EMICON
AIR CONDITIONING AND INDUSTRIAL APPLICATION

CE

USE AND MAINTENANCE MANUAL

PACKAGED AIR TO AIR - WATER TO AIR
ONLY COOLING AND HEAT PUMP ROOF TOP UNITS
RTR - P / RTR - P.W

Rev. 3 03/09

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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 packaged air to air or water to air , only cooling or heat pump version ,Roof top type, series RTR - P / RTR - P.W.
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 series RTR - P / RTR - P.W 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 cooled water chillers and heat pumps 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. All people authorized to operate with the unit, in particular, all technicians assigned to the unit maintenance, must know all information and instructions contained in this manual
In case the manual is lost or deteriorated, a new copy must be requested directly to the manufacturer

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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

RTR - P : Air cooled monobloc units intended for air-conditioning in over-crowding areas designed for external installation.

RTR - P.W : Water cooled monobloc units intended for air-conditioning in over-crowding areas designed for external installation , for specific application in plants with water loop technolog).

2.3 Forbidden use

Do not use the machine:

- Ø For other use than that described in paragraph 2.2;
- Ø When it is exposed to rainfall, especially when the unit is designed for internal installation;
- Ø in atmosphere with high risk of fire or explosion;
- Ø in spaces with corrosive atmosphere;
- Ø to heat or cool aggressive fluids for copper, carbon steel and stainless steel.

Any operation on the unit must be carried out in compliance with local technical standards.

2.4 Dangerous areas

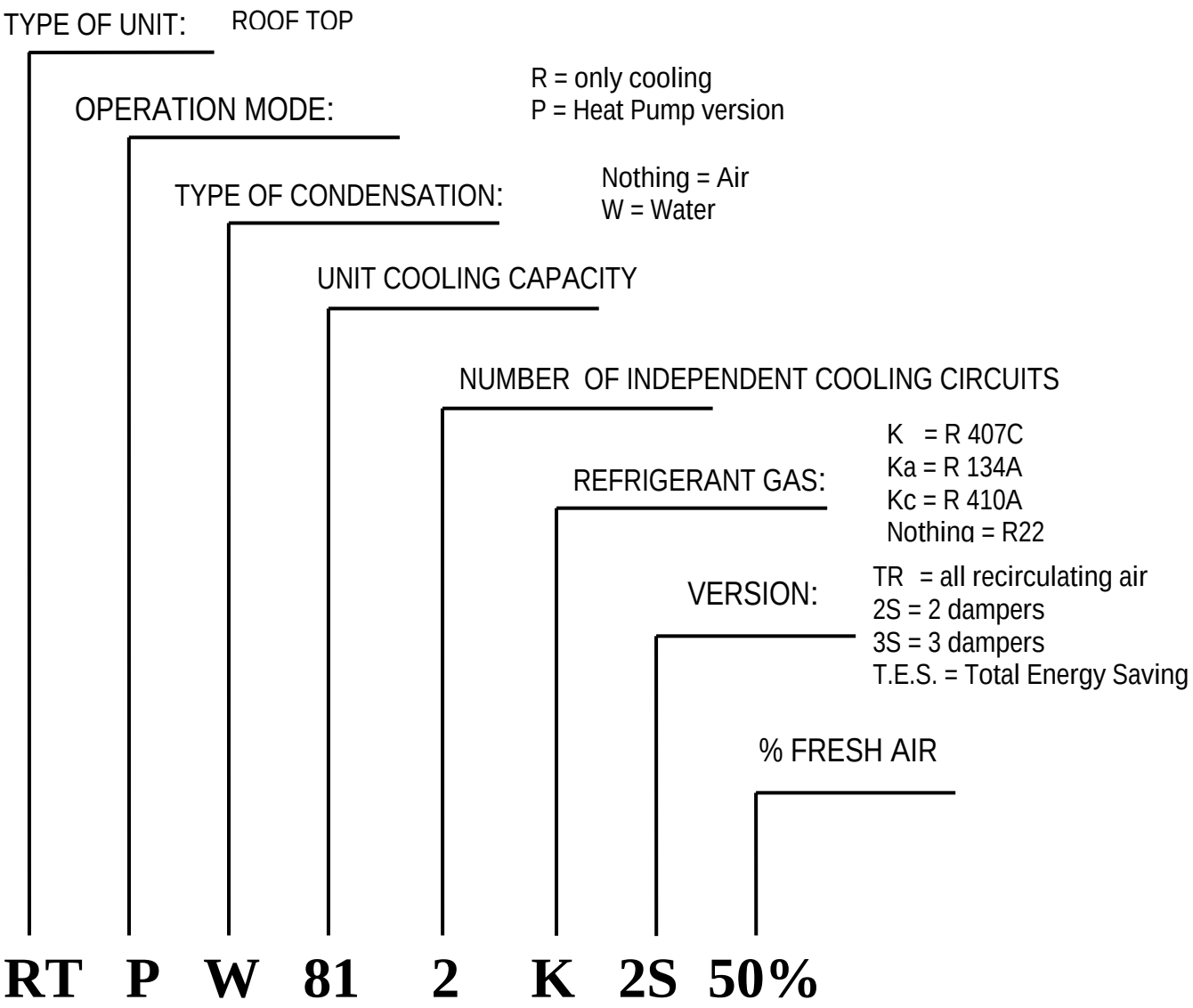
On the unit there are dangerous areas for electric risk and hot temperatures.
The unit can be closed by case panels; in this case the dangerous parts inside the unit are not accessible from outside. Only qualified and trained personnel can remove the covering panels. The unit is supplied with the cooling circuit already charged with pressure gas and therefore 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 Characteristics of the Roof top units series RTR - P / RTR - P.W

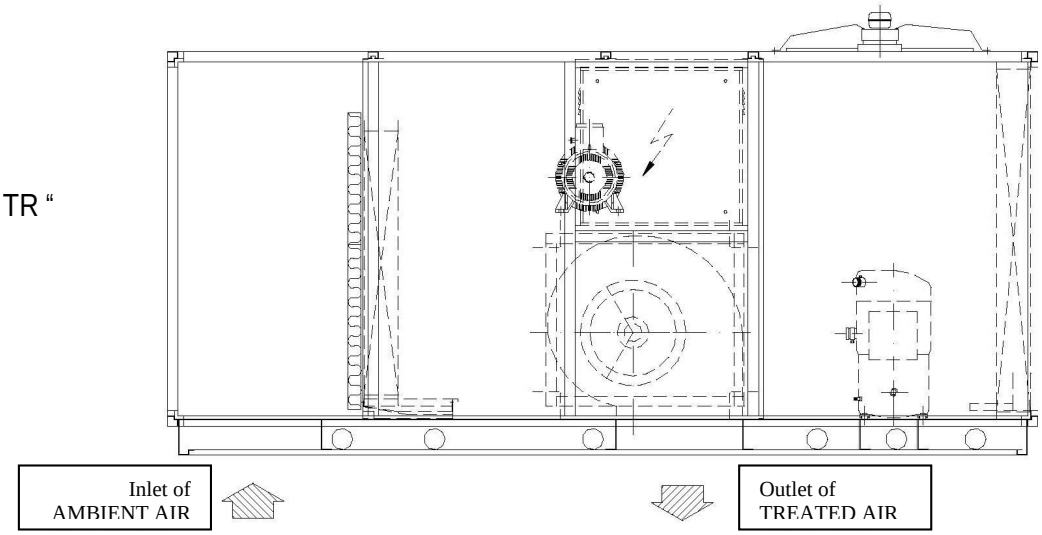
The units series RTR - P / RTR - P.W are supplied with refrigerant charge and anti-freeze oil; they are tested at the factory.

Interpreting key for the initials used to mark the units:

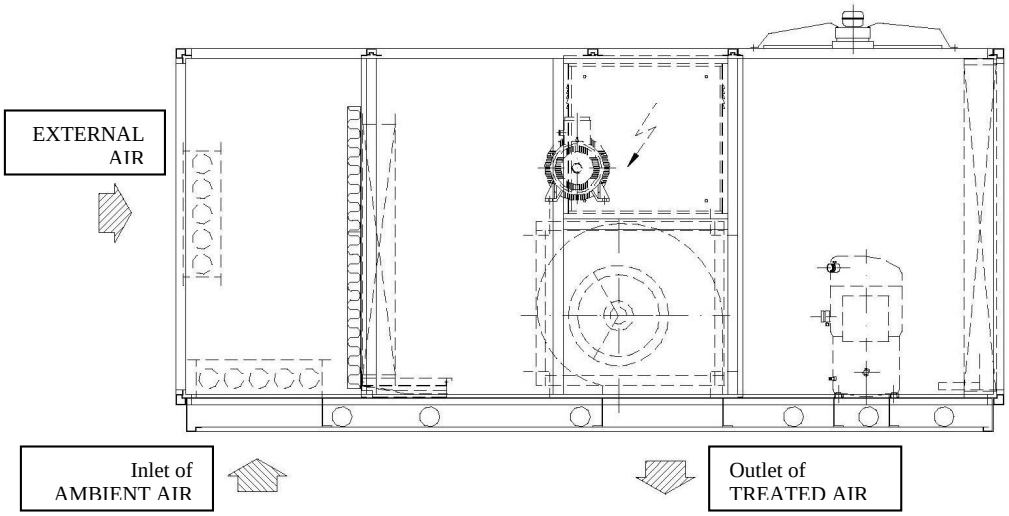


Basic Configurations

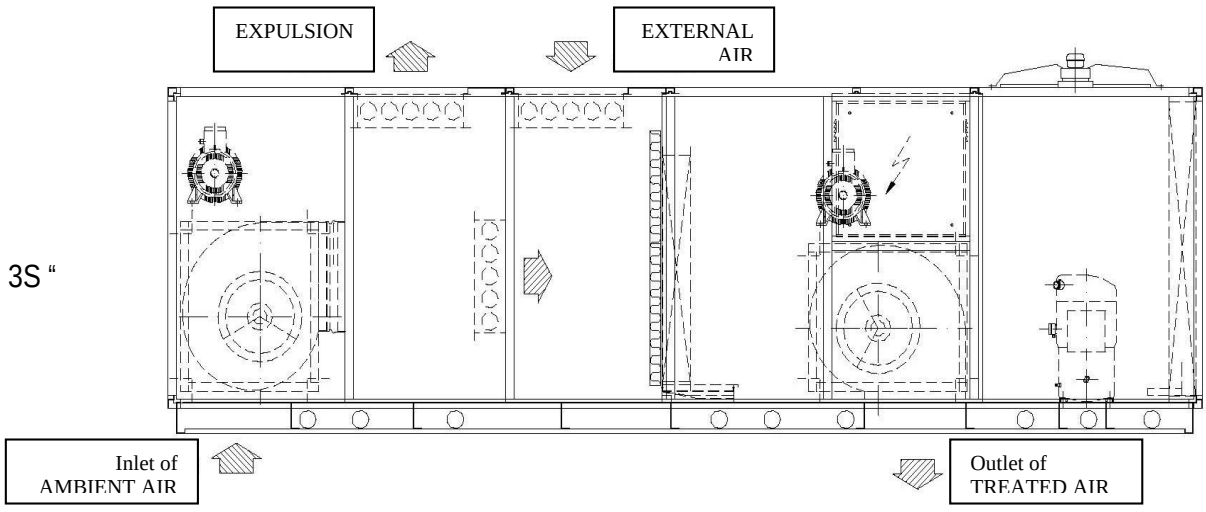
All recirculating air " TR "



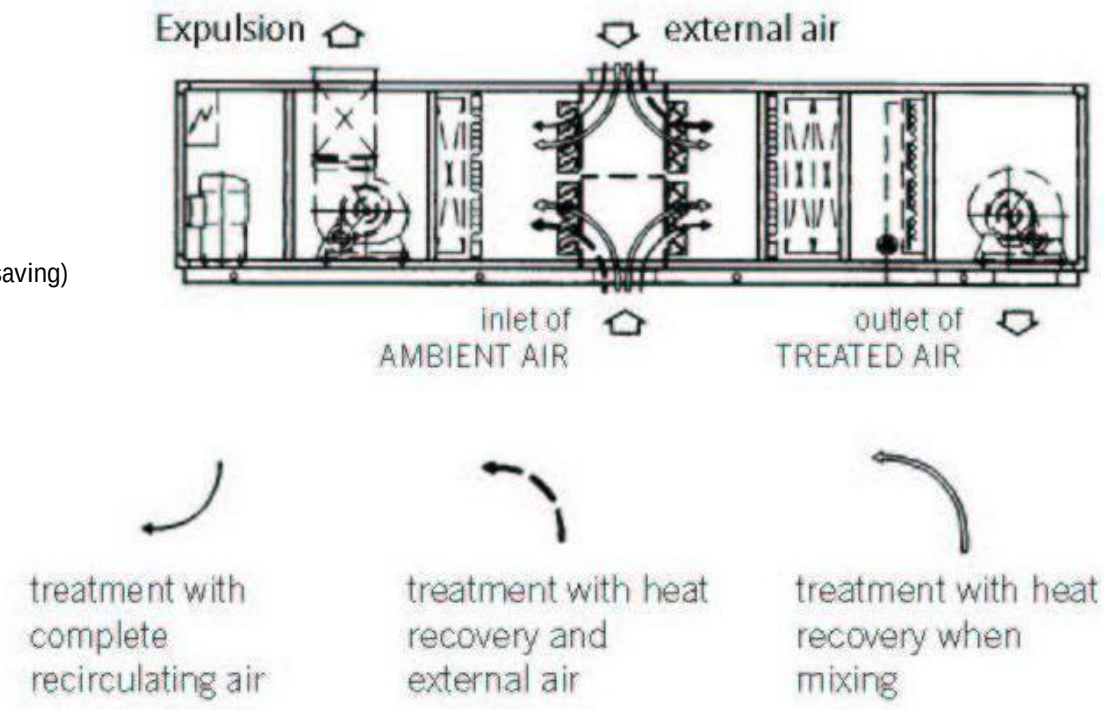
2 dampers " 2S "



3 dampers " 3S "



T E S (Total energy saving)

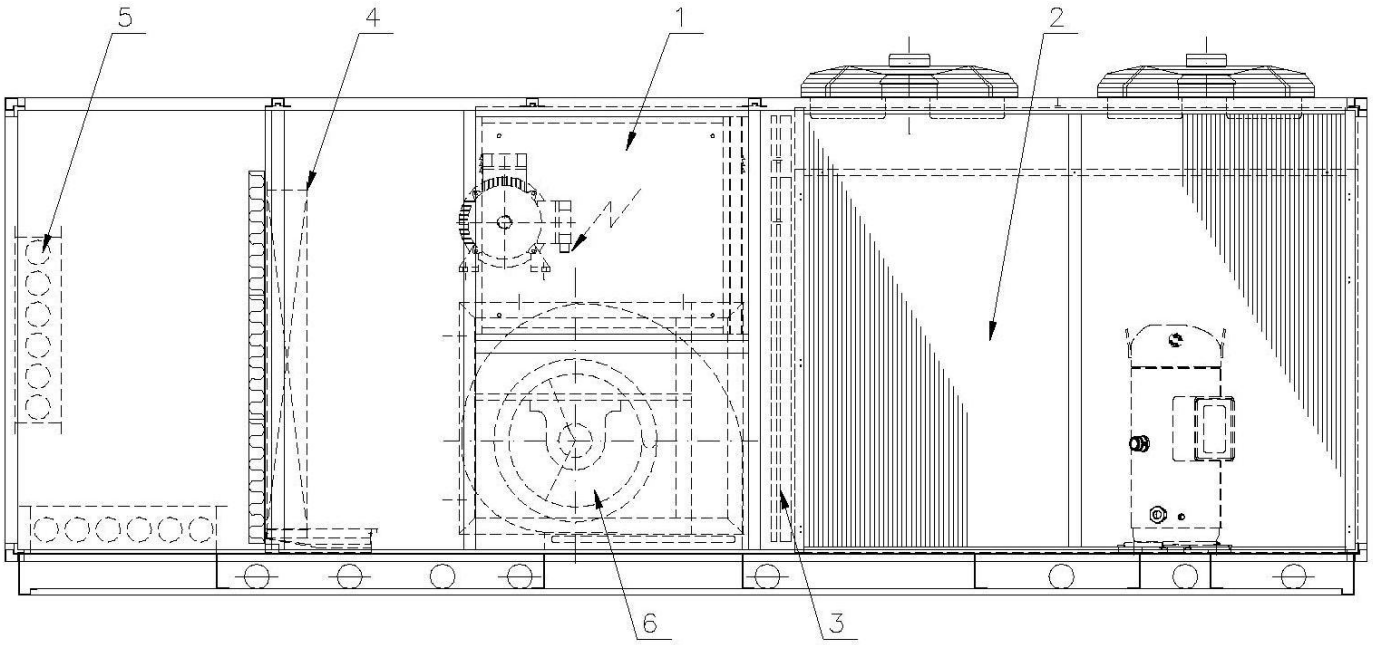


3.2 Main components

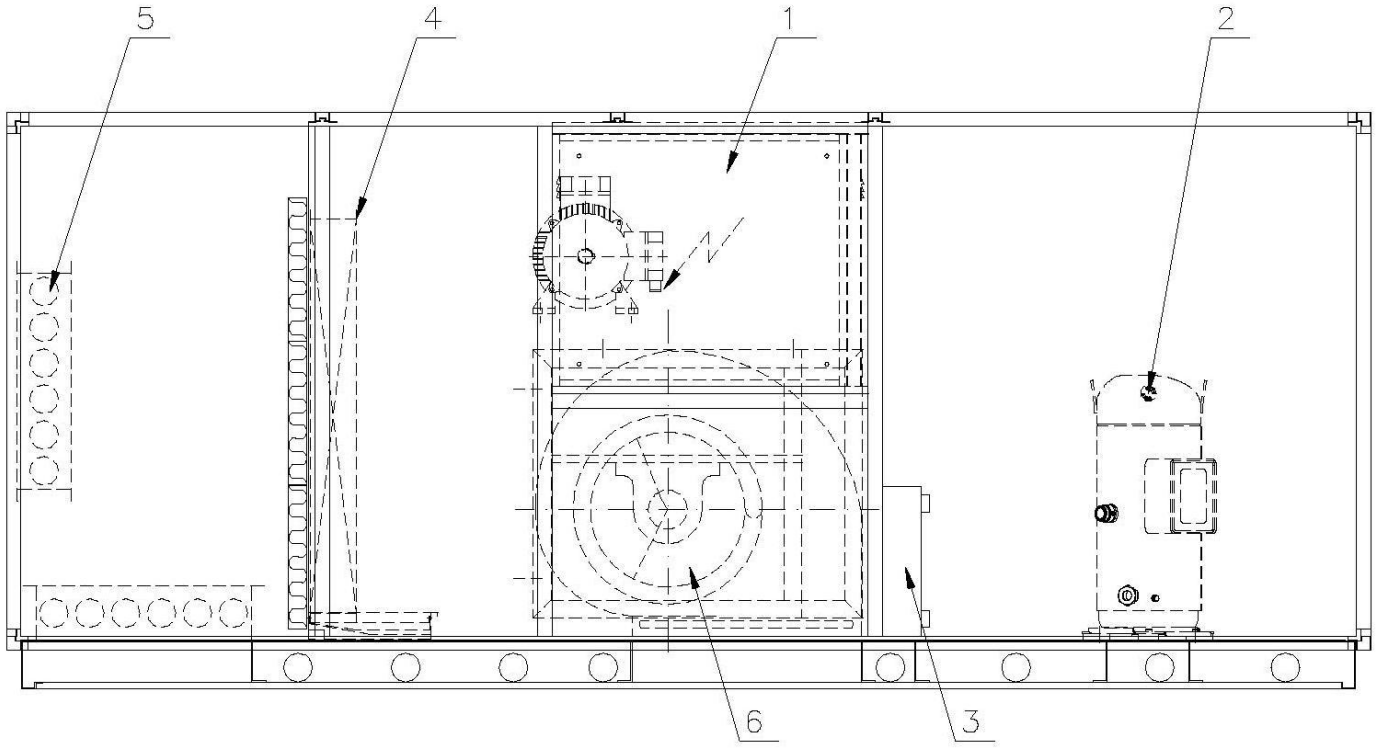
The units of RTR - P / RTR - P.W series are made of the following main components:

- Ø Structural frame in aluminium profiles and complete with sandwich panels ; all mounted on a base-frame in carbon steel profiles and painted with epoxy powder primer ;
- Ø Scroll Compressors, installed on rubber vibration dampers and equipped with crankase heater
- Ø Plate evaporatore with copper pipes and aluminium fins;
- Ø Plate condenser with copper pipes and aluminium fins or with AISI 316 stainless steel weld-brazed for version "W";
- Ø Centrifugal discharge and suction fans with double-suction forward blades, statically and dynamically balanced, installed on rubber-type vibration dampers and driven through belt and pulley transmission, by a 4-pole tri-phase electrical motor on slides.
- Ø Cooling circuit composed of: Thermostatic expansion valve, liquid sight glass, dehydrating filter, safety device, anti-freeze thermostat, high and low pressure switches, 4 way-valve for heat pump versions;
- Ø Electrical board compliant to CE standards, complete with lock-door main switch, protections switches and fuses, conductors, low tension auxiliary circuit and terminal board;
- Ø Electronic Microprocessor to automatically manage all the functions of control, status alarm and diagnostic.

Pict. 1 RTR - P



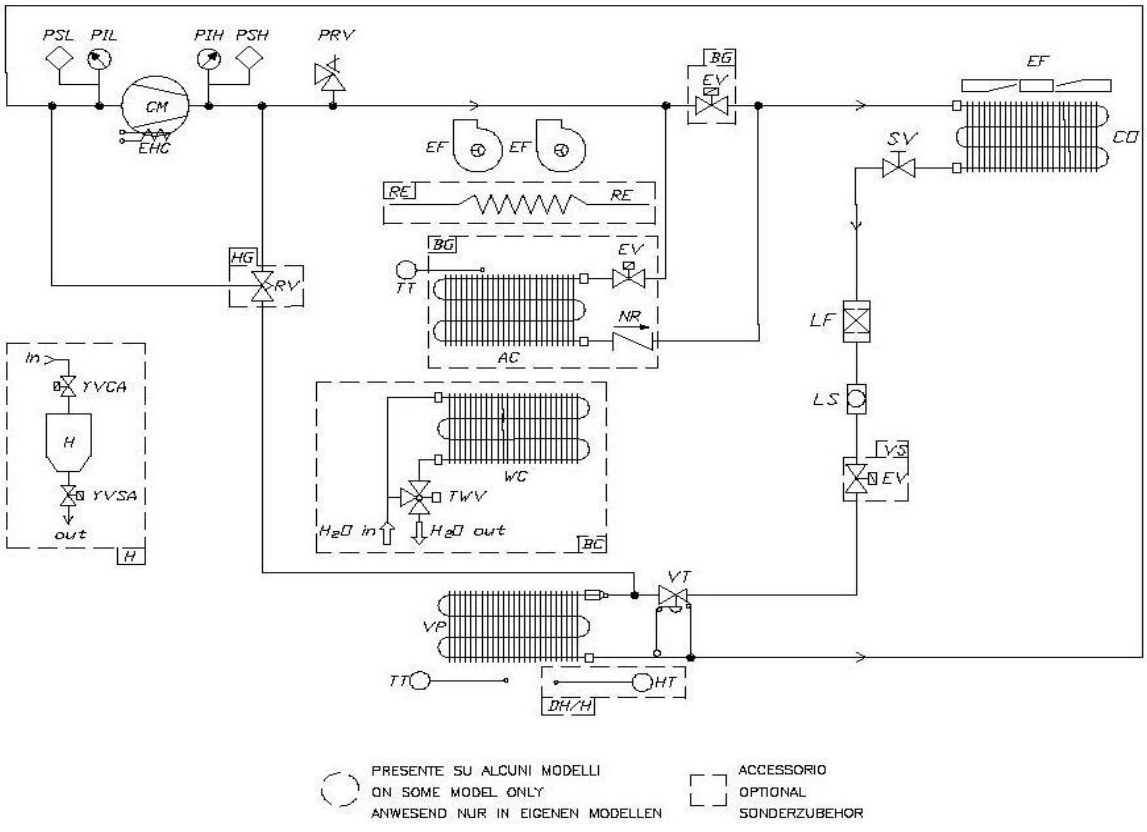
Pict. 2 RTR - P / W



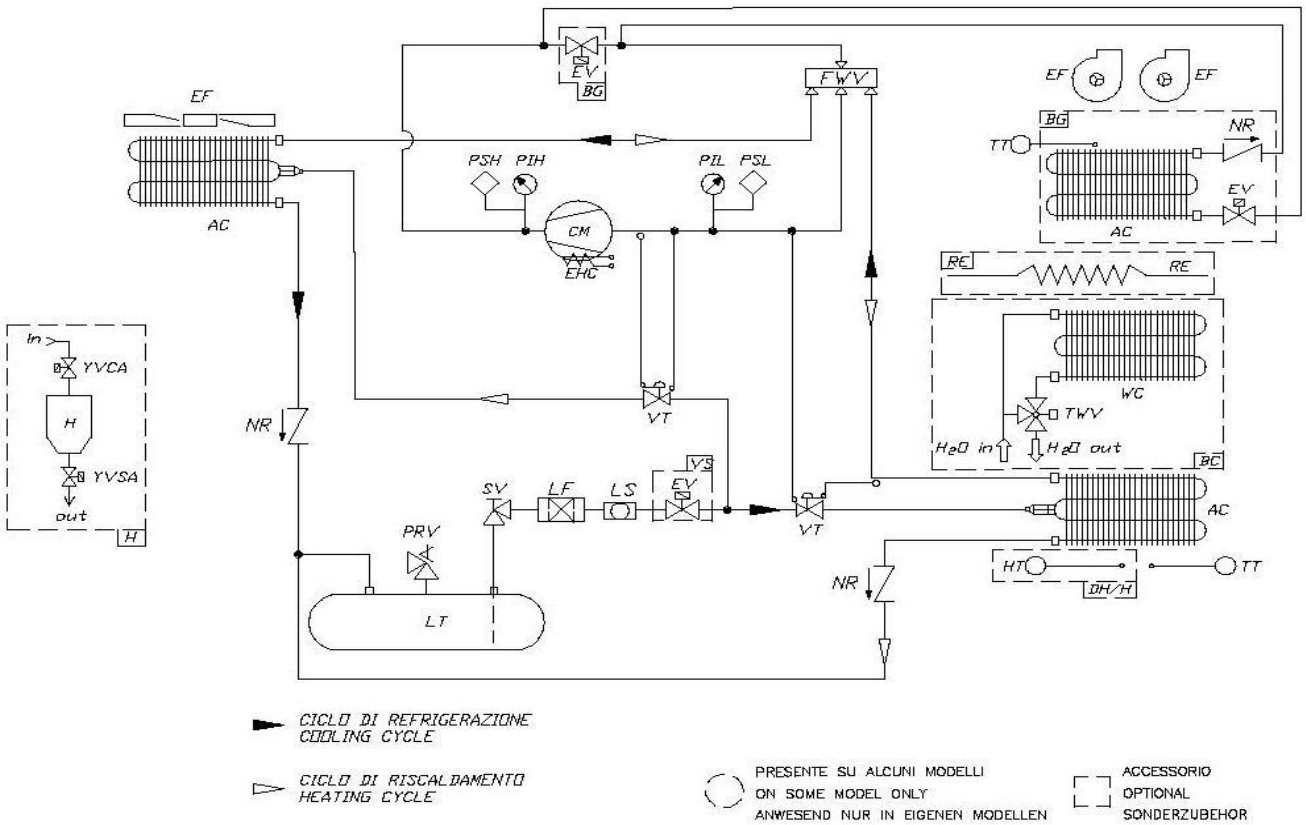
Keys
1) Electrical Board
2) Compressor
3) Condenser
4) Evaporator
5) Damper
6) Air treatment fan

3.3 Cooling circuit

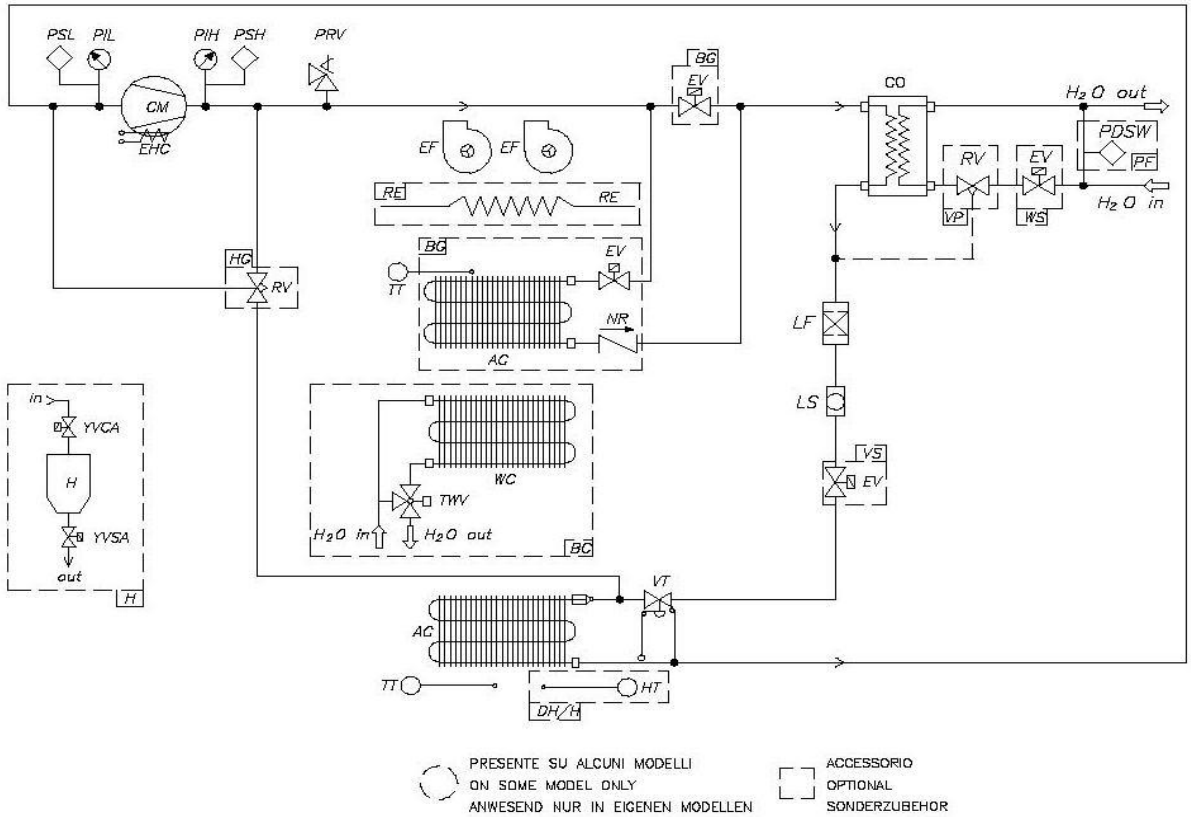
COOLING CIRCUIT RTR



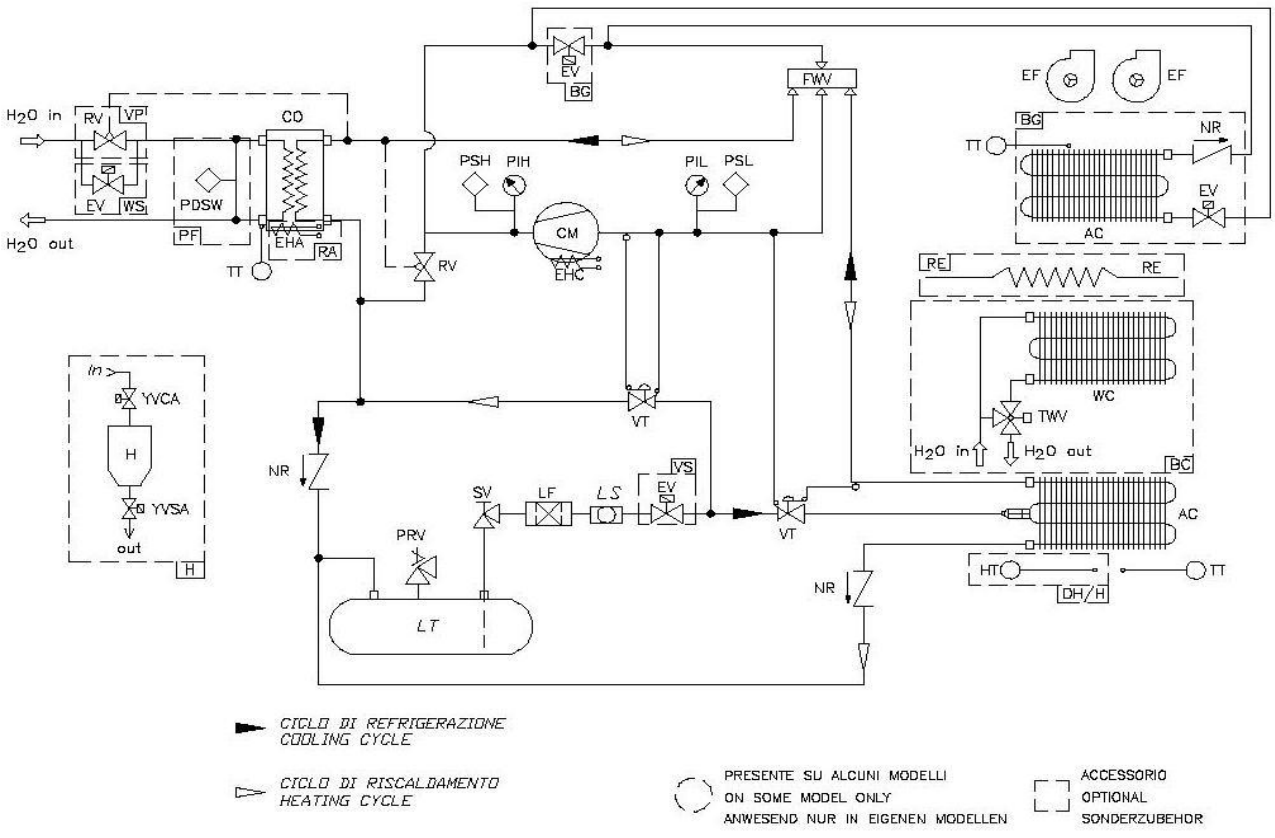
COOLING CIRCUIT RTP



COOLING CIRCUIT RTR.W



COOLING CIRCUIT RTP.W



Cooling circuit keys

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

3.4 Technical specification

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

3.5 Dimensional drawings

The dimensional drawing with unit's overall dimensions and ducts' size is attached

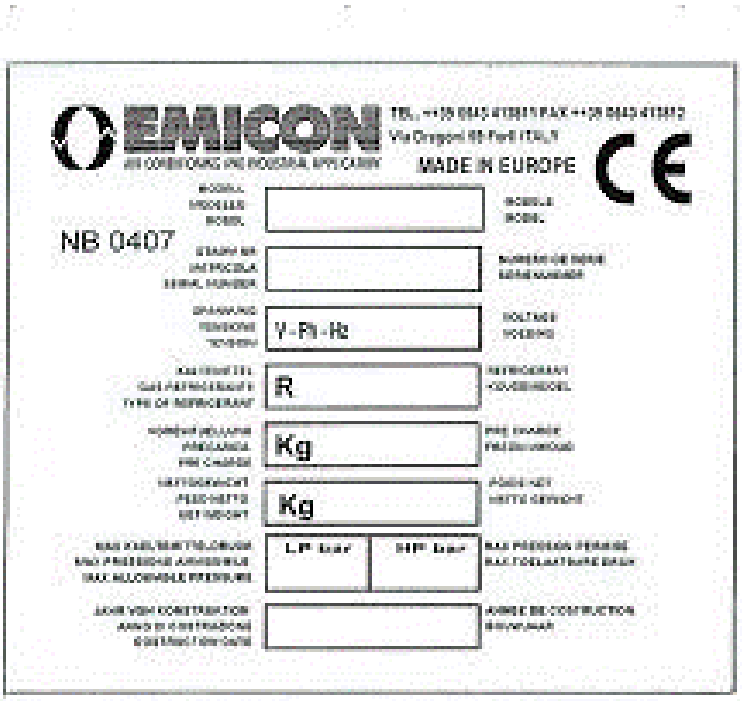
3.6 Main accessories

1M/2M: Centrifugal fans with higher external pressure.
AE: Electrical supplì different from standard.
AF: logge filters alarm
AFL: smoke alarm
BC: Hot water Heating coil
BC1: Water Post heating coil
BG: Hot gas Post heating coil
BT: Condensing pressure control (aircooled units)
F: free-cooling operation
FT: Bag filters
F5: F5 pleated filters
GP: Condensing coil protection grid (aircooled units)
H: Humidifier
HG: Hot gas By-pass.
IH: RS485 Serial Interface.
MS: Motorized dampers
MTB: Heating section with gas fired burner
MTC: Heating section with boiler
PA: Rubber AV mounts
PF: Water flow switch (watercooled units)
PM: Spring AV mounts
PQ: Remote Microprocessor
RA: rAnti-freeze heating coil on plate exchangers (watercooled units)
RC: Cross-flow heat recovery.
RE: Electrical post-heating coil
VP: Pressostatic valve
VS: Solenoid valve
VSW: Water solenoid valve (watercooled units)

4. INSTALLATION

4.1 Identification tag

The data for the identification of the unit are marked on a permanent tag (Picture 3).



Pict. 3 - Identification Tag

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.

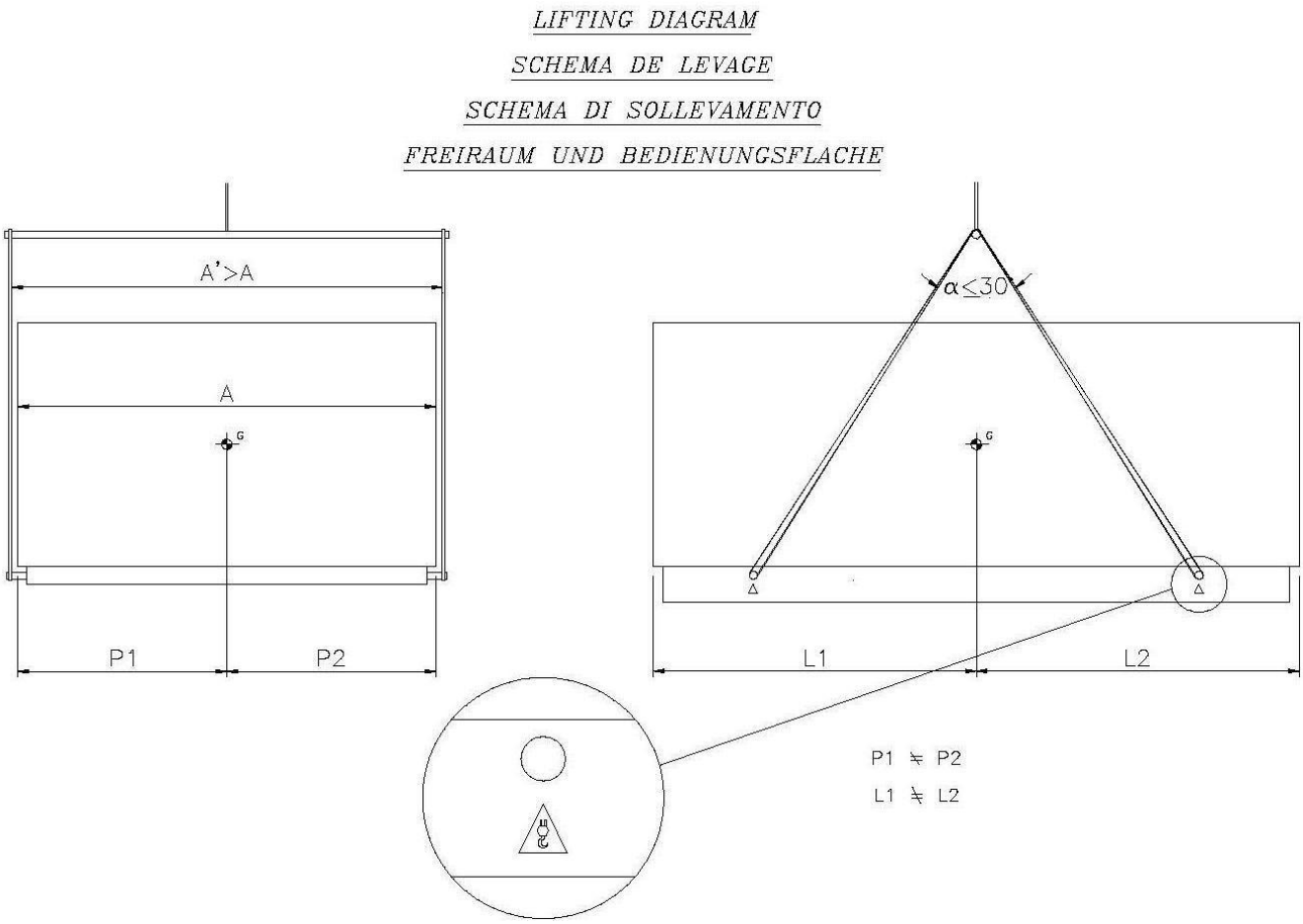
4.3 Handling

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 Picture 4. 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 α must not be greater than 30°; the pictures are just as an indication



Pict. 4 - Lifting of Roof Top units

The overall dimensions of the units, packaging included, are indicated in the packing list sent by e-mail in order to organise the loading..

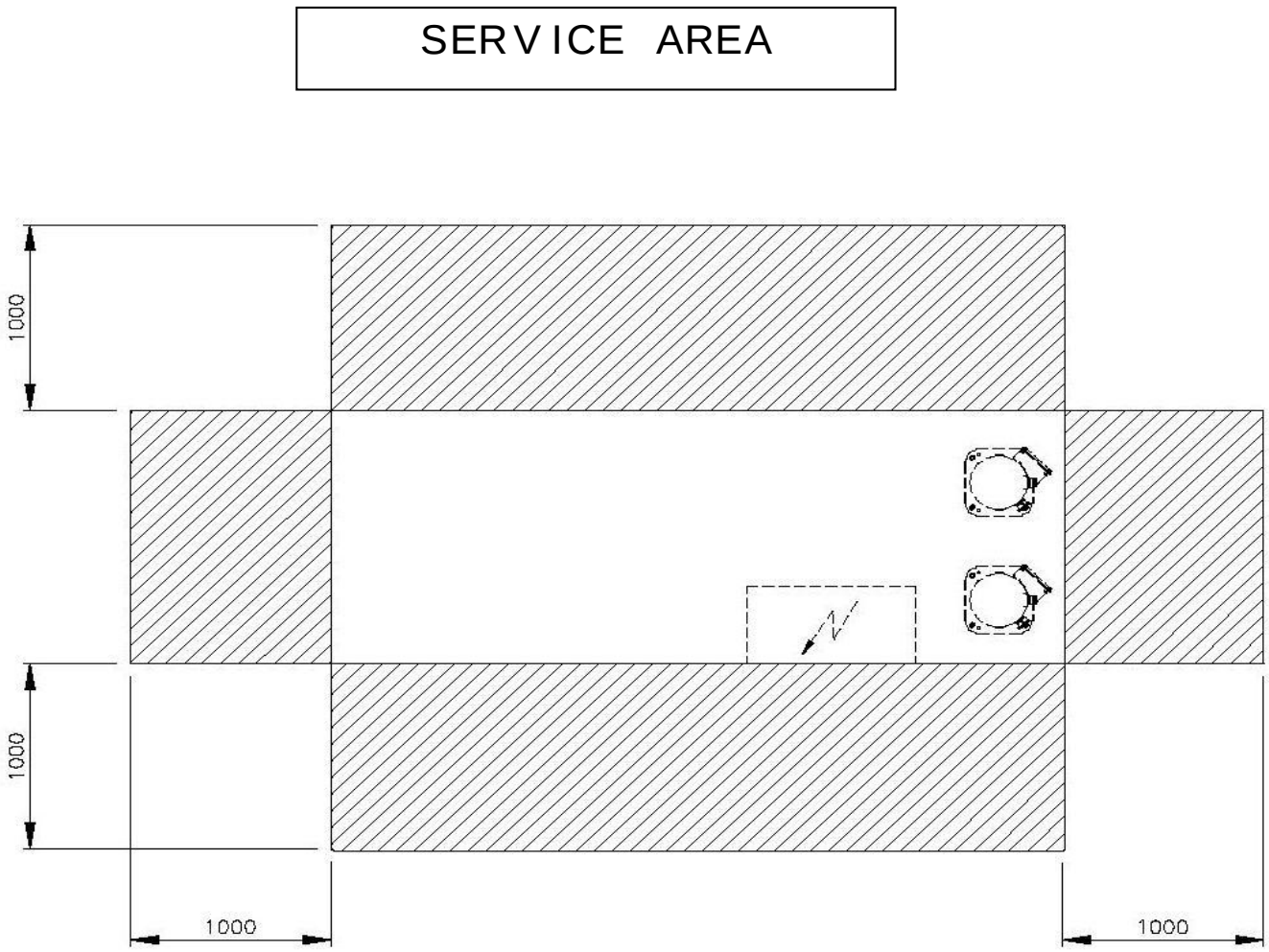
4.4 Arrangements and placing

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:

- Ø Connections for electric and hydraulic circuits must be done;
- Ø Enough room must be left around the unit to allow the routine and the special maintenance, such as compressors and heat exchangers replacement. The dimensions of this free space is represented by the dashed area as shown in Pictures 5, for units with single and multi-scroll compressors and for units with screw compressors.
- Ø The floor where the machine is positioned can bear the total unit weight under normal operation.



Pict. 5 - Service Area

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, just placing rubber gaskets or spring-type vibration dampers (options) underneath. Make sure that the unit features indicated in the attached technical data sheets match those required for the undertaken project.

4.5 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.
Particurarly consisder that pressure drops exceeding the unit's available pressure leed to a flow reduction and consequently to the unit's stop

4.5.1 Assembling

During the assembling it is advisable to pay attention to :

- Ø The ducts' weight must not rest on the connecting flanges
- Ø Place AV mounts between ducts and unit
- Ø 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
- Ø Possible external ducts must also be watertight
- Ø Limit the pressure drops optimizing the trial course, the type, the number of curves and branching

4.6 Hydraulic connections (for watercooled units)

The units are designed to be connected to a distribution system of cooled and/or heated water depending on the type of unit, if it is a water chiller or a heat pump. Only expert refrigeration technicians are allowed to perform the hydraulic connections and in conformity with local regulations. The following general instructions must be followed:

- Ø Perform the piping path in such a way so as to limit as much as possible the pressure drop in the system.
- Ø The water circulating pump must be able to deliver the appropriate water flow capacity with the necessary available pressure to overcome the system pressure drop in any operating conditions.
- Ø Pipes must be adequately supported by brackets and arranged so as to allow an easy installation and inspection.
- Ø The materials used for the realisation of the system must have a nominal pressure not lower than PN6.
- Ø During the piping insallation, all necessary measures to prevent dirt and solid particles from entering the tubes must be taken.
- Ø Once the pipes are placed and the unit installed, the system must be leak tested to detect any possible leak to be repaired before the starting up of the system .

Do not exceed 6 bar during the leak test!

- Ø The unit must be connected to the hydraulic system by using the appropriate areas as indicated in the commercial drawing here attached.
- Ø The diameter of the hydraulic connections are shown in the commercial drawing here attached.
- Ø depending on the water characteristics and working conditions it is advisable to frequently/periodically clean the condenser
- Ø If the unit is equipped with pressostatic valves (option) to regulate the condensing water flow, this must be taken into consideration while selecting the supply pump.

Furthermore a device must be installed in the plant to keep an adequate pressure (for example, an automatic filling group and expansion vessel) to the foreseen temperature regimes and plant's volume.

If a glycol filling in the plant is needed, to avoid water freezing inside piping during winter time the following table can be used as an example:

Description	Percentage of ethylene glycol							
	5%	**10%**	**15%**	**20%**	**25%**	**30%**	**35%**	**40%**
Freezing temperature	-2,1	-4,5	-7	-10	-13	-17	-21	-25

4.6.1 Hydraulic circuit filling

Once the hydraulic circuit and the unit connection are performed, it is necessary to fill the circuit.

- Ø Open all the air discharge valves on the circuit.
- Ø Connect the circuit to a water supply system, possibly in a permanent way, by means of an automatic fill group provided with a manometer and a non-return valve.

If the condensing circuit (version RTR-P/W) works with an anti-freeze mixture, fill the circuit with an appropriate quantity of pure anti-freeze fluid according to the system size and to the anti-freeze concentration to get

- Ø Start filling the system with water;
- Ø Check all the air discharge valves present on the system and shut them when water, instead of air, starts to go out.
- Ø Once all valves are closed, go on filling the system with water until a pressure between 1,5 and 3,5 bar is reached.

Make sure the water pressure in the system always ranges between 1,5 and 3,5 bar.

4.7 Electric connections

Check the electric circuits have not been damaged during transportation. Check all terminals screws are tight. Make sure the power tension and frequency match the same data as specified on the unit identification tag

Before starting the electric connection, it is advisable to check the wiring diagram contained in the unit electric panel.

4.7.1 Power supply connection

The unit can be powered with a 5-pole cable (3 poles+N+ T), if the power supply tension is 400V/3F/50Hz. In case the power supply tension is 230V/3F/50Hz, the supply cable is a 3-pole cable. On demand, it is possible to supply units with arrangements for special power supply tension (check the identification tag and the wiring diagram).
Connect the phases and the neutral to the terminals of the main switch and the earth wire to its corresponding terminal.
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 switch of appropriate size and features.

For the cross section of the power supply cable, the size of the automatic switch and the characteristics of the electric components, check the wiring diagram attached to the present manual.

4.7.2 Warning in case of connection to the terminal board when optional " TE" is installed

In case the unit is provided with optional TE (electronic thermostatic valve), pay the maximum attention to the spare battery power supply.
"GB1" (spare battery) is an electronic device which guarantees a temporary power supply to the "Driver" device in case of sudden power supply shortage, thus allowing the immediate shutoff of the thermostatic valve.

Before perfoming any operation, it is advisable to check the charge of the battery as per the instructions;

- Ø Power the control
- Ø Press the button I/O
- Ø Check parameter N4

For further information, check the control manual on chapter 7, section "input-output/driver" and chapter 9. If battery is flat, 48 hours are needed to charge it.

During the check-up operation before the unit startup, it is advisable to disconnect the spare battery to avoid that continuous power and disconnection operations might damage it.
- open the duct above the component GB1 (driver battery EVV) and disconnect the power supply cables (see the picture)

Pict. - 6

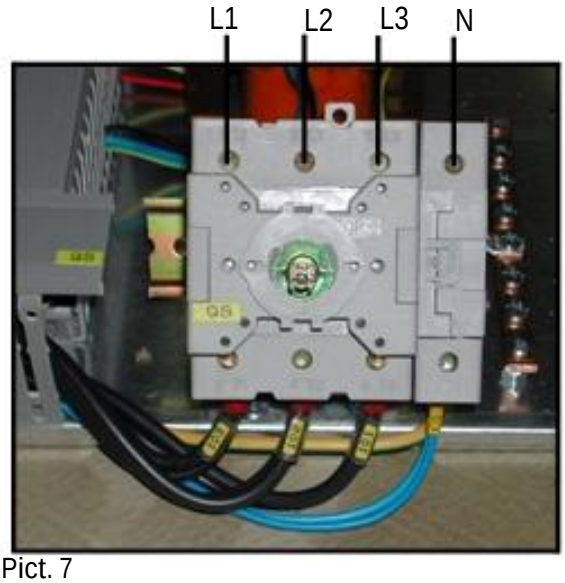
Once the test is completed, it is reminded to re-connect the battery to bring the unit back to a safety condition

4.7.3 User's terminal board connection

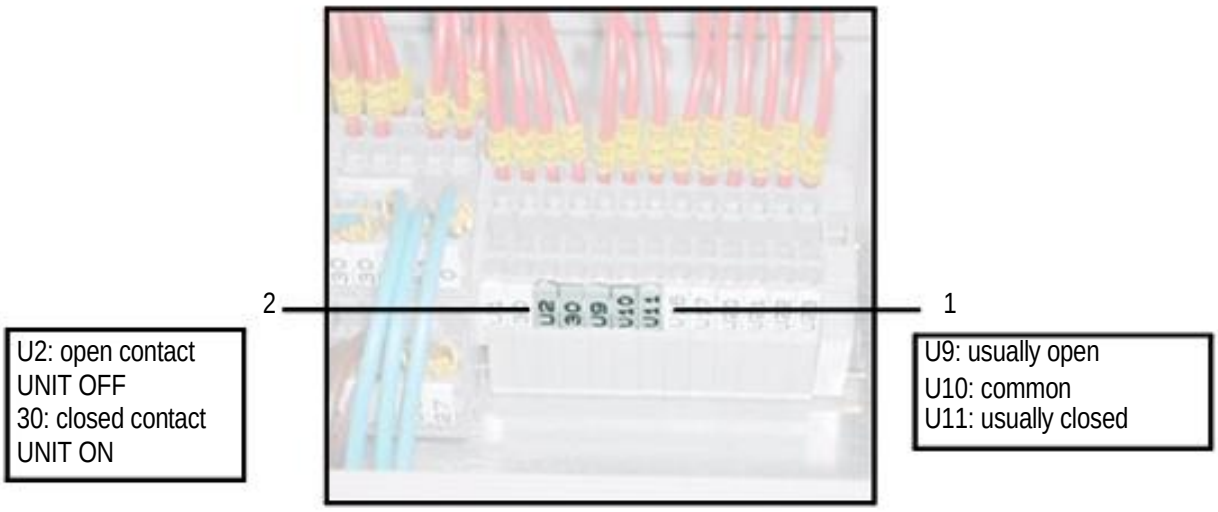
A user terminal board (Pict. 8) is available with free contacts designed for:

- Ø Generic alarm state (1);
- Ø Unit remote ON/OFF (2).

Check the wiring diagram for the exact correspondence of the terminals numbers.



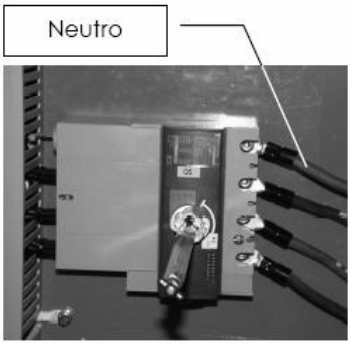
Pict. 7



Pict. 8

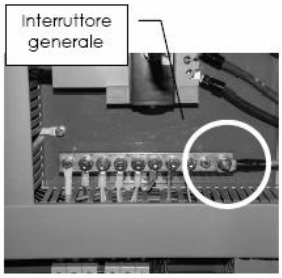
4.7.4 Instructions for the electric connection

The electric connection must be carried out by skilled personnel. The power cable input is shown in the attached dimensional scheme.



Pict. 9

The power cable conductors must be connected to the free terminals upstream the main disconnecting switch, while the grounding conductor must be connected to the appropriate terminal PE or to the ground bar.
On the lateral side of the unit, a hole must be performed to introduce the electric power cable and to arrange its corresponding cable connection.



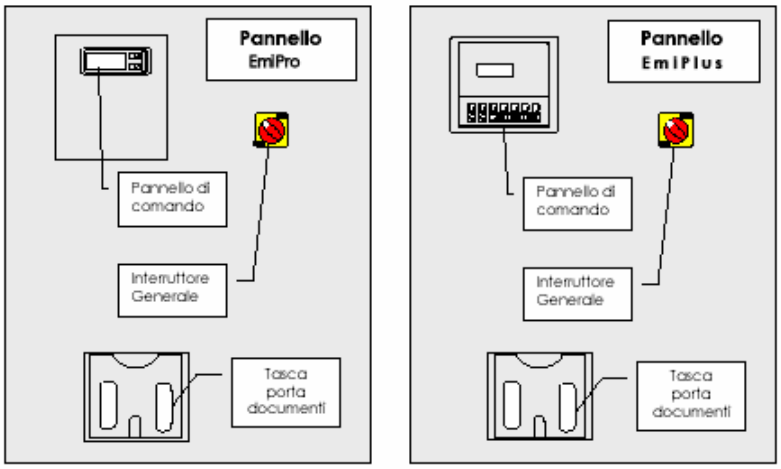
Pict. 10

Pict. 11

If the power cable comes from the top wiring box, perform a bend on the cable (Picture 11) before plugging it into the cable connection as illustrated in the example on the top on the right.

If the water circulating pump is not controlled by the unit microprocessor, it is recommended to connect an auxiliary contact of the pump electromagnetic switch to the remote ON/OFF terminals preset in the electrical panel (see attached wiring diagram), so that the unit can start only when the pump is working.
On its cover, the electrical board has the programming panel of the unit microprocessor. For the controls management, its functions and for the microprocessor use, see Chapter 8 “Unit control and start-up” of the present manual.

Pict. 12



4.7.5 Phases sequence in the power supply line

The rotation direction of all electric motors installed on the unit (compressors, fans, pumps) are checked and harmonized during the operational test performed by the manufacturer (at the exception of units supplied with arrangements for special power supply tension). In case of three-phase power supply, when connecting the unit to the power supply, it is necessary to check that the phases are connected in the correct sequence. On this purpose, make sure that all electric motors rotation is right: for pumps and fans, refer to the information indicated on the component itself; for scroll compressors, follow the instructions as described at Par. 5.1.

If the rotation of any component is wrong, two out of three phases must be inverted in the terminals of the main switch (do not unplug the neutral). If some components go on rotating in the wrong direction, check the conductors sequence of each 3-phase component and correct it, if needed verificare e, eventualmente correggere la sequenza .

5. OPERATION

5.1 First check

Prima di avviare la macchina assicurarsi che:

- Ø The evaporator and condenser water side is supplied with a suitable water flow according to the project;
- Ø The hydraulic and air connections are carried out following the use and maintenance manual;
- Ø The hydraulic circuit is charged and air free (for version RTR-P/W);
- Ø The shut-off valves on the hydraulic circuit are open;
- Ø All security conditions are respected;
- Ø The unit is placed correctly on the floor;
- Ø The service area is respected;
- Ø The electric connections are performed correctly;
- Ø The electric tension ranges within a tolerance of 10% compared to the unit nominal tension;
- Ø The connection to ground is performed correctly;
- Ø All electric and hydraulic connections are tight properly.

Check if the compressor rotation is correct. If the compressor rotates in the opposite direction, it produces a higher noise level, it causes a pressure difference between discharge and suction and its electric absorption is lower than scheduled; after few minutes of operation with the reversed rotation, the internal heat protection can be enabled. If necessary, reset the correct rotation direction by inverting two out of three phases in the input terminals of the main switch.

5.2 First startup

The first startup must be performed by a skilled refrigeration technician. The oil heaters must be energized for at least 3 hours before the unit startup, and for 6 hours in case of screw compressors. Check the shut-off valves on compressor and on the cooling circuit are open. Make sure all points described in the previous paragraph have been checked.

To start the unit:

- Ø Turn the main switch to "ON" position.
- Ø Press the ON/OFF button on the microprocessor keyboard.

Compressors startup time-delay has a default value equal to 1 minute and it can be re-set. Check all safety and control devices are working properly.

To stop the unit:

- Ø Press the ON/OFF button on the microprocessor keyboard;
- Ø If the unit must not work for more than 24 hours, turn the main switch to OFF position.

5.3 Microprocessor setting

Make sure the desired parameters are set on the microprocessor.
If the preset parameters need to be changed, proceed as described in the microprocessor manual (here attached).

5.4 Fault alarm and display system

The troubleshooting is realized 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 .

5.5 Troubleshooting

TROUBLE	POSSIBLE CAUSE	CORRECTIVE ACTION
A) The unit does not work	The electric panel is not powered.	Check presence of electric tension; make sure the
	The external impulse to the microprocessor fails	Check the status of the probes and other external impulses
	Compressor timer delay	Wait set time
	The impulse to the service thermostat fails	System in temperature, lack of demand; check setting and operation
	Fans thermal relais are activated	See point H
	The impulse to the safety device fails	See point G
B) The compressor does not start	Burnt or seized compressor	Replace compressor
	De-excited compressor switch	Check the tension at compressor coil's heads and the continuity of the coil itsself
	Power circuit open	Search the cause of protection intervention; close compressor automatic switch
C) Air flow alarm or lack of air	Stopped fans	Check fans protection switches, restart unit and check absorbtions
	Air flow switch damaged	Check correct operation of flow switch
D)reduced air flow	Clogged air filters	Clean or replace filters
E)Electric heaters are not working	Burnt heaters	Replace heaters
	Lack of tension	Check protection switches and contactors position
	Temperature probe damaged	Replace probe

TROUBLE	POSSIBLE CAUSE	CORRECTIVE ACTION
F)) the compressor does not start due to the intervention of the max pressure switch	Pressure switch failure	Check and replace
	Exceeding refrigerant charge	Recover exceeding gas
	Air Condenser obstructed. Lacking airflow	Clean with compressed air
	Condenser fans failure	See point H
	Condenser fans rotating in opposite direction	See paragraph “electric connections”
	Presence of un-condensable gas in the refr. circuit	Charge the circuit after discharging it and vacuum
	Circulating pump stopped	Check and reactivate pump
G) the compressor does not start due to the intervention of the min pressure switch G1) compressor starts and stops again and again	Pressure switch failure	Check and replace
	Unit totally discharged	See point G
	Clogged filter	Check and replace
	Shut off valve on liquid line not completely open	Check and open completely
	Thermostatic expansion valve does not run properly	Check, clean or replace
	Ice on evaporating coil	Stop compressor and run fans only
H) fans do not run	De-excited electromagnetic switch of fans motors	Check the tension at electromagnetic switch coil’s heads and the continuity of the coil itsself
	Intervention of fans motors thermal relais	Check insulation between windings and between them and earth
	Not set or damaged speed regulator	Check the setting of the regulator or replace it
I) Lack of gas	Leakage in the refr. circuit	Check the refr. circuit with a leak detector after putting the circuit under pressure at approx 4 bar. Repair, make the vacuum, and charge
L) unit runs always without stopping	Lack of refrigerant gas	See point I
	Wrong setting of the operating thermostat	Check setting and replace
	Exceed thermal load	Reduce thermal load
	Compressor does not gice expected cooling capacity	Check, replace or review
	Obstructed liquid filter	Clean or replace
	Thermostatic expansion valve not properly operating	Check, clean or replace
M) unit runs properly but with insufficient capacity	Poor refrigerant charge	See point I
	Humidity in the refr. circuit	Replace filter and dry and charge circuit
N) High air flow	External air intake system not properly set	Set fresh air damper
O)Damaged humidifier	Damaged control board or damaged probe	Check el. Circuits and replace damaged component
P)Low evaporating temperature	Lack of refrigerant, ice on evaporator, obstructed air filter, lack of air flow	Check proper fans operation, correct refrigerant charge, air filters status ecc.

5.6 Routine maintenance

5.6.1 Type and frequency of periodical checks

Before acceding any component inside the unit, turn the main switch of the power supply to OFF position. Then, also turn the unit main switch to OFF position.

Only trained technicians are alllowed to perform operations with powered electrical panel and with open panel board, since some functions of the system fail.

It is recommended to carry out periodical checks in order to make sure the unit works properly. Only authorized and skilled technicians are allowed to perform this kind of operations, included any maintenance operation.

5.6.2 Operations on the cooling circuit

Every time an operation involves the cooling circuit discharge, the gas must be collected by means of the appropriate gas recovery for environmental safety reasons.
Once the repair on the cooling circuit is performed, carry out the following operations:

- Ø Leak detection;
- Ø Vacuum and dehydratation;
- Ø Refrigerant charge.

A) LEAK DETECTION

Charge the cooling circuit with the gasous refrigerant up to reach a pressure of 1 bar. Then, add anhydrous nitrogen by means of cylinders with reducer up to reach a pressure of 15 bar.
Look for possible leakage and, if present, discharge the cooling circuit before welding (with phosphorus copper alloy with a minimum of 2% of silver).

Discharge completely the cooling circuit before welding in order to avoid explosions.

Do not use oxigen instead of nitrogen in order to avoid explosions.

B) VACUUM AND DEHYDRATATION

To obtain a good level of vacuum, an appropriate pump must be used (1,4 mbar of absolute pressure, 30 l/min. of water capacity). If the circuit has been open only for short time, by using this pump, only one vacuum operation is usually enough to reach the absolute pressure 1,4 mbar. If such a vacuum pump is not available or if the circuit has been open for long time, it is highly recommended to perform the vacuum three times by breaking the vacuum by means of the refrigerant. This method is also suitable when there is a high quantity of moisture in the circuit. The vacuum pump must be connected to the charge connections on high and low pressure side of the circuit.

Follow this procedure:

- Ø Discharge the circuit up to an absolute pressure of 35 mbar, then charge the cooling circuit with refrigerant gas up to reach a pressure of about 1 bar;
- Ø Repeat again the operation as described above reaching an absolute pressure of 35 mbar;
- Ø Repeat the above operation for the third time reaching the minimum absolute pressure as possible.

This operation allows to remove up to 99% of the polluting substances.

C) REFRIGERANT CHARGE

Follow this procedure:

- Ø Connect the refrigerant gas cylinder to the male charge connection 1/4" SAE placed on the liquid line, letting some gas go out to remove the air in the connection pipe;
- Ø Turn the cylinder upside down and charge the liquid up to reach 75% of the total charge;
- Ø Now connect to the charge connection on the suction line and, keeping the cylinder upright, complete the charge till the temperature of the liquid pipe before the filter is lower than 7-8°C for the chiller (4°C for the heat pump) compared to the temperature shown on the refrigerant manometer for the discharge pipe.

5.6.3 Check of the setting up

The setting up must be checked while the unit is working in conditions as close as possible to the nominal ones.
Make sure:

- Ø The thermal load is adequate;
- Ø The water capacity and the evaporating and condensing water temperatures are close to the nominal ones.

Check the gas charge: the charge will be complete when, after 10 minutes of operation in nominal conditions, no bubbles are shown in the liquid sight glass.
Check the gas overheating on the compressor intake as shown below and, if necessary, set the thermostatic valve. While the unit is working in nominal conditions, connect a manometer on the low pressure side. Check the gas temperatature on the compressor intake (Pict. 13) by means of a thermometer (Pict. 14).
The overheating intake value is given by the difference between the temperature shown on the thermometer and the saturation temperature (dew value for mixture) corresponding to the pressure shown on the manometer. If overheating is higher than 10°C, the thermostatic valve must be opened, while if it is lower than 5°C the valve must be shut off (Pict. 15 cap removal and Pict. 16 opening adjustment).
Valve adjusting operations must be always carried out with caution, turning the adjusting screw only half turn each time; wait for few minutes before every new adjustment in order to allow the unit to reach steady conditions..

Pict. 13

Gas: R407C
Suction temperature 7°C
Suction pressure: 3,9 bar = +2°C
Overheating: 5K

Pict. 14

Pict. 15

Pict. 16

The thermostatic valve adjustment is a very delicate operation, therefore it must be carried out by a skilled technician.

5.7 Precautionary planned maintenance

List of Operations

	Every 6 months	Every year
Check of cooling lines and of their insulation		x
Compressor noise level check	x	
Electric connection tightening check	x	
Contactors status check	x	
Check of conductors insulation status		x
Check of evaporator water temperature difference	x	
Liquid sight glass check	x	
Electric absorption check	x	
Working pressures check	x	
Unit general conditions check		x
Probes setting check	x	
Set parameters check		x
Refrigerant filter pressure drop check		x
Safety valve check		x
Safety pressure switch check	x	
Electric protections check	x	
Thermostatic valve check		x
Check of air presence in the hydraulic circuit	x	
Check of condenser water temperature difference	x	
Check of condenser cleaning condition		x

5.7.1 Coils cleaning (on the floor and under coverings)

If the plate finned condenser gets dirty the correct operation of the unit may be jeopardized. Situation may gradually degenerate until operation is stopped; It's obvious that during the decay period performances will be gradually reduced.
It is therefore advisable to periodically check the cleaning status of the coils.
The checks interval depends on the installation area and the use frequency.

The casual contact with the exchanger's fins may cause small cuts.
To perform the operations described below use protective gloves.

Use a stiff-bristle brush and the necessary equipment; the use of an industrial vacuum cleaner may facilitate this operation.
Disconnect the unit from the power supply by opening the main switch,
b. Remove the protection grid from the coil (if present),
c. Brush the coil from the top to the bottom, being careful not to damage the fins.
d. Accompany the brushing with the hoovering.
e. Remove the dust and the down gathered..

Do not use compressed air (it might damage the fins) or water (it might cause scale).

5.7.2 Condensers' cleaning

Thanks to the commonly high turbulence level of the exchangers, an auto-cleaning effect takes place inside the piping.
Anyway, by some applications encrustation possibility may be remarkably high, i.e. when extremely hard water at high temperatures is used. In such cases, an exchanger cleaning is always possible by means of a cleaning fluid . Use chemical products suitable to copper, such as formic, citric, acetic acid or other organic acids. Pump the clearing fluid through the exchanger.
To obtain the best cleaning, the clearing fluid flow rate should be at least 1,5 times the nominal flow, preferably in opposite circulation mode.
After the use, do not forget to carefully wash the exchanger with clean water. The exchangers cleaning must be carried out at regular time intervals.
In case of shell and tube exchangers it is advisable to carry out a mechanical clearing with swabbing after finishing the chemical washing of the exchanger.

5.7.3 Check of the hydraulic circuit and expansion vessel pressure

The hydraulic circuit pressure is determined by an expansion vessel and it is signalled outside the unit through a manometer. The pressure shown on the manometer must range between 0,15 and 0,30 MPa (1,5 and 3,0 bar).

5.7.4 Check of lubricant leaks - lubrication oil pressure

A lubricant oil leak in a cooling circuit is always accompanied by a refrigerant leak, therefore this check allows to detect possible leaks in advance. The inspection is visual-type and it is sufficient to light the areas to be checked by means of a good electric torch. All piping fittings and joints (welded and not welded) must be checked since they are more subject to vibration; if some oil is detected, contact the closest After Sale Centre for intervention. The lubrication oil pressure must be checked through the appropriate manometer (when present); the oil pressure must always be at least 0,15 MPa (1,5 bar) higher than the value shown on the low pressure gauge (L.P.).

5.7.5 Vibrations check

The cooling circuit is composed of several rotating parts (fans, compressors, pumps, etc) equipped with bearings and they are balanced at the beginning; excessive vibrations, scrapings, strikings, irregular noises such as whistles and creakings are all signals of mechanical troubles which might even generate serious and dangerous damages. The inspection must be performed while the unit is working and with the protection covers closed; in case of trouble, contact the closest technical service centre.

5.7.6 Check of terminals tightening

The vibrations the unit housing is subject to (and the electric box by transmission) can loosen the electric terminals thus causing malfunctionings; therefore, open the unit main switch and tighten all terminals screws; eventually, if it is always the same terminals to be loosened, contact the After Sales Service of EMICON A.C. S.p.A to report the fact.

5.7.7 Check of the water flow switch

The water flow switch takes the water pressure difference on exchanger's inlet and outlet. If the pipe marked with a white arrow clogs due to air presence or dirty (or roughly bends and then throttles) the switch may fail while sensing the pressure variation downstream with consequent system shutdown. Check the status of the pipe, its cleaning, check the connections are not leaking and vent the possible air.

5.7.8 Check of the gaskets on the centrifugal fans discharge

The centrifugal fans discharge is connected to the external skirt by means of a flexible gasket; the gasket must not be damaged and must not let air pass through. In this case, its replacement is necessary, therefore contact EMICON A.C. S. p. A. After Sales Service..

5.7.9 Compressors oil level check

Both scroll and semi-hermetic compressors are equipped with sigth glasses to check the oil level.

WHILE CHECKING THE OIL LEVEL ALWAYS MAKE SURE THE FAN SECTION IS NOT OPEN

Oil level must be checked while the unit is working in steady conditions (therefore, after at least 15-20 minutes of operation). The oil level must be compared with the instructions shown on tags close to the sight glass; however, at least a quarter on the bottom of the sight glass must show the oil. An excessive presence of foam means that the thermostatic valves are not set up properly.
In case of trouble, contact EMICON A.C. S.P.A. After Sales Service.

5.7.10 Insulation condition check

All low temperature parts are heat insulated by means of muffs or of shaped plates to eliminate or reduce any heat leak which can cause a cooling capacity reduction as well as condensing phenomena or ice formation (which can be dangerous since in some conditions they can cause mechanical breakings). The check is of visual type; the insulation must not be damaged, detached from the supports or cracked. Bear in mind that in time the surface of insulating materials tends to slightly flake off without jeopardizing the insulation feature. Cracks, cuts or detachments must be repaired immediately by sticking or taping properly.

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5.7.11 Supports and bearings check

While making the check, the unit main switch must be open ("0" position) and locked. The padlock key must be kept by the person in charge of the check

All rotating parts are equipped with supports and bearings. Usually these parts do not need any maintenance and/or lubrication as they are a long-life type. A direct check of these parts is only possible on fans by rotating manually the fan wheel: its movement must be fluid, with no blockings or creakings and it must not show any lubricant leak. If any of the mentioned cases occurs, contact EMICON A.C. S.p.A. After Sales Service for repairing it.

5.7.12 Belts tension check - belts replacement

While making the check, the unit main switch must be open (“0” position) and locked. The padlock key must be kept by the person in charge of the check.

Centrifugal fans belts must be checked at regular intervals and must be replaced every two years of operation.
Press firmly the belt in the middle between the two pulleys: it must give way no more than 5 mm; if it gives way more than that, unblock the motor tightening screws, unscrew the belt-tensioner bolt after screwing the other belt tensioner bolt on the opposite side of the motor. Tighten the belt correctly, make sure the pulley engine is aligned to the duct (use the bolt on the opposite side of the belt tensioner to make it easier), overflow the motor on the base. To replace the belt, loosen the motor tightening screws, screw completely the belt tensioner bolt and close the motor to the fan housing, remove the belt from the pulleys, replace it with another belt having same form and size and tighten as above mentioned explained. In case of belt replacement, re-check the belt tension after a couple of days of operation.

5.7.13 Humidity check of cooling circuit

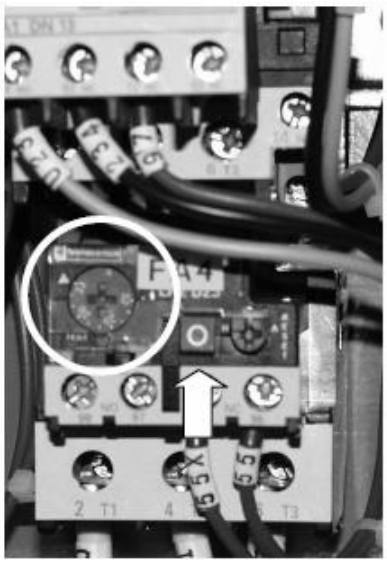
Humidity inside the cooling circuit can cause many troubles (ice formation inside the expansion valve, acidification of compressors oil, etc.), therefore it is important to intervene immediately if this problem occurs. The cooling circuits are equipped with a light able to signal when humidity is present in the circuit; the sensor material located at the centre or on the border of the sight glass is bright green to signal a dry circuit or yellow to signal a wet circuit. On the sight glass the two referring colours for each status (dry / wet) are shown. If foam or bubbles can be seen through the sight glass, the refrigerant charge could be insufficient. This could be a sign for a refrigerant leak, then it is necessary to inform EMICON A.C. S.p.A After Sales Service. If humidity is detected inside the circuit, contact immediately EMICON A.C. S.p.A After Sales Service for repairing it..

5.7.14 Check of supply continuity to the crankcase heater

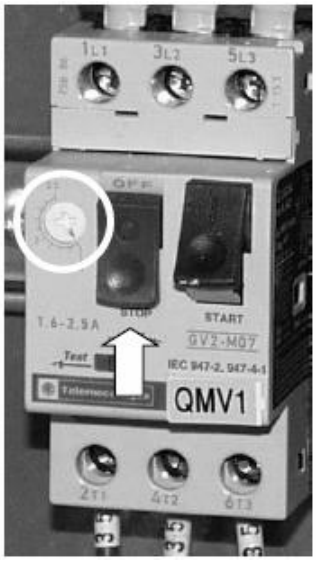
The unit main switch must be open (” O” position).
The compressors crankcase heater is essential to keep the oil free from refrigerant parts which otherswise might lead to possible seizure of compressor; the check must be performed by a common continuity tester checking there is supply continuity to the terminals after unplugging one of them from the terminal board. In case a supply interruption is detected, contact immediately EMICON A.C. S. p. A. After Sales Service for the shipment of the spare part of for the repair operation.

5.7.15 Regulation of overload protection relays

All electric motors are protected against overcurrent to prevent damage from over-loading the motor; for this reason, it is possible to install a regulation system which can interrupt current in case of overload or damage



Pict. 17



Pict. 18

The pictures show two different types of remote control switches: the one shown on (Pict. 17), is equipped with a detached protection, while the one shown on picture 18 is equipped with an incorporated protection (automatic circuit breaker). In both cases the regulation of the power-off switch value (maximum absorbed current per each motor phase) is performed by rotating the small wheel shown inside the white circle by means of a screwdriver till the referring triangle is in correspondence of the desired set value.

The maximum power-off value that can be set must not be higher than the absorbed current value shown on the electric motor tag..

When powered, the remote control switch can be opened by pressing the button indicated by the white arrow..

5.7.16 Replacement of protection fuses

Some parts of the unit circuits are protected by fuses enclosed in appropriate housings.

THE THE REPLACEMENT OF FUSES MUST BE EXCLUSIVELY PERFORMED WITH THE MAIN SWITCH OPEN.

Cartridge fuses

To replace the fuses, open the fuse holder, pull straight out on the small black handle down, remove the fuse/s and replace it/them with a new fuse having the same characteristics. Before replacing it, check the interrupting current rating of the broken fuse.

THE REPLACEMENT SHOULD ALWAYS HAVE THE SAME RATING AS THE ORIGINAL, SINCE A HIGHER RATING COULD CAUSE OVERHEATING, DAMAGE, FIRE.

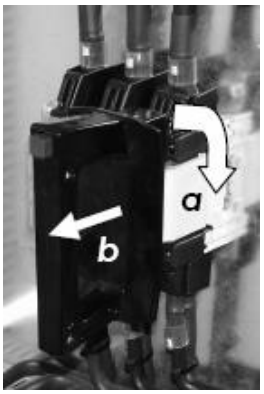
Blade fuses

This kind of fuse is designed for higher interrupting ratings and it must be absolutely replaced by using an appropriate device. Never try to replace it by using inappropriate devices: possible damage to the fuse holder and wounds to the hands may happen. Proceed as per the following instructions

Pict. 19

Pict. 20

1. Remove the fusebox cover.
2. Take the extractor tool "2" located inside the electrical panel.
3. Insert the puller into the fuse spring clips (see the white circle on Picture 19) and pull the extractor down till the clips are released.
4. Pull the extractor horizontally and firmly towards you; (any different movement could detach the cover from the fuse holder).
5. Press the button on the puller to remove the fuse (see Picture 22).
6. Insert the new fuse onto the puller and put it back into the fuse holder.
7. Release the puller by pressing the button.



Pict. 21

Pict. 22

DO NOT TOUCH THE FUSE WITH NAKED HANDS: THE TEMPERATURE OF THE SURFACE COULD BE VERY ELEVATED AND COULD CAUSE BURNS.

5.7.17 Replacement of condensing fan motors

While making the check, the unit main switch must be open ("0" position) and locked. The padlock key must be kept by the person in charge of the check.

There are two types of fans: axial and centrifugal. In case of axial fans, being external-rotor type, it is recommended to replace completely the damaged fan after disconnecting the power supply (take due note of the original wiring). Mount the fan on its supports and ensure the blades do not scrape the blade guard and the supports, re-connect the electric wirings, check the rotation direction (if needed, reverse two phases). In case of centrifugal fans, after disconnecting the motor from the power supply, unscrew the fixing screws and remove it in the same way as described for the belts replacement (see par. 5.7.12); remove the pulley from the shaft by means of an extractor, after unscrewing the fixing dies.

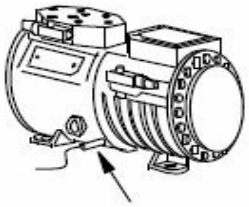
The motor pulley is of adjustable type. If to unscrew the fixing dies the regulation must be changed, it is necessary to mark the original position with an indelible felt-tip pen and count the turns of the mobile part so that it is possible to restablish exactly the original regulation once the operation is completed. Remove the protection paint from the shaft and from the new motor key (use a brush, solvent and some cloths); clean the inside part of pulley, lubricate with oil and install the pulley on the new motor making sure not to force the coupling. Once the pulley is entered into the shaft, insert it completely by means of a hard rubber mallet and block it definitely with the appropriate dies. Mount the motor and if needed restablish the original pulley regulation and tighten the belt (see par. 5.7.12). Reconnect the motor and check the rotation by a short impulse given to the remote control switch after energizing it. If necessary, change the electric connection (inverting the connection of two phase cables) after disconnecting the power supply. Close the protection covers..

5.7.18 Replacement of compressors crankcase heaters

While making the check, the unit main switch must be open (“0” position) and locked. The padlock key must be kept by the person in charge of the check.

The type of crankcase heater installed varies according to the type of compressor, if scroll or semi-hermetic; scroll compressors need to be installed a tubular heater (see picture), while semi-hermetic compressors need a cartridge heater (see drawing). The heater position may vary following the compressor type and model, anyway it is always located on the underside of the compressor crankcase.

Pict. 23



Pict. 24

The tubular heater must be replaced by unscrewing the fixing screws (position indicated by the arrow in the picture) so that it can be easily removed; mount the new heater in the same position of the replaced one and push it against the compressor housing. The cartridge heater must be replaced by removing it from its location and installing in its place the new heater. In order to improve the heat transmission, use conductive paste or oil.

The cartridge must not stick out from its location; the protruding part may overheat and stop working.

5.7.19 Electrical cables check

The check is visual: the electrical cables must be not damaged or show abrasions, cuttings or overheating signs. In this case, replace them immediately.

5.7.20 Contactors status check

This operation must be perfomed by an expert electrician able to dismantle and re-install the remote control switches without damaging them. In case of blazed or blackened auxiliary switches or the whole remote control switch, make sure the contactor interrupting power is adequate to the power it runs.

5.8 Special maintenance operations

The operations listed here below must be performed only by skilled service personnel equipped with the suitable equipment and only when the unit is stopped and disconnected from the power supply

	Operation	Frequency
1	Filling up of compressor oil	when necessary
2	Replacement of crankcase oil	when necessary
3	Replacement of compressor valves	when necessary
4	Check of cooling group performance	when necessary
5	Setting of cooling group pressure switches	when necessary
6	Replacement of cooling group pressure switches	when necessary
7	Replacement of filter cartridge	when necessary
8	Replacement of dehydrating filters	when necessary
9	Setting of cooling circuit valves	when necessary
10	Replacement of the cooling circuit valves	when necessary
11	Filling up / replacement of refrigerant	when necessary
12	Compressor replacement	when necessary
13	Replacement of compressor lubricant pump	when necessary
14	Heat exchanger replacement	when necessary
15	Condensing coil replacement	when necessary
16	Circulating pump replacement	when necessary

For all the above mentioned operations and for any other operations not completely described on this manual, it is necessary to contact EMICON A.C. S.p.A. After Sales Service. To guarantee the unit a long operation life and to keep it always in the best efficiency conditions and to increase its service reliability, it is highly recommended to contact EMICON A.C. S.p.A. After Sales Service to draw up a maintenance contract

6. DISMANTLING

When the unit has to be dismantled, drain the cooling circuit and collect the refrigerant gas by means of an adequate receiver, in order to protect people and environment.

Never release the gas contained in the cooling circuit in 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

Never release the oil compressor in the environment.

EMICON
AIR CONDITIONING AND INDUSTRIAL APPLICATION

CE

USE AND MAINTENANCE MANUAL

STEAM HUMIDIFIER

1 - INTRODUCTION

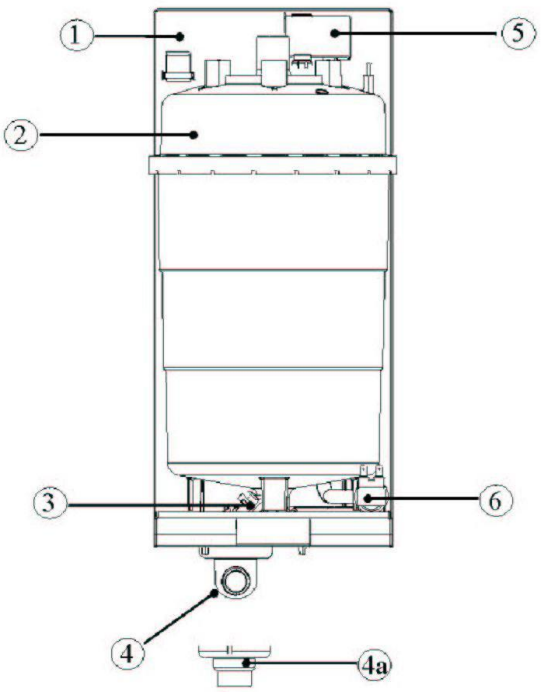
The humidifier described in this manual is an immersed electrode steam humidifier and it is equipped with the most advanced microprocessor technology.
The operation is completely automatic and it can be employed in any geographical area since it is able to adapt its functioning according to the chemical - 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

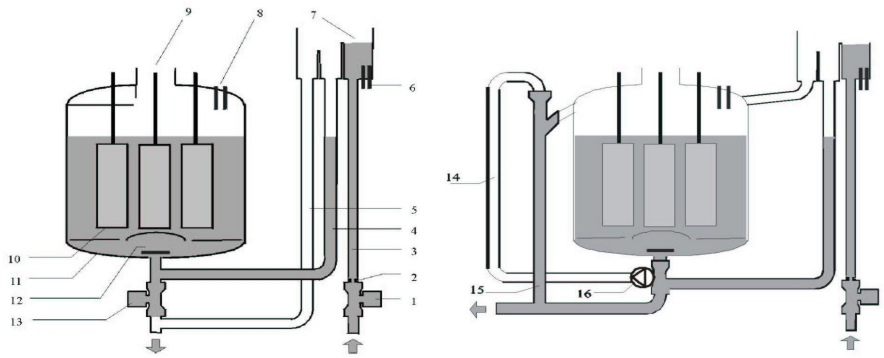
The electric components contained in the unit are powered.

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 monophase models, 3/6 for triphase 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				LIMITS Min.	LIMITS Max
Hydrogenions Activity	pH	-		7	8,5
Specific conductivity at 20°C	σR 20 °C	-	µS/cm	300	1250
Total dissolved solids	TDS	-	mg/l	(1)	(1)
Fixed Residual at 180°C	R_{180}	-	mg/l	(1)	(1)
Total hardness	TH	-	mg/l $CaCO_3$	100(2)	400
Temporary hardness		-	mg/l $CaCO_3$	60(3)	300
Iron + Manganese		-	mg/l Fe+Mn	0	0,2
Chlorides		-	ppm Cl	0	30
Silicon Dioxide		-	mg/l SiO_2	0	20
Residual Chloride		-	mg/l Cl	0	0,2
Anhydrite		-	mg/l $CaSO_4$	0	100
Metallic matters		-	mg/l	0	0
Solvents, diluents,soaps, lubricants		-	mg/l	0	0

(1) Values depending on the specific conductivity; generally speaking: TDS~= 0,93 * σ 20; R_{180}~=0,65 * σ 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	σR 20 °C	-	µS/cm	125	500
Total dissolved solids	TDS	-	mg/l	(1)	(1)
Fixed Residual at 180°C	R_{180}	-	mg/l	(1)	(1)
Total hardness	TH	-	mg/l $CaCO_3$	50(2)	250
Temporary hardness		-	mg/l $CaCO_3$	30(3)	150
Iron + Manganese		-	mg/l Fe+Mn	0	0,2
Chlorides		-	ppm Cl	0	20
Silicon Dioxide		-	mg/l SiO_2	0	20
Residual Chloride		-	mg/l Cl	0	0,2
Anhydrite		-	mg/l $CaSO_4$	0	60
Metallic matters		-	mg/l	0	0
Solvents, diluents,soaps, lubricants		-	mg/l	0	0

(1) Values depending on the specific conductivity; generally speaking: TDS~= 0,93 * σ 20; R_{180}~=0,65 * σ 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

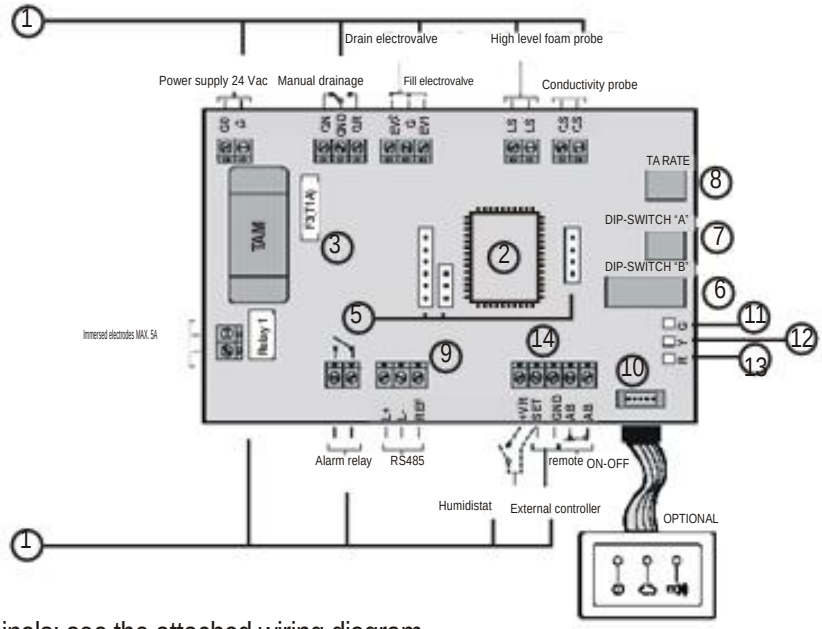
This phase is performed automatically as soon as the humidifier starts: before obtaining the nominal steam production, it is necessary to wait for an adequate period of time which mainly depends on the supply water conductivity and it may also take a few hours.

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 acceding 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.

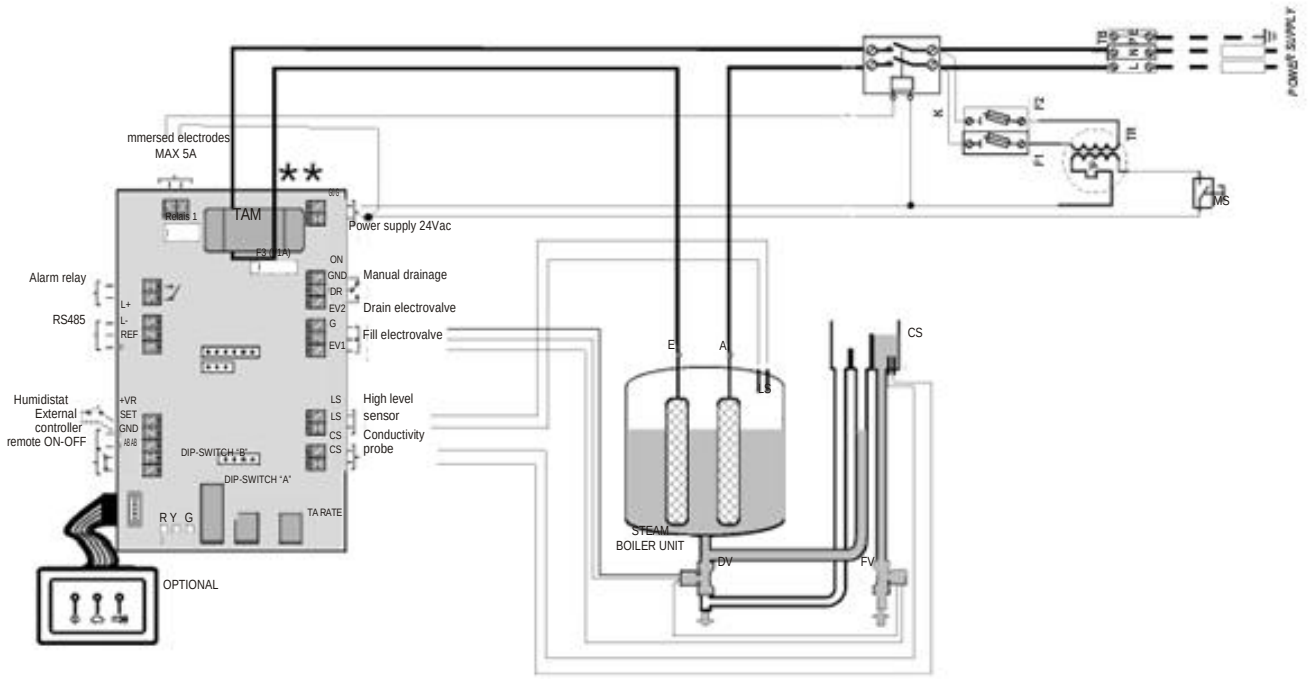
12 - Yellow: it is switched off when steam is not produced, while it is permanently switched on when at 100% of its nominal production. During the transitory production it winks at a frequency of 2 Hz. Once the nominal production is achieved it winks at a frequency of 0,5 Hz. A series of pulses is generated: 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.

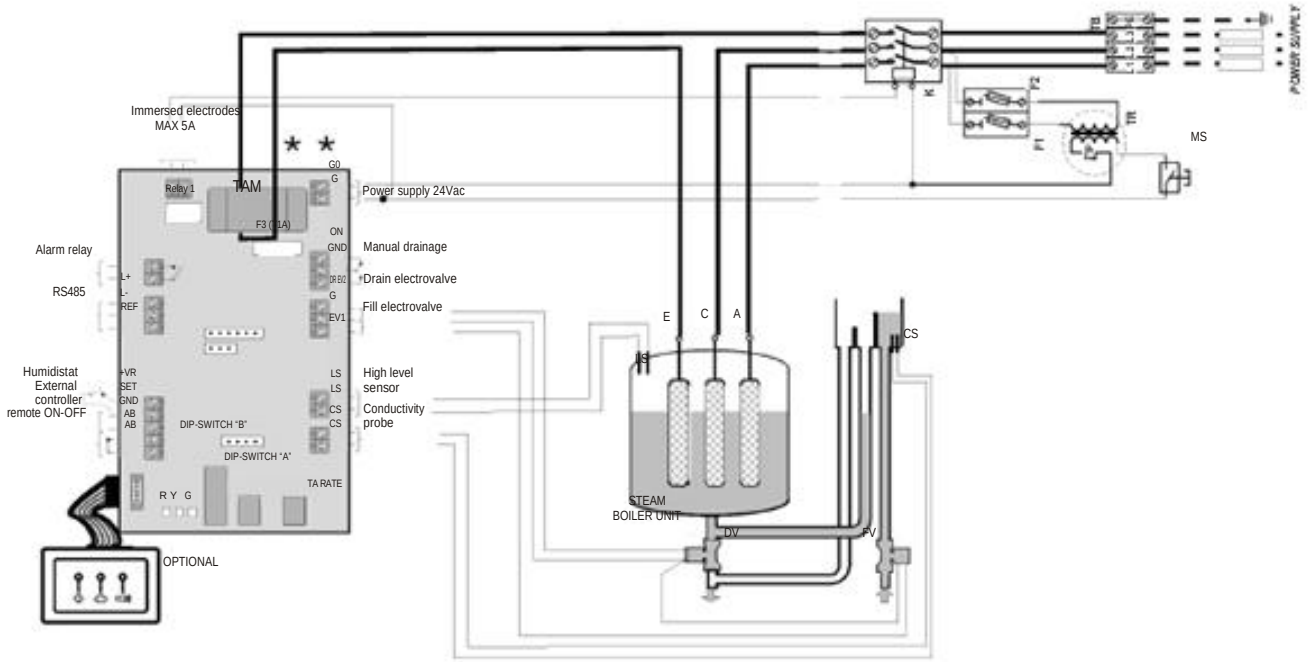
3.5 Digital terminals

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. 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	SPST relay, usually closed according to DIP A setting. The relay action is cumulative: • The contact is open in presence of at least 1 alarm and AB-AB closed; • the contact is closed when: - all alarm causes have been eliminated; - all alarms have been cancelled, both manually and automatically, or when AB-AB is open**.
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*.		
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. switch off the unit and disconnect the internal connections	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 (demineralisation, 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 demineralisaton 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 diffferent 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;
- Diconnect 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:

- Ø 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.
- Ø 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.
- Ø 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.
- Ø 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.
- Ø 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. Re-start 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.

EMICON
AIR CONDITIONING AND INDUSTRIAL APPLICATION

SINCERT
CERMET

Registrazione n.048
UNI EN ISO 9001:2000
UNI EN ISO 14001:2004

DICHIARAZIONE CE DI CONFORMITÀ
EC DECLARATION OF CONFORMITY
CE-KONFORMITÄTSERKLÄRUNG
DECLARATION CE DE CONFORMITÉ

Il Fabbricante | *The Manufacturer* | *Der Hersteller* | *Le Fabricant*

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DICHIARA	***DECLARES***	***ERKLÄRT***	***DECLARE***
che la macchina	*that the machinery*	*daß die Einheit*	*que l'unitè*
Modello	**Model**	**Modell**	**Modèle**
Matricola	**Serial Nr.**	**Seriennr.**	**N.ro de série**

è conforme a tutte le disposizioni pertinenti delle direttive | *fulfils all the relevant provisions of the directives* | *den folgenden Vorschriften entspricht* | *est conforme aux dispositions*

2004/108/EC | **2006/42/EC** | **2006/95/EC**

in quanto è stata progettata, costruita e collaudata in accordo con le seguenti Norme | *because it has been designed, manufactured and tested according to the following Standards* | *da sie in Überstimmung mit den folgenden Normen geplant gebaut und getestet wurde* | *étant l' appareil conçu, réalisé et testé dans le respect des normes suivantes*

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

EN ISO 12100-1
EN ISO 12100-2

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

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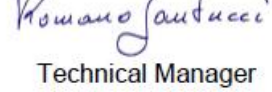
a costituirne il Fascicolo Tecnico.	*to compile its Technical File.*	*die technischen Unterlagen zu erstellen*	*à realiser le dossier technique.*

Meldola, ___/___/_____

Romano Santucci



Technical Manager

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