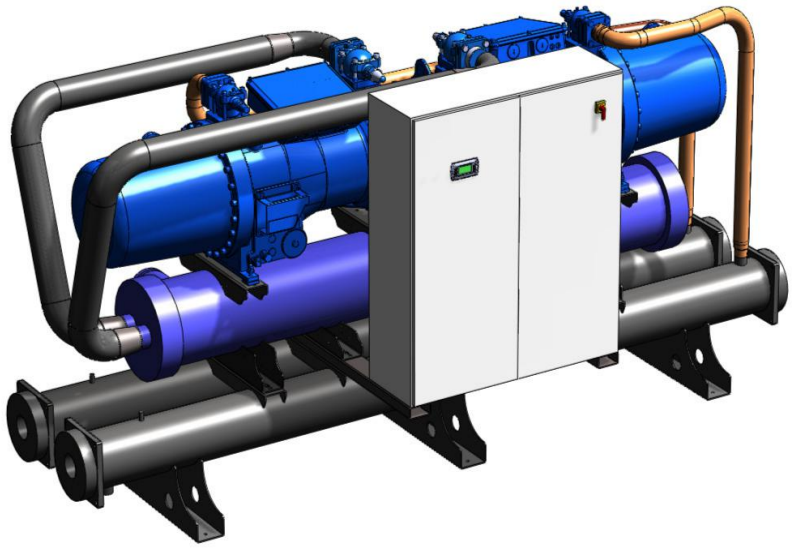
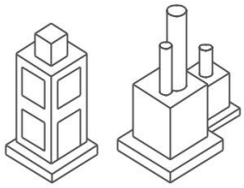
RWH-PWH Ka

WATER COOLED CHILLERS AND HEAT PUMPS WATER CONDENSED EQUIPPED WITH SCREW COMPRESSORS AND SHELL AND TUBE EXCHANGER





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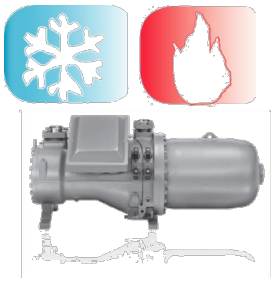

- ► **Chillers and heat pumps.**
- ► **Screw compressors.**
- ► **Shell and tube exchanger.**
- ► **Electronic expansion valve.**
- ► **High efficency at partial loads.**
- ► **Compact dimensions.**
- ► **Wide range of options.**
- ► **Special execution.**

Use and mantainance Book

Rev. 2.0 09/21

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1. INTRODUCTION

The RWH/PWH Ka Series units, operaing with R134a refrigerant, are water chillers and heat pumps water condensed, equipped with screw compressors and shell and tube exchangers. Depending to the cooling capacity required, are available in single or multi compressor, single or double cooling indipendents circuit and single or double hydraulic circuit

Those unit are suitable for indoor installations and particularly indicated for industrial and comfort applications, where is necessary to have a certain level of thermo-cooling power and guarantee excellent seasonal performance and low environment impact.

The hot water production, (on the PWH Version) is suitable with inversion on water side (not on teh gas side) to be carried out by the Owner during installation.

The use of screw compressors in those units allows various partialization of the cooling or the thermal power. The electronic regulations with microprocessor controls and manages all the components and operating parameters of the unit; an internal memory records the operating conditions at the moment when an alarm conditions arises in order to displayied on the screen

1.1 Preword

The present Handbook, originally written in Italian, was completed in accordance with the European Legislation. It contains all the necessary informations for carry out without any risk transportation, installation, start-up, operating, setting, maintainance and dismantling the unit.

All people authorized to operate with the unit, in particular, all technicians assigned to the unit maintainance, must know all informations and instructions contained in this Handbook and all its attachmets.

In the event of non-compliance with the instructions contained in this manual regarding the installation, start-up, operation, setting, maintainence and dismantlging of the unit, it could be unsafe for people, could damage objects and environment.

Should you have any doubt on the correct use of these instructions, please contact the Manufacturer in order to get further clarifications. The unit has to be installed, handled, subjected to maintainance, repaired and dismantling in compliance with local technical standards.

1.2 Symbols

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

 IT POINTS OUT A NOT ALLOWEDINTERVENTION, AS IT COULD PREJUDICE THE CORRECT UNIT OPERATION..

 IT POINTS OUT AN IMPORTANT WARNING FOR THE CORRECT UNIT MANAGEMENT.

IT POINTS OUT A DANGER TO PEOPLE, THINGS OR ENVIRONMENT..

IT POINTS OUT ELECTRICAL RISK FOR PEOPLE, THINGS OR ENVIRONMENT.

1.3 Reference Laws and Norms

Less differently stated on the order, the unit of this Handbook is manufactured in compliance with European Directive and in particular it meets the Essenntial Safety requiremnts of the following directives:

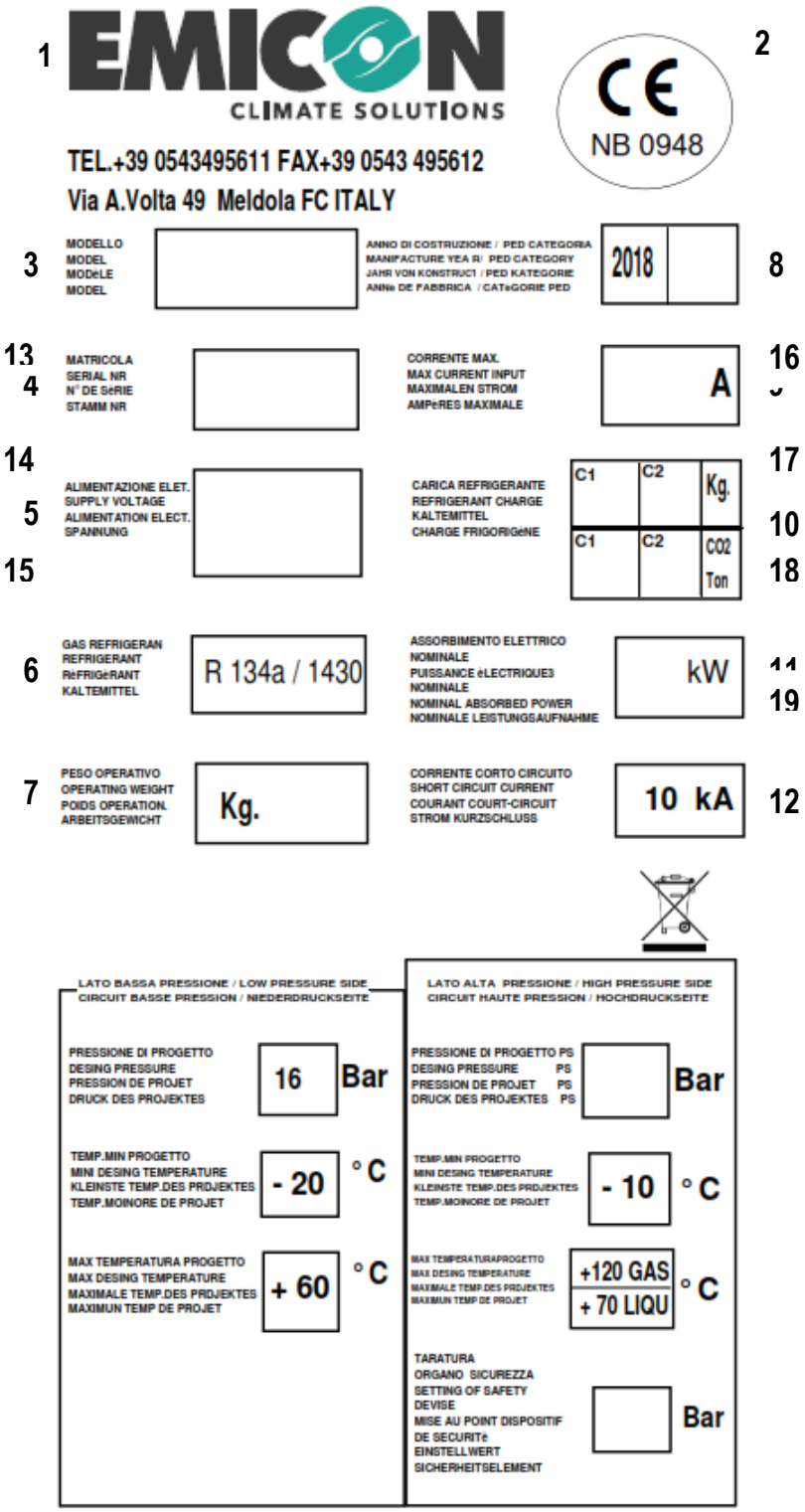
- 97/23/CE (PED),
- 2004/108/CE (Electromagnetic Compatibility),
- 2006/42/CE (Machinery Directive),
- 2006/95/CE (Low Tension Directive).

As required, compliance with the aforementioned directives is attested by the Declarations of Conformity and highlighted by the CE mark, represented on the Identification Plate of the group that will be described later

To ensure compliance of the appliance with the aforementioned directives, it 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 (Ideification Tag). Here below an example of the Identification Tag, showing ans describing all the stated information, in compliance with the applicable European directives.



- "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 per le protocole de Kyoto"

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

1	Manufacturer's name and address
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. deign temperature
19	Setting of safety device

1.5 Warranty

The Manufacturer guarantees the unit, in compliance with what stated on its Sales Conditions and with what explicity agreed in the contract, if present.

The Manufacturer warranty will decay if the instructions of this Handbook would be scrupolously followed.

The Manufacturer declines any responsability for possible damages to people, animals, things or environment due to any miss.installation, maintainance or regulation, i.e. to a misuse of the equipment; irt is considered a misuse any use of the unit not clearly stated in the Handbook

During the start-up on teh unit, fill teh Commissioning Report attached to the Handbook in, and send a copy to the Manufacturer in ordder to make the Warranty effective.

1.6 Manual readership

This manual and all its attachments are supplieed with the described unit.

The manual musk be kept by the machine's Owner or by the person in charge to care for the machine, in a proper place. To this end, a plastic bag where to store the manual has been 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 assigned to the maintainance and to charge the chiller with liquid refrigerant, must know all informations and instructions contained in this manual

The failure in following the instructions cointained in this Handbook during installation, operation, maintainance, repairing and disposal of the unit can cause damages to people, things and environmant.

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

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 teh refrigerant use, in compliance with current local Laws and Regulations in force.

All the maintainance and interventions requiring personnel with different special competences (such as welders, electricians, programmers, etc.) must be supervised by personnel with a deep competence and experience on cooling system.

The personnel operating with refrigerant fluids must be suitably trained to achieve the competence required 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 knowing and suitable training on refrigerant and required protective devices use;
- Knowing and training on leakages prevention, as well as on cans use, leakages detection, refrigerant recycling and disposal;
- The personal must be able to understand and apply the local applicable laws.

To keep this skills, 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;
- Moving mechanical parts;
- High temperature surfaces;
- Sharp edges and sharp items;
- Components holding high pressure fluids.

If possible, dangerous components are made inaccessibles by protecting them with 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.

1.9 Tests

Once the uniti s completed, its circuiti s submitted, following the directives stated in the Manufacturer's Quality Warranty System, to a mechanical sealing test and to leak test to find leakages if present.

Before the shipment a complete functional test is carried out.

2. DESCRIPTION

2.1 Nomenclature

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

The nominal cooling capacity is calculated with IN/OUT evaporator water 12/7°C, and IN/OUT condenser water .30/35°C.

2.2 RWH - PWK Ka – Kh - Ke Series Version

RWH – PWH Ka – Kh - Ke Series are available in Standard Version, with Inverter (VS) compressors and in high efficiency (HE) version.

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

MODELS WITH TOTAL HEAT RECOVERY (RT)

Each model RWH – PWH Ka – Kh - Ke Series, on demand, is available in total heat recovery version (RT option). In this configuration, each cooling circuit is equipped with a double shell and tube exchanger, managed in parallel to the water-condensing section, capable of recovering 100% of the condensation heat can be used for production of sanitary water or heating processes. The double tube bundle heat exchangers (RT option) are thermally coated with a 10mm thick mattress

MODELS WITH PARTIAL HEAT RECOVERY (RP)

Each model of RWH – PWH Ka – Kh - Ke Series, on demand, is avalaible in partial condensation heat recovery version (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 upstream the air condenser, is designed to recover a part of the condensing heat used for production of hot/warm sanitary water.

2.4 Main components

FRAME

Robuist and compact supporting structure, built with folded and painted steel profiles (RAL 9004 color –black-) that integrates the exchangers of the evaporator and tube bundle condenser unit and on which all components are mounted. On demand, the compressors can be acoustically insulated with a cabinet covered with a standard sound-proofed material (CF option) or with a double thickness sound-proofing material (CFU option) to further reduce the unit sound level.

COMPRESSORS

Semi-hermetic screw type compressors equipped with steps partialization, motor thermical protection, crankcase heater, discharge switch and phase monitor.

The lubrication is forced type without pump to avoid excessive migrations of oil to cooling circuit, the compressors are equipped with oil separator in the discharge side.

There available to reduce inrush current the Part-Winding (PW option) , standard on 281 / 321/ 361 / 452 / 562 / 642 / 732 RWHA/PWH Ka units, or the Delta-Star (DS option)

EVAPORATOR AND CONDENSER

The evaporator is of dry single-mass expansion type (perfect counttercurrent fluids flow) with bundle if mandrinated tubes with a head steel flange. The tubes are made of copper with special internal corrugation on the refrigerant side, mantle and water side tube plate are made of carbon steel. The evaporator is complete with anti-condensation insulation made of closed-cell polyurethane foam material and an anti-scratch and UV-resistant external coat (thickness 10mm). Inside of the mantleare appropriately positioned septa, resistant to corrosion, which guarantee the correct distribution of water making the tube bundle particularly robust and free from vibrations, even in case of high flow rates.

The condenser, complete with victaulic couplings, of singlepass type with water flow on the tube side (finned externally and internally lined) and refrigerant flow on the shell side. Any insulation is supplied in the heat pump version (DC option).

The evaporator is equipped with a safety differential pressostat on water side which prevent unit's operating in case of lack of flow and is colplete of Victaulic joints. Design pressure of both tube bundles are of 10bar on water side

COOLING CIRCUIT

Each RWH – PWH Ka – Kh - Ke cooling circuiti s equipped with:

- Dryer filter;
- Sight glass;
- Electronic thermostatic valve;
- Safety valve on high and low pressure side;
- Shut-off valve on liquid line;
- Non-return valve directly incorporated on the compressor outlet;
- High and low pressure gauges;
- High and low pressure switch;
- Temperature probes an 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 made by brazing or welding, following qualified processes and made by qualified personnel.

ELECTRIC BOARD

Theelectrical 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 / 3 ph / 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-comntacts.;

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 subjected to a safety cycle with continuity tests on the protection circuit, insulation resistance and tension test (dielectric strenght).

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

The microprocessori s made up of:

- An electronic control board with terminal blocks for transmitting the functional paramenters and operating the control devices;;
- An interface card for the user with programming keys and graphic display for displaying operating status and alarm messages.

The control electronic board manages all the device 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, ainter alia, to see the following informations::

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

There is teh possibility to interface EMS/BM;S management system.

SAFETY GAS SENSOR

The units of the range RWH-PWH Kh-Ke using A2L refrigerant are fitted with a safety gas leakage sensor installed into the unit.

At first start up (Power-On), the lekage sensor needs approximately 5 minutes before it is ready for function. During this period the unit has the power supply but remains on OFF .

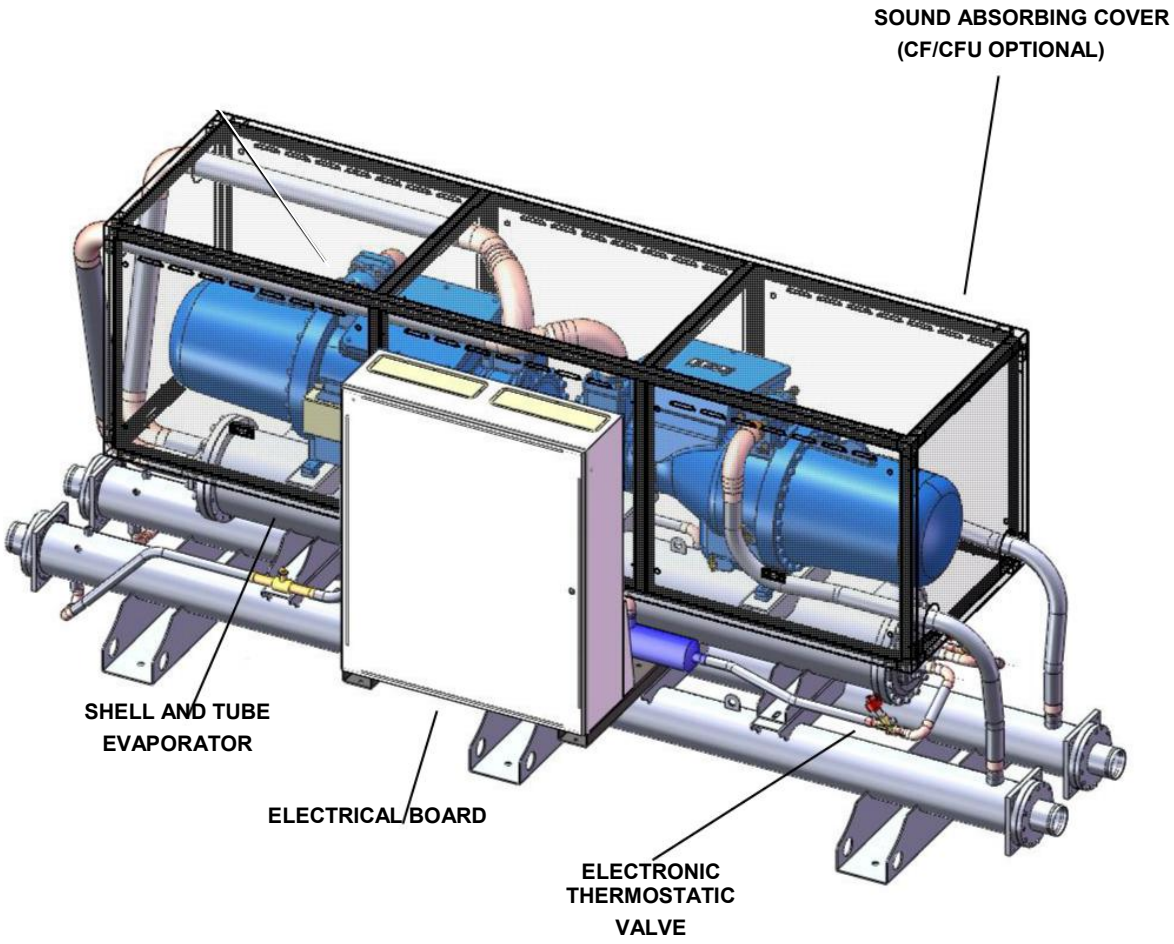
After this start up timing , wherever no malfunction will be indicated, the microprocessor gets the ok for starting and will be ready .

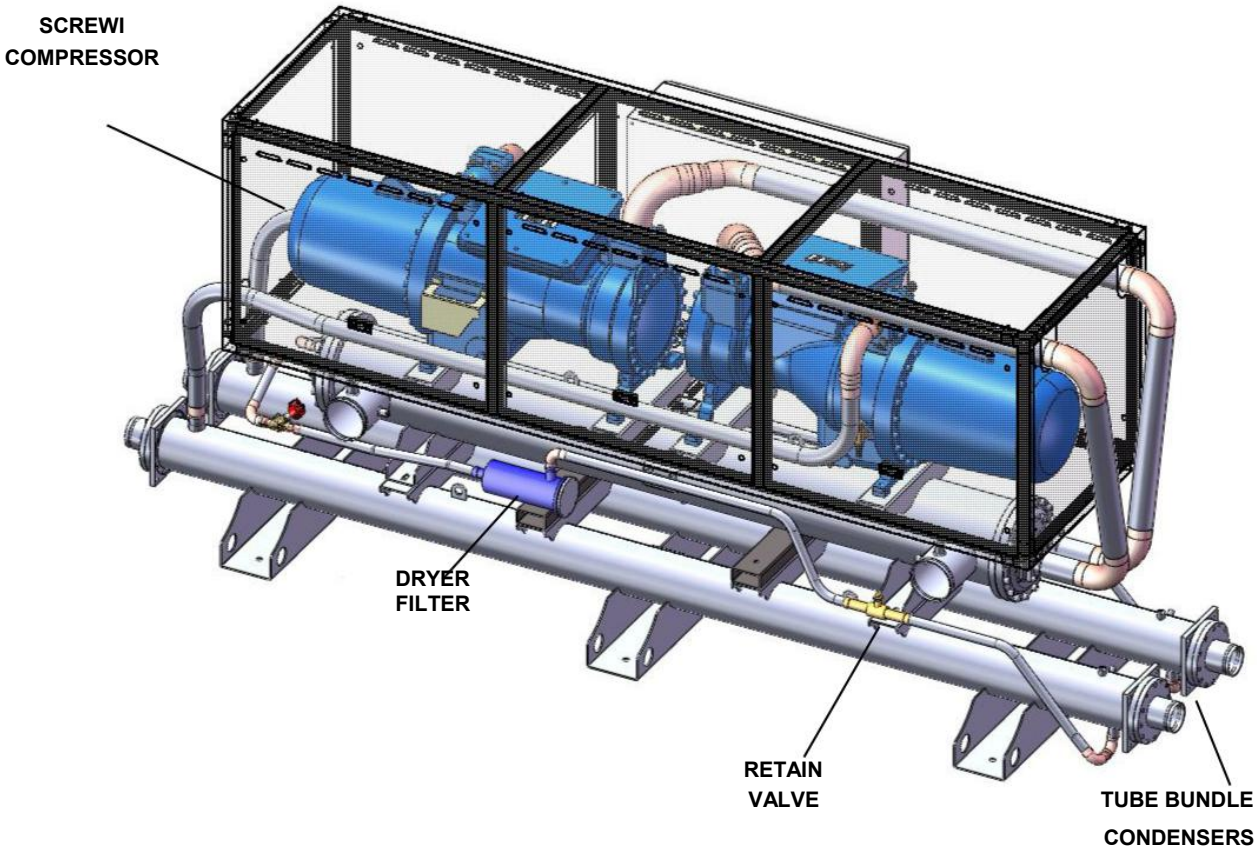
Wherever the sensor measure a gas concentration over 900ppm, this will release an alarm and the unit will be switched off immediately. To re start the unit , the alarm must be reset manually.

Recalibration of the sensor is required after each alarm intervention..

The sensor must be replaced if, after calibration, its sensitivity falls below 55% as specified by the manufacturer.

The sensor must be calibrated every 12 months. In any case, if more restrictive, the national legislation in force must also be applied regarding the minimum calibration interval of the sensor.


SOUND ABSORBING COVER
(CF/CFU OPTIONAL)
SHELL AND TUBE
EVAPORATOR
ELECTRICAL BOARD
ELECTRONIC
THERMOSTATIC
VALVE


SCREWI
COMPRESSOR
DRYER
FILTER
RETAIN
VALVE
TUBE BUNDLE
CONDENSERS

2.6 Options

Here below the main options which could be installed in RWH – PWH Ka 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 50/60Hz;

CA **Condenser suitable for sea water:** made of cupro.nichel or titanium, to be selected on request, suitable for working with seawater:

CC **Coibented condenser:** Condensers isolated with a 10mm thickness coibented material (only for PWH Series)

CF **Soundproofed compressors cabinet with standard material:** Insulation of compressors by a cabinet made of extruded anodized aluminium profiles, with panels in aluminium alloy, coated with soundproofing material.

CFU **Soundproofed compressors cabinet with bituminous rubber coated material:** Insulation of compressors by a cabinet made of extruded anodized aluminium profiles, with panels in aluminium alloy, coated with double thickness soundproofing material;

CS **Compressors inrush counter:** Electromechanical device positioned inside th electrical board, recording the total inrush starts of compressors.;

DS **Delta / Star:** Electric device of close tranition type to reduce the inrush current, complete with short circuit safety by mechanical interlock;

FL **Mechanical paddle flow switch:** On water side, for monitoring the correct water flow through the evaporator (Alternative to the safety water flow switch);

IE **Fumigated wooden crate packing:** Available on request for critical transport, so tu assure a suitable protection to the unit;

IH **RS 485 Serial Interface:** Electronic card to be connected to microprocessor, to allow communication between the units and a supervision system. It is possible to fully control the unit from remote. (Alternative to IH or IWG);

IH LON **IH LON Protocol Serial Interface:** Electronic card to be connected to the microprocessor to allow connection of the units to supervision system with LON Protocol, for a remote control and monitoring of the unit. (Alternative tp IH or IWG);

IM **Seawood packing:** Fumigated seawood case and film envelope together added with slowly vaporizing corrosion inhibitors completely nitrates and heavy metals (VCI) free suitable for long sea transport;

IWG **SNMP or TCP/IP Protocol Serial Interface:** Electronic card to be connected to the microprocessor it allow connection of the units to supervision system with SNMP or TCP(IP Protocol, for a remote control and monitoring of the unit. (Alternative to IH or IH LON);

LR **Liquid receiver:** Suitably sized to contain the exceeding quantity of liquid refrigerant;

M12÷25 **Modulating capacity control:** Made by means of some walves installed on compressors, depending on their quantity;

PA **Rubber-type vibration dampers:** Bell-shaped vibration dampers support for insulating the unit (supplied in kit), made of base and bell in galvanized steel and natural rubber mixture;

PM **Spring-type vibration dampers:** Spring vibration dampers support, 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 springs.

PQ **Remote microprocessor:** Remote terminal, allowing to display the temperature and humidity values detected by probes, the alarm digital inputs, the outputs and the remote ON/OFF of the unit, to change and program of the parameters, the sound signal and the display of the present alarms;

RA **Anti-freeze heater on evaporator:** Electrical heater installed on the evaporator, in order to prevent freezing and provided with thermostat;

RF **Power factor correction System Cosfi >0,9:** Electrical device made of suitable condenser for compressors rephrasing, ensuring a Cosfi value =0,9 so to reduce the power absorption from the electrical network;

RH **Shut-off valve on suction side:** They are used to isolate compressors during service ooperations;

RL **Compressors overload relays:** Electromechanical protection devices against compressor's overload;

RP **Partial heat recovery:** Of the condensing heat, by means of a refrigerant/water plate exchanger (desuperheater), always in series to the compressors. It is requested when you need to produce sanitary water, by recovering condensing heat capacity;

RT **Total heat recovery:** (100%) of the condensing heat, by means of a double condenser, in parallel to the water cooled condenser. It is requested when you need to produce sanitary water or heating by recovering condensing heat capacity. Exchangers are isolated by material of 10mm thickness;

V **Voltmeter:** Electrical device measuring the electrical tension in the power supply of the unit;

VB **Brine version:** Unit suitable for working with evaporator outlet water temperatures lower than 0°C. a 20mm evaporator insulation will be provided;

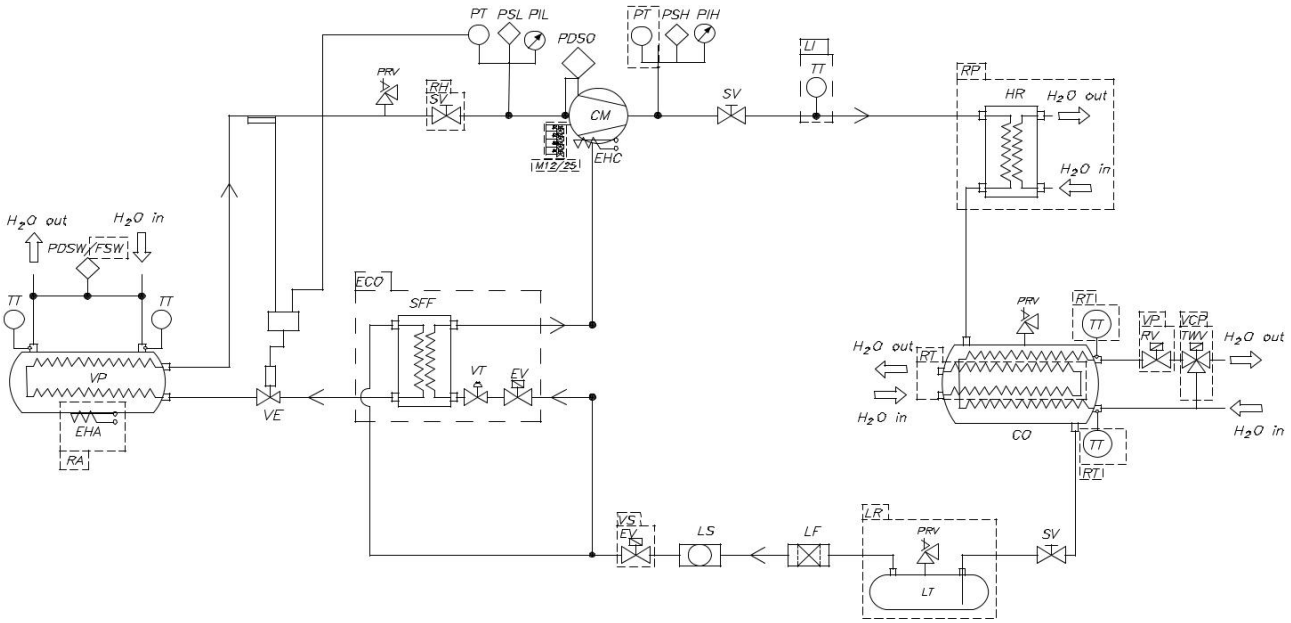
VCP **Regulation valve:** Of condensation pressure through the mixing on condenser water side, (supplied loose – alternative to VP);

VP **Pressostatic valve:** It is placed on condenser water side and controls the water flow rate according to the unit condensing pressure, (supplied loose – alternative to VCP);

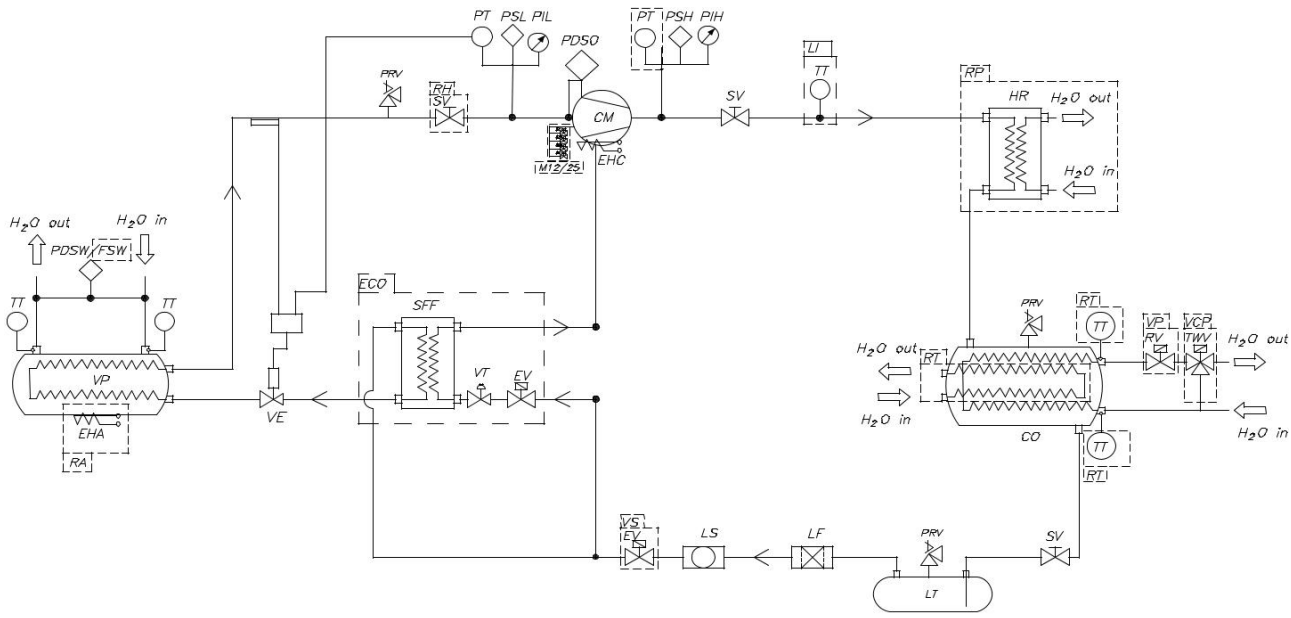
VS **Solenoid valve:** Electromagnetic solenoid valve on each cooling circuit to prevent refrigerant migratios and consequest flooding of compressors.

2.7 Functional diagram

RWH Ka COOLING CIRCUIT DIAGRAM (with some available options)



PWH Ka COOLING CIRCUIT DIAGRAM (with some available options)



LEGEND

CA	See water condenser	PIH	High pressure gauge
CM	Screw compressor	PIL	Low pressure gauge
CO	Tube bundle condenser	PRV	Freon safety switch
EHA	Anti-freezeelectronic heater	PSH	High pressure switch
EHC	Crankcase heater	PSL	Low pressure switch
EV	Solenoid valve	PT	Pressure tranducer
FSW	Paddle flow switch	RV	Water pressostatic switch
HR	Freon plates exchanger (for RP option)	SFF	Freon plates exchanger (for CEO)
LF	Dryer filter	SV	Shut-off ball switch
LS	Sight glass	TT	Temperature probe
M12/M25	Modulating capacity control	TWV	Three-way water valve
NR	Non-return valve	VE	Electronic expansion valve
PDSO	Opto-electronic oil sensor	VP	Shell and tube evaporator
PDSW	Differential pressure switch water side	VT	Mechanical expansion valve

2.8 Wiring diagram

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

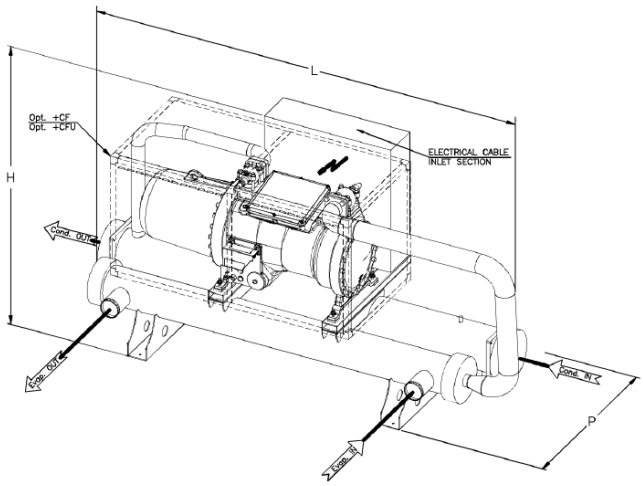
2.9 Sound emission

The unit doesn't 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 rang from the unit, issued under full load conditions.

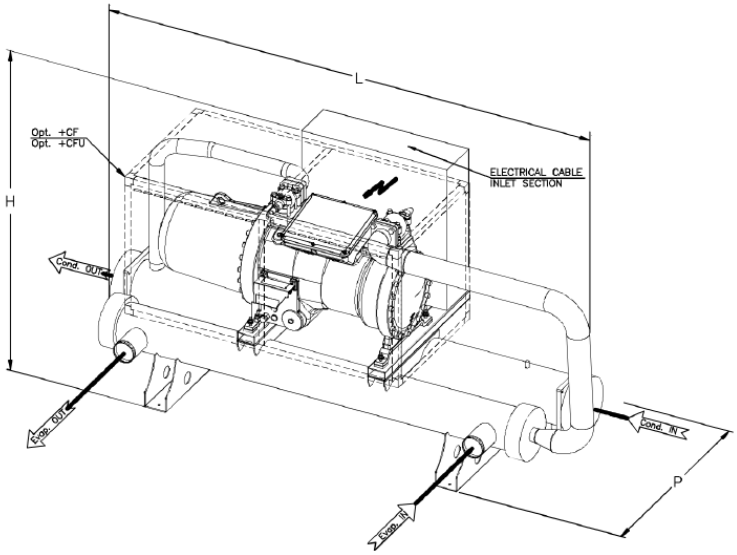
2.10 Dimensional drawing and weight table

In the following tab. are reported operate areas of RWH – PWH Ka Series unit.



BASES UNIT WEIGHT									
MODEL RWH		**281 Ka**	**321 Ka**	**361 Ka**	**421 Ka**	**452 Ka**	**491 Ka**	**562 Ka**	**551 Ka**
TRANSPORT	kg	1953	2024	2061	2713	2541	2957	3327	3026
OPERATING	kg	2120	2197	2234	2882	2781	3205	3569	3275
UNIT WEIGHT WITH OPTION									
OPERATING WITH CF	kg	2185	2262	2299	2947	2891	3270	3679	3340
OPERATING WITH CFU	kg	2205	2282	2319	2967	2921	3290	3709	3360
OPERATING WITH RP	kg	2146	2227	2269	2932	2825	3260	3613	3339
OPERATING WITH RT	kg	2384	2484	2534	3182	3256	3435	4149	3556
BASES UNIT DIMENSIONS									
LENGHT	mm	3600	3600	3600	3600	4100	3600	4100	3800
WIDHT	mm	1320	1320	1320	1320	1350	1500	1350	1500
HEIGHT	mm	1500	1500	1500	1500	1700	1950	1700	1950

BASES UNIT WEIGHT								
MODEL RWH		**601 Ka**	**642 Ka**	**732 Ka**	**852 Ka**	**992 Ka**	**1102 Ka**	**1202 Ka**
TRANSPORT	kg	3057	3846	4049	5407	5637	5716	5867
OPERATING	kg	3293	4208	4448	5814	6091	6161	6351
UNIT WEIGHT WITH OPTIONS								
OPERATING WITH CF	kg	3358	4318	4558	5924	6201	6271	6461
OPERATING WITH CFU	kg	3378	4348	4588	5954	6231	6301	6491
OPERATING WITH RP	kg	3362	4269	4517	5914	6202	6289	6489
OPERATING WITH RT	kg	3574	4670	5068	6554	6911	6981	7064
BASES UNIT DIMENSIONS								
LENGHT	mm	3800	4150	4200	4200	4200	4200	4200
WIDHT	mm	1500	1650	1650	1650	1650	1650	1650
HEIGHT	mm	1950	2000	2000	2000	2250	2250	2250



BASES UNIT WEIGHT									
MODEL PWH		**281 Ka**	**321 Ka**	**361 Ka**	**421 Ka**	**452 Ka**	**491 Ka**	**562 Ka**	**551 Ka**
TRANSPORT	kg	1990	2062	2099	2750	2604	2995	3401	3063
OPERATING	kg	2157	2234	2272	2920	2843	3242	3644	3312
UNIT WEIGHT WITH OPTIONS									
OPERATING WITH CF	kg	2222	2299	2337	2985	2953	3307	3754	3377
OPERATING WITH CFU	kg	2242	2319	2357	3005	2983	3327	3784	3397
OPERATING WITH RP	kg	2183	2264	2307	2970	2888	3298	3688	3376
OPERATING WITHRT	kg	2421	2521	2572	3220	3318	3472	4224	3593
BASES UNIT DIMENSION									
LENGHT	mm	3600	3600	3600	3600	4100	3600	4100	3800
WIDHT	mm	1320	1320	1320	1320	1350	1500	1350	1500
HEIGHT	mm	1500	1500	1500	1500	1700	1950	1700	1950

BASES UNIT WEIGHT								
MODEL PWH		**601 Ka**	**642 Ka**	**732 Ka**	**852 Ka**	**992 Ka**	**1102 Ka**	**1202 Ka**
TRANSPORT	kg	3094	3921	4123	5510	5741	5819	5971
OPERATING	kg	3331	4282	4523	5917	6195	6265	6454
UNIT WEIGHT WITH OPTION								
OPERATING WITH CF	kg	3396	4392	4633	6027	6305	6375	6564
OPERATING WITH CFU	kg	3416	4422	4663	6057	6335	6405	6594
OPERATING WITH RP	kg	3399	4343	4592	6018	6305	6393	6592
OPERATING WITH RT	kg	3612	4744	5143	6658	7015	7085	7167
BASES UNIT DIMENSIONS								
LENGHT	mm	3800	4150	4200	4200	4200	4200	4200
WIDHT	mm	1500	1650	1650	1650	1650	1650	1650
HEIGHT	mm	1950	2000	2000	2000	2250	2250	2250

3. INSTALLATION

The unit installation must comply with local existing Laws and Regulations.

3.1 Identification

The uniti s 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. The serial number must be always advised whenever submitting a request of Manufacturer technical service support.

3.2 Reception and inspection

It's very important to check (by visual inspection) the packing integrity immediatly 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, e-mail or by registerd letter within 8 days from tehh receiving data.

3.3 Handling

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

PERICOLO GENERICO

The weight of some models could be unbalanced, ti's necessary check the unit stability before starting to handle it.

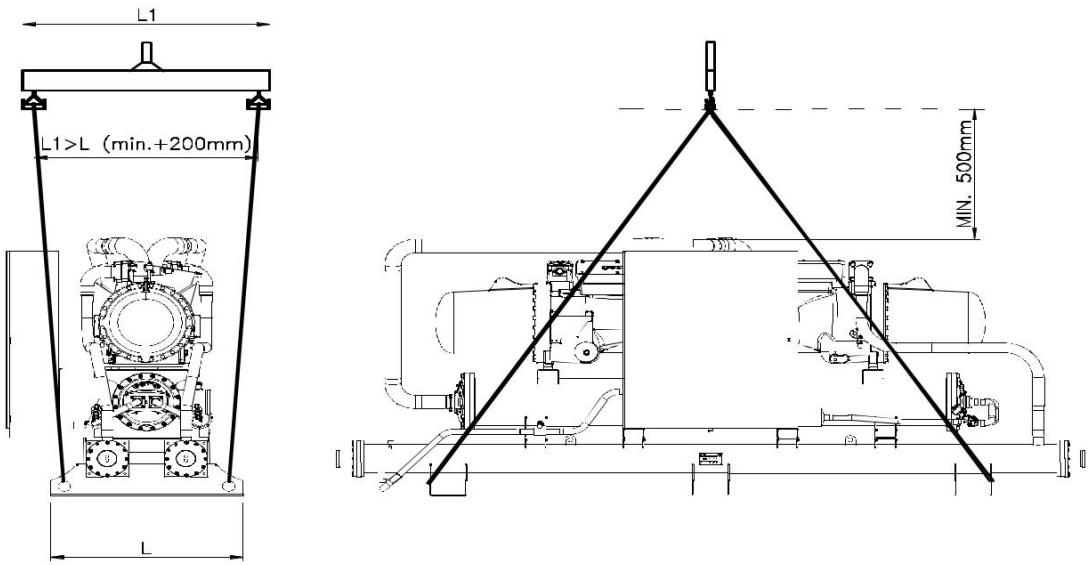
For any unit handling, please follow the instructions shown in figure 3.1, considering as indicative.

PERICOLO GENERICO

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

In the case the machine is moved 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..

UNIT LIFTING DRAWING



Before starting to handling 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 than 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, aluminium and other materials which are used in its constuction. It's necessary to carry out chemical analysis in case of doubts and to send the result to the Manufacturer, in ordr 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:

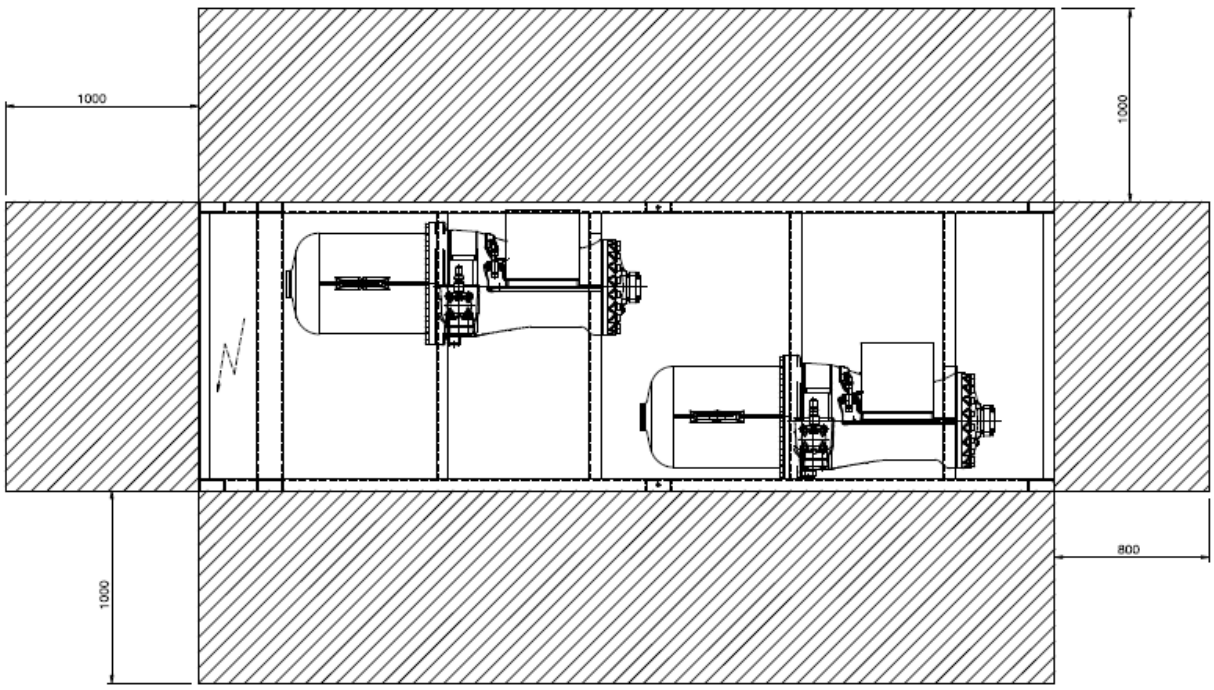
- The floor where the machine is positioned can bear the total unit weight under normal operation;
- Enough romm must be left around the unit to follow the routine and the special maintainance, such as compressors and heat exchanger replacement as shown in the drawing below;
- Connections for electric and hydraulic circuit must be done.

The unit is designed to be installed and to operate outdoor.

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

The unit doesn't need any special basement, since it can be simply laid down on the chosen surface.

SERVICE AREA



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

It is recommended to verify the congruence between the technical data of the Manual's unit and the project data.

3.5 Hydraulic circuit

The uniti s designed to be connected to a refrigerant and / or heated water distribution network, depending on whether they are chiller or heat pump. The pipes must be laid by an expert installer.

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

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

The diameter of the hydraulic connections are shown in the dimensional drawing attached to the Manual. The hydraulic system's pipes diameter must be chosen so as to contain the load losses in the circuit acceptable limits.

3.5.1 HYDRAULIC CONNECTIONS DIAMETER

RWH / PWH Ka UNITS								
MODEL	281 Ka	321 Ka	361 Ka	421 Ka	452 Ka	491 Ka	562 Ka	551 Ka
Evaporator connections	2 x 5" Victaulic	2 x 5" Victaulic	2 x 5" Victaulic	2 x 5" Victaulic	2 x 6" Victaulic	2 x 6" Victaulic	2 x 6" Victaulic	2 x 6" Victaulic
Condenser connections	2 x 5" Victaulic	2 x 5" Victaulic	2 x 5" Victaulic	2 x 5" Victaulic	4 x 4" Victaulic	2 x 5" Victaulic	4 x 4" Victaulic	2 x 5" Victaulic
Partial heat recovery connections	2 x 2" Victaulic	2 x 2" Victaulic	2 x 2" Victaulic	2 x 3" Victaulic	4 x 2" Victaulic	2 x 3" Victaulic	4 x 2" Victaulic	2 x 3" Victaulic
Total heat recovery connections	2 x 5" Victaulic	2 x 5" Victaulic	2 x 5" Victaulic	2 x 5" Victaulic	4 x 4" Victaulic	2 x 5" Victaulic	4 x 4" Victaulic	2 x 5" Victaulic

RWH / PWH Ka UNITS							
MODEL	601 Ka	642 Ka	732 Ka	852 Ka	992 Ka	1102 Ka	1202 Ka
Evaporator connections	2 x 6" Victaulic	2 x 8" Victaulic	2 x 8" Victaulic	2 x 8" Victaulic	2 x 8" Victaulic	2 x 8" Victaulic	2 x 8" Victaulic
Condenser connections	2 x 5" Victaulic	4 x 4" Victaulic	4 x 5" Victaulic	4 x 5" Victaulic	4 x 5" Victaulic	4 x 5" Victaulic	4 x 5" Victaulic
Partial heat recovery connections	2 x 3" Victaulic	4 x 2" Victaulic	4 x 2" Victaulic	4 x 3" Victaulic	4 x 3" Victaulic	4 x 3" Victaulic	4 x 3" Victaulic
Total heat recovery connections	2 x 5" Victaulic	4 x 5" Victaulic	4 x 5" Victaulic	4 x 5" Victaulic	4 x 5" Victaulic	4 x 5" Victaulic	4 x 5" Victaulic

Below are summarized some general indications, which it is good practice to follow, for the hydraulic circuit construction;

- Perform the piping path in such a way so as to limita s much as possible the pressure drop in the system;.
- Pipes must be adequately suported 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 particels 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 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 diaphgram pressure.

PERICOLO GENERICO

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

- The system must be protected by a safety valve and a pressure no higher than 6bar;
- Place the air discharge valves in the appropriate points of the hydraulic system
- The hydraulic system has to be outfitted with connections for its empty.
- The hydraulic system must be outfitted with connection so to fill with water, and if applicable with anti-freeze mixture;
- Washing the hydraulic circuit once the pipes are placed by appropriate substances. So avoiding dirt and solid particels remain in 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.

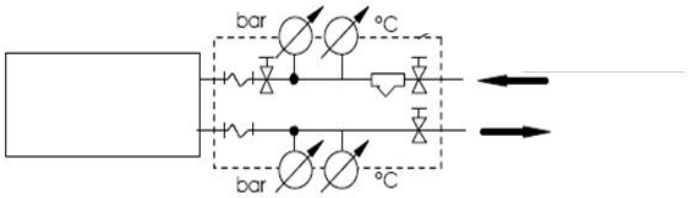
The unit must be connected to the hydraulic cirtuit by an expert and qualified technician, in compliance with the local Regulations in force.

It is important the chilled liquid flows in the correct direction into the evaporator. So 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 pipes 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 downtream the filter, to make the required cleaning operations easier and faster;
- The installation of probes and gauges near the unit in-and-outlet connections, makes the check of the right unit operation easier;
- The chilled water system must be covered by close cells anti-condense material, thermally insulated, steam resistant and with a thickness suitable to the worst foreseeable conditions, during working and stops;
- To connect the unit to the hydraulic system, the prearranged connections shown in the dimensional drawing enclosed in the Handbook, must be used;
- Once the circuit is done and the unit installed, an hydraulic leak test of the all system must be done, in order to find any possible leakage and repair it, before the unit will be filled and commissioned

After the hydraulic test, if the system will be started after a long break or the ambient temperature can go down to values near or lower than 0°C, the circuit must be drained and chargered with an anti-freeze liquid.

PERICOLO GENERICO

Make the compressors start only after the evaporator water circulation pumps will be on; this can be obtained, for example, by an electrical interlock (see wiring diagram attached in the Handbook)

3.5.3 HYDRAULIC CONNECTIONS - CONDENSER

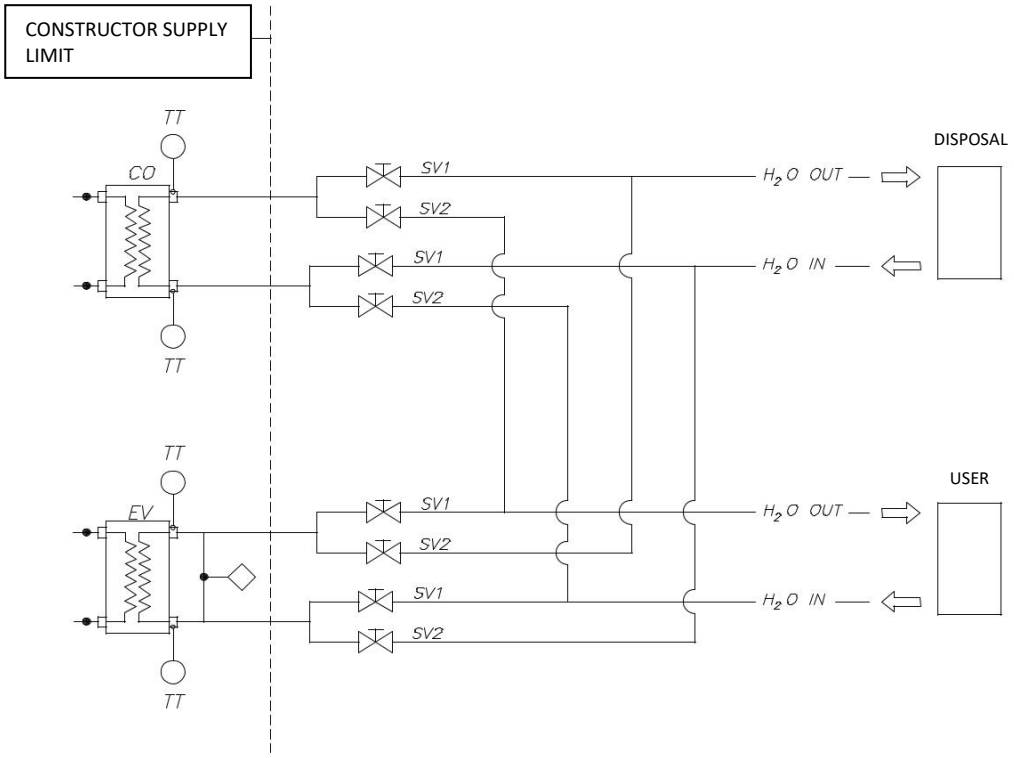
Keeping in mind the instructions previously provided for the installation of the pipes connected to the evaporator, for the condenser connection it is necessary to remember that, with a certain frequency also dependending of the charateristics of the water; it is essential to periodically clean the condenser.
If the uniti s equipped with pressure switches (optionals) to regulate the flow of condensation water, this must be consider when selecting the pumps.

3.5.4 HEAT PUMP HYDRAULI CONNECTIONS - PWH Ka SERIES

In case of heat pums (PWH Ka Series) with hydraulic cycle inversion, , the following situation occurs:

- Summer operation: the chilled water produced in the evaporator is sent for use, while the hot water produced in the condenser is sent to the exchanger in which it can dissipate the accumulated heat.
- Winter operation: the hot water produced in the condenser is sent for use, while the cold water produced in the evaporator is sent to the exchanger in which it absorbs the heat transferred.

In order to this operation take place, the hydraulic system must be built according to the principle diagram shown below; the circuit can be made according to specific, opportunities, with manual or automatic two or three-way valves.



Legenda:

CO - Tube bundle Condenser

EV – Tube bundle evaporator

SV1 - Valve (open in summer operating – closed in winter operating)

SV2 - Valve (open in winter operaing - closed in summer operating)

TT – Temperature probe

3.5.5 CHEMICAL-PHYSICAL PROPERTIES OF WATER

In the following table there are, just as 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 early 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_3O_4	ppm	0
CO_2	ppm	<10
H_2S	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 in ppm $CaC0_3$

pCa = logarithm of the limestone hardness in ppm $CaC0_3$

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 cjheck valve;

c) If the circuit works with an anti-freeze 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 last 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 pumps and discharge the gathered air, if present, by opening one after the other the air vent valves installed in the system;

i) Charge the circuit with water to bring pressure back to its origin value;

j) Repeat the steps from g) 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°C or, during stops, can get near to 0°C, introduce inside the circuit an antifreeze mixture, having a freezing point enough lower than the forseen minimum temperatures.

Some antifreeze liquids are dangerous if ingested or can cause skin and sensitive mucous membranes irritation. Carefully follow the safety instructions on the bottle or instruction 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 mixtures or those ones not compatible with copper, carbon steel, aluminimu and all the other material present in the system.

As an example, here below the freezing points for different values of ethylene glycol concentration in water are listed.

The values in the table are just an indication and must be used as a reference. Sometimes the suppliers deliver the product already thinned, therefore you have to refer to the diluition rate indicated by the fluid manufacturer

	ETHYLENE GLYCOL PERCENTAGE ON THE MIXTURE (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 one, 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 analyzed 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 pisposal services, in compliance with current local Laws and Norms.

3.6 Electronic connections

The electrical power supply must be sized by a qualified designer and realized by qualified technicians, on behalf of the Owner, in compliance with current local Regulationa.
The suplly 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 permitt the unit power cutting, without stopping other services like lightening, ventilation, alarm and safety system.

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 in the unit, consult 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

Must be utilized a cable with a suitable cross-section and as short as possible, to avoid excessive voltage drops.

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

3.6.1 Connection the power supply

The unit must be supplied by a 4 pole-cable (3 poles + GND), if the power supply voltage is 400V / 3ph / 50Hz (+/- 2%) +GND.
On demand, it is possible having a 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 upstream the unit through an automatic switch with suitable size and features. The power cable cross-section and the automatic switch size can be found in the attached electrical components table together with the amin switch size.
The position for cable entry is shown 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 pictures.

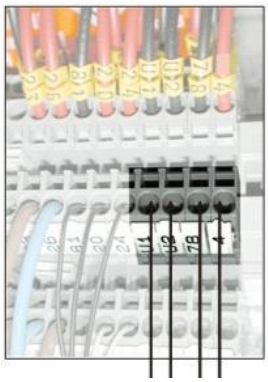
Before any intervention on the electrical system, visually check that the electical circuits of the unit have not be damaged during the transport.
In particular, verify that all the terminals screw are correctly tightened and the cable insulation is intact and undamaged.
The phase conductors of the supply 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.



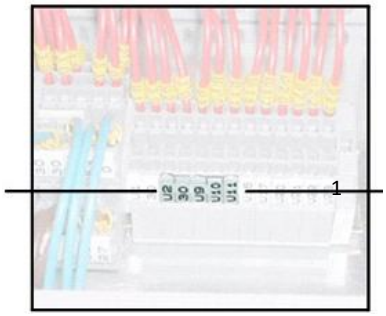
1 2

Inside the alectrical cabinet there is a terminal box with digital and analogue signal 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 the pre-arranged terminals for free contacts described in the table are represented

(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)

2



If, once the phase inversion is done, a component rotate in the wrong sense, verify and if required correct the supply cables sequence for each componet, as here 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 the 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 cn be connected to a drain pipe if present and if the installation design and current local Regulation allow it.

If provided, the valves must be conveyed individually, by means of metal pipes, to an area in which the refrigerant discharged can not cause damage to people or things

.

The refrigerant spilled from safety valves is an high pressure, high temperature and high speed discharge gas. Its flow may damage things and people if directly touched.

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

Units charged with A2L refrigerants (R513A, R1234Ze) create a Zone 2 area of 1,5 mt around and over the discharge of the safety valve when it opens. Be carefull to remove any ignition fire source in this area.

The pipe's diameter must be no smaller than safety valves draining pipes 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 pipe's outlet connections must be done so to avoid that rain, snow, ice and dirt can accumulate and obstruct it.

The valve's discharge must be done at a suitable distance from other equipmens, system or ignition sources; the discharges refrigerant must not accidentally enter buildings.
In any case, any pipe on the safety valve discharge, must be made in compliance with current Laws and Regulations.

3.8 RWH/PWH Ka application range

The nominal water flow of the standard units is referred to a Delta T 5K between inlet and outlet in connection to the supplied cooling capacity.

RWH / PWH Ka UNITS								
MODEL	281 Ka	321 Ka	361 Ka	421 Ka	452 Ka	491 Ka	562 Ka	551 Ka
Evaporator max flow (mc/h)	82,8	95,0	108,1	125,6	132,7	144,7	165,2	163,1
Evaporator min flow (mc/h)	33,8	38,8	44,2	51,3	54,2	59,1	67,5	66,6
Condenser max flow (mc/h)	100,1	114,8	130,9	151,9	80,8	174,5	99,7	197,8
Condenser min flow (mc/h)	40,9	46,9	53,5	62,1	33,0	71,3	40,7	80,8

RWH / PWH Ka UNITS							
MODEL	601 Ka	642 Ka	732 Ka	852 Ka	992 Ka	1102 Ka	1202 Ka
Evaporator max flow (mc/h)	177,9	191,1	216,4	251,0	294,2	328,8	363,2
Evaporator min flow (mc/h)	72,7	78,0	88,4	102,5	120,1	134,3	148,3
Condenser max flow (mc/h)	216,0	115,4	130,9	151,6	176,6	199,0	219,2
Condenser min flow (mc/h)	88,2	47,2	53,5	61,9	72,1	81,3	89,5

The maximum allowed flow is referred to a Delta T 3K in connection to the design cooling capacity (higer flow values could cause noise and vibration which could damage the evaporator.

The minimum allower flow is referred to a Delta T 7K in connection 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 = 58°C

1. For different uses please contact service department.
2. Lower temperatures could cause miss functioning.
3. Higher temperatures could cause safety devices intervention and the unit stop.
4. If water temperatures is lowerr than 5°C (evaporator outlet), besides the use of water and glycol mixture, recalibrate the anti-freeze thermostat (always 4°C higher than the mixture freezing point) and 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 maintainance, on safety measures and regulations to respect, as well as on any personal protective equipment to arrnage, 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, all the informations required to manage and maintain the system keeping it safe and reliable, must be kept in a visible position, 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 (henceforth called Register) should be prepared and kept updates, as stated in EN 378-4, par 4.3. This document must contains the following informations about the unit:

a) The details of all maintainance and repair works;

b) The charger refrigerant quantity and type (new, used or recycled) and the quantity of refrigerant each time discharged;

c) The used refrigerant analysis (results, where available, must be noted in the Register);

d) The 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 Register must be kept by the Owner so that and updated copy can always be consulted by the technicians during the unit maintainance and inspections.

4.2 Preliminary checks

Before the start-up, the unit must be visually inspected by a technician with a suitable experience. This inspection must includes the following checks

a) Identification of any possible damage occurred during transport, stockage 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 that 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, maintainance and repair;

l) Check the presence and good conditions of thermal and steam insulation.

The technician who carried out these checks must documents the realization following the current local Regulations.

Before starting unit, during start-up or after a long stop, verify the sonnections and wirings, as well as protective conductors connections. If any fault is detected, the unit cannot be started.

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 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 the 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 cooled circulates freely and in the right direction, in the evaporator;
- ITHde flow rate of the circulating fluid to be cooled is the same of the designed one;;
- The valves on the compressor and along the cooling line are in teh status (open or closed) suitable to a right unit operation;
- If required, the hydraulic line contains the needed antifreeze mixture in the required concentration;
- The values of regulation temperature and of the anti-freeze alarmi, on the microprocessor, are correctly settled;
- The designed water flow to the evaporator is granted;
- The hydraulic circuit valves are open;
- All safety requirements have been respected;
- The space to be left free have been respected;;
- Electrical connections have been correctly done;
- The voltage is within tolerance of +/- 10% in comparison to the unit normal one;
- The tightening of all electrical and hydraulic connections has been well done..

4.3 First start-up

The start-up of the unit must be carried out by a skilled refrigeration technician authorized by the Manufacturer.

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 give supply to the unit;

b) Press the ON/OFF button on the microprocessor keyboard, and switch it 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, settable by microprocessor, the fans shall start and, then all the compressors one after the other, according to the cooling capacity required to meet request.

Once the machine has reached a steady operation, the technicians carrying on the first star-up 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 their value is required one;

c) There are no refrigerant leakeages.

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

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

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PERICOLO GENERICO

During firt Start-up commissionig 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, condensation pressure adjustament 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 the machine is expected to stay in this conditions for more than 24hours, turn the main switch in OFF position in order to cut the power supply.

Any anomalies detected during unit operation must be solved as soons as possible, in order to avoid them to be present once more, when the unit will be again switched on.

4.4 Microprocessor regulation

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

Any modification on the microprocessor parameters must be done by qualified technicians only, 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. MAINTAINANCE

The Owner must take care that a suitable maintainance is carried out on the unit as indicated in the Handbook and as required by current local Laws and Regulations.

The unit maintainance must be carried out by qualified and trained personnel, equipped with personal protective devices, as required by current local Laws and Regulations in force.

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

Unii maintainance must be carried out so that:

a) The risk of accidents for people and of damage to things is minimal;

b) No damages occurs to the System Components;

c) The System operation and readiness are not compromised;

d) Any refrigerant leak is found and solved;

e) iPower consumption is minimal..

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

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

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

No modifications 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 the power supply to the electric panel off, by turning the mani switch to OFF position.

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

Components surfaces 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 maintainance operations on the unit.

5.1 Programmed maintainance

The Owner must take caret hat the unit is adequately maintained, according to the indications contained in the Handbook and what required by current local Laws and Regulations.

The Owner must take care that the unit is periodically suitably 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 leas once a year, to check that they work properly.

During its operation life the unit must be inspected and checked as stated by current local Laws and Regulations. In particular, unless more restrictive specifications, follow the recommendation on the following table (see. EN 378. Encl.D).

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

A	Inspection, after an intervention, with possible effects on the mechanical resistance or after a change purpose or after a stop longer than 2 years; all unfit components must be replaced. Do not carry on checks with higher pressures than designed one.
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 th amechanical resistance, refer to point A
D	Refrigerant leak detection after a justified suspicious. The System must be checked to find any leak, using direct measures (devices able to find the leak) or indirect ones (deduction of the leak presence analyzing the operational parameters), focusing attention on those parts which are more easilynexposed to leaks (junctions, for example)

If it is detected a failure compromising the reliable unit operation, the unit cannot be restart before it will be solved.

5.1.1 Leak detection

If not 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 Resulation 1516/2007).

If, during the leak test, there is a souspicious that there are may be a refrigerant leak (for instance, after a reduction of cooling capacity or after superheating or subcooling measuremets), 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 rstrictive local Regulation, the safety high pressure switches must be inspected at least every 12 monthe, 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 more restrictive local Regulation, external safety valves must be inspected on site at least every 12 months, to check their tightness. If a leak is detected, the valve must be replaced.
Valves must be inspected every 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 Fluid to be cooled check

IThe fluid of the refrigerant/liquid exchanger must be inspected at least 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 Check and calibration of the refrigerant leak detector

The maintenance (sight, operational and system one) of the detector must be done once a year to keep unchanged its safety and measurement performance and to grant the refrigerant detection alarm. The maintenance must be carefully done by skilled and qualified personnel.

The system control, carried out by qualified personnel, must be done every 12 months at least and involves minimum the following operations:

Functional check

Failure relay check

Alarm relay check

Point 0 check

Control and calibration check with test gas; to carry on such a test, you can buy the calibration kit or send the detector to the Manufacturer for the calibration.

To carry on the test, you need to use the dedicated kit by the Manufacturer; In any case refer to the handbook of the detector supplied with the unit.

The procedure indicated by the Manufacturer must be strictly followed. If the test is successfully completed, the detector can be installed and use once more.

If after the calibration is sensibility fall below the 55%, the detector must be replaced as suggested by the manufacturer.

5.2 Ordinary maintainance

5.2.1 Overcurrent protection devices check

The overcurrent protection devices must be inspected to check 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 by-passing the fuses used in the unit, or replacing them with bigger ones.

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

Blade-type fuses, used with high current values, must be replaced using the special handle provided with the unit. The use of unsuitable tools, can damage device and operator.

If adjustable devices (thermal relays and motors protection) are installed, verify that the set adsorption value is not higher than the one on Identification Tag of the component to be protected.

5.2.2 Contractors check

Contactors used to activate electrical loads must be checked to verify their integrity, contacts condition and the coil functionally.

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						
Unit visually inspect		X					
Check the noise and vibrations		X					
Check safety devices and interlocks				X			
Check the unit performance				X			
Check the absorbed current of the compo-nents (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 functio-ning					X		
Check microprocessor and display functio-ning			X				
Check microprocessor parameter 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 Delta T-densatore				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							
Compressors visually inspect		X					
Check compressors noise and vibrations		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 procedures can be directly done by the System Owner. The other interventions must be done by qualified and suitably trained personnel

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

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

Any intervention on the cooling circuit must be done by qualified and suitable trained technicians, licensed in compliance with current local Laws and Regulations.

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 detection of the failure occurring during the operation is made by the microprocessor, which besides signaling alarms, also shows the active failure kind.

The hereafter table reports the most common miss-functioning, and for each one of the most common 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).

Contactors used to activate electrical loads must be inspected to check theis integrity, contacts conditions and the coil functionally. Also verify that the electrical cables are correctly and firmly tighten 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 power supplied	Check each phase Voltage in the power supply line Check that main switch is closer (position ON)
	b) Auxiliary circuit is not power supplied	Check the fuses of the Auxiliary Circuit (see wiring diagram)
	c) Microprocessor doesn't start the unit	Check microprocessor's electrical connections Check temperature set values
	d) External consent to the unit start is missing	Check that the remote ON/OFF contact is closed (see wiring diagram) Enable consent to the unit start from user board (display)
2. Cooled 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 yeld is not sufficent	See point 11
	e) The Control System is not working	Check the Microprocessor Handbook
3. Cooled 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. Cooled water/condensing water flow is too low	a) The water pump is not working	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 resset, check tension and electric absorption
	d) Obstruction inthe hydraulic circuit	Make sure filter 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
5. The high pressure switch is activated	a) The high pressure switch is not set properly or is defective (if present)	Check the functionally and calibration of Control System on condensation
	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 sufficent	See point 4
6. The low pressure switch is activated	a) The flow 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 compressor discharge pressure	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 compressors discharge temperature is high, the cooling circuit must be discharge and recharged after the vacuum execution.
	d) Too hot water at the condenser	Check capacity of the condensation water cooling system
	e) Condensing water flow capacity insufficient	See point 4
	f) Encrusted condenser	Wash the exchanger with suitable products
8. Low compressor discharge pressure	a) The Control System of the condensation pressure is not work properly	Check setting and operation of pressostatic valve
	b) Suction pressure too low	See point 10
	a) Thermal load higher than estimated	Check the room thermal load value

9. High compressor suction pressure	b)	Discharge pressure too high	See point 7
	c)	Liquid refrigerant return to the compressor suction side	Make sure the thermostati cavlve overheating is correct Check the valve bulb is properly placed, fixed and insulated

FAILURE		PROBABLE CAUSE	SUGGESTED ACTIONS
10. Low compressor suction pressure	a)	Ambient temperature too low	See point 3
	b)	Cooled water floe capacity too low	See point 4
	c)	Clogged refrigerant filter	Check the refrigerant filter
	d)	The thermostatic valve is not settled properly or is defective	Check that 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	Check the thermostatic valve overheating is correct Check the valve bulb is properly placed, fixed and insulated
	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 is not working	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	Heck the probe connection and if it works in case of defect replace it.

5.4 Extraordinary maintainance

The unit must be repaired by qualified and trained peronnel, equipped with individual protection devices in compliance with current local Laws and Regulations.


No modification must be carried out 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 operations, all the components which could be damaged from the heat must be removed or covered with wet clothes.


When the intervention is made uninstallig shut off valves, replace gasket with new ones

6. DEMOLITION AND DISPOSAL

At unit disposal the different components the unit is made of must be devide and sent to the waste separated collection. This operation must be done by a specialized film, in compliance with current environmental Laws.

If the unit has worked with antifreeze mixture, collec all the fluid contained in the unit and send it to a disposal authorized centre.


It is forbidden disperse any antifreeze mixture if present in ambient.