

# ferroli

## CMA HE

CONDENSING UNITS  
FOR OUTDOOR INSTALLATION



### TECHNICAL MANUAL

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.

## TABLE OF CONTENTS

<b>GENERAL FEATURES</b> .....	<b>5</b>
Unit description .....	5
Unit identification code .....	5
Description of components .....	6
Control system .....	7
Options .....	7
Accessories .....	7
<b>TECHNICAL DATA AND PERFORMANCES</b> .....	<b>8</b>
Technical data .....	8
NOMINAL performances - Base setting up (AB) .....	9
NOMINAL performances - Low noise setting up (AS) .....	9
COOLING performances .....	10
HEATING performances .....	11
Operating limits .....	12
Electrical data .....	13
Noise levels .....	13
Weights .....	13
Overall dimensions .....	14
Minimum operating area .....	14



## GENERAL FEATURES

### Unit description

This series of condensing units 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 connected to a remote heat exchanger properly designed in order to transfer to the plant all the cooling (and heating for reversible units) power generated.

It is possible for example to connect direct expansion coils placed inside air handling units or remote plate heat exchangers placed inside technical rooms. In both cases the lack of outdoor hydraulic pipes eliminates the freezing problems and avoids brine solutions to be used.

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, axial fans with safety protection grilles, finned coil made of copper pipes and aluminium louvered fins and shut off valves on the liquid line and on the gas line. The reversible units are moreover supplied with reverse cycle valve, thermostatic expansion valve (working in heating mode) and liquid receiver.

The circuit is protected by high and low pressure switches.

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.

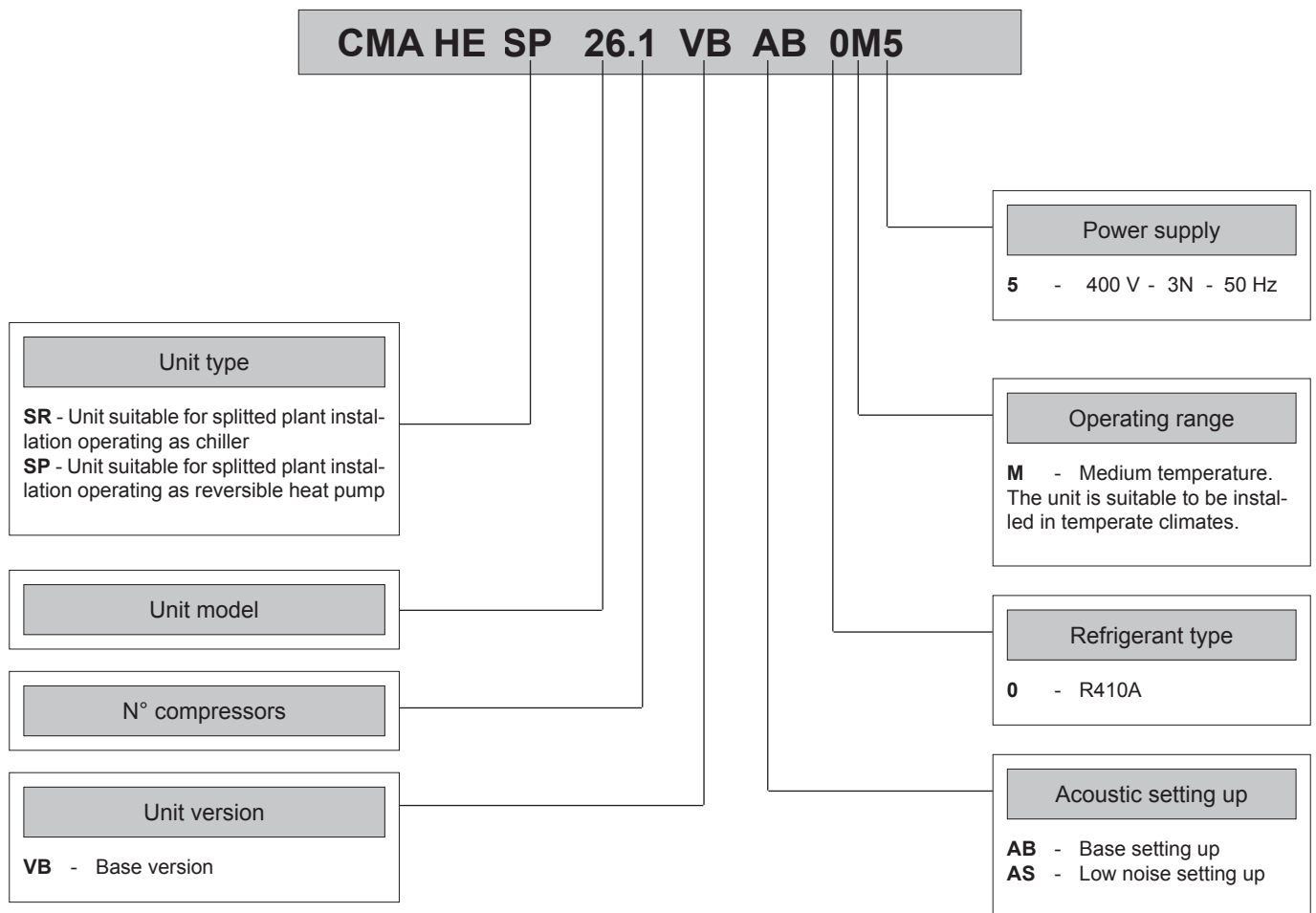
All the units are accurately built and individually tested in the factory.

All the units are supplied with refrigerant charge inside.

Only electric and refrigerant connections (between condensing unit and remote heat exchanger) are required for installation.

### Unit identification code

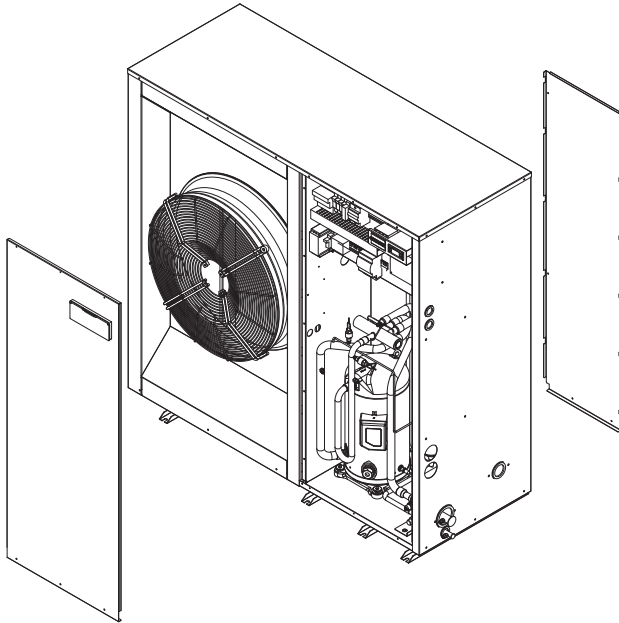
The codes that identify the units and the meaning of the letters used are described below.



## GENERAL FEATURES

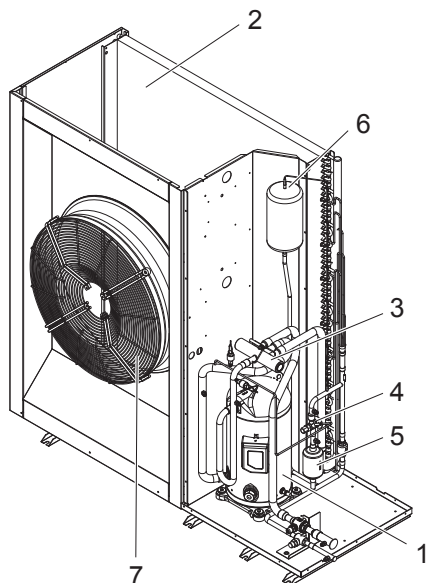
### Description of components

**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).

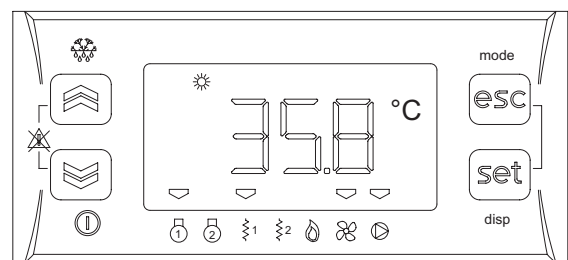


The **source side heat exchanger** (2) is a finned coil realized with grooved copper pipes and aluminium fins with notched profile to increase the heat exchange coefficient. A tray is obtained in the basement to collect the condensate generated in heating mode.

The refrigerant circuit of the heat pump models contains moreover a **4 way reverse cycle valve** (3) to allow operating mode change reversing the refrigerant flow, an **expansion device** (4) for heating mode, a thermostatic expansion valve with external equalizer, that allows the unit to adjust itself to the different operating conditions keeping steady the set superheating, a solid core hermetic **filter dryer** (5) to restrain impurity and moisture residuals that could be present in the circuit and a **liquid receiver** (6) to compensate the different refrigerant charge required in heating and in cooling mode.

The refrigerant circuit of each unit contains moreover **high and low pressure switches** in order to assure the compressor to operate inside the permitted limits, **shut off ball valves** on the liquid line and on the gas line to allow maintenance operations on the unit 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** (7) 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.



**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 or air 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

### Options

<b>Soft starter</b>		Reduces the compressor start current.
<b>Compressor power factor correction</b>		Allows to reduce the phase shift between the absorbed current and the power supply voltage keeping it above the value of 0,9.
<b>Fans control</b>	<b>Modulating control (condensation / evaporation control)</b>	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.
<b>Electrical loads protection</b>	<b>Fuses</b>	Allows to protect the electrical loads with fuses.
	<b>Thermal magnetic circuit breakers</b>	Allows to protect the electrical loads with thermal magnetic circuit breakers simplifying the maintenance operations.

### Accessories

<b>Rubber vibration dampers</b>	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.
<b>Coil protection grille</b>	Protects the external surface of the finned coil..
<b>Remote control</b>	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.
<b>Modbus serial interface on RS485</b>	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).
<b>Programmer clock</b>	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).
<b>Phase sequence and voltage controller</b>	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.
<b>Remote plate heat exchanger</b>	Stainless steel brazed plate heat exchanger properly sized for cooling and heating operating mode supplied with thermal insulation, differential pressure switch on the water side, temperature probes (water inlet and outlet) and antifreeze electrical heater.
<b>Liquid line (for SR units)</b>	It contains a thermostatic expansion valve sized for cooling operating mode, filter dryer, liquid indicator and solenoid valve.
<b>Liquid line (for SP units)</b>	It contains a thermostatic expansion valve sized for cooling operating mode, filter dryer, liquid indicator, solenoid valve and check valve (to be installed in parallel to the expansion valve).
<b>High and low pressure gauges</b>	Allow to visualize the evaporation and the condensation pressures.

## 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
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 <sup>2</sup>
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



## TECHNICAL DATA AND PERFORMANCES

### NOMINAL performances - Base setting up (AB)

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

SR	Cooling A35E5 ( source : air in 35°C d.b. / plant : evaporation temeprature 5°C )							
	Cooling capacity	21,8	24,2	28,3	34,2	39,7	44,9	kW
	Power input	6,48	7,10	8,25	10,2	11,8	13,3	kW
	EER	3,36	3,41	3,43	3,36	3,38	3,38	-

SP	Cooling A35E5 ( source : air in 35°C d.b. / plant : evaporation temeprature 5°C )							
	Cooling capacity	21,4	23,8	27,8	33,6	39,0	44,1	kW
	Power input	6,42	7,03	8,16	10,1	11,7	13,2	kW
	EER	3,33	3,39	3,40	3,34	3,33	3,33	-
	Heating A7C45 ( source : air in 7°C d.b. 6°C w.b. / plant : condansation temperature 45°C )							
	Heating capacity	22,4	24,8	28,9	35,1	40,7	46,1	kW
	Power input	5,66	6,19	7,19	8,86	10,3	11,7	kW
	COP	3,96	4,01	4,02	3,96	3,95	3,94	-
	Heating A7C50 ( source : air in 7°C d.b. 6°C w.b. / plant : condansation temperature 50°C )							
	Heating capacity	20,3	22,5	26,2	31,8	36,9	41,8	kW
	Power input	6,43	7,02	8,16	10,1	11,7	13,2	kW
	COP	3,16	3,21	3,21	3,15	3,15	3,17	-

### NOMINAL performances - Low noise setting up (AS)

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

SR	Cooling A35E5 ( source : air in 35°C d.b. / plant : evaporation temeprature 5°C )							
	Cooling capacity	21,0	23,2	27,2	32,9	38,2	43,2	kW
	Power input	7,01	7,67	8,91	11,0	12,7	14,3	kW
	EER	2,99	3,03	3,05	3,00	3,01	3,02	-

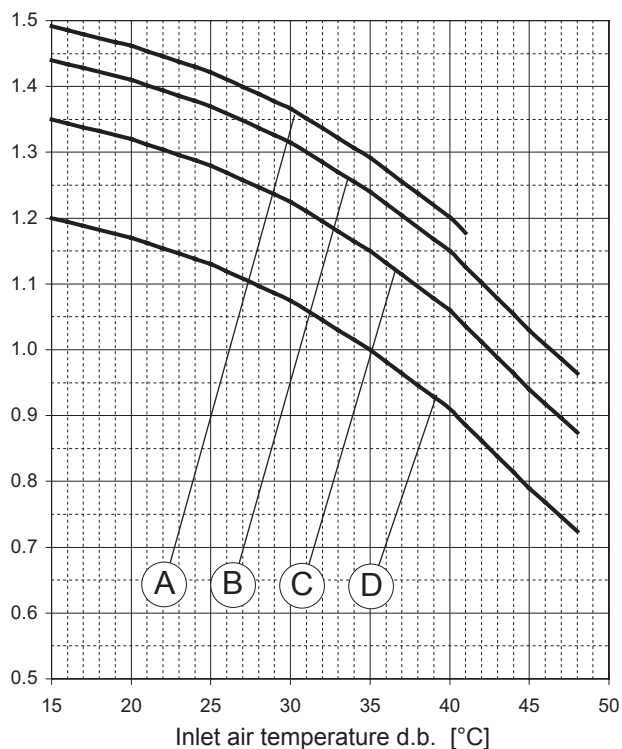
SP	Cooling A35E5 ( source : air in 35°C d.b. / plant : evaporation temeprature 5°C )							
	Cooling capacity	20,5	22,8	26,7	32,3	37,5	42,3	kW
	Power input	6,94	7,59	8,82	10,9	12,6	14,2	kW
	EER	2,96	3,00	3,02	2,97	2,98	2,98	-
	Heating A7C45 ( source : air in 7°C d.b. 6°C w.b. / plant : condansation temperature 45°C )							
	Heating capacity	21,2	23,5	27,6	33,4	38,7	43,9	kW
	Power input	5,43	5,95	6,90	8,51	9,90	11,2	kW
	COP	3,91	3,95	4,00	3,92	3,91	3,92	-
	Heating A7C50 ( source : air in 7°C d.b. 6°C w.b. / plant : condansation temperature 50°C )							
	Heating capacity	19,2	21,3	25,0	30,2	35,0	39,7	kW
	Power input	6,16	6,75	7,83	9,66	11,2	12,7	kW
	COP	3,12	3,15	3,19	3,13	3,12	3,13	-

Data declared with superheating and subcooling equal to 5°C. 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 :

**A35E5**

source : air in 35°C d.b.

plant : evaporation temperature 5°C

Evaporation temperature

plant side :

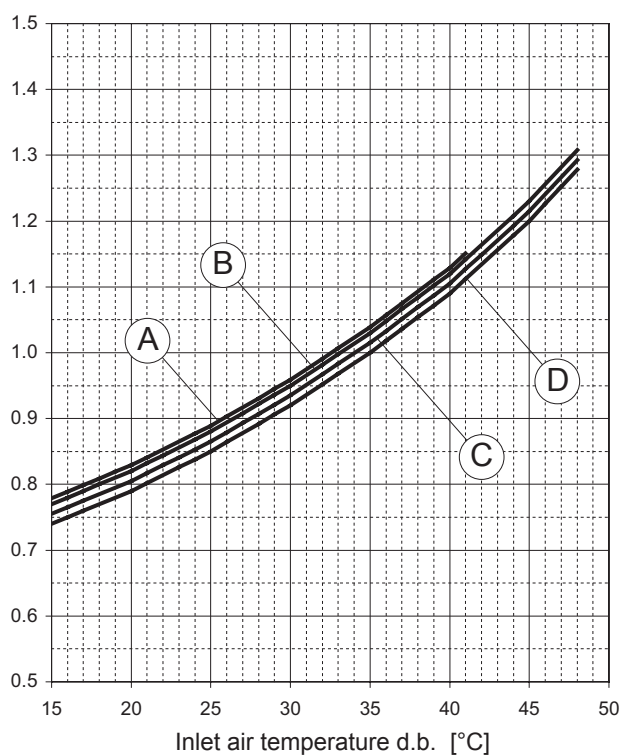
A = 22°C

B = 16°C

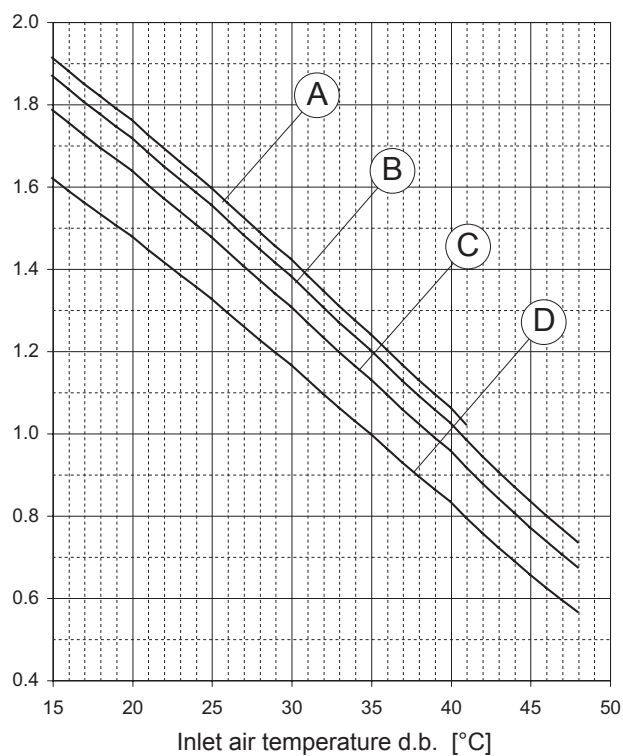
C = 10°C

D = 5°C

Power input



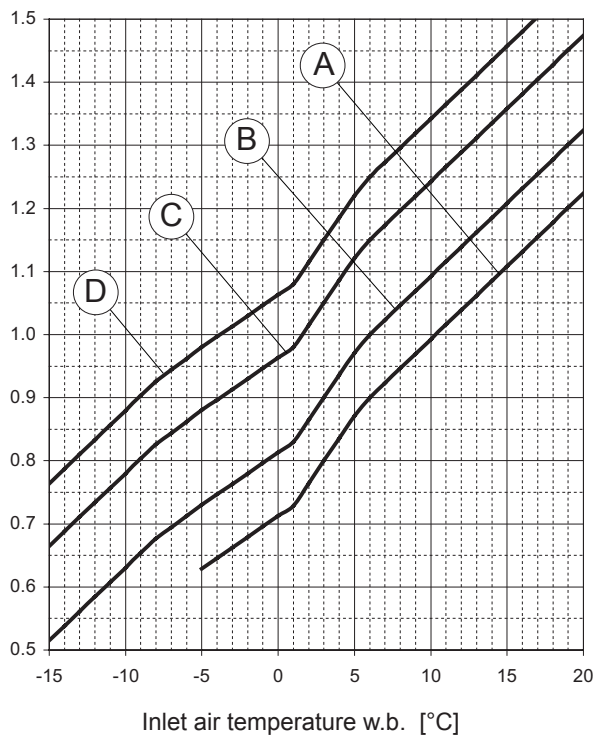
EER



# 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 :

**A7W50**

source : air in 7°C d.b. 6°C w.b.

plant : condensation temperature 50°C

Outlet temperature

plant side :

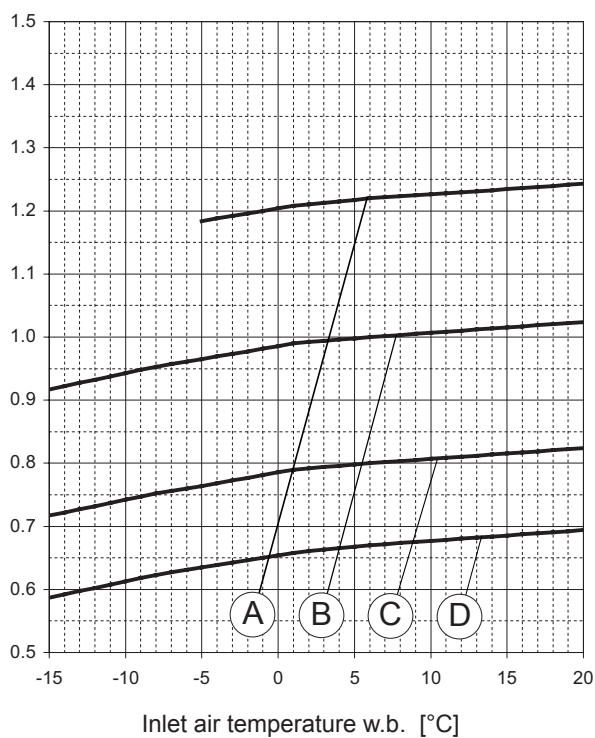
A = 60°C

B = 50°C

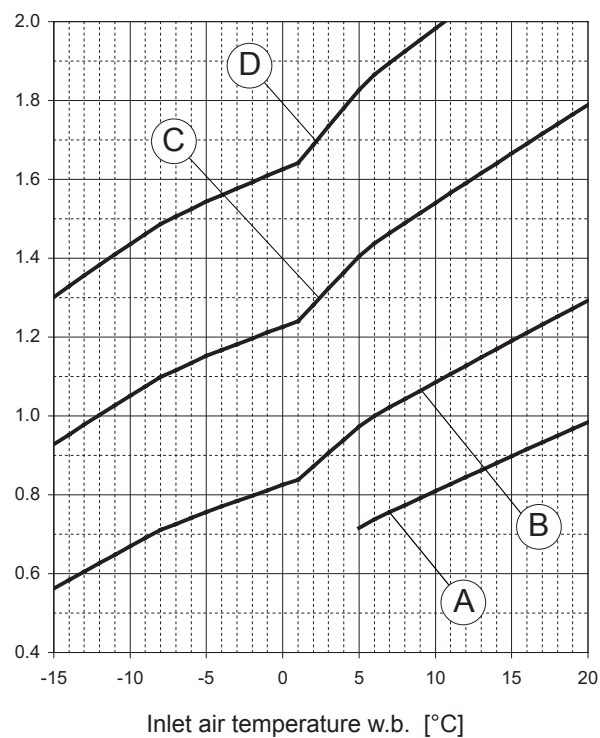
C = 40°C

D = 30°C

Power input



COP

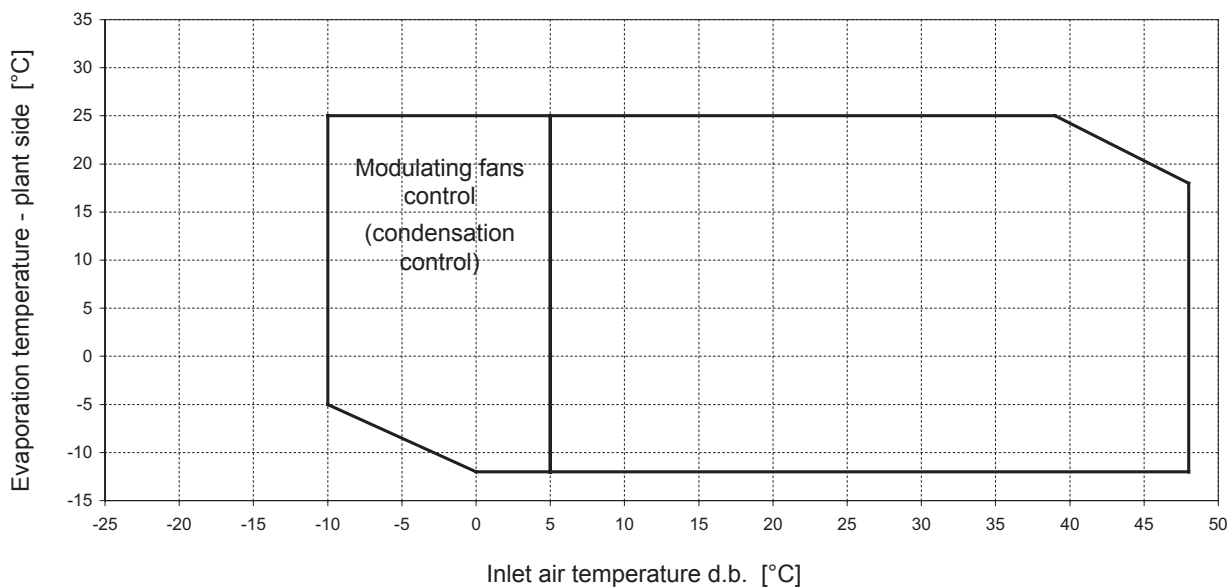


# TECHNICAL DATA AND PERFORMANCES

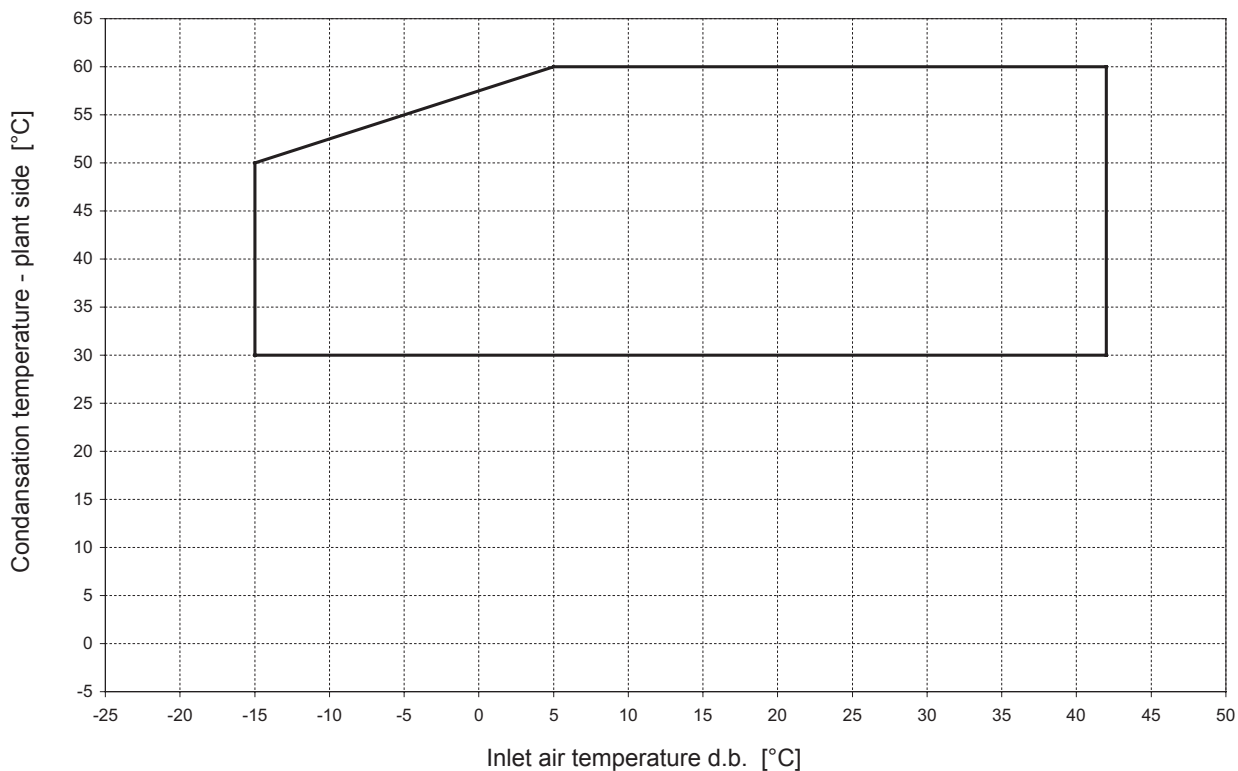
## Operating limits

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

### COOLING



### HEATING



	Superheating	Subcooling	
Maximum value	10	8	°C
Minimum value	3	2	°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.
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

### 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 A35E5.

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.

### Weights

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

#### Components weights

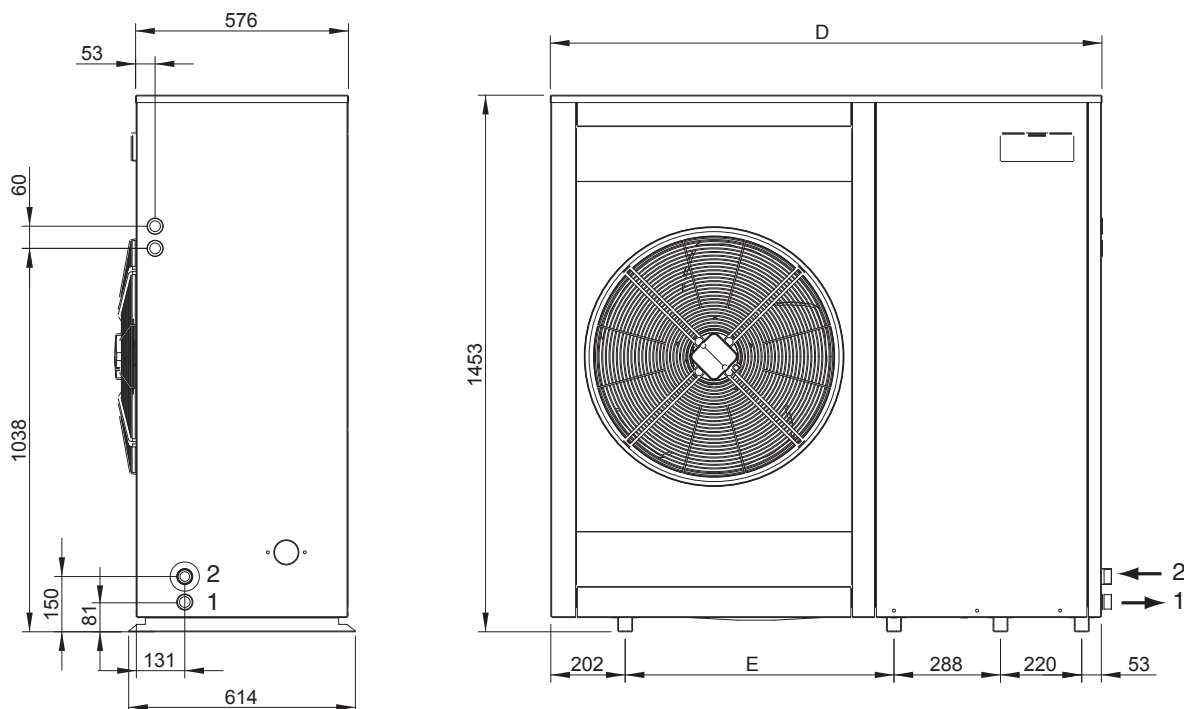
Unit without options	220	223	243	259	282	284	kg
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#### Transport weights

Unit without options	236	239	259	279	302	304	kg
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## TECHNICAL DATA AND PERFORMANCES

### Overall dimensions

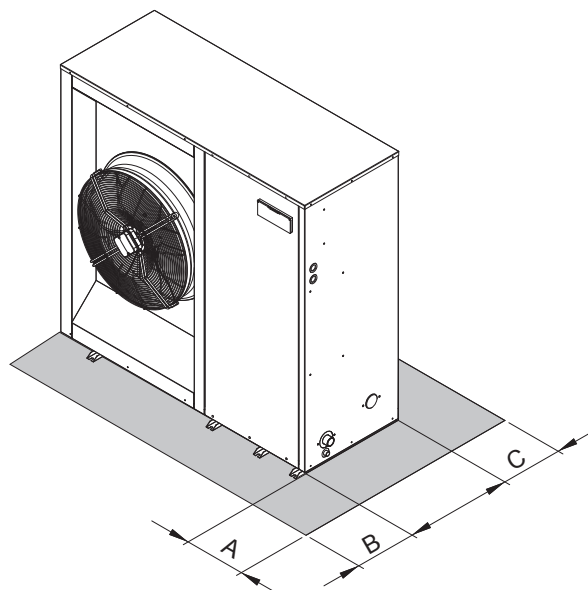


	Frame	1				2			
	Model	19.1	22.1	26.1	30.1	35.1	40.1		
Liquid line	1	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	inch	
Gas line	2	1" 1/8	1" 1/8	1" 1/8	1" 1/8	1" 1/8	1" 1/8	inch	
	D	1494				1704			mm
	E	728				938			mm

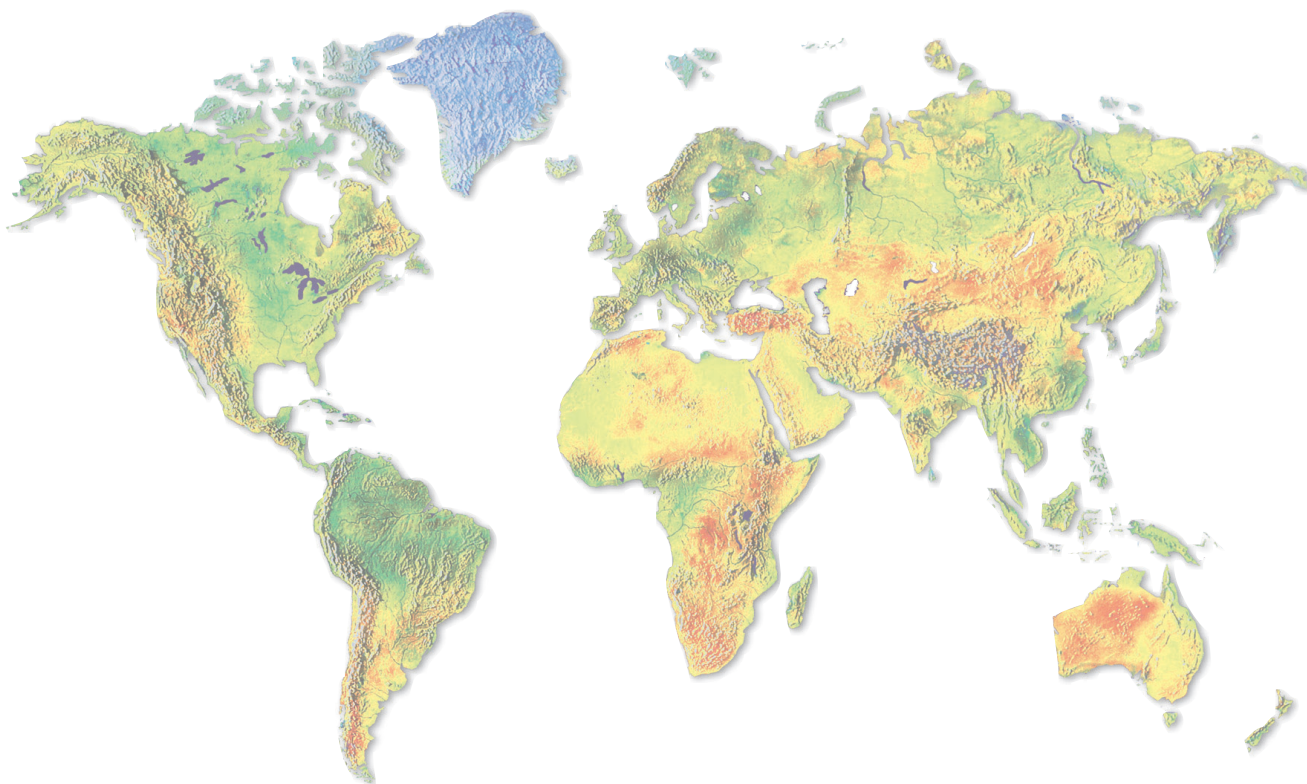
### Minimum operating area

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



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The reserves the right to modify the products contents in this catalogue without previous notice.



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