

PAC+ / PAC+ R

Air-to-Water Packaged Heat Pumps

Models 08, 10 and 12



5.6 to 7.1 kW

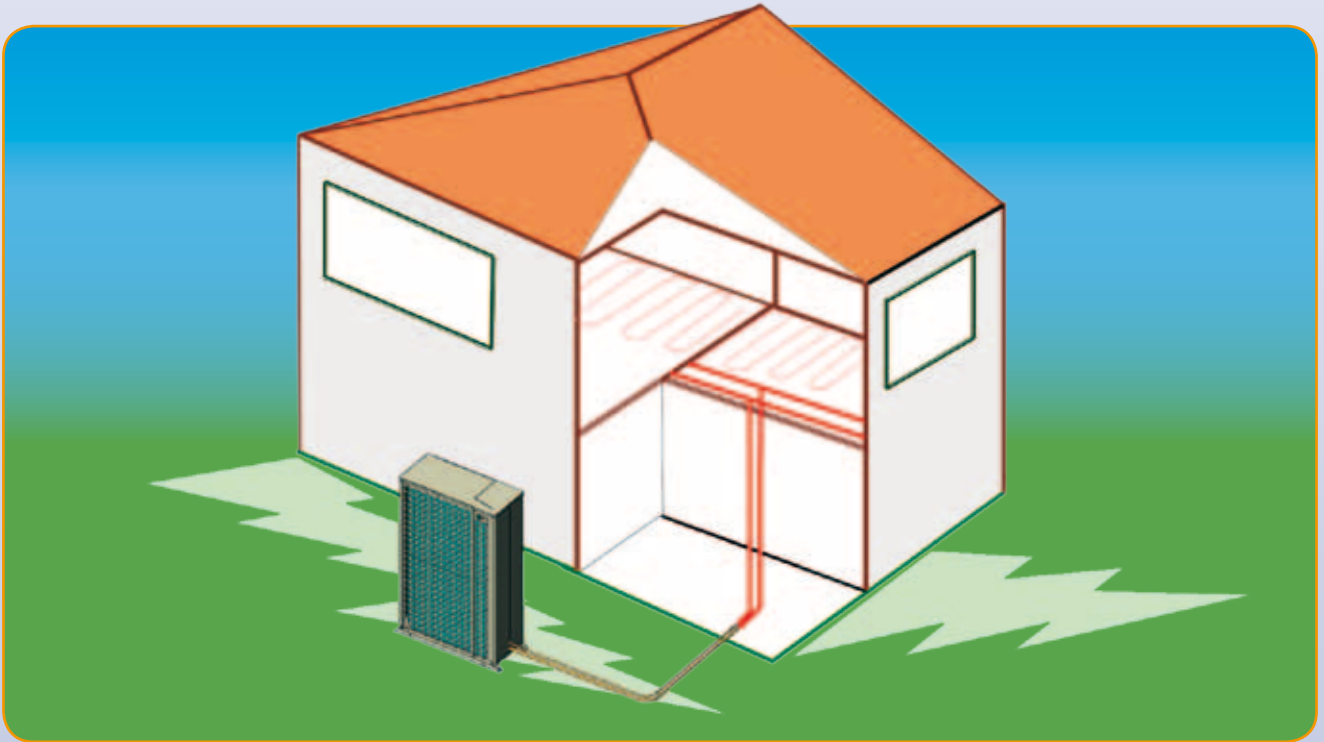


7.7 to 13.6 kW

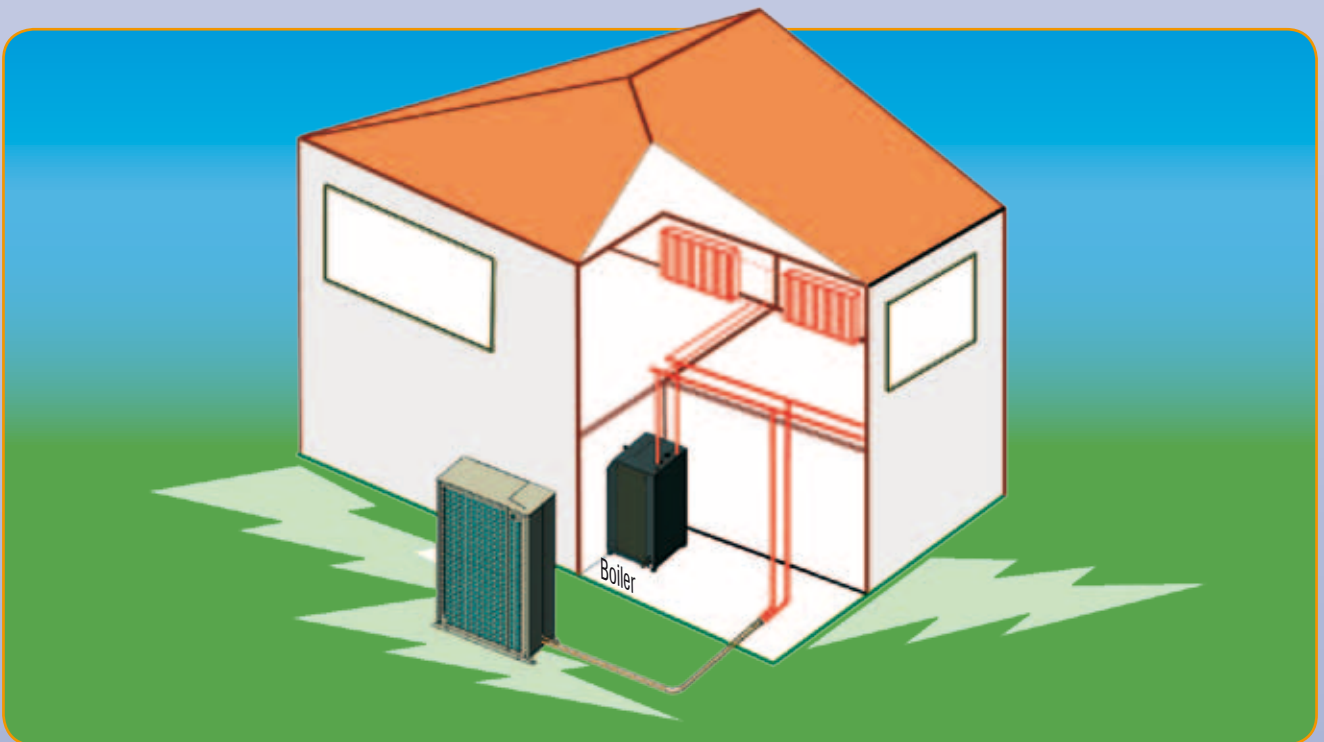


Installation illustrations

■ *New installation - PAC+*



■ *Installation in conjunction with a water boiler heating system - PAC+R*



Technical Description

Introduction

The PAC+ and PAC+R heat pump range renews the heat pump monobloc range by offering products with improved thermal and acoustic performance while retaining all the technical advantages that have contributed to the success of our heat pump systems, i.e. :

- Genuine heat pump system design, as opposed to a simple reversible chiller.
- Simplified refrigerating circuit, with an easily-accessible electrical cabinet for maintenance purposes and a regulation system designed for maximum heating comfort and economy.
- Readily-available, premium quality components.
- Coaxial heat exchanger selected for its excellent performance and low sensitivity to clogging.
- Use of R407C refrigerant fluid to obtain high outlet water temperatures for applications in conjunction with a hot water boiler.

Scope of application

PAC+ model : This type of heat pump is intended for new homes equipped with under-floor heating/cooling, fan coil or radiator systems. These units are heat pumps with integrated 2 kW + 4 kW additional electrical heating systems.

PAC+R model : Intended to operate in conjunction with a hot water heating boiler, the PAC+R models only provide heating. The electrical cabinet is pre-wired for regulation management kits (option) to control heating in conjunction with a hot water heating boiler.

Bodywork and frame

The steel bodywork is coated with oven-hardened epoxy paint.

Removable bodywork panels on all sides of the unit provide easy access to hydraulic and refrigerant circuits as well as electrical cabinet. When fully closed, the bodywork structure complies with IP 24 protection requirements.

The base of the unit has large openings beneath the exchanger coil for effective condensate water or defrosting water drainage.

Compressors

The Scroll type compressors are designed to provide a high output at low noise levels, and are maintenance-free.

Vibration-absorbing pads under the compressor prevent vibrations being transmitted to the unit bodywork.

As an option, the compressor can be encased in a soundproof jacket.

Water heat exchangers

Of the coaxial type with counter-current circuitry for winter mode, the heat exchangers provide excellent heating performance while offering all the proven advantages of coaxial design: low sensitivity to clogging and freezing, as well as low pressure losses.

Air heat exchangers

Exchangers are finished with a hydrophilic coating to assist condensation water runoff. Exchanger fins are of the slat-free waffle type to prevent clogging and maintain performance during sub-zero conditions and to reduce defrosting time and frequency : defrosting at only three hours intervals at an outdoor temperature of 2 °C and a water temperature at 40 °C - 45 °C.

Fans

Reinforced polypropylene axial fans with an optimised blade profile that run at low speeds to provide the required airflow at extremely low noise levels.

The fully-closed motor is maintenance-free and equipped with automatic reset thermal overload protection. The fan blades are protected by plastic grilles in accordance with health & safety standards.

An all-seasons control system acts on fan speed to maintain chilled water production condensing pressure (Summer mode on PAC+ version) down to outdoor temperatures of 10 °C, and to limit the evaporator load in heating mode under high outdoor temperatures.

Refrigerant circuit

The pre-charged and factory-checked circuit includes a dryer filter, a thermostatic expansion valve, as well as high and low pressostats.

The exchanger circuitry is designed for counter-current flow in heating mode in order to optimise unit performances in the most frequently used mode, i.e. winter mode.

Electrical cabinet

Accessible from the front of the unit.

The cabinet houses all the components for unit operation and protection and notably : compressor protection fuses or circuit breakers (depending on the model), additional electrical heating resistances protection fuses (PAC+ version), remote control protection fuses, start-up current draw limiter for single phase units and phase sequence controller for three phase units.

The microprocessor-based controller integrated in the cabinet controls all the unit's functions with the aid of high and low pressostats, a flow controller and four probes measuring water inlet (return) and outlet temperature, air exchanger temperature and outdoor temperature.

Safety functions controlled by the controller :

- High and low pressure safety, lack of water flow, low refrigerant charge, low evaporation pressure, high and low outlet water temperature limits, anti-freeze protection in chilled water production mode (PAC+ version), anti-freeze protection in winter.

Other functions managed by the controller :

- Defrosting the outdoor exchanger in winter.
- Controlling the inlet (return) water temperature in relation of outdoor temperature (water logic).
- Controlling additional electrical heating (PAC+ version).
- Controlling condensing pressure in the summer (PAC+ version).
- Controlling evaporation pressure (output regulation) in heating mode.

Technical Description (continued)

Standard equipment

PAC+ and PAC+R units are supplied with the following items as standard equipment :

- Electrical cabinet housing safety circuit breakers, fuses, electronic regulation, phase sequence controller (three phase models).
- Mains power switch.
- Start-up current draw limiter (single phase models).
- Refrigerating circuit with its corresponding safeties.
- Hydraulic kit comprising : 3-speed water circulation pump, pressostatic flow controller, 2 kW + 4 kW additional electrical heating resistances (PAC+ version only), auto and manual bleed valves, pressure gauge, safety valve (3.5 bars), 5 litre expansion tank (PAC+ version only).
- 4 vibration-absorbing pads for noise reduction.
- Exchanger protection grille.
- Ambience thermostat for heating and cooling temperature control. (PAC+ version only).
- Complete refrigerant charge.
- PAC+R units are available from the factory already set up for use with radiator or under-floor heating systems. Please state system type required at time of order.

Options and accessories

Factory-fitted options available for PAC+ and PAC+R models :

- Compressor soundproofing.

- Marine environment copper/copper air exchanger.
- ZH compressor for extended operating range.

Factory-fitted options available for PAC+ only :

- 5 litre expansion tank.

Field-installed accessories for PAC+ and PAC+R models :

- Water shut-off valve with pressure tap.
- Set of hoses - length 1 m, Ø 1 inch.
- Insulated 30 litre buffer tank.
- Water filter.

Field-installed accessories for PAC+R models only :

- Ambience thermostat with weekly programming functions.
- Electronic module for under-floor heating configuration parameterisation.
- Electronic module for radiator heating configuration parameterisation.
- Hydraulic connection kit with 3-way zone valve.
- Hydraulic connection kit without 3-way zone valve.
- 3-way zone valve kit.
- Regulation management kit with ambience thermostat.
- Wireless (radio) regulation management kit with ambience thermostat.

Regulation

PAC+ version

Summer/Winter mode selection via the ambience thermostat :

Summer regulation

The regulator maintains the temperature of the inlet (return) water flowing to the unit at the requested "COO" set temperature. Acceptable temperature range for the set inlet (return) water temperature in summer mode : 12 °C to 25 °C.

In addition, the ambience thermostat stops the unit when the ambient air temperature reaches the value requested by the thermostat.

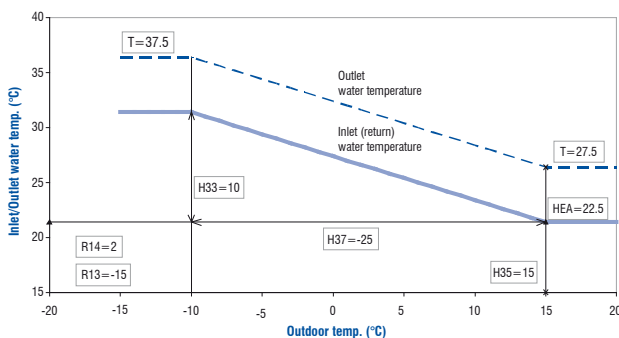
Winter regulation

The regulator maintains the temperature of the inlet (return) water in accordance with a water logic based on outdoor temperature. All the various parameters of this water logic can be set, i.e. :

- Setting the outdoor temperature used as the base benchmark for the water logic. Above this benchmark outdoor temperature, inlet (return) water temperature is maintained at the "HEAT" set temperature point.
- Setting the outdoor temperature offset between the beginning and end of temperature compensation.
- Setting the rise in inlet (return) water temperature between the beginning and end of temperature compensation.

Water logic - Compensation in under-floor heating application (factory settings)

R13 = -15 °C H33 = 10 °C H37 = -25 °C
R14 = 2 °C C04 = 2.5 °C
HEA = 22.5 °C H35 = 15 °C



If the inlet (return) water temperature calculated by the water logic cannot be reached by the compressor operating on its own, the regulator switches on the additional electrical heating system. The additional electrical heating system is divided into two stages, i.e. 2 kW + 4 kW. These stages can only be triggered when the following conditions are present :

- Difference between the ambient temperature and the set thermostat temperature greater than 0.9 °C.
- Outdoor temperature below outdoor thermostat set temperature. (KA6). This outdoor thermostat set temperature is adjustable (factory setting : +5 °C).

There is a 30 minute time delay before the second stage (4 kW) is triggered.

Emergency function : An "emergency heating" switch located near the regulator is used to engage the additional electrical heating resistances based solely on water logic, without any other condition.

The ambience thermostat has priority for stopping the unit when the ambient air set temperature is reached.

PAC+ R version

This version of the heat pump system only provides heating in conjunction with a hot water boiler.

The PAC+R can be connected to an ambience thermostat or to a regulation management kit.

Case of connection with an ambience thermostat only

In case of use with a thermostat alone, without the regulation management kit, heat pump regulation does not take account of boiler management.

The regulator maintains the temperature of the inlet (return) water in accordance with a water logic based on outdoor temperature. All the various parameters of this water logic can be set, i.e. :

- Setting the outdoor temperature used as the base benchmark for the water logic. Above this benchmark outdoor temperature, the inlet (return) water temperature is maintained at the "HEAT" set temperature point.
- Setting the outdoor temperature offset between the beginning and end of temperature compensation.
- Setting the rise in inlet (return) water temperature between the beginning and end of temperature compensation.

The heating function remains permanently under the control of the ambience thermostat that has priority in stopping the unit when the ambient air set temperature is reached.

The PAC+R versions are equipped with an "automatic forced shutdown" function that limits the use of the unit depending on the outdoor temperature. This shutdown temperature is set at the factory at -5 °C or -15 °C depending on whether it is installed with an under-floor heating or radiator system. These values are increased to -10 °C and -20 °C with the **ZH compressors option**.

Case of connection with the regulation management kit

Functions provided by the regulation management kit :

Heating mode selection in relation to outdoor temperature

- Above the factory-set balance point of +4 °C (specific value for each installation to be inputted into the regulation management kit), the unit operates on its own.
- Below the balance point, the unit continues to operate with priority over the boiler. Furthermore, if the inlet (return) water temperature does not correspond to the value calculated by the controller, the boiler is solicited as additional heating.
- Below the outdoor temperature for unit forced shutdown, only boiler operation is authorised.

Recap of forced shutdown temperatures for the PAC+R :

- Standard compressors :
 - For radiator application : -5 °C
 - For under-floor heating application : -15 °C
- ZH compressors (option) :
 - For radiator application : -10 °C
 - For under-floor heating application : -20 °C

Regulation (continued)

PAC+R shutdown control in relation with off-peak electricity tariffs

With the aid of a dry contact switch to be connected in the regulation management kit box, the unit can be shut down during "EJP" or "TEMPO" days (French special electricity tariff days for high energy consumers). During these peak periods the boiler can be controlled by outdoor temperature conditions.

Zone valve management

The regulation management kit controls the zone valve available as an option. This three-way, ON-OFF valve creates a bypass to prevent water reheated by the unit entering the boiler when the latter is not in operation.

Emergency heating function management

The regulation management kit includes an "emergency heating" switch that renders boiler operation independent of outdoor conditions.

Unit operating mode when connected with the regulation management kit

When the PAC+R is installed with the regulation management kit and the ambience thermostat supplied with the kit, its operation is identical to that described in the previous paragraph : Case of connection with an ambience thermostat only.

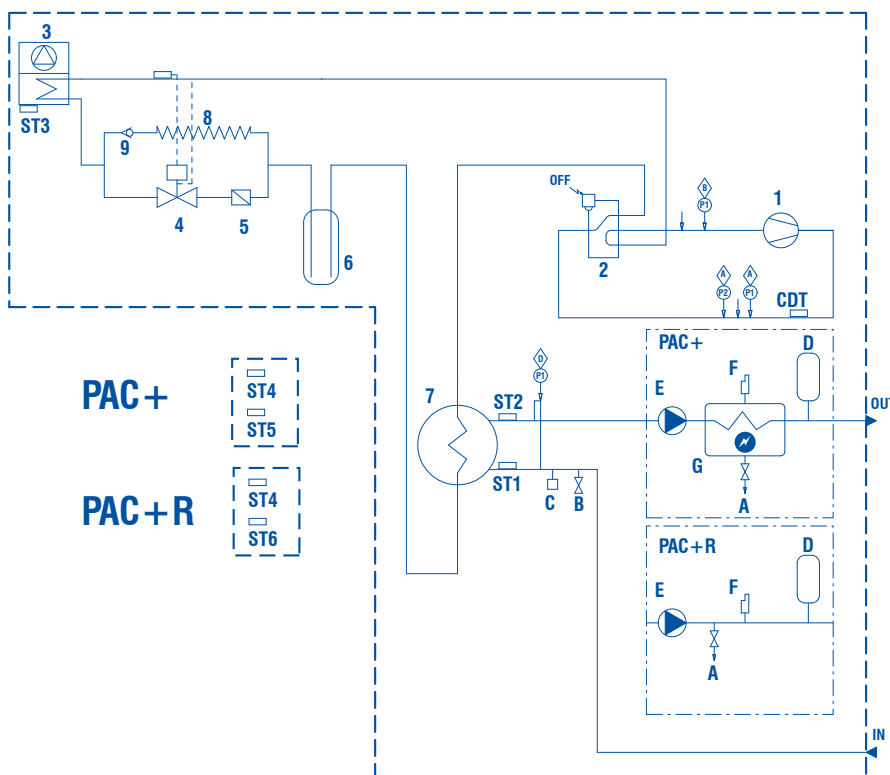
Boiler regulation operating mode

The boiler can be linked to the ambience thermostat supplied with the regulation management kit or left under the control of its own regulation system.

Comment : The thermostat supplied with the regulation management kit can be of the standard hardwired connection (3 wires) type or with an optional wireless (radio) link.

Refrigerant and Hydraulic Circuit Diagram

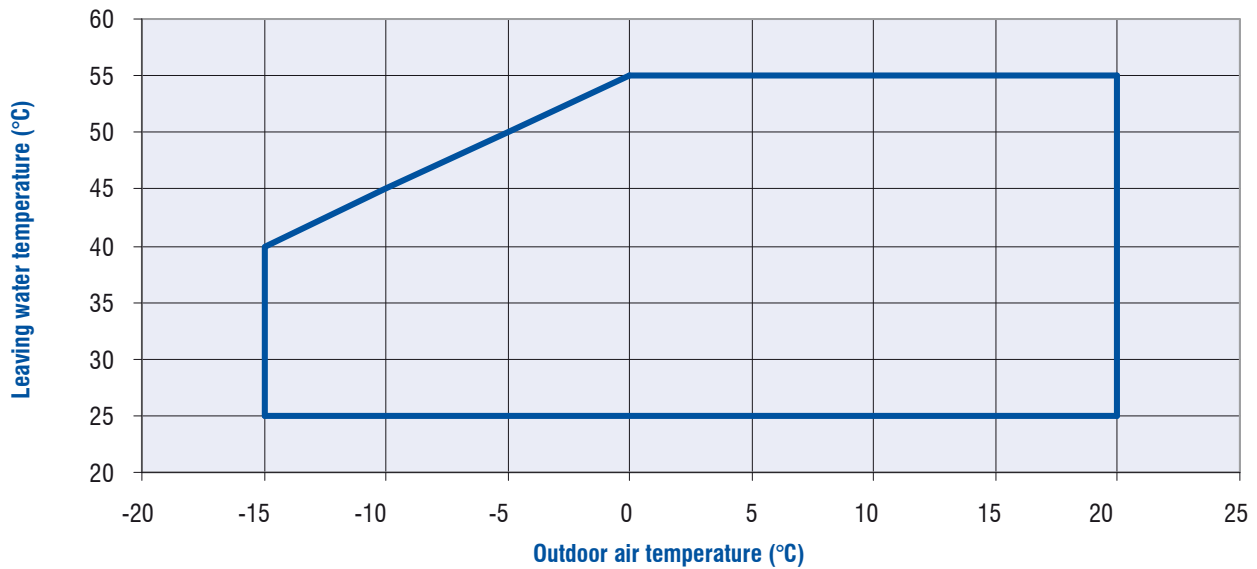
PAC+R installation in conjunction with a water boiler heating system



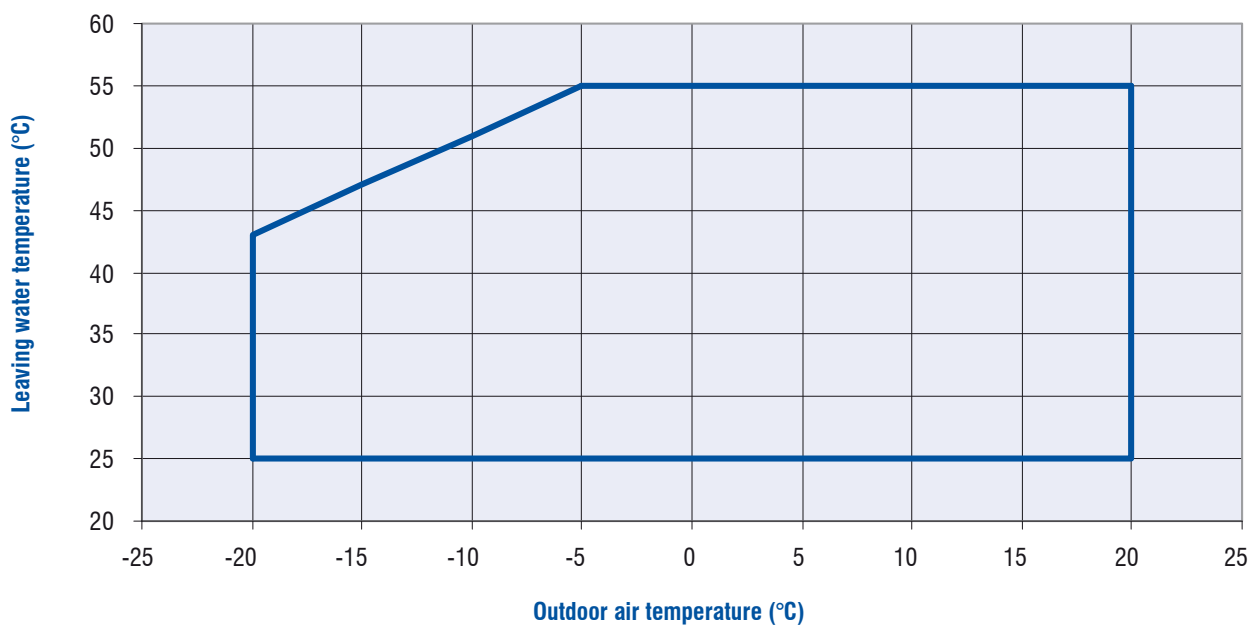
1	Scroll compressor.
2	Auto changeover valve (Power off - Heating mode).
3	Finned heat exchanger and fans.
4	Bi-directional thermostatic expansion valve.
5	Drier filter.
6	Liquid tank.
7	Coaxial condenser. Counter-current heating.
8	Capillary.
9	Non-return valve.
P1-A	High Pressure safety pressostat.
P2-A	Adaptive defrost system high pressure control pressostat.
P1-B	Low Pressure safety pressostat.
CDT	Discharge Thermostat.
A	Safety valve (3 bars).
B	Water filling and draining cock.
C	Water pressure gauge.
D	Expansion tank (option for PAC+R model).
E	Circulation pump.
F	Automatic bleed.
G	Electrical heater (PAC+).
P1-D	Water flow differential safety pressostat.
ST1	Water temperature probe (inlet).
ST2	Water temperature probe (outlet).
ST4	Air temperature probe.
ST5	Air temperature probe (PAC+).
ST6	Air temperature probe (PAC+R).

Operating Limits - Heating Mode

Operating limits - PAC+ and PAC+R with standard compressors

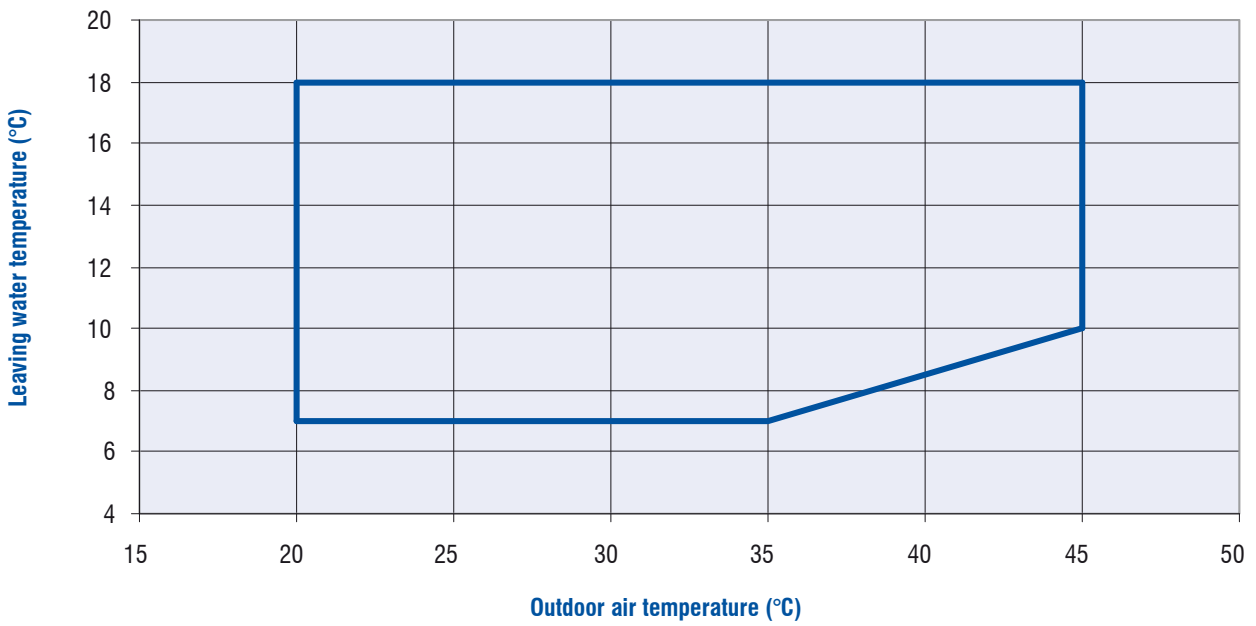


Operating limits - PAC+ and PAC+R with optional ZH compressors



Operating Limits - Cooling Mode

Operating limits - PAC+, PAC+R with standard compressors or optional ZH compressors



Physical Characteristics

PAC +/PAC+R MODELS		08	10	12
REFRIGERANT				
Type		R407C		
Charge	g	3550	3550	4000
HYDRAULIC CONNECTIONS				
Inlet water	gas	1" Female		
Outlet water	gas	1" Female		
Expansion tank* - Volume	litres	5	5	5
FANS				
Fans (x2)		206 W - 700 rpm - 6000 m ³ /h		
NOISE LEVELS				
Acoustic power level**		66	66	66
DIMENSIONS AND WEIGHTS				
Length	mm	1236	1236	1236
Width	mm	400	400	400
Height	mm	1308	1308	1308
Weight	kg	180	183	188

* Expansion tank standard on PAC+, option on PAC+R.

** Acoustic power level without the compressor jacket option. Acoustic power values are 3 dB(A) lower than stated when the unit is equipped with the compressor jacket option.

Electrical Characteristics

PAC +/PAC+R MODELS		08	10	12
SUPPLY VOLTAGE 400 V / 3 Ph / 50 Hz				
Current draw without 30 °C/35 °C water heater*	A	5.7	7.02	9.18
Current draw without 40 °C/45 °C water heater*	A	6.3	7.91	9.96
SUPPLY VOLTAGE 230 V / 1 Ph / 50 Hz				
Start-up current draw with limiter	A	< 45		
Current draw without 30 °C/35 °C water heater	A	10.70	15	17
Current draw without 40 °C/45 °C water heater	A	12.94	18	20
ADDITIONAL ELECTRICAL HEATING**				
First stage	kW	2	2	2
Second stage	kW	4	4	4

* Most loaded phase.

** Additional electrical heating only on PAC+.

Performance Data

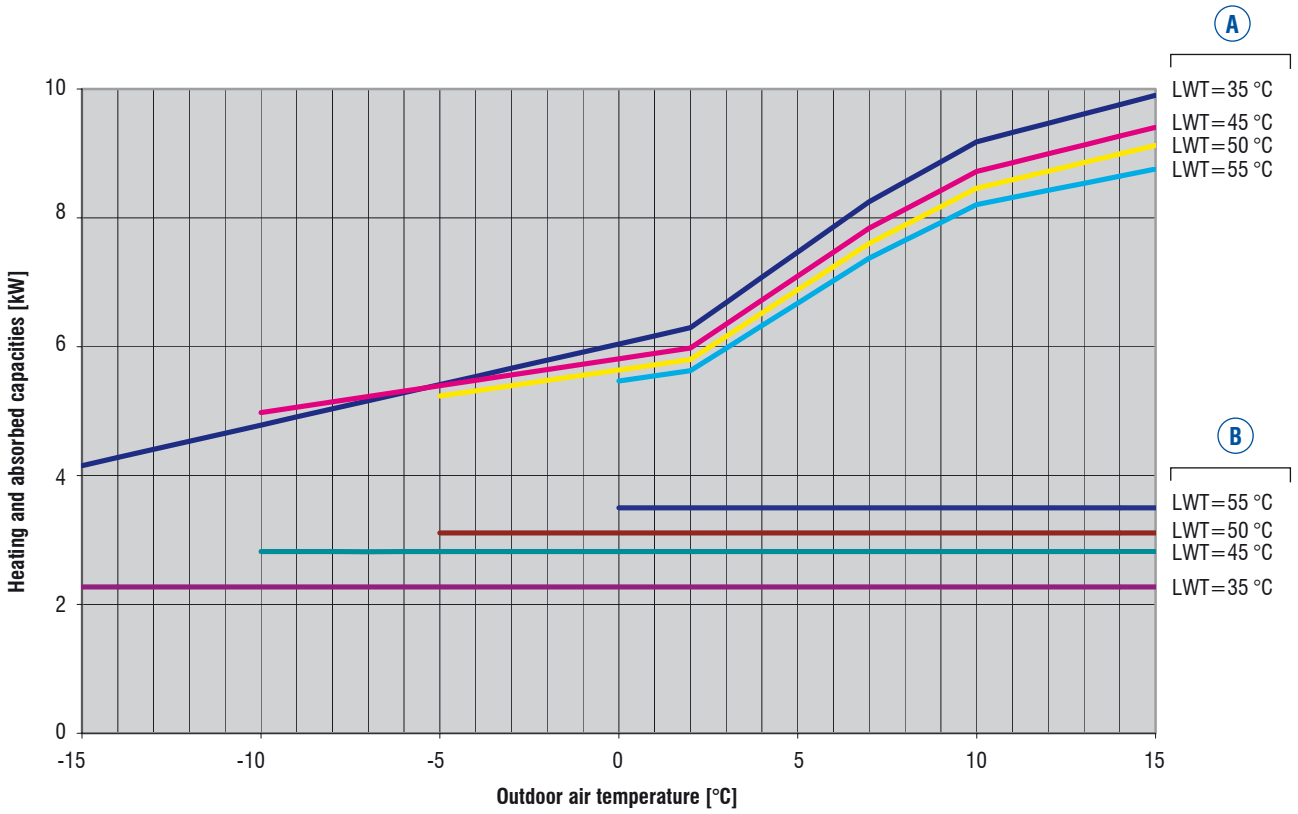
		Heating mode	PAC+ / PAC + R models				
			08	10	12		
Application : Under-floor heating	Water conditions : 30 / 35 °C	Water flow	l/h	1427	1970	2522	
		Available pressure HS	kPa	41	26	59	
		Pump correction	W	54	48	138	
		Air conditions 7 °C dry bulb / 6 °C wet bulb					
		Heating capacity	W	8087	11185	14071	
		Power input	W	2293	3110	3871	
		COP		3.53	3.60	3.64	
		Air conditions 2 °C Dry bulb / 1 °C Wet bulb					
		Heating capacity (*)	W	6168	8146	10004	
		Power input	W	2270	2986	3641	
		COP (*)		2.72	2.73	2.75	
		Air conditions -7 °C Dry bulb / -8 °C Wet bulb					
		Heating capacity (*)	W	5058	7167	8693	
		Power input	W	2270	3106	3670	
		COP (*)		2.23	2.31	2.37	
Application : Fan coil units	Water conditions : 40 / 45 °C	Water flow	l/h	1364	1898	2425	
		Available pressure	kPa	45	29	60	
		Pump correction	W	57	51	135	
		Air conditions 7 °C Dry bulb / 6 °C Wet bulb					
		Heating capacity	W	7682	10716	13616	
		Power input	W	2801	3797	4604	
		COP		2.74	2.82	2.96	
		Air conditions 2 °C Dry bulb / 1 °C Wet bulb					
		Heating capacity (*)	W	5860	8012	10293	
		Power input	W	2780	3664	4404	
		COP (*)		2.11	2.19	2.34	
		Air conditions -7 °C Dry bulb / -8 °C Wet bulb					
		Heating capacity (*)	W	5124	6941	9103	
		Power input	W	2817	3746	4483	
		COP (*)		1.82	1.85	2.03	

(*) With adaptative defrost system.

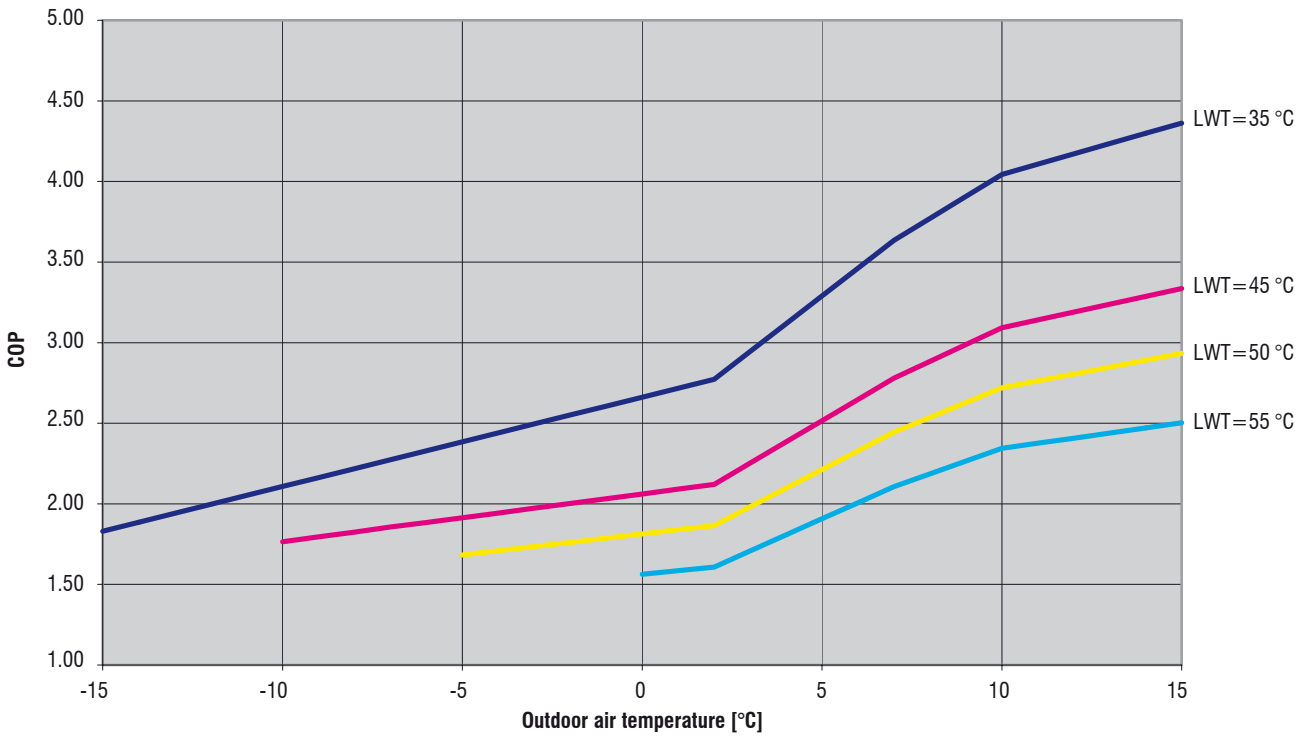
		Cooling mode	PAC+ models		
			08	10	12
Application : Fan coil units and under-floor heating	Air conditions 35 °C - Water conditions 12 °C / 7 °C				
	Water flow	l/h	955	1304	1214
	Available pressure	kPa	52	41	94
	Pump correction	W	46	49	106
	Cooling capacity	W	5632	7660	7083
	Power input	W	2536	3551	4215
	EER		2.22	2.16	1.68
	Air conditions 35 °C - Water conditions 23 °C / 18 °C				
	Water flow	l/h	1224	1554	1662
	Available pressure	kPa	47	36	85
	Pump correction	W	53	52	130
	Cooling capacity	W	7216	8904	9845
	Power input	W	2544	3685	4453
	EER		2.84	2.42	2.21

Note : Cooling mode operation is only available on PAC+ heat pump type models.

Performance Curves - PAC+ / PAC+ R 08

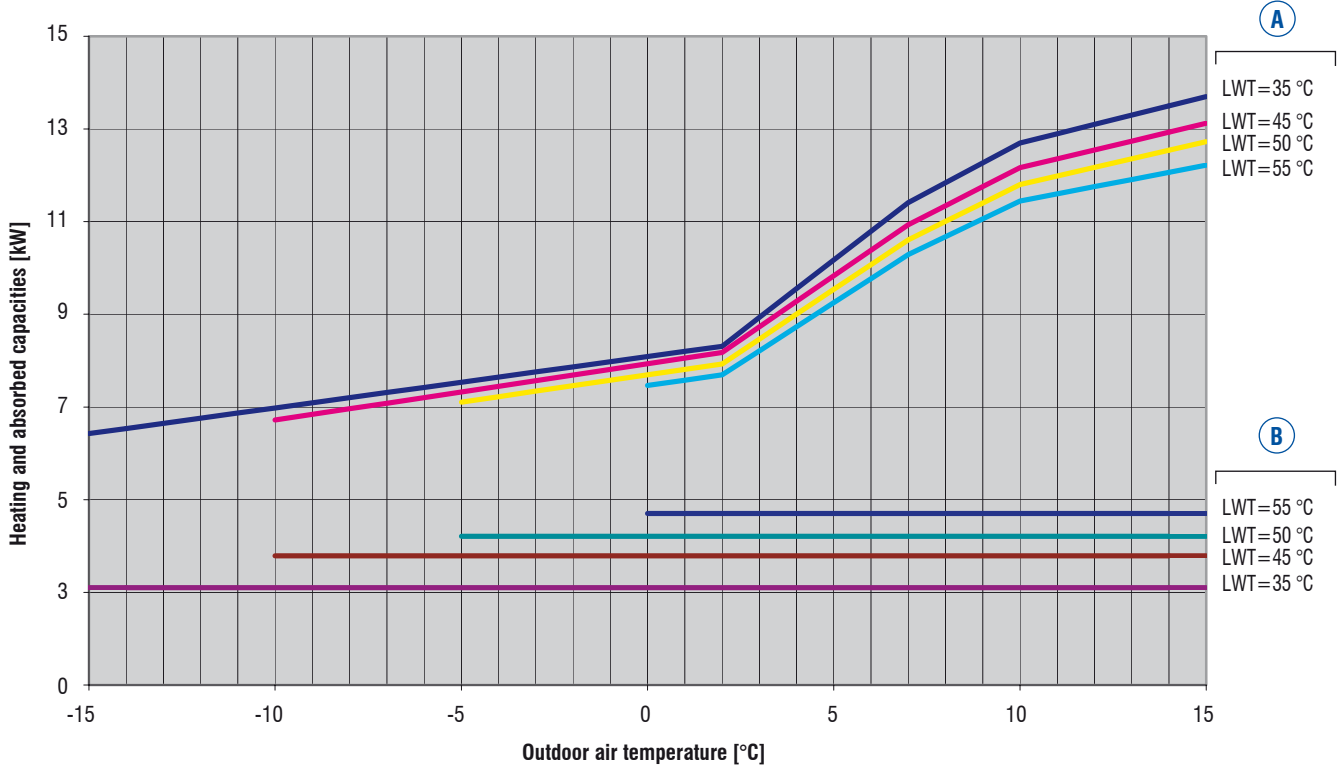


- A** Heating capacity curve with defrosting
- B** Absorbed capacity curve with defrosting

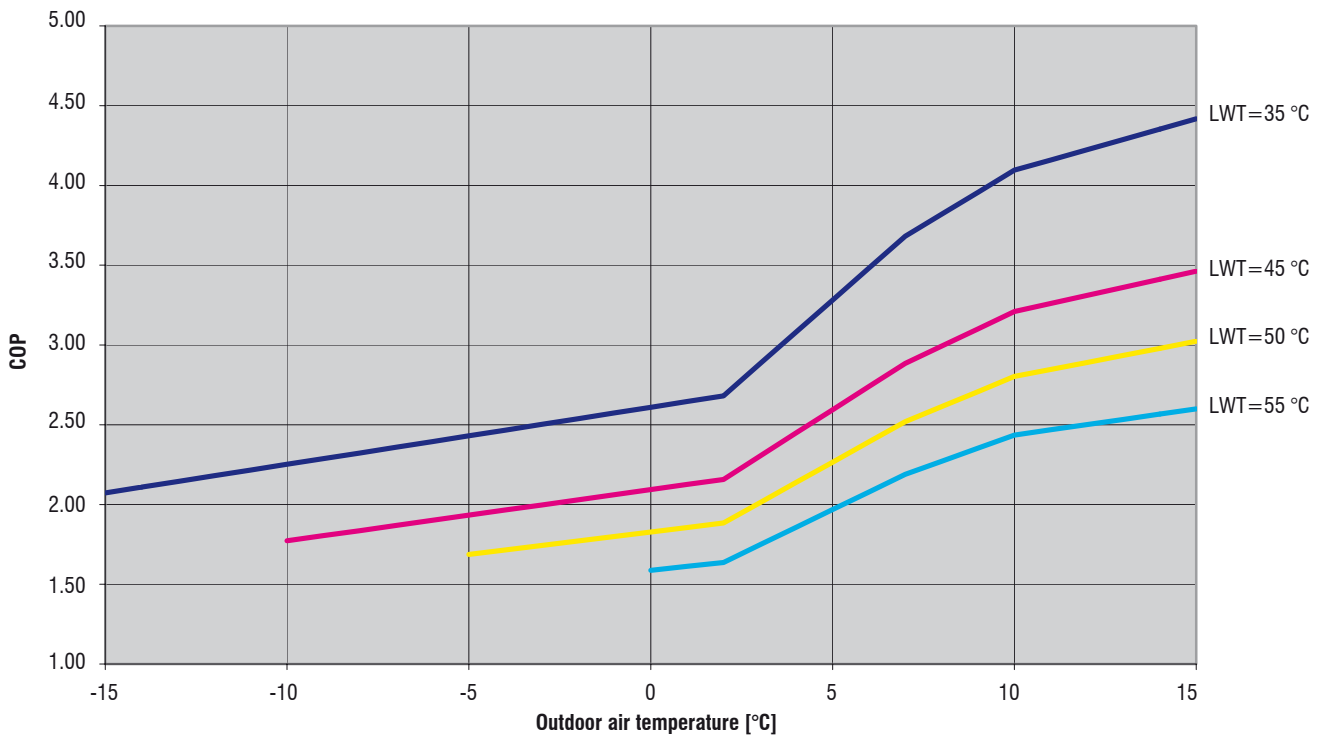


LWT : Leaving water temperature.

Performance Curves - PAC+ / PAC+ R 10

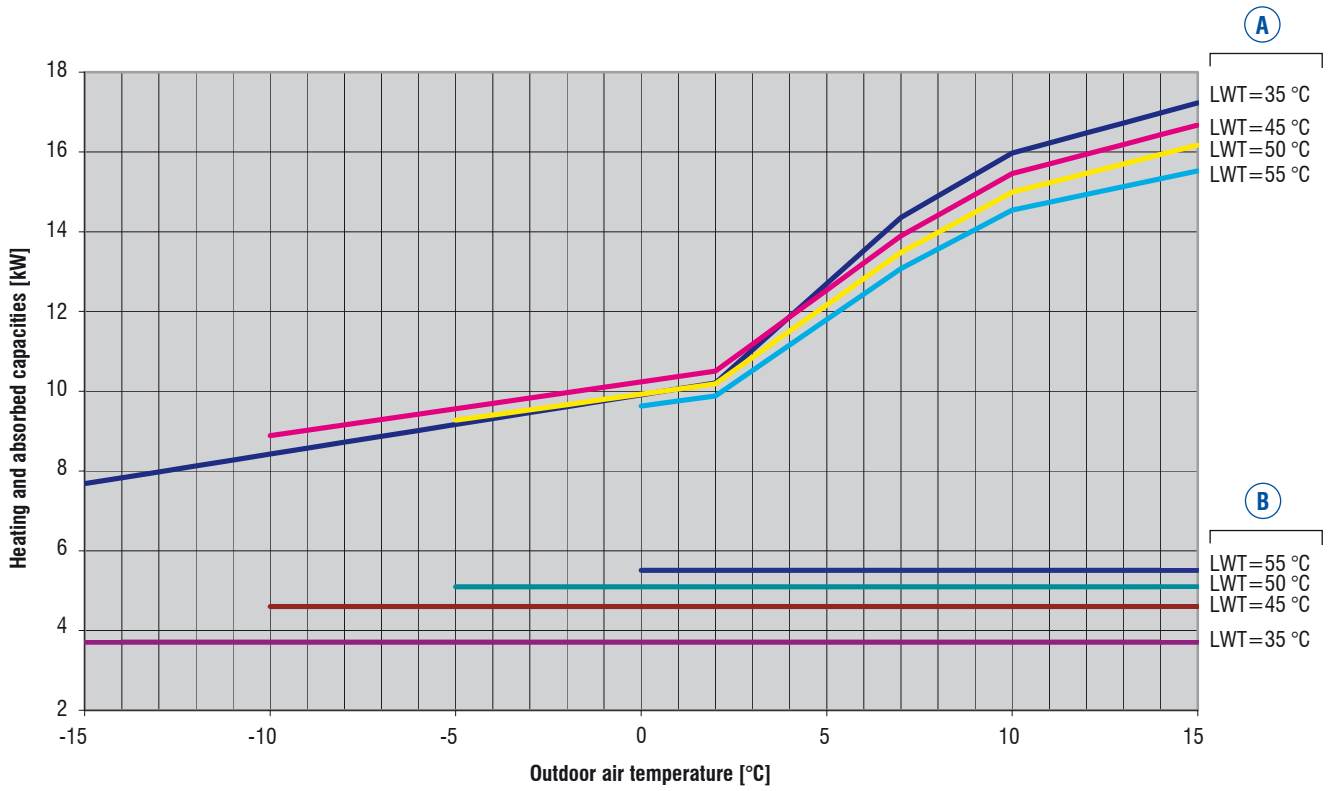


- A** Heating capacity curve with defrosting
- B** Absorbed capacity curve with defrosting

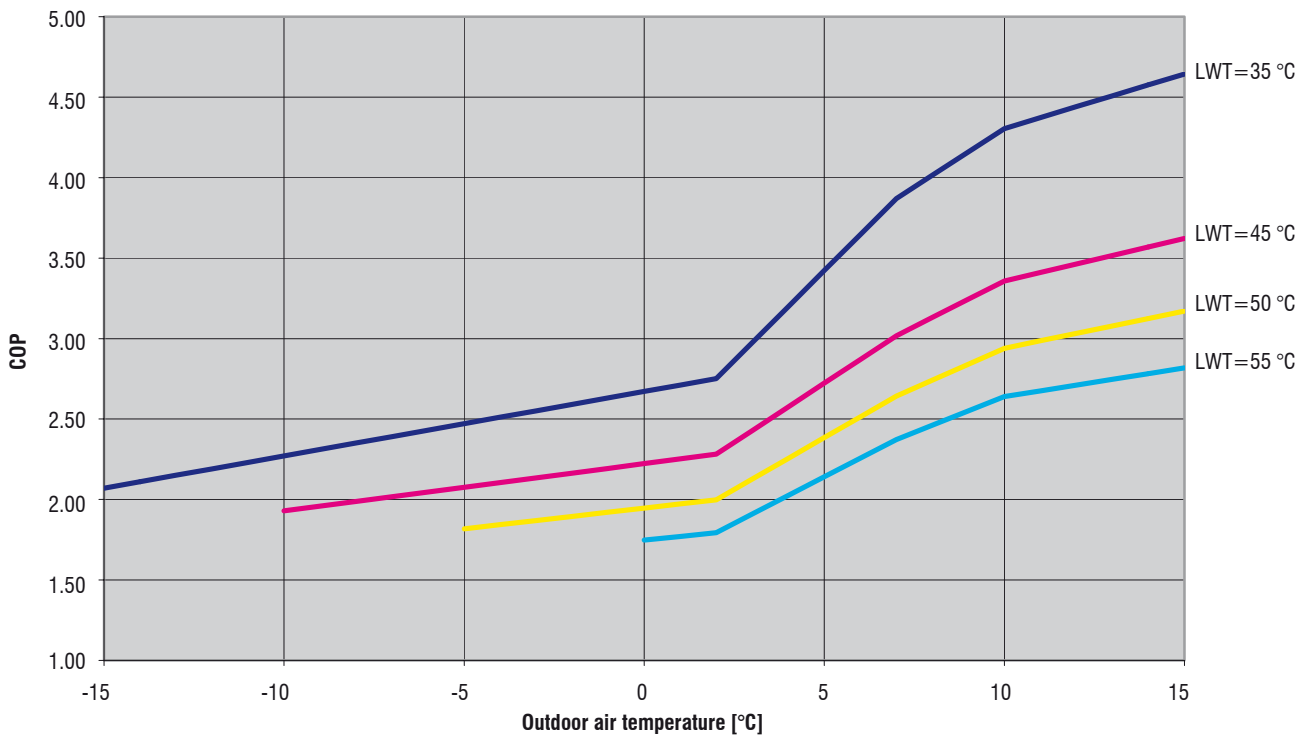


LWT : Leaving water temperature.

Performance Curves - PAC+ / PAC+ R 12



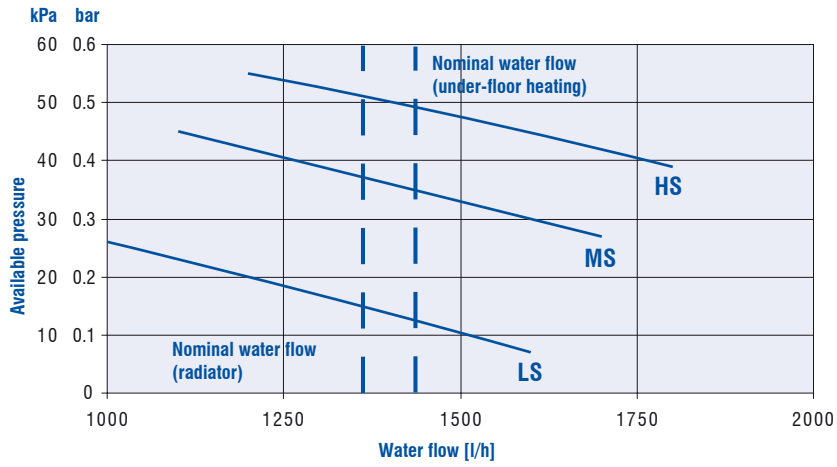
- A** Heating capacity curve with defrosting
- B** Absorbed capacity curve with defrosting



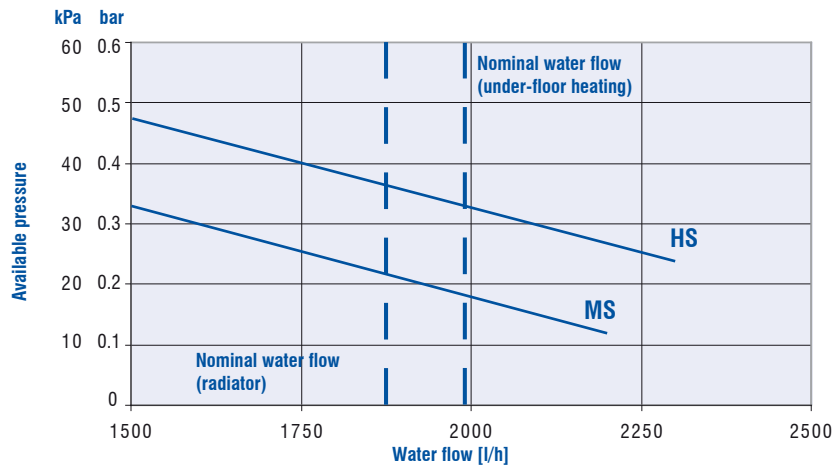
LWT : Leaving water temperature.

Circulation Pump Available Pressure / Water Flow Curves

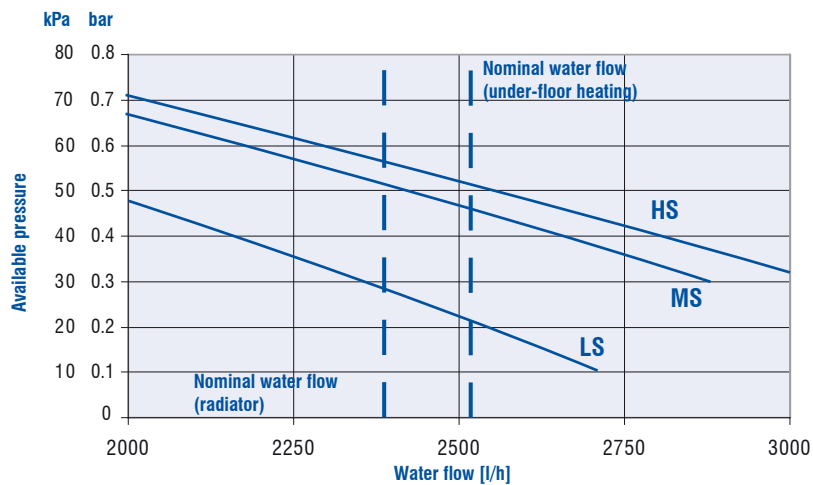
PAC+ / PAC+R 08



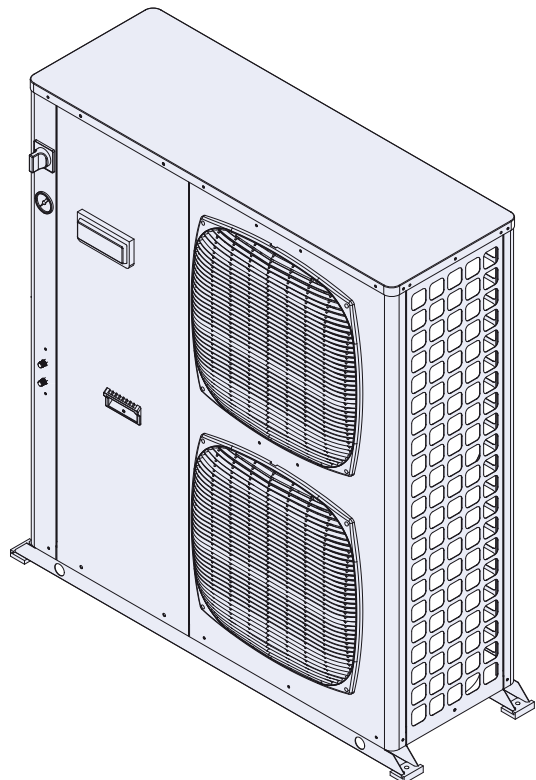
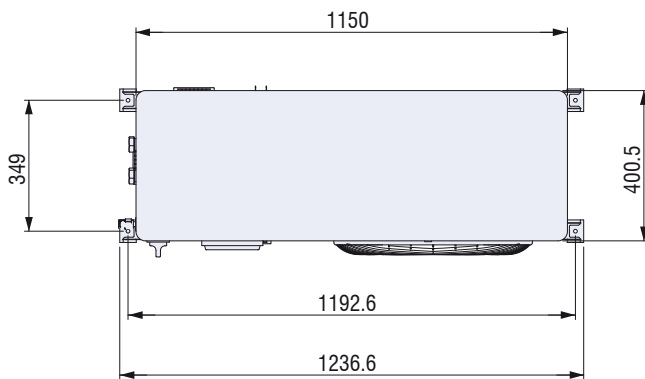
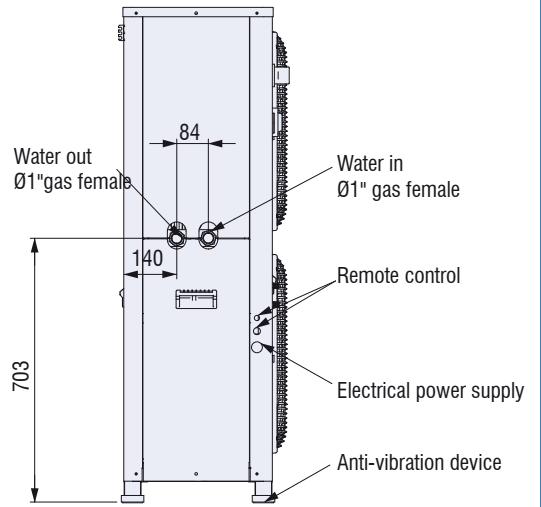
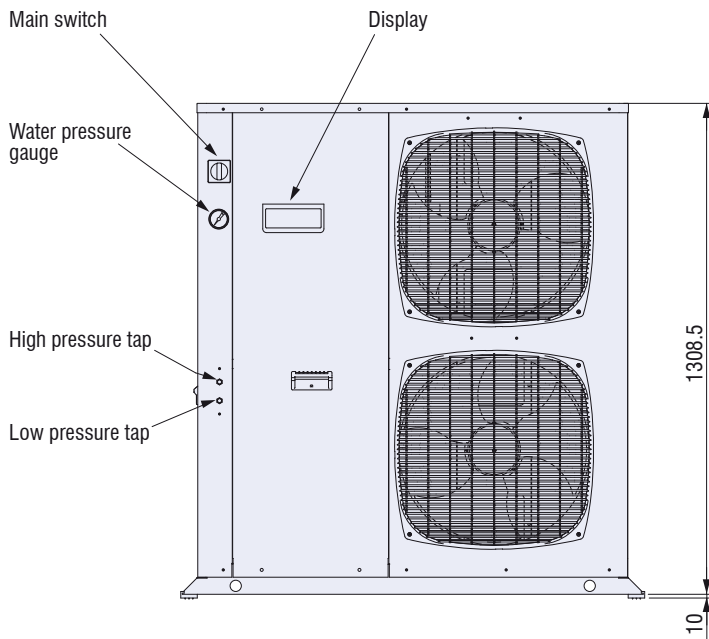
PAC+ / PAC+R 10



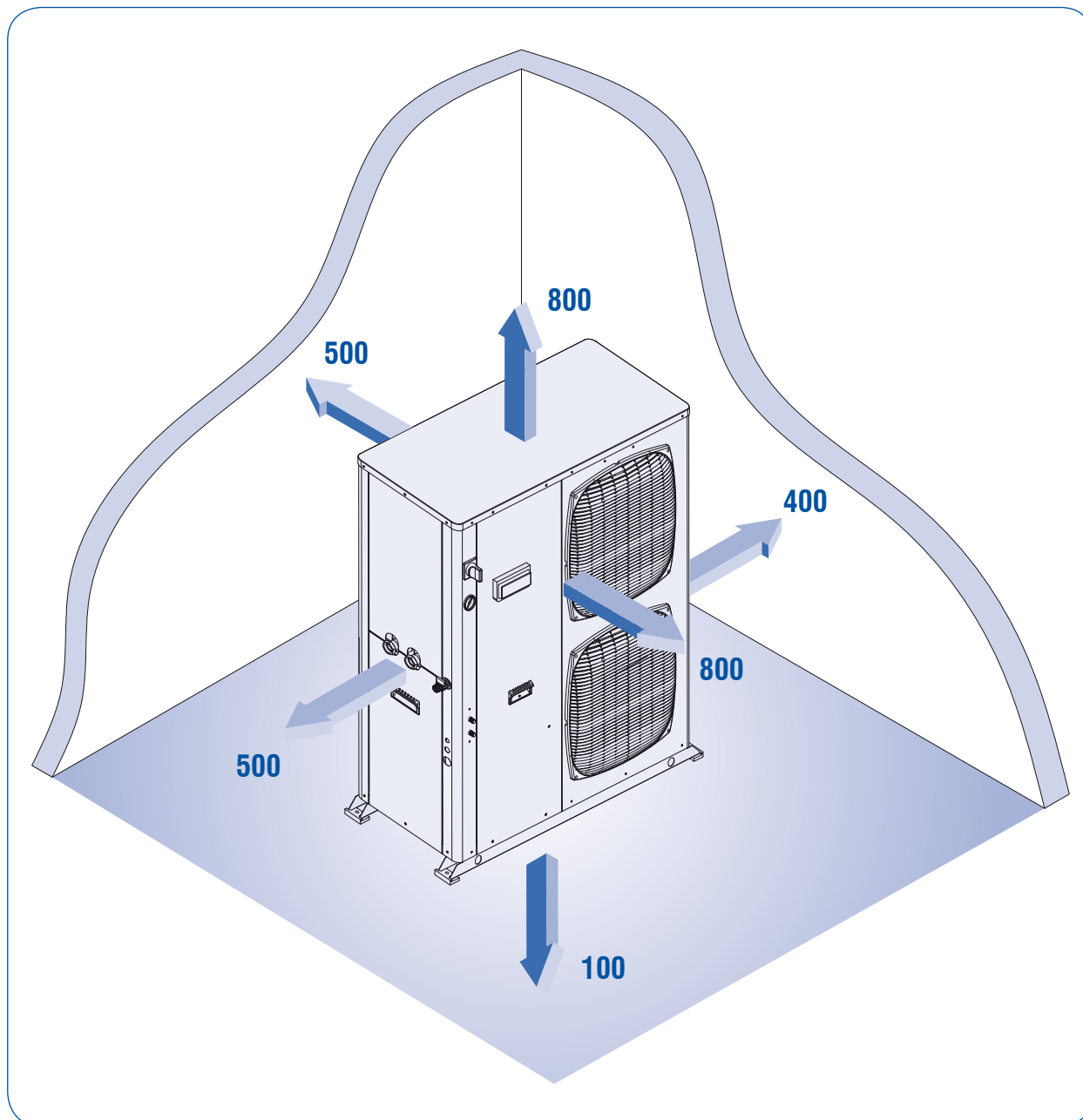
PAC+ / PAC+R 12



Dimensions - PAC+ / PAC+R 08 to 12



Minimum Clearance Around the Unit



As part of our ongoing product improvement programme, our products are subject to change without prior notice. Non contractual photos.

Ref. : EDM PAC-A.2GB/06.10 - Supersedes : EDM PAC-A.1GB/03.08



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