Air to water heat pumps

Technical Manual

Models

SHP290 40 kW
SHP290 50 kW

00	12-2023	AL.B.	A.R.	First issue
Rev	**Date**	**Author**	**Supervisor**	**Notes**
Catalogo / Catalogue / Katalog / Catalogue				**Serie / Series / Serie / Serie / Série**
BTE02070120000_00				**Inverter air/water heat pumps with axial fans**

Contents

1. DESCRIPTION OF UNIT AND TECHNICAL SPECIFICATIONS

1.1 FRAMEWORK

Structure suitable for outdoor installation consisting of thick profiles in hot-dip galvanised sheet steel painted with polyester powder, colour RAL 7035 textured weather resistant (corrosivity classification similar to C3 according to EN ISO 12944-2:2017).
Removable panels allow maintenance inside the refrigeration and hydraulic circuit.

1.2 COMPRESSORS

The DC inverter compressor is scroll type, are designed to operate with R290, equipped with thermal protection and mounted on rubber vibration dampers. All compressors are equipped with an electrical heater located on the compressor crankcase that switches on automatically when the machine is switched off, and are complete with PAG oil charge.
In tandem connections, there is an oil equalisation line with a control-controlled solenoid valve that ensures balancing and lubrication.

1.3 AIR SIDE HEAT EXCHANGER

AISI 304 stainless steel brazed plate heat exchanger, factory insulated using closed cell material. A flow switch installed on the water side ensures the presence of water flow, together with the protection probe, preventing the formation of ice inside. The exchangers can be equipped with an electric antifreeze resistor (optional KA accessory).

1.4 UTILITY SIDE HEAT EXCHANGER

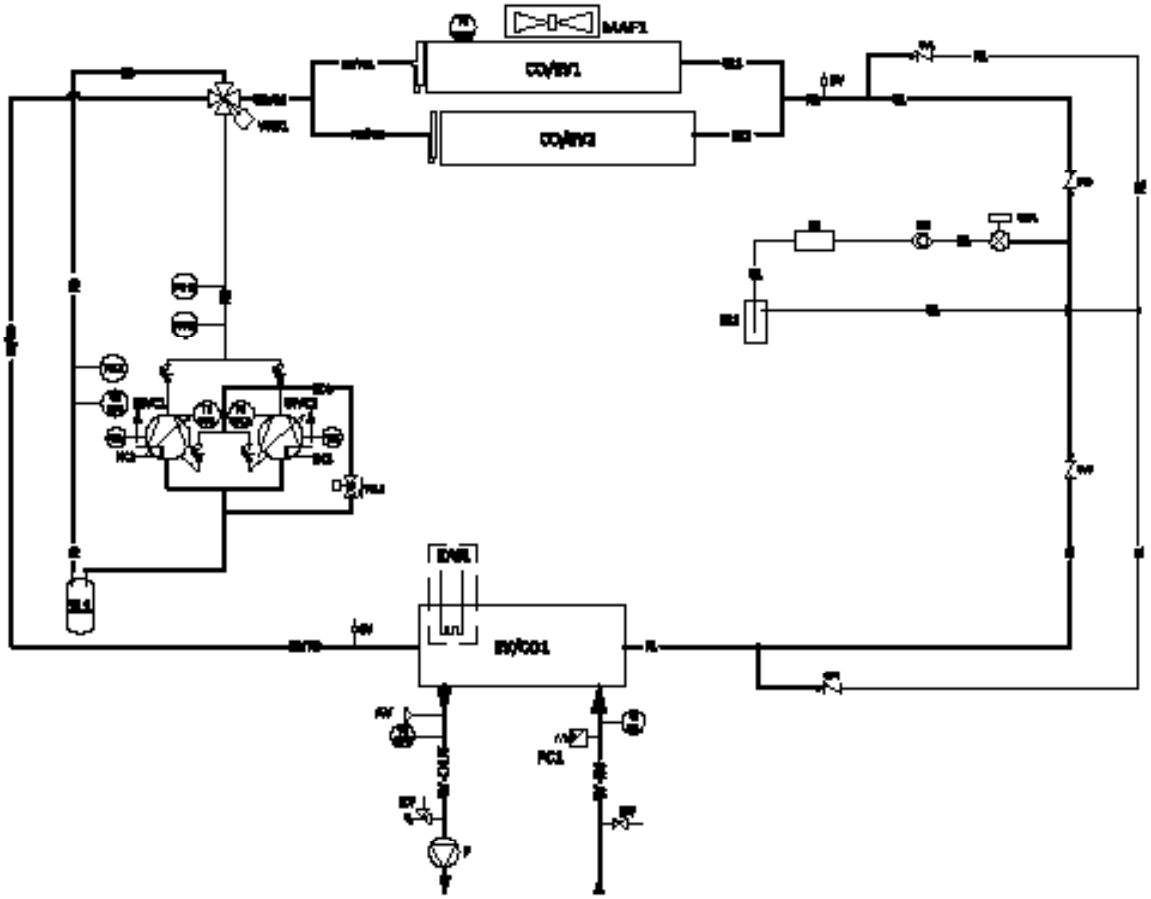
The air heat exchangers are made of copper pipes and prepainted aluminium fins. The pipes are mechanically expanded into aluminium fins to increase the thermal exchange factor. The shape of these exchangers allows a low air side pressure drops and therefore fans can run at low speed (thus reducing unit noise).
As optional the coils can be supplied with a “SILVER LINE” to allow greater resistance to acidity and salt spray resulting in increased hydrophilic ability and performance compared to a battery with simple aluminium fins. The air side exchangers are designed to minimise the refrigerant gas charge.

1.5 FAN

The fan is of the axial type with airfoil blades. It is statically and dynamically balanced, supplied complete with protection grille and air inlet/outlet nozzle with double flared profile, specially shaped to increase efficiency and reduce noise. The electric motor used is driven in modulation with a brushless EC motor, directly coupled, and is equipped with integrated thermal protection. The motor has an IP 54 protection rating in accordance with CEI EN 60529.

1.6 COOLING CIRCUIT

The cooling circuit is made with components of leading international companies and in compliance with UNI EN standard 13134 on braze-welding procedures. The coolant is the new R290 (GWP equal to 3) ecological gas. The basic version of the cooling circuit includes: 4-way cycle reversing valve, electronic expansion valve, liquid separator, liquid receiver, safety device (high-pressure switch), pressure transducers to carefully measure evaporation and condensing pressure, dehydrating filter to prevent clogging of the lamination valve, liquid flow indicator and presence of moisture. The suction line is thermally insulated with flexible, closed-cell elastomeric foam.
A pressure test is performed to detect any potential leakage and the unit is supplied already charged with the optimal amount of gas for proper functioning.



Legend					
INVC	1 / 2	VARIABLE SPEED COMPRESSOR	SG	1	MOISTURE INDICATOR
CO/EV	1 / 2	SOURCE-SIDE CONDENSER/EVAPORATOR	CV		NON-RETURN VALVE
EV/CO	1	USER-SIDE EVAPORATOR/CONDENSER	TRH	1	HIGH PRESSURE TRANSDUCER
LR	1	LIQUID RECEIVER	TRL	1	LOW PRESSURE TRANSDUCER
SL	1	LIQUID SEPARATOR	PSH		HIGH-PRESSURE SWITCH
EEV	1	ELECTRONIC EXPANSION VALVE	KAS	1	PLATE EXCHANGER ANTIFREEZE HEATER
SV		FILLING CONNECTION	TE SD	1	SUCTION LINE TEMPERATURE PROBE
F	1	FILTER DRIER	TE DT	1 / 2	COMPRESSOR DISCHARGE TEMPERATURE PROBE
HC	1 / 2	CRANKCASE HEATER	TE EXT	1	OUTDOOR AIR TEMPERATURE PROBE
MAF	1	AXIAL FAN	P		PUMP
RD		DISCHARGE LINE	DV		DRAIN TAP
RD/RS		DISCHARGE/SUCTION LINE	TE IN	1	USER INPUT TEMPERATURE PROBE
RL		LIQUID LINE	TE OUT	1	USER OUTLET TEMPERATURE PROBE
RS		SUCTION LINE	AV		AUTOMATIC AIR VENT VALVE
RS/RD		SUCTION/DISCHARGE LINE	RV		SAFETY VALVE
ROL		OIL EQUALISATION LINE	FC	1	FLOW SWITCH
TH	1 / 2	SAFETY THERMOSTAT	W-IN		USER RETURN
YOL	1	OIL LINE EQUALISATION SOLENOID	W-OUT		USER SENDING
Y4W	1	4-WAY CYCLE REVERSING VALVE			
_ _ _	OPTIONAL ON-BOARD ACCESSORY		_____		INSULATED PIPES

1.7 ELECTRICAL PANEL

Completely manufactured and wired in accordance with EN 60204-1:2018.

The power section includes:

- Main swich with door lock;
- Isolation transformer for control power supply;
- Thermal protection fuses for compressor driver, EC fan and Inverter pump (where present);
- Automatic switch for compressor protection (optional);
- Driver for modulating compressor control;
- Phase sequence control relays;
- Phase sequence control relay with minimum/maximum voltage setting (optional);

- Safety sensor control circuit

1.8 CONTROL SYSTEM

The control section includes:

- Interface terminal with alphanumeric display;
- Display function for set values, analogue inputs, fault codes, alarm history and parameter index;
- Key on/off and alarm reset;
- Key combinations to force defrost and force pump to maximum speed;
- Management of unit start-up from local or remote;
- ModBus connectivity (optional);
- BMS connectivity via converter (ModBus/Bacnet/Knx/Lonworks /Bacnet/Knx/Lonworks (optional)).
- Alarm signalling LED for R290 gas leakage.

1.9 CONTROL AND PROTECTION DEVICES

All units are equipped as standard with the following control and protection devices: inlet water temperature probe installed on the water return pipe from the system, outlet water temperature probe that also functions as an anti-freeze probe installed on the water supply pipe to the system, high pressure transducer, low pressure transducer, compressor suction and discharge temperature probes, compressor thermal protection, fan thermal protection, flow switch on the water side to protect the evaporator, high pressure switch.

1.10 HYDRAULIC CIRCUIT

The units in the series are supplied with a built-in hydraulic circuit that includes: plate heat exchanger, protection flow switch, safety valve (6 bar) to be connected to a collection system and manual air vent valve. Further layouts for the hydronic circuit are available and described in the next chapter.

2. DESCRIPTION OF VERSIONS AND ACCESSORIES

2.1 VERSIONS

The versions available for reverse cycle heat pumps are:

- SHP290 - Reverse cycle heat pump

The unit code consists of the following elements:

- 7 fixed digits.
- The symbol # as separator.
- 13 variable digits (fields) identifying the sizes, power supply and factory mounted accessories.
- 2 variable digits (MC field) which identify the i-290 series in any customisations.

0112322#(RV)(CT1)(CI1)(KS)(KA)(SIL)(EL3)(TR)(RP)(MB)(AC1)(MC)

Order code	0112322#	SHP290
Configuration	57	Reversible heat pump
Size	43	40 kW
	30	50 kW
Hydronic configration	0	-
	5	Pump version (modulated with Inverter) (PSI)
	6	Pump version (on off) (PS)
	8	Pump EC version (PSEC)
Tank	0	-
	2	Integrated technical storage (SI) *
Antifreeze kit	0	-
	5	Heat exchanger and pump resistance (if present) (KA1)
Muffling	0	-
	1	Silenced (SL)
	2	Super-silenced (SSL)
Electrical accessories	0	-
	2	Circuit breakers (IM)
Heat exchanger treatment	0	-
	8	With Silverline treatment (TR2)
Protection grids	0	-
	1	With protection grids (RP)
	2	Packaging with wooden cage (GL)
	3	Battery protection grids (RP) and packaging with wooden cage (GL)
Modbus connectivity	0	-
	1	Modbus connectivity (CM)
-	0	-
-	01	-

* Not valid option if no hydronic configuration is chosen (-PS/-PSI/-PSEC).

2.2 ACOUSTIC CONFIGURATION

It is possible to choose an acoustic configuration from the following:

- -SL Silenced version.

The silenced unit (with SL accessory) has an innovative thermo-acoustic insulation on the compressors. This insulation allows a noise reduction of up to 10% at certain compressor rotation frequencies.

- -SSL Super-silenced version.

The super-silenced unit (equipped with SSL accessory) includes, in addition to the thermo-acoustic cover on the compressors, a special fan with diffuser. This component increases the efficiency of the fan by reducing its speed, lowering the sound pressure and energy consumption. This saves substantial amounts of electricity for each fan.

2.3 HYDRONIC KIT

It is possible to combine the heat pump with one of the following hydronic kits:

- -PS - Reversible heat pump with fixed speed pump.
- -PSI - Reversible heat pump with pump controlled by an external inverter installed in the electrical panel.
- -PSEC - Reversible heat pump with pump equipped with integrated frequency converter.
- **-SI - Reversible heat pump with choice of hydronic kit (-PS/-PSI/-PSEC) and integrated tank. In this version the unit is extended to accommodate the storage tank and expansion vessel.

Hydronic kit characteristics		
Tank volume	l	400
Expansion vessel volume	l	24

2.4 LIST OF ACCESSORIES

Available accessories are indicated below:

Version Reversible heat pump				
Description	**Accessory**	**Standard**	**Factory fitted**	**Supplied loose/ activable after delivery**
Contact for DHW management with 3-way diverter valve with consent for heating element of valve motor (for operation below 0°C)	•	•	•	

Version Reversible heat pump				
Description	**Accessory**	**Standard**	**Factory fitted**	**Supplied loose/ activable after delivery**
Remote on/off contact	•	•	•	
Summer/winter collection	•	•	•	
Dynamic set-point	•	•	•	
Liquid indicator	•	•	•	
Flow switch	•	•	•	
Water side safety valve	•	•	•	
Water side drain tap	•	•	•	
Fan silent mode	•	•	•	
Enabling maximum Hz (*)	•		•	•
Enabling minimum Hz (*)		•	•	
Electronic lamination valve		•	•	
Connection for sensor alarm/fault/warm-up signalling	•	•	•	
DSFR - Three-phase relays for maximum and minimum voltage monitoring + phase failure/sequence	•	•	•	
IM - Magnetothermic switches on compressors	•		•	
KA1 - Antifreeze heater on: exchanger and pump (when present)	•		•	
CM - Ready for BMS connectivity via ModBus protocol	•		•	•
TR2 - Cu/Al battery with Silver Line treatment	•		•	
RP - Battery protection grid	•		•	•
SAS - Remote probe	•			•
Hi-TV415 - Remote display Touch screen	•			•
e-LITE - Remote control	•			•
USB/RS485 Serial Converter (ISK)	•			•
Local LAN/WiFi Converter (LNC)	•			•
OpenVPN LAN/Wifi 3G Remote Converter (OVPN)	•			•
AG - Rubber vibration dampers	•			•
VDIS4 - Three-way diverter valve for DHW production	•			•
FY - Y-filter	•			•
RV - Grooved connection joint	•			•
GI3 - External plant management module	•			•
FD - Defangator	•			•
DA - Deaerator	•			•
GL - Wooden cage packing	•		•	

(*) Functions that can be activated alternatively.

2.5 DESCRIPTION OF ACCESSORIES

2.5.1 Factory-fitted accessories

DSFR - Three-phase relays for maximum and minimum voltage monitoring + phase failure/sequence

Indicates the presence of all three phases in the correct sequence and if all three phase-to-phase voltages are within the set limits. The maximum and minimum voltage thresholds can be set separately.

Fan silent mode

Digital input that can be activated by an external contact to reduce the sound power level by acting on the ventilation. The mode is particularly suitable during night operation. Below are the decreases in capacity and sound power level when the "fan silent mode" function is active.
The reduction refers to the test condition (3) of the technical data tables; the value is determined on the basis of measurements carried out in accordance with UNI EN ISO 9614-1, in compliance with the requirements of Eurovent certification.

Model SHP290	Yeld reduction factor [-] A7W35	Sound power level reduction [dB(A)]
40 kW	0,99	-1
50 kW	0,99	-1

IM - Magnetothermal switches on compressors

Overcurrent circuit breakers applied to compressors, protect components from failures caused by current peaks.

KA1 - Antifreeze heater on: heat exchanger and pump

Electrical resistance located on the front face of the plate heat exchanger, which is activated when the temperature of the water inside the exchanger drops below +4°C.
If the hydronic kit chosen includes a pump, this component will also be equipped with a resistor to protect it from freezing.

CM - Ready for BMS connectivity via ModBus protocol

Accessory allowing connection of the unit to external controllers via serial cable with RS-485 electrical standard and ModBus RTU protocol.

TR2 - Cu/Al battery with Silver line superficial treatment

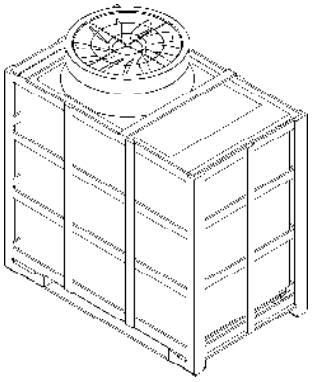
Finned pack heat exchanger with copper tubes and aluminium fins, treated with a special polyurethane-based paint for corrosion protection. The treatment makes the coil flexible to resist thermal expansion and contraction, mechanically resistant, UV protected and dirt repellent. The treatment guarantees protection of the batteries in practically all environmental conditions: from marine to rural environments, from industrial to urban areas.
For specific cleaning instructions for batteries treated in this way, please refer to the chapter in the user-installer manual entitled "Cleaning of finned batteries treated with the corrosion protection method".
The treatment resists 6000 h according to ASTM B117.

RP - Battery protection grid

Grids protecting the finned coils. The grids serve to protect the heat exchanger from accidental contact. They are especially recommended in places where people or animals could damage or be damaged by the finned exchanger. The accessory can be installed also separately.

GL - Packaging with wooden cage

Special packaging consisting of a wooden cage to protect the unit during transport. Opcional, it is recommended when travelling long distances (for example of shipping in container) or when the unit is stored in a wharehouse where it could be subject to accidental damage. The laths that compose the structure comply with ISPM15 standard.



Minimum Hz function

Activating this function by the procedure described in the controller manual, the unit will reduce the absorbed power by about 10% compared to the nominal reference value; there will therefore also be a reduction in capacity of the unit.

2.5.2 Accessories supplied separately

SAS - Domestic hot water / system remote probe

In some system solutions (e.g.: heat pump in parallel with the boiler on the same hydronic circuit and exclusion diverter valve) it may be necessary to enable a system temperature probe so that the on-board controller can process it correctly. The remote plant temperature probe only thermoregulates the heat pump during the compressor start-up phase; shutdown is managed by the probe on the heat pump flow.

Hi-TV415 - Remote display Touch screen

Touch screen remote control for centralised management of a chiller/heat pump network, it integrates humidity and temperature sensors for thermo-hygrometric analysis of the environment and management of the double set point for underfloor radiant systems using a dehumidification system.

e-LITE - Remote control

ModBus remote control with negative LCD and capacitive keys. The device is to be used as a remote machine keyboard with local temperature detection, replicating the functionality of the on-board control.

ISK - Serial converter USB/RS485

Interface device capable of reading and writing control registers via the RS485 standard and converting it to a USB port that can be connected to any supervisory system.

AG - Rubber antivibration

Are designed to prevent the transmission of vibrations to the structure; they are to be mounted under the unit in special holes.

VDIS4 - Three-way diverter valve for DHW production

Valve that diverts the flow of water produced by the heat pump, between the system and a technical tank for the production of domestic hot water. Model with 3-way motorised ball DN (1"1/2) Kvs 28, complete with servocontrol, insulation shell and spacer to guarantee operation even with glycol water. The power cable from the servomotor is 1 metre long.

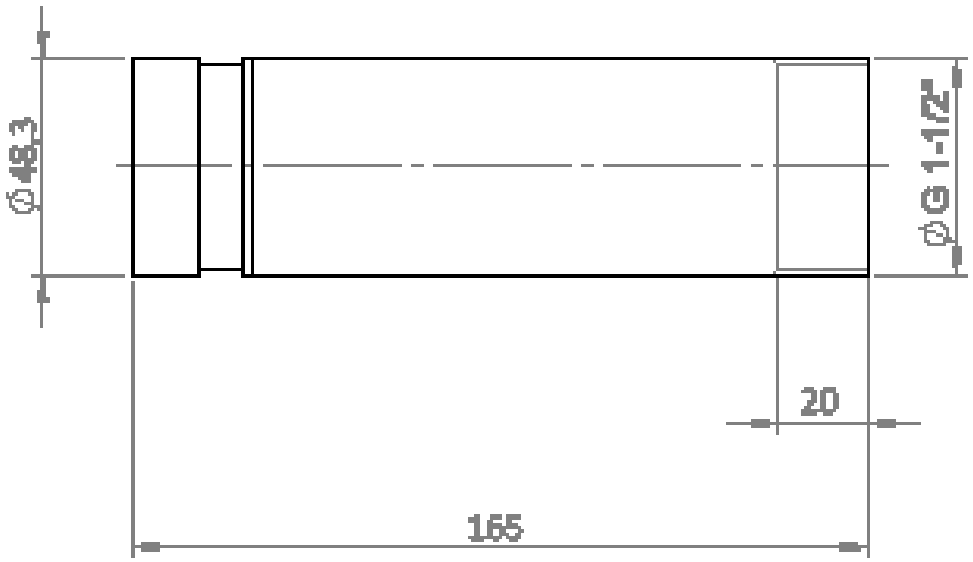
CAUTION: Install the valve outside the danger and safety zones indicated in Chapter 3.3.

FY - Y-filter

It contains an AISI 304 stainless steel mesh sieve (500 µm filtration - PN20) that collects solids in the water. Filtration prevents clogging and/or damage to devices installed downstream of the filter. The kit consists of a 2" female threaded brass Y-filter, adapter piece between machine and grooved connector.

Grooved connection joint

In order to facilitate the installation of the system, a carbon steel piping stub is supplied with a grooved connection on one side, compatible with the one on the unit and equipped with a suitable hook for making the connection, and a G 1" 1/2 M threaded connection on the other. The kit consists of 2 nozzles and 2 grooved connections to connect the nozzles to the unit.



GI3 - External plant management module

Enables management of the following functions:

- Recirculation circulator management.
- Plant-side mixing valve management.
- Solar thermal integration management.

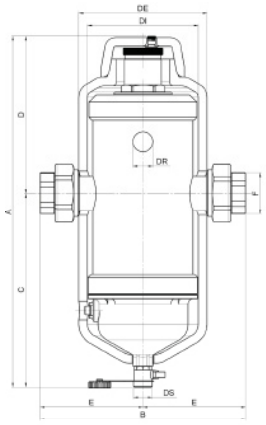
SPS - Solar panel probe for GI3

Probe required to measure the temperature of solar panels if the unit is integrated with a solar thermal system.

FD - Defangator / DA - Deaerator

Use as a defangator (installation in the return pipework, before the heat pump inlet): it allows the heavier impurities present in the hydraulic circuit to be blocked and retained, which are captured by a synthetic filtering network and collected in a settling chamber. A magnetic device placed inside the body of the defangator also allows ferromagnetic particles to be intercepted.
Use as a deaerator (installation in the delivery line to the system): a component that allows for the continuous capture and expulsion of air and any other gases dissolved in the water of the hydraulic circuit. The removal efficiency of this device is very high, making it possible to eliminate non-condensable gases present in the circuits down to the level of micro-bubbles.

Technical specifications	
Material	Painted steel / stainless steel AISI 304 (filter) / brass
Application fluid	Water, water with glycol
Maximum glycol percentage	50 %
Maximum operating pressure	10 bar
Maximum discharge pressure	10 bar
Maximum operating temperature	0 ÷ 110 °C
Connections	Threaded F 2"
Magnetic induction	4 x 1 T (4 x 10000 gauss)
Kvs	66



Dimensions [mm]	
DN	50
A	490
B	315
C	270
D	220
E	157,5
F	72
DE	178
DI	154
DS	G 3/4"
DR	G 1/2"
Weight [kg]	13,2

2.6 SAFETY RULES FOR R290 UNITS TRANSPORT AND STORAGE

Before opening the unit's packaging, ensure there are no gas leaks in the ambient with an appropriate gas detector. Check that there are no ignition sources near the unit.
No smoking near the unit.
Transport and storage must be performed in accordance with the national regulations in force. Specifically, according to ADR provisions, the total maximum quantity by transport unit in terms of net mass for flammable gases is 333 kg. In addition, for road transport, use vehicles that are preferably open or equipped with a ventilation system and operated by trained personnel.
For prerequisites on the transport by sea of equipment loaded with flammable refrigerant refer to the International Maritime Dangerous Goods Code (IMDG), and for transport by air check the regulations prescribed by the International Air Transport Organisation (IATA).
If it is necessary to store the unit for medium to long periods, please observe the following precautions:

- if storage is in a closed location, leave the machine in a dedicated place that is always dry, cool, well ventilated and protected from possible ignition sources, direct sunlight or other heat sources. It is also recommended to use one flammable gas detection sensor every 36-40 m2. Please refer to national regulations;
- if storage is carried out in an open area, observe the minimum safety distances from drains, cisterns, sewers and other underground areas, in compliance with the national regulations in force;
- do not remove covers and packaging;
- ensure that all panels are correctly mounted;
- do not obstruct the openings and holes made in the machine panels;
- avoid cleaning the unit with aggressive detergents or chemicals;
- it is advisable to remove any heating water inside the unit to prevent possible corrosion or, in cold climates, damage to components caused by freezing.

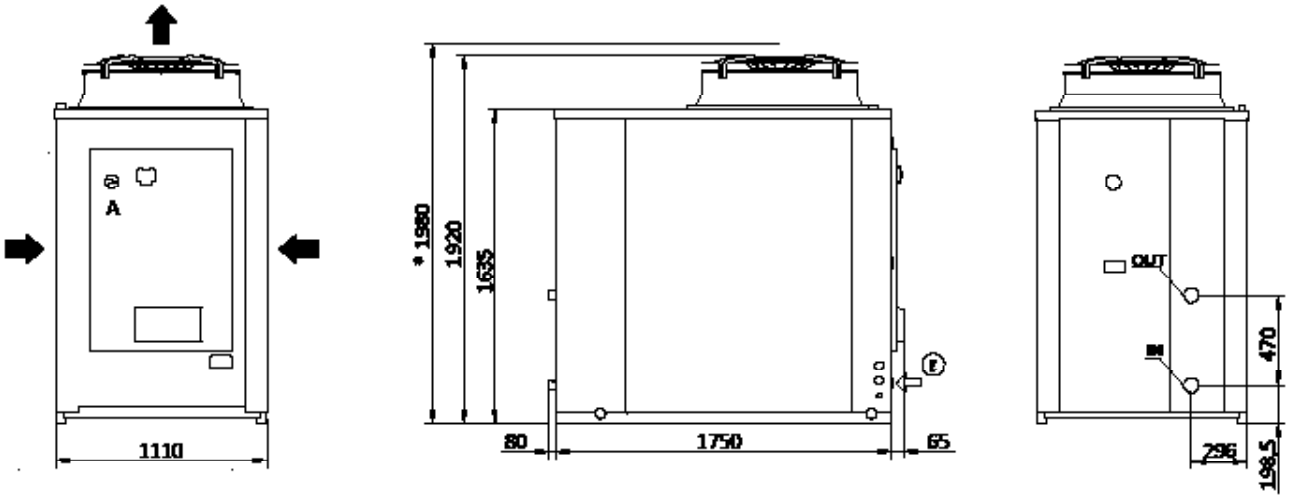
CAUTION: During transport and storage of the unit, beware of possible refrigerant gas leaks that could start a fire.

3. INSTALLATION

3.1 UNIT DIMENSIONS, HYDRAULIC CONNECTIONS, WEIGHTS AND CENTRE OF GRAVITY POSITION

3.1.1 Net dimensions and with packaging

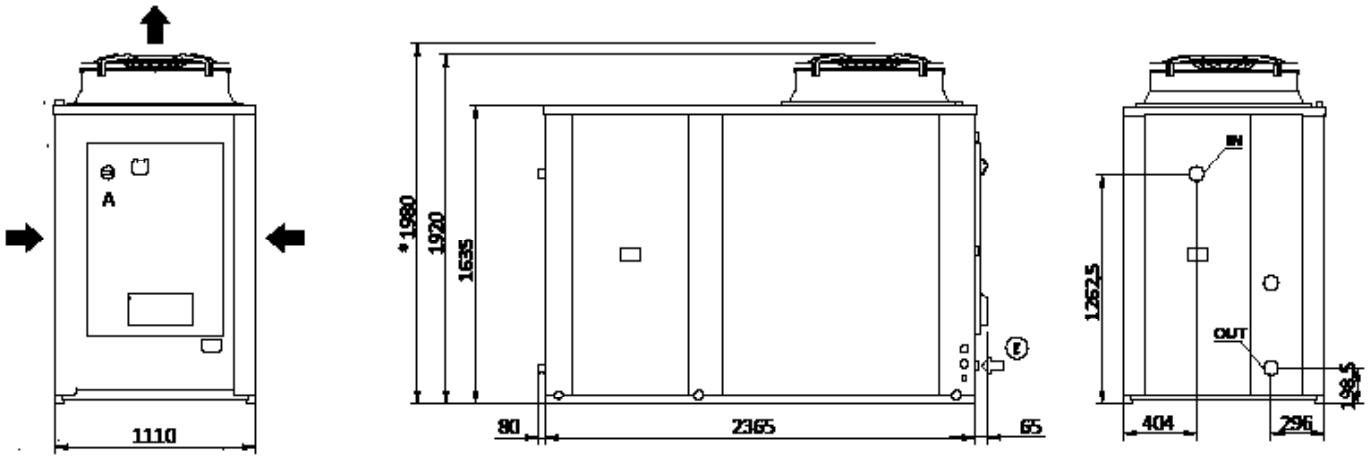
3.1.2 Standard version



Dimensions		
A - Lenght	mm	1895
B - Depth	mm	1110
C - Height	mm	1920
C - Height -SSL version	mm	1980
IN / OUT	inch	1" 1/2 Grooved
E	-	Power supply input

Dimensions with packaging		
A - Lenght	mm	1895
B - Depht	mm	1110
C - Height	mm	2040
C - Height -SSL version	mm	2100

3.1.3 Version with tank kit



Dimensions		
A - Lenght	mm	2510
B - Depth	mm	1110
C - Height	mm	1920
C - Height -SSL version	mm	1980

Dimensions		
IN / OUT	inch	1" 1/2 Grooved
E	-	Power supply input

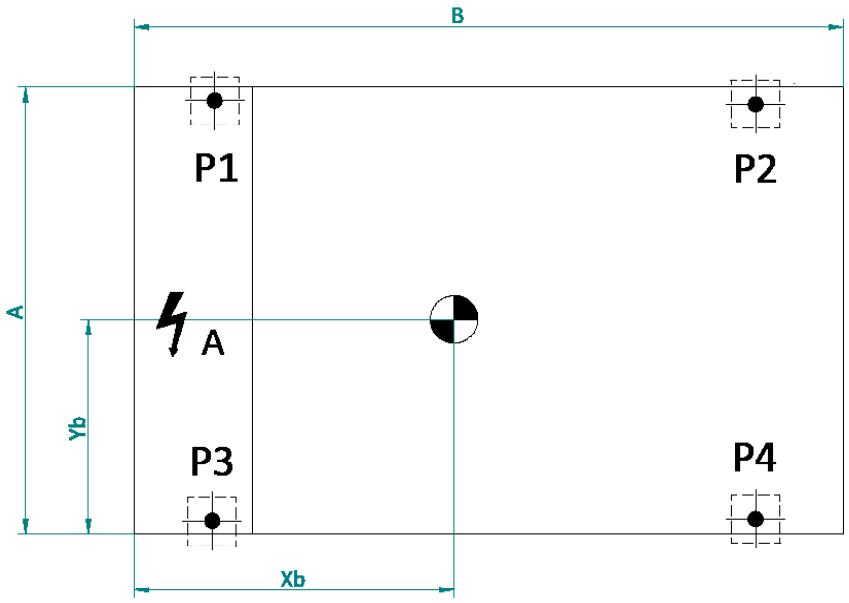
Dimensions with packaging		
A - Lenght	mm	2510
B - Depht	mm	1110
C - Height	mm	2040
C - Height -SSL version	mm	2100

3.1.4 Weights

Version	Models	SHP290 40 kW	SHP290 50 kW
Standard	Shipping weight [kg]	510	525
	Operating weight [kg]	515	530
With pump kit	Shipping weight [kg]	535	550
	Operating weight [kg]	542	557
With pump and tank	Shipping weight [kg]	655	670
	Operating weight [kg]	1090	1105

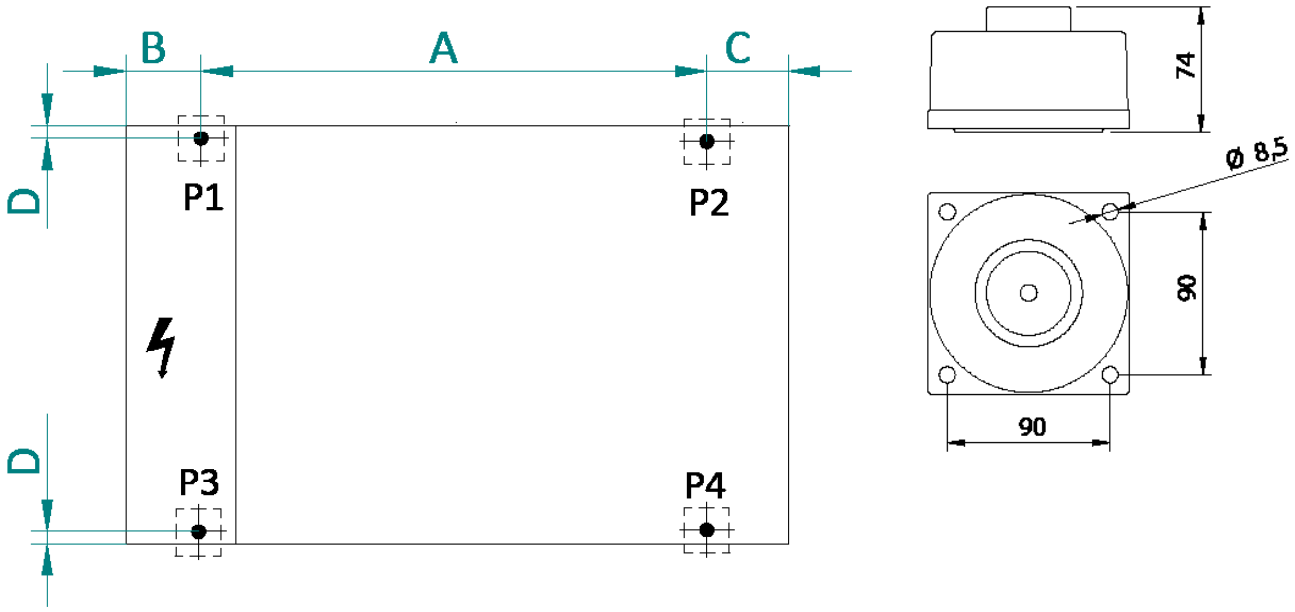
3.1.5 Location of the centre of gravity and vibrations dampers

The position of the centre of gravity of each machine is shown in the tables, with reference to the dimensions shown in the image. A distinction is made between a standard version and a machine with a tank (extended version).



Models	Version	A [mm]	B [mm]	Xb [mm]	Yb [mm]
SHP290 40 kW	Standard	1110	1754	652	517
	With tank kit	1110	2365	970	540
SHP290 50 kW	Standard	1110	1754	665	520
	With tank kit	1110	2365	963	540

The positions envisaged for the installation of vibration dampers for each type of machine are shown in the images below.



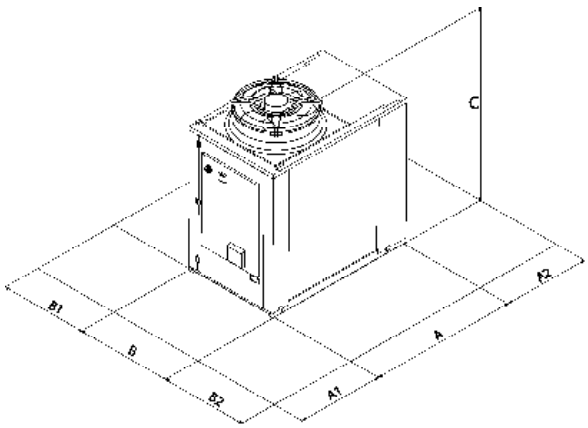
Models	Version	A [mm]	B [mm]	C [mm]	D [mm]
SHP290 40 kW / 50 kW	Standard	1410	105	235	32
	Hydronic kit with tank	2180	105	80	32

3.2 TECHNICAL SERVICE AREAS

All models in the series are designed and constructed for outdoor installation.
It is good practice to create a support slab of adequate size for the unit. The units transmit a low level of vibration to the ground: it is nevertheless advisable to place anti-vibration mounts between the base frame and the support surface.

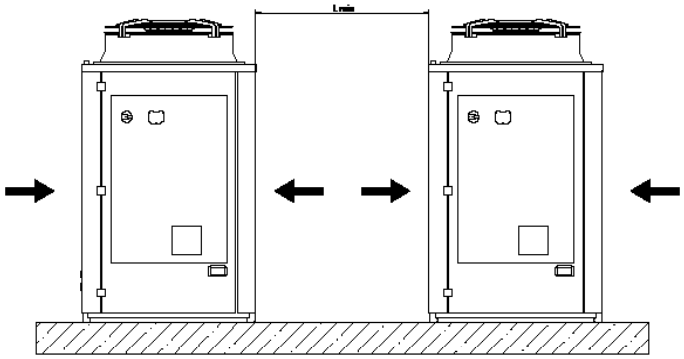
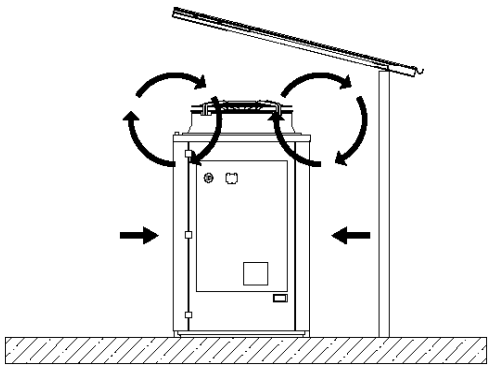
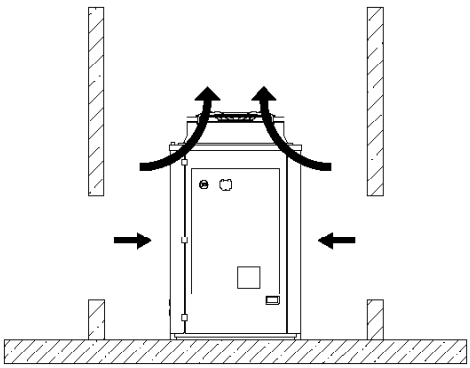
	**Suspended installation is prohibited.**
	**The support surface must have a sufficient capacity to support the weight of the unit, which can be seen on the technical label affixed to the machine and in the specific chapter of this manual. The support surface must not be inclined to ensure correct operation of the unit and to prevent it from tipping over. The installation surface of the unit must not be smooth, to avoid the deposit of water/ice, potential sources of danger.**
	**The installation site of the unit must be free from foliage, dust, etc., which could block or cover the heat exchange coils. Installation should be avoided in areas subject to stagnant or falling water, for example from gutters. Also avoid locations subject to snow accumulation (such as corners of buildings with sloping roofs). When installing in areas subject to snowfall, mount the unit on a base 20 to 30 cm above the ground to prevent snow from accumulating around the unit.**
	**It is recommended to ensure sufficient air exchange to dilute the R290 gas in case of accidental leakage, thus avoiding the formation of explosive atmospheres. For this reason, a minimum distance of 1 metre must be maintained from openings or wells, where the gas could accumulate.**
	**Do not install the unit under any type of cover,such as roofs, canopies, install the unit under cover of anything type as roofs,shelters and similar.**

It is very important to avoid recirculation phenomena between suction and delivery, otherwise the performance of the unit will deteriorate or even interrupt normal operation.
In this respect it is absolutely necessary to guarantee the minimum service spaces indicated below.



Model		A1	A2	B1	B2
SHP290 40 kW / 50 kW	mm	1200	1000	1500	1500

For installations in locations with strong winds refer to the area classification according to the Beaufort scale. If the value is ≥ 7 (strong wind, average wind speed = 13.9-17.1 m/s) it is strictly necessary to keep the fan powered at all times, in order to prevent its involuntary rotation.

In the event of side-by-side units, the minimum L_{min} dsitance between them is 2,2 m.	
Covering with canopies or positioning near plants or walls should be avoided in order to prevent air circulation.	
In the case of winds with speeds in excess of 13.9-17.1 m/s (strong winds according to the Beaufort scale), the use of windbreaks is recommended.	

It is always advisable to make an environmental impact assessment based on the power and sound pressure data given in the technical data chapter and the sound emission limits based on the installation area of the unit, with reference to the DPCM of 14/11/1997. An assessment must also be made if the unit is installed in the vicinity of workers, according to D. LGS. 81/2008 Art. 189 and following.

3.3 DANGER AND SAFETY ZONES

The SHP290 series units contain R290 refrigerant gas. The density of this gas is greater than that of air, so in the event of leakage it tends to

disperse and stratify, accumulating in niches, depressions in the ground or underground regions.
It is mandatory to comply with the danger and safety zones given in this manual, when installing the units. These zones have been designed in accordance with EN 60079-10-1, using the refrigerant loss rate given in EN 378-2 Annex I, in order to guarantee the safety of the units in the installation area. A **danger zone** is defined as a area around the machine in which, in the event of a leakage of refrigerant gas, a flammable atmosphere is formed for a short time, within which it is necessary to implement all the precautions described in the manual. In the absence of specific standards or regulations, when using the unit in an industrial or working environment, it is advisable to carry out the classification of places with explosion hazards considering the ATEX Directive 1999/92 (Directive 89/391). There must NOT be any sources of ignition in the danger zones, including:

- Flammable gases and sprays, self-igniting powders;
- Electrical equipment that is not suitable for use in potentially explosive areas (zone 2 according to Directive 89/391);
- Naked flames, heated surfaces (maximum surface temperature of 360°C) and processing by heat; smoking is prohibited, including for electronic cigarettes;
- Sparks, electrostatic charges, direct and indirect lightning effects, eddy currents and cathodic protection;
- Ignition sources due to remote processes (ionising and non-ionising radiation);
- Permanent electrical sources (switches, lamps, etc.) or other possible triggers;

In addition, danger zone must NOT:

- Include potentially dangerous areas or elements such as wells, manholes, openings to the sewage system and other openings to underground places and premises (e.g. garages), river drains, power lines, flammable deposits, electrical installations, etc.;
- Include doors, windows or glass panes, to prevent the possible return of the gas inside the building;
- Extending towards neighbouring residential properties, parking areas, public access sites, roads or railways.

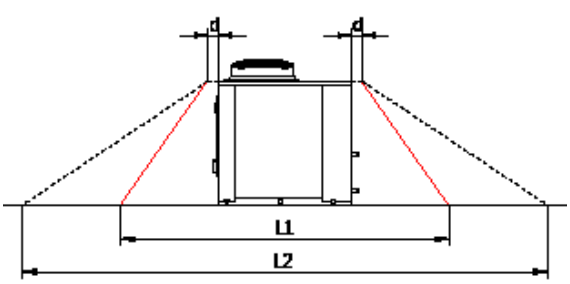
A **safety zone** extending beyond the danger zone must also be identified. Within the safety zone, in the event of a refrigerant leak, the concentration of the gas in the air is typically below the critical levels for the formation of flammable or hazardous atmospheres. Compliance with the following provisions remains mandatory:

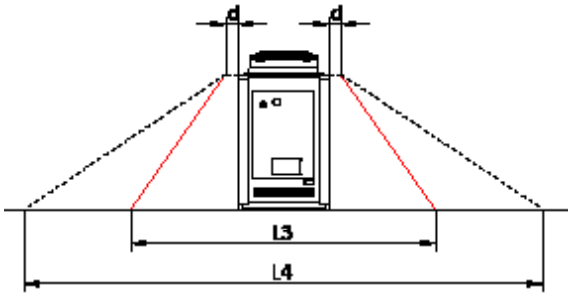
- Prevent accumulation and stagnation in underground spaces, drains, manholes, cellars, etc.;
- Do not place building vents inside or near the safety zone;
- Do not use naked flames and other direct heat sources.

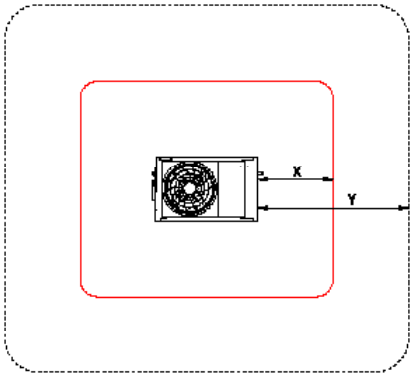
In any case, comply with national and local regulations for the installation of machinery (where applicable) in order to prevent the formation of fire hazards and to prevent gases from seeping underground into openings to the ground or floors below.
No structural modifications may be made in the danger and safety zones that would alter their extent or change the behaviour of the air-coolant mixture.
It is also strictly forbidden to tamper with, alter, remove or compromise, even partially, the functionality of the devices, guards and prescriptions provided for the safety of property and persons.
In this manual, different types of outdoor installation are considered, as indicated in the following paragraphs.

3.3.1 Free-field ground installation

For unit installed in open field terrain, the danger (continuos red line) and safety zones (dashed black line) are shown in the figures below:



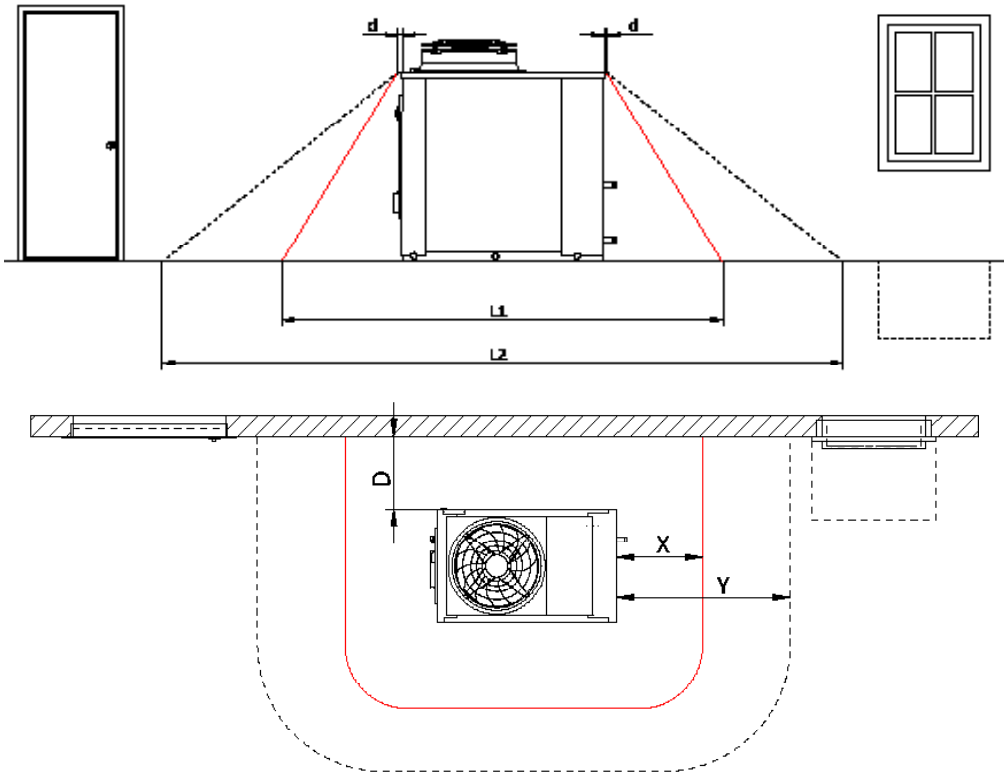




MODEL SHP290		X	Y	L1	L2	L3	L4	d
SHP290 40 kW	mm	1500	3000	4850	7850	4110	7110	250
SHP290 50 kW	mm	1500	3000	4850	7850	4110	7110	250

3.3.2 Ground installation in front of a wall

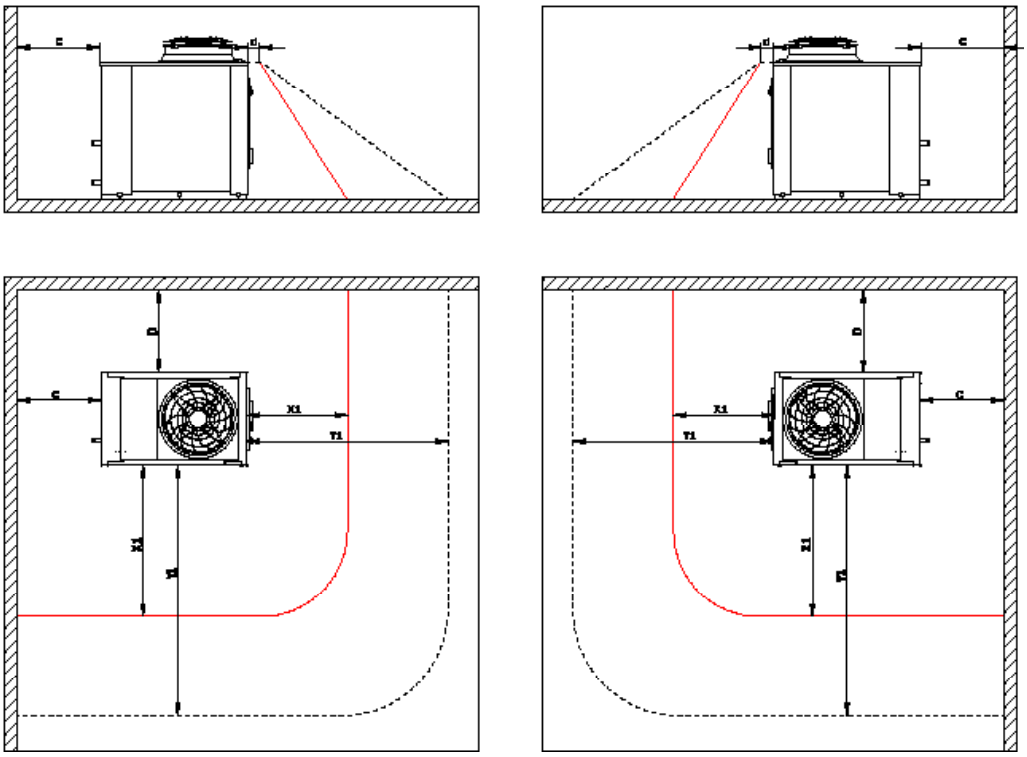
In the case of units installed on the ground in front of a wall, the danger (continuous red line) and safety zones (dashed black line) are shown in the figures below:



MODEL SHP290		X	Y	L1	L2	B1	d
SHP290 40 kW	mm	1500	3000	4850	7850	1500	250
SHP290 50 kW	mm	1500	3000	4850	7850	1500	250

3.3.3 Ground installation in a corner

For units installed on ground in a corner, the danger (continuous red line) and safety zones (dashed black line) are shown in the figures below:



MODEL SHP290		X1	Y1	C	D	d
SHP290 40 kW	mm	2750	4250	1000	1500	250
SHP290 50 kW	mm	2750	4250	1000	1500	250

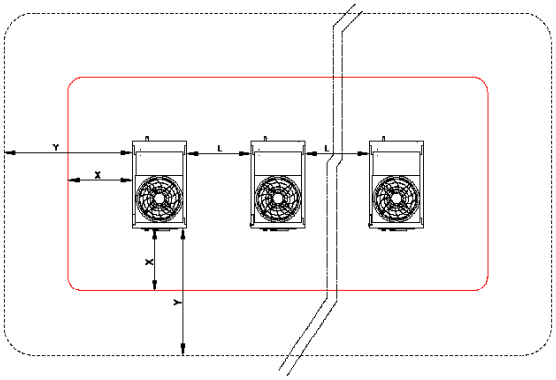
3.3.4 Flat floor installation

The installation configuration on a flat roof is similar to that on a free-field ground, although some additional aspects must be considered:

- place the machine at a sufficient distance from side walls and protrusions, which must therefore be beyond the safety zone;
- ensure that the roof structure of the building is solid;
- choose a location where no accumulations of snow, dust or foliage can form;
- pay attention to noise emissions and maintain an adequate distance from surrounding buildings;
- if high air velocities are detected, install the protections listed in the previous chapter.

3.3.5 Multiple installation

When installing several machines side by side, follow the above configurations, maintaining a respect distance of L between each machine.
As an example, see the following respect zones (danger and safety) for the case of a generic number "n" of units installed on open field terrain



MODEL SHP290		X	Y	L
SHP290 40 kW	mm	1500	3000	2200
SHP290 50 kW	mm	1500	3000	2200

For other types of installation not covered in this manual, contact technical support. If in doubt about the installation of the units, request a technical assessment by the fire brigade or a fire prevention expert.

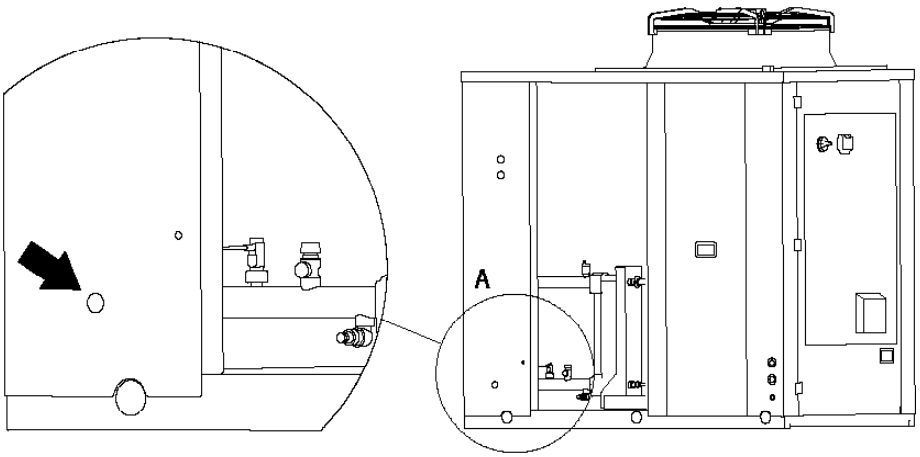
3.4 HYDRAULIC CIRCUIT

The plumbing connections must be made in accordance with national and/or local regulations; pipes can be made of steel, galvanised steel, multilayer steel or PVC. Pipes must be accurately sized according to the maximum water flow rate of the unit and the pressure drops of the water circuit. All pipes must be insulated with closed-cell material of adequate thickness. The chiller must be connected to the pipes using new flexible joints, not reused ones. The water circuit should include the following components.

- Well thermometers to monitor the circuit's temperature.
- Manual gate valves to isolate the chiller from the water circuit.
- Metal Y filter or a dirt separator (installed on the return pipe) with metal mesh no larger than 1 mm. (mandatory to maintain the validity of the guarantee).
- Loading group and exhaust valve where necessary.

	**CAUTION: When dimensioning the pipes, make sure that the maximum system-side leakage is not exceeded as shown in the technical data table in chapter 4 (see useful head).**
	**CAUTION: Connect the pipes to the connections, always using the key-to-wrench system.**
	**CAUTION: Create a suitable outlet for the safety valve.**
	**CAUTION: the expansion vessel, if present on the unit (check hydraulic diagram), has a limited capacity. it is the installer's responsibility to check that the expansion vessel is adequate for the actual capacity of the system, otherwise an additional expansion vessel must be provided.**
	**WARNING: The return pipe from the system must be at the "WATER INPUT" label, otherwise the evaporator may freeze.**
	**CAUTION: It is obligatory to install a metal filter (with a mesh size of no more than 1 mm) on the return pipe from the installation labelled "WATER INPUT". Alternatively, it is possible to install a defangator that guarantees a filtration degree of no more than 1 mm; in this case, it is no longer necessary to install the Y-filter. If the metal filter or the defangator are not present on the installation, the warranty will be immediately void. The filter (or the defangator) must be kept clean, so make sure they are still clean after the unit is installed and check them periodically.**
	**All units leave the factory with a flow switch (factory installed). If the flow switch is tampered with or removed, or if the water filter and deflector are not present in the unit, the guarantee will be invalid. Refer to the wiring diagram enclosed with the unit for the connection of the flow switch. Never connect the flow switch connections in the terminal block.**
	**The heating system and safety valves must comply with the requirements of EN 12828.**

The unit has a hole in the side cover plate in order to provide a suitable passage for the safety valve drainage (the installation of which is the responsibility of the user).



3.4.1 System water specifications

To ensure that the unit functions properly, the water must be adequately filtered (see the beginning of this section) and the quantity of dissolved substances must be minimal. The maximum permitted values are listed below.

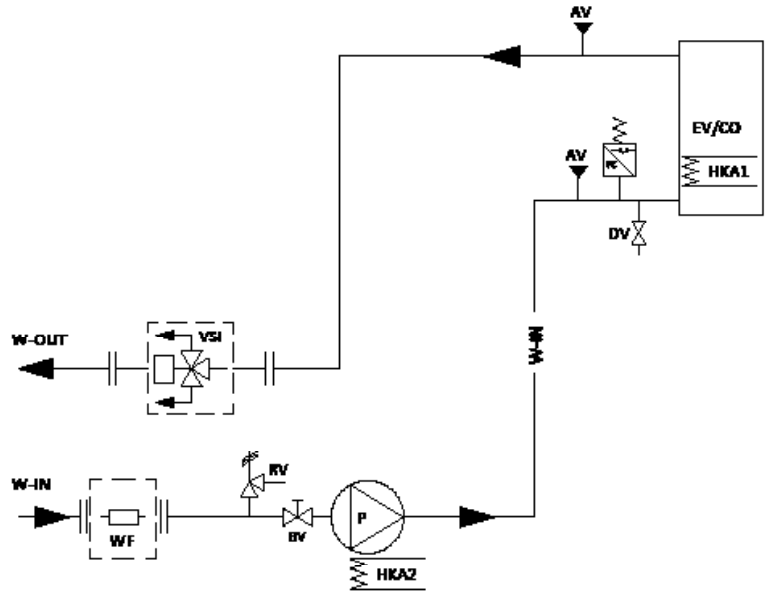
MAXIMUM PERMITTED CHEMICAL AND PHYSICAL CHARACTERISTICS OF THE SYSTEM WATER	
PH	7,5 - 9
Electrical conductivity	100 - 500 µS/cm
Total hardness	4,5 – 8,5 dH
Temperature	≤ 78 °C
Oxygen content	< 0,1 ppm
Max. quantity glycol	10 %
Phosphates (PO_4)	< 2ppm
Manganese (Mn)	< 0,05 ppm
Iron (Fe)	< 0,3 ppm
Alkalinity (HCO_3)	70 – 300 ppm
Chlorine ions (Cl-)	< 50 ppm
Sulphate ions (SO_4)	< 50 ppm
Sulphide ion (S)	No one
Ammonium ions (NH_4)	No one
Silica (SiO_2)	< 30 ppm

3.4.2 Hydraulic diagram inside the unit

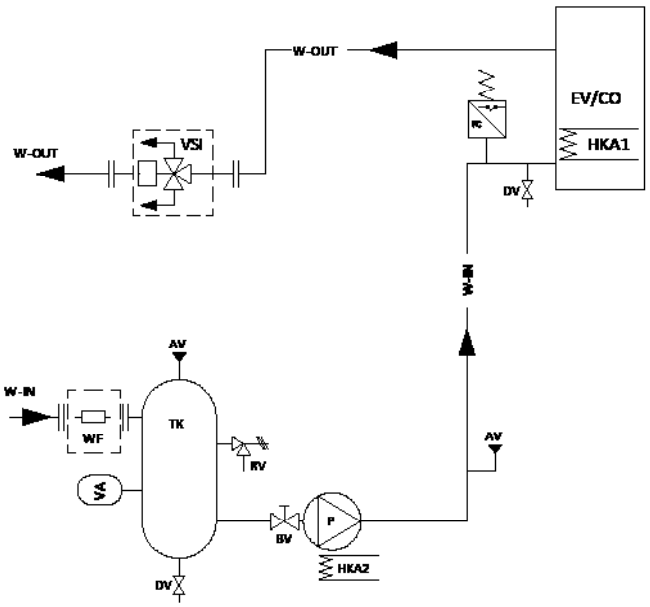
Below are the hydraulic connection diagrams to the unit for all available versions and the legend valid for all diagrams. In any case, a safety valve with an opening pressure of 6 bar is always included in each unit, regardless of the hydronic kit with which it is equipped.

Legend			
EV/CO	Plate heat exchanger	WF	Y-filter*
DV	Discharge tap	FC	Flow switch
RV	Safety valve	W-IN	Water inlet
BV	Shut-off valve	W-OUT	Water outlet
HKA1	Heat exchanger resistance*	VSI	3-way valve*
HKA2	Pump resistance*	CV	Non-return valve
HKA3	Tank antifreeze heater*	P	Pump*
VA	Expansion vessel	AV	Automatic air vent valve
*	Optional	TK	Tank*
_ _ _	Accessory supplied separately to be installed outside the unit		

STANDARD HYDRONIC CIRCUIT WITH OPTIONAL ACCESSORIES



SINGLE PUMP VERSION HYDRONIC CIRCUIT (WITH OPTIONAL TANK)



CAUTION: It is recommended to connect the safety valve vent to a suitable conveyor/discharge.
Otherwise, the discharged water could stagnate around the machine and become a danger due to slipping/falling.
The point of conveyance must be outdoors and within the danger zone defined in Chapter 3.3; or at another suitable point, bearing in mind that, in the event of a leakage of refrigerant gas, the collection zone must be treated as a danger zone (Chapter 3.3).

In the event of a leakage, refrigerant gas can escape from the unit through the holes in the base panel, so it is recommended that the condensate drain is always directed to an open place near the unit (within the danger zone defined in Chapter 3.3). If the unit is installed on the ground, it is also possible to direct the condensate into a bed of rubble or gravel for drainage.

3.4.3 Minimum water content and hydraulic circuit volumes

The table shows the recommended minimum system water content per unit. The volume of the hydraulic circuit is also indicated. If this volume is less than the recommended minimum water content, it must be ensured that the pipes connecting to the unit have sufficient capacity to compensate for this difference.
have sufficient capacity to compensate for this difference. The additional volume required is shown in the table.

Model SHP290	40 kW	50 kW
Minimum system water content [l]	365	415
Hydraulic circuit volume [l]	4,5	5,2
Hydraulic circuit volume with -PS/PSI/-PSEC [l] kit	6,5	7,0
Hydraulic circuit volume with -PS/PSI/-PSEC kit and -SI[l] tank	431	432

3.4.4 Condensate drainage system

Since the pipes are well insulated, condensation production is minimal and does not lead to water accumulating inside the refrigeration compartment. All heat pumps have a condensate drain hole in the basement, which is abundant especially in the post-defrost phase.

Caution: Do not obstruct the hole in the base panel for condensate drainage.

Especially in very cold climate regions, it is recommended to install elevation supports in order to allow ice formation under the unit without damaging it by freezing.

ATTENTION: For heat pump units, if the prepared ducting system is not used, a limited amount of water (possible ice in winter) from the condensate drainage system may be deposited in the vicinity of the unit, posing a slip/fall hazard.

In the event of a leak, the refrigerant gas may escape from the unit through the hole in the base panel, so it is advisable to always direct the condensate drain to an open place near the unit (within the danger zone defined in Chapter 3.3). If the unit is installed on the ground, it is also possible to direct the condensate into a bed of rubble or gravel for drainage.

3.4.5 System charging / Discharging

CAUTION: Supervise all charging/reintegration operations.

CAUTION: Before charging/reintegration the system, disconnect the power supply to the units.

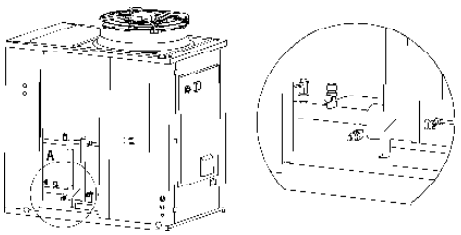
CAUTION: The charging/reintegration of the system must always take place under controlled pressure (1÷3 bar). Make sure that a pressure reducer and a safety valve have been installed on the charging/reintegration line.

CAUTION: The water in the filling/reintegration line must be pre-filtered from impurities and suspended particles. Ensure that a removable cartridge filter and a dirt separator are installed.

CAUTION: periodically check and vent the air that accumulates in the system.

CAUTION: provide an automatic air release valve at the highest point of the installation.

It is advisable to use an external tap to fill the system, which is the responsibility of the installer.
There is always a service tap in the unit to be used if it is necessary to top up/discharge the amount of water in the system or adjust the percentage of glycol.

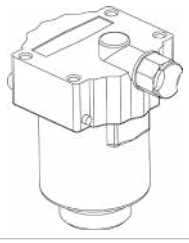


If the unit must be completely drained, first close the manual inlet and outlet shutters (not supplied) and then disconnect the pipes on the water inlet and outlet so that the liquid in the unit can drain (to make this operation easier, it is advisable to install two external drain cocks between the unit and the manual shutters on the water inlet and outlet).

If it is necessary to top up the system or adjust the glycol content, the service tap can be used.
Unscrew the cap of the service tap (A) and connect a pipe of 14 or 12 mm (inertial diameter measurements - check the tap model installed on your unit) connected to the water mains to the hose connector, then fill the system by unscrewing the ring nut (B). Once the operation is completed, tighten the ring nut (B) again and screw the cap (A). In any case, it is advisable to use an external tap to fill the system which is the responsibility of the installer.

3.4.6 Air vent valve

The unit is equipped with an air vent valve that automatically eliminates the air accumulated inside the circuit, avoiding: undesirable effects such as premature corrosion and wear, lower efficiency and reduced exchange yield.
The device also has a safety function in that, in the event of a break in the exchanger, it allows the refrigerant gas to escape into the external air, preventing it from being transported to the internal terminals.
It is possible to leave the valve in the closed position by closing the cap on the outlet; by loosening the cap the valve remains in the open position and the air is discharged automatically.



If you notice a water leak, you must replace the component by unscrewing it with a spanner, as shown in the image bellow.

4. TECHNICAL DATA

4.1 DATA SHEET

Performance referring to the following conditions, according to standard 14511:2022:

(1) Cooling: outdoor air temperature 35°C; in/out water temperature 12/7°C.
(2) Cooling: outdoor air temperature 35°C; in/out water temperature 23/18°C.
(3) Heating: outdoor air temperature 7°C b.s. 6°C b.u.; in/out water temperature 30/35°C.
(4) Heating: outdoor air temperature 7°C b.s. 6°C b.u.; in/out water temperature 47/55°C.
(5) Cooling: low temperature, variable water outlet.
(6) Heating: average climate conditions; T_{biv}=-7°C; low temperature, variable output, fixed flow.
(7) Indicative data subject to changes. For the correct value, always refer to the technical label on the unit.
(8) The volume indicated refers to the total volume required, the designer must meet it considering the quantity already present inside the unit depending on the hydronic kit chosen (please check this value in the technical data sheet).
(9) Sound power: mode (1); value determined on the basis of measurements made in accordance with standard UNI EN ISO 9614-1.
(10) Sound pressure: value calculated from the sound power level in condition (9) using EN ISO 3744:2010.
(11) Sound power: heating mode according to EN 12102:2022 Annex A; value determined on the basis of measurements made in accordance with UNI EN ISO 9614-1, in compliance with Eurovent certification.
(12) Heating: outdoor air temperature 7°C b.s. 6°C b.u.; in/out water temperature 55/65 °C.
(*) activating the maximum Hz function.

N.B. The performance data given are indicative and may be subject to variation. Furthermore, the yelds declared in points (1), (2), (3) and (4) refer to instantaneous power according to UNI EN 14511. The data declared in points (5) and (6) is determined according to UNI EN 14825:2022.

TECHNICAL CHARACTERISTICS		Unit	SHP290	
			40 kW	50 kW
Cooling	Cooling capacity (1)	kW	28,9	34,1
	Power input (1)	kW	9,20	11,0
	E.E.R. (1)	W/W	3,14	3,10
	Cooling capacity (2)	kW	34,5	37,0
	Power input (2)	kW	8,10	8,53
	E.E.R. (2)	W/W	4,26	4,34
	SEER (5)	W/W	4,86	4,80
	Water flow (1)	L/s	1,38	1,63
	Pressure drop on hydronic circuit side (1)	kPa	24	26
Heating	Heating capacity (3)	kW	40,1	50,0
	Power input (3)	kW	9,8	11,9
	C.O.P. (3)	W/W	4,10	4,20
	Heating capacity (4)	kW	38,0	47,9
	Power input (4)	kW	13,1	16,5
	C.O.P. (4)	W/W	2,90	2,90
	Heating capacity (12)	kW	38,4	45,8
	Power input (12)	kW	16,0	18,8
	C.O.P. (12)	W/W	2,40	2,44
	SCOP (6)	W/W	4,09	4,20
	Water flow (4)	L/s	1,14	1,43
	Pressure drop on hydronic circuit side (4)	kPa	20	26
	Energy efficiency - water 35°C / 55°C	Class	A++ / A++	A++ / A++
Compressor	Type		Scroll DC Inverter	
	Quantity		2	2
	Refrigerant oil (type)		PZ46M	PZ46M
	Refrigerant oil (quantity)	mL	1800	1800
	Refrigerant circuits		1	0
Refrigerant	Type		R290	
	Refrigerant quantity (7)	kg	3,15	3,50
	Refrigerant quantity in tonnes of CO2 equivalent (7)	ton	0,009	0,011
	Design pressure (high/low) heat pump mode	bar	30,3 / 1,7	
	Design pressure (high/low) chiller mode	bar	30,3 / 0,7	
External zone fans	Type		EC	
	Quantity	Quantity	1	
	Nominal power (1)	kW	0,62	0,69
	Maximum power input	kW	1,95	1,95
	Maximum curent input	A	3,3	3,3
	Nominal air flow	m³/h	17080	18490
Internal heat exchanger	Internal heat exchanger type		A piastre / BPHE	
	N° internal heat exchanger		1	1
	Water content	L	2,80	3,48
Hydronic circuit	Water content of the hydronic circuit	L	4,5	5,2
	Maximum pressure hydronic kit (safety valve setting)	bar	6	6
	Hydraulic connections	inch	1" 1/2 (DN 40)	1" 1/2 (DN 40)
	Minimum water volume (8)	L	365	415
Noise	Sound power Lw (9)	dB(A)	82	83
	Sound power level Lw configuration SL (9)	dB(A)	81	82
	Sound power level Lw configuration SSL (9)	dB(A)	80	81
	Sound pressure Lp1 (10) at 1 m	dB(A)	64/64/64	65/65/65
	Sound power level Lw (11)	dB(A)	74	75
Electrical data	Power supply		400V/3P+N+T/50Hz	
	Maximum power input	kW	23	27
	Maximum current input	A	37	44
	Max. power input with antifreeze kit	kW	23	27
	Max. current input with antifreeze kit	A	38	45

TECHNICAL CHARACTERISTICS		Unit	SHP290 -PS/PSI	
			40 kW	50 kW
Cooling	Cooling capacity (1)	kW	28,8	34,1
	Power input (1)	kW	9,29	11,0
	E.E.R. (1)	W/W	3,10	3,10
	Cooling capacity (2)	kW	34,5	37,0
	Power input (2)	kW	8,16	8,53
	E.E.R. (2)	W/W	4,23	4,34
	SEER (5)	W/W	4,89	4,81
	Water flow (1)	L/s	1,38	1,63
Heating	Heating capacity (3)	kW	40,0	50,1
	Power input (3)	kW	9,76	11,9
	C.O.P. (3)	W/W	4,10	4,21
	Heating capacity (4)	kW	38,1	47,9
	Power input (4)	kW	13,4	16,5
	C.O.P. (4)	W/W	2,84	2,90
	Heating capacity (12)	kW	38,5	45,9
	Power input (12)	kW	16,3	18,9
	C.O.P. (12)	W/W	2,36	2,43
	SCOP (6)	W/W	4,10	4,20
	Water flow (4)	L/s	1,14	1,43
	Energy efficiency - water 35°C / 55°C	Class	A++ / A++	A++ / A++
Compressor	Type		Scroll DC Inverter	
	Quantity		2	2
	Refrigerant oil (type)		PZ46M	PZ46M
	Refrigerant oil (quantity)	mL	1800	1800
	Refrigerant circuits		1	0
Refrigerant	Type		R290	
	Refrigerant quantity (7)	kg	3,15	3,50
	Refrigerant quantity in tonnes of CO2 equivalent (7)	ton	0,009	0,011
	Design pressure (high/low) heat pump mode	bar	30,3 / 1,7	
	Design pressure (high/low) chiller mode	bar	30,3 / 0,7	
External zone fans	Type		EC	
	Number		1	
	Nominal power (1)	kW	0,62	0,68
	Maximum power input	kW	1,95	1,95
	Maximum current input	A	3,3	3,3
	Nominal air flow	m³/h	16680	18020
Internal heat exchanger	Internal heat exchanger type		A piastre / BPHE	
	N° internal heat exchanger		1	1
	Water content	L	2,80	3,48
Hydraulic circuit	Useful prevalence (1) (**)	kPa	139	124
	Useful prevalence (4) (**)	kPa	153	144
	Water content of the hydronic circuit	L	6,5	7,0
	Maximum pressure hydronic kit (safety valve setting)	bar	6	6
	Hydraulic connections	inch	1" 1/2 (DN 40)	1" 1/2 (DN 40)
	Minimum water volume (8)	L	365	415
	Nominal pump power (1)	kW	0,75	0,75
	Maximum pump power input	kW	1,04	1,04
	Maximum pump current input	A	1,86	1,86
Noise	Sound power level Lw (9)	dB(A)	82	83
	Sound power level Lw configuration SL (9)	dB(A)	81	82
	Sound power level Lw configuration SSL (9)	dB(A)	80	81
	Sound pressure Lp1 (10) at 1 m	dB(A)	64/64/64	65/65/65
	Sound power level Lw (11)	dB(A)	74	75
Electrical data	Power supply		400V/3P+N+T/50Hz	
	Maximum power input	kW	23	27
	Maximum current input	A	37	44
	Max. power input with antifreeze kit	kW	23	27
	Max. current input with antifreeze kit	A	38	45

TECHNICAL CHARACTERISTICS		Unit	SHP290 -PSEC	
			40 kW	50 kW
Cooling	Cooling capacity (1)	kW	28,4	33,7
	Power input (1)	kW	9,73	11,4
	E.E.R. (1)	W/W	2,92	2,96
	Cooling capacity (2)	kW	34,0	36,6
	Power input (2)	kW	8,52	8,99
	E.E.R. (2)	W/W	3,99	4,07
	SEER (5)	W/W	4,21	4,20
	Water flow (1)	L/s	1,36	1,61
Heating	Heating capacity (3)	kW	40,4	50,1
	Power input (3)	kW	10,2	12,2
	C.O.P. (3)	W/W	3,96	4,11
	Heating capacity (4)	kW	38,4	48,3
	Power input (4)	kW	13,8	17,1
	C.O.P. (4)	W/W	2,78	2,82
	Heating capacity (12)	kW	38,9	46,2
	Power input (12)	kW	16,7	19,5
	C.O.P. (12)	W/W	2,33	2,37
	SCOP (6)	W/W	3,84	3,89
	Water flow (4)	L/s	1,15	1,44
	Energy efficiency - water 35°C / 55°C	Class	A++ / A+	A++ / A+
Compressor	Type		Scroll DC Inverter	
	Quantity		2	2
	Refrigerant oil (type)		PZ46M	PZ46M
	Refrigerant oil (quantity)	mL	1800	1800
	Refrigerant circuits		1	0
Refrigerant	Type		R290	
	Refrigerant quantity (7)	kg	3,15	3,50
	Refrigerant quantity in tonnes of CO2 equivalent (7)	ton	0,009	0,011
	Design pressure (high/low) heat pump mode	bar	30,3 / 1,7	
	Design pressure (high/low) chiller mode	bar	30,3 / 0,7	
External zone fans	Type		EC	
	Number		1	
	Nominal power (1)	kW	0,62	0,68
	Maximum power input	kW	1,95	1,95
	Maximum current input	A	3,3	3,3
	Nominal air flow	m³/h	17070	18480
Internal heat exchanger	Internal heat exchanger type		A piastre / BPHE	
	N° internal heat exchanger		1	1
	Water content	L	2,80	3,48
Hydraulic circuit	Useful prevalence (1) (**)	kPa	438	418
	Useful prevalence (4) (**)	kPa	450	438
	Water content of the hydronic circuit	L	6,5	7,0
	Maximum pressure hydronic kit (safety valve setting)	bar	6	6
	Hydraulic connections	inch	1" 1/2 (DN 40)	1" 1/2 (DN 40)
	Minimum water volume (8)	L	365	415
	Nominal pump power (1)	kW	2,20	2,20
	Maximum pump power input	kW	2,20	2,20
	Maximum pump current input	A	4,15	4,15
Noise	Sound power level Lw (9)	dB(A)	82	83
	Sound power level Lw configuration SL (9)	dB(A)	81	82
	Sound power level Lw configuration SSL (9)	dB(A)	80	81
	Sound pressure Lp1 (10) at 1 m	dB(A)	64/64/64	65/65/65
	Sound power level Lw (11)	dB(A)	74	75
Electrical data	Power supply		400V/3P+N+T/50Hz	
	Maximum power input	kW	23	27
	Maximum current input	A	37	44
	Max. power input with antifreeze kit	kW	23	27
	Max. current input with antifreeze kit	A	38	45

4.2 UNIT AND AUXILIARY ELECTRICAL DATA

Unit power supply	V/~/Hz	400/3PH+N+PE/50
On-board control circuit	V/~/Hz	12/1/50
Remote control circuit	V/~/Hz	12/1/50
Fan power supply	V/~/Hz	400/3PH+PE/50

NOTE: Electrical data is subject to change due to updating. It is therefore always necessary to refer to the technical characteristics label attached to the unit.

5. CORRECTIVE FACTORS

5.1 CORRECTION FACTORS FOR USE OF WATER-GLYCOLE MIXTURE

The correction factors for water flow rate and pressure drop must be applied to the values obtained without the use of glycol. The correction factor for water flow rate shall be calculated to maintain the same temperature difference as would be obtained without the use of glycol. The pressure drop correction factor is applied to the water flow rate value corrected by the water flow rate correction factor.

Percentage of glycol	Freezing point [°C]	Yeld corrector factor	Absorbed power correction factor	Water flow correction factor	Pressure drop correction factor
10%	-3,2	0,985	1	1,02	1,08

5.2 SCALING CORRECTION FACTOR

The correction factors due to contamination of the internal gas/water exchanger are shown below.

m^2 °C/kW	Power output correction factor	Power input correction factor
$0{,}44 \times 10^{-4}$	1,00	1,00
$0{,}88 \times 10^{-4}$	0,99	1,00
$1{,}76 \times 10^{-4}$	0,98	1,00

5.3 CALIBRATIONS AND PROTECTIONS CONTROL

Description	Value
High pressure switch	31,5 bar
High pressure alarm	30,3 bar
Low pressure alarm	0,7 bar heating / 1,7 bar cooling
Maximum number of restarts/hour after high/low pressure (manual reset)	3
Antifreeze protection (standard version/BT version)	+3
Hydronic circuit safety valve	6 bar

*Check that the antifreeze mixture concentration is suitable for the freezing temperature.

5.4 CORRECTION FACTORS DEPENDING ON ALTITUDE

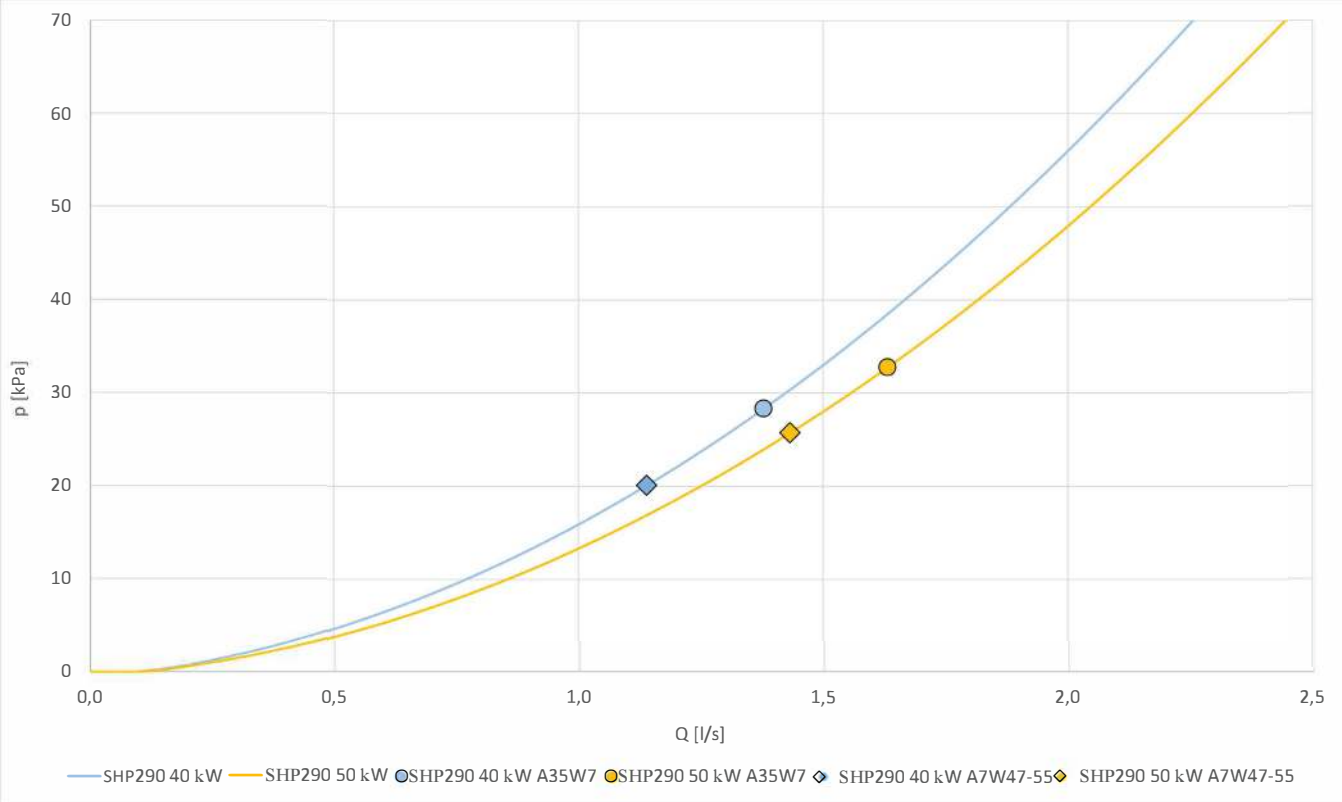
The correction factors for performance as a function of altitude are calculated for cooling under the conditions (1) and for heating under the conditions (3) in the above technical data tables and are given for altitudes of 500, 1000, 1500 and 2000 m.

Altitude [m]	500	1000	1500	2000
Correction factor heat output	0,9964	0,9941	0,9888	0,9869
Correction factor power input in heating mode	0,9931	0,9841	0,9853	0,9755
Correction factor cooling capacity	0,9888	0,9762	0,9618	0,9466
Correction factor power input in cooling mode	1,0106	1,0235	1,0386	1,0560

6. HYDRONIC GROUP DATA

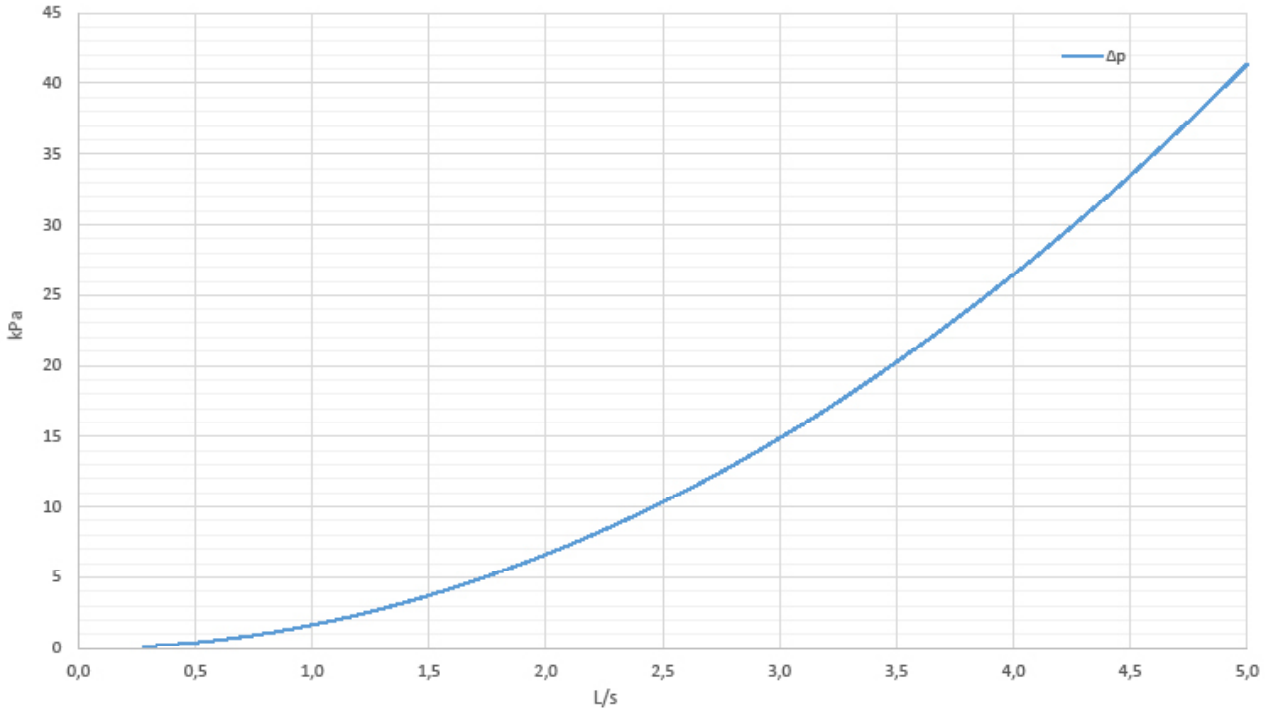
6.1 PRESSURE DROP OF THE HYDRAULIC CIRCUIT

The pressure drops of the hydronic side as a function of the flow rate are shown.
On each curve, the optimum operating point at the conditions specified at superscript (1) and (4) in the technical data table is highlighted.

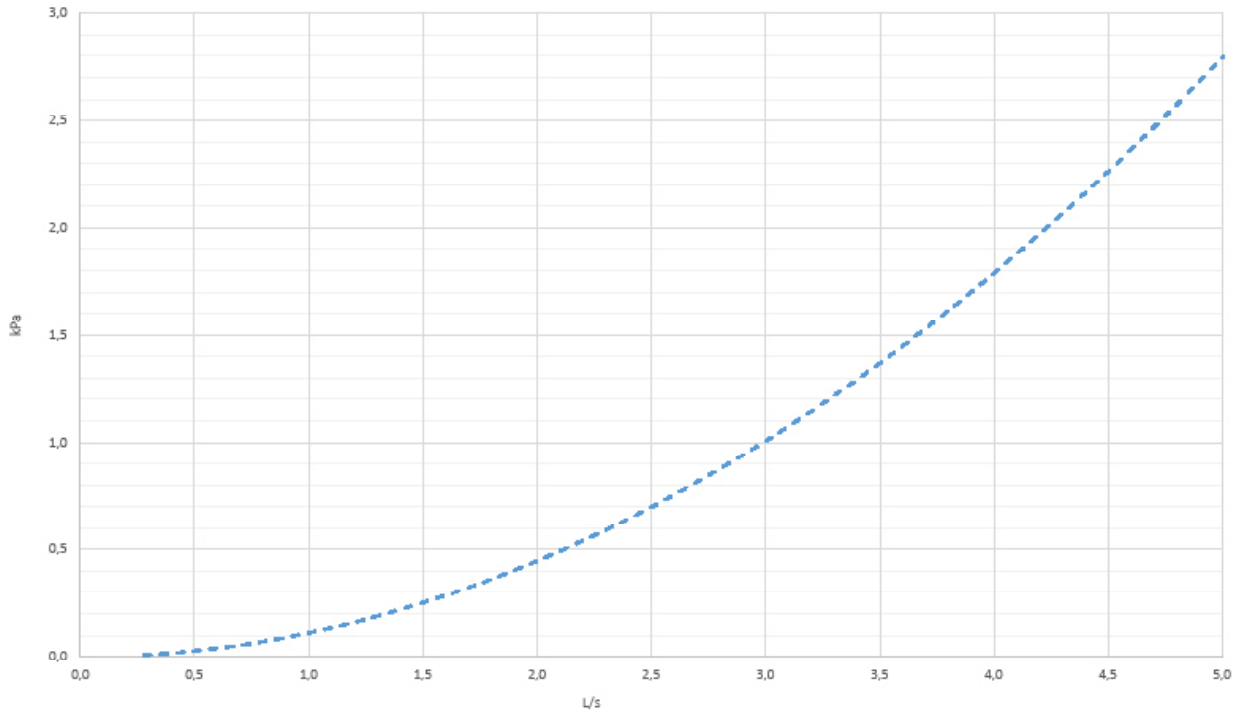


p [kPa]	Useful head
Q [l/s]	Water flow rate

6.2 PRESSURE DROP ACCESSORY 3-WAY VALVE



6.3 PRESSURE DROP Y-FILTER ACCESSORY



6.4 USEFUL HEAD FOR WATER AS CARRIER FLUID

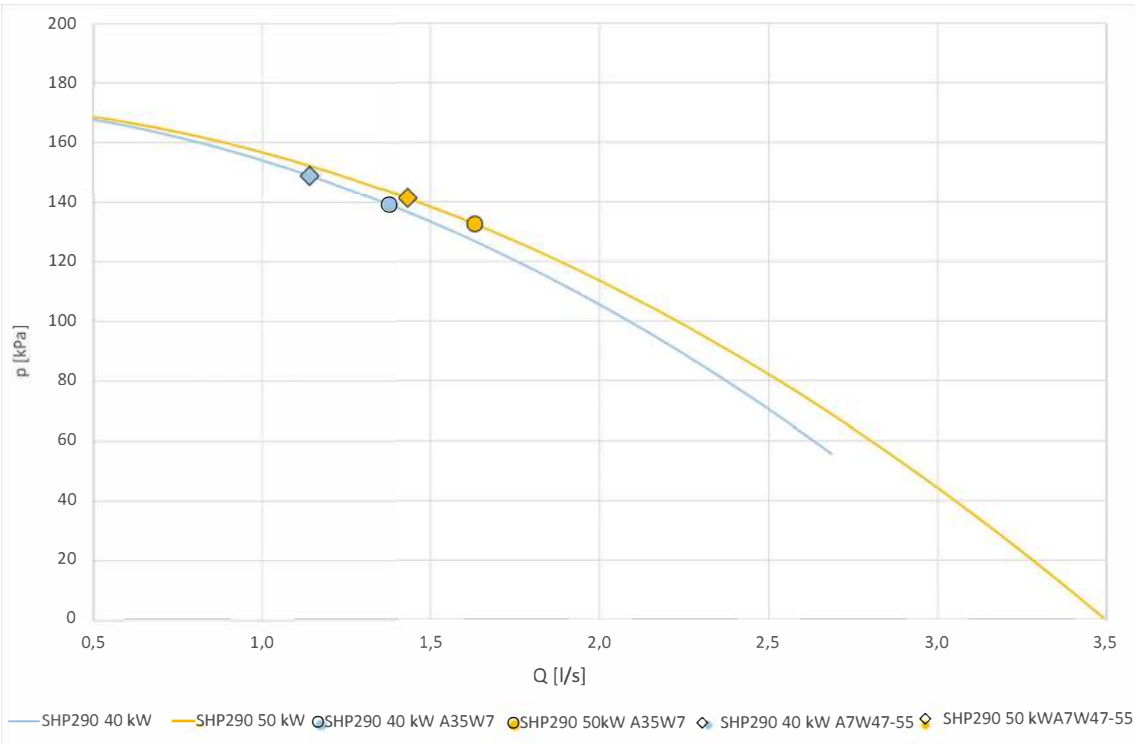
The characteristic head-flow curves net of pressure drops of the hydronic kit are shown below. Each curve shows the optimal working point at the conditions specified at the apex (1) and (4) in the technical data table.

The system must be designed in such a way as to guarantee the nominal flow rate relative to the working points shown below.

6.4.1 Data for PS/PSI kit

SHP290 40 kW -PS/PSI	
Flow rate [l/s]	Useful head [kPa]
0,5	168
0,7	164
0,9	159
1,0	153
1,2	147
1,4	139
1,6	131
1,7	122
1,9	112
2,1	101
2,3	89
2,4	76
2,6	63
2,8	48
3,0	33
3,1	17

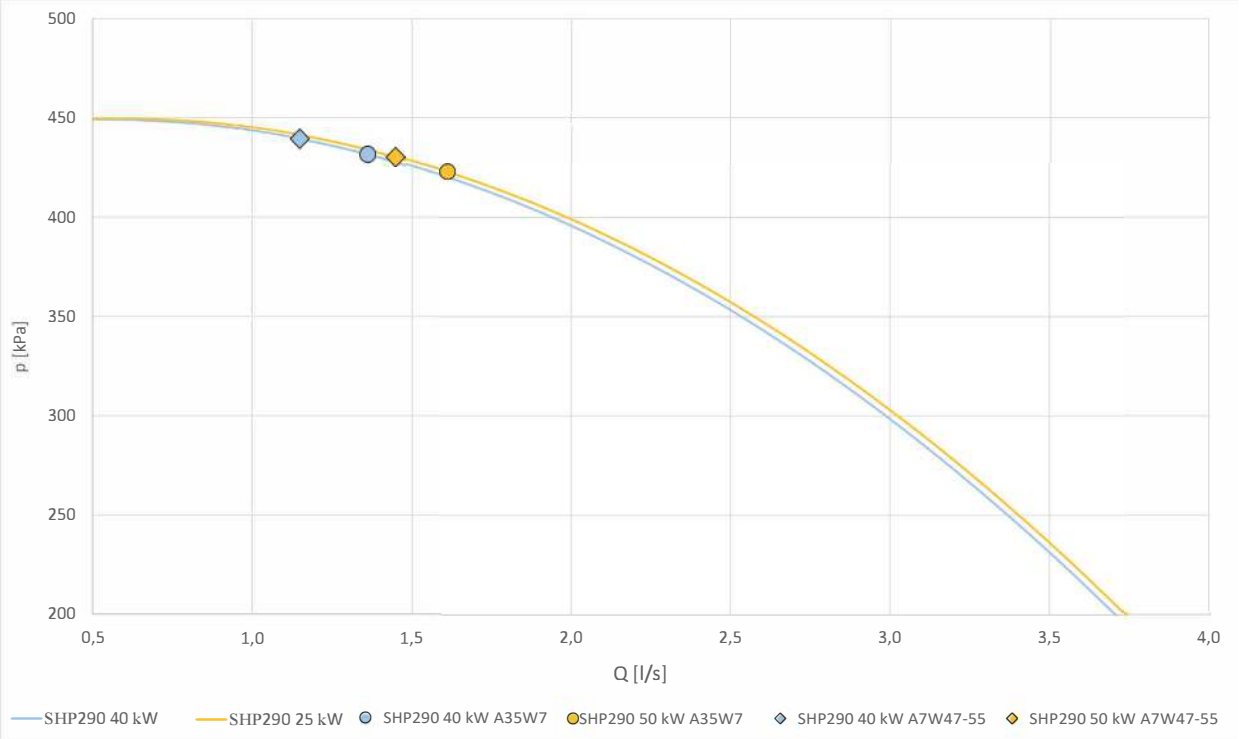
SHP290 50 kW -PS/PSI	
Flow rate [l/s]	Useful head [kPa]
0,5	168
0,7	165
0,9	160
1,1	155
1,3	148
1,4	141
1,6	133
1,8	124
2,0	114
2,2	103
2,4	91
2,6	78
2,8	64
2,9	49
3,1	34
3,3	17



6.4.2 Data for PSEC kit

SHP290 40 kW -PSEC	
Flow rate [l/s]	Useful head [kPa]
0,5	449
0,8	448
1,1	442
1,3	433
1,6	420
1,9	402
2,2	381
2,5	356
2,8	327
3,0	295
3,3	258
3,6	217
3,9	173
4,2	125
4,4	72
4,7	16

SHP290 50 kW -PSEC	
Flow rate [l/s]	Useful head [kPa]
0,5	450
0,8	449
1,1	444
1,3	435
1,6	422
1,9	406
2,2	385
2,5	360
2,8	332
3,0	299
3,3	263
3,6	222
3,9	178
4,2	130
4,4	78
4,7	21

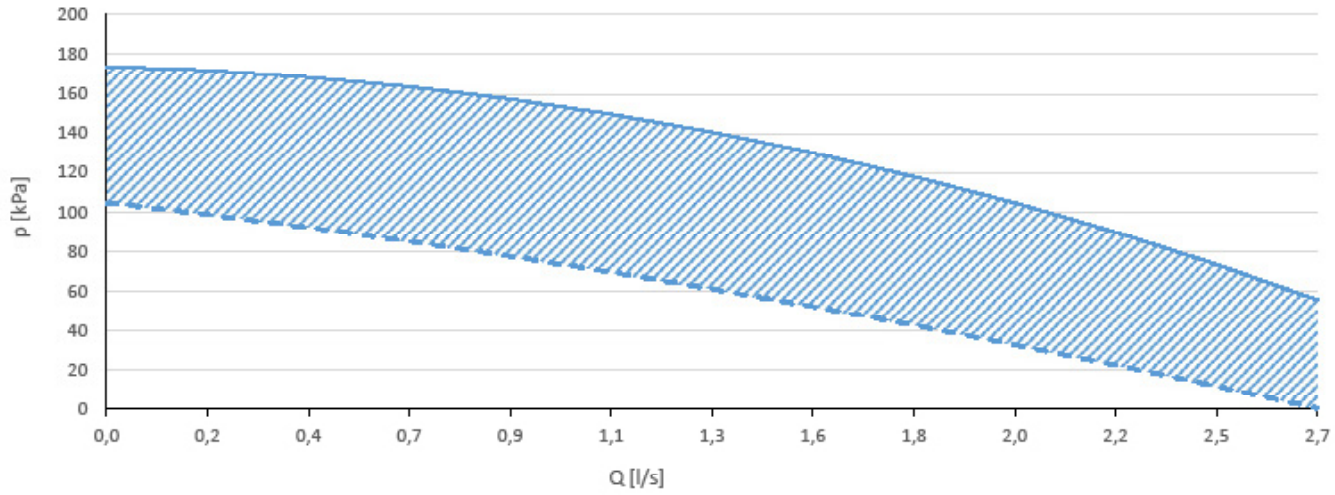


6.5 PUMP CURVES FOR WATER AS CARRIER FLUID

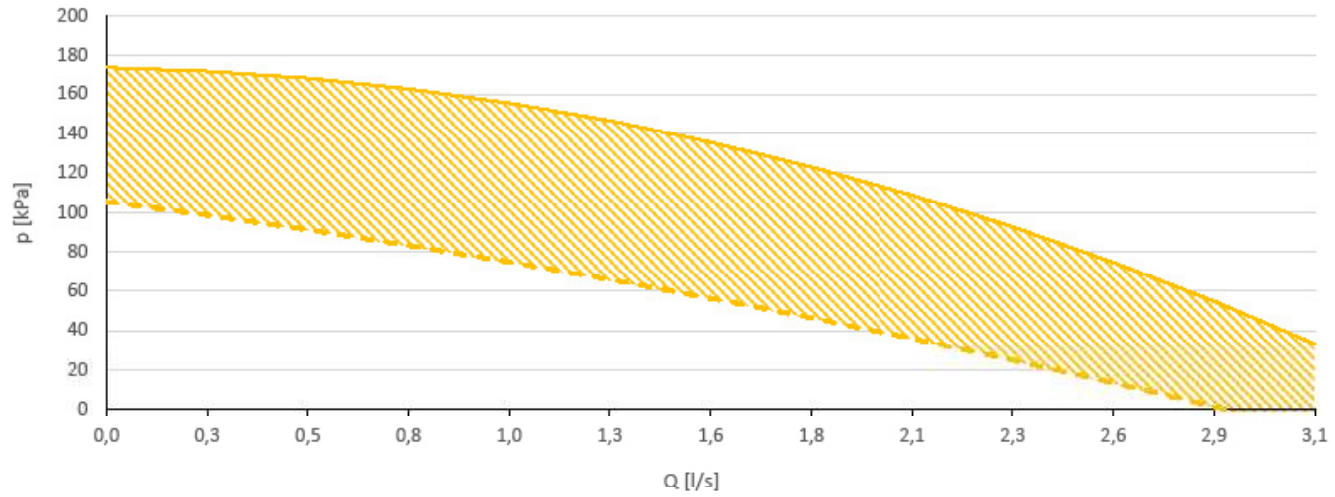
We report the range of useful heads that the machine guarantees during pump modulation (in case of chosen accessory).

6.5.1 Area for PSI kit

Operating area SHP290 40 kW -PSI

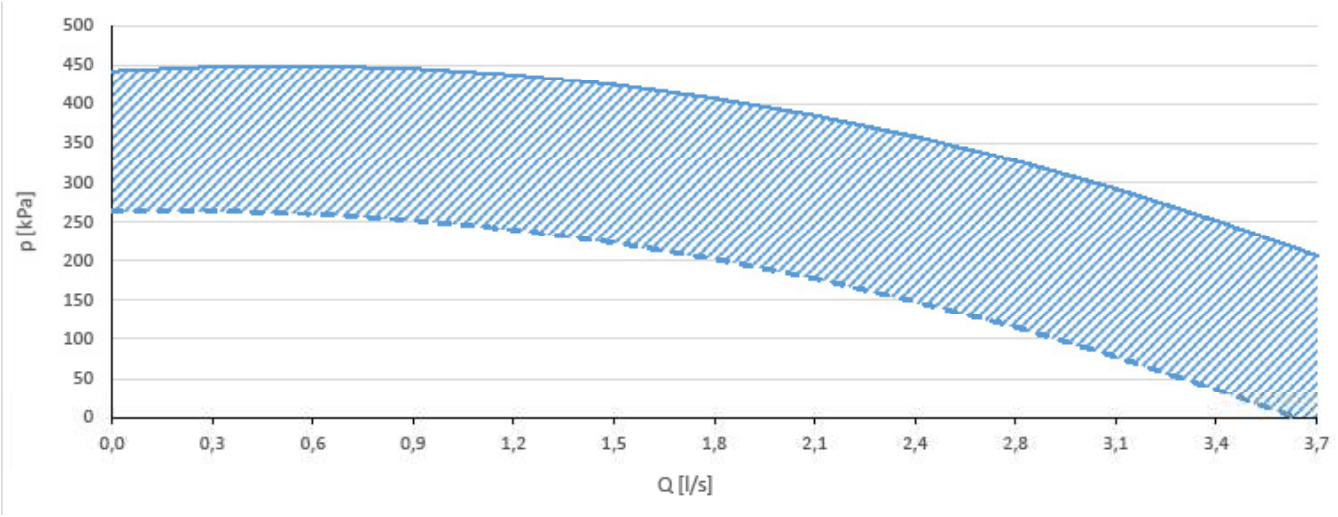


Operating area SHP290 50 kW -PSI

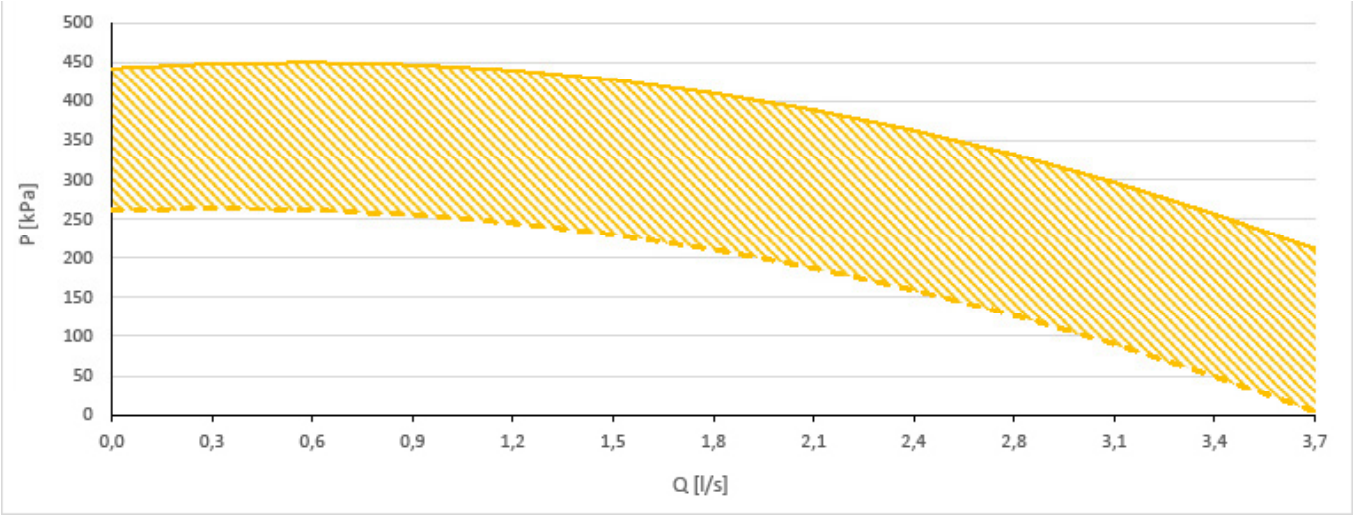


6.5.2 Area for PSEC kit

Operating area SHP290 40 kW -PSEC



Operating area SHP290 50 kW -PSEC



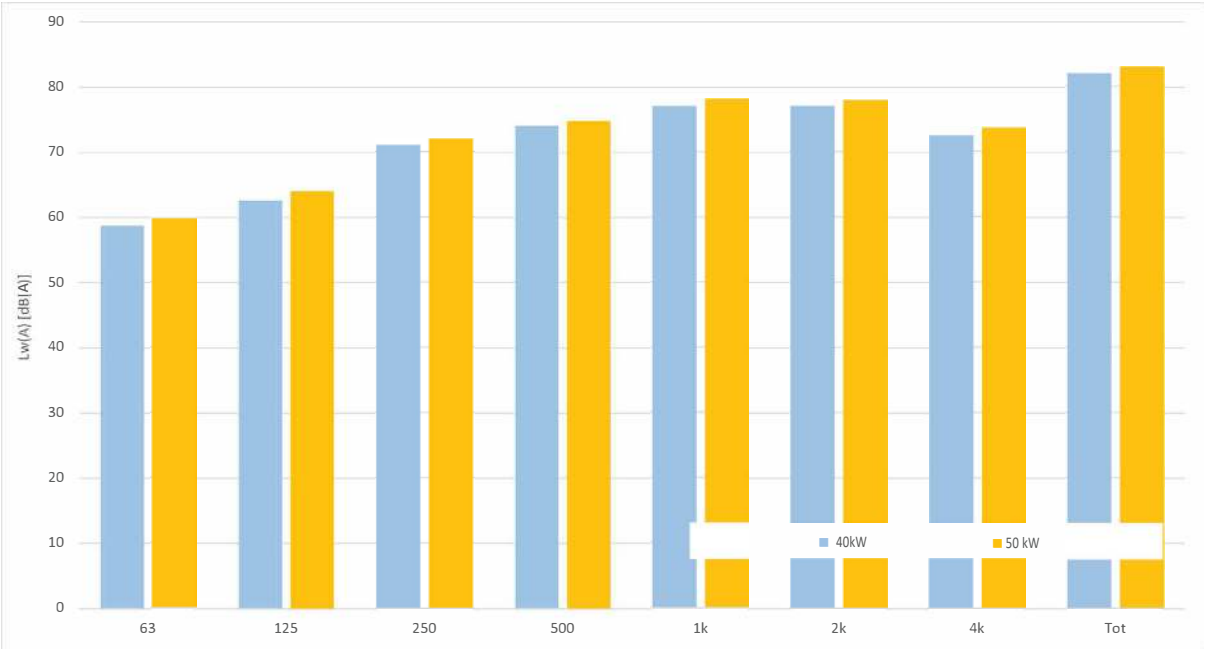
7. SOUND EMISSIONS

7.1 FULL LOAD UNIT

Sound levels refer to unit at full load and under normal test conditions in cooling mode, (outdoor air b.s. (b.u.) temperature = 35 °C (24), inlet-outlet water temperature = 12-7 °C). The tolerance on the total sound power level value is 2 dB(A). The value is determined in accordance with EN 12102-1:2022, used in conjunction with EN ISO 9614-1:2019, which describes the test methods and techniques for measuring sound power using the intensimetric method. Sound pressure values are calculated from the sound power level using ISO 3744:2010, considering units operating in the open field.

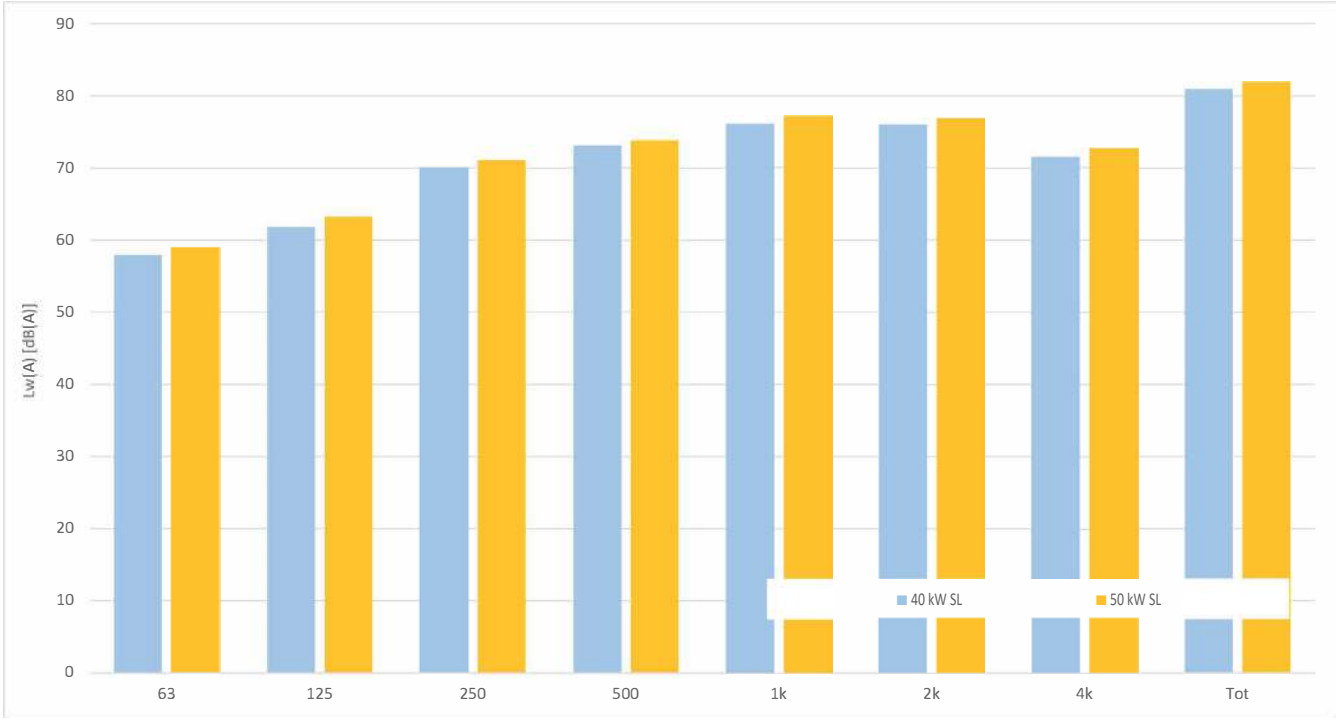
7.1.1 Power and sound pressure standard version

Model SHP290	Octave band sound power level							Sound power level Lw(A) [dB(A)]	Sound pressure level at 1m [dB(A)]	Sound pressure level at 10m [dB(A)]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	Tot	Tot	Tot
40 kW	58,7	62,6	71,0	74,1	77,0	77,0	72,4	82	64	50
50 kW	59,8	64,0	72,0	74,8	78,2	77,9	73,6	83	65	51



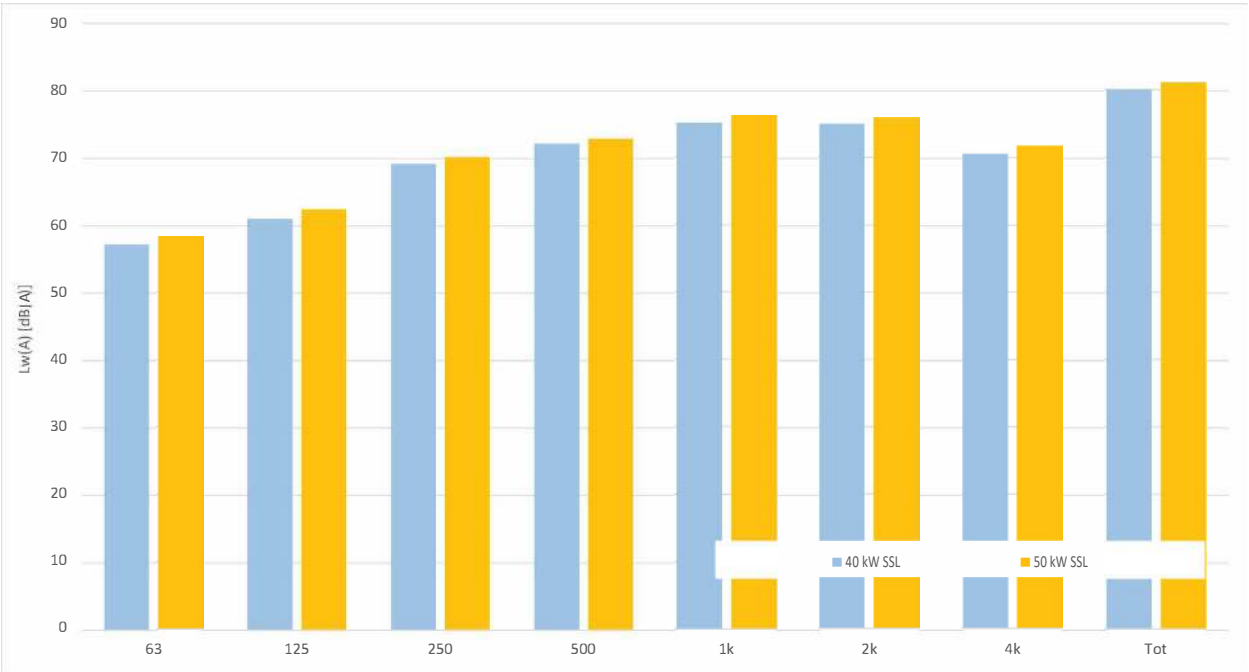
7.1.2 Power and sound pressure SL version

Model SHP290	Octave band sound power level							Sound power level Lw(A) [dB(A)]	Sound pressure level at 1m [dB(A)]	Sound pressure level at 10m [dB(A)]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	Tot	Tot	Tot
40 kW SL	58,0	61,8	70,1	73,1	76,0	76,0	71,5	81	64	50
50 kW SL	59,0	63,2	71,1	73,9	77,2	76,9	72,7	82	65	51



7.1.3 Power and sound pressure SSL version

Model SHP290	Octave band sound power level							Sound power level Lw(A) [dB(A)]	Sound pressure level at 1m [dB(A)]	Sound pressure level at 10m [dB(A)]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	Tot	Tot	Tot
40 kW SSL	57,2	61,0	69,2	72,2	75,1	75,0	70,6	80	64	50
50 kW SSL	58,3	62,4	70,2	72,9	76,2	76,0	71,8	81	65	51

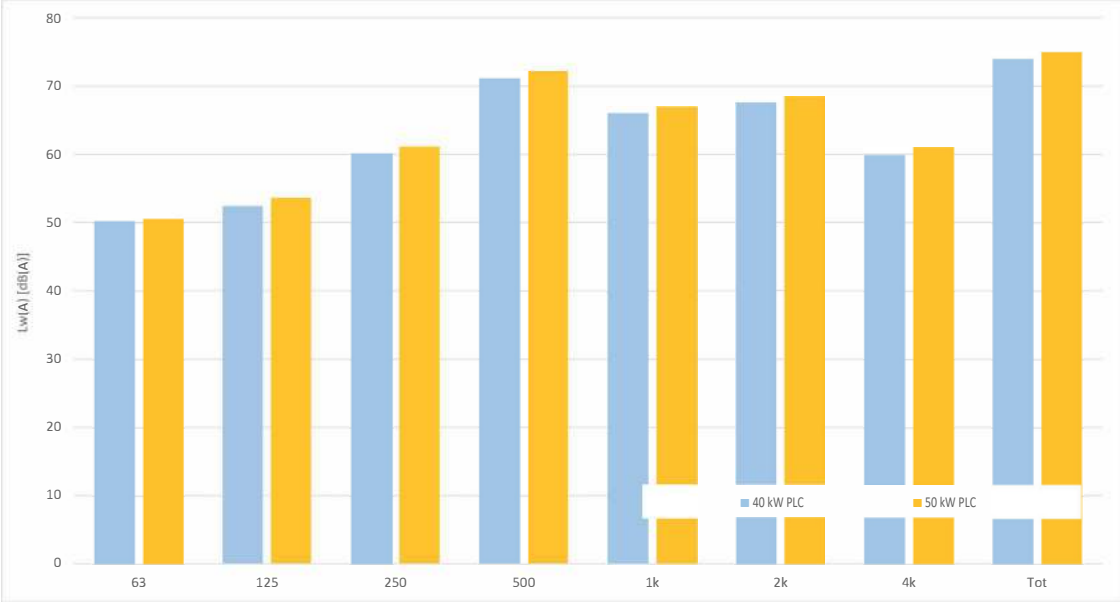


7.2 PARTIAL LOAD UNITS

The sound levels refer to a unit operating under conditions that guarantee a thermal capacity equal to that declared at an outdoor air temperature b.s. (b.u.) of 7 °C (6 °C) for temperate climate, according to EN 14825:2022. The tolerance on the total sound power level value is 2 dB(A). The value is determined in accordance with EN 12102-1:2022, used in conjunction with EN ISO 9614-1:2009, which describes the test methods and techniques for measuring sound power using the intensimetric method. Sound pressure values are calculated from the sound power level using UNI EN ISO 3744:2010, considering units operating in the open field.

7.2.1 Power and sound pressure standard version

Model SHP290	Octave band sound power level							Sound power level Lw(A) [dB(A)]	Sound pressure level at 1m [dB(A)]	Sound pressure level at 10m [dB(A)]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	Tot	Tot	Tot
40 kW PLC	50,2	52,4	60,1	71,2	66,1	67,6	59,9	74	56	42
50 kW PLC	50,6	53,6	61,1	72,2	67,1	68,5	61,0	75	57	43



8. OPERATING LIMITS

8.1 WATER FLOW RATE AT THE EVAPORATOR

The nominal water flow rate refers to a temperature difference between the inlet and outlet of the evaporator of 5°C. The maximum permissible flow rate is the one with a temperature difference of 3°C and the minimum is the one with a temperature difference of 10°C at nominal conditions as indicated in the data sheet.

Insufficient water flow rate can cause evaporation temperatures too low with the intervention of the safety devices and the stopping of the unit and, in some limit cases, with the formation of ice in the evaporator and consequent seious failures of the refrigertion circuit.

For greater precision we enclose a table showing the minimum flow rates to be ensured to the plate heat exchanger in order to guarantee its correct operation (please note: the water flow switch prevent the anti-freeze probe from tripping due to lack of flow, but does not guarantee the minimum water flow rate required for correct operation of the unit).

Model SHP290	Heat pump	
	40 kW	50 kW
Minimum water flow rate to be guaranteed in chiller mode (condition (1) data sheet) [l/s]	0,69	0,81
Maximum water flow rate to be guaranteed in chiller mode (condition (1) data sheet) [l/s]	2,29	2,72
Intervention flow rate status – flow switch decreasing* [l/s]	0,56	0,77
Intervention flow rate status – flow switch increasing* [l/s]	0,58	0,80

* When the flow rate falls below the indicated limit (flow switch intervention flow rate - decreasing flow) the flow switch signals an alarm,which can only be reset when the flow switch intervention low rate -increasing flow - is reached.

8.2 CHILLER WATER PRODUCTION (SUMMER OPERATION)

The minimum permissible temperature at the evaporator outlet is 5°C: for lower temperatures, contact the Technical Department. In this case, contact our technical office for a feasibility study and evaluation of the modifications to be made according to requirements. The maximum temperature that can be maintained at the evaporator outlet is 20°C. Slightly higher temperatures can, however, be tolerated in the transient and start-up phases.

8.3 HOT WATER PRODUCTION (WINTER OPERATION)

Once the system is fully operational, it must be ensured that the flow temperature is always above 20 °C **: lower values, not due to transient or start-up phases, can cause system faults with the possibility of compressor failure. The maximum outlet water temperature must not exceed 78 °C.
Temperature higher than those indicated, especially in conjcution with water flow rates, could result in malfunctioning of the unit, or in the most critical cases safety devices could be triggered.

8.4 AMBIENT AIR TEMPERATURE AND SUMMARY TABLE

The unit are designed and built to operate in summer mode, with condensation control, with outdoor ar temperature between +10 °C and +46 °C. In heat pump mode, the allowed range of outdoor air temperature varies from -20 °C to +45 °C depending on the outlet water temperature, as show in the table below.

Operating limits

Water chiller mode		
Air source temperature	Minimum +10 °C	Maximum +46 °C
Outlet water temperature	Minimum +5 °C	Maximum +20 °C

Heat pump mode		
Air source temperature	Minimum -20 °C	Maximum +20 °C
Outlet water temperature	Minimum +20 °C **	Maximum +78 °C **

Heat pump mode for domestic hot water		
Air source temperature with water at maximum +60 °C	Minimum -20 °C	Maximum +45 °C
Air source temperature with water at maximum +65 °C	Minimum -14 °C	Maximum +45 °C
Air source temperature with water at maximum +78 °C	Minimum +0 °C	Maximum +38 °C

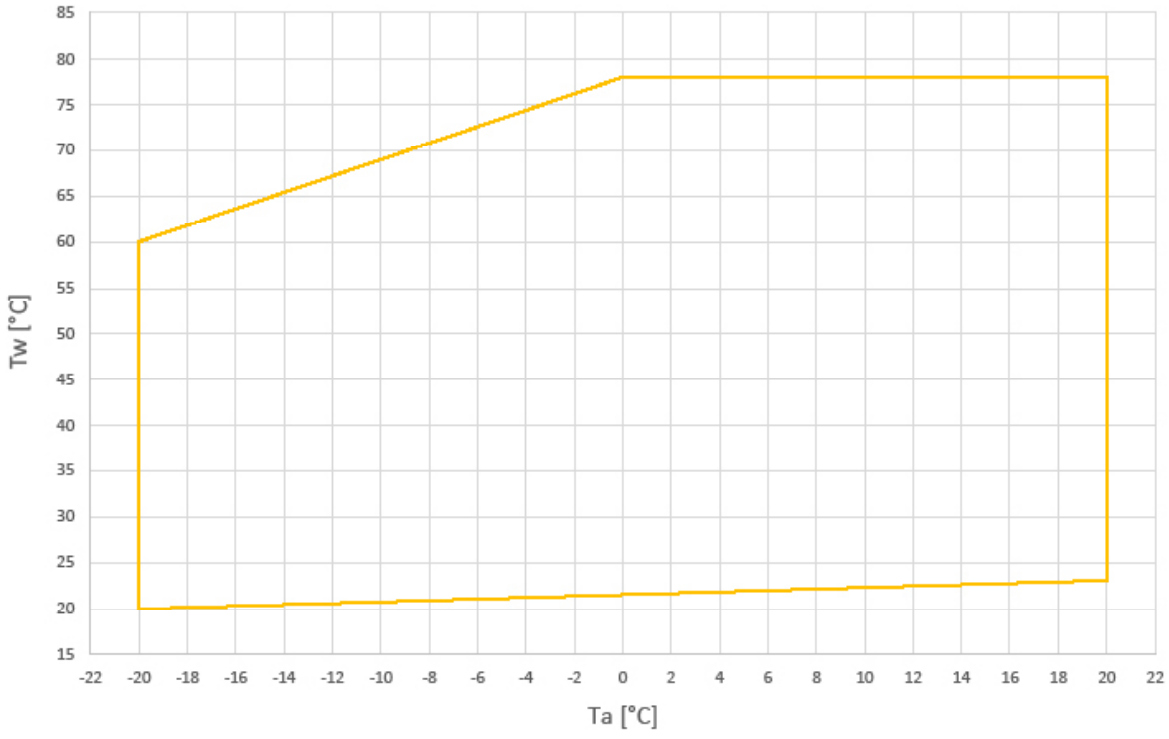
** The minimum and maximum permissible temperatures depend on the outside air temperature. Set the desired value considering the envelope.

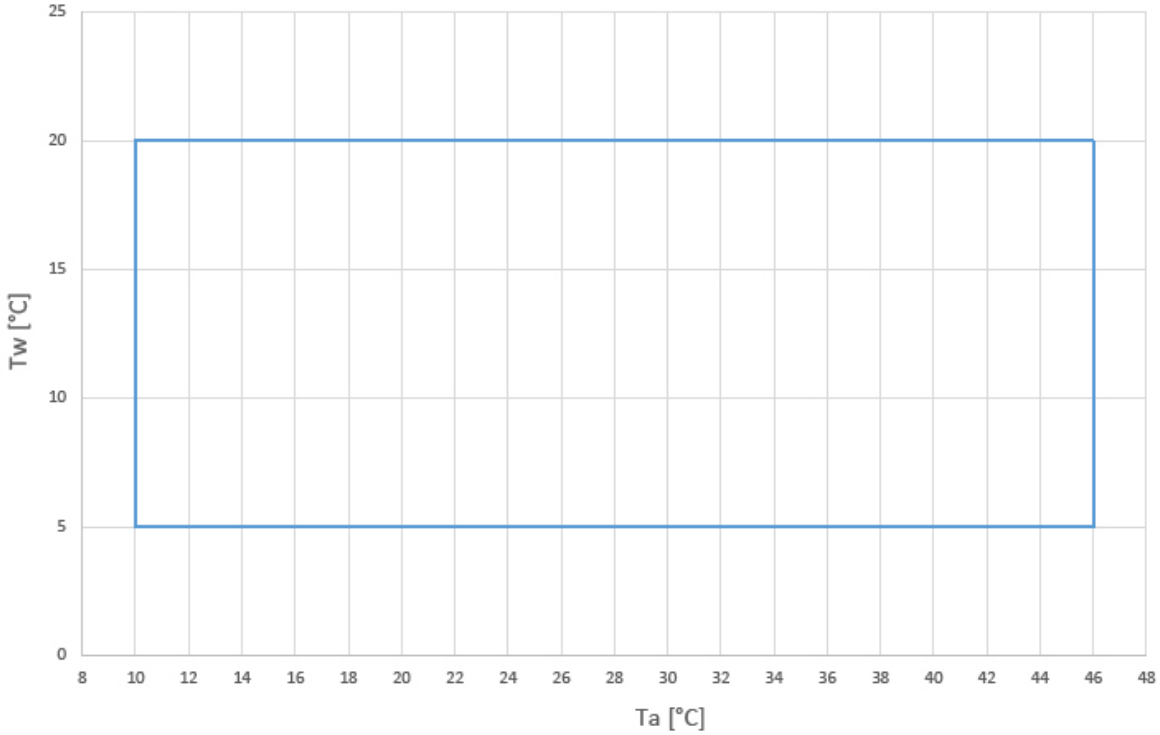
Limitations of installability	
Maximum altitude	2000 m s.l.m.
Refer to chapter 5.4 of BTE02070100000 for reduction of yeld as a function of altitude.	

Below are the graphed operating limits for heating, cooling and domestic hot water production. Please note that operating the unit outside the stated operating limits causes blocking alarms that lead to product shutdown, with possible damage to components and/or safety organs.

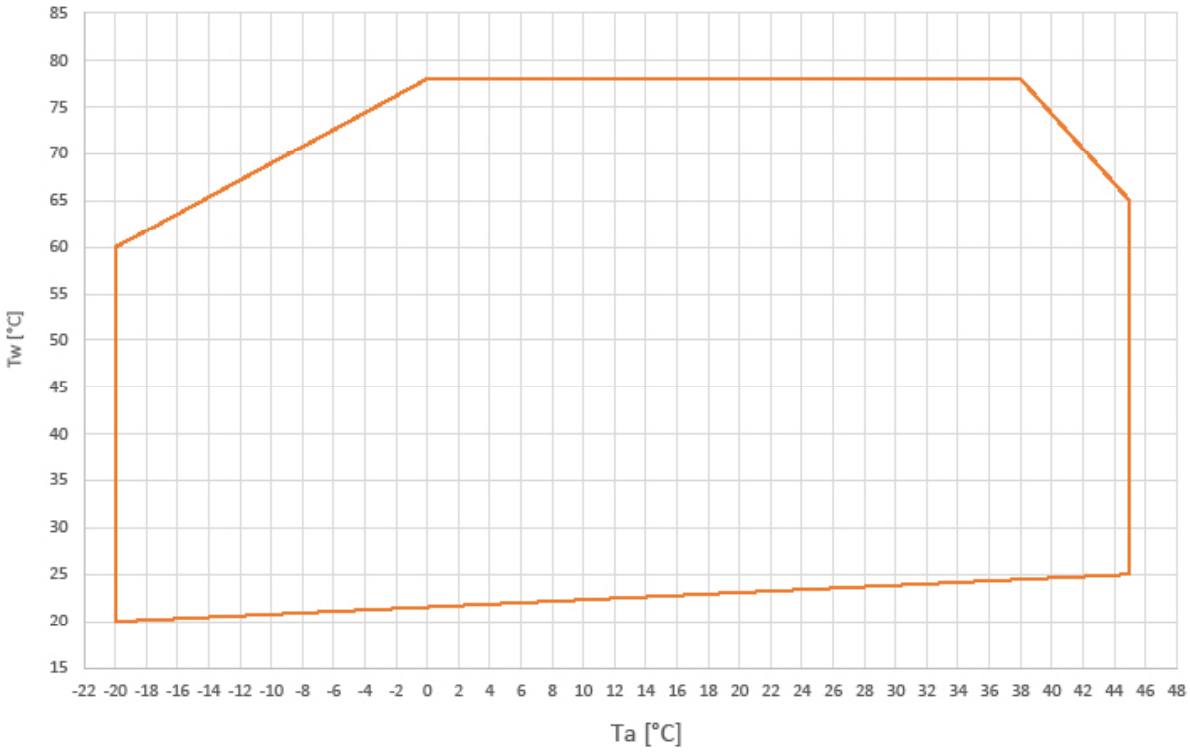
8.5 ENVELOPE IN HEATING AND COOLING

Tw = water temperature
Ta = air temperature
A = maximum Hz functionality has no effect





8.6 ENVELOPE IN DHW



9. PERFORMANCE TABLES

The tables show the capacity, power input and efficiency values for different outside air temperatures. The data shown are calculated according to EN 14511:2022. They are indicative and may be subject to change.

9.1 HEATING

HEATING																							
Model SHP290	T air outdoor [°C]	Tout [°C]																					
		25			30			35			40			45			50			55		
		Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]
40 kW	-20	24,2	12,87	1,88	23,7	13,62	1,74	23,2	14,32	1,62	22,9	15,37	1,49	22,6	16,38	1,38	21,5	17,77	1,21	20,9	19,00	1,10
	-15	26,4	12,22	2,16	25,8	12,90	2,00	25,2	13,48	1,87	24,8	14,59	1,70	24,3	15,68	1,55	23,4	16,83	1,39	22,9	17,89	1,28
	-10	30,6	11,91	2,57	30,3	12,68	2,39	30,0	13,51	2,22	29,8	14,68	2,03	29,6	16,09	1,84	29,2	17,28	1,69	28,4	17,97	1,58
	-7	35,3	12,09	2,92	35,0	12,92	2,71	34,6	13,78	2,51	34,3	15,11	2,27	33,9	16,54	2,05	33,7	17,83	1,89	32,7	18,27	1,79
	-2	38,3	10,49	3,65	37,7	11,39	3,31	37,3	12,31	3,03	36,9	13,42	2,75	36,6	14,58	2,51	36,0	15,79	2,28	35,4	16,94	2,09
	2	40,4	9,33	4,33	39,7	10,21	3,89	39,1	11,11	3,52	38,7	12,09	3,20	38,1	13,00	2,93	37,0	14,12	2,62	37,2	15,37	2,42
	7	41,7	8,03	5,19	40,9	8,91	4,59	40,1	9,78	4,10	39,6	10,50	3,77	39,0	11,30	3,45	37,7	12,28	3,07	37,8	13,40	2,82
	12	42,3	7,37	5,74	41,6	8,00	5,20	41,0	8,58	4,78	40,4	9,10	4,44	39,7	9,54	4,16	38,3	11,01	3,48	38,8	12,20	3,18
	15	42,4	6,77	6,26	41,6	7,43	5,60	40,7	8,06	5,05	39,9	8,66	4,61	39,0	9,24	4,22	38,1	10,30	3,70	38,3	11,20	3,42
	20	41,7	6,40	6,52	40,9	6,91	5,92	40,1	7,37	5,44	39,4	8,01	4,92	38,6	8,64	4,47	37,8	9,29	4,07	37,8	10,00	3,78
50 kW	-20	30,6	14,93	2,05	29,9	15,82	1,89	29,4	16,80	1,75	29,4	17,93	1,64	29,4	19,09	1,54	29,0	20,57	1,41	28,7	22,08	1,30
	-15	32,2	14,19	2,27	31,5	15,07	2,09	30,7	16,07	1,91	31,0	17,32	1,79	31,0	18,56	1,67	30,8	20,13	1,53	30,4	21,56	1,41
	-10	35,4	13,51	2,62	35,1	14,50	2,42	34,7	15,49	2,24	34,7	16,93	2,05	35,5	18,39	1,93	35,7	20,06	1,78	35,3	21,39	1,65
	-7	38,8	13,11	2,96	38,5	14,10	2,73	38,1	15,12	2,52	37,8	16,51	2,29	38,9	18,26	2,13	39,3	20,05	1,96	38,9	21,26	1,83
	-2	44,3	12,41	3,57	43,7	13,40	3,26	43,3	14,48	2,99	43,4	15,90	2,73	43,6	17,37	2,51	43,7	19,00	2,30	43,3	20,33	2,13
	2	48,7	11,51	4,23	47,9	12,51	3,83	47,0	13,58	3,46	46,8	14,90	3,14	47,0	16,21	2,90	46,8	17,59	2,66	46,1	18,89	2,44
	7	51,7	9,83	5,26	50,8	10,90	4,66	50,0	11,90	4,20	49,5	13,10	3,78	48,9	14,22	3,44	48,4	15,51	3,12	47,7	16,91	2,82
	12	53,5	9,07	5,90	52,5	9,31	5,64	51,6	10,40	4,96	51,0	11,51	4,43	50,3	12,70	3,96	49,6	14,01	3,54	48,7	15,22	3,20
	15	53,1	8,42	6,31	52,1	8,76	5,95	51,1	9,81	5,21	50,5	10,91	4,63	49,9	12,11	4,12	49,2	13,30	3,70	48,4	14,58	3,32
	20	51,7	7,79	6,64	50,7	7,88	6,43	49,8	8,85	5,63	49,2	9,74	5,05	48,7	10,80	4,51	48,1	12,00	4,01	47,5	13,19	3,60

HEATING																							
Model SHP290	T air outdoor [°C]	Tout [°C]																					
		47-55			60			65			55-65			70			75			78		
		Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]
40 kW	-20	20,9	18,66	1,12	20,8	19,44	1,07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-15	22,9	17,75	1,29	23,5	19,26	1,22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-10	28,4	17,75	1,60	29,5	19,93	1,48	29,1	20,94	1,39	29,2	20,42	1,43	-	-	-	-	-	-	-	-	-
	-7	32,7	17,87	1,83	33,9	20,55	1,65	33,5	21,75	1,54	33,6	21,27	1,58	28,1	19,12	1,47	-	-	-	-	-	-
	-2	35,5	16,59	2,14	36,9	19,22	1,92	36,4	20,45	1,78	36,6	19,89	1,84	33,0	19,88	1,66	32,2	21,18	1,52	-	-	-
	2	37,3	14,98	2,49	38,8	17,80	2,18	38,0	19,00	2,00	38,3	18,41	2,08	36,6	19,89	1,84	35,8	21,06	1,70	34,7	21,96	1,58
	7	38,0	13,10	2,90	38,9	15,31	2,54	38,1	16,49	2,31	38,4	16,00	2,40	37,0	17,62	2,10	35,9	18,70	1,92	35,1	19,39	1,81
	12	38,9	11,90	3,27	39,3	13,51	2,91	38,2	14,42	2,65	38,5	13,90	2,77	37,1	15,39	2,41	35,8	16,27	2,20	35,0	16,91	2,07
	15	38,5	10,91	3,53	38,6	12,41	3,11	37,5	13,20	2,84	37,9	12,80	2,96	36,4	14,11	2,58	35,3	14,89	2,37	34,5	15,47	2,23
	20	37,9	9,77	3,88	37,8	10,80	3,50	36,8	11,50	3,20	37,1	11,11	3,34	35,8	12,22	2,93	34,8	12,89	2,70	34,1	13,43	2,54
50 kW	-20	28,8	21,65	1,33	23,1	21,19	1,09	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-15	30,5	21,33	1,43	26,3	21,04	1,25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-10	35,4	20,95	1,69	32,4	21,7	1,49	32,6	23,0	1,42	32,8	22,5	1,46	-	-	-	-	-	-	-	-	-
	-7	39,0	20,74	1,88	36,7	21,8	1,68	36,3	23,3	1,56	36,3	22,7	1,60	32,1	21,8	1,47	-	-	-	-	-	-
	-2	43,4	19,91	2,18	41,2	21,24	1,94	40,6	22,6	1,80	40,8	21,9	1,86	37,9	22,6	1,68	37,0	23,9	1,55	-	-	-
	2	46,3	18,52	2,50	44,0	19,82	2,22	43,3	21,33	2,03	43,6	20,66	2,11	42,2	22,4	1,88	40,9	23,6	1,73	40,1	24,5	1,64
	7	47,9	16,52	2,90	46,1	17,87	2,58	45,4	19,40	2,34	45,8	18,77	2,44	44,2	20,46	2,16	42,8	21,73	1,97	41,9	22,41	1,87
	12	49,1	14,79	3,32	47,0	16,21	2,90	46,2	17,63	2,62	46,6	17,01	2,74	44,9	18,71	2,40	43,5	19,86	2,19	42,5	20,53	2,07
	15	48,5	14,18	3,42	46,5	15,50	3,00	45,8	16,90	2,71	46,2	16,33	2,83	44,4	17,98	2,47	43,1	19,07	2,26	42,1	19,67	2,14
	20	47,6	12,80	3,72	45,8	14,09	3,25	45,1	15,39	2,93	45,4	14,79	3,07	43,9	16,50	2,66	42,6	17,53	2,43	41,7	18,21	2,29

HEATING -PSI/-PS																					
Model SHP290	T air outdoor [°C]	Tout [°C]																			
		25			30			35			40			45			50			55		
		Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]
40 kW	-20	24,3	12,99	1,87	23,7	13,70	1,73	23,3	14,38	1,62	22,9	15,47	1,48	22,6	16,62	1,36	21,5	17,77	1,21	20,9	19,17	1,09
	-15	26,5	12,33	2,15	25,8	12,90	2,00	25,3	13,60	1,86	24,8	14,67	1,69	24,4	15,84	1,54	23,4	16,96	1,38	23,0	17,97	1,28
	-10	30,6	12,00	2,55	30,2	12,80	2,36	30,0	13,57	2,21	29,8	14,83	2,01	29,6	16,09	1,84	29,2	17,38	1,68	28,4	18,09	1,57
	-7	35,3	12,09	2,92	34,9	12,88	2,71	34,6	13,78	2,51	34,3	15,11	2,27	34,0	16,59	2,05	33,7	17,93	1,88	32,7	18,37	1,78
	-2	38,2	10,49	3,64	37,7	11,39	3,31	37,2	12,32	3,02	36,9	13,42	2,75	36,5	14,60	2,50	35,9	15,88	2,26	35,4	16,94	2,09
	2	40,3	9,31	4,33	39,6	10,21	3,88	39,0	11,11	3,51	38,6	12,10	3,19	38,0	13,01	2,92	37,0	14,12	2,62	37,1	15,39	2,41
	7	41,6	8,00	5,20	40,8	8,89	4,59	40,0	9,76	4,10	39,5	10,51	3,76	39,0	11,30	3,45	37,6	12,29	3,06	37,8	13,50	2,80
	12	42,1	7,33	5,74	41,5	7,97	5,21	40,9	8,56	4,78	40,3	9,08	4,44	39,6	9,54	4,15	38,3	11,01	3,48	38,6	12,22	3,16
	15	42,3	6,72	6,29	41,5	7,41	5,60	40,6	8,04	5,05	39,8	8,65	4,60	38,9	9,24	4,21	38,0	10,30	3,69	38,3	11,20	3,42
50 kW	-20	30,6	15,00	2,04	29,9	15,90	1,88	29,4	16,80	1,75	29,4	18,04	1,63	29,4	19,22	1,53	29,1	20,64	1,41	28,7	22,25	1,29
	-15	32,2	14,31	2,25	31,5	15,22	2,07	30,7	16,07	1,91	31,0	17,42	1,78	31,0	18,67	1,66	30,8	20,26	1,52	30,4	21,56	1,41
	-10	35,4	13,51	2,62	35,0	14,52	2,41	34,7	15,49	2,24	34,9	16,86	2,07	35,4	18,44	1,92	35,6	20,11	1,77	35,2	21,46	1,64
	-7	38,8	13,02	2,98	38,4	14,12	2,72	37,7	15,02	2,51	38,2	16,61	2,30	38,8	18,13	2,14	39,2	20,00	1,96	38,8	21,20	1,83
	-2	44,2	12,31	3,59	43,6	13,42	3,25	43,2	14,40	3,00	43,3	15,80	2,74	43,5	17,40	2,50	43,6	18,87	2,31	43,0	20,19	2,13
	2	48,6	11,41	4,26	47,7	12,49	3,82	47,0	13,51	3,48	46,6	14,79	3,15	46,9	16,12	2,91	46,7	17,62	2,65	46,0	18,93	2,43
	7	51,5	9,72	5,30	50,7	10,81	4,69	50,1	11,90	4,21	49,3	13,01	3,79	48,8	14,19	3,44	48,2	15,50	3,11	47,6	16,82	2,83
	12	53,3	9,00	5,92	52,3	9,21	5,68	51,4	10,30	4,99	50,8	11,39	4,46	50,2	12,61	3,98	49,3	13,89	3,55	48,7	15,22	3,20
	15	52,9	8,37	6,32	51,9	8,66	5,99	51,0	9,70	5,26	50,4	10,79	4,67	49,7	12,00	4,14	49,1	13,20	3,72	48,3	14,50	3,33

HEATING -PSI/-PS																					
Model SHP290	T air outdoor [°C]	Tout [°C]																			
		47-55			60			65			55-65			70			75			78		
		Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]
40 kW	-20	21,0	19,09	1,10	20,9	19,72	1,06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-15	23,1	17,91	1,29	23,7	19,43	1,22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-10	28,5	18,04	1,58	29,5	19,93	1,48	29,1	21,09	1,38	29,4	20,85	1,41	-	-	-	-	-	-	-	-	-
	-7	32,8	18,22	1,80	33,9	20,55	1,65	33,5	21,75	1,54	33,8	21,39	1,58	28,2	19,18	1,47	-	-	-	-	-	-
	-2	35,7	16,84	2,12	36,9	19,22	1,92	36,3	20,63	1,76	36,7	20,28	1,81	33,0	20,00	1,65	32,2	21,18	1,52	-	-	-
	2	37,4	15,20	2,46	38,8	17,80	2,18	38,0	19,10	1,99	38,5	18,78	2,05	36,5	19,95	1,83	35,4	21,07	1,68	34,8	21,89	1,59
	7	38,1	13,42	2,84	38,9	15,31	2,54	38,0	16,52	2,30	38,5	16,31	2,36	37,0	17,62	2,10	35,9	18,70	1,92	35,1	19,39	1,81
	12	39,0	12,11	3,22	39,2	13,52	2,90	38,2	14,42	2,65	38,7	14,18	2,73	37,0	15,42	2,40	35,8	16,27	2,20	35,0	16,91	2,07
	15	38,6	11,09	3,48	38,5	12,42	3,10	37,5	13,20	2,84	38,0	13,01	2,92	36,4	14,11	2,58	35,2	14,98	2,35	34,5	15,47	2,23
	20	38,0	9,90	3,84	37,7	10,80	3,49	36,8	11,50	3,20	37,3	11,41	3,27	35,8	12,22	2,93	34,7	12,90	2,69	34,1	13,43	2,54
50 kW	-20	28,9	22,06	1,31	23,1	21,39	1,08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-15	30,6	21,40	1,43	26,3	21,21	1,24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-10	35,5	21,26	1,67	32,4	21,7	1,49	32,6	23,0	1,42	32,9	22,7	1,45	-	-	-	-	-	-	-	-	-
	-7	39,1	21,02	1,86	36,7	21,8	1,68	36,2	23,2	1,56	36,5	23,0	1,59	32,1	22,0	1,46	-	-	-	-	-	-
	-2	43,5	19,86	2,19	41,1	21,08	1,95	40,5	22,5	1,80	41,0	22,0	1,86	37,9	22,6	1,68	37,0	23,9	1,55	-	-	-
	2	46,3	18,59	2,49	43,9	19,77	2,22	43,2	21,18	2,04	43,8	20,76	2,11	42,1	22,5	1,87	40,9	23,6	1,73	40,0	24,5	1,63
	7	47,9	16,52	2,90	46,0	17,83	2,58	45,3	19,28	2,35	45,9	18,89	2,43	44,1	20,51	2,15	42,7	21,68	1,97	41,8	22,35	1,87
	12	48,9	14,91	3,28	46,9	16,12	2,91	46,1	17,53	2,63	46,7	17,17	2,72	44,8	18,67	2,40	43,4	19,82	2,19	42,4	20,48	2,07
	15	48,6	14,29	3,40	46,4	15,42	3,01	45,7	16,80	2,72	46,3	16,48	2,81	44,4	17,90	2,48	43,0	19,03	2,26	42,1	19,67	2,14
	20	47,6	13,01	3,66	45,7	14,02	3,26	45,0	15,41	2,92	45,5	15,12	3,01	43,9	16,38	2,68	42,5	17,49	2,43	41,6	18,09	2,30

HEATING -PSEC																							
Model SHP290	T air outdoor [°C]	Tout [°C]																					
		25			30			35			40			45			50			55			
		Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]
40 kW	-20	24,5	13,5	1,81	24,0	14,2	1,69	23,5	14,9	1,58	23,2	16,0	1,45	22,9	17,0	1,35	21,8	18,5	1,18	21,2	19,6	1,08
	-15	26,7	12,7	2,10	26,1	13,4	1,95	25,5	14,0	1,82	25,1	15,1	1,66	24,6	16,3	1,51	23,7	17,4	1,36	23,2	18,6	1,25
	-10	30,9	12,4	2,49	30,6	13,2	2,32	30,3	14,0	2,16	30,1	15,2	1,98	29,9	16,6	1,80	29,5	17,8	1,66	28,7	18,5	1,55
	-7	35,6	12,5	2,85	35,3	13,3	2,65	34,9	14,2	2,46	34,6	15,6	2,22	34,4	17,0	2,02	34,0	18,3	1,86	33,0	18,8	1,76
	-2	38,5	10,9	3,53	38,0	11,8	3,22	37,6	12,8	2,94	37,2	13,9	2,68	36,9	15,1	2,44	36,3	16,3	2,23	35,8	17,4	2,06
	2	40,6	9,76	4,16	40,0	10,6	3,77	39,4	11,6	3,40	39,0	12,6	3,10	38,4	13,5	2,84	37,3	14,6	2,55	37,5	15,9	2,36
	7	41,9	8,46	4,95	41,2	9,34	4,41	40,4	10,2	3,96	39,9	11,0	3,63	39,3	11,8	3,33	37,8	12,8	2,95	38,1	13,9	2,74
	12	42,5	7,81	5,44	41,9	8,43	4,97	41,3	9,02	4,58	40,7	9,51	4,28	40,0	10,0	4,01	38,5	11,5	3,35	39,1	12,7	3,08
	15	42,6	7,17	5,94	41,9	7,83	5,35	41,0	8,47	4,84	40,2	9,07	4,43	39,3	9,66	4,07	38,4	10,7	3,59	38,6	11,6	3,33
	20	41,9	6,78	6,18	41,2	7,29	5,65	40,4	7,75	5,21	39,7	8,39	4,73	38,8	9,04	4,29	38,1	9,69	3,93	38,1	10,4	3,66
50 kW	-20	30,9	15,5	1,99	30,2	16,4	1,84	29,7	17,4	1,71	29,7	18,4	1,61	29,7	19,67	1,51	29,3	21,23	1,38	29,0	22,66	1,28
	-15	32,5	14,7	2,21	31,7	15,6	2,03	31,1	16,6	1,87	31,3	17,9	1,75	31,3	19,09	1,64	31,1	20,73	1,50	30,7	22,25	1,38
	-10	35,7	14,0	2,55	35,3	15,0	2,35	35,0	15,9	2,20	35,1	17,4	2,02	35,7	18,89	1,89	36,0	20,57	1,75	35,5	21,91	1,62
	-7	39,0	13,5	2,89	38,6	14,5	2,66	38,1	15,5	2,46	38,0	16,9	2,25	39,1	18,71	2,09	39,6	20,41	1,94	39,2	21,66	1,81
	-2	44,5	12,8	3,48	43,9	13,8	3,18	43,4	14,8	2,93	43,6	16,3	2,67	43,8	17,80	2,46	43,9	19,42	2,26	43,5	20,71	2,10
	2	48,8	11,79	4,14	48,1	12,8	3,76	47,2	13,9	3,40	47,4	15,2	3,12	47,1	16,58	2,84	47,0	18,01	2,61	46,3	19,29	2,40
	7	51,8	10,10	5,13	51,0	11,21	4,55	50,1	12,2	4,11	49,6	13,4	3,70	48,9	14,60	3,35	48,6	15,78	3,08	47,9	17,29	2,77
	12	53,6	9,39	5,71	52,6	9,62	5,47	51,7	10,70	4,83	51,1	11,80	4,33	50,4	12,99	3,88	49,8	14,31	3,48	48,9	15,62	3,13
	15	53,2	8,74	6,09	52,2	9,06	5,76	51,2	10,10	5,07	50,6	11,19	4,52	50,0	12,41	4,03	49,4	13,61	3,63	48,6	14,91	3,26
	20	51,8	8,14	6,36	50,8	8,21	6,19	49,9	9,17	5,44	49,4	10,10	4,89	48,9	11,09	4,41	48,3	12,29	3,93	47,7	13,51	3,53

HEATING -PSEC																							
Model SHP290	T air outdoor [°C]	Tout [°C]																					
		47-55			60			65			55-65			70			75			78			
		Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]
40 kW	-20	21,4	19,45	1,10	21,1	20,1	1,05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-15	23,3	18,35	1,27	23,9	19,8	1,21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-10	28,8	18,34	1,57	29,8	20,6	1,45	29,4	21,5	1,37	29,7	21,21	1,40	-	-	-	-	-	-	-	-	-
	-7	33,2	18,65	1,78	34,2	21,1	1,62	33,8	22,2	1,52	34,1	22,00	1,55	28,5	19,8	1,44	-	-	-	-	-	-
	-2	36,0	17,31	2,08	37,3	19,8	1,88	36,7	21,0	1,75	37,1	20,73	1,79	33,4	20,5	1,63	32,6	21,73	1,50	-	-	-
	2	37,8	15,68	2,41	39,1	18,3	2,14	38,3	19,5	1,96	38,8	19,21	2,02	36,9	20,4	1,81	35,8	21,57	1,66	35,0	22,44	1,56
	7	38,4	13,81	2,78	39,2	15,8	2,48	38,4	17,0	2,26	38,9	16,70	2,33	37,3	18,1	2,06	36,3	19,21	1,89	35,5	19,94	1,78
	12	39,4	12,59	3,13	39,6	14,0	2,83	38,5	14,9	2,58	39,0	14,72	2,65	37,4	15,9	2,35	36,1	16,79	2,15	35,4	17,44	2,03
	15	38,9	11,61	3,35	38,9	12,8	3,04	37,8	13,6	2,78	38,3	13,49	2,84	36,7	14,6	2,51	35,6	15,41	2,31	34,8	15,89	2,19
	20	38,4	10,41	3,69	38,1	11,2	3,40	37,1	11,9	3,12	37,6	11,79	3,19	36,1	12,6	2,87	35,2	13,28	2,65	34,4	13,82	2,49
50 kW	-20	29,2	22,64	1,29	23,4	21,87	1,07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-15	30,9	22,07	1,40	26,6	21,63	1,23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-10	35,8	21,70	1,65	32,7	22,2	1,47	32,9	23,5	1,40	33,2	23,2	1,43	-	-	-	-	-	-	-	-	-
	-7	39,5	21,35	1,85	37,0	22,4	1,65	36,6	23,8	1,54	36,9	23,5	1,57	32,4	22,3	1,45	-	-	-	-	-	-
	-2	43,8	20,47	2,14	41,4	21,68	1,91	40,8	23,1	1,77	41,3	22,7	1,82	38,2	23,0	1,66	37,3	24,4	1,53	-	-	-
	2	46,7	19,06	2,45	44,2	20,18	2,19	43,5	21,75	2,00	44,1	21,41	2,06	42,4	22,9	1,85	41,0	24,1	1,70	40,3	24,9	1,62
	7	48,3	17,13	2,82	46,3	18,23	2,54	45,6	19,83	2,30	46,2	19,49	2,37	44,4	20,94	2,12	43,0	22,05	1,95	42,2	22,81	1,85
	12	49,3	15,41	3,20	47,2	16,62	2,84	46,5	18,02	2,58	47,1	17,77	2,65	45,1	19,11	2,36	43,8	20,28	2,16	42,7	20,93	2,04
	15	49,0	14,80	3,31	46,7	15,88	2,94	46,0	17,29	2,66	46,7	16,98	2,75	44,6	18,43	2,42	43,4	19,46	2,23	42,4	20,09	2,11
	20	48,1	13,40	3,59	46,0	14,51	3,17	45,3	15,78	2,87	45,9	15,51	2,96	44,1	16,90	2,61	42,9	17,88	2,40	41,9	18,62	2,25

9.2 COOLING

COOLING																			
Model SHP290	T air outdoor [°C]	Tout [°C]																	
		5			7			10			12			15			18		
		Cooling capacity [kW]	Power input [kW]	EER [W/W]	Cooling capacity [kW]	Power input [kW]	EER [W/W]	Cooling capacity [kW]	Power input [kW]	EER [W/W]	Cooling capacity [kW]	Power input [kW]	EER [W/W]	Cooling capacity [kW]	Power input [kW]	EER [W/W]	Cooling capacity [kW]	Power input [kW]	EER [W/W]
40 kW	10	29,5	5,34	5,52	31,3	5,37	5,83	34,2	4,90	6,98	33,4	4,73	7,06	30,9	4,85	6,37	33,7	4,35	7,8
	20	27,6	6,34	4,35	29,3	6,43	4,56	32,3	6,06	5,33	31,6	5,88	5,37	29,7	6,07	4,89	32,5	5,69	5,71
	25	28,3	7,08	4,00	30,1	7,17	4,20	33,3	6,81	4,89	32,5	6,59	4,93	30,6	6,59	4,64	33,7	6,28	5,37
	30	28,0	7,98	3,51	29,8	8,08	3,69	33,0	7,78	4,24	32,6	7,51	4,34	31,2	7,32	4,26	34,5	7,06	4,89
	35	27,2	9,07	3,00	28,9	9,20	3,14	32,2	8,94	3,60	31,9	8,62	3,70	31,0	8,31	3,73	34,5	8,10	4,26
	40	27,3	11,10	2,46	29,0	11,28	2,57	32,0	11,11	2,88	32,2	10,49	3,07	32,1	10,00	3,21	35,3	9,83	3,59
	46	25,8	13,30	1,94	27,4	13,50	2,03	30,0	13,51	2,22	30,3	12,89	2,35	30,6	12,09	2,53	33,3	12,11	2,75
50 kW	10	31,8	6,07	5,24	34,6	6,03	5,74	38,7	6,01	6,44	38,8	5,34	7,27	37,1	4,40	8,43	38,5	4,39	8,8
	20	31,1	6,84	4,55	33,3	6,89	4,83	36,9	6,94	5,32	36,9	6,23	5,92	35,4	5,21	6,79	37,5	5,20	7,21
	25	31,6	7,96	3,97	33,7	8,00	4,21	37,3	8,14	4,58	37,4	7,33	5,10	35,6	6,15	5,79	37,7	6,37	5,92
	30	32,2	9,39	3,43	34,3	9,50	3,61	38,2	9,70	3,94	37,9	8,71	4,35	35,4	7,22	4,90	37,6	7,30	5,15
	35	32,0	10,88	2,94	34,1	11,00	3,10	37,8	11,28	3,35	37,4	10,19	3,67	34,8	8,47	4,11	37,0	8,53	4,34
	40	31,1	12,90	2,41	33,1	13,08	2,53	36,8	13,38	2,75	36,7	12,40	2,96	34,8	10,71	3,25	37,2	10,91	3,41
	46	29,0	15,18	1,91	30,8	15,40	2,00	33,9	15,69	2,16	34,3	14,78	2,32	33,5	13,29	2,52	35,3	13,32	2,65

COOLING -PSI/-PS																			
Model SHP290	T air outdoor [°C]	Tout [°C]																	
		5			7			10			12			15			18		
		Cooling capacity [kW]	Power input [kW]	EER [W/W]	Cooling capacity [kW]	Power input [kW]	EER [W/W]	Cooling capacity [kW]	Power input [kW]	EER [W/W]	Cooling capacity [kW]	Power input [kW]	EER [W/W]	Cooling capacity [kW]	Power input [kW]	EER [W/W]	Cooling capacity [kW]	Power input [kW]	EER [W/W]
40 kW	10	29,4	5,41	5,43	31,3	5,43	5,76	34,3	4,93	6,96	33,3	4,74	7,03	30,9	4,89	6,32	33,6	4,37	7,69
	20	27,6	6,45	4,28	29,3	6,51	4,50	32,3	6,11	5,29	31,6	5,94	5,32	29,5	6,15	4,80	32,6	5,74	5,68
	25	28,2	7,18	3,93	30,1	7,24	4,16	33,2	6,85	4,85	32,5	6,63	4,90	30,6	6,67	4,59	33,8	6,32	5,35
	30	28,0	8,07	3,47	29,7	8,16	3,64	33,1	7,83	4,23	32,6	7,56	4,31	31,2	7,39	4,22	34,5	7,10	4,86
	35	27,1	9,16	2,96	28,8	9,29	3,10	32,3	9,02	3,58	32,0	8,70	3,68	30,9	8,37	3,69	34,5	8,16	4,23
	40	27,2	11,19	2,43	28,9	11,29	2,56	32,0	11,11	2,88	32,4	10,59	3,06	32,1	10,09	3,18	35,4	9,86	3,59
	46	25,8	13,51	1,91	27,5	13,61	2,02	30,0	13,51	2,22	30,3	13,00	2,33	30,5	12,20	2,50	33,3	12,11	2,75
50 kW	10	31,9	6,12	5,21	34,7	6,05	5,74	38,8	5,99	6,48	38,2	5,35	7,14	36,9	4,34	8,50	38,5	4,39	8,77
	20	31,0	6,90	4,49	33,1	6,90	4,80	36,9	6,92	5,33	37,0	6,23	5,94	35,5	5,23	6,79	37,5	5,23	7,17
	25	31,6	8,00	3,95	33,7	8,02	4,20	37,6	8,12	4,63	37,5	7,34	5,11	35,8	6,17	5,80	37,8	6,18	6,12
	30	32,2	9,42	3,42	34,3	9,45	3,63	38,3	9,70	3,95	37,9	8,69	4,36	35,7	7,24	4,93	37,7	7,29	5,17
	35	32,0	10,88	2,94	34,1	11,00	3,10	38,0	11,31	3,36	37,4	10,19	3,67	34,8	8,45	4,12	37,0	8,53	4,34
	40	29,5	12,72	2,32	33,1	13,08	2,53	36,9	13,42	2,75	36,6	12,41	2,95	35,2	10,80	3,26	35,3	10,41	3,39
	46	29,0	15,18	1,91	30,8	15,40	2,00	34,0	15,67	2,17	34,3	14,78	2,32	33,6	13,28	2,53	35,4	13,31	2,66

COOLING -PSEC																		
Model SHP290	T air outdoor [°C]	Tout [°C]																
		5			7			10			12			15			18		
		Cooling capacity [kW]	Power input [kW]	EER [W/W]	Cooling capacity [kW]	Power input [kW]	EER [W/W]	Cooling capacity [kW]	Power input [kW]	EER [W/W]	Cooling capacity [kW]	Power input [kW]	EER [W/W]	Cooling capacity [kW]	Power input [kW]	EER [W/W]	Cooling capacity [kW]	Power input [kW]	EER [W/W]
40 kW	10	29,1	5,80	5,02	30,9	5,80	5,33	33,9	5,26	6,44	33,0	5,07	6,51	30,4	5,18	5,87	33,4	4,61	7,25
	20	27,2	6,85	3,97	29,0	6,92	4,19	31,9	6,48	4,92	31,2	6,29	4,96	29,1	6,47	4,50	32,1	6,03	5,32
	25	27,9	7,60	3,67	29,7	7,67	3,87	32,8	7,24	4,53	32,1	7,01	4,58	30,2	7,01	4,31	33,3	6,63	5,02
	30	27,6	8,52	3,24	29,4	8,60	3,42	32,7	8,24	3,97	32,2	7,95	4,05	30,7	7,75	3,96	34,1	7,45	4,58
	35	26,7	9,64	2,77	28,4	9,73	2,92	31,9	9,41	3,39	31,6	9,11	3,47	30,6	8,77	3,49	34,0	8,52	3,99
	40	26,9	11,7	2,30	28,6	11,8	2,42	31,7	11,6	2,73	31,8	11,0	2,89	31,7	10,5	3,02	35,0	10,3	3,40
	46	25,4	13,9	1,83	27,0	14,1	1,91	29,7	14,1	2,11	29,9	13,4	2,23	30,2	12,6	2,40	33,0	12,6	2,62
50 kW	10	31,5	6,54	4,82	34,4	6,47	5,32	38,4	6,41	5,99	38,4	5,75	6,68	36,6	4,85	7,55	38,2	4,81	7,94
	20	30,8	7,33	4,20	33,0	7,37	4,48	36,6	7,36	4,97	36,6	6,65	5,50	35,1	5,67	6,19	37,2	5,64	6,60
	25	31,3	8,46	3,70	33,4	8,46	3,95	36,9	8,56	4,31	37,2	7,77	4,79	35,4	6,62	5,35	37,5	6,82	5,50
	30	31,9	9,88	3,23	34,1	9,94	3,43	37,8	10,11	3,74	37,7	9,13	4,13	35,1	7,68	4,57	37,3	7,74	4,82
	35	31,7	11,4	2,78	33,7	11,4	2,96	37,6	11,7	3,21	37,1	10,6	3,50	34,5	8,94	3,86	36,6	8,99	4,07
	40	30,8	13,4	2,30	32,7	13,5	2,42	36,5	13,8	2,64	36,4	12,8	2,84	34,5	11,1	3,11	36,9	11,3	3,27
	46	28,7	15,7	1,83	30,5	15,9	1,92	33,6	16,1	2,09	34,0	15,2	2,24	33,2	13,7	2,42	35,1	13,7	2,56

9.3 DOMESTIC HOT WATER

The tables show the heating capacity, absorbed power and COP values for different outside air temperatures during the summer season for technical water at 45 / 50 / 55 °C for domestic hot water production. The data shown are indicative and may be subject to change.

HEATING																									
Model SHP290	T air outdoor [°C]	Tout [°C]																							
		45			50			55			60			65			70			75			78		
		Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]
40 kW	20	38,6	8,64	4,47	37,8	9,29	4,07	37,8	10,0	3,78	37,8	10,8	3,50	36,8	11,5	3,20	35,8	12,2	2,93	34,8	12,9	2,70	34,1	13,4	2,54
	25	36,7	7,84	4,68	36,0	8,31	4,33	36,6	8,78	4,17	37,1	9,61	3,86	36,1	10,4	3,47	35,1	10,9	3,22	33,9	11,5	2,95	33,2	11,8	2,81
	30	39,1	8,10	4,83	38,2	8,51	4,49	38,9	8,74	4,45	39,5	9,10	4,34	38,5	9,63	4,00	37,3	10,1	3,69	36,1	10,7	3,37	35,4	11,0	3,22
	35	41,8	8,34	5,01	40,8	8,79	4,64	41,5	9,00	4,61	42,1	9,36	4,50	41,0	9,90	4,14	39,8	10,4	3,83	38,6	11,0	3,51	37,8	11,3	3,35
	40	44,3	8,60	5,15	43,3	9,08	4,77	44,0	9,24	4,76	44,7	9,57	4,67	43,5	10,2	4,26	42,2	10,7	3,94	-	-	-	-	-	-
	45	47,1	8,89	5,30	45,8	9,37	4,89	46,6	9,51	4,90	47,3	9,81	4,82	45,9	10,4	4,41	-	-	-	-	-	-	-	-	-
50 kW	20	48,7	10,8	4,51	48,1	12,0	4,01	47,5	13,2	3,60	45,8	14,1	3,25	45,1	15,4	2,93	43,9	16,5	2,66	42,6	17,5	2,43	41,7	18,2	2,29
	25	48,1	9,47	5,08	47,4	10,6	4,47	46,7	11,7	3,99	44,6	12,5	3,57	43,8	13,7	3,20	42,6	14,7	2,90	41,3	15,7	2,63	40,5	16,3	2,48
	30	51,6	9,36	5,51	50,4	10,5	4,80	49,9	11,7	4,26	47,6	12,5	3,81	46,8	13,8	3,39	45,5	14,9	3,05	44,2	15,9	2,78	43,3	16,5	2,62
	35	55,2	9,22	5,99	54,1	10,4	5,20	52,9	11,7	4,52	50,5	12,5	4,04	49,7	13,9	3,58	48,4	15,0	3,23	47,0	16,0	2,94	46,1	16,7	2,76
	40	59,2	9,04	6,55	57,8	10,3	5,61	56,9	11,6	4,91	53,8	12,5	4,30	52,7	13,9	3,79	51,5	15,0	3,43	-	-	-	-	-	-
	45	63,0	8,87	7,10	61,8	10,2	6,06	60,5	11,5	5,26	57,4	12,5	4,59	56,1	13,9	4,04	-	-	-	-	-	-	-	-	-

HEATING -PSI/-PS																									
Model SHP290	T air outdoor [°C]	45			50			55			60			65			70			75			78		
		Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]
40 kW	20	38,5	8,65	4,45	37,7	9,29	4,06	37,7	10,0	3,77	37,7	10,8	3,49	36,8	11,5	3,20	35,8	12,2	2,93	34,7	12,9	2,69	34,1	13,4	2,54
	25	36,7	7,88	4,66	36,0	8,33	4,32	36,5	8,80	4,15	37,1	9,64	3,85	36,1	10,4	3,47	35,1	11,0	3,19	33,9	11,5	2,95	33,2	11,9	2,79
	30	39,1	8,10	4,83	38,2	8,51	4,49	38,8	8,74	4,44	39,4	9,10	4,33	38,4	9,62	3,99	37,3	10,2	3,66	36,1	10,7	3,37	35,4	11,0	3,22
	35	41,7	8,32	5,01	40,7	8,77	4,64	41,4	8,98	4,61	42,0	9,31	4,51	40,9	9,88	4,14	39,8	10,4	3,83	38,5	11,0	3,50	37,7	11,3	3,34
	40	44,2	8,57	5,16	43,2	9,04	4,78	44,0	9,21	4,78	44,6	9,53	4,68	43,4	10,1	4,30	42,2	10,7	3,94	-	-	-	-	-	-
	45	46,9	8,82	5,32	45,7	9,31	4,91	46,5	9,43	4,93	47,2	9,75	4,84	45,7	10,4	4,39	-	-	-	-	-	-	-	-	-
50 kW	20	48,6	10,8	4,50	48,0	12,0	4,00	47,3	13,2	3,58	45,7	14,0	3,26	45,0	15,4	2,92	43,9	16,4	2,68	42,5	17,5	2,43	41,6	18,1	2,30
	25	48,0	9,39	5,11	47,3	10,5	4,50	46,6	11,7	3,98	44,5	12,5	3,56	43,7	13,7	3,19	42,5	14,7	2,89	41,2	15,7	2,62	40,5	16,3	2,48
	30	51,4	9,24	5,56	50,7	10,4	4,88	49,8	11,6	4,29	47,5	12,5	3,80	46,7	13,7	3,41	45,4	14,8	3,07	44,2	15,8	2,80	43,2	16,5	2,62
	35	55,0	9,09	6,05	54,0	10,3	5,24	52,8	11,6	4,55	50,3	12,4	4,06	49,5	13,8	3,59	48,4	14,9	3,25	46,9	16,0	2,93	46,2	16,6	2,78
	40	59,0	8,87	6,65	57,7	10,2	5,66	56,6	11,5	4,92	53,6	12,4	4,32	52,6	13,8	3,81	51,4	14,9	3,45	-	-	-	-	-	-
	45	62,8	9,13	6,88	61,6	10,0	6,16	60,3	11,4	5,29	57,2	12,4	4,61	55,9	13,8	4,05	-	-	-	-	-	-	-	-	-

HEATING -PSEC																									
Model SHP290	T air outdoor [°C]	Tout [°C]																							
		45			50			55			60			65			70			75			78		
		Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]	Heating capacity [kW]	Power input [kW]	COP [W/W]
40 kW	20	38,8	9,04	4,29	38,1	9,69	3,93	38,1	10,4	3,66	38,1	11	3,40	37,1	11,9	3,12	36,1	12,6	2,87	35,2	13,3	2,65	34,4	13,8	2,49
	25	37,0	8,20	4,51	36,3	8,68	4,18	36,9	9,16	4,03	37,4	10	3,75	36,4	10,8	3,37	35,4	11,3	3,13	34,3	11,9	2,88	33,6	12,2	2,75
	30	39,4	8,44	4,67	38,5	8,85	4,35	39,2	9,07	4,32	39,8	9,41	4,23	38,8	9,95	3,90	37,6	10,4	3,62	36,4	11,1	3,28	35,7	11,3	3,16
	35	42,0	8,64	4,86	41,1	9,09	4,52	41,7	9,31	4,48	42,3	9,66	4,38	41,2	10,2	4,04	40,1	10,7	3,75	38,9	11,3	3,44	38,1	11,6	3,28
	40	44,5	8,88	5,01	43,5	9,38	4,64	44,2	9,51	4,65	44,9	9,85	4,56	43,7	10,5	4,16	42,4	11,0	3,85	-	-	-	-	-	-
	45	47,2	9,15	5,16	46,0	9,62	4,78	46,8	9,75	4,80	47,4	10,1	4,69	46,1	10,7	4,31	-	-	-	-	-	-	-	-	-
50 kW	20	48,9	11,1	4,41	48,3	12,3	3,93	47,7	13,5	3,53	46,0	14,5	3,17	45,3	15,8	2,87	44,1	16,9	2,61	42,9	17,9	2,40	41,9	18,6	2,25
	25	48,2	9,82	4,91	47,6	11,0	4,33	46,9	12,1	3,88	44,8	12,9	3,47	44,0	14,1	3,12	42,9	15,1	2,84	41,6	16,1	2,58	40,8	16,8	2,43
	30	51,7	9,66	5,35	50,4	10,8	4,67	50,1	12,0	4,18	47,8	12,9	3,71	47,0	14,2	3,31	45,7	15,3	2,99	44,4	16,3	2,72	43,6	16,9	2,58
	35	55,3	9,49	5,83	54,2	10,7	5,07	53,0	12,0	4,42	50,6	12,8	3,95	49,9	14,2	3,51	48,6	15,3	3,18	47,2	16,3	2,90	46,3	17,1	2,71
	40	59,2	9,26	6,39	57,9	10,6	5,46	57,0	11,9	4,79	53,9	12,8	4,21	52,8	14,2	3,72	51,7	15,3	3,38	-	-	-	-	-	-
	45	63,0	9,06	6,95	61,8	10,4	5,94	60,5	11,7	5,17	57,4	12,8	4,48	56,2	14,2	3,96	-	-	-	-	-	-	-	-	-

10. SEASONAL PERFORMANCE AT DIFFERENT TEMPERATURE LEVELS

The values of the seasonal performance coefficients SCOP, heating energy efficiency ηs,h and design heat output P_{design} for the SHP290 series units are shown. The data are calculated for three temperature levels according to UNI EN 14825: low (LT), medium (MT) and high (HT).

- LT: Heating in medium climate conditions, Tbiv= -7 °C, low temperature (35 °C), variable output, fixed flow rate.
- MT: Heating in medium climate conditions, Tbiv= -7 °C, medium temperature (55 °C), variable output, fixed flow rate.
- HT: Heating in medium climate conditions, Tbiv= -7 °C, high temperature (65 °C), variable output, fixed flow rate.

Model SHP290	Pdesign (LT)	SCOP (LT)	ηs,h (LT)	Pdesign (MT)	SCOP (MT)	ηs,h (MT)	Pdesign (HT)	SCOP (HT)	ηs,h (HT)
	kW	W/W	%	kW	W/W	%	kW	W/W	%
40 kW	39	4,09	160	38	3,44	134	38	2,98	116
40 kW -PS/ PSI	39	4,10	161	38	3,36	131	38	2,90	113
40 kW -PSEC	39	3,84	150	38	3,17	124	39	2,75	107
50 kW	43	4,20	165	44	3,34	131	41	2,87	112

10.1 DATA FOR THE ENERGY CERTIFICATION OF BUILDINGS ACCORDING TO UNI/TS 11300-4 FOR HEAT PUMPS

The supplementary data of heat pumps for the calculation of the energy performance of buildings according to UNI/TS 11300 part 4 are given below.
The characteristics quantities that will be provided for each model are explained below, according to statement 31 of the standard.

	E	A Tbival	B	C	D
Reference temperature	-10 °C	-7 °C	2 °C	7 °C	12 °C
PLR (T_{des} = -10°C)	100%	88%	54%	35%	15%
Power DC at full load		$DC_A = DC_{bival}$	DC_B	DC_C	DC_D
COP at partial load		COP_A	COP_B	COP_C	COP_D
COP at full load		COP'_A	COP'_B	COP'_C	COP'_D
CR	>1	1	$(0,54 \times P_{des}) / DC_B$	$(0,35 \times P_{des}) / DC_C$	$(0,15 \times P_{des}) / DC_D$
Correction factor Fp	1	1	COP_B/COP'_B	COP_C/COP'_C	COP_D/COP'_D
PLR	part load ratio - climatic load factor				
CR	heat pump load factor				
DC	full load power at indicated temperatures				
DC_{bival}	full load power at -7/35°C				
P_{design}	full load with temperate climate				
COP	COP with CR load at the same temperature conditions as COP'				
COP'	COP at full load under the same temperature conditions as COP				

10.1.1 Model SHP290 40 kW

Operating limits

COLD source:	OUTDOOR AIR	
Operating temperature (cut-off)	min	-20 °C
	max	20 °C

HOT source:	WATER	
Operating temperature (cut-off)	min	20 °C
	max	78 °C

Performance data measured in partial load conditions, according to UNI/TS 11300-4

Operating conditions		A Tbival	B	C	D
Reference temperature	[°C]	-7	2	7	12
PLR (T des = -10°C)	[%]	88	54	35	15
Power DC at full load	[kW]	34,6	39,1	40,1	41,0
COP at partial load		2,49	3,58	5,37	6,01
COP at full load		2,49	3,52	4,10	4,80
CR		1,00	0,99	0,77	0,30
Corrective factor Fp		1,00	1,02	1,31	1,25

10.1.2 Model SHP290 40 kW -PS/PSI

Operating limits

COLD source:	OUTDOOR AIR	
Operating temperature (cut-off)	min	-20 °C
	max	20 °C

HOT source:	WATER	
Operating temperature (cut-off)	min	20 °C
	max	78 °C

Performance data measured in partial load conditions, according to UNI/TS 11300-4

Operating conditions		A Tbival	B	C	D
Reference temperature	[°C]	-7	2	7	12
PLR (T des = -10°C)	[%]	88	54	35	15
Power DC at full load	[kW]	34,6	39,0	40,0	40,9
COP at partial load		2,49	3,58	5,38	6,02
COP at full load		2,49	3,51	4,10	4,79
CR		1,00	1,00	0,77	0,30
Corrective factor Fp		1,00	1,02	1,31	1,26

10.1.3 Model SHP290 40 kW-PSEC

Operating limits

COLD source:	OUTDOOR AIR	
Operating temperature (cut-off)	min	-20 °C
	max	20 °C

HOT source:	WATER	
Operating temperature (cut-off)	min	20 °C
	max	78 °C

Performance data measured in partial load conditions, according to UNI/TS 11300-4

Operating conditions		A Tbival	B	C	D
Reference temperature	[°C]	-7	2	7	12
PLR (T des = -10°C)	[%]	88	54	35	15
Power DC at full load	[kW]	34,8	39,4	40,4	41,3
COP at partial load		2,43	3,36	4,80	5,33
COP at full load		2,43	3,40	3,96	4,59
CR		1,00	1,00	0,77	0,29
Corrective factor Fp		1,00	0,99	1,21	1,16

10.1.4 Model SHP290 50 kW

Operating limits

COLD source:	OUTDOOR AIR	
Operating temperature (cut-off)	min	-20 °C
	max	20 °C

HOT source:	WATER	
Operating temperature (cut-off)	min	20 °C
	max	78 °C

Performance data measured in partial load conditions, according to UNI/TS 11300-4

Operating conditions		A Tbival	B	C	D
Reference temperature	[°C]	-7	2	7	12
PLR (T des = -10°C)	[%]	88	54	35	15
Power DC at full load	[kW]	38,1	47,2	50,0	51,6
COP at partial load		2,49	3,45	4,76	5,22
COP at full load		2,49	3,47	4,20	4,96
CR		1,00	1,00	0,76	0,30
Corrective factor Fp		1,00	0,99	1,13	1,05

10.1.5 Model SHP290 50 kW -PS/PSI

Operating limits

COLD source:	OUTDOOR AIR	
Operating temperature (cut-off)	min	-20 °C
	max	20 °C

HOT source:	WATER	
Operating temperature (cut-off)	min	20 °C
	max	78 °C

Performance data measured in partial load conditions, according to UNI/TS 11300-4

Operating conditions		A Tbival	B	C	D
Reference temperature	[°C]	-7	2	7	12
PLR (T des = -10°C)	[%]	88	54	35	15
Power DC at full load	[kW]	37,9	47,0	50,1	51,4
COP at partial load		2,49	3,44	4,70	5,19
COP at full load		2,49	3,46	4,21	4,99
CR		1,00	1,00	0,76	0,30
Corrective factor Fp		1,00	0,99	1,12	1,04

10.1.6 Model SHP290 50 kW-PSEC

Operating limits

COLD source:	OUTDOOR AIR	
Operating temperature (cut-off)	min	-20 °C
	max	20 °C

HOT source:	WATER	
Operating temperature (cut-off)	min	20 °C
	max	78 °C

Performance data measured in partial load conditions, according to UNI/TS 11300-4

Operating conditions		A Tbival	B	C	D
Reference temperature	[°C]	-7	2	7	12
PLR (T des = -10°C)	[%]	88	54	35	15
Power DC at full load	[kW]	38,2	47,3	50,1	51,7
COP at partial load		2,45	3,32	4,42	4,88
COP at full load		2,45	3,40	4,11	4,83
CR		1,00	0,99	0,76	0,30
Corrective factor Fp		1,00	0,98	1,08	1,01

10.2 EER DATA TO CALCULATE THE ENERGY PERFORMANCE OF BUILDINGS, ACCORDING TO UNI/TS 11300-3

The values of the EER coefficients under partial load conditions are shown.
The reference conditions at partial load specified by the UNI/TS 11300-3 standard are illustrated below.
The EER are also provided for load factors lower than 25%.

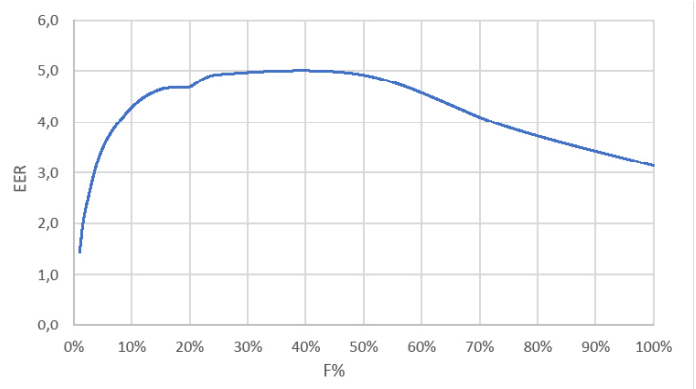
Test	Load factor F%	Outdoor air dry bulb temperature [°C]	Chilled water temperature on fan coil input/output [°C]
1	100%	35	12/7
2	75%	30	*)/7
3	50%	25	*)/7
4	25%	20	*)/7

(*) temperature set by the full load water flow rate.

10.2.1 Model SHP290 40 kW

Outdoor air dry bulb temperature [°C]	Load factor F%	EER	Cooling capacity [kW]
35	100%	3,14	28,9
30	75%	3,90	21,6
25	50%	4,92	16,4
20	25%	4,93	16,6

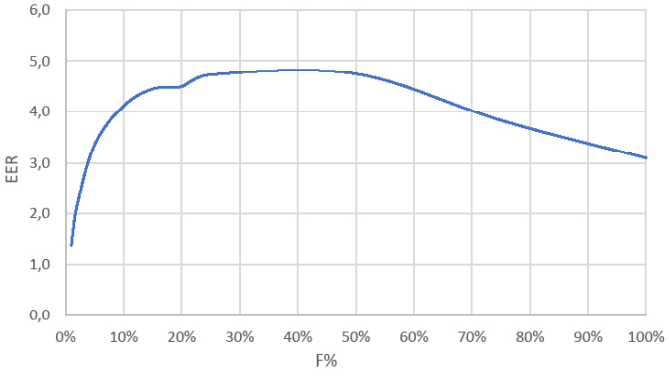
C	Load factor F%	EER @20°C x C
0,95	20%	4,68
0,94	15%	4,63
0,87	10%	4,29
0,71	5%	3,50
0,46	2%	2,27
0,29	1%	1,43



10.2.2 Model SHP290 40 kW -PS/PSI

Outdoor air dry bulb temperature [°C]	Load factor F%	EER	Cooling capacity [kW]
35	100%	3,10	28,8
30	75%	3,83	21,5
25	50%	4,75	16,3
20	25%	4,73	16,5

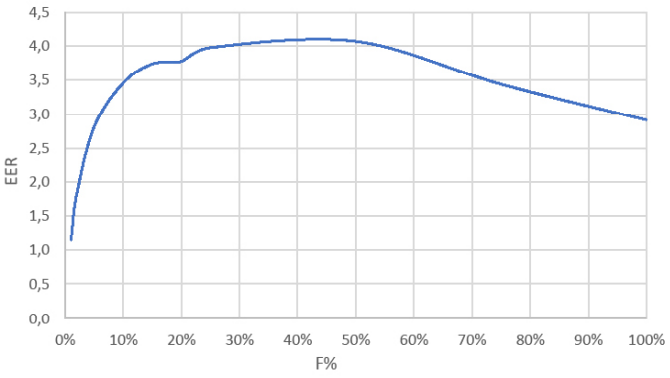
C	Load factor F%	EER @20°C x C
0,95	20%	4,49
0,94	15%	4,45
0,87	10%	4,11
0,71	5%	3,36
0,46	2%	2,18
0,29	1%	1,37



10.2.3 Model SHP290 40 kW -PSEC

Outdoor air dry bulb temperature [°C]	Load factor F%	EER	Cooling capacity [kW]
35	100%	2,92	28,4
30	75%	3,44	21,3
25	50%	4,07	16,0
20	25%	3,98	16,1

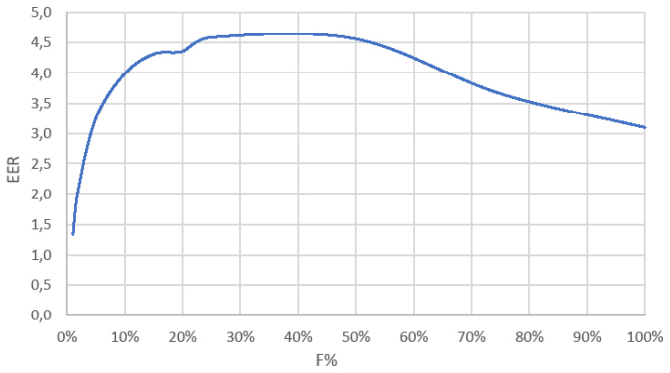
C	Load factor F%	EER @20°C x C
0,95	20%	3,78
0,94	15%	3,74
0,87	10%	3,46
0,71	5%	2,82
0,46	2%	1,83
0,29	1%	1,15



10.2.4 Model SHP290 50 kW

Outdoor air dry bulb temperature [°C]	Load factor F%	EER	Cooling capacity [kW]
35	100%	3,10	34,1
30	75%	3,66	25,5
25	50%	4,56	17,0
20	25%	4,58	14,4

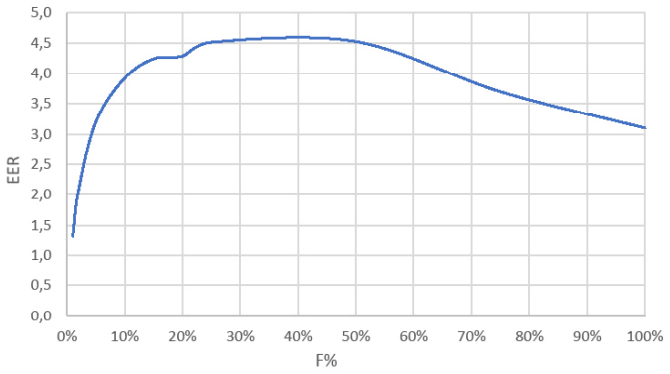
C	Load factor F%	EER @20°C x C
0,95	20%	4,35
0,94	15%	4,31
0,87	10%	3,99
0,71	5%	3,25
0,46	2%	2,11
0,29	1%	1,33



10.2.5 Model SHP290 50 kW -PS/PSI

Outdoor air dry bulb temperature [°C]	Load factor F%	EER	Cooling capacity [kW]
35	100%	3,10	34,1
30	75%	3,70	25,6
25	50%	4,52	17,1
20	25%	4,51	14,4

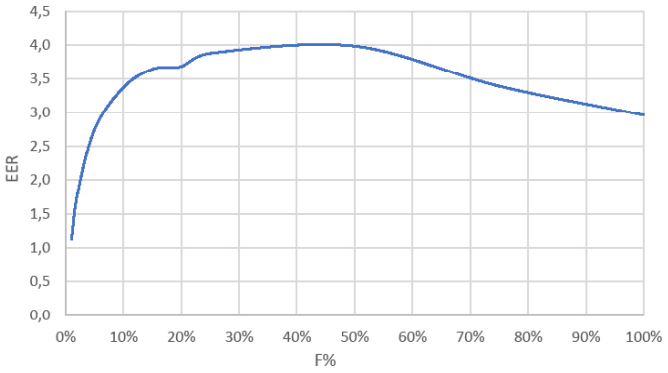
C	Load factor F%	EER @20°C x C
0,95	20%	4,28
0,94	15%	4,24
0,87	10%	3,92
0,71	5%	3,20
0,46	2%	2,07
0,29	1%	1,31



10.2.6 Model SHP290 50 kW-PSEC

Outdoor air dry bulb temperature [°C]	Load factor F%	EER	Cooling capacity [kW]
35	100%	2,96	33,7
30	75%	3,39	25,3
25	50%	3,98	16,9
20	25%	3,87	14,2

C	Load factor F%	EER @20°C x C
0,95	20%	3,68
0,94	15%	3,64
0,87	10%	3,37
0,71	5%	2,75
0,46	2%	1,78
0,29	1%	1,12



11. REFRIGERANT SAFETY DATA SHEET

Name:	R290
	HAZARDS IDENTIFICATION
Main hazards:	Highly flammable gas. Vapours are heavier than air and can cause asphyxiation due to reduced oxygen levels.
Specific hazards:	Contact with the liquid can cause frost burns.
	FIRST AID MEASURES
General information:	In high concentrations it can cause asphyxia. Symptoms may include loss of mobility and/or consciousness. In low concentrations it may have a narcotic effect.
Inhalation:	Move the victim to an uncontaminated area while wearing self-contained breathing apparatus. Use oxygen or artificial respiration artificial respiration if necessary. Keep the patient lying down and warm. Call a doctor.
Eye contact:	Carefully rinse with plenty of water for at least 15 minutes.
Skin contact:	Wash immediately with plenty of water for at least 15 minutes. Immediately remove contaminated clothing.
	FIRE FIGHTING MEASURES
Extinguishing media:	Water spray, dry powder.
Specific hazards:	Exposure to flames may cause the vessel to rupture or explode.
Specific methods:	Cool down the containers with a water spray from a safe position. Stop the product leakage if possible. Use water spray, if possible, to abate the fumes. Move the vessels away from the area of the fire if this can be done without posing any risks.
	ACCIDENTAL RELEASE MEASURES
Personal precautions:	Try to stop the leak. Evacuate personnel to safety areas. Eliminate the ignition sources. Ensure proper ventilation. Avoid entering sewers, basements, excavations and areas where accumulation can be dangerous. Use personal protective equipment. Remain upwind.
Environmental precautions:	Try to stop the leak.
Cleaning methods:	Ventilate the area.
	HANDLING AND STORAGE
Handling: Technical measures/precautions:	Ensure sufficient air exchange and/or suction in the working area. Do not smoke. Keep away from sources of ignition (including electrostatic charges). Use only appropriate equipment, suitable for the product.
Advice for safe use:	Do not inhale the gas.
Storage:	Close carefully and store in a cool and well ventilated area. Storage containers should be checked periodically. Do not store with other oxidants in general or other combustible substances. Containers must not be stored in conditions that could lead to corrosion. All electrical equipment in the storage area are compliant with the risk of explosive atmospheres formation.
	EXPOSURE CONTROLS/PERSONAL PROTECTION
Control parameters:	OEL: data not available. DNEL: data not available. PNEC: data not available.
Respiratory protection:	Filter masks can be used if the ambient conditions and duration of use are known.
Eye protection:	Safety goggles.
Hand protection:	Work gloves.
Hygienic measures:	No smoking.
	PHYSICAL AND CHIMICAL PROPERTIES
Colour:	Colourless.
Odour:	Odourless.
Boiling point:	-42,1 °C at atm press
Flash point:	470°C
Relative gas density (air=1) Relative liquid density (water=1)	1,50 0,58
Solubility in water:	75 mg/l.
	STABILITY AND REACTIVITY
Stability:	Stable under normal conditions.
Materials to avoid: Decomposition products hazardous:	Air, oxidising agents . Keep away from heat sources/sparks/open flames/heated surfaces. Under normal conditions of storage and use, dangerous decomposition products should not be generated.
	TOXICOLOGICAL INFORMATION
Acute toxicity: Local effects: Long term toxicity:	CL50/inhalation/4 hours/on rat = 20000 ppm. No known effect. No known effect.
	ENVIRONMENTAL INFORMATION
Global warming potential GWP (R744=1):	3
Ozone Depletion Potential ODP (R11=1):	0
Disposal consideration:	Refer to the supplier's gas recovery programme. Avoid direct discharge into the atmosphere. Do not discharge where accumulation can be dangerous. Ensure that the emissions limits required by local regulations or specified in authorizations are not exceeded.

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