Standard Air Handling Units

Application program for pCO^2, pCO^3, pCO^{xs}

GB

User manual

Manual version: 3.5 of 20/05/08
Program code: FLSTDMAHUA

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We wish to save you time and money!

We can assure you that the thorough reading of this manual will guarantee correct installation and safe use of the product described.

IMPORTANT WARNINGS

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

The appliance that this software is dedicated to has been developed to operate risk-free and for a specific purpose, as long as:
the software is installed, programmed, run and maintained according to the instructions in this manual and by qualified personnel;
all the conditions prescribed in the installation and user manual of the appliance in question are respected.

All other uses and modifications made to the device that are not authorised by the manufacturer are considered incorrect.
Liability for injury or damage caused by the incorrect use of the device lies exclusively with the user.

Contents

1. Introduction

1.1 Main new features in version 2.0

New functions:

1. Management of outlet fan and intake fan by Carel VFD inverter. The main parameters of the VFD can be set directly on the display of the pCO*, as Modbus communication is featured between the pCO* and the VFD
2. Additional fan control based on the outlet temperature

Updates:

1. Updated Belimo management for control of actuators with the new firmware currently made by Belimo. In any case compatibility is ensured with the old versions

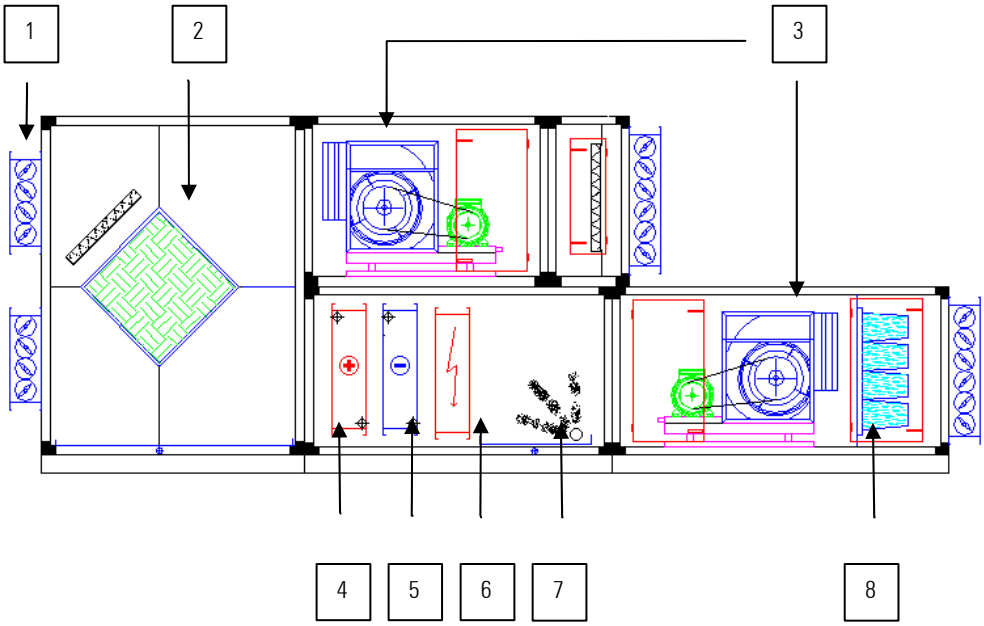
1.2 Introduction and functions performed by the program

The application program, using the pCO^3/pCO^2/pCO^{XS} platform, provides a complete and flexible solution for managing the most common configurations of air handling units. One of the main characteristics of this application is the possibility to configure, on the user terminal, all the parameters corresponding to the position of the inputs/outputs, making the wiring of the unit extremely flexible and guaranteeing maximum adaptability to all installations. The input/output configuration procedure has been protected to prevent unwanted tampering, so as to be defined by the manufacturer and not by the end user. There are 24 pre-configured models of systems, described in chapter "3.4.1 Diagrams of the models", which allow the rapid configuration of all the parameters and the positions of the inputs and outputs. Once having chosen the model considered most suitable, further modifications can be made manually to the configuration (on the user terminal) so as to guarantee compatibility between the software and the installation being managed, such as:

- readings of the probes connected, as well as calibration of the probes
- unit on/off
- alarms
- configuration parameters and operating parameters with password-protected access
- clock and time band settings (no password is required to access the clock branch)
- select one of the different languages available: English, Italian, French, German

WARNING: to avoid tampering during operation, only qualified personnel must know the password.

Layout of the air handling unit:



1: Outside air damper
2: Heat recovery unit
3: Fans
4: Heating coil
5: Cooling Coil
6: Post-heating coil
7: Humidifier
8: Filter

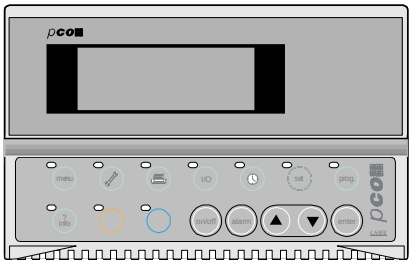
1.3 Compatible hardware

The program is compatible with the following devices:

- pCO2 (small, medium, large)
- pCO3 (small, medium, large)
- pCO^{XS}
- Standard external LCD
- Built-in LCD display on pCO2 and pCO^{XS}
- PGD0 semi-graphic display
- PGD0 built-in display on pCO3

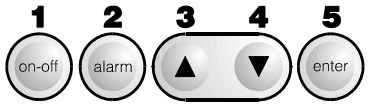
2. The user terminal

2.1 Standard external LCD



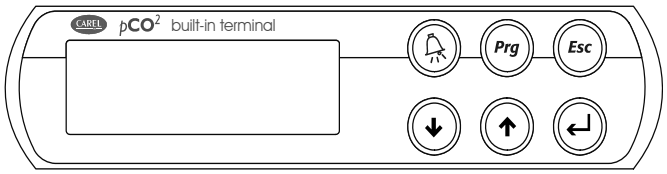
Button		Description
menu	MENU	Pressed in all loops except for the manufacturer loop, returns to main screen in the Menu branch (M0) Pressed in the manufacturer loop returns to the manufacturer menu (Z1) Pressed on the main screen M0 opens the menu of the loops available in the user interface.
	MAINTENANCE	Displays the values corresponding to the maintenance of the devices (operating hours of the device and reset hours, access the manual operation procedure) and the information on the software (+ change language) and the controller
	PRINTER	Accesses the alarm log
I/O	INPUTS AND OUTPUTS	Displays the status of the digital and analogue inputs and outputs
	CLOCK	Accesses the first screen in the Clock loop (K0) The clock loop is used to display / set the time and date and the on/off, temperature and humidity time bands
set	SET POINT	Used to set the set point and differentials
prog	PROGRAM	Used to set the various operating parameters (thresholds, delays etc..)
menu + prog	MENU+PROG	Accesses (after entering the password) the screens for setting the default values
info ?	INFO	Displays the version of the application software and other information on the unit

Functions of the silicon rubber buttons:



1. **ON/OFF** button: switches the unit on and off.
   When the LED is off the unit is off.
   When the LED is on (green) the unit is ON.
2. **ALARM** button: used to display the alarms, delete them and mute the alarm buzzer.
3. **UP ARROW**: this has three functions, a) scroll to the previous screens in the same branch when the cursor is in the home position (top L); b) increase the value of a setting field when the cursor is inside the field; for selection fields, on the other hand, pressing the arrow button displays the previous option; c) if pressed on the main screen M0 displays the unit start-up screen M1.
4. **DOWN ARROW**: this has three functions, a) scroll to the next screens in the same branch when the cursor is in the home position (top L); b) decrease the value of a setting field when the cursor is inside the field; for selection fields, on the other hand, pressing the arrow button displays the next option; c) if pressed on the main screen M0, displays the unit start-up screen M1.
5. **ENTER** button: used to move the cursor between the home position (in the top L) and the setting or selection fields, or to save the values set for the parameters after the cursor has left the setting fields;
6. **UP ARROW + DOWN ARROW**: pressing these together accesses the screen for setting the address of the devices in the MP-BUS network (F1).

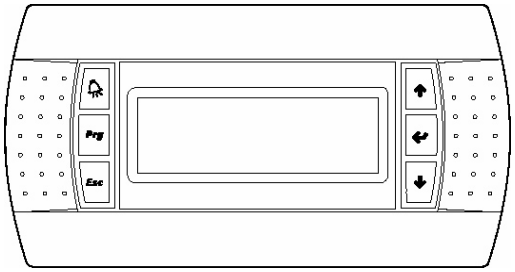
2.2 Built-in display



ALARM	PROG	ESC
UP	DOWN	ENTER

For the functions of the ALARM, UP arrow, DOWN arrow and ENTER buttons on the Built-in terminal, see the external terminal.
ON/OFF: as there is no ON/OFF button, the unit is switched on or off by accessing the ON/OFF screen (M1), pressing the **UP ARROW** or **DOWN ARROW** on the main screen M0.
LOOP OF SCREENS: as there are no buttons that directly enter the loop of screens, simply press the **ESC** button to display the list of the loops, then use the arrow buttons to select the desired loop and confirm by pressing **ENTER.**

2.3 PGD0 DISPLAY with 6 buttons



The operation of the PGD0 terminal is very similar to the Built-In terminal (access to the loop of screens, on/off, etc.). To switch between boards using a shared PGD0 terminal, access screen M2 by pressing the UP or DOWN buttons on screen M0 (main screen).

3. Uploading the program

3.1.1 Uploading the program using the hardware key

The hardware key available for all the versions of pCO² (code PCO201KEY0 1Mbyte version - PCO202KEY0 2Mbyte version) and the smart key code PCOS00AKY0 for the pCOxs and pCO³, creates exact copies of the software on a master pCO*. It is normally used on the production line for programming a series of pCO* devices for programming in the field, where it would be more complicated to upgrade the software via PC.
For further information, refer to the instruction sheet included with hardware key or the smart key.

3.1.2 Uploading the program from a computer

Using the kit code PC485KIT00 (RS485/RS232 converter) and the WinLOAD 32 program, the software files can be uploaded to the pCO², pCO3 and pCOXS. For further information on installing and using Winload 32, see the on-line help.

3.1.3 System requirements

The complete program in all four languages (IT, EN, FR, DE) requires the 2Mb flash memory.
Starting from version 1.6, this application software does not work with BIOS versions prior to 3.57.
For compatibility with the pCO3, the "fake" BIOS 3.84 is required.

4. Selecting the language

The software interface is available in the following languages: English, Italian, French and German.
To modify the language of the user interface, proceed as follows:

1. Press the button  (service) on the terminal;
2. Screen A0 will be displayed. Press the ENTER button to move the cursor to the parameter for selecting the language;
3. Select the language required with the Up or Down buttons;
4. Press the ENTER button to confirm.

Screen (V5) features a parameter for enabling the select language screen when starting the unit, so that when the board is powered up the desired language can be selected by pressing the ENTER button.

5. Installing the default values

The default values are assigned by CAREL to the main operating parameters of the application program, that is, the times, set points, differentials etc. After having installed the default values, the parameters can be modified, within the allowed range of values. The default values can be installed manually by the user, at any time, on the external or built-in terminal. Operations to be performed to manually install the default values for the parameters;

1. Press the MENU + PROG (ESC or MENU) buttons and enter the Manufacturer password (1234), then press ENTER;
2. Choose the "INITIALISATION" item and press Enter;
3. Display the default value installation screen (V6) and enter the model of the unit to be initialised, then confirm by pressing Enter;
4. **WARNING**: this operation must be performed with care, as it deletes all the parameters installed from the memory and replaces them with the default values; the previous values cannot be recovered after the operation;
5. After having pressed ENTER, the message "PLEASE WAIT.." will be displayed for a few seconds.

If updating the software with a new version, the application automatically installs the default values for model 1.
IMPORTANT: the default values of the analogue inputs are not installed for the pCOxs board. The user can decide the position of the probes; see par. 3.4 "Configuring the analogue inputs".

6. Configuring the inputs/outputs

The input/output configuration screens are located in the password-protected manufacturer branch; to access this, proceed as follows:

1. Press the menu button from the main screen M0;
2. From the menu select MANUFACTURER SETUP and press ENTER;
3. Enter the password and press ENTER, if the password is correct the screen Z1 will be displayed;
4. Select the item required and make the necessary configuration.

If using a standard PCOT external terminal, screen Z1 can be accessed directly by pressing MENU+PROG together.

Digital inputs

Scroll the Manufacturer menu on screen Z1 until reaching the item "DIGITAL I." and confirm by pressing ENTER. Screens D0-Db are used to associate the digital inputs with the connected devices. The software automatically searches for the first free digital input; the user can also select the desired position by scrolling, using the UP-DOWN buttons, the list of free digital inputs.
Screens "Dc-Dd" are used to set the operating logic (N.O.-N.C.) of digital inputs 1 to 18:
N.O. = Normally open;
N.C. = Normally closed.

Analogue inputs

Scroll the Manufacturer menu on screen Z1 until reaching the item "ANALOGUE I." and confirm by pressing ENTER.
Each analogue input requires three setting parameters, shown on the screens (E0-Eu):

- Position occupied by the probe on the pCO board.
- Type of probe used to read the value in question
- Operating limits of the probe (where envisaged)

If the terminal number of an analogue input is set to 0, the further configuration screens for that input will not be displayed (probe type and limits).

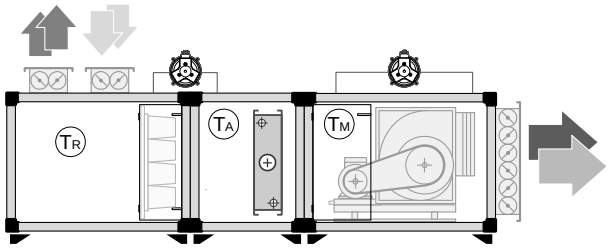
Digital outputs
Scroll the Manufacturer menu on screen Z1 until reaching the item "DIGITAL O." and confirm by pressing ENTER.
Screens J0-Je are used to associate the relays on the board with the connected devices.

Analogue outputs
Scroll the Manufacturer menu on screen Z1 until reaching the item "ANALOGUE O." and confirm by pressing ENTER.
Screens L0-L7 are used to associate the outputs on the board with the connected devices.

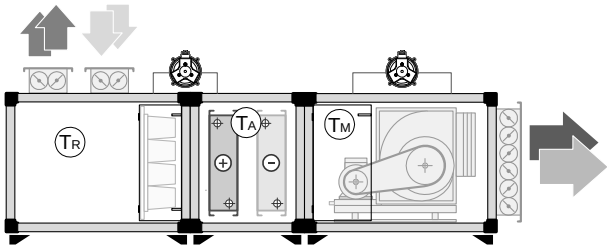
Table of compatibility between the analogue inputs – probe type

Analogue inputs	Probe type					
	0 to 20 mA	4 to 20 mA	NTC	PT1000	0 to 1 V	0 to 10 V
Outlet pressure	x	x			x	x
Intake pressure	x	x			x	x
Room temperature	x	x	x	x	x	x
Outlet temperature	x	x	x	x	x	x
Outside temperature	x	x	x	x	x	x
Discharge temperature	x	x	x	x	x	x
Intake humidity	x	x			x	x
Outlet humidity	x	x			x	x
Outside humidity	x	x			x	x
VOC air quality	x	x				x
CO2 air quality						x
Compensation set point			x	x		
Antifreeze temperature	x	x	x	x	x	x
Post-heating	x	x	x	x	x	x
Defrost	x	x	x	x	x	x

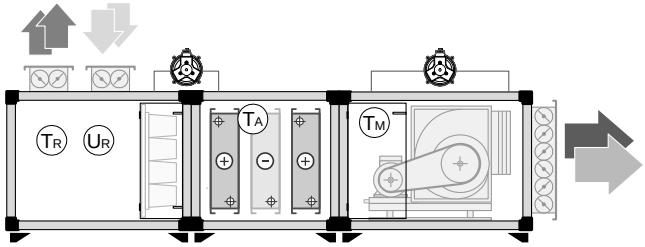
6.1.1 Diagrams of the models



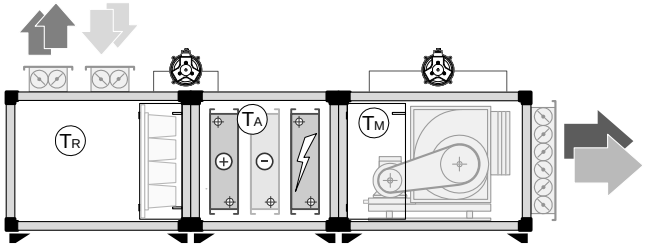
Model 1



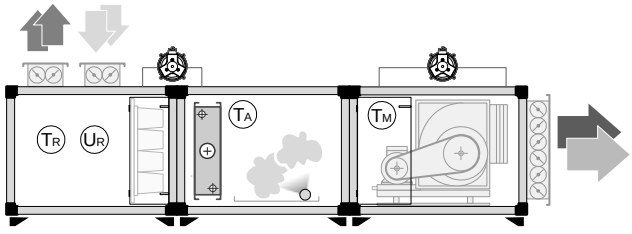
Model 2



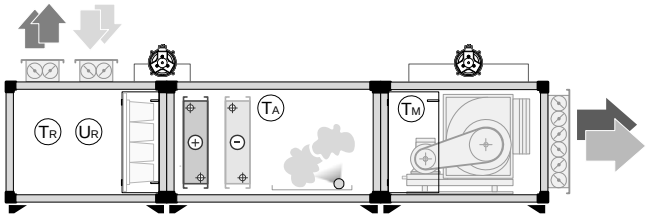
Model 3



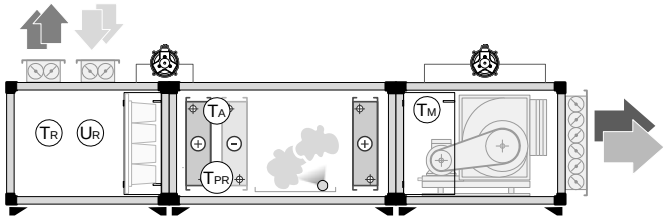
Model 4



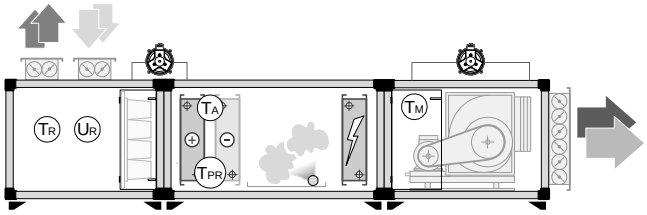
Model 5



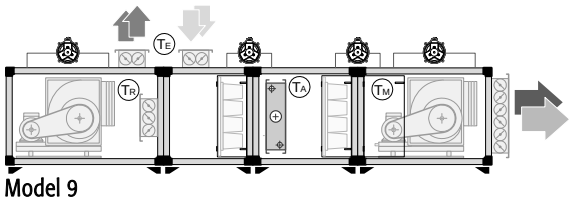
Model 6



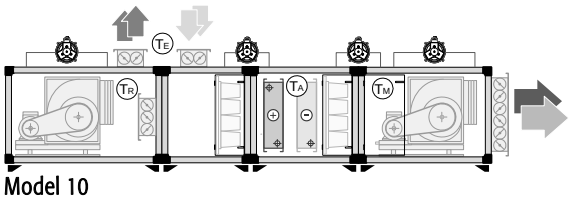
Model 7



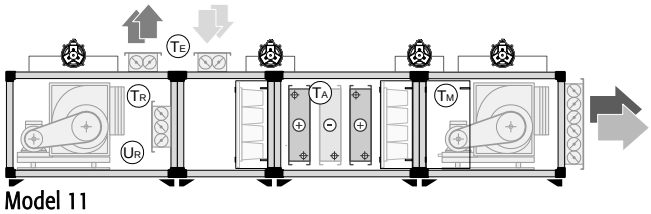
Model 8



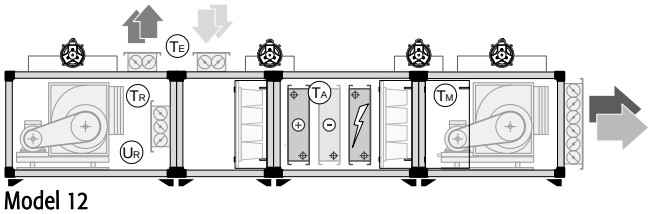
Model 9



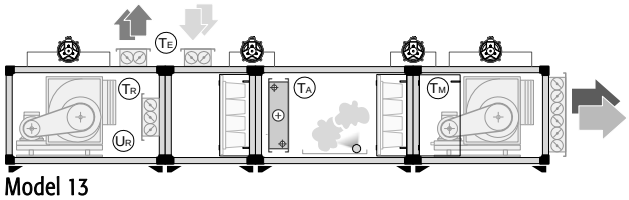
Model 10



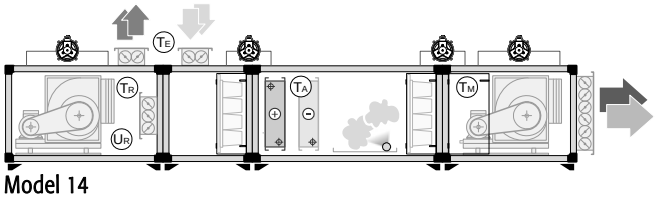
Model 11



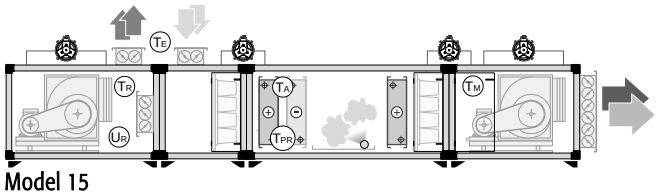
Model 12



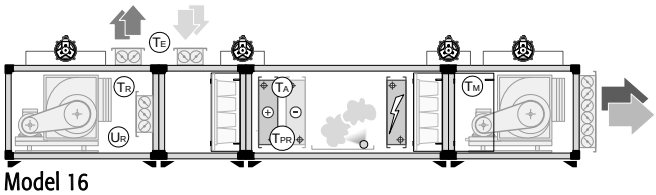
Model 13



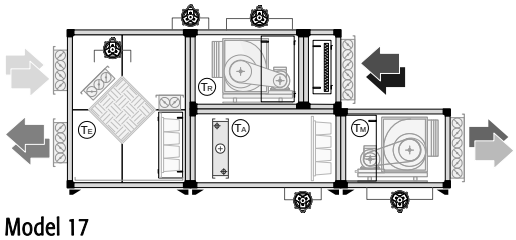
Model 14



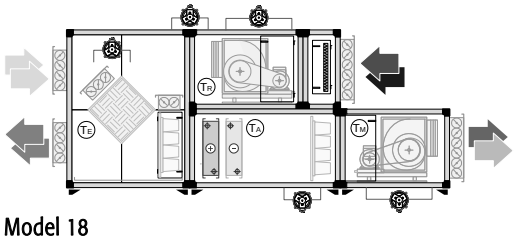
Model 15



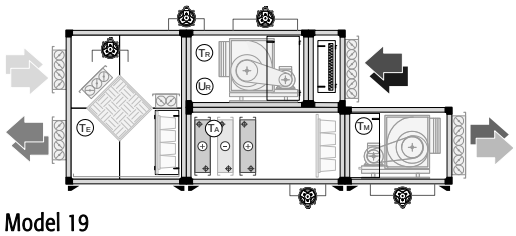
Model 16



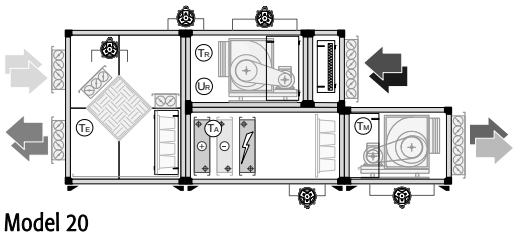
Model 17



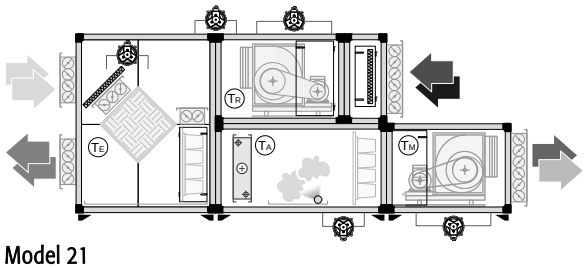
Model 18



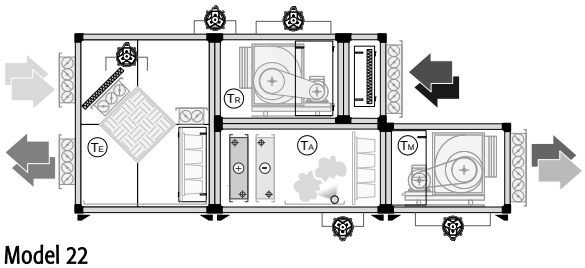
Model 19



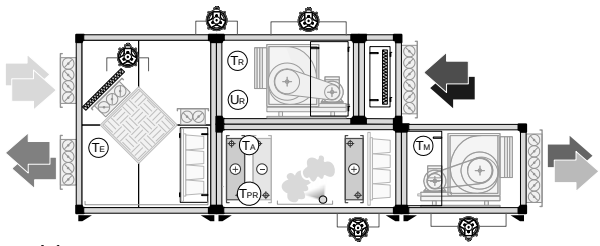
Model 20



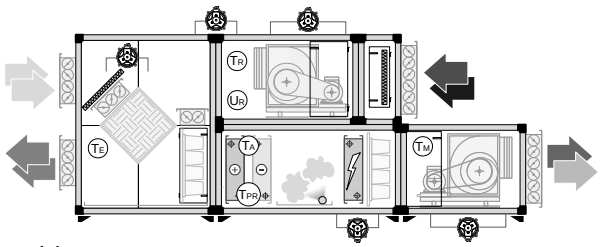
Model 21



Model 22



Model 23



Model 24

Analogue input configuration table models 1 to 8

In	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
B1	Intake air temperature	Intake air temperature	Intake air temperature	Intake air temperature	Intake air temperature	Intake air temperature	Intake air temperature	Intake air temperature
B2	Outlet air temperature	Outlet air temperature	Outlet air temperature	Outlet air temperature	Outlet air temperature	Outlet air temperature	Outlet air temperature	Outlet air temperature
B3	Antifreeze temperature	Antifreeze temperature	Intake humidity	Intake humidity	Intake humidity	Intake humidity	Intake humidity	Intake humidity
B4			Antifreeze temperature	Antifreeze temperature	Antifreeze temperature	Antifreeze temperature	Antifreeze temperature	Antifreeze temperature
B5							Preheating temperature	Preheating temperature

Digital input configuration table models 1 to 8

In	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
DI1	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout
DI3	Intake air filter differential pressure switch	Intake air filter differential pressure switch	Intake air filter differential pressure switch	Intake air filter differential pressure switch	Intake air filter differential pressure switch	Intake air filter differential pressure switch	Intake air filter differential pressure switch	Intake air filter differential pressure switch
DI4	Outlet air flow switch	Outlet air flow switch	Outlet air flow switch	Outlet air flow switch	Antifreeze thermostat	Antifreeze thermostat	Antifreeze thermostat	Antifreeze thermostat
DI5				Heater cutout	Outlet air flow switch	Outlet air flow switch	Outlet air flow switch	Outlet air flow switch
DI6					Humidifier alarm	Humidifier alarm	Humidifier alarm	Humidifier alarm
DI7								Heater cutout

Digital output configuration table models 1 to 8

Out	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
DO1	Outlet fan	Outlet fan	Outlet fan	Outlet fan	Outlet fan	Outlet fan	Outlet fan	Outlet fan
DO3	ON/OFF outside air damper	ON/OFF outside air damper	ON/OFF outside air damper	ON/OFF outside air damper	ON/OFF outside air damper	ON/OFF outside air damper	ON/OFF outside air damper	ON/OFF outside air damper
DO4				Heater 1	Humidifier	Humidifier	Humidifier	Humidifier
DO5				Heater 2				Heater 1
DO6				Heater 3				Heater 2
DO7								Heater 3

Analogue output configuration table models 1 to 8

Out	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Y2	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating
Y3		Modulating valve in cooling	Modulating valve in cooling	Modulating valve in cooling		Modulating valve in cooling	Modulating valve in cooling	Modulating valve in cooling
Y4			Modulating valve in post-heating				Modulating valve in post-heating	

Analogue input configuration table models 9 to 16

In	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15	Model 16
B1	Intake air temperature	Intake air temperature	Intake humidity	Intake humidity	Intake humidity	Intake humidity	Intake humidity	Intake humidity
B2	Outlet air temperature	Outlet air temperature	Outlet air pressure	Outlet air pressure	Intake air temperature	Intake air temperature	Intake air temperature	Intake air temperature
B3	Antifreeze temperature	Antifreeze temperature	Outlet air temperature	Outlet air temperature	Outlet air temperature	Outlet air temperature	Outlet air temperature	Outlet air temperature
B4	Outside air temperature	Outside air temperature	Antifreeze temperature	Antifreeze temperature	Antifreeze temperature	Antifreeze temperature	Antifreeze temperature	Antifreeze temperature
B5			Intake air temperature	Intake air temperature	Outside air temperature	Outside air temperature	Outside air temperature	Outside air temperature
B6			Outside air temperature	Outside air temperature	Preheating air temperature.	Preheating air temperature.	Preheating air temperature.	Preheating air temperature.

Digital input configuration table models 9 to 16

In	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15	Model 16
DI1	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout
DI2	Intake fan cutout	Intake fan cutout	Intake fan cutout	Intake fan cutout	Intake fan cutout	Intake fan cutout	Intake fan cutout	Intake fan cutout
DI3	Intake air filter differential pressure switch	Intake air filter differential pressure switch	Intake air filter differential pressure switch	Intake air filter differential pressure switch	Intake air filter differential pressure switch	Intake air filter differential pressure switch	Intake air filter differential pressure switch	Intake air filter differential pressure switch
DI4	Outlet air filter differential pressure switch	Outlet air filter differential pressure switch	Outlet air filter differential pressure switch	Outlet air filter differential pressure switch	Outlet air filter differential pressure switch	Outlet air filter differential pressure switch	Outlet air filter differential pressure switch	Outlet air filter differential pressure switch
DI5	Outlet air flow switch	Outlet air flow switch	Outlet air flow switch	Outlet air flow switch	Outlet air flow switch	Outlet air flow switch	Outlet air flow switch	Outlet air flow switch
DI6	Intake air flow switch	Intake air flow switch	Intake air flow switch	Intake air flow switch	Intake air flow switch	Intake air flow switch	Intake air flow switch	Intake air flow switch
DI7	Antifreeze thermostat	Antifreeze thermostat	Antifreeze thermostat	Heater cutout	Humidifier alarm	Humidifier alarm	Humidifier alarm	Humidifier alarm
DI8				Antifreeze thermostat				Heater cutout

Digital output configuration table models 9 to 16

Out	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15	Model 16
DO1	Outlet fan	Outlet fan	Outlet fan	Outlet fan	Outlet fan	Outlet fan	Outlet fan	Outlet fan
DO2	Intake fan	Intake fan	Intake fan	Intake fan	Intake fan	Intake fan	Intake fan	Intake fan
DO3	Filter blocked	Filter blocked	Filter blocked	Filter blocked	Filter blocked	Filter blocked	Filter blocked	Filter blocked
DO4				Heater 1				Heater 1
DO5				Heater 2				Heater 2
DO6				Heater 3				Heater 3

Analogue output configuration table models 9 to 16

Out	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15	Model 16
Y1	Mod. outside air dampers	Mod. outside air dampers	Mod. outside air dampers	Mod. outside air dampers	Mod. outside air dampers	Mod. outside air dampers	Mod. outside air dampers	Mod. outside air dampers
Y2	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating
Y3		Modulating valve in cooling	Modulating valve in cooling	Modulating valve in cooling	Humidifier	Modulating valve in cooling	Modulating valve in cooling	Modulating valve in cooling
Y4			Valve in post-heating.			Humidifier	Valve in post-heating.	Humidifier
Y5			Analogue outlet fan	Analogue outlet fan			Humidifier	

Analogue input configuration table models 17 to 24

In	Model 17	Model 18	Model 19	Model 20	Model 21	Model 22	Model 23	Model 24
B1	Outlet air pressure	Outlet air pressure	Intake air humidity	Intake air humidity	Intake air humidity	Intake air humidity	Intake air humidity	Intake air humidity
B2	Outlet air temperature	Intake air temperature	Outlet air pressure	Outlet air pressure	Outlet air pressure	Outlet air pressure	Intake air temperature	Intake air temperature
B3	Outside air temperature	Outlet air temperature	Intake air pressure	Intake air pressure	Intake air temperature	Intake air temperature	Outlet air temperature	Outlet air temperature
B4	Discharge air temperature	Outside air temperature	Intake air temperature	Intake air temperature	Outlet air temperature	Outlet air temperature	Outside air temperature	Outside air temperature
B5	Intake air temperature	Antifreeze temperature	Outlet air temperature	Outlet air temperature	Outside air temperature	Outside air temperature	Discharge air temperature	Antifreeze temperature
B6		Discharge air temperature	Outside air temperature	Outside air temperature	Discharge air temperature	Discharge air temperature	Antifreeze temperature	Discharge air temperature
B7			Antifreeze temperature	Antifreeze temperature	Antifreeze temperature	Antifreeze temperature		
B8			Discharge air temperature	Discharge air temperature				

Digital input configuration table models 17 to 24

In	Model 17	Model 18	Model 19	Model 20	Model 21	Model 22	Model 23	Model 24
DI1	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout	Outlet fan cutout
DI2	Intake fan cutout	Intake fan cutout	Intake fan cutout	Intake fan cutout	Intake fan cutout	Intake fan cutout	Intake fan cutout	Intake fan cutout
DI3	Intake air filter differential pressure switch	Intake air filter differential pressure switch	Intake air filter differential pressure switch	Intake air filter differential pressure switch	Intake air filter differential pressure switch-	Intake air filter differential pressure switch	Intake air filter differential pressure switch	Intake air filter differential pressure switch
DI4	Pump cutout in heating	Pump cutout in heating	Pump cutout in heating	Pump cutout in heating	Pump cutout in heating	Pump cutout in heating	Pump cutout in heating	Pump cutout in heating
DI5	Outlet air filter differential pressure switch	Pump cutout in cooling	Pump cutout in cooling	Pump cutout in cooling	Outlet air filter differential pressure switch	Pump cutout in cooling	Pump cutout in cooling	Pump cutout in cooling
DI6	Heat recovery differential pressure switch	Outlet air filter differential pressure switch	Outlet air filter differential pressure switch	Outlet air filter differential pressure switch	Heat recovery differential pressure switch	Outlet air filter differential pressure switch	Outlet air filter differential pressure switch	Outlet air filter differential pressure switch
DI7	Intake air flow switch	Heat recovery differential pressure switch	Heat recovery differential pressure switch	Heat recovery differential pressure switch	Intake air flow switch	Heat recovery differential pressure switch	Heat recovery differential pressure switch	Heat recovery differential pressure switch
DI8	Outlet air flow switch	Intake air flow switch	Intake air flow switch	Intake air flow switch	Outlet air flow switch	Intake air flow switch	Intake air flow switch	Intake air flow switch
DI9	Antifreeze thermostat	Outlet air flow switch	Outlet air flow switch	Outlet air flow switch	Antifreeze thermostat	Outlet air flow switch	Outlet air flow switch	Outlet air flow switch
DI10		Antifreeze thermostat	Antifreeze thermostat	Antifreeze thermostat		Antifreeze thermostat	Antifreeze thermostat	Antifreeze thermostat
DI11				Heater cutout				Heater cutout

Digital output configuration table models 17 to 24

Out	Model 17	Model 18	Model 19	Model 20	Model 21	Model 22	Model 23	Model 24
DO1	Outlet fan	Outlet fan	Outlet fan	Outlet fan	Outlet fan	Outlet fan	Outlet fan	Outlet fan
DO2	Intake fan	Intake fan	Intake fan	Intake fan	Intake fan	Intake fan	Intake fan	Intake fan
DO4	Pump/solenoid valve in heating	Pump/solenoid valve in heating	Pump/solenoid valve in heating	Pump/solenoid valve in heating	Pump/solenoid valve in heating	Pump/solenoid valve in heating	Pump/solenoid valve in heating	Pump/solenoid valve in heating
DO6	Filter blocked	Filter blocked	Filter blocked	Filter blocked	Filter blocked	Filter blocked	Filter blocked	Filter blocked
DO7				Heater 1				Heater 1
DO8				Heater 2				Heater 2
DO9				Heater 3				Heater 3

Analogue output configuration table models 17 – 24

Out	Model 17	Model 18	Model 19	Model 20	Model 21	Model 22	Model 23	Model 24
Y1	Mod. outside air dampers	Mod. outside air dampers	Mod. outside air dampers	Mod. outside air dampers	Mod. outside air dampers	Mod. outside air dampers	Mod. outside air dampers	Mod. outside air dampers
Y2	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating	Modulating valve in heating
Y3	Modulating outlet fan	Modulating valve in cooling	Modulating valve in cooling	Modulating valve in cooling	Humidifier	Modulating valve in cooling	Modulating valve in cooling	Modulating valve in cooling
Y4	Bypass damper	Modulating outlet fan	Modulating valve in post-heating	Bypass damper	Bypass damper	Humidifier	Humidifier	Humidifier
Y5		Bypass damper	Bypass damper		Modulating outlet fan	Bypass damper	Bypass damper	Bypass damper
Y6						Modulating outlet fan	Modulating valve in post-heating	

7. List of parameters

This table contains the list of all the parameters that appear on the screens, with the corresponding description.
Parameter: text shown on the screen;
Type: read (R), read/write (R/W);
Ref.: index of the screen;
Description: brief description of the parameter;
UOM: unit of measure;
Range: range of values;
Default: default value set by the manufacturer
Note: column available for the user's notes.

IMPORTANT: Not all the screens listed below will be displayed by scrolling the cursor; enabling a certain type of configuration may mean that the associated screens, previously not present, will now be displayed. This therefore depends on the initial configuration!

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
MAIN SCREEN			15 button terminal MENU button	PGD with 6 buttons or Built-in terminal ESC button			
Room Temp.:	R	M0	Temperature measured by the temperature sensor located at the intake	°C	Screen Cc		
Room humid.:	R	M0	Humidity measured by the humidity sensor located at the intake	%	Screen Cd		
Unit status:	R/W	M1	Display the status of the unit		COMFORT/ UNIT OFF		
Displays the unit: Current unit:	R/W	M2	Switch between boards on the shared terminal (PGD terminals only)				
CLOCK			15 button terminal CLOCK button	PGD with 6 buttons or Built-in terminal ESC and CLOCK button in the menu			
Clock time	R/W	K0	Set hour, minutes		(0 to 23), (0 to 59)		
Date:	R/W	K0	Set day, month, year		(1 to 31), (1 to 12,), (0 to 99)		
Day:	R/W	K0	Set the weekday	-			
Enable time Zone:	R/W	K1	Enable time band with set point variation	-	N / Y	N	
Timing zone A-1 ON=	R/W	K2	Start hours and minutes for first A time band	h & min.	(0 to 23), (0 to 59)		
Timing zone A-1 OFF=	R/W	K2	End hours and minutes for first A time band	h & min.	(0 to 23), (0 to 59)		
Temperature setpoint Timing z.A-1:	R/W	K2	Set point relating to the first A time band	°C	min. lim./ max. lim.		
Fan inverter setpoint time band A-1. Outlet:	R/W	K3	Set point relating to the pressure control of the outlet fan in band A1	Pa	0 to 1000		
Vent. Return:	R/W	K3	Set point relating to the pressure control of the intake fan in band A1	Pa	0 to 1000		
Timing zone A-2 ON=	R/W	K4	Start hours and minutes for second A time band	h & min.	(0 to 23), (0 to 59)		
Timing zone A-2 OFF=	R/W	K4	End hours and minutes for second A time band	h & min.	(0 to 23), (0 to 59)		
Temperature setpoint Timing z.A-2:	R/W	K4	Set point relating to the second A time band	°C	min. lim./ max. lim.		
Fan inverter setpoint time band A-2. Outlet:	R/W	K5	Set point relating to the pressure control of the outlet fan in band A2	Pa	0 to 1000		
Vent. Return:	R/W	K5	Set point relating to the pressure control of the intake fan in band A2	Pa	0 to 1000		
Time band B-1 ON=	R/W	K6	Start hours and minutes for time band B	h & min.	(0 to 23), (0 to 59)		
Timing zone B OFF=	R/W	K6	End hours and minutes for time band B	h & min.	(0 to 23), (0 to 59)		
Temperature setpoint Time band z. B:	R/W	K6	Set point relating to time band B	°C	min. lim./ max. lim.		
Outlet fan inverter setpoint time band B-1:	R/W	K7	Set point relating to the pressure control of the outlet fan in band B	Pa	0 to 1000		
Return fan:	R/W	K7	Set point relating to the pressure control of the intake fan in band B	Pa	0 to 1000		

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
Central Timing Zone C always ON	W	K8		-	-		
Central Timing Zone D always OFF	W	K8		-	-		
Weekly time bands, Mon.: Tue: Wed:.....	R/W	K9	Select the type of time band for each day of the week	-	A/B/C/D		
Clock not present	R	Ka					

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
INPUTS/OUTPUTS			**15 button terminal INPUT/OUTPUT button**		**PGD with 6 buttons or Built-in terminal ESC and INPUT/OUTPUT button in the menu**		
Intake temperature probes:	R	I0	Display the temperature read by the intake probe	°C	Probe limits	-	
Outlet:	R	I0	Display the temperature read by the outlet probe	°C	Probe limits	-	
Outside temperature probes:	R	I1	Display the temperature read by the outside probe	°C	Probe limits		
Expulsion:	R	I1	Display the temperature read by the discharge probe	°C	Probe limits		
Intake humidity probes:	R	I2	Display the humidity read by the intake probe	%	Probe limits		
Outlet:	R	I2	Display the humidity read by the outlet probe	%	Probe limits		
External:	R	I2	Display the humidity read by the outside probe	%	Probe limits		
Antifreeze temperature probes:	R	I3	Display the temperature read by the antifreeze probe	°C	Probe limits		
Defrost:	R	I3	Display the temperature read by the defrost probe	%	Probe limits		
Outlet pressure probes:	R	I4	Display the pressure read by the outlet probe	Pa			
Return:	R	I4	Display the pressure read by the intake probe	Pa	Probe limits		
VOC intake air quality probes:	R	I5	Display the quantity of VOC present in the air	Ppm	Probe limits		
CO2:	R	I5	Display the quantity of CO2 present in the air	Ppm	Probe limits		
Set point compensation probe:	R	I6	Display the temperature read by the compensation probe	°C	Probe limits		
Preheating:	R	I6	Display the preheating temperature	°C	Probe limits		
Internal enthalpy:	R	I7	Display the inside enthalpy calculated by the controller	kcal/kg	Screen limits		
External: expressed in kcal/kg	R	I7	Display the outside enthalpy calculated by the controller	kcal/kg	Screen limits		
Enthalpy setpoint (Regarding T. and H. setp. in kcal/kg)	R	I8	Display the enthalpy set point	kcal/kg	Screen limits		
Digital Input (C=close O=open): 10 : 11: :18	R	I9	Status of digital inputs 1..18 (C) = closed (O) = open	-	C/O		
Analogue valve output in heating	R	Ia	Display the opening of the valve in heating	%	0%/100%		
Cooling:	R	Ia	Display the opening of the valve in cooling	%	0%/100%		
Mixed analogue valve output	R	Ib	Display the opening of the mixed valve	%	0%/100%		
Analogue outputs Post-Heating valve:	R	Ic	Display the opening of the valve in post-heating	%	0%/100%		
Dampers outputs Air External:	R	Id	Display the opening of the outside air damper	%	0%/100%		
Mixing:	R	Id	Display the opening of the mixing air damper	%	0%/100%		
Outlet fan analogue outputs:	R	Ie	Display the outlet fan speed	%	0%/100%		
Return:	R	Ie	Display the intake fan speed	%	0%/100%		
Analogue outputs Rotative heating Recovery:	R	If	Display the speed of the rotary heat recovery unit	%	0%/100%		
Humidifier analogue output	R	Ig	Display the opening of the humidifier output	%	0%/100%		
Digitals outputs (C=Close O=Open) :10 11: :18	R	Ih	Status of digital outputs 1..18 (C) = closed (O) = open	-	C/O		
SET POINT			**15 button terminal SET POINT button**		**PGD with 6 buttons or Built-in terminal ESC and SET POINT button in the menu**		
Active Temperature Setpoint:	R	S0	Display the set point used for control	°C			
Intake setpoint control:	R/W	S1	Set the set point for control with the intake probe	°C	-999 to 999	22	
Different.:	R/W	S1	Set the differential for control with the intake probe	K	-999 to 999	2	
Neutral Z.:	R/W	S1	Set the dead zone for control with the intake probe	°C			
Outlet setpoint control:	R/W	S2	Set the set point for control with the outlet probe	°C	-999 to 999	22	
Different.:	R/W	S2	Set the differential for control with the outlet probe	K	-999 to 999	2	
Neutral Z.:	R/W	S2	Set the dead zone for control with the outlet probe	°C			
Humid. regulation Room set.:	R/W	S3	Set the set point for control with the intake humidity probe	%rH	-999 to 999	50	
Diff.:	R/W	S3	Set the differential for control with the intake humidity probe	%rH	-999 to 999	10	
Neutral Z.:	R/W	S3	Set the dead zone for control with the intake humidity probe	%rH	-99 to 99	5	
Fan-Coil manual management I speed	R/W	S4	Select the speed of the fan coil controlled with manual management		1, 2, 3	1	
Heat recovery Setpoints cross flow:	R/W	S5	Set the set point for the activation of the heat recovery unit a double coil	°C	0 to 999	2	
Heating rotative recovery Setpoint:	R/W	S6	Set the set point for the activation of the rotary heat recovery unit expressed by the difference between the outlet temperature and the discharge temperature	°C	0 to 999	40	
Diff.:	R/W	S6	Set the differential for the activation of the rotary heat recovery unit	K	0 to 999	2	
Reg.pre heating Set point:	R/W	S7	Set the set point for managing preheating	°C	-999 to 999	20	
Different.:	R/W	S7	Set the differential for managing preheating	K	-999 to 999	2	
Integr.time:	R/W	S7	Set the integration time for managing preheating	S	0 to 999	60	
Control setpoint for VOC air quality control :	R/W	S8	Set the set point for managing the outside damper with the VOC air quality probe	%	0 to 100	30	

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
Different.:	R/W	S8	Set the differential for managing the outside damper with the VOC air quality probe	%	0 to 100	20	
Neutral Z.:	R/W	S8	Set the dead zone for managing the outside damper with the VOC air quality probe	%	0 to 100	0	
Control setpoint for CO2 air quality control :	R/W	S9	Set the set point for managing the outside damper with the CO2 air quality probe	ppm	0 to 2500	500	
Different.:	R/W	S9	Set the differential for managing the outside damper with the CO2 air quality probe	ppm	0 to 999	100	
Neutral Z.:	R/W	S9	Set the dead zone for managing the outside damper with the CO2 air quality probe	ppm	0 to 999	0	
Heating/cooling temperature setpoint. External:	R/W	Sa	Set the set point for changing from heating to cooling and vice-versa based on the temperature read by the outside probe	°C	0 to 999	14	
Dig.In Setpoint Room:	R/W	Sb	Set the set point for control with the intake probe selectable by digital input	°C			
Outlet:	R/W	Sb	Set the set point for control with the outlet probe selectable by digital input	°C			
MAINTENANCE			15 button terminal MAINTENANCE button	PGD with 6 buttons or Built-in terminal ESC and MAINTENANCE button in the menu			
CAREL S.p.A. FLSTDMAHUA Ver X.XXX XX/XX/XX Language:	R/W	A0	Software version screen, contains the code, version and date of the software installed in the board. The "Language" parameter is used to select the language displayed on the user interface.		ITALIAN ENGLISH FRENCH GERMAN		
Bios: Boot: Manual: +030220260 of version: 3.0	R	A1	Screen containing file system information (boot-bios) and the manual code and version.				
Outlet fan operations Outlet:	R	A2	Outlet fan operating hours	H			
Fan Return:	R	A2	Intake fan operating hours	H			
Compressor 1 operations 1:	R	A3	Compressor no 1 operating hours	H			
Compressor 2:	R	A3	Compressor no 2 operating hours	H			
Password Maintenance	R/W	A4	Set the password to enter the maintenance menu				
Fans Working hours Threshold:	R/W	A5	Set the maintenance alarm threshold for the fans	H			
Compressors Working hours Threshold:	R/W	A6	Set the maintenance alarm threshold for the compressors	H			

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
Reset fan hour meter Outlet:	R/W	A7	Reset the hour counter for the outlet fan				
Fan Return:	R/W	A7	Reset the hour counter for the intake fan				
Reset compressor hour meter Compressor 1:	R/W	A8	Reset the hour counter for compressor 1				
Compressor 2:	R/W	A8	Reset the hour counter for compressor 2				
Pressure probe offset Supply:	R/W	A9	Value to be added to or subtracted from the value read by the outlet pressure probe / Value read by the probe	Pa			
Room:	R/W	A9	Value to be added to or subtracted from the value read by the intake pressure probe / Value read by the probe	Pa			
Temp. probes offset Room:	R/W	Aa	Value to be added to or subtracted from the value read by the intake temperature probe/ Value read by the probe	°C			
Suppl:	R/W	Aa	Value to be added to or subtracted from the value read by the outlet temperature probe / Value read by the probe	°C			
Temp. probes offset Exte.:	R/W	Ab	Value to be added to or subtracted from the value read by the outside temperature probe/ Value read by the probe	°C			
Exp.:	R/W	Ab	Value to be added to or subtracted from the value read by the discharge temperature probe / Value read by the probe	°C			
Set ambient humidity probe :	R/W	Ac	Value to be added to or subtracted from the value read by the intake humidity probe/ Value read by the probe	%rH			
Suppl:	R/W	Ac	Value to be added to or subtracted from the value read by the outlet humidity probe / Value read by the probe	%rH			
Exte.:	R/W	Ac	Value to be added to or subtracted from the value read by the outside humidity probe/ Value read by the probe	%rH			
Air quality probe Offset VOC:	R/W	Ad	Value to be added to or subtracted from the value read by the VOC air quality probe / Value read by the probe	%			
CO2:	R/W	Ad	Value to be added to or subtracted from the value read by the CO2air quality probe / Value read by the probe	%			
Compensat. Probe Offset Setp.:	R/W	Ae	Value to be added to or subtracted from the value read by the set point compensation probe / Value read by the probe	°C			
Temperature probe offset Antifr:	R/W	Af	Value to be added to or subtracted from the value read by the antifreeze temperature probe / Value read by the probe	°C			
Pre-H.:	R/W	Af	Value to be added to or subtracted from the value read by the preheating temperature probe / Value read by the probe	°C			
Temperature probe offset	R/W	Ag	Value to be added to or subtracted from the value read by the defrost	°C			

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
Defrost:			temperature probe / Value read by the probe				
Fl.Setp:	R/W	Ag	Value to be added to or subtracted from the value read by the floating setpoint probe / Value read by the probe	°C			
Belimo 1/ serial number (1):	R	Ah	Serial number of the Belimo device configured				
Belimo 1/ Ver.BIOS (1)	R	Ah	Software version of the Belimo device configured				
Belimo 1/ Type (1)	R	Ai	Type of Belimo device configured				
Belimo 1/ Actual pos. (1)	R	Ai	Current position (%) of the Belimo device configured				
Belimo 2/ serial number (2):	R	Aj	Serial number of the Belimo device configured				
Belimo 2/ Ver.BIOS (2)	R	Aj	Software version of the Belimo device configured				
Belimo 2/ Type (2)	R	Ak	Type of Belimo device configured				
Belimo 2/ Actual pos. (2)	R	Ak	Current position (%) of the Belimo device configured				
Belimo 3/ serial number (3):	R	Al	Serial number of the Belimo device configured				
Belimo 3/ Ver.BIOS (3)	R	Al	Software version of the Belimo device configured				
Belimo 3/ Type (3)	R	Am	Type of Belimo device configured				
Belimo 3/ Actual pos. (3)	R	Am	Current position (%) of the Belimo device configured				
Belimo 4/ serial number (4):	R	An	Serial number of the Belimo device configured				
Belimo 4/ Ver.BIOS (4)	R	An	Software version of the Belimo device configured				
Belimo 4/ Type (4)	R	Ao	Type of Belimo device configured				
Belimo 4/ Actual pos. (4)	R	Ao	Current position (%) of the Belimo device configured				
Belimo 5/ serial number (5):	R	Ap	Serial number of the Belimo device configured				
Belimo 5/ Ver.BIOS (5)	R	Ap	Software version of the Belimo device configured				
Belimo 5/ Type (5)	R	Aq	Type of Belimo device configured				
Belimo 5/ Actual pos. (5)	R	Aq	Current position (%) of the Belimo device configured				
Belimo 6/ serial number (6):	R	Ar	Serial number of the Belimo device configured				
Belimo 6/ Ver.BIOS (6)	R	Ar	Software version of the Belimo device configured				
Belimo 6/ Type (6)	R	As	Type of Belimo device configured				
Belimo 6/ Actual pos. (6)	R	As	Current position (%) of the Belimo device configured				
Belimo 7/ serial number (7):	R	At	Serial number of the Belimo device configured				
Belimo 7/ Ver.BIOS (7)	R	At	Software version of the Belimo device configured				
Belimo 7/ Type (7)	R	Au	Type of Belimo device configured				
Belimo 7/ Actual pos. (7)	R	Au	Current position (%) of the Belimo device configured				
Belimo 8/ serial number (8):	R	Av	Serial number of the Belimo device configured				
Belimo 8/ Ver.BIOS (8)	R	Av	Software version of the Belimo device configured				
Belimo 8/ Type (8)	R	Ax	Type of Belimo device configured				
Belimo 8/ Actual pos. (8)	R	Ax	Current position (%) of the Belimo device configured				
Delete Historical Alarms:	R/W	Ay	Delete the memory dedicated to the alarm log				
USER			**15 button terminal PROG button**	**PGD with 6 buttons or Built-in terminal ESC and USER button in the menu**			
User password :	R/W	P0	Enter user password		0 to 9999	1234	
Modify heaters threshold:	R/W	P1	Enable modification of the activation set point and differentials for each individual heater		Y/N		
Heaters parameters Heat.Setp.1: Heat.Setp.2: Heat.Setp.3:	R/W	P2	Set the activation set point for the first, second and third heater, expressed as a percentage of the control differential	%	0 to 99		
Heaters parameters. Heat. Diff.1: Heat.diff..2: Heat.diff. 3:	R/W	P3	Set the activation differential for the first, second and third heater, expressed as a percentage of the control differential	%	0 to 49		

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
Direct expansion number:	R/W	P4	Set the number of direct expansions used on the unit		0 to 3	3	
Modify direct expansions number:	R/W	P4	Enable modification of the set point and differentials of intervention for each individual step of direct expansion		Y/N		
Direct expansion Setp. 1: Setp. 2: Setp. 3:	R/W	P5	Set the activation set point for the first, second and third direct expansion stage, expressed as a percentage of the control differential	%	0 to 99		
Direct exp. Diff.1: Diff.2: Diff.3:	R/W	P6	Set the activation differential for the first, second and third direct expansion stage, expressed as a percentage of the control differential	%	0 to 49		
Number of fan speeds enabled:	R/W	P7	Set the number of fan coil speeds enabled		0 to 3	3	
Configure defrost relay Set point:	R/W	P8	Activation set point of the defrost digital output	°C	-20 to 35	50	
Diff.:	R/W	P8	Activation differential of the defrost digital output	K	0 to 100	20	
Setpoint alarm NTC probe antifreeze	R/W	P9	Set the set point for the antifreeze alarm	°C	-10 to 100	30	
Minimum opening damper:	R/W	Pa	Minimum opening of the outside air damper	%	0 to 99	30	
Fixed opening damper:	R/W	Pa	Fixed opening of the outside air damper	%	0 to 99		
Min. limits for outlet airflow:	R/W	Pb	Minimum pressure differential allowed for the outlet fan, below this value an alarm is generated	Pa	0 to 999	100	
Intake:	R/W	Pb	Minimum pressure differential allowed for the intake fan, below this value an alarm is generated	Pa	0 to 999	100	
Winter start-up setpoint:	R/W	Pc	Set the set point for the activation of winter start-up	°C	-999 to 999	8	
Time:	R/W	Pc	Set the duration of the winter start-up	s	0 to 999	12	
Setpoint stop Recovery external Temperature:	R/W	Pd	Set point to the stop heat recovery unit based on the temperature read by the outside temperature probe	°C	-100 to 100	2	
Supply setpoint Low temp.limit:	R/W	Pe	Enable lower limit based on the outlet temperature	-	Y/N		
Supply set.:	R/W	Pe	Set the outlet set point to be used as the lower limit	°C	0 to 999	18	
Diff.:	R/W	Pe	Set the outlet differential to be used with the lower limit	K	0 to 999	2	
High supply temp. limits :	R/W	Pf	Enable upper limit based of the outlet temperature		Y/N		
Supply set.:	R/W	Pf	Outlet set point to be used as the upper limit	°C	0 to 999	50	
Diff.:	R/W	Pf	Outlet differential to be used with the upper limit	K	0 to 999	2	
High supply humidity limit:	R/W	Pg	Enable upper limit based on the outlet humidity				
Supply set.:	R/W	Pg	Outlet set point to be used as the upper limit		0 to 999	50	
Diff.:	R/W	Pg	Outlet differential to be used with the upper limit		0 to 999	75	
Compensation set Probe comp.:	R/W	Ph	Select the probe used for the compensation of the set point		–/OutT./RoomT/Comp. sensor		
Probe type :	R/W	Ph	Type of signal used by the compensation probe		Active/NTC	Active	
Set point:	R/W	Ph	Select the set point to be compensated	°C	---/RoomSet/OutletSet		
COMPENSATION SET Set min.:	R/W	Pi	Set the start compensation value	°C			
Comp. band	R/W	Pi	Set the compensation differential	°C			
Comp. diff.:	R/W	Pi	Maximum value that the set point can reach in compensation	K			
Type free Cooling/heating:	R/W	Pj	Set the type of freecooling and freeheating		Not enabled/Temperature/Humidity/Enthalpy		
Delta freecooling freeheating:	R/W	Pk	Set the freecooling and freeheating differential,	°C			
Freecool/heating working time:	R/W	Pl	Set the duration of freecooling/freeheating operation only	min			
Free cool/heating enthalpy Delta:	R/W	Pm	Set the delta for freecooling/heating by enthalpy	kcal/kg			
Offs.:	R/W	Pm	Set the differential for freecooling/heating by enthalpy	kcal/kg			
Atmospheric Pressure:	R/W	Pn	Enter the atmospheric pressure value	Pa	600 to 1100	1000	
Enable restart After black-out :	R/W	Po	Enable restart unit after blackout				
Off by remote ID:	R/W	Po	Enable automatic start of the unit after stopping, from remote digital input and from the supervisor		Y/N		
Off by Superv.	R/W	Po	Enable automatic start of the unit after stopping from the supervisor		Y/N		
Setpoint change enable From Dig.In:	R/W	Pp	Enable change set point from digital input		Y/N		
from mask:	R/W	Pp	Enable change set point from mask		Y/N	N	
Floating setpoint enable	R/W	Pq	Enable floating setpoint		Y/N	N	
Dehumidify limit Minimum:	R/W	Pr	Dehumidify minimum limit	%	0…100	0	
Maximum:	R/W	Pr	Dehumidify minimum limit	%	0…100	100	
Modify heaters post-heating threshold	R/W	Ps	Post-heating heaters threshold activation modifying enable		Y/N	N	
Heaters parameters Heaters Setpoint 1:	R/W	Pt	Heater 1 activation setpoint	%	0…100	0	

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
Heaters Setpoint 2 :	R/W	Pt	Heater 2 activation setpoint	%	0…100	100/n° res	
Heaters Setpoint 3 :	R/W	Pt	Heater 3 activation setpoint	%	0…100	(100/(n° htr)*2	
Heaters parameters Heaters Diff. 1 :	R/W	Pu	Heater 1 activation differential	%	0…100	100/n° htr.	
Heaters Diff. 2 :	R/W	Pu	Heater 2 activation differential	%	0…100	100/n° res.	
Heaters Diff. 3 :	R/W	Pu	Heater 3 activation differential	%	0…100	100/n° htr.	
MANUFACTURER			**15 button terminal PROG + MENU button**		**PGD with 6 buttons or Built-in terminal ESC and MANUFACTURER button in the menu**		
Password Manufacturer	R/W	Z0	Enter manufacturer password		0 to 9999	1234	
CONFIGURAZIONE →							
Regulation type:	R/W	C0	Select the type of control		Automatic/ Fixed point		
Control probe/Change mode with	R/W	C0	Select the control probe / Change mode by		Intake temp. / Outlet temp. / External thermostat	1	
Ext.air damper	R/W	C1	Select type of control for the outside air damper		Modulating/ ON/OFF/ Fixed opening		
Damper output:	R/W	C1	Select type of control of the damper outputs		Single / Separate		
Mixed air damper:	R/W	C2	Enable mixing air damper		Y/N		
Expulsion:	R/W	C2	Enable discharge air damper		Y/N		
Heating/Cooling:	R/W	C3	Select the device to change the operating mode		Outside temp. / Keypad Din/ Control probe/ Supervisor	2	
Cold (Hot)	R/W	C3	Select the operating mode from the screen		Cool/Heat		
Status	R	C3	Display the current status		Cool/Heat		
Ventilation:	R/W	C4	Select the type of fan operation.		Temp. control/ Continuous/ Fan coil/ External therm.	1	
Star-delta	R/W	C4	Select the type of fans controlled		Direct/ Star-delta/ Inverter		
Automatic	R/W	C4	Select the type of control for the operation of the fans		Automatic/ Manual		
Fan cutouts:	R/W	C5	Enable fan cutout		None/ Outlet/ Intake/ Out+In		
Air filter:	R/W	C5	Enable air filter		None/ Outlet/ Intake/ Out+In		
Control Din. Airflow:	R/W	C6	Enable digital control of the air flow		Y/N		
Ain:	R/W	C6	Enable analogue control of the air flow		Y/N		
Humidifier:	R/W	C7	Enable and select of the humidifier control output		Not enabled/ Digital output/ Analogue output		
Enable dehumidification	R/W	C8	Enable dehumidification management		Y/N		
Priority during Dehum.:	R/W	C8	Enable the priority of temperature over humidity during the dehumidification request		Humidity/ Temperature/ No priority		
Defrost output Relay:	R/W	C9	Enable defrost relay output		Y/N		
Antifreeze :	R/W	C9	Select the type of antifreeze alarm		Not enabled/ NTC probe/ Digital input/ NTC probe+Din		
Winter starter:	R/W	Ca	Enable winter start-up mode		Y/N		
Pump cutouts:	R/W	Ca	Enable and select the position of the pump cutout		No/ Cool/ Heat/cool + Heat		

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
Clock board Present:	R/W	Cb	Enable the clock card on the pCOXS controller		Y/N		
Enable air quality control:	R/W	Cb	Enable air quality control		Y/N		
Heating recovery:	R/W	Cc	Enable and select the type of heat recovery unit used		Not enabled/Cross-flow/ Double coil / Rotary		
Filter rec.:	R/W	Cc	Enable the heat recovery unit dirty alarm		Y/N		
By-pass damp.:	R/W	Cc	Enable and select bypass damper control		N/ Digit./ Analogue.		
Protect digital inputs Smoke/fire	R/W	Cd	Enable the fire/smoke alarm		Y/N		
Switch door :	R/W	Cd	Enable the inspection door open alarm		Y/N		
Compressor:	R/W	Ce	Enable the compressors		Y/N		
Rotation:	R/W	Ce	Enable rotation of the compressors		Y/N		
Cutouts 1:	R/W	Ce	Enable compressor 1 cutout		Y/N		
Cutouts 2:	R/W	Ce	Enable compressor 2 cutout		Y/N		
Safety compressors HP 1-2:	R/W	Cf	Enable the high pressure switch alarm for compressors 1-2		Y/N		
LP 1-2:	R/W	Cf	Enable the low pressure switch alarm for compressors 1-2		Y/N		
Heating coil Module:	R/W	Cg	Enable and configure the heating coil		Not enabled/ Heating /Preheat		
Heating Regulation probe:	R/W	Ch	Select the device used to control the heating coil		Intake/ Outlet/ Saturation		
Reg.device Heating:	R/W	Ci	Select the device used to control heating		3 point valves/ Modulating valve / Heaters		
Heaters Number:	R/W	Ci	Set the number of electric heaters used on the unit		0 to 3	3	
Cooling regulation	R/W	Cj	Select the device used to control the cooling coil		Modulating valve / Three-point valve / Direct expansion / Not enabled		
Number steps:	R/W	Cj	Number of stages enabled for management of the direct expansion coil		1 to 3		
Cooling Regulation Probe:	R/W	Ck	Select the probe used to control cooling		Intake/ Outlet		
Cool/Heat Battery:	R/W	Cl	Enable the mixed heating/cooling valve		Y/N		
Enable Post-Heat:	R/W	Cm	Enable and select of the type of post-heating		Not enabled/ Compensation in Dehumidify/ Compensation + Integration		
Postheating Regulation Probe:	R/W	Cn	Select the post-heating control probe		Intake / Outlet / Saturation		
Reg. device Post-heating	R/W	Co	Select the device used to manage post-heating		Three-point valve / Modulating valve/ Heaters		
Heaters Number:	R/W	Co	Set the number of electric heaters used on the unit		0 to 3	3	
Number Belimo devices:	R/W	Cp	Set the number of Belimo devices connected to the pCOXS		1 to 8		
Device On-line	R	Cp	Display the Belimo devices on-line				
DIGITAL INPUTS →							
Digital inputs D0 Airflow V.M.	R/W	D0	Select the position of the outlet fan flow switch		1 to 18		
Return flow-sw.	R/W	D0	Select the position of the intake fan flow switch		1 to 18		
Outlet fan cutout	R/W	D0	Select the position of the outlet fan cutout		1 to 18		
Intake fan cutout .	R/W	D1	Select the position of the intake fan cutout		1 to 18		
Heaters cutout	R/W	D1	Select the position of the electric heater cutout		1 to 18		
Pump cutout in heating	R/W	D1	Select the position of the pump cutout in heating		1 to 18		
Pump cutout in cooling	R/W	D2	Select the position of the pump cutout in cooling		1 to 18		
Therm.compr.1	R/W	D2	Select the position of the compressor 1 cutout		1 to 18		
Therm.compr.2	R/W	D2	Select the position of the compressor 2 cutout		1 to 18		
All. Humidifier:	R/W	D3	Select the position of the dig. input for the humidifier alarm		1 to 18		
LP Compressor 1	R/W	D3	Select the position of the low pressure switch for compressor 1		1 to 18		
LP Compressor 2	R/W	D3	Select the position of the low pressure switch for compressor 2		1 to 18		
Digital inputs External ON/OFF	R/W	D4	Select the position of the external ON/OFF contact		1 to 18		
HP Compressor 1	R/W	D4	Select the position of the high pressure switch for compressor 1		1 to 18		

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
HP Compressor 2	R/W	D4	Select the position of the high pressure switch for compressor 2		1 to 18		
Antifreeze digital inputs	R/W	D5	Select the position of the antifreeze thermostat		1 to 18		
Supply filter	R/W	D5	Select the position of the outlet filter		1 to 18		
Return filter	R/W	D5	Select the position of the intake filter		1 to 18		
Fire/smoke digital inputs	R/W	D6	Select the position of the fire/smoke sensor		1 to 18		
Filter HeatR.	R/W	D6	Select the position of the pressure switch for the heat recovery unit dirty alarm		1 to 18		
Door switch	R/W	D6	Select the position of the door open switch		1 to 18		
Digital inputs cold outside temp.	R/W	D7	Select the position of the cold outside temp. protection		1 to 18		
Cold by ID	R/W	D7	Select the position of the heating/cooling input		1 to 18		
Generic filter	R/W	D7	Select the position of the generic filter input		1 to 18		
I.D.Ext.Therm.Fan Input 1	R/W	D8	Select the position of the first input for the control of the 3 fans by an external thermostat		1 to 18		
Input 2	R/W	D8	Select the position of the second input for the control of the 3 fans by an external thermostat		1 to 18		
Input 3	R/W	D8	Select the position of the third input for the control of the 3 fans by an external thermostat		1 to 18		
Change regulation Setpoint by Digital	R/W	D9	Select the position of the digital input to change the control set point		1 to 18		
Alarm from cool unit	R/W	Da	Select the position of the external cool unit alarm input				
Heating	R/W	Db	Select the position of the heating coil input				
Post-heating	R/W	Db	Select the position of the post-heating coil input				
Digital inp. Logic 1……9	R/W	Dc	Configure the logic of digital inputs from 1 to 9		1 to 18		
Digital inp. Logic 10……18	R/W	Dd	Configure the logic of digital inputs from 10 to 18		1 to 18		
ANALOGUE INPUTS →							
Position of outlet pressure probe	R/W	E0	Select the position of the outlet pressure probe		1 to 10		
Return press.:	R/W	E0	Select the position of the intake pressure probe		1 to 10		
Pressure probe type Outlet:	R/W	E1	Type of signal used by the outlet pressure probe		0 to 1 V / 0 to 10 V / 0 to 20mA / 4 to 20 mA		
Pressure probe type. Return:	R/W	E1	Type of signal used by the intake pressure probe		0 to 1 V / 0 to 10 V / 0 to 20mA / 4 to 20 mA		
Probes limit Supply pressure Minimum:	R/W	E2	Minimum value read by the outlet pressure probe	Pa			
Maximum:	R/W	E2	Maximum value read by the outlet pressure probe	Pa	0 to 32767	2500	
Probes limit Return pressure Minimum:	R/W	E3	Minimum value read by the intake pressure probe	Pa			
Maximum:	R/W	E3	Maximum value read by the intake pressure probe	Pa	0 to 32767	2500	
Temp. probe position Intake:	R/W	E4	Select the position of the intake temperature probe		1 to 10		
Temp. Outlet:	R/W	E4	Select the position of the outlet probe		1 to 10		
Probe type Room temp.	R/W	E5	Type of signal used by the intake probe		PT1000 / NTC / 0 to 20mA / 4 to 20 mA / 0 to 1 V / 0 to 10 V	1	
Supply temp.:	R/W	E5	Type of signal used by the outlet probe		PT1000 / NTC / 0 to 20mA / 4 to 20 mA / 0 to 1 V / 0 to 10 V	1	
Min. level intake temp. probe:	R/W	E6	Minimum value read by the probe	°C			
Maximum:	R/W	E6	Maximum value read by the probe	°C			
Min. level outlet temp. probe:	R/W	E7	Minimum value read by the probe	°C			
Maximum:	R/W	E7	Maximum value read by the probe	°C			
Position of outside temp. probe	R/W	E8	Select the position of the outside temperature probe		1 to 10		
Ejection temp.:	R/W	E8	Select the position of the discharge temperature probe		1 to 10		
Type of outside temp. probe:	R/W	E9	Type of signal used by the probe		PT1000 / NTC / 0 to 20mA / 4 to 20 mA / 0 to 1 V / 0 to 10 V		
Eject.temp:	R/W	E9	Type of signal used by the probe		PT1000 / NTC / 0 to 20mA / 4 to 20 mA / 0 to 1 V / 0 to 10 V		

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
Min. level outside temp. probe:	R/W	Ea	Minimum value read by the probe	°C			
Maximum:	R/W	Ea	Maximum value read by the probe	°C			
Min. level expulsion temp. probe:	R/W	Eb	Minimum value read by the probe	°C			
Maximum:	R/W	Eb	Maximum value read by the probe	°C			
Position intake humidity probe:	R/W	Ec	Select the position of the intake humidity probe		1 to 10		
Supply humid.:	R/W	Ec	Select the position of the outlet humidity probe		1 to 10		
Extern. humid:	R/W	Ec	Select the position of the outside humidity probe		1 to 10		
Type of intake humid. probe:	R/W	Ed	Type of signal used by the probe		0 to 1 V / 0 to 10 V / 0 to 20mA / 4 to 20 mA		
Supply humid.:	R/W	Ed	Type of signal used by the outside humidity probe		0 to 1 V / 0 to 10 V / 0 to 20mA / 4 to 20 mA		
Extern. humid:	R/W	Ed	Type of signal used by the outside humidity probe		0 to 1 V / 0 to 10 V / 0 to 20mA / 4 to 20 mA		
Min. level intake humidity probe:	R/W	Ee	Minimum value read by the probe	%	0 to 1000	10	
Maximum:	R/W	Ee	Maximum value read by the probe	%	0 to 1000	90	
Min. level outlet humidity probe:	R/W	Ef	Minimum value read by the probe	%	0 to 1000	10	
Maximum:	R/W	Ef	Maximum value read by the probe	%	0 to 1000	90	
Min. level outside humidity probe:	R/W	Eg	Minimum value read by the probe	%	0 to 1000	10	
Maximum:	R/W	Eg	Maximum value read by the probe	%	0 to 1000	90	
Position VOC air quality probe	R/W	Eh	Type of signal used by the VOC air quality probe		1 to 10		
CO2	R/W	Eh	Select the position of the CO2 air quality probe		1 to 10		
Type VOC air quality probe:	R/W	Ei	Type of signal used by the probe		0 to 1 V / 0 to 10 V / 0 to 20mA / 4 to 20 mA		
CO2 air quality	R/W	Ei	Type of signal used by the probe		0 to 10 V		
Min. level VOC air quality probe:	R/W	Ej	Minimum value read by the probe	%			
Maximum:	R/W	Ej	Maximum value read by the probe	%	0 to 1000	1000	
Min. level CO2 air quality probe:	R/W	Ek	Minimum value read by the probe	ppm			
Maximum:	R/W	Ek	Maximum value read by the probe	ppm	0 to 2500	2500	
Position compens. Setpoint probe:	R/W	El	Select the position of the set point compensation probe		1 to 10		
Pre-heating :	R/W	El	Select the position of the preheating temperature probe		1 to 10		
Probe type Compens.setp.:	R/W	Em	Type of signal used by the probe		PT1000 / NTC / 0 to 20mA / 4 to 20 mA / 0 to 1 V / 0 to 10 V	1	
Pre-heating.	R/W	Em	Type of signal used by the probe		PT1000 / NTC / 0 to 20mA / 4 to 20 mA / 0 to 1 V / 0 to 10 V	1	
Probe limits Setp compensation Minimum:	R/W	En	Minimum value read by the probe	°C			
Maximum:	R/W	En	Maximum value read by the probe	°C	0 to 999	50	
Min. level preheating probe:	R/W	Eo	Minimum value read by the probe	°C			
Maximum:	R/W	Eo	Maximum value read by the probe	°C			
Position probe Antifreeze temp:	R/W	Ep	Select the position of the defrost probe		1 to 10		
Defrost probe:	R/W	Ep	Select the position of the antifreeze probe		1 to 10		
Probe type Antifr. temp.:	R/W	Eq	Type of signal used by the probe		PT1000 / NTC / 0 to 20mA / 4 to 20 mA / 0 to 1 V / 0 to 10 V	1	
Defrost temp.:	R/W	Eq	Type of signal used by the probe		PT1000 / NTC / 0 to 20mA / 4 to 20 mA / 0 to 1 V / 0 to 10 V	1	
Min. level antifreeze temp. Probe:	R/W	Er	Minimum value read by the probe	°C			
Maximum:	R/W	Er	Maximum value read by the probe	°C	0 to 999	50	
Min. level defrost probe:	R/W	Es	Minimum value read by the probe	°C			
Maximum:	R/W	Es	Maximum value read by the probe	°C	0 to 999	50	
Input position Heating by	R/W	Et	Select the position of the analogue input to receive the signal for the heating				

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
thermostat			ramp from the external thermostat				
Input position Cooling bt thermostat	R/W	Eu	Select the position of the analogue input to receive the signal for the cooling ramp from the external thermostat				
DIGITAL OUTPUTS →							
Digital outputs outlet fan T1	R/W	J0	Select the position of the first outlet fan		1 to 18		
Supply T2:	R/W	J0	Select the position of the second outlet fan		1 to 18		
Digital outputs intake fan T1	R/W	J1	Select the position of the first intake fan		1 to 18		
Return T2:	R/W	J1	Select the position of the second intake fan		1 to 18		
Digital outputs line-outlet	R/W	J2	Position of the line contactor for the outlet fan			1	Fixed value
Supply-Delta:	R/W	J2	Position of the delta contactor for the outlet fan			2	Fixed value
Supply-Star:	R/W	J2	Position of the star contactor for the outlet fan			3	Fixed value
Digital outputs line-intake	R/W	J3	Position of the line contactor for the intake fan			4	Fixed value
Return-Delta:	R/W	J3	Position of the delta contactor for the intake fan			5	Fixed value
Return-Star:	R/W	J3	Position of the star contactor for the intake fan			6	Fixed value
Digital outputs Compressor 1	R/W	J4	Select the position of compressor 1		1 to 18		
Compressor 2:	R/W	J4	Select the position of compressor 1		1 to 18		
Digital outputs Heaters Elet.1	R/W	J5	Select the position of electric heater 1		1 to 18		
Elect. Heater 2:	R/W	J5	Select the position of electric heater 2		1 to 18		
Elect. Heater 3:	R/W	J5	Select the position of electric heater 3		1 to 18		
Digital outputs humidifier	R/W	J6	Select the position of the humidifier		1 to 18		
By pass rec.damp.:	R/W	J6	Select the position of the bypass heat recovery unit		1 to 18		
Double rec. coil:	R/W	J6	Select the position of the double coil heat recovery unit		1 to 18		
Digital outputs general alarm	R/W	J7	Select the position of the alarm signal device		1 to 18		
Unit status:	R/W	J7	Select the position of the device signalling the status of the unit		1 to 18		
Digital outputs blocked filter	R/W	J8	Select the position of the device for blocked filter alarm signal		1 to 18		
Cool pump:	R/W	J8	Select the position of the pump in cooling		1 to 18		
Heat pump:	R/W	J8	Select the position of the pump in heating		1 to 18		
Cold status:	R/W	J9	Select the position of the cooling status output		1 to 18		
Defrost:	R/W	J9	Select the position of the device for signalling the antifreeze alarm		1 to 18		
Digital damper	R/W	J9	Select the position of the discharge damper		1 to 18		
Direct expans. Cold step 1:	R/W	Ja	Select the position of the output for the activation of the first direct expansion cooling step		1 to 18		
Cold step 2:	R/W	Ja	Select the position of the output for the activation of the second direct expansion cooling step		1 to 18		
Cold step 3:	R/W	Ja	Select the position of the output for the activation of the third direct expansion cooling step		1 to 18		
Digital outputs open 3p cooling	R/W	Jb	Select the position of the output for opening the 3 point valve on the cooling coil		1 to 18		
Close cool:	R/W	Jb	Select the position of the output for closing the 3 point valve on the cooling coil		1 to 18		
Digital outputs open 3p Post-heating	R/W	Jc	Select the position of the output for opening the 3 point valve on the post-heating coil		1 to 18		
Close Post-H:	R/W	Jc	Select the position of the output for closing the 3 point valve on the post-heating coil		1 to 18		
Valve 3p Open heat:	R/W	Jd	Select the position of the output for opening the 3 point valve on the heating coil		1 to 18		
Close heat:	R/W	Jd	Select the position of the output for closing the 3 point valve on the heating coil		1 to 18		
Step fan 1:	R/W	Je	Select the position of the first fan speed in fan coil mode		1 to 18		
Step fan 2:	R/W	Je	Select the position of the second fan speed in fan coil mode		1 to 18		
Step fan 3:	R/W	Je	Select the position of the third fan speed in fan coil mode		1 to 18		
ANALOGUE OUTPUTS →							
Analogue outputs intake fan:	R/W	L0	Select the output for the intake fan		1 to 6		
Outlet:	R/W	L0	Select the output for the outlet fan		1 to 6		
Ext.Damper	R/W	L1	Select the output for the outside air damper		1 to 6		
Mixing damper.	R/W	L1	Select the output for the mixing damper		1 to 6		
Exp.Damper	R/W	L1	Select the output for the discharge damper		1 to 6		
Analogue output recovery bypass damper:	R/W	L2	Select the output for the heat recovery unit bypass damper		1 to 6		
Analogue output rotary heat recovery:	R/W	L3	Select the output for the rotary heat recovery unit		1 to 6		

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
valve Cooling:	R/W	L4	Select the output for the modulating valve in cooling		1 to 6		
Heating:	R/W	L4	Select the output for the modulating valve in heating		1 to 6		
Mixing valve Cool/heat Battery	R/W	L5	Select the output for the mixed modulating valve		1 to 6		
Analogue output Modulating valve post-heating.	R/W	L6	Select the output for the post-heating valve		1 to 6		
Analogue output humidifier:	R/W	L7	Select the analogue output for humidifier management		1 to 6		
PARAMETERS →							
Outlet fan inverter Setpoint	R/W	G0	Management of the outlet fan Control set point for the outlet fan	Pa	-9999 to 9999		
Diff.	R/W	G0	Control differential for the outlet fan	Pa	-999 to 999		
Offset:	R/W	G0	Control offset for the outlet fan	V	0 to 10		
Int. t. outlet control	R/W	G1	Integration time for the outlet fan	s	0 to 9999		
Der.T.	R/W	G1	Derivative time for the outlet fan	s	0 to 9999		
Intake fan inverter Setpoint	R/W	G2	Management of the intake fan Control set point for the intake fan	Pa	-9999 to 9999		
Diff.	R/W	G2	Control differential of the intake fan	Pa	-999 to 999		
Offset:	R/W	G2	Control offset for the intake fan	V	0 to 10		
Control intake I.T.	R/W	G3	Integration time for the intake fan	s	0 to 9999	600	
TD	R/W	G3	Derivative time for the intake fan	s	0 to 9999	600	
Temp. Control	R/W	G4			0/1		
R. integration time	R/W	G4		s	0 to 9999		
M	R/W	G4		s	0 to 9999		
TIMES →							
Min. on time Compressors	R/W	T0	Minimum time the compressors must remain on for when started	s	0 to 9999	600	
Min. off time compressors	R/W	T0	Minimum time the compressors must remain off for when stopped	s	0 to 9999	600	
Min. time between Different Compressors	R/W	T1	Minimum time that must elapse between the starts of two different compressors	s	0 to 9999	600	
Min. time between same compressor starts :	R/W	T2	Minimum time that must elapse between two starts of the same compressor	s	0 to 9999	600	
Star-Delta timing Start delay :	R/W	T3	Delay between unit on and fan on	s	0 to 9999	60	
On delays:	R/W	T3	Delay between compressors starts	s	0 to 9999	10	
Off delays :	R/W	T3	Delay between unit off and fan off	s	0 to 9999	10	
Time between Two steps Fans:	R/W	T4	Delay between the first and the second fan step	s			
Star-Delta timing Line-star	R/W	T5	Time that must elapse between the line and the star contactor	s/100	0 to 9999	500	
Star	R/W	T5	Duration of the star contactor	s/100	0 to 9999	200	
Star-delta	R/W	T5	Time that must elapse between the star and the delta contactor	s/100	0 to 9999	100	
Delay between act. Heating coil and post-heating coil	R/W	T6	Time between the activation of the heating coil and the post-heating coil	min	0 to 9999	1	
Delay airflow alarms:	R/W	T7	Set the flow switch alarm delay	s			
Low pressure	R/W	T7	Set the low pressure alarm delay	s	0 to 600	60	
Opening/closing time 3-point valve in cooling:	R/W	T8	Set the times for the 3 point valve in cooling				
Heat:	R/W	T8	Set the times for the 3 point valve in heating				
INITIALISATION →							
Supervisor Communication speed:	R/W	V0	Set the communication speed between the pCO board and the supervisor		1200(RS485/RS422) / 2400 (RS485/RS422) / 4800 (RS485/RS422) / 9600 (RS485 ONLY) / 19200 (RS485 ONLY)	4	
Ident:	R/W	V0	Set the identification number for the pCO inside the supervisor network		1 to 200	1	
Protocol type:	R/W	V1	Select the type of communication protocol		NONE / CAREL / REMOTE / MODBUS	1	
<MODEM> number rings	R/W	V2	Set the number of rings before answering		0 to 5		
Selection type	R/W	V2	Set the type of dialling used by the modem		TONE / PULSE		
Password	R/W	V2	Set the password to access the modem				
telephone number	R/W	V3	Select the telephone number to call				
Dial	R/W	V3	Manual dialling		OFF / ACTIVE		

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
New Passwords Manufacturer :	R/W	V4	Set the new password to access the manufacturer menu				
User:	R/W	V4	Set the new password to access the user menu				
Assistance:	R/W	V4	Set the new password to access the maintenance menu				
Reset lists I/O:	R/W	V5	Delete the values assigned to the input/output configuration parameters				
Setting network frequency:	R/W	V5	Set the mains frequency	Hz	50Hz / 60Hz		
Memory erasing	R/W	V6	Delete the configuration values				
Set model type	R/W	V6	Select the model of unit being controlled		1 to 24		
TEST DEVICES →							
Activate device tests:	R/W	R0	Enable test procedure on the devices enabled		0 to 1		
Analogue output vale in heating	R/W	R1	Value set for the opening of the valve in heating	%	0 to 100		
Cooling:	R/W	R1	Value set for the opening of the valve in cooling	%	0 to 100		
Analogue outputs Post-Heating valve:	R/W	R2	Value set for the opening of the valve in post-heating	%	0 to 100		
Damper outputs external air:	R/W	R3	Value set for the opening of the outside air damper	%	0 to 100		
mixing:	R/W	R3	Value set for the opening of the mixing air damper	%	0 to 100		
Analogue outputs Supply fan:	R/W	R4	Value set for the operation of the outlet fan	%	0 to 100		
Intake:	R/W	R4	Value set for the operation of the intake fan	%	0 to 100		
Analogue outputs Rotative heating Recovery:	R/W	R5	Value set for the operation of the rotary heat recovery unit	%	0 to 100		
Analogue outputs	R/W	R6	Value set for the operation of the humidifier	%	0 to 100		
Digital outputs C=closed A=open	R/W	R7	Status of the settable digital outputs		C / O		
Password VFD:	R/W	W0	Enter VFD password		0 to 9999	1234	
VFD management VFD menu: COMMUNICATION			15 button terminal MENU button		PGD with 6 buttons or Built-in terminal ESC and Communication button in the VFD menu		
Password VFD management	R/W	W0	Enter manufacturer password		0 to 9999	1234	
VFD menu: COMMUNICATION →							
Modbus protocol communication on	R/W	H0	Select the serial port for communication in Modbus protocol	-	NO pLAN (serial 0) Fieldbus (serial 1)	NO	
Modbus config. Stop bit	R/W	H1	Stop bits	-	1 STOP BIT 2 STOP BITS	1 STOP BIT	
Parity mode	R/W	H1	Parity	-	NO EVEN ODD	NO	
Modbus config. BaudRate	R/W	H2	Communication speed between the pCO board and the VFD via RS485	Kb/s	1200 2400 4800 9600 19200	19200	
Modbus config. Timeout	R/W	H2	Waiting time for the first response byte from the peripheral	ms	0 to 9999	1000	
Modbus config. Supply VFD addr	R/W	H3	Modbus address of the outlet VFD		1 to 255	1	
Return VFD addr	R/W	H3	Modbus address of the intake VFD		1 to 255	2	
VFD menu: INPUT/OUTPUT →							
Supply Stat.	R	B0	General status of the outlet actuator	-	NOT RDY READY		
Run	R	B0	Operating status of the outlet actuator	-	STOP RUN		
Direction	R	B0	Running direction of the outlet actuator	-	→ (forwards) ← (backwards)		
Alarms	R	B0	Active alarms on the outlet actuator	-	NO ALARM ALARMS		
VFD supply fan Request	R	B1	Percentage request to the outlet actuator	%			
Feedback	R	B1	Current frequency of the outlet actuator	Hz			
Return Stat.	R	B2	General status of the intake actuator		NOT RDY READY		
Run	R	B2	Operating status of the intake actuator		STOP RUN		
Direction	R	B2	Running direction of the intake actuator	-	→ (forwards) ← (backwards)		
Alarms	R	B2	Active alarms on the intake actuator	-	NO ALARM ALARMS		

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
VFD return fan Request	R	B3	Percentage request to the intake VFD	%			
Feedback	R	B3	Current frequency of the intake actuator	Hz			
Supply fan VFD Motor speed (Hz)	R	B4	Speed of the motor connected to the outlet actuator	Hz			
Motor speed (rpm)	R	B4	Speed of the motor connected to the outlet actuator	rpm			
Return fan VFD Motor speed (Hz)	R	B5	Speed of the motor connected to the intake actuator	Hz			
Motor speed (rpm)	R	B5	Speed of the motor connected to the intake actuator	rpm			
Supply fan VFD Motor current	R	B6	Current of the motor connected to the outlet actuator	A			
Motor torque	R	B6	Torque of the motor connected to the outlet actuator	%			
Return fan VFD Motor current	R	B7	Current of the motor connected to the intake actuator	A			
Motor torque	R	B7	Torque of the motor connected to the intake actuator	%			
Supply fan VFD Motor power	R	B8	Power of the outlet actuator motor	%			
Motor voltage	R	B8	Voltage of the outlet actuator motor	V			
Return fan VFD Motor power	R	B9	Power of the intake actuator motor	%			
Motor voltage	R	B9	Voltage of the intake actuator motor	V			
Supply fan VFD DC voltage	R	Ba	DC-link voltage measured	V			
Diss.temp	R	Ba	Temperature of the heat sink	°C			
Return fan VFD DC voltage	R	Bb	DC-link voltage measured	V			
Diss.temp	R	Bb	Temperature of the heat sink	°C			
VFD menu: USER →							
User Enable write param.	R/W	N0	Enable write parameters to VFD (outlet/intake)	-	N / Y	N	
Supply VFD Operating speeds In sup.setp.	R/W	N1	Outlet fan speed in the interval between outlet temperature set point ± dead zone	%	0.0 to 100.0	0.00	
Out sup.setp.	R/W	N1	Outlet fan speed for outlet temperature greater/less than the set point ± dead zone ± differential	%	0.0 to 100.0	50.00	
Return VFD Operating speeds In sup.setp.	R/W	N2	Intake fan speed in the interval between outlet temperature set point ± dead zone	%	0.0 to 100.0	0.0	
Out sup.setp.	R/W	N2	Intake fan speed for outlet temperature greater/less than the set point ± dead zone ± differential	%	0.0 to 100.0	100	
Supply VFD Rotation type	R/W	N3	Direction of rotation taken by the outlet actuator	-	-CLOCKWISE -COUNTER-CLOCKWISE		
Return VFD Rotation type	R/W	N4	Direction of rotation taken by the intake actuator	-	-CLOCKWISE -ANTICLOCKWISE		
Supply fan VFD Current limit	R/W	N5	Current limit of the outlet actuator	A	0.3 x I_H to 2 x I_H	I_L [1]	
Return fan VFD Current limit	R/W	N6	Current limit of the intake actuator	A	0.3 x I_H to 2 x I_H	I_L	
Supply fan VFD Motor nominal Voltage	R/W	N7	Rated voltage of the motor connected to the outlet actuator	V	180 to 690	230	
Return fan VFD Motor nominal Voltage	R/W	N8	Rated voltage of the motor connected to the intake actuator	V	180 to 690	230	
Supply fan VFD Motor nominal frequency	R/W	N9	Rated frequency of the motor connected to the outlet actuator	Hz	30.0 to 320.0	50.0	
Return fan VFD Motor nominal frequency	R/W	Na	Rated frequency of the motor connected to the intake actuator	Hz	30.0 to 320.0	50.0	
Supply fan VFD Motor nominal speed	R/W	Nb	Rated speed of the motor connected to the outlet actuator	rpm	300 to 20000	1440	

[1] I_L = Rated current in "normal" load conditions (40°C)
I_H = Rated current in "heavy" load conditions (50°C)
For the values of I_H and I_L , refer to the VFD user manual.

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
Return fan VFD Motor nominal speed	R/W	Nc	Rated speed of the motor connected to the intake actuator	rpm	300 to 20000	1440	
Supply fan VFD Motor nominal current	R/W	Nd	Rated current of the motor connected to the outlet actuator	A	0.3 x I_H to 2 x I_H	I_H	
Return fan VFD Motor nominal current	R/W	Ne	Rated current of the motor connected to the intake actuator	A	0.3 x I_H to 2 x I_H	I_H	
Supply fan VFD Motor Cos-fi	R/W	Nf	Cosine of angle (fi) of the motor connected to the outlet actuator	-	0.30 to 0.99		
Return fan VFD Motor Cos-fi	R/W	Ng	Cosine of angle (fi) of the motor connected to the intake actuator	-	0.30 to 0.99		
Supply fan VFD Control type	R/W	Nh	Control mode of the outlet actuator. Establishes the source of the activation/deactivation control signal. By default, the application assigns the digital input (of the VFD), that is, the digital output of the pCO as the source.	-	-DIN = from digital input -PANEL = from local control panel -MODBUS = from remote via Modbus protocol	DIN	
Return fan VFD Control type	R/W	Ni	Control mode of the intake actuator. Establishes the source of the activation/deactivation control signal. By default, the application assigns the digital input (of the VFD), that is, the digital output of the pCO as the source..	-	-DIN = from digital input -PANEL = from local control panel -MODBUS = from remote via Modbus protocol	DIN	
Supply fan VFD Require type	R/W	Nj	Source of the speed/frequency reference for the outlet actuator. By default, when starting/stopping the actuator via digital input (pCO digital output), the application assigns the serial port (Modbus) as the source of the frequency/speed request.	-	-FROM AIN1 -FROM AIN2 -FROM PANEL -FROM MODBUS -FROM MOTOR POT. -FROM PID	MODBUS	
Return fan VFD Require type	R/W	Nk	Source of the speed/frequency reference for the outlet actuator. By default, when starting/stopping the actuator via digital input (pCO digital output), the application assigns the serial port (Modbus) as the source of the frequency/speed request.	-	-FROM AIN1 -FROM AIN2 -FROM PANEL -FROM MODBUS -FROM MOTOR POT. -FROM PID	MODBUS	
Alarms gravity S=Serious L=light AL03	R/W	Nl	Select the level of seriousness of VFD alarm (intake/outlet) no. 3 :	-	-NOT SERIOUS -SERIOUS	NOT SERIOUS	
AL09	R/W	Nl	Select the level of seriousness of VFD alarm (intake/outlet) no. 9	-	-NOT SERIOUS -SERIOUS	NOT SERIOUS	
AL11	R/W	Nl	Select the level of seriousness of VFD alarm (intake/outlet) no. 11	-	-NOT SERIOUS -SERIOUS	NOT SERIOUS	
AL15	R/W	Nl	Select the level of seriousness of VFD alarm (intake/outlet) no. 15	-	-NOT SERIOUS -SERIOUS	NOT SERIOUS	
AL16	R/W	Nl	Select the level of seriousness of VFD alarm (intake/outlet) no. 16	-	-NOT SERIOUS -SERIOUS	NOT SERIOUS	
AL17	R/W	Nl	Select the level of seriousness of VFD alarm (intake/outlet) no. 17	-	-NOT SERIOUS -SERIOUS	NOT SERIOUS	
Alarms gravity S=Serious L=light AL29	R/W	Nm	Select the level of seriousness of VFD alarm (intake/outlet) no. 29	-	-NOT SERIOUS -SERIOUS	NOT SERIOUS	
AL50	R/W	Nm	Select the level of seriousness of VFD alarm (intake/outlet) no. 50	-	-NOT SERIOUS -SERIOUS	NOT SERIOUS	
AL53	R/W	Nm	Select the level of seriousness of VFD alarm (intake/outlet) no. 53	-	-NOT SERIOUS -SERIOUS	NOT SERIOUS	
AL54	R/W	Nm	Select the level of seriousness of VFD alarm (intake/outlet) no. 54	-	-NOT SERIOUS -SERIOUS	NOT SERIOUS	
AL55	R/W	Nm	Select the level of seriousness of VFD alarm (intake/outlet) no. 55	-	-NOT SERIOUS -SERIOUS	NOT SERIOUS	

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
VFD menu: MANUFACTURER →							
Manufacturer Enable write param.	R/W	Q0	Enable write parameters to VFD (outlet/intake)	-	N / Y	N	
Supply fan VFD Min frequency	R/W	Q1	Minimum outlet actuator frequency	Hz	0.0 to Max freq.		
Return fan VFD Min frequency	R/W	Q2	Minimum intake actuator frequency	Hz	0.0 to Max freq.		
Supply fan VFD Max frequency	R/W	Q3	Maximum outlet actuator frequency	Hz	Min freq. to 320.0	50.0	
Return fan VFD Max frequency	R/W	Q4	Maximum intake actuator frequency	Hz	Min freq. to 320.0	50.0	
Supply fan VFD Acceleration time1	R/W	Q5	Acceleration time of the outlet actuator	s	0.1 to 3000	1.0	
Return fan VFD Acceleration time1	R/W	Q6	Acceleration time of the intake actuator	s	0.1 to 3000	1.0	
Supply fan VFD Deceleration time1	R/W	Q7	Deceleration time of the outlet actuator	s	0.1 to 3000	1.0	
Return fan VFD Deceleration time1	R/W	Q8	Deceleration time of the intake actuator	s	0.1 to 3000	1.0	
Supply fan VFD Start function	R/W	Q9	Type of outlet actuator operation	-	-RAMP -FAST CONN.		
Return fan VFD Start function	R/W	Qa	Type of intake actuator operation	-	-RAMP -FAST CONN.		
Supply fan VFD Stop function	R/W	Qb	Type of outlet actuator stop	-	-BY INERTIA -RAMP		
Return fan VFD Stop function	R/W	Qc	Type of intake actuator stop	-	-BY INERTIA -RAMP		
Supply fan VFD V/F optimisation	R/W	Qd	Ratio optimisation between outlet actuator motor voltage and frequency	-	-NOT USED -AUTOMATIC TORQUE BOOST		
Return fan VFD V/F optimisation	R/W	Qe	Ratio optimisation between intake actuator motor voltage and frequency	-	-NOT USED -AUTOMATIC TORQUE BOOST		
Supply fan VFD Automatic restart	R/W	Qf	Automatic outlet actuator restart function	-	-NOT USED -USED		
Return fan VFD Automatic restart	R/W	Qg	Automatic intake actuator restart function	-	-NOT USED -USED		
Supply fan VFD Motor control mode	R/W	Qh	Control mode of the motor connected to the outlet actuator:	-	-FREQUENCY -SPEED		
Return fan VFD Motor control mode	R/W	Qi	Control mode of the motor connected to the intake actuator:		-FREQUENCY -SPEED		
Supply fan VFD V/F ration selection	R/W	Qj	Type of frequency variation with the voltage of the motor connected to the outlet actuator		-LINEAR -QUADRATIC -PROGRAMMABLE -LINEAR WITH FLOW OPTIMISATION		
Return fan VFD V/F ration selection	R/W	Qk	Type of frequency variation with the voltage of the motor connected to the intake actuator	-	-LINEAR -QUADRATIC -PROGRAMMABLE -LINEAR WITH FLOW OPTIMISATION		
Supply fan VFD V/F curve midpoint frequency	R/W	Ql	Intermediate frequency of the programmable V/f curve on the outlet actuator	%	0.0 to 100.0		
Return fan VFD V/F curve midpoint frequency	R/W	Qm	Intermediate frequency of the programmable V/f curve on the intake actuator	%	0.0 to 100.0		
Supply fan VFD V/F curve midpoint voltage	R/W	Qn	Intermediate voltage of the programmable V/f curve on the outlet actuator	%	0.0 to 100.0		
Return fan VFD V/F curve midpoint voltage	R/W	Qo	Intermediate voltage of the programmable V/f curve on the outlet actuator	%	0.0 to 100.0		
Supply fan VFD Out voltage at 0Hz	R/W	Qp	Output voltage at no frequency on the outlet actuator	%	0.0 to 100.0		
Return fan VFD Out voltage at 0Hz	R/W	Qq	Output voltage at no frequency on the intake actuator	%	0.0 to 100.0		
Supply fan VFD Switching freq.	R/W	Qr	Switching frequency of the outlet actuator	Hz	1.0 to 16.0	1.0	
Return fan VFD Switching freq.	R/W	Qs	Switching frequency of the intake actuator	Hz	1.0 to 16.0	1.0	
Supply VFD advan. Address	R/W	Qt	Modbus identifier of the generic parameter (not featured in the loop of screens) to be read/written from/to the outlet actuator	-	0 to 32760		

Parameter	Type	Ref.	Description	UOM	Range	Default	Note
-	R/W	Qt	Function to be performed for the outlet actuator address parameter	-	-READ -WRITE		
-	R/W	Qt	Value to write to the outlet actuator Modbus address identifier parameter	-	-2000 to 2000		
-	R	Qt	Value read from the outlet actuator Modbus address identifier parameter	-	-32768 to 32767		
Return VFD advan. Address	R/W	Qu	Modbus identifier of the generic parameter (not featured in the loop of screens) to be read/written from/to the intake actuator	-	0 to 32760		
-	R/W	Qu	Function to be performed for the intake actuator address parameter	-	-READ -WRITE		
-	R/W	Qu	Value to write to the intake actuator Modbus address identifier parameter	-	-2000 to 2000		
-	R	Qu	Value read from the intake actuator Modbus address identifier parameter	-	-32768 to 32760		

8. Screens

The user interface of this application is divided into loops (branches) of screens:

- Screens not protected by password: these are found in all loops, except for **PROG** and **MENU+PROG**. They show the values read by the probes, the status of the alarms, the operating hours of the devices, the time and the date; in addition, they are used to set the set point (temperature and humidity) and the clock. These screens are indicated by the "❶" symbol in the list of screens.
- Password-protected **USER** screens (password 1234 - modifiable): these are accessed by pressing the **PROG** button and are used to set the main functions (set point, differentials) of the devices connected. These screens are indicated by the "❶" symbol in the list of screens.
- Password-protected **MAINTENANCE** screens (password 1234 - modifiable): these are accessed by pressing the "**maintenance**" button and are used to periodically check the devices, calibrate the probes connected, modify the operating hours and manually manage the devices. These screens are indicated by the "❷" symbol in the list of screens.
  The first two screens in the maintenance menu (A0, A1) do not require password access, and contain information on the software and the controller board; the following two (again without password) contain information on the operating hours of the following devices: compressors 1-2, intake-outlet fans. These screens are indicated by the "❶" symbol in the list of screens.
- Password-protected **MANUFACTURER** screens (password 1234 - modifiable): these are accessed by pressing the **MENU+PROG** buttons and are used to configure the unit and enable the main functions. These are indicated by the "❸" symbol in the list of screens.
- Password-protected VFD screens (VARIABLE FREQUENCY DRIVER) (password 1234 - modifiable): these are accessed by pressing the **MENU** button, and are used to configure the communication network between the pCO and the VFD and to configure the parameters of the VFD. These are indicated by ❹ in the list of screens.

N.B.: The screens that refer to functions that are not available are not displayed.

8.1 List of screens

Below is the list of screens shown on the display. The columns in the table represent the loops of screens, and the first screen (A0, B0..) is the one displayed when pressing the corresponding button; from there, the arrow buttons can be used to scroll to the other screens. The codes (Ax, Bx, C) are displayed in the top right corner of the screens for easy identification. The meaning of the symbols ❶,❶…is explained in the previous paragraph. The symbol **PSW** indicates the screens that require the password to be entered.

❶ M0	❶ A0	❶ I0	❶ K0	❶ S0	**PSW** P0	❶ F1	**PSW** W0				
❶ M1	❶ A1	❶ I1	❶ K1	❶ S1	❶ P1	❶ F2	**I/O**	**Comm.**	**User**	**Manuf.**	
❶ M2	❶ A2	❶ I2	❶ K2	❶ S2	❶ P2	❶ F3	❹ B0	❹ H0	❹ N0	❹ Q0	
	❶ A3	❶ I3	❶ K3	❶ S3	❶ P3	❶ F4	❹ B1	❹ H1	❹ N1	❹ Q1	
	PSW A4	❶ I4	❶ K4	❶ S4	❶ P4	❶ F5	❹ B2	❹ H2	❹ N2	❹ Q2	
	❷ A5	❶ I5	❶ K5	❶ S5	❶ P5	❶ F6	❹ B3	❹ H3	❹ N3	❹ Q3	
	❷ A6	❶ I6	❶ K6	❶ S6	❶ P6	❶ F7	❹ B4		❹ N4	❹ Q4	
	❷ A7	❶ I7	❶ K7	❶ S7	❶ P7	❶ F8	❹ B5		❹ N5	❹ Q5	
	❷ A8	❶ I8	❶ K8	❶ S8	❶ P8	❶ F9	❹ B6		❹ N6	❹ Q6	
	❷ A9	❶ I9	❶ K9	❶ S9	❶ P9	❶ Fa	❹ B7		❹ N7	❹ Q7	
	❷ Aa	❶ Ia	❶ Ka	❶ Sa	❶ Pa	❶ Fb	❹ B8		❹ N8	❹ Q8	
	❷ Ab	❶ Ib		❶ Sb	❶ Pb	❶ Fc	❹ B9		❹ N9	❹ Q9	
	❷ Ac	❶ Ic			❶ Pc	❶ Fd	❹ Ba		❹ Na	❹ Qa	
	❷ Ad	❶ Id			❶ Pb	❶ Fe	❹ Bb		❹ Nb	❹ Qb	
	❷ Ae	❶ Ie			❶ Pe	❶ Ff			❹ Nc	❹ Qc	
	❷ Af	❶ If			❶ Pf	❶ Fg			❹ Nd	❹ Qd	
	❷ Ag	❶ Ig			❶ Pg	❶ Fh			❹ Ne	❹ Qe	
	❷ Ah	❶ Ih			❶ Ph	❶ Fi			❹ Nf	❹ Qf	
	❷ Ai				❶ Pi	❶ Fi			❹ Ng	❹ Qg	
	❷ Aj				❶ Pj				❹ Nh	❹ Qh	
	❷ Ak				❶ Pl				❹ Ni	❹ Qi	
	❷ Al				❶ Pm				❹ Nj	❹ Qj	
	❷ Am				❶ Pn				❹ Nk	❹ Qk	
	❷ An				❶ Po				❹ Nl	❹ Ql	
	❷ Ap				❶ Pp				❹ Nm	❹ Qm	
	❷ Aq									❹ Qn	
	❷ Ar									❹ Qo	
	❷ As									❹ Qp	
	❷ At									❹ Qq	
	❷ Au									❹ Qr	
	❷ Av									❹ Qs	
	❷ Ax									❹ Qt	
	❷ Ay									❹ Qu	

PSW Z0

Conf.
❸ C0
❸ C1
❸ C2
❸ C3
❸ C4
❸ C5
❸ C6
❸ C7
❸ C8
❸ C9
❸ Ca
❸ Cb
❸ Cc
❸ Cd
❸ Ce
❸ Cf
❸ Cg
❸ Ch
❸ Ci
❸ Cj
❸ Ck
❸ Cl
❸ Cm
❸ Cn
❸ Co
❸ Cp

Dig. In.
❸ D0
❸ D1
❸ D3
❸ D4
❸ D5
❸ D6
❸ D7
❸ D8
❸ D9
❸ Da
❸ Db
❸ Dc
❸ Dd

An. In.
❸ E0
❸ E1
❸ E2
❸ E3
❸ E4
❸ E5
❸ E6
❸ E7
❸ E8
❸ E9
❸ Ea
❸ Eb
❸ Ec
❸ Ed
❸ Ee
❸ Ef
❸ Eg
❸ Eh
❸ Ei
❸ Ej
❸ Ek
❸ El
❸ Em
❸ En
❸ Eo
❸ Ep
❸ Eq
❸ Er
❸ Es
❸ Et
❸ Eu

Dig. Out.
❸ J0
❸ J1
❸ J2
❸ J3
❸ J4
❸ J5
❸ J6
❸ J7
❸ J8
❸ J9
❸ Ja
❸ Jb
❸ Jc
❸ Jd
❸ Je

An. Out.
❸ L0
❸ L1
❸ L2
❸ L3
❸ L4
❸ L5
❸ L6
❸ L7

Param.
❸ G0
❸ G1
❸ G2
❸ G3
❸ G4

Times
❸ T0
❸ T1
❸ T2
❸ T3
❸ T4
❸ T5
❸ T6
❸ T7
❸ T8

Initial.
❸ V0
❸ V1
❸ V2
❸ V3
❸ V4
❸ V5
❸ V6

Test devices
❸ R0
❸ R1
❸ R2
❸ R3
❸ R4
❸ R5
❸ R6
❸ R7

9. Control

9.1 Switching the unit ON/OFF

9.1.1 Description of operation

The unit can be switched on/off using the following utilities:

1. Keypad on the user terminal
2. Time bands
3. Digital input
4. Supervisor.

The highest priority is given to the ON/OFF from the keypad, and therefore if the unit is switched OFF from the keypad, it cannot be switched on from any other source. The conditions such as OFF from digital input, OFF from time bands and OFF from the supervisor are only active if the unit is switched ON from the keypad

The main screen M0 displays the unit operating status:

1.	COMFORT	Unit in operation
2.	OFF FROM ALARM	Unit off from alarm
3.	OFF FROM THE SUPERVISOR	Unit off from the supervisor
4.	OFF FROM TIME BAND	Unit off from time bands
5.	OFF FROM REMOTE DI	Unit off remote digital input
6.	UNIT OFF	Unit off from the keypad
7.	ALARM	Unit in operation with alarm active

The procedure for switching the terminal on changes according to the terminal used:

- External terminal with 15 buttons, pCO1 or pCOT series: the unit is switched ON/OFF directly using the ON/OFF button.
- Built-In or pGD series terminal: the unit is switched ON/OFF as follows:
  - from the main screen M0, press the down arrow button to move to screen M1;
  - from screen M1, set the unit status from "unit OFF" to "COMFORT" or vice-versa.

9.2 Fixed point control

Inputs used

Position of the outlet and intake temperature probes (E4)
Position of the preheating probe (El)

Parameters used

Select the type of control (C0)
Select the control probe for the preheating coil (Ch)
Select the control probe for the cooling coil (Ck)
Select the control probe for the post-heating coil (Cn)

Description of operation

With this type of control, each coil on the unit works in independently and is controlled by a defined probe, without the software intervening automatically. The probe that controls the coil must be selected according to the constructional characteristics of the installation. Below is a summary table:

DEVICE	CONTROL PROBE
HEATING COIL	Intake temperature
	Outlet temperature
	Preheating temperature
COOLING COIL	Intake temperature
	Outlet temperature
POST-HEATING COIL	Intake temperature
	Outlet temperature
	Preheating temperature

After having selected the probes, set the corresponding control parameters (Set point, Differential and Dead zone) in the screens under the set point menu.

9.3 Automatic control

This type of control involves the automatic operation of the software, in the cases listed below, to control the heating (preheating), cooling and post-heating coils, and ensuring optimised management of the air handling unit and greater comfort in the rooms controlled. The software acts automatically on the following devices:

1. Heating coil;
2. Dehumidification and cooling coil;
3. Post-heating coil.

HEATING COIL: this is managed only is the humidifier is enabled, and in this case it can also work as a preheating coil.

Humidifier	Humidity request	Heating coil
Enabled	Not active	Controlled by the set control probe
Enabled	Active	Controlled by the preheating probe according to the corresponding set point and differential

DEHUMIDIFICATION AND POST-HEATING: for these two functions, priority must be given either to temperature or humidity. Based on this fundamental selection, the software will manage the heating and cooling coils as a consequence. Post-heating, on the other hand, can be applied to compensate for the lowering of the temperature due to the dehumidification function, or alternatively to supplement the main heating coil.

TEMPERATURE PRIORITY				
Dehumidification phase	Heating phase	Cooling coil	Post-heating coil for compensation only	Post-heating coil Comp.+Supp.
Not active	Active	Not active	Not active	Active if necessary to supplement main coil and managed by control probe
Active	Active	Wait for the heating phase to end	Wait for the heating phase to end	Active if necessary to supplement main coil and managed by control probe
Active	Not active	Controlled by the intake humidity probe	Controlled by the outlet probe	Controlled by supply probe to compensate

HUMIDITY PRIORITY				
Dehumidification phase	Heating phase	Cooling coil	Post-heating coil for compensation only	Post-heating coil Comp.+Supp.
Not active	Active	Not active	Not active	Active if necessary to supplement main coil and managed by control probe
Active	Active	Controlled by the intake humidity probe	Controlled by the outlet probe	Controlled by supply probe to compensate
Active	Not active	Controlled by the intake humidity probe	Controlled by the outlet probe	Controlled by supply probe to compensate

9.4 Temperature control

Inputs used

Position of the outlet temperature probe (E4).
Position of the intake temperature probe (E4).
Position of the outside temperature probe (E8).
Position of the preheating probe (El).

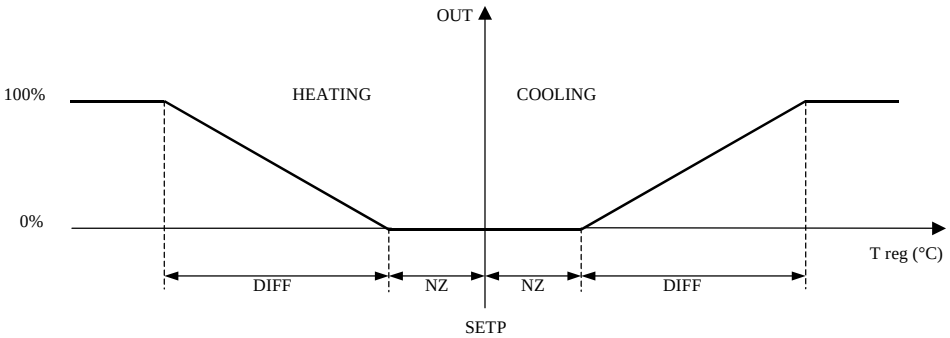
Parameters used

Select the control probe (C0).
Display the current set point (S0).
Intake control: set point, differential, dead zone (S1).
Outlet control: set point, differential, dead zone (S2).
Set point for selecting the operating mode, heating/cooling, according to the outside temperature (S9).
Select heating/cooling from: Out. temp., control temp., from the keypad, from digital input (C3).
Manual selection of the operating logic: Heating/cooling (C3).
Integration time for PI control with intake temperature control (G4).
Integration time for PI control with outlet temperature control (G4).

Description of operation

The software manages the typical control functions of the air handling unit. The main control function acts on the intake or outlet air temperature so as to ensure comfort at all times, by cooling or heating the air.

Graph of temperature control



SETP	Temperature control set point
DIFF	Temperature control differential
NZ	Dead zone
T reg	Control temperature
OUT	Temperature control request

Screen C0 is used to select the temperature control probe:

- Outlet temperature probe
- Intake temperature probe
- Control by external thermostat

In the event of control with outlet probe or intake probe, refer to the graph shown above (Graph of temperature control).
If the unit is off the temperature control requests are ignored and all control functions are deactivated.

The software can manage the following types of control:

- P - Proportional
- P+I - Proportional + integral

Parameters required for control on the intake temperature:

- Intake temperature set point
- Intake temperature differential
- Intake temperature dead zone
- Intake temperature control integration time

Parameters required for control on the outlet temperature:

- Outlet temperature set point
- Outlet temperature differential
- Outlet temperature dead zone
- Outlet temperature control integration time

9.4.1 Changing the set point from digital input

Inputs used

Position of the digital input to change the set point (D9)

Parameters used

Enable change set point from digital input (Pp)
Enable outlet and intake set point from digital input (Sb)

Description of operation

By enabling this function on screen Pp, the control set points (outlet and intake) can be replaced with two set points on screen Sb, when the status of the digital input set changes.

9.4.2 Changing the operating mode (heating/cooling)

Inputs used

Position of the digital input to change the operating mode (D7).

Parameters used

Select the type of change operating mode (C3).
Select the probe to change operating mode (C0).
Set point to change mode (heating/cooling) from outside temperature (Sa).
Select the operating mode from the keypad (C3).

Description of operation

The operating mode (heating/cooling) can be changed in the following ways:

- Outside temperature
- Keypad/digital input
- Control probe (change mode probe)
- Supervisor.

If changing mode based on the outside temperature, the controller automatically selects the operating mode (heating/cooling) by comparing the value measured by the outside temperature probe against the set point on screen Sa. The mode is changed using the keypad by accessing the parameter on screen C3, visible only when this mode is set for changing operation. The mode is changed from digital input by configuring the desired input on screen D7. The mode is changed using the control probe by selecting the probe to be used and comparing the values read by this probe against the control set point (S0). The mode is changed from the supervisor using digital variable 68 (see the database of supervisor variables). For both types of control, AUTOMATIC and FIXED POINT, the software needs to know which probe is the control probe, as this is essential for changing the operating mode. With FIXED POINT control, on screen C0 the message "change mode using" replaces the message "control probe", displayed if AUTOMATIC control is selected.

9.4.3 Managing the external thermostat

Control with external thermostat requires this to be interfaced with the pCO board as follows:

- **Heating and cooling signals**: The heating/cooling analogue outputs from the external thermostat can be connected to the 0 to 10V analogue inputs on the controller, which will use these signals to activate the corresponding heating and cooling devices. The configuration is performed in the manufacturer menu, choosing the position of the inputs for the two signals from the thermostat in the ANALOGUE I. section.
- **Heating/cooling selection**: If the thermostat has a heating/cooling digital output, this can be connected to a digital input on the controller.
- **3 fan speeds**: The digital outputs on the thermostat used to control the three fan speeds fan can be connected to the digital inputs on the controller, which then directly manages the fans, with the corresponding alarms and priorities.

9.4.4 Control set point compensation

Set point compensation allows energy savings when the values of the control temperature (or the outside temperature) differ significantly from the needs of the controlled environment.

Inputs used:

Position of the intake temperature probe (E4).
Position of the outlet temperature probe (E4).
Position of the outside temperature probe (E8).
Position of the compensation probe (El).

Parameters used:

Type of signal used by the compensation probe: Active, NTC (Ph).
Select the probe used for the compensation of the set point: Compensation disabled, Outside temperature, Intake temperature, Set point compensation probe (Ph).
Select the temperature control set point (intake or outlet) to be compensated (Ph).
Outside temperature set point for activating the compensation function (Pi).
Outside temperature differential for compensation (Pi).
Maximum value of set point compensation (Pi).

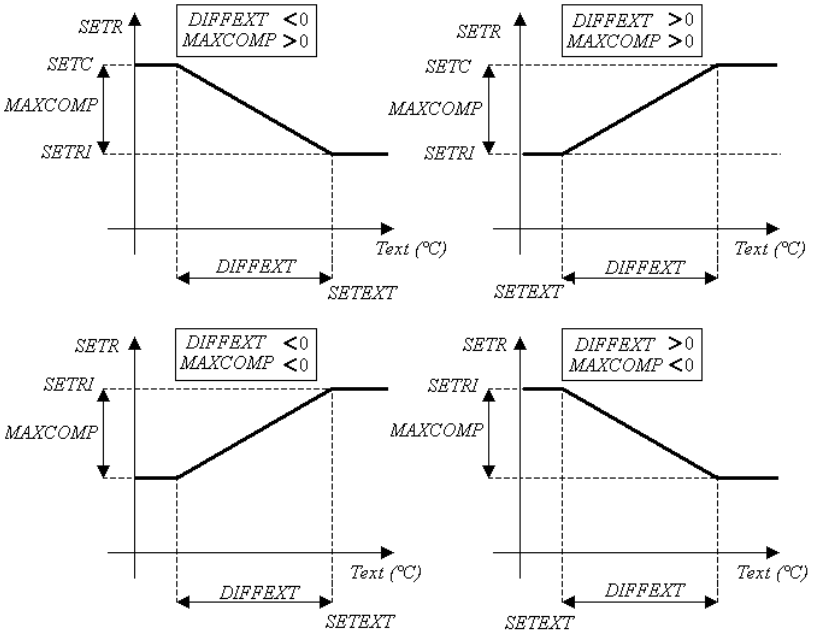
Description of operation:
The compensation function adds or subtract a "delta" value, function of external temperature, to the control set point(Ph).

In mask "Ph" you can set the following parameters:
- Select the probe used for the compensation of the set point;
- type of compensation probe;
- select the temperature control set point (intake or outlet) to be compensated.

In mask "Pi" you can set the following parameters:
- outside temperature set point for activating the compensation function;
- outside temperature differential for compensation;
- Maximum value of set point compensation.

The graphs below shows the curve achieved by compensating the control set point (intake or outlet) with the outside temperature probe.

Graph of the activation of set point compensation



SETR	Control set point
SETC	Set point with maximum compensation
SETRI	Control set point
SETEXT	Outside temperature set point to activate compensation
DIFFEXT	Outside temperature differential to activate compensation
MAXCOMP	Maximum value of set point compensation
Text	Outside temperature

10. Processes managed by an air handling unit

10.1 Cooling and dehumidification

Inputs used:
Position of the outlet temperature probe (E4).
Position of the intake temperature probe (E4).
Position of the intake humidity probe (Ec).

Parameters used:
Set point, differential and working dead zone for intake humidity control (S3).
Enable the dehumidification process (C8).
Select the priority (temp. or humidity) during dehumidification (C8).

Description of operation:
In an air handling system, the cooling coil is used to satisfy two possible requests:
- Cooling temperature control.
- Dehumidification.

If dehumidification is requested, the coil in question is activated according to the set priority :
- Priority to temperature.

- Priority to dehumidification.

In the first case, the coil operates for dehumidification only when the temperature control request (heating) is satisfied.
In the second case, the coil operates for dehumidification even when the temperature control request (heating) is yet to be satisfied.
Three types of cooling coil are possible:

- cooling coil with modulating valve.
- cooling coil with three-point valve.
- direct expansion cooling coil.

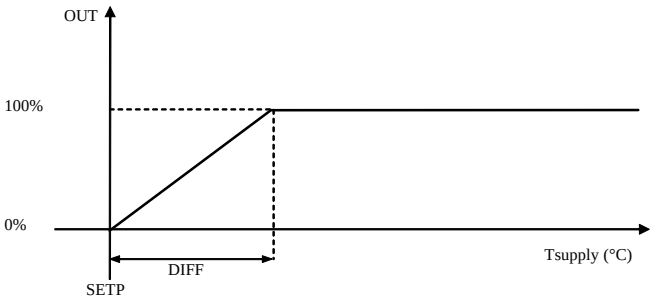
10.1.1 Cooling coil with modulating valve.

Devices used:
Analogue output of the modulating valve in cooling (L4)

Parameters used:
Enable the modulating valve in cooling (Cj)

Description of operation:
The control function, once the control probe has been selected, adjusts the position of the valve in cooling proportionally to the 0 to 10V output signal. If the outlet probe is installed, the minimum outlet limit can be set to avoid the formation of condensate in the duct and the introduction of excessively cold air into the room. If the outlet air temperature reaches this limit, the controller reduces the contribution of cold water by closing the modulating valve proportionally.

Graph of the activation of cooling coil with modulating valve



SETP	Cooling set point with modulating valve control
DIFF	Cooling differential with modulating valve control
Tsupply	Outlet air temperature
OUT	Modulating valve output

10.1.2 Cooling coil with three-point valve.

Devices used:

Three-point cooling valve opening position (Jb).
Three-point cooling valve closing position (Jb).

Parameters used:

Valve opening time in cooling (T8).

Description of operation:

When a request is active, either opening or closing, the corresponding contact remains energised for a time proportional to the request.
A valve opening time is envisaged, expressed in seconds. If the request in progress is between 10 and 90%, the opening or contact closing will remain energised for the value of the request as a percentage of the total set energising time.
If the request is between 90% and 100%, or between 0% and 10%, the opening and closing time is no longer proportional to the request. The controller completely opens and closes the valve and then activates the closing or opening contact, respectively, for the time required to move to the desired position. **Example:** The example describes the case where the opening request is equal to 50%, with a total opening time set to 180 seconds. The opening contact remains energised for 90 seconds (50% of 180 seconds). The preheating coil is forced to the maximum opening for a time that can be set if the winter starter function is enabled.

10.1.3 Direct expansion coil

Devices used

Position of the relay step 1, 2, 3 (Ja).

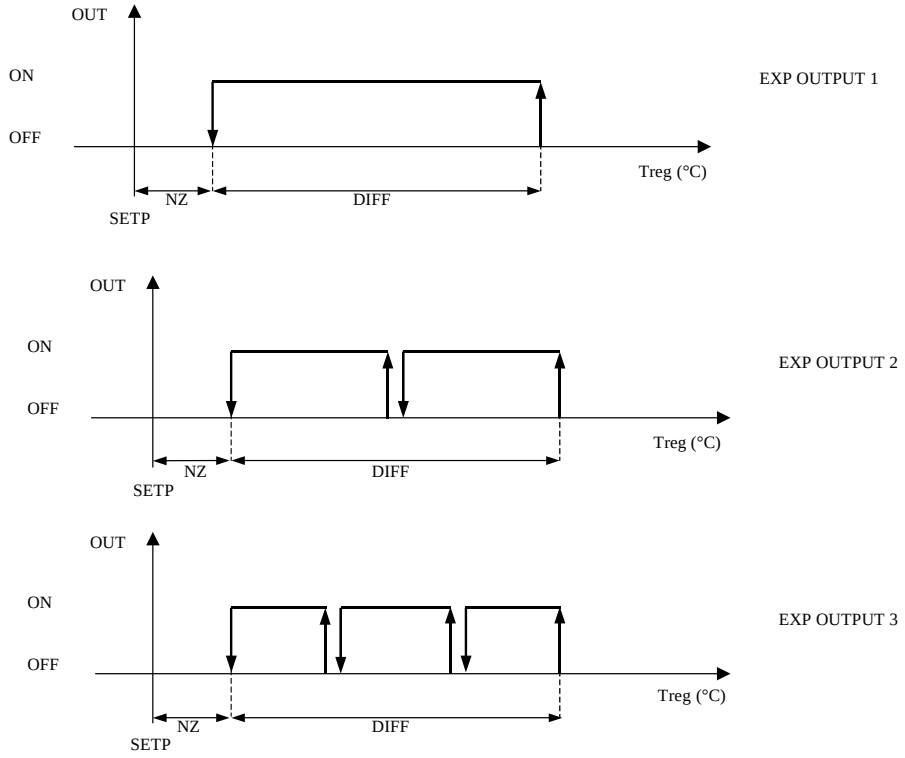
Parameters used

Select the number of direct expansion steps (P4).
Enable modification of direct expansion step set points and differentials (P4).
Set point for the activation of the individual direct expansion steps (P5).
Differential for the activation of the individual direct expansion steps (P6).

Description of operation

The direct expansion cooling coil manages a maximum of three cooling steps. The initialisation procedures enable three steps and set the set points and differentials with fixed values, in this way the control band is divided equally based on the number of heaters enabled. The set point and differential for the activation of each individual step can be set by enabling the parameter on screen (P4).
The following graphs show the activation of the direct expansion steps using the default values of the parameters.
The following graphs show the activation of the direct expansion steps using the default values of the parameters.

Graph of the activation of the direct expansion outputs (1, 2, 3)



SETP	Control set point
DIFF	Control differential
NZ	Control dead zone
Treg	Control temperature
OUT	Status of expansion outputs 1-2-3

10.1.4 Defrost

Inputs used:
Position of the defrost probe (Ep).

Parameters used:
Defrost control set point (P8).
Defrost control differential (P8).

Outputs used:
Defrost relay output (J8).
Enable defrost relay (C9).

Description of operation:
The defrost temperature sensor signals the formation of frost. The software has a dedicated digital output for the activation of an external utility for performing the defrost.
If the defrost temperature is less than the set point – differential (defrost situation present) the relay is activated;
If the defrost temperature is greater than the set point + differential (defrost situation absent) the relay is deactivated.

10.1.5 Management of the pump in cooling

Parameters used:
Enable pump cutout alarm in cooling (Ca).

Outputs used:
Position of the pump digital output in cooling (J8).

The controller features a digital output for managing the pump in the cooling coil circuit, if present, in the air handling unit. If cooling is performed by a mixed coil, the circuit has one valve only that manages the flow of liquid. The pump is started if the cooling request is present. In the event of a cooling pump cutout alarm, the controller closes the contact and consequently deactivates the circulating pump.

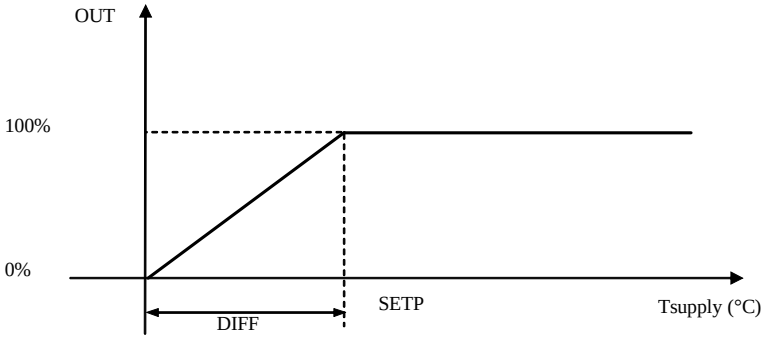
10.1.6 Outlet temperature lower limit

Devices used:
Position of the outlet temperature probe (E4)

Parameters used:
Lower limit and differential of the outlet temperature in cooling (Pe)
Enable outlet temperature lower limit (Pe)

Description of operation:
In cooling operation, control can be activated on the outlet temperature to avoid reaching too low temperatures and prevent condensate forming in the ducts of the air handling system.
The graph below should be interpreted considering the outlet temperature as the cooling request from the environment being controlled; when the outlet temperature decreases, the cooling request decreases in turn, proportionally, until reaching zero. This request affects the operating status of the cooling device connected.

Graph of the activation of outlet temperature limit control



OUT	Cooling request value
SETP	Outlet temperature lower limit set point
DIFF	Differential
Tsupply	Outlet air temperature

10.2 Compressors

Inputs used:
Position of the outlet temperature probe (E4).
Position of the intake temperature probe (E4).
Position of the intake humidity probe (Ec).

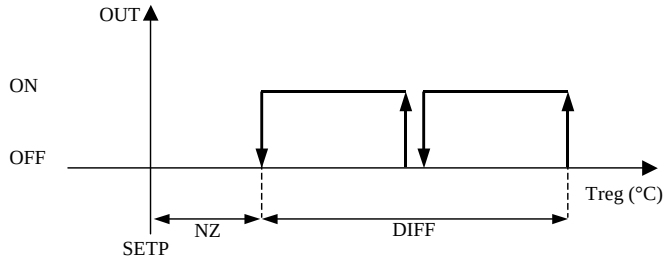
Devices used:
Position of the digital output for compressor 1, 2 (J4).

Parameters used:
Set point, differential and dead zone for outlet temperature control (S2).
Set point, differential and dead zone for intake temperature control (S1).
Set point and dead zone for intake humidity control (S3).
Enable control in dehumidification mode (C8).
Enable control of the compressors: No/ Yes (Ce).
Enable compressor rotation (Ce).

Description of operation
The management of the compressors allows two compressors to be controlled in independent circuits, with the following essential features for these types of application:
- Compressor timers;
- Safety protectors for each circuit.

The compressors, managed by the control probe, are only activated in the cooling phase.

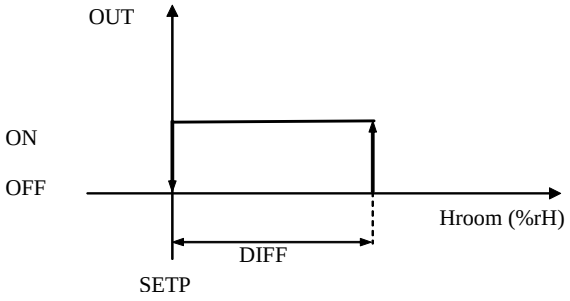
Graph of compressor activation



OUT	Status of the compressor
SETP	Control set point
NZ	Control dead zone
DIFF	Control differential
Treg	Control temperature

In the event where the dehumidification request is present, the software forces the activation of the compressors present.

Graph of compressor activation (dehumidification request)



OUT	Status of the compressors
SETP	Humidity control set point
DIFF	Humidity control differential
Hroom	Intake humidity

10.2.1 Times
Parameters used:
Minimum compressor on time (T0).
Minimum compressor off time (T0).
Minimum time between starts of different compressors (T1).
Minimum time between starts of the same compressor (T2).

Description of operation:
The management of the compressors features the following times:
- Minimum compressor ON time.
- Minimum compressor OFF time.
- Delay between starts of the same compressor.
- Delay between starts of different compressors.

10.2.2 Alarms

Inputs used:
Position of compressor 1/2 cutout (D2).
Position of the low pressure switch for compressor 1/2 (D3).
Position of the high pressure switch for compressor 1/2 (D4).

Parameters used:
Delay time for the low pressure alarm (T7).
Enable the compressor high/low pressure switch (Cf).
Enable the overload protection input for compressor 1/2 (Ce).

Description of operation:
The management of the compressors features the following alarms on each circuit:

- High pressure alarm;
- Low pressure alarm;
- Compressor cutout alarm.

The high pressure and compressor cutout alarms act immediately when generated, immediately switching off the compressor and signalling the alarm situation. This is to prevent serious problems with the installation as well as dangerous situations for the air handling unit. The low pressure alarm, on the other hand, is activated after a set delay time. After this time, during which the problem persists, the controller stops the compressor and signals the alarm situation.

10.3 Heating

Inputs used:
Position of the outlet temperature probe (E4).
Position of the intake temperature probe (E4).
Position of the antifreeze temperature probe (Ep).
Position of the antifreeze thermostat digital input (D5).

Devices used:
Position of the output for the pump in heating (J8).
Position of the digital output for opening/closing the three-point valve (Jd).
Position of the output for the modulating valve in heating (L4).
Position of the heaters (J5).

Parameters used:
Select the function of the heating coil: Heating – Preheating (Cg)
Enable control with device: three-point valve/modulating valve/heaters (Ci)
Enable the protection contact for the pump in heating (Ca).
Intake control: set point, differential, dead zone (S1).
Outlet control: set point, differential, dead zone (S2).
Comparison set point for the antifreeze alarm from NTC probe (P9).
Enable antifreeze control using: NTC probe/Digital input/both (C9).
Enable winter start-up (Ca).

Description of operation:
Heating management is strictly linked to the characteristics of the installation. Heating refers to the situation in which there is a single coil dedicated to this function; in the other possible cases, with two coils, this function is divided into Preheating and Post-heating (Cg). For convenience, Preheating will also be used to describe systems with a single coil, given that the device in question carries out the same function in both types of installation.

10.3.1 Preheating

Inputs used:
Position of the preheating probe (El).

Parameters used:
Select the function of the heating coil: Heating – Preheating (Cg).
Preheating temperature control: set point, differential, integration time (S7).

Description of operation
The preheating function, as well as heating the air introduced into the room, carries out two fundamental functions:

- Prevent the formation of frost on the coils in the installation when the unit is off.
- For adiabatic humidification, it is essential to bring the temperature of the air being humidified to a level such that the absolute humidity can be reached in the humidifier, that is, the g/kg of water vapour.

The control of the preheating probe is enabled if the preheating probe is fitted (El) and the parameter on screen (Cg) is set to "preheating". The preheating probe can be located downstream of the humidifier or downstream of the preheating coil.
Three types of preheating coil are possible:

- coil with three-point valve;
- coil with modulating valve;
- heater coil.

10.3.2 Preheating coil with three-point valve

Devices used:
Position of the digital output for opening/closing the three-point valve (Jd).

Parameters used:
Valve opening time in heating (T8).

Description of operation:
When a request is active, either opening or closing, the corresponding contact remains energised for a time proportional to the request.
A valve opening time is envisaged, expressed in seconds. If the request in progress is between 10 and 90%, the opening or contact closing will remain energised for the value of the request as a percentage of the total set energising time. If the request is between 90% and 100%, or between 0% and 10%, the opening and closing time is no longer proportional to the request. The controller completely opens and closes the valve and then activates the closing or opening contact, respectively, for the time required to move to the desired position.

Example:
The example describes the case where the opening request is equal to 50%, with a total opening time set to 180 seconds. The opening contact remains energised for 90 seconds (50% of 180 seconds). At power-up the preheating coil is forced on at the maximum opening for a set time if the winter start-up procedure is enabled.

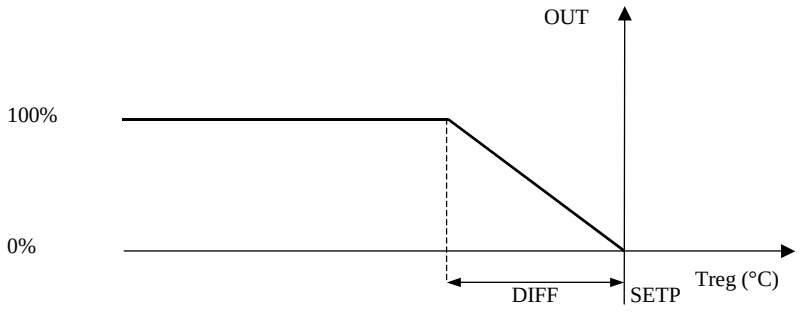
10.3.3 Preheating coil with modulating valve

Devices used:
Position of the modulating valve in heating (L4)

Description of operation:
The signal to enable control on the modulating valve comes from the activation of the fans.
The valve is forced to the maximum opening in the following cases:

- During the winter start-up phase;
- If antifreeze is active (antifreeze probe – thermostat).

Graph of the activation of the coil with modulating valve



SETP	Control set point
DIFF	Control differential
Tsupply	Outlet air temperature
OUT	Modulating valve output

10.3.4 Preheating coil with heaters

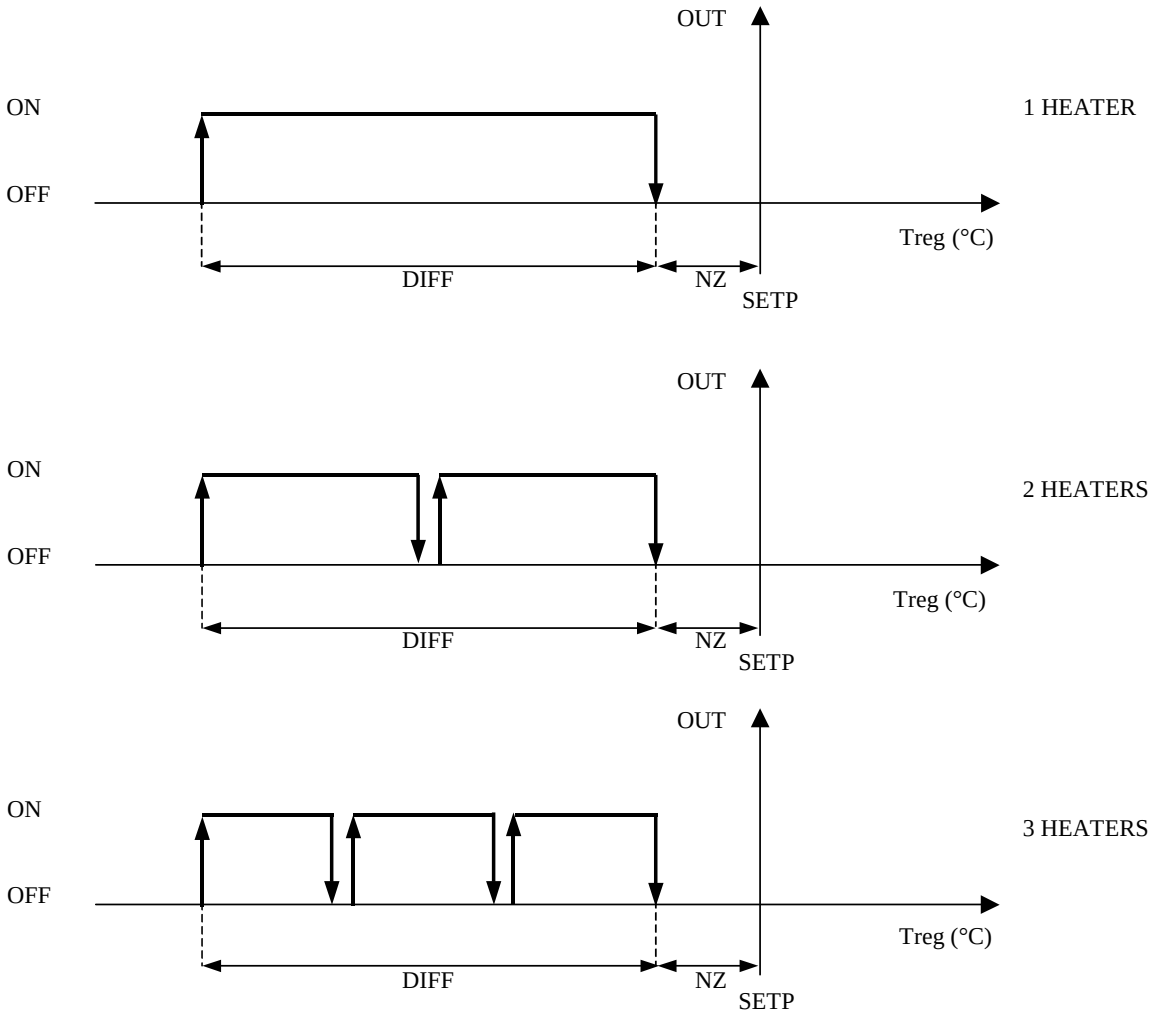
Inputs used:
Position of the electric heater protection cutout (D1).

Devices used:
Position of heaters 1/2/3.

Parameters used:
Enable preheating heaters (Ci).
Enable post-heating heaters (Co).
Select the number of heaters enabled (P1).
Enable modification of heater set points and differentials (P1).
Set point for the activation of the individual heaters (P2).
Differential for the activation of the individual heaters (P3).

Description of operation:
The preheating coil with heaters manages a maximum of three heaters, including heaters with different power ratings. The initialisation procedure enables three heaters and defines fixed values for the set points and differentials, so as to divide the control band equally based on the number of heaters enabled.
The activation set point and differential for each individual heater can be modified using the parameter on screen (P1).
The following graphs show the activation of the heaters.

Graph of the activation of the coil with 1,2,3 heaters with default parameter values



SETP	Control set point
DIFF	Control differential
NZ	Control dead zone
Treg	Control temperature
OUT	Status of heaters 1-2-3

The heaters can only be configured once, that is, they can be used either for the heating/preheating coil or the post-heating coil and not both.

10.3.5 Post-heating

Parameters used:

Activation delay of the post-heating coil (T6).

Three types of post-heating coil are available:

- Coil with three-point valve
- Coil with modulating valve
- Heater coil

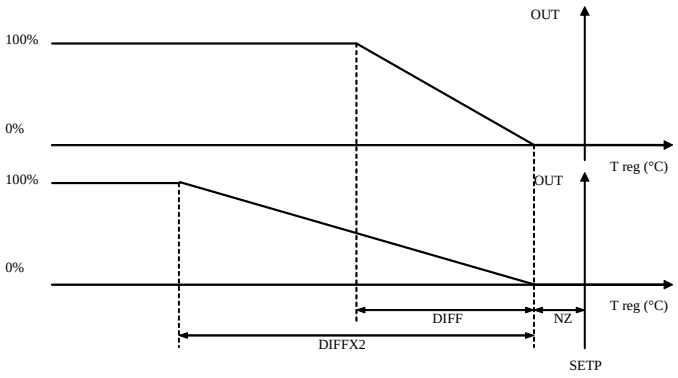
Description of operation

Two types of management are envisaged for the post-heating module:

1. **Heating support**: This function allows the post-heating coil to be used as support to the preheating coil following the request from the control probe. The graph of activation applies to any type of device used for the post-heating coil.
   Post-heating is activated when the preheating coil is working at 100%, that is, when the temperature is less than the set point–differential. The coil is activated after a set delay (T6) to prevent both coils from working instantly at the maximum output, and thus avoid excessively heating the air.
2. **Compensation in dehumidification:** to ensure a faster response, the coil is controlled by the outlet temperature probe. The post-heating coil is activated to compensate for the lowering of the temperature due to the function of the cooling coil for dehumidification.

The activation of the post-heating coil depends on the type of management selected, automatic or fixed point (C0). This subject is described in detail in the chapter on Control. The post-heating coil uses a differential that is double the value of the differential set for the heating function; this ensures that the post-heating coil stops operating the before the heating coil as the temperature approaches the set point.

Graph of the activation of the post-heating coil



SETP	Control set point
DIFFX2	Post-heating temperature differential
DIFF	Heating temperature differential
NZ	Temperature control dead zone
T reg	Control temperature
OUT	Modulating heating and post-heating output

10.3.6 Pump management in heating

Parameters used:

Enable pump cutout alarm in heating (Ca)

Outputs used

Position of the pump digital output in heating (J8)

Description of operation

The controller features a digital output for managing the pump in the heating coil circuit, if featured, in the air handling unit. If heating is managed by a mixed coil, the circuit has just one pump that handles the flow of the liquid.
In the event of pump cutout alarms in heating, the controller closes the contact and consequently deactivates the circulating pump.

10.3.7 Mixed valve management

Parameters used:

Position of the output for the modulating valve in heating (L4)

Outputs used:

Enable mixed heating/cooling control (Cl)
Enable control of the modulating valve in heating (Ci)
Enable the modulating valve in cooling (Cj)

Description of operation:

The management of the mixed valve is only possible if the two coils, cooling coil and heating coil, are fitted with modulating valves. The choice of the type of valve for these two components of the air handling unit is set in screens Ci and Cj. The status of the mixed valve is displayed on screen (Ib).

10.3.8 Outlet temperature upper limit

Inputs used

Position of the outlet probe (E4)

Parameters used

Outlet temperature upper limit (Pf)
Outlet limit differential (Pf)
Enable outlet upper limit (Pf)

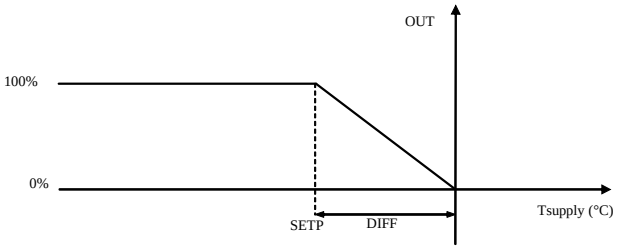
Description of operation.

In heating operation, control can be activated on the outlet temperature so as to avoid reaching too high temperatures due to excessive request from the intake probe. The actions performed depend on the control request.

Hot water coil with modulating valve.

The heating limit decreases when the outlet temperature is between the differential and the set point. The heating limit decreases proportionally as the outlet temperature approaches the set point - differential (see graph).

Graph of the activation of outlet temperature limit control



OUT	Heating
SETP	Outlet temperature upper limit set point
DIFF	Limit differential
Tsupply	Outlet air temperature

10.3.9 Antifreeze alarm

Inputs used

Position of the antifreeze thermostat input (D5)
Position of the antifreeze probe (Ep)

Parameters used

Enable antifreeze alarm: from digital input/NTC probe/both (C9)
Set point for antifreeze control (P9)

Description of operation

The antifreeze temperature is controlled using a temperature probe or alternatively an external thermostat. A reference set point is defined, and as soon as the temperature read by the antifreeze probe is less than the set point, the antifreeze alarm is activated and the following precautionary actions are performed on the system:

1. Instant closing of the outside air damper (Delay = 0 seconds);
2. The heating coil (modulating, three-point, heaters) is forced to the maximum output;
3. Instant shutdown of the compressors;
4. Deactivation of the cooling coil;
5. Deactivation of humidifier control;
6. The cooling coil is forced to 25%;
7. The heat recovery unit is operated so as to provide maximum recovery;
8. Instant shutdown of the fans;

The unit exits the antifreeze status when the temperature read by the antifreeze probe is higher than the value of the antifreeze set point + 2 °C (fixed differential).

10.3.10 Winter start-up

Inputs used:

Position of the outside temperature probe (E8)

Parameters used:

Enable winter start-up (Ca)
Outside temperature set point and duration of winter start-up (Pc)

Description of operation:

The winter start-up function, if enabled, involves the following actions:

1. The damper is closed if during the start-up phase the outside temperature is less than the limit value set;
2. Heating is activated at maximum output (whatever device is enabled for heating) for the set time;
3. The cooling coil is forced to 25%;
4. The text "Winter start" is shown on screen M0.
5. The fans are forced to Off

10.4 Heat recovery unit

Heat recovery units are exchangers that transfer heat between flows of intake and discharged air. The controller manages 3 types of heat recovery unit:

- **Cross-flow**: the discharged air is sent to the heat exchanger and gives up part of its heat to the flow of colder outside air that also passes through the same exchanger in a cross-flow arrangement.
- **Double coil**: the discharged air passes through a first coil (water or gas), giving up part of its heat to the fluid in the coil, which then flows to a second coil where it in turn gives up its heat to the fresh air.
- **Rotary**: in rotary heat recovery units, the heat is exchanged due to the accumulation of heat in the rotor; in fact, while the cylinder turns slowly the discharged air flows through half of the shell and gives up heat to the rotor, where it is accumulated. The fresh air that slows through the other half absorbs the accumulated heat. As the rotation continues, the parts that absorb and give up heat are continuously inverted.

Following is a list of the parameters used that are common to the three types of heat recovery unit.

Inputs used:

Position of the outside air temperature probe (E8)
Position of the discharged air temperature probe (E8)
Position of the outlet temperature probe (E4)

Devices used:

Position of the input for the pressure switch controlling the heat recovery unit dirty alarm (D6)

Parameters used:

Select the type of heat recovery unit (Cc).
Enable the heat recovery unit dirty filter input (Cc).

10.4.1 Management of the cross-flow heat recovery unit (bypass damper)

Devices used:
Position of the bypass damper output for the cross-flow heat recovery unit (J6)

Description of operation
The management of the cross-flow heat recovery unit involves the ON/OFF control of the bypass damper on the unit.
In the event where freecooling or freeheating are active, the controller closes the damper, thus deactivating the heat recovery unit.

10.4.2 Management of the double coil heat recovery unit

Devices used:
Position of the double coil heat recovery unit (J6)

Parameters used:
Set point for comparison with the outside temperature for the activation of the heat recovery unit (S5)

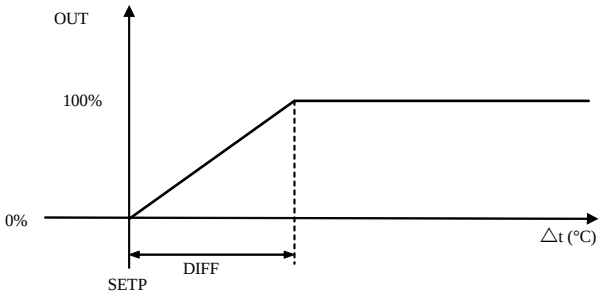
Description of operation:
The function acts on the external pump, managing the circulation between the two coils of the heat recovery unit.
The output is active when:

1. Unit is On
2. Request of heating or cooling
   - 2.1. In presence of Heating request must be satisfied the following condition:
     discharge temperature ≥ outside temperature + heat recovery unit set point (S5);
   - 2.2. In presence of Cooling request must be satisfied the following condition:
     discharge temperature ≤ outside temperature - heat recovery unit set point (S5);

10.4.3 Management of the rotary heat recovery unit

Devices used:
Analogue output for controlling the speed of the rotary heat recovery unit (L3)
Parameters used:
Set point and control differential of the rotary heat recovery unit (S6)
Description of operation:
The control function acts by changing the rotation speed of the heat recovery unit.
The rotation speed is controlled based on the difference between the discharge temperature and the outside temperature, and consequently the heat recovery unit will be off when this difference is equal to the set point, while it will be operating at maximum speed when the difference is equal to the set point + differential.

Graph of the operation of the rotary heat recovery unit



SETP	Heat recovery unit speed control set point
DIFF	Heat recovery unit speed control differential
•t	Discharge temperature – outside temperature
OUT	Rotary heat recovery unit modulating output

10.4.4 Alarms.

The following alarms deactivate the heat recovery unit:

- Antifreeze alarm from digital input
- Antifreeze alarm from analogue input
- Heat recovery unit blocked alarm (enabled only when the fan is on)

10.5 Outlet and intake air filter

Inputs used:
Position of the outlet air filter differential pressure switch (D5)
Position of the intake air filter differential pressure switch (D5)
Devices used:
Blocked filter signal (J8)
Parameters used:
Enable the dirty filter input on the outlet/intake/outlet + intake (C5)
Air flow alarm delay time (T7)
Description of operation:
The condition of the filtering system in the unit, in terms of cleaning, is measured by the differential pressure switch located upstream and downstream of the filters.
Which filters are present and the corresponding alarms can be enabled (C5):

- None (no filter and alarm enabled)
- Outlet (enable the outlet filter + alarm)
- Intake (enable the intake filter + alarm)
- Outlet and Intake (enable both filters + corresponding alarms).

10.6 Outside air damper – Freecooling and Freeheating

Inputs used:
Position of the outlet flow switch (D0)
Position of the intake flow switch (D0)
Position of the outside air temperature probe (E8)
Position of the intake and outside humidity probe (Ec)
Position of the intake temperature probe (E4)

Devices used:
Outside air damper control (L1)
ON/OFF control for air damper (J9)

Parameters used:
Enable dehumidification control (C8)
Enable the mixture and discharge dampers (C2)
Enable outside air damper control (C1)
Differential for freecooling control (Pk)
Minimum opening of the damper (Pa)
Set point for intake humidity control (S3)
Type of freecooling/freeheating (Pj)
Duration of freecooling/freeheating operation only (Pl)
Enthalpy freecooling/heating offset and differential (Pm)
Atmospheric pressure setting (Pn)

Damper control:
The software can manage the outside air damper with the following functions:
- Freecooling/Freeheating by temperature
- Freecooling by enthalpy
- Dew point
- Air quality.

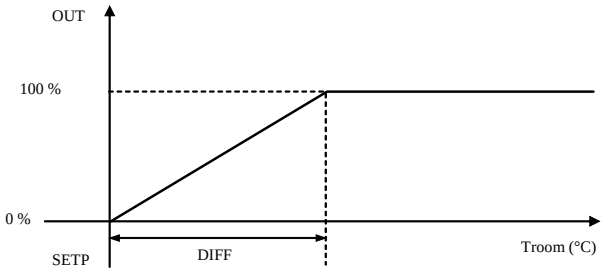
The dampers can be controlled in the following modes (C1):
- Modulating;
- ON/OFF (freecooling/freeheating cannot be activated);
- Fixed opening.

The dampers on the module can be activated together or separately. When enabled together all the dampers are activated by the same output. If enabled separately, the user decides which dampers (discharge and mixture) to enable (C2); consequently, these are then controlled by different outputs. The ON/OFF damper output remains activated in any case.

10.6.1 Freecooling

Freecooling, if enabled, is active when the following condition is true: *Intake temperature – Outside temperature > Freecooling differential*
Screen Pl includes the parameter for setting the duration of freecooling operation only. After this time, if cooling is still requested, the cooling coil is activated.

Graph of freecooling activation

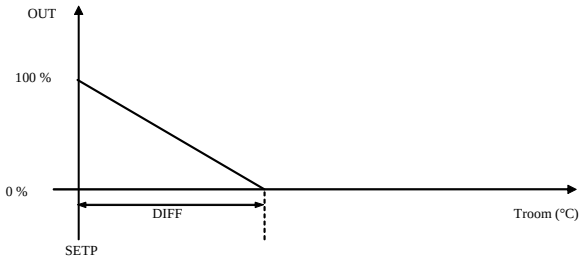


SETP	Control set point
DIFF	Control differential
Troom	Intake temperature
OUT	Modulating damper output

10.6.2 Freeheating

Freeheating, if enabled, is active when the following condition is true: *Outside temperature – Intake temperature > Freeheating differential*
Screen Pl includes the parameter for setting the duration of freeheating operation only. After this time, if heating is still requested, the heating coil is activated.

Graph of freeheating activation



SETP	Control set point
DIFF	Control differential
Troom	Intake temperature
OUT	Modulating damper output

10.6.3 Dew point

The dampers are opened for dewpoint control when the following conditions are satisfied:

- Intake humidity • intake humidity set point
- The intake set point dew point • outside dew point

The intake set point dew point is calculated based on the following values::

- Intake humidity set point
- Intake temperature set point

The outside dew point is calculated based on the following values::

- Outside humidity
- Outside temperature

10.6.4 Freecooling and freeheating control by enthalpy

Freecooling and freeheating control by enthalpy require the following enthalpy values to be calculated:

- Outside enthalpy
- Intake enthalpy
- Enthalpy of the set point

The outside enthalpy is calculated based on the following values:

- Outside temperature
- Outside humidity
- Atmospheric pressure

The intake enthalpy is calculated based on the following values:

- Intake temperature
- Intake humidity
- Atmospheric pressure

The enthalpy set point is calculated based on the following values:

- Active temperature set point
- Intake humidity set point
- Atmospheric pressure

Freecooling and freeheating control by enthalpy is OFF if the following conditions are true:

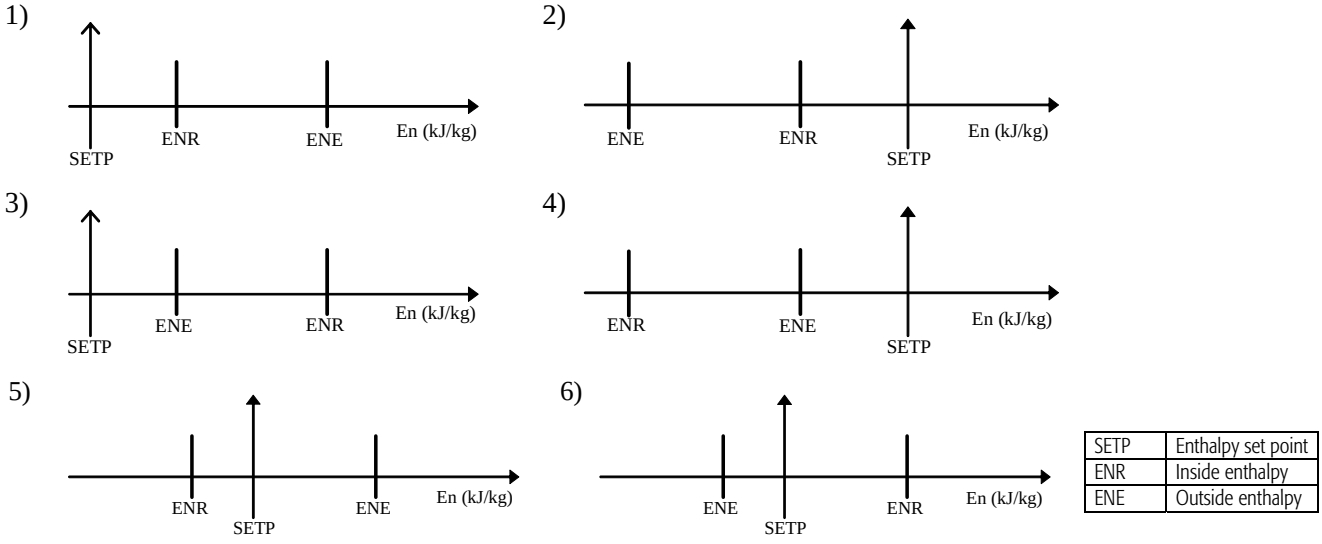
- Outside enthalpy > Intake enthalpy and Intake enthalpy > Enthalpy set point
- Outside enthalpy < Intake enthalpy and Intake enthalpy < Enthalpy set point

Description of operation

Freecooling and freeheating control by enthalpy is enabled if the following conditions are always true:

- Temperature probes (intake and outside) and humidity probes (intake and outside) enabled;
- Freecooling by enthalpy enabled (Pj);

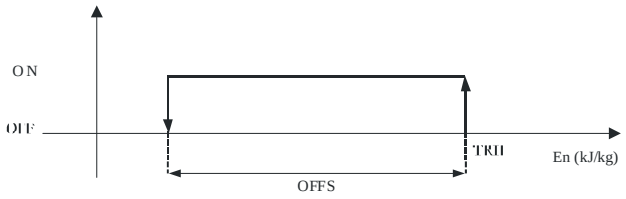
The purpose of the function is to maintain the intake enthalpy as near as possible to the enthalpy set point. The following cases are possible:



SETP	Enthalpy set point
ENR	Inside enthalpy
ENE	Outside enthalpy

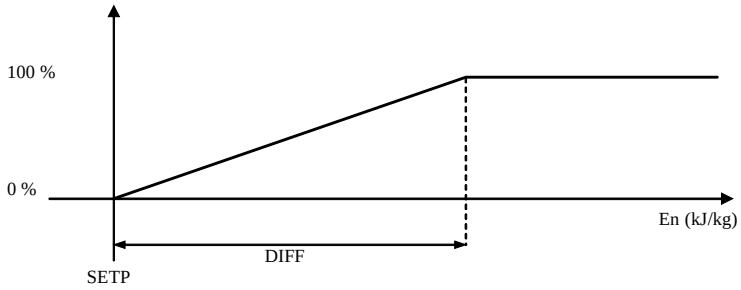
In conditions 1 and 2: it is not useful to open the outside damper as the inside enthalpy is closer than the outside enthalpy to the enthalpy set point.
In conditions 3 and 4 described above in the graphs: it is useful to open the damper as the outside enthalpy is closer than the inside enthalpy to the enthalpy set point.
In case number 5: the intake enthalpy is closer than the outside enthalpy to the enthalpy set point, however in this case it is useful to open the damper as by mixing the two enthalpies (inside and outside), the inside enthalpy approaches the enthalpy set point.
In case number 6: the outside enthalpy is closer than the intake enthalpy to the enthalpy set point, and therefore it is useful to open the damper as by mixing the intake and outside air the inside enthalpy approaches the enthalpy set point.
For all the graphs (1, 2, 3, 4, 5, 6), each threshold is added to an offset shown on screen Pm in the user branch.

This parameter has the function of preventing the continuous ON/Off of the freecooling function near the thresholds. This is shown in the graph below:



TRH	Threshold (ENR or ENE)
OFFS	Safety offset
EN	Ambient enthalpy

If the cases shown above in the graphs (3, 4, 5, 6) arise, the opening of the damper depends on the intake enthalpy, as described in the figure below:



SETP	Enthalpy set point
DIFF	Enthalpy differential
EN	Ambient enthalpy

Interaction between freecooling/freeheating by enthalpy and other functions in the management of the outside damper

If freecooling/freeheating by enthalpy is enabled, the outside damper cannot be controlled for freecooling/freeheating by temperature or humidity. The minimum opening set for the damper acts as the lower control limit for freecooling/freeheating management by enthalpy.
Example:

- Minimum damper opening = 20%
  Request for freecooling/heating by enthalpy = 15%
  Modulating outside damper output = 20%
- Minimum damper opening = 20%
  Request for freecooling/heating by enthalpy= 25%
  Modulating outside damper output= 25%

10.6.5 Control with air quality probe.

Inputs used

Position of the CO2 air quality probe (Eh)
Position of the VOC air quality probe (Eh)

Devices used

Position of the outside damper (L1)

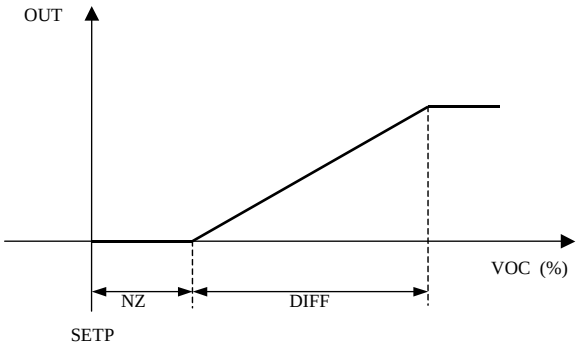
Parameters used

Enable air quality control (Cb)
Set point, differential and integration time for VOC air quality control (S8)
Set point, differential and integration time for CO2 air quality control (S9)

Description of operation with air quality control

The request for renewal air due to VOC or CO2 control has priority over the temp. control request for the modulation of the outside air dampers for freecooling/freeheating. This means that the outside air damper can open even if the outside temperature conditions or enthalpy are not favourable for freecooling/freeheating. The air will in any case be conditioned before being introduced into the room. The outlet temperature limit is always respected. If control is enabled using both probes, VOC+CO2, the damper is controlled according to the greater of the two signals measured.

Graph of damper opening with VOC +CO2 control



SETP	Outside air damper control set point
NZ	Outside air damper control dead zone
DIFF	Outside air damper control differential
VOC (%)	Value of VOC (or CO2) present in the room
OUT	Outside air damper modulating output

10.7 Humidifier

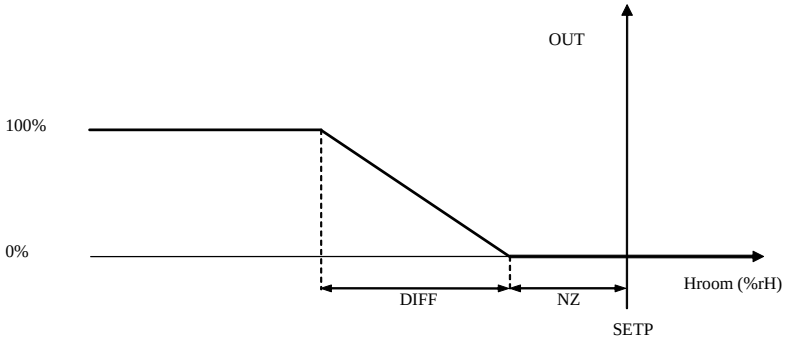
Inputs used:
Position of the intake humidity probe (Ec)
Position of the humidifier alarm digital input (D3)

Devices used:
Position of the modulating humidifier output (L7)
Position of the ON/OFF humidifier output (J6)

Parameters used:
Enable humidification control: "NOT ENABLED", "DIGITAL OUTPUT", "ANALOGUE OUTPUT" (C7)
Set point, differential and working dead zone for intake humidity control (S3)

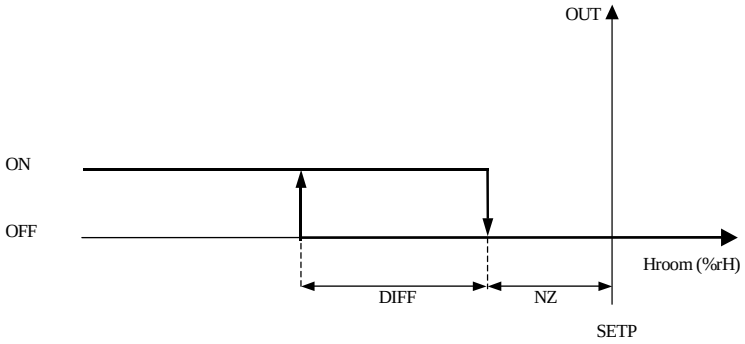
Description of operation:
The board has two outputs dedicated to humidifier control, one modulating and one ON/OFF. The user can choose which output to enable by the parameter present on screen C7.

Graph of the modulating humidifier output



SETP	Humidity control set point
DIFF	Humidity differential
NZ	Humidity dead zone
Hroom	Intake humidity
OUT	Modulating humidifier output

Graph of the ON/OFF humidifier output



SETP	Humidity control set point
DIFF	Humidity control differential
NZ	Humidity dead zone
Hroom	Intake humidity
OUT	Digital output humidifier

10.7.1 Outlet humidity upper limit

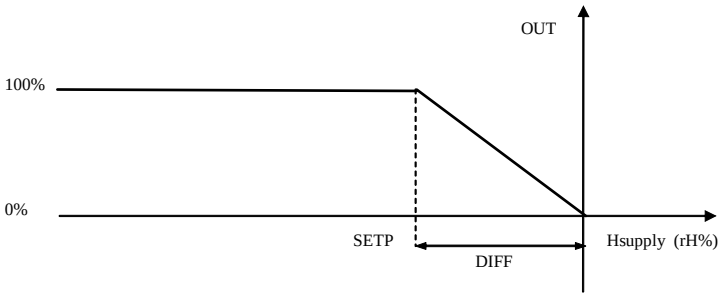
Inputs used:
Position of the outlet humidity probe (Ec)

Parameters used:
Enable outlet humidity upper limit control (Pg).
Outlet humidity upper limit and differential of (Pg).

Description of operation:
The upper limit of the outlet humidity is used to prevent excessive humidity values in the room that may lead to the formation of condensate in the outlet ducts. The humidity upper limit is controlled in two ways, depending on the type of humidifier control, On/Off or modulating.

Humidifier with modulating control:
The humidity upper limit decreases if the value of the outlet humidity is between the limit differential and set point. The graph shows how the limit decreases proportionally as the outlet humidity approaches the set point + differential.

Graph of outlet humidity upper limit (modulating humidifier)

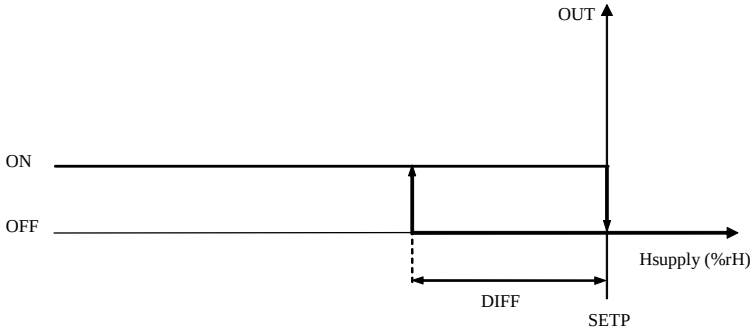


SETP	Outlet humidity limit set point
DIFF	Outlet humidity limit differential
Hsupply	Outlet humidity
OUT	Modulating humidifier output

Humidifier with ON/OFF control.

In the case of humidifiers with ON/OFF control, the upper limit function acts directly on the humidifier enabling signal.
Based on the values of the limit set point and differential (Pg), the outlet humidity control function acts as follows (also see the graph):
Humidity > Set point (set limit) + Differential the humidifier control signal is set to the logical value OFF.
Humidity < Set point (set limit) the humidifier control signal is set to the logical value ON.

Graph of outlet humidity upper limit (humidifier with ON/OFF control)



SETP	Humidity control set point
DIFF	Humidity control differential
Hsupply	Outlet humidity
OUT	Humidifier digital output

10.8 Fans

Inputs used:

Position of the temperature control probe (C3)
Position of the ambient humidity probe (Ec)
Position of the outlet temperature probe (E4)
Position of the outlet pressure probe (E0)
Position of the intake pressure probe (E0)

Parameters used:

Select the operating mode (C4).
Select the control mode (C4)
Select the type of fan (C4)
Activation/deactivation times (T3).

Description of operation:

In relation to the operating mode chosen, the type of control and consequently the type of fans can be selected (see the following chapter). The paragraphs below describe the different operating modes in detail.

10.8.1 Operating and control mode

The intake and outlet fans can be controlled in the following modes:

1) Request from thermostat. This type of control activates the fans (intake and outlet) based on the current request (heating, cooling, humidification, dehumidification). The fans are only on when there is a request pending. During operation, the fans can be controlled in the following modes:
   - ON/OFF
   - Modulation based on the outlet temperature
   - Modulation based on the pressure
2) Continuous mode. Fan control in continuous mode starts and stops the fans (intake and outlet) according to the activation and deactivation of the air handling unit. In the event of serious alarms, the fans are switched off, irrespective of the status of the unit. During operation (unit ON), the fans can be controlled in the following modes:
   - ON/OFF
   - Modulation based on the outlet temperature
   - Modulation based on the pressure
3) Fan coil control: fan coil control is based on the signals from the control probe. The signal from this probe activates the fan speed steps on the fan coil.
4) Fan coil control by external thermostat. Fan coil control is based on the signals from the control probe. The signal from this probe activates the fan speed steps on the fan coil.

10.8.2 Types of fan

As summarised in the table below, by setting the following operating modes:

- Request from thermostat based on unit ON/OFF
- Continuous based on unit ON/OFF

the following types of fans can be selected:

- Fans with star/delta starting;
- Fan with direct starting;

Setting, on the other hand, the following operating mode:

- Request from thermostat and modulation on the outlet temperature
- Request from thermostat and modulation on the pressure
- Continuous modulation on the outlet temperature
- Continuous modulation on the pressure

the following types of fans can be selected:

- 0-10V analogue output;
- VFD (Variable Frequency Driver);

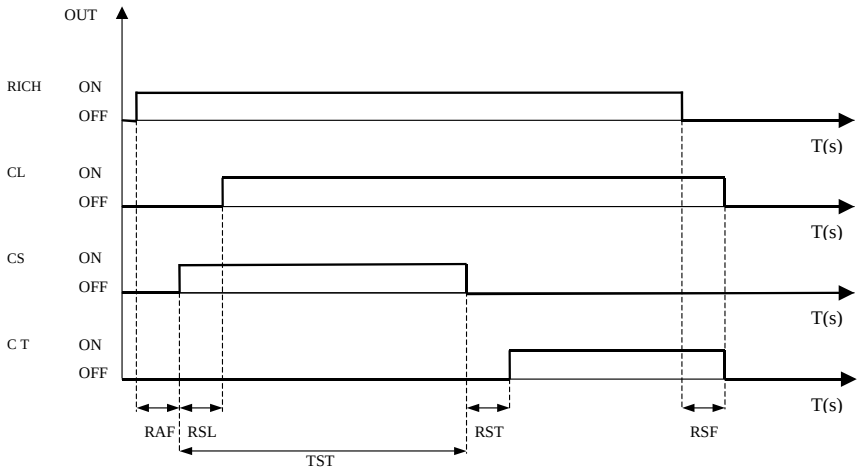
MODE	Case	CONTROL	TYPE OF FAN			
			Star/delta	Direct	0-10 V	VFD
Request from thermostat	1	ON/OFF	0/100%	0/100%	---	---
	2	Start upon request and modulation based on the outlet temperature	---	---	0-100%	0-100%
	3	Start upon request and modulation based on the pressure	---	---	0-100%	0-100%
Continuous	4	ON/OFF	0/100%	0/100%	---	---
	5	Start upon request and modulation based on the outlet temperature	---	---	0-100%	0-100%
	6	Start upon request and modulation based on the pressure	---	---	0-100%	0-100%
Fan coil	7	Control request	0-33-66-100% (via digital outputs)			
Fan coil by external thermostat	8	Control request	0-33-66-100% (via digital outputs)			

Fan with star-delta starting (On/Off)

With this type of starting, each fan configured uses three digital outputs.
The digital outputs DO1-DO3 or DO1-DO6 automatically ignore the configuration made on the terminal and take the following meaning:
- DO1: outlet fan line contactor;
- DO2: outlet fan delta contactor;
- DO3: outlet fan star contactor;
- DO4-DO5-DO6: same sequence but for the intake fan.

The contact activation times are set on screen T5.

Graph of fan activation with star-delta starting

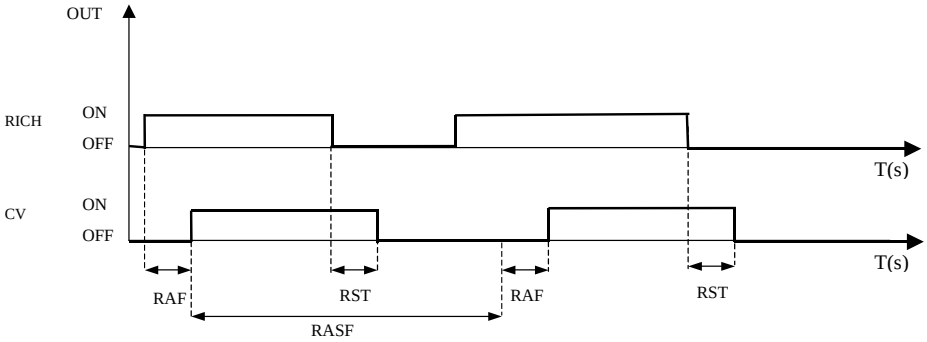


RICH	Fan activation request
CL	Line contactor
CS	Star contactor
CT	Delta contactor
OUT	Request and starter contact status
RAF	Fan start delay
RSL	Delay between star contact and line contact
TST	Duration of star contact
RST	Delay between star contact and delta contact
RSF	Fan stop delay
T(s)	Time expressed in seconds

Fan with direct starting (On/Off)

With this type of starting, each fan configured is activated by one digital output only (this can be configured on the terminal).

Graph of fan activation with direct starting



RICH	Fan activation request
CV	Fan contactor
OUT	Request and starter contact status
RAF	Fan start delay
RASF	Delay between starts of the same fan
RSF	Fan stop delay
T(s)	Time expressed in seconds

Fan with 0-10V analogue output (modulating)

Devices used:

Position of the outlet fan digital output (J0)
Position of the intake fan digital output (J0)
Analogue intake fan control (L0)
Analogue outlet fan control (L0)

Parameters used:

Minimum outlet fan speed (G0)
Minimum intake fan speed (G2)
Activation/deactivation times (T3). In addition there is a fixed delay of 10 seconds between the start of the outlet fan and the start of the intake fan.

Description of operation

The operation of the fans with 0-10V analogue output is based on the reading of the pressure probe. According to the pressure value, PID control is used to manage the modulation of the fan speed.

Graph of activation : see below

Fan with VFD (modulating)

Devices used:

Position of the outlet fan digital output (J0)
Position of the intake fan digital output (J0)
Outlet VFD actuator (Cq)
Intake VFD actuator (Cq)
pLAN (serial 0) or Fieldbus (serial 2) RS485 serial port via Modbus communication protocol (H0)

Parameters used:

Minimum outlet fan speed (N1)
Maximum speed outlet fan (N1)
Minimum intake fan speed (N2)
Maximum speed intake fan (N2)
Number of stop bits (H1)
Parity setting (H1)
Communication speed (H2)
VFD peripheral address settings (H3)
Activation/deactivation times (T3). In addition there is a fixed delay of 10 seconds between the start of the outlet fan and the start of the intake fan.

Description of operation

The operation of the fans with VFD can be based on the reading of the pressure probe or the outlet temperature probe. According to the control selected, PID control in the case of pressure, or proportional control in the case of the outlet temperature, is used to modulate the fan speed.

Graph of activation : see below

10.8.3 Fan control by thermostat in on/off mode based on request (case 1)

In this mode the fans can be controlled with star/delta or direct starting. Operation is not modulating, when the request is present (heating, cooling, humidification, dehumidification) the contacts close and the fans operate at 100%. Once the request is satisfied, the fans switch off (0%). The devices are switched on and off considering the corresponding delay times set (T3).

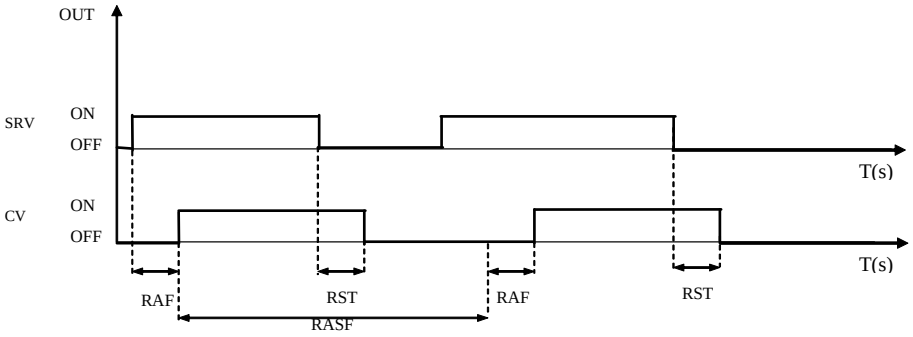
Inputs used:

Position of the control probe (C3)
Position of the ambient humidity probe (Ec)

Parameters used:

All the parameters used for temperature control, humidification and dehumidification.

Graph of activation



OUT	Request status
CV	Fan contact
SRV	Request status and fan request
RAF	Fan start delay
RASF	Delay between starts of the same fan
RST	Fan stop delay
T(s)	Time expressed in seconds

10.8.4 Fan control by thermostat based on request with modulation based on the outlet temperature (case 2)

This mode is used to control modulating fans with to 0-10V analogue signal or managed by VFD. Operation is modulating, when the request is present (heating, cooling, humidification, dehumidification) the contacts close and the fan speed starts modulating based on the outlet temperature and depending on the maximum (VFD only) and minimum limits set. Once the request is satisfied the fans are switched off (0%). The devices are switched on and off considering the corresponding delay times set (T3).

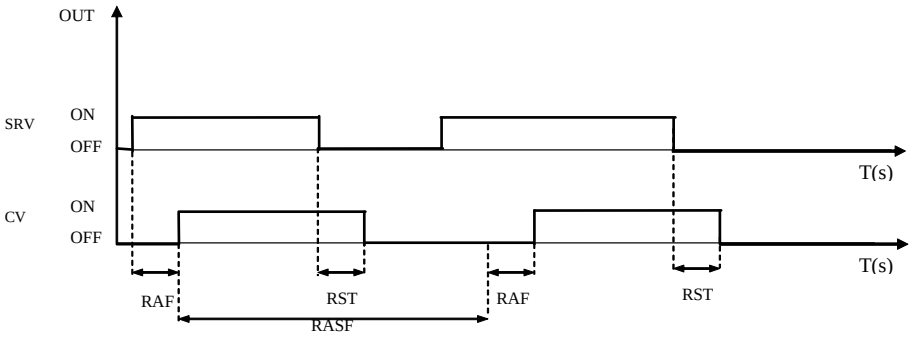
Inputs used:

Position of the temperature control probe (C3)
Position of the ambient humidity probe (Ec)
Position of the outlet temperature probe (E4)

Parameters used:

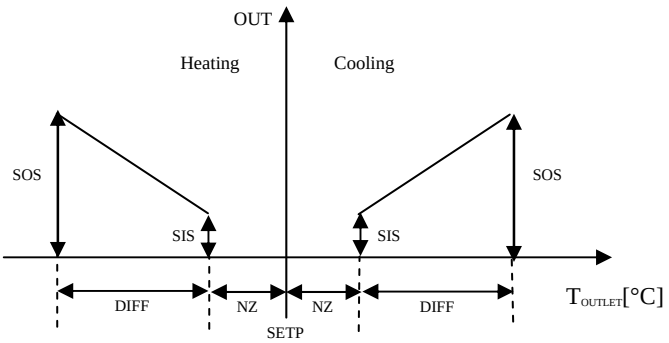
All the parameters used for temperature control, humidification and dehumidification.
Control outlet temperature set point (S2)
Differential for outlet temperature control (S2)
Dead zone for outlet temperature control (S2)

Graph of activation

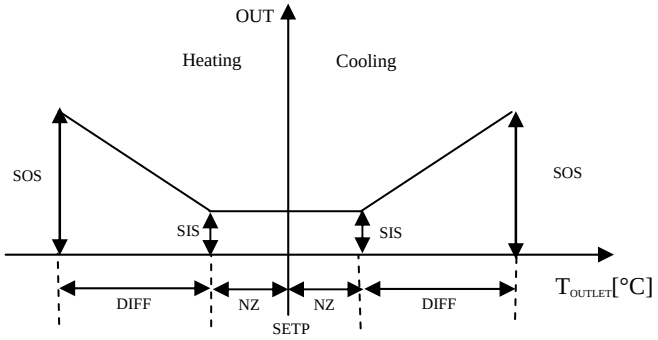


OUT	Request status
CV	Fan contact
SRV	Request status and fan request
RAF	Fan start delay
RASF	Delay between starts of the same fan
RST	Fan stop delay
T(s)	Time expressed in seconds

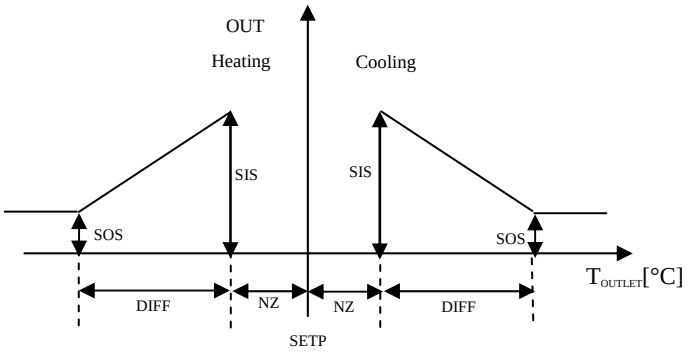
Control graphs:



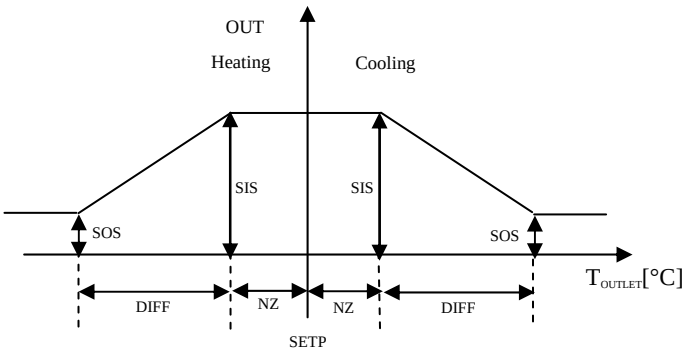
Unit temperature control on the outlet temperature probe (C3) and speed at set point < speed off set point



Unit temperature control on the intake temperature probe (C3) and speed at set point < speed off set point



Unit temperature control on the outlet temperature probe (C3) and speed at set point > speed off set point

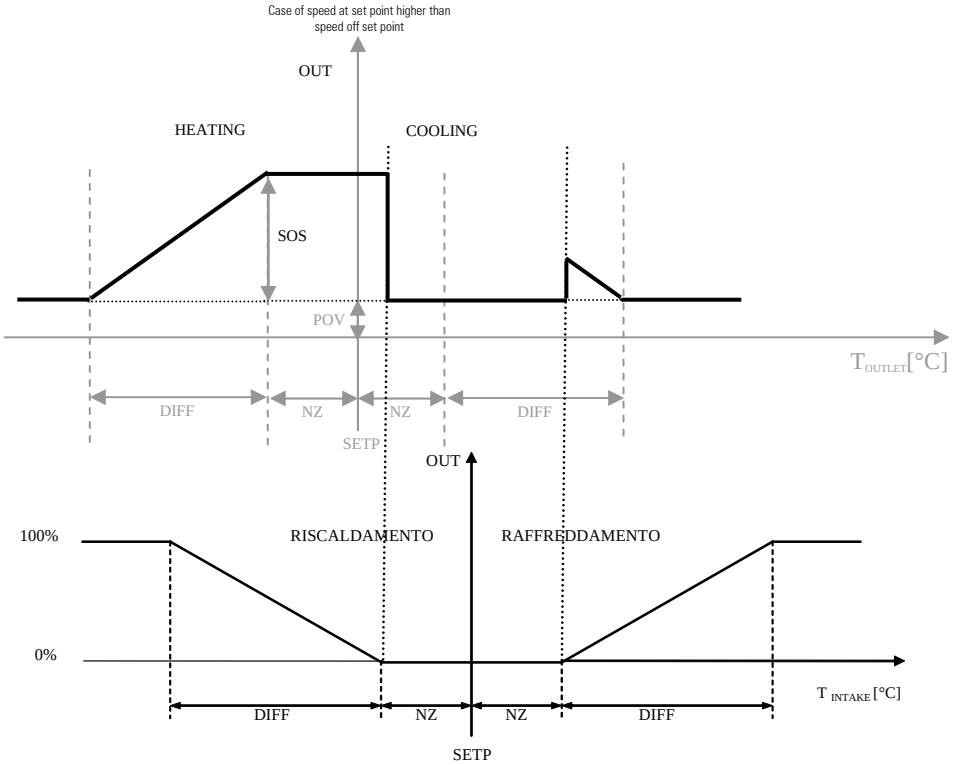


Unit temperature control on the intake temperature probe (C3) and speed at set point > speed off set point

OUT	Modulating fan output
SIS	Fan speed between set point +/- dead zone screens N1-N2
SOS	Fan speed at set point +/- dead zone +/- differential screens N1-N2
SETP	Fan outlet temperature control set point
T_{OUTLET}	Outlet temperature in °C
DIFF	Differential for fan outlet temperature control
NZ	Dead zone for fan outlet temperature control

The modulation of fan speed according to the temperature is always performed based the reading of the outlet temperature probe, consequently:

- if the unit temperature control probe (C3) is the outlet temperature probe, then the fan control intervals correspond to the control intervals of the heating/cooling devices.
- if the unit temperature control probe (C3) is the intake temperature probe, then the fan control intervals do not correspond to the control intervals of the heating/cooling devices. This means that with a temp. control request in progress (on intake temperature probe), the fans acquire the speed requested by the outlet temperature probe, according to their own control parameters. The following graph shows an example of the relationship between fan control based on the outlet temperature and temperature control based on the intake temperature. The fans only start when there is a request (outside of the interval SETP ± NZ) and are controlled following the trend in the outlet temperature.



10.8.5 Fan control by thermostat based on request with modulation based on the pressure (case 3)

This mode is used to control modulating fans with to 0-10V analogue signal or managed by VFD.
Operation is modulating, when the request is present (heating, cooling, humidification, dehumidification) the contacts close and the fan speed starts modulating based on the pressure (E0) and depending on the maximum (VFD only) and minimum limits set. Once the request is satisfied the fans are switched off (0%). The devices are switched on and off considering the corresponding delay times set (T3).
PID control is used. If the integration and derivative times are set to zero, the fan is managed with proportional control. The fan is activated when the control pressure is less than the set point (G0,G2).

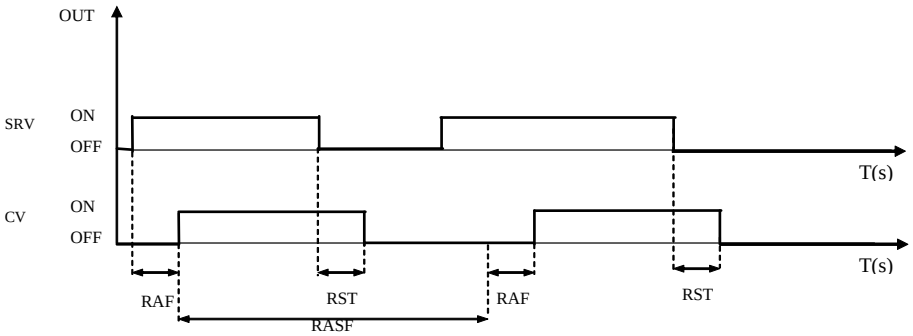
Inputs used:

Position of the outlet pressure probe (E0)
Position of the intake pressure probe (E0)

Parameters used:

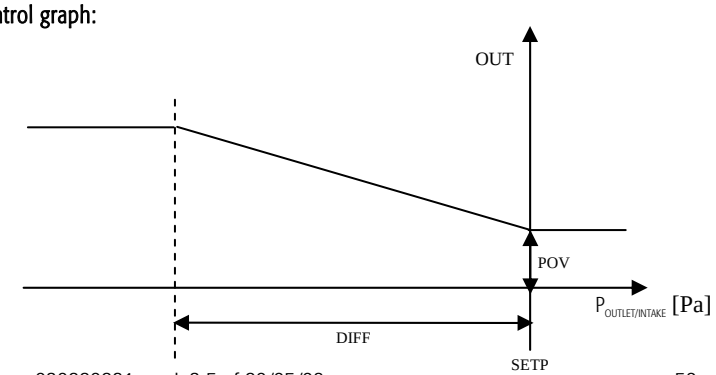
Outlet fan control set point and differential (G0)
Integration and derivative times for outlet fan control (G1)
Intake fan control set point and differential (G2)
Integration and derivative times for intake fan control (G3)
Enable analogue control of the air flow: Intake, Outlet, Outlet + Intake (C6)

Graph of activation



OUT	Request status
CV	Fan contact
SRV	Request status and fan request
RAF	Fan start delay
RASF	Delay between starts of the same fan
RST	Fan stop delay
T(s)	Time expressed in seconds

Control graph:

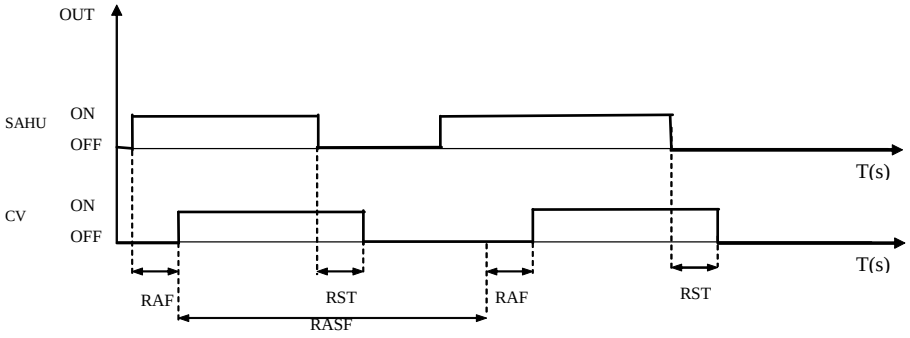


OUT	Modulating fan output
POV	Minimum fan speed
$P_{OUTLET/INTAKE}$	Pressure (outlet/intake) in Pascal
SETP	Fan pressure control set point
DIFF	Fan pressure control differential

10.8.6 Fan control in continuous mode based on unit ON/OFF (case 4)

In this mode, the fans can be controlled with star/delta or direct starting.
Operation is not modulating, when the unit starts, the contacts close and the fans operate at 100%. When the unit stops the fans switch off (0%). The devices are switched on and off considering the corresponding delay times set (T3).

Graph of activation:



OUT	Status of the AHU (On/Off)
CV	Fan contact
SAHU	AHU status
RAF	Fan start delay
RASF	Delay between starts of the same fan
RST	Fan stop delay
T(s)	Time expressed in seconds

10.8.7 Fan control in continuous mode based on unit ON/OFF and modulation based on the outlet temperature (case 5)

This mode is used to control modulating fans with to 0-10V analogue signal or managed by VFD.
Operation is modulating, when the unit starts, the contacts close and the fan speed starts modulating based on the outlet temperature and depending on the maximum (VFD only) and minimum limits set. Once the request is satisfied the fans are switched off (0%). The devices are switched on and off considering the corresponding delay times set (T3).

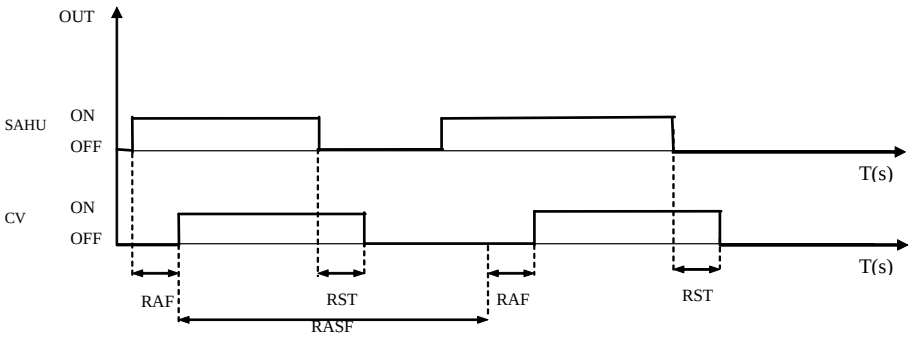
Inputs used:

Position of the outlet temperature probe (E4)

Parameters used:

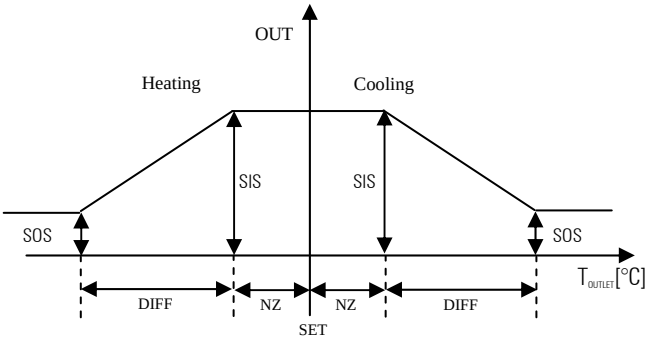
Control outlet temperature set point (S2)
Differential for outlet temperature control (S2)
Dead zone for outlet temperature control (S2)

Graph of activation:

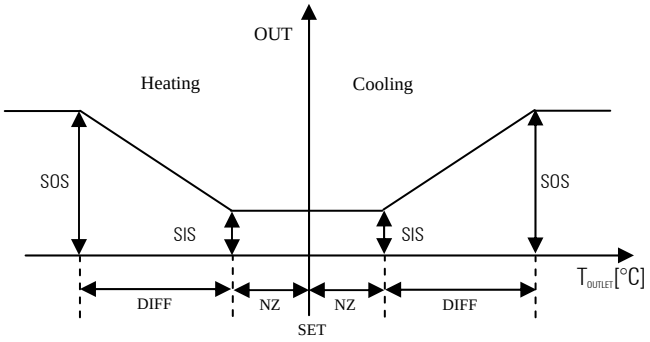


OUT	Status of the AHU (On/Off)
CV	Fan contact
SAHU	AHU status
RAF	Fan start delay
RASF	Delay between starts of the same fan
RST	Fan stop delay
T(s)	Time expressed in seconds

Control graph:



Modulating fan control with unit on/off (C4) and speed at set point > speed off set point



Modulating fan control with unit on/off (C4) and speed at set point < speed off set point

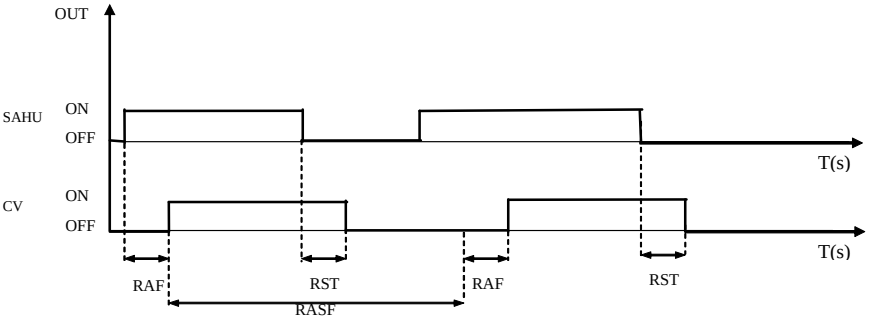
OUT	Modulating fan output
SIS	Fan speed between set point +/- dead zone screens N1-N2
SOS	Fan speed at set point +/- dead zone +/- differential screens N1-N2
SETP	Fan outlet temperature control set point
T_{OUTLET}	Outlet temperature in °C
DIFF	Differential for fan outlet temperature control
NZ	Dead zone for fan outlet temperature control

10.8.8 Fan control in continuous mode based on unit ON/OFF and modulation based on the pressure (case 6)

This mode is used to control modulating fans with to 0-10V analogue signal or managed by VFD.
Operation is modulating, when the request is present, the fan contacts close. The fans acquire the speed determined by the controller based on the current reading of the pressure probe (E0). Once the request is satisfied the fans are switched off (0%), regardless of the control pressure. The devices are switched on and off considering the corresponding delay times set (T3).

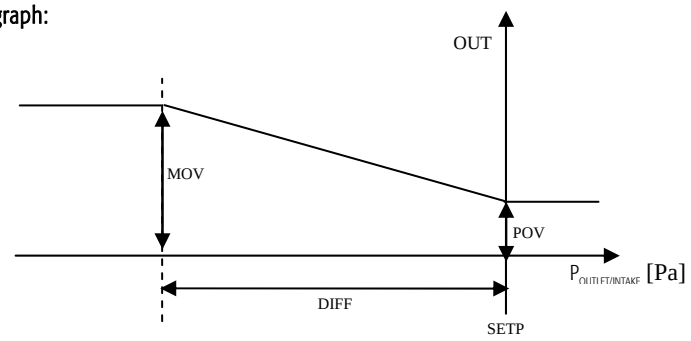
Parameters used:
Outlet fan control set point, differential and offset (G0)
Integration and derivative times for outlet fan control (G1)
Intake fan control set point, differential and offset (G2)
Integration and derivative times for intake fan control (G3)
Enable analogue control of the air flow: Intake, Outlet, Outlet + Intake (C6)

Graph of activation:



OUT	Status of the AHU (On/Off)
CV	Fan contact
SAHU	AHU and fan request status
RAF	Fan start delay
RASF	Delay between starts of the same fan
RST	Fan stop delay
T(s)	Time expressed in seconds

Control graph:



UT	Modulating fan output
POV	Minimum fan speed
$P_{OUTLET/INTAKE}$	Pressure (outlet/intake) in Pascal
SETP	Fan pressure control set point
DIFF	Fan pressure control differential

10.8.9 Fan coil control and fan coil control by external thermostat (cases 7 and 8)

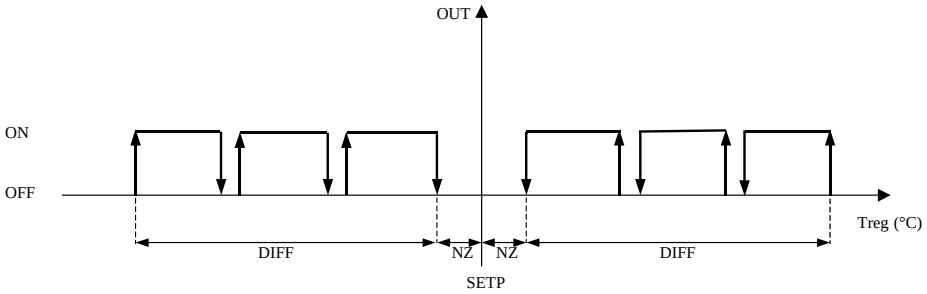
Fan coil control based on request
Inputs used:
Position of the outlet temperature probe (E4)
Position of the intake temperature probe (E4)

Devices used:
Position of the digital output for the 1st, 2nd, 3rd speed (Je)

Parameters used:
Select the type of fan coil control: AUTOMATIC (C4)
Speeds enabled: 1, 2, 3 (P7)

Description of operation:
Fan coil control is based on the signals from the control probe. The signal from this probe activates the fan speed steps on the fan coil.

Graph of fan coil activation with request from control probe



OUT	Speed of the fan coil
SETP	Control set point
DIFF	Control differential
NZ	Control dead zone
Treg	Control temperature

Devices used:
Position of the digital outputs for the 1st, 2nd, 3rd speed (Je)

Parameters used:
Select the type of fan coil control: MANUAL (C4)
Speeds enabled: 1, 2, 3 (P7)
Select fan coil speed: I, II, III (S4)

Manual fan coil control:
Manual fan coil control involves the management of the fan speed on the fan coils, with the unit on, by setting the parameter on screen (S4) in the set point branch.

Fan coil control by external thermostat
Inputs used:
Position of digital inputs 1, 2, 3 for controlling the fan speed by external thermostat (D8)

Devices used:
Position of the digital outputs for the 1st, 2nd, 3rd speed (Je)

Parameters used:
Number of speeds enabled: 1, 2, 3 (PZ)

Description of operation:
Fan coil control by external thermostat features 3 digital inputs to control the fan speed.
The status of these three digital inputs provides the meaning shown in the table:

DI 1	DI 2	DI 3	Fan speed
ON	OFF	OFF	1st speed
OFF	ON	OFF	2nd speed
OFF	OFF	ON	3rd speed
OFF	OFF	OFF	Fan OFF

Status of the digital outputs:
The digital outputs dedicated to the control of the fan coil speed have the status shown in the table, according to the current speed.

DO 1	DO 2	DO 3	Fan speed
ON	OFF	OFF	1st speed
OFF	ON	OFF	2nd speed
OFF	OFF	ON	3rd speed
OFF	OFF	OFF	Fan OFF

N.B. This is valid for all types of fan coil speed control: automatic, by thermostat and manual.

10.8.10 Alarms

Inputs used
Position of the outlet flow switch (D0)
Position of the intake flow switch (D0)
Position of the outlet cutout (D0)
Position of the intake cutout (D1)
Serial board for communication in Modbus protocol

Parameters used
Minimum outlet pressure set point for alarm (Pb)
Minimum intake pressure set point for alarm (Pb)
Enable the flow switch contact: none/outlet/intake/both (C6)
Air flow alarm delay time (T7)
Response timeout for communication in Modbus (H2)

Description of operation
The following alarms are used in the management of the fans:
- Outlet/intake air flow switch
- Outlet/intake fan cutout

The flow switch alarm is generated by:
- digital input
- pressure transducer with alarm threshold (settable)

The first possible causes of the outlet/intake air flow switch alarm depends simply on the status of the dedicated digital input.
When using the pressure transducer, the controller compares the reading against a set point. If the pressure read is less than the set point for a set time (alarm delay time), the outlet/intake air flow switch alarm is activated. The outlet/intake fan cutout alarm depends on the status of the dedicated digital input (or digital inputs).

10.9 Communication between the pCO and the VFD devices (Modbus RTU protocol over RS485)

Parameters used:
Operating mode of the fans (C4).
Control mode of the fans (C4)
Type of fan (C4)
Serial port for communication in Modbus Master protocol (H0)
Number of stop bits (H1)
Parity setting (H1)
Communication speed (H2)
VFD peripheral address settings (H3)

Description of operation:
As implemented in this application, the Modbus Master protocol is used to manage up to 2 VFD devices.
To configure the pCO/VFD network, the parameters for the application must be set on the pCO, as well as the parameters of the device VFD.
N.B. This function is not available for pCO^{XS} boards without Built-In terminal.

Parameters to be set on the pCO:

- **Configuration and identification of the VFD:**
  - From the main menu, select the "Manufacturer" branch and then Configuration
  - On screen C4, select the operating and fan control mode, compatible with the configuration of VFD devices (see the table in paragraph 5.8.2).
  - Finally select the type "Modulating VFD".
  - On screen Cq, select the position of the VFD devices (outlet, intake or both).
- **Communication:** From the main menu, then select the "VFD Management" branch and then the item "Communication"
  - On screen H0 select the serial port: serial port 2 (Fieldbus) or 0 (pLAN) can be selected. The latter can only be used for pCO boards with Built-In terminal.
  - On screens H1 and H2, select the communication parameters. The default values for the application allow communication without further settings or changes. The communication parameters must have the following values:

Parameter	Value	Screen
Stop bits	1 STOP bit	H1
Parity	NO	H1
Communication speed	19200	H2

  - On screen H3 enter the addresses of the VFD. The values must be assigned using the physical addresses assigned to the devices before being connected to the RS485 using their own parameter.

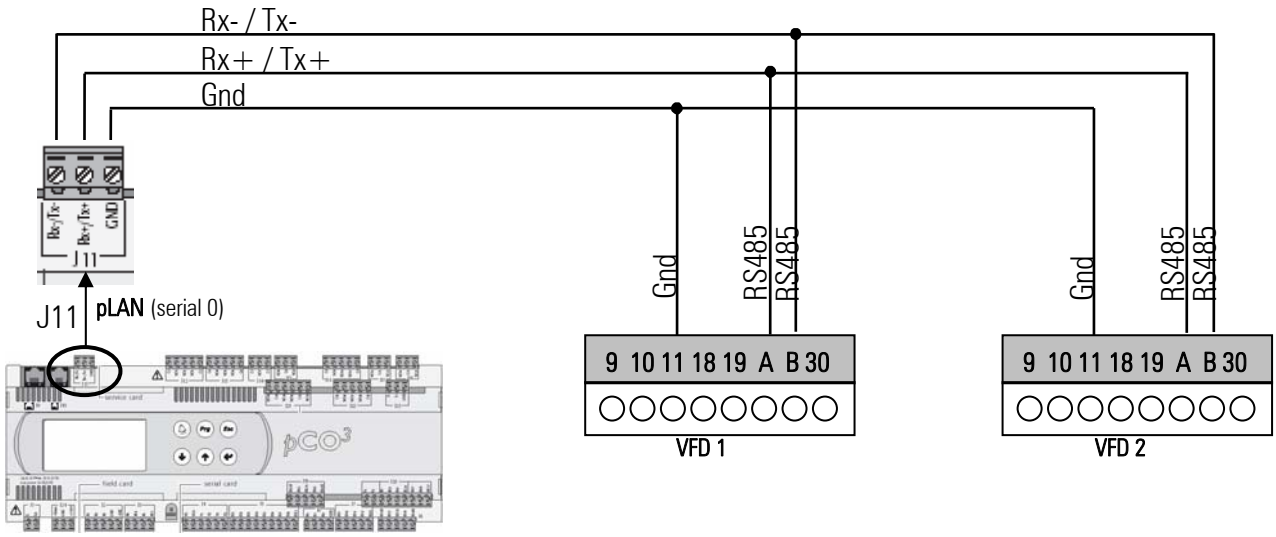
Parameters to be set on the VFD:
These are summarised in the following table

Code	Parameter	Default	Setting	Description
P6.10.2	Fieldbus protocol	1 (Modbus)	1 (Modbus)	Communication protocol
P6.10.3	Slave address	1	-	Address of the peripheral
P6.10.4	Baud rate	5 (9600)	6 (19200)	Communication speed
P6.10.5	Stop bits	0 (1 stop bit)	0 (1 stop bit)	Stop bits
P6.10.6	Parity	0 (No)	0 (No)	Parity
P2.2.21	Fieldbus reference	3 (Fieldbus)	3 (Fieldbus)	When the actuator is started/stopped via fieldbus, the serial connection is the source of the frequency/speed request. During normal operation of the application, the VFD actuators are started/stopped via the digital output of the pCO. During the device test procedure, the devices are started/stopped directly from the screen (R8, R9) and consequently via Modbus. For the VFD device test procedure to be successful, this parameter must not be changed.

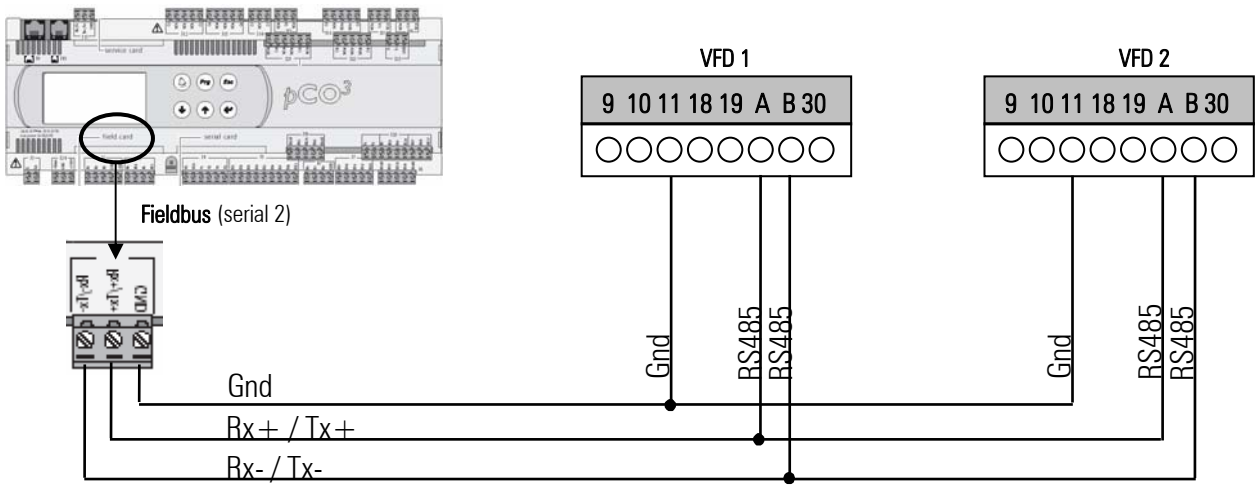
N.B. At the end of the configuration procedure, turn both the devices, pCO and VFD, off and turn on again. In general this procedure should be performed when modifying the communication parameters on either device.

Diagrams of connections between the pCO and the VFD
ATTENTION: The jumper used for the termination resistor on the VFD, must be leave on the position "TERMINATION RESISTOR RS485 IS NOT USED"

pLAN (serial 0) pCO2 / pCO3 / pCOxs



Fieldbus (serial 2) only pCO3



Alarm management

There are three types of alarms associated with the VFD devices:

- Offline: this occurs when serial communication fails between the pCO and the VFD. After three failed queries from the pCO to one of the VFD devices, the buzzer is activated (on the standard external LCD terminal) and the alarm screen is displayed. The alarm is featured for all the VFD devices in the network. The possible causes of the VFD Offline alarm are as follows:
  - Physical connection of the serial communication board on the pCO to the RS485 terminals on the actuator
  - Setting of the Modbus protocol communication parameters: baud rate, stop bits and parity (see section 5.8.11)
  - Setting of the device addresses: the addresses assigned to the actuators on screen H3 must correspond to the physical addresses set directly on the local control panel.
- Alarms that shut down the outlet/intake VFD actuator: these are alarms from AL58 to AL70 for the outlet VFD and from AL83 to AL90 for the intake VFD. These alarms are generated directly by the actuator and shutdown the device. Consequently, they also shutdown the unit.
- Alarms that do not shut down the outlet/intake VFD actuator : these alarms are generated directly by the actuator and do not shut down operation. Nonetheless, these can be set as shutdown alarms in the application (screens Nl and Nm); in this case, they shut down the unit and display the screens from AL71 to AL81 for the outlet VFD and from AL96 to AL106 for the intake VFD. If, on the other hand, they are not set as shutdown alarms, they are simply signalled on generic minor alarm screens (AL82 for the outlet VFD and AL107 for the intake VFD).

10.10 Communication between the pCO^{xs} and Belimo controllers (MP-BUS protocol)

Parameters used:
Number of devices present in the MP-BUS network (Cp)

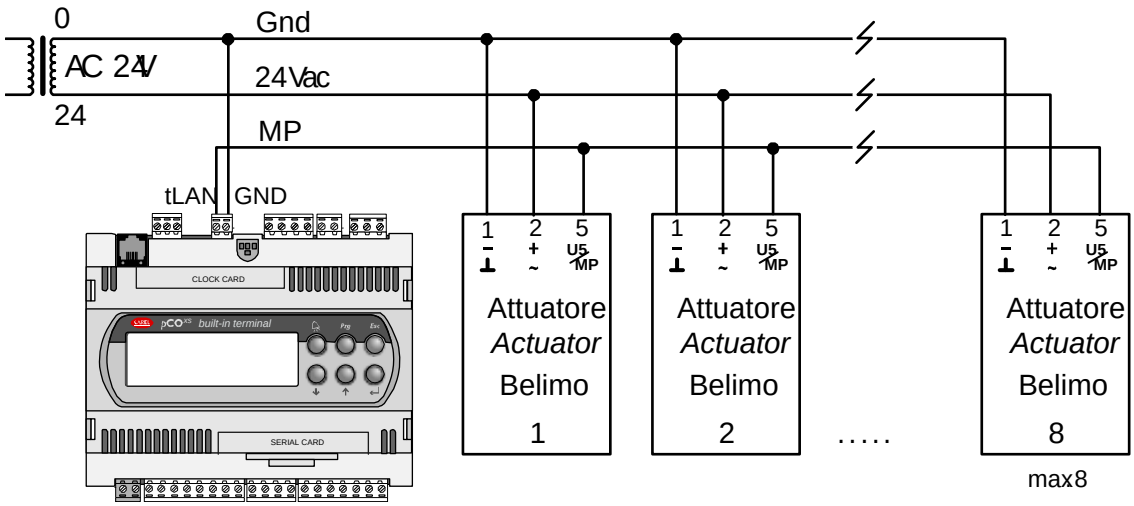
Description of operation:
The MP-BUS protocol allows the pCO^{XS} to control up to 8 Belimo actuators.
The devices are managed in Master/Slave configuration, where the pCO^{XS} represents the Master, while the Belimo devices are the Slaves.
The following is the procedure for configuring a pCO^{XS} Belimo network:

- **Identify the number of actuators connected:** before setting the addresses, the number of devices present in the MP-BUS network must be declared (Cp)
- **Set the address of the devices:** all the devices in the MP-BUS network must be powered and the unit must be off. Pressing the two arrow buttons (UP-DOWN) together for 2 seconds accesses the first Belimo configuration screen. This menu has 8 screens (F1 to F8) for setting the address of each Belimo actuator. In each, the first row shows the address of the device. The address will be assigned to the actuator when the special button for setting the address is pressed.
  Example:
  The objective is assign address 3 to an actuator. Proceed as follows:
  - press UP-DOWN for 2 seconds: this accesses screen F1 dedicated to actuator 1
  - Scroll the screens to F3, dedicated to actuator 3
  - Press Enter to go to the last row, with the text CONFIGURE -> and press Enter
  - Following the instructions, press Enter again
  - Following the instructions, press the button on the actuator that address 3 is to be assigned to.

  NOTE: No two actuators can have the same address in the network at the same time, otherwise there will be no communication between the pCO^{XS} and the actuators. Therefore, if the addresses on the actuators being configured are ignored, one actuator needs to be connected at a time to set the address.

- **Optional sensor connected to the device:** An optional sensor can be connected to each Belimo actuator:
  - NTC,
  - 0 to 1 Volt ,
  - 0 to 10 Volt,
  - Digital input (e.g. pressure switch).

pCO^{xs} – Belimo connection diagram



Alarm management

There are three types of alarms associated with the Belimo devices:

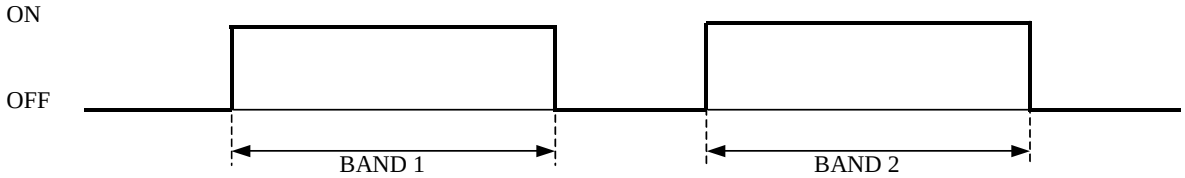
- **LAN:** this occurs when serial communication fails between the pCO^{XS} and the Belimo actuators. After five failed queries from the pCO^{XS} to one of the Belimo actuators, the buzzer is activated (on the standard external LCD terminal) and the alarm screen is displayed.
  The alarm is featured for all the Belimo actuators in the network.

10.11 Time bands

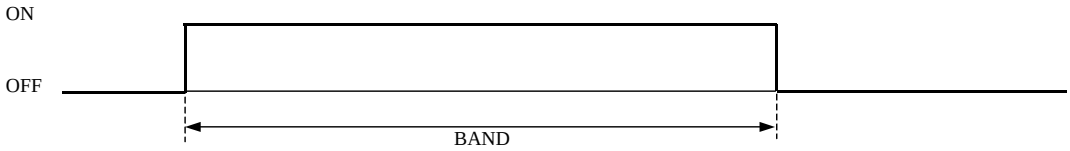
Parameters used:
Time and date setting (K0)
Enable time band management (K1)
On and off hours and minutes for the first A time band (K2)
Set point for the first A band (K2)
Intake and outlet fan set point for band A1 (K3)
On and off hours and minutes for the second A time band (K4)
Set point for the second A band (K4)
Intake and outlet fan set point for band A2 (K5)
On and off hours and minutes for time band B (K6)
Set point of the type time band B (K6)
Intake and outlet fan set point for band B (K7)
Select the type of band for the days of the week (K9)

Description of operation:
The system features a built-in clock with backup battery (optional on the pCOXS board) that manages the time and date for all functions where these are required. The time and date can be set on screen K0. Four different types of time bands can be selected:

- Type A: Used to set two bands per day with two different set points. Between the bands the unit is off :



- Type B: Used to set one band per day with corresponding set point.



- Type C: Used to set the unit in continuous operation, effectively meaning there are no time bands.
- Type D: Used to set the unit as being always off.

The following set points can be set for each band:

- Temperature control set point.
- Fan speed control set point.

If time band management is enabled, each day of the week must be associated with the type of band required. The graphs show that the unit is only on for the times included in the interval, with control based on the relative set point, and then switches off in the times that are not within the interval.

10.12 Test devices

Devices used:
Enable test devices (R0)
Open the heating valve (R1)
Open the cooling valve (R1)
Open the post-heating valve (R2)
Open the outside air Damper (R3)
Open the mixing air damper (R3)
Activate the outlet fan analogue output (R4)
Activate the intake fan analogue output (R4)
Start the rotary heat recovery unit (R5)
Start the analogue humidifier (R6)
Status of the digital outputs (R7)
Request outlet VFD speed via Fieldbus (R8)
Start/Stop outlet VFD via Fieldbus (R8)
Request intake VFD speed via Fieldbus (R9)
Start/Stop intake VFD via Fieldbus (R9)

The software features a test procedure for checking the operation of the devices connected. In the manufacturer branch, selecting the item "TEST DEVICES" accesses a loop of screens (R0-R7) showing the analogue and digital outputs that are enabled and managed by the controller. The first screen displayed (R0) is used to enable the device test procedure; when enabling the procedure, all the digital and analogue outputs are set to 0 so as to allow them to be controlled using the parameters on the test screens. The test procedure can be terminated as follows:

- Disabling the procedure (R0)
- Returning to the main screen M0 (after 5 minutes without pressing any button on the terminal).

11. Alarms

The unit manages all the procedures relating to the individual alarms: action, delays, reset and signals. When an alarm is activated, the devices are affected accordingly, where featured, and the following actions are performed simultaneously: LED on, buzzer on (external terminal), screen displayed and saving of the event in the log.
To check which alarm is active, simply press the ALARM button, and use the UP/DOWN buttons to scroll to any other active alarms. To reset the relay and delete the alarms, display the alarm screen and press the ALARM button again.

11.1 Special alarms

11.1.1 Operating hour alarms

Parameters used:
Reset the operating hours of the intake and outlet fan (A7);
Reset the operating hours of compressor 1-2 (A8);
Alarm threshold for fan operating hours (A5);
Alarm threshold for compressor operating hours (A6).

Description of operation.
This alarm is activated when the operating hours of a device (outlet fan, intake fan and compressors 1-2) exceed the threshold set.
N.B. If the threshold is set to "0 hours", this function is deactivated and no operating hour alarms are generated.

11.1.2 Door switch alarm

Inputs used:
Position of the door switch (D6)

Parameters used:
Enable door switch protection (Cd)

Description of operation
The door switch alarm is activated when the controller detects the opening of the inspection/service door on the air handling unit.
This alarm acts by immediately switching off the fans and, as a consequence, all the devices on the unit.

11.2 Table of alarms

CODE	DESCRIPTION	DELAY	UNIT OFF	DEVICES OFF
AL01	Outlet flow switch	Settable	Yes	All
AL02	Intake flow switch	Settable	Yes	All
AL03	Dirty outlet air filter	60 seconds (fixed)	No	-
AL04	Dirty intake air filter	60 seconds (fixed)	No	-
AL05	Outlet fan cutout	No	Yes	All
AL06	Intake fan cutout	No	Yes	All
AL07	Compressor 1 cutout	No	No	Stop compressor 1
AL08	Compressor 2 cutout	No	No	Stop compressor 2
AL09	Pump cutout in heating	No	No	Stop the pump in heating
AL10	Pump cutout in cooling	No	No	Stop pump in cooling
AL11	Electric heater cutout	No	No	Stop the electric heaters
AL12	High pressure switch compressor 1	NO	No	Stop compressor 1
AL13	Low pressure switch compressor 1	Settable	No	Stop compressor 1
AL14	High pressure switch compressor 2	NO	No	Stop compressor 2
AL15	Low pressure switch compressor 2	Settable	No	Stop compressor 2
AL16	Humidifier alarm	No	No	Stop the humidifier
AL17	Fire/smoke	No	Yes	All
AL18	Heat recovery unit dirty	60 seconds (fixed)	No	-
AL19	Door open	No	Yes	All
AL20	Direct expansion fault	Settable	No	-
AL21	Antifreeze alarm	No	No	See paragraph on antifreeze alarm
AL22	Outlet pressure probe fault	60 seconds (fixed)	No	-
AL23	Intake pressure probe fault	60 seconds (fixed)	No	-
AL24	Outside humidity probe fault	60 seconds (fixed)	No	-
AL25	Outlet temperature probe fault	60 seconds (fixed)	No	-
AL26	Intake temperature probe fault	60 seconds (fixed)	No	-
AL27	Intake humidity probe fault	60 seconds (fixed)	No	-
AL28	Set point compensation probe fault	60 seconds (fixed)	No	-
AL29	Antifreeze temperature probe fault	60 seconds (fixed)	No	-
AL30	Discharge air probe fault	60 seconds (fixed)	No	-
AL31	Outside air temperature probe fault	60 seconds (fixed)	No	-
AL32	VOC air quality probe fault	60 seconds (fixed)	No	-
AL33	VOC+CO2 air quality probe fault	60 seconds (fixed)	No	-
AL34	Preheating probe fault	60 seconds (fixed)	No	-
AL35	Outlet humidity probe fault	60 seconds (fixed)	No	-
AL36	Defrost probe fault	60 seconds (fixed)	No	-
AL37	Compressor 1 maintenance	No	No	-

AL38	Compressor 2 maintenance	No	No	-
AL39	Outlet fan maintenance	No	No	-
AL40	Return fan maintenance	No	No	-
AL41	Clock board fault	No	No	-
AL42	Alarm on Belimo device 1	No	No	-
AL43	Alarm on Belimo device 2	No	No	-
AL44	Alarm on Belimo device 3	No	No	-
AL45	Alarm on Belimo device 4	No	No	-
AL46	Alarm on Belimo device 5	No	No	-
AL47	Alarm on Belimo device 6	No	No	-
AL48	Alarm on Belimo device 7	No	No	-
AL49	Alarm on Belimo device 8	No	No	-
AL50	Alarm from digital input on Belimo device	No	No	-
AL51	Generic filter digital input	No	No	-
AL52	Outlet air flow analogue input	Settable	All	-
AL53	Intake air flow analogue input	Settable	All	-
AL54	Alarm from cooling unit	No	No	-
AL55	Post-heating heater alarm	No	No	-
AL56	Outlet VFD offline alarm	10 seconds (fixed)	Yes	All
AL57	Intake VFD offline alarm	10 seconds (fixed)	Yes	All
AL58	Excess current, outlet VFD	No	Yes	All
AL59	Voltage surge, outlet VFD	No	Yes	All
AL60	Contact charge, outlet VFD	No	Yes	All
AL61	System fault, outlet VFD	No	Yes	All
AL62	Low temperature, outlet VFD	No	Yes	All
AL63	High temperature, outlet VFD	No	Yes	All
AL64	EEPROM checksum error, outlet VFD	No	Yes	All
AL65	CPU watchdog fault, outlet VFD	No	Yes	All
AL66	Internal bus communication, outlet VFD	No	Yes	All
AL67	Unknown peripheral, outlet VFD	No	Yes	All
AL68	IGBT temperature, outlet VFD	No	Yes	All
AL69	External fault, outlet VFD	No	Yes	All
AL70	Panel communication interrupted, outlet VFD	No	Yes	All
AL71	Earth fault, outlet VFD	No	Settable (No/Yes)	Settable (None/All)
AL72	Voltage drop, outlet VFD	No	Settable (No/Yes)	Settable (None/All)
AL73	No phase current, outlet VFD	No	Settable (No/Yes)	Settable (None/All)
AL74	Motor shutdown, outlet VFD	No	Settable (No/Yes)	Settable (None/All)
AL75	High motor temperature, outlet VFD	No	Settable (No/Yes)	Settable (None/All)
AL76	Motor underload, outlet VFD	No	Settable (No/Yes)	Settable (None/All)
AL77	Thermistor fault, outlet VFD	No	Settable (No/Yes)	Settable (None/All)
AL78	Low current at analogue input, outlet VFD	No	Settable (No/Yes)	Settable (None/All)
AL79	Fieldbus fault, outlet VFD	No	Settable (No/Yes)	Settable (None/All)
AL80	Slot fault, outlet VFD	No	Settable (No/Yes)	Settable (None/All)
AL81	Effective supervisor alarm value, outlet VFD	No	Settable (No/Yes)	Settable (None/All)
AL82	Generic minor alarm, outlet VFD	No	No	-
AL83	Excess current, intake VFD	No	Yes	All
AL84	Voltage surge, intake VFD	No	Yes	All
AL85	Contact charge, intake VFD	No	Yes	All
AL86	System fault, intake VFD	No	Yes	All
AL87	Low temperature, intake VFD	No	Yes	All
AL88	High temperature, intake VFD	No	Yes	All
AL89	EEPROM checksum error, intake VFD	No	Yes	All
AL90	CPU watchdog fault, intake VFD	No	Yes	All
AL91	Internal bus communication, intake VFD	No	Yes	All
AL92	Unknown peripheral, intake VFD	No	Yes	All
AL93	IGBT temperature, intake VFD	No	Yes	All
AL94	External fault, intake VFD	No	Yes	All
AL95	Panel communication interrupted, intake VFD	No	Yes	All
AL96	Earth fault, intake VFD	No	Settable (No/Yes)	Settable (None/All)
AL97	Voltage drop, intake VFD	No	Settable (No/Yes)	Settable (None/All)
AL98	No phase current, intake VFD	No	Settable (No/Yes)	Settable (None/All)
AL99	Motor shutdown, intake VFD	No	Settable (No/Yes)	Settable (None/All)
AL100	High motor temperature, intake VFD	No	Settable (No/Yes)	Settable (None/All)
AL101	Motor underload, intake VFD	No	Settable (No/Yes)	Settable (None/All)
AL102	Thermistor fault, intake VFD	No	Settable (No/Yes)	Settable (None/All)
AL103	Low current at analogue input, intake VFD	No	Settable (No/Yes)	Settable (None/All)
AL104	Fieldbus fault, intake VFD	No	Settable (No/Yes)	Settable (None/All)
AL105	Slot fault, intake VFD	No	Settable (No/Yes)	Settable (None/All)
AL106	Effective supervisor alarm value, intake VFD	No	Settable (No/Yes)	Settable (None/All)
AL107	Generic minor alarm, intake VFD	No	No	-

11.2.1 Alarms with manual reset

The alarms managed by the program protect the devices connected and emit signals if the control parameters deviate from the normal values or the board malfunctions. The alarms may derive from the alarm digital inputs, from the probes and from the board. The effect of the alarms ranges from signal-only to stopping one or more devices or shutting down the unit (OFF). Many alarms have settable delays.
When an alarm arises, the following signals are generated:

- the buzzer on the external terminal sounds (absent on the Built-In terminal and on the PGD external terminal);
- the red LED underneath the ALARM button comes on;
- the main screen displays the unit status "AHU ALARM".

Pressing the Alarm button mutes the buzzer and displays the alarm screen. If there is more than one active alarm, once having accessed the alarm menu, simply use the arrow buttons to scroll all the alarms. Pressing any other button exits the alarm screens, however but these remain saved and are displayed again whenever the Alarm button is pressed. To manually reset the alarms and delete the messages, simply open the alarm screen and press the Alarm button again; if the cause of the alarms are no longer present (digital inputs reset or temperatures returned to normal, etc.) the screens disappear, the red LED goes off and the message "NO ACTIVE ALARM" is displayed. If the causes of one or more alarm are still present, only the alarms whose causes are no longer present will be cancelled, while the others remain displayed and the buzzer and red LED will come on again. All the alarms have manual reset, and therefore to reset them the operator must act directly on the terminal of the unit.

12. Alarm log

The alarm log is used to save the operating status of the air handling unit when alarms are activated or alternatively at certain moments. Each record represents an event that can be displayed from the list of all the events available in the memory. The log is used to resolve problems and faults as it can suggest the possible causes and solutions to the faults. The program features two types of log, the basic log and the advanced log. Without the clock card (optional on the pCOXS, built-in on the pCO²), the log is not available.

12.1 Basic alarm log

A maximum of 150 events can be saved in the memory on the pCO2 and pCOXS boards. The events are saved cyclically; on reaching the hundred-and-fiftieth, the next alarm will be saved over the oldest alarm. The events saved can be deleted by the user via the delete event log parameter on screen AY. The log screen can be accessed by selecting the "ALARM LOG" item in the main menu or by pressing the PRINTER button.

When an alarm is activated, the following data is saved:

- chronological number of the event (0...150);
- time;
- date;
- alarm description;
- outlet air temperature;
- intake air temperature.

If the cursor is moved to the chronological number, the alarm log can be scrolled using the arrow buttons, from 1 to the maximum number saved. In position 001, pressing the down arrow has no effect; likewise, if 15 alarms have been saved, in position 015, pressing the up arrow has no effect.

12.2 Advanced log

The events are saved to the 1MB or 2MB memory expansion, permanently connected to the board. The advantages and characteristics are listed below:

- Log by event: a typical log by event is the alarm log. If an alarm is activated, the alarm can be saved together with other significant values (temperature, pressure, set point, etc.).
- Log by time: a typical log by time is the log of temperature/pressure values. The temperature and pressure values are saved at regular intervals.
- Log of the logs: this saves the last alarms/temperature/pressure values recorded before a serious alarm. Unlike the data saved by the event and time logs, these data are not overwritten when the memory is full.
- Possibility to choose the values to be saved and the saving method at any time. The WinLOAD program can be used to define the values to be saved and the saving method. WinLOAD does not need the application software files, as it can directly request the information required from the application software installed on the pCO2-pCOXS.
- 1MB dedicated flash memory. The system saves the data to the 1MB flash memory on the memory expansion (code PCO200MEM0). As an example, 1MB of memory can contain 5000 alarm events with 5 values for each alarm, and save 2 values, for example temperature and pressure, every 5 minutes for 6 months.
- Possibility to define up to 7 different log configurations. Typically each controller will have an alarm log configured, and a log of the control values (temperature/humidity/pressure) and some "logs of the logs".
- Lookup the data saved from the LCD terminal (external or built-in) or from a connected PC.
- "Black box" operation. The memory expansion that contains the logs can be removed from the pCO² on the controlled unit and inserted in another pCO² to lookup the data saved. This pCO² does not need to run the same software as the original.
- Reliability of the data saved. The data are saved to FLASH memory that does not require batteries that may discharge. If following a software update the previously saved data are incompatible with the new software, all the data will be deleted (following confirmation).

12.2.1 Configuration using WinLOAD

The advanced log can be configured with WinLoad32, using the "LogsEditor" function.
Further explanations are available in the on-line help, under the section "Log Configuration Table Editor".

12.3 Supervision

pCO^{XS}, pCO^{2} and pCO^{3} can be connected with a local or remote supervisor PC running PlantVisor, with a GSM or traditional modem, and with the most commonly-used BMS (Modbus). To use the various functions listed, special optional cards (RS485, RS232) or Gateways (instruments that interpret different communication protocols) are required.

12.3.1 CAREL supervisor

The local connection between the pCO* board and a supervisor PC (PlantVisor or other) requires an additional RS485 board (pCO^{2}: PCO2004850; pCO3-pCO^{XS}: PCO1004850) to be fitted in the "Serial board" slot. For connection to the PC, connect the additional card to the RS485/RS232 converter via a 3-wire RS485 line. The RS485/RS232 converter is supplied by CAREL (PC485KIT00).
If the supervisor is remote, with the supervisor PC connected via telephone line, simply fit the optional RS232 board (pCO^{2}: PCO200MDM0; pCO3-pCO^{XS}: PCO100MDM0) and connect it to a traditional modem (not a GSM modem).

In this version of the software, the baud rate is set at 19200 bps.

12.4 Database of supervisor variables

12.4.1 Analogue variables

DESCRIPTION	ADD.	TYPE
Reading of analogue input no 1	1	R
Reading of analogue input no 2	2	R
Reading of analogue input no 3	3	R
Reading of analogue input no 4	4	R
Reading of analogue input no 5	5	R
Reading of analogue input no 6	6	R
Reading of analogue input no 7	7	R
Reading of analogue input no 8	8	R
Reading of analogue input no 9	9	R
Reading of analogue input no 10	10	R
Differential for defrost control	11	R/W
Activation differential for double coil heat recovery unit	12	R/W
Outside temperature to stop the heat recovery unit	13	R/W
Freecooling/freeheating activation delta	14	R/W
Comparison set point for antifreeze alarm from NTC probe	15	R/W
Physical analogue output 1	16	R
Physical analogue output 2	17	R
Physical analogue output 3	18	R
Physical analogue output 4	19	R
Physical analogue output 5	20	R
Physical analogue output 6	21	R
Set point compensation band	22	R/W
Intake control dead zone	23	R/W
Compensation set point	24	R/W
Band for outlet lower limit	25	R/W
Band for outlet upper limit	26	R/W
Maximum set point compensation value	27	R/W
Intake humidity control set point	28	R/W
Outlet temperature control set point	29	R/W
Intake temperature control differential	30	R/W
Outlet temperature control differential	31	R/W
Intake temperature control set point	32	R/W
Preheating set point	33	R/W
Preheating differential	34	R/W
Intake humidity control dead zone	35	R/W
Intake humidity control differential	36	R/W
Winter start-up set point	37	R/W
VOC air quality probe reading	38	R
Preheating probe reading	39	R
Effective intake control set point	40	R
Outlet humidity probe reading	41	R
Defrost temperature probe reading	42	R
Outside temperature probe reading	43	R
Antifreeze temperature probe reading	44	R
Intake temperature probe reading	45	R
Outlet temperature probe reading	46	R
Outside humidity probe reading	47	R
Intake humidity probe reading	48	R
Modulating valve opening in cooling	49	R
Modulating humidifier opening	50	R
Outlet inverter opening value	51	R
Intake inverter opening value	52	R
Modulating outside damper opening	53	R
High outlet humidity limit differential	54	R
Outlet temperature set point low limit	55	R
Outlet temperature set point high limit	56	R
Outlet humidity set point high limit	57	R
Defrost relay activation set point	58	R/W
Heating/cooling set point from outside temperature	59	R/W
Outlet temperature control dead zone	60	R/W
Set point compensation temperature probe	61	R
Modulating bypass damper control	62	R
Modulating post-heating coil valve control	63	R
Preheating request	64	R
Post-heating request	65	R
Cooling request	66	R
Modulating valve opening	67	R
Discharge temperature	68	R
Differential for the first cooling step	69	R/W
Differential for the second cooling step	70	R/W
Differential for the third cooling step	71	R/W
First cooling step set point for direct expansion	72	R/W
Second cooling step set point for direct expansion	73	R/W
Third cooling step set point for direct expansion	74	R/W
Set point for heater 1	75	R/W
Set point for heater 2	76	R/W
Set point for heater 3	77	R/W
Differential for heater 1	78	R/W
Differential for heater 2	79	R/W
Differential for heater 3	80	R/W
Current intake humidity set point	81	R
Dual intake temperature set point	85	R/W
Dual outlet temperature set point	86	R/W
Dual intake humidity set point	87	R/W
Minimum dehumidification limit	88	R/W
Maximum dehumidification limit	89	R/W
Modulating set point	90	R
Minimum outlet fan speed	91	R
Maximum outlet fan speed	92	R
Minimum intake fan speed	93	R
Maximum intake fan speed	94	R
Outlet fan speed request	95	R
Intake fan speed request	96	R
Outlet VFD speed (Hz)	97	R
Outlet VFD current	98	R
Outlet VFD torque	99	R
Outlet VFD power	100	R
Outlet VFD voltage	101	R

Intake VFD speed (Hz)	102	R
Intake VFD current	103	R
Intake VFD torque	104	R
Intake VFD power	105	R
Intake VFD voltage	106	R
Outlet fan speed in the interval between outlet temperature set point ± dead zone	107	R/W
Outlet fan speed for outlet temperature greater/less than set point ± dead zone ± differential	108	R/W
Outlet VFD current limit	109	R/W
Rated frequency of the motor connected to the outlet VFD	110	R/W
Rated current of the motor connected to the outlet VFD	111	R/W
Minimum outlet VFD frequency	112	R/W
Maximum outlet VFD frequency	113	R/W
Acceleration time 1, outlet VFD	114	R/W
Deceleration time 1, outlet VFD	115	R/W
Average frequency point in V/f curve, outlet VFD	116	R/W
Average voltage point in V/f curve, outlet VFD	117	R/W

Voltage at 0 Hz frequency, outlet VFD	118	R/W
Switching frequency, outlet VFD	119	R/W
Intake fan speed in the interval between outlet temperature set point ± dead zone	120	R/W
Intake fan speed for outlet temperature greater/less than set point ± dead zone ± differential	121	R/W
Intake VFD current limit	122	R/W
Rated frequency of the motor connected to the intake VFD	123	R/W
Rated current of the motor connected to the intake VFD	124	R/W
Minimum intake VFD frequency	125	R/W
Maximum intake VFD frequency	126	R/W
Acceleration time 1, intake VFD	127	R/W
Deceleration time 1, intake VFD	128	R/W
Average frequency point in V/f curve, intake VFD	129	R/W
Average voltage point in V/f curve, intake VFD	130	R/W
Voltage at 0 Hz frequency, intake VFD	131	R/W
Switching frequency, intake VFD	132	R/W

12.4.2 Digital variables

DESCRIPTION	ADD.	TYPE
Digital input 1	1	R
Digital input 2	2	R
Digital input 3	3	R
Digital input 4	4	R
Digital input 5	5	R
Digital input 6	6	R
Digital input 7	7	R
Digital input 8	8	R
Digital input 9	9	R
Digital input 10	10	R
Digital input 11	11	R
Digital input 12	12	R
Digital input 13	13	R
Digital input 14	14	R
Digital input 15	15	R
Digital input 16	16	R
Digital input 17	17	R
Digital input 18	18	R
Digital output 1	19	R
Digital output 2	20	R
Digital output 3	21	R
Digital output 4	22	R
Digital output 5	23	R
Digital output 6	24	R
Digital output 7	25	R
Digital output 8	26	R
Digital output 9	27	R
Digital output 10	28	R
Digital output 11	29	R
Digital output 12	30	R
Digital output 13	31	R
Digital output 14	32	R
Digital output 15	33	R
Digital output 16	34	R
Digital output 17	35	R
Digital output 18	36	R
Pump protection alarm in heating	37	R
Low pressure alarm compressor 2	38	R
Outlet fan protection alarm	39	R
Intake fan protection alarm	40	R
Preheating probe alarm	41	R
Outlet filter blocked alarm	42	R
Outlet humidity probe alarm	43	R
General alarm	44	R
Unit on	45	R
Intake filter blocked alarm	46	R
Intake flow switch alarm	47	R
Enable cooling coil with three-point valve	48	R
Electric heater protection alarm	49	R
Pump protection alarm in cooling	50	R
Built-In terminal present	51	R
Air quality probe alarm (VOC)	52	R
Air quality probe alarm (CO2)	53	R
Outside air humidity alarm	54	R
Intake air humidity alarm	55	R
Outlet flow switch alarm	56	R
Outside air temperature alarm	57	R
Antifreeze alarm	58	R
Intake air temperature alarm	59	R
Outlet temperature alarm	60	R
Discharge temperature alarm	61	R
Defrost temperature probe alarm	62	R
Type of modem operation (tone-pulse)	63	R/W
Enable heating with three-point valve	64	R
Enable outlet flow switch	65	R
Enable intake air flow	66	R
Enable air quality control	67	R/W
Enable change operation (heating/cooling) from the supervisor	68	R/W
Enable control on compressors	69	R
Unit on in cooling mode	70	R
Direct expansion enabled	71	R
Enable dehumidification	72	R/W
Enable door open alarm	73	R/W
Enable electric heater cutout.	74	R/W
Enable dirty filter contact on the outlet	75	R
Enable dirty filter contact on the intake.	76	R
Enable fire/smoke input	77	R/W
Enable antifreeze control from digital input	78	R
Unit on in heating mode	79	R
Enable the dirty heat recovery unit input	80	R/W
Enable high compressor pressure switch	81	R/W
Humidifier present	82	R
Priority of temperature in dehumidification	83	R/W
Enable low compressor pressure switch	84	R/W
Enable compressor 1 thermal overload	85	R/W
Enable compressor 2 thermal overload	86	R/W
Enable defrost control	87	R/W
Antifreeze active with NTC probe	88	R/W
Enable remote ON/OFF from digital input	89	R/W
Enable post-heating	90	R
Enable modulating valve in cooling	91	R
Enable modulating valve in heating	92	R
Outlet pressure control	93	R
Intake pressure control	94	R
Enable winter start-up	95	R/W
Enable outlet fan protection	96	R
Select type of compensation probe	97	R/W
Enable outlet lower limit control	98	R/W
Enable outlet upper limit control	99	R/W
Enable outlet upper limit control for humidity	100	R/W
Enable intake fan protection	101	R
Reset alarms	102	R/W
Mute buzzer	103	R/W
Status of the inspection door switch	104	R
Status of the outlet filter digital input	105	R
Status of the intake filter digital input	106	R
Status of the fire/smoke contact	107	R
Status of the heat recovery unit flow	108	R
Humidifier alarm	109	R
Start unit from supervisor	110	R/W
Unit on	111	R
Compressor 1 cutout alarm	112	R
Compressor 2 cutout alarm	113	R
Outlet pressure alarm	114	R
Intake pressure alarm	115	R
Evaporator alarm	116	R
Inspection door open alarm	117	R
Fire/smoke alarm	118	R
Antifreeze alarm	119	R
High pressure alarm compressor 1	120	R
High pressure alarm compressor 2	121	R
Heat recovery unit dirty alarm	122	R
Set point compensation probe alarm	123	R
Low pressure alarm compressor 1	124	R
Status of bypass damper digital output on the heat recovery unit	125	R

Digital damper opening	126	R
Enable antifreeze probe	127	R
Enable defrost temperature probe	128	R
Enable outside temperature probe	129	R
Enable outside humidity probe	130	R
Enable VOC air probe	131	R
Enable intake pressure probe	132	R
Enable intake humidity probe	133	R
Enable intake temperature probe	134	R
Enable outlet pressure probe	135	R
Enable outlet humidity probe	136	R
Enable outlet probe	137	R
Humidifier active	138	R
First intake fan step	139	R
First cooling coil step with direct expansion	140	R
First heating coil step with electric heaters	141	R
First outlet fan step	142	R
Enable CO2 air probe	143	R
Second cooling coil step with direct expansion	144	R
Third cooling coil step with direct expansion	145	R
Second heating coil step with electric heaters	146	R
Third heating coil step with electric heaters	147	R
Second outlet fan step	148	R
Second intake fan step	149	R
Defrost status	150	R
Winter start-up status	151	R
Enable pre-heating temperature probe	152	R
Enable set point compensation probe	153	R
Enable discharge probe	154	R

Enable modulating set point	155	R
Enable set point variation from DI	156	R
Enable set point variation from screen	157	R
Generic filter alarm	158	R
Outlet flow switch analogue input alarm	159	R
Intake flow switch analogue input alarm	160	R
Alarm from cooling unit	161	R
Not ready/ready status, outlet VFD	162	R
Stop/run status, outlet VFD	163	R
Direction of rotation, outlet VFD	164	R
Alarm status, outlet VFD	165	R
Offline alarm, outlet VFD	166	R
Minor alarms active, outlet VFD	167	R
Serious alarms active, outlet VFD	168	R
Not ready/ready status, intake VFD	169	R
Stop/run status, intake VFD	170	R
Direction of rotation, intake VFD	171	R
Alarm status, intake VFD	172	R
Offline alarm, intake VFD	173	R
Minor alarms active, intake VFD	174	R
Serious alarms active, intake VFD	175	R
Function selector to read/write generic parameter, outlet VFD	176	R/W
Direction of rotation selector, outlet VFD	177	R/W
Reset alarms, outlet VFD	178	R/W
Function selector to read/write generic parameter, intake VFD	179	R/W
Direction of rotation selector, intake VFD	180	R/W
Reset alarms, intake VFD	181	R/W

12.4.3 Integer variables

DESCRIPTION	ADD.	TYPE
Unit status	1	R
Type of probe 1	2	R
Type of probe 2	3	R
Type of probe 3	4	R
Type of probe 4	5	R
Type of probe 5	6	R
Type of probe 6	7	R
Type of probe 7	8	R
Type of probe 8	9	R
Type of probe 9	10	R
Type of probe 10	11	R
Air flow alarm delay time	12	R/W
Start hour first band A	13	R/W
Start hour second band A	14	R/W
Start hour band B	15	R/W
Start minutes first band A	16	R/W
Start minutes second band A	17	R/W
Start minutes band B	18	R/W
End hour first band A	19	R/W
End hour second band A	20	R/W
End hour band B	21	R/W
End minutes first band A	22	R/W
End minutes second band A	23	R/W
End minutes band B	24	R/W
Number of heaters enabled	25	R/W
Select compensation probe	26	R/W
Select compensation set point: Intake, Outlet	27	R/W
Duration of winter start-up	28	R/W
Outlet fan start delay	29	R/W
Delay between starts of the same fan	30	R/W
Minimum fan ON time	31	R/W
Low pressure alarm delay	32	R/W

Minimum compressor ON time	33	R/W
Minimum compressor OFF time	34	R/W
Minimum time between starts of same compressor	35	R/W
Number of cooling steps enabled	36	R/W
Minimum OFF time between starts of different compressors	37	R/W
Three-point valve opening/closing time in cooling	38	R/W
Three-point valve opening/closing time in heating	39	R/W
Number of rings to wait for the modem to answer	40	R/W
Compressor 1 operating hours	41	R
Compressor 2 operating hours	42	R
Outlet fan operating hours	43	R
Intake fan operating hours	44	R
CO2 air quality control differential	45	R/W
CO2 air quality control set point	46	R/W
CO2 air quality control dead zone	47	R/W
Select type of outside air damper	48	R/W
Select type of heat recovery unit	49	R/W
Enable air filter	50	R/W
Enable and select bypass damper control	51	R/W
Select the cooling management device	52	R/W
Select the heating management device	53	R/W
Select the post-heating management device	54	R/W
Type of humidifier output	55	R/W
Enable fan cutout	56	R/W
Select heating coil function	57	R/W
Select type of post-heating.: 1,compens. in dehum. - 2,compens.+integration	58	R/W
Digital air flow switch control	59	R/W
Analogue air flow switch control	60	R/W
Minimum opening of the outside damper	61	R/W
Minimum outlet air flow limit	62	R/W
Minimum intake air flow limit	63	R/W
Outlet inverter control differential	64	R/W

Intake inverter control differential	65	R/W
Outlet inverter control set point	66	R/W
Intake inverter control set point	67	R/W
CO2 air quality probe reading	68	R
VOC air quality probe reading	69	R
Outlet pressure probe reading	70	R
Intake pressure probe reading	71	R
Outlet inverter control offset	72	R/W
Intake inverter control offset	73	R/W
VOC air quality control differential	74	R/W
VOC air quality control set point	75	R/W
VOC air quality control dead zone	76	R/W
Enable compressors	77	R/W
Priority in dehumidification	78	R/W
Outlet VFD speed (rpm)	79	R
Outlet VFD DC voltage	80	R
Heat sink temperature, outlet VFD	81	R
Active alarm code, outlet VFD	82	R
Status word, outlet VFD	83	R
Intake VFD speed (rpm)	84	R
Intake VFD DC voltage	85	R
Heat sink temperature, intake VFD	86	R
Active alarm code, intake VFD	87	R
Status word, intake VFD	88	R
Type of control, outlet VFD	89	R/W
Speed reference, outlet VFD	90	R/W

Generic parameter address, outlet VFD	91	R/W
Generic parameter read/write data result, outlet VFD	92	R/W
Rated voltage of the motor connected to the outlet VFD	93	R/W
Rated speed of the motor connected to the outlet VFD	94	R/W
Cos-fi of the motor connected to the outlet VFD	95	R/W
Run function, outlet VFD	96	R/W
Stop function, outlet VFD	97	R/W
Optimisation of V/f curve, outlet VFD	98	R/W
Automatic restart, outlet VFD	99	R/W
Type of motor control, outlet VFD	100	R/W
Type of V/f curve, outlet VFD	101	R/W
Type of control, intake VFD	102	R/W
Speed reference, intake VFD	103	R/W
Generic parameter address, intake VFD	104	R/W
Generic parameter read/write data result, intake VFD	105	R/W
Rated voltage of the motor connected to the intake VFD	106	R/W
Rated speed of the motor connected to the intake VFD	107	R/W
Cos-fi of the motor connected to the intake VFD	108	R/W
Run function, intake VFD	109	R/W
Stop function, intake VFD	110	R/W
Optimisation of V/f curve, intake VFD	111	R/W
Automatic restart, intake VFD	112	R/W
Type of motor control, intake VFD	113	R/W
Type of V/f curve, intake VFD	114	R/W

13. Glossary

- **Actuator:** VFD device
- **Differential:** this defines a temperature zone around the set point within which the system manages the control devices.
- **Built-in:** display housed on the backbone of the pCO board[2].
- **Buzzer:** audible buzzer fitted on the external terminals; this emits an extended sound in the event of alarms, or a brief sound if the limits for setting the parameters are exceeded. The built-in terminals do not have a buzzer.
- **Default:** this term defines the values, for example the set point and proportional temperature band, that are automatically used by the system if no modifications are made by the user.
- **Freecooling:** action whereby outside air is introduced into the environment by opening a damper, so as to cool the environment and save energy.
- **Freeheating:** action whereby outside air is introduced into the environment by opening a damper, so as to heat the environment and save energy.
- **Step:** this defines an area of the proportional band (temperature or humidity) inside which a device is on, and at the same time also defines the activation and deactivation values of the device.
- **Screen index:** alphanumeric index located in the top right of every screen.
- **Outlet:** the air introduced in the environment.
- **Screen:** the page shown on the display of the terminal.
- **Master:** the Master is the board responsible for controlling the pLAN and consequently all the other boards connected; generally this is the board with address 1, except when this is off or disconnected.
- **MP-BUS:** communication protocol (1200 Baud)
- **Branch – loop:** series of screens that concern the same subject and that can be easily scrolled by pressing the arrow buttons; the branches are accessed by pressing one of the buttons on the terminal, which displays the first screen in the loop.
- **Range:** interval of values allowed for a parameter.
- **Intake:** air drawn in from the outside and introduced into the AHU.
- **R-R/W:** Type of variable (R = read-only, R/W = read and write)
- **Set point:** defines a temperature (or humidity) value to be satisfied; the system activates the heating or cooling devices until the temperature or humidity reach the set point.
- **Buffer (memory):** memory on the board used to save the default values set by CAREL for all the parameters in the software. Permanent memory even without power.
- **VFD :** Variable Frequency Driver (inverter).
- **VOC:** Volatile Organic Compounds
- **Dead zone:** this defines a very small temperature zone between the set point and the proportional band, inside which the devices are not activated.

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