

SPH/SPH-R

Air-to-Water Split Heat Pumps

Modeles 08, 10 and 12



5.6 to 7.1 kW

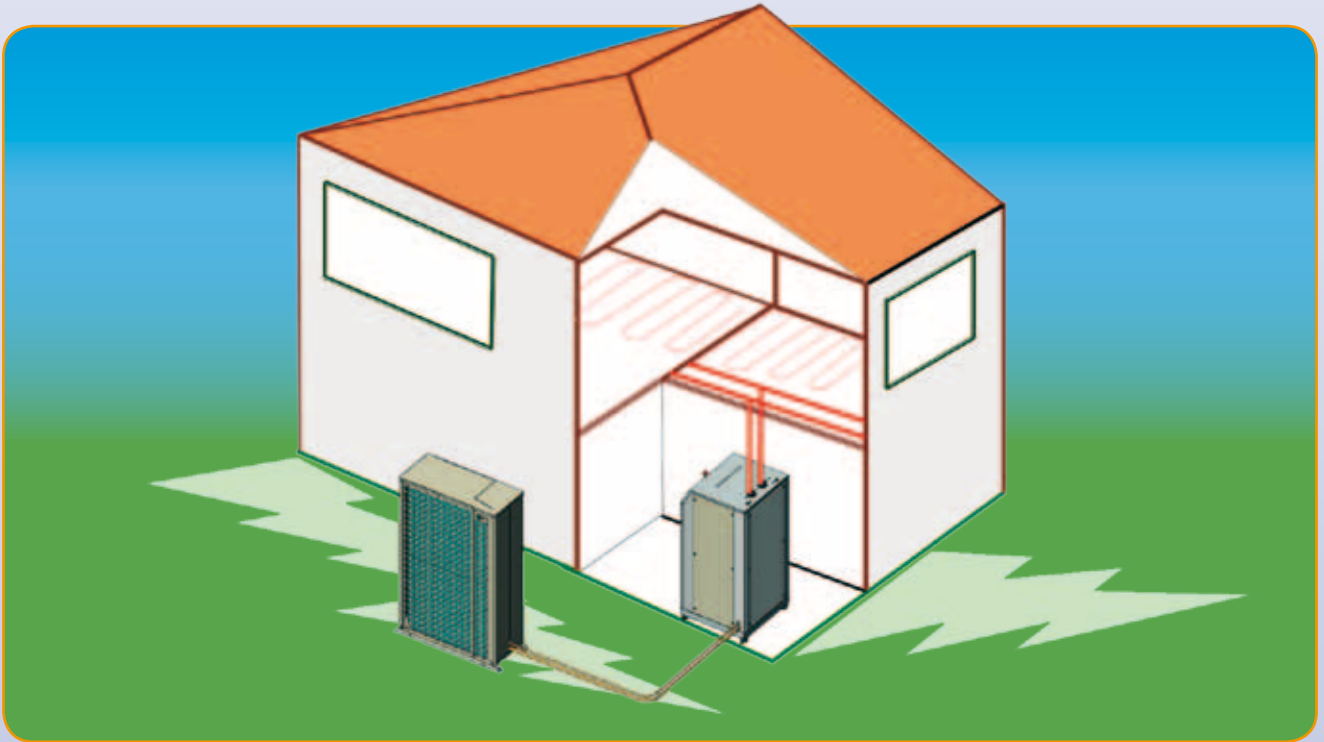


7.7 to 13.6 kW

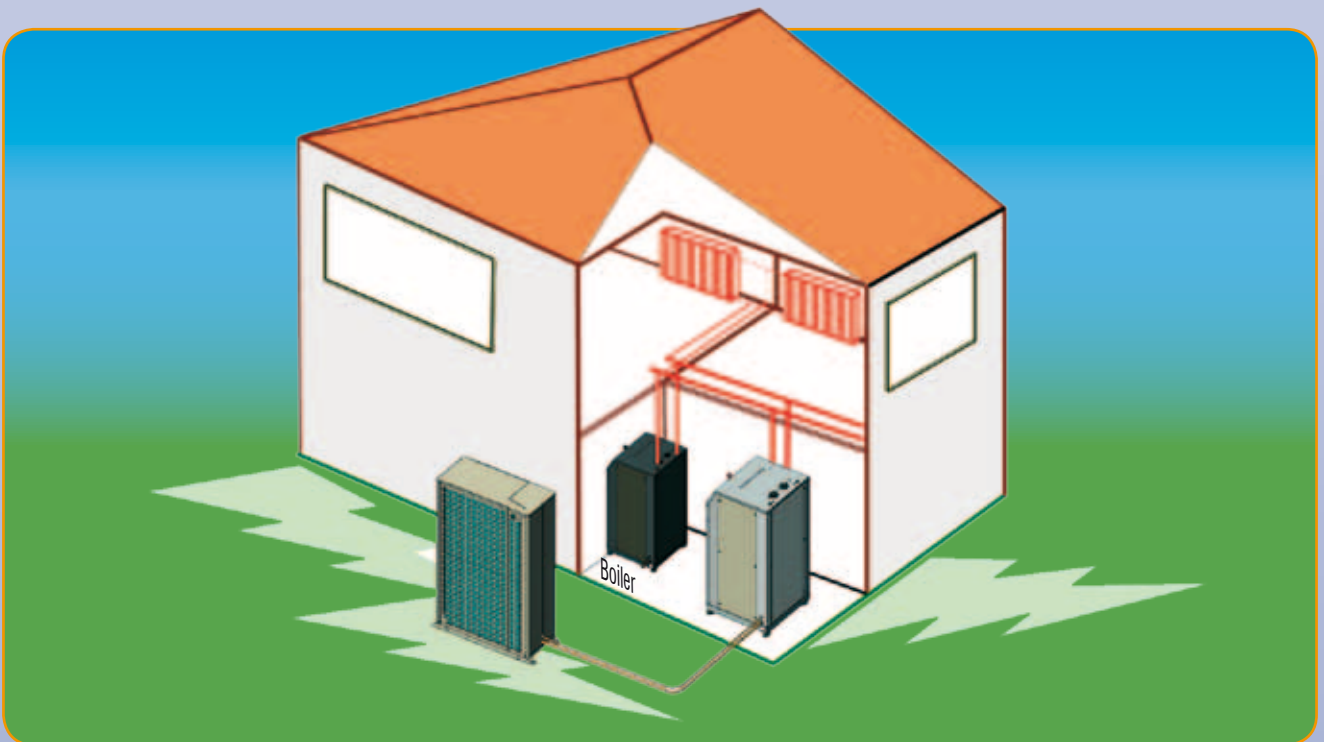


Installation illustrations

■ *New installation - SPH*



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



Technical Description

Introduction

The SPH and SPH-R split heat pumps complete the MCH and RCH packaged heat pumps by offering products that avoid the necessity of protecting the water circuits against freezing.

All the technical advantages that have contributed the success of the packaged heat pumps are retained in the SPH and SPH-R models, 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

SPH 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.

SPH-R model : Intended to operate in conjunction with a hot water heating boiler, these 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.

The SPH and SPH-R heat pumps are composed of two units linked by refrigerant piping.

The **outdoor unit** contains only :

- 2 or 3-row finned coil,
- 2 fans,
- Liquid tank,
- Thermostatic expansion valve (heating function) and capillaries (cooling and defrosting function).

All other equipments are located in the **indoor unit**.

The refrigerant linking pipes are of "to be brazed" type. They are not supplied with the unit. The heat pump is charged for use with 8-meter refrigerant pipes.

Advantages of split heat pumps

- The outdoor unit has only fans. Its sound level is considerably low, causing then a minimum trouble with the neighbourhood. The compressor sound treatment is easier in the indoor unit itself located in the technical room.
- All the electrical components are inside : ease of wiring and maintenance.
- The discharge line stays confined in the indoor unit; no heat losses unlike the discharge inside the linking pipes between the two units.
- During the off periods, the compressor is not in the cold part of the circuit, there is no risk of liquid accumulation; thus, less risks at re-starting.
- Controls, measurements, interventions on the electrical and refrigerant components are possible whatever the weather conditions.

Bodywork and frame

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

Indoor unit : 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.

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

Compressors

The Scroll type compressors are deigned 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 SPH version) down to outdoor temperatures of 10 °C, and to limit the evaporator load in heating mode under high outdoor temperatures.

Refrigerant circuit

The indoor and outdoor units are tested together and matched for shipment. The refrigerant charged at the factory is suitable for linking pipes up to 8 metres.

For higher distances, complete the charge on the basis of 30 g of R407C per metre. Maximum pipe length : 30 metres.

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.

Technical Description (continued)

Pipe insulation (not supplied)

The heat pump installed in the house is linked to the outdoor unit by 2 refrigerant pipes.

The pipe of smaller diameter (12.7 mm) is for "liquid" line.

That of bigger diameter (19 mm for models 08 and 10, 22 mm for model 12) is for "gas" line.

In heating mode of the heat pump operation, the refrigerant runs through the "gas" line at a temperature lower than 3 K in comparison with outdoor air.

The rise of this temperature during the refrigerant passage to the compressor, located inside the indoor unit, decreases the system performance of about 1% for each degree of increase.

It is thus very important to insulate this tube with a quality product in conformity to the EN ISO 8497 standard (thermal conductivity $\lambda < 0.036$ W/m.K). In addition, the insulation shall be thick enough notably inside the house, the most critical part, since it is the hottest part of the piping.

The following data, for an evaporating temperature of 1 °C and a condensing temperature of 40 °C, allow the insulation thickness to be calculated precisely :

SPH 08, mass flow = 40.4 g/s

SPH 10, mass flow = 58.9 g/s

SPH 12, mass flow = 72.4 g/s

In practice, we recommend an insulation thickness of 13 mm (λ of insulating material is 0.036 W/m.K). With this thickness, the capacity drop, for a pipe length of 30 metres, is lower than 4%.

Concerning the "liquid" line (1/2"), the refrigerant circulates inside the tube at a temperature lower than 5 K in comparison with the condensing temperature; thus, at a temperature higher than indoor and outdoor air. The liquid cooling in heating mode does not lead to any capacity loss. However, in cooling mode, we recommend an insulation thickness of 9 mm for the "liquid" tube in order to limit the capacity losses.

Electrical cabinet

Located in the indoor unit, it is 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 (SPH 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 (SPH 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 (SPH version).
- Controlling condensing pressure in the summer (SPH version).
- Controlling evaporation pressure (output regulation) in heating mode.

Standard equipment

SPH and SPH-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.
- Refrigerating circuit shut-off valve
- Hydraulic kit comprising: 3-speed water circulation pump, pressostatic flow controller, 2 kW + 4 kW additional electrical heating resistances (SPH version only), auto and manual bleed valves, pressure gauge, safety valve (3.5 bars), 5 litre expansion tank (SPH version only).
- 4 vibration-absorbing pads for noise reduction.
- Exchanger protection grille.
- Ambience thermostat for heating and cooling temperature control (SPH version only).
- Complete refrigerant charge for linking pipes up to 8 metres.
- SPH-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 SPH and SPH-R models :

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

Factory-fitted options available for SPH-R only :

- 5 litre expansion tank.

Field-installed accessories for SPH and SPH-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 SPH-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

SPH 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.

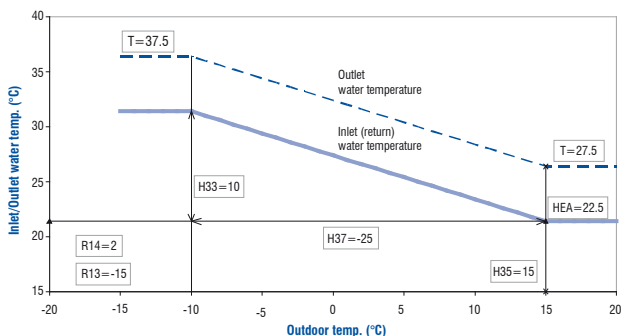
Winter regulation

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.

SPH-R version

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

The SPH-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 SPH-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 SPH-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)

SPH-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 SPH-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.

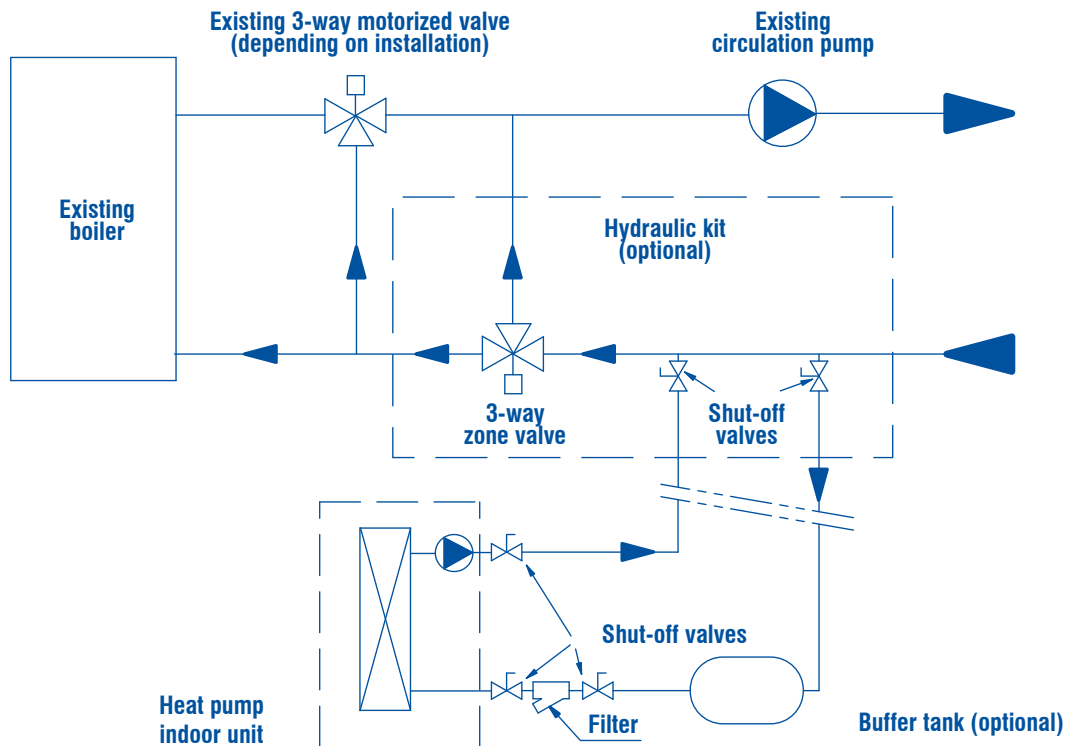
Boiler regulation operating mode

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.

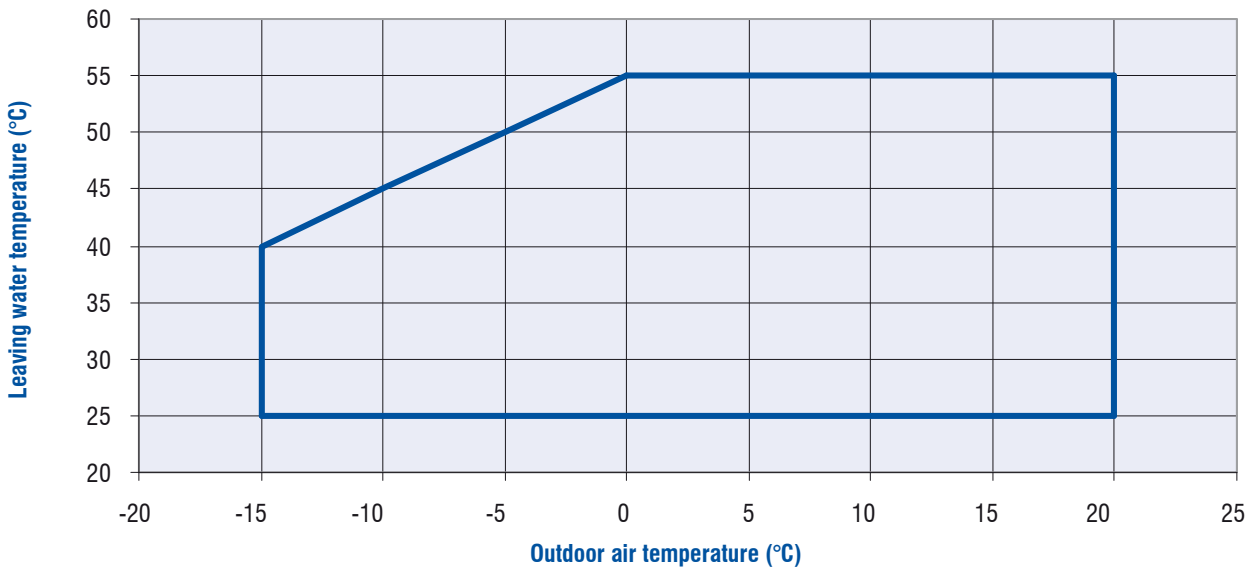
Hydraulic Circuit Diagram

SPH-R installation in conjunction with a water boiler heating system

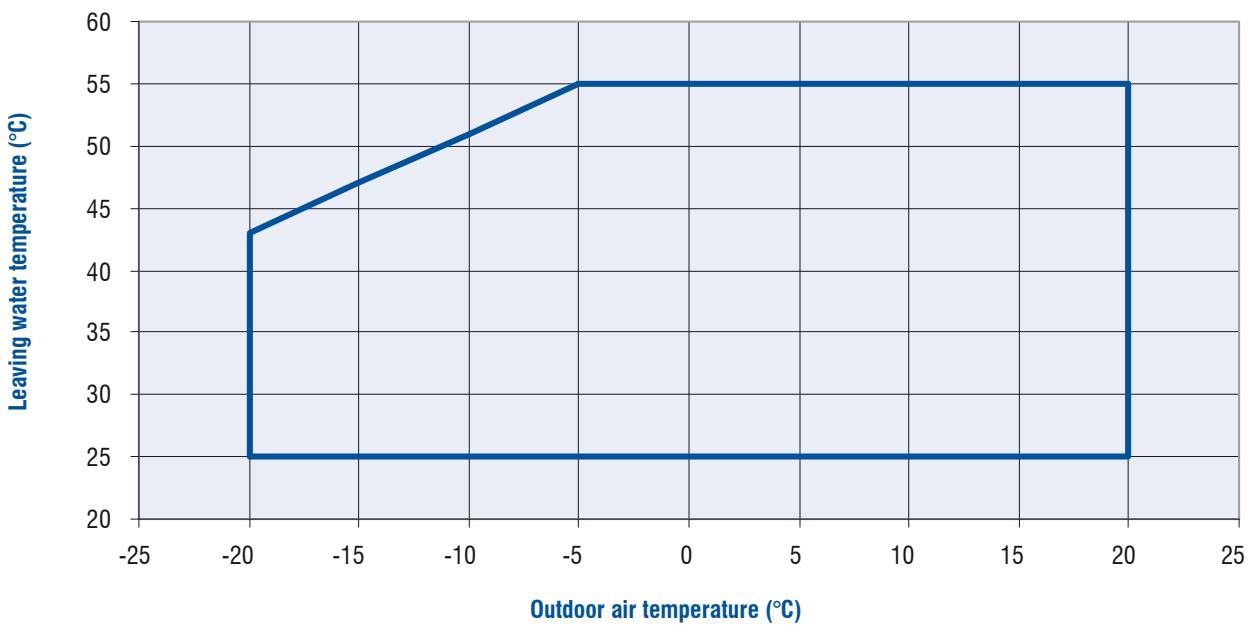


Operating Limits - Heating Mode

Operating limits - SPH and SPH-R with standard compressors

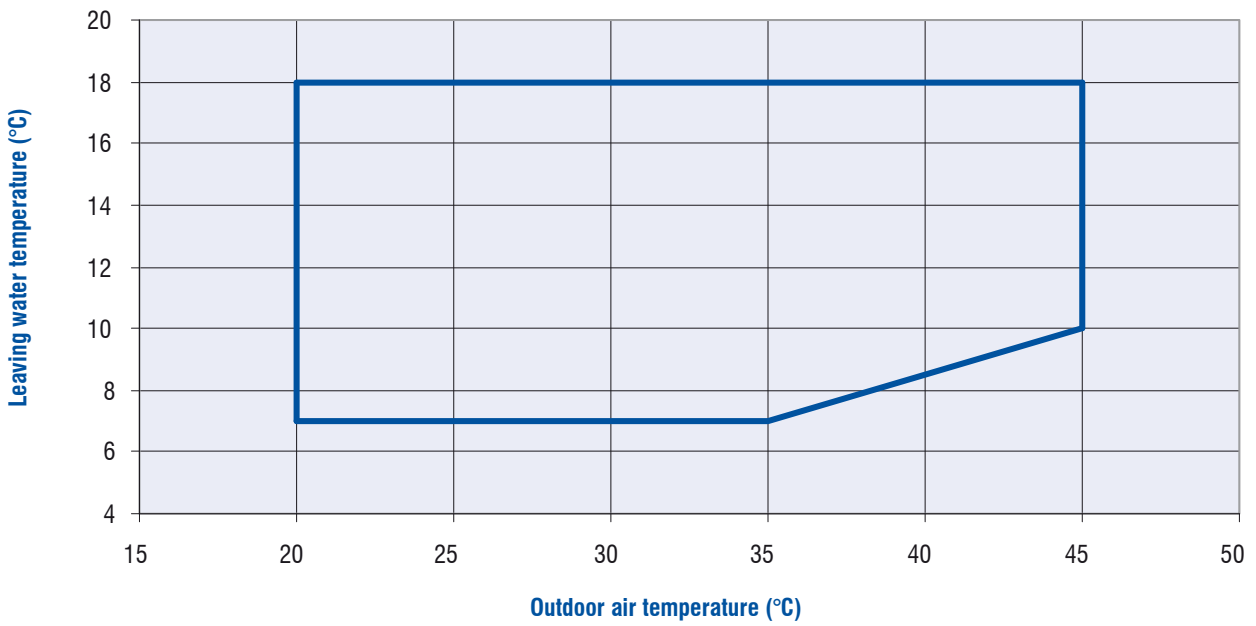


Operating limits - SPH and SPH-R with optional ZH compressors



Operating Limits - Cooling Mode

Operating limits - SPH, SPH-R with standard compressors or optional ZH compressors



Physical Characteristics

SPH/SPH-R MODELS		08	10	12
REFRIGERANT				
Type		R407C		
Factory charge for refrigerant pipes 0 to 8 metres	g	3550	3550	4000
Complementary charge from 8 to 20 metres	g/m	30	30	30
Complementary charge from 20 to 30 metres	g/m	60	100	100
REFRIGERANT CONNECTIONS				
Gas refrigerant pipes	inches	3/4	3/4	7/8
Liquid refrigerant pipes	inches	1/2	1/2	1/2
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		
Outdoor unit sound power level	dB(A)	66	66	66
Indoor unit sound power level (without optional compressor soundproofing)	dB(A)	56	56	56
Indoor unit sound power level (with optional compressor soundproofing)	dB(A)	53	53	53
DIMENSIONS AND WEIGHTS				
Outdoor unit dimensions Length x Height x Width	mm	998 x 1308 x 400		
Indoor unit dimensions Length x Height x Width	mm	596 x 1232 x 596		
Indoor unit gross weight	kg	115	128	133
Indoor unit net weight	kg	103	116	121
Outdoor unit gross weight	kg	90	90	98
Outdoor unit net weight	kg	78	78	86

Electrical Characteristics

SPH/SPH-R MODELS		08	10	12
INTENSITÉS				
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 / 50Hz		
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 FOR SPH				
First stage	kW	2	2	2
Second stage	kW	4	4	4

(*) Most loaded phase.

Performance Data - Heating Mode

	PERFORMANCES according to EN 14511-2 Sept 2004 Heating mode	SPH/SPH-R models			
		08	10	12	
Water conditions : 30 °C/35 °C Pipe length : 8 metres	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
	Water flow	l/h	1427	1970	2522
	Available pressure HS	kPa	41	26	59
	Pump correction	W	54	48	138

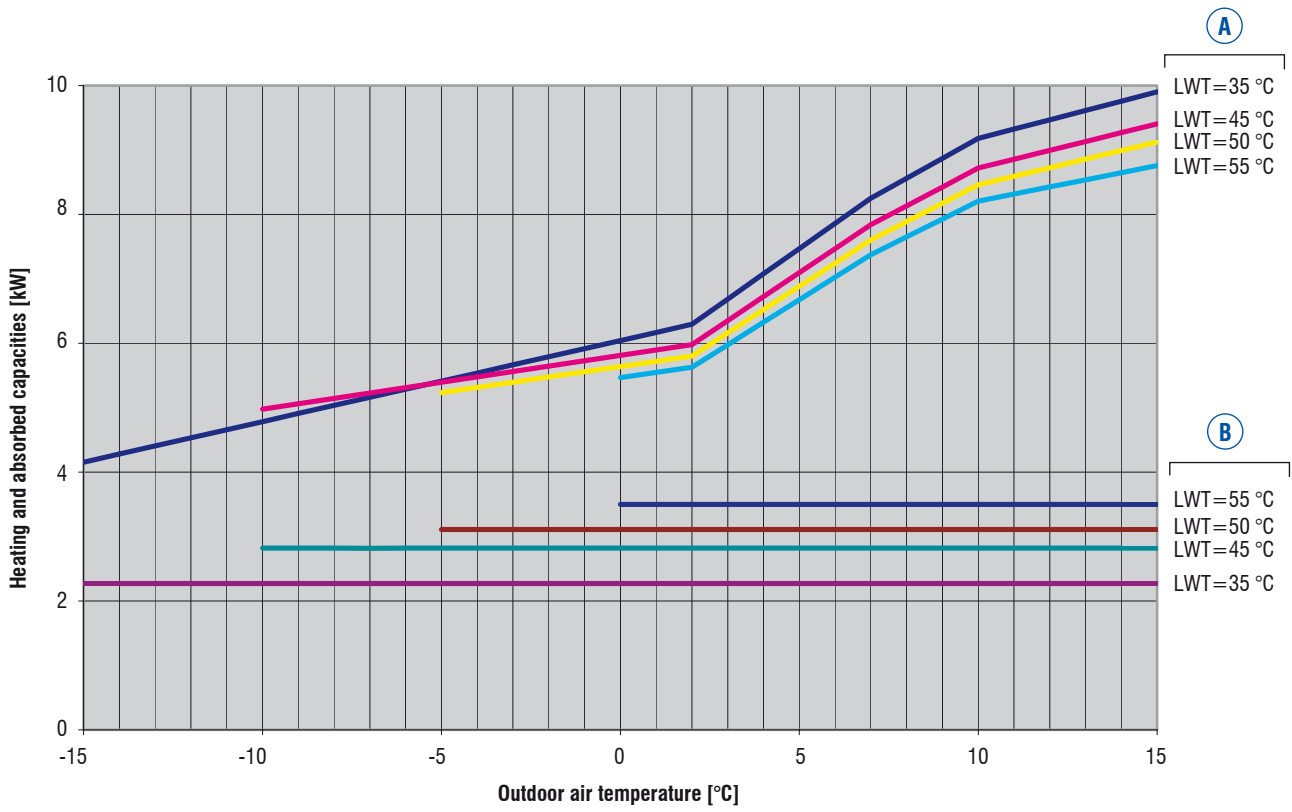
	PERFORMANCES according to EN 14511 Heating mode	SPH/SPH-R models			
		08	10	12	
Water conditions : 30°C/35°C Pipe length : 8 metres	Air conditions 2 °C dry bulb / 1 °C wet bulb				
	Heating capacity (*)	W	6168	8146	10004
	Power input	W	2270	2986	3641
	COP (*)		2.72	2.73	2.75
	Air conditions -7 °C dry bulb / -8 °C wet bulb				
	Heating capacity (*)	W	5058	7167	8693
	Power input	W	2270	3106	3670
	COP (*)		2.23	2.31	2.37
	Water conditions : 40 °C/45 °C Pipe length : 8 metres	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
Water flow		l/h	1364	1898	2425
Available pressure		kPa	45	29	60
Pump correction		W	57	51	135
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 defrosting.

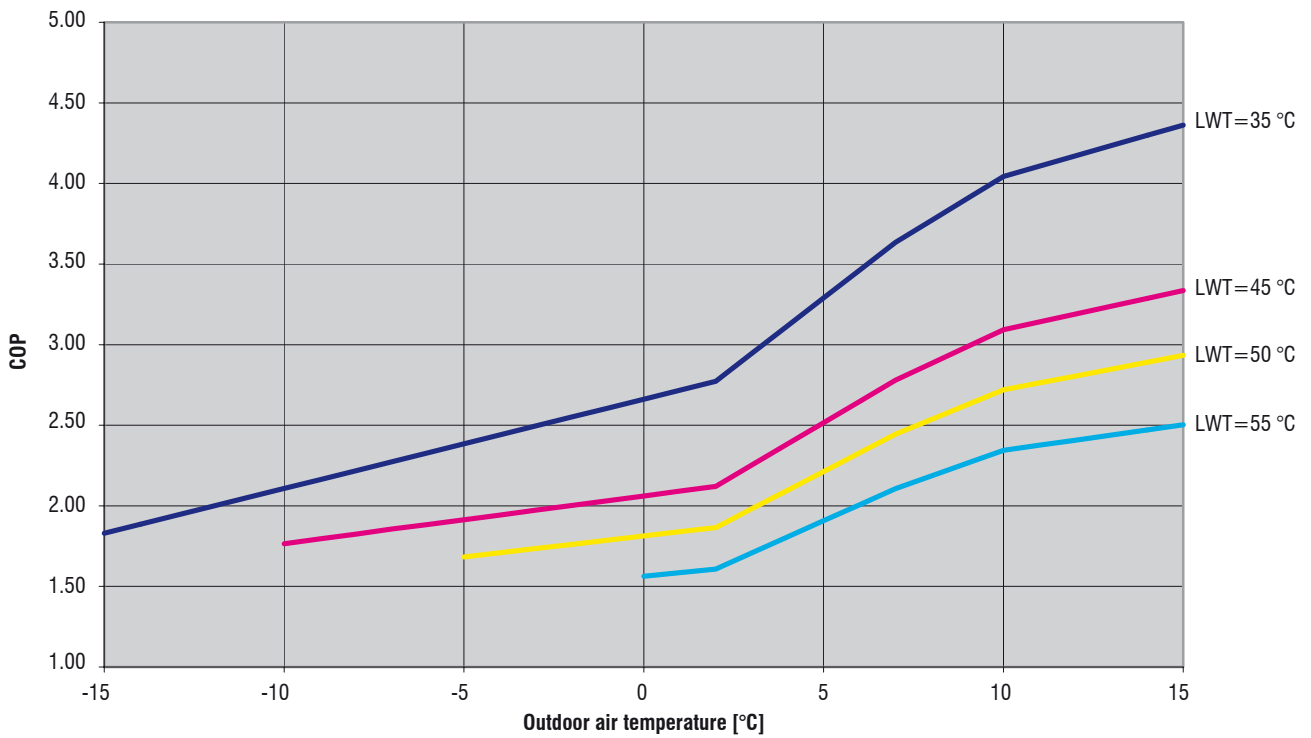
Performance Data - Cooling Mode

		Cooling mode	SPH/SPH-R models			
			08	10	12	
Application : Fan coil units and under floor heating Pipe length : 8 metres		Air conditions 35 °C - Water conditions 12 °C / 7 °C				
		Cooling capacity	W	5632	7660	7083
		Power input	W	2536	3551	4215
		EER		2.22	2.16	1.68
		Water flow	l/h	955	1304	1214
		Available pressure	kPa	52	41	94
		Pump correction	W	46	49	106
		Air conditions 35 °C - Water conditions 23 °C / 18 °C				
		Cooling capacity	W	7216	8904	9845
		Power input	W	2544	3685	4453
		EER		2.84	2.42	2.21
		Water flow	l/h	1224	1554	1662
		Available pressure	kPa	47	36	85
Pump correction	W	53	52	130		

Performance Curves - SPH/SPH-R 08

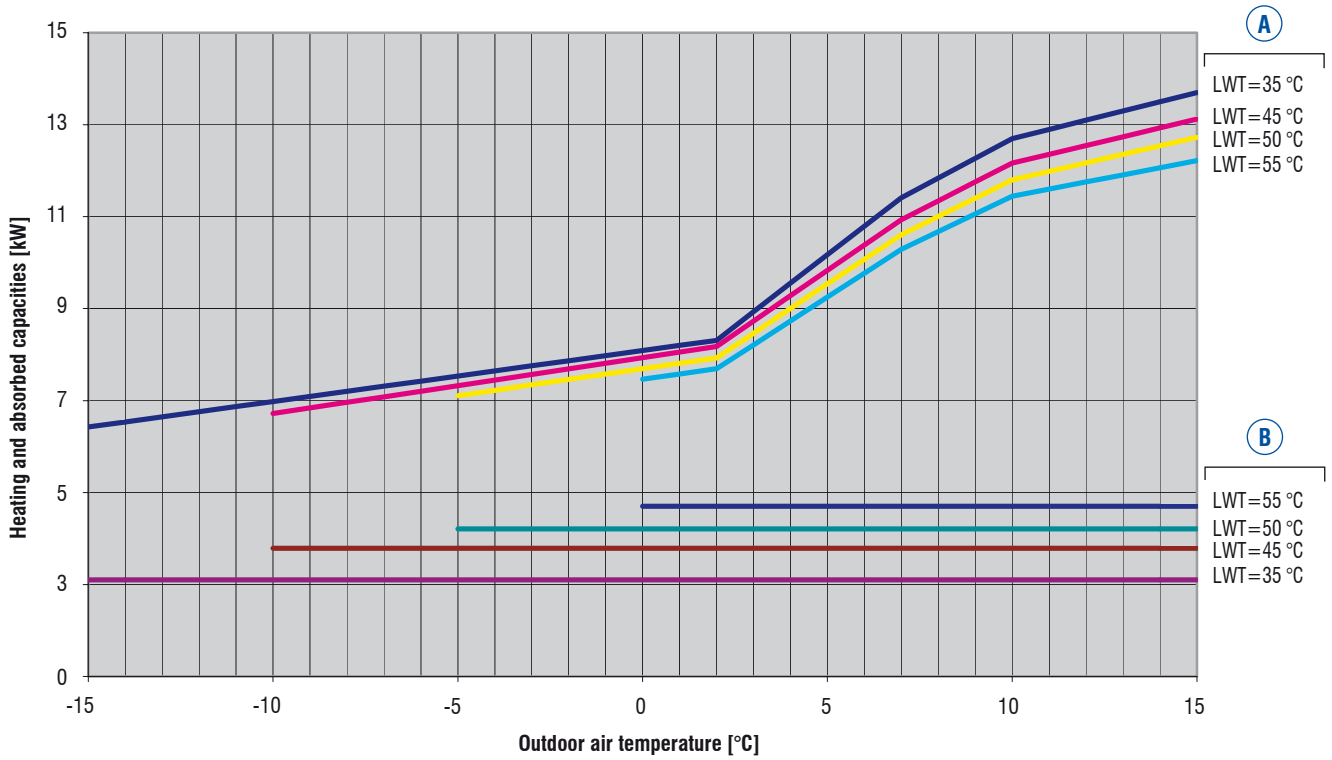


- A** Heating capacity curve with defrosting
- B** Absorbed capacity curve with defrosting

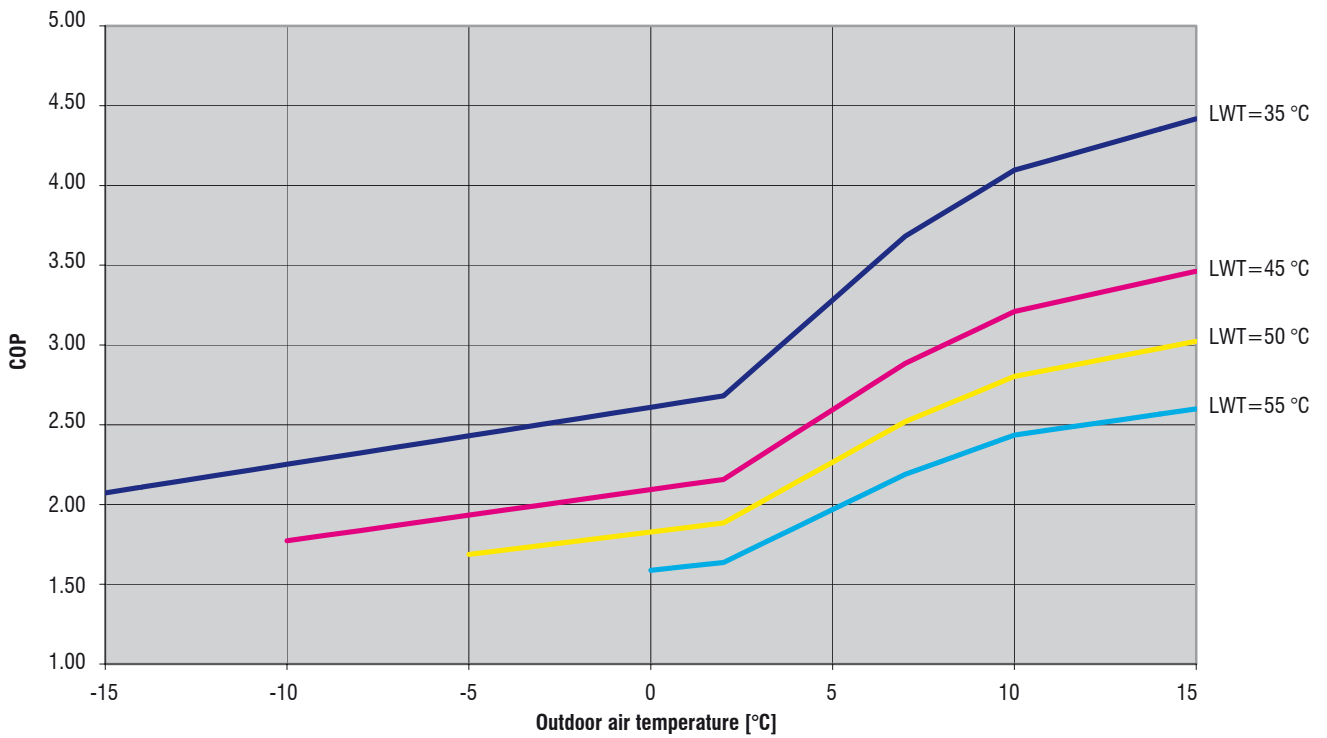


LWT : Leaving water temperature.

Performance Curves - SPH/SPH-R 10

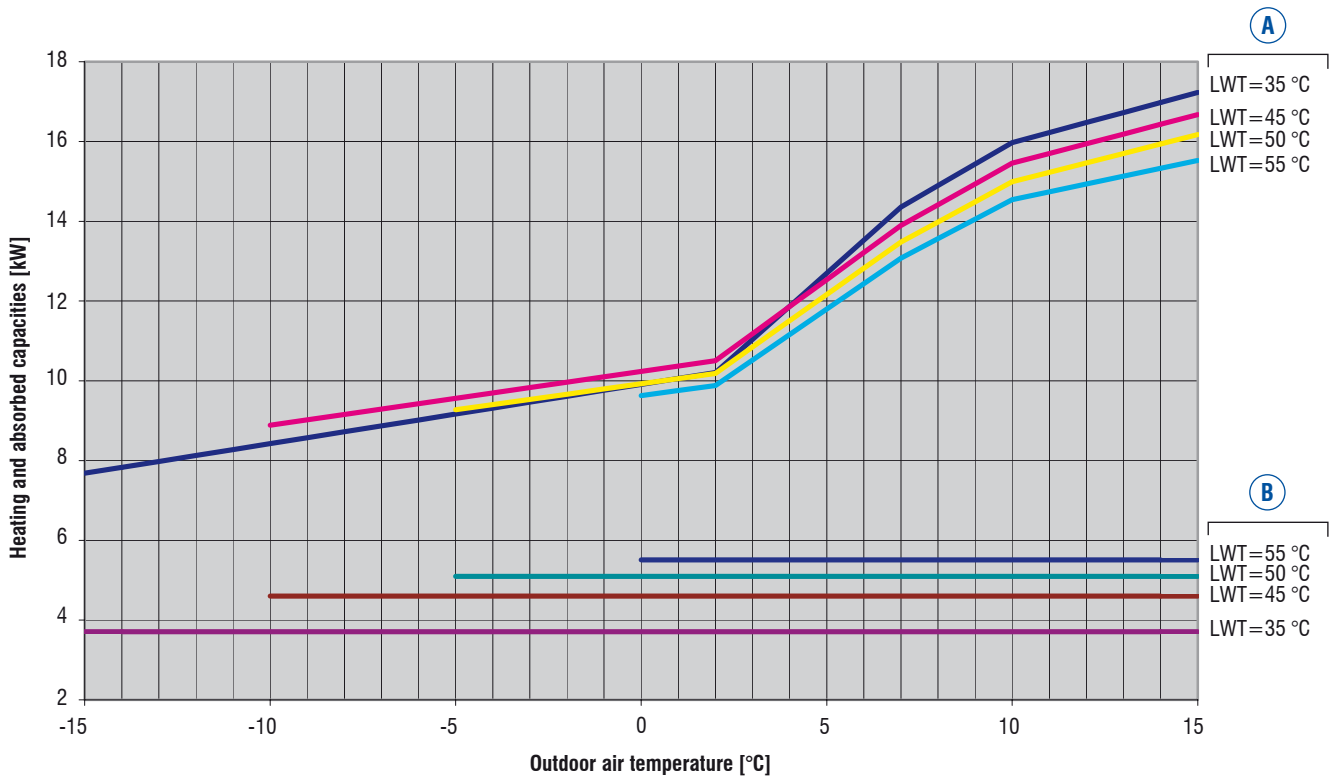


- A** Heating capacity curve with defrosting
- B** Absorbed capacity curve with defrosting

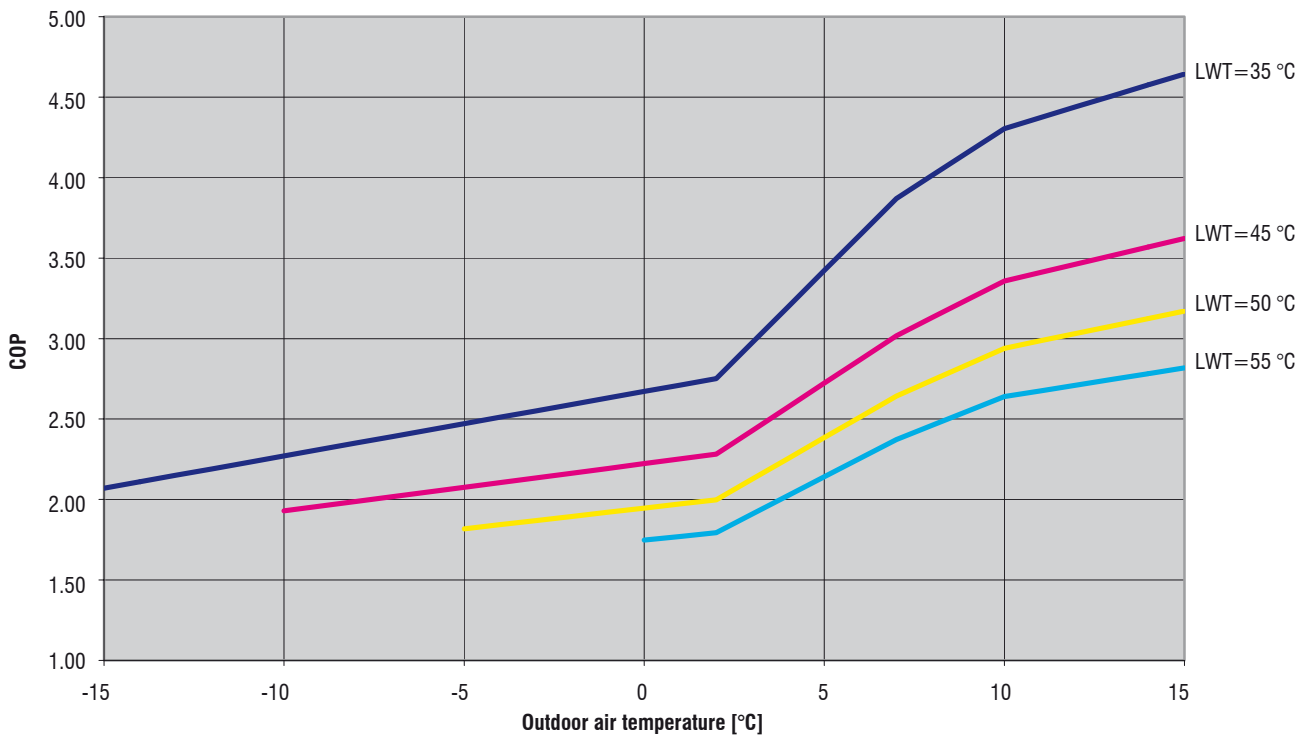


LWT : Leaving water temperature.

Performance Curves - SPH/SPH-R 12



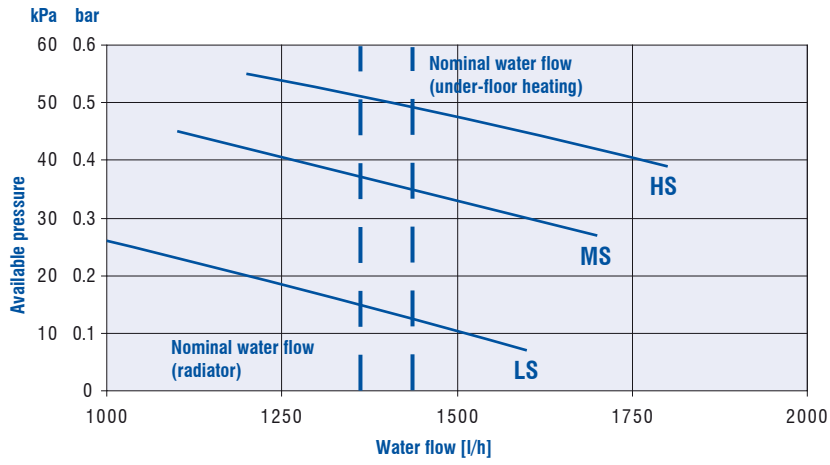
- A** Heating capacity curve with defrosting
- B** Absorbed capacity curve with defrosting



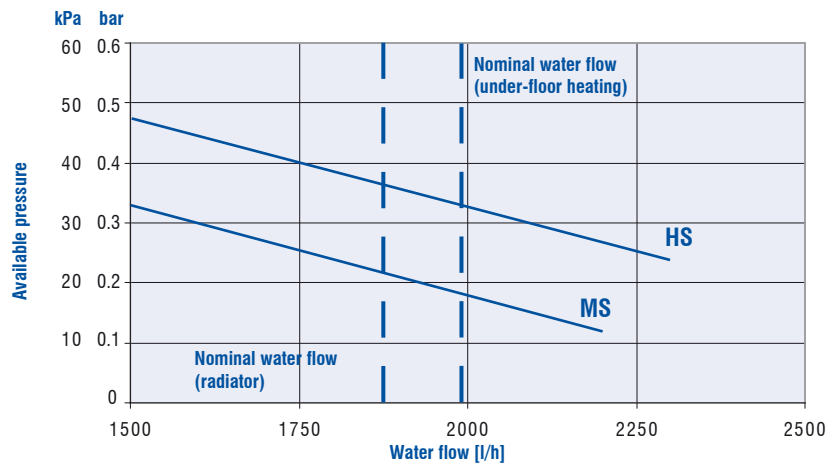
LWT : Leaving water temperature.

Circulation Pump Available Pressure / Water Flow Curves

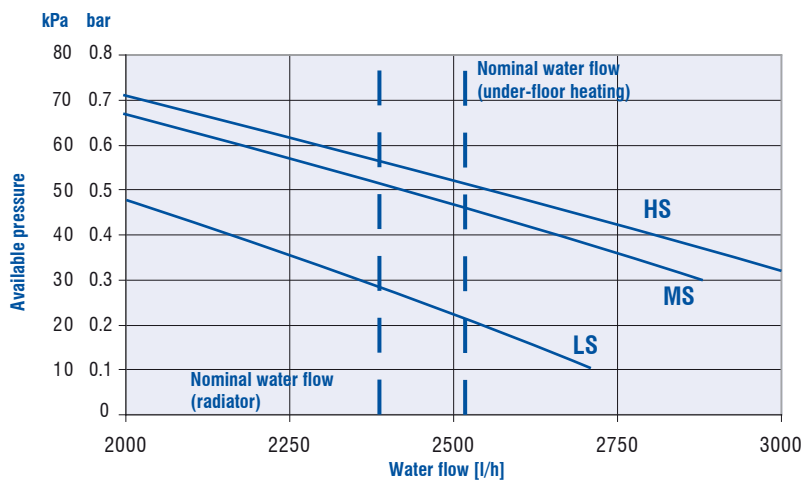
SPH/SPH-R 08



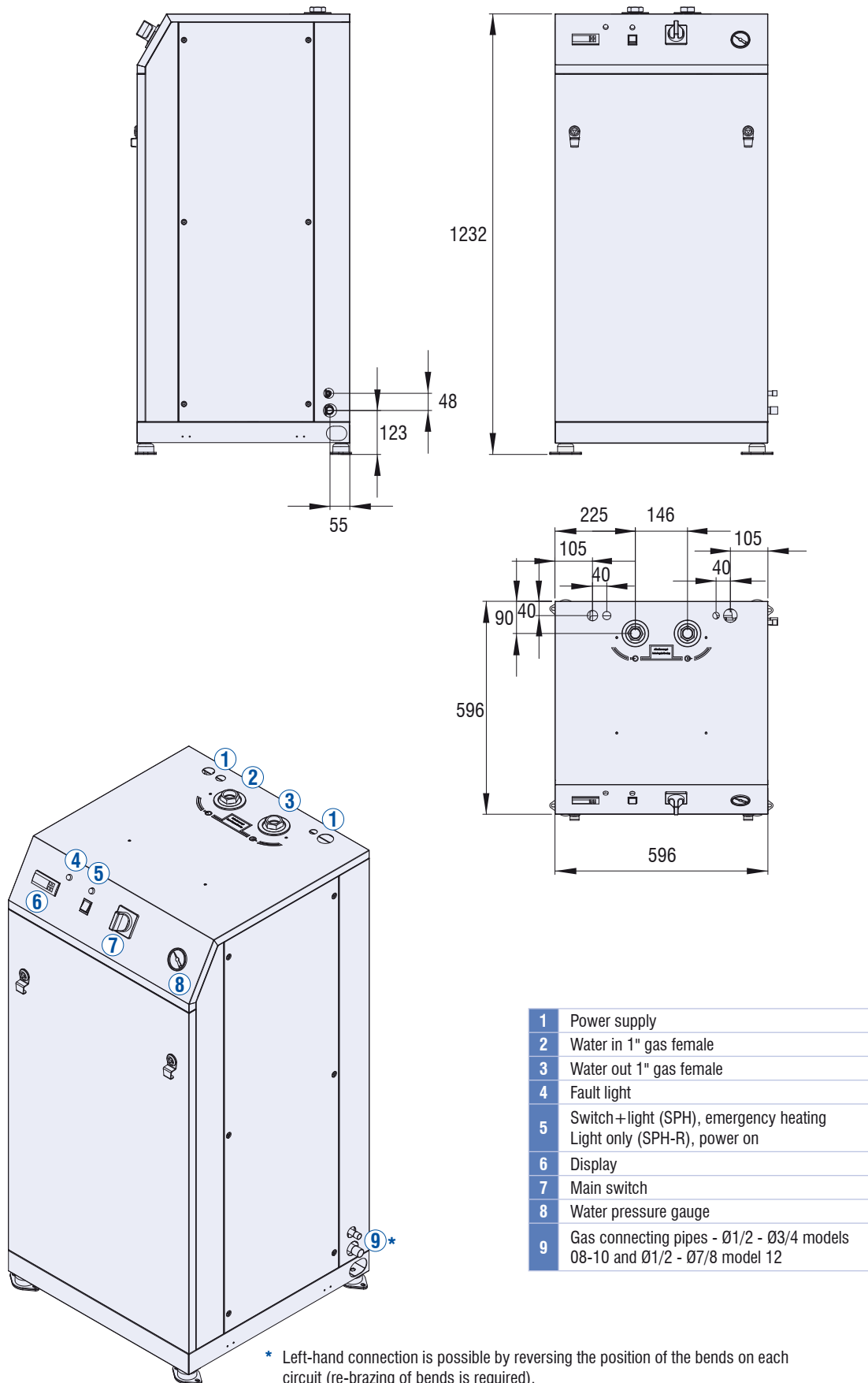
SPH/SPH-R 10



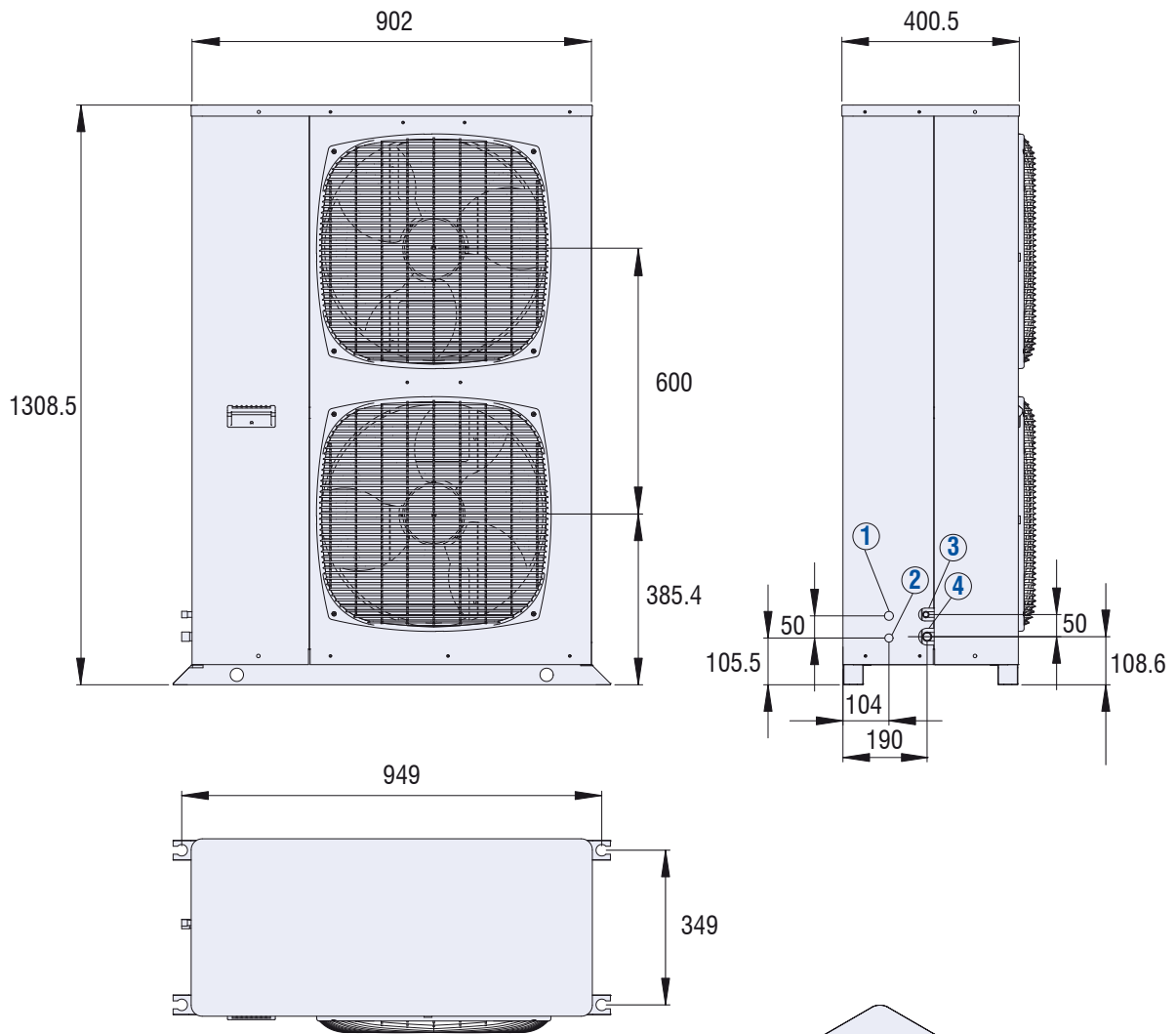
SPH/SPH-R 12



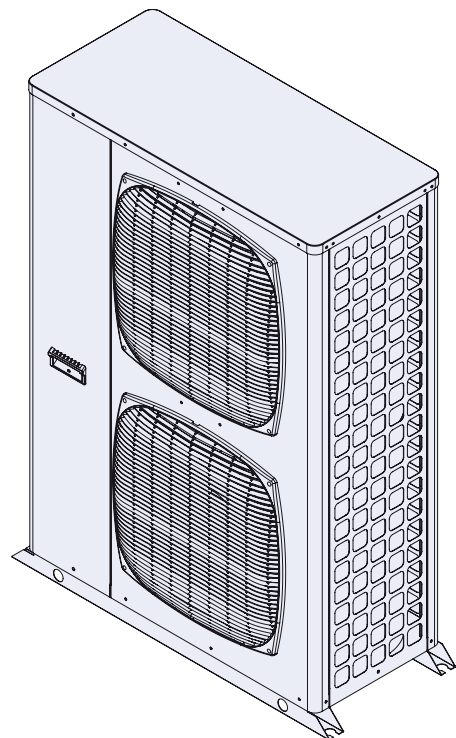
Dimensions - Indoor Unit SPH/SPH-R 08 to 12



Dimensions - Outdoor Unit SPH/SPH-R 08 to 12

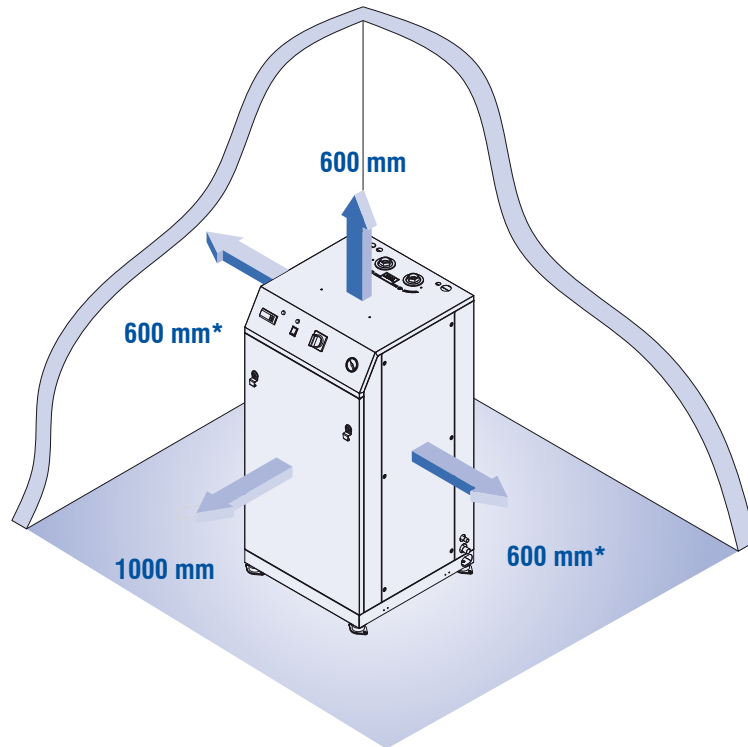


1	Power supply
2	Power supply
3	Gas connecting pipe - Ø1/2 - Ø3/4 models 08-10, Ø1/2 - Ø7/8 model 12
4	Gas connecting pipe - Ø1/2 - Ø3/4 models 08-10, Ø1/2 - Ø7/8 model 12



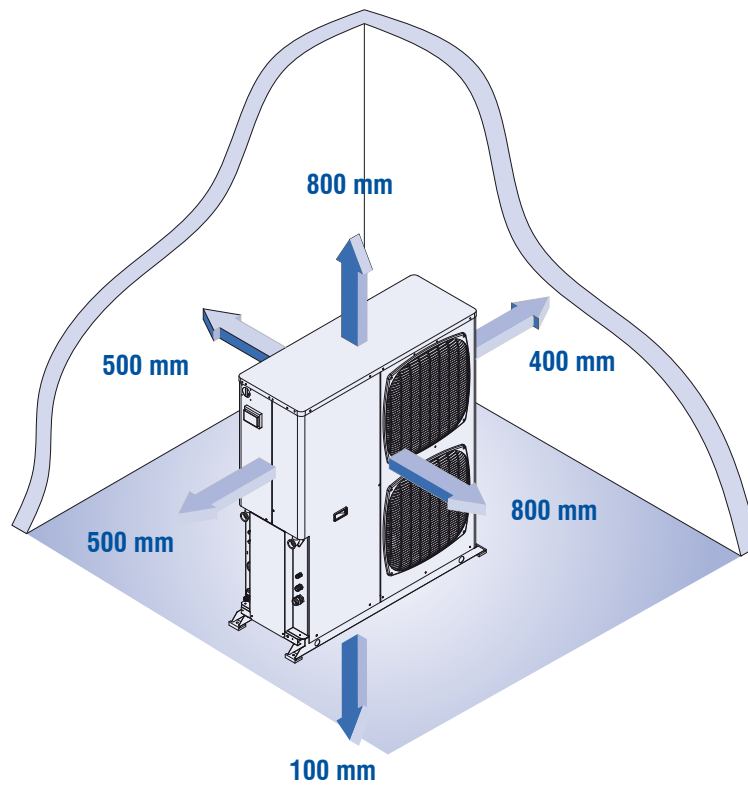
Minimum Clearance Around the Unit

Indoor unit



* Spaces required only for intervention works.

Outdoor unit





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Ref. : EDM SPH-A.2GB/06.10 - Supersedes : EDM SPH-A.1GB/02.08

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