EMICON
AIR CONDITIONING AND INDUSTRIAL APPLICATION

CE

USE AND MAINTENANCE MANUAL

WATER COOLED WATER CHILLERS
AND HEAT PUMPS
R-PWE / R-PWH / EWH

Rev. 1 02/09

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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 pwater cooled water chillers and heat pumps of series R-PWE / R-PWH / EWH.
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 R-PWE / R-PWH / EWH 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 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

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

RWE - H: Monobloc watercooled chiller intended for watercooling in air-conditioning and/or industrial systems. They are designed for internal installation.

PWE - H: Water-water monobloc Heat pumps with cycle inversion on water circuit, intended for watercooling and heating in air-conditioning and/or industrial systems. They are designed for internal installation.

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

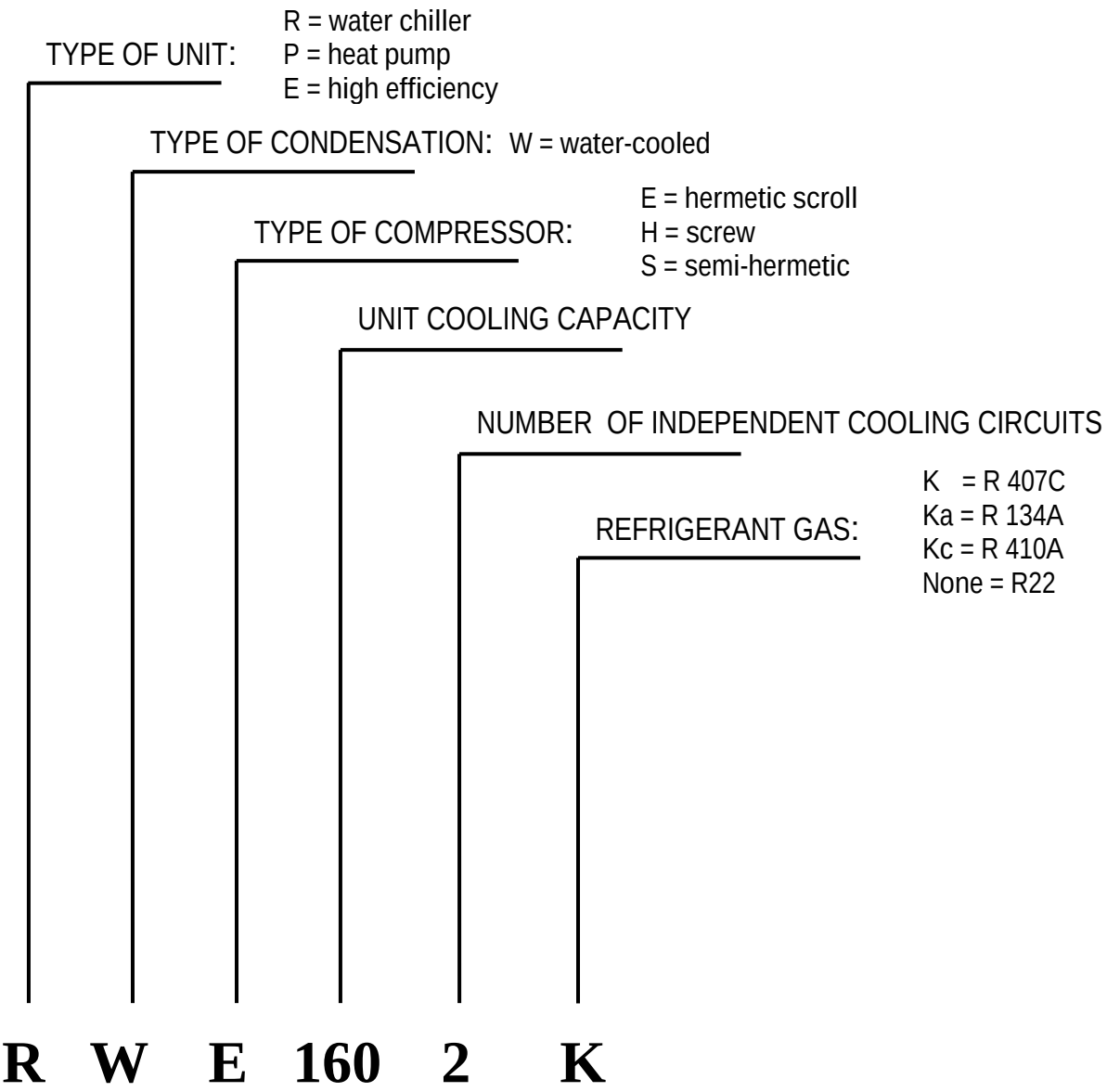
On the unit there are dangerous areas for electric risk and hot temperatures.
The unit can be closed by case panels; in this case the dangerous parts inside the unit are not accessible from outside. Only qualified and trained personnel can remove the covering panels. The unit is supplied with the cooling 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 water chillers RWE-H / EWH and of heat pumps PWE-H

The units of series R-PWE / R-PWH / EWH 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:

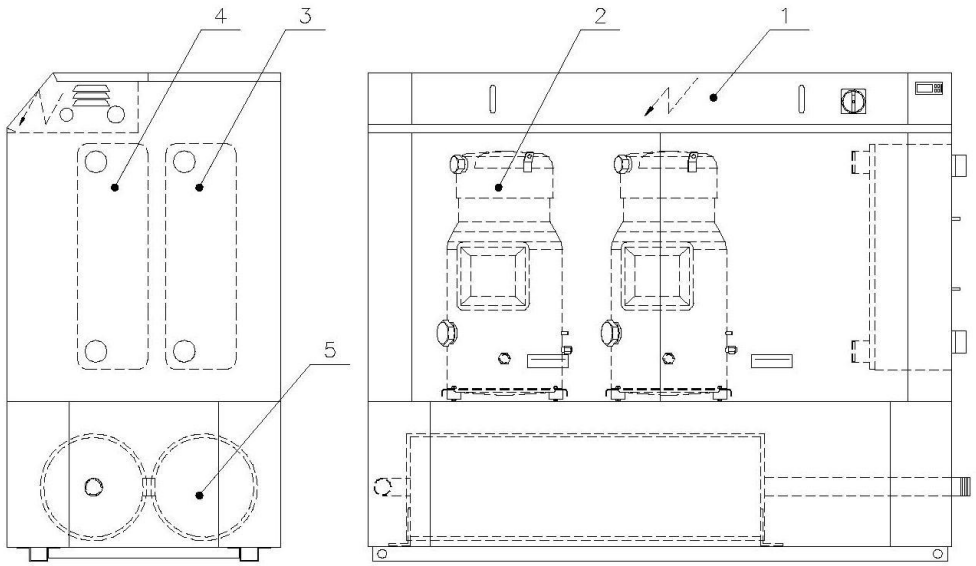


3.2 Main components

The units of R-PWE / R-PWH / EWH series are made of the following main components:

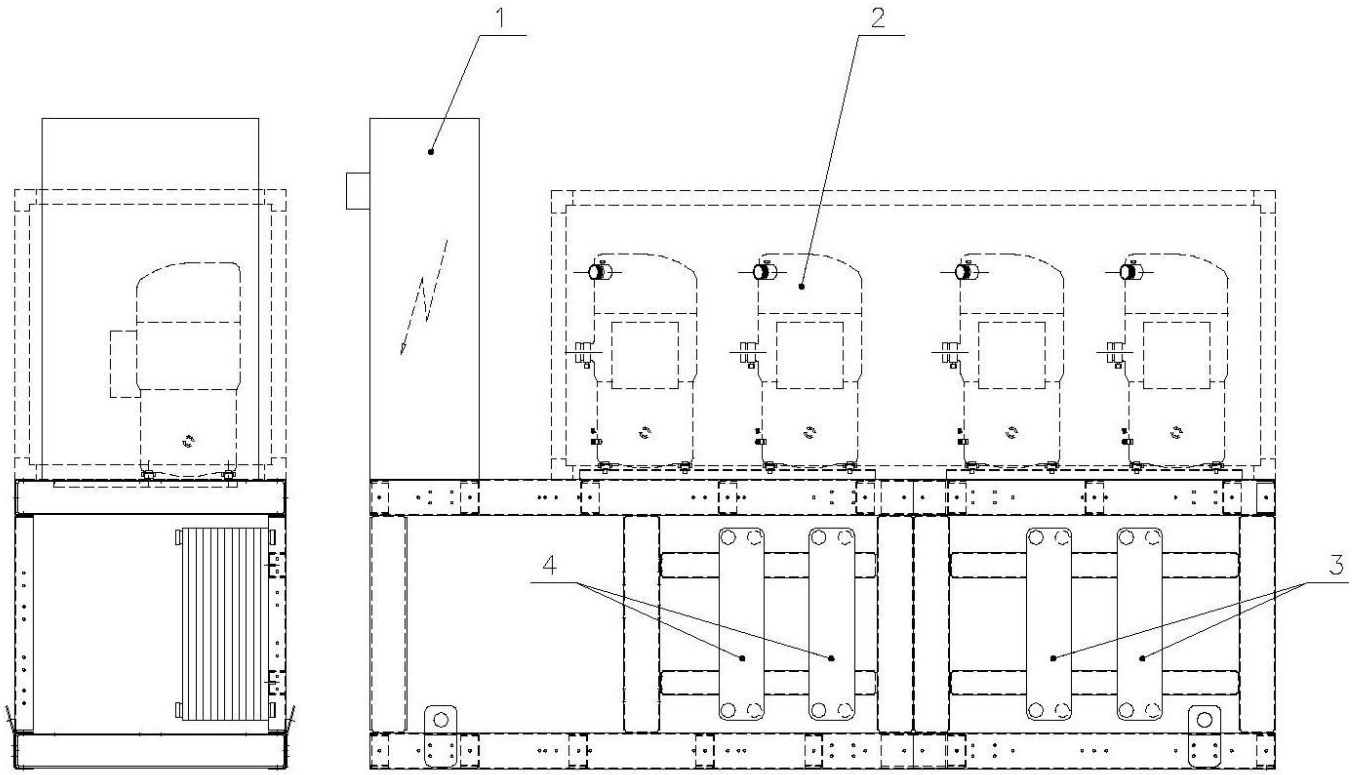
- Housing in painted steel plates or support frame made of bent and painted steel profiles;
- Compressors, installed on rubber vibration dampers and equipped with oil sump heater,
- Weld-brazed plate evaporator or shell & tube evaporator with heat insulation;
- Stainless steel AISI 316 weld-brazed plate evaporator or shell & tube evaporator;
- Cooling circuit composed of: thermostatic expansion valve, sight glass, dehydrating filter, safety device, anti-freeze thermostat, high and low pressure switches;
- Electric panel in compliance with CE norms and provided with main disconnecting switch; thermal and amperometric protections, contactors, auxiliary low voltage circuit, terminal board;
- The control microprocessor allows to manage the unit operation and its alarms.

RWE - PWE single circuit



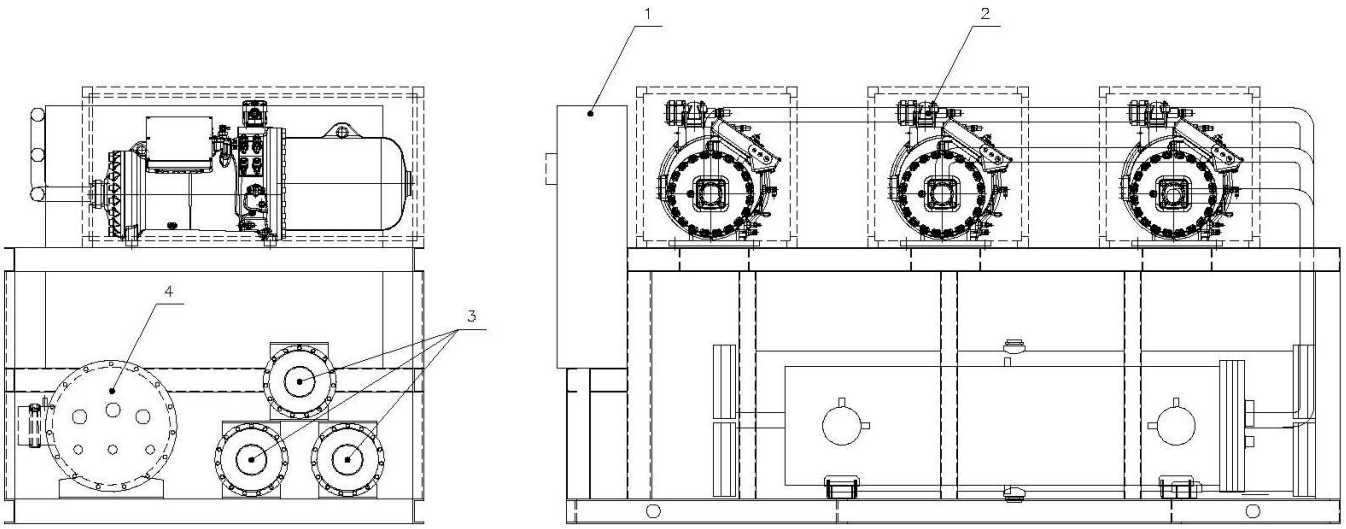
Pict. 1

RWE - PWE multicompressor



Pict. 2

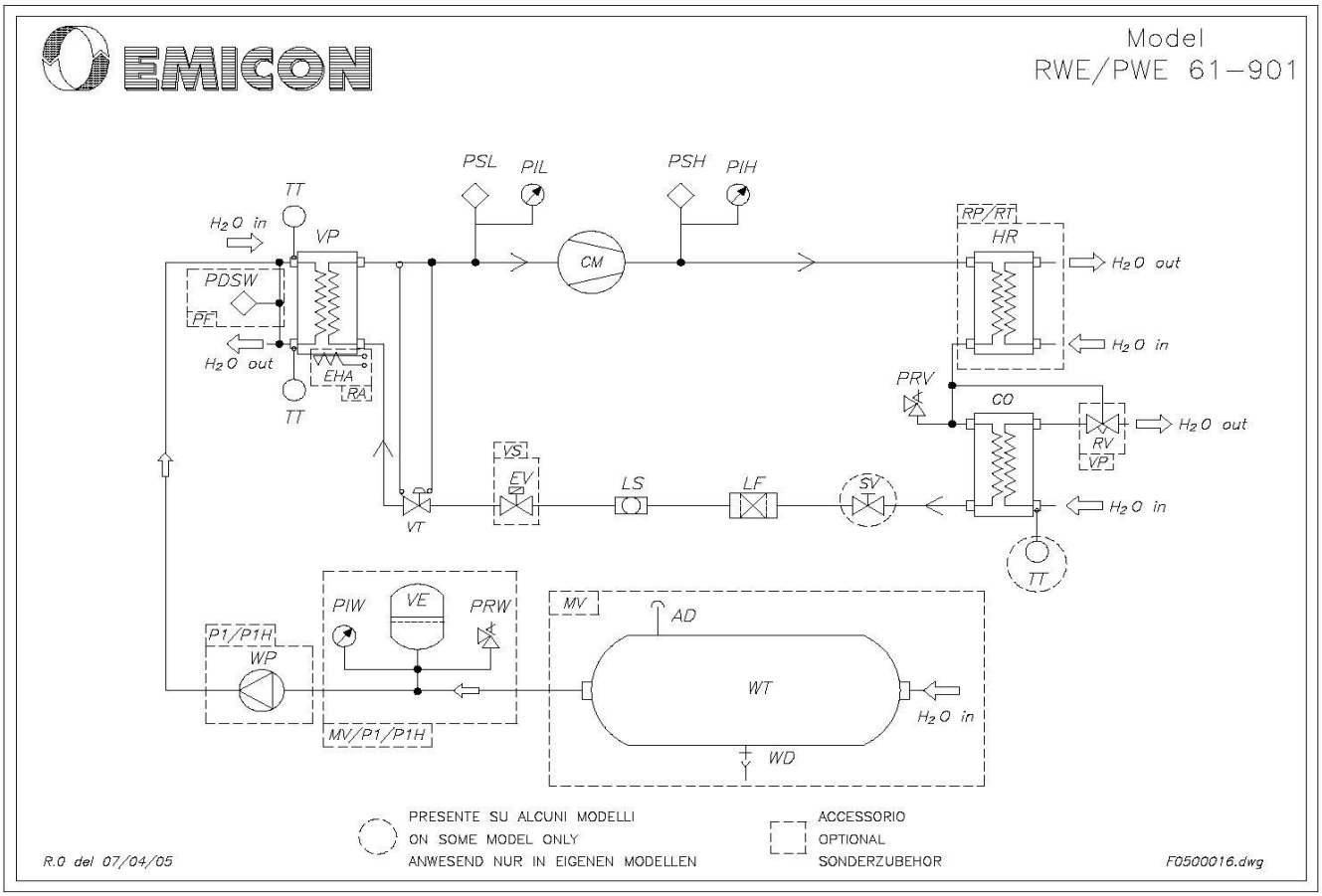
RWH - PWH mono/multicompressor



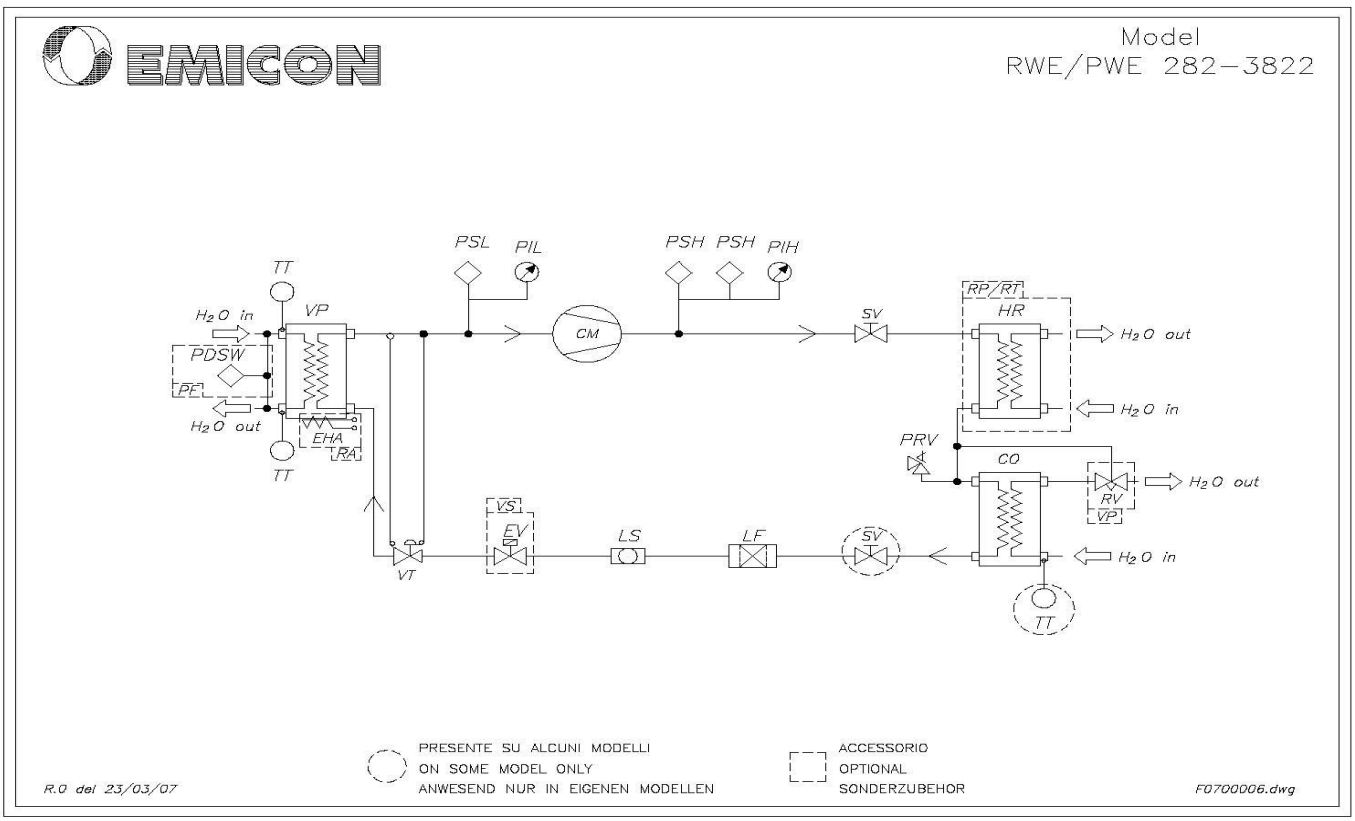
Pict. 3

Key
1) Electric panel
2) Compressor
3) Condenser
4) Evaporator
5) Tank

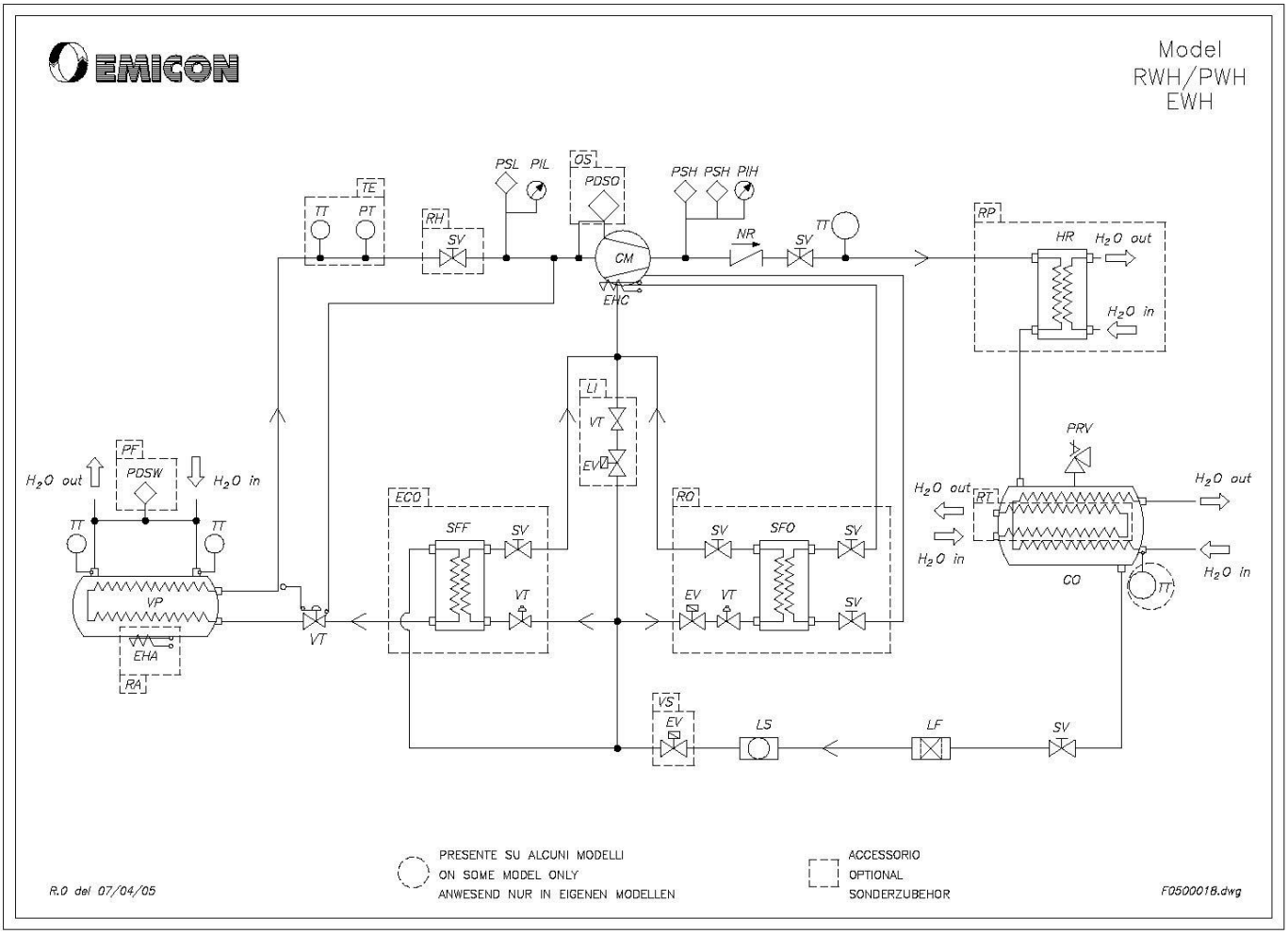
3.3 Cooling circuit



Pict. 4



Pict. 5



Pict. 6

Cooling circuit keys

AC	AIR HEAT EXCHANGER	**PDIO**	OIL GAUGE	**VE**	EXPANSION VESSEL
AD	AIR DISCHARGE VALVE	**PDSO**	OIL LEVEL PRESSOSTATIC VALVE	**VP**	EVAPORATOR
AV	VIBRATION DAMPER	**PDSW**	DIFFERENTIAL WATER SWITCH	**VT**	THERMOSTATIC EXPANSION VALVE
CM	COMPRESSOR	**PIH**	HIGH PRESSURE GAUGE	**WC**	WATER COIL
CO	CONDENSER	**PIL**	LOW PRESSURE GAUGE	**WD**	WATER CHARGE AND DISCAHRGE VALVE
CT	CONDUCTIVITY PROBE	**PIW**	WATER VALVE	**WE**	WATER EXCHANGER
EF	FAN	**PRV**	OVERPRESSURE DISCHARGE DEVICE	**WF**	WATER FILTER
EHA	ANTIFREEZE HEATER	**PRW**	SAFETY WATER FLOW SWITCH	**WP**	WATER PUMP
EHC	CRANK-CASE HEATER	**PSH**	HIGH PRESSURE SWITCH	**WT**	WATER BUFFER TANK ACQUA
EV	SOLENOID VALVE	**PSL**	LOW PRESSURE SWITCH	**BG**	HOT GAS COIL
FSR	FAN SPEED REGULATOR	**PT**	PRESSURE TRANSDUCER	**YVCA**	HUMIDIFIER FILL VALVE
FWV	4-WAY VALVE	**RE**	ELECTRIC HEATER	**YVSA**	HUMIDIFIER DRAIN VALVE

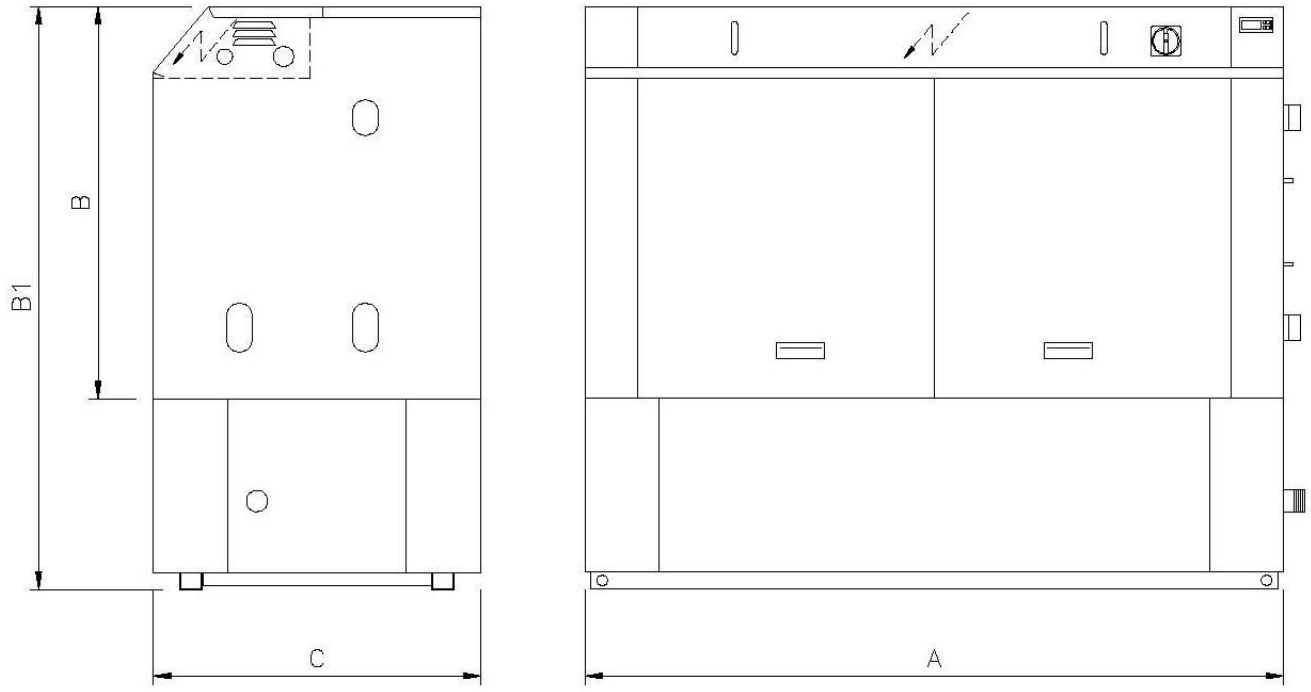
H	HUMIDIFIER	**RV**	MODULATING VALVE		
HR	HEAT RECOVERY	**SA**	LIQUID SEPARATOR		
HT	HUMIDITY PROBE	**SFF**	FREON – FREON HEAT EXCHANGER		
LF	DEHYDRATING FILTER	**SFO**	FREON – OIL HEAT EXCHANGER		
LS	SIGHT GLASS	**SL**	NOISE LEVEL REDUCER		
LT	LIQUID RECEIVER	**SO**	OIL SEPARATOR		
NR	NON-RETURN VALVE	**SV**	SHUT-OFF VALVE		
OF	OIL FILTER	**TS**	SAFETY THERMOSTATIC VALVE		
OLR	OIL LEVEL REGULATOR	**TT**	TEMPERATURE PROBE		
OT	OIL RESERVE	**TWV**	3-WAY VALVE		

3.4 Technical specification

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

3.5 Dimensional drawings

RWE - PWE single circuit

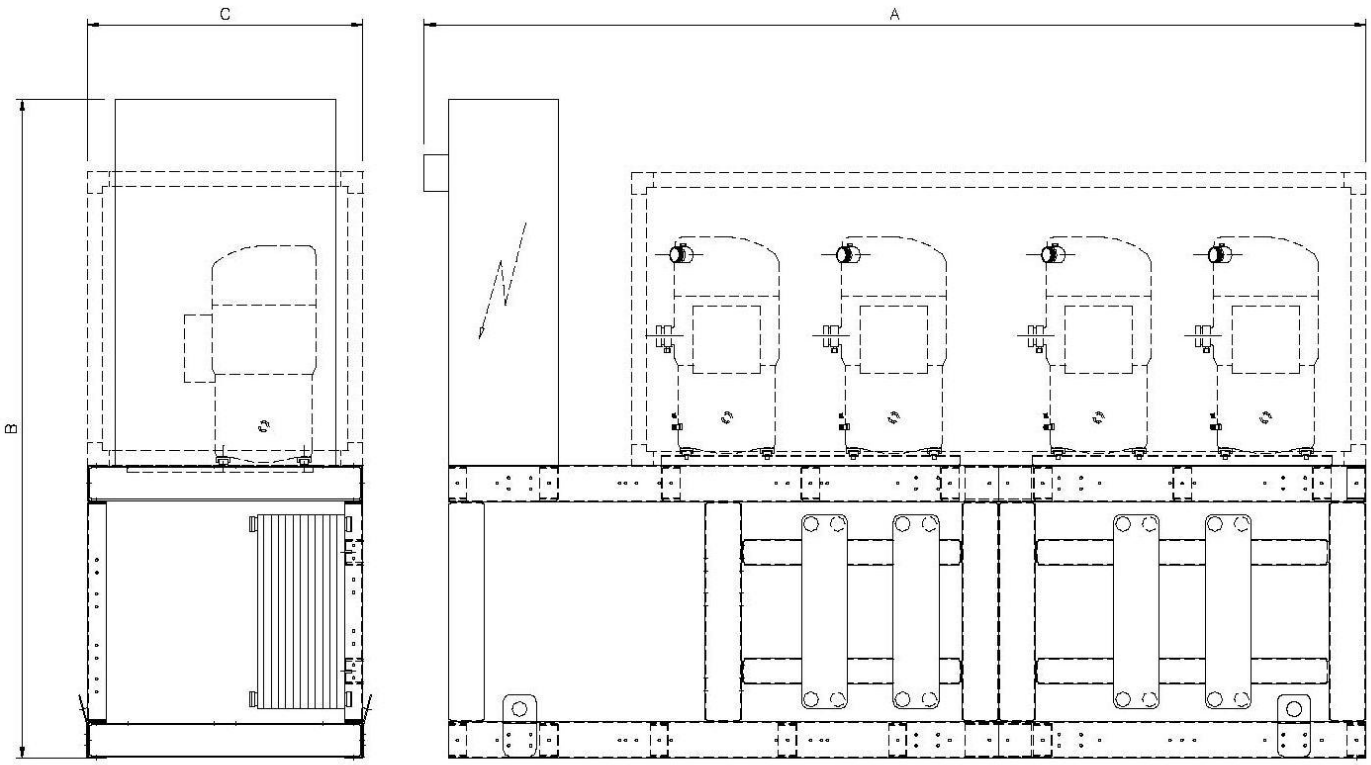


Pict. 7

Model RWE / PWE	Gas type	A	B	B_1*	C
61-111-171-201-221-251-301-381-461	K (R407C)	800	960	1430	500
501-571-751-901	K (R407C)	1600	960	1340	750
151-181-211-271-311	Ka (R134A)	800	960	1430	500
351-421- 521-601	Ka (R134A)	1600	960	1340	750
61-111-161-191-221-271-311-391-461	(R22)	800	960	1340	500
521-601-771-901	(R22)	1600	960	1430	750

* Version with pump and tank

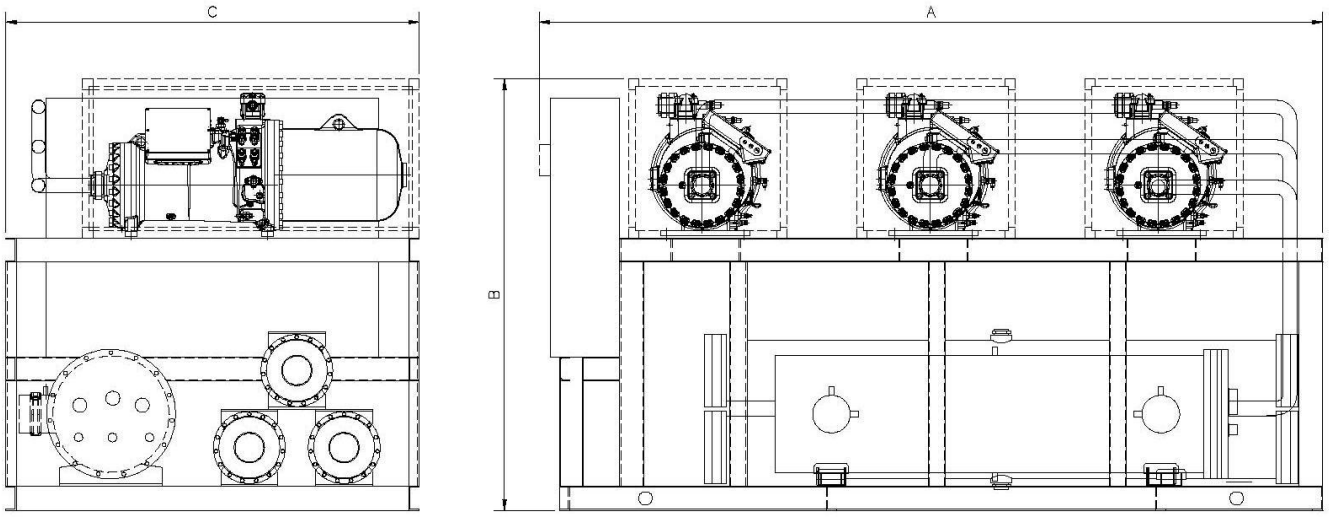
RWE - PWE multicompressor



Pict. 8

Model RWE / PWE	Gas type	A	B	C
541-631-761-931-442-532-612-762-922	K (R407C)	1500	1600	750
1201-1501-1901-1232-1552-1912	K (R407C)	1500	1800	750
892-1082-1212-1512-1852	K (R407C)	2500	1800	750
2462-3102-3822	K (R407C)	3000	1800	750
341-401-491-591-282-352-402-492-592	Ka (R134A)	1500	1600	750
711-971-1201-772-972-1222	Ka (R134A)	1500	1800	750
572-702-802-992-1192	Ka (R134A)	2500	1800	750
1522-1952-2442	Ka (R134A)	3000	1800	750
531-611-741-891-422-522-602-742-892	(R22)	1500	1600	750
1171-1451-1811-1172-1452-1812	(R22)	1500	1800	750
842-1052-1232-1482-1792	(R22)	2500	1800	750
2352-2922-3632	(R22)	3000	1800	750

RWH - PWH mono/multicompressor



Pict. 9

* Dimension including option CFU

Model RWH / PWH	Gas type	A	B *	C
131-161-191	K (R407C)	2430	1525	800
211-241	K (R407C)	2430	1610	850
301-341	K (R407C)	3310	1525	800
391	K (R407C)	3340	1610	850
531-611-691-731-831-	K (R407C)	3700	1900	1300
252-312	K (R407C)	3750	1790	750
372-422-472	K (R407C)	3860	1840	900
592-672-772	K (R407C)	3990	1990	1000
1062-1222-1392-1462-1652	K (R407C)	5200	1300	2450
1933-2203-2493	K (R407C)	5200	2450	2000
91-111-131-151-171	Ka (R134A)	2430	1525	800
211-241-271-321-361	Ka (R134A)	3350	1525	850
421-481-541-621	Ka (R134A)	3700	1900	1300
182-222	Ka (R134A)	3750	1710	750
252-292-332	Ka (R134A)	3860	1790	900
412-472	Ka (R134A)	3860	1840	900
542-642-732	Ka (R134A)	3990	1990	1000
842-972-1092-1232	Ka (R134A)	5200	2450	1300
1253-1453-1633-1793	Ka (R134A)	5200	2450	2000
131-161-191-221-251	(R22)	2430	1530	800
311-361-411	(R22)	3350	1525	850
551-641-731-811-911	(R22)	3700	1900	1300
262-322	(R22)	3750	1710	750
382-442	(R22)	3860	1790	900
502	(R22)	3860	1840	900
622-702	(R22)	3990	1990	1000
812	(R22)	3990	2030	1000
1102-1282-1462-1632-1832-	(R22)	5200	2450	1300
1903-2193-2433-2753	(R22)	5200	2450	2000

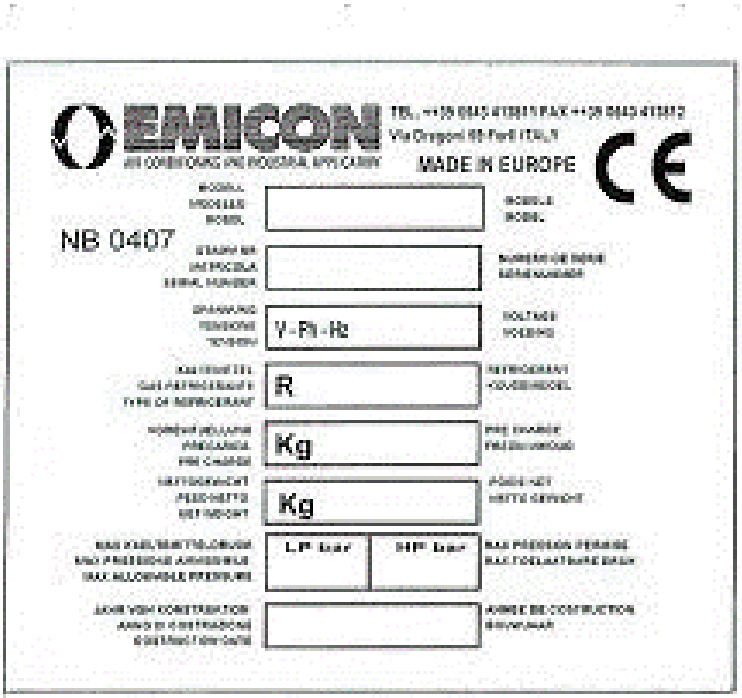
3.6 Main accessories

A: Amperometer
AE: Power supply different from the nominal power.
CA: Condenser for sea water
CC: Insulated condensers
CF: Soundproofed compressors cabinet with standard material
CFU: Soundproofed compressors cabinet with lead material or similar
CL: Soundproofed compressors cabinet with standard material (model RWE monocircuit)
CM: Soundproofed compressors cabinet with lead material or similar (model RWE monocircuit)
CS: Compressor inrush counter
DQ: Additional box for connection of power supplì cables (for units with screw compressors)
DS: Star/Delta compressors startup (units with screw compressors)
HG: Hot gas by-pass.
IE: Fumigated wooden crate packing.
IG: Watch card
IH: Serial interface RS485.
IM: Seawood packing
IR: Packing with fumigated wooden pallet and transparent film
LI: Liquid injection (units with screw compressors)
KS: Lifting kit
MF: Phase monitor
MP: Oversized Microprocessor
MT: High and low pressure gauges (model RWE monocircuit)
MV: Buffer tank; it is composed of: water tank, expansion vessel, safety valve, hydrometer, water charge and discharge valve, air discharge valve. (model RWE monocircuit)
M12: Modulating capacity control for 2-circuit units
M25: Modulating capacity control for 1-circuit units
PA: Rubber vibration dampers
PF: Safety water flow switch
PM: Spring-type vibration dampers
PW: Part-winding compressors startup
PQ: Remote microprocessor
P1: Pump group; expansion vessel, safety valve, hydrometer, water charge and discharge valve, air discharge valve.
P1H: Higher head pressure pump group; expansion vessel, safety valve, hydrometer, water charge and discharge valve, air discharge valve. (model RWE monocircuit)
RA: Antifreeze heater on evaporator.
RF: Power factor correction system cos φ = 0,9
RH: Shut-off valve on compressor suction side
RL: Compressors overload relays.
RP: Partial heat recovery
RT: Total heat recovery.
TC: Victaulic joints and welding coupling for condenser connection to water circuit (units with screw compressors)
TE: Electronic thermostatic valve
RV: Personalised RAL paint (model RWE monocircuit)
SN: Main switch (model RWE monocircuit)
V: Voltmeter.
VB: Brine version (water temperature < 0°C)
VP: Pressostatic valve (model RWE monocircuit)
VS: Solenoid valve.

4. INSTALLATION

4.1 Identification tag

The data for the identification of the unit are marked on a permanent tag (Picture 10).



Picture 10 - 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..

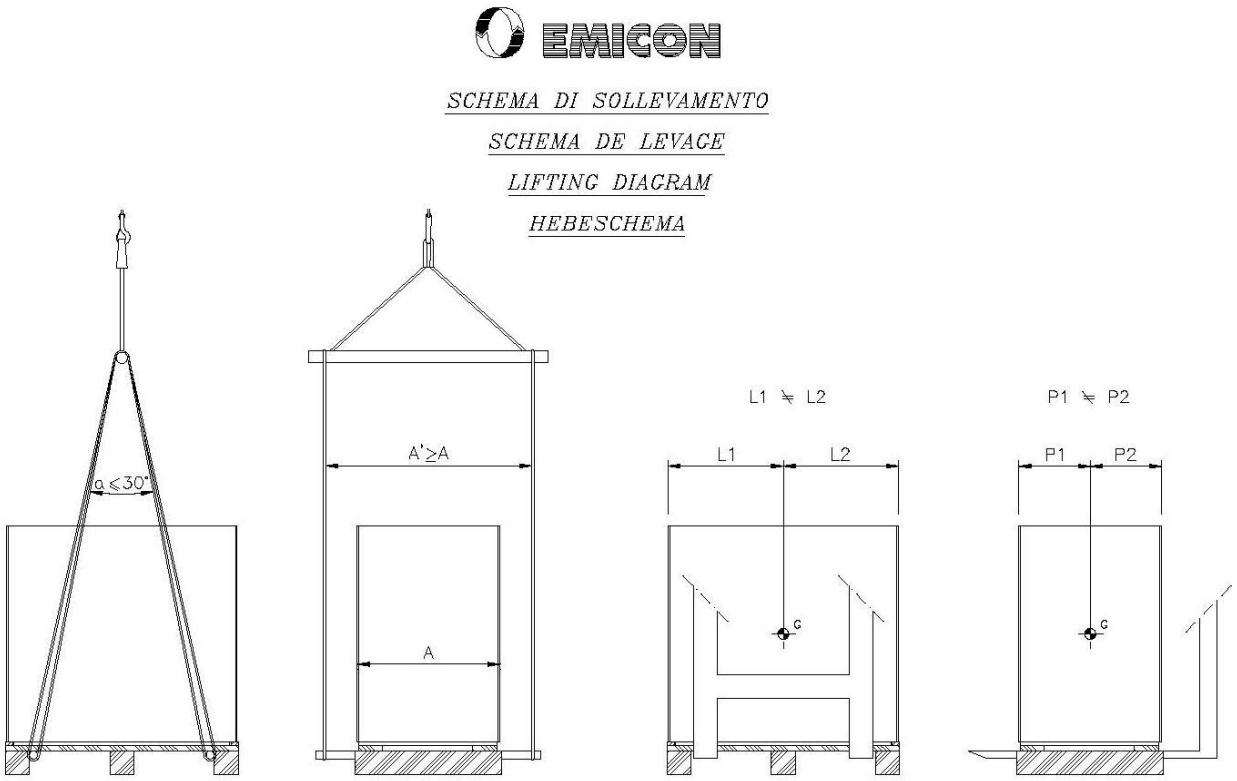
4.3 Handling

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.

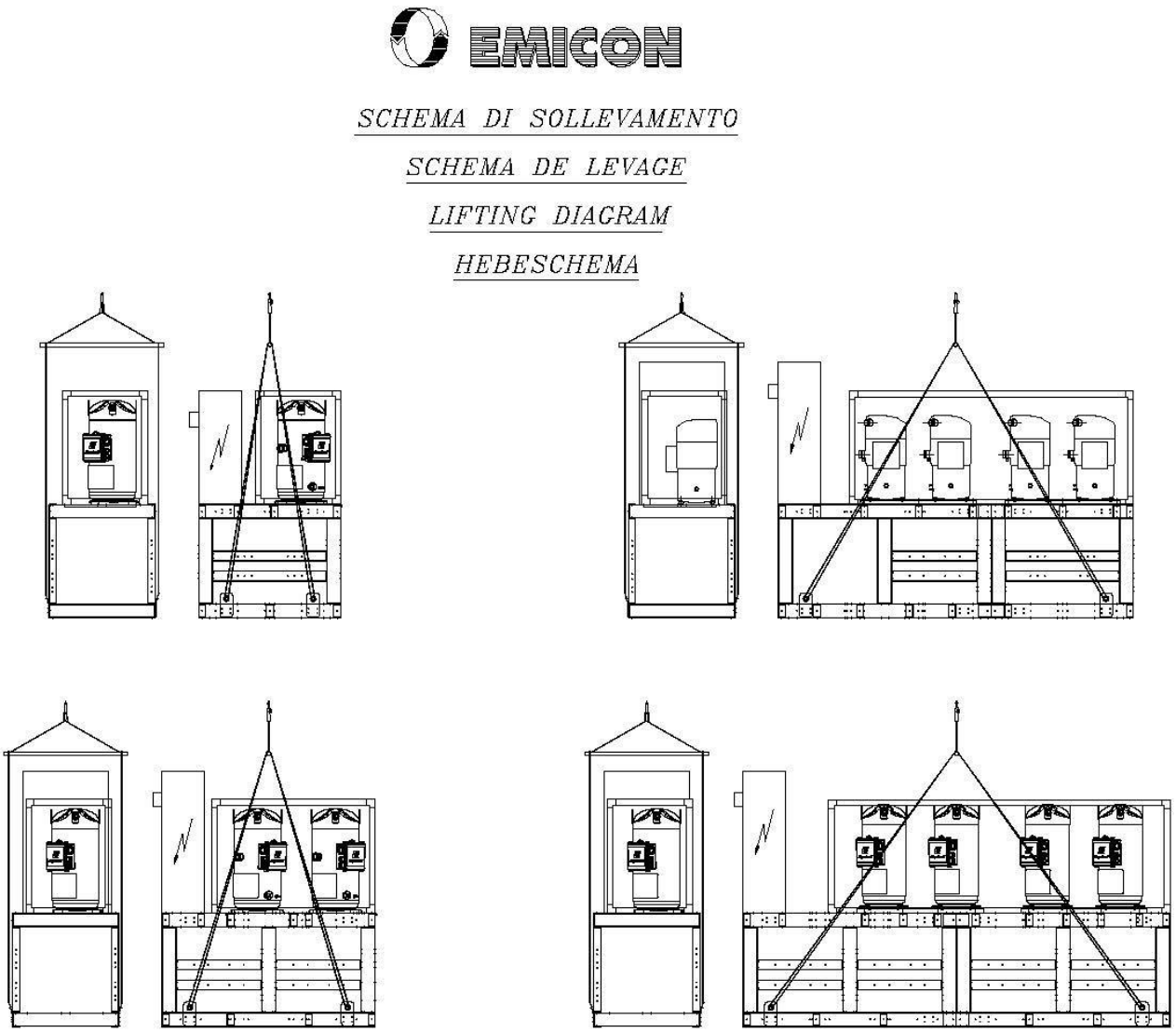
The weight of some models is unbalanced: check the unit stability before starting to handle it.

For any unit handling, please follow the instructions shown in Pictures 11, 12 and 13. 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.

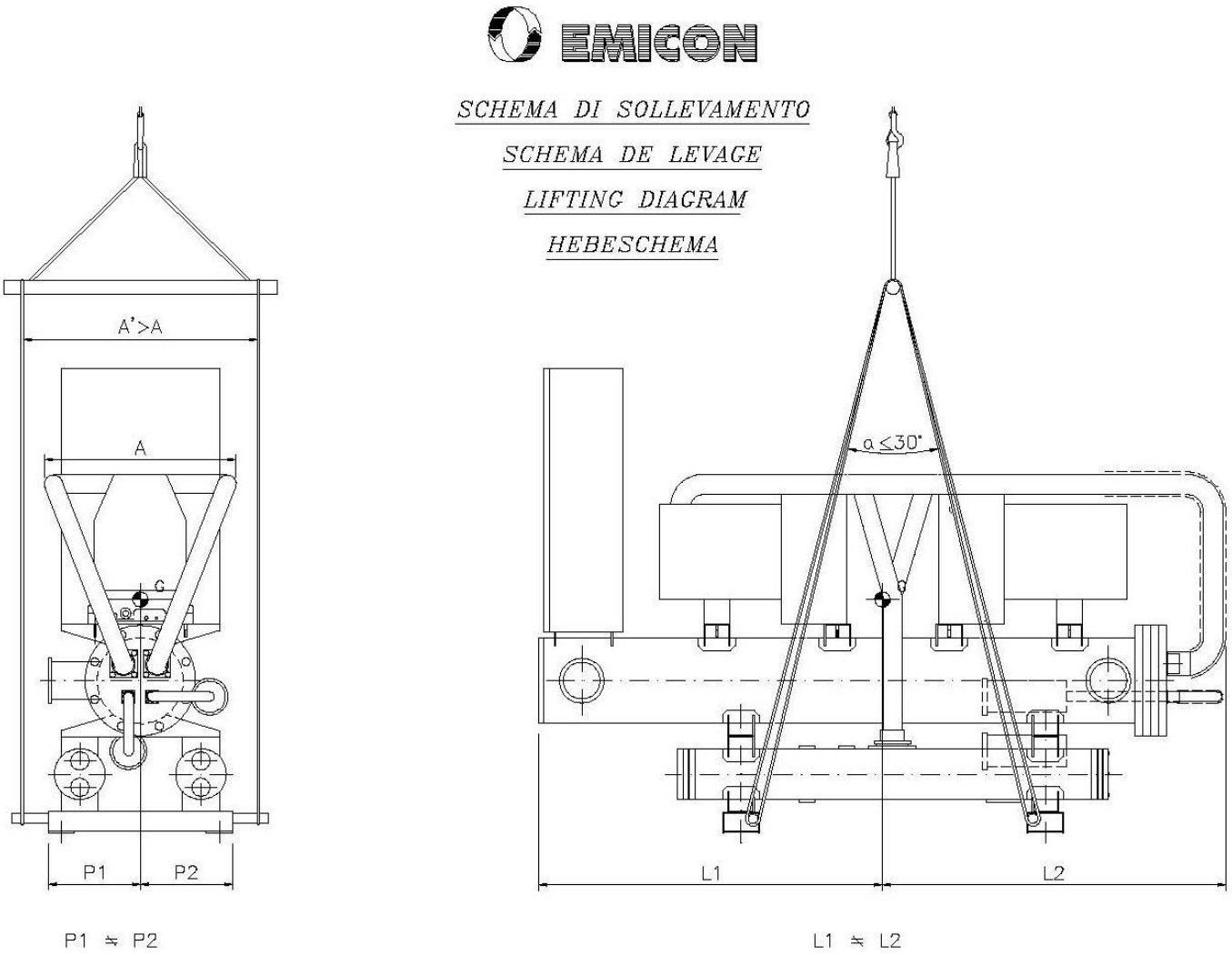
Angle α must not be greater than 30°; the pictures are just as an indication.



Pict. 11 - Lifting of monocircuit units



Pict. 12 - Lifting of scroll multicompressor units



Pict. 13 - Lifting of screw multicompressor units

In case the manufacturer lifting kit (option) is not employed, make sure that the lifting equipment used, the cables and the belts are in compliance with the relevant local regulation.

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

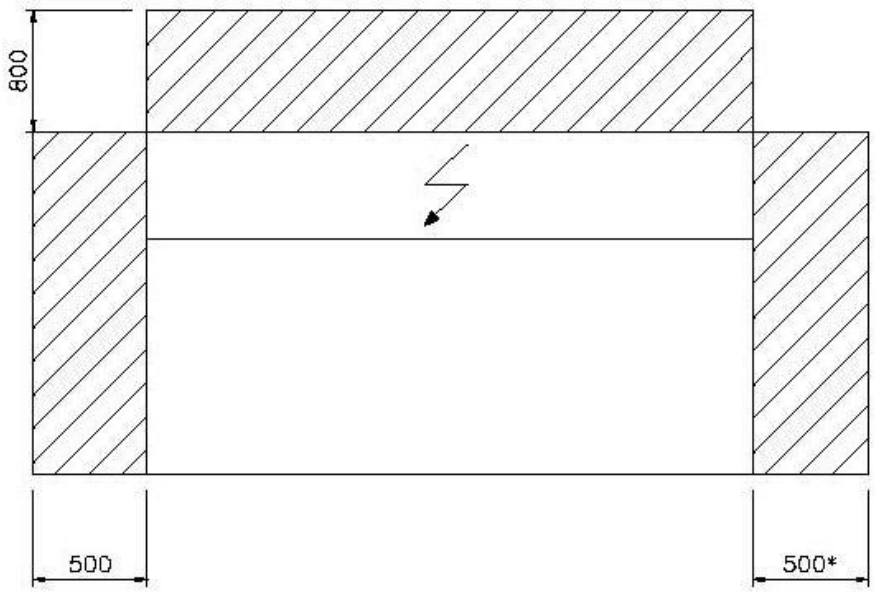
4.4 Arrangements and placing

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 14, 15 and 16, 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.



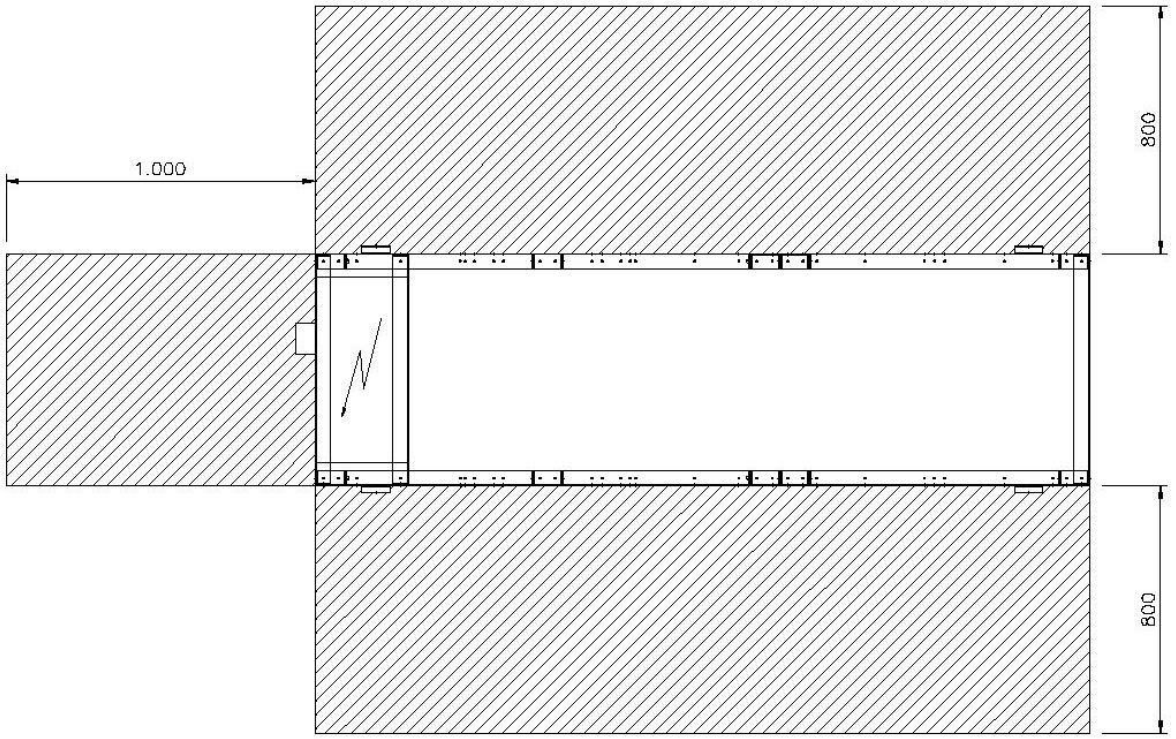
* E' NECESSARIO RISPETTARE QUESTA DISTANZA ANCHE PER IL COLLEGAMENTO IDRAULICO DEI MODELLI CON OPTIONAL RP.

* IL EST NECESSAIRE DE RESPECTER MEME CETTE DISTANCE POUR LA CONNECTION HIDRAULIQUE POUR LES MODELES AVEC LES OPTIONS RP.

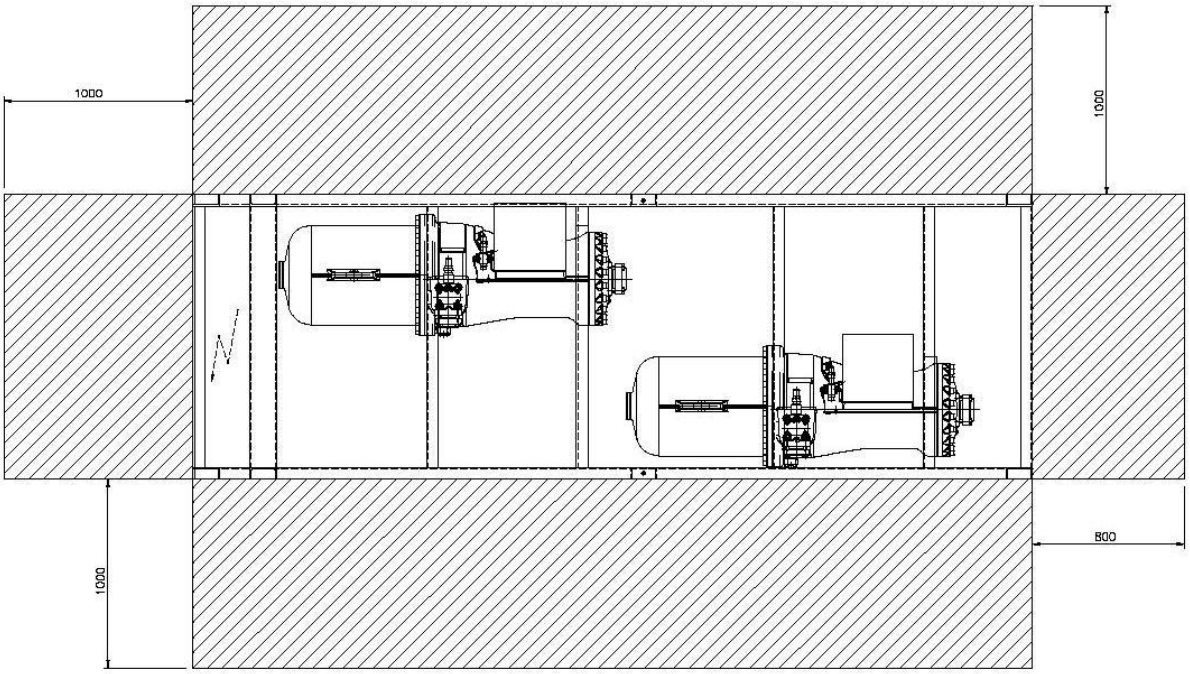
* IT IS NECESSARY TO SAFE THIS DISTANCE TOO, FOR THE HYDRAULIC CONNECTION USING THE MODELS WITH OPTIONAL RP.

* BEI MODELLEN MIT OPTION RP MÜSSEN FUR DEN HIDRAULIK ANSCHLUSS AUCH DIESE ABSTANDE EINGEHALTEN WERDEN.

Pict. 14 - Service Area for monocircuit units



Pict. 15 - Service Area for multicompressor scroll units



Pict. 16 - Service Area for multicompressor screw units

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 Hydraulic connections

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.

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.

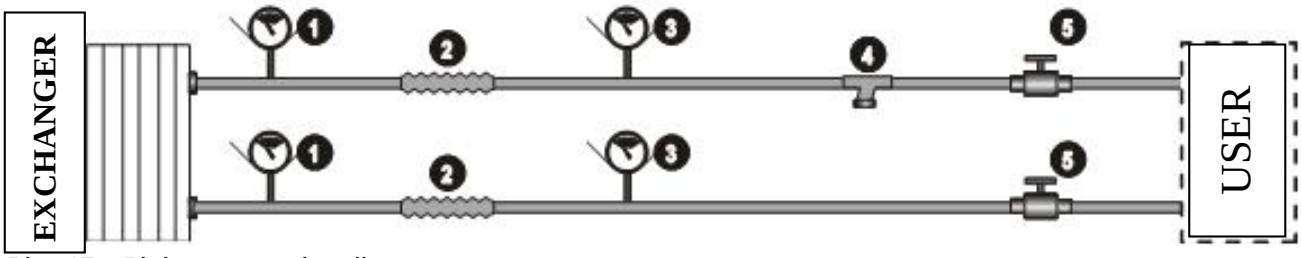
4.5.1 Evaporator

For the connection of pipes to the evaporator, it is advisable to follow the instructions listed here below:

- Ø Connect the pipes as shown in the diagram in Picture 17;
- Ø Employ anti-vibration pipe fittings to avoid any vibration transmission and to allow the thermal expansion;
- Ø Install on the water inlet a filter with grid not larger than 1 mm and with a bigger diameter than the pipe diameter;
- Ø Place the air discharge valves in the appropriate points of the hydraulic system;
- Ø Install a ball check valve on the inlet and outlet so that it is possible to shut off the unit in case of special maintenance operations. The installation of three-piece joints between the valves and the chiller will ease these operations;
- Ø The water system pressure must range between 1,5 and 3,5 bar.
- Ø In case of low evaporating temperatures (< 4°C) it is recommended to employ anti-freeze mixtures (glycol) as shown in the following tables, according to the kind of glycol used:

Percentage of ethylene glycol	5%	10%	15%	20%	25%	30%	35%	40%
Freezing temperature	-1,6	-3,7	-6,1	-8,9	-12,1	-15,8	-19,8	-24,8

Percentage of propylene glycol	5%	10%	15%	20%	25%	30%	35%	40%
Freezing temperature	-1,7	-3,4	-5,3	-7,5	-10	-13,2	-16,8	-21,6



Pict. 17 - Piping connection diagram

Keys:
1. Manometers
2. AV Mounts
3. Thermometers
4. Filters
5. Valves

If the anti-freeze mixture contains a lower ethylene glycol percentage than below recommended, there could be risks of freezing, while a higher percentage can reduce the unit performance. At the beginning of every winter, it is recommended to check the correct concentration of glycol in the system.

Do not use anti-freeze liquids unsuited to copper, stainless steel and to all other materials present in the system.

The cooled water system must be heat insulated with closed-cells material having adequate features of heat insulation and steam resistance for the unit operating conditions.

4.5.2 Condenser

Keeping in mind the instructions previously given for the installation of the evaporator connection piping, while connecting the condenser it must be remembered that 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.

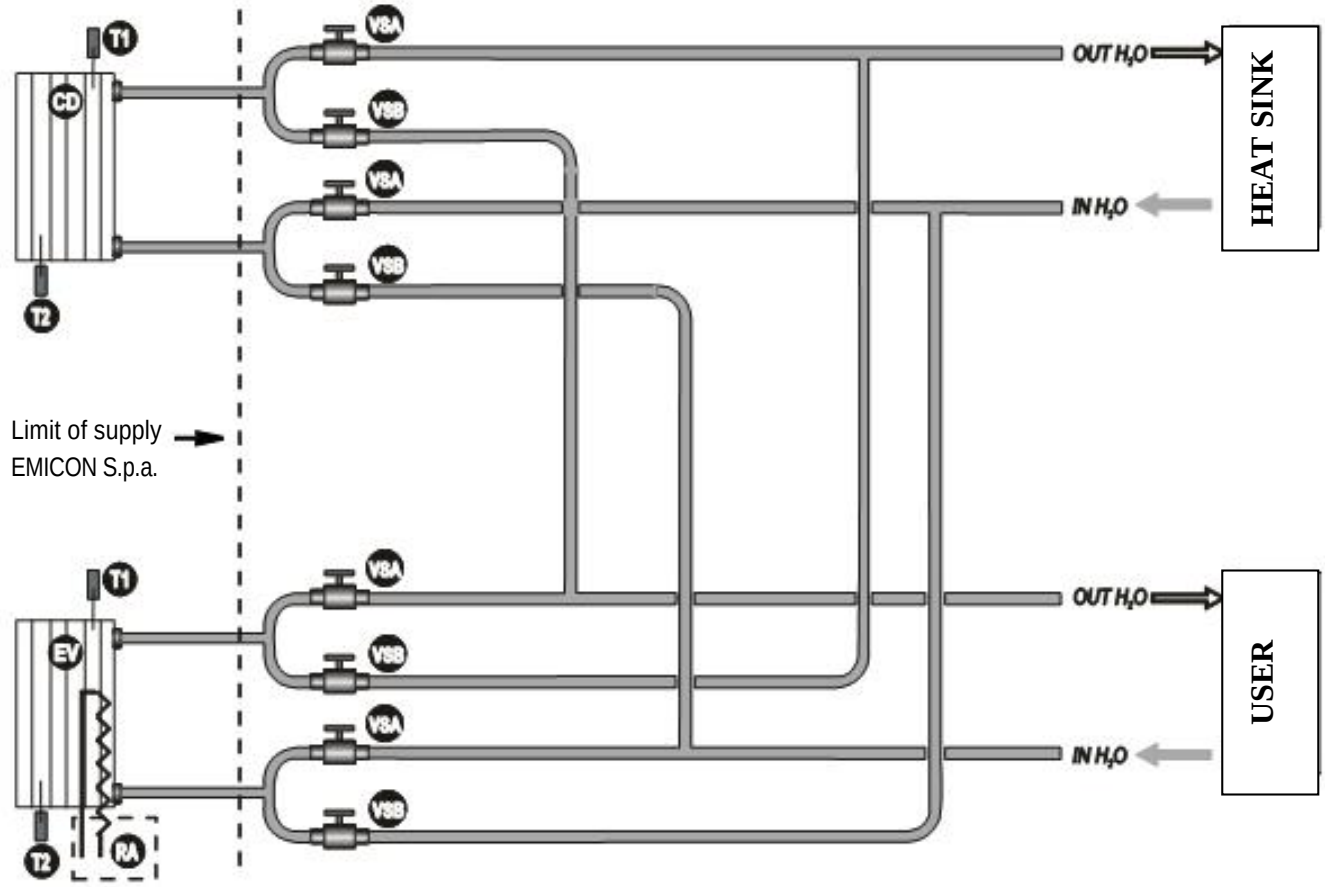
4.5.3 Hydraulic connections for heat pumps PWE / PWH

For the PWE heat pumps with cycle inversion on the hydraulic circuit, the following situation is present:

- Ø Summer operation: the cold water produced in the evaporator, is sent to the user, while the hot water produced in the condenser is sent to an exchanger where the accumulated heat can be dissipated.
- Ø Winter operation: the hot water produced in the condenser is sent to the user, while the cold water produced in the evaporator is sent to an exchanger where the released heat is absorbed .

In order this operation to take place in practice, the hydraulic system must be realized following the principle scheme shown in Pict. 18; the circuit can be manufactured using manual or automatic 2 or 3 way valves.

Avoiding the unit to operate with lack of water flow in the exchangers is of extreme importance.



Pict. 18 - Scheme of Cycle inversion on water side

Option

Key:

CD	Condenser
VSA	Valve (summer open - winter closed)
VSB	Valve (summer closed - winter open)
EV	Evaporator
RA	Heater on evaporator
T1	Inlet temperature
T2	Anti-freeze probe
T3	Condenser inlet temperature

4.5.4 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 circuit 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..

In case filling is done manually, stop the water charge and start the circulating pumps so that any presence of air can be gathered in the top points where air discharge valves are present. After two operating hours, stop the pumps and discharge the air by means of the air discharge valves. Charge more water to bring pressure back to its orginal value. Repeat the operation until no air goes out from the air discharge valves.

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

4.6 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.

4.6.1 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.

4.6.2 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. - 19

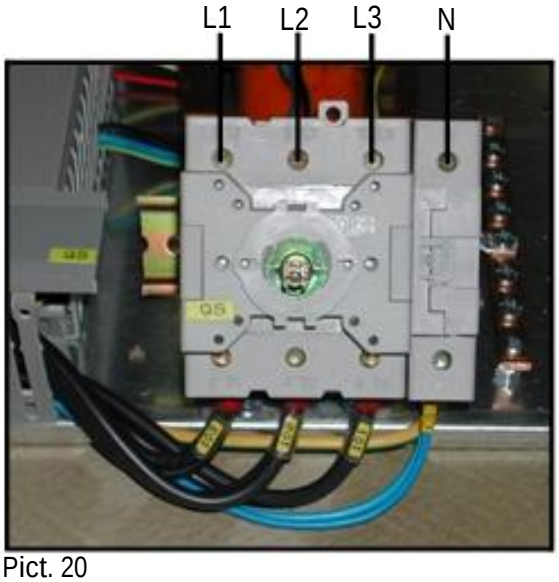
Once the test is completed, it is reminded to re-connect the battery to bring the unit back to a safety condition

4.6.3 User's terminal board connection

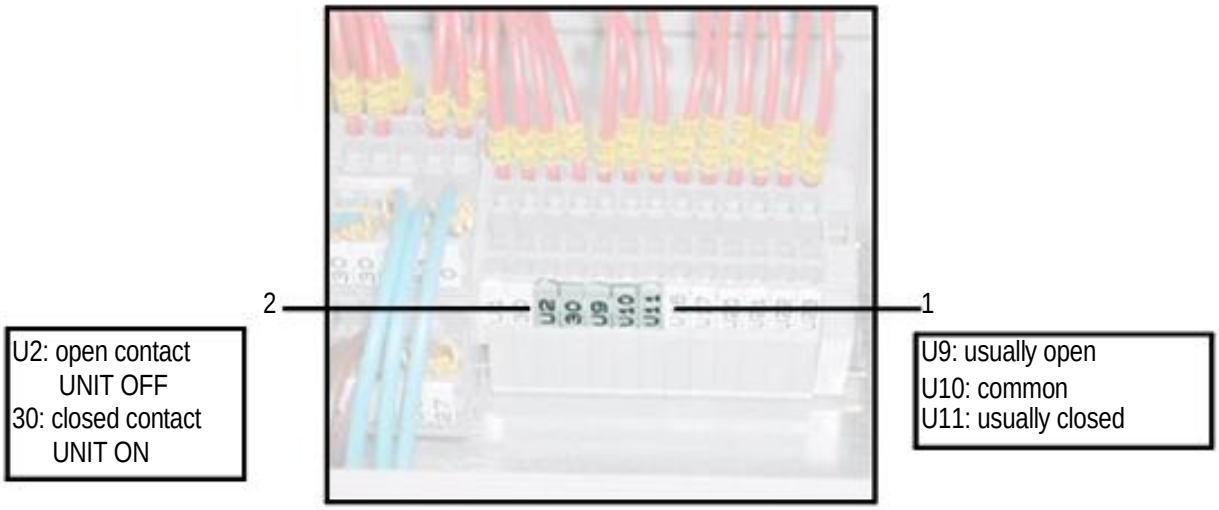
A user terminal board (Pict. 21) is available with free contacts designed for:

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

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



Pict. 20



Pict. 21

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 connections are carried out following the use and maintenance manual;
- Ø The hydraulic circuit is charged and air free;
- 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.

If a 3-phase scroll compressor is installed on the unit, when starting, check the 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).

The standard units are designed to work with an outlet cooled water temperature higher than 5°C; for operation at lower temperatures, use anti-freezing solutions having adequate properties. If necessary, set the anti-freeze set point.

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
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
	C) The microprocessor does not start the unit	Check the electric connections to the microprocessor and the setpoint
	D) The external impulse to the microprocessor fails	Check the remote ON/OFF contact is closed
2. Cooled water temperature too high	A) The unit does not work	See trouble 1
	B) The control system setting is not correct	Check the setting of the control system
	C) The compressor does not work	See trouble 11
	D) The compressor output is not sufficient	See troubles 7 and 10
	E) The control system does not work	Check the attached Microprocessor manual
	F) Thermal load higher than estimated	Check the thermal load value
3. Cooled water temperature too low	A) The control system setting is not correct	Check the setting of the control system
	B) The control system does not work	Check the attached Microprocessor manual
	C) The cooled water flow capacity is too low	See trouble 4
4. Cooled water/condensing water flow too low	A) The water pump does not work	Check the pump electric connections
	B) Pressure drop in the hydraulic system higher than estimated	Check the pressure drop and compare it with the pump head pressure
	C) The pump heat protection is activated	Check pump winding electric resistance; after reset, check tension and electric absorption
	D) Obstruction in the hydraulic circuit	Make sure filters are not clogged; check the shut-off valves on the circuit are open.
	E) Air presence in the hydraulic circuit	Discharge the air by means of the air discharge valves on the hydraulic circuit

TROUBLE	POSSIBLE CAUSE	CORRECTIVE ACTION
5. The high pressure switch is activated	A) The high pressure switch is not set properly or is defective	Replace the high pressure switch or reset it
	B) Discharge pressure too high	See trouble 7
	C) The condensing water flow capacity is not sufficient	See trouble 4
6. The low pressure switch is activated	A) The low pressure switch is not set properly	Replace the low pressure switch or reset it
	B) The cooled water flow capacity is not sufficient	See trouble 4
	C) Suction pressure too low	See trouble 10
7. High compressor discharge pressure	A) Suction pressure too high	See trouble 9
	B) The finned heat exchanger is dirty	Remove the obstructing material (leaves, paper, seeds, etc.)
	C) Circuit charged with too much refrigerant	High refrigerant undercooling: discharge some refrigerant from the circuit
	D) Non-condensable air or gas in the circuit	The flow sight glass shows gas bubbles. The compressor discharge temperature is high; the cooling circuit must be discharged and recharged after the vacuum execution.
	E) Too hot water at the condenser	Check capacity of the condensation water cooling system
	F) Condensing water flow capacity insufficient	See trouble 4
	G) Encrusted condenser	Wash the exchanger with suitable products
8. Low compressor discharge pressure	A) The control system of the condensation pressure is not working properly	Check setting and operation of the thermostatic valve
	B) Suction pressure too low	See trouble 10
9. High compressor suction pressure	A) Thermal load higher than estimated	Check the room thermal load value
	B) Discharge pressure too high	See trouble 7
	C) Liquid refrigerant return to the compressor suction side	Make sure the thermostatic valve overheating is correct; check the valve bulb is properly placed, fixed and insulated.
10. Low compressor suction pressure	A) Cooled water temperature too low	See trouble 3
	B) Cooled water flow capacity too low	See trouble 4
	C) Clogged refrigerant filter	Check the refrigerant filter
	D) The thermostatic valve is not set properly or is defective	Check the thermostatic valve overheating is correct; check the thermostatic element is not damaged
	E) Refrigerant charge is insufficient	Check possible leakage and recharge
	F) Discharge pressure too low	See trouble 8

TROUBLE	POSSIBLE CAUSE	CORRECTIVE ACTION
11. The compressor does not work	A Automatic switch activated	Reset the automatic switch; check the cause for the activation
	B) Compressor internal heat protection activated	Check the compressor winding resistance; after reset, check the tension and the electric absorption; check the working parameters are in the nominal range of values.
	C) The contactor does not work	Check the contacts and the contactor coil
12. The compressor is noisy	A) Liquid return to the compressor	Check the thermostatic valve overheating is correct; check the valve bulb is properly placed, fixed and insulated.
	B) The compressor is damaged	Replace the compressor
13. Probe alarm	A) The probe corresponding to the alarm code is defective or disconnected	Check the probe connection and if it works; in case of defect, replace it.

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 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.

5.6.4 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. 22) by means of a thermometer (Pict. 23).
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. 24 cap removal and Pict. 25 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. 22

Pict. 23

Pict. 24

Pict. 25

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

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.

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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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