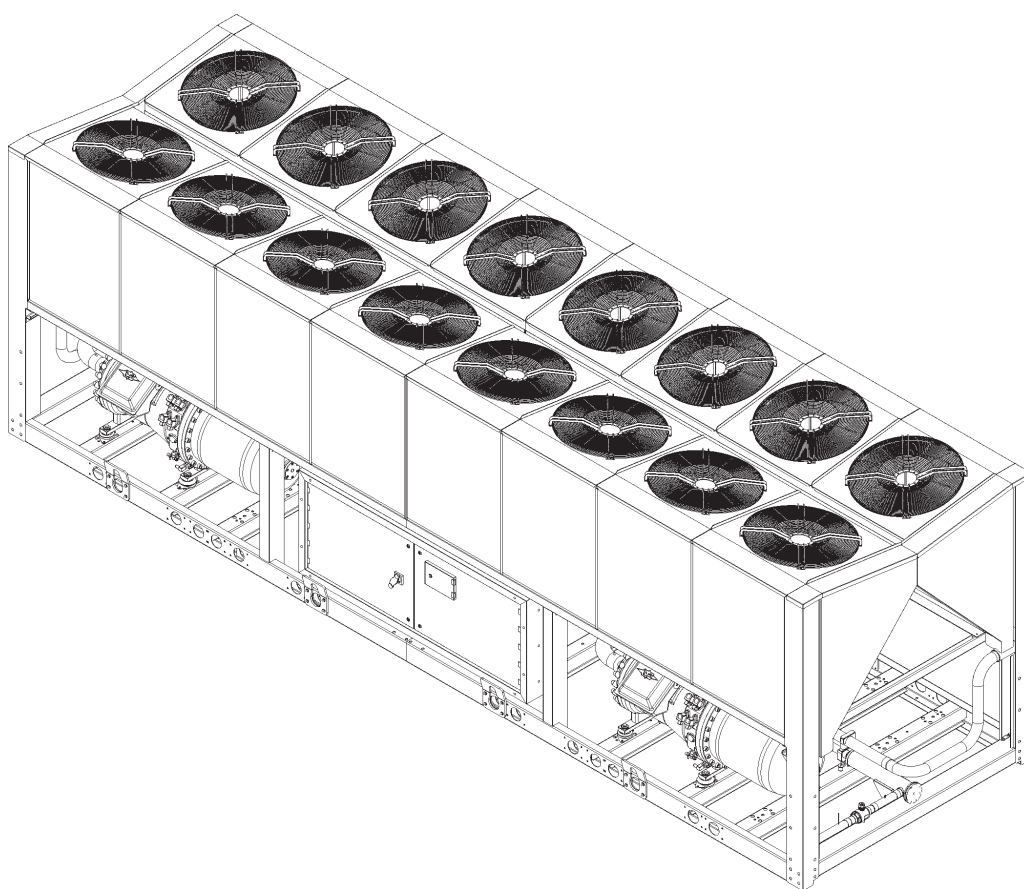




RHV BTZ

AIR COOLED WATER CHILLERS
WITH HELICAL FANS
364 ÷ 1430 kW



CE
INSTALLATION MANUAL

Dear Customer,

Thank you for having purchased a FERROLI Industrial coolers. It is the result of many years experience, particular research and has been made with top quality materials and highly advanced technologies. The CE mark guaranteed that the appliances meets European Machine Directive requirements regarding safety.

The qualitative level is kept under constant surveillance. FERROLI products therefore offer SAFETY, QUALITY and RELIABILITY. Due to the continuous improvements in technologies and materials, the product specification as well as performances are subject to variations without prior notice.

Thank you once again for your preference.
FERROLI S.p.A



GB

“CE” DECLARATION OF CONFORMITY

We, the undersigned, hereby declare under our responsibility, that the machine in question complies with the provisions established by Directives :

DK

“CE” OVERENSSTEMMELSESERKLÆRING

Underfegnede forsikrer under eget ansvar at den ovennævnte maskine er i overensstemmelse med vilkårene i direktivene :

DE

“EG” KONFORMITÄTSEKTLÄRUNG

Wir, die Unterzeichner dies er Erklärung, erklären unter unseren ausschließlichen Verantwortung, daß die genannte Maschine den Bestimmungen der folgenden EG-Richtlinien entspricht :

SE

FÖRSÄKRAN OM “CE” ÖVERENSSTÄMMELSE

Underfegnade försäkrar under eget ansvar att ovannämnda maskinskinen er i overensstemmelse med vilkårene i direktivene :

FR

DECLARATION “CE” DE CONFORMITE

Nous soussignés déclarons, sous notre entière responsabilité, que la machine en objet est conforme aux prescriptions des Directives :

NO

BEKREFTELSE OM ÆCEØ OVERENSSTEMMELSE

Underfegnede forsikrer under eget ansvar at den ovennævnte maskinen er i overensstemmelse med vilkårene i direktivene :

IT

DICHIARAZIONE “CE” DI CONFORMITÀ

Noi sottoscritti dichiariamo, sotto la nostra responsabilità, che la macchina in questione è conforme alle prescrizioni delle Direttive :

FI

“CE” VAATIMUSTENMUKAISUUSVAKUUTUS

Allekirjoittaneet vakuutamme omalla vastuullamme että yllämainittu kone noudattaa ehtoja direktiiveissä :

ES

DECLARACION “CE” DE CONFORMIDAD

Quienes subscribimos la presente declaración, declaramos, bajo nuestra exclusiva responsabilidad, que la maquina en objeto respeta lo prescrito por las Directivas :

GR

ΔΗΛΩΣΗ ΣΥΜΒΑΤΟΤΗΤΑΣ “EE”

Εμεγς που υπογραφουμε την παρουμεσα, δηλωνουμε υπο την αποκλειστικη μας ευθυνη, οτι το μηχανημα συμμορφουται οτα οσα ορτζουν οι Οδηγιες :

PT

DECLARAÇÃO “CE” DE CONFORMIDADE

Nós, signatários da presente, declaramos sob a nossa exclusiva responsabilidade, que a máquina em questão está em conformidade com as prescrições das Directivas :

HR

IZJAVA O “CE” SUGLASNOSTI

Mi niže potpisani izjavljujemo, pod našom odgovornošću, da ova Mašina odgovara zahtijevima iz Direktiva :

NL

“EG” CONFORMITEITSVERKLARING

Wij ondergetekenden verklaren hierbij op uitsluitend eigen verantwoording dat de bovengenoemde machine conform de voorschriften is van de Richtlijnen:

PL

DEKLARACJA ZGODNOŚCI “CE”

My niżej podpisani oświadczamy z pełną odpowiedzialnością, że niżej wymienione urządzenie w pełni odpowiada postanowieniom przyjętym w następujących Dyrektywach:

2006/42/EC
97/23/EC
2004/108/EC
2006/95/EC

Il legale rappresentante
Dante Ferrolli

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GENERAL SPECIFICATIONS

Presentation of the unit

This new series of air-cooled water chillers with helical fans is suitable for outdoor installation: the bearing structure and panelling are made of adequately thick, coated and galvanized sheet metal. All the fastening components are made of stainless and/or galvanized steel. The cabinet that houses the electrical components and all the parts exposed to outdoor weather conditions (fans, pressure switches, valves, etc.) have a protection degree of at least **IP54**.

When the units were designed, particular attention was also paid to sound emission in our endeavour to comply with the increasingly more restrictive laws governing acoustic pollution.

The units produce cold water from 5 to 15°C through to the maximum air temperature of 45/46°C. If equipped with the accessory head pressure control the units can operate at low outdoor temperatures down to about -10°C.

They are equipped with 2 independent refrigerant circuits, each of which has a semi-hermetic **TWINSCREW** compressor featuring a 25 to 100% control capacity device.

As part of the standard outfit, the units are also equipped with a shell and tube heat exchanger evaporator optimized for use with **R407C**, featuring high-efficiency grooved pipes and thermally insulated

and protected by means of a differential water pressure switch and electrical antifreeze heater that enables the exchanger to be protected against winter freezing down to a min. air temperature = -10°C,

coils with extended surfaces and extensive heat exchanging areas formed by copper pipes and louvered aluminium fins, electric fans with scythe-shaped blades to reduce the sound emission, electric panel for setting and controls with a door-locking main circuit-breaker, controller with microprocessor plus display with 4 lines of 20 characters, **R407C** environment-friendly refrigerant gas.

All the units are accurately built and tested individually, thus only the electrical and wet connections need be made for installation.

General specifications

- This manual and the wiring diagram supplied with the unit must be kept in a dry place and ready to hand for future consultation when required.
- This manual has been compiled to ensure that the unit is installed in the correct way and to supply comprehensive information about how to correctly use and service the appliance. **Before proceeding with the installation phase, please carefully read all the information in this manual, which describes the procedures required to correctly install and use the unit.**
- Strictly comply with the instructions in this manual and conform to the current safety standards.
- The appliance must be installed in accordance with the laws in force in the country in which the unit is installed.
- Unauthorized tampering with the electrical and mechanical equipment will **VOID THE WARRANTY**.
- Check the electrical specifications on the identification plate before making the electrical connections. Read the instructions in the specific section where the electrical connections are described.
- If the unit must be repaired for any reason, this must only be done by a specialized assistance center recognized by the manufacturer and using genuine spare parts.
- The manufacturer also declines all liability for any damage to persons or property deriving from failure of the information in this manual to correspond to the actual machine in your possession.
- **Proper uses: this series of chillers is designed to produce cold or hot water for use in hydronic systems for conditioning/heating purposes. The units are not suitable for the production of domestic hot water. Any use differing from this proper use or beyond the operating limits indicated in this manual is forbidden unless previously agreed with the manufacturer.**
- **The prevention of the risk of fire at the installation site is the responsibility of the end user.**

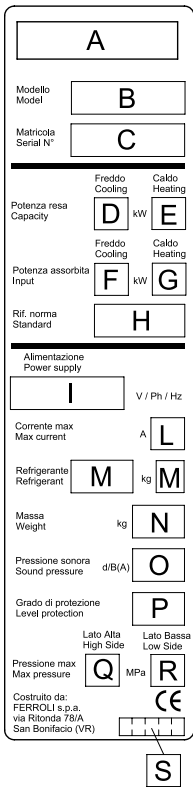
European Directives

The company hereby declares that the machine in question complies with the matters prescribed by the following Directives:

- | | |
|---|--------------------|
| • Machinery directive | 2006/42/EC |
| • Pressurised equipment directive (PED) | 97/23/EC |
| • Electromagnetic compatibility directive (EMC) | 2004/108/EC |
| • Low voltage directive (LVD) | 2006/95/EC |

GENERAL SPECIFICATIONS

Identification plate of the Unit



The figure on the left depicts the identification plate of the unit, affixed to the outer left-hand side of the Electric Panel.

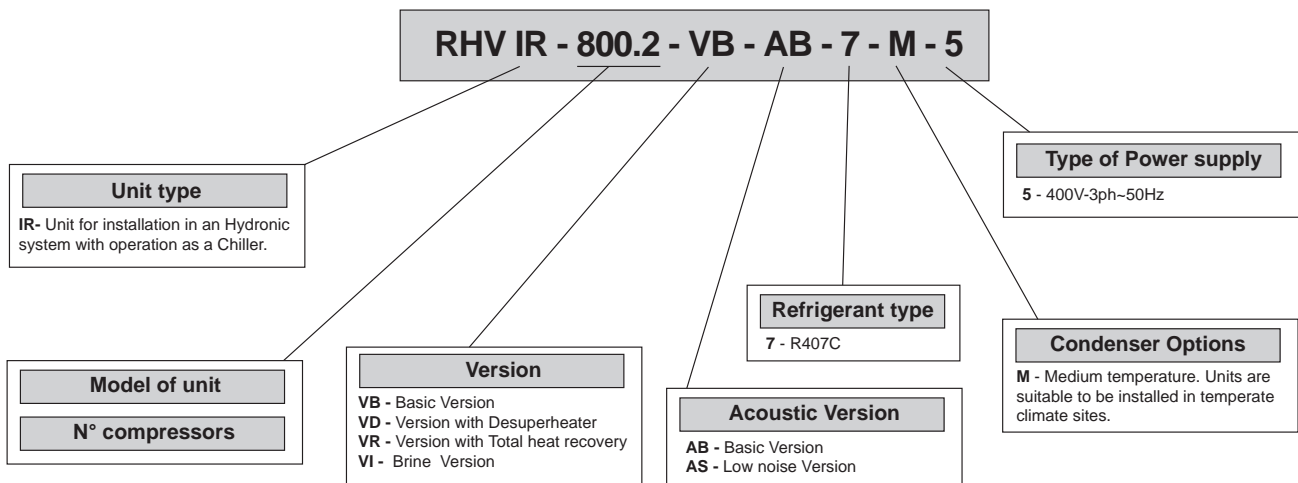
A description of the data is given below:

Basic versions

- A** - Trademark
- B** - Model
- C** - Serial number
- D** - Cooling Capacity
- E** - Heating Capacity
- F** - Power input in COOLING mode
- G** - Power input in HEATING mode
- H** - Reference standard
- I** - Electric power supply
- L** - Maximum current absorption
- M** - Type of refrigerant and weight of charge
- N** - Shipping weight of the unit
- O** - Sound pressure
- P** - IP Level Protection
- Q** - Maximum pressure - High Side
- R** - Maximum pressure - Low Side
- S** - PED certification authority

Identification code of the unit

The codes that identify the units are listed below and include the sequences of letters that determine the meanings for the various versions and set-ups.



Version

VB: Basic version. The unit can produce cold water at a temperature of 6 to 15°C.

Acoustic version:

AB: Basic Version. The compressors in these units are installed without a soundproofed cabinet and with axial fans operating at 900 rpm.

AS: Low Noise Version. The units are as standard equipped with head pressure control, made with compressors installed inside a soundproofed cabinet, helical fans working at low speed rotation at nominal condition. The unit can work with low noise emission up to an external air temperature of 40°C. Compared with the Basic Version the noise level is reduced of 5/6 dB and the cooling capacity decreases 3÷4% whereas the power input increases 3÷4%.

GENERAL SPECIFICATIONS

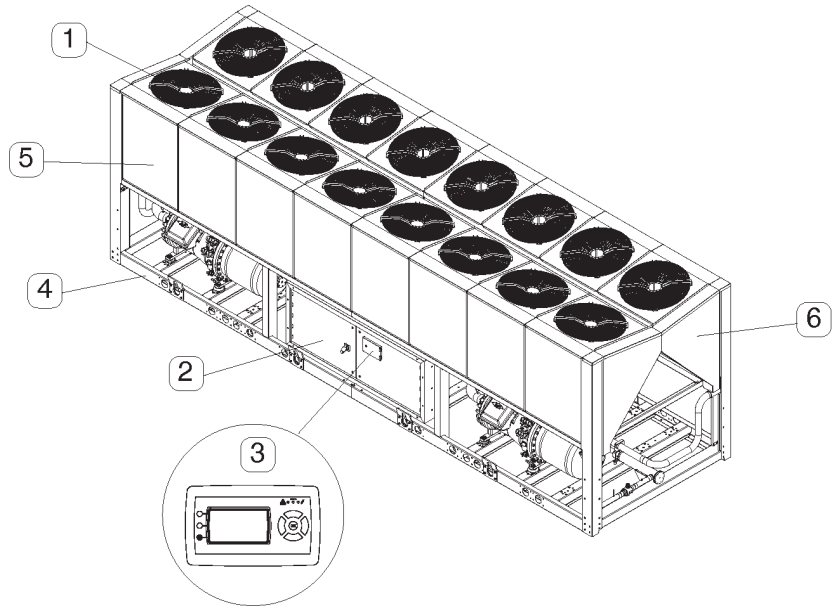
Description of the components

1. Fans. These are the helical type with scythe-shaped blades to increase efficiency and reduce the sound emissions. The fans are directly coupled to the threephase motor by means of an external rotor. Thermal protection against operating faults is installed inside the winding.

2. Electric control and monitoring panel.

It is housed in a cabinet made of adequately thick painted sheet metal suitable for outdoor installation (protection degree IP 54). The panel comprises the following main components:

- Main door-locking circuit-breaker.
- Contactors to control and manage the star-delta starting mechanism of each compressor.
- Fuse holders with protection fuses for each compressor.
- Fuse holders with protection fuses for the oil heaters of the compressors.
- Fuse holders with protection fuses for the antifreeze heater.
- Fuse holders and protection fuses for the fans (accessories).
- Fan control contactors.
- Insulating and safety transformer to power the auxiliaries, protected with fuses.
- Basic monitoring board with microprocessor



The main functions of the monitoring system are:

Temperature regulation of the water produced by the unit, operating hour counting for compressors and pump/s, operating hour balancing for compressors and pumps, start-up timing, parameter entry digitized via the keyboard, alarm diagnosis.

Functions associated with the digital inputs: high pressure, high discharge temperature, correct electric power phase presence-sequence, thermal protection for compressors, thermal protection for fans, thermal protection for pump, differential water pressure switch, remote controlled ON/OFF commands.

Functions associated with the digital outputs: compressor control, solenoid valve for compressor control capacity, liquid injection, liquid solenoid valve control, water pump/s control, electric antifreeze heater, ventilating step control for condensation control function, general alarm (can be remote controlled).

Functions associated with the analog inputs: water inlet and outlet temperatures, coil temperature. Suction and discharge pressure, discharge temperature probe. Suction temperature, liquid temperature.

Functions associated with the analog outputs: speed control (only with DCC Head pressure control accessory).

Moreover the controller allows:

- Alarm history (max 50m alarms managed with FIFO logic)
- Time scheduling (daily and weekly)
- Precise control of the water leaving temperature
- Prevention of the block of the unit: In case of critical conditions the machine does not stop but is able to regulate itself and provide the maximum power that can be generated in those conditions with the compressors working inside the admissible limits.
- Demand Limit by Digital Input and/or by Analog Input (4-20mA)
- Dinamic Setpoint by Analog Input (4-20mA): for instance by an outdoor temperature probe for the climate control
- Second Set Point by Digital Input
- Connection to BMS (supervision systems) through serial port RS 485 and MODBUS protocol

3. User interfacing terminal with display.

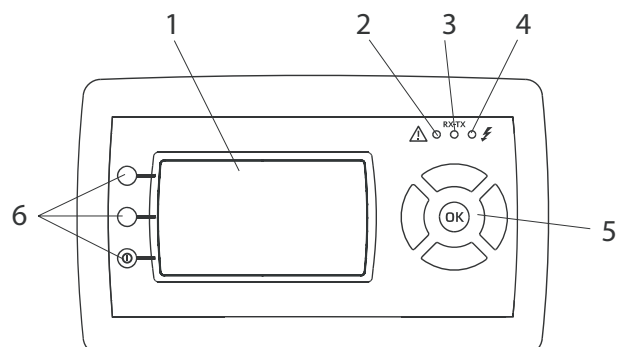
Control panel: composed of the instrument's front panel, equipped with an LCD display, three indicator LEDs, and one joystick buttons and three function button, it enables viewing and/or checking the operating mode and parameters, resources and complete alarm diagnostics.

In particular, it enables:

- Managing alarm situations
- Checking the status of resources.

KEY

- 1. Display
- 2. Alarms LED
- 3. LED for communication between the motherboard governing the unit a the keypad
- 4. Power supply LED
- 5. Joystick Menu Button
- 6. Function Button



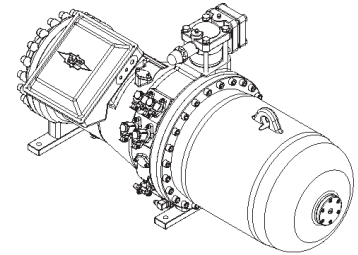
GENERAL SPECIFICATIONS

4. Bearing structure made of galvanized sheet metal coated with polyurethane powder paint to ensure good protection against adverse weather conditions.

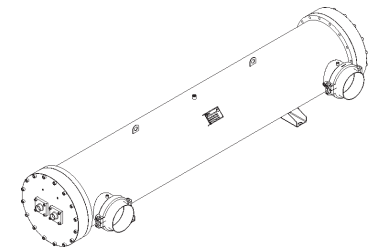
5. Condensing coils, the aluminium finned pack type with shaped profile to increase the heat exchange coefficient and with copper pipes arranged in staggered rows. A sub-cooling section is integrated into the lower part.

6. Covering panels, made of galvanized sheet metal coated with polyurethane powder paints to ensure the utmost ability to withstand adverse weather conditions.

- Compressors. Suitable for outdoor installation. They are the TWIN-SCREW type with 25 to 100% control capacity: in conjunction with accurate assembly, this technical solution allows the refrigerant to compress and the axial thrusts on the bearings (amongst the most critical components of the compressor) to be perfectly balanced, thus guaranteeing long life. They are equipped with an asynchronous three-phase motor (400V-3-50Hz) with aluminium squirrel-cage rotor, pre-engineered for star-delta starting (so as to reduce the current input during the starting phase to the minimum) and are protected by a chain of thermostats buried in the stator windings (controlled by an electronic module) and fuses housed in the electric panel. The standard outfit includes an efficient oil separator complete with electric heater (activated when the compressor stops). To widen the field of application to an even greater extent, they are equipped with a liquid injection system controlled by the electronic controller so that use only occurs when effectively necessary. As part of the standard supply, they are positioned on rubber vibration dampers to reduce the vibrations transmitted to the base of the unit.



- Evaporator of the shell and tube heat exchanger type, made of carbon steel and optimized for operation with R407C. Features high-efficiency grooved pipes and also achieves low losses on the wet side. It is installed within a shell of thermal barrier insulating material to prevent the formation of condensation and heat exchanges towards the outside. Standard supply also includes a differential water pressure switch built into the water supply circuit and antifreeze electrical heater to avoid the risk of freezing if the water flow is shut off for some reason. Also ensures that mechanical stress is absorbed to a good degree: the pipe nest can also be removed so that it can be inspected and serviced when required.



Hydraulic and refrigerant circuit components

- Refrigerant safety valve. (Conforms to the Directive governing pressurized equipments - PED) Installed on the delivery pipe of the compressors. It acts if critical service faults should occur.

- Liquid cock - Gas cock. Allow all the refrigerant in the coils to be pumped and then stored so as to carry out servicing work or to replace all the components of the chilling circuit without having to drain it.

- Dehydrator filter. Of the removable cartridge type. Retains impurities and traces of moisture in the circuit.

- Liquid injection solenoid valve (only for some models), to allow a larger operating envelope directly managed by electronic controller.

- Electronic expansion valve. It has the task of correctly feeding the evaporator insuring a steady superheat. The valve is managed by a dedicated electronic board. It has also the function to stop the liquid when the compressor is off, so avoiding the refrigerant migration from the coils to the evaporator and to the compressor.

- Compressor delivery probe. One per compressor, installed on the delivery pipe to protect the compressor if the end of compression temperature exceeds the established limits.

- Liquid and moisture sight glass. Signals when liquid passes through the circuit, indicating that the refrigerant charge is correct. The liquid indicator also changes colour to show the amount of moisture in the refrigerant.

- Pressure taps: 1/4 " SAE (7/16" UNF) (schraeder). Allow the operating pressure of both the circuits to be measured in 3 main points of each refrigerant circuit: compressor discharge, thermostatic valve inlet, compressor suction.

- High pressure switch. With fixed setting. It is installed on the delivery pipe and blocks the compressor of the circuit if the operating pressures exceed the tolerated values. If it activates, the circuit will block and can only be restarted by resetting via the user interface terminal.

- Oil crankcase heater to heat the compressor oil. One per compressor. Activated when the compressor switches off. Their task is to keep the temperature of the oil sufficiently high so as to prevent refrigerant from migrating during these pauses.

- Low pressure switch. With fixed setting. It is installed on the suction pipe and blocks the compressors if the operating pressures drop below the tolerated values. Automatically resets as the pressure increases. If it activates frequently, the unit will block and can only be restarted by resetting via the user interface terminal.

ACCESSORIES AND OPTIONAL EQUIPMENT

Available accessories

NOTE: The accessories can be of the following type:

(M): only installed in the factory.

(F): supplied for installation by the customer.

MAP (F) Storage and Pumping Module (Storage on the Delivery or Storage on Return). The purpose of the storage and pumping module is to lower the number of compressor surges, increasing the amount of water in the system and, thus, its thermal inertia. It consists of a base made of galvanized and painted sheet metal and aluminium sheet panelling suitable for outdoor installation. Designed for connection alongside the chiller, the accessory comprises an insulated carbon steel tank, a single or double centrifugal pump with on-off valves, an electric power panel, expansion tank, safety valve, air vent, pressure gauge and filling and draining valves.

FLS (M) Evaporator water flow switch.

RAG 8 (M) Antifreeze heating element for Water Storage Tank of Pumping Module.

GM (M) Pressure gauge unit. This consists of low pressure gauges and high pressure gauges (one low and one high pressure gauge for circuit).

GP (M) Protective guard for the coils. Consisting of metal guard that protect the coils.

GP (M) Anti-intrusion guard. Consisting of metal guard that protect the acces to hydraulic and refrigerant circuit.

RB(M) Compressor suction shut-off valve.

AVG (F) Rubber vibration dampers. Consisting of an adequate number of rubber vibration dampers, which varies depending on the model, to install under the unit. They reduce the mechanical vibrations generated by the compressor and fans during their normal operation, that are then transmitted to the bearing surface of the machine. The insulation degree provided by the vibration dampers is about 85%.

AVM (F) Spring vibration dampers. Consisting of an adequate number of spring vibration dampers, which varies depending on the model, to install under the unit. They reduce the mechanical vibrations generated by the compressor and fans during their normal operation, that are then transmitted to the bearing surface of the machine. The insulation degree provided by the vibration dampers is about 80%.

OP (F) Programmer Clock, applied to the remote ON/OFF function.

CR (F) Remote Control. Repeats the functions of the control system installed in the unit, thus allowing this latter to be controlled at a distance (up to 100 m) from the unit.

INT (M) RS485 Serial interface, for communication with the MODBUS protocol.

CSF (M) Voltage monitor and sequence meter. The device enables control of the correct sequence of power phases and the lack of any phases. It also ensures that the unit works within $\pm 10\%$ the rated voltage (MIN=360 V - RATED=400V - MAX=440V). It blocks the unit if the voltage is outside the limits provided for.

DCC (M) Head pressure control (as standard per low noise version AS).

The device is made by 2 electrical drivers that, by means of phase cutting, control the fans speed rotation, with the scope of mantaining the condensation pressure inside the correct operating limits.

Mechanical options

Special finned heat exchangers

- Coils with copper fins
- Coils with copper prepainted

Electrical options

- Compressor thermal magnetic switches
- Fan thermal magnetic switches
- Compressor power factor improvement condensers
- Compressor soft-start
- Compressor enabling selectors

GENERAL SPECIFICATIONS - IR UNIT FOR COOLING MODE ONLY

General technical specifications Basic Version Unit

Acoustic Version: AB (Basic Version) and AS (Low noise version)

The following data refer to an IR unit using R407C coolant

MODELS	360.2	410.2	460.2	520.2	580.2	630.2	680.2	780.2	900.2	1000.2	1150.2	1300.2	1450.2	UM
Power supply	400-3-50													V-ph-Hz
Refrigerant charge	R407C													Type
Refrigeration circuits	2													N°
Refrigerant charge	Take as reference the refrigerant charge value on the Unit Identification plate													-
Cooling capacity ⁽¹⁾	12.5 - 100													%
AB - Basic Version														
Cooling capacity ⁽¹⁾	364	410	452	511	576	621	672	771	882	995	1149	1308	1430	kW
Total power input ⁽¹⁾	130	153	171	190	209	228	242	270	313	364	416	471	448	kW
EER	145	168	186	205	228	247	261	293	340	391	446	509	494	kW
Water flow rate ⁽¹⁾	2.51	2.44	2.43	2.49	2.53	2.51	2.57	2.63	2.60	2.55	2.57	2.57	2.90	W/W
Water pressure drop ⁽¹⁾	17.4	19.6	21.6	24.4	27.5	29.7	32.1	36.8	42.1	47.5	54.9	62.5	68.3	l/s
Capacity control	54	50	44	50	39	45	53	43	55	57	46	56	46	kPa
AS - Low noise Version														
Cooling capacity ⁽¹⁾	350	396	435	494	555	601	650	743	853	963	1104	1260	1384	kW
Total power input ⁽¹⁾	135	159	177	197	217	236	250	280	323	376	433	489	463	kW
EER	146	169	188	207	230	249	263	295	342	394	453	515	494	kW
Water flow rate ⁽¹⁾	2.41	2.34	2.32	2.38	2.41	2.42	2.47	2.52	2.50	2.45	2.44	2.45	2.80	W/W
Water pressure drop ⁽¹⁾	16.7	18.9	20.8	23.6	26.5	28.7	31.0	35.5	40.7	46.0	52.8	60.2	66.1	l/s
Capacity control	50	47	41	47	36	42	50	40	51	53	42	52	43	kPa
Compressor specifications														
Type / capacity control	DOUBLE-SCREW / 25 - 100 %													-
Starting type	PART-WINDING						STAR-DELTA						-	
Quantity	2													N°
Oil type	POE BSE 170													-
Oil charge CP1	15	15	15	15	22	22	22	22	28	28	28	28	28	l
Oil charge CP2	15	15	15	22	22	22	22	22	28	28	28	28	28	l
Evaporator data														
Type	shell and tube heat exchanger													-
Quantity	1													N°
Total water capacity	106	103	153	148	262	262	262	248	241	413	398	405	543	l
Coils specifications														
Type	Copper pipes notched aluminium fins													-
Quantity	4	4	4	4	4	4	4	4	4	4	4	8	8	N°
Total area	18.0	18.0	18.0	18.0	22.4	22.4	22.4	26.9	31.4	31.4	35.9	44.8	53.8	m ²
Fan specifications														
Diameter [Ø]	800													mm
Quantity	8	8	8	8	10	10	10	12	14	14	16	20	24	N°
Maximum rotation speed	900													rpm
Air speed	2.55	2.55	2.5	2.45	2.45	2.375	2.3	2.3	2.45	2.3	2.3	2.3	2.3	m/s
Total air flow rate (max)	45900	45900	45000	44100	54880	53200	51520	61870	76930	72220	82570	103040	123740	l/s
Total power input	15	15	15	15	19	19	19	23	27	27	30	38	46	kW
Electrical specifications														
FLA Maximum current input	298	336	371	406	458	492	526	534	702	792	878	978	994	A
MIC Maximum surge current	515	607	704	739	861	914	948	956	844	1010	1121	1334	1350	A
FLI Maximum power input	180	206	226	246	276	297	318	322	434	484	536	600	608	kW
Noise levels AB / AS ⁽²⁾														
SWL Sound power levels	99 / 94	99 / 94	99 / 94	100 / 95	100 / 95	100 / 95	100 / 95	101 / 96	102 / 97	102 / 97	103 / 98	104 / 99	105 / 100	dB(A)
SPL Sound pressure levels at 1 mt	79 / 74	79 / 74	79 / 74	80 / 75	80 / 75	80 / 75	80 / 75	80 / 75	81 / 76	81 / 76	82 / 77	82 / 77	82 / 77	dB(A)
SPL Sound pressure levels at 5 mt	71 / 66	71 / 66	71 / 66	72 / 67	72 / 67	72 / 67	72 / 67	73 / 68	74 / 69	74 / 69	75 / 70	75 / 70	76 / 71	dB(A)
SPL Sound pressure levels at 10 mt	67 / 62	67 / 62	67 / 62	68 / 63	68 / 63	68 / 63	68 / 63	69 / 64	70 / 64	69 / 64	70 / 65	71 / 66	72 / 67	dB(A)

(1): The data refer to: Water temperature:inlet: 12°C - outlet: 7°C, Outdoor air temperature 35°C.

(2): The noise levels refer to units operating in the nominal conditions (water temperature: inlet: 12°C - outlet: 7°C, Outdoor air temperature 35°C).

SWL = Sound power levels, with reference to 2x10⁻¹² W.

The Total sound power level in dB(A) measured in compliance with ISO 9614 standards, is certified according to the Eurovent certification program.

Eurovent certification (E) exclusively refers to the Total Sound Power in dB(A), which is therefore the only binding acoustic specification (the values of the Octave bands in the table are indicative).

SPL = Sound pressure levels, with reference to 2x10⁻⁵ Pa.

The sound pressure levels are values calculated by applying the ISO-3744 relation (Eurovent 8/1) and refer to a distance of 1 meter away from the external surface of units operating in the open field with directivity factor 2 and the units operating in nominal conditions in the cooling mode.

GENERAL SPECIFICATIONS - IR UNIT FOR COOLING MODE ONLY

Standard performances - Basic Version VB

Mod. 360.2-580.2

MOD.	TW	OUTDOOR AIR TEMPERATURE (°C D.B.)												
		25		30		35		40		43		45		
		kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	
360	5	385	106	367	117	345	127	317	137	297	145	277	150	
	6	395	107	377	118	354	128	326	139	306	146	285	152	
	7	406	109	388	119	364	130	335	141	314	148	293	153	
	8	417	110	398	121	373	132	344	142	322	150	301	155	
	9	427	111	408	122	383	133	352	144	330	152	308	157	
	10	438	112	418	124	392	135	361	146	338	153	316	159	
	11	449	114	428	125	402	136	370	147	347	155	324	161	
	12	458	115	437	126	410	138	377	149	354	157	330	162	
	13	469	116	448	128	420	139	387	151	363	159	338	164	
	14	479	118	457	129	429	141	394	153	370	161	345	166	
	15	496	119	473	131	444	143	409	154	383	162	357	168	
	410	5	433	125	414	137	388	149	357	162	335	170	313	176
		6	445	126	425	139	399	151	367	164	344	172	321	178
		7	458	128	437	140	410	153	377	166	354	174	330	181
		8	469	129	448	142	421	155	387	168	363	176	339	183
9		481	131	459	144	431	157	397	169	372	178	347	185	
10		493	132	470	145	442	158	406	171	381	181	355	187	
11		506	134	482	147	453	160	417	173	391	183	365	189	
12		516	135	492	149	462	162	425	175	399	185	372	191	
13		528	137	504	150	474	164	436	177	409	187	381	193	
14		539	139	514	152	483	166	444	180	417	189	389	196	
15		558	140	533	154	500	168	460	182	432	191	403	198	
460		5	478	140	456	153	428	167	394	181	369	190	345	197
		6	491	141	468	155	440	169	405	183	380	193	354	199
		7	504	143	481	157	452	171	416	185	390	195	364	202
		8	518	145	494	159	464	173	427	187	400	197	373	204
	9	531	146	506	161	476	175	437	189	410	199	383	206	
	10	543	148	518	162	487	177	448	192	420	202	392	209	
	11	557	150	532	164	499	179	460	194	431	204	402	211	
	12	568	151	543	166	509	181	469	196	440	206	410	214	
	13	583	153	556	168	522	183	480	198	451	209	420	216	
	14	594	155	567	170	532	185	490	201	460	211	429	219	
	15	615	157	587	172	551	187	507	203	476	214	444	221	
	520	5	540	155	515	170	484	186	445	201	418	212	390	219
		6	555	157	530	172	497	188	457	203	429	214	400	222
		7	570	159	544	174	511	190	470	206	441	217	411	224
		8	585	161	558	176	524	192	482	208	452	219	422	227
9		600	163	573	178	538	194	495	210	464	222	433	229	
10		614	164	586	181	550	197	506	213	475	224	443	232	
11		630	166	601	183	565	199	519	215	487	227	455	235	
12		643	168	613	185	576	201	530	218	497	229	464	237	
13		659	170	629	187	590	204	543	220	509	232	475	240	
14		672	172	641	189	602	206	554	223	519	235	485	243	
15		696	174	664	191	623	208	574	226	538	237	502	246	
580		5	609	171	581	187	545	204	502	221	471	233	439	241
		6	625	173	597	190	560	207	516	224	484	235	451	244
		7	643	175	613	192	576	209	530	226	497	238	464	247
		8	660	177	629	194	591	211	544	229	510	241	476	249
	9	676	179	645	196	606	214	557	232	523	244	488	252	
	10	692	181	661	199	620	216	571	234	535	247	499	255	
	11	710	183	678	201	636	219	586	237	549	249	512	258	
	12	724	185	691	203	649	221	597	240	560	252	523	261	
	13	742	187	709	206	665	224	612	242	574	255	536	264	
	14	757	189	723	208	679	227	624	245	586	258	546	267	
	15	784	192	748	210	703	229	647	248	606	261	566	270	

TW= Outlet water temperature °C

kWf = Cooling capacity (kW).

kWa = Compressor power input (kW)

The standard performances refer to a 5°C temperature difference between the water entering and leaving the heat exchanger and to operation of the unit with all fans at nominal or maximum speed. A 0.44 x 10⁻⁴ m² K/W fouling factor has also been considered with the unit installed at zero meters above sea level (Pb = 1013mbar).

GENERAL SPECIFICATIONS - IR UNIT FOR COOLING MODE ONLY

Mod. 630.2-1000.2

MOD.	TW	OUTDOOR AIR TEMPERATURE (°C D.B.)												
		25		30		35		40		43		45		
		kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	
630	5	656	186	626	204	588	223	541	241	508	254	473	263	
	6	674	188	644	207	604	225	556	244	521	257	486	266	
	7	693	191	661	209	621	228	571	247	536	260	500	269	
	8	711	193	679	212	637	231	586	250	550	263	513	272	
	9	729	195	696	214	653	233	601	253	564	266	526	275	
	10	746	197	712	217	669	236	615	255	577	269	538	278	
	11	766	200	731	219	686	239	631	258	592	272	552	282	
	12	781	202	745	222	700	241	644	261	604	275	563	285	
	13	800	204	764	224	717	244	660	264	619	278	577	288	
	14	816	207	779	227	732	247	673	268	631	282	589	292	
	15	846	209	807	229	758	250	697	271	654	285	610	295	
	680	5	710	198	678	217	636	236	585	256	549	269	512	279
		6	730	200	696	220	654	239	602	259	564	273	526	282
		7	750	202	716	222	672	242	618	262	580	276	541	286
		8	769	205	734	225	689	245	634	265	595	279	555	289
9		789	207	753	227	707	248	650	268	610	282	569	292	
10		808	209	771	230	724	250	666	271	625	286	583	296	
11		829	212	791	233	743	253	683	274	641	289	598	299	
12		845	214	807	235	757	256	697	277	654	292	610	302	
13		866	217	827	238	776	259	714	281	670	296	625	306	
14		883	219	843	241	792	262	728	284	683	299	637	310	
15		915	222	873	244	820	265	754	287	708	302	660	313	
780		5	815	220	778	242	730	264	672	285	630	301	588	311
		6	837	223	799	245	750	267	690	289	647	304	604	315
		7	860	226	821	248	771	270	709	292	665	308	621	319
		8	883	228	842	251	791	273	728	296	683	311	637	322
	9	905	231	864	254	811	276	746	299	700	315	653	326	
	10	927	234	884	257	830	279	764	302	717	319	668	330	
	11	951	236	907	259	852	283	784	306	735	322	686	334	
	12	970	239	925	263	869	286	799	310	750	326	699	337	
	13	994	242	948	266	891	289	819	313	769	330	717	341	
	14	1014	245	967	269	908	293	836	317	784	334	731	345	
	15	1050	247	1002	272	941	296	865	320	812	337	757	349	
	900	5	932	256	890	281	835	306	768	331	721	349	672	361
		6	958	259	914	284	858	309	790	335	741	353	691	365
		7	984	262	939	287	882	313	811	339	761	357	710	369
		8	1010	265	964	291	905	317	833	343	781	361	728	374
9		1035	268	988	294	928	320	854	347	801	365	747	378	
10		1060	271	1012	297	950	324	874	351	820	369	765	382	
11		1088	274	1038	301	975	328	897	355	841	374	785	387	
12		1109	277	1059	304	994	331	914	359	858	378	800	391	
13		1137	280	1085	308	1019	335	937	363	879	382	820	396	
14		1160	284	1107	311	1039	339	956	367	897	387	836	400	
15		1201	287	1146	315	1076	343	990	372	929	391	866	405	
1000		5	1052	297	1004	326	942	356	867	385	813	405	759	420
		6	1080	301	1031	330	968	360	891	389	836	410	779	425
		7	1110	304	1060	334	995	364	915	394	859	415	801	430
		8	1139	308	1087	338	1021	368	939	399	881	420	822	435
	9	1168	311	1115	342	1047	372	963	403	903	425	843	440	
	10	1196	315	1141	346	1072	377	986	408	925	429	863	445	
	11	1227	319	1171	350	1099	381	1012	413	949	434	885	450	
	12	1251	322	1194	354	1121	386	1032	417	968	439	903	455	
	13	1283	326	1224	358	1149	390	1057	422	992	445	925	460	
	14	1308	330	1248	362	1172	395	1078	427	1012	450	944	466	
	15	1355	334	1293	366	1214	399	1117	432	1048	455	977	471	

TW= Outlet water temperature °C

kWf = Cooling capacity (kW).

kWa = Compressor power input (kW)

The standard performances refer to a 5°C temperature difference between the water entering and leaving the heat exchanger and to operation of the unit with all fans at nominal or maximum speed. A 0.44 x 10⁻⁴ m² K/W fouling factor has also been considered with the unit installed at zero meters above sea level (Pb = 1013mbar).

GENERAL SPECIFICATIONS - IR UNIT FOR COOLING MODE ONLY

Mod. 1150.2-1450.2

MOD.	TW	OUTDOOR AIR TEMPERATURE (°C D.B.)											
		25		30		35		40		43		45	
		kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa
1150	5	1214	340	1159	373	1088	406	1001	440	939	463	876	479
	6	1248	344	1191	377	1118	411	1029	445	965	469	900	485
	7	1282	348	1224	382	1149	416	1057	450	992	474	925	491
	8	1316	352	1256	386	1179	421	1085	456	1017	480	949	497
	9	1349	356	1287	391	1209	426	1112	461	1043	485	973	502
	10	1381	360	1318	395	1237	431	1138	466	1068	491	996	508
	11	1417	364	1352	400	1270	436	1168	471	1096	496	1022	514
	12	1445	368	1379	404	1295	441	1191	477	1118	502	1042	520
	13	1481	373	1413	409	1327	446	1221	482	1145	508	1068	526
	14	1511	377	1442	414	1354	451	1245	488	1168	514	1090	532
15	1564	381	1493	419	1402	456	1290	494	1210	520	1128	538	
1300	5	1382	385	1319	422	1239	460	1140	498	1069	524	997	543
	6	1420	389	1355	427	1273	466	1171	504	1098	531	1025	549
	7	1460	394	1393	432	1308	471	1203	510	1129	537	1053	556
	8	1498	398	1429	437	1342	476	1235	516	1158	543	1080	562
	9	1536	403	1465	442	1376	482	1266	522	1188	549	1108	569
	10	1572	407	1500	447	1409	487	1296	528	1216	556	1134	575
	11	1613	412	1539	453	1445	493	1330	534	1247	562	1163	582
	12	1645	417	1570	458	1474	499	1356	540	1272	569	1187	589
	13	1686	422	1609	463	1511	505	1390	546	1304	575	1216	595
	14	1720	427	1641	469	1541	510	1418	553	1330	582	1240	602
15	1781	432	1699	474	1596	516	1468	559	1377	589	1285	609	
1450	5	1511	366	1442	402	1354	438	1246	474	1169	499	1090	516
	6	1553	370	1482	406	1391	443	1280	479	1201	505	1120	522
	7	1596	375	1523	411	1430	448	1316	485	1234	511	1151	529
	8	1637	379	1563	416	1467	453	1350	491	1266	517	1181	535
	9	1679	383	1602	421	1504	458	1384	496	1298	523	1211	541
	10	1719	388	1640	426	1540	464	1417	502	1329	529	1240	547
	11	1763	392	1683	431	1580	469	1454	508	1364	535	1272	553
	12	1799	397	1716	436	1612	474	1483	514	1391	541	1297	560
	13	1843	401	1759	441	1652	480	1520	520	1425	547	1330	566
	14	1880	406	1794	446	1685	486	1550	526	1454	554	1356	573
15	1947	411	1858	451	1745	491	1605	532	1506	560	1404	580	

TW= Outlet water temperature °C

kWf = Cooling capacity (kW).

kWa = Compressor power input (kW)

The standard performances refer to a 5°C temperature difference between the water entering and leaving the heat exchanger and to operation of the unit with all fans at nominal or maximum speed. A 0.44 x 10⁻⁴ m² K/W fouling factor has also been considered with the unit installed at zero meters above sea level (Pb = 1013mbar).

Standard performances - Low noise version AS

For calculating the performances of the unit in low noise version (AS) you have to use the following correction factors for cooling capacity (CCPF) and compressors power input (CCPACP)

Mod.		360.2	410.2	460.2	520.2	580.2	630.2	680.2	780.2	900.2	1000	1150	1300	1450.2
CCPF	Coeff Corr Pf	0.962	0.965	0.963	0.966	0.963	0.968	0.967	0.964	0.967	0.968	0.961	0.963	0.968
CCPACP	Coeff Corr Pass_CP	1.040	1.036	1.038	1.035	1.037	1.033	1.035	1.036	1.033	1.032	1.040	1.038	1.033

Correction factor for the use of glycol EVAPORATOR WATER CIRCUIT

Correction factor for the use of **ETHYLENE GLYCOL** with water produced between 5±20°C.

Percentage Of glycol in mass / volume	0 / 0	10 / 8,9	20 / 18,1	30 / 27,7	40 / 37,5
Freezing point [°C]	0	-3.2	-8	-14	-22
Cooling capacity CCPF Power input CCPA	1.000	0.990	0.980	0.970	0.950
Power input CCPA	1.000	1.000	0.990	0.990	0.980
Water flow rate CCQA	1.000	1.040	1.080	1.120	1.160
Water pressure drop CCDP	1.000	1.080	1.160	1.250	1.350

Correction factor for the use of **PROPYLENE GLYCOL** with water produced between 5±20°C.

Percentage Of glycol in mass / volume	0 / 0	10 / 9,6	20 / 19,4	30 / 29,4	40 / 39,6
Freezing point [°C]	0	-3.3	-7	-13	-21
Cooling capacity CCPF Power input CCPA	1.000	0.980	0.960	0.940	0.920
Power input CCPA	1.000	0.990	0.980	0.950	0.930
Water flow rate CCQA	1.000	1.010	1.030	1.060	1.090
Water pressure drop CCDP	1.000	1.050	1.110	1.220	1.380

GENERAL SPECIFICATIONS - BRINE VERSION (VI)

Brine Version (VI)

Correction factors to apply to the basic version data

ETHYLENE GLYCOL

percentage of glycol in mass / volume	20 / 18.1						
freezing point [°C]	-8						
Produced water temperature	4	2	0	-2	-4	-6	-8
Refrigerating power c.f.	0,912	0,855	0,798	0,738	0,683	-	-
Power input c.f.	0,967	0,957	0,947	0,927	0,897	-	-
Water flow rate c.f.	0,955	0,895	0,836	0,773	0,715	-	-
Water pressure drop c.f.	1,09	1,095	1,1	1,11	1,12	-	-

percentage of glycol in mass / volume	30 / 27.7						
freezing point [°C]	-14						
Produced water temperature	4	2	0	-2	-4	-6	-8
Refrigerating power c.f.	0,899	0,842	0,785	0,725	0,67	0,613	0,562
Power input c.f.	0,96	0,95	0,94	0,92	0,89	0,87	0,84
Water flow rate c.f.	0,967	0,905	0,844	0,78	0,72	0,659	0,604
Water pressure drop c.f.	1,14	1,145	1,15	1,155	1,16	1,175	1,19

percentage of glycol in mass / volume	40 / 37.5						
freezing point [°C]	-22						
Produced water temperature	4	2	0	-2	-4	-6	-8
Refrigerating power c.f.	0,884	0,827	0,77	0,71	0,655	0,598	0,547
Power input c.f.	0,88	0,87	0,86	0,84	0,81	0,79	0,76
Water flow rate c.f.	1,062	0,929	0,887	0,798	0,74	0,672	0,607
Water pressure drop c.f.	1,19	1,195	1,2	1,21	1,22	1,235	1,25

PROPYLENE GLYCOL

percentage of glycol in mass / volume	20 / 19.4						
freezing point [°C]	-8						
Produced water temperature	4	2	0	-2	-4	-6	-8
Refrigerating power c.f.	0,874	0,807	0,74	0,69	0,641	-	-
Power input c.f.	0,945	0,935	0,925	0,9	0,875	-	-
Water flow rate c.f.	0,915	0,845	0,774	0,723	0,671	-	-
Water pressure drop c.f.	1,11	1,115	1,12	1,13	1,14	-	-

percentage of glycol in mass / volume	30 / 29.4						
freezing point [°C]	-14						
Produced water temperature	4	2	0	-2	-4	-6	-8
Refrigerating power c.f.	0,869	0,799	0,729	0,68	0,63	0,583	0,536
Power input c.f.	0,935	0,923	0,91	0,888	0,865	0,838	0,81
Water flow rate c.f.	0,934	0,859	0,784	0,731	0,678	0,627	0,576
Water pressure drop c.f.	1,16	1,175	1,19	1,2	1,21	1,255	1,3

percentage of glycol in mass / volume	40 / 39.6						
freezing point [°C]	-22						
Produced water temperature	4	2	0	-2	-4	-6	-8
Refrigerating power c.f.	0,848	0,784	0,719	0,67	0,62	0,57	0,52
Power input c.f.	0,865	0,855	0,845	0,82	0,795	0,773	0,75
Water flow rate c.f.	1,062	0,881	0,887	0,752	0,74	0,641	0,607
Water pressure drop c.f.	1,23	1,275	1,32	1,375	1,43	1,5	1,57

NOISE LEVELS

The noise levels refer to units operating in the nominal conditions (water temperature: inlet: 12°C - outlet: 7°C, Outdoor air temperature 35°C).

The acoustic pressure levels are measured 1/ 5 / 10 meters away from the outer surface of the unit operating in the free field and resting on a reflecting surface (directional factor of 2).

SWL = Sound power levels, with reference to 2×10^{-12} W.

The Total sound power level in **dB(A)** measured in compliance with **ISO 9614** standards, is certified according to the **Eurovent** certification program.

Eurovent certification (**E**) exclusively refers to the **Total Sound Power in dB(A)**, which is therefore the only binding acoustic specification (the values of the Octave bands in the table are indicative).

SPL = Sound pressure levels, with reference to 2×10^{-5} Pa.

The sound pressure levels are values calculated by applying the **ISO-3744 relation (Eurovent 8/1)** and refer to a distance of 1 meter away from the external surface of units operating in the open field with directivity factor 2 and the units operating in nominal conditions in the cooling mode.

AB Basic Version

MOD.	SWL (dB)									SPL [dB(A)]			
	Octave bands (Hz)								Total		1	5	10
	63	125	250	500	1000	2000	4000	8000	dB	dB(A)			
360.2	99	98	94	93	94	94	90	82	104	99	79	71	67
410.2	99	98	94	93	94	94	90	82	104	99	79	71	67
460.2	99	98	94	93	94	94	90	82	104	99	79	71	67
520.2	100	99	96	94	95	95	90	83	105	100	80	72	68
580.2	100	99	96	94	95	95	91	84	105	100	80	72	68
630.2	100	99	96	94	95	95	91	84	105	100	80	72	68
680.2	100	99	96	94	95	95	91	84	105	100	80	72	68
780.2	102	100	97	95	96	96	90	84	106	101	80	73	69
900.2	102	101	98	96	98	96	88	84	107	102	81	74	69
1000.2	103	102	98	97	98	96	89	85	108	102	81	74	69
1150.2	104	102	99	98	98	97	91	88	108	103	82	75	70
1300.2	104	103	100	100	99	99	92	90	109	104	82	75	71
1450.2	105	103	101	101	100	100	93	92	110	105	82	76	72

AS Low noise Version

MOD.	SWL (dB)									SPL [dB(A)]			
	Octave bands (Hz)								Total		1	5	10
	63	125	250	500	1000	2000	4000	8000	dB	dB(A)			
360.2	98	96	92	91	89	85	81	75	102	94	74	66	62
410.2	98	96	92	91	89	85	81	75	102	94	74	66	62
460.2	98	96	92	91	89	85	81	75	102	94	74	66	62
520.2	99	97	94	92	90	86	81	76	103	95	75	67	63
580.2	99	97	94	92	90	86	82	77	103	95	75	67	63
630.2	99	97	94	92	90	86	82	77	103	95	75	67	63
680.2	99	97	94	92	90	86	82	77	103	95	75	67	63
780.2	101	98	95	93	91	87	81	77	104	96	75	68	64
900.2	101	99	96	94	93	87	79	77	105	97	76	69	64
1000.2	102	100	96	95	93	87	80	78	106	97	76	69	64
1150.2	103	100	97	96	93	88	82	81	106	98	77	70	65
1300.2	103	101	98	98	94	90	83	83	107	99	77	70	66
1450.2	104	101	99	99	95	91	84	85	108	100	77	71	67

OPERATING RANGE

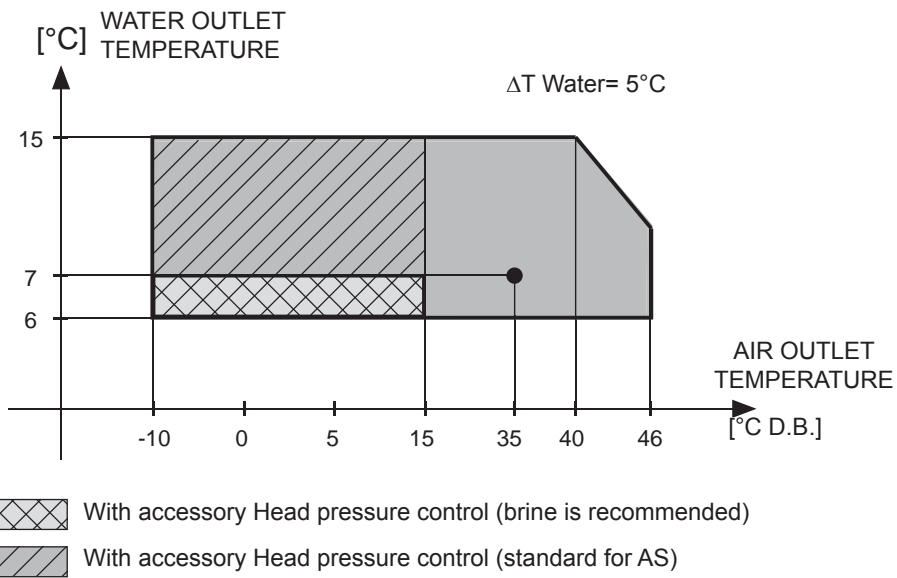
Operating range Basic Version

The table below lists the operating ranges within which correct operation of the units is guaranteed, depending on the Version and Operating Mode available for each type of unit.

Remember that in Heat Pump units, heat recovery only takes place during operation in the cooling mode.

Operating range of Basic Version

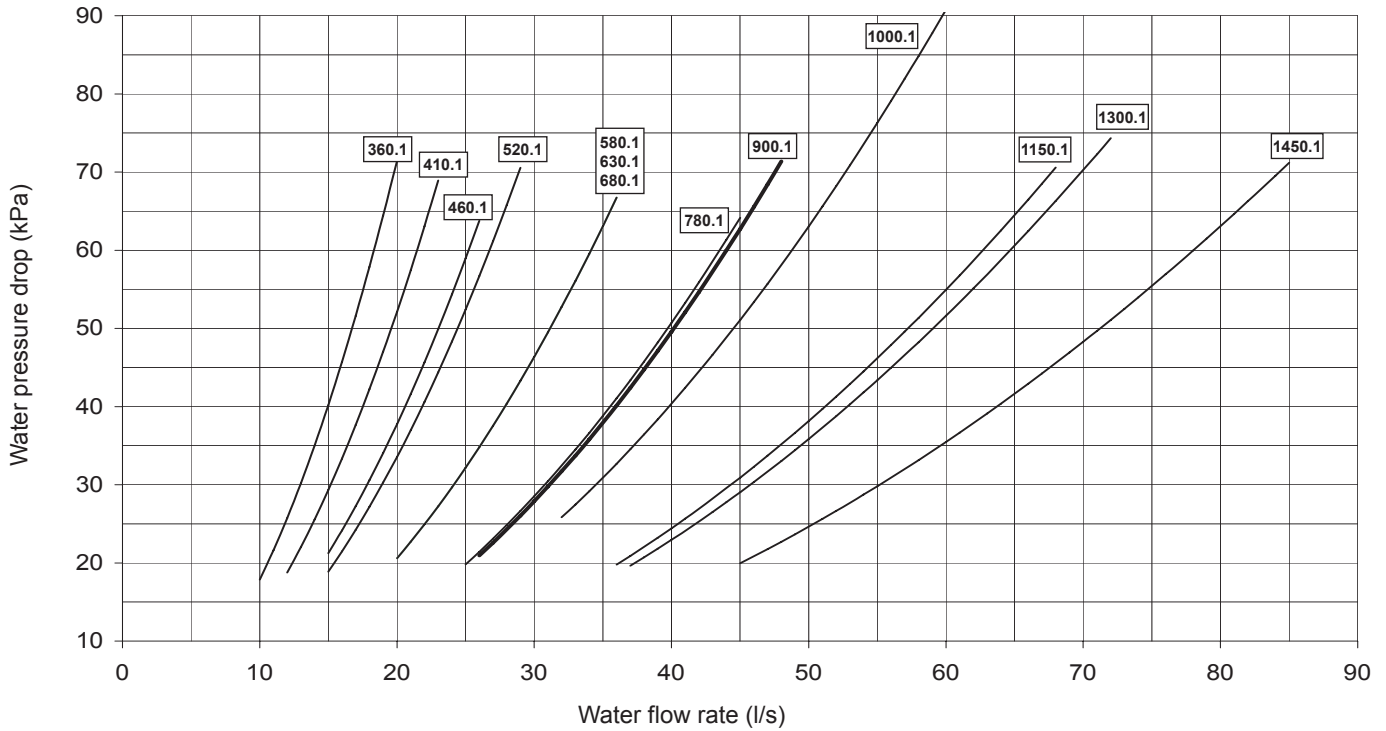
Thermal gradient of the water*		Limit value
Minimum	°C	4
Maximum	°C	8



* : Verify that water flow rate to the exchanger is inside the admissible limits.

WATER PRESSURE DROP EVAPORATOR

The graph below illustrates for the evaporator the water pressure drop values in kPa depending on the flow rate in liters/second. The operating range is delimited by the minimum and maximum values given in the next table.



Operating range

MOD.	360.2	410.2	460.2	520.2	580.2	630.2	680.2	780.2	900.2	1000.2	1150.2	1300.2	1450.2	UM
Min water flow rate	10,0	12,0	15,0	15,0	20,0	20,0	20,0	25,0	26,0	32,0	36,0	37,0	45,0	l/s
Max water flow rate	20,0	23,0	26,0	29,0	36,0	36,0	36,0	45,0	48,0	65,0	68,0	73,0	85,0	l/s

ARRIVAL

Inspections on arrival

As soon as the appliance is consigned, it is essential to make sure that all the ordered items have been received and that the shipment is complete. Carefully check that the equipment has not been damaged. If visible damage is discovered, immediately inform the haulage contractor and write “**Collected with reserves owing to evident damage**” on the consignment note. Delivery ex works means that, as established by law, reimbursement of any damages is at the insurance company’s charge.

Safety regulations

Comply with the current safety regulations concerning the equipment to use when handling the unit or the required ways of operating.

Handling

Check the weight of the appliance before proceeding with the moving and handling operations. The weight is indicated on the data plate of the appliance and in the **WEIGHTS AND CENTERS OF GRAVITY DURING TRASPOT AND OPERATION** section of this manual. Make sure that the appliance is handled with care and without jolting as rough treatment could damage the functional parts of the machine.

Comply with the following instructions when lifting and positioning the appliance:

• Handling and lifting with a crane or similar

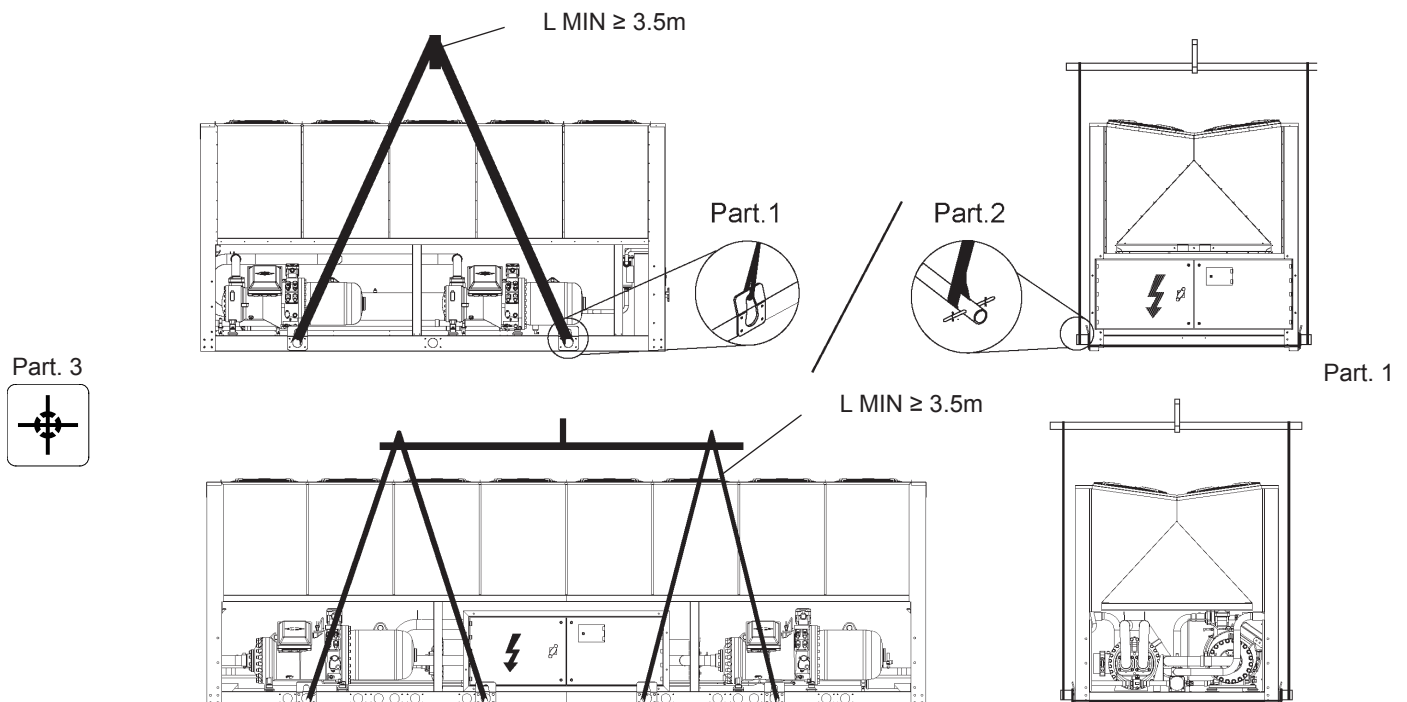
1) Using the brackets (**Part 1 Fig.1**) located by the lifting holes (refer to part 3 in the “Dimensional data” section).

2) Position metal pipes (**Part 2 Fig.1**) of adequate thickness in the holes in the base of the unit for lifting.

- The end portions of the pipes must stand out by an adequate extent to permit inserting the safety devices and housing the belts for lifting.
- Use spacer bars in the top of the unit to prevent crushing and damaging the batteries and the parts intended to cover the assembly.
- Consult the **WEIGHTS AND CENTERS OF GRAVITY DURING TRASPOT AND OPERATION** section for the center of gravity position.

NOTE: To correctly lift the machine, the belts used must be longer than 3.5 meters.

Refer to the data plates (**Part.3 Fig.1**) that identify the center of gravity position, applied to the **4 sides** of the base.



WARNING:

To safeguard persons and property, read the information on the packing that covers the unit before handling. Also make sure to:

- Handle the machine with care
- Do not stack other objects on top of the unit

Storage

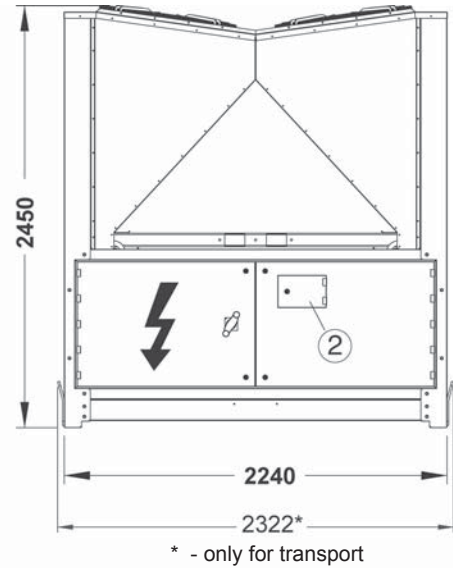
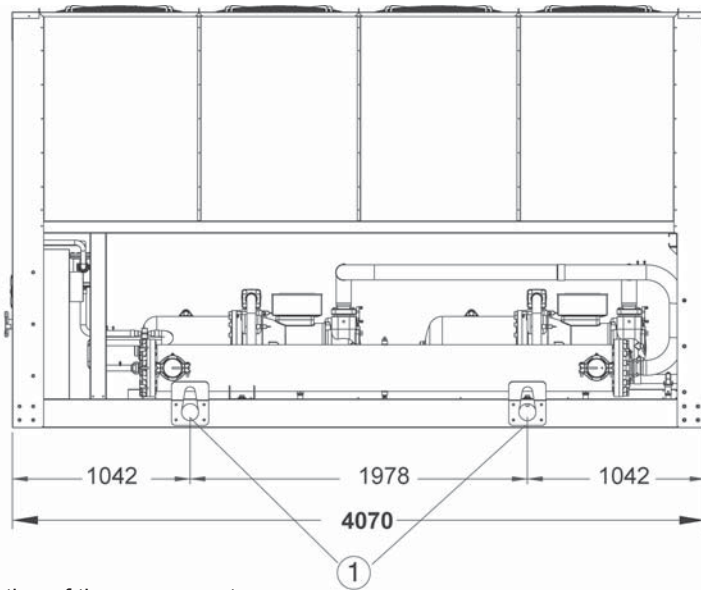
The units must be stored in a dry place, sheltered from the sun, rain, sand and wind.

Comply with the storage conditions given below:

- Do not stack the units
- Maximum temperature = 60°C
- Minimum temperature = -10°C
- Humidity = 90%

DIMENSIONAL AND PHYSICAL DATA

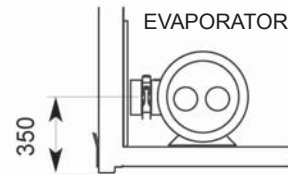
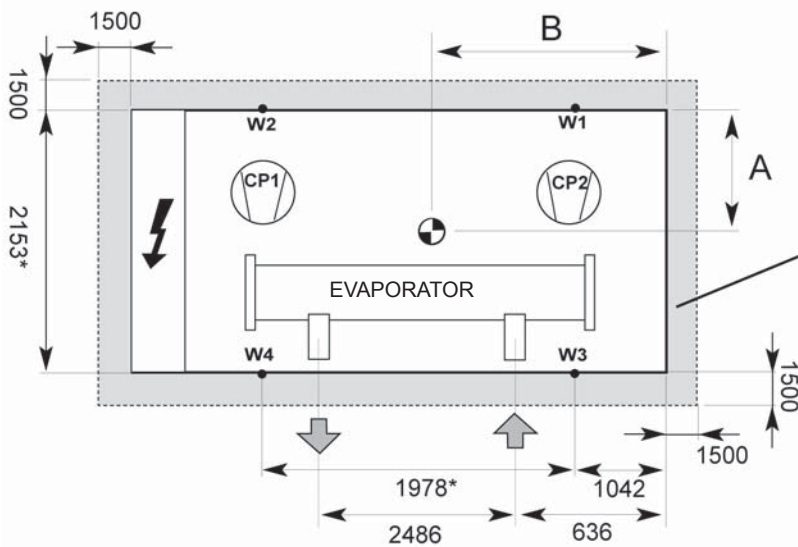
Mod. 360.2 - 410.2



* - only for transport
 POWER SUPPLY

Description of the components
 1 - Lifting points/brackets Ø base holes = 100mm
 2 - Display and keypad to control the unit

The unit water inlet (IN) and outlet (OUT) occur through 4" flexible Victaulic couplings (DN 100).



Minimum space required for operation

Refer to the figure alongside for the dimensions of the unit. To correctly install the unit, comply with the measurements for the free area that must be left around the machine, as shown in the figure. The distances must be doubled if the unit is to be installed in a pit.

NOTE: Allow for a clear area of not less than 2.5 meters above unit.
 The functional areas must be doubled if multiple units are installed.

* Center distance for vibration damper holes Ø=17mm

W1-W4 - they indicate the position where the spring antivibration dampers (accessory) are installed.

Weights and position of the centre of gravity in transport and operation

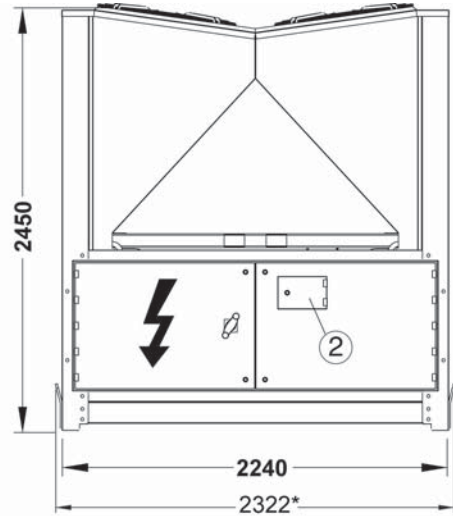
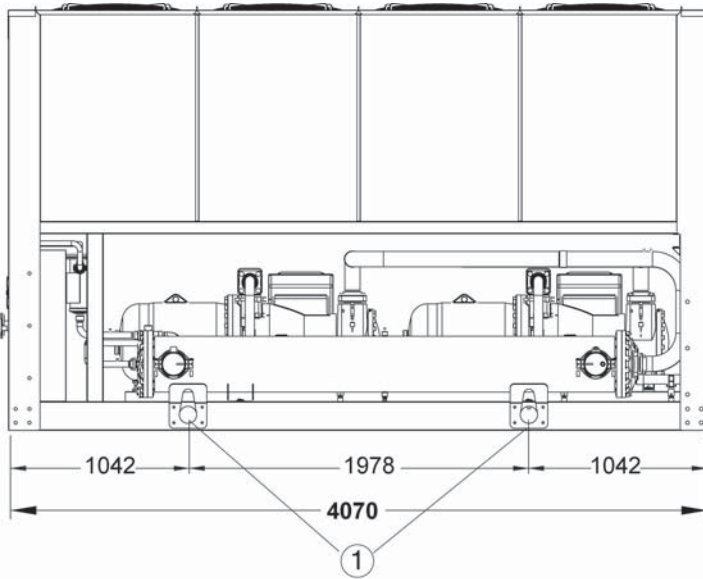
Mod.		Operation							Transport		
		A	B	Antivibration dampers				TOTAL WEIGHT	A	B	TOTAL WEIGHT
				W1	W2	W3	W4				
360.2	AB	911	2029	1060	1064	726	720	3570	891	2034	3464
	AS	900	2026	1140	1134	755	740	3769	880	2032	3663
410.2	AB	910	2029	1062	1067	729	722	3580	890	2034	3477
	AS	892	2024	1142	1137	758	742	3779	872	2029	3676

NOTA:

For Desuperheater versions the total weight increases of 3/4%. For Heat recovery versions the total weight increases of 8/10%.

DIMENSIONAL AND PHYSICAL DATA

Mod. 460.2 - 520.2



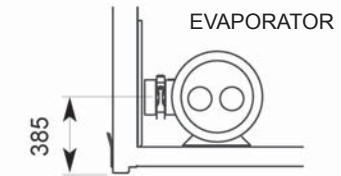
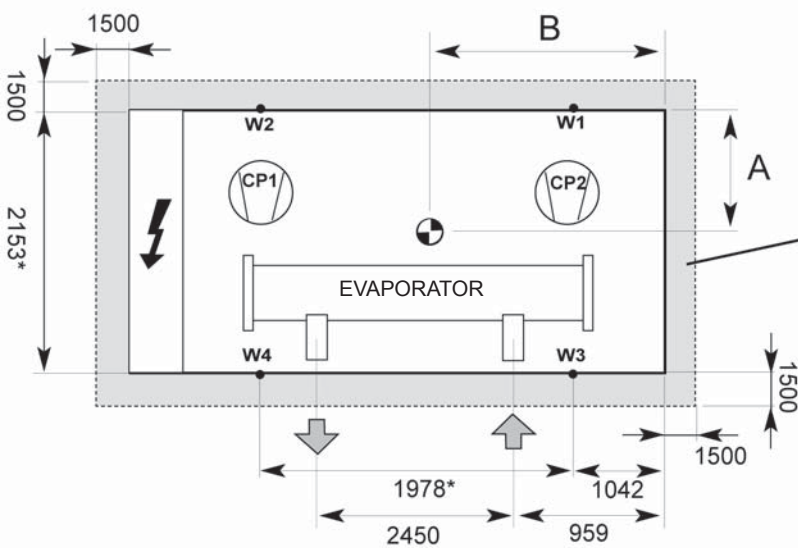
* - only for transport

↑
POWER SUPPLY

Description of the components

- 1 - Lifting points/brackets Ø base holes = 100mm
- 2 - Display and keypad to control the unit

The unit water inlet (IN) and outlet (OUT) occur through 5" flexible Victaulic couplings (DN 125).



Minimum space required for operation

Refer to the figure alongside for the dimensions of the unit.

To correctly install the unit, comply with the measurements for the free area that must be left around the machine, as shown in the figure. The distances must be doubled if the unit is to be installed in a pit.

NOTE: Allow for a clear area of not less than 2.5 meters above unit.

The functional areas must be doubled if multiple units are installed.

* Center distance for vibration damper holes Ø=17mm

W1-W4 - they indicate the position where the spring antivibration dampers (accessory) are installed.

Weights and position of the centre of gravity in transport and operation

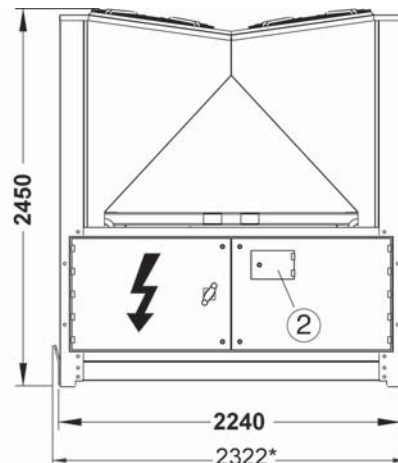
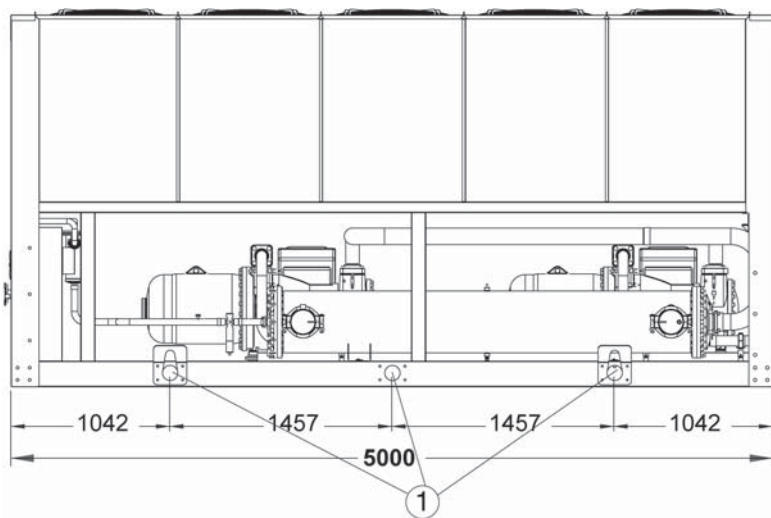
Mod.		Operation							Transport		
		A	B	Antivibration dampers				TOTAL WEIGHT	A	B	TOTAL WEIGHT
				W1	W2	W3	W4				
460.2	AB	907	1965	1264	1130	865	733	3992	881	1969	3839
	AS	890	1960	1353	1202	900	751	4206	965	1969	4053
520.2	AB	909	2004	1328	1267	898	835	4328	885	2009	4180
	AS	893	2001	1417	1346	932	862	4557	869	2006	4409

NOTA:

For Desuperheater versions the total weight increases of 3/4%. For Heat recovery versions the total weight increases of 8/10%.

DIMENSIONAL AND PHYSICAL DATA

Mod. 580.2 - 630.2 - 680.2



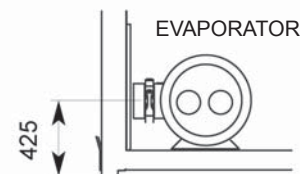
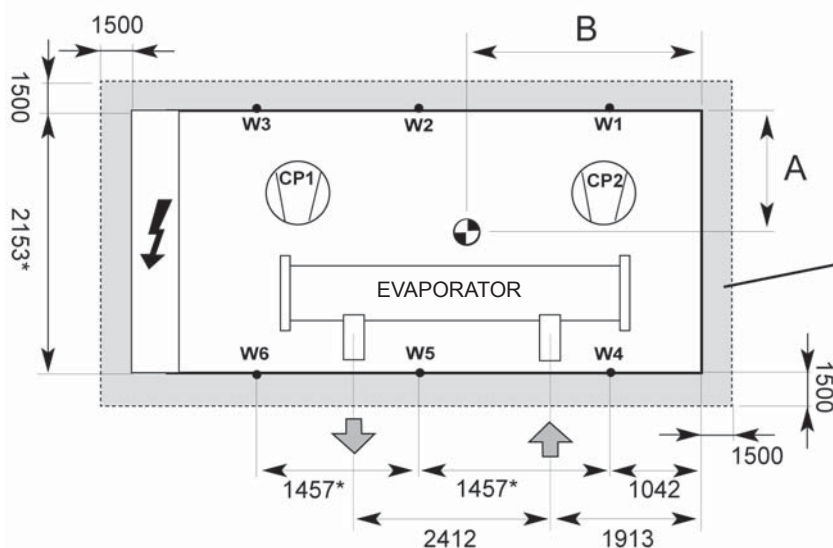
* - only for transport

↑
POWER SUPPLY

Description of the components

- 1 - Lifting points/brackets \varnothing base holes = 100mm
- 2 - Display and keypad to control the unit

The unit water inlet (IN) and outlet (OUT) occur through 6" flexible Victaulic couplings (DN 150).



Minimum space required for operation

Refer to the figure alongside for the dimensions of the unit.

To correctly install the unit, comply with the measurements for the free area that must be left around the machine, as shown in the figure. The distances must be doubled if the unit is to be installed in a pit.

NOTE: Allow for a clear area of not less than

2.5 meters above unit.

The functional areas must be doubled if multiple units are installed.

* Center distance for vibration damper holes $\varnothing=17$ mm

W1-W6 - they indicate the position where the spring antivibration dampers (accessory) are installed.

Weights and position of the centre of gravity in transport and operation

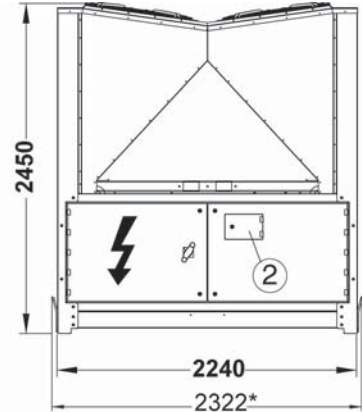
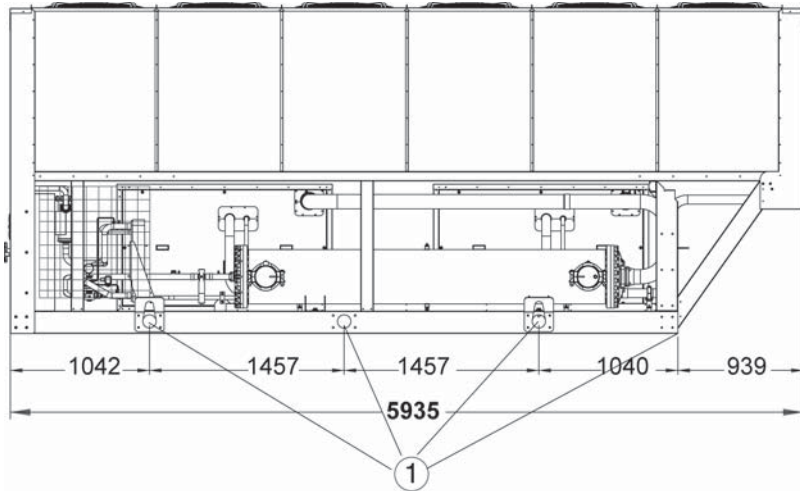
Mod.		Operation								Transport			
		A	B	Antivibration dampers						TOTAL WEIGHT	A	B	TOTAL WEIGHT
				W1	W2	W3	W4	W5	W6				
580.2	AB	966	2357	1050	932	814	816	702	580	4894	929	2386	4632
	AS	949	2354	1116	989	863	843	721	591	5123	913	2382	4861
630.2	AB	960	2354	1083	965	847	849	735	613	5089	881	1969	4827
	AS	943	2351	1149	1022	896	876	754	624	5318	965	1969	5056
680.2	AB	953	2350	1115	997	879	881	767	645	5284	885	2009	5022
	AS	936	2347	1181	1054	928	908	786	656	5513	869	2006	5251

NOTA:

For Desuperheater versions the total weight increases of 3/4%. For Heat recovery versions the total weight increases of 8/10%.

DIMENSIONAL AND PHYSICAL DATA

Mod. 780.2



* - only for transport



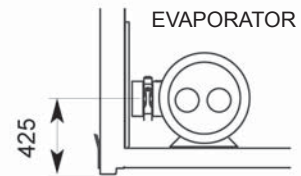
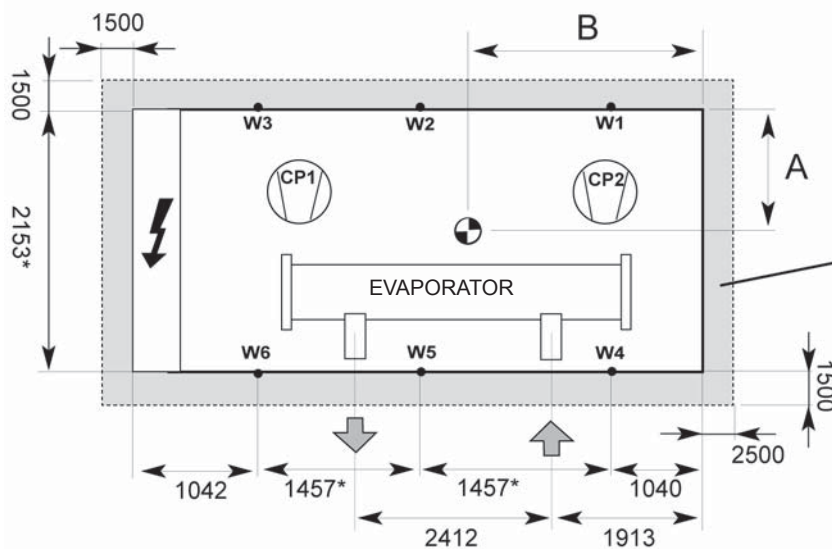
POWER SUPPLY

Description of the components

- 1 - Lifting points/brackets \varnothing base holes = 100mm
- 2 - Display and keypad to control the unit

In the following drains the measuras are refered to the base plate of the unit.

The unit water inlet (IN) and outlet (OUT) occur through 6" flexible Victaulic couplings (DN 150).



Minimum space required for operation

Refer to the figure alongside for the dimensions of the unit. To correctly install the unit, comply with the measurements for the free area that must be left around the machine, as shown in the figure. The distances must be doubled if the unit is to be installed in a pit.

NOTE: Allow for a clear area of not less than

2.5 meters above unit.

The functional areas must be doubled if multiple units are installed.

* Center distance for vibration damper holes $\varnothing=17$ mm

W1-W6 - they indicate the position where the spring antivibration dampers (accessory) are installed.

Weights and position of the centre of gravity in transport and operation

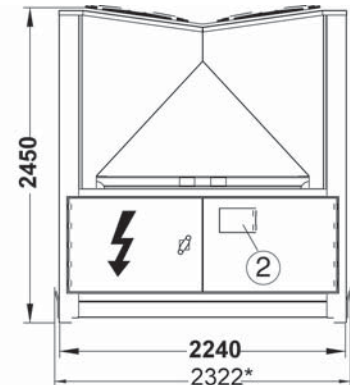
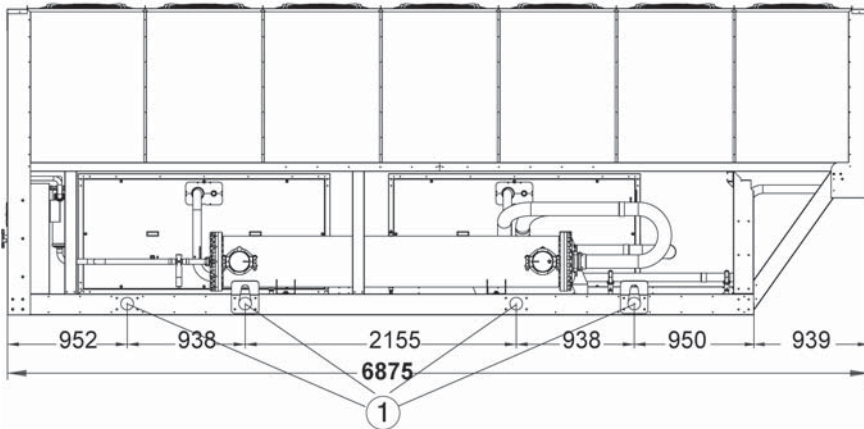
Mod.		Operation								Transport			
		A	B	Antivibration dampers						TOTAL WEIGHT	A	B	TOTAL WEIGHT
				W1	W2	W3	W4	W5	W6				
780.2	AB	970	2245	1344	1101	858	1084	841	598	5826	940	2264	5578
	AS	952	2241	1410	1158	907	1111	860	609	6055	932	2260	5807

NOTA:

For Desuperheater versions the total weight increases of 3/4%. For Heat recovery versions the total weight increases of 8/10%.

DIMENSIONAL AND PHYSICAL DATA

Mod. 900.2



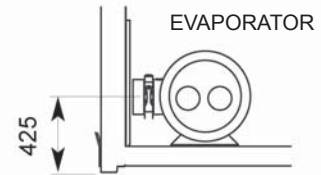
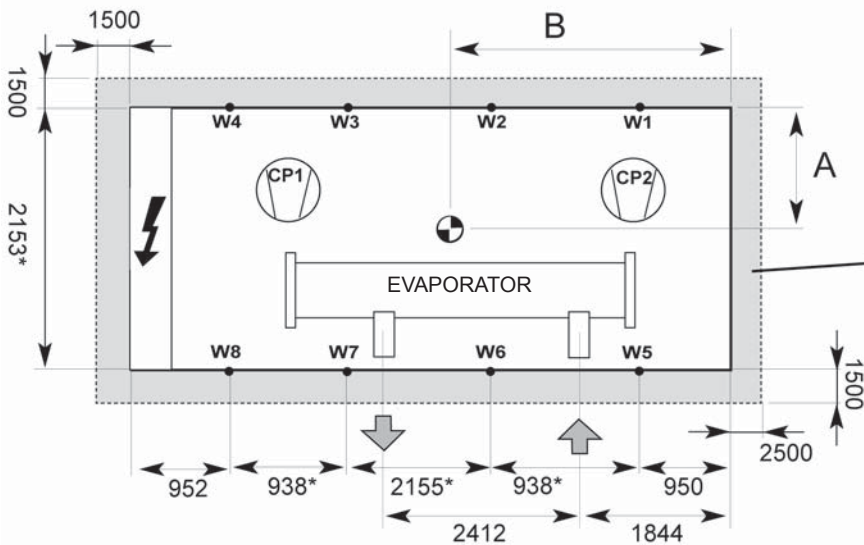
* - only for transport

↑
POWER SUPPLY

Description of the components

- 1 - Lifting points/brackets \varnothing base holes = 100mm
- 2 - Display and keypad to control the unit

In the following draings the measuras are refered to the base plate of the unit.
The unit water inlet (IN) and outlet (OUT) occur through 6" flexible Victaulic couplings (DN 150).



Minimum space required for operation

Refer to the figure alongside for the dimensions of the unit.

To correctly install the unit, comply with the measurements for the free area that must be left around the machine, as shown in the figure. The distances must be doubled if the unit is to be installed in a pit.

NOTE: Allow for a clear area of not less than 2.5 meters above unit.

The functional areas must be doubled if multiple units are installed.

* Center distance for vibration damper holes $\varnothing=17$ mm

W1-W8 - they indicate the position where the spring antivibration dampers (accessory) are installed.

Weights and position of the centre of gravity in transport and operation

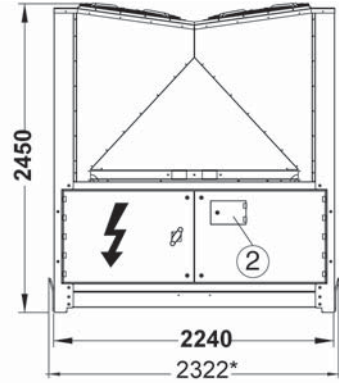
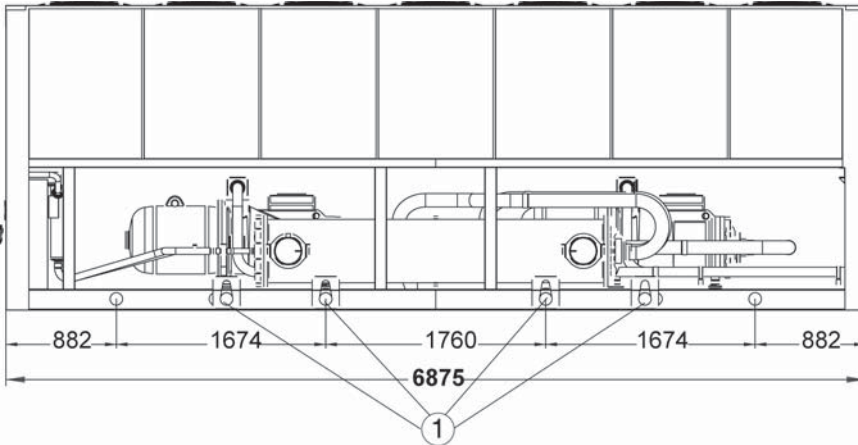
Mod.		Operation										Transport			
		A	B	Antivibration dampers								TOTAL WEIGHT	A	B	TOTAL WEIGHT
				W1	W2	W3	W4	W5	W6	W7	W8				
900.2	AB	903	2866	1067	1045	986	949	765	727	658	626	6823	877	2867	6582
	AS	890	2861	1174	1125	1005	941	840	774	643	585	7087	864	2862	6846

NOTA:

For Desuperheater versions the total weight increases of 3/4%. For Heat recovery versions the total weight increases of 8/10%.

DIMENSIONAL AND PHYSICAL DATA

Mod. 1000.2



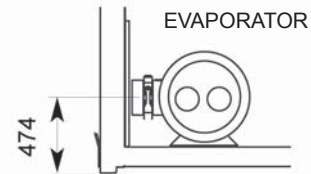
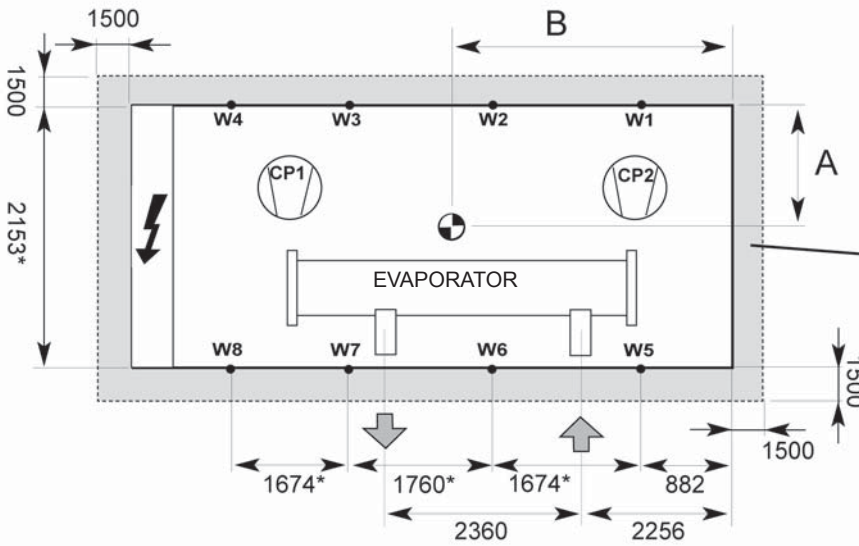
* - only for transport

POWER SUPPLY

Description of the components

- 1 - Lifting points/brackets Ø base holes = 100mm
- 2 - Display and keypad to control the unit

The unit water inlet (IN) and outlet (OUT) occur through 8" flexible Victaulic couplings (DN 200).



Minimum space required for operation

Refer to the figure alongside for the dimensions of the unit.

To correctly install the unit, comply with the measurements for the free area that must be left around the machine, as shown in the figure. The distances must be doubled if the unit is to be installed in a pit.

NOTE: Allow for a clear area of not less than 2.5 meters above unit.

The functional areas must be doubled if multiple units are installed.

* Center distance for vibration damper holes Ø=17mm

W1-W8- they indicate the position where the spring antivibration dampers (accessory) are installed.

Weights and position of the centre of gravity in transport and operation

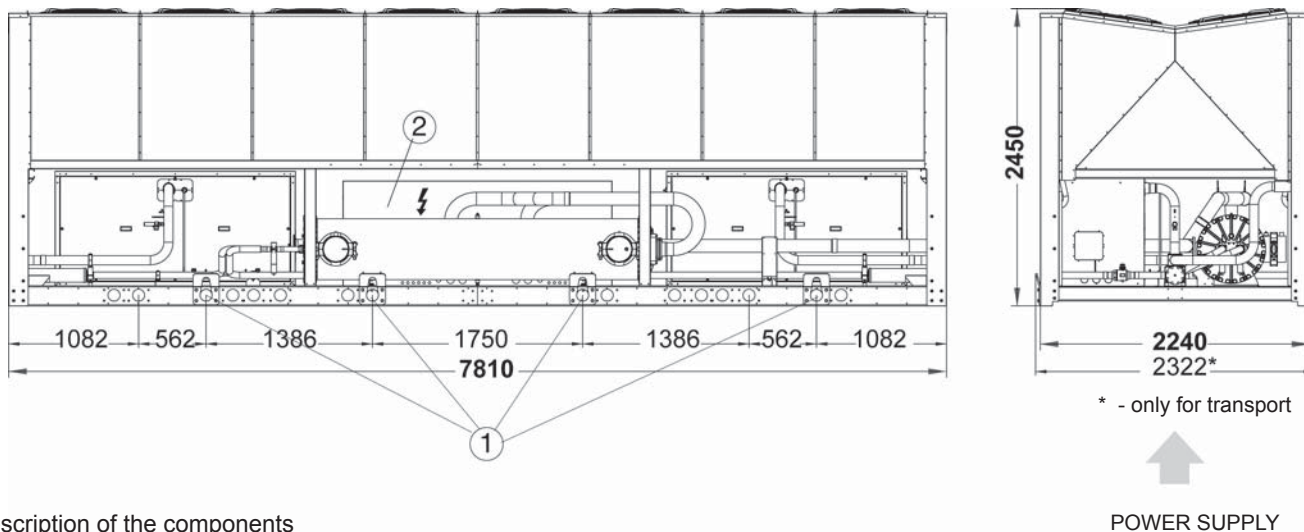
Mod.		Operation										Transport			
		A	B	Antivibration dampers								TOTAL WEIGHT	A	B	TOTAL WEIGHT
				W1	W2	W3	W4	W5	W6	W7	W8				
1000.2	AB	936	3455	1136	1144	1153	1161	821	829	838	846	7928	906	3458	7515
	AS	922	3453	1243	1224	1172	1153	896	876	823	805	8192	898	3457	7779

NOTA:

For Desuperheater versions the total weight increases of 3/4%. For Heat recovery versions the total weight increases of 8/10%.

DIMENSIONAL AND PHYSICAL DATA

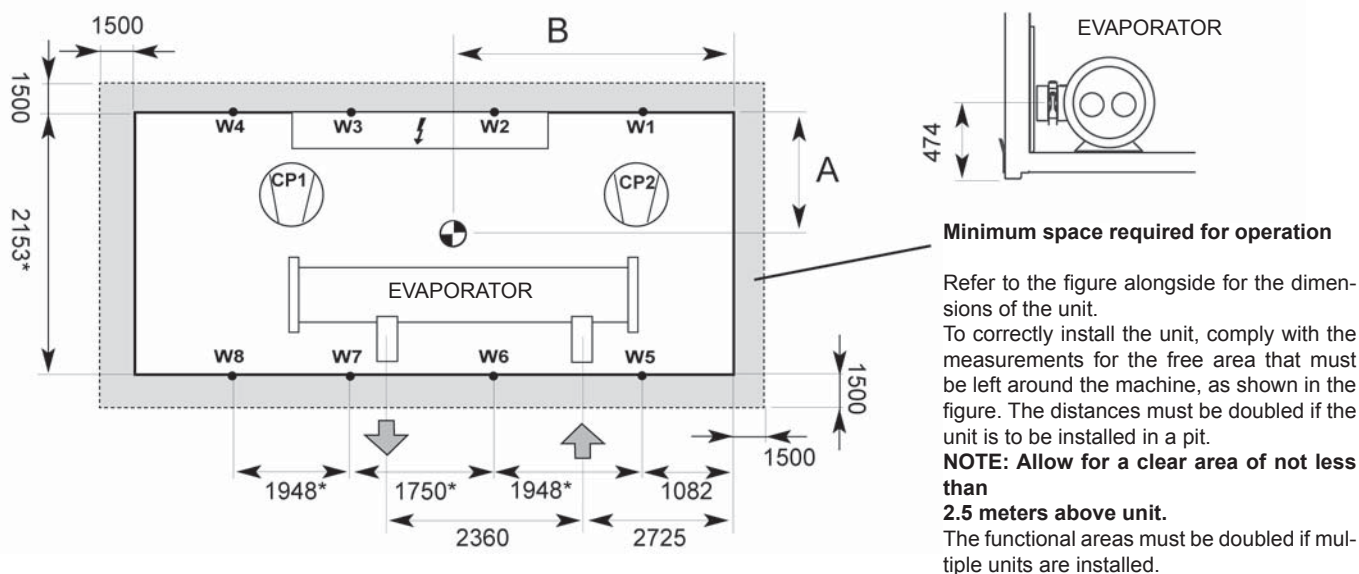
Mod. 1150.2



Description of the components

- 1 - Lifting points/brackets \varnothing base holes = 100mm
- 2 - Display and keypad to control the unit

The unit water inlet (IN) and outlet (OUT) occur through 8" flexible Victaulic couplings (DN 200).



* Center distance for vibration damper holes $\varnothing=17\text{mm}$

W1-W8 - they indicate the position where the spring antivibration dampers (accessory) are installed.

Weights and position of the centre of gravity in transport and operation

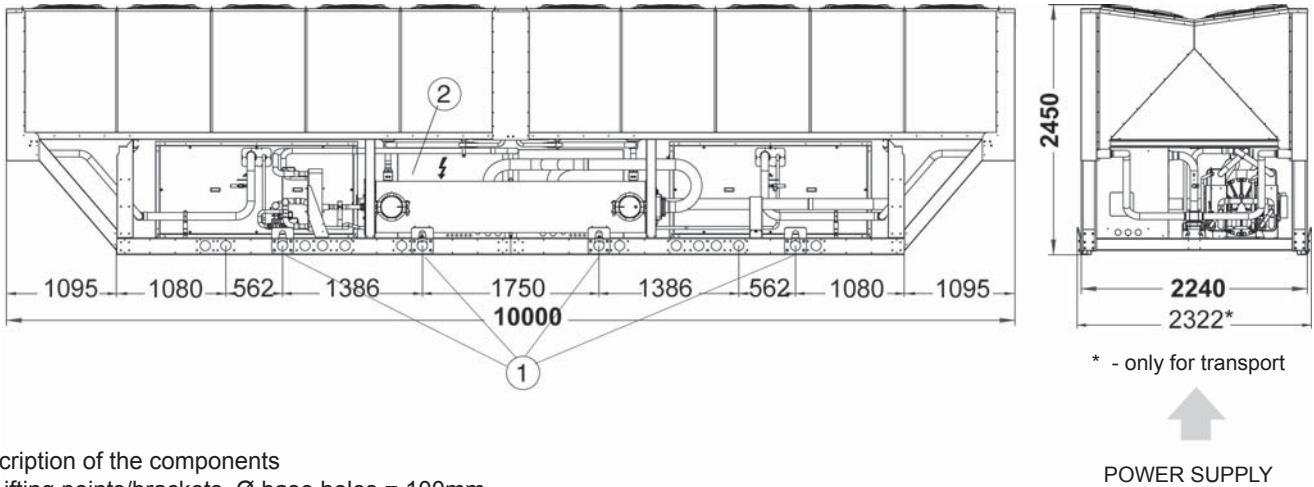
Mod.		Operation										Transport			
		A	B	Antivibration dampers								TOTAL WEIGHT	A	B	TOTAL WEIGHT
				W1	W2	W3	W4	W5	W6	W7	W8				
1150.2	AB	932	3454	1225	1226	1225	1228	837	841	838	840	8260	911	3457	7862
	AS	918	3452	1332	1306	1244	1220	912	888	823	799	8524	898	3456	8126

NOTA:

For Desuperheater versions the total weight increases of 3/4%. For Heat recovery versions the total weight increases of 8/10%.

DIMENSIONAL AND PHYSICAL DATA

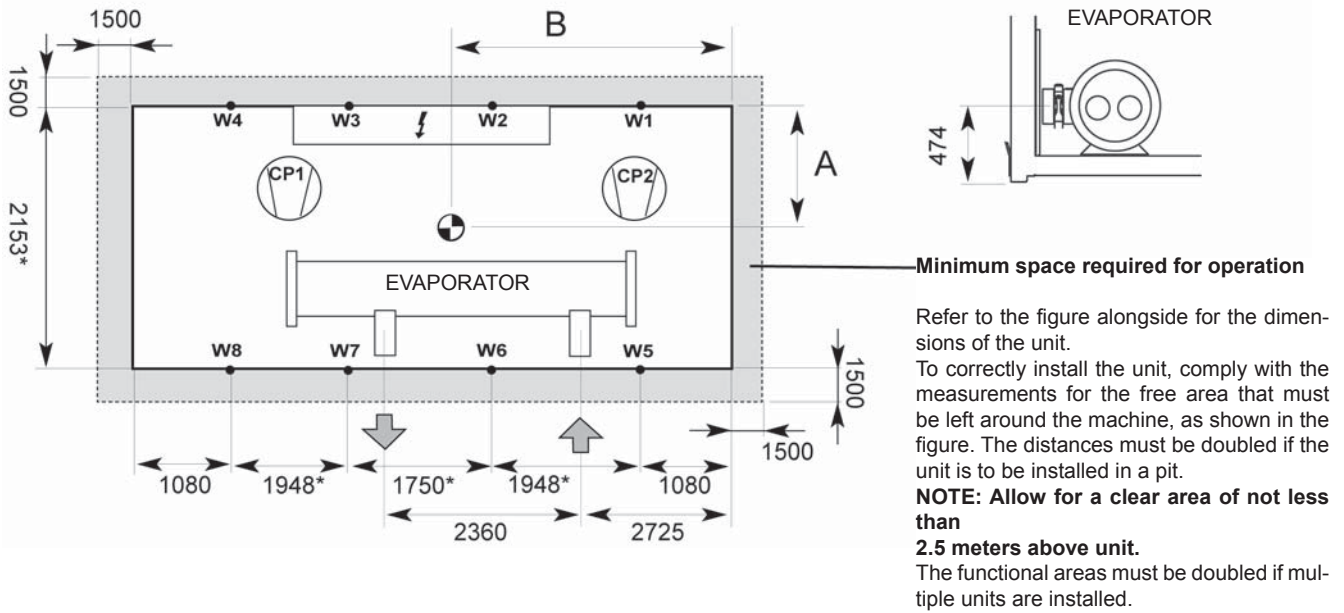
Mod. 1300.2



Description of the components

- 1 - Lifting points/brackets \varnothing base holes = 100mm
- 2 - Display and keypad to control the unit

In the following draings the measuras are refered to the base plate of the unit.
The unit water inlet (IN) and outlet (OUT) occur through 8" flexible Victaulic couplings (DN 200).



* Center distance for vibration damper holes $\varnothing=17$ mm

W1-W8 - they indicate the position where the spring antivibration dampers (accessory) are installed.

Weights and position of the centre of gravity in transport and operation

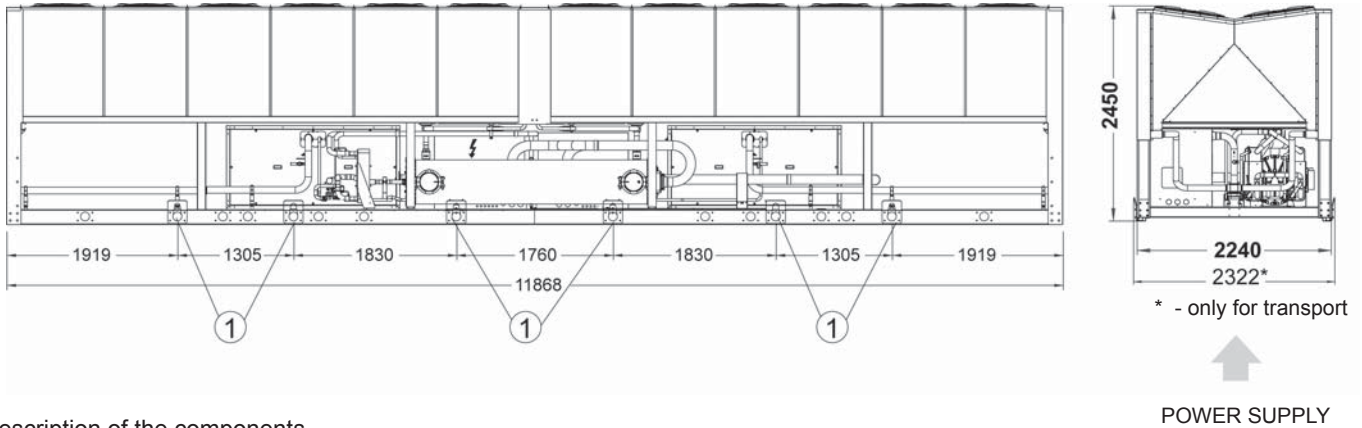
Mod.		Operation										Transport			
		A	B	Antivibration dampers								TOTAL WEIGHT	A	B	TOTAL WEIGHT
				W1	W2	W3	W4	W5	W6	W7	W8				
1300.2	AB	945	3937	1317	1331	1350	1373	939	952	966	988	9216	926	3940	8811
	AS	931	3935	1424	1411	1369	1365	1014	999	951	947	9480	908	3939	9075

NOTA:

For Desuperheater versions the total weight increases of 3/4%. For Heat recovery versions the total weight increases of 8/10%.

DIMENSIONAL AND PHYSICAL DATA

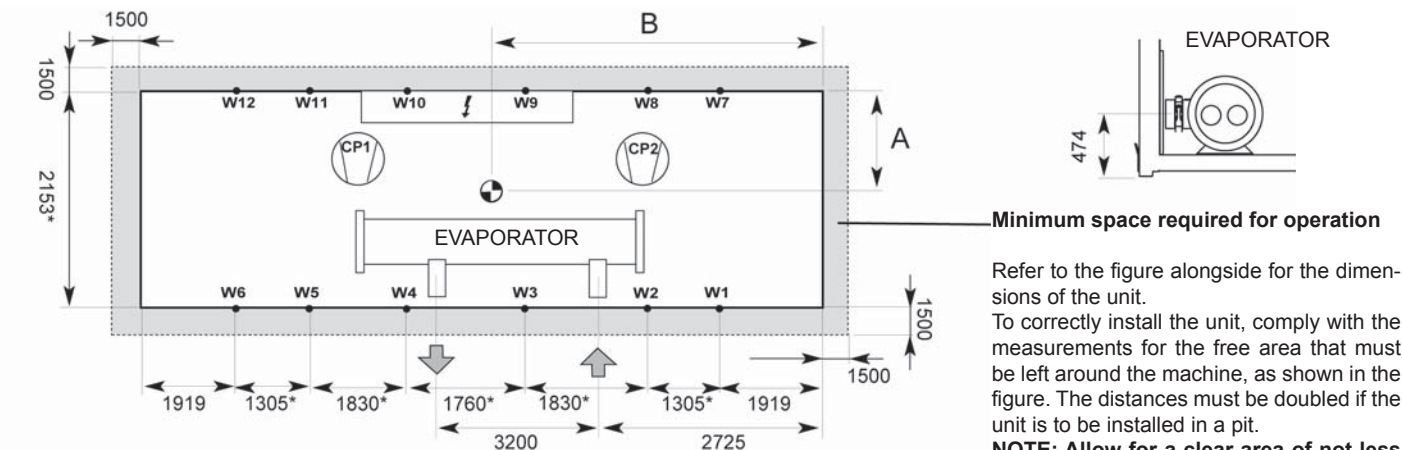
Mod. 1450.2



Description of the components

- 1 - Lifting points/brackets \varnothing base holes = 100mm
- 2 - Display and keypad to control the unit

In the following draings the measuras are refered to the base plate of the unit.
The unit water inlet (IN) and outlet (OUT) occur through 8" flexible Victaulic couplings (DN 200).



Minimum space required for operation

Refer to the figure alongside for the dimensions of the unit.

To correctly install the unit, comply with the measurements for the free area that must be left around the machine, as shown in the figure. The distances must be doubled if the unit is to be installed in a pit.

NOTE: Allow for a clear area of not less than 2.5 meters above unit.

The functional areas must be doubled if multiple units are installed.

* Center distance for vibration damper holes $\varnothing=17\text{mm}$

W1-W12 - they indicate the position where the spring antivibration dampers (accessory) are installed.

Weights and position of the centre of gravity in transport and operation

Mod.		Operation														Transport			
		A	B	Antivibration dampers												TOTAL WEIGHT	A	B	TOTAL WEIGHT
				W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12				
1450.2	AB	940	5943	926	997	818	826	990	910	718	807	709	697	818	706	9922	911	5948	9379
	AS	925	5948	956	1077	846	856	1069	935	729	821	702	686	818	691	10186	896	5953	9643

NOTA:

For Desuperheater versions the total weight increases of 3/4%. For Heat recovery versions the total weight increases of 8/10%.

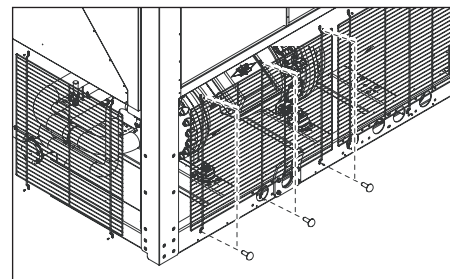
DIMENSIONAL AND PHYSICAL DATA

Coils and Antintrusion Guard protection

The unit is shipped with some Antintrusion guard not installed in order to avoid damages during the transport.

Please refer to the attached drawings to install the guards.

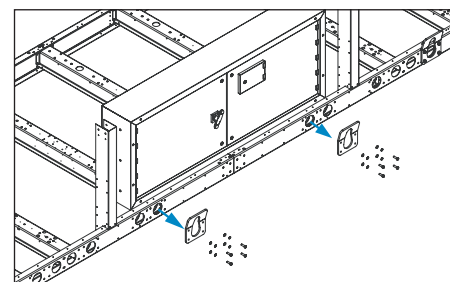
Each grill is fasten to the unit frame by 6 screw (4.8x13)



Remove the Lift plates

The lift plates could be removed unscrewing the 4 bolts fasten to base plate.

In order to access to the electrical panel, at least remove the 2 lift plates in front of it.



Vibration-damper installation

To prevent the operating unit from transmitting vibrations to the bearing structure, vibration dampening materials should be inserted under the bearing points.

The unit can be supplied with the rubber or spring vibration dampening accessory.

This must be mounted by the installer.

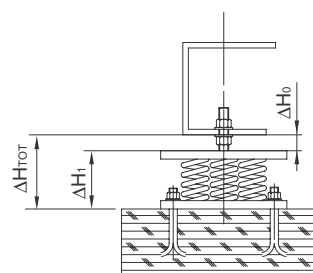
NOTE: If the unit is installed with spring vibration dampers, the height of the wet connections from the ground must be increased by the DH value.

$$\Delta H1 = 77 \pm 3$$

The jack supplied with vibration-dampers gives a further increase in weight of:

$$\Delta H0 = 40 \pm 10$$

Base hole
 $\varnothing = 17 \text{ mm}$

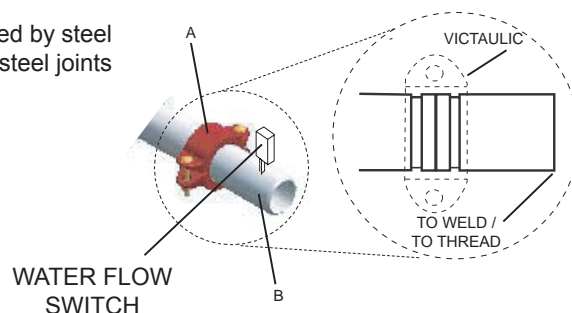


Victaulic connections and water flow switch (accessories)

These comprise two wet connections of the Victaulic type (Fig. 1-A) composed by steel joint (Fig. 1-B) and rubber packing not installed (supplied with the unit). The steel joints are suitable to be welded or threaded.

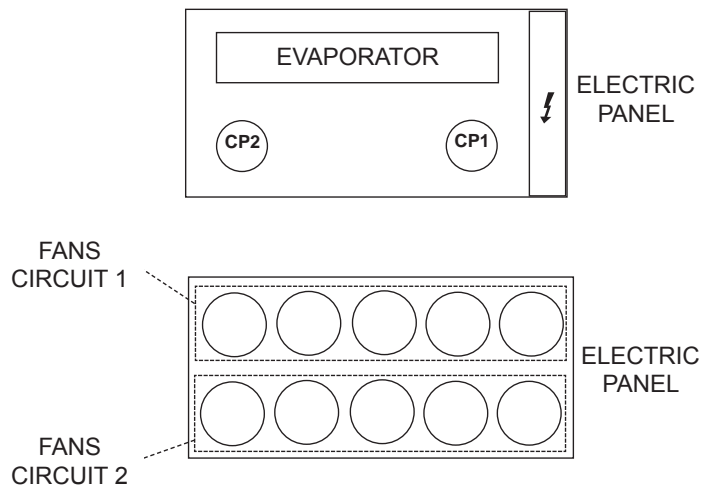
Nota:

Supplied as accessory (see "Accessory and optional equipment")

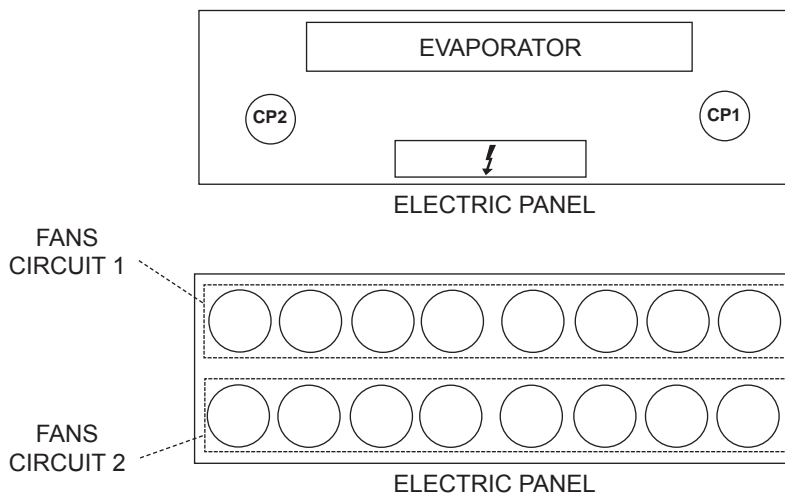


LAYOUT OF THE MAIN COMPONENT OF THE UNIT

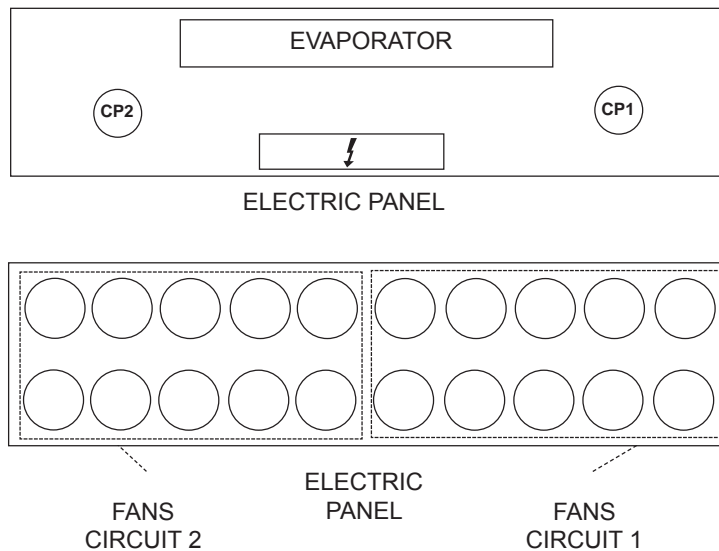
Mod. 360.2 - 410.2
 Mod. 460.2 - 520.2
 Mod. 580.2 - 630.2 - 680.2
 Mod. 780.2 - 900.2
 Mod. 1000.2



Mod. 1150.2



Mod. 1300.2 - 1450.2



ELECTRICAL CONNECTIONS

General rules

The appliance must be wired in compliance with the laws in force in the country in which it is installed. The units are supplied fully wired in the factory and pre-engineered for connection to the electricity main. The electric panel is made in compliance with the technical standards in force in the European Union.

Structure of the electric panel

All the electrical components are contained in a closed casing protected against the atmospheric agents and inspectionable by opening the front door after removing the front panel. The door for accessing the power section is locked by the mechanism. Access for the supply cables and earth cable (PE) is permitted through the opening on the bottom of the electric panel.

Composition of the system

The system comprises an electromechanical part consisting of the power circuit, with disconnecting device, contactors, fuses or thermal cutouts, transformer, and another part comprising the Microprocessor control system.

NOTES: Refer to the wiring diagram supplied with the unit for the layout of the electric panel.

Electrical connections

All electrical connections must be carried out by qualified personnel in the absence of electric power. The table below gives the electrical specifications of the different constructional configurations of the units.

Basic Version VB

UNIT	360.2	410.2	460.2	520.2	580.2	630.2	680.2	780.2	900.2	1000.2	1150.2	1300.2	1450.2	UM
Alimentazione	400 - 3 - 50													V-ph-Hz
TOTAL FLA	298	336	371	406	458	492	526	534	702	792	878	978	994	A
TOTAL FLI	180	206	226	246	276	297	318	322	434	484	536	600	608	kW
TOTAL MIC	515	607	704	739	861	914	948	956	844	1010	1121	1334	1350	A

NOTES:

FLA= Power draw at maximum tolerated conditions

FLI= Electric power draw at maximum tolerated conditions

LRA= Surge current

MIC= Maximum surge current of the unit

Compressor specification

UNIT	360.2	410.2	460.2	520.2	580.2	630.2	680.2	780.2	900.2	1000.2	1150.2	1300.2	1450.2	UM	
Alimentazione	400 - 3 - 50													V-ph-Hz	
FLA	CP 1	133	152	152	187	209	209	243	243	323	368	407	449	449	A
	CP 2	133	152	187	187	209	243	243	243	323	368	407	449	449	
FLI	CP 1	82	95	95	115	128	128	149	149	203	228	252	280	280	kW
	CP 2	82	95	115	115	128	149	149	149	203	228	252	280	280	
LRA	CP 1	350	423	423	520	612	612	665	665	465	586	650	805	805	A
	CP 2	350	423	520	520	612	665	665	665	465	586	650	805	805	

Fan specification

UNIT	360.2	410.2	460.2	520.2	580.2	630.2	680.2	780.2	900.2	1000.2	1150.2	1300.2	1450.2	UM
Alimentazione	400 - 3 - 50													V-ph-Hz
FLA	298	336	371	406	458	492	526	534	702	792	878	978	994	A
FLI	180	206	226	246	276	297	318	322	434	484	536	600	608	kW
LRA	515	607	704	739	861	914	948	956	844	1010	1121	1334	1350	A

For a complete information see the section "Layout of the main component of the unit".

ELECTRICAL CONNECTIONS

1) Connection to the electricity main

• Power supply line;

The machine's power supply line must be laid by following a clearly defined route in order to make it as correct as possible any without any breaks. Pass the line through the opening on the button of the electrical panel. Secure the line integral with the structure of the machine. Then continue inside the panel and connect the conductors directly to the input terminals of the main disconnecting device of the machine.

• Power supply system;

The power cables of the machine's supply line must be taken from a system of symmetrical three-phase voltages and of a separate protection conductor.

$$V = 400V \pm 10\%$$
$$f = 50 \text{ Hz}$$

• Protection on supply side:

An automatic switch must be installed on the supply side of the side in order to protect against any overcurrents and indirect contacts that could occur when the machine is operating.

It is advisable to install an automatic current limiter switch in order to limit the effective short-circuit current in the connecting point of the machine. This allows a protection device with a lower breaking capacity than that required in the connection point to be sized like the main circuit-breaker of the machine.

The line and switch must be coordinated in compliance with the current laws governing electrical safety matters, regarding the type of installation and environmental conditions in which the machine must operate.

• Protection conductor (ground wire):

The protection conductor from the feeder line must be connected straight to the ground screw identified by code "**PE**", which ensures the equipotential connection of all metal grounding points and structural parts of the machine.

2) Electric panel

• Protection degree:

The electric panel casing is made from sheet metal and has IP54 protection rating at the doors directly accessible from the outside. The other parts of the casing guarantee a protection degree that is at least equivalent to **IP22**, as established by the current laws in force: this has been achieved since the panel has further protection against the penetration of solid foreign bodies and atmospheric agents thanks to the machine structure in which it is housed.

• Starting and stopping function:

The red handle on the panel door directly acts on the main circuit-breaker. The handle also acts as a door lock since it ensures that the machine is only powered when the door is shut. The stopping function carried out by the main circuit-breaker is classified as type "0" since the machine is stopped by immediately cutting off the power supply.

3) Reference standards

• The provisions established by the following Directives have been complied with to ensure the safety of the electrical products placed on the European Union market:

- Low Voltage Directive **2006/95 EEC** which also includes the following harmonized standards:

CEI EN 60335-1 and 60335-2-40.

Classification: **CEI EN 60204-1**. Safety of machinery. Electrical equipment of machines. Part 1: General rules.

- Directive **2004/108/EEC** concerning "**Electromagnetic compatibility**".

4) User connection

On the electric panel are available the terminal connection for:

a) control of a pump group with 1 or 2 pumps and relative safety devices (relay 230V-2A)

b) clear contact input for remote ON/OFF of the unit

The following additional connections are present on Heat recovery versions:

c) general alarm relay (SPDT NO/NC 230V-2A)

d) recovery circulating pump control and relative safety devices (relay 230V-2A)

e) remote input for enabling of recovery mode

For more details refer to the wiring diagram of the unit.

WET CONNECTIONS

General rules

A mesh filter (hole $\varnothing \leq 500 \mu\text{m}$) must be installed on the unit's water inlet otherwise warranty is immediately forfeited. The filter performs the function of blocking any foreign matter in the system's plumbing circuit (shavings, machining debris, etc.). This prevents the shell and tube heat exchanger pipes from clogging then possibly freezing (and therefore bursting).

Comply with the local laws governing safety matters in order to correctly design the hydraulic circuit. The following information gives suggestions on how to correctly install the unit.

1) Standard supply.

• Standard supply includes a differential pressure switch situated between the water inlet and outlet of the shell and tube heat exchanger to avoid freezing if the water flow stops for any reason.

Activation is calibrated for a **80 mbar $\pm 5 \Delta p$** , while resetting occurs with a **Δp of 105 mbar ± 5** .

The differential pressure switch opens the contact and shuts down the unit when the water delivery decreases and $\Delta p \leq 80 \text{ mbar} \pm 5$.

The differential pressure switch closes and therefore the unit can restart when the water delivery increases and $\Delta p \leq 105 \text{ mbar} \pm 5$.

• The unit is supplied with an antifreeze heater as a protection of the evaporator. This enables protecting the unit from winter frost down to an air temperature = -10°C .

2) With pumping module accessory.

• Besides the standard accessories, the unit is equipped with all the hydraulic components, as specified in the "Options and accessories" section.

Hydraulic layout of the system

General suggestions

• The pipes must have the least possible number of bends to minimize load losses and must be adequately supported in order to prevent the connections of the unit from being excessively stressed.

• Install on-off valves near components that need to be serviced to isolate them when maintenance work needs to be done and to allow them to be replaced without having to discharge the system.

• Before isolating the pipes and charging the system, carry out preliminary inspections to make sure that there are no leaks.

• Isolate all the chilled water pipes to prevent condensation from forming along the pipes themselves. Make sure that the material used is the steam barrier type, failing this, cover the insulation with an appropriate protection. Also make sure that the air venting valves can be accessed through the insulation.

• Do not forget to install or at least allow for the installation of pressure and temperature reading instruments on the inlet and outlet parts of the hydraulic circuit. These instruments will allow you to monitor the operation of the system.

• The circuit can be kept under pressure by means of an expansion tank and a pressure reducer. A plant filling unit can also be used in order to automatically charge the system and keep it at the desired pressure if it drops below a certain pressure value. Install manual or automatic valves in the highest point of the system to eliminate air from the circuit.

Fit manual or automatic valves at the highest point in the circuit in order to vent air from the circuit.

• If anti-vibration mounts are installed under the unit, it is recommended to use flexible couplings before and after the water circulation pump and near the unit.

• Install a cock on the outlet of the unit in order to regulate the water flow.

Precautions for the Winter

The water could freeze and damage the exchanger of the unit and other parts of the system during the winter period, if the system was to remain at a standstill. This problem can be obviated in 3 different ways:

1. Drain the system completely, taking care to drain the exchangers and the pumps (if present) in order to drain the unit's plumbing system completely, open the water drain ball valves and the air vent valves.

N.B. The shell and tube evaporator is equipped with a water drain cock (Fig.1) and an air vent.

2. Operate with brine mixture taking account, depending on the % of glycol, of the factor of correction of the refrigerating capacity, power input, water flow rate and losses of head (see the paragraph "Correction factor for the use of glycol" on the section "GENERAL SPECIFICATIONS - IR UNIT FOR COOLING MODE ONLY").

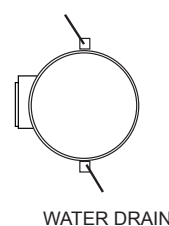
3. If it is certain that the unit will always be powered throughout the winter, the unit is able to protect itself from freezing, down to a temperature of -10°C : this is possible thanks to the antifreeze electric heating element installed on the exchanger and intelligent control of the water pump that must be governed by the microprocessor board (see the "Electric Connections" section).

If the unit is fitted with a Storage tank, solution no. 3 requires installing the tank antifreeze heating element accessory.

EVAPORATOR

AIR VENT

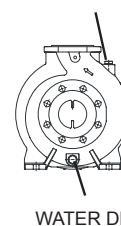
Fig. 1



PUMP

AIR VENT

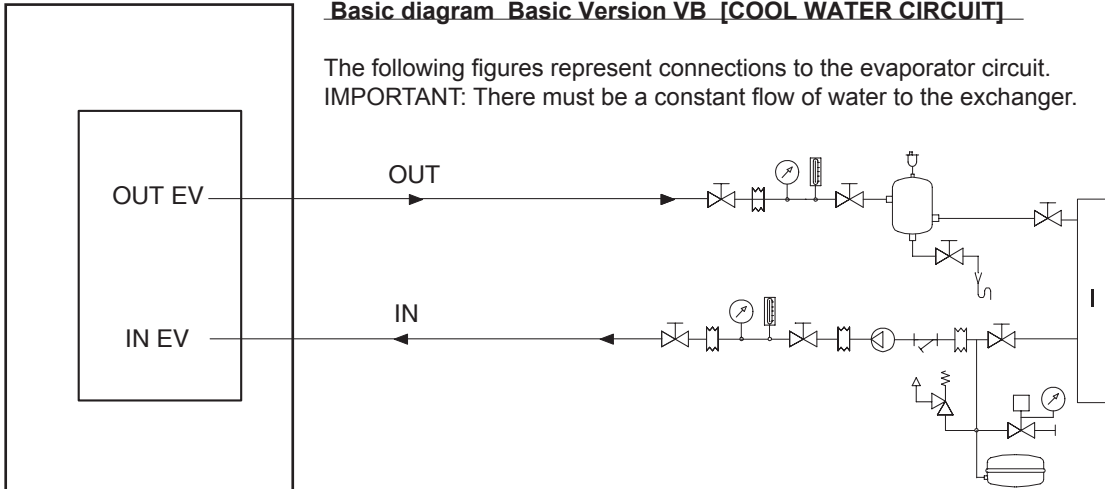
Fig. 2



WET CONNECTIONS

Basic diagram Basic Version VB [COOL WATER CIRCUIT]

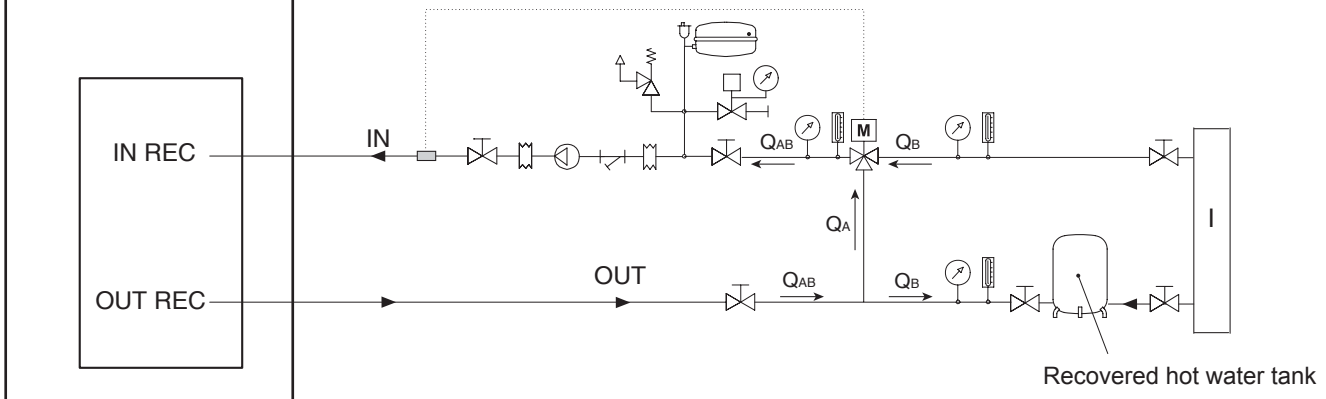
The following figures represent connections to the evaporator circuit.
IMPORTANT: There must be a constant flow of water to the exchanger.



Basic diagram for units with Heat Recovery [HOT WATER CIRCUIT]

The basic diagram given is valid for all the Special Versions VD - VR

The figure below shows the basic diagram of the portion of the system with the heat exchanger used for recovering partially or totally heating power that would otherwise be disposed of in the air.



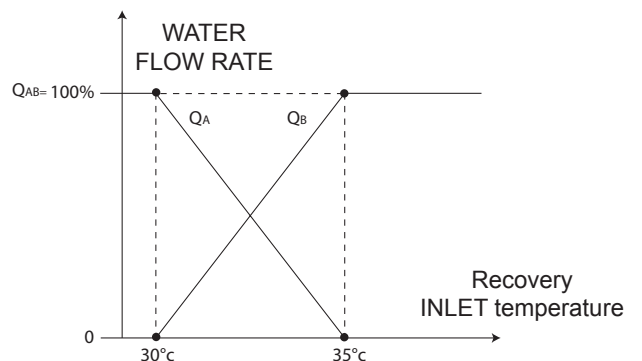
I = User system
 C = Chiller

- | | | | | | | | |
|--|--|--|----------------|--|----------------|--|---------------------------------|
| | Pressure gauge | | Pump | | Air vent valve | | Water filling unit |
| | Thermometer | | Filter | | Safety valve | | Three-way driven valve |
| | On-off and/or water flow rate regulating valve | | Tank | | Coupling | | Recovery water flow inlet probe |
| | Monitoring electronics (governor) | | Expansion tank | | | | |

Valve regulating diagram Three-way driven valve

To prevent problems from occurring when the machine is started with very cold water, you are strongly advised to install a mixer valve as shown in the diagram.

The valve must be regulated to suit the temperature at which the water flows into the recovery part (see diagram): the graph on the right shows the type of adjustment to use.



R407C PROTECTION DEVICES

Protection devices HIGH PRESSURE

The unit is protected against risk of overpressure by means of 4 levels protection chain.

Each compressor and so each circuit is equipped with:

- 1) ATC (Cooling Capacity Control)
- 2) high pressure transducer connected to electronic controller
- 3) high pressure automatic switch connected to electronic controller
- 4) high pressure manual switch connected to compressor contactor command and to electronic controller
- 5) high pressure safety valve

Protection devices technical data

LEVEL	1	2	3	4	5
Device	High pressure transducer ATC (Cooling Capacity Control)	High pressure transducer	High pressure automatic switch	High pressure manual switch	High pressure safety valve
Trip out	25.5 bar	27.5 bar	28 bar	29 bar	31 bar
Trip in	Automatic	19.5 bar	23 bar	RESET MANUALE	28 bar
connected to	electronic controller	electronic controller	electronic controller	compressor contactor command and electronic controller	Discharge the refrigerant to atmosphere to reduce the system pressure
effect	Controls the cooling capacity product by the compressor to have a correct operation inside the admissible limits	stop the compressor and the fans. The electronic expansion valve closed	stop the compressor and the fans. The electronic expansion valve closed	stop the compressor and the fans. The electronic expansion valve closed	Discharge the refrigerant to atmosphere to reduce the system pressure
reset *	Automatic	YES by keyboard after the solution of the problem that generates the alarm	YES by keyboard if the high pressure switch has trip-in and after the solution of the problem that generates the alarm	1) reset the button present on the manual pressure switch 2) then reset the alarm by keyboard	Not Necessary

*: For more details refers to section monitoring basic system.

Protection devices LOW PRESSURE

LEVEL	1	2
Device	Low pressure transducer	Low pressure automatic switch
Trip out	2.5 bar	1.38 bar
Trip in	3.5 bar	1.41 bar
connected to	electronic controller	electronic controller
effect	stop the compressor and the fans. The electronic expansion valve closed	stop the compressor and the fans. The electronic expansion valve closed
reset *	YES by keyboard after the solution of the problem that generates the alarm	YES by keyboard if the low pressure switch has trip-in and after the solution of the problem that generates the alarm

Protection devices DISCHARGE TEMPERATURE

LEVEL	1	2
Device	Liquid Injection (if present)	Discharge Temperature
Trip out	110°C	130°C
Trip in	100°C	120°C
connected to	electronic controller	electronic controller
effect	activates the liquid injection to the compressor, until the discharge temperature decrease down to the maximum admissible value	stop the compressor and the fans. The electronic expansion valve closed
reset *	Automatic	YES by keyboard after the solution of the problem that generates the alarm

Protection devices LOW PRESSURE - MOP (Maximum Operation Low Pressure)

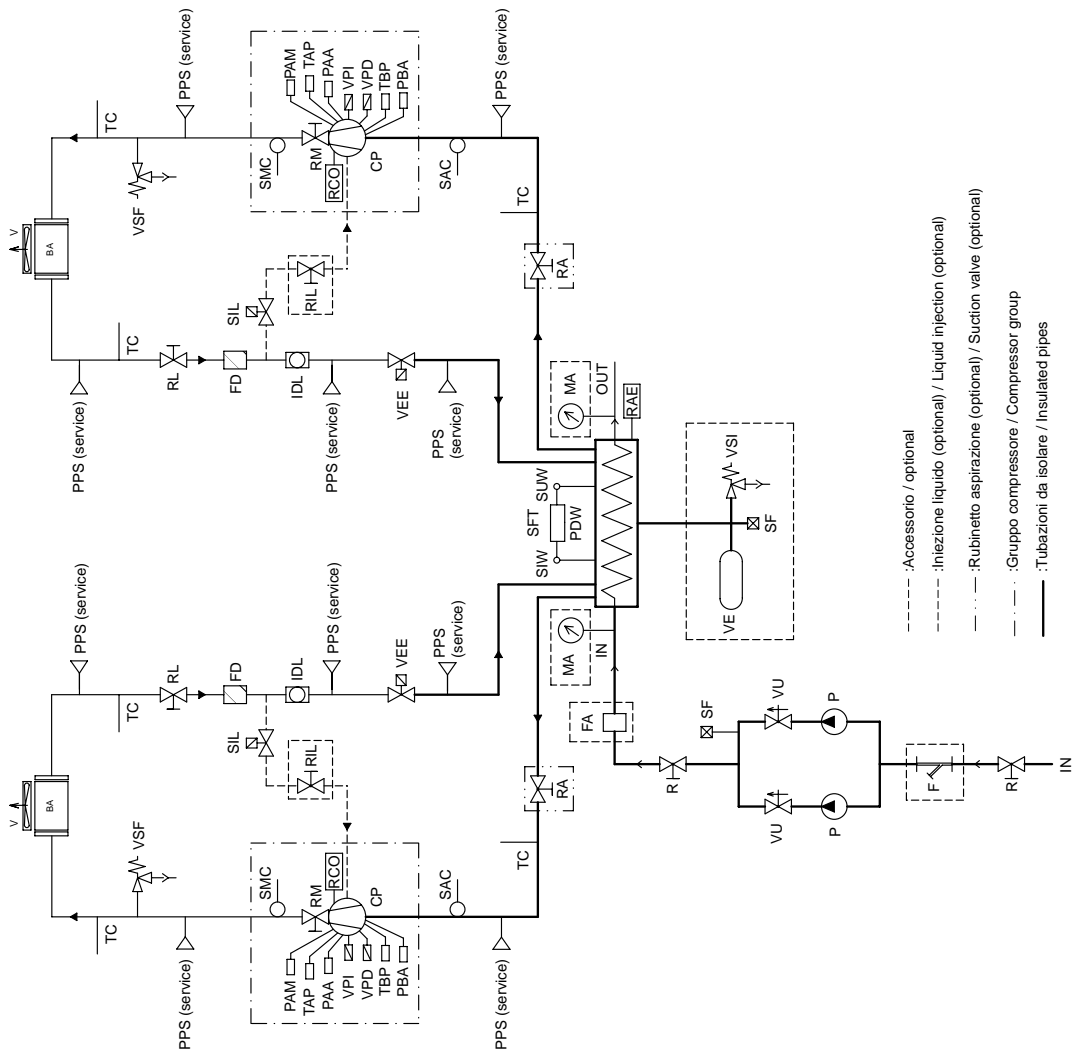
The electronic valve's controller limits the maximum operation valve the low pressure as indicated in the table.

	LOW PRESSURE
MOP (Maximum Operation Low Pressure)	6.4 bar (15°C)

REFRIGERANT FLOW DIAGRAM

Refrigerant flow diagram basic version

	Descrizione	Description
BA	BATTERIA ALETTATA	COIL
CP	COMPRESSORE VITE	SCREW COMPRESSOR
F	FILTRO ACQUA	WATER FILTER
FA	FLUSSOSTATO ACQUA	WATER FLOW SWITCH
FD	FILTRO DEIDRATORE	DRIER FILTER
IDL	INDICATORE LIQUIDO E UMIDITA'	LIQUID AND MOISTURE INDICATOR
MA	MANOMETRO ACQUA	WATER PRESSURE GAUGE
P	POMPA	PUMP
PAA	PRESSOSTATO DI ALTA RIARMO AUTOMATICO	AUTOMATIC RESET HIGH PRESSURE SWITCH
PBA	PRESSOSTATO DI BASSA AUTOMATICO	AUTOMATIC LOW PRESSURE SWITCH
PAM	PRESSOSTATO DI ALTA RIARMO MANUALE	MANUAL RESET HIGH PRESSURE SWITCH
PDW	PRESSOSTATO DIFFERENZIALE ACQUA	DIFFERENTIAL WATER PRESSURE SWITCH
PPS	PRESA DI PRESSIONE % SAE CON SPILLO	PRESSURE GAUGE WITH SCHRAEDER
R	RUBINETTO INTERCETTAZIONE	SHUT-OFF VALVE
RA	RUBINETTO APIRAZIONE (OPTIONAL)	SUCTION VALVE (OPTIONAL)
RAE	RESISTENZA ANTIGELO EVAPORATORE (OPTIONAL)	EVAPORATOR ANTI-FREEZE HEATER (OPTIONAL)
RCO	RESISTENZA CARTER OLIO	OIL CRANKCASE HEATER
RIL	RUBINETTO INIEZIONE DEL LIQUIDO (OPTIONAL)	LIQUID INJECTION BALL VALVE (OPTIONAL)
RL	RUBINETTO DEL LIQUIDO	LIQUID VALVE
RM	RUBINETTO DI MANDATA	DISCHARGE VALVE
SAC	SONDA ASPIRAZIONE COMPRESSORE	SUCTION TEMPERATURE PROBE
SF	VALVOLA SFILATO ARIA	AIR VENT VALVE
SFT	SCAMBIATORE A FASCIO TUBIERO	SHELL AND TUBE HEAT EXCHANGER
SIL	SOLENOIDE INIEZIONE LIQUIDO (OPTIONAL)	LIQUID INJECTION SOLENOID VALVE (OPTIONAL)
SIW	SONDA INGRESSO ACQUA	WATER INLET PROBE
SMC	SONDA MANDATA COMPRESSORE	DISCHARGE TEMPERATURE PROBE
SUW	SONDA USCITA ACQUA	WATER OUTLET PROBE
TAP	TRASDUTTORE ALTA PRESSIONE	HIGH PRESSURE TRANSDUCER
TBP	TRASDUTTORE BASSA PRESSIONE	LOW PRESSURE TRANSDUCER
TC	TRONCHETTO DI CARICA	PIPE FOR REFRIGERANT FILLING
V	VENTILATORE	FAN
VE	VASO DI ESPANSIONE	EXPANSION TANK
VEE	VALVOLA ESPANSIONE ELETTRONICA	ELECTRONIC EXPANSION VALVE
VPD	VALVOLA PARZIALIZZAZIONE DECREMENTO	DECREASING CONTROL CAPACITY VALVE
VPI	VALVOLA PARZIALIZZAZIONE INCREMENTO	INCREASING CONTROL CAPACITY VALVE
VSF	VALVOLA DI SICUREZZA CIRCUITO FRIGO	REFRIGERANT SAFETY VALVE
VSI	VALVOLA DI SICUREZZA ACQUA	WATER SAFETY VALVE
VU	VALVOLA UNIDIREZIONALE	CHECK VALVE

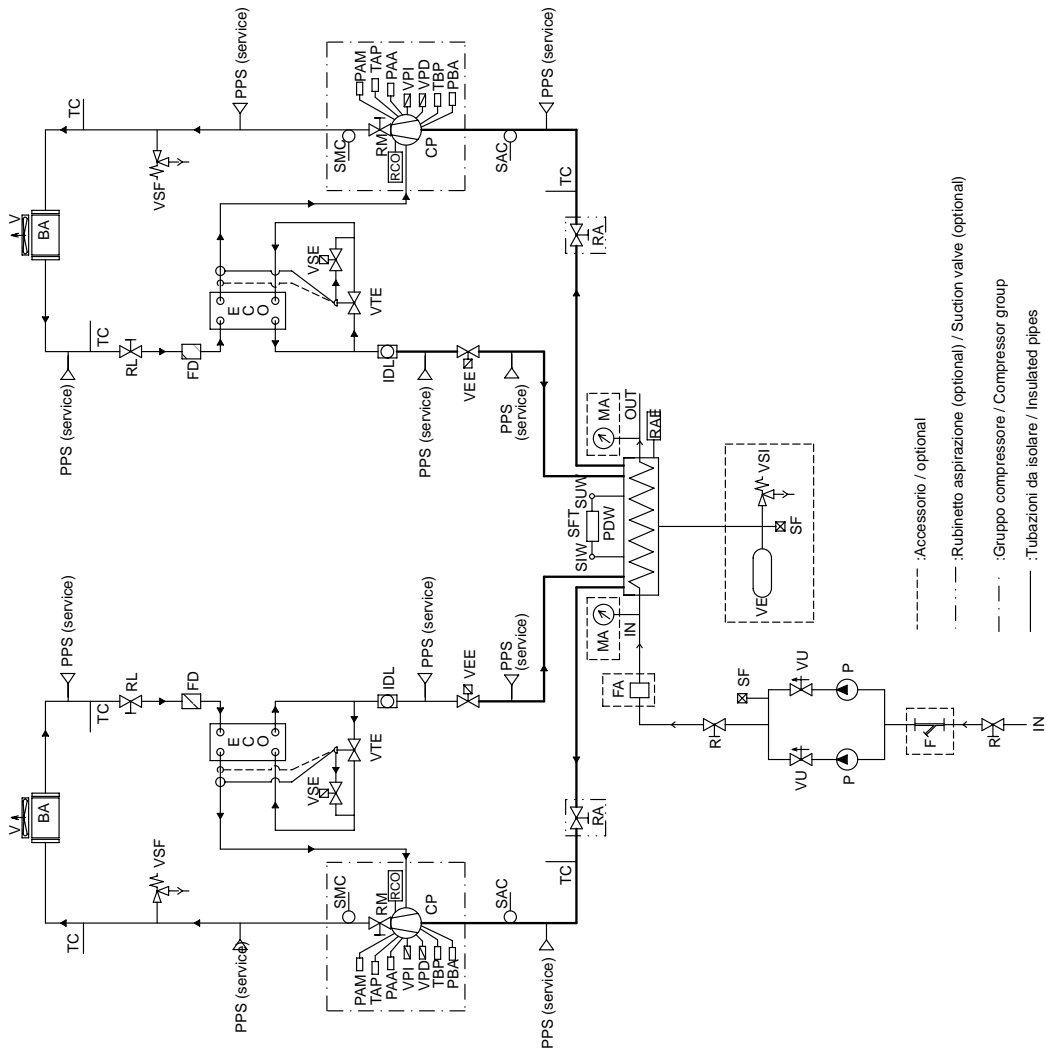


REFRIGERANT FLOW DIAGRAM

Refrigerant flow diagram basic version with economizer

ONLY FOR MOD. 780.2

	Descrizione	Description
BA	BATTERIA ALETTATA	COIL
ECO	ECONOMIZZATORE	ECONOMIZER
CP	COMPRESSORE VITE	SCREW COMPRESSOR
F	FILTRO ACQUA	WATER FILTER
FA	FLUSSOSTATO ACQUA	WATER FLOW SWITCH
FD	FILTRO DEIDRATORE	DRIER FILTER
IDL	INDICATORE LIQUIDO E UMIDITA'	LIQUID AND MOISTURE INDICATOR
MA	MANOMETRO ACQUA	WATER PRESSURE GAUGE
P	POMPA	PUMP
PAA	PRESSOSTATO DI ALTA RIARMO AUTOMATICO	AUTOMATIC RESET HIGH PRESSURE SWITCH
PBA	PRESSOSTATO DI BASSA AUTOMATICO	AUTOMATIC LOW PRESSURE SWITCH
PAM	PRESSOSTATO DI ALTA RIARMO MANUALE	MANUAL RESET HIGH PRESSURE SWITCH
PDW	PRESSOSTATO DIFFERENZIALE ACQUA	DIFFERENTIAL WATER PRESSURE SWITCH
PPS	PRESA DI PRESSIONE 1/4 SAE CON SPILLO	PRESSURE GAUGE WITH SCHRAEDER
R	RUBINETTO INTERCETTAZIONE	SHUT-OFF VALVE
RA	RUBINETTO APIRAZIONE (OPTIONAL)	SUCTION VALVE (OPTIONAL)
RAE	RESISTENZA ANTIGELO EVAPORATORE (OPTIONAL)	EVAPORATOR ANTIFREEZE HEATER (OPTIONAL)
RCO	RESISTENZA CARTER OLIO	OIL CRANKCASE HEATER
RL	RUBINETTO DEL LIQUIDO	LIQUID VALVE
RM	RUBINETTO DI MANDATA	DISCHARGE VALVE
SAC	SONDA ASPIRAZIONE COMPRESSORE	SUCTION TEMPERATURE PROBE
SF	VALVOLA SFIATO ARIA	AIR VENT VALVE
SFT	SCAMBIATORE A PASCIO TUBIERO	SHELL AND TUBE HEAT EXCHANGER
SIW	SONDA INGRESSO ACQUA	WATER INLET PROBE
SMC	SONDA MANDATA COMPRESSORE	DISCHARGE TEMPERATURE PROBE
SUW	SONDA USCITA ACQUA	WATER OUTLET PROBE
TAP	TRASDUTTORE ALTA PRESSIONE	HIGH PRESSURE TRANSDUCER
TBP	TRASDUTTORE BASSA PRESSIONE	LOW PRESSURE TRANSDUCER
TC	TRONCHETTO DI CARICA	PIPE FOR REFRIGERANT FILLING
V	VENTILATORE	FAN
VE	VASO DI ESPANSIONE	EXPANSION TANK
VEE	VALVOLA ESPANSIONE ELETTRONICA	ELECTRONIC EXPANSION VALVE
VPD	VALVOLA PARZIALIZZAZIONE DECREMENTO	DECREASING CONTROL CAPACITY VALVE
VPI	VALVOLA PARZIALIZZAZIONE INCREMENTO	INCREASING CONTROL CAPACITY VALVE
VSE	VALVOLA SOLENOIDE ECONIMIZZATORE	ECONOMIZER SOLENOID VALVE
VSF	VALVOLA DI SICUREZZA CIRCUITO FRIGO	REFRIGERANT SAFETY VALVE
VSI	VALVOLA DI SICUREZZA ACQUA	WATER SAFETY VALVE
VTE	VALVOLA TERMOSTATICA ECONIMIZZATORE	ECONOMIZER THERMOSTATIC VALVE
VU	VALVOLA UNIDIREZIONALE	CHECK VALVE



SETTING AT WORK

General Rules

To validate the contractual warranty, the machine must be set at work by technicians from an authorized assistance center. Before they are called, check to make sure that all parts of the installation have been completed, the unit levelled, the wet connections made with the relative air vent and the electrical connections made.

MAINTENANCE

General Rules

Maintenance is of extreme importance if the plant is to operate in a regular way and give fade-free service. Have extraordinary maintenance work done by qualified and authorized personnel. Comply with the safety precautions given in the relative section of this manual and take all the necessary precautions.

The following information is only a guide for the end user.

Routine maintenance

The inspections described below, to which the unit must be subjected, do not require specific technical know-how.

They merely include a few simple inspections involving certain parts of the unit.

Call an authorized assistance center if actual maintenance work is required.

The table below gives a recommended list of inspections which should be carried out at the indicated intervals.

DESCRIPTION	WEEKLY	MONTHLY	EVERY SIX MONTHS
Visual inspection of the unit			•
Inspection of hydraulic circuit		•	
Inspection of electrical system		•	
Inspection of condensing system		•	
Inspection and adjustment of operat. parameters	•		

• Visual inspection of the structure of the unit

When checking the condition of the parts that form the structure of the unit, pay particular attention to the parts liable to rust.

If traces of rust are noted, they must be treated with rust-inhibitor paint in order to eliminate or reduce the problem.

Check to make sure that the external panels of the unit are well fixed.

Bad fixing gives rise to noise and abnormal vibrations.

• Inspection of hydraulic circuit

Check visually to make sure that there are no leaks in the hydraulic circuit. If the pumping module accessory is installed, it is advisable to make sure that the water filter is clean.

• Inspection of electrical system

Make sure that the power cable that connects the unit to the distribution panel is not torn, cracked or damaged in a way that could impair its insulation.

• Inspection of the condensing system

WARNING: The finned pack exchanger has fins made of aluminium or some other thin material, thus even accidental contact could cause cuts. Comply with the instructions in the relative section.

• Condensing coils

In view of the function of this component, it is very important for the surface of the exchanger to be as free as possible from clogging caused by items that could reduce the fan's air flow rate and, thus, the performances of the unit itself.

The following operations may be required:

- Remove all impurities (such as paper scraps, leaves, etc.) that could be clogging the surface of the bank either by hand or using a brush (comply with the above mentioned safety prescriptions).

- If the dirt has deposited on the fins and is difficult to remove by hand, use a jet of compressed air or pressurized water on the aluminium surface of the coils, remembering to direct the jet in a vertical direction to prevent the fins from being damaged.

- "Comb" the coils with the relative tool, using the appropriate comb spacing for the fins if some parts of them are bent or squashed.

• Helical electric fans

Visually inspect these parts to make sure that the electric fans are well fixed to the bearing grille and that this latter is fixed to the structure of the unit. Bad fixing gives rise to noise and abnormal vibrations.

• Reading and adjustment of the operating parameters

This control can be done using the pressure gauges (if installed) of the refrigerant circuits and using the pressure and temperature gauges (if installed) of the hydraulic circuits of the unit (evaporator + heat recovery - if present)

MAINTENANCE

General considerations

The machine has been designed with a view to reducing the risks to persons and the environment in which it is installed, to the minimum. To eliminate residue hazards, it is therefore advisable to become as familiar as possible with the machine in order to avoid accidents that could cause injuries to persons and/or damage to property.

a. Access to the unit

Only qualified persons who are familiar with this type of machine and who are equipped with the necessary safety protections (footwear, gloves, helmet, etc.) may be allowed to access the machine. Moreover, in order to operate, these persons must have been authorized by the owner of the machine and be recognized by the actual Manufacturer.

b. Elements of risk

The machine has been designed and built so as not to create any condition of risk. However, residue hazards are impossible to eliminate during the planning phase and are therefore listed in the following table along with the instructions about how to neutralize them.

Part in question	Residue hazard	Mode	Precautions
Compressor and delivery pipe	Burns	Contact with the pipes and/or compressor	Avoid contact by wearing protective gloves
Delivery pipes, heat recovery exchanger and coils	Explosion	Excessive pressure	Turn off the machine, check the high pressure switch and safety valve, the fans and condenser
Pipes in general	Ice burns	Leaking refrigerant	Do not pull on the pipes
Electrical cables, metal parts	Electrocution, serious burns	Defective cable insulation, live metal parts	Adequate electrical protection (correctly ground the unit)
Heat exchange coils	Cuts	Contact	Wear protective gloves
Fans	Cuts	Contact with the skin	Do not push the hands or objects through the fan grille

c. Pollution

The unit contains refrigerant gas and lubricating oil. When scrapping the unit these fluids must be recovered and disposed of in compliance with the regulations in force in the country where it is installed. The unit must not be abandoned during the scrapping stage.

SAFETY AND POLLUTION

General recommendations about the R407C refrigerant used

COMPOSITION / INFORMATION ON INGREDIENTS

Substance name	Contents	CAS No	EC No	Index No	Classification
Difluoromethane (R32)	Between 22 and 24 % in weight	75-10-5	200-839-4	-----	-----F+; R12
Pentafluoroethane	Between 24 and 26 % in weight 354-33-6	354-33-6	206-557-8	-----	
1,1,1,2-Tetrafluoroethane (R 134a)	Between 51 and 54 % in weight	811-97-2	212-377-0	-----	

HAZARDS IDENTIFICATION

Hazards identification :

In high concentrations may cause asphyxiation.
 Gas/vapour heavier than air.
 May reduce oxygen.
 Liquefied gas.
 May cause freezing.
 May cause heart arrhythmia.

FIRST AID MEASURES

First aid measures

- Inhalation :

In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation.
 If breathing is difficult, give oxygen.
 Remove victim to uncontaminated area wearing self contained breathing apparatus.
 Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

- Skin/eye contact :

Immediately flush eyes thoroughly with water for at least 15 minutes.
 Remove contaminated clothing.
 Obtain medical assistance.

- Ingestion :

Ingestion is not considered a potential route of exposure.

FIRE-FIGHTING MEASURES

Flammable class :

Non flammable.

Specific hazards :

Exposure to fire may cause containers to rupture/explode.

Hazardous combustion products :

None.

Extinguishing media

- Suitable extinguishing media :

All known extinguishants can be used.

Specific methods :

If possible, stop flow of product.
 Move away from the container and cool with water from a protected position.
 In confined space use self-contained breathing apparatus.

Special protective equipment for fire fighters :

ACCIDENTAL RELEASE MEASURES

Personal precautions :

Evacuate area.
 Ensure adequate air ventilation.
 Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.

Environmental precautions :

Try to stop release.
 Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.

Clean up methods :

Ventilate area.

SAFETY AND POLLUTION

HANDLING AND STORAGE

General :	Avoid all unnecessary exposure.
Personal protection :	Protect eyes, face and skin from liquid splashes.
Storage :	Store in dry, cool, well-ventilated area. Keep in original containers. Segregate from flammable gases and other flammable materials in store. Do not store with flammables and organic peroxide. Keep container below 50°C in a well ventilated place.
Handling :	Open valve slowly to avoid pressure shock. Suck back of water into the container must be prevented. Do not allow backfeed into the container. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt. Handle only in well ventilated area. Do not breath vapours/aerosols. Refer to supplier's container handling instructions.

EXPOSURE CONTROLS / PERSONAL PROTECTION

Personal protection :	Avoid all unnecessary exposure. Ensure adequate ventilation.
- Respiratory protection :	Wear suitable respiratory equipment. Gas/vapour heavier than air. May reduce oxygen.
- Hand protection :	Use rubber gloves.
- Skin protection :	Skin protection appropriate to the conditions of use should be provided.
- Eye protection :	Chemical goggles or face shield with safety glasses. Contact lenses should not be worn.
- Head protection :	Protective helmet.
- Foot protection :	Steel pointed safety shoes (metatarsal protection is recommended).
Industrial hygiene :	When using, do not eat, drink or smoke. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Occupational Exposure Limits :	Difluoromethane (R32) : LTEL - UK [ppm] : 1000 1,1,1,2-Tetrafluoroethane (R 134a) : OEL (UK)-LTEL [ppm] : 1000
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Simbology



PHYSICAL AND CHEMICAL PROPERTIES

Physical state at 20 °C :	Liquefied gas.
Colour :	Colourless.
Odo(u)r :	Ethereal.
Vapour pressure, 50°C :	2186 KPa
Solubility in water [mg/l] :	Not known, but considered to have low solubility.
Other data :	Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

STABILITY AND REACTIVITY

Stability and reactivity :	Stable under normal conditions.
Hazardous decomposition products :	Halogenous acid, halogenous carbide.
Materials to avoid :	Alkaline metals, Al, Zn, Be etc in powder.
Conditions to avoid :	Avoid : Direct sunlight. Temperature exceeding : 50°C.

SAFETY AND POLLUTION

TOXICOLOGICAL INFORMATION

Toxicity information :

Acute toxicity :

No known toxicological effects from this product.

Difluoromethane: LC50 / inalation/ 4 hours/ mouse = > 760 ml/l

Pentafluoroethane: LC50 / inalation/ 1 hour/ mouse = > 3480 mg/l

1,1,1,2-Tetrafluoroethane ALC/ inalation/ 4 hours/ mouse = 567 ml/l

Does not show any cancerogenic, teratogenic and mutagenic effects.

Chronic toxicity :

Other toxicological information :

Narcotic effects above TLV.

Lung edema.

ECOLOGICAL INFORMATION

Ecological effects information :

Environmental precautions :

No known ecological damage caused by this product.

Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.

Effect on ozone layer :

None.

DISPOSAL CONSIDERATIONS

General :

Do not discharge into any place where its accumulation could be dangerous.

Contact supplier if guidance is required.

Disposal method :

Consult supplier for specific recommendations.

TRANSPORT INFORMATION

UN No. :

3340

H.I. nr :

20

ADR/RID

- Proper shipping name :

REFRIGERANT GAS R 407C

- ADR Class :

2

- ADR/RID Classification code :

2 A

- Labelling ADR :

Label 2.2 : Non flammable, non toxic gas.

Other transport information :

Avoid transport on vehicles where the load space is not separated from the driver's compartment.

Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency.

Before transporting product containers :

- Ensure that containers are firmly secured.

- Ensure cylinder valve is closed and not leaking.

- Ensure valve outlet cap nut or plug (where provided) is correctly fitted.

- Ensure valve protection device (where provided) is correctly fitted.

- Ensure there is adequate ventilation.

- Compliance with applicable regulations.

REGULATORY INFORMATION

EC Labelling :

Not classified as dangerous preparation/substance.

- Symbol(s) :

None.

- R Phrase(s) :

None.

- S Phrase(s) :

None.

OTHER INFORMATION

Asphyxiant in high concentrations.

Keep container in a well-ventilated place.

Do not breathe the gas.

The hazard of asphyxiation is often overlooked and must be stressed during operator training.

Receptacle under pressure.

Ensure all national/local regulations are observed.

This Safety Data Sheet has been established in accordance with the applicable European Directives and applies to all countries that have translated the Directives in their national laws.

Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.

Details given in this document are believed to be correct at the time of going to press. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

SAFETY AND POLLUTION

First aid

- Move the victim away from the toxic source, keep him warm and allow him to rest.
- Administer oxygen if necessary.
- Proceed with artificial respiration if necessary.
- Give heart massage in the case of heart failure.
- Immediately seek medical help.

Contact with the skin:

- Immediately thaw the affected parts under running lukewarm water.
- Remove contaminated clothing (garments may stick to the skin in the case of ice burns) if they have not adhered to the skin.
- Seek medical assistance if necessary.

Contact with the eyes:

- Immediately rinse the eyes with physiologic eyewash or clean water for at least 10 minutes with the eyelids pulled open.
- Seek medical assistance if necessary.

Swallowing:

- Do not make the victim vomit. If the victim is conscious, have him rinse his mouth out with clean water and then drink 200, 300 ml of water.
- Immediately seek medical help.
- Do not administer adrenaline or sympathomimetic drugs after exposure owing to the risk of cardiac arrhythmia.

For further information about the characteristics of the refrigerant, consult the technical briefs that can be obtained from manufacturers of refrigerant products.



**GRUPPO
FERROLI**

Ferroli spa - 37047 San Bonifacio (Verona) Italy - Via Ritonda 78/A
tel. +39.045.6139411 - fax +39.045.6100933 - www.ferroli.it