EN7630117-00

10 - 2023

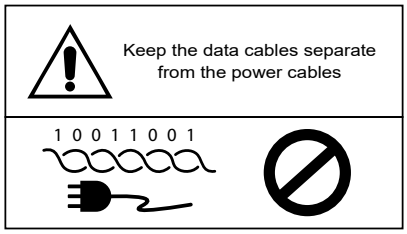
DFU control

Advanced control and managament system

USER MANUAL

SAFETY SYMBOLS

WARNING



	READ CAREFULLY
	WARNING
	DANGER VOLTAGE

GENERAL WARNINGS

TRANSLATION BY ORIGINAL INSTRUCTIONS

Keep this manual intact and in good condition for the entire service life of the machine.

Read all of the information contained herein carefully, with particular attention to the parts marked with “Important” and “Attention”;

Failure to observe the instructions could cause damage to people or the machine.

In case of malfunction consult this manual and, if necessary, contact your nearest Carrier assistance centre.

Installation and maintenance operations must be performed by qualified staff, unless stated otherwise in this manual. Before performing any procedure on the unit, disconnect the voltage to the machine.

Failure to observe the regulations reported in the manual will cause the warranty to lapse immediately.

Carrier will not be held liable for any damage deriving from improper use of the machine or failure to observe the regulations reported in this manual and on-board the unit.

This appliance is not intended to be used by children or persons with physical, sensorial or mental problems, inexpert or unprepared, without supervision. Be careful that children do not approach the appliance.

Upon reception of the appliance check its conditions, verifying that it has there is no damage due to transport.

For the installation and news of any accessories please refer to the related technical data sheets.

CONTENTS

1 - GENERAL CHARACTERISTICS

The application software is developed for the command and control of heat recovery units and compact air handling units with water coils or/and with direct expansion coils (without integrated refrigeration unit).

The software is designed to manage ventilation, air quality, heat recovery, heat treatment and filtration control.

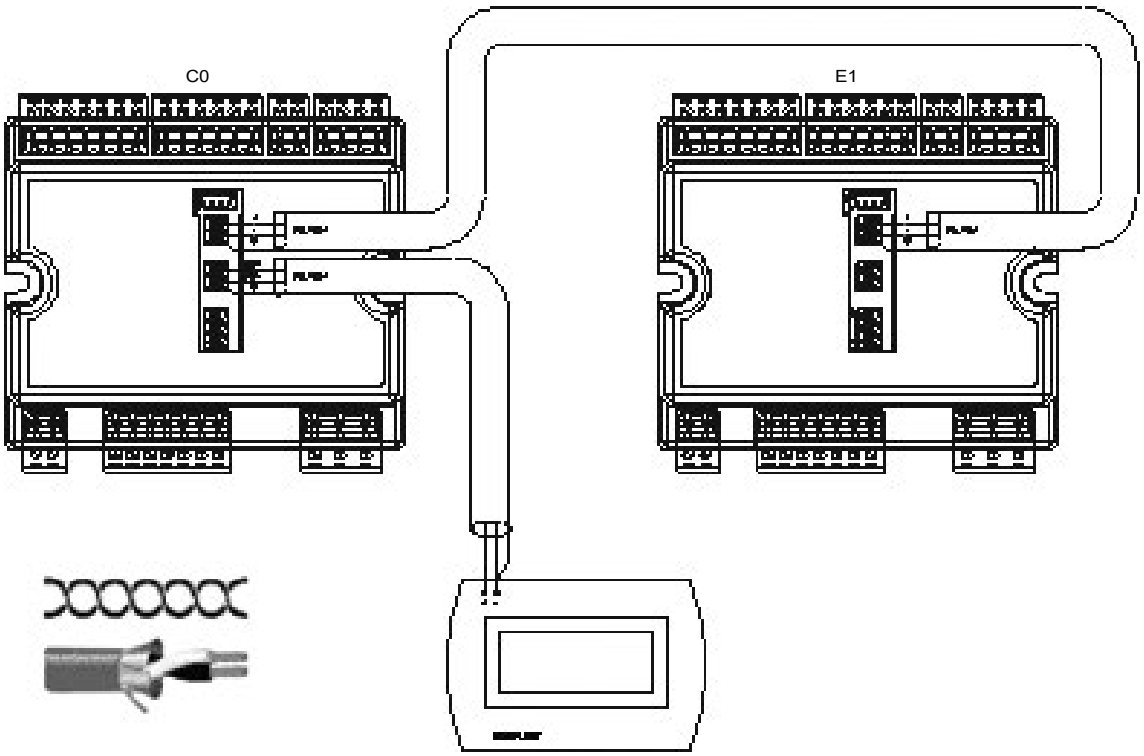
The software is equipped with various functions for the maximum energy efficiency to obtain the desired set point (through smart activation of the devices, to consume as little energy as possible), as well as advanced protection functions for the recuperator devices (e.g. defrosting of the recuperator, antifreeze functions, monitoring of the safety thermostats, delayed shutdown for electric batteries proper heat dissipation, dedicated minimum ventilation with electric heating devices, etc.).

The control system is composed by:

- Power board containing the power supply circuit, the microprocessor system and the connectors for connecting the input and output devices;
- Controller expansion (optional) containing the power supply circuit, the microprocessor system and the connectors for connecting the input and output devices; Required when the enabled functions exceed those supported by the main board;
- User interface consisting of graphic display and keyboard (six keys) equipped with clock and probe for reading the ambient temperature.

WARNING:The connection between the I/O board and the user unit is set up using the relative connectors and a data transmission cable fitted with a pair of twisted conductors and shielding.

The device is equipped with a serial port of type RS485 and uses a modbus RTU communication protocol; this makes it compatible with all systems BMS on the market.



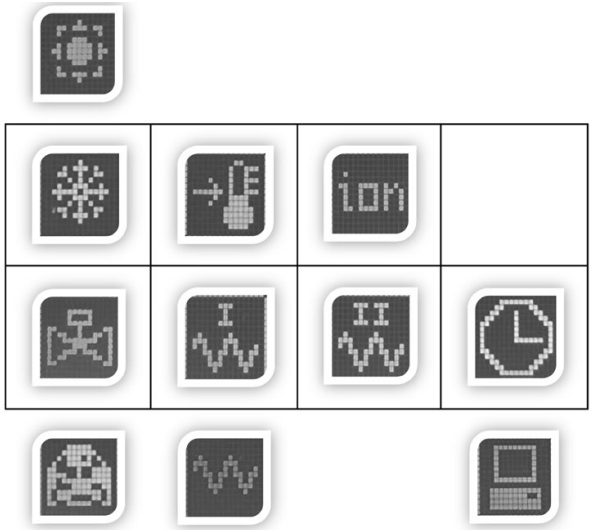
2 - MAIN FUNCTIONS (DEPENDING CONFIGURATION OF THE UNIT PURCHASED)

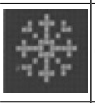
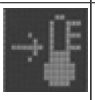
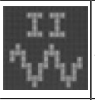
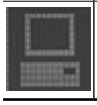
- Setting of the parameters dedicated to the operation of the machine protected by password.
- Ventilation control:
  - Constant or variable speed according to the set temperature.
  - Flow control settable from the display.
  - Pressure control settable from the display.
  - Air quality control and fan speed variation.
- Management of the recuperator by-pass damper (freecooling / freeheating) based on the relationship between the external and return air temperatures.
- Dirty filter monitoring function with display signalling.
- Recovery section antifreeze function:
  - Standard function with flow unbalancing, signaling via display and subsequent block in the event of a prolonged alarm; to protect the machine. Optional function with electric heater with 2 intervention steps; also in this case the prolonged permanence in the alarm phase leads to the blocking of the machine to preserve the internal devices.
- Management of several main treatment resources:
  - Cooling water coil only with modulating type control.
  - Hot/cold water coil with modulating type control.
  - Cold or hot/cold direct expansion coil with modulating type control (without management of the refrigeration cycle)
- Heating resource management:
  - Water coil with on/off or modulating type control.
  - Electric heater with two steps; with monitoring of safety thermostats.
  - Modulating electric heater; with monitoring of safety thermostats.
- Management of the post ventilation for the dissipation of the heat generated by the electric heaters.
- Possibility to select the control probe:
  - Return, supply, display (ambient).
- Selectable summer / winter switching:
  - Keypad, external contact, via BMS, automatic.
- Management of external shutters with fan activation delay.
- Control software realized in 3 languages (French, Italian, English).
- Operation with TIME BANDS.
- Digital input for remote ON/OFF.
- Digital input for Summer / Winter.
- Digital output with dry contact configurable:
  - (general alarm, filter alarm, on/off status, high temperature alarm, summer/winter)

3 - USER INTERFACE

For a better understanding we will divide the main screen into two boxes (which will be referred to as left box and right box in the following) divided by a vertical dividing line (not actually present in the display).

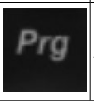
- In the top left box we can read the temperature of the control probe (Display, Return, Supply) based on the configuration of the recovery unit.
- In the box on the right we find the following information, starting from the top the ON / OFF indication, the active ventilation symbol and the set in use
- In the lower left box we find all the status symbols, some in a fixed position, others alternate.



	Operating mode indication: HEATING
	Operating mode indication: COOLING
	Heat recovery antifreeze electric coil in operation
	Sanification enable
	Water valve in operation
	Direct expansion coil in operation
	1 step heating electric coil in operation
	2 step heating electric coil in operation
	Modulating electric heating coil in operation
	Time slots enabled
	Serial communication with supervision system active

4 - KEYBOARD

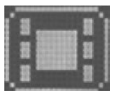
The user interface keys are 6; the basic functions associated with each key are indicated below.

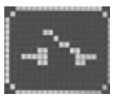
	View the list of active alarms and the history. Press for 3 seconds to reset the active alarm.
	Access to the main menu.
	Return to the previous mask.
	Browse through the display masks or value increase
	Allows you to switch from viewing to change of the parameters; Confirm value and return to parameter list.
	Navigate through the display masks or value decrease. During normal operation, it allows access to the menu for machine turn on/off.

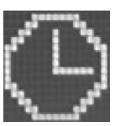
4.1 - Main user functions:

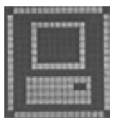
4.1.1 - Turn on/off

The on-off procedure can be performed in various ways.

 Display

 Remote contact

 Time slots

 From supervision (BMS)

4.2 - Turn on / off from the display

		From the main screen press the “down arrow” key
		Confirm switching on with the Enter key.
		The machine is operation

4.3 - Turn on / off from remote contact

	When the open contact symbol appears, it means that the remote ON/ OFF function has been enabled (factory default) and the contact enabled for the function is open. Once the contact is closed, the machine can start up directly (if left ON from the display) or remain OFF waiting for start-up from the display.
	

4.4 - Time bands turn on / off

When the “clock” symbol appears, it means that the time bands function has been enabled. The function can be activated by the end user via a menu screen (for information on programming and enabling the time slots, refer to the next chapters). In this mode, the machine will switch on and off according to the programming carried out in the “time bands” menu. However, it will be possible to intervene on and off at any time via the display.

4.5 - Turn on / off by supervision (BMS)

When the “computer” symbol appears, it means that the supervision function (BMS) has been enabled; in addition to switching on / off, this function allows total control of the machine via Modbus protocol. The function can be activated by a technician via a menu screen (for information on scheduling and enabling time slots, see next chapters). With this mode the machine will turn on and off controlled by the BMS system. However, it will be possible to intervene on the turn on and on the turn off at any time via the display.

ATTENTION: if the “computer” symbol flashes, it means that the machine is not connected to the supervisory system

If under the OFF symbol appears the display symbol means that the machine is turned off by keyboard; this has priority over the turn on from BMS; you will have to turn on via display (see previous chapters), only then the command passes to the BMS system.

4.6 - Screens available

		From the main screen, by pressing the “down arrow” key, we can scroll through the entire menu dedicated to machine operation.
		Turn on
		Return to previous page

	Modify the temperature set (editable)		Change summer / winter mode (editable)
	Enabling time slots (editable)		Reading of return or room temperature (in case of regulation in return)
	Supply temperature reading (in case of return control)		Reading of the external air probe

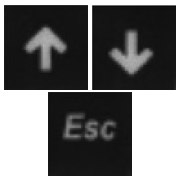
	Reading of the recuperator antifreeze probe		Supply fan speed reading (1)
	Return fan speed reading (1)		Valve opening reading (cold – hot/cold)
	Heating load (%)		Fan reading working hours

To modify the values of the editable fields		
		
Press enter to modify	Modify the value with the arrows	Confirm with enter

(1) The screens concerning the ventilation control depend on the mode selected during the purchase phase. for the various types of control, please refer to the next section. the control mode is programmed in the factory.

EC - Constant rpm control

The speed can be changed from the display; the range depends on the configuration, models with electric heater have higher minimum speeds to prevent their overheating.

			 Modify the value with the arrows
			 Navigate the menu with the arrows; Esc to exit

EC - Constant flow control

The flow vset is set in the factory or during the start-up phases by the technician; this cannot be changed from the display (user available screens).

What you read in the following screens is the current reading of the measured flow rate.

EC - Constant pressure control

The pressure set is set in the factory or during the start-up phases by the technician; this cannot be changed from the display (user available screens).

What you read in the following screens is the current reading of the measured pressure.

5 - VENTILATION REGULATION

EC - Quality control with IAQ (CO_2/VOC) probe

The quality set (CO_2 and VOC) is set in the factory or during the start-up phases by the technician; this cannot be changed from the display (user available screens).

What you read in the following screenshots is the current air quality reading.

The fan speed increases as you move away from the set point.

The software parameters Are set by the factory based on the configuration of the unit Purchased.

5.1 - Menu

The menu can be accessed both from the machine on (main screen) and from the machine off.

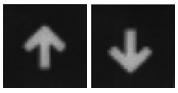
We recommend accessing the menu only if necessary and only with the machine off.

Some menu items are password protected.

Some menu items can only be consulted and modified by expert personnel.

Some items in the menu can only be consulted and modified by the manufacturer of the machine.

5.2 - Navigate in the menus and modify the parameters

To navigate and enter the sub-menus		
		
Navigate the menu with the arrows	Press enter to enter	Press ESC to exit
To modify the values of the editable fields		
		
Press enter to modify	Modify the value with the arrows	Confirm with enter

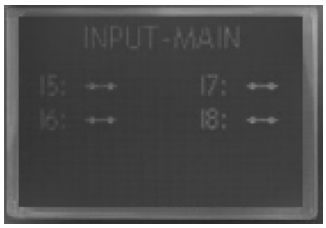
5 - VENTILATION REGULATION

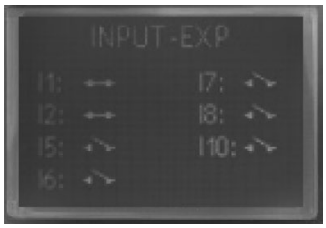
	⚠	Machine configuration menu. Protection password XX Access to this section is for the exclusive use of the manufacturer. Changing these parameters could compromise correct operation
	⚠	Regulation menu Protection password XX The access to this section is for the exclusive use of a specialized technician. Changing these parameters could compromise correct operation.
		Clock setup menu Access to this section allows you the clock and calendar setting; necessary procedure for the correct functioning of the time slots.
	⚠	Serial communication menu Protection password XX The access to this section is for the exclusive use of a specialized technician. The modification of these parameters allows the machine to be inserted in a network for control via BMS
		Input / output status menu It is a section dedicated to reading the digital inputs and analog outputs of the controller. Menu used during the installation or testing phase.
	⚠	Outputs test menu Protection password XX The access to this section is for the exclusive use of a specialist technician. It allows to activate the outputs and the actuators connected to them. Menu used during installation or testing.
		Time slot menu It allows you to set three different sets for each hour of the day of the whole week. It also allows you to program automatic turn on and turn off.
		Software version information menu Indicates the software version installed in the machine.

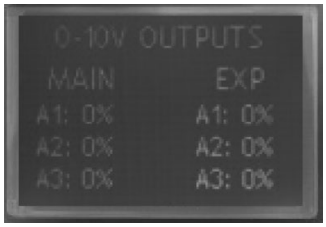
5.3 - Clock setup menu

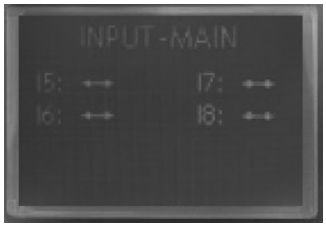
The access to this section allows you the clock and calendar setting; necessary procedure for the correct functioning of the time slots.

5.4 - Menu inputs/ outputs status





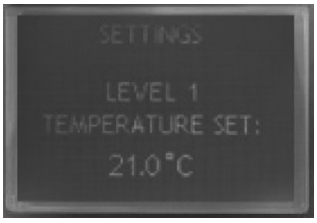




It is a section dedicated to reading the digital inputs and analog outputs of the controller of both the main and the expansion module (if installed; the expansion module is combined with some accessories)

This function is only for display and is particularly useful during installation or testing phase.

5.5 - Time bands menu



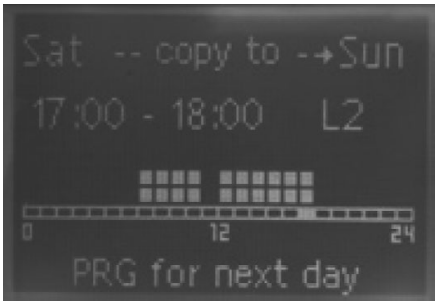
In the first 6 screens we have the possibility to set the 3 levels of both temperature and ventilation (in models without flow control) that you would like to alternate in the various time slots.

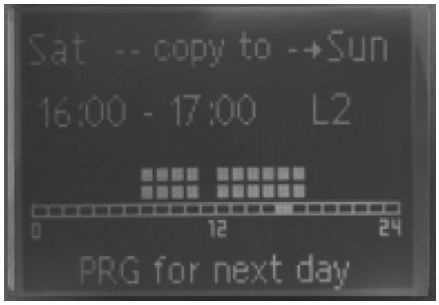
Note: To change values and move in the menu, refer to chapter:

NAVIGATE IN THE MENUS AND MODIFY THE PARAMETERS

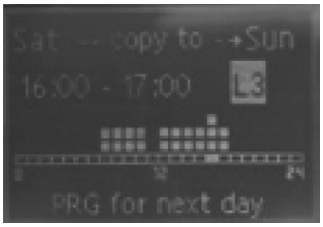
1. Day to be modified
2. Time slot to be modified
3. Slider to change the time slot (up/down to scroll)
4. Day in which duplicate
5. Set point
6. Set band (up/down to modify)

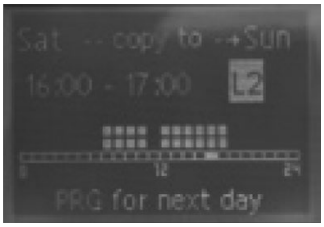
To scroll through the days of the week press the button	
To scroll through the hours within the day	

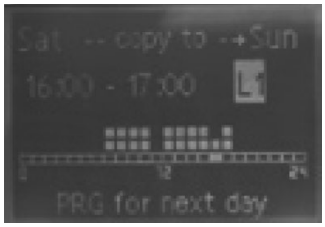


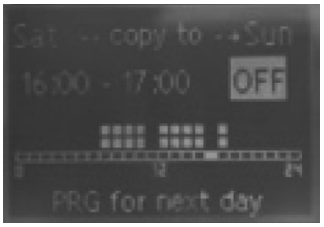


To select the time to be changed press the button





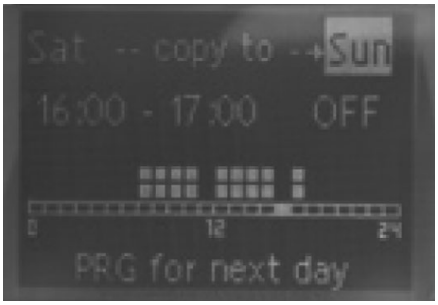


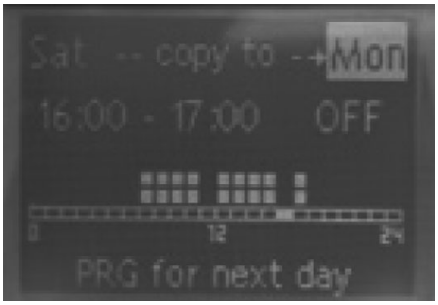


To change the level of each band
You can also set the shutdown

To confirm

To copy the day just modified press simultaneously





To select the day on which copy

To confirm

5.6 - Menu software version information

Indicates the version of software installed on the machine.

6 - ALARMS

Any alarms are signaled on the main screen; some of these cause the stop of the machine, others are only for signalling.

The reset of the alarm signal can be automatic, i.e. when normal conditions are restored, the signal disappears; or manual, which requires user intervention.

TO VERIFY WHICH IS THE ALARM

To reset an alarm press and keep pressed the “bell” button for 3 / 5 seconds

When an alarm stops the machine, the “on” symbol flashes in these cases we recommend contacting the technical assistance service

6.1 - Alarms list

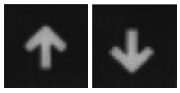
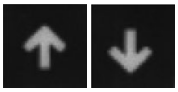
Code	English	Rearmament	Blocking
AL01	Outlet fan	MANUAL	YES
AL02	Inlet fan	MANUAL	YES
AL03	Clogged filter	AUTOMATIC	NO
AL04	Pre-heating electrical heaters	MANUAL	NO
AL06	Heat recovery antifreeze electric heaters	MANUAL	NO
AL08	Room air temperature probe	AUTOMATIC	NO (1)
AL09	Supply air temperature probe	AUTOMATIC	NO (1)
AL10	External air temperature probe	AUTOMATIC	NO
AL12	Heat recovery temperature probe	AUTOMATIC	NO
AL15	Serious alarm by digital input	MANUAL	YES
AL16	Alarm by digital input	MANUAL	NO
AL17	High room temperature	AUTOMATIC	NO
AL18	Low room temperature	AUTOMATIC	NO
AL21	Heat recovery antifreeze failure	MANUAL	YES
AL23	Expansion board offline	MANUAL	NO

(1) They only block the thermoregulation

7 - INSTALLER MAIN FUNCTIONS

	⚠	Regulation menu Protection password XX The access to this section is for the exclusive use of a specialized technician. Changing these parameters could compromise correct operation.
	⚠	Serial communication menu Protection password XX The access to this section is for the exclusive use of a specialized technician. The modification of these parameters allows the machine to be inserted in a network for control via BMS

7.1 - Navigate in the menus and modify the parameters

To navigate and enter the sub-menus		
		
Navigate the menu with the arrows	Press enter to enter	Press ESC to exit
To modify the values of the editable fields		
		
Press enter to modify	Modify the value with the arrows	Confirm with enter

7.2 - Regulation parameter list

Parameter	Description	Range	Default
	REGULATION (Password = 108)		
R0	Minimum temperature setpoint limit	0/MAX	20,0 °C
R1	Maximum temperature setpoint limit	MIN/99,9 °C	30,0 °C
R2	Control type	PROPORTIONAL / PROP+INTEGRAL	PROP+INTEGRAL
R3	Cooling prop. band	0/15 °C	3,0 °C
R4	Heating prop. band	0/15 °C	3,0 °C
R5	Integral time	0/999 s	90 s
R6	Neutral zone	0/15 °C	0,5 °C
R11	Fan minimum value	20/100%	60%
R12	Fan maximum value	MIN/100%	60%
R13	Air probe offset	-99,9/99,9 °C	0,0 °C
R14	Supply probe service	-99,9/99,9 °C	0,0 °C
R15	External probe offset	-99,9/99,9 °C	0,0 °C
R16	Recovery probe offset	-99,9/99,9 °C	0,0 °C
R19	Supply temperature control	NO/YES	NO
R22	Higt room temperature alarm threshold	0/99,9 °C	30,0 °C
R23	Low room temperature alarm threshold	0/99,9 °C	10,0 °C
R29	Antifreeze set	-99,9/99,9	1°C
R30	Antifreeze differential	0,0/99,9	3,0
R31	Fan start delay	0/250 s	150 s
R32	Unit on/off enabled by password	NO/SI	NO
R33	Recovery delta temp.	0,0/99,9	5,0°C
R34	Recovery hysteresis	0,0/99,9	3,0°C
R35	Minimum fan speed with heaters on	VEL MIN/VEL MAX	65%

Parameter	Description	Range	Default
R36	Antifreeze alarm delay	0/999	180 s
R37	Supply fan pressure set	0/9999	300 Pa
R38	Return fan pressure set	0/9999	300 Pa
R39	Supply fan flow set	0/9999	1000 m³/h
R40	Return fan flow set	0/9999	1000 m³/h
R43	Fan regulation band	0/9999	100 Pa
R44	Fan regulation dead zone	0/9999	10
R45	Fan regulation band	0/9999	200 m³/h
R46	Fan regulation dead zone	0/9999	20 m³/h
R47	Fan regulation minimum steps	0/100	50
R48	Fan regulation timing	0/100	10s
R49	Fan regulation multiplier factor	0/100	2
R50	Fan regulation divider factor	0/100	2
R51	Set CO_2	0/2000	1200
R52	CO_2 differential	0/2000	400
R53	Set voc	0/100	50
R54	Voc differential	0/100	20
R55	Water valve minimum opening	0/100	0
R56	Water valve maximum opening	0/100	100
R57	Standby valve opening (summer)	0/100	0
R58	Standby valve opening (winter)	0/100	0
R61	Air flow alarm starting delay	0/220	30
R62	Air flow alarm running delay	0/220	20
R64	Fan switch-off delay	0/999	60s

7.3 - Communication parameter list

Page	Description	Range	Default
Network and connections (Password = 108)			
S0	Node configuration	NOT LINKED	NOT LINKED
		LAG	
		LEAD	
S1	Protocol	MODBUS	MODBUS
S2	Serial address	0/255	0
S3	Baudrate	1200	19200
		2400	
		4800	
		9600	
		19200	
		38400	
S4	Enable on/off bay serial	YES / NO	NO
S5	Enable set temp. by serial	YES / NO	NO
S6	Enable flow set by serial	YES / NO	NO

7.4 - Serial variable list

Address	Description
1	ON/OFF unit status
2	General alarm
3	Clogged filter alarm
4	Air flow alarm – supply fan
5	Air flow alarm – return fan
6	Contact alarm – supply fan
7	Contact alarm – return fan
8	Pre-heating electrical heaters alarm
9	Post-heating electrical heaters alarm
10	Recovery-heating electrical heaters alarm
11	Humidifier alarm
12	Jonix failure
13	Jonix mainteinance
14	Recovery antifreeze alarm
15	Room humidity probe alarm
16	Delivery temperature probe alarm
17	Recovery temperature probe alarm
18	Outdoor temperature probe alarm
19	Humidity probe alarm
20	High room temperature alarm
21	Low room temperature alarm
22	High room humidity alarm
23	Low room humidity alarm
24	Exchanger temperature probe alarm
25	Supply fan on
26	Return fan on
27	Pre-heating electrical heaters on
28	Post-heating electrical heaters on
29	Heat-recovery electrical heaters on
30	Heat recovery on
31	External damper on
32	Main valve on
33	Pre-heating valve on
34	Post-heating valve on
35	Summer/winter status
36	Digital output 1 status
37	Digital output 2 status
38	Digital output 3 status
39	Digital output 4 status
40	Digital output 5 status
41	Digital output 6 status
42	Digital output 7 status
43	Expansion digital output 1 status
44	Expansion digital output 2 status
45	Expansion digital output 3 status
46	Expansion digital output 4 status
47	Expansion digital output 5 status
48	Expansion digital output 6 status
49	Expansion digital output 7 status

7.5 - Read/write digital variables (coil status)

Address	Description
1	Unit ON/OFF
2	Summer/winter mode

7.6 - Only read register (input register)

Address	Description
1	Temperature
2	Room humidity
3	Heat recovery antifreeze temperature
4	Delivery temperature
5	Outdoor temperature
6	Exchanger antifreeze temperature
7	(not used)
8	Temperature set active
9	Humidity set active
10	Supply fan speed
11	Return fan speed
12	Main valve opening
13	Pre-heating valve opening
14	Post-heating valve opening
15	CO_2 value [ppm]
16	Voc value [%]
17	Mix damper opening
18	Analogue output 1
19	Analogue output 2
20	Analogue output 3
21	Analogue output 1 – expansion board
22	Analogue output 2 – expansion board
23	Analogue output 3 – expansion board
24	Supply fan differential pressure
25	Return fan differential pressure
26	Supply fan flow
27	Return fan flow

7.7 - Read/write register (holding register)

Address	Description
1	Room temperature set
2	Room temperature set minimum value
3	Room temperature set maximum value
4	Room humidity set
5	Room humidity set minimum value
6	Room humidity set maximum value
7	Supply fan speed
8	Return fan speed
9	Main fan flow set
10	Inlet fan flow set

7.8 - Communication parameters

Baudrate: 9600 (default); Format: none parity, 8 data-bit, 1 stop-bitù

7.9 - Modbus functions available

Address	Description
15	Write multiple coil status
16	Write multiple holding register

The quality management system of this product's assembly site has been certified in accordance with the requirements of the ISO 9001 standard (latest current version) after an assessment conducted by an authorized independent third party.
Please contact your sales representative for more information.

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