

## USE AND MAINTENANCE MANUAL



### PRECISION AIR CONDITIONING UNITS WITH CHILLED WATER COIL FOR TELECOM APPLICATION

**UV.SF** (Free-cooling system)



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The manufacturer reserves the right to modify this manual without any prior notice

## 1 - INTRODUCTION

### 1.1 Manual content

The present handbook, originally written in Italian, was completed in compliance with the "Machinery Directive". It contains all the necessary information for carrying out without any risk transportation, installation, startup, operation, setting, maintenance and dismantling of the air conditioning unit of UV-SF series .

Should you have any doubt on the correct understanding of these instructions, please contact the Manufacturer in order to get further explanations.

### 1.2 Safety marks

The following safety marks are used in this manual to draw attention to all useful information in order to avoid any dangerous situation which could be unsafe and harmful for people, could damage equipment and environment besides breaking the unit..



It means operation and behaviour not allowed.



It means danger or risk to people, things or environment.



It means an electrical danger.



It means a warning about important functions or useful information. Pay the maximum attention to the paragraphs marked with this symbol.

### 1.3 Referring standards

The units of the 'UV-SF' series are designed and manufactured in compliance with the relevant European Directives and in particular, they meet the "Essential Safety Requirements" as set out in the European Directive 89/392/CEE, and further amendments, as attested by the CE mark that is on each unit.

As a matter of fact, the units are certified by the manufacturer and are provided together with the CE Declaration of Conformity which is attached to the present manual.

Where applicable, the units mentioned in this handbook are in conformity with the directive 97/23/CE (PED), concerning the pressure devices

## 1.4 Warranty

The manufacturer warrants the Air Conditioning Units according to what stated on his general sales terms or according to what else explicitly agreed.

**The Manufacturer Warranty is void in case the guidance of this manual has not been carefully respected.**

The manufacturer refuses all responsibility for any damage to people, animals, things or environment, caused by incorrect installation, maintenance or setting or misuse of the machine. It is considered as "misuse" of the machine any use not explicitly allowed in this manual.



**Warning: on the first startup, duly fill in the relevant report attached to this manual and send a copy to Emicon A.C. (Customer Service), in order to make the warranty valid.**

## 1.5 Readers of the Manual

This manual and all its attachments are supplied with the described unit. The manual must be kept by the machine's owner in a proper place. To this end, a plastic bag where to store the manual has been placed inside the machine so that it can be always easily accessible for consultation and at the same time, it can be preserved in a good state.

In case the manual is lost or deteriorated, a new copy must be requested directly to the manufacturer.

# 2 – MAIN SAFETY RULES

## 2.1 General warnings



Read carefully the whole handbook before performing any operation on the unit. Only qualified and trained technicians must perform any operation on the machine.



Do not touch the machine if with bare feet or with humid or wet parts of the body.

Do not perform any cleaning operation before the main switch is "OFF" and power line disconnected.

Do not spread, leave unattended or to the reach of children any packaging material (carton box, staples, plastic bags, etc.) as they may be a source of danger.

## 2.2 Allowed use

The machine has been designed and produced for air conditioning of technology centres and therefore it must be used only for this purpose, according to its performing features. All different uses are not allowed and disclaim all manufacturer's responsibility for damages caused to environment, people, animals and properties.

## 2.3 Forbidden use

Do not use the machine:

- for other use than that described in paragraph 2.2;
- when it is exposed to rainfall;
- in atmosphere with high risk of fire or explosion;
- in spaces with corrosive atmosphere



Qualunque operazione sull'unità deve essere condotta in ottemperanza con le norme locali vigenti.

## 2.4 Dangerous areas

The machine is closed by case panels, at the exception of the upper part on some models. The dangerous parts inside the unit are not accessible from outside.



Only qualified and trained personnel is allowed to remove the covering panels because inside the unit there are parts with high risk of electric shock, areas with high temperature and working mechanical components



If the machine is supplied with the cooling circuit already charged with pressure gas, it is necessary to pay the maximum attention in order to avoid accidental release of the gas in the atmosphere.

## 3 – GENERAL DESCRIPTION

### 3.1 Unit description

The precision air conditioning units with chilled water coil of the serie UV have been designed for being used in technology centres, computer processing centres, telecom applications and whenever special thermic and humidity conditions are required.

The machines have been conceived for operating with chilled water at nominal conditions inlet 7°C / outlet 12°C.

The machines are suitable only for internal installation.

All units are electrically tested at the factory.

The available versions are:

**UV.... SF** Free-cooling monobloc unit with chilled water coil;

The machines are available in different configurations according to the air intake and discharge:

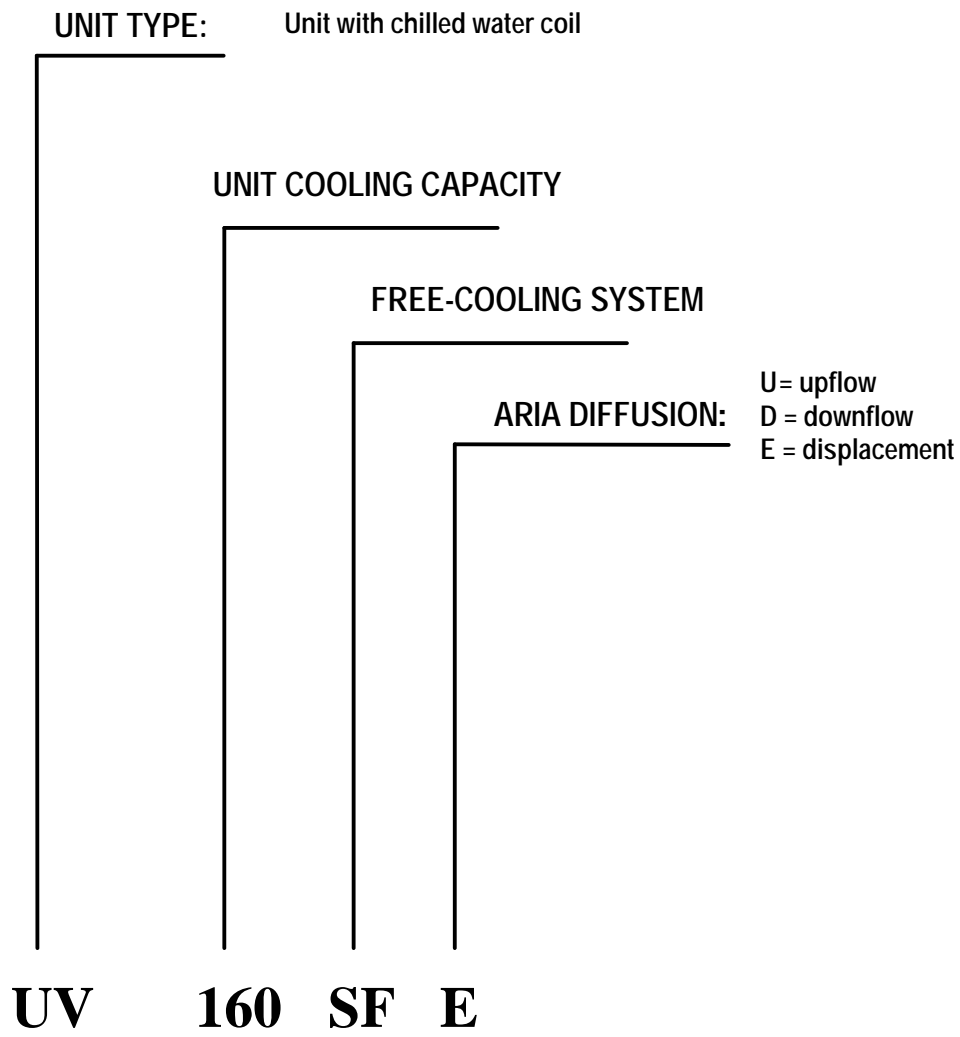
**U:** Air intake from the back and upflow air discharge;

**D:** Air intake from the back and downflow air discharge.

**E:** Air intake from the back and downflow horizontal displacement air diffusion;

The different unit models of the UV-SF series are marked with initials, whose interpreting key is shown in the scheme on page 5.

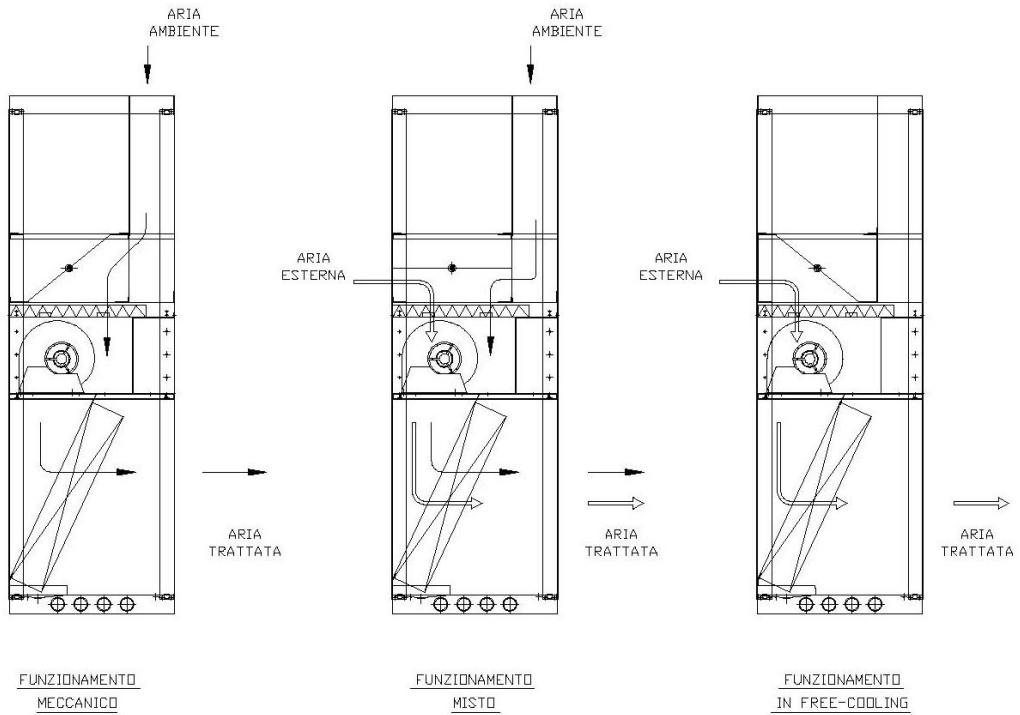
### Interpreting key for the initials used to mark the air conditioning units of the UV.SF series



As shown in the scheme in the previous page, the air conditioning units are classified according to the transfer path of the air inside the conditioning machine before being discharged into the working room at the desired temperature. The following pictures show the four possible different configurations, according to the air distribution system.

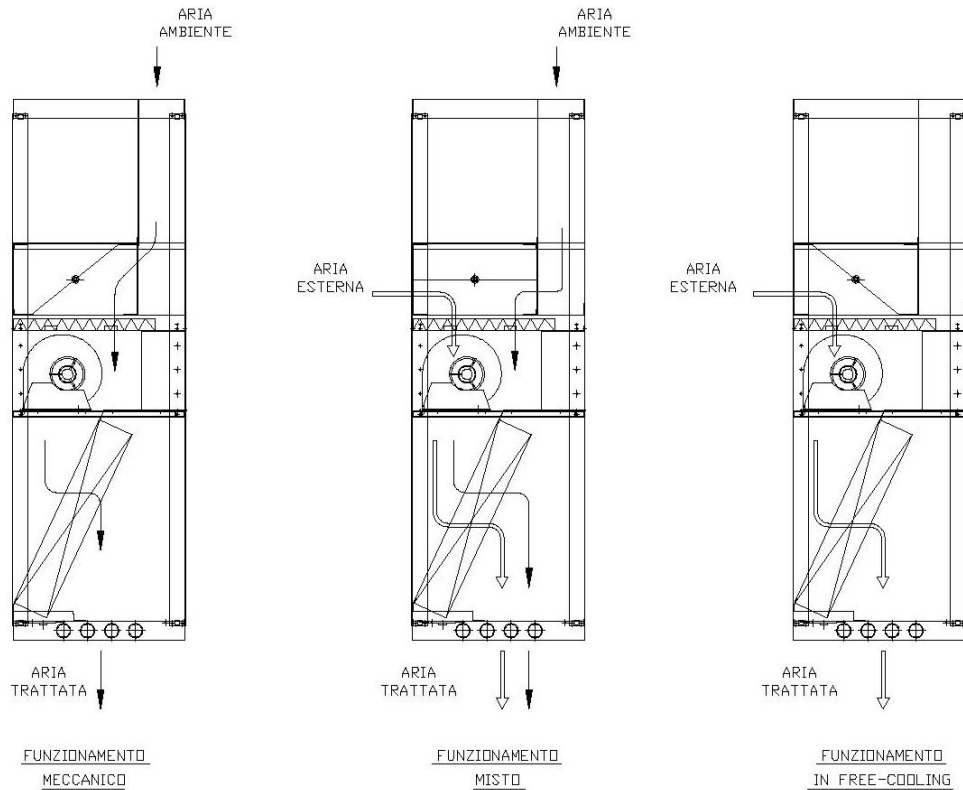
Version UV.SF E

Pict. 1



Version UV. SF D

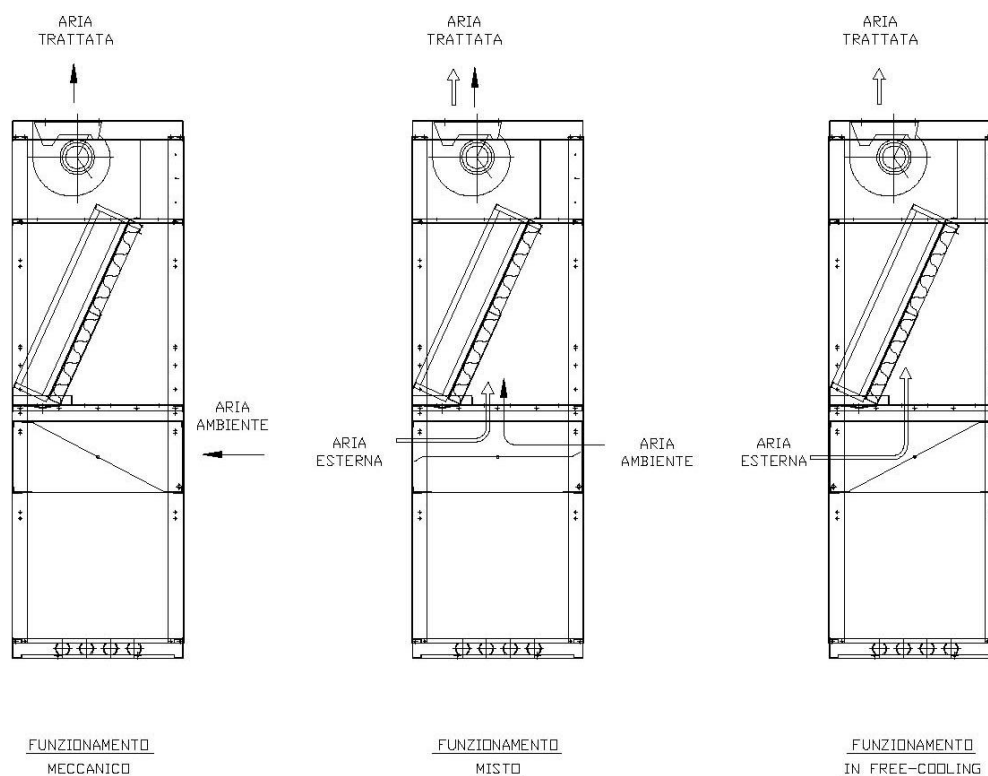
Pict. 2





## Version UV.SF U

Pict. 3



### 3.2 Main components

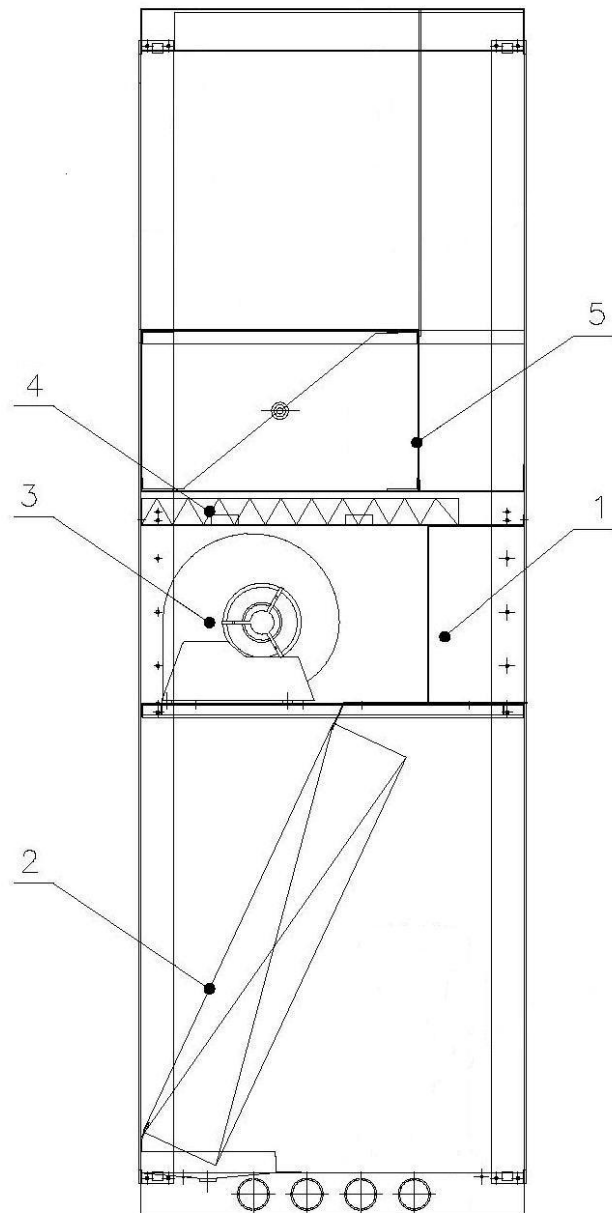
The units of UV.SF series are made of the following main components:

- The housing is made of galvanized steel sections covered with plastic-coated steel plate panels. The panels are provided with internal polyurethane plate covers to reduce noise.
- Centrifugal fans directly coupled with low fan speed regulation
- Chilled water coil with copper pipes and aluminium fins.
- Stainless steel drain pan.
- Regenerable air filters with efficiency grade F4.
- Cooling circuit composed of all required components for a correct and reliable unit operation, as described in par. 3.2.1
- The electric board in compliance with CE regulations and provided with main disconnecting switch; thermal and amperometric protections, contactors, auxiliary low voltage circuit, terminal board and control by microprocessor.
- Damper for free-cooling operation

Key:

- 1) Electric board
- 2) Chilled water coil
- 3) Discharge fan
- 4) Air Filter
- 5) Free-cooling Damper

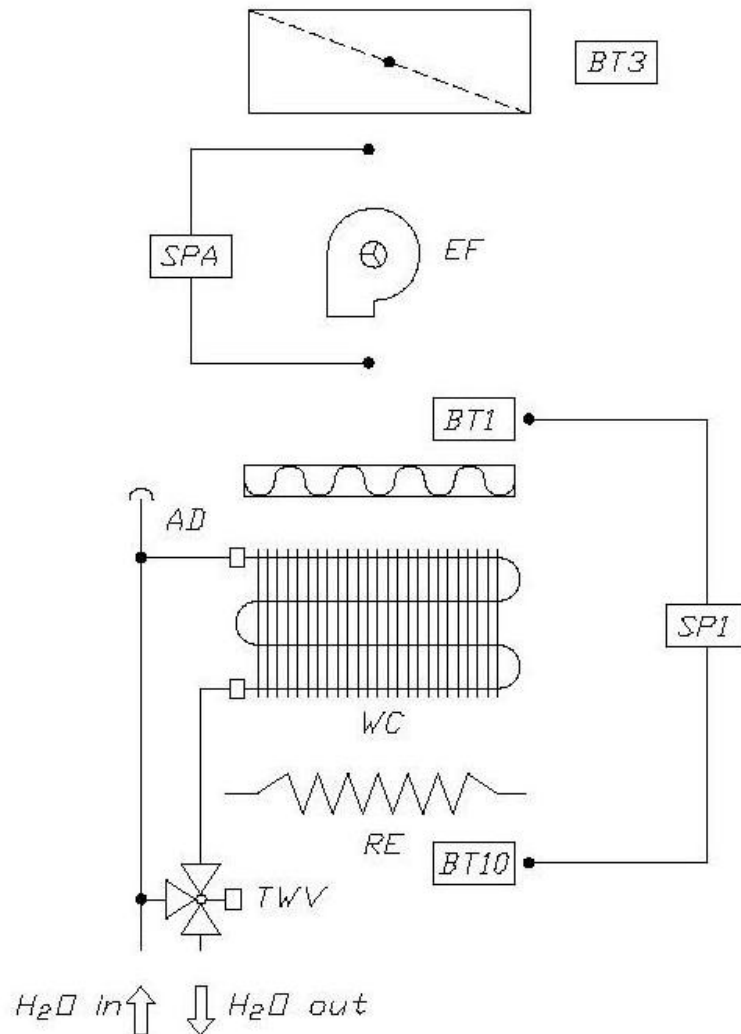
Pict. 4



### 3.2.1 Cooling circuits

Air conditioning unit with chilled water coil and inbuilt Free-cooling system serie **UV.SF**

PICT. 5



## Cooling circuits key

<b>AC</b>	AIR HEAT EXCHANGER	<b>OT</b>	OIL RESERVE	<b>TWV</b>	3-WAY VALVE
<b>AD</b>	AIR DISCHARGE VALVE	<b>PDIO</b>	OIL GAUGE	<b>VE</b>	EXPANSION VESSEL
<b>AV</b>	VIBRATION DAMPER	<b>PDSO</b>	OIL LEVEL PRESSOSTATIC VALVE	<b>VP</b>	EVAPORATOR
<b>BT1</b>	REGULATING PROBE	<b>PDSW</b>	DIFFERENTIAL WATER SWITCH	<b>VT</b>	THERMOSTATIC EXPANSION VALVE
<b>BT3</b>	FREE-COOLING ANTI-FREEZE PROBE	<b>PIH</b>	HIGH PRESSURE GAUGE	<b>WC</b>	WATER COIL
<b>BT 10</b>	ANTI-FREEZE TEMPERATURE PROBE	<b>PIL</b>	LOW PRESSURE GAUGE	<b>WD</b>	WATER CHARGE AND DISCHARGE VALVE
<b>CM</b>	COMPRESSOR	<b>PIW</b>	WATER VALVE	<b>WE</b>	WATER EXCHANGER
<b>CO</b>	CONDENSER	<b>PRV</b>	OVERPRESSURE DISCHARGE DEVICE	<b>WF</b>	WATER FILTER
<b>CT</b>	CONDUCTIVITY PROBE	<b>PRW</b>	SAFETY WATER FLOW SWITCH	<b>WP</b>	WATER PUMP
<b>EF</b>	FAN	<b>PSH</b>	HIGH PRESSURE SWITCH	<b>WT</b>	WATER BUFFER TANK
<b>EHA</b>	ANTIFREEZE HEATER	<b>PSL</b>	LOW PRESSURE SWITCH	<b>BG</b>	HOT GAS COIL
<b>EHC</b>	CRANK-CASE HEATER	<b>PT</b>	PRESSURE TRANSDUCER	<b>YVCA</b>	HUMIDIFIER FILL VALVE
<b>EV</b>	SOLENOID VALVE	<b>RE</b>	ELECTRIC HEATER	<b>YVSA</b>	HUMIDIFIER DRAIN VALVE
<b>FSR</b>	FAN SPEED REGULATOR	<b>RV</b>	MODULATING VALVE		
<b>FWV</b>	4-WAY VALVE	<b>SA</b>	LIQUID SEPARATOR		
<b>H</b>	HUMIDIFIER	<b>SFF</b>	FREON-FREON HEAT EXCHANGER		
<b>HR</b>	HEAT RECOVERY	<b>SFO</b>	FREON-OIL HEAT EXCHANGER		
<b>HT</b>	HUMIDITY PROBE	<b>SL</b>	NOISE LEVEL REDUCER		
<b>LF</b>	DEHYDRATING FILTER	<b>SO</b>	OIL SEPARATOR		
<b>LS</b>	SIGHT GLASS	<b>SPA</b>	FLOW SWITCH		
<b>LT</b>	LIQUID RECEIVER	<b>SP1</b>	CLOGGED FILTER SWITCH		
<b>NR</b>	NON-RETURN VALVE	<b>SV</b>	SHUT-OFF VALVE		
<b>OF</b>	OIL FILTER	<b>TS</b>	SAFETY THERMOSTATIC VALVE		
<b>OLR</b>	OIL LEVEL REGULATOR	<b>TT</b>	TEMPERATURE PROBE		

Table 1

### 3.3 Specification

The main technical features of the units are shown in the attachments.

### 3.4 Dimensional drawings

The unit's dimensions, ducts' size and when foreseen ( version UV.SF ) pipes' size to complete the cooling circuit are shown in the attached dimensional drawing..

### 3.5 Accessories

The units can be equipped with a wide range of optional accessories, the main of which are described in the following list:

**AA:** Flooding probe sensitive to the water present under the floor.

**AE:** Power supply different from the nominal power

**AL:** Smoke alarm.

**B:** The base frame in welded steel tubes is available for every unit model and its height is adjustable between 140 and 580 mm.

**H:** Humidifier.

**IG:** Watch card.

**IH:** Serial interface RS485.

**IM:** Seawood packaging

**KC:** Spare F4 efficiency filters kit

**RE:** Electrical heater with aluminium armoured elements and safety thermostat

**RM:** Epoxycoating of the coil for sea environment

**RR:** Coil with copper/copper fins

## 4 - INSTALLATION

### 4.1 Identification tag

The data for the identification of the unit are marked on a permanent tag (Picture 6) attached both on the packing and inside the unit, close to the electrical panel.

<b>EMICON</b> AIR CONDITIONING AND INDUSTRIAL APPLICATION		TEL. ++39 0445 418811 FAX ++39 0445 418812 Via Oragoni 80-Favè (TN), 7	<b>MADE IN EUROPE</b>	<b>CE</b>
MODELLO MODELLI MODEL	<input type="text"/>	MODELLO MODELLI MODEL	<input type="text"/>	
NB 0407	<input type="text"/>	NUMERO DI SÉRIE SERIAL NUMBER	<input type="text"/>	
ESAPPLICA INSTALLAZIONE SERIAL NUMBER	<input type="text"/>	VOLTAGGIO VOLTAGE VOLTAGE	<input type="text"/>	
SPAZZIAMENTO RIPARTIZIONE RIPARTIZIONE	<input type="text" value="V-FI-Hz"/>	REFRIGERANTE REFRIGERANT REFRIGERANT	<input type="text"/>	
NUMERO UNITA' CABINETTI TYPE OF REFRIGERANT	<input type="text" value="R"/>	PESO UNITA' WEIGHT WEIGHT	<input type="text"/>	
NUMERO UNITA' CABINETTI TYPE OF REFRIGERANT	<input type="text" value="Kg"/>	PESO NETTO NET WEIGHT NET WEIGHT	<input type="text"/>	
NUMERO UNITA' CABINETTI TYPE OF REFRIGERANT	<input type="text" value="Kg"/>	MAX PRESSION OPERATING MAXIMUM OPERATING PRESSURE	<input type="text"/>	
NUMERO UNITA' CABINETTI TYPE OF REFRIGERANT	<input type="text" value="L.P. Unit"/>	NUMERO UNITA' CABINETTI TYPE OF REFRIGERANT	<input type="text"/>	
NUMERO UNITA' CABINETTI TYPE OF REFRIGERANT	<input type="text" value="H.P. Unit"/>	NUMERO UNITA' CABINETTI TYPE OF REFRIGERANT	<input type="text"/>	
NUMERO UNITA' CABINETTI TYPE OF REFRIGERANT	<input type="text"/>	NUMERO UNITA' CABINETTI TYPE OF REFRIGERANT	<input type="text"/>	

Pict. 6



The correct unit identification by means of the serial number is essential for the execution of any operation to carry out on the unit. The serial number must be always advised whenever submitting a request of technical service support

### 4.2 Reception and inspection

It is very important to check the packing integrity immediately upon delivery. In case the packing is found damaged, it is necessary to accept the goods "with reservation" and indicate on the consignment note the state of the received goods and let the driver countersign it. Any claim concerning the delivered material must be sent to the manufacturer by fax or by registered letter within 8 days from the receiving date. It is advisable to unpack the unit only when the installation begins and possibly after the unit has been moved to the location where it must be installed.



It is forbidden to stack units, even if they are packed. If the unit is stored after receiving, it must be not exposed to weather agents, even if packed.

### 4.3 Handling

The handling of the unit must be carried out by expert personnel, equipped with appropriate equipment in relation to the weight and to the dimensions of the machine. During the handling operation, the machine must be always kept upright.

The weight of some models is unbalanced; check the unit stability before starting to handle it.



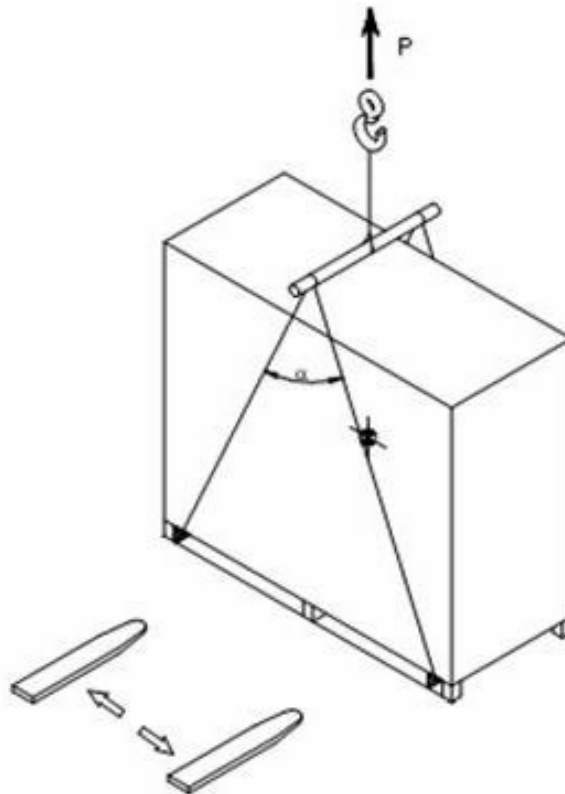
For any unit handling, please follow the instructions shown in (Pict. 7).

In case the fork lift is employed, the forks must be spaced out to the maximum allowed by the pallet size. In case the machine is moved by means of a crane, it is important to avoid that cables and belts exert a too high tractive effort on the packing that might damage it.



Angle  $\alpha$  must not be greater than 30 °.

Pict. 7



The overall dimensions of the units packaging included are indicated in the packing list sent via @ to arrange loading.

#### 4.4 Arrangements and placing

The installation of the machine is under the responsibility of the installer who must supervise the execution operations. The execution of a correct installation presupposes that a plan has been drawn up by an expert and that is carried out by skilled and trained technicians.

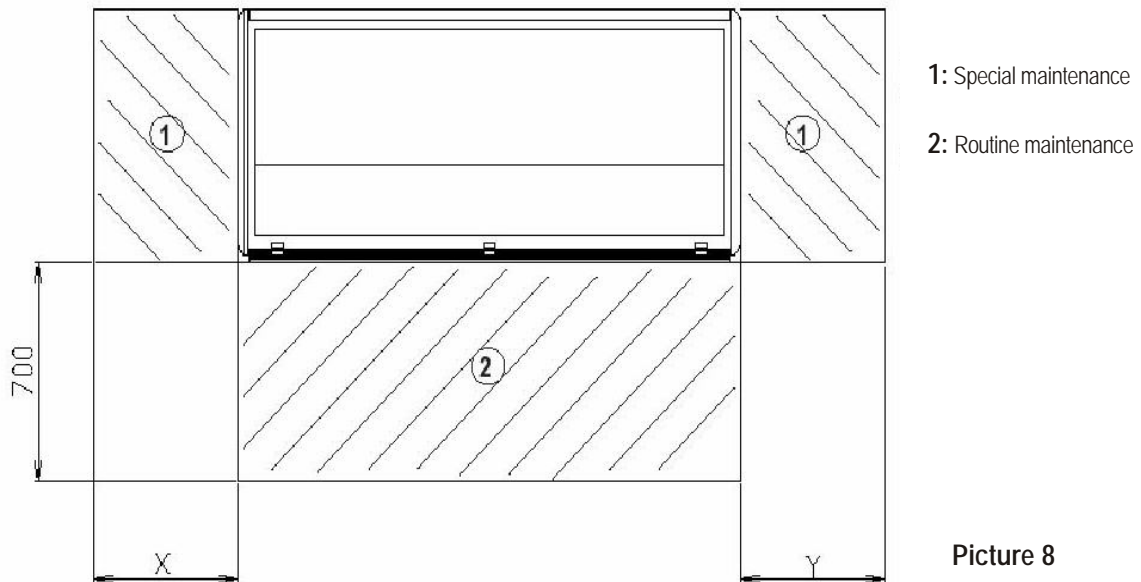
In the following paragraphs there are some tips and information to keep in mind when planning and executing the machine installation.

The unit installation must comply with local existing laws.



Before placing the unit, the following points must be checked:

- Connections for cooling, electrical, hydraulic and condensate drainage circuits must be done;
- Enough room must be left around the unit to allow the routine maintenance, as shown in **Picture 8** by the dashed area in front of the machine. It is necessary to keep some free room on the right and/or left side of the unit if connections are on the unit sides. If possible, also leave the necessary free lateral room for special maintenance, such as compressor, heat exchanger and fans replacement;
- The floor where the machine is positioned can bear the total weight of the unit under normal operation



X = 500 mm

Y = 500 mm



Before starting to handle the unit to position it, it is necessary to identify the best way to arrive to the place, taking into consideration the unit overall dimensions and weight, the available lifting equipment and any optional accessory dimensions.

All units described in this manual do not need any special foundation, since they can be simply laid down on the chosen surface or arranged on a base frame (option) just placing a rubber gasket of about 5 mm thickness underneath.

Make sure that the aeraulic features of the unit, as described in the attached data sheets, match those required for the undertaken project.

In case of units provided with downflow air discharge, it is necessary to take into account the height of the floating floor because it can greatly influence the unit performance.

In order to avoid high noise level and / or unacceptable reductions of airflow, the height of the floating floor should be never inferior than the unit width.

Make sure that the value of the pressure drop of the air distribution system is not higher than the unit available pressure in its standard configuration. In case of special requirement, higher levels of available pressure are available as an optional on UV.SF.

Make sure that the number and the characteristics of the air suction and distribution grids are suitable for the unit airflow capacity.

For the installation of any spare accessory, strictly follow the instructions attached to each of them.

#### 4.5 Cooling connections

The machines are conceived to be connected to a chilled water distribution net. The pipe installation must be performed by a skilled refrigeration technician.

The piping path must be such to reduce as much as possible the pressure drops in the plant. In any case the pump aimed to chilled water circulation must be able to give the suitable head pressure and available pressure to win the plant's pressure drops in all possible working conditions. Pipes must be adequately supported by brackets and placed in order to allow their installation and inspection. The materilas used to carry out the plant must have a nominal pressure not lower than PN 6. The chilled water plant must be insulated with close cells material having thermal insulating and steam resistance properties suitable to the working conditions.

During the piping installation, the tubes must be sealed to prevent foreign bodies and dirt go inside.

Once the piping installation is finished and the unit is installed, a plant's hydraulic tightness test must be performed in order to sort out possible leakages to be repaired before the system's start up.

Do not exceed 6 bar while looking for leakages.



In order to connect the units to the chilled water network, use the foreseen areas as mentioned in **Pict. 9**. The diameters of units' water piping are listed in the attached drawing.

It is advisable to install a water filter on the unit's inlet having a mesh dimension not bigger than 1 mm. To make unit's extraordinary maintenance operations easier it is advisable to install ball valves on water inlet/ and outlet. It is furthermore appropriate to connect the unit to the water plant by means of couplings in 3 parts which remarkably help interventions on the hydraulic circuit .



Install air vent valves in the higher points of the hydraulic plant and anyway wherever gas pockets may occur and obstruct the water circulation.

If the units are meant to operate with an anti-freeze mixture, a consequent change in cooling capacity and pressure drops values must be expected.

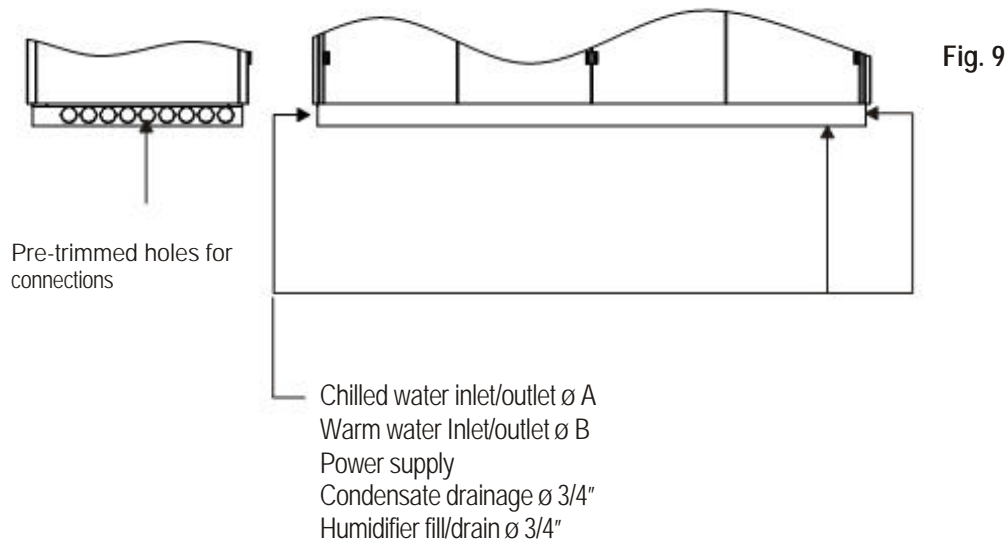


Use exclusively anti-freeze fluids compatible with the materials used in the unit and in the plant.

A device keeping the pressure constant must be foreseen in the plant (i.e., automatic filling group and expansion vessel) suitable to the scheduled temperature rates and plant volume.



Strictly comply with existing local regulations when performing the cooling connections.



#### 4.6 Condensate drainage connection

The air conditioning unit is provided with a stainless steel tank collecting the condensate generated during the dehumidification phase. The tank must be connected to the drainage collector by means of a flexible pipe having internal diameter of 27 mm. The pipe shall be placed with a slope not lower than 1,5% (1,5 cm/m) toward the outlet direction.



To guarantee a correct condensate drainage, **it is necessary to set up a siphon of at least 20 mm in the flexible pipe** before doing the connection to the drainage collector.

#### 4.7 Air Connection (version with inbuilt air condensation)

The proper sizing and carrying out of the air connections are essential to grant the good unit's operation and a suitable sound level in the room.

While sizing the ducts **pressure drops, air flow and air speed** are to be considered and must be congruent to the unit's features.

Particularly consider that pressure drops exceeding the unit's available pressure lead to a flow reduction and consequently to the unit's stop.

##### 4.7.1 Assembling

During the assembling it is advisable to pay attention to:

- The ducts' weight must not rest on the connecting flanges
- Place AV mounts between ducts and unit
- The connection to the flanges and among the several ducts' sections must assure the air tightness, avoiding air loss on the discharge and air return in the suction which penalize the overall plant efficiency
- Possible external ducts must also be watertight
- Limit the pressure drops optimizing the trial course, the type, the number of curves and branching

##### 4.7.2 Minimum Ducts' dimensions

In order to make the ducts' sizing easier, but to make sure that the air flow is the one required to assure the good unit's operation, the following table (**TAB. 2**) is supplied to provide the available pressure values and the minimum expected duct's surface.

Tab. 2

MODEL	AVAILABLE PRESSURE Pa	MINIMUM SURFACE Cm <sup>2</sup>
51	65	1830
71	65	
131	70	
161	65	
181	70	2562
191	70	
262	70	4026

#### 4.8 Electric connections

Before carrying out the connection of the unit to the power supply, it is necessary to carefully check the following:

- the power tension and frequency are the same data as stated on the unit identification tag (Picture 1);
- make sure there is no humidity trace inside the electrical panel and on all electric and electronic components. In case humidity is found, detect and eliminate the cause of the infiltration;
- make sure the circuit and the electric components have not been damaged during transportation, handling and positioning. If any damage is detected, proceed with the needed repair.
- The electrical wires must be properly tightened; if necessary, tighten adequately any loose wire.



Only authorized and trained personnel can carry out any intervention on the electrical wiring.



Check the wiring diagram placed inside the key board.



Strictly comply with existing local regulations when performing the electrical connections



Check the attached wiring diagram to know the power supply cable cross section, the automatic switch size and the characteristics of the electrical components.

#### 4.8.1 Power supply connection (Pict. 10)

The unit standard power supply tension is 400 V/3f/50Hz; on request, it is also possible to supply units with arrangements for special power supply tension (check the identification tag and the wiring diagram).

The unit is normally powered with a 5-pole cable (3 phases + neutral + earth).

Connect the phases and the neutral to the terminals of the main switch (L1, L2, L3 and, respectively, N) and the earth wire to its corresponding terminal (PE). Use a power supply cable of adequate cross section and of moderate length to avoid voltage drops.

Protect the power supply cable by means of an automatic differential switch of appropriate size and features. The cross section of the power supply cable and the size of the automatic switch can be found on the attached wiring diagram, where it is indicated the main switch size according to different unit models and configurations.

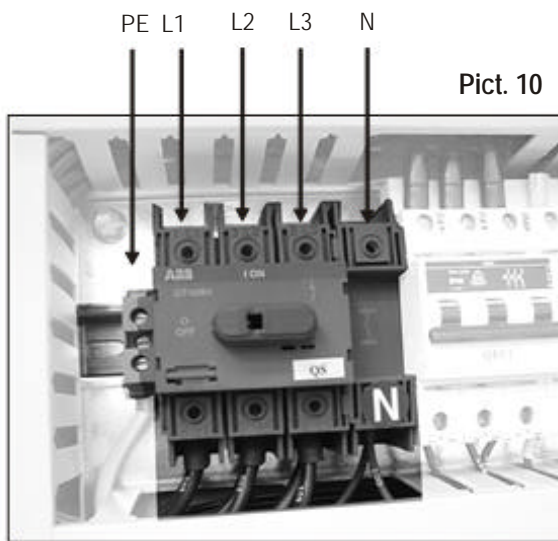
#### 4.8.2 User's terminal board connection

A user terminal board (**Pict. 11**) is available with free contacts designed for:

- generic alarm state (1);
- unit remote ON/OFF (2)..



For the exact correspondence of the terminal numbers, check the wiring diagram.



Pict. 10

Pict. 11



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## 4.10 Charge of the Hydraulic circuit

Once the hydraulic plant and the unit's connection are completed, the circuit must be charged. Open all air vent valves present in the circuit.

Connect the circuit to a water supply network, permanently if possible, by means of an automatic filling group with manometer, provided with check valve.



If the circuit operates with an anti-freeze mixture, fill in the circuit with the proper quantity of pure anti-freeze fluid, based on the plant's volume and the needed concentration.

Start to charge water in the system

Check all air vent valves in the system and close them when air stops coming out and water flows.

Once all air vent valves have been closed, continue to charge water in the system till a pressure between 1,5 and 3,5 bar is achieved.

If a manual charge is performed, suspend the water charge and run the circulation pumps in order to pump the air still present in the system towards the higher points provided with air vent valves. After 2 hours, stop the pumps and breath the air through the air vent valves. Charge more water in the circuit in order to bring the pressure to the original value. Repeat the operation till air stops coming out from all air vent valves



Make sure the water pressure in the circuit is always between 1,5 and 3,5 bar.

## 5 - OPERATION

### 5.1 First startup

Before starting the unit, the following simple operations must be carried out:

#### - Cooling circuit

Check that the hydraulic circuit has been completely emptied of air through the air vent valves and that the water flow and temperature are correct.

#### - Start up

Perform all operations as described in par 4.9 'Electric connections' and then follow the instructions here below:

Turn the main switch to ON position



Start the unit pressing the ON/OFF button on the microprocessor keyboard.;

Check the fans rotation direction, when these are of triphase type; if rotation is reversed, two out of the three phases must be inverted in the terminals of the main switch.



Once the unit is started, after a short period needed to the microprocessor for an auto-test, the unit electric fans will start to rotate. At this point, all system components will start working automatically according to the selected and detected thermal and humidity parameters.

To stop the air conditioning unit, push the ON/OFF button on the microprocessor keyboard.



If the unit should not work for more than 24 hours, turn the main switch to OFF position.

#### - Setup

The setup must be performed when the unit is operating in conditions as close as possible to the nominal ones.

Make sure:

- The thermal load is adequate;
- Doors and windows are shut;
- Surrounding spaces are clean.

#### - Microprocessor setting

Make sure the desired thermal and humidity parameters are set on the microprocessor.

If the preset parameters need to be changed, proceed as described in the microprocessor manual (see attachment).



Standard units are designed to work with room temperature between 22 and 27 °C ( 50% relative humidity).

### 5.2 Fault alarm and display system

The troubleshooting is realised by the microprocessor, which activates an alarm and shows on its display the type of fault occurred ((see also the attached microprocessor manual)

Since the alarm state is very often generated by an unfitted electric contact, in case of fault make sure all wiring connections are plugged in the corresponding terminals

In case of fault, consult the attached microprocessor manual to check the parameters setting has been done properly.

### 5.3 Troubleshooting

TROUBLE	POSSIBLE CAUSE	CHECK / CORRECTIVE ACTION
1) The unit does not work	A) The electric panel is not powered	Check presence of electric tension; make sure the main switch is closed.
	B) The auxiliary circuit is not powered	Check fuses FUT and FUA
2) The unit does not start	A) The microprocessor does not start the unit	Check the electric connections to the microprocessor
	B) The external impulse to the microprocessor fails	Check the remote ON/OFF contact is closed
3) Room temperature too high (high temperature alarm signal)	A) The unit does not work	See troubles 1 and 2
	B) The control system setting is not correct	Check the setting of the control system
	C) The air flow capacity is too low	See trouble 6
	D) The compressor does not work	See trouble 13
	E) The compressor output is not sufficient	1) See trouble 9 2) See trouble 12
	F) The control system does not work	Consult the attached Microprocessor manual
	G) Thermal load higher than estimated	Check the room thermal load value
4) Room temperature too low (low temperature alarm signal)	A) The control system setting is not correct	Check the setting of the control system
	B) The electric heaters do not work (if installed)	See trouble 15
	C) The control system does not work	Consult the attached Microprocessor manual
	D) Thermal loss higher than estimated	Check the thermal loss value
5) Room humidity too high (if the humidity control is installed) (high room humidity alarm)	A) The control system setting is not correct	Check the setting of the control system
	B) Latent load higher than estimated	Check the room latent load value
	C) The compressor does not work when in dehumidification phase	See trouble 13
	D) The control system does not work	See the attached Microprocessor manual
6) Low or no air flow (flow or fans alarm)	A) Fans are not powered	Check the fans electric circuit
	B) Clogged filter (filter alarm, if installed)	Clean or replace the filter
	C) Obstruction in the air duct or excess of pressure drop in the air ducts	Check the total pressure drop and compare it with the unit available pressure
	D) Fan heat protection system is activated	Check fan winding resistance; after reset, check tension and electric absorption
7) 3 way-valve does not work	A) The control system does not work	Consult the attached Microprocessor manual
	B) The valve servomotor does not work	Check electric connections and replace the servomotor, if defective
	C) The valve is mechanically stuck	Try to loose the valve and replace it if needed
8) The electric heater or the heat coil do not work (if installed)	A) The safety thermostat is activated	1) the air flow capacity is too low: see trouble 6. 2) check the safety thermostat and replace it if needed
	B) Fuses are activated	Replace damaged fuses
	C) The contactor is not working	Check the contacts and the coil.
9) Alarm of any probe	The probe corresponding to the alarm code is defective or disconnected	Check the connection of the probe and make sure it works; if it is defective replace it

Tab. 3

## 5.4 Routine maintenance

	Monthly	Quarterly	Annual
Air filter cleaning	X		
Condensate tank cleaning		X	
Fans noise level check		X	
Electric connection tightening check		X	
Contactors status check		X	
Check of duct insulation status			X
Water flow check	X		
Electric absorption check		X	
General unit conditions check			X
Probes setting check			X
Set parameter values check		X	
Electric protections operation check		X	
3-way valve operation check			X
Check of air presence in the hydraulic circuit	X		

Tab. 4

## 6 - DISMANTLING

When the unit has to be dismantled, the unit components must be sorted and sent to a waste management facility. This operation must be performed by waste collection companies in compliance with local environmental laws.

Usually the unit does not contain hazardous liquids to people, things or environment as it works by water.



Do not release the refrigerant contained in the refr. circuit into the environment.

When dismantling the unit or when replacing the compressor, carefully collect the oil compressor and deliver it to an authorized company for oil disposal.



Do not release the compressor oil into the environment.



## USE AND MAINTENANCE MANUAL



## STEAM HUMIDIFIER



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## 1 - INTRODUCTION

The humidifier described in this manual is an immersed electrode steam humidifier and it is equipped with the most advanced microprocessor technology.

The operation is completely automatic and it can be employed in any geographical area since it is able to adapt its functioning according to the chemical – physical characteristics of water, provided that water is drinkable and it is not demineralised.

### 1.1 Principle of operation

By giving an electric tension to two metal electrodes immersed in water, an electric current is generated and it heats water up to make it boil. As a matter of fact, as long as water contains a minimum quantity of salts, it acts as an electric heater which closes the circuit between two electrodes.

### 1.2 Operation and unit components

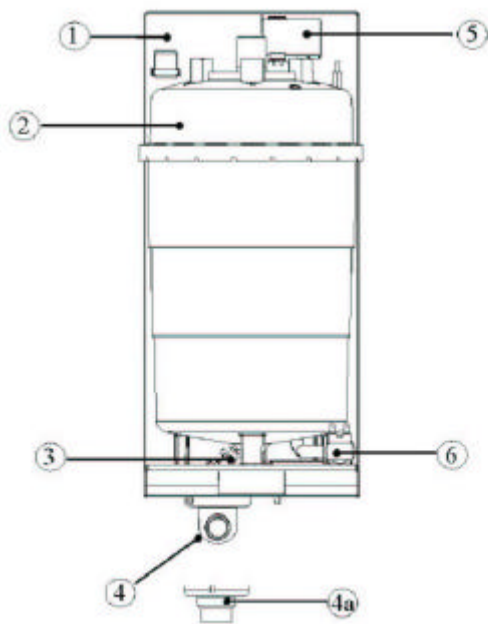
When a steam production is needed, the electronic control sends an electric tension to the electrodes immersed in the water contained in the boiler, by closing the appropriate contactor. Steam production is controlled with an amperometric transformer (TAM) which measures the energy transferred from water.

When water level decreases and, consequently, energy goes below the set parameter, the fill electrovalve is open to allow water to reach the fill tank. From here, water flows inside the cylinder by gravity.

The two small electrodes located on the top of the cylinder monitor that the water level does not exceed the maximum value. As a matter of fact, beyond this level the water is drained by means of the overflow pipe into the fill tank.

The other two electrodes placed on the fill tank measure the supply water conductivity. This is useful for the electronic control in order to optimize the humidifier operation following the chemical characteristics of water.

The fill electrovalve is activated from the control as much frequently is needed depending on the supply water characteristics in order to maintain the optimal saline concentration inside the cylinder.



n.	description
1	Supporting frame
2	Cylinder
3	Draining electrovalve
4	Exhaust pipe fitting swinging at 90°
4a	Flat Pipe fitting (equipped)
5	Fill tank + Conductivity meter
6	Supply electrovalve

## 2 - USE

### 2.1 Main Warnings



The electric components contained in the unit are powered.



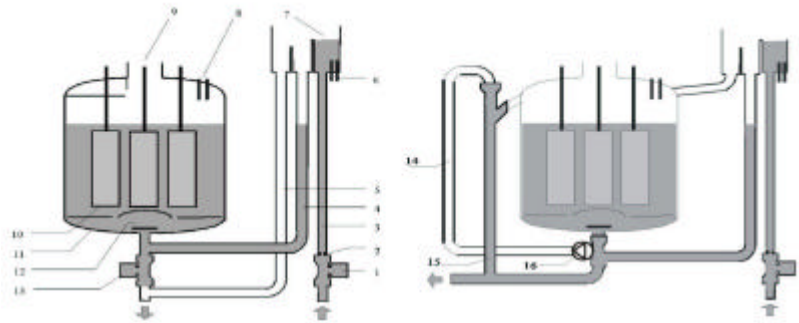
Only qualified and trained personnel must carry out any operations on the unit.



The unit contains hot surfaces, in particular:

- The steam cylinder can reach temperatures over 60°C;
- The steam produced and therefore the draining pipe, in particular conditions, can reach the temperature of 100°C.

n.	description
1	Supply Electrovalve
2	Flow limiting device
3	Supply Pipe
4	Fill Pipe
5	Overflow pipe
6	Electrodes to measure conductivity
7	Supply tank - overflow
8	High level electrodes
9	Steam outlet
10	Electrodes (2/6 for monophasic models, 3/6 for triphasic models)
11	Cylinder case
12	filter
13	Draining Electrovalve
14	Exhaust corrugated pipe
15	Draining Column
16	Exhaust pump



### 2.2 Supply water characteristics

**LIMIT VALUES OF SUPPLY WATERS WITH MEDIUM-HIGH CONDUCTIVITY  
FOR HUMIDIFIERS WITH IMMERSED ELECTRODES**

Hydrogenions Activity	pH	-	
Specific conductivity at 20°C	$\sigma_R$ 20 °C	-	$\mu\text{S}/\text{cm}$
Total dissolved solids	TDS	-	mg/l
Fixed Residual at 180°C	R <sub>180</sub>	-	mg/l
Total hardness	TH	-	mg/l CaCO <sub>3</sub>
Temporary hardness		-	mg/l CaCO <sub>3</sub>
Iron + Manganese		-	mg/l Fe+Mn
Chlorides		-	ppm Cl
Silicon Dioxide		-	mg/l SiO <sub>2</sub>
Residual Chloride		-	mg/l Cl
Anhydrite		-	mg/l CaSO <sub>4</sub>
Metallic matters		-	mg/l
Solvents, diluents, soaps, lubricants		-	mg/l

LIMITS	
Min.	Max
7	8,5
300	125
(1)	(1)
(1)	(1)
100(2)	400
60(2)	300
0	0,2
0	30
0	20
0	0,2
0	100
0	0
0	0

(1) Values depending on the specific conductivity; generally speaking: TDS= 0,93 \*  $\sigma$  20; R<sub>180</sub>= 0,65 \*  $\sigma$  20

(2) Not less than 200% of chlorides content in mg/l of Cl

(3) Not less than 300% of chlorides content in mg/l of Cl

**LIMIT VALUES OF SUPPLY WATERS WITH MEDIUM-LOW CONDUCTIVITY  
FOR HUMIDIFIERS WITH IMMERSED ELECTRODES**

			LIMITS	
			Min.	Max
Hydrogenions Activity	pH	-	7	8,5
Specific conductivity at 20°C	$^{\circ}R\ 20\ ^{\circ}C$	-	125	500
Total dissolved solids	TDS	-	(1)	(1)
Fixed Residual at 180°C	R <sub>180</sub>	-	(1)	(1)
Total hardness	TH	-	50(2)	250
Temporary hardness		-	30(2)	150
Iron + Manganese		-	0	0,2
Chlorides		-	0	20
Silicon Dioxide		-	0	20
Residual Chloride		-	0	0,2
Anhydrite		-	0	60
Metallic matters		-	0	0
Solvents, diluents, soaps, lubricants		-	0	0

(1) Values depending on the specific conductivity: generally speaking: TDS =  $0,93 \cdot ^{\circ}R\ 20$ ; R<sub>180</sub> =  $0,65 \cdot ^{\circ}R\ 20$

(2) Not less than 200% of chlorides content in mg/l of Cl

(3) Not less than 300% of chlorides content in mg/l of Cl

**Warning:** there exists no reliable relation between hardness and conductivity of water.



Do not treat water with softeners! They can cause electrodes corrosion and generate foam, thus involving troubles of irregular functioning.



It is not advisable:

- To employ well water, industrial water, process water coming from the cooling circuits or contaminated water with chemical or bacteriological substances;
- To employ supply water containing disinfectants or anticorrosion compounds because they are potentially irritant.

### 2.3 Startup, check and stop



Before the startup, make sure the humidifier is in perfect condition, there are no water leakages and the electric parts are dry.

Do not give power, if the unit is damaged or partially wet!



**Once the installation is completed, purge the supply water pipe for about 30 minutes letting water flow directly to the drainage line without entering the humidifier;** this will help eliminate any remains or installation debris which could clog the drainage valve and cause foam generation during boiling.



Before starting the unit, it is advisable to eliminate the PE film around the pipe to allow a correct heat exchange (the film is part of the pipe packing)

#### 2.3.1 Preliminary checks

Before starting the humidifier, it is necessary to check the following:


- Hydraulic and electric connections and the steam distribution system must be performed according to the instructions described in this handbook
- The water shut-off valve on humidifier must be opened;
- The line fuses must be installed and they must not be damaged;
- Terminals AB of control CP4 must be jumpered or must be connected to the remote ON/OFF contact and the latter must be closed;
- The steam outlet pipe must not present any choking.

#### 2.3.2 Startup with vacuum cylinder

This phase is performed automatically as soon as the humidifier starts: before obtaining the nominal steam production, it is necessary to wait for an adequate period of time which mainly depends on the supply water conductivity and it may also take a few hours.

## 3 - SETTING

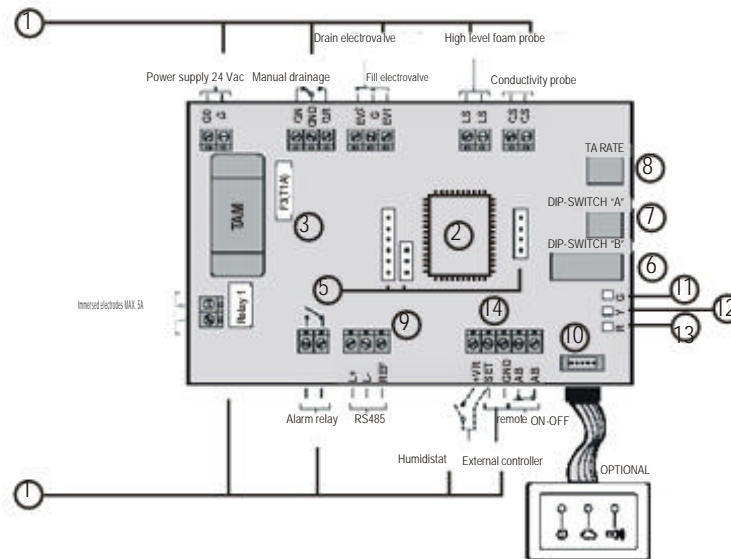
The control CP4 is a microprocessor electronic card which is installed on the unit electric board when Emiro microprocessor is used.

 CP4 card is not present in case Emiplus microprocessor is installed, since CP4 functions are already integrated in Emiplus software. In this case, for humidifier setting, refer to the attached microprocessor manual.



The unit contains powered electric parts.

Before accessing to the inside parts, disconnect the unit from the power supply.



### 3.1 Electric parts

1 - Connection terminals: see the attached wiring diagram.

2 - Configuration microprocessor: it is the component where the humidifier operating data are memorized.

3 - 2A fuses.

4 - TAM: amperometric transformer. Its function is to detect the humidifier absorbed current during the steam production phase.

5 - Combs: see the attached wiring diagram.

### 3.2 Dip-switch

6 - Dip-switch B: it is used for auxiliary functions and to set the automatic drainage time. It is set up from the manufacturer.

7 - Dip-switch A: it is used to set the alarm relay (usually closed) and the maximum steam production. It is set up from the manufacturer.

8 - TA rate: used to set TAM transformation rate. It is set up from the manufacturer.

### 3.3 Connectors

9 - It allows the connection to the serial interface RS485.

10 - It allows the connection to the remote display (if present)

### 3.4 Led

11 - Green: is switched on when the electronic card is powered correctly.

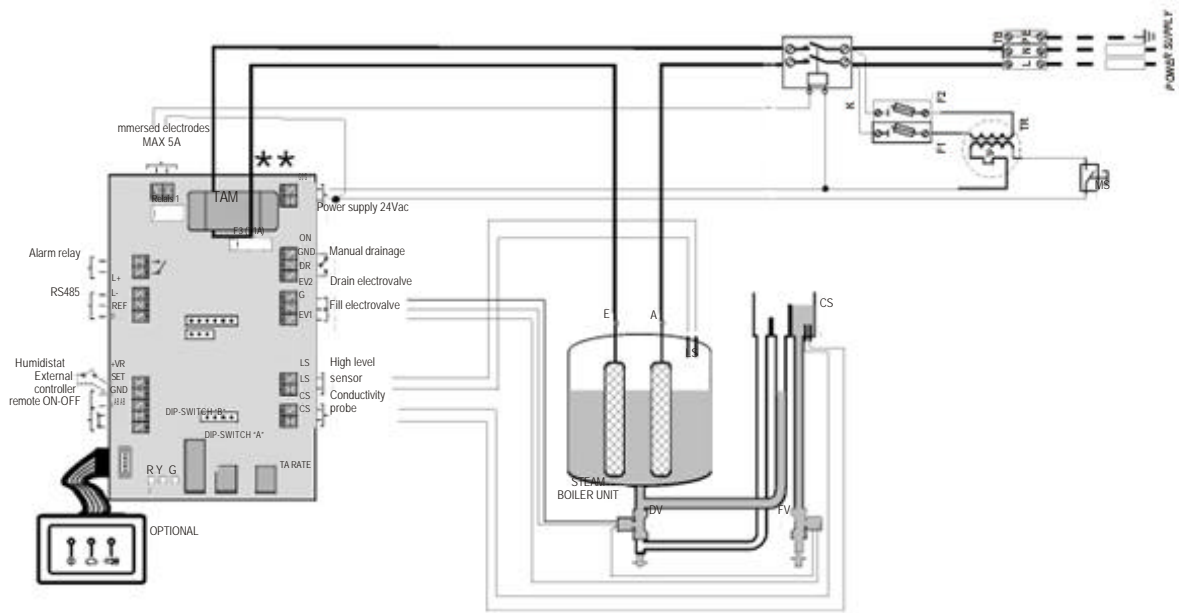
12 - Yellow: it is switched off when steam is not produced, while it is permanently switched on when at 100% of its nominal production. During the transitory production it winks at a frequency of 2 Hz. Once the nominal production is achieved it winks at a frequency of 0,5 Hz. A series of pulses is generated: each train of pulses is separated from the following train by means of a 3-seconds pause: by counting the number of pulses it is possible to determine the steam production in that moment.

13 - Red: in absence of alarms it is off; according to the type of alarm activated it emits short flashings (frequency of 2 Hz) or long flashings (frequency of 0,5 Hz); all trains of pulses are separated one from the other by a 3-seconds pause.

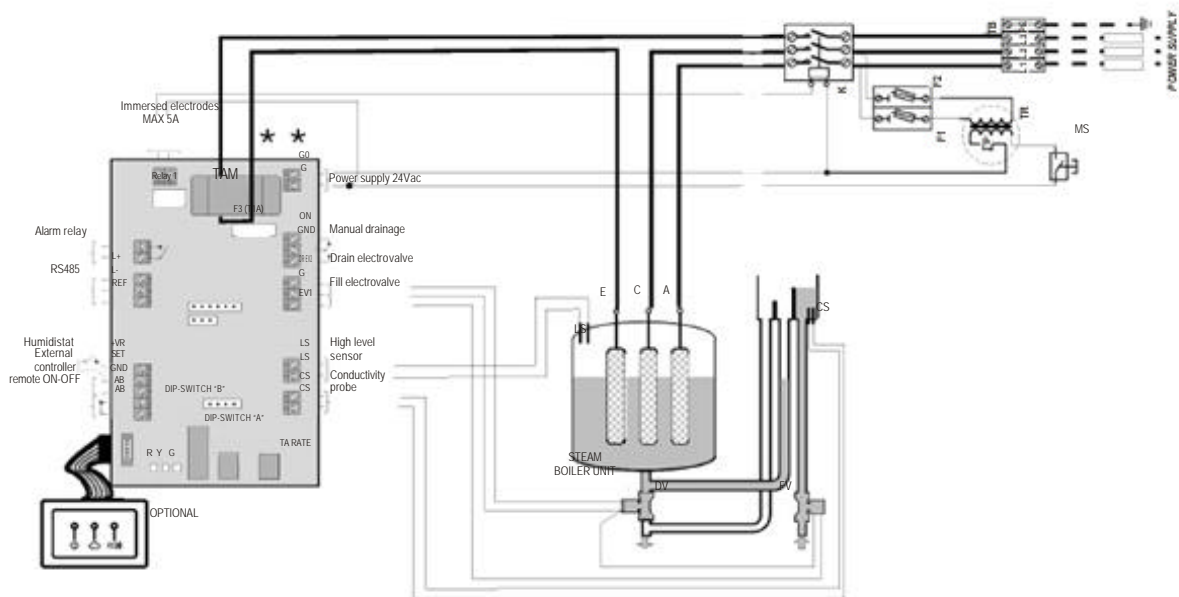
### 3.5 Digital terminals

14 - AB - AB remote ON-OFF activation..

### 3.6 Wiring diagram for single phase humidifier



### 3.7 Wiring diagram for three-phase humidifier





### 3.8 Types of alarms

TYPE	DESCRIPTION	RE-START ( if what caused the alarm has been corrected)	RED LED	ALARM RELAY
Stop	The card stops the humidifier	Manual: to re-start, switch on and switch off the card	Alarm codes: each code is displayed in sequence.	SPST relay, usually closed according to DIP A setting. The relay action is cumulative: <ul style="list-style-type: none"> <li>• The contact is open in presence of at least 1 alarm and AB-AB closed;</li> <li>• the contact is closed when:               <ul style="list-style-type: none"> <li>- all alarm causes have been eliminated;</li> <li>- all alarms have been cancelled, both manually and automatically, or when AB-AB is open**.</li> </ul> </li> </ul>
Disabled	The card stops the humidifier	- Automatic - Manual: to re-start, switch on and switch off the card or t send a reset order via RS485*.	Codes are displayed even if the alarm causes have been eliminated: to cancel the codes display, switch off and then switch on the card or send a reset order via RS 485	
Pre - alarm	The card does not stop the humidifier	automatic		

(\*) Check in the following table the automatic-restart alarms and the manual-restart alarms.

(\*\*) Not all alarms are associated to the relay (check the following table)

### 3.9 Alarms description

Red LED flashings	Description and possible causes	Corrective action	Alarm		
			Type	Reset	Alarm relais
2 short flashings	Overcurrent at the electrodes: 1. water conductivity too high (usually when the unit restarts after a short stop) 2. high water level caused by a drain valve malfunction 3. high water level caused by a fill valve leakage 4. electrodes malfunction	1. drain some water and re-start 2. check the discharge valve operates properly 3. check possible leakage of the fill valve when not energised	stop	manual	active
3 short flashings	No current at the electrodes: when the humidifier is on, no steam is produced	1. check the external control signal: type (V or mA)? Value?Connections? 2. <b>switch off the unit and disconnect the internal connections</b>	stop	manual	active
4 short flashings	Internal memory error	1. download the appropriate configuration by means of Humiset 2. if the problem persists, contact CAREL customer service	stop	manual	active
5 short flashings	High supply water conductivity	1. check the threshold set with the parameter via RS485 2. switch off the unit and clean the conductivity probe electrodes 3. if the problem persists, change the supply water source or install a suitable treatment system (deminalisation, even only partially) N.B.: the problem cannot be solved by softening the supply water .	stop	manual	active
2 long flashings	Cylinder depleted	Perform the maintenance and/or replace the cylinder	signal	manual	Not affected
3 long flashings	No supply water	1. make sure the charge pipe to the humidifier and the internal pipe are not blocked or bended and supply pressure is sufficient (0.1/0.8 MPa) 2. Check the fill valve operates properly 3. check the counter pressure in steam outlet hose does not exceed the maximum limit, preventing the supply water from flowing into the cylinder by gravity 4. check the steam outlet hose is not clogged and there is no condensate	disabled	manual	active
4 long flashings	Excessive reduction in production	Cylinder completely depleted or excessive foam. Carry out the cylinder maintenance.	disabled	manual	active
5 long flashings	Drain malfunctioning	Check the drain circuit and the correct operation of the drain valve	disabled	manual	active
6 long flashings	User parameters error	1. download the appropriate configuration by means of Humiset 2. if the problem persists, contact CAREL customer service	stop	manual	active
7 long flashings	Pre-alarm of high water supply conductivity	1. check the water supply conductivity 2. check the limit set by parameter b5 via RS485 3. if needed, install an appropriate demineralisation system N.B.: the problem cannot be solved by softening the supply water.	signal	Display, automatic reset	Not affected
8 long flashings	Control signal not correctly connected (only 0/10V)	1. check the connection to the external controller 2. check the setting of parameters A0 and A2 via RS485	disabled	Alarm: Automatic Display: manual	active
9 long flashings	Full cylinder with no production	With the humidifier OFF: 1. check between the fill valve filaments and the condensate return pipe 2. check the level sensors are clean	disabled	manual	active
10 long flashings	Foam	Foam is generally caused by surface-active agents container in water (lubricants, solvents, detergents, agents for water treatment, softeners) or by an excessive concentration of dissolved salts: 1. drain and clean the supply water pipes 2. clean the cylinder 3. check the presence of softeners (in this case employ a different type of supply water or reduce the softening)	signal	Display, manual reset	not affected
11 long flashings	Cylinder almost completely depleted	Carry out the maintenance and/or replace the cylinder	signal	Display, manual reset	Not affected
RS 485	Hour counter error	Switch off the humidifier and make sure there is no defective electric connection or damage, then clear the hour counter via RS485	signal	only via RS485	Not affected

## 4 - GENERAL MAINTENANCE



The routine maintenance operations refer to the steam cylinder replacement and to the yearly unit cleaning.



Before starting any maintenance operation, disconnect the humidifier power supply.

### 4.1 Steam cylinder replacement

This operation is necessary when the electrodes active surface is so encrusted as to impede a sufficient current flow. When this situation occurs, an alarm is activated from the control card.



The cylinder might be hot. Leave it cool down before touching it or wear gauntlets.

How often this operation must be done depends on the supply water quality and on the operating conditions. Anyway, it is recommended to replace the cylinder at least every 5 years or after 10,000 hours of operation.

To replace the cylinder, it is necessary to:

- Drain completely the water contained into the cylinder;
- Disconnect the unit power supply by means of the main switch or the line fuses;
- Take the steam pipe off the cylinder;
- Disconnect the electric connections on main electrodes and take the plugs off the level electrodes;
- Unblock the cylinder from the fixing system and lift it to remove it;
- Install the new cylinder on the humidifier, performing the previous operations in reverse order.

### 4.2 Periodical checks

After one hour of operation:

- Make sure there is no significant water leakage.

**Every 15 days or no more than 300 operating hours:**

- Check operation, the absence of significant water leaks, the general humidifier conditions. Make sure during operation there is no arc or spark between the electrodes.

**Every three months or no more than 1000 operating hours:**

Check operation, the absence of significant water leaks, and replace the cylinder if necessary



In case of leakage, disconnect the humidifier from the power supply before touching the cylinder.

---

### 4.3 Unit cleaning

The unit must be checked and cleaned yearly. It is advisable to do it in summer when the unit stops working.



**Do not employ detergents or solvents to clean plastic components.**



**Descaling washings can be carried out with a solution containing 20% of vinegar or acetic acid, then rinse with water..**

After taking the boiler cylinder off, the following operations must be performed:

- After disconnecting the wirings and the pipes, remove the fill solenoid valve and check if the inlet filter needs any cleaning. If needed, wash the filter with water and a soft brush.
- Remove the drain pump and check there are no deposits in the cylinder connection and remove, if it is the case, the impurities. Make sure the O-ring seal is not damaged or cracked and replace it if necessary.
- Disconnect the drain valve from the power supply, unscrew the collector, remove the coil and dismantle the valve body, remove any impurities and rinse with water.
- Make sure there are no clogging up or solid particles in the fill tank and check the conductivity electrodes are clean; remove any impurities and rinse with water.
- Check the inlet supply water pipes, the fill water pipes and the overflow pipes. No debris must be present. If it is the case, remove them and rinse with water



After replacing or checking the hydraulic parts, check the connections have been carried out correctly. Restart the unit and execute a number of fill and drain cycles (from 2 to 4). Once the cycles are completed, check there are no water leaks by employing the safety procedure



When stopping the unit for a certain period, empty the steam cylinder completely

## 5 - TROUBLESHOOTING

TROUBLE	POSSIBLE CAUSE	CORRECTIVE ACTION
Humidifier cannot start	No power supply	check the protection upstream the humidifier and check if there is power supply
	Controller connectors are not plugged correctly	make sure the connectors are plugged properly in the terminal board
	Fuses interrupted	check fuses F1/F2/F3
	Damaged transformer	check that on secondary side of transformer there are 24 VAC
Humidifier does not work	Remote ON/OFF contact open (relay/terminals AB- AB) on control CP4	close ON/OFF contacts (relay/terminals AB- AB) on control CP4
	Control signal not compatible with the set signal	make sure the external signal is 0-10V
Humidifier fills water without producing steam	Too high counter pressure into steam outlet hose	check the steam outlet hose has no bending or choking
	Clogged inlet cylinder filter	clean the filter
	Limestone deposit in the fill tank	wash the fill tank
	Malfunctioning of the drain electrovalve	check if any irregular presence of 24 Vac on drain electrovalve and/or replace the drain electrovalve
The line magnetothermic switch is activated	The magnetothermic switch is undersized	make sure the magnetothermic switch is oversized for a current value equivalent to at least 1,5 times the humidifier nominal current value
	Overcurrent at the electrodes	check the drain electrovalve operation, the fill electrovalve tightness when it is not excited, drain some water and restart.
Humidifier wets into the duct	The system is oversized	reduce the steam production set on the electronic card
Humidifier wets the floor	The supply hydraulic circuit or the overflow circuit is leaking	check the entire hydraulic circuit
	The steam outlet hose is not fixed properly to the cylinder	Check the steam outlet hose is well fixed



For troubles reported by the electronic card CP4 alarms, see par. 3.8

## 6 - DISMANTLING

The unit is made of plastic and metal parts.

Do not release these parts in the environment, but dispose them in compliance with local laws in force.



**DICHIARAZIONE CE DI CONFORMITÀ  
EC DECLARATION OF CONFORMITY  
CE-KONFORMITÄTSERKLÄRUNG  
DECLARATION CE DE CONFORMITE**

*Il Fabbricante*

*The Manufacturer*

*Der Hersteller*

*Le Fabricant*

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e-mail [emicon@emiconac.it](mailto:emicon@emiconac.it)

**DICHIARA**  
*che la macchina*

**DECLARES**  
*that the machinery*

**ERKLÄRT**  
*daß die Einheit*

**DECLARE**  
*que l'unité*

**Modello**

**Model**

**Modell**

**Modèle**

**Matricola**

**Serial Nr.**

**Seriennr.**

**N.ro de série**

*è conforme a tutte le disposizioni pertinenti delle direttive*

**2004/108/EC**  
*in quanto è stata progettata, costruita e collaudata in accordo con le seguenti Norme*

**EN 61000-6-1  
EN 61000-6-2  
EN 61000-6-3  
EN 61000-6-4**

*fulfils all the relevant provisions of the directives*

**2006/42/EC**  
*because it has been designed, manufactured and tested according to the following Standards*

**EN ISO 12100**

*den folgenden Vorschriften entspricht*

**2006/95/EC**  
*da sie in Übereinstimmung mit den folgenden Normen geplant gebaut und getestet wurde*

*est conforme aux dispositions*

**2006/95/EC**  
*étant l' appareil conçu, réalisé et testé dans le respect des normes suivantes*

**EN 60204-1  
EN 60335-1  
EN 60335-2-40  
EN 60439-1**

**AUTORIZZA**

*a costituire il Fascicolo Tecnico.*

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*to compile its Technical File.*

**AUTORISIERT**

*die technischen Unterlagen zu erstellen*

**AUTORISE**

*à réaliser le dossier technique.*

Meldola, \_\_\_/\_\_\_/\_\_\_\_\_

Romano Santucci



Technical Manager





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