Ferroli

RMA² HE

AIR-WATER CHILLERS AND HEAT PUMPS
FOR OUTDOOR INSTALLATION

TECHNICAL MANUAL

The manufacturer declines all the responsabilities regarding inaccuracies contained in this manual, if due to printing or typing mistakes. The manufacturer reserves the right to apply changes and improvements to the products at any time without notice.

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GENERAL FEATURES

Unit description

This series of air-water chillers and heat pumps satisfies the cooling and heating requirements of residential plants of small and medium 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 compressor mounted on damper supports, brazed plate heat exchanger, thermostatic expansion valve, reverse cycle valve, axial fans with safety protection grilles, finned coil made of copper pipes and aluminium louvered fins. The circuit is protected by high and low pressure switches and differential pressure switch on the plate heat exchanger.
The plate 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.
All the units are supplied with an outdoor temperature sensor, already installed on the unit, in order to realize the climatic control.
All the units are provided with a phase presence and correct sequence controller device.
All the units are accurately built and individually tested in the factory. Only electric and hydraulic connections are required for installation.

Unit identification code

The codes that identify the units and the meaning of the letters used are described below.

RMA² HE IP 26.1 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
VP - Pump version
VA - Tank version

Power supply

5 - 400 V - 3N - 50 Hz

Operating range

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

Refrigerant type

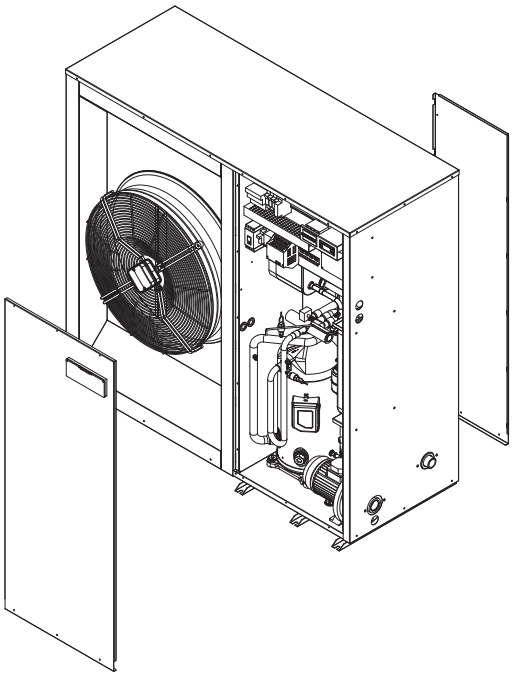
0 - R410A

Acoustic setting up

AB - Base setting up
AS - Low noise setting up

Description of components

External structure. Basement, supporting structure and lateral panels are made of galvanized and painted sheet-steel (colour RAL 7035) to guarantee good resistance to atmospheric agents. Accessibility to internal parts is possible removing the frontal panel. For extraordinary manteinances also the rear panel can be removed.



Refrigerant circuit. It is contained inside a compartment separated from the air flow to simplify maintenance and control operations.

The hermetic scroll **compressor** (1) is mounted on damper supports and is protected against overtemperatures and overcurrents. It is equipped with an electrcal heater, that is activated when the compressor turns off, to keep the compressor crankcase oil temperature high enough to prevent migration of the refrigerant during winter stops and to evaporate any liquid present in the crankcase, in order to prevent possible liquid rushes on starting (only heat pump units, accessory for cooling only units).

The **plant side heat exchanger** (2) is a brazed stainless steel plate heat exchanger, properly insulated to avoid condensate generation and to minimize thermal losses, and protected by a differential pressure switch that detects whatever water flow lack. It is moreover protected against freeze danger by an antifreeze electrical heater.

The **source side heat exchanger** (3) is a finned coil realized with grooved copper pipes and aluminium fins with notched profile to increase the heat exchange coefficient. A tray is obtained in the basement to collect the condensate generated in heating mode.

The **expansion device** (4), a thermostatic expansion valve with external equalizer, allows the unit to adjust itself to the different operating conditions keeping steady the set superheating.

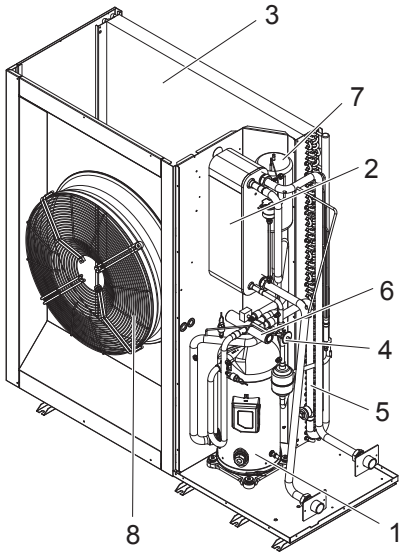
The refrigerant circuit of each unit contains moreover solid core hermetic **filter dryer** (5) to restrain impurity and moisture residuals that could be present in the circuit, **high and low pressure switches** in order to assure the compressor to operate inside the permitted limits, **4 way reverse cycle valve** (6) to allow operating mode change reversing the refrigerant flow (only heat pump models), **liquid receiver** (7) to compensate the different refrigerant charge required in heating and in cooling mode (only heat pump models) and **pressure connections** SAE 5/16" - UNF 1/2" - 20 equipped with pin, gasket and blind nut, as required for the use of R410A refrigerant (they allow the complete check of the refrigerant circuit: compressor inlet pressure, compressor outlet pressure and thermostatic expansion valve upstream pressure).

The axial **fans** (8) are contained in a sheet nozzle and are equipped with a safety grille. The fans rotational speed can be modulated continuosly by an inverter (option) to control the condensation pressure (in cooling) and the evaporation pressure (in heating) in order to extend the operating limits of the unit and to reduce noise emissions.

Hydraulic circuit. All the pipes are thermally insulated to avoid condensate generation and minimize thermal losses. The circuit can be equipped with different kind of circulation pump (option). In that case the circuit is also equipped with expansion vessel and air vents. It is also possible to integrate inside the unit a buffer tank arranged as buffer on the flow towards the plant (option). In that case the circuit is equipped not only with expansion vessel and air vents, but also with safety valve, automatic air vent and drain cock.

Electrical panel. It contains all the power, control and security components necessary to guarantee the unit to work properly. The unit is managed by a microprocessor controller to which all the electrical loads and the control devices are connected. The user interface, placed on the frontal panel, allows to view and to modify, if necessary, all the parameters of the unit.

All the units are supplied with an outdoor temperature sensor, already installed on the unit, in order to realize the climatic control.



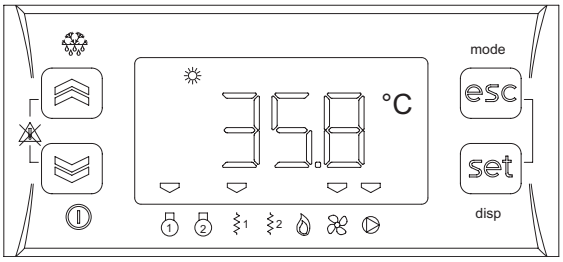
GENERAL FEATURES

Control system

The unit is managed by a microprocessor controller to which, through a wiring board, all the electrical loads and the control devices are connected. The user interface is realized by a display and four buttons that allow to view and, if necessary, modify all the operating parameters of the unit. It's available, as an accessory, a remote control that reports all the functionalities of the user interface placed on the unit.

The main functions available are :

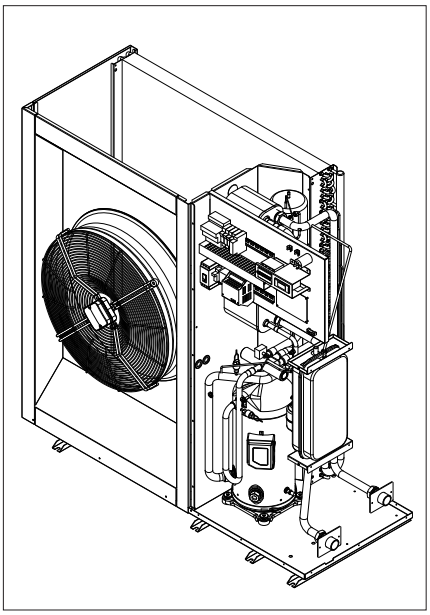
- water temperature management (through set point adjustment)
- adaptive function
- climatic control in heating and in cooling mode (automatic set point adjustment according to outdoor air temperature)
- dynamic defrost cycle management according to outdoor air temperature
- alarm memory management and diagnostic
- fans management by means of continuous rotational speed control
- pump management
- integrative electrical heaters management in heating mode (2 step logic)
- compressor and pump operating hours recording
- serial communication through Modbus protocol
- remote stand by
- remote cooling-heating
- general alarm digital output



Versions

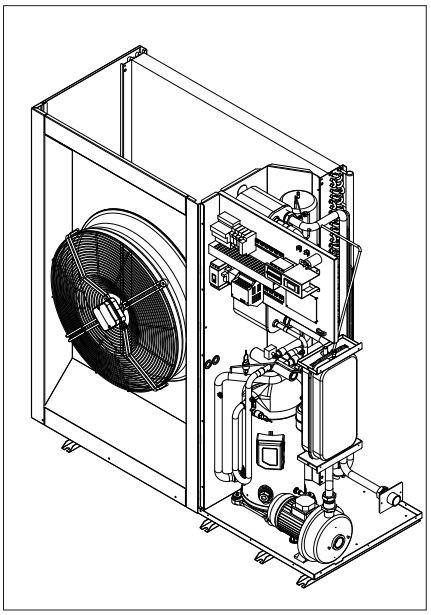
Each model can be supplied in three different versions to satisfy the application requirements of the plants. The unit is always supplied assembled, wired and factory tested.

The version is automatically identified by the option "Storing and pumping module" selected.



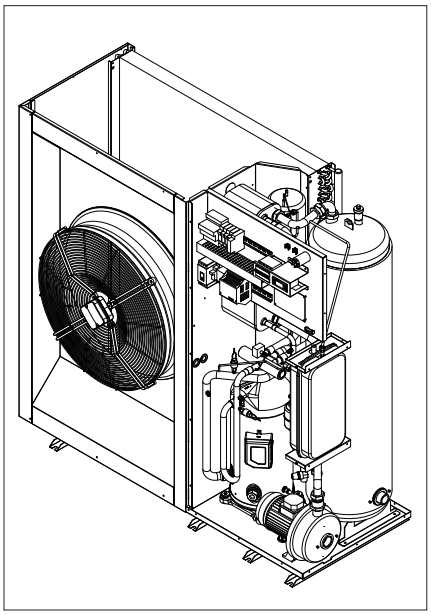
Base Version - VB

The unit does not contain neither circulating pump nor tank. Therefore a proper water flow through the plate heat exchanger must be guaranteed to prevent internal safety devices activation. In any case the pump, if properly sized, can be connected to the electrical panel of the unit and managed by the controller of the unit.



Pump Version - VP

The unit contains a circulating pump, air vents, expansion vessel and drain cock.



Tank Version - VA

The unit contains a tank (arranged as buffer on the flow towards the plant), safety valve, circulating pump, air vents, expansion vessel and drain cock.
The tank is also arranged for the installation of antifreeze or integrative electrical heaters.

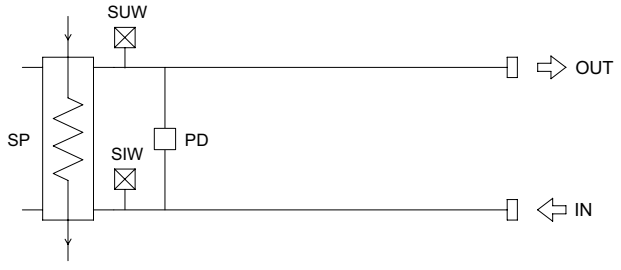
ACCESSORIES AND OPTIONAL EQUIPMENT

Options

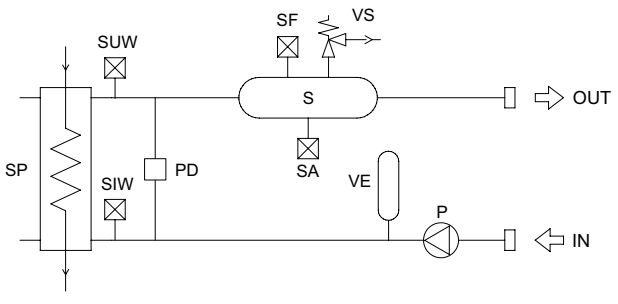
Storing and pumping module	**Standard pump**	Allows the circulation of the water on the plant side.
	High head pump	Allows the circulation of the water on the plant side and guarantees a higher available static head, suitable for high pressure drop plants.
	Modulating pump	Allows the circulation of the water on the plant side with the possibility to set the rotational speed of the pump in order to get the requested flow rate without the necessity to install other setting devices.
	Tank and 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.
	Tank and 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.
	Tank and modulating pump	Allows the circulation of the water on the plant side with the possibility to set the rotational speed of the pump in order to get the requested flow rate without the necessity to install other setting devices. The thermal inertia of the buffer tank allows to reduce the number of compressor starts and to guarantee a more stable flow temperature.
Electrical heaters	**Antifreeze**	Activated together with the antifreeze electrical heater of the plate heat exchanger, it has the task to keep the water in the buffer tank at a temperature high enough to avoid ice generation during winter.
	Integrative	Integrate or replace the heating power supplied by the heat pump and are managed by the unit controller with a 2 step logic. They are also activated as antifreeze electrical heaters. Available only for the VA version.
Soft starter		Reduces the compressor start current.
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 0,9.
Fans control	**Modulating control (condensation / evaporation control)**	The fans rotational speed can be modulated continuosly by an inverter to control the condensation pressure (in cooling) and the evaporation pressure (in heating) in order to extend the operating limits of the unit and to reduce noise emissions.
Electrical loads protection	**Fuses**	Allows to protect the electrical loads with fuses.
	Thermal magnetic circuit breakers	Allows to protect the electrical loads with thermal magnetic circuit breakers simplifying the maintenance operations.

Hydraulic scheme

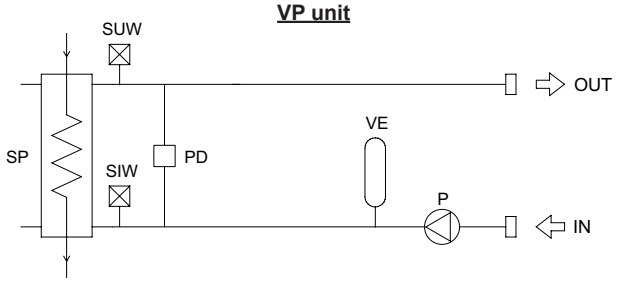
VB unit



VA unit



VP unit



ITEM	DESCRIPTION
P	PUMP
PD	DIFFERENTIAL PRESSURE WATER
S	STORAGE TANK
SA	WATER DRAIN VALVE
SF	VALVOLASFIATO AIR
SIW	PROBE WATER INLET
SP	HEAT EXCHANGER
SUW	PROBE WATER OUTLET
VE	EXPANSION TANK
VS	SAFETY VALVE

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.
Coil protection grille	Protects the external surface of the finned coil..
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.
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).
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.
Water 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).

Factory mounted accessories

Coil protection grille	Protects the external surface of the finned coil..
Coils protection kit (for transport)	It is a sheet of polystyrene which increases protection of the finned coil during transport.
Casing Kits protection (for transport)	Consisting of 4 profiles cardboard that increase the protection of the casing of the unit during transport.
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.
High and low pressure gauges	2 pressure gauges allow visualization of high and low refrigerant gas pressure.
Pressure transducer*	It consists of a transducer, which allows operation of the control condensation, evaporation and defrost by reading the pressure.
Crankcase heaters compressor oil	(standard for IP and BP units, ccessory IR and BR units) consist of electrical heaters heating oil compressors.

NOTES

* This accessory can be selected only for units with modulating fan control.

TECHNICAL DATA AND PERFORMANCE - BASE VERSION (VB)

Technical data

Frame	1			2			
Model	**19.1**	**22.1**	**26.1**	**30.1**	**35.1**	**40.1**	U.M.
Power supply	400 - 3N - 50	400 - 3N - 50	400 - 3N - 50	400 - 3N - 50	400 - 3N - 50	400 - 3N - 50	V-ph-Hz
Refrigerant							
Type	R410A	R410A	R410A	R410A	R410A	R410A	-
Compressor							
Type	scroll	scroll	scroll	scroll	scroll	scroll	-
Quantity	1	1	1	1	1	1	n°
Power steps	0 - 100	0 - 100	0 - 100	0 - 100	0 - 100	0 - 100	%
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	-
Quantity	1	1	1	1	1	1	n°
Source side heat exchanger							
Type	finned coil	finned coil	finned coil	finned coil	finned coil	finned coil	-
Quantity	1	1	1	1	1	1	n°
Fans							
Type	axial	axial	axial	axial	axial	axial	-
Quantity	1	1	1	1	1	1	n°
Diameter	630	630	630	800	800	800	mm
Maximum rotational speed	900	900	900	900	900	900	rpm
Total installed power	0,6	0,6	0,6	1,8	1,8	1,8	kW
Plant side hydraulic circuit							
Expansion vessel volume VP - VA	10	10	10	10	10	10	l
Tank volume - VA	85	85	85	85	85	85	l
Safety valve set * - VP - VA	3	3	3	3	3	3	bar
Standard pump (option)							
Type	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	-
Installed power	0,6	0,6	0,6	0,8	0,8	0,8	kW
High head pump (option)							
Type	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	-
Installed power	0,9	0,9	0,9	1,6	1,6	1,6	kW
Modulating pump (option)							
Type	centrifugal pump with inverter	centrifugal pump with inverter	centrifugal pump with inverter	centrifugal pump with inverter	centrifugal pump with inverter	centrifugal pump with inverter	-
Installed power	0,6	0,6	0,6	0,8	0,8	0,8	kW
Integrative electrical heaters in the tank (option)							
Installed power	6,6	6,6	6,6	6,6	6,6	6,6	kW
Power steps	2	2	2	2	2	2	n°

NOTES
*: Standard version for VA, to be installed by the customer for VP version.

TECHNICAL DATA AND PERFORMANCE - BASE VERSION (VB)

NET NOMINAL performances - Base setting up (AB) - Standard plants - EUROVENT certified data

	Frame	1			2			
	Model	**19.1**	**22.1**	**26.1**	**30.1**	**35.1**	**40.1**	U.M.
	Cooling A35W7 (source : air in 35°C d.b. / plant : water in 12°C out 7°C)							
	Cooling capacity	20,1	22,3	26,1	31,5	36,6	41,3	kW
	Power input	6,51	7,15	8,29	10,3	11,9	13,5	kW
IR	EER	3,09	3,12	3,15	3,06	3,08	3,06	W/W
	ESEER	3,44	3,48	3,51	3,44	3,45	3,45	W/W
	Water flow rate plant side	3466	3844	4496	5439	6315	7138	l/h
	Pressure drops plant side	26	32	26	37	32	41	kPa
	Cooling A35W7 (source : air in 35°C d.b. / plant : water in 12°C out 7°C)							
	Cooling capacity	19,7	21,9	25,6	30,9	35,9	40,5	kW
	Power input	6,45	7,08	8,20	10,2	11,8	13,4	kW
	EER	3,05	3,09	3,12	3,03	3,04	3,02	W/W
	ESEER	3,40	3,46	3,47	3,42	3,40	3,40	W/W
	Water flow rate plant side	3398	3775	4410	5337	6194	7001	l/h
IP	Pressure drops plant side	25	31	25	36	31	39	kPa
	Heating A7W45 (source : air in 7°C d.b. 6°C w.b. / plant : water in 40°C out 45°C)							
	Heating capacity	21,2	23,5	27,4	33,3	38,6	43,8	kW
	Power input	6,21	6,82	7,89	9,79	11,3	12,9	kW
	COP	3,41	3,45	3,47	3,40	3,42	3,40	W/W
	Water flow rate plant side	3603	3995	4661	5651	6556	7427	l/h
	Pressure drops plant side	28	34	28	40	34	43	kPa

NET NOMINAL performances - Base setting up (AB) - Standard plants

	Frame	1			2			
	Model	**19.1**	**22.1**	**26.1**	**30.1**	**35.1**	**40.1**	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	17,5	19,5	22,7	27,5	31,9	36,2	kW
IP	Power input	6,12	6,70	7,78	9,62	11,1	12,7	kW
	COP	2,86	2,91	2,92	2,86	2,87	2,85	W/W
	Water flow rate plant side	2971	3312	3859	4678	5430	6147	l/h
	Pressure drops plant side	19	24	19	28	24	30	kPa

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

NET NOMINAL performances - Base setting up (AB) - Radiant plants

	Frame	1			2			
	Model	**19.1**	**22.1**	**26.1**	**30.1**	**35.1**	**40.1**	U.M.
	Cooling A35W18 (source : air in 35°C d.b. / plant : water in 23°C out 18°C)							
	Cooling capacity	26,1	28,9	33,9	40,8	47,4	53,5	kW
	Power input	6,67	7,35	8,49	10,60	12,2	13,9	kW
IR	EER	3,91	3,93	3,99	3,85	3,89	3,85	-
	Water flow rate plant side	4517	4998	5856	7076	8209	9291	l/h
	Pressure drops plant side	43	52	43	62	53	67	kPa
	Cooling A35W18 (source : air in 35°C d.b. / plant : water in 23°C out 18°C)							
	Cooling capacity	25,5	28,4	33,2	40,0	46,5	52,5	kW
	Power input	6,60	7,27	8,40	10,5	12,1	13,7	kW
	EER	3,86	3,91	3,95	3,81	3,84	3,83	-
	Water flow rate plant side	4414	4912	5736	6938	8055	9102	l/h
	Pressure drops plant side	41	50	41	59	51	64	kPa
	Heating A7W35 (source : air in 7°C d.b. 6°C w.b. / plant : water in 30°C out 35°C)							
	Heating capacity	21,6	24,0	28,0	34,0	39,4	44,7	kW
IP	Power input	5,24	5,76	6,66	8,28	9,57	10,9	kW
	COP	4,12	4,17	4,20	4,11	4,12	4,10	-
	Water flow rate plant side	3686	4097	4783	5794	6720	7611	l/h
	Pressure drops plant side	29	36	29	42	36	46	kPa
	Heating A2W35 (source : air in 2°C d.b. 1°C w.b. / plant : water in 30°C out 35°C)							
	Heating capacity	17,9	19,9	23,3	28,2	32,6	37,1	kW
	Power input	5,15	5,64	6,54	8,10	9,39	10,7	kW
	COP	3,48	3,53	3,56	3,48	3,47	3,47	-
	Water flow rate plant side	3051	3394	3977	4817	5571	6326	l/h
	Pressure drops plant side	20	25	21	30	25	32	kPa

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

TECHNICAL DATA AND PERFORMANCE - BASE VERSION (VB)

NET NOMINAL performances - Low noise setting up (AS) - Standard plants - EUROVENT certified data

	Frame	1			2			
	Model	**19.1**	**22.1**	**26.1**	**30.1**	**35.1**	**40.1**	U.M.
IR	**Cooling A35W7** (source : air in 35°C d.b. / plant : water in 12°C out 7°C)							
	Cooling capacity	19,3	21,4	25,1	30,3	35,2	39,8	kW
	Power input	7,02	7,71	8,94	11,1	12,8	14,4	kW
	EER	2,75	2,78	2,81	2,73	2,75	2,76	W/W
	ESEER	3,06	3,10	3,12	3,07	3,08	3,09	W/W
	Water flow rate plant side	3329	3689	4324	5234	6074	6864	l/h
	Pressure drops plant side	24	29	24	35	30	38	kPa
IP	**Cooling A35W7** (source : air in 35°C d.b. / plant : water in 12°C out 7°C)							
	Cooling capacity	18,9	21,0	24,6	29,7	34,5	39,0	kW
	Power input	6,95	7,63	8,84	11,0	12,7	14,3	kW
	EER	2,72	2,75	2,78	2,70	2,72	2,73	W/W
	ESEER	3,03	3,07	3,09	3,04	3,05	3,05	W/W
	Water flow rate plant side	3260	3621	4238	5131	5954	6726	l/h
	Pressure drops plant side	23	28	23	34	29	36	kPa
	Heating A7W45 (source : air in 7°C d.b. 6°C w.b. / plant : water in 40°C out 45°C)							
	Heating capacity	20,1	22,3	26,1	31,7	36,7	41,7	kW
	Power input	5,95	6,54	7,56	9,38	10,9	12,4	kW
	COP	3,38	3,41	3,45	3,38	3,37	3,36	W/W
	Water flow rate plant side	3415	3790	4439	5378	6232	7069	l/h
	Pressure drops plant side	25	31	25	36	31	40	kPa

NET NOMINAL performances - Low noise setting up (AS) - Standard plants

	Frame	1			2			
	Model	**19.1**	**22.1**	**26.1**	**30.1**	**35.1**	**40.1**	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	16,5	18,5	21,6	26,1	30,2	34,3	kW
	Power input	5,87	6,43	7,46	9,22	10,7	12,1	kW
	COP	2,81	2,88	2,90	2,83	2,82	2,83	W/W
	Water flow rate plant side	2817	3142	3671	4439	5139	5839	l/h
	Pressure drops plant side	17	22	18	25	22	28	kPa

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

NET NOMINAL performances - Low noise setting up (AS) - Radiant plants

	Frame	1			2			
	Model	**19.1**	**22.1**	**26.1**	**30.1**	**35.1**	**40.1**	U.M.
IR	**Cooling A35W18** (source : air in 35°C d.b. / plant : water in 23°C out 18°C)							
	Cooling capacity	25,0	27,8	32,6	39,3	45,6	51,5	kW
	Power input	7,18	7,91	9,14	11,4	13,1	14,8	kW
	EER	3,48	3,51	3,57	3,45	3,48	3,48	-
	Water flow rate plant side	4328	4809	5633	6818	7900	8930	l/h
	Pressure drops plant side	40	48	40	57	49	62	kPa
IP	**Cooling A35W18** (source : air in 35°C d.b. / plant : water in 23°C out 18°C)							
	Cooling capacity	24,5	27,2	31,9	38,6	44,8	50,5	kW
	Power input	7,10	7,81	9,04	11,2	12,9	14,7	kW
	EER	3,45	3,48	3,53	3,45	3,47	3,44	-
	Water flow rate plant side	4242	4706	5513	6681	7745	8759	l/h
	Pressure drops plant side	38	47	38	55	47	60	kPa
	Heating A7W35 (source : air in 7°C d.b. 6°C w.b. / plant : water in 30°C out 35°C)							
	Heating capacity	20,5	22,8	26,6	32,3	37,4	42,5	kW
	Power input	5,02	5,52	6,38	7,92	9,17	10,5	kW
	COP	4,08	4,13	4,17	4,08	4,08	4,05	-
	Water flow rate plant side	3497	3891	4543	5503	6377	7234	l/h
	Pressure drops plant side	26	32	27	38	33	42	kPa
	Heating A2W35 (source : air in 2°C d.b. 1°C w.b. / plant : water in 30°C out 35°C)							
	Heating capacity	16,9	18,9	22,1	26,7	31,0	35,2	kW
	Power input	4,93	5,42	6,28	7,76	9,00	10,3	kW
	COP	3,43	3,49	3,52	3,44	3,44	3,42	-
	Water flow rate plant side	2897	3223	3771	4560	5297	6000	l/h
	Pressure drops plant side	19	23	19	27	23	29	kPa

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

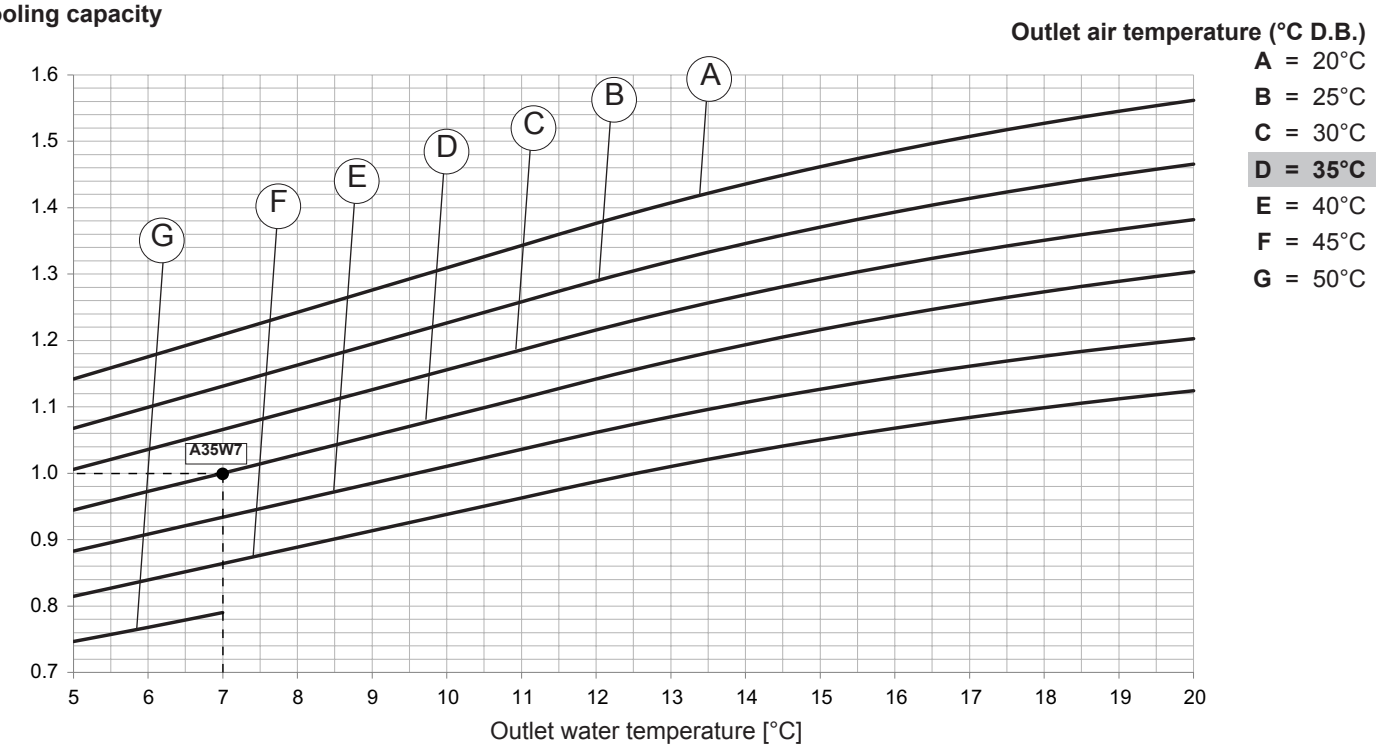
TECHNICAL DATA AND PERFORMANCE - BASE VERSION (VB)

COOLING performances

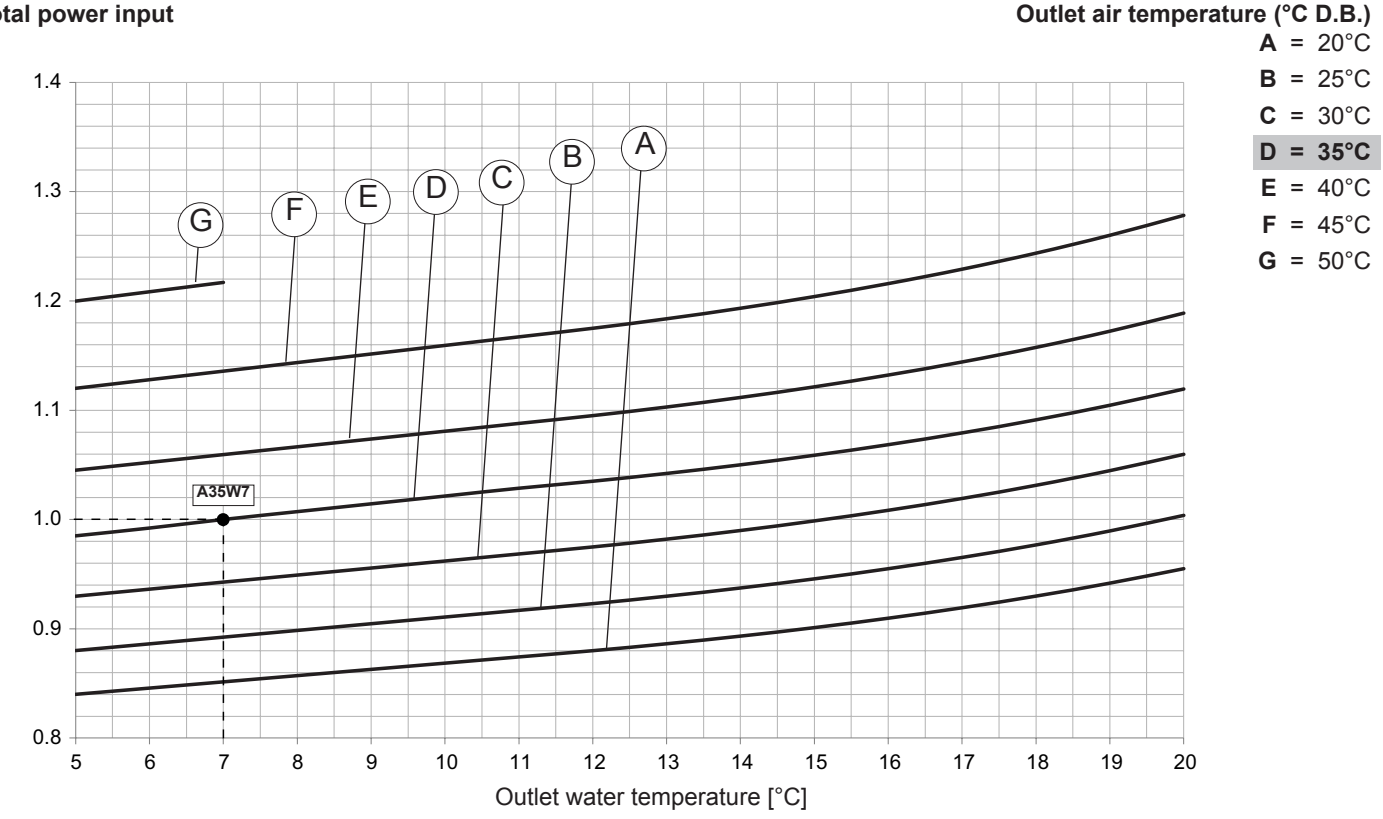
The graphs allow to get the corrective factors to be applied to the nominal performances in order to obtain the real performances in the selected operating conditions. For the "Operation limits" of the unit refer to the section limits.

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

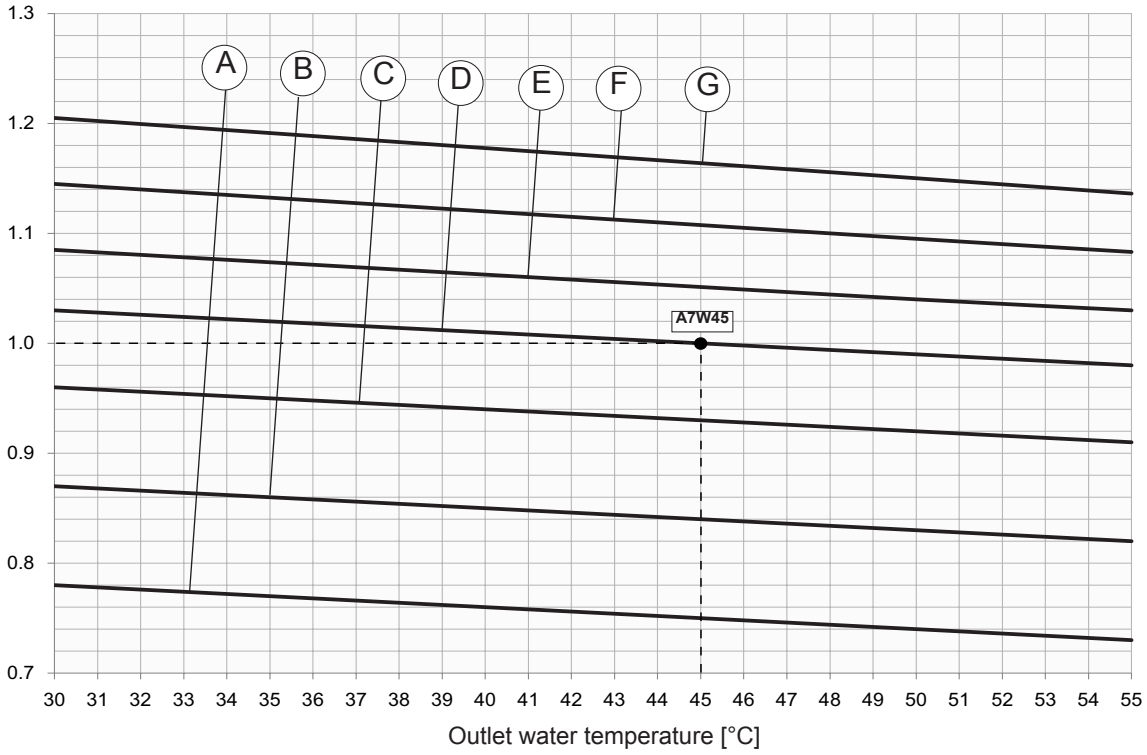
The graphs allow to get the corrective factors to be applied to the nominal performances in order to obtain the real performances in the selected operating conditions. For the "Operation limits" of the unit refer to the section limits.

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.)

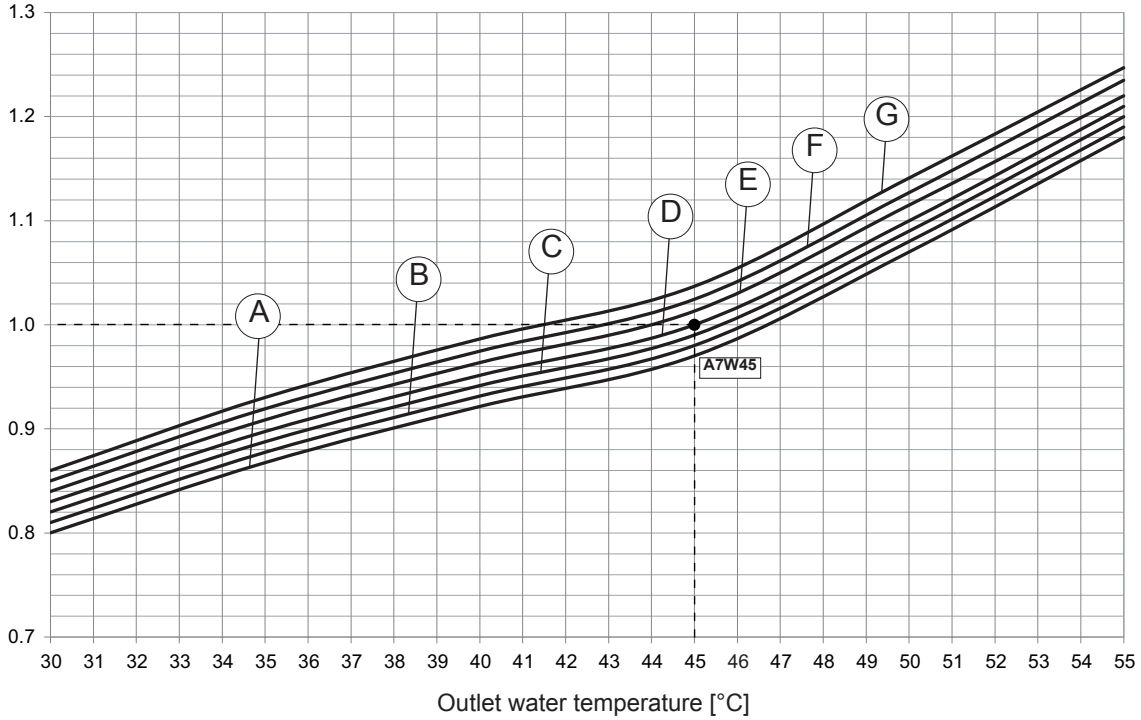
A = -5,5 / -6°C
B = -1,3 / -2°C
C = 2,8 / 2°C
D = 7 / 6°C
E = 10,1 / 9°C
F = 13,2 / 12°C
G = 16,4 /15°C



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.

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

Base setting up (AB)

Model	Sound power levels [dB] by octave bands [Hz]								Sound power level		Sound pressure level		
											at 1 metre	at 5 metres	at 10 metres
	63	125	250	500	1000	2000	4000	8000	[dB]	[dB(A)] (E)	[dB(A)]	[dB(A)]	[dB(A)]
19.1	82,4	83,6	80,2	74,8	71,0	65,5	59,4	53,6	87	77	61	51	46
22.1	82,6	83,8	80,4	75,0	71,2	65,7	59,6	53,8	88	77	62	51	46
26.1	83,5	84,7	81,3	75,9	72,1	66,6	60,5	54,7	89	78	62	52	47
30.1	88,2	83,4	80,0	78,2	76,5	72,3	69,5	60,5	90	81	65	55	50
35.1	88,6	83,8	80,4	78,6	76,9	72,7	69,9	60,9	91	82	66	55	50
40.1	88,9	84,1	80,7	78,9	77,2	73,0	70,2	61,2	91	82	66	56	50

Low noise setting up (AS)

Model	Sound power levels [dB] by octave bands [Hz]								Sound power level		Sound pressure level		
											at 1 metre	at 5 metres	at 10 metres
	63	125	250	500	1000	2000	4000	8000	[dB]	[dB(A)] (E)	[dB(A)]	[dB(A)]	[dB(A)]
19.1	80,3	81,5	78,1	71,7	66,9	61,2	54,9	49,1	85	74	58	48	43
22.1	80,5	81,7	78,3	71,9	67,1	61,4	55,1	49,3	85	74	59	48	43
26.1	81,4	82,6	79,2	72,8	68,0	62,3	56,0	50,2	86	75	59	49	44
30.1	86,9	82,1	78,7	75,9	73,2	68,8	65,8	56,8	89	78	62	52	47
35.1	87,5	82,7	79,3	76,5	73,8	69,4	66,4	57,4	90	79	63	53	48
40.1	87,9	83,1	79,7	76,9	74,2	69,8	66,8	57,8	90	79	63	53	48

Reference conditions

Performances referred to units operating in cooling mode at nominal conditions A35W7.
Unit placed in free field on reflecting surface (directional factor equal to 2).
The sound power level is measured according to ISO 3744 standard.
The sound pressure level is calculated according to ISO 3744 and is referred to a distance of 1/5/10 metres from the external surface of the unit.

(E): EUROVENT certifield data

ELECTRICAL DATA

Electrical data

Frame		1			2			
Model		19.1	22.1	26.1	30.1	35.1	40.1	U.M.
Unit								
Power supply		400-3N-50	400-3N-50	400-3N-50	400-3N-50	400-3N-50	400-3N-50	V-ph-Hz
F.L.A.	Maximum total current input	15,8	17,6	19,1	24,4	26,8	30,8	A
F.L.I.	Maximum total power input	9,2	10,7	12,0	14,6	16,1	18,4	kW
M.I.C.	Maximum total start current	106	116	129	156	160	191	A
	Maximum total start current with soft starter (option)	61	67	74	85	87	106	A
Units with pumping module STD								
Power supply		400-3N-50	400-3N-50	400-3N-50	400-3N-50	400-3N-50	400-3N-50	V-ph-Hz
F.L.A.	Maximum total current input	17,3	19,1	20,6	26,0	28,4	32,4	A
F.L.I.	Maximum total power input	9,8	11,3	12,6	15,4	16,9	19,2	kW
M.I.C.	Maximum total start current	107	117	130	158	162	193	A
	Maximum total start current with soft starter (option)	62	68	76	86	89	107	A
Units with pumping module HP1								
Power supply		400-3N-50	400-3N-50	400-3N-50	400-3N-50	400-3N-50	400-3N-50	V-ph-Hz
F.L.A.	Maximum total current input	17,5	19,3	20,8	27,4	29,8	33,8	A
F.L.I.	Maximum total power input	10,1	11,5	12,9	16,2	17,7	20,0	kW
M.I.C.	Maximum total start current	108	118	131	159	163	194	A
	Maximum total start current with soft starter (option)	62	68	76	88	90	109	A
Integrative electrical heaters standard in the tank (option)								
Power supply		400-3-50	400-3-50	400-3-50	400-3-50	400-3-50	400-3-50	V-ph-Hz
F.L.A.	Maximum total current input	9,5	9,5	9,5	9,5	9,5	9,5	A
F.L.I.	Maximum total power input	6,6	6,6	6,6	6,6	6,6	6,6	kW
Compressor								
Power supply		400-3-50	400-3-50	400-3-50	400-3-50	400-3-50	400-3-50	V-ph-Hz
F.L.A.	Maximum total current input	14,6	16,4	17,9	20,3	22,7	26,7	A
F.L.I.	Maximum total power input	8,6	10,1	11,4	12,8	14,3	16,6	kW
L.R.A.	Maximum total start current	101	111	124	141	145	176	A
	Maximum total start current with soft starter (option)	61	67	74	85	87	106	A
Fan								
Power supply		400-3-50	400-3-50	400-3-50	400-3-50	400-3-50	400-3-50	V-ph-Hz
F.L.A.	Maximum total current input	1,20	1,20	1,20	4,10	4,10	4,10	A
F.L.I.	Maximum total power input	0,60	0,60	0,60	1,80	1,80	1,80	kW
L.R.A.	Start current	5,0	5,0	5,0	15,0	15,0	15,0	A
Standard THREE-PHASE pump (option)								
Power supply		400-3-50	400-3-50	400-3-50	400-3-50	400-3-50	400-3-50	V-ph-Hz
F.L.A.	Maximum total current input	1,45	1,45	1,45	1,58	1,58	1,58	A
F.L.I.	Maximum total power input	0,61	0,61	0,61	0,82	0,82	0,82	kW
L.R.A.	Start current	6,3	6,3	6,3	9,4	9,4	9,4	A
High head THREE-PHASE pump (option)								
Power supply		400-3-50	400-3-50	400-3-50	400-3-50	400-3-50	400-3-50	V-ph-Hz
F.L.A.	Maximum total current input	1,65	1,65	1,65	3,00	3,00	3,00	A
F.L.I.	Maximum total power input	0,88	0,88	0,88	1,60	1,60	1,60	kW
L.R.A.	Start current	9,9	9,9	9,9	16,3	16,3	16,3	A

OPERATING LIMITS

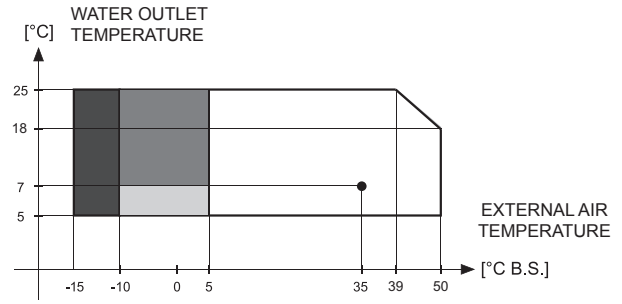
The table below lists the operating limits within which correct operation of the units is guaranteed, depending on the Version and Operating Mode available for each type of unit.
Remember that in Heat Pump units, heat recovery only takes place during operation in the cooling mode.

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").

STANDARD UNIT IR-IP

IN COOLING MODE



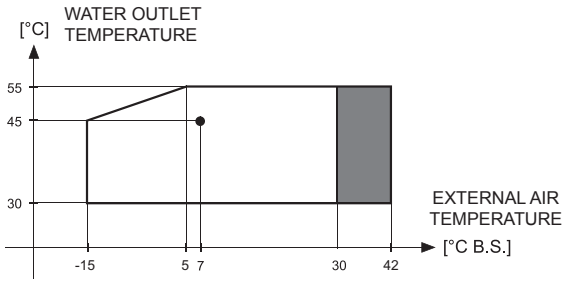
With fans modulating control options

With fans modulating control options and glicole water*

With fans modulating control options, glicole water* and "pressure transducer" accessory.

*: Or other antifreeze solutions

IN HEATING MODE

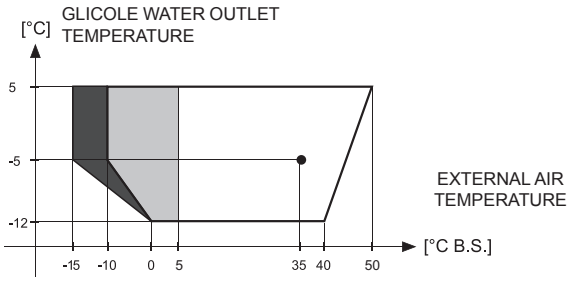


With fans modulating control options

BRINE UNIT BR - BP

For these applications requires the use of brine or other antifreeze solutions.

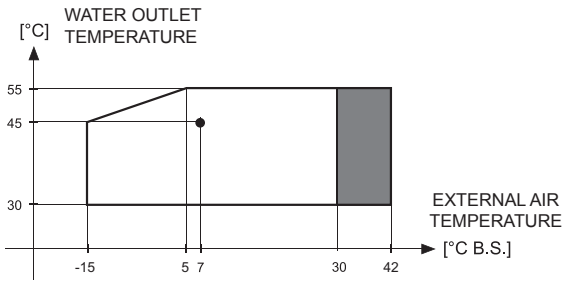
IN COOLING MODE



With fans modulating control options

With fans modulating control options and "pressure transducer" accessory.

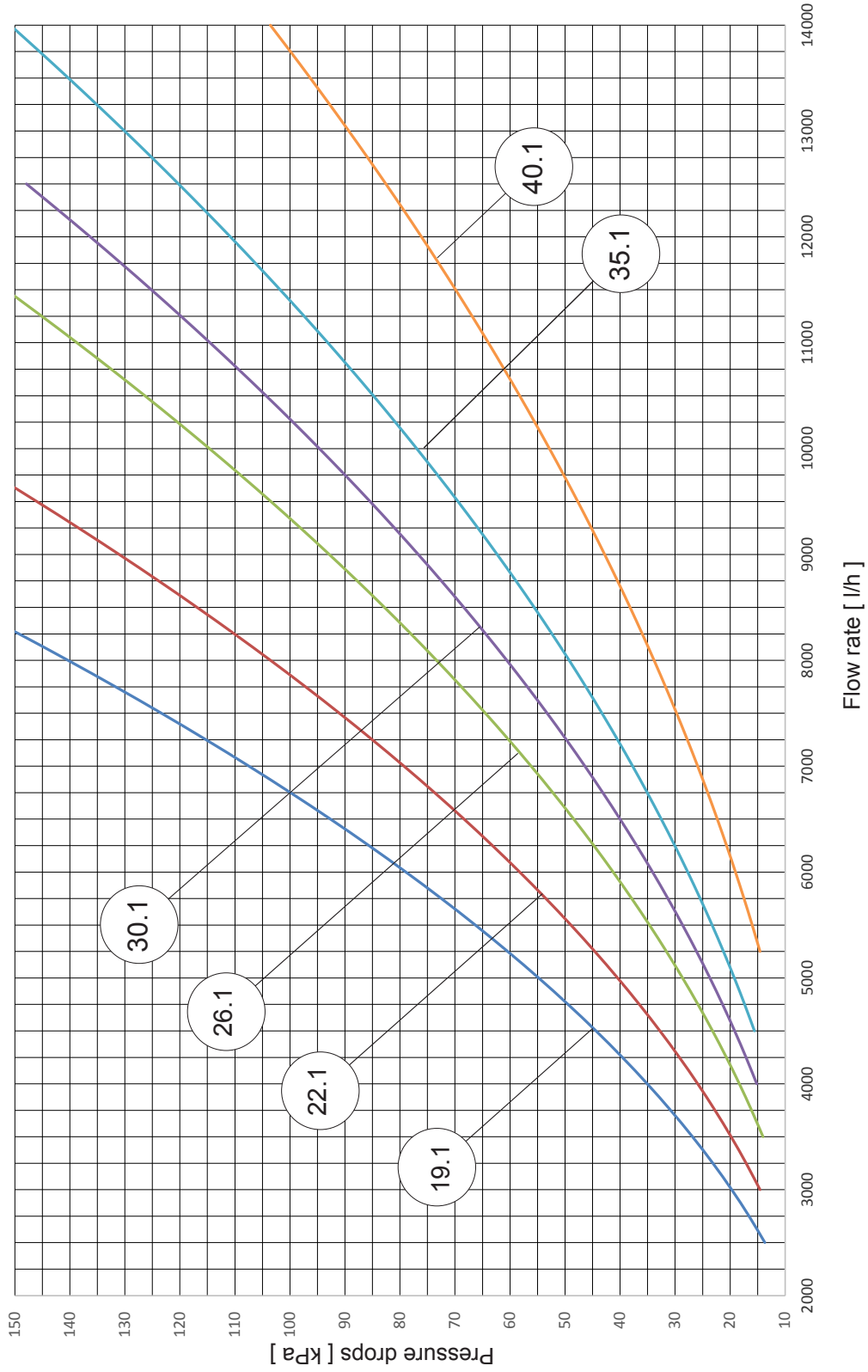
IN HEATING MODE



With fans modulating control options

WATER PRESSURE DROP

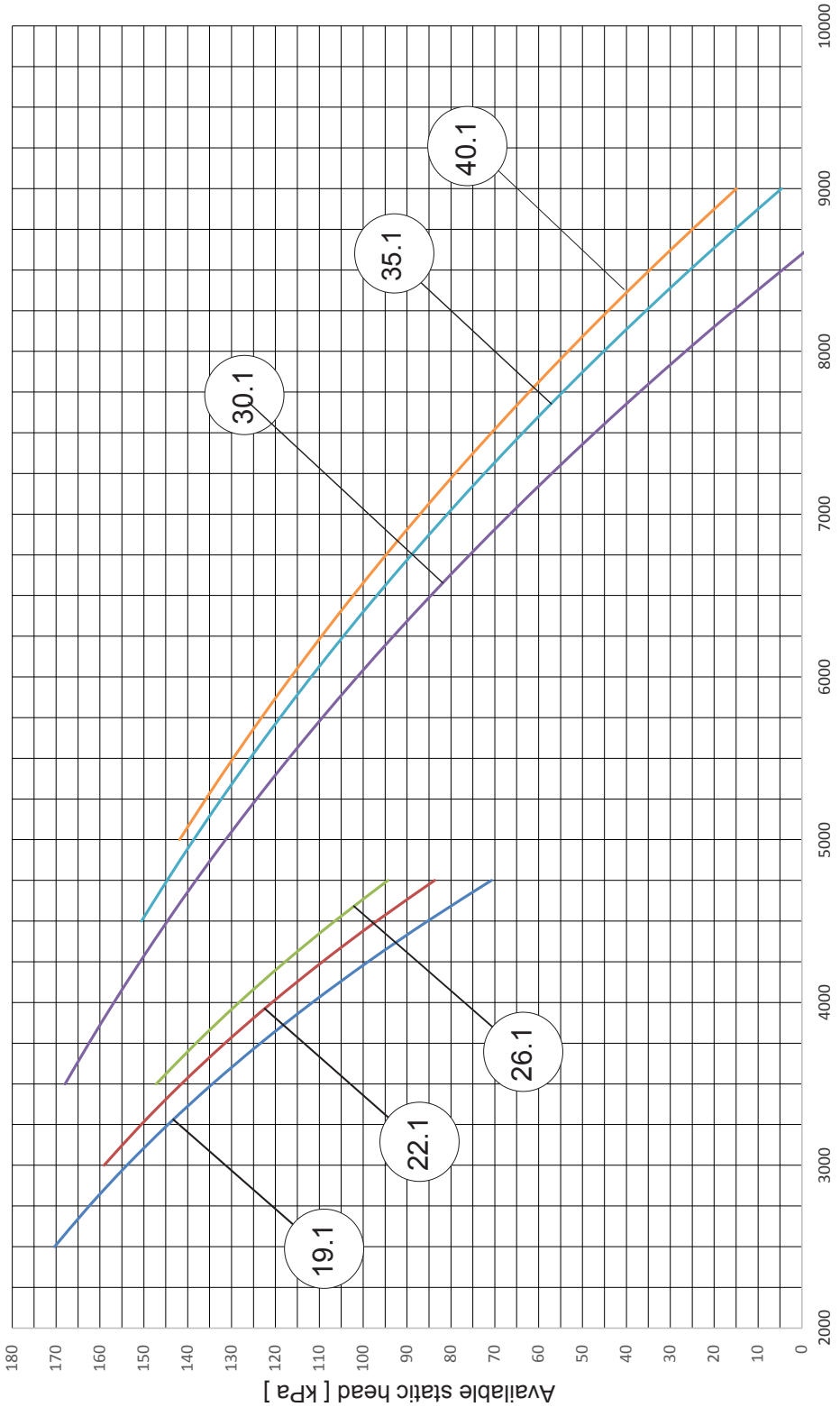
Pressure drops - unit without options



MODELS		19.1	22.1	26.1	30.1	35.1	40.1	UM	NOTE
Lower limit value	Q	2500	3000	3500	4000	4500	5250	l/h	**Q**= Water flow rate
Upper limit value	Q	8500	10000	11500	12500	140000	14000	l/h	

The graphs are referred to units operating with water at the temperature of 10°C (density 1000 kg/m^3).

Available static head - unit with option “Storing and pumping module” :
“Standard pump” or "Tank and standard pump"
“Modulating pump” or "Tank and modulating pump"

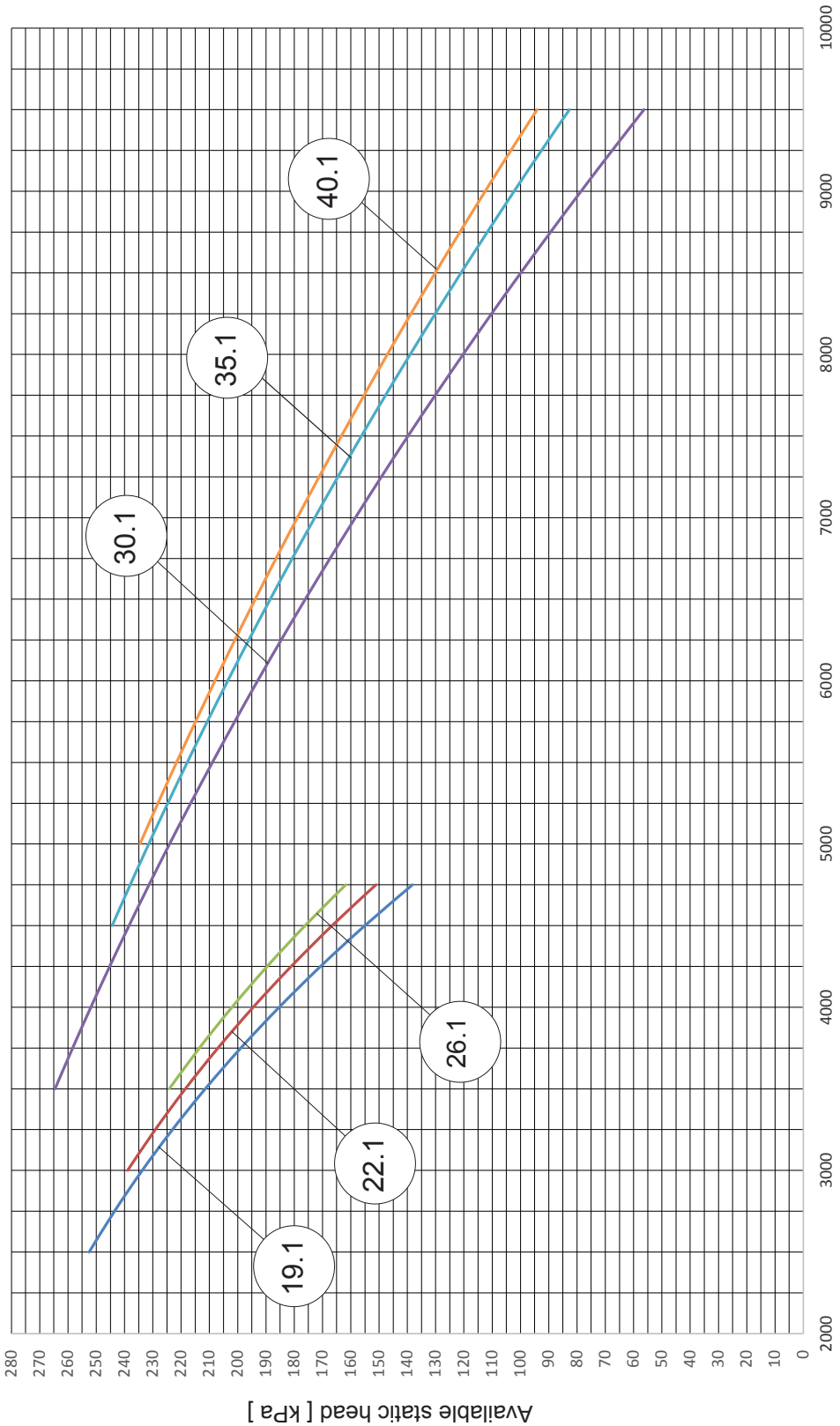


MODELS		19.1	22.1	26.1	30.1	35.1	40.1	UM	NOTE
Lower limit value	Q	2500	3000	3500	4000	4500	5250	l\h	**Q**= Water flow rate
Upper limit value	Q	4750			7800	8500	8900	kPa	

The graphs are referred to units operating with water at the temperature of 10°C (density 1000 kg/m³).

WORKING HEAD

Available static head - unit with option “Storing and pumping module” :
“High head pump” or "Tank and high head pump"

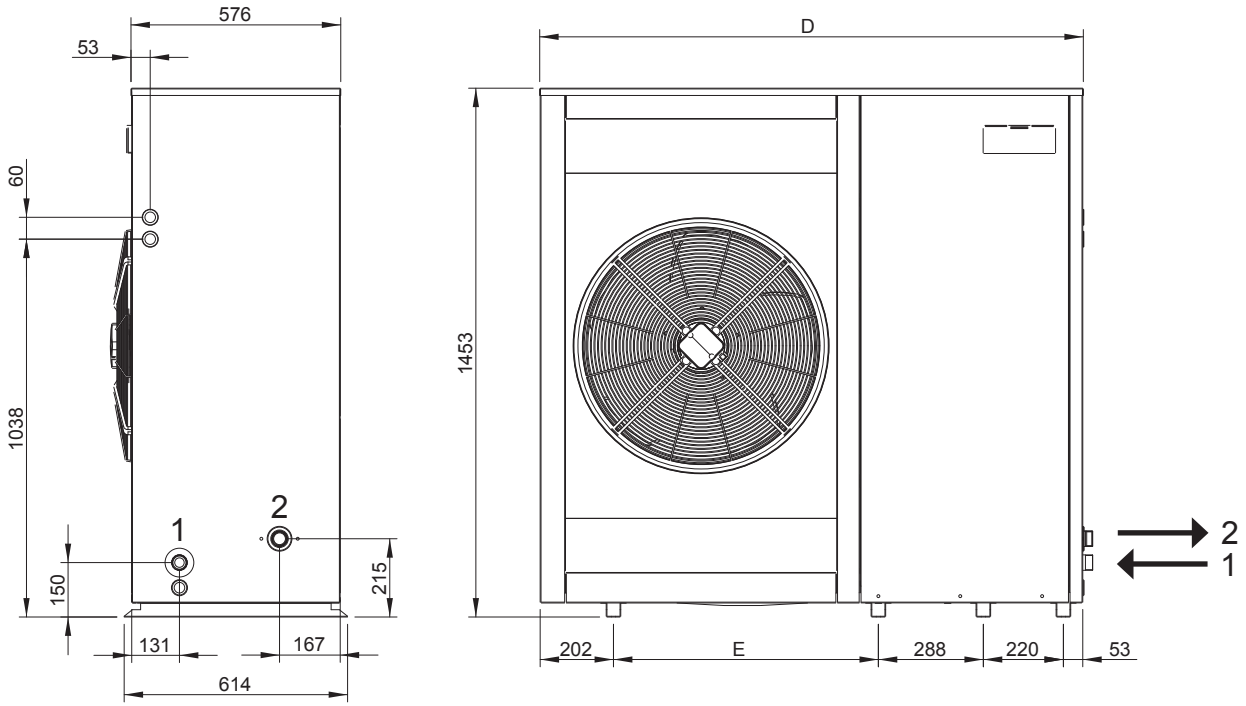


MODELS		19.1	22.1	26.1	30.1	35.1	40.1	UM	NOTE
Lower limit value	Q	2500	3000	3500	4000	4500	5250	l\h	**Q**= Water flow rate
Upper limit value	Q	4750				9500		kPa	

The graphs are referred to units operating with water at the temperature of 10°C (density 1000 kg/m^3).

DIMENSIONAL AND PHYSICAL DATA

Overall dimensions

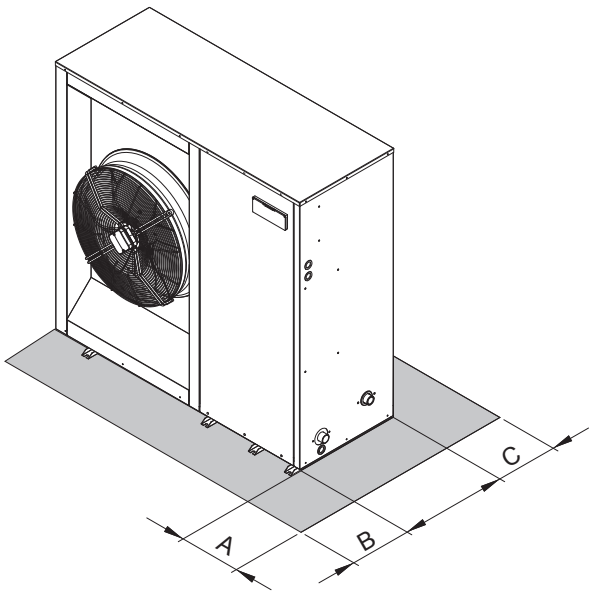


	Frame	1			2			
	Model	19.1	22.1	26.1	30.1	35.1	40.1	
Plant return	1	1"1/4 F	1"1/4 F	1"1/4 F	1"1/4 F	1"1/4 F	1"1/4 F	-
Plant flow	2	1"1/4 M	1"1/4 M	1"1/4 M	1"1/4 M	1"1/4 M	1"1/4 M	-
	D	1494			1704			mm
	E	728			938			mm

Minimum operating area

Respect the free area around the unit as shown in the figure in order to guarantee a good accessibility and facilitate maintenance and control operations.

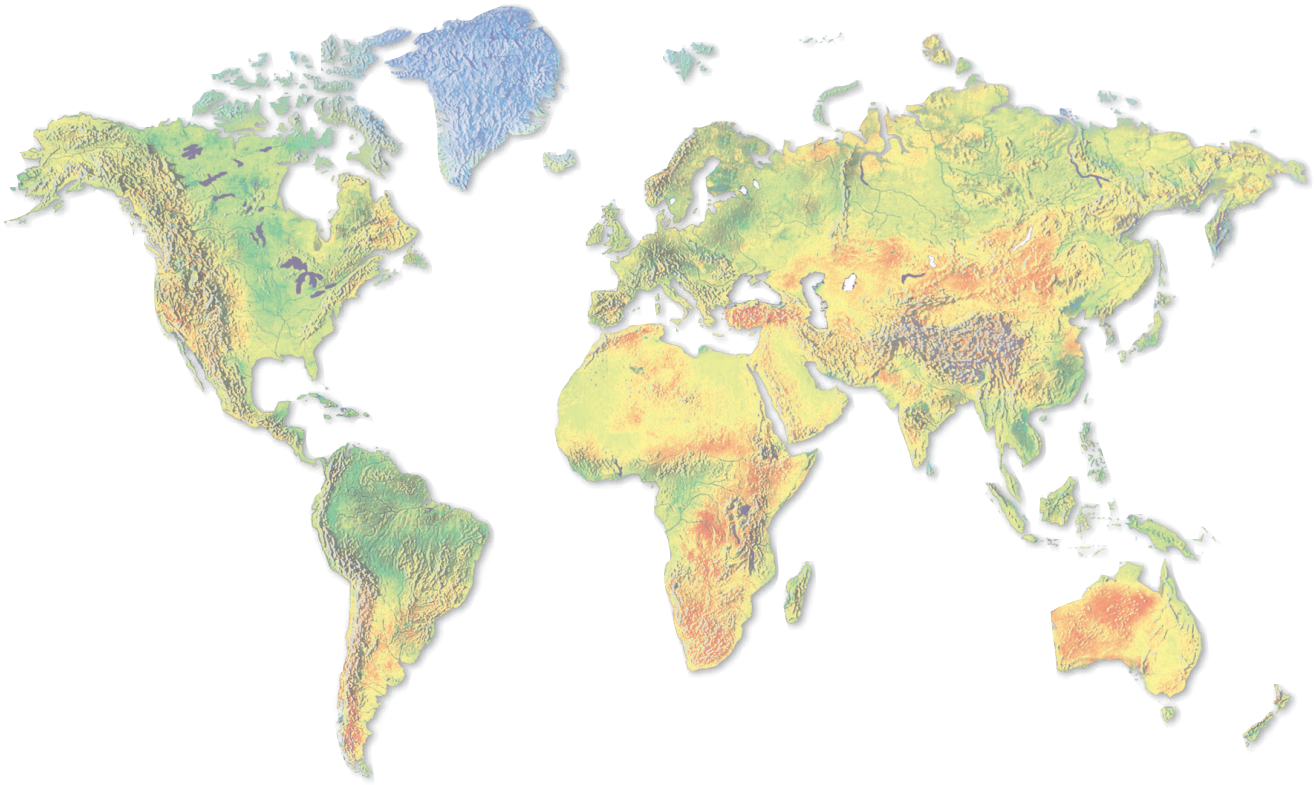
A	400 mm
B	600 mm
C	200 mm



DIMENSIONAL AND PHYSICAL DATA

Weights

Frame			1			2			
Model			19.1	22.1	26.1	30.1	35.1	40.1	U.M.
Empty weight									
Unit without options			235	238	261	280	303	305	kg
Options	Storing and pumping module	Standard pump	9	9	9	9	11	11	kg
		High head pump	12	12	12	12	13	13	kg
		Modulating pump	12	12	12	14	16	16	kg
		Tank and standard pump	31	31	31	31	33	33	kg
		Tank and high head pump	34	34	34	34	35	35	kg
		Tank and modulating pump	34	34	34	36	38	38	kg
	Integrative electrical heaters	Standard in the tank	5	5	5	5	5	5	kg
Transport weights									
Unità senza opzioni			251	254	277	300	323	325	kg
Options	Storing and pumping module	Standard pump	9	9	9	9	11	11	kg
		High head pump	12	12	12	12	13	13	kg
		Modulating pump	12	12	12	14	16	16	kg
		Tank and standard pump	31	31	31	31	33	33	kg
		Tank and high head pump	34	34	34	34	35	35	kg
		Tank and modulating pump	34	34	34	36	38	38	kg
	Integrative electrical heaters	Standard in the tank	5	5	5	5	5	5	kg
Operating weights									
Unità senza opzioni			239	242	266	285	309	311	kg
Options	Storing and pumping module	Standard pump	10	10	10	10	12	12	kg
		High head pump	13	13	13	13	14	14	kg
		Modulating pump	13	13	13	15	17	17	kg
		Tank and standard pump	117	117	117	117	119	119	kg
		Tank and high head pump	120	120	120	120	121	121	kg
		Tank and modulating pump	120	120	120	122	124	124	kg
	Integrative electrical heaters	Standard in the tank	5	5	5	5	5	5	kg



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