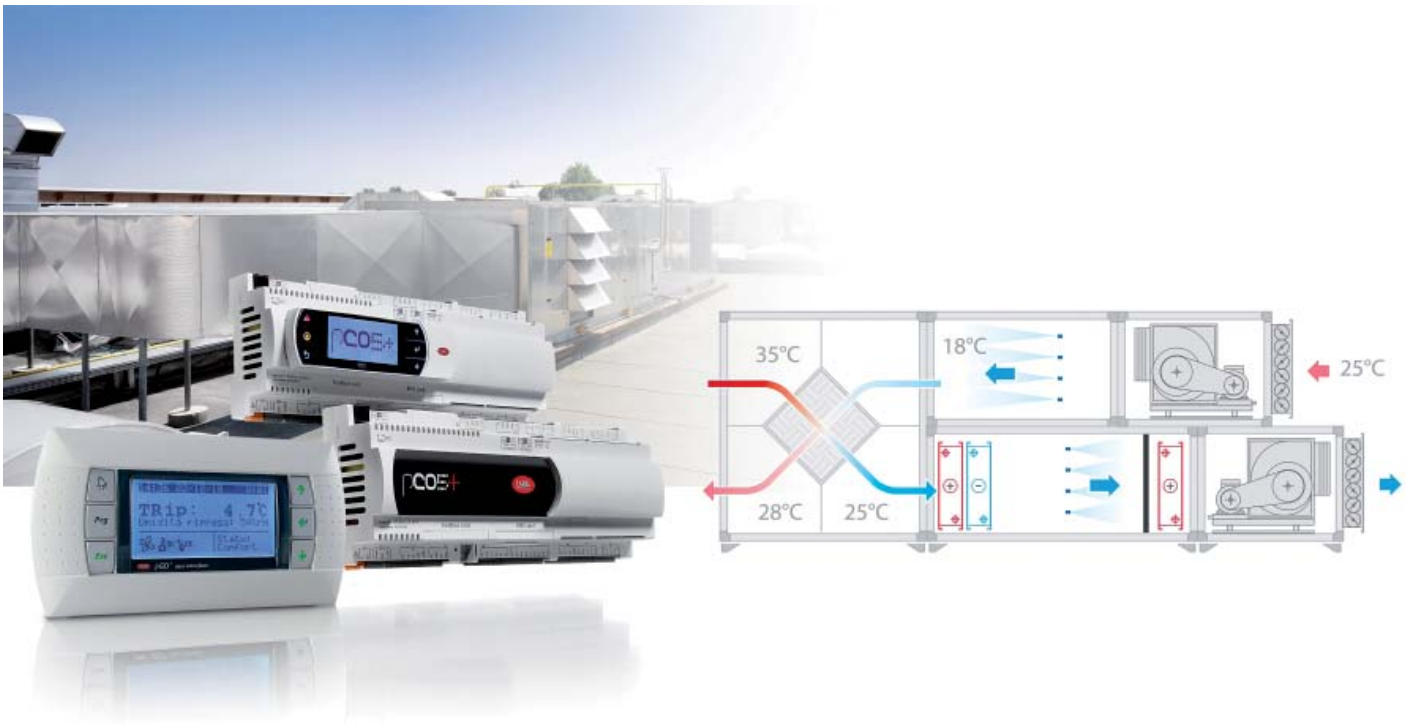
FLSTDMAHUE

CAREL

Application for managing air handling units with integrated DEC - IEC



ENG User manual

LEGGI E CONSERVA QUESTE ISTRUZIONI

READ AND SAVE THESE INSTRUCTIONS

NO POWER & SIGNAL CABLES TOGETHER

READ CAREFULLY IN THE TEXT!

Integrated Control Solutions & Energy Savings

Warning

CAREL bases the development of its products on decades of experience in HVAC, on the continuous investments in technological innovations to products, procedures and strict quality processes with in-circuit and functional testing on 100% of its products, and on the most innovative production technology available on the market. CAREL and its subYESdiaries nonetheless cannot guarantee that all the aspects of the product and the software included with the product respond to the requirements of the final application, despite the product being developed according to start-of-the-art techniques.
The customer (manufacturer, developer or installer of the final equipment) accepts all liability and risk relating to the configuration of the product in order to reach the expected results in relation to the specific final installation and/or equipment.
CAREL may, based on specific agreements, act as a consultant for the poYEStive commisYESoning of the final unit/application, however in no case does it accept liability for the correct operation of the final equipment/system.

The CAREL product is a state-of-the-art product, whose operation is specified in the technical documentation supplied with the product or can be downloaded, even prior to purchase, from the webYESte www.CAREL.com.
Each CAREL product, in relation to its advanced level of technology, requires setup / configuration / programming / commisYESoning to be able to operate in the best possible way for the specific application. The failure to complete such operations, which are required/indicated in the user manual, may cause the final product to malfunction; CAREL accepts no liability in such cases.
Only qualified personnel may install or carry out technical service on the product.
The customer must only use the product in the manner described in the documentation relating to the product.

In addition to observing any further warnings described in this manual, the following warnings must be heeded for all CAREL products:

- Prevent the electronic circuits from getting wet. Rain, humidity and all types of liquids or condensate contain corroYESve minerals that may damage the electronic circuits. In any case, the product should be used or stored in environments that comply with the temperature and humidity limits specified in the manual.
- Do not install the device in particularly hot environments. Too high temperatures may reduce the life of electronic devices, damage them and deform or melt the plastic parts. In any case, the product should be used or stored in environments that comply with the temperature and humidity limits specified in the manual.
- Do not attempt to open the device in any way other than described in the manual.
- Do not drop, hit or shake the device, as the internal circuits and mechanisms may be irreparably damaged.
- Do not use corroYESve chemicals, solvents or aggressive detergents to clean the device.
- Do not use the product for applications other than those specified in the technical manual.

All of the above suggestions likewise apply to the controllers, serial boards, programming keys or any other accessory in the CAREL product portfolio.
CAREL adopts a policy of continual development. Consequently, CAREL reserves the right to make changes and improvements to any product described in this document without prior warning.

The technical specifications shown in the manual may be changed without prior warning.

The liability of CAREL in relation to its products is specified in the CAREL general contract conditions, available on the webYESte www.CAREL.com and/or by specific agreements with customers; specifically, to the extent where allowed by applicable legislation, in no case will CAREL, its employees or subYESdiaries be liable for any lost earnings or sales, losses of data and information, costs of replacement goods or services, damage to things or people, downtime or any direct, indirect, incidental, actual, punitive, exemplary, special or consequential damage of any kind whatsoever, whether contractual, extra-contractual or due to negligence, or any other liabilities deriving from the installation, use or imposYESbility to use the product, even if CAREL or its subYESdiaries are warned of the posYESbility of such damage.

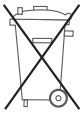
The product must be installed with the earthconnected, using the special yellow-green terminal on the terminal block. Do not use the neutral for the earth connection.

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

Warranty on the materials: 2 years (from the date of production, excluding consumables).

Approval: the quality and safety of CAREL INDUSTRIES Hqs products are guaranteed by the ISO 9001 certified design and production system.

DISPOSAL



INFORMATION FOR USERS ON THE CORRECT HANDLING OF WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)

In reference to European Union directive 2002/96/EC issued on 27 January 2003 and the related national legislation, please note that:

- WEEE cannot be disposed of as municipal waste and such waste must be collected and disposed of separately;
- the public or private waste collection systems defined by local legislation must be used. In addition, the equipment can be returned to the distributor at the end of its working life when buying new equipment;
- the equipment may contain hazardous substances: the improper use or
- incorrect disposal of such may have negative effects on human health and on the environment;
- the symbol (crossed-out wheeled bin) shown on the product or on the
- packaging and on the instruction sheet indicates that the equipment has been introduced onto the market after 13 August 2005 and that it must be disposed of separately;
- in the event of illegal disposal of electrical and electronic waste, the penalties are specified by local waste disposal legislation.

Content

1. INTRODUCTION

FLSTDMAHUE is an application program developed by CAREL for the management of air handling units (AHU). It runs on the pCO5+ range of programmable controllers (pCO5+ small, medium, large), selected according to the complexity of the unit, and the pGD1/pLDPRO terminal. Its main feature is its adaptability to many types of air handling unit, with different types of probes and actuators, on/off type or modulating. Moreover, the possibility to connect up to two pCOe serial options via RS485 card allows additional probes and outputs to be added, ensuring maximum flexibility. Alternatively, the MP-Bus® card can be used to connect up to 8 Belimo®, actuators each with its probe or digital input; this eliminates a lot of the wiring needed during installation. CAREL temperature, humidity and combined serial probes can be connected, for both rooms and ducts, as well as active differential pressure probes, flow switches and pressure switches to signal alarms following faults on fans or pumps. The supply and return air fans can be controlled by inverter based on pressure, flow-rate, speed or air quality requirements. The control software can manage temperature or humidity as the priority, control an adiabatic or isothermal humidifier, freecooling/freeheating based on enthalpy and humidity recovery using a heat wheel. The possibility to integrate adiabatic humidifiers into temperature control (with direct evaporative cooling - DEC, and indirect evaporative cooling - IEC) means the desired conditions can be reached extremely effectively and efficiently. The commissioning procedure is based on the documented design of the air handling unit being controlled: the inputs and outputs can be assigned dynamically, meaning there is no fixed position for the various types of probes/actuators connected, with the software proposing the first position available for the type of input/output (e.g. a certain input can accept a passive NTC probe or active probe with 0 to 1 V or 4 to 20 mA output). The identification of the type of AHU being controlled is not based on the choice between a certain number of pre-configured units; rather the selection of the devices installed on the AHU (e.g. preheating / cooling / reheating coils, fans, pumps, inverter, heaters, dampers, humidifiers, heat recovery unit) and then setting their parameters. This simplifies configuration, as the user only sees the parameters relating to the components used. Changes can be made subsequently to the configuration without needing to start again from scratch.

1.1 Main features

- Parameter settings divided by level, user, installer or manufacturer, with password-protected access;
- temperature and/or humidity control with differentiated set point in cooling and heating;
- automatic cooling/heating changeover;
- set point compensation in cooling and heating;
- selection of up to four daily time bands, with settings for each operating mode;
- holiday and special day function, with reduced set point;
- cascaded control of heating / cooling devices so as to maximise energy saving;
- operation in comfort, precomfort or economy mode, if time bands are enabled;
- management of pumps, including in tandem, for preheating cooling/ reheating coils, with rotation, backup, overload alarms and anti-blocking for each pump;
- minimum water temperature limit settable for opening the coil valves;
- dehumidification by cooling (also with dew point, or specific humidity set point control) and reheating coil;
- bands for activating the preheating and reheating devices can be overlapped to supplement each other;
- ON/OFF or modulating control of isothermal or adiabatic humidifiers;
- "freecooling" and "freeheating" based on temperature or enthalpy;
- management of adiabatic humidifiers for direct (DEC) and indirect evaporative cooling (IEC);
- heat recovery with cross-flow heat recovery unit, run-around coil or heat wheel, based on temperature or enthalpy;
- fan control by inverter based on pressure, flow-rate, speed or air quality requirements;
- management of fans, including in tandem, with rotation and backup functions;
- air quality control with CO2 and VOC (volatile organic compounds) probes;
- safety protectors for antifreeze, dirty filters, smoke/fire, no air or water flow, humidifier alarm, inverter alarm, open door alarm;
- unit antifreeze and room protection;
- up to 4 independent auxiliary control loops, each with its own PI control and control probe (for example to manage a second humidifier);
- input/output test to check correctness of wiring during installation;
- connection via FieldBus port to serial probes, inverters, pCOe expansion card;
- connection via BMS port to supervisor (PlantVisorPRO, PlantWatch…), sending the values read by four probes.

1.2 Accessories available for FLSTDMAHUE

Below is a list of devices suitable for use with FLSTDMAHUE. CAREL features passive, active and serial temperature, humidity and differential pressure probes, for room or duct installation, specifically for the air handling unit appliance. See the CAREL price list for the complete list.

Room temperature and humidity sensor

(Technical leaflet +050001240)

Temperature sensors

P/N	Type	Range
DPWT011000	NTC	-10T60°C
DPWT010000	0…1 V, 4…20 mA	
DPWT014000	RS485 serial opto	

Temperature and humidity sensors

P/N	Type	Range
DPWC112000	0…10 V, 0…10 V	-10T60°C,10…90% RH
DPWC115000	NTC, 0…10V	
DPWC110000	0…1 V, 4…20 mA	
DPWC114000	RS485 serial opto	
DPWC111000	NTC, 0…1V, 4…20mA	
DPPC112000	0…10 V, 0…10 V	-10T60°C,10…90% RH
DPPC110000	0…1 V, 4…20mA	
DPPC111000	NTC, 0…1 V, 4…20mA	

Duct temperature and humidity sensor

(Technical leaflet +050001245)

Temperature sensors

P/N	Type	Range
DPDT011000	NTC	-20T70°C
DPDT010000	0…1 V, 4…20 mA	
DPDT014000	RS485 serial opto	-20T60°C

Temperature and humidity sensors

P/N	Type	Range
DPDC112000	0…10 V, 0…10 V	-10T60°C, 10…90% RH
DPDC110000	0…1 V, 4…20 mA	
DPDC111000	NTC, 0…1V, 4…20mA	
DPDC114000	RS485 serial opto	

Outdoor sensors
(Technical leaflet +050001790)

P/N	Type	Range
DPUT011000	Temperature	-50T90°C, resistive output NTC 10kΩ@25°C
DPUC110000	Temperature	-35T80°C, resistive output NTC 10kΩ@25°C & 4-20 mA
	Humidity	10 to 90 RH, 4 to 20 mA output

NTC temperature sensors
(Manual +030220655)

P/N	Type	Range
NTC*HP*	10 kΩ±1%@25 °C, IP67	-50…105/50°C (air / fluid)
NTC*WF*	10 kΩ±1%@25 °C (Fast), IP67	-50…105°C (fast)
NTC*WHP*	10 kΩ±1%@25 °C, IP68	-50…105°C
NTC*HF*	10 kΩ±1%@25 °C,strap-on, IP67	-50…~~90°C~~ 105°C
NTC*WS*	10 kΩ±1%@25 °C, IP67	-40…105°C

PT1000 temperature sensors
(Manual +030220655)

P/N	Type	Range
PT1*HP*	IP67	-50…105/50°C (air/ fluid)
PT1*WF*	IP67	-50…105°C
PT1*WP*	IP67	-50…105°C
PT1*HT*	IP67	-50…250°C
PT1*HF*	IP67, strap on	-50…105°C

Room air quality sensors
(Technical leaflet +050001300)

DPWQ* DPDQ*

CO_2 Sensors

P/N	Range	Output
DPWQ402000	0…2000 ppm	0…10 V
DPDQ402000	0…2000 ppm	0…10 V

CO_2 and VOC Sensors

P/N	Range		Output
	CO_2	VOC	
DPWQ502000	0…2000 ppm	0…100 %	0…10 V, 0…10 V
DPDQ502000	0…2000 ppm	0…100 %	0…10 V, 0…10 V

Differential air pressure sensors
(Technical leaflet +050000651)

P/N	Range	Output
SPKD00U5N0	0...1000 Pa; 0...2500 Pa; 0...3000 Pa; 0...5000 Pa	4...20 mA
SPKD00C5N0	-50...+50 Pa; -100...+100 Pa; 0...+50 Pa; 0...+100 Pa	4...20 mA

Differential air pressure switches/flow switches
(Technical leaflet +050000645/ +050000647)

Pressure switches

P/N	Range	Output
DCPD000100	0.5…5 mbar	ON/OFF
DCPD001100	0.2…2 mbar	ON/OFF

Flow switches

P/N	Range	Output
DCFL000100	1…9 m/s	ON/OFF

Smoke and fire sensors
(Technical leaflet +050000520)

P/N	Type	Output
SFFS000000	Smoke detector, 24 Vdc PS	ON/OFF
SFFF000000	Fire detector, 24 Vdc PS	ON/OFF

USB /RS485 converter code CVSTDUTLF0/ CVSTDUMOR0
(Technical leaflet +050000590)

CVSTDUTLFO CVSTDUMOR0

The USB/RS485 converter code CVSTDUTLF0 is used to connect a personal computer running the pCO Manager program to the pLAN port (J10) on the pCO controller, via a telephone connector. Alternatively, the CVSTDUMOR0 converter can be connected to other ports (figure).

Once the connection has been made, the application program software can be loaded and the parameters set. See chapters "Software installation" and "Appendix".

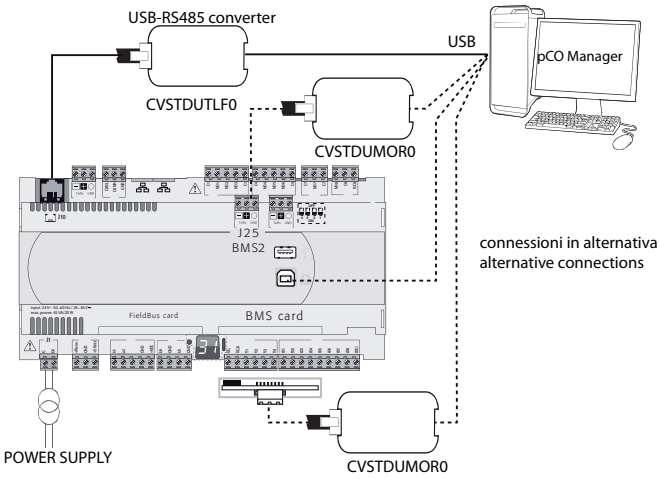


Fig. 1.a

Smart key cod. pCOS00AKY0

(Technical leaflet +050003420 / +050003410)

Smart key

PCOS00AKC0

The Smart key is an electronic device used to program and service the pCO family controllers. It simplifies the transfer of data between the controllers installed and a personal computer by exploiting the high capacity flash memory for storing software applications, BIOS and variable logs. The pCO is connected directly via the telephone connector using the cable supplied, while to transfer the data to a personal computer, the USB adapter code PCOS00AKC0 is required. The power supply comes either via the USB port on the PC or from the controller, therefore no external power supply is needed.

Optically-isolated fieldbus RS485 card code PCO100FD10

(Technical leaflet +050003270)

This card is used to connect the Fieldbus serial port on the pCO to an RS485 network. It is installed in the slot marked "field card", when needing to connect serial probes, CAREL VFD inverters or pCOe expansion cards.

Belimo MP-BUS card code PCO100MPB0

(Technical leaflet +050003270)

This card connects the pCO to an MP-Bus network of I/O devices that use the Belimo® standard. Up to 8 actuators can be connected at the same time, over a maximum distance of 30 m. It is installed in the slot marked "field card"..

BMS 485/Modbus card code PCOS004850

(Technical leaflet +050003237)

This optically-isolated card connects the BMS serial port to an RS485 network, for example to run the commissioning procedure from a personal computer installed with pCO Manager. It is installed in the slot marked "serial card". Once commissioning has been completed, it can be replaced with one of the cards listed in the table.

BMS cards	Code
Ethernet card	PCO1000WB0
BACnet MS/TP 485 card	PCO1000BA0
Konnex	PCOS00KXB0
LON	PCO10000F0

pGD1 terminal

(Technical leaflet +050001050)

The pGD1 graphic display is an electronic device that allows graphics management using the icon-based display as well as supporting international fonts.

pLDPRO terminal

(Technical leaflet +050001840)

The pLDPRO graphic display is an electronic device that allows the complete graphics management through the use of icons and international fonts. The terminal offers a wide range of operating temperatures (-20T60 °C) and the front panel guarantees a high degree of protection (IP65).

VFD inverter

(Technical leaflet +050001230)

CAREL VFD inverters are available in various sizes for controlling fans at constant pressure or fixed speed. See "Connecting the VFD inverter".

pCOe expansion card

(Technical leaflet +050003265)

The expansion card code PCOE004850 is an electronic device, part of the pCO sistema family, designed to increase the number of inputs and outputs available on pCO controllers.

Belimo® actuators

The MP- Bus card can be used to control up to 8 Belimo® valve and damper actuators, each where necessary with their probe or digital input, meaning significant savings in wiring required during installation.

2. COMMUNICATION PORTS

2.1 Serial ports

See the pCO5+ manual +0300020EN for the hardware features of the serial ports. The FLSTDMAHUE software manages the protocols shown in the table on the specified serial ports.

Serial	Type/ Connectors	Protocol
Serial ZERO	pLAN/J10, J11	pLAN
Serial ONE	BMS 1 Serial card	Extended Modbus CAREL RS485 WinLoad
Serial TWO	FieldBus 1 Serial card	MP- Bus Belimo Modbus Master
Serial THREE	BMS 2 / J25	Extended Modbus CAREL RS485 WinLoad
Serial FOUR	FieldBus 2 / J26 (and J23 on Large and Extralarge version)	Modbus Master

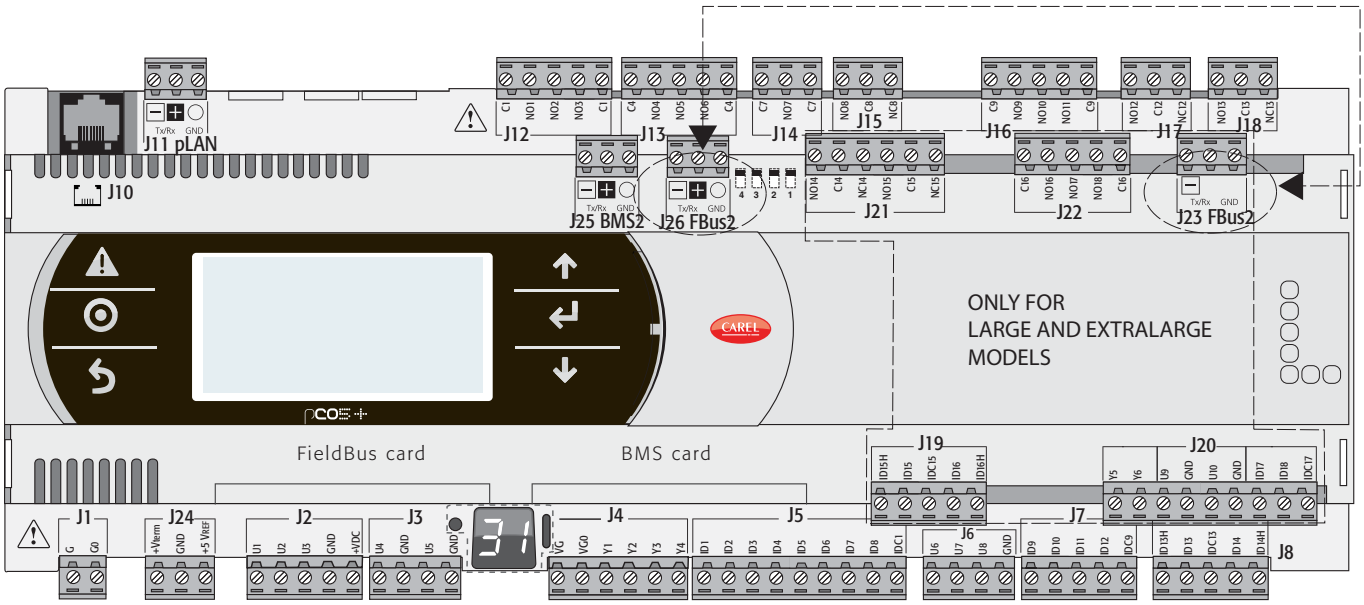


Fig. 2.b

3. HARDWARE INSTALLATION

3.1 DIN rail assembly and dimensions

pCO5+

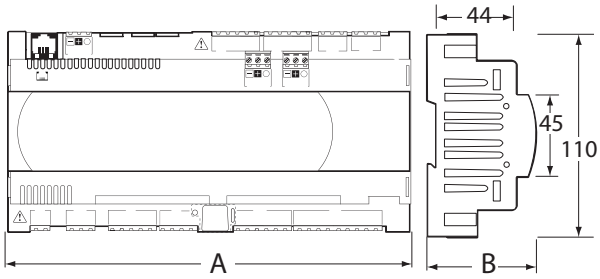


Fig. 3.a

pGD1

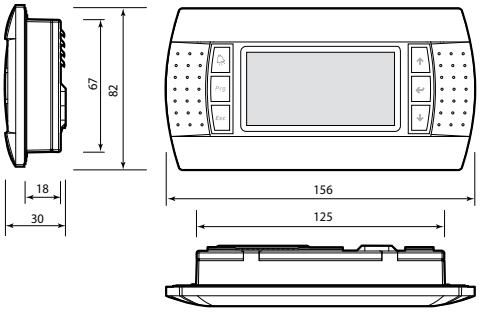


Fig. 3.b

	SMALL	MEDIUM	LARGE
A (mm)	227,5	315	315
B (mm)	60	60	60
B (with USB port/built-in terminal)	70	70	70

3.2 Description of the terminals on the pCO Large

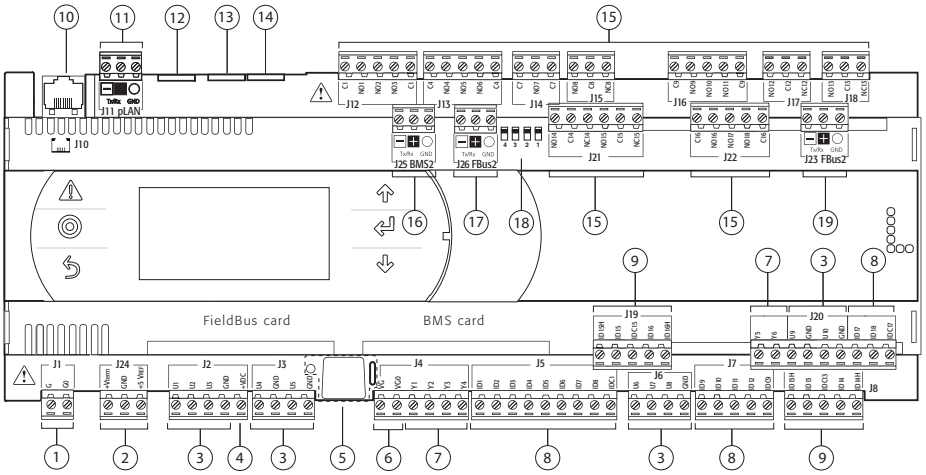


Fig. 3.c

Key

1	power supply connector	G(+), G0(-)
2	additional terminal power supply power supply for ratiometric probes	+Vterm +5 VREF
3	universal analogue inputs, NTC, PT1000, 0 to 1 V, 0 to 10 V, 4 to 20 mA	U1, U2, U3, GND, +VDC e U6, U7, U8, GND e U9, U10, GND
4	power supply for active probes	+VDC
5	button for setting pLAN address, secondary display, LED	
6	power supply at voltage A (*) for opto-isolated analogue output	VG, VG0
7	analogue outputs	Y1, Y2, Y3, Y4, Y5, Y6
8	ID...: digital inputs for voltage A (*)	ID1, ID2, ID3, ID4, ID5, ID6, ID7, ID8, IDC1, e ID9, ID10, ID11, ID12, IDC9 e ID17, ID18, IDC17
9	ID...: digital inputs for voltage A (*); IDH...: digital inputs for voltage B (**)	ID13H,ID13, IDC13, ID14, ID14H e ID15H, ID15, IDC15, ID16, ID16H
10	pLAN telephone connector for terminal/downloading application	
11	pLAN plug-in connector	Rx-/Tx-, Rx+/Tx+, GND
12	reserved	
13	reserved	
14	reserved	
15	Relay digital outputs	C1, NO1, NO2, NO3, C1 e C4, NO4, NO5, NO6, C4 e C7, NO7, C7 e NO8, C8, NC8 e C9, N09, N10, NO11, C9 e NO12, C12, NC12 e NO13, C13, NC13 e NO14, C14, NC14, NO15, C15, NC15 e C16, NO16, NO17, NO18, C16
16	BMS2 port	Rx-/Tx-, Rx+/Tx+, GND
17	FieldBus2 port	Rx-/Tx-, Rx+/Tx+, GND
18	jumper for selecting FieldBus/BMS	
19	FieldBus2 port	Rx-/Tx-, Rx+/Tx+, GND
(*) Voltage A: 24 Vac or 28 to 36 Vdc (**) Voltage B: 230 Vac - 50/60 Hz		

Tab. 3.a

Models and features	pCO5+SMALL	pCO5+MEDIUM	pCO5+LARGE	pCOe (expansion card)
No. of analogue inputs	5	8	10	4
No. of digital inputs	8	14	18	4
No. of analogue outputs	4	4	6	1
No. of digital outputs	8	13	18	4

3.3 Installation

Installation instructions

Important:

Environmental conditions

Avoid assembling the pCO5+ board and the terminal in rooms with the following characteristics:

- temperature and humidity that do not conform to the rated operating data of the product;
- strong vibrations or knocks;
- exposure to aggressive and polluting atmospheres(e.g.: sulphur and ammonia fumes, saline mist, smoke) so as to avoid corrosion and/or oxidation;
- strong magnetic and/or radio frequency interference (therefore avoid installing the units near transmitting antennae);
- exposure of the pCO5+ board to direct sunlight and to the elements in general;
- large and rapid fluctuations in the room temperature;
- environments where explosives or mixes of flammable gases are present;
- exposure to dust (formation of corrosive patina with possible oxidation and reduction of insulation).

Positioning inside the panel

The position of the controller in the electrical cabinet must be chosen so as to guarantee correct physical separation from the power components (solenoids, contactors, actuators, inverters, ...) and the connected cables. Proximity to such devices/cables may create random malfunctions that are not immediately evident. The structure of the panel must allow the correct flow of cooling air.

Important:

Wiring instructions

Important: when laying the wiring, "physically " separate the power part from the control part. The proximity of these two sets of wires will, in most cases, cause problems of induced disturbance or, over time, malfunctions or damage to the components. The ideal solution is to house these two circuits in two separate cabinets. Sometimes this is not possible, and therefore the power part and the control part must be installed in two separate areas inside the same panel. For the control signals, it is recommended to use shielded cables with twisted wires. If the control cables have to cross over the power cables, the intersections must be as near as possible to 90 degrees, always avoiding running the control cables parallel to the power cables. CAREL highlights the following warnings:

- use cable ends suitable for the corresponding terminals. Loosen each screw and insert the cable ends, then tighten the screws. When the operation is completed, slightly tug the cables to check they are sufficiently tight;
- separate as much as possible the sensor signal, digital input and serial line cables from the cables carrying inductive loads and power cables to avoid possible electromagnetic disturbance. Never insert power cables (including the electrical cables) and probe signal cables in the same conduits. Do not install the sensor cables in the immediate vicinity of power devices (contactors, circuit breakers or similar);
- reduce the path of the sensor cables as much as possible, and avoid spiral paths that enclose power devices;
- avoid touching or nearly touching the electronic components fitted on the boards to avoid electrostatic discharges (extremely damaging) from the operator to the components;
- do not secure the cables to the terminals by pressing the screwdriver with excessive force, to avoid damaging the pCO5+ controller;
- for applications subject to considerable vibrations (1.5 mm pk-pk 10/55 Hz), secure the cables connected to the pCO5+ around 3 cm from the connectors using clamps;
- if the product is installed in industrial environments (application of the EN 61000-6-2 standard) the length of the connections must be less than 30 m;
- all the extra low voltage connections (analogue and 24 Vac/Vdc digital inputs, analogue outputs, serial bus connections, power supplies) must have reinforced or double insulation from the mains network;
- in residential environments, the connection cable between the pCO5+ controller and the terminal must be shielded;
- there is no limit to the number of cables that can be connected to an individual terminal. The only limitation concerns the maximum current crossing each terminal: this must not exceed 8 A;
- the maximum cross-section of the cable that connected to a terminal is 2.5 mm2 (12 AWG);
- the maximum value of the twisting torque to tighten the screw on the terminal (torque tightening) is 0.6 Nm;
- installation must be performed according to the standards and legislation in force in the country where the device is used;
- for safety reasons the equipment must be housed inside an electrical panel, so that the only accessible part is the display and the keypad;
- in the event of malfunctions, do not attempt to repair the device, but rather contact the CAREL service centre.

Anchoring the pCO5+ board

The pCO5+ is installed on a DIN rail. To fasten the unit to the DIN rail, press it lightly against the rail. The rear tabs will click into place, locking the unit in place. Removing the unit is just as simple, using a screwdriver through the release slot to lever and lift the tabs. These are kept in the locked position by springs.

Power supply

Power supply t the pCO5+3 board (co controller with terminal connected): 2828 to 36 Vdc +10/-20% or 24 Vac +10/-15% 50 / 60 Hz; Maximum power P= 15 W (power supply Vdc), P= 40 VA (Vac).

- power supply other than that specified will seriously damage the system;
- a Class 2 safety transformer, rating 50 VA, must be used in the installation to supply just one pCO5+ controller (30 VA for PCO5+1XSE);
- the power supply to the pCO5+ controller and terminal (or pCO5+ controllers and terminals) should be separated from the power supply to the other electrical devices (contactors and other electromechanical components) inside the electrical panel;
- if the power transformer secondary is earthed, check that the earth wire is connected to terminal G0. This applies to all the devices connected to the pCO5+;
- if more than one pCO5+ board is connected in a pLAN network, make sure that the G and G0 references are observed (G0 must be maintained for all boards);
- a yellow LED indicates that the pCO5+ board is powered.

3.4 Connection of the analogue inputs

Note: FLSTDMAHUE filters the type of analogue inputs according to the type of unit selected. The analogue inputs on the pCO5+ board can be configured for the more common sensors on the market: NTC, PT1000, 0 to 1 V, 0 to 10 V, 4 to 20 mA. The different types of probes can be selected by setting the inputs on the screens in menu Hb: I/O configuration. See chapter 7.

Connecting active temperature and humidity probes

The pCO5+ controller can be connected to all the CAREL DP* series active temperature and humidity probes configured as 0 to 1 V or as 4 to 20 mA. For the temperature probes use the 4 to 20 mA or NTC configuration, as the 0 to 1 Vdc signal is limited to the range 0 to 1 V and therefore is not always compatible with the standard 10 mV/°C signal of CAREL probes (for negative temperatures and temperatures above 100 °C a probe alarm may be generated). The inputs must be pre-configured on the screens in menu Hb:

I/O Configuration

Terminals		
pCO	Probe terminal	Description
GND	M	Reference
+Vdc	+G	Power supply
U1,U2,U3,U6, U7,U8	out H	Active humidity output
	out T	Active temperature output

Note: for connection of the serial probes see chapter 7.

Connecting the NTC/PT1000 temperature probes

The analogue inputs are compatible with 2-wire NTC/PT1000 sensors.
The inputs must be pre-configured on the screens in menu Hb:
I/O Configuration.

Terminals	NTC
pCO5+	probe wire
GND;	1
U1,U2,U3,U4,U5,U6,U7,U8,U9,U10	2

Connecting the pressure probes with current signal

The pCO can be connected to CAREL SPKT**** series active differential pressure probes or any pressure probe available on the market with 4 to 20 mA signal. The inputs must be pre-configured on the screens in menu Hb: I/O Configuration.

Controller	pCO terminals	Probe
pCO5+	+Vdc	power supply
	U1,U2,U3,U6,U7,U8	signal

Connecting the active probes with 0 to 10 V output

The inputs must be pre-configured on the screens in menu Hb:
I/O Configuration.

Terminals pCO	0…10V probe wire
GND	Reference
U1,U2,U3,U6,U7,U8	signal

Remote connection of analogue inputs

The sizes of the cables for the remote connection of the analogue inputs are shown in the following table:

Type of input	size (mm^2) for length up to 50 m	size (mm^2) for length up to 100 m
NTC	0.5	1.0
PT1000	0.75	1.5
I (current)	0.25	0.5
V (voltage)	1.5	not recommended

Note: If the product is installed in industrial environments (application of the EN 61000-6-2 standard) the length of the connections must be less than 30 m. This length shouldn't be exceeded in any case, to avoid measurement errors.

3.5 Connecting the digital inputs

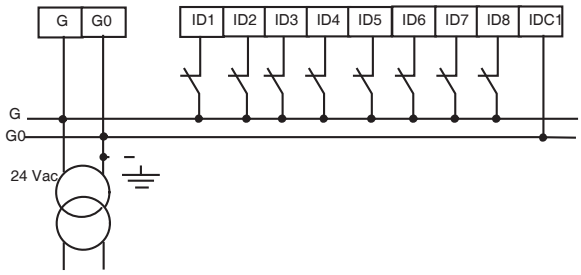
The pCO controller features digital inputs for connection to safety devices, alarms, device status and remote enabling signals. These inputs are all optically isolated from the other terminals, and can work at 24 Vac (+10/-15%) or 28 to 36 Vdc (-20/+10%), indicated as ID*, and some at 230 Vac (indicated as IDH*).

Note:
- if the digital inputs are connected to safety systems (alarms), the presence of voltage across the contact should be taken as the normal operating condition, while no voltage represents an alarm situation. This will ensure that any interruption (or disconnection) of the input will also be signalled;
- do not connect the neutral in place of an open digital input; always interrupt the phase.

Important: separate as much as possible the probe signal and digital input cables from the inductive load and power cables, to avoid possible electromagnetic disturbance. Never run power cables (including the electrical panel cables) and probe signal cables in the same conduits.

24 Vac digital inputs

The following figure illustrates one of the most common connection diagrams.



Note: the connection diagrams shown in these figures, which while being the most common and convenient, do not exclude the possibility of powering the digital inputs independently from the power supply to the pCO5+ board. In any case, the inputs only have functional insulation from the rest of the controller..

24 Vdc digital inputs

All inputs can be 24Vdc.
The following figure represents one of the most common connection diagrams for 24 Vdc digital inputs.

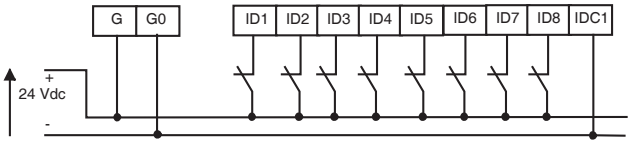


Fig. 3.d

230 Vac digital inputs

There are up to two groups of inputs powered at 230 Vac; each group has two inputs. The groups feature double insulation between them and can refer to different voltages. Within each group the digital inputs are not independent, however: for example the inputs ID13H and ID14H, due to the common terminal, must be powered at the same voltage to avoid dangerous short-circuits and/or the powering of lower-voltage circuits at 230 Vac. In any case, the inputs feature reinforced insulation from the rest of the controller.

	input
pCO5+ terminals	ID13H, ID14H, ID15H, ID16H

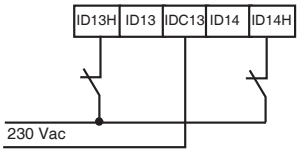


Fig. 3.e

Note:
- The range of uncertainty of the switching threshold is from 43 to 90 Vac.
- the voltage must be 230 Vac (+10/-15%), 50/60 Hz.

Remote connection of digital inputs

Important: do not connect other devices to the digital inputs. The sizes of the cables for the remote connection of the digital inputs are shown in the following table:

size (mm^2) for length up to 50 m	size (mm^2) for length up to 100 m
0,25	0,5

Note: if the product is installed in industrial environments (application of the EN 61000-6-2 standard) the length of the connections must be less than 30 m. This length shouldn't be exceeded in any case, to avoid measurement errors.

3.6 Connecting the analogue outputs

Connecting the 0 to 10 V analogue outputs

The pCO controller features optically-isolated 0 to 10 V analogue outputs, to be powered externally at the same voltage as the controller, 24 Vac or 38-36Vdc. The table below summarises the distribution of the analogue outputs according to the versions available.

Model	Terminals	Reference
pCO small	Y1, Y2, Y3, Y4	VG0
pCO medium	Y1, Y2, Y3, Y4	VG0
pCO large	Y1, Y2, Y3, Y4,Y5, Y6	VG0

3.7 Connecting the digital outputs

The pCO5+ controller features digital outputs with electromechanical relays. For ease of installation, the common terminals of some of the relays have been grouped together.

Electromechanical relay digital outputs

The relays have been grouped together, depending on the insulation distance. Within a group, the relays have functional insulation from one another and thus must be powered at the same voltage (generally 24 Vac or 110/230 Vac). Between groups, on the other hand, there is reinforced insulation and thus the groups can be powered at different voltages. In any case, there is basic insulation between each digital output terminal and the rest of the controller.

Model	Relays with same insulation			
	Group 1	Group 2	Group 3	Group 4
small	1…3	4…6	7	8
Type of relay	Type A	Type A	Type A	Type A
medium	1…3	4…6	7	8
Type of relay	Type A	Type A	Type A	Type A
large NO	1…3	4…6	7	8
Type of relay	Type A	Type A	Type A	Type A

Model	Relays with same insulation				
	Group 5	Group 6	Group 7	Group 8	Group 9
small					
Type of relay					
medium	9…11	12	13		
Type of relay	Type A	Type A	Type A		
large NO	9…11	12	13	14…15	16…18
Type of relay	Type A	Type A	Type A	Type A	Type A

Relay ratings	SPDT, 2000 VA, 250 Vac, 8 A resistive	
Approval	UL60730	2 A resistive, 250 Vac, 30.000 cicli Pilot duty C300, 240 Vac, 30.000 cycles
	EN 60730-1	2(2)A, 250 Vac, 100.000 cycles

Remote connection of digital outputs

The table below shows the cable sizes required for remote connection of digital outputs:

AWG	Cross-section (mm2)	Current (A)
20	0.5	2
15	1.5	6
14	2.5	8

Note: when different relay outputs must be operated consecutively at very close intervals (e.g. star-delta motor starter) in the order of hundreds of ms, use relays belonging to the same group, according to the following table.

Relay groups for consecutive commands (~ 100 ms)

	1	2	3	4 - pCO5+ Large	5
Relay	1, 2, 3, 4	5, 6, 7, 8	9, 10, 11, 12, 13	14, 15, 16, 17, 18	22, 23, 24, 25, 26, 27, 28, 29

Important: using relays that belong to different groups can cause delays in switching.

3.8 Connecting the fan inverter via analogue input

To connect the inverter for fan control to the serial network, see paragraph 7.7. Alternatively, the fan inverter can be connected even if the MP-Bus card is used to control Belimo® actuators. Connect the modulating analogue output on the pCO5+ (e.g. Y4), the alarm signal digital input (e.g. ID2) and the enabling signal digital output (e.g. NO2). The inputs must be pre-configured on the screens in menu Hb: I/O configuration. The figure illustrates the connection to the Carel VFD-NXL; for other inverters, see the corresponding manual.

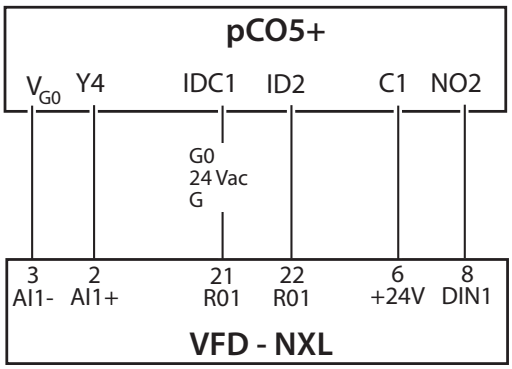


Fig. 3.f

Note: for further details and for the complete connection diagrams, see the dedicated VFD_NXL manual (+030220720) and the programming manual code +030220725.

3.9 Connecting serial devices with Modbus/ Belimo® protocol

See paragraphs 7.6 and 7.8. The serial probes must be installed according to the following diagram, and require the field serial card PCO5+100FD10 to be inserted in the special slot ("Field-Bus"). The power supply must be 24 Vac. To connect Belimo® devices, use card PCO5+100MPB0. The following figure shows two alternative connection possibilities.

3.10 Remote terminal with pLAN network

If the pCO5+ boards are connected in a pLAN network, the terminal can be installed up to 50 m away, using a telephone cable, while if using a shielded twisted pair cable, TCONN6J000 and separate power supply, it can be installed up to 500 m away.

Note: if the terminal is used in a residential environment the cable must always be shielded. The maximum distance between the pCO5+ and the user terminal is shown in the following table:

type of cable	power supply distance	power supply
telephone	50 m	taken from pCO5+ (150 mA)
AWG24 shielded cable	200 m	taken from pCO5+ (150 mA)
AWG20/22 shielded cable	500 m	separate power supply via TCONN6J000

The maximum distance between two pCO5+3 controllers with AWG20/22 shielded cable is 500 m.

Note: for further details and for the connection diagrams, see the pCO5+ sistema manual (+0300020EN).

3.11 Connection diagrams

The following paragraphs show the functional and wiring diagrams for the air handling unit (AHU) managed by the various pCO5+ boards, according to the corresponding default parameters. Where possible, the symbols used refer to the following standards:

- UNI 9511-1;
- UNI 9511-3.

pCO5+ Small

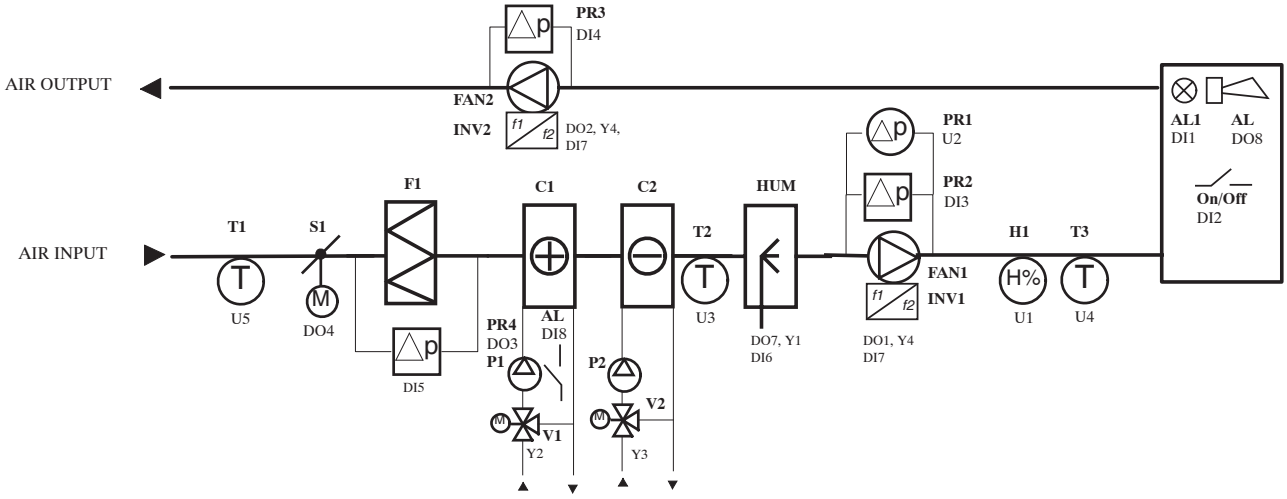


Fig. 3.g

AI	Analogue inputs	AO	Analogue outputs	P1	Preheating coil pump
U1	Supply humidity	Y1	Humidifier	P2	Cooling coil pump
U2	Differential pressure outlet air	Y2	Preheating valve	T	Temperature probe
U3	Frost protection temperature	Y3	Cooling valve	H	Humidity probe
U4	Supply temperature	Y4	Supply fan	INV1	Supply fan inverter
U5	Outside temperature			INV2	Return fan inverter

DI	Digital inputs	DO	Digital outputs	C1	Preheating coil
DI1	Generic alarm	DO1	Supply fan	C2	Cooling coil
DI2	Remote ON/OFF	DO2	Return fan	PR	Differential pressure switch/probe
DI3	Supply air flow alarm	DO3	Preheating pump 1	HUM	Humidifier
DI4	Return air flow alarm	DO4	Outside air damper	F1, F2	Filters
DI5	Supply air filter alarm	DO5	Filter alarm (not indicated)	AL	Generic alarm
DI6	Humidifier alarm	DO7	Humidifier	AL1	Generic alarm
DI7	Supply (return) fan inverter alarm	DO8	Generic alarm	S1	Outside damper
DI8	Preheating pump thermal overload alarm				

Tab. 3.b

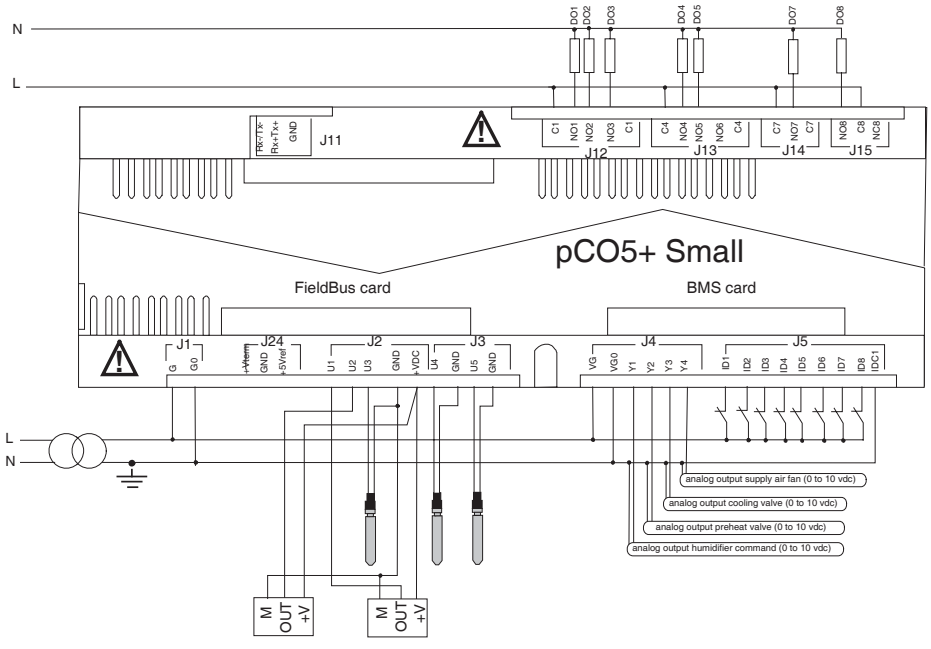


Fig. 3.h

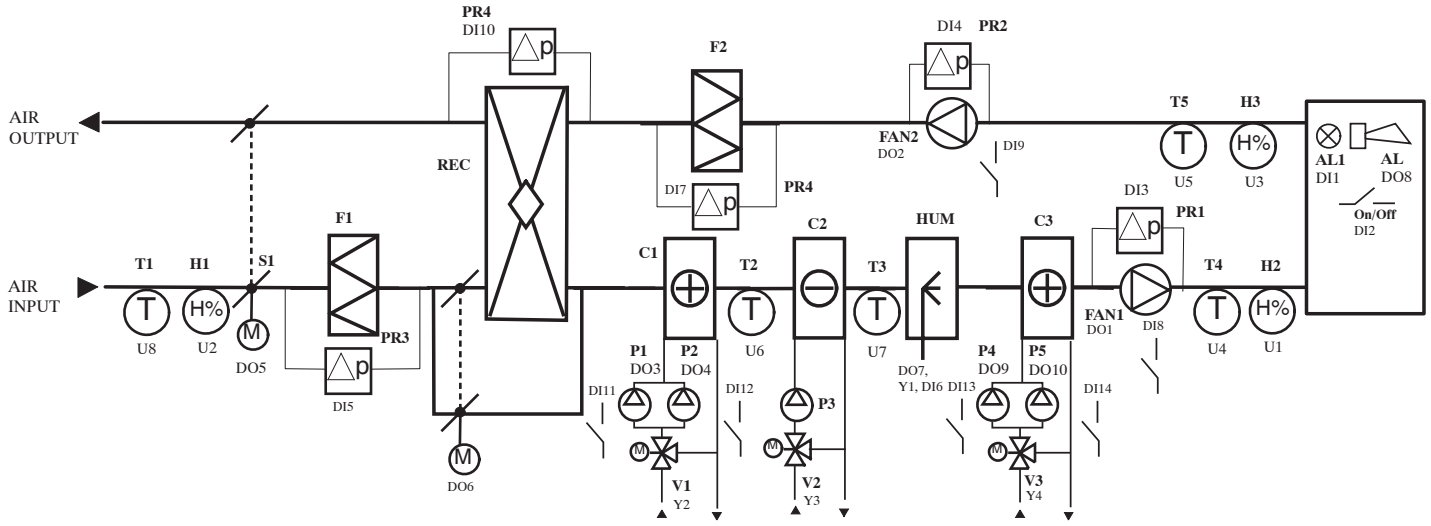


Fig. 3.i

AI	Analogue inputs	AO	Analogue outputs	P1/2	Preheating pump 1/2
U1	Supply humidity	Y1	Humidifier	P3	Cooling pump
U2	Outside humidity	Y2	Preheating valve	T	Temperature probe
U3	Return humidity	Y3	Cooling valve	H	Humidity probe
U4	Supply temperature	Y4	Reheating valve	C1	Preheating coil
U5	Return temperature	DI	Digital inputs	C2	Cooling coil
U6	Frost protection temperature	DI1	Generic alarm	PR	Differential pressure switch/probe
U7	Temperature downstream of coils	DI2	Remote ON/OFF	HUM	Humidifier
U8	Outside temperature	DI3	Supply air flow alarm	F1, F2	Filters
DO	Digital outputs	DI4	Return air flow alarm	AL	Generic alarm
DO1	Supply fan	DI5	Supply air filter alarm	AL1	Generic alarm
DO2	Return fan	DI6	Humidifier alarm	S1	Outside damper
DO3	Preheating pump 1	DI7	Return filter alarm		
DO4	Preheating pump 2	DI8	Supply fan thermal overload alarm		
DO5	Outside air damper	DI9	Return fan thermal overload alarm		
DO6	Bypass damper	DI10	Dirty heat recovery unit alarm		
DO7	Humidifier	DI11	Preheating pump 1 thermal overload alarm		
DO8	Generic alarm	DI12	Preheating pump 2 thermal overload alarm		
DO9	Reheating pump 1	DI13	Reheating pump 1 thermal overload alarm		
DO10	Reheating pump 2	DI14	Reheating pump 2 thermal overload alarm		

Tab. 3.c

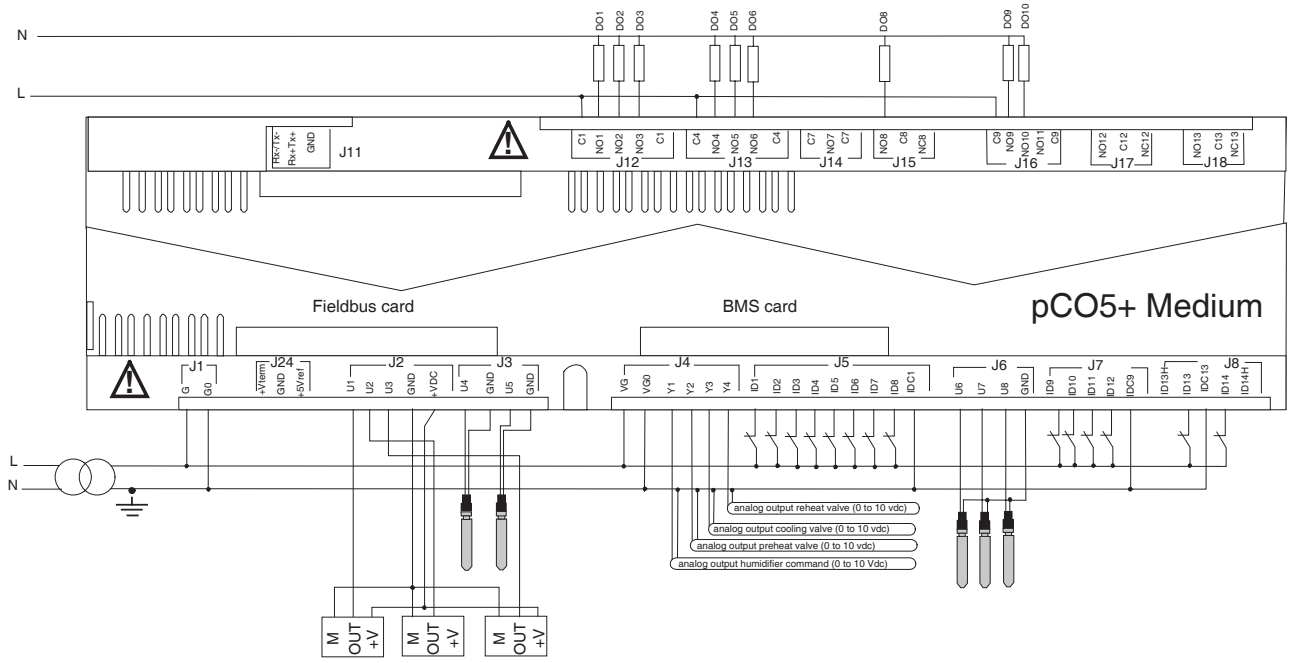


Fig. 3.j

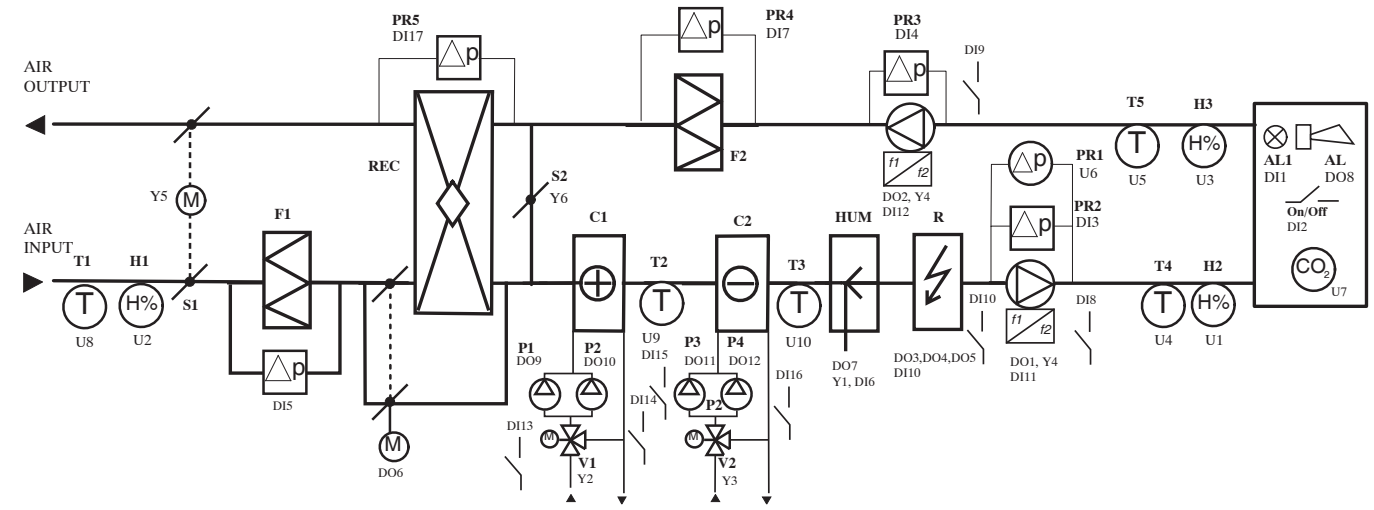


Fig. 3.k

AI	Analogue inputs	**AO**	Analogue outputs	P1…4	Pumps
U1	Supply humidity	Y1	Humidifier	T	Temperature probe
U2	Outside humidity	Y2	Preheating valve	H	Humidity probe
U3	Return humidity	Y3	Cooling valve	C1	Preheating coil
U4	Supply temperature	Y4	Supply fan	C2	Cooling coil
U5	Return temperature	Y5	Outside/exhaust air damper	PR	Differential pressure switch/probe
U6	Differential pressure outlet air	Y6	Mixing damper	HUM	Humidifier
U7	CO2 probe	**DI**	Digital inputs	F1, F2	Filters
U8	Outside temperature	DI1	Generic alarm	AL	Generic alarm
U9	Frost protection temperature	DI2	Remote ON/OFF	AL1	Generic alarm
U10	Temperature downstream of coils	DI3	Supply air flow alarm	S1	Outside/exhaust damper
DO	Digital outputs	DI4	Return air flow alarm	S2	Mixing damper
DO1	Supply fan	DI5	Supply air filter alarm	R	Heater
DO2	Return fan	DI6	Humidifier alarm		
DO3	Reheat heater 1	DI7	Return air filter alarm		
DO4	Reheat heater 2	DI8	Supply fan thermal overload alarm		
DO5	Reheat heater 3	DI9	Return fan thermal overload alarm		
DO6	Bypass damper	DI10	Reheating heater thermal overload alarm		
DO7	Humidifier	DI11	Supply fan inverter alarm		
DO8	Generic alarm	DI12	Return fan inverter alarm		
DO9	Preheating pump 1	DI13	Preheating pump 1 thermal overload alarm		
DO10	Preheating pump 2	DI14	Preheating pump 2 thermal overload alarm		
DO11	Cooling pump 1	DI15	Cooling pump 1 thermal overload alarm		
DO12	Cooling pump 2	DI16	Cooling pump 2 thermal overload alarm		
		DI17	Dirty heat recovery unit alarm		

Tab. 3.d

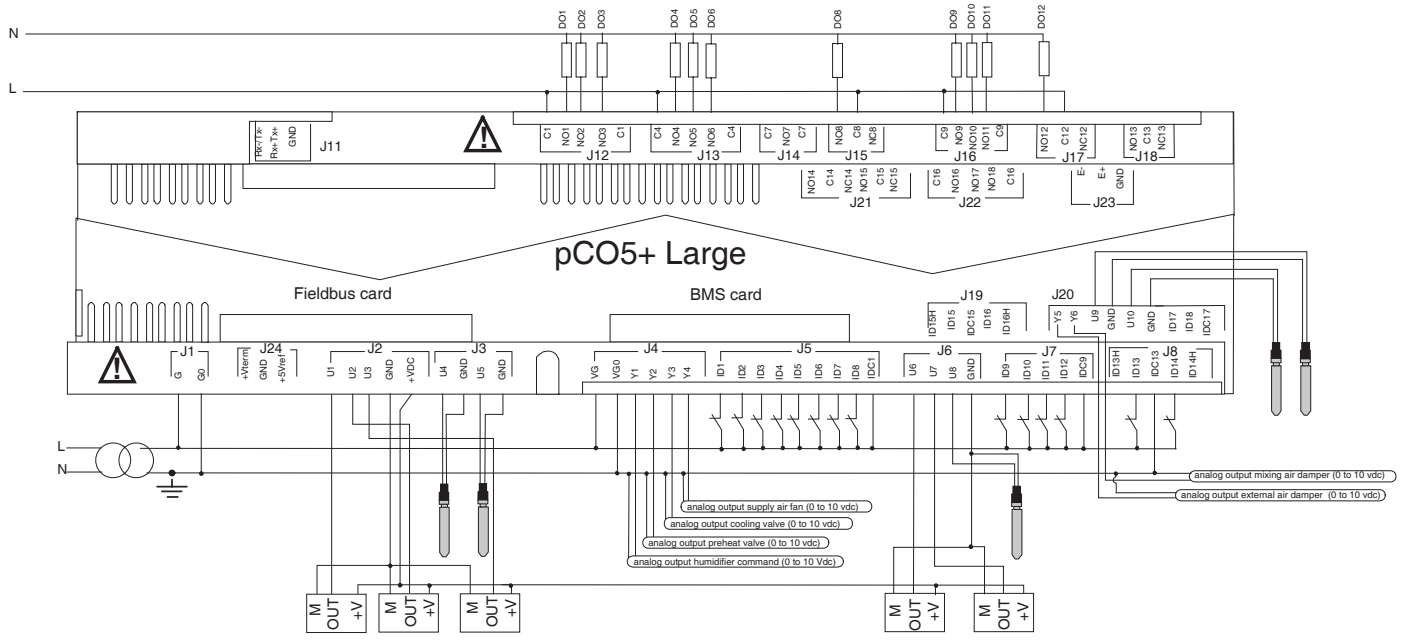


Fig. 3.l

3.12 DEC-IEC functional diagram

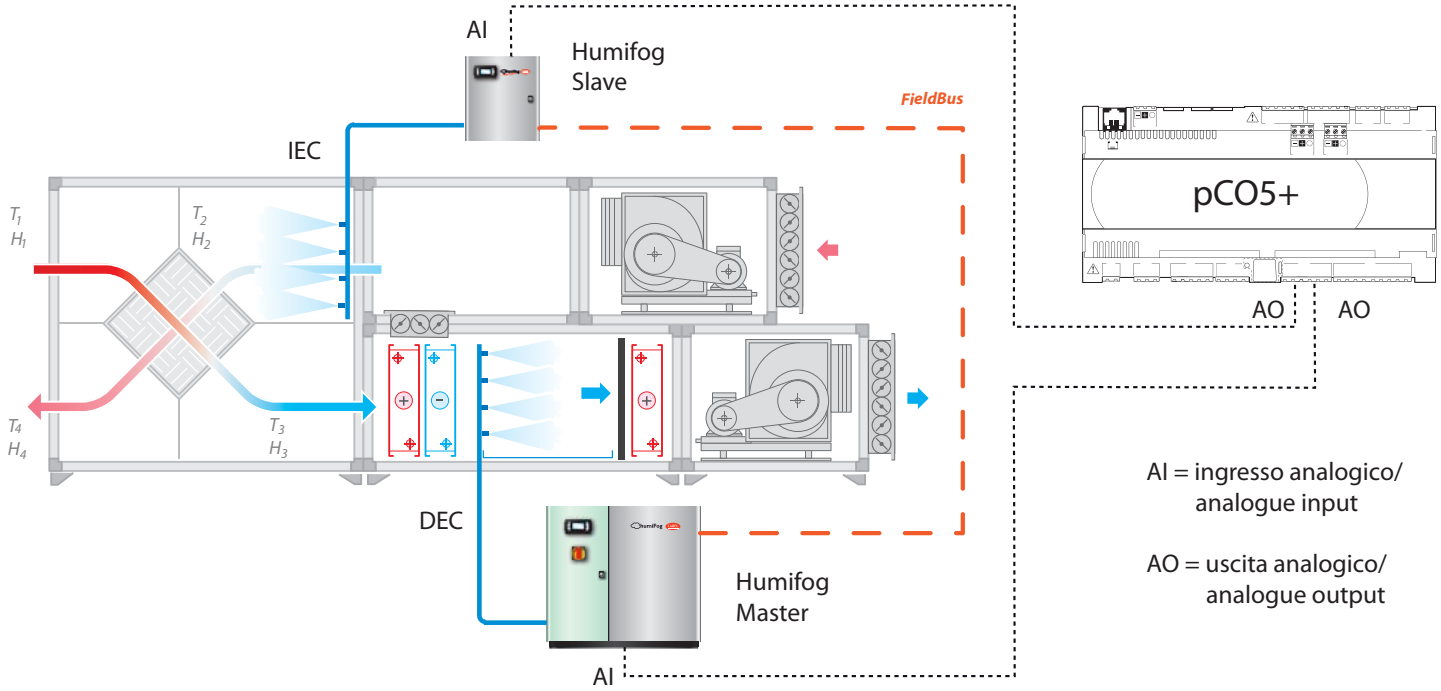


Fig. 3.m

The CAREL HumiFog humidifier in the Master-Slave configuration can manage both direct (DEC) and indirect evaporative cooling evaporative cooling (IEC) at the same time.

Functions available in the application program

1. If enabling a humidifier with On/Off control (screens: Ha01, Ha13), DEC cannot be activated; only the supply humidification function can be activated. DEC requires a humidifier with modulating control;
2. IEC is enabled independently of the humidifier, and only on the analogue output called "IEC".;

Type of adiabatic humidifier enabled		DEC available	IEC available	DEC + IEC available	Humidification enabled	Inputs/Outputs enabled (screen)
On/Off	-->	NO	YES	NO	YES	Hb35: On/Off humidifier, Hb68: IEC
Modulating	-->	YES	YES	YES	YES	Hb57: Humidifier, Hb68: IEC

Tab. 3.e

4. USER INTERFACE

4.1 Graphic terminal

The pGD1 terminal, in the wall or panel-mounted versions, or included with the pCO5+ board (built-in), features the display and the keypad, featuring 6 buttons that, pressed alone or in combination, are used to configure and program the controller.

Fig. 4.a

Button	Description
Alarm	- Display the list of active alarms - Reset alarms with manual reset
Prg	Access the main menu
Esc	Return to previous screen
Up / Down	Scroll screen displayed or increase / decrease value
Enter	- Switch from display to programming parameters - Confirm value and return to the list of parameters

Tab. 4.a

4.2 Display e tastiera

During normal operation, the graphic display shows the time, date and selected unit, two selectable system variables, the active device icon and unit control status.

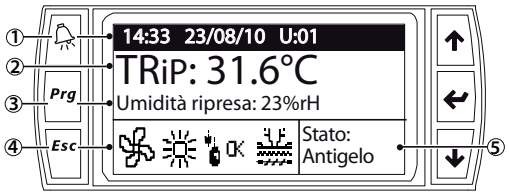


Fig. 4.b

Key

1 Time/date/unit displayed
2 Variable 1 on display
3 Variable 2 on display
4 Active devices
5 Control status

Note:

- the graphic display can be shared across a pLAN network with a maximum of 8 pCO5+ controllers. See screen F. Board switch;
- the variables on the display can be selected on screen Gfc01.

Icone	Descrizione
	At least 1 fan on
OK	No preheating coil/ reheating/ cooling active
OK	Humidifier not active / no dehumidification
	Cooling coil active for cooling
	Cooling coil active for dehumidification
	At least 1 preheating or reheating coil active for heating or frost protection
	Humidifier active
	Frost protection prevention (see "Functions")
	Heat recovery unit active
FC FH	Freecooling or freeheating active

Tab. 4.b

Note: if the unit is in freecooling or freeheating, the OK and OK icons are displayed next to the corresponding icon to indicate that no coil or humidifier is active.

Regulation mode

	Text on display	Unit status
OFF	OFFbyALR	Off due to alarm
	OFFbyBMS	Off from BMS (*)
	OFFdaFSC	Off from time band
	OFFbyDIN	Off from digital input
	OFFbyKEY	Off from keypad
	Wait	Software checks in progress
ON	Unit ON	Unit on
	Manual	Manual actuator override (see Menu Gg)
	Comfort (Autocomfort)	Comfort mode (from time band)
	Pre-Comf (Autoprec)	Pre-comfort mode (from time band)
	Economy (Autoecon)	Economy mode (from time band)
	Protect	Protection mode
	Startup	Start-up phase
	Shutdown	Shutdown phase
	Purging	Purging phase

Tab. 4.c

(*) BMS = Building Management System

4.3 Programming mode

The parameters can be modified using the front keypad. Access differs according to the level: user parameters (accessible without password), Service (password=PW1) and Manufacturer (password = PW2). Press Prg to access the main menu.

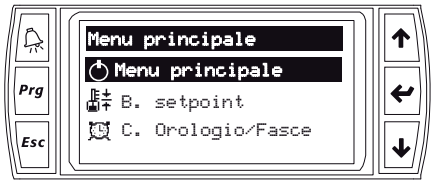


Fig. 4.c

Main menu icons

A.		On/Off unit	E.		Data logger
B.		Setpoint	F.		Board switch
C.		Clock/scheduler	G.		Service
D.		Input/Output	H.		Manufacturer

Tab. 4.d

Nota: the control remembers the last category of parameters accessed and goes directly to this category when next accesses.

Set/display user parameters

The user parameters (A…F) are all the parameters accessible without password, and include the following categories:

A. ON/OFF Unit: set the ways the unit is switched ON and OFF;
B. Setpoint: display the current temperature and humidity set points (B01), set the temperature and humidity set point for cooling and heating modes;
C. Clock/scheduler: set the current time and date (C01), the daily time bands (C02) with weekly programming, holiday periods (C03), special days (C04), days when daylight saving starts and ends (C05);
D. Input/output: display the inputs and outputs, indicating the position of the terminals based on the markings screen printed on the pCO5+ boards and the values measured by the probes (D01 to D29);
E. Data logger: display up to 50 alarms with progressive numbering, activation time and date, supply and return recorded;
F. Board switch: the terminal can be shared by up to 8 pCO5+ controllers.

Browsing

1. press Esc one or more times to move to the standard display;
2. press Prg to enter the main menu tree;
3. select the category of parameters (A…H) with Up / Down;
4. press Enter to enter the first screen: the cursor flashes at the top left: press Down to move to the following screen (e.g. B01→B02);

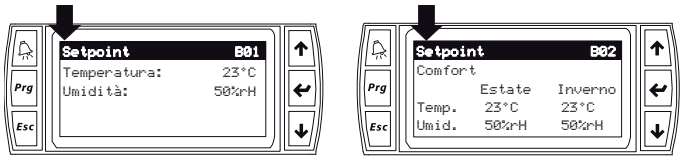


Fig. 4.d

5. press Enter to set the first parameter on the screen: the cursor flashes in front of the value being set; press ↑ / ↓ to change the value and confirm by pressing Enter. This moves automatically to the next parameter.

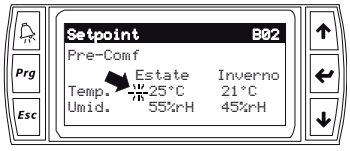


Fig. 4.e

6. press Up/ Down and Enter to set this parameter or Enter to move to the next parameter;
7. once having concluded the settings for the parameters on the screen, press Enter to access the screen, Esc to move to the higher level and continue settings parameters on other screens, following steps 3 to 7.

Note: modifiable text values are shown on the display in UPPER CASE.

EXAMPLE 1: Setting the current time/date.

1. press Esc one or more times to move to the standard display;
2. press Prg: the display shows the main menu;
3. press UP/DOWN to move to category C. Clock/scheduler;
4. press Enter to display the first screen: C01;
5. press Enter to modify the current time using UP/DOWN;
6. confirm by pressing Enter and move to the minutes;
7. repeat steps 5 and 6 three times to modify the date (day / month / year);
8. press Esc to exit the parameter setting procedure.

Fig. 4.f

EXAMPLE 2: Setting the time bands.

1. press Esc one or more times to move to the standard display;
2. press Prg: the display shows the main menu;
3. press UP/DOWN to move to category C. Clock/scheduler;
4. press Enter and UP/DOWN to display the second screen C02: "Enable bands" and choose "YES";
5. choose the day of the week, the time each band starts (F1, F2, F3, F4) and the corresponding operating mode;
6. if necessary copy the settings from one day to another.

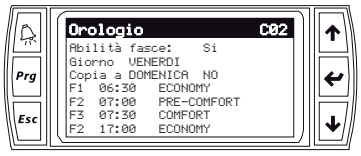


Fig. 4.g

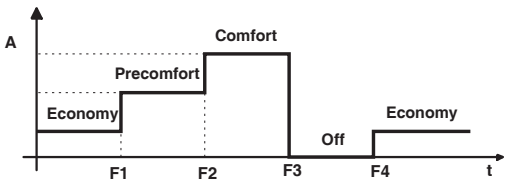


Fig. 4.h

Note:

- set the set point for the Comfort, Precomfort and Economy operating modes on screens B02, B03, B04 respectively;
- a different air flow-rate can be set for each time band. See the "Functions" chapter.

Setting the Service parameters

The Service parameters (letter G) concern:

1. parameters modifiable without password:
   a. Change language;
   b. Information: application, BIOS and BOOT version;
   c. Summer/winter: summer/winter changeover mode (keypad, digital input, BMS, auto, water temperature);
   d. Working hours: read device operating hours;
2. parameters accessible with password PW1 **(default =1234)**;
   e. BMS configuration: choose the BMS communication protocol (CAREL, LON, Modbus), communication speed (baud rate), network address and activate commissioning service (Ge03);
   f. Service settings: include device operating hour settings, probe calibration, temperature control and change password (PW1);
   g. Manual management: procedure for manually activating the devices so as to prepare for commissioning.

Procedure: The setting/display procedure is similar to the one for the user parameters, however password PW1 must be entered to access category G parameters.

Note:

- if no button is pressed, after around 5 min the display automatically returns to standard mode;
- the service password PW1 can be changed on screen Gfd03;
- once entered, the password remains active for a certain time, after which it needs to be entered again.

Setting the Manufacturer parameters

The Manufacturer parameters (letter H) are only accessible after entering **password PW2 (default =1234),** and concern:

a. Selection and configuration of the devices on the AHU;
b. I/O configuration: configuration of inputs and outputs, in other words assignment of the position of the probes (e.g. supply, return, room temperature), digital inputs (e.g. remote ON/OFF, summer/winter changeover, alarms), digital outputs (e.g. fans, pumps, heaters) and analogue outputs (e.g. fans, dampers, humidifier);
c. Factory settings: setting of temperature and humidity control probes, minimum and maximum limits for opening the dampers, fan activation delay, coil activation delay on unit startup, travel times of three position valves, temperature limits for activation of preheating, reheating and cooling coils, delay time for activation of alarms and inverter (VFD) configuration parameters for the supply and return fan. See the chapters on commissioning and description of the functions.

Procedure: The setting/display procedure is similar to the one for the user parameters, however password PW2 must be entered to access category H parameters.

Important: the Manufacturer parameters can only be modified when the controller is OFF.

Note:

- the manufacturer password PW2 can be changed on screen Hd03;
- entering the manufacturer password PW2 also allows access to the parameters protected by service password PW1.

5. MENU DESCRIPTION

Press the **Prg** button to access the main menu. Select the category of parameters using UP/ DOWN and confirm by pressing Enter. If the password is required, enter each figure using the i ↑/↓ buttons and confirm by pressing Enter. After a certain time, if no button is pressed, the password will need to be entered again.

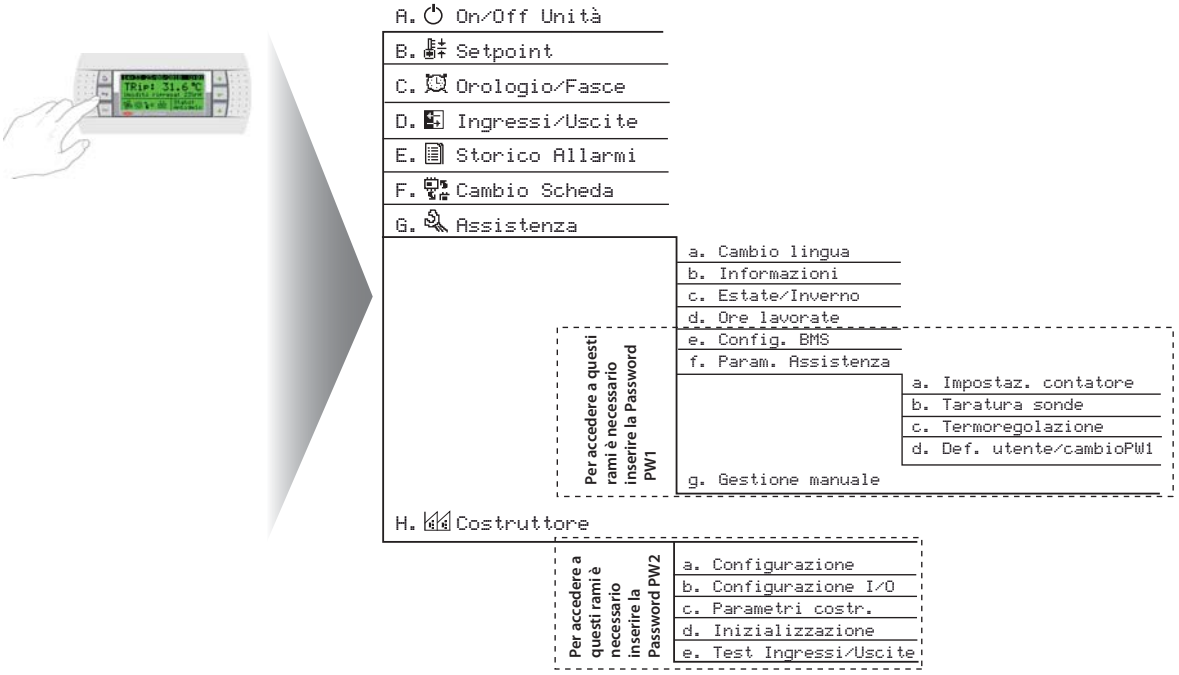


Fig. 5.a

5.1 A. On/Off Unit

There are two possible cases:

- if time bands are disabled (C.Clock/scheduler ➔ C02.Enable scheduler), the unit can only be switched on from the keypad in Comfort mode. The temperature and humidity set points defined for this mode will then be used indefinitely for control. (B.Setpoint ➔ B02.Comfort);
- if time bands are enabled, the unit will be able to follow the time band settings if "Auto" is selected (A.On/Off Unit ➔ A01.Auto). On the display, in the special area, the operating mode will be determined by the time band setting (C02) and preceded by the prefix "Auto". If a different operating mode is selected, the unit switches to manual mode.

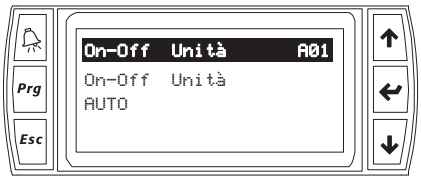


Fig. 5.b

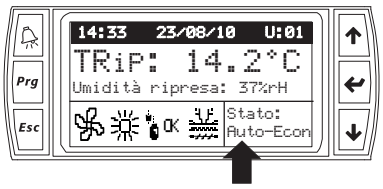


Fig. 5.c

Note: see the "Functions" chapter for the complete description of the On/Off function.

Manual mode

If time bands are enabled (C.Clock/scheduler ➔ C02.Enable scheduler), and the unit is started from the keypad (A01.On/Off Unit), the following operating modes can be selected:

1. Auto: see previous paragraph;
2. Manual mode: the unit is forced to operate in one of the available operating modes (OFF, Economy, Pre-comfort, Comfort), for a time ranging from 30 minutes to 8 hours. Automatic operation can resume after this period by enabling reset (A.On/Off Unit ➔ Enable auto-resume). Naturally the temperature and humidity set points must have previously been set in the corresponding menu (B02.Setpoint➔Comfort; B03. Setpoint➔Pre-comfort; B04.Setpoint➔Economy).

The display shows the operating mode in the relevant area, e.g. Comfort..

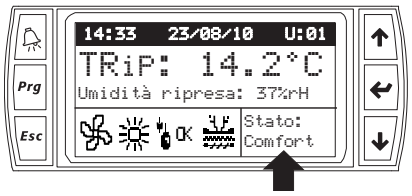


Fig. 5.d

5.2 B. Setpoint

The first screen B01 displays the current temperature and humidity set points. The temperature set point displayed considers any set point compensation function operating (see the "Functions" chapter). If time bands are enabled (C: Clock/scheduler ➔ C02: Enable scheduler), different temperature and humidity set points can be set for Economy, Pre-comfort and Comfort modes (B: Setpoint ➔Comfort, Pre-comf, Economy) according to the season, summer or winter. In total, then, 6 temperature set points and 6 humidity set points can be set (screens B02, B03, B04). If time bands are not enabled, only the set point for comfort mode can be set.

Economy mode is used to set a reduced set point (e.g. night-time), for lower energy consumption, and the unit can be switched from Comfort to Economy mode via a digital input, if enabled (screen Ha18); Pre-comfort mode is half-way between Economy and Comfort.

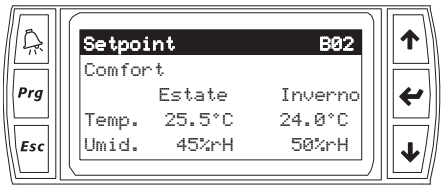


Fig. 5.e

5.3 C. Clock/Scheduler

The following values can be set:

- current time and date;

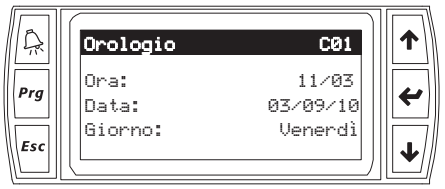


Fig. 5.f

- enable and program the time bands. The time bands are programmed on a weekly basis, with four time bands available for each day of the week, starting from times F1, F2, F3, F4. Each time band can be assigned an operating mode, choosing between OFF, Economy, Pre-Comfort and Comfort. The settings can be copied from one day to another;

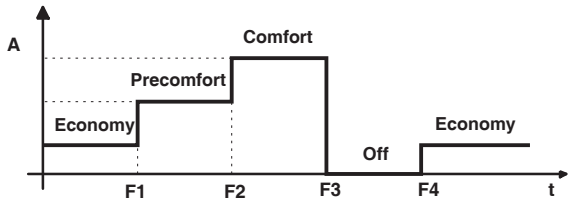


Fig. 5.g

Key:

F1…F4	Start time band 1 to 4	time
A	Operating mode	

Note: the set points can be set independently for each operating modes;

- holidays: three holiday periods can be set, with start and end sate and operating mode (Economy, Pre-comfort, Comfort).

Fig. 5.h

- special days: up to six special days can be selected, defining the operating mode;

Note: the "auto" option involves normal operation based on the time band settings.

Fig. 5.i

- enable daylight saving, selecting the start and end date and time for the period. A transition time can be set, between 0 and 240 minutes.

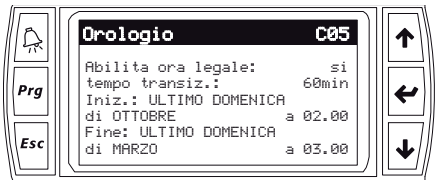


Fig. 5.j

Note: if the set point from digital input is enabled (screens Ha18 and Hb24: dual set point), the input can be used to switch from Comfort to Economy mode. In this case, screens C02, C03, C04 for programming the time bands, holidays and special days are no longer available.

5.4 D. Input/Output

Note: after configuring the software (see the corresponding chapter) menu D is used to see what inputs and outputs have been configured.
The first row on the screens in menu D indicates the type, input or output, analogue or digital, to make browsing simpler.

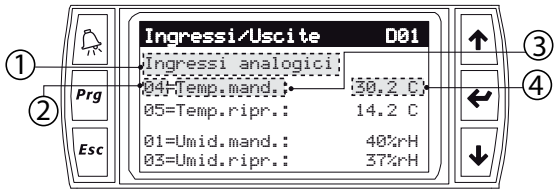


Fig. 5.k

1	Type of input	3	Description of the input
2	Terminal number on board	4	Value measured

- analogue inputs: temperature, humidity, differential pressure and air quality probes.
- digital inputs: status of pressure switches/flow switches connected to the supply and return filters (open/closed), flow switches connected to supply and return air fans, safety thermostats for pumps/fans, heaters, alarms on the inverter connected to the supply/return air fan, dirty heat recovery unit alarm, remote On/Off controls, change season summer/winter;

Fig. 5.l

- display % air quality request and purge request;
- digital outputs: activate/deactivate the supply/return air fan, defrost heater, heat recovery unit, humidifier, generic alarm, bypass damper, reheating heaters, pumps;

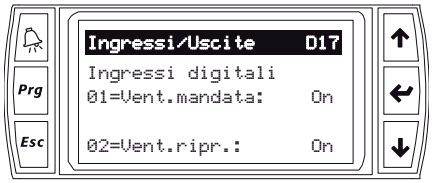


Fig. 5.m

Note: the status of the digital input (ON/OFF) also depends on whether its configured as normally open (NO) or normally closed (NC) in menu Hb

- analogue outputs: control signals for modulating actuators, supply/return air fan, dampers, humidifier, valves. See the list of parameters.

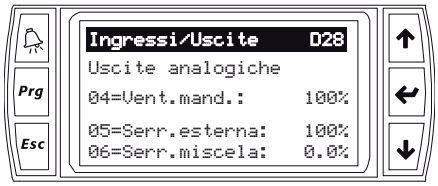


Fig. 5.n

Important: the menu D only shows the inputs/outputs that have been enabled, i.e. position ≠ 0 assigned in menu Hb. See paragraph 7.3

5.5 E. Data logger

From the main menu (E.) the logged alarms can be displayed in sequence: the alarm is saved with its number in the log, the time, date, code, description and the supply (TS) and return (TR) temperature measured when the alarm was activated; to cancel the alarms, access the Service menu with password (G.Service ➔f.Service settings➔d.User service/Change PW1 ➔ Delete data logger). The "Alarm" button, on the other hand, is used to mute the buzzer (if fitted), display currently active alarms and reset them (obviously these remain in the log) and at the end of the list go directly to the data logger.

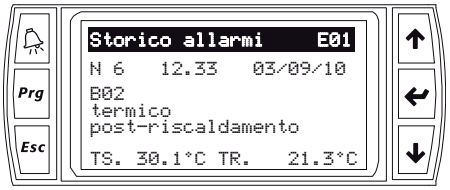


Fig. 5.o

Note:

- also see the chapter on alarms;
- the alarm log cannot be accessed directly by pressing the alarm button .

5.6 F. Board switch

The main menu (F.) displays the graph of controllers connected in the pLAN network. To switch from one controller to another, scroll to the "go to unit" field and enter the address of the unit to connect to: as soon as the connection has been established, the address is shown in the "unit address" field and on the graph.

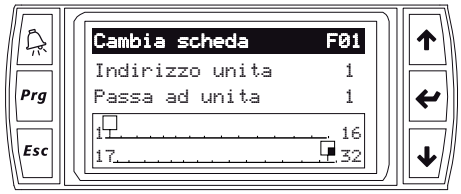


Fig. 5.p

5.7 G. Service

The main menu (G.) provides access to a submenu divided into two parts:

- FIRST PART (a, b, c, d): is not password-protected and can be used to display and set the following:

- G.a. Change language: select one of the languages loaded in the application program (Italian, English…) and then on the following screen enable language selection when starting;
- G.b. Information: information relating to the application code (and version), on the first screen available, while the second shows the information concerning the pCO board hardware.

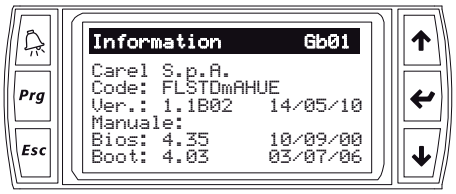


Fig. 5.q

- G.c. Summer/Winter: the season can be selected via:
  - Keypad: the following screen is used to select the current season: summer or winter;
  - Digital input: summer/winter changeover depends on a previously configured digital input (Hb24);
  - BMS: season changeover is managed by the supervisor;
  - Keypad/BMS: the season changeover control is the most recent between keypad or BMS;
  - AUTO: if "FIX DAYS" is selected on the following screen, the start summer and start winter dates can be set, while if on the other hand AUTO is selected, as well as the start summer and start winter dates temperature thresholds can be set to change season automatically. See paragraph 8.7;
- G.d. Working hours: displays the operating hours of the main devices on the AHU (fans, humidifier, pumps, heaters) that may require periodical maintenance.

- SECOND PART (e, f, g): from this point on in the submenu, password PW1 must be entered to browse the screens.

- G.e. BMS configuration: this section is used to set all the parameters required for connection to a supervisory system, such as the protocol, communication speed and address. The BMS offline alarm can be enabled to signal communication failures during operation, and finally the commissioning service can be activated, requiring connection to a computer running the pCO5+ manager program.
- G.f.a. Working hour set: used to set the operating hour threshold for the main devices on the unit: fans, humidifier, pumps and heaters. When the operating hours are exceeded a "warning" is shown that must be reset by accessing this screen. See the chapter on alarms.
- G.f.b. Probe adjustment: used to set an offset to add too or subtract from the probe reading in question (temperature, humidity, differential pressure, air quality). Once having confirmed the offset value (Cal), pressing automatically updates the value of the corresponding probe (shown to the side)
- G.f.c. Thermoregulation: this branch includes all the parameters relating to temperature control and that can be modified during installation or service, except for the manufacturer parameters, which are located in branch H.c;
  - Main mask information: these are the two variables available on the standard display;
  - Temperature/humidity limits set: these are the minimum and maximum limits for setting the corresponding set points (B.Setpoint➔B02. Comfort, B03.Pre-comfort, B04.Economy) in Economy, Pre-comfort and Comfort modes, both summer and winter;
  - For the explanation of the following screens relating to the control algorithms, see the "Functions" chapter.

- G.f.d. User service/change PW1: this is used to:
  - load the unit configuration saved (H.Manufacturer➔d.Initialization ➔01.Save configuration) at the end of the software configuration procedure (see chapter 7);
  - delete the alarm log;
  - change the Service password (PW1);
- G.g. Manual management: is used to switch the individual devices on the unit from automatic to manual. For the digital outputs the options are ON (100%) or OFF (0%), while for analogue outputs the possibilities vary from 0 to 100%. This selection bypasses control, but not the alarm thresholds, so as to safeguard unit safety; in general, this operation is used to test the individual actuators during commissioning (see chapter 7).

Note: if a device is managed manually, the control status on the display is "manual".

5.8 H. Manufacturer

The main menu (H.) provides access to the manufacturer submenu, after entering the corresponding password PW2.

Ha: Configuration

The configuration is the first step in defining the type of air handling unit. Unlike other software that allows selection of a preloaded model that comes closest to the actual one, then making any slight changes required, this application program uses the following identification procedure:

1. hard copy drawing of the air handling unit;
2. choice of the type of actuators installed on the unit in the configuration menu.

Note: below is a brief description of the menu: the detailed software configuration procedure is described in chap. 7.

Ha01:
- fan type: supply fan only or supply and return air fans; in the latter case an activation delay can be set for the return fan after the supply fan (Hc06);
- coil type: none, cool+pre+reheat, cool, heat, cool + preheat; cool + reheat, heating/cooling, heating/cooling + reheat;
- enable humidifier and heat recovery unit;

Note: if the heating/cooling is used, enable the heat / cool output on Hb42 for changeover based on demand and the switching delay set on Hc12;

Ha02:
- damper type: fresh air only (On/Off or modulating), fresh air+mixing, fresh air+mixing+exhaust, fresh air (modulating) +exhaust;
- enable freecooling and freeheating by temperature or enthalpy;
- enable air quality control;

Ha03:
- select the type of fan control: see paragraph 9.20;

Ha04: type of fan alarms: see paragraph 9.1;

Ha05: select preheating device:
- modulating valve: control with 0 to 10 Vdc input: once selected, a minimum value > 0 V and a maximum value <10 V can be set;
- floating valve: the floating valve motor travel time needs to be defined (Hc08): 1 to 3200 s;
- heaters: see paragraph 8.13;
- select probe used for humidification: paragraph 9.4;

Ha06: select cooling device:
- modulating valve;
- floating valve: the floating valve motor travel time needs to be defined (Hc08): 1 to 3200 s;
- direct expansion: from 1 to 3 steps can be selected. The demand managed by the steps is divided into equal parts based on the number of steps selected. On the cooling cascade screen (Gfc20) set the % of demand managed by freecooling (if enabled) and the remaining % managed by the cooling coil;
- type of dehumidification: see paragraph 9.4.

Ha07: type of heating/cooling coil:
- modulating valve;
- floating valve;
- steps: similar to direct expansion described for Ha06.

Ha08:
- select reheating device: see the selection of the preheating device;
- select function of reheating coil:
  1. compensation: this involves heating the air after having dehumidified it using the cooling (reheating) coil or after having humidified the air using the adiabatic humidifier;
  2. integration: in heating cascade control, the reheating coil supplements the preheating coil. The action of the reheating coil and the preheating coil may overlap (Gfc22);
  3. compensation +integration: both functions are performed.

Ha09: enable coil pumps and water flow control alarms.
See paragraph 9.17;

Ha10/Ha11/Ha12: cooling / preheating / reheating coil pumps. See paragraph 9.17;

Ha13: type of humidifier: see paragraph 9.4.

Ha14: enable and select type of heat recovery unit: see paragraph 8.10.

Note: assign the analogue/digital outputs to the actuators in the I/O configuration menu. Also set the maximum and minimum values for the modulating bypass damper.

Ha15: air quality and enable purging. See paragraph 9.21.

Ha16: frost protection. See paragraph 9.23.

Ha17: ON/OFF from digital input and BMS. See paragraph 9.1.

Ha18: setpoint from digital input. See paragraph 9.2.

Ha19: setpoint offset by analogue input. See paragraph 9.2.

Ha20, Ha21, Ha22, Ha23: auxiliary regulation loops. See paragraph 9.24.

Ha24: Protocols. Protocols can be set:
a) for the BMS serial
- Winload: the Winload protocol must be selected in order to activate the Commissioning service, i.e. for setting the parameters from pCO5+ Manager. The RS485/USB converter code CVSTDUMOR0 and RS485 serial interface (PCO5+S004850) are required;
- BMS: select between the boards listed in chapter 1.

b) for the Fbus serial:
- Belimo: see paragraph 6.8.
- Modbus master: connect the optically-isolated RS485 card (code PCO5+100FD10).

Ha25: Modbus master settings
Set the parameters for the Modbus master protocol:
- Baudrate or transmission speed: 1200/2400/4800/9600/19200 bit/s;
- Stop bits: 1 or 2;
- Parity: even or no;
- Timeout: 100 to 5000 ms: this is the time after which if communication is interrupted the device offline error is shown: serial probe or VFD (Variable Frequency Drive = inverter).

Ha26: Modbus master settings
Number of pCOe expansion cards and serial probes.

Ha30: enable probes and digital inputs from supervisor
See paragraph 6.9.

Ha39… Ha56: screens relating to the VFD Carel inverter
See the Commissioning chapter.

Hb: I/O configuration

See paragraph 7.3.

Hc: Factory settings

See the "Software configuration" and "Functions" chapters.

6. SOFTWARE INSTALATION

The following systems can be used to update and install the FLSTDMAHUE application on the pCO controller board:
- pCO Manager (with Winload communication protocol);
- SmartKey;
- USB pen drive.

6.1 pCO Manager

On all CAREL 16 bit pCO sistema controllers (see the pCO sistema manual) the resident software can be updated using a PC. For this purpose, CAREL provides the pCOLoad program and a serial converter with RS485 output (code CVSTDUTLF0) to be connected to the pCO. The special driver also needs to be installed on the PC, also provided by CAREL. The program is included in the installation of the "1Tool" program suite or with the pCO Manager program, downloadable separately from http://ksa.CAREL.com, under "download support software utilities". The installation, as well as the program, also includes the user manual. The pCO controller can be connected directly to the PC via the RS485 serial port used for the "pLAN" connection or using the BMS2 o BM serial port with optional RS485 serial card used for the "supervisor" or USB port connection (figure).

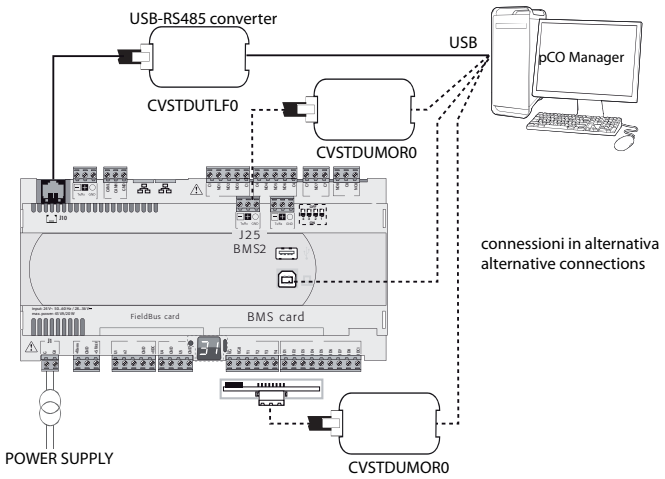


Fig. 6.a

It must be underlined that updating the BOOT Updating the BOOT is generally NOT RECOMMENDED by CAREL; during production CAREL always loads the BOOT required for the correct operation of the unit. Only in very special cases will CAREL ask the user to update the BOOT. The BIOS can only be loaded via the pLAN serial connection. When updating the application and the BIOS, the pCO operating mode switches to low level. In this special mode, the logged data cannot be downloaded to the PC nor can the application be loaded in compressed format. To return the unit to normal communication mode, reset the pCO board. If uploading the BOOT or BIOS files only, the other application files then need to be uploaded again. The consequences of interruption to the upload procedure depend on the instant this occurs. In any case, the upload needs to be repeated. If pCOLoad cannot connect to the pCO, a Smart Key must be used to download the BIOS and any other operating application (e.g.: pCO functional test). This refreshes the pCO memory, allowing connection to pCOLoad.

Commissioning Tool (1tool)

Commissioning tool is configuration and real-time monitoring software used to check the operation of an application installed on a pCO, for commissioning, debugging and maintenance. This tool can be used to set the configuration parameters, set the values of volatile and permanent variables, save the trend in the main values of the unit to a file, manually manage the unit I/Os using a simulation file and monitor/restore the alarms on the unit where the device is installed. The configuration functions available on the commissioning tool allow the designer to decide which variables will be monitored/logged/plotted or monitored by event, to organise the variables into categories, and to choose the set of configuration parameters.

Support files

Following development of the application, 1tool generates various files during compilation; these include two that are required for commissioning:
< *applicationName*>.2CF (descriptive of variables)
<*applicationName*>.2CD (descriptive of categories and access profiles)

As well as these files, the <*applicationName*>.DEV file that contains the pre-defined set of unit parameters can also be managed. When the commissioning procedure is complete, or for configuration or monitoring, the user can generate the following files:
<*applicationName*>.2CW (descriptive of categories, access profiles, monitoring groups)
<*CommissioningLogFileName*>.CSV (commissioning log file, containing the data on the variables recorded during monitoring);

For the configuration phase of the commissioning procedure, the following files must be available: .2CF, 2CD and where necessary .DEV, which can be imported and exported.
For the monitoring phase, as well as the files mentioned above, the .2CW file with the definition of the working environment may be required. The commissioning log file is an output file only.

Connection mode

Each controller has five serial ports (0,1,2,3,4,5), each with its own default protocol:

Port	Default protocol	Description
Serial 0	pLAN	Terminal and pLAN network connection
Serial 1	BMS 1	Supervisor connection
Serial 2	Fieldbus 1	Field device connection
Serial 3	BMS 2	Supervisor connection
Serial 4	Fieldbus 2	Field device connection

Tab. 6.a

There are two modes for commencing local communication between pCO Manager and the controller:
1. Activate the WinLoad protocol on the required port;
2. On BMS only, irrespective of the protocol set on the pCO, simply connect pCO Manager and from "Connection settings" select SearchDevice = Auto (BMS). In this case it will take around 15-20 seconds to go online.

Memory limits

The periodical monitoring of the application variables is limited to a maximum of 250 WORDS, freely selectable from the entire memory available to the application. The virtualisation of application variables is limited to a maximum of 50 WORDS, selectable from the entire memory available to the application. There are no address limits for "one-shot" read/write of individual variables: all memory addresses reserved for the application in all types of memory available on the pCO can be used: X memory, T memory, P memory, E memory.

Note: for further details on installing and updating the software on the pCO controller, see the online help for the pCO Manager program.

6.2 SmartKey

The SMARTKEY programming key is used to emulate the operation of the parallel programming key on pCO models where this is not available (pCO3), with the exception of the BOOT, which is not loaded by the SMARTKEY. Specifically, the key can clone the contents of one pCO and then download the data to another identical pCO via the terminal telephone connector (the pLAN must be disconnected).
This function is obviously available for all pCO controllers, even those with parallel key. In addition to this mode, the key can transfer the data logged on a series of pCO devices and download them to the PC. From the PC, using the "SMARTKEY PROGRAMMER", the key can be configured to run certain operations: retrieve logs, program applications, program BIOS, etc. For further details see the online help for the "SMARTKEY PROGRAMMER" and the SMARTKEY instruction sheet.

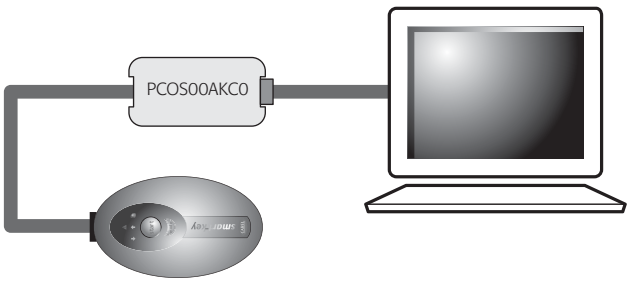


Fig. 6.b

Note: for further details on installing and updating the software on the pCO controller, see the online help for the pCO Manager program.

6.3 USB pen drive

The procedure for loading the SW in the following example is performed using a pCO5 controller+ with built-in display. The procedure loads the "Bios" and application program files.

Bios

The Bios is supplied in ".os" format.

Open the ".os" file using a ".zip" file manager;
Extract the ".bin" file corresponding to the controller the application is being loaded onto (e.g. pCO5+) and move it to the UPLOAD package directory
.

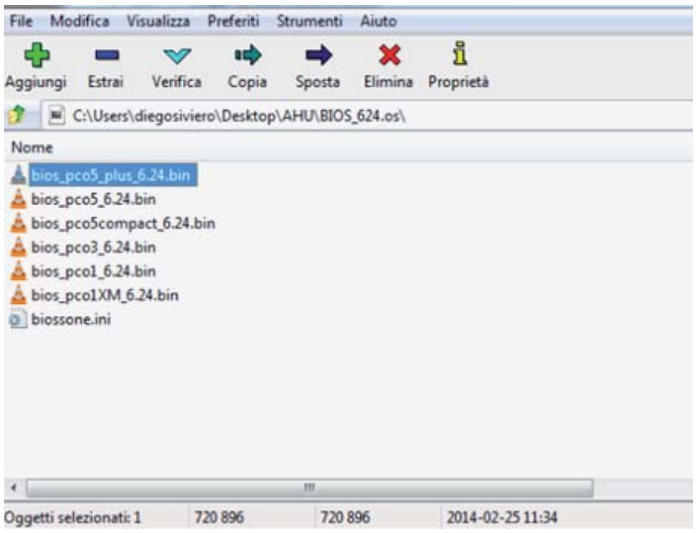


Fig. 6.c

Application program

Load the fields in UPLOAD directory on the USB pen drive, in level 1 "root":

1. FLSTDmAHUE.bin;
1. FLSTDmAHUE.grp;
1. FLSTDmAHUE.dev;
1. one or more *.iup files (depending on how many languages are being loaded).

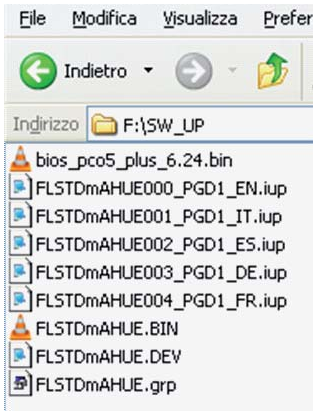


Fig. 6.d

Procedure:

1. Plug the USB pen drive into the Master port;

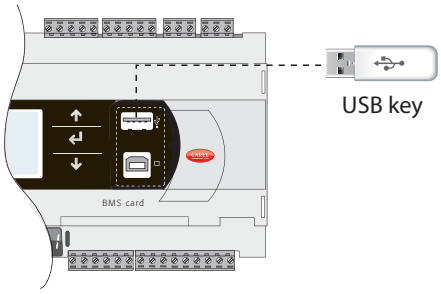
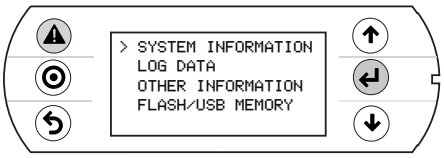
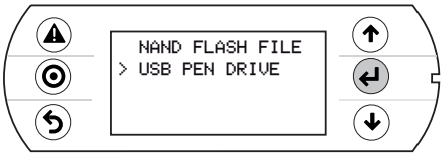


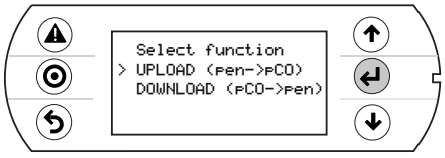
Fig. 6.e

2. Press Alarm and Enter together for 3 seconds to enter the multiple choice menu.

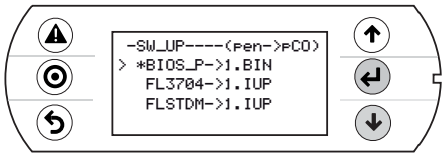


3. Select FLASH/USB memory and confirm by pressing Enter. Select "USB PEN DRIVE" UPLOAD and MANUAL;

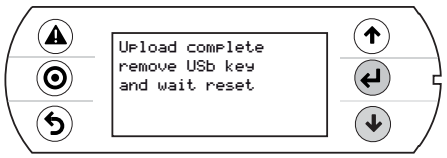




4. A file is selected by pressing Enter when the cursor is positioned on the file name. A selected file is identified by the "*" symbol on the left;

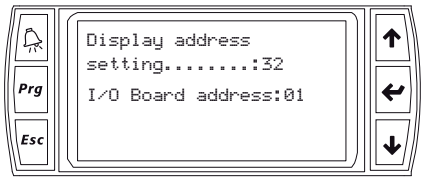


5. Once having selected the files (all in the same directory), start the upload procedure by pressing PRG; at the end, a message will be shown on the display prompting to remove the pen drive, wait and then switch the controller on/off to complete installation.



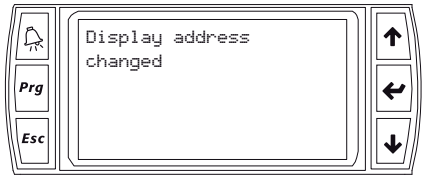
6.4 Setting the terminal address

The address of the terminal can be set in the range from 0 to 32; addresses between 1 and 32 are used by the pLAN protocol, while address 0 identifies the Local terminal protocol, used for non-graphic point-to-point connections and to configure the pCO controller. The default address is 32. The address of the terminal can only be set after having powered the terminal via the RJ12 connector. To access configuration mode press ↑, ↓ and ↵ together for at least 5 seconds; the terminal will display a screen similar to the one shown below, with the cursor flashing in the top left corner::



To modify the address of the terminal ("Display address setting") carry out the following operations in sequence.

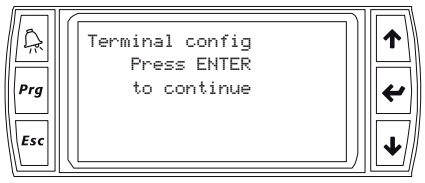
1. Press ↵ once: the cursor will move to the "Display address setting" field;
2. Select the desired value using ↑ nd ↓, and confirm by pressing ↵ again;
3. If the value selected is different from the value saved, the following screen will be displayed and the new value will be saved to the permanent memory on the display.



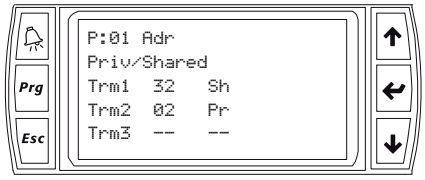
If the address field is set to 0, the terminal communicates with the pCO board using the Local terminal protocol and the "I/O Board address" field disappears, as it no longer has any meaning. To modify the list of the terminals (private and shared) associated with a pCO board, carry out the following operations in sequence:

4. Enter configuration mode (see above) pressing ↑, ↓ and ↵ together for at least 5 seconds.
5. Press ↵ twice: the cursor will move to the "I/O Board address" field.
6. Select the address of the pCO board in question and confirm by pressing ↵.

Then the pCO controller will start the configuration procedure, opening a screen similar to the following.



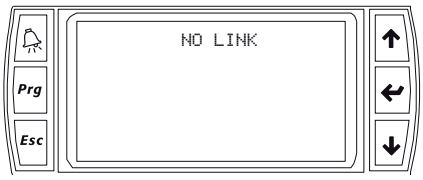
7. Press ↵ again: the configuration screen will be shown, similar to the one below.



8. Configure the terminals as desired. Pressing. ↵ moves the cursor from one field to the next, while ↑ and ↓ change the value of the current field. P:xx represents the address of the selected pCO board (in the example in the figure, this is board 1).
9. To exit the configuration procedure and save the data, select "Ok?", set "Yes" and confirm by pressing ↵. During the configuration procedure, if the terminal remains inactive (no button is pressed) for more than 30 seconds, the pCO board automatically interrupts the procedure without saving any changes.

⚠ Important: if during operation the terminal detects inactivity on the pCO board it is connected to, the display is cancelled and a message similar to the one shown below is displayed.

If the terminal detects inactivity of the entire pLAN network, that is, it does not receive any messages from the network for 10 seconds consecutively, the display is cancelled completely and the following message is shown:



7. SOFTWARE CONFIGURATION

Important: some of the following operations are often carried out during installation, as the devices are connected in the field and configured. The software configuration procedure includes these steps:

1. Select devices (screens Ha01, Ha02);
2. Configure devices (screens Ha03, …, Ha30);
3. Assign inputs/ outputs (menu Hb);
4. Set device control parameters (menu Hc);

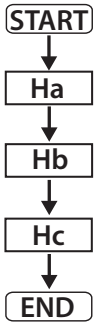


Fig. 7.a

7.1 Select devices (Ha)

Once the application program has been installed and the electrical connections have been completed (see the "Hardware installation" chapter), the operations required for commissioning the controller depend on the type of air handling unit, and involve these steps:

1. Check correspondence between the design AHU - **it's recommended to refer to a complete hard copy drawing** - and the AHU managed by the pCO board with the default parameters. See the "Hardware installation" chapter;

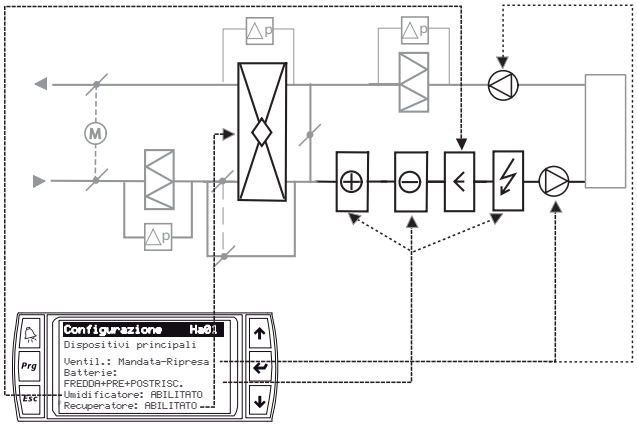


Fig. 7.b

Note: selecting the devices on screens Ha01 and Ha02 defines the AHU and determines which of the following screens or configuration menus for the inputs and outputs (Hb) are displayed.

2. If the design AHU is similar to the default AHU, try adding or removing devices or probes until achieving a complete match;
3. If the design AHU is very different from the unit managed by the default parameters, delete all the configured analogue and digital inputs and outputs. To do this access menu H. Manufacturer ➔b.I/O configuration ➔Hb99. Positions deletes to delete the default configuration and then enter the new configuration;
4. Access menu H. Manufacturer ➔a.Configuration to select:
   - Ha01: the main devices on the AHU (number of fans, number of heating coils, enable humidifier, enable heat recovery unit;
   - Ha02: type of dampers, enable freecooling/freeheating (by temperature/ enthalpy), air quality control…
5. Again in menu H. Manufacturer ➔a.Configuration: configure the type of devices: modulating valve, floating valve, heaters, no. of pumps for each coil, type of air quality control and other functions such as purging, type of frost protection, etc.

See the table of parameters for the list of devices on the "Ha" screens that are displayed according to the selections made on Ha01 and Ha02.

Example: the default configuration of the pCO Large includes a heat recovery unit with bypass damper. If the AHU is designed for an application in which neither freecooling nor the possibility of frost forming on the heat recovery unit are envisaged, this device may not exists and therefore can be excluded, thus freeing an output. Simply access the "Configuration" menu (screen Ha14) and disable the bypass damper.

7.2 Configure devices (Ha)

From screen Ha03 on the selected devices, type of control and corresponding probes are configured. These settings must be coherent both with the electrical connections made and the software loaded on the pCO board during installation.

Ha03):	type of fans: with inverter or on/off control, different types, see par. 9.20;
Ha03a):	on-off dampers on the supply, return and corresponding limit switch;
Ha04):	type of fan alarms: overload and/or of flow;
Ha05):	type of preheating device: floating valve , modulating valve, heaters;
Ha06):	type of cooling device: floating valve , modulating valve, floating valve , direct expansion steps;
Ha07):	type of heating/cooling coil;
Ha08):	type of reheating device: floating valve , modulating valve, heaters;
Ha08):	type of reheating device: floating valve , modulating valve, heaters;
Ha08):	reheating for compensation, supplement, supplement + compensation;
Ha09):	enable pumps for cooling, pre/reheating coils;
Ha13):	type of humidifier: isothermal or adiabatic, ON/OFF or modulating;
Ha13a):	enable direct evaporative cooling - DEC;
Ha14):	type of heat recovery unit: cross-flow, run-around coil or modulating wheel;
Ha14):	bypass damper available;
Ha14a):	enable indirect evaporative cooling - IEC;
Ha15):	air quality control type: P+I or proportional only;
Ha15):	air quality probe type: CO2, VOC, CO2+VOC;
Ha15):	enable purging;
Ha16):	frost protection type: from probe, thermostat, probe+thermostat;
Ha17):	enable unit ON/OFF from digital input or BMS;
Ha18):	enable change set point from comfort to economy from digital input;
Ha19):	enable offset on setpoint from analogue input;
Ha19):	activate auxiliary control loop;
Ha24):	select protocol on Fieldbus serial and BMS serial;
Ha25):	communication speed, parity and timeout for Modbus master protocol;
Ha26):	number of pCOe expansion cards and number of serial probes connected;
Ha29):	configure VFD inverter parameters;
Ha30):	enable probes and digital inputs from supervisor.

7.3 Assign inputs/outputs (Hb)

In the menu H. Manufacturer ➔b.I/O configuration:

1. select the type and position of the analogue and digital inputs and the analogue and digital outputs. For active probes also set the minimum limit attributed to the minimum input value and the maximum limit attributed to the maximum input value;
2. Check the configuration in menu D. Inputs/outputs and the input readings;
3. Test the outputs (He01…) to verify correct wiring and operation of the devices.

Note:

- the controller automatically identifies which terminals are free and automatically proposes the first available positions, according to the type of input (e.g. NTC, PT1000, 0 to 1 V, 0 to 10 V, 4 to 20 mA) based on the hardware features of the pCO board used;
- some screens are only shown if the corresponding device has been enabled and configured.

Important:
- a device is only enabled if the position of the corresponding analogue or digital output is not zero;
- a probe or digital input is only enabled if the position of the corresponding input ≠0, or is selected from the serial probes (T1…T6, H1…H6, A1…A6), probes on the pCOe expansion card (E1…E8) or supervisor probes (S1…S4). See paragraphs 6.5 and 6.6;
- if certain inputs or outputs are not shown on the assignment screens as expected, see the parameters table, which highlights the conditions required for displaying a screen.

Configurable inputs

ANALOGUE		DIGITAL	
Ref.	Description	Ref.	Description
Hb01	Supply temperature	Hb24	Remote On/Off
Hb02	Return temperature	Hb24	Summer/winter
Hb03	Outside temperature	Hb24	Set point from DI
Hb04	Room temperature	Hb25	Generic alarm
Hb05	Supply humidity	Hb25	Serious alarm
Hb06	Return humidity	Hb25	Frost protection alarm
Hb07	Outside humidity	Hb26	Supply filter 1 alarm
Hb08	Room humidity	Hb26	Supply filter 2 alarm
Hb09	Supply diff. pressure	Hb26	Return filter alarm
Hb10	Return diff. pressure	Hb27	Supply flow switch
Hb11	Frost protection temperature	Hb27	Return flow switch
Hb12	Saturation temperature	Hb28	Humidifier alarm
Hb13	CO2 probe	Hb28	Supply inverter alarm
Hb14	VOC probe	Hb28	Return inverter alarm
Hb15	Exhaust temperature	Hb29	Supply fan 1 thermal overload
Hb16	Cooling or heating/cooling coil temperature	Hb29	Supply fan 2 thermal overload
Hb17	Preheating coil temperature	Hb29	Return fan 1 thermal overload
Hb18	Reheating coil temperature	Hb29	Return fan 2 thermal overload
Hb19	Auxiliary probe 1	Hb30	Cooling pump 1 thermal overload
Hb20	Auxiliary probe 2	Hb30	Preheat pump 1 thermal overload
Hb21	Auxiliary probe 3	Hb30	Reheat pump 1 thermal overload
Hb22	Auxiliary probe 4	Hb31	Cooling pump 2 thermal overload
Hb23	Set point offset from AIN	Hb31	Preheat pump 2 thermal overload
Hb34b	Supply/return damper limit switch	Hb31	Reheat pump 2 thermal overload
Hb23b	Temperature after heat recovery	Hb32	Cooling pump flow switch
Hb23c	IEC limit probe	Hb32	Preheat pump flow switch
		Hb32	Reheat pump flow switch
		Hb33	Dirty heat recovery unit alarm
		Hb33	Preheat heater overload
		Hb33	Reheat heater overload
		Hb34	Dirty filter alarm
		Hb34	Door contact open
		Hb34	Smoke-fire alarm
		Hb34a	Fireman override
		Hb34a	Generic signal
		Hb34b	Supply damper limit switch
		Hb34b	Return damper limit switch

Tab. 7.b

Note: a digital input can be used to activate a generic signal that does not stop the unit and is reset manually.

POSSIBLE OPTIONS		POSSIBLE OPTIONS	
pCO3SMALL	1…5	pCO3SMALL	1…8
pCO3MEDIUM	1…8	pCO3MEDIUM	1…12
pCO3LARGE	1…10	pCO3LARGE	1…14
pCOe (no PT1000)	pCOe1: E1…E4	pCOe	pCOe1: E1…E4
	pCOe2: E5…E8		pCOe1: E5…E8
Serial probes	Temperature: T1…T6; A1…A6	Belimo®	M1…M8
	Humidity: H1…H6; A1…A6	BMS Variables	S1…S4
Belimo®	M1…M8		
BMS Variables	S1…S4		

Tab. 7.c

Configurable outputs

ANALOGUE		DIGITAL	
Ref.	Description	Ref.	Description
Hb51	Supply fan	Hb35	Supply fan 1
Hb52	Return fan	Hb35	Return fan 1
Hb53	Outside damper	Hb35	Humidifier
Hb54	Mixing damper	Hb36	Supply fan 2
Hb55	Exhaust damper	Hb36	Return fan 2
Hb56	Bypass damper	Hb37	Supply fan star delta
Hb57	Humidifier	Hb38	Return fan star delta
Hb58	Preheating valve	Hb39	Bypass damper
Hb59	Cooling valve or heating/cooling	Hb39	Heat wheel/heat recovery unit pump
Hb60	Modulating preheating heater	Hb39a	Supply fan damper
Hb61	Reheating valve	Hb39a	Return fan damper
Hb62	Reheating valve	Hb40	Generic alarm
Hb63	Heat wheel	Hb40	Serious alarm
Hb64	Auxiliary 1	Hb40	Minor alarm
Hb65	Auxiliary 2	Hb41	Unit status (ON/OFF)
Hb66	Auxiliary 3	Hb41	Filter alarm
Hb67	Auxiliary 4	Hb41	Heat recovery unit defrost heater
Hb68	IEC	Hb42	Heat/cool
Hb69	Heat recovery unit pump	Hb43	Cooling pump 1
		Hb43	Preheat pump 1
		Hb43	Reheat pump 1
		Hb44	Cooling pump 2
		Hb44	Preheat pump 2
		Hb44	Reheat pump 2
		Hb45	Floating valve opening, cooling-heating/cooling
		Hb45	Floating valve opening, preheat
		Hb45	Floating valve opening, reheat
		Hb46	Floating valve closing, cooling-heating/cooling
		Hb46	Floating valve closing, preheat
		Hb46	Floating valve closing, reheat
		Hb47	Cooling-heating/cooling step 1
		Hb47	Cooling-heating/cooling step 2
		Hb47	Cooling-heating/cooling step 3
		Hb47a	Cooling-heating/cooling step 4
		Hb48	Preheat heater 1
		Hb48	Preheat heater 2
		Hb48	Preheat heater 3
		Hb48	Preheat heater 4
		Hb49	Reheat heater 1
		Hb49	Reheat heater 2
		Hb49	Reheat heater 3
		Hb49	Reheat heater 4
		Hb50	Auxiliary loop 1 On/Off
		Hb50	Auxiliary loop 2 On/Off
		Hb50	Auxiliary loop 3 On/Off
		Hb50	Auxiliary loop 4 On/Off

Tab. 7.d

POSSIBLE OPTIONS		POSSIBLE OPTIONS	
pCO3SMALL	1…4	pCO3SMALL	1…8
pCO3MEDIUM	1…4	pCO3MEDIUM	1…13
pCO3LARGE	1…6	pCO3LARGE	1…18
pCOe	pCOe1: E1	pCOe	pCOe1: E1…E4
	pCOe2: E2		pCOe1: E5…E8
Belimo®	M1…M8		

Tab. 7.e

Configuring alarms

Configuration of alarms, the function of the contact, alarm delay and type of alarm must be completed during installation. The following table shows the settings.


Normally open (NO)


Normally closed (NC)

Type of alarm	Enabling	Config.	Delay
Generic	Always	Hb25	Hc20
Serious	Always	Hb25	-
Frost protection	Ha16	Hb25	-
Supply filter 1	Always	Hb26	-
Supply filter 2	Always	Hb26	-
Return filter	Ha01-Hc07	Hb26	-
Supply flow switch	Always	Hb27	Startup and
Return flow switch	Ha01-Ha04	Hb27	steady: Hc07
Pump 1 thermal overload			
Cooling coil	Ha09-Ha10	Hb30	
Preheating	Ha09-Ha11	Hb30	
Reheating	Ha09-Ha12	Hb30	
Pump 2 thermal overload			
Cooling coil	Ha09-Ha10	Hb31	
Preheating	Ha09-Ha11	Hb31	
Reheating	Ha09-Ha12	Hb31	
Coil flow switches			
Cooling coil	Ha09	Hb32	
Preheating	Ha09	Hb32	
Reheating	Ha09	Hb32	
Fan thermal overloads			
Supply 1	Ha04	Hb29	
Supply 2	Ha01, Ha03 (Backup), Ha04	Hb29	
Return 1	Ha01, Ha04	Hb29	
Return 2	Ha01, Ha03 (Backup), Ha04	Hb29	
Humidifier	Ha01	Hb28	
Supply inverter	Ha03	Hb28	
Return inverter	Ha01, Ha03, Ha04	Hb28	
Preheat heater thermal overload	Ha05	Hb33	
Reheat heater thermal overload	Ha08	Hb33	
Dirty heat recovery unit	Ha01	Hb33	Hc18
Dirty filter	Always	Hb34	
Fire & Smoke	Always	Hb34	
Door open	Always	Hb34	

General	Always	Hb40	
BMS offline	Ge02		
Number of warnings (attempts) for pumps			
Cool/heat-cool coil	Ha10		
Preheating	Ha11		
Reheating	Ha12		

Tab. 7.f

Note: following configuration, the screens in menu D show the inputs and outputs that have effectively been configured.

7.4 Device control parameters (Hc)

Once the devices available and the probes/digital inputs have been selected, the main control parameters are configured on the Hc screens. These include:
- selection of temperature and humidity control probes (supply, return, room);
- minimum and maximum limits for the dampers;
- the delays in activating the fan after opening the dampers (opening time) and in closing the dampers after stopping the fan (closing delay);
- mixing damper configuration with unit off;
- bypass damper configuration with IEC active;
- K coefficients for supply/return for calculating the fan air flow-rate;
- delay time for star/delta starting;
- floating valve travel times;
- fan inverter parameters.

See the following paragraphs and the "Functions" chapter for a more detailed description of the control parameters.

Note: if a heating/cooling coil is used the heating/cooling digital output can be enabled (screen Hb42) to switch operation according to demand and the switching delay set on Hc12.

7.5 pCOe expansion card connection

After having inserted the serial card (PCO100FD10) in the slot marked "field card", up to 2 pCOe expansion cards can be connected, and must be enabled on screen Ha26. Each pCOe card can be connected to:
- 4 Carel NTC probes (-50T90 °C; R/T = 10 kΩ at 25°C) or active probes: 0 to 1 Vdc, 0 to 10 Vdc, 4 to 20 mA, selectable via software in groups of two (B1, B2 and B3, B4)
- 4 digital inputs;
- 1 analogue output;
- 4 digital outputs.

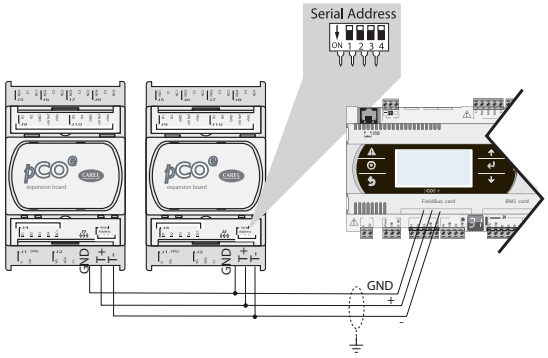


Fig. 7.c

Each expansion card must be set with a unique network address using the dipswitches. The configuration screens are used to select:
- the card address;
- the functions of the probes.

Screen index	Display description	Selection
Ha26	pCOe number	1 to 2
	pCOe 1 address	1 to 5
	pCOe 2 address	1 to 5
Hb01 to Hb08	Analogue inputs	
	Supply, return, outside, room temperature	
	Supply, return, outside, room humidity	
	position ≠ 0	
	type: 4 to 20 mA ¦ 0 to 1 V ¦ 0 to 10 V	

Tab. 7.g

Note:
- the position of the probes connected to pCOe is defined as follows

pCOe	pCOe 1	E1, E2, E3, E4
	pCOe 2	E5, E6, E7, E8

- E1 to E8 identify both analogue and digital inputs.
- the position of the digital outputs connected to pCOe is defined as follows:

pCOe	pCOe 1	E1, E2, E3, E4
	pCOe 2	E5, E6, E7, E8

- the position of the analogue outputs connected to pCOe is defined as follows:

pCOe	pCOe 1	E1
	pCOe 2	E2

7.6 Serial probe connection

After having inserted the serial card (PCO100FD10) in the slot marked "field card", up to 6 serial probes can be connected, and must be enabled on screen Ha26.

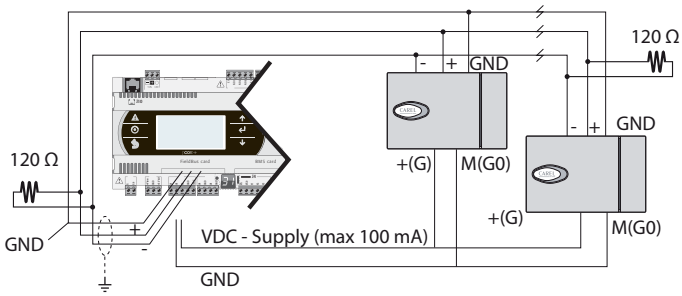


Fig. 7.d

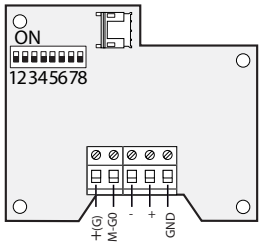
For each serial probe, the following need to be selected using the dipswitches (see the figure):
- a unique network address;
- communication speed (baud rate), the same as set on screen Ha25;

The configuration screens are used to select:
- a unique network address;
- the type, i.e. temperature or temperature/humidity probe (Ha91);
- the default probe parameter settings;
- assignment of the function to the serial probe (e.g. supply/return/room temperature /humidity probe).

Setting the parameters and the address

The default values (Baud rate = 19200, Stop bits = 2, Timeout = 300 ms, Priority = none) can be displayed and modified if necessary on screen Ha05. For DP probes, on the other hand, set dipswitches 6, 7 and 8 (6 = OFF, 7 = ON, 8 = OFF), while the address Adr = 128 to 133 is set using dipswitches 1 to 5.

Note: for further details and for the connection diagrams, see the DP serial probe manual (+030220660).



Dip 1-5 Address ON (128-159)
Dip 6-5 OFF-OFF = Superv. Carel
OFF-ON = Modbus 1,8 N,2
ON-OFF = Auto (Superv.C-Modbus)
ON-ON = Modbus 1,8 E,1
Dip 8 OFF = 19200
ON = 9600 Bit/S

Fig. 7.e

Screen index	Display description	Selection
Ha24	Protocols	
	Field port	Modbus master
Ha25	Modbus Master settings	
	Baudrate	9600 ¦ 19200
Ha26	Number of serial probes	
	No, 1…6	
Ha31	Press Enter to configure serial probes ➔ Ha91	

Screen index	Display description	Selection
Ha91…Ha96	Serial probe n°1…6	
	Address	128…159
	Type	Temperature ¦ Temperature+Humidity
	Default installation	No ¦ Yes
Hb01…Hb08	Analogue inputs	
	Supply, return, outside, room temperature	
	Supply, return, outside, room humidity	
	position > 0	
	Min limit, max limit	

Tab. 7.h

Note:
- default installation refers to the default configuration of serial probe parameters shown on the probe instruction sheet;
- also set the address, protocol and communication speed using the dipswitches on the serial probe;
- the position of the serial probes is defined as follows:

Serial probes	Temperature	T1…T6, A1…A6
	Humidity	H1…H6, A1…A6

with the following meanings:

A1	Average between all probes
A2	Average between 1, 2
A3	Average between 1, 2, 3
A4	Average between 3, 4
A5	Average between 4, 5 or 4, 5, 6
A6	Average between 5, 6

7.7 VFD inverter connection

The inverter is used to manage the fan speed, for constant pressure and fixed speed control modes. After having inserted the serial card (PCO100FD10) in the slot marked "field card", up to 2 VFD inverters can be connected for the control of supply and return air fans, which must be selected on screen Ha03.

Note: serial network connection is also useful for ON/OFF or fixed speed fan control, as the inverter parameters can be set directly from the terminal.

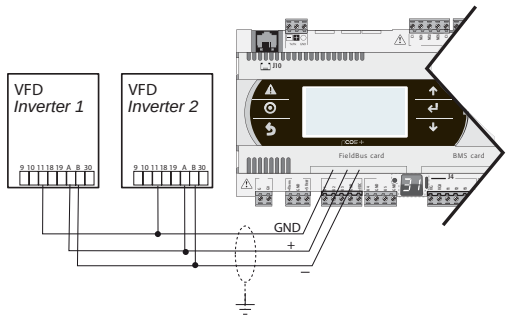


Fig. 7.f

Screen index	Display description	Selection
Ha03	Fan type	4: Inverter ¦
	Fan regulation	1: Constant pressure ¦2: Air quality ¦ 3: Fixed speed ¦
Ha24	Field port	Modbus master
Ha29	Press Enter to configure the VFD	
Ha39	Enable VFD: Modbus protocol: Yes	

Tab. 7.i

Screen index	Display description	Def	Min	Max	UOM
Ha40/Ha50	Supply/return VFD				
	Address	1/2	0	999	-
	Data address	0	0	9999	-
	Data value	0	-32768	32767	-
	Default install	N	No	Yes	-
Ha46/Ha56	Supply/return VFD: motor parameters				
	Volt	0	180	690	V
	Cosfi	0,0	0,3	0,99	-
	Frequency	0	30	320	Hz
	Speed	0	300	20000	rpm
	Current	0	-999.9	999.9	A
	Current limit	0	0	999.9	A

Screen index	Display description	Def	Min	Max	UOM
Hc40/Hc50	Supply/return VFD				
	Volt at 0 Hz	0	0	40	%
	Switch frequency	0	1	16	kHz
	V/ f curve midpoint				
	Voltage	0	0	100	%
	Frequency	0	0	320	Hz

Tab. 7.j

Screen index	Display description	Selection
Ha41/Ha51	Supply/return VFD	
	Control place	1: I/O terminal ¦2:Keypad ¦ 3: Fieldbus
	Speed reference type	0: Ain1 ¦ 1: Ain2 ¦ 2: Keypad ¦ 3: Fieldbus ¦ 4: Motor potentiometer ¦ 5:PID regulation
	Rotation type	Clockwise ¦ anticlockwise
Ha42/Ha52	Supply/return VFD	
	Motor control mode	Frequency ¦ speed
	Start function	Ramp ¦ flying start
	Stop function	Ramp ¦ coasting
Ha43/Ha53, Ha44/ Ha54, Ha45/Ha55	Action when in fault	See parameters table
Hc41/ Hc51	Supply/return VFD	
	V/f ratio	Linear ¦ squared¦ programmable ¦ linear with flux optimisation
	V/f Optimisation	Not used ¦ automatic boost ¦
	Auto restart	Not used ¦ used

Tab. 7.k

Screen index	Display description	Def	Min	Max	UOM
Hc42/ Hc52	Supply/return VFD				
	Min/ max frequency	0	0	Freq.max	Hz
	Acceleration time	1	0.1	3200	s
	Deceleration time	1	0.1	3200	s

Tab. 7.l

Note:
- the "control place" parameter establishes the source of the signal to the start/stop the fan. The "speed reference" parameter establishes the source of the speed/frequency reference. See the VFD inverter manual;
- for on/off fans, the VFD can be configured to set the parameters from the display.

7.8 Belimo actuator connection

After having inserted the serial card (PCO100FD10) in the slot marked "field card" up to 8 Belimo actuators (dampers, valves, etc.) can be connected, and must be selected on screen Ha27. The Belimo protocol must be set on screen Ha24. Each Belimo actuator can be connected to:
- an NTC probe;
- one 0 to 1 V or 0 to 10 V input;
- one digital input.

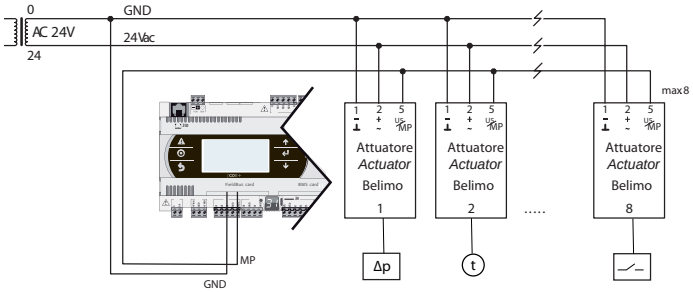


Fig. 7.g

The following parameters are selected on the screens for each actuator:
- actuator address setting procedure, manual or automatic;
- type of probe connected and the minimum/ maximum limits;
- function of the probe.

In addition, the adaptation procedure needs to be run to align the position.

Screen index	Display description	Selection
Ha24	Protocol	
	…	
	Field port	Belimo
Ha27	Belimo devices	
	Number of actuators	0…8
Ha28	Press Enter to configure Belimo actuators ➔Ha60	
Ha60	Belimo 1…Belimo 8	
Ha60, Ha63…Ha81	Actuator type (read-only)	1: None ¦ 2: Air actuator ¦ 3: Valve actuator ¦ 4: Valve actuator 5: None ¦6: Fire-smoke damper ¦ 7: None ¦ 8: VAV Smoke-fire damper ¦ 9: None
	Addressing mode	0: Manual 1: Auto
	SN: 00000-00000-000-000	
	Address actuator	0:No¦ 1:Yes
Ha61, Ha64…Ha82	Enable external input/ probe	0:No¦ 1:Yes
	Type	NTC ¦ 0 to 1 V ¦ 0 to 10 V ¦ ON/OFF
	Min value	-999.9 to Max value
	Max value	Min value to 999.9
Ha62, Ha65…Ha83	Position or air flow limits	
	Minimum	0 to Maximum
	Maximum	Minimum to 100
Gg60…Gg67	Belimo 1…Belimo 8	
	Start adaptation	No
	Start testrun	No
	Adapted angle	Yes
	Alarms reset	No

Tab. 7.m

Setting the Belimo actuator address

There are two procedures for setting the address:

1. automatic;
2. manual.

Automatic address setting

- identify the serial number from the barcode (see the figure);
- select "automatic" address setting mode;
- enter the number from the SN field in screens H60 to Ha81 (actuators 1 to 8);
- enter Yes in the Address actuator field;
- after a few seconds the message "address setting OK" is displayed to confirm that the address has been set successfully.

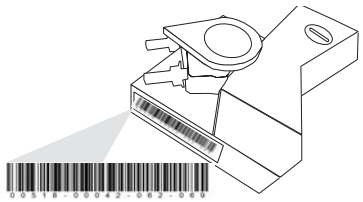


Fig. 7.h

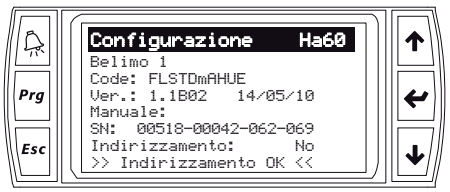


Fig. 7.i

Manual address setting

A. select "manual" address setting mode;
B. enter Yes in the Address actuator field;
C. press the button indicated by the arrow repeatedly (see the figure);
D. after a few seconds the message "address setting OK" is displayed to confirm that the address has been set successfully.

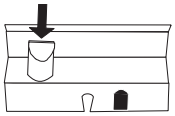


Fig. 7.j

Note: In the event of errors, to reset the address, repeat steps A and B and then set the "Address actuator" field to No.

7.9 Probes from supervisor

The BMS port fitted with the RS485 serial card can be connected to a supervisor (PlantVisorPro, PlantWatchPro) that sends the values of up to 4 probes. The BMS serial protocol must be set (Ha24) to "BMS", while the BMS configuration (Ge01) must be set by selecting the protocol (e.g. Modbus), communication speed and network address. Supervisor probes must be enabled (Ha30), and the backup probes used after a certain timeout following interruption to communication defined, and finally the functions assigned on the "Hb" screens. The supervisor probes are identified by letters S1 to S4.

Note: the values of the probes and digital inputs can be written by the supervisor, however analogue inputs can be set as backup only for the probes (not for the digital inputs) already utilized or to be configured for the application in use.

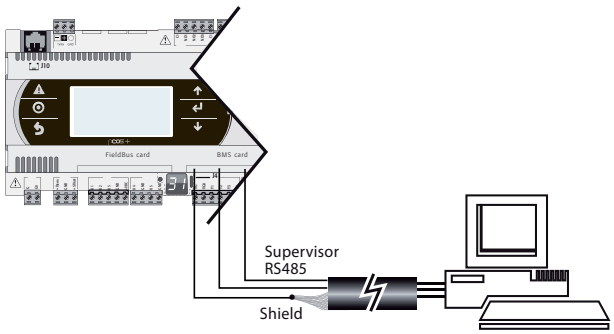


Fig. 7.k

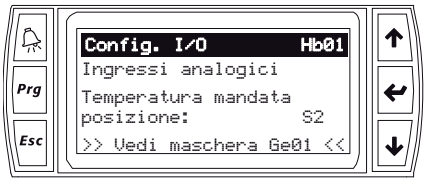


Fig. 7.l

Screen index	Display description	Selection
Ha24	Protocol	
	pLAN port	pLAN
	BMS port	BMS ¦ Winload
	Field port	Modbus master ¦ Belimo
Ha30	Enable BMS probes and digital inputs	No ¦ Yes
	Backup probe 1	None, AIN1 to AIN10
	Backup probe 2	None, AIN1 to AIN10
	Backup probe 3	None, AIN1 to AIN10
	Backup probe 4	None, AIN1 to AIN10
Ge01	BMS configuration	
	BMS protocol	Modbus ¦ LON ¦ CAREL
	Baud rate	1200 ¦ 2400 ¦ 4800 ¦ 9600 ¦ 19200
	Address	0 to 207
Ge02	BMS offline alarm enable	No ¦ Yes
	Timeout	0 to 900 s

Tab. 7.n

8. COMMISSIONING

Commissioning refers to installation of the electrical panel in the field and setting the air handling unit application software parameters, as well as all the operations needed to complete the setup of the devices. The Commissioning procedure is activated on the screen Ge03, after having fitted the BMS RS485 card on the controller and established the connection to a personal computer running the pCO Manager program (see the appendix).

8.1 Loading the configuration

If necessary, load the configuration saved following the software configuration procedure, on screen Gfd01. Once the parameters have been loaded, the following operations are possible:

1. verify correspondence of the I/Os to the AHU design;
2. set the PID parameters for temperature and humidity control, air quality and advanced control functions (cascade, enable direct [DEC] and indirect evaporative cooling [IEC], supply limits, compensation, etc..). See the "Functions" chapter;
3. set the auxiliary control loops, if featured;
4. set the baud rate and serial address for Fieldbus and BMS serial communication;
5. calibrate the probes;
6. manually calibrate the fans, coil actuators, humidifier, and activate purging.

Note: see the screens in menus Ga, Gb, Gc, Gfc, Ge, Gg and the "Functions" chapter.

8.2 Commissioning

Warning: before performing any operation on the pCO board, disconnect power to the device by moving the main switch on the electrical panel to OFF. To configure the parameters using PCO Manager:

Step	BMS1	BMS2
A		Manually set the protocol to Winload in screen Ha24: Serial BMS2-->Winload;
B	Disconnect any BMS cards other than RS485 (e.g. LON);	
C	Connect the RS485BMS card;	
D	Activate the Commissioning service on screen Ge03	

Fig. 8.a

1. Connect to the computer using the USB/RS485 connector;

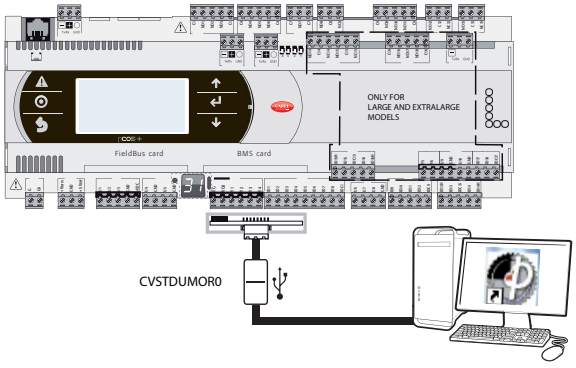


Fig. 8.b

2. Run the commissioning procedure using pCO Manager. See appendix;
3. At the end of all the operations, stop the Commissioning service.

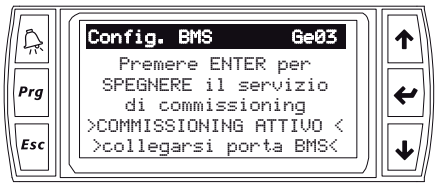


Fig. 8.c

4. Reconnect the BMS card and restore the connection;
5. Check that the serial protocol is the same as at the start on Ha24:

-->BMS and Ge01: protocol BMS1: CAREL, Modbus, Lon and Ge02: Protocol BMS2: CAREL, Modbus, Lon.

Note: the commissioning service automatically sets the BMS protocol to "Winload". Once the procedure has ended, the protocol automatically returns to "BMS", allowing reconnection to the supervisor.

8.3 Probe calibration

In menus Gfb01 to Gfb08, calibrate the probes if necessary and check the correct reading against a sample probe.
See the parameters table.

8.4 Setting the control parameters

To set the control parameters see the "Software configuration" and "Functions" chapters. The parameters can be modified from the terminal or a personal computer using the pCO Manager program. See the appendix.

8.5 Setting the hour counters

On screens Gfa01 to Gfa06 (see the parameters table) a maximum number of operating hours before maintenance is required can be set for each device. On exceeding the maintenance hours, a "warning" is signalled on the display and recorded in the alarm log, without affecting control. Access screens Gfa01 to Gfa06 again to reset the warning. The purpose is to allow service personnel to be notified to ensure preventive maintenance.

8.6 Enthalpy management

Enter the atmospheric pressure for parameter Gfc16 to allow the controller to correctly calculate the values on the psychrometric chart.

Screen index	Display description	Def	UOM	Min	Max
Gfc16	Enthalpy management				
	Atmospheric pressure	1090	mbar	600	1100

Tab. 8.a

8.7 I/O test

Screens He01 to He50 can be used to test the actuators during installation, see menu Gg01. Modulating fan actuators can be adjusted from 0 to 100% to achieve design air flow-rates. For the digital outputs, 0% corresponds to OFF and 100% to ON.

9. FUNCTIONS

FLSTDMAHUE features advanced control functions that can be activated based on the devices installed on the air handling unit:
- Temperature and humidity control;
- Freecooling and freeheating;
- Heat recovery;
- Direct (DEC) and indirect evaporative cooling (IEC);
- Air quality;
- Air cleaning (purging);
- Priority to temperature or humidity control;
- Set point compensation;
- Automatic summer/winter (cooling/heating) changeover;
- Temperature and humidity supply limits;
- Auxiliary control loops;
- Frost protection and room protection.

The possible operations are described below; additional custom functions can be created using the 1tool programming environment modules. Refer to this for further information.

9.1 On/Off

ON Functioning

Before switching On, the AHU temporarily goes through the Start-up stage, during which the controller checks for any alarms, opens the dampers and when open starts the supply and return air fans. ON status requires the following, with a logical AND relationship:
- digital input;
- keypad or BMS with keypad override;
- scheduler (time bands)
- BMS.

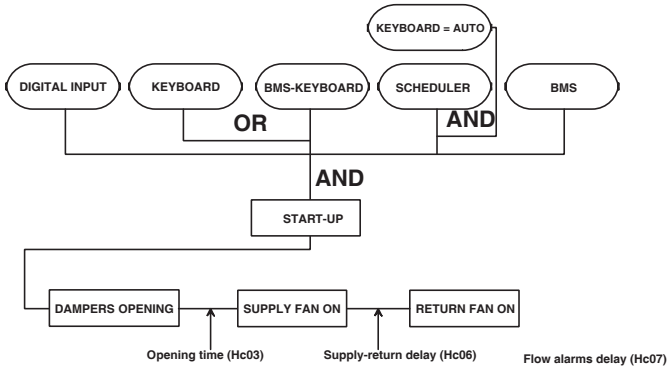


Fig. 9.a

Note:
- the keypad (A01) switches the AHU ON if "Comfort", "Precomfort" or "Economy" has been set;
- BMS with keypad override means the possibility to override the selection made on the keypad using a BMS variable;
- ON from scheduler requires the keypad to be set to AUTO;
- ON from BMS is a further ON signal using a separate variable.

See the list of BMS variables.

Fan activation and damper limit switches

When powering on the unit, the dampers, selected based on the air handling unit configuration, are opened, and after the opening delay (Hc03) the fans are activated.

Screen index	Display description	Selection
Ha02	Type of dampers	1: Fresh air only (On/Off) ¦ 2: Fresh air only (Mod) ¦ 3: Fresh air + Mixing(Mod) ¦ 4: Fresh air + Mixing+ Exhaust (Mod) ¦ 5: Fresh air + Exhaust (Mod) 6: Fresh air + Exhaust (On/Off)

Screen index	Display description	Def	Min	Max	UOM
Hc03	Opening delay	120	0	9999	s
	Closing delay	120	0	9999	s

When selecting the devices, the on-off supply and/or return dampers can be added and the respective limit switches (digital inputs) that signal opening can be enabled.

Screen index	Display description	Selection
Ha03a	Fan dampers	1: None ¦ 2:Supply ¦ 3:Return ¦ 4: Supply + Return ¦
	Damper limit switches	1:None ¦ 2:Supply ¦ 3:Return ¦ 4: Supply + Return ¦
Hb39a	Supply/return fan damper	position≠0

Screen index	Display description	Def	Min	Max	UOM
Hc06	Fan times				
	Supply - Return	0	-999	999	s
Hc07a	Damper limit switch alarm delay	10	0	999	s

A delay can be set between activation of the supply and return air fans (Hc06). If the supply-return delay is >0 (<0) the supply (return) fan is activated first. If the supply/return air fan damper does not open within the "Damper limit switch alarm delay" time, as measured by the corresponding limit switch, both the supply fan and return fan are switched off and the alarm is activated.

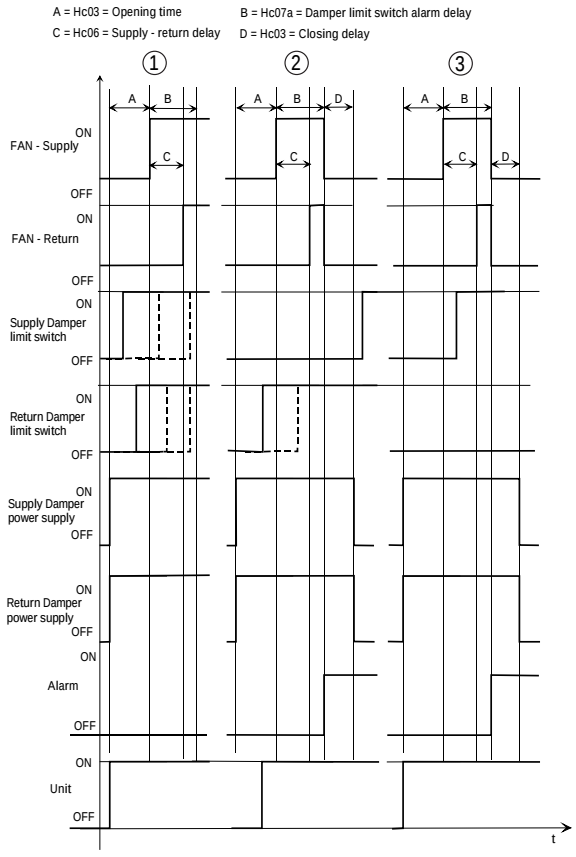


Fig. 9.b

Key

A	Opening delay (Hc03)	C	Supply-return delay (Hc06)
B	Damper limit switch alarm delay (Hc07a)	D	Closing delay (Hc03)

Note:
- the supply-return fan activation delay is used to reduce the risk of excess current draw when activating both simultaneously. When deactivating there is no delay;
- if B=0, the fan only starts if the damper limit switch contact is closed (corresponding to the damper being physically open).

Unit start-up with electric preheating coil

On air handling units with water heating coil, if the unit is OFF and the temperature conditions are sufficiently low, the unit enters frost protection status (see par. "Frost protection") to protect the water coils. The pump is activated, the valve opens and the circulation of hot water ensures the unit exits frost protection status when OFF, and can therefore start as normal.

On air handling units with electric heating coils, if the unit is OFF and the temperature conditions are sufficiently low, the unit enters frost protection status. The heater however is not activated, as frost protection prevents the fan from starting, therefore frost protection status remains active, unless the temperature rises naturally. To start the unit, a frost protection alarm delay can be set for activating the heater, starting the fan, heating the unit and thus exiting the frost protection conditions.

Screen index	Display description	Def	Min	Max	UOM
Hc07c	Frost protection alarm delay with heaters	120	0	600	s

OFF Functioning

Before switching Off, the AHU temporarily goes through the Shutdown stage, during which the controller stops the devices and fans and closes the dampers. ON status requires the following, with a logical OR relationship:

- digital input;
- keypad;
- scheduler
- BMS.

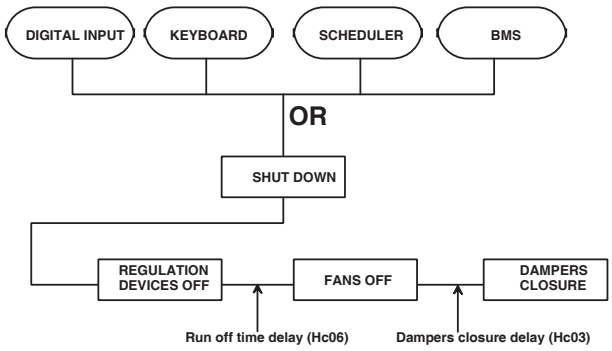


Fig. 9.c

The position of the mixing damper with the unit off can be selected as open or closed, to avoid the stack effect (unwanted circulation of air).

Screen index	Display description	Selection
Hc03a	Mixing damper configuration with unit off	0:Closed ¦ 1:Open

9.2 Set point

After having selected the main temperature and humidity probes and cooling and heating set points for each operating mode (screens B02, B03, B04), screen B01 displays the temperature and humidity set points. The maximum and minimum limits for the temperature and humidity set points in cooling and heating can be set in the Service menu, on screens Gfc02 and Gfc03. For the temperature set point, an offset from analogue input can be enabled on Ha19, and the effect of the offset seen on B01, i.e. display the current working set point and the effect of the offset on the set points defined on B02, B03, B04. The following inputs can also be enabled, configured on Hb24:

1. change in set point from comfort to economy from digital input , enabled on Ha18 and configured on Hb24 (double set point);
2. remote On/Off, directly configured on Hb24.

Screen index	Display description	Selection
Ha18	Setpoint from digital input	0:No¦ 1:Yes
Hb24	Double set point	Position ≠0
Ha19	Enable setpoint offset by analog input	0:No¦ 1:Yes

Screen index	Display description	Def	Min	Max	UOM
B02/B03/ B04	Comfort/Pre-comfort/ Economy temp. summer	-	Lim. Inf. (Gfc02)	Lim. Sup. (Gfc02)	°C
B02/B03/ B04	Comfort/Pre-comfort/ Economy temp. winter	-	Lim. Inf. (Gfc02)	Lim. Sup. (Gfc02)	°C
Gfc02	Temperature set limits				
	Summer low	15	-99.9	99.9	°C
	Summer high	35	Summer low	99.9	°C
	Winter low	15	-99.9	99.9	°C
	Winter high	35	Winter low	99.9	°C
Gfc03	Humidity set limits				
	Summer low	30	0	100	%rH
	Summer high	90	Summer low	100	%rH
	Winter low	30	0	100	%rH
	Winter high	90	Winter low	100	%rH

9.3 Temperature control

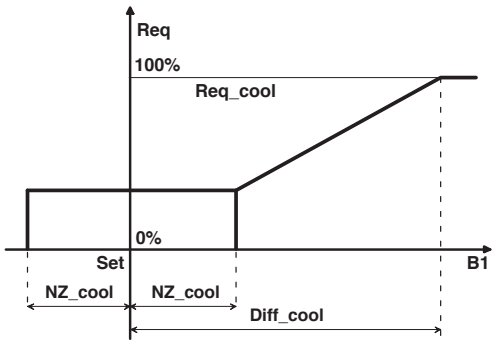
Enabling

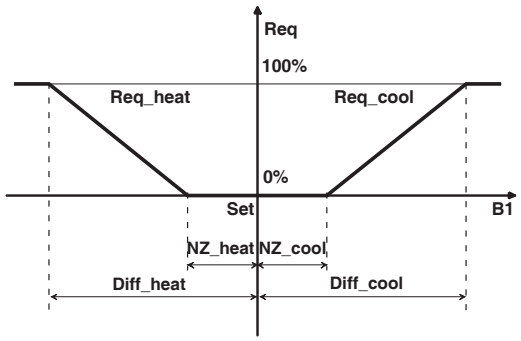
The following need to be enabled:

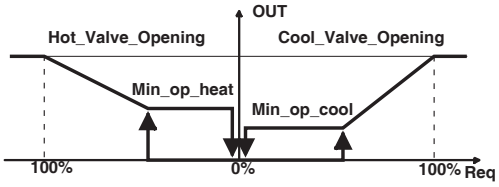
1. the probe used for control (Hc01);
2. the type of control (proportional, proportional+integral, proportional+integral+derivative), the same for heating and for cooling (Gfc04);
3. the PID control parameters for winter and summer operation and the corresponding neutral zone (Gfc05, Gfc06);
4. the cooling and heating temperature set point limits (paragraph 8.2), if control is on the return/room probe;
5. if necessary, cooling in winter and heating in summer (auto heat/cool, Gfc04);
6. if the reheating coil only operates to supplement the action of the preheating coil (integration) or also to compensate (compensation) for the lowering in temperature due to dehumidification (Ha08).

Note:

- the heating and cooling coils have a minimum opening settable by parameter, therefore if the control probe value does not deviate from the set point by more than the neutral zone and the resulting request is not sufficient to reach the minimum opening, the valve won't open; see the following graphs;
- control normally performs heating in winter and cooling in summer. Only if auto cool/heat is set (Gfc04) heating can also be applied in summer and cooling in winter, based on the current set point;
- for simplicity the following graphs refer to proportional control only;
- see available literature for more complete details on PID control.







Key

Req_heat	Heating request	Req_cool	Cooling request
Req	Request	B1	Control probe
Diff_cool	Cooling differential	Diff_heat	Heating differential
Set	Set point		
Min_op_cool	Cooling valve minimum opening	Min_op_heat	Heating valve minimum opening
NZ_cool	Neutral zone in cooling	NZ_heat	Neutral zone in heating

Screen index	Display description	Selection
Ha08	Reheating output	Integration ¦ Compensation ¦ Compensation + integration
Hc01	Main regulation probe selection	
	Temperature	Return ¦ supply ¦ room
Gfc04	Regulation type	Proportional ¦ Proportional + integral ¦ PID
	Auto cool/heat	NO ¦ YES

Screen index	Display description	Def	Min	Max	U.M
Gfc02	Temperature set limits				
	Summer low	15	-99.9	99.9	°C
	Summer high	35	Summer low	99.9	°C
	Winter low	15	-99.9	99.9	°C
	Winter high	35	Winter low	99.9	°C
Gfc05	Cooling regulation				
	Differential	2	0	99.9	°C
	Neutral zone	1	0	99	°C
	Integral time	300	0	999	s
	Derivative time	0	0	999	s
Gfc06	Control hot				
	Differential	2	0	99.9	°C
	Neutral zone	1	0	99	°C
	Integral time	300	0	999	s
	Derivative time	0	0	999	s
Gfc23	Minimum cooling valve opening				
	Cooling	0	0	100	%
Gfc24	Minimum opening heating valve	0	0	100	%
Gfc26	Minimum heat/cool valve opening				
	Cooling	0	0	100	%

Note: the graphs show that the valves do not open inside the neutral zone around the set point, therefore the heating or cooling action is not performed.

9.4 Humidity control

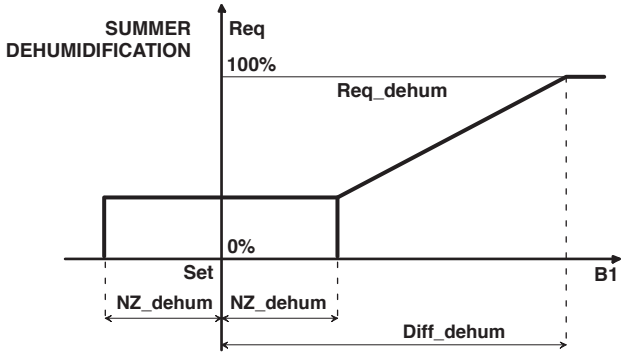
Enabling

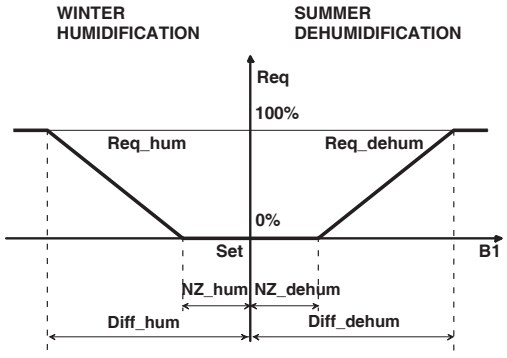
The following must be enabled or selected:

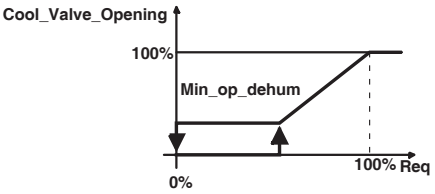
1. the humidifier (Ha01);
2. the type of humidifier (Ha13) and in the event of adiabatic humidifier the supply temperature lower limit (Gfc35);
3. the probe used for humidity control (Hc01);
4. for adiabatic humidifiers, the air preheating probe (Gfc25, Gfc27);
5. the type of control (proportional, proportional+integral, proportional+integral+derivative, on Gfc10);
6. the PID control parameters for humidification and dehumidification and the corresponding neutral zone (Gfc12, Gfc11);
7. the humidity set point limits in summer and winter (paragraph 8.2);
8. humidification in summer or dehumidification in winter according to request (auto hum/dehum, Gfc10);
9. the enthalpy differential, used to calculate the preheating coil request during humidification (visible when an adiabatic humidifier is used).

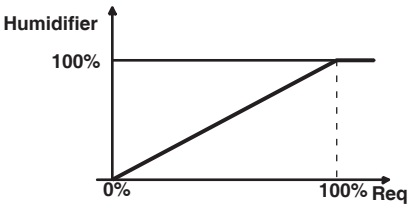
Note:

- control normally performs humidification in winter and dehumidification in summer. Only if auto hum/dehum is set (Gfc10) humidification is also performed in summer and dehumidification in winter;
- the minimum opening in dehumidification mode may be different from that in cooling because represents the minimum passage of water that manufactures dehumidification.









Key

Req	Request	Set	Humidity set point
Diff_dehum	Dehumidification differential	Diff_hum	Humidification differential
NZ_hum	Neutral zone in humidification	NZ_dehum	Neutral zone in dehumidification
B1	Control probe	Min_op_dehum	Cooling valve minimum opening

Screen index	Display description	Selection

Ha01	Main device enable	
	Humidifier	Disabled ¦ Enabled
Ha06	Dehumidification	1: Request humidity ¦ 2: Dew point ¦ 3: Specific humidity
Ha08	Reheating output	Integration ¦ Compensation ¦ Compensation+ Integration
Ha13	Humidifier	
	Type	Isothermal (ON/OFF control) ¦ Isothermal (Control model.) ¦ Adiabatic (ON/OFF control) ¦ Adiabatic (Control model.)
Hc01	Main regulation probe selection	
	Humidity	Return ¦ supply ¦ room
Gfc10	Humidity regulation	
	Regulation type	Proportional ¦Proportional+integral ¦ PID
	Auto hum/dehum	No ¦ Yes
Gfc35	Adiabatic humidifier - Supply low temperature limit	
	Enable limit	No ¦ Yes

Screen index	Display description	Def	Min	Max	UOM
B02/B03/B04	Comfort/Pre-comfort/Economy temp. summer	-	0	100	%rh
B02/B03/B04	Comfort/Pre-comfort/Economy temp. winter	-	0	100	%rh
Gfc11	Dehumidification regulation				
	Differential	5	0	100	% RH
	Neutral zone	5	0	100	% RH
	Integral time	300	0	999	s
	Derivative time	0	0	999	s
Gfc12	Humidification regulation				
	Differential	4	0	100	% RH
	Neutral zone	2	0	100	% RH
	Integral time	300	0	999	s
	Derivative time	0	0	999	s
Gfc23	Minimum cooling valve opening				
	Dehumidification	0	0	100	%
Gfc25	Enthalpy control				
	Differential	5	0	100	% RH
Gfc26	Minimum heat/cool valve opening				
	Dehumidification	0	0	100	%

Humidification control

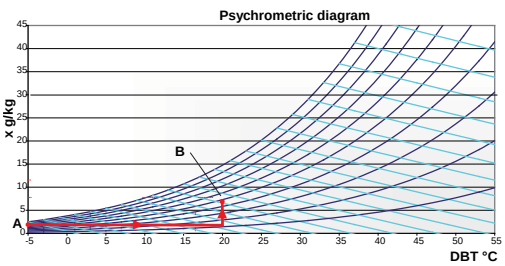
The control parameters are as follows:

Screen index	Display description	Selection
Ha05	Temperature probe when humidifying (preheating coil)	Off coil ¦ Regulation
Ha07	Temperature probe when humidifying (heat-cool coil)	Off coil ¦ Regulation
Ha13	Humidifier type	Isothermal ¦ adiabatic

Screen index	Display description	Def	Min	Max	UOM
Gfc25	Preheating coil settings when humidifying				
	Setpoint	23	-99.9	99.9	°C
	Differential	2	0	99.9	°C
Gfc27	Heat/cool coil settings when humidifying				
	Setpoint	20	-99.9	99.9	°C
	Differential	2	0	99.9	°C
Gfc35	Adiabatic humidifier – Supply low temperature limit				
	Enable limit	No	No	Yes	-
	Setpoint	15	0	99.9	°C
	Differential	2	0	99.9	°C

Control is performed in two ways, according to the type of humidifier:

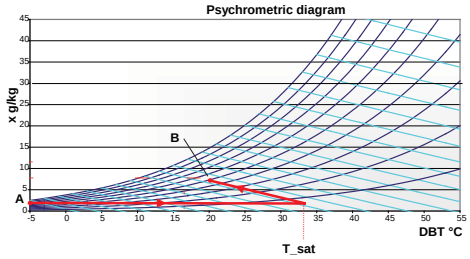
1. isothermal: air humidification is performed with a negligible variation in the supply air temperature. The controller sends the signal to start steam production and/or modulate output using a 0 to 10 V signal until reaching the humidity set point. Example of humidification from point A (-5 °C, 85 % RH) to point B (20 °C, 50 % RH)..



Key

x Specific humidity DBT Dry bulb temperature

2. adiabatic: evaporation of the droplets of atomised water brings about cooling of up to 10 °C if the air is warm and dry to start with. To compensate for this effect and increase humidification efficiency, the preheating coil is activated based on the saturation probe and in any case a minimum air temperature limit is set for the supply probe so as to stop humidification if the air temperature falls too low. Example of humidification from point A (-5 °C, 85 % RH) to point B (20 °C, 50 % RH).



Key

x Specific humidity DBT Dry bulb temperature

Note: the specific humidity set point is calculated automatically based on the relative humidity and temperature set point.

Supply specific humidity control is quite delicate, as relative humidity measurement is affected by temperature and consequently coil temperature control. As a result, this may cause wide swings: a sudden lowering of the temperature may cause an increase in relative humidity, which in turn activates dehumidification.

Dehumidification control

Note: if AUTO mode is enabled, a delay can be set in changing over between humidification/dehumidification.

Screen index	Display description	Selection
Gfc10	Auto mode	Yes

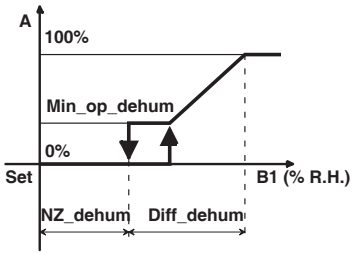
Screen index	Display description	Def	Min	Max	UOM
Gfc12a	Humidification/dehumidification changeover delay	10	0	999	min

Control depends on the selection: humidity request, dew point, specific humidity.

1. humidity request

Screen index	Display description	Selection
Ha06	Dehumidification	Humidity request

Based on the humidity control probe reading, the cooling actuator is controlled proportionally to the request in order to reach the humidity set point.

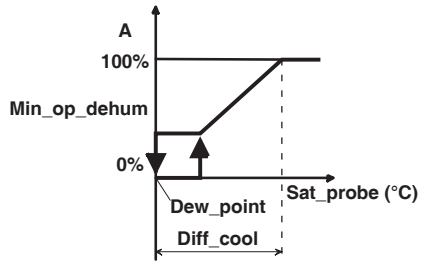


Key			
A	Cooling actuator opening	Set	Humidity set point
B1	Humidity control probe	Min_op_dehum	Minimum cooling coil opening
NZ_dehum	Dehumidification neutral zone	Diff_dehum	Dehumidification differential

2. dew point:

Screen index	Display description	Selection
Ha06	Dehumidification	Dew point

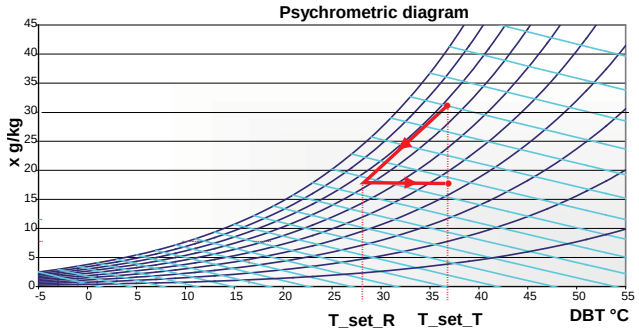
The dehumidification request is managed based on the humidity set point and the differential, according to the humidity measured by the control probe. Once the request is received, the controller uses the dew point calculation, and based on the humidity and temperature set point controls the cooling actuator, comparing against the value measured by the temperature probe downstream of the coils. As soon as the humidity probe detects a dehumidification request, the control calculates the final dewpoint and sets this as the temperature set point (T_set_R) after the cooling coil.



Key

A	Cooling actuator opening	Dew_point	Dewpoint
Sat_probe	Saturation probe	Min_op	Coil minimum opening

Screen index	Display description	Def	Min	Max	UOM
Gfc05	Cooling control				
	Differential	2	0	99.9	°C



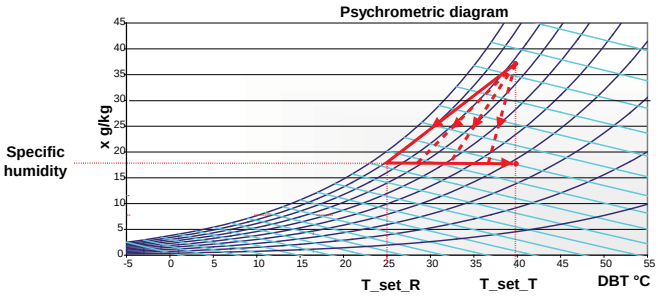
Key

T_set_R	Dew point	T_set_T	Temperature set point

3. specific humidity

Screen index	Display description	Selection
Ha06	Dehumidification	Specific humidity

The relative humidity probe needs to be installed downstream of coils and activated. Specific humidity is calculated based on relative humidity and temperature. The coil cools until the specific humidity reaches the set point. The advantage compared to the previous case is less need for reheating, as it is not necessary to cool down to the dew point (T_set_R, see figure).



Key

T_set_R	Dew point	T_set_T	Temperature set point

Dehumidification based on absolute humidity requires the setting of several control parameters: maximum and minimum limit based on the season, differential and integral time. The limits are also active with supply humidity control, meaning supply relative humidity control is possible with limits in terms of specific humidity.

Screen index	Display description	Def	Min	Max	UOM
Gfc13a	Supply specific humidity limits				
	Summer high	15	0	100	g/Kg
	Winter high	15	0	100	g/Kg
	Summer low	5	0	100	g/Kg
	Winter low	5	0	100	g/Kg
	Differential	0	0	100	g/Kg
	Integral time - Ti	0	0	100	g/Kg

For all dehumidification methods, the reheating coil will be activated to offset cooling, as shown in the table.

Reheating control

No.	Control	Preheating coil	Cooling coil	Reheating coil
1	Dehumidification without temperature request	Deactivated	Control based on humidity control probe or probe downstream of coil	For return control, the supply temperature set point is equal to the return temperature set point (cooling neutralised during dehumidification). For supply control, control is based on supply conditions.
2	Dehumidification with cooling request	Deactivated	Control based on higher of two required	Control based on supply probe with set point and differential equal to minimum supply limit

9.5 Temperature / humidity control / no priority

To control temperature and humidity, the coils and the humidifier must be enabled and the types must be set. The following also need to be activated and set:

1. the temperature and humidity control probes;
2. the dehumidification function and mode;
3. the humidifier and control probe;
4. the temperature and humidity set points.

Simultaneous requests for:

1. heating and humidification;
2. dehumidification and cooling:
   are not incompatible as regards activation of the devices, consequently if a priority has been set the controller will try to satisfy both requests. If this involves the same actuator, the latter operates based on the higher of the two requests. To prevent uncomfortable situations being created, the "supply limits" function can be used.

On the other hand, in the event of simultaneous requests for:

1. heating and dehumidification;
2. cooling and humidification, control is performed according to the table below, based on the priority: temperature, humidity or none.

Temperature priority

Temp. request	Humidity request	Preheating coil	Cooling coil	Reheating coil	Humidifier
Heating	Dehumidif.	Based on temperature control probe	Off	If "integration"	
Cascade control	Off				
Cooling	Humidific.	Off	Based on temp. control probe	Off	Waits for temperature set point to be reached

Tab. 9.b

Note: in the case of request of cooling and dehumidification the control considers the greater than the two required on the cooling coil.

Humidity priority

Temp. request	Humidity request	Preheating coil	Cooling coil	Reheating coil	Humidifier
Heating	Dehumidif.	Waits for humidity set point to be reached	Based on humidity control probe	If "compensation"	
Cooling	Humidification	Control on temperature probe set downstream of coils if humidifier = adiabatic	Waits for humidity set point to be reached	Off due to cooling	Based on humidity control probe

Tab. 9.c

The "no priority" setting should be selected if evaporative cooling (DEC) is enabled, in which case the simultaneous request for cooling and humidification use the same actuator and therefore both influence each other.

No priority

	Temperature request	Humidity request	Preheating coil	Cooling coil	Reheating coil
	Heating	Dehumidification	Off	Control on humidity control probe or probe downstream of coils	Controls based on request, but only with reheating
Return/ room control	Cooling	Humidification	Off	The cascade control ramp acts on the humidity request, which becomes the higher of the two values (humidity request for humidity control and humidity request for temperature control) and any limits that compensate for the value	
Supply control	Cooling	Humidification	Off	Control on humidity control probe while the cooling coil controls the temperature (DEC provides a free contribution)	

Tab. 9.d

Note: see the paragraph on "Direct evaporative cooling - DEC".

9.6 Set point compensation

Set point compensation adjusts the set point defined by the user with an offset that depends on a probe. This function in some cases ensures energy saving by adapting the set point to the outside temperature, while still guaranteeing suitable values for comfort. A temperature set point of 23 °C for example can be adjusted to 21 °C when the climate is extreme. In other cases, it's used to:

1. improve comfort, reducing the difference between the outside temperature and the inside or room temperature;
2. integrate another air-conditioning system: for example, if in summer at 7 in the morning the outside temperature is lower than the room temperature, the room probe can be used as the compensation probe and the supply probe as the control probe to lower the set point and exploit freecooling.

The following are possible:

1. differentiate between compensation in summer and winter;
2. select the probe used for compensation, between outside, supply, return and room probe;
3. increase or decrease the set point being compensated.

Note: compensation is disabled if the control probe and the compensation probe are the same.

Below is an example with the compensation probe set as the outside temperature probe that compensates the room temperature set point.

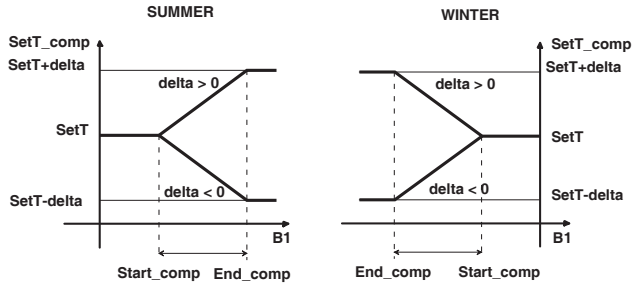


Fig. 9.d

KKey

SetT	Temperature set point	End_comp	End compensation
Delta	Compensation delta	B1	Compensation probe
Start_comp	Start compensation	SetT_comp	Compensation set point

Screen index	Display description	Selection
Hc01	Main regulation probe selection	
	Temperature	Return ¦ supply ¦ room
Gfc08	Type of summer set point compensation	
	None ¦ external ¦ room ¦ supply ¦ return	
	Compensation delta	2 °C
	Compensation start	25 °C
	Compensation end	32 °C
Gfc09	Type of winter set point compensation	
	None ¦ external ¦ room ¦ supply ¦ return	
	Compensation delta	-2 °C
	Compensation start	0 °C
	Compensation end	-8 °C

9.7 Summer/winter changeover

This changeover can be performed from the keypad, digital input or supervisor (BMS), based on the heating/cooling coil temperature or automatically. Summer/winter changeover switches the control set point from summer to winter. The basic function involves switching from cooling in summer to heating in winter. If "Auto" cool/heat is active (Gfc04) both heating and cooling are possible in summer and winter.

Screen index	Display description	Selection
Gc01	Season selection from	Keypad ¦ Digital input ¦ B.M.S ¦ Keypad /B.M.S. ¦Auto ¦ H2O Temperature
Gc02	Set season	Auto ¦ Fix days
Gfc04	Temperature regulation	
	Auto cool/heat	No ¦ Yes

Note: if selecting Auto mode = yes, a delay can be set for the summer/winter changeover.

Screen index	Display description	Def	Min	Max	UOM
Gfc05a	Summer/winter changeover delay	10	0	999	min

For automatic season changeover, on screen Gc01 and Gc02 the season must be selected as "Auto". Automatic selection allows the changeover to be managed "actively", in the sense that for one month before and one month after the set date the season changeover can be brought forward or postponed if the outside temperature remains above or below a certain level for a certain set time in hours (both to enter and exit the function, eliminating swings in system operation). This allows a temporary change in season (and corresponding set point) without having to act manually to adapt for days with uncharacteristic outside temperatures for that period.

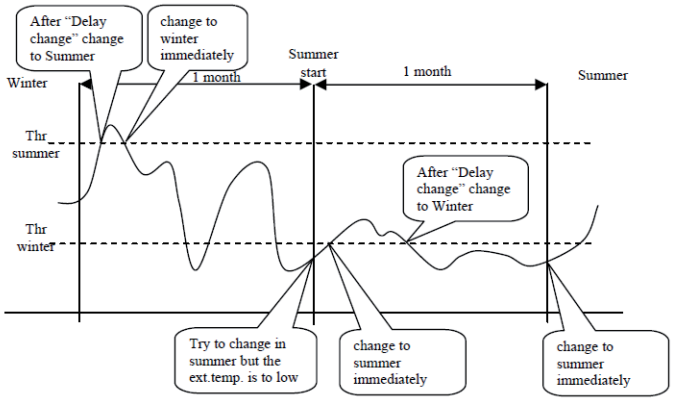


Fig. 9.e

Screen index	Display description	Def	Min	Max	UOM
Gc02	Set season				
	Summer start	15/05	01/01	31/12	dd/mm
	Winter start	30/09	01/01	31/12	dd/mm
	Threshold summer	25	-99.9	99.9	°C
	Threshold winter	10	-99.9	99.9	°C
	Delay change	1	0	999	hour

9.8 Freecooling and freeheating

Note: when the AHU is in freecooling/freeheating mode, the bypass damper on the heat recovery unit is open and consequently heat recovery is disabled.

Definition

In air-conditioning systems the freecooling/freeheating functions are used to cool/heat for free using only a part or all the fresh air intake, when the temperature and relative humidity conditions allow. Freecooling and freeheating are thus considered free sources of energy, activated with priority over cascade control in cooling and heating. Demand is shared between the various cascade control devices. The function has two stages:

1. check whether the outside temperature or enthalpy conditions are favourable compared to the return air conditions;
2. control the opening of the fresh air damper based on the cooling/heating request.

Enabling

The freecooling/freeheating function can only be enabled if the mixing damper is installed and the corresponding output is configured.

Note: if the AHU has the fresh air damper only (not the mixing damper) the quantity of fresh air is not controlled.

Screen index	Display description	Selection
Ha02	Type of dampers	1: Fresh air only (On/Off) ¦ 2: Fresh air only (Mod) ¦ 3: Fresh air + Mixing(Mod) ¦ 4: Fresh air + Mixing+ Exhaust (Mod) ¦ 5: Fresh air + Exhaust (Mod) ¦ 6: Fresh air + Exhaust (On/Off)
	Freecooling	1: None ¦ 2: Temperature ¦ 3: Enthalpy
	Freeheating	1: None ¦ 2: Temperature ¦ 3: Enthalpy
Hb39, Hb53	Fresh air damper	Position ≠ 0
Hb54	Mixing damper	Position ≠ 0
Hb55	Exhaust damper	Position ≠ 0

Activation by temperature

Note: the following graphs consider the outside temperature to be constant.

Freecooling and freeheating by temperature are activated when:

1. the outside temperature is closer to the temperature set point than the return temperature, or
2. the outside and return temperature straddle the set point.

FREECOOLING (cooling request active)

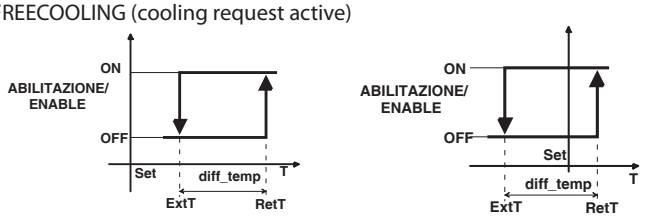


Fig. 9.f

ON: RetT- ExtT> diff_temp; OFF: RetT-ExtT<0

FREEHEATING (heating request active)

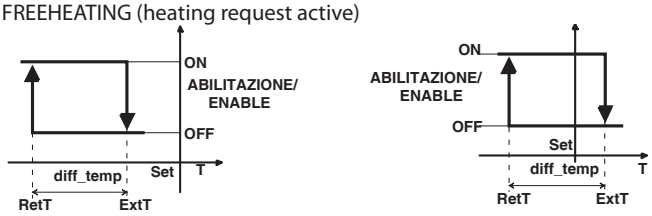


Fig. 9.g

ON: ExtT-RetT> diff_temp; OFF: ExtT-RetT<0

Key

RetT	Return temperature	Set	Set point
ExtT	Outside temperature	diff_temp	Temperature differential
T	Temperature		

Note: for control by enthalpy, the same rules apply for activation, with the values calculated enthalpy based on the temperature and humidity set points and the outside air conditions, displayed on screen D06. In this case the "enthalpy activation differential" is set on screen Gfc15. See the following paragraph.

Temperature differentials are needed to determine whether it's efficient to sue freecooling/freeheating, considering that the higher the deviation between outside and return temperatures, the more efficient the function will be.

Screen index	Display description	Def	Min	Max	UOM
Gfc15	Freecooling/Freeheating dampers setting				
	Temperature differential	4	0	99.9	°C

Temperature control

The control differentials used are those that apply to normal temperature control.

Screen index	Display description	Def	Min	Max	UOM
Gfc05	Cooling regulation				
	Differential	2	0	99.9	°C
Gfc06	Heating regulation				
	Differential	2	0	99.9	°C

When the function has been activated, the fresh air damper and mixing damper are controlled proportionally to the cooling/heating request with the percentages defined on Gfc20/ Gfc21. The fresh air damper opens and the mixing damper closes to compensate for the pressure drop. If the fresh air damper and exhaust damper are used, the two control signals are identical.

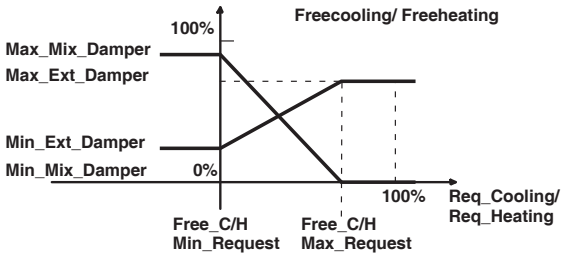


Fig. 9.h

Key

Max_Mix_Damper	Mixing damper maximum opening
Max_Ext_Damper	Fresh air damper maximum opening
Min_Mix_Damper	Mixing damper minimum opening
Min_Ext_Damper	Fresh air damper minimum opening
Req_cooling/heating	Cooling/heating request

The limits for opening the damper are set in the manufacturer parameters menu, Hc02.

Screen index	Display description	Def	Min	Max	UOM
Hc02	Dampers limits setting				
	Fresh air damper - min	-	0	100	%
	Fresh air damper - max	-	30	100	%
	Mixing damper - min	-	0	100	%
	Mixing damper - max	-	0	100	%

To exploit freecooling/freeheating to the maximum, a delay can be set when starting the unit for activation of the other devices in cascade control.

Screen index	Display description	Def	Min	Max	UOM
Hc03	Damper setting				
	Coil start delay	0	0	120	min

Note:

- if air quality control is also enabled (see. Ha02), when both functions are active the fresh air damper will open according to the higher request;
- in the winter season, freecooling is especially useful for cooling. A typical example a crowded shopping centre or conference centre. To do this, enable "auto" mode on Gfc04 and set the freecooling parameters accordingly.

Activation by enthalpy

Note: the following graphs consider the outside enthalpy to be constant. Freecooling and freeheating by enthalpy are activated when:

1. the outside enthalpy is closer to the enthalpy set point than the return enthalpy, or alternatively
2. the outside and return enthalpy straddle the set point.

FREECOOLING ENTHALPY

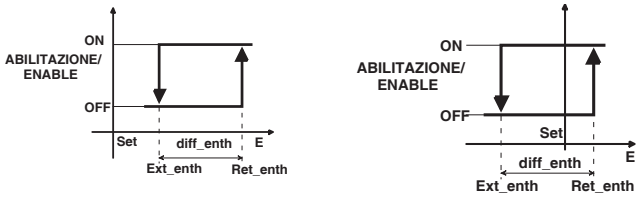


Fig. 9.i

ON: Ret_Enth- Ext_enth>diff_enth; OFF: Ret_Enth-Ext_Enth<0

FREEHEATING ENTHALPY

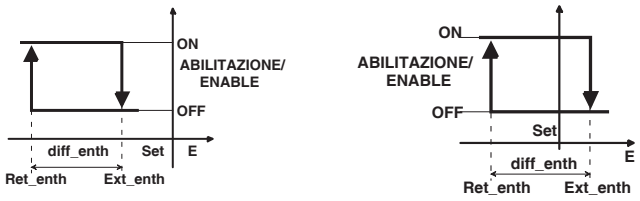


Fig. 9.j

ON: Ext_Enth-Ret_enth> diff_enth; OFF: Ext_enth-Ret_Enth<0

Key

Ret_enth	Return enthalpy	Set	Enthalpy set point
Ext_enth	Outside enthalpy	E	Enthalpy

Screen index	Display description	Def	Min	Max	UOM
Gfc15	Freecooling/ Freeheating damper setting				
	Enthalpy activation differential	4	0	53.5	kJ/kg

Enthalpy control

The enthalpy control set point and supply, return and outside enthalpy values can be seen on screen D06. The control differential is set on screen Gfc15.

Screen index	Display description	Def	Min	Max	UOM
D06	Enthalpy				
	Supply	-	0	99.9	kJ/kg
	Return	-	0	99.9	kJ/kg
	External	-	0	99.9	kJ/kg
	Setpoint	-	0	99.9	kJ/kg
Gfc15	Freecooling/ Freeheating dampers settings				
	Enthalpy differential	5	0	99.9	kJ/kg

When the function has been activated, the fresh air damper and mixing damper are controlled proportionally to the freecooling/freeheating enthalpy request. The fresh air damper opens and the mixing damper closes to compensate for the pressure drop. If the fresh air damper and exhaust damper are used, the two control signals are identical.

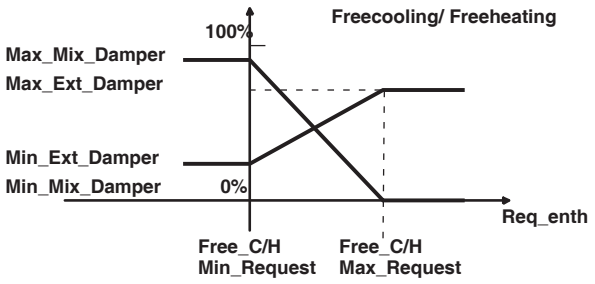
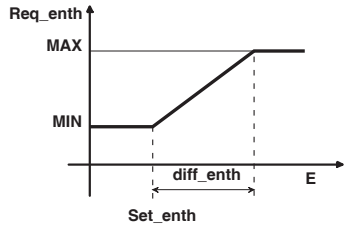


Fig. 9.k

Key

Max_Mix_Damper	Mixing damper maximum opening
Max_Ext_Damper	Fresh air damper maximum opening
Min_Mix_Damper	Mixing damper minimum opening
Min_Ext_Damper	Fresh air damper minimum opening
Req_enth	Enthalpy request

In the case of freecooling by enthalpy, the control request will depend on the deviation from the control set point. Control for freeheating by enthalpy is similar.



Key

Req_enth	Control request
diff_enth	Enthalpy control differential
Set_enth	Enthalpy set point

9.9 Heat recovery

Definition

If the AHU is fitted with a heat recovery unit, the heat contained in the exhaust air is recovered and transferred to the primary air so as to preheat or precool it, if the conditions are favourable: consequently freecooling/freeheating and heat recovery are mutually exclusive. When the AHU is in heat recovery mode, the bypass damper on the heat recovery unit is closed.

In cascade control the request is shared between the various devices available. Heat recovery is thus considered a free source of energy free, activated with priority in cascade control in cooling and heating modes.

Enabling

The heat recovery function can only be enabled if a heat recovery unit is installed and enabled. The bypass damper (Ha01) may not be necessary. Below is a list of possible combinations.

Ha14	Type of heat recovery				
Bypass damper	Cross flow	Double ON/OFF coil	Modulating run-around coil	Modulating wheel	On/Off wheel
No	YES	YES	YES	YES	YES
On/Off	YES	YES	YES	YES	YES
Modulating	YES	YES	YES	NO	YES

Tab. 9.e

ON/OFF Devices

Screen index	Display description	Enable
Hb39	Heat recovery unit pump (double coil)	Position ≠ 0
	Heat wheel (ON/OFF)	Position ≠ 0
	Bypass damper (ON/OFF)	Position ≠ 0
Hb69	Heat recovery pump (analogue output)	Position ≠ 0

Tab. 9.f

Modulating devices

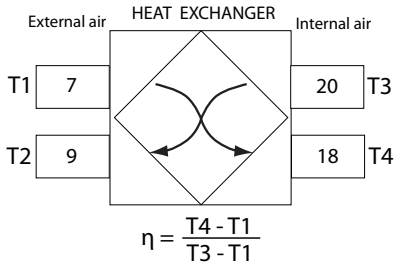
Hb63	Heat wheel	Position ≠ 0
Hb56	Bypass damper (ON/OFF)	Position ≠ 0

Tab. 9.g

Types of heat recovery unit

Cross-flow heat recovery unit: no dedicated output.

The efficiency of the heat recovery unit can be displayed once the probes have been configured: outside (T1), return (T3), temperature after heat recovery unit (T4), according to the formula shown in the figure:



Screen index	Temperature probe
Hb03	Outside
Hb02	Return
Hb23b	After heat recovery unit (supply)
Hb15	Exhaust
D88	Heat recovery unit efficiency

Run-around coil heat recovery unit: only one digital output is activated, which starts the pump. If the bypass damper has On/Off operation, activation of the pump will be the reverse to the damper. With modulating dampers, the pump will remain on while heat can be recovered and the bypass damper will modulate the quantity of heat recovered, depending on the request.

Modulating heat wheel: an analogue output is managed for modulation of wheel rotation speed and an On/Off output for the bypass damper. The heat recovery request acts directly on the wheel speed, which may have a minimum limit set. The bypass damper will be activated when no heat can be recovered.

On/Off heat wheel: an on/off output is managed to control the heat recovery unit. The bypass damper will be activated when no heat can be recovered.

Screen index	Display description	Selection	
Ha14	Heat recovery type	1: None ¦ 2: Plate exchanger ¦ 3: Run-around coil ¦	4: Modulating rotary ¦ 5: On/Off rotary

Note: with on/off or modulating heat wheels, heat can also be recovered by controlling the enthalpy conditions.

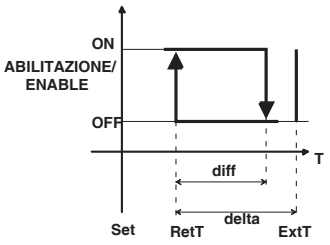
The function has two stages:

1. check whether the return temperature or enthalpy conditions are favourable compared to the outside air conditions;
2. the request of summer/winter acts on the speed of the heat wheel or on the modulating bypass damper.

Activation

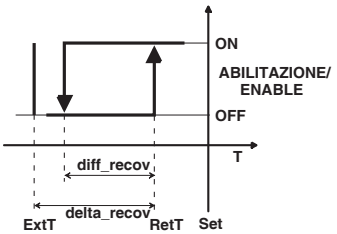
Note: the following graphs consider the outside temperature to be constant. Heat recovery is activated when the return temperature is closer to the temperature set point than the outside temperature.

RECOVERY IN COOLING (cooling request active)



ON: ExtT-RetT> delta_recov; OFF: ExtT-RetT< delta_recov – diff_recov

RECOVERY IN HEATING (heating request active)



ON: RetT-ExtT-> delta_recov; OFF: RetT-ExtT < delta_recov – diff_recov

Key

diff_recov	Recovery differential	Set	Set point
RetT	Return temperature	delta_recov	Recovery delta
ExtT	Outside temperature		

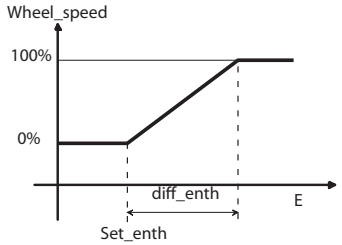
Screen index	Display description	Def	Min	Max	UOM
Gfc31	Heat recovery temperature activation				
	Delta recovery	5	0	99.9	°C
	Differential	3	0	99.9	°C

Note: for heat recovery by enthalpy, only applicable to the wheel, the same rules apply for activation. The enthalpy delta is fixed at 4 kJ/kg and the differential is fixed at 2 kJ/kg.

Based on the efficiency of the heat recovery unit, a deviation (delta) must be set between the return and outside temperature. The more efficient the heat recovery unit, the lower the delta. The differential (diff_recov) is used to switch off the devices in advance, so as to reduce energy consumption, above all relating to operation of the heat wheel or pump for the run-around coil heat recovery unit. For heat recovery units consisting of a plate heat exchanger, on the other hand, flow through the heat exchanger increases pressure drop and consequently fan power consumption.

Control

Control by temperature depends on the set point and the temperature differentials, based on the percentage of request reserved for the heat recovery unit. See the paragraph "Cascade control". As regards control by enthalpy, the control differential needs to be set, based on which the heat wheel rotation speed will vary. For run-around coil heat recovery units, the pump will be on or off according to the activation graphs shown in the previous paragraph.



Key

Wheel_speed	Heat wheel speed
diff_enth	Enthalpy control differential
Set_enth	Enthalpy set point
E	Enthalpy

Screen index	Display description	Def	Min	Max	UOM
Gfc31	Enthalpy control				
	Enthalpy differential	5	0	99.9	kJ/kg

Heat recovery unit frost protection function

The heat recovery unit frost protection function prevents problems due to frost forming on the heat recovery unit. The actions undertaken depend on the type of heat recovery unit: in any case, the bypass damper is fully open. Given that the exhaust air has a defrosting effect:

- the run-around coil heat recovery unit pump continues operating;
- the heat wheel continues operating.

Activation and control

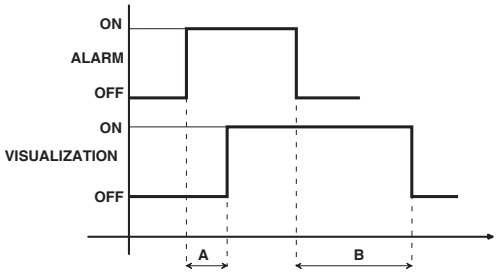
To enable the function, define the probe that measures the temperature, enable (optional) a defrost heater and define the activation set point and differential. For modulating heat wheels, the speed during frost protection can also be selected.

Screen index	Display description	Selection
Ha14	Heat recovery type	
	…	
	Defrost probe	None ¦ External-Return (*) ¦ Exhaust ¦ External
	Recovery heater	No ¦ Yes
Hb41	Heater heat recovery unit	Position ≠ 0

(*) Arithmetic average between the 2 probes.

Screen index	Display description	Def	Min	Max	UOM
Gfc32	Heat recovery defrost				
	Setpoint	-1	-99.9	10	°C
	Differential	4	0	99.9	°C
	Heater offset	3	0	99.9	°C
	Minimum speed (enthalpy wheel)	100	0	100	%
Hc18	Heat recovery				
	Defrost delay				
	Start	120	0	999	s
	End	60	0	999	s
	Clogged alarm delay	60	0	300	s

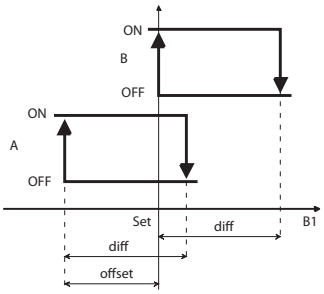
Once the heat recovery unit frost protection alarm is activated, for example when the frost protection thermostat contact closes, a delay from the start of the signal and a delay from the end of the signal can be set.



Key

A Start B End

Below is a graph showing activation of the damper and frost protection heater, based on the defrost probe reading.



Key

A	Heat recovery unit frost protection heater	Set	Setpoint
B	Bypass damper	offset	Offset
B1	Defrost probe	diff	Differential

9.10 Cascade control

The cooling request and heating request can be shared between freecooling/freeheating and the coil, and between the heat recovery unit and the coil.

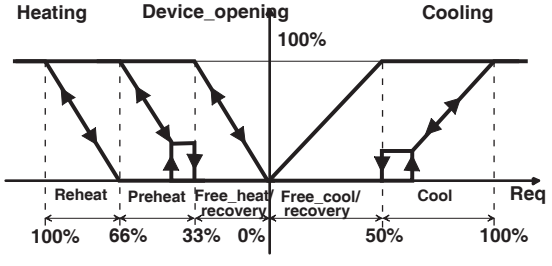
Screen index	Display description	Def	Min	Max	UOM
Gfc20	Cooling cascade				
	Freecooling	50	0	100	%
	Coil	50	0	100	%
	Recovery	40	0	100	%
	Coil	40	0	100	%
Gfc21	Heating cascade				
	Freeheating	50	0	100	%
	Coil	50	0	100	%
	Recovery	40	0	100	%
	Coil	40	0	100	%

As regards heating, the heating request can be further shared between the preheating and reheating coils.

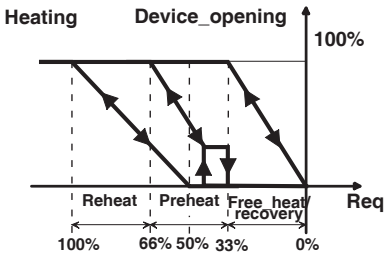
Note: overlapping operation of the preheating and reheating coils is also possible.

Screen index	Display description	Def	Min	Max	UOM
Gfc22	Heating cascade				
	Reheating	80	%	0	100

Example 1: partition of request between devices.



Example 2: overlapping of preheating and reheating coils.



Key

Recovery	Recovery	Req	Request
Free_heat	Freeheating	Device_opening	Device activation
Preheat	Preheating coil valve	Reheat	Reheating coil valve

9.11 Supply limits

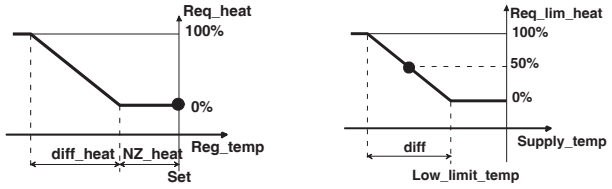
Definition

Note: the supply limits function can be activated (Gfc04) only if the control probe is the return probe or room probe .

The algorithm is used to correct the action of the main control function to return within acceptable values for the supply temperature. For example, if the fresh air damper opens to satisfy a air quality request, this attenuates the request on the actuators (e.g. heating coil, humidifier) so as to mitigate the effect on the supply temperature and humidity. Without this function, the supply air may cause discomfort (e.g. too hot or too cold) near the air inlets. The function can be activated on either the minimum or maximum temperature or humidity. There are two possible cases: action concordant with or contrasting against control.

Temperature limits with concordant action

Example of operation in heating mode (winter): when the control set point is reached and the heating coil stops heating, an air quality request causes the fresh air damper to open and consequently the air supply temperature decreases. To prevent the temperature measured by the control probe from changing further, when the air supply temperature is less than minimum allowed limit the heating coil is activated, with proportional or PI control, according to the following graph, where the total request is 50%.

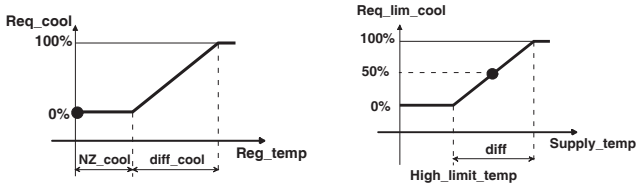


0% + 50% = 50%

Key

Req_lim_ heat	Additional heating request	Reg_temp	Control probe temperature
NZ_heat	Neutral zone in heating	Supply_temp	Supply probe temperature
Diff_heat	Heating differential	Diff	Supply limit differential

The behaviour is similar in cooling mode (summer).



0% + 50% = 50%

Key

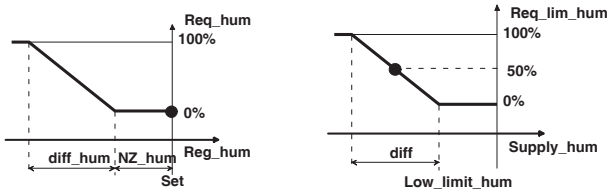
Req_lim_cool	Additional cooling request	Reg_temp	Control probe temperature
NZ_cool	Neutral zone in cooling	Supply_temp	Supply probe temperature
Diff_cool	Cooling differential	Diff	Supply limit differential
High_limit_ temp	High temperature limit		

Screen index	Display description	Selection
Gfc04	Temperature regulation	
	Auto cool/heat	No ¦ Yes
	Supply limits	None ¦ High ¦ Low ¦
High/low		
Alto/basso		

Screen index	Display description	Def	Min	Max	UOM
Gfc07	Temperature supply limits				
	Summer high	40	-99.9	99.9	°C
	Winter high	40	-99.9	99.9	°C
	Summer low	10	-99.9	99.9	°C
	Winter low	10	-99.9	99.9	°C
	Differential	3	0	99.9	°C
	Integral time	150	0	999	s

Humidity limits with concordant action

Example of operation in humidification mode: when the control set point is reached and humidification ends, an air quality request causes the fresh air damper to open and consequently the supply humidity may decrease. To prevent the humidity measured by the control probe from changing further, when the supply air humidity is less than minimum allowed limit, the humidifier is activated, with proportional or PI control, according to the following graph, where the total request is 50%.

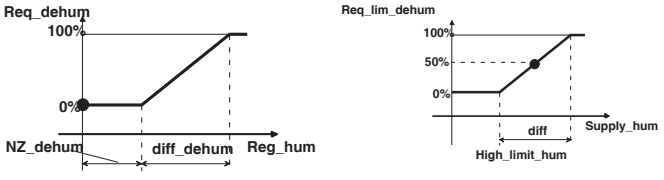


0% + 50% = 50%

Key

Req_lim_hum	Additional humidification request	Reg_hum	Control probe humidity
NZ_hum	Neutral zone in humidification	Supply_hum	Supply probe humidity
Diff_hum	Humidification differential	Diff	Supply limit differential
Low_limit_hum	Low humidity limit		

The behaviour is similar in dehumidification mode



0% + 50% = 50%

Key

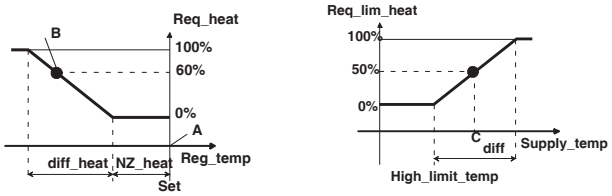
Req_lim_dehum	Dehumidification request for limit	Reg_hum	Control probe humidity
NZ_dehum	Neutral zone in dehumidification	Supply_hum	Supply probe humidity
Diff_dehum	Dehumidification differential	Diff	Supply limit differential
High_limit_hum	High humidity limit		

Screen index	Display description	Selection
Gfc10	Humidity regulation	
	Auto hum/dehum	No ¦ Yes
	Supply limits	None ¦ High ¦ Low ¦
High/low		

Screen index	Display description	Def	Min	Max	UOM
Gfc13	Humidity supply limits				
	High limit	100	0	100	% RH
	Low limit	0	0	100	% RH
	Differential	4	0	100	% RH
	Integral time	150	0	999	s

Temperature/humidity limits with contrasting action

Example of operation in heating mode (winter): the temperature measured by the control probe moves away from the set point (A) and reaches point B; the heating coil is then activated at 60%. If the temperature measured by the supply probe reaches point C, a control function is activated that limits the request signalled to the heating coil to 10% (60%-50%).



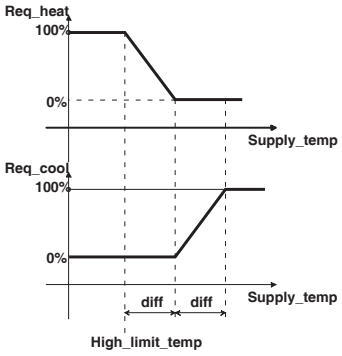
60% - 50% = 10%

Key

Req_lim_heat	Heating request for limit	Reg_temp	Control probe temperature
NZ_heat	Neutral zone in heating	Supply_	
temp	Supply probe temperature		
Diff_heat	Heating differential	Diff	Supply limit differential

If double action is enabled, the action of the heating device will be limited until complete deactivation after the differential, when the cooling device will be activated.

Screen index	Display description	Selection
Hc07	Temperature supply limits	
	Enable double action	0:No¦ 1:Yes



Key

Req_heat	Heating request	Reg_temp	Control probe temperature
Diff	Supply limit differential	Supply_temp	Supply probe temperature
High_limit_temp	High temperature limit		

The function is similar in:
1. cooling;
2. humidification;

Note: the limiting action acts on the request signal. Therefore, the devices involved depend on the cascade control function described in point 8.10. For example, on an AHU in heating operation with auto mode enabled, in summer may operate with freecooling only

9.12 Direct evaporative cooling - DEC

Definition

Free cooling with direct evaporative cooling is particularly important in arid places or in periods with low outside humidity in temperate climates. It can be useful if the enthalpy of the outside air is lower than that needed in the air-conditioned space and, at the same time, the specific humidity is sufficiently lower than that in the air-conditioned space, in order to satisfy indoor latent loads.

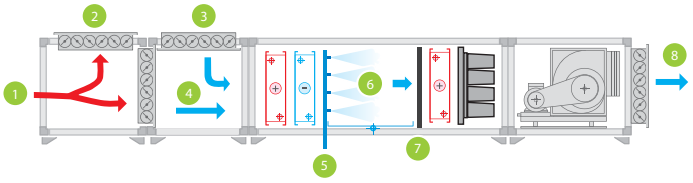


Fig. 9.I

Key

1	Return air	5	Cooling line in summer
2	Exhaust air	6	Summer cooling rack
3	Outside air	7	Droplet separator
4	Recirculated air	8	Supply air

Enabling

The following need to be enabled:
1. adiabatic humidifier;
2. DEC cooling.

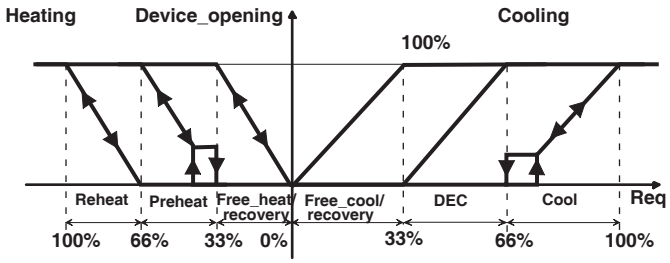
Screen index	Display description	Selection
Ha13	Humidifier	
	Type	3: Adiabatic (ON/OFF) ¦ 4: Adiabatic (Modulating)
	Enable DEC	Yes

Activation

The following conditions are required for activation:
1. cooling request;
2. no dehumidification request;
3. maximum supply limit humidity not reached;
4. cooling coil not active (if selected for parameter Ha14c, DEC settings, Cooling: coil only): the aim is to avoid wasting energy by dehumidifying after having humidified.

Control

DEC thus represents a cooling device that works in cascade with free cooling upstream of the cooling coil. The options are available are coil only, or DEC + coil.



Screen index	Display description	Def	Min	Max	UOM
Gfc20a	Cooling cascade control (DEC)				
	Free cooling	50	0	100	%
	DEC	50	0	100	%
	Coil	0	0	100	%
Ha14c	DEC settings	Selection			
	Cooling	Coil only ¦ DEC +coil			

If temperature priority is set, the adiabatic humidifier will operate so as to first to reach the set temperature, and then the humidity setting, and both set points will not be reached. The opposite is true when setting the priority for humidity. Consequently, "No priority" must be selected.

Screen index	Display description	Selection
Gfc14	Priority	0: temperature ¦ 1:humidity ¦ 2: no priority

There are two possible critical conditions, due to simultaneous requests for
1. cooling and humidification;
2. heating and dehumidification.

Cooling and humidification

ADIABATIC HUMIDIFIER

		CONTROL PROBE	
	Case	Return / Room	Supply
1	Simultaneous request for cooling/ humidification	The cascade control ramp acts on the humidity request, which becomes the higher of the two values and any limits that compensate for the value (*)	The humidifier controls based on the supply humidity control probe, the cooling coil attempts to meet the temperature requirements
2	Cooling only	The cascade control ramp acts to satisfy the humidity request due to temperature control	Humidity control only
3	Humidification only	Humidity control only	Control on humidity probe, however maintaining supply temperature within limits (Gfc35)

(*) When the humidity reaches the set point, case 2 applies, while if reaching the temperature set point, case 3 applies.

See par. 9.5 for simultaneous heating and dehumidification.

9.13 Indirect evaporative cooling - IEC

Note: the return temperature probe must be installed to activate IEC.

Definition

The possibility of heat recovery in temperate climates is further increased by the indirect evaporative cooling technique. One possible operating diagram, illustrated in the figure, shows how the air is humidified before being expelled: its temperature decreases, meaning this cooler air can be used to exchange heat with the outside air, which is in turn cooled without variations in its moisture content (humidity).

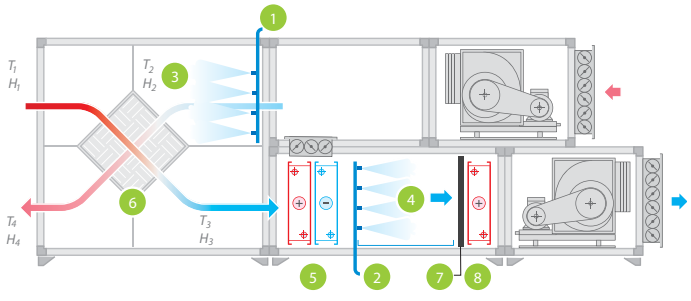


Fig. 9.m

Key

1	Summer cooling rack - IEC	7	Droplet separator
2	Humidification rack in winter - DEC	8	Reheating coil
3	Summer cooling rack	T1,H1	Outside temperature/humidity
4	Humidification rack in winter	T2,H2	Return temperature/humidity
5	Heating and cooling coils	T3,H3	Supply temperature/humidity
6	Heat recovery unit	T4,H4	Exhaust temperature/humidity

To measure the efficiency of heat recovery unit, see the chapter on "Heat recovery"..

Enabling

The following need to be enabled/set:
1. indirect evaporative cooling - IEC;
2. the IEC limit probe to be installed position after the droplet separator, where present;
3. the analogue output for the adiabatic humidifier request (pressurised water line 2);
4. the analogue output for the humidification rack control in summer (pressurised water line 1).

Screen index	Display description	Selection
Ha14a	Enable IEC	NO/YES
	Rec.-IEC delay	0 s
Ha14b	IEC settings:	
	Humidification	Alternating ¦ IEC + Humidification
	Dehumidification	Stop IEC ¦ IEC + coil
Hb23c	IEC limit probe	Position ≠ 0
Hb68	IEC	Position ≠ 0
Hc03a	Bypass damper with IEC active	Always force closed ¦ no forced closing

Screen index	Display description	Def	Min	Max	UOM
Gfc32a	IEC activation delta				
	Heat recovery unit + IEC	0	0	15	°C
	IEC only	0	0	20	°C
	Delta at 100%	0	0	20	°C
	IEC diff.	0	0	20	°C

The drawings below refer to the following:

Heat recovery + IEC	D4
IEC only	D3
Delta at 100%	D2
IEC diff.	D1

Activation

The following conditions are required for activation:
1. cooling request;
2. on/off heat recovery unit with pleat exchanger or run-around coil (not enthalpy wheel);
3. following conditions are required based on return temperature, outside temperature and saturation temperature;
4. no humidification request;
5. no dehumidification request.

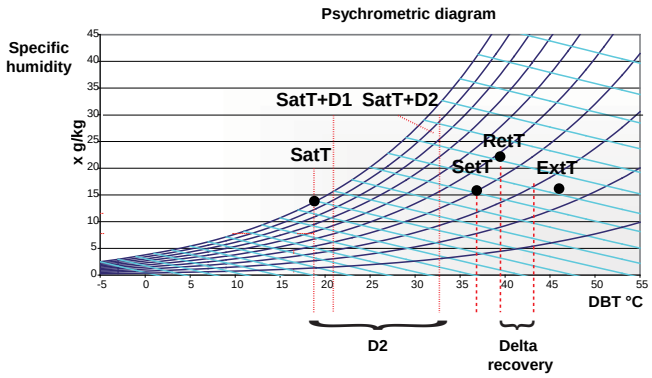
Also see the chapter on "Heat recovery" for the conditions in which heat recovery is activated.

Conditions for activation by temperature

The controller activates IEC in two cases:
1. the heat recovery unit is already active (a) and the conditions for activation of IEC are satisfied (b);

   a) ExtT- RetT > delta_recov

   b) RetT- SatT > D2



Key

RetT	Return temperature
ExtT	Outside temperature
SatT	Saturation temperature

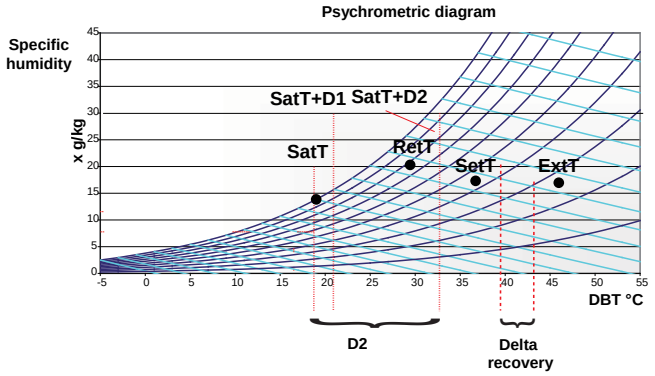
IEC can be enabled with a settable delay from when the heat recovery conditions are satisfied.

Screen index	Display description	Def	Min	Max	UOM
Ha14a	Enable IEC				
	Heat recovery - IEC delay	0	0	999	s

If condition b) is not satisfied, IEC is not activated

a) ExtT- RetT > delta_recov

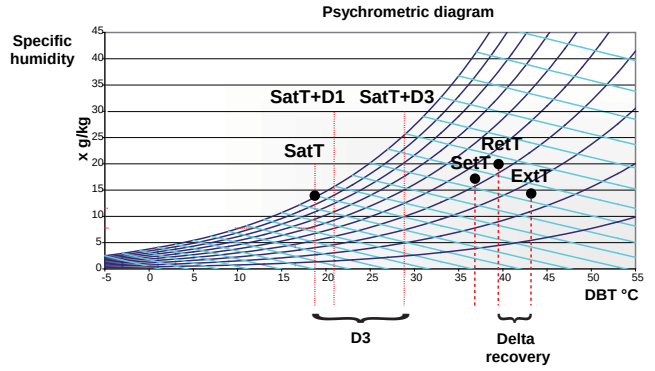
b) RetT- SatT < D2



2. the heat recovery unit is not active (c), but the condition for activation of IEC (d) is satisfied, with threshold D3, therefore IEC is activated immediately after the heat recovery unit starts.

c) ExtT- RetT < delta_recov

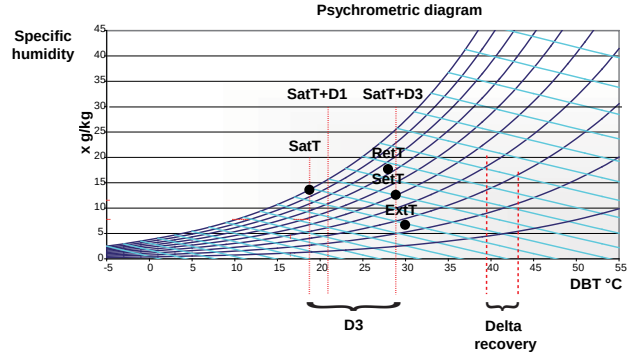
d) RetT- SatT > D3



If condition d) is not satisfied, IEC is not activated, and neither is heat recovery.

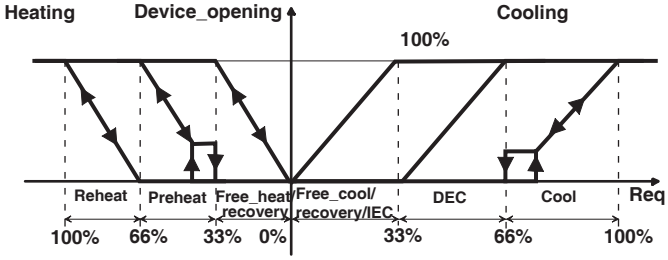
c) ExtT- RetT < delta_recov

d) RetT- SatT < D1



Control

IEC acts as a cooling device that occupies the first position in the cascade, as an alternative to free cooling or heat recovery only. The request acts directly on the IEC analogue output.



Cooling and humidification

Once IEC has been enabled, two analogue outputs are available to modulate water production in the supply and return racks. These two humidifiers can be activated as "alternating", i.e. when humidification and cooling are both required, the controller gives priority to the humidification request and, when this is satisfied, restarts IEC. If selecting "IEC + humidification", the two requests are satisfied at the same time. The two outputs are the humidifier digital or analogue output and the IEC analogue output.

Screen index	Display description	Selection
Ha14b	IEC settings	
	Humidification	Alternating ¦ IEC + Humidification

Cooling and dehumidification

In the event of simultaneous requests for cooling and dehumidification, it may be required to not use IEC (Stop IEC), as its contribution is negligible, and only the cooling coil is used to both dehumidify and cool. In other cases, the sizing of the components is such that pre-cooling makes a useful contribution (IEC + coil).

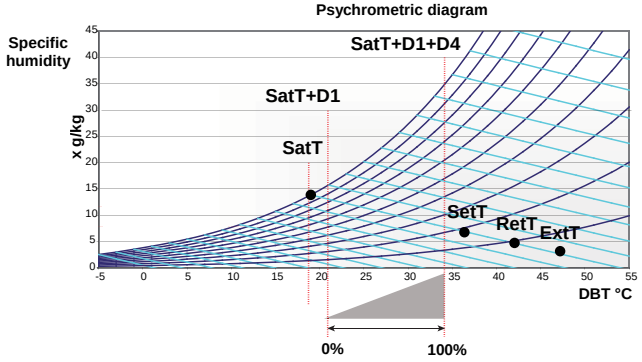
Screen index	Display description	Selection
Ha14b	IEC settings	
	Dehumidification	Stop IEC ¦ IEC + coil

9.14 IEC limitation from algorithm/probe

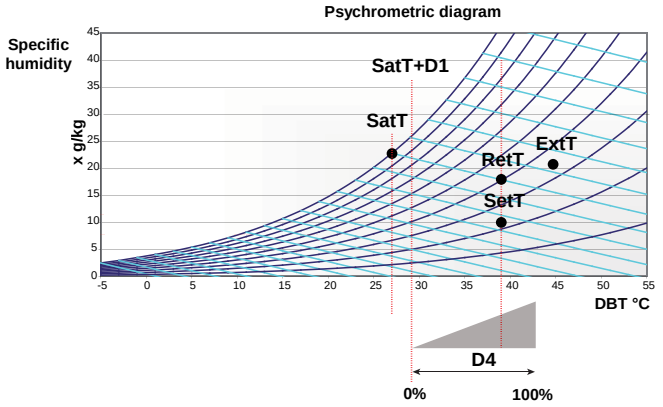
Output of the summer cooling rack is limited in two modes, by setting the corresponding parameter.

Screen index	Display description	Selection
Ha14a	Enable IEC	0: No ¦ 1: Yes
	Control	From algorithm ¦ From probe
Hb23c	IEC limit probe	Position ≠ 0

1. from algorithm: the maximum allowable output is used to respond to the IEC request, whereby
   - the minimum (0%) corresponds to saturation temperature + hysteresis: SatT+D1;
   - the maximum (100%) corresponds to saturation temperature + hysteresis + interval: SatT+D1+D4. Coefficient D4 is calculated based on the control set point at which control can be activated at 100%, based on the size of the humidifier.



In the following graph, the same D1 is shown in the new conditions, in which there is a new saturation temperature. In this case, using the same delta D4, the maximum allowable % may be less than 100%.



2. from probe: this must be fitted downstream of the summer cooling rack, and limits the relative humidity before the heat recovery unit to a value set by parameter (e.g. 90%), and consequently limits the IEC request.

Screen index	Display description	Def	Min	Max	UOM
Gfc32b	IEC limit				
	Set point	100	0	100	%RH
	Differential	5	0	100	%RH

Note:

- connect the IEC limit probe only to the pCO5+, not to the humidifier;
- make sure the settings are consistent: if IEC limitation is from algorithm, the limit probe must not be installed on the humidifier.

9.15 IEC limitation from mixing damper/bypass damper opening

1. Mixing damper: the maximum allowable output can be linked to the percentage of recirculated air, controlled by opening the mixing damper. The parameter indicates the maximum allowable % of request with maximum opening of the mixing damper (the parameter will range from 100% at minimum opening of the mixing damper, meaning total exhaust of return air, to the value corresponding to the maximum opening of the recirculation damper and minimum exhaust of return air).

Screen index	Display description	Def	Min	Max	UOM
Hc18a	IEC air flow limit	0	0	100	%

2. Bypass damper: if always forced closed, all the return air will flow through the heat recovery unit, giving maximum heat recovery. If not forced closed, the controller will modulate damper opening based on request.

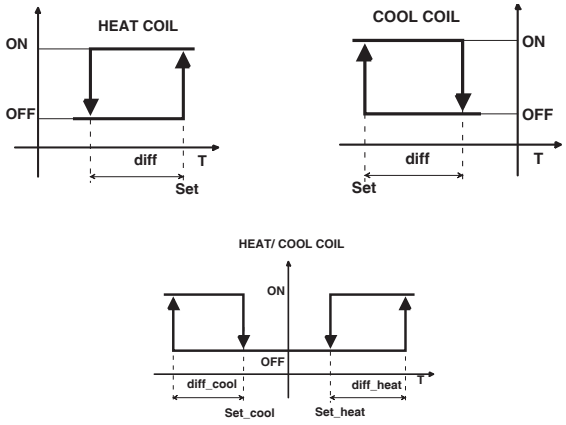
Screen index	Display description	Selection
Hc03a	Bypass damper with IEC active	0: Always force closed ¦ 1: No forced closing

9.16 Coils water temperature limits

To avoid opening of valves on the coils when the water temperature has not exceeded a minimum limit, the "Coil temperature limits" function can be enabled, available for every type of coil with its own set point and differential.

Screen index	Display description	Selection
Hc09	Enable preheating coil water temperature threshold	0:No¦ 1:Yes
Hc11	Enable cooling coil water temperature threshold	0:No¦ 1:Yes
Hc14	Enable heat/cool coil water temperature threshold	0:No¦ 1:Yes
Hc16	Enable reheating coil water temperature threshold	0:No¦ 1:Yes

Screen index	Display description	Def	Min	Max	UOM
Hc09	Enable preheating coil water temperature threshold				
	Threshold	25	-99.9	99.9	°C
	Differential	2	0	99.9	°C
Hc11	Enable cooling coil water temperature threshold				
	Threshold	35	-99.9	99.9	°C
	Differential	2	0	9.9	°C
Hc14	Enable heat/cool coil water temperature threshold				
	Hot threshold	25	-99.9	99.9	°C
	Cool threshold	35	-99.9	99.9	°C
	Differential	2	0	9.9	°C
Hc16	Enable reheating coil water temperature threshold				
	Threshold	25	-99.9	99.9	°C
	Differential	2	0	99.9	°C



Note: when season changeover is enabled based on the water temperature, the heating/cooling coil temperature limit is set on Hb16 and the switching threshold on Gc03.

Screen index	Display description	Selection
Gc01	Season selection from	H2O temperature

Screen index	Display description	Def	Min	Max	UOM
Gc03	Season threshold				
	Summer	25	-99.9	99.9	°C
	Winter	30	-99.9	99.9	°C

9.17 Pump management

Up to two pumps are managed, with rotation and alarms. The corresponding functions concern:

1. automatic rotation between the pumps to equally share the work load and operating hours between pumps. This is activated:
   - when a certain period of time expires;
   - when a thermal overload alarm is activated or there is no flow on one of the two pumps;
2. antiblock management, with temporary activation of the pump when the system is not used for long periods;
3. frost protection by starting the pump to circulate fluid.

The pumps are enabled as devices and consequently the number needs to be defined. For the explanations of the other parameters, see "Rotation between two pumps" and "Pump alarms".

Screen index	Display description	Selection
Ha09	Enable water pumps Cooling-Cool/heat	0:No¦ 1:Yes
	Preheating	0:No¦ 1:Yes
	Reheating	0:No¦ 1:Yes
	Enable flow feedback	0:No¦ 1:Yes

Screen index	Display description	Def	Min	Max	U.M
Ha10	Cooling – cool/ heat pumps				
	Number of pumps	2	1	2	-
	Warning limit	3	0	5	-
	Enable antiblock	Yes	0	1	-
Ha11	Preheating pumps				
	Number of pumps	2	1	2	-
	Warning limit	3	0	5	-
	Enable antiblock	Yes	0	1	-
Ha12	Reheating pumps				
	Number of pumps	2	1	2	-
	Warning limit	3	0	5	-
	Enable antiblock	Yes	0	1	-
Hc17	Pumps				
	Alarm flow delay	30	1	999	s
	Start	15	1	999	s
	Pumps rotation time	96	0	999	hour
	Overwork time	0	0	999	s

Rotation between two pumps

When one pump has operated for the time defined by "Rotation time", operation of the pumps is rotated. "Overlapping time" can be used to manage the changeover sequence between pumps:

OVERLAPPING TIME		
>0	=0	<0
Active pump stop delay	Pump ON stops and pump OFF starts	Pump OFF start delay (*)

(*) During the overlapping time no pump is on.

Pump alarms

There are two types of alarm:

- in the event of overload alarms, the alarm is signalled and the pump stops immediately. If a second pump is available operation is rotated;
- in the event of flow alarms, a warning signal is sent until the pump stops completely. If a second pump is available operation is rotated. Each pump sends a number of malfunction signals equal to the "Warning limit" before the no flow alarm is activated. This alarm has a delay from when absence of flow is measured, and differs depending on whether the pump is starting or is in steady operation.

In the following example the alarm is activated after two warnings.

Note:

- the number of warnings is reset as soon as water flow is measured and is automatic;
- the warning remains active during the attempts to restore pump flow;
- as soon as the alarm is activated the warning is automatically reset;
- when there is an active warning, the pump stays off for a set time. Only after this time interval can the pump start again, repeating the start-up procedure: the warning is reset only flow is measured and the pump is on;
- if the number of attempts to restore flow is 0, the alarm is activated immediately and no attempt is performed to restore flow;
- also see the documents on pump module in 1tool.

EXAMPLE

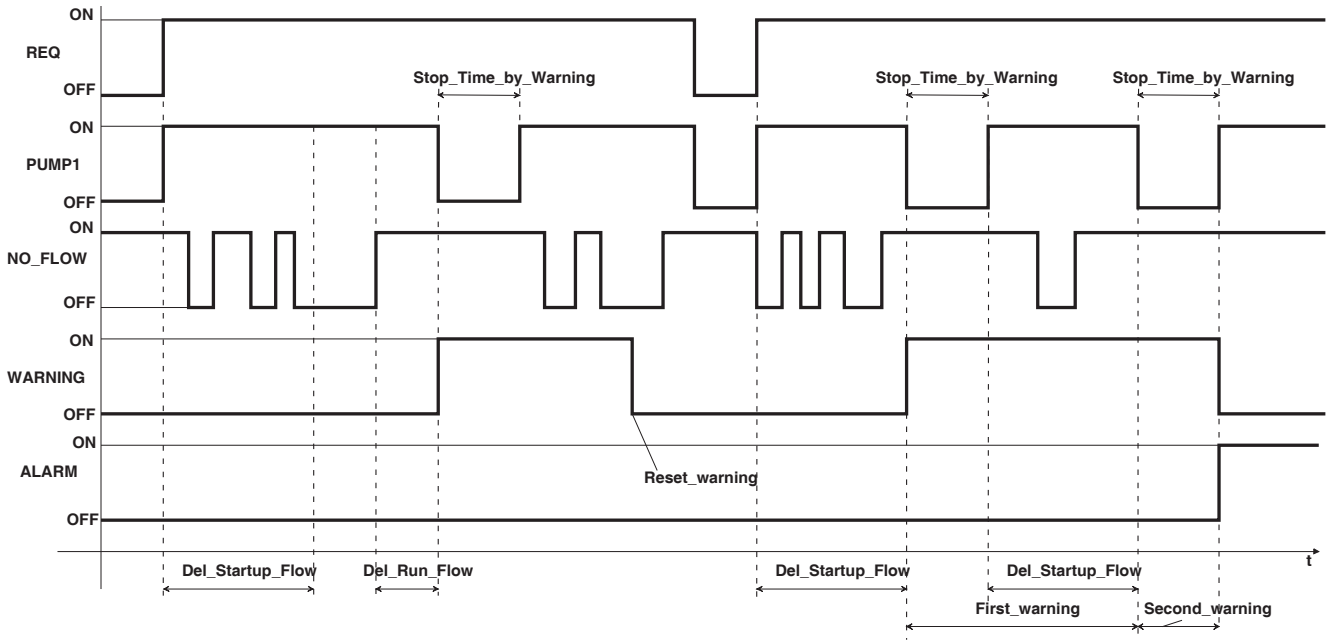


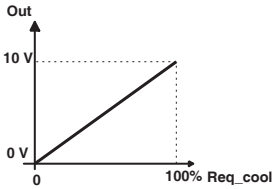
Fig. 9.n

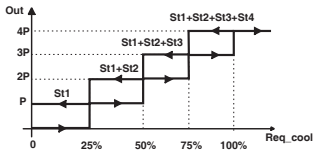
Key

REQ	Request	Del_Startup_flow	Flow alarm delay in start-up
PUMP1	Pump	Del_Run_Flow	Flow alarm delay in steady operation
ALARM	Alarm		

9.18 Cooling devices

The following cooling devices are managed (Ha06):
- valves: 0 to 10 V with one analogue output
- floating valves, with two relays outputs, one for the open command and one for closing;
- direct expansion: stepped control, calling the condenser only without management of the refrigeration cycle.





Key

Req_cool	Cooling request	St1 to 3	Step 1 to 3
P	Capacity		

Note: the total cooling request is divided between the various cascade control devices, based on the PID control parameters, and is affected by the supply limits.

9.19 Heating devices

The following heating devices are managed (Ha05, Ha08):
- valves: 0 to 10 V with one analogue output
- floating valves, with two relays outputs, one for the open command and one for closing;
- heaters.

Note: the total heating request is divided between the various cascade control devices, based on the PID control parameters, and is affected by the supply limits.

The heaters may be on/off or modulating, for the selection see parameter Ha05.

Screen index	Display description	Selection
Ha05	Heaters type	On/Off ¦ Modulating ¦ On/Off binary

The type of control depends on the number of heaters:
1. Modulating: see the graph in the previous paragraph;
2. ON/OFF;
3. ON/OFF binary (for 2 heaters only): if the heaters are suitably sized (R1 with power P and R2 with power 2P) the controller can deliver capacity in steps from 0 to 3P (figure).

	Pre-heating heaters
Type	ON/OFF, Modulatingi, ON/OFF binary

ON/OFF binary control for 2 heaters

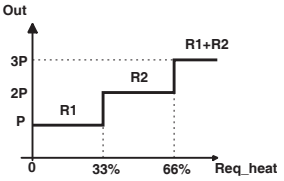


Fig. 9.o

Key

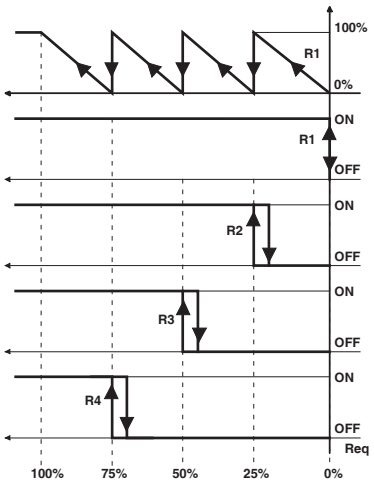
P	Power	R1,2	Heater 1, 2
Req_heat	Heating request		

If control is modulating and there is one heater, this will be controlled by a digital output plus 1 analogue output for modulation, while if there are from 2 to 4 heaters (with the same power rating) modulation will only be applied to one heater (1 digital output + 1 analogue output) and the remaining heaters will be controlled by digital outputs only.

Outputs for modulating heater control

No. Heaters	Digital outputs	Analogue outputs
1	1	1
2	2	1
3	3	1
4	4	1

Tab. 9.h



Key

Req	Request	R1…R4	Heater 1…4

9.20 Fan management

Note: see the par. on "On/Off " for fan activation with damper limit switch.
Regardless of the type of fans, these only start when the unit is on and the dampers are completely open (delay=opening time). When both these conditions are true, the fans are activated immediately. If the dampers are no longer open, the fans are stopped immediately. Alternatively, they may be stopped after a delay to allow for any thermal inertia of the coils (delay = closing delay).

Note: the total cooling request is divided between the various cascade control devices, based on the PID control parameters, and is affected by the supply limits.

Screen index	Display description	Def	Min	Max	UOM
Hc03	Damper setting				
	Opening time	120	0	9999	s
	Closing delay	120	0	9999	s

On screen Ha01, can you select if fans are presents in:
- supply;
- supply+return.

When the number of fans are selected, select the type:

Type of fan control

Selection	Type of control	Outputs envisaged (*)	
		DIG	AN
Inverter	Air quality	1	1
	Static pressure		
On-off (double)	Two fans installed in parallel to modify the ventilating section. Same control as direct starting with delay set between the two	2	-
On-off (star – delta)	Same as direct starting with setting of contactor digital outputs	3	-
On-off (direct starting)	Fan start-up linked only to unit power-on	1	-
On-off (backup fan)	Pair of fans where one is the backup for the other in the event of faults (flow, thermal overload alarm)	2	-
On-off (2 speed)	Speed 1. Unit ON 2. Air quality request		

Tab. 9.i

(*) if only supply fan fitted. Double the number of outputs with supply and return air fans.

On/Off fans with direct and star-delta starting

The fans are started when the unit is powered up. For starting, as well as the fan outputs, the outputs for the 3 contactors also need to be enabled (see the figure)

1. Supply/return air fan line (K1)
2. Supply/return air fan star (K3);
3. Supply/return air fan delta (K2)

The switching delay time also needs to be set.

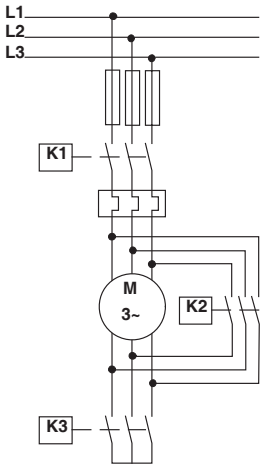


Fig. 9.p

Screen index	Display description	Selection
Ha03	Fan type	1: On-Off(direct start) ¦ 2: On-Off(star-delta) ¦ 3: On-Off (double) ¦ 4: Inverter ¦ 5: On-Off(2 speed) ¦ 6: On-Off (duty standby) ¦
Hb37	Star-delta logic	
	Supply fan line	position ≠0
	Supply fan star	position ≠0
	Supply fan delta	position ≠0
Hb37	Return fan line	position ≠0
	Return fan star	position ≠0
	Return fan delta	position ≠0

Screen index	Display description	Def	Min	Max	UOM
Hc04	Fans Star-Delta timing				
	Star-line	-	0	99	ms
	Star	-	0	99	ms
	Star-delta	-	0	99	ms

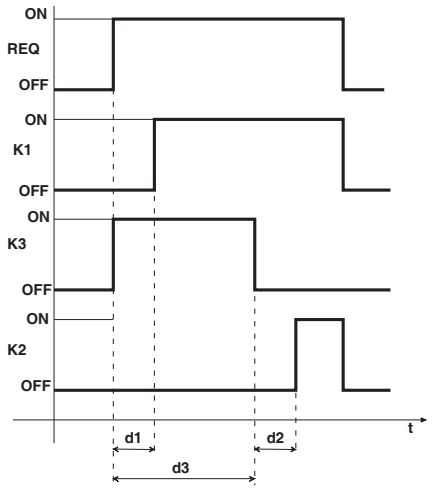


Fig. 9.q

Key

REQ	Fan request		
K1	Fan line	K2	Fan delta
K3	Fan star	d1	Line – star delay
d2	Star-delta delay	d3	Star time

Double On/Off fans

This is when there are two fans fitted in parallel, to modify the ventilating section. Activation again depends on unit power-on, however a delay is available between activation of the first and second fan (supply – return).

Screen index	Display description	Def	Min	Max	UOM
Hc06	Fans timing				
	Stop delay	30	0	999	s
	Supply-return	0	0	999	s

Fans with inverters

If the fans are controlled by inverter, three types of control can be selected:

Screen index	Display description	Selection
Ha03	TYpe of control	1: Static pressure ¦ 2: Air quality ¦ 3: Fixed speed ¦ 4: Air flow-rate

1. Constant pressure/flow-rate: at unit power-on, the fan will operate at minimum speed and subsequently will try to reach the differential pressure/flow-rate set point, using the PID parameter settings. The values are converted using the formula shown in the figure, once the value of coefficient K has been set. The set point can be selected as pressure or flow-rate, according to the formula shown in the figure. The flow-rate setting allows a different set point to be selected in pre-comfort, comfort and economy modes.

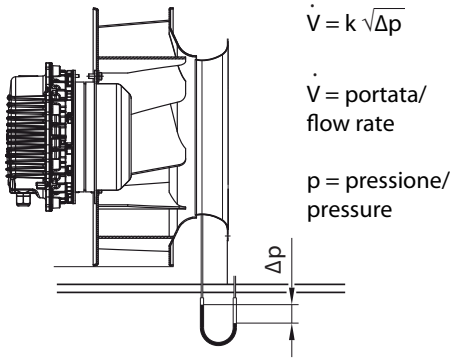
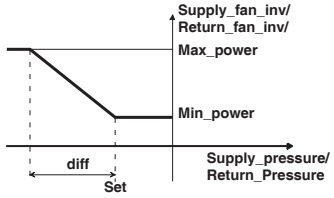


Fig. 9.r

Screen index	Display description	Def	Min	Max	UOM
Hc07b	Coefficient for calculating the flow-rate				
	Supply K	0	0	5000	-
	Return K	0	0	5000	-
Gfc17	Supply fan inverter				
	Minimum/fixed power	30	0	100	%
	Maximum power	100	0	100	%
	Return fan inverter				%
	Minimum/fixed power	30	0	100	%
	Maximum power	100	0	100	%
Gfc18	Supply fan inverter flow				
	Set point	1500	0	Max supply press. diff. limit	Pa
	Differential	300	0	1000	Pa
	Integral time	300	0	1000	s
	Derivative time	10	0	9999	s
Gfc19	Return fan inverter flow				
	Set point	1500	0	Max return press. diff. limit	Pa
	Differential	300	0	1000	Pa
	Integral time	300	0	1000	s
	Derivative time	10	0	9999	s
Gfc19a	Supply flow control set point				
	Comfort:	20000	0	3276700	m³/h
	Pre-comfort:	20000	0	3276700	m³/h
	Economy:	20000	0	3276700	m³/h
Gfc19b	Return flow control set point				
	Comfort:	20000	0	3276700	m³/h
	Pre-comfort:	20000	0	3276700	m³/h
	Economy:	20000	0	3276700	m³/h
Gfc19c	Supply air flow control				
	Differential	1000	0	3276700	m³/h
	Integral time	300	0	9999	s
	Derivative time	10	0	9999	s
	Neutral zone	500	0	200000	m³/h

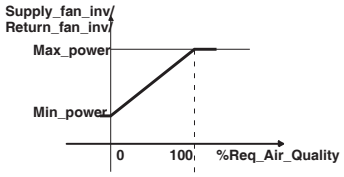
Gfc19d	Return flow control				
	Differential	1000	0	3276700	m3/h
	Integral time	300	0	9999	s
	Derivative time	10	0	9999	s
	Neutral zone	500	0	200000	m^3/h



Key

Supply_pressure/ return pressure	Supply/ return pressure
Supply_fan_inv/ Return_fan_inv	Supply / return fan inverter request
Min_power	Minimum power
Max_power	Maximum power

2. Air quality: on unit power-up the fan tries to satisfy the request.



3. Fixed speed: control is completely disabled and the fan operates at a fixed speed.

Screen index	Display description	Def	Min	Max	UOM
Gfc17	Supply inverter				
	Minimum/fixed power	30	0	100	%
	Return inverter				%
	Minimum/fixed power	30	0	100	%

On/Off fans with backup

This configuration features a pair of fans, where one is backup for the other in the event of flow or excess temperature alarms. If activated (Ha04), there are two overload alarms for the supply fans and two for the return fans. The flow alarm, on the other hand, uses one device (pressure switch/flow switch or differential probe) for the supply fans and one device for the return fans. A rotation time can be set between the two fans and backup fan activation can be brought forward/delayed by setting the overlapping time >/<0.

Screen index	Display description	Def	Min	Max	UOM
Hc06	Fans timing				
	Stop delay	30	0	999	s
	Supply-return	0	0	999	s
	Rotation time	0	0	999	h
	Overworking time	0	-99	99	s

Two speed fans

In this case a two-speed fan can be installed, where the first is activated when the unit starts (supply/return air fan 1) and the second is activated due to an air quality request (supply/return air fan 2).

Screen index	Display description	Selection
Hb35	Supply fan	
	Position	≠0
	Logic	NC, NO
Hb36	Supply fan 2	
	Position	≠0
	Logic	NC, NO

If activated (Ha04), one thermal overload alarm is available for the supply fan and one thermal overload alarm for the return fan.

Fan alarms

The alarms due to excess temperature or no flow are enabled on screen Ha04. The thermal overload alarm is only signalled via a digital input, connected for example to a suitably calibrated thermostat. The flow alarm can be generated by a pressure switch/flow switch or by a differential pressure probe.

Screen index	Display description	Selection
Ha04	Fan alarms	
	Overload	1: None ¦ 2: Supply ¦ 3: Supply + return
	Air flow	1: None ¦ 2: Supply ¦ 3: Supply + return
	Air flow from	0: Pressure switch ¦ 1: Transducer
	Stop action	0: Individual ¦ 1: All
Hb27	Supply flow control	
	Position	≠0
	Logic	NC, NO
	Return flow control	
	Position	Position
	Logic	Logic
Hb09	Supply pressure position	
	Position	
	Type	4 to 20 mA ¦ 0 to 1 V ¦ 0 to 10 V
	Min limit	
	Max limit	
Hb09	Return pressure position	
	Position	
	Type	4 to 20 mA ¦ 0 to 1 V ¦ 0 to 10 V
	Min limit	
	Max limit	

Note: if the alarms involve the supply fan (Ha04), the control devices that are stopped are those on the supply.

A delay when starting and a delay in steady operation can be set for the flow alarm. The alarm has automatic reset until reaching the set number of attempts and subsequently has manual reset. The flow alarm stops the fan for a certain fixed time before attempting to start it again. In the case of backup fans, the second fan will be activated immediately, if available.

Screen index	Display description	Def	Min	Max	UOM
Hc05	Flow alarm threshold				
	Supply	100	0	9999	Pa
	Return	100	0	9999	Pa
	Differential	300	0	9999	Pa
Hc07	Fans flow alarm				
	Start-up delay	20	1	999	s
	Running delay	5	1	999	s
	Flow warning retries	0	0	5	-

9.21 Air quality

Definition

CO2 and/or VOC (Volatile Organic Compound) probes can be used to monitor air quality and if necessary increase the flow-rate of fresh air to increase the concentration of oxygen.

Enabling

The air quality control function can only be enabled if the mixing damper is fitted or the fan features modulating operation. The type of control can be selected between proportional or proportional+integral.

Screen index	Display description	Selection
Ha02	Dampers type	Fresh air+mixing ¦ Fresh air+mixing+exhaust
	Enable air quality management	Yes
Ha03	Fan type	inverter
	Fan regulation	Air quality
Ha15	Air quality	
	Regulation type	Proportional ¦ P+I
	Air quality: Probe type	CO2 ¦ CO2+VOC ¦ VOC
Hb13	CO2 air quality	Position ≠ 0
Hb14	VOC air quality	Position ≠ 0

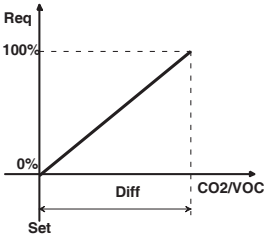
Note:

- if both probes (CO2+VOC) are set, the active request will be the higher of the two;
- setting fan control to air quality automatically enables the function. With other settings, to enable quality control, set the corresponding parameter on Ha02.

Control

Once the type of probe has been selected, the set point and differential need to be defined for each function. For P+I control, also set the integral time.

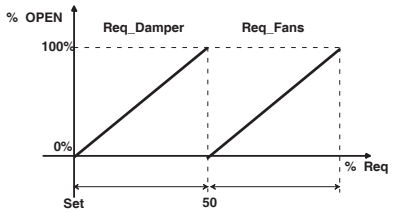
Screen index	Display description	Def	Min	Max	UOM
Gfc30	Air quality with CO2				
	Setpoint	1200	0	5000	ppm
	Differential	200	0	5000	°C
	Air quality with VOC				
	Setpoint	50	0	100	%
	Differential	10	0	100	%
Hc19	Integral time	300	9999		s



Key

CO2/VOC	CO2/VOC probe	Req	Air quality request
Set	CO2/VOC air quality set point		
Diff	CO2/VOC air quality differential		

Based on the request, first the fresh air damper output will be increased and then the fan output (cascade control).



Key

Set	Air quality set point
Req_Fans	Fan request
Req_Damper	Fresh air damper request
Req	Air quality request

Note: the fan request from 0 to 100 % varies the fan speed between minimum and maximum.

The maximum and minimum limits for the mixing and fresh air dampers are set on Hc02. Based on the percentage of the air quality request, the dampers will operate with the following trend. The exhaust damper, if available, follows the trend of the fresh air damper. For ON/OFF dampers, maximum corresponds to ON and minimum to OFF.

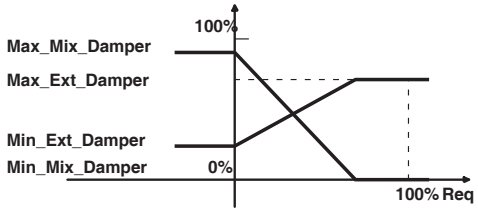


Fig. 9.s

Key

Req	Air quality request
Min_Mix_Damper	Mixing damper minimum limit
Max_Mix_Damper	Mixing damper maximum limit
Min_Ext_Damper	Fresh air damper minimum limit
Max_Ext_Damper	Fresh air damper minimum limit

Note: opening the fresh air damper involves proportionally closing the mixing damper, respecting the corresponding minimum and maximum limits. If a freecooling/freeheating request is also active, the fresh air damper will open based on the higher of the two.

9.22 Purging

Definition

Air purging, once enabled, manually forces fresh air into the room for a set time.

Enabling

The following are possible:

1. enable the purge function manually only if the mixing damper is installed and the function is enabled;
2. automatically activate the function at start-up (based on the scheduler).

Screen index	Display description	Selection
Ha15	Enable purging	0: No ¦ 1: Yes
Gg02	Air quality	
	Start purging	No ¦ Yes
	Stop purging	No ¦ Yes
	Resume time	---min
	Repeat at start-up	No ¦ Yes

Screen index	Display description	Def	Min	Max	UOM
Hc19	Cleaning time	10	0	300	min

Control

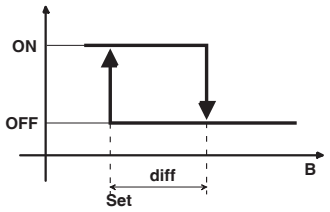
During the purge function, the fresh air damper is fully opened to assist the inlet of fresh air and the fan is operated at maximum speed.

Note: in the status of frost protection the function is disabled.

9.23 Frost protection

Unit frost protection

This can be activated by thermostat, probe or thermostat and probe together. If activated by thermostat, the "Frost protection alarm" digital input is configured on Hb25, if activated by probe the frost protection probe analogue input is configured on Hb11; the set point and differential are set on Gfc33.



Key

Set	Frost protection set point	B	Frost protection probe
diff	Frost protection differential		

Screen index	Display description	Selection
Ha16	Frost protection	1: none ¦
		2: by frost-stat ¦
		3: by probe ¦
		4: by probe+frost-stat
Hb11	Frost temperature position	position ≠0
		type: NTC ¦ PT1000
Hb25	Frost-stat	position ≠0

Screen index	Display description	Def	Min	Max	UOM
Gfc33	Frost temperature position				
	Setpoint	5	-99.9	99.9	°C
	Differential	3	0	99.9	°C

If the frost protection probe measures a temperature less than Set+diff, the controller activates "Frost protection prevention" mode, with the icon shown on the display: the preheating coil capacity is increased gradually. The fresh air damper is closed gradually however only if the mixing damper is installed. The controller exits "frost protection prevention" mode when the temperature exceeds Set+diff.

If, on the other hand, the temperature continues falling and the frost protection probe value is less than Set, the frost protection alarm is activated, with automatic reset. The display continues showing the icon. The controller:

1. stops the fans;
2. closes the dampers;
3. activates the preheating coil at 100%;
4. activates the cooling coil at 50%;
5. activates all the pumps.

If, as a consequence of these actions, the frost protection probe measures a temperature greater than Set+diff, the controller exits frost protection mode.

Note:

- unit frost protection is also active when the unit is OFF;
- frost protection by thermostat only features the alarm with automatic reset;
- for alarms from probe +thermostat, use the thermostat as a safety device and calibrate it to lower temperature than the frost protection set point.

Room frost protection

The room probe must be enabled on Hb04. The set point is then set on Gfc34. The differential is fixed at 3°C.

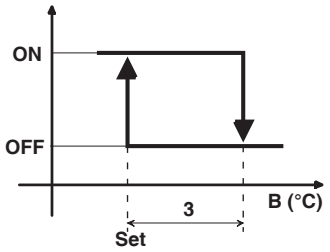


Fig. 9.t

Key

Set	Room frost protection set point	B	Room probe

Screen index	Display description	Selection
Hb04	Room temperature	Position ≠ 0
Gfc34	Room frost protection enable	No ¦ Yes

Screen index	Display description	Def	Min	Max	UOM
Gfc34	Setpoint	5	-99.9	99.9	°C

If the room temperature is less than the set point and the controller is OFF:

- the display shows frost protection as being active;
- the controller starts operating as if it were ON, based on the control probe reading

9.24 Auxiliary control

Four auxiliary control loops can be enabled, each with its probe, P, PI or PID control and activation. The set points, differentials and integral times can be displayed on screens B11 to B14.

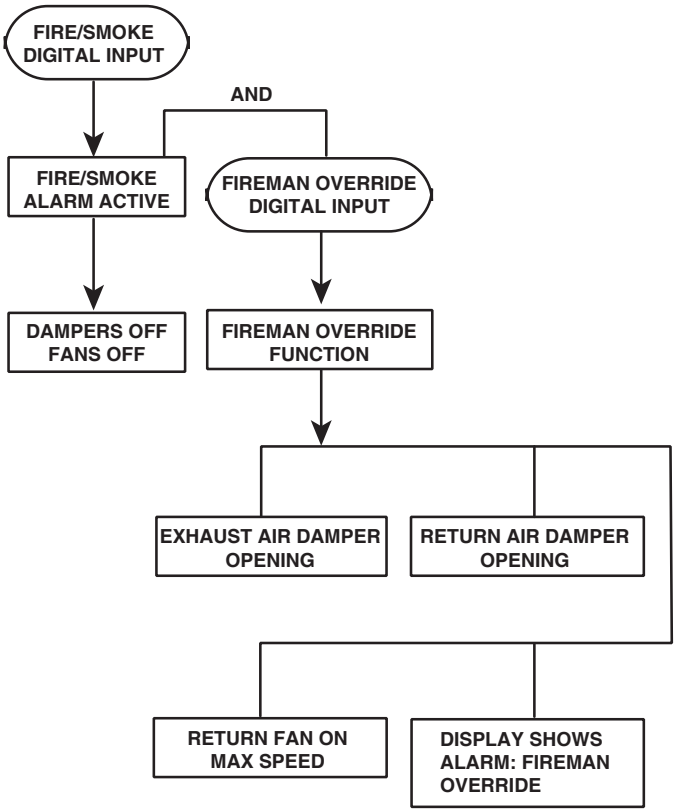
Screen index	Display description	Selection
Ha19	Auxiliary regulation loop	None, 1 to 4
Ha20…Ha23	Regulation loop 1	
	Regulation type	Direct ¦ inverse
	Output type	Modulating +on/off ¦ on/off ¦ modulating
	Other management	None¦ on with supply fan ¦ Force with frost protection
Hb19…22	Regulation probe loop 1 to 4	
	Position	≠0
	Type	NTC ¦ PT1000 ¦ 0 to 1 V ¦ 0 to 10 V ¦ 4 to 20 mA
Gfc36…39	Regulation loop 1 to 4	
	Setpoint	
	Differential	
	Integral time	

9.25 Fireman override

The "fireman override" function is designed to help fire-fighters. In the event of fire alarms, as measured by the smoke detector, the unit operates so as to avoid fuelling the fire, and therefore:

1. isolates the areas affected by the fire: the shut-off dampers are closed (e.g. using the built-in return spring mechanism), meaning the areas affected by the fire is safely isolated;
2. removes smoke from the affected areas: the air exhaust damper is opened and the return fan is activated at maximum speed.

Screen index	Display description	Selection
Hb34	Fire & smoke alarm	Position >0
Hb34a	Fireman override	Position >0



10. PARAMETERS TABLE

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel Address
A. On/Off Unit										
A01	On-Off Unit		0	-	0	4	0: OFF ¦ 1: COMFORT ¦ 2: PRECOMFORT¦ 3: ECONOMY ¦ 4: AUTO	I	R/W	12
	Reset time		4	Hour	0,5	16		I	R	-
	Override for		-	Hour	0,5	16		I	R	-
	Enable auto-resume		No	-	No	Yes	0:No¦ 1:Yes	I	R/W	-
B. Setpoint										
B01	Temperature	Current temperature set point	0	°C	-99.9	99.9		A	R	93
	Humidity	Current humidity set point	0	% RH	0	100		I	R	13
	External compensation	Enable: Gfc08-Gfc09 Config.: Hb03	0	°C	-99.9	99.9		A	R	-
	AIN Offset	Enable: Ha19 Configure: Hb23	0	°C	-99.9	99.9		A	R	25
B02	Comfort temp. Summer	Comfort room temp. set point (cooling)	23	°C	Min. temp. set limit in cooling (Gfc02)	Max. temp. set limit in cooling (Gfc02)		A	R/W	94
	Comfort temp. Winter	Comfort room temp. set point (heating)	23	°C	Min. temp. set limit in heating (Gfc02)	Max. temp. set limit in heating (Gfc02)		A	R/W	95
	Comfort humid. Summer	Comfort room humidity set point (cooling)	50	%r.H.	Min. humid. set limit in cooling (Gfc03)	Max. humid. set limit in cooling (Gfc03)		I	R/W	14
	Comfort humid. Winter	Comfort room humidity set point (heating)	50	%r.H.	0	100		I	R/W	15
B03	Pre-comfort temp. Summer	Precomfort room temp. set point (cooling)	25	°C	Min. temp. set limit in cooling (Gfc02)	Max. temp. set limit in cooling (Gfc02)				
	Pre-comfort temp. Winter	Precomfort room temp. set point (heating)	21	°C	Min. temp. set limit in heating (Gfc02)	Max. temp. set limit in heating (Gfc02)				
	Pre-comfort humid. Summer	Precomfort room humidity set point (cooling)	55	%r.H.	0	100		I	R/W	16
	Pre-comfort humid. Winter	Precomfort room humidity set point (heating)	45	%r.H.	0	100		I	R/W	17
B04	Economy temp. Summer	Economy room temp. set point (cooling)	27	°C	Min. temp. set limit in cooling (Gfc02)	Max. temp. set limit in cooling (Gfc02)		A	R/W	98
	Economy temp. Winter	Economy room temp. set point (heating)	19	°C	Min. temp. set limit in heating (Gfc02)	Max. temp. set limit in heating (Gfc02)		A	R/W	99
	Economy humid. Summer	Economy room humidity set point (cooling)	60	%r.H.	0	100		I	R/W	18
	Economy humid. Winter	Economy room humidity set point (heating)	40	%r.H.	0	100		I	R/W	19
B11	Regulation loop 1 (see Ha20…Ha23; Gfc36…Gfc39)	Setpoint	0	-	-3200	3200		A	R/W	148
		Differential	0	-	-3200	3200		A	R/W	149
		Integral time	0	s	0	999		I	R/W	129
B12	Regulation loop 2	Setpoint	0	-	-3200	3200		A	R/W	150
		Differential	0	-	-3200	3200		A	R/W	151
		Integral time	0	s	0	999		I	R/W	130
B13	Regulation loop 3	Setpoint	0	-	-3200	3200		A	R/W	152
		Differential	0	-	-3200	3200		A	R/W	153
		Integral time	0	s	0	999		I	R/W	131
B14	Regulation loop 4	Setpoint	0	-	-3200	3200		A	R/W	154
		Differential	0	-	-3200	3200		A	R/W	155
		Integral time	0	s	0	999		I	R/W	132

Screen index	Display description			Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel Address
C. Clock/ Scheduler												
C01	Hour			Current time	-	hh:mm	00:00	23:59		I	R/W	-
	Date			Current date	-	dd/mm/aa	01/01/00	31/12/99		I	R/W	-
	Day			Day of the week	-	Mo…Su	Mo	Su		I	R	-
C02	Enable scheduler			Enable time bands	No	-	No	Yes	0:No¦1:Yes	D	R/W	85
	Day			Day time band setting	Mo	-	Mo	Su	0: Mo…6: Su	I	R/W	25
	Copy to			Day to copy settings to	Mo	-	Mo	All	0: Mo ¦…¦ 6: Su ¦ 7: All	D	R/W	-
	No/Yes			Enable copy settings	No	-	No	Yes	0:No¦1:Yes	I	R/W	-
	F1	hh		Time band F1 start hour	8	Hour	0	23		I	R/W	26
		mm		Time band F1 start minutes	30	minutes	0	59		I	R/W	27
		operating mode		Time band F1 operating mode	comfort	-	0	3	0: off ¦ 1: comfort ¦ 2: pre-comf. ¦ 3: economy	I	R/W	28
	F2	hh		Time band F2 start hour	12	Hour	0	23	-	I	R/W	29
		mm		Time band F2 start minutes	30	minutes	0	59	-	I	R/W	30
		operating mode		Time band F2 operating mode	pre-comfort	-	0	3	0: off ¦ 1: comfort ¦ 2: pre-comf. ¦ 3: economy	I	R/W	31
	F3	hh		Time band F3 start hour	13	Hour	0	23	-	I	R/W	32
		mm		Time band F3 start minutes	30	minutes	0	59	-	I	R/W	33
		operating mode		Time band F3 operating mode	pre-comfort	-	0	3	0: off ¦ 1: comfort ¦ 2: pre-comf. ¦ 3: economy	I	R/W	34
	F4	hh		Time band F4 start hour	13	Hour	0	23	-	I	R/W	35
		mm		Time band F4 start minutes	30	minutes	0	59	-	I	R/W	36
		operating mode		Time band F4 operating mode	comfort	-	0	3	0: off ¦ 1: comfort ¦ 2: pre-comf. ¦ 3: economy	I	R/W	37
C03	Enable holiday period			Enable holidays	No	-	No	Yes	0:No¦1:Yes	D	R/W	86
	Period 1	Start	dd	Holiday period 1 start day	-	day	01	31	-	I	R/W	38
			mm	Holiday period 1 start month	-	month	01	12	-	I	R/W	39
		End	dd	Holiday period 1 end day	-	day	01	31	-	I	R/W	40
			mm	Holiday period 1 end month	-	month	01	12	-	I	R/W	41
		Set		Holiday period 1 operating mode	-	-	0	3	0: off ¦ 1: comfort ¦ 2: pre-comf. ¦ 3: economy	I	R/W	42
	Period 2	Start	dd	Holiday period 2 start day	-	day	01	31	-	I	R/W	43
			mm	Holiday period 2 start month	-	month	01	12	-	I	R/W	44
		End	dd	Holiday period 2 end day	-	day	01	31	-	I	R/W	45
			mm	Holiday period 2 end month	-	month	01	12	-	I	R/W	46
		Set		Holiday period 2 operating mode	-	-	0	3	0: off ¦ 1: comfort ¦ 2: pre-comf. ¦ 3: economy	I	R/W	47
	Period 3	Start	dd	Holiday period 3 start day	-	day	01	31	-	I	R/W	48
			mm	Holiday period 3 start month	-	month	01	12	-	I	R/W	49
		Fine	dd	Holiday period 3 end day	-	day	01	31	-	I	R/W	50
			mm	Holiday period 3 end month	-	month	01	12	-	I	R/W	51
		Set		Holiday period 3 operating mode	-	-	0	3	0: off ¦ 1: comfort ¦ 2: pre-comf. ¦ 3: economy	I	R/W	52
C04	Enable special days				No	-	No	Yes	0:No¦1:Yes	D	R/W	87
	GS1	gg		Special day 1: day	-	day	01	31	-	I	R/W	53
		mm		Special day 1: month	-	month	01	12	-	I	R/W	54
		set		Special day 1 operating mode	-	-	-	4	0: off ¦ 1: comfort ¦ 2: pre-comf. ¦ 3: economy¦ 4: auto	I	R/W	55
	GS2	gg		Special day 2: day	-	day	01	31	-	I	R/W	56
		mm		Special day 2: month	-	month	01	12	-	I	R/W	57
		set		Special day 2 operating mode	-	-	0	4	0: off ¦ 1: comfort ¦ 2: pre-comf. ¦ 3: economy¦ 4: auto	I	R/W	58
	GS3	gg		Special day 3: day	-	day	01	31	-	I	R/W	59
		mm		Special day 3: month	-	month	01	12	-	I	R/W	60
		set		Special day 3 operating mode	-	-	0	4	0: off ¦ 1: comfort ¦ 2: pre-comf. ¦ 3: economy¦ 4: auto	I	R/W	61
	GS4	gg		Special day 4: day	-	day	01	31	-	I	R/W	62
		mm		Special day 4: month	-	month	01	12	-	I	R/W	63
		set		Special day 4 operating mode	-	-	0	4	0: off ¦ 1: comfort ¦ 2: pre-comf. ¦ 3: economy¦ 4: auto	I	R/W	64
	GS5	gg		Special day 5: day	-	day	01	31	-	I	R/W	65
		mm		Special day 5: month	-	month	01	12	-	I	R/W	66

C04		set	Special day 5 operating mode	-	-	0	4	0: off ¦ 1: comfort ¦ 2: pre-comf. ¦ 3: economy¦ 4: auto	I	R/W	67
	GS6	gg	Special day 6: day	-	day	01	31	-	I	R/W	68
		mm	Special day 6: month	-	month	01	12	-	I	R/W	69
		set	Special day 6 operating mode	-	-	0	4	0: off ¦ 1: comfort ¦ 2: pre-comf. ¦ 3: economy¦ 4: auto	I	R/W	70
C05	Enable summer time			No	-	No	Yes	0:No¦1:Yes	D	R/W	88
	Transition time			0	min	0	240		I	R/W	-
	Start	day	Daylight saving start day	last	-	4	-	0: last ¦ 1: first ¦ 2: second ¦ 3: third ¦ 4: fourth	I	R/W	-
		day of the week	Daylight saving start weekday	Sunday	-	1	7	1: Monday ¦…¦ 7: Sunday	I	R/W	-
		month	Daylight saving start month	March	month	January	December	1: January ¦… ¦ 12: December	I	R/W	-
		hour	Daylight saving start time	02:00	hour	00:00	23:00	End	I	R/W	-
	End	day	Daylight saving end day	last	-	4	-	0: last ¦ 1: first ¦ 2: second ¦ 3: third ¦ 4: fourth	I	R/W	-
		day of the week	Daylight saving end weekday	Sunday	-	1	7	1: Monday ¦…¦ 7:Sunday	I	R/W	-
		month	Daylight saving end month	March	month	January	December	1: January ¦… ¦ 12: December	I	R/W	-
		hour	Daylight saving end time	03:00	hour	00:00	23:00	D. Input/Output	I	R/W	-

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel Address
D. Input/ Output										
D01	Analog inputs									
	--- = Supply temperature		-	°C	-99.9	99.9		A	R	10
	--- = Return temperature		-	°C	-99.9	99.9		A	R	11
	--- = Room temperature		-	°C	-99.9	99.9		A	R	12
	--- = Supply humidity		-	%rH	0	100		I	R	13
	--- = Return humidity		-	%rH	0	100		I	R	14
	--- = Room humidity		-	%rH	0	100		I	R	15
D02	Analog inputs									
	--- = Supply pressure		-	Pa	-9999	9999		I	R	1
	--- = Return pressure		-	Pa	-9999	9999		I	R	2
	--- = External temperature		-	°C	-99.9	99.9		A	R	16
	--- = External humidity		-	%rH	0	0		A	R	17
D03	--- = Frost temperature		-	°C	-99.9	99.9		A	R	18
	--- = Off-coil temperature		-	°C	-99.9	99.9		A	R	19
	--- = Exhaust temperature		-	°C	-99.9	99.9		A	R	20
	--- = CO2		-	ppm	0	9999		I	R	3
	--- = VOC		-	%	0	100		A	R	21
D04	Water coil temperature									
	--- = Cooling- cool/heat	Enable: Hc11-Hc14; Config: Hb16	-	°C	-99.9	99.9		A	R	22
	--- = Pre - heating	Enable: Hc09; Config: Hb17	-	°C	-99.9	99.9		A	R	23
	--- = Re – heating	Enable: Hc16; Config: Hb18	-	°C	-99.9	99.9		A	R	24
D05	--- = Set offset	Enable: Ha19; Config: Hb23	-	°C	-99.9	99.9		A	R	25
	--- = Regulation loop 1	Enable: Ha19; Config: Hb19	-	-	-3200	3200		A	R	26
	--- = Regulation loop 2	Enable: Ha19; Config: Hb20	-	-	-3200	3200		A	R	27
	--- = Regulation loop 3	Enable: Ha19; Config: Hb21	-	-	-3200	3200		A	R	28
	--- = Regulation loop 4	Enable: Ha19; Config: Hb22	-	-	-3200	3200		A	R	29
D05a	--- = Humidity probe downstream of coils	Enable: Ha23a	-	-	-99.9	99.9		I	R	192
	--- = Temperature probe after rec.	Enable: Hb12	-	-	-99.9	99.9		A	R	161
	--- = IEC limit	Enable: Ha14a	-	%rH	0	0		i	R	194
D6	Enthalpy									
	Supply	Enable: Ha02	-	kJ/kg	0	999.9		A	R	-
	Return	Enable: Ha02	-	kJ/kg	0	999.9		A	R	-
	Room	Enable: Ha02	-	kJ/kg	0	999.9		A	R	-
	External	Enable: Ha02	-	kJ/kg	0	999.9		A	R	-
	Setpoint	Enable: Ha02	-	kJ/kg	0	999.9		A	R	-
D07	Digital inputs									
	--- = Remote On/Off	Enable: Ha17; Config: Hb24	0	-	0	1	0:C:closed¦1:A:open	D	R	6
	--- = Summer/Winter	Enable: Gc01; Config: Hb24	0	-	0	1	0:C:closed¦1:A:open	D	R	7
	--- = Double setpoint	Enable: Ha18; Config: Hb24	0	-	0	1	0:C:closed¦1:A:open	D	R	8
D08	--- = Generic alarm	Config: Hb25; Delay Hc20	0	-	0	1	0:C:closed¦1:A:open	D	R	9
	--- = Serious alarm	Config: Hb40	0	-	0	1	0:C:closed¦1:A:open	D	R	10
	--- = Humidifier alarm	Enable: Ha01; Config: Hb28	0	-	0	1	0:C:closed¦1:A:open	D	R	11
	--- = Frost-stat	Enable: Ha16; Config: Hb25	0	-	0	1	0:C:closed¦1:A:open	D	R	12
D09	--- = 1st supply filter	Config: Hb26	0	-	0	1	0:C:closed¦1:A:open	D	R	13
	--- = 2nd supply filter	Config: Hb26	0	-	0	1	0:C:closed¦1:A:open	D	R	14
	--- = Return filter	Enable: Ha01; Config: Hb26	0	-	0	1	0:C:closed¦1:A:open	D	R	15
	--- = Supply flow	Config: Hb27	0	-	0	1	0:C:closed¦1:A:open	D	R	16
	--- = Return flow	Enable: Ha01-Ha04; Config: Hb27	0	-	0	1	0:C:closed¦1:A:open	D	R	17

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel Address
D10	Overload pump 1									
	--- = Cooling-Cool/heat	Enable: Ha09-10; Config: Hb30	0	-	0	1	0:C:closed¦1:A:open	D	R	18
	--- = Pre-heating	Enable: Ha09-11; Config: Hb30	0	-	0	1	0:C:closed¦1:A:open	D	R	19
	--- = Re-heating	Enable: Ha09-12; Config: Hb30	0	-	0	1	0:C:closed¦1:A:open	D	R	20
D11	Overload pump 2									
	--- = Cooling-Cool/heat	Enable: Ha09-10; Config: Hb31	0	-	0	1	0:C:closed¦1:A:open	D	R	21
	--- = Pre-heating	Enable: Ha09-11; Config: Hb31	0	-	0	1	0:C:closed¦1:A:open	D	R	22
	--- = Re-heating	Enable: Ha09-12; Config: Hb31	0	-	0	1	0:C:closed¦1:A:open	D	R	23
D12	Coil flow									
	--- = Cooling-Cool/heat	Enable: Ha09; Config: Hb32	0	-	0	1	0:C:closed¦1:A:open	D	R	24
	--- = Pre-heating	Enable: Ha09;Config: Hb32	0	-	0	1	0:C:closed¦1:A:open	D	R	26
	--- = Re-heating	Enable: Ha09; Config: Hb32	0	-	0	1	0:C:closed¦1:A:open	D	R	25
D13	Fans overload									
	--- = Supply 1	Enable: Ha04; Config: Hb29;	0	-	0	1	0:C:closed¦1:A:open	D	R	27
	--- = Supply 2	Enable: Ha03(backup)-Ha04; Config: Hb29;	0	-	0	1	0:C:closed¦1:A:open	D	R	28
	--- = Return 1	Enable: Ha01-Ha04; Config: Hb29;	0	-	0	1	0:C:closed¦1:A:open	D	R	29
	--- = Return 2	Enable:Ha01-Ha03(backup)-Ha04; Config: Hb29;	0	-	0	1	0:C:closed¦1:A:open	D	R	30
D14	--- = Supply inverter alarm	Enable: Ha03; Config: Hb28	0	-	0	1	0:C:closed¦1:A:open	D	R	31
	--- = Return inverter alarm	Enable: Ha01-Ha03; Config: Hb28	0	-	0	1	0:C:closed¦1:A:open	D	R	32
	--- = Pre-heaters overload	Enable: Ha04-Ha05; Config: Hb33	0	-	0	1	0:C:closed¦1:A:open	D	R	33
	--- = Re-heaters overload	Enable: Ha04-Ha08; Config: Hb33	0	-	0	1	0:C:closed¦1:A:open	D	R	34
D15	--- = Recovery clogged	Enable: Ha01; Config: Hb33	0	-	0	1	0:C:closed¦1:A:open	D	R	35
	--- = Filter clogged	Config: Hb34	0	-	0	1	0:C:closed¦1:A:open	D	R	36
	--- = Fire & smoke	Enable: always;Config: Hb34;	0	-	0	1	0:C:closed¦1:A:open	D	R	37
	--- = Open switch	Enable: always;Config: Hb34;	0	-	0	1	0:C:closed¦1:A:open	D	R	38
D15a	--- = Fireman override	Enable: Hb34a	0	-	0	1	0:C:closed¦1:A:open	D	R	193
	--- = Supply damper limit switch	Enable: Hb34b	0	-	0	1	0:C:closed¦1:A:open	D	R	194
	--- = Return damper limit switch	Enable: Hb34b	0	-	0	1	0:C:closed¦1:A:open	D	R	195
D16	Air quality demand	Enable: Ha02; Ha15; Config: Gfc30, Hc19, Hb13, Hb14	-	%	0	100		A	R	-
	Purging demand	Enable: Ha15;Config: Gg02; Hc19; Enable: Gg02		0	-	0	1	0:No¦ 1:Yes	D	R
	Resume time	Enable: Ha15;Config: Gg02	0	min	0	299		I	R	-
D17	Digital outputs									
	--- = Supply fan	Config: Hb35	Off	-	Off	On	0:Off¦ 1:On	D	R	39
	--- = Supply fan 2nd	Enable: Ha03 (2 coupled fans); Config: Hb36	Off	-	Off	On	0:Off¦ 1:On	D	R	40
	--- = Return fan	Enable: Ha01; Config: Hb35	Off	-	Off	On	0:Off¦ 1:On	D	R	41
	--- = Return fan 2nd	Enable: Ha01; Ha03 (2 coupled fans); Config: Hb36	Off	-	Off	On	0:Off¦ 1:On	D	R	
D18	--- = Supply fan line	Enable: Ha03(star-delta); Config: Hb37	Off	-	Off	On	0:Off¦ 1:On	D	R	43
	--- = Supply fan star	Enable: Ha03; Config: Hb37	Off	-	Off	On	0:Off¦ 1:On	D	R	
	--- = Supply fan delta	Enable: Ha03; Config: Hb37	Off	-	Off	On	0:Off¦ 1:On	D	R	
	--- = Return fan line	Enable: Ha01-Ha03(star-delta); Config: Hb38	Off	-	Off	On	0:Off¦ 1:On	D	R	44
	--- = Return fan star	Enable: Ha01-Ha03; Config: Hb38	Off	-	Off	On	0:Off¦ 1:On	D	R	
	--- = Return fan delta	Enable: Ha01-Ha03; Config: Hb38	Off	-	Off	On	0:Off¦ 1:On	D	R	
D19	--- = Unit status (On/Off)	Enable: always; Config: Hb41	Off	-	Off	On	0:Off¦ 1:On	D	R	45
	--- = Humidifier	Enable: Ha01-Ha13; Config: Hb35	Off	-	Off	On	0:Off¦ 1:On	D	R	46
	--- = Rotary rec./ Run around coil	Enable: Ha14; Config: Hb39	Off	-	Off	On	0:Off¦ 1:On	D	R	47
	--- = Recovery heater	Enable: Ha14; Config: Hb41	Off	-	Off	On	0:Off¦ 1:On	D	R	48
D20	--- = Global alarm	Config: Hb40	Off	-	Off	On	0:Off¦ 1:On	D	R	49
	--- = Serious alarm	Enable: always; Config: Hb40	Off	-	Off	On	0:Off¦ 1:On	D	R	50
	--- = Minor alarm	Enable: always; Config: Hb40	Off	-	Off	On	0:Off¦ 1:On	D	R	51
	--- = Filter alarm	Enable: always; Config: Hb41	Off	-	Off	On	0:Off¦ 1:On	D	R	52
D21	--- = Fresh air damper	Enable: Ha02-Ha14; Config: Hb39	Off	-	Off	On	0:Off¦ 1:On	D	R	53
	--- = By-pass damper	Enable: Ha14; Config: Hb39	Off	-	Off	On	0:Off¦ 1:On	D	R	54
	--- = Re-heater 1	Enable: Ha08; Config: Hb49	Off	-	Off	On	0:Off¦ 1:On	D	R	55
	--- = Re-heater 2	Enable: Ha08; Config: Hb49	Off	-	Off	On	0:Off¦ 1:On	D	R	56
	--- = Re-heater 3	Enable: Ha08; Config: Hb49	Off	-	Off	On	0:Off¦ 1:On	D	R	57
	--- = Re-heater 4	Enable: Ha08; Config: Hb49	Off	-	Off	On	0:Off¦ 1:On	D	R	58
D22	--- = Pre-heater 1	Enable: Ha05; Config: Hb48	Off	-	Off	On	0:Off¦ 1:On	D	R	59
	--- = Pre-heater 2	Enable: Ha05; Config: Hb48	Off	-	Off	On	0:Off¦ 1:On	D	R	
	--- = Pre-heater 3	Enable: Ha05; Config; Hb48	Off	-	Off	On	0:Off¦ 1:On	D	R	61
	--- = Pre-heater 4	Enable: Ha05; Config:Hb48	Off	-	Off	On	0:Off¦ 1:On	D	R	62
D23	--- = Cooling step 1	Enable: Ha06 (Direct exp.); Config: Hb47	Off	-	Off	On	0:Off¦ 1:On	D	R	63
	--- = Cooling step 2	Enable: Ha06 (Direct exp.); Config: Hb47	Off	-	Off	On	0:Off¦ 1:On	D	R	64
	--- = Cooling step 3	Enable: Ha06 (Direct exp.); Config: Hb47	Off	-	Off	On	0:Off¦ 1:On	D	R	65
	--- = Cool/ heat step 1	Enable: Ha01-Ha07(steps); Config:Hb47	Off	-	Off	On	0:Off¦ 1:On	D	R	63
	--- = Cool/ heat step 2	Enable: Ha01-Ha07(steps); Config:Hb47	Off	-	Off	On	0:Off¦ 1:On	D	R	64
	--- = Cool/ heat step 3	Enable: Ha01-Ha07(steps); Config:Hb47	Off	-	Off	On	0:Off¦ 1:On	D	R	65
	--- = Cool/ Heat	Enable: Ha01; Config: Hb42	0	-	0	1	0:Cool¦ 1:Heat	D	R	66
D24	Pump 1									
	--- = Cooling- Cool/heat	Enable: Ha01-Ha09; Config: Hb43	Off	-	Off	On	0:Off¦ 1:On	D	R	67
	--- = Pre-heating	Enable: Ha01-Ha09; Config: Hb43	Off	-	Off	On	0:Off¦ 1:On	D	R	68
	--- = Re-heating	Enable: Ha01-Ha09;Config: Hb43	Off	-	Off	On	0:Off¦ 1:On	D	R	69
D25	Pump 2									
	--- = Cooling- Cool/heat	Enable: Ha01-Ha09; Config: Hb44	Off	-	Off	On	0:Off¦ 1:On	D	R	70
	--- = Pre-heating	Enable: Ha01-Ha09; Config: Hb44	Off	-	Off	On	0:Off¦ 1:On	D	R	71
	--- = Re-heating	Enable: Ha01-Ha09;Config: Hb44	Off	-	Off	On	0:Off¦ 1:On	D	R	72
D26	--- = Cooling floating valve open	Enable: Ha01-Ha06; Config: Hb45	Off	-	Off	On	0:Off¦ 1:On	D	R	73
	--- = Cooling floating valve close	Enable: Ha01-Ha07; Config: Hb45	Off	-	Off	On	0:Off¦ 1:On	D	R	73
	--- = Cool/heat floating valve open	Enable: Ha01-Ha06; Config: Hb46	Off	-	Off	On	0:Off¦ 1:On	D	R	74
	--- = Cool/heat floating valve close	Enable: Ha01-Ha07; Config: Hb46	Off	-	Off	On	0:Off¦ 1:On	D	R	74
	--- = Preheating floating valve open	Enable: Ha01-Ha05; Config: Hb45	Off	-	Off	On	0:Off¦ 1:On	D	R	75
	--- = Preheating floating valve close	Enable: Ha01-Ha05; Config: Hb46	Off	-	Off	On	0:Off¦ 1:On	D	R	76
	--- = Reheating floating valve open	Enable: Ha01-Ha08; Config: Hb45	Off	-	Off	On	0:Off¦ 1:On	D	R	77
	--- = Reheating floating valve close	Enable: Ha01-Ha08; Config: Hb46	Off	-	Off	On	0:Off¦ 1:On	D	R	78
D27	--- = Regulation loop 1	Enable: Ha19; Config: Hb50	Off	-	Off	On	0:Off¦ 1:On	D	R	79
	--- = Regulation loop 2	Enable: Ha19; Config: Hb50	Off	-	Off	On	0:Off¦ 1:On	D	R	80
	--- = Regulation loop 3	Enable: Ha19; Config: Hb50	Off	-	Off	On	0:Off¦ 1:On	D	R	81
	--- = Regulation loop 4	Enable: Ha19; Config: Hb50	Off	-	Off	On	0:Off¦ 1:On	D	R	82

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel Address
D27a	--- = Exhaust damper	Enable: Hb55	Off	-	Off	On	0:Off¦ 1:On	D	R	196
	--- = Supply damper	Enable: Hb34b	Off	-	Off	On	0:Off¦ 1:On	D	R	197
	--- = Return damper	Enable: Hb34b	Off	-	Off	On	0:Off¦ 1:On	D	R	198
D28	Analog outputs									
	--- = Supply fan	Enable: Ha03 (inverter); Config: Hb51	0	%	0	100		A	R	35
	--- = Return fan	Enable: Ha01-Ha03 (inverter); Config:Hb52	0	%	0	100		A	R	36
	--- = Exhaust damper	Enable: Ha02; Config: Hb55	0	%	0	100		A	R	37
	--- = Fresh air damper	Enable: Ha02; Config: Hb53	0	%	0	100		A	R	38
	--- = Mixing damper	Enable: Ha02; Config: Hb54	0	%	0	100		A	R	40
D29	--- = Bypass damper	Enable; Ha14; Config: Hb56	0	%	0	100		A	R	39
	--- = Rotary recovery	Enable: Ha14; Config: Hb63	0	%	0	100		A	R	44
	--- = Preheat heaters	Enable: Ha01-Ha05; Config: Hb60	0	%	0	100		A	R	43
	--- = Reheat heaters	Enable: Ha01-Ha08; Config: Hb62	0	%	0	100		A	R	42
D30	--- = Humidifier	Enable: Ha13; Config: Hb57	0	%	0	100		A	R	41
	Valve									
	--- = Cooling – Cool/heat %	Enable: Ha01-Ha06; Config: Hb59	0	%	0	100		A	R	45
	--- = Preheating%	Enable: Ha05; Config: Hb58	0	%	0	100		A	R	47
	--- = Reheating %	Enable: Ha08; Config: Hb61	0	%	0	100		A	R	46
D31	--- = Regulation loop 1	Enable: Ha19; Config: Hb64	0	%	0	100		A	R	48
	--- = Regulation loop 2	Enable: Ha19; Config: Hb65	0	%	0	100		A	R	49
	--- = Regulation loop 3	Enable: Ha19; Config: Hb66	0	%	0	100		A	R	50
	--- = Regulation loop 4	Enable: Ha19; Config: Hb67	0	%	0	100		A	R	51
D40	Supply VFD									
	Status		0	-	0	1	0: not ready ¦ 1: ready	D	R	-
	Run		0	-	0	1	0: stop ¦ 1: run	D	R	-
	Direction		0	-	0	1	0: --> ¦1: <--	D	R	-
	Alarms		0	-	0	1	0: No alarms ¦ 1: active	D	R	-
	Speed status		0	-	0	1	0: ramping ¦ 1: reference reached	D	R	-
D41	Request		0	-	0	100		A	W	53
	Feedback		0	-	-99.9	99.9		A	W	-
	Dissipator temperature		0	°C	-999	999		I	R	4
	DC voltage		0	V	0	9999		I	R	5
D42	Motor data									
	Speed		0	-	-9999	9999		I	W	-
	Voltage		0	V	-9999	9999		A	R	54
	Current		0	A	-99.9	99.9		A	R	55
	Torque		0	%	-9999	9999		A	R	56
	Power		0	%	-999.9	999.9		A	R	57
D50	Return VFD									
	Status		0	-	0	1	0: not ready ¦ 1: ready	D	R	-
	Run		0	-	0	1	0: stop ¦ 1: run	D	R	-
	Direction		0	-	0	1	0: --> ¦1: <--	D	R	-
	Alarms		0	-	0	1	0: No alarms ¦ 1: active	D	R	-
	Speed status		0	-	0	1	0: ramping ¦ 1: reference reached	D	R	-
D51	Request		0	-	0	100		A	W	59
	Feedback		0	-	-99	99		A	W	-
	Dissipator temperature		0	°C	-999	999		I	R	7
	DC voltage		0	V	0	9999		I	R	8
D52	Motor data									
	Speed		0	-	-9999	9999		I	R	-
	Voltage		0	V	-9999	9999		A	R	60
	Current		0	A	-99.9	99.9		A	R	61
	Torque		0	%	-999.9	999.9		A	R	62
	Power		0	%	-999.9	999.9		A	R	63
D60	Belimo 1…8	Enable: Ha24-Ha27-Ha28-Ha60…83; Config: -								
D62 D64 D66 D68 D70 D72 D74	Request		0	-	0	9	0: Closed¦1: Override open¦ 2: Open	A	R/W	65;67; 69;71; 73;75; 77;79
	Actual position		0	%	0	100		A	R	66;68; 70;72; 74;76; 78;80
	Flow-rate		0	m3/h	0	100		A	R	-
	External input			%	0	100		I	R	-
			0	-	0	1	0: Open¦ 1: Closed	D	R	-
	Network alarm		0	-	0	-	0: none¦ 1: offline¦ 2: unknown command¦ 3: unpermitted command¦ 4: device error	I	R	-
D61, D63	Belimo Information 1…8									
D65, D67	Version		0	-	-	-		I	R	-
D69, D71 D73, D75	Serial number		0	-	-	-	-	I	R	-
D81, D82	Serial probe n°1…6	Enable: Ha26; Config: Ha31-Ha91	0	-	0	99		I	W	-
D83, D84	Temperature		0	°C	-	-		A	W	-
D85, D86	Humidity		0	%RH	-	-		A	W	-
	Dew point		0	°C	-	-		A	W	-
D87	Air flow-rate	Enable: Ha03								
	Supply		0	m3/h	---	---		I	R	229
	Return		0	m3/h	---	---		I	R	230
D88	Heat recovery unit efficiency									
	DTA/DTT		0	%	0	100		I	R	227
	DTA= Aft.Rec.T - Ext. T		---	°C	---	---		I	R	-
	DTT= Ret.T - Ext. T		---	°C	---	---		I	R	-

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel Address
E. Data logger										
E01	Alarm No.-hour-date Code – Description Supply temperature – Return temperature	Pressing the bell button displays the alarm log. For the complete list see chap. Alarms	0	-	0	99		I	R/W	-
F. Board switch: see chapter "Description of the Menus"										
G. Service										
a.	Change language									
Ga01	ENTER to change/ ESC to confirm		0	-	0	9	0:Italian ¦1: English ¦2:Spanish	I	R/W	-
Ga02	Disable language mask at startup		No	-	No	Yes	0:No¦ 1:Yes	D	R/W	-
	Display countdown		60	s	0	999		I	R	-
b.	Information									
Gb01	Software code – Version - date Manual: Bios: …; Date …; Boot: …; Date …;		0	-	0	99		I	R	-
Gb02	pCO type		0	-	1	10	0: pCO2¦ 1: pCO1 ¦ 2: pCO2¦ 3: pCOC¦ 4: pCOXS¦ ¦ 5: pCOOEM¦ ¦ 6: -¦ 7: PCO3¦ ¦ 8: Snode¦9: -¦ ¦ 10: pCO5¦	I	R	-
	Type of pCO controller		0	-	0	99	10: Large¦ 11: Medium ¦ 12: Small ¦ 13: XL N.O. ¦ 17: XL N.C.	I	R	-
	Total flash		0	-	0	9999		I	R/W	-
	Ram		0	-	0	9999		I	R/W	-
	Built-in type		0	-	0	9	0: No¦ 2: pGD0¦ 3: pGD1	I	R	-
	Main cycle		0	-	0	9999		A	W	-
	Cycle/s		0	-	0	9999		I	R	-
c.	Summer/winter									
Gc01	Season selection from		0	-	0	5	0:Keypad ¦1: Digital input ¦ 2:B.M.S. ¦ 3:Keypad/B.M.S. ¦4:Auto ¦5: H2O temperature	I	R/W	133
Gc02	Set season		0	-	0	1	0:Auto¦1:Fix days	D	R/W	174
	Summer start		15/05	dd/mm	01/01	31/12		I	R/W	134-5
	Winter start		30/09	dd/mm	01/01	31/12		I	R/W	136-7
	Threshold summer		25	°C	-99.9	99.9		A	R/W	156
	Threshold winter		10	°C	-99.9	99.9		A	R/W	157
	Delay change		1	Hour	0	999		I	R/W	138
Gc03	Season threshold	Enable: Gc01=temp.H2O, Hc14, Hb16								
	Summer		25	°C	-99.9	99.9		A	R/W	
	Winter		30	°C	-99.9	99.9		A	R/W	
d.	Working hours									
Working hours										
Gd01	Supply fan		0	Hour	0	999		I	R	146-7 *
	Return fan		0	Hour	0	999		I	R	150-1 *
	Humidifier		0	Hour	0	999		I	R	154-5 *
	Rotary recovery		0	Hour	0	999		I	R	156-7 *
Gd02	Cool pump 1		0	Hour	0	999		I	R	158-9 *
	Cool pump 2		0	Hour	0	999		I	R	160-1 *
	Preheat pump 1		0	Hour	0	999		I	R	162-3 *
	Preheat pump 2		0	Hour	0	999		I	R	164-5 *
	Reheat pump 1		0	Hour	0	999		I	R	166-7 *
	Reheat pump 2		0	Hour	0	999		I	R	168-9 *
Gd03	Preheating heaters									
	Heater 1		0	Hour	0	999		I	R	170-1 *
	Heater 2		0	Hour	0	999		I	R	172-3 *
	Heater 3		0	Hour	0	999		I	R	174-5 *
	Heater 4		0	Hour	0	999		I	R	176-7 *
Gd04	Reheating heaters									
	Heater 1		0	Hour	0	999		I	R	178-9 *
	Heater 2		0	Hour	0	999		I	R	180-1 *
	Heater 3		0	Hour	0	999		I	R	182-3 *
	Heater 4		0	Hour	0	999		I	R	184-5 *
										* = working hours x 1000
e.	Config. BMS									
Ge01	BMS protocol		0	-	0	2	0:CAREL¦ 1:MODBUS¦ 2:LON¦	I	R/W	-
	Baud rate		0	bps	0	4	0:1200 ¦1:2400 ¦ 2:4800 ¦3:9600 ¦ 4:19200 ¦ 5:38400	I	R/W	-
	Address		1	-	0	207		I	R/W	-
Ge01a	BMS2 configuration									
	BMS2 protocol		Modbus	-	-	-	0:CAREL¦ 1:MODBUS¦ 2: LON	I	R/W	-
	Baud rate		19200	bit/s	-	-	0:1200 ¦1:2400 ¦ 2:4800 ¦3:9600 ¦ 4:19200 ¦ 5:38400	I	R/W	-
	Address		1	-	1	207		I	R/W	
Ge02	BMS offline alarm enable		0	-	0	1	0:No¦1:Yes	I	R/W	-
	Timeout		0	s	0	900	-	I	R	-
Ge03	Press ENTER to ENABLE commissioning service /Connect the BMS port		0	-	0	1	0:No¦1:Yes	D	R	-
f.	Service settings									
a.	Working hour set									

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel Address
Gfa01	Supply fan									
	Threshold		0	h	0	99000		I	R/W	-
	Reset (acts on counter Gd01)		0	-	0	1	0:N=No ¦ 1:Y=Yes	D	R/W	-
	Return fan									
	Threshold		0	h	0	99000		I	R/W	-
	Reset (acts on counter Gd01)		0	-	0	1	0:N=No ¦ 1:Y=Yes	D	R/W	-
Gfa02	Humidifier									
	Threshold		0	h	0	99000		I	R/W	-
	Reset (acts on counter Gd01)		0	-	0	1	0:N=No ¦ 1:Y=Yes	D	R/W	-
	Rotary recovery									
	Threshold		0	h	0	99000		I	R/W	-
	Reset (acts on counter Gd01)		0	-	0	1	0:N=No ¦ 1:Y=Yes	D	R/W	-
Gfa03/4	Pump 1/2	-								
	Cooling									
	Threshold		0	h	0	99000		I	R/W	-
	Reset (acts on counter Gd02)		0	-	0	1	0:N=No ¦ 1:Y=Yes	D	R/W	-
	Preheating									
	Threshold		0	h	0	99000		I	R/W	-
	Reset (acts on counter Gd02)		0	-	0	1	0:N=No ¦ 1:Y=Yes	D	R/W	-
	Reheating									
	Threshold		0	h	0	99000		I	R/W	-
Gfa05	Preheating heaters									
	Threshold heater 1		0	h	0	99000		I	R/W	-
	Reset (acts on counter Gd03)		0	-	0	1	0:N=No ¦ 1:Y=Yes	D	R/W	-
	Threshold heater 2		0	h	0	99000		I	R/W	-
	Reset (acts on counter Gd03)		0	-	0	1	0:N=No ¦ 1:Y=Yes	D	R/W	-
	Threshold heater 3		0	h	0	99000		I	R/W	-
	Reset (acts on counter Gd03)		0	-	0	1	0:N=No ¦ 1:Y=Yes	D	R/W	-
	Reset (acts on counter Gd03)		0	h	0	99000		I	R/W	-
	Reset (acts on counter Gd03)		0	-	0	1	0:N=No ¦ 1:Y=Yes	D	R/W	-
Gfa06	Reheating heaters									
	Threshold heater 1		0	h	0	99000		I	R/W	-
	Reset (acts on counter Gd01)		0	-	0	1	0:N=No ¦ 1:Y=Yes	D	R/W	-
	Threshold heater 2		0	h	0	99000		I	R/W	-
	Reset (acts on counter Gd01)		0	-	0	1	0:N=No ¦ 1:Y=Yes	D	R/W	-
	Threshold heater 3		0	h	0	99000		I	R/W	-
	Reset (acts on counter Gd01)		0	-	0	1	0:N=No ¦ 1:Y=Yes	D	R/W	-
	Threshold heater 4		0	h	0	99000		I	R/W	-
	Reset (acts on counter Gd01)		0	-	0	1	0:N=No ¦ 1:Y=Yes	D	R/W	-
b.	Probe adjustment									
Gfb01	Supply temperature									
	Offset		0	°C	-9.9	9.9		A	R/W	-
	Probe		-	°C	-99.9	99.9		A	R	10
	Return temperature									
	Offset		0	°C	-9.9	9.9		A	R/W	-
	Probe		-	°C	-99.9	99.9		A	R	11
	Return temperature									
	Offset		0	°C	-9.9	9.9		A	R/W	-
	Probe		-	°C	-99.9	99.9		A	R	16
Gfb02	Supply humidity									
	Offset		0	%RH	-20	20		I	R/W	-
	Probe		0	%RH	0	100		A	R	13
	Return humidity									
	Offset		0	%RH	-20	20		I	R/W	-
	Probe		0	%RH	0	100		A	R	14
	External humidity									
	Offset		0	%RH	-20	20		I	R/W	-
	Probe		0	%RH	0	100		I	R	17
Gfb03	Supply pressure									
	Offset		0	Pa	-200	200		I	R/W	-
	Probe		0	Pa	-9999	9999		I	R	1
	Return pressure									
	Offset		0	Pa	-200	200		I	R/W	-
	Probe		0	Pa	-9999	9999		I	R	2
Gfb04	CO2 air quality									
	Offset		0	ppm	-99	99		I	R/W	-
	Probe		0	ppm	0	9999		I	R	3
	VOC air quality									
	Offset		0	%	-50	50		I	R/W	-
	Probe		0	%	0	999		A	R	-
Gfb05	Frost temperature									
	Offset		0	°C	-9.9	9.9		A	R/W	-
	Probe		0	°C	-99.9	99.9		A	R	18
	Temperature downstream of coils		-	°C	-99.9	99.9		A	R	19
	Offset		0	°C	-9.9	9.9		A	R/W	-
	Probe		0	°C	-99.9	99.9		A	R	19
	Exhaust temperature									
	Offset		0	°C	-9.9	9.9		I	R/W	-
	Probe		0	°C	-99.9	99.9		A	R	20
Gfb06	Cool water temperature									
	Offset		0	°C	-9.9	9.9		A	R/W	-
	Probe		0	°C	-99.9	99.9		A	R	22
	Preheat water temperature									
	Offset		0	°C	-9.9	9.9		A	R/W	-
	Probe		0	°C	-99.9	99.9		A	R	23
	Reheat water temperature									
	Offset		0	°C	-9.9	9.9		A	R/W	-
	Probe		0	°C	-99.9	99.9		A	R	24

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel Address
Gfb07	Room temperature									
	Offset		0	°C	-9.9	9.9		I	R/W	-
	Probe		0	°C	-99.9	99.9		A	R	12
	Room humidity									
	Offset		0	%RH	-99.9	99.9		A	R/W	-
	Probe		0	%RH	0	100		A	R	-
Gfb08	Regulation loop probes 1/2/3/4									
	Offset		0		-20	20		A	R/W	-
	Probe		0		-3200	3200		I	R	26;27; 28;29
Gfb09	Serial probe n°		0	---	0	99		I	W	
	Temperature									
	Adj:		0.0	---	-99.9	99.9		A	R/W	
	Prb: °C		0.0	---	-30.0	70.0		A	W	
			0	---	0	1	0: 1: Humidity	D	R/W	
	Adj:		0.0	---	-10.0	10.0		A	R/W	
	Prb: %		0.0	---	0.0	99.9		A	W	
Gfb10	Serial probe n°		0	---	0	99		I	W	
	Temperature									
	Adj:		0.0	---	-10.0	10.0		A	R/W	
	Prb: °C		0.0	---	-30.0	70.0		A	W	
			0	---	0	1	0: 1: Humidity	D	R/W	
	Adj:		0.0	---	-10.0	10.0		A	R/W	
	Prb: %		0.0	---	0.0	99.9		A	W	
Gfb11	Serial probe n°		0	---	0	99		I	W	
	Temperature									
	Adj:		0.0	---	-10.0	10.0		A	R/W	
	Prb: °C		0.0	---	-30.0	70.0		A	W	
			0	---	0	1	0: 1: Humidity	D	R/W	
	Adj:		0.0	---	-10.0	10.0		A	R/W	
	Prb: %		0.0	---	0.0	99.9		A	W	
Gfb12	Serial probe n°		0	---	0	99		I	W	
	Temperature									
	Adj:		0.0	---	-10.0	10.0		A	R/W	
	Prb: °C		0.0	---	-30.0	70.0		A	W	
			0	---	0	1	0: 1: Humidity	D	R/W	
	Adj:		0.0	---	-10.0	10.0		A	R/W	
	Prb: %		0.0	---	0.0	99.9		A	W	
Gfb13	Serial probe n°		0	---	0	99		I	W	
	Temperature									
	Adj:		0.0	---	-10.0	10.0		A	R/W	
	Prb: °C		0.0	---	-30.0	70.0		A	W	
			0	---	0	1	0: 1: Humidity	D	R/W	
	Adj:		0.0	---	-10.0	10.0		A	R/W	
	Prb: %		0.0	---	0.0	99.9		A	W	
Gfb14	Serial probe n°		0	---	0	99		I	W	
	Temperature									
	Adj:		0.0	---	-10.0	10.0		A	R/W	
	Prb: °C		0.0	---	-30.0	70.0		A	W	
			0	---	0	1	0: 1: Humidity	D	R/W	
	Adj:		0.0	---	-10.0	10.00		A	R/W	
	Prb: %		0.0	---	0.0	99.9		A	W	
Gfb15	pCOe number:		1	---	0	999		I	W	
	Ch 1:									
	Ofs.:		0.0	---	-99.9	99.9		A	R/W	
	Prb.:		0.0	---	0.0	10.0		I	R/W	
	Ch 2:									
	Ofs.:		0.0	---	-99.9	99.9		A	R/W	
	Prb.:		0.0	---	0.0	10.0		I	R/W	
Gfb16	pCOe number:		1	---	0	999		I	W	
	Ch 3:									
	Ofs.:		0.0	---	-10.0	10.0		A	R/W	
	Prb.:		0.0	---	0.0	10.0		I	R/W	
	Ch 4:									
	Ofs.:		0.0	---	99.9	999.9		A	R/W	
	Prb.:		0.0	---	0.0	10.0		I	R/W	
Gfb17	pCOe number:		1	---	0	999		I	W	
	Ch 1:									
	Ofs.:		0.0	---	-10.0	10.0		A	R/W	
	Prb.:		0.0	---	0.0	10.0		I	R/W	
	Ch 2:									
	Ofs.:		0.0	---	99.9	999.9		A	R/W	
	Prb.:		0.0	---	0.0	10.0		I	R/W	
Gfb18	pCOe number:		1	---	0	999		I	W	
	Ch 3:									
	Ofs.:		0.0	---	-10.0	10.0		A	R/W	
	Prb.:		0.0	---	0.0	10.0		I	R/W	
	Ch 4:									
	Ofs.:		0.0	---	99.9	999.9		A	R/W	
	Prb.:		0.0	---	0.0	10.0		I	R/W	
Gfb19	Belimo		0	---	1	8		I	W	
	Ofs.:		0.0	---	-9.9	9.9		A	R/W	
	Prb.:		0.0	---	-99.9	99.9		A	R	
	Belimo		0	---	1	8		I	W	
	Ofs.:		0.0	---	-9.9	9.9		A	R/W	
	Prb.:		0.0	---	-99.9	99.9		A	R	

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel Address
Gfb20	Belimo		0	---	1	8		I	W	
	Ofs.:		0.0	---	-9.9	9.9		A	R/W	
	Prb.:		0.0	---	-99.9	99.9		A	R	
	Belimo		0	---	1	8		I	W	
	Ofs.:		0.0	---	-9.9	9.9		A	R/W	
	Prb.:		0.0	---	-99.9	99.9		A	R	
Gfb21	Belimo		0	---	1	8		I	W	
	Ofs.:		0.0	---	-9.9	9.9		A	R/W	
	Prb.:		0.0	---	-99.9	99.9		A	R	
	Belimo		0	---	1	8		I	W	
	Ofs.:		0.0	---	-9.9	9.9		A	R/W	
	Prb.:		0.0	---	-99.9	99.9		A	R	
Gfb22	Belimo		0	---	1	8		I	W	
	Ofs.:		0.0	---	-9.9	9.9		A	R/W	
	Prb.:		0.0	---	-99.9	99.9		A	R	
	Belimo		0	---	1	8		I	W	
	Ofs.:		0.0	---	-9.9	9.9		A	R/W	
	Prb.:		0.0	---	-99.9	99.9		A	R	
Gfb23	Probe calibration									
	Humidity probe offset downstream of coils	Enable: Hb23a	0	%RH	-99.9	99.9		A	R/W	
	Temperature probe offset after heat recovery unit	Enable: Hb23b	0	°C	-9.9	9.9		A	R/W	
Gfb24	IEC humidity probe offset		0	%RH	-99.9	99.9		A	R/W	
c.	Thermoregulation									
Gfc01	Main mask information									
	1st row		Return temperature	-	0	14	0:None 1:Supply temp.¦ 2:Return temp.¦ 3:Room temp.¦ 4:External temp¦ 5:Temp setpoint¦ 6: Supply humid.¦ 7: Return humid.¦8:Room humid.¦ 9:Ext. humid.¦ 10: Humid. setpoint¦ 11:Supply pressure.¦ 12:Return pressure¦ 13: CO2 quality¦ 14: VOC quality	I	R/W	-
	2nd row		Return hum.	-	0	14	See 1st row	I	R/W	
Gfc02	Temperature set limits									
	Summer low		15	°C	-99.9	99.9		A	R/W	106
	Summer high		35	°C	Summer low	99.9		A	R/W	107
	Winter low		15	°C	-99.9	99.9		A	R/W	108
	Winter high		35	°C	Winter low	99.9		A	R/W	109
Gfc03	Humidity set limits									
	Summer low		30	% RH	0	100		I	R/W	71
	Summer high		90	% RH	Summer low	100		I	R/W	72
	Winter low		30	% RH	0	100		I	R/W	73
	Winter high		90	% RH	Winter low	100		I	R/W	74
Gfc04	Temperature regulation									
	Regulation type		Prop+ integr				0:Proportional¦ 1:Prop.+Integr.¦2:PID	I	R/W	75
	Auto cool/heat		No	-	No	Yes	0:No¦1:Yes	D	R/W	168
	Supply limits		None	-	1	4	1:None ¦2:High ¦3:Low ¦ 4:High/Low	I	R/W	76
Gfc05	Cooling regulation									
	Differential		2	°C	0	99.9		A	R/W	110
	Neutral zone		1	°C	0	99		A	R/W	111
	Integral time		300	s	0	999		I	R/W	77
	Derivative time		0	s	0	999		I	R/W	78
Gfc05a	Summer/winter changeover delay	Enable: Gfc04, auto; Ha01: cool/heat	10	min	0	999		I	R/W	198
Gfc06	Heating regulation									
	Differential		2	°C	0	99.9		A	R/W	112
	Neutral zone		1	°C	0	99		A	R/W	113
	Integral time		300	s	0	999		I	R/W	79
	Derivative time		0	s	0	999		I	R/W	80
Gfc07	Temperature supply limits									
	Summer high		40	°C	-99.9	99.9		A	R/W	116
	Winter high		40	°C	-99.9	99.9		A	R/W	117
	Summer low		10	°C	-99.9	99.9		A	R/W	114
	Winter low		10	°C	-99.9	99.9		A	R/W	115
	Differential		3	°C	0	99.9		A	R/W	118
	Integral time		150	s	0	999		I	R/W	81
	Enable double action	Enable: Gfc04: Auto cool/heat: yes Supply limits: high/low	No	-	No	Yes	0:No¦1:Yes	D	R/W	169

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel Address
Gfc08	Type of summer setpoint compensation		None	-	-	-	0:None ¦ 1:External ¦ 2:Room ¦ 3:Return	I	R/W	82
	Compensation delta		2	°C	-99.9	99.9		A	R/W	121
	Compensation start		25	°C	-99.9	99.9		A	R/W	119
	Compensation end		32	°C	-99.9	99.9		A	R/W	120
Gfc09	Type of winter setpoint compensation		None	-	-	-	0:None ¦ 1:External ¦ 2:Room ¦ 3:Return	I	R/W	83
	Compensation delta		-2	°C	-99.9	99.9		A	R/W	124
	Compensation start		0	°C	-99.9	99.9		A	R/W	122
	Compensation end		-8	°C	-99.9	99.9		A	R/W	123
Gfc10	Humidity regulation									
	Regulation type		Proport				0:Proportional ¦1:Proportional +Integral ¦2:PID	I	R/W	84
	Auto hum/dehum		No	-	No	Yes	0:No ¦ 1:Yes	D	R/W	170
	Supply limits						1: none ¦ 2: high ¦ 3: low ¦ 4: high/low	I	R/W	85
Gfc11	Dehumidification regulation									
	Differential		5	% RH	0	100		I	R/W	86
	Neutral zone		2	% RH	0	100		I	R/W	87
	Integral time		300	s	0	999		I	R/W	88
	Derivative time		0	s	0	99		I	R/W	89
Gfc12	Humidification regulation									
	Differential		4	% RH	0	100		I	R/W	90
	Neutral zone		2	% RH	0	100		I	R/W	91
	Integral time		300	s	0	999		I	R/W	92
	Derivative time		0	s	0	99		I	R/W	93
Gfc12a	Humid./dehumid. changeover delay	Enable: in Gfc10, auto mode: Yes	10	min	0	999		I	R/W	199
Gfc13	Supply humidity limits	Enable: Hc01 (Humidity probe ≠ supply), Gfc10: supply limits								
	Summer high		80	%rH	0	100		I	R/W	200
	Winter high		80	%rH	0	100		I	R/W	95
	Summer low		20	%rH	0	100		I	R/W	201
	Winter low		20	%rH	0	100		I	R/W	94
	Differential		4	%rH	0	100		I	R/W	96
	Integral time		150	s	0	999		I	R/W	97
Gfc13a	Supply specific humidity limits									
	Summer high		15	g/Kg	0	100		I	R/W	202
	Winter high		15	g/Kg	0	100		I	R/W	203
	Summer low		5	g/Kg	0	100		I	R/W	204
	Winter low		5	g/Kg	0	100		I	R/W	205
	Differential		0	g/Kg	0	100		I	R/W	206
	Integral time - Ti		0	s	0	999		I	R/W	207
Gfc14	Priority	-	0	-	0	1	0: temperature ¦ 1: humidity ¦ 2: none	D	R/W	171
Gfc15	Freecooling/Freeheating dampers settings									
	Temperature differential		4	°C	0	99.9		A	R/W	125
	Enthalpy differential		5	kJ/kg	0	99.9		A	R/W	126
	Enthalpy activation differential	Enable: Ha02, enthalpy	4.0	kJ/kg	0	99.9		A	R/W	162
Gfc16	Enthalpy management									
	Atmospheric pressure		1090	mbar	600	1100		I	R/W	98
Gfc17	Supply inverter									
	Min/ fixed power		30	%	0	Max.pwr		A	R/W	127
	Max power		100	%	Min.pwr	100		A	R/W	128
	Return inverter									
	Min/ fixed power		30	%	0	Max.pwr		A	R/W	129
	Max power		100	%	Min.pwr	100		A	R/W	130
Gfc18	Supply flow control									
	Setpoint		1500	Pa	0	Max supply press. diff lim. (Hb09)		I	R/W	99
	Differential		300	Pa	0	1000		I	R/W	100
	Integral time		300	s	0	9999		I	R/W	101
	Derivative time		10	s	0	9999		I	R/W	102
	Neutral zone		0	Pa	0	2000		I	R/W	208
Gfc19	Return flow control									
	Setpoint		1500	Pa	0	Max ret. press. diff lim. (Hb10)		I	R/W	103
	Differential		300	Pa	0	1000		I	R/W	104
	Integral time		300	s	0	9999		I	R/W	105
	Derivative time		10	s	0	9999		I	R/W	106
	Neutral zone		0	Pa	0	2000		I	R/W	209
Gfc19a	Supply flow control set point									
	Comfort:		20000	m^3/h	0	3276700		I	R/W	210
	Pre-comfort:		20000	m^3/h	0	3276700		I	R/W	211
	Economy:		20000	m^3/h	0	3276700		I	R/W	212
Gfc19b	Return flow control set point									
	Comfort:		20000	m^3/h	0	3276700		I	R/W	213
	Pre-comfort:		20000	m^3/h	0	3276700		I	R/W	214
	Economy:		20000	m^3/h	0	3276700		I	R/W	215
Gfc19c	Supply air flow control									
	Differential		1000	m^3/h	0	3276700		I	R/W	216
	Int. time:		300	s	0	9999		I	R/W	101
	Deriv. time:		10	s	0	9999		I	R/W	102
	Neutral zone		500	m^3/h	0	200000		I	R/W	217

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel Address
Gfc19d	Return flow control									
	Differential		1000	m^3/h	0	3276700		I	R/W	218
	Int. time:		300	s	0	9999		I	R/W	105
	Deriv. time:		10	s	0	9999		I	R/W	106
	Neutral zone		500	m^3/h	0	200000		I	R/W	219
Gfc20	Cooling cascade									
	Freecooling		50	%	0	100		I	R/W	107
	Coil		50	%	0	100		I	R/W	108
	Recovery		40	%	0	100		I	R/W	109
	Coil		40	%	0	100		I	R/W	110
Gfc20a	Cooling cascade control (DEC)	Enable: Ha13: Enable DEC: Yes								
	Free cooling		50	%	0	100		I	R/W	107
	DEC (Min)		50	%	0	100		I	R/W	108
	DEC (Max)		50	%	0	100		I	R/W	220
	Coil		0	%	0	100		I	R/W	221
Gfc21	Heating cascade									
	Freeheating		50	%	0	100		I	R/W	111
	Coil		50	%	0	100		I	R/W	112
	Recovery		40	%	0	100		I	R/W	114
	Coil		40	%	0	100		I	R/W	115
Gfc22	Heating cascade	Enable: Ha08: Reheating operation = supplement								
	Preheating		100	%	0	100		I	R/W	113
	Reheating		80	%	0	100		I	R/W	116
Gfc23	Minimum cooling valve opening									
	Cooling		0	%	0	100		I	R/W	117
	Dehumidification		0	%	0	100		I	R/W	118
	Unit off		0	%	0	100		I	R	-
	Only antiblock		No	-	No	Yes	0:No¦1:Yes	D	R	-
Gfc24	Minimum preheating valve opening		0	%	0	100		I	R/W	119
	Unit off		0	%	0	100		I	R	-
	Only antiblock		No	-	No	Yes	0:No¦1:Yes	D	R	-
Gfc25	Preheating coil settings when humidifying									
	Setpoint		23	°C	-99.9	99.9		A	R/W	131
	Differential		2	°C	0	99.9		A	R/W	132
	Enthalpy control	Enable: Ha02: Freeheating: enthalpy								
	Differential		0	KJ	0	999		I	R/W	224
Gfc26	Minimum heat/cool valve opening									
	Cooling		0	%	0	100		I	R/W	121
	Dehumidification		0	%	0	100		I	R/W	122
	Heating		0	%	0	100		I	R/W	123
	Unit off		0	%	0	100		I	R	-
	Only antiblock		No	-	No	Yes	0:No¦1:Yes	D	R	-
Gfc27	Preheating coil settings when humidifying									
	Setpoint		20	°C	-99.9	99.9		A	R/W	133
	Differential		2	°C	0	99.9		A	R/W	134
Gfc29	Minimum reheat valve opening		0	%	0	100		I	R/W	120
	Unit off		0	%	0	100		I	R	-
	Only antiblock		No	-	No	Yes	0:No¦1:Yes	D	R	-
Gfc30	Air quality with CO2									
	Setpoint		1200	ppm	0	5000		I	R/W	124
	Differential		200	ppm	0	5000		I	R/W	126
	Air quality with VOC									
	Setpoint		50	%	0	100		I	R/W	125
	Differential		10	%	0	100		I	R/W	127
Gfc31	Heat recovery temperature activation									
	Delta recovery		5	°C	0	99.9		A	R/W	137
	Differential recovery		3	°C	0	99.9		A	R/W	138
	Enthalpy regulation									
	Differential		5	kJ/kg	0	99.9		A	R/W	139
Gfc32	Heat recovery defrost									
	Setpoint		-1	°C	-99.9	10		A	R/W	140
	Differential		4	°C	0	99.9		A	R/W	141
	Heater offset		3	°C	0	99.9		A	R/W	142
	Wheel min speed		100	%	0	100		I	R/W	128
Gfc32a	IEC activation delta									
	Recovery+IEC:		0	°C	0	15		I	R/W	165
	IEC only:		0	°C	0	20		I	R/W	164
	Delta at 100%:		0	°C	0	20		I	R/W	163
	IEC diff.:		0	°C	0	20		I	R/W	166
Gfc32b	IEC limit									
	Set point		100	RH	0	100		I	R/W	231
	Differential		5	RH	0	100		I	R/W	232
Gfc33	Frost protection setting									
	Set point		5	°C	-99.9	99.9		A	R/W	143
	Differential		3	°C	0	99.9		A	R/W	144
Gfc34	Room frost protection enable		0	-	0	1	0: No¦1: Yes	D	R/W	172
	Threshold		5	°C	-99.9	99.9		A	R/W	145
Gfc35	Adiabatic humidifier - Supply low temperature limit									
	Enable limit		No	-	No	Yes	0: No¦1: Yes	D	R/W	173
	Setpoint		15	°C	0	99.9		A	R/W	146
	Differential		2	°C	0	99.9		A	R/W	147
Gfc36	Regulation loop 1									
	Setpoint		0	-	-3200	3200		A	R/W	148
	Differential		0	-	-3200	3200		A	R/W	149
	Integral time		0	s	0	999		I	R/W	129
Gfc37	Regulation loop 2									
	Setpoint		0	-	-3200	3200		A	R/W	150
	Differential		0	-	-3200	3200		A	R/W	151
	Integral time		0	s	0	999		I	R/W	130

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel Address
Gfc38	Regulation loop 3									
	Setpoint		0	-	-3200	3200		A	R/W	152
	Differential		0	-	-3200	3200		A	R/W	153
	Integral time		0	s	0	999		I	R/W	131
Gfc39	Regulation loop 4									
	Setpoint		0	-	-3200	3200		A	R/W	154
	Differential		0	-	-3200	3200		A	R/W	155
	Integral time		0	s	0	999		I	R/W	132
d.	User device /Change PW1									
Gfd01	Load configuration		No	-	No	Yes	0: No¦ 1: Yes	D	R/W	-
	Last saving		--/--/--	dd/mm/aa	00/00/00	99/99/99		D	R/W	-
Gfd02	Delete data logger		No	-	No	Yes	0: No¦ 1: Yes	D	R/W	-
Gfd03	Insert new service password (PW1)		1234	----	0000	9999	-	I	R	
g.	Manual management (1=0%; 101= 100%)									
Gg01	Supply fan		Auto	%	0	101	0:Auto¦ 1:0%; ¦101=100%	I	R/W	139
	Return fan		Auto	%	0	101	0:Auto¦ 1:0%; ¦101=100%	I	R/W	140
	Cooling -Cool/heat coil		Auto	%	0	101	0:Auto¦ 1:0%; ¦101=100%	I	R/W	141
	Preheating coil		Auto	%	0	101	0:Auto¦ 1:0%; ¦101=100%	I	R/W	142
	Reheating coil		Auto	%	0	101	0:Auto¦ 1:0%; ¦101=100%	I	R/W	143
	Humidifier		Auto	%	0	101	0:Auto¦ 1:0%; ¦101=100%	I	R/W	145
Gg02	Air quality									
	Start purging		No	-	No	Yes	0: No ¦ 1: Yes	D	R/W	175
	Stop purging		No	-	No	Yes	0: No ¦ 1: Yes	D	R/W	176
	>> Cleaning active <<		0	-	0	1	0: No ¦ 1: Yes	D	R	-
	Purging time									
	Resume time		0	min	0	999		I	W	
	Repeat at start-up		No	-	No	Yes	0: No ¦ 1: Yes	D	R	
Gg40	Supply VFD									
	Reset alarms		No	-	No	Yes	0: No ¦ 1: Yes	D	R/W	177
Gg50	Return VFD									
	Reset alarms		No	-	No	Yes	0: No ¦ 1: Yes	D	R/W	178
Gg60, Gc61	Belimo1…Belimo8									
Gc62, Gc63	Start adaptation		No	-	No	Yes		D	R/W	
Gc64, Gc65	Start testrun		No	-	No	Yes		D	R/W	
Gc66, Gc67	Adapted angle		Yes	-	No	Yes		D	R/W	
	Alarms reset		No		No	Yes		D	R/W	

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel Address
H. Manufacturer										
a.	Configuration									
Ha01	Main device enable									
	Fans		Supply-Return	-	Supply	Supply-return	0: Supply¦1: Supply-Return	D	R/W	-
	Coil		Cool+ Preheat+ Reheat				0: None ¦1:Cool+ Preheat+ Reheat¦ 2: Cooling ¦ 3: Heating ¦ 4: Cooling+ Preheating ¦ 5: Cooling+Reheating 6: Cool/Heat coil ¦ 7: Cool/Heat coil +Reheat	I	R/W	-
	Humidifier		Enabled	-	Disabled	Enabled	0: Disabled ¦1: Enabled	D	R/W	-
	Recovery		Enabled	-	Disabled	Enabled	0: Disabled ¦1: Enabled	D	R/W	-
Ha02	Dampers type		Fresh air+ mixing				1: Fresh air (On/Off) ¦ 2: fresh air (Mod) ¦ 3: Fresh air+Mixing ¦ 4:Fresh air +Mix+Exhaust ¦ 5: Fresh air(Mod) +Exhaust	I	R/W	-
	Freecooling		Temp.	-	1	3	1: None ¦ 2: Temperature ¦ 3: Enthalpy	I	R/W	-
	Freeheating		Temp.	-	1	3	1: None ¦ 2: Temperature ¦ 3: Enthalpy	I	R/W	-
	Enable air quality managem.		Yes	-	0	1	0: No ¦ 1: Yes	D	R/W	-
Ha03	Fan type		Inverter	-	1	6	1: On-Off (Direct start) ¦ 2: On-Off (Star-delta) ¦ 3: On-Off (Double.) 4: Inverter ¦ 5: On-Off (2 speed) ¦ 6: On-Off (Duty stand-by)	I	R/W	-
	Fan Regulation		Static press.	-	1	6	1: Static pressure ¦ 2: Air quality ¦ 3: Fixed speed	I	R/W	-
Ha03a	Fan dampers						1: None ¦ 2: Supply ¦ 3: Return ¦ 4: Supply + return	I	R/W	416
	Damper limit switch						1: None ¦ 2: Supply ¦ 3: Return ¦ 4: Supply + return	I	R/W	417
Ha04	Fan alarms									
	Overload		Supply +return	-	1	3	1: None ¦ 2: Supply ¦ 3: Supply+return	I	R/W	-
	Air flow		Supply +return	-	0	3	1: None ¦ 2: Supply ¦ 3: Supply+return	I	R/W	-
	Air flow from		Pressure switch	-	0	1	0: Pressure switch ¦ 1: Transducer	D	R/W	-
	Stop action		Indiv.	-	0	1	0: Individual ¦1: All	D	R/W	-

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel Address
Ha05	Preheating output		Modulating valve		1	3	1: Modulating valve¦ 2: Floating valve¦ 3:Heaters	I	R/W	-
	Heaters number		0	-	1	4		I	R/W	-
	Heaters type		On/Off	-			1: On/Off ¦ 2: Modulating 3: On/Off binary (2 heaters)	I	R/W	-
	Temperature probe when humidifying		Downstream of coils	-			0: Downstream of coils ¦ 1: Regulation	D	R/W	-
Ha06	Cooling output type		Modulating valve	-	1	3	1: Modulating valve ¦ 2: Floating valve ¦ 3: Direct expansion	I	R/W	-
	Cooling steps (direct expans.)		1	-	1	4		I	R/W	-
	Dehumidification		Humidity request	-	1	3	1: Humidity request ¦ 2: Dew point ¦ 3: Specific humidity ¦ 4: Disabled	I	R/W	-
Ha07	Heat cool output	Enable: Ha01	Modulating valve	-	1	3	1: Modulating valve 2: Floating valve 3: Steps	I	R/W	-
	Dehumidification		Humidity request	-	1	3	1: Humidity request 2: On dew point¦ 3: Disabled	I	R/W	-
	Temperature probe when humidifying		Downstream of coils	-	0	1	0: Downstream of coils 1: Regulation	D	R/W	-
Ha08	Reheating output		Heaters	-	1	3	1: Modulating valve 2: Floating valve 3: Heaters	I	R/W	-
	Heaters number		3	-	1	4		I	R/W	-
	Heaters type		On/Off	-	1	3	1: On/Off ¦ 2: Modulating ¦ 3: On/Off binary (2 heaters)	I	R/W	-
	Reheating working mode		Compensation	-	1	3	1: Integration ¦ 2: Compensation ¦ 3: Compensation+Integ	I	R/W	-
Ha09	Enable water pumps Cooling-Cool/heat	Cool/heat (Ha01)	No	-	0	1	0:No¦1:Yes	D	R/W	-
	Preheating		No	-	0	1	0:No¦1:Yes	D	R/W	-
	Reheating		No		0	1	0:No¦1:Yes	D	R/W	-
	Enable flow feedback		No		0	1	0:No¦1:Yes	D	R/W	-
Ha10	Cooling – cool/ heat pumps									
	Number of pumps		2	-	1	2		I	R/W	-
	Warning limit		3	-	0	5		I	R/W	-
	Enable antiblock		Yes	-	0	1	0:No¦1:Yes	D	R/W	-
Ha11	Preheating pumps									
	Number of pumps		2	-	1	2		I	R/W	-
	Warning limit		3	-	0	5		I	R/W	-
	Enable antiblock		Yes	-	0	1	0:No¦1:Yes	D	R/W	-
Ha12	Reheating pumps									
	Number of pumps		2	-	1	2		I	R/W	-
	Warning limit		3	-	0	5		I	R/W	-
	Enable antiblock		Yes	-	0	1	0:No¦1:Yes	D	R/W	-
Ha13	Humidifier									
	Type		Adiabatic (mod. control)	-	1	4	1: Isothermic (On/Off control)¦ 2: Isothermic (Modulating control) ¦ 3:Adiabatic (On/Off control)¦ 4: Adiabatic (Modulating control)	I	R/W	-
	Enable DEC						0:No¦1:Yes			
Ha14	Heat recovery type		Plate exch.	-	1	5	1: None ¦ 2: Plate exchanger¦ 3: Run around coil ¦ 4: Modulating rotary exchanger¦ 5: On/Off rotary exchanger	I	R/W	-
	Regulation		Temp.	-	0	1	0: Temperature ¦ 1: Enthalpy (rotary exchanger)	D	R/W	-
	Bypass damper		On/Off	-	1	3	1: None ¦ 2: On/Off ¦ 3: Modulating	I	R/W	-
	Wheel min speed (Modulating rotary exchanger)		0%	%	0	100	0…100%	I	R/W	-
	Defrost probe		External-Return	-	0	3	0: None ¦ 1: External-return ¦ 2: Exhaust ¦ 3: External	I	R/W	-
	Recovery heater		No		0	1	0:No¦1:Yes	D	R/W	-
Ha14a	Enable IEC:						0:No¦1:Yes	D	R/W	322
	Rec.- IEC delay:		0	s	0	999	0 s	I	R/W	447
	Control:						From algorithm ¦ From probe	D	R/W	323
Ha14b	IEC settings									
	Humidification						Alternating ¦ IEC + Humid.	D	R/W	325
	Dehumidification						Stop IEC ¦ IEC + coil	D	R/W	324
Ha14c	DEC settings									
	Cooling:						Coil only ¦ DEC + coil	D	R/W	
Ha15	Air quality									
	Regulation type		P+I	-	1	2	1: Proportional ¦ 2: P+I	I	R/W	-
	Probe type		CO2	-	1	3	1: CO2 ¦ 2: CO2+VOC ¦ 3: VOC	I	R/W	-
	Enable purging		Yes		0	1	0:No¦1:Yes	D	R/W	-
Ha16	Frost protection		By probe				1: none ¦ 2: by frost-stat ¦ 3: by probe ¦ 4: by probe+frost-stat	I	R/W	-
Ha17	Enable unit On/Off									
	By digit input		Yes				0:No¦1:Yes	D	R/W	-
	By BMS		No				0:No¦1:Yes	D	R/W	-
Ha18	Setpoint from digital input		No	-	0	1	0:No¦1:Yes	D	R/W	-
Ha19	Enable setpoint offset by analog input		No	-	0	1	0:No¦1:Yes	D	R/W	-
	Auxiliary regulation loop		None	-	0	4	0:None, 1…4	I	R/W	-

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel Address
Ha20	Regulation loop 1									
	Regulation type		Direct	-	0	1	0: direct¦1: inverse	I	R/W	-
	Output type		Modul. +On/Off	-	0	2	0: modulating+on/off ¦ 1: on/off ¦2: modulating	I	R/W	-
	Other management		None	-	0	2	0: none ¦ 1: on with supply fan ¦ 2: force with frost protection	I	R/W	-
Ha21	Regulation loop 2									
	Regulation type		Direct	-	0	1	0: direct¦1: inverse	I	R/W	-
	Output type		Modul. + On/Off	-	0	2	0: modulating+on/off ¦ 1: on/off ¦2: modulating	I	R/W	-
	Other management		None	-	0	2	0: none ¦ 1: on with supply fan ¦ 2: force with frost protection	I	R/W	-
Ha22	Regulation loop 3									
	Regulation type		Direct	-	0	1	0: direct¦1: inverse	I	R/W	-
	Output type		Modul + On/Off	-	0	2	0: modulating+on/off ¦ 1: on/off ¦2: modulating	I	R/W	-
	Other management		None	-	0	2	0: none ¦ 1: on with supply fan ¦ 2: force with frost protection	I	R/W	-
Ha23	Regulation loop 4									
	Regulation type		Direct	-	0	1	0: direct¦1: inverse	I	R/W	-
	Output type		Modul + On/Off	-	0	2	0: modulating+on/off ¦ 1: on/off ¦2: modulating	I	R/W	-
	Other management		None	-	0	2	0: none ¦ 1: on with supply fan ¦ 2: force with frost protection	I	R/W	-
Ha24	Protocol									
	pLAN serial		pLAN	-	0	21	5: pLAN ¦ 21:Modbus Master	I	R/W	-
	BMS serial		BMS	-	0	4	1:BMS ¦ 4:Winload	I	R/W	-
	Fieldbus serial		Modbus master	-	1	21	1:Belimo ¦ 21:Modbus master	I	R/W	-
	BMS 2 serial		BMS	-	0	4	1:BMS ¦ 4:Winload	I	R/W	-
Ha25	Modbus Master settings									
	Baudrate		19200	Bit/s	0	4	0: 1200 ¦ 1: 2400 ¦ 2: 4800 3: 9600 ¦ 4: 19200	I	R/W	-
	Stop bit		2	-	1	2		I	R/W	-
	Parity mode		None	-			0:None ¦ 1:Even ¦ 2:Odd	I	R/W	-
	Timeout		300	ms	100	5000		I	R/W	-
Ha26	pCOe number		0	-	0	2		I	R/W	-
	pCOe1 address		3	-	1	5		I	R/W	-
	pCOe2 address		4	-	1	5		I	R/W	-
	Number of serial probe		None		None	6		I	R/W	-
Ha27	Belimo device									
	Number of actuators		0	-	0	8		I	R/W	-
Ha28	Press Enter to configure Belimo actuators➔Ha60									
Ha29	Press Enter to configure the VFD									
Ha30	Enable BMS probes and digital inputs		No	-	No	Yes	0:No¦1:Yes	D	R/W	-
	Backup probe 1		None	-	None	Ain10	0: None; 1: Ain1…10: Ain10	I	R/W	-
	Backup probe 2		None	-	None	Ain10	0: None; 1: Ain1…10: Ain10	I	R/W	-
	Backup probe 3		None	-	None	Ain10	0: None; 1: Ain1…10: Ain10	I	R/W	-
	Backup probe 4		None	-	None	Ain10	0: None; 1: Ain1…10: Ain10	I	R/W	-
Ha31	Press Enter to configure serial probes➔Ha91									
Ha39	Enable VFD: (Modbus protocol)						No¦ Yes	D	R/W	
Ha40	Supply VFD									
	Address		1	-	0	999		I	R/W	-
	Data address		0	-	0	9999		I	R/W	-
	Data value		0	-	-32768	32767		I	R/W	-
	Default install (*) for pCO3 built-in		N		No	Yes	0:N=No ¦ 1:Y=Yes	D	R/W	
Ha41	Supply VFD									
	Control place		I/O terminal	-	1	3	1: I/O terminal ¦ 2:keypad ¦ 3: Fieldbus	I	R/W	-
	Speed reference type		Ain1	-	0	5	0:Ain1 ¦ 1:Ain2 ¦ 2:Keypad ¦ 3: Fieldbus¦ 4: Motor potentiometer ¦5:PID regulation	I	R/W	-
	Rotation type		Clock wise	-	0	1	0:Clockwise ¦ 1: Counter-clockwise	D	R/W	-
Ha42	Supply VFD									
	Motor control mode		Frequency	-	0	1	0:Frequency ¦ 1:Speed	I	R/W	-
	Start function		Ramp	-	0	1	0:Ramp ¦ 1: Flying start	I	R/W	-
	Stop function		Coasting	-	0	1	0:Coasting ¦ 1:Ramp	I	R/W	-
Ha43	Supply VFD									
	Action when in fault: #03;#09;#11;#15		none	-	0	3	0:None ¦ 1:Warning ¦ 2:Fault stop function ¦ 3: Fault coasting	I	R/W	-
Ha44	Supply VFD									
	Action when in fault: #16;#17;#29;#50		none	-	0	3	0:None ¦ 1:Warning ¦ 2:Fault stop function ¦ 3: Fault coasting	I	R/W	-
Ha45	Supply VFD									
	Action when in fault: #53;#54		none	-	0	3	0:None ¦ 1:Warning ¦ 2:Fault stop function ¦ 3: Fault coasting	I	R/W	-
	#55		none	-	0	4	0:None ¦ 1:Warning (below limit)¦ 2:Warning (above limit) ¦ 3: Fault (below limit ¦ 4: Fault (above limit)	I	R/W	-

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel Address
Ha46	Supply VFD: motor parameters									
	Volt		0	V	180	690		I	R/W	-
	Cosfi		0.0	-	0,30	0,99		I	R/W	-
	Frequency		0	Hz	30	320		A	R/W	-
	Speed		0	rpm	300	20000		I	R/W	-
	Current		0	A	-999.9	999.9		A	R/W	-
	Current limit		0	A	0	999.9		A	R/W	-
Ha50	Return VFD									
	Address		2	-	0	999		I	R/W	-
	Data address		0	-	0	9999		I	R/W	-
	Data value		0	-	-32768	32767		I	R/W	-
	Default install		N		N	S	0:N=No¦ 1:Y=Yes	D	R/W	-
Ha51	Return VFD									
	Control place		I/O terminal	-	1	3	1: I/O terminal ¦ 2:keypad ¦ 3: Fieldbus	I	R/W	-
	Speed reference type		Ain1	-	0	5	0:Ain1 ¦ 1:Ain2 ¦ 2:Keypad ¦ 3: Fieldbus¦ 4: Motor potentiometer ¦5:PID regulation	I	R/W	-
	Rotation type		Clockwise	-	0	1	0:Clockwise ¦ 1: Counter-clockwise	D	R/W	-
Ha52	Return VFD									
	Motor control mode		Frequency	-	0	1	0:Frequency ¦ 1:Speed	I	R/W	-
	Start function		Ramp	-	0	1	0:Ramp ¦ 1: Flying start	I	R/W	-
	Stop function		Coasting	-	0	1	0:Coasting ¦ 1:Ramp	I	R/W	-
Ha53	Return VFD									
	Action when in fault: #03;#09;#11;#15		none	-	0	3	0:None ¦ 1:Warning ¦ 2:Fault stop function ¦ 3: Fault coasting	I	R/W	-
Ha54	Return VFD									
	Action when in fault: #16;#17;#29;#50		none	-	0	3	0:None ¦ 1:Warning ¦ 2:Fault stop function ¦ 3: Fault coasting	I	R/W	-
Ha55	VFD return									
	Action when in fault: #53;#54;#55		none	-	0	3	0:None ¦ 1:Warning ¦ 2:Fault stop function ¦ 3: Fault coasting	I	R/W	-
	#55		none	-	0	4	0:None ¦ 1:Warning (below limit)¦ 2:Warning (above limit) ¦ 3: Fault (below limit ¦ 4: Fault (above limit)	I	R/W	-
Ha56	Return VFD: motor parameters									
	Volt		0	V	180	690		I	R/W	-
	Cosfi		0.0	-	0,30	0,99		I	R/W	-
	Frequency		0	Hz	30	320		A	R/W	-
	Speed		0	rpm	300	20000		I	R/W	-
	Current		0	A	-999.9	999.9		A	R/W	-
	Current limit		0	A	0	999.9		A	R/W	-
	Belimo 1…Belimo 8									
Ha60, Ha63 Ha66, Ha69	Actuator type		None	-	0	9	0-1: None ¦ 2: Air actuator ¦ 3,4: Valve actuator¦ 5: None ¦ 6: Fire-smoke damper ¦ 7: None ¦ 8: VAV actuator¦ 9: None	I	R/W	-
Ha72,	Addressing mode		Manual	-	0	1	0: Manual ¦ 1: Auto	D	R/W	-
Ha75	SN: 00000-00000-000-000		0	-	0	9		I	R/W	-
Ha78, Ha81	Address actuator	Enable addressing	No	-	0	1	0:No¦ 1:Yes	D	R/W	
Ha61, Ha64	Enable external input/ probe		No	-	No	Yes	0:No¦1:Yes	D	R/W	-
Ha67, Ha70	Type		NTC	-			0:NTC ¦ 2:0…1V ¦ 3:0…10V ¦ 5: ON/OFF	I	R/W	-
Ha73,	Min value		0	-	-999.9	Max		A	R/W	-
Ha76 Ha79, Ha82	Max value		0	-	Min	999.9		A	R/W	-
Ha62,	Position or air flow limits									
Ha65	Minimum		0	%	0	Lim_max		A	R/W	-
Ha68, Ha71 Ha74, Ha77 Ha80, Ha83	Maximum		0	%	Lim_min	100		A	R/W	-
Ha91 … Ha96	Serial probe n°1…6									
	Address		128	-	128	159		I	R/W	-
	Type		Temperature	-	0	1	0:Temperature ¦ 1: Temperature+humidity	D	R/W	-
	Default installation		No	-	No	Yes	0:No¦ 1:Yes	D	R/W	-

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel address
H. Manufacturer										
b.	I/O configuration									
	Analog inputs									
Hb01	Supply temperature									
	Position		--	-	0	99		I	R/W	-
	Type		NTC	-	0	4	0:NTC ¦ 1:Pt1000 ¦ 2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit		0	°C	-50	MAX limit		A	R/W	-
	MAX limit		0	°C	MIN limit	200		A	R/W	-
Hb02	Return temperature									
	Position		--	-	0	99		I	R/W	-
	Type		NTC	-	0	4	0:NTC ¦ 1:Pt1000 ¦ 2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit		0	°C	-50	MAX limit		A	R/W	-
	MAX limit		0	°C	MIN limit	200		A	R/W	-

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel address
Hb03	External temperature									
	Position		--	-	0	99		I	R/W	-
	Type		NTC	-	-	-	0:NTC ¦ 1:Pt1000 ¦ 2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit		0	°C	-50	MAX limit		A	R/W	-
	MAX limit		0	°C	MIN limit	200		A	R/W	-
	MIN limit		0	°C	-50	MAX limit		A	R/W	-
	MAX limit		0	°C	MIN limit	200		A	R/W	-
	Type						2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
Hb04	Room temperature									
	Position		--	-	0	99		I	R/W	-
	Type		NTC	-	-	-	0:NTC ¦ 1:Pt1000 ¦ 2:0…1V ¦ ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit		0	°C	-50	MAX limit		A	R/W	-
	MAX limit		0	°C	MIN limit	200		A	R/W	-
Hb05	Supply humidity									
	Position		--	-	0	99		I	R/W	-
	Type						2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit			%RH	0	MAX limit		I	R/W	-
	MAX limit			%RH	MIN limit	100		I	R/W	-
Hb06	Return humidity									
	Position		--	-	0	99		I	R/W	-
	Type						2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit			%RH	0	MAX limit		I	R/W	-
	MAX limit			%RH	MIN limit	100		I	R/W	-
Hb07	External humidity									
	Position		--	-	0	99		I	R/W	-
	Type						2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit			%RH	0	MAX limit		I	R/W	-
	MAX limit			%RH	MIN limit	100		I	R/W	-
Hb08	Room humidity									
	Position		--	-	0	99		I	R/W	-
	Type						2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit			%RH	0	MAX limit		I	R/W	-
	MAX limit			%RH	MIN limit	100		I	R/W	-
Hb09	Supply pressure position									
	Position		--	-	0	99		I	R/W	-
	Type						2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit			Pa	0	MAX limit		I	R/W	-
	MAX limit			Pa	MIN limit	5000		I	R/W	-
Hb10	Return pressure position									
	Position		--	-	0	99		I	R/W	-
	Type						2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit			Pa	0	MAX limit		I	R/W	-
	MAX limit			Pa	MIN limit	5000		I	R/W	-
Hb11	Frost protection temp.									
	Position		--	-	0	99		I	R/W	-
	Type						0:NTC ¦ 1:Pt1000 ¦ 2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit		0	°C	-50	MAX limit		A	R/W	-
	MAX limit		0	°C	MIN limit	200		A	R/W	-
Hb12	Temperature downstream of coils									
	Position		--	-	0	99		I	R/W	-
	Type						0:NTC ¦ 1:Pt1000 ¦ 2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit		0	°C	-50	MAX limit		A	R/W	-
	MAX limit		0	°C	MIN limit	200		A	R/W	-
Hb13	CO2 air quality									
	Position		--	-	0	99		I	R/W	-
	Type						2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit		0	ppm	0	MAX limit		A	R/W	-
	MAX limit		2000	ppm	Limit_min	5000		A	R/W	-
Hb14	VOC air quality									
	Position		--	-	0	99		I	R/W	-
	Type						2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit		0	%	0	MAX limit		A	R/W	-
	MAX limit		100	%	Limit_min	100		A	R/W	-
Hb15	Exhaust temperature									
	Position		--	-	0	99		I	R/W	-
	Type						0:NTC ¦ 1:Pt1000 ¦ 2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit		0	%	0	MAX limit		A	R/W	-
	MAX limit		100	%	Limit_min	100		A	R/W	-
Hb16	Cooling -heating/cooling coil input	Ha06, Ha09, Hc11								
	Position		--	-	0	99		I	R/W	-
	Type						0:NTC ¦ 1:Pt1000 ¦ 2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit		0	%	0	MAX limit		A	R/W	-
	MAX limit		100	%	Limit_min	100		A	R/W	-
Hb17	Preheat coil water temperature	Ha05, Ha09, Hc09								
	Position		--	-	0	99		I	R/W	-
	Type						0:NTC ¦ 1:Pt1000 ¦ 2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit		0	%	0	MAX limit		A	R/W	-
	MAX limit		100	%	Limit_min	100		A	R/W	-

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel address
Hb18	Reheating coil water temperature	Ha08, Ha09, Hc16								
	Position		--	-	0	99		I	R/W	-
	Type						0:NTC ¦ 1:Pt1000 ¦ 2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit		0	%	0	MAX limit		A	R/W	-
	MAX limit		100	%	Limit_min	100		A	R/W	-
Hb19	Auxiliary probe 1									
	Position		--	-	0	99		I	R/W	-
	Type						0:NTC ¦ 1:Pt1000 ¦ 2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit		0	%	0	MAX limit		A	R/W	-
	MAX limit		100	%	Limit_min	100		A	R/W	-
Hb20	Auxiliary probe 2									
	Position		--	-	0	99		I	R/W	-
	Type						0:NTC ¦ 1:Pt1000 ¦ 2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit		0	%	0	MAX limit		A	R/W	-
	MAX limit		100	%	Limit_min	100		A	R/W	-
Hb21	Auxiliary probe 3									
	Position		--	-	0	99		I	R/W	-
	Type						0:NTC ¦ 1:Pt1000 ¦ 2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit		0	%	0	MAX limit		A	R/W	-
	MAX limit		100	%	Limit_min	100		A	R/W	-
	MIN limit		0	%	0	MAX limit		A	R/W	-
	MAX limit		100	%	Limit_min	100		A	R/W	-
Hb22	Auxiliary probe 4									
	Position		--	-	0	99				
	Type						0:NTC ¦ 1:Pt1000 ¦ 2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit		0	%	0	MAX limit		A	R/W	-
	MAX limit		100	%	Limit_min	100		A	R/W	-
Hb23	Enable offset on set point from analogue input	Enable:Ha19								
	Position		--	-	0	99		I	R/W	-
	Type						0:NTC ¦ 1:Pt1000 ¦ 2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
	MIN limit		0	%	0	MAX limit		A	R/W	-
	MAX limit		100	%	Limit_min	100		A	R/W	-
Hb23a	Humidity downstream of coils	Enable: Ha06: Dehumid.=ass. humid								
	Position		--	-	0	99		I	R/W	-
	Type						1:0…1V ¦ 2:0…10V ¦ 3:4…20mA	I	R/W	-
	MIN limit		0	%	0	MAX limit		A	R/W	-
	MAX limit		100	%	Limit_min	100		A	R/W	-
Hb23b	Temperature after heat recovery unit	In supply								
	Position		--	-	0	99		I	R/W	-
	Type:						0:NTC ¦ 1:Pt1000	I	R/W	-
Hb23c	IEC limit probe (humidity)	Probe before heat recovery unit on exhaust	Enable: Ha14a: Enable IEC: Yes Control: from probe	%	0	100		I	R/W	-
	Position		--	-	0	99				
	Type:						2:0…1V ¦ 3:0…10V ¦ 4:4…20mA	I	R/W	-
Digital inputs										
Hb24	Remote On-Off									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Summer/winter									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Double setpoint	Ha18								
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
Hb25	Generic alarm									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Serious alarm									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Frost alarm	Enable: Ha16								
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
Hb26	Supply air filter 1									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Supply air filter 2									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Return air filter									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
Hb27	Supply flow									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Return flow									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel address
Hb28	Humidifier alarm									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Inverter supply fan alarm									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Inverter return fan alarm									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
Hb29	Supply fan overload									
	1.Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	2.Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Return fan overload									
	1.Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	2.Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
Hb30	Cool pump 1 overload									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Preheat pump 1 overload									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Reheat pump 1 overload									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
Hb31	Cool pump 2 overload									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Preheat pump 2 overload									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Reheat pump 2 overload									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
Hb32	Cooling flow alarm									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Preheating flow alarm									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Reheating flow alarm									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
Hb33	Heat recovery clogged									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Preheating heaters overload									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Reheating heaters overload									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
Hb34	Filter clogged									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Door switch alarm									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Fire and smoke alarm									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
Hb34a	Fireman override									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Generic signal									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
Hb34b	Supply damper limit switch									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Return damper limit switch									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-

Digital outputs

Hb35	Supply fan									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Return fan									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	On/Off humidifier									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel address
Hb36	Supply fan 2									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
	Return fan 2									
	Position		--	-	0	99		I	R/W	-
	Logic		NC	-	-	-	NC, NO	D	R/W	-
Hb37	Star – Delta logic									
	Supply fan - Line		--	-	0	16		I	R/W	-
	Supply fan - Star		--	-	0	16		I	R/W	-
	Supply fan - Delta		--	-	0	16		I	R/W	-
Hb38	Return fan - Line		--	-	0	16		I	R/W	-
	Return fan - Star		--	-	0	16		I	R/W	-
	Return fan - Delta		--	-	0	16		I	R/W	-
	Fresh air damper									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Bypass damper									
	Position		--	-	0	99		I	R/W	-
Hb39	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Run around coil	Ha14: run around coil								
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Rotary recovery	Ha14: rotary recovery on/off								
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
Hb39a	Supply fan damper									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Return fan damper									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Global alarm									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Serious alarm									
Hb40	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Minor alarm									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Unit status									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Filter alarm									
Hb41	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Recovery heater									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
Hb42	Cool/heat									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Cool – Cool/heat pump 1									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Preheat pump 1									
Hb43	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Reheat pump 1									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Cool – Cool/heat pump 2									
	Position		--	-	0	99		I	R/W	-
Hb44	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Preheat pump 2									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Reheat pump 2									
Hb44	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Cool - Cool/heat floating valve open									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Preheating floating valve open									
Hb45	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Reheating floating valve open									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Cool - Cool/heat floating valve close									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Preheating floating valve close									
Hb46	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Reheating floating valve close									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel address
	Cooling – cool/heat step 1									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Cooling – cool/heat step 2									
Hb47	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	Cooling – cool/heat step 3									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
Hb47a	Cooling – cool/heat step 4									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
Hb48	Preheating heaters									
	1									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	2									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	3									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	4									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
Hb49	Reheating heaters									
	1									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	2									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	3									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	4									
	Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
Hb50	Auxiliary On/Off									
	1 Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	2 Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	3 Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-
	4 Position		--	-	0	99		I	R/W	-
	Logic		NO	-	-	-	NC, NO	D	R/W	-

Analog output

Hb51	Supply fan									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb52	Return fan position									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb53	Fresh air damper									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb54	Mixing damper									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb55	Exhaust damper									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb56	Bypass damper									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb57	Humidifier									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb58	Preheating valve									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb59	Cooling – Cool/heat valve									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb60	Modulating preheating heaters									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel address
Hb61	Reheating valve									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb62	Modulating reheaters position									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb63	Rotary recovery									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb64	Auxiliary 1									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb65	Auxiliary 2									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb66	Auxiliary 3									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb67	Auxiliary 4									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb68	IEC									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb69	Heat recovery unit pump									
	Position	--	-	0	99		I	R/W	-	
	Minimum	0	V	0	Maximum		A	R/W	-	
	Maximum	0	V	Min.	10		A	R/W	-	
Hb99	Positions delete									
	Din	No	-	0	1	0:No¦ 1:Yes	D	R/W	-	
	Ain	No	-	0	1	0:No¦ 1:Yes	D	R/W	-	
	Dout	No	-	0	1	0:No¦ 1:Yes	D	R/W	-	
	Aout	No	-	0	1	0:No¦ 1:Yes	D	R/W	-	

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel address
H. Factory settings										
c.	Factory parameters									
Hc01	Main regulation probe selection									
	Temperature		Return				0:Return ¦ 1:Supply ¦ 2:Room	I	R	-
	Humidity		Return				0:Return ¦ 1:Supply ¦ 2:Room	I	R	-
Hc02	Dampers limits setting									
	Fresh air damper			%	0	100		A	R/W	-
	Min			%	0	100		A	R/W	-
	Max			%	30	100		A	R/W	-
	Mixing damper									
	Min			%	0	100		A	R/W	-
	Max			%	0	100		A	R/W	-
Hc03	Damper settings									
	Delay for integration with coils		0	min	0	120		I	R/W	-
	Opening delay		120	s	0	9999		I	R/W	-
	Closing delay		120	s	0	9999		I	R/W	-
Hc03a	Mixing damp. config.									
	With unit off						0:Closed ¦ 1:Open	I	R	-
	Bypass damper with IEC active						0:Always force closed ¦ 1:No forced closing	I	R	-
Hc04	Fans Star-Delta timing									
	Star - Line		2000	ms	0	99990		I	R/W	-
	Star		5000	ms	0	99990		I	R/W	-
	Star - Delta		500	ms	0	99990		I	R/W	-
Hc05	Flow alarm threshold	Ha04: Air flow from: transducer								
	Supply		100	Pa	0	9999		I	R/W	-
	Return		100	Pa	0	9999		I	R/W	-
	Differential		300	Pa	0	9999		I	R/W	-
Hc06	Fans timing	Ha03: Fan type: On/Off (Backup fan)								
	Stop delay		30	s	0	999		I	R/W	-
	Supply - Return		0	s	0	999		I	R/W	-
	Fan1-Fan2 delay		5	s	0	999		I	R/W	-
	Rotation time		0	h	0	999		I	R/W	-
	Overworking time		0	s	-99	99		I	R/W	-
Hc07	Fans flow alarm									
	Start-up delay		20	s	1	999		I	R/W	-
	Running delay		5	s	1	999		I	R/W	-
	Flow warning retries		0	-	0	5		I	R/W	-
Hc07a	Damper limit switch alarm delay	Enable: Hc03a	10	s	0	999		I	R/W	-
Hc07b	Coefficient for flow-rate calculation	Enable: Ha03								
	Supply K		0	-	0	5000		I	R/W	-
	Return K		0	-	0	5000		I	R/W	-

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel address
Hc07c	Frost protection alarm delay with heaters	Enable: (Ha05) min 1 preheating heater and output assigned	120	s	0	600		I	R/W	-
Hc08	Floating valve travel time		180	s	1	3200		I	R/W	-
Hc09	Enable preheating coil water temp. threshold		No	-	No	Yes	0:No¦1:Yes	I	R/W	-
	Setpoint		25	°C	-99.9	99.9		A	R/W	-
	Differential		2	°C	0	9,		A	R/W	-
Hc10	Cooling coil									
	Floating valve travel time		180	s	1	3200		I	R/W	-
Hc11	Enable cooling coil water temperature threshold		No	-	No	Yes	0:No¦1:Yes	D	R/W	-
	Setpoint		35	°C	-99.9	99.9		A	R/W	-
	Differential		2	°C	0	9.9		A	R/W	-
Hc12	Delay between cooling/heating change		10	min	0	999		I	R/W	-
Hc13	Heating/cooling coil									
	Floating valve travel time		180	s	1	3200		I	R/W	-
Hc14	Enable heating/cooling coil input limit		No	-	No	Yes	0:No¦1:Yes	D	R/W	-
	Hot threshold		25	°C	0	99.9		A	R/W	-
	Cool threshold		35	°C	0	99.9		A	R/W	-
	Differential		2	°C	0	9.9		A	R/W	-
Hc15	Reheating coil									
	Floating valve travel time		180	s	0	3200		I	R/W	-
Hc16	Enable reheating coil water temperature threshold		No	-			0:No¦1:Yes	D	R/W	-
	Setpoint		25	°C	-99,	99,		A	R/W	-
	Differential		2	°C	0	9,		A	R/W	-
Hc17	Pumps									
	Flow alarm delay									
	Start		30	s	1	999		I	R	-
	Steady operation		15	s	1	999		I	R	-
	Rotation time		96	Hour	0	999		I	R/W	-
	Overlapping time		0	s	-99	99		I	R/W	-
Hc18	Heat recovery unit									
	Frost protection delay									
	Start		120	s	0	999		I	R/W	-
	End		60	s	0	999		I	R/W	-
	Clogged alarm delay		60	s	0	300		I	R/W	-
Hc18a	IEC air flow limit									
	Maximum		0	%	0	100		I	R/W	-
Hc19	Air quality									
	Integral time		300	s	0	9999		I	R/W	-
	Cleaning time		10	min	0	300		I	R/W	-
	Generic alarm input delay		0	s	0	9999		I	R/W	-
Hc20	Disable buzzer		No	-	-	-	0:No¦1:Yes	D	R/W	-
	Enable clock board		No	-	-	-	0:No¦1:Yes	D	R/W	-
Hc40	Supply VFD									
	Volt at 0 Hz		0	%	0	40		A	R/W	-
	Switch frequency		0	kHz	1	16		A	R/W	-
	V/f curve midpoint									
	Voltage		0	%	0	100		A	R/W	-
	Frequency		0	Hz	0	320		A	R/W	-
Hc41	Supply VFD									
	V/f ratio		Linear				0:Linear ¦ 1:Squared ¦ 2:Programmable ¦ 3:Linear with flux optimisation	I	R/W	-
	V/f Optimisation		Not used				0:Not used ¦ 1:Automatic boost	I	R/W	-
	Auto restart		Not used				0:Not used ¦ 1:used	I	R/W	-
Hc42	Supply VFD									
	Min frequency		0	Hz	0	Max freq.		A	R/W	-
	Max frequency		50	Hz	Min freq.	320		A	R/W	-
	Acceleration time		1	s	0.1	3200		A	R/W	-
	Deceleration time		1	s	0.1	3200		A	R/W	-
Hc50	Return VFD									
	Volt at 0 Hz		0	%	0	40		A	R/W	-
	Switch frequency		0	kHz	1	16		A	R/W	-
	V/f curve midpoint									
	Voltage		0	%	0	100		A	R/W	-
	Frequency		0	Hz	0	320		A	R/W	-
Hc51	Return VFD									
	V/f ratio		Linear				0:Linear ¦ 1:Squared ¦ 2:Programmable ¦ 3:Linear with flux optimisation	I	R/W	-
	V/f Optimisation		Not used				0:Not used ¦ 1:Automatic boost	I	R/W	-
	Auto restart		Not used				0:Not used ¦ 1:used	I	R/W	-
Hc52	Return VFD									
	Min frequency		0	Hz	0	Max freq.		A	R/W	-
	Max frequency		50	Hz	Min freq.	320		A	R/W	-
	Acceleration time		1	s	0.1	3200		A	R/W	-
	Deceleration time		1	s	0.1	3200		A	R/W	-
d. Initialisation										
Hd01	Save configuration		No	-	No	Yes	0:No¦1:Yes	D	R/W	-
Hd02	Default installation Erase user settings and install global default values		No	-	-	-	0:No¦1:Yes	I	R/W	-
Hd03	Insert new manufacture password (PW2)		1234	-	0	9999		I	R/W	-
e. Input/output test										
	Digital output									
	Supply fan		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
He01	Supply fan 2		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Return fan		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Return fan 2		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-

Screen index	Display description	Description/notes	Def.	UOM	Min	Max	Value description	Type	R/W	Carel address
	Digital output									
	Supply fan line		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Supply fan star		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
He02	Supply fan delta		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Return fan line		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Return fan star		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Return fan delta		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Digital output									
	Unit status		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
He03	Humidifier		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Rotary recovery/ run around coil		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Digital output									
	Global alarm		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
He04	Serious alarm		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Minor alarm		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Filter alarm		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Digital output									
	Fresh air damper		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Bypass damper		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
He05	Reheater 1		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Reheater 2		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Reheater 3		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Reheater 4		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Digital output									
	Pre heater 1		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
He06	Pre heater 2		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Pre heater 3		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Pre heater 4		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
He07	Cooling - heating/cooling step 1		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Cooling - heating/cooling step 2		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Cooling - heating/cooling step 3		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Cooling - heating/cooling step 4		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Digital output									
	Pump 1									
He08	Cooling – Cool/heat		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Preheating		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Reheating		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Digital output									
	Pump 2									
He09	Cooling – Cool/heat		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Preheating		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Reheating		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Digital output									
	Cooling – Cool/heat floating valve open		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Cooling – Cool/heat floating valve close		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
He10	Preheating floating valve open		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Preheating floating valve close		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Reheating floating valve open		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Reheating floating valve closed		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Digital output									
	Regulation loop 1		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
He11	Regulation loop 2		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Regulation loop 3		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Regulation loop 4		Auto	-	Auto	On	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Analog output									
	Supply fan		Auto	-	0	100	0:Auto ¦ 1:0% ¦ 101:100%	I	R/W	-
He12	Return fan		Auto	-	0	100	0:Auto ¦ 1:0% ¦ 101:100%	I	R/W	-
	Exhaust damper		Auto	-	0	100	0:Auto ¦ 1:0% ¦ 101:100%	I	R/W	-
	Fresh air damper		Auto	-	0	100	0:Auto ¦ 1:0% ¦ 101:100%	I	R/W	-
	Mixing damper		Auto	-	0	100	0:Auto ¦ 1:0% ¦ 101:100%	I	R/W	-
	Analog output									
	Bypass damper		Auto	-	0	101	0:Auto ¦ 1:0% ¦ 101:100%	I	R/W	-
He13	Rotary recovery		Auto	-	0	101	0:Auto ¦ 1:0% ¦ 101:100%	I	R/W	-
	Preheat heater		Auto	-	0	101	0:Auto ¦ 1:0% ¦ 101:100%	I	R/W	-
	Reheat heater		Auto	-	0	101	0:Auto ¦ 1:0% ¦ 101:100%	I	R/W	-
	Analog output									
	Valve									
He14	Cooling – Cool/heat		Auto	-	0	101	0:Auto ¦ 1:0% ¦ 101:100%	I	R/W	-
	Preheating		Auto	-	0	101	0:Auto ¦ 1:0% ¦ 101:100%	I	R/W	-
	Reheating		Auto	-	0	101	0:Auto ¦ 1:0% ¦ 101:100%	I	R/W	-
	Analog output									
	Regulation loop 1		Auto	-	0	101	0:Auto ¦ 1:0% ¦ 101:100%	I	R/W	-
He15	Regulation loop 2		Auto	-	0	101	0:Auto ¦ 1:0% ¦ 101:100%	I	R/W	-
	Regulation loop 3		Auto	-	0	101	0:Auto ¦ 1:0% ¦ 101:100%	I	R/W	-
	Regulation loop 4		Auto	-	0	101	0:Auto ¦ 1:0% ¦ 101:100%	I	R/W	-
	Supply VFD									
He40	Require		0	%	0	100		A	R/W	-
	Force VFD		Stop	-	Stop	Run	0: Stop ¦ 1: Run	D	R/W	-
	Return VFD									
He50	Require		0	%	0	100		A	R/W	-
	Force VFD		Stop	-	Stop	Run	0: Stop ¦ 1: Run	D	R/W	-
He51	Exhaust damper		Auto	%	0	100	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Supply fan damper		Auto	%	0	100	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-
	Return fan damper		Auto	%	0	100	0:Auto ¦ 1:Off ¦ 2:On	I	R/W	-

9.1 BMS variables

FLSTDMAHUE can be connected to various supervisory systems, using the following BMS communication protocols: Carel and Modbus.
A BMS serial port serial port is used for the connection. The various connection protocols are managed using the following optional cards:

- Carel RS485: code PCOS004850
- Modbus RS485: code PCOS004850
- Lon Works FTT10: code PCO10000F0
- BACnet RS485: code PCO1000BA0
- BACnet Ethernet: code PCO1000WB0

The following list of variables specifies the variable identifier, visible via the Commissioning Tool: the description explains the meaning of the variable, while the last column specifies whether the BMS variable is read-only or read/write.

Digital variables

Modbus ADDR	Carel ADDR.	Screen index	Commissioning Tool variable name	Description	Def.	UOM	Min	Max	R/W
1	1		HeartBit	Heart beat	-	-	0	1	R/W
2	2		Bms_Din_1	Digital input 1 from BMS	-	-	0	1	R/W
3	3		Bms_Din_2	Digital input 2 from BMS	-	-	0	1	R/W
4	4		Bms_Din_3	Digital input 3 from BMS	-	-	0	1	R/W
5	5		Bms_Din_4	Digital input 4 from BMS	-	-	0	1	R/W
6	6		Din_On_Off	Status of Unit On/Off digital input	-	-	0	1	R
7	7		Din_Season	Select season from DI (cooling = open)	-	-	0	1	R
8	8		Din_Double_Set	Status of double set point selection digital input	-	-	0	1	R
9	9		Din_Generic	Generic alarm	-	-	0	1	R
10	10		AI_Din_Serious	AL U02 – Serious alarm from digital input	-	-	0	1	R
11	11		AI_Din_Humidifier	Humidifier alarm from digital input	-	-	0	1	R
12	12		AI_Antifreeze_Din	Frost protection alarm from digital input	-	-	0	1	R
13	13		Din_Supply_Filter	Supply filter alarm	-	-	0	1	R
14	14		Din_Supply_Filter_2	Second supply filter alarm	-	-	0	1	R
15	15		Din_Return_Filter	Return filter alarm	-	-	0	1	R
16	16		Din_Supply_Flow	Supply flow alarm	-	-	0	1	R
17	17		Din_Return_Flow	Return flow alarm	-	-	0	1	R
18	18		Din_OverL_Pump1_Cool	Cooling coil pump 1 overload	-	-	0	1	R
19	19		Din_OverL_Pump1_PreHeat	Preheating coil pump 1 overload	-	-	0	1	R
20	20		Din_OverL_Pump1_PostHeat	Reheating coil pump 1 overload	-	-	0	1	R
21	21		Din_OverL_Pump2_Cool	Cooling coil pump 2 overload	-	-	0	1	R
22	22		Din_OverL_Pump2_PreHeat	Preheating coil pump 2 overload	-	-	0	1	R
23	23		Din_OverL_Pump2_PostHeat	Reheating coil pump 2 overload	-	-	0	1	R
24	24		Din_Cool_Flow	Cooling coil flow alarm	-	-	0	1	R
25	25		Din_PostHeat_Flow	Reheating coil flow alarm	-	-	0	1	R
26	26		Din_PreHeat_Flow	Reheating coil flow alarm	-	-	0	1	R
27	27		Din_OverL_Supply_Fan_1	Supply fan 1 overload	-	-	0	1	R
28	28		Din_OverL_Supply_Fan_2	Supply fan 2 overload	-	-	0	1	R
29	29		Din_OverL_Return_Fan_1	Return fan 1 overload	-	-	0	1	R
30	30		Din_OverL_Return_Fan_2	Return fan 2 overload	-	-	0	1	R
31	31		Din_Supply_Inv_Fan_Alarm	Supply inverter alarm from DI	-	-	0	1	R
32	32		Din_Return_Inv_Fan_Alarm	Return inverter alarm from DI	-	-	0	1	R
33	33		Din_OverL_PreH_Heaters	Preheating heater overload	-	-	0	1	R
34	34		Din_OverL_PostH_Heaters	Reheating heater overload	-	-	0	1	R
35	35		Din_Dirty_Recovery	Dirty heat recovery unit alarm from DI	-	-	0	1	R
36	36		AI_Din_Dirty_Filter	Filter alarm	-	-	0	1	R
37	37		AI_Din_FireSmoke	Smoke-fire alarm	-	-	0	1	R
38	38		AI_Din_Door_Switch	Door open alarm	-	-	0	1	R
39	39		On_Off_Supply_Fan_1	Supply fan 1 on/Off output	-	-	0	1	R
40	40		On_Off_Supply_Fan_2	Supply fan 2 on/Off output	-	-	0	1	R
41	41		On_Off_Return_Fan_1	Return fan 1 on/Off output	-	-	0	1	R
42	42		On_Off_Return_Fan_2	Return fan 2 on/Off output	-	-	0	1	R
43	43		Supply_Fan_Line	Supply fan line	-	-	0	1	R
44	44		Return_Fan_Line	Return fan line	-	-	0	1	R
45	45		SysOn	System On/Off status	-	-	0	1	R
46	46		On_Off_Humidifier	Humidifier On/Off output	-	-	0	1	R
47	47		On_Off_Rotary_Recovery	Heat wheel On/Off output	-	-	0	1	R
48	48		Recovery_Heater	Heat recovery unit defrost heater outputs	-	-	0	1	R
49	49		AI_Global	Generic alarm	-	-	0	1	R
50	50		AI_Serious	AL U02 – Serious alarm	-	-	0	1	R
51	51		AI_Minor	Minor alarm	-	-	0	1	R
52	52		AI_Filters	Filter alarm output	-	-	0	1	R
53	53		On_Off_External_Damper	Outside damper On/Off output	-	-	0	1	R
54	54		On_Off_ByPass_Damper	Bypass damper On/Off output	-	-	0	1	R
55	55		Heaters_Post_1	Reheating heater output 1	-	-	0	1	R
56	56		Heaters_Post_2	Reheating heater output 2	-	-	0	1	R
57	57		Heaters_Post_3	Reheating heater output 3	-	-	0	1	R
58	58		Heaters_Post_4	Reheating heater output 4	-	-	0	1	R
59	59		Heaters_Pre_1	Preheating heater output 1	-	-	0	1	R
60	60		Heaters_Pre_2	Preheating heater output 2	-	-	0	1	R
61	61		Heaters_Pre_3	Preheating heater output 3	-	-	0	1	R
62	62		Heaters_Pre_4	Preheating heater output 4	-	-	0	1	R
63	63		Cool_Step_1	Cooling step 1	-	-	0	1	R
64	64		Cool_Step_2	Cooling step 2	-	-	0	1	R
65	65		Cool_Step_3	Cooling step 3	-	-	0	1	R
66	66		Common_Cool_Heat	Heat or cool mode for heating/cooling coil	-	-	0	1	R
67	67		Cool_Pump_1	Cooling or heating/cooling coil pump 1 output	-	-	0	1	R
68	68		PreHeat_Pump_1	Preheating coil pump 1 output	-	-	0	1	R
69	69		PostHeat_Pump_1	Reheating coil pump 1 output	-	-	0	1	R
70	70		Cool_Pump_2	Cooling or heating/cooling coil pump 2 output	-	-	0	1	R
71	71		PreHeat_Pump_2	Preheating coil pump 2 output	-	-	0	1	R
72	72		PostHeat_Pump_2	Reheating coil pump 2 output	-	-	0	1	R
73	73		Cool_3P_Open	Close floating cooling or heating/cooling coil valve	-	-	0	1	R
74	74		Cool_3P_Close	Close floating cooling or heating/cooling coil valve	-	-	0	1	R

Modbus ADDR	Carel ADDR.	Screen index	Commissioning Tool variable name	Description	Def.	UOM	Min	Max	R/W
75	75		PreHeat_3P_Open	Open preheating coil floating valve	-	-	0	1	R
76	76		PreHeat_3P_Close	Close preheating coil floating valve	-	-	0	1	R
77	77		PostHeat_3P_Open	Open reheating coil floating valve	-	-	0	1	R
78	78		PostHeat_3P_Close	Close reheating coil floating valve	-	-	0	1	R
79	79		OnOff_Auxiliary_1	Auxiliary loop 1 On/Off	-	-	0	1	R
80	80		OnOff_Auxiliary_2	Auxiliary loop 2 On/Off	-	-	0	1	R
81	81		OnOff_Auxiliary_3	Auxiliary loop 3 On/Off	-	-	0	1	R
82	82		OnOff_Auxiliary_4	Auxiliary loop 4 On/Off	-	-	0	1	R
83	83		SCHEDULER.En_Resume_time	Resume time enable	-	-	0	1	R/W
84	84		SCHEDULER.Write_Data	Write the hour/minute scheduler settings	-	-	0	1	R/W
85	85		SCHEDULER.Day_Scheduler_En	Enable Scheduler	-	-	0	1	R/W
86	86		SCHEDULER.Holiday_Period_En	Enable holiday period	0	-	0	1	R/W
87	87		SCHEDULER.Special_Days_En	Enable special days	0	-	0	1	R/W
88	88		AI_Serial_Prb_Offline_1_Db	AL S12 - Serial probe 1 offline	0	-	0	1	R/W
89	89		AI_Regulation_Probe	AL A24 – Control probe fault or disconnected	-	-	0	1	R
90	90		AI_Recovery_Dirty	AL B01 – Dirty heat recovery unit	-	-	0	1	R
91	91		REHEATING.AI_PostH_Heaters	AL B02 – Reheating heater alarm	-	-	0	1	R/W
92	92		PREHEATING.AI_PreH_Heaters	AL B03 – Preheating heater alarm	-	-	0	1	R/W
93	93		AI_pCOe_1_Offline	AL E11 - pCOe 1 offline	-	-	0	1	R
94	94		AI_pCOe_2_Offline	AL E21 - pCOe 2 offline	-	-	0	1	R
95	95		Warning_Ain_1_2_pCOe_1	AL E12 - Analog inputs 1&2 on pCOe1 not same type	-	-	0	1	R/W
96	96		Warning_Ain_3_4_pCOe_1	AL E13 - Analog inputs 3&4 on pCOe1 not same type	-	-	0	1	R/W
97	97		Warning_Ain_1_2_pCOe_2	AL E22 - Analog inputs 1&2 on pCOe2 not same type	-	-	0	1	R/W
98	98		Warning_Ain_3_4_pCOe_2	AL E23 - Analog inputs 3&4 on pCOe2 not same type	-	-	0	1	R/W
99	99		pCOe_1.AI_AinCh1	AL E14 – Analogue probe alarm on channel 1	-	-	0	1	R
100	100		pCOe_1.AI_AinCh2	AL E15 - Analogue probe alarm on channel 2	-	-	0	1	R
101	101		pCOe_1.AI_AinCh3	AL E16 - Analogue probe alarm on channel 1	-	-	0	1	R/W
102	102		pCOe_1.AI_AinCh4	AL E14 - Analogue probe alarm on channel 4	-	-	0	1	R/W
103	103		pCOe_2.AI_AinCh1	AL E24 - Analogue probe alarm on channel 1	-	-	0	1	R
104	104		pCOe_2.AI_AinCh2	AL E25 - Analogue probe alarm on channel 2	-	-	0	1	R
105	105		pCOe_2.AI_AinCh3	AL E26 - Analogue probe alarm on channel 1	-	-	0	1	R/W
106	106		pCOe_2.AI_AinCh4	AL E27 - Analogue probe alarm on channel 4	-	-	0	1	R/W
107	107		FANS.AI_Supply_Flow_1	AL F01 - Supply fan 1 flow alarm	-	-	0	1	R
108	108		FANS.AI_Supply_Flow_2	AL F03 - Supply fan 2 flow alarm	-	-	0	1	R
109	109		FANS.AI_Return_Flow_1	AL F02 - Return fan 1 flow alarm	-	-	0	1	R
110	110		FANS.AI_Return_Flow_2	AL F04 - Return fan 2 flow alarm	-	-	0	1	R
111	111		FANS.AI_Supply_Overload_1	AL F05 - Supply fan 1 overload alarm	-	-	0	1	R
112	112		FANS.AI_Supply_Overload_2	AL F09 - Supply fan 2 overload alarm	-	-	0	1	R
113	113		FANS.AI_Return_Overload_1	AL F06 - Return fan 1 overload alarm	-	-	0	1	R
114	114		FANS.AI_Return_Overload_2	AL F10 - Return fan 2 overload alarm	-	-	0	1	R
115	115		FANS.AI_Din_Supply_Inv_Fan	AL F07 - Supply inverter alarm	-	-	0	1	R
116	116		FANS.AI_Din_Return_Inv_Fan	AL F08 - Return inverter alarm	-	-	0	1	R
117	117		FANS.Warning_Sfan1	AL F11 - Supply fan 1 warning	-	-	0	1	R
118	118		FANS.Warning_Sfan2	AL F12 - Supply fan 2 warning	-	-	0	1	R
119	119		FANS.Warning_RFan1	AL F13 - Return fan 1 warning	-	-	0	1	R
120	120		FANS.Warning_RFan2	AL F14 - Return fan 2 warning	-	-	0	1	R
121	121		AI_Extd_Memory	AL G02 - Extended memory error	-	-	0	1	R/W
122	122		FROST.AI_Antifreeze_Ain	AL G03 - Frost protection alarm from probe	-	-	0	1	R
123	123		FROST.AI_Antifreeze_Din	AL G04 - Frost protection alarm from thermostat	-	-	0	1	R
124	124		Protect_Mode	AL G05 – Room protection active	-	-	0	1	R
125	125		HUMIDIFIER.AI_Humidifier	AL H01 – Humidifier alarm	-	-	0	1	R
126	126		Belimo_1.AI_Belimo_Offline	AL M11 - Belimo 1 offline	-	-	0	1	R
127	127		Belimo_2.AI_Belimo_Offline	AL M21 - Belimo 2 offline	-	-	0	1	R
128	128		Belimo_3.AI_Belimo_Offline	AL M31 - Belimo 3 offline	-	-	0	1	R
129	129		Belimo_4.AI_Belimo_Offline	AL M41 - Belimo 4 offline	-	-	0	1	R
130	130		Belimo_5.AI_Belimo_Offline	AL M51 - Belimo 5 offline	-	-	0	1	R
131	131		Belimo_6.AI_Belimo_Offline	AL M61 - Belimo 6 offline	-	-	0	1	R
132	132		Belimo_7.AI_Belimo_Offline	AL M71 - Belimo 7 offline	-	-	0	1	R
133	133		Belimo_8.AI_Belimo_Offline	AL M81 - Belimo 8 offline	-	-	0	1	R
134	134		Warning_Cool_Pump1	AL P01 - Cooling pump 1 flow warning	-	-	0	1	R
135	135		Warning_Cool_Pump2	AL P02 - Cooling pump 2 flow warning	-	-	0	1	R
136	136		Warning_PreH_Pump1	AL P07 - Preheating pump 1 flow warning	-	-	0	1	R
137	137		Warning_PreH_Pump2	AL P08 - Preheating pump 2 flow warning	-	-	0	1	R
138	138		Warning_PostH_Pump1	AL P13 - Reheating pump 1 flow warning	-	-	0	1	R
139	139		Warning_PostH_Pump2	AL P14 - Reheating pump 2 flow warning	-	-	0	1	R
140	140		Cool_Pumps.AI_Flow_Pump_1	AL P03 – Cooling pump 1 flow alarm	-	-	0	1	R
141	141		Cool_Pumps.AI_Flow_Pump_2	AL P04 - Cooling pump 2 flow alarm	-	-	0	1	R
142	142		PreHeat_Pumps.AI_Flow_Pump_1	AL P09 - Preheating pump 1 flow alarm	-	-	0	1	R
143	143		PreHeat_Pumps.AI_Flow_Pump_2	AL P10 - Preheating pump 2 flow alarm	-	-	0	1	R
144	144		ReHeat_Pumps.AI_Flow_Pump_1	AL P15 - Reheating pump 1 flow alarm	-	-	0	1	R
145	145		ReHeat_Pumps.AI_Flow_Pump_2	AL P16 - Reheating pump 2 flow alarm	-	-	0	1	R
146	146		Cool_Pumps.AI_Overload_1	AL P05 - Cooling pump 1 overload	-	-	0	1	R
147	147		Cool_Pumps.AI_Overload_2	AL P06 - Cooling pump 2 overload	-	-	0	1	R
148	148		PreHeat_Pumps.AI_Overload_1	AL P11 - Preheating pump 1 overload	-	-	0	1	R
149	149		PreHeat_Pumps.AI_Overload_2	AL P12 - Preheating pump 2 overload	-	-	0	1	R
150	150		ReHeat_Pumps.AI_Overload_1	AL P17 - Reheating pump 1 overload	-	-	0	1	R
151	151		ReHeat_Pumps.AI_Overload_2	AL P18 - Reheating pump 2 overload	-	-	0	1	R
152	152		AI_Din_Generic	AL U01 - Generic alarm from digital input	-	-	0	1	R
153	153		AI_Din_Supply_Filter	AL U03 - Supply filter alarm	-	-	0	1	R
154	154		AI_Din_Supply_Filter_2	AL U04 - 2nd supply filter alarm	-	-	0	1	R
155	155		AI_Din_Return_Filter	AL U05 - Return filter alarm	-	-	0	1	R
156	156		AI_Serial_Prb_Offline_1	AL S12 - Serial probe 1 offline	-	-	0	1	R
157	157		AI_Serial_Prb_Offline_2	AL S22 - Serial probe 2 offline	-	-	0	1	R
158	158		AI_Serial_Prb_Offline_3	AL S32 - Serial probe 3 offline	-	-	0	1	R
159	159		AI_Serial_Prb_Offline_4	AL S42 - Serial probe 4 offline	-	-	0	1	R
160	160		AI_Serial_Prb_Offline_5	AL S52 - Serial probe 5 offline	-	-	0	1	R
161	161		AI_Serial_Prb_Offline_6	AL S62 - Serial probe 6 offline	-	-	0	1	R
162	162		AI_Offline_VFD1	AL V11 - Supply VFD offline	-	-	0	1	R
163	163		AI_Offline_VFD2	AL V21 - Return VFD offline	-	-	0	1	R
164	164		COOLING.AI_Inlet_Cool_Temp	AL B04 - Cooling coil water temperature fault	-	-	0	1	R
165	165		PREHEATING.AI_Inlet_PreH_Temp	AL B05 - Preheating coil water temperature fault	-	-	0	1	R
166	166		REHEATING.AI_Inlet_PostH_Temp	AL B06 - Reheating coil water temperature fault	-	-	0	1	R

Modbus ADDR	Carel ADDR.	Screen index	Commissioning Tool variable name	Description	Def.	UOM	Min	Max	R/W
167	167		COOL_HEAT_COIL.AI_Inlet_Common_Coil_Temp	AL B07 - Cool / heat coil water temperature fault	-	-	0	1	R
168	168	Gfc04	TEMP_REG.Regulation_Mode	Automatic season control	0	-	0	1	R/W
169	169	Gfc07	TEMP_REG.En_Double_Actions	Enable automatic heat/cool selection	0	-	0	1	R/W
170	170	Gfc10	HUMID_REG.Regulation_Mode	Enable automatic humidify/dehumidify selection	0	-	0	1	R/W
171	171	Gfc14	AI_Din_Minor_Alrm	Minor alarm	0	-	0	1	R/W
172	172	Gfc34	SCHEDULER.Set_Protection_En	Enable room temperature protection	-	-	0	1	R/W
173	173	Gfc35	HUMIDIFIER.En_Sup_LT_Lim_Ctrl	Enable minimum supply temperature limit with adiabatic humidifier	0	-	0	1	R/W
174	174		SCHEDULER.Summer_Winter_Auto_Fix	Set cool/heat selection, automatic or fixed days	0	-	0	1	R/W
175	175		AIR_QUALITY.Msk_Start_Cleaning	Start purge control with outside air	1	-	0	1	R/W
176	176		AIR_QUALITY.Msk_Stop_Cleaning	Stop purge control with outside air	-	-	0	1	R/W
177	177		Supply_VFD_1.Reset_VFD_Alarms	Reset supply VFD alarms	-	-	0	1	R/W
178	178		Return_VFD_1.Reset_VFD_Alarms	Reset return VFD alarms	-	-	0	1	R/W
179	179		BMS_Season	Cool/heat selection from BMS	-	-	0	1	R/W
180	180		Superv_OnOff	Enable supervision	1	-	0	1	R/W
181	181		Din_Fireman_Override	Fireman override	-	-	0	1	R
182	182		Din_SupplyDamper_Limit	Supply damper limit	-	-	0	1	R
183	183		Din_ReturnDamper_Limit	Return damper limit	-	-	0	1	R
184	184		Cooling_Antiblock	Min cool coil valve open during antiblock	-	-	0	1	R/W
185	185		PreHeating_Antiblock	Min preheat coil valve open during antiblock	0	-	0	1	R/W
186	186		CoolHeat_Antiblock	Min heat/cool coil valve open during antiblock.	0	-	0	1	R/W
187	187		PostHeating_Antiblock	Min reheat coil valve open during antiblock	0	-	0	1	R/W
188	188		AI_Serial_Prb_Offline_2_Db	AL S22 - Serial probe 2 offline	0	-	0	1	R
189	189		AI_Serial_Prb_Offline_3_Db	AL S32 - Serial probe 3 offline	-	-	0	1	R
190	190		AI_Serial_Prb_Offline_4_Db	AL S42 - Serial probe 4 offline	-	-	0	1	R
191	191		AI_Serial_Prb_Offline_5_Db	AL S52 - Serial probe 5 offline	-	-	0	1	R
192	192		AI_Serial_Prb_Offline_6_Db	AL S62 - Serial probe 6 offline	-	-	0	1	R
193	193		Msk_Fireman_Override	Fireman Override digital input	0	-	0	1	R
194	194		Msk_SupplyDamper_Limit	Supply damper limit switch digital input	0	-	0	1	R
195	195		Msk_ReturnDamper_Limit	Return damper limit switch digital input	0	-	0	1	R
196	196		OnOff_Exh_Damper	Exhaust damper status	0	-	0	1	R
197	197		OnOff_SupplyFan_Damper	Supply damper fan	0	-	0	1	R
198	198		OnOff_ReturnFan_Damper	Return damper fan	0	-	0	1	R
207	207		Reset_Alarm_BMS	Reset alarms from BMS	-	-	0	1	R/W
301	301		AIR_QUALITY.En_Cleaning	Enable purge for air quality	1	-	0	1	R/W
302	302		COOL_HEAT_COIL.PreH_Temp_Prb_Sel	Preheating probe	0	-	0	1	R/W
303	303		Cool_Pumps.En_Antiblock	Enable pump antiblock	1	-	0	1	R/W
304	304		DAMPERS.En_Air_Quality_Mng	Enable air quality management	0 ¦ 0 ¦1(*)	-	0	1	R/W
305	305		FANS.Air_Flow_Input_Type	Type of air flow input	0	-	0	1	R/W
306	306		FANS.Stop_Type	Type of stop (individual or global)	0	-	0	1	R/W
307	307		En_DEC	Enable direct evaporative cooling (DEC)	0	-	0	1	R/W
308	308		En_Humidifier	Enable humidifier	1	-	0	1	R/W
309	309		En_Recovery	Enable recovery	0 ¦ 1 ¦ 1(*)	-	0	1	R/W
310	310		Fans_Type_Sel	Select type of fans	1	-	0	1	R/W
311	311		En_Cool_Pump	Enable cooling pump	0 ¦ 0 ¦ 1(*)	-	0	1	R/W
312	312		En_Flow_Check	Enable check flow	1	-	0	1	R/W
313	313		En_PostH_Pump	Enable reheating pump	0	-	0	1	R/W
314	314		En_PreH_Pump	Enable preheating pump	1	-	0	1	R/W
315	315		En_Ain_Setp_Offset	Enable set point offset from analogue input	0	-	0	1	R/W
316	316		En_BMS_Probe_Din	Enable probe and digital input from supervisor	0	-	0	1	R/W
317	317		OnOff_Unit_Status.En_Dig_In_OnOff	Enable unit On/Off from digital input	1	-	0	1	R/W
318	318		OnOff_Unit_Status.En_Superv_OnOff	Enable unit On/Off from supervisor	0	-	0	1	R/W
319	319		PreHeat_Pumps.En_Antiblock	Enable preheating pump antiblock	1	-	0	1	R/W
320	320		PREHEATING.PreH_Temp_Prb_Sel	Preheating temperature	0	-	0	1	R/W
321	321	Ha14c	HUMID_REG.En_DEC_Contemp	DEC settings	0	-	0	1	R/W
322	322	Ha14a, Hc03a	Recovery.En_IEC	Enable IEC	0	-	0	1	R/W
323	323	Ha14a	Recovery.IEC_Regulation_Type	IEC: control	0	-	0	1	R/W
324	324	Ha14b	Recovery.En_Contemp_Dehum	IEC settings: dehumidification	0	-	0	1	R/W
325	325	Ha14b	Recovery.En_Contemp_Hum	IEC settings: humidification	0	-	0	1	R/W
326	326		Recovery.Defrost_Heater_En	Enable heat recovery unit frost protection heater	0	-	0	1	R/W
327	327		Recovery.Reg_Type	Type of heat recovery unit control	0	-	0	1	R/W
328	328		ReHeat_Pumps.En_Antiblock	Enable reheating pump antiblock	1	-	0	1	R/W
329	329		SCHEDULER.Set_By_Dig_Inp_En	Enable set point from digital input	0	-	0	1	R/W
401	401		Belimo_1.Address_Setting	Enable address of actuator number 1	-	-	0	1	R/W
402	402		Belimo_1.Man_Auto_Address	Address setting mode	-	-	0	1	R/W
403	403		Belimo_1.En_Ext_Input	Enable external input/probe	0	-	0	1	R/W
404	404		Belimo_2.Address_Setting	Enable address of actuator number 2	-	-	0	1	R/W
405	405		Belimo_2.Man_Auto_Address	Address setting mode	-	-	0	1	R/W
406	406		Belimo_2.En_Ext_Input	Enable external input/probe	0	-	0	1	R/W
407	407		Belimo_3.Address_Setting	Enable address of actuator number 3	-	-	0	1	R/W
408	408		Belimo_3.Man_Auto_Address	Address setting mode	-	-	0	1	R/W
409	409		Belimo_3.En_Ext_Input	Enable external input/probe	0	-	0	1	R/W
410	410		Belimo_4.Address_Setting	Enable address of actuator number 4	-	-	0	1	R/W
411	411		Belimo_4.Man_Auto_Address	Address setting mode	-	-	0	1	R/W
412	412		Belimo_4.En_Ext_Input	Enable external input/probe	0	-	0	1	R/W
413	413		Belimo_5.Address_Setting	Enable address of actuator number 5	-	-	0	1	R/W
414	414		Belimo_5.Man_Auto_Address	Address setting mode	-	-	0	1	R/W
415	415		Belimo_5.En_Ext_Input	Enable external input/probe	0	-	0	1	R/W
416	416		Belimo_6.Address_Setting	Enable address of actuator number 6	-	-	0	1	R/W
417	417		Belimo_6.Man_Auto_Address	Address setting mode	-	-	0	1	R/W
418	418		Belimo_6.En_Ext_Input	Enable external input/probe	0	-	0	1	R/W
419	419		Belimo_7.Address_Setting	Enable address of actuator number 7	-	-	0	1	R/W
420	420		Belimo_7.Man_Auto_Address	Address setting mode	-	-	0	1	R/W
421	421		Belimo_7.En_Ext_Input	Enable external input/probe	0	-	0	1	R/W
422	422		Belimo_8.Address_Setting	Enable address of actuator number 8	-	-	0	1	R/W
423	423		Belimo_8.Man_Auto_Address	Address setting mode	-	-	0	1	R/W
424	424		Belimo_8.En_Ext_Input	Enable external input/probe	0	-	0	1	R/W
601	601	Gfb09	Serial_Prb_1.Probe_Type	Select type of serial probe 1	0	-	0	1	R/W
602	602		Serial_Prb_1.Msk_Default	Default installation	0	-	0	1	R/W

Modbus ADDR	Carel ADDR.	Screen index	Commissioning Tool variable name	Description	Def.	UOM	Min	Max	R/W
603	603	Gfb10	Serial_Prb_2.Probe_Type	Select type of serial probe 2	0	-	0	1	R/W
604	604		Serial_Prb_2.Msk_Default	Default installation	-	-	0	1	R/W
605	605	Gfb11	Serial_Prb_3.Probe_Type	Select type of serial probe 3	0	-	0	1	R/W
606	606		Serial_Prb_3.Msk_Default	Default installation	-	-	0	1	R/W
607	607	Gfb12	Serial_Prb_4.Probe_Type	Select type of serial probe 4	0	-	0	1	R/W
608	608		Serial_Prb_4.Msk_Default	Default installation	-	-	0	1	R/W
609	609	Gfb13	Serial_Prb_5.Probe_Type	Select type of serial probe 5	0	-	0	1	R/W
610	610		Serial_Prb_5.Msk_Default	Default installation	-	-	0	1	R/W
611	611	Gfb14	Serial_Prb_6.Probe_Type	Select type of serial probe 6	0	-	0	1	R/W
612	612		Serial_Prb_6.Msk_Default	Default installation	-	-	0	1	R/W
651	651		En_VFD	Enable VFD	0	-	0	1	R/W
652	652		Return_VFD_1.Msk_VFD_Default	Return VFD1 default installation	-	-	0	1	R/W
653	653		Return_VFD_1.CounterClockwise	Type of rotation	0	-	0	1	R/W
654	654		Supply_VFD_1.Msk_VFD_Default	Supply VFD1 default installation	-	-	0	1	R/W
655	655		Supply_VFD_1.CounterClockwise	Type of rotation	0	-	0	1	R/W
701	701		COOL_HEAT_COIL.En_Inlet_Temp_Mng	Enable heating/cooling coil temperature limit	0	-	0	1	R/W
702	702		COOLING.En_Inlet_Temp_Mng	Enable cooling coil water temperature control	0	-	0	1	R/W
703	703	Hc03a	DAMPERS.MixDamper_UnitOff	Mixing damper with unit off: open/closed	0	-	0	1	R/W
704	704		Buzzer_Disable	Disable buzzer	-	-	0	1	R/W
705	705		En_Clock_Board	Enable clock card	0	-	0	1	R/W
706	706		PREHEATING.En_Inlet_Temp_Mng	Enable preheat coil temperature threshold	0	-	0	1	R/W
707	707		REHEATING.En_Inlet_Temp_Mng	Enable reheat coil temperature threshold	0	-	0	1	R/W

(*) Default diversi per Small, Medium, Large.

Analogue variables

Modbus ADDR	Carel ADDR.	Screen index	Commissioning Tool variable name	Description	Def.	UOM	Min	Max	R/W
1	1		Bms_Ain_1	Analogue input 1 from supervisor	-	-	-99.9	99.9	R/W
2	2		Bms_Ain_2	Analogue input 2 from supervisor	-	-	-99.9	99.9	R/W
3	3		Bms_Ain_3	Analogue input 3 from supervisor	-	-	-99.9	99.9	R/W
4	4		Bms_Ain_4	Analogue input 4 from supervisor	-	-	-99.9	99.9	R/W
5	5		unused_Dont_Delete_5	Reserved					
6	6		unused_Dont_Delete_6	Reserved					
7	7		unused_Dont_Delete_7	Reserved					
8	8		unused_Dont_Delete_8	Reserved					
9	9		unused_Dont_Delete_9	Reserved					
10	10	Gfb01	Supply_Temp	Supply temperature	-	°C	-99.9	99.9	R
11	11	Gfb01	Return_Temp	Return temperature	-	°C	-99.9	99.9	R
12	12	Gfb07	Room_Temp	Room temperature	-	°C	-99.9	99.9	R
13	13		Supply_Humid	Supply humidity	-	%rH	0	99.9	R
14	14		Return_Humid	Return humidity	-	%rH	0	99.9	R
15	15		Room_Humid	Room humidity	-	%rH	0	99.9	R
16	16	Gfb02	External_Temp	Outside temperature	-	°C	-99.9	3276.7	R
17	17		External_Humid	Outside humidity	-	%rH	0	99.9	R
18	18	Gfb05	Freeze_Temp	Frost protection temperature	-	°C	-99.9	99.9	R
19	19	Gfb05	Saturation_Temp	Saturation temperature (downstream of coils)	-	°C	-99.9	99.9	R
20	20	Gfb05	Exhaust_Temp	Exhaust temperature	-	°C	-99.9	99.9	R
21	21		Air_Quality_VOC	VOC quality air	-	%	0	100	R
22	22	Gfb06	Cool_Coil_Temp	Cooling - heating/cooling coil water temperature	-	°C	-99.9	99.9	R
23	23	Gfb06	PreHeat_Coil_Temp	Preheating coil water temperature	-	°C	-99.9	99.9	R
24	24	Gfb06	PostHeat_Coil_Temp	Reheating coil water temperature	-	°C	-99.9	99.9	R
25	25		Temp_Setp_Offset	Set point offset	-	°C	-99.9	99.9	R
26	26	Gfb08	Auxiliary_1	Auxiliary loop 1 analog input	-	-	-3200	3200	R
27	27	Gfb08	Auxiliary_2	Auxiliary loop 2 analog input	-	-	-3200	3200	R
28	28	Gfb08	Auxiliary_3	Auxiliary loop 3 analog input	-	-	-3200	3200	R
29	29	Gfb08	Auxiliary_4	Auxiliary loop 4 analog input	-	-	-3200	3200	R
30	30		Supply_Enth	Supply enthalpy	-	kJ/kg	0	999.9	R
31	31		Return_Enth	Return enthalpy	-	kJ/kg	0	999.9	R
32	32		Room_Enth	Room enthalpy	-	kJ/kg	0	999.9	R
33	33		External_Enth	Outside air enthalpy	-	kJ/kg	0	999.9	R
34	34		Setp_Enth	Enthalpy set point	-	kJ/kg	0	999.9	R
35	35		Mod_Supply_Fan	Supply fan modulating output	-	%	0	100	R
36	36		Mod_Return_Fan	Return fan modulating output	-	%	0	100	R
37	37		Mod_Exhaust_Damper	Exhaust damper modulating output	-	%	0	100	R
38	38		Mod_External_Damper	Outside damper modulating output	-	%	0	100	R
39	39		Mod_ByPass_Damper	Bypass damper modulating output	-	%	0	100	R
40	40		Mod_Mixing_Damper	Mixing damper modulating output	-	%	0	100	R
41	41		Mod_Humidifier	Humidifier modulating output	-	%	0	100	R
42	42		Mod_PostH_Heater_Inv	Reheating heater modulating output	-	%	0	999.9	R
43	43		Mod_PreH_Heater_Inv	Preheating heater modulating output	-	%	0	999.9	R
44	44		Mod_Rotary_Recovery	Heat wheel modulating output	-	%	0	100	R
45	45		Mod_Valve_cool	Cooling–heating/cooling valve modulating output	-	%	0	100	R
46	46		Mod_Valve_PostHeat	Reheat valve modulating output	-	%	0	100	R
47	47		Mod_Valve_PreHeat	Preheat valve modulating output	-	%	0	100	R
48	48		Mod_Auxiliary_1	Modulating output auxiliary loop 1	-	%	0	100	R
49	49		Mod_Auxiliary_2	Modulating output auxiliary loop 2	-	%	0	100	R
50	50		Mod_Auxiliary_3	Modulating output auxiliary loop 3	-	%	0	100	R
51	51		Mod_Auxiliary_4	Modulating output auxiliary loop 4	-	%	0	100	R
52	52		VFDs_Status	Supply and return VFD status	-	-	-3276.8	-3276.7	R
53	53		Supply_VFD_1.Speed_Require	Supply VFD speed request (Hz)	-	-	0	100	R
54	54		Supply_VFD_1.Voltage	Supply VFD voltage (V)	-	V	-999.9	-999.9	R
55	55		Supply_VFD_1.Current	Supply VFD current (A)	-	-	-99.9	99.9	R
56	56		Supply_VFD_1.Torque	Supply VFD torque (Nm)	-	%	-999.9	999.9	R
57	57		Supply_VFD_1.Power	Supply VFD power (Watt)	-	%	-999.9	999.9	R
58	58		Supply_Speed_Hz	Supply VFD speed (Hz)	-	Hz	-99.9	99.9	R
59	59		Return_VFD_1.Speed_Require	Return VFD speed request (Hz)	-	-	0	100	R/W
60	60		Return_VFD_1.Voltage	Return VFD voltage (V)	-	V	-999.9	-999.9	R
61	61		Return_VFD_1.Current	Return VFD current (A)	-	-	-99.9	99.9	R

Modbus ADDR	Carel ADDR.	Screen index	Commissioning Tool variable name	Description	Def.	UOM	Min	Max	R/W
62	62		Return_VFD_1.Torque	Return VFD torque (Nm)	-	%	-999.9	999.9	R
63	63		Return_VFD_1.Power	Return VFD power (Watt)	-	%	-999.9	999.9	R
64	64		Return_Speed_Hz	Return VFD speed (Hz)	-	Hz	-99.9	99.9	R
65	65		Aout_Belimo_1	Belimo 1 request	-	%	0	100	R
66	66		Act_Belimo_Position_1	Belimo 1 position feedback	-	%	0	100	R
67	67		Aout_Belimo_2	Belimo 2 request	-	%	0	100	R
68	68		Act_Belimo_Position_2	Belimo 2 position feedback	-	%	0	100	R
69	69		Aout_Belimo_3	Belimo 3 request	-	%	0	100	R
70	70		Act_Belimo_Position_3	Belimo 3 position feedback	-	%	0	100	R
71	71		Aout_Belimo_4	Belimo 4 request	-	%	0	100	R
72	72		Act_Belimo_Position_4	Belimo 4 position feedback	-	%	0	100	R
73	73		Aout_Belimo_5	Belimo 5 request	-	%	0	100	R
74	74		Act_Belimo_Position_5	Belimo 5 position feedback	-	%	0	100	R
75	75		Aout_Belimo_6	Belimo 6 request	-	%	0	100	R
76	76		Act_Belimo_Position_6	Belimo 6 position feedback	-	%	0	100	R
77	77		Aout_Belimo_7	Belimo 7 request	-	%	0	100	R
78	78		Act_Belimo_Position_7	Belimo 7 position feedback	-	%	0	100	R
79	79		Aout_Belimo_8	Belimo 8 request	-	%	0	100	R
80	80		Act_Belimo_Position_8	Belimo 8 position feedback	-	%	0	100	R
81	81		Serial_Temp_1	Serial probe 1 temperature	-	°C	-99.9	99.9	R
82	82		Serial_Humid_1	Serial probe 1 humidity	-	%rH	0	99.9	R
83	83		Serial_Temp_2	Serial probe 2 temperature	-	°C	-99.9	99.9	R
84	84		Serial_Humid_2	Serial probe 2 humidity	-	%rH	0	99.9	R
85	85		Serial_Temp_3	Serial probe 3 temperature	-	°C	-99.9	99.9	R
86	86		Serial_Humid_3	Serial probe 3 humidity	-	%rH	0	99.9	R
87	87		Serial_Temp_4	Serial probe 4 temperature	-	°C	-99.9	99.9	R
88	88		Serial_Humid_4	Serial probe 4 humidity	-	%rH	0	99.9	R
89	89		Serial_Temp_5	Serial probe 5 temperature	-	°C	-99.9	99.9	R
90	90		Serial_Humid_5	Serial probe 5 humidity	-	%rH	0	99.9	R
91	91		Serial_Temp_6	Serial probe 6 temperature	-	°C	-99.9	99.9	R
92	92		Serial_Humid_6	Serial probe 6 humidity	-	%rH	0	99.9	R
93	93		Set_Temperature	Actual temperature set point	-	°C	-99.9	99.9	R
94	94		SCHEDULER.Set_Temp_Comf_S	Comfort temperature set point (summer)	23	°C	-99.9	99.9	R/W
95	95		SCHEDULER.Set_Temp_Comf_W	Comfort temperature set point (winter)	23	°C	-99.9	99.9	R/W
96	96		SCHEDULER.Set_Temp_PreComf_S	Pre-comfort temperature set point (summer)	25	°C	-99.9	99.9	R/W
97	97		SCHEDULER.Set_Temp_PreComf_W	Pre-comfort temperature set point (winter)	21	°C	-99.9	99.9	R/W
98	98		SCHEDULER.Set_Temp_Econ_S	Economy temperature set point (summer)	27	°C	-99.9	99.9	R/W
99	99		SCHEDULER.Set_Temp_Econ_W	Economy temperature set point (winter)	19	°C	-99.9	99.9	R/W
100	100		AI_Probe_Status_1	Probe 1 alarm status (bitfield)	-	-	-3276.8	3276.7	R
101	101		AI_Probe_Status_2	Probe 2 alarm status (bitfield)	-	-	-3276.8	3276.7	R
102	102		AI_Belimo_Prb_FS	Belimo probe and Fire/Smoke alarm status (bitfield)	-	-	-3276.8	3276.7	R
103	103		AI_Working_Hours_1	Operating hour threshold for maintenance request (X1000)	-	-	-3276.8	3276.7	R
104	104		AI_Working_Hours_2	Operating hour threshold for maintenance request	-	-	-3276.8	3276.7	R
105	105		AI_Serial_Prb	Serial probe alarm status (bitfield)	-	-	-3276.8	3276.7	R
106	106	Gfc02	SCHEDULER.Set_T_Lim_Low_S	Minimum temperature set point limit (summer)	15	°C	-99.9	99.9	R/W
107	107	Gfc02	SCHEDULER.Set_T_Lim_Hi_S	Maximum temperature set point limit (summer)	35	°C	-99.9	99.9	R/W
108	108	Gfc02	SCHEDULER.Set_T_Lim_Low_W	Minimum temperature set point limit (winter)	15	°C	-99.9	99.9	R/W
109	109	Gfc02	SCHEDULER.Set_T_Lim_Hi_W	Maximum temperature set point limit (winter)	35	°C	-99.9	99.9	R/W
110	110	Gfc05	TEMP_REG.Diff_Reg_Cool	Differential in cooling	3	°C	0	99.9	R/W
111	111	Gfc05	TEMP_REG.NZ_Reg_Cool	Neutral zone in cooling	1	°C	0	99.9	R/W
112	112	Gfc06	TEMP_REG.Diff_Reg_Heat	Differential in heating	2	°C	0	99.9	R/W
113	113	Gfc06	TEMP_REG.NZ_Reg_Heat	Neutral zone in heating	1	°C	0	99.9	R/W
114	114	Gfc07	TEMP_REG.Setp_Sum_L_Lim	Min. supply temperature limit (summer)	10	°C	-99.9	99.9	R/W
115	115	Gfc07	TEMP_REG.Setp_Win_L_Lim	Minimum supply temperature limit (winter)	10	°C	-99.9	99.9	R/W
116	116	Gfc07	TEMP_REG.Setp_Sum_H_Lim	Maximum supply temperature limit (summer)	40	°C	-99.9	99.9	R/W
117	117	Gfc07	TEMP_REG.Setp_Win_H_Lim	Maximum supply temperature limit (winter)	40	°C	-99.9	99.9	R/W
118	118	Gfc07	TEMP_REG.Diff_Lim	Differential for supply limit	3	°C	0	99.9	R/W
119	119	Gfc08	Start_Ext_Temp_Sum	Starting point for compensation in summer	25	°C	-99.9	99.9	R/W
120	120	Gfc08	End_Ext_Temp_Sum	End point for compensation in summer	32	°C	-99.9	99.9	R/W
121	121	Gfc08	Max_Comp_Temp_Sum	Maximum compensation in summer	2	°C	-99.9	99.9	R/W
122	122	Gfc09	Start_Ext_Temp_Win	Starting point for compensation in winter	0	°C	-99.9	99.9	R/W
123	123	Gfc09	End_Ext_Temp_Win	End point for compensation in winter	0	°C	-99.9	99.9	R/W
124	124	Gfc09	Max_Comp_Temp_Win	Maximum compensation in winter	0	°C	-99.9	99.9	R/W
125	125	Gfc15	DAMPERS.Delta_Temp	Activation differential	0	°C	0	99.9	R/W
126	126	Gfc15	DAMPERS.Diff_Enth	Dampers enthalpy differential	0	kJ/kg	0	99.9	R/W
127	127	Gfc17	FANS.Supply_Min_Speed	Minimum supply inverter speed	30	%	0	100	R/W
128	128	Gfc17	FANS.Supply_Max_Speed	Maximum supply inverter speed	100	%	0	100	R/W
129	129	Gfc17	FANS.Return_Min_Speed	Minimum return inverter speed	30	%	0	100	R/W
130	130	Gfc17	FANS.Return_Max_Speed	Maximum return Inverter speed	100	%	0	100	R/W
131	131	Gfc25	PREHEATING.Setp_PreH_Temp	Preheating coil set point	20	°C	-99.9	99.9	R/W
132	132	Gfc25	PREHEATING.Diff_PreH_Temp	Preheating coil differential	2	°C	0	99.9	R/W
133	133	Gfc27	COOL_HEAT_COIL.Setp_PreH_Temp	Cooling coil set point	20	°C	-99.9	99.9	R/W
134	134	Gfc27	COOL_HEAT_COIL.Diff_PreH_Temp	Cooling coil differential	2	°C	0	99.9	R/W
135	135	Gfc28	Serial_Temp_1_Db	Serial probe 1 temperature	-	°C	-99.9	99.9	R/W
136	136	Gfc28	Serial_Temp_2_Db	Serial probe 2 temperature	-	°C	-99.9	99.9	R/W
137	137	Gfc31	Recovery.Delta_Act_Recovery	Heat recovery activation T differential	5	°C	0	99.9	R/W
138	138	Gfc31	Recovery.Diff_Act_Recovery	Heat recovery control T differential	3	°C	0	99.9	R/W
139	139	Gfc31	Recovery.Diff_Enth	Heat recovery control enthalpy differential	5	kJ/kg	0	99.9	R/W
140	140	Gfc32	Recovery.Defrost_Setp	Heat recovery defrost T threshold	-1	°C	-99.9	10	R/W
141	141	Gfc32	Recovery.Defrost_Diff	Heat recovery defrost T differential	4	°C	0	99.9	R/W
142	142	Gfc32	Recovery.Defrost_Heater_Offset	Heat recovery defrost heater offset	3	°C	0	99.9	R/W
143	143	Gfc33	FROST.Setp_Freeze_Temp	Frost protection T threshold	5	°C	0	99.9	R/W
144	144	Gfc33	FROST.Diff_Freeze_Temp	Frost protection T differential	3	°C	0	99.9	R/W
145	145	Gfc34	SCHEDULER.Set_Protection	Room temperature protection threshold	5	°C	-99.9	99.9	R/W
146	146	Gfc35	HUMIDIFIER.Limit_Setp_Low_Temp	Minimum supply temperature limit during adiabatic humidification	15	°C	0	99.9	R/W
147	147	Gfc35	HUMIDIFIER.Limit_Diff_Low_Temp	Minimum limit differential during adiabatic humidification	2	°C	0	99.9	R/W
148	148	Gfc36	Reg_Loop_1.Gen_Setpoint	Generic loop 1 set point	0	-	-3200	3200	R/W
149	149	Gfc36	Reg_Loop_1.Gen_Differential	Generic loop 1 differential	0	-	-3200	3200	R/W
150	150	Gfc37	Reg_Loop_2.Gen_Setpoint	Generic loop 2 set point	0	-	-3200	3200	R/W
151	151	Gfc37	Reg_Loop_2.Gen_Differential	Generic loop 2 differential	0	-	-3200	3200	R/W
152	152	Gfc38	Reg_Loop_3.Gen_Setpoint	Generic loop 3 set point	0	-	-3200	3200	R/W

Modbus ADDR	Carel ADDR.	Screen index	Commissioning Tool variable name	Description	Def.	UOM	Min	Max	R/W
153	153	Gfc38	Reg_Loop_3.Gen_Differential	Generic loop 3 differential	0	-	-3200	3200	R/W
154	154	Gfc39	Reg_Loop_4.Gen_Setpoint	Generic loop 4 set point	0	-	-3200	3200	R/W
155	155	Gfc39	Reg_Loop_4.Gen_Differential	Generic loop 4 differential	0	-	-3200	3200	R/W
156	156		SCHEDULER.S_Thr_Temp_Auto	Temp. threshold for automatic setting in summer mode	25	°C	-99.9	99.9	R/W
157	157		SCHEDULER.W_Thr_Temp_Auto	Temp. threshold for automatic setting in winter mode	10	°C	-99.9	99.9	R/W
158	158		Active_Devices	Device status (Bitfield)	-	-	-3276.8	3276.7	R
159	159		Devices_Cfg_1	Device configuration 1 (Bitfield)	-	-	-3276.8	3276.7	R
160	160		Devices_Cfg_2	Device configuration 2 (Bitfield)	-	-	-3276.8	3276.7	R
161	161	Gfb23	AfterRecovery_Probe	Probe after heat recovery unit	-	%RH	-100	100	R
162	162	Gfc15	DAMPERS.Enthalpy_Diff_ON	Enthalpy activation differential	4	KJ/Kg	0	99.9	R/W
163	163		Recovery.IEC_RecoveryDelta	Delta at 100%	0	°C	0	20	R/W
164	164		Recovery.IEConly_Delta	IEC only	0	°C	0	20	R/W
165	165		Recovery.IEC_DeltaMax	Heat recovery unit +IEC	0	°C	0	15	R/W
166	166		Recovery.IEC_Off_Thr	IEC diff.	0	°C	0	20	R/W
167	167		Serial_Temp_3_Db	Serial temperature probe 3	-	°C	-99.9	-99.9	R
168	168		Serial_Temp_4_Db	Serial temperature probe 4	-	°C	-99.9	-99.9	R
169	169		Serial_Temp_5_Db	Serial temperature probe 5	-	°C	-99.9	-99.9	R
170	170		Serial_Temp_6_Db	Serial temperature probe 6	-	°C	-99.9	-99.9	R
171	171		FC_FH_Temp	Free cooling/free heating temperature calculation	-	°C	-99.9	-99.9	R
401	401		Belimo_1.Limit_Device_Max	Maximum air flow limit Belimo 1	-	%	0	100	R/W
402	402		Belimo_1.Limit_Device_Min	Minimum air flow limit Belimo 1	-	%	0	100	R/W
403	403		Belimo_1.Limit_Prb_Max	Maximum probe limit Belimo 1	0	-	-999.9	999.9	R/W
404	404		Belimo_1.Limit_Prb_Min	Minimum probe limit Belimo 1	0	-	-999.9	999.9	R/W
405	405		Belimo_2.Limit_Device_Max	Maximum air flow limit Belimo 2	-	%	0	100	R/W
406	406		Belimo_2.Limit_Device_Min	Minimum air flow limit Belimo 2	-	%	0	100	R/W
407	407		Belimo_2.Limit_Prb_Max	Maximum probe limit Belimo 2	0	-	-999.9	999.9	R/W
408	408		Belimo_2.Limit_Prb_Min	Minimum probe limit Belimo 2	0	-	-999.9	999.9	R/W
409	409		Belimo_3.Limit_Device_Max	Maximum air flow limit Belimo 3	-	%	0	100	R/W
410	410		Belimo_3.Limit_Device_Min	Minimum air flow limit Belimo 3	-	%	0	100	R/W
411	411		Belimo_3.Limit_Prb_Max	Maximum probe limit Belimo 3	0	-	-999.9	999.9	R/W
412	412		Belimo_3.Limit_Prb_Min	Minimum probe limit Belimo 3	0	-	-999.9	999.9	R/W
413	413		Belimo_4.Limit_Device_Max	Maximum air flow limit Belimo 4	-	%	0	100	R/W
414	414		Belimo_4.Limit_Device_Min	Minimum air flow limit Belimo 4	-	%	0	100	R/W
415	415		Belimo_4.Limit_Prb_Max	Maximum probe limit Belimo 4	0	-	-999.9	999.9	R/W
416	416		Belimo_4.Limit_Prb_Min	Minimum probe limit Belimo 4	0	-	-999.9	999.9	R/W
417	417		Belimo_5.Limit_Device_Max	Maximum air flow limit Belimo 5	-	%	0	100	R/W
418	418		Belimo_5.Limit_Device_Min	Minimum air flow limit Belimo 5	-	%	0	100	R/W
419	419		Belimo_5.Limit_Prb_Max	Maximum probe limit Belimo 5	0	-	-999.9	999.9	R/W
420	420		Belimo_5.Limit_Prb_Min	Minimum probe limit Belimo 5	0	-	-999.9	999.9	R/W
421	421		Belimo_6.Limit_Device_Max	Maximum air flow limit Belimo 6	-	%	0	100	R/W
422	422		Belimo_6.Limit_Device_Min	Minimum air flow limit Belimo 6	-	%	0	100	R/W
423	423		Belimo_6.Limit_Prb_Max	Maximum probe limit Belimo 6	0	-	-999.9	999.9	R/W
424	424		Belimo_6.Limit_Prb_Min	Minimum probe limit Belimo 6	0	-	-999.9	999.9	R/W
425	425		Belimo_7.Limit_Device_Max	Maximum air flow limit Belimo 7	-	%	0	100	R/W
426	426		Belimo_7.Limit_Device_Min	Minimum air flow limit Belimo 7	-	%	0	100	R/W
427	427		Belimo_7.Limit_Prb_Max	Maximum probe limit Belimo 7	0	-	-999.9	999.9	R/W
428	428		Belimo_7.Limit_Prb_Min	Minimum probe limit Belimo 7	0	-	-999.9	999.9	R/W
429	429		Belimo_8.Limit_Device_Max	Maximum air flow limit Belimo 8	-	%	0	100	R/W
430	430		Belimo_8.Limit_Device_Min	Minimum air flow limit Belimo 8	-	%	0	100	R/W
431	431		Belimo_8.Limit_Prb_Max	Maximum probe limit Belimo 8	0	-	-999.9	999.9	R/W
432	432		Belimo_8.Limit_Prb_Min	Minimum probe limit Belimo 8	0	-	-999.9	999.9	R/W
501	501		Return_VFD_1.Nominal_Frequency	Return VFD frequency: Hz	-	Hz	30	320	R/W
502	502		Return_VFD_1.Nominal_Current	Return VFD rated current	-	A	-999.9	999.9	R/W
503	503		Return_VFD_1.Current_Limit	Return VFD current limit	-	A	0	999.9	R/W
504	504		Supply_VFD_1.Nominal_Frequency	Supply VFD frequency: Hz	-	Hz	30	320	R/W
505	505		Supply_VFD_1.Nominal_Current	Supply VFD rated current	-	A	-999.9	999.9	R/W
506	506		Supply_VFD_1.Current_Limit	Supply VFD current limit	-	A	0	999.9	R/W
551	551		COOL_HEAT_COIL.Setp_Heat_Inlet_Temp	Heat/cool coil heating set point	25	°C	0	99.9	R/W
552	552		COOL_HEAT_COIL.Setp_Cool_Inlet_Temp	Heat/cool coil cooling set point	35	°C	0	99.9	R/W
553	553		COOL_HEAT_COIL.Diff_Inlet_Temp	Heat/cool coil differential	2	°C	0	9.9	R/W
554	554		COOLING.Setp_Inlet_Temp	Cooling water temperature set point	25	°C	0	99.9	R/W
555	555		COOLING.Diff_Inlet_Temp	Cooling water temperature differential	2	°C	0	9.9	R/W
556	556		DAMPERS.Min_Ext_Damper	Minimum outside damper opening	0	%	0	100	R/W
557	557		DAMPERS.Max_Ext_Damper	Maximum outside damper opening	100	%	0	100	R/W
558	558		DAMPERS.Min_Mix_Damper	Minimum mixing damper opening	0	%	0	100	R/W
559	559		DAMPERS.Max_Mix_Damper	Maximum mixing damper opening	100	%	0	100	R/W
560	560		PREHEATING.Setp_Inlet_Temp	Preheating water temperature threshold	25	°C	-99.9	-99.9	R/W
561	561		PREHEATING.Diff_Inlet_Temp	Preheating water temperature differential	2	°C	0	9.9	R/W
562	562		REHEATING.Setp_Inlet_Temp	Reheating water temperature threshold	25	°C	-99.9	-99.9	R/W
563	563		REHEATING.Diff_Inlet_Temp	Reheating water temperature differential	2	°C	0	9.9	R/W
564	564		Return_VFD_1.Out_V_at_0_Hz	Return VFD: volts at 0 Hz	-	%	0	40	R/W
565	565		Return_VFD_1.Switch_Khz	Switching frequency	-	-	0	99.9	R/W
566	566		Return_VFD_1.Curve_Midpoint_V	V/f curve central voltage	-	%	0	100	R/W
567	567		Return_VFD_1.Curve_Midpoint_F	V/f curve central frequency	-	%	0	320	R/W
568	568		Return_VFD_1.Min_Frequency	Return VFD: minimum frequency	-	Hz	0	320	R/W
569	569		Return_VFD_1.Max_Frequency	Return VFD: maximum frequency	-	Hz	0	320	R/W
570	570		Return_VFD_1.Acceler_Time	Acceleration time	-	s	0.01	3000	R/W
571	571		Return_VFD_1.Deceler_Time	Deceleration time	-	s	0.01	3000	R/W
572	572		Supply_VFD_1.Out_V_at_0_Hz	Supply VFD: volts at 0 Hz	-	%	0	40	R/W
573	573		Supply_VFD_1.Switch_Khz	Switching frequency	-	-	0	99.9	R/W
574	574		Supply_VFD_1.Curve_Midpoint_V	V/f curve central voltage	-	%	0	100	R/W
575	575		Supply_VFD_1.Curve_Midpoint_F	V/f curve central frequency	-	%	0	320	R/W
576	576		Supply_VFD_1.Min_Frequency	Supply VFD: minimum frequency	-	Hz	0	320	R/W
577	577		Supply_VFD_1.Max_Frequency	Supply VFD: maximum frequency	-	Hz	0	320	R/W
578	578		Supply_VFD_1.Acceler_Time	Acceleration time	-	s	0.01	3000	R/W
579	579		Supply_VFD_1.Deceler_Time	Deceleration time	-	s	0.01	3000	R/W

Integer variables

Note: Modbus address for BMS1: CAREL address + 208;
Modbus address for BMS2: CAREL address + 5001.

Modbus ADDR	Carel ADDR.	Screen index	Commissioning Tool variable name	Description	Def.	UOM	Min	Max	R/W
209	1	Gfb03	Supply_Press	Supply air pressure differential	-	Pa	-9999	9999	R
210	2	Gfb03	Return_Press	Return air pressure differential	-	Pa	-9999	9999	R
211	3	Gfb04	Air_Quality_CO2	Air quality in ppm of CO2	-	ppm	0	9999	R
212	4		Supply_VFD_1.Temp_Dissip	Supply VFD heat sink temperature	-	°C	-999	999	R
213	5		Supply_VFD_1.DC_Voltage	Supply inverter DC voltage	-	V	0	9999	R
214	6		Supply_Speed_rpm	Supply inverter speed (rpm)	-	rpm	-9999	9999	R
215	7		Return_VFD_1.Temp_Dissip	Return VFD heat sink temperature	-	°C	-999	999	R
216	8		Return_VFD_1.DC_Voltage	Return inverter DC voltage	-	V	0	9999	R
217	9		Return_Speed_rpm	Return inverter speed (rpm)	-	rpm	-9999	9999	R
218	10		BMS_Sw_Ver	Software version	-	-	0	32767	R
219	11		BMS_Sw_Date	Software date	-	-	0	32767	R
220	12		SCHEDULER.OnOff_Status	Scheduler ON-OFF status	0	-	0	4	R/W
221	13		Set_Humidity	Current humidity set point	-	%rH	0	100	R
222	14		SCHEDULER.Set_Humid_Comf_S	Comfort humidity set point (summer)	50	%rH	0	100	R/W
223	15		SCHEDULER.Set_Humid_Comf_W	Comfort humidity set point (winter)	50	%rH	0	100	R/W
224	16		SCHEDULER.Set_Humid_PreComf_S	Pre-comfort humidity set point (summer)	55	%rH	0	100	R/W
225	17		SCHEDULER.Set_Humid_PreComf_W	Pre-comfort humidity set point (winter)	45	%rH	0	100	R/W
226	18		SCHEDULER.Set_Humid_Econ_S	Economy humidity set point (summer)	60	%rH	0	100	R/W
227	19		SCHEDULER.Set_Humid_Econ_W	Economy humidity set point (winter)	40	%rH	0	100	R/W
228	20		pCO_Hour	Hour from clock on pCO	-	h	0	23	R/W
229	21		pCO_Minute	Minutes from clock on pCO	-	min	0	59	R/W
230	22		pCO_Day	Day from clock on pCO	-	day	1	31	R/W
231	23		pCO_Month	Month from clock on pCO	-	month	1	12	R/W
232	24		pCO_Year	Year from clock on pCO	-	anno	0	99	R/W
233	25		SCHEDULER.Day_Scheduler_Setting	Select day from Scheduler	-	day	0	6	R/W
234	26		SCHEDULER.F1_Start_Hour	Start hours band F1	-	Hour	0	24	R/W
235	27		SCHEDULER.F1_Start_Minute	Start minutes band F1	-	min	0	59	R/W
236	28		SCHEDULER.F1_Set_Type	Type of set point band F1	-	-	0	3	R/W
237	29		SCHEDULER.F2_Start_Hour	Start hours band F2	-	Hour	0	24	R/W
238	30		SCHEDULER.F2_Start_Minute	Start minutes band F2	-	min	0	59	R/W
239	31		SCHEDULER.F2_Set_Type	Type of set point band F2	-	-	0	3	R/W
240	32		SCHEDULER.F3_Start_Hour	Start hours band F3	-	Hour	0	24	R/W
241	33		SCHEDULER.F3_Start_Minute	Start minutes band F3	-	min	0	59	R/W
242	34		SCHEDULER.F3_Set_Type	Type of set point band F3	-	-	0	3	R/W
243	35		SCHEDULER.F4_Start_Hour	Start hours band F4	-	Hour	0	24	R/W
244	36		SCHEDULER.F4_Start_Minute	Start minutes band F4	-	min	0	59	R/W
245	37		SCHEDULER.F4_Set_Type	Type of set point band F4	-	-	0	3	R/W
246	38		SCHEDULER.P1_Start_Day	Start day period 1	0	day	0	31	R/W
247	39		SCHEDULER.P1_Start_Month	Start month period 1	0	month	0	12	R/W
248	40		SCHEDULER.P1_Stop_Day	End day period 1	0	day	0	31	R/W
249	41		SCHEDULER.P1_Stop_Month	End month period 1	0	month	0	12	R/W
250	42		SCHEDULER.P1_Set_Type	Type of set point period 1	0	-	0	4	R/W
251	43		SCHEDULER.P2_Start_Day	Start day period 2	0	day	0	31	R/W
252	44		SCHEDULER.P2_Start_Month	Start month period 2	0	month	0	12	R/W
253	45		SCHEDULER.P2_Stop_Day	End day period 2	0	day	0	31	R/W
254	46		SCHEDULER.P2_Stop_Month	End month period 2	0	month	0	12	R/W
255	47		SCHEDULER.P2_Set_Type	Type of set point period 2	0	-	0	4	R/W
256	48		SCHEDULER.P3_Start_Day	Start day period 3	0	day	0	31	R/W
257	49		SCHEDULER.P3_Start_Month	Start month period 3	0	month	0	12	R/W
258	50		SCHEDULER.P3_Stop_Day	End day period 3	0	day	0	31	R/W
259	51		SCHEDULER.P3_Stop_Month	End month period 3	0	month	0	12	R/W
260	52		SCHEDULER.P3_Set_Type	Type of set point period 3	0	-	0	4	R/W
261	53		SCHEDULER.SD1_Day	Day for special day 1	0	day	0	31	R/W
262	54		SCHEDULER.SD1_Month	Month for special day 1	0	month	0	12	R/W
263	55		SCHEDULER.SD1_Set_Type	Type of set point special day 1	0	-	0	5	R/W
264	56		SCHEDULER.SD2_Day	Day for special day 2	0	day	0	31	R/W
265	57		SCHEDULER.SD2_Month	Month for special day 2	0	month	0	12	R/W
266	58		SCHEDULER.SD2_Set_Type	Type of set point special day 2	5	-	0	5	R/W
267	59		SCHEDULER.SD3_Day	Day for special day 3	0	day	0	31	R/W
268	60		SCHEDULER.SD3_Month	Month for special day 3	0	month	0	12	R/W
269	61		SCHEDULER.SD3_Set_Type	Type of set point special day 3	0	-	0	5	R/W
270	62		SCHEDULER.SD4_Day	Day for special day 4	0	day	0	31	R/W
271	63		SCHEDULER.SD4_Month	Month for special day 4	0	month	0	12	R/W
272	64		SCHEDULER.SD4_Set_Type	Type of set point special day 4	0	-	0	5	R/W
273	65		SCHEDULER.SD5_Day	Day for special day 5	0	day	0	31	R/W
274	66		SCHEDULER.SD5_Month	Month for special day 5	0	month	0	12	R/W
275	67		SCHEDULER.SD5_Set_Type	Type of set point special day 5	0	-	0	5	R/W
276	68		SCHEDULER.SD6_Day	Day for special day 6	0	day	0	31	R/W
277	69		SCHEDULER.SD6_Month	Month for special day 6	0	month	0	12	R/W
278	70		SCHEDULER.SD6_Set_Type	Type of set point special day 6	0	-	0	5	R/W
279	71	Gfc03	SCHEDULER.Set_H_Lim_Low_S	Minimum humidity set point limit (summer)	30	%rH	0	100	R/W
280	72	Gfc03	SCHEDULER.Set_H_Lim_Hi_S	Maximum humidity set point limit (summer)	90	%rH	0	100	R/W
281	73	Gfc03	SCHEDULER.Set_H_Lim_Low_W	Minimum humidity set point limit (winter)	30	%rH	0	100	R/W
282	74	Gfc03	SCHEDULER.Set_H_Lim_Hi_W	Maximum humidity set point limit (winter)	90	%rH	0	100	R/W
283	75	Gfc04	TEMP_REG.Regulation_Type	Type of temperature control (P-PI-PID)	1	-	0	2	R/W
284	76	Gfc04	TEMP_REG.Limit_Type	Type of temperature limit control	1	-	1	4	R/W
285	77	Gfc05	TEMP_REG.Int_Time_Cool	Integral time in cooling	300	s	0	999	R/W
286	78	Gfc05	TEMP_REG.Der_Time_Cool	Derivative time in cooling	0	s	0	999	R/W
287	79	Gfc06	TEMP_REG.Int_Time_Heat	Integral time in heating	300	s	0	999	R/W
288	80	Gfc06	TEMP_REG.Der_Time_Heat	Derivative time in heating	0	s	0	999	R/W
289	81	Gfc07	TEMP_REG.Int_Limit_Time	Integral time for supply limit	150	s	0	999	R/W
290	82	Gfc08	Comp_Sum_Type	Type of compensation in summer	0	-	0	3	R/W
291	83	Gfc09	Comp_Win_Type	Type of compensation in winter	0	-	0	3	R/W
292	84	Gfc10	HUMID_REG.Regulation_Type	Type of humidity control (P-PI-PID)	0	-	0	2	R/W
293	85	Gfc10	HUMID_REG.Limit_Type	Type of humidity limit control	1	-	1	4	R/W

Modbus ADDR	Carel ADDR.	Screen index	Commissioning Tool variable name	Description	Def.	UOM	Min	Max	R/W
294	86	Gfc11	HUMID_REG.Diff_Reg_Dehum	Dehumidification differential	5	%rH	0	100	R/W
295	87	Gfc11	HUMID_REG.NZ_Reg_Dehum	Dehumidification neutral zone	2	%rH	0	100	R/W
296	88	Gfc11	HUMID_REG.Int_Time_Dehum	Dehumidification integral time	300	s	0	999	R/W
297	89	Gfc11	HUMID_REG.Der_Time_Dehum	Dehumidification derivative time	0	s	0	999	R/W
298	90	Gfc12	HUMID_REG.Diff_Reg_Humid	Humidification differential	4	%rH	0	100	R/W
299	91	Gfc12	HUMID_REG.NZ_Reg_Humid	Humidification neutral zone	2	%rH	0	100	R/W
300	92	Gfc12	HUMID_REG.Int_Time_Humid	Humidification integral time	300	s	0	999	R/W
301	93	Gfc12	HUMID_REG.Der_Time_Humid	Humidification derivative time	0	s	0	999	R/W
302	94	Gfc13	HUMID_REG.Setp_Win_L_Lim	Minimum supply humidity limit	20	%rH	0	100	R/W
303	95	Gfc13	HUMID_REG.Setp_Win_H_Lim	Maximum supply humidity limit	80	%rH	0	100	R/W
304	96	Gfc13	HUMID_REG.Diff_Lim	Differential for humidity limit	4	%rH	0	100	R/W
305	97	Gfc13	HUMID_REG.Int_Limit_Time	Integral time for humidity limit	150	s	0	999	R/W
306	98	Gfc16	P_Atm	Atmospheric pressure (mbar) for enthalpy calculation	1090	mbar	600	1100	R/W
307	99	Gfc18	FANS.Setp_Press_Sup	Supply pressure setpoint	1500	Pa	0	2000	R/W
308	100	Gfc18	FANS.Diff_Press_Sup	Supply pressure differential setpoint	300	Pa	0	1000	R/W
309	101	Gfc18	FANS.Supply_Int_Time	Supply fan control integral time	300	s	0	9999	R/W
310	102	Gfc18	FANS.Supply_Der_Time	Supply fan control derivative time	10	s	0	9999	R/W
311	103	Gfc19	FANS.Setp_Press_Ret	Return pressure setpoint	1500	Pa	0	2000	R/W
312	104	Gfc19	FANS.Diff_Press_Ret	Return pressure differential setpoint	300	Pa	0	1000	R/W
313	105	Gfc19	FANS.Return_Int_Time	Return fan control integral time	300	s	0	9999	R/W
314	106	Gfc19	FANS.Return_Der_Time	Return fan control derivative time	10	s	0	9999	R/W
315	107	Gfc20	Cascade.Thr_End_FreeC_Cool	Freecooling control end point in Cascade (% Diff.)	50	%	0	100	R/W
316	108	Gfc20	Cascade.Thr_Start_FreeC_Cool	Cooling coil control starting point in Cascade (% Diff.)	50	%	0	100	R/W
317	109	Gfc20	Cascade.Thr_End_Rec_Cool	Heat recovery control end point in Cascade (% Diff.	40	%	0	100	R/W
318	110	Gfc20	Cascade.Thr_Start_Rec_Cool	Cooling coil control starting point in Cascade with heat recovery	40	%	0	100	R/W
319	111	Gfc21	Cascade.Thr_End_FreeC_Heat	Freeheating control end point in Cascade (% Diff.l)	50	%	0	100	R/W
320	112	Gfc21	Cascade.Thr_Start_FreeC_Heat	Freeheating control starting point in Cascade (% Diff.)	50	%	0	100	R/W
321	113	Gfc21, Gfc22	Cascade.Thr_End_Heat_PostHeat	Heating coil control end point	100	%	0	100	R/W
322	114	Gfc21	Cascade.Thr_End_Rec_Heat	Heat recovery control end point	40	%	0	100	R/W
323	115	Gfc21	Cascade.Thr_Start_Rec_Heat	Heating coil control starting point	40	%	0	100	R/W
324	116	Gfc22	Cascade.Thr_Start_Heat_PostHeat	Reheating coil control starting point	80	%	0	100	R/W
325	117	Gfc23	COOLING.CutOff_Cool	Cooling valve cut-off in cooling	0	%	0	100	R/W
326	118	Gfc23	COOLING.CutOff_Dehum	Cooling valve cut-off in dehumidify	0	%	0	100	R/W
327	119	Gfc24	PREHEATING.CutOff_PreH	Preheating valve cut-off	0	%	0	100	R/W
328	120	Gfc29	REHEATING.CutOff_PostH	Reheating valve cut-off	0	%	0	100	R/W
329	121	Gfc26	COOL_HEAT_COIL.CutOff_Cool	Cool/heat valve cut-off in cooling.	0	%	0	100	R/W
330	122	Gfc26	COOL_HEAT_COIL.CutOff_Dehum	Cool/heat valve cut-off in dehumidify	0	%	0	100	R/W
331	123	Gfc26	COOL_HEAT_COIL.CutOff_Heat	Cool/heat valve cut-off in heating.	0	%	0	100	R/W
332	124	Gfc30	AIR_QUALITY.Setp_Reg_CO2	Air quality set point in ppm of CO2	1200	ppm	0	5000	R/W
333	125	Gfc30	AIR_QUALITY.Setp_Reg_VOC	Air quality set point in % of VOC	50	%	0	100	R/W
334	126	Gfc30	AIR_QUALITY.Diff_Reg_CO2	Air quality differential in ppm of CO2	200	ppm	0	2000	R/W
335	127	Gfc30	AIR_QUALITY.Diff_Reg_VOC	Air quality differential in % of VOC	10	%	0	100	R/W
336	128	Gfc32	Recovery.Defrost_Speed	Heat wheel speed in defrost	100	rpm	0	100	R/W
337	129	Gfc36	Reg_Loop_1.Gen_Reg_Int_Time	Generic loop 1 integral time	0	s	0	999	R/W
338	130	Gfc37	Reg_Loop_2.Gen_Reg_Int_Time	Generic loop 2 integral time	0	s	0	999	R/W
339	131	Gfc38	Reg_Loop_3.Gen_Reg_Int_Time	Generic loop 3 integral time	0	s	0	999	R/W
340	132	Gfc39	Reg_Loop_4.Gen_Reg_Int_Time	Generic loop 4 integral time	0	s	0	999	R/W
341	133		SCHEDULER.Season_Sel_From	Select season from BMS/ID	4	-	0	4	R/W
342	134		SCHEDULER.S_Start_Day	Summer start day	15	day	1	31	R/W
343	135		SCHEDULER.S_Start_Month	Summer start month	5	month	1	12	R/W
344	136		SCHEDULER.W_Start_Day	Winter start day	30	day	1	31	R/W
345	137		SCHEDULER.W_Start_Month	Winter start month	9	month	1	12	R/W
346	138		SCHEDULER.S_W_Delay_Auto_Change	Summer/Winter season changeover delay	1	Hour	0	999	R/W
347	139		Force_Supply_Fan	Force supply fan (0=Auto, 1=000%...101=100%)	0	%	0	101	R/W
348	140		Force_Return_Fan	Force return fan (0=Auto, 1=000%...101=100%)	0	%	0	101	R/W
349	141		Force_Cooling	Force cooling coil(0=Auto, 1=000%...101=100%)	0	%	0	101	R/W
350	142		Force_PreHeating	Force preheating coil (0=Auto, 1=000%...101=100%)	0	%	0	101	R/W
351	143		Force_PostHeating	Force reheating coil (0=Auto, 1=000%...101=100%)	0	%	0	101	R/W
352	144		Force_Heat_Cool	Force heating/cooling coil (0=Auto, 1=000%...101=100%)	0	%	0	101	R/W
353	145		Force_Humidifier	Force humidifier (0=Auto, 1=000%...101=100%)	0	%	0	101	R/W
354	146		Hour_Supply_Fan_1	Supply fan 1 operating hours (X1000) - thousands	-	-	0	999	R
355	147		Hour_L_Supply_Fan_1	Supply fan 1 operating hours	-	Hour	0	999	R
356	148		Hour_Supply_Fan_2	Supply fan 2 operating hours (X1000) - thousands	-	-	0	999	R
357	149		Hour_L_Supply_Fan_2	Supply fan 2 operating hours	-	Hour	0	999	R
358	150		Hour_Return_Fan_1	Return fan 1 operating hours (X1000) - thousands	-	-	0	999	R
359	151		Hour_L_Return_Fan_1	Return fan 1 operating hours	-	Hour	0	999	R
360	152		Hour_Return_Fan_2	Return fan 2 operating hours (X1000) - thousands	-	-	0	999	R
361	153		Hour_L_Return_Fan_2	Return fan 2 operating hours	-	Hour	0	999	R
362	154		Hour_Humidifier	Humidifier operating hours (X1000) - thousands	-	-	0	999	R
363	155		Hour_L_Humidifier	Humidifier operating hours	-	Hour	0	999	R
364	156		Hour_Rotary_Recovery	Heat wheel operating hours (X1000) - thousands	-	-	0	999	R
365	157		Hour_L_Rotary_Recovery	Heat wheel operating hours	-	Hour	0	999	R
366	158		Hour_Cool_Pump_1	Cooling coil pump 1 operating hours (X1000) - thousands	-	-	0	999	R
367	159		Hour_L_Cool_Pump_1	Cooling coil pump 1 operating hours	-	Hour	0	999	R
368	160		Hour_Cool_Pump_2	Cooling coil pump 2 operating hours (X1000) - thousands	-	-	0	999	R
369	161		Hour_L_Cool_Pump_2	Cooling coil pump 2 operating hours	-	Hour	0	999	R
370	162		Hour_PreH_Pump_1	Preheating coil pump 1 operating hours (X1000) - thousands	-	-	0	999	R
371	163		Hour_L_PreH_Pump_1	Preheating coil pump 1 operating hours	-	Hour	0	999	R
372	164		Hour_PreH_Pump_2	Preheating coil pump 2 operating hours (X1000) - thousands	-	-	0	999	R
373	165		Hour_L_PreH_Pump_2	Preheating coil pump 2 operating hours	-	Hour	0	999	R
374	166		Hour_PostH_Pump_1	Reheating coil pump 1 operating hours (X1000) - thousands	-	-	0	999	R
375	167		Hour_L_PostH_Pump_1	Reheating coil pump 1 operating hours	-	Hour	0	999	R
376	168		Hour_PostH_Pump_2	Reheating coil pump 2 operating hours (X1000) - thousands	-	-	0	999	R
377	169		Hour_L_PostH_Pump_2	Reheating coil pump 2 operating hours	-	Hour	0	999	R
378	170		Hour_Heaters_Pre_1	Preheating heater 1 operating hours (X1000) - thousands	-	-	0	999	R
379	171		Hour_L_Heaters_Pre_1	Preheating heater 1 operating hours	-	Hour	0	999	R
380	172		Hour_Heaters_Pre_2	Preheating heater 2 operating hours (X1000) - thousands	-	-	0	999	R
381	173		Hour_L_Heaters_Pre_2	Preheating heater 2 operating hours	-	Hour	0	999	R
382	174		Hour_Heaters_Pre_3	Preheating heater 3 operating hours (X1000) - thousands	-	-	0	999	R
383	175		Hour_L_Heaters_Pre_3	Preheating heater 3 operating hours	-	Hour	0	999	R
384	176		Hour_Heaters_Pre_4	Preheating heater 4operating hours (X1000) - thousands	-	-	0	999	R

Modbus ADDR	Carel ADDR.	Screen index	Commissioning Tool variable name	Description	Def.	UOM	Min	Max	R/W
385	177		Hour_L_Heaters_Pre_4	Preheating heater 4 operating hours	-	Hour	0	999	R
386	178		Hour_Heaters_Post_1	Reheating heater 1 operating hours (X1000) - thousands	-	-	0	999	R
387	179		Hour_L_Heaters_Post_1	Reheating heater 1 operating hours	-	Hour	0	999	R
388	180		Hour_Heaters_Post_2	Reheating heater 2 operating hours (X1000) - thousands	-	-	0	999	R
389	181		Hour_L_Heaters_Post_2	Reheating heater 2 operating hours	-	Hour	0	999	R
390	182		Hour_Heaters_Post_3	Reheating heater 3 operating hours (X1000) - thousands	-	-	0	999	R
391	183		Hour_L_Heaters_Post_3	Reheating heater 3 operating hours	-	Hour	0	999	R
392	184		Hour_Heaters_Post_4	Reheating heater 4operating hours (X1000) - thousands	-	-	0	999	R
393	185		Hour_L_Heaters_Post_4	Reheating heater 4 operating hours	-	Hour	0	999	R
394	186		Unit_Status	Unit status	-	-	0	17	R/W
396	187		OffCoil_Hum	Humidity downstream of coils	-	-	0	100	R/W
397	188		Force_Cooling_Ana	Force cooling coil analogue output	-	-	0	100	R/W
398	189		Force_PreHeating_Ana	Force preheating heater analogue output	-	-	0	100	R/W
399	190		Force_PostHeating_Ana	Force reheating heater analogue output	-	-	0	100	R/W
400	191		Force_Humid_Reg_Req_Ana	Force humidity request	-	-	0	100	R/W
401	192	Gfb23	Msk_OffCoil_Hum	Humidity probe value downstream of coils	-	%RH	0	1000	R
402	193		IEC_Limit_Probe	IEC limit probe (humidity)	-	%RH	0	1000	R
403	194	Gfb24	Msk_IEC_Limit_Probe	IEC limit probe value (humidity)	-	%RH	0	1000	R
404	195	Gfc14	Temp_Hum_Priority	Priority, temperature or humidity	2	-	0	2	R/W
405	196	Gfc01	Main_Info_1st_Sel	Variable 1 on display	7	-	0	16	R/W
405	197	Gfc01	Main_Info_2st_Sel	Variable 2 on display	7	-	0	16	R/W
406	198	Gfc05a	Cool_Heat_Delay	Summer/winter changeover delay	10	min	0	999	R/W
407	199	Gfc12a	Humid_Dehumid_Delay	Humidification/dehumidification changeover delay	10	min	0	999	R/W
408	200	Gfc13	HUMID_REG.Setp_Sum_H_Lim	Supply humidity limits: summer high	80	%RH	0	100	R/W
409	201	Gfc13	HUMID_REG.Setp_Sum_L_Lim	Supply humidity limits: summer low	20	%RH	0	100	R/W
410	202		HUMID_REG.Setp_Sum_AbsHum_H_Lim	Supply absolute (specific) humidity limits: summer high	15	g/Kg	0	100	R/W
411	203		HUMID_REG.Setp_Win_AbsHum_H_Lim	Supply absolute (specific) humidity limits: winter high	15	g/Kg	0	100	R/W
412	204		HUMID_REG.Setp_Sum_AbsHum_L_Lim	Supply absolute (specific) humidity limits: summer low	5	g/Kg	0	100	R/W
413	205		HUMID_REG.Setp_Win_AbsHum_L_Lim	Supply absolute (specific) humidity limits: winter low	5	g/Kg	0	100	R/W
414	206		HUMID_REG.Diff_Lim_AbsHum	Supply limit differential	0	g/Kg	0	100	R/W
415	207		HUMID_REG.Int_Limit_Time_AbsHum	Supply limit integral time	0	s	0	999	R/W
416	208	Gfc18	FANS.DeadBand_Press_Sup	Supply pressure neutral zone	0	Pa	0	2000	R/W
417	209	Gfc19	FANS.DeadBand_Press_Ret	Return pressure neutral zone	0	Pa	0	2000	R/W
418	210		ComfortSetp_AirFlow_Sup	Supply flow set point in Comfort (x 100 m3/h)	200	-	0	32767	R/W
419	211		PreComfSetp_AirFlow_Sup	Supply flow set point in Pre-comfort (x 100 m3/h)	200	-	0	32767	R/W
420	212		EcoSetp_AirFlow_Sup	Supply flow set point in Economy (x 100 m3/h)	200	-	0	32767	R/W
421	213		ComfortSetp_AirFlow_Ret	Return flow set point in Comfort (x 100 m3/h)	200	-	0	32767	R/W
422	214		PreComfSetp_AirFlow_Ret	Return flow set point in Pre-comfort (x 100 m3/h)	200	-	0	32767	R/W
423	215		EcoSetp_AirFlow_Ret	Return flow set point in Economy (x 100 m3/h)	200	-	0	32767	R/W
424	216		FANS.Diff_AirFlow_Sup	Supply flow: differential	10	m3/h	0	32767	R/W
425	217		FANS.DeadBand_AirFlow_Sup	Supply flow: neutral zone (x 100 m3/h)	5	Pa	0	2000	R/W
426	218		FANS.Diff_AirFlow_Ret	Return flow: differential	10	m3/h	0	32767	R/W
427	219		FANS.DeadBand_AirFlow_Ret	Return flow: neutral zone (x 100 m3/h)	5	Pa	0	2000	R/W
428	220		Cascade.Thr_End_DEC_Cool	DEC cooling control end point	0	%	0	100	R/W
429	221		Cascade.Thr_Start_DEC_Cool	DEC cooling control starting point	0	%	0	100	R/W
430	222	Gfc23	CutOff_SysOff_Cooling	Minimum cooling valve opening	0	-	0	100	R/W
431	223	Gfc24	CutOff_SysOff_PreHeating	Minimum preheating valve opening	0	-	0	100	R/W
432	224	Gfc25	Diff_PreH_Enthalpy	Enthalpy control: differential	0	-	0	100	R/W
433	225	Gfc26	CutOff_SysOff_CoolHeat	Minimum heating/cooling valve opening	0	-	0	100	R/W
434	226	Gfc29	CutOff_SysOff_PostHeating	Minimum reheating valve opening	0	-	0	100	R/W
435	227		Recovery_Efficiency	Heat recovery unit efficiency (%)	-	%	0	100	R
436	228		BMS_SwVerZ	BMS_SwVerZ	-	-	-	-	R
437	229		Current_Supply_Air_Flow	Supply air flow-rate	0	m3/h	-	-	R
438	230		Current_Return_Air_Flow	Return air flow-rate	0	m3/h	-	-	R
439	231		Recovery.Set_IEC_limit	IEC set point	100	RH	0	100	R/W
440	232		Recovery.Diff_IEC_Limit	IEC differential	5	RH	0	100	R/W
609	401		AIR_QUALITY.Probe_Type	Type of air quality probe	1	---	1	3	R/W
610	402		AIR_QUALITY.Type_Regulation	Type of air quality control	2	---	1	2	R/W
611	403		COOL_HEAT_COIL.Steps_Number	No. of heating/cooling coil steps	3	---	1	3	R/W
612	404		COOL_HEAT_COIL.Type_Common_Device	Type of heating/cooling coil device	1	---	1	3	R/W
613	405		COOL_HEAT_COIL.Type_Dehumid	Type of dehumidifier	1	---	1	4	R/W
614	406		Cool_Pumps.N_Pumps	Number of cooling coil pumps	0	---	1	2	R/W
615	407		Cool_Pumps.N_Warnings	Max no. warnings before cooling coil alarm	3	---	0	5	R/W
616	408		COOLING.Steps_Number	No. of cooling steps	1	---	1	3	R/W
617	409		COOLING.Type_Cool_Device	Type of cooling output	1	---	1	3	R/W
618	410		COOLING.Type_Dehumid	Type of cooling coil dehumidification	1	---	1	4	R/W
619	411		DAMPERS.Freecooling_Mode	Free cooling mode	2	---	1	3	R/W
620	412		DAMPERS.Freeheating_Mode	Free heating mode	2	---	1	3	R/W
621	413		DAMPERS.Type_Dampers	Type of dampers	1	---	1	5	R/W
622	414		FANS.Flow_Type	Type of flow	3	---	1	3	R/W
623	415		FANS.Type_Overload	Type of fan overload	2	---	1	3	R/W
624	416	Ha03a	DAMPERS.Fan_Dampers_Type	Type of fan dampers	0	---	0	3	R/W
625	417	Ha03a	FANS.DamperLimitSwitch_Type	Fan damper limit switch	0	---	0	3	R/W
626	418		FANS.Fan_Type	Type of fans	4	---	1	6	R/W
627	419		FANS.Type_Reg_Fans	Type of fan control	1	---	1	2	R/W
628	420		FROST.Freeze_Type	Type of frost protection alarm	3	---	1	4	R/W
629	421		HUMIDIFIER.Type_Humidifier	Type of humidifier	4	---	1	4	R/W
630	422		Coil_Type_Sel	Select type of coil	4	---	0	7	R/W
631	423		Aux_Reg_Loop_Number	Number of auxiliary loops	0	---	0	4	R/W
632	424		Belimo_Number	Number of Belimo actuators	0	---	0	8	R/W
633	425		Backup_Probe_1	Backup probe 1	0	---	0	10	R/W
634	426		Backup_Probe_2	Backup probe 2	0	---	0	10	R/W
635	427		Backup_Probe_3	Backup probe 3	0	---	0	10	R/W
636	428		Backup_Probe_4	Backup probe 4	0	---	0	10	R/W
637	429		pCOe_1_Address	pCOe no. 1 address	3	---	1	5	R/W
638	430		pCOe_2_Address	pCOe no. 2 address	4	---	1	5	R/W
639	431		pCOe_Number	Number of pCOe devices	0	---	0	2	R/W
640	432		Serial_Probe_Number	Number of serial probes	0	---	0	6	R/W
641	433		Protocol_Ser0	Serial protocol 0 (pLAN)	5	---	0	21	R/W
642	434		Protocol_Ser1	Serial protocol 1 (BMS)	1	---	1	33	R/W
643	435		Protocol_Ser2	Serial protocol 2 (FieldBus)	1	---	0	21	R/W
644	436		Protocol_Ser3	Serial protocol 3 (BMS2)	1	---	0	30	R/W

Modbus ADDR	Carel ADDR.	Screen index	Commissioning Tool variable name	Description	Def.	UOM	Min	Max	R/W
645	437		Protocol_Ser4	Serial protocol 4 (FieldBus2)	21	---	0	30	R/W
646	438		PreHeat_Pumps.N_Pumps	No. of preheating coil pumps	1	---	1	2	R/W
647	439		PreHeat_Pumps.N_Warnings	Max no. warnings before preheat. coil alarm	3	---	0	5	R/W
648	440		PREHEATING.Heat_Device_Type	Type of preheating output	1	---	1	3	R/W
649	441		PREHEATING.Heaters_Number	No. of preheating steps	0	---	1	4	R/W
650	442		PREHEATING.Heaters_Type	Type of preheating heaters	1	---	1	3	R/W
651	443		Protocol_Mng.Baudrate	Modbus master protocol: baud rate	4	---	0	4	R/W
652	444		Protocol_Mng.Parity_mode	Modbus master protocol: parity	0	---	0	2	R/W
653	445		Protocol_Mng.Stop_bits	Modbus master protocol: stop bits	1	---	0	1	R/W
654	446		Protocol_Mng.Timeout	Modbus master protocol: timeout	300	ms	100	5000	R/W
655	447	Ha14a	Recovery.Delay_After_OnRec	Heat recovery - IEC delay	0	s	0	999	R/W
656	448		Recovery.ByPass_Damper_Type	Type of bypass damper	2	---	1	3	R/W
657	449		Recovery.Defrost_Probe	Type of defrost probe	1	---	1	3	R/W
658	450		Recovery.Min_Speed	Minimum enthalpy wheel speed	0	giri/min	0	100	R/W
659	451		Recovery.Recovery_Type	Type of heat recovery	2	---	1	6	R/W
660	452		Reg_Loop_1.Gen_Reg_Out_Type	Type of generic control output	0	---	0	2	R/W
661	453		Reg_Loop_1.Gen_Reg_Type	Type of control, generic loop 1	0	---	0	1	R/W
662	454		Reg_Loop_1.Special_cond	Special condition to activate or force coil	0	---	0	2	R/W
663	455		Reg_Loop_2.Gen_Reg_Out_Type	Type of generic control output	0	---	0	2	R/W
664	456		Reg_Loop_2.Gen_Reg_Type	Type of control, generic loop 2	0	---	0	1	R/W
665	457		Reg_Loop_2.Special_cond	Special condition to activate or force coil	0	---	0	2	R/W
666	458		Reg_Loop_3.Gen_Reg_Out_Type	Type of generic control output	0	---	0	2	R/W
667	459		Reg_Loop_3.Gen_Reg_Type	Type of control, generic loop 3	0	---	0	1	R/W
668	460		Reg_Loop_3.Special_cond	Special condition to activate or force coil	0	---	0	2	R/W
669	461		Reg_Loop_4.Gen_Reg_Out_Type	Type of generic control output	0	---	0	2	R/W
670	462		Reg_Loop_4.Gen_Reg_Type	Type of control, generic loop 4	0	-	0	1	R/W
671	463		Reg_Loop_4.Special_cond	Special condition to activate or force coil	0	-	0	2	R/W
672	464		ReHeat_Pumps.N_Pumps	No. of reheating coil pumps	2	-	0	2	R/W
673	465		ReHeat_Pumps.N_Warnings	Max no. warnings before reheat. coil alarm	3	-	0	5	R/W
674	466		REHEATING.Heat_Device_Type	Type of reheating output	1	-	1	3	R/W
675	467		REHEATING.Heaters_Number	No. of reheating steps	3	-	1	4	R/W
676	468		REHEATING.Heaters_Type	Type of reheating heaters	1	-	1	3	R/W
677	469		REHEATING.PostH_Mode	Reheat coil: compensation or integration	2	-	1	3	R/W
809	601	Gfb19	Belimo_1.Address	Belimo address 1	-	-	1	8	R
810	602		Belimo_1.Device_Type	Type of device	-	-	0	9	R
811	603		Belimo_1.Serial_1_H_In	Digits 1-2 for setting Belimo address 1	-	-	0	99	R/W
812	604		Belimo_1.Serial_1_L_In	Digits 3-4-5 for setting Belimo address 1	-	-	0	999	R/W
813	605		Belimo_1.Serial_2_H_In	Digits 6-7 for setting Belimo address 1	-	-	0	99	R/W
814	606		Belimo_1.Serial_2_L_In	Digits 8-9-10 for setting Belimo address 1	-	-	0	999	R/W
815	607		Belimo_1.Serial_3_In	Digits 11-12-13 for setting Belimo address 1	-	-	0	999	R/W
816	608		Belimo_1.Serial_4_In	Digits 14-15-16 for setting Belimo address 1	-	-	0	999	R/W
817	609		Belimo_1.Address_txt	Text for setting the address	-	-	0	4	R
818	610		Belimo_1.Type_Ext_Input	Type of external input	0	-	0	5	R/W
819	611	Gfb19	Belimo_2.Address	Belimo address 2	-	---	1	8	R
820	612		Belimo_2.Device_Type	Type of device	-	---	0	9	R
821	613		Belimo_2.Serial_1_H_In	Digits 1-2 for setting Belimo address 2	-	---	0	99	R
822	614		Belimo_2.Serial_1_L_In	Digits 3-4-5 for setting Belimo address 2	-	---	0	999	R/W
823	615		Belimo_2.Serial_2_H_In	Digits 6-7 for setting Belimo address 2	-	---	0	99	R/W
824	616		Belimo_2.Serial_2_L_In	Digits 8-9-10 for setting Belimo address 2	-	---	0	999	R/W
825	617		Belimo_2.Serial_3_In	Digits 11-12-13 for setting Belimo address 2	-	---	0	999	R/W
826	618		Belimo_2.Serial_4_In	Digits 14-15-16 for setting Belimo address 2	-	---	0	999	R/W
827	619		Belimo_2.Address_txt	Text for setting the address	-	---	0	4	R
828	620		Belimo_2.Type_Ext_Input	Type of external input	0	---	0	5	R/W
829	621	Gfb20	Belimo_3.Address	Belimo address 3	-	---	1	8	R
830	622		Belimo_3.Device_Type	Type of device	-	---	0	9	R
831	623		Belimo_3.Serial_1_H_In	Digits 1-2 for setting Belimo address 3	-	---	0	99	R
832	624		Belimo_3.Serial_1_L_In	Digits 3-4-5 for setting Belimo address 3	-	---	0	999	R/W
833	625		Belimo_3.Serial_2_H_In	Digits 6-7 for setting Belimo address 3	-	---	0	99	R/W
834	626		Belimo_3.Serial_2_L_In	Digits 8-9-10 for setting Belimo address 3	-	---	0	999	R/W
835	627		Belimo_3.Serial_3_In	Digits 11-12-13 for setting Belimo address 3	-	---	0	999	R/W
836	628		Belimo_3.Serial_4_In	Digits 14-15-16 for setting Belimo address 3	-	---	0	999	R/W
837	629		Belimo_3.Address_txt	Text for setting the address	-	---	0	4	R
838	630		Belimo_3.Type_Ext_Input	Type of external input	0	---	0	5	R/W
839	631	Gfb20	Belimo_4.Address	Belimo address 4	-	---	1	8	R
840	632		Belimo_4.Device_Type	Type of device	-	---	0	9	R
841	633		Belimo_4.Serial_1_H_In	Digits 1-2 for setting Belimo address 4	-	---	0	99	R
842	634		Belimo_4.Serial_1_L_In	Digits 3-4-5 for setting Belimo address 4	-	---	0	999	R/W
843	635		Belimo_4.Serial_2_H_In	Digits 6-7 for setting Belimo address 4	-	---	0	99	R/W
844	636		Belimo_4.Serial_2_L_In	Digits 8-9-10 for setting Belimo address 4	-	---	0	999	R/W
845	637		Belimo_4.Serial_3_In	Digits 11-12-13 for setting Belimo address 4	-	---	0	999	R/W
846	638		Belimo_4.Serial_4_In	Digits 14-15-16 for setting Belimo address 4	-	---	0	999	R/W
847	639		Belimo_4.Address_txt	Text for setting the address	-	---	0	4	R
848	640		Belimo_4.Type_Ext_Input	Type of external input	0	---	0	5	R/W
849	641	Gfb21	Belimo_5.Address	Belimo address 5	-	---	1	8	R
850	642		Belimo_5.Device_Type	Type of device	-	---	0	9	R
851	643		Belimo_5.Serial_1_H_In	Digits 1-2 for setting Belimo address 5	-	---	0	99	R
852	644		Belimo_5.Serial_1_L_In	Digits 3-4-5 for setting Belimo address 5	-	---	0	999	R/W
853	645		Belimo_5.Serial_2_H_In	Digits 6-7 for setting Belimo address 5	-	---	0	99	R/W
854	646		Belimo_5.Serial_2_L_In	Digits 8-9-10 for setting Belimo address 5	-	---	0	999	R/W
855	647		Belimo_5.Serial_3_In	Digits 11-12-13 for setting Belimo address 5	-	---	0	999	R/W
856	648		Belimo_5.Serial_4_In	Digits 14-15-16 for setting Belimo address 5	-	---	0	999	R/W
857	649		Belimo_5.Address_txt	Text for setting the address	-	---	0	4	R
858	650		Belimo_5.Type_Ext_Input	Type of external input	0	---	0	5	R/W
859	651	Gfb21	Belimo_6.Address	Belimo address 6	-	---	1	8	R
860	652		Belimo_6.Device_Type	Type of device	-	---	0	9	R
861	653		Belimo_6.Address_txt	Digits 1-2 for setting Belimo address 6	-	---	0	99	R
862	654		Belimo_6.Type_Ext_Input	Digits 3-4-5 for setting Belimo address 6	-	---	0	999	R/W
863	655		Belimo_7.Address	Digits 6-7 for setting Belimo address 6	-	---	0	99	R/W
864	656		Belimo_7.Device_Type	Digits 8-9-10 for setting Belimo address 6	-	---	0	999	R/W
865	657		Belimo_7.Serial_1_H_In	Digits 11-12-13 for setting Belimo address 6	-	---	0	999	R/W
866	658		Belimo_7.Serial_1_L_In	Digits 14-15-16 for setting Belimo address 6	-	---	0	999	R/W
867	659		Belimo_7.Serial_2_H_In	Text for setting the address	-	---	0	4	R

Modbus ADDR	Carel ADDR.	Screen index	Commissioning Tool variable name	Description	Def.	UOM	Min	Max	R/W
868	660		Belimo_7.Serial_2_L_In	Type of external input	0	---	0	5	R/W
869	661	Gfb22	Belimo_7.Serial_3_In	Belimo address 7	-	---	1	8	R
870	662		Belimo_7.Serial_4_In	Type of device	-	---	0	9	R
871	663		Serial_1_H_In	Digits 1-2 for setting Belimo address 7	-	---	0	99	R
872	664		Serial_1_L_In	Digits 3-4-5 for setting Belimo address 7	-	---	0	999	R/W
873	665		Serial_2_H_In	Digits 6-7 for setting Belimo address 7	-	---	0	99	R/W
874	666		Serial_2_L_In	Digits 8-9-10 for setting Belimo address 7	-	---	0	999	R/W
875	667		Serial_3_In	Digits 11-12-13 for setting Belimo address 7	-	---	0	999	R/W
876	668		Serial_4_In	Digits 14-15-16 for setting Belimo address 7	-	---	0	999	R/W
877	669		Belimo_7.Address_txt	Text for setting the address	-	---	0	4	R
878	670		Belimo_7.Type_Ext_Input	Type of external input	0	---	0	5	R/W
879	671	Gfb22	Belimo_8.Address	Belimo address 8	0	---	1	8	R
880	672		Belimo_8.Device_Type	Type of device	0	---	0	9	R
881	673		Belimo_8.Serial_1_H_In	Serial address per setting the address	0	---	0	99	R
882	674		Belimo_8.Serial_1_L_In	Serial address per setting the address	0	---	0	999	R/W
883	675		Belimo_8.Serial_2_H_In	Serial address per setting the address	0	---	0	99	R/W
884	676		Belimo_8.Serial_2_L_In	Serial address per setting the address	0	---	0	999	R/W
885	677		Belimo_8.Serial_3_In	Serial address per setting the address	-	-	0	999	R/W
886	678		Belimo_8.Serial_4_In	Serial address per setting the address	-	-	0	999	R/W
887	679		Belimo_8.Address_txt	Text for setting the address	-	-	0	4	R
888	680		Belimo_8.Type_Ext_Input	Type of external input	0	-	0	5	R/W
1009	801	Gfb09	Serial_Prb_1.Probe_Order_ID	Serial probe 1 ID	-	-	0	99	R/W
1010	802		Serial_Prb_1.Probe_Address	Probe 1 address	128	---	128	159	R/W
1011	803	Gfb10	Serial_Prb_2.Probe_Order_ID	Serial probe 2 ID	0	---	0	99	R/W
1012	804		Serial_Prb_2.Probe_Address	Probe 2 address	128	---	128	159	R/W
1013	805	Gfb11	Serial_Prb_3.Probe_Order_ID	Serial probe 3 ID	0	---	0	99	R/W
1014	806		Serial_Prb_3.Probe_Address	Probe 3 address	128	---	128	159	R/W
1015	807	Gfb12	Serial_Prb_4.Probe_Order_ID	Serial probe 4 ID	0	---	0	99	R/W
1016	808		Serial_Prb_4.Probe_Address	Probe 4 address	128	---	128	159	R/W
1017	809	Gfb13	Serial_Prb_5.Probe_Order_ID	Serial probe 5 ID	0	---	0	99	R/W
1018	810		Serial_Prb_5.Probe_Address	Probe 5 address	128	---	128	159	R/W
1019	811	Gfb14	Serial_Prb_6.Probe_Order_ID	Serial probe 6 ID	0	---	0	99	R/W
1020	812		Serial_Prb_6.Probe_Address	Probe 6 address	128	---	128	159	R/W
1059	851		Return_VFD_1.VFD_Address	Return VFD address	2	---	1	255	R/W
1060	852		Return_VFD_1.Address_Generic	Generic data address	-	---	0	9999	R/W
1061	853		Return_VFD_1.DATA_Generic	Generic data value	-	---	-32768	32767	R/W
1062	854		Return_VFD_1.Type_Switch	Return VFD control position	-	---	1	3	R/W
1063	855		Return_VFD_1.Type_Require	Type of speed reference	-	---	0	5	R/W
1064	856		Return_VFD_1.Motor_Control_Mode	Return VFD motor control mode	-	---	0	1	R/W
1065	857		Return_VFD_1.Start_Function	Start function	-	---	0	1	R/W
1066	858		Return_VFD_1.Stop_Function	Stop function	-	---	0	1	R/W
1067	859		Return_VFD_1.VFD_TYPE_AL_3	Return VFD action when error #03	-	---	0	3	R/W
1068	860		Return_VFD_1.VFD_TYPE_AL_9	Return VFD action when error #09	-	---	0	3	R/W
1069	861		Return_VFD_1.VFD_TYPE_AL_11	Return VFD action when error #11	-	---	0	3	R/W
1070	862		Return_VFD_1.VFD_TYPE_AL_15	Return VFD action when error #15	-	---	0	3	R/W
1071	863		Return_VFD_1.VFD_TYPE_AL_16	Return VFD action when error #16	-	---	0	3	R/W
1072	864		Return_VFD_1.VFD_TYPE_AL_17	Return VFD action when error #17	-	---	0	3	R/W
1073	865		Return_VFD_1.VFD_TYPE_AL_29	Return VFD action when error #29	-	---	0	3	R/W
1074	866		Return_VFD_1.VFD_TYPE_AL_50	Return VFD action when error #50	-	---	0	3	R/W
1075	867		Return_VFD_1.VFD_TYPE_AL_53	Return VFD action when error #53	-	---	0	3	R/W
1076	868		Return_VFD_1.VFD_TYPE_AL_54	Return VFD action when error #54	-	---	0	3	R/W
1077	869		Return_VFD_1.VFD_TYPE_AL_55	Return VFD action when error #55	-	---	0	4	R/W
1078	870		Return_VFD_1.Nominal_Volt	Return VFD motor parameters: Volt	-	V	0	690	R/W
1079	871		Return_VFD_1.Motor_Cosfi	Cosfi	-	---	0	99	R/W
1080	872		Return_VFD_1.Nominal_Speed	Speed in rpm	-	---	300	20000	R/W
1081	873		Supply_VFD_1.VFD_Address	Supply VFD address	1	---	1	255	R/W
1082	874		Supply_VFD_1.Address_Generic	Data address	-	---	0	9999	R/W
1083	875		Supply_VFD_1.DATA_Generic	Data value	-	---	-32768	32767	R/W
1084	876		Supply_VFD_1.Type_Switch	Supply VFD control position	-	---	-32768	32767	R/W
1085	877		Supply_VFD_1.Type_Require	Type of speed reference	-	---	0	5	R/W
1086	878		Supply_VFD_1.Motor_Control_Mode	Supply VFD motor control mode	-	---	0	1	R/W
1087	879		Supply_VFD_1.Start_Function	Start function	-	---	0	1	R/W
1088	880		Supply_VFD_1.Stop_Function	Stop function	-	---	0	1	R/W
1089	881		Supply_VFD_1.VFD_TYPE_AL_3	Supply VFD action when error #03	-	---	0	3	R/W
1090	882		Supply_VFD_1.VFD_TYPE_AL_9	Supply VFD action when error #09	-	---	0	3	R/W
1091	883		Supply_VFD_1.VFD_TYPE_AL_11	Supply VFD action when error #11	-	---	0	3	R/W
1092	884		Supply_VFD_1.VFD_TYPE_AL_15	Supply VFD action when error #15	-	---	0	3	R/W
1093	885		Supply_VFD_1.VFD_TYPE_AL_16	Supply VFD action when error #16	-	---	0	3	R/W
1094	886		Supply_VFD_1.VFD_TYPE_AL_17	Supply VFD action when error #17	-	---	0	3	R/W
1095	887		Supply_VFD_1.VFD_TYPE_AL_29	Supply VFD action when error #29	-	---	0	3	R/W
1096	888		Supply_VFD_1.VFD_TYPE_AL_50	Supply VFD action when error #50	-	---	0	3	R/W
1097	889		Supply_VFD_1.VFD_TYPE_AL_53	Supply VFD action when error #53	-	---	0	3	R/W
1098	890		Supply_VFD_1.VFD_TYPE_AL_54	Supply VFD action when error #54	-	---	0	3	R/W
1099	891		Supply_VFD_1.VFD_TYPE_AL_55	Supply VFD action when error #55	-	---	0	4	R/W
1100	892		Supply_VFD_1.Nominal_Volt	Supply VFD motor parameters: Volt	-	V	180	690	R/W
1101	893		Supply_VFD_1.Motor_Cosfi	Cosfi	-	---	30	99	R/W
1102	894		Supply_VFD_1.Nominal_Speed	Speed in rpm	-	---	300	20000	R/W
1159	951		AIR_QUALITY.Int_Time	Air quality integral time	300	s	0	9999	R/W
1160	952		AIR_QUALITY.Cleaning_Time	Air quality purge time	10	min	0	300	R/W
1161	953		COOL_HEAT_COIL.Three_Way_Running_Time	Heating/cooling coil three-way valve travel time	180	s	1	3200	R/W
1162	954		COOLING.Three_Way_Running_Time	Cooling coil three-way valve travel time	180	s	1	3200	R/W
1163	955		DAMPERS.Integration_Delay	Coil start delay when free cooling active	0	min	0	100	R/W
1164	956		DAMPERS.Open_Time	Damper opening delay	120	s	0	9999	R/W
1165	957		DAMPERS.Off_Delay	Damper closing delay	120	s	0	9999	R/W
1166	958		FANS.Delay_Startup_Flow_Alarm	Fan flow alarm delay when starting	20	s	1	999	R/W
1167	959		FANS.Delay_Run_Flow_Alarm	Fan flow alarm delay in steady operation	5	s	1	999	R/W
1168	960		FANS.N_Warnings	Number of no flow warnings	0	---	0	5	R/W
1169	961	Hc07a	FANS.DamperLimSwitch_Alarm_Delay	Damper limit switch alarm delay	10	---	0	999	R/W
1170	962		FANS.Set_Min_S_Press	Supply flow alarm threshold	100	Pa	0	9999	R/W
1171	963		FANS.Set_Min_R_Press	Return flow alarm threshold	100	Pa	0	9999	R/W
1172	964		FANS.Diff_Flow_Alarm	Flow alarm differential	300	Pa	0	9999	R/W

Modbus ADDR	Carel ADDR.	Screen index	Commissioning Tool variable name	Description	Def.	UOM	Min	Max	R/W
1173	965		FANS.Stop_Fan_Delay	Stop fan delay	30	s	0	999	R/W
1174	966		FANS.Sup_Return_Fan_Delay	Supply-return fan delay	0	s	0	999	R/W
1175	967		FANS.Fan1_Fan2_Delay	Fan 1/fan 2 delay	5	s	0	999	R/W
1176	968		FANS.Rot_Time_hh	Rotation time	0	Hour	1	999	R/W
1177	969		FANS.Overworking_Time	Couple fan overlapping time	0	s	-999	999	R/W
1178	970	Hcb07b	FANS.K1_supply	K coefficient to calculate supply flow	0	---	0	32767	R/W
1179	971	Hcb07b	FANS.K1_return	K coefficient to calculate return flow	0	---	0	32767	R/W
1180	972		FANS.Star_Line_Delay	Star-delta delay	200	s/100	0	3200	R/W
1181	973		FANS.Time_Star	Star time	500	s/100	0	3200	R/W
1182	974		FANS.Star_Delta_Delay	Star-delta delay	50	s/100	0	3200	R/W
1183	975	Hc18a	IEC_Qlimit_max	IEC air flow limit	0	---	0	100	R/W
1184	976		Temp_Reg_Prb_Sel	Select temperature control probe	0	---	0	2	R/W
1185	977		Humid_Reg_Prb_Sel	Select humidity control probe	0	---	0	2	R/W
1186	978		Generic_Alarm_Delay	Generic alarm delay time	0	---	0	9999	R/W
1187	979		Delay_Startup_Flow_Alarm	Flow alarm delay at start-up	30	s	1	9999	R/W
1188	980		Delay_Run_Flow_Alarm	Flow alarm delay in steady operation	15	s	1	9999	R/W
1189	981		Pumps_Rot_Time	Pump rotation time	96	Hour	0	999	R/W
1190	982		Pumps_Overwork_Time	Pump overlapping time	0	---	0	999	R/W
1191	983	Hc07c	SysOn_Delay	Frost protection alarm delay with heaters	120	s	0	600	R/W
1192	984		PREHEATING.Three_Way_Running_Time	Preheating valve travel time	180	s	1	3200	R/W
1193	985		Recovery.Defrost_Delay_On	Heat recovery unit frost protection activation delay	120	s	0	999	R/W
1194	986		Recovery.Defrost_Delay_Off	Heat recovery unit frost protection deactivation delay	60	s	0	999	R/W
1195	987		Recovery.Dirty_Rec_Delay	Dirty heat recovery unit alarm delay	60	s	0	300	R/W
1196	988		REHEATING.Three_Way_Running_Time	Reheating valve travel time	180	s	1	3200	R/W
1197	989		Return_VFD_1.Ratio_Selection	Return VFD: V/F ratio	-	---	0	3	R/W
1198	990		Return_VFD_1.Auto_Boost	V/F optimisation	-	---	0	1	R/W
1199	991		Return_VFD_1.Automatic_Restart	Automatic restart	-	---	0	1	R/W
1200	992		Supply_VFD_1.Ratio_Selection	Supply VFD: V/F ratio	-	---	0	3	R/W
1201	993		Supply_VFD_1.Auto_Boost	V/F optimisation	-	---	0	1	R/W
1202	994		Supply_VFD_1.Automatic_Restart	Automatic restart	-	---	0	1	R/W

11. ALARMS

11.1 Types of alarms

For configuration of the alarms see paragraph 6.1.1.

Input alarms: generic (shuts down the unit), serious (stops the unit immediately). Output alarms: general (minor+serious), minor (see table of alarms), serious (see table of alarms) and filters (supply 1 +supply 2 +return +filters). There are three types of alarms:

- with manual reset;
- with automatic reset: the alarm is resets and the unit restarts automatically when the alarm condition has been resolved;
- with semiautomatic reset: reset is automatic but the alarm signal remains active.

When an alarm occurs, the bell button flashes with a red light and the buzzer sounds. To mute the buzzer, press the bell button, while to reset the alarms press and hold the bell button for 3 s.

11.2 Alarm log

The 50 most recent alarms are saved in a FIFO alarm log. The last alarm activated is added to the bottom of the alarm log. To access the log, from the standard display:

Alarm button ➔Enter➔Alarm log

The screen displays the alarm code, description and readings of the supply and return probes at the moment the alarm was activated.

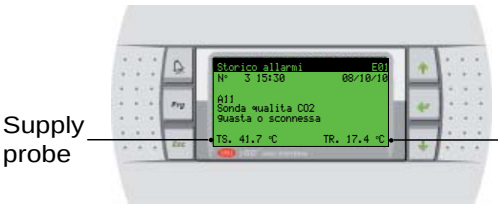


Fig. 11.a

11.3 Alarm table

Code	Description	Type of reset	Effect on control		Alarm: Serious (G) Minor (L)
A01	Supply temperature probe	Automatic	Stop temperature limit function, stop reheating if Sreg=return		Serious
A02	Return temperature probe	Automatic	Stop set point compensation function and heat recovery		Serious
A03	Outside temperature sensor	Automatic	Stop set point compensation function and heat recovery		Minor
A04	Humidity probe supply	Automatic	Stop humidity limit function		Serious
A05	Return humidity probe	Automatic	Stop heat recovery by enthalpy, freecooling by enthalpy, if return probe= Sreg → stop unit		Serious
A06	Outside humidity probe	Automatic	Stop freecooling/ freeheating and heat recovery by enthalpy functions		Minor
A07	Supply pressure probe	Automatic	Stop individual fan or unit as per parameter Ha04		Serious
A08	Return pressure probe fault	Automatic	Stop individual fan or unit as per parameter Ha04		Serious
A09	Frost protection temperature probe	Automatic	Shutdown unit		Serious
A10	Saturated temperature probe	Automatic	-		Minor
A11	Air quality probe (CO2)	Automatic	Fan at MAX and outside damper open at MAX		Minor
A12	Air quality probe (VOC)	Automatic	Fan at MAX and outside damper open at MAX		Minor
A13	Exhaust temperature probe	Automatic	Stop heat recovery function if frost protection control on exhaust probe		Minor
A14	Cooling or heat/cool coil temperature probe	Automatic	Deactivate coil		Minor
A15	Preheating coil temperature probe fault	Automatic	Deactivate coil		Minor
A16	Reheating coil temperature probe fault	Automatic	Deactivate coil		Minor
A17	Auxiliary probe 1	Automatic	Stop auxiliary control loop 1		Minor
A18	Auxiliary probe 2	Automatic	Stop auxiliary control loop 2		Minor
A19	Auxiliary probe 3	Automatic	Stop auxiliary control loop 3		Minor
A20	Auxiliary probe 4	Automatic	Stop auxiliary control loop 4		Minor
A21	Room temperature probe fault	Automatic	Stop room protection		Minor
A22	Room humidity probe	Automatic	-		Minor
A23	Analogue input probe offset	Automatic	Eliminate offset		Minor
A24	Control probe fault	Automatic	Shutdown unit		Serious
B01	Dirty heat recovery unit alarm	Automatic	Stop heat recovery function		Minor
B02	Reheating heaters thermal overload alarm	Manual	Shutdown unit		Serious
B03	Preheating heaters thermal overload alarm	Manual	Shutdown unit		Serious
B04	Cooling coil inlet limit alarm	Automatic	Deactivate coil (after 10 min)		Serious
B05	Preheat coil inlet limit alarm	Automatic	Deactivate coil (after 10 min)		Serious
B06	Reheat coil inlet limit alarm	Automatic	Deactivate coil (after 10 min)		Serious
B07	Heat / cool coil inlet limit alarm	Automatic	Deactivate coil (after 10 min)		Serious
E11	pCOe 1 offline	Semiautomatic	Shutdown unit		Serious
E12	Incorrect probe 1, 2 configuration on pCOe 1	Automatic	Immediately stop unit		Serious
E13	Incorrect probe 3, 4 configuration on pCOe 1	Automatic	Immediately stop unit		Serious
E21	pCOe 2 offline	Semiautomatic	Shutdown unit		Serious
E22	Incorrect probe 1, 2 configuration on pCOe 2	Automatic	Immediately stop unit		Serious
E23	Incorrect probe 3, 4 configuration on pCOe 2	Automatic	Immediately stop unit		Serious
F01	Supply 1 flow alarm	Manual	Ha04	effect	Serious
			global	total shutdown	
			individual	stop supply fan and control devices	
F02	Return 1 flow alarm	Manual	Ha04	effect	Serious
			global	total shutdown	
			individual	stop return fan	
F03	Supply 2 flow alarm	Manual	Ha04	effect	Serious
			global	total shutdown	
			individual	stop supply fan and control devices	
F04	Return 2 flow alarm	Manual	Ha04	effect	Serious
			global	total shutdown	
			individual	stop return fan	

Code	Description	Type of reset	Effect on control		Alarm: Serious (G) Minor (L)
F05	Supply fan 1 overload	Manual	Stop all control devices on supply		Serious
F06	Return fan 1 overload	Manual	**Ha04**	**effect**	Serious
			global	total shutdown	
			individual	stop return fan	
F07	Supply inverter alarm	Manual	**Ha04**	**effect**	Serious
			global	total shutdown	
			individual	stop supply fan and control devices	
F08	Return inverter alarm	Manual	**Ha04**	**effect**	Serious
			global	total shutdown	
			individual	stop return fan	
F09	Supply fan 2 overload	Manual	Stop all control devices on supply		Serious
F10	Return fan 2 overload	Manual	**Ha04**	**effect**	Serious
			global	total shutdown	
			individual	stop return fan	
F11	Supply 1 flow warning	Automatic	Perform number of attempts set on Hc07		Minor
F12	Supply 2 flow warning	Automatic	Perform number of attempts set on Hc07		Minor
F13	Return 1 flow warning	Automatic	Perform number of attempts set on Hc07		Minor
F14	Return 2 flow warning	Automatic	Perform number of attempts set on Hc07		Minor
F15	Supply damper limit switch alarm	Manual	Shutdown unit		Serious
F16	Return damper limit switch alarm	Manual	Shutdown unit		Serious
G01	Clock fault	Manual	Stop time bands, maintains last operating mode		Minor
G02	Extended memory fault	Manual	Deactivate load default parameters Ha96		Minor
G03	Frost protection alarm AIN	Automatic	Stop fans, close dampers, activate preheating coil at 100%, and cooling coil at 50%, all pumps on		Minor
G04	Frost protection alarm DIN	Automatic			Minor
G05	Low room temperature protection	Automatic	Control operates as if it were ON		Minor
G06	Generic signal from digital input	Manual	Signal only		-
H01	Humidifier alarm	Manual	Stop humidification function		Serious
M11	Belimo 1 Offline	Semiautomatic	Immediately stop unit		Serious
M12	Belimo 1 probe fault	Semiautomatic	Depends on probe function		Minor
M13	Belimo 1 Fire/Smoke	Manual	Immediately stop unit		Serious
M21	Belimo 2 Offline	Semiautomatic	Immediately stop unit		Serious
M22	Belimo 2 probe fault	Semiautomatic	Depends on probe function		Minor
M23	Belimo 2 Fire/Smoke	Manual	Immediately stop unit		Serious
M31	Belimo 3 Offline	Semiautomatic	Immediately stop unit		Serious
M32	Belimo 3 probe fault	Semiautomatic	Depends on probe function		Minor
M33	Belimo 3 Fire/Smoke	Manual	Immediately stop unit		Serious
M41	Belimo 4 Offline	Semiautomatic	Immediately stop unit		Serious
M42	Belimo 4 probe fault	Semiautomatic	Depends on probe function		Minor
M43	Belimo 4 Fire/Smoke	Manual	Immediately stop unit		Serious
M51	Belimo 5 Offline	Semiautomatic	Immediately stop unit		Serious
M52	Belimo 5 probe fault	Semiautomatic	Depends on probe function		Minor
M53	Belimo 5 Fire/Smoke	Manual	Immediately stop unit		Serious
M61	Belimo 6 Offline	Semiautomatic	Immediately stop unit		Serious
M62	Belimo 6 probe fault	Semiautomatic	Depends on probe function		Minor
M63	Belimo 6 Fire/Smoke	Manual	Immediately stop unit		Serious
M71	Belimo 7 Offline	Semiautomatic	Immediately stop unit		Serious
M72	Belimo 7 probe fault	Semiautomatic	Depends on probe function		Minor
M73	Belimo 7 Fire/Smoke	Manual	Immediately stop unit		Serious
M81	Belimo 8 Offline	Semiautomatic	Immediately stop unit		Serious
M82	Belimo 8 probe fault	Semiautomatic	Depends on probe function		Minor
M83	Belimo 8 Fire/Smoke	Manual	Immediately stop unit		Serious
O01	BMS offline alarm	Automatic	Replace BMS probes with backup probes		Serious
P01	Cooling pump 1 flow warning	Automatic	Perform number of attempts set on Ha10		Minor
P02	Cooling pump 2 flow warning	Automatic	Perform number of attempts set on Ha10		Minor
P03	Cooling pump 1 flow alarm	Manual	Depends on the no. of pumps		Serious
P04	Cooling pump 2 flow alarm	Manual	Depends on the no. of pumps		Serious
P05	Cooling pump 1 thermal overload alarm	Manual	Depends on the no. of pumps		Serious
P06	Cooling pump 2 thermal overload alarm	Manual	Depends on the no. of pumps		Serious
P07	Preheating pump 1 flow warning	Automatic	Perform number of attempts set on Ha10		Minor
P08	Preheating pump 2 flow warning	Automatic	Perform number of attempts set on Ha10		Minor
P09	Preheating pump 1 flow alarm	Manual	Depends on the no. of pumps		Serious
P10	Preheating pump 2 flow alarm	Manual	Depends on the no. of pumps		Serious
P11	Preheating pump 1 thermal overload alarm	Manual	Depends on the no. of pumps		Serious
P12	Preheating pump 2 thermal overload alarm	Manual	Depends on the no. of pumps		Serious
P13	Reheating pump 1 flow warning	Automatic	Perform number of attempts set on Ha10		Minor
P14	Reheating pump 2 flow warning	Automatic	Perform number of attempts set on Ha10		Minor
P15	Reheating pump 1 flow alarm	Manual	Depends on the no. of pumps		Serious
P16	Reheating pump 2 flow alarm	Manual	Depends on the no. of pumps		Serious
P17	Reheating pump 1 thermal overload alarm	Manual	Depends on the no. of pumps		Serious
P18	Reheating pump 2 thermal overload alarm	Manual	Depends on the no. of pumps		Serious
S11	Serial humidity probe 1 fault	Semiautomatic			Minor
S12	Serial probe 1 offline	Semiautomatic			Minor
S13	Serial temperature probe 1 fault	Semiautomatic			Minor
S21	Serial humidity probe 2 fault	Semiautomatic			Minor
S22	Serial probe 2 offline	Semiautomatic			Minor
S23	Serial temperature probe 2 fault	Semiautomatic			Minor
S31	Serial humidity probe 3 fault	Semiautomatic			Minor
S32	Serial probe 3 offline	Semiautomatic			Minor
S33	Serial temperature probe 3 fault	Semiautomatic			Minor
S41	Serial humidity probe 4 fault	Semiautomatic			Minor
S42	Serial probe 4 offline	Semiautomatic			Minor
S43	Serial temperature probe 4 fault	Semiautomatic			Minor
S51	Serial humidity probe 5 fault	Semiautomatic			Minor

Code	Description	Type of reset	Effect on control	Alarm: Serious (G) Minor (L)
S52	Serial probe 5 offline	Semiautomatic		Minor
S53	Serial temperature probe 5 fault	Semiautomatic		Minor
S61	Serial humidity probe 6 fault	Semiautomatic		Minor
S62	Serial probe 6 offline	Semiautomatic		Minor
S63	Serial temperature probe 6 fault	Semiautomatic		Minor
T01	Humidifier maintenance warning	Manual	Reset service hours (Gf*)	Minor
T02	Supply fan 1 maintenance warning	Manual	Reset service hours (Gf*)	Minor
T03	Return fan 1 maintenance warning	Manual	Reset service hours (Gf*)	Minor
T04	Cooling pump 1 maintenance warning	Manual	Reset service hours (Gf*)	Minor
T05	Cooling pump 2 maintenance warning	Manual	Reset service hours (Gf*)	Minor
T06	Preheating pump 1 maintenance warning	Manual	Reset service hours (Gf*)	Minor
T07	Preheating pump 2 maintenance warning	Manual	Reset service hours (Gf*)	Minor
T08	Preheating pump 1 maintenance warning	Manual	Reset service hours (Gf*)	Minor
T09	Preheating pump 2 maintenance warning	Manual	Reset service hours (Gf*)	Minor
T10	Reheat heater 1 warning	Manual	Reset service hours (Gf*)	Minor
T11	Reheat heater 2 warning	Manual	Reset service hours (Gf*)	Minor
T12	Reheat heater 3 warning	Manual	Reset service hours (Gf*)	Minor
T13	Heat wheel warning	Manual	Reset service hours (Gf*)	Minor
T14	Warning supply fan 2 maintenance	Manual	Reset service hours (Gf*)	Minor
T15	Warning return fan 2 maintenance	Manual	Reset service hours (Gf*)	Minor
T16	Reheat heater 4 warning	Manual	Reset service hours (Gf*)	Minor
T17	Preheat heater 1 warning	Manual	Reset service hours (Gf*)	Minor
T18	Preheat heater 2 warning	Manual	Reset service hours (Gf*)	Minor
T19	Preheat heater 3 warning	Manual	Reset service hours (Gf*)	Minor
T20	Preheat heater 4 warning	Manual	Reset service hours (Gf*)	Minor
U01	Generic alarm from digital input	Automatic	Stop unit	Minor
U02	Serious alarm from digital input	Manual	Stop unit	Serious
U03	Supply filter 1 alarm	Automatic		Minor
U04	Supply filter 2 alarm	Automatic		Minor
U05	Return filter alarm	Automatic		Minor
U06	Smoke/fire alarm	Manual	Immediately stop unit	Serious
U07	Open door alarm	Manual	Immediately stop unit	Serious
U08	Dirty filter alarm	Automatic		Minor
V11	Supply VFD offline	Semiautomatic	Immediately stop unit	Serious
V12	Supply VFD alarms 1-2-3-5	Semiautomatic	Ha04 / effect global / total shutdown individual / stop supply fan and control devices	Serious / Minor
V13	Supply VFD alarms 9-11-13-14-15	Semiautomatic		Serious / Minor
V14	Supply VFD alarms 16-17-22-25-29	Semiautomatic		Serious / Minor
V15	Supply VFD alarms 34-40-41-50-51	Semiautomatic		Serious / Minor
V16	Supply VFD alarms 52-53-54-55	Semiautomatic		Serious / Minor
V21	Return VFD offline	Semiautomatic	Immediately stop unit	Serious
V22	Return VFD alarms 1-2-3-5	Semiautomatic		
V23	Return VFD alarms 9-11-13-14-15	Semiautomatic	Ha04 / effect global / total shutdown individual / stop return fan	
V24	Return VFD alarms 16-17-22-25-29	Semiautomatic		
V25	Return VFD alarms 34-40-41-50-51	Semiautomatic		
V26	Return VFD alarms 52-53-54-55	Semiautomatic		
Z01	No active alarms			
Z02	Alarms reset			

Tab. 11.j

12. PCO MANAGER

12.1 Installation

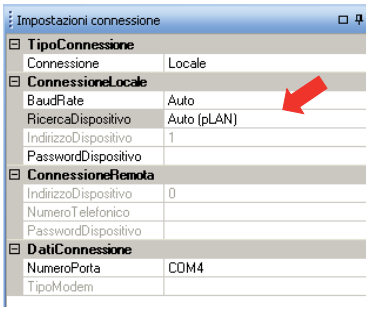
On the http://ksa.carel.com website, under the pCO sistema section, select pCO_manager. After having accepted the general license conditions for free use of the software, a dialogue box is displayed for downloading the pCO_manager.zip file.

12.2 PC - pCO controller connection

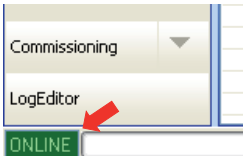
The computer's USB port must be connected via cable to the USB/RS485 converter and this must be connected via a telephone cable to the pLAN port on the pCO.
When opening the pCO_manager program, a screen is shown with the connection settings at the top right. Choose:

1. local connection;
2. baudrate: Auto;
3. search device: Auto (pLAN).

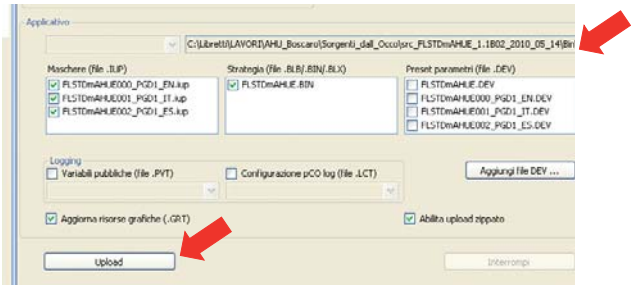
As regards the port number, follow the instructions in the wizard for automatic recognition (e.g. COM4).



Power down the controller and then power up again, click the button to make the connection; once connected the "ONLINE" icon will flash in the bottom left corner.

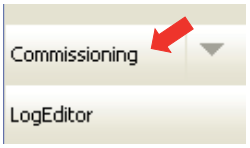


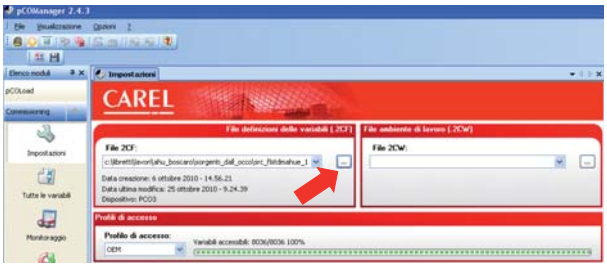
Select the directory where the application files are located and select "Upload" to load the application to the pCO controller.



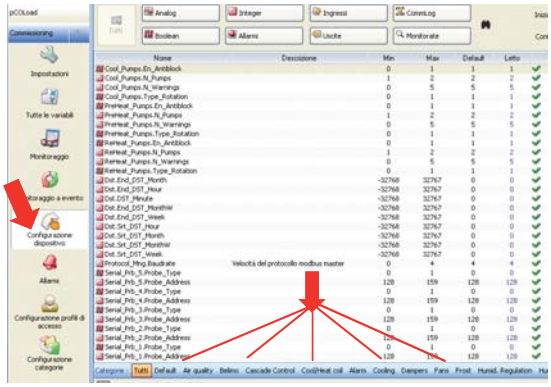
12.3 Commissioning

Use the mouse to select "commissioning" at the bottom left. A new work area will be displayed. Select the directory where the ".2cf" files are located.



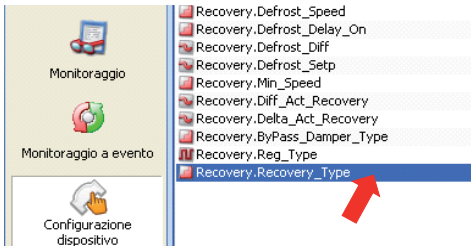


Select the configure device function to show all the application variables. These can be selected based on the categories shown below:



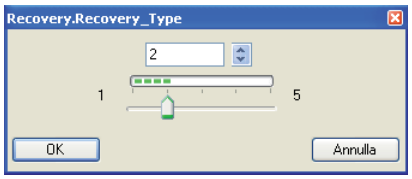
Setting a parameter

Choose the category of parameters and then the desired parameter: this will be highlighted in blue (e.g. recovery.recovery_type).

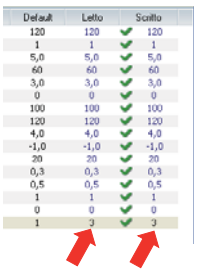


To set the parameter:

1. double click the "read" column. A dialogue box is displayed for entering the new value of the parameter.



2. choose the new value (e.g. 3) and then click OK. The new value will be shown in the "written" column. To write the parameter to the pCO controller, press the right mouse button and then select "write selected". The value will be shown in the "written" column as confirmation.



At the end, select "Save" to generate the ".2cw" project file.

CAREL

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