



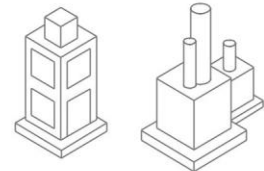
R410A

R134A

R454B

RWE-PWE Kc/ Ka /Kr

WATER COOLED CHILLERS AND HEAT PUMPS WITH SCROLL COMPRESSORS



Range 50-475 kW



- ▶ Chillers and heat pumps.
- ▶ Packaged internal installation.
- ▶ Scroll compressors.
- ▶ Waterside cycle inversion.
- ▶ Maximum efficiency at lower sound emission.
- ▶ Wide range of option.

Use and maintenance Book

Rev. 2.0 03/21



Management System
 ISO 9001:2015
 ISO 14001:2015
 OHSAS 18001:2007



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 ID 9108645668

SUMMARY

1.	INTRODUCTION	4
1.1	Note	4
1.2	Symbols	4
1.3	Reference laws and norms	4
1.4	Identification tag	5
1.5	Warranty	6
1.6	Manual receiver	6
1.7	Personnel requirement	6
1.8	Dangerous areas	6
2.	DESCRIPTION	7
2.1	Nomenclature	7
2.2	RWE – PWE Kc-Ka-Kr Series Version	7
2.3	Models with partial and total heat recovery (RP / RT option)	7
2.4	Main components	8
2.5	Factory tests	10
2.5	Options	11
2.6	Functional diagram	12
2.7	Wiring diagram	13
2.8	Sound level	13
2.9	Dimensional diagram and weight tables	13
3.	INSTALLATION	14
3.1	Identification	14
3.2	Receipt and inspection	14
3.3	Handling	14
3.4	Positioning	15
3.5	Hydraulic circuit	16
3.5.1	Hydraulic connections diameters	16
3.5.2	Hydraulic connections - Evaporator	17
3.5.3	Hydraulic connections - Condenser	17
3.5.4	Heat pumps hydraulic connections - PWE Kc-Ka-Kr Series Version	18
3.5.5	Chemical-physical properties of water	19
3.5.6	Hydraulic circuit filling	20
3.5.7	Antifreeze mixture use	20
3.6	Electric connections	21
3.6.1	Connection the power supply	21
3.6.2	User side terminal box connections	21
3.7	Freon safety valves	22
3.8	RWE/PWE Kc-Ka-Kr application range	23
4.	OPERATION	24
4.1	Documentation	24
4.2	Preliminary checks	24
4.3	First start-up	25
4.3.1	Switching on	25
4.3.2	Switching off	26
4.4	MICROPROCESSOR REGULATION	26
5.	MAINTENANCE	27
5.1	Routine Maintenance	27
5.1.1	Leak detection	28
5.1.2	Safety pressure switches check	28
5.1.3	Safety valves check	28

5.1.4	Check of fluid to be refrigerated	28
5.1.5	Noise and vibration check	28
5.1.6	Leakage sensor check and calibration	28
5.2	Ordinary Maintenance	29
5.2.1	Overcurrent protection devices check	29
5.2.2	Contactors check	30-31
5.3	Troubleshooting	32-33
5.4	Extraordinary Maintenance	34
6.	DEMOLITION AND DISPOSAL	34

1. INTRODUCTION

The RWE/PWE Kc – Ka - Kr Series units, operating with R410a (Kc), R134a (Ka) e R454B (Kr) refrigerants, are water cooled chillers and heat pumps, with high efficiency plates exchanger and hermetic scroll compressors working on single circuit or double circuit, single or tandem configuration, depending on the cooling capacity of the unit.

They are suitable for indoor installations, particularly indicated for small or medium sized air-conditioning systems, servicing multiple dwellings or commercial installations where a water ring for heat disposal is available.

The production of hot water, in the heap pump version, is made by waterside inversion (not on the gas side) to be carried out by the customer during installation.

1.1 Note

The present handbook, originally written in Italian, is made in accordance with the European legislation. It contains all the necessary information to carry out without any risk transport, installation, commissioning, operation, regulation, maintenance and dismantling of the unit.

All people authorized to operate on the unit, in particular, all technicians in charge of the unit maintenance, must know all information and instructions contained in this handbook and all its attachments.

The failure to comply with the instructions contained in this manual regarding the installation, commissioning, operation, regulation, maintenance and dismantling of the unit, could be unsafe for people and could damage objects and environment.

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

The unit has to be installed, handled, subject to maintenance, repaired and dismantled in compliance with local technical standards.

1.2 Symbols

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



IT INDICATES A FORBIDDEN INTERVENTION, AS IT COULD PREJUDICE THE CORRECT UNIT OPERATION.



IT INDICATES AN IMPORTANT WARNING FOR THE CORRECT UNIT MANAGEMENT.



IT INDICATES A DANGER TO PEOPLE, OBJECTS OR ENVIRONMENT.



IT INDICATES ELECTRICAL RISK FOR PEOPLE, OBJECTS OR ENVIRONMENT.

1.3 Reference Laws and Norms

Unless differently stated on the order, the unit of this Handbook is manufactured in compliance with the relevant European Directives and in particular, it meets the Essential Safety requirements of the following directives:


- 2014/68/EU (PED),
- 2004/108/CE (Electromagnetic compatibility),
- 2006/42/CE (Machinery Directive),
- 2006/95/CE (Low tension Directive).

As required, compliance with the aforementioned directives is attested by the Declarations of Conformity and highlighted by the CE mark, represented on the Identification Tag of the group described in the following paragraphs.

To ensure compliance of the unit with the aforementioned directives, the same is designed, constructed and tested in accordance with the provisions of the harmonized standards listed in the aforementioned certificates of conformity.


1.4 Identification Tag

The unit is identified by an indelible label on the external panel of the electrical cabinet (henceforth Identification Tag). Here below an example of the Identification Tag, showing and describing all the information, in compliance with the applicable European directives.

1  AIR CONDITIONING AND INDUSTRIAL APPLICATION

TEL.+39 0543495611 FAX+39 0543 495612

Via A.Volta 49 Meldola FC ITALY

2  NB 0948

3 MODELLO / MODEL / MODELE / MODEL ANNO DI COSTRUZIONE / PED CATEGORIA / MANUFACTURE YEAR / PED CATEGORY / JAHR VON KONSTRUKT / PED KATEGORIE / ANNI DE FABBRICA / CATEGORIE PED 2018


4 MATRICOLA / SERIAL NR / N° DE SERIE / STAMM NR CORRENTE MAX. / MAX CURRENT INPUT / MAXIMALEN STROM / AMPERES MAXIMALE A

5 ALIMENTAZIONE ELET. / SUPPLY VOLTAGE / ALIMENTATION ELECT. / SPANNUNG CARICA REFRIGERANTE / REFRIGERANT CHARGE / KALTEMITTEL / CHARGE FRIGORIGENE

C1	C2	Kg.
C1	C2	CO2 Ton

6 GAS REFRIGERAN / REFRIGERANT / REFRIGERANT / KALTEMITTEL R 410A / 2088 ASSORBIMENTO ELETTRICO / NOMINALE / PUISSANCE ELECTRIQUE3 / NOMINALE / NOMINAL ABSORBED POWER / NOMINALE LEISTUNGS-AUFNAHME kW

7 PESO OPERATIVO / OPERATING WEIGHT / POIDS OPERATION / ARBEITSGEWICHT Kg. CORRENTE CORTO CIRCUITO / SHORT CIRCUIT CURRENT / COURANT COURT-CIRCUIT / STROM KURZSCHLUSS 10 kA



1	Name and address of Manufacturer
2	CE mark and the Notified Organization identification number which released the PED certification
3	Model
4	Serial number
5	Supply voltage
6	Refrigerant
7	Operating weight
8	Manufacture year / PED category
9	Max current input
10	Refrigerant charge
11	Nominal absorbed power
12	Short circuit current
13	Design pressure
14	Min. design temperature
15	Max design temperature
16	Design pressure
17	Min. design temperature
18	Max. design temperature
19	Setting of safety device

<p>13 LATO BASSA PRESSIONE / LOW PRESSURE SIDE / CIRCUIT BASSE PRESSION / NIEDERDRUCKSEITE</p> <p>PRESSIONE DI PROGETTO / DESING PRESSURE / PRESSION DE PROJET / DRUCK DES PROJEKTES <input type="text"/> 29,5 Bar</p> <p>TEMP. MIN PROGETTO / MINI DESING TEMPERATURE / KLEINSTE TEMP. DES PROJEKTES / TEMP. MOINORE DE PROJET <input type="text"/> - 30 °C</p> <p>MAX TEMPERATURA PROGETTO / MAX DESING TEMPERATURE / MAXIMALE TEMP. DES PROJEKTES / MAXIMUM TEMP DE PROJET <input type="text"/> + 50 °C</p>	<p>16 LATO ALTA PRESSIONE / HIGH PRESSURE SIDE / CIRCUIT HAUTE PRESSION / HOCHDRUCKSEITE</p> <p>PRESSIONE DI PROGETTO PS / DESING PRESSURE PS / PRESSION DE PROJET PS / DRUCK DES PROJEKTES PS <input type="text"/> Bar</p> <p>TEMP. MIN PROGETTO / MINI DESING TEMPERATURE / KLEINSTE TEMP. DES PROJEKTES / TEMP. MOINORE DE PROJET <input type="text"/> - 10 °C</p> <p>MAX TEMPERATURA PROGETTO / MAX DESING TEMPERATURE / MAXIMALE TEMP. DES PROJEKTES / MAXIMUM TEMP DE PROJET <input type="text"/> +120 GAS °C <input type="text"/> + 65 LIQU °C</p> <p>19 TARATURA / ORGANO SICUREZZA / SETTING OF SAFETY / DEVISE / MISE AU POINT DISPOSITIF DE SECURITE / EINSTELLWERT / SICHERHEITSELEMENT <input type="text"/> Bar</p>
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- "apparecchiatura che contiene gas fluorurati ad effetto serra disciplinati dal protocollo di Kyoto"

- "equipment that contains fluorinated greenhouse gases covered by the Kyoto protocol"

- "équipement qui contient des gaz fluorés à effet de serre couverts par le protocole de Kyoto"

- "Maschine die enthalt fluorierte Treibhausgase enthalt durch das Kyoto-protokoll fallen"

1.5 Warranty

The Manufacturer guarantees the unit, in compliance with his Sales Conditions and, eventually, with the contract agreements.



The Manufacturer warranty will decay if you are not scrupulously respecting the instructions of this Handbook.

The Manufacturer declines any responsibility for possible damages to people, animals, objects or environment due to any wrong installation, maintenance or regulation, i.e. to a misuse of the equipment; it is considered a misuse any use of the unit not clearly stated in the Handbook.



During the Commissioning of the unit, please duly fulfil the Commissioning Report attached to the Handbook and send a copy to the Manufacturer in order to make the Warranty effective.

1.6 Manual receiver

This manual and all its attachments are supplied with the unit.

The machine's owner or the person in charge of the unit must keep this manual in a suitable place. On this purpose, this manual is supplied in a plastic bag, placed inside of the electric panel board of 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 in charge of the maintenance must be aware all information and instructions of this manual.



The failure in following the instructions contained in this Handbook during installation, operation, maintenance, repairing and disposal of the unit could cause damages to people, objects or environment.

In case you lost or deteriorate the manual, please ask the Manufacturer for a new copy.

1.7 Personnel requirement

Any intervention on the unit, especially on the cooling circuit, must be carried out by qualified and well-instructed personnel, who must be suitably equipped with individual protective devices and trained to the refrigerant use, in compliance with current local Laws and Regulations in force.

Personnel with a deep knowledge and experience on cooling system must supervise all the maintenance operations and interventions requiring personnel with different special skills (such as welders, electricians, programmers, etc.)

The personnel operating with refrigerant fluids must be suitably trained to achieve the required skill for a safe use of these substances. This includes, besides those stated by current local laws, the following competences

- Current local laws, Regulations and Standards concerning refrigerant knowledge;
- Deep knowledge and suitable training on refrigerant and required protective devices use;
- Knowledge and training on leakages prevention, as well as on cylinders use, leakages detection, refrigerant recycling and disposal;
- The personal must be able to understand and apply the local applicable laws

To keep these skills updated, the personnel must be regularly and periodically trained, in compliance with the local laws in force.

1.8 Dangerous areas

Inside the unit, there could be areas subject to residual risks, such as:

- Devices subject to electrical voltage;
- Mechanical moving parts;
- High temperature surfaces;
- Sharp edges and sharp items;
- Components containing high-pressure fluids.

If possible, you have to prevent the access to dangerous components by protecting them by suitable covers, which can be removed by qualified and suitably instructed personnel only.

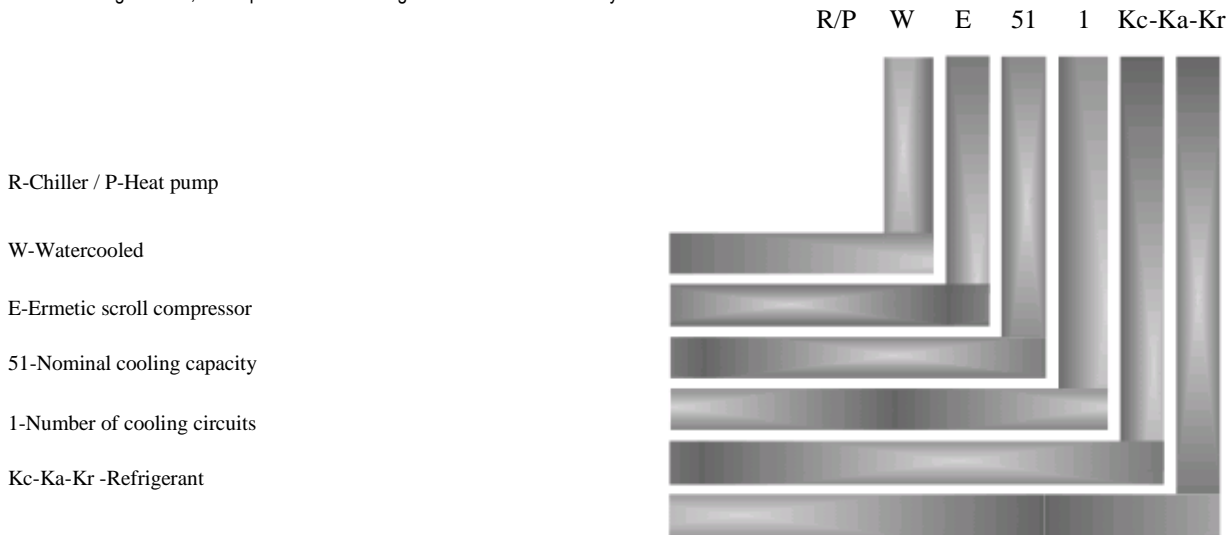
If the a.m. protections are not present, the dangerous areas are clearly marked.

Models RWE-PWE Kr are charged with ecological low –GWP R454B refrigerant. According to PED Directive, it is classified as Group 1 and, according to EN 378 standard, belonging to A2l safety class (Non-toxic and slightly flammable fluids).

2. DESCRIPTION

2.1 Nomenclature

In the following scheme, it is explained the meaning of the device name acronym



The nominal cooling capacity is referred to evaporator IN/OUT water temperature 12/7°C and condenser IN/OUT water temperature 30/35°C.

2.2 Versions of RWE - PWE Kc – Ka - Kr Series

RWE – PWE Kc – Kr Series are only available in Standard Version. RWE-PWE Ka series is available in Standard and High Temperature (HT) version.

2.3 Models with partial and total heat recovery (RP/RT options)

MODELS WITH TOTAL HEAT RECOVERY (RT)

Each model of RWE – PWE Kc – Ka - Kr series, on demand, is available with total heat recovery (RT option). In this configuration, each cooling circuit is equipped with a refrigerant/water plates exchanger on gas discharge side. This exchanger, positioned in parallel to the water cooled condenser, is sized so to recover 100% of the condensing heat for production of hot/warm sanitary water or other.

MODELS WITH PARTIAL HEAT RECOVERY (RP)

Each model of RWE – PWE Kc – Ka - Kr series, on demand, is available with desuperheater (RP option). In this configuration, each cooling circuit is equipped with a refrigerant/water plates exchanger on gas discharge side. This exchanger, installed in series and before the water cooled condenser, is designed to recover about 20% of the condensing heat for production of hot/warm sanitary water.

2.4 Main components

FRAME

The structure is built by robust steel pressed and bent profiles, and then painted in RAL 7035 colour. All the unit's components, including the accessories available (such as the additional heat exchanger for the partial or total recovery of the condensation heat RP or RT) are integral with the structure and mounted on sight. The structural elements are assembled together so as to constitute a sturdy frame, able to support the components of the unit and to withstand the stresses that may arise during the handling and operation of the unit

On demand, in the case in which is necessary to reduce the sound level of the units, it is possible to request the soundproofing of the compressors, realized by a structure in extruded and anodised aluminium profiles, padded with aluminium alloy panels, coated with sound-proof material of a standard or higher thickness (CF or CFU option).

COMPRESSORS

High efficiency scroll compressors with orbiting-spirals (EER 3,37 at ARI conditions) for refrigerant R410A, R134a, R454B, with direct start motor and low sound level, complete with built-in thermistor with manual reset protecting them from overloads. The compressors in single or tandem configuration are installed on rubber anti-vibration dampers, polyester oil charged and provided with crankcase heater. For units with two cooling circuits, the operation of the unit at 50% of its cooling capacity is anyway granted in case of problem on one of two circuits. During partial loads operations, the microprocessor on board is able to manage the start and stop of compressors in order to guarantee the required capacity at the maximum efficiency levels.

EVAPORATOR AND CONDENSER

Evaporator and condenser are of the brazed stainless steel AISI 316 plate type, single circuit or double circuit version, referring to unit type. The exchangers are optimized for R410A, R134a and R454B refrigerant use with plate dimensions and corrugation such as to ensure low temperature approaches in order to guarantee maximum efficiency. The evaporator is supplied insulated with closed cell polyurethane foam mat to prevent condensation and to contain thermal dispersions and is equipped with thermometric pockets on the waterside inlet end outlet and drain connections.

The max operating pressure are 10barg for the waterside and 42barg for refrigerant side.

COOLING CIRCUIT

Each cooling circuit of RWE /PWE Kc series is equipped with:

- Dryer filter;
- Sight glass;
- Mechanical thermostatic valve;
- Certified safety valve on high pressure side (if required);
- Shut-off valve on liquid line;
- High and low pressure gauges
- High and low pressure switch
- Temperature probes on inlet and outlet of evaporator.

The above-mentioned components are connected in a close circuit through copper pipes and connections. The permanent junctions among components are realized by brazing or welding operations, according to qualified processes and made by qualified personnel.

LEAK DETECTION SENSOR (For RWE-PWE Kr only)

At unit switching on (power ON), there is the heating / initialising of the sensor (about 1min).

In this period, the internal sensor led is blinking, the refrigerant leakage alarm is activated (leakage) with its alarm lamp on the electrical panel, and the 24Vac auxiliary circuit is not powered and the forced ventilation in the compressor compartment is then activated, by the extraction fan.

If there are no more signals from the sensor, after this period, the microprocessor is powered on and the unit is ready for normal operation.

In absence of the refrigerant leak alarm, the forced ventilation is cyclically made. The cycle is active for 2 minutes each hour, but you can settle different delays by a dedicated timer.

In case of refrigerant leaks, the sensor is immediately activated: the leakage sensor led switches ON, cutting off the microprocessor supply and activating the extraction fan in the compressor compartment. Ventilation will be active until the sensor is detecting the presence of refrigerant.

The sensor presents two stages of alarm level:

- the first at 20% of LOWER FLAMMABLE LIMIT (LFL) with automatic reset; when the alarm disappears, the extraction fan and consequently the indication led turn OFF. The microprocessor is powered again so to start normal operation.
- The second at 30% of LFL with manual reset: in this case the extraction fan and the indication led will be active and the microprocessor OFF, until the alarm is manually reset (by cutting off tension to the sensor itself or pushing its internal reset button).

NOTE: RED lamp signals on the electrical panel door indicates the refrigerant leak alarm but also the extraction fan thermal alarm (manual reset inside the electrical board). In this particular case, the extraction fan turns OFF, there is no more forced ventilation and the unit turns OFF.

By means of the calibration tool, you can check if the sensor needs to be calibrated (see "Days left until maintenance = negative number")



It is compulsory to carry out the sensor periodic maintenance and calibration (please refer to Programmed Maintenance paragraph): after the use (electrical supply) of the sensor for total 200 days, you will display the alarm for maintenance, turning the unit OFF. You can reset the alarm only after maintenance.



You have to calibrate the sensor after each alarm intervention



The sensor needs to be replaced if, after calibrating, its sensibility goes down 55%, as per indication of the manufacturer.

The sensor need to be recalibrated each 12 months. In each case, if more restrictive, you must consider the national regulation in force, as far as the minimum sensor calibration delay is concerned.

ELECTRICAL BOARD

The electrical cabinet of the unit is realized in compliance with current European Standards inside a metal compartment with protection degree IP54 suitable for external installation and separated from airflow.

The main features are:

- Three-phase power supply 400V / 3ph / 50Hz on all models (if not differently required);
- Low voltage auxiliary circuit 24Vac with insulation transformer;
- Lockable mechanical main switch;
- Protection automatic switches;
- Terminal box for signal and management free-contacts;

The opening panel of the a.m. electrical cabinet is equipped with main switch. Inside the compartment, the following main components are also installed:

- Contactors;
- Automatic overload protection switches;
- Transformers;
- Numbered wires;
- Low voltage auxiliary circuit;
- Terminals;
- Management and control electronic cards

All the unit are subject to a safety cycle with continuity tests on the protection circuit, insulation resistance and tension test (dielectric strength).

The unit control is made by the management program uploaded in the electronic microprocessor.

The microprocessor is made up of:

- A user interface for 3-characters programming and diagnosing a 7-segment display with integrated terminal block;;
- Possible expansion for unit with two cooling circuits.

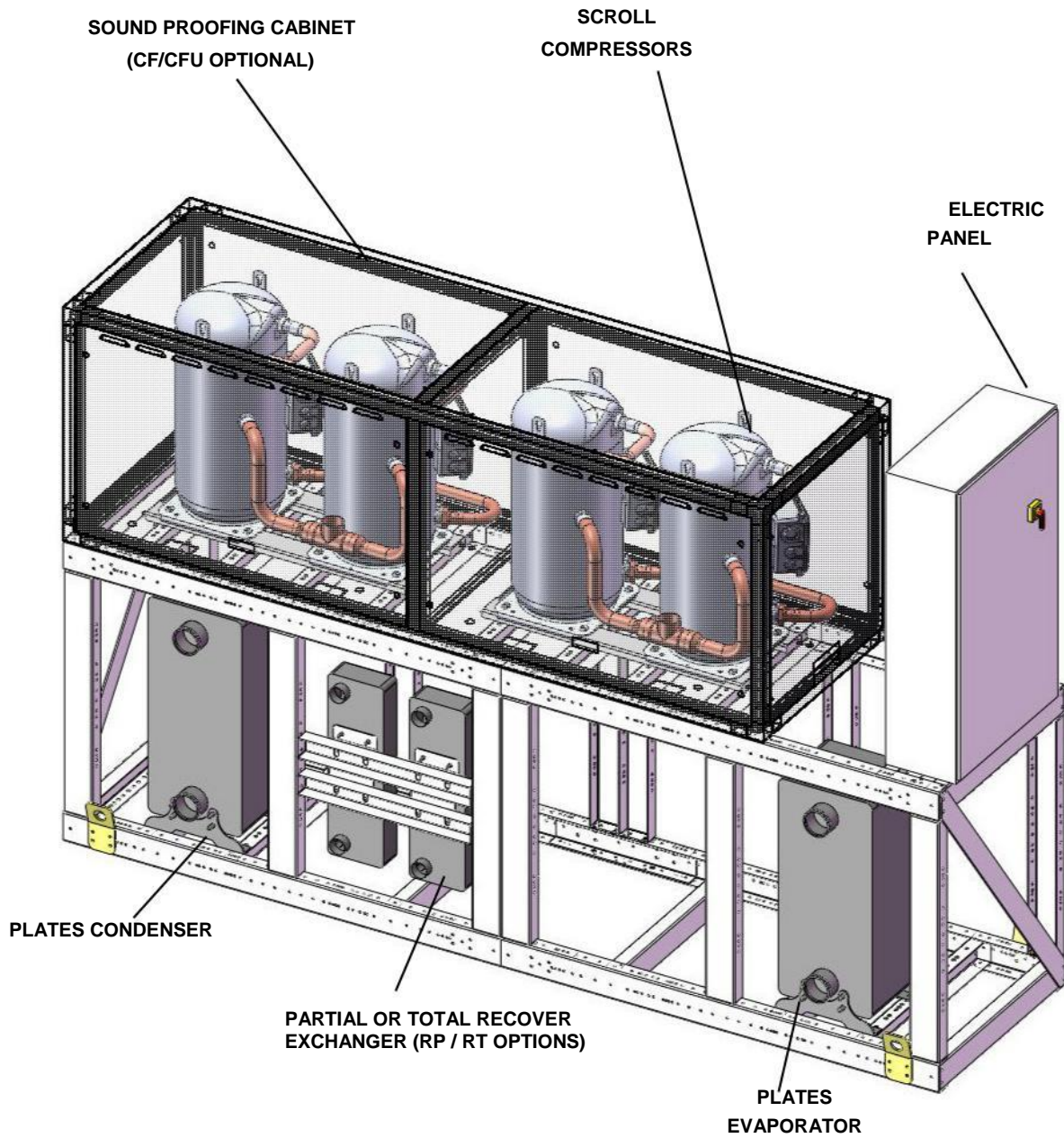
The control electronic board manages all the devices installed in the unit on the values of the operation variables, with, inter alia, the following main functions:

- Unit ON/OFF from board or from remote position;
- Management and storage of alert and alarm statues.

The user interface display of the microprocessor allows, inter alia, to see the following information;

- Working parameters set values;
- Functional variables values;
- Analogue and digital inputs and outputs status;
- Unit operation status;
- Alert and alarm indications.

Possibility to interface EMS/BMS management system.



2.5 Factory Tests

Once ready, the circuit is subject to a mechanical pressure test, according to the procedures indicated in the Quality System, and a check of the eventual leakage. Before delivery, we carry out a functional test of the chiller.

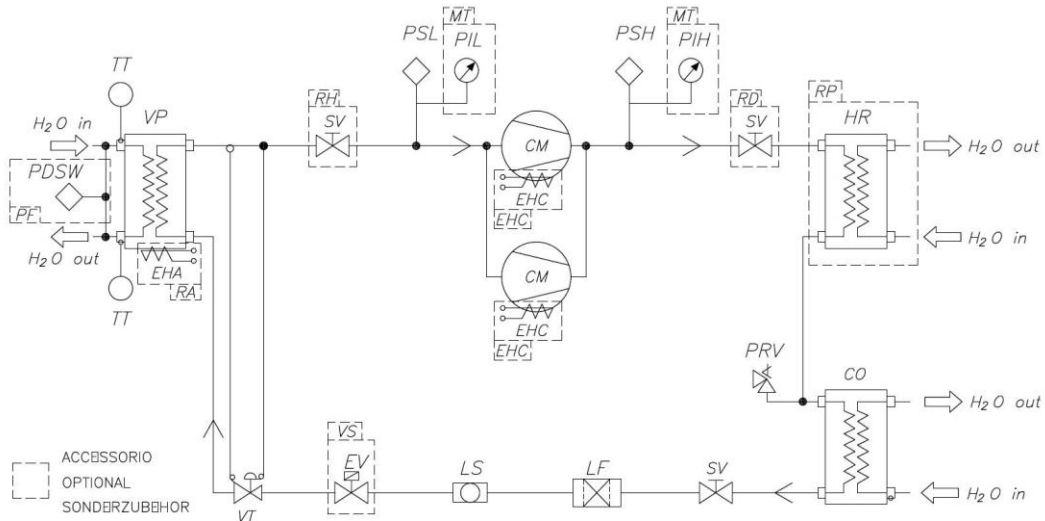
2.6 Options

Here below the main options which for RWE /PWE Kc-Ka-Kr series:

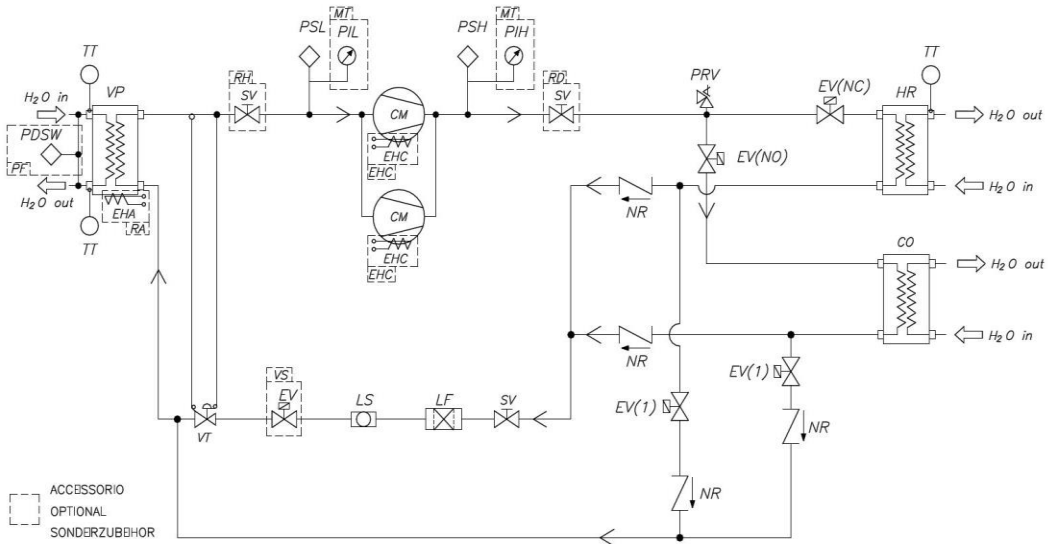
- A Amperometer:** Electrical device to measure the absorbed electrical current intensity;
- AE Electrical power different than standard:** Especially 230V three phase, 460V three phase. Frequencies 50/60 Hz
- CF Soundproofed compressors cabinet with standard material:** Compressors soundproofed case made of extruded and anodized aluminium profiles, padded with aluminium alloy panels, covered with ashlar-like sound-absorbing material
- CFU Soundproofed cabinet with bituminous rubber material:** Cabinet made of extruded and anodized aluminium profiles, padded with aluminium alloy panels, covered with double thickness soundproofed material in bituminous rubber.
- CS Compressors inrush counter:** Electromechanical device positioned inside the electrical board, recording the total inrush starts of compressors.
- EHC Crankcase heater:** Used to heat the oil in compressors
- IG Watch card:** Electronic card to program the switchover and rotation between units, after a pre-set time.
- IH RS 485 Serial Interface:** Electronic card to be connected to the microprocessor to allow connection of the unit to external for supervision system for a remote control and service of the unit
- IM Seawood packing:** Fumigated seawood case and film added with slowly vaporizing corrosion inhibitors completely nitrates and heavy metals (VCI) free, suitable for long sea transports.
- IR Packaging with fumigated wooden pallets:** Minimum packaging consisting of wooden pallets and transparent film around the machine.
- MF Phase monitor:** Electronic device that controls the correct sequence and/or the lack of one of the three-phases, stopping unit if necessary
- MP Oversized microprocessor:** Compared to the basic one, it allows the multilingual reading of the display, a more detailed description of the parameters, of managing communication protocols different than standard (LON WORKS, TCP / IP, BACNET), a better accessibility to the control parameters and programming parameters
- MT High and low pressure gauges:** For measuring circuit pressure
- PA Rubber-type vibration dampers:** Bell-shaped vibration dampers supports for isolating the unit (supplied in kit), consisting of base and bell made op of galvanized steel and natural rubber mixture.
- PF Safety water flow switch:** Installed on evaporator, it switches off the unit in case of water flow rate lack to the evaporator.
- PM Spring-type vibration dampers:** For insulating the unit (supplied in kit), mainly indicated for installation in difficult and aggressive environments. Made of two steel plates containing a suitable quantity of harmonic steel spring.
- PQ Remote display:** Remote terminal, allowing to display the temperature values detected by probes, the alarm digital inputs, the outputs and the remote ON/OFF of the unit, as well as to change and programs the parameters and to signal and display any occurred alarm.
- RA Anti-freeze heater on evaporator:** Electrical heater installed in the evaporator, in order to prevent freezing and equipped with its own thermostat.
- RD Shut-off valve discharge side:** They are used to isolate compressors during service operations.
- RF Power factor correction system Cosfi $\geq 0,9$:** Electrical device made of suitable condenser for compressors rephrasing, ensuring a Cosfi value $\geq 0,9$, so to reduce the reactive power absorption from the electrical network.
- RH Shut-off valve on suction side:** Used to isolate compressors during service operations.
- RL Compressors overload relays:** Electromechanical protection devices against compressors overload.
- RP Partial heat recovery:** (about 20%) of condensing heat through a refrigerant/water plate exchanger (desuperheater) always in series to the compressors. It is used when you want to partially recover condensing heat for producing hot sanitary water.
- RT Total heat recovery:** (100%) of condensing heat through a refrigerant/water plate exchanger always in series to the compressors. It is used when you want to produce sanitary water, and/or for heating processes.
- SF Soft starter:** Used to reduce the peak starting current of the compressors
- TE Electronic thermostatic valve:** Reduce unit's response time. Useful in case of frequent variations of the refrigeration load to increase the efficiency of the unit.
- V Voltmeter:** Electrical device measuring the electrical voltage of the unit power supply.
- VB Brine version:** Unit suitable for working with evaporator outlet water temperatures lower than $=^{\circ}\text{C}$. A 20mm evaporator insulation will be provided.
- VS Solenoid valve:** Electromagnetic solenoid valve on each cooling circuit to cut off the liquid line at compressors stop.

2.7 Functional diagram

COOLING CIRCUIT DIAGRAM OF RWE/PWE Kc-Ka-Kr (with some available options)



COOLING CIRCUIT DIAGRAM OF RWE/PWE Kc-Ka-Kr + RT (with some available options)



LEGEND

CM	Scroll compressors	PIH	High pressure gauge
CO	Plates condenser	PIL	Low pressure gauge
EHA	Anti-freeze heater	PRV	Safety switch
EHC	Crankcase heater	PSH	High pressure switch
EV	Solenoid valve	PSL	Low pressure switch
HR	Plates exchanger	SV	Shut-off ball switch
LF	Drier filter	TT	Temperature probe
LS	Sight glass	VP	Plates evaporator
NR	Non-return valve	VT	Thermostatic-expansion valve
PDSW	Water side differential switch		

2.8 Wiring diagram

The wiring diagrams of control unit and power, terminals and the resume tab of components, is attached to the Manual

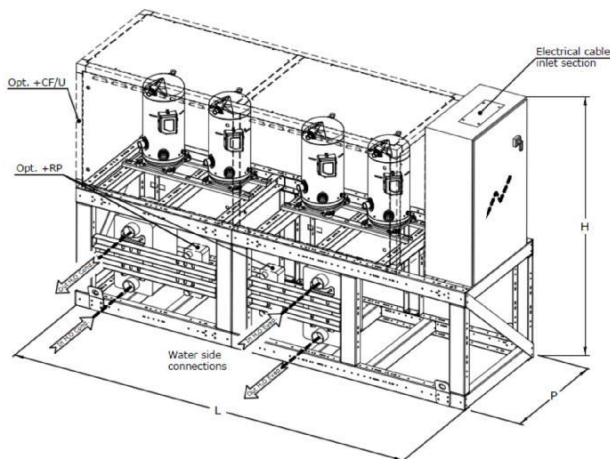
2.9 Sound emission

The unit does not required operators presence cause is able to operate in total autonomy.

Is not necessary provide sound emission data; in the attachments is indicated the medium level of sound pressure, at 1 meter free range from the unit, issued under full load conditions.

2.10 Dimensional diagram and weight charts

In the following tab., are reported operate areas of RWE / PWE Kc-Ka-Kr series units.



APPROXIMATE UNIT WEIGHTS									
MODEL		511 Kc	611 Kc	771 Kc	891 Kc	772 Kc	892 Kc	1192 Kc	1452 Kc
OPERATING	kg	436	451	470	624	486	638	714	743
TRANSPORT	kg	431	444	462	615	478	629	703	729
APPROXIMATE UNIT WEIGHT WITH OPTIONS									
OPERATING WITH CF	kg	468	483	502	656	518	670	746	775
OPERATING WITH CFU	kg	484	499	518	672	534	686	762	791
OPERATING WITH RP	kg	441	457	477	632	495	648	726	756
OPERATING WITH RT	kg	460	479	502	661	519	675	762	799
DIMENSIONS									
LENGHT	mm	1500	1500	1500	1500	1500	1500	1500	1500
WIDHT	mm	750	750	750	750	750	750	750	750
HEIGHT	mm	1600	1600	1800	1800	1800	1800	1800	1800

APPROXIMATE UNIT WEIGHTS										
MODEL		1022 Kc	1222 Kc	1542 Kc	1782 Kc	2382 Kc	2892 Kc	3812 Kc	4182 Kc	4782 Kc
OPERATING	kg	738	758	814	1131	1237	1322	1411	1453	1567
TRANSPORT	kg	727	746	799	1113	1211	1284	1363	1402	1507
APPROXIMATE UNIT WEIGHT WITH OPTIONS										
OPERATING WITH CF	kg	789	809	865	1186	1292	1377	1466	1508	1567
OPERATING WITH CFU	kg	814	834	890	1216	1322	1407	1496	1538	1567
OPERATING WITH RP	kg	749	770	829	1147	1258	1349	1446	1496	1615
OPERATING WITH RT	kg	780	806	874	1203	1333	1439	1558	1600	1740
DIMENSIONS										
LENGHT	mm	2500	2500	2500	3000	3000	3000	3000	3000	3000
WIDHT	mm	750	750	750	750	750	750	750	850	850
HEIGHT	mm	1800	1800	1800	1800	2030	2030	2030	2030	2030

3. INSTALLATION

The unit installation must comply with local existing laws and regulations.

3.1 Identification

The unit is identified by the Identification Tag, described above, attached inside of the electric cabinet.



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

3.2 Reception and inspection

It is very important to check (by visual inspection) 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 delivery note the state of the received goods and let the driver countersign it.



You have to send any claim concerning the delivered material to the manufacturer by fax, e-mail or by registered letter within 8 days from the date of receipt.

3.3 Handling

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



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

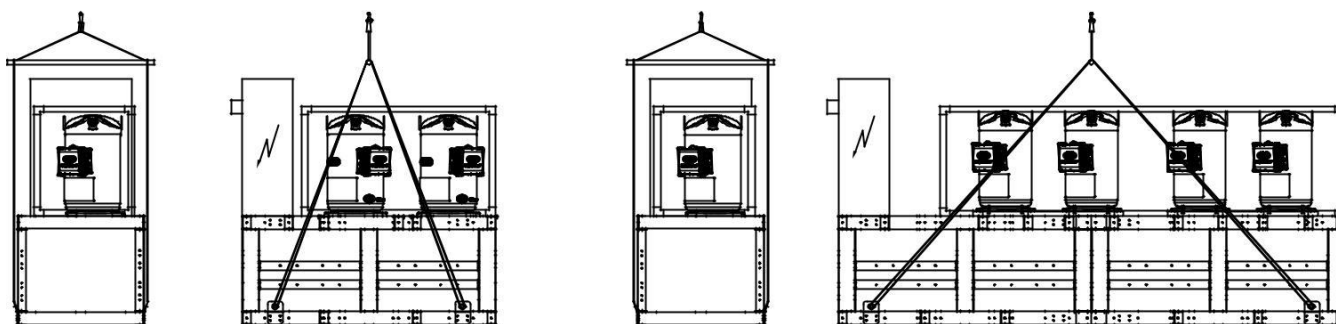
For any unit handling, please follow the instructions shown in figure 3.1, considering as indicative.



Lift the unit vertically, without jerks and as a speed suitable for the load, so as not to affect the integrity of the structure.

In the case you can move the unit by means of a crane, it is important to avoid that cables and belts that may exert a too high tractive effort on the packing that may damage it.

2 OR 4 COMPRESSORS UNIT LIFTING DRAWING



Before starting and moving the unit, it is advisable to identify the optimal way, considering the unit size and weight, the available equipment and the accessories dimensions.

3.4 Positioning

The unit's owner is responsible for expenses of installation, and he must supervise the execution operation. The execution of a correct installation presupposes that a plan has been drawn up by an expert and that is carried out by skilled trained technicians.



The area used to install the unit, there must be no aggressive substance or not compatible with copper, carbon steel, aluminium and other materials which are used in its construction. It's necessary to carry out chemical analysis in case of doubts and to send the result to the Manufacturer, in order to develop of common agreements on necessary measures.



The installation must be carried out in compliance with laws and local regulations.

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

- The floor where the machine is positioned can bear the total unit weight under normal operation;
- All around the unit, there is enough space for the routine and the extraordinary maintenance, such as compressors and heat exchanger replacement as shown in the drawing below;
- You have made connections for electric and hydraulic circuit.

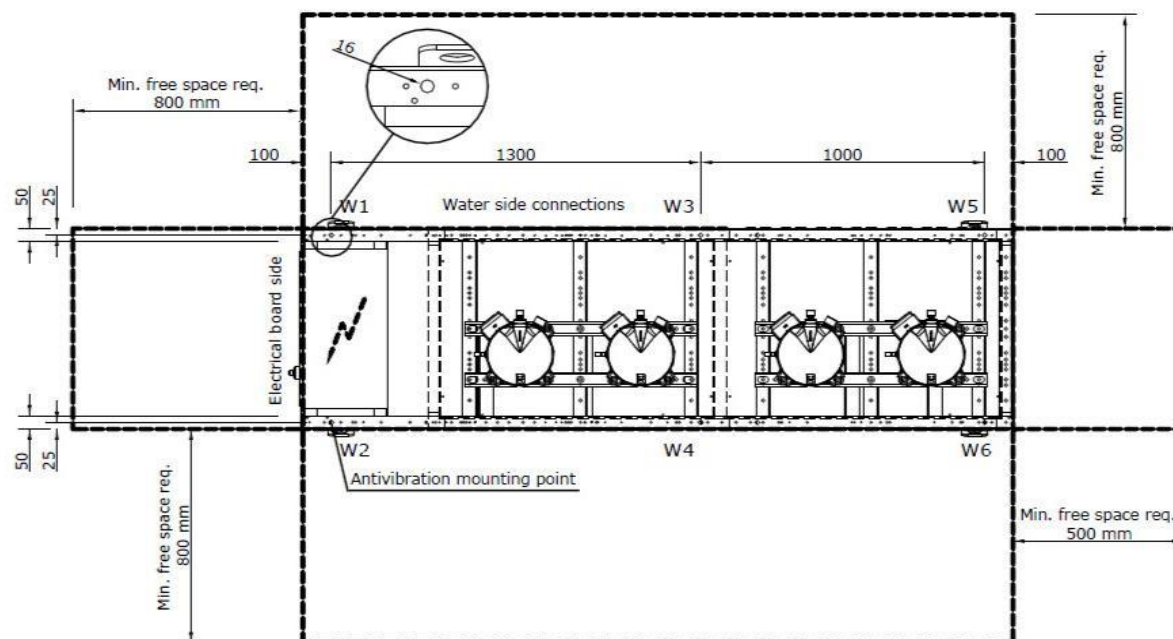
The unit is designed for outdoor installation and operation.



The unit basement must be ground plane with an acceptable tolerance of 5° in length and width.

The unit does not need any special basement, since you can simply position it on the base frame.

SERVICE AREAS



It is necessary to respect the service area for possible lateral hydraulic connections



Before proceeding with installation, we recommend to verify the congruence between the technical data of the Manual's unit and the project data.

3.5 Hydraulic circuit

The unit is designed for connection to a chilled and / or hot water distribution network, depending on whether they are chiller or heat pumps. A skilled contractor must realize the piping.



The fluid must not contain aggressive substances or not compatible with copper, carbon steel, aluminium and other materials which are used in its construction. It is necessary to carry out chemical analysis in case of doubt and to send the result to the Manufacturer, so to commonly agree the necessary measures.

The hydraulic system must be sized by a qualified engineer and realized by qualified personnel, on behalf of the Owner, in accordance with local Regulations in force.



You can find the diameter of the hydraulic connections in the dimensional drawing attached at the Manual. The hydraulic system's pipes diameter must be chosen to contain the load losses in the circuit acceptable limits.

3.5.1 HYDRAULIC CONNECTIONS DIAMETER

RWE / PWE Kc-Ka-Kr								
MODEL	511 Kc	611 Kc	771 Kc	891 Kc	772 Kc	892 Kc	1192 Kc	1452 Kc
Evaporator connections	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic
Condenser connections	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" 1/2 Victaulic
Partial heat recovery connections	2 x 1" G M	2 x 1" G M	2 x 1" G M	2 x 1" G M	4 x 1" G M	4 x 1" G M	4 x 1" G M	4 x 1" G M
Total heat recovery connections	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" 1/2 Victaulic

RWE / PWE Kc-Ka-Kr									
MODEL	1022 Kc	1222 Kc	1542 Kc	1782 Kc	2382 Kc	2892 Kc	3812 Kc	4182 Kc	4782 Kc
Evaporator connections	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" 1/2 Victaulic	2 x 3" Victaulic	2 x 3" Victaulic	2 x 3" Victaulic	2 x 3" Victaulic
Condenser connections	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" 1/2 Victaulic	2 x 2" 1/2 Victaulic	2 x 3" Victaulic	2 x 3" Victaulic	2 x 3" Victaulic	2 x 3" Victaulic	2 x 3" Victaulic
Partial heat recovery connections	4 x 1" G M	4 x 1" G M	4 x 1" G M	4 x 1" G M	4 x 1" G M	4 x 1" 1/4 G M	4 x 2" G M	4 x 2" G M	4 x 2" G M
Total heat recovery connections	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" 1/2 Victaulic	2 x 2" 1/2 Victaulic	2 x 3" Victaulic	2 x 3" Victaulic	2 x 3" Victaulic	2 x 3" Victaulic	2 x 3" Victaulic

Here below we are summarizing some general indications, which it is good practice to follow, for the hydraulic circuit construction;

- Realize the piping path in such a way so as to limit as much as possible the pressure drop in the system;
- Pipes must be adequately supported by brackets and arranged to as to allow an easy installation and inspection;
- The material used for the realisation of the system must have a nominal pressure not lower than PN6
- During the installation, all necessary measures to prevent dirt and solid particles from entering the tubes must be taken
- 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.;
- The circulation pump shall be sized for the suitable water flow and for an available pressure such to manage the pressure drops of the installation during all predictable working conditions.
- The functioning pressure of the hydraulic circuit must be between 1,5 and 3,5 bar. Therefore, they have to be fitted with one or more diaphragm pressure vessel.



It is essential to inform the Manufacturer in the event that hydraulic circuit is designed to function with pressure lower than 1,5bar (opened system) or higher than 3,5bar, in order to develop of common agreements on necessary measures.

- The system must to be protected by a safety valve and a pressure no higher than 6 bar;
- Place the air discharge valves in the appropriate points of the hydraulic system;
- The hydraulic system outfitted of connection for its emptying
- The hydraulic system must be outfitted with connection so to fill water in, and if applicable of anti-freeze mixture
- Wash the hydraulic circuit once the pipes are placed by appropriate substances, so to avoid dirt and solid particles inside the tubes and to cause any damage.
- To connect the unit to the water system, use the areas provided in the attached commercial drawing.



In the leak detection phase, the system must not be subjected to a pressure higher than 6 bar.

The machine must be connected to the hydraulic circuit by an expert and qualified technician, in compliance with the local Regulations in force

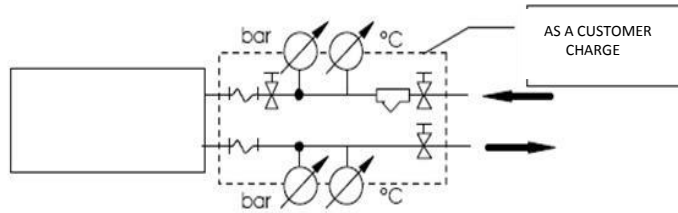


It is important the chilled liquid flows in the correct direction into the evaporator. The pipes must be joined following the indication given on the connections point of the unit.

3.5.2 HYDRAULIC CONNECTIONS - EVAPORATOR

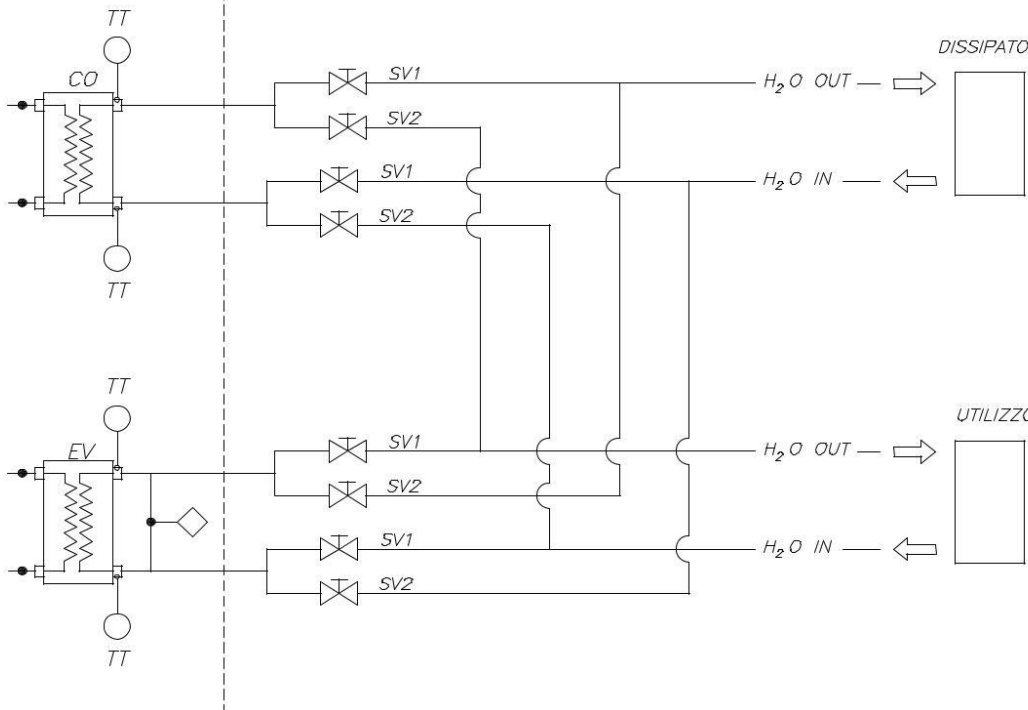
To connect the pipes to the evaporator it is advisable to follow the following indications:

- Connect the pipe as shown in the following diagram (as customer's charge);



- Install anti-vibration pipe fittings to avoid any vibration transmission and allow the thermal expansion;
- To avoid the entry of foreign bodies and dirt, install on the unit water inlet a cleanable mechanical filter with grid not larger than 2mm and with suitable nominal diameter to reduce pressure drops;
- It is advisable to install shut-off valves up and downstream the filter, to make the required cleaning operations easier and faster;

LIMITE DI FORNITURA
del COSTRUTTORE



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DISSIPATORE and repair it, before the

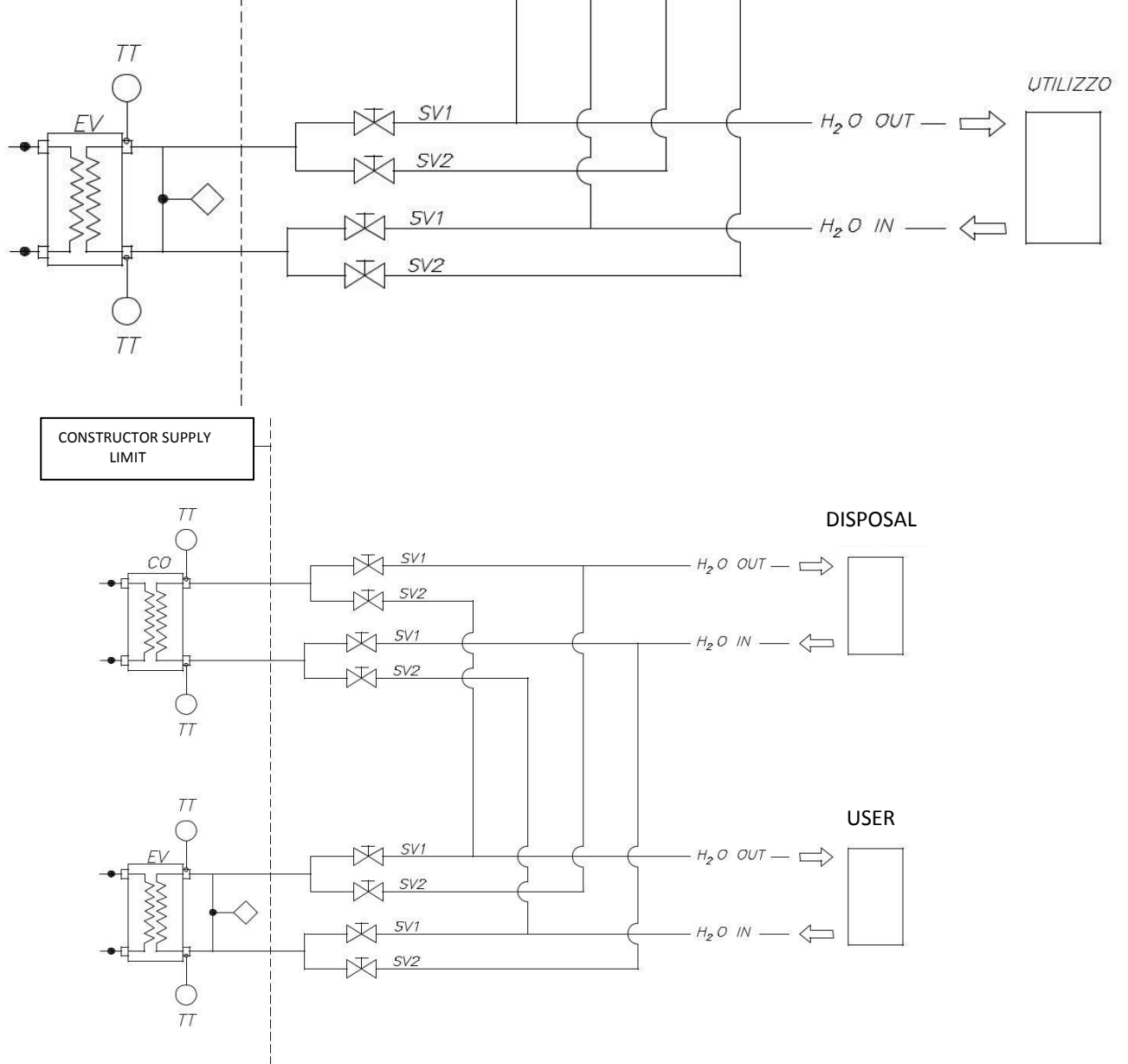
the circuit must be

interlock (see wiring diagram

UTILIZZO

user, it is necessary to remember

is.



Legend:

- CO – Plates condenser
- EV – Plates evaporator
- PF – Differential pressure switch
- RA – Anti-freeze heater
- SV1 - Valve (open during summer cycle – closed during winter cycle)
- SV2 – Valve (open during winter cycle – closed during summer cycle)
- TT – Temperature probe

3.5.5 CHEMICAL-PHYSICAL PROPERTIES OF WATER

In the following table, you can find, just as an indication, the main values of chemical and physical properties of the water to be respected to avoid corrosion or any sediment. To this purpose, it is advisable a yearly check of the PH stability.

pH		7,5 - 9
SO ₄ ²⁻	ppm	<100
HCO ₃ ⁻ / SO ₄ ²⁻	ppm	>1
Hardness	°d	4,0 - 8,5
Hardness	°f	7,0 - 15,0
Cl	ppm	<50
Electric conductivity at 20°C	µS / Cm	<500
PO ₄ ³⁻	ppm	<2
NH ₃	ppm	<0,5
Free chlorine	ppm	<0,5
Fe ₃₊	ppm	<0,5
Mn ²⁺	ppm	<0,05
Fe ₃ O ₄	ppm	0
CO ₂	ppm	<10
H ₂ S	ppb	<50
O ₂	ppm	<0,1
Temperature	°C	<45
Langelier's index (pH - pS - pAlc - pCa)		<0 basically corrosive water = 0 neutral water >0 water inclined to form deposit
Ryznar's stability index (2x (pS + pAlc + pCa) - pH)		<5,5 water with high tendency to form deposit 5,5 - 6,2 water inclined to form deposit 6,2 - 6,8 neutral water 6,8 - 8,5 corrosive water >8,5 high corrosive water

pS = logarithm of the suspended solids in ppm and measured at water temperature falling point

pAlc = logarithm of the alkalinity factor in ppm CaCO₃

pCa = Logarithm of the limeston hardness in ppm CaCO₃

3.5.6 HYDRAULIC CIRCUIT FILLING

Once the hydraulic circuit is done, the unit connected and the system seal test performed, fill the circuit, following the here below described steps:

- a) Open all the vent valves on the circuit;
- b) Connect the circuit, if possible permanently, to the water supply system, using an automatic filling group provided with a manometer and a check valve;
- c) If the circuit works with an antifreeze mixture, fill the circuit with an appropriate quantity of antifreeze fluid, according to the system size and the antifreeze concentration to reach;
- d) Start to fill the system with water using the filling group;
- e) Check all the vent valves on the system, and close them when water, instead of air, starts to come out;
- f) Once all the vent valves are closed, go on filling the system with water until a pressure between 1,5 and 6 bar is reached
- g) Stop the water charge, and switch on the circulation pumps making them working for at least 2 hours, so that any presence of air can be gathered to the top points where the air vent valves are installed;
- h) Stop the pump and discharge the gathered air, if present, by opening one after the other the air vent valves installed in the system;
- i) Charge circuit with water to bring pressure back to its origin value;
- j) Repeat the steps from G9 to i) until no air comes out from the air vent valves

3.5.7 ANTIFREEZE MIXTURE USE

If, during the unit operation, the cooled fluid temperature is expected to fall below 4 degrees or, during stops, can get near to 0°C, introduce inside the circuit an antifreeze mixture, having a freezing point enough lower than the foreseen minimum temperature.



Some antifreeze liquids are dangerous if swelled or can cause skin and sensitive mucous membranes irritation. Carefully follow the safety instructions on their bottle or instructions for use.

It is in any case recommended to wear protection glasses and rubber gloves. Also to avoid the contact with the mouth.



It is forbidden the use of aggressive antifreeze mixture or those ones not compatible with copper, carbon steel, aluminium and all the other material present in the system

As an example, here below you can find the freezing points for different values of ethylene glycol concentration in water.

The values in the table are just an indication and must be used as a reference. Sometimes the suppliers already deliver the product in ready-to-use solutions; therefore you have to refer to the dilution rate indicated by the fluid manufacturer.

	ETHYLENE GLYCOL PERCENTAGE ON THE MIXTURE (IN MASS [KG/KG])							
	5%	10%	15%	20%	25%	30%	35%	40%
Volume concentration (l/l)	4,4%	8,9%	13,6%	18,1%	22,9%	27,7	32,6	37,5
Freezing temperature (°C)	-1,4	-3,2	-5,4	-7,8	-10,7	-14,1	-17,9	-22,3

The use of mixture with glycol percentage lower than required could cause freezing and braking of the hydraulic circuit and especially of the evaporator. The use of useless high percentages could cause a reduction of the unit performances and particularly of its energy efficiency.

The fluid in the hydraulic circuit must be periodically analysed and anyway at the beginning of the cool season, in order to verify its composition and concentration. The fluid in the system must be replaced with the frequency indicated by the antifreeze substance Manufacturer and anyway every 2 years.



Absolutely do not release the antifreeze solution in the environment, but deliver it to authorized waste disposal services, in compliance with current local Laws and Norms.

3.6 Electrical connections

The electrical power supply must be sized by a qualified engineer and realized by qualified technicians, on behalf of the Owner, in compliance with current local regulations.

The supply cable upstream the unit must be protected by an automatic switch with suitable size and features and in compliance with current local dispositions.

The system must be realized in order to cut-off the power supply of the unit, without stopping other services like lightening, ventilation, alarms and safety systems.



Any intervention on the electrical circuit must be done by expert and suitable qualified personnel, in compliance with current local laws and regulations.



Before any intervention on the electrical system of the unit, please refer to the wiring diagram enclosed in the Handbook.



Verify that Voltage and Frequency match the ones on the identification Tag and on the wiring diagram enclosed in the Handbook.

Please use a cable with a suitable cross-section and as short as possible, to avoid excessive voltage drops.



To size the cable cross-section, the size and intervention value of the automatic switch, please refer to the wiring diagram enclosed in the Handbook.

3.6.1 Connection to the power supply

The unit must be supplied by a 4 wire-cable (3 phases +GND), if the power supply voltage is 400V / 3ph / 50Hz (+/- 2%) +GND.

On demand, it is possible to have special power supplies (check identification Tag in wiring diagram).

Connect the phases to the terminals of the main switch and the earth wire to its own terminal. Use a power cable with a suitable cross-section and as short as possible, to avoid excessive voltage drops.

Protect the power cable before the unit by an automatic switch with suitable size and features. You can find the power cable cross-section and the automatic switch size in the attached electrical components table, where you can also find the main switch size.

The position for cable entry is indicated in the dimensional drawing enclosed in the Handbook. The cable entry of the unit must be suitably protected in compliance with current local Regulation.



If the cable arrives from the top, run a bend break, as shown in the side picture.



Before any intervention on the electrical system, visually check that the electrical circuits of the unit have not be damaged during the transport.

In particular, verify that all the terminals screws are correctly tightened and the cable insulation is intact and undamaged.

The phase conductors of the supply cable must be connected to the main switch input free terminals. The grounding conductor will be connected to the Relevant terminal (identified by the abbreviation PE).

3.6.2 User side terminal box connection

A user terminal box with the following pre-arranged free contacts is available:

- General alarm (1);
- Unit remote ON/OFF (2).

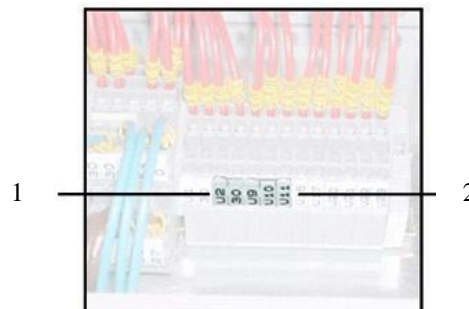


Refer to the wiring diagram to verify the exact Terminal numbering.

Inside the electrical cabinet, there is a terminal box with digital and analogue signals for the unit operations. Since the terminal configuration can be different in each single unit, refer to the one shown in the wiring diagram enclosed in the Handbook.

As an example, here below you can find the pre-arranged terminals for free contacts described in the table.

(1)	Digital input (free contact)	U2-30	Remote ON/OFF: Open = Unit OFF Closed = Unit ON
(2)	Digital Input (free contact)	U9-U10	Common Alarm: NO contact (Closed = Alarm)
	Digital output (free contact)	U10-U11	Common Alarm: NC contact (Open = Alarm)



If a component is rotating in the wrong sense, after the phase inversion, please check and eventually correct the supply cables sequence for each component, as above described.

If the water circulation pump is not controlled by the unit microprocessor, it is advisable to connect an auxiliary contact of the pump contactor to the pre-arranged remote ON/OFF terminal of the electrical cabinet (see attached diagram), so that the unit can start only when pump is working.

3.7 Freon safety valves

The outlet connections of the external safety valves installed on the unit are equipped with a threaded connection, so they can be connected to a drainpipe, if present, and if the installation design and current local regulation allow it.



The refrigerant leaving from safety valves is at high pressure, temperature and high speed. Its flow may damage objects and people if directly in contact with it.



The intensity of the noise made by the opening of safety valves may damage hearing of people staying near the unit.

The piping diameter should not be smaller than the safety valves draining pipe ones; refrigerant pressure drops in the line must be as small as possible and in any case should not provoke a reduction in the discharge rate of the valves.

The piping outlet connection must be done so to avoid that rainwater, snow, ice, and dirt can accumulate and obstruct it.

The valve discharge must be done at a suitable distance from other equipment, systems or ignition sources; the leaving refrigerant should not accidentally enter into buildings.

In any case, any pipe on the safety valve discharge must be made in compliance with current laws and regulation.

3.8 RWE / PWE Kc-Ka-Kr application range

The nominal water flow of the standard unit is referred to a Delta T 5K between inlet and outlet, in relation to the cooling capacity.

RWE / PWE Kc UNITS								
MODEL	511 Kc	611 Kc	771 Kc	891 Kc	772 Kc	892 Kc	1192 Kc	1452 Kc
Evaporator max flow (mc/h)	14,6	17,5	22,1	25,6	22,1	25,6	34,1	41,4
Evaporator min flow (mc/h)	6,3	7,5	9,5	11,0	9,5	11,0	14,6	17,8
Condenser max flow (mc/h)	17,9	21,2	26,9	31,5	26,9	31,5	41,9	50,9
Condenser min flow (mc/h)	7,7	9,1	11,5	13,5	11,5	13,5	18,0	21,8

RWE / PWE Kc UNITS									
MODEL	1022 Kc	1222 Kc	1542 Kc	1782 Kc	2382 Kc	2892 Kc	3812 Kc	4182 Kc	4782 Kc
Evaporator max flow (mc/h)	29,3	35,1	44,2	51,2	68,1	82,9	109,3	119,6	136,1
Evaporator min flow (mc/h)	12,6	15,0	18,9	21,9	29,2	35,5	46,8	51,2	58,3
Condenser max flow (mc/h)	35,7	42,5	53,7	63,0	83,9	101,9	133,5	146,5	166,0
Condenser min flow (mc/h)	15,3	18,2	23,0	27,0	35,9	43,7	57,2	62,8	71,1

The maximum allowed flow is referred to a Delta T 3K in relation to the design cooling capacity (higher flow values could cause noise and vibrations damaging the evaporator).

The minimum allowed flow is referred to a Delta T 7K in relation to the design cooling capacity (lower values could cause too low outlet water temperatures with the consequent intervention of safety devices and unit stop).

EVAPORATOR FLUID: PURE WATER	CONDENSER FLUID: PURE WATER
Minimum water outlet temperature evaporator = 5°C Maximum water inlet temperature evaporator = 20°C	Minimum water inlet temperature condenser= 25°C Maximum water outlet temperature condenser = 55°C

1. For different uses, please contact service department.
2. Lower temperatures could cause malfunctioning.
3. Higher temperatures could cause the intervention of safety devices and the unit stop.
4. If water temperature is lower than 5°C (evaporator outlet), besides the use of water and glycol mixture, it is necessary to recalibrate the anti-freeze thermostat (always 4°C higher than the mixture freezing point), the set point on the required temperature and the evaporator Delta T.

4. OPERATION



Before its commissioning, the operational staff must be instructed, also by means of this Handbook, on the unit manufacture, management, operation and maintenance, on safety measures and regulations to respect, as well as on any personal protective equipment to arrange, properties and indications to handle the used refrigerant.

4.1 Documentation

The Owner of the unit must require all the authorizations and prepare the documents for the unit installation and operation required by the current applicable local laws and regulations. In particular, he must collect and make available the documentation required to confirm that the installation has been carried out as per design specifications, and as required by current local Laws and Regulations.

Near the equipment, in a suitably protected position, the owner has to keep in a visible position all the information required to manage and maintain the system safe and reliable, according to the current local Regulations.

Besides, if the unit (with a refrigerant charge higher than 3kg) is installed inside the European Community, a Unit Register (hereinafter called Register) should be prepared and kept updated, as stated in EN 378-4, par 4.3. This document must contains the following information about the unit:

- a) The details of all maintenance and repair works;
- b) The refrigerant charges and type (new, re-used, or recycled) and the quantity of refrigerant each time discharged;
- c) The re-used refrigerant analysis (results, where available, must be noted in the Register);
- d) The origin for re-used refrigerant origin;
- e) System components modifications and replacements;
- f) The results of all programmed tests;
- g) The record of all relevant stop periods.

The owner must keep the Register so that technicians can always consult it during the unit maintenance and inspections.

4.2 Preliminary checks

Before the start-up, a technician with a suitable experience must visually inspect the unit. This inspection must include the following checks:

- a) Identification of any possible damage occurred during transport, storage or handling;
- b) Comparison of the installation with the hydraulic and wiring diagrams;
- c) Check of safety devices and their documentation;
- d) Check of certificates, Identification Tag, and in general, of required documentation;
- e) Check that accessible piping cannot accidentally harm people;
- f) Check that the power supply is suitable to the required one;
- g) Check that the shut-off and check valves are in the right position and in good condition;
- h) Check the dampers and fastening devices are adequate;
- i) Check the quality of welding, brazing and other junctions;
- j) Check the protection against mechanical damage, heat and moving devices are adequate;
- k) Check that the main components are easily accessible for inspection, maintenance and repair;
- l) Check the presence and good conditions of thermal and steam insulation;

The technician who carries out these checks must document the realization following the current local Regulations.



Before starting unit, during start up or after a long stop, verify the connections and wirings, as well as protective conductor's connections. If any fault, the unit cannot be commissioned.

Before starting the unit, verify that:

- The chiller is placed on a frame which can stably support it;
- The earth network is well done and connected to an efficient system;
- The power supply line is protected by an automatic switch with suitable size and features;
- On the unit connection entry, a mechanical filter with suitable size and features is installed



Periodically verify that the mechanical filter is clean, to prevent a decrease of the fluid to be cooled flow rate due to excessive pressure drops.



During unit operation, the hydraulic system pressure must be always be between 1,5 and 3,5 bar.

- The hydraulic system has been correctly filled and air totally eliminated;
- Hydraulic connections are correctly done and are leak-free;
- The fluid to be refrigerated freely circulates and correctly circulates through the evaporator;
- The flow rate of the circulating fluid to be refrigerated is the same of the designed one;
- The valves on the compressor and along the cooling line are in the correct status (open or closed) for a proper unit operation;
- If required, the hydraulic line contains the necessary antifreeze mixture in the proper concentration;
- The values of regulation temperature and of the anti-freeze alarm, on the microprocessor, are correctly set;
- The designed water flow to the evaporator is granted;
- The hydraulic circuit valves are open;
- All safety requirements have been respected;
- The free spaces for maintenance have been left;
- Electrical connections have been correctly done;
- The voltage tolerance is +/- 10% if compared to the unit standard one;
- The tightening of all electrical and hydraulic connections has been correctly done.

4.3 First start-up



A skilled refrigeration technician authorized by the Manufacturer must carry out the start-up of the unit.

4.3.1 Switching on

Before the unit start-up or after a long break, check that the parameter set on the microprocessor are coherent to the required operating conditions.

To start the unit:

- a) Turn the main switch to ON position, to power the unit;
- b) Press the ON/OFF button on the microprocessor keyboard, and switch it to ON.

If the ON/OFF remote contact is closed, the circulation pump, if present, controlled by the microprocessor, shall be immediately switched on.

After a delay time, to be set by microprocessor, the fans shall start and, then all the compressors one after the other, according to the requested cooling capacity.

Once the machine has reached a steady operation, the technicians carrying out the first startup must verify the unit functioning parameters and that:

- a) The safety high pressure switch work, are correctly installed and calibrated;
- b) The calibration pressure is indicated on the external safety valve and its value is the required one;
- c) There are no refrigerant leakages

The collected data must be recorded on the First Commissioning module attached in the Handbook.



A copy of the First Commissioning Report, duly filled out, must be transmitted to the Manufacturer, in order to make the device warranty effective.



During first commissioning operations, the technician must check that safety (high- and low-pressure switches, water differential pressure switch, anti-freeze thermostat, etc.) and management devices (regulation thermostat, condensing pressure regulation device, etc.) properly work.

4.3.2 SWITCHING OFF

To stop the unit, press the ON/OFF button on the microprocessor keyboard, and switch it to OFF:

If you foresee to keep the machine OFF for more than 24 hours, then turn the main switch in OFF position so to cut off the power supply.



In the event of any anomaly detected during unit operation, you must solve it as soon as possible, in order to avoid they are still present when switching ON.

4.4 Microprocessor regulation

In order to change microprocessor settings, follow the instructions on the microprocessor documentation attached in the Handbook.



Only qualified technicians must do any modification on the microprocessor parameters, and, anyways, after prior authorization by the Manufacturer. Incorrect values can make the unit operate in working conditions different from the set ones, and, consequently, damage the unit and the whole system.

5. MAINTENANCE

The Owner is responsible to maintain the unit properly as indicated in the Handbook and as required by current local Laws and Regulations.



Qualified and trained personnel, equipped with personal protective devices, as required by current local Laws and Regulation in force, must carry out the unit maintenance.

In general, anyone handling the refrigerant must be equipped, at least, with protective glasses and gloves.

The owner has to carry out unit maintenance so that:

- a) The risk of accidents to people and of damage to objects is minimal;
- b) No damages occur to the System Components;
- c) The System operation and readiness are not compromised;
- d) Any refrigerant leak is found and solved;
- e) Power consumption is minimal.

Maintenance operations not requiring specific refrigeration know-how (for example the cleaning of fins of chilled water coils), may be carried out by qualified personnel appointed by the Owner.

During unit's maintenance operations, only authorized personnel may stay close to the unit.

During unit's maintenance operations, check the conditions of labels and warnings on the System and its components; unreadable writings must be replaced.

No modification can be carried out on the unit and no component replaced, without prior explicit authorization by the Manufacturer.



Before carrying out any kind of intervention on the machine, cut off the power supply to the electric panel, by turning the main switch to OFF position.



Inside the unit, there can be high voltage areas. Only qualified and trained personnel, licensed as required by current local Laws and Regulations, may carry out the intervention on such areas.



Surfaces of component on the compressor discharge and liquid line may reach high temperatures and they may cause severe burns if touched.



In the unit, there are sharp parts and cutting edges which, if accidentally hit, may cause cuts or scratches.



In case of doubts on the detected malfunction or on the most suitable way to solve it, please contact the Manufacturer.



Smoking is forbidden during maintenance operations on the unit.

5.1 Routine maintenance

The Owner is responsible to maintain the unit properly, as indicated in the Handbook and as required by current local Laws and Regulations.

The Owner must take care that the unit is periodically inspected and maintained, according to the system type, size, age and functions and to the indication in the Handbook.



If leak detection instruments are installed on the system, they must be inspected at least once a year, to check that they work properly.

During its operating life, the unit must be inspected and checked as stated by the current local laws and regulation. In particular, lack of more restrictive specifications, please comply to the recommendation in the following table (see. EN 378-4. Encl. D).

CASE	Sight inspection (par. 4.2, p.ti a – I)	Pressure test	Leak detection
A	X	X	X
B	X	X	X
C	X		X
D	X		X

A	Inspection, after air intervention, with possible effects on the mechanical resistance or after a change of use or after a stop longer than 2 years; all non-proper components must be replaced. Do not carry on checks with higher pressures than design ones.
B	Inspection following an intervention, or a relevant modification of the system or its components. The check can be restricted to the components involved in the intervention, but if a refrigerant leak is detected, a leak detection must be made on the all system.
C	Inspection following a change of the unit position. If there could be consequences on the mechanical resistance, refer to point A.
D	Refrigerant leak detection after a valid suspicion. The system must be checked to find any leaks, using direct measures (devices able to find the leak) or indirect ones (detection of the leak presence by the analysis of the operational parameters), and pay attention to those parts which are more easily exposed to leaks (junctions, for example).



In the event of a failure compromising the reliable unit operation, you cannot restart the unit, before solving the failure.

5.1.1 Leak detection

If no further precautions are required, carry on a tightness test on the unit at least every three months (for units installed in the European Community), leakage detection must be carried out in compliance with indications stated in the (EC Regulation 1516/2007).

If, during the leak test, there is the suspicion that there may be a refrigerant leak (for instance, after a reduction of cooling capacity or after superheating or subcooling measurements), find it using appropriate instruments, repair it and carry out another tightness check, in compliance with current national Laws.

The result of the checks and taken measures must be recorded on the Register.

The personnel involved in the refrigerant leak detection must not use open flames or source of ignition.

Refrigerant leaks must be found and repaired as soon as possible by qualified personnel, as required by current local laws and regulations.

5.1.2 Safety pressure switches check

Without any more restrictive local regulations, the safety high-pressure switches must be inspected on site at least every twelve months, to check that they are well regulated and work properly, as well as installed according to applicable laws.

5.1.3 Safety valves check

Without any no more restrictive local Regulations, you must inspect external safety valves on site at least every twelve months, to check their tightness. In the event of a leak, you must replace the valve.

You must inspect valves each five years, to check that they are in good conditions, that the calibration pressure printed on the valves themselves is readable, that they are installed and have proper features to grant the system safety, in compliance with current Regulations.

5.1.4 Check of fluid to be refrigerated

You must inspect the fluid of the refrigerant/liquid exchanger every six months, to check its composition and identify the presence of any refrigerant in it

5.1.5 Noise and vibration check

Check, at least once a month that the unit does not make unusual noises, and that piping does not vibrate abnormally, because this may damage it.

5.1.6 Leakage sensor check and calibration

It is mandatory to perform the sensor maintenance regularly (visual, functional or main) to maintain the safety, measure with consequent leakage signal only by qualified and trained technicians.

The main check, by expert personnel must be performed at least once a year including the following checks:

- Functional check;
- Check of fault relay;

- Check of Alarm relay;
- Check of basic setting values;
- Control and calibration check with test gas; to perform this test it is necessary to buy calibration kit or uninstall the sensor to send it to Emicon AC SpA.

To carry out the test, it is possible to buy the kit provided by the Manufacturer MSR Electronic GmbH, Wurdinger Str. 27a - 94060 Pocking - Germany; in any case refer to sensor Manual you can find on-board of the unit.

It is necessary to follow strictly the procedure indicated by the Manufacturer to perform the test, in case of positive test result the sensor can be reinstalled and re-used

After a new calibration, if the sensor sensibility is lower than 55%, you must replace the sensor, as per instructions of the manufacturer.

5.2 Ordinary maintenance

5.2.1 Overcurrent protection devices check

You must check the overcurrent protection devices to control their integrity and functionality.



Replace fuses only after the unit is disconnected from the power supply, turning the main switch to OFF position.



It is forbidden to bypass the fuses installed on the unit, or replacing them with bigger ones.



Fuses can reach very high temperatures that can cause burns, if not carefully handled.



You must replace blade-type fuses, provided in case of high current values by means of the special handle supplied with the unit. The use of unsuitable tools, can damage device and operator.



In case of adjustable devices (thermal relays and motors protection), please verify that the set absorption value is not higher than the one on the Identification Tag of the component to be protected.

5.2.2 Contractors check

You must check contactors used to activate electrical loads to control their integrity, contacts condition and the coil functionally.

Please also verify that electrical cables are strongly and rightly connected to their terminals.

If required, remove dust and debris, which can cause a noisy and unreliable operation of the device.

ACTIONS	FREQUENCY						
	Daily	Monthly	Every 2 months	Every 6 months	Once a year	Every 5 years	If required
ELECTRICAL SYSTEM AND CONTROL DEVICES							
Check that the unit works properly and that there are not alarms	X						
Visually inspect the unit		X					
Check the noise and vibrations		X					
Check safety devices and interlocks				X			
Check the unit performances				X			
Check the absorbed current of the components (compressors, fans, etc.)				X			
Check the supply voltage of the unit				X			
Check the cable connection to their terminals				X			
Check that the cable insulation shield is not damaged					X		
Check contactors conditions and functioning					X		
Check microprocessor and display functioning			X				
Check microprocessor parameters set values					X		
Eliminate any dust from electrical and Electronic components					X		
Check probes and transducers functioning And calibration					X		
Check the evaporator Delta T				X			
Check the condenser Dleta T				X			
Check liquid indicator light				X			

ACTIONS	FREQUENCY						
	Daily	Monthly	Every 2 months	Every 6 months	Once a year	Every 5 years	If required
COMPRESSORS							
Visually inspect compressors		X					
Check compressors noise and vibration		X					
Check compressors supply voltage				X			
Check the compressors electrical Connections					X		
Check the conditions of the compressors Electrical cables and their connections to the terminals				X			



Daily and Monthly procedure can be directly done by the System Owner. Qualified and suitably trained personnel must do the other interventions.



Do not touch the unit barefoot, or with wet or damp body parts.



Do not start any cleaning operation before disconnecting the unit from the electrical power supply, turning the main switch to OFF position.



Qualified and suitable trained technicians, licensed in compliance with current local laws and regulations, must do any intervention on the cooling circuit.



During any intervention on the unit, use the required individual protection devices. In particular, wear protective glasses, gloves, helmet and safety footwear.

5.3 Trouble shooting

The microprocessor is detecting failures occurring during the operation and, besides signalling alarms, it also shows the type of active failure.

The hereafter table reports the most common malfunctioning, and for each one of the most probable causes and possible solutions.

In case of alarm, before any intervention, verify that:

- Working conditions are the expected ones, and in any case, compatible with the unit working limits;
- All electrical cables of the involved components are firmly connected to their terminals (refer to the enclosed wiring diagram);
- The set values for the involved parameters are compatible with the real working conditions (refer to the enclosed microprocessor Handbook).

You must inspect contactors activating electrical loads to check their integrity, contacts conditions and the coil functionality. Also verify that the electrical cables are correctly and firmly tightened to their terminals.

If required, remove any dust or waste which can cause a noisy and unreliable operation of the device.

FAILURE	PROBABLE CAUSE	SUGGESTED ACTIONS
1. Unit is not working	a) Electrical board is not powered	Check each phase Voltage in the power supply line Check that main Switch is closed (position ON)
	b) Auxiliary circuit is not powered	Check the fuses of The auxiliary Circuit (see Wiring Diagram)
	c) Microprocessor does not start the unit	Check microprocessor electrical connections Check temperature set value
	d) External input to the unit start is missing	Check that the remote ON/OFF contact is closed (see wiring diagram)
	e) Alarm of refrigerant leak sensor	Enable input to the unit start from user board (display) Check expiry date of calibration
2. Chilled water temperature Too high	a) Unit is not working	See point 1
	b) The calibration of Control System is incorrect	Check the calibration of Control System
	c) Compressor is not working	See point 11
	d) The compressor capacity is not sufficient	See point 11
	e) The Control System is not working	Check the microprocessor Handbook
3. Chilled water temperature Too low	a) The calibration of Control System is incorrect	Check the calibration of Control System
	b) The Control System is not working	Check the microprocessor Handbook
	c) The chilled water flow is too low	See point 4
4. Chilled water/condensing Water flow too low	a) The water pump does not work	Check the pump electronic 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 through The air vent along the hydraulic circuit
5. The high pressure switch is activated	a) The high pressure switch is not set properly or is Defective (if present)	Check the functionality and calibration of condensing Control device
	b) High pressure switch is not set properly	Replace the high pressure switch
	c) Discharge pressure too high	See point 7
	d) The condensing water flow capacity is not sufficient	See point 4

FAILURE	PROBABLE CAUSE	SUGGESTED ACTION
6. The low pressure switch is activated	a) The low pressure switch is not set properly	Replace the low pressure switch
	b) The cooled water flow capacity is not sufficient	See point 4
	c) Suction pressure too low	See point 10
7. High pressure on compressor's discharge side	a) Suction pressure too high	See point 9
	b) Circuit charged with too much refrigerant	High refrigerant undercooling; discharge some refrigerant From the circuit
	c) Non-condensable air or gas in the circuit	The flow sight glass shows gas bubbles. The compressor discharge temperature is high; you must discharge and charge again the cooling circuit after vacuum execution.
	d) Too hot water temperature at the condenser	Check capacity of the condensing Water cooling system
	e) Condensing water flow capacity insufficient	See point 4
	f) Encrusted condenser	Wash the exchanger with suitable products
8. Low pressure on compressor's discharge side	a) The control system of the condensation pressure is not working properly	Check setting and operation of the pressostatic valve
	b) Suction pressure too low	See point 10
9. High pressure on compressor's suction side	a) Thermal load higher than estimated	Check the room Thermal load value
	b) Discharge pressure too high	See point 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
Low pressure on 10. compressor's suction pressure	a) Ambient temperature too low	See point 3
	b) Cooled water flow capacity too low	See point 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 valve bulb is properly placed, fixed and insulated
	e) Refrigerant charge is insufficient	Check possible Leakage and recharge
	f) Discharge pressure too low	See point 8
11. The compressor is not working	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 that 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.

5.4 Extraordinary maintenance

Qualified and trained personnel, equipped with individual protection devices in compliance with current local laws and regulation, must repair the unit.



You cannot carry out any modification on the unit or any components replaced, without Manufacturer's explicit authorization.

Any intervention made by technicians with specific skills (welders, electricians, programmers, etc) must be carried out under the supervision of personnel expert in refrigeration field.



During brazing and welding operation, all the components, which could be damaged from heat, must be removed or covered with wet clothes.



In the event of interventions requiring the disassembling of shut off valves, it is recommended to replace gaskets with new ones.

6. DEMOLITION AND DISPOSAL

At unit disposal, it is necessary to separate the different components for recycling. A specialized firm, in compliance with current environmental laws, must do this operation.

Usually the unit is not charged with dangerous fluids for people, objects or environment, since working with water.



In the event unit worked with antifreeze mixture, it is necessary to collect all the fluids inside the unit and send it to a disposal-authorized centre.



It is forbidden to disperse any eventual antifreeze mixture in the environment.

