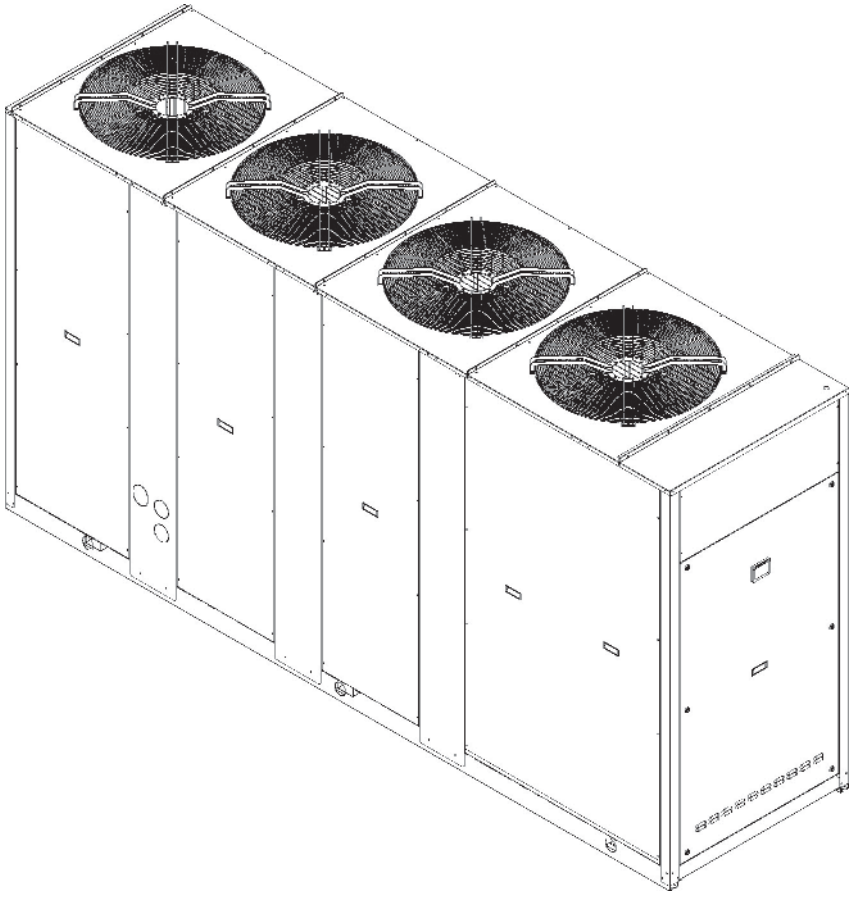
Ferroli

RGA ST

AIR COOLED WATER CHILLERS WITH AXIAL FANS

53.5 ÷ 200 kW IN COOLING MODE

ECO-FRIENDLY R410A REFRIGERANT GAS



CE

INSTALLATION AND OPERATION MANUAL

Dear Customer,
Thank you for having purchased a **FERROLI** product. It is the result of many years experience and particular research, and has been made with top quality materials and higlly advanced technologies.The CE mark guarantees that the appliances meet 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

CE

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 :

DE **"EG" KONFORMITÄTSERKLÄRUNG**
Wir, die Unterzeichner dies er Erklärung, erklären unter unseren ausschlie ßlichen Verantwortung, daß die genannte Maschine den Bestimmungen der folgenden EG-Richtlinien entspricht :

FR **DECLARATION "CE" DE CONFORMITE**
Nous soussignés déclarons, sous notre entière responsabilité, que la machine en objet est conforme aux prescriptions des Directives :

IT **DICHIARAZIONE "CE" DI CONFORMITÀ**
Noi sottoscritti dichiariamo, sotto la nostra responsabilità, che la macchina in questione è conforme alle prescrizioni delle Direttive :

ES **DECLARACION "CE" DE CONFORMIDAD**
Quienes subscribimos la presente declaracion, declaramos, baio nuestra exclusiva responsabilidad, que la maquina en objeto respeta lo prescrito par las Directivas :

PT **DECLARAÇÃO "CE" DE CONFORMIDADE**
Nós, signatários da presente, declaramos sob a nassa exclusiva responsabilidade, que a má quina em questão está em conformidade com as prescrições das Directrizes :

NL **"EG" CONFORMITEITSVERKLARING**
Wij ondergetekenden verklaren hierbij op uitsluitend eigen verantwoording dat de bovengenoemde machine conform de voorschriften is van de Richtlijnen:

DK **"CE" OVERENSSTEMMELSESERKLERING**
Underfegnede forsikrer under eget ansvar al den ovennævnte maskine er i overensstemmelse med vilkårene i direktiveme :

SE **FÖRSÄKRAN OM "CE" ÖVERENSSTÄMMELSE**
Underfecknade försäkrar under eget ansvar alt ovannämnda maskinskinen er i overensstemmelse med vilkarene i direktivene :

NO **BEKREFTELSE OM ÆCEØ OVERENSSTEMMELSE**
Underfegnede forsikrer under eget ansvar al den ovennevnte maskinen er i overensstemmelse med vilkarene i direktivene :

FI **"CE" VAATIMUSTENMUKAISUUSVAKUUTUS**
Allekirjoittaneet vakuutamme omalla vastuullamme että yllämainittu kone noudattaa ehtoja direktiiveissä :

GR **ΔΗΛΩΣΗ ΣΥΜΒΑΤΟΤΗΤΑΣ "ΕΕ"**
Εμετς που υπογραφουμε την παρουσα, δηλωνουμε υπο την αποκλειστικη μας ευθυνη, οτι το μηχανημα συμμορφουται οτα οσ α ορτζουν οι Οδηγιες :

HR **IZJAVA O "CE" SUGLASNOSTI**
Mi niže potpisani izjavljujemo, pod našom odgovornošu, da ova Mašina odgovara zahtijevima iz Direktiva :

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 Ferroli

3QE22170 rev.03

TABLE OF CONTENTS

THIS MANUAL IS DIVIDED INTO SECTIONS. THEIR NAMES APPEAR IN THE HEADING OF EACH PAGE.

GENERAL SPECIFICATIONS

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 geuine 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 responsiblity of the end user.

European Directives

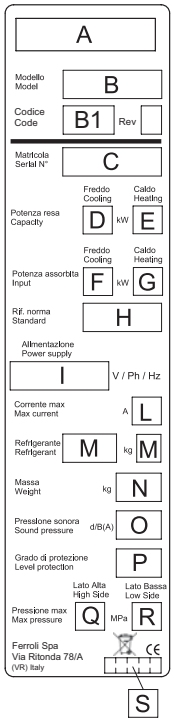
The company hereby declares that the machine in question complies with the matters prescribed by the following Directives:

• Machine Directive	**98/37 EEC**
• Low voltage Directive	**73/23 EEC**
• Electromagnetic compatibility Directive	**EMC 89/336 EEC;**
• Directive governing pressurized vessels	**97/23 EEC**

Any other Directives have to be considered not applicable.

Unit identification plate

The figure on the left illustrates the identification plate of the unit:



Standard versions

A - Trademark
B - Model
B1- Code
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 load current
M - Type of refrigerant and charge
N - Shipping weight of the unit
O - Sound pressure level at 1m
P - IP Level Protection
Q - Maximum pressure - High Side
R - Maximum pressure - Low Side
S - PED certification authority

GENERAL SPECIFICATIONS

Unit description

This new series of industrial chillers has been designed to meet the demands of global markets in the small-medium power industrial and commercial plants. Units are compact and highly configurable, built to fit different types of plants so to meet the needs of highly qualified engineers.
Units are water chillers condensed in air with axial fans suitable for outdoor installation: the structure and panels are robust, made of galvanized and painted steel; all fasteners are made of stainless steel or galvanized steel, the frame containing the electrical equipment and all the components exposed to weather have a minimum **IP54** degree of protection.
This series is composed of twelve models divided in four sizes with nominal cooling capacity from **53.5** to **200 kW**.
The units product cold water from 5 to 25°C and **as standard** they are equipped with continuous adjustment of axial fans rotating speed in order to allow the units to operate with low outdoor temperature in cooling mode as well as to reduce noise emissions.
All the units are equipped with 2 scroll compressors arranged in pairs (tandem) on 1 circuit operating with **environmental friendly R410A gas**, brazed plate heat exchanger completely insulated and protected by water side with a differential pressure control and with an antifreeze electrical heater, coil heat exchanger made of louver aluminum fins and copper tubes, axial fans with profiled blades to contain noise and with thermal protection built-in, on-board electrical control panel equipped with control system to manage the main functions.
During the design of the units particular attention has been given to achieve high system efficiency, to reduce overall energy consumptions and sound levels in order to meet the increasingly restrictive laws in terms of noise. Upon request, you can choose for a Standard Unit (AB) or Low noise unit (AS) which provides sound attenuation thanks to sound absorbing insulation in compressors area, sound jackets on compressors and reduced speed axial fans, or a Extra low noise unit (AX), which provides in addition slower axial fans and more powerful finned coils.
All units are accurately build in compliance with the existing standards and are individually tested in factory. Only electrical and hydraulic connections are required for installation.

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.

RGA ST IR - 50.2 - VB - AB - 0 - M - 5

Unit type
IR- units suitable for hydronic plant installation operating as chillers.

Unit model
N° Compressor

Unit version
VB - Standard Version

Acoustic Version
AB - Standard unit
AS - Low noise unit
AX - Extra low noise unit

Type of Refrigerant
0 - R410A

Operating range
M - Medium temperature. Units are suitable to be installed in temperate climate sites.
A - High temperature. Units are suitable to be installed in tropical climate sites.

Power Supply
5 - 400V-3ph~50Hz

GENERAL SPECIFICATIONS

Description of the components

The complete series of industrial chillers and heat pumps for use in hydronic systems includes **12 constructional sizes** rang **from 53.5 to 200 kW** in the cooling mode.

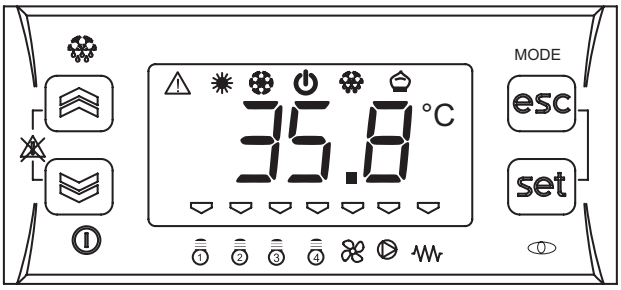
Main components:

1. **Fans.** These are the helical type with scythe-shaped blades to increase the efficiency and reduce the noise level. The fans are directly coupled to the single-phase motor by means of an external rotor. Thermal protection against operating faults is installed inside the winding. As standard they are equipped with continuous adjustment of axial fans rotating speed in order to allow the units to operate both with low outdoor temperature in cooling mode and with high outdoor temperature in heating mode.
2. **Electric control and monitoring panel.** This is housed in a metal casing in which the various electrical components are positioned on one metal plate.

2a. The power section includes:
- Main door-locking circuit-breaker.
- Fuse-holder that can be isolated with protection fuse triad for each compressor.
- Fuse-holder that can be isolated with protection fuse for compressor oil heaters and antifreeze (if installed).
- Control contactor for each compressor.
- Protection fuse for the ventilation unit.
- Fan speed regulating board.
- Contactor and magnetothermic switch to protect the pump (if the Hydronic Kit accessory is installed).
- Pump contactor (if the Hydronic Kit accessory is installed).
- Phase presence and sequence monitoring device on power supply

2b. The auxiliary section includes:
- Fuses on the auxiliary transformer.
- Fuses for fans protection
- Electromagnetic noise filter
- Adjusting fan speed board
- Insulating and safety transformer to power the auxiliary circuit.

2c. The microprocessor monitoring section includes:
- User interfacing terminal with display.
- On-off key.
- Operating mode selector key.
- Compressor on-off display **LED**.
- Operational mode **LED**
- Antifreeze heaters activated indicator **LED**.
- Fans on-off dislay **LED**
- Pumps on-off display **LED**
- Check-control with fault code display
- Defrosting, alarm, economy, stand-by **LED.**
- ON / Stand-by remote - Summer/Winter (E/I).



Control system main functions: temperature control of the water produced by the unit, compressor and pump operating hour counter, timing and cycling of start-ups, input parameters by keyboard, alarms management, dynamic set-point (climatic control), scheduling and integrative heaters control.
If you installed the hydronic kit these functions are enabled: antifreeze with pump, start-up cycle after prolonged inactivity (anti-sticking), if the hydronic kit installed has 2 pumps there is a cycling between each pump to ensure an equivalent lifetime, with inverter modulating hydronic kit the water flow of the plant can be adjusted.

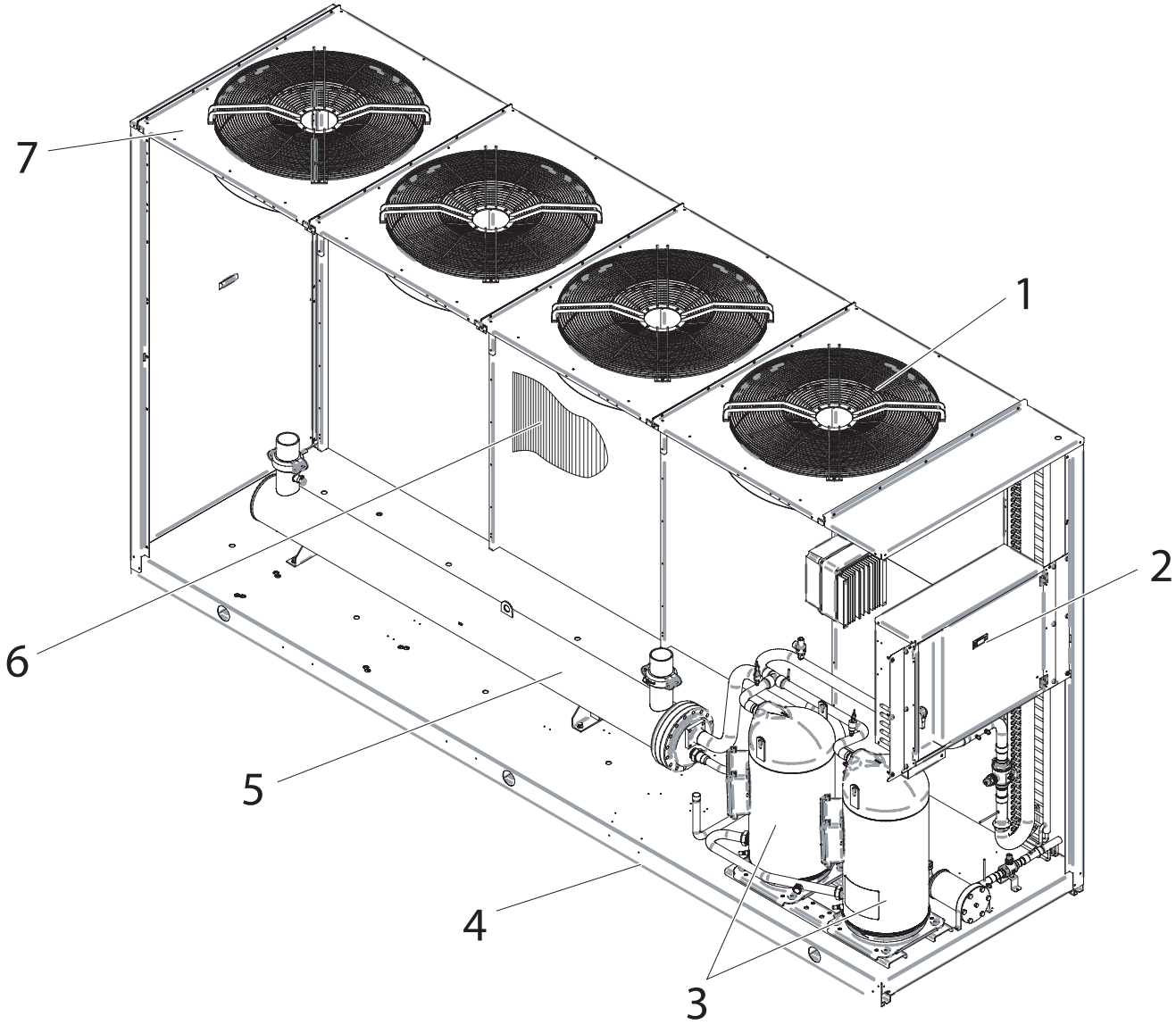
Digital input functions: low pressure, high pressure, high temperature on compressor supply, phase presence and sequence monitoring device on power supply, differential water pressure control, compressors thermal protection, fans thermal protection, pumps thermal protection (only if installed MP accessory), ON/OFF and remote operating mode change, demand limit and Economy function.

Digital output functions: compressor start-up, pump start-up (only with MP accessory), plate heat exchanger electrical heater, remote general alarm, integrative heaters and clean contact on compressors start-up.

Analogic input functions: in and out water temperature, coil temperature probe, external air temperature probe (if present).

Analogic output functions: continuous adjustment of axial fans rotating speed, continuous adjustment of pump rotating speed.

GENERAL SPECIFICATIONS



3. Compressors. They are the **SCROLL** type with orbiting coil equipped with built-in thermal protection and oil heater. The AS unit includes: a soundproofing jacket for the compressors, an acoustic cladding around the compartment where they are housed, to reduce noise level, and reduced rotating speed of axial fans; AX unit integrates batteries with condensing surface increased and rotating speed of axial fans further reduced. All units are equipped with two compressors connected in parallel (1 single cooling circuit) which can operate at the same time (**100% cooling power**) or individually (**50% of the cooling power**), thus adapting to the different thermal loads of the system supplied.

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

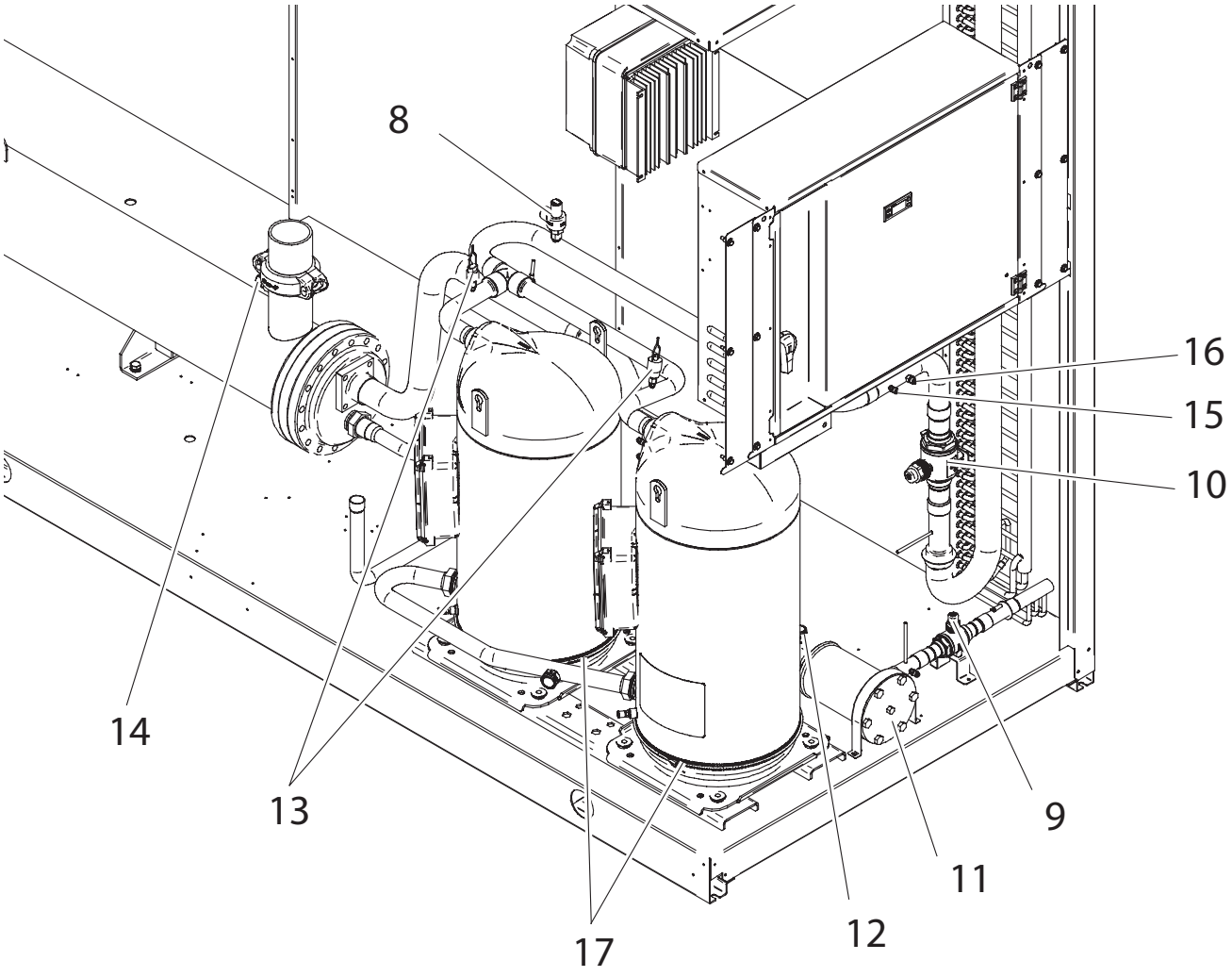
5. Evaporator of the shell and tube heat exchanger type, made of carbon steel and optimized for operation with R410A. Features high-efficiency grooved pipes and also achieves low losses on the wet side. It is installed in a shell of heat-insulating material to prevent the formation of condensation and heat exchanges towards the outside. Standard supply also includes antifreeze heater and a differential pressure switch on the water circuit to avoid the risk of freezing if the water flow is shut off for some reason.

6. 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.

7. Covering panels, made of galvanized sheet metal coated with polyurethane powder paint to ensure maximun protection against adverse weather conditions

Hydraulic and cooling circuit components

8. Safety valve. Installed on the delivery pipe of the compressors, this operates if extreme faults should occur in the plant.
9. Fluid tap. Ball type, this allows the gas flow on the fluid line to be turned on and off. Along with the tap on the compressor delivery, it allows the components of the fluid line to be subjected to extraordinary maintenance work and the compressors to be replaced if necessary (without discharging the coolant from the unit).
10. Compressor delivery tap. Ball type, allows the gas delivered to the compressors to be turned on and off.
11. Dehydrator filter. Mechanical type. Retains impurities and traces of moisture in the circuit. **Hermetic** type for models **50÷80**; **cartridge** type for models **90÷200**.
12. Fluid and humidity indicator. Signals when fluid passes through the circuit, indicating that the coolant charge is correct. The fluid indicator light also indicates the amount of moisture in the coolant by changing colour.
13. High pressure switch (n°2). With fixed setting. Are is installed on the delivery pipe and blocks the compressors if the operating pressures exceed the tolerated values. If it activates, the unit will block and can only be restarted by resetting via the user interface terminal.
14. Water differential pressure switch. This is standard supply and is installed on the connections between the water inlet and outlet of the exchanger. It stops the unit if it activates.
15. Pressure taps: 1/4 " SAE (7/16" UNF) type with flow regulator. Allow the operating pressure of the system to be measured: compressor delivery, lamination component inlet, compressor intake.
16. Pressure taps: 5/16 " SAE type with flow regulator. Allow the charge/discharge of the gas from the system, precisely from compressor outlet an expansion valve inlet.
17. Electrical heating elements to heat the compressor oil. "Belt" type. These activate when the compressor turns off and keep the temperature of the oil sufficiently high so as to prevent coolant from migrating during these pauses.
- Low pressure switch (N°1). 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.
- Thermostatic valve. With external equalizer, this supplies the evaporator correctly, keeping the selected overheating degree at a steady level.



ACCESSORIES AND OPTIONAL EQUIPMENT

Accessories

AVG - Rubber vibration dampers. Consisting of 4/6 rubber vibration dampers to fit under the unit. Reduce the extent to which the mechanical vibrations created by the compressors and fans during normal operation are transmitted to the bearing surface of the machine. The insulating degree of the vibration dampers is about 85%.

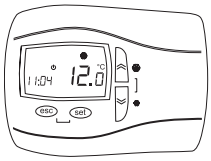
GM - Pressure gauge unit. Consisting of 2 pressure gauges that display the pressure values of the refrigerating fluid on the compressor suction and delivery sides.

GP - Protective grilles. These are metal grilles installed to protect the finned banks.

BCN- Drain Pan Kit (M). Provides a pan under the coil to drain the condensing water, fitted with 1/2" outlet connection positioned opposite to the electric control panel.

CR - Remote control (F). This can be used to select all the monitoring and display functions of the control unit on the machine at a maximum distance of 100 meters away. It must be installed by using a cable with three strands or three wires in **PVC** of the **N07-VK** type with a 1mm^2 section. The transmission line must be installed in a raceway separate from any electric powering wires (**230/400 V**).

The control unit has the following buttons:



MODE key : used to select the operating mode
ON/OFF key : used to turn the unit ON/OFF and to reset the alarms
Mode + ON/OFF keys : used to access and quit the various menu levels
UP key: scrolls forwards through the menu items or increases the value of a parameter
Tasto DOWN: scrolls backwards through the menu items or decreases the value of a parameter.

KOP - Programmer clock (F). Allows the unit to be turned on and off depending on the programmed time setting (up to 14 switching actions can be programmed as required throughout the 7 days of the week).

TAT- High Temperature Thermostat (M). Two thermostats in series on compressors outlet pipes preserve operation not allowing temperature to rise up than a specified non adjustable value.

SND- External Air Probe (M). External air probe mounted near coil allows smart defrosting, climatic variation of setpoint and enables heat pump stop reducing the external air temperature below a setpoint.

INT - Serial interface (F). Allows serial communication on RS485 by MODBUS protocol

FLS - Flow switch (F). Paddle flow switch on the water circuit to avoid the risk of freezing if the water flow is shut off for some reason.

SS - Soft Starter (M). Soft starter for compressor, reduce the maximum starting current up to 60% of nominal starting current.

RIF - Capacitors for power factor corrections (M). Capacitors for power factor corrections increase power factor cos φ (>0.91) and reduce power input.

MTC - Magnetothermic switch (M). Magnetothermic switch on all loads place of fuses.

CSF - Voltage monitor and sequence meter (M). 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 ± 10% the rated voltage (MIN=360 V - RATED=400V - MAX=440V). It blocks the unit if the voltage is outside the limits provided for.

NOTE: **(M):** Installed **(F):** To be installed by customers

Mechanical options

Special finned heat exchangers
- Coils with copper fins
- Coils with tin-coated copper fins
- Coils with aluminium fins with acrylic, epoxy or hydrophilic coating.

Electrical options

Other power source voltage rating (contact our technical department).

TECHNICAL SPECIFICATIONS AND STANDARD PERFORMANCES - IR COOLING UNIT ONLY

Technical specifications of unit AB Standard Unit

Model	50	60	70	80	90	100	115	130	145	160	180	200	UM
Power supply	400V - 3ph+N - 50 Hz				400V - 3ph - 50 Hz								V-f-Hz
Type of refrigerant	R410A												/
Circuits	1												n°
Cooling capacity (1)	53.5	58.6	68.8	78.7	91.0	102	112	126	143	158	180	200	kW
Compressors power input (1)	16.5	18.5	21.7	25.6	28.2	31.6	35.5	40.5	45.0	50.5	56.0	62.8	kW
Compressor EER	3.24	3.17	3.17	3.07	3.23	3.23	3.15	3.11	3.18	3.13	3.21	3.18	-
Total power input (1)	18.3	20.3	23.5	27.4	31.8	35.2	39.1	44.1	50.4	55.9	63.2	70.0	kW
Total EER	2.92	2.89	2.93	2.87	2.86	2.90	2.86	2.86	2.84	2.83	2.85	2.86	-
ESEER	4.03	3.98	4.04	3.96	3.95	4.00	3.95	3.94	3.92	3.90	3.93	3.94	-
Water flow rate (1)	2.56	2.80	3.29	3.76	4.35	4.87	5.35	6.02	6.83	7.55	8.60	9.56	l/s
Water pressure drops (1)	29	35	45	60	50	31	37	53	70	82	57	40	kPa

Compressor

Type	Scroll												/
Quantity	2												n°
Load steps	0-50-100												%
Oil charge CP1	3.25	3.25	3.25	3.25	3.25	4.7	4.7	6.8	6.8	6.3	6.3	6.3	l
Oil charge CP2	3.25	3.25	3.25	3.25	4.7	4.7	6.8	6.8	6.3	6.3	6.3	6.3	l

Heat Exchanger

Type	Shell and tube												/
Quantity	1												n°
Water volume	15.3	15.3	15.3	15.3	19.8	21.7	21.7	29.2	29.2	29.2	37.8	48.3	l

Fan

Type	Axial												-
Quantity	3				2				3		4		n°
Maximum rotational speed	900												rpm
Total air flow rate	29050	29050	28100	27680	41460	40100	47440	47440	62190	59820	82920	79760	m^3/h
Power input	1.8				3.6				5.4		7.2		kW

Coil

Type	Aluminum fins and copper tubes												/
Quantity	1												n°
Front area	3.38				4.72		5.90				7.41		m^2

Electrical Data

Total maximum power input [FLA]	48.2	50.9	58.3	68.6	76.0	81.5	89.9	98.3	117	131	150	165	A
Total maximum power input [FLI]	25.5	27.7	31.1	35.5	43.6	49.2	53.9	58.6	69.4	78.2	90.8	101	kW
Total maximum starting current [MIC]	146	147	173	211	265	270	317	325	368	382	470	485	A

Data referred to standard operating condition.
(1): water temperature: in 12°C - out 7°C air temperature: in 35°C d.b.

TECHNICAL SPECIFICATIONS AND STANDARD PERFORMANCES - IR COOLING UNIT ONLY

Standard performances AB Standard unit

Mod. 50-100

MOD.	Tw	OUTDOOR AIR TEMPERATURE (°C D.B.)													
		20		25		30		35		40		45		50	
		kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa
50	5	61.1	11.6	57.0	13.3	53.9	14.7	50.6	16.2	47.1	17.8	43.6	19.4	40.0	21.0
	6	62.8	11.7	58.6	13.4	55.4	14.8	52.0	16.3	48.4	18.0	44.8	19.6	41.1	21.2
	7	64.6	11.8	60.3	13.6	57.0	15.0	**53.5**	**16.5**	49.8	18.2	46.1	19.8	42.3	21.4
	8	66.4	11.9	62.0	13.7	58.6	15.1	55.0	16.7	51.2	18.4	47.4	20.0	-	-
	9	68.2	12.1	63.7	13.9	60.2	15.3	56.5	16.8	52.6	18.6	48.7	20.2	-	-
	10	70.1	12.2	65.4	14.0	61.8	15.4	58.0	17.0	54.0	18.8	50.0	20.4	-	-
	11	71.8	12.3	67.1	14.1	63.4	15.6	59.5	17.2	55.4	18.9	51.3	20.6	-	-
	12	73.8	12.4	68.9	14.3	65.1	15.7	61.1	17.4	56.9	19.1	52.7	20.8	-	-
60	5	66.9	13.0	62.4	14.9	59.0	16.5	55.4	18.1	51.5	20.0	47.7	21.8	43.9	23.6
	6	68.7	13.1	64.2	15.1	60.7	16.6	56.9	18.3	53.0	20.2	49.1	22.0	45.1	23.8
	7	70.7	13.2	66.0	15.2	62.4	16.8	**58.6**	**18.5**	54.5	20.4	50.5	22.2	46.4	24.0
	8	72.8	13.4	67.9	15.4	64.2	17.0	60.3	18.7	56.1	20.6	51.9	22.5	-	-
	9	74.8	13.5	69.8	15.6	66.0	17.1	61.9	18.9	57.6	20.8	53.4	22.7	-	-
	10	76.7	13.7	71.6	15.7	67.7	17.3	63.6	19.1	59.1	21.0	54.8	22.9	-	-
	11	78.7	13.8	73.5	15.9	69.5	17.5	65.2	19.3	60.7	21.2	56.2	23.2	-	-
	12	80.8	13.9	75.5	16.0	71.3	17.6	67.0	19.5	62.3	21.4	57.7	23.4	-	-
70	5	78.5	15.2	73.3	17.5	69.3	19.3	65.0	21.3	60.5	23.5	56.1	25.6	51.5	27.6
	6	80.7	15.4	75.3	17.7	71.2	19.5	66.9	21.5	62.2	23.7	57.6	25.8	52.9	27.9
	7	83.1	15.5	77.5	17.9	73.3	19.7	**68.8**	**21.7**	64.0	23.9	59.3	26.1	54.5	28.2
	8	85.4	15.7	79.7	18.1	75.4	19.9	70.7	21.9	65.8	24.2	61.0	26.4	-	-
	9	87.8	15.9	81.9	18.2	77.5	20.1	72.7	22.2	67.6	24.4	62.6	26.6	-	-
	10	90.1	16.0	84.1	18.4	79.5	20.3	74.6	22.4	69.4	24.7	64.3	26.9	-	-
	11	92.4	16.2	86.2	18.6	81.6	20.5	76.5	22.6	71.2	24.9	66.0	27.2	-	-
	12	94.9	16.3	88.6	18.8	83.8	20.7	78.6	22.8	73.1	25.2	67.7	27.4	-	-
80	5	89.8	18.0	83.9	20.7	79.3	22.8	74.4	25.1	69.2	27.7	64.1	30.2	58.9	32.6
	6	92.3	18.1	86.2	20.9	81.5	23.0	76.5	25.3	71.1	27.9	65.9	30.5	60.5	32.9
	7	95.0	18.3	88.7	21.1	83.9	23.2	**78.7**	**25.6**	73.2	28.2	67.8	30.8	62.3	33.3
	8	97.7	18.5	91.2	21.3	86.2	23.5	80.9	25.9	75.3	28.5	69.7	31.1	-	-
	9	100	18.7	93.7	21.5	88.6	23.7	83.2	26.1	77.4	28.8	71.7	31.4	-	-
	10	103	18.9	96.2	21.7	91.0	23.9	85.4	26.4	79.4	29.1	73.6	31.7	-	-
	11	106	19.1	98.7	21.9	93.3	24.2	87.5	26.7	81.5	29.4	75.4	32.0	-	-
	12	109	19.3	101	22.2	95.8	24.4	89.9	26.9	83.7	29.7	77.5	32.3	-	-
90	5	104	19.8	97.0	22.8	91.7	25.1	86.0	27.7	80.1	30.5	74.1	33.2	68.1	35.9
	6	107	20.0	100	23.0	94.2	25.3	88.4	27.9	82.3	30.8	76.2	33.5	70.0	36.3
	7	110	20.2	103	23.2	97.0	25.6	**91.0**	**28.2**	84.7	31.1	78.4	33.9	72.0	36.6
	8	113	20.4	105	23.5	100	25.9	93.6	28.5	87.1	31.4	80.6	34.3	-	-
	9	116	20.6	108	23.7	102	26.1	96.2	28.8	89.5	31.7	82.9	34.6	-	-
	10	119	20.8	111	23.9	105	26.4	98.7	29.1	91.8	32.1	85.1	34.9	-	-
	11	122	21.0	114	24.2	108	26.6	101	29.4	94.2	32.4	87.2	35.3	-	-
	12	126	21.2	117	24.4	111	26.9	104	29.7	96.7	32.7	89.6	35.6	-	-
100	5	116	22.2	109	25.5	103	28.1	96.4	31.0	89.7	34.2	83.1	37.2	76.3	40.3
	6	120	22.4	112	25.7	106	28.4	99.1	31.3	92.2	34.5	85.4	37.6	78.4	40.6
	7	123	22.6	115	26.0	109	28.7	**102**	**31.6**	94.9	34.8	87.9	38.0	80.7	41.1
	8	127	22.9	118	26.3	112	29.0	105	31.9	97.6	35.2	90.4	38.4	-	-
	9	130	23.1	121	26.6	115	29.3	108	32.3	100	35.6	92.9	38.8	-	-
	10	134	23.3	125	26.8	118	29.6	111	32.6	103	35.9	95.3	39.2	-	-
	11	137	23.5	128	27.1	121	29.8	113	32.9	106	36.3	97.8	39.5	-	-
	12	141	23.8	131	27.4	124	30.1	117	33.2	108	36.6	100	39.9	-	-

Tw= Outlet water temperature °C **kWf =** refrigerating power (kW). **kWa =** Power input of compressors (kW)

The standard performances refer to a 5°C temperature difference between the water entering and leaving the plate-type heat exchanger and to operation of the unit with all fans at top speed. A 0.44 x 10^{-4} m^2 K/W fouling factor has also been considered with the unit installed at zero meters above sea level (Pb = 1013mbar).

TECHNICAL SPECIFICATIONS AND STANDARD PERFORMANCES - IR COOLING UNIT ONLY

Mod. 115-200

MOD.	Tw	OUTDOOR AIR TEMPERATURE (°C D.B.)													
		20		25		30		35		40		45		50	
		kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa
115	5	128	24.9	119	28.7	113	31.6	106	34.8	98.5	38.4	91.3	41.8	83.8	45.2
	6	131	25.1	123	28.9	116	31.9	109	35.1	101	38.7	93.8	42.2	86.1	45.7
	7	135	25.4	126	29.2	119	32.2	**112**	**35.5**	104	39.1	96.5	42.7	88.6	46.1
	8	139	25.7	130	29.5	123	32.6	115	35.9	107	39.6	99.2	43.1	-	-
	9	143	25.9	133	29.8	126	32.9	118	36.3	110	40.0	102	43.6	-	-
	10	147	26.2	137	30.1	129	33.2	121	36.6	113	40.4	105	44.0	-	-
	11	150	26.5	140	30.4	133	33.5	125	37.0	116	40.7	107	44.4	-	-
	12	154	26.7	144	30.7	136	33.9	128	37.3	119	41.1	110	44.9	-	-
130	5	144	28.4	134	32.7	127	36.0	119	39.7	111	43.8	103	47.7	94.3	51.6
	6	148	28.7	138	33.0	130	36.4	122	40.1	114	44.2	106	48.2	96.9	52.1
	7	152	29.0	142	33.3	134	36.7	**126**	**40.5**	117	44.6	109	48.7	100	52.6
	8	156	29.3	146	33.7	138	37.1	130	40.9	121	45.1	112	49.2	-	-
	9	161	29.6	150	34.0	142	37.5	133	41.4	124	45.6	115	49.7	-	-
	10	165	29.9	154	34.4	146	37.9	137	41.8	127	46.0	118	50.2	-	-
	11	169	30.2	158	34.7	149	38.3	140	42.2	130	46.5	121	50.7	-	-
	12	174	30.5	162	35.1	153	38.6	144	42.6	134	46.9	124	51.2	-	-
145	5	163	31.6	152	36.3	144	40.0	135	44.1	126	48.6	117	53.0	107	57.3
	6	168	31.9	157	36.7	148	40.4	139	44.5	129	49.1	120	53.5	110	57.9
	7	173	32.2	161	37.0	152	40.8	**143**	**45.0**	133	49.6	123	54.1	113	58.5
	8	178	32.6	166	37.5	157	41.3	147	45.5	137	50.1	127	54.7	-	-
	9	182	32.9	170	37.8	161	41.7	151	46.0	141	50.6	130	55.2	-	-
	10	187	33.2	175	38.2	165	42.1	155	46.4	144	51.2	134	55.8	-	-
	11	192	33.5	179	38.6	170	42.5	159	46.9	148	51.7	137	56.3	-	-
	12	197	33.9	184	39.0	174	42.9	163	47.3	152	52.2	141	56.9	-	-
160	5	180	35.4	168	40.8	159	44.9	149	49.5	139	54.6	129	59.5	118	64.3
	6	185	35.8	173	41.2	164	45.3	154	50.0	143	55.1	132	60.1	122	64.9
	7	191	36.1	178	41.6	168	45.8	**158**	**50.5**	147	55.7	136	60.7	125	65.6
	8	196	36.5	183	42.0	173	46.3	162	51.1	151	56.3	140	61.4	-	-
	9	202	36.9	188	42.5	178	46.8	167	51.6	155	56.8	144	62.0	-	-
	10	207	37.3	193	42.9	183	47.2	171	52.1	159	57.4	148	62.6	-	-
	11	212	37.6	198	43.3	187	47.7	176	52.6	164	58.0	151	63.2	-	-
	12	218	38.0	203	43.7	192	48.2	181	53.1	168	58.5	156	63.8	-	-
180	5	205	39.3	192	45.2	181	49.8	170	54.9	158	60.5	147	66.0	135	71.4
	6	211	39.7	197	45.6	186	50.3	175	55.4	163	61.1	151	66.6	138	72.0
	7	217	40.1	203	46.1	192	50.8	**180**	**56.0**	167	61.7	155	67.3	142	72.8
	8	223	40.5	209	46.6	197	51.4	185	56.6	172	62.4	160	68.0	-	-
	9	230	40.9	214	47.1	203	51.9	190	57.2	177	63.0	164	68.7	-	-
	10	236	41.3	220	47.5	208	52.4	195	57.8	182	63.7	168	69.4	-	-
	11	242	41.7	226	48.0	213	52.9	200	58.3	186	64.3	173	70.1	-	-
	12	248	42.1	232	48.5	219	53.4	206	58.9	191	64.9	177	70.8	-	-
200	5	228	44.1	213	50.7	202	55.9	189	61.6	176	67.9	163	74.0	150	80.0
	6	235	44.5	219	51.2	207	56.4	194	62.2	181	68.5	167	74.7	154	80.8
	7	241	44.9	225	51.7	213	57.0	**200**	**62.8**	186	69.2	172	75.5	158	81.6
	8	248	45.4	232	52.3	219	57.6	206	63.5	191	70.0	177	76.3	-	-
	9	255	45.9	238	52.8	225	58.2	211	64.1	197	70.7	182	77.1	-	-
	10	262	46.3	244	53.3	231	58.7	217	64.8	202	71.4	187	77.8	-	-
	11	269	46.8	251	53.8	237	59.3	222	65.4	207	72.1	192	78.6	-	-
	12	276	47.2	258	54.4	244	59.9	229	66.0	213	72.8	197	79.4	-	-

Tw= Outlet water temperature °C **kWf =** refrigerating power (kW). **kWa =** Power input of compressors (kW)

The standard performances refer to a 5°C temperature difference between the water entering and leaving the plate-type heat exchanger and to operation of the unit with all fans at top speed. A 0.44 x 10^{-4} m^2 K/W fouling factor has also been considered with the unit installed at zero meters above sea level (Pb = 1013mbar).

TECHNICAL SPECIFICATIONS AND STANDARD PERFORMANCES - IR COOLING UNIT ONLY

Technical specifications of unit AS Low noise unit

Model	50	60	70	80	90	100	115	130	145	160	180	200	UM
Power supply	400V - 3ph+N - 50 Hz				400V - 3ph - 50 Hz								V-f-Hz
Type of refrigerant	R410A												/
Circuits	1												n°
Cooling capacity (1)	51.9	56.8	66.7	76.3	88.2	98.5	109	122	139	153	174	194	kW
Compressors power input (1)	17.2	19.3	22.6	26.8	29.5	33.0	37.1	42.3	47.0	52.7	58.5	65.6	kW
Compressor EER	3.01	2.94	2.95	2.85	2.99	2.98	2.94	2.88	2.96	2.90	2.97	2.96	-
Total power input (1)	19.0	21.1	24.4	28.6	33.1	36.6	40.7	45.9	52.4	58.1	65.7	72.8	kW
Total EER	2.73	2.69	2.73	2.67	2.66	2.69	2.68	2.66	2.65	2.63	2.65	2.66	-
ESEER	3.76	3.71	3.77	3.68	3.68	3.71	3.70	3.67	3.66	3.63	3.65	3.68	-
Water flow rate (1)	2.48	2.71	3.19	3.65	4.21	4.71	5.21	5.83	6.64	7.31	8.31	9.27	l/s
Water pressure drops (1)	27	33	42	57	47	29	35	50	66	77	53	38	kPa

Compressor

Type	Scroll												/
Quantity	2												n°
Load steps	0-50-100												%
Oil charge CP1	3.25	3.25	3.25	3.25	3.25	4.7	4.7	6.8	6.8	6.3	6.3	6.3	l
Oil charge CP2	3.25	3.25	3.25	3.25	4.7	4.7	6.8	6.8	6.3	6.3	6.3	6.3	l

Heat Exchanger

Type	Shell and tube												/
Quantity	1												n°
Water volume	15.3	15.3	15.3	15.3	19.8	21.7	21.7	29.2	29.2	29.2	37.8	48.3	l

Fan

Type	Axial												-
Quantity	3				2				3		4		n°
Maximum rotational speed	900												rpm
Total air flow rate	24208	24208	23417	23067	34550	33417	39533	39533	51825	49850	69100	66467	m^3/h
Power input	1.8				3.6				5.4		7.2		kW

Coil

Type	Aluminum fins and copper tubes												/
Quantity	1												n°
Front area	3.38				4.72		5.90				7.41		m^2

Water Storage Tank (SAA accessory)

Water volume	200				400						460		l
Safety valve setting	600												kPa
Surge chamber volume	12				24								l
Surge chamber default pressure	150												kPa
Max. operating pressure	1000				800								kPa

Electrical Data

Total maximum power input [FLA]	48.2	50.9	58.3	68.6	76.0	81.5	89.9	98.3	117	131	150	165	A
Total maximum power input [FLI]	25.5	27.7	31.1	35.5	43.6	49.2	53.9	58.6	69.4	78.2	90.8	101	kW
Total maximum starting current [MIC]	146	147	173	211	265	270	317	325	368	382	470	485	A

Data referred to standard operating condition.
(1): water temperature: in 12°C - out 7°C air temperature: in 35°C d.b.

TECHNICAL SPECIFICATIONS AND STANDARD PERFORMANCES - IR COOLING UNIT ONLY

Standard performances AS Low noise unit

Mod. 50-100

MOD.	Tw	OUTDOOR AIR TEMPERATURE (°C D.B.)													
		20		25		30		35		40		45		50	
		kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa
50	5	59.2	12.1	55.3	13.9	52.3	15.3	49.1	16.9	45.7	18.6	42.3	20.3	38.8	22.0
	6	60.9	12.2	56.8	14.0	53.7	15.5	50.4	17.1	46.9	18.8	43.5	20.5	39.9	22.2
	7	62.7	12.3	58.5	14.2	55.3	15.6	**51.9**	**17.2**	48.3	19.0	44.7	20.7	41.1	22.4
	8	64.4	12.5	60.1	14.3	56.9	15.8	53.4	17.4	49.7	19.2	46.0	20.9	-	-
	9	66.2	12.6	61.8	14.5	58.4	16.0	54.8	17.6	51.0	19.4	47.3	21.1	-	-
	10	68.0	12.7	63.4	14.6	60.0	16.1	56.3	17.8	52.4	19.6	48.5	21.4	-	-
	11	69.7	12.8	65.1	14.8	61.5	16.3	57.7	17.9	53.7	19.8	49.8	21.6	-	-
	12	71.6	13.0	66.8	14.9	63.2	16.4	59.3	18.1	55.2	20.0	51.1	21.8	-	-
60	5	64.8	13.5	60.5	15.6	57.2	17.2	53.7	18.9	50.0	20.9	46.3	22.7	42.5	24.6
	6	66.6	13.7	62.2	15.7	58.8	17.3	55.2	19.1	51.3	21.1	47.6	23.0	43.7	24.8
	7	68.6	13.8	64.0	15.9	60.5	17.5	**56.8**	**19.3**	52.8	21.3	48.9	23.2	45.0	25.1
	8	70.5	14.0	65.8	16.1	62.2	17.7	58.4	19.5	54.3	21.5	50.3	23.4	-	-
	9	72.5	14.1	67.6	16.2	64.0	17.9	60.0	19.7	55.8	21.7	51.7	23.7	-	-
	10	74.4	14.2	69.4	16.4	65.7	18.1	61.6	19.9	57.3	21.9	53.1	23.9	-	-
	11	76.3	14.4	71.2	16.5	67.3	18.2	63.2	20.1	58.8	22.2	54.4	24.2	-	-
	12	78.4	14.5	73.1	16.7	69.2	18.4	64.9	20.3	60.4	22.4	55.9	24.4	-	-
70	5	76.1	15.9	71.1	18.3	67.2	20.1	63.1	22.2	58.7	24.5	54.3	26.7	49.9	28.8
	6	78.2	16.0	73.0	18.4	69.1	20.3	64.8	22.4	60.3	24.7	55.8	26.9	51.3	29.1
	7	80.5	16.2	75.2	18.6	71.1	20.5	**66.7**	**22.6**	62.1	25.0	57.5	27.2	52.8	29.4
	8	82.8	16.4	77.3	18.8	73.1	20.8	68.6	22.9	63.8	25.2	59.1	27.5	-	-
	9	85.1	16.5	79.4	19.0	75.1	21.0	70.5	23.1	65.6	25.5	60.7	27.8	-	-
	10	87.3	16.7	81.5	19.2	77.1	21.2	72.3	23.3	67.3	25.7	62.3	28.1	-	-
	11	89.6	16.9	83.6	19.4	79.1	21.4	74.2	23.6	69.0	26.0	63.9	28.3	-	-
	12	92.0	17.0	85.9	19.6	81.2	21.6	76.2	23.8	70.9	26.2	65.7	28.6	-	-
80	5	87.1	18.8	81.3	21.6	76.9	23.8	72.1	26.3	67.1	29.0	62.2	31.6	57.1	34.1
	6	89.5	19.0	83.5	21.8	79.0	24.1	74.1	26.5	69.0	29.2	63.9	31.9	58.7	34.5
	7	92.1	19.2	86.0	22.1	81.3	24.3	**76.3**	**26.8**	71.0	29.5	65.7	32.2	60.4	34.8
	8	94.7	19.4	88.4	22.3	83.6	24.6	78.5	27.1	73.0	29.9	67.6	32.6	-	-
	9	97.3	19.6	90.9	22.5	85.9	24.8	80.6	27.4	75.0	30.2	69.5	32.9	-	-
	10	100	19.8	93.3	22.8	88.2	25.1	82.8	27.6	77.0	30.5	71.3	33.2	-	-
	11	102	20.0	95.6	23.0	90.4	25.3	84.9	27.9	79.0	30.8	73.1	33.5	-	-
	12	105	20.2	98.2	23.2	92.9	25.6	87.2	28.2	81.1	31.1	75.1	33.9	-	-
90	5	101	20.7	94.0	23.8	88.9	26.2	83.4	28.9	77.6	31.9	71.9	34.8	66.0	37.6
	6	103	20.9	96.6	24.0	91.3	26.5	85.7	29.2	79.7	32.2	73.9	35.1	67.8	37.9
	7	106	21.1	99.4	24.3	94.0	26.8	**88.2**	**29.5**	82.1	32.5	76.0	35.4	69.8	38.3
	8	109	21.3	102	24.6	96.6	27.1	90.7	29.8	84.4	32.9	78.2	35.8	-	-
	9	113	21.6	105	24.8	99.3	27.3	93.2	30.1	86.7	33.2	80.3	36.2	-	-
	10	115	21.8	108	25.0	102	27.6	95.7	30.4	89.0	33.5	82.4	36.6	-	-
	11	118	22.0	111	25.3	105	27.9	98.1	30.7	91.3	33.9	84.5	36.9	-	-
	12	122	22.2	114	25.5	107	28.1	101	31.0	93.8	34.2	86.8	37.3	-	-
100	5	112	23.2	105	26.6	99.2	29.4	93.1	32.4	86.6	35.7	80.3	38.9	73.7	42.0
	6	116	23.4	108	26.9	102	29.6	95.7	32.7	89.0	36.0	82.5	39.3	75.8	42.4
	7	119	23.6	111	27.2	105	29.9	**98.5**	**33.0**	91.6	36.4	84.9	39.7	78.0	42.9
	8	122	23.9	114	27.5	108	30.3	101	33.4	94.2	36.8	87.3	40.1	-	-
	9	126	24.1	117	27.7	111	30.6	104	33.7	96.8	37.1	89.7	40.5	-	-
	10	129	24.3	120	28.0	114	30.9	107	34.0	99.4	37.5	92.1	40.9	-	-
	11	132	24.6	123	28.3	117	31.2	110	34.4	102	37.9	94.4	41.3	-	-
	12	136	24.8	127	28.6	120	31.5	113	34.7	105	38.2	97.0	41.7	-	-

Tw= Temperatura acqua in uscita in °C **kWf =** Potenza frigorifera netta(kW). **kWa =** Potenza assorbita dai compressori (kW)

Le prestazioni standard si riferiscono ad un differenza di 5 °C di temperatura tra acqua entrante ed uscente dallo scambiatore a piastre, e al funzionamento dell'unità con tutti i ventilatori alla massima velocità. Si considera inoltre un fattore di sporcamento di 0.44 x 10^{-4} m^2 K/W e l'unità posta a zero metri sul livello del mare (Pb = 1013mbar).

TECHNICAL SPECIFICATIONS AND STANDARD PERFORMANCES - IR COOLING UNIT ONLY

Mod. 115-200

MOD.	Tw	OUTDOOR AIR TEMPERATURE (°C D.B.)													
		20		25		30		35		40		45		50	
		kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa
115	5	124	26.0	116	30.0	110	33.0	103	36.4	95.9	40.1	88.8	43.7	81.6	47.3
	6	128	26.3	119	30.2	113	33.3	106	36.7	98.5	40.5	91.3	44.1	83.8	47.7
	7	132	26.5	123	30.5	116	33.6	**109**	**37.1**	101	40.9	93.9	44.6	86.3	48.2
	8	135	26.8	126	30.9	119	34.0	112	37.5	104	41.3	96.6	45.1	-	-
	9	139	27.1	130	31.2	123	34.4	115	37.9	107	41.8	99.2	45.5	-	-
	10	143	27.4	133	31.5	126	34.7	118	38.3	110	42.2	102	46.0	-	-
	11	146	27.6	137	31.8	129	35.0	121	38.6	113	42.6	104	46.4	-	-
	12	150	27.9	140	32.1	133	35.4	125	39.0	116	43.0	107	46.9	-	-
130	5	139	29.7	130	34.1	123	37.6	115	41.5	107	45.7	99.4	49.8	91.3	53.9
	6	143	30.0	134	34.5	126	38.0	119	41.9	110	46.2	102	50.3	93.8	54.4
	7	147	30.3	137	34.8	130	38.4	**122**	**42.3**	114	46.6	105	50.8	96.6	55.0
	8	151	30.6	141	35.2	134	38.8	125	42.8	117	47.1	108	51.4	-	-
	9	156	30.9	145	35.6	137	39.2	129	43.2	120	47.6	111	51.9	-	-
	10	160	31.2	149	35.9	141	39.6	132	43.6	123	48.1	114	52.4	-	-
	11	164	31.5	153	36.3	145	40.0	136	44.1	126	48.6	117	52.9	-	-
	12	168	31.8	157	36.6	149	40.3	139	44.5	130	49.0	120	53.5	-	-
145	5	159	33.0	148	38.0	140	41.8	131	46.1	122	50.8	113	55.4	104	59.9
	6	163	33.3	152	38.3	144	42.2	135	46.5	126	51.3	116	55.9	107	60.5
	7	168	33.6	157	38.7	148	42.6	**139**	**47.0**	129	51.8	120	56.5	110	61.1
	8	173	34.0	161	39.1	152	43.1	143	47.5	133	52.4	123	57.1	-	-
	9	177	34.4	166	39.5	157	43.5	147	48.0	137	52.9	127	57.7	-	-
	10	182	34.7	170	39.9	161	44.0	151	48.5	140	53.4	130	58.3	-	-
	11	187	35.0	174	40.3	165	44.4	155	49.0	144	54.0	133	58.8	-	-
	12	192	35.4	179	40.7	169	44.8	159	49.4	148	54.5	137	59.4	-	-
160	5	175	37.0	163	42.6	154	46.9	145	51.7	135	57.0	125	62.1	114	67.2
	6	179	37.3	168	43.0	158	47.3	149	52.2	138	57.5	128	62.7	118	67.8
	7	185	37.7	172	43.4	163	47.8	**153**	**52.7**	142	58.1	132	63.4	121	68.5
	8	190	38.1	177	43.9	168	48.4	157	53.3	146	58.8	136	64.1	-	-
	9	195	38.5	182	44.3	172	48.8	162	53.9	150	59.4	139	64.7	-	-
	10	200	38.9	187	44.8	177	49.3	166	54.4	154	59.9	143	65.4	-	-
	11	205	39.3	192	45.2	181	49.8	170	54.9	158	60.5	147	66.0	-	-
	12	211	39.7	197	45.7	186	50.3	175	55.5	163	61.1	151	66.6	-	-
180	5	199	41.0	185	47.2	175	52.0	165	57.4	153	63.2	142	68.9	130	74.5
	6	204	41.4	191	47.7	180	52.5	169	57.9	157	63.8	146	69.6	134	75.2
	7	210	41.9	196	48.2	185	53.1	**174**	**58.5**	162	64.5	150	70.3	138	76.0
	8	216	42.3	202	48.7	191	53.6	179	59.1	166	65.2	154	71.1	-	-
	9	222	42.7	207	49.2	196	54.2	184	59.7	171	65.8	158	71.8	-	-
	10	228	43.2	213	49.7	201	54.7	189	60.3	176	66.5	163	72.5	-	-
	11	234	43.6	218	50.2	206	55.3	194	60.9	180	67.2	167	73.2	-	-
	12	240	44.0	224	50.6	212	55.8	199	61.5	185	67.8	171	73.9	-	-
200	5	221	46.0	207	53.0	195	58.3	183	64.3	171	70.9	158	77.3	145	83.6
	6	228	46.5	212	53.5	201	58.9	189	64.9	175	71.6	162	78.0	149	84.4
	7	234	46.9	219	54.0	207	59.5	**194**	**65.6**	180	72.3	167	78.8	154	85.2
	8	241	47.5	225	54.6	213	60.2	199	66.3	186	73.1	172	79.7	-	-
	9	247	47.9	231	55.1	218	60.8	205	67.0	191	73.8	177	80.5	-	-
	10	254	48.4	237	55.7	224	61.4	210	67.7	196	74.6	181	81.3	-	-
	11	261	48.9	243	56.2	230	62.0	216	68.3	201	75.3	186	82.1	-	-
	12	268	49.4	250	56.8	236	62.6	222	69.0	206	76.0	191	82.9	-	-

Tw= Temperatura acqua in uscita in °C **kWf =** Potenza frigorifera netta(kW). **kWa =** Potenza assorbita dai compressori (kW)

Le prestazioni standard si riferiscono ad un differenza di 5 °C di temperatura tra acqua entrante ed uscente dallo scambiatore a piastre, e al funzionamento dell'unità con tutti i ventilatori alla massima velocità. Si considera inoltre un fattore di sporcamento di 0.44 x 10^{-4} m^2 K/W e l'unità posta a zero metri sul livello del mare (Pb = 1013mbar).

TECHNICAL SPECIFICATIONS AND STANDARD PERFORMANCES - IR COOLING UNIT ONLY

Technical specifications of unit AX Extra low noise unit

Model	50	60	70	80	90	100	115	130	145	160	180	200	UM
Power supply	400V - 3ph+N - 50 Hz				400V - 3ph - 50 Hz								V-f-Hz
Type of refrigerant	R410A												/
Circuits	1												n°
Cooling capacity (1)	50.7	55.5	65.2	74.5	86.2	96.2	106	119	135	150	170	189	kW
Compressors power input (1)	17.6	19.9	23.1	27.6	28.6	34.1	38.3	43.7	48.0	53.9	60.4	67.7	kW
Compressor EER	2.88	2.79	2.82	2.70	3.01	2.82	2.77	2.72	2.81	2.79	2.81	2.79	-
Total power input (1)	19.4	21.7	24.9	29.4	32.2	37.7	41.9	47.3	53.4	59.3	67.6	74.9	kW
Total EER	2.61	2.56	2.62	2.53	2.68	2.55	2.53	2.52	2.53	2.53	2.51	2.52	-
ESEER	3.61	3.53	3.61	3.50	3.69	3.52	3.49	3.47	3.49	3.49	3.47	3.48	-
Water flow rate (1)	2.42	2.65	3.12	3.56	4.12	4.60	5.06	5.69	6.45	7.17	8.12	9.03	l/s
Water pressure drops (1)	26	31	40	54	45	28	33	47	62	74	51	36	kPa

Compressor

Type	Scroll												/
Quantity	2												n°
Load steps	0-50-100												%
Oil charge CP1	3.25	3.25	3.25	3.25	3.25	4.7	4.7	6.8	6.8	6.3	6.3	6.3	l
Oil charge CP2	3.25	3.25	3.25	3.25	4.7	4.7	6.8	6.8	6.3	6.3	6.3	6.3	l

Heat Exchanger

Type	Shell and tube												/
Quantity	1												n°
Water volume	15.3	15.3	15.3	15.3	19.8	21.7	21.7	29.2	29.2	29.2	37.8	48.3	l

Fan

Type	Axial												-
Quantity	3				2				3		4		n°
Maximum rotational speed	900												rpm
Total air flow rate	19367	19367	18733	18453	27640	26733	31627	31627	41460	39880	55280	53173	m^3/h
Power input	1,8				3,6				5,4		7,2		kW

Coil

Type	Aluminum fins and copper tubes				/
Quantity	1				n°
Front area	3.38	4.72	5.90	7.41	m^2

Water Storage Tank (SAA accessory)

Water volume	200	400	460	l
Safety valve setting	600			kPa
Surge chamber volume	12	24		l
Surge chamber default pressure	150			kPa
Max. operating pressure	1000	800		kPa

Electrical Data

Total maximum power input [FLA]	48.2	50.9	58.3	68.6	76.0	81.5	89.9	98.3	117	131	150	165	A
Total maximum power input [FLI]	25.5	27.7	31.1	35.5	43.6	49.2	53.9	58.6	69.4	78.2	90.8	101	kW
Total maximum starting current [MIC]	146	147	173	211	265	270	317	325	368	382	470	485	A

Data referred to standard operating condition.
(1): water temperature: in 12°C - out 7°C air temperature: in 35°C d.b.

TECHNICAL SPECIFICATIONS AND STANDARD PERFORMANCES - IR COOLING UNIT ONLY

Standard performances AX Extra low noise unit

Mod. 50-100

MOD.	Tw	OUTDOOR AIR TEMPERATURE (°C D.B.)													
		20		25		30		35		40		45		50	
		kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa
50	5	57.9	12.3	54.0	14.2	51.1	15.7	47.9	17.3	44.6	19.0	41.3	20.7	37.9	22.4
	6	59.5	12.5	55.5	14.3	52.5	15.8	49.3	17.4	45.8	19.2	42.5	20.9	39.0	22.6
	7	61.2	12.6	57.1	14.5	54.0	16.0	**50.7**	**17.6**	47.2	19.4	43.7	21.1	40.1	22.9
	8	62.9	12.7	58.8	14.6	55.6	16.1	52.1	17.8	48.5	19.6	44.9	21.4	-	-
	9	64.7	12.9	60.4	14.8	57.1	16.3	53.6	18.0	49.8	19.8	46.2	21.6	-	-
	10	66.4	13.0	62.0	14.9	58.6	16.5	55.0	18.1	51.2	20.0	47.4	21.8	-	-
	11	68.1	13.1	63.6	15.1	60.1	16.6	56.4	18.3	52.5	20.2	48.6	22.0	-	-
	12	69.9	13.2	65.3	15.2	61.7	16.8	57.9	18.5	53.9	20.4	49.9	22.2	-	-
60	5	63.4	14.0	59.1	16.1	55.9	17.7	52.5	19.5	48.8	21.5	45.2	23.5	41.5	25.4
	6	65.1	14.1	60.8	16.2	57.5	17.9	53.9	19.7	50.2	21.7	46.5	23.7	42.7	25.6
	7	67.0	14.2	62.5	16.4	59.1	18.0	**55.5**	**19.9**	51.6	21.9	47.8	23.9	43.9	25.9
	8	68.9	14.4	64.3	16.6	60.8	18.2	57.1	20.1	53.1	22.2	49.2	24.2	-	-
	9	70.8	14.5	66.1	16.7	62.5	18.4	58.6	20.3	54.6	22.4	50.5	24.4	-	-
	10	72.7	14.7	67.8	16.9	64.1	18.6	60.2	20.5	56.0	22.6	51.9	24.7	-	-
	11	74.5	14.8	69.6	17.1	65.8	18.8	61.7	20.7	57.4	22.8	53.2	24.9	-	-
	12	76.6	15.0	71.5	17.2	67.6	19.0	63.4	20.9	59.0	23.1	54.6	25.1	-	-
70	5	74.4	16.2	69.5	18.7	65.7	20.6	61.6	22.7	57.4	25.0	53.1	27.2	48.8	29.4
	6	76.5	16.4	71.4	18.8	67.5	20.7	63.4	22.9	58.9	25.2	54.6	27.5	50.1	29.7
	7	78.7	16.5	73.5	19.0	69.5	21.0	**65.2**	**23.1**	60.7	25.5	56.2	27.8	51.6	30.0
	8	80.9	16.7	75.6	19.2	71.4	21.2	67.0	23.4	62.4	25.8	57.8	28.1	-	-
	9	83.2	16.9	77.6	19.4	73.4	21.4	68.9	23.6	64.1	26.0	59.4	28.4	-	-
	10	85.4	17.1	79.7	19.6	75.4	21.6	70.7	23.8	65.8	26.3	60.9	28.6	-	-
	11	87.6	17.2	81.7	19.8	77.3	21.8	72.5	24.1	67.5	26.5	62.5	28.9	-	-
	12	89.9	17.4	83.9	20.0	79.4	22.0	74.5	24.3	69.3	26.8	64.2	29.2	-	-
80	5	85.0	19.4	79.4	22.3	75.1	24.5	70.4	27.1	65.5	29.8	60.7	32.5	55.8	35.2
	6	87.4	19.5	81.6	22.5	77.1	24.8	72.4	27.3	67.4	30.1	62.4	32.8	57.3	35.5
	7	89.9	19.7	84.0	22.7	79.4	25.0	**74.5**	**27.6**	69.3	30.4	64.2	33.2	59.0	35.9
	8	92.5	20.0	86.3	23.0	81.6	25.3	76.6	27.9	71.3	30.8	66.0	33.5	-	-
	9	95.0	20.2	88.7	23.2	83.9	25.6	78.7	28.2	73.2	31.1	67.8	33.9	-	-
	10	97.6	20.4	91.1	23.4	86.1	25.8	80.8	28.5	75.2	31.4	69.6	34.2	-	-
	11	100	20.6	93.4	23.7	88.3	26.1	82.9	28.7	77.1	31.7	71.4	34.5	-	-
	12	103	20.8	95.9	23.9	90.7	26.3	85.1	29.0	79.2	32.0	73.4	34.9	-	-
90	5	98.4	20.1	91.8	23.1	86.8	25.4	81.5	28.0	75.8	30.9	70.2	33.7	64.5	36.4
	6	101	20.3	94.4	23.3	89.3	25.7	83.8	28.3	77.9	31.2	72.2	34.0	66.3	36.8
	7	104	20.5	97.1	23.5	91.9	25.9	**86.2**	**28.6**	80.2	31.5	74.3	34.4	68.2	37.2
	8	107	20.7	100	23.8	94.5	26.2	88.6	28.9	82.5	31.9	76.4	34.7	-	-
	9	110	20.9	103	24.0	97.1	26.5	91.1	29.2	84.7	32.2	78.5	35.1	-	-
	10	113	21.1	105	24.3	100	26.8	93.5	29.5	87.0	32.5	80.6	35.4	-	-
	11	116	21.3	108	24.5	102	27.0	95.9	29.8	89.2	32.8	82.6	35.8	-	-
	12	119	21.5	111	24.8	105	27.3	98.5	30.1	91.6	33.1	84.9	36.1	-	-
100	5	110	23.9	102	27.5	96.9	30.3	91.0	33.4	84.6	36.9	78.4	40.2	72.0	43.4
	6	113	24.2	105	27.8	100	30.6	93.5	33.8	87.0	37.2	80.5	40.6	74.0	43.9
	7	116	24.4	108	28.1	103	30.9	**96.2**	**34.1**	89.5	37.6	82.9	41.0	76.1	44.3
	8	119	24.7	111	28.4	105	31.3	98.9	34.5	92.0	38.0	85.2	41.4	-	-
	9	123	24.9	115	28.7	108	31.6	102	34.8	94.6	38.4	87.6	41.8	-	-
	10	126	25.2	118	29.0	111	31.9	104	35.2	97.1	38.8	89.9	42.3	-	-
	11	129	25.4	121	29.2	114	32.2	107	35.5	100	39.1	92.2	42.7	-	-
	12	133	25.7	124	29.5	117	32.5	110	35.9	102	39.5	94.7	43.1	-	-

Tw= Temperatura acqua in uscita in °C **kWf =** Potenza frigorifera netta(kW). **kWa =** Potenza assorbita dai compressori (kW)

Le prestazioni standard si riferiscono ad un differenza di 5 °C di temperatura tra acqua entrante ed uscente dallo scambiatore a piastre, e al funzionamento dell'unità con tutti i ventilatori alla massima velocità. Si considera inoltre un fattore di sporcamento di 0.44 x 10^{-4} m^2 K/W e l'unità posta a zero metri sul livello del mare (Pb = 1013mbar).

TECHNICAL SPECIFICATIONS AND STANDARD PERFORMANCES - IR COOLING UNIT ONLY

Mod. 115-200

MOD.	Tw	OUTDOOR AIR TEMPERATURE (°C D.B.)													
		20		25		30		35		40		45		50	
		kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa	kWf	kWa
115	5	121	26.9	113	30.9	107	34.1	100	37.6	93.2	41.4	86.4	45.1	79.3	48.8
	6	124	27.1	116	31.2	110	34.4	103	37.9	95.8	41.8	88.8	45.6	81.5	49.3
	7	128	27.4	119	31.5	113	34.7	**106**	**38.3**	98.6	42.2	91.3	46.0	83.9	49.8
	8	132	27.7	123	31.9	116	35.1	109	38.7	101	42.7	93.9	46.5	-	-
	9	135	28.0	126	32.2	119	35.5	112	39.1	104	43.1	96.5	47.0	-	-
	10	139	28.3	130	32.5	123	35.8	115	39.5	107	43.5	99.1	47.5	-	-
	11	142	28.5	133	32.8	126	36.2	118	39.9	110	44.0	102	47.9	-	-
	12	146	28.8	136	33.2	129	36.5	121	40.3	113	44.4	104	48.4	-	-
130	5	136	30.7	127	35.3	120	38.9	113	42.9	105	47.2	97.0	51.5	89.1	55.7
	6	140	30.9	130	35.6	123	39.2	116	43.3	108	47.7	100	52.0	91.5	56.2
	7	144	31.3	134	36.0	127	39.6	**119**	**43.7**	111	48.2	103	52.5	94.2	56.8
	8	148	31.6	138	36.4	130	40.1	122	44.2	114	48.7	105	53.1	-	-
	9	152	31.9	142	36.7	134	40.5	126	44.6	117	49.2	108	53.6	-	-
	10	156	32.2	145	37.1	138	40.9	129	45.1	120	49.7	111	54.2	-	-
	11	160	32.6	149	37.5	141	41.3	132	45.5	123	50.2	114	54.7	-	-
	12	164	32.9	153	37.8	145	41.7	136	46.0	127	50.7	117	55.2	-	-
145	5	154	33.7	144	38.8	136	42.7	128	47.1	119	51.9	110	56.6	101	61.2
	6	158	34.0	148	39.1	140	43.1	131	47.5	122	52.4	113	57.1	104	61.8
	7	163	34.4	152	39.5	144	43.6	**135**	**48.0**	126	52.9	116	57.7	107	62.4
	8	168	34.7	156	40.0	148	44.0	139	48.6	129	53.5	120	58.3	-	-
	9	172	35.1	161	40.4	152	44.5	143	49.0	133	54.1	123	58.9	-	-
	10	177	35.4	165	40.8	156	44.9	146	49.5	136	54.6	126	59.5	-	-
	11	181	35.8	169	41.2	160	45.4	150	50.0	140	55.1	129	60.1	-	-
	12	186	36.1	174	41.6	164	45.8	154	50.5	144	55.7	133	60.7	-	-
160	5	171	37.8	160	43.5	151	47.9	142	52.8	132	58.2	122	63.5	112	68.6
	6	176	38.1	164	43.9	155	48.4	146	53.3	136	58.8	126	64.1	115	69.3
	7	181	38.5	169	44.3	160	48.8	**150**	**53.9**	140	59.4	129	64.7	119	70.0
	8	186	39.0	174	44.8	164	49.4	154	54.4	144	60.0	133	65.4	-	-
	9	191	39.3	179	45.3	169	49.9	159	55.0	147	60.6	137	66.1	-	-
	10	196	39.7	183	45.7	173	50.4	163	55.5	151	61.2	140	66.7	-	-
	11	201	40.1	188	46.2	178	50.9	167	56.1	155	61.8	144	67.4	-	-
	12	207	40.5	193	46.6	183	51.4	171	56.6	159	62.4	148	68.1	-	-
180	5	194	42.4	181	48.8	171	53.7	161	59.2	150	65.3	139	71.2	127	77.0
	6	199	42.8	186	49.2	176	54.2	165	59.8	154	65.9	142	71.8	131	77.7
	7	205	43.2	192	49.7	181	54.8	**170**	**60.4**	158	66.6	146	72.6	135	78.5
	8	211	43.7	197	50.3	186	55.4	175	61.1	163	67.3	151	73.4	-	-
	9	217	44.1	202	50.8	191	55.9	180	61.7	167	68.0	155	74.1	-	-
	10	223	44.6	208	51.3	196	56.5	184	62.3	172	68.7	159	74.9	-	-
	11	228	45.0	213	51.8	202	57.1	189	62.9	176	69.3	163	75.6	-	-
	12	235	45.4	219	52.3	207	57.6	194	63.5	181	70.0	167	76.3	-	-
200	5	216	47.5	201	54.7	190	60.2	179	66.4	166	73.2	154	79.8	141	86.3
	6	222	47.9	207	55.2	196	60.8	184	67.0	171	73.9	158	80.5	145	87.1
	7	228	48.4	213	55.7	201	61.4	**189**	**67.7**	176	74.6	163	81.4	150	88.0
	8	235	49.0	219	56.3	207	62.1	194	68.4	181	75.4	167	82.3	-	-
	9	241	49.5	225	56.9	213	62.7	200	69.1	186	76.2	172	83.1	-	-
	10	247	50.0	231	57.5	218	63.3	205	69.8	191	77.0	177	83.9	-	-
	11	254	50.4	237	58.0	224	63.9	210	70.5	196	77.7	181	84.7	-	-
	12	261	50.9	243	58.6	230	64.6	216	71.2	201	78.5	186	85.5	-	-

Tw= Temperatura acqua in uscita in °C **kWf =** Potenza frigorifera netta(kW). **kWa =** Potenza assorbita dai compressori (kW)

Le prestazioni standard si riferiscono ad un differenza di 5 °C di temperatura tra acqua entrante ed uscente dallo scambiatore a piastre, e al funzionamento dell'unità con tutti i ventilatori alla massima velocità. Si considera inoltre un fattore di sporcamento di 0.44 x 10^{-4} m^2 K/W e l'unità posta a zero metri sul livello del mare (Pb = 1013mbar).

CORRECTION FACTOR FOR THE USE OF GLYCOL

Correction factor for the use of glycol IN COOLING MODE

Correction factor for the use of ethylene glycol with water produced between 5÷20ºC.

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	1.00	0.99	0.98	0.97	0.95
Compressor power input CCPA	1.00	1.00	0.99	0.99	0.98
Water flow rate CCQA	1.00	1.04	1.08	1.12	1.16
Water pressure drop CCDP	1.00	1.08	1.16	1.25	1.35

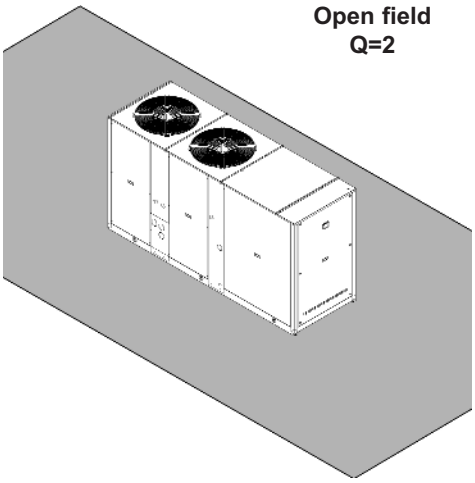
Correction factor for the use of Propylene Glycol with water produced between 5÷20ºC.

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	1.00	0.98	0.96	0.94	0.92
Compressor power input CCPA	1.00	0.99	0.98	0.95	0.93
Water flow rate CCQA	1.00	1.01	1.03	1.06	1.09
Water pressure drop CCDP	1.00	1.05	1.11	1.22	1,38

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), due to a change of external air temperature noise levels may change to ensure proper functioning of the unit within operating range.
The acoustic pressure levels are calculated 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 $1x10^{-12}$ W.
The **Total** sound power level in **dB(A)** measured in compliance with **ISO 9614** standards, is certified according to the **Eurovent** certification program and it is the only mandatory value (the values of octave band 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 (Q=2) and the units operating in nominal conditions in the cooling mode.



AB Standard unit

Mod.	SWL (dB)										SPL (dBA)		
	Octave bands (Hz)								Total				
	63	125	250	500	1000	2000	4000	8000	dB	dB(A)	1m	5m	10m
50	89.4	87.0	84.8	80.3	77.4	73.8	65.3	56.0	**93**	**83**	65	56	51
60	89.4	87.0	84.8	80.3	77.4	73.8	65.3	56.0	**93**	**83**	65	56	51
70	91.2	88.9	86.4	82.3	78.0	71.6	64.0	55.6	**94**	**84**	66	57	52
80	91.2	88.9	86.4	82.3	78.0	71.6	64.0	55.6	**94**	**84**	66	57	52
90	92.2	89.9	87.4	83.3	79.0	72.6	65.0	56.6	**95**	**85**	67	58	53
100	92.2	89.9	87.4	83.3	79.0	72.6	65.0	56.6	**95**	**85**	67	58	53
115	92.2	89.9	87.4	83.3	79.0	72.6	65.0	56.6	**95**	**85**	66	58	53
130	92.4	90.0	87.8	83.3	80.4	76.8	68.3	59.0	**96**	**86**	67	59	54
145	94.2	91.9	89.4	85.3	81.0	74.6	67.0	58.6	**97**	**87**	68	60	55
160	94.2	91.9	89.4	85.3	81.0	74.6	67.0	58.6	**97**	**87**	68	60	55
180	92.4	90.1	88.6	86.0	83.2	77.8	71.2	62.8	**96**	**88**	69	61	56
200	92.4	90.1	88.6	86.0	83.2	77.8	71.2	62.8	**96**	**88**	69	61	56

AS Low noise unit

Mod.	SWL (dB)										SPL (dBA)		
	Octave bands (Hz)								Total				
	63	125	250	500	1000	2000	4000	8000	dB	dB(A)	1m	5m	10m
50	83.4	86.3	82.6	77.8	74.3	67.8	59.2	50.3	**90**	**80**	62	53	48
60	83.4	86.3	82.6	77.8	74.3	67.8	59.2	50.3	**90**	**80**	62	53	48
70	84.4	87.3	83.6	78.8	75.3	68.8	60.2	51.3	**91**	**81**	63	54	49
80	84.4	87.3	83.6	78.8	75.3	68.8	60.2	51.3	**91**	**81**	63	54	49
90	85.4	88.3	84.6	79.8	76.3	69.8	61.2	52.3	**92**	**82**	64	55	50
100	85.4	88.3	84.6	79.8	76.3	69.8	61.2	52.3	**92**	**82**	64	55	50
115	85.4	88.3	84.6	79.8	76.3	69.8	61.2	52.3	**92**	**82**	63	55	50
130	89.4	87.0	84.8	80.3	77.4	73.8	65.3	56.0	**93**	**83**	64	56	51
145	91.2	88.9	86.4	82.3	78.0	71.6	64.0	55.6	**94**	**84**	65	57	52
160	91.2	88.9	86.4	82.3	78.0	71.6	64.0	55.6	**94**	**84**	65	57	52
180	92.2	89.9	87.4	83.3	79.0	72.6	65.0	56.6	**95**	**85**	66	58	53
200	92.2	89.9	87.4	83.3	79.0	72.6	65.0	56.6	**95**	**85**	66	58	53

AX Extra low noise unit

Mod.	SWL (dB)										SPL (dBA)		
	Octave bands (Hz)								Total				
	63	125	250	500	1000	2000	4000	8000	dB	dB(A)	1m	5m	10m
50	89.0	81.0	80.0	76.0	72.0	67.0	62.0	52.0	**90**	**78**	60	51	46
60	89.0	81.0	80.0	76.0	72.0	67.0	62.0	52.0	**90**	**78**	60	51	46
70	90.0	82.0	81.0	77.0	73.5	67.0	64.0	52.0	**91**	**79**	61	52	47
80	90.0	82.0	81.0	77.0	73.5	67.0	64.0	52.0	**91**	**79**	61	52	47
90	83.4	86.3	82.6	77.8	74.3	67.8	59.2	50.3	**90**	**80**	62	53	48
100	83.4	86.3	82.6	77.8	74.3	67.8	59.2	50.3	**90**	**80**	62	53	48
115	83.4	86.3	82.6	77.8	74.3	67.8	59.2	50.3	**90**	**80**	61	53	48
130	84.4	87.3	83.6	78.8	75.3	68.8	60.2	51.3	**91**	**81**	62	54	49
145	85.4	88.3	84.6	79.8	76.3	69.8	61.2	52.3	**92**	**82**	63	55	50
160	85.4	88.3	84.6	79.8	76.3	69.8	61.2	52.3	**92**	**82**	63	55	50
180	89.4	87.0	84.8	80.3	77.4	73.8	65.3	56.0	**93**	**83**	64	56	51
200	89.4	87.0	84.8	80.3	77.4	73.8	65.3	56.0	**93**	**83**	64	56	51

OPERATING RANGE

Operating range

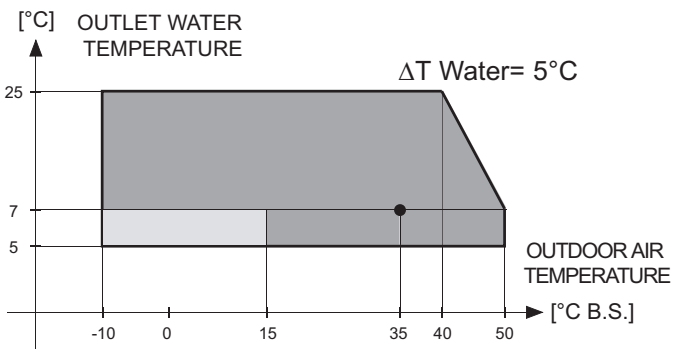
The graphs below give the operating ranges within which correct operation of the units is guaranteed.
The use of the units in conditions differing from those indicated will void the warranty with which the product is supplied.
In the following table, there are the thermal water head limit values of the unit.

Thermal Water Head		Limit value
Minimum	°C	3
Maximum	°C	8

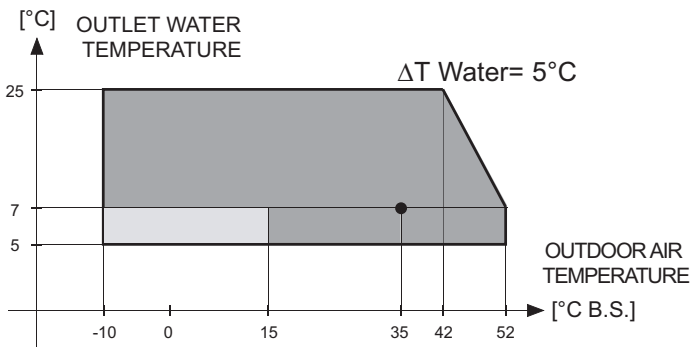
Note: Make sure the water flow is within the minimum and maximum pressure drop as reported "water pressure drop plate heat exchanger ".

COOLING MODE

Medium Temperature 0M5



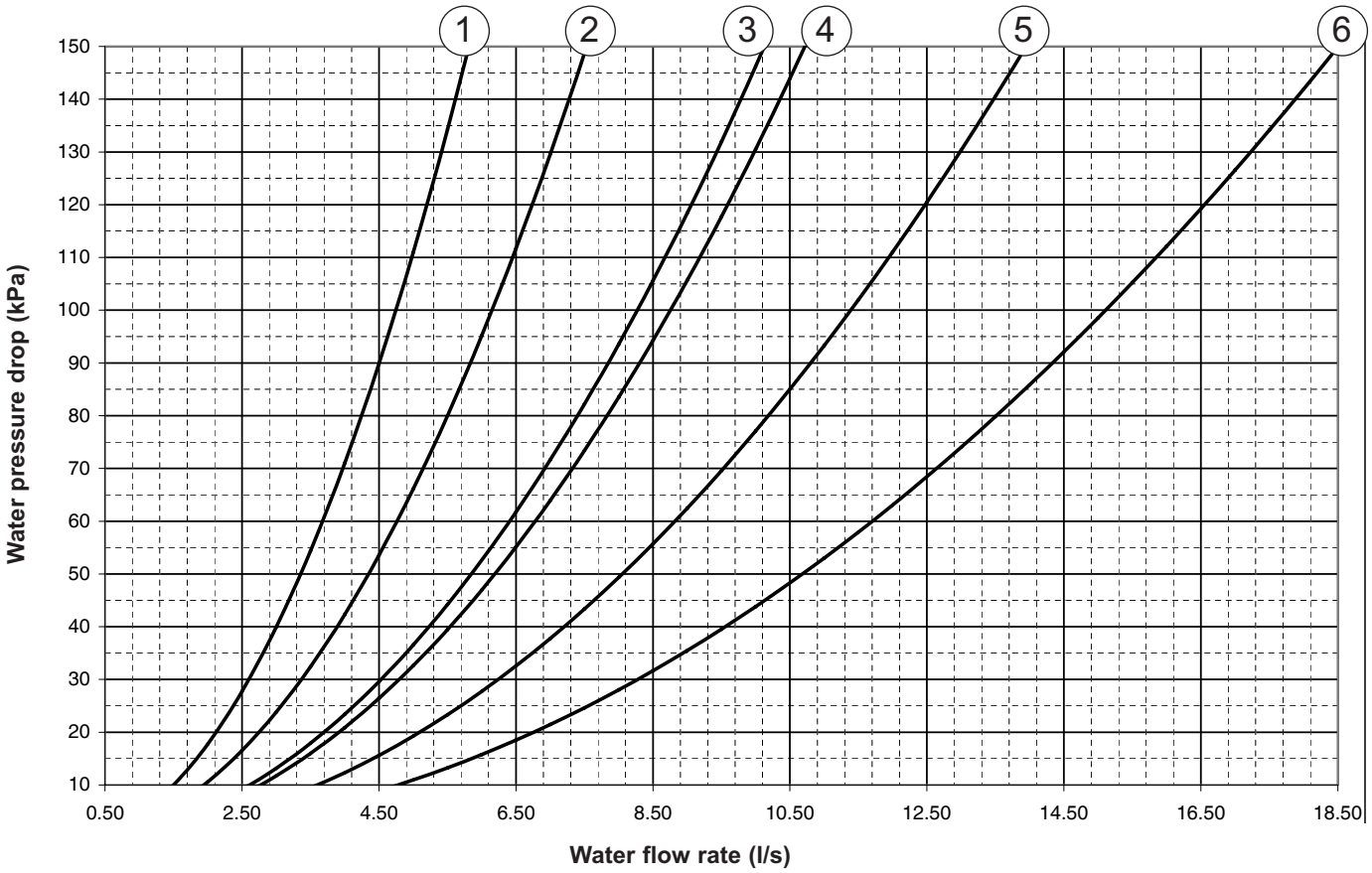
High Temperature 0A5



In these applications, it's advisable to use brine.

WATER PRESSURE DROP PLATE HEAT EXCHANGER

The graph below illustrates 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.



Operation range

Unit Size		50	60	70	80	90	100	115	130	145	160	180	200	UM	NOTES
Graph reference		1				2	3		4			5	6		**Q=**Water flow rate **Δp=**Water pressure drop
Lower limit value	**Q**	1.50	1.50	1.50	1.50	1.94	2.77	2.77	2.62	2.62	2.62	3.60	4.78	l\s	
	Δp	10												kPa	
Upper limit value	**Q**	5.81	5.81	5.81	5.81	7.53	10.7	10.7	10.1	10.1	10.1	13.9	18.5	l\s	
	Δp	150												kPa	
Max. operating pressure on wet side		600												kPa	

MAXIMUM VOLUME OF WATER

Maximum volume of water in the system with wet module

Before filling the water system, it is advisable to consider the type of installation in question, i.e. check the difference in level between the wet module and user. The following table gives the maximum water content of the water supply system in liters, depending on the capacity of the standard surge chamber supplied and the pressure at which it should be charged. The surge chamber setting must be regulated to suit the maximum positive difference in level of the user.
Maximum setting value **600 kPa**.
With a positive H of more than 12.25 meters, calculate the surge chamber's service charge value in kPa using the formula below:

Surge chamber service charge= [H/10.2+0.3]x100 = [kPa]

NOTE: In case **A**, make sure that the user's lowest point is able to withstand the global pressure.

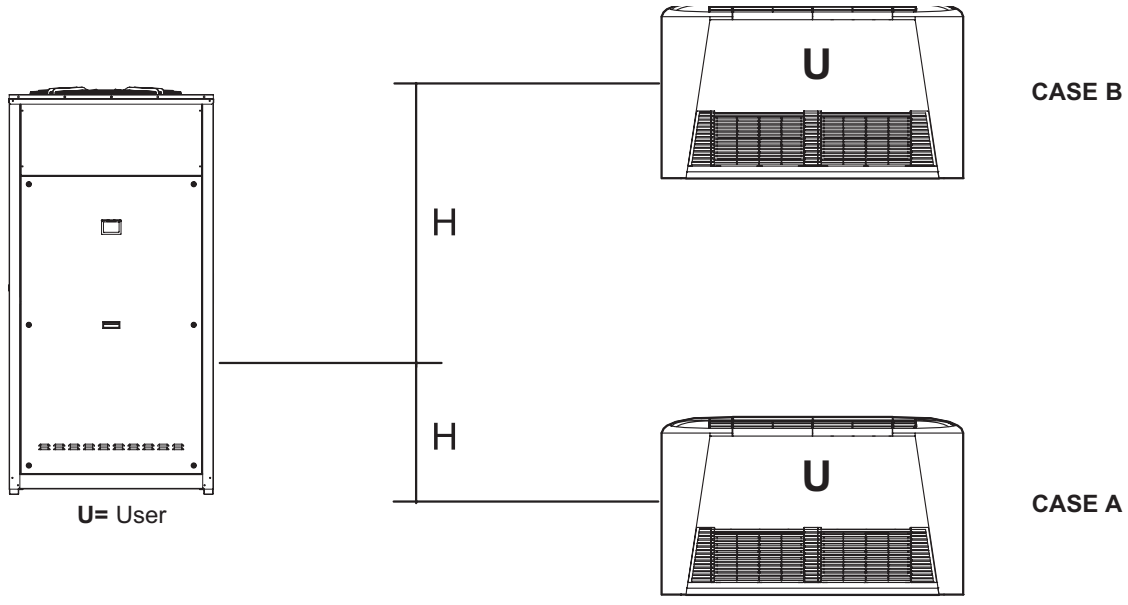
Tab.1

Model			50-60-70-80		90-100-110-115-130-145-160-180-200	
Surge chamber volume (liters)			12		24	
Thermal expansion of water (10-40°C)			0.0074			
Thermal expansion of water (10-60°C)			0.0167			
H (meters)		Surge chamber pressure (kPa)	Maximum total volume of water supply system (liters)			
			IR	IP	IR	IP
Case A	H <0	150 (standard)	1043	461	2085	921
Case B	0 < H < 12.25	150 (standard)	1043	461	2085	921
	15	177	980	435	1960	870
	20	226	866	384	1732	768
	25	275	753	334	1505	667
	30	324	640	283	1279	566

NOTE: If the unit operates with brine, calculate the real volume of the system by taking into account the corrective factors for the volume of the system given in the table below.

Corrective factors per total maximum volume of the system with brine

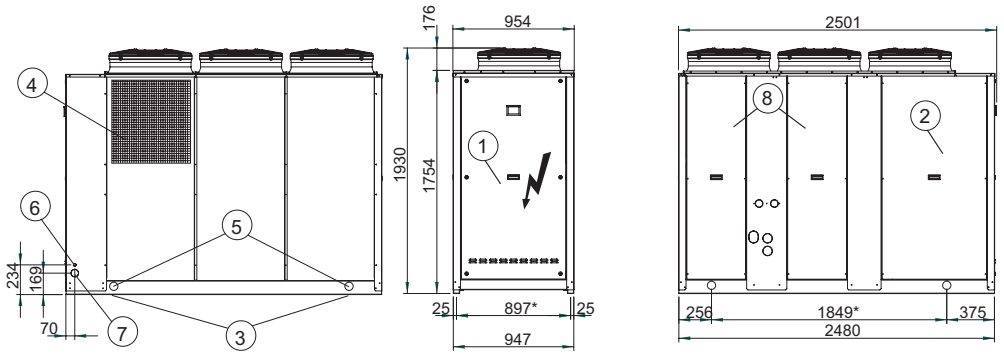
% of brine	0%	10%	20%	30%	40%
Cooling Mode	1.000	0.738	0.693	0.652	0.615
Heating Mode	1.000	0.855	0.811	0.769	0.731



DIMENSIONAL DATA

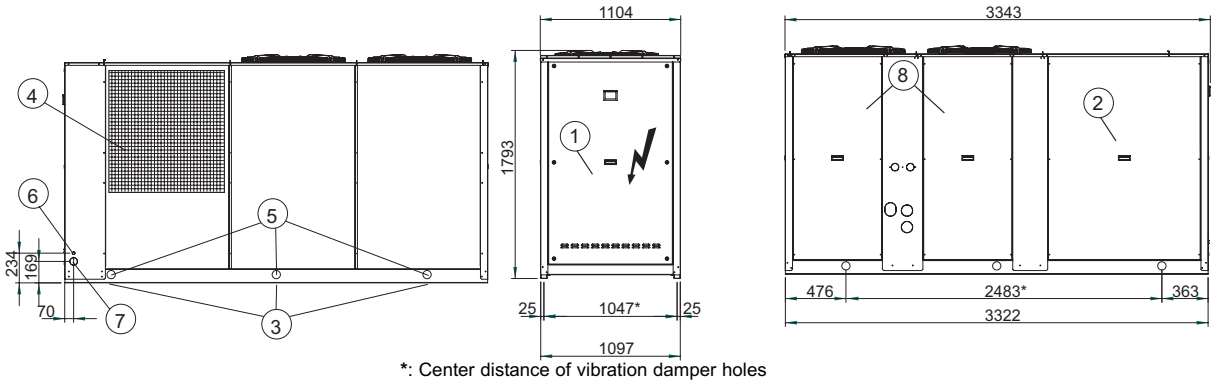
Overall dimensions

Mod. 50-60-70-80



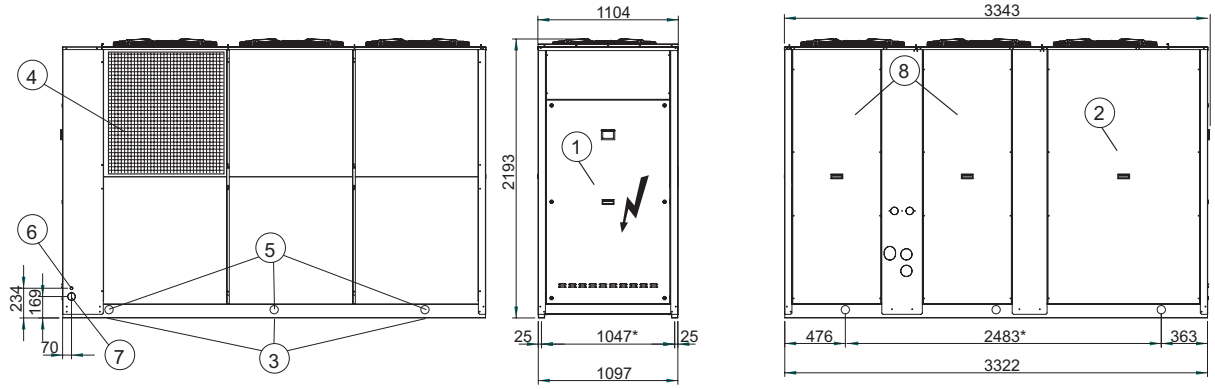
*: Center distance of vibration damper holes

Mod. 90-100



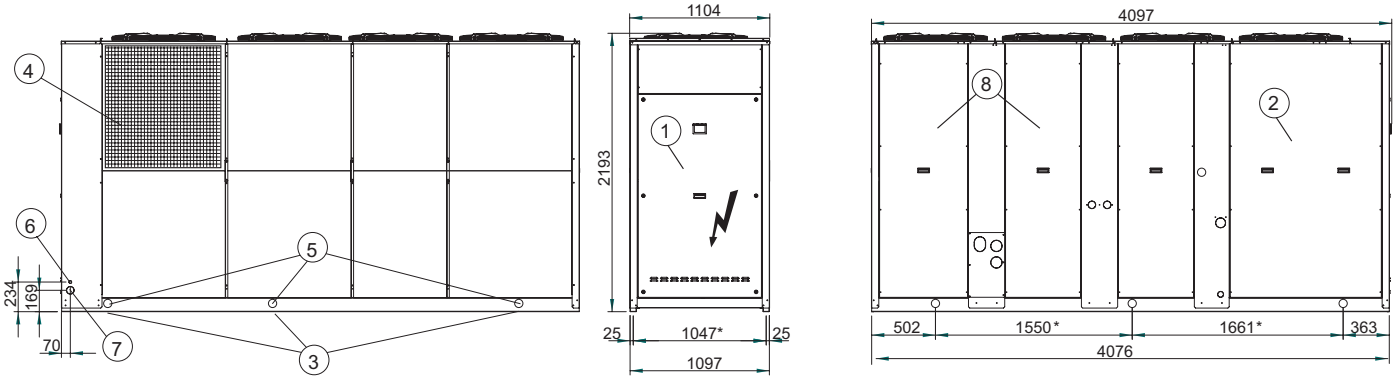
*: Center distance of vibration damper holes

Mod. 115-130-145-160



*: Center distance of vibration damper holes

Mod. 180-200



*: Center distance of vibration damper holes

DIMENSIONAL DATA

Description of the components

1 - Access panel to electric panel's power section

2 - Access panel to compressor compartment

3 - Vibration damper fixing holes (4 pcs)

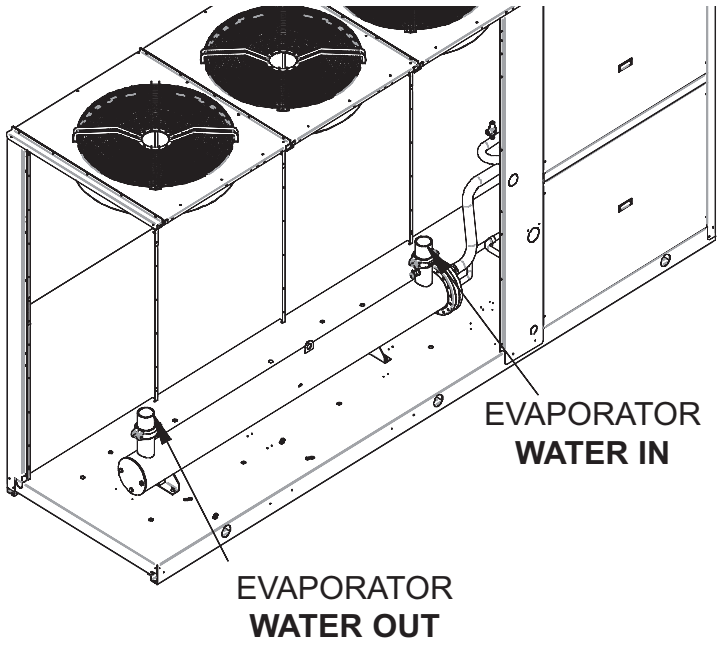
4 - Coil protection grilles (accessory)

5 - ø 65 mm lifting holes

6 - ø 22 mm input hole for accessory cables

7- ø 60 mm hole for electric power supply input

8 - Access panel to pump compartment

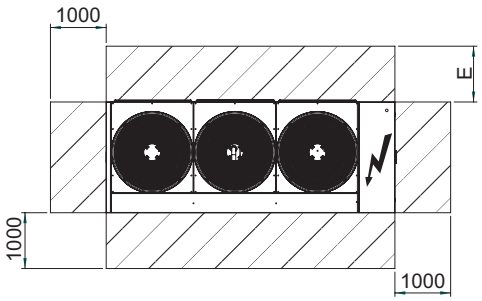


MOD.		50÷115	130÷180	200
WATER CONNECTIONS	IN	2"M	3" VIC	4" VIC
	OUT			

Note: Water connections do not allow external connection to the sutside of the unit.

Minimum space required for operation

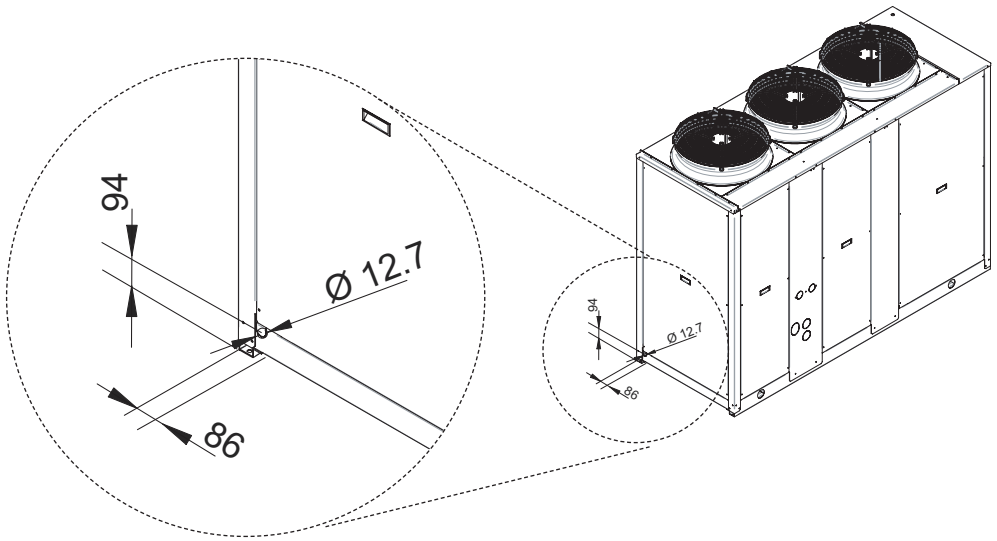
To correctly install the unit, comply with the measurements for the free area that must be left around the machine, as shown in the figure.
This will ensure good air circulation, allow the unit to operate correctly and facilitate future maintenance work.
The distances must be doubled if the unit is to be installed in a pit.
NOTE. Allow for an uncluttered area of not less than 2.5 meters above the unit.



Modello	50-80	90-100	115-200
	1600		2000

Position of condensate drain

The condensate tray (if present) must have a suitable drain trap to prevent spilling of water during operation.



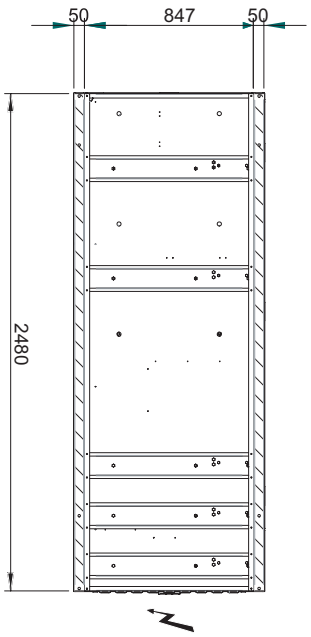
WEIGHT DURING TRANSPORT

Vibration-damper installation

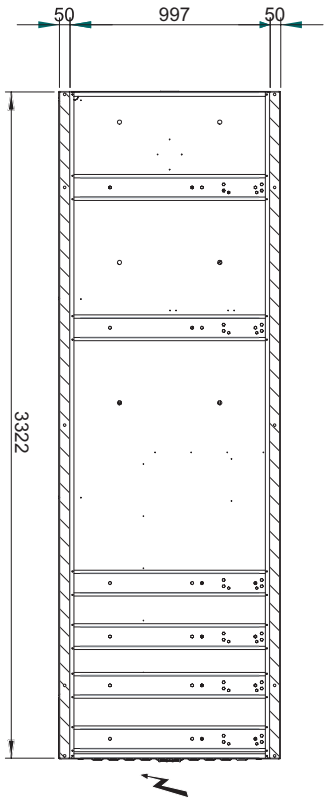
To prevent the operating unit from transmitting vibrations to the bearing structure, vibration dampening materials should be inserted under the bearing points.
The unit can be supplied with the rubber or spring vibration dampening accessory. This must be mounted by the installer.

Area of support

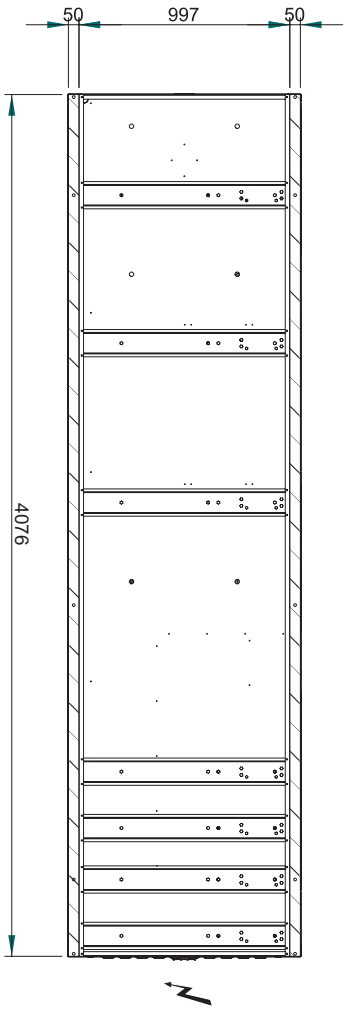
Mod. 50-60-70-80



Mod. 90-100-115-130-145-160



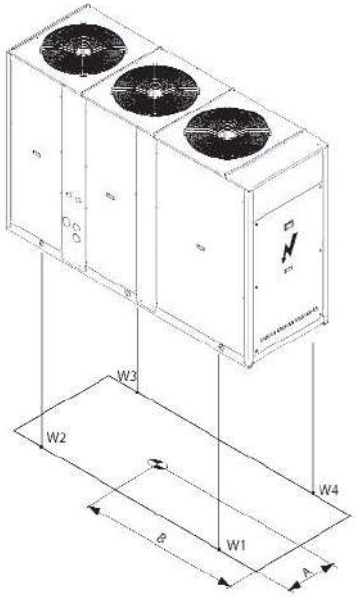
Mod. 180-200



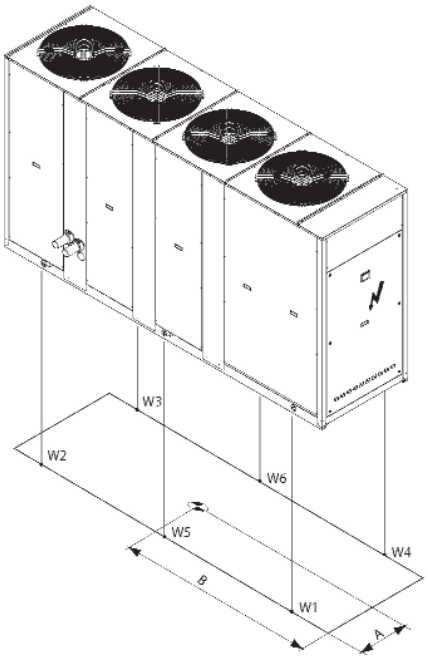
WEIGHT DURING TRANSPORT

To correctly install the unit, comply with the measurements for the free area that must be left around the machine, as shown in the drawing.

Mod. 50-60-70-80-90-100-115-130-145-160



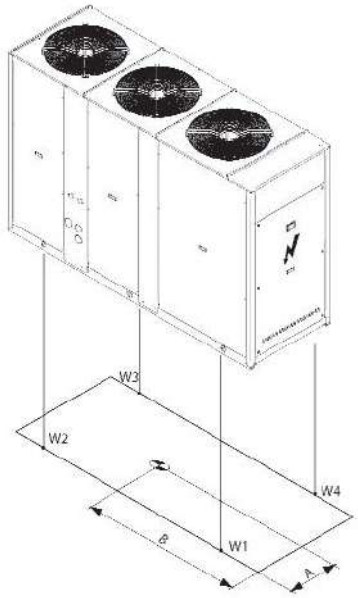
Mod. 180-200



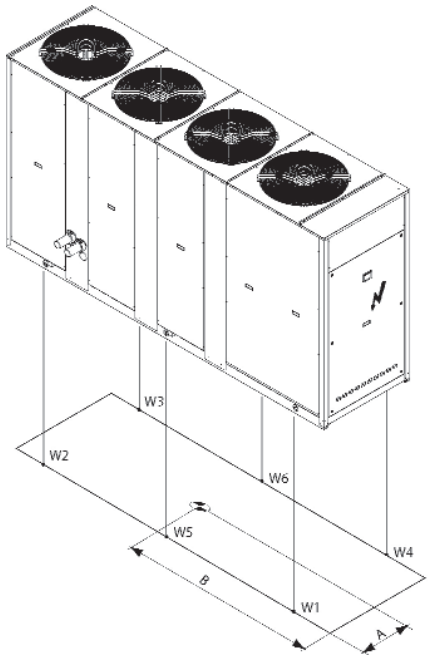
Mod.	AB-AS			AX		
	Center of gravity position [mm]		Weight [Kg]	Center of gravity position [mm]		Weight [Kg]
	A	B		A	B	
50	404	904	**609**	421	922	**632**
60	403	904	**610**	421	921	**632**
70	414	909	**649**	424	921	**665**
80	419	914	**676**	419	914	**682**
90	467	1235	**920**	484	1249	**940**
100	449	1180	**1002**	465	1195	**1023**
115	463	1199	**1115**	482	1215	**1145**
130	458	1187	**1143**	476	1203	**1172**
145	457	1175	**1198**	475	1191	**1227**
160	470	1185	**1247**	470	1185	**1260**
180	465	1431	**1397**	480	1449	**1431**
200	477	1441	**1442**	477	1441	**1456**

WEIGHT DURING OPERATION

Mod. 50-60-70-80-90-100-115-130-145-160



Mod. 180-200



Acustic version	AB-AS									AX								
	Center of gravity position [mm]		Load on the supports [Kg]						Weight [Kg]	Center of gravity position [mm]		Load on the supports [Kg]						Weight [Kg]
	A	B	W1	W2	W3	W4	W5	W6		A	B	W1	W2	W3	W4	W5	W6	
50	402	928	265	99	72	192	-	-	**628**	419	944	263	102	80	206	-	-	**651**
60	401	927	266	99	72	192	-	-	**629**	419	943	263	102	80	206	-	-	**651**
70	411	932	276	104	79	209	-	-	**668**	422	942	275	107	85	218	-	-	**686**
80	417	935	283	108	84	220	-	-	**696**	417	935	286	110	85	222	-	-	**703**
90	465	1263	364	185	135	263	-	-	**947**	481	1277	360	187	145	276	-	-	**968**
100	447	1208	422	195	131	284	-	-	**1032**	462	1222	416	198	141	298	-	-	**1052**
115	461	1224	453	216	154	323	-	-	**1147**	479	1239	447	219	168	342	-	-	**1176**
130	455	1218	475	222	155	332	-	-	**1184**	473	1234	468	226	169	350	-	-	**1213**
145	453	1205	503	231	159	348	-	-	**1241**	471	1221	495	234	173	368	-	-	**1270**
160	466	1214	510	237	173	371	-	-	**1291**	466	1213	515	239	174	374	-	-	**1303**
180	463	1469	436	121	42	357	284	205	**1445**	477	1488	430	120	53	364	280	214	**1460**
200	475	1488	446	122	52	374	289	219	**1503**	475	1488	450	124	53	378	292	221	**1518**

RECEPTION AND POSITIONING

Inspections on arrival

As soon as the unit is consigned, it is essential to make sure that all the ordered items have been received and that the dispatch is complete. Carefully check that the load 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 at the plant means that any damages will be reimbursed by the insurance company as established by law.

Safety prescriptions

Comply with the current safety provisions in relation to the equipment used to handle the unit and the ways in which these operations are carried out.

Handling

Before moving the unit, check its weight on the data plate with the general specifications of the appliance and consult the **Main Features** section of this manual. Make sure that the unit is handled with care, that it is not jolted in any way and that none of its functional parts is damaged.
Comply with the following instructions when lifting and positioning the unit:

• Handling with a lift truck or similar

The unit has four wooden bases so that it can be transported in a longitudinal direction (**not sideways**).
Place something suitable in between to separate the truck from the unit in order to prevent the surfaces of the bank or electric panel from being damaged if the unit has to be moved sideways (**Fig.1**). Do not allow the unit or any of its parts to drop on to the ground. Remember that the heaviest part is the one where the compressor is installed (**electric panel side Fig.1**).

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

Fig.1

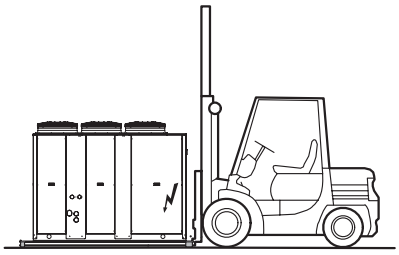


Fig.2

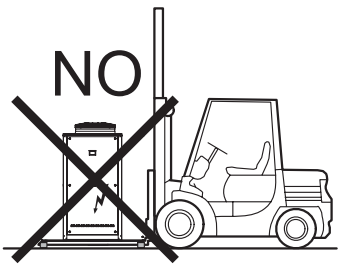
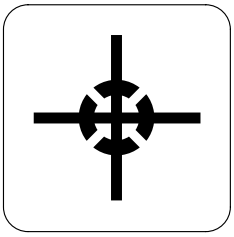
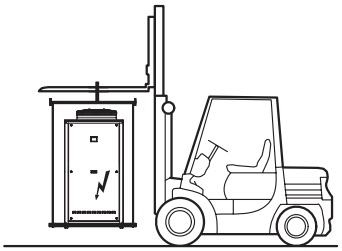


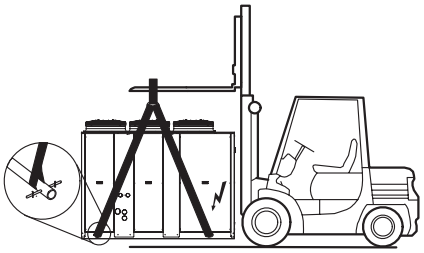
Fig.3



• Lifting and handling with a crane or similar

• Position metal tubes of an adequate thickness in the holes on the base of the unit in order to lift it.
• The ends of the tubes must project to an adequate extent to allow safety components to be inserted and the lifting belts to be fitted.
• Consult the tables in the **When the appliance arrives** section for the venter of gravity position.
• Use spacer bars in the top part of the unit to prevent the banks and plastic parts covering the unit from being crushed and damaged.





WARNING:
Before proceeding with the handling operations, read the information on the wrapping to ensure the safety of persons and property. Also be sure to:
• Handle the load with care
• Avoid stacking other objects on top of the unit

Storage

The units must be stored in a dry place sheltered from the run, rain, sand and wind.
The storage conditions are:
• Do not stack the units
• Maximum temperature = **60°C**
• Minimum temperature = **-10°C**
• Humidity = **90%**

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 housed in an enclosed casing protected against adverse weather conditions. They can be inspected through the screen-printed front door. The door is locked by the door locking mechanism of the main circuit-breaker. The powering flex and ground wire (**PE**) access the panel through the opening on the left-hand side in the lower part of the side of the unit and enter the actual panel through the lower part of the junction box.

Composition of the system

The system consists of an electromechanical part formed by the power circuit (which includes the circuit-breaker, the contactors, fuse protections and transformer) and a second part formed by the microprocessor monitoring system.

NOTE: 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.

Compressor specifications

MOD.		50	60	70	80	90	100	115	130	145	160	180	200
Power supply	V-ph-Hz	400 - 3 - 50											
FLA [A]	CP1	20.4	22.6	25.6	31.0	31.0	37.0	37.0	45.0	45.0	60.0	60.0	82.0
	CP2	20.4	22.6	25.6	31.0	37.0	37.0	45.0	45.0	60.0	60.0	82.0	82.0
LRA [A]	CP1	118	118	140	173	173	225	225	272	272	310	310	394
	CP2	118	118	140	173	225	225	272	272	310	310	394	394
FLI [kW]	CP1	11.8	13.2	14.7	17.0	17.0	22.6	22.6	27.3	27.3	36.1	36.1	46.7
	CP2	11.8	13.2	14.7	17.0	22.6	22.6	27.3	27.3	36.1	36.1	46.7	46.7

Single Fan specifications

MOD.	50	60	70	80	90	100	115	130	145	160	180	200
Power supply [V-ph-Hz]	230 - 1 - 50				400 - 3 - 50							
FLA [A]	2.3				4.3							
LRA [A]	4.4				15.0							
FLI [kW]	0.5				2.0							

Summary Fan specifications

MOD.	50	60	70	80	90	100	115	130	145	160	180	200
Power supply [V-ph-Hz]	230 - 1 - 50				400 - 3 - 50							
FLA [A]	6.8				8.6				12.9		18.2	
LRA [A]	13.2				30.0				45.0		60.0	
FLI [kW]	1.6				4.0				6.0		8.0	

Summary tables (total values):

MOD.	50	60	70	80	90	100	115	130	145	160	180	200
Power supply [V-ph-Hz]	400 - 3 +N - 50				400 - 3 - 50							
FLA TOTALE [A]	48.2	50.9	58.3	68.6	76.0	81.5	89.9	98.3	117	131	150	165
FLI TOTALE [kW]	25.5	27.7	31.1	35.5	43.6	49.2	53.9	58.6	69.4	78.2	90.8	101
MIC TOTALE [A]	146	147	173	211	265	270	317	325	368	382	470	485

NOTES:
Values valid for IR units, STANDARD and EXTRA LOW NOISE UNIT unit.
FLA= Full load current at maximum tolerated conditions
LRA= Locked rotor current
FLI= Full load power input at maximum tolerated conditions
MIC= Maximum instantaneous current of the unit
Values relative to a **400V-3-50Hz** power supply voltage rating

ELECTRICAL CONNECTIONS

1) Connection to the electricity main

• Feeder line;
The feeder line of the machine must follow a well defined route without interruptions. Run the line through the precut hole at the bottom of the right panel on the machine. It is advisable to use a cable gland, to secure the line to the machine structure. Now route the line inside the compressor compartment until it reaches the hole in the bottom of the electric panel. Here again, make sure you use an adequately sized cable clamp, **use a high temperature cable or sheath, not place the cable or sheath on the compressors.**
Connect the conductors straight to the input terminals of the main circuit-breaker of the machine.
• Powering system;
The power cables of the feeder line of the machine must come from a symmetric threephase voltage system complete with neutral conductor and separate protection conductor.

V= 400V ± 10%
f= 50 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.
• Neutral conductor:
The neutral conductor in the feeder line must be connected to the neutral conductor identified by the letter "**N**" corresponding to the fourth pole of the main panel circuit-breaker (if possible).

2) Electric panel

• Protection degree:
The electric panel casing is made of galvanised sheet metal and has an **IP54** protection degree in corre spondence to the door, which can be directly accessed from 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.
• Emergency function:
The handle also acts as an emergency stop since it can be directly accessed removing the cover panel and is also evident owing to its red colour.

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**".

HYDRAULIC CONNECTIONS

General rules

A mesh filter (hole Ø £ 500 µm) must be installed on the unit's water inlet otherwise warranty is immediately forfeited for units with either the standard or the complete pipe kit and MP-PS. The filter performs the function of blocking any foreign matter in the system's plumbing circuit (shavings, machining debris, etc.). This prevents the plate exchanger water pipes from clogging then possibly freezing (and therefore bursting). This filter is included in the unit equipped with the hydronic kit accessory.

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.

• The unit comes as standard with a differential pressure switch located between the entrance and exit of water exchanger to prevent freezing problems in case of lack of water flow.

The intervention is calibrated to a ΔP of 80 ± 5 mbar, while the reset occurs with a ΔP of 105 ± 5 mbar.

The differential pressure switch contact opens and stop the unit when you reduce the water flow and so ΔP ≤ 80 mbar ± 5.

The differential pressure switch closes and then the unit can restart when the water flow increases and so Δp ≥ 105 mbar ± 5.

• The unit comes standard with an antifreeze heater placed between the evaporator and its insulation controlled by the electronic controller unit.

2) With hydronic kit 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 (with which the unit is equipped if the hydronic kit accessory is installed) 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 values 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.

• Depending on the chosen accessory, there may be male threaded connections or Victaulic-type joints for hooking up to the unit. The joints allow the pipes to expand due to changes in temperature and in addition the elastomer gasket and the specified play help insulate and absorb noise and vibration.

• 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 tap 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 plate exchanger (in order to drain the unit's plumbing system completely, open the water drain ball valves and the air vent valves) and centrifugal pumps.

2. Operate with glycol water 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 table on following page)

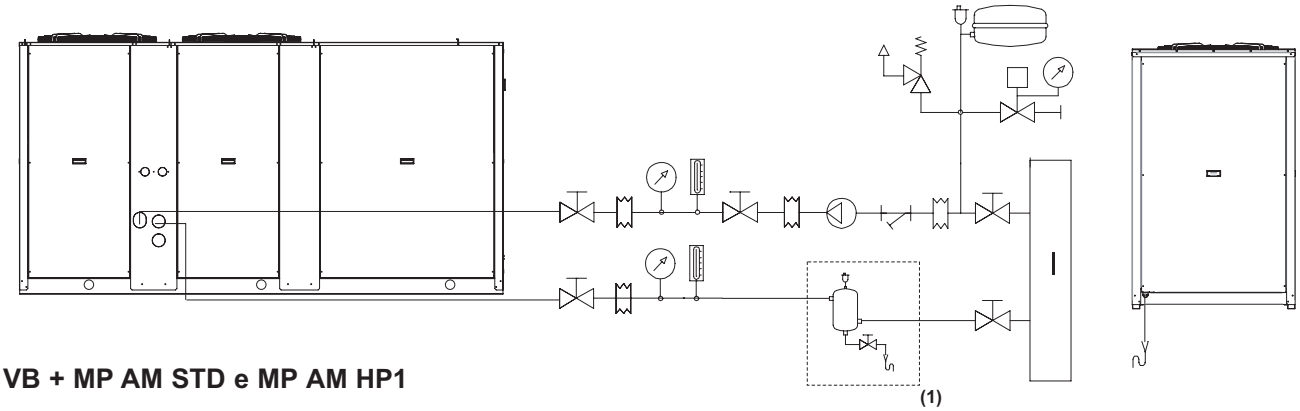
3. If it is certain that the unit will always be powered throughout the winter, the unit is able to protect itself from freezing, down to a temperature of -20°C: this is possible thanks to an antifreeze electric heating element installed on the plate exchanger and intelligent control of the water pump 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 accessor

HYDRAULIC CONNECTIONS

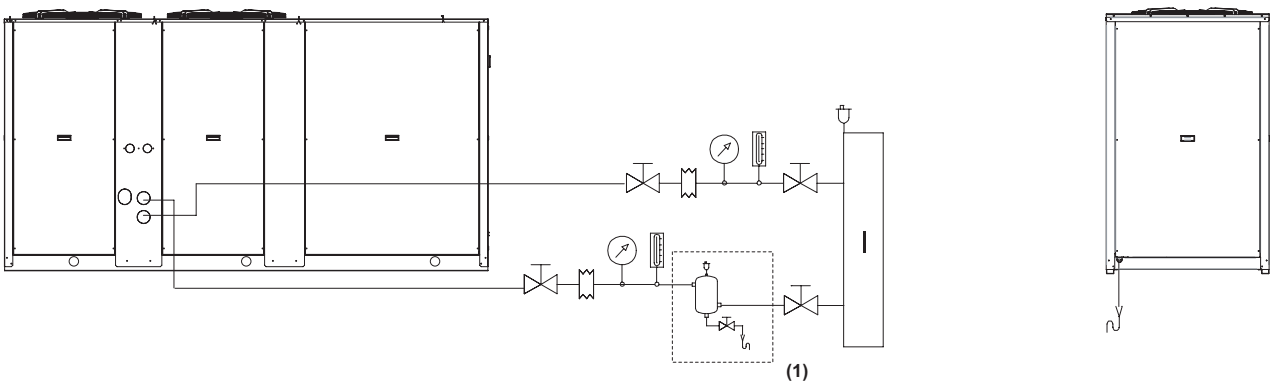
Basic diagram Standard Unit VB [COLD WATER CIRCUIT]

The following figures represent connections to the evaporator circuit.
IMPORTANT: There must be a constant flow of water to the exchanger. With accessory primary-secondary hydronic kit MP-PS is mandatory to install a water filter in the secondary circuit immediately before of the water tank.

VB + MP PS STD



VB + MP AM STD e MP AM HP1



(1): Component not required if the unit is equipped with the “Water storage tank” accessory. Installation of this accessory is recommended if the unit is without it.

I = User system

- Pressure gauge
- Pump
- Breather valve
- Coupling
- Thermometer
- Filter
- Safety valve
- Water filling unit
- On-off and/or water flow rate regulating valve
- Tank(1)
- Siphon

Air vent and water drain

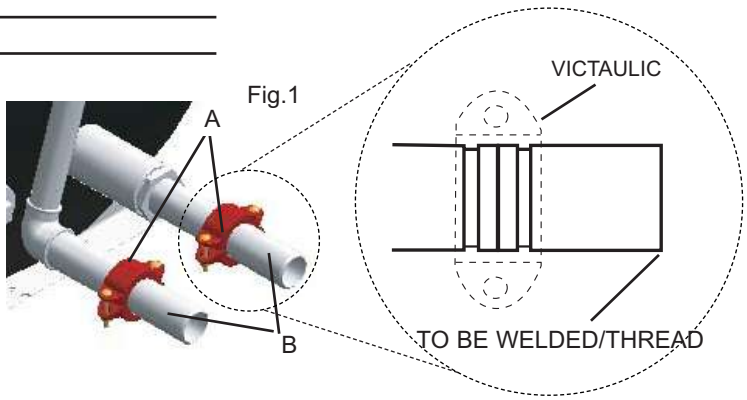
On the plumbing circuit feeding the unit, especially when equipped with the standard pipe kit, the installer must fit an appropriate number of valves (manual or automatic) at the top of the circuit in order to vent any air in the plumbing system. In the same way, he must install a water drain valve in order, when necessary, to drain the unit's plate exchanger completely (especially during the winter in order to prevent freezing that would seriously jeopardize the operation of the unit). For units with the complete pipe kit there is an air vent valve on the top pipe (water inlet) and a water drain valve on the bottom pipe (water outlet). See “Accessories and options” section.

HYDRAULIC CONNECTIONS

Plumbing connection with Victaulic couplings

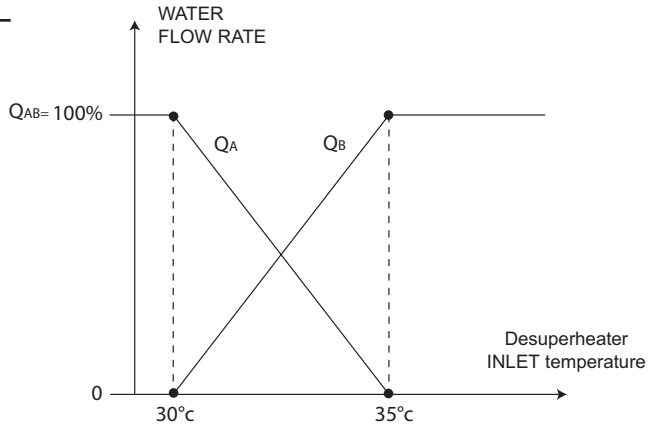
It is composed of two Victaulic type quick couplers (Fig. 1-A) comprehensive of union (Fig. 1-B) and seal not installed (supplied with the unit). The unions are supplied to be welded on the end. Here we give the instructions to follow for installing the quick couplers.

Fig.1



Valve regulating diagram 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 desuperheater (see diagram): the graph on the right shows the type of adjustment to use.



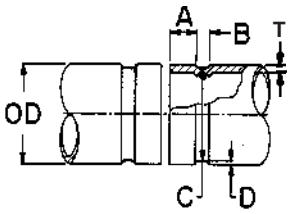
HYDRAULIC CONNECTIONS

ISO-G	DN(mm)	EXTERNAL DIAMETER OD(mm)	A	B	O	D	T
1”	25	33.7	15.875	7.137	30.226	1.600	1.651
1 1/4”	32	42.4	15.875	7.137	38.989	1.600	1.651
1 1/2”	40	48.3	15.875	7.137	45.085	1.600	1.651
2”	**50**	**60.3**	**15.875**	**8.738**	**57.150**	**1.600**	**1.651**
2 1/2”	**65**	**76.1**	**15.875**	**8.738**	**72.260**	**1.981**	**2.108**
3”	80	88.9	15.875	8.738	84.938	1.981	2.108
4”	100	114.3	15.875	8.738	110.084	2.108	2.108
5”	125	139.7	15.875	8.738	135.500	2.134	2.769
6”	150	168.3	15.875	8.738	163.957	2.159	2.769
8”	200	219.1	19.050	11.913	214.401	2.337	2.769

1) Pipe groove inspections

Check the depth and diameter of the grooves and their distance from the pipe ends. Make sure that the work has been carried out with care and that the end surface of the pipes is smooth and not ovalized.

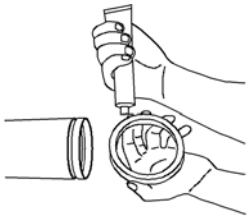
Make sure that there are no notches, burrs or other imperfections that could impair the tightness. Groove dimensions in mm **A**=16-**B**=8-**C**=57.2-**D**=1.6



2) Checking the seal and relative lubrication

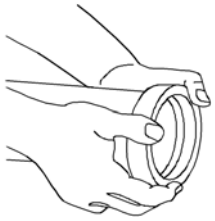
Make sure that the type of seal used is compatible with the nature and temperature of the fluid. Signal green **EPDM** seals are used.

Apply a film of grease to the seal: on the back, on the side flanks and on the inner lips that contact the pipe. Work in conditions of the utmost cleanliness as particles of dirt could damage the seal. Always and only use synthetic grease. Greasing makes it easier to fit the seal on the pipe and improves the tightness. It also allows the seal to slide within the connection, avoiding tensions and projections near the bolts.



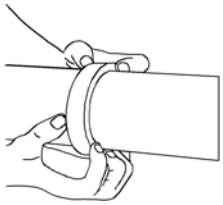
3) How to fit the seal

Fully insert the seal into the end of a pipe. Make sure that the seal lips adhere to the pipe itself.



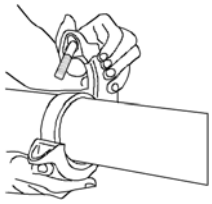
4) Alignment

Align the pipes and move their ends near to each other. Now push the seal, centering it on the two pipe ends. The seal must remain inside the grooves.



5) Joint assembly

Remove one bolt and loosen (without removing) the other one. Seat part of the body of the joint at the bottom, between the pipe ends, inserting and edges of the grooves. Now seat the other part of the body at the top, on the two ends, and close the joint. Make sure that the parts of the body of the joint touch each other.

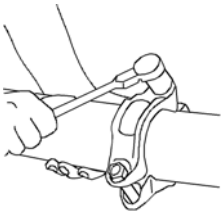


6) Nut torquing

Fit the previously removed bolt back in place and tighten both nuts by hand. Now torque them with the relative wrench, tightening them alternately a few turns.

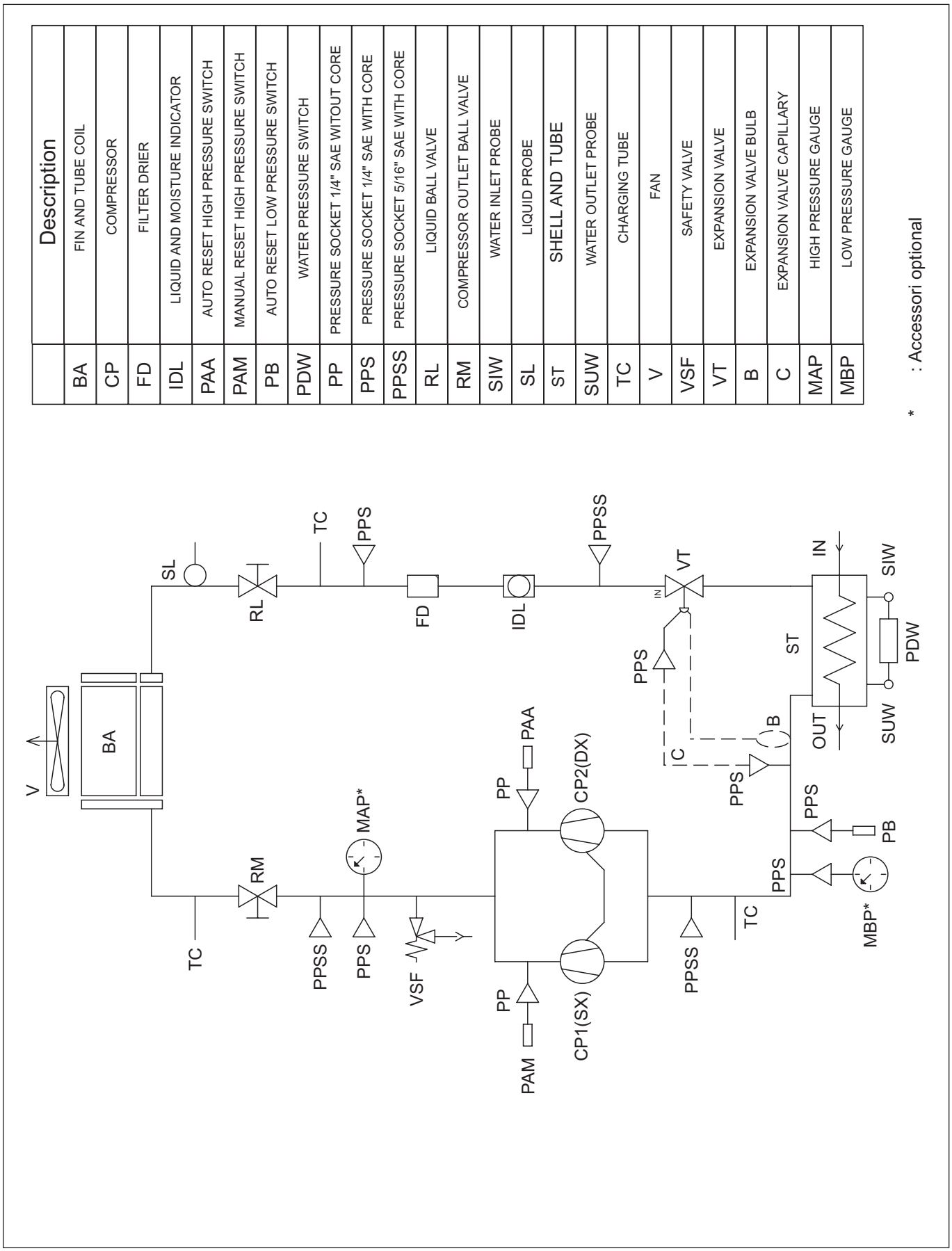
WARNING:

If one nut is fully tightened at a time, the seal could slip between the jaws of the opposite side of the joint.



HYDRAULIC CONNECTIONS

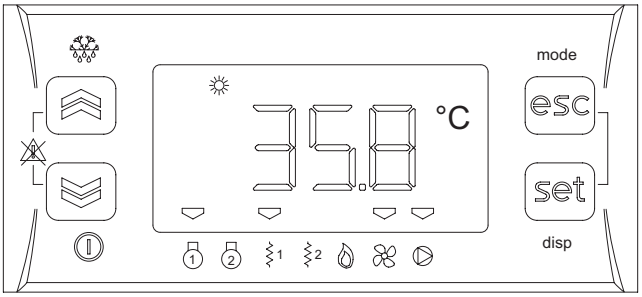
Refrigerant flow diagram basic version in cooling mode IR



ADJUSTMENT AND CONTROL

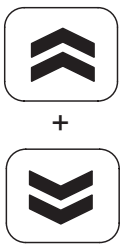
Control system

The unit is managed by a **microprocessor controller** to which all the loads and control devices are connected by means of a terminal block. The user interface comprises a display and four buttons with which it is possible to show and possibly modify all the unit's operation parameters. The interface, located in the front part of the unit and accessible from the outside, is protected by a transparent plastic door. A remote control having all the same functions as the interface fitted on the unit is available as an accessory.



Every button provides for :
- a **direct function** : indicated on the button itself and obtained by pressing the button
- an **associated function** : indicated on the front of the instrument at the corresponding button and obtained by prolonged pressing (3 seconds) of the button
- a **combined function** : obtained by pressing 2 buttons at the same time

Button		Direct function	Associated function	
	UP	Increase value of selected parameter Scroll menu up		Manual defrost
	DOWN	Decrease value of selected parameter Scroll menu down	-	-
esc	ESC	Go to menu higher level without saving the modification	mode	Access the "Operation mode" menu
set	SET	Go to menu higher level and save the modification Go to menu lower level Access the "Status" menu	disp	Changing the display value
	ALL	Alarm deactivation	-	-

Button		Combined function	
	UP + DOWN		Manual reset
esc + set	ESC + SET		Access the "Programming" menu

ADJUSTMENT AND CONTROL

Display
The following are shown in normal display :

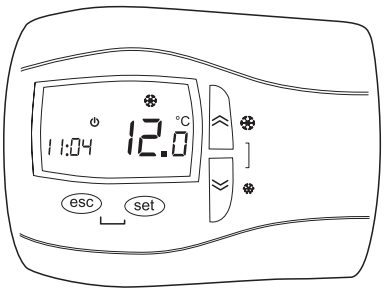
• adjustment temperature, or unit outlet water temperature (in degrees Celsius with decimal point)

• alarm code, if at least one is activated (in case of several alarms the code of the first according to the Table of Alarms is displayed)

In menu mode the display depends on its position (see menu structure).

	Icon	Description	Colour	On fixed	On flashing
Operation status and modes	⚠	Alarm	Red	Alarm in progress	Alarm deactivated
	☀	Heating	Green	Heating mode from keyboard	Heating mode from remote
	❄	Cooling	Green	Cooling mode from keyboard	Cooling mode from remote
	⏻	Standby	Green	Standby from keyboard	Standby from remote
	❄	Defrost	Green	Defrost in progress	-
		Economy	Green	not used	-
Unit of measure		Clock	Red	Time display format 24.00	Time setting format 24.00
	°C	Centigrade degrees	Red	Unit of measure of selected parameter	-
	Bar	Bar	Red	not used	-
	%R.H.	Relative humidity	Red	not used	-
	ABC	Menu	Red	Menu browsing	-
Users	①	Compressor 1	Amber	User activated	Safety timing
	②	Compressor 2	Amber	User activated	Safety timing
	③	not used	-	-	-
	④	not used	-	-	-
		Antifreeze heater Supplementary heating element 1st step	Amber	User activated	Safety timing
		Fans	Amber	User activated	Safety timing
		Pumps	Amber	User activated	Safety timing

Remote control



Suitable for wall mounting, it has all the functions of the standard interface fitted on the unit.
The buttons, functions associated with the buttons and the display indications are the same as those provided for the standard interface.
All configuration and control operations are further facilitated by the double display which allows the name and value of the selected parameter to be shown at the same time.

Refer to the enclosed manual for the installation and connection procedures and operating instructions.

ADJUSTMENT AND CONTROL

Menu structure

The control system provides for three menus with tree structure.

Menu	Access procedure	Submenu	Parameters	Available functions
Operation mode	Press (prolonged)  (ESC button associated function)	StbY	-	Change operation mode
		HEAt		
		COOL		
UP button	Press  (UP button direct function)	-	-	Value increases, the next label
DOWN button	Press  (DOWN button direct function)	-	-	Value decreases, the next label
Main view (disp)	Press (prolonged)  (SET button direct function)	AI.	AIL1	Display input AI1
			AIL2	Display input AI2
			AIL3	Display input AI3
			AIL4	Display input AI4 (se abilitato)
			AIL5	Display input AI5 (se abilitato)
		rtC	-	Visualizzazione orologio
		SEtP	-	Visualizzazione set-point impostato
		SEtr	-	Visualizzazione set-point reale
Status	Pres  (SET button direct function)	AI.	AIL1	Display input AI1
			AIL2	Display input AI2
			AIL3	Display input AI3
			AIL4	Display input AI4
			AIL5	Display input AI5
		di.	diL1	Display input DI1
			diL2	Display input DI2
			diL3	Display input DI3
			diL4	Display input DI4
			diL5	Display input DI5
			diL6	Display input DI6
		AO	tCL1	-
			AOL1	Display output AO1
			AOL2	Display output AO2
			AOL3	Display output AO3
			AOL4	Display output AO4
			AOL5	Display output AO5
		dO	dOL1	Display output DO1
			dOL2	Display output DO2
			dOL3	Display output DO3
			dOL4	Display output DO4
			dOL5	Display output DO5
			dOL6	Display output DO6
		CL	HOUr	Adjusting clock : hour
			dAtE	Adjusting clock : data
			YEAr	Adjusting clock : year
			HEAt	Viewing and setting set-point: heating
			COOL	Viewing and setting set-point: cooling
			HEAt	Display set-point real: heating
			COOL	Display set-point real: cooling
			CPO1	Viewing compressor 1 operating hours
			CPO2	Viewing compressor 2 operating hours
			PUO1	Viewing hours operating pump 1
			PUO2	Viewing hours operating pump 2

ADJUSTMENT AND CONTROL

Menu	Access procedure	Submenu		Parameters	Available functions
	Press **ESC + SET at the same time**  (combined function buttons ESC + SET)	PAr	CL	CL20	Offset probe SIW (ST1) - input AI1
				CL21	Offset probe SIW (ST2) - input AI2
				CL22	Offset probe SIW (ST3) - input AI3
				CL23	STAE offset probe (S1) - input AI4
				CL24	Input Offset AI5 (S2)
			CF	CF01	Selection Protocol COM1 (TTL)
				CF20	Protocol controller address Eliwell
				CF21	Family Controller Protocol Eliwell
				CF30	Address Controller Modbus Protocol
				CF31	Baud rate serial output
				CF32	Protocol Modbus Parity
			Ui	Ui10	Selecting main view
			Ui	Ui11	Selecting main display remote terminal
			tr	tr10	Set point in cooling
				tr11	Minimum set point in cooling
				tr12	Maximum set point in cooling
				tr13	Hysteresis in cooling
				tr15	Differential set point in cooling
				tr20	Set point in heating
				tr21	Minimum set point in heating
				tr22	Maximum set point in heating
				tr23	Hysteresis in heating
				tr25	Differential set point in heating
			Pi	Pi01	Interval of inactivity pump anti-lock
				Pi03	Minimum time to pump up anti-lock
				Pi50	Approval with antifreeze pump
				Pi51	Set-point with antifreeze pump
				Pi52	With hysteresis antifreeze pump
			Hi	Hi20	Enabling integrative resistance
				Hi10	Set-point electrical resistance with antifreeze
				Hi15	Hysteresis antifreeze with electrical resistance
				Hi22	Differential resistance integrative
				Hi25	Hysteresis resistance integrative
				Hi26	2nd step differential resistance integrative
			dF	dF11	Set-point start counting defrost
				dF13	Cumulative counting time defrost
				dF30	Enabling dynamic defrost
			dS	dS00	Enabling climate
				dS01	Time scheduling (cooling)
				dS02	Time scheduling (heatling)
				dS03	Maximum differential (cooling)
				dS04	Maximum differential (heatling)
				dS05	Set-point start regolation (cooling)
				dS06	Set-point start regolation (heating)

ADJUSTMENT AND CONTROL

Menu	Access procedure	Submenu		Parameters	Available functions
				tE00	Enable time scheduling
				tE01...07	Selection profile day 1 (monday) ... 7 (sunday)
				tE 10-38-66	Event 1 - Hours selections *profile 1-2-3*
				tE 11-39-67	Event 1 - Minutes selections *profile 1-2-3*
				tE 12-40-68	Event 1 - Operation mode selections On/Standby *profile 1-2-3*
				tE 13-41-69	Event 1 - Set point cool *profile 1-2-3*
				tE 14-42-70	Event 1 - Set point heat *profile 1-2-3*
				tE 17-45-73	Event 2 - Hours selections *profile 1-2-3*
				tE 18-46-74	Event 2 - Minutes selections *profile 1-2-3*
				tE 19-47-75	Event 2 - Operation mode selections On/Standby *profile 1-2-3*
				tE 20-48-76	Event 2 - Set point cool *profile 1-2-3*
				tE 21-49-77	Event 2 - Set point heat *profile 1-2-3*
				tE 24-52-80	Event 3 - Hours selections *profile 1-2-3*
				tE 25-53-81	Event 3 - Minutes selections *profile 1-2-3*
				tE 26-54-82	Event 3 - Operation mode selections On/Standby *profile 1-2-3*
				tE 27-55-83	Event 3 - Set point cool *profile 1-2-3*
				tE 28-56-84	Event 3 - Set point heat *profile 1-2-3*
				tE 31-59-87	Event 4 - Hours selections *profile 1-2-3*
				tE 32-60-88	Event 4 - Minutes selections *profile 1-2-3*
				tE 33-61-89	Event 4 - Operation mode selections On/Standby *profile 1-2-3*
				tE 34-62-90	Event 4 - Set point cool *profile 1-2-3*
				tE 35-63-91	Event 4 - Set point heat *profile 1-2-3*
			rC	rC01	Recovery Set point regolator
				rc02	Recovery Hysteresis regolator
			AL	AL51	Set-point alarm antifreeze
				AL52	Antifreeze alarm hysteresis
		FnC		dEF	Manual defrost
				tA	Silence alarms
			St	OFF	Change in OFF state
				On	Change in status ON
			CC	UL	Upload program parameters
				dL	Download the program parameters
				Fr	Format Multi Function Key
				EUr	Reset historical alarms, long press button 
		PASS		-	Enter password
		EU		-	Viewing historical alarms
Alarm silence	Pressure contemporary buttons  (combined function UP+DOWN button)	-	-	-	Manual
Manual defrost	Long press button  (UP button function associated)	-	-	-	Enable manual defrost

Press SET to go from one level to that below. Press ESC to go to higher level.
Press the UP and DOWN buttons respectively to scroll the menu up and down inside the same level.

Press the UP and DOWN buttons to modify the value of the selected parameter. Press SET to confirm the modification. Press ESC to not confirm the modification.

ADJUSTMENT AND CONTROL

Inputs and outputs

To monitor the unit, the controller has the following inputs and outputs :
- Analogue inputs : 4
- Digital inputs : 5
- Analogue outputs : 1
- Digital outputs : 6

DESCRIPTION			CHARACTERISTICS
Analogue inputs			
AI1	SIW	water inlet probe	NTC temperature sensor (-50°C ÷ 99°C)
AI2	SUW	water outlet probe	NTC temperature sensor (-50°C ÷ 99°C)
AI3	SL	liquid probe	NTC temperature sensor (-50°C ÷ 99°C)
AI4	STAE / IN CF1	outside air probe / remote ON/OFF - S/W.-demand limit-economy	NTC temperature sensor (-50°C ÷ 99°C) / DIG IN
AI5	IN CF2	see AI5 on "digital inputs"	configured as digital input
- Input AI4 is factory-set as not enabled. Its configuration for specific use must be carried out at the time of installation according to the needs of the moment, modifying the configuration by parameter. - Input AI5 is factory-set as neutral and its configuration for specific use must be carried out at the time of installation according to the needs of the moment, modifying theconfiguration by parameter. **Modification and parameter configuration operations must only be carried out by an authorised service centre or by competent personnel.**			
Digital inputs			
DI1	TC1*	Thermal switch compressor 1 – thermo-statted delivery 1 –high pressure switch	Digital input with voltage-free contact
DI2	TC2*	Thermal switch compressor 2 –thermo-statted delivery 2 – high pressure switch	Digital input with voltage-free contact
DI3	PB +SEQ + TV	Low pressure switch + sequence meter + fan thermal switch	Digital input with voltage-free contact
DI4	TP1	Thermal switch pump 1	Digital input with voltage-free contact
DI5	TP2	Thermal switch pump 2	Digital input with voltage-free contact
DI6	P.diff.	Differential pressure switch	Digital input with voltage-free contact
AI5-IN DIG	Multiconf.	Remote ON/OFF - S/W.-demand limit-economy	Analogue input configured as digital
*refer to section alarms. ER10-ER11 for more details Note for input ID5 thermal switch pump 2. If only one pump is used and only one thermal switch is required, ID5 can be used as an additional multiconf. input for Remote ON/OFF - S/W.-demand limit-economy. In this way it is possible to have both the - remote ON/OFF, and - S/W - demand limit – economy - External probe ID5 is factory-configured as pump 2 thermal switch. To modify the configuration, refer to the section “configurable inputs setting”.			

DESCRIPTION			CHARACTERISTICS
Analougue outputs			
AO1	VE	Fans	pwm signal for control of single-phase fans in phase cut
AO4	VE	Fans	signal 0-10V for control of three-phase fans in phase cut
AO5	MP1M	Inverter pump	signal 4...20mA for inverter control pump
Digital outputs			
DO1	CP1	Compressor 1	2A resistive relays
DO2	CP2	Compressor 2	2A resistive relays
DO3	VIC	Reverse cycle valve	2A resistive relays
DO4	RSC-RAG-RE1	Antifreeze resistance – support 1st step	2A resistive relays
DO5	RE2	Resistance support 2nd step	Open collector - 12Vdc max 35mA
DO6	ALL	Alarm relay	2A resistive relays
AO2	P1	Relay pump 1 (using 12Vdc external relay)	Open collector - 12Vdc max 35mA
AO3	P2	Relay pump 2 (using 12Vdc external relay)	Open collector - 10Vdc max 28mA
Note: AO2 is analogue output configured as digital			

Controller technical data

Description	Typical	Minimum	Maximum
Power supply voltage	12-24 V~	10,8-21,6 V~	13,2-26,4 V~
Power supply frequency	50 Hz / 60 Hz	-	-
Power	6 VA	-	-
Insulation class	2	-	-
Protection rating	Frontal IP0	-	-
Ambient operating temperature	25 °C	-10 °C	60 °C
Ambient operating humidity (non-condensing)	30 %	10 %	90 %
Ambient storage temperature	25 °C	-20 °C	85 °C
Ambient storage humidity (non-condensing)	30 %	10 %	90 %

Alarms

Alarm activation and reset
The controller can perform a complete diagnosis of the unit, detecting all operation faults and signalling a number of alarms.
Activation of an alarm involves :
• blocking of users concerned
• signalling of alarm code on the display (in case of simultaneous alarms the one with the lowest index is displayed whereas the complete list of active alarms can be shown by accessing the “Status \ AL”) menu
• recording of event in the alarms history

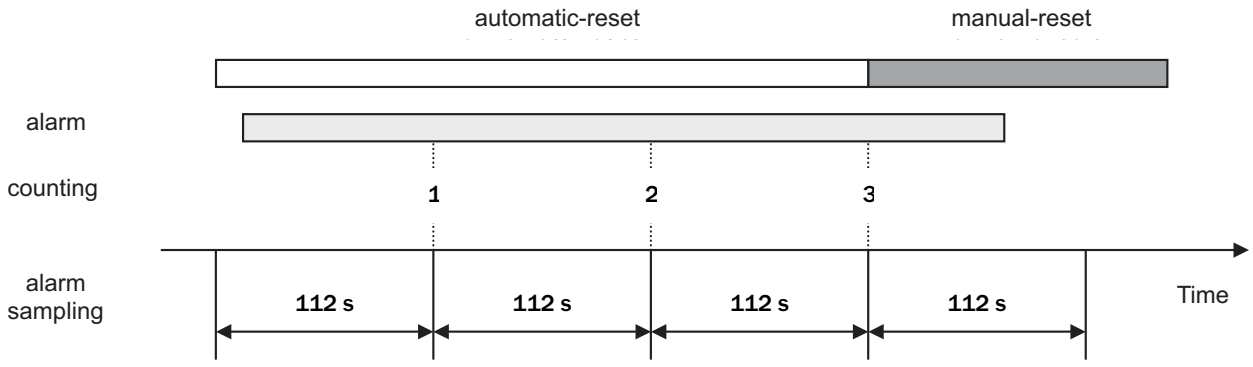
Alarms that can damage the unit or system require **manual resetting** or an action by the operator to reset the controller (pressing the UP and DOWN buttons at the same time). It is advisable to carefully check the cause of the alarm and make sure the problem is eliminated before restarting the unit. In any case the unit restarts only if the cause of the alarm has ended.

Less critical alarms are **automatic reset.** As soon as the cause is eliminated the unit starts working again and the alarm code disappears from the display. Some of these alarms become manual reset if the number events per hour exceeds a fixed limit.

Press any button to **deactivate the alarm** : alarm signalling disappears from the display, the alarm LED starts flashing and the Alarm digital output is disabled. This operation does not affect the alarm in progress.

Number of events per hour
The counting of events per hour is provided for some alarms : if the number of events reaches a fixed limit in the last hour, the alarm goes from automatic to manual reset.
Sampling of alarms occurs every 112 seconds. If an alarm is activated several times in a sampling period (112 seconds) it is counted only once.

Example. If an number of events per hour equal to 3 is set, it must have a duration of between 2*112 seconds and 3*112 seconds so that the alarm goes from automatic to manual reset.



Alarms history
The controller enables the recording of alarms occurring during unit operation (up to a max. of 99 events). The following are memorised for each event :
- alarm code
- input time
- input date
- output time
- output date
- type of alarm (automatic or manual reset)

This information can be shown by accessing the “Programming \ EU” menu.
When the number of events memorised is more than 99, alarm Er90 is generated and the subsequent events are memorised overwriting the oldest alarms.
The alarms history can be cancelled by means of the Eur function available inside the “Programming \ FnC” menu.

Table of alarms

Code	Alarm		Type of alarm	input	COMPRESSORS	EXCHANGER FANS (WITH LOSS)	PRIMARY CIRCUIT PUMPS	EXCHANGER RESISTANCES PRIMARY	AUXILIARY OUTPUT
Er05	Low pressure + sequence meter + fans thermal switch		A/M (2)	ID3	OFF	OFF			
Er 10	Compressor 1 thermal protection	High pressure	M	ID1	OFF comp.1				
Er 11	Compressor 2 thermal protection		M	ID2	OFF comp.2				
Er20	Primary circuit water differential pressure switch		A/M	ID6	OFF		OFF if manual-reset	OFF	
Er21	Primary circuit pump 1 thermal protection		M	ID4	OFF	OFF	OFF p.1	OFF	
Er22	Primary circuit pump 2 thermal protection		M	ID5	OFF	OFF	OFF p.2	OFF	
Er25	Recovery water differential pressure switch		M	DIE2	OFF	OFF	ON	OFF	
Er26	Recovery pump 1 thermal protection		M	DIE3	OFF	OFF	ON	OFF	
Er30	Primary circuit antifreeze		M	AI2	OFF				
Er45	Clock fault error		A						
Er46	Clock to be set error		A						
Er47	Remote keyboard communication error		A						
Er60	Primary exchanger inlet water temperature probe fault		A	AI1	OFF	OFF	OFF	OFF	OFF
Er61	Primary exchanger outlet water temperature probe fault		A	AI2	OFF	OFF	OFF	OFF	OFF
Er62	Liquid temperature probe		A	AI3					
Er63	Recovery inlet water temperature probe fault		A	AI1	OFF	OFF	OFF	OFF	OFF
Er64	Recovery outlet water temperature probe fault		A	AI2	OFF	OFF	OFF	OFF	OFF
Er68	External air temperature probe fault		A	AI4					
Er80	Configuration error		A		OFF	OFF	OFF	OFF	OFF
Er90	Recordings for alarms history exceeded signalling		M						

Notes:
(1) A = automatic reset, M = manual reset
(2) Only when the alarm becomes manual reset

Er05 Low pressure – Sequence meter - Fans thermal protection
The alarm becomes manual reset when the number of events per hour is more than 3.
The alarm is bypassed for 120 seconds from activation of the compressor or the reverse cycle valve.
Er 10 Compressor 1 thermal protection
The manual-reset alarm intervenes in the event of activation of the compressor 1 thermal protection or the thermostat located on the outlet of the compressor 1.
Er 11 Compressor 2 thermal protection
The manual-reset alarm intervenes in the event of activation of the compressor 2 thermal protection or the thermostat located on the outlet of the compressor 2.
Er 10 Er 11* Compressor 1 thermal protection - Compressor 2 thermal protection - High pressure switch (PAA)
The manual-reset alarm intervenes in the event of activation of the compressor 2 thermal protection or the thermostat located on the outlet of the compressor 2 AND in the event of activation of the compressor 1 thermal protection or the thermostat located on the outlet of the compressor 1 and/or more likely it means the auto-reset high pressure switch (PAA) trips in.
Er20 Differential pressure switch
The alarm is activated if the associated digital input remains activated for at least 5 seconds and automatically resets if the digital input remains not activated for at least 3 seconds. The alarm becomes manual reset if the digital input remains activated for more than 10 seconds.
The alarm is bypassed for 30 seconds from pump activation.
Er30 Antifreeze
The alarm is bypassed for 3 minutes from switching on of the unit (in heating mode only).
Er62 Liquid probe fault
When the alarm is activated the fans work with on-off logic by compressor request. The defrost input and output are managed according to compressor operation time.
Er68 Outside air probe fault
When the alarm is activated, climate adjustment in heating and dynamic defrost are unavailable.
Er90 Maximum number of recordings in alarms history exceeded
Indicates that the alarms history buffer is full. Every new alarm will be memorised, cancelling the oldest alarm.

*** Note: The manual-reset high pressure (PAM) does not have reference on the control display so you can not identify it through the internal diagnostics as it acts directly on contactors, it may happen that the control display does not signal any error but the compressors are however still, in this case rearm the manual-reset high pressure switch by pressing the button located at the top of the switch.**

Functions available for the user

ON-OFF of the unit
When the unit is powered it may be in STAND BY status (the display shows the message StbY) or ON status. It is possible to switch between ON and STAND BY by pressing (prolonged) the MODE button.
When the unit is STAND BY all the users are disabled and the antifreeze function is not activated.
Operation mode selection
When the unit is ON, one of the operation modes can be selected by accessing the “Operation mode” menu.
- Cooling COOL
- Heating HEAt
- STANDBY StdbY

Remote ON/OFF
This function allows remote selection of the STANDBY mode. If the input is activated (contact open) the controller is in STANDBY mode and the operation mode cannot be modified from keyboard.
The function is available if one of the configurable inputs is configured for this, contact closed = unit ON (display SIW), contact open = OFF (display StdbY).
Remote Cooling-Heating
This function allows remote selection of Cooling or Heating mode. If the input is activated (contact open) the unit is in heating mode. If the input is not activated (contact closed) the unit is in cooling mode. The operation mode cannot be modified from the keyboard (but STANDBY mode can be selected).
To enable this function, follow the indications in the section “configurable inputs setting”.
Set point
The set point value in cooling (COOL) and heating (HEAt) can be set by accessing the “Status \ SP” menu. The purpose of the controller is to keep the water temperature at the unit inlet as close as possible to the set value, by activating the compressor according to an on-off logic.
Operation in heat pump mode
For all units in heat pump version the parameter tr01 enables operation in heat pump mode when it assumes value 1. It is possible set an outside air temperature value (parameter HP01) below which operation in heat pump mode is blocked (the supplementary electrical heating elements remain activated in any case, if present).
Antifreeze
The plate-type exchanger is protected by activation of an electrical heating element and activation of the antifreeze alarm, occurring in sequence when the exchanger outlet water temperature reaches dangerous values. The storage tank is protected by the antifreeze heater (accessory) activated in parallel with the plate-type exchanger heating element.
When the outside air temperature approaches 0°C, if the unit is not working, the pump is activated in any case to prevent excessive cooling of the water in the pipes.
Supplementary electrical heating elements
The parameter H102 enables operation of the electrical elements supplementing the heat pump when it assumes value 1. The heating elements are activated according to a two-step logic depending on the unit inlet water temperature. When present, the heating elements also carry out a storage tank antifreeze function.
Climate adjustment
In heating, the parameter d500 allows enabling of climate adjustment when it assumes value 1. The heating set point is adjusted according to the outside air temperature (if the external probe is installed).
To configure this function, follow the indications in the section “configurable inputs setting”.
Modulating speed of the pump
Changing the value of PI31 or PI41 is it possible to manually adjust the speed of the pump accordingly to the desired difference of temperature between water IN and OUT.
Dynamic defrost
The activation limit is modified in a dynamic way according to the outside air temperature (if the external probe is installed).
Power limitation.
With this function, the unit can be forced to operate at 50% maximum power, from a digital output, thus reducing energy consumption.
To enable this function, proceed as indicated in the section “configurable inputs setting”.
Economy function
This function allows the set point to be varied by a certain value from a digital input.
In cooling mode the set point is increased by the value set on tr15 (e.g. going from 9.5°C to 14.5 °C).
In heating mode the set point is decreased by the value set on tr25 (e.g. going from 42°C to 36°C)
To enable this function, proceed as indicated in the section “configurable inputs setting”.
Serial communication
The device is configured for communicating on a serial line using the MODBUS protocol. When connecting the device it must be assigned an address univocally identifying it among all the devices connected to the same serial line (“*Modbus individual address*”). This address must be between 1 and 247 and is configurable by means of the parameter CF30 (see section on serial communication).
Recording hours of operation
The controller can record the hours of compressor and pump operation. Access the “Status \ Hr” menu to show the values. The hours are reset by pressing (prolonged) the SET button, while the hours of operation are displayed.
Power failure
In case of a power failure, when the power is restored the controller will go to the status prior to the power failure. The procedure is cancelled if a defrost is in progress. All timing in progress is cancelled and reinitialised.
Clock
The controller has an internal clock for memorising the date and time of each alarm occurring during unit operation (see “Alarms history”). The clock can be set by accessing the “Status \ CL” menu.

Timer scheduling

The scheduling allows to set weekly time zones to obtain a reduce in energy consumption when the cooling or heating demand is lower.

There are 3 time zones each one with 4 events per hour.

For each event, you can set hours and minutes of start and stop, an operating mode (Stand-by or ON), a cooling set point and a heating set point.

ATTENTION: you can not change the operating mode via scheduling. The operating mode (cooling or heating) will be the same adopted before the enabling of time scheduling.
To enable time scheduling you must set up the date and time into the controller

The parameters for the scheduling can be accessed in the "tE" (time event) folder.

Enabling
The function can be enabled with the parameters tE00 – Enabling scheduling

Parameters		Description	value
tE00	Enabling scheduling	Scheduling disabled	0
		Scheduling enabled	1

Management time
For each day of the week you can select one of the 3 time zone available

Parameters	day	Time zone	Time zone	Time zone
tE01	Monday	1	2	3
tE02	Tuesday	1	2	3
tE03	Wednesday	1	2	3
tE04	Thursday	1	2	3
tE05	Friday	1	2	3
tE06	Saturday	1	2	3
tE07	Sunday	1	2	3

For each time zone you can associate 4 events.
The parameters involved in time events are described below:

Event hour start time
It determines the hour of the start of the event [0-23]

Event minute start time
It determines the minutes of the start of the event [0-59]

Operating Mode ON/Standby
It determines the operating mode during the event
- 0 = ON
- 1 = Stand-by

Set point Cool
It determines the set point in cooling mode that will be set if the unit is in cooling mode before time scheduling

Set point Heat
It determines the set point in heating mode that will be set if the unit is in heating mode before time scheduling

Summary parameters table for time scheduling

Description		Time zone 1	Time zone 2	Time zone 3
EVENT 1		tE 10..tE 14	tE38..tE42	tE66..tE70
	Hour / minutes	tE 10..tE 11	tE38..tE39	tE66..tE67
	Mode operating ON/Standby	tE 12	tE40	tE68
	SetPoint Cool	tE 13	tE41	tE69
	SetPoint Heat	tE 14	tE42	tE70
EVENT 2		tE 17..tE21	tE45..tE49	tE73..tE77
	Hour / minutes	tE 17..tE 18	tE45..tE46	tE73..tE74
	Mode operating ON/Standby	tE 19	tE47	tE75
	SetPoint Cool	tE20	tE48	tE76
	SetPoint Heat	tE21	tE49	tE77
EVENT 3		tE24..tE28	tE52..tE56	tE80..tE84
	Hour / minutes	tE24..tE25	tE52..tE53	tE80..tE81
	Mode operating ON/Standby	tE26	tE54	tE82
	SetPoint Cool	tE27	tE55	tE83
	SetPoint Heat	tE28	tE56	tE84
EVENT 4		tE31..tE35	tE59..tE63	tE87..tE91
	Hour / minutes	tE31..tE32	tE59..tE60	tE87..tE88
	Mode operating ON/Standby	tE33	tE61	tE89
	SetPoint Cool	tE34	tE62	tE90
	SetPoint Heat	tE35	tE63	tE91

Example of timer scheduling:
You choose to set time zone 1 from Monday to Friday with the following setup:

At 07.30 you put the unit ON with a set point of 12°Cin cooling mode, and 40°C in heating mode
At 12.30 you change the set point to 14°C in cooling mode, 37°C in heating mode
At 13.30 you change the set point to 12°C in cooling mode, 40°C in heating mode
At 18.00 you put the unit in stand-by

You have to set the following parameters:

tE00=1 enabling scheduling

tE01, tE02, tE03, tE04, tE05, = 1 time zone 1

EVENT 1 – unit ON
tE 10=8 hour
tE 11=30 minutes

tE 12= 0 ON, unit is ON (pay attention: 0=ON, 1=stand-by)

tE 13= 12 set point cool 12°C
tE 14=40 set point heat 40°C

EVENT 2 – change set point
tE17=12 hour
tE18=30 minutes

tE19= 0 ON, unit is ON (pay attention: 0=ON, 1=stand-by)

tE 20= 12 set point cool 14°C
tE 21=40 set point heat 37°C

EVENT 3 – change set point
tE 24=13 hour
tE 25=30 minutes

tE 26= 0 ON, unit is ON (pay attention: 0=ON, 1=stand-by)

tE 27= 12 set point cool 12°C
tE 28=40 set point heat 40°C

EVENT 4 – unit in stand-by
tE 31=18 hour
tE 32=00 minutes

tE 33= 1 stand-by, unit is in stand-by (pay attention: 0=ON, 1=stand-by)

tE 34= 12 set point cool 12°C
tE 35=40 set point heat 40°C

The operating mode (cooling or heating) adopted is the one already active before the event happens.

For Saturday or Sunday you can choose time zone 1 or another time zone (2 or 3) and set the parameters in a similar manner as described in this example.

ADJUSTMENT AND CONTROL

Configurable inputs setting
The configurable inputs are AI4, AI5 and ID5.
For configuration, access the parameters CL and select the required function according to the following tables.

I/O	Sigla	digital/analogic input	Configuration	Polarity	Offset (range) / Status
	S1	Not configured	CL03 = 0 CL33 = 0 CL53 = 0	----	----
		External probe sensor (provided with accessory SND3)	CL03 = 2 CL33 = 9 CL53 = 0	NTC probe	CL23 (-12,0... +12,0 [°C]) CL I3 = Start value scale AiL4 [°C] CL I2 = Full scale value AiL4 [°C]
		External probe air as analog input 4-20 mA	CL03 = 3 CL33 = 9 CL53 = 0	----	CL23 (-12,0... +12,0 [°C]) CL I3 = Start value scale AiL4 [°C] CL I2 = Full scale value AiL4 [°C]
		External probe air as analog input 0-10 V	CL03 = 4 CL33 = 9 CL53 = 0	----	CL23 (-12,0... +12,0 [°C]) CL I3 = Start value scale AiL4 [°C] CL I2 = Full scale value AiL4 [°C]
		External probe air as analog input 0-5 V	CL03 = 5 CL33 = 9 CL53 = 0	----	CL23 (-12,0... +12,0 [°C]) CL I3 = Start value scale AiL4 [°C] CL I2 = Full scale value AiL4 [°C]
		External probe air as analog input 0-1 V	CL03 = 6 CL33 = 9 CL53 = 0	----	CL23 (-12,0... +12,0 [°C]) CL I3 = Start value scale AiL4 [°C] CL I2 = Full scale value AiL4 [°C]
		ON/STBY remote (digital input)	CL03 = 1 CL33 = 0 CL53 = +1	input active open contact	open contact = STAND-BY close contact = ON
		Summer / Winter remote (digital input)	CL03 = 1 CL33 = 0 CL53 = +3	input active close contact	close contact = HEAT (Winter)
		Demand Limit 50% (digital input)	CL03 = 1 CL33 = 0 CL53 = +21	input active close contact	close contact = Demand Limit 50%
		Economy (digital input)	CL03 = 1 CL33 = 0 CL53 = +22	input active close contact	close contact = economy
	S2	Not configured	CL04 = 0 CL34 = 0 CL54 = 0	----	----
		External probe sensor (analogic input)	CL04 = 2 CL34 = 9 CL54 = 0	NTC probe	CL24 (-12,0... +12,0 [°C])
		ON/STBY remoto (digital input)	CL04 = 1 CL34 = 0 CL54 = +1	input active open contact	open contact = STAND-BY close contact = ON
		Summer / Winter remote (digital input)	CL04 = 1 CL34 = 0 CL54 = +3	input active close contact	close contact = HEAT (Winter)
		Demand Limit 50% (digital input)	CL04 = 1 CL34 = 0 CL54 = +21	input active close contact	close contact = Demand Limit 50%
		Economy (analogic input)	CL04 = 1 CL34 = 0 CL54 = +22	input active close contact	close contact = economy
DI5		Not configured	CL44 = 0	----	----
	QF2.2	thermal pump 2	CL44 = -48	input active open contact	open contact = thermal pump 2
		ON/STBY remote	CL44 = -1	input active open contact	open contact = STAND-BY
		Summer / Winter remote	CL44 = +3	input active close contact	close contact = HEAT (Winter)
		Demand Limit 50%	CL44 = +21	input active close contact	close contact = Demand Limit 50%
		Economy	CL44 = +22	input active close contact	close contact = economy
If present the module of pumping two pumps can not get that DI5 must be configured CL44 = -48					
The outdoor air sensor (optional SND3) is factory installed on input AI4; if it were necessary to can install it on input AI4 or AI5, as specified above. The input AI4 can also accept an input signal current (4-20mA) or voltage (0-10V ,0-5V ,0-1V) from a probe external air by the user.					

Probe characteristics

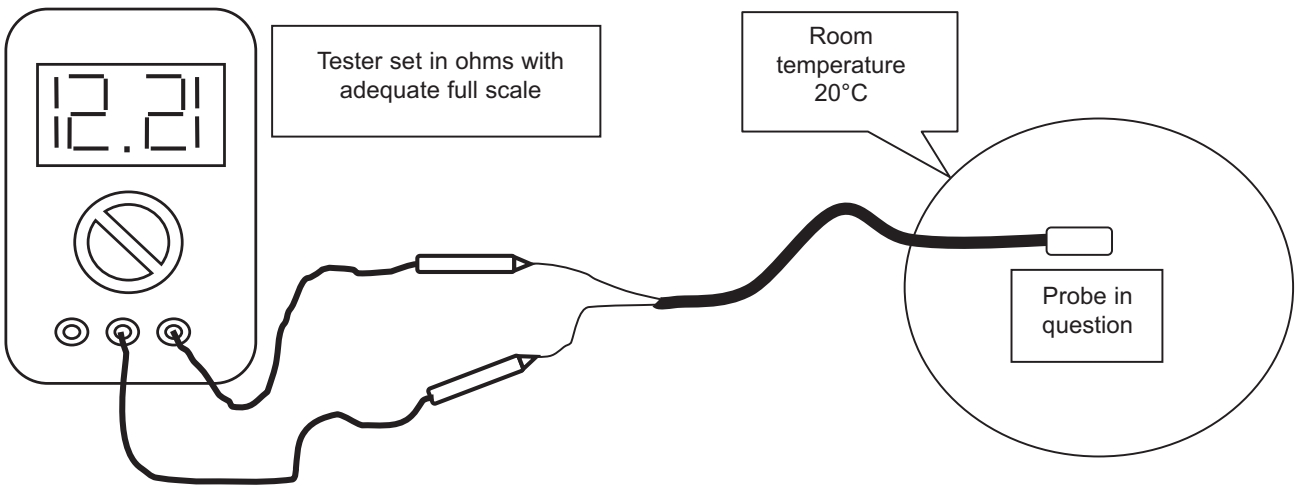
NTC10K-25°C type temperature probes are used.
When the probe bulb is at a temperature of 25°C the electrical resistance measurable at the probe ends with a multimeter is approx. 10 kΩ. The thermistor of these probes has a negative temperature coefficient: the electrical resistance value decreases as the temperature increases.

To find out if a temperature probe is faulty or disconnected, check the correspondence between the resistance value in kΩ and the bulb temperature in °C according to the following table.

Temperature [°C]	Resistance [kΩ]	Temperature [°C]	Resistance [kΩ]	Temperature [°C]	Resistance [kΩ]
0	25.7950	20	12.2110	40	5.7805
1	24.8483	21	11.7628	41	5.5683
2	23.9363	22	11.3311	42	5.3640
3	23.0578	23	10.9152	43	5.1671
4	22.2115	24	10.5146	44	4.9774
5	21.3963	25	10.1287	45	4.7948
6	20.6110	26	9.7569	46	4.6188
7	19.8546	27	9.3988	47	4.4493
8	19.1259	28	9.0539	48	4.2860
9	18.4239	29	8.7216	49	4.1287
10	17.7477	30	8.4015	50	3.9771
11	17.0963	31	8.0931	51	3.8312
12	16.4689	32	7.7961	52	3.6906
13	15.8644	33	7.5100	53	3.5551
14	15.2822	34	7.2343	54	3.4246
15	14.7213	35	6.9688	55	3.2989
16	14.1810	36	6.7131	56	3.1779
17	13.6605	37	6.4667	57	3.0612
18	13.1592	38	6.2293	58	2.9489
19	12.6762	39	6.0007	59	2.8406

For a reliable check it is not necessary to control each single value, but just several sample values. If the instrument gives an infinite resistance, this means the probe is disconnected.

Example. With a temperature of 20°C on the probe, the ohmmeter display will indicate approx. 12.21 kΩ



Serial communication

The unit can communicate on serial line using the **Modbus** communication protocol with **RTU** coding.
The unit can be connected to an RS485 network by means of the serial interface supplied as an accessory, and respond to requests from any master device connected to the network.

Serial line settings

The serial line must be set as follows :

- baud rate : **9600**
- data bits : **8**
- stop bits : **1**
- parity : **even**

All the devices connected to the same serial line MUST use the same settings.

Device address

To communicate correctly, each device connected to the serial network must have an univocal address ("*Modbus individual address*") of between 1 and 247. This address can be set by modifying the parameter CFG3.

Modbus commands

The Modbus commands implemented by the controller are :

- parameter reading **3** *(Hex 03 : Read Holding Registers)*
- parameter writing **16** *(Hex 10 : Write Multiple Registers)*

Table of addresses

All the available resources are stored in the controller as WORD (2 byte) and therefore require the reading or writing of an entire Modbus register. According to the Modbus protocol, to identify a register of address X the address X-1 must appear in the message.
Some registers contain more than one piece of information : in this case the bits representing the resource value are identified by means of the number of bits used ("Bit number") and by the least significant bit ("Lsb"). In the writing operation for these registers it is necessary to read the current register value, modify the bits representing the resource concerned and rewrite the entire register.

Example.

Bit number = 4
Lsb = 7
Resource value = 3

15	14	13	12	11	**10**	**9**	**8**	**7**	6	5	4	3	2	1	0
0	1	1	0	1	**0**	**0**	**1**	**1**	1	0	1	1	0	1	0

The resources can be read only (R), write only (W) or read and write (RW).

To interpret the value written in the register it is necessary to consider the value of CPL, EXP and UM :

CPL : if the register represents a number with sign (CPL = Y) carry out the following conversion :

0 = register value < 32767 : resource value = register value
32768 = register value < 65535 : resource value = register value – 65536

EXP : indicates the exponent of the power of 10 to be multiplied by the register value to obtain the resource value.

	Multiplier	
-2	10^{-2}	0.01
-1	10^{-1}	0.1
0	10^{0}	1
1	10^{1}	10
2	10^{2}	100

MU : indicates the unit of measure of the resource

IMPORTANT. DO NOT modify any parameter not indicated in the tables provided or indicated as a read only parameter (R), otherwise the warranty will be cancelled.

Label	Description	RW	Register address		Bit number	Lsb	CPL	EXP	UM
			Dec	Hex					
TR10	Set point temperature controller in Cool	RW	17062	H12A6	16	0	Y	-1	°C
TR20	Set point temperature controller in Heat	RW	17074	H12B2	16	0	Y	-1	°C
-	Hours of operation compressor 1	R	857	H0359	16	0	N	0	hours
-	Hours of operation compressor 2	R	859	H035B	16	0	N	0	hours
-	Hours of operation pump 1	R	865	H0361	16	0	N	0	hours
-	Hours of operation pump 2	R	867	H0363	16	0	N	0	hours
-	Analogue input AIL1	R	412	H019C	16	0	Y	-1	°C
-	Analogue input AIL2	R	414	H019E	16	0	Y	-1	°C
-	Analogue input AIL3	R	416	H01A0	16	0	Y	-1	°C/Bar
-	Analogue/digital input AIL4	R	418	H01A2	16	0	Y	-1	°C/Bar
-	Analogue/digital input AIL5	R	420	H01A4	16	0	Y	-1	°C
-	Device in COOL	R	33028,4	H0104	1	4	N	0	num
-	Device in COOL (from digital input)	R	33028,5	H0104	1	5	N	0	num
-	Device in HEAT	R	33028,6	H0104	1	6	N	0	num
-	Device in HEAT (from digital input)	R	33028,7	H0104	1	7	N	0	num
-	Device in STAND BY	R	33028	H0104	1	2	N	0	-
-	Device in STAND BY (from digital input)	R	33028	H0104	1	3	N	0	-
COOL	Select COOL Mode	W	33450,3	H02AA	1	3	N	0	num
HEAT	Select HEAT Mode	W	33450,4	H02AA	1	4	N	0	num
STBY	Select STAND BY Mode	W	33450,5	H02AA	1	5	N	0	num
Er00	General alarm	R	33104	H0150	1	0	N	0	flag
Er05	Alarm: low pressure - sequence meter - fan thermal switch	R	33104,5	H0150	1	5	N	0	flag
Er10	Alarm: compressor 1 thermal protection – thermostatted delivery 1 – High pressure	R	33105,2	H0151	1	2	N	0	flag
Er11	Alarm: compressor 2 thermal protection – thermostatted delivery 2 - High pressure	R	33105,3	H0151	1	3	N	0	flag
Er20	Alarm: primary circuit flow switch	R	33106,4	H0152	1	4	N	0	flag
Er21	Alarm: primary circuit pump 1 thermal protection	R	33106,5	H0152	1	5	N	0	flag
Er22	Alarm: primary circuit pump 2 thermal protection	R	33106,6	H0152	1	6	N	0	flag
Er30	Alarm: primary circuit antifreeze	R	33107,6	H0153	1	6	N	0	flag
Er45	Alarm: clock fault	R	33109,5	H0155	1	5	N	0	flag
Er46	Alarm: time loss	R	33109,6	H0155	1	6	N	0	flag
Er47	Alarm: no communication with remote keyboard	R	33109,7	H0155	1	7	N	0	flag
Er60	Alarm: water temperature probe or inlet air primary exchanger fault	R	33111,4	H0157	1	4	N	0	flag
Er61	Alarm: water temperature probe or outlet air primary exchanger fault	R	33111,5	H0157	1	5	N	0	flag
Er62	Alarm: temperature probe exchanger (with loss) fault	R	33111,6	H0157	1	6	N	0	flag
Er68	Alarm: external temperature probe fault	R	33112,4	H0158	1	4	N	0	flag
Er90	Signalling alarms history full	R	33115,2	H015B	1	2	N	0	flag

** If several operation modes are enabled by mistake:*

- *OFF has priority over STAND BY, HEATING, COOLING*
- *STAND?BY has priority over HEATING, COOLING*
- *HEATING has priority over COOLING*

SETTING AT WORK

General Rules

To validate the **contractual warranty**, the machine must only 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 plumbing connections made with the relative air vent and the electrical connections made. **Power on the unit at least 12 hours before the start.**

MAINTENANCE

Maintenance

IMPORTANT. MAKE SURE THE POWER TO UNIT IS DISCONNECTED BEFORE CARRYING OUT ANY CLEANING OR MAINTENANCE OPERATION. ALL ROUTINE AND EXTRAORDINARY MAINTENANCE OPERATIONS MUST BE CARRIED OUT BY SPECIALISED AND AUTHORISED PERSONNEL, IN ORDER TO ENSURE COMPLIANCE WITH THE CURRENT SAFETY REGULATIONS.

This section is extremely important for efficient operation of the unit over time. A few operations carried out periodically can avoid the need to call specialised personnel. The operations to be carried out do not require particular technical knowledge and consist of simple checks of the unit's components.
Contact an authorised service centre if maintenance is required.

Structure
To prevent the creation of anomalous vibrations and noise, make sure the various steel parts are secured together and that the inspection panels are properly fixed to the unit.
In case of oxidation, treat with paints suitable for eliminating or reducing the phenomenon in the parts of the unit affected.

Fans
Before every seasonal start-up, check the fixing of the fans and respective grilles to the unit's structure. Check any unbalance in the axial fan, indicated by anomalous vibrations and noise.

Finned coils
Accidental contact with the exchanger fins can cause small cuts. Use special gloves to carry out the operations described below. The exchangers must be able to ensure maximum heat exchange, therefore their surfaces must always be free of any dirt and dust deposited on them due to the action of the fans. Using a brush, remove all the impurities deposited on the surface of the coil. Clean the aluminium surface of the coil with a compressed air jet, making sure to aim the jet with the direction of fins so as to avoid damage. If the aluminium fins are damaged, "comb" the coil with a special tool until the damage is completely eliminated.

Finned coil condensate drain
In winter operation, the finned coil defrost stage occurs periodically through reversal of the refrigeration cycle. During this stage make sure the dripping of water from the finned pack has regular downflow and that the drain union on the base of the unit is not clogged. If the downflow is not correct, with particularly rigid temperatures a layer of ice could form over the base, compromising the unit's operation.

Plumbing system
Visually check that there are no leaks in the plumbing circuit and that it is pressurised. Make sure there is no air in the circuit (by operating the air vents). Make sure the filters in the unit (VP and VA versions) and in the system are clean.

Electrical system
Make sure there are no cuts, cracks or alterations able to comprise the insulation of the power cable connecting the unit to the distribution board. Contact an authorised service centre if maintenance is required. Carefully check the fixing of all the electrical connects after an initial period of operation following first start-up, and at every seasonal start-up or stop.

SAFETY AND POLLUTION

General considerations

The machine has been designed to reduce risks to persons and to 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 the 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 Manufacturer itself.

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 are are therefore listed in the following table along with the instructions on how to neutralize them.

Part in question	Residue hazard	Mode	Precautions
Compressor and delivery pipe	Burns	Contact with the pipes and/or the compressor	Avoid contact by wearing protective gloves
Delivery pipes and bank	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 coolant	Do not exercise tension 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 bank	Cuts	Contact	Wear protective gloves
Electric fans	Cuts	Contact with the skin	Do not push the hands or objects through the fan grille

c. Pollution

The machine contains **r410a** coolant and lubricating oil. Thus, if the unit is scrapped, these fluids must be recovered and disposed of in accordance with the laws in force in the country where the machine is installed. **The machine must not be abandoned when scrapped.**

SAFETY AND POLLUTION

Refrigerant safety card

1 SUPPLIER COMPANY AND PRODUCT IDENTIFICATION

Card No.	FRIG 8
Product	R-410A
Supplier company identification	RIVOIRA SpA

2 COMPOSITION / INFORMATION ON INGREDIENTS

Substance / Preparation	Preparation
Components / Impurities	Contains the following components : Difluoromethane (R32) 50 % in weight Pentafluoroethane (R125) 50 % in weight
EEC No.	Non-applicable for mixtures
Trade-name	/

3 IDENTIFICATION OF HAZARDS

Identification of hazards	Liquefied gas. The vapours are heavier than air and can cause suffocation, reducing the oxygen available for breathing. Rapid evaporation of the fluid can cause freezing. Can cause cardiac arrhythmia.

4 FIRST-AID MEASURES

Inhalation	Do not administer anything if the person has fainted. Take the person outdoors. Use oxygen or artificial respiration if necessary. Do not administer adrenaline or similar substances.
Contact with eyes	Rinse thoroughly with plenty of water for at least 15 minutes and see a doctor.
Contact with skin	Wash immediately with plenty of water. Immediately remove all contaminated garments.
Swallowing	Risk unlikely.

5 FIRE-PREVENTION MEASURES

Specific hazards	Increase in pressure.
Dangerous fumes	Halogen acids, traces of carbonyl halides.
Fire-extinguishing means usable	All the known fire-extinguishing means can be used.
Specific methods	Cool the containers/tanks with water sprays.
Special protection equipment	Use self-contained breathing apparatus in confined spaces.

6 MEASURES AGAINST ACCIDENTAL SPILLING OF THE PRODUCT

Personal protection	Evacuate personnel to safe areas. Provide for adequate ventilation. Use personal protection equipment
Protection for the environment	It evaporates.
Product removal methods	It evaporates.

7 HANDLING AND STORAGE

Handling and storage	Ensure an adequate air change and/or extraction in the workplaces. Only use well-ventilated rooms. Do not breathe vapours or aerosols. Carefully close the containers and keep them in a cool, dry and well-ventilated place. Keep in the original containers.
Incompatible products	Explosives, flammable materials, organic peroxides.

8 CONTROL OF EXPOSURE / PERSONAL PROTECTION

Personal protection	Ensure adequate ventilation, especially in closed areas.
Control parameters	Difluoromethane (R32): Recommended exposure limits: AEL (8h and 12h TWA) = 1000 ml/m3 Pentafluoroethane (R125): Recommended exposure limits: AEL (8h and 12h TWA) = 1000 ml/m3
Respiratory tract protection	For rescue and for maintenance works in tanks, use self-contained breathing apparatus. The vapours are heavier than air and can cause suffocation, reducing the oxygen available for breathing.
Eye protection	Total protection glasses.
Hand protection	Rubber gloves.
Hygiene measures	Do not smoke.

9 CHEMICAL-PHYSICAL PROPERTIES

Relative density, gas (air=1)	Heavier than air.
Solubility in water (mg/l)	Not known, but deemed very low.
Appearance	Colourless liquefied gas.
Odour	Similar to ether.
Fire point	Does not ignite.

10 STABILITY AND REACTIVITY

Stability and reactivity	No decomposition if used according to the special instructions.
Materials to be avoided	Alkali metals, alkali-earth metals, granulated metal salts, Al, Zn, Be, etc. in powder.
Hazardous products of decomposition	Halogen acids, traces of carbonyl halides.

11 TOXICOLOGICAL INFORMATION

Local effects	Concentrations substantially above the value TLV (1000 ppm) can cause narcotic effects. Inhalation of highly concentrated products of decomposition can cause respiratory insufficiency (pulmonary oedema).
Long-term toxicity	No carcinogenic, teratogenic or mutagenic effects have been recorded in experiments on animals.
Specific effects	Rapid evaporation of the fluid can cause freezing. Can cause cardiac arrhythmia.

12 ECOLOGICAL INFORMATION

Effects linked to ecotoxicity	Pentafluoroethane (R125) Potential global warming with halocarbides; HGWP (R-11 = 1) = 0.84 Potential impoverishment of the ozone; ODP (R-11 = 1) = 0

SAFETY AND POLLUTION

13 CONSIDERATIONS ON DISPOSAL

General	Do not dispose of where accumulation can be hazardous. Usable with reconditioning. The depressurised containers must be returned to the supplier. Contact the supplier if instructions for use are deemed necessary.

14 INFORMATION FOR TRANSPORT

Designation for transport	LIQUEFIED GAS N.A.S. (DIFLUOROMETHANE, PENTAFLUOROETHANE)
UN No.	3163
Class/Div	2.2
ADR /RID No.	2, 2nd A
ADR/RID hazard no.	20
ADR label	Label 2 : non-toxic non-flammable gas.
CEFIC Groupcard	20g39 - A
Other information for transport	Avoid transport on vehicles where the loading zone is not separate from the cab. Make sure the driver is informed about the potential risk of the load and knows what to do in case of accident or emergency. Before starting transport, make sure the load is properly secured and : make sure the valve of the container is closed and does not leak; make sure the blind cap of the valve (when provided) is correctly fitted; make sure the cap (when provided) is correctly fitted and that there is an adequate ventilation passage; ensure compliance with the current provisions.

15 INFORMATION ON REGULATIONS

The product must not be labelled according to Directive 1999/45/EC.
Comply with the regulations given below, and the relevant applicable updates and amendments.
Circulars no. 46/79 and 61/81 of the Ministry of Labour : Risks related to the use of products containing aromatic amines
Leg. Decree no. 133/92 : Regulations on the discharge of hazardous substances in waters
Leg. Decree no. 277/91 : Protection of workers against noise, lead and asbestos
Law 256/74, Decree 28/1/92, Leg. Decree no. 52 dated 3/2/97, Decree dated 28/4/97 as amended : Classification, packing and labelling of hazardous substances and preparations
Decree no. 175/88, as amended : Activities with significant accident risks (Seveso Law)
Decree no. 203/88 : Emissions into the atmosphere
Decree no. 303/56 : Work hygiene
Decree no. 547/55 : Regulations on accident prevention
Leg. Decree no.152 dated 11/5/99 : Protection of waters

16 OTHER INFORMATION

Recommended uses: Refrigerant
Can cause suffocation in high concentration.
Keep in a well-ventilated place.
Do not breathe the gas.
The risk of suffocation is often underestimated and must be clearly explained during the training of operators.
Ensure compliance with all the national and regional regulations.
Before using this product in any new process or trial, an in-depth study on safety and compatibility of the product with the materials must be carried out.
The above information is based on our current know-how and describes the product according to the safety requirements. It does not however represent a guarantee and assurance of the qualities in a legal sense. Each person responds personally for compliance with such regulations.

The information contained in this document is to be deemed valid at the time of printing. The company declines any liability for damage caused by use of the product in incorrect applications and/or conditions different from those provided for.

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.

Consult the technical safety briefs available from coolant manufacturers for further information about the characteristics of the cooling fluid.

Ferroli

Cod. 3QE29130

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