EMICON
CLIMATE SOLUTIONS

PAE N Kc Kr

HEAT PUMPS FOR OUTDOOR INSTALLATION EQUIPPED WITH SCROLL COMPRESSORS AND AXIAL FANS

INSTALLATION, USE AND MAINTENANCE TECHNICAL MANUAL

Incorporated in this document are the following:
- Declaration of conformity
- Technical manual
- Dimensional drawing

TÜVRheinland CERTIFIED
Management System
ISO 9001:2015
ISO 14001:2015
ISO 45001:2018
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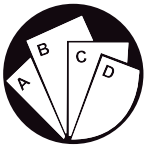
CE



Multiple instructions: Consult the specific part

Read and understand the instructions before undertaking any work on the unit

RETAIN FOR FUTURE REFERENCE

Declaration of conformity

We declare under our own responsibility that the below equipment complies in all parts with the CEE and EN directives.
The declaration of conformity is enclosed to the technical booklet enclosed with the unit. The unit contains fluorinated greenhouse gases.

INDEX

1. INTRODUCTION

1.1 Preliminary information

Reproduction, storage or transmission of any part of this publication in any form, without the prior written consent of the Company, is prohibited.
The unit to which these instructions refer, is designed to be used for the the purposes described and to be operated in accordance with these instructions.
The Company will not be liable for claims for damage caused to persons, animals, material goods or property caused by improper installation, adjustment and maintenance or improper use. Any use not specified in this manual is prohibited.
This document is intended to provide information only and does not form a contract with third parties.
The Company pursues a policy of constant improvement and development of its products and therefore reserves the right to change the specifications and the documentation at any time, without notice and without obligation to update existing equipment.

1.2 Aim and content of the manual

These instructions are intended to provide the information required for the selection, installation, use and maintenance of the unit.
They have been prepared in accordance with the European Union laws and with the technical standards in force at the date of issue of the instructions.
The instructions contain all the necessary information to prevent any reasonably foreseeable misuse.

1.3 How to store this manual

The manual must be kept in a suitable place with easy access for users and operators, protected from dust and damp.
The manual must always accompany the unit during the entire life cycle of the same and therefore must be transferred to any subsequent user.

1.4 Manual Update

It is recommended that the manual is updated to the latest revision available.
If updates are sent to the customer they must be added to this manual.
The latest information regarding the use of its products is available by contacting the Company.

1.5 How to use this manual

The manual is an integral part of the unit.

Users or operators must consult the manual before performing any operation and especially so when transporting, handling, installating, maintaining, or dismantling the unit in order to eliminate uncertainty and reduce risk.

In these instructions symbols have been used (described in the following paragraphs) to draw the attention of operators and users to the operations that have a higher risk and which must be performed safely.

1.6 Potential Risks

Whilst the unit has been designed to minimize any risk posed to the safety of people who will interact with it, it has not been technically possible to eliminate completely the causes of risk. It is therefore necessary to refer to the requirements and symbolism below:

LOCATION OF RISK	POTENTIAL RISK	METHOD OF INJURY	PRECAUTIONS
Thermal heat exchangers.	Small stab wounds.	Contact	Avoid any contact, use protective gloves.
Fan and fan grilles.	Cuts, eye damage, broken bones.	Insertion of sharp objects through the grid while the fans are operating.	Never put objects through the protection grilles.
Internal component: compressors and discharge pipes	Burns.	Contact	Avoid any contact, use protective gloves.
Internal component: electric cables and metallic parts	Electrocution, severe burns.	Defect in the supply cable insulation, live metallic parts.	Adequate protection of power cables, ensure correct earthing of all metal parts.
External to unit: unit enclosure	Poisoning, severe burns.	Fire due to short circuit or overheating of the supply cable external to unit.	Size cables and mains protection system in accordance with iee regulations.
Low pressure safety valve.	Poisoning, severe burns.	High evaporating pressure causing a refgrigerant discharge during maintenance.	Carefully check the evaporating pressure during the maintenance operations.
High pressure safety valve.	Poisoning, severe burns, hearing loss.	Activation of the high pressure safety valve with the refrigerant circuit open.	If possible, do not open the refrigerant circuit valve; carefuly check the condensing pressure; use all the personal protective equipment required by law.
Entire unit	External fire	Fire due to natural disasters or combustions of elements nearby unit	Provide the necessary fire-fighting equipment
Entire unit	Explosion, injuries, burns, poisoning, folgoramento for natural disasters or earthquake.	Breakages, failures due to natural disasters or earthquake	Plan the necessary precautions both electrical (suitable differential magneto and electrical protection of the supply lines; greatest care during the connections of the metal parts), and mechanical (special anchors or seismic vibrations to prevent breakages or accidental falls).

1.7 General Description of Symbols Used

Safety symbols combined in accordance with ISO 3864-2:

BANNED
A black symbol inside a red circle with a red diagonal indicates an action that should not be performed.

WARNING
A black graphic symbol added to a yellow triangle with black edges indicates danger.

ACTION REQUIRED
A white symbol inserted in a blue circle indicates an action that must be done to avoid a risk.

Safety symbols combined in accordance with ISO 3864-2:

The graphic symbol “warning” is qualified with additional safety information (text or other symbols).

1.8 Safety symbols used

GENERAL RISK
Observe all signs placed next to the pictogram. The failure to follow directions may create a risk situation that may be injurious to the user.

ELECTRICAL HAZARD
Observe all signs placed next to the pictogram.
The symbol indicates components of the unit and actions described in this manual that could create an electrical hazard.

MOVING PARTS
The symbol indicates those moving parts of the unit that could create risk.

HOT SURFACES
The symbol indicates those components with high surface temperature that could create risks.

SHARP SURFACES
The symbol indicates components or parts that could cause stab wounds.

EARTH CONNECTION
The symbol identifies Earthing connection points in the unit.

READ AND UNDERSTAND THE INSTRUCTIONS
Read and understand the instructions of the machine before any operations.

RECOVER OR RECYCLE MATERIAL

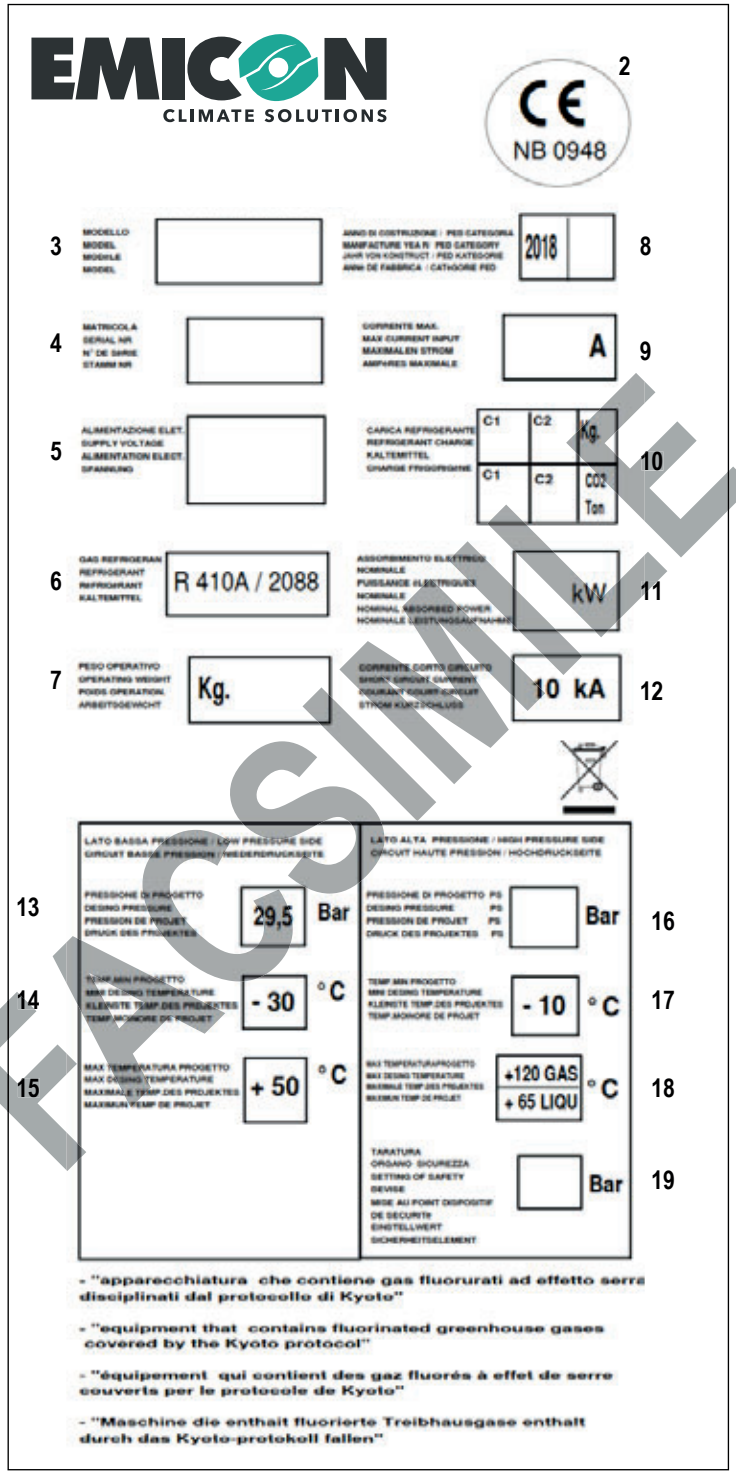
1.9 Limitations and prohibited use

The machine is designed and built exclusively for the uses described in “Limitations of use” of the technical manual.
Any other use is prohibited because it may pose a potential risk to the health of operators and users.

The unit is not suitable for operations in environments:
- excessively dusty or potentially explosive atmospheres;
- where there are vibrations;
- where there are electromagnetic fields;
- where there are aggressive atmospheres

1.10 Unit identification

Each unit has a rating plate that provides key information regarding the machine. The rating plate may differ from the one shown below as the example is for a standard unit without accessories. For all electrical information not provided on the label, refer to the wiring diagram. A facsimile of the label is shown below:



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

The product label should never be removed from the unit.

2. SAFETY

2.1 Warning on potentially dangerous toxic substances

2.1.1 Identification of the Type of Refrigerant Fluid Used: R410A

- Difluoromethane (HFC-32) 50% by weight CAS No.: 000075-10-5
- Pentafluoroethane (HFC-125) 50% by weight CAS No.: 000354-33-6

2.1.2 Identification of the Type of Refrigerant Fluid Used: R454B

- Difluoromethane (R32) 31,1% by weight CAS No.: 000075-10-5
- Tetrafluoropropene (R1234 yf) 68,9 by weight CAS No.: 000754-12-1

2.1.3 Identification of the Type of Oil Used.

The lubricant used is polyester oil. Please refer to the information provided on the compressor data plate.

For further information regarding the characteristics of the refrigerant and oil used, refer to the safety data sheets available from the refrigerant and oil manufacturers and attached in this manual.

Main Ecological Information Regarding the Types of refrigerants Fluids used.

ENVIRONMENTAL PROTECTION : Read the ecological information and the following instructions carefully.

2.1.4 Persistence and degradation

The refrigerants used decompose in the lower atmosphere (troposphere) relatively quickly. The decomposed products are highly dispersible and therefore have a very low concentration. They do not influence the photochemical smog which is not among the VOC volatile organic compounds (as stipulated in the guidelines to the UNECE). The used constituent refrigerants do not damage the ozone layer. These substances are regulated under the Montreal Protocol (revised 1992) and regulations EC no. 2037/200 of 29 June 2000.

2.1.5 Effects of discharges

Discharges into the atmosphere of this product does not cause a long-term contamination.

2.1.6 Exposure controls and personal protection

Wear protective clothing and gloves, protect your eyes and face

2.1.7 Professional exposure limits

R410A

HFC-32	TWA 1000 ppm
HFC-125	TWA 1000 ppm

R454B

HFC-32	TWA 1000 ppm
HF0-1234 yf	TWA 500 ppm

2.2 Refrigerant handling

Users and maintenance personnel must be adequately informed about the possible risks of handling potentially toxic substances. Failure to follow such instructions can cause damage to personnel or to the unit.

2.3 Prevent inhalation of high vapor concentration

Atmospheric concentrations of refrigerant must be minimized and kept to a level that is below the occupational exposure limit. Vapor is heavier than air and can form dangerous concentrations near the ground where the ventilation rate is lower. Always ensure adequate ventilation. Avoid contact with open flames and hot surfaces as this can cause toxic and irritating decomposition products to form. Avoid contact between liquid refrigerant and the eyes or skin.

2.4 Procedures to be adopted in the event of accidental release of refrigerant

Ensure suitable personal protection (especially respiratory protection) during cleaning operations.
If deemed safe, isolate the source of the leak. If the leakage is small and if adequate ventilation is provided, allow the refrigerant to evaporate. If the loss is substantial ensure that measures are taken to adequately ventilate the area.
Contain spilled material with sand, earth or other suitable absorbent material.
Do not allow the refrigerant to enter drains, sewers or basements, as pockets of vapor can form.

2.5 Main Toxicological Information Regarding the Type of refrigerant used

2.5.1 Inhalation

A high atmospheric concentration can cause anaesthetic effects with possible loss of consciousness. Prolonged exposure may lead to irregular heartbeat and cause sudden death. Higher concentrations may cause asphyxia due to the reduced oxygen content in the atmosphere.

2.5.2 Contact with skin

Splashes of nebulous liquid can produce frostbite. Probably not hazardous if absorbed trough the skin. Repeated or prolonged contact may remove the skin's natural oils, with consequent dryness, cracking and dermatitis.

2.5.3 Contact with eyes

Splashes of liquid may cause frostbite.

2.5.4 Ingestion

While highly improbable, may produce frostbite.

2.6 First Aid Measures

Adhere scrupulously to the warnings and first aid procedures indicated below.

2.6.1 Inhalation

Move the person away from the source of exposure, keep him/her warm and let him/her rest. Administer oxygen if necessary. Attempt artificial respiration if breathing has stopped or shows sings of stopping. If the heart stops, perform external heart massage. Seek medical assistance.

2.6.2 Contact with skin

In case of contact with skin, wash immediately with lukewarm water. Thaw tissue using water. Remove contaminated clothing. Clothing may stick to the skin in case of frostbite. If irritation, swelling or blisters appear, seek medical assistance.

2.6.3 Contact with eyes

Rinse immediately using an eyewash or clean water, keeping eyelids open, for at least ten minutes. Seek medical assistance.

2.6.4 Ingestion

Do not induce vomiting. If the injured person is conscious, rinse his/her mouth with water and make him/her drink 200-300ml of water. Seek immediate medical assistance.

2.6.5 Further medical treatment

Treat symptoms and carry out support therapy as indicated. Do not administer adrenaline or similar sympathomimetic drugs following exposure, due to the risk of cardiac arrhythmia.

3. TECHNICAL CHARACTERISTICS

3.1 Unit description

Units are single-block liquid air-cooled chillers, suitable for external installation. Such units are equipped with one or more independent cooling circuits, as well as hermetic scroll compressors with R410A or R454B.
They are suitable for cooling water for any application and fluids of any type, such as e.g. glycol water, to be used in industrial processes.
All units are equipped in a silenced version (S) obtained with soundproof compressors casing, while the fans are star-connected, so as to reduce rotation speed. .

3.1.1 Frame

Strong and compact structure, made of base and frame with high-thickness galvanized steel elements assembled with stainless steel rivets; All galvanized steel surfaces externally positioned are superficially coated by an oven powder-painting with color RAL7035.
The load bearing elements are assembled so as to make a solid frame, capable to support unit components, and support stressing that may arise during handling and unit operation .Components are installed within the structure, so as to be easily accessible on the front to make possible all necessary procedures during operation and servicing of the unit.

3.1.2 Scroll Compressors

All models are provided with Scroll compressors with refrigerant R410A or R454B on one or two independent cooling circuits, as a tandem or trio version. Compressors of all models are mounted on rubber dampers and equipped with:
• Direct start motors, cooled by aspirated refrigerant gas;
• Oil crankcase heater
• Electronic device for motor protection with external module;
• Charged with polyester oil
• Terminal board for compressors has IP54 protection degree.
Activation and deactivation of compressors is controlled by microprocessor of the control system of the units, which consequently sets cooling-heating power.

3.1.3 Evaporators

Stainless steel brazed plate evaporator of single or dual circuit type, with high thickness close cell insulation and UV ray-proof. The evaporator is also equipped with safety water flow switch switching off the unit in case of low water flow through the evaporator.

3.1.4 Heat - exchange external coils

Heat exchange external condensing coils are made with micro fined copper pipes positioned in staggered rows, mechanically expanded into an aluminium finned pack.
Pipes surfacing of the fins are studied and made so as to maximise thermal global heat exchange coefficient (Turbo-fin), by maintaining air pressure drop at an acceptable level. Pipes are connected with each other, so as to compose circuits with enough length to avoid excessive pressure drop, by allowing enough refrigerant speed. The maximum operating pressure of the condenser coils is 45 bar Freon side.
Coils are subject to the tightness test and cleaned before installation by the Manufacturer.

3.1.5 Axial Fans

Of directly coupled type, with wing-profile blades, are designed not to create air turbulence. This ensures the max efficiency with the lowest sound level. Each fan is provided with a galvanized steel protection grid, which is painted after construction. The IP54 fans motors are completely closed and provided with in-built overload protection thermostat, incorporated to the motor windings.

3.1.6 Cooling circuit

Each cooling circuit is equipped with:
• Safety valve (integrated in the compressor);
• Dehydrating filter
• Sight glass
• Solenoid valve
• Thermostatic valve (electronic type is supplied as standard);
• Safety valves on high pressure side (if required);
• Shut-off valves on liquid line;
• High and low pressure gauges;
• High and low pressure switch;

•4-way cycle reversing valve;
• Temperature probes at inlet and outlet of the evaporator;
The above components are connected in a closed circuit by pipings and copper fitting. Permanent joints between components are either soldered or brazed by qualified operators and process.

3.1.7 Electrical board

The electrical panel is separated from the technical section and is realized in order to avoid the refrigerant entry in case of leak. The inverter compartment is separated as well and equipped with self-ventilation system. The unit is planned in order to activate the actuators block in case of anomalies.

The electrical panel, in compliance with European standards in force, is built inside of a metal container with a protection factor making it suitable for an external installation. Its main features are:
- Three-phase power supply 400V/3ph/50Hz +N in all the units (special requests excluded);
- Control circuit 24Vac with insulation transformer;
- Auxiliary circuit 230V with insulation transformer;
- Compressors protection with magneto thermal switch and fuses and also with thermal module (Kriwan);
- Mechanical main switch with door-locker;
- Signal and control Free-contacts terminal board;

Inside the a.m. electrical cabinet, closed by an access panel equipped with main switch, are installed the following main components:
- Contactors;
- Transformers;
- Numerated conductors;
- Low tension auxiliary circuits;
- Terminal boards;
- Management and control electronic boards.

All the units are subject to the safety cycle with protection circuit continuities tests, insulating heater and tension test (dielectric strength). The group is realized through the management program recorded in the electronic microprocessor.

The microprocessor is made up of:
- A Control electronic board with the terminal boards for the functional parameters transmission and the activation of the control devices;
- User interface card with program keys and alphanumerical display showing the operating status, realizing among the others,the following functions:
- Unit ON/OFF from keyboard or remotely;
- Alarm and alert status management;
- Compressors operating status.

The User interface display of the microprocessor also allows to see the following parameters:
- Set regulation parameters values;
- Functional variables values;
- Digital and analogical input /output status;
- Unit operation status;
- Alarm and alert warning;
- BMS systems interfacing possibility.

3.1.8 Microprocessor

Electronic Microprocessor for unit management installed inside the electrical cabinet, with double evaporator in/out control of the chilled water temperature, as well as control of working parameters and equalization of compressors working hours, failures auto-detection system, alarm log, start and set point timeslot programming, possibility of remote management and supervision by enabling standard communication protocols management, complete with compressors hour counter.

3.1.9 Safety gas sensor (for R454B)

At unit start, there is the heating/initializing of the sensor (about 1' duration).
During this period the internal sensor LEDs flash, the refrigerant leakage alarm is signaled , with relevant light alarm on the electrical panel, the 24Vac auxiliary circuit is not powered and the compressor cabinet forced ventilation, made through the washing fans, is activated.
After that, no further signals arrive from the sensor, the control PLC is powered ON and the unit is ready to work.
Without refrigerant leakage alarm, the forced ventilation is cyclically made,2' per hour, but a different timing can be set through a timer.
With refrigerant leakages, the sensor activates and the leakages signaling led immediately lights, powering the control PLC OFF, and activating the compressors cabinet washing fan. The ventilation keeps ON as long as the leakage sensor signals refrigerant presence.

The sensor has got 2 different alarm levels:

- The first one set at 20% of the LOWER FLAMMABLE LIMIT (LFL) with automatic reset; when the alarm is solved, the extraction fan stops, the PLC is again powered to return to the normal operation;
- The second one set at 30% of the LFL with manual reset; in this case, the extraction fan and the signal led will remain active and the PLC not powered till the alarm will be manually reset (disconnecting the sensor power supply or pressing the reset key inside the sensor itself)).

Note: The red lamping signal on the door of the electrical panel indicates the refrigerant leakage and also the washing fan thermal alarm (to be manual reset inside the electrical cabinet), in this case the washing fan will stop, the forced ventilation is done anymore and the unit is stopped (POWER OFF).

Using the calibration tool it is possible to state if the sensor needs to be calibrated (see "Days left until maintenance= negative umber)

THE PERIODIC MAINTENANCE OF THE SENSOR AND ITS CALIBRATION IS MANDATORY, SEE SECTION ON SCHEDULED MAINTENANCE. After 200 cumulative days of use (of power supply),the sensor goes in alarm asking for maintenance and stopping the unit.
The alarm is reset only once the maintenance is done.

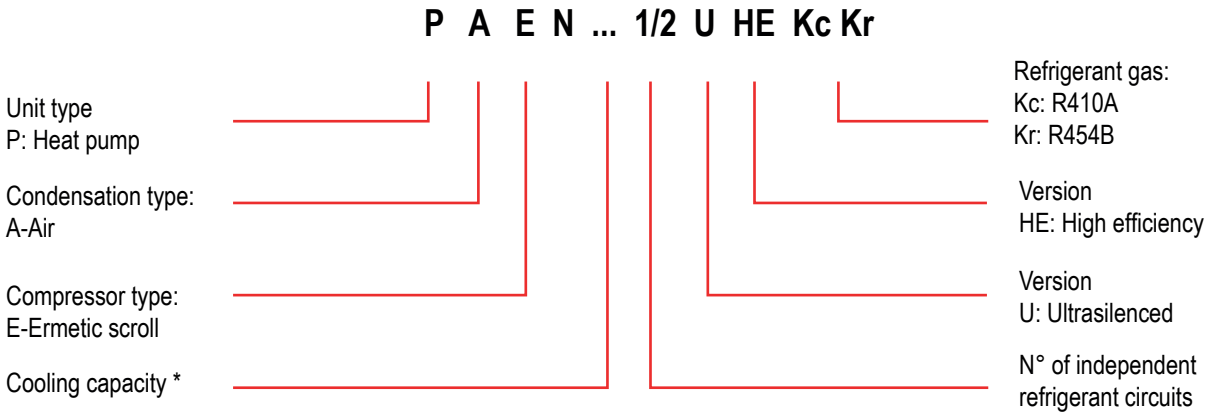
Recalibration of the sensor is required after each alarm intervention.

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.

3.1.10 Nomenclature

In following scheme, the meaning of the elements corresponding to the unit nomenclature:



* Cooling capacity is calculated at evaporator water conditions +12°C / + 7°C with an external air temp of +35°C and 50% HR

3.2 Other versions

3.2.1 Version with Total Heat Recovery (RT)

Each model of the range is available in total heat recovery version. In such setting, each cooling circuit is equipped with a refrigerant/water exchanger on gas discharge line. Such exchanger, installed in parallel to the air condenser, it is dimensioned to recover 100% condensing heat for hot sanitary water production.

3.2.2 Version with Partial Heat Recovery (RP)

In this configuration, a refrigerant/water heat exchanger is installed on each cooling circuit on gas discharge line. Such exchanger, placed in series and before the air condenser, is sized to recover about 20% of the condensing heat to produce hot sanitary water at medium / high temperatures.

3.2.3 Version ultrasilenced (U)

The remarkably low sound level is reached on U versions without sacrificing performance or working limits.
This is done by:

- Adopting refrigerant/air exchangers with wider surfaces than those of the units in standard version.
- Soundproof compressor casing with higher thickness of the soundproof material;
- Fan speed control through variable fixed drive.

18 models are available for the ultrasilenced version, with a nominal cooling power between 70 and 630 kW.

3.3 Options

A	**Amperometer**: Electrical devices used to measure the electrical current absorbed.
AE	**Electrical supply different from standard**
BEF	**Electrofin-coated coil**
BF	**Low ambient temperature operation (inverter):** Electronic device, frequency converter type, for the continuous modulating control of the condensing pressure through the variation of the fan rotation speed, which allows the operation till -20°C external air temperature. (Standard PAE N U)
BT	**Low ambient temperature operation**: Electronic device for the continuous modulating voltage control of the condensing pressure through the variation of the fan rotation speed, which allows the operation till -10°C. (Standard PAE N)
CF	**Soundproofed compressors cabinet with standard material** (Standard for PAE N and PAE N HE): Insulation of compressors by a cabinet coated with soundproofing material. Access panels are easy to be opened thanks to a triangular wrench.
CFU	**Soundproofed compressors cabinet with higher thickness sound-proofed material insulation**: Insulation of all the technical section with higher thickness soundproofed material
CFT	**Overall compressor and technical compartment cabinet:** Metal protection grid to protect compressors and exchangers. (Not available with CF, CFU and CFT)
CI	**Soundproofing jacket on compressors:** Made of soundproofing material, wrapped all around compressors so to further reduce the overall sound level of the unit.
CS	**Compressors inrush counter:** Electromechanical device positioned inside the electrical board, recording the total inrush starts of compressors.
EC	**Axial fans with electronic commutated motor:** with external rotor directly coupled to a three-phase electronically commutated motor (EC) they have the possibility of a continuous regulation of the speed by means of a 0-10V signal completely managed by the microprocessor. Aluminum blades with wings profile are suitably designed to avoid any turbulence in the air detachment zone, granting in this way the max efficiency with the minimum noise level. The fan is equipped with galvanized steel protection grid painted after the construction. Thanks to a more accurate adjustment of air flow, they allow operation of the unit with external temperature down to -20°C.
GP	**Condensing coil protection grid:** Metal grid to protect against accidental impacts.
GP2	**Condensing coil protection grid:** Metal grid to protect against accidental impacts.
GP3	**Anti-intrusion grid with compressors cabinet:** Anti-intrusion metal protection grid coupled with soundproofed compressor cabinet.
I1	**Victaulic insulation on pump side:** Insulation of the joints by close-cell polyurethane material, to prevent condensation, pump side.
I2	**Victaulic insulation buffer tank side**: Insulation of the joints by close-cell polyurethane material, to prevent condensation, buffer tank side.
IH	**RS 485 Serial interface:** Electronic card to be connected to the microprocessor to allow connection of the units to supervision systems, for a remote control and monitoring of the unit. (Alternative to IH BAC).
IH-BAC	**BACNET RS485 Protocol serial interface:** Electronic card to be connected to the microprocessor to allow the connection of the unit to external supervision system with BACNET Protocol in order to fully and remotely assistance.
IM	**Seawood packing:** Fumigated seawood case and protection bag with hygroscopic salts, suitable for long sea transports.
IWG	**SNMP or TCP/IP Protocol serial interface**: Electronic card to be connected to the microprocessor to allow the connection of the unit to external supervision system with SNMP or TCP/IP Protocol for a remote control and monitoring of the unit. (Alternative to IH and IH-BAC).
MF	**Phase monitor**: Electronic device that checks the correct sequence and/or the lack of one of the 3 phases, switching off the unit if necessary.
MV	**Buffer tank module**: Of suitable capacity complete with expansion vessel, safety valve, water gauge, water charge and discharge valves, air purging valves, check valves for filter service operations.

P1	**Pump group**: Chilled water pump group made of a single pump, expansion vessel, safety valve water gauge, water charge and discharge valves, air purging valves, electric control of the pump. The pump is of enbloc 2-pole type.
P1H	**Higher available pressure pump group**: Chilled water pump group made of a single pump, expansion vessel, safety valve water gauge, water charge and discharge valves, air purging valves, electric control of the pump. The pump is of enbloc 2-pole type.
P2	**Double pump group (only one working):** Chilled water pump group made by two pumps in parallel, expansion vessel, safety valve, water gauge, water charge and discharge valves, air purging valves, water shut-off valve on suction and check valve on discharge for each single pump, electric control of the pump. The pump is of enbloc 2-pole type.
P2H	**Higher available pressure double pump group (only one working)**: Chilled water pump group made by two higher available pressure pumps in parallel, expansion vessel, safety valve, water gauge, water charge and discharge valves, air purging valves, water shut-off valve on suction and check valve on discharge for each single pump, electric control of the pump. The pump is of enbloc 2-pole type.
P1 + MV	**Pump group + storage tank**
P1H + MV	**Higher available pressure pump group + storage tank**
P2 + MV	**Double pump group (only one working) + storage tank**
P2H + MV	**Higher available pressure double pump group (only one working) + storage tank**
P1 VS	**Pump group inverter**
P1H VS	**Higher available pressure pump group inverter**
P2 VS	**Double pump group (only one working) inverter**
P2H VS	**Higher available pressure double pump group (only one working) inverter**
P1 VS + MV	**Pump group inverter + storage tank**
P1H VS + MV	**Higher available pressure pump group inverter + storage tank**
P2 VS + MV	**Double pump group (only one working) inverter + storage tank**
P2H VS + MV	**Higher available pressure double pump group (only one working) inverter + storage tank**
PA	**Rubber-type vibration dampers:** Vibration bell type dampers for insulating the unit from the support base (supplied in kit), composed of a bell base in galvanized steel and rubber compound.
PM	**Spring-type vibration dampers:** Spring-type 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 display:** Remote interface displaying temperature values detected by probes, alarm digital inputs, outputs, remote ON/OFF of the unit. It also gives the possibility to change and program parameters and report/display alarms.
PT	**In-line twin pump group (only one working):** Chilled water pump group made by a twin pump group with a single impeller body and two separate electric motors. The hydronic kit is made by an expansion vessel, safety valve, water gauge, water charge and discharge valves, air purging valves, electric control of the pump. The pumps are of enbloc 2-pole type.
PT + MV	**In-line twin pump group (only one working) + storage tank**
PTVS	**In-line twin pump group (only one working) inverter**
PTVS + MV	**In-line twin pump group (only one working) inverter + storage tank**

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

RD **Shut-off valve on compressors discharge side:** They are used to isolate compressors during service operation.

RF **Power factor correction system cosfi ≥0,9:** Electrical device made by suitable condensers for compressor rephasing that ensure a cosfi value ≥0,9, so to reduce absorption from electrical network.

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

RL **Compressor overload relays:** Electromechanical protection devices against compressors overload.

RM **Condensing coil with pre-painted fins:** Double-layer treatment of condensing coils aluminium fins surface, to be used if there is an high concentration of corrosive agents in the environment.

RP **Partial heat recovery:** Refrigerant/water plate exchanger (desuperheater) in series to the compressors. It is used to partially recover condensing heat capacity (about 20%) for production of sanitary water.

RR **Copper/Copper coil:** Special condensing coils with copper pipes and fins.

TE **Electronic thermostatic valve**: Electronic thermostatic valve that reduces the response times of the unit. Useful in case of frequent changes on cooling demand, so as to improve efficiency. (standard included in model 1001, from model 2402 on and in all the units included in the VB version).

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 0°C. A 20 mm evaporator insulation will be provided.

3.4 Technical data

3.4.1 PAE N Kc

PAE N Kc		601	801	1001	1201	1401	1601	1801	1802	2002	2101
Cooling											
Nominal cooling capacity	kW	69,1	85,8	103,0	126,0	145,0	173,0	188,0	183,0	206,0	213,0
Nominal input power	kW	22,7	30,4	35,9	44,1	50,8	59,6	66,4	63,3	67,5	72,1
Nominal input current	A	44,4	55,6	65,8	77,5	90,0	104,0	115,0	118,0	122,0	126,0
EER	W/W	3,04	2,82	2,87	2,86	2,85	2,90	2,83	2,89	3,05	2,95
Refrigerant circuits	n°	1	1	1	1	1	1	1	2	2	1
Compressors	n°	2	2	2	2	2	2	2	4	4	2
Heating											
Nominal heating capacity	kW	79,8	98,4	124,0	149,0	175,0	199,0	224,0	215,0	267,0	254,0
Nominal input power	kW	19,5	24,8	30,8	37,0	44,2	49,6	54,6	57,4	72,8	62,4
Nominal input current	A	41,1	48,4	60,2	69,2	82,6	91,3	99,6	112,0	121,0	114,0
COP	W/W	4,09	3,97	4,03	4,03	3,96	4,01	4,10	3,75	3,67	4,07
SCOP	W/W	3,30	3,27	3,36	3,58	3,43	3,43	3,59	3,21	3,50	3,55
$\eta_{s,h}$	%	129	128	131	140	134	134	141	125	137	139
Refrigerant data R410A											
Refrigerant charge	kg	23	22	33	45	50	50	66	62	94	66
Global warming potential (GWP)		2088	2088	2088	2088	2088	2088	2088	2088	2088	2088
Equivalent CO_2 charge	t	47	47	70	94	104	104	139	130	196	138
Axial fans (1)											
Number	n°	2	2	2	2	3	3	3	6	6	4
Total air flow	m^3/h	51550	54314	50145	49505	74774	77261	71996	118157	109331	98477
Total fan power input	kW	3,86	4,05	4,10	4,40	6,15	6,34	6,41	8,41	9,42	8,21
Total fan current	A	9,84	9,84	10,1	10,3	15,1	15,1	15,4	21,2	21,6	20,3
Evaporator (2)											
Number	n°	1	1	1	1	1	1	1	1	1	1
Water flow	m^3/h	13,79	17,22	21,51	25,99	30,33	34,72	38,87	37,18	46,17	43,86
Pressure drop	kPa	23,5	27,5	40,8	46,3	48,7	50,4	51,2	45,1	58,1	55,2
Weights											
Transport weight	kg	977	1041	1117	1298	1432	1446	1725	1802	2066	1707
Operating weight	kg	983	1047	1124	1305	1440	1455	1736	1814	2078	1719
Dimensions											
Length	mm	2660	2660	2660	2660	3700	3700	3700	3775	3775	4740
Depth	mm	1370	1370	1370	1370	1370	1370	1370	2300	2300	1370
Height	mm	2420	2420	2420	2420	2420	2420	2420	2560	2560	2420
Sound data											
Sound pressure level (3)	dB(A)	83	86	86	88	89	90	90	88	90	91
Sound power level (4)	dB(A)	51	54	54	56	57	58	58	56	58	59
Power supply											
Voltage/Phase/Frequency	V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
General electrical data											
Maximum input power	kW	29,0	40,4	47,8	56,8	69,5	78,4	88,6	86,9	94,4	100,0
Maximum input current	A	60,7	79,5	92,9	108,0	129,0	147,0	163,0	168,0	176,0	186,0
Inrush current	A	182	282	332	346	374	472	489	370	379	511

Performances are referred to the following conditions:
(1) Air temperature 7°C
(2) Fluid: water - in/out temperature: 30/35°C
(3) Sound power level in accordance with ISO 3744.
(4) Sound pressure level at 10 mt from the unit in free field conditions in accordance with ISO 3744.

Data may change without notice; it is therefore necessary to ALWAYS refer to the sheet supplied with the offer.

PAE N Kc		2302	2502	2802	3202	3602	4202	4802	5202	5602	6002
Cooling											
Nominal cooling capacity	kW	234,0	252,0	295,0	336,0	382,0	427,0	497,0	555,0	600,0	646,0
Nominal input power	kW	77,2	86,6	103,0	113,0	131,0	144,0	172,0	189,0	205,0	220,0
Nominal input current	A	138,0	153,0	182,0	197,0	227,0	249,0	299,0	325,0	353,0	368,0
EER	-	3,03	2,91	2,86	2,97	2,92	2,97	2,89	2,94	2,93	2,94
Refrigerant circuits	n°	2	2	2	2	2	2	2	2	2	2
Compressors	n°	4	4	4	4	4	4	6	6	6	6
Heating											
Nominal heating capacity	kW	278,0	305,0	348,0	393,0	438,0	481,0	585,0	628,0	674,0	723,0
Nominal input power	kW	69,5	78,5	91,9	104,0	111,0	123,0	146,0	161,0	174,0	192,0
Nominal input current	A	131,0	145,0	169,0	188,0	201,0	221,0	265,0	289,0	311,0	326,0
COP	-	4,00	3,89	3,79	3,78	3,95	3,91	4,01	3,90	3,87	3,77
SCOP	n°	3,48	3,50	3,35	3,48	3,56	3,60	3,61	3,52	3,42	3,41
$\eta_{s,h}$	n°	136	137	131	136	139	141	141	138	134	-
Refrigerant data R410A											
Refrigerant charge	kg	94	94	88	132	131	175	214	213	193	258
Global warming potential (GWP)		2088	2088	2088	2088	2088	2088	2088	2088	2088	2088
Equivalent CO_2 charge	t	196	196	183	276	274	365	446	446	402	538
Axial fans (1)											
Number	n°	6	6	8	8	8	8	10	10	12	12
Total air flow	m^3/h	112128	114414	169194	154303	160753	159906	190332	194971	246631	269868
Total fan power input	kW	8,54	8,73	11,9	11,5	12,0	12,6	15,3	15,6	18,5	22,4
Total fan current	A	21,6	21,6	28,2	28,7	28,7	29,1	36,5	36,5	43,1	36,2
Evaporator (2)											
Number	n°	1	1	1	1	1	1	1	1	1	1
Water flow	m^3/h	47,95	52,69	61,18	67,87	76,44	84,64	101,6	109,7	118,6	127,3
Pressure drop	kPa	45,7	54,0	30,6	71,6	46,8	55,3	59,4	61,8	70,5	67,7
Weights											
Transport weight	kg	2018	2488	2641	3101	3115	3578	4204	4230	4455	4964
Operating weight	kg	2034	2505	2658	3120	3150	3613	4249	4280	4505	5023
Dimensions											
Length	mm	3775	3775	4750	4750	4750	4750	5725	5725	6700	6700
Depth	mm	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300
Height	mm	2560	2560	2560	2560	2560	2560	2560	2560	2560	2560
Sound data											
Sound pressure level (3)	dB(A)	90	90	91	90	92	94	92	94	94	96
Sound power level (4)	dB(A)	58	58	58	58	59	62	60	62	62	63
Power supply											
Voltage/Phase/Frequency	V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
General electrical data											
Maximum input power	kW	105,0	155,0	140,0	160,0	178,0	196,0	236,0	254,0	275,0	306,0
Maximum input current	A	197,0	218,0	259,0	293,0	327,0	362,0	431,0	466,0	508,0	540,0
Inrush current	A	436	457	504	537	653	687	676	791	833	865

Performances are referred to the following conditions:
(1) Air temperature 7°C
(2) Fluid: water - in/out temperature: 30/35°C
(3) Sound power level in accordance with ISO 3744.
(4) Sound pressure level at 10 mt from the unit in free field conditions in accordance with ISO 3744.

Data may change without notice; it is therefore necessary to ALWAYS refer to the sheet supplied with the offer.

3.4.2 PAE N U Kc

PAE N U Kc		601	801	1001	1201	1401	1601	1801	1802	2002	2101
Cooling											
Nominal cooling capacity	kW	67,8	84,4	101,0	125,0	147,0	170,0	187,0	185	202,0	209,0
Nominal input power	kW	22,1	28,4	35,2	43,0	49,6	58,5	63,7	59,5	67,1	72,3
Nominal input current	A	41,6	50,7	62,9	74,7	85,5	99,5	109,0	109,0	118,0	122,0
EER	-	3,07	2,97	2,87	2,91	2,96	2,91	2,94	3,11	3,01	2,89
Refrigerant circuits	n°	1	1	1	1	1	1	1	2	2	1
Compressors	n°	2	2	2	2	2	2	2	4	4	2
Heating											
Nominal heating capacity	kW	78,8	102,0	123,0	154,0	178,0	203,0	227,0	221,0	245,0	252,0
Nominal input power	kW	18,4	23,6	29,4	36,7	42,5	47,6	54,2	55,6	62,4	59,8
Nominal input current	A	37,0	44,5	55,7	67,5	76,7	85,1	96,4	105,0	111,0	106,0
COP	W/W	4,28	4,32	4,18	4,20	4,19	4,26	4,19	3,97	3,93	4,21
SCOP	W/W	3,63	3,69	3,68	3,67	3,74	3,74	3,73	3,53	3,65	3,76
$\eta_{s,h}$	%	142	145	144	144	147	147	146	138	143	147
Refrigerant data R410A											
Refrigerant charge	kg	23	34	45	50	67	67	66	94	94	89
Global warming potential (GWP)		2088	2088	2088	2088	2088	2088	2088	2088	2088	2088
Equivalent CO_2 charge	t	47	70	93	105	140	140	138	196	196	186
Axial fans (1)											
Number	n°	2	2	2	3	3	3	4	6	6	4
Total air flow	m^3/h	41976	38822	37219	58268	54343	56118	76579	86295	88012	74781
Total fan power input	kW	2,71	2,75	2,86	4,13	4,17	4,30	5,54	6,23	6,47	5,73
Total fan current	A	5,69	5,86	5,98	8,79	8,97	8,98	11,8	13,8	13,8	12,0
Evaporator (2)											
Number	n°	1	1	1	1	1	1	1	1	1	1
Water flow	m^3/h	13,65	17,61	21,34	26,61	30,80	35,15	39,28	38,20	42,34	43,61
Pressure drop	kPa	23,0	29,3	41,3	49,1	50,2	52,3	52,2	47,4	57,4	54,4
Weights											
Transport weight	kg	999	1075	1151	1327	1473	1486	1746	1824	2044	1793
Operating weight	kg	1005	1082	1158	1334	1481	1496	1757	1836	2056	1805
Dimensions											
Length	mm	2660	2660	2660	3700	3700	3700	4740	3775	3775	4740
Depth	mm	1370	1370	1370	1370	1370	1370	1370	2300	2300	1370
Height	mm	2420	2420	2420	2420	2420	2420	2420	2560	2560	2420
Sound data											
Sound pressure level (3)	dB(A)	80	82	82	84	85	86	86	83	84	87
Sound power level (4)	dB(A)	49	50	50	51	53	53	53	50	52	55
Power supply											
Voltage/Phase/Frequency	V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
General electrical data											
Maximum input power	kW	27,1	38,6	46,0	56,5	66,7	75,6	87,4	82,8	90,3	96,3
Maximum input current	A	56,2	75,0	88,4	106,0	123,0	140,0	160,0	159,0	168,0	177,0
Inrush current	A	177	278	327	345	367	465	485	362	370	502

Performances are referred to the following conditions:
(1) Air temperature 7°C
(2) Fluid: water - in/out temperature: 30/35°C
(3) Sound power level in accordance with ISO 3744.
(4) Sound pressure level at 10 mt from the unit in free field conditions in accordance with ISO 3744.

Data may change without notice; it is therefore necessary to ALWAYS refer to the sheet supplied with the offer.

PAE N U Kc		2302	2502	2802	3202	3602	4202	4802	5202	5602	6002
Cooling											
Nominal cooling capacity	kW	231,0	251,0	294,0	328,0	383,0	432,0	508,0	559,0	604,0	637,0
Nominal input power	kW	76,5	87,4	98,9	113,0	129,0	145,0	171,0	191,0	206,0	216,0
Nominal input current	A	133,0	152,0	170,0	193,0	219,0	246,0	292,0	324,0	347,0	363,0
EER	-	3,02	2,87	2,97	2,90	2,97	2,98	2,97	2,93	2,93	2,95
Refrigerant circuits	n°	2	2	2	2	2	2	2	2	2	2
Compressors	n°	4	4	4	4	4	4	6	6	6	6
Heating											
Nominal heating capacity	kW	281,0	296,0	349,0	389,0	433,0	496,0	579,0	622,0	670,0	720,0
Nominal input power	kW	67,9	78,1	89,1	102,0	108,0	123,0	145,0	159,0	169,0	176,0
Nominal input current	A	123,0	141,0	160,0	178,0	191,0	215,0	257,0	280,0	296,0	305,0
COP	W/W	4,14	3,79	3,92	3,81	4,01	4,03	3,99	3,91	3,96	4,09
SCOP	W/W	3,76	3,48	3,68	3,69	3,76	3,65	3,68	3,61	4,46	3,86
$\eta_{s,h}$	%	147	136	144	145	147	143	144	141	175	-
Refrigerant data R410A											
Refrigerant charge	kg	126	88	131	176	175	159	194	193	259	229
Global warming potential (GWP)		2088	2088	2088	2088	2088	2088	2088	2088	2088	2088
Equivalent CO_2 charge	t	263	183	274	367	365	332	405	402	541	479
Axial fans (1)											
Number	n°	6	8	8	8	8	10	12	12	12	14
Total air flow	m^3/h	83366	133081	121305	118423	124448	156439	189844	194550	188351	243591
Total fan power input	kW	6,37	8,92	8,62	8,94	9,26	11,2	13,5	13,8	14,2	11,0
Total fan current	A	14,0	18,0	18,3	18,6	18,6	23,0	27,5	27,5	27,9	20,5
Evaporator (2)											
Number	n°	1	1	1	1	1	1	1	1	1	1
Water flow	m^3/h	48,47	51,55	60,27	67,21	75,90	86,12	100,9	109,1	118,1	127,3
Pressure drop	kPa	46,5	51,3	33,4	70,3	45,8	58,4	58,3	60,7	69,6	67,2
Weights											
Transport weight	kg	2229	2503	2712	3171	3185	3582	4204	4230	4550	4955
Operating weight	kg	2246	2520	2729	3190	3220	3617	4250	4279	4600	5014
Dimensions											
Length	mm	3775	4750	4750	4750	4750	5725	6700	6700	6700	7675
Depth	mm	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300
Height	mm	2560	2560	2560	2560	2560	2560	2560	2560	2560	2560
Sound data											
Sound pressure level (3)	dB(A)	84	84	85	84	86	88	86	88	88	90
Sound power level (4)	dB(A)	52	52	52	52	53	56	53	56	56	57
Power supply											
Voltage/Phase/Frequency	V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
General electrical data											
Maximum input power	kW	101,0	114,0	134,0	154,0	172,0	192,0	232,0	249,0	267,0	312,0
Maximum input current	A	189,0	214,0	248,0	282,0	316,0	355,0	422,0	457,0	491,0	547,0
Inrush current	A	428	453	493	526	641	681	667	782	817	873

Performances are referred to the following conditions:
(1) Air temperature 7°C
(2) Fluid: water - in/out temperature: 30/35°C
(3) Sound power level in accordance with ISO 3744.
(4) Sound pressure level at 10 mt from the unit in free field conditions in accordance with ISO 3744.

Data may change without notice; it is therefore necessary to ALWAYS refer to the sheet supplied with the offer.

3.4.3 PAE N HE Kc

PAE N HE Kc		1001	1201	1401	1601	1802	2002	2302	2502
Cooling									
Nominal cooling capacity	kW	107,0	133,0	153,0	181,0	193,0	215,0	235,0	268,0
Nominal input power	kW	35,7	43,2	50,3	58,1	62,9	68,6	77,7	86,7
Nominal input current	A	63,5	74,4	85,9	98,2	113,0	119,0	134,0	150,0
EER	-	3,00	3,08	3,04	3,12	3,07	3,13	3,02	3,09
Refrigerant circuits	n°	1	1	1	1	2	2	2	2
Compressors	n°	2	2	2	2	4	4	4	4
Heating									
Nominal heating capacity	kW	131,0	161,0	186,0	214,0	227,0	257,0	287,0	317,0
Nominal input power	kW	30,6	35,5	43,1	49,2	54,5	60,5	68,4	78,6
Nominal input current	A	57,0	65,9	76,4	86,3	101,0	108,0	122,0	139,0
COP	W/W	4,28	4,41	4,32	4,35	4,17	4,25	4,20	4,03
SCOP	W/W	3,32	3,76	3,53	3,56	3,45	3,69	3,69	3,63
$\eta_{s,h}$	%	130	147	138	139	135	145	145	142
Refrigerant data R410A									
Refrigerant charge	kg	50	67	66	89	94	126	126	132
Global warming potential (GWP)		2088	2088	2088	2088	2088	2088	2088	2088
Equivalent CO_2 charge	t	104	140	138	186	196	263	263	276
Axial fans (1)									
Number	n°	3	3	4	4	6	6	6	8
Total air flow	m^3/h	75828	72740	99129	97848	119635	114515	116918	162578
Total fan power input	kW	4,45	4,66	5,84	6,39	7,23	7,16	7,59	9,88
Total fan current	A	7,44	7,76	9,78	10,6	12,6	12,5	13,1	17,2
Evaporator (2)									
Number	n°	1	1	1	1	1	1	1	1
Water flow	m^3/h	22,57	27,82	32,21	37,00	39,30	44,42	49,52	54,82
Pressure drop	kPa	28,8	28,3	36,7	34,0	31,8	39,8	48,5	49,7
Weights									
Transport weight	kg	1325	1452	1644	1787	2185	2431	2431	2852
Operating weight	kg	1334	1463	1655	1804	2202	2447	2447	2871
Dimensions									
Length	mm	3700	3700	4740	4740	3775	3775	3775	4750
Depth	mm	1370	1370	1370	1370	2300	2300	2300	2300
Height	mm	2420	2420	2420	2420	2560	2560	2560	2560
Sound data									
Sound pressure level (3)	dB(A)	84	87	87	88	89	91	91	91
Sound power level (4)	dB(A)	52	55	55	56	57	58	58	59
Power supply									
Voltage/Phase/Frequency	V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
General electrical data									
Maximum input power	kW	51,8	60,8	74,0	82,9	93,3	101,0	111,0	128,0
Maximum input current	A	97	112	133	150	167	175	196	224
Inrush current	A	336	350	378	476	396	378	435	463

Performances are referred to the following conditions:
(1) Air temperature 7°C
(2) Fluid: water - in/out temperature: 30/35°C
(3) Sound power level in accordance with ISO 3744.
(4) Sound pressure level at 10 mt from the unit in free field conditions in accordance with ISO 3744.

Data may change without notice; it is therefore necessary to ALWAYS refer to the sheet supplied with the offer.

PAE N HE Kc		2802	3202	3602	4202	4802	5202	5602	6002
Cooling									
Nominal cooling capacity	kW	304,0	342,0	383,0	435,0	517,0	565,0	612,0	650,0
Nominal input power	kW	101,0	114,0	130,0	145,0	171,0	188,0	202,0	218,0
Nominal input current	A	172,0	193,0	220,0	243,0	289,0	317,0	339,0	365,0
EER	-	3,01	3,00	2,95	3,00	3,02	3,01	3,03	2,98
Refrigerant circuits	n°	2	2	2	2	2	2	2	2
Compressors	n°	4	4	4	4	6	6	6	6
Heating									
Nominal heating capacity	kW	357,0	400,0	460,0	516,0	625,0	674,0	693,0	734,0
Nominal input power	kW	89,8	102,0	114,0	126,0	128,0	140,0	177,0	191,0
Nominal input current	A	157,0	177,0	197,0	217,0	262,0	285,0	305,0	326,0
COP	W/W	3,98	3,92	4,04	4,10	4,88	4,81	3,92	3,84
SCOP	W/W	3,62	3,77	3,62	3,82	3,58	3,52	3,21	3,30
$\eta_{s,h}$	%	142	148	142	150	140	138	-	-
Refrigerant data R410A									
Refrigerant charge	kg	131	176	161	214	259	229	308	308
Global warming potential (GWP)		2088	2088	2088	2088	2088	2088	2088	2088
Equivalent CO_2 charge	t	274	367	335	446	541	479	643	643
Axial fans (1)									
Number	n°	8	8	10	10	12	14	14	14
Total air flow	m^3/h	167878	165033	210148	204223	249839	306832	303594	311627
Total fan power input	kW	10,9	11,4	13,9	14,2	15,2	18,2	23,3	25,2
Total fan current	A	18,5	19,4	23,6	24,1	30,1	35,9	38,6	41,0
Evaporator (2)									
Number	n°	1	1	1	1	1	1	1	1
Water flow	m^3/h	61,70	69,06	79,48	89,17	108,10	116,70	120,6	128,7
Pressure drop	kPa	50,5	55,8	51,0	52,6	57,0	55,3	62,8	69,5
Weights									
Transport weight	kg	3034	3482	3610	3955	4597	4697	5190	5220
Operating weight	kg	3056	3506	3645	3995	4646	4756	5248	5279
Dimensions									
Length	mm	4750	4750	5725	5725	6700	7675	7675	7675
Depth	mm	2300	2300	2300	2300	2300	2300	2300	2300
Height	mm	2560	2560	2560	2560	2560	2560	2560	2560
Sound data									
Sound pressure level (3)	dB(A)	91	91	92	94	92	95	95	96
Sound power level (4)	dB(A)	59	58	60	62	60	62	62	63
Power supply									
Voltage/Phase/Frequency	V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
General electrical data									
Maximum input power	kW	148,0	168,0	192,0	210,0	253,0	276,0	294,0	312,0
Maximum input current	A	258	291	333	367	437	479	513	547
Inrush current	A	502	536	658	693	681	804	838	873

Performances are referred to the following conditions:
(1) Air temperature 7°C
(2) Fluid: water - in/out temperature: 30/35°C
(3) Sound power level in accordance with ISO 3744.
(4) Sound pressure level at 10 mt from the unit in free field conditions in accordance with ISO 3744.

Data may change without notice; it is therefore necessary to ALWAYS refer to the sheet supplied with the offer.

3.4.4 PAE N HE U Kc

PAE N HE U Kc		1001	1201	1401	1601	1802	2002	2302	2502
Cooling									
Nominal cooling capacity	kW	107,0	131,0	153,0	181,0	192,0	213,0	231,0	264,0
Nominal input power	kW	32,9	40,7	46,5	54,3	57,9	64,4	73,9	81,1
Nominal input current	A	59,7	71,1	80,9	93,2	106,0	113,0	129,0	142,0
EER	-	3,25	3,22	3,29	3,33	3,32	3,31	3,13	3,26
Refrigerant circuits	n°	1	1	1	1	2	2	2	2
Compressors	n°	2	2	2	2	4	4	4	4
Heating									
Nominal heating capacity	kW	130,0	156,0	181,0	207,0	219,0	248,0	276,0	307,0
Nominal input power	kW	28,4	34,1	40,1	45,8	50,4	56,4	64,9	72,3
Nominal input current	A	53,6	62,4	72,1	81,5	95,1	102,0	116,0	130,0
COP	W/W	4,58	4,57	4,51	4,52	4,35	4,40	4,25	4,25
SCOP	W/W	3,88	4,17	4,08	4,05	3,94	4,11	4,07	3,97
$\eta_{s,h}$	%	152	164	160	159	155	161	160	156
Refrigerant data R410A									
Refrigerant charge	kg	50	67	66	89	94	126	126	132
Global warming potential (GWP)		2088	2088	2088	2088	2088	2088	2088	2088
Equivalent CO_2 charge	t	104	140	138	186	196	263	263	276
Axial fans (1)									
Number	n°	3	3	4	4	6	6	6	8
Total air flow	m^3/h	58611	56375	76389	75775	90697	86630	87953	123163
Total fan power input	kW	2,16	2,28	2,85	3,11	3,23	3,24	3,38	4,41
Total fan current	A	4,07	4,28	5,39	5,83	6,44	6,45	6,68	8,75
Evaporator (2)									
Number	n°	1	1	1	1	1	1	1	1
Water flow	m^3/h	22,39	26,95	31,25	35,76	37,84	42,84	47,69	53,04
Pressure drop	kPa	28,3	27,7	36,0	33,1	30,8	38,6	46,9	48,4
Weights									
Transport weight	kg	1347	1474	1666	1809	2207	2453	2453	2874
Operating weight	kg	1356	1485	1677	1826	2224	2469	2469	2893
Dimensions									
Length	mm	3700	3700	4740	4740	3775	3775	3775	4750
Depth	mm	1370	1370	1370	1370	2300	2300	2300	2300
Height	mm	2420	2420	2420	2420	2560	2560	2560	2560
Sound data									
Sound pressure level (3)	dB(A)	80	82	82	83	82	84	84	84
Sound power level (4)	dB(A)	48	49	50	50	49	52	52	52
Power supply									
Voltage/Phase/Frequency	V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
General electrical data									
Maximum input power	kW	51,8	60,8	74,0	82,9	93,3	101,0	111,0	128,0
Maximum input current	A	97	112	133	150	167	175	196	224
Inrush current	A	336	350	378	476	369	378	435	463

Performances are referred to the following conditions:
(1) Air temperature 7°C
(2) Fluid: water - in/out temperature: 30/35°C
(3) Sound power level in accordance with ISO 3744.
(4) Sound pressure level at 10 mt from the unit in free field conditions in accordance with ISO 3744.

Data may change without notice; it is therefore necessary to ALWAYS refer to the sheet supplied with the offer.

PAE N HE U Kc		2802	3202	3602	4202	4802	5202	5602	6002
Cooling									
Nominal cooling capacity	kW	300,0	335,0	377,0	427,0	508,0	555,0	596,0	635,0
Nominal input power	kW	95,2	110,0	124,0	140,0	164,0	180,0	196,0	213,0
Nominal input current	A	164,0	187,0	211,0	236,0	279,0	306,0	331,0	357,0
EER	-	3,15	3,05	3,04	3,05	3,10	3,08	3,04	2,98
Refrigerant circuits	n°	2	2	2	2	2	2	2	2
Compressors	n°	4	4	4	4	6	6	6	6
Heating									
Nominal heating capacity	kW	344,0	384,0	444,0	497,0	575,0	621,0	664,0	703,0
Nominal input power	kW	83,8	94,8	105,0	118,0	140,0	151,0	167,0	175,0
Nominal input current	A	148,0	166,0	184,0	204,0	246,0	266,0	289,0	304,0
COP	W/W	4,11	4,05	4,23	4,21	4,11	4,09	3,98	4,02
SCOP	W/W	4,11	4,05	3,99	4,08	3,96	3,95	3,82	3,87
$\eta_{s,h}$	%	161	159	157	160	155	155	-	-
Refrigerant data R410A									
Refrigerant charge	kg	131	176	161	214	259	229	308	308
Global warming potential (GWP)		2088	2088	2088	2088	2088	2088	2088	2088
Equivalent CO_2 charge	t	274	367	335	446	541	479	643	643
Axial fans (1)									
Number	n°	8	8	10	10	12	14	14	14
Total air flow	m^3/h	125893	123886	157553	152873	187061	229303	224890	230316
Total fan power input	kW	4,70	5,07	5,95	6,22	7,85	9,22	9,94	10,6
Total fan current	A	9,22	9,84	11,7	12,1	15,1	17,7	18,9	20,0
Evaporator (2)									
Number	n°	1	1	1	1	1	1	1	1
Water flow	m^3/h	59,45	66,35	76,72	85,82	99,83	108,4	116,5	124,5
Pressure drop	kPa	49,1	53,9	49,6	51,0	54,8	53,3	60,0	66,8
Weights									
Transport weight	kg	3056	3504	3632	3977	4619	4719	5212	5242
Operating weight	kg	3078	3528	3667	4017	4668	4778	5270	5301
Dimensions									
Length	mm	4750	4750	5725	5725	6700	7675	7675	7675
Depth	mm	2300	2300	2300	2300	2300	2300	2300	2300
Height	mm	2560	2560	2560	2560	2560	2560	2560	2560
Sound data									
Sound pressure level (3)	dB(A)	85	84	86	88	86	88	88	92
Sound power level (4)	dB(A)	52	52	53	56	54	56	56	60
Power supply									
Voltage/Phase/Frequency	V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
General electrical data									
Maximum input power	kW	148,0	168,0	192,0	210,0	253,0	276,0	294,0	312,0
Maximum input current	A	258	291	333	367	437	479	513	547
Inrush current	A	502	536	658	693	681	804	838	873

Performances are referred to the following conditions:
(1) Air temperature 7°C
(2) Fluid: water - in/out temperature: 30/35°C
(3) Sound power level in accordance with ISO 3744.
(4) Sound pressure level at 10 mt from the unit in free field conditions in accordance with ISO 3744.

Data may change without notice; it is therefore necessary to ALWAYS refer to the sheet supplied with the offer.

3.4.5 PAE N Kr

PAE N Kr		601	801	1001	1201	1401	1601	1801	1802	2002	2101
Cooling											
Nominal cooling capacity	kW	62,2	77,3	103,0	126,0	149,0	169,0	186,0	181,0	210,0	215,0
Nominal input power	kW	21,5	27,4	35,0	43,7	49,6	57,2	62,5	64,1	70,3	68,3
Nominal input current	A	42,2	52,8	64,4	77,4	87,1	102,0	109,0	116,0	124,0	123,0
EER	-	2,89	2,82	2,94	2,88	3,00	2,95	2,98	2,82	2,99	3,15
Refrigerant circuits	n°	1	1	1	1	1	1	1	2	2	1
Compressors	n°	2	2	2	2	2	2	2	4	4	2
Heating											
Nominal heating capacity	kW	73,1	89,7	119,0	146,0	169,0	191,0	214,0	212,0	251,0	244,0
Nominal input power	kW	19,3	23,5	30,1	36,9	42,3	48,2	53,4	56,1	64,8	60,4
Nominal input current	A	40,4	48,8	59,6	70,4	79,7	92,4	98,2	108,0	120,0	115,0
COP	W/W	3,79	3,82	3,95	3,96	4,00	3,96	4,01	3,78	3,87	4,04
SCOP	W/W	3,22	3,35	3,33	3,48	3,56	3,50	3,62	3,20	3,31	3,58
$\eta_{s,h}$	%	126	131	130	136	139	137	142	125	130	140
Refrigerant data R454B											
Refrigerant charge	kg	22	22	34	45	51	50	67	95	94	31
Global warming potential (GWP)		466	466	466	466	466	466	466	466	466	466
Equivalent CO_2 charge	t	10	10	16	21	24	23	31	44	44	14
Axial fans (1)											
Number	n°	2	2	2	2	3	3	3	6	6	4
Total air flow	m^3/h	49326	51890	48979	48020	72249	75066	69582	116270	108283	94738
Total fan power input	kW	3,70	3,88	4,04	4,27	5,96	6,17	6,21	8,16	8,03	7,93
Total fan current	A	9,84	9,84	10,1	10,3	15,1	15,1	15,5	19,3	19,9	20,3
Evaporator (2)											
Number	n°	1	1	1	1	1	1	1	1	1	1
Water flow	m^3/h	12,62	15,47	20,59	25,25	29,27	33,05	37,01	36,65	43,35	42,11
Pressure drop	kPa	34,5	38,0	47,2	54,2	14,5	18,0	22,1	38,5	51,8	23,9
Weights											
Transport weight	kg	977	1041	1117	1298	1432	1446	1725	1802	2066	1701
Operating weight	kg	983	1047	1124	1305	1440	1455	1736	1814	2078	1719
Dimensions											
Length	mm	2660	2660	2660	2660	3700	3700	3700	3775	3775	4740
Depth	mm	1370	1370	1370	1370	1370	1370	1370	2300	2300	1370
Height	mm	2420	2420	2420	2420	2420	2420	2420	2560	2560	2420
Sound data											
Sound pressure level (3)	dB(A)	83	86	86	88	89	90	90	88	90	91
Sound power level (4)	dB(A)	51	54	54	56	57	58	58	56	58	59
Power supply											
Voltage/Phase/Frequency	V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
General electrical data											
Maximum input power	kW	31,0	37,6	51,3	65,0	72,0	82,5	87,0	83,7	91,1	100,0
Maximum input current	A	54,5	66,7	100,0	134,0	134,0	183,0	178,0	181,0	227,0	233,0
Inrush current	A	179	236	298	332	371	421	416	345	391	471

Performances are referred to the following conditions:
(1) Air temperature 7°C
(2) Fluid: water - in/out temperature: 30/35°C
(3) Sound power level in accordance with ISO 3744.
(4) Sound pressure level at 10 mt from the unit in free field conditions in accordance with ISO 3744.

Data may change without notice; it is therefore necessary to ALWAYS refer to the sheet supplied with the offer.

PAE N Kr		2302	2502	2802	3202	3602	4202	4802	5202	5602	6002
Cooling											
Nominal cooling capacity	kW	233,0	253,0	288,0	324,0	372,0	413,0	487,0	527,0	569,0	853,0
Nominal input power	kW	77,8	85,8	99,9	108,0	123,0	136,0	162,0	177,0	193,0	207,0
Nominal input current	A	138,0	152,0	172,0	182,0	212,0	239,0	271,0	302,0	334,0	355,0
EER	-	2,99	2,95	2,88	3,00	3,02	3,04	3,01	2,98	2,95	4,12
Refrigerant circuits	n°	2	2	2	2	2	2	2	2	2	2
Compressors	n°	4	4	4	4	4	4	6	6	6	6
Heating											
Nominal heating capacity	kW	274,0	298,0	323,0	376,0	422,0	470,0	562,0	606,0	646,0	702,0
Nominal input power	kW	69,8	75,6	87,2	97,6	108,0	116,0	140,0	150,0	165,0	177,0
Nominal input current	A	131,0	142,0	158,0	170,0	193,0	215,0	245,0	268,0	298,0	315,0
COP	W/W	3,93	3,94	3,70	3,85	3,91	4,05	4,01	4,04	3,92	3,97
SCOP	W/W	3,60	3,72	3,53	3,66	3,76	3,91	3,73	3,79	3,62	3,50
$\eta_{s,h}$	%	141	146	138	143	147	154	146	149	142	-
Refrigerant data R454B											
Refrigerant charge	kg	95	95	88	133	131	175	214	213	193	258
Global warming potential (GWP)		466	466	466	466	466	466	466	466	466	466
Equivalent CO_2 charge	t	44	44	41	62	61	81	100	99	90	120
Axial fans (1)											
Number	n°	6	6	8	8	8	8	10	10	12	12
Total air flow	m^3/h	111027	113143	162707	150709	155569	155659	185908	191035	239433	258513
Total fan power input	kW	8,22	8,38	11,3	11,0	11,4	11,9	14,4	14,8	17,5	19,7
Total fan current	A	19,9	19,9	25,6	26,3	26,3	27,0	33,9	34,0	39,6	32,6
Evaporator (2)											
Number	n°	1	1	1	1	1	1	1	1	1	1
Water flow	m^3/h	47,41	51,46	56,18	65,03	72,97	82,46	97,13	104,8	112,3	121,8
Pressure drop	kPa	49,0	56,9	47,9	62,4	61,2	55,9	54,9	59,0	66,8	66,1
Weights											
Transport weight	kg	2018	2488	2641	3101	3115	3578	4204	4230	4455	4964
Operating weight	kg	2034	2505	2658	3120	3150	3613	4249	4280	4505	5023
Dimensions											
Length	mm	3775	3775	4750	4750	4750	4750	5725	5725	6700	6700
Depth	mm	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300
Height	mm	2560	2560	2560	2560	2560	2560	2560	2560	2560	2560
Sound data											
Sound pressure level (3)	dB(A)	90	90	91	90	92	94	92	94	94	96
Sound power level (4)	dB(A)	58	58	58	58	59	62	60	62	62	63
Power supply											
Voltage/Phase/Frequency	V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
General electrical data											
Maximum input power	kW	111,0	131,0	144,0	153,0	174,0	195,0	266,0	246,0	271,0	306,0
Maximum input current	A	249,0	271,0	267,0	256,0	355,0	454,0	376,0	476,0	582,0	680,0
Inrush current	A	447	469	505	494	593	692	614	714	820	918

Performances are referred to the following conditions:
(1) Air temperature 7°C
(2) Fluid: water - in/out temperature: 30/35°C
(3) Sound power level in accordance with ISO 3744.
(4) Sound pressure level at 10 mt from the unit in free field conditions in accordance with ISO 3744.

Data may change without notice; it is therefore necessary to ALWAYS refer to the sheet supplied with the offer.

3.4.6 PAE N U Kr

PAE N U Kr		601	801	1001	1201	1401	1601	1801	1802	2002	2101
Cooling											
Nominal cooling capacity	kW	62,2	77,3	104,0	126,0	150,0	169,0	186,0	181,0	210,0	214,0
Nominal input power	kW	20,8	25,6	33,9	42,5	48,2	56,2	59,9	59,8	70,5	67,3
Nominal input current	A	38,9	48,4	60,8	74,6	82,3	97,9	103,0	108,0	121,0	118,0
EER	-	2,99	3,02	3,07	2,96	3,11	3,01	3,11	3,03	2,98	3,18
Refrigerant circuits	n°	1	1	1	1	1	1	1	2	2	1
Compressors	n°	2	2	2	2	2	2	2	4	4	2
Heating											
Nominal heating capacity	kW	72,6	89,8	120,0	147,0	170,0	191,0	215,0	214,0	249,0	244,0
Nominal input power	kW	18,3	22,7	29,6	36,6	40,5	46,4	52,5	53,4	61,9	57,4
Nominal input current	A	36,4	45,3	56,1	68,7	73,6	86,4	94,4	101,0	111,0	106,0
COP	W/W	3,97	3,96	4,05	4,02	4,20	4,12	4,10	4,01	4,02	4,24
SCOP	W/W	3,50	3,76	3,86	3,77	3,97	3,96	3,87	3,84	3,86	4,00
$\eta_{s,h}$	%	137	147	151	148	156	155	152	151	151	157
Refrigerant data R454B											
Refrigerant charge	kg	22	34	45	51	68	67	67	95	95	89
Global warming potential (GWP)		466	466	466	466	466	466	466	466	466	466
Equivalent CO_2 charge	t	10	16	21	24	32	31	31	44	44	42
Axial fans (1)											
Number	n°	2	2	2	3	3	3	4	6	6	4
Total air flow	m^3/h	40113	36897	36050	56478	52568	54477	73489	77649	79868	72228
Total fan power input	kW	2,59	2,63	2,77	4,02	4,05	4,18	5,34	5,23	5,37	5,56
Total fan current	A	5,69	5,86	5,98	8,80	8,98	8,98	11,8	11,7	11,7	12,0
Evaporator (2)											
Number	n°	1	1	1	1	1	1	1	1	1	1
Water flow	m^3/h	12,52	15,48	20,71	25,37	29,31	33,04	37,09	36,98	43,09	42,14
Pressure drop	kPa	33,8	52,9	64,0	57,5	14,9	18,6	22,7	40,5	49,9	23,6
Weights											
Transport weight	kg	999	1075	1151	1327	1473	1486	1746	1824	2044	1793
Operating weight	kg	1005	1082	1158	1334	1481	1496	1757	1836	2056	1805
Dimensions											
Length	mm	2660	2660	2660	3700	3700	3700	4740	3775	3775	4740
Depth	mm	1370	1370	1370	1370	1370	1370	1370	2300	2300	1370
Height	mm	2420	2420	2420	2420	2420	2420	2420	2560	2560	2420
Sound data											
Sound pressure level (3)	dB(A)	80	82	82	84	85	86	86	83	84	87
Sound power level (4)	dB(A)	49	50	50	51	53	53	53	50	52	55
Power supply											
Voltage/Phase/Frequency	V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
General electrical data											
Maximum input power	kW	29,1	35,7	49,4	64,7	69,2	79,7	85,8	79,2	86,6	96,3
Maximum input current	A	50,0	62,2	96,0	133,0	127,0	177,0	174,0	170,0	216,0	224,0
Inrush current	A	175	231	294	331	365	415	412	334	380	462

Performances are referred to the following conditions:
(1) Air temperature 7°C
(2) Fluid: water - in/out temperature: 30/35°C
(3) Sound power level in accordance with ISO 3744.
(4) Sound pressure level at 10 mt from the unit in free field conditions in accordance with ISO 3744.

Data may change without notice; it is therefore necessary to ALWAYS refer to the sheet supplied with the offer.

PAE N U Kr		2302	2502	2802	3202	3602	4202	4802	5202	5602	6002
Cooling											
Nominal cooling capacity	kW	233,0	253,0	288,0	324,0	372,0	413,0	487,0	527,0	569,0	853,0
Nominal input power	kW	77,8	85,8	99,9	108,0	123,0	136,0	162,0	177,0	193,0	207,0
Nominal input current	A	138,0	152,0	172,0	182,0	212,0	239,0	271,0	302,0	334,0	355,0
EER	-	2,99	2,95	2,88	3,00	3,02	3,04	3,01	2,98	2,95	4,12
Refrigerant circuits	n°	2	2	2	2	2	2	2	2	2	2
Compressors	n°	4	4	4	4	4	4	6	6	6	6
Heating											
Nominal heating capacity	kW	274,0	295,0	326,0	378,0	419,0	465,0	560,0	600,0	633,0	706,0
Nominal input power	kW	67,0	76,6	83,9	95,0	104,0	115,0	137,0	148,0	158,0	179,0
Nominal input current	A	123,0	138,0	148,0	161,0	183,0	209,0	234,0	258,0	282,0	319,0
COP	W/W	4,09	3,95	3,89	3,98	4,03	4,04	4,09	4,05	4,01	3,94
SCOP	W/W	3,96	3,77	3,94	3,96	4,05	4,04	3,93	3,99	3,97	3,39
$\eta_{s,h}$	%	156	148	155	155	159	159	154	157	156	-
Refrigerant data R454B											
Refrigerant charge	kg	126	89	132	176	175	159	194	193	259	229
Global warming potential (GWP)		466	466	466	466	466	466	466	466	466	466
Equivalent CO_2 charge	t	59	41	62	82	81	74	90	90	121	107
Axial fans (1)											
Number	n°	6	8	8	8	8	10	12	12	12	14
Total air flow	m^3/h	75851	117844	108924	105398	110063	139615	168165	172826	168337	308924
Total fan power input	kW	5,38	7,39	7,21	7,33	7,64	9,33	11,2	11,5	11,7	21,8
Total fan current	A	11,9	15,3	15,5	15,8	15,8	19,5	23,4	23,4	23,7	36,4
Evaporator (2)											
Number	n°	1	1	1	1	1	1	1	1	1	1
Water flow	m^3/h	47,30	51,09	56,32	65,31	72,61	80,39	96,86	104,6	110,6	122,3
Pressure drop	kPa	49,4	53,9	51,1	61,4	59,6	56,8	53,2	56,8	65,5	66,5
Weights											
Transport weight	kg	2229	2503	2712	3171	3185	3582	4204	4230	4550	4955
Operating weight	kg	2246	2520	2729	3190	3220	3617	4250	4279	4600	5014
Dimensions											
Length	mm	3775	5750	4750	4750	4750	5725	6700	6700	6700	7675
Depth	mm	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300
Height	mm	2560	2560	2560	2560	2560	2560	2560	2560	2560	2560
Sound data											
Sound pressure level (3)	dB(A)	84	84	85	84	86	88	86	88	88	90
Sound power level (4)	dB(A)	52	52	52	52	53	56	53	56	56	57
Power supply											
Voltage/Phase/Frequency	V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
General electrical data											
Maximum input power	kW	107,0	129,0	138,0	147,0	168,0	191,0	220,0	241,0	262,0	312,0
Maximum input current	A	238,0	264,0	253,0	242,0	341,0	444,0	362,0	462,0	561,0	688,0
Inrush current	A	436	462	490	479	579	982	600	700	799	926

Performances are referred to the following conditions:
(1) Air temperature 7°C
(2) Fluid: water - in/out temperature: 30/35°C
(3) Sound power level in accordance with ISO 3744.
(4) Sound pressure level at 10 mt from the unit in free field conditions in accordance with ISO 3744.

Data may change without notice; it is therefore necessary to ALWAYS refer to the sheet supplied with the offer.

3.4.7 PAE N HE Kr

PAE N HE Kr		1001	1201	1401	1601	1802	2002	2302	2502
Cooling									
Nominal cooling capacity	kW	104,0	128,0	150,0	174,0	185,0	209,0	229,0	261,0
Nominal input power	kW	33,1	41,5	46,5	52,3	59,7	68,9	76,7	81,9
Nominal input current	A	59,8	72,6	79,6	92,2	107,0	119,0	133,0	145,0
EER	-	3,14	3,08	3,23	3,33	3,10	3,03	2,99	3,19
Refrigerant circuits	n°	1	1	1	1	2	2	2	2
Compressors	n°	2	2	2	2	4	4	4	4
Heating									
Nominal heating capacity	kW	124,0	154,0	175,0	203,0	220,0	253,0	277,0	305,0
Nominal input power	kW	30,5	37,4	42,3	48,1	54,4	62,2	69,1	76,0
Nominal input current	A	56,7	67,6	74,4	87,1	101,0	110,0	123,0	138,0
COP	W/W	4,07	4,12	4,14	4,22	4,04	4,07	4,01	4,01
SCOP	W/W	3,26	3,63	3,45	3,51	3,45	3,59	3,63	3,61
$\eta_{s,h}$	%	127	142	135	137	135	141	142	141
Refrigerant data R454B									
Refrigerant charge	kg	51	67	67	89	95	126	126	132
Global warming potential (GWP)		466	466	466	466	466	466	466	466
Equivalent CO_2 charge	t	24	31	31	41	44	59	59	62
Axial fans (1)									
Number	n°	3	3	4	4	6	6	6	8
Total air flow	m^3/h	77083	74268	100602	101412	116566	112595	114556	158853
Total fan power input	kW	4,35	4,49	5,61	5,52	6,78	6,82	7,16	9,27
Total fan current	A	7,46	7,71	9,69	9,55	11,9	12,0	12,5	16,3
Evaporator (2)									
Number	n°	1	1	1	1	1	1	1	1
Water flow	m^3/h	21,45	26,66	30,30	35,13	37,93	43,73	47,90	52,65
Pressure drop	kPa	52,5	62,2	16,0	20,9	34,0	43,9	51,7	44,2
Weights									
Transport weight	kg	1325	1452	1644	1787	2185	2431	2431	2852
Operating weight	kg	1334	1463	1655	1804	2202	2447	2447	2871
Dimensions									
Length	mm	3700	3700	4740	4740	3775	3775	3775	4750
Depth	mm	1370	1370	1370	1370	2300	2300	2300	2300
Height	mm	2420	2420	2420	2420	2560	2560	2560	2560
Sound data									
Sound pressure level (3)	dB(A)	84	87	87	88	89	91	91	91
Sound power level (4)	dB(A)	52	55	55	56	57	58	52	59
Power supply									
Voltage/Phase/Frequency	V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
General electrical data									
Maximum input power	kW	55,6	69,3	76,9	87,4	90,6	98,0	118,0	144,0
Maximum input current	A	104,0	138,0	137,0	187,0	181,0	226,0	248,0	278,0
Inrush current	A	302	336,0	375	425	345	390	446	476

Performances are referred to the following conditions:
(1) Air temperature 7°C
(2) Fluid: water - in/out temperature: 30/35°C
(3) Sound power level in accordance with ISO 3744.
(4) Sound pressure level at 10 mt from the unit in free field conditions in accordance with ISO 3744.

Data may change without notice; it is therefore necessary to ALWAYS refer to the sheet supplied with the offer.

PAE N HE Kr		2802	3202	3602	4202	4802	5202	5602	6002
Cooling									
Nominal cooling capacity	kW	291,0	321,0	366,0	418,0	483,0	531,0	576,0	620,0
Nominal input power	kW	94,8	107,0	121,0	134,0	159,0	175,0	187,0	200,0
Nominal input current	A	161,0	176,0	206,0	232,0	262,0	294,0	320,0	346,0
EER	-	3,07	3,00	3,02	3,12	3,04	3,03	3,08	3,10
Refrigerant circuits	n°	2	2	2	2	2	2	2	2
Compressors	n°	4	4	4	4	6	6	6	6
Heating									
Nominal heating capacity	kW	339,0	376,0	433,0	488,0	563,0	609,0	665,0	708,0
Nominal input power	kW	86,0	96,1	106,0	117,0	141,0	153,0	166,0	178,0
Nominal input current	A	149,0	160,0	185,0	210,0	237,0	264,0	291,0	317,0
COP	W/W	3,94	3,91	4,08	4,17	3,99	3,98	4,01	3,98
SCOP	W/W	3,64	3,70	3,66	3,92	3,59	3,25	3,29	3,38
$\eta_{s,h}$	%	142	145	143	154	141	-	-	-
Refrigerant data R454B									
Refrigerant charge	kg	132	176	161	214	259	229	308	308
Global warming potential (GWP)		466	466	466	466	466	466	466	466
Equivalent CO_2 charge	t	62	82	75	100	121	107	144	144
Axial fans (1)									
Number	n°	8	8	10	10	12	14	14	14
Total air flow	m^3/h	162246	159040	203288	197943	240144	295932	284102	290741
Total fan power input	kW	9,85	10,3	12,6	13,0	16,0	19,4	19,6	20,9
Total fan current	A	17,1	17,8	21,8	22,4	27,4	33,0	33,3	35,2
Evaporator (2)									
Number	n°	1	1	1	1	1	1	1	1
Water flow	m^3/h	58,63	65,06	74,89	84,32	97,38	105,3	115,0	122,3
Pressure drop	kPa	48,8	57,0	50,0	44,2	53,6	52,7	61,7	68,9
Weights									
Transport weight	kg	3034	3482	3610	3955	4597	4697	5190	5220
Operating weight	kg	3056	3506	3645	3995	4646	4756	5248	5279
Dimensions									
Length	mm	4750	4750	5725	5725	6700	7675	7675	7675
Depth	mm	2300	2300	2300	2300	2300	2300	2300	2300
Height	mm	2560	2560	2560	2560	2560	2560	2560	2560
Sound data									
Sound pressure level (3)	dB(A)	91	91	92	94	92	95	95	96
Sound power level (4)	dB(A)	59	58	60	62	60	62	62	63
Power supply									
Voltage/Phase/Frequency	V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
General electrical data									
Maximum input power	kW	153,0	162,0	189,0	210,0	243,0	270,0	291,0	312,0
Maximum input current	A	266,0	255,0	362,0	461,0	383,0	489,0	589,0	688,0
Inrush current	A	504	493	600	699	620	727	827	926

Performances are referred to the following conditions:
(1) Air temperature 7°C
(2) Fluid: water - in/out temperature: 30/35°C
(3) Sound power level in accordance with ISO 3744.
(4) Sound pressure level at 10 mt from the unit in free field conditions in accordance with ISO 3744.

Data may change without notice; it is therefore necessary to ALWAYS refer to the sheet supplied with the offer.

3.4.8 PAE N HE U Kr

PAE N HE U Kr		1001	1201	1401	1601	1802	2002	2302	2502
Cooling									
Nominal cooling capacity	kW	104,0	127,0	151,0	173,0	184,0	208,0	226,0	260,0
Nominal input power	kW	31,6	40,2	44,6	51,7	57,8	66,9	75,1	79,4
Nominal input current	A	57,5	70,6	76,7	91,2	104,0	115,0	130,0	140,0
EER	-	3,29	3,16	3,39	3,35	3,18	3,11	3,01	3,27
Refrigerant circuits	n°	1	1	1	1	2	2	2	2
Compressors	n°	2	2	2	2	4	4	4	4
Heating									
Nominal heating capacity	kW	125,0	156,0	177,0	203,0	221,0	255,0	278,0	307,0
Nominal input power	kW	27,9	34,9	39,3	45,2	50,0	58,3	65,1	70,7
Nominal input current	A	53,0	64,0	69,9	82,8	94,0	104,0	117,0	130,0
COP	W/W	4,48	4,47	4,50	4,49	4,42	4,37	4,27	4,34
SCOP	W/W	4,04	4,19	4,20	4,20	3,93	3,84	4,12	4,25
$\eta_{s,h}$	%	159	165	165	165	154	151	162	167
Refrigerant data R454B									
Refrigerant charge	kg	51	67	67	89	95	126	126	132
Global warming potential (GWP)		466	466	466	466	466	466	466	466
Equivalent CO_2 charge	t	24	31	31	41	44	59	59	62
Axial fans (1)									
Number	n°	3	3	4	4	6	6	6	8
Total air flow	m^3/h	58933	56858	76672	75938	88725	85179	86525	120219
Total fan power input	kW	2,03	2,12	2,63	2,84	3,03	3,09	3,22	4,10
Total fan current	A	3,96	4,13	5,17	5,54	6,10	6,20	6,43	8,25
Evaporator (2)									
Number	n°	1	1	1	1	1	1	1	1
Water flow	m^3/h	21,64	26,94	30,66	35,06	38,23	44,06	48,10	53,05
Pressure drop	kPa	51,7	60,8	15,7	20,0	33,4	42,9	50,3	43,2
Weights									
Transport weight	kg	1347	1474	1666	1809	2207	2453	2453	2874
Operating weight	kg	1356	1485	1677	1826	2224	2469	2469	2893
Dimensions									
Length	mm	3700	3700	4740	4740	3775	3775	3775	4750
Depth	mm	1370	1370	1370	1370	2300	2300	2300	2300
Height	mm	2420	2420	2420	2420	2560	2560	2560	2560
Sound data									
Sound pressure level (3)	dB(A)	80	82	82	83	82	84	84	84
Sound power level (4)	dB(A)	48	49	50	50	49	52	52	52
Power supply									
Voltage/Phase/Frequency	V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
General electrical data									
Maximum input power	kW	55,6	69,3	76,9	87,4	90,6	98,0	118,0	144,0
Maximum input current	A	104,0	138,0	137,0	187,0	181,0	226,0	248,0	278,0
Inrush current	A	302	336	375	425	345	390	446	476

Performances are referred to the following conditions:
(1) Air temperature 7°C
(2) Fluid: water - in/out temperature: 30/35°C
(3) Sound power level in accordance with ISO 3744.
(4) Sound pressure level at 10 mt from the unit in free field conditions in accordance with ISO 3744.C

Data may change without notice; it is therefore necessary to ALWAYS refer to the sheet supplied with the offer.

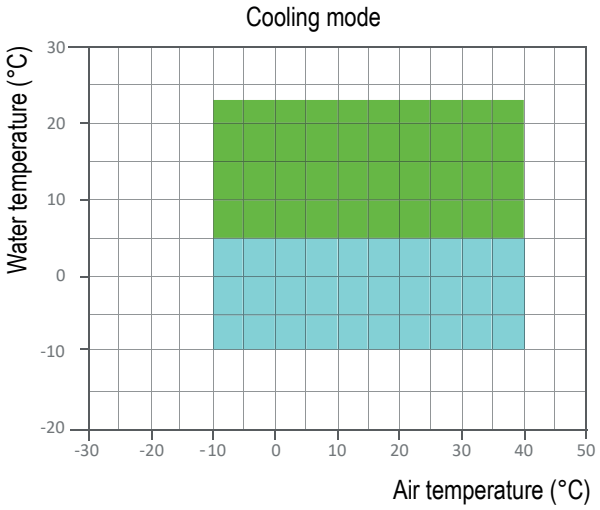
PAE N HE U Kr		2802	3202	3602	4202	4802	5202	5602	6002
Cooling									
Nominal cooling capacity	kW	291,0	321,0	365,0	414,0	480,0	528,0	573,0	609,0
Nominal input power	kW	91,7	104,0	117,0	131,0	155,0	156,0	170,0	182,0
Nominal input current	A	15,0	171,0	200,0	228,0	256,0	286,0	313,0	344,0
EER	-	3,17	3,09	3,12	3,16	3,10	3,38	3,37	3,35
Refrigerant circuits	n°	2	2	2	2	2	2	2	2
Compressors	n°	4	4	4	4	6	6	6	6
Heating									
Nominal heating capacity	kW	340,0	377,0	433,0	489,0	566,0	611,0	656,0	689,0
Nominal input power	kW	79,5	90,1	99,6	110,0	131,0	142,0	154,0	166,0
Nominal input current	A	140,0	151,0	175,0	199,0	222,0	247,0	274,0	300,0
COP	W/W	4,28	4,18	4,35	4,45	4,32	4,30	4,26	4,15
SCOP	W/W	4,28	4,24	4,30	4,47	4,27	3,38	3,92	4,00
$\eta_{s,h}$	%	168	167	169	176	168	-	-	-
Refrigerant data R454B									
Refrigerant charge	kg	132	176	161	214	259	259	308	308
Global warming potential (GWP)		466	466	466	466	466	466	466	466
Equivalent CO_2 charge	t	62	82	75	100	121	107	144	144
Axial fans (1)									
Number	n°	8	8	10	10	12	14	14	14
Total air flow	m^3/h	123355	117781	154006	149014	180263	222440	217556	222322
Total fan power input	kW	4,42	4,60	5,59	5,78	7,05	8,41	9,01	9,59
Total fan current	A	8,77	9,08	11,1	11,4	13,9	16,5	17,4	18,4
Evaporator (2)									
Number	n°	1	1	1	1	1	1	1	1
Water flow	m^3/h	58,68	65,21	74,92	84,43	97,84	105,6	113,6	120,0
Pressure drop	kPa	47,3	55,2	48,2	42,8	52,2	51,1	58,2	64,5
Weights									
Transport weight	kg	3056	3504	3632	3977	4619	4719	5212	5242
Operating weight	kg	3078	3528	3667	4017	4668	4778	5270	5301
Dimensions									
Length	mm	4750	4750	5725	5725	6700	7675	7675	7675
Depth	mm	2300	2300	2300	2300	2300	2300	2300	2300
Height	mm	2560	2560	2560	2560	2560	2560	2560	2560
Sound data									
Sound pressure level (3)	dB(A)	85	84	86	88	86	88	88	92
Sound power level (4)	dB(A)	52	52	53	56	54	56	56	60
Power supply									
Voltage/Phase/Frequency	V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
General electrical data									
Maximum input power	kW	153,0	162,0	189,0	210,0	243,0	270,0	291,0	312,0
Maximum input current	A	266,0	255,0	362,0	461,0	383,0	489,0	589,0	688,0
Inrush current	A	504	493	600	699	620	727	827	926

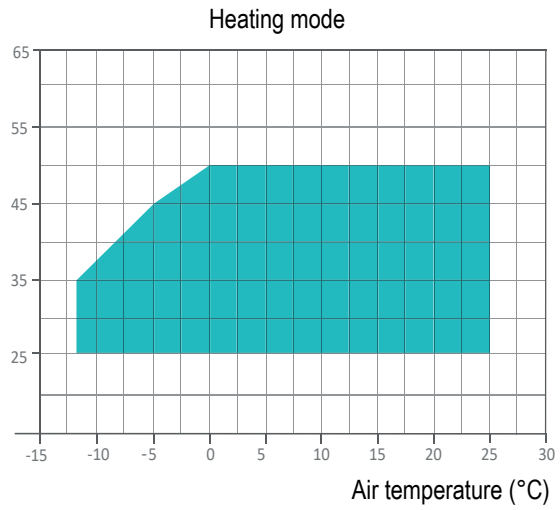
Performances are referred to the following conditions:
(1) Air temperature 7°C
(2) Fluid: water - in/out temperature: 30/35°C
(3) Sound power level in accordance with ISO 3744.
(4) Sound pressure level at 10 mt from the unit in free field conditions in accordance with ISO 3744.

Data may change without notice; it is therefore necessary to ALWAYS refer to the sheet supplied with the offer.

3.5 Operational limits

3.5.1 Standard version



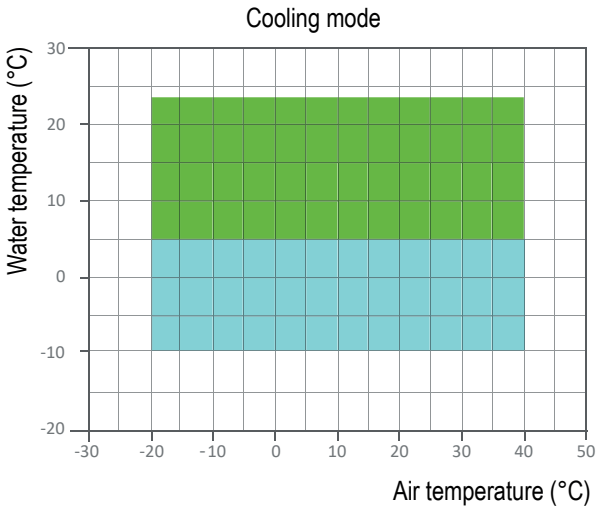


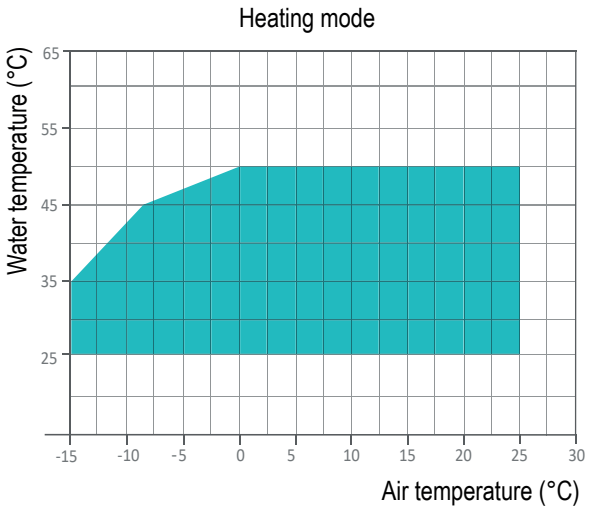
Cooling mode

Cooling with glycol

Heating mode

3.5.2 HE Version





Cooling mode

Cooling with glycol

Heating mode

3.5.3 User heat exchanger water flow rate

The nominal water flow rate provided, relates to a ΔT of 5°C. The maximum flow rate allowed is one that provides a ΔT of 3°C. Higher values may cause too high a pressure drop. The minimum water flow rate allowed is that which results in a ΔT of 7°C. Insufficient flow will result in evaporating temperatures that are too low leading to the operation of safety devices that will prevent unit operation.

Units are designed and manufactured to European safety and technical standards. The units have been designed exclusively for cooling and DHW production. The units must be used for this specific purpose only.
The Company will not be liable for claims for damage caused to persons, animals or material goods or property caused by improper installation, adjustment and maintenance or improper use. Any use not specified in this manual is prohibited.

In case of operations outside of these values, please contact the company.

If the unit is installed in particularly windy areas, it will be necessary to provide some windbreaker barriers to avoid any malfunction. We suggest to install the barriers only if the wind exceeds 2,5m/s.

The units, in their standard configuration, are not suitable for installation in saline environments.

3.6 Correction tables

3.6.1 Operation with glycol

Glycol percentage	Freezing point (°C)	CCF	IPCF	WFCF	PDCF
10	-3.2	0.985	1	1.02	1.08
20	-7.8	0.98	0.99	1.05	1.12
30	-14.1	0.97	0.98	1.09	1.22
40	-22.3	0.965	0.97	1.14	1.25
50	-33.8	0.955	0.965	1.2	1.33

CCF: Capacity correction factor **IPCF: Input power correction factor**
WFCF: Water flow correction factor **PDCF: Pressure drops correction factor**

The water flow rate and pressure drop correction factors are to be applied directly to the values given for operation without glycol. The water flow rate correction factor is calculated in order to maintain the same temperature difference as that which would be obtained without glycol. The pressure drop correction factor takes into account the different flow rate obtained from the application of the flow rate correction factor.

3.6.2 Correction tables different Δt

Water temperature diff.(°C)	3	5	8
CCCP	0.99	1	1.02
IPCF	0.99	1	1.01

CCCP = Cooling capacity correction factor **IPCF = Input power correction factor**

3.6.3 Correction tables different Fouling factors

Fouling factor	0.00005	0.0001	0.0002
CCCP	1	0.98	0.94
IPCF	1	0.98	0.95

CCCP = Cooling capacity correction factor **IPCF = Input power correction factor**

3.7 Sound data

The sound level reported is calculated at the cooling-only operating condition.

PAE N Kc											
Mod.	Octave bands (Hz)								Lw	Lp1	Lp10
	63	125	250	500	1K	2K	4K	8K	dB(A)	dB(A)	dB(A)
	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)			
601	57	63	69	77	80	76	74	66	83	65	51
801	57	63	69	77	83	81	77	69	86	68	54
1001	57	63	69	77	83	81	77	69	86	68	54
1201	57	63	72	77	84	84	77	72	88	70	56
1401	58	65	71	79	86	84	80	72	89	70	57
1601	58	65	74	79	87	85	80	72	90	71	58
1801	58	65	74	82	87	85	80	71	90	71	58
1802	57	61	72	77	84	84	77	72	88	68	56
2002	57	61	73	80	84	87	80	72	90	70	58
2101	60	66	72	80	87	88	80	72	91	72	59
2302	57	61	73	80	84	87	80	72	90	70	58
2502	57	61	73	80	84	87	80	72	90	70	58
2802	59	63	73	81	86	87	80	72	91	70	58
3202	59	63	73	81	86	87	80	73	90	70	58
3602	59	63	75	83	87	88	83	75	92	71	59
4202	59	63	75	83	90	91	83	75	94	74	62
4802	60	64	75	83	87	88	82	75	92	71	60
5202	60	64	76	84	90	91	83	73	94	74	62
5602	60	64	75	83	90	91	83	75	94	73	62
6002	66	74	77	85	92	93	85	73	96	75	63

PAE N HE Kc											
Mod.	Octave bands (Hz)								Lw	Lp1	Lp10
	63	125	250	500	1K	2K	4K	8K	dB(A)	dB(A)	dB(A)
	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)			
1001	56	59	67	74	78	81	74	66	84	67	52
1201	56	59	67	74	81	84	77	69	87	68	55
1401	58	60	70	75	83	84	77	69	87	69	55
1601	58	60	69	77	84	85	80	69	88	70	56
1802	65	73	73	79	84	84	80	72	89	67	57
2002	65	73	76	82	84	87	80	75	91	68	58
2302	65	73	76	82	84	87	80	75	91	68	58
2502	67	74	74	80	87	87	80	75	91	67	59
2802	67	74	74	83	86	87	80	75	91	71	59
3202	67	74	74	83	86	87	80	73	91	73	58
3602	68	75	75	84	87	88	83	75	92	73	60
4202	68	75	75	84	90	91	83	75	94	75	62
4802	68	76	76	85	87	88	82	75	92	74	60
5202	69	77	76	85	90	91	83	76	95	75	62
5602	69	77	76	85	90	91	83	76	95	74	62
6002	69	77	79	85	92	93	85	76	96	76	63

PAE N U Kc											
Mod.	Octave bands (Hz)								Lw	Lp1	Lp10
	63	125	250	500	1K	2K	4K	8K	dB(A)	dB(A)	dB(A)
	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)			
601	50	58	64	73	77	75	69	61	80	62	49
801	50	58	64	73	77	78	72	64	82	63	50
1001	50	58	64	73	77	78	72	64	82	63	50
1201	50	58	67	73	80	78	74	66	84	64	51
1401	52	59	66	74	82	81	74	66	85	66	53
1601	52	59	66	74	82	82	74	66	86	66	53
1801	52	59	66	74	82	82	74	66	86	66	53
1802	54	58	64	71	78	78	74	66	83	63	50
2002	54	58	67	74	78	81	74	66	84	64	52
2101	53	61	67	76	84	82	77	67	87	67	55
2302	54	58	67	74	78	81	74	66	84	64	52
2502	54	58	67	74	78	81	74	66	84	64	52
2802	56	60	69	76	80	81	74	69	85	64	52
3202	56	60	69	76	80	81	74	67	84	64	52
3602	56	60	69	77	81	82	77	69	86	65	53
4202	56	60	69	77	84	85	77	69	88	67	56
4802	57	61	70	77	81	82	76	69	86	65	53
5202	57	61	70	78	84	85	77	70	88	67	56
5602	57	61	70	77	84	85	77	69	88	67	56
6002	63	70	71	79	86	87	79	67	90	68	57

PAE N HE U Kc											
Mod.	Octave bands (Hz)								Lw	Lp1	Lp10
	63	125	250	500	1K	2K	4K	8K	dB(A)	dB(A)	dB(A)
	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)			
1001	56	58	63	70	75	75	71	63	80	61	48
1201	56	58	66	73	75	78	71	63	82	62	49
1401	57	59	64	75	77	78	74	66	82	63	50
1601	57	59	67	72	78	79	74	66	83	63	50
1802	58	66	67	73	75	78	71	63	82	62	49
2002	58	66	67	74	78	81	74	66	84	64	52
2302	58	66	67	74	78	81	74	66	84	64	52
2502	59	67	68	74	78	81	74	66	84	64	52
2802	59	67	68	75	80	81	74	66	85	64	52
3202	59	67	68	75	80	81	74	64	84	64	52
3602	60	68	69	77	81	82	77	66	86	65	53
4202	60	68	69	77	84	85	77	66	88	67	56
4802	61	69	70	77	81	82	76	66	86	65	54
5202	62	69	71	78	84	85	77	67	88	67	56
5602	62	69	71	77	84	85	77	66	88	67	56
6002	57	73	78	81	89	87	82	73	92	71	60

Lw: Sound power level according to ISO 3744.
Lp1: Sound pressure level measured at 1 mt from the unit in free field conditions direction factor Q=2 according to ISO 3744.
Lp10: Sound pressure level measured at 10 mt from the unit in free field conditions direction factor Q=2 according to ISO 3744.

4. INSTALLATION

4.1 General safety guidelines and and use of symbols

Before undertaking any task the operator must be fully trained in the operation of the machines to be used and their controls. They must also have read and be fully conversant with all operating instructions.

All maintenance must be performed by TRAINED personnel and be in accordance with all national and local regulations.

The installation and maintenance of the unit must comply with the local regulations in force at the time of the installation.

Avoid contact and do not insert any objects into moving parts.

4.2 Health and safety Considerations

The workplace must be kept clean, tidy and free from objects that may prevent free movement. Appropriate lighting of the work place shall be provided to allow the operator to perform the required operations safely. Poor or too strong lighting can cause risks.

Ensure that work places are always adequately ventilated and that respirators are working, in good condition and comply fully with the requirements of the current regulations.

4.3 Personal protective equipment

When operating and maintaining the unit, use the following personal protective equipment listed below as required by law.

Protective footwear.

Eye protection.

Protective gloves.

Respiratory protection.

Hearing protection.

4.4 Inspection

When installing or servicing the unit, it is necessary to strictly follow the rules reported on this manual, to conform to all the specifications of the labels on the unit, and to take any possible precautions of the case. Not observing the rules reported on this manual can create dangerous situations. After receiving the unit, immediately check its integrity. The unit left the factory in perfect conditions; any eventual damage must be questioned to the carrier and recorded on the Delivery Note before it is signed.
Before accepting the unit check:

- The unit did not suffer any damage during transport;
- The delivered goods are conforming to what shown in the delivery note.

In Case of Damage

- List the damage on the delivery note
- Inform the Company of the extent of the damage within 8 days of receipt of the goods. After this time any claim will not be considered.
- A full written report is required for cases of severe damage.

4.5 Transport and handling

The unit handling must be done by skilled personnel only, with suitable equipment to the unit weight and dimensions. During the handling operations, keep the unit in vertical position (i.e. with the basement parallel to the ground)

The transport company is always responsible for any possible damage during the transport of the goods. Before installing the unit and preparing it for the commissioning, accurately sight inspect the unit to verify the packaging integrity or that the unit has no visible damage, and oil or refrigerant leakage.
Also verify that the unit complies what required in phase of order.

Any possible damage or claim must be communicated to the Manufacturer or to the carrier by means of registered mail within 8 days from goods receipt.

If one or more components are damaged, do not start the unit, and immediately inform the manufacturer, in order to agree any intervention on the unit.

It is suggested to unpack the unit at effective unit installation place. The internal handling must be done with care, avoiding using the equipment components as holds.
Avoid any damage during the unit handling.

The hydraulic circuit must be fully empty before anyhow move the unit.

The units lifting must be vertical, preferably done by means of a forklift.
Use a distribution beam if straps or ropes are used for the harness, carefully checking that no pressure is done on the higher edges of the unit or of the packaging.

4.6 Storage

If it is necessary to store the unit, leave it packed in a closed place. If for any reason the machine has already been unpacked, follow these instructions to prevent damage, corrosion and/or deterioration:

- Make sure that all openings are properly closed or sealed;
- Never use steam or other cleaning agents to clean the unit that could damage it;
- Remove any keys needed to access the control panel and entrust them to the site manager.

The unit can be stored at temperatures between -10°C and 50°C. When not in use, in order to prevent corrosion, deposits or breakage due to the ice formation, it is essential that the heat exchangers, on the user side, are completely empty or completely filled with water properly glycol.

4.7 Unpacking

Packaging could be dangerous for the operators.

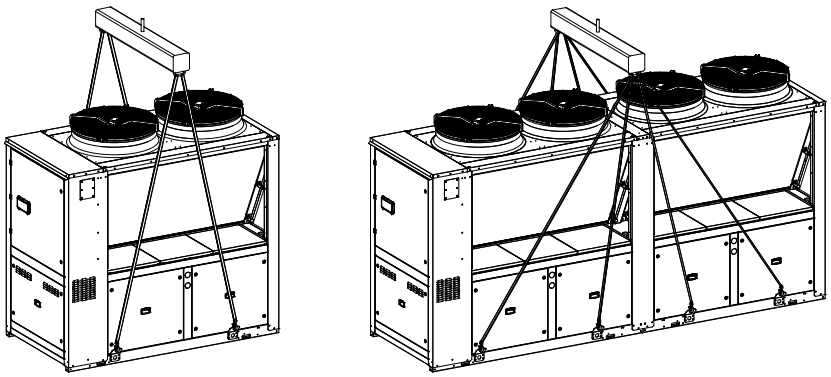
It is advisable to leave packaged units during handling and remove it before the installation.
The packaging must be removed carefully to prevent any possible damage to the machine.
The materials constituting the packaging may be different in nature (wood, cardboard, nylon, etc.).

The packaging materials should be seperated and sent for disposal or possible recycling to specialist waste companies.

4.8 Lifting and handling

When unloading the unit, it is strongly recommended that sudden movements are avoided in order to protect the refrigerant circuit, copper tubes or any other unit component. Units can be lifted by using a forklift or, alternatively, using belts. Take care that the method of lifting does not damage the side panels or the cover. It is important to keep the unit horizontal at all time to avoid damage to the internal components.

The Source heat exchangers fins are sharp. Use protection gloves.



The unit handling must be carried out by skilled personnel, suitable equipped for the weight and the dimension of the model.

The weight of some models could be unbalanced, therefore the unit stability must be checked before handling the unit.

Lift the unit in vertical position, avoiding any jerk and with a speed suitable to the charge, in order to preserve the structure integrity.

If a forklift is used, the forks must be spaced to the maximum allowed by the size of the pallet.

Any lifting device, or cables, ropes and bands, used to move the device, must be in compliance with the local norms in force.

4.9 Location and minimum technical clearances

In compliance with the EN 378-1, the unit can be identified as an indirect closed system,
The refrigerant charge and type are indicated on the unit identification tag.
The unit positioning must be done considering the charge limits imposed by the EN 378-1, annex C and, in particular, by what stated in Table C1 for the refrigerant included in the group 3.

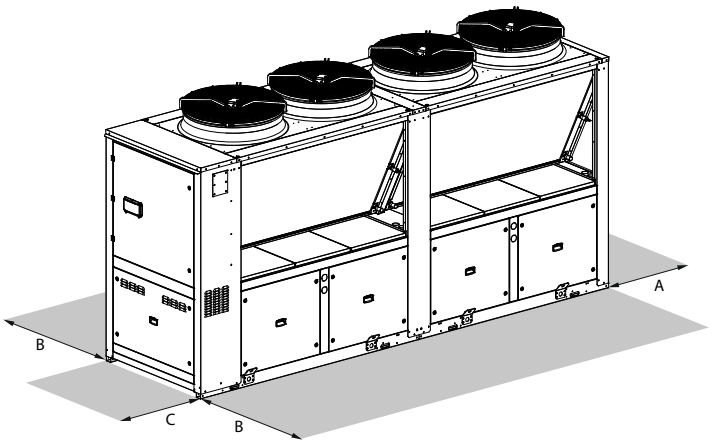
All units are designed for external installation : any overhang above the unit and location near trees, if they partially cover the unit,must be avoided in order to prevent air by-pass. It is advisable to create a proper mounting plinth, with a size similar to the unit foot-print. Unit vibration level is very low: it is advisable however, to install vibration dampers (spring or rubber) between the plinth and the unit base-frame to keep vibrations at a very low level. It is vital to ensure adequate air volume to the source fan. Re-circulation of discharge air must be avoided; failure to observe this point will result in poor performance or activation of safety controls. For these reasons it is necessary to observe the following clearances.

The group must be installed so that any possible refrigerant leakage cannot penetrate inside any building or closed ambient.

The unit has to be installed such that maintenance and repair is possible. The warranty does not cover costs for the provision of lifting apparatus, platforms or other lifting systems required to perform repairs during warranty period.

The installation site should be chosen in accordance with EN 378-1 and 378-3 standards. When choosing the installation site, all risks caused by accidental refrigerant leakage should be taken into consideration.

The Unit baseframe, during operation, must be in horizontal position; the max inclination allowed is 5° in lenght and width.



	A	B	C
mm	1000	1500	1000

4.10 Serial interface card RS485 (IH) (Optional)

Supervision system interface (MODBUS RS485 available only)
This system allows you to remotely monitor all parameters of the unit and change their values.
It is necessary to respect the polarity of the wiring as shown in the wiring diagram. Any reversal of polarity will result in the non-functioning unit. The supervision connectivity cable must be telephone one type 2x0, 25 mm^2.
The unit is configured at the factory with serial address 1. In case of using the MODBUS system, you can request the list of variables by contacting the assistance.

4.11 Hydraulic connections

The water pipe-work must be installed in accordance with national and local regulation and can be made from copper, steel, galvanized steel or PVC. The Pipework must be designed to cater for the nominal water flow and the hydraulic pressure drops of the system, a maximum pressure drop of 300 Pa/m run being typical. All pipes must be insulated with closed-cell material of adequate thickness. The hydraulic piping should includes:

- Pockets for temperature sensor to measure the temperature in the system.
- Flexible joints, to isolate the unit from the rest of the system.
- Temperature and pressure gauges for maintenance and servicing operations.
- Shut-off manual valves to isolate the unit from the hydraulic circuit.
- Metallic filters to be mounted on the inlet pipe with a mesh not larger than 1 mm (supplied as standard).
- Vent valves, expansion tank with water filling, discharge valve.

The hydraulic connection diameters are specified in the "Technical Data" table.

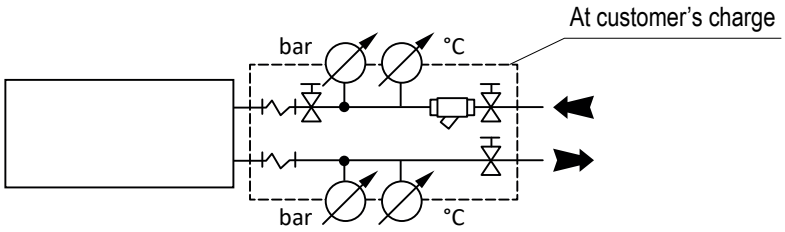
System return water must be fitted to the connection labelled: ”USER WATER IN” as incorrect connection can damage the heat exchanger by freezing.

It is compulsory to install on the USER WATER IN connection, a water strainer with a mesh not larger than 1 mm. Fitting this filter is COMPULSORY and the warranty will be invalidated if it is removed. The filter must be kept clean and checked periodically.

The connection of the unit to the hydraulic circuit must be carried out by an experienced and qualified technician in accordance with the local regulations in force.

The connection of the unit to the system must be carried out in such a way that the fluid to be cooled circulates in the evaporator in the correct direction. To this purpose, the pipes must be connected in compliance with the instructions given in the connection on the unit.

To connect the pipes to the evaporator, take care of the following advises:
• Connect the pipes as shown in picture



• To avoid any vibration transmission and permit the thermal expansions, anti-vibration fittings must be installed on the pipes. ;
• To avoid the inlet of foreign bodies and particles, you need to install, on unit inlet, a cleanable mechanic filter, with mesh dimension not larger than 2mm and with suitable nominal diameter, to reduce pressure drops;
• The installation of shut-off valve up and down stream of the filter is recommended, in order to make the cleaning operation simpler and quicker;
• The installation of thermometers and gauges near the inlet and outlet connection of the device, make the check of the unit operation easier;
• The chilled water system must be coated with close-cells anti-condensation material, with thermal insulation characteristics, vapor impermeability and with suitable thickness for the worst foreseeable conditions, in operation and stand-by mode;
• Use the pre-arranged connection shown in the attached dimensional drawing to connect the unit to the hydraulic system;
• Once the circuit is done and the unit installed, seal test of the whole system must be done, in order to find out any possible leakage and repair it, before the circuit filling and commissioning.

After the seal test, if the start-up of the system is planned after a long period of stop or if the ambient temperature can go down till values near to 0°C or lower, you need to drain the water from the circuit or enter a suitable percentage of glycol.

You must be sure that compressors of the units can start only after the operation of the evaporator water circulation pumps. This is possible, for example, by using an electrical interblock. (as in the wiring diagram attached to the manual)

If the pump group for the fluid circulation inside the evaporator is not supplied with the unit, be sure that the compressors start only after that the pump group is on.

In case of breaking of the user side exchanger, the refrigerant can enter the water circuit. Position then the vent valves of the system in airy zone and far from manholes where the refrigerant could be concentrated, creating potentially explosive atmospheres. If not possible, the closed ambient where these vent valves are present, must be arranged with the precautions stated in the EN-378.

All units are factory supplied with a flow switch/differential pressure switch which is fitted in the pipework connection labelled "USER WATER OUT". If the flow switch is altered, removed, or the water filter omitted on the system, the warranty will be invalidated.

The water flow through the heat exchangers of the unit should not be fall below Δt 8K measured at the following conditions:

Cooling mode: 35°C dry bulb ambient temperature, 7°C water outlet temperature.

When starting the unit for the first time, it is necessary to load it with clean water with chemical-physical characteristics such as to prevent corrosive phenomena or deposits of any kind. For this purpose, it is advisable to check annually the stability of the pH.

4.12 Chemical characteristics of the water

In the following table there are, 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 yearly check PH stability.

EXPLANATIONS:

+ Good resistance under normal conditions
0 Corrosion problems may occur especially when more factors are valued 0
- Use is not recommended

			Plate Material			Brazing Material		
WATER CONTENT	**CONCENTRATION (mg/l or ppm)**	**TIME LIMITS Analyze before**	**AISI 304**	**AISI 316**	**254 SMO**	**COPPER**	**NICKEL**	**STAINLESS STEEL**
Alkalinity (HCO_3^-)	< 70	Within 24 h	+	+	+	0	+	+
	70-300		+	+	+	+	+	+
	> 300		+	+	+	0/+	+	+
Sulphate[1] (SO_4^{2-})	< 70	No limit	+	+	+	+	+	+
	70-300		+	+	+	0/-	+	+
	> 300		+	+	+	-	+	+
HCO_3^- / SO_4^{2-}	> 1.0	No limit	+	+	+	+	+	+
	< 1.0		+	+	+	0/-	+	+
Electrical conductivity	< 10 µS/cm	No limit	+	+	+	0	+	+
	10-500 µS/cm		+	+	+	+	+	+
	> 500 µS/cm		+	+	+	0	+	+
pH [2]	< 6.0	Within 24 h	0	0	0	0	+	0
	6.0-7.5		+	+	+	0	+	+
	7.5-9.0		+	+	+	+	+	+
	>9.0		+	+	+	0	+	+
Ammonium (NH_4^+)	< 2	Within 24 h	+	+	+	+	+	+
	2-20		+	+	+	0	+	+
	>20		+	+	+	-	+	+
Chlorides (Cl^-)	<100	No limit	+	+	+	+	+	+
Please also see	100-200		0	+	+	+	+	+
table below	200-300		-	+	+	+	+	+
	>300		-	-	+	0/+	+	-
Free chlorine (Cl_2)	< 1	Within 5 h	+	+	+	+	+	+
	1-5		-	-	0	0	+	-
	> 5		-	-	-	0/-	+	-
Hydrogen sulfide (H_2S)	< 0.05	No limit		+	+	+	+	+
	>0.05			+	+	0/-	+	+
Free (aggressive)	< 5	No limit	+	+	+	+	+	+
carbon dioxide (CO_2)	5-20		+	+	+	0	+	+
	> 20		+	+	+	-	+	+
Total hardness (°dH)	4.0-8.5	No limit	+	+	+	+	+	+
Nitrate[1] (NO_3^-)	< 100	No limit	+	+	+	+	+	+
	> 100		+	+	+	0	+	+
Iron[3] (Fe)	< 0.2	No limit	+	+	+	+	+	+
	> 0.2		+	+	+	0	+	+
Aluminium (Al)	< 0.2	No limit	+	+	+	+	+	+
	> 0.2		+	+	+	0	+	+
Manganese[3] (Mn)	< 0.1	No limit	+	+	+	+	+	+
	> 0.1		+	+	+	0	+	+

[1] Sulfates and nitrates works as inhibitors for pitting corrosion caused by chlorides in pH neutral environments

[2] In general low pH (below 6) increase corrosion risk and high pH (above 7.5) decrease the corrosion risk

[3] Fe^{3+} and Mn^{4+} are strong oxidants and may increase the risk for localised corrosion on stainless steels

[4] in combination with brazing material copper

SiO_2 above 150ppm increase the risk of scaling

CHLORIDE CONTENT	**MAXIMUM TEMPERATURE** 30°C	60°C	80°C	120°C	130°C
= 10 ppm	SS 304	SS 304	SS 304	SS 304	SS 316
= 25 ppm	SS 304	SS 304	SS 304	SS 316	SS 316[4]
= 50 ppm	SS 304	SS 304	SS 316	SS 316	Ti / 254 SMO
= 80 ppm	SS 316	SS 316	SS 316	SS 316[4]	Ti / 254 SMO
= 150 ppm	SS 316	SS 316	SS 316[4]	Ti / 254 SMO	Ti / 254 SMO
= 300 ppm	SS 316	SS 316[4]	Ti / 254 SMO	Ti / 254 SMO	Ti / 254 SMO
> 300 ppm	Ti / 254 SMO	Ti / 254 SMO	Ti / 254 SMO	Ti / 254 SMO	Ti / 254 SMO

pS logarithm of the suspended solids expressed in ppm and measured at water temperature in the falling point
pAlc logarithm of the alkalinity factor expressed in ppm CaCo3
pCa logarithm of the limestone hardness expressed in ppm CaCo3
In order to prevent corrosive phenomena or deposits of any nature it is recommended to:
• Empty the evaporator before any maintenance work is carried out;
• Do not clean the evaporator with unsuitable mechanical systems, such as drill bits or high-pressure jets;
• Do not clean with too aggressive cleaning agents. Before using a chemical detergent, check the compatibility with the construction materials of the exchanger.
• During winter stops, carefully empty the heat exchanger.

In case of long stops, leave the heat exchanger completely filled with adequate glycol water or completely empty.

4.13 Filling the hydraulic circuit

- Before filling, check that the installation drain valve is closed.
- Open all pipework, heat pump and terminal unit air vents.
- Open the shut off valves.
- Begin filling, slowly opening the water valve in the filling group outside the unit.
- When water begins to leak out of the terminal air vent valves, close them and continue filling until the pressure gauge indicates a pressure of 1.5 bars.

The installation should be filled to a pressure of between 1 and 2 bars. It is recommended that this operation be repeated after the unit has been operating for a number of hours (due to the presence of air bubbles in the system). The pressure of the installation should be checked regularly and if it drops below 1 bar, the water content should be topped-up. If frequent top-ups are required, check all connections for leaks.

4.14 User circuit minimum water content

Heat pump units need a minimum water content inside the user circuit in order to guarantee the correct functioning of the unit. A correct water content reduces the number of starts-and-stops of the compressors and this extends the oeprating life of the unit and allows a reduced reduction of the hot water temperature during the defrosting cycle. For these reason it's necessary to guarantee to the unit the following minimum water contents in the user circuit:
recommended water content: 15l/kW.
Recommended minimum water content: 20 lt. x heating capacity (kW) / Number of compressors.

PAE N Kc	601	801	1001	1201	1401	1601	1801	1802	2002	2101
Minimum water content winter mode (l)	798	984	1240	1490	1750	1990	2240	1075	1335	2540

PAE N Kc	2302	2502	2802	3202	3602	4202	4802	5202	5602	6002
Minimum water content winter mode (l)	1390	1525	1740	1965	2190	2405	2925	3140	3370	3615

PAE N U Kc	601	801	1001	1201	1401	1601	1801	1802	2002	2101
Minimum water content winter mode (l)	788	1020	1230	1540	1780	2030	2270	1105	1225	2520

PAE N U Kc	2302	2502	2802	3202	3602	4202	4802	5202	5602	6002
Minimum water content winter mode (l)	1405	1480	1745	1945	2165	2480	2895	3110	3350	3600

PAE N HE Kc	1001	1201	1401	1601	1802	2002	2302	2502
Minimum water content winter mode (l)	1310	1610	1860	2140	1135	1285	1435	1585

PAE N HE Kc	2802	3202	3602	4202	4802	5202	5602	6002
Minimum water content winter mode (l)	1785	2000	2300	2580	3125	3370	3465	3670

PAE N HE U Kc	1001	1201	1401	1601	1802	2002	2302	2502
Minimum water content winter mode (l)	1300	1560	1810	2070	1095	1240	1380	1535

PAE N HE U Kc	2802	3202	3602	4202	4802	5202	5602	6002
Minimum water content winter mode (l)	1720	1920	2220	2485	2875	3105	3320	3515

PAE N Kr	601	801	1001	1201	1401	1601	1801	1802	2002	2101
Minimum water content winter mode (l)	731	897	1190	1460	1690	1910	2140	1060	1255	2440

PAE N Kr	2302	2502	2802	3202	3602	4202	4802	5202	5602	6002
Minimum water content winter mode (l)	1370	1490	1615	1880	2110	2350	2810	3030	3230	3510

PAE N U Kr	601	801	1001	1201	1401	1601	1801	1802	2002	2101
Minimum water content winter mode (l)	726	898	1200	1470	1700	1910	2150	1070	1245	2440

PAE N U Kr	2302	2502	2802	3202	3602	4202	4802	5202	5602	6002
Minimum water content winter mode (l)	1370	1475	1630	1890	2095	2325	2800	3000	3165	3530

PAE N HE Kr	1001	1201	1401	1601	1802	2002	2302	2502
Minimum water content winter mode (l)	1240	1540	1750	2030	1100	1265	1385	1525

PAE N HE Kr	2802	3202	3602	4202	4802	5202	5602	6002
Minimum water content winter mode (l)	1695	1880	2165	2440	2815	3045	3325	3540

PAE N HE U Kr	1001	1201	1401	1601	1802	2002	2302	2502
Minimum water content winter mode (l)	1250	1560	1770	2030	1105	1275	1390	1535

PAE N HE U Kr	2802	3202	3602	4202	4802	5202	5602	6002
Minimum water content winter mode (l)	1700	1885	2165	2445	2830	3055	3280	3445

4.15 Emptying the installation

- Before emptying, place the mains switch in the “Off” position.
- Make sure the filling group valve is closed.
- Open the drainage valve outside the unit and all the installation and terminal air vent valves.

If the fluid in the circuit contains anti-freeze, it MUST not be allowed to run away to drain. It must be collected for possible re-cycling or for correct disposal.

4.16 Use of antifreeze mixture

In case it is possible that, during working period, fluid temperature goes down 4°C or, during stops, can get close to 0°C, it will be necessary to introduce in the hydraulic circuit an antifreeze mixture, with a freezing point sufficiently lower than the minimum temperature.

Some liquids are harmful if ingested, or may cause irritations if coming to contact with skin and mucus. Therefore, when handling such substances, it is necessary to respect safety indications on the container and its related working instructions, or, anyway, it is always advisable to wear protection glasses and rubber gloves. Therefore, it is necessary to make sure that such substances never get to mouth.

It is forbidden to use aggressive antifreeze mixes, or uncompatible with copper, carbon steel and other materials of the plant;

In following table are indicated the freezing temperatures for different ethylene glycol concentration in water .Values on this table are an indication and must be used only as a reference. In some cases, suppliers may deliver the product in a solution, therefore it is necessary to refer to dilution percentages indicated by the antifreeze fluid supplier

	Concentration of ethylene glycol in the mix (as [kg/kg])							
	5%	10%	15%	20%	25%	30%	35%	40%
Volume concentration	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 mixtures with glycol concentration lower than necessary, may cause freezing and breaking of the hydraulic circuit and, in particular, of the evaporator. The use of unnecessarily high concentrations, instead, may lead to a reduction of unit performance and, in particular, of its energy efficiency. Fluid in the hydraulic circuit must be periodically analyzed, and especially during the beginning of the cold season, to verify its composition and its concentration. All fluid present in the plant will have to be replaced within the period indicated by the producer of the antifreeze mixture, or at least each two years.

It is absolutely forbidden to discharge the antifreeze mixture in the environment; it must be therefore disposed by experts (disposal services), in compliance with the laws and local regulations.

4.17 Electric connections: preliminary safety information

The electric panel is located inside the unit at the top of the technical compartment where the various components of the refrigerant circuit are also to be found. To access the electrical board, remove the front panel of the unit:

Power connections must be made in accordance to the wiring diagram enclosed with the unit and in accordance to the norms in force.

Make sure the power supply upstream of the unit is (blocked with a switch). Check that the main switch handle is padlocked and it is applied on the handle a visible sign of warning not to operate.

It must be verified that electric supply is corresponding to the unit electric nominal data (tension, phases, frequency) reported on the label in the front panel of the unit.

Power cable and line protection must be sized according to the specification reported on the form of the wiring diagram enclosed with the unit.

The cable section must be commensurate with the calibration of the system-side protection and must take into account all the factors that may influence (temperature, type of insulation, length, etc.).

Power supply must respect the reported tolerances and limits: If those tolerances should not be respected, the warranty will be invalidated.

Flow switches must be connected following the indication reported in the wiring diagram. Never bridge flow switches connections in the terminal board. Guarantee will be invalidated if connections are altered or not properly made.

Make all connections to ground provided by law and legislation.

Before any service operation on the unit, be sure that the electric supply is disconnected.

The power line and the unit external safety devices must be sized in order to ensure the correct voltage at the maximum operating conditions of the unit reported in the wiring diagram of the unit.

FROST PROTECTION
If opened, the main switch cuts the power off to any electric heater and antifreeze device supplied with the unit, including the compressor crankcase heaters. The main switch should only be disconnected for cleaning, maintenance or unit reparation.

The unit must be powered by a 4-wire cable (3 phases +GND), if the power supply is 400 V73PH/50 Hz +GND. On demand, power supplies different from standard are available (check on the unit nameplate and wiring diagram).
Connect the phases to the input clamp of the main switch and the ground conductor to the dedicated clamp. Use a power supply cable with suitable section and as short as possible to avoid voltage drops.
Protect the power supply cable upstream the unit by means of an automatic switch with suitable size and features. The power supply cable section and the automatic switch size, can be found in the electrical components table attached, as well as the main switch size.
The cable entry is shown in the dimensional drawing of the unit attached to the Handbook. It must be suitably protected in compliance with the local regulations in force.
If the power supply cable entry is from the top, make a drop-break fold.

Before anyhow intervene on the unit, slightly verify that the electrical circuits of the device have not been damaged during the transport. Especially check that all the screws of the clamps are correctly tightened, and that the cable insulation is intact and in good conditions.

The conductors for the phases power supply cable, must be connected to the free clamps to the unit main switch entry; the ground conductor must be connected to the dedicated pre-arranged clamp (PE).

4.18 Electric data

The recommended power cable cross-section is shown in the circuit diagram supplied with the unit and is calculated according to the conditions specified below:
• Cable type: FG16
• Operating temperature: 45°C
• Installation: pipe and duct

The correct choice of cable section according to the type of conductor and laying method always remain the responsibility of the electrical designer/installer.

The line voltage fluctuations can not be more than ±10% of the nominal value, while the voltage unbalance between one phase and another can not exceed 1%, according to EN60204. If those tolerances should not be respected, please contact our Company. **The use of the unit with a power supply with higher variations than those indicated will invalidate the warranty.**

4.19 Connection to the terminal box user side

The numbering of the terminals may change without notice. For their connection is mandatory to refer to the wiring diagram supplied along with the unit.

A terminal box user side is available where dry contacts are to be found for:
- General alarm (1);
- Unit remote ON/OFF (2).

If, at the end of the phase inversion, some components are rotating in the wrong direction, it will be necessary to verify, and eventually make sure, that the sequence of the power supply conductors for the single user is correct, as described in previous paragraph.If the circulation pump is not controlled by the microprocessor of the units, it is advisable to connect an auxiliary contact for the teleruptor of the pump to the ON/OFF remote clamps on the electrical board (see enclosed Diagram), so that the units can start only when the pump is working.

4.19.1 Correct phase sequence check

The rotation sense of all electrical motors installed on the units (fans, pumps) is checked and harmonized during the factory test (except for units that cannot be switched on, for example, due to a special power supply). Once the wiring has been executed, it is necessary to verify that the phases have been connected in the correct way. On this purpose, please make sure that all electrical motors run in the correct direction. For units with triphase power supply, in case the rotation direction of some component is incorrect, you must assume that all motors rotate in the incorrect way and, therefore, it will be necessary to disconnect two conductors of the power supply line, and invert the position, on the inlet clamps entering to the main switch.

To avoid wiring errors you must not connect any other conductors of the main switch besides the two involved in the operation.

If, at the end of the inversion of all phases, it is detected that some components run in the incorrect way , it will be necessary to verify, and eventually correct the conductor sequence, for the single user, as described in previous paragraph.

5. UNIT START UP

5.1 Preliminary checks

Before starting the unit the checks detailed in this manual of the electric supply and connections, the hydraulic system and the refrigerant circuit, should be performed.

Start-up operations must be performed in accordance with the instructions detailed in the previous paragraphs.

If it is required to switch the unit on and off, never do this using the main isolator: this should only be used to disconnect the unit from the power supply when the unit is to be permanently off. Isolation will result in no supply for the crankcase heater and on start up the compressor could be seriously damaged.

5.1.1 Documentation

The owner of the units must request authorisation and prepare documentation for installation and operation of the units, in compliance with applicable local laws and regulations. Close to the unit in an adequately protected position, all necessary information must be available to manage and keep safety the system, as requested by local regulations in force. Moreover, if the unit (with a refrigerant charge higher than 3 kg) is installed in the European Community area, you must fulfil a Unit Register (here in after: Register), in compliance with EN 378-4. In such a document, following information about the unit must be indicated:

a) Detail for all servicing and repair jobs;
b) Quantity and type of charged refrigerant (new, reconditioned, or recycled) and quantity of replaced refrigerant on each occasion;
c) Analysis of reconditioned refrigerant, whose result, if available, must be stored in the Register
d) Origin of reconditioned refrigerant;
e) Any modification and substitution of system components;
f) Results of all scheduled tests;
g) Data storing for all relevant inactivity periods .

The Register must be held by the Owner, so that one updated copy is available for personnel during servicing and check tion on the unit.

5.1.2 Before start-up

Damage can occur during shipment or installation. It is recommended that a detailed check is made, before the installation of the unit, for possible refrigerant leakages caused by breakage of capillaries, pressure switch connections, tampering of the refrigerant pipework, vibration during transport or general abuse suffered by the unit.

- Verify that the unit is installed in a workmanlike manner and in accordance with the guidelines in this manual.
- Check that all power cables are properly connected and all terminals are correctly fixed.
- The operating voltage between phases R S T is the one shown on the unit labels.
- Check that the unit is connected to the system earth.
- Check that there is no refrigerant leakage.
- Check for oil stains, sign of a possible leak.
- Check that the refrigerant circuit shows the correct standing pressure on the pressure gauges (if present) otherwise use external ones.
- Check that the Shrader port caps are the correct type and are tightly closed.
- Check that crankcase heaters are powered correctly (if present).
- Check that all water connections are properly installed and all indications on unit labels are observed.
- The system must be flushed, filled and vented in order to eliminate any air.
- Check that the water temperatures are within the operation limits reported in the manual.
- Before start up check that all panels are replaced in the proper position and locked with fastening screws.

- Before start-up, check that all the water taps on the compressor outlets are open.
- Identify any damage occurred during transport, storage and handling.
- Check certifications, nameplates and in general the expected documentation.
- Check that the accessible piping cannot cause accidental damages to people.
- Check the welding, brazing and any junction quality.
- Check the suitability of the protections against mechanical damages, heat and moving parts.
- Check that the unit can be accessed for inspection, maintenance and repairing of the main components.
- Check the presence and status of the thermal and steam insulation.
- Check that a suitable mechanical filter is installed at unit inlet connection.
- Check that the fluid to be cooled flow is the designed one.
- Check that, if necessary, the required antifreeze fluid percentage is filled into the cooling circuit.
- Check the right set value of the regulation temperature and of the antifreeze alarm on the microprocessor.
- Check that the designed flow on waterside is granted to the evaporator.
- Check that the voltage is within a tolerance of 10% than the nominal one of the unit.

Do not modify internal wiring of the unit as this will immediately invalidate the warranty.

Crankcase heaters must be powered at least 12 hours before start up (pre-heating period) To do this, isolate the compressor(s), fans and pump(s) in the electrics box and then switch on the main isolator (heaters are automatically supplied when the main switch is closed). The crankcase heaters are working properly if, after several minutes, the compressor crankcase temperature is about 10÷15°C higher than ambient temperature.

During the 12 hours pre-heating period it is also important to check that the label OFF is shown on the display or that the unit is on stand-by mode. If there is an accidental start-up before the 12 hours pre-heating period has elapsed, the compressors could be seriously damaged and therefore the warranty will immediately terminate .

Before starting the unit, during its commissioning or after a long stop, check any connection and wiring, as well as any connection of the protection conductors. In case of failure, the unit cannot be started.

Periodically check the mechanical filter cleaning, in order to avoid that it can cause an excessive pressure drop, reducing in this way the fluid to be cooled flow.

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

5.2 Commissioning

The unit commissioning must be carried-out by a skilled refrigeration technician authorized by the manifacturer.

Before switching the unit ON check that all the shut-off valves on compressors discharge side are open.

Before starting the unit for the first time or after a long period of stop, verify that the parameters set on the microprocessor are coherent with the required working conditions.

To switch the device ON, turn the main switch to ON, to power the unit. Then press the ON/OFF key on the microprocessor keyboard, positioning it on ON.

If the remote ON/OFF contact is closed, the circulation water pump, if present, will immediately start. After a delay time, settable by microprocessor, also the fans will start and then the different compressors in relation to the required cooling capacity to satisfy the present thermal load.

Once the unit has reached a stable operation regime, the technicians must verify the group working parameters and verify that:
a) the safety high pressure switches are right installed and calibrated;
b) on the external safety valves it is shown the calibration pressure and that the value is the one foreseen.
c) No refrigerant leakage is present

The collected data must to be recorded on the commissioning report attached to this manual.

A copy of the commissioning report, duly filled, must be sent to the manufacturer, to make the warranty valid.

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

5.2.1 Device and security Set-point (R410A)

Device		Set-point	Differential	Reset
Anti-freeze thermostat	°C	4,5	2	Manual
High-pressure safety valve	Bar	43,4	----	-----
High pressure switch	Bar	42	----	Manual
Low pressure switch	Bar	2,3*	1	Automatic

* Water outlet +7 °C

5.2.2 Device and security Set-point (R454B)

Device		Set-point	Differential	Reset
Anti-freeze thermostat	°C	4	2	Manual
High-pressure safety valve	Bar	43,4	----	-----
High pressure switch	Bar	42	1,5	Manual
Low pressure switch	Bar	2	1,3	Automatic

* Water outlet +7 °C

If the unit is required for heating/cooling only (without domestic hot water production) the internal parameter of the microprocessor FS1 has to be modified from 2 to 1 in order to avoid configuration alarms. Please contact the company for support.

5.3 Controls during unit operation

- Check the rotation of the compressors and fans. If the rotation is incorrect, disconnect the main switch and change over any two phases of the incoming main supply to reverse motor rotation (only for units with three-phase fan motors).

- After several hours of operation, check that the sight glass has a green colour core: if the core is yellow moisture is present in the circuit. In this event it is necessary for dehydration of the circuit to take place. This must be performed by qualified people only. Check that there are no continuous vapour bubbles present at the sight glass. This would indicate a shortage of refrigerant. A few vapour bubbles are acceptable.

5.3.1 Safety valves

The outlet connections of the safety valves installed on the unit are provided with a threaded connection, which can be used to connect the drain to a safe area. If provided, the valves must be individually directed in metal piping, to an area where the refrigerant spill cannot damage people or things.

The refrigerant spilled from safety valves is an high pressure, high temperature and high speed discharged gas. Its flow may damage things and people coming in direct contact with it.

For units with refrigerant R454B, it is necessary to direct the discharge at a distance of at least 2 meters, using the connection present on the unit side.

The opening of safety valves comes with a noise whose intensity may damage hearing capabilities of surrounding people.

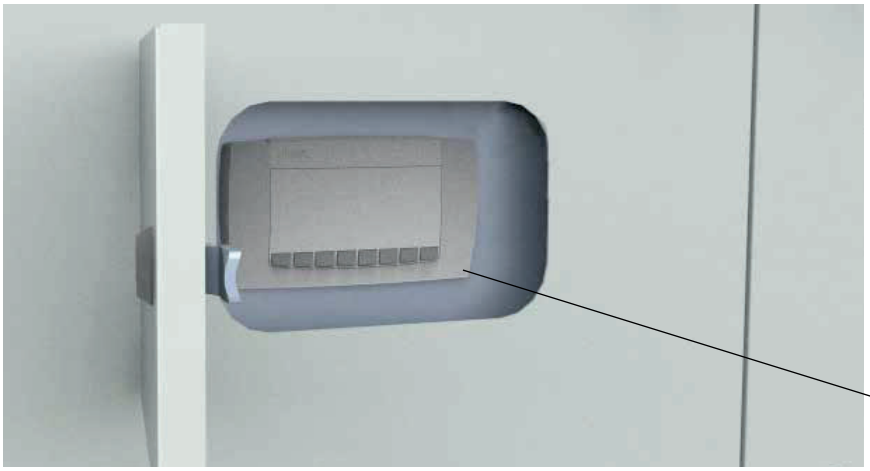
The piping diameter must be no smaller than the safety valves draining pipe ones; refrigerant leaks in the line must be as small as possible and in any case should not cause a reduction in the discharge rate of the valves.
The piping outlet connection must be done so to avoid that rain water, snow, ice, and dirt can accumulate and obstruct the pipeline.
The valve discharge must be at a suitable distance from other equipments, systems or ignition sources; the discharged refrigerant must not accidentally enter buildings.
In any case, any pipes on the safety valves discharge must be made in compliance with current laws and regulation.

5.3.2 Regulation of microprocessor

To change the parameters values, please refer to instructions indicated in the microprocessor documentation, attached to the manual.

The modification of the parameters values must be done by expert engineers only and, in any case, against manufacturer's authorisation.
As a matter of fact, incorrect values could let the chiller operate at different conditions from the design ones and, consequently, cause damages to the chiller itself and to the installation .

5.4 Position of the control panel



5.5 Description of the control panel

Control for the unit is made by management software stored on the electronic microprocessor, which is made of:
• An electronic control card with a terminal board for transmission of working parameters, and the activation of the command devices.
• An user interface card with setting buttons and display for visualization of the operation status and the alarm messages.

The electronic control card manages different devices installed on the unit, according to the values of the working parameters, by having following main functions:
• Unit ON/OFF from keypad or from remote.
• Alert and alarm status management and storage.

Interface user display for the microprocessor allows, among other things, to visualize following information:
• Set parameters for regulation;
• Functioning vairbles values;
• Digital and analogue input and output status
• Operation units status,
• Alert and alarm
Possibility to interface to EMS/BMS systems

5.6 Emergency Stop

The emergency stop gives the possibility to stop the unit for the minimum possible time.
If an emergency stop is required, follows this procedure:

- Turn the main switch (red and yellow) OFF; the unit immediately stops.
- Press the red emergency stop button as well.

5.6.1 Start after an emergency stop

Before restarting the unit, verify that the cause of the emergency stop has been eliminated

Restarting the unit proceeding as follows:
Turn the main switch ON; (this does not switch the unit ON and does not allow a restarting after a second voluntary action);
Rotate the emergency stop button. The unit is thus restarted).

6. MAINTENANCE OF THE UNIT

6.1 General warnings

Starting from 01/01/2016 the new European Regulation 517_2014, “Obligations concerning the containment, use, recovery and destruction of fluorinated greenhouse gases used in stationary refrigeration, air conditioning and heat pumps”, became effective. This unit is subject to the following regulatory obligations, which have to be fulfilled by all operators:
(a) Keeping the equipment records
(b) Correct installation, maintenance and repair of equipment
(c) Leakage control
(d) Refrigerant recovery and disposal management
(e) Presentation to the Ministry of the Environment of the annual declaration concerning the atmospheric emissions of fluorinated greenhouse gases.

Maintenance can:

- Keep the equipment operating efficiently
- Prevent failures
- Increase the equipment life

It is advisable to maintain a record book for the unit which details all operations performed on the unit as this will facilitate troubleshooting.

Maintenance must be performed in compliance with all requirements of the previous paragraphs.

Use personal protective equipment required by regulations as compressor casings and discharge pipes are at high temperatures. Coil fins are sharp and present a cutting hazard.

If the unit is not to be used during the winter period, the water contained in the pipes may freeze and cause serious damage. In this event, fully drain the water from the pipes, checking that all parts of the circuit are empty including any internal or external traps and siphons.

If the unit is not used for long or during the seasonal stops, do not forget to close the shut-off valve on compressor discharge side (optional).

Inside the unit, there can be high voltage zones. Any intervention on them, must be done by authorized personnel qualified in compliance with the local regulations in force.

The surfaces of the components in the compressor discharge side and in the refrigerant liquid line could reach very high temperatures and any contact can cause burns.

Before carrying out any kind of work on the machine, it is necessary to cut off the power supply from the electric panel, by turning the main switch to the 0FF position

To carry on any intervention requiring the opening of the cooling circuit, follow this procedure:

1) activate the crankcase heater of the compressor for 4 hours minimum-
2) recover the refrigerant by means of an approved cylinder
3) make the vacuum in the circuit
4) flow the circuit with inert gas (nitrogen)
5) use orbital blades to dissect the pipes

Smoking is forbidden during maintenance operations.

6.2 Drive access

Access to the unit once installed, should only be possible to authorized operators and technicians. The owner of the equipment is the company legal representative, entity or person owns the property where the machine is installed.
They are fully responsible for all safety rules given in this manual and regulations. If it is not possible to prevent access to the machine by outsiders, a fenced area around the machine at least 1.5 meters away from external surfaces in which operators and technicians only can operate, must be provided.

6.3 Routine maintenance

The Owner must take care that 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 least once a year, to check that they work properly.

During its operation life the unit must be inspected and checked as stated by the current local laws and regulation. In particular, unless more restrictive specifications, follow the recommendation on the following table (see. EN 378-4. 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 of purpose or after a stop longer than 2 years; all unfit 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 is the chance to have effects on the mechanical resistance, refer to point A.
D	Refrigerant leak detection after a justified suspicious. The system must be checked to find any leaks, using direct measures (devices able to find the leak) or indirect ones (deduction of the leak presence analysing the operational parameters), focusing attention on those parts which are more easily exposed to leaks (junctions, for example).

If it is detected a fault that endangers the reliable operation of the unit, it's necessary to rectified it before restart the unit.

6.3.1 Leak detection

Without any more precautionary requirement, the unit must be leak tested at least every 3 months ( ). If, during check, a possible refrigerant leak is suspected, (e.g. after a cooling capacity reduction, or after overheating or sub-cooling tests), it must be found by means of suitable devices, repaired and a new tightness test must be carried out in compliance with the national legislation in force. The result of the test and the used solutions must be noted on the Register. The technicians involved in the refrigerant leak detection must not use open flames, or any ignition source. The refrigerant leaks must be found and repaired as soon as possible, by certified personnel in compliance with local laws and regulations in force.

6.3.2 Safety pressure switches check

Without any more precautionary requirement, high-pressure safety switches must be inspected on site at least every twelve months, in order to verify that they are right set and work properly, as well as that they have been installed in compliance with applicable laws.

6.3.3 Safety valves check

Without any more precautionary requirement, the external safety valves must be inspected on site at least every twelve months, in order to check their tightness. If a leak is found, the valve must be replaced. Every five years, the valves must be inspected in order to verify that they are in good conditions, the working pressure, printed on the valve itself, is readable, they are correctly installed and with suitable features to grant the system safety in compliance with the regulations in force.

6.3.4 Fluid to be cooled

The exchanger fluid must be inspected every six months, in order to check its composition and detect any refrigerant presence.

6.3.5 Noise and vibration check

Check at least monthly that the unit does not make any unusual noise and that piping does not vibrate anomalously, in order to avoid possible breakings.

6.4 Periodical checks

The start-up operations should be performed in compliance with all requirements of the previous paragraphs.

All of the operations described in this chapter MUST BE PERFORMED BY TRAINED PERSONNEL ONLY. Before commencing service work on the unit ensure that the electric supply is disconnected. The top case and discharge line of compressor are usually at high temperature. Care must be taken when working in their surroundings. Aluminium coil fins are very sharp and can cause serious wounds. Care must be taken when working in their surroundings. After servicing, replace the cover panels, fixing them with locking screws.

6.4.1 Electrical system and control devices

Actions	Frequency						
	Daily	Monthly	Every 2 months	Every 6 months	Once a year	Every 5 years	If required
Check that the unit works properly and that there are no alarms	X						
Visually inspect the unit		X					
Check unit noise and vibration		X					
Check safety devices and interlocks				X			
Check the unit performances				X			
Check the absorbed current of the components (compressors, fans, pumps, etc.)				X			
Check the supply voltage of the unit				X			
Check the connection of cables to the pre-arranged clamps				X			
Check the integrity of the insulating coating of the electrical cables					X		
Check contactors conditions and functioning					X		
Check microprocessor and display functioning			X				
Check microprocessor set parameter values					X		
Eliminate any dust from electrical and electronic components				X			
Check probes and transducers functioning and calibration					X		
Check evaporator refrigerant level sensor functioning (if present)					X		
Check evaporator refrigerant level sensor calibration (if present)					X		
Check the calibration of the refrigerant leakage sensor					X		

6.4.2 Condensing coils fans and cooling circuit

Actions	Frequency						
	Daily	Monthly	Every 2 months	Every 6 months	Once a year	Every 5 years	If required
Visually inspect condensing coil		X					
Clean finned coils (1)				X			
Check the water flow and/or any leaks		X					
Check that the flow switch is working properly				X			
Clean the metallic filter on the water pipe (3)				X			
Check fans noise and vibration		X					
Check fans supply voltage				X			
Check fans electrical connection					X		
Check proper operation and calibration of the fans speed regulation system					X		
Check 4 way valve proper operation (if present)					X		
Check 3 way valve proper operation (if present)					X		
Check presence of air the hydraulic circuit		X					
Check the color of the humidity display on the liquid line				X			
Check if there are any freon leaks (2)							X

(1) If the unit is installed in strongly windy areas, near coasts or deserts or in areas subjects to wind and/or sand storms, or near airports, industries or in places with high levels of air pollution in general inspect the unit more frequently (**every three months**) to check the real condition of the surface protection. follow the instructions given in the paragraph "Cleaning the condensing coils".

(2) In order to carry out operations on the refrigerant, it is necessary to observe the European Regulation 517_2014, "Obligations regarding the containment, use, recovery and destruction of fluorinated greenhouse gases used in stationary refrigeration, air conditioning and heat pump equipment".

(3) It can be carried out with a higher frequency (also weekly) depending on the Δt.

6.4.3 Compressor

Actions	Frequency						
	Daily	Monthly	Every 2 months	Every 6 months	Once a year	Every 5 years	If required
Visually inspect compressors		X					
Check compressor noise and vibration		X					
Check compressors supply voltage				X			
Check the compressors electrical connections					X		
Check the oil level in the compressors using the oil level indicator light.				X			
Check that the crankcase heaters are powered and working properly.		X					
Check the conditions of the compressors electrical cables and their connection to their clamps				X			

Monthly and daily procedure can be directly done by the Owner. The other interventions must be done by qualified and suitably trained personnel.

Do not start any cleaning operation before disconnecting the unit from the electrical power supply, turning the main switch to OFF Position. Do not touch the equipment with barefoot or wet /damp parts of the body.

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

6.4.4 Condensing coils cleaning

In order to grant the optimal unit operation and to keep the unit performances unchanged, periodically inspect the cleaning condition of the condensing coils and proceed with cleaning operation at least once per year if the unit is not installed in an high polluted zone, far from industrial areas or high populated centres. If it is instead installed in areas with high powders or Pollens concentration or near airports, industries or, in general, in high polluted areas, inspection and cleaning must be done every three Months.

It is important cleaning the surface of the coil, removing any solid residue which could impede the correct airflow worsening in that way the heat exchange. A frequent cleaning helps in keeping high unit performance values increasing condensing coil and unit itself lifetime.

To clean a not treated coil first of all remove the dirty on the exchangers surface using an industrial vacuum cleaner or compressed air. Only after the removal of any solid residue on the coil surface, it is possible starting the washing, which must be done with pure water without the addition of any chemical substances or other detergents that could damage the superficial oxide layer which protects the exchanger and, if damaged, could favour the activation of corrosion phenomena.

The use of pressure washers and chemical substances (or other detergents)to wash the surface of the coils is forbidden.
If any damage will be cause by the high pressure jet, no warranty cover will be recognized on the unit.

When intervene on the unit, keep attention on avoiding to damage the coil surface by hitting it with the metal nozzle of the tools used for cleaning.

6.4.5 Check and calibration of the refrigerant leak detector (R454B)

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.

6.4.6 Condensing coils treated with AiAX coating cleaning (optional ACP)

To clean the condensing coils treated with AiAX coating, first of all remove the dirty on the exchangers surface using an industrial vacuum cleaner or compressed air. Only after the removal of any solid residue on the coil surface, it is possible starting the washing, which must be done with pure water, or water added with standard cleansing agents with PH between 4 and 10. In this case proceed with an abundant final rinse to remove any trace of the used detergent from the coil surface.

6.4.7 End of seasons

If you believe that during unit stop, ambient temperature can go lower, or go close to 0°C, it will be necessary to introduce in the hydraulic circuit an antifreeze mixture with a freezing point sufficiently lower than minimum forecast temperature, as per indications of dedicated paragraph.

In case it is not possible to introduce antifreeze mixture in the circuit, it is possible to avoid freezing by installing heating resistances, which can be activated by a thermostat measuring the water or air temperature. In this case, of course, it is necessary to grant water flow continues to flow and, therefore, the pump stays on (if it is controlled by the unit, this should be electrically powered).

If the unit is to be left out of commission for a long period, the hydraulic circuit should be drained down. This operation is compulsory if the ambient temperature is expected to drop below the freezing point of the fluid in the circuit (typical seasonal operation).
Before a new filling, the system must be washed.

6.4.8 Unit OFF

To stop the unit, press the ON/OFF key on the microprocessor, turning it on OFF position. If the unit will be OFF for more than 24 h turn the main switch to OFF position to cut the unit electrical power.
If any malfunction has occurred during the unit operation, solve it asap, in order to avoid that it will occur again at next operation.

6.5 Refrigerant circuit repair

Before any intervention with devices able to create sparks, heat, naked flames etc. totally empty and blow the circuit from any refrigerant.

For leak detection, the system should be charged with nitrogen using a gas bottle with a pressure reducing valve, until 15 bar pressure is reached. Any leakage is detected using a bubble leak finder. If bubbles appear discharge the nitrogen from the circuit before brazing using the proper alloys.

Never use oxygen instead of nitrogen: explosions may occur.

Site assembled refrigerant circuits must be assembled and maintained carefully, in order to prevent malfunctions.

Therefore:
- Avoid oil replenishment with products that are different from that specified and that are pre-loaded into the compressor.
- In the event of a gas leakage on machines using refrigerant R407C, even if it is only a partial leak, do not top up. The entire charge must be recovered, the leak repaired and a new refigerant charge weighed in to the circuit.
- When replacing any part of the refrigerant circuit, do not leave it exposed for more than 15 minutes.
- It is important when replacing a compressor that the task be completed within the time specified above after removing the rubber sealing caps.
- When replacing the compressor following a burn out, it is advisable to wash the cooling system with appropriate products including a filter for acid.
- When under vacuum do not switch on the compressor.

7. DECOMMISSIONING

7.1 Disconnect the unit

All decommissioning operations must be performed by authorized personnel in accordance with the national legislation in force in the country where the unit is located.

- Avoid spills or leaks into the environment.
- Before disconnecting the machine please recover:
  - the refrigerant gas;
  - Glycol mixture in the hydraulic circuit;
  - the compressor lubricating oil.

Before decommissioning the machine can be stored outdoors, providing that it has the electrical box, refrigerant circuit and hydraulic circuit intact and closed.

7.2 Disposal, recovery and recycling

The frame and components, if unusable, should be taken apart and sorted by type, especially copper and aluminum that are present in large quantities in the machine.
All materials must be recovered or disposed in accordance with national regulations.

The refrigerant circuit of the unit contains lubricant oil that binds the disposal mode of components .

7.3 RAEE Directive (only UE)

The crossed-out bin symbol on the label indicates that the product complies with regulations on waste electrical and electronic equipment.
The abandonment of the equipment in the environment or its illegal disposal is punishable by law.

This product is included in the application of Directive 2012/19/EU on the management of waste electrical and electronic equipment (WEEE).
The unit should not be treated with household waste as it is made of different materials that can be recycled at the appropriate facilities. Inform through the municipal authority about the location of the ecological platforms that can receive the product for disposal and its subsequent proper recycling.
The product is not potentially dangerous for human health and the environment, as it does not contain dangerous substances as per Directive 2011/65/EU (RoHS), but if abandoned in the environment it has a negative impact on the ecosystem.
Read the instructions carefully before using the unit for the first time. It is recommended not to use the product for any purpose other than that for which it was designed, as there is a risk of electric shock if used improperly.

8. DIAGNOSIS AND TROUBLESHOOTING

8.1 Fault finding

All units are checked and tested at the factory before shipment, however, during operation an anomaly or failure can occur.

BE SURE TO RESET AN ALARM ONLY AFTER YOU HAVE REMOVED THE CAUSE OF THE FAULT; REPEATED RESET MAY RESULT IN IRREVOCABLE DAMAGE TO THE UNIT AND IMMEDIATELY VOID THE WARRANTY

Code	Alarm Description	Cause	Solution
AL021 **AL118**	Eeprom alarm	Severe hardware damage in the microprocessor control system.	Switch OFF the unit and, after few second switch ON the unit; if the alarm appears again contact the service.
AL085 - AL086 - AL090	User water flow switch alarm	Presence of air or dirtiness in the user hydraulic system.	Bleed carefully the user hydraulic system or check and clean the water strainer.
AL095	Compressor unloading alarm	User water temperature is too high.	Wait until the user water temperature is lower.
AL113 - AL016 - AL052 - AL149	Low temperature unloading signal circ. 1- circ. 2 - circ. 3 - circ. 4	Too low outlet temperature	Wait for the outlet temperature to rise
da AL002 a AL007	Alarm user inlet water temperature sensor.	Wrong electrical connection, Sensor defect.	Check the electrical connection of the sensor to the terminal board, if correct call the service to replace the sensor.
AL012 **AL013** **AL014** **AL047** **AL048** **AL049**	Alarm DRIVER sensor		
AL087 **AL088** **AL091**	Evaporator water pump 1 and 2 overload		

Code	Alarm Description	Cause	Solution
AL038 **AL066** **AL135** **AL163**	High pressure switch circuit 1 circuit 2 circuit 3 circuit 4	In heating mode: Insufficient user circuit water flow; Insufficient domestic hot water circuit water flow. In cooling mode: Insufficient air flow at the source fan; Insufficient domestic hot water circuit water flow.	Restore the correct user circuit water flow. Restore the correct domestic hot water circuit water flow. Restore the correct air flow to spurce fan. Restore the correct domestic hot water circuit water flow.
AL075 **AL076** **AL172** **AL173**	Anti-freeze alarm circuit 1 - circuit 2 - circuit 3 - circuit 4 (cooling mode)	Too low water temperature	Check user temperature set point; Check user water flow.
AL030 **AL058** **AL127** **AL155**	High pressure transducer alarm circ. 1- circ. 2 - circ. 3 - circ. 4	Transducer defect	Replace the faulty transducer.
AL039 **AL067** **AL136** **AL164**	Low pressure switch circ. 1- circ. 2 - circ. 3 - circ. 4	Refrigerant charge leakage.	Find leakage and repair.
AL034 **AL062** **AL131** **AL159**	Low pressure transducer alarm circ. 1- circ. 2 - circ. 3 - circ. 4	Transducer defect	Replace the faulty transducer.
AL174 **AL175** **AL179** **AL097** **AL092** **AL093**	Overload source fan alarm circuit 1 - circuit 2	Fan input current outside operation limits.	Check the proper operation of the source fan and, in case replace it.
AL035 **AL063** **AL132** **AL160**	Compressor 1 overload circ. 1- circ. 2 - circ. 3 - circ. 4	Compressor input current outside operation limits.	Replace the compressor.
AL036 **AL064** **AL133** **AL161**	Compressor 2 overload circ. 1- circ. 2 - circ. 3 - circ. 4	Compressor input current outside operation limits.	Replace the compressor.
AL037 **AL065** **AL134** **AL162**	Compressor 3 overload circ. 1- circ. 2 - circ. 3 - circ. 4	Compressor input current outside operation limits.	Replace the compressor.

8.2 Troubleshooting

MALFUNCTIONING	LIKELY CAUSE	SUGGESTED ACTIONS
1. Unit is not working	a. Unpowered electrical board	Verify tension for each power supply phase Verify that general sectioner is closed (position ON)
	b. Auxiliary circuit is not powered	Verify auxiliary circuit fuses (see Electrical Diagram)
	c. Microprocessor is not starting the unit	Verify electrical connections to the microprocessor Verify temperature set value
	d. External contact to unit startup missing	Verify that ON/OFF remote contact is closed (see Electrical Diagram) Enable contact for unit startup from terminal user display.
2. High pressure switch	a. Condensing pressure control system is not efficient (if present)	Verify setting and functionality of the system for control of the condensing.
	b. One or more condensing fans out of order	Verify intervention of the internal heating protection for the fans that are not working, replace the defect fans.
	c. High pressure switch badly set	Replace high pressure switch
	d. Discharge pressure too high	See point 8
3. Low pressure switch	a. Low pressure switch badly set	Replace low pressure switch
	b. Suction pressure too low	See point 7
4. Compressor not working	a. Automatic switch	Reset automatic switch , verify compressor winding
	b. Compressor internal protection	Verify resistance of all compressor windings. After reset, measure tension and absorption. Verify that operation parameters are within nominal range
	c. Contactor not working	Verify contacts and oontactor coil.
5. Noisy compressor	a. Liquid return to the compressor	Verify functionality and overheating of the expansion valve
	b. Compressor damaged	Replace compressor

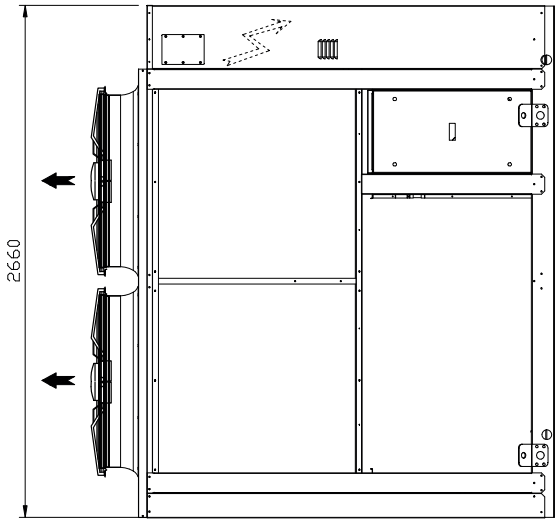
6. Compressor high suction pressure	a. Heating load > than planned	Verify consistency of ambient heating load
	b. Discharge pressure too high	See point 8
	c. Liquid refrigerant return to compressor suction	Verify that thermostatic valve overheating is correct Verify that bulb probe is well positioned, fixed and isolated
7. Compressor low suction pressure (Likelihood of brine on the coil)	a. Ambient temp too low	See point 3
	b. Airflow too low or absent	Verify functioning fan
	c. Refrigerant filter obstructed	Verify refrigerant filter
	d. Thermostatic valve badly set of defect	Verify that overheating of the themrostatic valve is correct Verify integrity of rhe thermostatic element
	e. Insufficient refrigerant charge	Verify any leak and restore charge
	f. Discharge pressure too low	See point 9
8. High discharge compressor pressure	a. Air to condenser is too hot	Verify for any recirculation air presence
	b. Low condensing airflow	Verify absence of obstacles to free flow of air on finned exchanger
	c. Suction pressure too high	See point 6
	d. Finned pack condenser is clogged	Remove material
	e. Refrigerant level on circuit too high: condenser partially flooded	High refrigerant subrcooling: discharge refrigerant from circuit
	f. Air non-condensable or gas in the circuit	The flow sensor shows gas bubbles: compressor discharge temperature is high: the circuit must be uncharged and recharged after executing vacuum
9. Low compressor discharge pressure	a. Condensing pressure control system is not efficient	Verify setting and functionality of the condensing control system
	b. Suction pressure too low	See point 7
10. Probe alarm	a. The probe corresponding to the alarm code is faulty or disconnected	Verify connection of the faulty probe and its functionality . Replace probe.

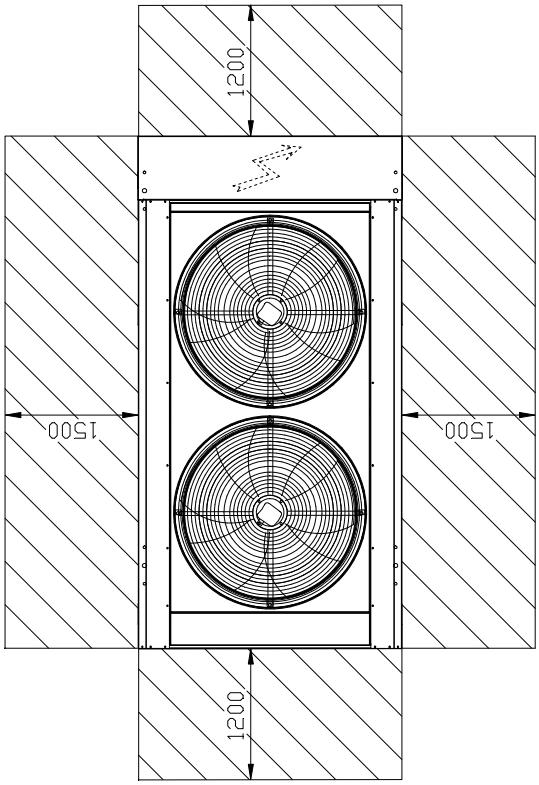
11. Fans not starting	a. Power supply cut off / black out	Verify the general sectioner and the power supply cable
	b. Open protection switch	Reset protection switch and verify amps and absorption of the motor.
	c. Transformer activated	Verify any short circuits on the auxiliary circuit
	d. Faulty contactor	Fix or replace contactor
	e. Fans are not powered	Verify fans power supply circuit
	f. Fans overload protection halts their functioning	Verify if the rotor is blocked, if power supply is not adequate, or if thare has been a phase loss
	g. Unpowered microprocessor (display OFF)	Verify any short circuits on the auxiliary circuit
	h. Unit rurned off (position OFF)	Set position ON from keypad

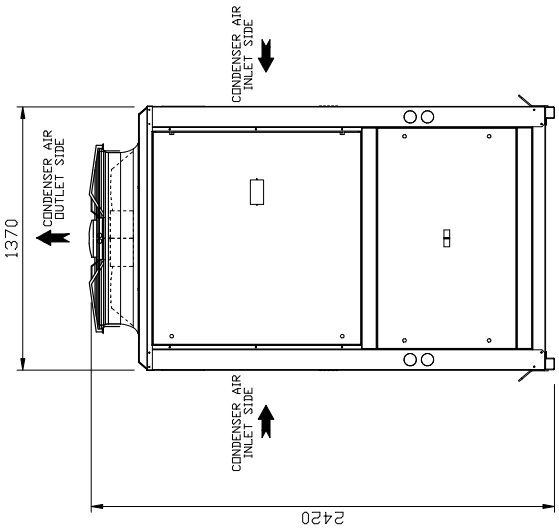
9. DIMENSIONAL DRAWING

Dimensional drawings are to be considered indicative and not binding, therefore it is always necessary to request the definitive dimensional drawing before setting up the installation of the unit.

PAE N Kc 601-801-1001-1201
PAE N U Kc 601-801-1001

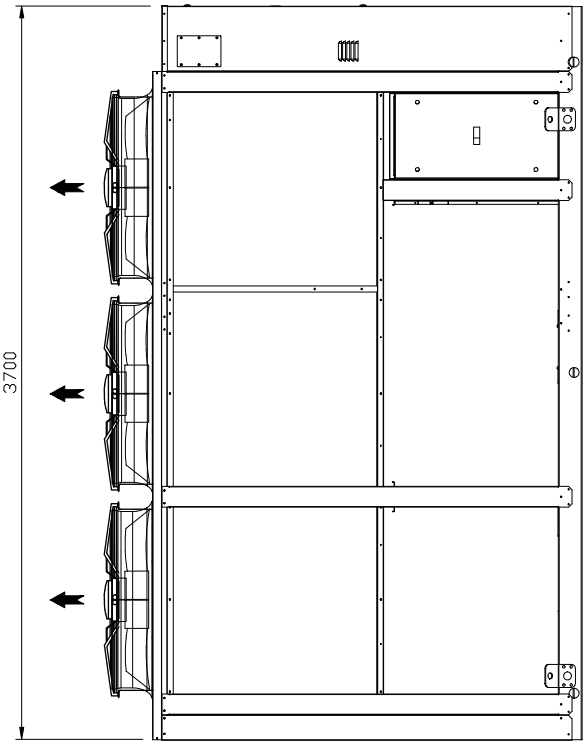


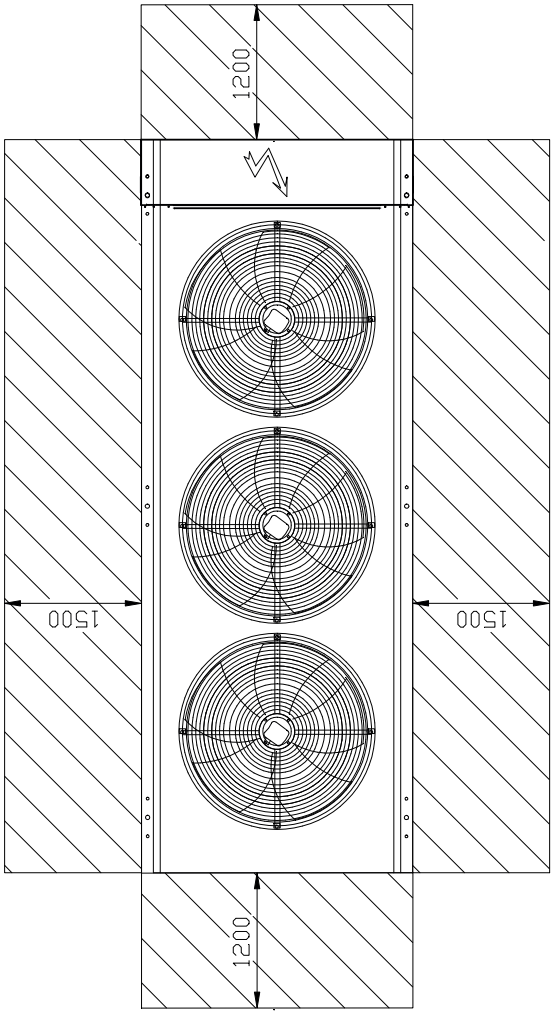


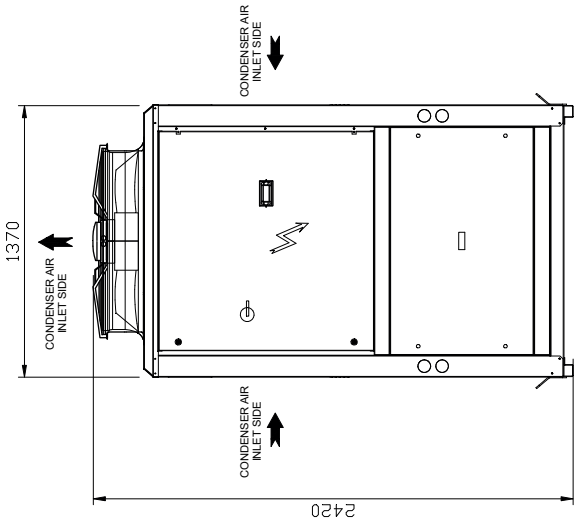


SERIE	MODELLO	L (mm)	B (mm)	H (mm)	PESO (kg)
" STD "	601 Kc	2660	1370	2420	***
	801 Kc				***
	1001 Kc				***
	1201 Kc				***
" U "	601 U Kc				***
	801 U Kc				***
	1001 U Kc				***

PAE N Kc 1401-1601-1801
PAE N U Kc 1201-1401-1601
PAE N HE Kc 1001-1201
PAE N HE U Kc 1001-1201

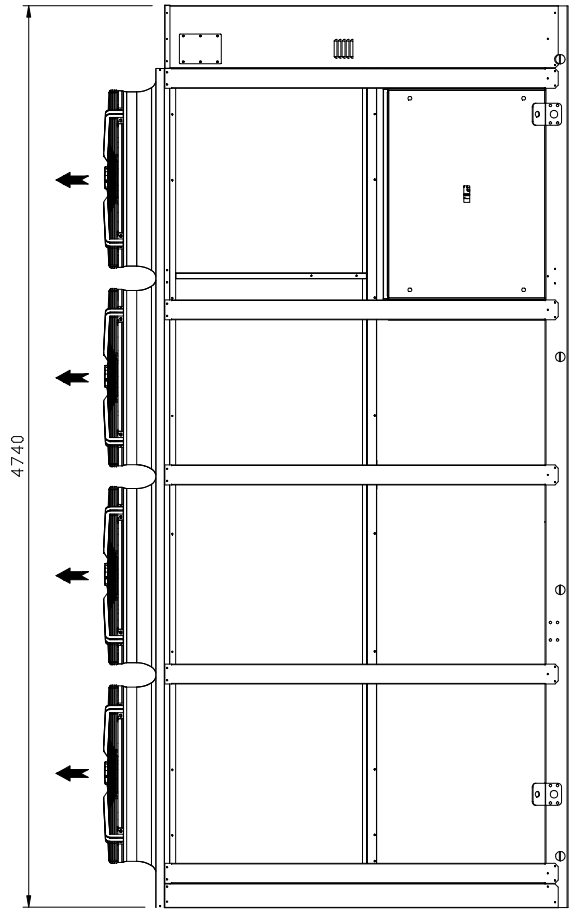


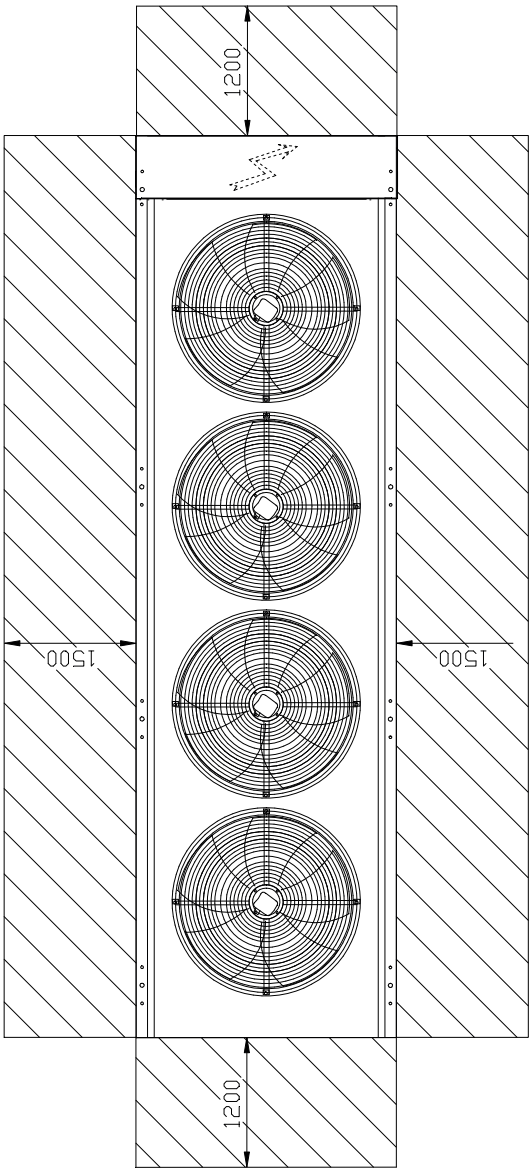


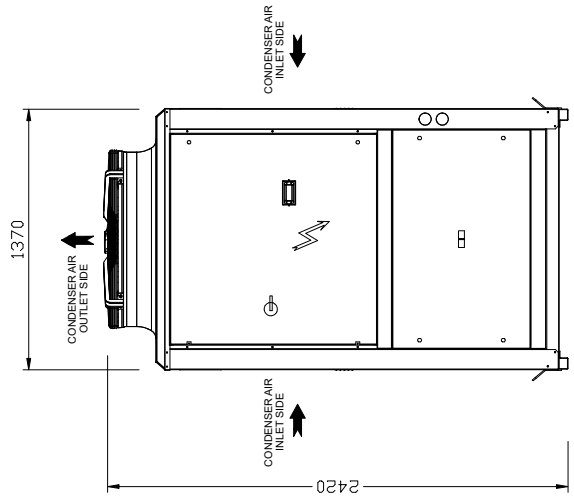


SERIE	MODELLO	L (mm)	B (mm)	H (mm)	PESO (kg)
" STD "	1401 Kc	3700	1370	2420	***
	1601 Kc				***
	1801 Kc				***
" U "	1201 U Kc				***
	1401 U Kc				***
	1601 U Kc				***
" HE "	1001 HE Kc				***
	1201 HE Kc				***
" HE U "	1001 HE U Kc				***
	1201 HE U Kc				***

PAE N Kc 2101
PAE N U Kc 1801-2101
PAE N HE Kc 1401-1601
PAE N HE U Kc 1401-1501

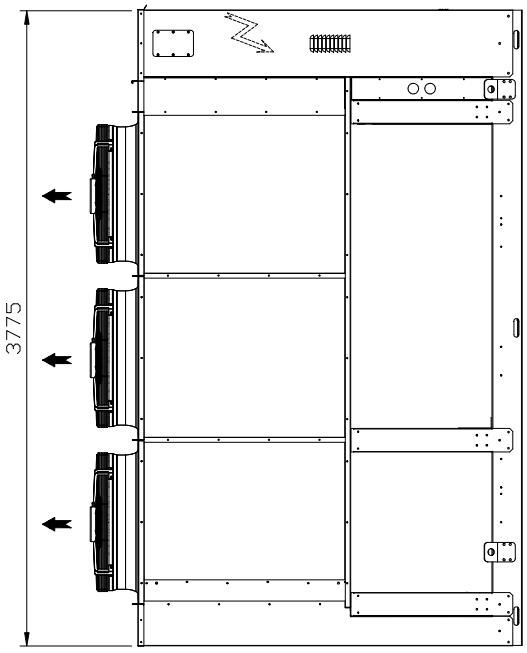


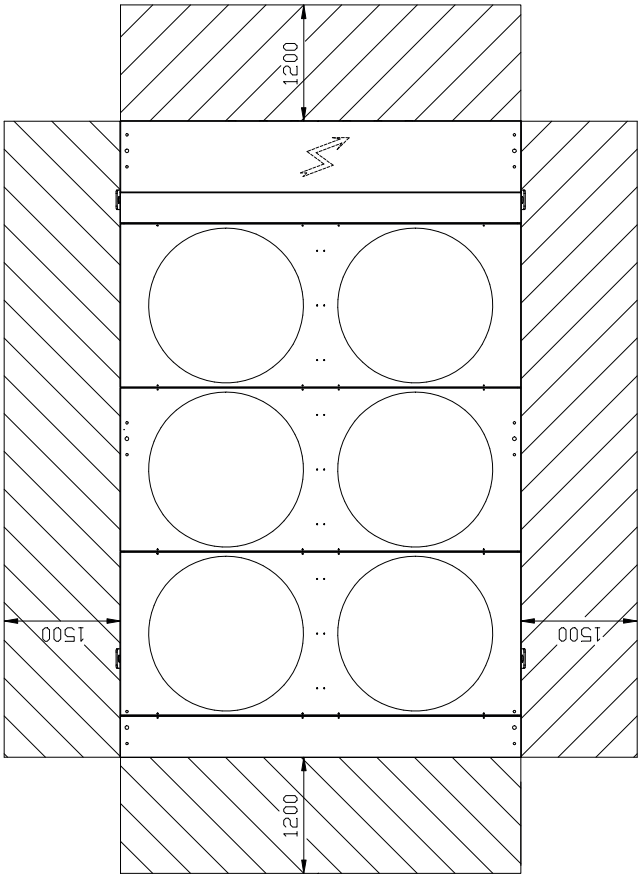


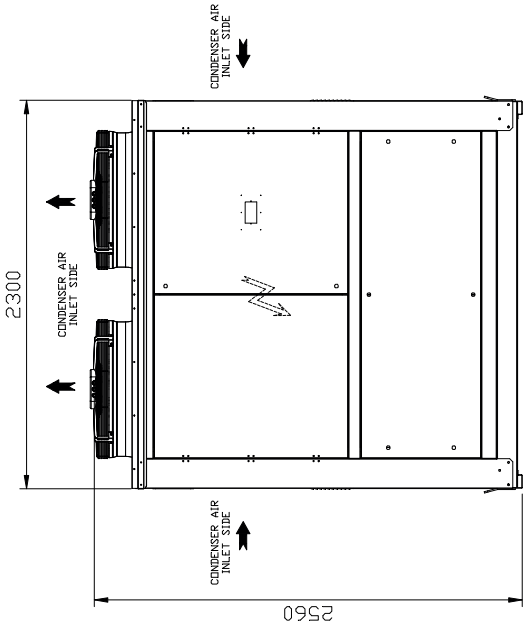


SERIE	MODELLO	L (mm)	B (mm)	H (mm)	PESO (kg)
" STD "	2101 Kc	4740	1370	2420	***
" U "	1801 U Kc				***
	2101 U Kc				***
" HE "	1401 HE Kc				***
	1601 HE Kc				***
" HE U "	1401 HE U Kc				***
	1501 HE U Kc				***

PAE N Kc 1802-2002-2302-2502
PAE N U Kc 1802-2002-2302
PAE N HE Kc 1802-2002-2302
PAE N HE U Kc 1802-2002-2302

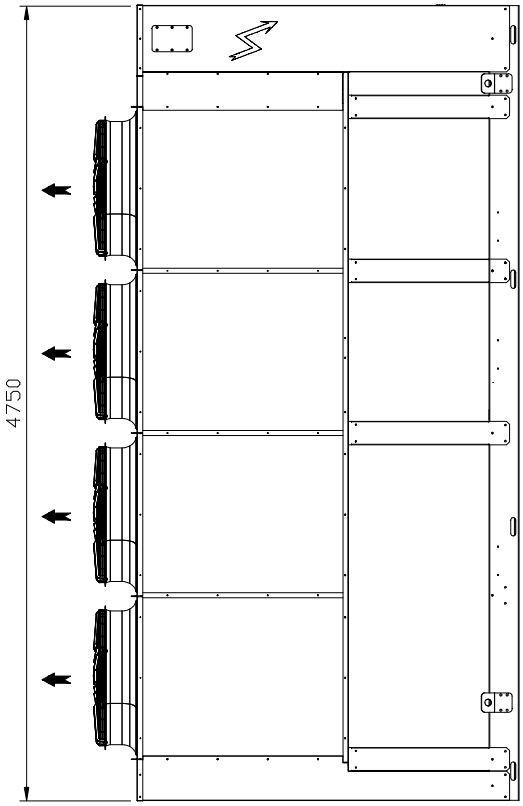


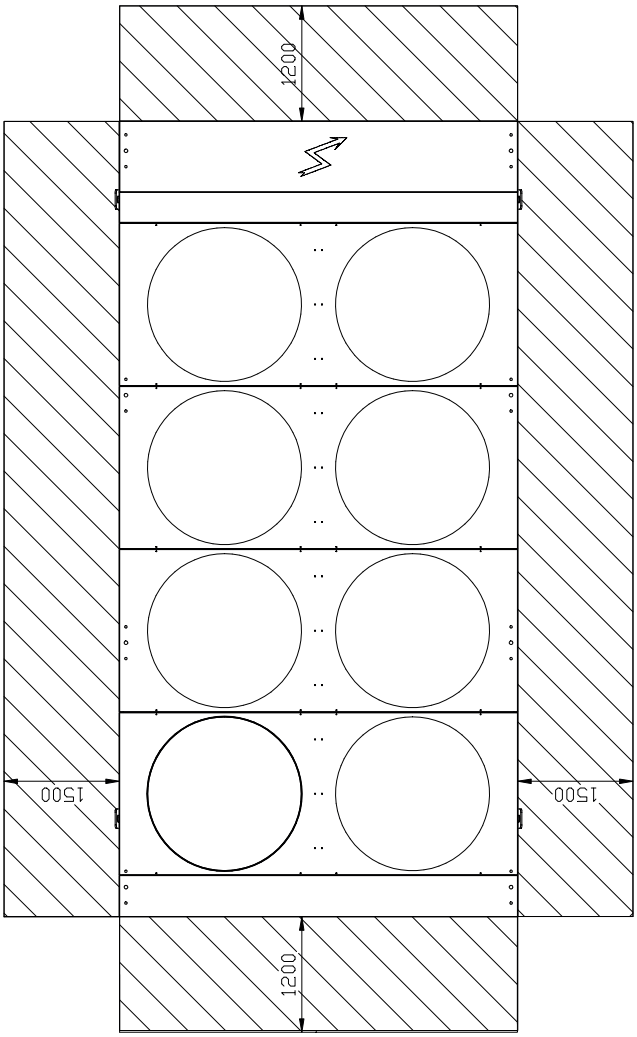


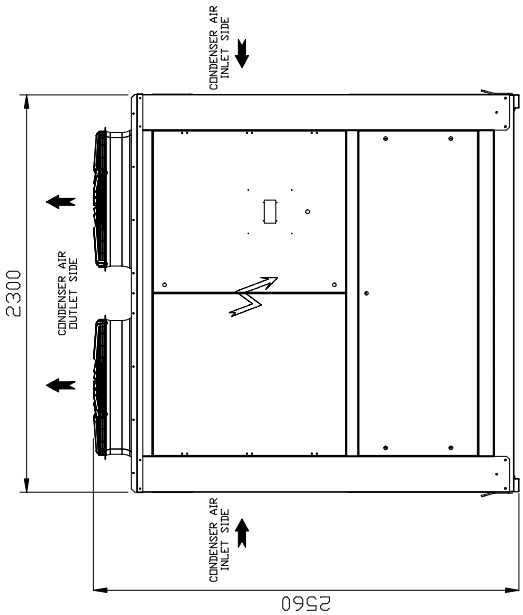


SERIE	MODELLO	L (mm)	B (mm)	H (mm)	PESO (kg)
" STD "	1802 Kc	3775	2300	2560	***
	2002 Kc				***
	2302 Kc				***
	2502 Kc				***
" U "	1802 U Kc				***
	2002 U Kc				***
	2302 U Kc				***
" HE "	1802 HE Kc				***
	2002 HE Kc				***
	2302 HE Kc				***
" HE U "	1802 HE U Kc				***
	2002 HE U Kc				***
	2302 HE U Kc				***

PAE N Kc 2802-3202-3602-4202
PAE N U Kc 2502-2802-3202-3602
PAE N HE Kc 2502-2802-3202
PAE N HE U Kc 2502-2802-3202

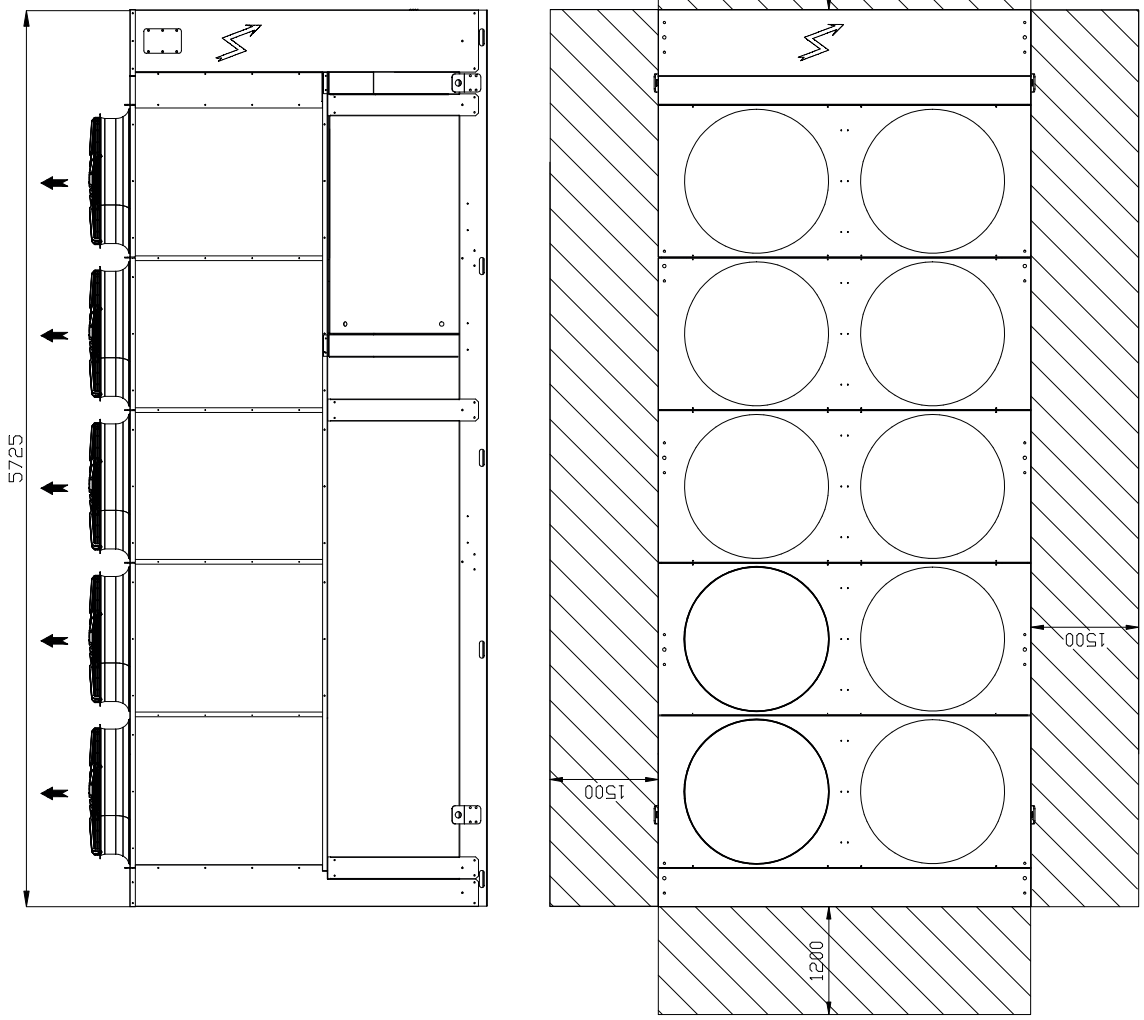


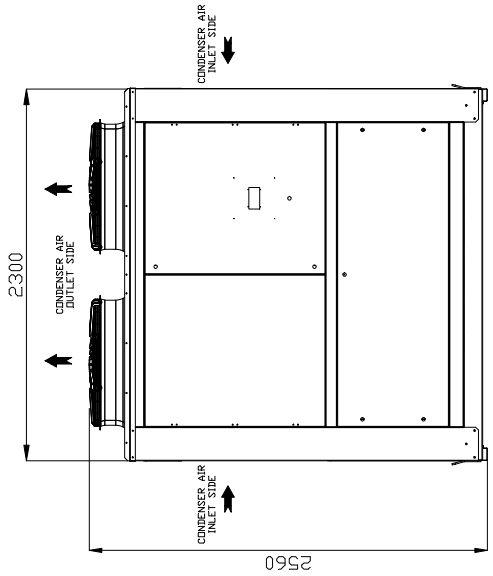




SERIE	MODELLO	L (mm)	B (mm)	H (mm)	PESO (kg)
" STD "	2802 Kc	4750	2300	2560	***
	3202 Kc				***
	3602 Kc				***
	4202 Kc				***
" U "	2502 U Kc				***
	2802 U Kc				***
	3202 U Kc				***
	3602 U Kc				***
" HE "	2502 HE Kc				***
	2802 HE Kc				***
	3202 HE Kc				***
" HE U "	2502 HE U Kc				***
	2802 HE U Kc				***
	3202 HE U Kc				***

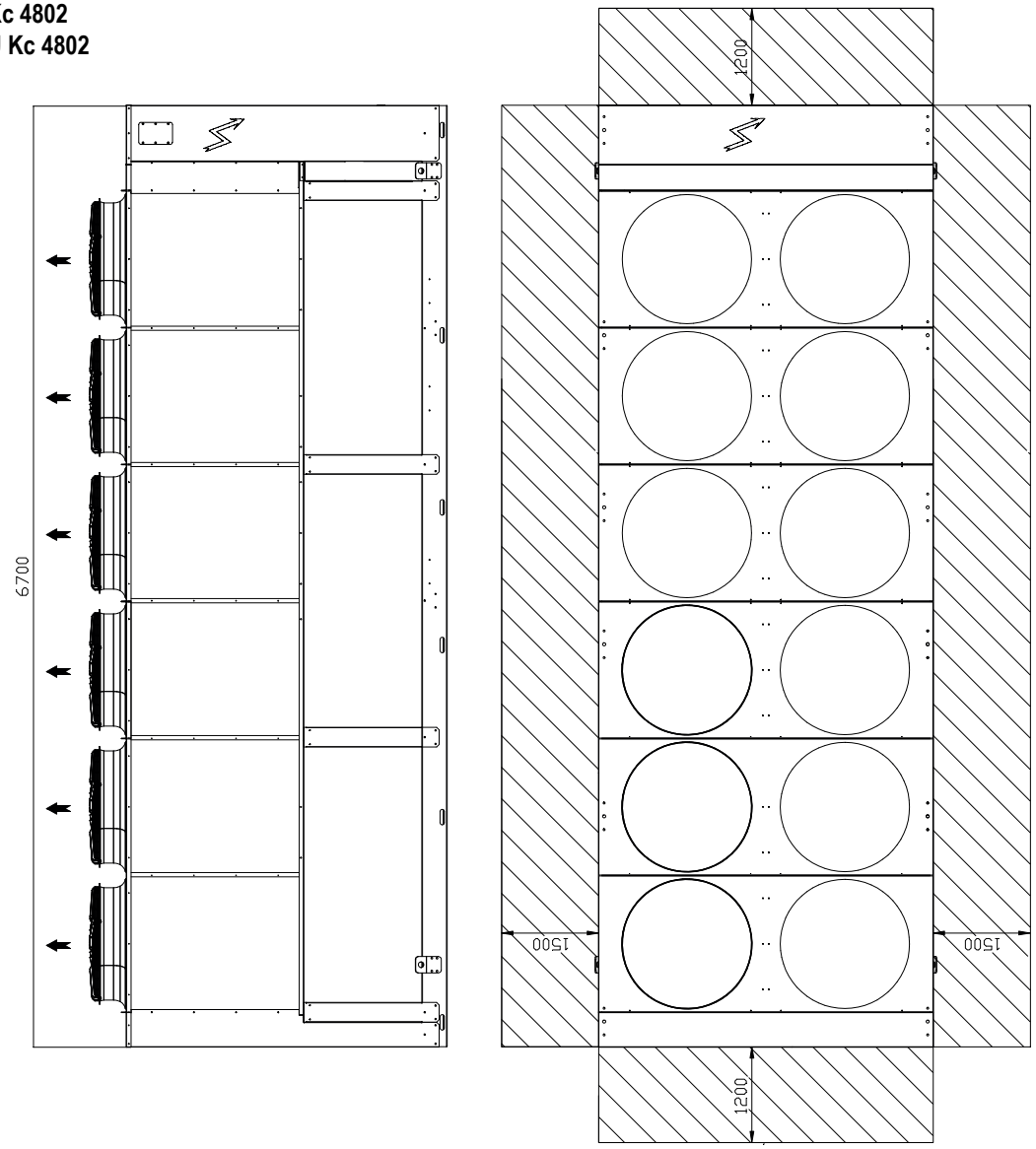
PAE N Kc 4802-5202
PAE N U Kc 4202
PAE N HE Kc 3602-4202
PAE N HE U Kc 3602-4202

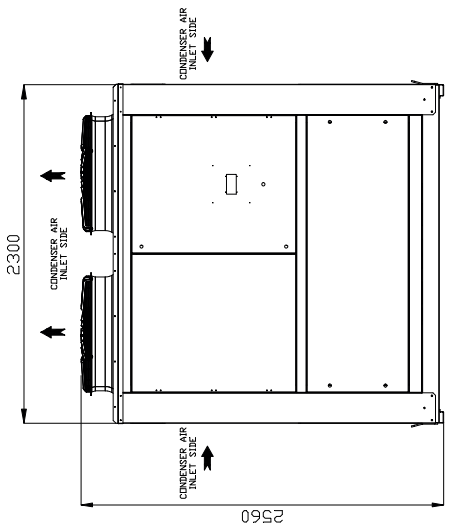




SERIE	MODELLO	L (mm)	B (mm)	H (mm)	PESO (kg)
" STD "	4802 Kc	5725	2300	2560	***
	5202 Kc				***
" U "	4202 U Kc				***
" HE "	3602 HE Kc				***
	4202 HE Kc				***
" HE U "	3602 HE U Kc				***
	4202 HE U Kc				***

PAE N Kc 5202-6002
PAE N U Kc 4802-5202-5602
PAE N HE Kc 4802
PAE N HE U Kc 4802





SERIE	MODELLO	L (mm)	B (mm)	H (mm)	PESO (kg)
" STD "	5602 Kc	6700	2300	2560	***
	6002 Kc				***
" U "	4802 U Kc				***
	5202 U Kc				***
	5602 U Kc				***
" HE "	4802 HE Kc				***
" HE U "	4802 HE U Kc				***

PAE N U Kc 6002
PAE N HE Kc 5202-5602-6002
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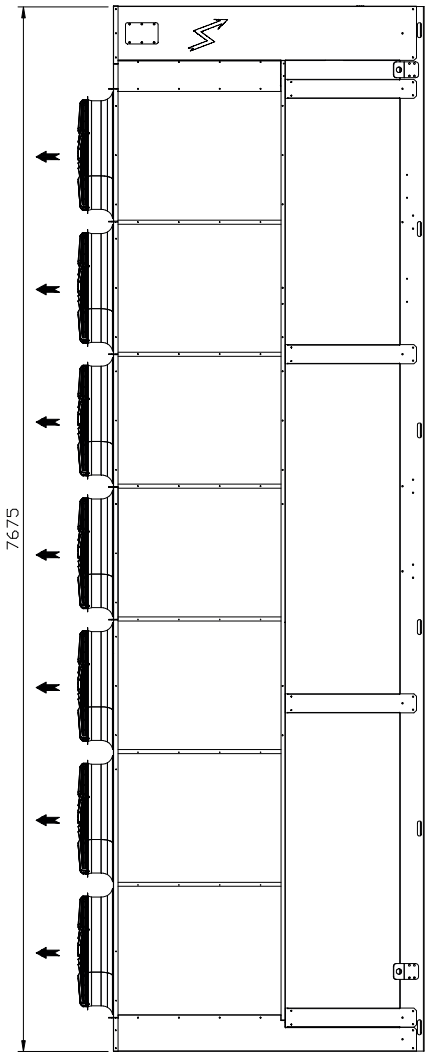

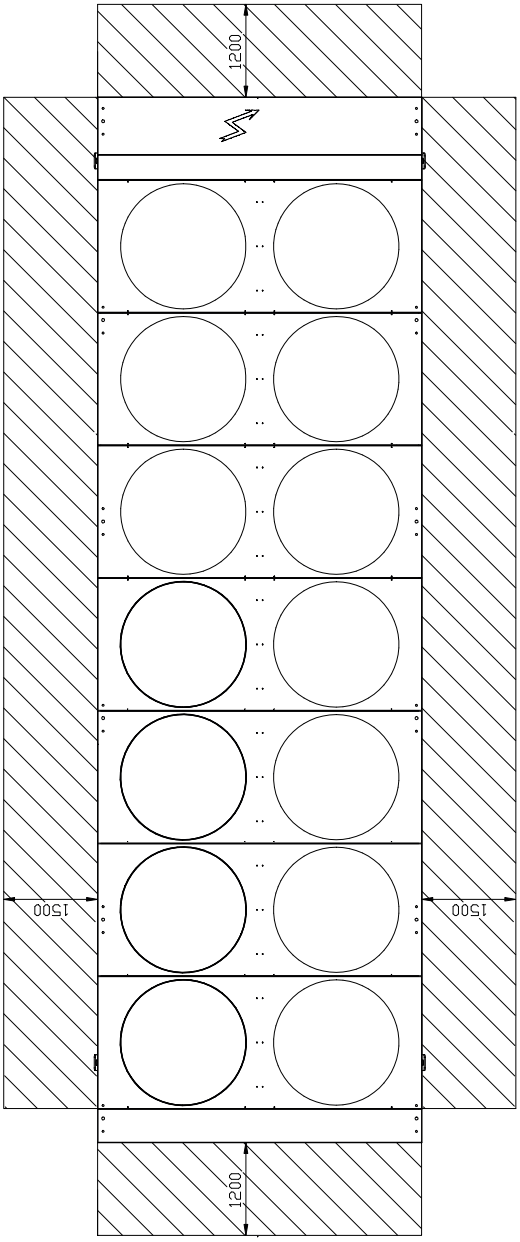

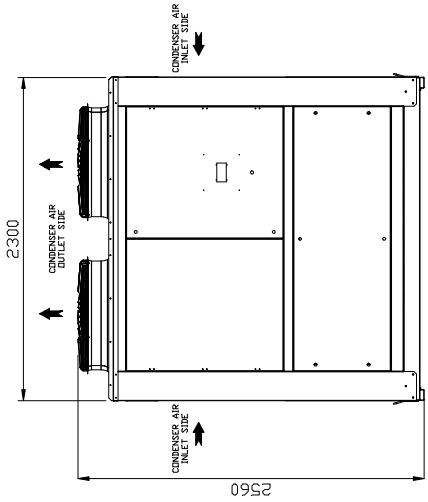

SERIE	MODELLO	L (mm)	B (mm)	H (mm)	PESO (kg)
" U "	6002 U Kc	7675	2300	2560	***
" HE "	5202 HE Kc				***
	5602 HE Kc				***
	6002 HE Kc				***
" HE U "	5202 HE U Kc				***
	5602 HE U Kc				***
	6002 HE U Kc				***

10. SAFETY DATA SHEET OF REFRIGERANT

Safety Data Sheet according to Regulation (CE) n° 1907/2006	Revision date: 01.12.2017 Version: 3.3

R 454 B

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Trade name : Opteon™ XL41 (R-454B) Refrigerant

SDS-Identcode : 130000143545

1.2 Relevant identified uses of the substance or mixture and uses advised against

Use of the Substance/Mixture : Refrigerant

Recommended restrictions on use : For professional and industrial installation and use only.

1.3 Details of the supplier of the safety data sheet

Company : Chemours Netherlands B.V.
Baanhoekweg 22
3313 LA Dordrecht Netherlands

Telephone : +31-(0)-78-630-1011

Telefax : +31-78-6163737

E-mail address of person responsible for the SDS : sds-support@chemours.com

1.4 Emergency telephone number

+(44)-870-8200418 (CHEMTREC - Recommended)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

Flammable gases, Category 1	H220: Extremely flammable gas.
Gases under pressure, Liquefied gas	H280: Contains gas under pressure; may explode if heated.

2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Safety Data Sheet according to Regulation (CE) n° 1907/2006	Revision date: 01.12.2017 Version: 3.3

R 454 B

Hazard pictograms :

Signal word : Danger

Hazard statements : H220 Extremely flammable gas.
H280 Contains gas under pressure; may explode if heated.

Precautionary statements :

Prevention:

P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response:

P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 In case of leakage, eliminate all ignition sources.

Storage:

P410 + P403 Protect from sunlight. Store in a well-ventilated place.

Additional Labelling

Contains fluorinated greenhouse gases. (HFC-32)

2.3 Other hazards

This mixture contains no substance considered to be persistent, bioaccumulating and toxic (PBT).
This mixture contains no substance considered to be very persistent and very bioaccumulating (vPvB).
May displace oxygen and cause rapid suffocation.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
Misuse or intentional inhalation abuse may cause death without warning symptoms, due to cardiac effects.
Rapid evaporation of the product may cause frostbite.

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Hazardous components

Chemical name	CAS-No. EC-No. Index-No. Registration number	Classification	Concentration (% w/w)
Difluoromethane*	75-10-5 200-839-4 01-2119471312-47	Flam. Gas 1; H220 Press. Gas Liquefied gas; H280	68.9
2,3,3,3-Tetrafluoropropene*	754-12-1	Flam. Gas 1; H220	31.1

	468-710-7 01-0000019665-61	Press. Gas Liquefied gas; H280	

* Voluntarily-disclosed non-hazardous substance
For explanation of abbreviations see section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice : In the case of accident or if you feel unwell, seek medical advice immediately.
When symptoms persist or in all cases of doubt seek medical advice.

Protection of first-aiders : No special precautions are necessary for first aid responders.

If inhaled : If inhaled, remove to fresh air.
Get medical attention if symptoms occur.

In case of skin contact : Thaw frosted parts with lukewarm water. Do not rub affected area.
Get medical attention immediately.

In case of eye contact : Get medical attention immediately.

If swallowed : Ingestion is not considered a potential route of exposure.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms : May cause cardiac arrhythmia.

Other symptoms potentially related to misuse or inhalation abuse are
Cardiac sensitisation
Anaesthetic effects
Light-headedness
Dizziness
confusion
Lack of coordination
Drowsiness
Unconsciousness

Risks : Contact with liquid or refrigerated gas can cause cold burns and frostbite.

4.3 Indication of any immediate medical attention and special treatment needed

Treatment : Treat symptomatically and supportively.

Safety Data Sheet according to Regulation (CE) n° 1907/2006	Revision date: 01.12.2017 Version: 3.3

R 454 B

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Water spray
Alcohol-resistant foam
Carbon dioxide (CO2)
Dry chemical

Unsuitable extinguishing media : None known.

5.2 Special hazards arising from the substance or mixture

Specific hazards during fire-fighting : Vapours may form flammable mixture with air
Exposure to combustion products may be a hazard to health.
If the temperature rises there is danger of the vessels bursting due to the high vapor pressure.

Hazardous combustion products : Hydrogen fluoride
carbonyl fluoride
Carbon oxides
Fluorine compounds

5.3 Advice for firefighters

Special protective equipment for firefighters : Wear self-contained breathing apparatus for firefighting if necessary. Use personal protective equipment.

Specific extinguishing methods : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Fight fire remotely due to the risk of explosion.
Use water spray to cool unopened containers.
Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
Remove undamaged containers from fire area if it is safe to do so.
Evacuate area.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Personal precautions : Evacuate personnel to safe areas.
Only trained personnel should re-enter the area.
Remove all sources of ignition.
Avoid skin contact with leaking liquid (danger of frostbite).
Ventilate the area.
Follow safe handling advice and personal protective equipment recommendations.

Safety Data Sheet according to Regulation (CE) n° 1907/2006	Revision date: 01.12.2017 Version: 3.3

R 454 B

6.2 Environmental precautions

Environmental precautions : Prevent further leakage or spillage if safe to do so.
Retain and dispose of contaminated wash water.

6.3 Methods and material for containment and cleaning up

Methods for cleaning up : Ventilate the area.
Non-sparking tools should be used.
Suppress (knock down) gases/vapours/mists with a water spray jet.
Local or national regulations may apply to releases and disposal of this material, as well as those materials and items employed in the cleanup of releases. You will need to determine which regulations are applicable.
Sections 13 and 15 of this SDS provide information regarding certain local or national requirements.

6.4 Reference to other sections

See sections: 7, 8, 11, 12 and 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Technical measures : Use equipment rated for cylinder pressure. Use a backflow preventative device in piping. Close valve after each use and when empty.

Local/Total ventilation : Use with local exhaust ventilation.
Use only in an area equipped with explosion-proof exhaust ventilation if advised by assessment of the local exposure potential

Advice on safe handling : Handle in accordance with good industrial hygiene and safety practice, based on the results of the workplace exposure assessment
Keep container tightly closed.
Wear cold insulating gloves/ face shield/ eye protection.
Prevent backflow into the gas tank.
Open the valves slowly to prevent pressure surges.
Close valve after each use and when empty. Do NOT change or force fit connections.
Prevent the intrusion of water into the gas tank.
Keep away from heat and sources of ignition.
Take precautionary measures against static discharges.
Take care to prevent spills, waste and minimize release to the environment.

Avoid breathing gas.
Valve protection caps and valve outlet threaded plugs must remain in place unless container is secured with valve outlet piped to use point.

Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.
Use a pressure reducing regulator when connecting cylinder to lower pressure (<3000 psig) piping or systems.
Never attempt to lift cylinder by its cap.
Do not drag, slide or roll cylinders.
Use a suitable hand truck for cylinder movement.

Hygiene measures : Ensure that eye flushing systems and safety showers are located close to the working place. When using do not eat, drink or smoke. Wash contaminated clothing before re-use.

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers : Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Separate full containers from empty containers. Do not store near combustible materials. Avoid area where salt or other corrosive materials are present. Keep in properly labelled containers. Keep tightly closed. Keep in a cool, well-ventilated place. Keep away from direct sunlight. Store in accordance with the particular national regulations. Keep away from heat and sources of ignition.

Advice on common storage : Do not store with the following product types:
Self-reactive substances and mixtures
Organic peroxides
Oxidizing agents
Flammable liquids
Flammable solids
Pyrophoric liquids
Pyrophoric solids
Self-heating substances and mixtures
Substances and mixtures, which in contact with water, emit flammable gases
Explosives
Acutely toxic substances and mixtures
Substances and mixtures with chronic toxicity

Storage period : > 10 yr

Recommended storage temperature : < 52 °C

Further information on storage stability : The product has an indefinite shelf life when stored properly.

7.3 Specific end use(s)

Specific use(s) : No data available

Safety Data Sheet according to Regulation (CE) n° 1907/2006	Revision date: 01.12.2017 Version: 3.3

R 454 B

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Derived No Effect Level (DNEL) according to Regulation (EC) No. 1907/2006:

Substance name	End Use	Exposure routes	Potential health effects	Value
Difluoromethane	Workers	Inhalation	Long-term systemic effects	7035 mg/m3
	Consumers	Inhalation	Long-term systemic effects	750 mg/m3
2,3,3,3-Tetrafluoropropene	Workers	Inhalation	Long-term systemic effects	950 mg/m3

Predicted No Effect Concentration (PNEC) according to Regulation (EC) No. 1907/2006:

Substance name	Environmental Compartment	Value
Difluoromethane	Fresh water	0.142 mg/l
	Intermittent use/release	1.42 mg/l
	Fresh water sediment	0.534 mg/kg
2,3,3,3-Tetrafluoropropene	Fresh water	0.1 mg/l
	Intermittent use/release	1 mg/l
	Fresh water sediment	1.77 mg/kg dry weight (d.w.)
	Soil	1.54 mg/kg dry weight (d.w.)
	Marine water	0.01 mg/l
	Marine sediment	0.178 mg/kg dry weight (d.w.)

8.2 Exposure controls

Engineering measures

Minimize workplace exposure concentrations.
Use only in an area equipped with explosion-proof exhaust ventilation if advised by assessment of the local exposure potential
Use with local exhaust ventilation.

Personal protective equipment

Eye protection : Wear the following personal protective equipment:
Chemical resistant goggles must be worn.
Face-shield

Hand protection
Material : Low temperature resistant gloves

Remarks : Choose gloves to protect hands against chemicals depending

		on the concentration and quantity of the hazardous substance and specific to place of work. For special applications, we recommend clarifying the resistance to chemicals of the aforementioned protective gloves with the glove manufacturer. Wash hands before breaks and at the end of workday. Breakthrough time is not determined for the product. Change gloves often!
Skin and body protection	:	Wear the following personal protective equipment: Flame retardant antistatic protective clothing, unless assessment demonstrates that the risk of explosive atmospheres or flash fires is low
Respiratory protection	:	Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines.
Filter type	:	Organic gas and low boiling vapour type (AX)
Protective measures	:	Wear cold insulating gloves/ face shield/ eye protection.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance	:	Liquefied gas
Colour	:	colourless
Odour	:	slight, ether-like
Odour Threshold	:	No data available
pH	:	No data available
Melting point/freezing point	:	No data available
Initial boiling point and boiling range	:	-50.9 °C
Flash point	:	Not applicable
Evaporation rate	:	> 1 (CCL4=1.0)
Flammability (solid, gas)	:	Flammable
Upper explosion limit / Upper flammability limit	:	Upper flammability limit 22 %(V) Method: ASTM E681
Lower explosion limit / Lower	:	Lower flammability limit

Safety Data Sheet according to Regulation (CE) n° 1907/2006	Revision date: 01.12.2017 Version: 3.3

R 454 B

flammability limit		11.25 %(V) Method: ASTM E681
Vapour pressure	:	15,856 hPa (25 °C)
Relative vapour density	:	2.2 (Air = 1.0)
Relative density	:	0.98 (25 °C)
Density	:	0.98 g/cm3 (25 °C) (as liquid)
Solubility(ies) Water solubility	:	No data available
Partition coefficient: n-octanol/water	:	Not applicable
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity Viscosity, kinematic	:	Not applicable
Explosive properties	:	Not explosive
Oxidizing properties	:	The substance or mixture is not classified as oxidizing.

9.2 Other information

Particle size	:	Not applicable

SECTION 10: Stability and reactivity

10.1 Reactivity

Not classified as a reactivity hazard.

10.2 Chemical stability

Stable if used as directed. Follow precautionary advice and avoid incompatible materials and conditions.

10.3 Possibility of hazardous reactions

Hazardous reactions	:	Vapours may form flammable mixture with air Can react with strong oxidizing agents. Extremely flammable gas.

10.4 Conditions to avoid

Conditions to avoid	:	Heat, flames and sparks.

Safety Data Sheet according to Regulation (CE) n° 1907/2006	Revision date: 01.12.2017 Version: 3.3

R 454 B

10.5 Incompatible materials

Materials to avoid : Oxidizing agents

10.6 Hazardous decomposition products

No hazardous decomposition products are known.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Information on likely routes of exposure : Inhalation
Skin contact
Eye contact

Acute toxicity

Not classified based on available information.

Components:

Difluoromethane:

Acute inhalation toxicity : LC50 (Rat): > 520000 ppm
Exposure time: 4 h
Test atmosphere: gas

Lowest observed adverse effect concentration (Dog): > 350000 ppm
Symptoms: Cardiac sensitisation

No observed adverse effect concentration (Dog): 350000 ppm
Symptoms: Cardiac sensitisation

Cardiac sensitisation threshold limit (Dog): > 735,000 mg/m3
Symptoms: Cardiac sensitisation

2,3,3,3-Tetrafluoropropene:

Acute inhalation toxicity : LC50 (Rat): > 405000 ppm
Exposure time: 4 h
Test atmosphere: gas

Lowest observed adverse effect concentration (Dog): > 120000 ppm
Test atmosphere: gas
Symptoms: Cardiac sensitisation

No observed adverse effect concentration (Dog): 120000 ppm
Test atmosphere: gas
Symptoms: Cardiac sensitisation

Cardiac sensitisation threshold limit (Dog): > 559,509 mg/m3
Test atmosphere: gas
Symptoms: Cardiac sensitisation

Safety Data Sheet according to Regulation (CE) n° 1907/2006	Revision date: 01.12.2017 Version: 3.3

R 454 B

Skin corrosion/irritation

Not classified based on available information.

Components:

Difluoromethane:

Species: Not tested on animals
Result: No skin irritation

2,3,3,3-Tetrafluoropropene:

Species: Not tested on animals
Result: No skin irritation

Serious eye damage/eye irritation

Not classified based on available information.

Components:

Difluoromethane:

Species: Not tested on animals
Result: No eye irritation

2,3,3,3-Tetrafluoropropene:

Species: Not tested on animals
Result: No eye irritation

Respiratory or skin sensitisation

Skin sensitisation

Not classified based on available information.

Respiratory sensitisation

Not classified based on available information.

Components:

Difluoromethane:

Exposure routes: Skin contact
Species: Not tested on animals
Result: negative

Species: Not tested on animals
Result: negative

2,3,3,3-Tetrafluoropropene:

Exposure routes: Skin contact
Species: Not tested on animals
Result: negative

Safety Data Sheet according to Regulation (CE) n° 1907/2006	Revision date: 01.12.2017 Version: 3.3

R 454 B

Germ cell mutagenicity

Not classified based on available information.

Components:

Difluoromethane:

Germ cell mutagenicity- Assessment	:	Weight of evidence does not support classification as a germ cell mutagen.

2,3,3,3-Tetrafluoropropene:

Germ cell mutagenicity- Assessment	:	Weight of evidence does not support classification as a germ cell mutagen.

Carcinogenicity

Not classified based on available information.

Components:

2,3,3,3-Tetrafluoropropene:

Carcinogenicity - Assessment	:	Weight of evidence does not support classification as a carcinogen

Reproductive toxicity

Not classified based on available information.

Components:

Difluoromethane:

Reproductive toxicity - Assessment	:	Weight of evidence does not support classification for reproductive toxicity, Based on data from similar materials

2,3,3,3-Tetrafluoropropene:

Reproductive toxicity - Assessment	:	Weight of evidence does not support classification for reproductive toxicity

STOT - single exposure

Not classified based on available information.

STOT - repeated exposure

Not classified based on available information.

Components:

Difluoromethane:

Assessment: No significant health effects observed in animals at concentrations of 250 ppmV/6h/d or less.

2,3,3,3-Tetrafluoropropene:

Assessment: No significant health effects observed in animals at concentrations of 250 ppmV/6h/d or less.

Repeated dose toxicity

Components:

Difluoromethane:

Species: Rat
NOAEL: 49100 ppm
Application Route: inhalation (gas)
Exposure time: 90 d
Remarks: No significant adverse effects were reported

2,3,3,3-Tetrafluoropropene:

Species: Rat
NOAEL: 50000 ppm
LOAEL: >50000 ppm
Application Route: inhalation (gas)
Exposure time: 90 d
Method: OECD Test Guideline 413
Remarks: No significant adverse effects were reported

Aspiration toxicity

Not classified based on available information.

SECTION 12: Ecological information

12.1 Toxicity

Components:

Difluoromethane:

Toxicity to fish	:	LC50 (Fish): 1,507 mg/l Exposure time: 96 h
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia (water flea)): 652 mg/l Exposure time: 48 h
Toxicity to algae	:	EC50 (algae): 142 mg/l Exposure time: 96 h
Toxicity to fish (Chronic toxicity)	:	NOEC: 65.8 mg/l Exposure time: 30 d Species: Fish

2,3,3,3-Tetrafluoropropene:

Toxicity to fish	:	LC50 (Cyprinus carpio (Carp)): > 197 mg/l Exposure time: 96 h
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): > 100 mg/l Exposure time: 48 h

Safety Data Sheet according to Regulation (CE) n° 1907/2006	Revision date: 01.12.2017 Version: 3.3

R 454 B

Toxicity to algae : NOEC (algae): > 100 mg/l
Exposure time: 72 h

12.2 Persistence and degradability

Components:

Difluoromethane:

Biodegradability : Result: Not readily biodegradable.
Biodegradation: 5 %
Exposure time: 28 d
Method: OECD Test Guideline 301D

2,3,3,3-Tetrafluoropropene:

Biodegradability : Result: Not readily biodegradable.
Method: OECD Test Guideline 301F

12.3 Bioaccumulative potential

Components:

Difluoromethane:

Partition coefficient: n-octanol/water : log Pow: 0.714

2,3,3,3-Tetrafluoropropene:

Bioaccumulation : Remarks: No bioaccumulation is to be expected (log Pow <= 4).

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

Product:

Assessment : This mixture contains no substance considered to be persistent, bioaccumulating and toxic (PBT).. This mixture contains no substance considered to be very persistent and very bioaccumulating (vPvB)..

12.6 Other adverse effects

Global warming potential

Regulation (EU) No 517/2014 on fluorinated greenhouse gases

Product:

100-year global warming potential: 466.319

Safety Data Sheet according to Regulation (CE) n° 1907/2006	Revision date: 01.12.2017 Version: 3.3

R 454 B

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product : Dispose of in accordance with local regulations.
According to the European Waste Catalogue, Waste Codes are not product specific, but application specific.
Waste codes should be assigned by the user, preferably in discussion with the waste disposal authorities.

Contaminated packaging : Empty containers should be taken to an approved waste handling site for recycling or disposal.
Empty pressure vessels should be returned to the supplier.
If not otherwise specified: Dispose of as unused product.

SECTION 14: Transport information

14.1 UN number

ADN : UN 3161

ADR : UN 3161

RID : UN 3161

IMDG : UN 3161

IATA (Cargo) : UN 3161

IATA (Passenger) : UN 3161
Not permitted for transport

14.2 UN proper shipping name

ADN : LIQUEFIED GAS, FLAMMABLE, N.O.S.
(Difluoromethane, 2,3,3,3-Tetrafluoropropene)

ADR : LIQUEFIED GAS, FLAMMABLE, N.O.S.
(Difluoromethane, 2,3,3,3-Tetrafluoropropene)

RID : LIQUEFIED GAS, FLAMMABLE, N.O.S.
(Difluoromethane, 2,3,3,3-Tetrafluoropropene)

IMDG : LIQUEFIED GAS, FLAMMABLE, N.O.S.
(Difluoromethane, 2,3,3,3-Tetrafluoropropene)

IATA (Cargo) : Liquefied gas, flammable, n.o.s.
(Difluoromethane, 2,3,3,3-Tetrafluoropropene)

IATA (Passenger) : LIQUEFIED GAS, FLAMMABLE, N.O.S.
Not permitted for transport

14.3 Transport hazard class(es)

ADN : 2

ADR : 2

RID : 2

Safety Data Sheet according to Regulation (CE) n° 1907/2006	Revision date: 01.12.2017 Version: 3.3

R 454 B

IMDG : 2.1

IATA (Cargo) : 2.1

IATA (Passenger) : Not permitted for transport

14.4 Packing group

ADN

Packing group : Not assigned by regulation
Classification Code : 2F
Hazard Identification Number : 23
Labels : 2.1

ADR

Packing group : Not assigned by regulation
Classification Code : 2F
Hazard Identification Number : 23
Labels : 2.1
Tunnel restriction code : (B/D)

RID

Packing group : Not assigned by regulation
Classification Code : 2F
Hazard Identification Number : 23
Labels : 2.1 ((13))

IMDG

Packing group : Not assigned by regulation
Labels : 2.1
EmS Code : F-D, S-U

IATA (Cargo)

Packing instruction (cargo aircraft) : 200
Packing group : Not assigned by regulation
Labels : Flammable Gas

IATA (Passenger) : Not permitted for transport

14.5 Environmental hazards

ADN

Environmentally hazardous : no

ADR

Environmentally hazardous : no

RID

Environmentally hazardous : no

IMDG

Marine pollutant : no

14.6 Special precautions for user

Not applicable

14.7 Transport in bulk according to Annex II of Marpol and the IBC Code

Remarks : Not applicable for product as supplied.

Safety Data Sheet according to Regulation (CE) n° 1907/2006	Revision date: 01.12.2017 Version: 3.3

R 454 B

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, preparations and articles (Annex XVII)	:	Not applicable
REACH - Candidate List of Substances of Very High Concern for Authorisation (Article 59).	:	Not applicable
Regulation (EC) No 1005/2009 on substances that deplete the ozone layer	:	Not applicable
Regulation (EC) No 850/2004 on persistent organic pollutants	:	Not applicable
Regulation (EC) No 649/2012 of the European Parliament and the Council concerning the export and import of dangerous chemicals	:	Not applicable

Seveso III: Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances.

		Quantity 1	Quantity 2
P2	FLAMMABLE GASES	10 t	50 t

Other regulations:

Take note of Directive 94/33/EC on the protection of young people at work or stricter national regulations, where applicable.

15.2 Chemical safety assessment

Chemical Safety Assessments have been carried out for these substances.

SECTION 16: Other information

Other information	:	Opteon™ and any associated logos are trademarks or copyrights of The Chemours Company FC, LLC. Chemours™ and the Chemours Logo are trademarks of The Chemours Company. Before use read Chemours safety information. For further information contact the local Chemours office or nominated distributors.

Full text of H-Statements

H220	:	Extremely flammable gas.
H280	:	Contains gas under pressure; may explode if heated.

Full text of other abbreviations

Flam. Gas	:	Flammable gases
Press. Gas	:	Gases under pressure

Safety Data Sheet according to Regulation (CE) n° 1907/2006	Revision date: 01.12.2017 Version: 3.3

R 454 B

ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road; AICS - Australian Inventory of Chemical Substances; ASTM - American Society for the Testing of Materials; bw - Body weight; CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECHA - European Chemicals Agency; EC-Number - European Community number; ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID - Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; SVHC - Substance of Very High Concern; TCSI - Taiwan Chemical Substance Inventory; TRGS - Technical Rule for Hazardous Substances; TSCA - Toxic Substances Control Act (United States); UN - United Nations; vPvB - Very Persistent and Very Bioaccumulative

Further information

Sources of key data used to compile the Safety Data Sheet	:	Internal technical data, data from raw material SDSs, OECD eChem Portal search results and European Chemicals Agency, http://echa.europa.eu/

Classification of the mixture:		**Classification procedure:**
Flam. Gas 1	H220	Based on product data or assessment
Press. Gas Liquefied gas	H280	Based on product data or assessment

Items where changes have been made to the previous version are highlighted in the body of this document by two vertical lines.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and shall not be considered a warranty or quality specification of any type. The information provided relates only

Safety Data Sheet according to Regulation (CE) n° 1907/2006	Revision date: 01.12.2017 Version: 3.3

R 454 B

to the specific material identified at the top of this SDS and may not be valid when the SDS material is used in combination with any other materials or in any process, unless specified in the text. Material users should review the information and recommendations in the specific context of their intended manner of handling, use, processing and storage, including an assessment of the appropriateness of the SDS material in the user's end product, if applicable.

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