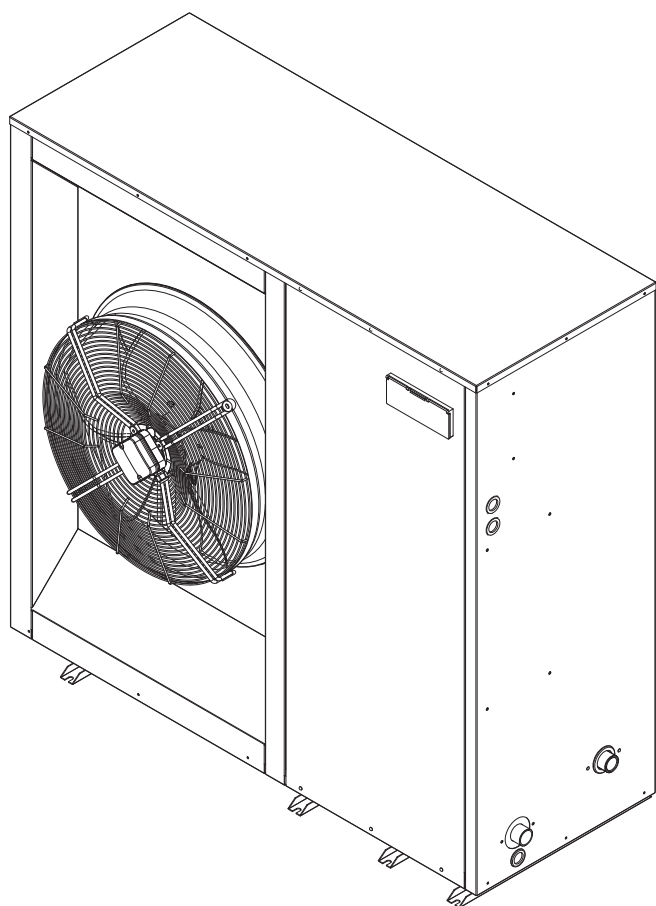




RMA HE

AIR-WATER CHILLERS AND HEAT PUMPS
FOR OUTDOOR INSTALLATION



INSTALLATION AND OPERATION MANUAL

Dear Customer,

Thank you for having purchased a FERROLI product. It is the result of many years of experiences and of particular research studies and has been made with top quality materials and advanced technologies. The CE mark guarantees that the products satisfy all the applicable European Directives.

The qualitative level is kept under constant control and FERROLI products therefore offer SAFETY, QUALITY and RELIABILITY.

Due to the continuous improvements in technologies and materials, the product specification as well as performances are subject to variations without prior notice.

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

The manufacturer declines all the responsibilities 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

General instructions

This manual and the wiring diagram supplied with the unit must be kept in a dry place for possible future consultation.

The manual provides information on installation and correct use and maintenance of the unit. **Before carrying out installation, please carefully read all the information contained in this manual, which describes the procedures necessary for correct installation and use of the unit.**

Follow carefully the instructions contained in this manual and respect the safety regulations in force. The unit must be installed in conformity with the laws in force in the country of use. Unauthorized tampering with the electrical and mechanical equipment **INVALIDATES THE WARRANTY.**

Check the electrical specifications given on the dataplate before making the electrical connections. Read the instructions given in the specific section on electrical connections.

Deactivate the equipment in case of fault or poor operation.

If the unit requires fixing, contact only specialized service centers recognized by the manufacturer and use original spare parts.

The unit must be installed outdoor and connected to a hydronic cooling and/or heating system. Any use different from that permitted or outside the operating limits indicated in this manual is prohibited (unless previously agreed with the firm).

The manufacturer declines any responsibility for damage or injury due to non-compliance with the information given in this manual.

Declaration of conformity

The firm declares that the present unit complies with the requirements of the following directives :

- Machinery directive (MD) **2006/42/EC**
- Pressure equipment directive (PED) **97/23/EC**
- Electromagnetic compatibility directive (EMC) **2004/108/EC**
- Low voltage directive (LVD) **2006/95/EC**

Unit dataplate

The figure shows the fields reported on the unit dataplate :

A		
Modello Model	B	
Codice Code	B1 Rev	
Matricola Serial N°	C	
Potenza resa Capacity	Freddo Cooling D kW	Caldo Heating E
Potenza assorbita Input	Freddo Cooling F kW	Caldo Heating G
Rif. norma Standard	H	
Alimentazione Power supply	I V / Ph / Hz	
Corrente max Max current	L A	
Refrigerante Refrigerant	M kg	M
Massa Weight	N kg	
Pressione sonora Sound pressure	O d(B(A)	
Grado di protezione Level protection	P	
Pressione max Max pressure	Lato Alta High Side Q MPa	Lato Bassa Low Side R
Ferrolli Spa Via Ritonda 78/A (VR) Italy	S	

- A - Trademark
- B - Model
- B1 - Code
- C - Serial number
- D - Capacity in cooling
- E - Capacity in heating (heat pump)
- F - Power input in cooling
- G - Power input in heating (heat pump)
- H - Reference standard
- I - Power supply
- L - Maximum absorbed current
- M - Refrigerant type and charge weight
- N - Unit weight
- O - Sound pressure level at 1 metre
- P - IP protection level
- Q - Maximum pressure - high pressure side
- R - Maximum pressure - low pressure side
- S - PED certification body

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.

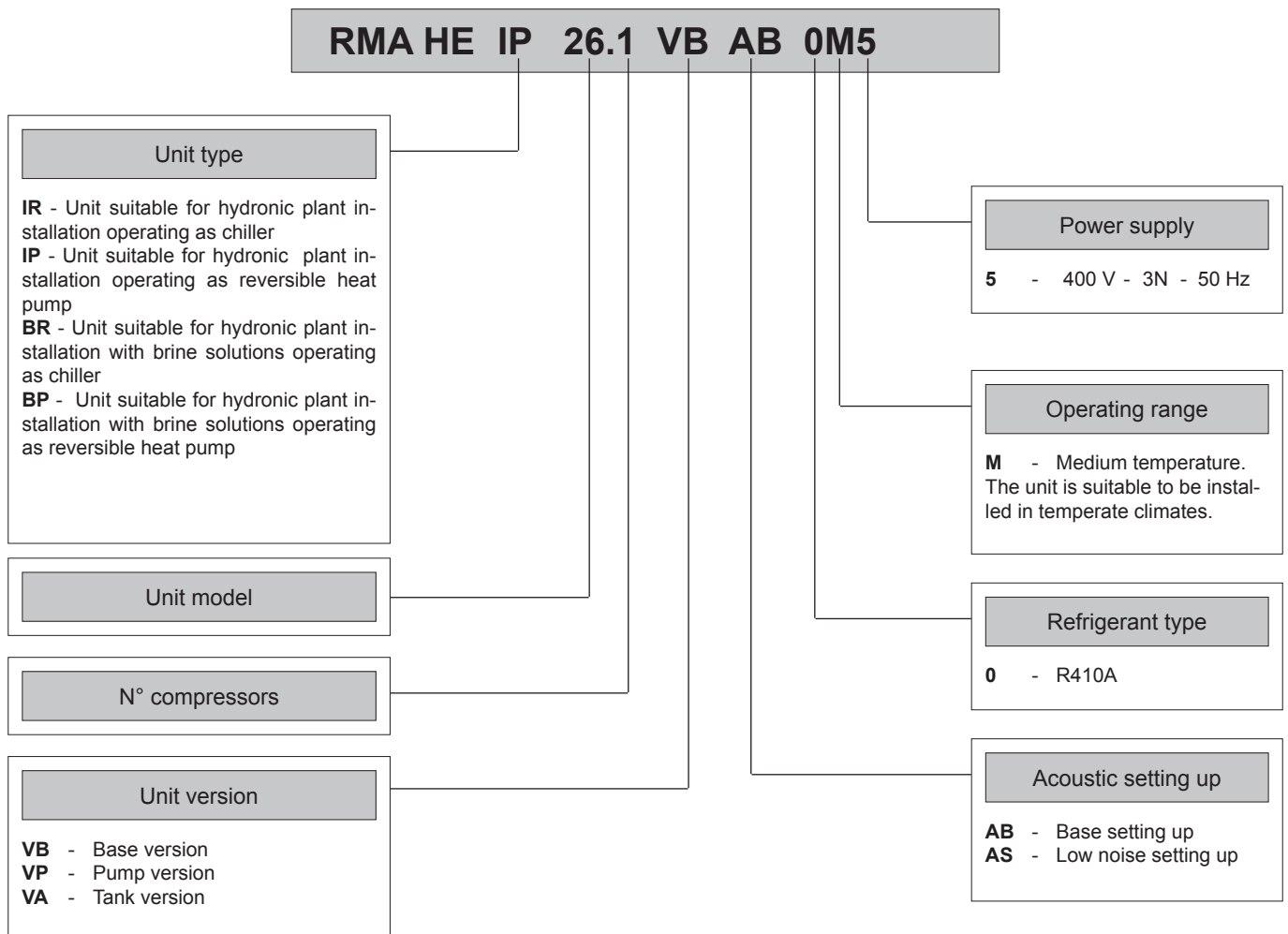
All the units are supplied with an outdoor temperature sensor, already installed on the unit, in order to realize the climatic control.

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

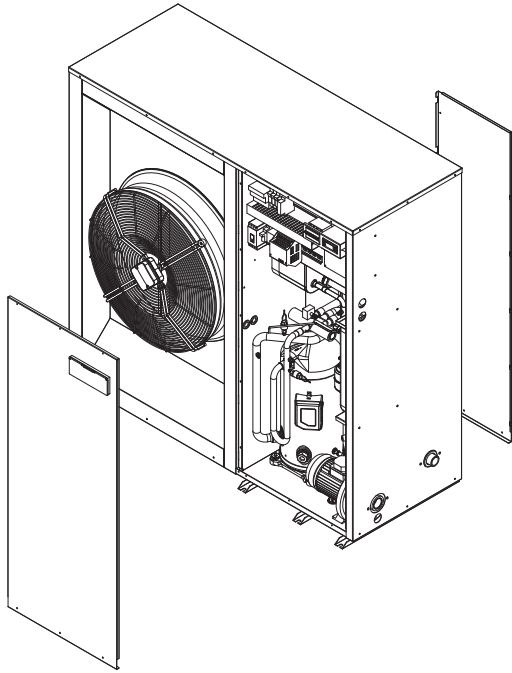
The codes that identify the units and the meaning of the letters used are described below.



GENERAL FEATURES

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 maintenances 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 electrical 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 models).

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**

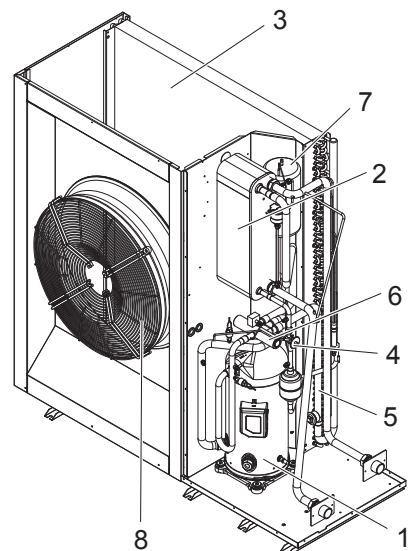
pressure switches in order to assure the compressor to operate inside the permitted limits, **4 way reverse cycle valve** (6) to allow operating mode change reversing the refrigerant flow (only heat pump models), **liquid receiver** (7) to compensate the different refrigerant charge required in heating 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 continuously 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

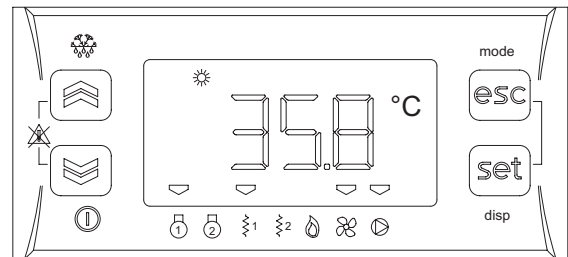
Control system

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

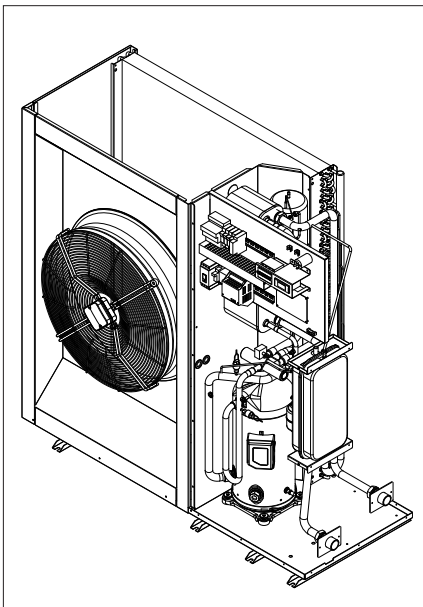
- pump management
- integrative electrical heaters management in heating mode (2 step logic)
- compressor and pump operating hours recording
- serial communication through Modbus protocol
- remote stand by
- remote cooling-heating
- general alarm digital output



Versions

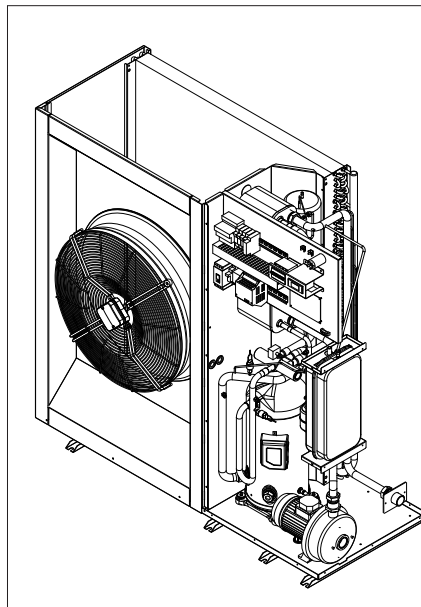
Each model can be supplied in three different versions to satisfy the application requirements of the plants. The unit is always supplied assembled, wired and factory tested.

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



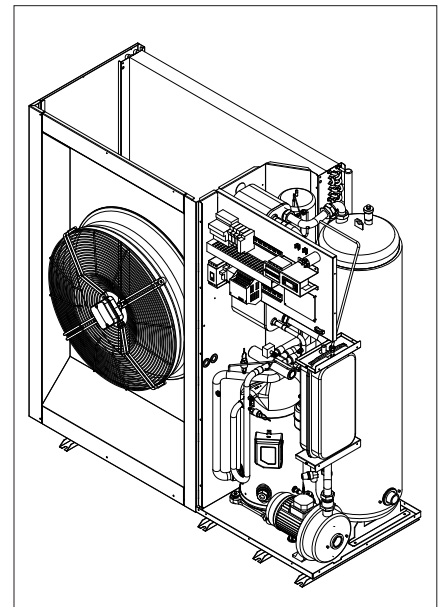
Base Version - VB

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

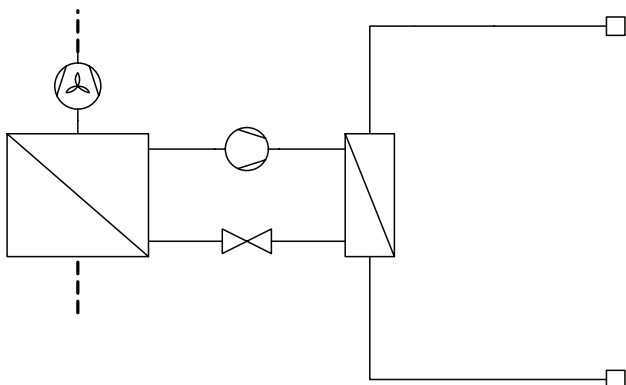
The unit contains a tank (arranged as buffer on the flow towards the plant), safety valve, circulating pump, air vents, expansion vessel and drain cock. The tank is also arranged for the installation of antifreeze or integrative electrical heaters.

GENERAL FEATURES

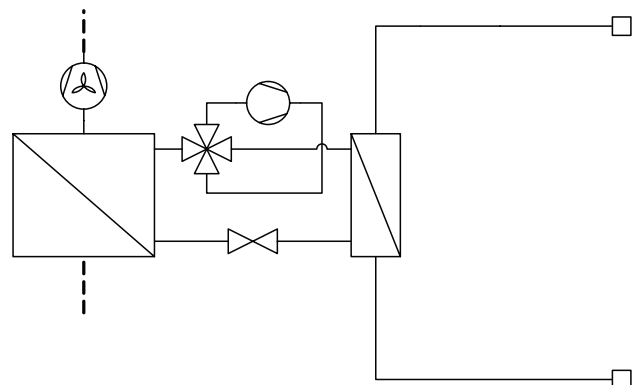
Options

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.
Integrative electrical heaters	Standard in the tank	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 continuously 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.

Chiller (IR) without options (VB)



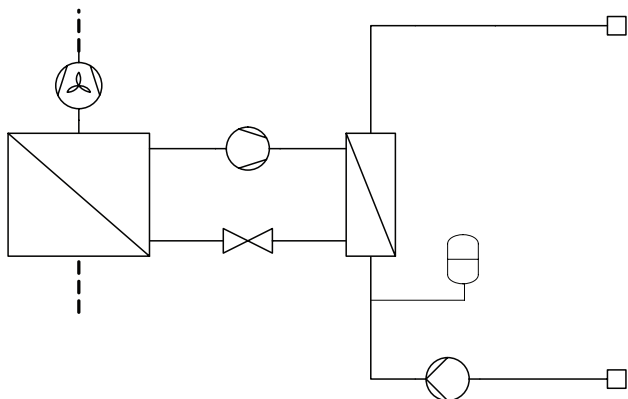
Heat pump (IP) without options (VB)



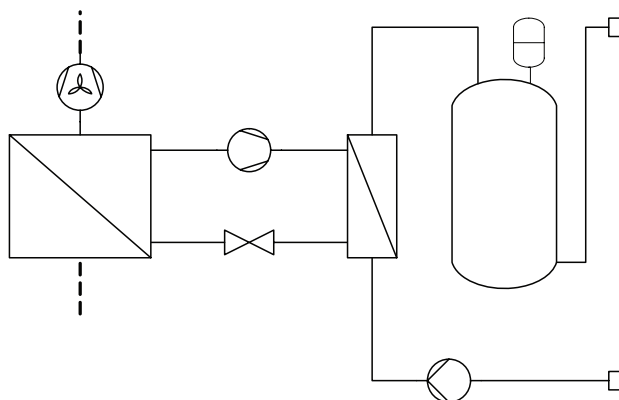
GENERAL FEATURES

Option "Storing and pumping module"

Standard, high head or modulating pump
(VP version)

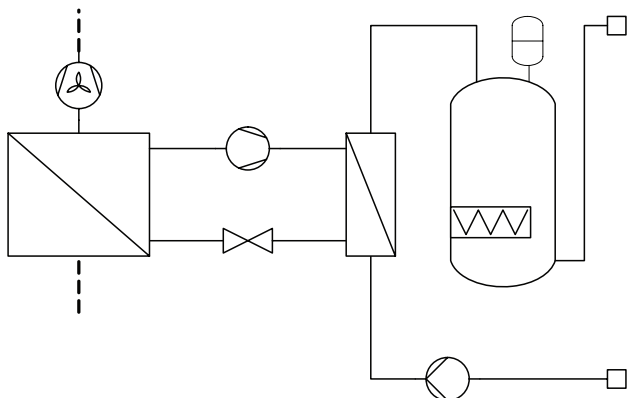


Tank and standard, high head or modulating pump
(VA version)



Option "Integrative electrical heaters"

Standard in the tank
(only for VA version)



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..
Tank antifreeze electrical heater	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.
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 protection offered by the differential pressure switch (standard).

TECHNICAL DATA AND PERFORMANCES

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	%
Oil charge	2,51	3,25	3,25	3,25	3,25	3,25	kg
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°
Water volume	1,90	1,90	2,56	2,56	3,33	3,33	l
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°
Frontal surface	1,45	1,45	1,45	1,75	1,75	1,75	m ²
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	10	10	10	10	10	10	l
Tank volume - VA	85	85	85	85	85	85	l
Safety valve set - VA	6	6	6	6	6	6	bar
Standard pump (option)							
Type	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	-
Installed power	0,7	0,7	0,7	0,7	1,0	1,0	kW
High head pump (option)							
Type	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	centrifugal pump	-
Installed power	1,2	1,2	1,2	1,2	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	0,7	0,7	0,7	0,7	1,0	1,0	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°

TECHNICAL DATA AND PERFORMANCES

NOMINAL performances - Base setting up (VB) - Standard plants

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

Cooling A35W7 (source : air in 35°C d.b. / plant : water in 12°C out 7°C)								
IR	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
	EER	3,09	3,12	3,15	3,06	3,08	3,06	-
	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)								
IP	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	-
	Water flow rate plant side	3398	3775	4410	5337	6194	7001	l/h
	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	-
	Water flow rate plant side	3603	3995	4661	5651	6556	7427	l/h
	Pressure drops plant side	28	34	28	40	34	43	kPa
	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
	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	-
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.

NOMINAL performances - Base setting up (VB) - Standard plants - EUROVENT certified 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

Cooling A35W7 (source : air in 35°C d.b. / plant : water in 12°C out 7°C)								
IR	Cooling capacity	20,2	22,4	26,2	31,7	36,8	41,6	kW
	EER	3,14	3,18	3,20	3,14	3,15	3,15	-
	Pressure drops plant side	26	32	26	37	32	40	kPa
	ESEER	3,55	3,59	3,62	3,55	3,56	3,56	-

Cooling A35W7 (source : air in 35°C d.b. / plant : water in 12°C out 7°C)								
IP	Cooling capacity	19,8	22,0	25,7	31,1	36,1	40,8	kW
	EER	3,11	3,16	3,17	3,12	3,11	3,11	-
	Pressure drops plant side	25	31	25	36	31	39	kPa
	ESEER	3,51	3,57	3,58	3,53	3,51	3,51	-
	Heating A7W45 (air 7 °C bs - 6 °C bu / water 40 - 45 °C)							
	Heating capacity	21,1	23,4	27,3	33,1	38,4	43,5	kW
	COP	3,45	3,50	3,51	3,46	3,46	3,45	-
	Pressure drops plant side	28	34	28	40	35	44	kPa

TECHNICAL DATA AND PERFORMANCES

NOMINAL performances - Base setting up (VB) - Radiant plants

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	
IR	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
	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
IP	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
	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 PERFORMANCES

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.
Power supply	400 - 3N - 50	400 - 3N - 50	400 - 3N - 50	400 - 3N - 50	400 - 3N - 50	400 - 3N - 50	V-ph-Hz

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	-
	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	-
	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	-
	Water flow rate plant side	3415	3790	4439	5378	6232	7069	l/h
	Pressure drops plant side	25	31	25	36	31	40	kPa
	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	-	
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.

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.
Power supply	400 - 3N - 50	400 - 3N - 50	400 - 3N - 50	400 - 3N - 50	400 - 3N - 50	400 - 3N - 50	V-ph-Hz

IR	Cooling A35W7 (source : air in 35°C d.b. / plant : water in 12°C out 7°C)							
	Cooling capacity	19,4	21,5	25,2	30,5	35,4	40,0	kW
	EER	2,79	2,83	2,85	2,80	2,81	2,82	-
	Pressure drops plant side	24	29	24	35	30	38	kPa
	ESEER	3,15	3,20	3,22	3,16	3,18	3,19	-

IP	Cooling A35W7 (source : air in 35°C d.b. / plant : water in 12°C out 7°C)							
	Cooling capacity	19,0	21,1	24,7	29,9	34,7	39,2	kW
	EER	2,76	2,80	2,82	2,77	2,78	2,78	-
	Pressure drops plant side	23	28	23	33	29	36	kPa
	ESEER	3,12	3,16	3,19	3,13	3,14	3,14	-
	Heating A7W45 (air 7 °C bs - 6 °C bu / water 40 - 45 °C)							
	Heating capacity	20,0	22,2	26,0	31,5	36,5	41,4	kW
	COP	3,41	3,45	3,49	3,42	3,41	3,42	-
Pressure drops plant side	25	31	26	37	32	40	kPa	

TECHNICAL DATA AND PERFORMANCES

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.
Power supply	400 - 3N - 50	400 - 3N - 50	400 - 3N - 50	400 - 3N - 50	400 - 3N - 50	400 - 3N - 50	V-ph-Hz

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

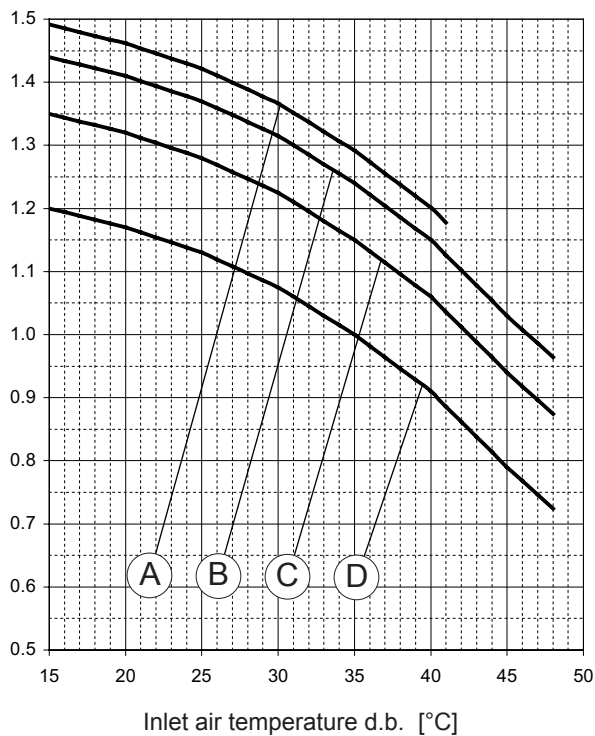
IP	Cooling A35W18 (source : air in 35°C d.b. / plant : water in 23°C out 18°C)							
	Cooling capacity	24,5	27,2	31,9	38,6	44,8	50,5	kW
	Power input	7,10	7,81	9,04	11,2	12,9	14,7	kW
	EER	3,45	3,48	3,53	3,45	3,47	3,44	-
	Water flow rate plant side	4242	4706	5513	6681	7745	8759	l/h
	Pressure drops plant 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 PERFORMANCES

COOLING performances

Cooling capacity



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

source : air in 35°C d.b.

plant : water in 12°C out 7°C

Outlet temperature

plant side :

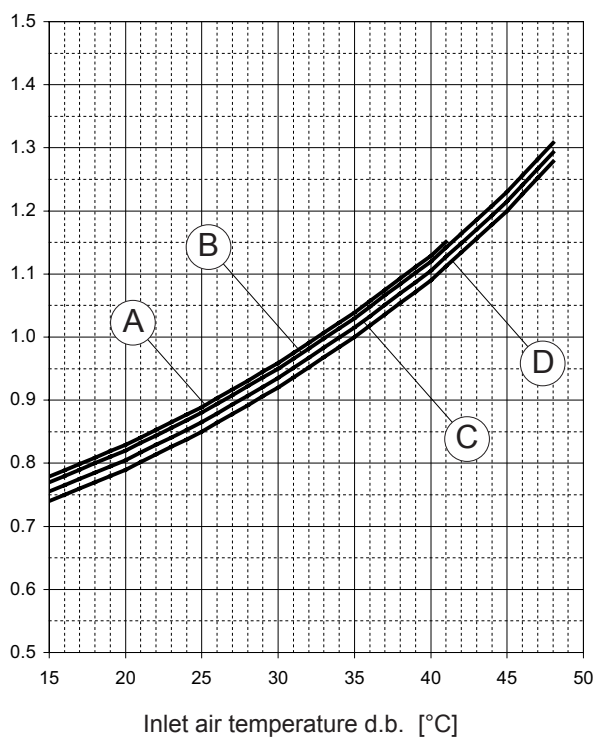
A = 24°C

B = 18°C

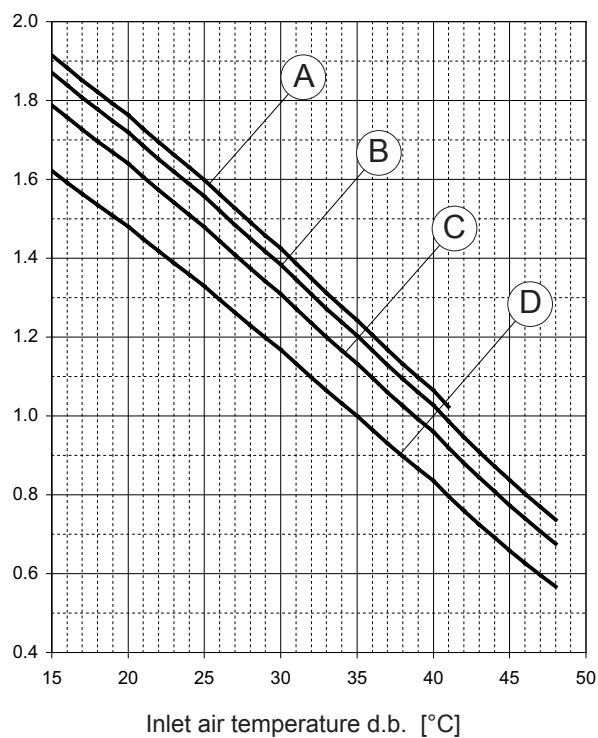
C = 12°C

D = 7°C

Power input



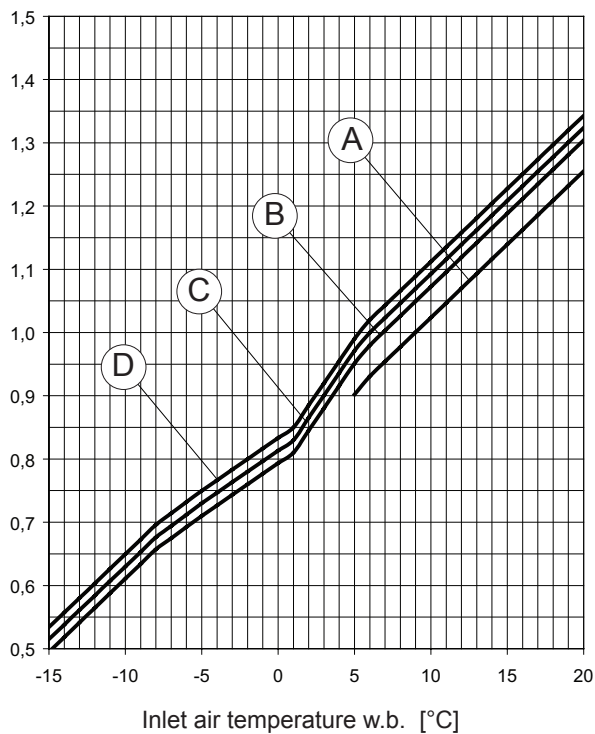
EER



TECHNICAL DATA AND PERFORMANCES

HEATING performances

Heating capacity



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 :

A7W35

source : air in 7°C d.b. 6°C w.b.

plant : water in 30°C out 35°C

Outlet temperature

plant side :

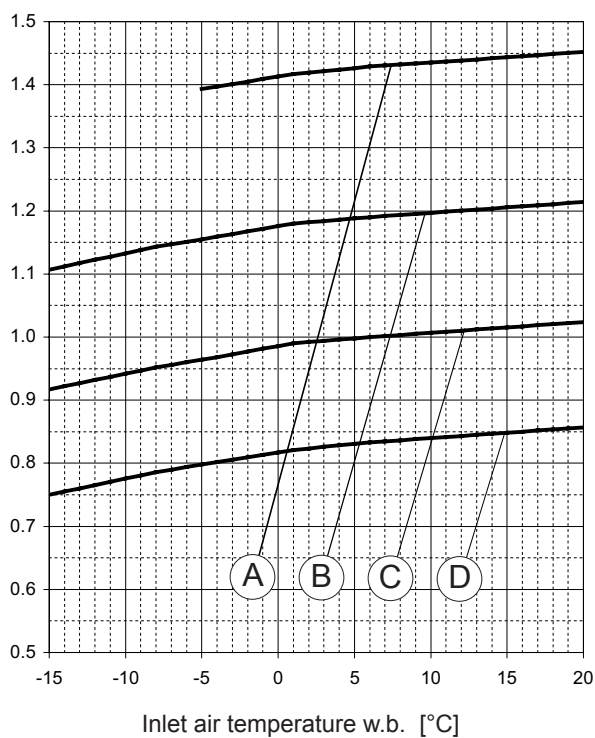
A = 55°C

B = 45°C

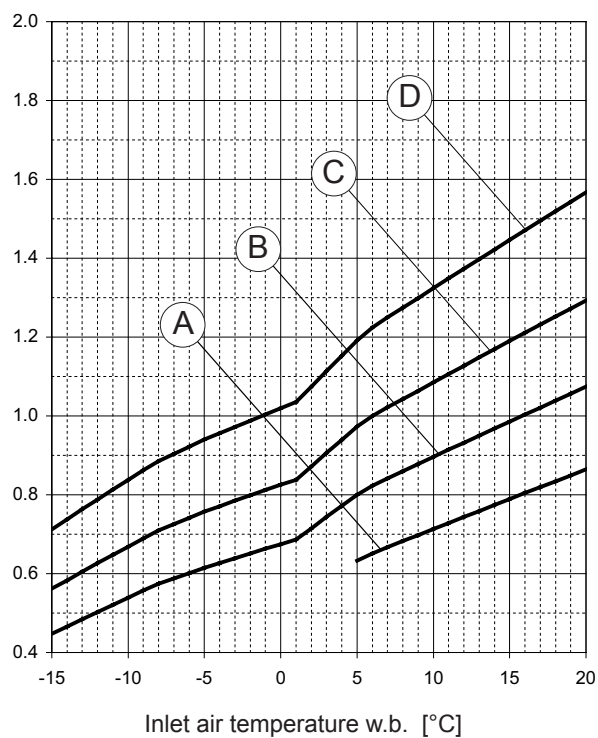
C = 35°C

D = 25°C

Power input



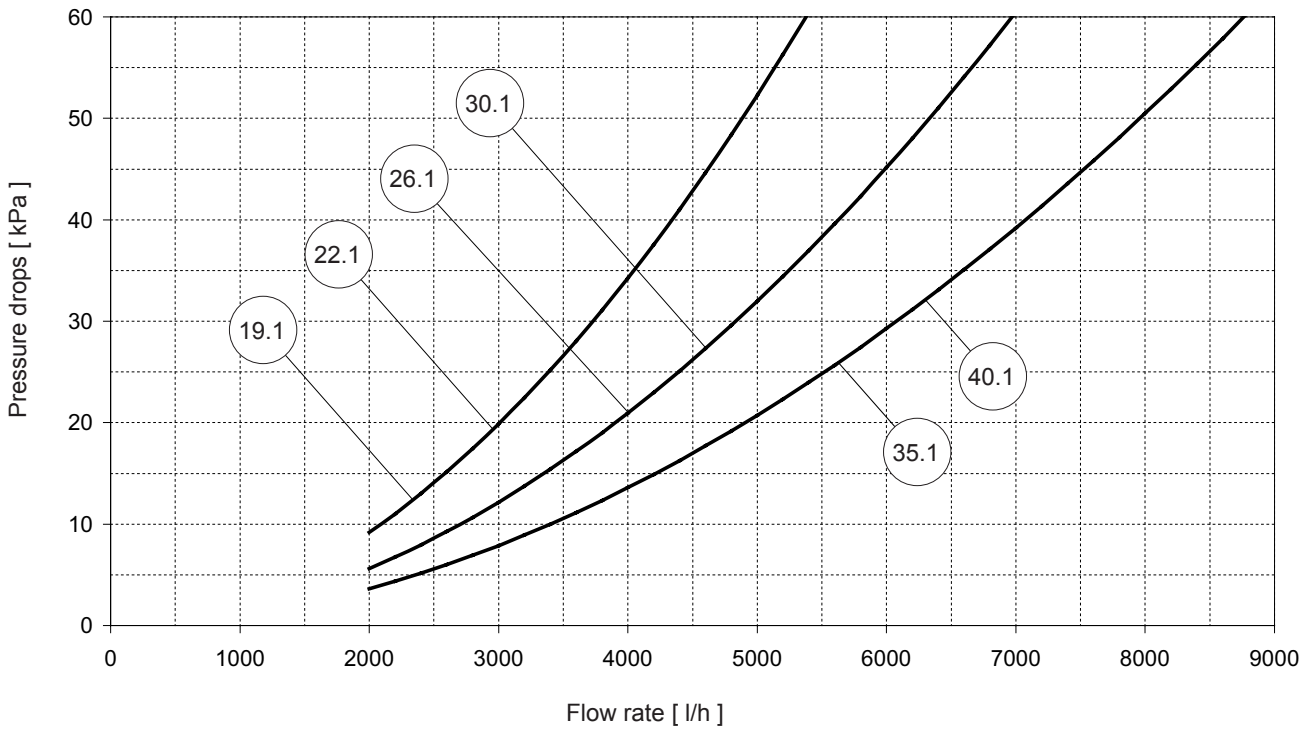
COP



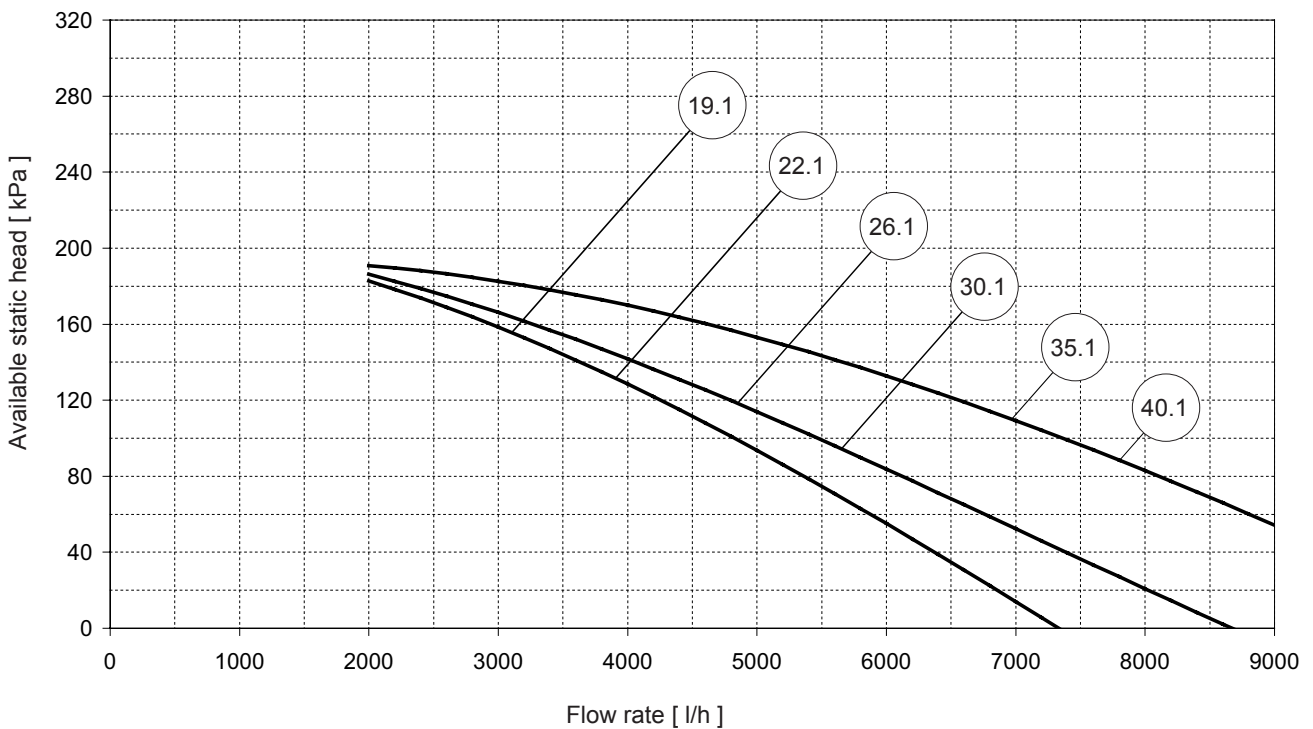
TECHNICAL DATA AND PERFORMANCES

Plant side hydraulic performances

Pressure drops - unit without options



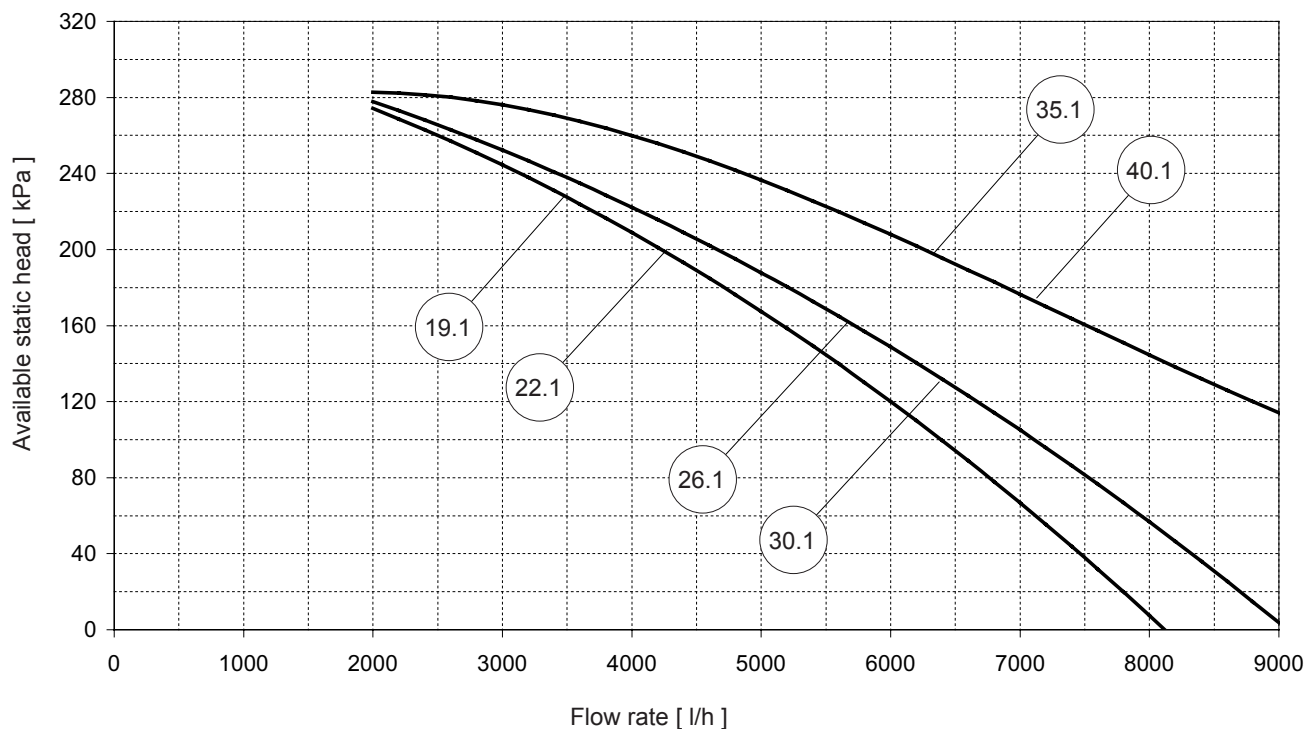
Available static head - unit with option "Storing and pumping module" : "Standard pump" or "Tank and standard pump"



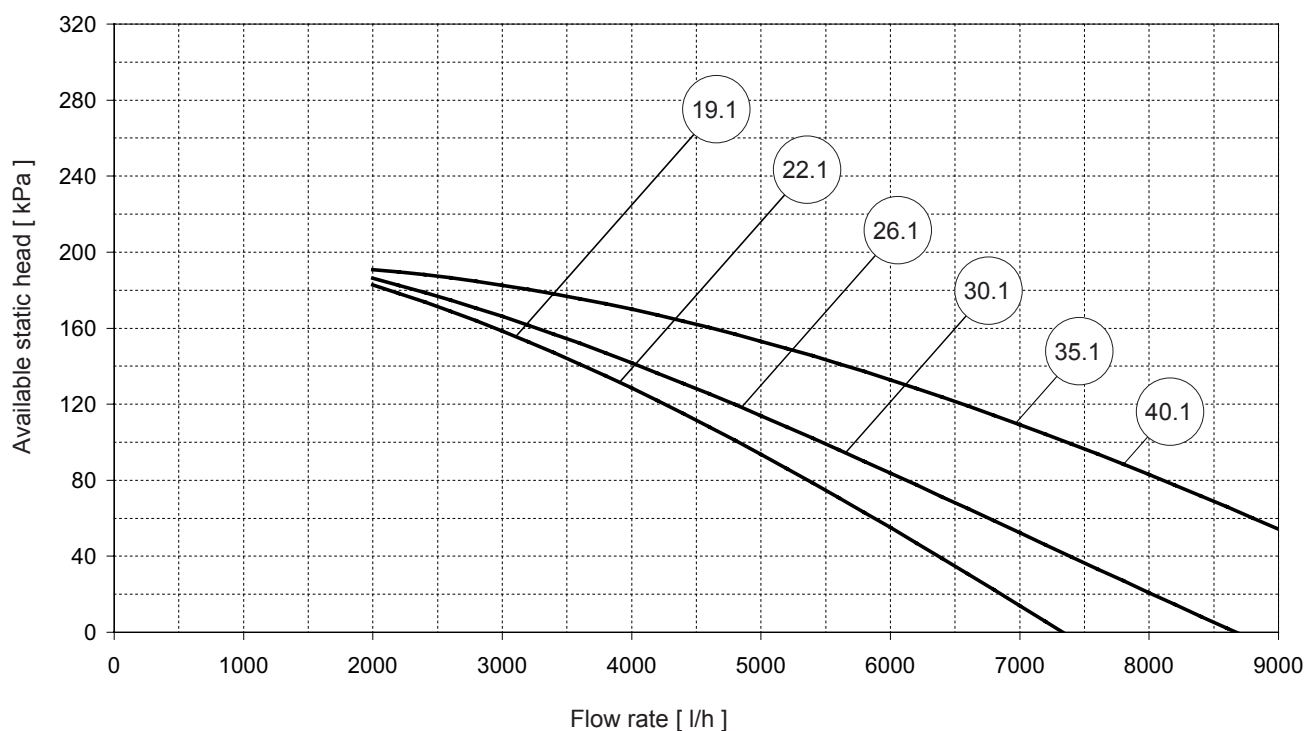
The graphs are referred to units operating with water at the temperature of 10°C (density 1000 kg/m³).

TECHNICAL DATA AND PERFORMANCES

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



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



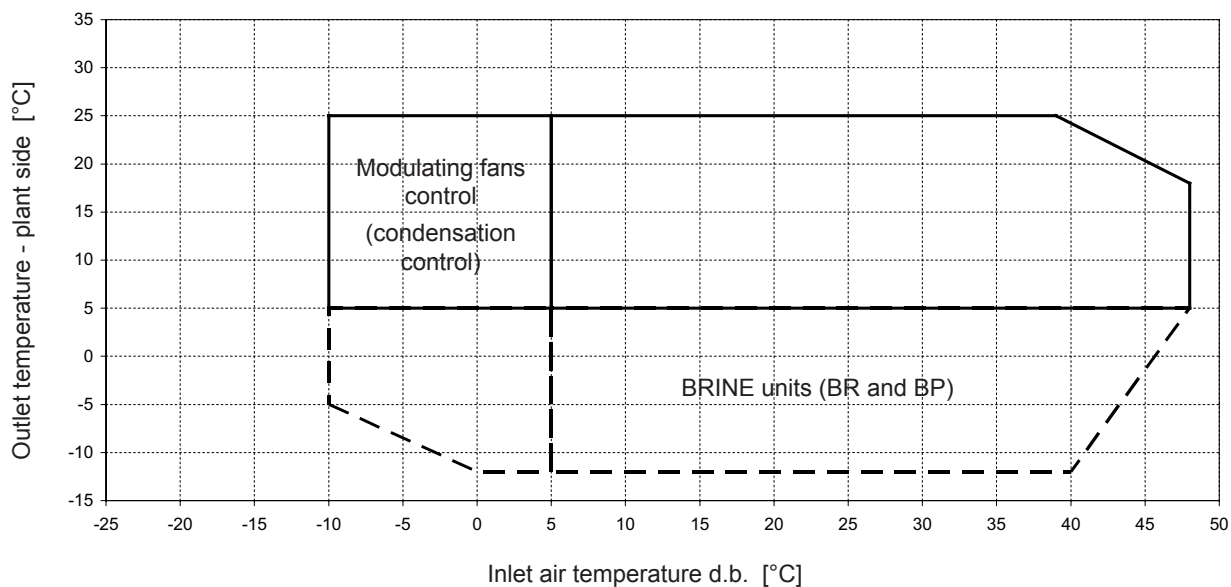
The graphs are referred to units operating with water at the temperature of 10°C (density 1000 kg/m³).

TECHNICAL DATA AND PERFORMANCES

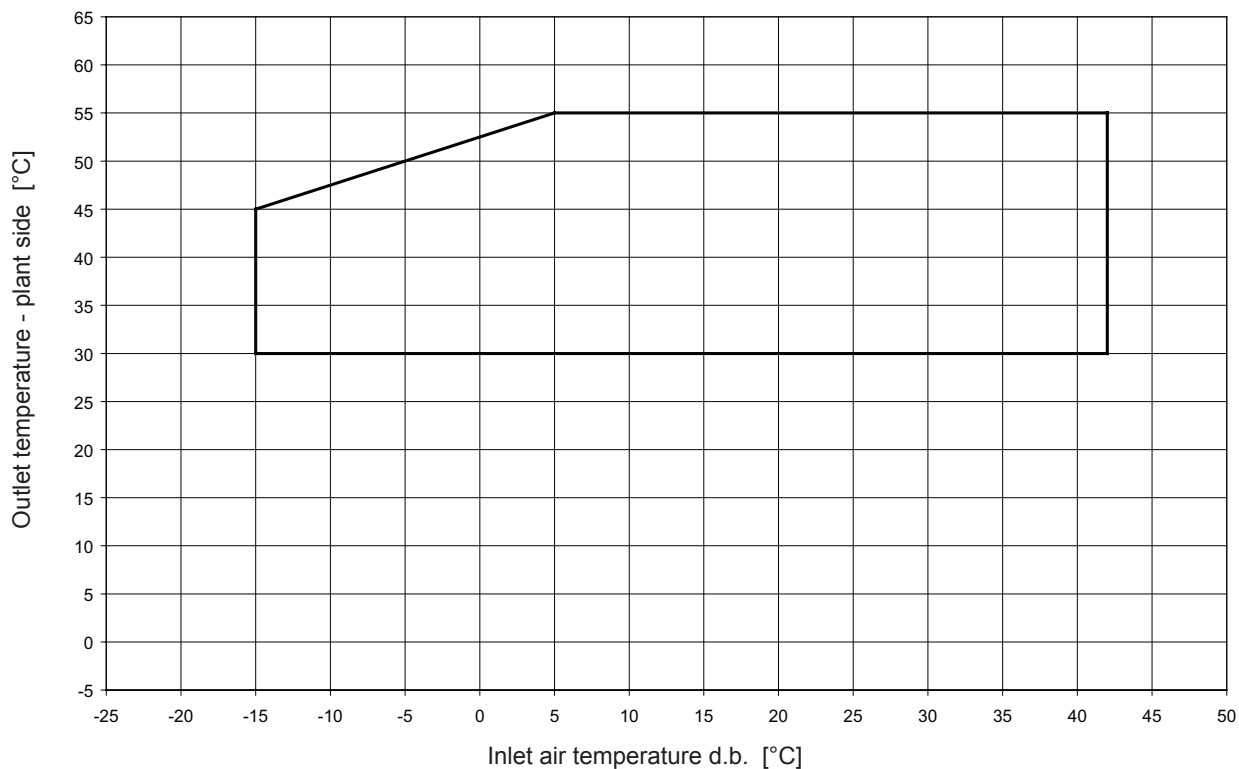
Operating limits

The graphs reported below show the operating area inside which the correct working of the unit is guaranteed.

COOLING



HEATING



Temperature difference between unit inlet and outlet		Plant side	
ΔT max	Maximum value	8	°C
ΔT min	Minimum value	3	°C

TECHNICAL DATA AND PERFORMANCES

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	18,8	20,8	22,9	25,9	29,9	34,0	A
F.L.I.	Maximum total power input	10,8	12,1	13,4	15,8	18,4	21,0	kW
M.I.C.	Maximum total start current	98	114	121	129	144	178	A
	Maximum total start current with soft starter (option)	55	64	68	73	82	102	A

Integrative electrical heaters standard in the tank (option)

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	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

Standard pump (option)

Power supply		230-1-50	230-1-50	230-1-50	230-1-50	230-1-50	230-1-50	V-ph-Hz
F.L.A.	Maximum total current input	3,6	3,6	3,6	3,6	5,1	5,1	A
F.L.I.	Maximum total power input	0,7	0,7	0,7	0,7	1,0	1,0	kW

High head pump (option)

Power supply		230-1-50	230-1-50	230-1-50	230-1-50	230-1-50	230-1-50	V-ph-Hz
F.L.A.	Maximum total current input	6,1	6,1	6,1	6,1	8,2	8,2	A
F.L.I.	Maximum total power input	1,2	1,2	1,2	1,2	1,6	1,6	kW

Modulating pump (option)

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	3,6	3,6	3,6	3,6	5,1	5,1	A
F.L.I.	Maximum total power input	0,7	0,7	0,7	0,7	1,0	1,0	kW

TECHNICAL DATA AND PERFORMANCES

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)]	[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)]	[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.

TECHNICAL DATA AND PERFORMANCES

Weights

Frame	1			2			
Model	19.1	22.1	26.1	30.1	35.1	40.1	U.M.

Components weights

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

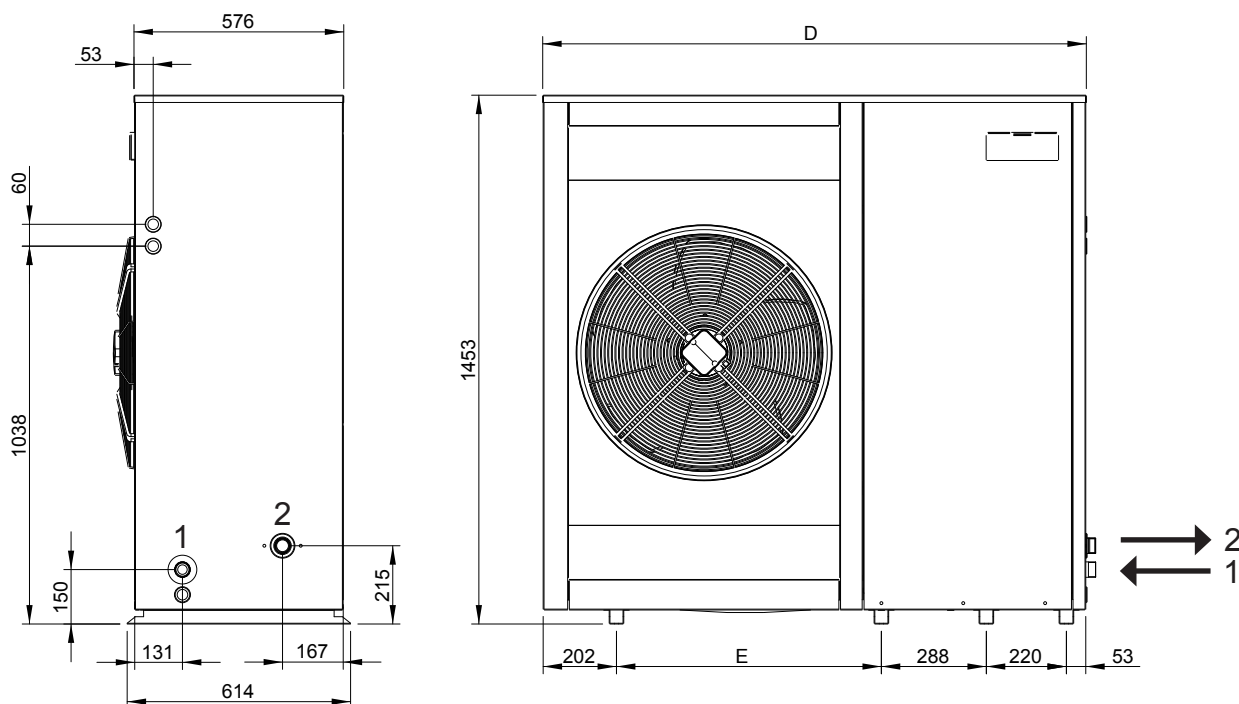
Unità senza opzioni			251	254	277	300	323	325	kg
Options	Storing and pumping module	Standard pump	9	9	9	9	11	11	kg
		High head pump	12	12	12	12	13	13	kg
		Modulating pump	12	12	12	14	16	16	kg
		Tank and standard pump	31	31	31	31	33	33	kg
		Tank and high head pump	34	34	34	34	35	35	kg
		Tank and modulating 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

TECHNICAL DATA AND PERFORMANCES

Overall dimensions

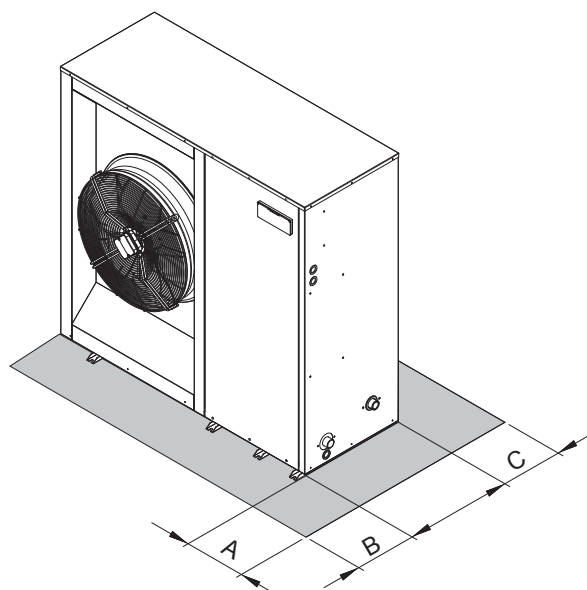


	Frame	1				2			
	Model	19.1	22.1	26.1	30.1	35.1	40.1		
Plant return	1	1"1/4 F	1"1/4 F	1"1/4 F	1"1/4 F	1"1/4 F	1"1/4 F	-	
Plant flow	2	1"1/4 M	1"1/4 M	1"1/4 M	1"1/4 M	1"1/4 M	1"1/4 M	-	
	D	1494				1704			mm
	E	728				938			mm

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



CONNECTIONS

Hydraulic connections

To design properly the hydraulic system respect the local safety regulations in force.

It is always necessary to guarantee an appropriate water flow through the plate heat exchanger of the unit even if is installed, as standard, a differential pressure switch that stops the unit if the water flow rate is too low.

Moreover all the unit are equipped with an antifreeze electrical heater on the plate heat exchanger.

To adjust the water flow rate through the heat exchanger modify the speed of the pump by means of the 3 speed selector (if present). For a more accurate adjustment it is recommended the installation of a valve on the outlet of the circuit.

It is also recommended to install a filter (with mesh Ø holes ≤ 500 µm) on the inlet of each circuit, otherwise the warranty will be invalidated. The filter fulfil the function to block the entrance of foreign substances (chips, machining debris...) contained inside the hydraulic circuit, avoiding the heat exchanger from clogging and from the possibility to freeze up (and subsequently burst).

If as "Storing and pumping module" option has been chosen "Standard pump" or "High head pump" or "Modulating pump" or "Tank and standard pump" or "Tank and high head pump" or "Tank and modulating pump", the hydraulic circuit is equipped with an expansion vessel. To maintain the circuit under pressure a self-filling group, that automatically fills the circuit, can be installed.

Hydraulic circuit cleaning

Before connecting the unit ensure a proper plant washing using clean water, filling and discharging the plant several times and cleaning the filters installed on the unit inlet.

Verify by qualified personnel the quality of the water or of the brine solution used. Avoid in particular the presence of inorganic salts, bioburden (algae), suspended solids and dissolved oxygen.

Suggestions for the hydraulic plant realization

Prepare the pipes with the minimum possible number of bends in order to minimize pressure losses, and suitably support them to prevent excessive stresses at the connections of the unit.

Install shut-off valves near the components that need maintenance, to allow their replacement without having to drain the system.

Provide manual or automatic valves in the highest part of the circuit to vent the air.

Make sure there are no leaks before insulating the pipes and filling the system.

In order to avoid condensate generation, insulate all the pipes using steam barrier type material.

Finned coil condensate drainage

The condensate generated by the finned coil in heating mode is collected in the tray obtained in the basement of the unit and can

be drained connecting a pipe to the fitting supplied as standard with all the heat pump units.

Precautions during winter time

During winter, in case of plant stops, the water could freeze and damage the plate heat exchanger of the unit and other plant components. To prevent these problems three solutions are possible :

1. Completely drain the plant, paying attention to the plate heat exchanger drainage (open all air vents to facilitate the operation).
2. Use brine solutions considering that, according to the glycol quantity added, the performances of the unit have to be corrected.
3. Keep the unit electrically powered during the whole winter. The plate heat exchanger is protected by the antifreeze electrical heater supplied as standard on the heat exchanger. The circulating pump is activated by the controller of the unit according to the outdoor air temperature in order to protect the pipes. For the unit with the tank (VA) is available, as an accessory, an antifreeze electrical heater that avoids ice generation inside the tank and is activated by the controller of the unit together with the antifreeze electrical heater of the plate heat exchanger. The integrative electrical heaters, if present, also carry out the antifreeze function.

Expansion vessel setting

The precharge pressure of the expansion vessel must be adequate to the total volume of the hydraulic circuit to which the unit is connected.

The factory setting is the minimum value necessary to avoid the presence of zones with a negative relative pressure inside the hydraulic circuit and the risk of pump cavitation, supposing that no parts of the plant are placed at a higher level than the one at which the unit is installed. In that case the precharge pressure must be increased proportionally to the elevation of the highest part of the plant according to the following relation :

$$p_{VE} = p_{VE-std} + H_{max} / 9,81$$

p_{VE} : expansion vessel precharge pressure [bar g]

H_{max} : elevation of the highest part of the plant referred to the unit installation level [m]

The maximum value of the precharge pressure is equal to the safety valve pressure set.

Increasing the precharge pressure, the maximum plant volume supported by the expansion vessel supplied with the unit is reduced :

$$V_1 = V_{VE} \cdot C_e \cdot [1 - (1 + p_{VE}) / (1 + p_{VS})]$$

V_1 : plant volume supported by the expansion vessel [l]

V_{VE} : expansion vessel volume [l]

C_e : expansion coefficient

p_{VS} : safety valve pressure set [bar g]

	Water	Ethylene glycol (percentage by volume)				Propylene glycol (percentage by volume)			
		10%	20%	30%	40%	10%	20%	30%	40%
Freezing temperature [°C]	0	-3,8	-8,9	-15,7	-24,9	-3,4	-7,4	-13,1	-21,5
C_e Plant side ($T_{min} = 5^{\circ}C$, $T_{max} = 60^{\circ}C$)	58,63	47,80	45,24	42,82	40,61	45,47	39,96	35,82	32,88

CONNECTIONS

If the real plant volume is higher than such calculated volume, it is necessary to install an additional expansion vessel of appropriate volume.

Once the hydraulic circuit has been filled, the pressure at the expansion vessel must be slightly higher than the precharge pressure.

Electrical connections

The electrical wirings must be carried out by qualified personnel according to the regulations in force at the installation time in the country of installation. Before starting any work on the electrical circuit make sure that the unit power supply line is disconnected at the start.

N.B. Refer to the electrical diagram enclosed in the unit.

Power supply system

The power cables of the heat pump power supply line must be connected to :

- for single phase power supply : from a single phase voltage system provided with neutral conductor and separated earth wire :

$$V = 230 V \pm 10 \%$$

$$f = 50 \text{ Hz}$$

- for three phase power supply : from a symmetrical three phase voltage system provided with neutral conductor and separated earth wire :

$$V = 400 V \pm 10 \%$$

$$f = 50 \text{ Hz}$$

The units are shipped completely factory wired and arranged for the connection to the power supply.

The power cables must enter the unit through the holes on the lateral panel and must be connected to the power supply terminals of the unit.

The integrative electrical heaters (option) must be supplied by a dedicated power supply line to be connected to the power supply terminals inside the electrical board of the unit.

Unit power supply

The power supply cables must have an adequate section for the power absorbed by the unit and must be chosen in conformity with the regulations in force. Design the power supply line, always referring to the total FLI and FLA values of the unit, taking into account the selected options (except the integrative electrical heaters) and the installed accessories.

Alimentazione delle resistenze elettriche integrative

The power supply cables must have an adequate section for the power absorbed by the only integrative electrical heaters and must be chosen in conformity with the regulations in force.

The electrical heaters must be connected to a single phase power supply if the unit power supply is single phase or to a three phase power supply if the unit power supply is three phase.

If parts of the plant are placed at a lower level than the one at which the unit is installed, verify that the components can withstand the maximum pressure that can be present.

Upstream protection

An automatic switch suitable for ensuring protection against overcurrents and indirect contacts must be installed upstream each power supply line.

Coordination between line switch must be carried out observing the regulations in force on electrical safety, regarding the type of installation and the installation ambient conditions.

Connections available for the user

The wiring board inside the electrical panel contains dedicated terminals for the following connections.

General alarm

Voltage output (230V - max 2A) to be used to notify the presence of an active alarm.

Output active : active alarms

Output not active : no active alarms

Remote stand by

To turn on and off the unit, a remote device (selector, programmer clock, centralised supervision device ...) with a voltage free contact suitable for switching loads of very low power, can be connected.

This function must be enabled by parameter (see the section "Adjustment and control") and prevails the settings made on the user interface.

Remote Cooling-Heating

It is possible to switch between cooling mode and heating mode from remote by connecting a device equipped with a voltage free contact suitable for switching loads of very low power.

This function must be enabled by parameter (see the section "Adjustment and control") and prevails the settings made on the user interface.

Remote control

It is possible to connect a remote control that has all the control and display functions available on the user interface on the unit and therefore enables the complete remote control of the unit.

Pump control

The controller of the unit can directly activate the circulating pump by means of a voltage free contact (maximum absorbed current 4A).

ATTENTION

Carry out all the connections outside the unit avoiding the power cables and the probe cables to be coupled.

RECEIVING AND POSITIONING

Receiving

Check on receiving

As soon as the unit is received verify accurately the correspondence of the load to what was ordered to make sure that all the material has been delivered. Check carefully that the load has not been damaged. In case of goods with visible damages inform promptly the haulage contractor reporting on the delivery note the phrase “**Collected with reserves owing to evident damage**”. Delivery ex works implies reimbursement of any damage on charge of the insurance company as established by law.

Safety instructions

Observe the safety regulations in force concerning the equipment to use for unit handling or the operating formalities to follow.

Handling

Before handling the unit, check the weight of the unit, reported both on the dataplate and on the technical documentation. Make sure the unit to be handled with care avoiding any kind of collision that could damage the operating parts of the unit. On the packaging of the unit are reported all the instructions

necessary for a correct handling during storing and installation. The unit is supplied on a pallet suitable for the transport. It is advisable to place protective material between the truck and the unit to avoid damages to the unit. Prevent the unit or parts of it from falling down.

Storing

The units must be stored in a dry place, repaired from sun, rain, sand or wind.

Do not stack the units.

Maximum temperature = 60 °C

Minimum temperature = -20 °C

Humidity = 90 %

Packaging removal

Remove the packaging taking care not to damage the unit.

Check for any visible damage.

Get rid of the packaging material sending them to specialized recycling centres (observe the regulations in force).

Positioning

The units are suitable for outdoor installation.

Verify that the support surface can bear the weight of the selected unit and is perfectly horizontal. In order to limit the vibrations transmitted by the unit it is possible to place, between the unit base and the support surface, a strip of hard rubber or, if a higher level of insulation is required, vibration dampers.

In any case it is not advisable to place the unit near private offices, bedrooms or zones where very low noise levels are required.

Protect the finned coil against direct sunlight and prevailing winds and do not place the unit on dark ground (for example tarred surfaces) to avoid the risk of overheating during operation.

Do not place the unit under roofs or near plants (even if the unit is only partly covered) in order not to reduce the possibility of air recirculation.

Respect the minimum operating area and verify that the installation place is not subject to flooding.

START UP

Start up

The following operations must be carried out only by properly trained personnel. To make the **contractual warranty** effective, start up **must be carried out by authorized service centres**.

Before calling the service centre it is advisable to make sure that all the installation steps have been completed (positioning, electrical connections, hydraulic connections).

Preliminary checks before turning on

1. Verify that :

- the unit has not suffered visible damages due to transport or positioning
- the unit is placed on an horizontal surface able to bear its weight
- the minimum operating area are respected
- the ambient conditions comply with the provided operating limits
- the hydraulic and electrical connections has been carried out correctly

2. Disconnect the unit power supply line at the start and make sure that :

- the unit power supply line complies with the regulations in force
- the screws, fastening the electrical cables to the components inside the electrical panel of the unit, are well tightened (vibrations during transport phases could have caused some loosening)

3. Connect the unit power supply line and verify that :

- the voltage of the power supply line complies with the the nominal one of the unit
- for three phase power supply units, the unbalance between the phases is lower than 2% (a higher value produces an excessive current input on one or more phases causing possible damages to the electrical components of the unit)

NOTE. Example of phase unbalance calculation

- Read the value of the three line voltages using a voltmeter :

line voltage between phases L_1 and L_2 : $V_{1-2} = 390 \text{ V}$

line voltage between phases L_2 and L_3 : $V_{2-3} = 397 \text{ V}$

line voltage between phases L_3 and L_1 : $V_{3-1} = 395 \text{ V}$

- Calculate the difference between the maximum and minimum value of the measured line voltages :

$$\Delta V_{\max} = \max (V_{1-2} ; V_{2-3} ; V_{3-1}) - \min (V_{1-2} ; V_{2-3} ; V_{3-1}) = V_{2-3} - V_{1-2} = 397 - 390 = 7 \text{ V}$$

- Calculate the average line voltage value :

$$\Delta V_{\text{average}} = (V_{1-2} + V_{2-3} + V_{3-1}) / 3 = (390 + 397 + 395) / 3 = 394 \text{ V}$$

- Calculate the percentage unbalance value :

$$\Delta V_{\max} / V_{\text{average}} \times 100 = 7 / 394 \times 100 = 1,78 \% < 2 \%$$

Turning on

Turn on the main switch of the unit (ON position).

A wrong sequence of the power supply phases is immediately detected by the phase sequence controller (standard on all the three phase power supply units) and reported on the display of the unit. To eliminate the error switch each other two phases of the power supply line.

Start all the plant components necessary to guarantee an adequate water flow rate on the plant hydraulic circuit.

Activate the unit in cooling or in heating mode operating on the user interface and setting a set point suitable to require the unit to work.

Checks and adjustments after turning on

Make sure that :

- there are no refrigerant leakages (all the caps of the pressure connections must be fitted and screwed down)
- the saturation temperature (dew point) corresponding to the condensing pressure is about 10-15°C higher than the outdoor air temperature in cooling and about 5°C higher than the water outlet temperature in heating
- the saturation temperature (dew point) corresponding to the evaporating pressure is about 5°C lower than the water outlet temperature in cooling and about 5-10°C lower than the outdoor air temperature in heating
- the superheating and the subcooling are between 5°C and 10°C
- the compressor outlet temperature is 30-40°C higher than the saturation temperature (dew point) corresponding to the condensing pressure
- the difference between the water inlet and outlet temperature from the plate heat exchanger of the unit is inside the limits provided, as indicated in the section "Technical data and performances"
- the current absorbed by the compressor and the fans is lower than the maximum value admitted (FLA), as indicated in the section "Technical data and performances"

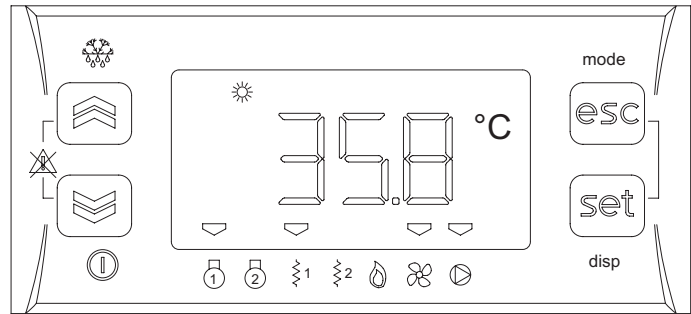
N.B. The reported values are reference values, to be considered only for units operating with water flow rate and temperatures similar to the nominal ones.

CONTROL SYSTEM

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 interface, placed on the frontal panel of the unit, is accessible from the outside and is protected by a transparent plastic door.

It's available, as an accessory, a remote control that reports all the functionalities of the user interface placed on the unit.



To each button are associated :

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

Button		Direct function	Associated function	
	UP	To increase the value of the selected parameter To scroll up the menu	-	-
	DOWN	To decrease the value of the selected parameter To scroll down the menu	-	-
	ESC	To go to the higher level of the menu without saving	mode	To access the "Operating mode" menu
	SET	To go to the higher level of the menu saving To go to the lower level of the menu Access the "Status" menu	-	-
-	ALL	Alarm deactivation	-	-

Button		Combined function	
	UP +		Manual reset
	ESC +		To access the "Programming" menu

CONTROL SYSTEM

Display

Normally are shown :

- the setting temperature that is the water inlet temperature (in tenths of Celsius degree with decimal dot)
- alarm code, if at least one alarm is active (if more alarms are active, the first one according to the order of the Alarm Table, is shown)

In menu mode the informations on the display change according to the position inside the menu (see the structure of the menu).



	Icon	Description	Colour	Steady on	Flashing on
Status and operating modes		Alarm	Red	Active alarm	Deactivated alarm
		Heating	Green	Heating mode from keyboard	Heating mode from remote
		Cooling	Green	Cooling mode from keyboard	Cooling mode from remote
		Stand by	Green	Stand by from keyboard	Stand by from remote
		Defrost	Green	Defrost in progress	-
		Economy	Green	not used	-
Measure units		Clock	Red	Time display format 24.00	Time setting format 24.00
	°C	Celsius degrees	Red	Unit of measure of the selected parameter	-
	Bar	Bar	Red	not used	-
	%R.H.	Relative humidity	Red	not used	-
	ABC	Menu	Red	Menu browsing	-
Loads		Compressor	Amber	Active load	Safety time in progress
		not used	-	-	-
		Antifreeze heater Integrative heater 1 st step	Amber	Active load	Safety time in progress
		Integrative heater 2 nd step	Amber	Active load	Safety time in progress
		not used	-	-	-
		Fans	Amber	Active load	Safety time in progress
		Pump	Amber	Active load	Safety time in progress

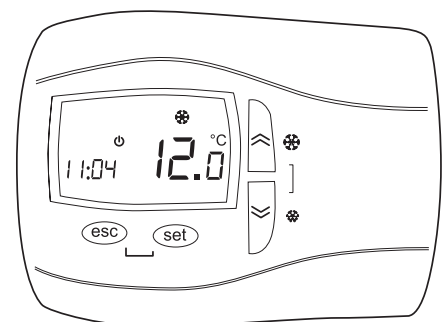
Remoto control

Suitable for wall mounting, it reports all the functions available on the user interface placed on the unit.

The buttons, functions associated with the buttons and the display indications are the same as those provided for the standard interface.

All configuration and control operations are further facilitated by the double display which allows the name and value of the selected parameter to be shown at the same time.

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



CONTROL SYSTEM

Menu structure

The control system provides for three menus with tree structure.

Menu	Access procedure	Sub menu	Parameters	Available functions			
Operating mode	Press ESC button for long (ESC button associated function)	SEbY	-	Operating mode change			
		HEAt					
		COOL					
Status	Press SET button (SET button direct function)	A i	A i01	Display input AI1			
			A i02	Display input AI2			
			A i03	Display input AI3			
			A i04	Display input AI4			
		d i	d i01	Display input ID1			
			d i02	Display input ID2			
			d i03	Display input ID3			
			d i04	Display input ID4			
			d i05	Display input ID5			
		AO	AO1	Display output AO1			
			AO2	Display output AO2			
			AO3	Display output AO3			
		dO	dO01	Display output DO1			
			dO02	Display output DO2			
			dO03	Display output DO3			
			dO04	Display output DO4			
			dO05	Display output DO5			
		CL	HOUr	Clock adjustment : time			
			dAtE	Clock adjustment : date			
			YEAr	Clock adjustment : year			
		AL	-	Display active alarms			
		SP	HEAt	Set point display and setting : heating			
			COOL	Set point display and setting : cooling			
		Sr	HEAt	Display real set point : heating			
			COOL	Display real set point : cooling			
		Hr	CP01	Display compressor operating hours			
			PUD1	Display pump operating hours			
		Programming	Press ESC + SET buttons at the same time (combined function) ESC + SET buttons)	PRr	CF	CF19	Remote stand by enable
						CF20	Remote Cooling-Heating enable
						CF63	Device address (Modbus protocol)
CF66	Display parameter map code						
CF67	Display parameter map revision						
Er	Er01			Heat pump enable			
	Er17			Heat pump lock set point			
Pi	Pi05			Modulating pump speed : cooling			
	Pi11			Modulating pump speed : heating			
Hi	Hi02			Integrative electrical heaters enable			
FnC	EUr			Alarm memory reset			
EU	-			Alarm memory display			

To go from one level to the level below press the SET button. To return to the upper level press the ESC button. To scroll the menu up and down inside the same level, press respectively the UP and DOWN buttons.

To modify the value of the selected parameter press the UP and DOWN buttons. Press the SET button to confirm the new value. Press the ESC button not to confirm the new value.

CONTROL SYSTEM

Inputs and outputs

In order to control the unit, the controller is equipped with the following inputs and outputs :

- Analogue inputs : 4
- Digital inputs : 5
- Analogue outputs : 2
- Digital outputs : 6

DESCRIPTION			CHARACTERISTICS
Analogue inputs			
AI1	SIW	water inlet probe	NTC temperature sensor (-30°C ÷ 90°C)
AI2	SUW	water outlet probe	NTC temperature sensor (-30°C ÷ 90°C)
AI3	SL	liquid line probe	NTC temperature sensor (-30°C ÷ 90°C)
AI4	STAE	outdoor air probe	NTC temperature sensor (-30°C ÷ 90°C)
Digital inputs			
ID1	PA	High pressure switch	voltage free digital input
	TVE	Fan thermal protection	
	SS	Soft starter alarm	
ID2	PB	Low pressure switch	voltage free digital input
	SEQ	Phase presence and sequence controller	
ID3	PD	Differential pressure switch	voltage free digital input
ID4	ON-OFF	Remote stand by	voltage free digital input
ID5	E-I	Remote Cooling-Heating	voltage free digital input
Analogue outputs			
AO1	VE	Fan	PWM output for relay or inverter control
AO3	PM	Modulating pump	10V voltage output
Digital outputs			
DO1	ALL	Alarm	relay 2 A resistive - 250 Vac
DO2	CP	Compressor	relay 2 A resistive - 250 Vac
DO3	VIC	Reverse cycle valve	relay 2 A resistive - 250 Vac
DO4	RSC	Plate heat exchanger antifreeze heater	relay 2 A resistive - 250 Vac
	RAG	Tank antifreeze heater	
	RE1	Integrative heater 1 st step	
DO5	P	Pump	500mA - 12Vdc voltage output for control of relay K1 (4 A resistive - 250 Vac)
AO2	RE2	Integrative heater 2 nd step	10V voltage output for control of relay KA2 (12 A resistive - 250 Vac)

All the inputs and outputs are connected to the wiring board except for output AO2 which directly controls a relay inside the electrical panel of the unit and output AO3 which directly control the modulating pump.

Controller technical data

Description	Typical	Minimum	Maximum
Power supply voltage *	12,0 V~	10,8 V~	13,2 V~
Power supply frequency	50 Hz / 60 Hz	-	-
Power	5 VA	-	-
Insulation class	2	-	-
Protection degree	Frontale IP0	-	-
Ambient operating temperature	25 °C	-10 °C	60 °C
Ambient operating humidity (not condensing)	30 %	10 %	90 %
Ambient storage temperature	25 °C	-20 °C	85 °C
Ambient storage humidity (not condensing)	30 %	10 %	90 %

* The controller is powered by a proper insulated transformer mounted on the wiring board.

Alarms

Alarm activation and reset

The controller can perform a complete diagnosis of the unit, detecting all the operating faults and reporting a set of alarms.

Activation of an alarm involves :

- locking of the loads concerned
- reporting of the alarm code on the display (in case of simultaneous alarms the one with the lowest index is displayed whereas the complete list of active alarms can be shown by accessing the “Status \ AL” menu)
- recording of the event in the alarms memory

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

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

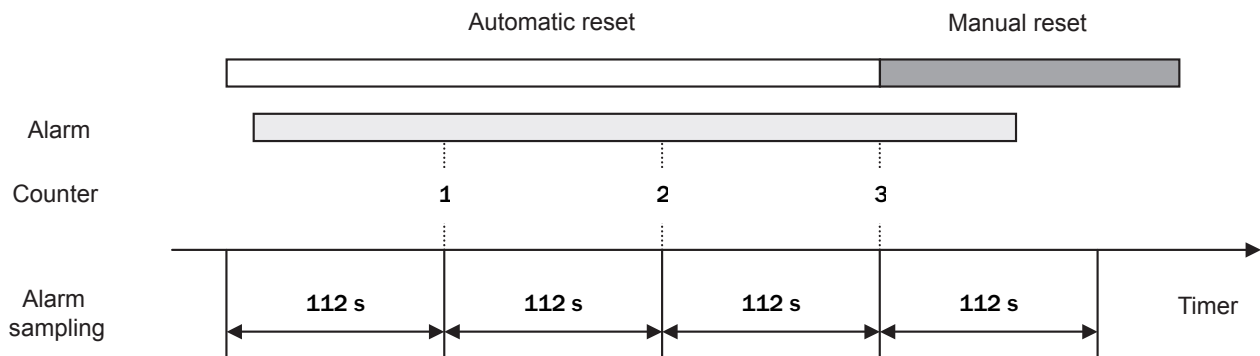
Pressing any button it's possible to **deactivate the alarm** : alarm report disappears from the display, the alarm LED starts flashing and the Alarm digital output is disabled. The deactivation of the alarm does not affect the alarm in progress.

Number of events per hour

For some alarms the number of events per hour is recorded : if, in the last hour, the number of events reaches a fixed limit, the alarm reset change from automatic to manual.

Sampling of alarms occurs every 112 seconds. If an alarm is activated several times in a sampling period (112 seconds) it is counted only once.

Esempio. If the fixed limit of events per hour is 3, in order to change from automatic to manual reset, the alarm has to remain active for a period of time between $2 \cdot 112$ seconds and $3 \cdot 112$ seconds.



Alarms memory

The controller enables the recording of the alarms occurred during the unit operation (up to a maximum 99 events). The following informations are recorded for each event :

- alarm code
- activation time
- activation date
- deactivation time
- deactivation date
- type of alarm (automatic or manual reset)

Such informations can be shown by accessing the “Programming \ EU” menu.

When the number of events recorded is higher than 99 the following events are recorded overwriting the oldest alarms.

The alarms memory can be cancelled by means of the E_{UR} function available inside the “Programming \ FN” menu, keeping pressed the SET button till $\mathcal{N}E5$ appears on the display.

CONTROL SYSTEM

Alarms table

CODE	ALARM	RESEt ⁽¹⁾	INPUT	Locked loads				
				Compressor	Antifreeze heater integrative heaters 1 st step	Pump	Integrative heaters 2 nd step	Fans
				DO2	DO4	DO5	AO3	AO1
<i>E_r05</i>	Low pressure Phase presence and sequence controller	A / M	ID2	X				X
<i>E_r20</i>	Differential pressure switch	A / M	ID3	X	X	X ⁽²⁾	X	X
<i>E_r30</i>	Antifreeze	M	AI2	X				X
<i>E_r41</i>	High pressure / Fan thermal protection / Soft starter alarm	A / M	ID1	X				X
<i>E_r45</i>	Clock fault	A	-					
<i>E_r46</i>	Clock to be adjusted	A	-					
<i>E_r47</i>	Communication error with remote control	A	-					
<i>E_r60</i>	Water inlet probe fault	A	AI1	X	X	X	X	X
<i>E_r61</i>	Water outlet probe fault	A	AI2	X	X	X	X	X
<i>E_r62</i>	Liquid line probe fault	A	AI3					
<i>E_r68</i>	Outdoor air probe fault	A	AI4					
<i>E_r80</i>	Configuration error	A	-	X	X	X	X	X

Notes:

(1) A = automatic reset , M = manual reset

(2) Only when the alarm change to manual reset

E_r05 Low pressure – Phase presence and sequence controller

The alarm change to manual reset when the number of events per hour is more than 3.

The alarm is bypassed for 120 seconds from the activation of the compressor or of the reverse cycle valve.

The alarm is disabled during defrosting.

E_r20 Differential pressure switch

The alarm is activated if the associated digital input remains activated for at least 5 seconds and automatically resets if the digital input remains not activated for at least 3 seconds. The alarm change to manual reset if the digital input remains activated for more than 10 seconds.

The alarm is bypassed for 30 seconds from the activation of the pump.

E_r30 Antifreeze

The alarm is bypassed for 3 minutes from switching on of the unit (in heating mode only).

E_r41 High pressure / Fan thermal protection / Soft starter alarm

The alarm change to manual reset when the number of events per hour is more than 3.

E_r62 Liquid line probe fault

When the alarm is activated the fans work with on-off logic according to compressor request. The defrost cycle inlet and outlet are managed according to the operating time of the compressor.

E_r68 Outdoor air probe fault

When the alarm is activated, neither climate control nor dynamic defrost are available.

Functions available for the user

Operating mode selection

It's possible to select the operating mode by accessing the "Operating mode" menu :

- Cooling *COOL*
- Heating *HEAT*
- STAND BY * *StdbY*

* The antifreeze function is still active.

Remote STAND BY

This function allows remote selection of the STANDBY mode. If the input is activated (open contact) the controller is in STANDBY mode and the operating mode can not be modified from the user interface.

The digital input used is DI4. Set the parameter *CF19* = -27 to enable this function.

Remote Cooling-Heating

This function allows remote selection of Cooling or Heating mode. If the input is activated (open contact) the unit is in heating mode. If the input is not activated (closed contact) the unit is in cooling mode. The operating mode can not be modified from the user interface (but STAND BY mode can be selected).

The digital input used is DI5. To enable this function set the parameter *CF20* = 14.

Set point

The set point value in cooling (*COOL*) and heating (*HEAT*) can be set by accessing the "*SETPOINT \ SP*" menu. These values must be between a fixed maximum and minimum value. The purpose of the controller is to keep the water temperature at the unit inlet as close as possible to the set value, by activating the compressor according to an on-off logic.

Operating in heat pump mode

For all the heat pump units the parameter *Er01* enables operation in heat pump mode when its value is 1. It is possible to set an outdoor air temperature value (parameter *Er17*) below which heat pump mode is locked (in any case the integrative electrical heaters, if present, remain activated).

Antifreeze

The plate heat exchanger is protected by the activation of an electrical antifreeze heater and the activation of the antifreeze alarm, occurring in sequence when the temperature of the water at the exchanger outlet reaches dangerous values. The buffer tank is protected by the antifreeze heater (accessory) activated together with the plate heat exchanger heater.

When the outdoor air temperature approaches 0°C, if the unit is not working, the pump is activated in any case to prevent excessive cooling of the water in the pipes.

Integrative electrical heaters

The parameter *H02* enables the electrical heaters, as integration of the heat pump, when its value is 1. The heaters are activated according to a two step logic depending on the unit inlet water temperature. When present, the heaters also carry out the storage tank antifreeze function .

Dynamic defrost

The activation limit is modified in a dynamic way according to the outdoor air temperature.

Serial communication

The device is configured to communicate on a serial line using the MODBUS protocol. When the device is connected, it must be assigned an address univocally identifying it among all the devices connected to the same serial line ("Modbus individual address"). This address must be between 1 and 247 and is configurable by means of the parameter *CF53* (see section on serial communication).

Operating hours recording

The controller can record the operating hours of compressor and pump. Access the "*SETPOINT \ Hr*" menu to see the values. The hours are reset by pressing the SET button for long, while the hours of operation are displayed.

Power failure

In case of a power failure, when the power is restored the controller will return to the status before the power failure. If a defrost cycle was in progress the procedure is cancelled. All safety timing in progress are cancelled and reinitialized.

Clock

The controller is equipped with an internal clock to record date and time of each alarm occurred during unit operation (see "Alarms memory"). The clock can be set by accessing the "*SETPOINT \ CL*" menu.

Modulating pump management

It is possible to set the rotational speed of the modulating pump in order to get the water flow rate required to maintain the desired temperature difference between the water inlet and outlet. Modifying the parameters *Pi05* (for cooling mode) and *Pi11* (for heating mode) from 40 to 100, the rotational speed of the pump changes from the minimum to the maximum speed.

CONTROL SYSTEM

Serial communication

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

Serial line settings

The serial line must be set as follows :

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

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

Device address

To communicate properly, each device connected to the serial network must have an univocal address ("*Modbus individual address*") contained between 1 and 247. This address can be set by modifying the parameter [FF3].

Modbus commands

The Modbus commands implemented by the controller are :

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

Addresses table

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

Example.

Bit number	=	4																	
Lsb	=	7																	
Resource value	=	3																	

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

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

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

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

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

EXP	Multiplicatore	
-2	10 ⁻²	0,01
-1	10 ⁻¹	0,1
0	10 ⁰	1
1	10 ¹	10
2	10 ²	100

MU : indicates the unit of measure of the resource

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

CONTROL SYSTEM

Label	Description	RW	Register address		Bit number	Lsb	CPL	EXP	UM
			Dec	Hex					
CPDL	Set point cooling	RW	16900	4204	16	0	Y	-1	°C
HEPt	Set point heating	RW	16902	4206	16	0	Y	-1	°C
CF19	Remote stand by enable	RW	49303	C097	8	0	Y	0	-
CF20	Remote Cooling-Heating enable	RW	49304	C098	8	0	Y	0	-
CF63	Device serial address	RW	49178	C01A	8	0	N	0	-
Er01	Heat pump enable	RW	49665	C201	8	0	N	0	-
Er17	Heat pump lock set point	RW	16930	4222	16	0	Y	-1	°C
Pi05	Modulating pump speed : cooling	RW	49749	C255	8	0	N	0	%
Pi11	Modulating pump speed : heating	RW	49757	C25D	8	0	N	0	%
H102	Integrative electrical heaters enable	RW	49858	C2C2	8	0	N	0	-
CP01	Compressor operating hours	R	753	02F1	16	0	N	0	ore
PU01	Pump operating hours	R	763	02FB	16	0	N	0	ore
AI01	Water inlet probe	R	344	0158	16	0	Y	-1	°C
AI02	Water outlet probe	R	346	015A	16	0	Y	-1	°C
AI03	Liquid line probe	R	348	015C	16	0	Y	-1	°C
AI04	Outdoor air probe	R	350	015E	16	0	Y	-1	°C
-	Unit operating in COOLING	R	33028	8104	1	4	N	0	-
-	Unit operating in HEATING	R	33028	8104	1	6	N	0	-
-	Unit in STAND BY (user interface or serial communication)	R	33028	8104	1	2	N	0	-
-	Unit in STAND BY (digital input)	R	33028	8104	1	3	N	0	-
-	Unit in OFF	R	33028	8104	1	0	N	0	-
-	COOLING mode enable *	W	33471	82BF	1	3	N	0	-
-	HEATING mode enable *	W	33471	82BF	1	4	N	0	-
-	STAND BY enable *	W	33471	82BF	1	5	N	0	-
-	Unit switching on (1 = ON ; 0 = OFF)	W	33471	82BF	1	7	N	0	-
-	Alarm Er05	R	33037	810D	1	5	N	0	-
-	Alarm Er20	R	33039	810F	1	4	N	0	-
-	Alarm Er30	R	33040	8110	1	6	N	0	-
-	Alarm Er41	R	33042	8112	1	1	N	0	-
-	Alarm Er45	R	33042	8112	1	5	N	0	-
-	Alarm Er46	R	33042	8112	1	6	N	0	-
-	Alarm Er60	R	33044	8114	1	4	N	0	-
-	Alarm Er61	R	33044	8114	1	5	N	0	-
-	Alarm Er62	R	33044	8114	1	6	N	0	-
-	Alarm Er68	R	33045	8115	1	4	N	0	-

- * If several operation modes are enabled by mistake :
- OFF has priority over STAND BY, HEATING, COOLING
 - STAND BY has priority over HEATING, COOLING
 - HEATING has priority over COOLING

Probes characteristics

The temperature probes used are NTC 10K (10 kΩ at 25°C).
 When the probe bulb is at the temperature of 25°C the electrical resistance measurable at the probe ends is 10 kΩ.
 The thermistor of these probes has a negative temperature coefficient: the electrical resistance value decreases as the temperature increases.

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

For a reliable verify it is not necessary to check all the single values but is enough to check some random values. If the instrument indicates neverending resistance then the probe is interrupted.

Temperature [°C]	Resistance [kΩ]
0	25,7950
5	21,3963
10	17,7477
15	14,7213
20	12,2110
25	10,1287
30	8,4015
35	6,9688
40	5,7805
45	4,7948
50	3,9771
55	3,2989

MAINTENANCE

Maintenance

IMPORTANT. MAKE SURE THE UNIT IS NOT ELECTRICALLY POWERED BEFORE CARRYING OUT ANY CLEANING OR MAINTENANCE OPERATION. ALL ORDINARY AND EXTRAORDINARY MAINTENANCE OPERATIONS MUST BE CARRIED OUT BY SPECIALIZED AND AUTHORIZED PERSONNEL, IN ORDER TO ENSURE COMPLIANCE WITH THE CURRENT SAFETY REGULATIONS.

NB.: always make sure that the power supply lines (of the unit and of the integrative electrical heaters) are disconnected at the start before carrying out any maintenance operation.

This section is extremely important for efficient operation of the unit during the years. A few operations carried out periodically can avoid the need to call specialized personnel. The operations to be carried out do not require particular technical knowledge and consist of simple checks of the components of the unit.

Contact an authorized service centre if maintenance is required.

Structure

To prevent noise and strange vibrations to rise make sure that the various steel parts are well fastened together and that the inspection panels are properly fixed to the unit.

In case of oxidation, treat with paints, suitable to avoid or reduce the problem, the parts of the unit affected.

Hydraulic plant

Visually check that the hydraulic plant is leaks free and is pressurized. Verify there is no air in the circuit (acting on the air vents). Verify that the filters in the plant are clean.

Electrical plant

Verify that the power supply cable that connects the unit to the distribution panel is not affected by cuts, cracks or alterations that could compromise the insulation. Contact an authorized service center if maintenance is required. After a first period of time from the first start up and at every stop or seasonal start up carefully check that each electrical connection is well fixed.

Fans

Verify that the fans are well fixed to the protective grilles and to the structure of the unit. Check any unbalance of the fans pointed out by anomalous vibrations and noise.

Finned coil

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

Finned coil condensate drainage

Verify that, during the defrosting cycles that take place in heating mode, the drainage of the water from the finned pack occurs properly and that the drainage fitting on the unit basement is not clogged. If the flow is not correct, with low outdoor temperature, a layer of ice could be generated on the unit basement and the operating of the unit could be compromised.

SAFETY AND POLLUTION

General considerations

Accessing the unit

The access to the unit must be granted exclusively to qualified personnel trained to operate on this type of units and provided with the necessary protection equipment. Moreover such personnel, to operate, must be authorized by the owner of the unit and recognized by the Manufacturer.

Residual risks

The unit are designed and built in such a way to minimize risks for people and for the place where the unit is installed. The residual risks, impossible to eliminate during the design process, are reported in the following table along with the indications necessary for their neutralization.

Considered part	Residual risk	Mode	Precautions
Compressor	Burns	Contact	Use protective gloves
Refrigerant circuit pipes	Burns	Contact	Use protective gloves
	Cold burns	Fuoriuscita di refrigerante e contatto con la pelle	Use protective gloves
Electrical circuit	Electrocutions	Contact with live parts	Verify the unit earth connection Disconnect the power supply line before carrying out any operation inside the unit
Finned coil	Cuts	Contact	Use protective gloves

Pollution

The unit contains refrigerant gas and lubricating oil. During discarding such fluids must be recovered and eliminated according to the regulations in force in the country where the unit is installed. The unit must not be abandoned during discarding.

Refrigerant safety card

1 SUPPLIER COMPANY AND PRODUCT IDENTIFICATION

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

2 COMPOSITION / INFORMATION ON INGREDIENTS

Substance / Preparation Preparation
Components / Impurities Contains the following components :
Difluoromethane (R32) 50 % in weight
Pentafluoroethane (R125) 50 % in weight
Non-applicable for mixtures
/ /

EEC No.
Trade-name

3 IDENTIFICATION OF HAZARDS

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

4 FIRST-AID MEASURES

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

5 FIRE-PREVENTION MEASURES

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

6 MEASURES AGAINST ACCIDENTAL SPILLING OF THE PRODUCT

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

7 HANDLING AND STORAGE

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

8 CONTROL OF EXPOSURE / PERSONAL PROTECTION

Personal protection Ensure adequate ventilation, especially in closed areas.
Control parameters Difluoromethane (R32): Recommended exposure limits: AEL (8h and 12h TWA) = 1000 ml/m³
Pentafluoroethane (R125): Recommended exposure limits: AEL (8h and 12h TWA) = 1000 ml/m³

SAFETY AND POLLUTION

Respiratory tract protection

For rescue and for maintenance works in tanks, use self-contained breathing apparatus. The vapours are heavier than air and can cause suffocation, reducing the oxygen available for breathing.

Eye protection

Total protection glasses.

Hand protection

Rubber gloves.

Hygiene measures

Do not smoke.

9 CHEMICAL-PHYSICAL PROPERTIES

Relative density, gas (air=1)

Heavier than air.

Solubility in water (mg/l)

Not known, but deemed very low.

Appearance

Colourless liquefied gas.

Odour

Similar to ether.

Fire point

Does not ignite.

10 STABILITY AND REACTIVITY

Stability and reactivity

No decomposition if used according to the special instructions.

Materials to be avoided

Alkali metals, alkali-earth metals, granulated metal salts, Al, Zn, Be, etc. in powder.

Hazardous products of decomposition

Halogen acids, traces of carbonyl halides.

11 TOXICOLOGICAL INFORMATION

Local effects

Concentrations substantially above the value TLV (1000 ppm) can cause narcotic effects. Inhalation of highly concentrated products of decomposition can cause respiratory insufficiency (pulmonary oedema).

Long-term toxicity

No carcinogenic, teratogenic or mutagenic effects have been recorded in experiments on animals.

Specific effects

Rapid evaporation of the fluid can cause freezing. Can cause cardiac arrhythmia.

12 ECOLOGICAL INFORMATION

Effects linked to ecotoxicity

Pentafluoroethane (R125)

Potential global warming with halocarbons; HGWP (R-11 = 1) = 0.84

Potential impoverishment of the ozone; ODP (R-11 = 1) = 0

13 CONSIDERATIONS ON DISPOSAL

General

Do not dispose of where accumulation can be hazardous.

Usable with reconditioning.

The depressurised containers must be returned to the supplier.

Contact the supplier if instructions for use are deemed necessary.

14 INFORMATION FOR TRANSPORT

Designation for transport

LIQUEFIED GAS N.A.S.

(DIFLUOROMETHANE, PENTAFLUOROETHANE)

UN No.

3163

Class/Div

2.2

ADR /RID No.

2, 2nd A

ADR/RID hazard no.

20

ADR label

Label 2 : non-toxic non-flammable gas.

CEPIC Groupcard

20g39 - A

Other information for transport

Avoid transport on vehicles where the loading zone is not separate from the cab.

accident or emergency.

Make sure the driver is informed about the potential risk of the load and knows what to do in case of

Before starting transport, make sure the load is properly secured and :

make sure the valve of the container is closed and does not leak;

make sure the blind cap of the valve (when provided) is correctly fitted;

make sure the cap (when provided) is correctly fitted and that there is an adequate ventilation passage;

ensure compliance with the current provisions.

15 INFORMATION ON REGULATIONS

The product must not be labelled according to Directive 1999/45/EC.

Comply with the regulations given below, and the relevant applicable updates and amendments.

Circulars no. 46/79 and 61/81 of the Ministry of Labour : Risks related to the use of products containing aromatic amines

Leg. Decree no. 133/92 : Regulations on the discharge of hazardous substances in waters

Leg. Decree no. 277/91 : Protection of workers against noise, lead and asbestos

Law 256/74, Decree 28/1/92, Leg. Decree no. 52 dated 3/2/97, Decree dated 28/4/97 as amended : Classification, packing and labelling of hazardous substances and preparations

Decree no. 175/88, as amended : Activities with significant accident risks (Seveso Law)

Decree no. 203/88 : Emissions into the atmosphere

Decree no. 303/56 : Work hygiene

Decree no. 547/55 : Regulations on accident prevention

Leg. Decree no. 152 dated 11/5/99 : Protection of waters

16 OTHER INFORMATION

Recommended uses

Refrigerant

Can cause suffocation in high concentration.

Keep in a well-ventilated place.

Do not breathe the gas.

The risk of suffocation is often underestimated and must be clearly explained during the training of operators.

Ensure compliance with all the national and regional regulations.

Before using this product in any new process or trial, an in-depth study on safety and compatibility of the product with the materials must be carried out.

The above information is based on our current know-how and describes the product according to the safety requirements. It does not however represent a guarantee and assurance of the qualities in a legal sense. Each person responds personally for compliance with such regulations.

The manufacturer declines all responsibility for any inaccuracies in this manual due to printing or typing errors.
The reserves the right to modify the products contents in this catalogue without previous notice.

DECLARATION OF CONFORMITY



GB

“CE” DECLARATION OF CONFORMITY

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

DK

“CE” OVERENSSTEMMELSESERKLÆRING

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

DE

“EG” KONFORMITÄTSERKLÄRUNG

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

SE

FÖRSÄKRAN OM “CE” ÖVERENSSTÄMMELSE

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

FR

DECLARATION “CE” DE CONFORMITE

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

NO

BEKREFTELSE OM ÆCEØ OVERENSSTEMMELSE

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

IT

DICHIARAZIONE “CE” DI CONFORMITÀ

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

FI

“CE” VAATIMUSTENMUKAISUUSVAKUUTUS

Allekirjoittaneet vakuutamme omalla vastuullamme että yllämainittu kone noudattaa ehtoja direktiiveissä :

ES

DECLARACION “CE” DE CONFORMIDAD

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

GR

ΔΗΛΩΣΗ ΣΥΜΒΑΤΟΤΗΤΑΣ “EE”

Εμετες που υπογραφουμε την παρουμεα, δηλωνουμε υπο την αποκλειστικη μας ευθυνη, οτι το μηχανημα συμμορφουται οτα οα ορτζουν οι Οδηγιες :

PT

DECLARAÇÃO “CE” DE CONFORMIDADE

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

HR

IZJAVA O “CE” SUGLASNOSTI

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

NL

“EG” CONFORMITEITSVERKLARING

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

PL

DEKLARACJA ZGODNOŚCI “CE”

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

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

Il legale rappresentante
Dante Ferrolli

NOTE

Lined area for note-taking with 22 horizontal lines.



**GRUPPO
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