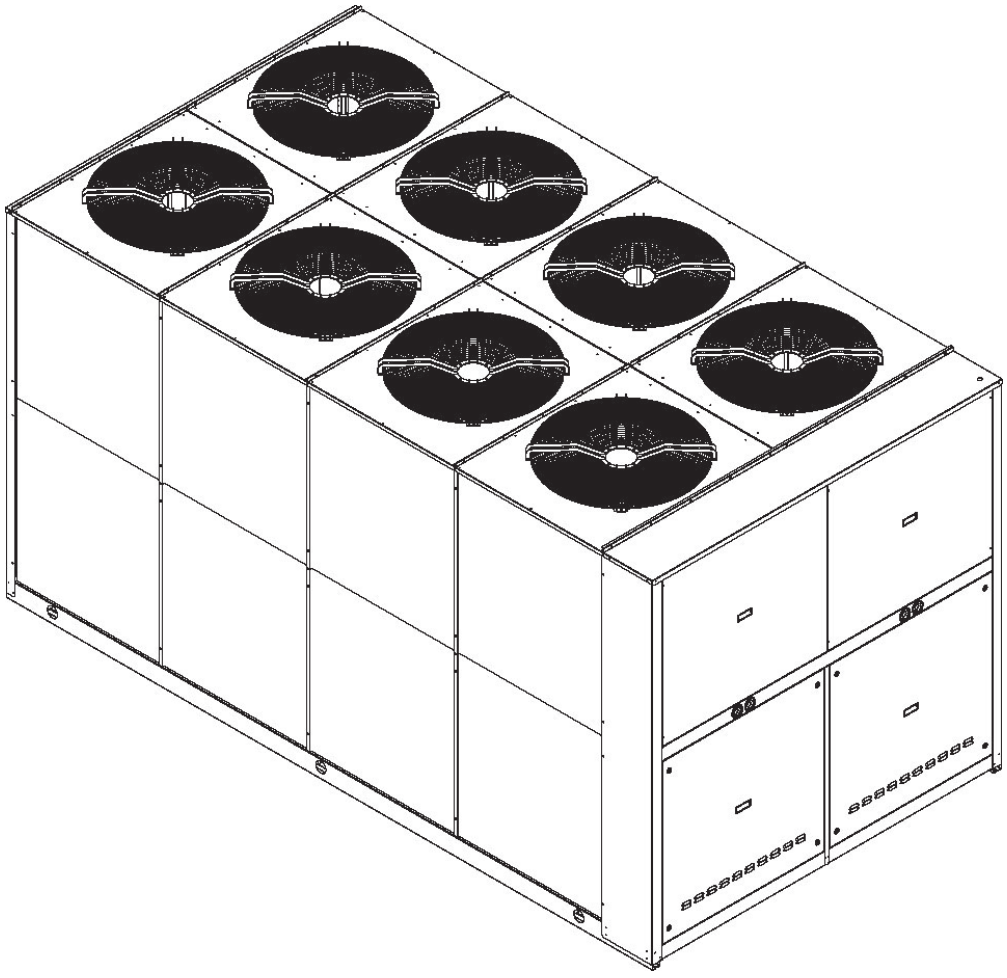
Ferroli

RLA ST

AIR COOLED WATER CHILLERS
AND HEAT PUMPS WITH AXIAL FANS

ECO-FRIENDLY R410A REFRIGERANT GAS

SHELL AND TUBE



CE

USER AND INSTALLATION MANUAL

Dear Customer,
Thank you for having purchased a FERROLI Idustrial coolers. It is the result of many years experience, particular research and has been made with top quality materials and higlly advanced technologies.The CE mark guaranteed thats the appliances meets European Machine Directive requirements regarding safety.
The qualitative level is kept under constant surveillance. FERROLI products therefore offer SAFETY, QUALITY and RELIABILITY.
Due to the continuous improvements in technologies and materials, the product specification as well as performances are subject to variations without prior notice.

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

TABLE OF CONTENTS

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

GENERAL SPECIFICATIONS

CONTAINS FLUORINATED GREENHOUSE GASES COVERED BY THE KYOTO PROTOCOL:
- R410A (GLOBAL WARMING POTENTIAL GWP = 2088)
- R134a (GLOBAL WARMING POTENTIAL GWP = 1430)

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.

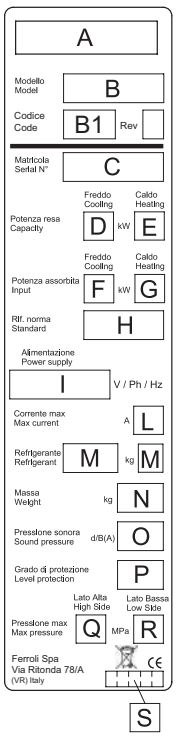
European Directives

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

•	Machine Directive	**2006/42/CE**
•	Directive governing pressurized vessels (PED)	**97/23/CE**
•	Electromagnetic compatibility Directive (EMC)	**2004/108/CE**
•	Low voltage Directive (LVD)	**2006/95/CE**

Any other Directives have to be considered not applicable.

Identification plate of the Unit



The figure on the left depicts the identification plate of the unit, affixed to the outer left-hand side of the Electric Panel.
A description of the data is given below:

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

Special versions

A - Trademark
B - Model
B1- Code
C - Serial number
D - Cooling Capacity (same as Standard Version of the unit)
E - Heating Capacity
for IR unit, VD version, Recovered Heating Capacity
for IP unit, VD version, Heating Capacity / Recovered Heating Capacity
F - Power input in COOLING mode (same as Standard version of the unit)
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

NOTE: The identification plate of the Brine Unit (BR - BP) is filled out as shown in the diagram for the Basic Version of the unit (VB).

GENERAL SPECIFICATIONS

Presentation of the unit

This series of air-water chillers and heat pumps satisfies the cooling and heating requirements of residential plants of medium-large size. All the units are suitable for outdoor installation and can be applied to fan coil plants, radiant floor plants and high efficiency radiators plants. The refrigerant circuit, contained in a compartment protected from the air flow to simplify the maintenance operations, is equipped with scroll compressors mounted on damper supports, shell and tube heat exchanger with threaded or victaulic fittings (according to the model), electronic expansion valve, reverse cycle valve, dehydrator filter, axial fans with safety protection grilles, finned coil made of copper pipes and aluminium louvered fins with subcooling section. The circuit is protected by a safety gas valve, high and low pressure switches and differential pressure switch on the heat exchanger. The heat exchanger and all the hydraulic pipes are thermally insulated in order to avoid condensate generation and to reduce thermal losses.
All the units can be equipped with variable speed fans control that allows the units to operate with low outdoor temperatures in cooling and high outdoor temperature in heating and permits to reduce noise emissions in such operating conditions.
The low noise acoustic setting up (AS) is obtained, starting from the base setting up (AB), reducing the rotational speed of the fans and mounting sound jackets on the compressors and the technical compartment is clad with soundproofing material of suitable thickness. The eXtra low noise acoustic setting up (AX) is obtained, starting from the low noise setting up (AS), further reducing the rotational speed of the fans and using finned coil with bigger surface.
All the units are supplied with a management and control electrical panel containing general switch, phase presence and correct sequence controller, microprocessor controller with display and all the other electrical components with IP54 minimum protection degree. All the units are accurately built and individually tested in the factory. Only electric 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.

RLA ST IP 40.2 VB AB 0M5

Unit type

IR - Unit suitable for hydronic plant installation operating as chiller
IP - Unit suitable for hydronic plant installation operating as reversible heat pump
BR - Unit suitable for hydronic plant installation with brine solutions operating as chiller
BP - Unit suitable for hydronic plant installation with brine solutions operating as reversible heat pump

Unit model

N° compressors

Unit version

VB - Base version
VD - Desuperheaters version (with plate heat exchanger)
VR - Total recovery version (with plate heat exchanger)

Power supply

5 - 400 V - 3 - 50 Hz

Operating range

M - Medium temperature. The unit is suitable to be installed in temperate climates.
A - Medium temperature. The unit is suitable to be installed in tropical climates.

Refrigerant type

0 - R410A

Acoustic setting up

AB - Base setting up
AS - Low noise setting up
AX - Extra low noise setting up

The available special versions are described below:
VB: Standard unit.
VD: Version with Desuperheater (available forboth IR units and IP units)
Produces cold water in the same way as the standard version plus hot water from 30 to 70°C at the same time. This is achieved by installing a water-refrigerant gas heat exchanger between the compressor and coils in order to recover 20 to 25% of the heating capacity that would otherwise be dispersed in the air.
It helps to remind that hot water production is possible only in combination with cold-hot water production in the main heat exchanger and it is subordinated by it.
VR: Total Heat Recovery version
Produces cold water as in the standard version plus hot water at a temperature of 35 to 55°C at the same time. This is achieved thanks to a water-refrigerant gas heat exchanger that totally recovers the heating capacity that would otherwise be dispersed in the air. The total heat recovery function is enabled and disabled by means of a valve on the compressor delivery of each circuit: when the temperature of the water that enters the recuperator drops, the valve switches the hot gas flow from the condensing coils to the recovery heat exchanger. On the other hand, when the temperature of the water reaches the set-point, the valve shuts off the heat recuperator and switches the hot gas flow to the condensing coils.
It helps to remind that hot water production is possible only in combination with cold water production in the main heat exchanger and it is subordinated by it.

GENERAL SPECIFICATIONS

Description of the 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.

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

- Main door-locking circuit-breaker.
- Fuse holders with protection fuses for each compressor.
- Fuse holders with protection fuses for the antifreeze heater.
- Fuse holders and protection fuses for the fans (accessories).
- Fan control contactors.
- Insulating and safety transformer to power the auxiliaries, protected with fuses.
- Basic monitoring board with microprocessor

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, smart defrosting control and operating mode change (only IP unit), dynamic set-point (climatic control), scheduling and integrative heaters control ATC. 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.

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), remote ON/OFF and remote operating mode change E/I (only IP unit), demand limit, double Set-point.

Digital output functions: compressor start-up, pump start-up (only with MP accessory), heat exchanger electrical heater, remote general alarm, 4-way valve (only IP unit), additional heating management, available digital contact on compressors running.

Analogic input functions: in and out water temperature, coil temperature probe, external air temperature probe.

Analogic output functions: continuous adjustment of axial fans rotating speed (if installed).

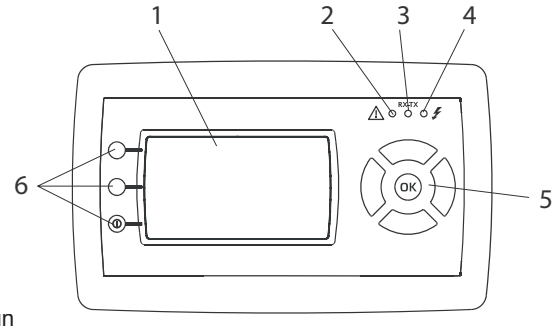
Moreover the controller allows:

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

3. User interfacing terminal with display.

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

· Managing alarm situations
· Checking the status of resources.



KEY

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

4. Compressors. They are the SCROLL type with orbiting coil equipped with built-ın thermal protection and oil heater (accessory for IR, as standard for IP). The version unit AS and AX includes: a soundproofing jacket for the compressors, acoustic cladding for the entire compressor compartment to reduce the noise level and continuous adjustment of axial fans rotating speed. All units are equipped with four compressors connected in parallel (2 cooling circuits) which can operate at the same time (100% cooling power) or individually (75-50-25% of the cooling power), thus adapting to the different thermal loads of the system supplied.

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

6. Evaporator shell and tube type, 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 a differential pressure switch on the water circuit to avoid the risk of freezing if the water flow is shut off for some reason.

7. 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.

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

- One-way valves (IP unit only), allowing the coolant to pass into the appropriate exchangers, depending on the operating cycle.

- 4-way cycle reversal valve (IP unit only), reverses the flow direction of the gas as the summer/winter operating mode is changed.

GENERAL SPECIFICATIONS

Hydraulic and cooling circuit components

11. Safety valve. Installed on the delivery pipe of the compressors, this operates if extreme faults should occur in the plant.

12. Fluid valve (accessory). Ball type, this allows the gas flow on the fluid line to be turned on and off. Along with the valve 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): pump down.

13. Compressor delivery valve (accessory). Ball type, allows the gas delivered to the compressors to be turned on and off.

14. Dehydrator filter. Mechanical cartridge type. Retains impurities and traces of moisture in the circuit.

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

17. 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.

18. Electronic expansion valve. This supplies the evaporator correctly, keeping the selected overheating degree at a steady level.

19. 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.

20. 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.

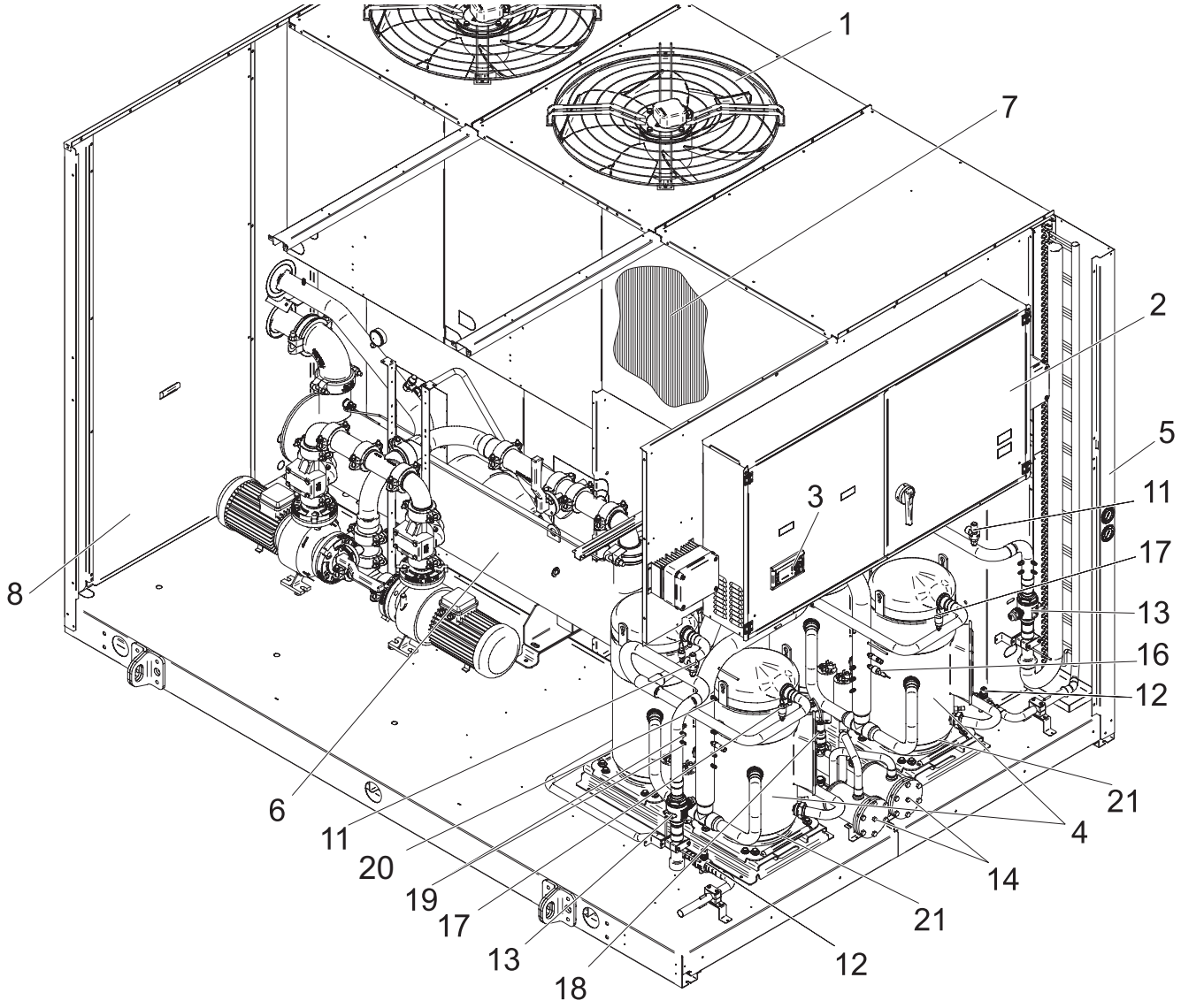
21. Electrical heating elements to heat the compressor oil (accessory for IR, as standard for IP)**.** "Belt" type. These activate when the compressor turns off and keep the temperature of the oil sufficiently high so as to prevent coolant from migrating during these pauses.

- 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.

- Fluid receiver (IP unit only), this is a plenum tank that accounts for variations to the coolant charge the machine must supply as the summer/winter operating mode varies.

- Fluid separator (IP unit only), on the compressor intake to protect against possible fluid back-flows.

- **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.



Version with Desuperheater VD (available for both IR units and IP units)

Hydraulic and chilling circuit components:
1. Desuperheater. Specially designed for the specific version. Plate type, made of stainless steel (AISI 316).
It is installed within a shell of thermal barrier insulating material to prevent heat exchanges towards the outside. Standard supply also includes an electric antifreeze heater to prevent the parts from freezing during the winter, when the system remains at a standstill (if not drained).
2. Water safety valve. On the heat recovery inlet pipe. It acts whenever faulty service leads to an operating pressure in the plumbing system that exceeds the valve opening value.
3. Water drain cock for emptying the exchangers and pipes of the machine dedicated to heat recovery.
4. Air vent. Accessed by removing the front panels. It consists of a manually operated valve installed in the highest part of the water pipes. To use in conjunction with the water drain cocks situated in the rear part of the unit, for emptying the exchangers and pipes dedicated to heat recovery.

Total Heat Recovery unit VR (only available for IR units)

Hydraulic and cooling circuit components:
1. Heat recovery exchanger. Specially designed for the specific version. Plate type, made of stainless steel (AISI 316). It is installed within a shell of thermal barrier insulating material to prevent heat dispersion towards the outside. Standard supply also includes an electric antifreeze heater to prevent the parts from freezing during the winter, if is it not drained.
2. Differential water pressure switch. Installed on exchanger. It disables the heat recovery version if activated owing to lack of water flowing through the recovery exchangers.
3. Heat recovery management valve. This delivers refrigerant to the condensing coils or heat recovery exchanger, depending on demands for hot water, and into the appropriate exchangers depending on whether hot water is required or not.
4. Fluid receiver. This is a plenum tank that accounts for the refrigerant charge variations required by the unit as the operating modes change (condensing in air or in water).
5. One-way valves. Make the refrigerant obligatorily pass through the appropriate heat exchangers (coils / heat exchanger), depending on the operating mode.

ACCESSORIES AND OPTIONAL EQUIPMENT

Accessories

Supplied accessories

Rubber vibration dampers	Allow to reduce the transmission to the unit support plane of the mechanical vibrations generated by the compressor and by the fans in their normal operating mode, the degree of isolation is about 85%
Spring vibration dampers	Allow to reduce the transmission to the unit support plane of the mechanical vibrations generated by the compressor and by the fans in their normal operating mode, the degree of isolation is about 90%
Water paddle flow switch	Allows to detect the water flow lack through the heat exchanger and operates as an integration of the protecion offered by the differential pressure switch (standard).
Remote control	It is suitable for wall mounting and reports all the control and visualization functions available on the user interface placed on the unit. It therefore allows the complete remote control of the unit.
Programmer clock	It allows the unit to be turned on and off according to a set program, through the digital input available on the unit wiring board (remote stand by).
Phase sequence and voltage controller	It checks not only the presence and correct order of the power supply phases but also the voltage level on each phase and avoid the unit to operate with voltage levels outside the permitted limits.

Factory mounted accessories

Victaulic connections	This accessory consists of steel pipes that allows the water inlet/outlet to be connected straight inside the unit.
Coil protection grilles	Protects the external surface of the finned coil.
High and low pressure gauges	2 pressure gauges allow visualization of high and low refrigerant gas pressure.
Coil shut off valves	It consists of two ball valves installed before and after the coil that allow for the pump-down maintenance.
Low temperature kit	(di serie per unità IP e BP, optional per unità IR e BR) sono costituite da resistenze carter di riscaldamento olio compressori.
Modbus serial interface on RS485	It allows to communicate with the unit controller and to view the operating conditions of the unit through Modbus communication protocol. The RS485 serial line ensures the signal quality up to distances of about 1200 meters (that can be extended by means of proper repeaters).
Phase sequence and voltage controller	It checks not only the presence and correct order of the power supply phases but also the voltage level on each phase and avoid the unit to operate with voltage levels outside the permitted limits.
Pressure transducer	It consists of a transducer, which allows operation of the control condensation, evaporation and defrost by reading the pressure.

Mechanical options

For finned coils with special treatment (copper fins, tin-copper plated, acrylic, epoxy or hydrophilic painting) please contact our technical department.

Electrical options

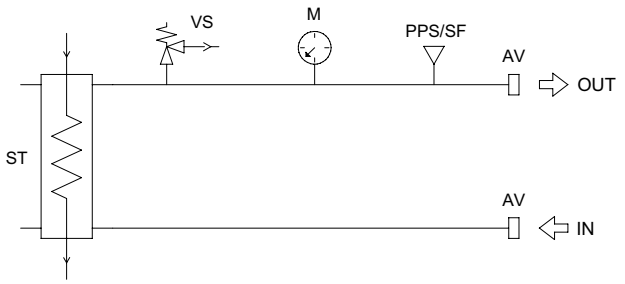
For other voltages, please contact our technical department

ACCESSORIES AND OPTIONAL EQUIPMENT

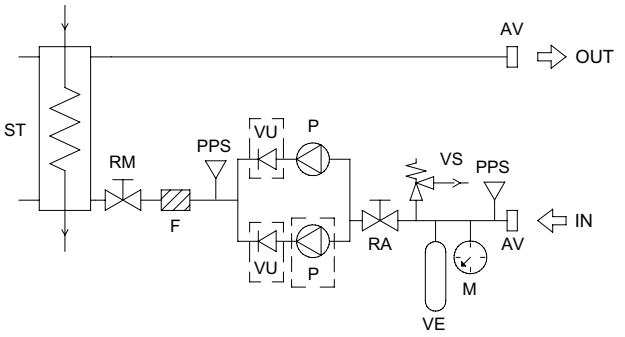
"Storing and hydronic kit" options

Storing and hydronic kit	**MKT SS** **Pipe kit without tank**	This accessory consists of steel pipes insulated with thermal barrier material and allows the water inlet/outlet connection to be routed outside the unit.
	M1P SS 2P STD **1 Standard pump**	Allows the circulation of the water on the plant side.
	M1P SS 2P HP1 **1 High head pump**	Allows the circulation of the water on the plant side and guarantees a higher available static head, suitable for high pressure drop plants.
	M2P SS 2P STD **2 Standard pumps**	Allows the circulation of the water on the plant side and includes a second pump installed as a backup to the first.
	M2P SS 2P HP1 **2 High head pumps**	Allows the circulation of the water on the plant side, ensuring a higher available static head, suitable for high pressure drop plants, and includes a second pump installed as a backup to the first.

Pipe kit



Standard pump



ITEM	DESCRIPTION
AV	VICTAULIC CONNECTIONS
F	FILTER
M	GAUGE
P	PUMP
PPS/SF	PRESSURE SOCKET 1/4" SAE WITH CORE TO BE USED AS AIR PURGE
RA	SUCTION BALL VALVE
RM	DISCHARGE BALL VALVE
SF	AIR VENT VALVE
SP / ST	HEAT EXCHANGER
VE	EXPANSION VESSEL
VS	SAFETY VALVE
VU	CHECK VALVE

– – – only in case of 2 pumps

Options

Soft starter		Reduces the compressor start current of about 40%.
Compressor power factor correction		Allows to reduce the phase shift between the absorbed current and the power supply voltage keeping it above the value of 0,91.
Fans control	**On-off**	(standard for AB unit) the condensation pressure (in cooling) and the evaporation pressure (in heating) is regulated by on-off cycles.
	Modulating control (condensation / evaporation control)	(standard for AS and AX unit, optional for AB unit) The fans rotational speed can be modulated continuosly by an adjusting fan speed device to control the condensation pressure (in cooling) and the evaporation pressure (in heating) in order to extend the oOperating limits of the unit, to reduce noise emissions and improve energy efficiency.
	Modulating control (condensation / evaporation control) with EC fans	(optional for AB, AS and AX unit) The fans rotational speed can be modulated continuosly by EC fans (Electronic Commutation) to control the condensation pressure (in cooling) and the evaporation pressure (in heating) in order to extend the oOperating limits of the unit, to reduce noise emissions and maximize energy efficiency.
Electrical protecion load	**Fuses**	Allows to protect the electrical loads with fuses.
	Thermal magnetic	Allows to protect the electrical loads with thermal magnetic circuit breakers simplifying the maintenance and reload operations.
Drain pan kit		Provides a pan under the coil to drain the condensing water, fitted with 1/2" outlet connection positioned opposite to the electric control panel.
High temperature thermostat		Two thermostats in series on compressors outlet pipes preserve operation not allowing temperature to rise up than a specified non adjustable value.

TECHNICAL DATA AND PERFORMANCE - BASE VERSION (VB)

General technical specifications

Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	U.M.
Power supply	400 - 3 - 50	400 - 3 - 50	400 - 3 - 50	400 - 3 - 50	400 - 3 - 50	400 - 3 - 50	400 - 3 - 50	400 - 3 - 50	400 - 3 - 50	V-ph-Hz
Refrigerant										
Type	R410A	R410A	R410A	R410A	R410A	R410A	R410A	R410A	R410A	-
Refrigerant circuits										
Quantity	2	2	2	2	2	2	2	2	2	n°
Compressor										
Type	scroll	scroll	scroll	scroll	scroll	scroll	scroll	scroll	scroll	-
Quantity	4	4	4	4	4	4	4	4	4	n°
Power steps	0-25-50-75-100	0-25-50-75-100	0-25-50-75-100	0-25-50-75-100	0-25-50-75-100	0-25-50-75-100	0-25-50-75-100	0-25-50-75-100	0-25-50-75-100	%
Oil charge CP1	3,25	3,25	5,3	5,3	5,3	5,3	5,3	5,3	5,3	l
Oil charge CP2	3,25	4,7	5,3	5,3	5,3	5,3	5,3	5,3	5,3	l
Oil charge CP3	3,25	3,25	5,3	5,3	5,3	5,3	5,3	5,3	5,3	l
Oil charge CP4	3,25	4,7	5,3	5,3	5,3	5,3	5,3	5,3	5,3	l
Oil charge - C CP1	3,25	3,25	4,7	4,7	6,8	6,8	6,3	6,3	6,3	l
Oil charge - C CP2	3,25	4,7	4,7	6,8	6,8	6,3	6,3	6,3	6,3	l
Oil charge - C CP3	3,25	3,25	4,7	4,7	6,8	6,8	6,3	6,3	6,3	l
Oil charge - C CP4	3,25	4,7	4,7	6,8	6,8	6,3	6,3	6,3	6,3	l
Plant side heat exchanger										
Type	shell and tube	shell and tube	shell and tube	shell and tube	shell and tube	shell and tube	shell and tube	shell and tube	shell and tube	-
Quantity	1	1	1	1	1	1	1	1	1	n°
Source side heat exchanger										
Type	batteria alettata	batteria alettata	batteria alettata	batteria alettata	batteria alettata	batteria alettata	batteria alettata	batteria alettata	batteria alettata	-
Quantity	2	2	2	2	2	2	2	2	2	n°
Frontal surface	5,54	5,54	5,54	5,54	5,54	5,54	7,41	7,41	7,41	m^2
Fans										
Type	axial	axial	axial	axial	axial	axial	axial	axial	axial	-
Quantity	4	4	4	4	6	6	6	8	8	n°
Diameter	800	800	800	800	800	800	800	800	800	mm
Maximum rotational speed	900	900	900	900	900	900	900	900	900	rpm
Plant side hydraulic circuit										
Expansion vessel volume	24	24	24	24	24	24	24	24	24	l
Safety valve set	600	600	600	600	600	600	600	600	600	kPa
Standard pump (option)										
Type	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	-
Nominal power	3	3	4	4	4	5,5	5,5	5,5	7,5	kW
HP1 High head pump (option)										
Type	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	-
Nominal power	4	4	5,5	5,5	5,5	7,5	7,5	7,5	11	kW
Electrical data units										
FLA TOTALE	140	151	177	193	217	243	269	314	335	A
FLI TOTALE	76	87	107	118	133	148	163	186	200	kW
MIC TOTALE	283	340	347	355	379	469	495	510	558	A
MIC TOTALE con soft starter	213	250	263	271	295	354	380	404	438	A
Electrical data units with pumping module MP SS HP1 (1 or 2 pumps)										
FLA TOTALE	149	160	187	203	227	256	282	327	357	A
FLI TOTALE	81	91	113	124	139	156	171	194	212	kW
MIC TOTALE	292	348	357	365	389	482	508	524	580	A
MIC TOTALE con soft starter	222	258	273	281	305	368	394	417	460	A

TECHNICAL DATA AND PERFORMANCE - BASE VERSION (VB)

NET NOMINAL performances - Standard unit (AB) - Standard plants

	Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	U.M.
	Cooling A35W7 (source : air in 35°C d.b. / plant : water in 12°C out 7°C)										
	Cooling capacity	161	178	199	228	255	289	323	368	409	kW
	Power input	56,2	62,7	70,9	80,4	90,7	103	115	130	146	kW
IR	EER	2,86	2,84	2,81	2,84	2,81	2,81	2,81	2,83	2,80	W/W
	ESSER	3,84	3,81	3,79	3,82	3,79	3,80	3,79	3,80	3,79	W/W
	Water flow rate plant side	7,74	8,55	9,60	11,0	12,3	14,0	15,6	17,7	19,7	l/s
	Pressure drops plant side	50	61	36	46	56	52	31	37	48	kPa
	Cooling A35W7 (source : air in 35°C d.b. / plant : water in 12°C out 7°C)										
	Cooling capacity	154	171	192	215	244	275	310	357	397	kW
	Power input	55,4	61,8	69,6	78,5	89,9	102	113	129	144	kW
	EER	2,78	2,77	2,76	2,74	2,71	2,70	2,74	2,77	2,76	W/W
	ESSER	3,72	3,70	3,72	3,68	3,65	3,65	3,66	3,72	3,73	W/W
	Water flow rate plant side	7,41	8,22	9,27	10,4	11,8	13,3	14,9	17,2	19,2	l/s
IP	Pressure drops plant side	46	57	33	41	52	47	29	35	45	kPa
	Heating A7W45 (source : air in 7°C d.b. 6°C w.b. / plant : water in 40°C out 45°C)										
	Heating capacity	169	191	215	240	273	308	345	395	439	kW
	Power input	56,8	64,0	72,3	81,2	92,7	104	116	132	147	kW
	COP	2,98	2,98	2,97	2,96	2,94	2,96	2,97	2,99	2,99	W/W
	Water flow rate plant side	8,03	9,03	10,2	11,4	12,9	14,6	16,3	18,7	20,8	l/s
	Pressure drops plant side	54	68	40	49	62	56	34	42	53	kPa

Data declared according to **EN 14511**. The values are referred to units without options and accessories.

NET NOMINAL performances - Low noise unit (AS) - Standard plants

	Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	U.M.
	Cooling A35W7 (source : air in 35°C d.b. / plant : water in 12°C out 7°C)										
	Cooling capacity	155	171	191	219	245	277	311	353	393	kW
	Power input	59,2	66,1	75,0	85,2	95,5	109	121	137	154	kW
IR	EER	2,62	2,59	2,55	2,57	2,57	2,54	2,57	2,58	2,55	W/W
	ESSER	3,85	3,80	3,77	3,80	3,79	3,76	3,78	3,80	3,76	W/W
	Water flow rate plant side	7,45	8,22	9,22	10,6	11,8	13,4	15,0	17,0	18,9	l/s
	Pressure drops plant side	46	57	33	43	52	48	29	35	44	kPa
	Cooling A35W7 (source : air in 35°C d.b. / plant : water in 12°C out 7°C)										
	Cooling capacity	148	164	185	206	234	265	298	343	382	kW
	Power input	58,3	65,2	73,6	86,4	94,7	107	123	136	152	kW
	EER	2,54	2,52	2,51	2,38	2,47	2,48	2,42	2,52	2,51	W/W
	ESSER	3,72	3,69	3,69	3,51	3,64	3,63	3,55	3,73	3,70	W/W
	Water flow rate plant side	7,12	7,88	8,89	9,94	11,3	12,8	14,3	16,5	18,4	l/s
IP	Pressure drops plant side	42	52	31	37	47	43	26	33	42	kPa
	Heating A7W45 (source : air in 7°C d.b. 6°C w.b. / plant : water in 40°C out 45°C)										
	Heating capacity	162	183	206	230	262	296	331	379	422	kW
	Power input	53,5	60,3	68,2	76,6	87,3	99	110	125	140	kW
	COP	3,03	3,03	3,02	3,00	3,00	2,99	3,01	3,03	3,01	W/W
	Water flow rate plant side	7,69	8,65	9,75	10,9	12,4	14,0	15,7	17,9	20,0	l/s
	Pressure drops plant side	50	63	37	45	57	52	32	38	49	kPa

Data declared according to **EN 14511**. The values are referred to units without options and accessories.

EER (Energy Efficiency Ratio) = ratio of the total cooling capacity to the effective power input of the unit
ESEER (European Seasonal Energy Efficiency Ratio)
COP (Coefficient Of Performance) = ratio of the total heating capacity to the effective power input of the unit
HRE (Heat Recovery Efficiency) = ratio of the total capacity of the system (heating plus cooling capacity) to the effectice power input

TECHNICAL DATA AND PERFORMANCE - BASE VERSION (VB)

NET NOMINAL performances - Extra low noise unit (AX) - Standard plants

	Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	U.M.
IR	**Cooling A35W7** (source : air in 35°C d.b. / plant : water in 12°C out 7°C)										
	Cooling capacity	151	167	187	214	240	272	304	346	385	kW
	Power input	59,8	66,9	76,0	86,4	96,6	111	123	138	157	kW
	EER	2,53	2,50	2,46	2,48	2,48	2,45	2,47	2,51	2,45	W/W
	ESSER	3,90	3,85	3,82	3,84	3,86	3,82	3,82	3,88	3,81	W/W
	Water flow rate plant side	7,26	8,03	9,03	10,3	11,6	13,1	14,6	16,7	18,5	l/s
	Pressure drops plant side	44	54	32	40	50	45	28	33	42	kPa
IP	**Cooling A35W7** (source : air in 35°C d.b. / plant : water in 12°C out 7°C)										
	Cooling capacity	145	161	181	203	229	259	291	335	374	kW
	Power input	59,0	66,1	74,6	84,4	95,8	109	122	137	153	kW
	EER	2,46	2,44	2,43	2,41	2,39	2,38	2,39	2,45	2,44	W/W
	ESSER	3,79	3,75	3,75	3,71	3,70	3,69	3,69	3,79	3,77	W/W
	Water flow rate plant side	6,98	7,74	8,70	9,75	11,0	12,5	14,0	16,1	18,0	l/s
	Pressure drops plant side	41	50	29	36	45	41	25	31	40	kPa
	Heating A7W45 (source : air in 7°C d.b. 6°C w.b. / plant : water in 40°C out 45°C)										
	Heating capacity	161	181	204	228	259	293	328	374	417	kW
	Power input	51,8	58,5	66,2	74,5	84,6	95,6	106	121	135	kW
	COP	3,11	3,09	3,08	3,06	3,06	3,06	3,09	3,09	3,09	W/W
	Water flow rate plant side	7,64	8,60	9,65	10,8	12,3	13,9	15,5	17,7	19,7	l/s
	Pressure drops plant side	49	62	36	44	56	51	31	37	48	kPa

Data declared according to **EN 14511**. The values are referred to units without options and accessories.

EER (Energy Efficiency Ratio) = ratio of the total cooling capacity to the effective power input of the unit
ESEER (European Seasonal Energy Efficiency Ratio)
COP (Coefficient Of Performance) = ratio of the total heating capacity to the effective power input of the unit
HRE (Heat Recovery Efficiency) = ratio of the total capacity of the system (heating plus cooling capacity) to the effectice power input

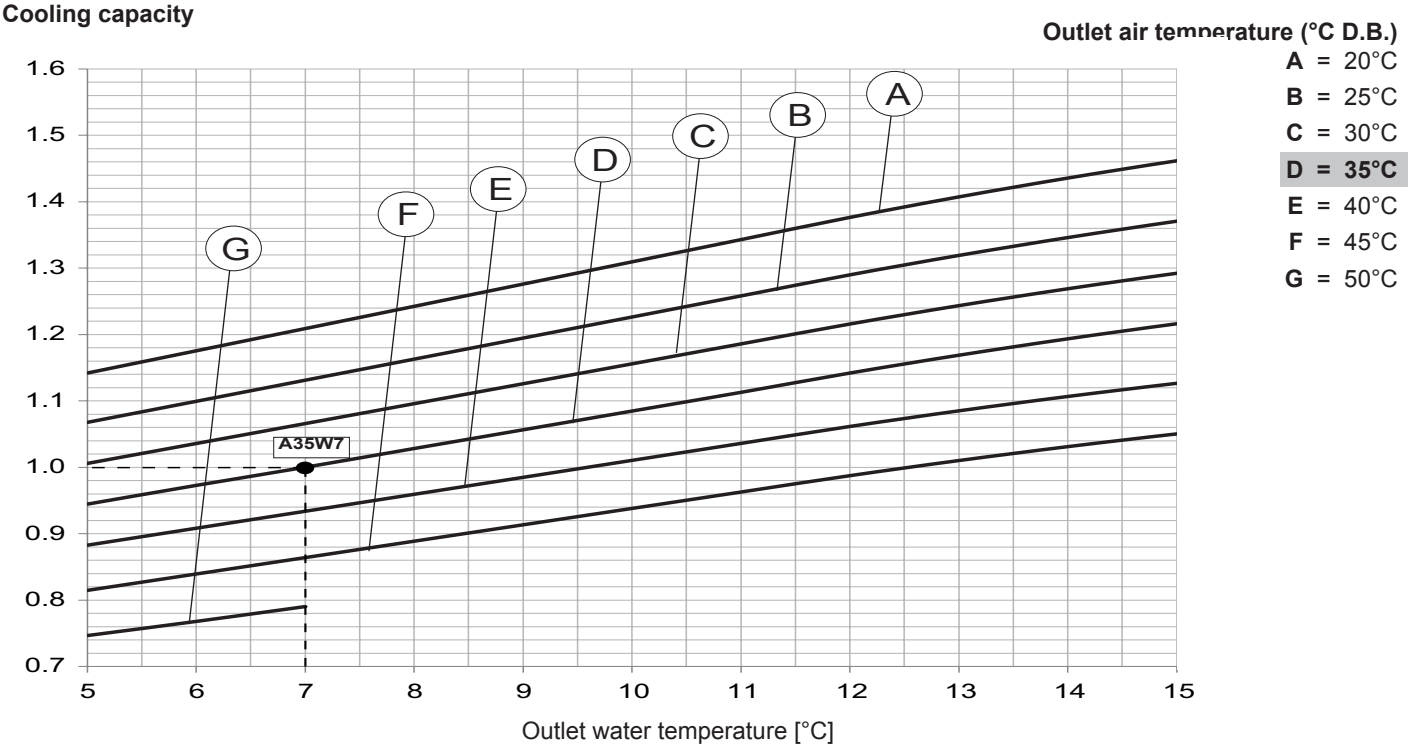
TECHNICAL DATA AND PERFORMANCE - BASE VERSION (VB)

COOLING performances

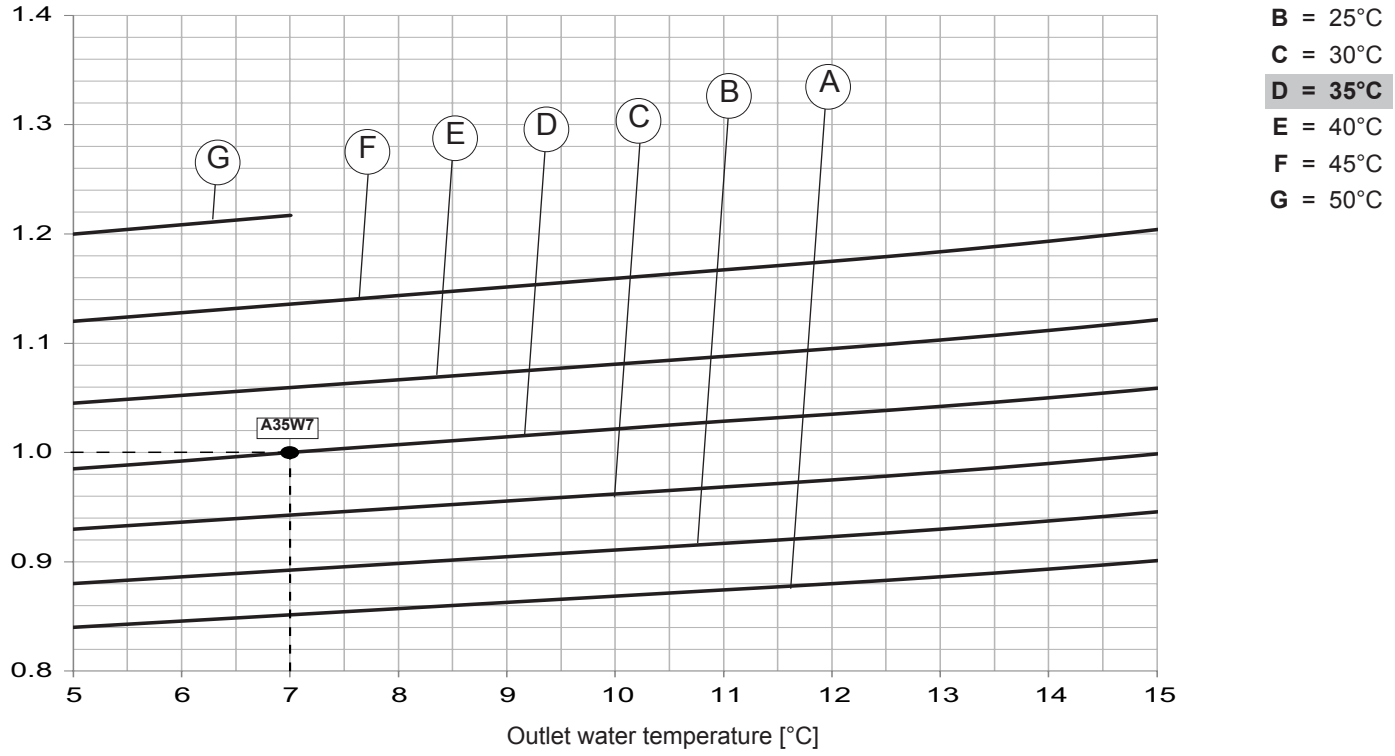
The graphs allow to get the corrective factors to be applied to the nominal performances in order to obtain the real performances in the selected operating conditions. For the "Operation limits" of the unit refer to the section limits.

The reference nominal condition is: **A35W7** (source : air in 35°C d.b. / plant : water in 12°C out 7°C)

Cooling capacity



Total power input



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

TECHNICAL DATA AND PERFORMANCE - BASE VERSION (VB)

HEATING performances

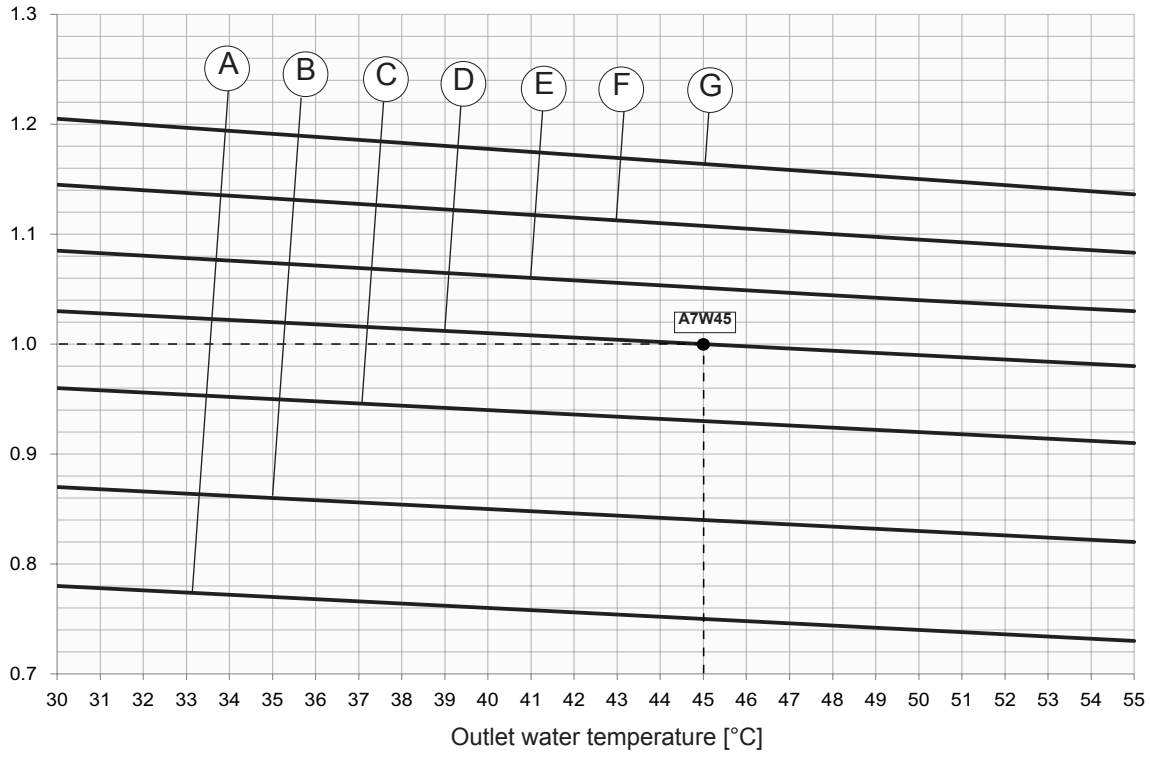
The graphs allow to get the corrective factors to be applied to the nominal performances in order to obtain the real performances in the selected operating conditions. For the "Operation limits" of the unit refer to the section limits.

The reference nominal condition is: **A7W45** (source : air in 7°C d.b. 6°C w.b. / plant : water in 40°C out 45°C)

Heating capacity

Outlet air temperature (°C D.B. / W.B.)

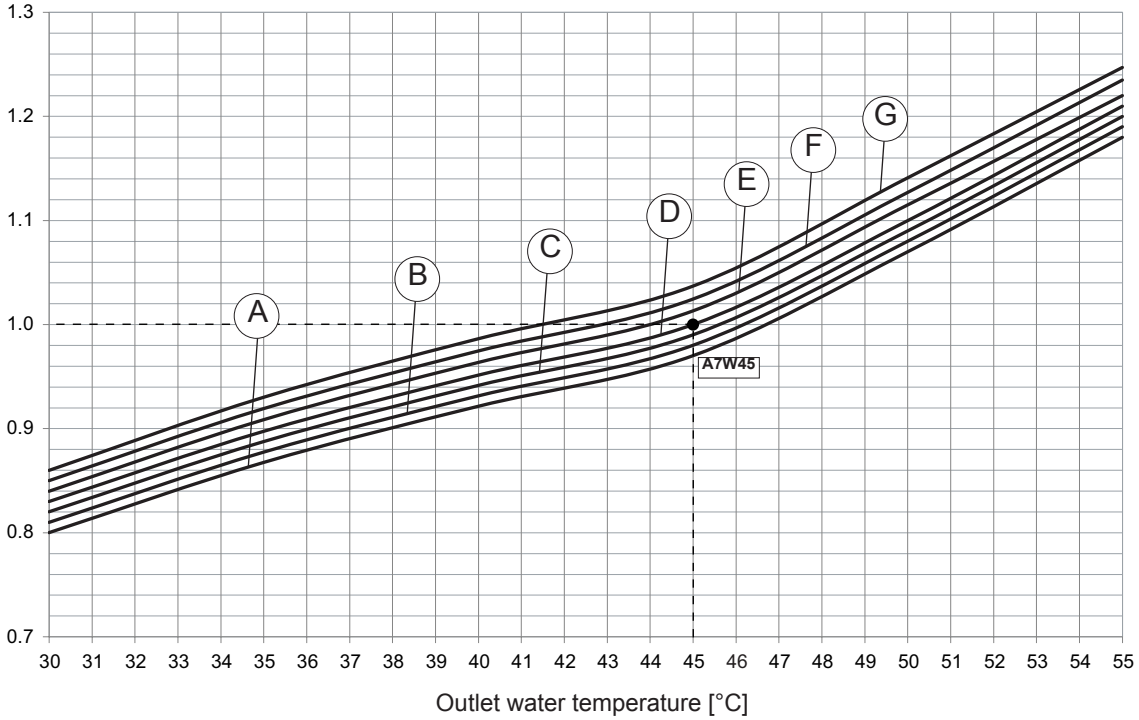
A = -5,5 / -6°C
B = -1,3 / -2°C
C = 2,8 / 2°C
D = 7 / 6°C
E = 10,1 / 9°C
F = 13,2 / 12°C
G = 16,4 /15°C



Total power input

Outlet air temperature (°C D.B. / W.B.)

A = -5,5 / -6°C
B = -1,3 / -2°C
C = 2,8 / 2°C
D = 7 / 6°C
E = 10,1 / 9°C
F = 13,2 / 12°C
G = 16,4 /15°C



The standard performances refer to a 5°C temperature difference between the water entering and leaving the heat exchanger and to operation of the unit with all fans at nominal or maximum speed. A 0.44 x 10^{-4} m^2 K/W fouling factor has also been considered with the unit installed at zero meters above sea level (Pb = 1013mbar).
NOTE For air temperatures of less than 7°C, the heating capacity is declared without considering the effect of the defrosting, strictly correlated with the humidity in the outdoor air.

Correction factor for the use of glycol in heating mode

ETHYLENE GLYCOL with water produced between 30 ÷ 55 º C.

Percentage Of glycol in mass / volume	0 / 0	10 / 8,9	20 / 18,1	30 / 27,7	40 / 37,5
Freezing point [°C]	0	-3,2	-8	-14	-22
CCPT - Heating capacity	1,000	0,995	0,985	0,975	0,970
CCPA - Power input	1,000	1,010	1,015	1,020	1,030
CCQA - Water flow rate	1,000	1,038	1,062	1,091	1,127
CCDP - Water pressure drop	1,000	1,026	1,051	1,077	1,103

PROPYLENE GLYCOL with water produced between 30 ÷ 55ºC.

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
CCPT - Heating capacity	1,000	0,990	0,975	0,965	0,955
CCPA - Power input	1,000	1,010	1,020	1,030	1,040
CCQA - Water flow rate	1,000	1,018	1,032	1,053	1,082
CCDP - Water pressure drop	1,000	1,026	1,051	1,077	1,103

Based on DESIGN CONDITIONS extract Heating Capacity (kWt_r).
Based on type and percentage of glycol extract CCPT, CCQA, CCDP.
Then calculate.

$Pt\_brine = kWt_r \times CCPT$

$Pass\_CP\_brine = kWa \times CCPA$

Then calculate brine flow rate to the heat recovery exchanger:

$Q\_brine\ [l/s] = CCQA \times (Pt\_brine\ [kW] * 0.86 / \Delta T\_brine) / 3.6$

where ΔT_brine is the temperature difference outlet-intlet heat recovery exchanger:

$\Delta T\_brine = Twout\_brine - Twin\_brine$

With this brine flow rate enter in abscissa on the water pressure drop of the heat recovery then you have Dp_app.
Finally you can calculate the actual pressure drop of the brine on heat recovery:

$Dp\_brine = CCDP \times Dp\_app$

Correction factor for the use of glycol in cooling mode

ETHYLENE GLYCOL with water produced between 5 ÷ 20 ° C.

Percentage Of glycol in mass / volume	0 / 0	10 / 8,9	20 / 18,1	30 / 27,7	40 / 37,5
Freezing point [°C]	0	-3,2	-8	-14	-22
CCPF - Cooling capacity	1,00	0,99	0,98	0,97	0,95
CCPA - Power input	1,00	1,00	0,99	0,99	0,98
CCQA - Water flow rate	1,00	1,04	1,08	1,12	1,16
CCDP - Water pressure drop	1,00	1,08	1,16	1,25	1,35

PROPYLENE GLYCOL with water produced between 5 ÷ 20 ° C.

Percentage Of glycol in mass / volume	0 / 0	10 / 9,6	20 / 19,4	30 / 29,4	40 / 39,6
Freezing point [°C]	0	-3,3	-7	-13	-21
CCPF - Cooling capacity	1,00	0,98	0,96	0,94	0,92
CCPA - Power input	1,00	0,99	0,98	0,95	0,93
CCQA - Water flow rate	1,00	1,01	1,03	1,06	1,09
CCDP - Water pressure drop	1,00	1,05	1,11	1,22	1,38

Based on outdoor air temperature and leaving water temperature of the evaporator (DESIGN CONDITIONS) extract Cooling Capacity (kWf) and Compressors Power Input (kWa).
Based on type and percentage of glycol extract CCPF, CCPA, CCQA, CCDP.
Then calculate.

Pf_brine = kWf x CCPF

Pass_CP_brine = kWa x CCPA

Then calculate brine flow rate of the evaporator:

$$Q\_brine\_evap\ [l/s] = CCQA \times (Pf\_brine\ [kW] * 0.86 / \Delta T\_brine) / 3.6$$

where ΔT_brine is the difference inlet-outlet evaporator water temperature:

$$\Delta T\_brine = Twin\_evap\_brine - Twout\_evap\_brine$$

With this brine flow rate enter in abscissa on the water pressure drop of the evaporator then you have Dp_app.
Finally you can calculate the actual pressure drop of the brine on evaporator side:

$$Dp\_evap\_brine = CCDP \times Dp\_app$$

Fouling factors

The performances supplied with the tables are referred to a fouling factory = 0.44×10^{-4} m² K/W . For different values of the fouling factory, use the reduction coefficients reported in the following table.

Fouling factory		Evaporator	
		F.c. PF	F.c. PA
(m² K / W)	**$0{,}44 \times 10^{-4}$**	**1,00**	**1,00**
(m² K / W)	$0{,}86 \times 10^{-4}$	0,98	0,99
(m² K / W)	$1{,}72 \times 10^{-4}$	0,93	0,98

F.c. PF: Correction Factor for Cooling capacity
F.c. PA: Correction Factor for compressor power Input

TECHNICAL DATA AND PERFORMANCE - DESUPERHEATER VERSION (VD)

Heat exchanger specifications

Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	U.M.
Type of recovery exchanger	A piastre inox saldobrasate									-
Quantity	1									N°
Max. operating pressure on wet side	600									kPa
Total water content of recovery exchangers	1,3	1,3	1,3	1,3	1,3	1,3	1,6	1,6	1,6	l

NET NOMINAL performances - IR unit - Standard plants

Base setting up AB

Modello		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	U.M.
IR	**Cooling A35W7 - W45** (source : air in 35°C d.b. / plant : water in 12°C out 7°C / Recovery : water in 40°C out 45°C)										
	Cooling capacity	167	185	207	237	264	300	336	382	425	kW
	Total power input	55.0	61.2	69.3	78.5	88.7	101	112	127	143	kW
	EER	3.04	3.01	2.99	3.02	2.98	2.97	3.00	3.01	2.98	W/W
	HRE	3.90	3.89	3.87	3.91	3.85	3.85	3.90	3.88	3.86	W/W
	Water flow rate	8.05	8.89	10.0	11.4	12.8	14.5	16.2	18.4	20.5	l/s
	Water pressure drop	55	55	63	62	65	68	58	62	63	kPa
	Recovered heating capacity	47.2	53.4	61.2	70.3	76.6	88.7	99.9	110.8	126.6	kW
	Recovered water flow rate	2.25	2.55	2.93	3.36	3.66	4.24	4.77	5.29	6.05	l/s
	Recovered water pressure drop	5	7	8	10	13	16	16	21	25	kPa

Low noise setting up AS

Modello		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	U.M.
IR	**Cooling A35W7 - W45** (source : air in 35°C d.b. / plant : water in 12°C out 7°C / Recovery : water in 40°C out 45°C)										
	Cooling capacity	161	177	199	228	254	288	323	367	408	kW
	Total power input	57.8	64.5	73.2	83.1	93.3	107	118	134	151	kW
	EER	2.79	2.75	2.72	2.74	2.73	2.70	2.73	2.74	2.71	W/W
	HRE	3.67	3.65	3.62	3.66	3.61	3.60	3.64	3.64	3.61	W/W
	Water flow rate	7.75	8.55	9.6	11.0	12.3	13.9	15.6	17.7	19.7	l/s
	Water pressure drop	51	51	58	57	60	63	54	58	58	kPa
	Recovered heating capacity	51.0	57.7	66.2	76.0	82.7	95.9	108	120	137	kW
	Recovered water flow rate	2.43	2.76	3.16	3.63	3.95	4.58	5.15	5.72	6.52	l/s
	Recovered water pressure drop	6	8	10	12	15	19	19	24	29	kPa

Extra low noise setting up AX

Modello		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	U.M.
IR	**Cooling A35W7 - W45** (source : air in 35°C d.b. / plant : water in 12°C out 7°C / Recovery : water in 40°C out 45°C)										
	Cooling capacity	157	173	195	223	249	282	316	360	400	kW
	Total power input	58.3	65.2	74.1	84.2	94.3	108	120	135	153	kW
	EER	2.69	2.66	2.63	2.64	2.65	2.61	2.63	2.67	2.62	W/W
	HRE	3.59	3.57	3.55	3.57	3.55	3.53	3.56	3.57	3.54	W/W
	Water flow rate	7.55	8.35	9.4	10.7	12.0	13.6	15.2	17.3	19.3	l/s
	Water pressure drop	49	49	55	54	58	60	51	55	56	kPa
	Recovered heating capacity	52.3	59.3	68.0	78.1	85.0	98.5	111	123	140	kW
	Recovered water flow rate	2.50	2.83	3.25	3.73	4.06	4.71	5.29	5.86	6.71	l/s
	Recovered water pressure drop	6	8	10	13	16	20	20	25	31	kPa

Data declared according to **EN 14511**. The values are referred to units without options and accessories.

EER (Energy Efficiency Ratio) = ratio of the total cooling capacity to the effective power input of the unit
ESEER (European Seasonal Energy Efficiency Ratio)
COP (Coefficient Of Performance) = ratio of the total heating capacity to the effective power input of the unit
HRE (Heat Recovery Efficiency) = ratio of the total capacity of the system (heating plus cooling capacity) to the effectice power input

TECHNICAL DATA AND PERFORMANCE - DESUPERHEATER VERSION (VD)

Heat exchanger specifications

Modello	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	U.M.
Type of recovery exchanger	A piastre inox saldobrasate									-
Quantity	1									N°
Max. operating pressure on wet side	600									kPa
Total water content of recovery exchangers	1,3	1,3	1,3	1,3	1,3	1,3	1,6	1,6	1,6	l

NET NOMINAL performances - IP unit - Standard plants

Base setting up AB

	Modello	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	U.M.
IP	**Cooling A35W7 - W45** (source : air in 35°C d.b. / plant : water in 12°C out 7°C / Recovery : water in 40°C out 45°C)										
	Cooling capacity	160	177	200	224	253	286	322	371	413	kW
	Total power input	54.1	60.4	67.9	76.6	87.8	99	111	126	140	kW
	EER	2.96	2.94	2.94	2.92	2.89	2.88	2.91	2.95	2.96	W/W
	HRE	3.82	3.81	3.83	3.82	3.75	3.76	3.81	3.83	3.85	W/W
	Water flow rate	7.70	8.55	9.64	10.8	12.2	13.8	15.5	17.9	19.9	l/s
	Water pressure drop	51	51	58	55	59	62	53	59	59	kPa
	Recovered heating capacity	46.5	52.7	60.1	68.8	76.1	87.5	98.9	110	124	kW
	Recovered water flow rate	2.22	2.52	2.87	3.29	3.64	4.18	4.73	5.25	5.91	l/s
	Recovered water pressure drop	5	6	8	10	13	16	16	20	24	kPa

Low noise setting up AS

	Modello	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	U.M.
IP	**Cooling A35W7 - W45** (source : air in 35°C d.b. / plant : water in 12°C out 7°C / Recovery : water in 40°C out 45°C)										
	Cooling capacity	154	170	192	215	243	275	310	357	397	kW
	Total power input	56.9	63.6	71.8	81.1	92.5	105	117	132	147	kW
	EER	2.70	2.68	2.67	2.65	2.63	2.62	2.65	2.69	2.69	W/W
	HRE	3.59	3.57	3.58	3.56	3.52	3.52	3.56	3.59	3.60	W/W
	Water flow rate	7.40	8.20	9.24	10.3	11.7	13.3	14.9	17.2	19.1	l/s
	Water pressure drop	47	47	53	50	55	57	49	54	55	kPa
	Recovered heating capacity	50.3	57.0	64.9	74.3	82.2	94.5	107	119	134	kW
	Recovered water flow rate	2.40	2.72	3.10	3.55	3.93	4.51	5.11	5.67	6.38	l/s
	Recovered water pressure drop	6	7	9	11	15	19	18	24	28	kPa

Extra low noise setting up AX

	Modello	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	U.M.
IP	**Cooling A35W7 - W45** (source : air in 35°C d.b. / plant : water in 12°C out 7°C / Recovery : water in 40°C out 45°C)										
	Cooling capacity	151	167	188	211	238	269	302	349	389	kW
	Total power input	57.5	64.4	72.7	82.2	93.5	106	119	134	150	kW
	EER	2.62	2.60	2.58	2.56	2.55	2.53	2.55	2.61	2.60	W/W
	HRE	3.52	3.51	3.50	3.49	3.45	3.45	3.48	3.52	3.52	W/W
	Water flow rate	7.25	8.05	9.04	10.1	11.5	13.0	14.6	16.8	18.7	l/s
	Water pressure drop	45	45	51	48	53	55	47	52	52	kPa
	Recovered heating capacity	51.6	58.6	66.7	76.3	84.5	97.1	110	122	138	kW
	Recovered water flow rate	2.47	2.80	3.19	3.64	4.04	4.64	5.25	5.81	6.57	l/s
	Recovered water pressure drop	6	8	10	12	16	20	19	25	30	kPa

Data declared according to **EN 14511**. The values are referred to units without options and accessories.

EER (Energy Efficiency Ratio) = ratio of the total cooling capacity to the effective power input of the unit
ESEER (European Seasonal Energy Efficiency Ratio)
COP (Coefficient Of Performance) = ratio of the total heating capacity to the effective power input of the unit
HRE (Heat Recovery Efficiency) = ratio of the total capacity of the system (heating plus cooling capacity) to the effectice power input

NOTE : THE HEATING CAPACITY RECOVERED BY THE DESUPERHEATER EXCLUSIVELY REFERS TO UNITS OPERATING IN THE COOLING MODE.

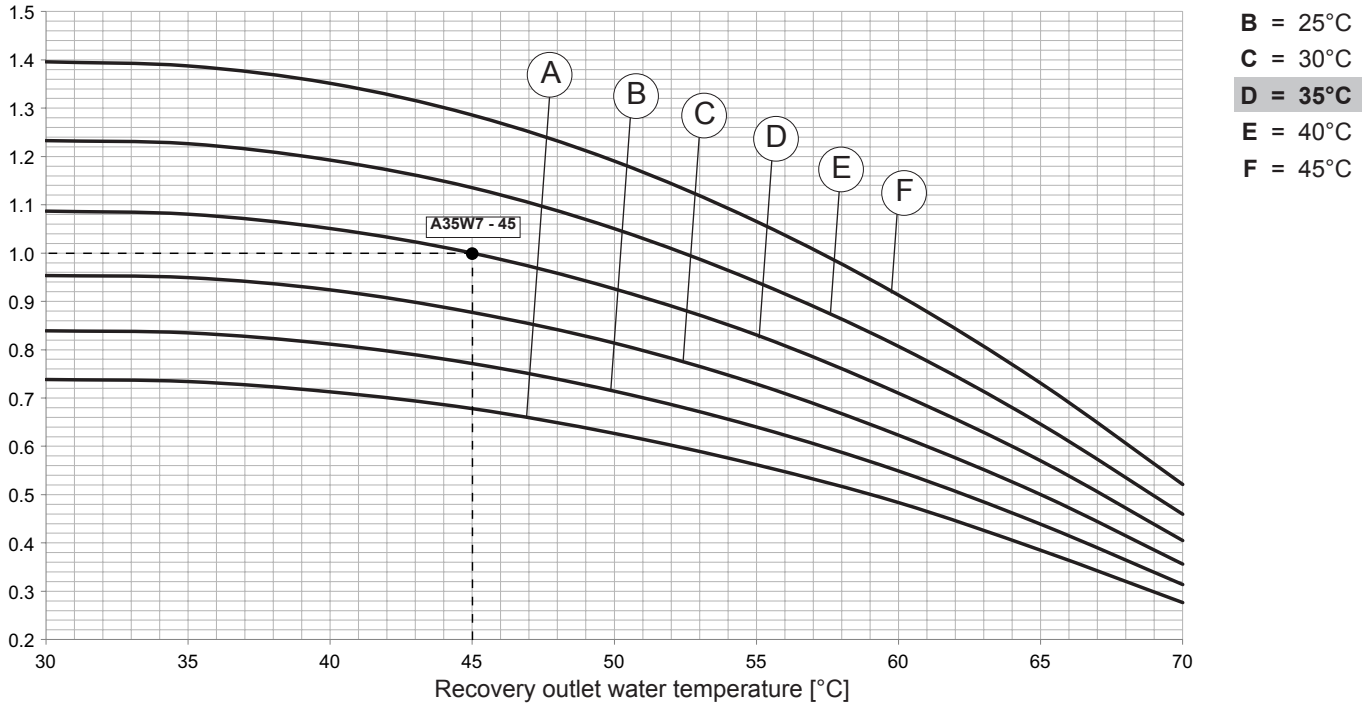
TECHNICAL DATA AND PERFORMANCE - DESUPERHEATER VERSION (VD)

Desuperheaters VD performances

The graphs allow to get the corrective factors to be applied to the nominal performances in order to obtain the real performances in the selected operating conditions.

The reference nominal condition is: **A35W7 - 45** (source : air in 35°C d.b. / plant : water in 12°C out 7°C / Recovery : water in 40°C out 45°C)

Recovered capacity VD



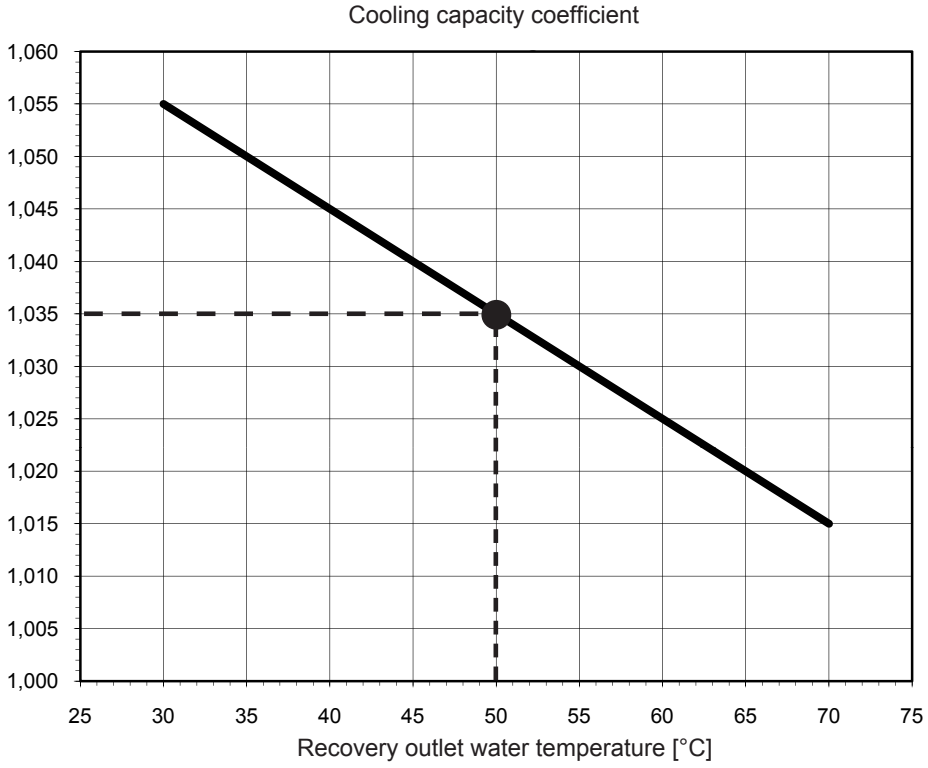
The standard performances refer to a 5°C temperature difference between the water entering and leaving the heat exchanger and to operation of the unit with all fans at nominal or maximum speed. A 0.44 x 10^{-4} m^2 K/W fouling factor has also been considered with the unit installed at zero meters above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

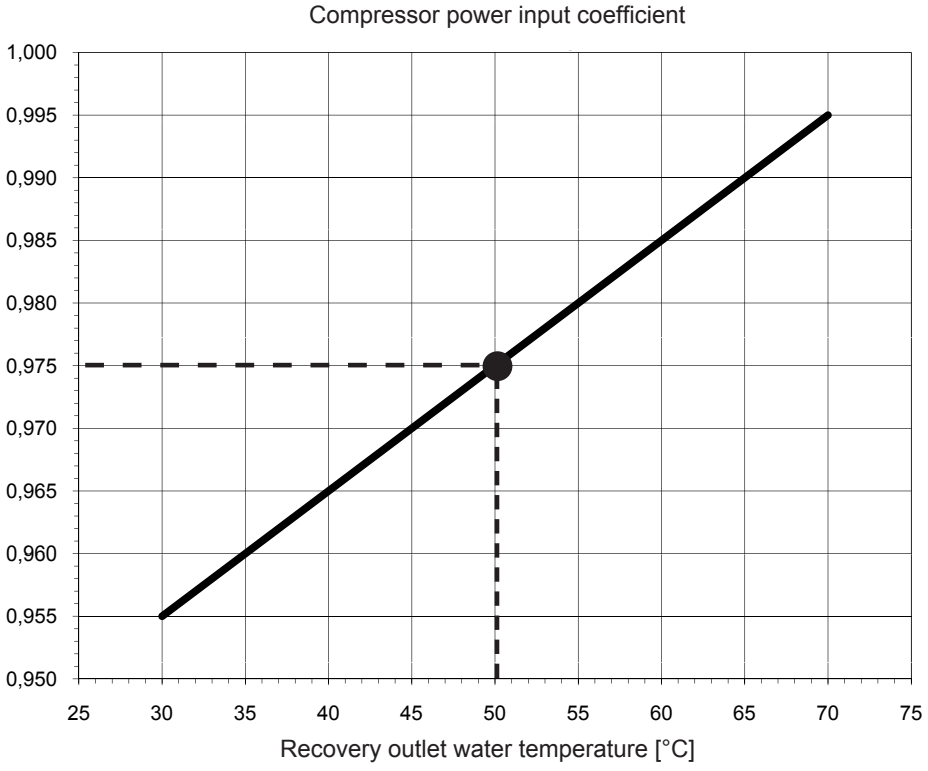
Corrective factors

On the water leaving temperature of the desuperheater, extract from the graphs the correction factors that have to be applied to the cooling capacity and power input.

Es. water leaving temperature of the desuperheater = 50°C

Cooling capacity	Pf_{VD}= Pf x CPf_{VD}	→	Pf_{VD}= Pf x 1,035
Power input	Pa_{VD}= Pa x CPa_{VD}	→	Pa_{VD}= Pa x 0,975





TECHNICAL DATA AND PERFORMANCE - RECOVERY VERSION (VR)

Heat exchanger specifications

Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	U.M.
Type of recovery exchanger	Brazed plates									-
Quantity	1									N°
Max. operating pressure on wet side	600									kPa
Total water content of recovery exchangers	17.6	19.2	21.6	24.8	27.2	30.4	34.4	38.4	43.2	l

NET NOMINAL performances - IR unit - Standard plants

Base setting up AB

	Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	U.M.
IR	**Cooling A35W7 - W45** (source : air in 35°C d.b. / plant : water in 12°C out 7°C / Recovery : water in 40°C out 45°C)										
	Cooling capacity	169	186	209	239	267	303	339	386	429	kW
	Total power input	47.3	53.5	61.6	70.7	77.2	89.5	100	111	127	kW
	EER	3.56	3.48	3.39	3.38	3.46	3.39	3.38	3.46	3.37	W/W
	HRE	8.08	7.91	7.75	7.71	7.87	7.72	7.71	7.87	7.69	W/W
	Water flow rate	8.13	8.98	10.1	11.5	12.9	14.6	16.4	18.6	20.7	l/s
	Water pressure drop	56	57	64	63	66	69	59	64	64	kPa
	Recovered heating capacity	214	237	268	306	340	388	434	492	550	kW
	Recovered water flow rate	10.2	11.3	12.8	14.6	16.2	18.5	20.7	23.5	26.3	l/s
	Recovered water pressure drop	45	43	45	45	47	49	49	51	51	kPa

Low noise setting up AS

	Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	U.M.
IR	**Cooling A35W7 - W45** (source : air in 35°C d.b. / plant : water in 12°C out 7°C / Recovery : water in 40°C out 45°C)										
	Cooling capacity	169	186	209	239	267	303	339	386	429	kW
	Total power input	47.3	53.5	61.6	70.7	77.2	89.5	100	111	127	kW
	EER	3.56	3.48	3.39	3.38	3.46	3.39	3.38	3.46	3.37	W/W
	HRE	8.08	7.91	7.75	7.71	7.87	7.72	7.71	7.87	7.69	W/W
	Water flow rate	8.13	8.98	10.1	11.5	12.9	14.6	16.4	18.6	20.7	l/s
	Water pressure drop	56	57	64	63	66	69	59	64	64	kPa
	Recovered heating capacity	214	237	268	306	340	388	434	492	550	kW
	Recovered water flow rate	10.2	11.3	12.8	14.6	16.2	18.5	20.7	23.5	26.3	l/s
	Recovered water pressure drop	45	43	45	45	47	49	49	51	51	kPa

Extra low noise setting up AX

	Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	U.M.
IR	**Cooling A35W7 - W45** (source : air in 35°C d.b. / plant : water in 12°C out 7°C / Recovery : water in 40°C out 45°C)										
	Cooling capacity	169	186	209	239	267	303	339	386	429	kW
	Total power input	47.3	53.5	61.6	70.7	77.2	89.5	100	111	127	kW
	EER	3.56	3.48	3.39	3.38	3.46	3.39	3.38	3.46	3.37	W/W
	HRE	8.08	7.91	7.75	7.71	7.87	7.72	7.71	7.87	7.69	W/W
	Water flow rate	8.13	8.98	10.1	11.5	12.9	14.6	16.4	18.6	20.7	l/s
	Water pressure drop	56	57	64	63	66	69	59	64	64	kPa
	Recovered heating capacity	214	237	268	306	340	388	434	492	550	kW
	Recovered water flow rate	10.2	11.3	12.8	14.6	16.2	18.5	20.7	23.5	26.3	l/s
	Recovered water pressure drop	45	43	45	45	47	49	49	51	51	kPa

Data declared according to **EN 14511**. The values are referred to units without options and accessories.

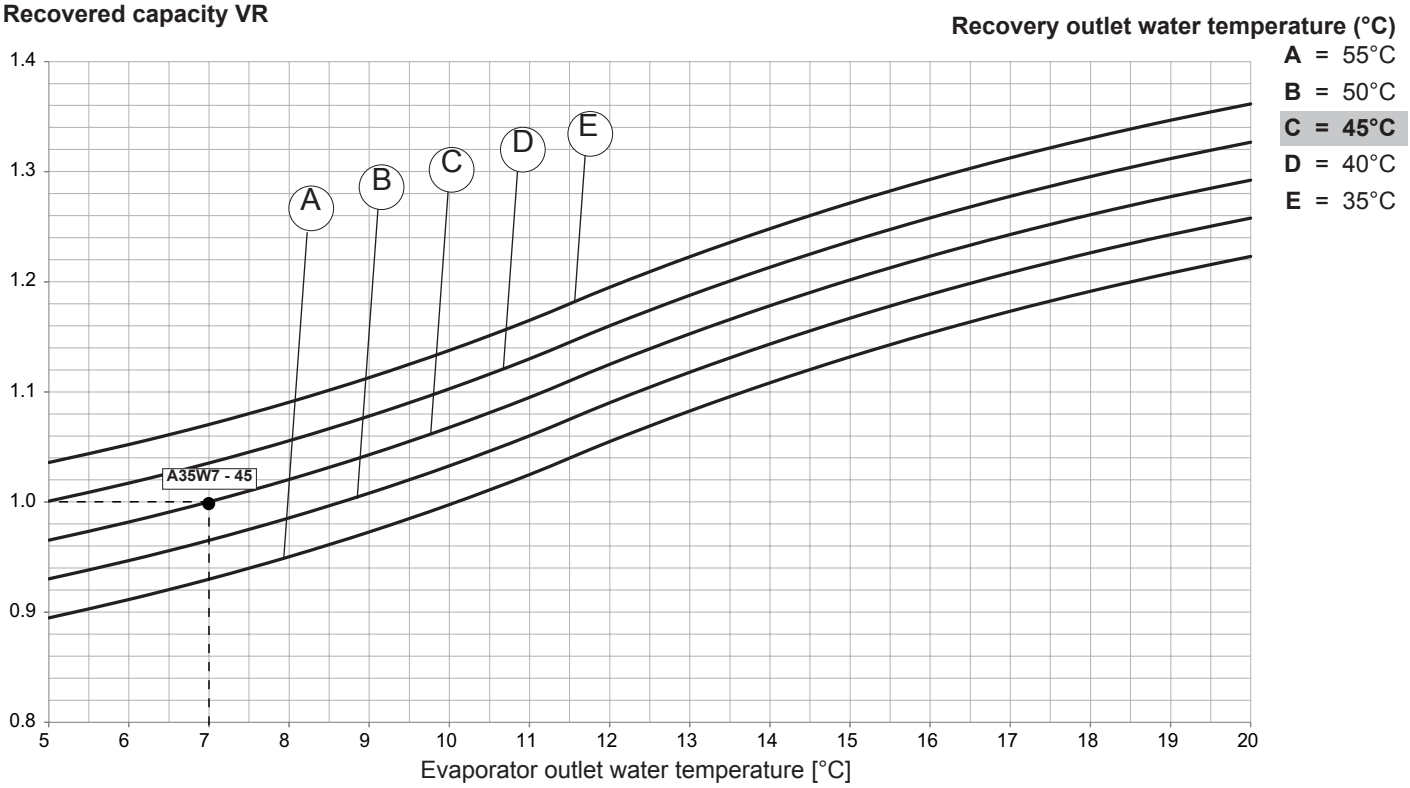
EER (Energy Efficiency Ratio) = ratio of the total cooling capacity to the effective power input of the unit
ESEER (European Seasonal Energy Efficiency Ratio)
COP (Coefficient Of Performance) = ratio of the total heating capacity to the effective power input of the unit
HRE (Heat Recovery Efficiency) = ratio of the total capacity of the system (heating plus cooling capacity) to the effectice power input

Total recovery VR performances

The graphs allow to get the corrective factors to be applied to the nominal performances in order to obtain the real performances in the selected operating conditions.

The reference nominal condition is: **A35W7 - 45** (source : air in 35°C d.b. / plant : water in 12°C out 7°C / Recovery : water in 40°C out 45°C)

Recovered capacity VR



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

Corrective factors

Correction factors to apply to the basic version data.

ETHYLENE GLYCOL

Percentage Of glycol in mass / volume	20 / 18,1								
Freezing point [°C]	-8								
Produced water temperature	4	2	0	-2	-4	-6	-8	-10	-12
CCPF - Cooling capacity	0,912	0,855	0,798	0,738	0,683	-	-	-	-
CCPA - Power input	0,967	0,957	0,947	0,927	0,897	-	-	-	-
CCQA - Water flow rate	1,071	1,072	1,073	1,075	1,076	-	-	-	-
CCDP - Pressure drop	1,090	1,095	1,100	1,110	1,120	-	-	-	-

Percentage Of glycol in mass / volume	30 / 27,7								
Freezing point [°C]	-14								
Produced water temperature	4	2	0	-2	-4	-6	-8	-10	-12
CCPF - Cooling capacity	0,899	0,842	0,785	0,725	0,670	0,613	0,562	-	-
CCPA - Power input	0,960	0,950	0,940	0,920	0,890	0,870	0,840	-	-
CCQA - Water flow rate	1,106	1,107	1,108	1,109	1,110	1,111	1,112	-	-
CCDP - Pressure drop	1,140	1,145	1,150	1,155	1,160	1,175	1,190	-	-

Percentage Of glycol in mass / volume	40 / 37,5								
Freezing point [°C]	-22								
Produced water temperature	4	2	0	-2	-4	-6	-8	-10	-12
CCPF - Cooling capacity	0,884	0,827	0,770	0,710	0,655	0,598	0,547	0,490	0,437
CCPA - Power input	0,880	0,870	0,860	0,840	0,810	0,790	0,760	0,724	0,686
CCQA - Water flow rate	1,150	1,151	1,153	1,154	1,155	1,157	1,158	1,159	1,161
CCDP - Pressure drop	1,190	1,195	1,200	1,210	1,220	1,235	1,250	1,269	1,290

PROPYLENE GLYCOL

Percentage Of glycol in mass / volume	20 / 19,4								
Freezing point [°C]	-7								
Produced water temperature	4	2	0	-2	-4	-6	-8	-10	-12
CCPF - Cooling capacity	0,874	0,807	0,740	0,690	0,641	-	-	-	-
CCPA - Power input	0,945	0,935	0,925	0,900	0,875	-	-	-	-
CCQA - Water flow rate	1,037	1,038	1,039	1,039	1,040	-	-	-	-
CCDP - Pressure drop	1,110	1,115	1,120	1,130	1,140	-	-	-	-

Percentage Of glycol in mass / volume	30 / 29,4								
Freezing point [°C]	-13								
Produced water temperature	4	2	0	-2	-4	-6	-8	-10	-12
CCPF - Cooling capacity	0,869	0,799	0,729	0,680	0,630	0,583	0,536	-	-
CCPA - Power input	0,935	0,923	0,910	0,888	0,865	0,838	0,810	-	-
CCQA - Water flow rate	1,072	1,071	1,070	1,069	1,069	1,068	1,067	-	-
CCDP - Pressure drop	1,160	1,175	1,190	1,200	1,210	1,255	1,300	-	-

Percentage Of glycol in mass / volume	40 / 39,6								
Freezing point [°C]	-21								
Produced water temperature	4	2	0	-2	-4	-6	-8	-10	-12
CCPF - Cooling capacity	0,848	0,784	0,719	0,670	0,620	0,570	0,520	0,478	0,438
CCPA - Power input	0,865	0,855	0,845	0,820	0,795	0,773	0,750	0,714	0,680
CCQA - Water flow rate	1,116	1,114	1,112	1,110	1,108	1,107	1,105	1,103	1,101
CCDP - Pressure drop	1,230	1,275	1,320	1,375	1,430	1,500	1,570	1,642	1,724

Based on leaving water temperature of the evaporator and condensing temperature = 7°C extract Cooling Capacity (kWf) and Compressors Power Input (kWa).
Based on type and percentage of glycol extract CCPF, CCPA, CCQA, CCDP.
Then calculate.

Pf_brine = kWf x CCPF

Pass_CP_brine = kWa x CCPA

Then calculate brine flow rate:

*Q_brine_evap [l/s]=CCQA x (Pf_brine [kW]*0.86/∆T_brine)/3.6*

where ∆T_brine is the difference between inlet-outlet evaporator water temperature:

∆T_brine=Twin_evap_brine-Twout_evap_brine

With this brine flow rate enter in abscissa on the water pressure drop of the evaporator then you have Dp_app.
Finally you can calculate the actual pressure drop of the brine on evaporator side:

Dp_evap_brine =CCDP x Dp_app

BR and BP units must be used with a mixture of water and antifreeze fluid (eg glycol) in a percentage enought to prevent freezing of the mixture under all possible conditions, otherwise it will **VOID THE WARRANTY**.
Please contact our customer service to set the following parameters: →

Parameter to set	DEFAULT	How to calculate the value to set
cooling mode setpoint 1	7,0 °C	TWE_1
minimum cooling mode setpoint 1	5,0 °C	TWE_1 – 2°C
cooling mode setpoint 2 *	7,0 °C	TWE_2
minimum cooling mode setpoint 2*	5,0 °C	TWE_2 – 2°C
antifrost alarm set 1 in cooling mode	3,0 °C	TWE_1 -4°C
antifrost alarm set 2 in cooling mode	3,0 °C	TWE_2 -4°C

* Valid only for double setpoint units

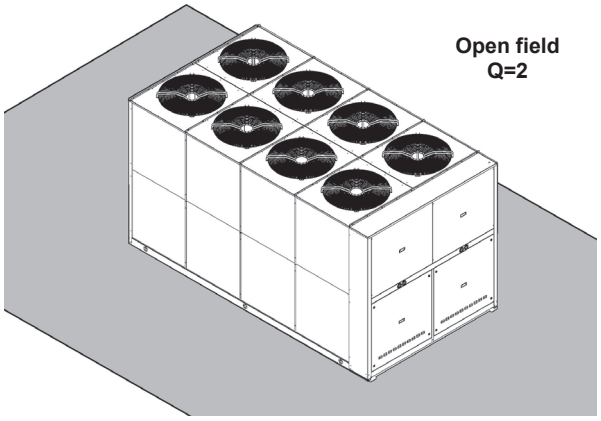
TWE_1 = required water leaving temperature of the plant heat exchanger with SetPoint 1 = Main Set Point

TWE_2 = required water leaving temperature of the plant heat exchanger with SetPoint 2 = Secundary Set Point

NOISE LEVELS

The noise levels refer to units operating in the nominal conditions (water temperature: inlet: 12°C - outlet: 7°C, Outdoor air temperature: inlet: 30°C - outlet: 35°C). The acoustic pressure levels are measured 1/ 5 / 10 meters away from the outer surface of the unit operating in the free field and resting on a reflecting surface (directional factor of 2).

SWL = Sound power levels, with reference to $1x10^{-12}$ 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).
Eurovent certification **(E)** exclusively refers to the **Total** Sound Power in **db(A)**, which is therefore the only binding acoustic specification (the values of the Octave bands in the table are indicative).
SPL = Sound pressure levels, with reference to $2x10^{-5}$ Pa.
The sound pressure levels are values calculated by applying the **ISO-3744 relation (Eurovent 8/1)** and refer to a distance of 1 meter away from the external surface of units operating in the open field with directivity factor 2 (Q=2) and the units operating in nominal conditions in the cooling mode.



Standard Unit AB

MOD.	SWL (dB)										SPL [dB(A)]		
	Octave bands (Hz)								**Total**				
	63	125	250	500	1000	2000	4000	8000	**dB**	**dB(A)**	1 m	5 m	10 m
160.4	96,1	92,2	91,3	89,2	86,1	81,0	74,4	66,9	**99**	**91**	72	64	59
180.4	96,4	94,1	92,6	90,0	87,2	81,8	75,2	66,8	**100**	**92**	73	65	60
200.4	96,4	94,1	92,6	90,0	87,2	81,8	75,2	66,8	**100**	**92**	73	65	60
230.4	96,4	94,1	92,6	90,0	87,2	81,8	75,2	66,8	**100**	**92**	73	65	60
260.4	98,1	94,2	93,3	91,2	88,1	83,0	76,4	68,9	**101**	**93**	74	66	61
290.4	98,4	96,2	93,8	91,4	88,9	85,9	78,1	68,6	**102**	**94**	75	67	62
330.4	98,4	96,2	93,8	91,4	88,9	85,9	78,1	68,6	**102**	**94**	74	67	62
375.4	99,2	95,5	95,4	93,0	90,2	85,5	80,1	72,0	**103**	**95**	75	68	63
420.4	99,2	95,5	95,4	93,0	90,2	85,5	80,1	72,0	**103**	**95**	75	68	63

Low noise unit AS

MOD.	SWL (dB)										SPL [dB(A)]		
	Octave bands (Hz)								**Total**				
	63	125	250	500	1000	2000	4000	8000	**dB**	**dB(A)**	1 m	5 m	10 m
160.4	91,4	89,0	86,8	82,3	79,4	75,8	67,3	58,0	**95**	**85**	66	58	53
180.4	92,4	90,0	87,8	83,3	80,4	76,8	68,3	59,0	**96**	**86**	67	59	54
200.4	92,4	90,0	87,8	83,3	80,4	76,8	68,3	59,0	**96**	**86**	67	59	54
230.4	92,4	90,0	87,8	83,3	80,4	76,8	68,3	59,0	**96**	**86**	67	59	54
260.4	94,2	91,9	89,4	85,3	81,0	74,6	67,0	58,6	**97**	**87**	68	60	55
290.4	92,4	90,1	88,6	86,0	83,3	77,8	71,2	62,8	**96**	**88**	69	61	56
330.4	92,4	90,1	88,6	86,0	83,3	77,8	71,2	62,8	**96**	**88**	68	61	56
375.4	95,4	93,0	90,8	86,3	83,4	79,8	71,3	62,0	**99**	**89**	69	62	57
420.4	95,4	93,0	90,8	86,3	83,4	79,8	71,3	62,0	**99**	**89**	69	62	57

Extra low moise unit AX

MOD.	SWL (dB)										SPL [dB(A)]		
	Octave bands (Hz)								**Total**				
	63	125	250	500	1000	2000	4000	8000	**dB**	**dB(A)**	1 m	5 m	10 m
160.4	85,4	88,3	84,6	79,8	76,3	69,8	61,2	52,3	**92**	**82**	63	55	50
180.4	89,4	87,0	84,8	80,3	77,4	73,8	65,3	56,0	**93**	**83**	64	56	51
200.4	89,4	87,0	84,8	80,3	77,4	73,8	65,3	56,0	**93**	**83**	64	56	51
230.4	89,4	87,0	84,8	80,3	77,4	73,8	65,3	56,0	**93**	**83**	64	56	51
260.4	90,4	88,0	85,8	81,3	78,4	74,8	66,3	57,0	**94**	**84**	65	57	52
290.4	91,4	89,0	86,8	82,3	79,4	75,8	67,3	58,0	**95**	**85**	66	58	53
330.4	91,4	89,0	86,8	82,3	79,4	75,8	67,3	58,0	**95**	**85**	65	58	53
375.4	92,4	90,0	87,8	83,3	80,4	76,8	68,3	59,0	**96**	**86**	66	59	54
420.4	92,4	90,0	87,8	83,3	80,4	76,8	68,3	59,0	**96**	**86**	66	59	54

OOPERATING LIMITS

The table below lists the oOperating limits within which correct operation of the units is guaranteed, depending on the Version and Operating Mode available for each type of unit.
Remember that in Heat Pump units, heat recovery only takes place during operation in the cooling mode.

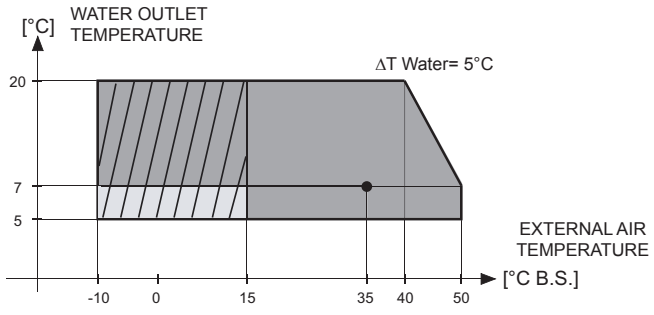
STANDARD UNIT

Thermal gradient of the water		Limit value
Minimum	°C	3
Maximum	°C	8
Verify that water flow rate is inside the admissible limits.		

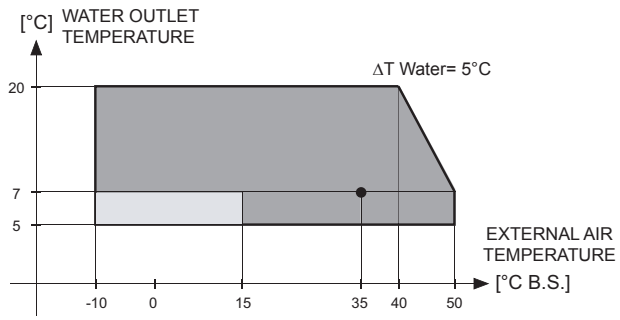
NOTE: the admissible limits for water flow rate on heat exchangers are indicated under the related pressure drop graph (see section "water pressure drop"). If the unit is equipped with pumping module the admissible limits are indicated under the related working head graph (see section "working head").

IN COOLING MODE

UNIT MEDIUM TEMPERATURE - 0 M 5



UNIT HIGH TEMPERATURE - 0 A 5

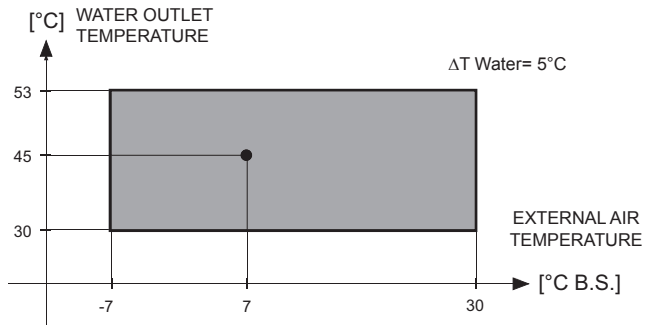


With fans modulating control

With fans modulating control and brine

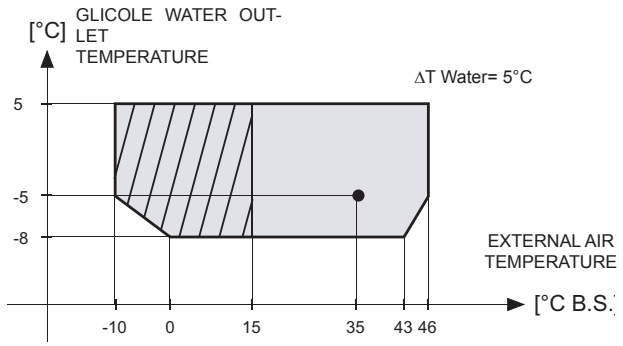
ATC — ATC (Advanced Temperature Control) function may occur, if present

IN HEATING MODE



With fans modulating control

BRINE UNIT BR - BP - IN COOLING MODE

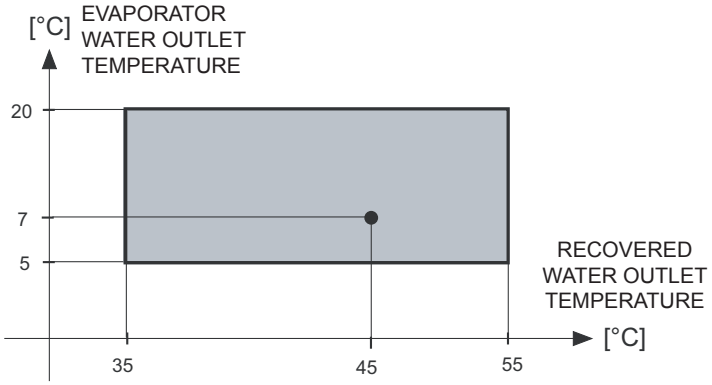


With fans modulating control and brine is mandatory

Brine is mandatory

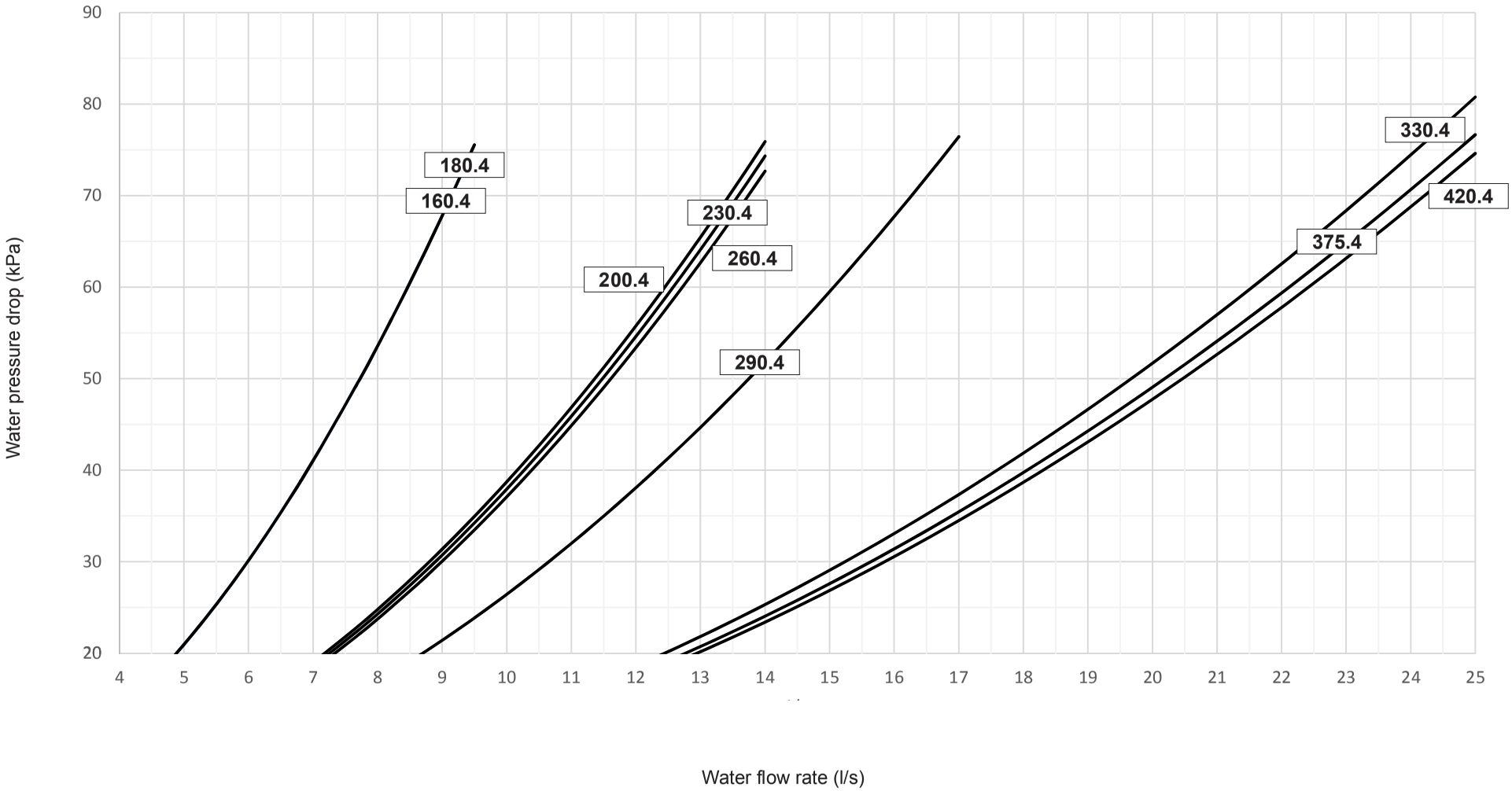
HEAT RECOVERY UNIT

Version	Limit value
with Desuperheater (VD)	Recovery water temp. from 30 to 70°C (Refer to Desuperheater Standard Performances table)
Total Recovery (VR)	See graph



Plant side exchanger

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

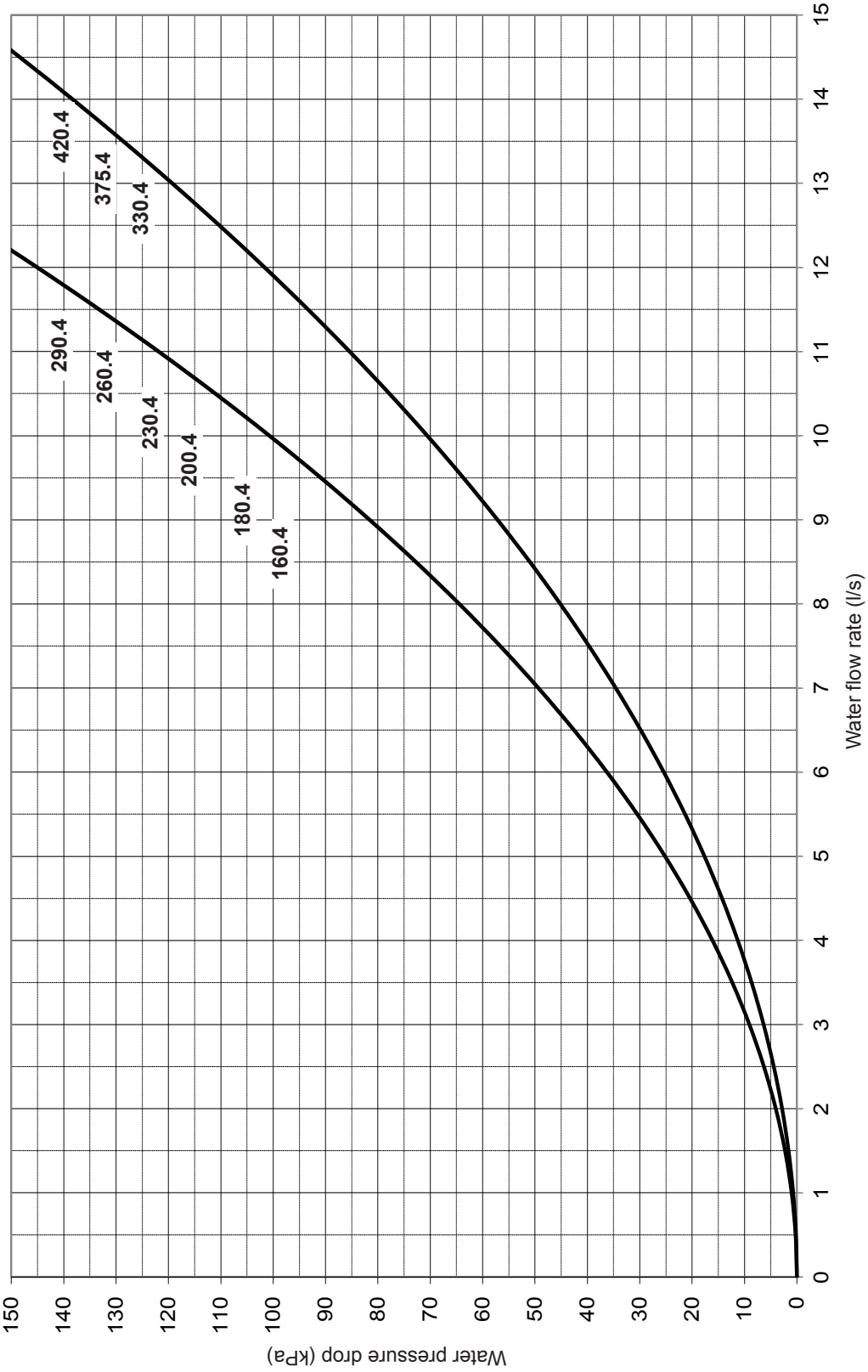


Operating limits

Unit size		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	UM	NOTES
Lower limit value	Q	9.5	9.5	14.0	14.0	14.0	17.0	25.0	25.0	25.0	l/s	**Q**= Water flow rate **ΔP**= Water pressure drop
	Δp	20									kPa	
Upper limit value	Q	9.5	9.5	14.0	14.0	14.0	17.0	25.0	25.0	25.0	l/s	
	Δp	75	75	75	74	73	75	80	76	75	kPa	

Desuperheaters

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

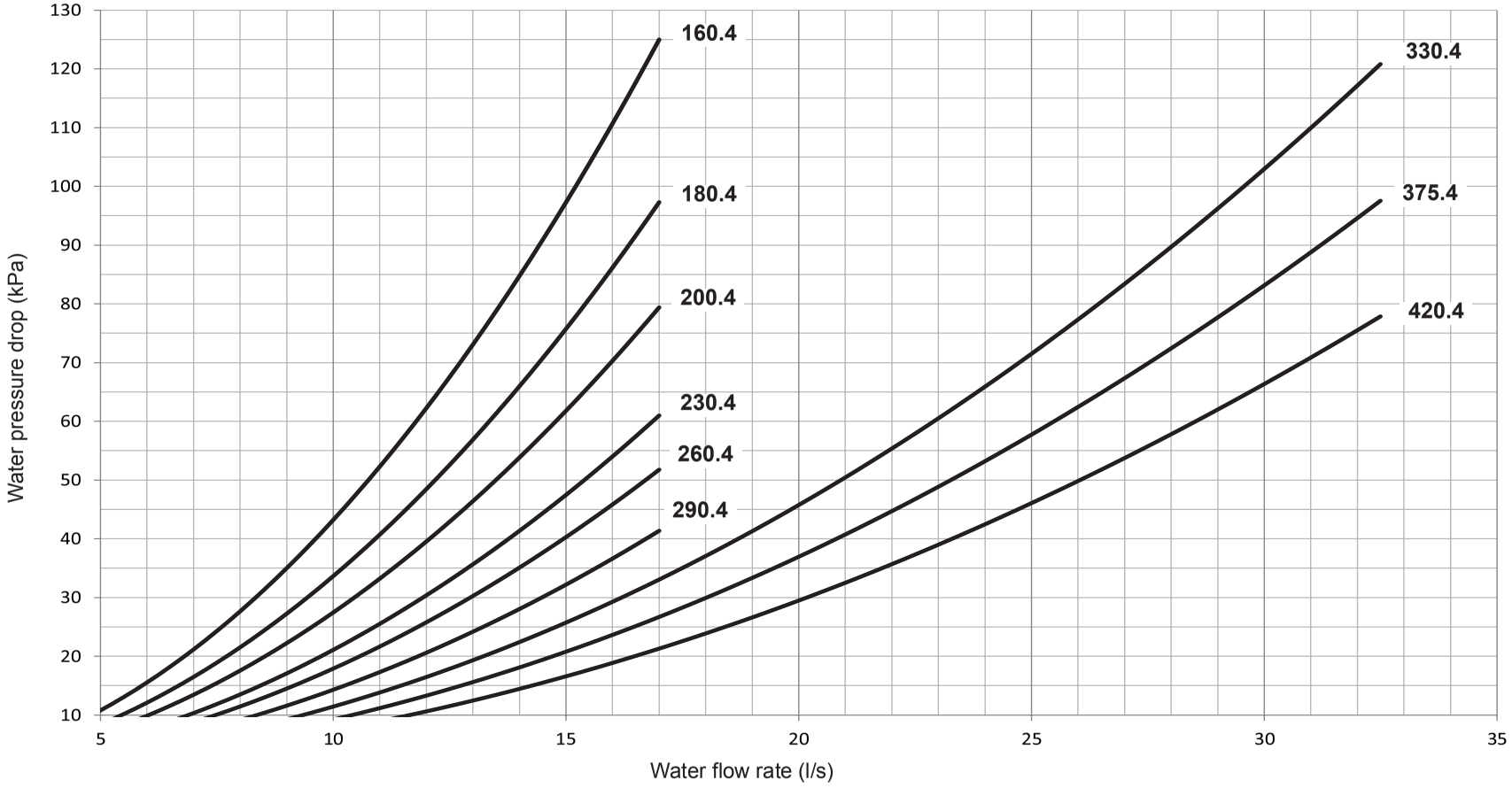


Operating limits

Unit size		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	UM	NOTES
Lower limit value	Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	l/s	**Q**= Water flow rate **ΔP**= Water pressure drop
	Δp	0									kPa	
Upper limit value	Q	12.2	12.2	12.2	12.2	12.2	12.2	14.6	14.6	14.6	l/s	
	Δp	150									kPa	

Total recovery exchanger

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

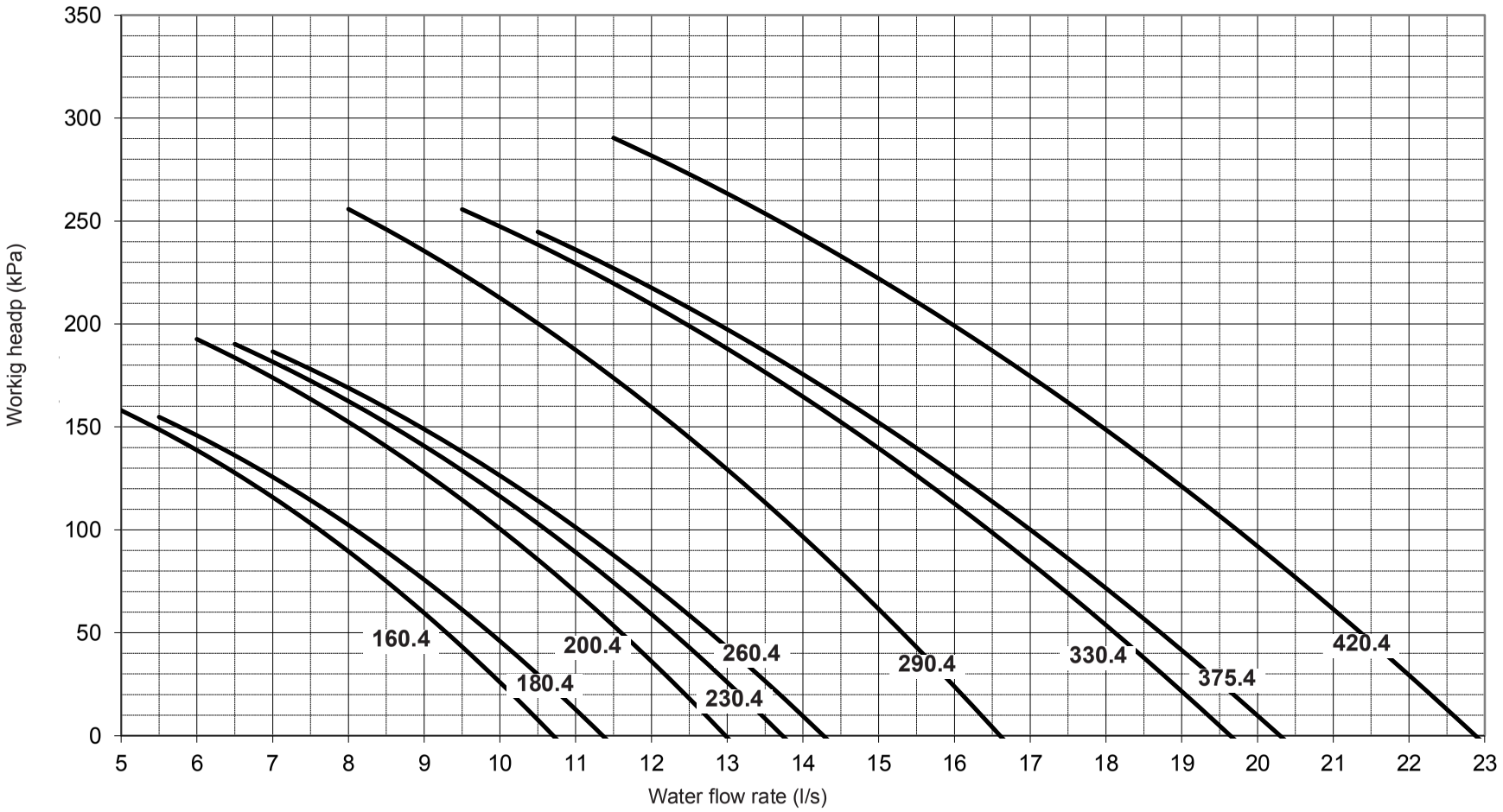


Operating limits

Unit size		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	UM	NOTES
Lower limit value	Q	5.00	5.60	6.20	7.00	7.30	8.50	9.70	10.50	11.70	l/s	**Q**= Water flow rate **ΔP**= Water pressure drop
	Δp	20									kPa	
Upper limit value	Q	17.0	17.0	17.0	17.0	17.0	17.0	32.5	32.5	32.5	l/s	
	Δp	150									kPa	

Working head pumps MP SS STD

Working head is that at the pumping module outlet reduced by all pressure losses inside the unit.
The graph below illustrates for the pumping module the working head values in kPa depending on the flow rate in liters/second. The Operating limits is delimited by the minimum and maximum values given in the next table.

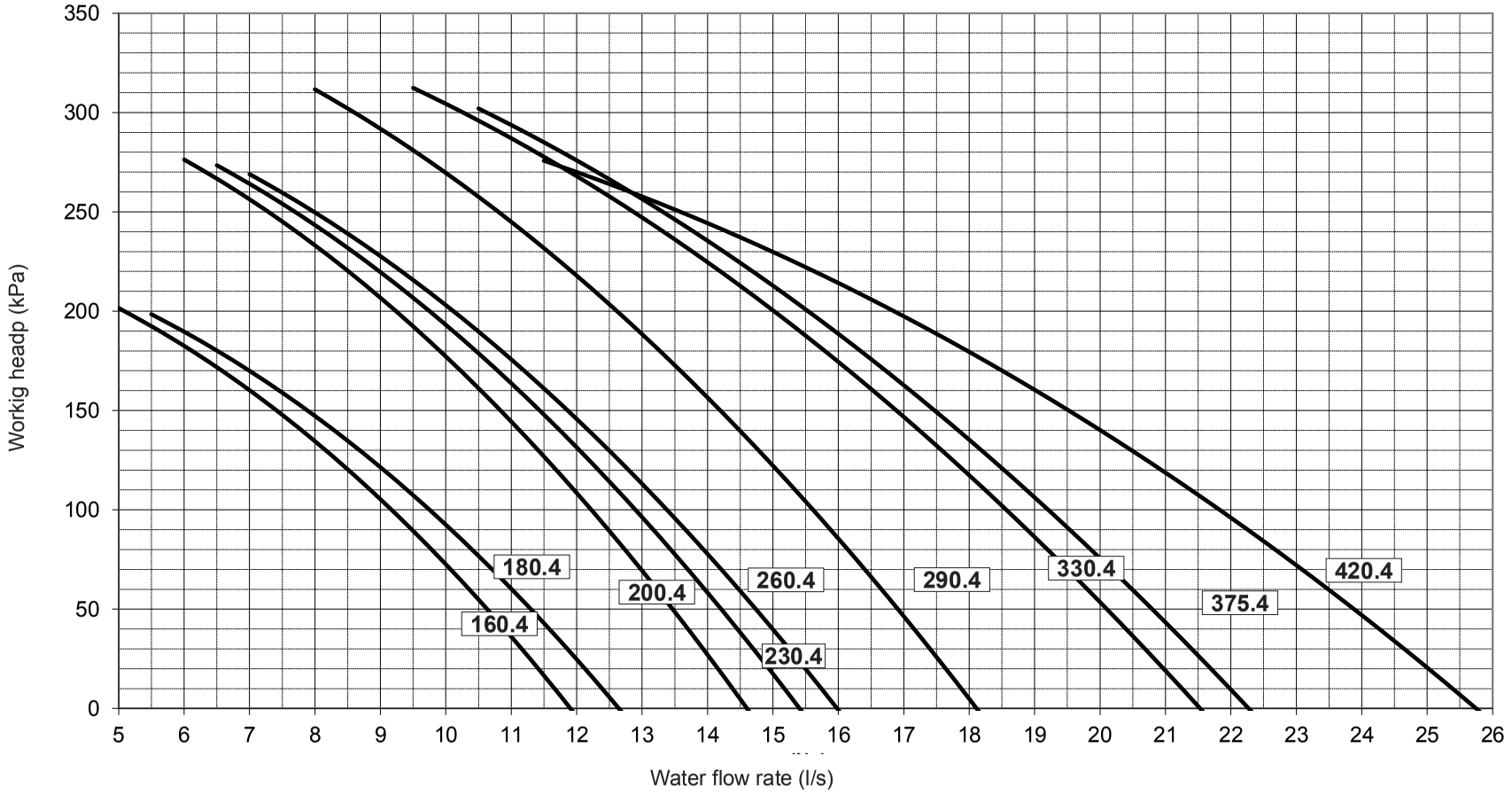


Operating limits

Unit size		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	UM	NOTE
Lower limit value	Q	9.5	9.5	14.0	14.0	14.0	17.0	25.0	25.0	25.0	l/s	Q=Portata acqua
Upper limit value	Q	10.7	11.4	13.0	13.7	14.3	16.6	19.6	20.3	22.8	l/s	

Working head pumps MP SS HP1

Working head is that at the pumping module outlet reduced by all pressure losses inside the unit.
The graph below illustrates for the pumping module the working head values in kPa depending on the flow rate in liters/second. The Operating limits is delimited by the minimum and maximum values given in the next table.



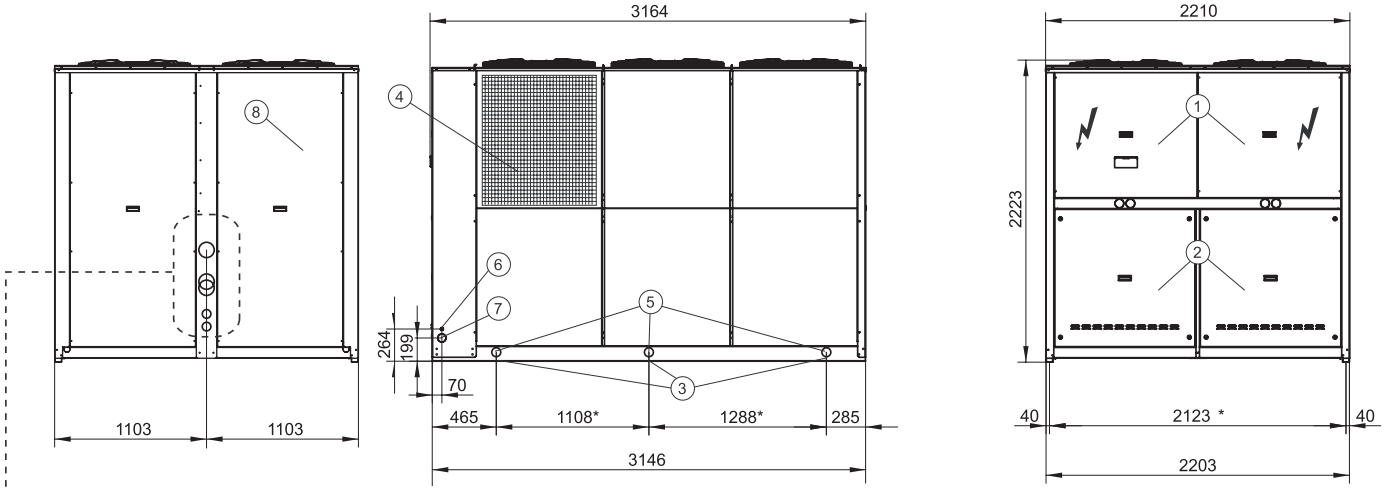
Operating limits

Unit size		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	UM	NOTE
Lower limit value	**Q**	9.5	9.5	14.0	14.0	14.0	17.0	25.0	25.0	25.0	l/s	**Q**= Water flow rate
Upper limit value	**Q**	11.9	12.6	14.6	15.5	16.0	18.1	21.5	22.2	25.7	kPa	

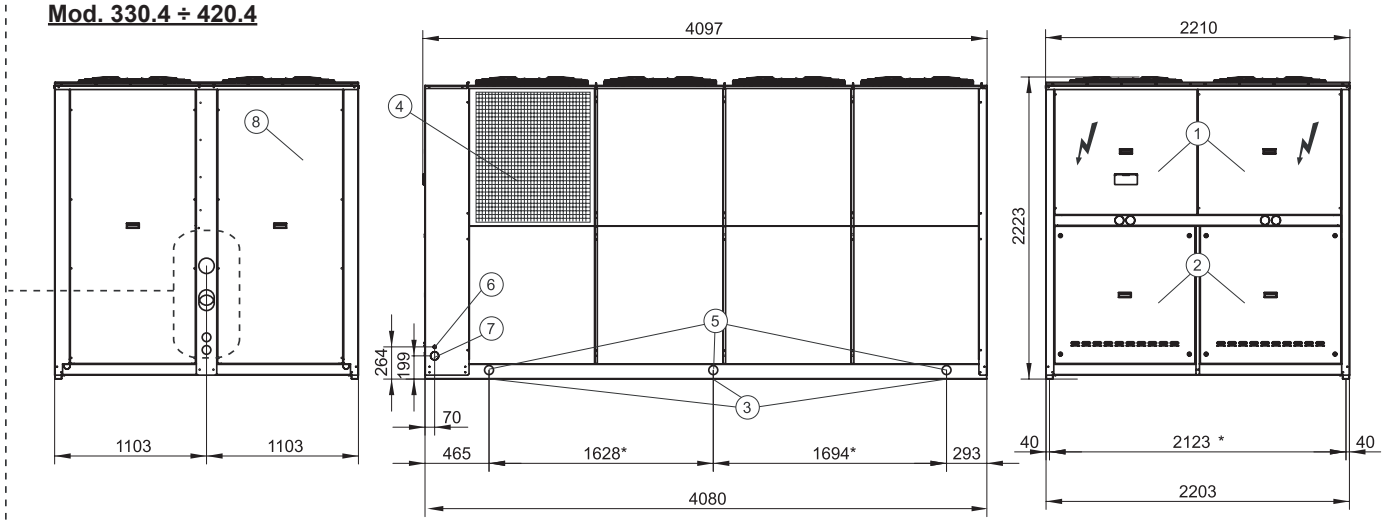
DIMENSIONAL AND PHYSICAL DATA

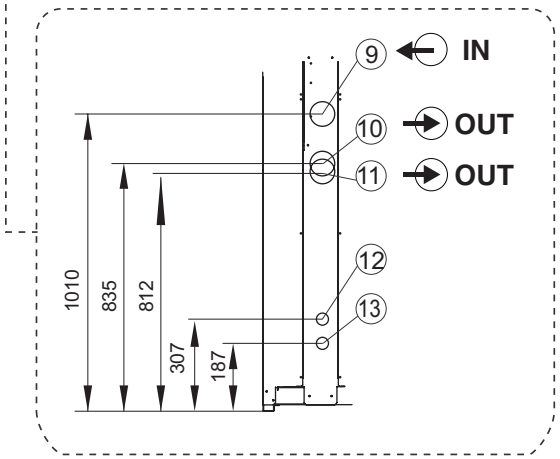
Overall dimensions

Mod. 160.4 ÷ 290.4



Mod. 330.4 ÷ 420.4





Description of the components

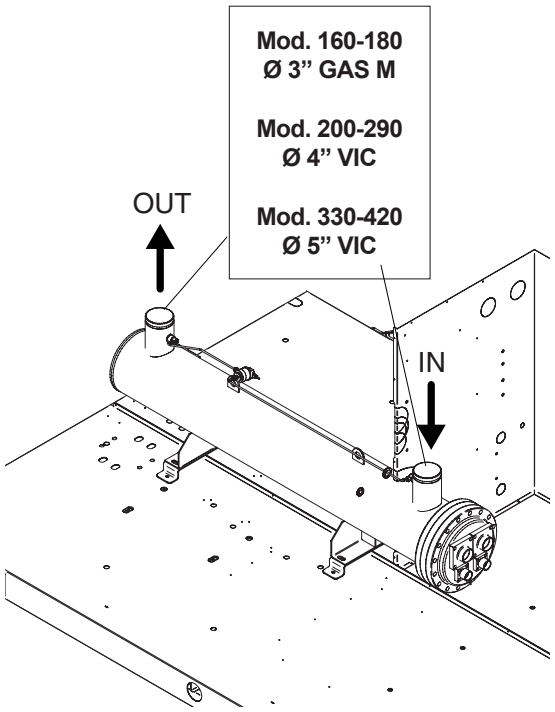
1 - Access panel to electric panel's power section
2 - Access panel to compressor compartment
3 - Vibration damper fixing holes ø 18 mm (6 pcs)
4 - Coil protection grilles (accessory)
5 - ø 65 mm lifting holes (in case of handling with metal pipes)
6 - ø 22 mm input hole for accessory cables
7- ø 60 mm hole for electric power supply input
8 - Access panel to pump compartment
9 - Water inlet for MKT SS and MP SS
mod. 160-290 IN 3" (DN80) VIC
mod. 330-420 IN 4" (DN100) VIC
10 - Water outlet for MKT SS and MP SS
mod. 200-420 IN 4" (DN100) VIC
11 - Water outlet for MKT SS and MP SS
mod. 160-180 IN 3" (DN80) VIC
12 - Discharge shell and tube mod. 330-420
13 - Discharge shell and tube mod. 160-290

*** :** Center distance of vibration damper holes

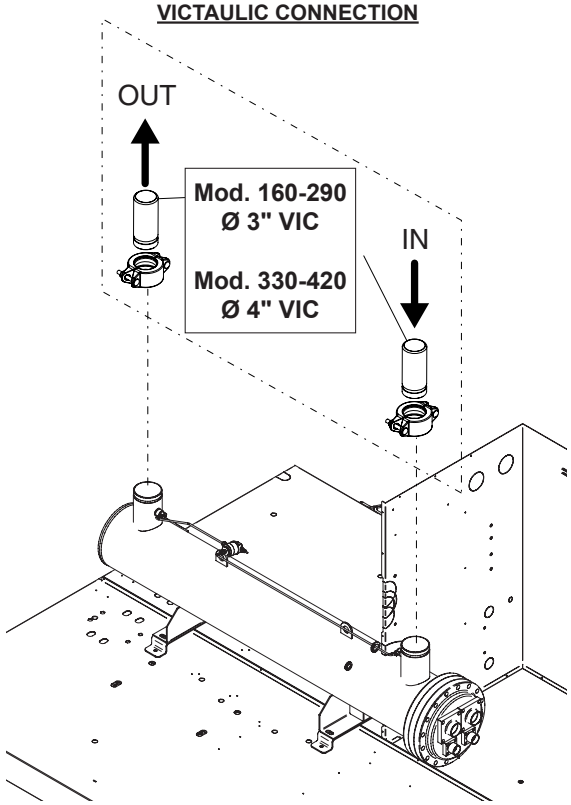
DIMENSIONAL AND PHYSICAL DATA

Hydraulic connections

STANDARD UNIT (WITHOUT KIT)

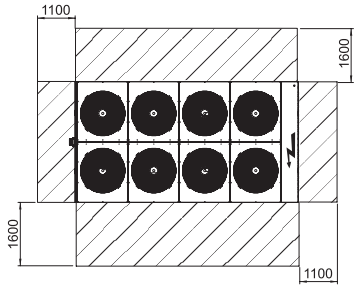


UNIT WITH ACCESSORY VICTAULIC CONNECTION



Inclusive of VICTAULIC brackets and iron pipes (IN/OUT) that are supplied with the unit.

Minimum space required for operation

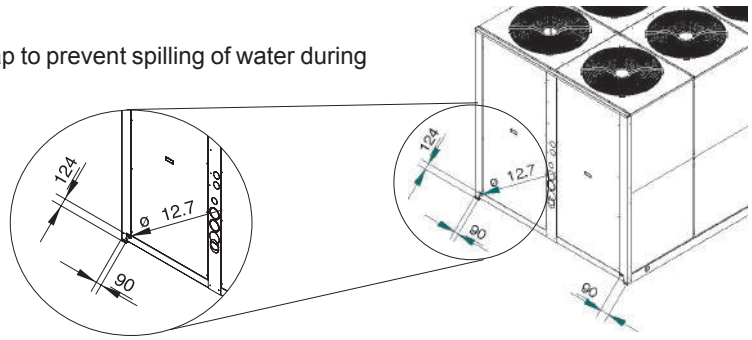


To correctly install the unit, comply with the measurements for the free area that must be left around the machine, as shown in the figure.
This will ensure good air circulation, allow the unit to operate correctly and facilitate future maintenance work.
The distances must be doubled if the unit is to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

Position of condensate drain

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

During winter in heat pump mode is produced a large quantity of water from the external batteries due to defrost cycles, provide a proper drainage system that prevent the stagnation in areas subject to passage of persons.

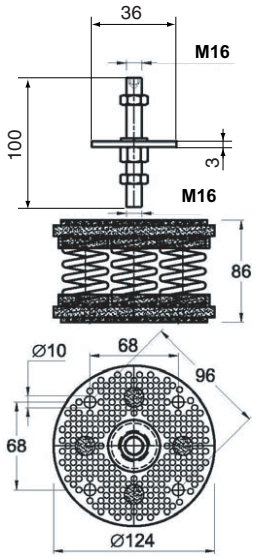


DIMENSIONAL AND PHYSICAL DATA

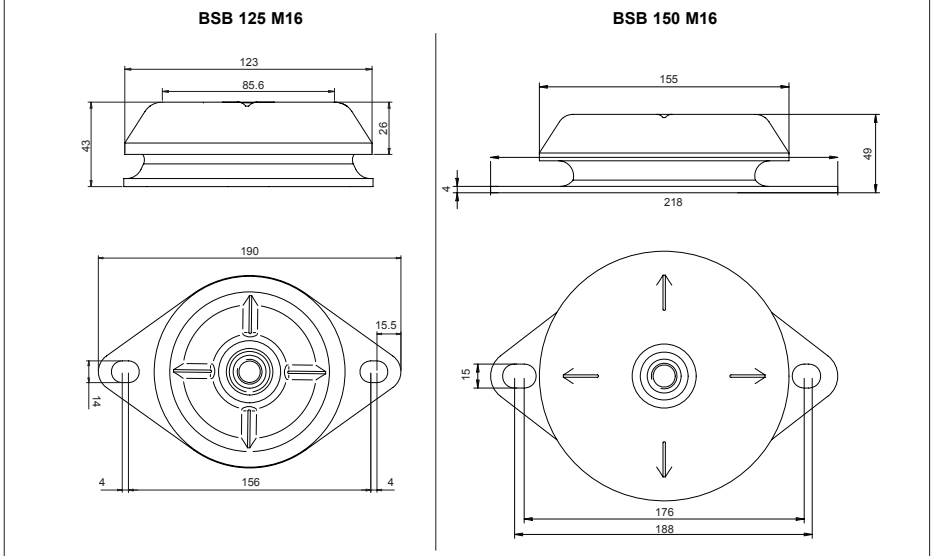
Vibration-damper installation

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.

Springs supports AVM

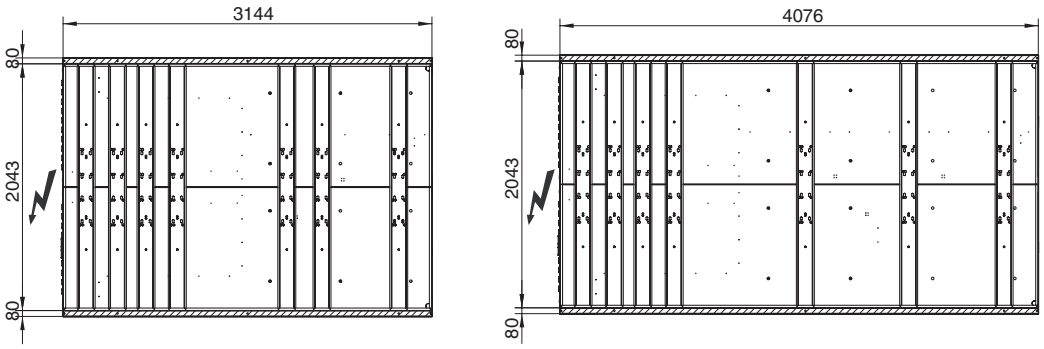


Rubber supports AVG



For details on installation refer to operating instruction supplied with the accessory.

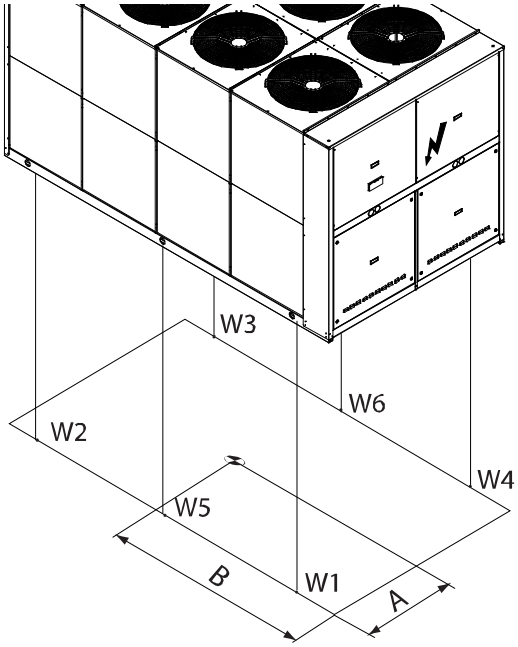
Area of support



DIMENSIONAL AND PHYSICAL DATA

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.



UNIT **WITHOUT** WATER STORAGE TANK

Unit WITHOUT Hydronic Kit

IR Version

Acustic version	AB-AS			AX		
Mod.	Center of gravity position [mm]		Weight [Kg]	Center of gravity position [mm]		Weight [Kg]
	A	B		A	B	
160	1106	1170	1575	1106	1185	1635
180	1106	1160	1755	1106	1175	1815
200	1106	1150	1935	1106	1165	1999
230	1106	1128	2141	1106	1128	2165
260	1106	1103	2162	1106	1118	2225
290	1106	1119	2230	1106	1119	2250
330	1108	1387	2386	1108	1405	2459
375	1108	1359	2496	1108	1377	2569
420	1108	1370	2612	1108	1370	2638

IP Version

Acustic version	AB-AS			AX		
Mod.	Center of gravity position [mm]		Weight [Kg]	Center of gravity position [mm]		Weight [Kg]
	A	B		A	B	
160	1105	1175	1670	1105	1190	1733
180	1105	1165	1860	1105	1180	1924
200	1105	1155	2051	1105	1170	2119
230	1105	1133	2269	1105	1133	2295
260	1105	1108	2292	1105	1123	2359
290	1105	1124	2364	1105	1124	2385
330	1107	1376	2529	1107	1394	2607
375	1107	1348	2646	1107	1366	2723
420	1107	1359	2769	1107	1359	2796

Unit WITH Hydronic Kit

IR Version

Acustic version	AB-AS			AX		
Mod.	Center of gravity position [mm]		Weight [Kg]	Center of gravity position [mm]		Weight [Kg]
	A	B		A	B	
160	1100	1334	1825	1100	1349	1890
180	1100	1324	2005	1100	1339	2070
200	1100	1314	2185	1100	1329	2254
230	1100	1292	2391	1100	1292	2420
260	1100	1267	2412	1100	1282	2480
290	1100	1283	2480	1100	1283	2505
330	1100	1588	2649	1100	1606	2725
375	1100	1560	2759	1100	1578	2835
420	1100	1571	2875	1100	1571	2904

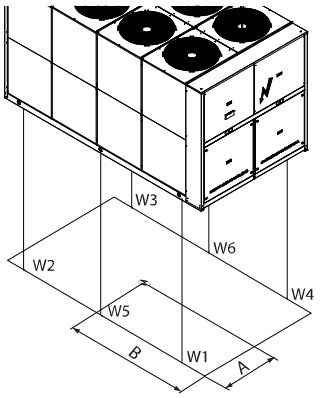
IP Version

Acustic version	AB-AS			AX		
Mod.	Center of gravity position [mm]		Weight [Kg]	Center of gravity position [mm]		Weight [Kg]
	A	B		A	B	
160	1099	1324	1935	1099	1339	2003
180	1099	1314	2125	1099	1329	2194
200	1099	1304	2316	1099	1319	2389
230	1099	1282	2534	1099	1282	2565
260	1099	1257	2557	1099	1272	2629
290	1099	1273	2629	1099	1273	2655
330	1099	1577	2808	1099	1595	2888
375	1099	1549	2925	1099	1567	3005
420	1099	1560	3048	1099	1560	3078

NOTA: For Desuperheater versions the total weight increases of 4%. For Heat recovery versions the total weight increases of 10%.

DIMENSIONAL AND PHYSICAL DATA

Weight during operation



UNIT **WITHOUT** WATER STORAGE TANK

IR Version

Unit WITHOUT Hydronic Kit

Acustic version	AB-AS									AX							
Mod.	Center of gravity position [mm]		Load on bearing points [Kg]						Weight [Kg]	Center of gravity position [mm]		Load on bearing points [Kg]						Weight [Kg]
	A	B	W1	W2	W3	W4	W5	W6		A	B	W1	W2	W3	W4	W5	W6	
160	1106	1170	429	91.3	93.3	430	273	275	1591	1106	1185	445	94.8	96.8	446	283	285	1651
180	1106	1160	478	102	104	479	304	306	1773	1106	1175	494	105	108	496	314	316	1833
200	1106	1150	527	112	115	528	335	337	1954	1106	1165	544	116	118	546	346	349	2019
230	1106	1128	583	124	127	585	371	373	2162	1106	1128	590	126	128	591	375	378	2187
260	1106	1103	589	125	128	591	374	377	2184	1106	1118	606	129	132	608	385	388	2247
290	1106	1119	607	129	132	609	386	389	2252	1106	1119	613	130	133	615	390	392	2273
330	1108	1387	672	124	127	676	404	407	2410	1108	1405	693	128	131	697	416	419	2484
375	1108	1359	703	130	133	707	422	426	2521	1108	1377	724	133	137	728	434	438	2595
420	1108	1370	736	136	139	740	442	445	2638	1108	1370	743	137	141	748	446	450	2664

Unit WITH Hydronic Kit

Acustic version	AB-AS									AX							
Mod.	Center of gravity position [mm]		Load on bearing points [Kg]						Weight [Kg]	Center of gravity position [mm]		Load on bearing points [Kg]						Weight [Kg]
	A	B	W1	W2	W3	W4	W5	W6		A	B	W1	W2	W3	W4	W5	W6	
160	1100	1334	445	167	165	443	317	315	1852	1100	1349	461	173	171	459	328	326	1918
180	1100	1324	489	184	182	487	348	346	2035	1100	1339	505	190	187	503	359	357	2101
200	1100	1314	533	200	198	531	379	377	2218	1100	1329	549	207	204	548	391	389	2288
230	1100	1292	583	219	217	581	415	412	2427	1100	1292	590	222	219	588	420	417	2456
260	1100	1267	588	221	218	586	419	416	2448	1100	1282	604	227	225	603	430	428	2517
290	1100	1283	604	227	225	603	430	428	2517	1100	1283	610	230	227	609	435	432	2542
330	1100	1588	673	223	221	670	452	450	2689	1100	1606	692	230	227	689	465	463	2766
375	1100	1560	700	233	230	698	471	469	2800	1100	1578	720	239	236	717	483	482	2877
420	1100	1571	730	242	240	727	490	489	2918	1100	1571	737	245	242	734	495	493	2947

UNIT **WITHOUT** WATER STORAGE TANK

IP Version

Unit WITHOUT Hydronic Kit

Acustic version	AB-AS									AX							
Mod.	Center of gravity position [mm]		Load on bearing points [Kg]						Weight [Kg]	Center of gravity position [mm]		Load on bearing points [Kg]						Weight [Kg]
	A	B	W1	W2	W3	W4	W5	W6		A	B	W1	W2	W3	W4	W5	W6	
160	1105	1175	454	96.6	98.7	455	288	291	1683	1105	1190	471	100	102	472	299	302	1747
180	1105	1165	505	108	110	507	321	324	1875	1105	1180	523	111	114	524	332	335	1939
200	1105	1155	557	119	121	559	354	357	2068	1105	1170	576	123	125	578	366	369	2136
230	1105	1133	617	131	134	619	392	395	2288	1105	1133	623	133	136	625	396	399	2313
260	1105	1108	623	133	135	625	396	399	2310	1105	1123	641	136	139	643	407	410	2377
290	1105	1124	642	137	140	644	408	411	2383	1105	1124	648	138	141	650	412	415	2404
330	1107	1376	711	131	135	715	427	430	2549	1107	1394	732	135	139	737	440	444	2627
375	1107	1348	744	137	141	748	447	450	2667	1107	1366	765	141	145	770	460	464	2745
420	1107	1359	778	144	148	783	467	471	2791	1107	1359	786	145	149	791	472	476	2819

Unit WITH Hydronic Kit

Acustic version	AB-AS									AX							
Mod.	Center of gravity position [mm]		Load on bearing points [Kg]						Weight [Kg]	Center of gravity position [mm]		Load on bearing points [Kg]						Weight [Kg]
	A	B	W1	W2	W3	W4	W5	W6		A	B	W1	W2	W3	W4	W5	W6	
160	1099	1324	471	177	175	469	335	333	1960	1099	1339	487	183	181	486	347	345	2029
180	1099	1314	517	194	192	515	368	366	2153	1099	1329	534	201	198	532	380	378	2223
200	1099	1304	563	212	209	562	401	399	2346	1099	1319	581	219	216	579	414	411	2420
230	1099	1282	616	232	229	615	439	436	2567	1099	1282	624	235	232	622	444	441	2598
260	1099	1257	622	234	231	620	443	440	2590	1099	1272	640	241	238	638	455	452	2663
290	1099	1273	640	241	238	638	455	452	2663	1099	1273	646	243	240	644	460	457	2690
330	1099	1577	711	236	234	709	478	476	2844	1099	1595	732	243	240	729	492	490	2926
375	1099	1549	741	246	243	738	498	496	2963	1099	1567	761	253	250	759	512	510	3044
420	1099	1560	772	256	253	769	519	517	3087	1099	1560	780	259	256	777	524	522	3118

NOTA: For Desuperheater versions the total weight increases of 4%. For Heat recovery versions the total weight increases of 10%.

RECEPTION AND POSITIONING

Inspections on arrival

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

Safety prescriptions

Comply with the current safety regulations concerning the equipment to use when handling the unit or the required ways of operating. Use single protection devices as goggles, gloves, helmets… when handling the unit to avoid risk of injuries.

Handling

Plan the handling activity verifying:

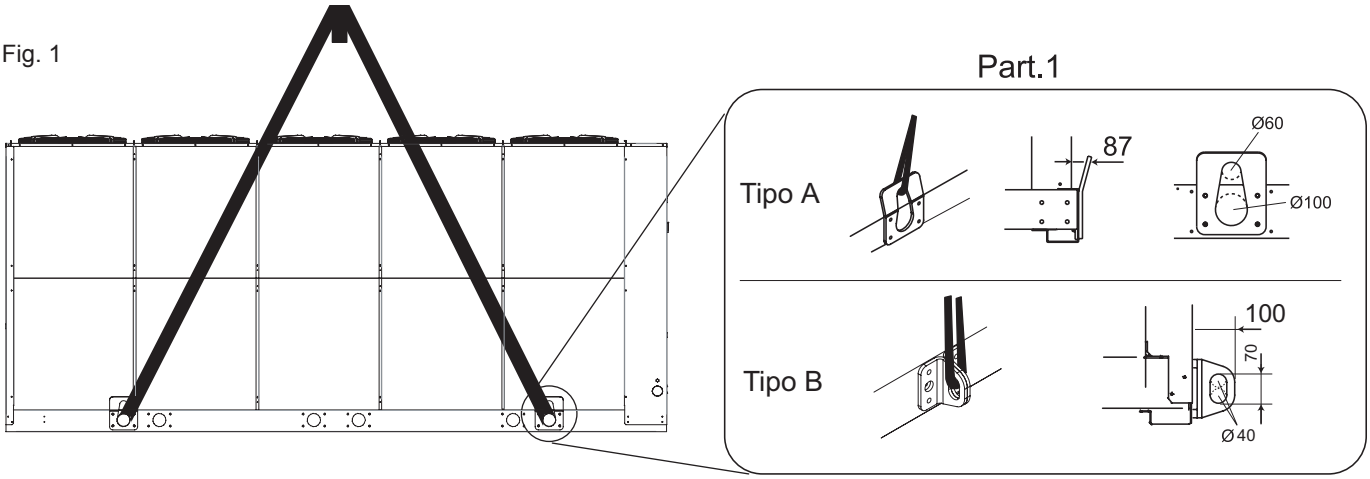
- Weight of the unit indicated on the data plate of the appliance and in the section **“DIMENSIONAL and PHYSICAL DATA”** of this manual
- Lifting capacity of the equipment that has to be used appropriate to the weight of the unit
- Type and dimensions of the unit
- Center of Gravity position and the availability of straps / ropes or other devices able of positioning the lifting hook exactly at the unit center of gravity: For the CG position in transport and operation, ref. section **“DIMENSIONAL and PHYSICAL DATA”** . Also refer to the labels (Part.3) identification of transport the center of gravity, applied on all 4 sides of the base.
- State and physical characteristics of the place where the unit has been handled (yard dirt, asphalted square, etc.).
- State and physical characteristics of the destination place (roof, yard, terrace, etc.).
- Length and type of the handling route with particular attention to critical points of transition such as ramps, stairs, uneven or slippery steps, doors, etc..

Note that the handling examples shown in the drawings are indications, the choice of handling mean and method should been done considering all the factors above mentioned.

Comply with the following instructions when lifting and positioning the appliance:
• Handling and lifting with a crane or similar

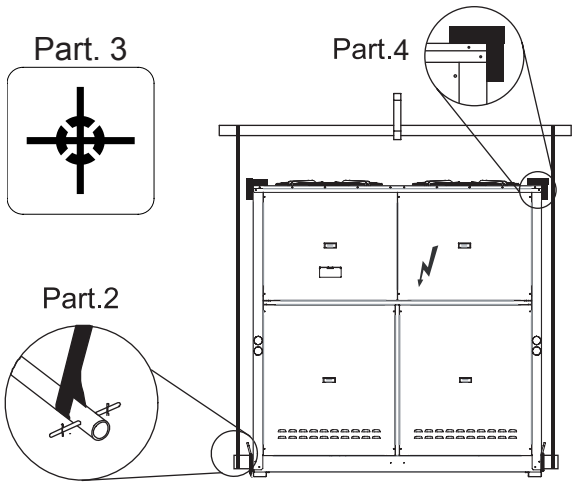
1) Using the brackets (Part 1 Fig.1).

Fig. 1



2) Position metal pipes (Part 2 Fig.1) of adequate thickness in the holes in the base of the unit for lifting.
• The end portions of the pipes must stand out by an adequate extent to permit inserting the safety devices and housing the belts for lifting.
• Use spacer bars in the top of the unit to prevent crushing and damaging the batteries and the parts intended to cover the assembly.

• Consult the DIMENSIONAL AND PHYSICAL DATA section for the center of gravity position.
NOTE: To correctly lift the machine, the belts used must be longer than 3.5 meters.
Refer to the data plates (Part.3 Fig.1) that identify the center of gravity position, applied to the 4 sides of the base.
Use protections on edges (Part.4 Fig.1) to void risk of damages.



WARNING:
To safeguard persons and property, read the information on the packing that covers the unit before handling. Also make sure to:
• Handle the machine with care
• Do not stack other objects on top of the unit

Storage

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

Packing removing

Recycle and dispose of packing material in conformity with local regulations, be extremely careful not to damage the unit.

Positioning

Before positioning please consider the overall dimensions and the technical requirements of the system and the unit, electric and hydraulic connections and any air pipes/ducts or free passages.
Neglecting these aspects may decrease performance and operational life of the unit and therefore increase the operating costs and maintenance.
Units are designed to be installed **OUTSIDE** and in fixed positions.

Before placing the unit be sure that:

- the location is in a safe accessible place
- the framework or the floor is adequate to support the weight of the unit **WORKING** (tank filled with water, etc…), please refer to weight paragraph
- support points are leveled and aligned
- the place can not be subject to flooding
- the maximum level of the snow does not obstruct the airflow to the unit

To ensure the best air circulation to the unit and thus ensure a smooth operation it is recommended to:

- avoid obstructions to air flow near or above the unit
- protect the unit from high winds that can favor or not the airflow
- protect the unit from heat sources or pollutants (chimneys, extractors…)
- protect the unit from air stratification or recirculation (avoid ducting of the fans, containment structure, high walls or corners next to the unit)

These advises if not respected can lead to a lower efficiency of the unit or to high pressure stops (in summer) or low pressure stops (in winter).

HYDRAULIC CONNECTIONS

General rules

A mesh filter (hole Ø<1mm for plates heat exchanger Ø<1.5mm for shell and tubes heat exchanger) must be installed on the unit's water inlet otherwise warranty is immediately forfeited. The filter
The filter performs the function of blocking any foreign matter in the system's plumbing circuit (shavings, machining debris, etc.) limiting or avoiding possible problems of fouling (that decreases the heat exchange coefficient), erosion, and clogging
The clogging and fouling of the exchanger can lead to a reduction of the water flow rate and. In the case that the exchanger works as evaporator- of the evaporation temperature: these 2 factors can cause the icing of the exchanger
The icing event leads to the bursting of the exchanger, the inlet of water into the refrigerant circuit and so the necessity of a replacement of the main components (compressors, filters, expansion valves,. Etc.) and an accurate washing of components as refrigerant pipes, coils, etc., practically the rebuilding nearly complete of the refrigerant circuit.

The filter must be maintained clean: this is so necessary verify the cleanness after the unit installation and checking periodically the state.

Protection devices

Standard supply includes a differential pressure switch situated between the water inlet and outlet of the heat exchanger to avoid freezing if the water flow stops for any reason.
Activation is calibrated for a 80 mbar ±5 Δp, while resetting occurs with a Δp of 105 mbar ±5.
The differential pressure switch opens the contact and shuts down the compressors when the water flow ratey decreases and $\Delta p \leq$ 80 mbar ±5.
The differential pressure switch closes and therefore the unit can restart when the water flow rate increases and $\Delta p \geq$ 105 mbar ±5.
• Standard supply includes an antifreeze heater placed between the external thermal insulation and the shell of the exchanger and controlled by the main electronic controller of the unit in order to protect the evaporator full of water (but not the pipes) from the winter icing when the unit is in stand-by mode. The exchanger is protected down to an outdoor air temperature of -20°C.
NOTE the antifreeze protection only worlk if the unit is electrically connected the standby period.
It is recommended to install a water paddle flow switch at the water inlet of the unit (it can be supplied as accessory or option): the water paddle flow switch has to be electrically wired in series with the differential pressure switch.
It is mandatory to calibrate the trip out of the water paddle flow switch at a water flow rate value higher than the minimum water flow rate admissible for the exchanger (re. section Pressure Drop).

Tips for a successful installation

For a correct design and installation of the hydraulic plant comply the local laws governing safety matters and sound…
The following information is suggestion for a correct installation of the unit:
• Before connecting the unit to the system wash adequately the pipes using clean water, filling and emptying and cleaning the filters. Only after that proceed connecting the unit to the system; this operation is crucial to ensure proper start-up without the need to have repeated stops to clean the filter, with the possible risk of damage to heat exchangers and other components.
• Check by qualified personnel the quality of the water or of the mixture used; avoid the presence of inorganic salts, biological load (seaweeds, etc.) suspended solids, dissolved oxygen and the pH. Water with inadequate characteristics can cause a pressure drop increase due to a rapid fouling of the filter, energy efficiency decrease and corrosive symptom increase that can damage the unit.
• The pipes must have the least possible number of bends to minimize load losses and must be adequately supported in order to prevent the connections of the unit from being excessively stressed.
• Install on-off valves near components that need to be serviced to isolate them when maintenance work needs to be done and to allow them to be replaced without having to discharge the system.
• Before isolating the pipes and charging the system, carry out preliminary inspections to make sure that there are no leaks.
• Isolate all the chilled water pipes to prevent condensation from forming along the pipes themselves. Make sure that the material used is the steam barrier type, failing this, cover the insulation with an appropriate protection. Also make sure that the air venting valves can be accessed through the insulation.
• Do not forget to install or at least allow for the installation of pressure and temperature reading instruments on the inlet and outlet parts of the hydraulic circuit. These instruments will allow you to monitor the operation of the system.
• The circuit can be kept under pressure by means of an expansion tank and a pressure reducer. A plant filling unit can also be used in order to automatically charge the system and keep it at the desired pressure if it drops below a certain pressure value. Install manual or automatic 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.
• the water connections are 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 vibrations dampers are installed under the unit, it is recommended to use flexible couplings before and after the water circulation pump and near the unit.
• Install on the outlet of the unit a suitable valve able to regulate the water flow.
• Avoid that the weight of the connection pipes pushes on the hydraulic connections of the unit using approved supports.

Check that plant components are suitable to bear the maximum static pressure (it depends on the height of the building).

HYDRAULIC CONNECTIONS

Water component for corrosion limit

pH	7.5 ÷ 9.0	-
SO4 --	< 100	ppm
HCO3 -/ SO4 --	>1.0	
Total hardness	8.0 ÷ 15.2	°F
Cl-	< 50	ppm
PO4 3-	< 2.0	ppm
NH3	< 0.5	ppm
Free Chlorine	< 0.5	ppm
Fe3+	< 0.5	ppm
Mn++	< 0.05	ppm
CO2	< 50	ppm
H2S	< 50	ppb
Temperature	< 65	°C
Oxygen content	< 0.1	ppm

Precautions for the Winter

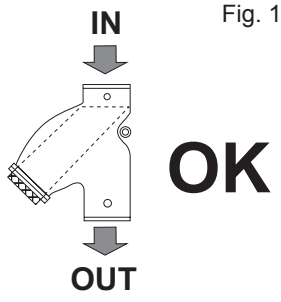
The water could freeze and damage the exchanger of the unit and other parts of the system during the winter period, if the system was to remain at a standstill. This problem can be obviated in 3 different ways:
1. Drain the system completely, taking care to drain the exchanger (in order to drain the unit's piping system completely, open the water drain ball valves and the air vent valves, open any valves closed).
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 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.

Filter cleaning

For the correct operation of the unit, we recommend to clean the filter according to the section "maintenace".

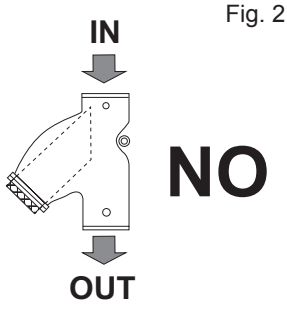
For unit equipped with **victaulic connections filter,** after the filter cleaning pay attention to reinstall in the correct position the filtering mesh (fig.1).

Fig. 1



FILTER MESH
CORRECTLY INSTALLED

Fig. 2



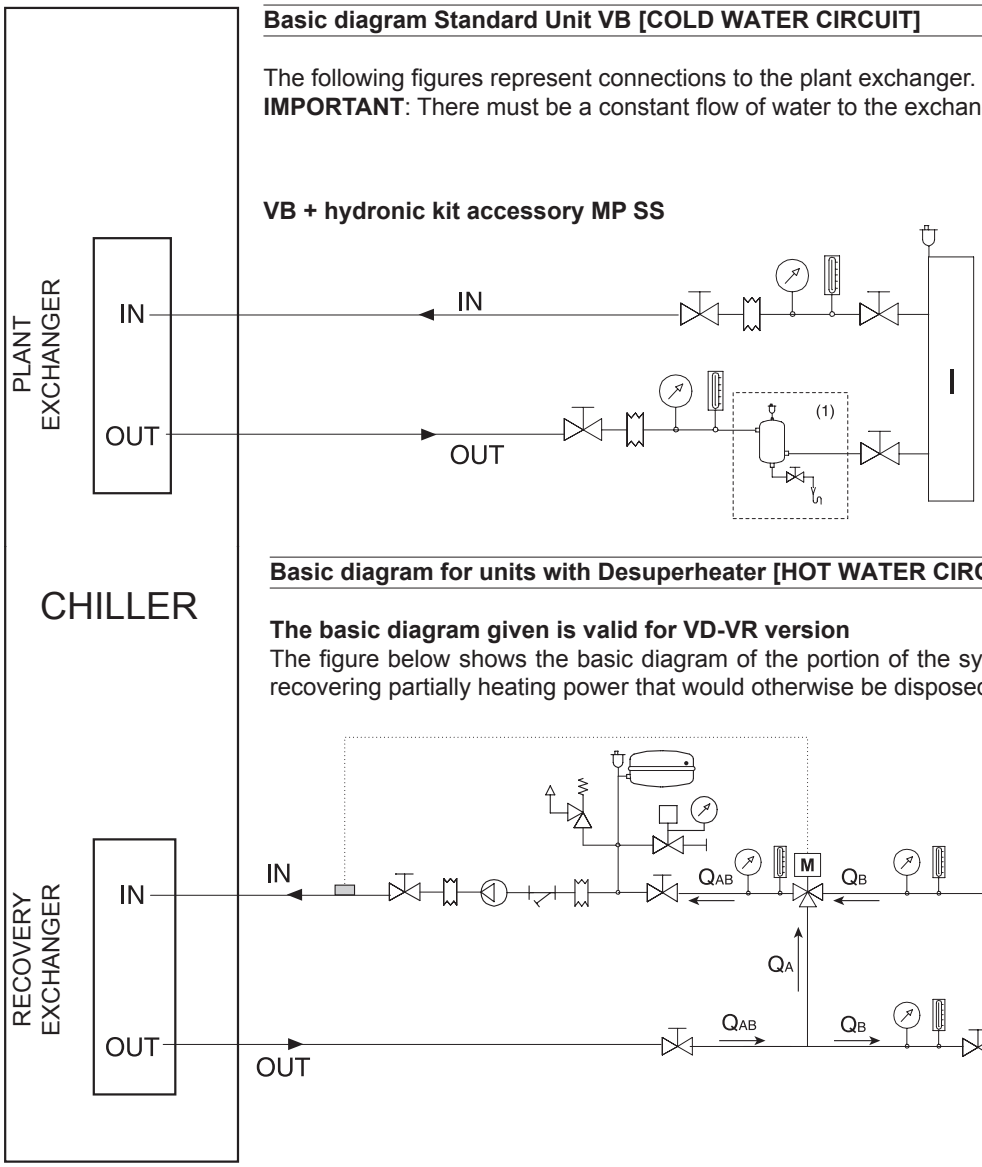
FILTER MESH
NOT CORRECTLY INSTALLED

HYDRAULIC CONNECTIONS

Basic diagram Standard Unit VB [COLD WATER CIRCUIT]

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

VB + hydronic kit accessory MP SS



Basic diagram for units with Desuperheater [HOT WATER CIRCUIT]

The basic diagram given is valid for VD-VR version
The figure below shows the basic diagram of the portion of the system with the heat exchanger used for recovering partially heating power that would otherwise be disposed of in the air.

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

HYDRAULIC CONNECTIONS

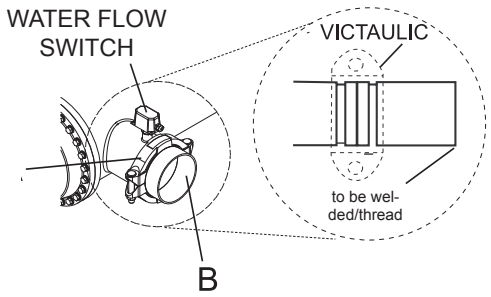
Air vent and water drain

On the plumbing circuit feeding the unit, especially when equipped with the Victaulic connection 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 exchanger completely (especially during the winter in order to prevent freezing that would seriously jeopardize the operation of the unit). For units with the "Pumping module" option 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.

Plumbing connection with Victaulic couplings and Water flow switch

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.

Do not weld the pipe with Victaulic connection joint mounted since the gasket may be damaged irreparably.

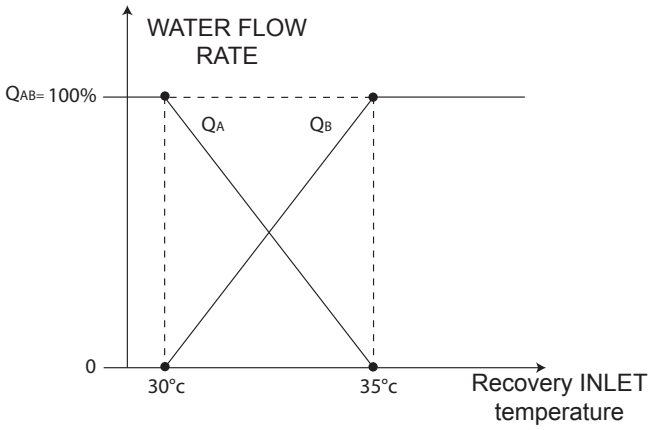


Note:
Supplied as optional (see "ACCESSORIES AND OPTIONAL EQUIPMENT ").

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.

Water connections must be performed carefully as for the evaporator (filter, circuit washing, etc.)
Perform all necessary interventions to avoid RISK OF FREEZING (tubes insulation, emptying of circuit, addition of glycol, anti-freeze resistances).
Water temperature can reach high temperatures (up to 100°C for VD unit, up to 65°C for VR unit), therefore:
• avoid RISK OF BURNS by adopting the necessary precautions (insulations of tubes, temperature detecting station on water if the sanitary use is foreseen, etc.).
• install safety valves and specifically dimensioned expansion tanks in the hydraulic circuit.

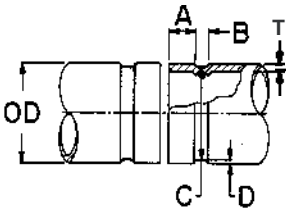


HYDRAULIC CONNECTIONS

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
11/4”	32	42.4	15.875	7.137	38.989	1.600	1.651
11/2”	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
21/2”	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

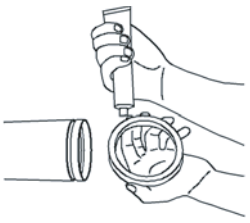
Check the depth and diameter of the grooves and their distance from the pipe ends. Make sure that the work has been carried out with care and that the end surface of the pipes is smooth and not ovalized. Make sure that there are no notches, burrs or other imperfections that could impair the tightness. Groove dimensions in mm A=16-B=8-C=57.2-D=1.6



2) Checking the seal and relative lubrication

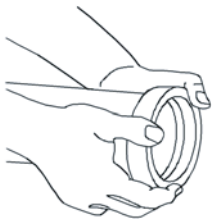
Make sure that the type of seal used is compatible with the nature and temperature of the fluid. Signal green **EPDM** seals are used.

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.



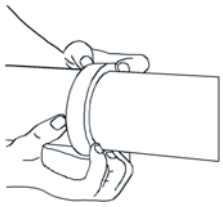
3) How to fit the seal

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



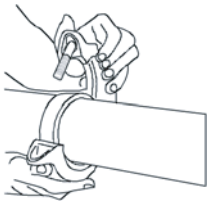
4) Alignment

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.

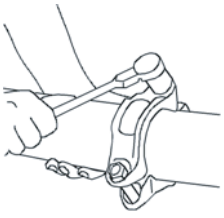


6) Nut torquing

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.



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 expansion vessel supplied and the pressure at which it should be charged. The expansion vessel 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 expansion vessel precharge value in kPa using the formula below:

Expansion vessel precharge= [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.

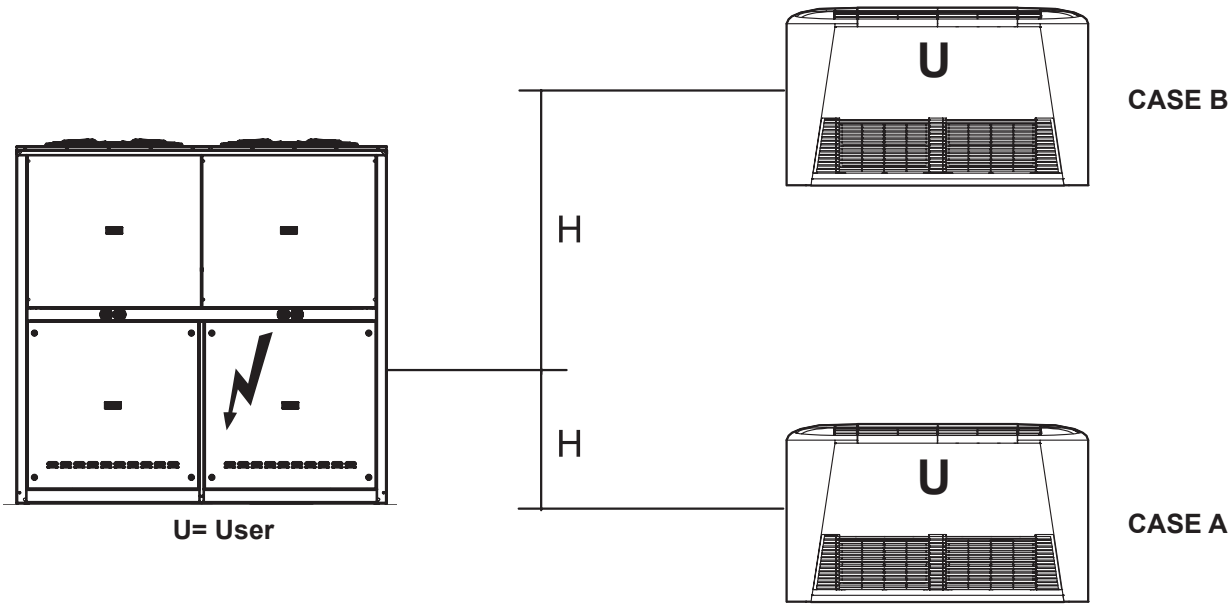
Tab.1

Model		160.4 ÷ 420.4		
Expansion vessel volume (liters)		24		
Thermal expansion of water (10-40°C)		0.0074		
Thermal expansion of water (10-60°C)		0.0167		
H (metri)		Expansion vessel pressure (kPa)	IR	IP
Case A	H <0	150 (standard)	2085	921
Case B	0 < H < 12.25	150 (standard)	2085	921
	15	177	1960	870
	20	226	1732	768
	25	275	1505	667
	30	324	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



ELECTRICAL CONNECTIONS

General rules

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

Structure of the electric panel

All the electrical components are contained in a closed casing protected against the atmospheric agents and inspectionable by opening the front door after removing the front panel. The door for accessing the power section is locked by the mechanism.
Access for the supply cables and earth cable (PE) is permitted through the opening on the botton of the electric panel.
The system comprises an electromechanical part consisting of the power circuit, with disconnecting device, contactors, fuses or thermal cutouts, transformer, and another part comprising the Microprocessor control system.
NOTES: Refer to the wiring diagram supplied with the unit for the layout of the electric panel.

Electrical connections

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

1) Connection to the electricity main
• Power supply line;
The machine's power supply line must be laid by following a clearly defined route in order to make it as correct as possible any without any breaks. Pass the line through the opening on the button of the electrical panel. Secure the line integral with the structure of the machine. Then continue inside the panel and connect the conductors directly to the input terminals of the main disconnecting device of the machine.
• Power supply system;
The power cables of the machine's supply line must be taken from a system of symmetrical three-phase voltages and of a separate protection conductor.

V= 380÷415V
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.

2) Electric panel
• Protection degree:
The electric panel casing is made from sheet metal and has IP54 protection rating at the doors directly accessible from the outside. The other parts of the casing guarantee a protection degree that is at least equivalent to **IP22**, as established by the current laws in force: this has been achieved since the panel has further protection against the penetration of solid foreign bodies and atmospheric agents thanks to the machine structure in which it is housed.
• Starting and stopping function:
The red handle on the panel door directly acts on the main circuit-breaker. The handle also acts as a door lock since it ensures that the machine is only powered when the door is shut. The stopping function carried out by the main circuit-breaker is classified as type "0" since the machine is stopped by immediately cutting off the power supply.

3) Reference standards
• The provisions established by the following Directives have been complied with to ensure the safety of the electrical products placed on the European Union market:
- Low Voltage Directive **2006/95 EEC** which also includes the following harmonized standards:
CEI EN 60335-1 and 60335-2-40.
Classification:**CEI EN 60204-1.** Safety of machinery. Electrical equipment of machines. Part 1:
General rules.
- Directive **2004/108/EEC** concerning **"Electromagnetic compatibility".**

4) User connection
On the electric panel are available the terminal connection for:
a) Control of the plant water pump and its own safety devices (thermal switch)
b) Desuperheater water pump command
c) Digital input to manage the remote ON/OFF of the unit
d) Digital input to manage the remote switching mode (Cool / Heat) of the unit
e) Terminals for connecting water flow switch of the plant
Moreover for the units with total heat recovery are available the following conncetions:
f) Control of the recovery water pump and its own safety devices (thermal switch)
g) Digital input to manage the remote switching mode (Cool / Recovery) of the unit

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

ELECTRICAL CONNECTIONS

Electrical data

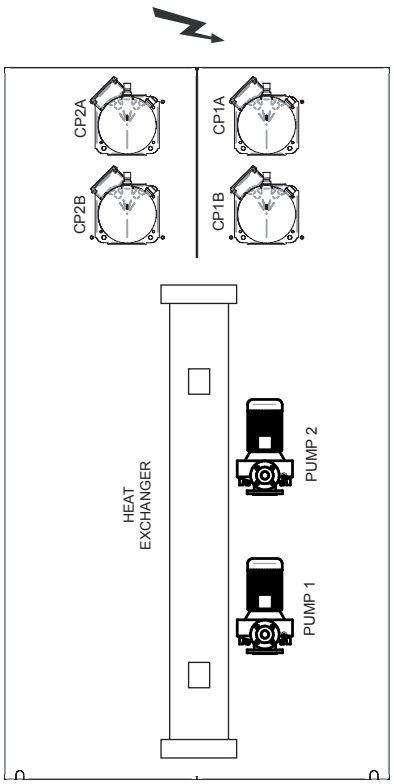
Compressor specification data

UNIT		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	UM
Power supply		400 - 3 - 50									V-ph-Hz
FLA	CP1A	30.9	30.9	40.1	40.1	48	48	61.0	70.2	75.6	A
	CP1B	30.9	36.4	40.1	48	48	61.0	61.0	70.2	75.6	
	CP2A	30.9	30.9	40.1	40.1	48	48	61.0	70.2	75.6	
	CP2B	30.9	36.4	40.1	48	48	61.0	61.0	70.2	75.6	
LRA	CP1A	174	174	210	210	210	210	287	267	298	A
	CP1B	174	225	210	210	210	287	287	267	298	
	CP2A	174	174	210	210	210	210	287	267	298	
	CP2B	174	225	210	210	210	287	287	267	298	
FLI	CP1A	17.2	17.2	25	25	30.5	30.5	38	42.8	46.4	kW
	CP1B	17.2	22.6	25	30.5	30.5	38.0	38	42.8	46.4	
	CP2A	17.2	17.2	25	25	30.5	30.5	38	42.8	46.4	
	CP2B	17.2	22.6	25	30.5	30.5	38.0	38	42.8	46.4	

Compressor specification data - type C

UNIT		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	UM
Power supply		400 - 3 - 50									V-ph-Hz
FLA	CP1A	30.9	30.9	36.4	36.4	44.6	44.6	59.3	59.3	73.8	A
	CP1B	30.9	36.4	36.4	44.6	44.6	59.3	59.3	73.8	73.8	
	CP2A	30.9	30.9	36.4	36.4	44.6	44.6	59.3	59.3	73.8	
	CP2B	30.9	36.4	36.4	44.6	44.6	59.3	59.3	73.8	73.8	
LRA	CP1A	174	174	225	225	272	272	310	310	394	A
	CP1B	174	225	225	272	272	310	310	394	394	
	CP2A	174	174	225	225	272	272	310	310	394	
	CP2B	174	225	225	272	272	310	310	394	394	
FLI	CP1A	17.2	17.2	22.6	22.6	27.6	27.6	36.1	36.1	46.7	kW
	CP1B	17.2	22.6	22.6	27.6	27.6	36.1	36.1	46.7	46.7	
	CP2A	17.2	17.2	22.6	22.6	27.6	27.6	36.1	36.1	46.7	
	CP2B	17.2	22.6	22.6	27.6	27.6	36.1	36.1	46.7	46.7	

Unit layout



Single Fan specifications AC

UNIT		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	UM
Power supply		400 - 3 - 50									V-ph-Hz
FLA	AB	4,1									A
LRA	AB	13,5									A
FLI	AB	2,1									kW

Single Fan specifications EC

UNIT		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	UM
Power supply		400 - 3 - 50									V-ph-Hz
FLA	AB	2,85									A
LRA	AB	11,4									A
FLI	AB	1,85									kW

Specifications of pumping module accessory MP SS STD

UNIT	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	UM
Power supply	400 - 3 - 50									V-ph-Hz
FLA	6.10	6.10	8.70	8.70	8.70	10.4	10.4	10.4	21.9	A
LRA	57.7	57.7	87.0	87.0	87.0	116	116	116	186	A
FLI	3.48	3.48	4.56	4.56	4.56	6.29	6.29	6.29	12.2	kW

Specifications of pumping module accessory High working head MP SS HP1

UNIT	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	UM
Power supply	400 - 3 - 50									V-ph-Hz
FLA	8.70	8.70	10.4	10.4	10.4	13.7	13.7	13.7	21.9	A
LRA	87.0	87.0	116	116	116	140	140	140	186	A
FLI	4.56	4.56	6.29	6.29	6.29	8.45	8.45	8.45	12.2	kW

NOTE:

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

MIC SS = Maximum instantaneous current of the unit with soft starter options

Summary tables (total values) with standard compressor:

Units without pumping module

UNIT	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	UM
Total maximum load current [FLA]	140	151	177	193	217	243	269	314	335	A
Total maximum power input [FLI]	76	87	107	118	133	148	163	186	200	kW
Total maximum starting current [MIC]	283	340	347	355	379	469	495	510	558	A
Total maximum starting current with soft starter [MIC]	213	250	263	271	295	354	380	404	438	A
Units with pumping module MP SS STD (1 or 2 pumps)										
Total maximum load current [FLA]	146	157	186	201	227	253	279	324	349	A
Total maximum power input [FLI]	79	90	112	123	139	154	169	192	208	kW
Total maximum starting current [MIC]	289	346	355	363	389	479	505	521	571	A
Total maximum starting current with soft starter [MIC]	220	256	271	279	305	364	390	414	452	A
Units with pumping module MP SS HP1 (1 or 2 pumps)										
Total maximum load current [FLA]	149	160	187	203	227	256	282	327	357	A
Total maximum power input [FLI]	81	91	113	124	139	156	171	194	212	kW
Total maximum starting current [MIC]	292	348	357	365	389	482	508	524	580	A
Total maximum starting current with soft starter [MIC]	222	258	273	281	305	368	394	417	460	A

Summary tables (total values) with C type compressor:

Units without pumping module

UNIT	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	420.4	UM
Total maximum load current [FLA]	141	152	163	179	204	234	263	301	330	A
Total maximum power input [FLI]	76.8	88	98.4	108	122	139	156	182	203	kW
Total maximum starting current [MIC]	284	340	352	407	432	484	514	621	650	A
Total maximum starting current with soft starter [MIC]	214	250	262	298	323	360	390	463	492	A
Units with pumping module MP SS STD (1 or 2 pumps)										
Total maximum load current [FLA]	147	158	172	188	213	245	275	312	345	A
Total maximum power input [FLI]	80	91	103	113	127	146	163	188	212	kW
Total maximum starting current [MIC]	290	347	360	416	441	496	525	633	665	A
Total maximum starting current with soft starter [MIC]	220	257	270	307	332	372	401	475	507	A
Units with pumping module MP SS HP1 (1 or 2 pumps)										
Total maximum load current [FLA]	150	161	175	191	216	249	278	316	352	A
Total maximum power input [FLI]	82	93	105	115	129	148	165	188	216	kW
Total maximum starting current [MIC]	293	349	363	418	443	499	529	636	672	A
Total maximum starting current with soft starter [MIC]	223	259	273	310	335	375	405	478	514	A

NOTE:

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

MIC SS = Maximum instantaneous current of the unit with soft starter options

R410A PROTECTION DEVICES

Protection devices HIGH PRESSURE

The unit is protected against risk of overpressure by means of 5 levels protection chain.

Each compressor and so each circuit is equipped with:
1) ATC (Cooling Capacity Control)
2) high pressure transducer connected to electronic controller (if installed)
3) high pressure automatic switch connected to electronic controller
4) high pressure manual switch connected to compressor contactor command and to electronic controller
5) high pressure safety valve

Protection devices technical data

LEVEL	1	2	3	4	5
Device	ATC (Cooling Capacity Control)	High pressure transducer	High pressure automatic switch	High pressure manual switch	High pressure safety valve
Trip out (barg)	-	40,5	41,0	43,0	45,0
Trip in (barg)	-	29,5	29,5	31,0	41,0
connected to	electronic controller	electronic controller	electronic controller	compressor contactor command	Discharge the refrigerant to atmosphere to reduce the system pressure
effect	Controls the cooling capacity shutting down compressors	stop the compressor and the fans	stop the compressor and the fans	stop the compressor	Discharge the refrigerant to atmosphere to reduce the system pressure
reset *	Automatic	YES by keyboard after the solution of the problem that generates the alarm	YES by keyboard if the high pressure switch has trip-in and after the solution of the problem that generates the alarm	Press the button present on the manual pressure switch **CAUTION**	Not necessary

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

CAUTION

IN CASE OF COMPRESSORS TRIP-OUT BY MANUAL RESET HIGH PRESSURE SWITCH THERE ARE NO EVIDENCES IN THE MONITORING SYSTEM, DO NOT RESET THE PRESSURE SWITCH BEFORE YOU HAVE DONE THE FOLLOWING STEPS:
1) SHUT DOWN THE UNIT USING THE OFF BUTTON
2) THEN RESET THE HIGH PRESSURE SWITCH

Protection devices LOW PRESSURE

LEVEL	1	2
Device	Low pressure transducer	Low pressure automatic switch
Trip out (barg)	2,5 bar (IR, IP unit in cooling mode)	4 bar (IR, IP unit in cooling mode) 2 bar (BR,BP, IP unit in heating mode)
Trip in (barg)	3,5 bar (IR, IP unit in cooling mode)	6 bar (IR, IP unit in cooling mode) 4 bar (BR,BP, IP unit in heating mode)
connected to	electronic controller	electronic controller
effect	stop the compressors of that circuit	stop the compressor.
reset *	YES by keyboard after the solution of the problem that generates the alarm	YES by keyboard if the low pressure switch has trip-in and after the solution of the problem that generates the alarm

Protection devices DISCHARGE TEMPERATURE (if installed)

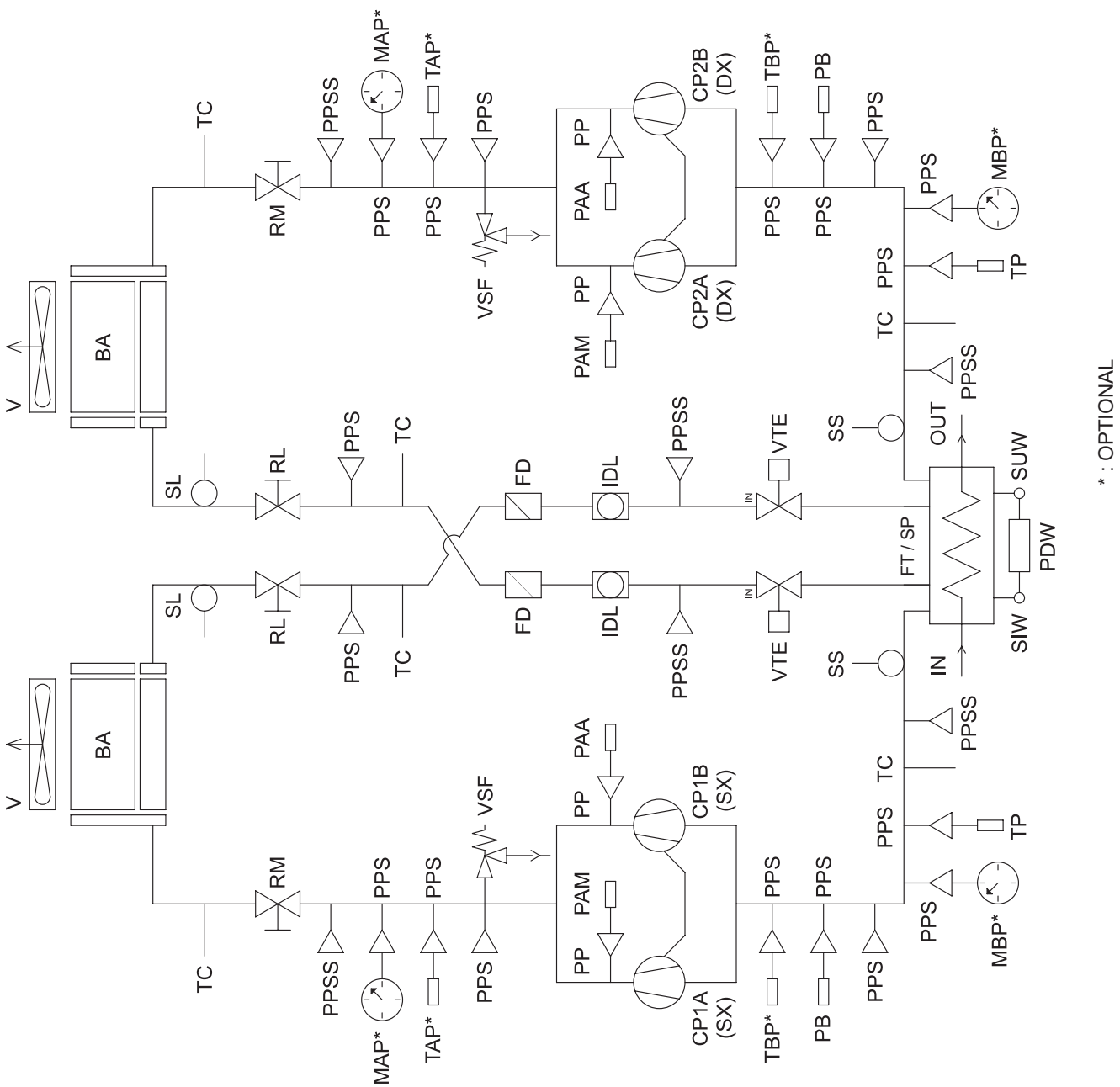
LEVEL	1
Device	Discharge Temperature
Trip out	135°C
Trip in	120°C
connected to	electronic controller
effect	stop the compressor.
reset *	YES by keyboard after the solution of the problem that generates the alarm

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

REFRIGERANT FLOW DIAGRAM - STANDARD UNIT VB

Refrigerant flow diagram in cooling mode IR

	Description
BA	FIN AND TUBE COIL
CP	COMPRESSOR
FD	FILTER DRIER
IDL	LIQUID AND MOISTURE INDICATOR
MAP	HIGH PRESSURE GAUGE
MBP	LOW PRESSURE GAUGE
PAA	AUTO RESET HIGH PRESSURE SWITCH
PAM	MANUAL RESET HIGH PRESSURE SWITCH
PB	AUTO RESET LOW PRESSURE SWITCH
PDW	WATER PRESSURE SWITCH
PP	PRESSURE SOCKET 1/4" SAE WITOUT CORE
PPS	PRESSURE SOCKET 1/4" SAE WITH CORE
PPSS	PRESSURE SOCKET 5/16" SAE WITH CORE
RL	LIQUID BALL VALVE
RM	COMPRESSOR OUTLET BALL VALVE
SIW	WATER INLET PROBE
SL	LIQUID PROBE
FT/SP	HEAT EXCHANGER
SS	SUPERHEATING PROBE
SUW	WATER OUTLET PROBE
TAP	HIGH PRESSURE TRANSDUCER
TBP	LOW PRESSURE TRANSDUCER
TC	CHARGING TUBE
TP	PRESSURE TRANSDUCER
V	FAN
VSF	SAFETY VALVE
VTE	ELECTRONIC THERMOSTATIC EXPANSION VALVE

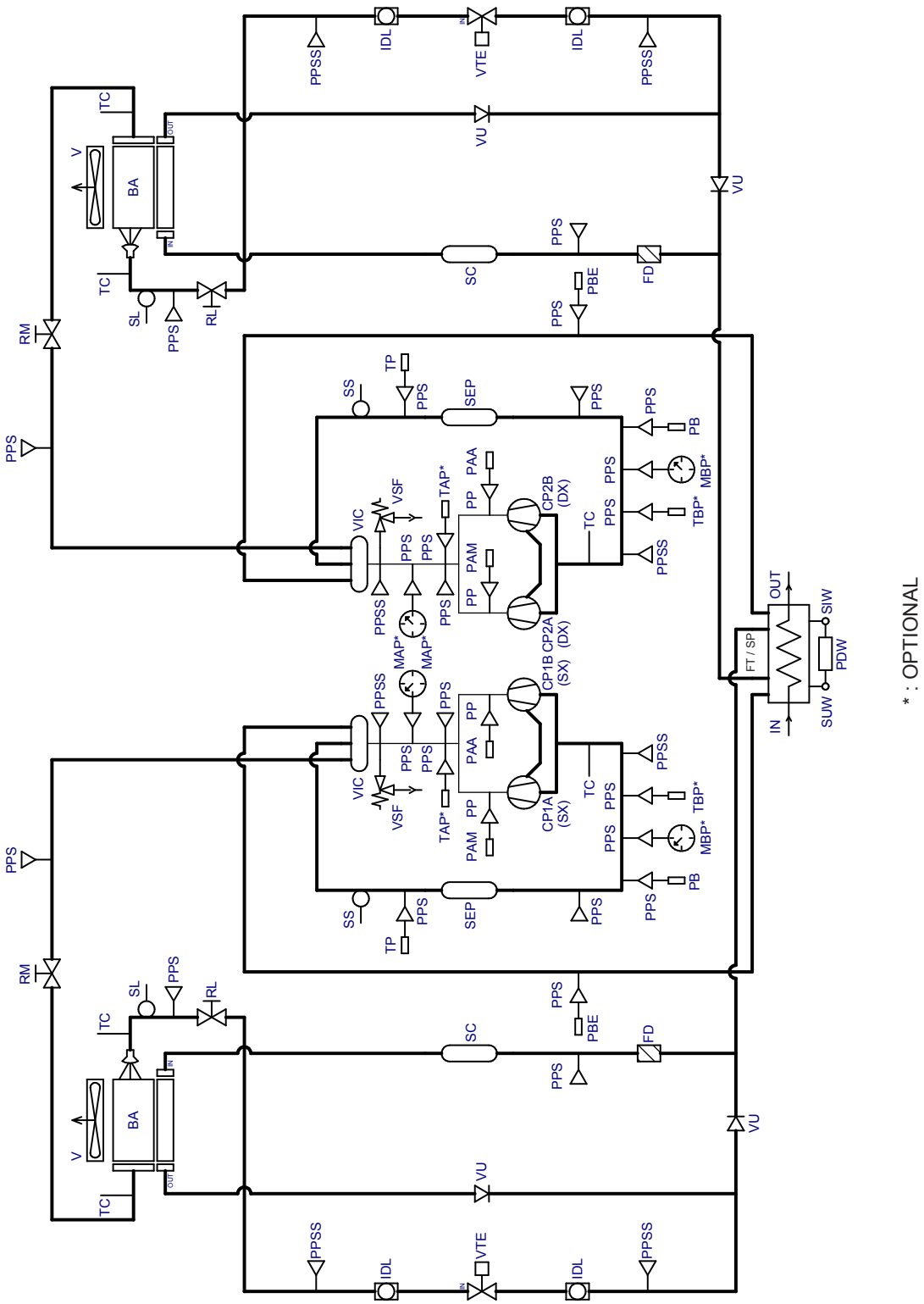


* : OPTIONAL

REFRIGERANT FLOW DIAGRAM - STANDARD UNIT VB

Refrigerant flow diagram in heating mode IP

	Description
BA	FIN AND TUBE COIL
CP	COMPRESSOR
FD	FILTER DRIER
IDL	LIQUID AND MOISTURE INDICATOR
MAP	HIGH PRESSURE GAUGE
MBP	LOW PRESSURE GAUGE
PAA	AUTO RESET HIGH PRESSURE SWITCH
PAM	MANUAL RESET HIGH PRESSURE SWITCH
PB	AUTO RESET LOW PRESSURE SWITCH
PBE	EVAPORATOR AUTO RESET LOW PRESSURE SWITCH
PDW	WATER PRESSURE SWITCH
PP	PRESSURE SOCKET 1/4" SAE WITHOUT CORE
PPS	PRESSURE SOCKET 1/4" SAE WITH CORE
PPSS	PRESSURE SOCKET 5/16" SAE WITH CORE
RL	LIQUID BALL VALVE
RM	COMPRESSOR OUTLET BALL VALVE
SC	LIQUID RECEIVER
SEP	LIQUID SEPARATOR
SIW	WATER INLET PROBE
SL	LIQUID PROBE
FT/SP	HEAT EXCHANGER
SS	SUPERHEATING PROBE
SUW	WATER OUTLET PROBE
TAP	HIGH PRESSURE TRANSDUCER
TBP	LOW PRESSURE TRANSDUCER
TC	CHARGING TUBE
TP	PRESSURE TRANSDUCER
V	FAN
VIC	REVERSING CYCLE VALVE
VSF	SAFETY VALVE
VTE	ELECTRONIC THERMOSTATIC EXPANSION VALVE
VU	CHECK VALVE



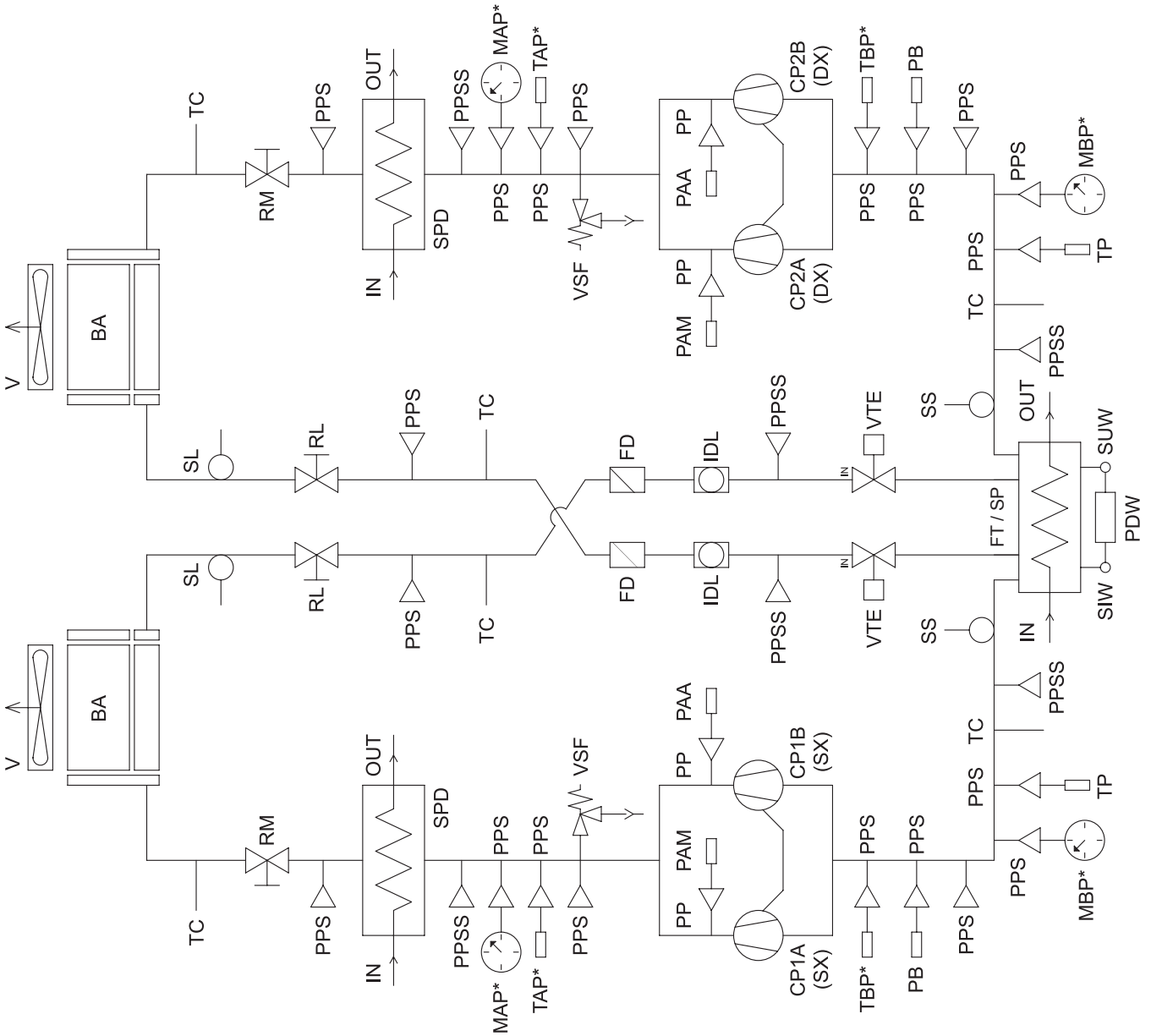
* : OPTIONAL

REFRIGERANT FLOW DIAGRAM - VERSION WITH DESUPERHEATERS VD

Refrigerant flow diagram in cooling mode IR

	Description
BA	FIN AND TUBE COIL
CP	COMPRESSOR
FD	FILTER DRIER
IDL	LIQUID AND MOISTURE INDICATOR
MAP	HIGH PRESSURE GAUGE
MBP	LOW PRESSURE GAUGE
PAA	AUTO RESET HIGH PRESSURE SWITCH
PAM	MANUAL RESET HIGH PRESSURE SWITCH
PB	AUTO RESET LOW PRESSURE SWITCH
PDW	WATER PRESSURE SWITCH
PP	PRESSURE SOCKET 1/4" SAE WITOUT CORE
PPS	PRESSURE SOCKET 1/4" SAE WITH CORE
PPSS	PRESSURE SOCKET 5/16" SAE WITH CORE
RL	LIQUID BALL VALVE
RM	COMPRESSOR OUTLET BALL VALVE
SIW	WATER INLET PROBE
SL	LIQUID PROBE
FT/SP	HEAT EXCHANGER
SPD	DESUPERHEATER PLATE HEAT EXCHANGER
SS	SUPERHEATING PROBE
SUW	WATER OUTLET PROBE
TAP	HIGH PRESSURE TRANSDUCER
TBP	LOW PRESSURE TRANSDUCER
TC	CHARGING TUBE
TP	PRESSURE TRANSDUCER
V	FAN
VSF	SAFETY VALVE
VTE	ELECTRONIC THERMOSTATIC EXPANSION VALVE

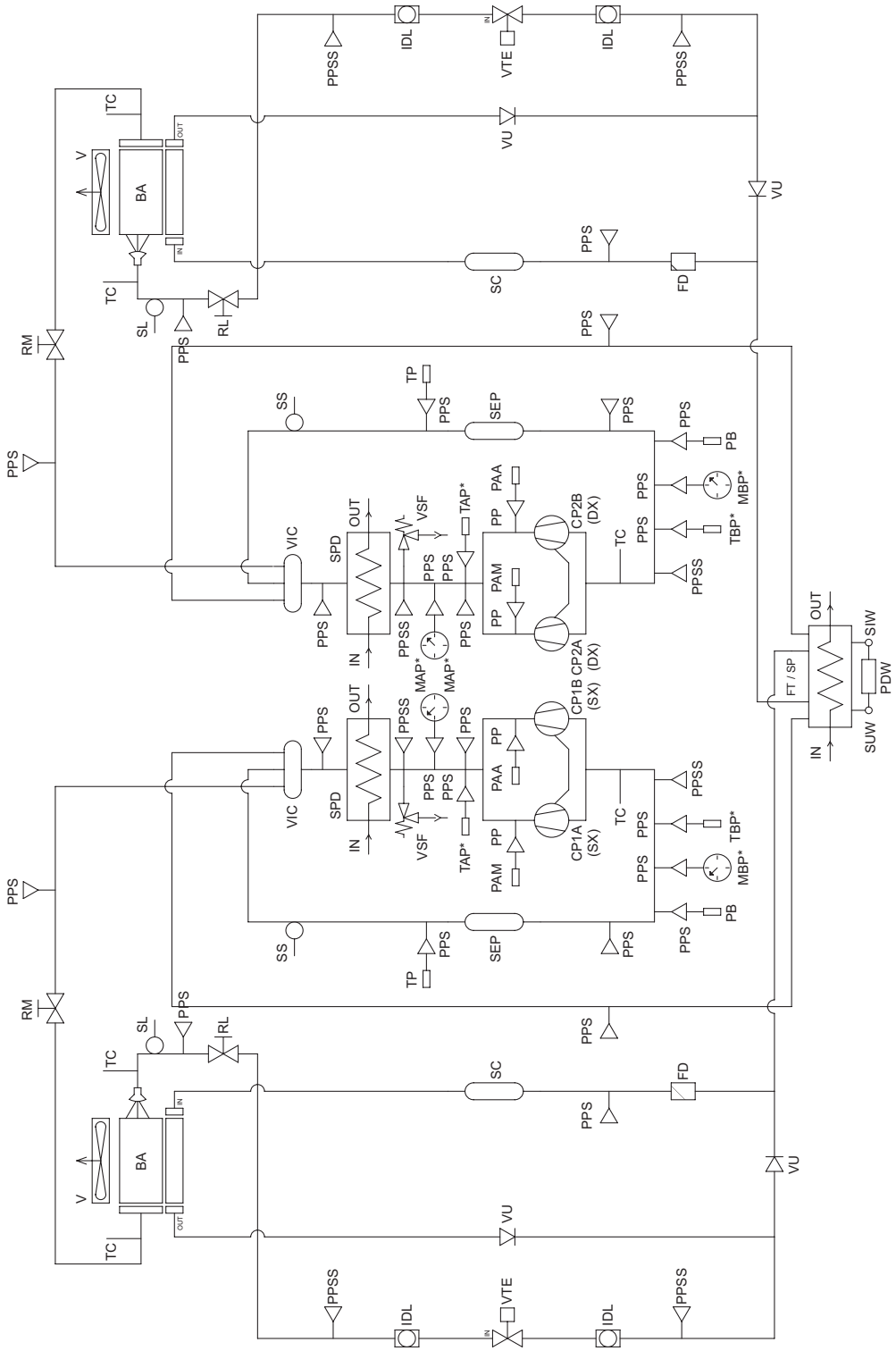
* : OPTIONAL



REFRIGERANT FLOW DIAGRAM - VERSION WITH DESUPERHEATERS VD

Refrigerant flow diagram in heating mode IP

	Description
BA	FIN AND TUBE COIL
CP	COMPRESSOR
FD	FILTER DRIER
IDL	LIQUID AND MOISTURE INDICATOR
MAP	HIGH PRESSURE GAUGE
MBP	LOW PRESSURE GAUGE
PAA	AUTO RESET HIGH PRESSURE SWITCH
PAM	MANUAL RESET HIGH PRESSURE SWITCH
PB	AUTO RESET LOW PRESSURE SWITCH
PDW	WATER PRESSURE SWITCH
PP	PRESSURE SOCKET 1/4" SAE WITHOUT CORE
PPS	PRESSURE SOCKET 1/4" SAE WITH CORE
PPSS	PRESSURE SOCKET 5/16" SAE WITH CORE
RL	LIQUID BALL VALVE
RM	COMPRESSOR OUTLET BALL VALVE
SC	LIQUID RECEIVER
SEP	LIQUID SEPARATOR
SIW	WATER INLET PROBE
SL	LIQUID PROBE
FT/SP	HEAT EXCHANGER
SPD	DESUPERHEATER PLATE HEAT EXCHANGER
SS	SUPERHEATING PROBE
SUW	WATER OUTLET PROBE
TAP	HIGH PRESSURE TRANSDUCER
TBP	LOW PRESSURE TRANSDUCER
TC	CHARGING TUBE
TP	PRESSURE TRANSDUCER
V	FAN
VIC	REVERSING CYCLE VALVE
VSF	SAFETY VALVE
VTE	ELECTRONIC THERMOSTATIC EXPANSION VALVE
VU	CHECK VALVE



* : OPTIONAL

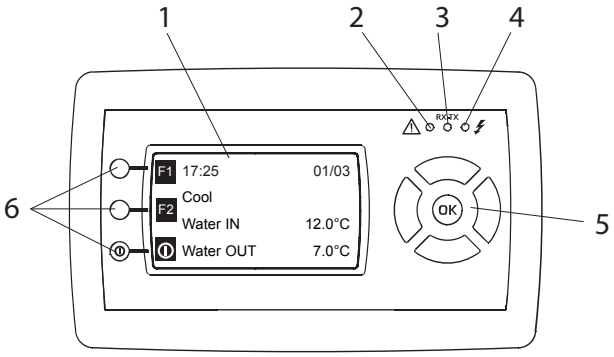
MONITORING SYSTEM - User interface

CAUTION: IF THE ALARM SIGNAL "**RTC**" (**R**EAL **T**IME **C**LOCK) APPEARS WHEN STARTING FOR THE FIRST TIME, SET THE DATE AND TIME IN THE RESPECTIVE "DATE AND TIME" MENU.

CONTROL PANEL

The control panel is composed of the instrument's front panel, equipped with an **LCD** display, three indicator LEDs, and one joy-stick buttons and three function button, it enables viewing and/or checking the operating mode and parameters, resources and complete alarm diagnostics.
In particular, it enables:

- Managing alarm situations
- Checking the status of resources.



KEY

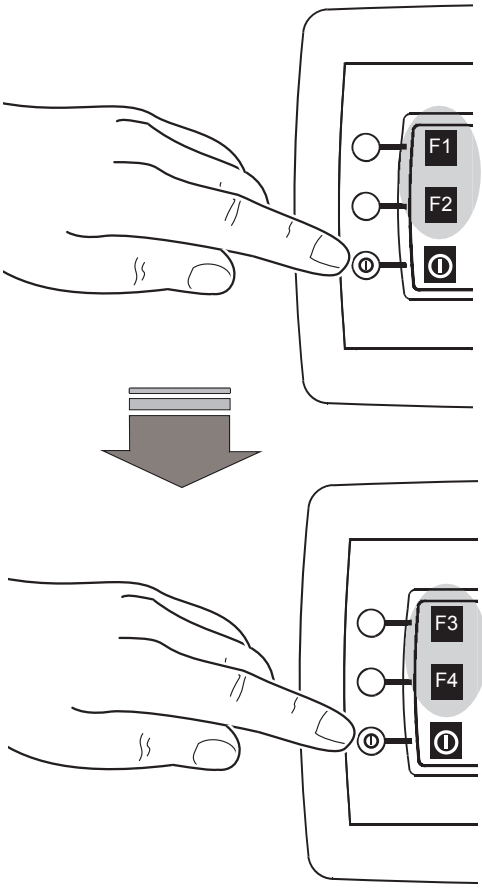
1.Display
2. Alarms LED
3. LED for communication between the motherboard and the keypad
4. Power supply LED
5. Joystick Menu Buttons
6. Function Buttons

On pressing any of the buttons the display will light up for a few seconds; without pressing any of the buttons, the display will go out after a few seconds. When switching on, the instrument will go into the state saved at the last machine shutdown or stand-by.

FUNCTION BUTTONS "F1", "F2", "F3", "F4" AND "ON/OFF"

On the left of the keyboard there are 3 buttons whose function is shows on the left of the LCD.
At POWER ON the LCD display shows the F1 (up), F2 (middle) and ON/OFF (down) functions.

• **By a single pressure of ON/OFF button**: the keyboard displaying change: F1 became F3 (up button) and F2 became F4 (middle button). The ON/OFF (down) button doesn't change.
By a new pressure on ON/OFF button, the keyboard displaying change and show the previous situation:
F1, F2 and ON/OFF.



• BY PUSHING FOR SOME SECONDS THE ON/OFF BUTTON: THE MACHINE ON-OFF (ON-OFF)

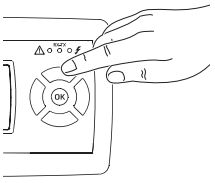
Using the buttons, the function of which is shown on the display, you can directly access main functions:
- **Pressing a single time:** shows the main menu on the display.
- **Pressing for a few seconds:** directly access the menu associated with that particular position.

KEY **F1** : show the **INPUTS** and **OUTPUTS** resources of system control.
KEY **F2** : show the **PARAMETER** submenu (for the service only, with password).
KEY **F3** : show the **ALARMS** submenu.
KEY **F4** : show the **COMPRESSOR** submenu.

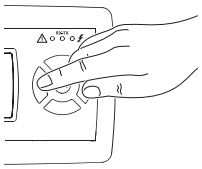
JOYSTICK BUTTON: "MENU"

Used to scroll through the menus by acting on the four positions (**UP; DOWN; LEFT; RIGHT**) pressing a single time; in particular:

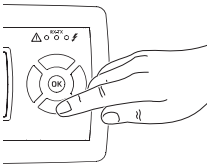
• **Position UP**: scrolls through the menu items upwards or increases the value of a parameter.



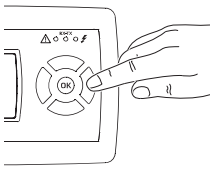
• **Position LEFT** (ESC): returns to the previous menu.



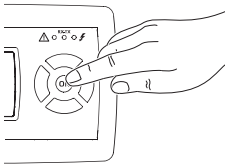
• **Position DOWN:** scrolls through the menu items downwards or decreases the value of a parameter.



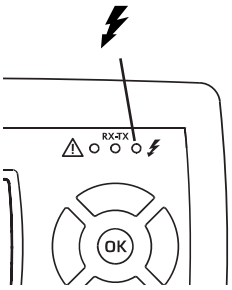
• **Position RIGHT:** moves into the sub-menu, confirms an action, enters editing a value or again confirms a changed value.



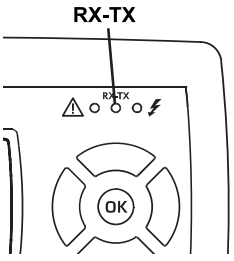
N.B. PRESSING THE (ENTER) BUTTON IN THE MIDDLE CONFIRMS THE COMMAND OR ACCESSES THE DISPLAYED MENU.



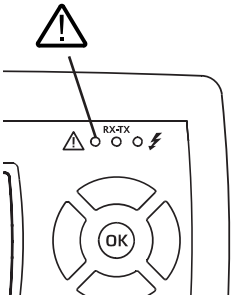
LED STATUS



LEDs (⚡)
The first LED (green) indicates there is supply voltage:
• LED **ON** means that the controller is powered
• LED **OFF** means that the controller is not powered



LED (RX-TX)
The second LED (amber) indicates there is communication between the controller and the keypad:
• **ON** when there is communication
• **OFF** when there is no communication



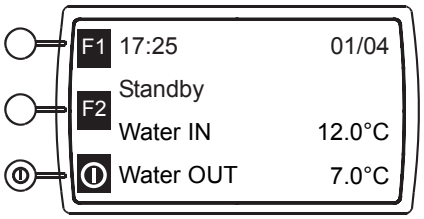
LED (⚠)
The third LED (red) indicates there are alarms:
• **ON** if there is at least one active alarm
• **OFF** if there are no active alarms
• **BLINKING** if there are alarms that have ended but have not yet been manually reset.
• **BLINKING** without alarms to indicate that:
- function HPP (High Pressure Prevention) is active (RHV - RVW units)
- function ATC (Advanced Temperature Control) is active (RLA - LFL unit)
- function PRE-ALARM HIGH PRESSURE is active (RLA - LFL unit)
- function PRE-ALARM LOW PRESSURE is active (RLA - LFL unit).

The alarm reset procedure is explained in paragraph MONITORING SYSTEM - ALARMS

COOLING MODE IR

When the unit switches on, the display shows the first page of the main screen. On the top line there is the current time (17:25) and the page no. (1/4 comprising the screen.

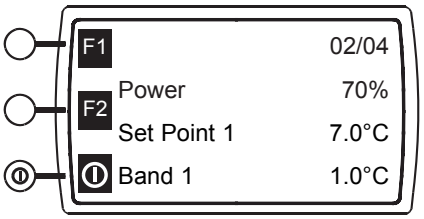
- **"Standby"** indicate the state of operation of the unit (Standby, cooling, shutdown).
- **"Water IN"** indicate the temperature of inlet evaporator.
- **"Water OUT"** indicate the temperature of the outlet evaporator.



Pressing the **DOWN** button takes you to page 02/04

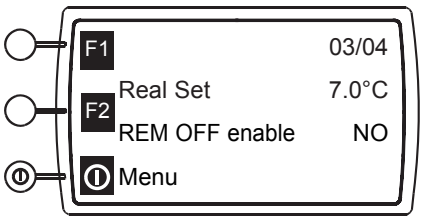
- **"Power"** show the power output from the unit.
- **"Set Point 1"** the set point adjustment.
- **"Band 1"** the band adjustment

By using the **UP/DOWN-ENTER** buttons to select the Set point 1 and/or Band 1 line, it is possible to change the adjustment settings.



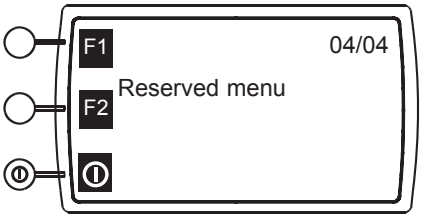
Pressing the **DOWN** button takes you to page 03/04.

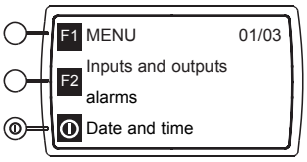
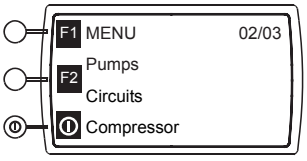
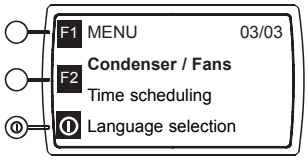
- **"Real Set"** indicate the current point of adjustment.
- **"REM OFF enable"** enable **switch off** the unit via digital input. This function has priority over keypad commands. On the RH side of the display YES/NO appears depending on the enabling of Remote OFF.
- "**Menu"** indicate the access point to the user menu. Pressing **Enter**, with the **UP/DOWN** buttons it is possible to access the following pages (see the table).



Pressing the **DOWN** button takes you to page 04/04.

-"Reserved menu" is reserved for the support service.

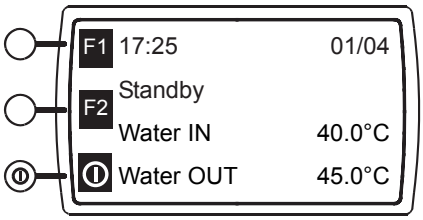


DISPLAY		DESCRIPTION
		**Page 1 of 3**
	Inputs and outputs	Displays the status and values of the digital and analog inputs/outputs
	Alarms	Used to see and/or reset the status of the alarms
	Date and time	Used to set the current date and time
		**Page 2 of 3**
	Pumps	Used to see the activation status of the pumps
	Circuits	Used to see the activation status of the circuits
	Compressors	Used to see the activation status of the compressors
		**Page 3 of 3**
	Condenser (water condenser) Fans (air condenser)	Used to see the state of condensation control Used to see the state of fans control
	Time scheduling	Used to set the operating time scheduling
	Language selection	Used to select the language (english by default)

HEATING MODE IP (reversible refrigerant side)

When the unit switches on, the display shows the 4 page of the main screen
On the top line there is the current time (17:25) and the page no. (1/4 comprising the screen.

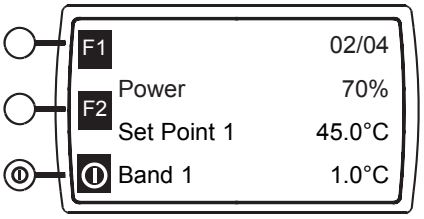
- **"Standby"** indicate the state of operation of the unit (standby, cooling, hot, shutdown).
- **"Water IN"** indicate the temperature of inlet evaporator.
- **"Water OUT"** indicate the temperature of the outlet evaporator.



Pressing the **DOWN** button takes you to page 02/04

- **"Power"** indicate the power delivered by the unit.
- **"Set Point 1"** the set point adjustment.
- **"Band 1"**, the band of adjustment.

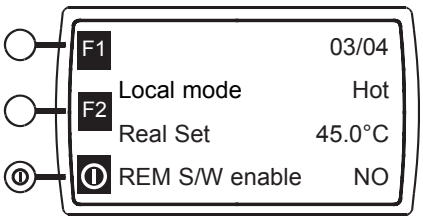
By using the **UP/DOWN-ENTER** buttons to select the Set point 1 it is possible to change the adjustment settings.



Pressing the **DOWN** button takes you to page 03/04.

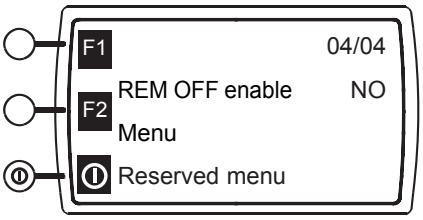
- **"Local mode"**, selection of the mode of operation by control panel.
- **"Real Set"**, indicate the current point of adjustment.
- **"REM S/W enable"** enable mode change of the unit via digital input. This function has priority over keypad commands. On the RH side of the display YES/NO appears depending on the enabling of REM S/W.

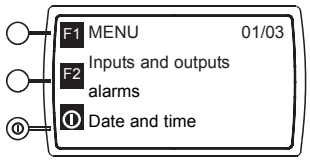
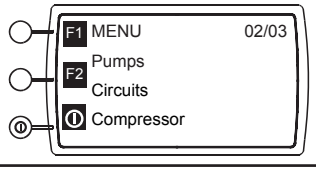
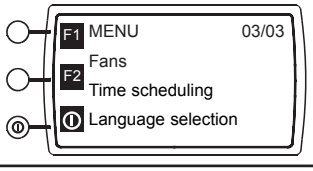
By using the **UP/DOWN-ENTER** buttons to select the **"Local mode"** it is possible to change the Mode of operation (HOT-COOLING) of unit.



Pressing the **DOWN** button takes you to page 04/04.

- "**REM OFF enable"** enable **switch off** the unit via digital input. This function has priority over keypad commands. On the RH side of the display YES/NO appears depending on the enabling of REM OFF.
- "**Menu"** indicate the access point to the user menu. Pressing **Enter**, with the **UP/DOWN** buttons it is possible to access the following pages (see the table).
- **"Reserved menu"** is reserved for the support service.

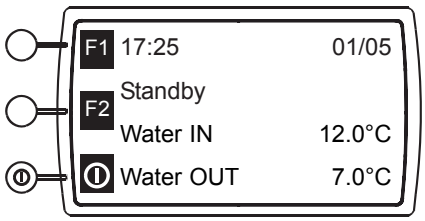


DISPLAY		DESCRIPTION
		**Page 1 of 3**
	Inputs and outputs	Displays the status and values of the digital and analog inputs/outputs
	Alarms	Used to see and/or reset the status of the alarms
	Date and time	Used to set the current date and time
		**Page 2 of 3**
	Pumps	Used to see the activation status of the pumps
	Circuits	Used to see the activation status of the circuits
	Compressors	Used to see the activation status of the compressors
		**Page 3 of 3**
	Fans	Used to see the state of fans control
	Time scheduling	Used to set the operating time scheduling
	Language selection	Used to select the language (english by default)

MONITORING SYSTEM - User interface

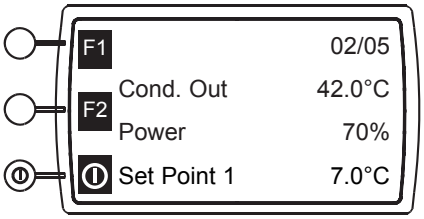
HEATING MODE IW (reversible water side)

When the unit switches on, the display shows the first page of the main screen
On the top line there is the current time (17:25) and the page no. (1/5 comprising the screen.



- **"Standby"** indicate the state of operation of the unit (Standby, cooling, hot, shutdown).
- **"Water IN"** indicate the temperature of inlet evaporator.
- **"Water OUT"** indicate the temperature of the outlet evaporator.

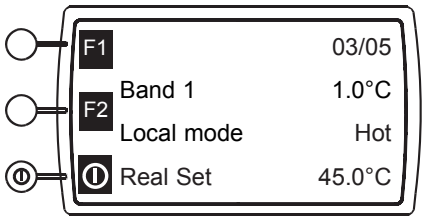
Pressing the **DOWN** button takes you to page 02/05



- **"Cond. Out"** indicate the temperature of the outlet condenser.
- **"Power"** show the power output from the unit.
- **"Set Point 1"** the set point adjustment.

By using the **UP/DOWN-ENTER** buttons to select the Set point 1 it is possible to change the adjustment settings.

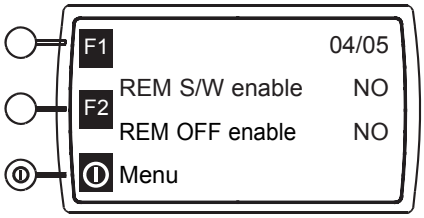
Pressing the **DOWN** button takes you to page 03/05.



- **"Band 1"**, the band 1 of adjustment.
- **"Local mode"**, selection of the mode of operation by control panel.
- **"Real Set"**, indicate the current point of adjustment.

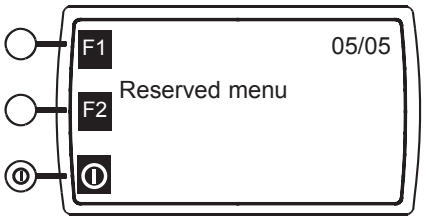
By using the **UP/DOWN-ENTER** buttons to select the **"Band 1"** it is possible to change the band regolation.
By using the **UP/DOWN-ENTER** buttons to select the **"Local mode"** it is possible to change the Mode of operation (HOT-COOLING) of unit.

Pressing the **DOWN** button takes you to page 04/05.

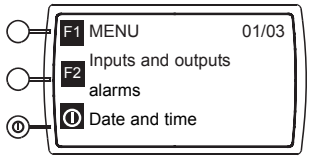
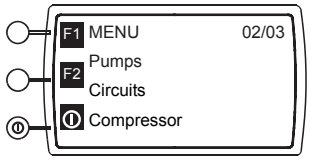
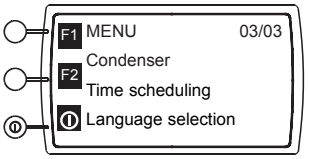


- "REM S/W enable" enable mode change of the unit via digital input. This function has priority over keypad commands. On the RH side of the display YES/NO appears depending on the enabling of REM S/W.
- "**REM OFF enable"** enable **switch off** the unit via digital input. This function has priority over keypad commands. On the RH side of the display YES/NO appears depending on the enabling of REM OFF .
- "**Menu"** indicate the access point to the user menu. Pressing **Enter**, with the **UP/DOWN** buttons it is possible to access the following pages (see the table).

Pressing the **DOWN** button takes you to page 05/05.



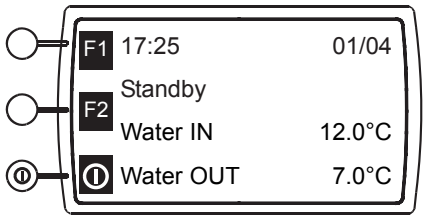
-"Reserved menu" is reserved for the support service.

DISPLAY		DESCRIPTION
		**Page 1 of 3**
	Inputs and outputs	Displays the status and values of the digital and analog inputs/outputs
	Alarms	Used to see and/or reset the status of the alarms
	Date and time	Used to set the current date and time
		**Page 2 of 3**
	Pumps	Used to see the activation status of the pumps
	Circuits	Used to see the activation status of the circuits
	Compressors	Used to see the activation status of the compressors
		**Page 3 of 3**
	Condenser	Used to see the state of condensation control
	Time scheduling	Used to set the operating time scheduling
	Language selection	Used to select the language (english by default)

HEAT RECOVERY

When the unit switches on, the display shows the first page of the main screen On the top line there is the current time (17:25) and the page no. (1/4 comprising the screen.

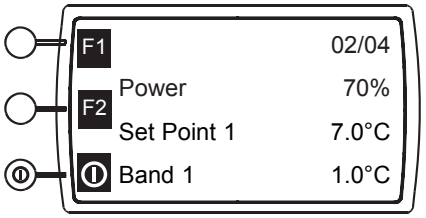
- **"Standby"** indicate the state of operation of the unit (standby, cooling, shutdown).
- **"Water IN"** indicate the temperature of inlet evaporator.
- **"Water OUT"** indicate the temperature of the outlet evaporator.



Pressing the **DOWN** button takes you to page 02/04

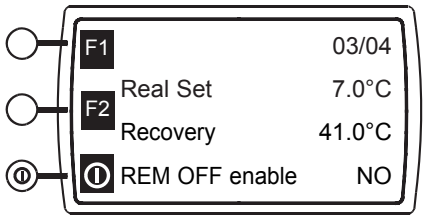
- **"Power"** show the power output from the unit.
- **"Set Point 1"** the set point adjustment.
- **"Band 1"** the band adjustment.

By using the **UP/DOWN-ENTER** buttons to select the Set point 1 and/or Band 1 line, it is possible to change the adjustment settings.



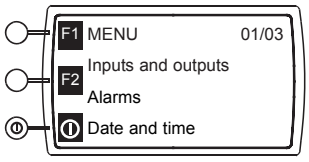
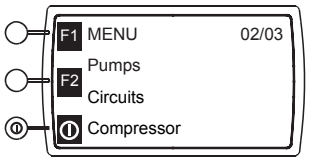
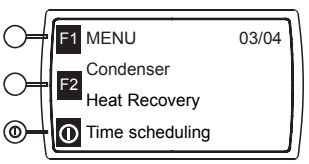
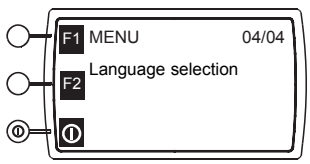
Pressing the **DOWN** button takes you to page 03/04.

- **"Real Set"** indicate the current point of adjustment.
- **"Recovery"** indicate the inlet heat recovery temperature.
- **"REM OFF enable"** enable **switch off** the unit via digital input. This function has priority over keypad commands. On the RH side of the display YES/NO appears depending on the enabling of REM OFF .



Pressing the **DOWN** button takes you to page 04/04.

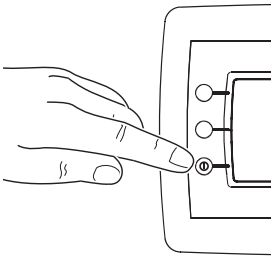
- "**Menu"** indicate the access point to the user menu. Pressing **Enter**, with the **UP/DOWN** buttons it is possible to access the following pages (see the table).
-"Reserved menu" is reserved for the support service.

DISPLAY		DESCRIPTION
		**Page 1 di 4**
	Inputs and outputs	Displays the status and values of the digital and analog inputs/outputs
	Alarms	Used to see and/or reset the status of the alarms
	Date and time	Used to set the current date and time
		**Page 2 di 4**
	Pumps	Used to see the activation status of the pumps
	Circuits	Used to see the activation status of the circuits
	Compressors	Used to see the activation status of the compressors
		**Page 3 di 4**
	Condenser	Used to see the state of condensation control
	Heat Recovery	Used to see the state of heat recovery
	Time scheduling	Used to set the operating time scheduling
		**Page 4 di 4**
	Language selection	Used to select the language (english by default)

MONITORING SYSTEM - User interface

CONTROL PANEL UNIT ON/OFF

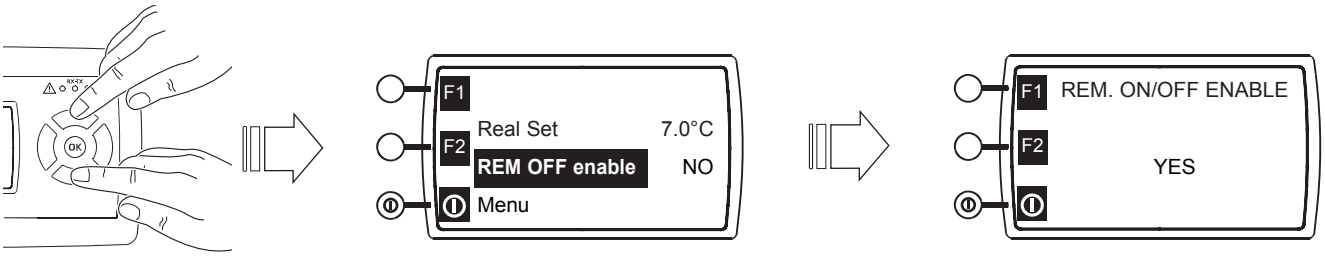
To switch the machine on and off, press the "**on/off**" function button for a few seconds.



REMOTE OFF BY DIGITAL INPUT

To activate this function, select **REM OFF enable** from the main screen and with the joystick-menu buttons set YES.

NOTE: IF YOU ENABLE REM OFF BY DIGITAL INPUT WHILE THE UNIT IS ON, THE UNIT COULD SWITCH OFF IF THE 1_On/OffRem REMOTE DIGITAL INPUT IS OPEN.



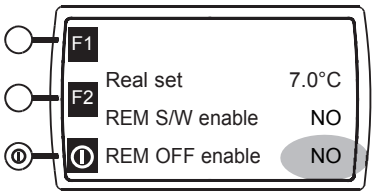
Unit ON-OFF by control panel	**REM OFF enable**	digital input: **1_On/Off REM**	Unit status
on	No	The unit status not depends by digital input	on
off			off
on	Yes	CLOSE **(off)**	on
off			off
on		OPEN **(on)**	off
off		The unit status not depends by digital input	off

MONITORING SYSTEM - User interface

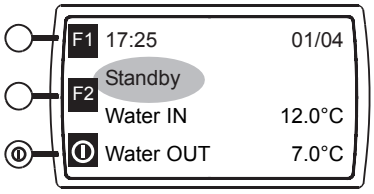
RECOMMENDED SETTINGS : to configure correctly the function ON / OFF from digital input, follow the following guidelines :

CAUTION : THESE OPERATIONS MUST BE PERFORMED BY QUALIFIED PERSONNEL.

- Sure that the parameter **REM OFF Enable** is set to **NO** (figura 1).



- Turn off the unit from the control panel and wait until it is displayed the writing Standby.



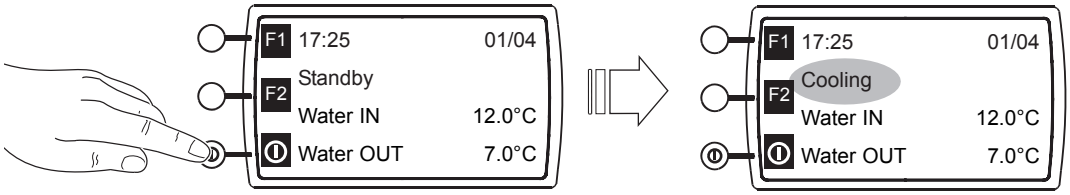
- Remove power to the electrical panel by bringing the door lock switch in position "**0**".

- connect the **remote contact** to the user terminal within the electrical panel and make sure that **contact** is **closed**.
(ref. Electrical schematic of the unit).

- Close the electrical panel.

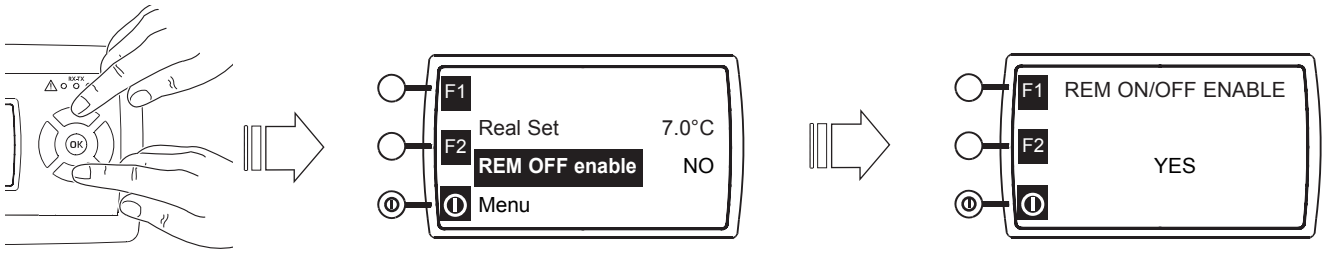
- Apply power to the electrical panel by bringing the door lock switch in position **"1"**.

- Press the ON / OFF button on the control panel to turn on the machine.



At this point the machine is turned on and is ready to turn the compressors to meet the set-point set.

- Set the parameter REM OFF enable at YES. In this way, digital off contact is enabled.

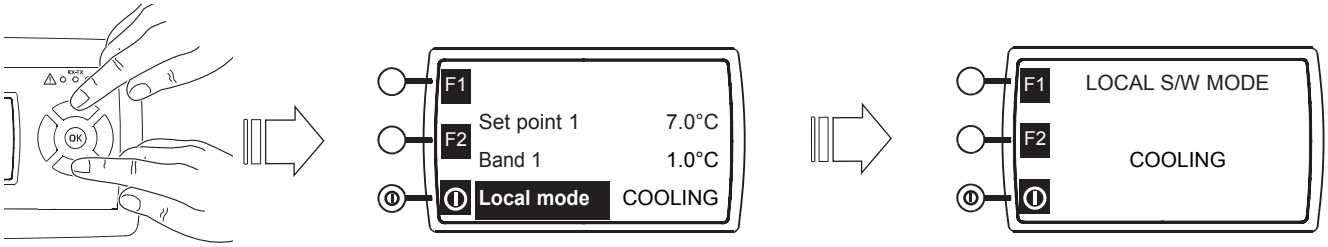


Opening the contact On/Off REM the unit before shutting down and then in standby.

CHANGE OPERATING MODE (hot / cooling) BY CONTROL PANEL

To change the operation mode (hot / cooling) by control panel, select **LOCAL MODE** from the main screen.

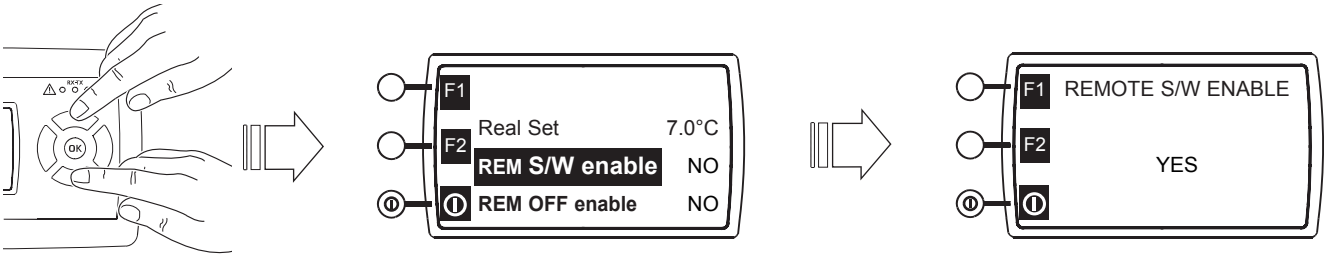
NOTE: THE CHANGE, OF THE OPERATION MODE BY CONTROL PANEL HAS A PRIORITY MORE LOW COMPARED TO CHANGE THE OPERATION MODE BY DIGITAL INPUT: IF THE DIGITAL INPUTS S/W REM IS OPEN THE UNIT WORK IN HEAT PUMP REGARDLESS TO CHANGE OPERATING MODE BY CONTROL PANEL.



CHANGE OPERATING MODE (SUMMER / WINTER) BY DIGITAL INPUT

To activate this function, select **REM S/W enable** from the main screen and with the joystick-menu buttons set YES.

NOTE: IF YOU ENABLE REM S/W WHILE THE UNIT IS TURNED ON, THE UNIT COULD SWITCH OFF AND CHANGE THE MODE OF OPERATION IF THE DIGITAL INPUT REM S/W IS OPEN.



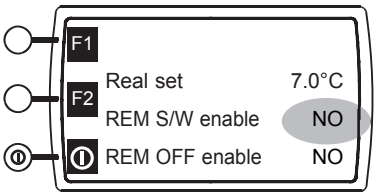
THE CHANGE OPERATING MODE FROM DIGITAL INPUT HAS PRIORITIES IN RELATION TO CHANGE OPERATING MODE FROM KEYBOARD: IF THE DIGITAL INPUTS S/W REM IS OPEN THE UNIT WORK IN HEAT PUMP REGARDLESS TO CHANGE OPERATING MODE FROM KEYBOARD.

Local mode by control panel	**REM S/W enable**	digital input: **14_S/W REM**	Mode of operation of unit
Cooling	NO	the mode of operation of unit, not depends by digital input	Cooling
Hot			Hot
Cooling	YES	CLOSE **(off)**	Cooling
Hot			
Cooling	YES	OPEN **(on)**	Hot
Hot			

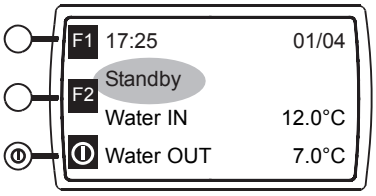
RECOMMENDED SETTINGS : to properly configure the change mode of operation by digital input, try the following:

CAUTION: THESE OPERATIONS MUST BE PERFORMED BY QUALIFIED PERSONNEL

-Sure that the parameter **REM S/W Enable** is set to **NO**.



-Turn off the unit from the control panel and wait until it is displayed the writing Standby.



-Remove power to the board by bringing the door lock switch in position **"0"**.

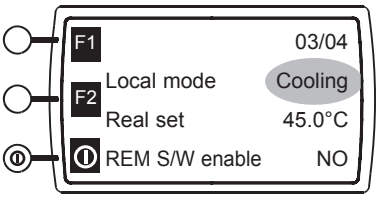
- Connect the **remote contact (summer / winter)** to the user terminal within the electrical panel and make sure that **contact** is **close.** (Electrical schematic of the unit).

- Close the electrical panel.

- Apply power to the electrical panel by bringing the door lock switch in position **"1"**

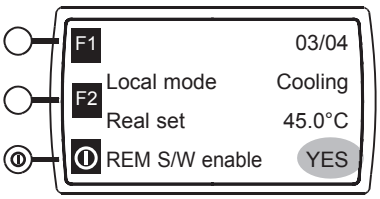
- Wait for the main page on the control panel.

- Set the local mode of operation at **Cooling**.



-Set the parameter REM S/W Enable at **YES**.

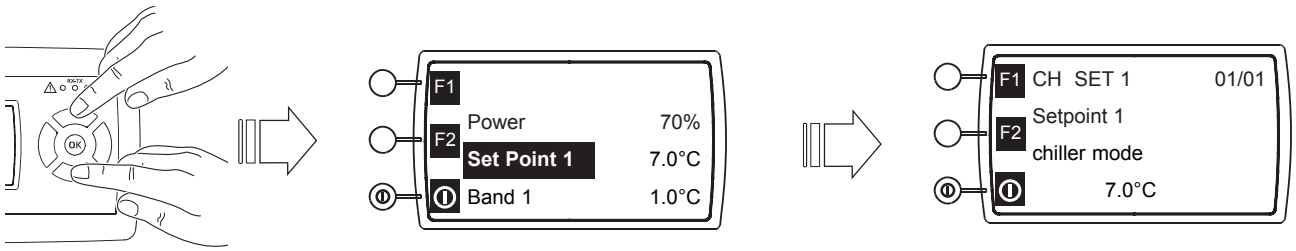
(Note: If you set **REM S/W Enable = YES** and the remote contact Summer / Winter is
- CLOSED **(off):** the unit is ready for operation at cooling mode
- OPEN **(on)**: 4-way valves immediately reverse cycle-switching
and the unit will be ready for operation at heat-pump mode)



TO PRESS THE ON/OFF BUTTON ON THE CONTROL PANEL, THE UNIT AUTOMATICALLY BEGINS TO OPERATE IN A MODE ESTABLISHED BY REM S/W DIGITAL CONTACT.

SETTING THE OPERATING SET POINT

From the main screen, press the "**Up**" and "**Down**" buttons to access **Set Point 1** and press **ENTER**: the **"Setpoint 1 chiller mode"** screen will appear. Press **ENTER** to make the temperature value 7.0°C blink and change it with the "**Up**" and "**Down**" buttons as required. Press **ENTER** to confirm.
To return to the main screen, press the **LEFT (ESC)** button several times:



To modify the **Band 1** proceed in a similar manner to the one described for setting the operating SET POINT.

IMPORTANT NOTE:
In "time proportional regulation" is reccomended to keep the band=1°C.

TERMOREGULATION TIME PROPORTIONAL

COOLING MODE (IR)

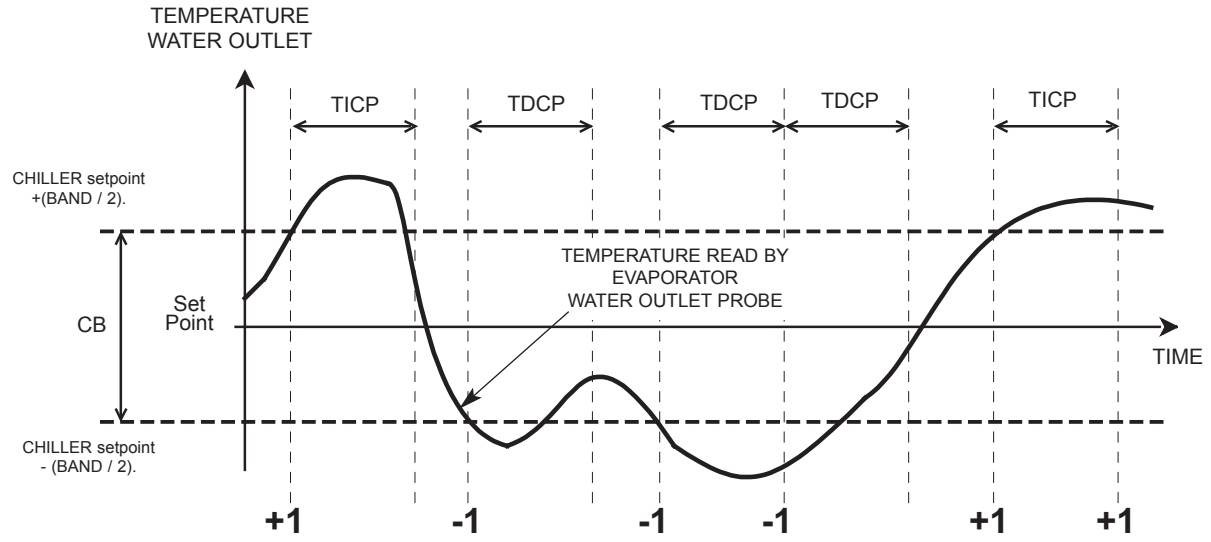
The function of the regulator consists in activating a number of resources (power step) in proportion to the time that the evaporator water outlet by spends beyond the threshold given by **CHILLER SETPOINT + (BAND / 2).** The band is symmetric with respect to the value of CHILLER SETPOINT.

When the temperature has exceeded the threshold value for the duration of the parameter **CHILLER INC POWER TIME,** activate a power step. If the temperature of evaporator water outlet by remains above the threshold value for further **TEMPO POWER INCREASE IN COLD**, is another power step.

If the temperature of evaporator water outlet by remain within the temperature range determined by **CHILLER SETPOINT + (BAND / 2)** and **CHILLER SETPOINT - (BAND / 2)** the power output from the machine remains constant.

If the temperature of evaporator water outlet by remains below the threshold **CHILLER SETPOINT - (BAND / 2)** for the time given by the parameter **CHILLER DEC POWER TIME** is a step off power.

In this algorithm there is no hysteresis.



TICP: Chiller INC power time (TIME INCREASING COOLING POWER)

TDCP: Chiller DEC power time (TIME DECREASING COOLING POWER)

CB: COOLING BAND

SET POINT: SET POINT TEMPERATURE IN COOLING

HEATING MODE (IP / IW)

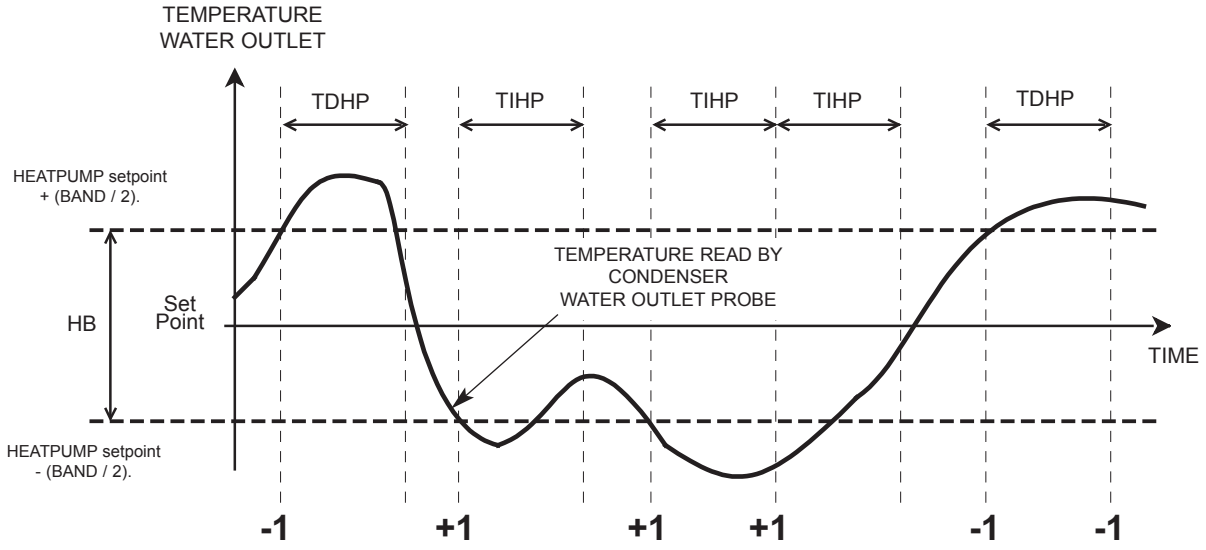
The function of the regulator consists in activating a number of resources (power step) in proportion to the time that the evaporator water outlet by spends below the threshold given by **HEAT PUMP SETPOINT - (BAND / 2).** The band is symmetric with respect to the value of HEAT PUMP SETPOINT.

When the temperature remains below the threshold value for the duration of the parameter **HEAT PUMP INC POWER TIME,** activate a power step. If the temperature of evaporator water outlet by remains below the threshold value for further **HEAT PUMP INC POWER TIME**, is another power step.

If the temperature of evaporator water outlet by remain within the temperature range determined by **HEAT PUMP SETPOINT + (BAND / 2)** and **HEAT PUMP SETPOINT - (BAND / 2)** the power output from the machine remains constant.

If the temperature of evaporator water outlet by remains above the threshold **HEAT PUMP SETPOINT + (BAND / 2)** for the time given by the parameter **HEAT PUMP DEC POWER TIME** is a step off power.

In this algorithm there is no hysteresis.



TIHP: Chiller INC power time (TIME INCREASING HEATING POWER)

TDHP: Chiller DEC power time (TIME DECREASING HEATING POWER)

HB: HEATING BAND

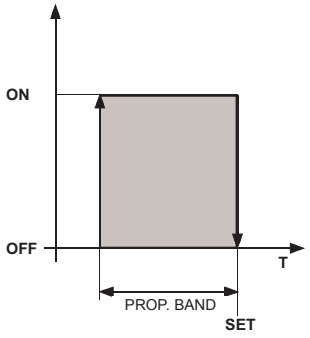
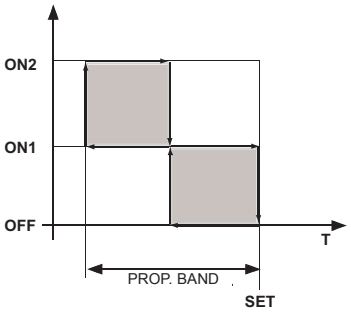
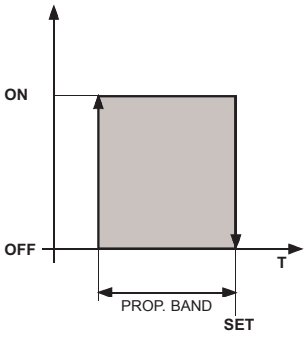
SET POINT: SET POINT TEMPERATURE IN HEATING

HEAT RECOVERY

The recovery function heats water using heat from the condenser that otherwise would be dispersed in the environment:
- In air (**air-water** units)
- In water (**water-water** units)

When the machine is in cooling mode (compressors on), if the water in the recovery circuit is of a sufficiently low temperature to require heat, the machine switches from normal to recovery mode.
When the water temperature reaches the recovery set point, the machine switches back to normal operating mode.

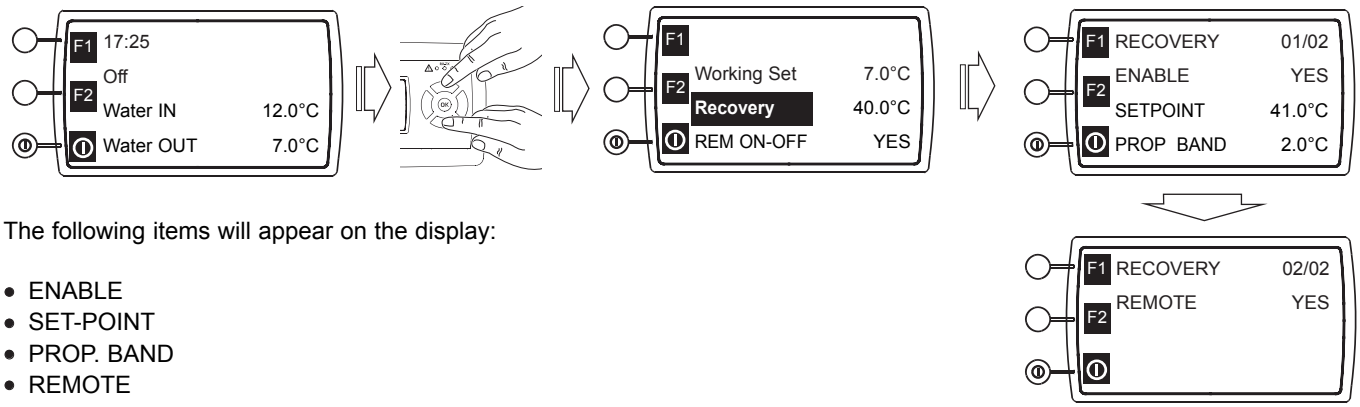
Switching from normal operation to heat recovery and vice versa, takes place:
- respecting the minimum time of operation set for the two modes
- minimize compressor power (screw compressor).

-	AIR-WATER UNIT	WATER-WATER UNIT
PARTIAL HEAT RECOVERY **VP**		Units in **water-water** condensation is unique for all circuits refrigerator and heat recovery is always **TOTAL**.
TOTAL HEAT RECOVERY **VR**		

SET - recovery set-point **PROP. BAND** - proportional band **T:** Temperature measured by sensor at recovery water inlet

HEAT RECOVERY SETTING THE PARAMETERS

To access the operating parameters for heat Recovery mode, bring on the start screen, scroll through the pages to select the **"Recovery"** and press **ENTER**.



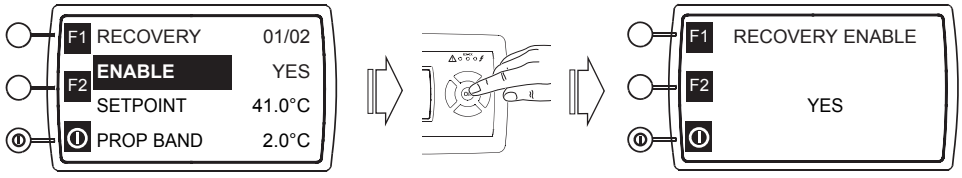
The following items will appear on the display:

- ENABLE
- SET-POINT
- PROP. BAND
- REMOTE

ENABLE

Serves to enable the Recovery function.

Using the **MENU** joystick buttons, select ENABLE .



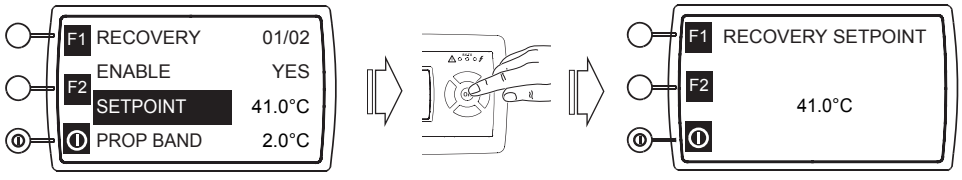
To change the YES/NO status, press **"Enter"** twice:
the value YES will start flashing

- change the value as required using the **"Up/Down"**buttons.

After changing the value, press **"Enter"** to confirm and then press **"Left"** to exit.

SET-POINT

Using the **MENU** joystick buttons, select the SET POINT parameter.
This parameter is set by default to 41.0 °C.



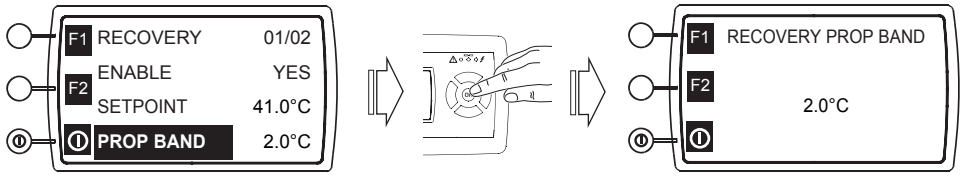
To change this set-point value, press **"Enter"** twice:
the value 41.0 ºC will start flashing

- change the set-point value as required using the **"Up/Down"** buttons.

After changing the value, press **"Enter"** to confirm and then press **"Left"** to exit.

PROP. BAND

Using the **MENU** joystick buttons, select the PROP. BAND parameter.
This parameter is set by default to 2.0 °C.



To change this set-point value, press **"Enter"** twice:
the value 2.0 °C will start flashing

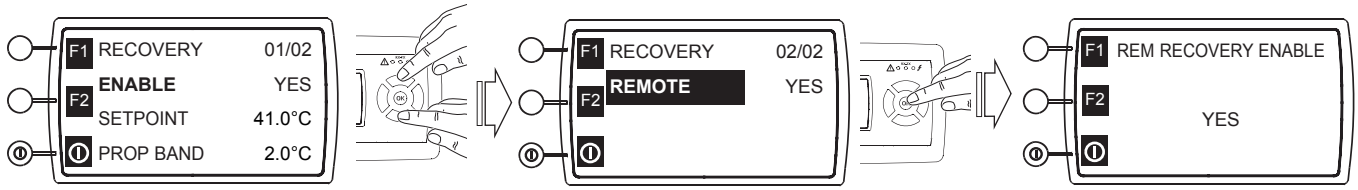
- change the value as required using the **"Up/Down"**buttons.

After changing the value, press **"Enter"** to confirm and then press **"Left"** to exit.

REMOTE

Allows the Recovery function to be enabled from a remote digital input.

Using the **MENU** joystick buttons, select the REMOTE parameter.



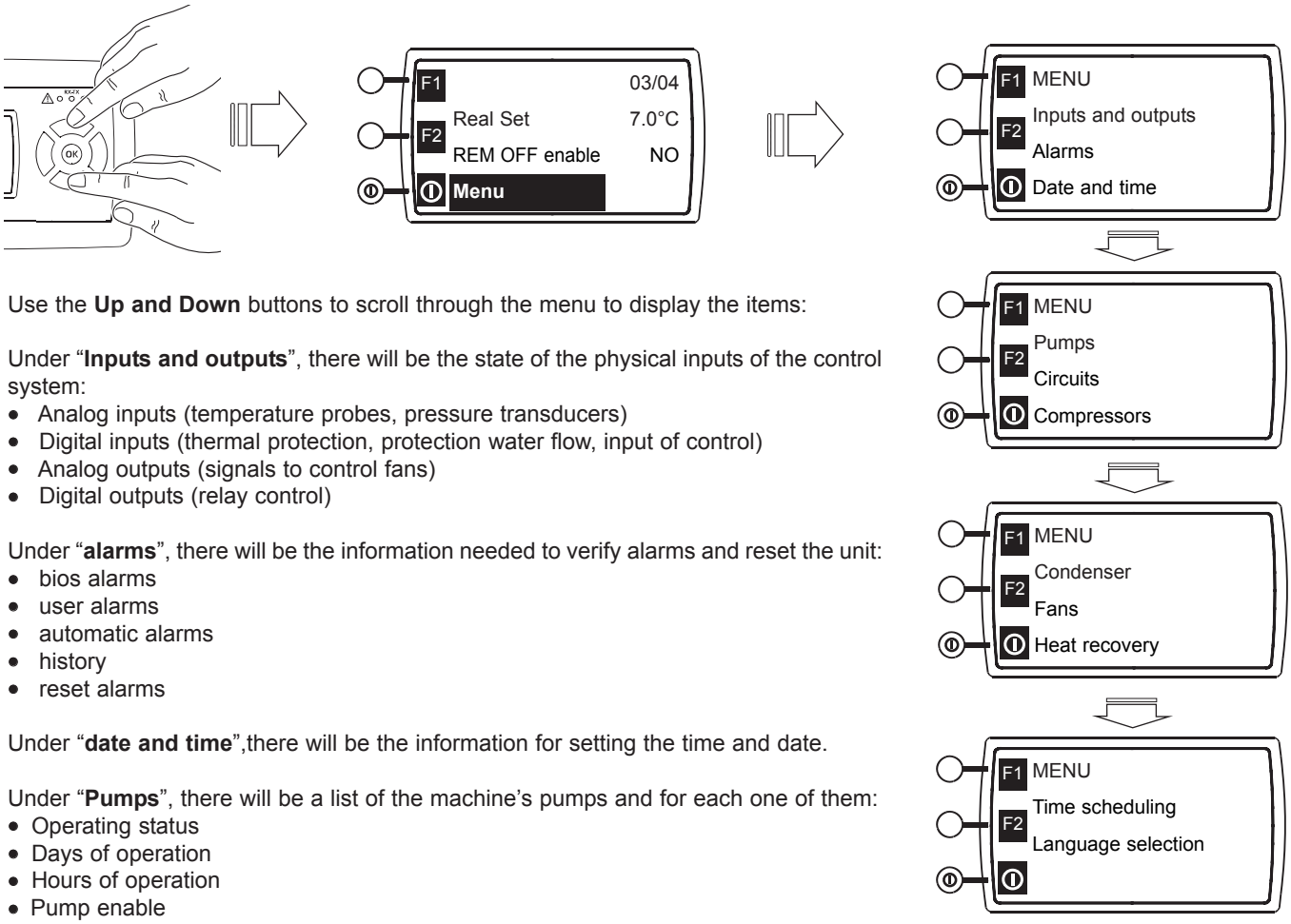
To change the YES/NO status press **"Enter"**twice:
the value will start flashing

- change the value as required using the **"Up/Down"**buttons.

After changing the value, press **"Enter"** to confirm and then press **"Left"** to exit.

STATE OF OPERATION

To know the machine's operating status, scroll through the main menu down to the bottom and select "menu", then press "**Enter**".



Use the **Up and Down** buttons to scroll through the menu to display the items:

Under "**Inputs and outputs**", there will be the state of the physical inputs of the control system:
- Analog inputs (temperature probes, pressure transducers)
- Digital inputs (thermal protection, protection water flow, input of control)
- Analog outputs (signals to control fans)
- Digital outputs (relay control)

Under "**alarms**", there will be the information needed to verify alarms and reset the unit:
- bios alarms
- user alarms
- automatic alarms
- history
- reset alarms

Under "**date and time**",there will be the information for setting the time and date.

Under "**Pumps**", there will be a list of the machine's pumps and for each one of them:
- Operating status
- Days of operation
- Hours of operation
- Pump enable

Under "**Circuits**" there will be a list of the machine's circuits and, for each one of them, there will be displayed:
- The compressor suction pressure read by the low-pressure transducer (if present)
- The compressor discharge pressure read by the high-pressure transducer (if present)
- The current operating status (alarm or power)
- The power of the circuits
- Condensation temperature
- The HPP's status - High Pressure Prevention (only RHV / WSH / RVW unit)
- The ATC's status - Advanced Temperature Control (only RLA / LFL / WRL unit)

Under “**Compressor**” there will be a list of the machine’s compressors and, for each one of them, there will be displayed:
- The current state of operation (power or alarm)
- Power output expressed as a %
- Compressor discharge temperature
- Hours of operation
- Days of operation
- Compressor enable

Under “**Condenser”** there will be the percente of condensing control (water-water unit).

Under "**Fans**" will list the bench and fans for each of them, will be displayed:
- speed of operation, expressed in %

Under the heading "**Heat Recovery**" will list the condensers for the heat recovery and for each of them, will be displayed:
- recovery enable
- the power expressed in %
- input temperature

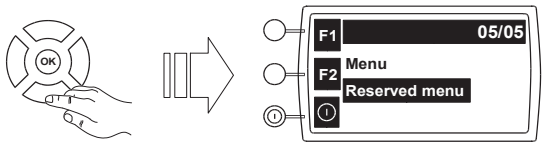
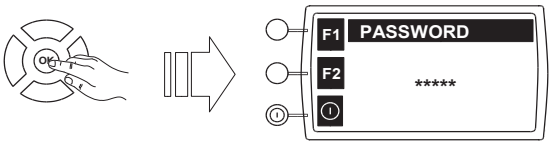
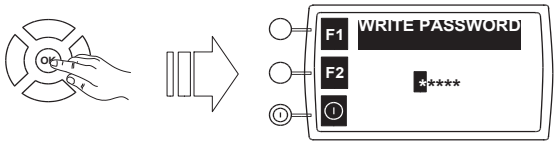
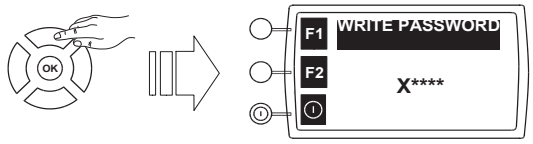
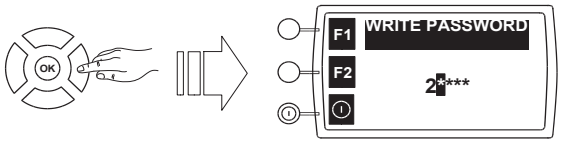
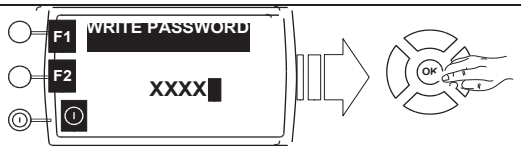
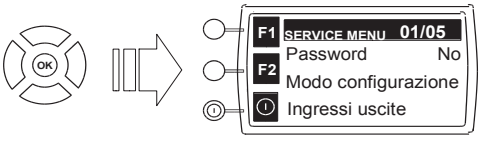
Under **"time scheduling"**, will be settings for configuring the time scheduling.

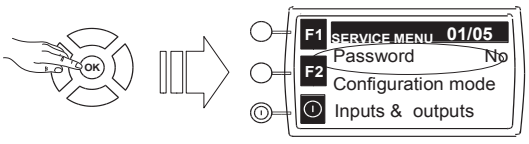
Under "**Language Selection**", gives us the opportunity to change the user menu language:
- 0 = italian
- 1 = english

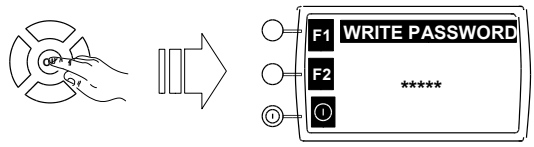
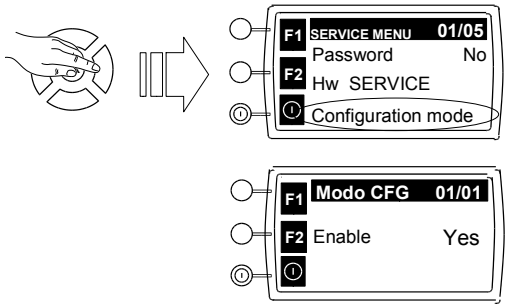
PARAMETERS SETTING OF BRINE UNIT

1 -Set the unit in st-by

2 - select menu service in according the following instructions

To access the service menu, press the **DOWN** key and select the Reserved menu item on the last of the main pages.	
Press **OK** to access the page for entering the **password** of the **service menu.**	
Press **OK**. The first digit " * " will start flashing.	
Enter the password "" one digit at a time using the UP, DOWN keys. Press the **RIGHT** key to go to the next digit	 
After entering the password, press **OK** to confirm. **The control system does not generate any warning if the password entered is incorrect.**	
Press F1	
It will appear SERVICE MENU	
If the **SERVICE MENU** does not appear, it means a mistake was made entering the password and it is necessary to start the procedure again. **The password is reserved to the technical service**	

Select Password, then press OK	

It will appear ***** Press OK 2 time to select and confirma *****	
Select Configuration mode and press OK. Then pressing RIGTH or OK select Enable Yes	

Then press the **LEFT key** once, scroll the menu to select **Parameters modify** and press OK.

Modify the parameters of the following tables in according the water temperature desired and the model of the unit

RLA – RHA

Path menu	PARAMETER	DEFAULT	DESCRIPTION	
Menu factory – parameters modify - machine parameters- thermoregulation-chiller	***setpoint 1 chiller mode***	7.0 °C	Regulation set point 1 in cooling mode.	Parameters involved during operation with **set point 1**
	MIN setpoint 1 chiller mode	5.0 °C	Minimum value set point 1 in cooling mode.	
Menu factory – parameters modify - machine parameters- thermoregulation-chiller	***setpoint 2 chiller mode***	7.0 °C	Regulation set point 2 in cooling mode.	Parameters involved during operation with **set point 2**
	MIN setpoint 2 chiller mode	5.0 °C	Minimum value set point 2 in cooling mode.	
Menu factory – parameters modify - machine parameters- Antifreeze – antifreeze alarm	***CH antifreeze alarm set point 1***	3.0 °C	Parameters for management of alarm activation (**SET 1**)	
	CH antifreeze alarm set point 2	3.0 °C	Parameters for management of alarm activation (**SET 2**)	
Menu factory – parameters modify - machine parameters- Antifreeze – antifreeze prevention	***Ch antifreeze prev. set point 1***	4.0 °C	Parameters for management of antifreeze prevention in cooling mode (**SET 1 pump**) with antifreeze heater and pump.	
	Ch antifreeze prev. set point 2	4.0 °C	Parameters for management of antifreeze prevention in cooling mode (**SET 2 pump**) with antifreeze heater and pump.	
Menu factory – parameters modify - machine parameters- circuits	***min press. Alarm setpoint***	3 bar R410A	Parameters for management of low pressure alarm by electronic transducer	

NOTE: When you have finished editing parameters, return to the Configuration Mode and press RIGHT / OK to set NO.

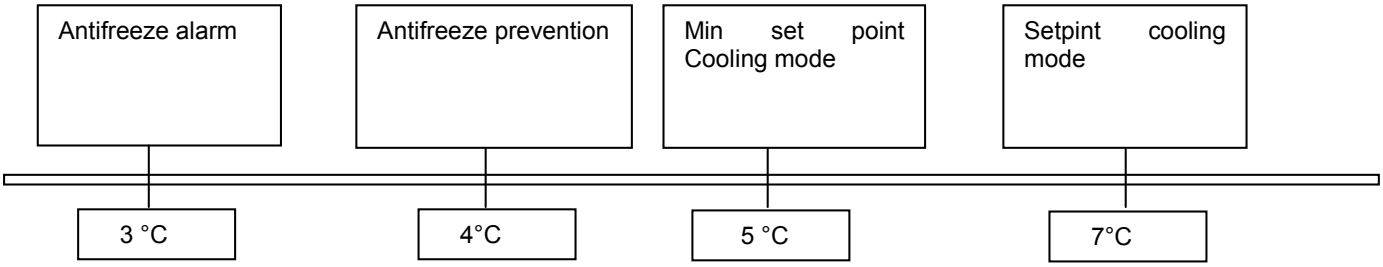
Press many times the left button up to return the main menu.

At the end, power OFF the unit and power ON by the main switch to reset the system.

MONITORING SYSTEM - User interface

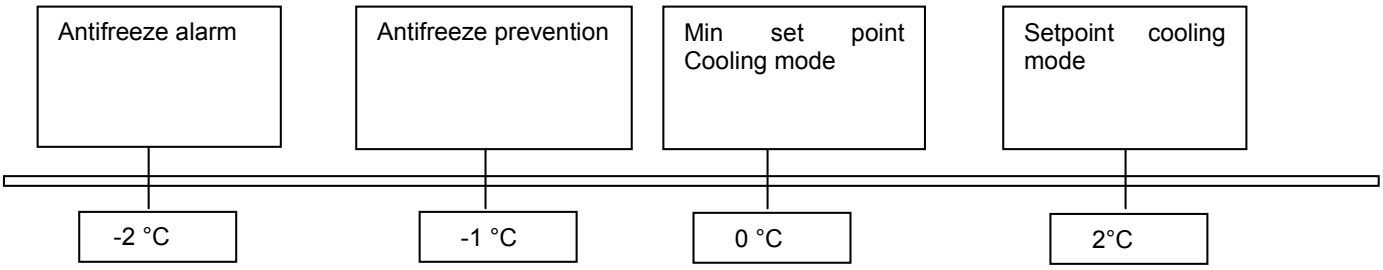
Default factory value

T. in 12°C – T. out 7°C



Modified values for BRINE

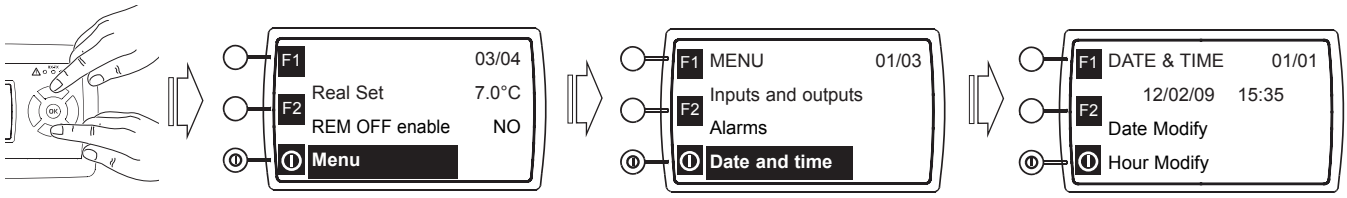
T. in 7°C – T. out 2°C



VERY IMPORTANT : A CORRECT GLYCOL % SOLUTION MUST ALWAYS BE USED WITH THESE UNITS.

DATE AND TIME

The “**Date and time**” menu is used to set the date and time on the instrument.
To set the date and time, go to the “**Date and time**” menu with the joystick-Menu buttons.

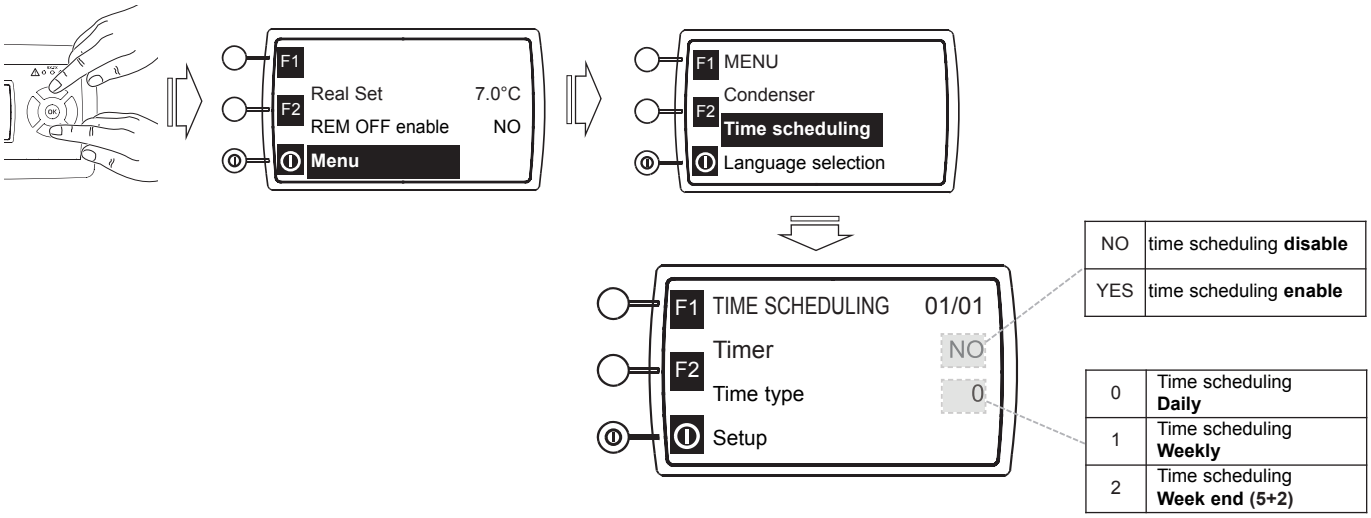


TIME SCHEDULING MANAGEMENT

The control panel allows you to program the time scheduling of the unit.

PREMISE:
For the correct working of the time scheduling is necessary to set up current day and hour

Time scheduling setup can be done by logging on to the submenu. :



TIMER TYPE = 0: “Time scheduling Daily”: With this timer type you can select a different time scheduling for each day of the week. Under SETUP line you can set up max 4 time bands- singularly activable- for **each different day** of the week.

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Time band 1							
Time band 2							
Time band 3							
Time band 4							

TIMER TYPE = 1: “Time scheduling Weekly” : With this timer type for all days the unit will work with the same time scheduling. Under SETUP line you can set up max 4 time bands- singularly activable- **for all the days** of the week.

	WEEKLY
Time band 1	
Time band 2	
Time band 3	
Time band 4	

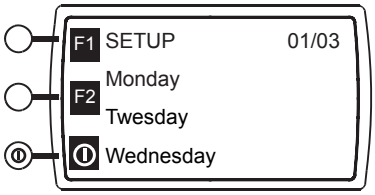
TIMER TYPE = 2: “Time scheduling Week end (5+2)” : With this timer type you can select 2 different time scheduling: one for working days and one for weekend. Under SETUP line you can set up max 4 time bands- singularly activable- **for the working days (from Monday to Friday) and for the weekend days (Saturday and Sunday).**

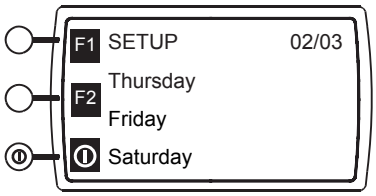
	MONDAY - FRIDAY	SATURDAY - SUNDAY
Time band 1		
Time band 2		
Time band 3		
Time band 4		

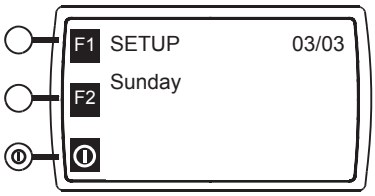
After timer type set you have to go to **SETUP** line to actually setup the start, the end, the unit mode and water temp setup for each time band.

SETUP: according to the different timer type selected on the display there will be different lines:

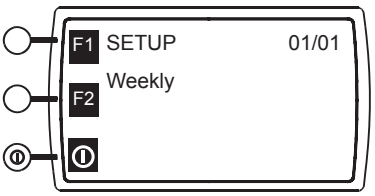
TIMER TYPE = 0 (Daily)



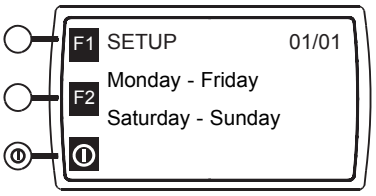




TIMER TYPE = 1 (Weekly)



TIMER TYPE = 3 (Week-end 5+2)



IMPORTANT NOTE

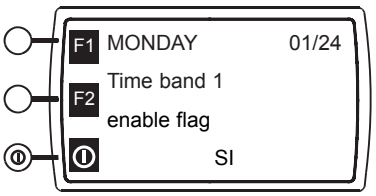
For the chiller working, the time scheduling setup is always priority on the setup done by keyboard control, except the remote ON/OFF by digital input

The digital input remote ON/OFF -IF ENABLED- is always priority on time scheduling:
If the unit is in OFF mode by remote (remote ON/OFF) and the time scheduling are enabled the unit remains OFF. When you switch ON the unit by remote ON/OFF the unit starts to work following the time scheduling setup.

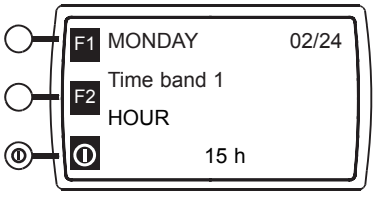
Time scheduling management is disabled even if the configuration mode is activated.

For instance for **TIMER TYPE = 0** (daily) in submenu **SETUP** you have to move on **MONDAY** line then press ENTER and so setup for each time band the parameters showed:

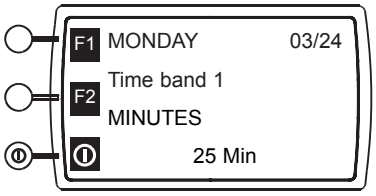
TIME BAND 1 ENABLE FLAG: this parameter enable/disables the first time band



TIME BAND 1 HOUR: this parameter allows the setting of the start hour of the first time band

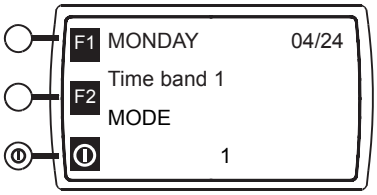


TIME BAND 1 MINUTES: this parameter allows the setting of the start minutes (from 0 to 59 inside the time band hour) of the first time band.



TIME BAND 1 MODE: this parameter allows the setting of the unit operation mode in the first time band:

1 = OFF
Enabling this mode the unit is off and it is not possible to switch on neither by display user interface nor by digital input (for instance by remote)

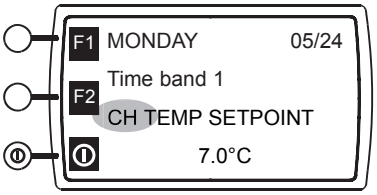


2 = COOLING
Enabling this mode the unit is on and in cooling mode. The water set point is the value fixed on **TIME BAND 1 CH TEMP SETPOINT It is not possible to switch off the unit by display user interface, but only by digital input (Remote ON/OFF) - if activated -**

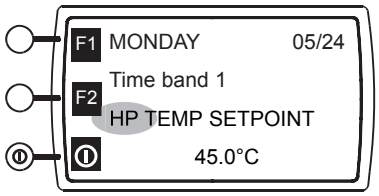
3 = MANUAL MODE (not used)

4 = LOCAL SET (only cool)
Enabling this mode the unit is on and in cooling mode.
The water set point is the value fixed by display user interface (we can define standard set point). **It is not possible to switch off the unit by display user interface, but only by digital input (Remote ON/OFF) - if activated -.**

TIME BAND 1 CH TEMP SETPOINT:
This parameter allows the setting on chiller mode (**CH**) of the water temperature set point.



TIME BAND 1 HP TEMP SETPOINT: <u>not used for only cooling units.</u>
This parameter can be used only for heat pump (**HP**) units: it allows the setting on heat pump mode of the water temperature set point.

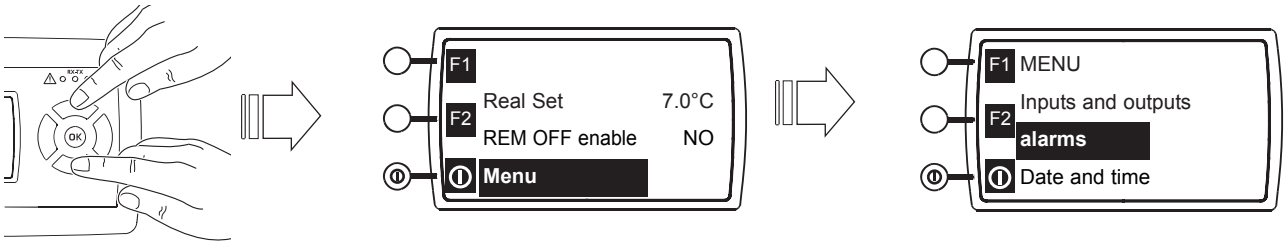


For each operating mode the standard set point is stored in a non volatile memory of the control board and it will be used again by the unit when the time scheduling are disabled.

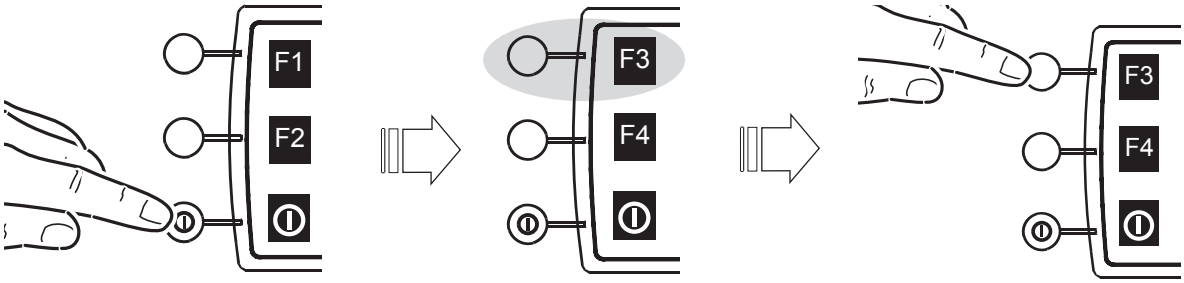
ALARMS

The alarms menu is used to display and reset any active alarms and display the alarm log.
There are 2 different ways of accessing the alarms menu:

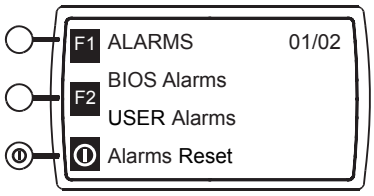
Mode 1: Scroll through the main menu down to the bottom and select “Menu”, then press “Enter”, then select “Alarms” and press “Enter”.



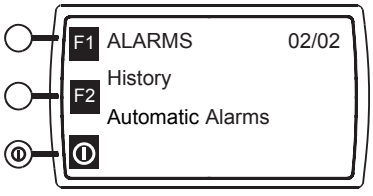
Mode 2: Press and hold down button F3 for a few seconds.
The alarm menu is displayed as follow



1° VIEW



2° VIEW



Select the relevant item and press “**Enter**”.
- When an alarm is present, the red led is ON.
- When an alarm is resettable, the red led is blinking.
- In order to reset an alarm, select “alarm reset” and press ENTER.

BIOS ALARMS

They solely concern **HW** and **SW** operation of the micro-controller and do not involve the machine components (**compressors, pumps, sensors, etc.**)
After selecting the bios alarms menu, all active bios alarms are displayed.
The bios alarms can end automatically or can last until operator intervention.
For example: The RTC battery alarm (RTC= Real Time Clock), while not being a cause of failure, shuts down the machine until the current date and time are set correctly.

If there is no **bios alarm** the "**EMPTY**" string is displayed for 2 seconds.

Bios alarms list

View display	description	recovery action
TIMEOUT INTERNAL EXP	Communication error with the expansion boards	Turn off the unit from switch control panel Check the connection between the motherboard and expansions Turn on the unit and verify the adsens of the alarm If the problem persists contact the service support
TIMEOUT EXP.1		
TIMEOUT EXP.2		
TIMEOUT EXP.3		
TIMEOUT EXP.4		
BIOS AREA CRC ERR EXTERNAL EEPROM	Sw error	Turn off the unit from switch control panel Turn on the unit and verify the adsens of the alarm If the problem persists contact the service support
USER AREA CRC ERR EXTERNAL EEPROM	Sw error	
Communication RTC ERR	Sw error	
Registers RTC ERROR	Sw error	
Modem connection ERR	Sw error	
Hardware modem ERR	Sw error	
Software modem ERR	Sw error	
Low battery RTC	**data and time are lost**	**date and time must be setted**

MONITORING SYSTEM - Alarms

USER ALARMS

They are only **manual reset** alarms and concern solely the machine's components (compressors, fans, pumps, sensors, pressure switches, etc.) and do not involve the HW and SW operation of the micro-controller.

in order to restart the system it is necessary:
- removing the cause of alarm
- to reset manually the alarm from the alarm submenu

If there are no active user alarms, the "**EMPTY**" string is displayed for 2 seconds.

User alarms table

Alarms shown on display	Components involved	Alarm effect	Cause of alarm
high temperature water evaporator	evaporator water inlet probe	Stop compressor and fan The pump stays on	Values outside limit
evaporator 1 antifreeze	evaporator water outlet probe		
circuit 1 high press auto/man	circuit 1 high press switch and or transducer		-Values outside limit
circuit 2 high press auto/man	circuit 2 high press switch and or transducer		
Circuit 1 low pressure	circuit 1 low press switch		
Circuit 2 low pressure	circuit 2 low press switch		
compressor 1 thermal protection	Compressor electronic protector Discharge pipe compressor thermal switch (if installed)	Stop compressor and fan The evaporator pump stays on Stop condenser pump	-current value outside limit -electronic thermal protector damaged - high temperature compressor outlet
compressor 2 thermal protection			
compressor 1A thermal protection			
compressor 1B thermal protection			
compressor 1C thermal protection			
compressor 2A thermal protection			
compressor 2B thermal protection			
compressor 2C thermal protection			
Compressor 1 discharge temp	Discharge pipe compressor 1 sensor		- Values outside limit
Compressor 2 discharge temp	Discharge pipe compressor 2 sensor		
evaporator pump A unavailable	evaporator pump A	Stop evaporator pump A	-Pump not available from the controller
evaporator pump B unavailable	evaporator pump B	Stop evaporator pump B	
evaporator pump A thermal protection	evaporator pump A	Stop evaporator pump A	-current value outside limit
evaporator pump B thermal protection	evaporator pump B	Stop evaporator pump B	
evaporator water flow evaporator 1 water flow	evaporator water differential pressure switch and/or flowswitch.	Stop unit with only 1 pump present. Swap to the other pump if two pump are present If the alarm persist, stop the unit.	-no water circulation or insufficent water flow rate -defective sensors switch not correct
fans 1 thermal protections	thermal protection Fans 1	Stop compressor and fan The evaporator pump stays on	-current value outside limit
fans 2 thermal protections	thermal protection Fans 2		
Heat recovery pump A thermal protections	Heat recovery pump A	Stop heat recovery pump A	-current value outside limit
Heat recovery pump B thermal protections	Heat recovery pump B	Stop heat recovery pump B	
heat recovery pump A unavailable	Heat recovery pump A	Stop heat recovery pump A	-Pump not available from the controller
heat recovery pump B unavailable	Heat recovery pump B	Stop heat recovery pump B	
heat recovery water flow	differential pressure switch and/or flow switch, recovery water heat exchanger	immediate exit from recovery mode	-no water circulation or insufficent water flow rate -defective sensors switch not correct
Circuit 1 EEV alarm	electronic expansion valv 1 error	Stop compressor and fan The pump stays on	- value outside limit (refer to electronic expansion valve alarm table)
Circuit 2 EEV alarm	electronic expansion valv 2 error		
Immediate stop chiller	Electrical panel temperature switch (high temperature version)	Stop the unit	- too high temperature inside the electrical panel - electrical panel fans damaged - fans filters dirty (high temperature version)

MONITORING SYSTEM - Alarms

Alarms shown on display	Components involved	Alarm effect	Cause of alarm
High temperature water condenser	Water outlet probe condenser 1 Water outlet probe condenser 2	Stop the unit	- value outside limit
Low temperature water condenser			
Condenser water flow	Condenser water differential pressure switch and/or flowswitch.	Stop the unit	-no water circulation or insufficent water flow rate -defective sensors switch not correct
Condenser pump A thermal protections	Condenser Pump A	Condenser Pump A stop	-current value outside limit
Condenser pump B thermal protections	Condenser Pump B	Condenser Pump B stop	
Condenser pump A unavailable	Condenser Pump A	Condenser Pump A stop	-Pump not available from the controller
Condenser pump B unavailable	Condenser Pump B	Condenser Pump B stop	
High temperature plant return	Evaporator water inlet probe	Stop compressor and fans of all circuits Evaporator pumps remain active	- value outside limit
Low temperature plant return			

MONITORING SYSTEM - Alarms

AUTOMATIC ALARMS

In case of these alarms the unit start automatically after removing the cause. Manual reset is not required.

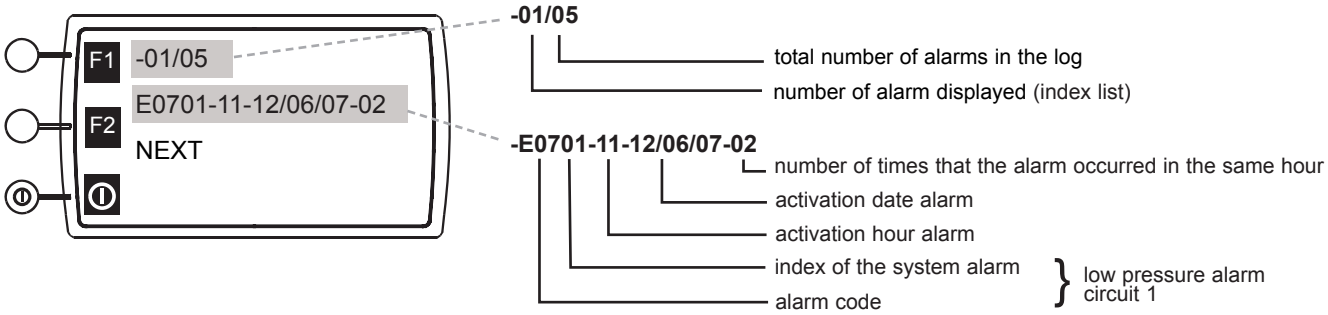
If there are no active **AUTOMATIC alarms**, the "**EMPTY**" string is displayed for 2 seconds.

Automatic alarms table

Alarms shown on display	Components involved	Alarm effect	Cause of alarm
Dinamic set point sens ERR	Dinamic setpoint probe	Stop dinamic setpoint function	Sensor faulty, Interrupted or in short circuit
Sens ERR evaporator water inlet	Evaporator water inlet probe	Stop compressors and fans The evaporator pump stays on. Stop condenser pump	
Sens ERR evaporator water outlet	Evaporator water outlet probe		
circuit 1 High press sens ERR	High pressure transducer circuit 1	Stop compressors 1 and fans circuit 1 The evaporator pump stays on. Stop condenser pump	
comp 1 temp disch sens ERR	Discharge pipe compressor 1 probe		
circuit 1 Low press sens ERR	Low pressure transducer circuit 1		
condenser 1 temp sens ERR	Condenser 1 water outlet probe		
circuit 2 High press sens ERR	High pressure transducer circuit 2	Stop compressors 2 and fans circuit 2 The evaporator pump stays on Stop condenser pump	
comp 2 temp disch sens ERR	Discharge pipe compressor 2 probe		
circuit 2 Low press sens ERR	Low pressure transducer circuit 2		
condenser 2 temp sens ERR	Condenser 2 water outlet probe		
Power supply control alarm	Phase sequence monitor	Stop unit	Incorrect sequence or no power supply phases
Heat recovery H2OIN sens ERR	Heat recovery water inlet probe	immediate exit from heat recovery mode	Sensor faulty, Interrupted or in short circuit
Sens ERR outdoor air probe	Outdoor air probe	The settings depend on the probe not be executed	Sensor faulty, Interrupted or in short circuit
DEMAND LIMIT sens ERR	DEMAND LIMIT analog input	DEMAND LIMIT function ignored	Sensor faulty, Interrupted or in short circuit
Circuit 1 liquid probe sens ERR	Circuit 1 coil probe	Stop compressors and fans circuit 1 The evaporator pump stays on	Sensor faulty, Interrupted or in short circuit
Circuit 2 liquid probe sens ERR	Circuit 2 coil probe	Stop compressors and fans circuit 2 The evaporator pump stays on	
Circuit 1 high press pre-all	High pressure transducer circuit 1	Red LED blinking Stores in the historic alarm The unit stay on	-current value outside limit
Circuit 2 high press pre-all	High pressure transducer circuit 2		
Circuit 1 low press pre-all	Low pressure transducer circuit 1		
Circuit 2 low press pre-all	Low pressure transducer circuit 2		
Circuit 1 gas leakage	Low pressure transducer / switch circuit 1	Stop unit	possible leakage of gas from the circuit
Circuit 2 gas leakage	Low pressure transducer / switch circuit 2		
ERR open file black-box	Black-box file	Nothing	SW error
ERR write file black-box			
ERR close file black-box			

ALARMS HISTORY

The control board has the ability to store in code the last 50 alarm entries that occurred in the unit.



DISPLAYING THE ALARMS HISTORY

The alarms log can be displayed from the specific menu using the keys on the keypad. When **first** opened, the oldest alarm in the log (number 1 in the list) is shown. Press ENTER on the keypad to scroll through the stored alarms to the most recent. The last alarm is stored as an index list the greatest number.

If you access the alarms log display menu after having browsed through the alarms log, the display will show the last alarm to be displayed instead of the the last alarm to be activated.

pressing ENTER on the MENU joystick, displays the next alarm in the list; the alarm list number will therefore be increased. When you arrive at the end of the list, pressing ENTER will return you to the first alarm in the alarms log.

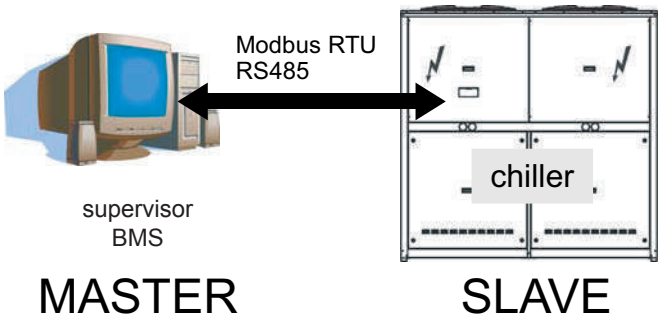
Alarms history table

Alarm code	Alarm
E0000	sens err evaporator water inlet
E0300	high temperature plant return
E0400	low temperature plant return
E0501	circuit 1 high press sens err
E0502	circuit 2 high press sens err
E0601	circuit 1 high press auto/man
E0602	circuit 2 high press auto/man
E0701	circuit 1 low pressure
E0702	circuit 2 low pressure
E0901	compressor 1a thermal protection
E0902	compressor 1b thermal protection
E0903	compressor 1c thermal protection
E0904	compressor 2a thermal protection
E0905	compressor 2b thermal protection
E0906	compressor 2c thermal protection
E1101	evaporator pump a thermal protection
E1102	evaporator pump b thermal protection
E1200	evaporator 1 water flow
E1301	fans circuit 1 thermal protection
E1302	fans circuit 2 thermal protection
E1401	evap 1 water out sens err
E1501	evaporator 1 antifreeze
E1601	circuit 1 liquid probe sens err
E1602	circuit 2 liquid probe sens err
E1801	circuit 1 low press sens err
E1802	circuit 2 low press sens err
E2000	power supply control alarm
E2101	circuit 1 eev alarm
E2102	circuit 2 eev alarm
E2301	heat recovery pump a thermal protection
E2302	heat recovery pump b thermal protection
E2400	heat recovery water flow
E2500	heat recovery h2o in sens err
E3100	outdoor air probe sens err
E3301	circuit 1 high press pre-all
E3302	circuit 2 high press pre-all
E3401	circuit 1 low press pre-all
E3402	circuit 2 low press pre-all
E3601	circuit 1 gas leakage
E3602	circuit 2 gas leakage

SERIAL INTERFACE: RS485 MODBUS® RTU

Through the accessory interface RS485 MODBUS ® RTU control system is able to communicate with the outside world. The outside world means a master device, usually a supervisory system or a BMS (Building Management System), designed by the customer.

CAUTION :
The use of serial communication must be made by qualified personnel.
The company assumes no responsibility for any damage to the machine due to misuse of the serial interface.



Communication with the machine is with MODBUS ® RTU on RS485 serial network.

RS485 settings of the chiller

Serial communication with the chiller is only possible if you installed accessory: interface RS485 MODBUS ® RTU.
The default parameters of MODBUS ®-RTU are:

Serial address of chiller	1
Protocol	MODBUS®-RTU
Baud rate	9600 b/s
Parity	EVEN

MODBUS ® Address Table: Machine Level

Parameter/Description	Def	Min	Max	U.M.	Type (*)	Decimal Position	Modbus	Modbus HEX	R/W	Notes/Meaning
Chiller on/off					D		340	0154	R/W	
Change mode		0	1		D		585	249	RW	0= cooling 1= heating
Chiller mode		0	3		I	0	1520	05F0	R	0 = standby 1 = cooling 2 = hot 3 = shut down
Chiller capacity		0	100	%	I	0	1524	05F4	R	
Evaporator water inlet temperature		-50.0	150.0	°C	A	1	1522	05F2	R	
Evaporator water outlet temperature		-50.0	150.0	°C	A	1	1523	05F3	R	
Setpoint 1 chiller mode	7.0	5.0 -8.0 (**)	20.0	°C	A	1	624	0270	R/W	(**) for brine unit
Band 1 chiller mode	1.0	0.5	5.0	°C	A	1	628	0274	R/W	
Setpoint 2 chiller mode	7.0	5.0 -8.0 (**)	20.0	°C	A	1	635	027B	R/W	(**) for brine unit
Band 2 chiller mode	1.0	0.5	5.0	°C	A	1	638	027E	R/W	
Setpoint 1 heatpump mode	45.0	30.0	55.0	°C	A	1	656	0290	R/W	
Band 1 heatpump mode	1.0	0.5	3.0	°C	A	1	660	0294	R/W	
Setpoint 2 heatpump mode	45.0	30.0	55.0	°C	A	1	667	029B	R/W	
Band 2 heatpump mode	1.0	0.5	3.0	°C	A	1	670	029E	R/W	
Current setpoint		-50.0	150.0	°C	A	1	1518	05EE	R	
Heat recovery water inlet temperature		-50,0	150,0	°C	A	1	1381	0565	R	
Heat recovery enable function	1	0	1		D	0	1199	04AF	R/W	0 = not enabled 1 = enabled
Heat recovery setpoint temp	42,5	32,0	53,0	°C	A	1	1202	04B2	R/W	
Heat recovery prop band	5,0	4,0	10,0	°C	A	1	1203	04B3	R/W	
ALARM Chiller general	0	0	2		I	0	1519	05EF	R	0 = not active 1 = active 2 = resettable
ALARM Plant high temperature	0	0	2		I	0	1245	04DD	R	
ALARM Plant low temperature	0	0	2		I	0	1246	04DE	R	
ALARM Evaporator freezing	0	0	3		I	0	1290	050A	R	0 = not active 1 = automatic 2 = resettable 3 = active
ALARM Evaporator water flow	0	0	3		I	0	1292	050C	R	
ALARM Phase sequence	0	0	3		I	0	1371	055B	R	
ALARM Heat recovery water flow	0	0	3		I	0	1247	04DF	R	
ERROR water inlet probe	0	0	1		I	0	1335	0537	R	0 = active 1 = not active
ERROR water outlet probe	0	0	1		I	0	1325	052D	R	
ERROR external air probe	0	0	1		I	0	1375	055F	R	
ERROR Heat recovery Inlet Water probe	0	0	1		I	0	1372	055C	R	

(*) Type of variable/parameter: **A= Analog; D = Digital; I = Integer**

SERIAL INTERFACE: RS485 MODBUS® RTU

MODBUS ® Address Table: Pumps Level

Parameter/Description	Def	Min	Max	U.M.	Type (*)	Decimal Position	Modbus	Modbus HEX	R/W	Notes/Meaning
Pump A evaporator status		0	1		D	0	1525	05F5	R	0 = off 1 = on
Pump B evaporator status		0	1		D	0	1526	05F6	R	
Enabling pump A evaporator	1	0	1		D	0	1127	0467	R/W	0 = not enabled 1 = enabled
Enabling pump B evaporator	1	0	1		D	0	1128	0468	R/W	
DAY of use pump A evaporator		0	32000		I	0	1152	0480	R	
DAY of use pump B evaporator		0	32000		I	0	1153	0481	R	
HOUR of use pump A evaporator		0	24	h	I	0	1154	0482	R	
HOUR of use pump B evaporator		0	24	h	I	0	1155	0483	R	
Heat recovery pump A status		0	1		D	0	1384	0568	R	
Heat recovery pump B status		0	1		D	0	1385	0569	R	
Enabling Heat recovery pump A	1	0	1		D	0	423	01°7 (a)	R/W	0 = off 1 = on
Enabling Heat recovery pump B	1	0	1		D	0	424	01°8 (a)	R/W	
DAY of use Heat recovery pump A		0	32000		I	0	1160	0488	R	0 = not enabled 1 = enabled
DAY of use Heat recovery pump B		0	32000		I	0	1161	0489	R	
HOUR of use Heat recovery pump A		0	24	h	I	0	1162	048A	R	
HOUR of use Heat recovery pump B		0	24	h	I	0	1163	048B	R	
ALARM Evaporator pump A unavailable	0	0	2		I	0	1294	050E	R	0 = not active 1 = active 2 = resettable
ALARM Evaporator pump B unavailable	0	0	2		I	0	1295	050F	R	
ALARM Heat recovery pump A unavailable	0	0	2		I	0	1248	04E0	R	
ALARM Heat recovery pump B unavailable	0	0	2		I	0	1249	04E1	R	
ALARM Evaporator pump A thermal	0	0	2		I	0	1296	0510	R	
ALARM Evaporator pump B thermal	0	0	2		I	0	1297	0511	R	
ALARM Heat recovery pump A thermal protection	0	0	2		I	0	1250	04E2	R	
ALARM Heat recovery pump B thermal protection	0	0	2		I	0	1251	04E3	R	

(*) Type of variable/parameter: **A= Analog; D = Digital; I = Integer**

Address Table MODBUS ®: Circuits Level

Parameter/Description	Def	Min	Max	U.M.	Type (*)	Decimal Position	Modbus	Modbus HEX	R/W	Notes/Meaning
Circuit 1 status		0	4		I	0	1551	060F	R	0 = on 1 = alarm 2 = not used 3 = not used 4 = defrost
Circuit 2 status		0	4		I	0	1552	0610	R	
Circuit 1 capacity		0	100	%	I	0	1543	0607	R	
Circuit 2 capacity		0	100	%	I	0	1544	0608	R	
Circuit 1 liquid temperature		-50.0	150.0	°C	A	1	1575	0627	R	
Circuit 2 liquid temperature		-50.0	150.0	°C	A	1	1576	0628	R	
Circuit 1 low pressure		-1.0	-30.0	bar	A	1	2332	091C	R	Only if installed pressure transducer
Circuit 2 low pressure		-1.0	-30.0	bar	A	1	2333	091D	R	
Circuit 1 high pressure		-1.0	-50.0	bar	A	1	1559	0617	R	
Circuit 2 high pressure		-1.0	-50.0	bar	A	1	1560	0618	R	
Heat recovery circuit 1 status		0	1		I	0	1386	056A	R	0 = off ; 1 = on;
Heat recovery circuit 2 status		0	1		I	0	1387	056B	R	
ALARM Circuit 1 low pressure	0	0	3		I	0	1270	04F6	R	0 = not active 1 = automatic 2 = resettable 3 = active
ALARM Circuit 2 low pressure	0	0	3		I	0	1271	04F7	R	
ALARM Circuit 1 high pressure	0	0	2		I	0	1262	04EE	R	0 = not active 1 = active 2 = resettable
ALARM Circuit 2 high pressure	0	0	2		I	0	1263	04EF	R	
ALARM Circuit 1 electronic expansion valve	0	0	2		I	0	1258	04EA	R	
ALARM Circuit 2 electronic expansion valve	0	0	2		I	0	1259	04EB	R	
ERROR Circuit 1 liquid probe	0	0	1		I	0	1339	053B	R	0 = active 1 = not active
ERROR Circuit 2 liquid probe	0	0	1		I	0	1340	053C	R	
ERROR Circuit 1 low pressure transducer	0	0	1		I	0	1363	0553	R	0 = active 1 = not active Only if installed pressure transducer
ERROR Circuit 2 low pressure transducer	0	0	1		I	0	1364	0554	R	
ERROR Circuit 1 high pressure transducer	0	0	1		I	0	1327	052F	R	
ERROR Circuit 2 high pressure transducer	0	0	1		I	0	1328	0530	R	

(*) Type of variable/parameter: **A= Analog; D = Digital; I = Integer**

MODBUS ® Address Table: Fans Level

Parameter/Description	Def	Min	Max	U.M.	Type (*)	Decimal Position	Modbus	Modbus HEX	R/W	Notes/Meaning
Circuit 1 fans power		0	100	%	I	0	1567	061F	R	0
Circuit 2 fans power		0	100	%	I	0	1568	0620	R	0
ALARM Circuit 1 fans thermal	0	0	2		I	0	1286	0506	R	0 = not active 1 = active 2 = resettable
ALARM Circuit 2 fans thermal	0	0	2		I	0	1287	0507	R	

(*) Type of variable/parameter: **A= Analog; D = Digital; I = Integer**

Address Table MODBUS ®: Compressor Level

Parameter/Description	Def	Min	Max	U.M.	Type (*)	Decimal Position	Modbus	Modbus HEX	R/W	Notes/Meaning
Compressor 1A enable	1	0	1		D	0	800	0320	R/W	0 = not enabled 1 = enabled
Compressor 1B enable	1	0	1		D	0	801	0321	R/W	
Compressor 2A enable	1	0	1		D	0	803	0323	R/W	
Compressor 2B enable	1	0	1		D	0	804	0324	R/W	
Compressor 1A status		0	9		I	0	1527	05F7	R	0 = off 1..5 = not used 6 = on 7 = alarm 8 = not usable 9 = waiting
Compressor 1B status		0	9		I	0	1528	05F8	R	
Compressor 2A status		0	9		I	0	1530	05FA	R	
Compressor 2B status		0	9		I	0	1531	05FB	R	
Compressor 1A capacity		0	100	%	I	0	2370	0942	R	0 = off 100 = on
Compressor 1B capacity		0	100	%	I	0	2371	0943	R	
Compressor 2A capacity		0	100	%	I	0	2373	0945	R	
Compressor 2B capacity		0	100	%	I	0	2374	0946	R	
DAY of use compressor 1A		0	32000		I	0	816	0330	R	
DAY of use compressor 1B		0	32000		I	0	817	0331	R	
DAY of use compressor 2A		0	32000		I	0	819	0333	R	
DAY of use compressor 2B		0	32000		I	0	1014	03F6	R	
HOUR of use compressor 1A		0	24	h	I	0	820	0334	R	
HOUR of use compressor 1B		0	24	h	I	0	821	0335	R	
HOUR of use compressor 2A		0	24	h	I	0	823	0337	R	
HOUR of use compressor 2B		0	24	h	I	0	1018	03FA	R	
Compressor 1A thermal alarm	0	0	2		I	0	1278	04FE	R	0 = not active 1 = active 2 = resettable
Compressor 1B thermal alarm	0	0	2		I	0	1279	04FF	R	
Compressor 2A thermal alarm	0	0	2		I	0	1281	0501	R	
Compressor 2B thermal alarm	0	0	2		I	0	1282	0502	R	

(*) Type of variable/parameter: **A= Analog; D = Digital; I = Integer**

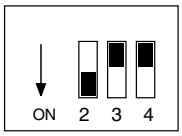
SERIAL INTERFACE: RS485 MODBUS® RTU

The MODBUS Device address is selectable by the dip switches 2-3-4

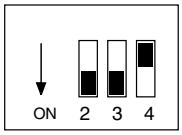
(dip switch 1 is used only for CANBUS - ON: terminal resistor enabled - OFF: terminal resistor disabled)

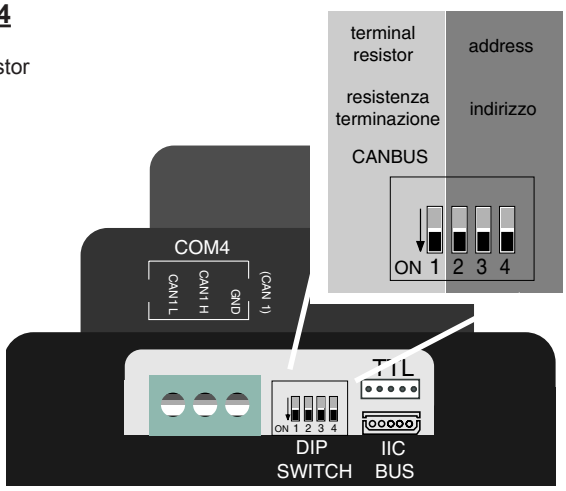
Dip switch 2-3-4 used for MODBUS address
Addresses available from 1 to 7, 0 not available
•ON: value =1
•OFF: value =0
Examples

• If dip 2 ON, dip 3 OFF, dip 4 OFF, address=1 (the binary number is 001 read from right to left)



• If dip 2 ON, dip 3 ON, dip 4 OFF, addres=3 (the binary number is 011 read from right to left)





COM 1 PORT MODBUS CONFIGURATION

Use the keyboard EXTK-PRO installed on the Unit to access the SERVICE MENU:

● Then, from the home page go through the menu to select “Reserved menu”, type the password service (value “22222”) and confirm by pressing ENTER.

● Then, press the ESC key 2 times (left arrow) to return to the previous page.

● With the UP arrow select SERVICE MENU and confirm pressing ENTER.

● With the DOWN arrow select SETTINGS and press ENTER to confirm

● With the DOWN arrow select BIOS and confirm pressing ENTER

● With the DOWN arrow select COMMUNICATION, and press ENTER to confirm.

THE FOLLOWING PARAMETERS MUST BE SET AS SPECIFIED IN BOLD CHARACTER.

PARAMETRO PARAMETER	VALORE VALUE	DESCRIZIONE DESCRIPTION
PAR_ANA_BIOS_187	**0**	**MSB** serial address
PAR_ANA_BIOS_188	**0**	**VIS/MOD**
PAR_ANA_BIOS_189	**0**	**PCH**
PAR_BOO_BIOS_18	**NO**	**Modem enable**
PAR_ANA_BIOS_190	2=micronet **3 = MODBUS-RTU** 4= Modbus ASCII	**Seriale protocol**
PAR_ANA_BIOS_191	**0=9600 b/s** 1=19200 2=38400	**Baudrate**
PAR_ANA_BIOS_192	0 = NULL 1 = ODD **2 = EVEN**	**Parity**

User interface

The front panel of the device functions as the user interface and is used to perform all operations relating to the device.

XVD	SKP 10
	

XVD LED

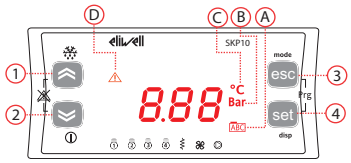
There are 3 LEDs on the front panel of the XVD driver showing the status of the valve.
There are a further 3 LEDs inside the door for uploading/downloading parameters and/or *applications* (see Multi Function Key chapter).

	LEDs	Colour	On	Blinking		Off
	**EEV**	Green	Valve regulation	Valve closed (No regulation in progress) Setpoint satisfied		NA*
	**Defrost**	Yellow	Defrost in progress Valve closed (No regulation in progress)	//	No serial connection	No defrost
	**Alarm**	Red	NA	Alarm present		No alarm
* EEV LED off means no power is reaching driver.						

SKP 10 keys

The values displayed on the remote SKP 10 terminal can have up to 4 digits or 3 digits plus a sign.

SKP 10



No.	Key	Single press (press and release)	[press and hold]
1	**UP**	Quick modification of overheating setpoint* Increases a value / Goes to next *label*	//
2	**DOWN**	Quick modification of overheating setpoint* Decreases a value / Goes to previous *label*	//
3	**ESC**	Exit without saving new settings Go back to previous level	//
4	**set**	Confirms value / exit and save new settings Go to next level (access to *folder*,sub-*folder*, parameter, value) Access to State Menu	**disp** [Main display] See paragraph on Main display
3+4	**esc+set**	**Prg** **Esc+set** keys pressed at the same time. Opens *Programming Menu*	
* Can also be modified from parameter dE32			

LED SKP 10

The display shows the value/resource set for the "main display".
In the event of an alarm, it will alternate with the alarm code Exx. (when more than one alarm occurs, the one with the lowest number will be shown first).

LEDs			
No.	**Colour**	**Description**	**Note**
A	Red	Menu (ABC)	
B	Red	Pressure Display (Bar)	Values are in relative bars. If the value is Psi, the symbol is not shown.
C	Red	Temperature Display (degrees centigrade)	If the value is °F the symbol is not shown.
D	Red	Alarm	

Access to folders - menu structure

Access to folders is organised into menus.
Access is determined by the keys on the front panel (see relative sections).
Access to each individual menu is explained below (or in the sections indicated).
There are 2 menus:

- *"States" menu* → See "States Menu' section
- "Programming" Menu → See '*Programming Menu*' section

There are 3 folders/submenus in the *Programming Menu*:

- Parameters Menu (PAr *folder*) → See Parameters chapter
- *MFK* menu (*folder* FnC) → See Multi Function Key chapter
- PASS Password → See Parameters chapter

Set main display

Main Display refers to the contents of the *default* display, i.e. when keys are not used.
XVD allows you to modify the main display to your own requirements. The various contents can be selected from the "disp" menu which is opened by pressing and holding the [set] key for more than 3 seconds.
The main display can be selected from:

Label	Description	Value on display	Value on display in the event of a probe error (backup)
drE1	Overheating temperature	AI3 Overheating probe	AI4 Backup overheating probe
drE2	Refrigerant saturation temperature	AI1 Saturation probe	AI2 Backup saturation probe
drE3	**Backup probe** overheating temperature	AI4	- - -
drE4	**Backup probe** refrigerant saturation temperature	AI2	- - -
drE5*	Overheating	Difference drE1-drE2	NA
drE6	Refrigerant pressure	AI1 When configuring probe as saturation probe 4..20mA or ratiometric	AI2 When configuring probe as backup saturation probe 4..20mA or ratiometric Otherwise, it shows - - -
drE7	Percentage valve opening		
* *default*			

N.B.

- *Analogue inputs* are preconfigured during manufacture.
- The probe display always shows temperatures (to see pressure values, see Input/Output Display).

Step by step instructions are provided below.

Set main display		
		
To open the [disp] menu and modify the main display setup, press and hold the set key for at least 3 seconds.	This opens the blinking menu for the previous display (in this case drE3).	To modify the display, use the "up" and "down" keys to scroll through the menu and press the set key to confirm. When you have selected the type of display (e.g. drE1), press the set key to confirm. You will be automatically returned to the main display set.

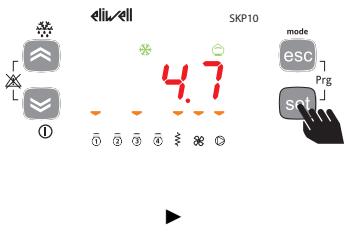
"States" menu

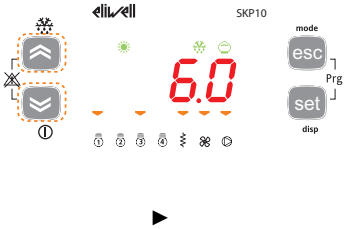
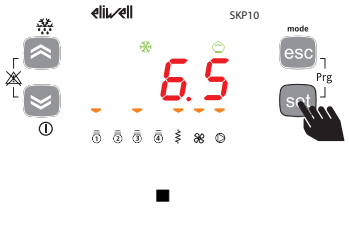
From the states menu you can view values for each resource.
Setpoints can be viewed and modified.
The resources may be present / not present depending on the model (e.g. dO2 is not present in XVD100).

Label					Description	Change
rE	drE1	drE2	...	drE7	Main display	NO This is a view only menu; see the relative paragraph for information on configuration.
Ai	dAi1	dAi2	dAi3	dAI4	*Analogue inputs*	NO
di	ddi1	ddi2			*Digital inputs*	NO
dO	ddO1	ddO2			*Digital outputs*	NO
AL	Er01	Er02	...	Er15	*Alarms*	NO
SP	**SP1**	**SP2**	**SP3**	SP4	Setpoint	YES (SP4 excluded)

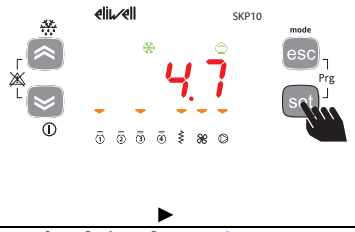
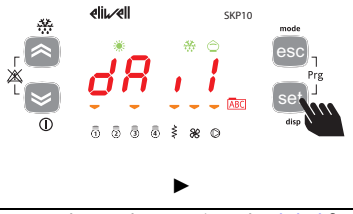
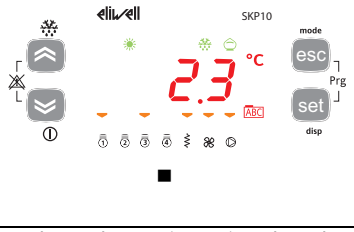
Programming the Set Point

Setpoint	Description	Settable from Parameter	Note
SP1	minimum overheating setpoint	**dE32**	If dE32 = 0 is intended as the only overheating setpoint - - - If dE30 = 1 is intended as overheating target Quick modification with UP and DOWN keys.
SP2	Maximum overheating setpoint	**dE31**	Valid if dE30=1
SP3	MOP setpoint.	**dE52**	expressed in units of temperature
SP4	Dynamic overheating temperature.	View only, not modifiable. Calculated dynamically	If dE30 = 0 then the set is defined in dE32

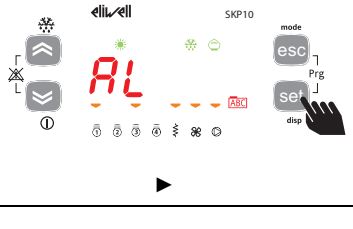
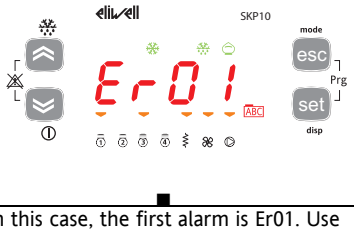
Programming the setpoint		
 ▶	 ▶	 ■
Example of SP1 configuration To access the State Menu, press and release the set key. *Label* rE will appear on the display. (Use the UP and DOWN keys to scroll the other labels until you find the SP *label* required)	Press the set key to view the *label* for the first setpoint SP1.	Press the set key again to view the value of SP1 (use the up and down keys to view other setpoints). To modify the display, press the up and down keys and then the set key to confirm. Press the set key to confirm. You will be automatically returned to the main display set.

Rapid Setpoint SP1 programming		
 ▶	 ▶	 ■
Press the up and down keys to quickly modify the setpoint.	The current setpoint value appears on the display To modify the value, press the up and down keys and then the set key to confirm.	Press the set key to confirm. You will be automatically returned to the main display set.

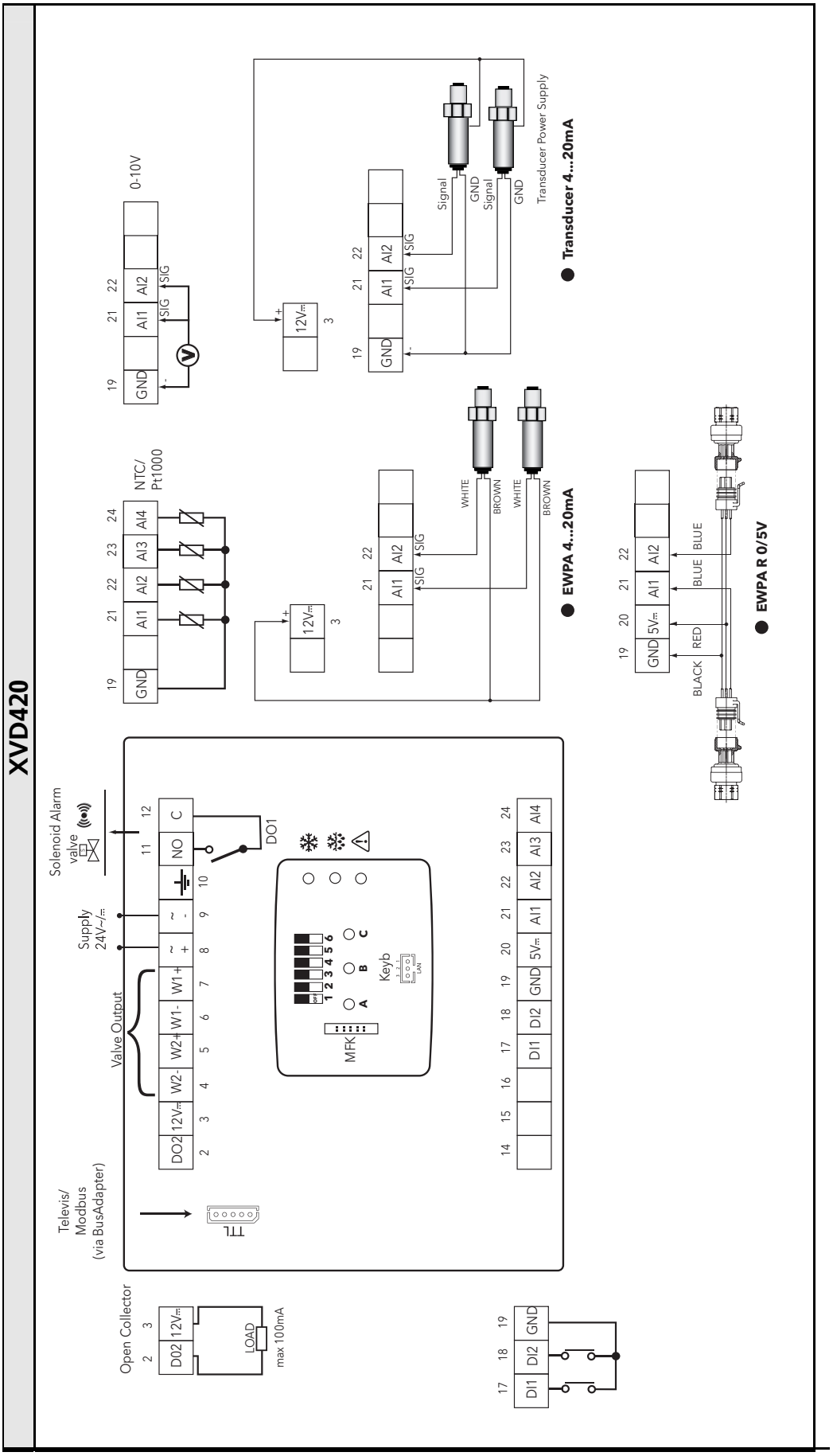
Inputs/Outputs display

Inputs/Outputs display		
 ▶	 ▶	 ■
Example of view for *Analogue Inputs*. The same procedure applies to all other I/Os*** To access the State Menu, press and release the set key. *Label* rE will appear on the display. (Use the UP and DOWN keys to scroll the other labels until you find the Ai *label* required)	Press the set key to view the *label* for the first analogue input (dAi1 in this case).	Press the set key again to view the value of dAi1. Note that the °C icon lights up to indicate that the value shown is in degrees centigrade ---------- Press the esc key to go back to the main display.
***For *digital inputs*, the value will be: - 0 = input not active (this is equivalent to input open) - 1 = input active (this is equivalent to input shortcircuited to ground)		

Alarm Display (AL)

Alarm display		
 ▶	 ▶	 ■
To access the State Menu, press and release the set key. *Label* rE will appear on the display. (Use the UP and DOWN keys to scroll the other labels until you find the AL *label* required)	Press the set key to view the *label* of the first active alarm (if it exists)	In this case, the first alarm is Er01. Use the UP and DOWN keys to scroll any other *alarms*. ---------- NOTE: the menu is not cyclical. For example, if the active *alarms* are Er01 and Er02, the display will show: Er01 ->Er02<Er01 NOTE: -> UP, <-DOWN Press the esc key to go back to the main display.

Wiring scheme



ELECTRONIC EXPANSION VALVE CONTROL

Inputs and outputs

Analog inputs		
DESCRIPTION		**CHARACTERISTICS**
AI1	suction pression transducer	electronic transducer 4-20 mA (0 barg ÷ 30 barg)
AI3	suction temperature	NTC temperature sensor (-50°C ÷ 99°C)

Digital inputs		
DESCRIPTION		**CHARACTERISTICS**
DI1	Enabling regolation	Digital input with voltage-free contact

Digital outputs		
DESCRIPTION		**CHARACTERISTICS**
DO1	Alarms	5A resistive relays - 250Vac

Technical data

Description	Typical	Minimum	Maximum
Power supply voltage	24 V~ / --	-	-
Power supply frequency	50 Hz / 60 Hz	-	-
Power	30 VA - 25Watt	-	-
Protection rating	2	-	-
Ambient operating temperature	25 °C	-5 °C	55 °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 %

Table alarms

Code	Driver input	Allarm	Cause	Effect	Alarm type	Alarm on main controller	Input on main controller	Troubleshooting
Er01	AI1	Probe AI1 fault	Probe fault / shortcircuit / non connected	Valve closed	Automatic	er05	DI3	Check wiring of the probe, replace probe AI1
Er03	AI3	Probe AI3 fault	Probe fault / shortcircuit / non connected	Valve closed	Automatic	er05	DI3	Check wiring of the probe, replace probe AI3
Er06	AI1 - AI3	Errore uscita saturazione	Probe AI1 AI3 fault / shortcircuit / non connected	Valve closed	Automatic	er05	DI3	Check wiring of the probe, replace probe AI1 AI3
Er07	-	MOP alarm	Saturation temperature > setpoint MOP 20°C for more than 255 s	Valve closed	Automatic	er05	DI3	Wait for saturation temperature < 20°C
Er10	-	NO link alarm	Serial communication fault	Valve closed	Automatic	er05	DI3	Re-establish connection
Er11	W2- W2+ W1- W1+	Motor protection alarm	Excedeed absorbed current	Valve closed	Manual *	er05	DI3	Check motor phases, motor connections
Er12	W1- W1+	Motor protection alarm	Disconnection winding 1	Valve closed	Manual *	er05	DI3	Check winding connection 1 (terminals 6-7)
Er13	W1- W1+	Motor protection alarm	Shortcircuit winding 1	Valve closed	Manual *	er05	DI3	Check winding connection 1 (terminals 6-7)
Er14	W2- W2+	Motor protection alarm	Disconnection winding 2	Valve closed	Manual *	er05	DI3	Check winding connection 2 (terminals 4-5)
Er15	W2- W2+	Motor protection alarm	Shortcircuit winding 2	Valve closed	Manual *	er05	DI3	Check winding connection 2 (terminals 4-5)

START-UP

Start up

The following operations must be carried out only by properly trained personnel. To make the **contractual warranty** effective, start up **must be carried out by authorized service centres**.
Before calling the service centre it is advisable to make sure that all the installation steps have been completed (positioning, electrical connections, hydraulic connections).

Preliminary operation

WARNING - Before you perform the checks listed below, please read carefully the section "Safety and Maintenance"
Verify that :
- the unit has not suffered visible damages due to transport or positioning
- the unit is placed on an horizontal surface able to bear its weight
- the minimum operating area are respected
- the ambient conditions comply with the provided operating limits
- the hydraulic and electrical connections has been carried out correctly

Electrical cheks
Verify that the unit power supply line complies with the regulations in force. Check that the section of power cables are suitable to withstand the overall absorption of the unit (see electrical data), and that the unit has been properly grounded.

Check that all electrical connections are well fixed and all terminals properly tightened.
Switch on the unit by turning the switch in position ON . The display will light a few seconds after power up , check the operating status of both Std -by or off (via keyboard). A wrong sequence of the power supply phases is immediately detected by the phase sequence controller (standard on all the three phase power supply units) and reported on the display of the unit. To eliminate the error switch each other two phases of the power supply line.
Verify that:
- the voltage of the power supply line complies with the the nominal one of the unit
- for three phase power supply units, the unbalance between the phases is lower than 3% (a higher value produces an excesive current input on one or more phases causing possible damages to the electrical components of the unit)

NOTE. *Example of phase unbalance calculation*

- Read the value of the three line voltages using a voltmeter :
  line voltage between phases L_1 and L_2 : $V_{1-2} = 390$ V
  line voltage between phases L_2 and L_3 : $V_{2-3} = 397$ V
  line voltage between phases L_3 and L_1 : $V_{3-1} = 395$ V
- Calculate the difference between the maximum and minimum value of the measured line voltages :
  $\Delta V_{max} = \max(V_{1-2}; V_{2-3}; V_{3-1}) - \min(V_{1-2}; V_{2-3}; V_{3-1}) = V_{2-3} - V_{1-2} = 397 - 390 = 7$ V
- Calculate the average line voltage value :
  $\Delta_{average} = (V_{1-2} + V_{2-3} + V_{3-1}) / 3 = (390 + 397 + 395) / 3 = 394$ V
- Calculate the percentage unbalance value :
  $\Delta V_{max} / V_{average} \times 100 = 7 / 394 \times 100 = 1,78\ \% < 2\ \%$

Check that the connections made by the installer comply with the data reported here .
If present, check that the resistance of the compressors oil crankase are operating, by measuring the temperature rise of the oil crankase. The resistance / s must be in operation for at least 24 hours before starting the compressor , and in each case the temperature of the oil crankase must be 10 - 15 ° C higher than the ambient temperature .
WARNING - At least 24 hours prior to the operation of the unit (or at the end of each period of prolonged pause) the unit must be powered in such a way as to allow the heating elements of the compressor crankcases to evaporate the refrigerant present in the oil. Failure to do so may cause serious damage to the compressor and will void the warranty.

Hydraulic circuit checks
Check that all hydraulic connections are executed correctly: Refer to the installation manual.
Check that the hydraulic system is filled, under pressure and air free (possibly vent it).
Make sure that any shutoff valves present in the system are properly open.
Make sure that the circulation pump is running and that the water flow is sufficient to close the contact of the differential pressure and / or flow switches .
Check the correct operation of the differential pressure and / or flow switches: close the shutoff valve at the outlet of the heat exchanger, the unit display must show the alarm message, eventually reopen the valve and reset the alarm.

Turning on
ATTENTION . The operation must be agreed in advance depending on the timing of construction of the plant . Before the intervention of Service Department all works (electrical and plumbing connections , water filling and air vent of the plant) will have been completed.
Start all the plant components necessary to guarantee an adequate water flow rate on the plant hydraulic circuit.
Activate the unit in cooling or in heating mode operating on the user interface and setting a set point suitable to require the unit to work.

Refrigerant circuit checks
The vibrations during transport , may have loose connections : check for leaks of refrigerant gas especially at the refrigerant pressure taps , pressure transducers and pressure switches.
After a short period of operation, check the oil level of the compressor (if present siight oil) and the absence of bubbles in the glass of liquid indicator (if present) . The continuous passage of vapor bubbles may mean that the refrigerant charge is low or that the expansion valve is not properly adjusted. The presence of bubbles in the running for short periods , however, is possible.

Evaporation and condensation temperature
Verify that:
- the saturation temperature (dew point) corresponding to the condensing pressure is about 10-15°C higher than the outdoor air temperature in cooling and about 5°C higher than the water outlet temperature in heating
- the saturation temperature (dew point) corresponding to the evaporating pressure is about 5°C lower than the water outlet temperature in cooling and about 5-10°C lower than the outdoor air temperature in heating

Superheat
Check the superheat comparing the temperature measured with a contact thermostat fitted to the compressor suction pipe , with the temperature shown on the low pressure gauge (saturation temperature corresponding to the evaporation pressure) . The difference between these two temperatures gives the value of the superheta. The optimal values are between 4 and 8 ° C.

Subcooling
Check the subcooling comparing the temperature measured with a contact thermostat on the pipe outlet of the condenser , with the temperature shown on the pressure gauge of high pressure (saturation temperature corresponding to the condensation pressure) . The difference between these two temperatures gives the value of subcooling . The optimal values are between 4 and 5 ° C, for reversible units with subcooler in the coil the optimal values are between 10 and 20 ° C depending on the external air temperature .

Discharge temperature
If the values of subcooling and superheat are regular, the temperature measured at the outlet of the compressor discharge pipe must be:
- Units charged with R410A of 30/40 ° C higher than the condensing temperature
- Units charged with R134a of 15/20 ° C higher than the condensing temperature .

Hydraulic circuit check
- the difference between the water inlet and outlet temperature from the plate heat exchanger of the unit is inside the limits provided.

Electrical setting check
- the current absorbed by the compresor and the fans is lower than the maximum value admitted (FLA), as indicated in the section "Technical data and performances"

SAFETY AND MAINTENANCE

Basic safety rules

Recall that the use of products that use electricity and water entails the observance of some basic safety rules , such as: This appliance is not intended for use by persons (including children) with reduced physical , sensory or mental capabilities or lack of experience and knowledge, unless supervised or instructed on the use of the appliance by a person responsible for their safety . Children should be supervised to ensure that they do not play with the appliance.

It is forbidden to any technical intervention or maintenance without first disconnecting the unit from the mains supply by moving the master switch and the main control panel to “Off” .
You may not modify safety equipment or settings.
Do not pull, detach or twist the electrical cables coming from the unit even if it is disconnected from the mains supply.
It is forbidden to leave containers of flammable substances near the unit.
Do not touch the appliance when barefoot or with wet or damp parts of the body .
It is forbidden to open the doors of access to the internal parts of the unit without first ensuring that the system switch to “Off”.
Not dispose of, abandon or leave within reach of children packaging materials as it can be a potential source of danger.

IMPORTANT SAFETY INFORMATION
There is no guarantee proper operation as a result of a fire, before restarting the machine, contact an authorized service center. If equipped with safety valves refrigerant, in case of excessive pressure the safety valves can discharge high temperature refrigerant gas to the atmosphere. Wind, earthquakes and other natural phenomena of exceptional intensity were not considered. When using the unit in an aggressive atmosphere and or with aggressive water consult the factory.

Residual Risks

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

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

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

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

Disconnection and disposal

The machine contains lubricating oil and refrigerant gas for which, during the destruction of the unit, these fluids will be recovered and disposed of in accordance with the rules in force in the country where it is installed.
During the disconnection thus avoid spills or leaks of refrigerant gas and of the plant water if treated with additives or antifreeze substances.
The machine must not be abandoned in the process of destruction, but it can also be stored outdoors with gas, water and electrical circuits intact and closed.
For dismissing and disposal, deliver the units to specialized centres according to your national laws.

General recommendations about the R410A refrigerant used

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	

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

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.

First aid

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

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

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

Swallowing:
• Do not make the victim vomit. If the victim is conscious, have him rinse his mouth out with clean water and then drink 200, 300 ml of water.
• Immediately seek medical help.
• Do not administer adrenaline or sympathomimetic drugs after exposure owing to the risk of cardiac arrhythmia.
For further information about the characteristics of the refrigerant, consult the technical briefs that can be obtained from manufacturers of refrigerant products.

SAFETY AND MAINTENANCE

General Rules for Maintanance

The maintenance is extremely important for the functioning of the system and the regular working of the unit over time.
In accordance with the European Regulation EC 303/2008 , it should be noted that companies and engineers in maintenance , repair, leak testing and recovery / recycle refrigerant gases should be CERTIFIED in accordance with local regulations.
Maintenance must be performed in compliance with the safety rules and tips given in the manual supplied with the unit.
Routine maintenance helps maintain unit efficiency, reduce the rate of deterioration which each device is subject in time and gather information and data to understand the efficiency of the unit and prevent failures.
For extraordinary maintenance or in case you need service , contact only to a specialized service center approved by the manufacturer and use original spare parts.
In accordance with the European Regulation EC 1516/2007 it is necessary to prepare a “equipment record”.
Provide anyway a databook (not supplied) that allows you to keep track of interventions made on the unit; in this way it will be easier to properly program the various interventions and will facilitate a possible troubleshooting.
Bring on the databook : date, type of intervention made, description of the intervention , measurements , reported anomalies , alarms recorded in the alarm history , etc. ...

Routine maintenance

The inspections described below, to which the unit must be subjected, do not require specific technical know-how.
They merely include a few simple inspections involving certain parts of the unit.
The table below gives a recommended list of inspections which should be carried out at the indicated intervals.
Provide controls and interventions more frequently in case of heavy (continuous or intermittent high, close to operating limits, etc ...) or critical (essential service such as data centres, hospital etc ...) use.

DESCRIPTION	WEEKLY	MONTHLY	EVERY SIX MONTHS
Visual inspection of the unit			•
Inspection of hydraulic circuit		•	
Inspection of electrical system		•	
Inspection of condensing system		•	
Inspection of the water heat exchanger			•
Inspection of the water filter		•	
Inspection of the water pumps (if present)			•
Reading and adjustment of the operating parameters	•		

• Visual inspection of the structure of the unit
When checking the condition of the parts that form the structure of the unit, pay particular attention to the parts liable to rust.
If traces of rust are noted, they must be treated with rust-inhibitor paint in order to eliminate or reduce the problem.
Check to make sure that the external panels of the unit are well fixed.
Bad fixing gives rise to noise and abnormal vibrations.

• Inspection of hydraulic circuit
Check visually to make sure that there are no leaks in the hydraulic circuit. Check that water filters are clean.

• Inspection of electrical system
Make sure that power cables that supply the unit are not torn, cracked or damaged in a way that could impair its insulation.

• Inspection of the ventilated condensing/evaporating section
WARNING: The finned pack exchanger has fins made of aluminium or some other thin material, thus even accidental contact could cause cuts.

Condensing/Evaporating coils
In view of the function of this component, it is very important for the surface of the exchanger to be as free as possible from clogging caused by items that could reduce the fan’s air flow rate and, thus, the performances of the unit itself.
The following operations may be required:
- Remove all impurities (such as paper scraps, leaves, etc.) that could be clogging the surface of the bank either by hand or using a brush (comply with the above mentioned safety prescriptions).
- If the dirt has deposited on the fins and is difficult to remove by hand, use a flow of compressed air or pressurized water on the aluminium surface of the coils, remembering to direct the flow in a vertical and opposite to the standard flow direction to prevent the fins from being damaged.
- “Comb” the coils with the relative tool, using the appropriate comb spacing for the fins if some parts of them are bent or squashed.

Axial fans
Visually inspect these parts to make sure that the fans are well fixed to the bearing grille and that this latter is fixed to the structure of the unit. Check the fan bearings, and close the terminal box and cable glands. Bearings damaged and bad fixing are the source of abnormal noise and vibrations,

• Inspection of the water heat exchangers
The exchangers must ensure the maximum heat transfer possible so keep them clean and free from dirt that may reduce efficiency; make sure that the temperature difference between water outlet temperature and evaporation/condensation does not increase over time, if the difference exceeds 8 -10 ° C it is necessary to proceed cleaning the water side of the exchanger, keeping in mind the following: water circulation must be in the opposite direction than normal, the fluid velocity does not exceed 1.5 times the nominal velocity and use just water or moderately acid products but only water for final washing.

• Inspection of the water filters
Make sure to clean the filter and remove any impurities that block the proper flow of water, contributing to increase pressure drop and therefore energy consumption of the pumps. Refer to the section “Hydraulic Connections” too.

• Inspection of the water pumps
Check water leakages, the state of the bearings, the closing of the terminal box and integrity of the cable. Bearings damaged and bad fixing are the source of abnormal noise and vibrations,

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

NOTE:
FOR THE PLANT WATER FILL AND DRAIN REFER TO THE SECTION HYDRAULIC CONNECTIONS

CAUTION
As a result of extraordinary maintenance on the cooling circuit with component replacement, before restarting the machine, perform the following steps:
- Pay attention to restore the refrigerant charge indicated on the name plate of the machine.
- Open all the ball valves in the refrigerant circuit.
- Correctly connect the power supply and grounding.
- Check the hydraulic connections.
- Check that the water pump is working properly.
- Clean water filters.
- Check that the finned coils are not dirty or clogged.
- Check the proper rotation of fans.

Ferroli

COD. 3QE41430

GRUPPO FERROLI

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