current is excessive in this initial period, the algorithm responds by immediately switching off the electrodes and performing a drain cycle. If the excess current continues, the operation of the humidifier is stopped and a **high current alarm** is signalled.

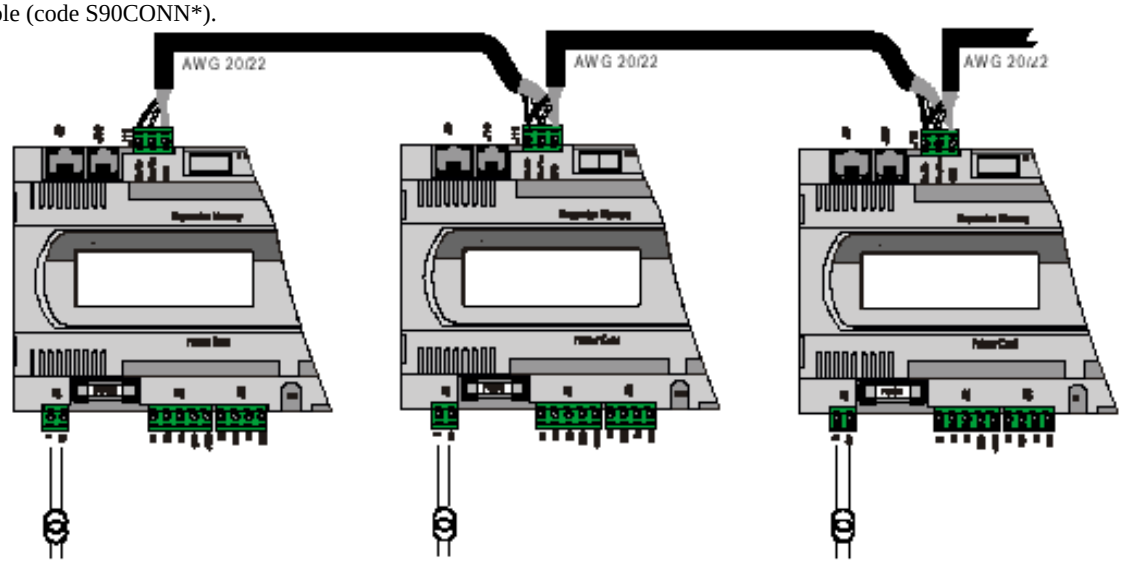
The algorithm also controls the drain cycles, signalling a **drain alarm** if there is no appreciable decrease in current when the drain cycle starts.
Vice-versa, a **no water alarm** will be signalled if there is no appreciable increase in current when the humidifier is being filled with water.

3.0 BOARD CONNECTION MANAGEMENT (pLAN)

The pLAN network identifies a physical connection between the boards (pCO1 or pCO2) and the external terminals.
pLAN=**p**.CO **L**.ocal **A**.rea **N**.etwork. Boards connection in pLAN network allows exchanging variables from a board to another, according to a logic established by the program, to make them work together in a functional way.
The variables exchanged among the boards are already established by the program, as well as the direction they must follow and from which they come. Therefore, they cannot be programmed by the user, who must execute the electrical connections only.
Do not execute pCO1 – pCO2 mixed connections, use exclusively boards of the same type.

3.1 pLAN PHYSICAL CONNECTIONS

The pLAN electrical connection among pCO1 or pCO2 boards is executed in parallel with 3 wires, from board to board, by using connector J11; the data are sent through Rs485 logic; no additional device is required. As usual, terminals shall be connected to the boards by the relevant telephone cable (code S90CONN*).

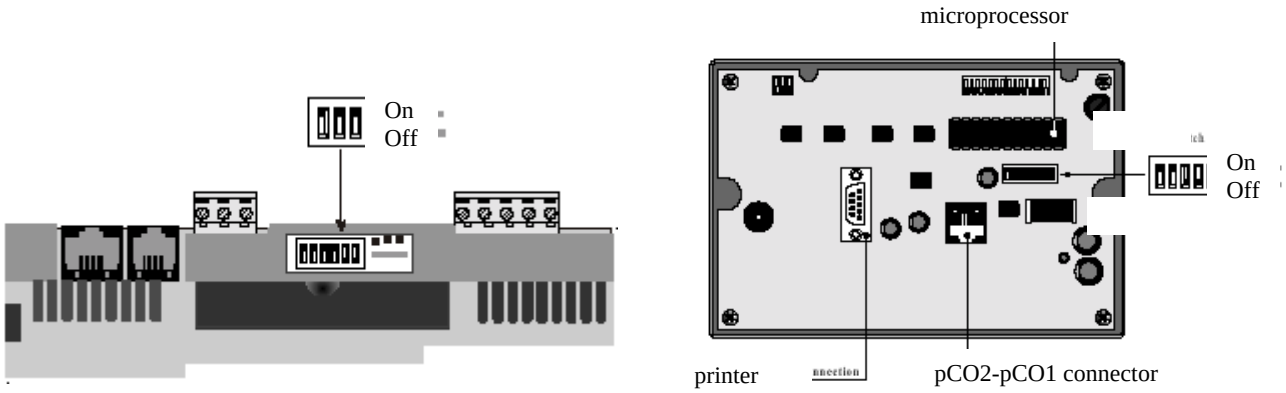


3.2 SETTING THE pLAN ADDRESS

For pLAN proper operation, the boards and the external terminals (not the built-in terminals) shall be addressed.
Even if only one board is being used, address 1 shall be set on the board and address 25 shall be set on the external terminal, if any. If the same address is assigned to two network elements, the pLAN cannot work!
The available addresses range from 1 to 32 (in binary logic), where 32 is the total number of boards + terminals + electronic expansion valves that can be connected with the pLAN, divided into 8 boards (addresses 1–8), 16 electronic valves (addresses 9–24) and 8 external terminals (addresses 25–32).
In case external terminals or electronic valves are not used, the boards maximum number (8) keeps unchanged. The addresses to be assigned to boards, valves and terminals are already established to facilitate installation and are listed in the following paragraph.

3.3 HOW TO ASSIGN THE ADDRESSES

The pLAN addresses are set with binary logic by changing the dip switch position on the back of the external terminals, on pCO2 boards (see figure below) and inside the electronic valves drivers, with all devices compulsorily not powered; in the pCO1, address is numerical and is assigned in a different way by an external terminal.



To read the address of a pCO2 board, external terminal or driver without remembering the binary code by heart, follow this simple rule: if the switch is in position 1, add up value 1 for switch 1, 2 for switch 2, 4 for switch 3, 8 for switch 4, and so on. Do not add up any values for the switches in position 0. In the example below, the selected address is: 1 + 2 + 4 + 8 = 15.

	Switch1		Switch2		Switch3		Switch4	
State	off	on	off	on	off	on	off	on
P	0	1	0	2	0	4	0	8
Address = P(Sw1)+P(Sw2)+P(Sw3)+P(Sw4)								

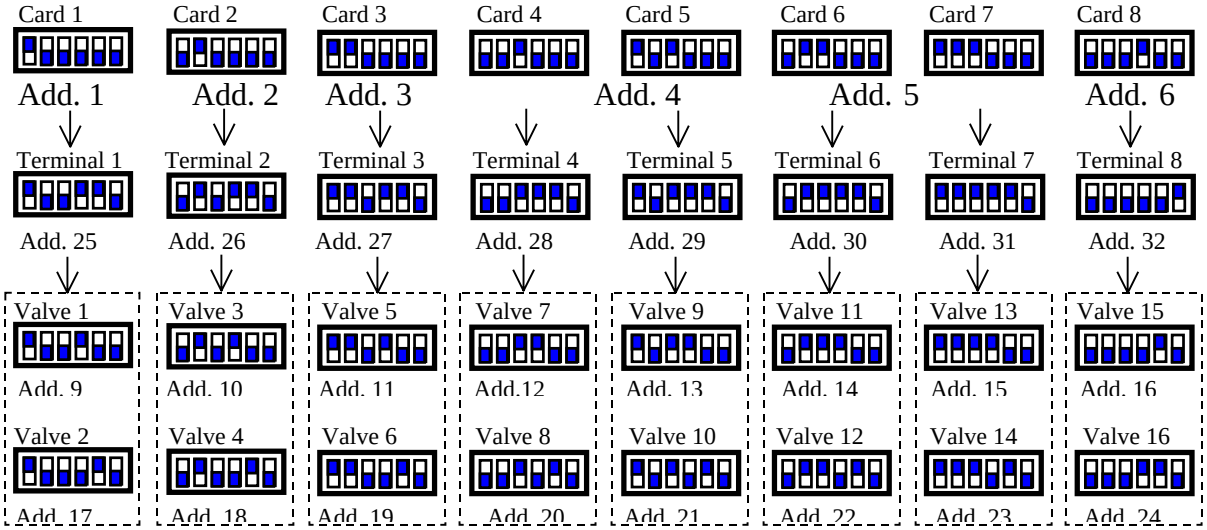
3.3.1 SETTING THE pCO1 ADDRESS

Operations to be carried out for pCO1 boards pLAN addressing:

1. Cut pCO1 board power off and connect an external terminal with pLAN address"0"
2. Power pCO1 board keeping terminal buttons Alarm + Up pressed until a screen is displayed
3. After the screen is displayed, carry out the indicated operations, that is key in the numerical pLAN address (1,2,3….) by using buttons Up and Down, then confirm by pushing Enter
4. Cut pCO1 board power off
5. If required, assign the correct pLAN address to the external terminal, if provided
6. Power pCO1 board.

3.3.2 SETTING THE ADDRESS OF PCO2, EXTERNAL TERMINALS AND VALVE DRIVERS

This paragraph indicates the addresses to be set on pCO2 boards, external terminals and valves drivers. If pCO1 boards are being used, refer to the previous paragraph as for boards only (as for terminals and drivers, the following indications are valid).



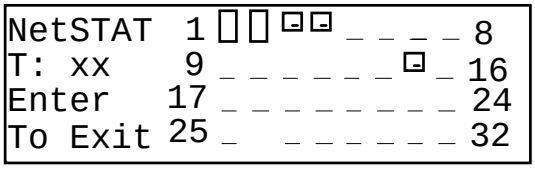
Each external terminal refers to one board and two electronic valves, that is:

- board add. 1 → valves add. 9/17 → terminal add. 25,
- board add. 2 → valves add. 10/18 → terminal add. 26…..

The terminals Menu main screen displays the address of the connected board in the upper right corner. Terminal add. 32 allows controlling all boards without requiring other terminals or in addition to the other terminals; as a matter of fact, the program allows terminal with add. 32 to access the parameters of all connected boards, one by one. Passage among the boards can be executed by simply pushing button info.
In all other program screens, the address of the connected board can be known by pushing button info.

3.4 pLAN STATUS

When starting the system, the pLAN network could undergo some problems (failed boards and terminals 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 pLAN network state can be displayed in real time, thus identifying which devices (boards and terminals) are properly connected and addressed. To display the special screen, push buttons Up-Down-Enter of any network terminal 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:



As it can be seen, network addresses from 1 to 32 are displayed, together with a symbol indicating if a terminal (small rectangle) or a board / valve driver (big rectangle) is concerned. The dash indicates that the board / terminal has incorrect address or is connected improperly. In case the symbols appear and disappear, it means that pLAN is unstable or, more probably, that repeated addresses are present. The number following T indicates the address of the terminal being used. The example indicates that the network consists of two boards or valves drivers with address 1, 2, and of three terminals with address 3, 4, 15. After the screen is checked, cut network power off, verify connections and addresses and power the system again.

3.5 CHECK pLAN ADDRESS

During pCO1 – pCO2 board normal operation, the board pLAN address can be checked at any time by pushing the red button (Prg+Enter in case a built-in terminal is being used). The information appears on the display first row, covering a part of the displayed screen for 2 seconds.
The pLAN address is always displayed in the M0 Menu screen.

4.0 FIRST INSTALLATION AND SOFTWARE UPDATING

At first installation, the boards shall be programmed by DOWNLOADING the application program to the Flash buffer memory; this operation can be performed either using a computer or the hardware key.

4.1 PROGRAM DOWNLOAD FROM HARDWARE KEY

To connect the key to the pCO2 – pCO1, proceed as follows:

1. Switch the pCO2 – pCO1 off and remove the "expansion memory" cover using a screwdriver
2. Place the key selector on 
3. Insert the key into the corresponding slot
4. Press Up and Down together and switch the board on
5. Check that the red key LED comes on
6. Wait until the upload request is displayed on the LCD, then release the buttons and confirm by pressing Enter; the data transfer operation will take approximately 10 seconds
7. Switch the pCO2 – pCO1 off, remove the key, place the cover in its original position and switch the board back on again
8. The board will now work with the program transferred from the key.

4.2 PROGRAM DOWNLOAD FROM COMPUTER

Use the kit code PC485KIT00 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 pCO2 – pCO1 using a telephone cable (code S90CONN00*)
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 "pCO² 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 pLAN 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 pCO2-pCO1. Also select the *.blb files (for non-pLAN applications) or the flash1.bin file in the program being loaded (for pLAN 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 terminal (if featured), then switch the board off and on again

NOTE: if a pLAN 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 "pCO² ADD" in the WinLOAD32 program.

4.3 INSTALLING THE DEFAULT PARAMETERS

Default parameters are the values assigned by CAREL 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 in par. 6.0).
After installing default values, the parameters can be modified within the prescribed values range.
If required, parameters can also be installed manually by the user, at any time, by the external or built-in terminal.
Operations to be carried out for default parameters manual installation:

1. Push buttons MENU + PROG and key in the Manufacturer password (1234), then push Enter
2. By pushing button Down three times, move the cursor on "INITIALISATION" (last row), then push ENTER
3. The parameters installation screen is displayed; to install, push ENTER and key in 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.

4.4 LANGUAGE SELECTION

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

1. Push buttons MENU + PROG and key in the Manufacturer password (1234), then push Enter
2. By pushing button Down three times, move the cursor on "INITIALISATION" (last row), then push ENTER
3. The parameters installation screen is displayed; push button Down three times
4. The screen with the language selection parameter is displayed, push Enter to scroll and select the language.

5.0 CONFIGURATION LIST

The pCO1/pCO2 small/medium boards allow managing both "ED" direct expansion and "CW" water coil air-conditioning units. When started, the program recognises the board type and size, consequently prearranging inputs and outputs, also based on the air-conditioning unit type (ED or CW) established in the Manufacturer branch. The following tables indicate inputs and outputs configurations in the possible combinations. The multiple items (xxx / xxx / …) indicate different inputs and outputs purposes; selection is carried out by Manufacturer screens branch parameters. As for wiring harness, refer to the technical manual of the pCO1 and pCO2 boards.

5.1 DIGITAL INPUTS

	ED		CW	
N.	**pCO1 – pCO2 SMALL**	**pCO1 – pCO2 MEDIUM**	**pCO1 – pCO2 SMALL**	**pCO1 – pCO2 MEDIUM**
ID 1	C1 alarm / C1 low pressure	C1 alarm	Flooding / fire alarm	Flooding alarm
ID 2	C2 alarm / C1 high pressure	C2 alarm	Summer – Winter selection	Summer – Winter selection
ID 3	Heater 1 thermal alarm	Heater 1 thermal alarm	Heater 1 thermal alarm	Heater 1 thermal alarm
ID 4	Heater 2 thermal alarm	Heater 2 thermal alarm	Heater 2 thermal alarm	Heater 2 thermal alarm
ID 5	Fire / filter / flooding alarm	Dirty filters alarm	Dirty filters alarm	Dirty filters alarm
ID 6	Fan thermal alarm	Fan thermal alarm	Fan thermal alarm	Fan thermal alarm
ID 7	Air flow controller alarm	Air flow controller alarm	Air flow controller alarm	Air flow controller alarm
ID 8	Remote On-Off	Remote On-Off	Remote On-Off	Remote On-Off
ID 9	---	C1 low pressure alarm	---	Auxiliary alarm
ID 10	---	C2 low pressure alarm	---	Water flow controller alarm
ID 11	---	Humidifier water level	---	Humidifier water level
ID 12	---	Fire / flooding alarm	---	Fire alarm
ID 13	---	C1 cond. fan thermal alarm	---	---
ID 14	---	C2 cond. fan thermal alarm	---	---

5.2 ANALOGUE INPUTS

	ED		CW	
N.	**pCO1 – pCO2 SMALL**	**pCO1 – pCO2 MEDIUM**	**pCO1 – pCO2 SMALL**	**pCO1 – pCO2 MEDIUM**
B 1	Ambient humidity	Ambient humidity	Ambient humidity	Ambient humidity
B 2	C1 high press. / C1 cond. temp. / Outlet temperature (pCO2)	C1 high press. / C1 cond. temp.	Outlet temperature	Outlet temperature
B 3	C2 high press. / C2 cond. temp. / Recovery temperature	C2 high press. / C2 cond. temp. / Recovery temperature (pCO2) / Humidif. conductibility (pCO1)	Recovery temperature	Recovery temperature (pCO2) / Humidif. conductibility (pCO1)
B 4	External temperature	External temperature (pCO2) Humidifier current (pCO1)	External temperature	External temperature (pCO2) / Humidifier current (pCO1)
B 5	Ambient temperature	Ambient temperature	Ambient temperature	Ambient temperature
B 6	Outlet temperature (pCO1)	Outlet temperature	FREE	FREE
B 7	---	Humidif. conductibility (pCO2) Recovery temperature (pCO1)	---	Humidif. conductibility (pCO2)
B 8	---	Humidifier current (pCO2) External air temperature (pCO1)	---	Humidifier current (pCO2)

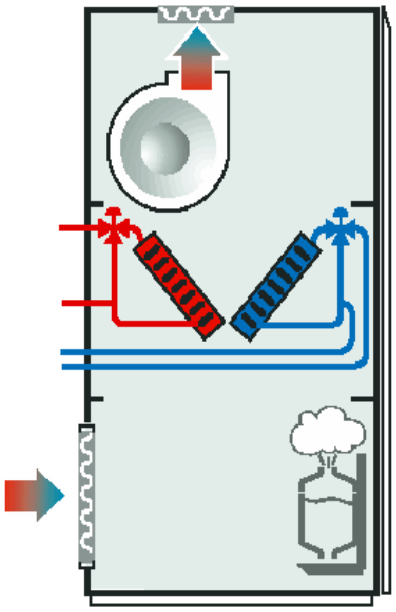
5.4 DIGITAL OUTPUTS

	ED		CW	
N.	**pCO1 – pCO2 SMALL**	**pCO1 – pCO2 MEDIUM**	**pCO1 – pCO2 SMALL**	**pCO1 – pCO2 MEDIUM**
DO 1	Outlet fan	Outlet fan	Outlet fan	Outlet fan
DO 2	Compressor 1	Compressor 1	Cold valve opening / single	Cold valve opening / single
DO 3	Compressor 2	Compressor 2	Cold valve closing / single	Cold valve closing / single
DO 4	Resist.1 / Warm valve opening	Resist.1 / Warm valve opening	Resist.1 / Warm valve opening	Resist.1 / Warm valve opening
DO 5	Resist.2 / Warm valve closing	Resist.2 / Warm valve closing	Resist.2 / Warm valve closing	Resist.2 / Warm valve closing
DO 6	Dehumidification	Dehumidification	Dehumidification	Dehumidification
DO 7	Recovery	Recovery / Non-serious alarms	Recovery	Recovery / Non-serious alarms
DO 8	Generic alarms	Serious alarms	Generic alarms	Serious alarms
DO 9	---	C1 cond. fan / C1 capacity control	---	---
DO 10	---	C2 cond. fan / C2 capacity control	---	---
DO 11	---	Humidification	---	Humidification
DO 12	---	Humidifier water load	---	Humidifier water load
DO 13	---	Humidifier water drain	---	Humidifier water drain

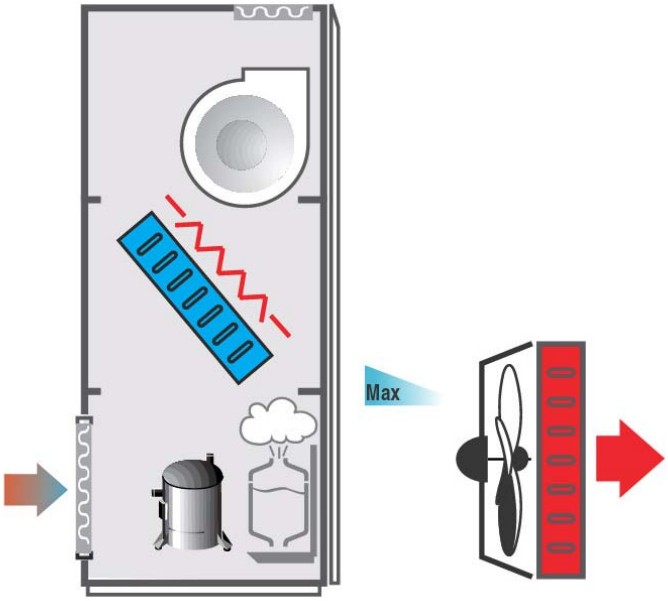
5.3 ANALOGUE OUTPUTS

	ED		CW	
N.	**pCO1 – pCO2 SMALL**	**pCO1 – pCO2 MEDIUM**	**pCO1 – pCO2 SMALL**	**pCO1 – pCO2 MEDIUM**
AO 1	Outlet fan / Recovery valve	Outlet fan / Recovery valve	Cold valve / single	Cold valve / single
AO 2	Warm valve	Warm valve / Humidification	Warm valve / Recovery valve	Warm valve / Recovery valve / Humidification
AO 3	Condensing fan 1	Condensing fan 1	---	---
AO 4	Condensing fan 2	Condensing fan 2	Outlet fan	Outlet fan

5.5 CLOSE CONTR. UNIT WITH COILS



CLOSE CONTR. UNIT WITH DIRECT EXPANS. COIL

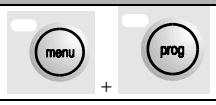


6.0 LIST OF PARAMETERS AND DEFAULT VALUES

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 terminal

PARAMETER DESCRIPTION	SCREEN	DEFAULT	USER VALUE	RANGE	UOM
					
Select display language	A0	English		En,It,Fr,De,Sp	
Manual humidifier drain with unit ON	A4	No		No-Yes	
Enter password	A6	1234		0-9999	
Modify outlet fan operating hours	A7	0		0-99 . 0-999	hours
Modify compressor 1 operating hours	A7	0		0-99 . 0-999	hours
Modify compressor 2 operating hours	A7	0		0-99 . 0-999	hours
Device operating hour threshold	A8	99		0-99	hours x 1000
Humidity probe calibration	A9	0		-9.9 - 9.9	%RH
Condenser 1 pressure probe calibration	A9	0		-9.9 - 9.9	bar
Condenser 2 pressure probe calibration	A9	0		-9.9 - 9.9	bar
Ambient temperature probe calibration	Aa	0		-9.9 - 9.9	ºC / ºF
Outside temperature probe calibration	Aa	0		-9.9 - 9.9	ºC / ºF
Outlet temperature probe calibration	Aa	0		-9.9 - 9.9	ºC / ºF
Recovery temperature probe calibration	Ab	0		-9.9 - 9.9	ºC / ºF
Condenser 1 temperature probe calibration	Ab	0		-9.9 - 9.9	ºC / ºF
Condenser 2 temperature probe calibration	Ab	0		-9.9 - 9.9	ºC / ºF
Manual activation of digital outputs 1 – 2 – 3	Ac	Off		Off-on	
Manual activation of digital outputs 4 – 5 – 6	Ad	Off		Off-on	
Manual activation of digital outputs 7 – 8	Ae	Off		Off-on	
Manual activation of digital outputs 9 – 10	Af	Off		Off-on	
Manual activation of modulating outputs 1 – 2	Ag	0		0-10.0	Volt
Manual activation of modulating outputs 3 – 4	Ah	0		0-10.0	Volt
Manual activation of pre wash built-in humidifier	Ai	No		No-Yes	
Manual activation of total water drain built-in humidifier.	Ai	No		No-Yes	
Driver 1 valve control mode	Aj	Automatic		Auto-Man.	
Driver 1 valve manual opening steps	Aj	0		0-9999	Steps
Driver 2 valve control mode	Ak	Automatic		Auto-Man.	
Driver 2 valve manual opening steps	Ak	0		0-9999	Steps
Driver 1 manual release on start-up	Al	No		No-Yes	
Driver 2 manual release on start-up	Am	No		No-Yes	
Enter new Maintenance password	An	1234		0-9999	
					
Cyclical print interval	H1	24		0-999	hours
Send immediate print	H1	No		No-Yes	
					
Hour setting	K0	current hour		0-23	Hours
Minute setting	K0	current minutes		0-59	minutes
Day setting	K0	current day		1-31	
Month setting	K0	current month		1-12	
Year setting	K0	current year		0-99	
Enter Clock password	K1	1234		0-9999	
Enable temperature / humidity / On-Off time bands	K2	No		No-Yes	
Start and end hour for On-Off time bands F1-1 and F1-2	K3	9 / 13 / 14 / 21		0-23	hours
Start and end minutes for On-Off time bands F1-1 and F1-2	K3	0 / 0 / 0 / 0		0-59	minutes
Start and end hour for On-Off time band F2	K4	14 / 21		0-23	hours
Start and end minutes for On-Off time band F2	K4	0 / 0		0-59	minutes
Select On-Off time bands (F1,F2,F3,F4) for each day	K5	F2		F1-F4	
Start hour temperature bands 1 and 2	K6	0 / 6		0-23	hours
Start minutes temperature bands 1 and 2	K6	0 / 0		0-59	minutes
Set point temperature bands 1 and 2	K6	23.0		see P1	ºC / ºF
Start hour temperature bands 3 and 4	K7	12 / 18		0-23	hours
Start minutes temperature bands 3 and 4	K7	0 / 0		0-59	minutes

PARAMETER DESCRIPTION	SCREEN	DEFAULT	USER VALUE	RANGE	UOM
Set point temperature bands 3 and 4	K7	23.0		see P1	ºC / ºF
Start hour humidity bands 1 and 2	K8	0 / 6		0-23	hours
Start minutes humidity bands 1 and 2	K8	0 / 0		0-59	minutes
Set point humidity bands 1 and 2	K8	23.0		see P2	%RH
Start hour humidity bands 3 and 4	K9	12 / 18		0-23	hours
Start minutes humidity bands 3 and 4	K9	0 / 0		0-59	minutes
Set point humidity bands 3 and 4	K9	23.0		see P2	%RH
Enter new Clock password	Ka				
					
Temperature set point	S1	23.0		see P1	ºC / ºF
Humidity set point	S1	50.0		see P2	%RH
					
Enter user password	P0	1234		0-9999	
Minimum and maximum temperature set point limits	P1	-99.9 / 99.9		-999.9-999.9	ºC / ºF
Minimum and maximum humidity set point limits	P2	0.0 / 100.0		0.0-100.0	%RH
Proportional temperature bands in Heating and cooling	P3	3.0 / 3.0		0.0-100.0	ºC / ºF
Temperature dead zone	P3	0,0		0.0-99.9	ºC / ºF
Proportional bands in Humidification and Dehumidification	P4	2.0 / 2.0		0.0-99.9	%RH
Maximum production allowed, built-in humidifier	P4	Rated output		20% -100% of rated output	kg/h
Switch unit off from button	P5	No		No-Yes	
Enable remote On-Off digital input	P5	No		No-Yes	
Recovery water temperature set point	P6	12,0		0-99.9	ºC / ºF
Enable compensation function	P7	No		No-Yes	
Outside air compensation set point	P7	25.0		-999.9-999.9	ºC / ºF
Outside air compensation differential	P7	3.0		-999.9-999.9	ºC / ºF
Offset maximum of compensation of the set of temperature	P7	2.0		-999.9-999.9	ºC / ºF
High and low ambient temperature alarms offset	P8	10.0 / 10.0		-999.9-999.9	ºC / ºF
High and low ambient humidity alarms offset	P9	20.0 / 30.0		0-100,0	%RH
Enable outlet limit function	Pa	No		No-Yes	
Outlet air set point for the limitation function	Pa	15.0		-999.9-999.9	ºC / ºF
Outlet air differential for the limitation function	Pa	5.0		-999.9-999.9	ºC / ºF
Assign type of alarm Serious/Minor AL01-AL20	Pb	All N		N-Y	
Assign type of alarm Serious/Minor AL21-AL40	Pc	All N		N-Y	
Assign type of alarm Serious/Minor AL41-AL60	Pd	All N		N-Y	
Assign type of alarm Serious/Minor AL61-AL67	Pe	All N		N-Y	
Board identification number for supervisory network	Pf	1		0-200	
Board communication speed for supervisory network	Pf	1200		1200-19200	Baudrate
Serial communication protocol	Pf	Carel		Carel,Modbus, Lon,RS232,Gsm	
Telephone numbers entered on analogue modem	Pg	1		1-4	
Enter telephone numbers on analogue modem	Pg	0		0…9,#,*,@,^	
Number of rings for analogue modem	Ph	0		0-9	
Password for supervisor remote connection	Ph	0		0-9999	
Type of analogue modem	Ph	Tone		Tone-Pulse	
Number of rings for GSM modem	Pi	0		0-9	
Password to write SMS text message	Pi	0		0-9999	
Destination GSM telephone number	Pi	0		0…9,#,*,@,^	
Enter new user password	Pj	1234		0-9999	
					
Enter manufacturer password	Z0	1234		0-9999	
CONFIGURATION →					
Enable BMS	C0	No		No-Yes	
Enable printer	C0	No		No-Yes	
Select unit of measure for temperature probes and parameters	C0	ºC		ºC-ºF	
Enable clock board (pCO1 only)	C0	No		No-Yes	
Type of unit	C1	ED		ED-CW	
Select refrigerant	C1	R134a		R22,R134a, R404a,R407C, R410A	
Number of compressors	C2	2		1-2	
Enable compressor capacity-control steps	C2	No		No-Yes	

PARAMETER DESCRIPTION	SCREEN	DEFAULT	USER VALUE	RANGE	UOM
Heating mode	C2	Heaters		Heaters-Coil	
Humber of heaters	C2	2		0-3	
Type of valve for heating coil	C2	0-10Volt		0-10V/3 pos.	
Type of coil	C3	C/H		C/H-Cool	
Type of valve for the coil	C3	0-10Volt		0-10V/3 pos.	
Heating mode	C3	Heaters		Heaters-Coil 2	
Humber of heaters	C3	2		0-3	
Type of valve for heating coil	C3	0-10Volt		0-10V/3 pos.	
Digital input 5 configuration	C4	Filter alarm		Flood alarm, Filter alarm, Fire alarm	
Digital input 12 configuration	C5	Fire alarm		Fire alarm, Flood alarm	
Digital input 1 configuration	C6	Fire alarm		Fire alarm, Flood alarm	
Digital output 7 configuration	C7	Recovery valve		Recovery valve, minor alarms	
Probe 2 input configuration	C8	Pressure 1		Pressure 1, Cond. temp.1, Outlet temp.	
Probe 3 input configuration	C9	Pressure 2		Pressure 2, Cond. temp. 2, Recovery temp	
Modulating output 1 configuration	Ca	Modulating fan		Recovery valve, modulating fan	
Enable modulating 0-10 humidifier output	Ca	No		No-Yes	
Modulating output 2 configuration	Cb	Recovery valve		Recovery valve, 0-10V humid.	
Enable recovery coil	Cc	No		No-Yes	
Enable modulating outlet fan	Cc	No		No-Yes	
Enable condenser function	Cd	No		No-Yes	
Type of condenser	Cd	Single		Single-Sep.	
Select type of fans	Cd	Inverter		Inverter-Step	
Select number of On-Off fans	Cd	1		1-2	
Maximum voltage threshold for Triac	Ce	92		0-100	%
Minimum voltage threshold for Triac	Ce	70		0-100	%
Duration of Triac impulse	Ce	2		0-10	m seconds
Logic of the dehumidification contact	Cf	NO		NO-NC	
Number of compressors enabled for dehumidification	Cf	0		0-2	
Enable cooling coil for dehumidification	Cf	No		No-Yes	
Enable built-in humidifier	Cf	No		No-Yes	
Type of humidifier	Cg	Type 8		1-44 (see 2.1)	
Maximum production	Cg	70		0-100	%
Optional card model	Cg	PCOUMID000		PCOUMID200-PCOUMID000	
Enable humidity probe	Ch	No		No-Yes	
Type of signal from the humidity probe	Ch	0-1V		0-1V,0-10V, current	
Minimum and maximum value measured by the humidity probe	Ch	0.0 / 100.0		0-100,0	%RH
Enable pressure probe 1	Ci	No		No-Yes	
Type of signal pressure probe 1	Ci	Current		0-1V,0-10V, current	
Minimum and maximum value pressure probe 1	Ci	0.0 / 30.0		-20.0 - 50.0	Bar
Enable pressure probe 2	Cj	No		No-Yes	
Type of signal pressure probe 2	Cj	Current		0-1V,0-10V, current	
Minimum and maximum value pressure probe 2	Cj	0.0 / 30.0		-20.0 - 50.0	Bar
Type of signal from ambient temperature probe	Ck	NTC		NTC-PT100	
Enable outlet probe	Ck	No		No-Yes	
Type of signal from outlet temperature probe	Ck	NTC		NTC-PT100	
Enable outside temperature probe	Cl	No		No-Yes	
Type of signal from outside temperature probe	Cl	NTC		NTC-PT100	
Enable recovery probe	Cl	No		No-Yes	
Type of signal from recovery temperature probe	Cl	NTC		NTC-PT100	
Enable condenser 1 temperature probe	Cm	No		No-Yes	
Type of signal from condenser 1 temperature probe	Cm	NTC		NTC-PT100	
Enable condenser 2 temperature probe	Cm	No		No-Yes	
Type of signal from condenser 2 temperature probe	Cm	NTC		NTC-PT100	
pLAN connection class, board 1	Cn	Present-no rot.		Present-rot., Present-no rot., Not present	
pLAN connection class, boards 2 – 3	Cn	Not present		Present-rot., Present-no rot., Not present	
pLAN connection class, boards 4 – 6	Co	Not present		Present-rot., Present-no rot., Not present	

PARAMETER DESCRIPTION	SCREEN	DEFAULT	USER VALUE	RANGE	UOM
pLAN connection class, boards 7 – 8	Cp	Not present		Present-rot., Present-no rot., Not present	
PARAMETERS →					
Enable compressors/cooling coil together with recovery coil	G0	No		No-Yes	
Enable FIFO compressor rotation	G1	No		No-Yes	
Type of temperature control	G1	Proportional		Prop.-P+I	
Logic of the capacity-control contact	G1	NC		NC-NO	
Starting point to open modulating valve in cooling (or single valve) with recovery (see G0)	G2	50.0		0.0-100.0	%
Starting and end point to open modulating valve in cooling (or single valve)	G2	0.0 / 100.0		0.0-100.0	%
Starting point to open 3 position valve in cooling (or single valve) with recovery (see G0)	G3	50,0		0.0-100.0	%
Starting and end point to open 3 position valve in cooling (or single valve)	G3	0.0 / 100.0		0.0-100.0	%
Starting and end point to open modulating valve in heating	G4	0.0 / 100.0		0.0-100.0	%
Starting and end point to open 3 position valve in heating	G5	0.0 / 100.0		0.0-100.0	%
Starting and end point to open modulating valve in recovery	G6	0.0 / 100.0		0.0-100.0	%
Minimum and maximum modulating fan speed	G7	0.0 / 100.0		0.0-100.0	Volt
Outlet fan speed during dehumidification	G7	5,0		0.0-100.0	Volt
Starting and end point to open modulating humid. output	G8	0.0 / 100.0		0.0-100.0	%
Temperature differential to stop dehumidification	G9	5.0		0-99.9	ºC / ºF
Temperature offset to restart dehumidification	G9	4.0		0-99.9	ºC / ºF
Disable water drain for set point reduction	Ga	No		No-Yes	
Disable drain for extended humidifier standby	Ga	No		No-Yes	
Disable minor humidifier alarm messages	Ga	No		No-Yes	
High conductivity pre-alarm threshold	Gb	1500		0-2000	uS/cm
High conductivity alarm delay	Gb	2000		0-2000	uS/cm
Drain time as % of H3 (see humidifier manual)	Gc	100		50-200	%
Evaporation time as % of H4 (see humidifier manual)	Gc	100		50-200	%
High pressure alarm set point	Gd	23.5		-99.9 - 99.9	bar
High pressure alarm differential	Gd	1.0		-99.9 - 99.9	bar
Condensing (pressure) set point	Ge	14.0		-99.9 - 99.9	bar
Condensing (pressure) differential	Ge	2.0		-99.9 - 99.9	bar
Modulating condensing fan speed-up time	Ge - Gf	2		0-999	seconds
Condensing (temperature) set point	Gf	55.0		-99.9 - 99.9	ºC / ºF
Condensing (temperature) differential	Gf	1.0		-99.9 - 99.9	ºC / ºF
Minimum and maximum mod. cond. fan speed	Gg	0.0 / 10.0		0-10,0	Volt
Enable high pressure alarm Prevent function	Gh - Gi	No		No-Yes	bar
Prevent function set point (pressure)	Gh	20.0		-99.9 - 99.9	Bar
Prevent function differential (pressure)	Gh	2.0		-99.9 - 99.9	bar
Prevent function set point (temperature)	Gi	70.0		-99.9 - 99.9	ºC / ºF
Prevent function differential (temperature)	Gi	1.0		-99.9 - 99.9	ºC / ºF
Enable Carel network Master Control function	Gj	No		No-Yes	
Rotation mode for units in pLAN network	Gk	Automatic		Automatic, Time bands, Operating hours	
Number of units set in Standby mode	Gk	0		0-No. unit in Present-rotation mode	
Automatic rotation interval for units in pLAN	Gk	24		1-240	Hours
Automatic rotation hours for units in pLAN network	Gl	22		0-23	hours
Automatic rotation minutes for units in pLAN network	Gl	00		0-59	minutes
Interval in days for automatic rotation in pLAN network	Gl	3		1-7	days
Enable Force units in pLAN network	Gm	No		No-Yes	
Forcing delay for low and high ambient temperature	Gm	3 / 3		0-999	minutes
Low ambient temp. diff. for forcing units in network	Gn	8		0-99.9	ºC / ºF
Low ambient temp. offset for forcing units in network	Gn	4		0-99.9	ºC / ºF
High ambient temp. diff. for forcing units in network	Go	8		0-99.9	ºC / ºF
High ambient temp. offset for forcing units in network	Go	4		0-99.9	ºC / ºF
CAREL EXV DRIVERS →					
Number of drivers connected	F0	0		0-2	
Enable backup battery driver 1	F0	No		No-Yes	
Enable backup battery driver 1	F0	No		No-Yes	
Type of valve circuit 1	F1	10 (Carel)		0-11 (see 1.5)	
Superheating set point circuit 1	F1	6.0		2,0-50,0	ºC
Dead band circuit 1	F1	0		0-9.9	ºC
Type valve circuit 2	F2	10 (Carel)		0-11 (see 1.5)	
Superheating set point circuit 2	F2	6.0		2.0-50.0	ºC
Dead band circuit 2	F2	0		0-9.9	ºC
PID control – proportional gain circuit 1	F3	2.5		0.0-99.9	
PID control – integration time circuit 1	F3	25		0-999	seconds
PID control – derivative time circuit 1	F3	5,0		0.0-99.9	seconds

PARAMETER DESCRIPTION	SCREEN	DEFAULT	USER VALUE	RANGE	UOM
PID control – proportional gain circuit 2	F4	2.5		0.0-99.9	
PID control – integration time circuit 2	F4	25		0-999	seconds
PID control – derivative time circuit 2	F4	5,0		0.0-99.9	seconds
Threshold for low superheat protection circuit 1	F5	4.0		-4.0 - 10.0	ºC
Prot. threshold integration time, low superheat circuit 1	F5	10		0-255	seconds
Threshold for low superheat protection circuit 2	F6	4.0		-4.0 - 10.0	ºC
Prot. threshold integration time, low superheat circuit 2	F6	10		0-255	seconds
Percentage ratio between cooling capacity and Driver capacity C 1	F7	60		0-100	%
Percentage ratio between cooling capacity and Driver capacity C 2	F7	60		0-100	%
LOP threshold	F8	-40.0		-70.0 - 50.0	ºC
LOP threshold integration time	F8	40		0-255	seconds
MOP start delay	F9	30		0-500	seconds
MOP threshold	F9	40.0		-50.0 - 99.9	ºC
MOP threshold integration time	F9	40		0-255	seconds
High condensing temp. protection threshold	Fa	75.0		0-99.9	ºC
Integration time for high condensing temp. threshold	Fa	40		0-255	seconds
High suction temperature threshold	Fb	30.0		0-100.0	ºC
Custom Valve: minimum steps	Fc	0		0-8100	
Custom Valve: maximum steps	Fc	1600		0-8100	
Custom Valve: closing steps	Fd	3600		0-8100	
Custom Valve: return steps	Fd	0		0-8100	
Custom Valve: enable extra step in opening	Fe	No		No-Yes	
Custom Valve: enable extra step in closing	Fe	No		No-Yes	
Custom Valve: operating current	Ff	250		0-1000	mA
Custom Valve: holding current	Ff	100		0-1000	mA
Custom Valve: frequency	Fg	100		32-330	Hertz
Custom Valve: duty cycle	Fg	50		0-100	%
Minimum evaporation pressure probe value	Fh	-0.5		-9.9 - 10.0	Bar
Maximum evaporation pressure probe value	Fh	7.0		3.5 - 40.0	Bar
Low superheating alarm delay	Fi	0		0-3600	seconds
High suction temperature alarm delay	Fi	0		0-3600	seconds
LOP alarm delay	Fj	0		0-3600	seconds
MOP alarm delay	Fj	0		0-3600	seconds
TIMES →					
Outlet fan start and stop delay	T0	10 / 20		0-999	seconds
Integration time for P+I temperature control	T1	600		0-999	seconds
Travel time for 3 position valve	T1	180		0-999	seconds
Low pressure alarm delay	T2	180		0-999	seconds
High-low temperature-humidity alarm delays	T2	600		0-999	seconds
Alarm relay 7 activation delay, minor alarm	T3	0		0-999	seconds
Alarm relay 8 activation delay, serious alarm	T3	0		0-999	seconds
Air flow switch alarm delay	T4	10		0-999	seconds
Water flow switch alarm delay	T4	10		0-999	seconds
Minimum compressor off time	T5	180		0-999	seconds
Minimum compressor on time	T5	60		0-999	seconds
Delay between compressor starts	T6	360		0-999	seconds
Minimum delay between starts of different compressors	T6	10		0-999	seconds
Cap. control activation delay	T7	10		0-999	seconds
Heater start delay	T8	3		0-999	seconds
INITIALISATION →					
Enter password for reset Default values function	V0	1234		0-9999	
Delete BASIC alarm log	V1	No		No-Yes	
Enter new manufacturer password	V2	1234		0-9999	

7.0 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 buzzer incorporated into the external terminal (not provided for on the built-in terminal) turns on
- 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.

7.1 ALARM RELAYS

The medium boards provide a relay for the serious alarms and another relay for the non-serious alarms. The small boards include all alarms in the only available relay.
The non-serious alarm relay is closed in case of any type of alarm; the serious alarm relay is closed in case of serious alarms only. Each managed alarm may be identified as serious or non-serious, consequently allowing to determine which relay shall be enabled. The delay time can be determined for both relays before closing.

7.2 TABLE OF ALARMS

CODE	DESCRIPTION	DELAY	UNIT OFF	DISABLED DEVICES
A01	Compressor 1 general alarm	-	-	Compressor 1
A02	Compressor 2 general alarm	-	-	Compressor 2
A03	Compressor 1 low pressure	see T2	-	Compressor 1
A04	Compressor 2 low pressure	see T2	-	Compressor 2
A05	No air flow	see T4	yes	All
A06	Outlet fan thermal	-	yes	All
A07	Heater 1 thermal	-	-	Heater 1
A08	Heater 2 thermal	-	-	Heater 2
A09	Fire / Smoke detection	-	yes	All
A10	Dirty filters	-	-	-
A11	High ambient temperature	see T2	-	-
A12	Low ambient temperature	see T2	-	-
A13	High ambient humidity	see T2	-	-
A14	Low ambient humidity	see T2	-	-
A15	Compressor 1 working hours threshold reached	-	-	-
A16	Compressor 2 working hours threshold reached	-	-	-
A17	Outlet fan working hours threshold reached	-	-	-
A18	Ambient temperature probe faulty or disconnected	60 sec (fixed)	-	-
A19	Recovery water temperature probe faulty or disconnected	60 sec (fixed)	-	-
A20	External air temperature probe faulty or disconnected	60 sec (fixed)	-	-
A21	Outlet air temperature probe faulty or disconnected	60 sec (fixed)	-	-
A22	Ambient humidity probe faulty or disconnected	60 sec (fixed)	-	-
A23	Condenser 1 pressure probe faulty or disconnected	60 sec (fixed)	-	-
A24	Condenser 2 pressure probe faulty or disconnected	60 sec (fixed)	-	-
A25	Condenser 1 temperature probe faulty or disconnected	60 sec (fixed)	-	-
A26	Condenser 2 temperature probe faulty or disconnected	60 sec (fixed)	-	-
A27	High humidifier current	-	-	Humidifier
A28	No water inside humidifier cylinder	?	-	-
A29	No current in humidifier	?	-	-
A30	Clock card not present / faulty	-	-	-
A31	Circuit 1 high pressure	-	-	Compressor 1
A32	Circuit 2 high pressure	-	-	Compressor 2
A33	Water under floor	-	yes	All
A34	Auxiliary alarm	-	-	-
A35	Compressor 1 high pressure + thermal	-	-	Compressor 1
A36	Humidifier working hours threshold reached	-	-	-
A37	Compressor 2 high pressure + thermal	-	-	Compressor 2
A38	Condensing fan 1 thermal	-	-	Condensing fan 1
A39	Condensing fan 2 thermal	-	-	Condensing fan 2
A40	No water flow	see T4	yes	All
AL41	pLAN disconnected	60 sec (fixed)	-	-
AL42	Driver 1 alarm, probes faulty or disconnected	-	-	Compressor 1
AL43	Driver 1 EEPROM faulty or damaged	-	-	Compressor 1
AL44	Driver 1 valve motor faulty or damaged	-	-	Compressor 1
AL45	Driver 1 alarm, battery discharged or faulty	-	-	-
AL46	Driver 1 high evaporation pressure (MOP)	See Fj	-	-
AL47	Driver 1 low evaporation pressure (LOP)	See Fj	-	-
AL48	Driver 1 low superheating	See Fi	-	Compressor 1
AL49	Driver 1 valve not closed during blackout	-	-	Compressor 1
AL50	Driver 1 high suction pressure	See Fi	-	-
AL51	Driver 2 alarm, probes faulty or disconnected	-	-	Compressor 2
AL52	Driver 2 EEPROM faulty or damaged	-	-	Compressor 2
AL53	Driver 2 valve motor faulty or damaged	-	-	Compressor 2
AL54	Driver 2 alarm, battery discharged or faulty	-	-	-
AL55	Driver 2 high evaporation pressure (MOP)	See Fj	-	-
AL56	Driver 2 low evaporation pressure (LOP)	See Fj	-	-
AL57	Driver 2 low superheating	See Fi	-	Compressor 2
AL58	Driver 2 valve not closed during blackout	-	-	Compressor 2
AL59	Driver 2 high suction pressure	See Fi	-	-
AL60	Built-in humidifier: high conductivity alarm	See threshold Gb: delay 1h	-	Humidifier
AL61	Built-in humidifier: high conductivity pre alarm	See threshold Gb: delay 1h	-	-
AL62	Built-in humidifier: low steam production	-	-	Humidifier
AL63	Built-in humidifier: water drain alarm	-	-	Humidifier
AL64	Built-in humidifier: cylinder full alarm	-	-	Humidifier
AL65	Built-in humidifier: cylinder being depleted signal	-	-	-
AL66	Built-in humidifier: presence of foam	-	-	-
AL67	Built-in humidifier: cylinder depleted	-	-	-

8.0 SCREENS

The screens are divided into five categories:

- **USER** screens not protected by password: present in all branches but "**prog**" and "**menu+prog**", they show probes values, alarms, devices working hours, hour and date; these screens also allow setting the temperature and humidity set points and regulating the clock. In the following parameters table, they are indicated with symbol "❶".
- **USER** screens protected by password (1234, modifiable): these screens are accessed by pushing button "**prog**" and allow setting the main functions (timing, sets, differentials) of the connected devices; the screens referring to non-available functions are not displayed. In the following parameters table, they are indicated with symbol "❶".
- **SERVICE** screens protected by password (1234, modifiable): these screens are accessed by pushing button "**maintenance**" and allow checking the devices periodically, calibrating the connected probes, modifying the working hours and managing the devices manually. In the following parameters table, they are indicated with symbol "❷".
- **CLOCK** screens protected by password (1234, modifiable): these screens are accessed by pushing button "**clock**" and allow setting and enabling the temperature and humidity time bands. In the following parameters table, they are indicated with symbol "❸".
- **MANUFACTURER** screens protected by password (1234, modifiable): these screens are accessed by pushing buttons "**menu+prog**" and allow configuring the air-conditioning unit, enabling the main functions and selecting the connected devices. In the following parameters table, they are indicated with symbol "❹".

8.1 LIST OF THE SCREENS

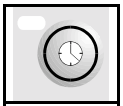
The following list indicates the displayed screens. Columns represent the screens loops: the first screen (A0, B0…) can be displayed by pushing the relevant button and the other screens can be scrolled by using the arrow buttons. Codes (Ax, Bx, Cx…) are displayed in the screens upper right corner, so as to be easily identified. The meaning of symbols ❶, ❶… is explained in the previous paragraph. Symbol PSW indicates the screens for entering passwords.

⓪	M0
⓪	M1
⓪	M2

⓪	A0
⓪	A1
⓪	A2
⓪	A3
⓪	A4
⓪	A5
PSW	A6
②	A7
②	A8
②	A9
②	Aa
②	Ab
②	Ac
②	Ad
②	Ae
②	Af
②	Ag
②	Ah
②	Ai
②	Aj
②	Ak
②	Al
②	Am
②	An

⓪	H0
⓪	H1

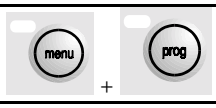
⓪	I0
⓪	I1
⓪	I2
⓪	I3
⓪	I4
⓪	I5
⓪	I6
⓪	I7
⓪	I8
⓪	I9
⓪	Ia
⓪	Ib
⓪	Ic
⓪	Id
⓪	Ie
⓪	If
⓪	Ig
⓪	Ih
⓪	Ii
⓪	Ij
⓪	Ik
⓪	Il
⓪	Im
⓪	In
⓪	Io
⓪	Ip
⓪	Iq
⓪	Ir
⓪	Is
⓪	It
⓪	Iu
⓪	Iv



⓪	K0
PSW	K1
③	K2
③	K3
③	K4
③	K5
③	K6
③	K7
③	K8
③	K9
③	Ka

⓪	S0
⓪	S1

PSW	P0
①	P1
①	P2
①	P3
①	P4
①	P5
①	P6
①	P7
①	P8
①	P9
①	Pa
①	Pb
①	Pc
①	Pd
①	Pe
①	Pf
①	Pg
①	Ph
①	Pi
①	Pj



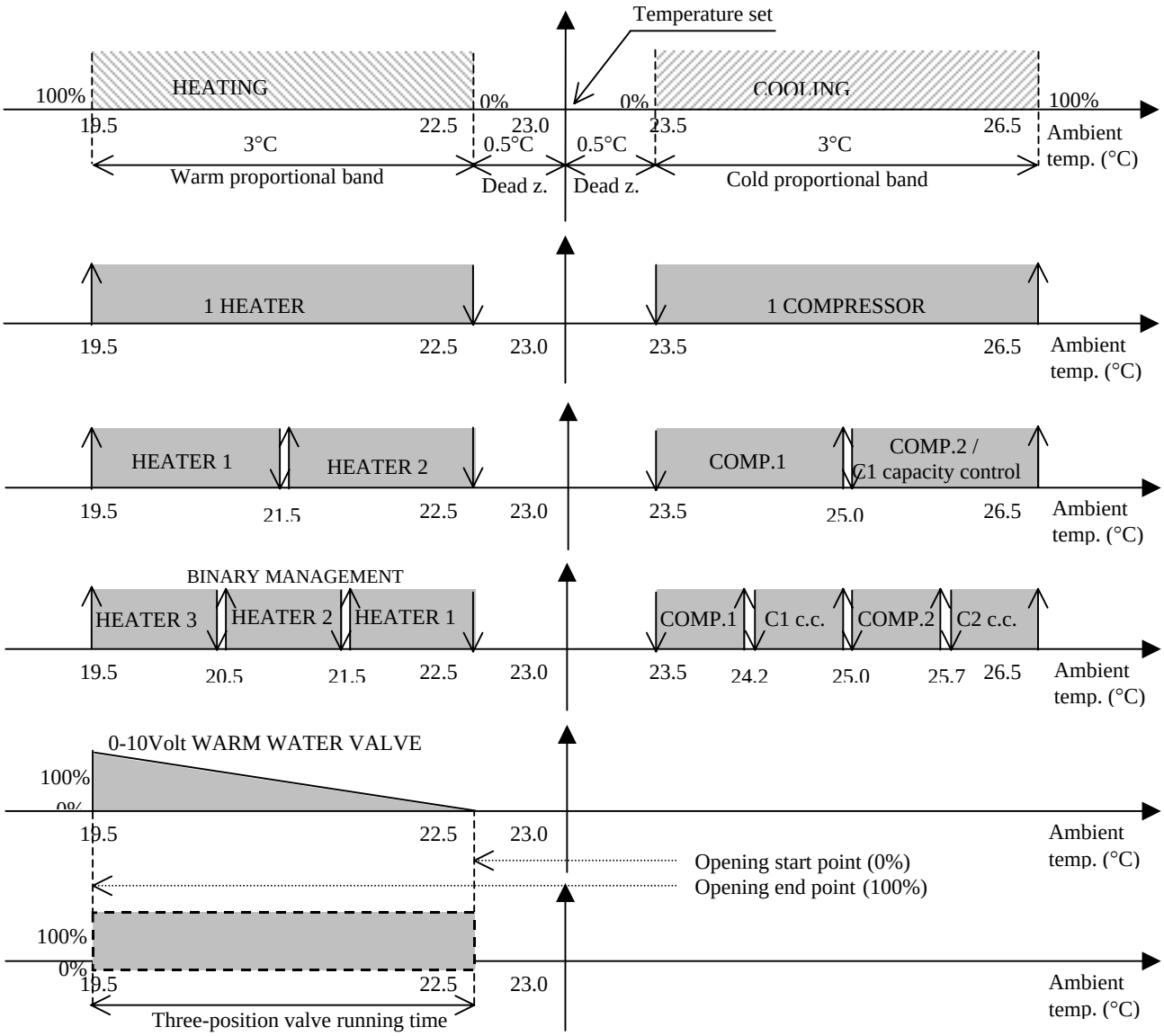
PSW	Z0		
④	Z1		
CONFIGURATION	→	④	C0
		④	C1
		④	C2
		④	C3
		④	C4
		④	C5
		④	C6
		④	C7
		④	C8
		④	C9
		④	Ca
		④	Cb
		④	Cc
		④	Cd
		④	Ce
		④	Cf
		④	Cg
		④	Cj
		④	Ci
		④	Cl
		④	Cm
		④	Cn
		④	Co
		④	Cp
		④	Co
		④	Cp
PARAMETERS	→	④	G0
		④	G1
		④	G2
		④	G3
		④	G4
		④	G5
		④	G6
		④	G7
		④	G8
		④	G9
		④	Ga
		④	Gb
		④	Gc
		④	Gd
		④	Ge
		④	Gf
		④	Gg
		④	Gh
		④	Gi

	④	Gj
	④	Gk
	④	Gl
	④	Gm
	④	Gn
	④	Go
CAREL EXV DRIVER→	④	F0
	④	F1
	④	F2
	④	F3
	④	F4
	④	F5
	④	F6
	④	F7
	④	F8
	④	F9
	④	Fa
	④	Fb
	④	Fc
	④	Fd
	④	Fe
	④	Ff
	④	Fg
	④	Fh
	④	Fi
	④	Fj
TIMES →	④	T0
	④	T1
	④	T2
	④	T3
	④	T4
	④	T5
	④	T6
	④	T7
	④	T8
INITIALISATION →	④	V0
	④	V1
	④	V2

9.0 TEMPERATURE CONTROL

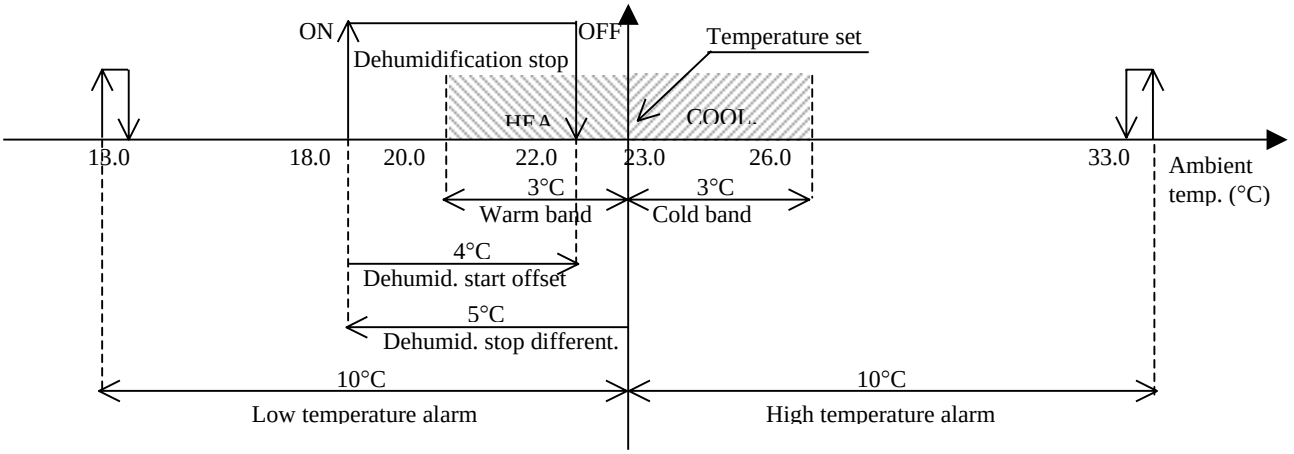
The heating and cooling devices are managed based on the temperature value measured by the ambient (or room temperature) probe. The measured temperature is compared to the set temperature (set point); the devices are enabled based on the difference between the two values. The proportional band identifies 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.

9.1 CLOSE CONTROL UNITS WITH DIRECT EXPANSION COIL



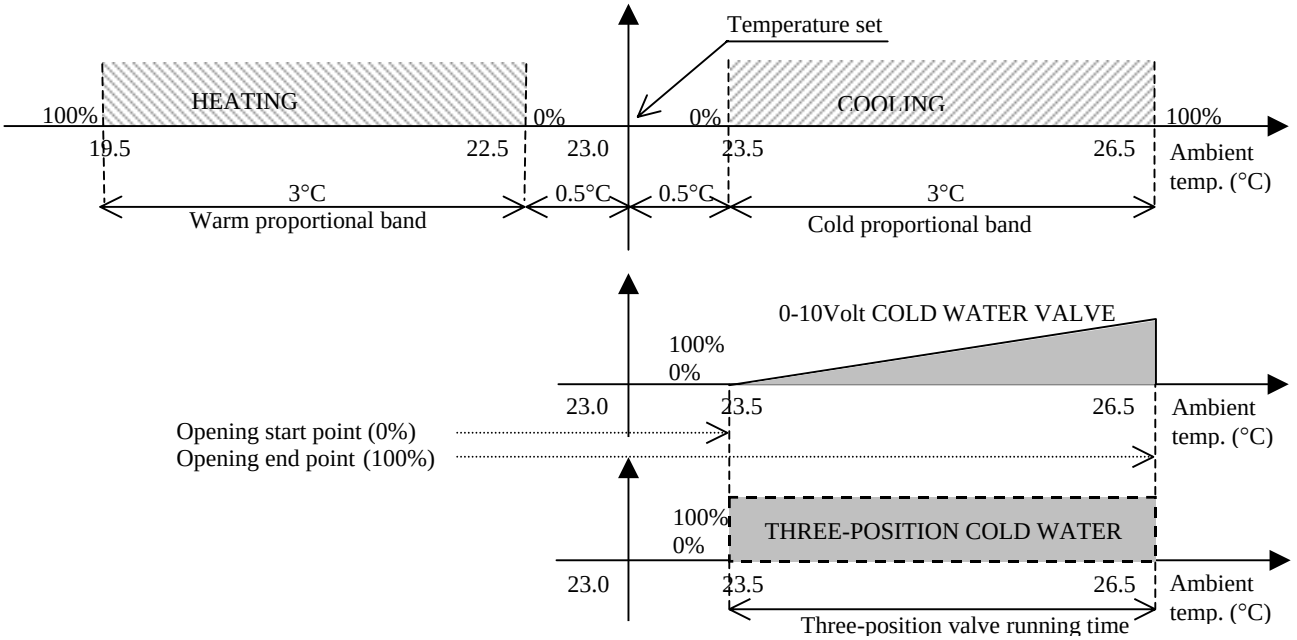
9.2 OTHER TEMPERATURE FUNCTIONS

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.



9.3 CLOSE CONTROL UNITS WITH TWO WATER COILS

These close control units are equipped with a warm water coil and a cold water coil. In addition, heating can also be executed by heaters. The following diagram shows the cooling devices action, whereas the heating devices action is dealt with in the paragraph describing the direct expansion units.



9.4 CLOSE CONTROL UNITS WITH SINGLE WATER COIL

In these close control units, the coil provides for both heating and cooling, depending on the type of water circulating inside it. In practice, the unit works as it was equipped with two different coils. The coil operation depends from a Summer / Winter digital contact that “reports” whether the circulating water is warm or cold to the board; if the “type of water” circulating inside the coil complies with the ambient request, the valve is modulated to regulate temperature.
In addition, heating can also be executed by heaters or a warm coil. For any information about coil and heaters operation, refer to the previous paragraphs.

10.0 HUMIDITY CONTROL

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.
Humidification is available for medium boards only. On the contrary, dehumidification is always available and enables the available cooling devices and a contact for an external dehumidifier or for reducing the outlet fan speed.
In case of medium boards, humidification can be executed as follows:

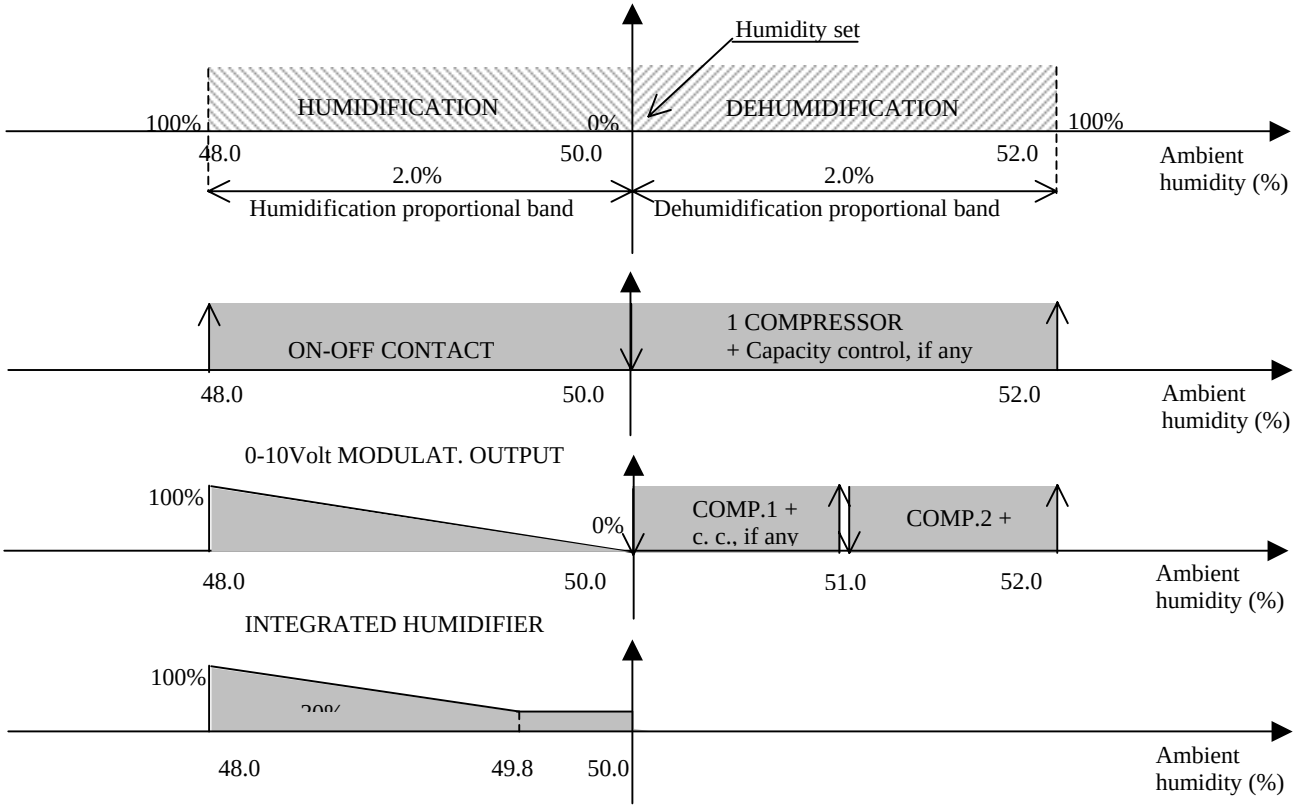
- built-in humidifier
- 0-10Volt modulating output
- On-Off contact

Dehumidification can be executed as follows:

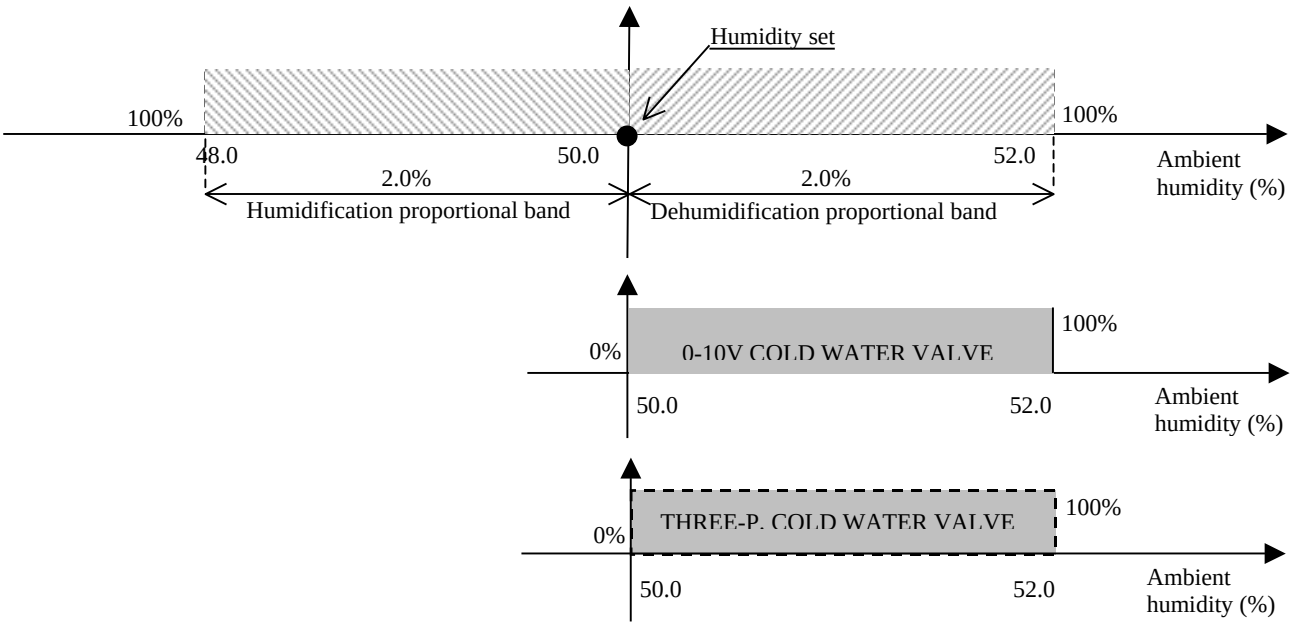
- On-Off contact for an external dehumidifier or for reducing the outlet fan speed
- compressors enabling (active capacity controls included, if any)
- 100% enabling of the 0-10Volt or three-position modulating cooling valve

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.

10.1 CLOSE CONTROL UNITS WITH DIRECT EXPANSION COIL



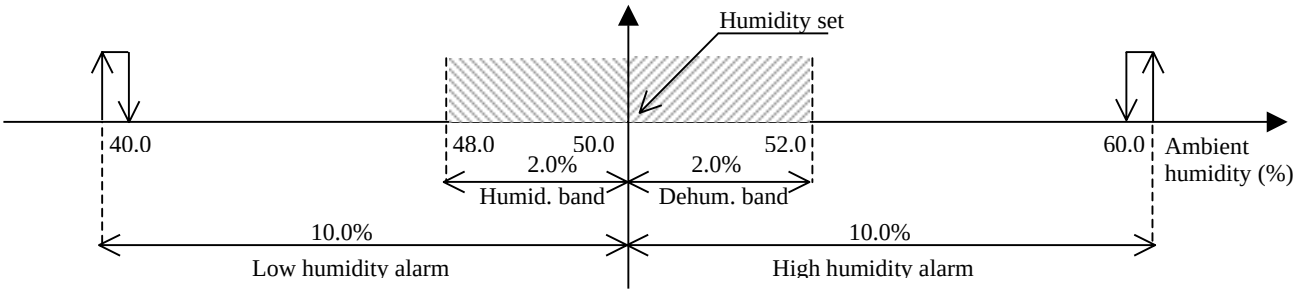
10.2 OTHER HUMIDITY FUNCTIONS



The high and low humidity alarms cause alarm screen signalling and have modifiable delay time.

10.3 CLOSE CONTROL UNITS WITH WATER COILS

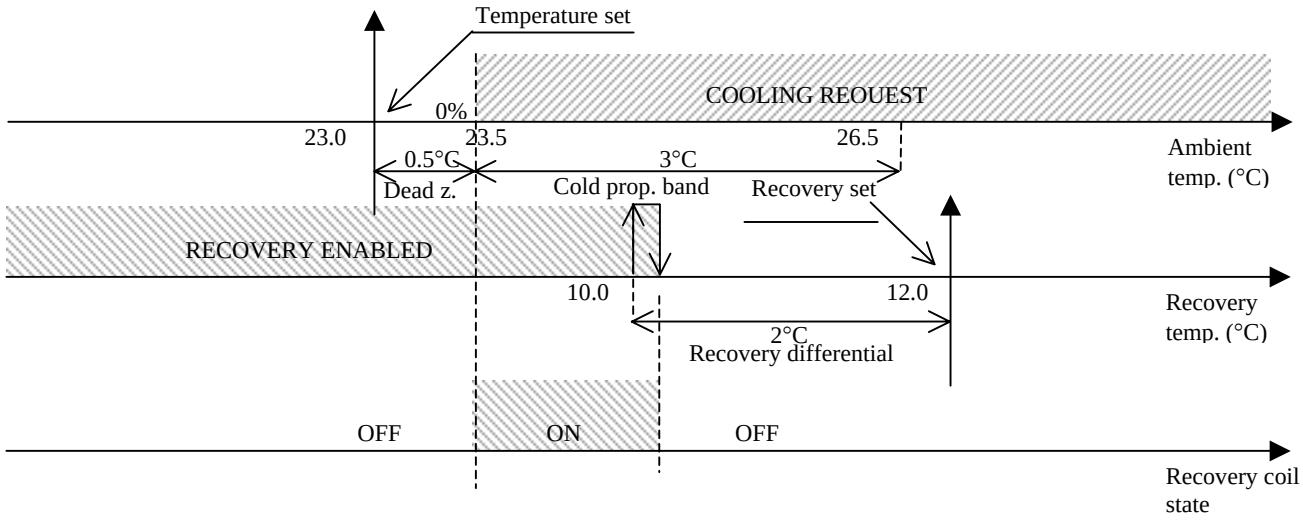
In these close control units, the cold water coils provide for dehumidification. The humidification devices are the same as the direct expansion close control units ones (On-Off contact, 0-10Volt modulating signal, built-in humidifier): for any information about their operation, refer to the previous paragraph. The following diagrams show the dehumidification devices action. The percentage values indicate the modulating valves opening range. Please note that the dehumidification cold water coils are enabled at 100%, not in modulating mode, in case of both three-position and 0-10Volt valves.



11.0 RECOVERY COIL

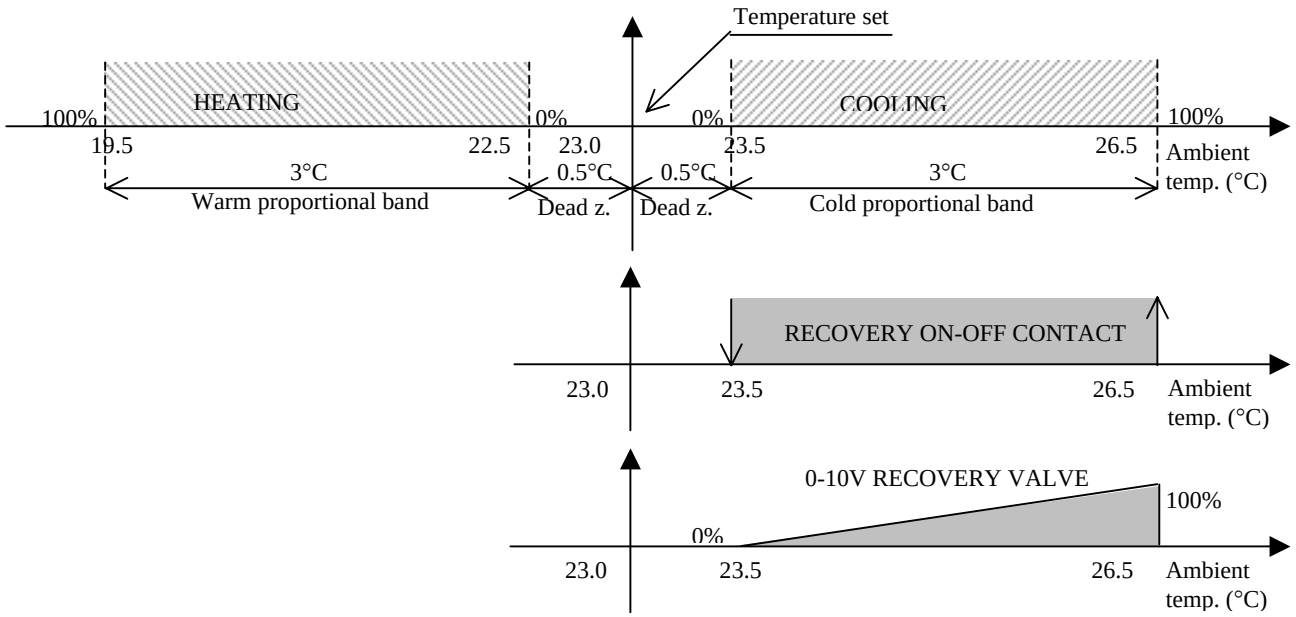
Recovery is an optional function: an additional cold coil using water coming from an external source (i.e., evaporation tower) is enabled if the temperature of water running inside it is quite low. This allows saving on the system management costs. The coil is enabled by On-Off contact or 0-10Volt modulating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

The following diagram shows the recovery coil enabling conditions: environment cooling request and recovery water temperature lower than recovery set – recovery differential.



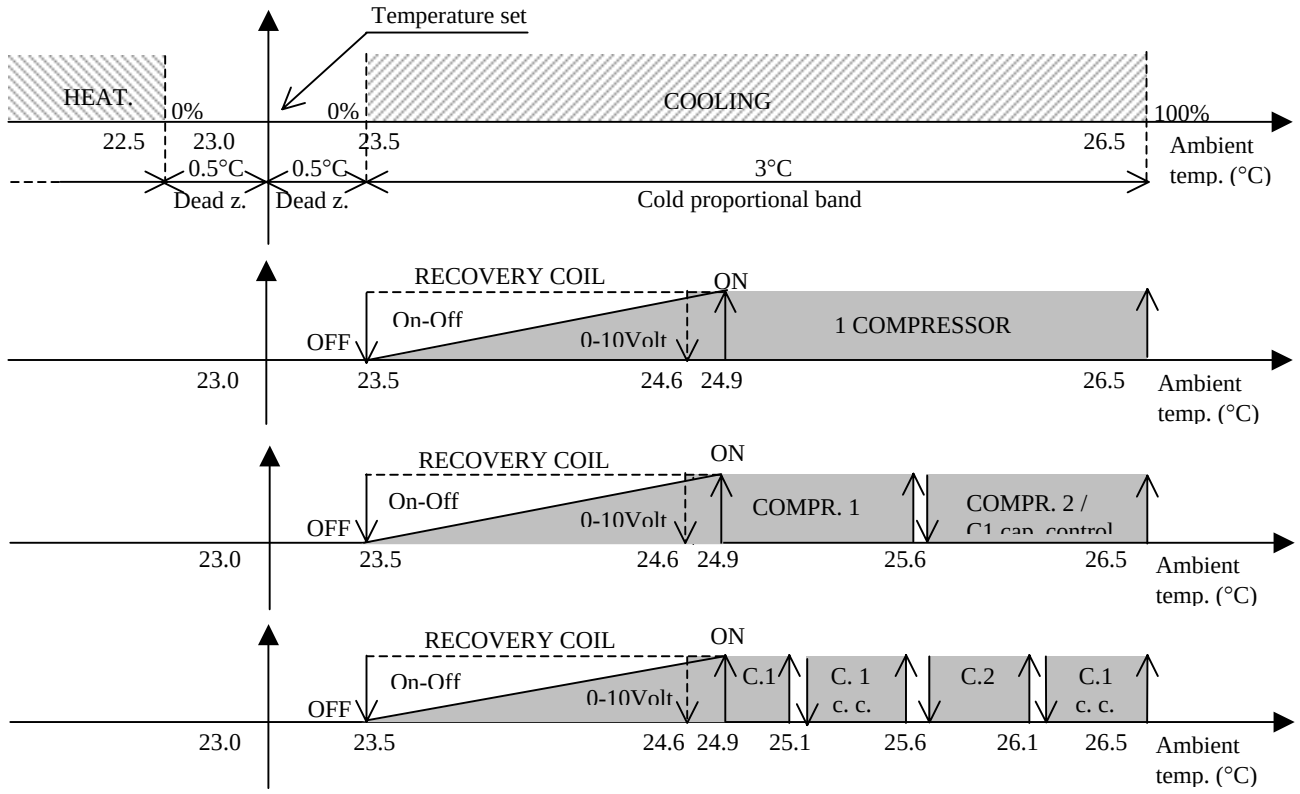
11.1 RECOVERY WITHOUT COOLING DEVICES

As shown in the previous diagram, the recovery coil only is enabled, whereas the conventional cooling devices are not switched on; as it can be noted in the following diagram, the recovery coil takes up the entire cold proportional band.



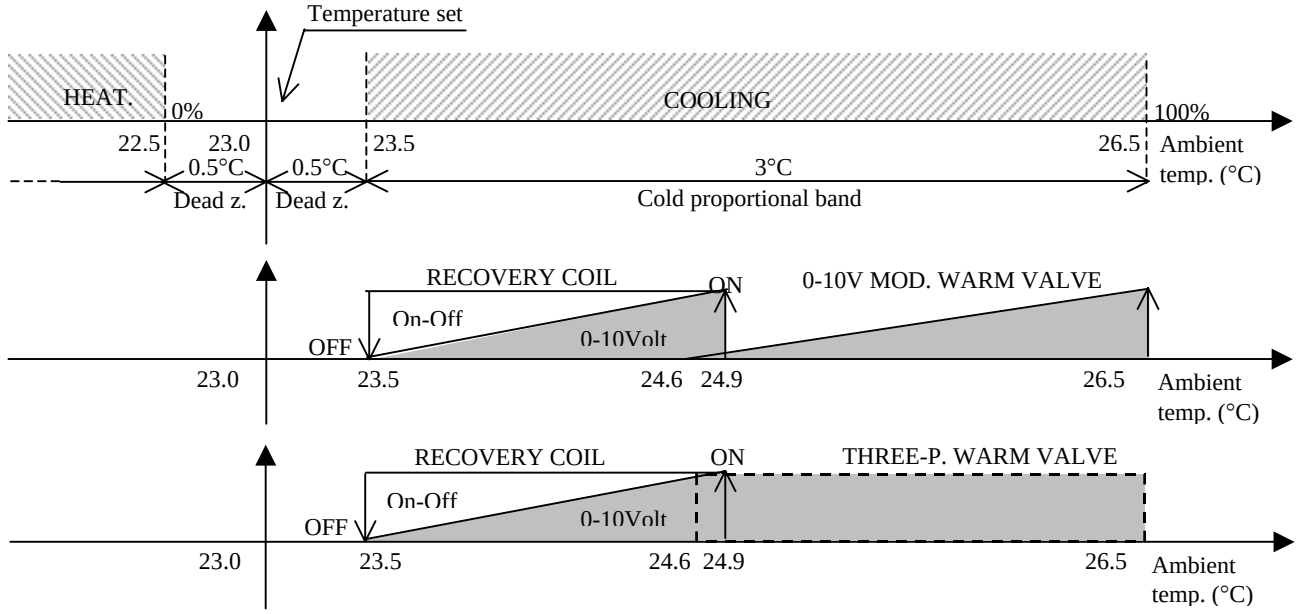
11.2 RECOVERY WITH COOLING DEVICES ON CLOSE CONTR. UNITS WITH DIRECT EXPAN. COIL

With recovery coil enabled, the conventional cooling devices are switched on only if ambient temperature increases above a certain value; adding the effects of recovery coil and devices together, temperature decreases, but before reaching the set point, the cooling devices are switched off again. In this case, the cooling devices favour Recovery but do not substitute for it. The following diagram shows how the cooling devices steps are offset compared to normal position to ensure energy saving.



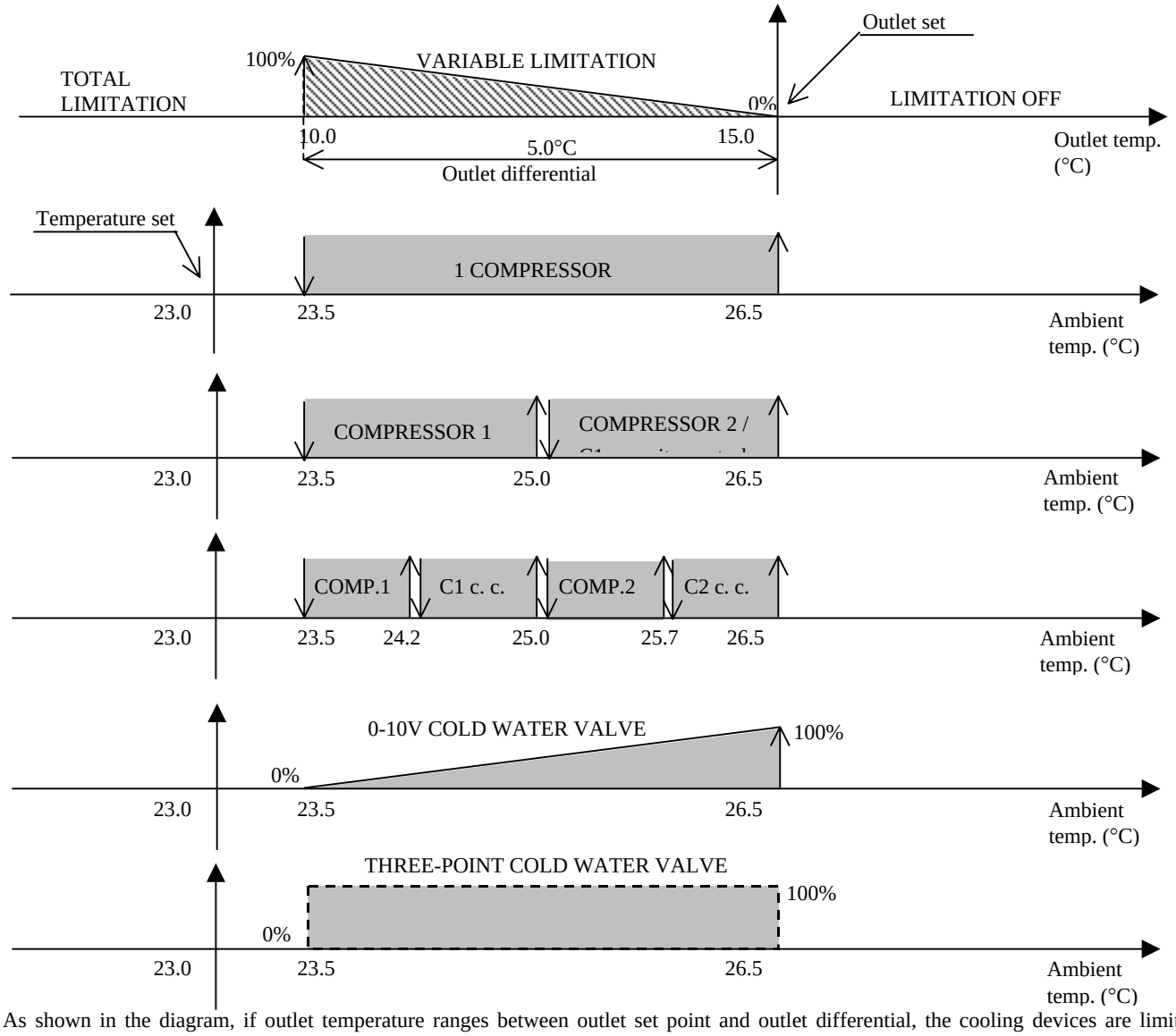
11.3 RECOVERY WITH COOLING DEVICES ON CLOSE CONTROL UNITS WITH WATER COILS

The following diagram shows how the cold coil steps are offset compared to normal position to ensure energy saving.



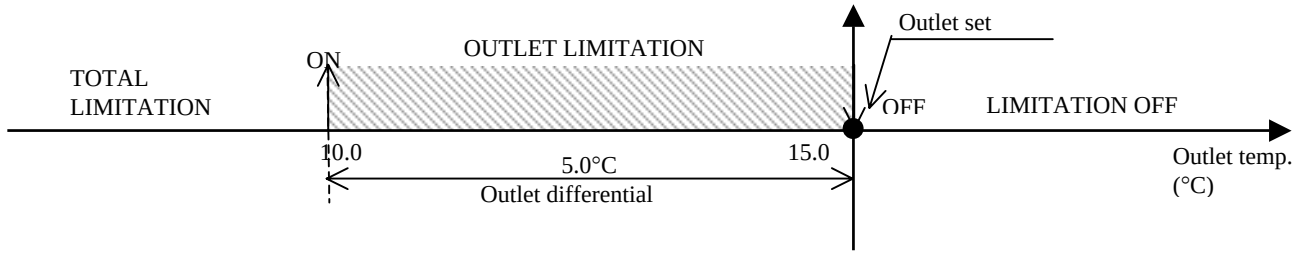
12.0 OUTLET LIMIT

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:



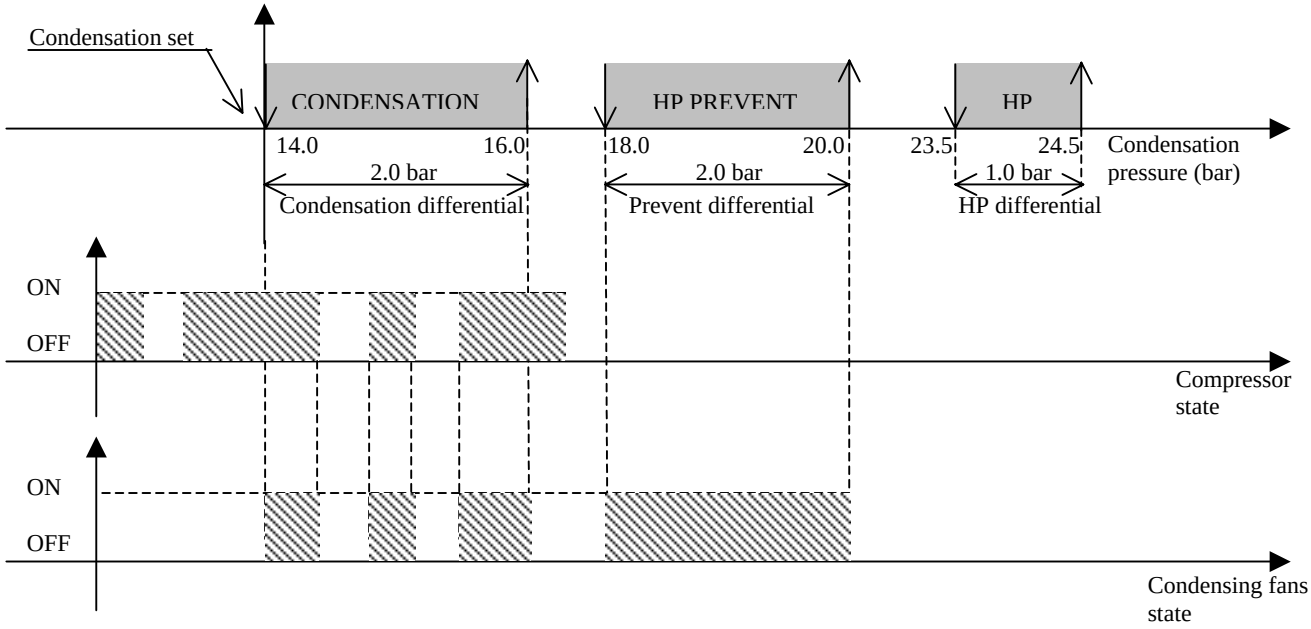
As shown in the diagram, if outlet temperature ranges between outlet set point and outlet differential, the cooling devices are limited only partially; the more temperature decreases the more limitation increases.

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:

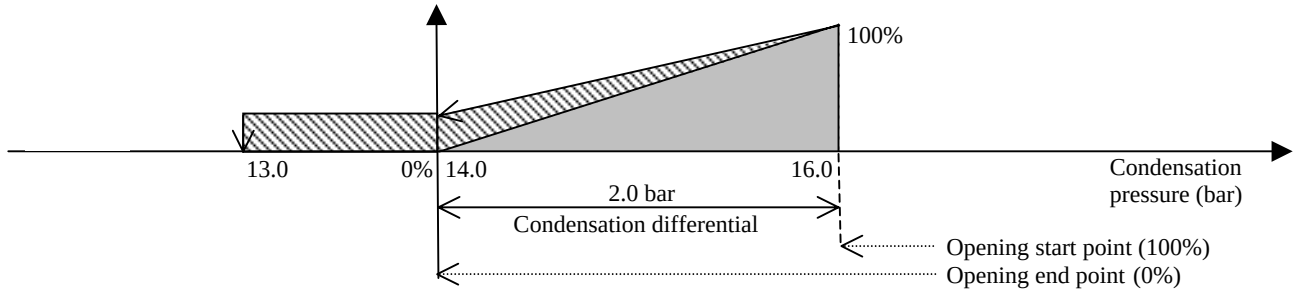


13.0 CONDENSER FANS

Condensing pressure control is available on ED 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 (on medium boards). 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.

13.1 SINGLE OR SEPARATE COILS

In case of single coil, only one output (on-off or modulating) is enabled. In case of units with at least one condensing probe and enabled on-off outputs (medium boards), two on-off outputs may be enabled in sequence, dividing the differential by two.
In case of separated coils, two different outputs (on-off or modulating) are enabled, one per circuit.

13.2 NUMBER OF 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.

13.3 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.

13.4 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.

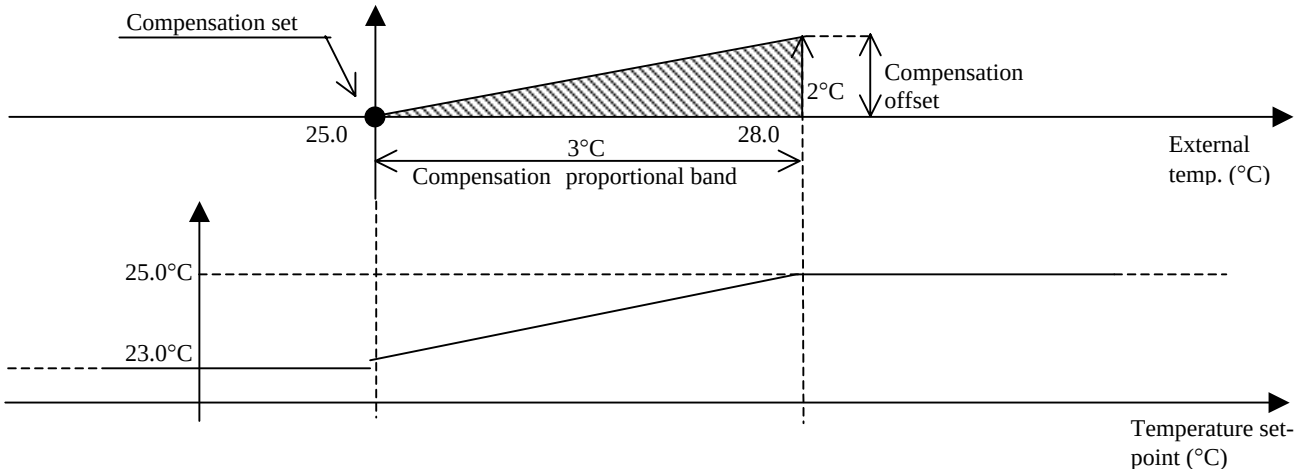
13.5 PRESSURE – TEMPERATURE CONVERSION

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).

14.0 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:



15.0 COMPRESSORS

Compressors are managed in ON-OFF mode. Maximum 2 compressors can be present, each having capacity control. Therefore, the total amount of compressors + capacity controls allows for 4 cold steps.

15.1 CAPACITY CONTROL

Their logic can be N.O. (relays normally open) or N.C. (relays normally closed). With respect to compressors, these controls are enabled with a programmable delay time. The capacity controls are available for medium boards only. During dehumidification, capacity controls are started simultaneously with the compressors to obtain the maximum cooling power.

15.2 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.

15.3 TIMING

15.3.1 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.

15.3.2 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.

15.3.3 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.

15.3.4 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.

15.3.5 CAPACITY CONTROLS START MINIMUM TIME

It represents the minimum time between compressor and capacity control start. This parameter is available only if capacity controls have been selected.

15.4 COMPRESSOR ALARMS

Compressors alarms are distributed in two digital inputs, with an exception for the two-compressor ED configuration on small boards, in which the alarms are compacted in a single digital input.
In case two digital inputs are present, the alarms mean Thermal alarm / High and Low pressure alarm.
In case a single digital input is present, the alarm means General alarm.
If any alarm input shall not be used, the 24Vac supply needs to be energised.
As for electrical connections of alarm digital inputs, refer to the pCO1 – pCO2 boards technical manual.

15.4.1 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 terminal 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.

15.4.2 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 terminal 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.

15.4.3 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 terminal 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.

16.0 HEATERS

The heaters are managed as simple ON-OFF loads. Normally up to 2 heaters with the same power can be managed, connected to the 2 outputs.
"Binary management" allows the use of three heating steps with just two outputs. Consequently, there are two possible options:
management of 2 loads with different power values;
management of 3 loads. To use this system, a recognizer is required (NOT supplied), which, connected to the outputs, reads the logic and activates the loads.
The outputs behave as follows:

			CODE	2 DIFFERENT LOADS	3 LOADS
STEP 1	Relay 1=On	Relay 2=Off	10	Heat.1=On / Heat.2=Off	Heat.1=On / Heat.2=Off / Heat.3=Off
STEP 2	Relay 1=Off	Relay 2=On	01	Heat.1=Off / Heat.2=On	Heat.1=On / Heat.2=On / Heat.3=Off
STEP 3	Relay 1=On	Relay 2=On	11	Heat.1=On / Heat.2=On	Heat.1=On / Heat.2=On / Heat.3=On

The outputs are activated with a slight delay from one to the other, to avoid simultaneous peaks.

16.1 HEATER ALARMS

Each heater is provided with a digital input to be connected with a compressor overload or differential for signalling any failure.
If any input shall not be used, the 24Vac supply needs to be energised.
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 terminal Alarm button, provided that the compressor overload or the differential have rearmed energising the digital input.

17.0 MODULATING VALVES

17.1 THREE-POSITION VALVES

Valves with three electrical contacts (besides supply): shared, opening and closing. The two relays of pCO1-pCO2 boards (opening – closing relays) must be connected to these contacts.
Based on the relays enabling time, the valves opening range varies from 0% to 100% taking an opening/closing time defined as "running time" (time taken to open or close completely; it is a valves rating). The relays must never be enabled simultaneously, thus the valve open, close or keep still.
The valves opening range is calculated based on the proportion between temperature differential and running time. When ambient temperature corresponds to the set point, the valves keep closed; the more temperature is offset compared to the set point the more the valves are opened, until they open completely when temperature is equal or higher than set point + / - differential.
During operation, the valves are frequently subject to partial opening and closing; the program can recognise the valves opening range at any time by adding up and subtracting all partial times executed from board start-up.

17.1.1 REALIGNMENT

As there is no feedback to define precisely the valves opening range, the program cannot easily manage the three-position valves. A slight difference between the time calculated by the program and the relays enabling time or a mechanical friction preventing the valves from moving freely may originate discrepancy between the valves actual opening range and the range calculated by the program. To obviate this problem, the following precautions are provided for:

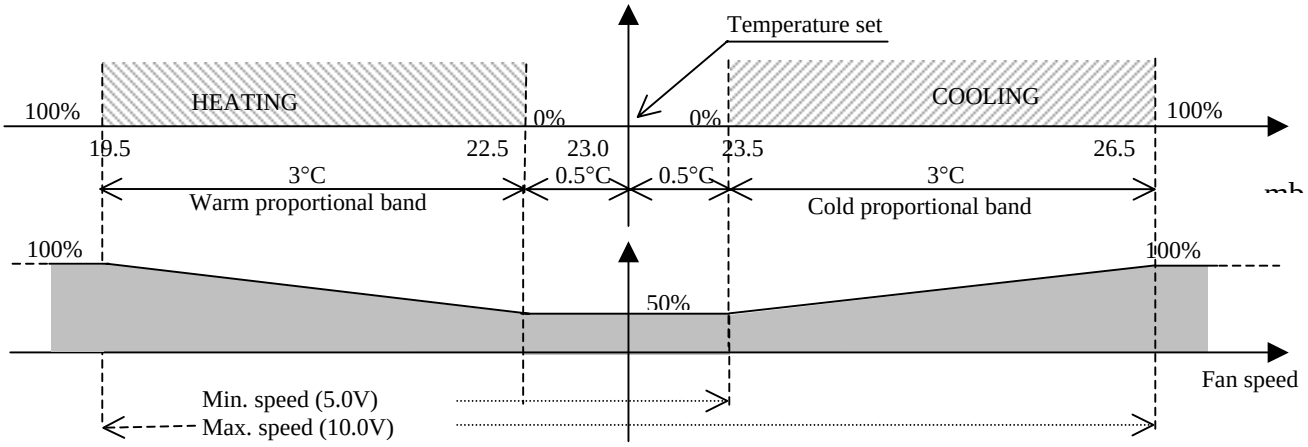
- whenever temperature control requires a valve complete opening or closing, the program increases the opening or closing relay enabling time by 25% to ensure complete opening/closing.
- whenever the board is started, the valves are completely closed during the running time; only after time has elapsed, the valves start modulating their opening range based on the control request.

17.2 0-10Volt VALVES

These valves use a 0-10Volt modulating signal coming from the pCO1-pCO2 to modify their opening range from 0% to 100%.
The 0-10Volt electric signal is directly proportional to the temperature proportional band. Unlike the three-position valves, these valves do not require adjustment since their opening range is directly proportional to the analogue output value.

18.0 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:



During dehumidification, speed is automatically decreased to 5.0V (50%) default value, modifiable if required. The minimum and maximum speeds default values correspond to 5.0V and 10.0V, modifiable if required.

19.0 MANUAL DEVICE MANAGEMENT

The devices connected to outputs can be enabled manually without using timing, compressors rotation and independently from control and probes values. In manual mode, the only available support is the management of the alarms safeguarding devices safety and soundness. The analogue outputs enabling allows forcing a value between 0V and 10V.
The manual procedure can be enabled by button only if the unit is in OFF mode and is automatically stopped within 30 minutes after enabling the last device or disabling all devices manually.
During devices manual management, the air-conditioning unit cannot be turned on. This operative mode is identified by message "MANUAL PROCEDURE" shown on the last display row, on the Menu main screen. The enabling parameters are displayed in the Maintenance screens branch under Password.

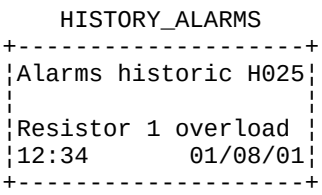
20.0 ALARM DATA LOGGING

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.

20.1 MAIN LOG (pCO1 – pCO2)

Events can be stored thanks to the pCO1-pCO2 boards very large buffer memory. The MAIN data logging can be enabled by parameter; if the clock card (optional on pCO1, integrated on pCO2) 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 Menu (Esc if the built-in terminal is being used). The screen is displayed as follows:



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.

20.2 ADVANCED LOG (pCO2)

The events are saved in the 1MB or 2MB memory expansion, available on the pCO2 board. The advantages and characteristics of this log are as follows:

- Log by event: a typical log by event is the alarm log. When an alarm is activated, the event is saved together with other significant values (temperature, humidity, pressure, set point, etc.).
- Log by time: a typical log by time is the temperature/humidity log. The temperature and humidity values are saved at regular intervals.
- Log of logs: a typical log of logs involves the saving of the last alarms/temperature/humidity values recorded before a serious alarm. Unlike the data saved for the log by event and log by time, this data is not overwritten when the memory is full.
- Possibility to choose the values to be saved and the saving options at any time. The "WinLOAD" program can be used to define, using a practical "Wizard", the values to be saved and the options. WinLOAD does not require the application program "files", as it is able to directly receive all the information required from the program installed on the pCO1 – pCO2.
- 1MB dedicated FLASH memory. The system saves the data in the 1MB FLASH memory in the memory expansion (code PCO200MEM0). For example, 1MB of memory is able to store 5000 alarm events with 5 values per alarm, and record 2 values, such as temperature and humidity, for 6 months, saved every 5 minutes.
- Possibility to define up to 7 different log configurations. Typically, each controller will have an alarm log, a log of the control values (temperature/humidity/pressure) and some "logs of logs".
- Possibility to display the data saved on the terminal LCD (external or built-in), or on a PC.
- "Black box" function. The memory expansion that contains the logs can be removed from the pCO² on the unit controlled and inserted in another pCO² to display the data saved. The latter pCO² does not need to have the same application program as the original.
- Reliability of the data saved. The data are saved in FLASH memory, which does not require batteries that risk being discharged. If following a software update the previously saved data are incompatible with the new software, all the data will be deleted (following confirmation).

20.2.1 CONFIGURATION USING "WINLOAD"

The Advanced Log function, including all the options described above, is configured using the "On line help" feature in the WINLOAD32 program, the same used to upload the program software to the pC01 and pCO2 boards.

21.0 SUPERVISION

pCO1 and pCO2 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).

21.1 CAREL SUPERVISOR

The local connection between pCO1 – pCO2 board and a supervisory PC requires the insertion of the Rs485 additional card (pCO2: PCO2004850; pCO1: PCO1004850) into the "Serial card" port. From the additional card, connect to the Rs485 serial line up to the Rs485/Rs232 converter supplied by Carel (PC485KIT00) for connection with the PC.
In case of remote supervisor with supervisory PC connected with the telephone line, simply install the Rs232 optional card (pCO2: PCO200MDM0; pCO1: PCO100MDM0) and connect it to a traditional modem (not GSM). The program allows managing the modem and setting the phone numbers to be called. As for connections, refer to the instruction sheet.

21.2 BMS

The connection with the BMS supervisory systems is executed in different ways.
Lonworks: insert the additional card into the "Serial card" port (pCO2: PCO20LFTTL / PCO20L485L; pCO1: PCO10LFTTL / PCO10L485L) and connect as prescribed in the instruction sheet. Enable LON function on the LCD terminal.
Modbus: insert the Rs485 additional card; the card only is required since the program manages this protocol by itself.
Bacnet: insert the Rs485 additional card and connect it with Carel's gateway code GATEWAYBN0 by Rs485 line.
Owners' BMS: Carel has developed many other Gateways for interfacing with less spread BMS, i.e. OTE.

21.3 GSM PROTOCOL

By selecting the GSM protocol, SMS (text) messages can be sent to and from GSM phones, using a GSM modem. The pCO1 or pCO2 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:

Parameter	Unit Add. 1	Unit Add. 2	Unit Add. 3	Unit Add. 4	Unit Add. 5	Unit Add. 6	Unit Add. 7	Unit Add. 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
Recovery 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

For details on the syntax of the SMS messages sent to the pCO* and on the use of the above table, refer to the manual: *GSM modem protocol for pCO2 (code+030220330).*

N.B. When the GSM protocol is active, the remote supervisor cannot call the pCO1 or pCO2 board.

21.4 VARIABLE DATABASE

A specific communication database is featured that includes all the more important program variables, from the values read by the probes to the parameters set on the screens. The following table describes the database, divided into digital, integer and analogue variables, indicating for each its description, address and type, that is, read-only (R) or modifiable from the supervisor (R/W).

21.4.1 DIGITAL VARIABLES

DESCRIPTION	SCR	ADD	TYPE
Digital input number 1	I3	1	R
Digital input number 2	I3	2	R
Digital input number 3	I3	3	R
Digital input number 4	I3	4	R
Digital input number 5	I3	5	R
Digital input number 6	I3	6	R
Digital input number 7	I3	7	R
Digital input number 8	I3	8	R
Digital input number 9	I3	9	R
Digital input number 10	I3	10	R
Humidifier water level contact	I3	11	R
Digital input number 12	I3	12	R
Digital input number 13	I3	13	R
Digital input number 14	I3	14	R
Digital output number 1	I7	15	R
Digital output number 2	I7	16	R
Digital output number 3	I7	17	R
Digital output number 4	I7	18	R
Digital output number 5	I7	19	R

DESCRIPTION	SCR.	ADD.	TYPE
Humid. operating hour threshold alarm	A36	63	R
Thermal cutout and high pressure alarm, comp. 2	A37	64	R
Condens. 1 fan thermal cutout alarm	A38	65	R
Condens. 2 fan thermal cutout alarm	A39	66	R
Water flow alarm	A40	67	R
Enable compressors/cooling coil together with recovery coil	G0	69	R/W
Enable outside temperature probe	Cl	70	R/W
Enable pressure probe 1	Ci	71	R/W
Enable pressure probe 2	Cj	72	R/W
Enable humidity probe	Ch	73	R/W
Enable outlet probe	Ck	74	R/W
Enable condenser 1 temp. probe	Cm	75	R/W
Enable condenser 2 temp. probe	Cm	76	R/W
Enable recovery probe	Cl	77	R/W
Modulating output 1 configuration (0=rec. valve; 1=modulating fan)	Ca	78	R/W
Type of unit (0=ED; 1=CW)	C1	79	R/W
Modulating output 2 configuration (0=recovery valve; 1=humidifier)	Cb	80	R/W
Digital input 1 configuration (0=fire/smoke; 1=flood)	C6	81	R/W
Digital input 12 configuration	C5	82	R/W

DESCRIPTION	SCR	ADD	TYPE
Digital output number 6	I7	20	R
Digital output number 7	I7	21	R
Digital output number 8	I7	22	R
Digital output number 9	I7	23	R
Digital output number 10	I7	24	R
Digital output number 11	I7	25	R
Digital output number 12	I7	26	R
Digital output number 13	I7	27	R
Generic alarm compressor 1	A01	28	R
Generic alarm compressor 2	A02	29	R
Low pressure alarm compressor 1	A03	30	R
Low pressure alarm compressor 2	A04	31	R
Air flow alarm	A05	32	R
Fan thermal cutout alarm	A06	33	R
Thermal cutout alarm heater 1	A07	34	R
Thermal cutout alarm heater 2	A08	35	R
Fire / smoke alarm	A09	36	R
Dirty filter alarm	A10	37	R
High ambient temperature alarm	A11	38	R
Low ambient temperature alarm	A12	39	R
High ambient humidity alarm	A13	40	R
Low ambient humidity alarm	A14	41	R
Op. hour threshold alarm, compressor 1	A15	42	R
Op. hour threshold alarm, compressor 2	A16	43	R
Op. hour threshold alarm, fan	A17	44	R
Room temperature probe faulty alarm	A18	45	R
Recovery temperature probe faulty alarm	A19	46	R
Outside temperature probe faulty alarm	A20	47	R
Outlet temperature probe faulty alarm	A21	48	R
Room humidity probe faulty alarm	A22	49	R
Pressure probe 1 faulty alarm	A23	50	R
Pressure probe 2 faulty alarm	A24	51	R
Cond. temp. probe 1 faulty alarm	A25	52	R
Cond. temp. probe 2 faulty alarm	A26	53	R
High current in the humidifier alarm	A27	54	R
No water in humidifier alarm	A28	55	R
No current in humidifier alarm	A29	56	R
Clock card fault alarm	A30	57	R
High pressure alarm circuit 1	A31	58	R
High pressure alarm circuit 2	A32	59	R
Flood alarm	A33	60	R
Auxiliary alarm	A34	61	R
Thermal cutout and high pressure alarm, comp. 1	A35	62	R

DESCRIPTION	SCR.	ADD.	TYPE
(0=fire/smoke; 1=flood)			
Enable modulating outlet fan	Cc	83	R/W
Heating mode (0=heaters; 1=hot coil)	C2-C3	84	R/W
Type of valve on cooling coil (0=0-10V; 1=3pos)	C3	85	R/W
Type of valve on heating coil (0=0-10V; 1=3pos)	C2-C3	86	R/W
Enable modulating 0-10V humidifier output	Ca	87	R/W
Type of coil on main unit CW (0=single; 1=double)	C3	88	R/W
Type of condenser (0=single coil; 1=separate coils)	Cd	89	R/W
Select type of fans (0=inverter; 1=steps)	Cd	90	R/W
Enable condenser function	Cd	91	R/W
Enable high press. Prevent function	Gh-Gi	92	R/W
Enable outlet limit function	Pa	93	R/W
Enable compensation function	P7	94	R/W
Enable cooling coil for dehumidif.	Cf	95	R/W
Enable recovery coil	Cc	96	R/W
Dehumidif contact logic (0=NO; 1=NC)	Cf	97	R/W
Enable FIFO compressor rotation	G1	98	R/W
Enable compressor capacity-control steps	C2	99	R/W
Cap. control contact logic (0=NO; 1=NC)	G1	100	R/W
Type of temperature control (0=P; 1=P+I)	G1	101	R/W
Enable built-in humidifier	Cf	102	R/W
Enable Carel Master Control	Gj	105	R/W
Enable Force units in pLAN	Gm	106	R/W
Enable On-Off time bands	K2	107	R/W
Enable temperature time bands	K2	108	R/W
Enable humidity time bands	K2	109	R/W
Enable unit off from button	P5	110	R/W
Enable remote On-Off dig. input	P5	111	R/W
Unit On-Off from supervisor	---	112	R/W
Digital output 7 configuration (0=recovery valve; 1=minor alarms)	C7	113	R/W
Select temperature unit of measure	C0	114	R/W
Enable clock card (pCO1)	C0	115	R/W
Enable printer	C0	116	R/W
Confirm hour setting	K0	117	R/W
Confirm minute setting	K0	118	R/W
Confirm day setting	K0	119	R/W
Confirm month setting	K0	120	R/W
Confirm year setting	K0	121	R/W
Reset alarms from supervisor	---	123	R/W

21.4.2 ANALOGUE VARIABLES

DESCRIPTION	SCR	ADD.	TYPE
Room humidity probe reading		1	W
Pressure probe 1 reading		2	W
Pressure probe 2 reading		3	W
Room temperature probe reading		4	W
Air outlet temperature probe reading		5	W
Outside temperature probe reading		6	W
Cond. 1 temperature probe reading		7	W
Cond. 2 temperature probe reading		8	W
Water recovery temperature probe reading		9	W
Temperature set point	S1	10	R/W
Minimum temperature set point limit	P1	11	R/W
Maximum temperature set point limit	P1	12	R/W
Humidity set point	S1	13	R/W
Minimum humidity set point limit	P2	14	R/W
Maximum humidity set point limit	P2	15	R/W
Temperature time band set point Z1	K6	16	R/W
Temperature time band set point Z2	K6	17	R/W
Temperature time band set point Z3	K7	18	R/W

DESCRIPTION	SCR.	ADD.	TYPE
Condensing (pressure) differential	Ge	43	R/W
Condensing (temp.) differential	Gf	44	R/W
Max condenser fan speed	Gg	45	R/W
Min condenser fan speed	Gg	46	R/W
Condensing (pressure) set point	Ge	47	R/W
Condensing (temperature) set point	Gf	48	R/W
High ambient temperature alarm offset	P8	53	R/W
Low ambient temperature alarm offset	P8	54	R/W
High ambient humidity alarm offset	P9	55	R/W
Low ambient humidity alarm offset	P9	56	R/W
End point to open modulating humidifier output	G8	57	R/W
Starting point to open modulating humidifier output	G8	58	R/W
Maximum humidifier production	Cg	59	R/W
Maximum outlet fan speed	G7	60	R/W
Minimum outlet fan speed	G7	61	R/W
Maximum value humidity probe	Ch	62	R/W
Minimum value humidity probe	Ch	63	R/W
Maximum value pressure probe 1	Ci	64	R/W

DESCRIPTION	SCR	ADD.	TYPE
Temperature time band set point Z4	K7	19	R/W
Humidity time band set point Z1	K8	20	R/W
Humidity time band set point Z2	K8	21	R/W
Humidity time band set point Z3	K9	22	R/W
Humidity time band set point Z4	K9	23	R/W
Temperature dead zone	P3	24	R/W
Proportional band in Cooling	P3	25	R/W
Proportional band in Heating	P3	26	R/W
Proportional band in Humidification	P4	27	R/W
Proportional band in Dehumidification	P4	28	R/W
Maximum compensation set temp. offset	P7	29	R/W
Outside temperature probe calibration	Ea	30	R/W
Condens. 1 pressure probe calibration	E9	31	R/W
Condens. 2 pressure probe calibration	E9	32	R/W
Humidity probe calibration	E9	33	R/W
Room temperature probe calibration	Ea	34	R/W
Outlet temperature probe calibration	Ea	35	R/W
Condens.1 temperature probe calibration	Eb	36	R/W
Condens.2 temperature probe calibration	Eb	37	R/W
Recovery temperature probe calibration	Eb	38	R/W
Stop dehumidification temp. differential	G9	39	R/W
Air outlet differential	Pa	40	R/W
Outside air differential for compensation	P7	41	R/W
High pressure alarm differential	Gd	42	R/W

DESCRIPTION	SCR.	ADD.	TYPE
Minimum value pressure probe 1	Ci	65	R/W
Maximum value pressure probe 2	Cj	66	R/W
Minimum value pressure probe 2	Cj	67	R/W
Restart dehumidification temp. offset	G9	68	R/W
Prevent (pressure) differential	Gh	69	R/W
Prevent (temperature) differential	Gi	70	R/W
Prevent (pressure) set point	Gh	71	R/W
Prevent (temperature) set point	Gi	72	R/W
Water recovery set point temperature	P6	73	R/W
High pressure alarm set point	Gd	74	R/W
Air outlet set point	Pa	75	R/W
Outside air set point for compensation	P7	76	R/W
Outlet fan speed in dehumid.	G7	77	R/W
Current superheating value driver 1	Ik	78	R
Evaporation temperature driver 1	Ik	79	R
Suction temperature driver 1	Ik	80	R
Evaporation pressure driver 1	Il	81	R
Condensing temperature driver 1	Im	82	R
Current superheating value driver 2	Ip	83	R
Evaporation temperature driver 2	Ip	84	R
Suction temperature driver 2	Ip	85	R
Evaporation pressure driver 2	Iq	86	R
Condensing temperature driver 2	Ir	87	R

21.4.3 INTEGER VARIABLES

DESCRIPTION	SCR	ADD.	TYPE
Analogue output 1		1	R
Analogue output 2		2	R
Analogue output 3		3	R
Analogue output 4		4	R
Current hour		5	R
Current minutes		6	R
Day		7	R
Month		8	R
Year		9	R
Weekday		10	R
Hour setting	K0	14	R/W
Minute setting	K0	15	R/W
Day setting	K0	16	R/W
Month setting	K0	17	R/W
Year setting	K0	18	R/W
Number of compressors	C2	20	R/W
Number of compressors for dehumidify	Cf	21	R/W
Select number of On-Off fans	Cd	22	R/W
Humber of heaters	C2-C3	23	R/W
Probe 2 input configuration (0=cond. 1 press.; 1=cond.1 temp.; 2=outlet temp.)	C8	24	R/W
Probe 3 input configuration (0= cond.2 press.; 1=cond.2 temp.; 2=recovery temp.)	C9	25	R/W
Digital input 5 configuration (0=flood; 1=filters; 2=fire/smoke)	C4	26	R/W
Type of signal from the humidity probe (2=0-1V; 3=0-10V; 4=current)	Ch	27	R/W
Type of signal pressure probe 1 (2=0-1V; 3=0-10V; 4=current)	Ci	28	R/W
Type of signal pressure probe 2 (2=0-1V; 3=0-10V; 4=current)	Cj	29	R/W
Type of signal condens. 1 T probe (0=NTC; 1=PT1000; 2=0-1V; 3=0-10V; 4=current)	Cm	30	R/W
Type of signal condens. 2 T probe (0=NTC; 1=PT1000; 2=0-1V; 3=0-10V; 4=current)	Cm	31	R/W
Type of signal from the temperature probe external (0=NTC; 1=PT1000)	Cl	32	R/W
Type of signal from recovery temperature probe (0=NTC; 1=PT1000)	Cl	33	R/W
Type of signal from room temperature probe (0=NTC; 1=PT1000)	Ck	34	R/W
Type of signal from outlet temperature probe (0=NTC; 1=PT1000)	Ck	35	
Select refrigerant (0=no; 1=R22; 2=134a; 3=404a; 4=407C; 5=410A)	C1	36	R/W
Air flow switch alarm delay	T4	37	R/W

DESCRIPTION	SCR	ADD.	TYPE
Start minutes On-Off time band F1-1	K3	59	R/W
End hour On-Off time band F1-1	K3	60	R/W
End minutes On-Off time band F1-1	K3	61	R/W
Start hour On-Off time band F1-2	K3	62	R/W
Start minutes On-Off time band F1-2	K3	63	R/W
End hour On-Off time band F1-2	K3	64	R/W
End minutes On-Off time band F1-2	K3	65	R/W
Start hour On-Off time band F2	K3	66	R/W
Start minutes On-Off time band F2	K3	67	R/W
End hour On-Off time band F2	K3	68	R/W
End minutes On-Off time band F2	K3	69	R/W
Start hour temperature time band Z1	K6	70	R/W
Start minutes temperature time band Z1	K6	71	R/W
Start hour temperature time band Z2	K6	72	R/W
Start minutes temperature time band Z2	K6	73	R/W
Start hour temperature time band Z3	K7	74	R/W
Start minutes temperature time band Z3	K7	75	R/W
Start hour temperature time band Z4	K7	76	R/W
Start minutes temperature time band Z4	K7	77	R/W
Start hour humidity time band Z1	K8	78	R/W
Start minutes humidity time band Z1	K8	79	R/W
Start hour humidity time band Z2	K8	80	R/W
Start minutes humidity time band Z2	K8	81	R/W
Start hour humidity time band Z3	K9	82	R/W
Start minutes humidity time band Z3	K9	83	R/W
Start hour humidity time band Z4	K9	84	R/W
Start minutes humidity time band Z4	K9	85	R/W
Select On-Off time bands Monday (0=F1; 1=F2; 2=F3; 3=F4)	K5	86	R/W
Select On-Off time bands Tuesday (0=F1; 1=F2; 2=F3; 3=F4)	K5	87	R/W
Select On-Off time bands Wednesday (0=F1; 1=F2; 2=F3; 3=F4)	K5	88	R/W
Select On-Off time bands Thursday (0=F1; 1=F2; 2=F3; 3=F4)	K5	89	R/W
Select On-Off time bands Friday (0=F1; 1=F2; 2=F3; 3=F4)	K5	90	R/W
Select On-Off time bands Saturday (0=F1; 1=F2; 2=F3; 3=F4)	K5	91	R/W

DESCRIPTION	SCR	ADD.	TYPE
Outlet fan off delay	T0	38	R/W
Outlet fan start delay	T0	39	R/W
Delay in activating minor alarm relay no.7	T3	40	R/W
Delay in activating serious alarm relay no.8	T3	41	R/W
Water flow switch alarm delay	T4	42	R/W
Delay between starts of different compressors	T6	43	R/W
Heater start delay	T8	44	R/W
Low pressure alarm delay	T2	45	R/W
Integration time for P+I control	T1	46	R/W
Minimum compressor off time	T5	47	R/W
Minimum compressor on time	T5	48	R/W
High ambient temperature differential to force units in network	Go	49	R/W
Delay between compressor starts	T6	49	R/W
Low ambient temperature differential to force units in network	Gn	50	R/W
Cap. control activation delay	T7	50	R/W
High ambient temperature offset to force units in network	Go	51	R/W
3 position valve travel time	T1	51	R/W
Low ambient temperature offset to force units in network	Gn	52	R/W
High-low temperature-humidity alarm delay	T2	52	R/W
High conductivity pre-alarm threshold	Gb	53	R/W
High conductivity alarm delay	Gb	54	R/W
Type of humidifier	Cg	55	R/W
Start hour On-Off time band F1-1	K3	58	R/W

DESCRIPTION	SCR	ADD.	TYPE
Select On-Off time bands Sunday (0=F1; 1=F2; 2=F3; 3=F4)	K5	92	R/W
Cond. fan Speed-up time	Ge-Gf	93	R/W
Compressor 1 operating hours threshold	E8	94	R/W
Compressor 2 operating hours threshold	E8	95	R/W
Humidifier operating hour threshold	E8	96	R/W
Fan operating hour threshold	E8	97	R/W
Rotation mode for units in pLAN network	Gk	98	R/W
Forcing delay for high ambient temp.	Gm	99	R/W
Forcing delay for low ambient temp.	Gm	100	R/W
Interval in days for automatic rotation	Gl	101	R/W
Hour automatic rotation	Gl	102	R/W
Minutes automatic rotation	Gl	103	R/W
Number of units in Standby mode	Gk	105	R/W
Automatic rotation interval for units in pLAN	Gk	106	R/W
pLAN connection class board 1 (0=not present; 1=present/no rot.; 2=present/rotation)	Cn	107	R/W
pLAN connection class board 2 (0=not present; 1=present/no rot.; 2=present/rotation)	Cn	108	R/W
pLAN connection class board 3 (0=not present; 1=present/no rot.; 2=present/rotation)	Cn	109	R/W
pLAN connection class board 4 (0=not present; 1=present/no rot.; 2=present/rotation)	Co	110	R/W
pLAN connection class board 5 (0=not present; 1=present/no rot.; 2=present/rotation)	Co	111	R/W
pLAN connection class board 6 (0=not present; 1=present/no rot.; 2=present/rotation)	Co	112	R/W
pLAN connection class board 7 (0=not present; 1=present/no rot.; 2=present/rotation)	Cp	113	R/W
pLAN connection class board 8 (0=not present; 1=present/no rot.; 2=present/rotation)	Cp	114	R/W
Valve position driver 1	Ij	115	R
Valve position driver 2	Io	116	R

22.0 EXAMPLES OF INSTALLATION

The connection of pCO1 - pCO2 boards in pLAN 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 terminal
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 terminal.

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

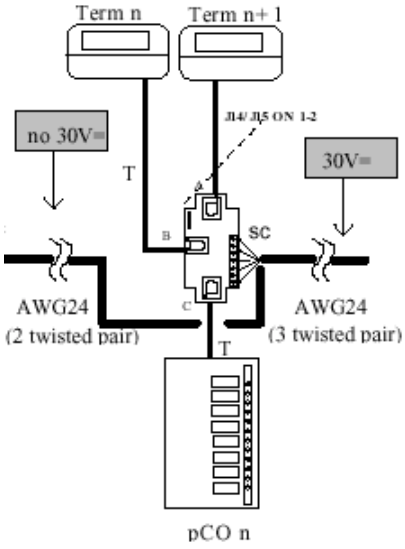
Networks in which boards are connected with the pLAN allow selecting the units involved in the Rotation functions, thus obtaining a mixed network with interacting and independent units.

pLAN connection among the boards allows using a shared external terminal (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 terminal is installed inside a room.

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

22.1 SHARED EXTERNAL TERMINAL

The Menu main screen shows the pLAN address of the displayed board in the upper right corner; in private displays, it is a fixed number corresponding to the pLAN address of the board they are connected with (1-8).
Terminal no. 32 allows selecting the board to be displayed by pushing button Info; whenever a button is pressed, the address displayed in the upper right corner increases by 1 and the display shows the parameters of the board selected among the connected ones.
In case of a board alarm, the shared terminal automatically connects with it to display the alarm.
The shared terminal can be connected to any network board; in case of boards equipped with built-in terminal, the shared terminal must be connected to connector J10 by a telephone cable; in case of boards equipped with private external display, the shunt code TCONNJ6000, shown in the following figure, is required (private=Term n; shared=Term n+1):



The shared terminal only allows printing all boards alarms and parameters.

22.2 AUTOMATIC START AND STAND-BY UNITS

The boards connected with pLAN 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 pLAN 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 pLAN network but not involved in the rotation function (however, unit can manage the shared terminal, printing and Carel's 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 pLAN address 1 provides for functions management; if the board is disconnected from pLAN 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.

22.2.1 CRITICAL SITUATIONS

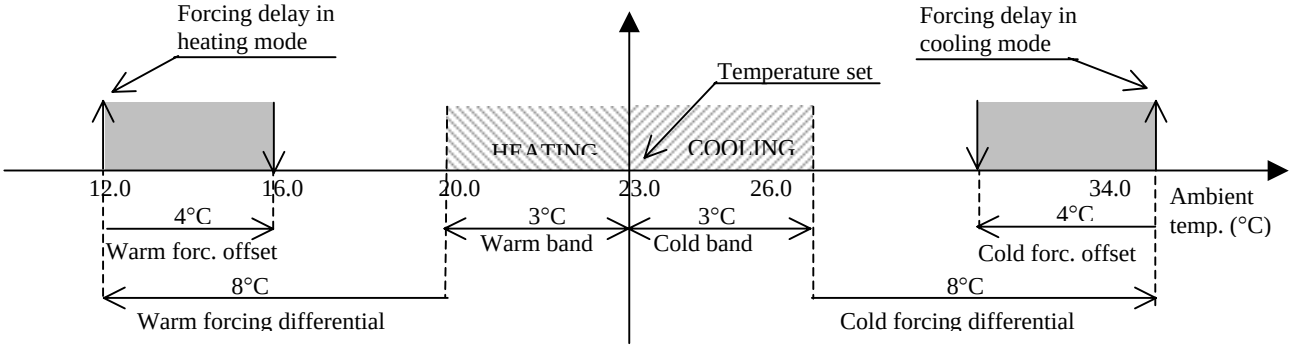
Units in Present/Rotation and stand-by modes are enabled in any of the following critical situations concerning the running boards:

- 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 pLAN 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 pLAN action occurs, with the exception of alarm signalling on the involved unit.

22.2.2 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:



22.2.3 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, pLAN 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 pLAN address 1 that manages rotation. Rotation can be executed following the pLAN 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.

22.2.4 FIXED-DAY ROTATION

The clock card (optional on pCO1, integrated on pCO2) 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.

22.2.5 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.

23.0 MASTER CONTROL

The units connected with pLAN network and in Present/… mode follow the working logic of the unit with pLAN 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 pLAN 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 pLAN network, the network units start functioning independently again based on the relevant probes only.

24.0 GLOSSARY OF TERMS

- **Step:** term identifying a (temperature or humidity) proportional band area within which the device is turned on; it also defines the device start and stop values. Refer to diagram 7.2.
- **Set point:** term identifying a temperature (or humidity) value to be met; the system enables the warm or cooling devices until the temperature or humidity set points are reached.
- **Default:** term identifying some values, i.e. temperature set point and proportional band, automatically used by the system in case the user does not intervene; the entire list is given in table 24.1.
- **Proportional band:** term identifying a temperature zone consisting of few degrees from the set point, within which the system manages the control devices. Refer to control diagrams from 7.1 to 7.11.
- **Dead zone – neutral zone:** terms identifying a small temperature zone between set point and proportional band, within which the devices do not turn on.
- **Branch – loop:** series of screens relating to the same subject, thus easily accessed by pushing the arrow buttons only. The branch can be accessed by pushing any of the terminal buttons; after pushing, the first loop screen is displayed.
- **Screen:** term identifying the displayed window; the program consists of the screens listed in paragraph 27.0.
- **Ramp:** term identifying the modulating valve opening/closing time from 0% to 100%.
- **Three-position valve – modulating valve:** the three-position valve, commonly used, is enabled by two relays providing for time opening and closing. The modulating valve is controlled by a 0-10V voltage signal and ensures higher precision.
- **Master:** term identifying the pCO2 board intended for controlling the pLAN local network and, consequently, all the connected pCO2 boards; generally, it corresponds to the board with address 1, unless it is shut down or disconnected.
- **Sleep mode:** term identifying the Off state of a pCO2 unit when required by the Master unit, in automatic rotation mode.
- **Built-in:** term identifying the display located on the pCO2 board back.
- **Range:** term identifying the range of a parameter available values; refer to table 24.1.
- **Outlet:** term identifying air introduced by the unit into an environment.
- **Intake:** term identifying the controlled environment air, sucked by the air-conditioning unit.
- **Free cooling:** term identifying the introduction of external air into an environment by opening a damper, to refresh air saving energy
- **Manual:** term identifying the start and stop of all devices connected with the pCO2 board outputs by appropriate screens and with unit off.
- **Buffer (memory):** term identifying the pCO2 memory in which the default values (selected by Carel) of all parameters are stored. Memory is permanent even if voltage is cut off.
- **Buzzer:** term identifying a warning buzzer assembled on the external terminals. In case of alarm, its sound is prolonged; in case limits are exceeded when setting the parameters, its sound is shorter. The built-in terminals are not equipped with buzzers.
- **Upload:** term identifying the operation for uploading the application program to the Flash memory of pCO1 – pCO2 board by a computer or programming key.

CAREL S.p.A.
Via dell'Industria, 11 - 35020 Brugine - Padova (Italy)
Tel. (+39) 049.9716611 Fax (+39) 049.9716600
http://www.carel.com - e-mail: carel@carel.com

Agency:

Cod: +030221421
Rel. 1.2 - 11, April, 2003