Ferroli

RLA HE

AIR COOLED WATER CHILLERS
AND HEAT PUMPS WITH AXIAL FANS

TECNICAL MANUAL

TABLE OF CONTENTS

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

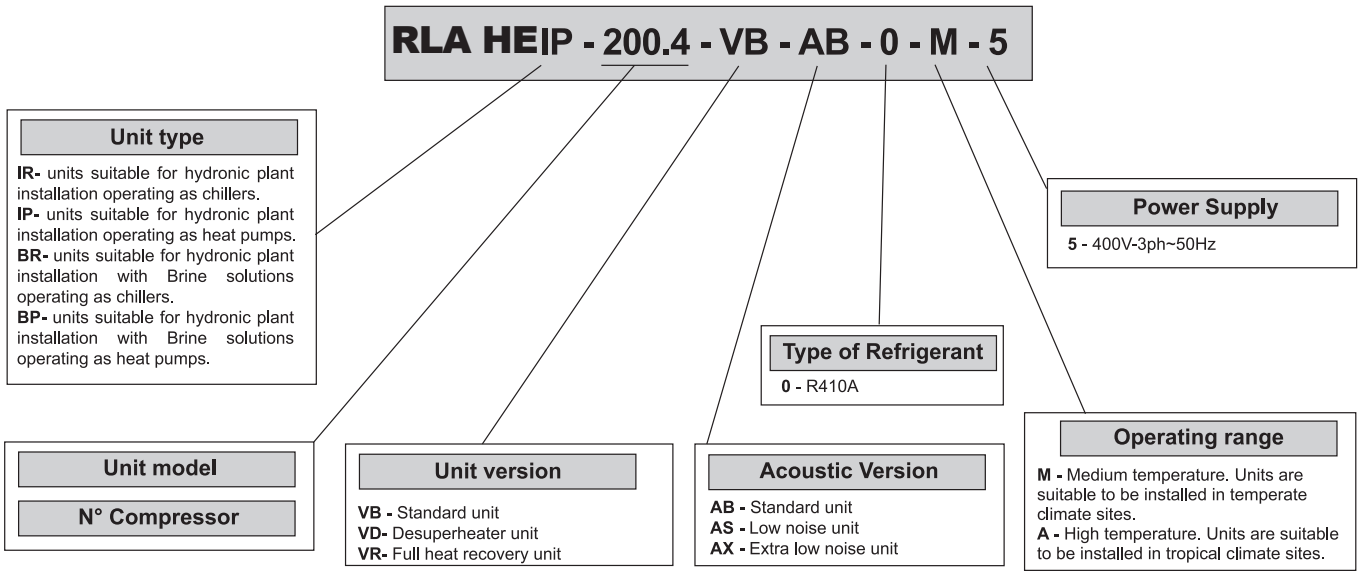
GENERAL SPECIFICATIONS

Presentation of the unit

This new series of industrial chillers and heat pumps has been designed to meet the demands of global markets in the small-medium power industrial and commercial plants. Units are compact and highly configurable, built to fit different types of plants so to meet the needs of highly qualified engineers.
Units are water chillers and heat pumps condensed in air with axial fans suitable for outdoor installation: the structure and panels are robust, made of galvanized and painted steel; all fasteners are made of stainless steel or galvanized steel, the frame containing the electrical equipment and all the components exposed to weather have a minimum **IP54** degree of protection.
This series is composed of seven models divided in 9 sizes with nominal cooling capacity **from 155 to 413 kW** and thermal capacity **from 168 to 435 kW.**
The units product cold water from **5 to 25°C** (in summer) and hot water from **30 to 55°C** (in winter) and as optional 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 as well as to reduce noise emissions.
All the units are equipped with 4 scroll compressors arranged in pairs (tandem) on 2 circuits operating with environmental friendly **R410A** gas, brazed plate heat exchanger completely insulated and protected by water side with a differential pressure control and with an antifreeze electrical heater, electronic expansion valve, coil heat exchanger made of louver aluminum fins and copper tubes, axial fans with profiled blades to contain noise and with thermal protection built-in, on-board electrical control panel equipped with control system to manage the main functions.
Hydronic group (MP) composed of fittings and connections is available as an accessory with 1 or 2 pumps and also with high available head pumps; the accessory Water Storage Tank (SAA) is completely insulated and available on delivery side or for primary-secondary hydraulic circuit (Victaulic connections already in place) depending on the kind of plants to serve.
A variety of other accessories are available to extend the capabilities of the units.
During the design of the units particular attention has been given to achieve high system efficiency, to reduce overall energy consumptions and sound levels in order to meet the increasingly restrictive laws in terms of noise. Upon request, you can choose for a Standard Unit (AB) a Low Noise Unit (AS) which provides sound attenuation thanks to sound absorbing insulation in compressors area, sound jackets on compressors, a head pressure control to reduce axial fans speed or an Extra Low Noise Unit (AX), which provides in addition slower axial fans, more powerful finned coils and activation logic of the compressors in saturation.
All units are accurately build in compliance with the existing standards and are individually tested in factory. Only electrical and hydraulic connections are required for installation.

Identification code of the unit

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



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), plate 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

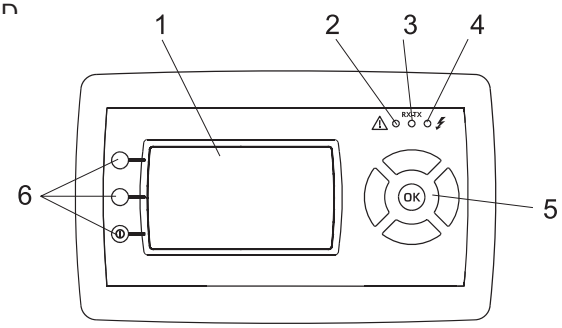
3. User interfacing terminal with display.

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

In particular, it enables:

· Managing alarm situations

· Checking the status of resources.



KEY

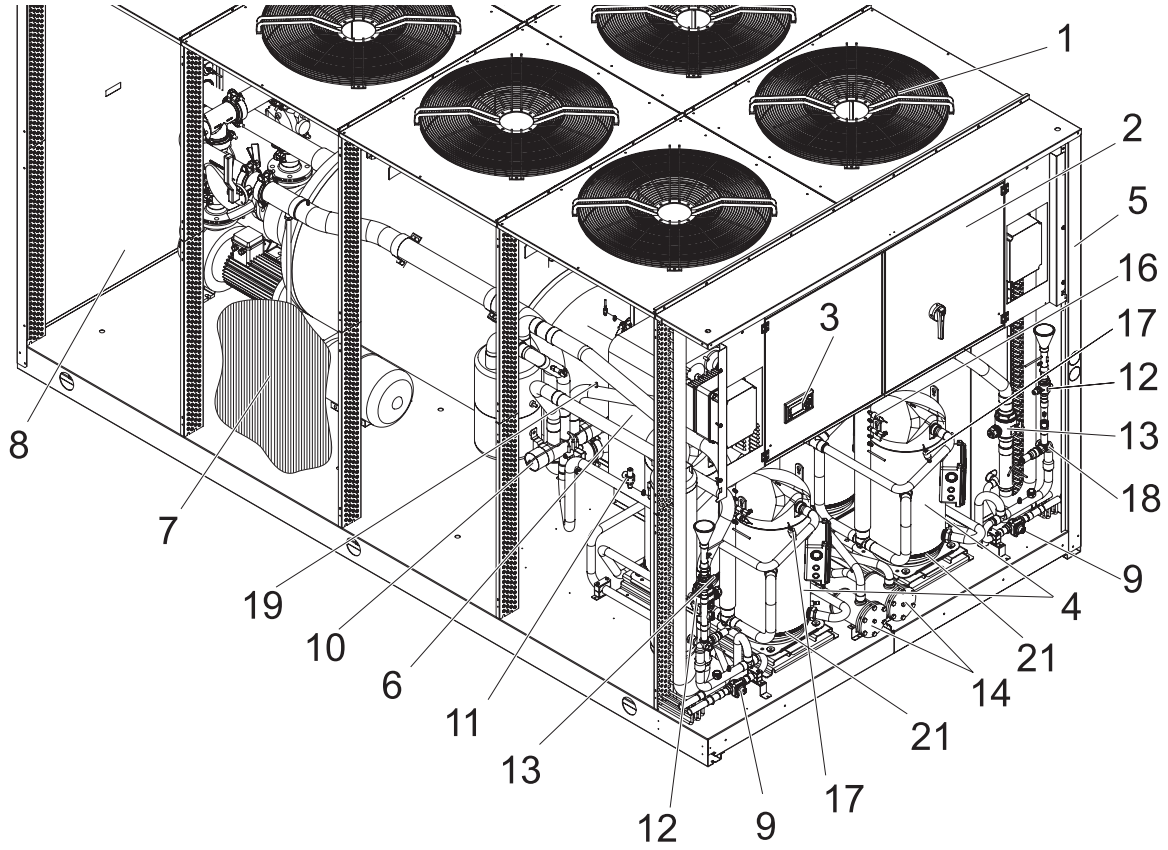
1.Display
2. Alarms LED
3. LED for communication between the motherboard governing the unit and the keypad
4. Power supply LED
5. Joystick Menu Button
6. Function Button

4. Compressors. They are the SCROLL type with orbiting coil equipped with built-in 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 made of brazed stainless steel plates (AISI 316). 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
9.One-way valves (IP unit only), allowing the coolant to pass into the appropriate exchangers, depending on the operating cycle.
10. 4-way cycle reversal valve (IP unit only), reverses the flow direction of the gas as the summer/winter operating mode is changed.

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.
15. 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.
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 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 plate heat exchanger and operates as an integration of the protecion offered by the differential pressure switch (standard).
Tank antifreeze electrical heater	Activated together with the antifreeze electrical heater of the plate heat exchanger, it has the task to keep the still water in the buffer tank at a temperature high enough to avoid ice generation during winter.
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.
Tank antifreeze electrical heater	Activated together with the antifreeze electrical heater of the plate heat exchanger, it has the task to keep the still water in the buffer tank at a temperature high enough to avoid ice generation during winter.
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

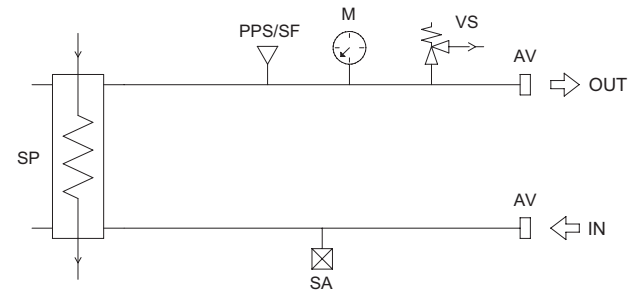
For other voltages, please contact our technical department

"Storing and hydronic kit" options

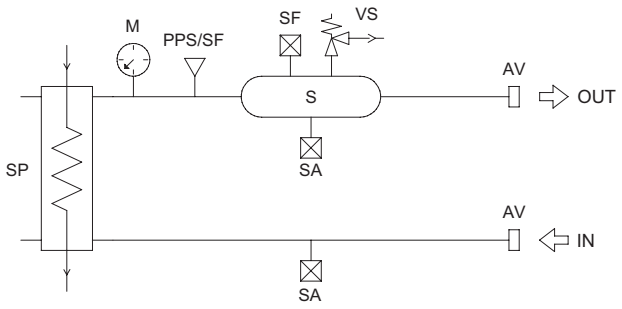
Storing and hydronic kit	**MKT SS** **Pipe kit without tank**	This accessory consists of steel pipes insulated with thermal barrier material and allows the water inlet/outlet connection to be routed outside the unit.
	M1P SS 2P STD **1 Standard pump**	Allows the circulation of the water on the plant 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.
	MKT AM **Pipe kit with 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. The thermal inertia of the buffer tank allows to reduce the number of compressor starts and to guarantee a more stable flow temperature.
	M1P AM 2P STD **Tank and 1 standard pump**	Allows the circulation of the water on the plant side. The thermal inertia of the buffer tank allows to reduce the number of compressor starts and to guarantee a more stable flow temperature.
	M1P AM 2P HP1 **Tank and 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. The thermal inertia of the buffer tank allows to reduce the number of compressor starts and to guarantee a more stable flow temperature.
	M2P AM 2P STD **Tank and 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. The thermal inertia of the buffer tank allows to reduce the number of compressor starts and to guarantee a more stable flow temperature.
	M2P AM 2P HP1 **Tank and 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. The thermal inertia of the buffer tank allows to reduce the number of compressor starts and to guarantee a more stable flow temperature.
	M1P PS 2P STD **Tank and 1 standard pump** **(primary and secondary configuration)**	Allows the circulation of the water on the primary between the tank and the heat exchanger. The thermal inertia of the buffer tank allows to reduce the number of compressor starts and to guarantee a more stable flow temperature.
	M2P PS 2P STD **Tank and 2 standard pumps** **(primary and secondary configuration)**	Allows the circulation of the water on the primary between the tank and the heat exchanger and includes a second pump installed as a backup to the first. The thermal inertia of the buffer tank allows to reduce the number of compressor starts and to guarantee a more stable flow temperature.

ACCESSORIES AND OPTIONAL EQUIPMENT

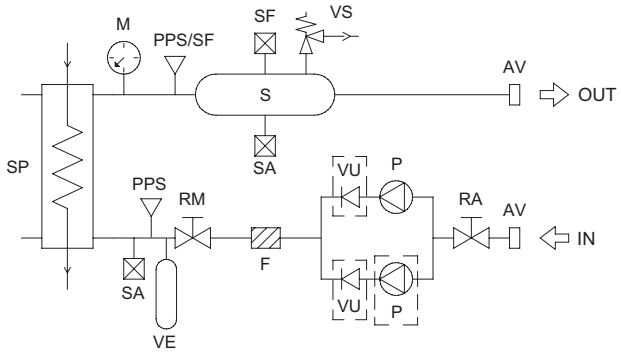
Pipe kit without tank



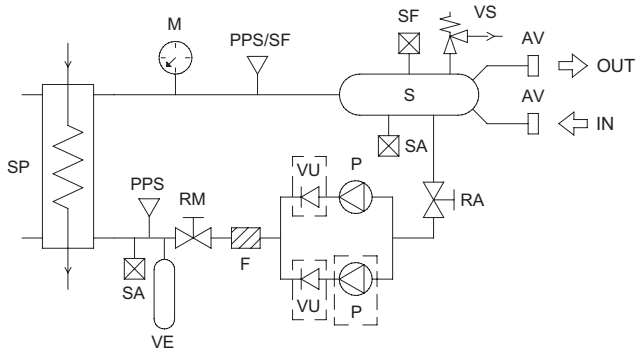
Pipe kit with tank



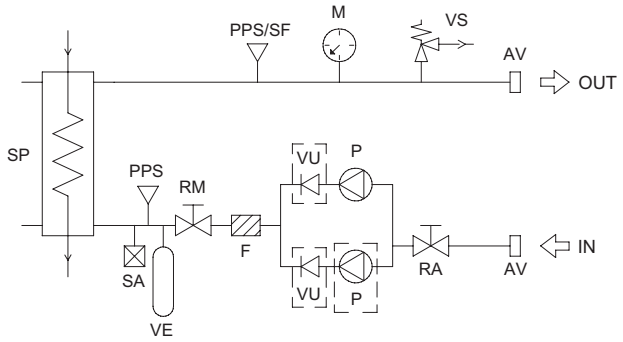
Tank and standard pump



Tank and standard pump (primary and secondary configuration)



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
S	TANK
SA	DRAIN WATER VALVE
SF	AIR VENT VALVE
SP	HEAT EXCHANGER
VE	EXPANSION VESSEL
VS	SAFETY VALVE
VU	CHECK VALVE

– – – only in case of 2 pumps

ACCESSORIES AND OPTIONAL EQUIPMENT

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	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	V-ph-Hz
Refrigerant									
Type	R410A	R410A	R410A	R410A	R410A	R410A	R410A	R410A	-
Refrigerant circuits									
Quantity	2	2	2	2	2	2	2	2	n°
Compressor									
Type	scroll	scroll	scroll	scroll	scroll	scroll	scroll	scroll	-
Quantity	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	%
Oil charge CP1	3,25	3,25	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	l
Oil charge CP3	3,25	3,25	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	l
Oil charge - C CP1	3,25	3,25	4,7	4,7	6,8	6,8	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	l
Oil charge - C CP3	3,25	3,25	4,7	4,7	6,8	6,8	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	l
Plant side heat exchanger									
Type	stainless steel brazed plates	stainless steel brazed plates	stainless steel brazed plates	stainless steel brazed plates	stainless steel brazed plates	stainless steel brazed plates	stainless steel brazed plates	stainless steel brazed plates	-
Quantity	1	1	1	1	1	1	1	1	n°
Water volume	9	10	11	13	15	25	28	33	l
Source side heat exchanger									
Type	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	n°
Frontal surface	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	-
Quantity	4	4	4	4	6	6	6	8	n°
Diameter	800	800	800	800	800	800	800	800	mm
Maximum rotational speed	900	900	900	900	900	900	900	900	rpm
Plant side hydraulic circuit									
Expansion vessel volume	24	24	24	24	24	24	24	24	l
Tank volume	325	325	325	325	325	710	710	710	l
Safety valve set	600	600	600	600	600	600	600	600	kPa
Primary / secondary pump (option)									
Type	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	-
Nominal power	3	3	3	3	3	5,5	5,5	5,5	kW
Standard pump (option)									
Type	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	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	-
Nominal power	4	4	5,5	5,5	5,5	7,5	7,5	11	kW
Electrical data units without pumping module									
FLA TOTALE	140	151	177	193	217	243	269	335	A
FLI TOTALE	76	87	107	118	133	148	163	200	kW
MIC TOTALE	283	340	347	355	379	469	495	558	A
MIC TOTALE con soft starter	213	250	263	271	295	354	380	438	A
Electrical data units with pumping module MP AM HP1 and MP SS HP1 (1 or 2 pumps)									
FLA TOTALE	149	160	187	203	227	256	282	357	A
FLI TOTALE	81	91	113	124	139	156	171	212	kW
MIC TOTALE	292	348	357	365	389	482	508	580	A
MIC TOTALE con soft starter	222	258	273	281	305	368	394	460	A

TECHNICAL DATA AND PERFORMANCE - BASE VERSION (VB)

NET NOMINAL performances - Standard unit (AB) - Standard plants - EUROVENT certified data

	Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	U.M.
IR	**Cooling A35W7** (source : air in 35°C d.b. / plant : water in 12°C out 7°C)									
	Cooling capacity	172	191	212	237	267	304	340	387	kW
	Power input	52.7	58.0	65.4	74.1	83.6	95	106	122	kW
	EER	3.26	3.29	3.24	3.20	3.19	3.20	3.21	3.17	W/W
	ESSER	4.57	4.61	4.54	4.48	4.47	4.48	4.49	4.44	W/W
	Water flow rate plant side	8.22	9.13	10.13	11.3	12.8	14.5	16.2	18.5	l/s
	Pressure drops plant side	39	36	38	39	40	36	36	33	kPa
IP	**Cooling A35W7** (source : air in 35°C d.b. / plant : water in 12°C out 7°C)									
	Cooling capacity	169	187	208	234	266	301	339	385	kW
	Power input	52.7	58.0	65.3	73.3	83.2	94.0	106	121	kW
	EER	3.22	3.23	3.19	3.19	3.20	3.20	3.20	3.18	W/W
	ESSER	4.50	4.52	4.46	4.47	4.48	4.48	4.48	4.45	W/W
	Water flow rate plant side	8.09	8.95	9.94	11.2	12.7	14.4	16.2	18.4	l/s
	Pressure drops plant side	38	35	36	38	39	35	36	33	kPa
	Heating A7W45 (source : air in 7°C d.b. 6°C w.b. / plant : water in 40°C out 45°C)									
	Heating capacity	176	196	218	242	279	316	351	401	kW
	Power input	52.6	59.9	66.7	74.6	85.9	97	107	124	kW
	COP	3.34	3.28	3.27	3.24	3.25	3.26	3.28	3.23	W/W
	Water flow rate plant side	8.39	9.37	10.4	11.6	13.3	15.1	16.8	19.2	l/s
	Pressure drops plant side	41	38	40	41	43	39	39	36	kPa

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

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	U.M.
IP	**Heating A2W45** (source : air in 2°C d.b. 1°C w.b. / plant : water in 40°C out 45°C)									
	Heating capacity	160	178	198	220	254	288	319	365	kW
	Power input	51.9	59.1	65.8	73.6	84.8	95.4	105	122	kW
	COP	3.08	3.01	3.01	2.99	3.00	3.02	3.04	2.99	W/W
	Water flow rate plant side	7.63	8.53	9.48	10.5	12.1	13.7	15.3	17.4	l/s
	Pressure drops plant side	34	32	33	33	35	32	32	29	kPa

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

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

	Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	U.M.
IR	**Cooling A35W7** (source : air in 35°C d.b. / plant : water in 12°C out 7°C)									
	Cooling capacity	-	-	-	-	-	-	-	-	kW
	EER	-	-	-	-	-	-	-	-	-
	Pressure drops plant side	-	-	-	-	-	-	-	-	kPa
	ESEER	-	-	-	-	-	-	-	-	-
IP	**Cooling A35W7** (source : air in 35°C d.b. / plant : water in 12°C out 7°C)									
	Cooling capacity	-	-	-	-	-	-	-	-	kW
	EER	-	-	-	-	-	-	-	-	-
	Pressure drops plant side	-	-	-	-	-	-	-	-	kPa
	ESEER	-	-	-	-	-	-	-	-	-
	Heating A7W45 (air 7 °C bs - 6 °C bu / water 40 - 45 °C)									
	Heating capacity	-	-	-	-	-	-	-	-	kW
	COP	-	-	-	-	-	-	-	-	-
	Pressure drops plant side	-	-	-	-	-	-	-	-	kPa

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 - Standard unit (AB) - Radiant plants

	Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	U.M.
IR	**Cooling A35W18** (source : air in 35°C d.b. / plant : water in 23°C out 18°C)									
	Cooling capacity	218	242	269	300	338	385	431	491	kW
	Power input	57.7	63.4	71.6	81.2	91.5	104	116	133	kW
	EER	3.78	3.82	3.76	3.69	3.69	3.70	3.72	3.69	-
	Water flow rate plant side	10.52	11.7	13.0	14.5	16.3	18.6	20.8	23.7	l/s
	Pressure drops plant side	64	60	62	64	64	59	60	54	kPa
IP	**Cooling A35W18** (source : air in 35°C d.b. / plant : water in 23°C out 18°C)									
	Cooling capacity	215	238	264	297	337	382	430	489	kW
	Power input	57.5	63.3	71.3	80.2	91.0	103	116	132	kW
	EER	3.74	3.76	3.70	3.70	3.70	3.71	3.71	3.70	-
	Water flow rate plant side	10.36	11.5	12.7	14.3	16.3	18.4	20.7	23.5	l/s
	Pressure drops plant side	62	58	59	62	64	57	59	53	kPa
	Heating A7W35 (source : air in 7°C d.b. 6°C w.b. / plant : water in 30°C out 35°C)									
	Heating capacity	187	209	233	258	298	337	375	428	kW
	Power input	47.1	53.4	59.4	66.4	76.9	86.1	95	110	kW
	COP	3.97	3.91	3.92	3.89	3.88	3.91	3.95	3.89	-
	Water flow rate plant side	8.89	9.93	11.0	12.3	14.1	16.0	17.8	20.3	l/s
	Pressure drops plant side	45	43	45	46	48	43	44	40	kPa
	Heating A2W35 (source : air in 2°C d.b. 1°C w.b. / plant : water in 30°C out 35°C)									
	Potenza termica	147	164	183	203	234	265	294	336	kW
	Potenza assorbita	44.6	50.5	56.1	62.6	72.7	81.4	89.7	104	kW
	COP	3.30	3.25	3.26	3.24	3.22	3.26	3.28	3.23	-
	Portata acqua lato impianto	7.94	8.87	9.86	10.90	12.60	14.30	15.90	18.10	l/s
	Perdite di carico lato impianto	36	34	36	36	38	35	35	32	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 - Low noise unit (AS) - Standard plants - EUROVENT certified data

	Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	U.M.
IR	**Cooling A35W7** (source : air in 35°C d.b. / plant : water in 12°C out 7°C)									
	Cooling capacity	165	183	204	228	256	292	326	372	kW
	Power input	55.6	61.4	69.4	78.8	88.3	101	113	130	kW
	EER	2.97	2.98	2.94	2.89	2.90	2.90	2.89	2.86	W/W
	ESSER	4.57	4.59	4.53	4.46	4.46	4.47	4.45	4.41	W/W
	Water flow rate plant side	7.9	8.7	9.8	10.9	12.2	14.0	15.6	17.8	l/s
	Pressure drops plant side	36	33	35	36	36	33	34	31	kPa
IP	**Cooling A35W7** (source : air in 35°C d.b. / plant : water in 12°C out 7°C)									
	Cooling capacity	163	180	200	225	255	289	325	370	kW
	Power input	55.6	61.4	69.2	77.9	87.9	99.6	113	129	kW
	EER	2.93	2.93	2.89	2.89	2.90	2.90	2.88	2.87	W/W
	ESSER	4.51	4.51	4.45	4.45	4.47	4.47	4.44	4.42	W/W
	Water flow rate plant side	7.8	8.6	9.6	10.8	12.2	13.8	15.5	17.7	l/s
	Pressure drops plant side	35	32	34	35	36	32	33	30	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	188	209	232	268	303	337	385	kW
	Power input	49.6	56.5	63.0	70.5	81.0	91.3	101	117	kW
	COP	3.41	3.33	3.32	3.29	3.31	3.32	3.35	3.29	W/W
	Water flow rate plant side	8.1	9.0	10.0	11.1	12.8	14.5	16.1	18.4	l/s
	Pressure drops plant side	37	35	37	37	40	36	36	33	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	U.M.
IP	**Heating A2W45** (source : air in 2°C d.b. 1°C w.b. / plant : water in 40°C out 45°C)									
	Heating capacity	154	171	190	211	244	276	307	350	kW
	Power input	49.7	56.5	62.9	70.2	81.0	91.2	100	117	kW
	COP	3.10	3.03	3.02	3.01	3.01	3.03	3.07	2.99	W/W
	Water flow rate plant side	7.4	8.2	9.1	10.1	11.7	13.2	14.7	16.7	l/s
	Pressure drops plant side	31	29	30	31	33	30	30	27	kPa

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

GROSS 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	U.M.
IR	**Cooling A35W7** (source : air in 35°C d.b. / plant : water in 12°C out 7°C)									
	Cooling capacity	-	-	-	-	-	-	-	-	kW
	EER	-	-	-	-	-	-	-	-	-
	Pressure drops plant side	-	-	-	-	-	-	-	-	kPa
	ESEER	-	-	-	-	-	-	-	-	-

IP	**Cooling A35W7** (source : air in 35°C d.b. / plant : water in 12°C out 7°C)									
	Cooling capacity	-	-	-	-	-	-	-	-	kW
	EER	-	-	-	-	-	-	-	-	-
	Pressure drops plant side	-	-	-	-	-	-	-	-	kPa
	ESEER	-	-	-	-	-	-	-	-	-
	Heating A7W45 (air 7 °C bs - 6 °C bu / water 40 - 45 °C)									
	Heating capacity	-	-	-	-	-	-	-	-	kW
	COP	-	-	-	-	-	-	-	-	-
	Pressure drops plant side	-	-	-	-	-	-	-	-	kPa

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 - Low noise unit (AS) - Radiant plants

	Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	U.M.
IR	**Cooling A35W18** (source : air in 35°C d.b. / plant : water in 23°C out 18°C)									
	Cooling capacity	209	232	259	289	325	371	414	472	kW
	Power input	61.2	67.4	76.3	86.6	97.2	110	124	142	kW
	EER	3.42	3.44	3.39	3.34	3.34	3.37	3.34	3.32	-
	Water flow rate plant side	10.1	11.2	12.5	13.9	15.7	17.9	19.9	22.7	l/s
	Pressure drops plant side	59	55	58	59	60	54	55	50	kPa
IP	**Cooling A35W18** (source : air in 35°C d.b. / plant : water in 23°C out 18°C)									
	Cooling capacity	207	228	254	285	323	367	412	470	kW
	Power input	61.1	67.3	75.9	85.5	96.8	109.2	123.6	141.1	kW
	EER	3.39	3.39	3.35	3.33	3.34	3.37	3.32	3.33	-
	Water flow rate plant side	10.0	11.0	12.2	13.8	15.6	17.7	19.9	22.6	l/s
	Pressure drops plant side	57	53	55	58	59	53	55	49	kPa
	Heating A7W35 (source : air in 7°C d.b. 6°C w.b. / plant : water in 30°C out 35°C)									
	Heating capacity	180	201	223	248	286	323	360	410	kW
	Power input	45.0	51.0	56.7	63.2	73.4	82.2	90.5	105	kW
	COP	4.00	3.94	3.93	3.92	3.90	3.93	4.00	3.90	-
	Water flow rate plant side	8.56	9.52	10.6	11.7	13.6	15.3	17.1	19.5	l/s
	Pressure drops plant side	42	40	41	42	45	40	40	37	kPa
	Heating A2W35 (source : air in 2°C d.b. 1°C w.b. / plant : water in 30°C out 35°C)									
	Heating capacity	142	157	175	194	225	254	282	322	kW
	Power input	42.7	48.2	53.6	59.7	69.5	77.8	85.5	99.6	kW
	COP	3.33	3.26	3.26	3.25	3.24	3.26	3.30	3.22	-
	Water flow rate plant side	7.64	8.50	9.45	10.5	12.1	13.7	15.2	17.4	l/s
	Pressure drops plant side	34	31	33	33	35	32	32	29	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 - EUROVENT certified data

	Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	U.M.
	Cooling A35W7 (source : air in 35°C d.b. / plant : water in 12°C out 7°C)									
	Cooling capacity	162	180	199	223	251	286	320	364	kW
	Power input	56.3	62.2	70.4	80.1	89.4	102	114	132	kW
IR	EER	2.88	2.89	2.83	2.78	2.81	2.80	2.82	2.77	W/W
	ESSER	4.66	4.69	4.58	4.51	4.55	4.53	4.56	4.48	W/W
	Water flow rate plant side	7.7	8.6	9.5	10.7	12.0	13.7	15.3	17.4	l/s
	Pressure drops plant side	34	32	33	35	35	32	32	29	kPa
	Cooling A35W7 (source : air in 35°C d.b. / plant : water in 12°C out 7°C)									
	Cooling capacity	159	176	196	220	250	283	319	362	kW
	Power input	56.3	62.2	70.3	79.2	89.0	101	114	131	kW
	EER	2.82	2.83	2.79	2.78	2.81	2.80	2.81	2.77	W/W
	ESSER	4.58	4.58	4.52	4.50	4.55	4.54	4.55	4.49	W/W
	Water flow rate plant side	7.6	8.4	9.4	10.5	11.9	13.5	15.2	17.3	l/s
	Pressure drops plant side	33	31	32	34	34	31	32	29	kPa
	Heating A7W45 (source : air in 7°C d.b. 6°C w.b. / plant : water in 40°C out 45°C)									
	Heating capacity	167	186	207	230	265	300	333	381	kW
IP	Power input	48.0	54.8	61.1	68.5	78.4	88.5	97.9	113	kW
	COP	3.48	3.39	3.39	3.36	3.38	3.39	3.40	3.39	W/W
	Water flow rate plant side	8.0	8.9	9.9	11.0	12.7	14.3	15.9	18.2	l/s
	Pressure drops plant side	37	34	36	37	39	35	35	32	kPa

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

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	U.M.
	Heating A2W45 (source : air in 2°C d.b. 1°C w.b. / plant : water in 40°C out 45°C)									
	Heating capacity	152	169	188	209	241	273	303	347	kW
IP	Power input	48.8	55.5	61.7	69.0	79.6	89.5	98.8	114	kW
	COP	3.11	3.05	3.05	3.03	3.03	3.05	3.06	3.04	W/W
	Water flow rate plant side	7.3	8.1	9.0	10.0	11.5	13.0	14.5	16.6	l/s
	Pressure drops plant side	30	29	30	30	32	29	29	27	kPa

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

GROSS 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	U.M.
	Cooling A35W7 (source : air in 35°C d.b. / plant : water in 12°C out 7°C)									
	Cooling capacity	-	-	-	-	-	-	-	-	kW
IR	EER	-	-	-	-	-	-	-	-	-
	Pressure drops plant side	-	-	-	-	-	-	-	-	kPa
	ESEER	-	-	-	-	-	-	-	-	-
	Cooling A35W7 (source : air in 35°C d.b. / plant : water in 12°C out 7°C)									
	Cooling capacity	-	-	-	-	-	-	-	-	kW
	EER	-	-	-	-	-	-	-	-	-
	Pressure drops plant side	-	-	-	-	-	-	-	-	kPa
IP	**ESEER**	-	-	-	-	-	-	-	-	-
	Heating A7W45 (air 7 °C bs - 6 °C bu / water 40 - 45 °C)									
	Heating capacity	-	-	-	-	-	-	-	-	kW
	COP	-	-	-	-	-	-	-	-	-
	Pressure drops plant side	-	-	-	-	-	-	-	-	kPa

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) - Radiant plants

	Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	U.M.
IR	**Cooling A35W18** (source : air in 35°C d.b. / plant : water in 23°C out 18°C)									
	Cooling capacity	205	228	252	283	318	363	406	462	kW
	Power input	62.6	68.9	77.9	88.5	99.4	113	126	145	kW
	EER	3.27	3.31	3.23	3.20	3.20	3.21	3.22	3.19	-
	Water flow rate plant side	9.91	11.0	12.2	13.6	15.4	17.5	19.6	22.3	l/s
	Pressure drops plant side	57	53	55	56	57	52	53	48	kPa
IP	**Cooling A35W18** (source : air in 35°C d.b. / plant : water in 23°C out 18°C)									
	Cooling capacity	202	223	249	279	317	359	405	460	kW
	Power input	62.5	68.8	77.7	87.5	98.9	112	126	144	kW
	EER	3.23	3.24	3.20	3.19	3.21	3.21	3.21	3.19	-
	Water flow rate plant side	9.72	10.8	12.0	13.5	15.3	17.3	19.5	22.1	l/s
	Pressure drops plant side	54	50	53	55	57	51	53	47	kPa
	Heating A7W35 (source : air in 7°C d.b. 6°C w.b. / plant : water in 30°C out 35°C)									
	Heating capacity	178	198	221	245	283	320	355	406	kW
	Power input	44.2	50.1	55.6	62.1	72.1	80.7	88.9	103	kW
	COP	4.03	3.95	3.97	3.95	3.93	3.97	3.99	3.94	-
	Water flow rate plant side	8.46	9.42	10.5	11.6	13.4	15.2	16.9	19.3	l/s
	Pressure drops plant side	41	39	41	41	43	39	40	36	kPa
	Heating A2W35 (source : air in 2°C d.b. 1°C w.b. / plant : water in 30°C out 35°C)									
	Heating capacity	140	156	173	193	222	251	279	319	kW
	Power input	41.9	47.4	52.6	58.7	68.2	76.4	84.1	97.1	kW
	COP	3.34	3.29	3.29	3.29	3.26	3.29	3.32	3.29	-
	Water flow rate plant side	7.55	8.41	9.36	10.4	12.0	13.6	15.1	17.2	l/s
	Pressure drops plant side	33	31	32	33	35	31	32	29	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

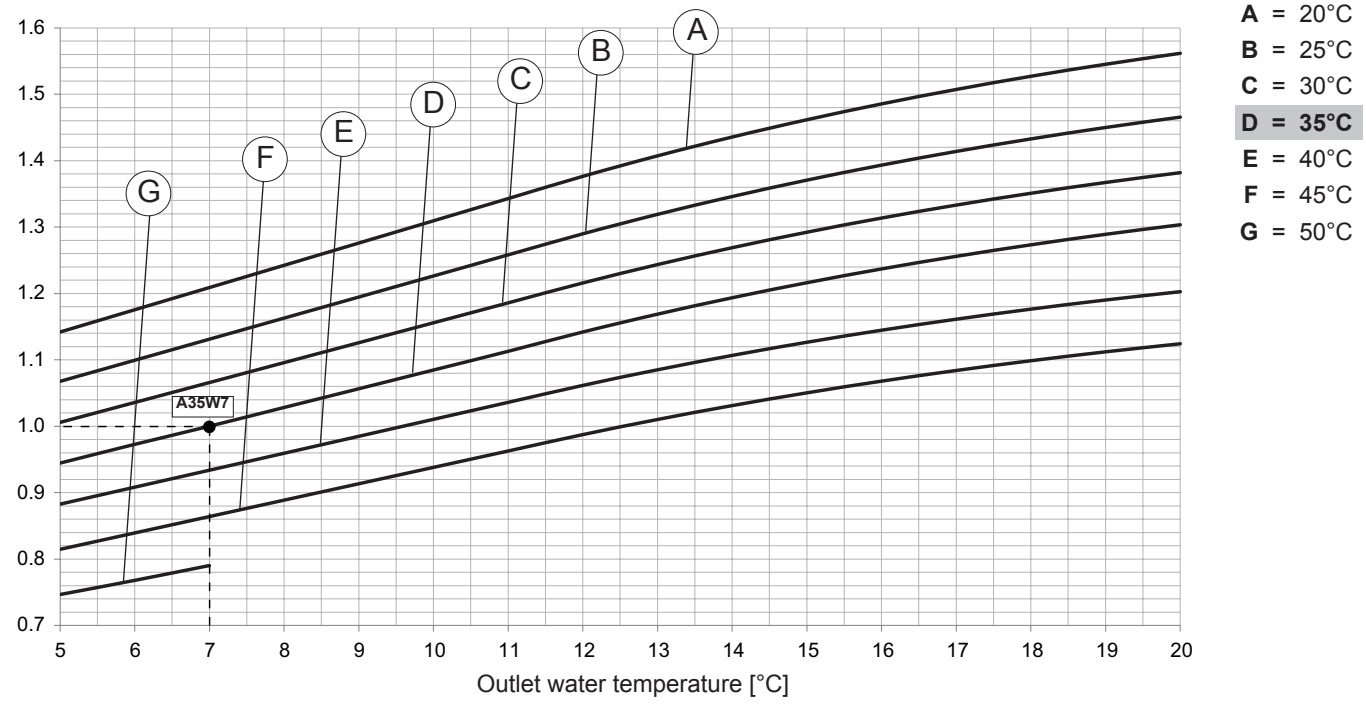
TECHNICAL DATA AND PERFORMANCE - BASE VERSION (VB)

COOLING performances

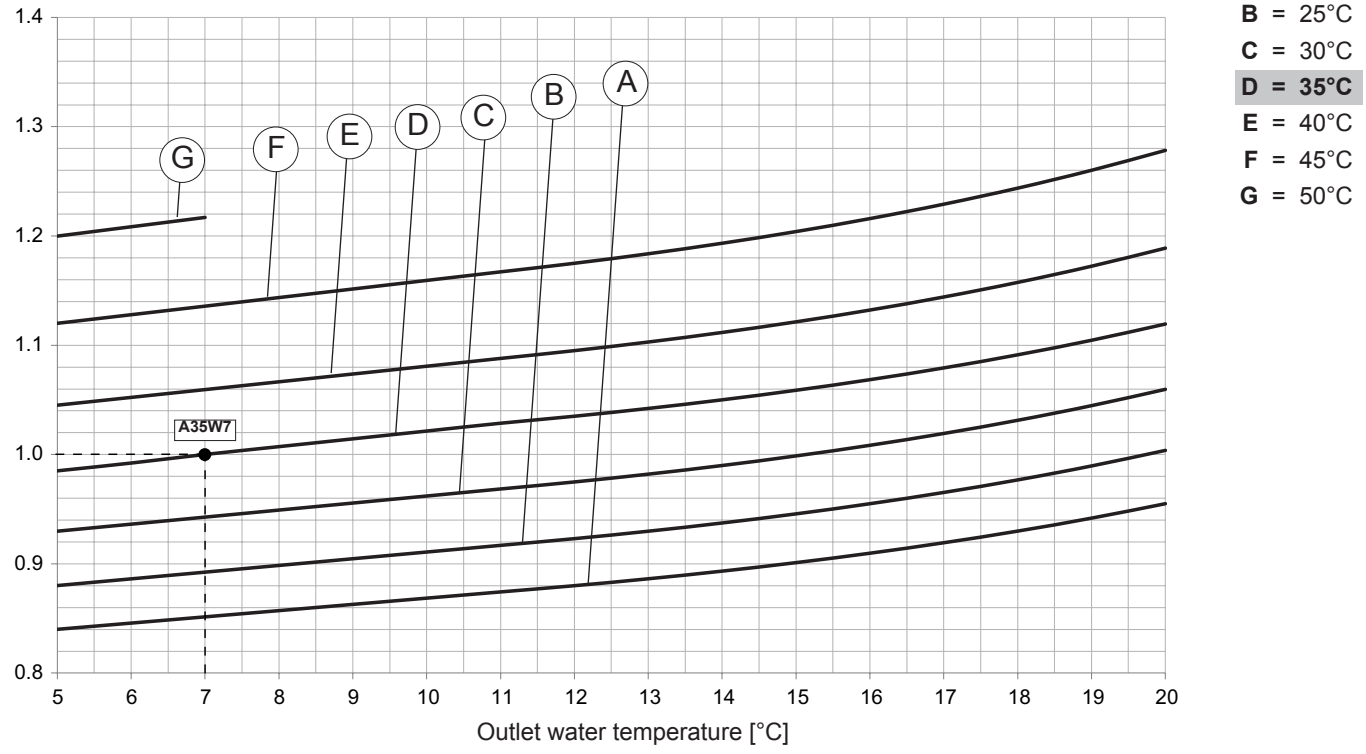
The graphs allow to get the corrective factors to be applied to the nominal performances in order to obtain the real performances in the selected operating conditions. For the "Operation limits" of the unit refer to the section limits.

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

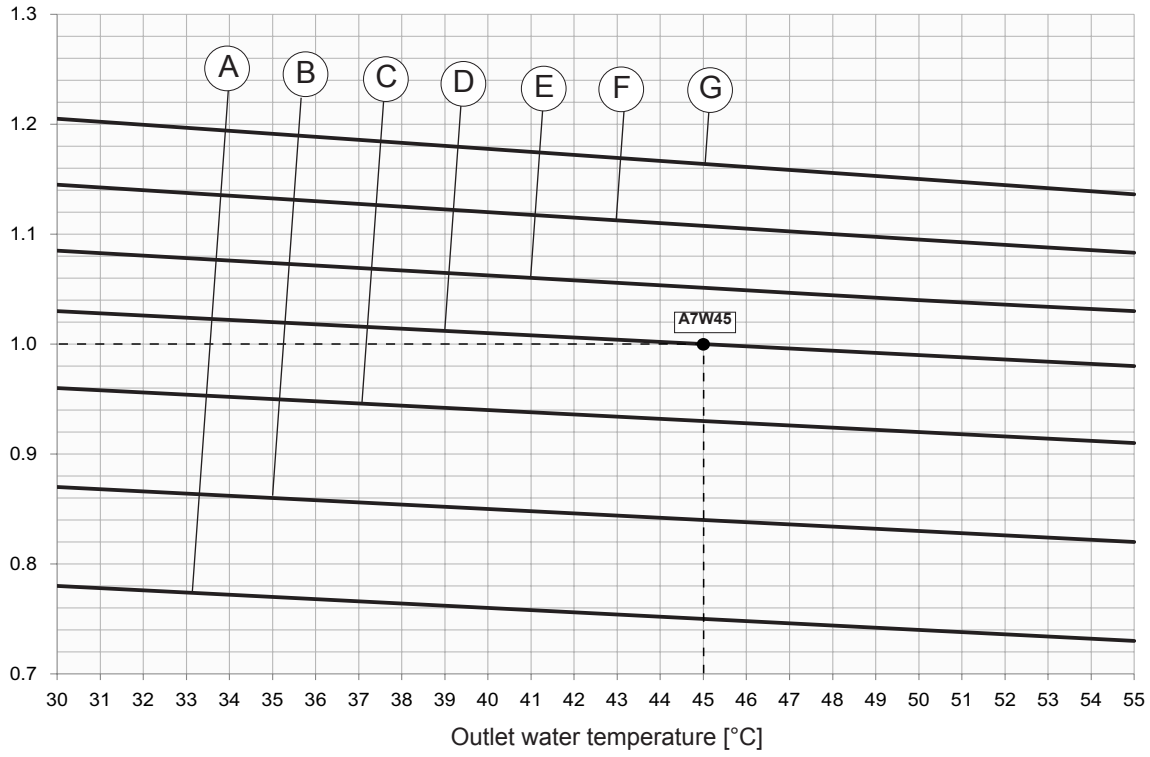
The graphs allow to get the corrective factors to be applied to the nominal performances in order to obtain the real performances in the selected operating conditions. For the “Operation limits” of the unit refer to the section limits.

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.)

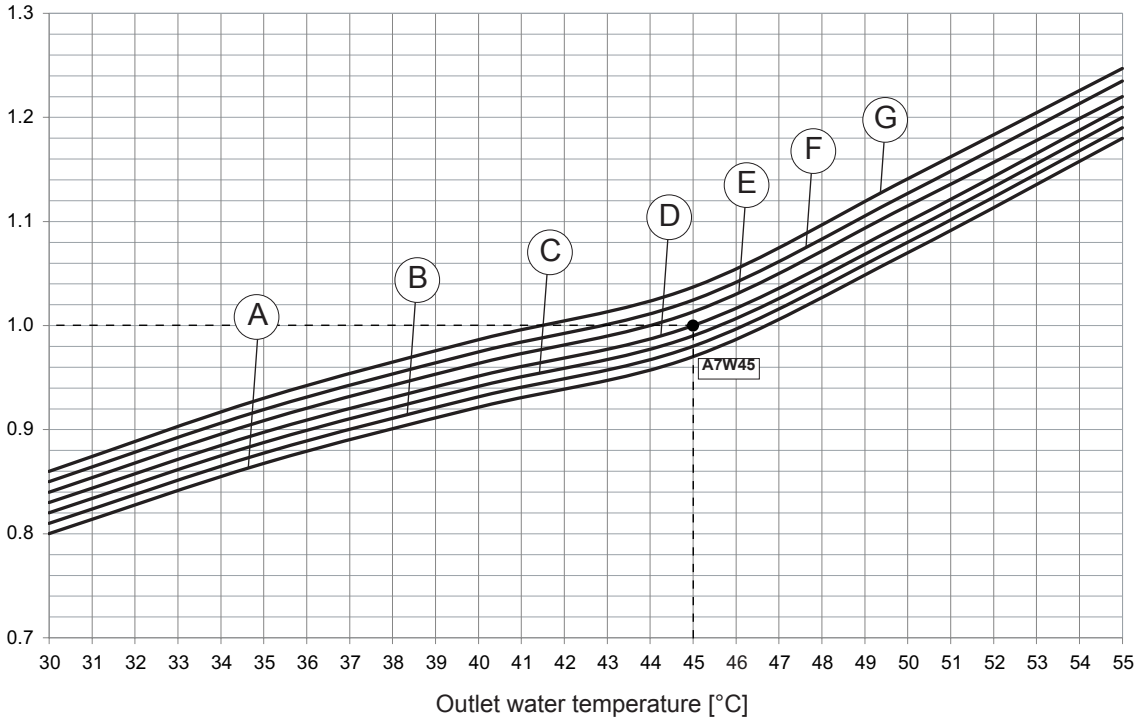
A = -5,5 / -6°C
B = -1,3 / -2°C
C = 2,8 / 2°C
D = 7 / 6°C
E = 10,1 / 9°C
F = 13,2 / 12°C
G = 16,4 /15°C



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 x (Pf_brine [kW]*0.86/∆T_brine)/3.6*

where ∆T_brine is the difference 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

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	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	1,3	1,3	1,3	1,3	1,3	1,3	1,6	1,6	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	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	177	197	218	244	275	312	350	398	kW
	Total power input	53.1	58.5	66.1	74.7	84.5	96	106	123	kW
	EER	3.33	3.36	3.30	3.27	3.25	3.24	3.29	3.22	W/W
	HRE	4.18	4.22	4.17	4.15	4.10	4.11	4.17	4.09	W/W
	Water flow rate	8.55	9.49	10.5	11.8	13.3	15.1	16.9	19.2	l/s
	Water pressure drop	62	63	69	66	71	74	63	68	kPa
	Recovered heating capacity	45.0	50.3	57.6	66.2	72.0	83.4	94.0	107	kW
	Recovered water flow rate	2.15	2.40	2.75	3.16	3.44	3.98	4.49	5.11	l/s
	Recovered water pressure drop	5	6	8	10	12	16	20	26	kPa

Low noise setting up AS

MODEL		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	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	170	189	210	235	264	300	336	383	kW
	Total power input	55.7	61.5	69.7	78.9	88.7	101	113	130	kW
	EER	3.05	3.07	3.01	2.98	2.97	2.97	2.98	2.94	W/W
	HRE	3.93	3.95	3.91	3.88	3.85	3.85	3.88	3.83	W/W
	Water flow rate	8.20	9.09	10.1	11.3	12.7	14.5	16.2	18.5	l/s
	Water pressure drop	57	58	64	61	64	68	58	63	kPa
	Recovered heating capacity	48.6	54.3	62.2	71.5	77.8	90.0	102	116	kW
	Recovered water flow rate	2.32	2.60	2.97	3.42	3.72	4.30	4.87	5.53	l/s
	Recovered water pressure drop	5	7	9	12	14	19	24	31	kPa

Extra low noise setting up AX

MODEL		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	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	186	205	230	258	294	330	375	kW
	Total power input	56.2	62.1	70.4	80.0	89.6	103	113	132	kW
	EER	2.97	2.99	2.91	2.87	2.88	2.87	2.91	2.85	W/W
	HRE	3.86	3.88	3.82	3.79	3.78	3.77	3.82	3.75	W/W
	Water flow rate	8.05	8.94	9.9	11.1	12.5	14.2	15.9	18.1	l/s
	Water pressure drop	55	56	61	58	62	65	56	60	kPa
	Recovered heating capacity	50	55.8	63.9	73.5	79.9	92.6	104	119	kW
	Recovered water flow rate	2.39	2.67	3.05	3.51	3.82	4.42	4.96	5.67	l/s
	Recovered water pressure drop	6	7	9	12	15	20	25	32	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

GROSS 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	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	-	-	-	-	-	-	-	-	kW
	Total power input	-	-	-	-	-	-	-	-	kW
	EER	-	-	-	-	-	-	-	-	W/W
	HRE	-	-	-	-	-	-	-	-	W/W
	Water flow rate	-	-	-	-	-	-	-	-	l/s
	Water pressure drop	-	-	-	-	-	-	-	-	kPa
	Recovered heating capacity	-	-	-	-	-	-	-	-	kW
	Recovered water flow rate	-	-	-	-	-	-	-	-	l/s
	Recovered water pressure drop	-	-	-	-	-	-	-	-	kPa

Low noise setting up AS

	Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	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	-	-	-	-	-	-	-	-	kW
	Total power input	-	-	-	-	-	-	-	-	kW
	EER	-	-	-	-	-	-	-	-	W/W
	HRE	-	-	-	-	-	-	-	-	W/W
	Water flow rate	-	-	-	-	-	-	-	-	l/s
	Water pressure drop	-	-	-	-	-	-	-	-	kPa
	Recovered heating capacity	-	-	-	-	-	-	-	-	kW
	Recovered water flow rate	-	-	-	-	-	-	-	-	l/s
	Recovered water pressure drop	-	-	-	-	-	-	-	-	kPa

Extra low noise setting up AX

	Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	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	-	-	-	-	-	-	-	-	kW
	Total power input	-	-	-	-	-	-	-	-	kW
	EER	-	-	-	-	-	-	-	-	W/W
	HRE	-	-	-	-	-	-	-	-	W/W
	Water flow rate	-	-	-	-	-	-	-	-	l/s
	Water pressure drop	-	-	-	-	-	-	-	-	kPa
	Recovered heating capacity	-	-	-	-	-	-	-	-	kW
	Recovered water flow rate	-	-	-	-	-	-	-	-	l/s
	Recovered water pressure drop	-	-	-	-	-	-	-	-	kPa

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

MODEL	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	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	1,3	1,3	1,3	1,3	1,3	1,3	1,6	1,6	l

NET NOMINAL performances - IP unit - Standard plants

Base setting up AB

MODEL		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	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	174	193	214	241	274	309	349	396	kW
	Total power input	53.0	58.4	65.9	73.8	84.1	95	106	122	kW
	EER	3.29	3.31	3.25	3.26	3.25	3.25	3.28	3.23	W/W
	HRE	4.14	4.17	4.12	4.15	4.11	4.12	4.16	4.10	W/W
	Water flow rate	8.42	9.31	10.34	11.6	13.2	15.0	16.8	19.1	l/s
	Water pressure drop	60	61	67	64	70	73	62	67	kPa
	Recovered heating capacity	45.0	50.3	57.5	65.4	71.6	82.3	94.0	106	kW
	Recovered water flow rate	2.15	2.40	2.75	3.12	3.42	3.93	4.49	5.06	l/s
	Recovered water pressure drop	5	6	8	10	12	16	20	26	kPa

Low noise setting up AS

MODEL		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	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	168	186	206	232	262	297	335	381	kW
	Total power input	55.6	61.4	69.3	78.0	88.3	100	113	129	kW
	EER	3.02	3.02	2.97	2.97	2.97	2.97	2.97	2.95	W/W
	HRE	3.89	3.91	3.86	3.88	3.85	3.86	3.88	3.83	W/W
	Water flow rate	8.10	8.94	9.94	11.2	12.7	14.4	16.1	18.4	l/s
	Water pressure drop	56	56	62	59	64	67	57	62	kPa
	Recovered heating capacity	48.6	54.3	62.0	70.6	77.4	88.9	102	115	kW
	Recovered water flow rate	2.32	2.60	2.96	3.38	3.70	4.25	4.87	5.48	l/s
	Recovered water pressure drop	5	7	9	12	14	18	24	30	kPa

Extra low noise setting up AX

MODEL		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	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	164	181	202	227	257	291	329	373	kW
	Total power input	56.1	62.0	70.3	79.0	89.2	101	113	131	kW
	EER	2.92	2.93	2.87	2.87	2.89	2.88	2.90	2.86	W/W
	HRE	3.81	3.83	3.78	3.79	3.78	3.78	3.81	3.76	W/W
	Water flow rate	7.90	8.75	9.74	10.9	12.4	14.1	15.9	18.0	l/s
	Water pressure drop	53	54	59	56	61	65	56	60	kPa
	Recovered heating capacity	50.0	55.8	63.8	72.6	79.5	91.4	104	118	kW
	Recovered water flow rate	2.39	2.67	3.05	3.47	3.80	4.37	4.96	5.63	l/s
	Recovered water pressure drop	6	7	9	12	15	19	25	32	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)

GROSS NOMINAL performances - IP unit - Standard plants

Base setting up AB

	MODEL	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	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	-	-	-	-	-	-	-	-	kW
	Total power input	-	-	-	-	-	-	-	-	kW
	EER	-	-	-	-	-	-	-	-	W/W
	HRE	-	-	-	-	-	-	-	-	W/W
	Water flow rate	-	-	-	-	-	-	-	-	l/s
	Water pressure drop	-	-	-	-	-	-	-	-	kPa
	Recovered heating capacity	-	-	-	-	-	-	-	-	kW
	Recovered water flow rate	-	-	-	-	-	-	-	-	l/s
	Recovered water pressure drop	-	-	-	-	-	-	-	-	kPa

Low noise setting up AS

	MODEL	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	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	-	-	-	-	-	-	-	-	kW
	Total power input	-	-	-	-	-	-	-	-	kW
	EER	-	-	-	-	-	-	-	-	W/W
	HRE	-	-	-	-	-	-	-	-	W/W
	Water flow rate	-	-	-	-	-	-	-	-	l/s
	Water pressure drop	-	-	-	-	-	-	-	-	kPa
	Recovered heating capacity	-	-	-	-	-	-	-	-	kW
	Recovered water flow rate	-	-	-	-	-	-	-	-	l/s
	Recovered water pressure drop	-	-	-	-	-	-	-	-	kPa

Extra low noise setting up AX

	MODEL	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	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	-	-	-	-	-	-	-	-	kW
	Total power input	-	-	-	-	-	-	-	-	kW
	EER	-	-	-	-	-	-	-	-	W/W
	HRE	-	-	-	-	-	-	-	-	W/W
	Water flow rate	-	-	-	-	-	-	-	-	l/s
	Water pressure drop	-	-	-	-	-	-	-	-	kPa
	Recovered heating capacity	-	-	-	-	-	-	-	-	kW
	Recovered water flow rate	-	-	-	-	-	-	-	-	l/s
	Recovered water pressure drop	-	-	-	-	-	-	-	-	kPa

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.

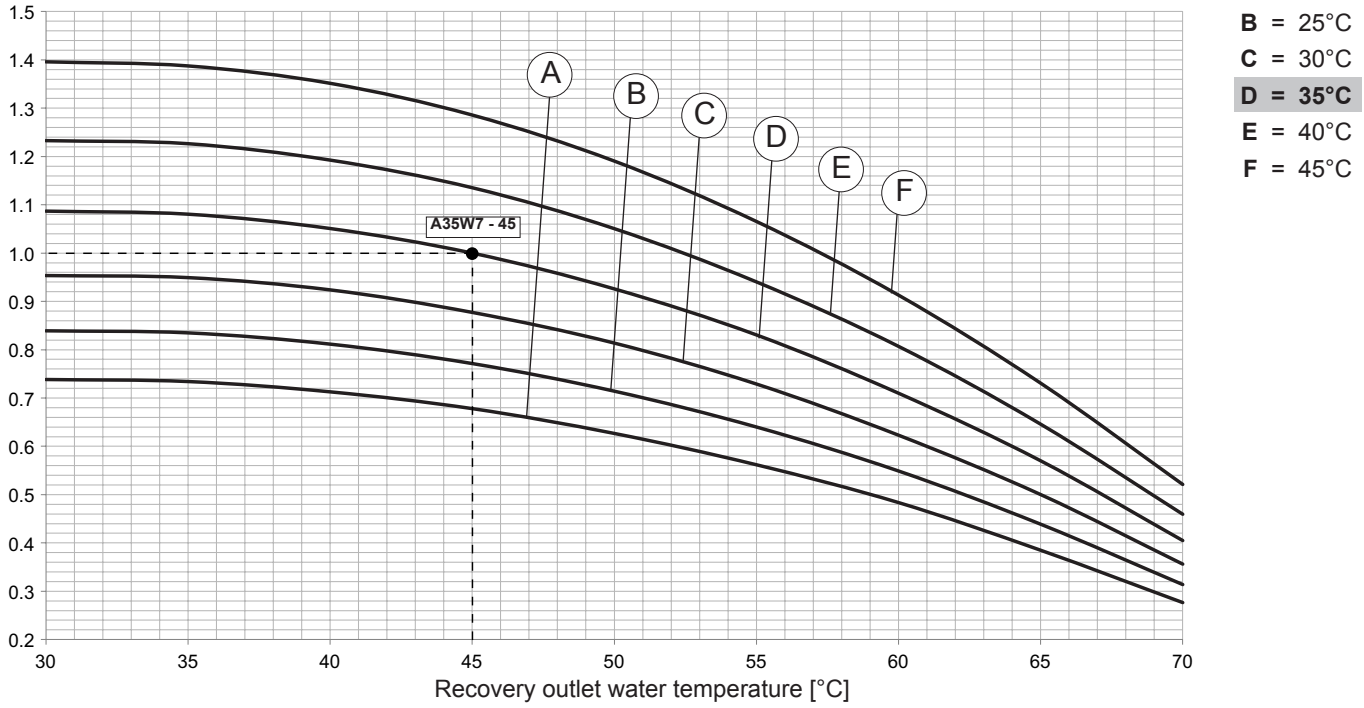
TECHNICAL DATA AND PERFORMANCE - DESUPERHEATER VERSION (VD)

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



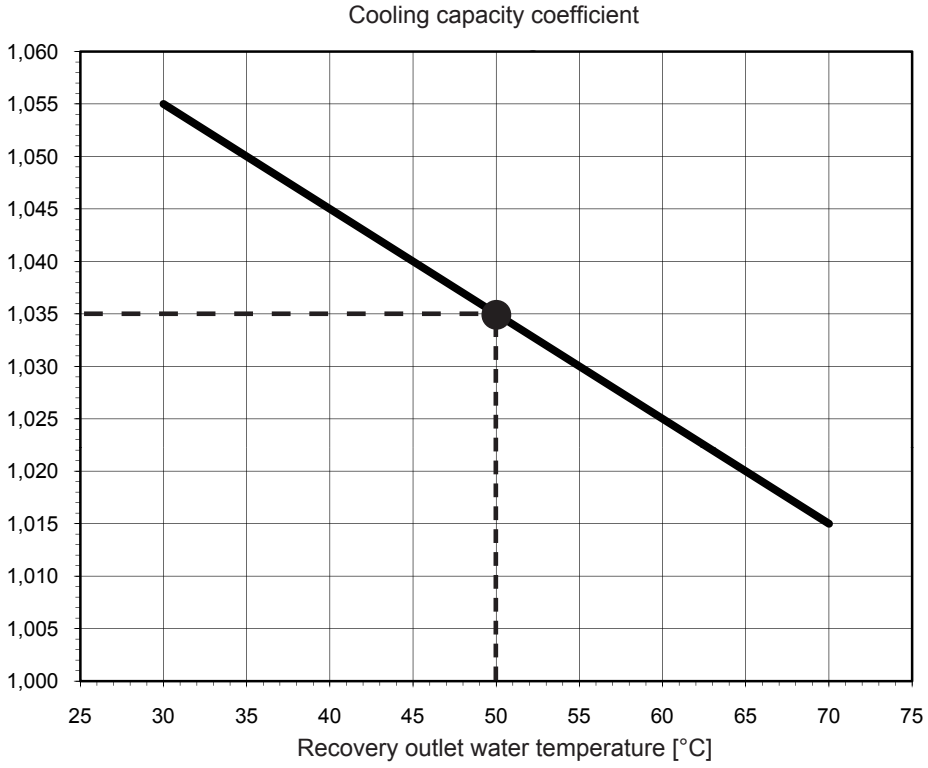
The standard performances refer to a 5°C temperature difference between the water entering and leaving the heat exchanger and to operation of the unit with all fans at nominal or maximum speed. A 0.44 x 10^{-4} m^2 K/W fouling factor has also been considered with the unit installed at zero meters above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

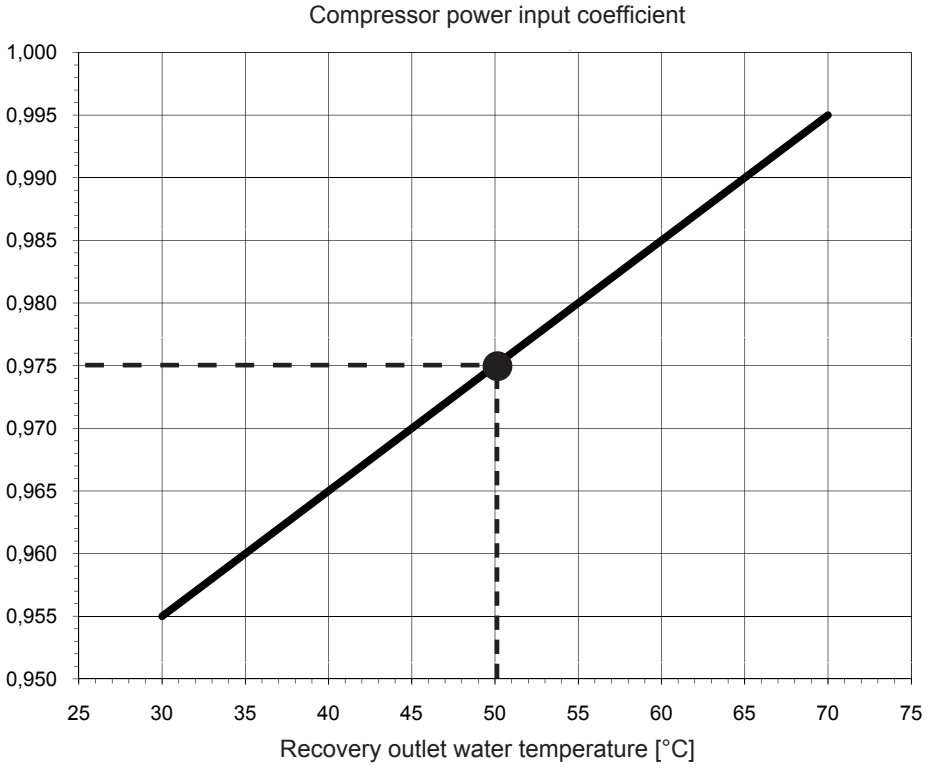
Corrective factors

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	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	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	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	179	198	220	246	277	315	353	402	kW
	Total power input	45.5	50.8	58.4	66.9	73.1	84.8	95	108	kW
	EER	3.93	3.91	3.77	3.68	3.79	3.72	3.72	3.72	W/W
	HRE	8.81	8.77	8.50	8.32	8.54	8.39	8.40	8.38	W/W
	Water flow rate	8.63	9.58	10.6	11.9	13.4	15.3	17.1	19.4	l/s
	Water pressure drop	64	64	70	67	72	76	65	69	kPa
	Recovered heating capacity	222	247	276	310	347	396	444	505	kW
	Recovered water flow rate	10.6	11.8	13.2	14.8	16.6	18.9	21.2	24.1	l/s
	Recovered water pressure drop	49	47	48	47	49	51	51	53	kPa

Low noise setting up AS

Model		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	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	179	198	220	246	277	315	353	402	kW
	Total power input	45.5	50.8	58.4	66.9	73.1	84.8	95	108	kW
	EER	3.93	3.91	3.77	3.68	3.79	3.72	3.72	3.72	W/W
	HRE	8.81	8.77	8.50	8.32	8.54	8.39	8.40	8.38	W/W
	Water flow rate	8.63	9.58	10.6	11.9	13.4	15.3	17.1	19.4	l/s
	Water pressure drop	64	64	70	67	72	76	65	69	kPa
	Recovered heating capacity	222	247	276	310	347	396	444	505	kW
	Recovered water flow rate	10.6	11.8	13.2	14.8	16.6	18.9	21.2	24.1	l/s
	Recovered water pressure drop	49	47	48	47	49	51	51	53	kPa

Extra low noise setting up AX

Model		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	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	179	198	220	246	277	315	353	402	kW
	Total power input	45.5	50.8	58.4	66.9	73.1	84.8	95	108	kW
	EER	3.93	3.91	3.77	3.68	3.79	3.72	3.72	3.72	W/W
	HRE	8.81	8.77	8.50	8.32	8.54	8.39	8.40	8.38	W/W
	Water flow rate	8.63	9.58	10.6	11.9	13.4	15.3	17.1	19.4	l/s
	Water pressure drop	64	64	70	67	72	76	65	69	kPa
	Recovered heating capacity	222	247	276	310	347	396	444	505	kW
	Recovered water flow rate	10.6	11.8	13.2	14.8	16.6	18.9	21.2	24.1	l/s
	Recovered water pressure drop	49	47	48	47	49	51	51	53	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 - RECOVERY VERSION (VR)

GROSS 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	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	-	-	-	-	-	-	-	-	kW
	Total power input	-	-	-	-	-	-	-	-	kW
	EER	-	-	-	-	-	-	-	-	W/W
	HRE	-	-	-	-	-	-	-	-	W/W
	Water flow rate	-	-	-	-	-	-	-	-	l/s
	Water pressure drop	-	-	-	-	-	-	-	-	kPa
	Recovered heating capacity	-	-	-	-	-	-	-	-	kW
	Recovered water flow rate	-	-	-	-	-	-	-	-	l/s
	Recovered water pressure drop	-	-	-	-	-	-	-	-	kPa

Low noise setting up AS

	Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	U.M.
IR	**Raffreddamento A35W7 - W45** (sorgente : aria in 35°C b.s. / impianto : acqua in 12°C out 7°C / Recupero : acqua in 40°C out 45°C)									
	Cooling capacity	-	-	-	-	-	-	-	-	kW
	Total power input	-	-	-	-	-	-	-	-	kW
	EER	-	-	-	-	-	-	-	-	W/W
	HRE	-	-	-	-	-	-	-	-	W/W
	Water flow rate	-	-	-	-	-	-	-	-	l/s
	Water pressure drop	-	-	-	-	-	-	-	-	kPa
	Recovered heating capacity	-	-	-	-	-	-	-	-	kW
	Recovered water flow rate	-	-	-	-	-	-	-	-	l/s
	Recovered water pressure drop	-	-	-	-	-	-	-	-	kPa

Extra low noise setting up AX

	Model	160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	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	-	-	-	-	-	-	-	-	kW
	Total power input	-	-	-	-	-	-	-	-	kW
	EER	-	-	-	-	-	-	-	-	W/W
	HRE	-	-	-	-	-	-	-	-	W/W
	Water flow rate	-	-	-	-	-	-	-	-	l/s
	Water pressure drop	-	-	-	-	-	-	-	-	kPa
	Recovered heating capacity	-	-	-	-	-	-	-	-	kW
	Recovered water flow rate	-	-	-	-	-	-	-	-	l/s
	Recovered water pressure drop	-	-	-	-	-	-	-	-	kPa

The values are referred to units without options and accessories.

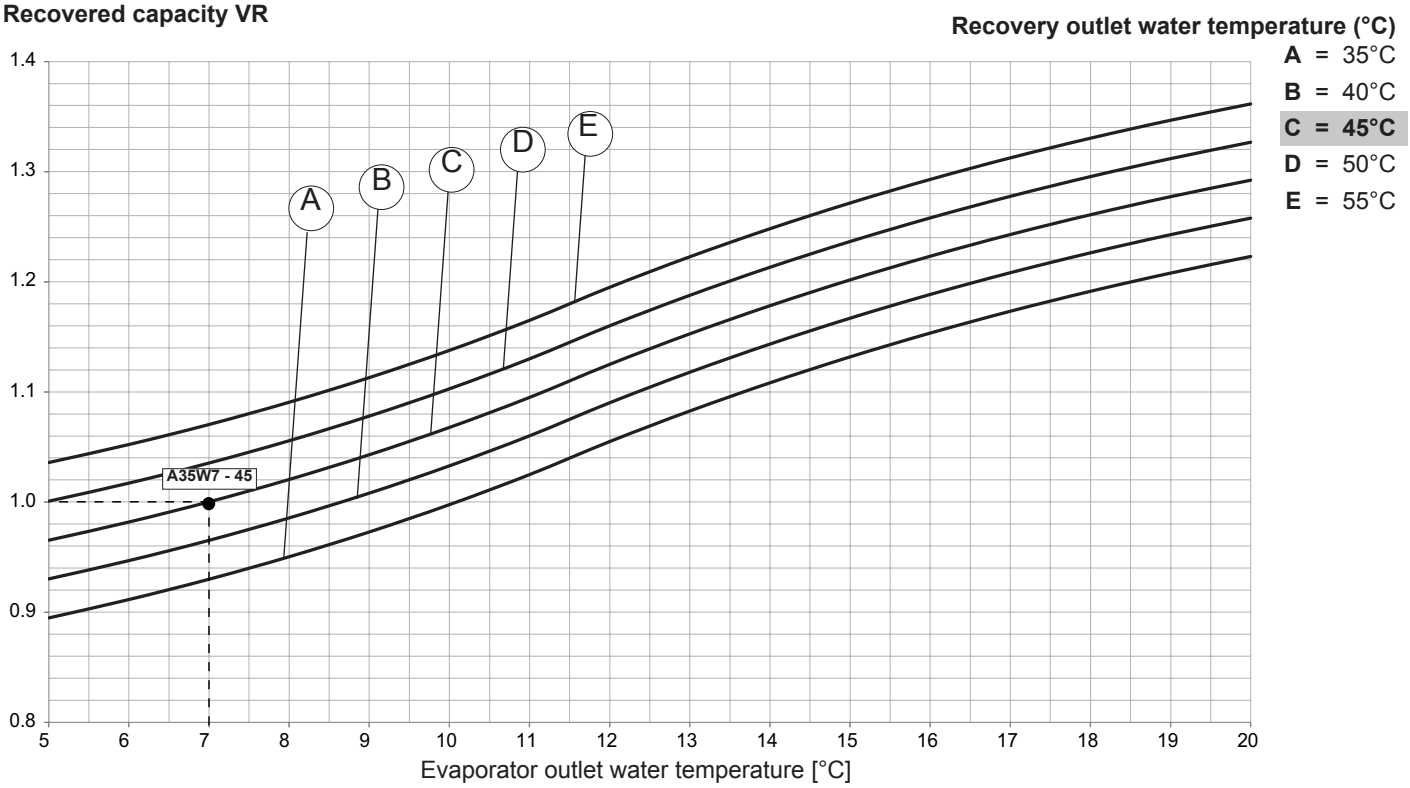
EER (Energy Efficiency Ratio) = ratio of the total cooling capacity to the effective power input of the unit
ESEER (European Seasonal Energy Efficiency Ratio)
COP (Coefficient Of Performance) = ratio of the total heating capacity to the effective power input of the unit
HRE (Heat Recovery Efficiency)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

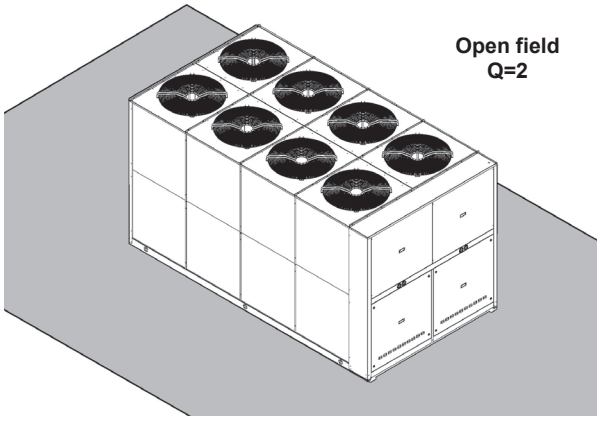
With this brine flow rate enter in abscissa on the water pressure drop of the evaporator then you have Dp_app.
Finally you can calculate the actual pressure drop of the brine on evaporator side:

Dp_evap_brine =CCDP x Dp_app

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) (E)	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

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) (E)	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

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) (E)	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

(E): EUROVENT certifield data. The values are for units without options and accessories.

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.

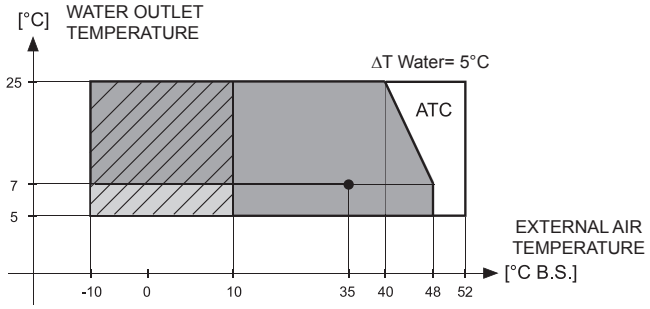
STANDARD UNIT

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

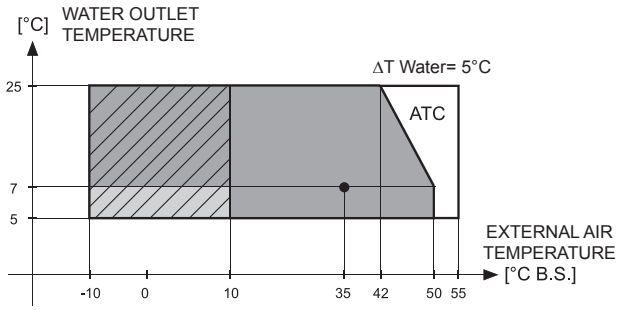
NOTE: the admissible limits for water flow rate on heat exchangers are indicated under the related pressure drop graph (see section "water pressure drop"). If the unit is equipped with pumping module the admissible limits are indicated under the related working head graph (see section "working head").

IN COOLING MODE

UNIT MEDIUM TEMPERATURE - 0 M 5



UNIT HIGH TEMPERATURE - 0 A 5

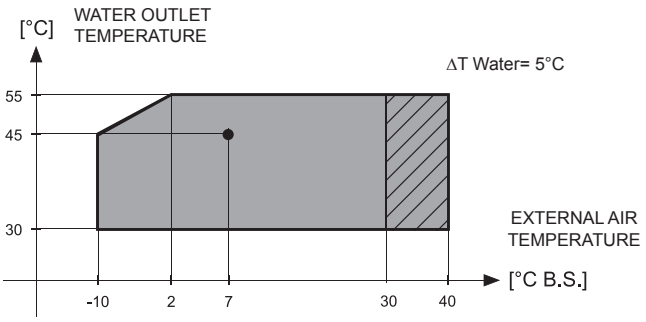


With fans modulating control

With fans modulating control and brine

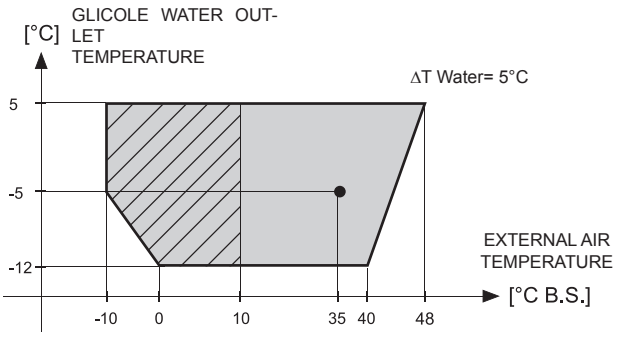
ATC — ATC (Advanced Temperature Control) function may occur, if present

IN HEATING MODE



With fans modulating control

BRINE UNIT BR - BP - IN COOLING MODE

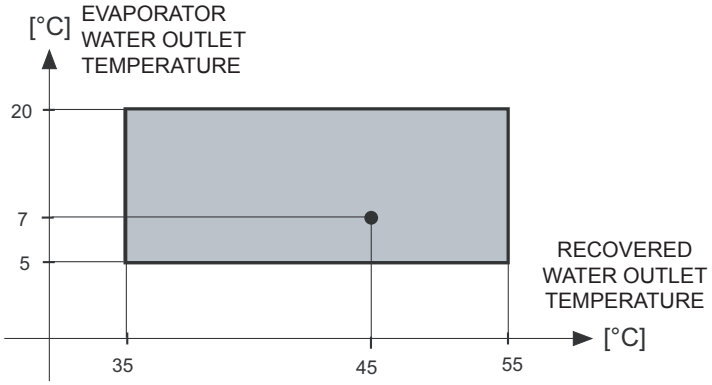


With fans modulating control and brine is mandatory

Brine is mandatory

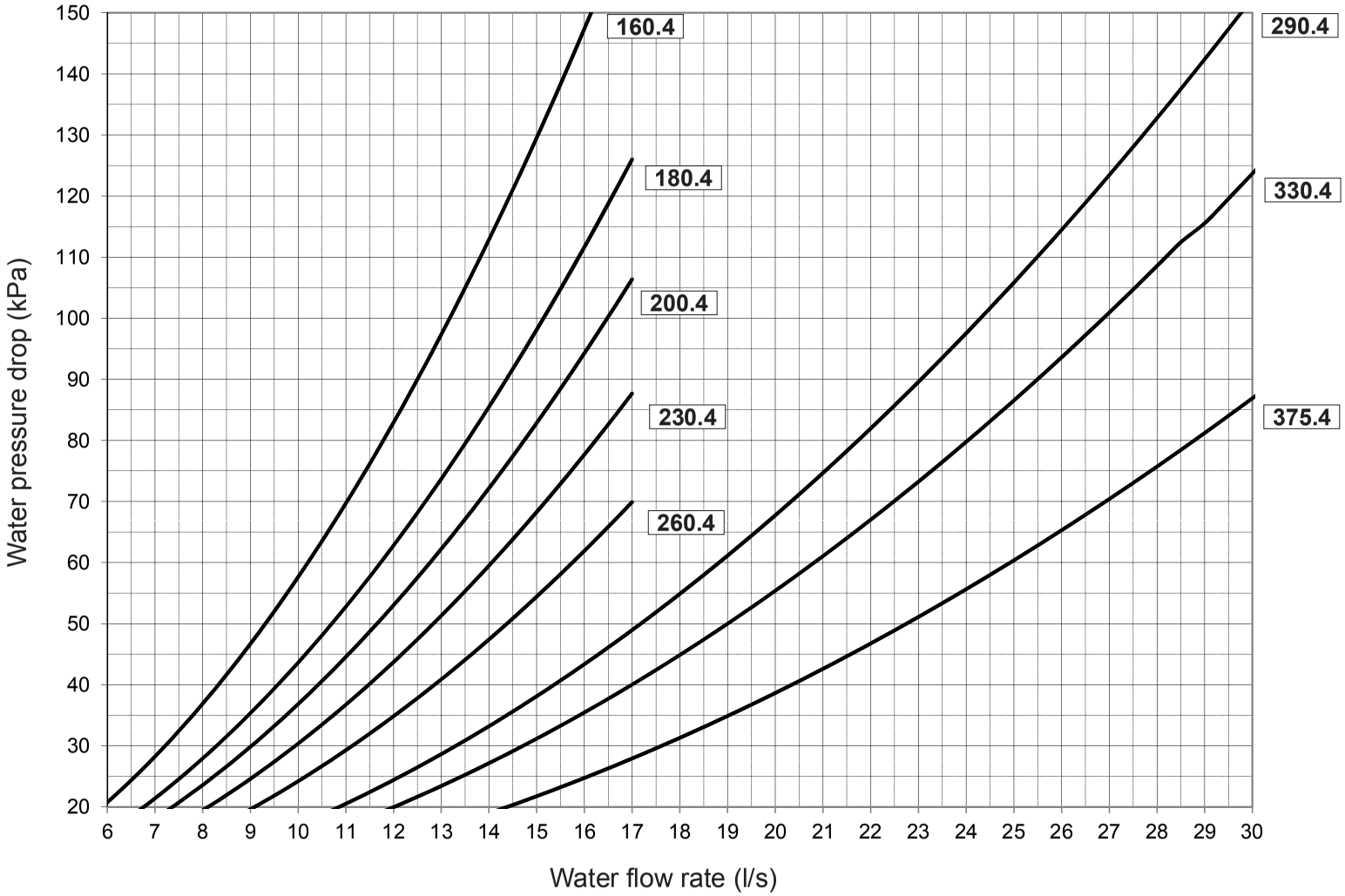
HEAT RECOVERY UNIT

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.

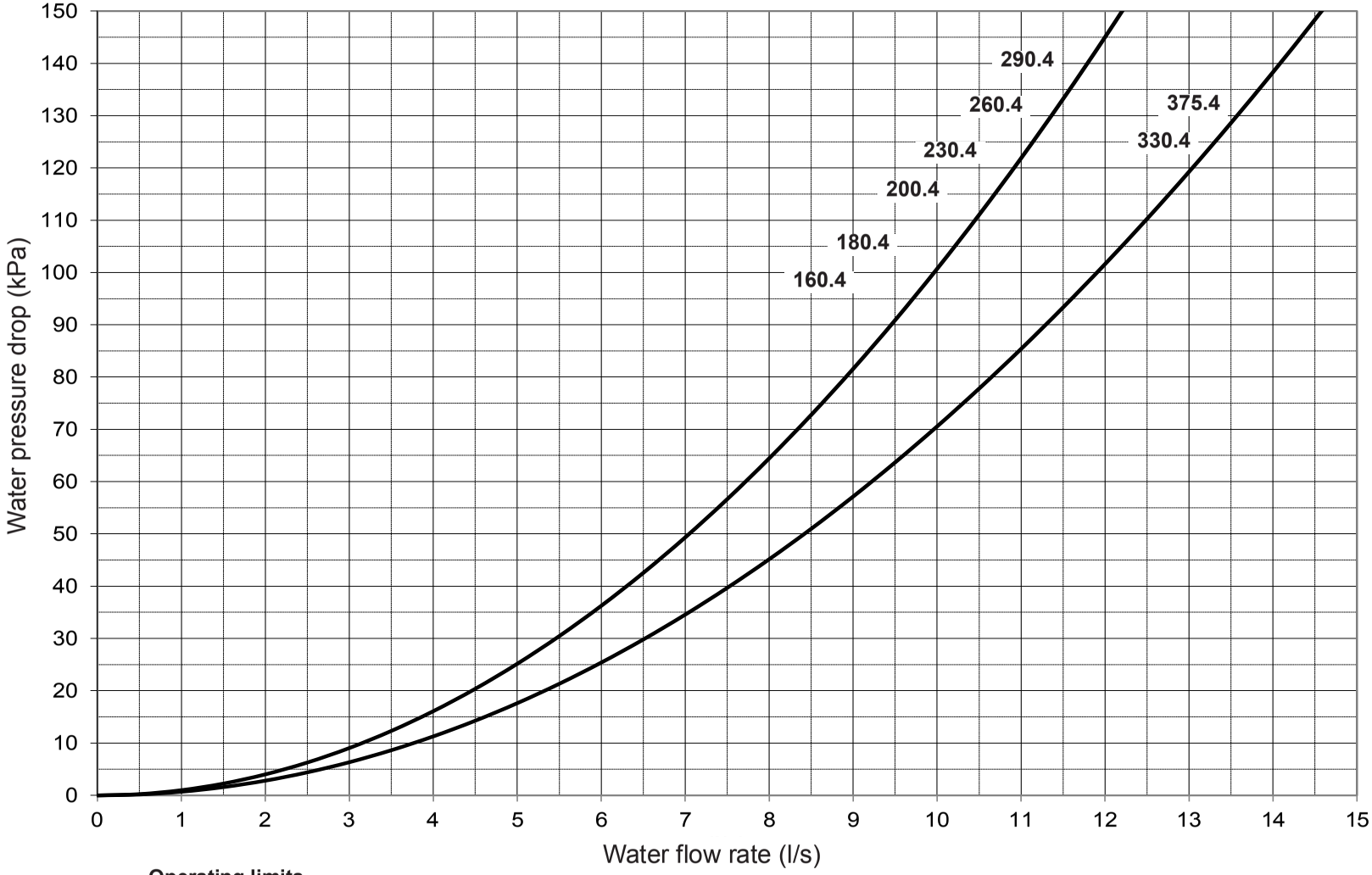


Operating limits

MODEL		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	UM	NOTE
Lower limit value	Q	5.91	6.76	7.37	8.15	9.05	10.88	12.06	14.37	l/s	Q= Water flow rate
	Δp	20								kPa	
Upper limit value	Q	16.2	18.5	20.2	17.2	17.2	17.2	33.0	39.4	l/s	ΔP= Water pressure drop
	Δp	150								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.

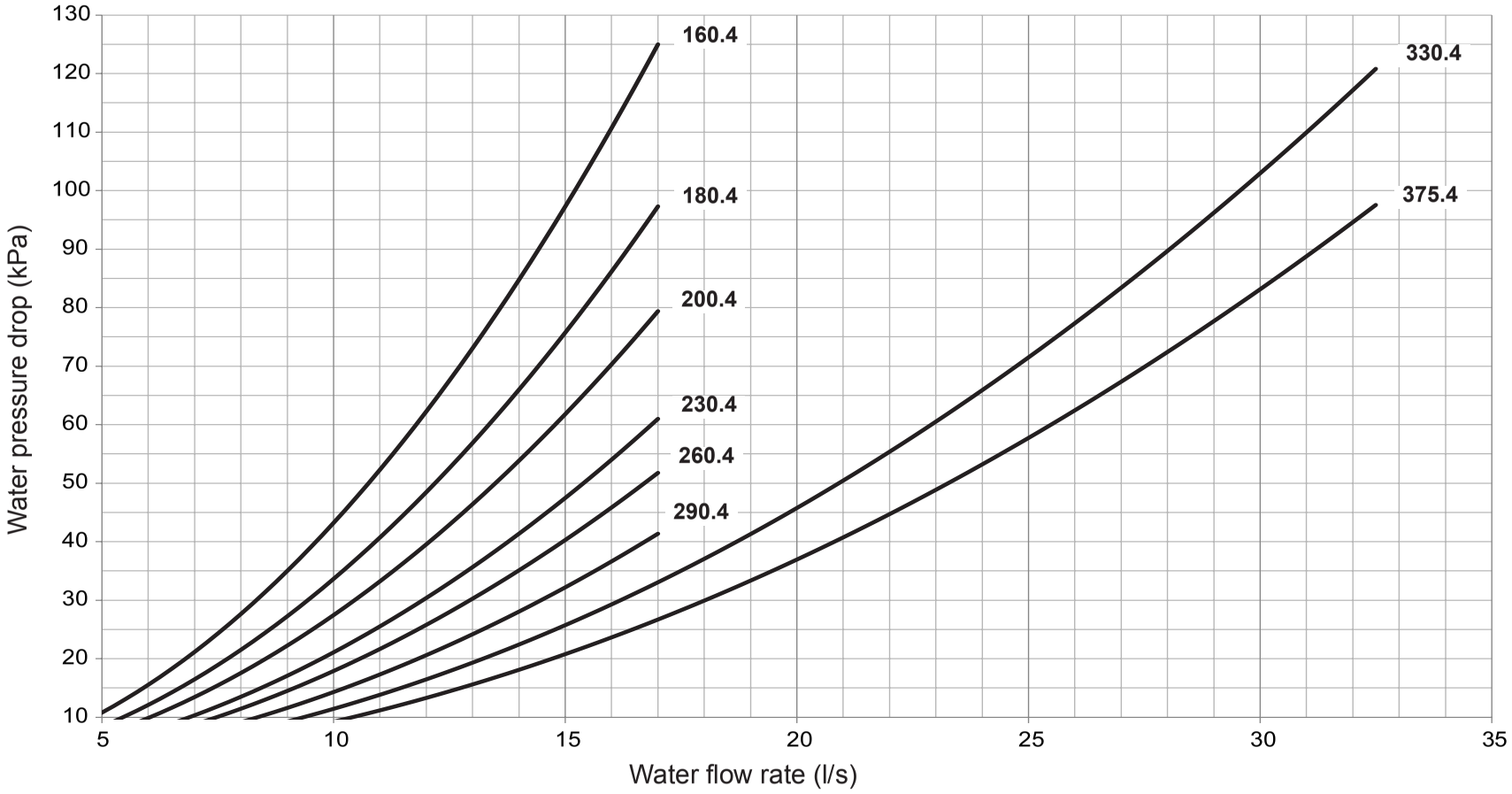


Operating limits

MODEL		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	UM	NOTE
Lower limit value	Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	l/s	Q= Water flow rate
	Δp	0								kPa	ΔP= Water pressure drop
Upper limit value	Q	12.2	12.2	12.2	12.2	12.2	12.2	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.

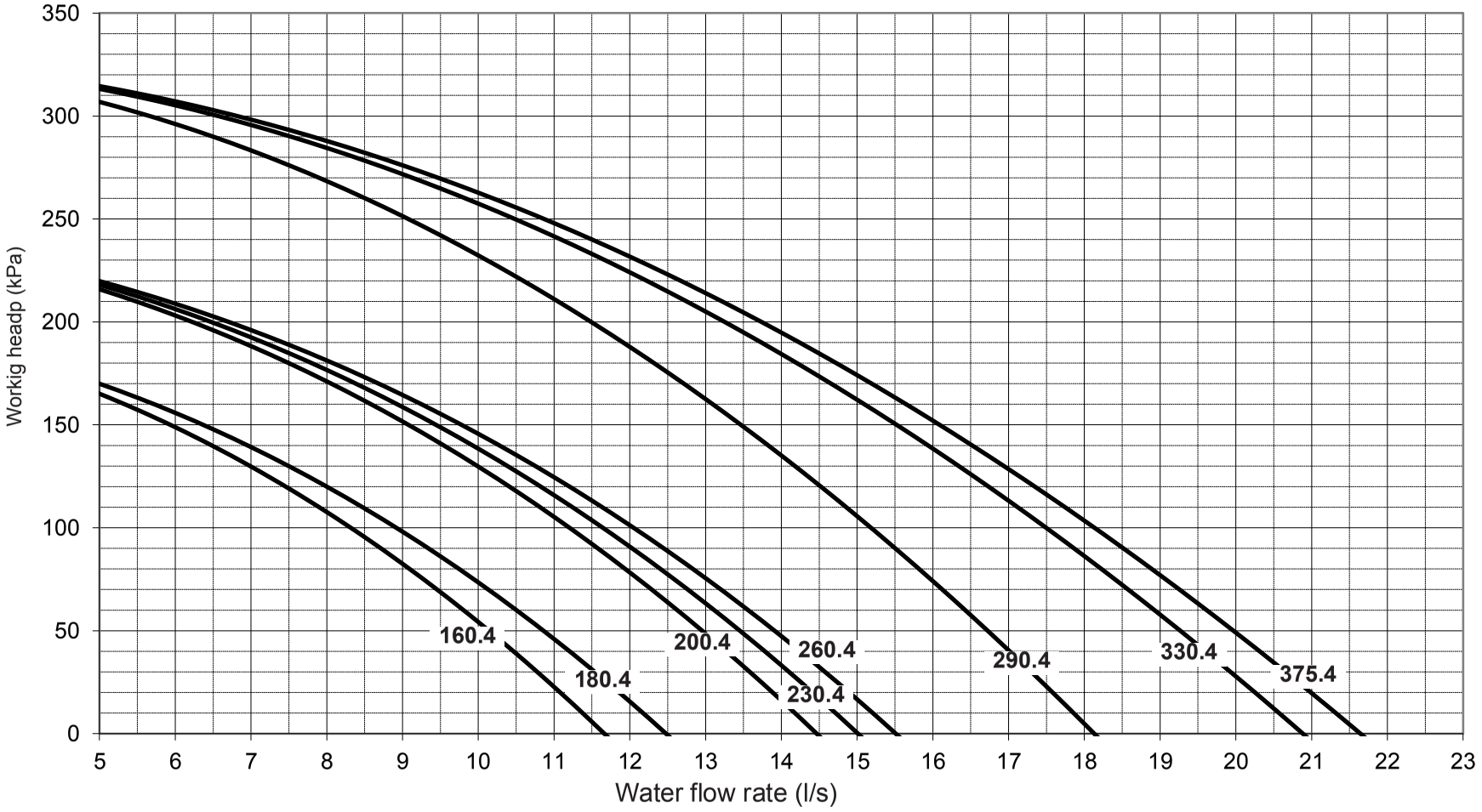


Operating limits

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

Working head pumps MP AM STD e 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.

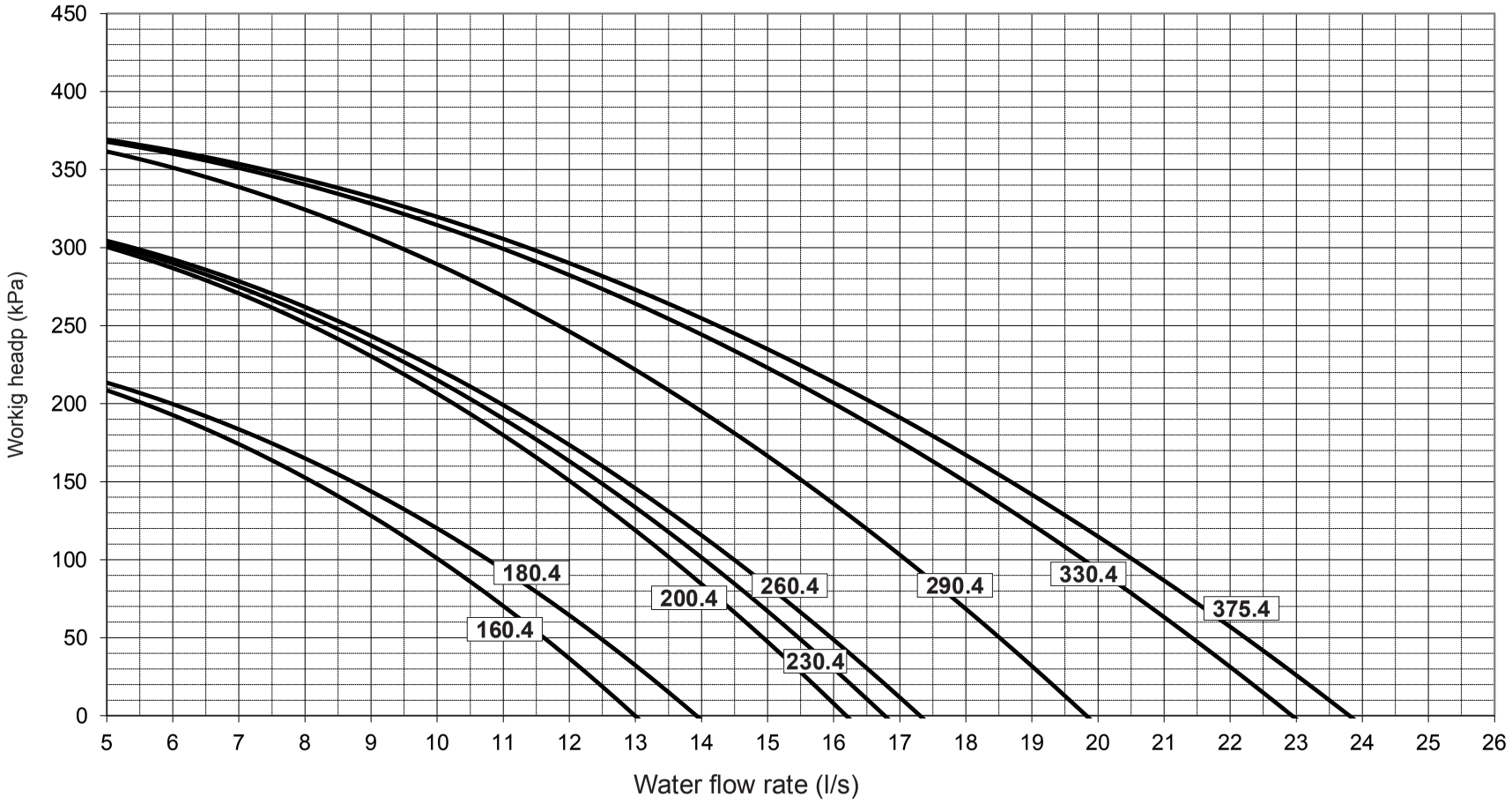


Operating limits

MODEL		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	UM	NOTE
Lower limit value	Q	5.91	6.76	7.37	8.15	9.05	10.88	12.06	14.37	l/s	Q= Water flow rate
Upper limit value	Q	10.7	11.4	13.0	13.7	14.3	16.6	19.6	20.3	l/s	

Working head pumps MP AM HP1 e 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.

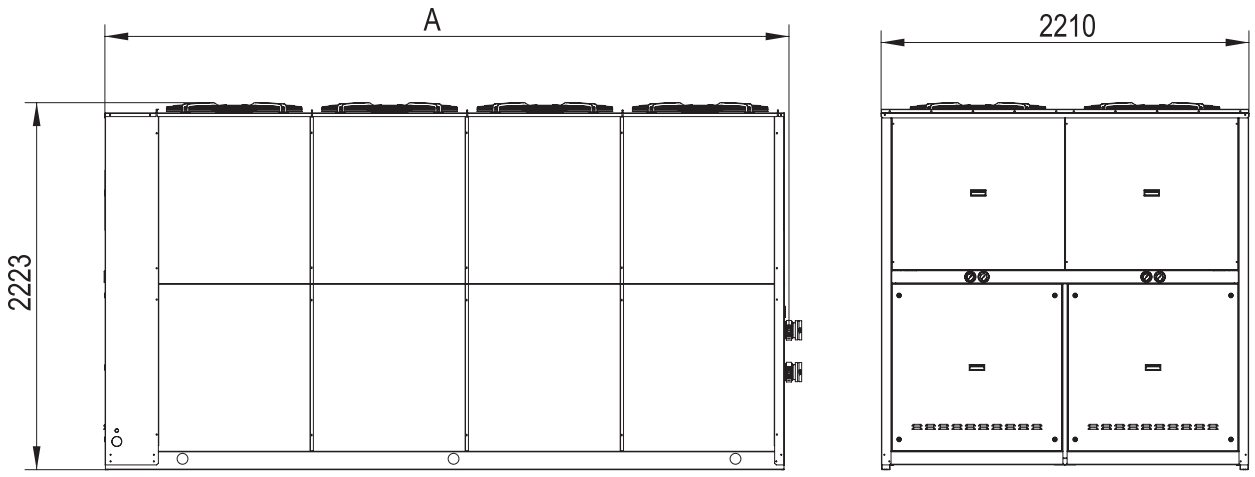


Operating limits

MODEL		160.4	180.4	200.4	230.4	260.4	290.4	330.4	375.4	UM	NOTE
Lower limit value	Q	5.91	6.76	7.37	8.15	9.05	10.88	12.06	14.37	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	kPa	

DIMENSIONAL AND PHYSICAL DATA

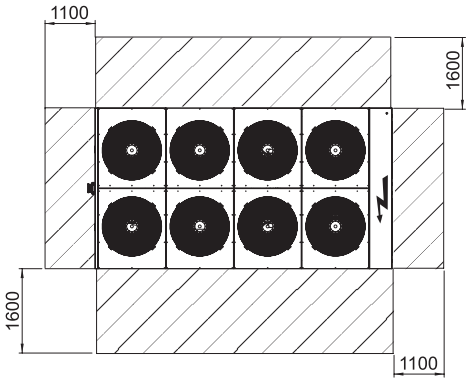
Overall dimensions



Weight refers to Standard unit VB, low noise unit AX with water storage tank accessory (SAA) and 2 pumps hydronic kit (M2P).									
Model	**160.4**	**180.4**	**200.4**	**230.4**	**260.4**	**290.4**	**330.4**	**375.4**	**UM**
Frame	**1**					**2**			**-**
Length A [mm]	3164					4097			mm
IR transport unit weight [kg]	2055	2243	2474	2628	2714	2888	3043	3133	kg
IR operation unit weight [kg]	2409	2600	2833	2989	3077	3640	3795	3887	kg
IP transport unit weight [kg]	2158	2355	2598	2761	2851	3035	3196	3292	kg
IP operation unit weight [kg]	2512	2712	2957	3122	3214	3787	3948	4046	kg
IN / OUT connection	3”					4”			-

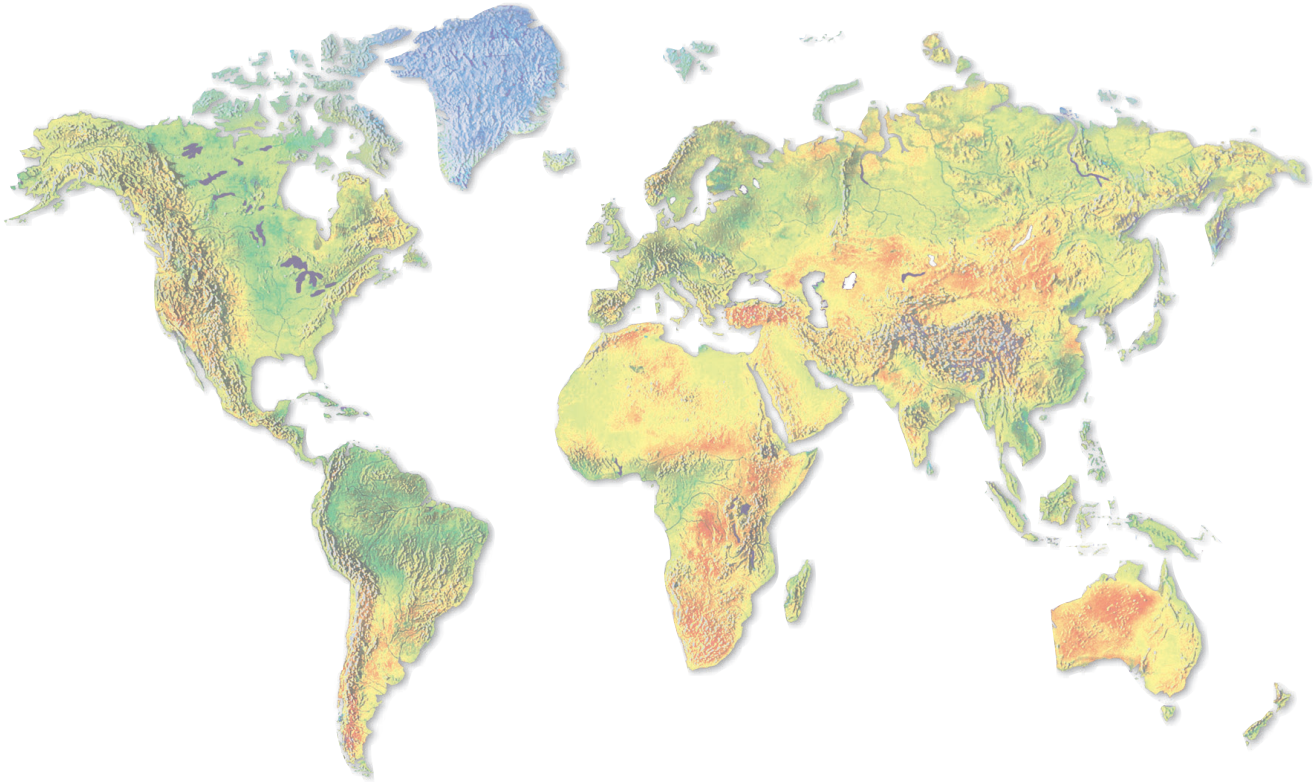
Minimum space required for operation

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.



NOTE

NOTE



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