

humiFog multizone

pumping unit

CAREL



(ENG) User manual

**LEGGI E CONSERVA
QUESTE ISTRUZIONI!**
**READ AND SAVE
THESE INSTRUCTIONS**



H i g h E f f i c i e n c y S o l u t i o n s

WARNINGS



CAREL INDUSTRIES Hq humidifiers are advanced products, whose operation is specified in the technical documentation supplied with the product or can be downloaded, even prior to purchase, from the website www.carel.com. Each CAREL INDUSTRIES Hq product, in relation to its advanced level of technology, requires setup/configuration/programming/commissioning 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 INDUSTRIES Hq accepts no liability in such cases.

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 INDUSTRIES Hq may, based on specific agreements, act as a consultant for the installation/commissioning/use of the unit, however in no case does it accept liability for the correct operation of the humidifier and the final installation if the warnings or suggestions provided in this manual or in other product technical documents are not heeded. In addition to observing the above warnings and suggestions, the following warnings must be heeded for the correct use of the product:

- **DANGER OF ELECTRIC SHOCK**

- The humidifier contains live electrical components. Disconnect the mains power supply before accessing inside parts or during maintenance and installation;

- **DANGER OF WATER LEAKS**

- The humidifier automatically and constantly fills/drains certain quantities of water. Malfunctions in the connections or in the humidifier may cause leaks;

- **For isothermal humidifiers: DANGER OF BURNS**

- The humidifier contains high temperature components (100°C/212°F);

- **For gas-fired isothermal humidifiers: DANGER OF GAS LEAKS**

- The humidifier is connected to the gas mains. Malfunctions in the connections or inside the humidifier may cause gas leaks.
- The installation of the product must include an earth connection, using the special yellow-green terminal available in the humidifier.
- The environmental and power supply conditions must conform to the values specified on the product rating labels.
- The product is designed exclusively to humidify rooms either directly or through distribution systems (ducts). In addition, for adiabatic-water spray-pressure humidifiers, humidification also occurs through the atomisation rack.
- Only qualified personnel who are aware of the necessary precautions and able to perform the required operations correctly may install, operate or carry out technical service on the product.
- Only water with the characteristics indicated in this manual must be used for steam or water vapour production.
- Warning, demineralised drinking water must be used for adiabatic-water spray-pressure humidifiers (as specified in the manual). In addition, the particles of water not absorbed by the air must be removed into the droplet collection tank (in the humidification section) and by the droplet separator (at the end of the humidification section).
- All operations on the product must be carried out according to the instructions provided in this manual and on the labels applied to the product. Any uses or modifications that are not authorised by the manufacturer are considered improper. CAREL INDUSTRIES Hq declines all liability for any such unauthorised use.
- Do not attempt to open the humidifier in ways other than those specified in the manual.
- Observe the standards in force in the place where the humidifier is installed.
- Keep the humidifier out of the reach of children and animals.
- Do not install and use the product near objects that may be damaged when in contact with water (or condensate). CAREL INDUSTRIES Hq declines all liability for direct or indirect damage following water leaks from the humidifier.
- Do not use corrosive chemicals, solvents or aggressive detergents to clean the inside and outside parts of the humidifier, unless specifically indicated in the user manual.
- Do not drop, hit or shake the humidifier, as the inside parts and the linings may be irreparably damaged.
- For adiabatic-water spray-pressure humidifiers: the atomised water must be distributed using a special atomising 'rack' or through distribution systems specified by CAREL INDUSTRIES Hq
- For isothermal appliances: these are designed to produce steam at atmospheric pressure, and not pressurised steam. CAREL INDUSTRIES Hq does not recommend and waives all liability for the use of distribution devices other than those specified.

CAREL INDUSTRIES Hq 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 INDUSTRIES Hq in relation to its products is specified in the CAREL INDUSTRIES Hq general contract conditions, available on the website www.carel.com and/or by specific agreements with customers; specifically, to the extent where allowed by applicable legislation, in no case will CAREL INDUSTRIES Hq, its employees or subsidiaries 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 impossibility to use the product, even if CAREL INDUSTRIES Hq or its subsidiaries are warned of the possibility of such damage.

DISPOSAL



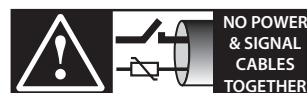
The humidifier is made up of metal parts and plastic parts. In reference to European Union directive 2002/96/EC issued on 27 January 2003 and the related national legislation, please note that:

1. WEEE cannot be disposed of as municipal waste and such waste must be collected and disposed of separately;
2. 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;
3. 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;
4. 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;
5. in the event of illegal disposal of electrical and electronic waste, the penalties are specified by local waste disposal legislation.

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

Approval: the quality and safety of CAREL INDUSTRIES Hq products are guaranteed by the ISO 9001 certified design and production system, as well as by the following marks.

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.



NO POWER & SIGNAL CABLES TOGETHER

READ CAREFULLY IN THE TEXT!

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1. INTRODUCTION AND ASSEMBLY

1.1 Description of humiFog

humiFog is a humidifier and adiabatic cooler that atomises demineralised water into very fine droplets that evaporate spontaneously in the air, which is humidified and cooled.

humiFog uses a volumetric pump to pressurise the water, which is atomised by special stainless steel nozzles.

The sophisticated control system combines the action of an inverter, which controls the speed and consequently the flow-rate of the pump, with a series of solenoid valves that activate only the nozzles that are necessary, allowing the system to always operate at the ideal pressure to atomise the water, across a wide range of flow-rates (a 5-100 % flow range working with a constant pressure of 14-100% for operating while controlling the flow).

The effect of cooling the air is due to the spontaneous evaporation of the droplets of water: the change in state from liquid to steam occurs by subtracting energy from the air that, as a consequence, is cooled. Each kilogram of water evaporated absorbs 0.69 kWh of heat from the air.

humiFog is a complete humidification and/or adiabatic cooling system that can be used both in AHUs (air handling units) and to humidify or cool industrial environments by spraying water directly into the environments. The term zone refers to both AHUs and industrial environments.

1.2 Components in the system

humiFog is made up of:

- a pumping unit that delivers the water at high pressure (25-70 bars). It also contains the electronic controller that completely manages the pumping unit, controlling the temperature/humidity in a zone (either AHU or environment) and managing any other zones connected to the pumping unit;
- The pumping unit can be set to operate:
 - with flow control (maximum precision, minimum energy and water consumption, only single zone applications);
 - at constant pressure (suitable for multizone applications where one pumping unit supplies the humidification and/or cooling system in different zones);
- distribution and atomisation system: system of pipes carrying the pressurised water that house the atomisation nozzles and, in general, the capacity-control solenoid valves and drain solenoid valves;
- droplet separator (only when installed in an AHU);
- temperature and/or humidity probes (if necessary);
- water treatment system: typically this is a reverse osmosis demineraliser that supplies water with a low mineral salt content to the humiFog.

1.3 humiFog system configurations

The humiFog system can be used in the following configurations:

- single zone: for humidification and/or cooling applications in a AHU or an industrial environment;
- multizone: for applications where one pumping unit (master) is used to supply multiple zones with pressurised water. The master will control one zone, in the sense that in relation to the zone probe readings or the external controller, it will activate and control the distribution and atomisation system so as to maintain the humidity or temperature level. All other zones will have a controller (slave electrical panel) that communicates with the master, and in relation to the zone probe readings or the external controller will activate and control the distribution atomisation system so as to maintain the humidity or temperature level.

One important configuration is for indirect adiabatic cooling applications: a pumping unit can be used to humidify the air in winter and to cool the discharged air in summer before it enters a heat recovery unit. This configuration is explained in detail in the chapters below.

humiFog humidifiers are available for:

- maximum flow-rates respectively of 100 l/h (UA100.), 200 l/h (UA200.), 320 l/h (UA320.), 460 l/h (UA460.), 600 l/h (UA600.);
- type of cabinet: H=single zone master; Z=multizone master; S=slave cabinet;
- power supply voltage: D= 230 V 50 Hz; U= 208 V 60 Hz;
- shows the version of the launched product (1 - 4)
- damper: 0=without damper; 1=with damper (only versions with 100 and 200 l/h flow-rate)
- features of the pump and circuits: 0= brass; 1=stainless steel; 2= stainless steel, silicon free

1.4 Supply water characteristics

Why does humiFog require demineralised water?

Humifog only works with demineralised water, to ensure:

- minimum maintenance;
- no blockage of the nozzles;
- no dust (the droplets that evaporate do not leave mineral salts in the AHU/environment);
- more hygiene.

The use of demineralised water is also required by standards such as UNI8883, VDI6022, VDI3803

humiFog must only be supplied with treated water, based on the limit values listed below. In normal circumstances, this means that the water must be treated using a reverse osmosis system.

recommended supply water characteristics	unit of measure	limits	
		min.	max.
bH (**) (pH)		6,5	8,5
Specific conductivity at 20°C (**) (σ _R , 20°C) for steel pump	μS/cm	0	30
Specific conductivity at 20°C (**) (σ _R , 20°C) for brass pump	μS/cm	30	50
Total hardness (**) (TH)	mg/l CaCO ₃	0	25
Temporary hardness	mg/l CaCO ₃	0	15
Total quantity of dissolved solids (cR)	mg/l	(*)	(*)
Dry residue at 180° (R180°C)	mg/l	(*)	(*)
Iron + Manganese	mg/l Fe+Mn	0	0
Chlorides	ppm Cl	0	10
Silicon dioxide	mg/l SiO ₂	0	1
Chlorine ions	mg/l Cl ⁻	0	0
Calcium sulphate	mg/l CaSO ₄	0	5

Tab. 1.a

(*) values depend on the specific conductivity; in general:

$$C_R \approx 0,65 * \sigma_{R, 20^\circ C}; R_{180} \approx 0,93 * \sigma_{R, 20^\circ C}$$

(**) main values to keep in consideration for every type installation.

⚠ Important: If the specific conductivity is less than 30 μS/cm, the stainless steel pump should be used.

⚠ Important: (**) for conductivity values around "0", contact CAREL INDUSTRIES for operating suggestions.

⚠ Caution: for conductivity higher than 1000 μS/cm, it is required to pre-treat the water before subjecting it to reverse osmosis.

⚠ Caution: the pump is able to operate at a maximum temperature of 40°C.

1.5 Periodic checks for consumables

Summary table of checks and maintenance:

Pump		
Check/Replace	monthly	every 1000 h
Water filters		X
Oil level	X	
Replace oil		X
Check/replacement gasket and valves		X

Attention: after the first 50 h of exercise you need to replace the oil pump.

Attention: if the "1000h" check does not identify any leaks or malfunctions, then the possibility to postpone the replacement shall be assessed. Typically, in optimum operating conditions, this process is necessary around 3000 h of operation.

Rack/distribution system	
visually check	every 1000 h
obstructed nozzles	X
solenoid valves	X
accessories	X
drain and water	X
droplet separator	X

Tab. 1.b

Installations in AHUs or ducts must also comply with national maintenance standards (ASHRAE 12-2000, VDI 6022, UNI 8884, VDI 3803, etc.)

Please note that:

- maintenance personnel must reset the hour counter after having performed the preventive maintenance operations listed in the columns "after 50 hours" and "every 1000 hours". If the hour counter is not reset, the maintenance warnings will no longer be signalled (to reset the hour counter, see the information under Section 9.8 Maintenance menu/submenu f/screen 02);
- maintenance personnel are responsible for any malfunctions due to a lack of preventive maintenance. The controller will display maintenance warning code "C5" after the first 50 hours and, subsequently, routine maintenance warning code "CL" every 2000 hours, as a reminder for the operations listed;
- failure to change the oil after the first 50 hours of operation may cause oil leaks and serious damage to the pumps, reducing operating life;
- maintenance signals do not stop the operation of humiFog.

1.6 Dimensions and weights

Humifog master

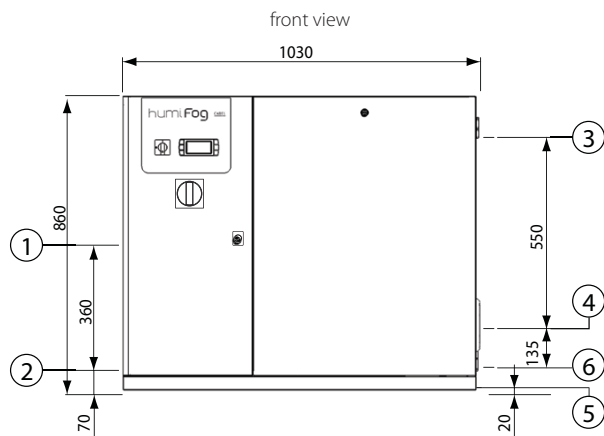


Fig. 1.a

detail of cabinet, water inlet/outlet side view

electrical connection side view

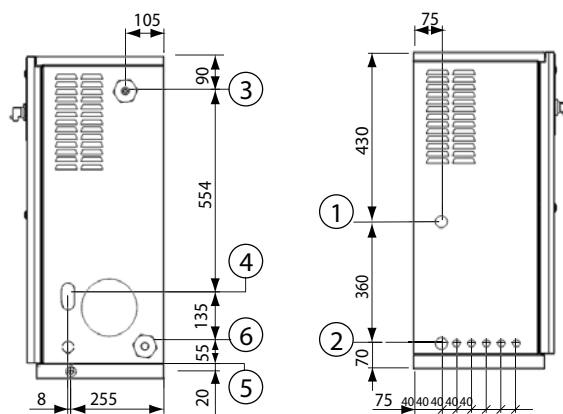


Fig. 1.b

Key:

1. power supply inlet;
2. terminal block inlet;
3. water inlet;
4. water outlet;
5. drain
6. drain bypass..



N.B.: inlets for electrical connections ready to be cut out, opening and cable gland installation to be performed by the installer

Packaging dimensions:

- height (H): 1020 mm (40.16 inch);
- width (W) 1100 mm (43.30 inch);
- depth (D) 455 mm (17.50 inch).

Weight of packaged humidifier:

- UA(100,200)(H,Z)4** models: 100 kg (220 lb);
- UA(320,460)(H,Z)4** models: 110 kg (240 lb);
- UA600(H,Z)4** models: 120 kg (265 lb);
- UA1K0(H,Z)4** models: 125 kg (276 lb);

Weight of installed humidifier:

- UA(100,200)(H,Z)4** models: 85 kg (190 lb);
- UA(320,460)(H,Z)4** models: 95 kg (210 lb);
- UA600(H,Z)4** models: 100 kg (220 lb);
- UA1K0(H,Z)4** models: 105 kg (230 lb);

Mechanical specifications:

- Installation: floor standing;
- IP20; (enclosure type 1).
- cabinet operating conditions: 1 to 40 °C (34 to 104 °F) <80 % RH non-condensing;
- storage conditions: 1 to 50 °C (34 to 122 °F) <80 % RH non-condensing

Humifog slave

front view

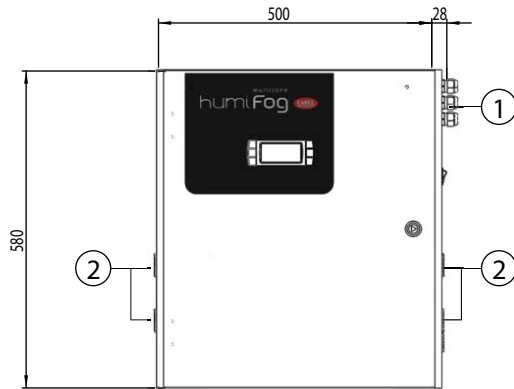


Fig. 1.c

detail of cabinet, air & water inlet side view

detail of cabinet, outlet side view (to nozzles)

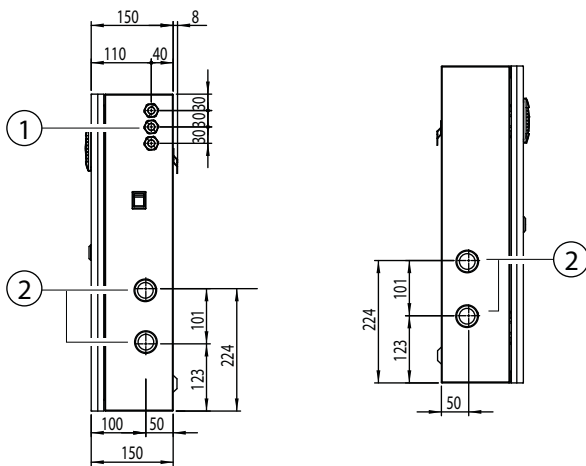


Fig. 1.d

N.B.: inlets for electrical connections ready to be cut out, opening and cable gland installation to be performed by the installer

Packaging dimensions:

- height (H): 770 mm (30.14 inch);
- width (W) 605 mm (23.82 inch);
- depth (D) 255 mm (10.00 inch).

Weight of packaged humidifier:

- UA000S(D,U)400 models: 21 kg (46.3 lb);

Weight of installed humidifier:

- UA000S(D,U)400 models: 19.5 kg (43 lb);

Mechanical specifications:

- Installation: wall mounted;
- IP20; (enclosure type 1)
- cabinet operating conditions: 1 to 40 °C (34 to 104 °F) <80 % RH non-condensing;
- storage conditions: 1 to 50 °C (34 to 122 °F) <80 % RH non-condensing

1.7 Components (master/slave)

Electrical components

Master cabinet

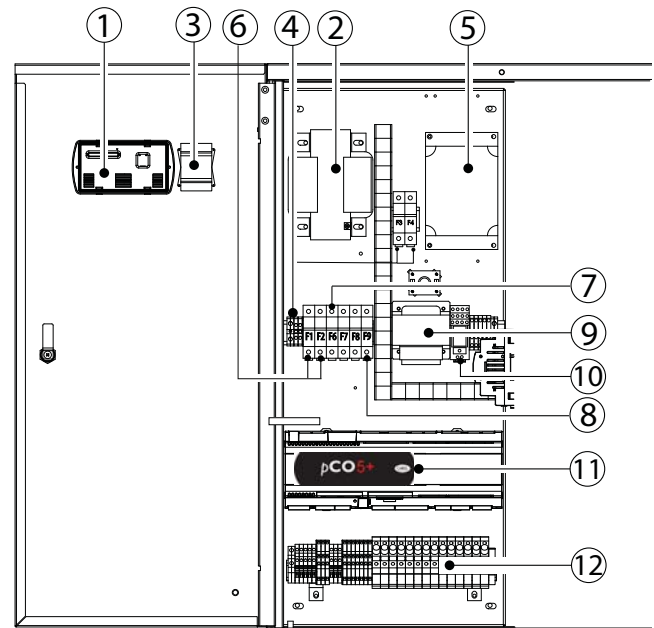


Fig. 1.e

Slave cabinet

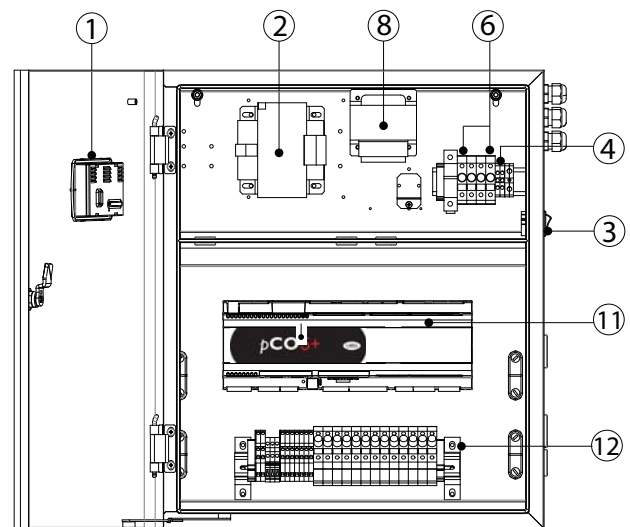


Fig. 1.f

Key:

1. terminal rear view.
2. transformer B.
3. main switch G.
4. power supply terminal block.
5. VFD inverter.
6. transformer primary fuse carrier (TRA: F1,F2; TRB:F3,F4).
7. inverter fuse carrier (F6, F7).
8. transformer B secondary fuse carrier (F8).
9. transformer A.
10. start relay K.
11. electronic controller;
12. control terminal block plus fuses

installer

user

service

Water circuit components

installer

user

service

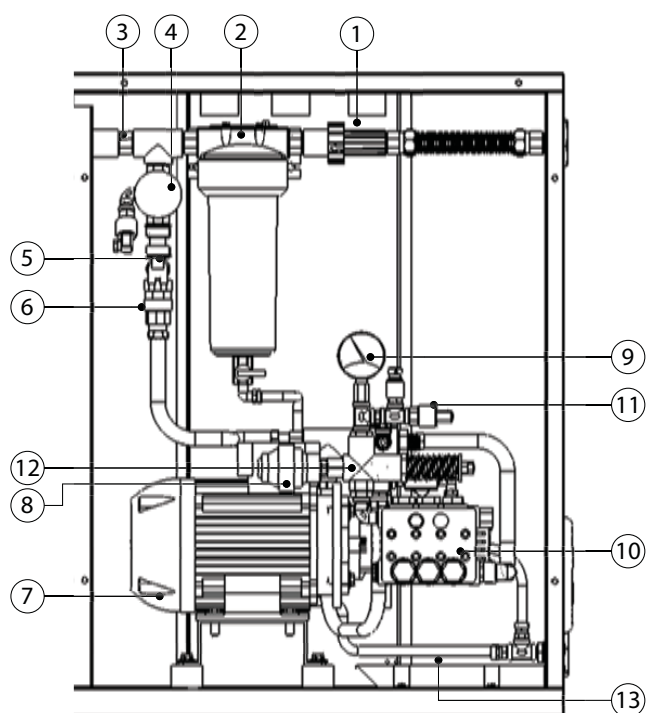


Fig. 1.g

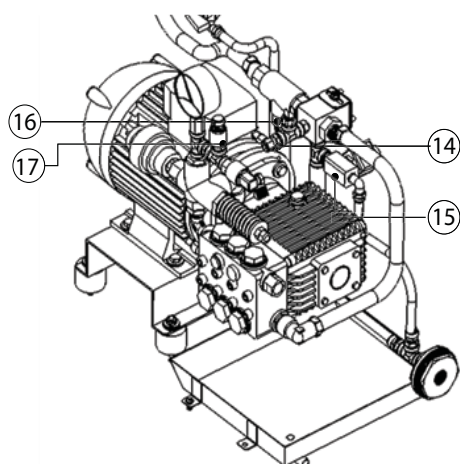


Fig. 1.h

Key:

1. inlet water pressure reducer with filter;
2. 1st pressure gauge, inlet;
3. water filter;
4. minimum pressure switch (1 bar);
5. 2nd pressure gauge, downstream of the water filter;
6. conductivity sensor;
7. water supply solenoid valve;
8. motor;
9. pulsation damper;
10. outlet pressure gauge, high pressure side;
11. piston pump;
12. maximum pressure switch (95 bars);
13. high pressure control valve;
14. thermostat (70 °);
15. bypass solenoid valve;
16. temperature probe;
17. pressure transducer
18. drain bypass.

1.8 Electrical specifications

MASTER 50 HZ

model	UA100*D4**	UA200*D4**	UA320*D4**	UA460*D4**	UA600*D4**	UA1K0*HL4*
VAC	230 V	230 V	230 V	230 V	230 V	400 V
phases	1	1	1	1	1	3
Hz	50 -60 Hz	50 -60 Hz	50 -60 Hz	50 -60 Hz	50 -60 Hz	50-60 Hz
power	0,955 kW	0,955 kW	1,150 kW	1,150 kW	1,95 kW	4 kW
current	7,0 A	7,0 A	9,2 A	9,2 A	12,0 A	4,6 A

Product in compliance with EN55014, EN61000, EN60204.

Insulation grade III

MASTER 60 HZ

model	UA100*U4**	UA200*U4**	UA320*U4**	UA460*U4**	UA600*U4**	UA1K0*HM4*
VAC	230 V	230 V	230 V	230 V	230 V	460 V
phases	1	1	1	1	1	3
Hz	60 Hz	60 Hz	60 Hz	60 Hz	60 Hz	60 Hz
power	0,955 kW	0,955 kW	1,150 kW	1,150 kW	1,95 kW	2,75 kW
current	8,00 A	8,00 A	10,20 A	10,20 A	13 A	4,8 A
FLA	1HP/8 A	1HP/8 A	2HP/12 A	2HP/12 A	3HP/17 A	3HP/6.1 A
SCCR	5KA	5KA	5KA	5KA	5KA	5KA

Product in compliance with UL998

SLAVE

model	UA000SD400	UA000SU400
VAC	230 V	208 V
phases	1	1
Hz	50 Hz	60 Hz
power	0,280 kW	0,280 kW
current	2,20 A	2,50 A
FLA	-	3/4HP
SCCR	-	5KA

Product in compliance with UL998

Tab. 1.c

1.9 Opening the packaging



- ☐ make sure the humidifier is intact upon delivery and immediately notify the transporter, in writing, of any damage that may be due to careless or improper transport;
- ☐ move the humidifier to the site of installation before removing from the packaging, grasping the neck from underneath;

for the master cabinet:

- ☐ position the cabinet near the site of installation (still packaged on the pallet);
- ☐ remove the packaging;
- ☐ unscrew the bolts and remove the pallet (the cabinet is secured to the bottom of the pallet using 4 bolts);

for the slave cabinet:

- ☐ open the cardboard box, remove the protective material and remove the humidifier, keeping it vertical at all times.

Keep the packaging in a cool and dry environment (cardboard box, pallet, 4 bolts used to secure the cabinet to the pallet) for reuse.

1.10 Positioning the cabinet

Both cabinets: master and slave, should be positioned so as to guarantee the following:

- read the values on the display;
- access the keypad on the display;
- open the front panels;
- access to the inside parts for checks and maintenance;
- connection of the water supply lines;
- connection to the water distribution lines;
- power and control connections;
- prepare a base of at least 200 mm.

in particular, for the Master cabinet:

It can be positioned wherever the following conditions are ensured:

- clearance for routine maintenance as described in Fig. 1.f
- humidity 20-80% rH non-condensing
- temperature 1-40 °C;
- cabinet compliant with seismic testing standards IEC 60068-2-6, IEC 60068-2-57, IEC 60068-2-64, ISO2041. To ensure compliance with the above-mentioned standards, the cabinet must be anchored to the floor using the threaded holes provided (M6 female thread), as shown in Fig. 1.i.

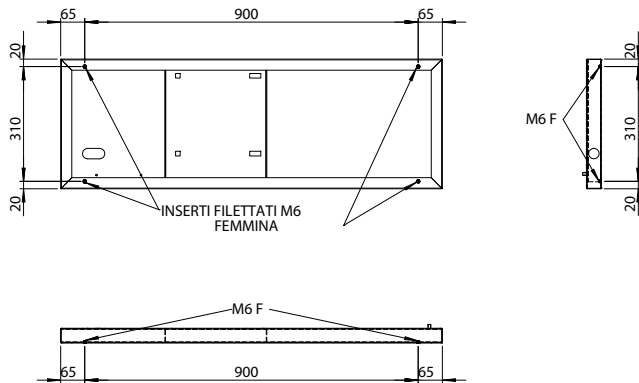


Fig. 1.i

⚠ Important: the maximum distance between the cabinet and rack/distribution system is 50 metres, for higher distances contact CAREL INDUSTRIES.

Positioning procedure:

- after opening the packaging;
- position the cabinet in the final position;
- level the cabinet horizontally.

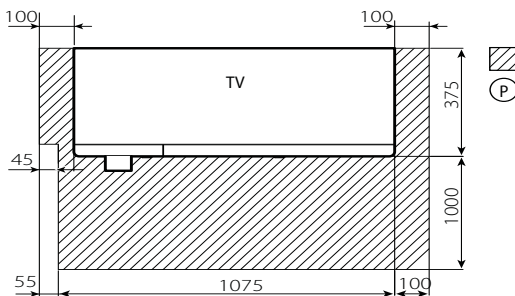


Fig. 1.j

Slave cabinet

Fasten it to a solid support surface using the screws and bracket supplied. Make sure there is enough space for the electrical power supply and control connections.

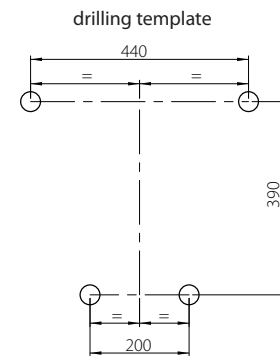
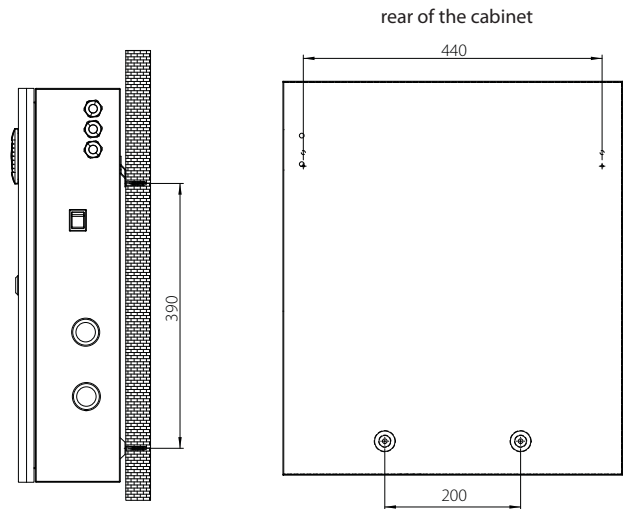


Fig. 1.k

1.11 Opening the cabinet door

Master cabinet

Opening Fig. 1.h:

1. Release the water circuit panel:
use a flat-head screwdriver (max. 8 mm);
turn anticlockwise until releasing the panel.

2. Remove the panel:
tilt the panel and lift it.

Closing Fig. 1.h:

3. Reposition the water circuit panel:

Important: insert the bottom pins of the panel in the corresponding holes (F).

4. Lock the panel:
use a flat-head screwdriver (max. 8 mm);
turn clockwise until the panel is secured

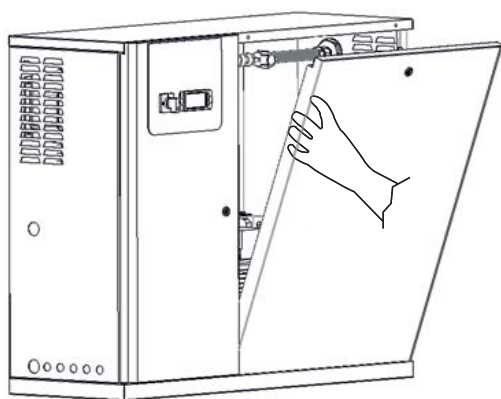
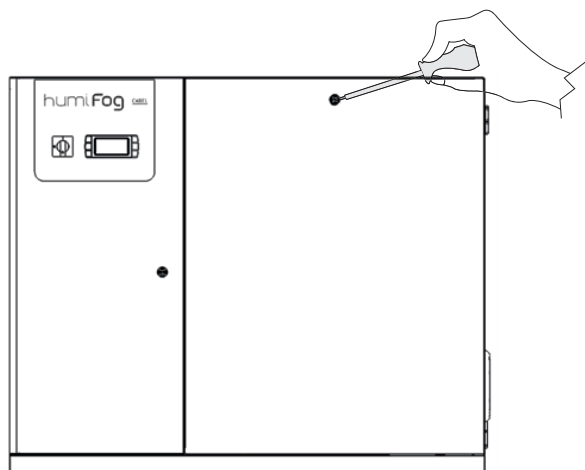


Fig. 1.l

Slave cabinet

1. press and turn anticlockwise with a flat-head screwdriver (max 8 mm) until releasing the panel;
2. open the cabinet door by turning it to the left.



Fig. 1.m

1.12 Components and accessories

Once having opened the packaging and removed the front cover of the humidifier, make sure the following are included:

for master units:

- tool for opening the water inlet filter casing;
- PG13 and PG21 cable glands for the electrical connections (CE versions only).
- yellow/black pump motor oil cap, to replace the red cap on the pump.

for slave units

- kit of screws with plugs for wall-mounting;
- PG13 and PG21 cable glands for the electrical connections (CE versions only).

2. WATER CIRCUIT CONNECTIONS

2.1 Water circuit installation: instructions

The water connections are

- water inlet;
- high pressure water outlet to the rack (see "connecting the cabinet to the rack" in the distribution manual);
- water drain.

Water circuit installation: instructions

To simplify installation and maintenance, install a manual valve immediately before connecting the water inlet to the cabinet (this valve is not supplied by CAREL).

humifog only operates on demineralised water, preferably from a reverse osmosis system. The specifications and the limits of the water are described in detail in chap. 1.4 "supply water characteristics".

1. open the water circuit (vedi par. 1.10 "Opening the cabinet door");
2. connect the water supply hose:
 - the supply hose connection fitting is G1/2"F (NPT1/2"F - UL 60 Hz version).
 - the inside diameter of the supply hose must not be less than 13 mm.
 - run the water supply hose through hole "3" Fig. 1.a.

Water drain connection

1. connect the drain "5" Fig. 1.a to the drain system:
 - use a hose with inside diameter 10 mm, resistant to demineralised water.
 - connect the hose to the drain connection underneath the cabinet using a hose clamp.



N.B.: the hose and the clamp are not supplied by CAREL, to tighten clamp, lift the cabinet.

2. connect the drain bypass "6" Fig. 1.a to the drain system.

Replacing the top oil cap on the pump

1. replace the top oil cap on the pump:
 - replace the TOP oil cap ((Fig. 2.a, A), used for transport only, with the CAP WITH THE VENT HOLE (Fig. 2.a, B) used in normal operation;
 - keep closed cap for future transport.
2. reposition the front panel on the water circuit and close it.

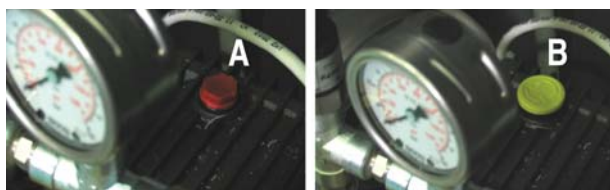


Fig. 2.a

CE versions

model	UA100*D4**	UA200*D4**	UA320*D4**	UA460*D4**	UA600*D4**	UA1K0*HL4*
max flow rate (l/h; lb/h;Gd)	100 220 634	200 441 1268	320 705 2028	460 1014 2916	600 1323 3805	950 2095 6023
inlet pressure (Mpa,Bar, PSI)	0,3...0,8 Mpa 3...8 Bar 40...100 PSI					
temperat.	1T40 °C / 34T104 °F					
input	G1/2"F					G1/2"F
adapter outlet (pump)	M16,5m DIN 2353 (G3/8"F)					M22,5m DIN 2353 (G1/2"F)
main drain	G1/2"F					
drain tray	External stainless steel pipe φ 10 mm/ 0.4 inch					

Tab. 2.a

UL versions

model	UD100*U4**	UD200*U4**	UD320*U4**	UD460*U4**	UD600*U4**	UA1K0*HM4*
max flow rate (l/h; lb/h;Gd)	100 220 634	200 441 1268	320 705 2028	460 1014 2916	600 1323 3805	950 2095 6023
inlet pressure (Mpa,Bar, PSI)	0,3...0,8 Mpa 3...8 Bar 40...100 PSI					
temperat.	1T40 °C / 34T104 °F					
input	NPT 1/2"F (with adapter G1/2" M - NPT 1/2"F)					
adapter outlet (pump)	NPT3/8F					NPT1/2F
main drain	NPT 1/2"F (with adapter G1/2" M - NPT 1/2"F)					
drain tray	External stainless steel pipe φ 10 mm/ 0.4 inch					

Tab. 2.b

2.2 Water circuit installation: checklist

humifog system name: _____



Description / notes

- ☐ Cabinet level
- ☐ Distance between cabinet-rack/water distribution system: ≤50 m.
- ☐ Water supply connection
- ☐ Water inlet pressure ≥3 bars (0.3 MPa, 40 PSI)
- ☐ Filters filled with water
- ☐ Drain connected to the water drain system
- ☐ drain bypass: TFN8x10 NYLON WHITE hose connected to the water drain
- ☐ Pump: oil cap replaced with the cap featuring the vent
- ☐ Supply water within the limit values See the section on "Supply water characteristics"

Date: _____

Signature: _____

3. ELECTRICAL CONNECTIONS

Master version

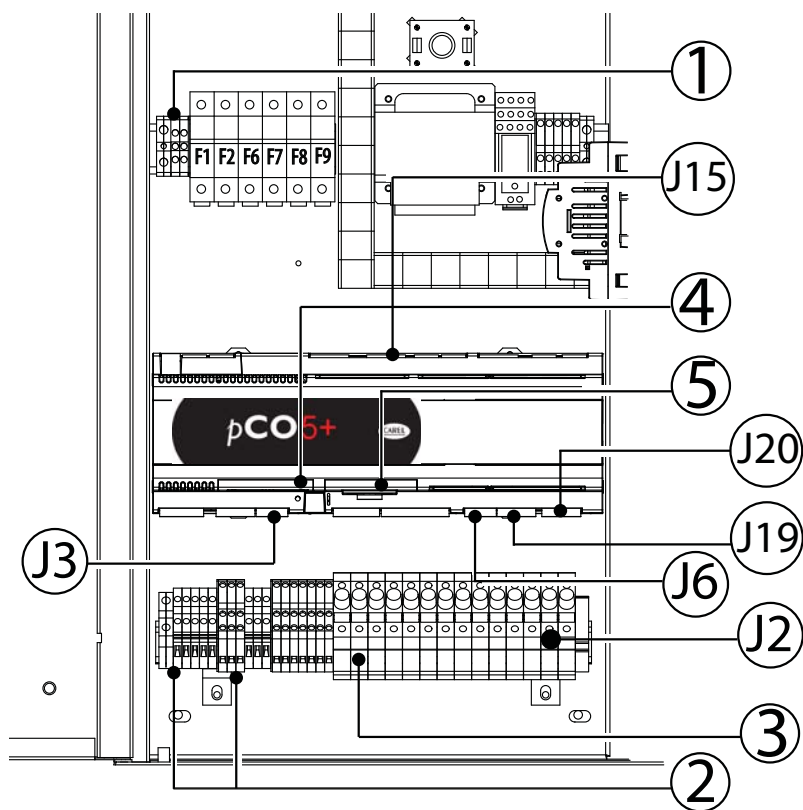


Fig. 3.a

Slave version

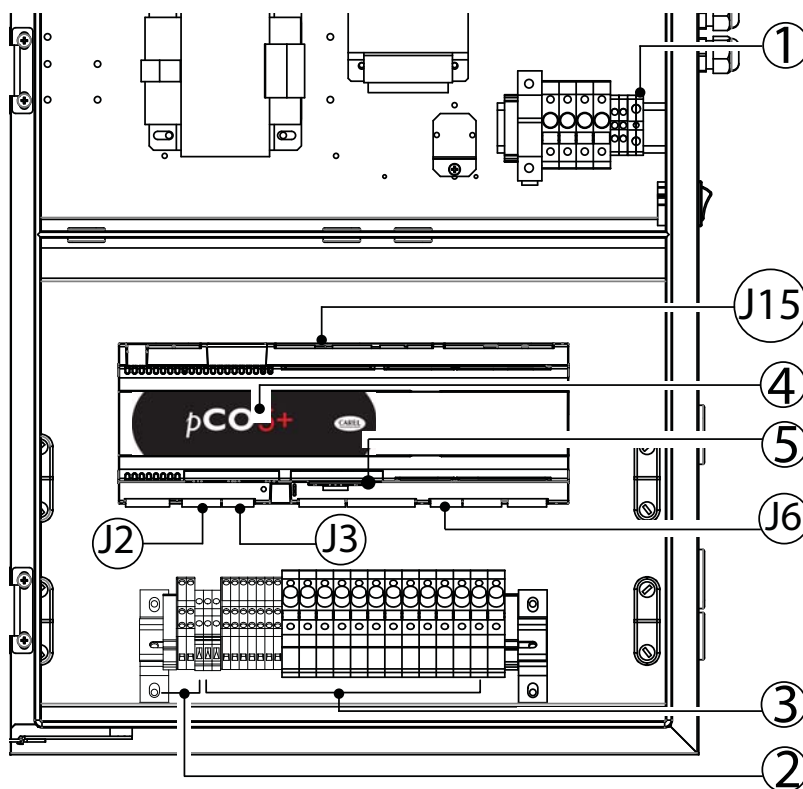


Fig. 3.b

Legenda:

1	L/N/GR	Power supply Important • make sure that the cable glands are fitted • do not run the control and signal cables through this cable gland.
J2	U1 U2 U3	Main humidity/temperature probe Limit humidity/temperature probe AUX probe (temperature display only)
J3	U5	Segnale recuperatore di calore per EC, uscita configurabile sia analogica che digitale
J6	U8	rack temperature probe
J15	NO8	Cumulative alarm relay
J19	NO24	Pumping unit signal
J20	NO27	Pumping unit enable signal
2	PEN/G0A	Pumping unit remote enabling signal
	ROAL/G0A	Water treatment system control
	BKUP/G0A	Back up cabinet signal
	ROEN/COM	comand for water treatment system
	ON-OFF/G0A	Control signals from external contact type humidistat ON/OFF
	RKEN/G0A	RACK production enable
	FLUX/G0A	Air flow
3	NC1÷NC6/GOB	Slicing solenoid valves step
	NO1÷NO6/GOB	Drain solenoid valve step
	NOL	Drain solenoid valve line
	NOV	Fan solenoid valve (rack)
4	Field card	Field card input for Master Slave connection
5	Serial Card	Serial card input for BMS (Building Management Systems)



N.B.: feature adequate protection on all activation outputs to external devices.

3.1 Power supply

Depending on the model:

- UA***D4** voltage 230 V 1~ 50Hz
- UA***U4** voltage 230 V 1~ 60Hz
- UA1k0*HL4* voltage 400 V 3~ 50Hz
- UA1k0*HM4* voltage 460 V 3~ 60Hz

Important: The cables must conform to local standards.
Install a power switch outside the humidifier to completely isolate the mains power supply, with earth fault protection (30 mA).

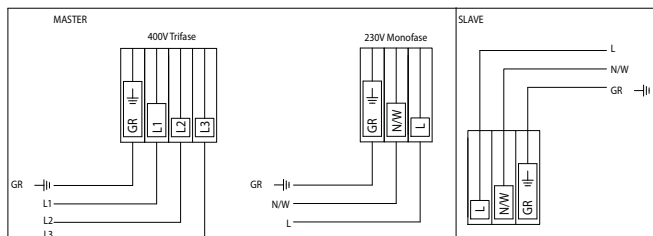


Fig. 3.c

CONNECTIONS

Cabinet master - slave 230V Monophase	Powersupply cable
L	L/F (fase) AWG13 (2,5 mm)
N	N/W (neutro) AWG13 (2,5 mm)
GR	GR/PE (terra) AWG13 (2,5 mm)

Cabinet master 400/460V Threephase	Powersupply cable
L1	L1 (fase 1) AWG13 (2,5 mm)
L2	L2 (fase 2) AWG13 (2,5 mm)
L3	L3 (fase 3) AWG13 (2,5 mm)
GR	GR/PE (terra) AWG13 (2,5 mm)

3.2 Remote ON/OFF

Cables	• up to 30 m: two-wire cable AWG20/22
electrical specifications of the contact:	voltage-free contact

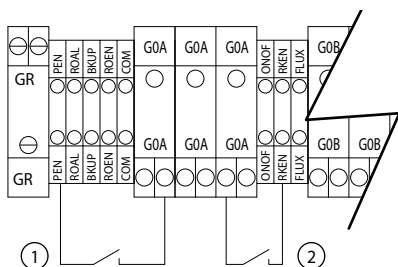


Fig. 3.d

Key:

1. Pump remote ON/OFF
2. Zone remote ON/OFF

CONNECTIONS

humifog Master cabinet	Remote ON/OFF
PEN (enable pump)	NC/NO
RKEN (enable master rack)	NC/NO
GOA	COM

humifog Slave cabinet	Remote ON/OFF
RKEN (enable slave rack)	NC/NO
GOA	COM

N.B.: the Master unit is supplied with contacts PEN-GOA and RKEN-GOA jumpered, the Slave unit is supplied with contact RKEN-GOA jumpered

3.3 Control signals from external voltage-free contact (humidistat)

a) ON/OFF (C control)

Cables	• up to 30 m: two-wire cables cross-section 0.5 mm ² (AWG20) • greater than 30 m: shielded cables cross-section 1.5 mm ² (AWG15)
electrical specifications of the contact	voltage-free contact

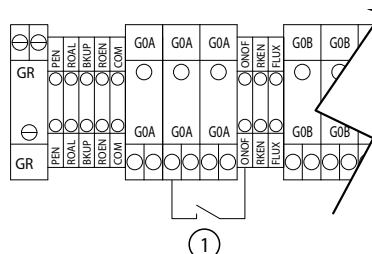


Fig. 3.e

Contact open: humiFog deactivated

Contact closed: humiFog activated

humifog Master cabinet	ON/OFF humidistat thermostat
ON/OFF	NC/NO
GOA	COM

b) ON/OFF and limit probe (CH/CT control)

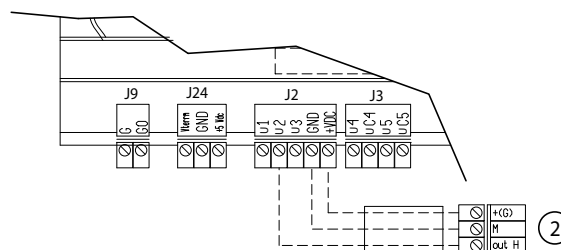
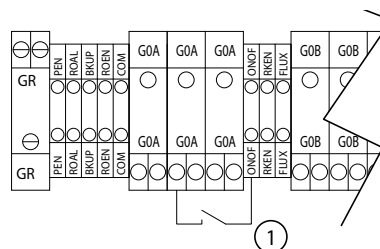


Fig. 3.f

Key:

1. ON/OFF humidistat thermostat
2. limit humidity/temperature probe

3.4 Modulating control signal (J2)

The control signal input connections depend on the control algorithm activated.

Cables	<ul style="list-style-type: none"> up to 30 m: two-wire cables cross-section 0.5 mm² (AWG20)
the signal may come from	<ul style="list-style-type: none"> modulating control with external controller modulating control with ambient humidity probe external controller and limit humidity probe ambient humidity probe and limit humidity probe modulating control with temperature control modulating control with temperature control and limit probe

To set the type of operation, control and signal: "installer menu > type of control (see chap. 9.11 Installer menu)."

N.B.: shielded cables should be used. The cables must not run near the 230 V/208 V power cables nor near the contactor cables: this avoids measurement errors due to electromagnetic disturbance.

a. Modulating control with external controller (P control)

0 to 1 V; 0 to 10 V; 2 to 10 V; 0 to 20 mA; 4 to 20 mA.

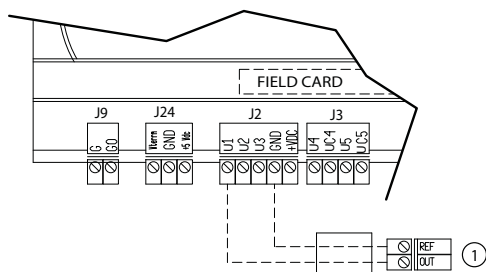


Fig. 3.g

Key:

1. external controller

Connections:

	humiFog cabinet	External controller
J2	B1	OUT
	GND	Reference, shield

b. Modulating control with ambient humidity probe (H control)

0 to 1 V; 0 to 10 V; 2 to 10 V; 0 to 20 mA; 4 to 20 mA

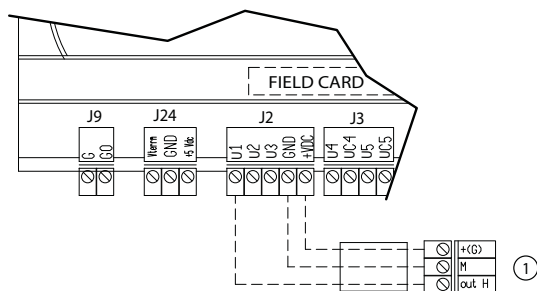


Fig. 3.h

Key:

1. humidity sensor

Connections:

	humiFog cabinet	Ambient humidity probe
J2	B1	OUT H
	+Vdc	+(G)
	GND	M

c. Modulating control with controller and limit probe (PH/PT control)

0 to 1 V; 0 to 10 V; 2 to 10 V; 0 to 20 mA; 4 to 20 mA

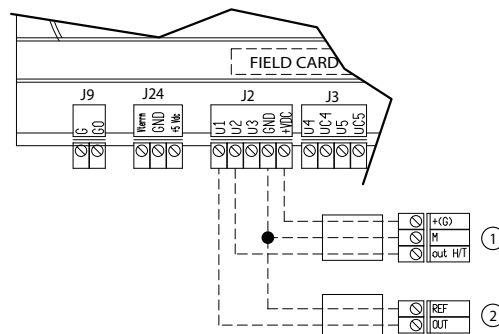


Fig. 3.i

Key:

1. limit humidity/temperature probe;
2. external controller.

Connections:

	humiFog cabinet	External controller	Limit humidity probe
J2	B1	OUT	
	B2		OUT H/T
	+Vdc		+(G)
	GND	Reference	M

d. Modulating control with ambient humidity probe and limit humidity and temperature probe (HH/HT control)

0 to 1 V; 0 to 10 V; 2 to 10 V; 0 to 20 mA; 4 to 20 mA

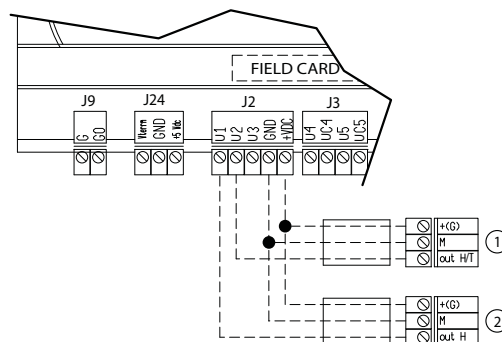


Fig. 3.j

Key:

1. limit humidity/temperature probe;
2. ambient humidity probe.

Connections:

	humiFog cabinet	External controller	limit humidity probe
J2	B1	OUT H	
	B2		OUT H/T
	+Vdc	+(G)	+(G)
	GND	M	M

e. Modulating control with temperature control (T control)

0 to 1 V; 0 to 10 V; 2 to 10 V; 0 to 20 mA; 4 to 20 mA

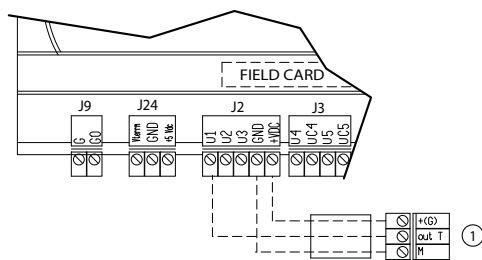


Fig. 3.k

Key:

1. ambient temperature probe;

Connections:

	humifog cabinet	Ambient temperature probe
J2	B1	OUT T
	+Vdc	+(G)
	GND	M

f. Modulating control with temperature control using NTC probe (T control)

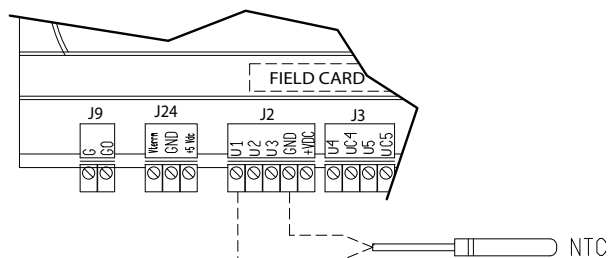


Fig. 3.l

Connections:

	humifog cabinet	NTC probe
J2	B1	NTC
	GND	NTC

g. Modulating control with temperature control and limit humidity probe (TH control)

0 to 1 V; 0 to 10 V; 2 to 10 V; 0 to 20 mA; 4 to 20 mA

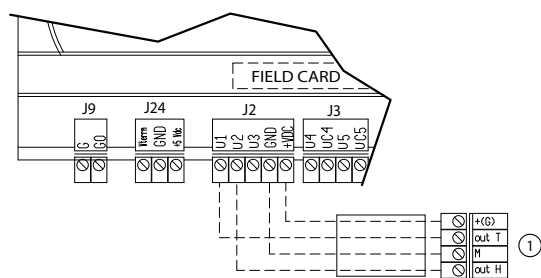


Fig. 3.m

Key:

1. ambient temperature probe and limit humidity probe;

Connections:

	humifog cabinet	Ambient temperature probe + limit humidity probe
J2	B1	OUT T (main)
	B2	OUT H (limit)
	+Vdc	+(G)
	GND	M

h. Modulating control with temperature control and limit humidity and temperature probe (TT/TH control)

0 to 1 V; 0 to 10 V; 2 to 10 V; 0 to 20 mA; 4 to 20 mA

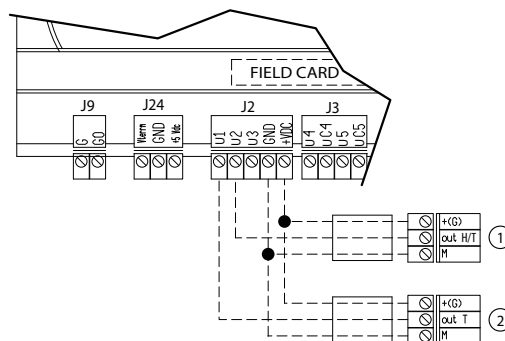


Fig. 3.n

Key:

1. limit humidity/temperature probe;
2. ambient temperature probe.

Connections:

	humifog cabinet	Ambient temperature probe	limit probe
J2	B1	OUT T	
	B2		OUT T/H
	+Vdc	+(G)	+(G)
	GND	M	M

3.5 Heat recovery signal

J3 inlet U5 terminal, analogue or digital configurable signal associated with the position of the recovery damper

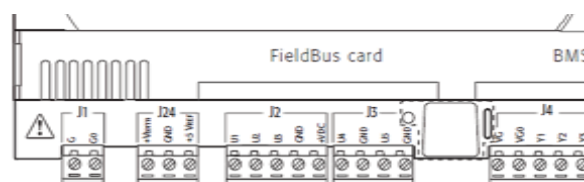


Fig. 3.o

3.6 Solenoid valve connection for distribution system

For the management of the distribution system, the cabinet controls four types of solenoid valves:

- normally closed "NC" for capacity-control of the manifolds.
- normally open "NO" for draining the manifolds.
- normally open vent valves.
- normally open line drain valves.

Recommended connection cables: two-wire plus earth AWG 13 (1.5mm²), maximum length 100 m.

the following table contains the bipolar cable sections suggested in relation to the number of solenoid valves per step for the NC and NO valves

	1 EV per step	fino a 4 EV per step	Fino a 7 EV per step
Sez.cavo	AWG 18	AWG14	AWG10



N.B. in cases up to 4 solenoid valves and up to 7 solenoid valves for a single step it is necessary to provide the accessories box, code UAKDER6000.



N.B. For electrical distances greater than 30 m contact Carel.

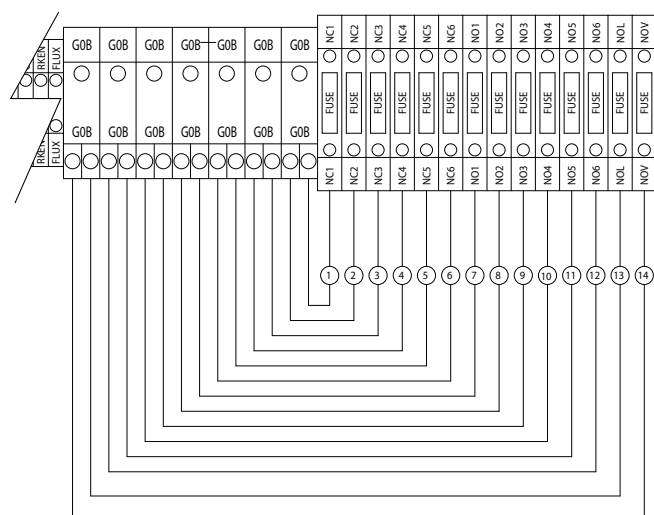



Fig. 3.p

Rif.	Cabinet terminal block	Solenoid valve connector	Description	Max. no. of solenoid valves per step. Master up to 460	Max. no. of solenoid valves per step. 600/1k0	Max. no. of solenoid valves per step. Slave
1	NC1 – G0B	1-2	Capacity-control sol.valves 1st step	6	7	4
2	NC2 – G0B	1-2	Capacity-control sol. valves 2nd step	4	4	4
3	NC3 – G0B	1-2	Capacity-control sol. valves 3rd step	4	4	4
4	NC4 – G0B	1-2	Capacity-control sol. valves 4th step	4	4	2
5	NC5 – G0B	1-2	Capacity-control sol. valves 5th step	2	2	2
6	NC6 – G0B	1-2	Capacity-control sol. valves 6th step	2	2	2
7	NO1 – G0B	1-2	Drain solenoid valves 1st step	6	7	4
8	NO2 – G0B	1-2	Drain solenoid valves 2nd step	4	4	4
9	NO3 – G0B	1-2	Drain solenoid valves 3rd step	4	4	4
10	NO4 – G0B	1-2	Drain solenoid valves 4th step	4	4	2
11	NO5 – G0B	1-2	Drain solenoid valves 5th step	2	2	2
12	NO6 – G0B	1-2	Drain solenoid valves 6th step	2	2	2
13	NOL – G0B	1-2	Line drain solenoid valves	2	2	2
14	NOV – G0B	1-2	Vent drain solenoid valves	1	1	

Tab. 3.c



 **N.B.:** using the solenoid valves supplied by Carel SpA, each individual cabinet can power up to 22 solenoid valves, divided as follows:

- 10 NC capacity-control solenoid valves
- 10 NO manifold drain solenoid valves.
- 1 line drain solenoid valve.
- 1 vent drain solenoid valve.

Cabinet master 600 l/h and 1000 l/h

- 15 slicing solenoid valves NC
- 15 collector drain solenoid valves NO.
- 1 line drain solenoid valve.
- 1 ventilation solenoid valve

3.7 Water treatment unit contact

Cables	• up to 30 m: two-wire cable cross-section 0,5 mm ² (AWG15)	
Electrical characteristics allowed by the contact:	<ul style="list-style-type: none"> • power 50 VA; • voltage 24 V; • current 0,5A resistive/inductive 	
Status of the contact according to master status:	Master OFF or in standby	open contact
	Master ON	closed contact

Tab. 3.d

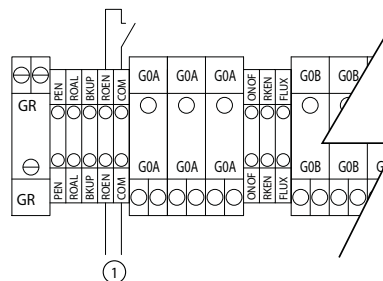


Fig. 3.q

Legenda:

1. Pump state contact (can be used for allowing a water treatment plant)

3.8 Cumulative alarm relay (J15)

Activated when one or more alarms is detected via a contact/output that can be transferred to a supervisory system.

Cable	two-wire AWG 15/20	
Electrical specifications of the relay	power 500 VA; voltage 250 V; current 2 A resistive/ inductive	
Status and operation of the relay:	contact open contact closed	no alarm active active alarm/alarms

Tab. 3.e

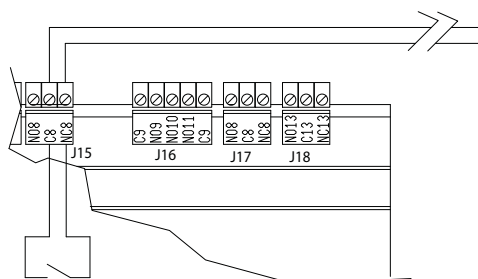


Fig. 3.r

Connections

humifog cabinet	terminal	
J15	N08	normally open
	C8	COM

3.9 Pump state contact

J19 inlet NO24 terminal, configurable digital and logical outlet that shows the pump status: closed contact "open", free contact "closed".

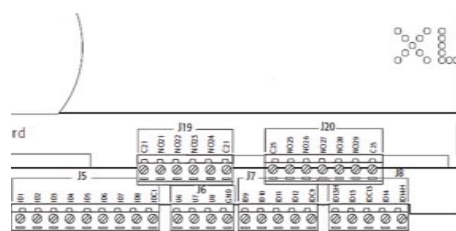


Fig. 3.s

3.10 Pump life signal

The J20 inlet NO27 terminal identifies the life signal of the pumping station. Signal used by humiFog for back-up or pump rotation.

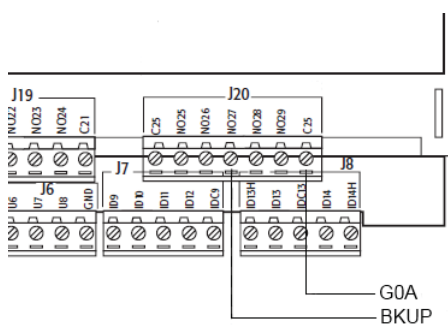


Fig. 3.t

3.11 Alarm inputs from external devices

Cable	two-wire AWG 15/20	
Electrical specifications of the relay	voltage-free contact	
Status and operation of the relay:	contact open	no alarm active
	contact closed	active alarm/alarms

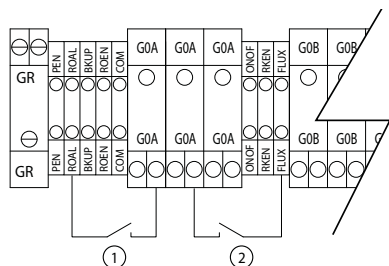


Fig. 3.u

Key:

1. alarm input from water treatment system;
2. alarm input from AHU pressure sensor (flow switch).

N.B.: the unit is supplied with contacts ROAL-G0A and FLUX-G0A jumpered.

3.12 Backup/rotation (redundancy)

The backup/rotation feature allows the use of two pumping stations associated to a single area in order to have a redundant system capable of:

1. Ensuring the continuity of production when the operating cabinet generates the blocking alarm
2. Distributing the operation hours between two cabinets in order to reduce the number of maintenance interventions

Enabling the backup feature requires to perform the following tasks:

Electrical connections:

Connect the two pumping stations by following the diagram below

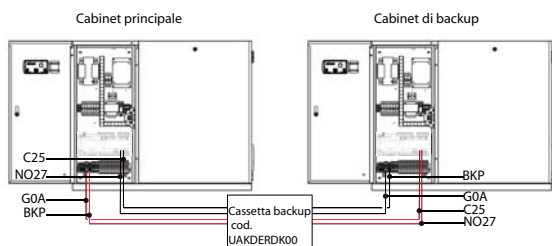


Fig. 3.v

Software configuration:

1. In the Bbc08 screen, enable the backup feature by selecting the priority of the cabinet at start-up. In a generic system, a cabinet must be set as "Primary Cabinet" while the other will be set as a secondary cabinet. This configuration is required for defining the priority (and thus the cabinet), which will attempt to start first following the simultaneous power supply delivered to the two machines. After the power supply, there is no operational difference between the two devices.
2. If you decide to enable the rotation of the cabinet, set the "Rotation" parameter to "Yes" in the Bbc08 screen and select the number of hours of pump operation that will trigger the rotation request.

A configured system will thus be composed of a cabinet in operation and one in standby, in the "Backup Off/ Rotation Off" state, based on the settings, waiting to take over the operation of the currently active cabinet. As soon as the active cabinet (recognizable by the closed NO27-C25 contact) is in one of the following situations

The following recommendations are taken into account:

- the adjustment parameters of the two units (adjustment type for configuring probes, configuring alarms, etc.) must be configured in the same way.
- If a single rack is used for the two pumping stations, it is required to use an adequate junction box (code UAKDERDK00) and the proper version of non-return valves (code UAKCHV****).
- The two pumping stations must be associated to the same area.
- If the rotation is not enabled, the cabinet that requested the blocking alarm switch can be reactivated only after a blocking alarm is generated on the cabinet that has replaced it, even if the alarm condition that has caused the unit change has resumed
- With the rotation enabled, in case of the alarm switch, the rotation counter is reset and the first useful request is ignored.

3.13 Expansion mode/remote actuator

Expansion

The Slave (UA***S****) cabinets can be configured on the Bbc01 screen as Expansion/Remote actuators.

This mode transforms the cabinet in an I/O expansion for another Humifog generic cabinet (pumping station or slave) in order to:

- Provide a tool to simplify the wiring if the rack is too far from the pumping station (Remote Actuator)
- Allow the slave cabinet to use a rack with 6 NC valves on step 1 and 4 NC valves on step 4.

Remote rack actuator

This mode allows you to control the solenoid valves of the rack in the area associated with the pumping station via one or two "remote area" cabinets controlled in serial sequence via the J23 port of pCO5+.

This configuration is particularly useful if the rack is located away from the pumping station, since it allows to bring the control signal via the only serial cable in the rack area, reducing the number and length of the cables of the solenoid valves between the rack and the device that physically controls it (the remote area cabinet).

To enable the function, proceed as follows:

Electrical connections:

- Connect the expansion (or two expansions) serially in port J23 of the pCO5+ as follows:

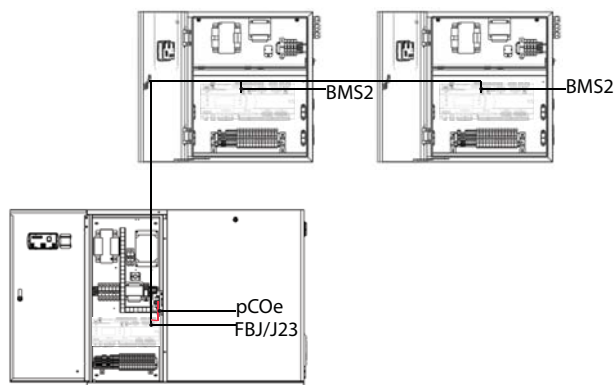


Fig. 3.w

- Connect the control signals used for the cabinet configured as "Remote expansion/Actuator 1"
- Connect the solenoid valves to the remote area cabinet that controls them. If two cabinets are used, distribute them evenly. For example, in the case of the first step with 6 collectors, connect three solenoid valves to the first expansion cabinet and three solenoid valves to the second cabinet.

Software configuration:

- On the pumping station, enable the use of the remote actuator on the Bbc09 screen: the software automatically establishes the number of required actuators (1 and 2) based on the number of collectors present, and alerts the user via a dedicated pop-up window

Configure the first slave as "Expansion/Remote actuator 1" and the second one (only at request) as "Expansion/Remote actuator 2"

Note: if you are using this mode, the probe readings of the main control (U1), limit (U2), auxiliary (U3), heat recovery signal (U5), rack temperature (U8) and the ventilation solenoid valve are transferred to the remote area cabinet configured as "Expansion/Remote actuator 1".

Remote area expansion

The software installed on the remote area cabinet, based on the number of set collectors, automatically determines whether it is necessary to add a second cabinet, used as an expansion for the proper management of the solenoid valves. The system is pre-configured based on the number of set collectors. The following are necessary to enable the feature:

Electrical connections:

- Connect the J23 port of the remote area cabinet that requires expansion to the BMS2 port of the cabinet configured as expansion, as follows:
- Connect the adjustment probes and the ventilation valve (if present) to the remote area cabinet and distribute the solenoid valves between the two cabinets. For example, in case of a step with 6 solenoid valves, connect three to the first cabinet and three to the second cabinet.

Software configuration:

- The remote area cabinet, based on the number of set collectors, establishes if it is required to expand and alerts the user via a dedicated pop-up window
- Configure the slave used for the expansion as "Expansion/Remote actuator 1"

3.14 Master-slave connection

The multi-zone master-slave configuration is serial and done through optically-isolated integrated Field-bus 485 present in the humiFog unit.

Cable section Use twisted and shielded two wire cables, AWG20/22 with clamp sections of 2 mm min 0.2 – max 2.5

Connections:

Fieldbus card humiFog master	BMS2 humiFog slave
+	+
-	-
GND	GND

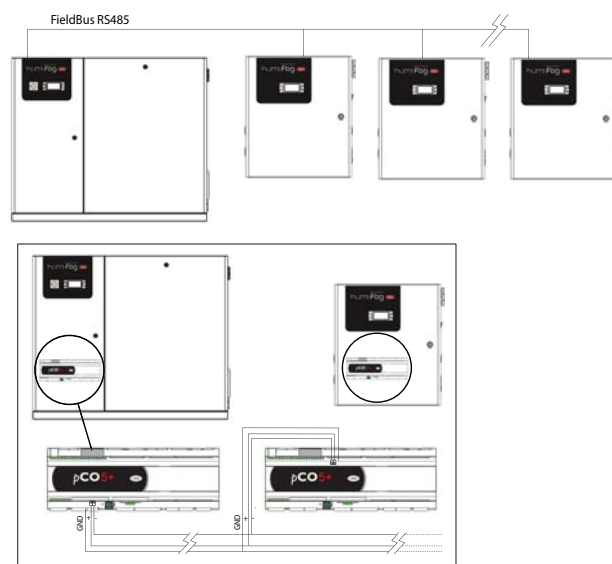


Fig. 3.x

Note: if the optional card is in the last position on the supervisor serial line and the line is longer than 100 m, connect the 120 Ω - 1/4 W line terminal resistors to the pins, as shown in the following figure.

3.15 Supervisor network

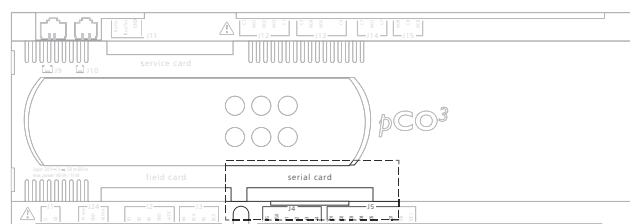


Fig. 3.y

Optional CAREL cards

	network/card	protocol supported
PCOS004850	RS485 (standard)	CAREL, Modbus®
PCO100MDM0	RS232 (external modem)	CAREL for remote connections
PCO1000WB0	Ethernet™	TCP/IP SNMP v1 & v2c BACnet™ Ethernet™ ISO8802-2/8802-3 BACnet/IP
PCO1000BA0	Ethernet™ (Modbus®)	BACnet™ MS/TP

Important: Follow the instructions shown on the optional cards for the technical specifications, connections and expansion boards.

Default: CAREL supervisor protocol.

All the new features are supplied as standard with the RS485 card, other cards and protocols are optional.

4. PUMPING UNITS

4.1 Pumping unit with flow control configuration

humiFog controls the humidification and/or cooling capacity by continuously controlling the atomised water flow-rate across a wide range of modulation.

This configuration is used in the following applications:

- humidification and/or adiabatic cooling (direct) in an AHU;
- humidification and indirect adiabatic cooling in an AHU with heat recovery unit (one atomisation system at a time atomises the water). In this case, a zone electrical panel will be required, see the next chapters for further information.

humiFog is fitted with an inverter to continuously and precisely control the speed of the pump and, consequently, the flow-rate.

The outlet pressure is kept within the optimum water atomisation limits by the range of modulation of the pump speed and control of the number of nozzles that atomise the water.

In detail, the nozzles must be supplied at a pressure in the range from 25 to 70 bars, to ensure that the droplets generated have an average equivalent diameter of 10-15 µm.

Based on the flow-rate of water to be atomised, humiFog will activate the number of nozzles that ensures the pressure is within the range indicated above.

It is clear that if the required flow-rate is low, just a few nozzles will be needed to atomise the water; if the request increases, the increase in flow-rate will cause an increase in pressure that, if it exceeds 70 bars, will activate other atomising nozzles, consequently decreasing the pressure and returning it within the range of optimum values. Similarly, if the humidification request decreases, the flow-rate and thus the pressure will decrease and, if the latter falls below 25 bars, some nozzles will be closed so that the pressure returns within the optimum atomisation range.

This is possible because the nozzles are assembled into groups of up to four, with different capacities; when suitably activated, these guarantee continuous modulation of the flow-rate across a wide range, nominally from 14 to 100% of the maximum flow-rate, with a pressure from 25 to 70 bars.

The groups of nozzles are normally configured when selecting the humiFog system, and the procedure is clearly described in the documents supplied with the water distribution system (rack).

The pumping unit in the flow control configuration can only be used for single-zone applications: one pumping unit supplies just one zone at a time. Multizone configurations are not possible.

The flow control configuration guarantees maximum humidification and adiabatic cooling precision as capacity is controlled continuously and across a wide range.

4.2 Pumping unit with constant pressure control

The humiFog controller manages the water pressure generated to ensure it remains at a constant level, typically 70 bars.

This configuration is used in the following applications:

- humidification and/or adiabatic cooling (direct) in an AHU (the flow control configuration is recommended);
- humidification and indirect adiabatic cooling in an AHU fitted with heat recovery unit (the two distribution systems can atomise water at the same time);
- humidification and/or adiabatic cooling (direct) in an industrial environment;
- humidification and/or adiabatic cooling (direct) in multiple zones, whether AHUs, AHUs fitted with heat recovery units, industrial environments, or any combination of these.

Note that in the case of humidification and/or cooling adiabatic directly into rooms, constant pressure control is preferred over flow control: as the droplets are atomised directly into the environment, to minimise the space required for evaporation, the smallest possible diameter should be achieved and therefore the water must be atomised at maximum pressure. This is represented by constant pressure control, which maintains the pressure at 70 bars.

humiFog is fitted with an inverter to control the speed of the pump and maintain the pressure at the rated value set by parameter, typically 70 bars.

The humiFog system will be made up of a pumping unit (master) that also controls its own zone, as well as a series of zone electrical panels (slaves) corresponding to the number of remaining zones.

Note that for humidification and indirect adiabatic cooling in an AHU fitted with heat recovery unit (the two distribution systems may atomise the water at the same time) a zone panel (slave) will be required.

The water distribution system/systems have nozzles organised into groups, called steps, which in general each have different capacities. Based on the flow-rate of water to be atomised in one or more zones, the humiFog system will activate the required steps until the nozzles atomise the required quantity of water. Each zone can have up to 6 modulation steps.

The groups of nozzles are normally configured when selecting the humiFog system, and the procedure is clearly described in the documents supplied with the water distribution system (rack or room distribution and atomisation system)

Constant pressure control rationalises operation of the humiFog pumping unit as, despite the lower precision, it can treat a number of zones at the same time without installing a pumping unit for each AHU or industrial environment.

5. DISTRIBUTION SYSTEM

This paragraph briefly describes the distribution and atomisation systems for AHUs (rack and droplet separator) and for rooms. These are described in detail in the "humiFog – distribution systems" manual.

5.1 Air handling unit: distribution, atomisation system and droplet separator

The rack is supplied made-to-measure based on the AHU/duct and is made up of various vertical manifolds with atomisation nozzles, each with activation and drain solenoid valves. Each rack is also fitted with a main drain solenoid valve installed at the lowest point of the piping that connects the rack to the pumping unit. In addition, it is fitted with a vent solenoid valve on the horizontal manifold so as to completely empty the pipelines. The manifolds house the required number of atomising stainless steel nozzles located in specific positions, calculated during the system configuration phase and described in the documents supplied with the rack.

The droplet separator has the purpose of trapping the droplets of water that are not completely evaporated, so as to prevent objects located downstream from getting wet. The droplet separator is supplied in standard modules that can be assembled on a support structure to cover the cross-section of the AHU. The structure is always in stainless steel, and guarantees fast and effective draining of the water trapped by the droplet separator. The modules are available with glass wool or stainless steel filters, the latter required for hygiene-certified installations, such as VDI6022, UNI8884, etc.

The width and height of the rack and the droplet separator vary with approximately 152 mm within the following limits:

- width: 508...2,788 mm;
- height: 516...279 mm.

If the droplet separator does not exactly cover the cross-section of the AHU, the free spaces must be sealed to prevent air from bypassing the droplet separator.

Flexible or stainless steel hoses are supplied for connecting the pumping unit to the rack.

Note that a droplet collector tank with drain connection must also be fitted, containing the rack, droplet evaporation chamber and droplet separator. This tank is not supplied by CAREL.

5.2 Direct humidification into the room: distribution and atomisation system

This system consists of

- hoses and/or stainless steel pipes for the distribution of pressurised water;
- capacity-control solenoid valves to shut off the branches of the system that don't need to atomise water (on/off operation, N.C.);
- drain solenoid valves to empty the installation and prevent stagnation of water (on/off operation, N.O., opening pressure 13 bars);
- main drain solenoid valve installed on the lowest point of the piping that connects the rack to the pumping unit, so as to completely empty the system and avoid stagnation of water. The solenoid drain valves are also used to quickly discharge water pressure when the line stops atomising, avoiding dripping. In addition, the solenoid drain valves are used for the automatic periodical washing function managed by humiFog;
- stainless steel manifolds (pipes with holes) with atomising nozzles;
- blower units: compact units featuring manifolds with atomising nozzles, on-off solenoid and drain valve, plus a fan that creates a stream of air that carries the droplets and ensures they evaporate completely before falling in the environment.

The distribution and atomisation system can have up to 6 capacity modulation steps, where, obviously, each step can have a series of branches with pipes, manifolds and/or blower units.

Special attention must be paid to the position of the nozzles and the blower units inside the environment: observe the installation limits (minimum installation height and minimum horizontal distance from objects/machinery/people that must not be wetted), as shown in the "humiFog multizone: distribution system" manual.

6. APPLICATIONS

humiFog for AHU/ducts is suitable for all applications in which the air can be humidified and/or cooled adiabatically, atomising demineralised water. Below are some possible applications of humiFog:

- office buildings
- hotels and call centers
- printing and paper industries
- cleanrooms
- libraries and museums
- textiles industry
- food industry
- direct/indirect adiabatic cooling
- timber industry
- other industrial applications.

The possibility of using an atomising rack for indirect adiabatic cooling is especially interesting: the air to be discharged is cooled adiabatically (bringing it to saturation) and is then used to cool the fresh outside air using an air-air heat exchanger, as shown in the following figure.

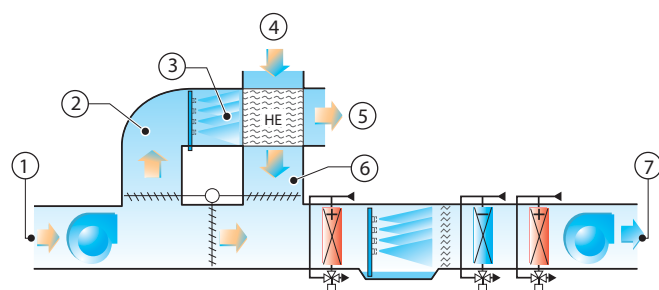


Fig. 6.a

Key:

1. recirculated air;
2. exhaust air;
3. saturated and cooled air;
4. outside air inlet;
5. heated exhaust air;
6. cooled outside air;
7. fresh air.

Further advantages of the humiFog system include:

- extremely low electricity consumption: around 4 Watts for each litre/hour of humidification capacity;
- high maximum capacity: 600 kg/h (customised versions are available with capacities up to 5000 kg/h);
- high precision, thanks to models with continuous modulation from 14% to 100% of maximum capacity;
- complete distribution rack, supplied already assembled and tested;
- extremely fine atomisation with consequently very little space required for evaporation, due to high water pressure (25 to 75 bars);
- optimum humidification and cooling effect in the AHU thanks to custom racks made to measure based on the cross-section of the AHU;
- very low maintenance requirements
- automatic washing and emptying cycles to avoid stagnation of water
- no dripping;
- silent nozzles
- modularity: one pumping unit can supply up to 6 zones
- connectivity: humiFog can be connected to external systems, for example BMS, using the MODBUS, TCP/IP protocols etc. (see paragraph 3.10).

6.1 Main advantages of humiFog multizone

The main characteristic of humiFog for AHUs is compliance with the European standards on air hygiene, as certified by the Institut für Lüthygiene in Berlin, which has declared it as compliant with the following standards:

Standard climatisation		Hospitals	
VDI 6022, page 1 (7/2011)	✓	DIN 1946, part 4 (12/2008)	✓
VDI 3803 (02/2010)	✓	ONORM H 6020 (09/2003)	✓*
ONORM H 6021 (09/2003)	✓	SWKI 99-3 (05/2003)	✓
SWKI VA104-01 (04/2006)	✓		
DIN EN 13779 (09/2007)	✓		

Tab. 6.a

*: In accordance with H6020 (02/07), chapter 6.13.2 the use of steam humidifiers or equivalent humidification systems is required in Austria.

Please note:

- VDI6022/2006: "Hygiene requirements for ventilation and air-conditioning systems and units"
- DIN EN 13779: "Ventilation for non-residential buildings – Performance requirements for ventilation and room conditioning systems"
- DIN1946 - Ventilation and air conditioning - part 4: Ventilation in hospitals

7. CONTROL

The electronic controller fitted in the humiFog features different control algorithms, which can be selected from the installer menu.

• HH control:

modulates the capacity (water flow-rate) using two humidity probes, one control probe normally installed in the AHU in the return air, and one limit probe, usually installed downstream of the droplet separator.

• HT control:

modulates the capacity (water flow-rate) with two probes, one humidity control probe and one limit temperature probe. This configuration is recommended for systems in which a certainly humidity level is required without however excessively cooling the air.

• H control:

like the HH algorithm but without the limit humidity probe;

Below is the diagram of operation using humidity control probes

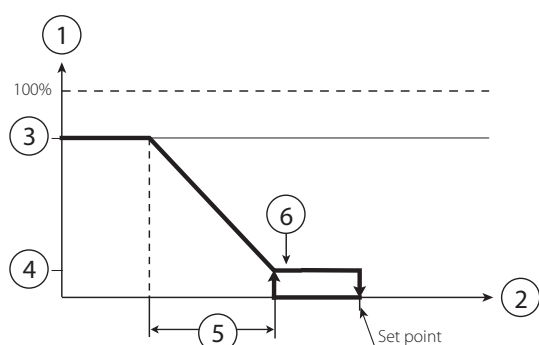


Fig. 7.a

The following chart shows the control probes with humidity control with differential P+I

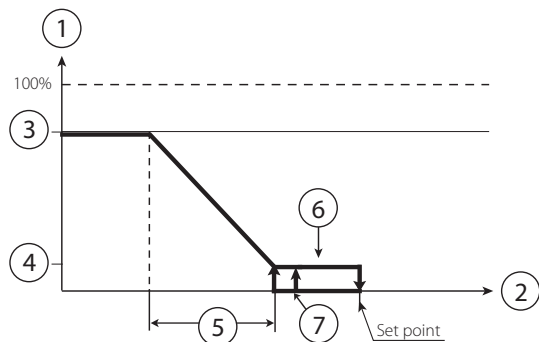


Fig. 7.b

Key:

1. production
2. humidity control probe
3. maximum production
4. minimum production
5. proportional band
6. hysteresis (10% of "5")
7. differenziale

• TH control:

modulates the capacity (water flow-rate) with a temperature probe normally installed in the AHU in the return air, and a limit humidity probe, usually installed downstream of the droplet separator. In room applications, both probes are installed so that the temperature and relative humidity represent the average ambient values (for example, not near windows or the nozzles where the cooling and humidification effect do not correspond to the averages in the room)

• TT control:

modulates the capacity (water flow-rate) with a temperature control probe and a limit temperature probe. This configuration is recommended for adiabatic cooling systems in rooms where the control probe is usually installed in the centre of the room and the limit probe at another "critical" point where the temperature must absolutely not fall below a set limit value.

• T control:

like the TH algorithm, but without the limit humidity probe;

Below is the diagram of operation using temperature control probes

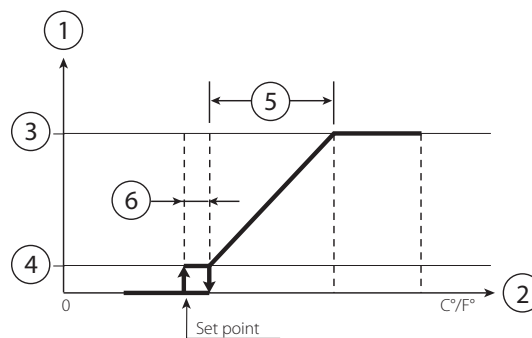


Fig. 7.c

Key:

1. production
2. probe control temperature
3. maximum production
4. minimum production
5. proportional band
6. hysteresis (10% of "5")

• PH/PT control:

capacity is modulated proportionally to an external control signal and is limited based on the value measured by the limit temperature or humidity probe. This is the typical configuration used in humiFog installations connected to a Building Management System that generates a control signal;

• P control:

like the PH/PT algorithm but without the limit humidity probe;

Below is the diagram of operation with proportional control.

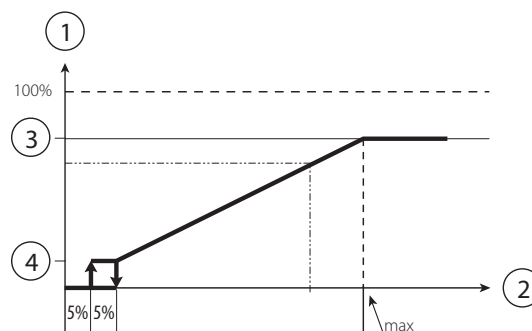


Fig. 7.d

Key:

1. production
2. external request
3. maximum production
4. minimum production

• CH/CT control:

operation in on/off mode, based on a voltage-free external contact (for example, a humidistat). The capacity will thus be either the maximum set or nothing, depending on the status of the external contact, and is limited based on the value measured by the limit probe.

• C control:

like the CH/CT algorithm but without the limit probe;

The HH and TH algorithms are the most commonly-used, and recommended for humiFog installations.

The limit humidity probe described above is usually set to high values, e.g. 80% rH, so as to limit the maximum moisture in the air introduced into the duct and into the room. This is especially recommended in installations where air flow-rate and operating, temperature and humidity conditions, may change over time and, consequently an additional safety system is required to prevent the humidifier from over-humidifying the air and, in the worse case scenario, condensing in the ducts downstream.

Below are the two diagrams of operation with humidity or temperature probes

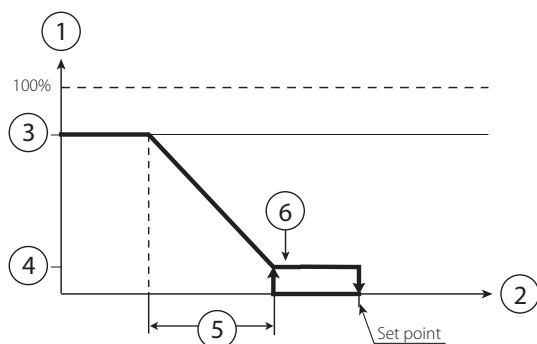


Fig. 7.e

Key:

1. production
2. limit probe
3. maximum production
4. minimum production
5. proportional band
6. hysteresis (10% of the set point)

N.B.: for convenience, the diagrams show continuous modulation of the flow-rate while, depending on the model, control may be continuous or in steps.

7.2 Evaporative Cooling

If optiMist is used as an application dedicated to evaporative cooling, the possible controls are:

- TT Control
- TH Control
- TF Control
- T Control
- PH/PT/PF Control
- P Control
- C Control
- CH/CT/CF Control

IMPORTANT: All of these controls require a consent signal that lets the humidifier know when it can operate. This indication corresponds with the activation of the recovery unit in the Air Treatment Unit (ATU); this information can be sent to the humidifier through:

- a modulating 0-10V signal (corresponding to the opening of the renewal air locks) or
- a digital contact or
- a digital variable via supervision (DIG 63).

A delay in the humidifier activation can be set, starting from the activation signal from the recovery unit previously described.

T CONTROL

This type of control consists of a Proportional+Integral type control of the temperature detected by a probe located in the return air, downstream from the exchanger.

The proportional action will allow for the control of the flow-rate as a function of the distance between the temperature detected and the setpoint. The integral action, on the other hand, will act on the reaction speed of the system. L'azione integrale, invece, agirà sulla velocità di reazione del sistema.

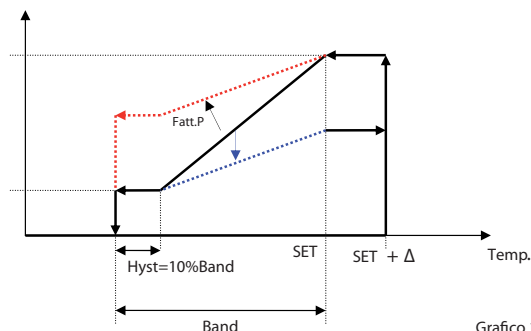


Grafico 1

Fig. 7.f

As seen in the figure, increasing factor P (dashed red line) reduces sensibility to temperature variations, resulting in a decreased reduction request in correspondence to the same temperature variation. The integral contribution, on the other hand, reduces the request to a greater extent the longer the deviation from the control temperature setpoint remains.

• controllo TH:

This type of control is used to modulate the capacity (water flow-rate) with a temperature probe, installed in the return air, downstream from exchanger, an a limit humidity probe, usually installed downstream from the droplet separator.

In order to enable this configuration, a droplet separator is NECESSARY, otherwise there is a risk that the probe could get wet, thus constantly detecting humidity values close to the saturation point.

The humidity probe will further limit the maximum request.

TT CONTROL

This type of control is used to modulate the capacity (water flow-rate) with a temperature control probe and a temperature limit probe. The control probe is usually installed in the centre of the room and the limit probe in another "critical" point where the temperature must absolutely not be lower than a settable limit value.

TF CONTROL (T + air flow/flow-rate limit)

This type of control is used to modulate the capacity (water flow-rate) with a temperature control probe and an air flow modulator, which can correspond to:

- the modulating opening signal of the recirculation air lock;
- the modulating signal from the fan

In this case, the limit signal will function as:

- a temperature limit signal, in the event of a modulating signal from the fan
- a humidity limit signal, in the event of a air lock opening modulating signal.

PH/PT/PF CONTROL

The modulation of the capacity is proportional to an external control signal and limited based on the measured value of the temperature, humidity or flow limit signal.

This is the typical configuration when the control is entrusted to a Building Management System that generates a control signal.

• P Control

This control is like the PH control, but without humidity limit probe. The following is a graphic with proportional control.

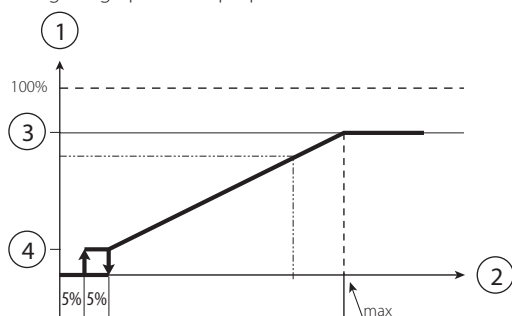


Fig. 7.g

Key:

1. production
2. external request
3. maximum production
4. minimum production

• CH/CT/CF control

This control mode corresponds to the ON/OFF operation, from a non-powered external contact (for example, a humidistat).

The capacity will therefore be the maximum set or nothing (no modulation) according to the status of the external contact and limited based on the limit signal.

See sections TT/TH/TF for more information regarding limit signals.

• C control

This control corresponds to the ON/OFF operation mode without any limit probe. The request directly follows only the control contact.



Note: Whenever the activation signal from the recovery unit is a digital signal, the control contact will NOT be the same signal; they will be two distinct signals.

• Limit probe

In the following graphics, the first represents the limitation of the maximum production with a temperature limit probe or an activation signal from the IEC ventilator. The second graphic, on the other hand, represents the case in which the limit probe is a humidity probe or an opening signal from the recirculation air lock.

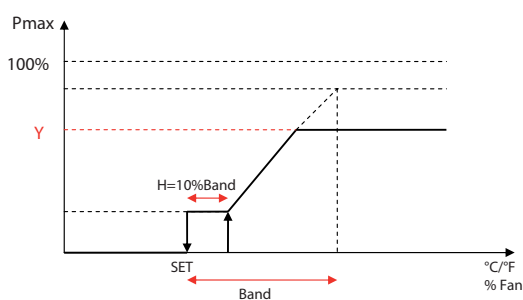


Fig. 7.h

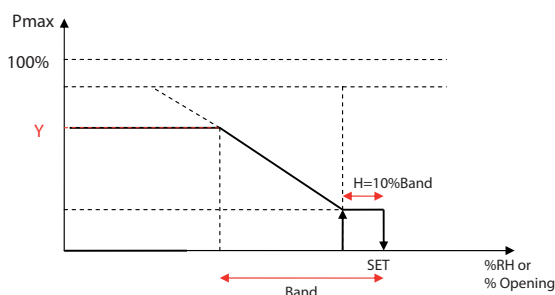


Fig. 7.i

8. SINGLE ZONE AND MULTIZONE CONFIGURATION

The humiFog system can be used in the following configurations:

8.1 Single zone

For humidification and/or cooling applications in AHUs or industrial environments. The pumping unit has just one distribution system, a rack in the case of AHUs or a room distribution system with simple manifolds and nozzles or blower units. The humiFog control system (single zone version UAxxxxxxx) controls both the pumping unit and the connected distribution system. In particular, it receives signals from the probes and/or the external control system, calculates the required humidification/cooling capacity, starts the pump to pressurise the water and manages the solenoid valves in the distribution system. In addition, it manages the filling, wash and drain cycles.

Single zone application in AHU

As can be seen in the figure, humiFog is a complete system for humidification/cooling in AHUs.

humiFog can be set for:

- capacity/flow-rate control:

As described in detail in the paragraph "humiFog with flow control", the humiFog controller manages the humidification and/or cooling capacity by controlling the water flow-rate atomised continuously across a wide range of modulation.

The outlet pressure is kept within the optimum water atomisation limits by the range of modulation of the pump speed and control of the number of nozzles that atomise the water.

For example, if low capacity is required, only the first group of nozzles is activated and the pump speed will be controlled to ensure the required capacity (Fig. 8.a point 1). If the request increases, the pump speed will increase and, as a consequence, the flow-rate and outlet pressure will increase. If the pressure exceeds the maximum limit (75 bars, settable) humiFog will activate a further group of nozzles (max 4 groups), Fig. 8.a point 2, so that, for the same flow-rate, the operating pressure will drop and fall within the limits (25-75 bars, settable). If the request increases further, the pump will increase the flow-rate and the pressure until activating a further, third, group of nozzles (Fig. 8.a point 3). The process is repeated until the maximum flow-rate is reached, corresponding to all the groups of nozzles being active and the pump operating at the maximum rack flow-rate (Fig. 8.a point 4). Similarly, the system will behave in reverse if the request decreases, reducing the speed and consequently the flow-rate of the pump and deactivating the groups of nozzles one after the other.

The groups of nozzles on the rack are configured automatically during humiFog system selection procedure using the "humiFog excel tool" and is described in detail in the documents supplied with the water distribution system (rack).

The flow control configuration guarantees maximum precision of humidification and adiabatic cooling as capacity is controlled continuously and across a wide range.

- constant pressure control:

As better described in the paragraph "humiFog with constant pressure", humiFog is fitted with an inverter to control the speed of the pump, so as to maintain the pressure at the rated value set by parameter, typically 70 bars.

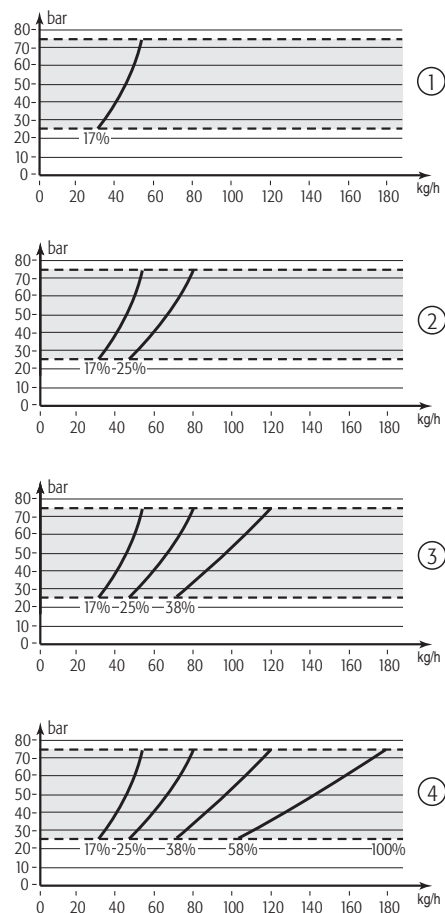


Fig. 8.a

The water distribution system/systems have nozzles organised into groups, called steps, which in general each have different capacities. Based on the flow-rate of water to be atomised in one or more zones, the humiFog system will activate the best combinations of steps until the nozzles atomise the required quantity of water. For example, if the system has three steps with the following capacities: step 1 - 30kg/h, step 2 - 30kg/h; step 3 - 20kg/h, and the request is 30 kg/h, then step 1 is activated, if the request is 50 kg/h then step 1 and step 3 are activated, while if the request is 60 kg/h then step 1 and step 2 will be activated.

In AHU applications, it is useful to suitably distribute the capacity of the steps so as to allow good resolution of capacity modulation. For example, a humiFog with a 180 kg/h rack, using 4 modulation steps and 4 kg/h nozzles, may have steps with the following capacities:

- step 1 96kg/h
- step 2 48kg/h
- step 3 24kg/h
- step 4 12kg/h

Note that the resolution is $12/180=6.6\%$, therefore very good, with just 4 modulation steps!

The technique involves assigning around half of the capacity to one step, half of this to the next step, half of the latter to the following step and so on, according to the following formula:

$$S = \frac{M \cdot 2^{T-1}}{2^N - 1}$$

With:

S= capacity of step T

M= rack capacity

T= index of the step, 1 to N

N= step number



N.B.: the maximum flow-rate of one step is 120 l/h.

Obviously, the capacity calculated above should be rounded off based on the capacity of the nozzles (in this example, 4 kg/h), the number of nozzle manifolds that can be installed, etc.

Each zone may have up to 6 modulation steps.

The groups of nozzles are normally configured when selecting the humiFog system, and the procedure is clearly described in the documents supplied with the water distribution system (rack or room distribution and atomisation system).

Single AHU application

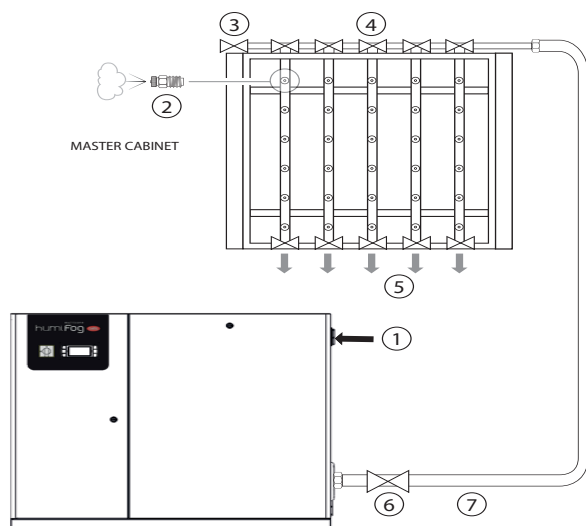


Fig. 8.b

Key:

1. water from REVERSE OSMOSIS system;
2. atomising nozzles;
3. vent valve;
4. water fill valve;
5. water drain;
6. main drain valves;
7. high pressure stainless steel or rubber hoses.

Single zone room applications

As can be seen in the figure, humiFog is a complete system for humidification directly into rooms.

As better described in the paragraph on "humiFog with constant pressure", humiFog features an inverter to control the speed of the pump, so as to maintain the pressure at the rated value set by parameter, typically 70 bars.

Note that in the case of humidification and/or cooling adiabatic directly into rooms, constant pressure control is preferred over flow control: as the droplets are atomised directly into the environment, to minimise the space required for evaporation, the smallest possible diameter should be achieved and therefore the water must be atomised at maximum pressure. This is represented by constant pressure control, which maintains the pressure at 70 bars.

The water distribution system/systems have nozzles organised into groups, called steps, which in general each have different capacities. For simple installation and operation, however it is recommended to use steps of the same capacity. For example, a 100 kg/h system may have two 50 kg/h steps, where necessary made up of two or more lines with nozzles/blower units. Based on the flow-rate of water to be atomised, the humiFog system will activate the steps required for the nozzles to atomise the necessary quantity of water. The zones can have up to 6 modulation steps. humiFog also manages rotation of the lines, emptying, washing etc, better described in the following paragraphs.

The groups of nozzles are normally configured when selecting and sizing the humiFog system.

Single room application

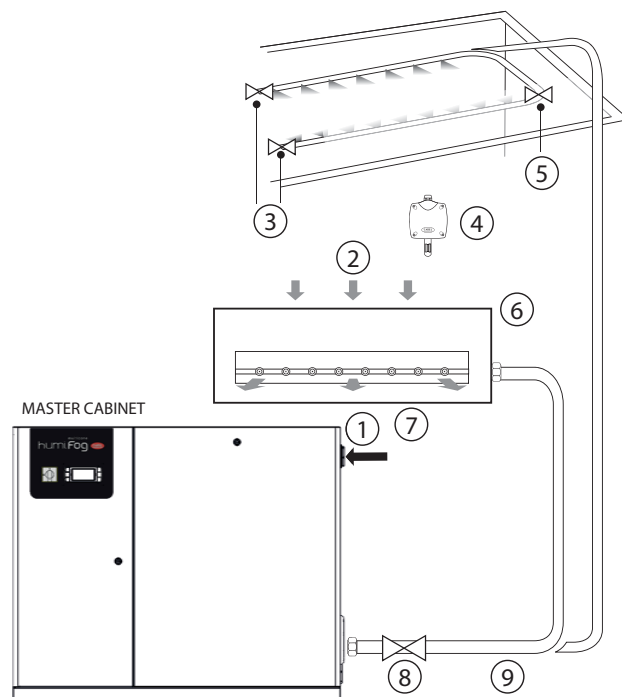


Fig. 8.c

Key:

1. water from REVERSE OSMOSIS system;
2. air inlet;
3. drain valves;
4. ambient probe;
5. fill valves;
6. blower;
7. main drain valves;
8. high pressure stainless steel or rubber hoses.

8.2 Multizone application in AHU or room

For standard humidification and/or cooling applications in AHUs or industrial environments.

The humiFog controller manages the water pressure generated so as to keep it at a constant level, typically 70 bars.

As illustrated in the following figure, the pumping unit has a distribution system, a rack in the case of AHUs or a room distribution system with simple manifolds and nozzles or blower units. The humiFog control system (multizone zone version UAxxxxxxx) controls both the pumping unit and the connected distribution system. All the other zones, whether an AHU or an industrial environment, has a zone control cabinet fitted with electronic controller that manages its own distribution system, a rack in the case of AHUs or a room distribution system with simple manifolds and nozzles or blower units. In addition, it communicates with the Master for all the common system procedures, such as washing, emptying, etc. Each cabinet, both Master and Slave, receives the signals from the probes and/or the external control system, calculates the required humidification/cooling capacity and, when the water has reached the rated pressure, manages the solenoid valves in the distribution system to generate the required capacity.

Constant pressure control rationalises operation of the humiFog pumping unit as, despite the lower precision of stepped modulation, it can treat a number of zones at the same time without installing a pumping unit for each AHU or industrial environment.

For the configuration of the steps, see the instructions provided in the previous paragraph "Single zone applications in AHUs – constant pressure control" and "Single zone applications in rooms".

Multi-AHU application

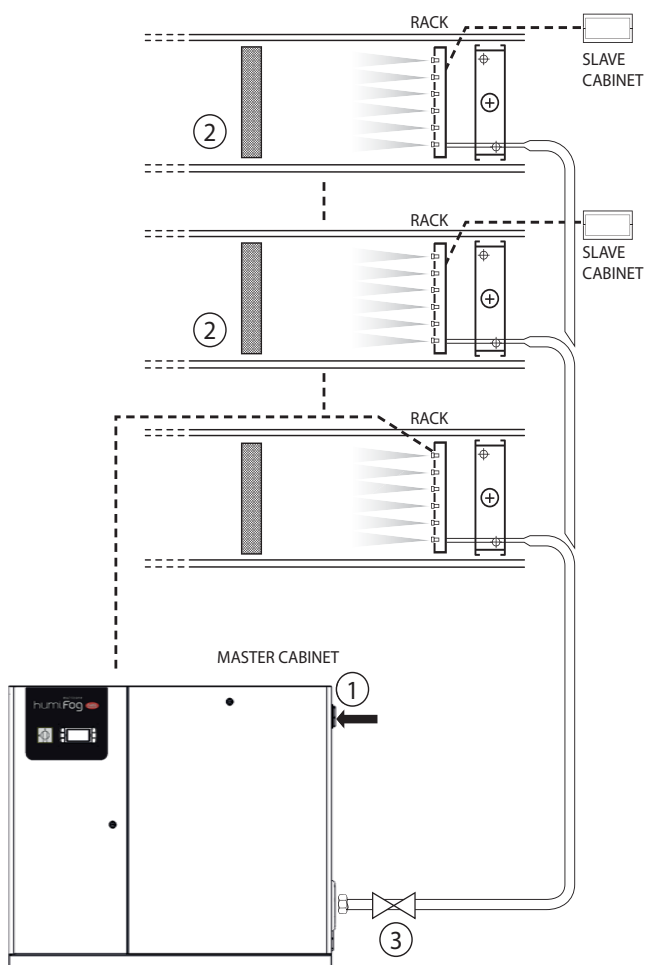


Fig. 8.d

Key:

- 1. water from REVERSE OSMOSIS system;
- 2. air handling unit;
- 3. main drain valve

Multi-room application

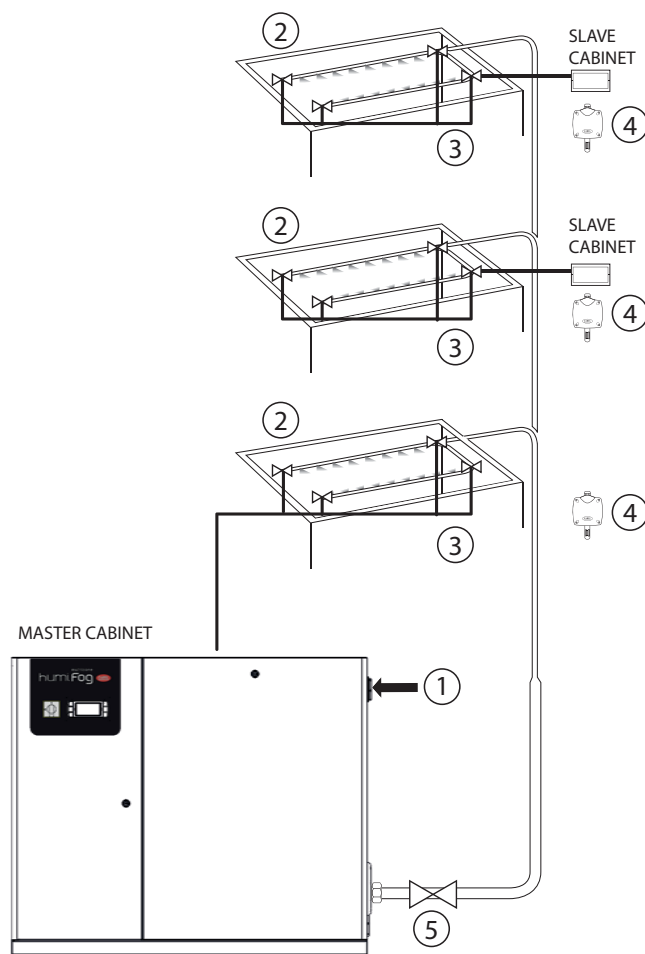


Fig. 8.e

Key:

- 1. water from REVERSE OSMOSIS system;
- 2. drain valves (one in each zone);
- 3. fill valve;
- 4. ambient probe;
- 5. main drain valve.

installer

user

service

8.3 Indirect adiabatic cooling applications

One important function involves indirect adiabatic cooling applications (summer): a pumping unit can cool the exhaust air before it enters a heat recovery unit. This function is often complementary with the use of humiFog for air humidification in winter. The configuration in question is illustrated in the figure.

The system can be configured in two ways:

- **capacity/flow-rate control:** just one rack at a time atomises the water, with continuous system capacity control and consequently maximum precision. See paragraph "4.1 Pumping unit with flow control configuration" for further information on capacity control.
- **constant pressure control:** two racks can atomise the water at the same time or individually. This maximises energy saving by simultaneous indirect (cooling the air before the heat recovery unit) and direct adiabatic cooling (cooling the air before this is introduced into the environment), however with less precise control (stepped capacity modulation, see paragraph "4.2 Pumping unit with constant pressure control" for further information on capacity control).

For example, an indirect system with 100 kg/h of water sprayed can cool the exhaust air with an equivalent cooling capacity of 68 kW; this, in the heat exchanger/heat recovery unit, will cool the fresh air with an equivalent cooling capacity of 34 kW, for a power consumption of just 1.2 kW! In addition, this reduces the capacity required of the cooling coil and the chiller. For a detailed and complete description, see "Air humidification" by Lazzarin - Nalini, chapter 11.

Indirect and direct adiabatic cooling

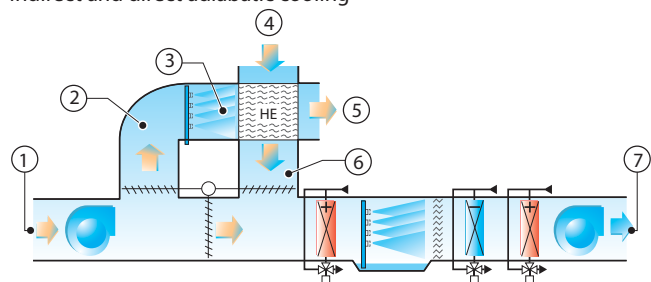


Fig. 8.f

Key:

1. recirculated air;
2. exhaust air;
3. saturated and cooled air;
4. outside air inlet;
5. heated exhaust air;
6. cooled outside air;
7. fresh air.

8.4 System operation

humiFog multizone independently manages the production of pressurised water, the distribution and filling, drain and wash cycles. This paragraph illustrates the latter functions.

Filling: before starting the production/atomisation phase, the piping must be filled with water and, then, vented of air. This ensures correct pressurisation of the lines and minimises the possibility of pressure swings due to air trapped in the piping. The system is empty when first started and following draining due to extended inactivity (see the rest of the paragraph for further information). Before starting production, the system is filled by starting the pump, which generates the rated capacity of the pumping unit and fills the piping with water for a time set by parameter. This time must be established by trial and error when starting the system. When filling, all the capacity-control and drain valves in all the zones are open, while the vent and main drain valves are closed. The distribution system must be sized so that, in these conditions, the water pressure does not exceed 5 bars, thus avoiding situations where the nozzles atomise/spray water (each nozzle contains a valve that prevents atomisation at pressures below 7 bars).

Washing: this is performed periodically and involves flushing water through the piping for a time set on the menu. The purpose is to completely wash the system and avoid stagnation of water. It is performed in the same way as filling, but lasts longer: the time should be set so that the water used for washing is at least 3 times the volume of water contained in the complete installation. The wash cycle is performed every day at the same time (e.g. every day at 4 in the morning) or periodically at an interval set by parameter. At the end of the first wash cycle, the system remains full, while, starting from the second consecutive wash cycle without operation, the installation will be left empty. In addition, a wash cycle is also performed at start-up.

If the wash cycle is disabled, then the system will be left empty after a period, set by parameter, during which it has remained full and without operation.

Pressure relief: this last function is used to save water and limit the filling and emptying cycles, without affecting the hygiene features of the system, nor its performance.

The pressure relief function, when a branch (piping with nozzles or blower units) is disabled (stops atomising), the capacity-control valve is obviously closed and the drain valve is opened. The latter, however, will be closed again a few seconds later so that the pressure falls below 7 bars (and then the nozzles no longer spray) however the branch remains almost completely full of water. This avoids emptying the branch (saving water) and having to fill the system when production is required again in the branch. Note that opening the drain valve is required to achieve a rapid decrease in pressure from 70 bars to virtually 0, preventing the nozzles from spraying water at intermediate pressure values and generating large droplets that would wet the AHU/room.

Clearly, it is recommended to enable pressure relief. Indeed, thanks to the emptying procedure described above, in this case too there will not be stagnation of water in the piping for a time greater than the set value.

Rotation (only if "Pressure relief" is enabled): in constant pressure systems, humiFog periodically "rotates" the branches (piping with nozzles or blower units) that atomise the water. For example, if the zone has four branches and only two are in production, then the first and the third will be activated, for example, for 20 seconds, and then deactivated; at the same time, branches two and four will be activated. After a further 20 s, branches two and four will be deactivated (with pressure relief), and one and three will be activated simultaneously. The example in the diagram where each configuration (row) lasts 20 s. "A" indicates the active branch, "d" the inactive branch:

t=0	A	d	d	A	d	d
t=20s	d	A	d	d	A	d
t=40s	d	d	A	d	d	A
t=60s	A	d	d	A	d	d
t=80s	d	A	d	d	A	d
t=100s	d	d	A	d	d	A

Rotation is feasible if system operates with constant pressure and all the branches have the same rated capacity. Obviously, pressure relief must be enabled, otherwise each rotation would require a filling cycle.

8.5 Constant pressure systems: notes on capacity control

In constant pressure systems, humiFog keeps the pressure at the desired value when the required capacity changes (that is, the sum of the capacities required by each zone).

Capacity required increases: whenever a zone requires an increase in capacity, the pumping unit does not respond immediately: the flow-rate/capacity of the pump is modified to generate the required capacity and only then is the signal sent to the zone, which suitably controls the solenoid valves (overboost cycle). For example, if a zone has 4 branches, 25 kg/h in each branch, two branches are active and the request increases to 75 kg/h, then the zone controller sends the request to the pumping unit, which increases the flow-rate to 75 kg/h and, only when this has been reached, sends the signal to the zone to activate the third branch and consequently spray 75 kg/h. In the delay until the signal is received, the water pressure rises above the pressure set point, however this guarantees that, when the third branch is activated, the pressure will not fall below the required value and cause the nozzles to spray coarse droplets. During this transient period, the excess water is recirculated by the bypass valve. Subsequently, when the zone is in the final status (solenoid valves suitably activated, third branch open, as in the example) the water pressure drops for a few seconds to around 60 bars, to ensure complete closing of the bypass solenoid valve (underboost cycle).

Capacity required decreases: in this case, the pumping unit responds immediately to the request from any one of the zones to decrease the capacity. As a consequence of the reduction in atomised water in the zone/zones, the pressure will increase and the bypass valve may be activated. There will also be a reduction in the pump rotation speed (to reduce the flow-rate to the new value required by the zone) and, if the bypass valve has been activated, an underboost cycle will be performed (see the description above).

In the general case where there are multiple zones that require variations in capacity, these will be satisfied one at a time, in order, and only at the end of the last variation will the underboost cycle be performed, if necessary.

9. START UP

Before starting the humidifier check:

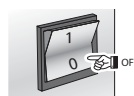


- ☐ water and air connections (chap. 2). In the event of water leaks do not start the humidifier before having resolved the problem;
- ☐ electrical connections (cap. 3)

9.1 Starting



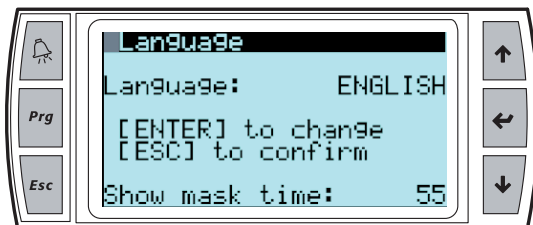
9.2 Stopping



Note: if the system is stopped for an extended time, open the valve at the end of the water line to assist drainage. If the system is fitted with drain solenoid valves at the end of the line (optional), this is done automatically.

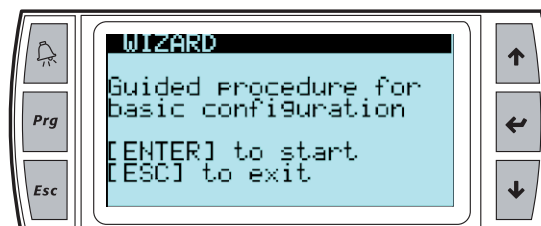
9.3 First start-up

HumiFog is fitted with a guided procedure for the first start-up, which guides the user step by step on how to set the humidifier. The first screen is dedicated to language, as shown in the following screen



Press ENTER to select the desired language. Once finished press ESC to return to the startup procedure. This screen is displayed for 60 seconds.

Successively, a series of "wizard" screens shall appear, which will guide the user on fillig-in all the parameters required for the proper setting of the humidifier



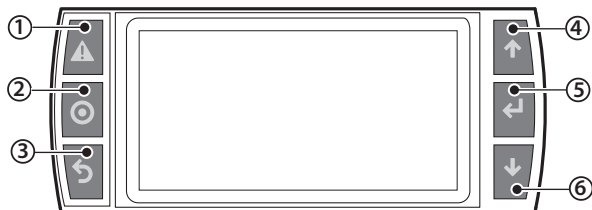
- YES: the screen for selecting the language displays at the next start-up of the humidifier;
- NO: the screen for selecting the language does not display any more at start-up.



Note: the language can be changed at any time by following the instructions in Chapter 9.7 Installer menu.

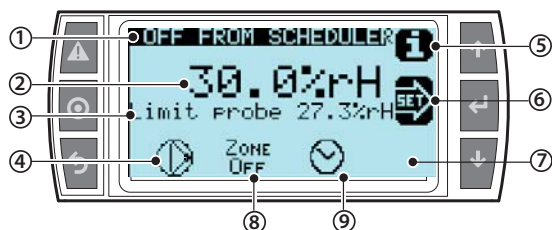
10. USER INTERFACE

10.1 Keypad



Ref.		Function
1	alarm	list active alarms and reset any alarms present
2	PRG	from the "main" screen, access the main menu
3	ESC	return to the previous screen/display
4	UP	circular navigation inside the menus, the screens, the parameters and the values of the parameters from the "main" screen, access an "INFO menu"
5	ENTER	select and confirm (like the "Enter" key on a computer keyboard) from the main screen, access the "SET" screen
6	DOWN	circular navigation inside the menus, the screens, the parameters and the values of the parameters from the main screen, access the "ALARM HISTORY" screen

10.2 "Main" screen

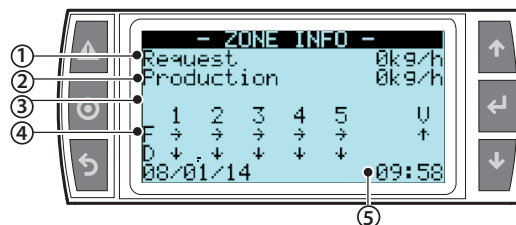


Ref.	Function
1	description of the area status: "OFF" state area "IN Function" state area "READY" state area (is in standby) "WASHING" state area "FILLING" state area The descriptions of the missing areas are grouped in the supervision table
2	value read from the main control signal
3	limit probe reading (if enabled)
4	pump state: • pump in Function (the triangle in the center of the icon flashes); • pump not in Function (the triangle in the center of the icon does not flash, empty);
5	Access to the "INFO" screen (UP key)
6	Access to the "SET" screen (ENTER key)
7	Access to the "HISTORY ALARM" screen (DOWN key)
8	State of spray nozzles: • spray nozzles in Function • spray nozzles not in Function • disabled area
9	Time frame in "ACTIVE" state

10.3 "INFO" screens

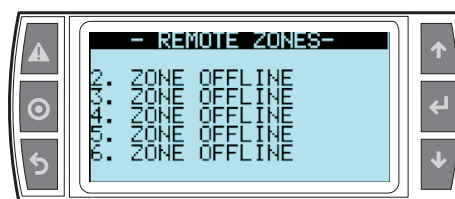
Series of read-only screens for displaying the main humidifier status values. To access, press UP from the "Main" screen. There are four "INFO" screens; to move from one screen to the next, press UP or DOWN. Press ESC to return to the "Main" screen.

1. INFO screen - Information area (read-only)



Ref.	Parameter and UM	Status
1	Request [kg/h]	
2	Production [kg/h]	
3	AUX Probe	(if enabled)
4	Valve state: Refill valve F Drain valve D Ventilation V	"→" Opened (atomizing branch); "-" closed "↓" Opened (drain branch); "-" closed "↑" Opened (in ventilation); "-" closed
5	Date and hour	

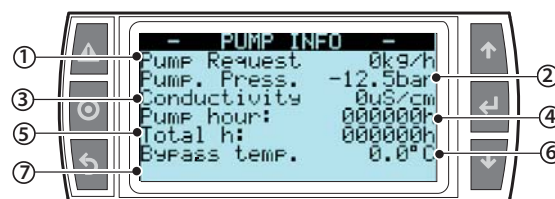
2. INFO screen - Remote information area (read-only)



Indicates the current status of each remote location connected to the cabinet

- Off to flow state
- In production
- No request
- Etc...

3. INFO screen - Pump information (read-only)



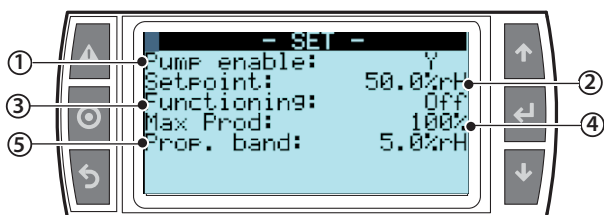
Ref.	Parameter and UM	Status
1	Request [kg/h]	Represents the total requests of each area
2	Pump pressure [bar]	Pressure generated by the pump
3	Conductivity [µS/cm]	Conductivity measured at the inlet of humiFog
4	Pump hours [h]	Hours of operation occurred since the last reset of the hour meter
5	Total hours [h]	Total hours of operation only
6	Bypass temp. [°C/°F]	Temperature of the water recycled in the pump
7	Rack temp. [°C/°F]	Temperature detected by the probe in the atomization area (optional). Setpoint set from CTA

10.4 "SET" screen

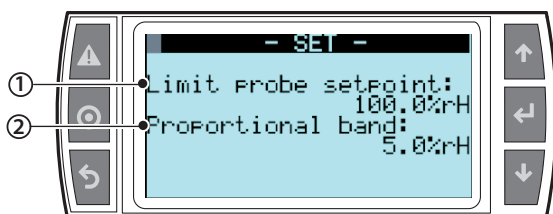
Used to set the main values for the humidifier.

From the main screen press:

- ENTER to access the menu;
- ENTER to select the parameter you want to set;
- UP and DOWN to modify the value of the selected parameter;
- ENTER to confirm and go to the next value.



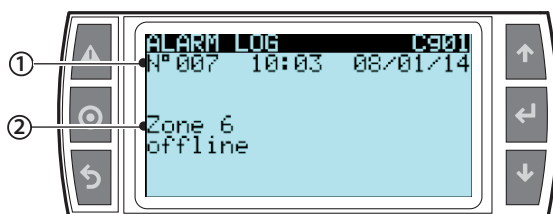
Ref.	Parameter and UM	Status
1	Enabling the pump set [Yes/No] to the no parameter to completely disable the system	YES
2	Setpoint (T or %rH) [°C/°F or %U.R.] represents the requested humidity or temperature (available if the control is fitted with a probe)	28°C/82°F or 50%rH
3	Auto Operation [Auto/OFF] following the request of the area; OFF the non-atomized area even in the presence of a request	Auto
4	Maximum pressure [%] setting of the maximum production from the area	100 %
5	Proportional band (T or %rH) [°C/°F or %U.R.]	5 °C/°F or 5% rH
....	Differential (present only if P/I)	2 °C/°F or 5% rH



Ref.	Parameter and UM	Default
1	Limit probe setpoint (T or %rH) [°C/°F or %U.R.]	10°C/50°F or 90 %rH
2	Limit probe proportional band	5 °C/°F or 5% rH

10.5 "Alarm History" screen

The alarm history screen displays the messages generated by warnings or alarms that are solved.



Ref.	Parameter
1	number, hour and date of warning/alarm
2	Description of warning/alarm

10.6 "Main" Menu

To access press PRG from the main screen

Buttons:

- UP and DOWN: navigation inside the submenus, screens, and range of values and settings;
- ENTER: confirm and save the changes made;
- ESC: to go back (pressed more than once returns to the "Main" screen)
-

Menù	1° level	2° level	Indexing
A. User	a. Alarm Threshold	--	Aa01
	b. Clock	--	Ab01...2
	c. Scheduler	--	Ac01...2
B. Installer	a. Pump setup	a. Pump setup	Baa01...2
		b. Water supply	Bab01...2
		c. Special functions	Bac01...6
	b. Zone setup	a. Configuration	Bba01...6
		b. Distr. system	Bbb01...3
		c. Special funct.	Bbc01...10
		d. Supervisor	Bbd01...2
		e. External alarms	Bbe01
	c. Remote zones	Remote zones	Bc01
	d. Change Language	Language	Bda01...2
C. Maintenance	a. System config	--	Ca01...2
	b. Unit info	--	Cb01...3
	c. Probe readings	--	Cc01
	d. Manual request	--	Cd01...11
	e. Unit Status	--	Ce01
	f. Working hours	--	Cf01...2
	g. Alarm log	--	Cg01

10.7 "User" Menu

From the main screen press:

- PROG to access the main menu;
- ENTER to select and access the selected menu;
- UP/DOWN to move between the submenus;
- ENTER to enter the submenus
- ENTER to select the parameter and move between the parameters;
- UP/DOWN to modify the parameter;
- ENTER to confirm selected parameter and go to the next parameter;
- ESC to return to the previous menu.

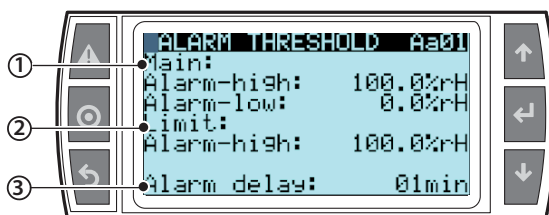
To navigate inside the screens:

- UP or DOWN to modify the value (within the options/range),
- ENTER to confirm and move the cursor to the next value
- ESC to return to the installer menu.

User Menu Screens:

Menù	1° level	2° level	Indexing
A. User	a. Alarm Threshold	---	Aa01
	b. Clock	---	Ab01...2
	c. Scheduler	---	Ac01...2

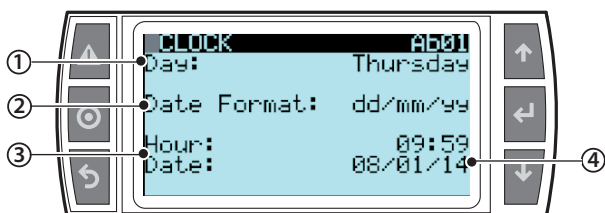
Submenu: a. 01 Alarm threshold



Ref.	Display	Description	Range	Default	Unit
Main					
1	Alarm-high	Alarm threshold for high humidity or temperature	0...100 o -20...70	100 o 40	U.R. o °C
2	Alarm-low	Alarm threshold for low humidity or temperature	0...100 o -20...70	0 o 20	U.R. o °C
Limits					
3	Alarm-high	Alarm threshold for high humidity or temperature limits	0...100 o -20...70	100 o 10	U.R. o °C
4	Alarm-delay	Minutes beyond which the alarm is triggered	0...99	1	min

Submenu: b. Clock

b. Clock 01 CLOCK
Day, date and hour setup



Ref.	Display	Description	Range
1	Giorno	Setting the week day	Monday to Sunday
2	Formato data	Setting the European or American date format	dd/mm/yy - mm/dd/yy
3	Ora	Setting the hour	0 - 24
	Data	Setting according to date format	

b. Clock 02 Clock

Gestione ora solare/legale



Ref.	Display	Description	Range
1	Ora legale	"ENABLE", defines the automatic switching between standard time and daylight saving time	Enable/disable
2	Transition time:	Determine the number of minutes by which the clock will be adjusted during the activity time of the transition.	-60 min
3	Start	Defines the start of the daylight saving time period	
4	End	Defines the end of the daylight saving time period	

Same type of setting and requested for the end transition threshold.

This is expressed relatively, not based on the number of days but on the day of the week.

Setting this parameter requires entries in four different fields:

- Week selection (available options: First, Second, Third, Fourth, Last);
- Day selection;
- Month selection
- Transition start time

The same type of setting is required for the transition end threshold

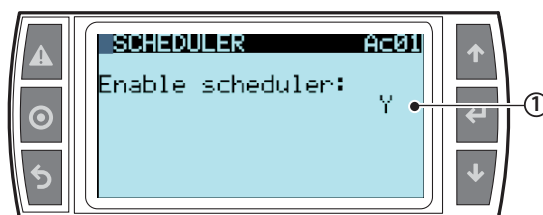


Note: the default configuration includes changing the standard time/daylight saving time according to the European standard and the UTC +1 time zone

Submenu: c. Scheduler

c. Scheduler 01 SCHEDULER

Enabling the scheduler (operation time frames)



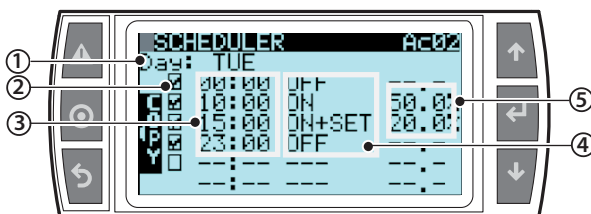
Ref.	Display	Description	Range	Default	Unit
1	Enable scheduler:		Abilita/disabilita		



Note:

- if the unit is configured with the "On/Off" setting or the "Proportional external signal", the scheduler manages the switching on and off of the unit, while the actual regulation is delegated to the external signal;
- if the unit is in "Off by scheduler" the request from the external signal is ignored, while it is satisfied if the unit is placed in "On" by the scheduler.

Scheduler settings (operation time frames)



Ref.	Display	Description	Range	Def.	Unit
1	Day	Setting day of the time frame			
2		Enable/disable the time frame			
3	00:00	Start hour of time frame			ora
4	ON+SET	Type of time frame	ON ON+SET OFF		
5	00.0%	Setpoint of the humidity or temperature frame (editable only for "ON+SET" frames)			% rH %T

**Note:**

It is possible to set up to 6 time slots in each day of the week to define ON/OFF and setpoint changes over 24 hours, as follows:

ON: The unit is ON and the production works respecting the current request (in the case of adjustments in temperature or humidity setpoint is used in the mask "Set")

ON+SET (only regulation in humidity or temperature): The unit is ON following the setpoint defined in the mask of the scheduler.

OFF: The unit going in "Off by scheduler": each production request isn't consider and there is no production.

**Note:** referring to the mask Scheduler AC02 below:

The humidifier is in "Off" mode from 0:00 to 10:00 am

At 10:00, the humidifier is in ON mode and works with setpoint equal to global setpoint (editable in mask "Set" and reported in mask "scheduler" AC02)

At 15, the humidifier is always in ON mode and works with a setpoint other than the global 20% rH

At 23:00 the unit is turned off.

10.8 "Installer" Menu

From the main screen press:

- PRG to access the main menu;
- DOWN to move to the installer menu;
- ENTER to move to the password;
- UP/DOWN to enter the password "77"
- ENTER to access the selected menu;
- UP/DOWN to move between the submenus;
- ENTER to select the parameter and move between the parameters;
- UP/DOWN to modify the parameter;
- ENTER to confirm the selected parameter and go to the next parameter;
- ESC to return to the previous menu.

To navigate inside the screens:

- UP or DOWN to modify the value (within the options/range),
- ENTER to confirm and move the cursor to the next value
- ESC to return to the installer menu.

The installer menu is divided into four submenus:

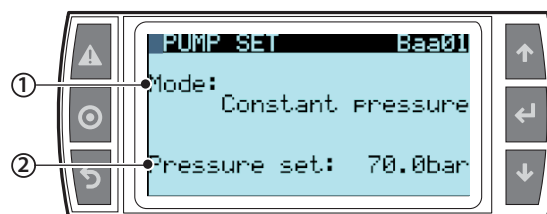
Menù	1° level	2° level	Indexing
B. Installer	a. Pump setup	a. Pump setup	Baa01...2
		b. Water supply	Bab01...2
		c. Special functions	Bac01...6
	b. Zone setpu	a. Configuration	Bba01...6
		b. Distr. system	Bbb01...3
		c. Special funct.	Bbc01...10
		d. Supervisor	Bbd01...2
		e. External alarms	Bbe01
	c. Remote zones	Remote zones	Bc01
	d. Change Language	Language	Bda01...2

Submenu a. Pump setup

a. Pump setup - Pump setup
1...2

Contains the menu with the installer parameters related to the pump station

Pump operation mode



Define the type of operation of the pumping station - between constant pressure (the atomization occurs when the pressure is set constantly, set the pressure to 70 bar) and flow control, the atomization starts at 25 bar and increases to 70 bar. If the humidity setpoint is not reached at this point, then the next branch is opened, atomizing again between high and low pressure, which are the only two parameters to be set. In the case of a multi-area system, the only possible option is the constant pressure setting.

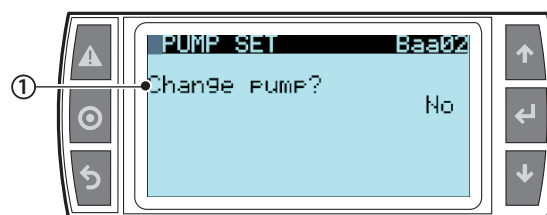
Constant pressure

Ref.	Display	Description	Default	Unit
1	Mode	Set to constant pressure	PC per i codici UA...ZD... CP per i codici UA...HD...	
2	Pressure set	Pressure at which the atomization occurs	70	bar

Flow control

Ref.	Display	Description	Default	Unit
	Mode	Set to flow control	PC per i codici UA...ZD... CP per i codici UA...HD...	
	High pressure	Activation value of the next rack branch	70	bar
	Low pressure	Deactivation value of the rack branch	25	bar

Change pump



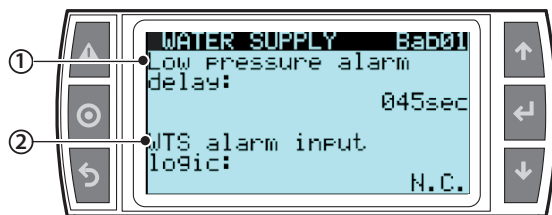
Ref.	Display	Description	Default	Unit
1	Change pump?	Activity to be performed only when the pump is replaced, in order to reset the operating hours and the warnings related to them	No	

If it is necessary to replace the pump, it is required to set the parameter to "YES" by resetting the hourmeter from the first 50 hours of operation. If it is necessary to replace the pump assembly, it is of fundamental importance to signal the replacement on the Baa02 screen, in order to reset the parameters related to the operation of the pump and have the correct maintenance and oil change alerts, particularly that relating to the first 50 hours of operation, which is not restored following the simple reset of the hourmeter on the Cf02 screen.

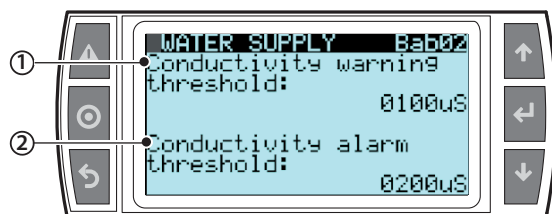
- Submenu a. Pump setup
- a. Pump setup -
 - b. water supply 1...2

Water alarm settings

In the menu you will find two screens that define the parameters of water supply and the relative signal delay of any warnings



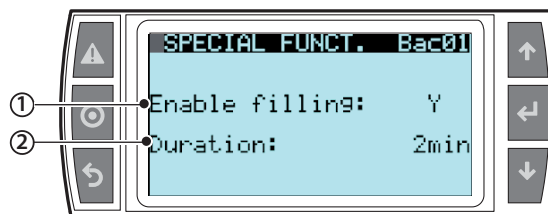
Ref.	Display	Description	De- fault	Unit	unità
1	Low pressure alarm delay	The time after the locking alarm is notified, with regard to the low water pressure in the pump outlet of the humidifier, does not exceed the minimum threshold set by Carel at 20 bar	0 - 999	45	sec
2	WTS alarm input logic	Manages the logic of the ROAL-GOA contact which receives the possible alarm state coming from the water treatment system. In the event that an alarm state occurs, this is also displayed on the cabinet display as "water treatment plant alarm". The possible logics are the following: N.C. means that the alarm state will occur at the opening of this contact N.A. means that the alarm state will occur at the closing of this contact	N.C./ N.A.	N.C.	



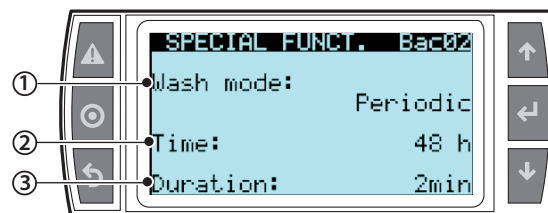
Ref.	Display	Description	De- fault	Unit	unità
1	Conductivity warning threshold	Conductivity value of the inlet water to the pumping station beyond which a warning is triggered. This threshold does not represent a blocking notification for the system, but only a pre-alarm		100	μS
2	Conductivity alarm threshold	Conductivity value of the inlet water to the pumping station beyond which the system is blocked. The value set by the "high conductivity alarm threshold" parameter must always be greater than the previous parameter		200	μS

- Submenu a. Pump setup
- a. Pump setup -
 - c. Special function 1...6


Washing and filling

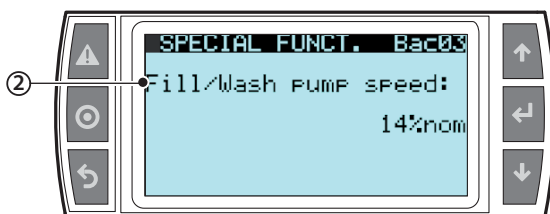


Ref.	Display	Description	De- fault	Unit	unità
1	Enable filling	When the pumping station should start and detects that the water discharge line is empty before start-up, enabling the pump, seasonal restart etc., enabling this parameter with Yes, the pump dispenses the minimum flow for a defined time to the next parameter, in order to fill the line before the start of the atomization	Si/No	Si	
2	Duration	The filling time of the discharge line before starting the atomization, only if the discharge line is detected as being empty	1/60	2	min



Ref.	Display	Description	De- fault	Unit	unità
1	Wash mode: Periodic Giornaliero Solo svuotamento	Washing performed after a set number of inactive hours Washing performed daily at a pre-defined hour Complete emptying of the lines performed after a set number of inactive hours	Periodico giornaliero solo svuotamento	Periodico	Tipo
2	Intervallo Ora Intervallo	Number of inactive hours after which the periodic washing is performed Time of day when you run the daily wash Number of inactive hours after which the complete emptying of the lines is performed		49 0 49	h h h
3	Duration Duration -	Number of minutes for which the periodic washing is performed Number of minutes for which the daily washing is performed	1 - 10 1-10 -	2 2 -	min min -

 **Note:** if the washing parameter was set to "Periodic" or "Daily", a washing will be performed at every start of the pumping station.



Ref.	Display	Description	De- fault	Unit	unità
1	Fill/Wash pump speed:	As specified on the Bac01 screen, if the filling or washing is enabled, you have the possibility to set the nominal flow rate in % at which the filling and washing is performed	0...999	14	%

Slowdown pump



Ref.	Display	Description	De- fault	Unit	unità
1	Slowdown vent. valve zone	Defines in which area to open the ventilation valve during the slowdown of the pump at the reached setpoint. This phase is required because the normal mechanical inertia of the pump when reaching the setpoint could generate a critical pressure for the next restart	0...6 (Numero della zona da aprire)	1	n°
2	Opening duration ventilation valve	Time of opening the ventilation valve to ensure the correct pressure of the system at the next restart	1...15	3	sec.
3	Fill/Drain valves	Time of opening the drain valves of the area defined by the first parameter of the screen to ensure the proper pressure at the opening of the ventilation valve	1...15	1	sec

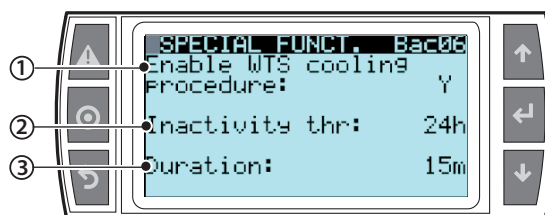
Drain-valve status in stand-by



Ref.	Display	Description	Def.	Unit	unità
1	close fill valves in case of empty standby for more than:	Set minutes after which, if the system detects an empty standby, stops the supply towards the load solenoid valves (N.C.)	0...540	15	min
2	Pump status relay logic:	Set the relay logic that represents the state of the pump through the free ROEN-COM contact. Open contact ON pump (if the set parameter is N.A., otherwise vice versa) Closed contact OFF pump (if the set parameter is N.A., otherwise vice versa)	N.A/ N.C.	N.A.	

Cooling the water treatment system

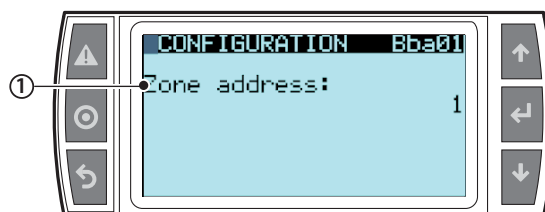
In order to preserve the state of the membranes even in limited environmental conditions (for example temperature) it is possible to provide the enabling of the successive parameters which run the water by avoiding overheating



Ref.	Display	Description	Range	Default	Unit
1	Enable WTS cooling procedure	Enables at the end of the "T. Inactivity" parameter, the opening of the load solenoid valve of the pumping station for a time defined by the "Duration" parameter in order to activate the water treatment system to ensure optimal conditions for maintaining the membranes	SI/NO	SI	Tipo
2	Inactivity thr:	Time after which the system opens the load solenoid valves of the pumping station	0...999	24	h
3	Duration	Opening time of the load solenoid valves of the pumping station	0...99	15	min

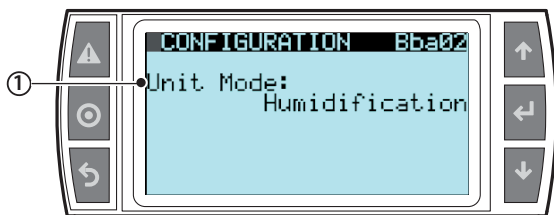
Submenu b. Zone setup
b. Zone setup -
a. Input config.1...6

Remote area address



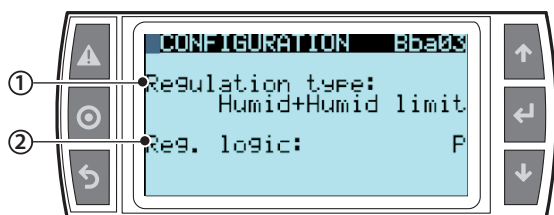
Ref.	Display	Description	Range	Default	Unit
1	Zone address:	Field-bus address of the area	1-6	1	n°

Operating mode (in this regard consult the chapters xxxx)



Ref.	Display	Description	Range	Default	Unit
1	Unit mode	Defines the operating mode of each area Humidification or D.E.C I.E.C.: Indirect evaporative cooling with temperature setpoint Generator of pressurized water: defines a pressure setpoint according to the pre-set measuring unit. With this operation disable the management of the solenoid valves of the distribution system and the distribution system in general	Humidification I.E.C. Generator of pressurized water (only to a single area UA...HD...)	Umidific	Tipo

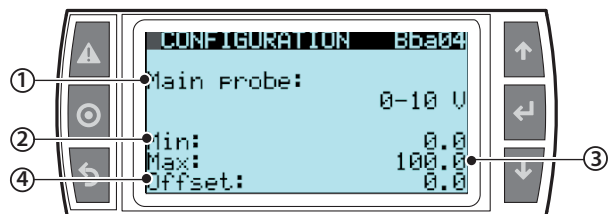
Regulation type



Ref.	Display	Description	Range	Default	Unit
1	Regulation type	Set the adjustment type of the atomised water production Humidity + Lim temp = main humidity probe with temperature limits Humidity+Lim. Humid. = main humidity probe with humidity limits Humidity = main humidity probe ON/OFF+Lim. Temp = humidistat/thermostat + limit temp. probe ON/OFF = humidistat/thermostat ON/OFF = humidistat/thermostat + flow limits (only IEC) Ext. Sign. + Temp. Lim. = analogic signal + limit temperature probe Ext. Sign. + Hum. Lim. = analogic signal + limit humidity probe External signal = analogic signal External signal = analogic signal + flow limits (only IEC) Temp.+Lim. Temp. = main temperature probe with temp. limits Temp.+Lim. Humid. = main temperature probe with temp. limits Temperature = main temperature probe Temperature = main temperature probe + flow limits (only IEC)	Umidità+Lim temp Umidità+Lim. Umid Umidità ON/OFF+Lim. Temp ON/OFF Segn.Ext+Lim.Temp Segn.Ext+Lim.Umid Segnale esterno Temp.+Lim. Temp Temp.+Lim. Umid. Temperatura	Umidità+Lim. Umid	tipo
2	Reg. logic	P = proportional P+I = proportional + integral	P P+I	P	tipo

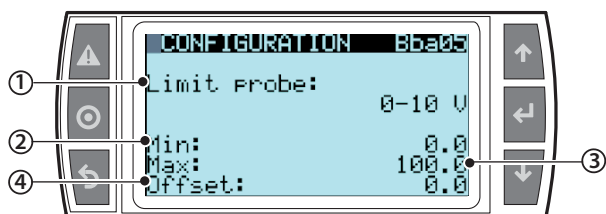
Probe configuration

Main probe configuration



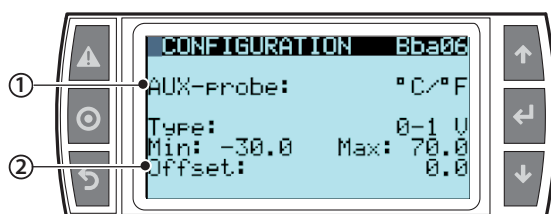
Ref.	Display	Description	Range	Default	Unit
1	Main probe	Type of main control signal	0 - 10 V 2 - 10 V 0 - 1 V 135 - 1000 Kohm 0 - 135 ohm 4 - 20 mA 0 - 20 mA	0 - 10	V
2	Min:	Correlates the minimum value of the humidity/temperature with the minimum value of the main signal	-100 ... +100	0.0	%/°
3	Max	Correlates the maximum value of the humidity/temperature with the minimum value of the main signal	--100 ... +100	100	%/°
4	Offset	Humidity correction factor read by the main signal	-20 ... +20	0.0	%/°

Limit probe configuration



Ref.	Display	Description	Range	De- fault	Unit
	Limit probe	Type of signal of the limit probe	0 - 10 V 2 - 10 V 0 - 1 V NTC 135 - 1000 ohm 0 - 135 ohm 4 - 20 mA 0 - 20 mA	0 - 10	V
	Min	Correlates the minimum value of the humidity/temperature with the minimum value of the limit probe signal	-100 ... +100	0.0	%/°
	Max	Correlates the maximum value of the humidity/temperature with the minimum value of the limit probe signal	-100 ... +100	100	%/°
	Offset	Humidity correction factor read by the limit probe signal	-20 ... +20	0.0	%/°

Auxiliary probe configuration



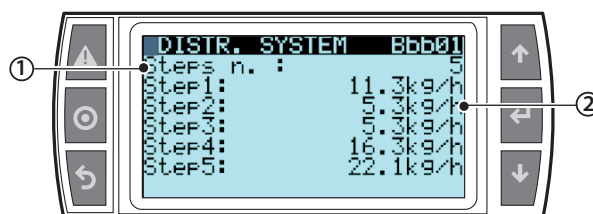
Ref.	Display	Description	Range	Default	Unit
1	AUX-probe	Enables the temperature or humidity read-only feature of the auxiliary, without causing any effect on the control of the single area	°C/°F %rH	°C/°F	°C/°F
2	Type	Defines the type of signal from the auxiliary reading probe	0 - 10 V 2 - 10 V 0 - 1 V 135 - 1000 ohm 0 - 135 ohm 4 - 20 mA 0 - 20 mA	0 - 10	V
3	Offset	Correlates the min, max and offset values	Min - Max - Offset Min - Max - Offset	0.0 - 100 - 0.0 0.0 - 100 - 0.0	%/°

Some masks were included only the probe-parameters probes that correspond to the type of operation set.

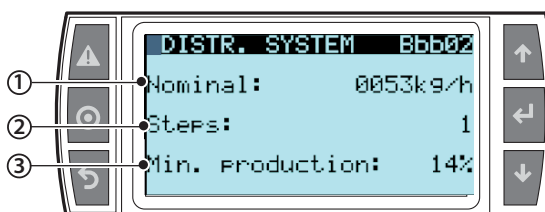
Submenu B. Zone setup
b. Zone setup -
b Distr. system

Within the sub-menu, settings area, "distribution systems", there are 3 screens which will be different in relation to the chosen "mode" parameter (code Baa01), between flow control or constant pressure, from the first screen of the Pump settings submenu. Below are the steps for the definition of the distribution system in "constant pressure" mode

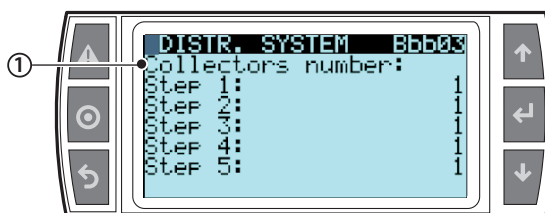
Definition of the distribution system



Ref.	Display	Description	Range	Def.	Unit
1	Step n.	Step no. of the area (as shown in the documentation attached to the rack)	1 - 6	1	n°
2	...kg/h	Flow rate of each single step (as shown in the documentation attached to the rack)			kg/h



Ref.	Display	Description	Range	Default	Unit
1	Nominal	Setting the nominal flow rate of the RACK in the single area (not to be confused with that of the pumping station). This value can be found in the documentation provided with the Rack	10...1000	10	kg/h
2	Step	Step number (as shown in the documentation attached to the rack)		4	n°
3	Min production	Setting the minimal flow rate of the RACK (not to be confused with that of the pumping station!). This value is found in the documentation provided with the rack and ensures that, at the minimum flow rate, the water pressure does not drop below 20 bar, which would generate a blocking alarm.	From the theoretical minimum calculated according to the "Nominal flow" and the "Number of branches" up to 80% of the "Nominal flow"	Theoretical minimum calculated according to the "Nominal flow" and the "Number of branches"	kg/h



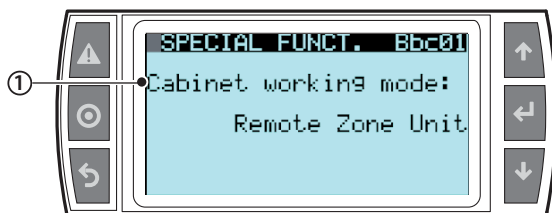
Ref.	Display	Description	Range	De- fault	Unit
1	Collectors number	Set the number of vertical collectors dedicated to each single step (as shown in the documentation attached to the rack)			

Submenu b. Zone setup

b. Zone setup - c. Special functions

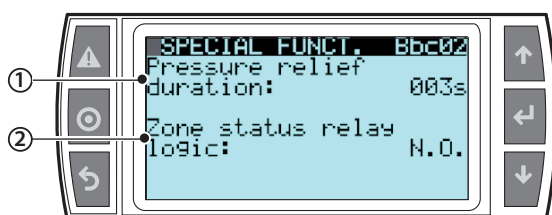
Contains nine screens and their parameters, and any notes and clarifications contained in chapter xxxxx

Remote area cabinet mode



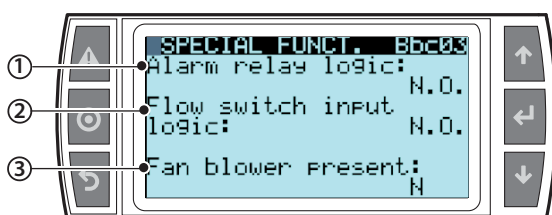
Ref.	Display	Description	Range	Default	Unit
	Cabinet working mode		Remote zone		

Pressure relief



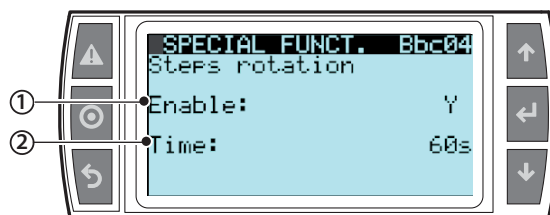
Ref.	Display	Description	Range	Def.	Unit
1	Pressure relief duration	Defines the opening time of the load solenoid valves N.A. of the step in closing phase. This parameter is fundamental to let the pressurized water inside the collectors and avoid dripping problems.	0 - 999	3	sec
2	Zone status relay logic	Set the relay logic that represents the state of the area through the free C25 - NO26 contact J20 terminal. Se N.A. Free contact OFF area - none of the steps of the area are in atomization phase Closed contact ON area - at least one of the steps of the area is in atomization phase	N.A. - N.C.	N.A.	

Alarm relay logic and fan blower



Ref.	Display	Description	Range	Def.	Unit
1	Alarm relay logic	Set the logic of the J15 alarm relay N.A. free contact between the NO8 - C8 terminals N.C. closed contact between the NO8 - C8 terminals	N.A. - N.C.	N.A.	
2	Flow switch input logic	Manages the logic of the FLUX-GOA contact which verifies the air passage in the duct. The possible logics are the following: N.C. signifies that there is an air passage in the duct N.A. signifies that there is no air passage in the duct	N.A. - N.C.	N.C.	
3	fan blower present	Set to "YES" if you want to enable the environment atomization of the pumping station with the use of ventilating heads	YES-NO	NO	

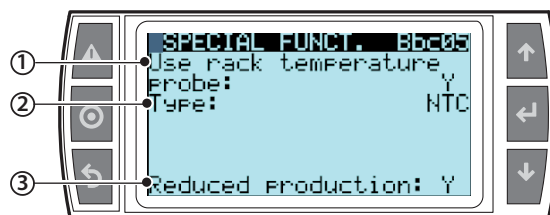
Step rotation



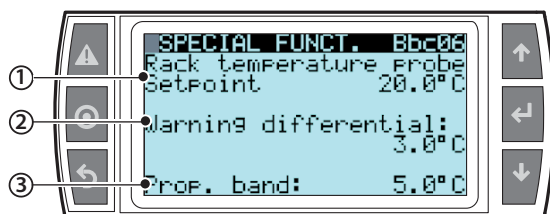
Ref.	Display	Description	Range	De-fault	Unit
	Steps rotation				
1	Enable	Enable the rotation of the activation logic only in constant pressure mode and if all the steps have been dimensioned with the same capacity	Si/NO	NO	
2	Time	Time after which the rotation is performed from one step to another	3...999	60	seconds

Rack temperature probe

It is possible to install a temperature probe immediately before the distribution system in order to verify if the temperature is optimum for the proper absorption of the atomized water.



Ref.	Display	Description	Range	Def.	Unit
1	Use rak temperature probe	Enables the detection of the temperature in the atomization area. When the temperature drops below the "rack temp. probe setpoint" a warning video is signalled.	YES - No	NO	
2	Type	Probe type	NTC 0 - 10 V 2 - 10 V 0 - 1 V NTC 135 - 1000 ohm 0 - 135 ohm 4 - 20 mA 0 - 20 mA	NTC	
3	Reduced production	Enables the reduction of production if the temperature in the atomization area falls below the "rack temp. probe setpoint" proportionally with the offset from the ideal atomization temperature	YES-NO	NO	



Ref.	Display	Description	Range	Def.	Unit
1	Rack temperature probe setpoint	Represents the minimum recommended temperature for atomization	-999.9 - +999.9	20	°C
2	Warning differential	Defines the interval after which the warning message disappears	-999.9 - +999.9	3	°C
3	Prop. band	Defines a modulation interval equal with the "Rack temp. probe setpoint" - "band prop.". Below this interval the production comes to a minimum Above this interval the production restarts according with the std. Displayed only if the production reduction is enabled	-999.9 - +999.9	5	°C

The Function, configurable on the FUNZ. SPECIALI Bbc05 and FINZ screens. SPECIALI Bbc06, is formed of two distinct modes:

Only Warning:

If the temperature is below the setpoint set on the Bbc06 screen, calculated by the system dimensioning, the "Rack low temperature" warning is activated

Warning + Production reduction:

When the temperature drops below the setpoint in the same time as the activation of the warning, the production is reduced by decreasing the temperature until it is completely stopped when the difference between the setpoint of the temperature probe on the rack and the measured temperature is higher than the "Prop. band" parameter Set on the Bbc06 screen.

The operation of the warning and production reduction is summarized in the following graph where all the specified parameters are settable from the FUNZ SPECIALI Bbc06 screen

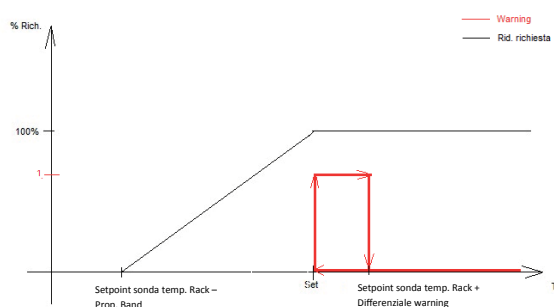
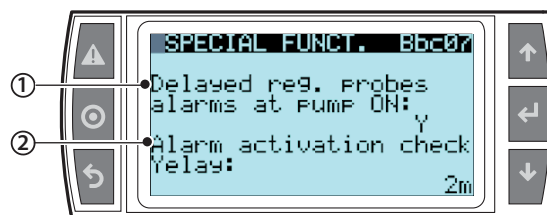


Fig. 10.a

Alarm delay of control probes



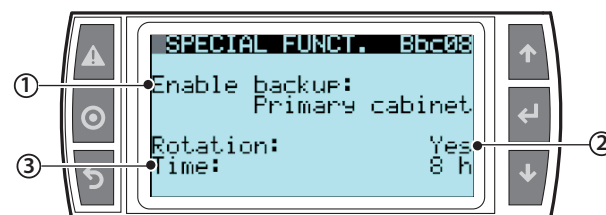
Ref.	Display	Description	Range	De-fault	Unit
1	Delayed reg. probes alarms at pump ON	Inhibits if set to YES, the alarm sensor is disconnected for a defined time by the following parameter "activation delay". This time is measured starting from the start-up of the pump	YES -NO	NO	
2	Activation delay	Activation delay time of the disconnected probe alarms		2	min

If the characteristics of the application can bring the control probe readings - particularly the humidity - too low, it is possible to temporarily disable the alarm "Sensor broken or disconnected" at the start of the control, avoiding the presence of false positives, setting in a timely manner the parameters of the Bbc07 screen.

When the Function is enabled, the electronic control ignores the presence of alarms for the preset time, calculated from the start of the control.

Enable back-up

For clarifications refer to chapter xxxx



Ref.	Display	Description	Range	De-fault	Unit
1	Enable backup primary cabinet	Defines the cabinet as "main cabinet", "secondary cabinet" or it does not define the cabinet if set to "NO". This parameter is fundamental because, if the rotation or redundancy is provided, the system needs to understand what is the first cabinet to take precedence at startup	NO Cabinet secondary Cabinet primario	NO	
2	Rotation	Set the parameter to "YES" when in the presence of two cabinets you want, even in the normal work phase, to rotate the operation of the cabinets in order to manage and balance the wear of the two pumps	YES-NO	NO	
3	Time	If the rotation is enabled define the Function time of the pump after which the pump is rotated	0 - 8	8	h

Remote actuator



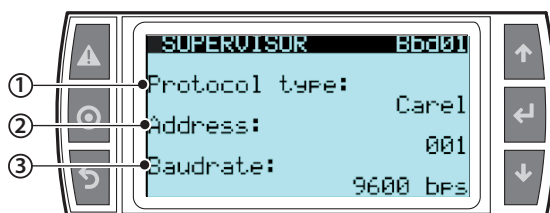
Ref.	Display	Description	Range	Def.	Unit
1	Use remote rack actuator	Notification to the pumping station that the directly controlled area is managed by one or more slave cabinets configured as simple actuators. This allows the correct and rational management of large distances between the pumping station and the rack. The "slave" cabinet will be configured automatically by enabling this parameter. If the branches of the step do not observe the limit (1 step > 5 branches and 4° step > 3 branches) managed by a "single actuator", the system generates the "collector number not set" alarm	YES-NO	NO	
2	Show wizard at unit power on	Set to "YES" when you want the wizard to display at start-up, every time the pumping station is supplied with power, as explained in section 9.3 "First start-up", in order to guide you step by step with regard to the data required for setting the humidifier	SI-NO	SI	

(*) the humiFog is provided with flow inlet state, thus the machine is enabled.

Submenu b. Zone setup

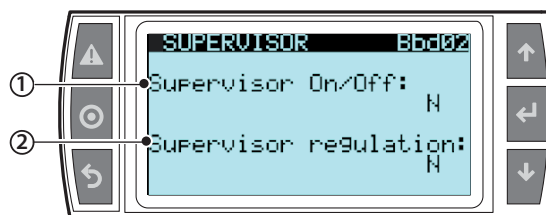
b. Zone setup - d. supervisor

Setting the supervision



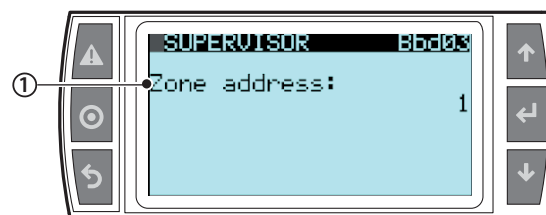
Ref.	Display	Description	Range	Default	Unit
1	Protocol	Set the communication protocol with the supervisor when this is required	Carel, Bacnet Winload Rs232 Lon Modbus	Modbus	
2	BMS address	Set the control address within the network	0...207	1	
3	Baudrate	Define the speed at which the communication is sent within the network	1200 2400 4800 9600 19200	19200	bps

Supervision adjustment



Ref.	Display	Description	Range	Def.	Unit
1	Supervisor On/Off	set to "YES" if you want to control only the start-up from the supervisor. (N.B. the ON/OFF from the supervisor is independent from the supervisor adjustment)	YES-NO	NO	
2	Supervisor regulation	Set to "YES" if you want to enable the adjustment from the supervisor, in this case the production of the area shall be adjusted with a variable between 0-1000 % sent by the supervisor via the i156 parameter. (N.B. even if the adjustment from the supervisor is activated, it is recommended to also activate the ON/OFF feature from the supervisor, however taking into account that the parameters remain independent)	YES-NO	NO	

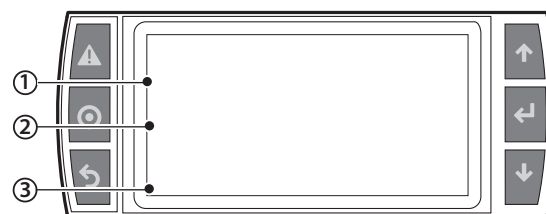
Zone address



Ref.	Display	Description	Range	Def.	Unit
1	Zone address	If a remote area is used, identify the address of the area within the system (area connected on the BMS, value set from the Wizard and installer menu/ settings area/ input configuration)			

Submenu b. Zone setup

b. Zone setup - e. External alarms

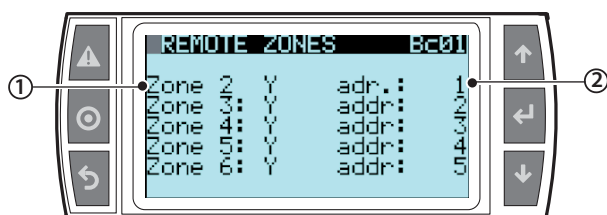


Ref.	Display	Description	Range	Default	Unit
1	Zone address	Screen visible only to ensure the compatibility with previous versions of humiFog			

(*) the humiFog is provided with an alarm input for water treatment, thus the machine is enabled.

Submenu c. Zone remote
c. Zone remote - zone remote 01

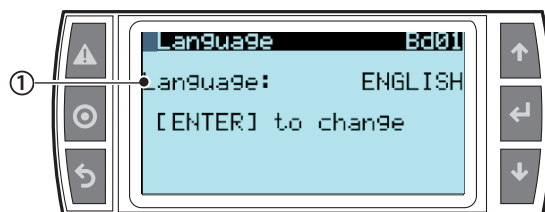
Remote area configuration



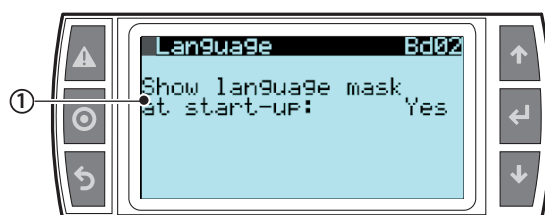
Ref.	Display	Description	Range	Def.	Unit
1	Zone 2: Yes/No	Activate from the pumping station the presence or absence of remote areas	Yes/No	no	
2	addr: 2	Also, when remote areas are activated on the pumping station, it allows the user to provide the number of areas and consequently the BMS address. This address will have to coincide with what is set in the same area	1...32	no	

Submenu d. Change language
d. Change language - language 01...02

Change language



Ref.	Display	Description	Range	Default	Unit
	Language	From the following screen select the desired language. With Enter change the language until you find the desired one. With "ESC" confirm and return to the previous screen	Italian German Spanish French Chinese English	Italian	



Ref.	Display	Description	Range	Def.	Unit
	Show language mask start-up	Set this parameter to "YES" when you want to view the procedure for selecting the language every time the pumping station is started-up	YES-NO	NO	

10.9 Menu manutentore



Important: the operations described in this menu must only be carried out by qualified personnel.

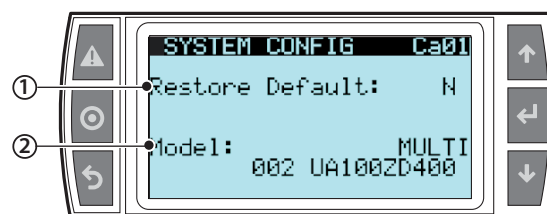
From the main screen press:

- PRG to access the main menu;
- DOWN to move to the maintenance menu;
- ENTER to move to the password;
- UP/DOWN to enter the password "77"
- ENTER to access the selected menu;
- UP or DOWN to move between the submenus;
- ENTER to select the parameter and move between the parameters;
- UP/DOWN to modify the parameter;
- ENTER to confirm the selected parameter and go to the next parameter;
- ESC to return to the previous menu.

Menù	1° level	2° level	Indexing
C. Maintenance	a. System config	--	Ca01...2
	b. Unit info	--	Cb01...3
	c. Probe readings	--	Cc01
	d. Manual request	--	Cd01...11
	e. Unit Status	--	Ce01
	f. Working hours	--	Cf01...2
	g. Alarm log	--	Cg01

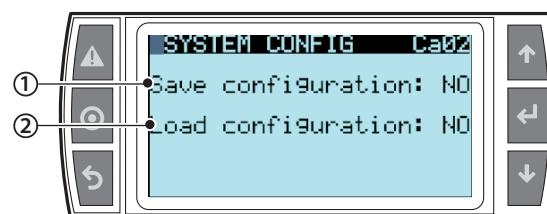
Submenu a. System config 01...02

Factory reset



Ref.	Display	Description	Range	Def.	Unit
1	Restore default	Set to "YES" when you want to reset all the humiFog parameters to the default factory settings		NO	
2	Model	View one of the choices expressed under "range" and the system code. It is an editable value in that it must be changed after any replacement	Single area Multi area Remote area		

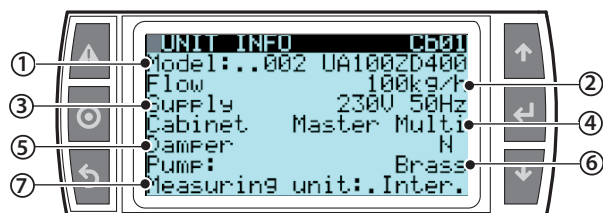
Restore configuration



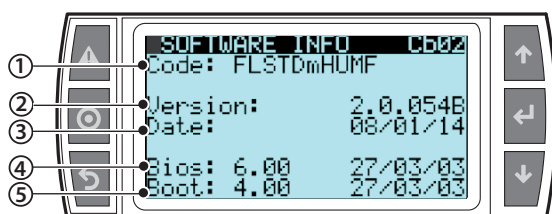
Ref.	Display	Description	Range	Def.	Unit
1	Save configuration	Set the parameter to "YES" when you want to save the chosen configuration. This option allows you to return to this configuration in any moment without setting the parameters one by one. It is possible to save only one configuration (however, if the system is restored to factory settings, the saved configuration shall be removed)	YES-NO	NO	
2	Load configuration	Set to "YES" when you want to load the saved configuration.		NO	

Submenu b. Unit info 01...03

Info of the unit



Ref.	Display	Description	Range	Def.	Unit
1	Model	Represents the code of the device	UA...		
2	Flow	Represents the flow rate of the device			kg/h
3	Supply	Identifies the voltage and frequency of the system			VHZ
4	Cabinet	Identifies the cabinet type	Master/multi		
5	Damper	Identifies the presence or absence of the damper		No	
6	Pump	Identifies the type of pump installed	STAINLESS STEEL BRASS SILICON FREE		Steel
7	Measuring unit	Defines the measuring unit	International Imperial		Inter.



Ref.	Display	Description	Range	Def.	Unit
1	Code	Identifies the software code			
2	Version	Identifies the software version and the date on which it was updated			
3	Date	Identifies the software launch date			
4	Bios	Version of the Bios system			
5	Boot	Version of the system's Boot			

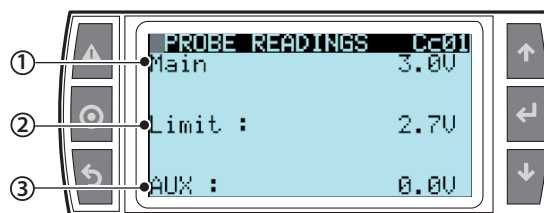
Change password



Ref.	Display	Description	Range	Def.	Unit
1	Insert new maintenance password	Defines the new password of the maintainer menu			

Submenu c. Letture istantanee 01

Main probe reading



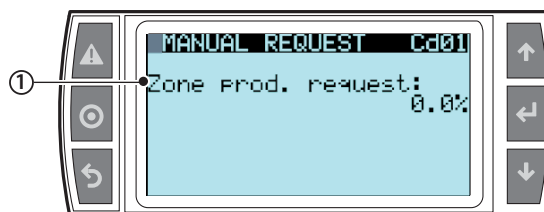
Ref.	Display	Description	Range	Def.	Unit
1	Principale	Display only the signal value read from the main probe, otherwise viewable from the Installer menu/ settings area 04			Ohm, mA o Volt
2	Limite	Display only the signal value read from the limit probe, otherwise viewable from the Installer menu/ settings area 05			Ohm, mA o Volt
3	Aux	Display only the signal value read from the auxiliary probe, otherwise viewable from the Installer menu/ settings area 06			Ohm, mA o Volt

I segnali non collegati vengono evidenziati con la scritta "non presente" nella visualizzazione della maschera.

Submenu d. Manual request 01...03

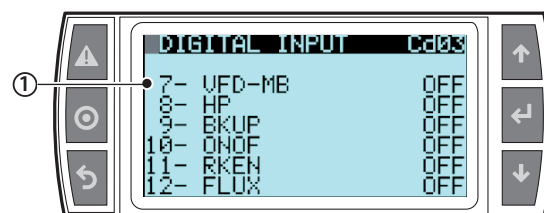
Manual request

Allows to control all the outlets and the single components of the pumping station or of the manual control areas. This Function is explained to test the individual components of the machine



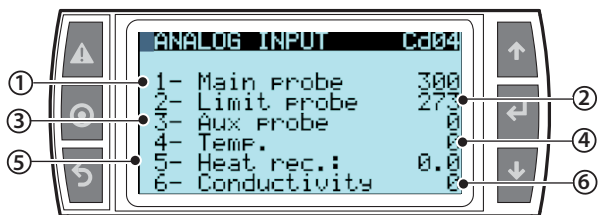
Ref.	Display	Description	Range	Def.	Unit
1	Zone prod. request	Set the production of the area in percentages	0...100		%

Digital inputs



Ref.	Display	Description	Range	Def.	Unit
1	Digital inputs	Allows only to view all the digital inputs			

Reading analogic inputs

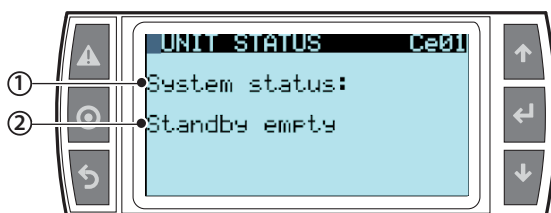


Ref.	Display	Description	Range	Def.	Unit
1	Main probe				
2	Limit probe				
3	Aux probe				
4	Temp.				
5	Heat rec.				
6	Conductivity				

Submenu e. Unit Status 01

Unit state

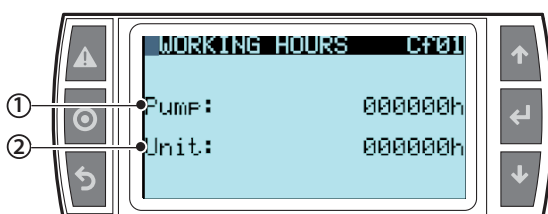
Views detail information of humiFog



Ref.	Display	Description	Range	Def.	Unit
1	System status	View installation status	StandbyEmpty / StandbyFull / Filling / Washing / Emptying / Production		
2	Standby empty	View pump state	Standby / Production increase / Bypass closing / Filling pressure / Washing pressure / Load reduction (production decrease ramp to obtain a single EV unload) / Load closing / At regime (production as well as emptying)		

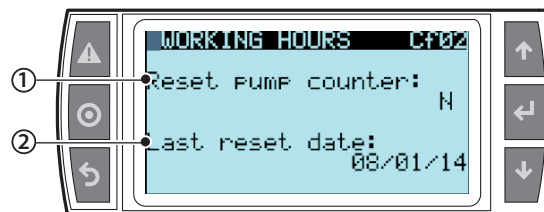
Submenu f. Working hours 01...02

Working hours



Ref.	Display	Description	Range	Def.	Unit
1	Pump	View the operating hours of the pump from the last reset in read-only mode	000000		h
2	Unit	View the operating hours of the pump from the last reset in read-only mode	000000		h

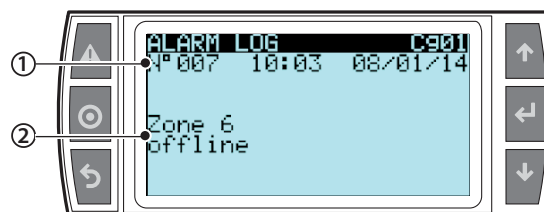
➡ N.B. Within the Maintainer Menu, f submenu, Operating hours, the 02 screen allows to reset the operating hours and shows the date of the last reset.



Ref.	Display	Description	Range	Def.	Unit
1	Reset pump counter	Resetting the hourmeter for pump operation	Si/No		
2	Last reset date	View the date of the last resetting			gg/mm/aaaa

Submenu g. Alarm log

Alarm log



Ref.	Display	Description	Range	Def.	Unit
1	N° xxx hour date	Succession of screens that contain the two rows displayed on the left: number of alarm messages, alarm hour, alarm date and alarm message.	YES/No		
2	Zona xxx offline				

The history contains 200 alarms, the older ones being overwritten.

11. TABLE OF ALARMS

When an alarm is activated, the alarm button starts flashing.

In these conditions, pressing the alarm button once displays the type of alarm.

In the case of potentially dangerous alarms, the controller automatically stops production. For some alarm events, the alarm relay is also activated at the same time as the signal (see the table below).

Alarm	Cause	Solution	Reset	Alarm relay state	Action	Note
No valid model selected	After replacing the control, the software was not configured correctly	Configure the unit model in use on the Ca01 screen	Automatic	Active	Disabled production	It is possible to access the Ca01 screen directly from the alarm screen
Nominal rack capacity = 0	The flow rate of the distribution system has not been set correctly	Configure the capacity of the rack on the Bbb01/Bbb02 screen (according to the pump control type)	Automatic	Active	Disabled production	Bbb01 is used for a system with flow rate modulation control, Bbb02 for a system with constant pressure. It is possible to access the configuration screen directly from the alarm screen
The number of collectors is not set	The number of collectors by which the steps of the rack are formed has not been set	Set the number of collectors on the Bbb03 screen	Automatic	Active	Disabled production	It is possible to access the Bbb03 screen directly from the alarm screen
Water treatment plant	ID4-IDC1 digital input on the opened control.	Check the proper operation of the water treatment plant. If correct, check on the Bab01 screen that the input logic coincides with that of the plant alarm signal - If correct, manually close or open the entrance with a plank; if the alarm persists, replace the control	Automatic	Active	Stop production	
Low pressure alarm	Low pressure at water inlet	Check the circuit and the pressure of the supplied water	Automatic	Active	Stop production	
High conductivity warning	The conductivity of the water has reached the warning threshold	Check the water treatment system. If absent, increase the warning threshold on the Bab02 screen	Manual	Not active	Solo segnalazione	
High conductivity alarm	The conductivity of the water has reached the alarm threshold	Check the water treatment system. If absent, increase the alarm threshold on the Bab02 screen	Manual	Active	Stop produzione	
Bypass high temperature alarm	Excessive recycling of the water on the bypass	Check the operating temperature of the installation (environment and water); Check if the distribution system is not obstructed in such a way to cause the recycling of the water	Automatic	Not active	Only warning	
Inverter alarm	Malfunction of inverter	Check, based on the signalling on the display, the status of the inverter and eventually replace it	Automatic	Active	Stop production	The alarm is automatically reset on the control. For the inverter, see chapter 7 of the inverter's manual
High temperature alarm at the thermostat bypass	Excessive recycling of the water on the bypass	Check the proper operation of the water treatment plant. If correct, check on the Bab01 screen that the input logic coincides with that of the plant alarm signal - If correct, manually close or open the entrance with a plank; if the alarm persists, replace the control	Manual	Active	Stop production	
Low temperature at the cabinet pump	Water temperature at inlet lower than 2°C	Reheat the supplied water or the cabinet with a proper dimensioned heater	Automatic	Active	Stop production	
High pressure alarm from the pressure switch	Flow pressure exceeding 90 bar	Contact CAREL for instructions on checking the conditions of the bypass valve	Manual	Active	Stop production	
High pressure warning from the pressure probe	Flow pressure higher than 30% of the nominal pressure	Contact CAREL for instructions on checking the conditions of the bypass valve	Automatic	Not active	Only warning	
Low pressure warning from the pressure probe	During production, the flow pressure is lower than 20 bar	Check the tightness of the hydraulic circuit at discharge	Manual	Active	Stop production	
Remote area # offline	On the Multi-area pumping station, the slave unit is not connected to the fieldbus network	Check the correct setting (address, enable) of the remote areas connected to the pumping station and that there are no more areas with the same address. Then check the wiring and the correct operation of the optional fieldbus card	Automatic	Active	Stop production	It is possible to check the correct addressing on the Bc01 screens (Pumping station), Bbc01 and Bbd03 (Remote area)
Offline pumping station	On the "Remote area" cabinet, the master unit is not connected to the BMS2 port	Check if the address of the remote area corresponds with the one set on the pumping station and that there are no more other areas with the same address. Then check the wiring and the correct operation of the optional fieldbus card	Automatic	Active	Stop production	It is possible to check the correct addressing on the Bc01 screens (Pumping station), Bbc01 and Bbd03 (Remote area)

Alarm	Cause	Solution	Reset	Alarm relay state	Action	Note
Broken or disconnected pressure probe	Faulty or incorrectly connected pressure probe	Check the connection and the status of the pressure probe	Manual	Active	Stop production	
Broken or disconnected main probe	Broken or incorrectly connected main probe	Check the connection and the status of the main control probe	Manual	Active	Stop production	
Broken or disconnected secondary probe	Broken or incorrectly connected secondary (limit) probe	Check the connection and the status of the secondary control probe	Manual	Active	Stop production	
Broken or disconnected auxiliary probe	Broken or incorrectly connected auxiliary probe	Check the connection and the status of the auxiliary probe	Manual	Not active	Only warning	
Broken clock	The clock card is not working properly	Replace the control	Manual	Active	Stop production	
Faulty or disconnected bypass temperature probe	Broken or disconnected bypass temperature probe	Check the correct coupling and operation of the probe	Manual	Active	Stop production	
High humidity alarm	The humidity value detected by the main probe is higher than the high humidity threshold alarm	Check the control parameters to understand if the production is reduced or increased. Eventually change the threshold on the Aa01 screen	Manual	Not active	Only warning	The viewing of the alarm depends on the type of control used
Low humidity alarm	The humidity value detected by the main probe is lower than the low humidity threshold	Check the control parameters to understand if the production is reduced or increased. Eventually change the threshold on the Aa01 screen	Manual	Not active	Only warning	The viewing of the alarm depends on the type of control used
High temperature alarm	The temperature value detected by the main probe is higher than the high temperature threshold	Check the control parameters to understand if the production is reduced or increased. Eventually change the threshold on the Aa01 screen	Manual	Not active	Only warning	The viewing of the alarm depends on the type of control used
Low temperature alarm	The temperature value detected by the main probe is lower than the low temperature threshold	Check the control parameters to understand if the production is reduced or increased. Eventually change the threshold on the Aa01 screen	Manual	Not active	Only warning	The viewing of the alarm depends on the type of control used
High humidity alarm from the limit probe	The humidity value measured by the limit probe is higher than the high humidity threshold of the limit probe	Check the control parameters to understand if the production is reduced or increased. Eventually change the threshold on the Aa01 screen	Manual	Not active	Only warning	The viewing of the alarm depends on the type of control used
Low temperature alarm from the limit probe	The temperature value detected by the limit probe is lower than the low temperature threshold of the limit probe	Check the control parameters to understand if the production is reduced or increased. Eventually change the threshold on the Aa01 screen	Manual	Not active	Only warning	The viewing of the alarm depends on the type of control used
Maintenance: Change oil	The pump has worked for a number of hours higher than the maintenance threshold	Change the oil of the pump	Manual	Not active	Only warning	After changing the oil, reset the operating hours of the pump from the Cf02 screen in order to reset the alarm
The requested flow exceeds the maximum available flow	In controlled systems (Single and Multi-Area) with constant pressure, the total demand exceeds the nominal flow of the pump by 10% or more	Check if the flows of the steps are correctly set. If correct, check the dimensioning of the installation	Manual	Not active	Only warning	
pCO ₂ Offline	The pCO ₂ is not connected to pCO ₂ +	Check if pCO ₂ is correctly supplied. Then check the wiring between pCO ₂ and pCO ₂ +	Manual	Active	Stop production	
Actuator 1 offline	Remote actuator/expansion 1 not connected	Check if the slave cabinet used as a slave is configured correctly. Then check the correct wiring between the J23 port of pCO ₂ +	Manual	Active	Stop production	
Actuator 2 offline	Remote actuator/expansion 2 not connected	Check if the slave cabinet used as a slave is configured correctly. Then check the correct wiring between the J23 port of pCO ₂ +	Manual	Active	Stop production	
Offline supervision system	If the On-Off control by supervisor is used, the supervisor has not received requests for more than 30 seconds.	Check if the supervisor network settings (protocol, baud rate and slave address) coincide with those of the Humifog	Automatic	Not active	Stop production	The production is stopped only if the adjustment is enabled by the supervisor

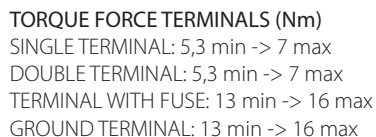
Alarm	Cause	Solution	Reset	Alarm relay state	Action	Note
Broken or disconnected heat recovery signal	In IEC mode with analogic heat recovery signal status, the signal is not connected or out of range	Check the correct connection of the recuperator at the U5 input, then check that the signal is set correctly	Manual	Active	Stop production	The signalling is reset manually: the production is resumed automatically as soon as it detects a valid signal from the recuperator.
System block	With backup and/or rotation enabled: it was not possible to start any of the two pumping stations following four consecutive switch requests for less than 15 minutes from one to the other without any Humifog starting	Check in the Alarm history what the switch has generated and based on the viewed alarm, follow the instructions in this table	Manual	Active	Stop production	The alarm that has caused the switch is easily identified in the alarm history (Cg01 screen or main screen shortcut) as it is saved immediately before the "Unit Switch" event
Rack low temperature	The temperature measured on the rack is lower than the set threshold	Check the environment conditions in the vicinity of the rack, possibly increase the threshold	Manual	Active	View only	If the production reduction is enabled in case of rack low temperature (Bbc05 screen), the current production is reduced based on the measured temperature
Broken or disconnected rack temperature probe	The rack temperature probe is broken or improperly connected	Check the connection and the status of the rack temperature probe	Manual	Not active	View only	If the production reduction is enabled in case of rack low temperature (Bbc05 screen), the production reduction feature is disabled

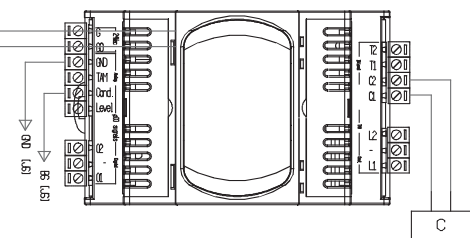
installer

user

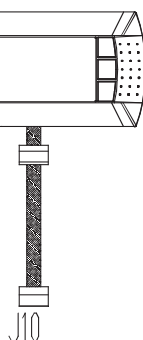
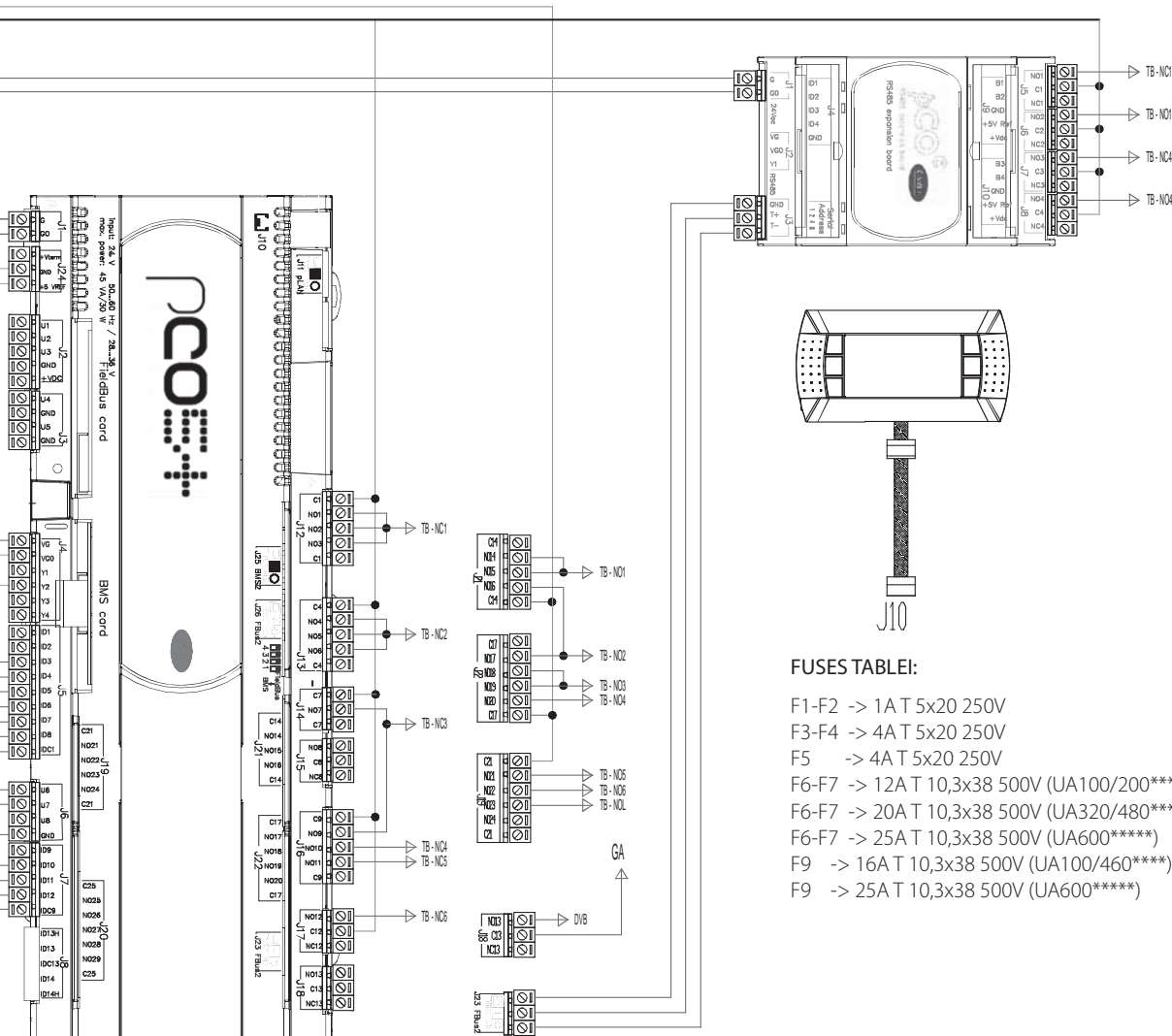
service

12.1 Wiring diagram humiFog multizone - Master - CE - MONOFASE





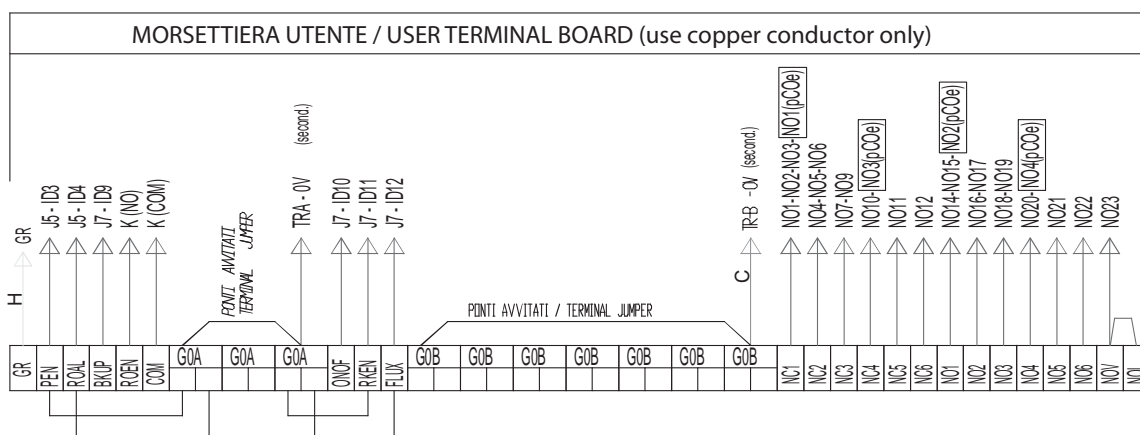
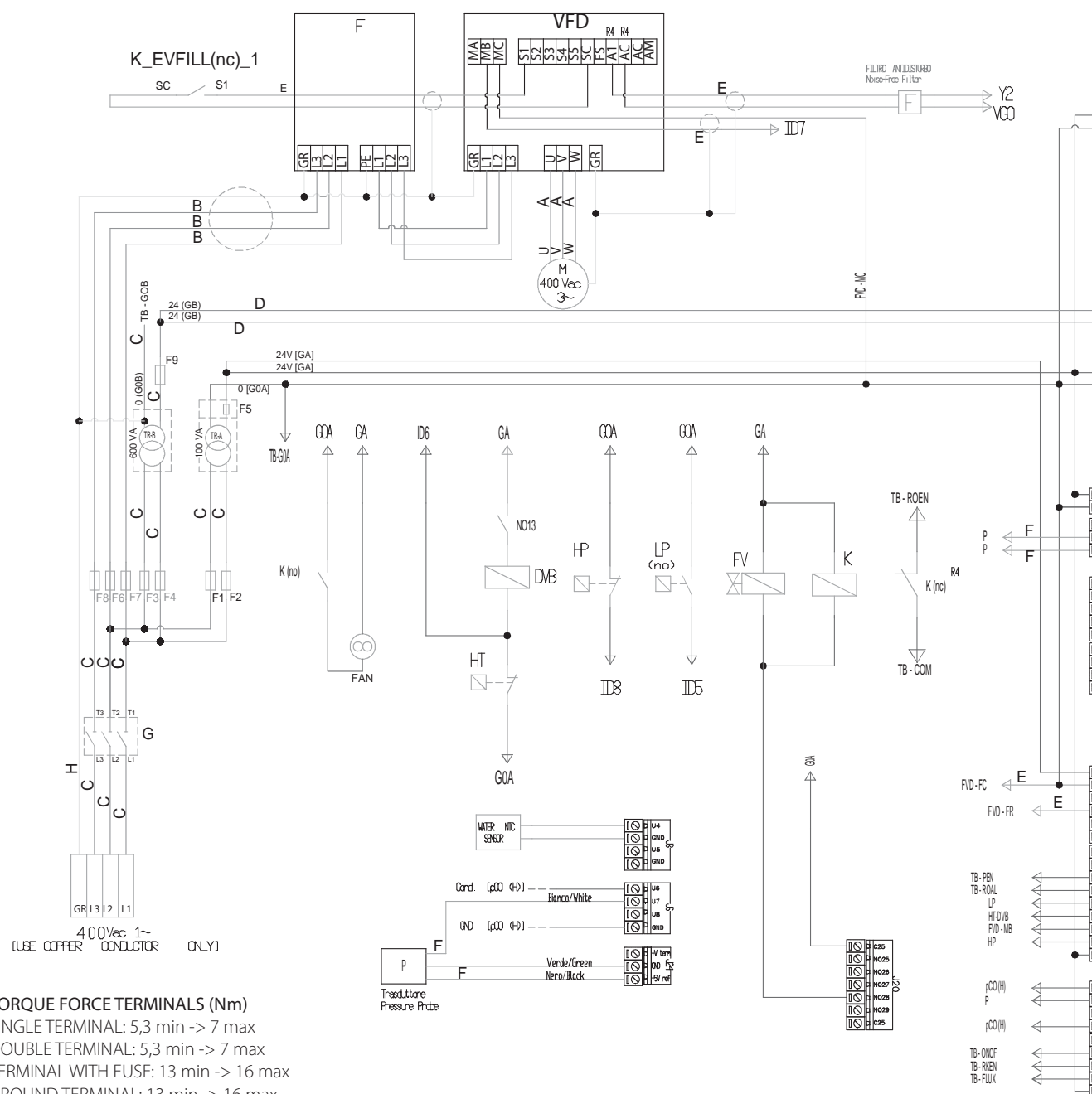
FORZA DI SERRAGGIO MORSETTI pCO5+
TORQUE FORCE TERMINALS pCO5+
(Nm) = 0,5 min -> 0,6 max



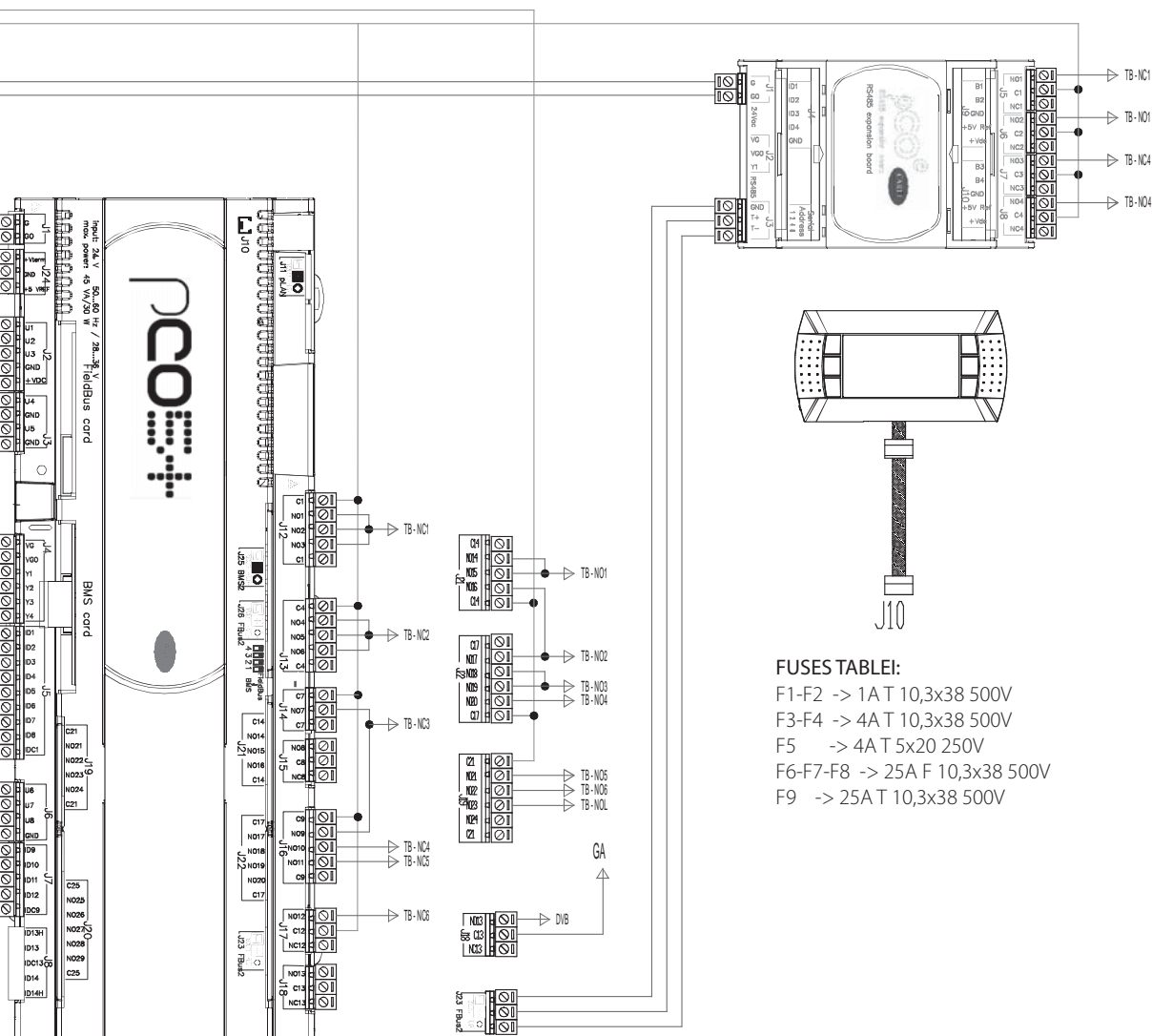
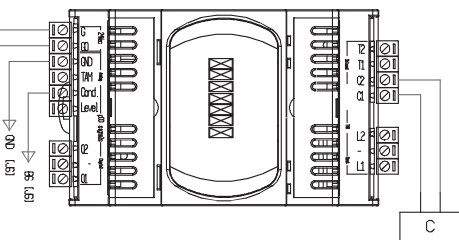
FUSES TABLE:

- F1-F2 -> 1A T 5x20 250V
- F3-F4 -> 4A T 5x20 250V
- F5 -> 4A T 5x20 250V
- F6-F7 -> 12A T 10,3x38 500V (UA100/200*****)
- F6-F7 -> 20A T 10,3x38 500V (UA320/480*****)
- F6-F7 -> 25A T 10,3x38 500V (UA600*****)
- F9 -> 16A T 10,3x38 500V (UA100/460*****)
- F9 -> 25A T 10,3x38 500V (UA600*****)

12.2 Wiring diagram humiFog multizone - Master - CE - TRIFASE (solo per UA10K***)

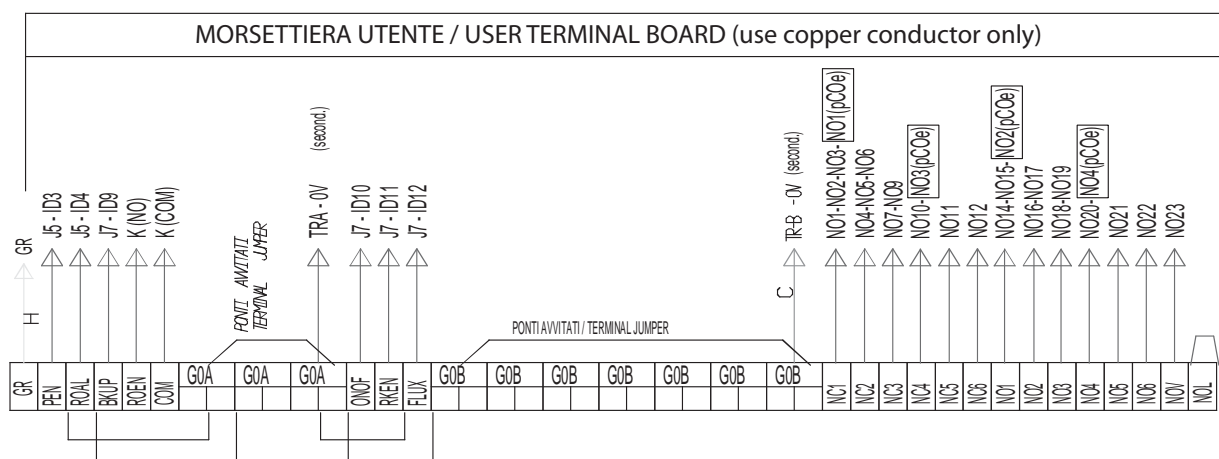
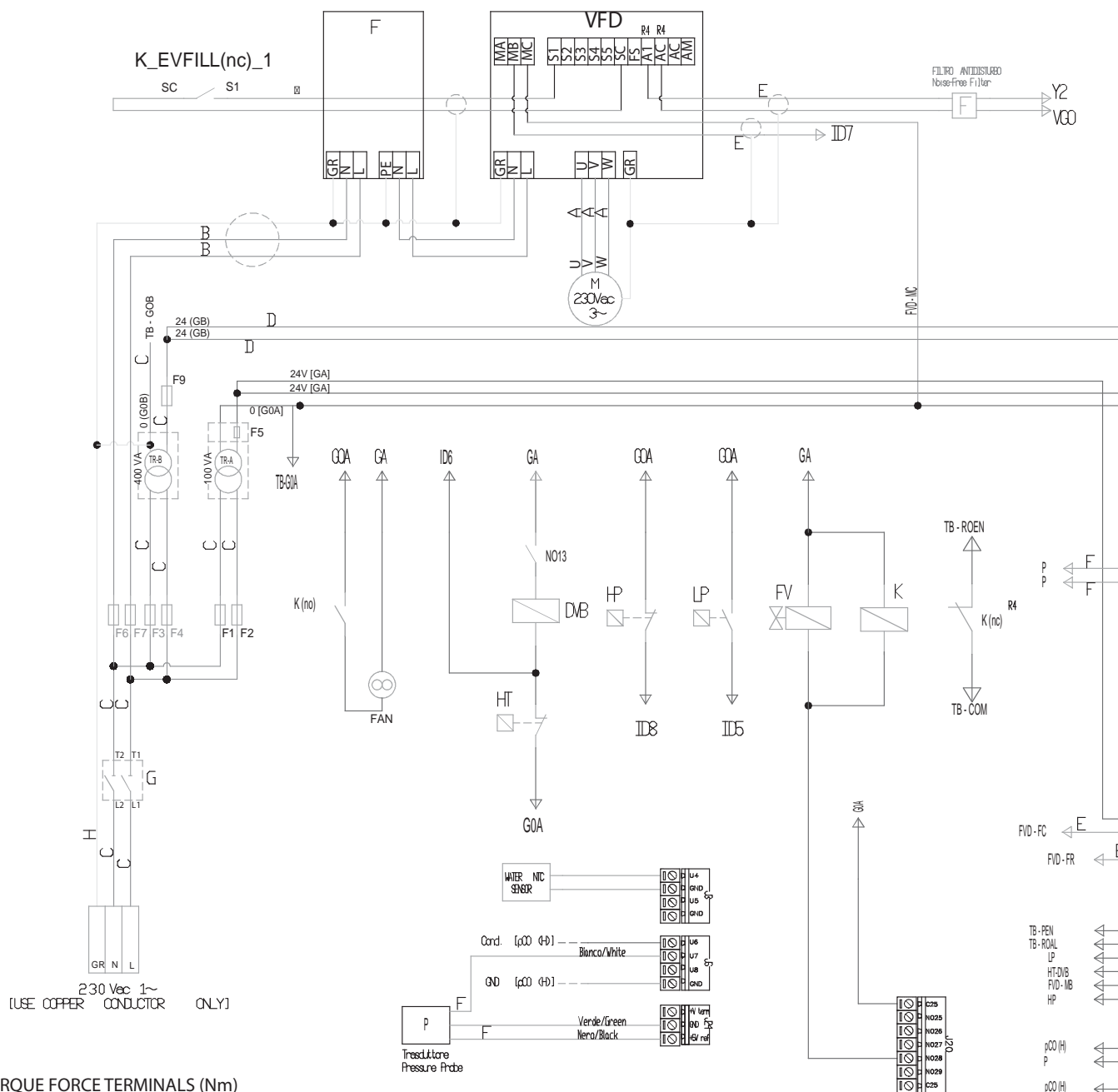


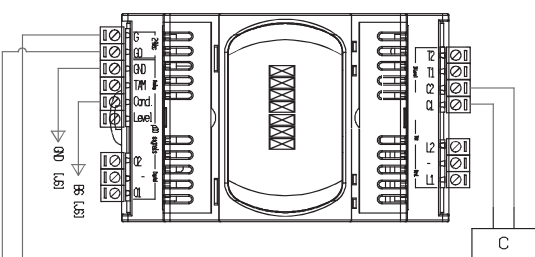
FORZA DI SERRAGGIO MORSETTI pCO5+
TORQUE FORCE TERMINALS pCO5+
(Nm) = 0,5 min -> 0,6 max



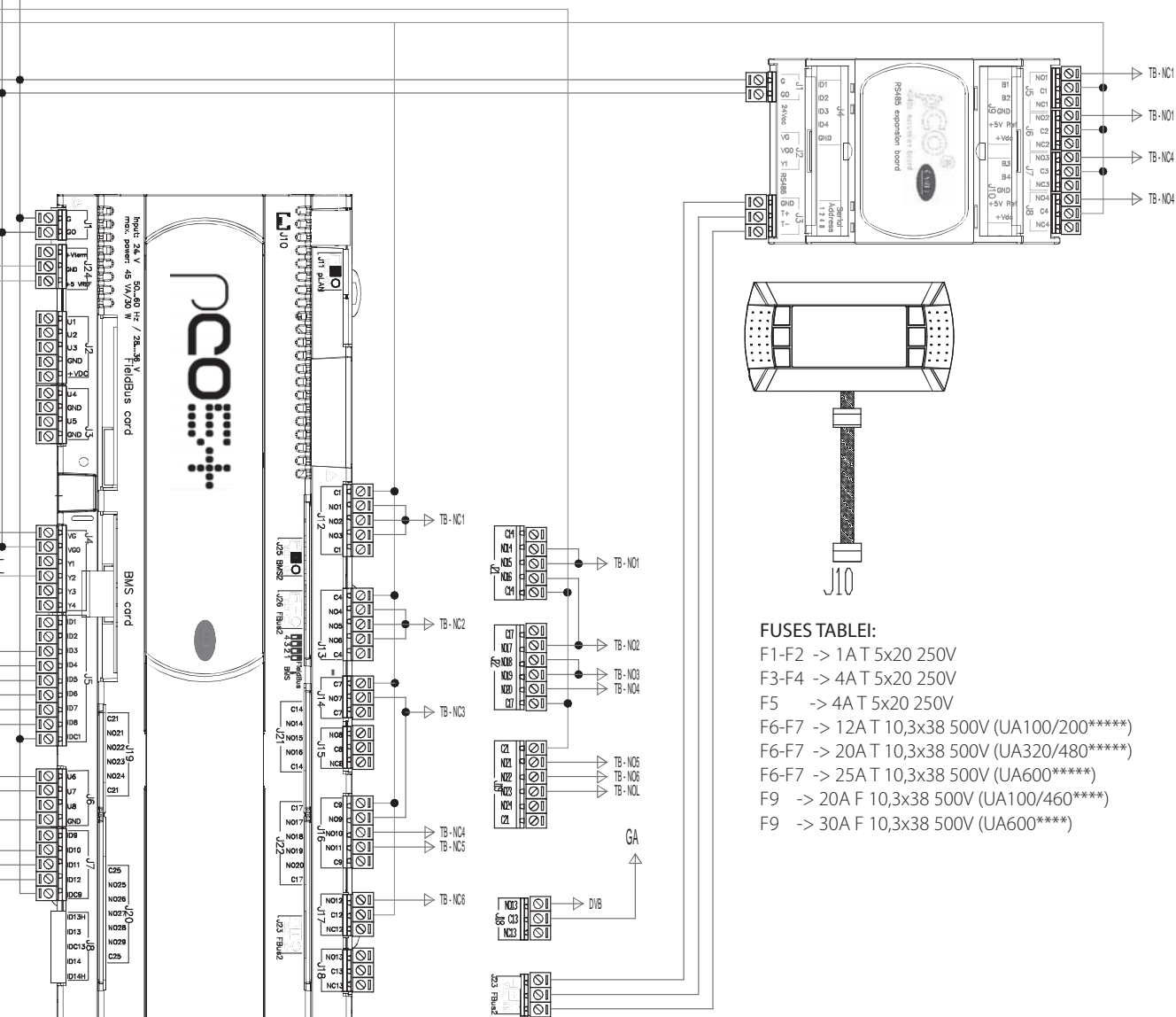
FUSES TABLE:
F1-F2 -> 1A T 10,3x38 500V
F3-F4 -> 4A T 10,3x38 500V
F5 -> 4A T 5x20 250V
F6-F7-F8 -> 25A F 10,3x38 500V
F9 -> 25A T 10,3x38 500V

12.3 Wiring diagram humiFog multizone - Master - UL - MONOFASE





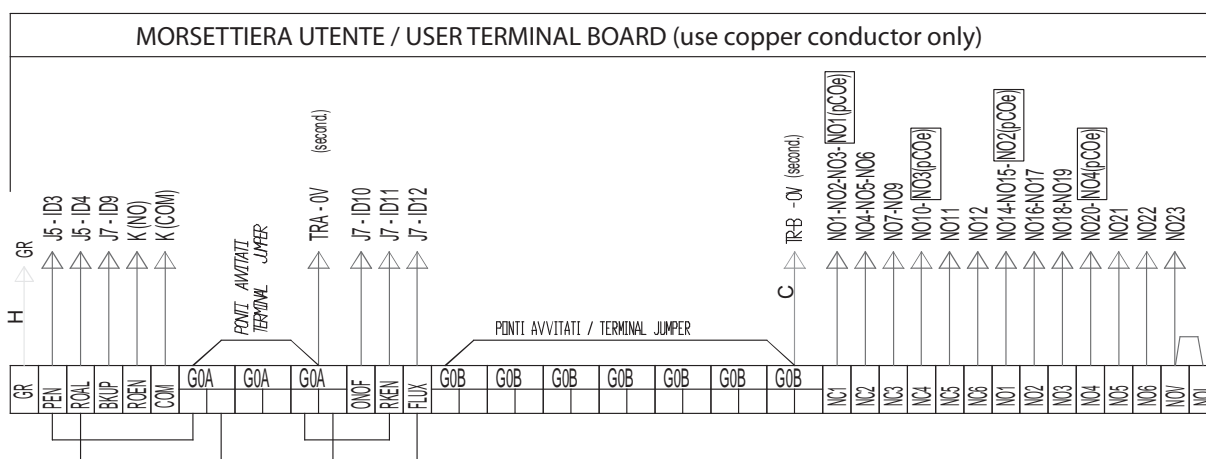
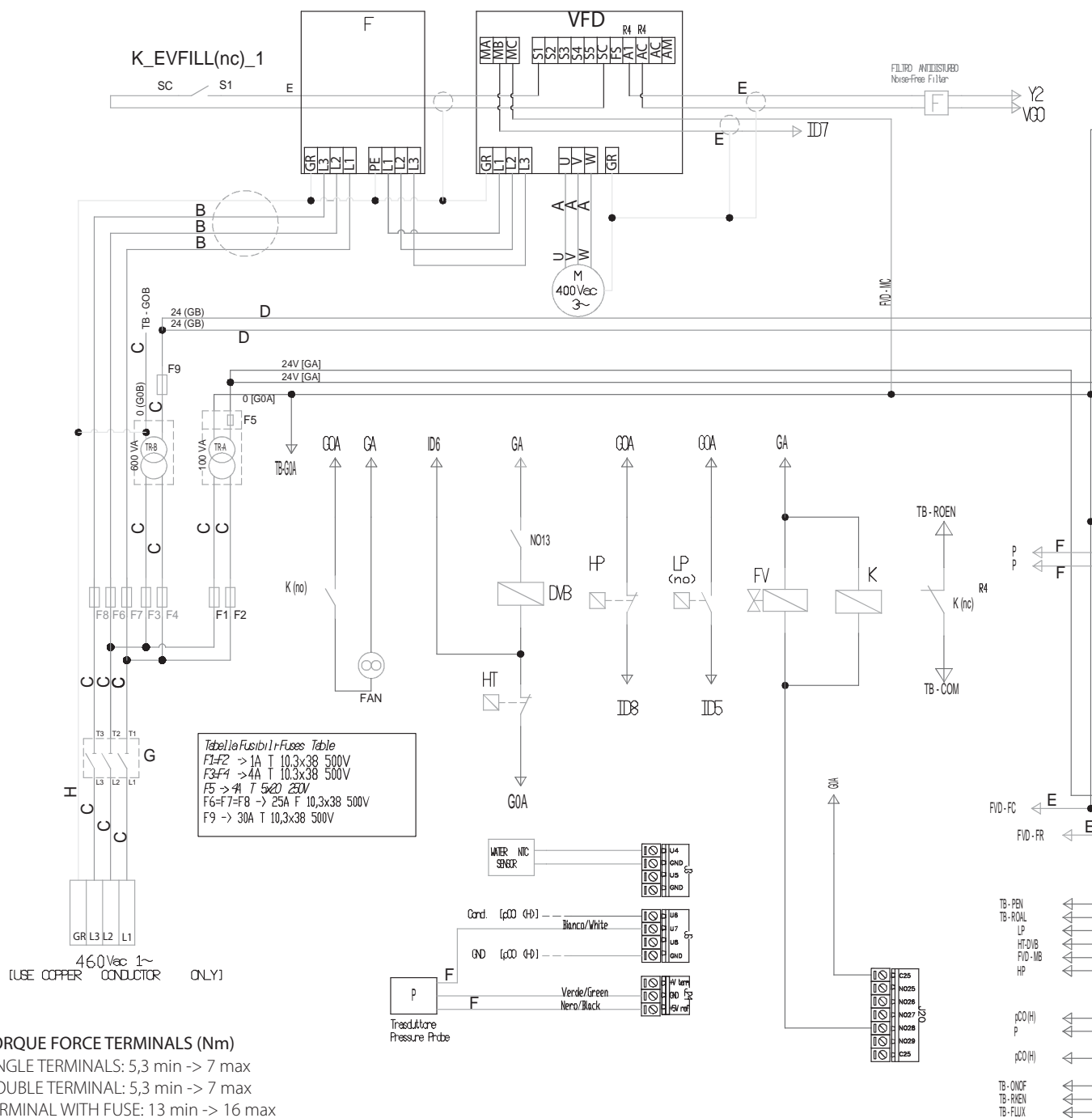
FORZA DI SERRAGGIO MORSETTI pCO5+
TORQUE FORCE TERMINALS pCO5+
(Pound Inches) = 4,4 min -> 5,3 max

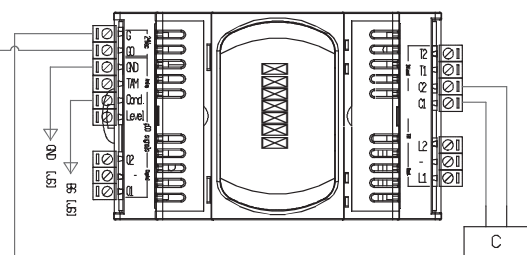


FUSES TABLE:

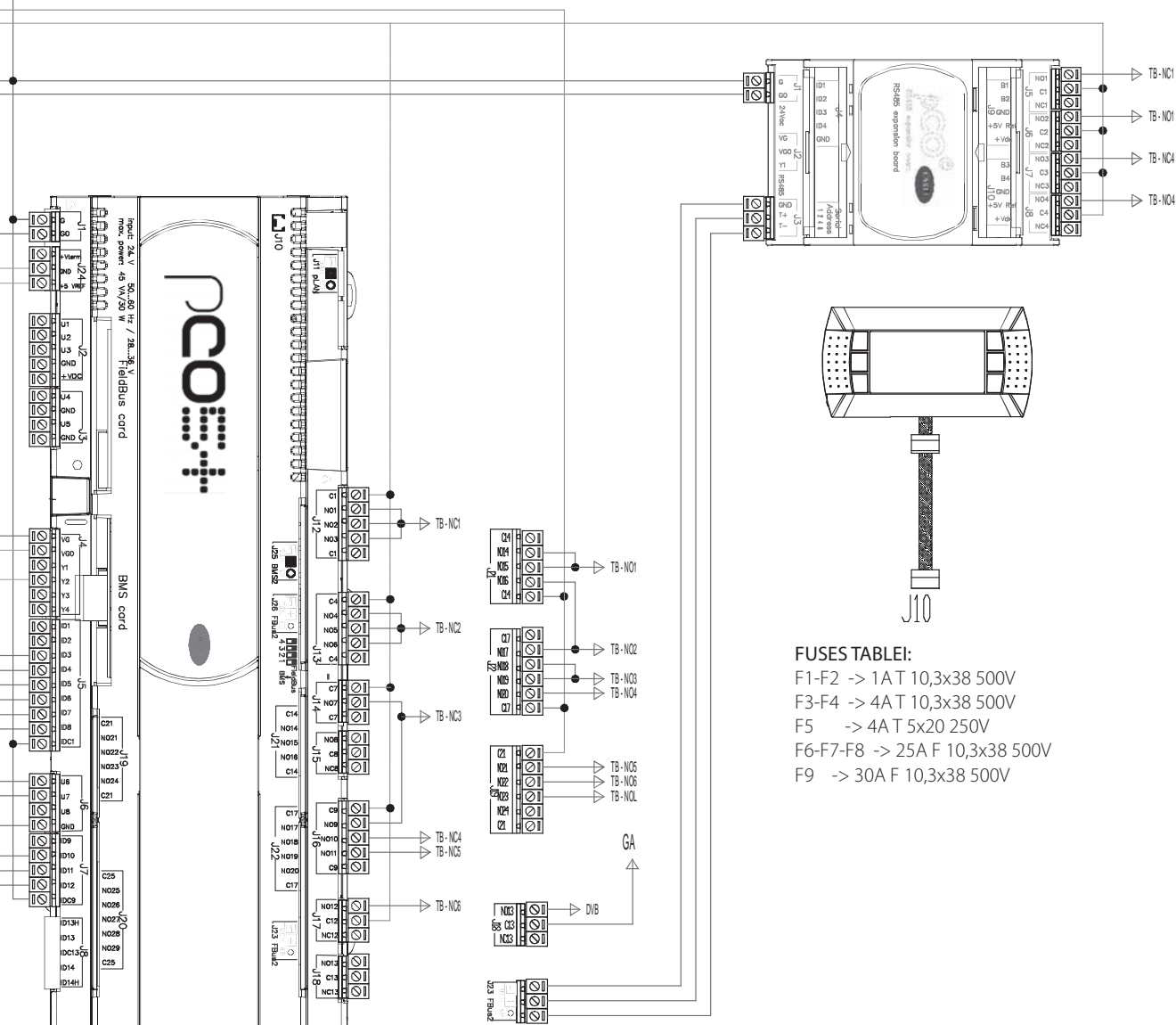
- F1-F2 -> 1A T 5x20 250V
- F3-F4 -> 4A T 5x20 250V
- F5 -> 4A T 5x20 250V
- F6-F7 -> 12A T 10,3x38 500V (UA100/200****)
- F6-F7 -> 20A T 10,3x38 500V (UA320/480****)
- F6-F7 -> 25A T 10,3x38 500V (UA600****)
- F9 -> 20A F 10,3x38 500V (UA100/460****)
- F9 -> 30A F 10,3x38 500V (UA600****)

12.4 Wiring diagram humiFog multizone - Master - UL - TRIFASE





FORZA DI SERRAGGIO MORSETTI pCO5+
TORQUE FORCE TERMINALS pCO5+
 (Pound Inches) = 4,4 min -> 5,3 max



FUSES TABLE:

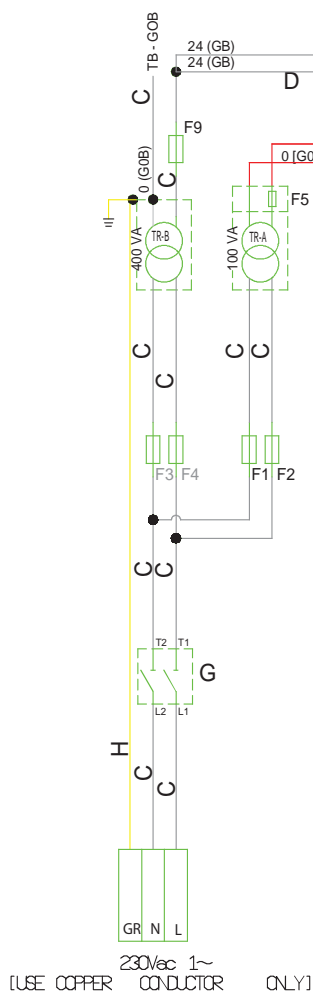
- F1-F2 -> 1AT 10,3x38 500V
- F3-F4 -> 4AT 10,3x38 500V
- F5 -> 4AT 5x20 250V
- F6-F7-F8 -> 25A F 10,3x38 500V
- F9 -> 30A F 10,3x38 500V

12.5 Wiring diagram humiFog multizone - Slave - CE

installer

user

service



TORQUE FORCE TERMINALS (Nm)

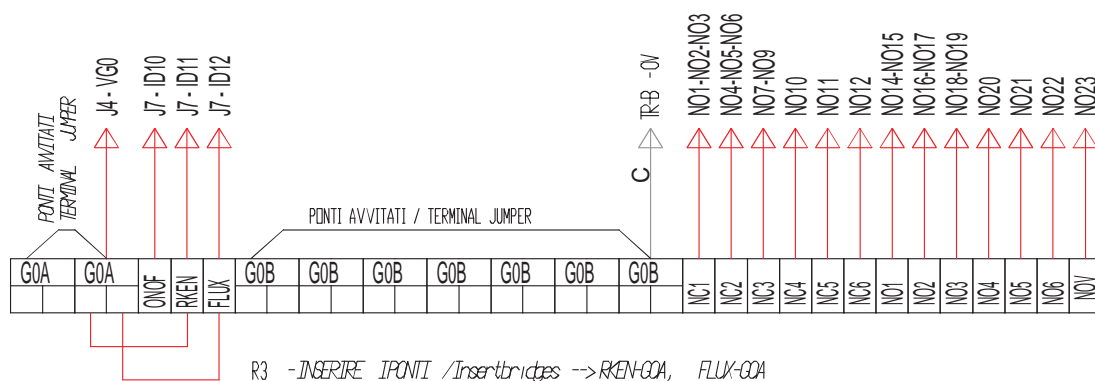
SINGLE TERMINAL: 0,6 min -> 0,8 max

DOUBLE TERMINAL: 0,6 min -> 0,8 max

TERMINAL WITH FUSE: 1,5 min -> 1,8 max

GROUND TERMINAL: 1,5 min -> 1,8 max

MORSETTIERA UTENTE / USER TERMINAL BOARD (use copper conductor only)

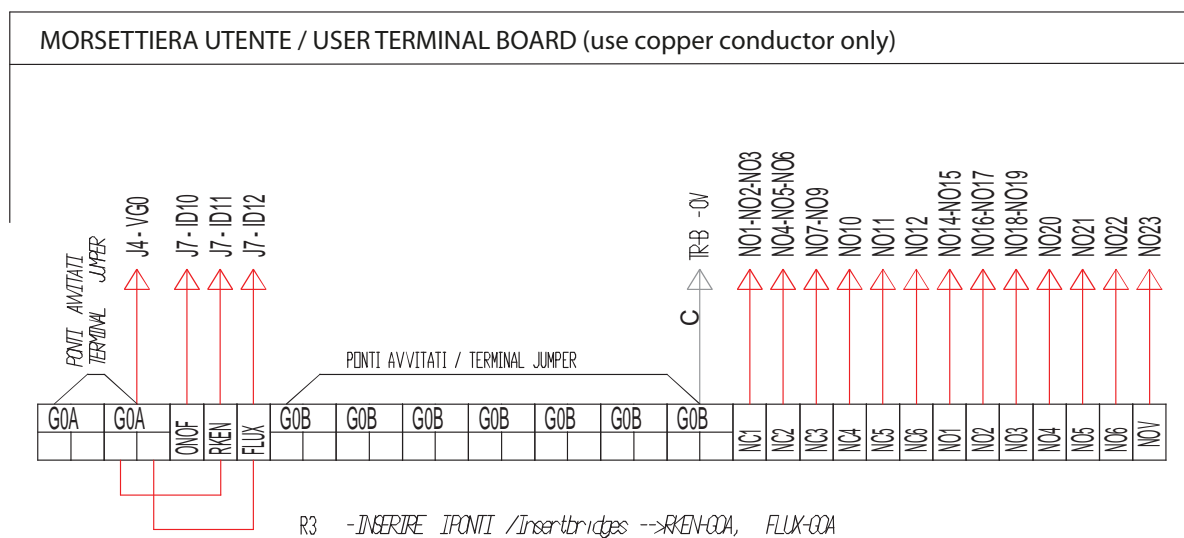


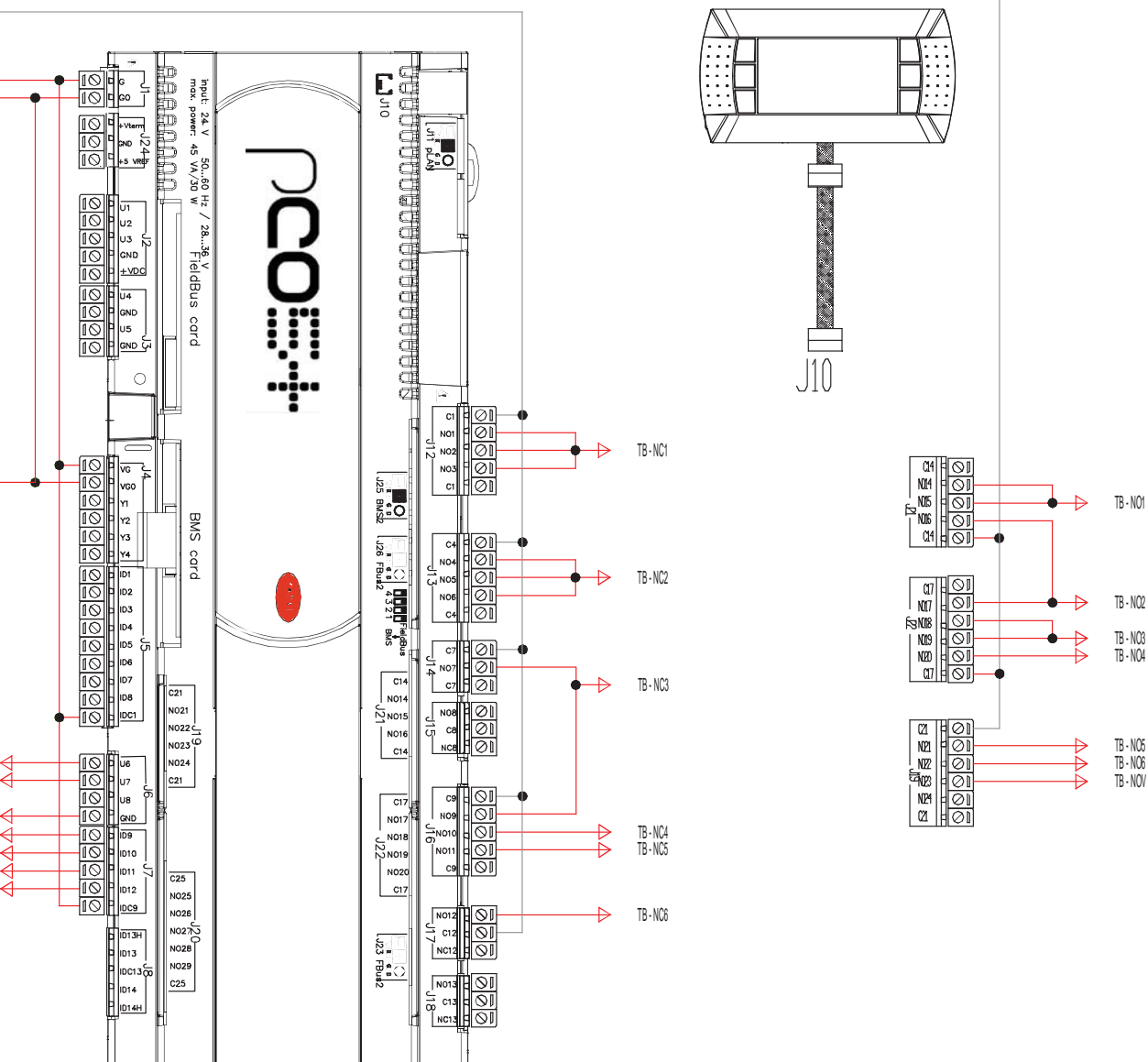




pCO (H)
P
pCO (H)
TB - BKUP
TB - ONOF
TB - RKEN
TB - FLUX

GROUND TERMINAL: 1,5 min -> 1,8 max





FUSES TABLE:

F1-F2 -> 1A F 5x20 600V

F3-F4 -> 4A F 5x20 600V

F5 -> 4A T 5x20 250V

F9 -> 16AT 10,3x38 500V

FORZA DI SERRAGGIO MORSETTI pCO5+

TORQUE FORCE TERMINALS pCO5+

(Pound Inches) = 0,5 min -> 0,6 max

CAREL

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