

STREBEL

S-ASX-VP Range

Air Source Heat Pump

Models 60 - 70 - 80 - 90 - 100

Installation, Operating & Maintenance Manual



Please read and understand before commencing installation and leave the manual with the customer for future reference.



STREBEL
HEATING TECHNOLOGY

2025-08-04 V10

Declaration of Conformity

The manufacturer declares that the present equipment complies with the requirements of the following directives :

- **Machinery Directive** (MD)
2006/42/EC
- **Pressure Equipment Directive** (PED)
2014/68/EU
- **Electromagnetic Compatibility Directive** (EMC)
2014/30/EU
- **Low Voltage Directive** (LVD)
2014/35/EU
- **Energy Efficiency Directive** (EED)
2012/27/EU

ORIGINAL INSTRUCTIONS

The manufacturer disclaims any liability arising from the incorrect use of this manual.
The manufacturer reserves the right to make modifications and/or improvements to this manual
and to the products due to any reason, in any time, and without prior notice.
This manual is the exclusive property of the manufacturer. Any reproduction, even partial, is forbidden.

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General Information

General Warnings

MANUAL AND DOCUMENTATION - This manual provides all the information necessary for a correct installation and for a correct use and maintenance of the equipment. Before proceeding with the installation, carefully read this manual and follow the instructions contained therein.

The manufacturer declines all responsibility for any direct or indirect damage to persons or property deriving from failure to observe the information provided in this manual.

This manual and the wiring diagram supplied with the machine must be properly stored to be readily available for future reference in case of need.

ACCESS TO THE UNIT - Access to the unit must be allowed only to personnel trained in this type of unit and equipped with the necessary accident prevention protections. Furthermore, this personnel must be authorised by the owner of the unit and recognised by the manufacturer to operate.

The equipment may not be used by children under the age of 8 and by persons with reduced physical, sensory or mental abilities or lack of experience and skills unless they are supervised or instructed to use the equipment safely and they understand the related dangers. Children must not play with the equipment. Cleaning and maintenance by the user must not be carried out by the categories previously listed without supervision.

INSTALLATION - The equipment must be installed only and exclusively by qualified personnel, in compliance with all current and applicable safety regulations in accordance with the national legislation of the country of installation.

USE - The appliance must be connected to a hydronic heating and/or cooling system. Any use other than that permitted or outside the operating limits mentioned in this manual is forbidden (unless previously agreed with the manufacturer).

FAILURES OR MALFUNCTIONS - Switch off the equipment in case of failure or malfunction. If the equipment needs to be repaired, please contact a specialized service center recognised by the manufacturer and use original spare parts.

The manufacturer declines all responsibility deriving from electrical or mechanical tampering of the equipment which, if not authorised by the manufacturer, **THE WARRANTY IS VOID.**

The unit must be serviced by qualified personnel in compliance with all applicable and applicable safety regulations in accordance with the national legislation of the country of installation.

IDENTIFICATION OF THE UNIT - All units are supplied with the identification plate described below. The serial number uniquely identifies the machine. In the event of a request for assistance, the user must always specify the model of the unit, the serial number and the year of manufacture, so as to trace the specific characteristics of the product and the assembled components and to correctly supply any spare parts.

Unit Data Plate

A				CE	
S/N	B				
Model	C				
Code	D				
Power supply	E				
Max Current Input [A]	F				
Standard	G	Heating A7W35		Cooling A35W7	
Capacity	[kW]	H	J		
Power input	[kW]	I	K		
Max pressure	[bar]	High	L	Low	M
Refrigerant	[kg]		N		P
	[tCO ₂ eq]		O		Q
Weight	[kg]	R			
Sound pressure at 1m	[dB(A)]			S	
Protection degree		T	U		
PED category	V	Manufactured by			
	W	X			

- A Trademark
- B Serial number
- C Model
- D Code
- E Power supply
- F Maximum input current [A]
- G Reference standard
- H Capacity in heating mode at nominal condition * [kW]
- I Power input in heating mode at nominal condition * [kW]
- J Capacity in cooling mode at nominal condition * [kW]
- K Power input in cooling mode at nominal condition * [kW]
- L Maximum pressure on the high pressure side [barg]
- M Maximum pressure on the low pressure side [barg]
- N Quantity of refrigerant [kg]
- O Tonnes of equivalent CO₂ [tCO₂eq]
- P Type of refrigerant
- Q Refrigerant GWP
- R Weight [kg]
- S Sound pressure level at 1 metre [dB(A)]
- T Type of protection
- U Protection level
- V PED category
- W PED certification body
- X Manufacturer

Nominal conditions *	Air - Water
Heating	A7W35
Cooling	A35W7

Description

Description of Components

External Structure

Basement, supporting structure and panels are made of galvanized and painted sheet steel to ensure good resistance to atmospheric agents. Accessibility to internal parts is possible removing frontal and lateral panels. In the units with low noise acoustic setting basement, main structure and panels are completely insulated in order to minimize noise emissions in the surroundings.

Refrigerant Circuit

The hermetic scroll compressors are mounted on damper supports and is protected against over-temperatures and over-currents. Each compressor is equipped with an electrical heater, that keep the compressor crankcase oil temperature high enough to prevent migration of refrigerant during winter stops and to evaporate any liquid present in the crankcase, in order to prevent possible liquid rushes on starting.

Each compressor is equipped with vapour and liquid injection and is placed on an economized refrigerant circuit with plate heat exchanger and electronic expansion valve dedicated to the injection.

The heat exchanger on the plant side is a brazed stainless steel plates heat exchanger, properly insulated to avoid condensate generation and to minimize thermal losses, and protected by a differential pressure switch that detects whatever water flow lack. The heat exchanger on the source side is a finned coil with grooved copper pipes and hydrophilic aluminum fins with waved profile to increase the heat exchange coefficient. Under the coil a tray is installed that collect the condensate generated by the coil in heating mode.

The expansion device, an electronic expansion valve, allows the unit to adjust itself to the different operating conditions keeping steady the set super-heating. The refrigerant circuit of each unit contains moreover solid core hermetic filter dryer to restrain impurity and moisture residuals that could be present in the circuit. High pressure switch and pressure sensors in order to

assure the compressor to operate inside the permitted limits. A 4 way reverse cycle valve to allow operating mode change reversing the refrigerant flow, liquid receiver to compensate the different refrigerant charge required in heating and in cooling mode, pressure connections equipped with pin, gasket and blind nut. All the pipes of the refrigerant circuit are properly insulated to avoid condensate generation and to minimise thermal losses.

The Axial Fans

Equipped with an high efficiency electronically commutated (EC) motor and guarantee high efficiencies in all the operating conditions. The speed of the fans can be adjusted in order to reduce the noise during the night. The fans provide an available static head suitable to install the unit indoor and duct inlet and outlet air flow. The available static head supplied by the fans can be adjusted according to the plant needs modifying the parameters related to the maximum fans speed.

Hydraulic Circuit

The hydraulic circuit is equipped with safety valve and manual air vents in order to assure deaeration of the hydraulic circuit inside the unit. All the pipes are thermally insulated to avoid condensate generation and minimise thermal losses. The hydraulic circuit can be equipped with a circulation pump with the possibility to choose different pump types as an option.

Electrical Panel

It contains all the power, control and safety components necessary to guarantee the unit to work properly. The unit is managed by a microprocessor controller to which all the electrical loads and the control devices are connected. The remote user interface, to be installed indoor, allows to view and to modify, if necessary, all the parameters of the unit.

Options

Standard Supply & Additional Options		
Acoustic setting up	Low noise acoustic setting up (Standard Supply)	Allows to reduce the noise emitted by the unit by means of the refrigerant circuit vaneacoustic insulation.
Plant Side Flow Rate Management	Modulating Pump (Standard Supply)	Allows the circulation of the water on the plant side. With the modulating pump is possible to adjust the water flow rate in order to keep constant the temperature difference between inlet and outlet.
	High Head Pump (Additional Supply)	

Components Supplied with the Unit – Mandatory Installation	
Remote User Interface	Mandatory installation: According to indications reported in “Control system” paragraph.
Outdoor Air Sensor	Mandatory installation: According to indications reported in “Control system” paragraph.
6mm Temp Sensors	Mandatory Installation: To be installed to Thermal Store(s) & DHW Cylinder(s) in addition to any BMS sensors.

Identification Code

S-ASX-VP 90 R 2 S F N B 0

1	2	3	4	5	6	7	8
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1	Product range	
2	Model	
3	Operating mode	
	R	Heating and cooling (reversible on the refrigerant side)
4	Number of compressors	
5	Type of compressors	
	SF	Scroll compressors - Fixed speed
6	Power supply	
	M	230V - 1 - 50Hz
	N	400V - 3N - 50Hz
	T	400V - 3 - 50Hz
7	Acoustic setting up	
	B	Base
	S	Low noise
8	Refrigerant	
	0	R410A

Technical Data

EU reg 811/2013			60	70	80	90	100	
Efficiency class	AVERAGE Climate Low temperature application		A++	A++	A++	A++	A++	-
	AVERAGE Climate High temperature application		A++	A++	A++	A++	A++	-
Seasonal efficiency η_s	AVERAGE Climate Low temperature application		173	172	171	172	171	%
	AVERAGE Climate High temperature application		138	136	136	136	135	%
SCOP	AVERAGE climate Low temperature application - 35°C		4.49	4.47	4.48	4.48	4.49	-
	AVERAGE climate Mid temperature application - 45°C		3.88	3.85	3.86	3.87	3.87	-
	AVERAGE climate High temperature application - 55°C		3.59	3.56	3.57	3.58	3.57	-
	AVERAGE climate Very high temperature application - 65°C		3.18	3.15	3.16	3.17	3.16	-
P design	AVERAGE climate Low temperature application - 35°C		57	67	76	84	99	kW
	AVERAGE climate Mid temperature application - 45°C		58	68	77	86	101	kW
	AVERAGE climate High temperature application - 55°C		59	70	78	87	103	kW
	AVERAGE climate Very high temperature application - 65°C		60	71	80	89	105	kW

			60	70	80	90	100	
Refrigerant			R410A					-
Refrigerant charge			17.0	17.0	17.0	22.0	22.0	kg
Compressors	Type		high temperature scroll with vapour injection					-
	n° of compressors		2					-
	oil charge		3.38	3.38	3.38	3.38	3.38	kg
Refrigerant circuits	n° of circuits		1					-
Power steps			0 - 50 - 100					%
Plant side heat exchangers	Type		stainless steel brazed plates					-
	n°		1					-
	Water volume		6.4	8.0	9.8	9.8	11.8	l
Source side heat exchangers	Type		finned coil with copper pipes and hydrophilic aluminum fins					-
	n°		1					-
	Frontal surface		2.46	2.46	2.46	3.28	3.28	m²
Fans	Type		Axial EC					-
	n°		3	3	3	4	4	-
Nominal total air flow rate			19000	20000	21400	26800	28400	m³/h
Hydraulic circuit	Max pressure		6					bar
	Min pressure *		0.3					bar
	Min pressure with integrated circulation pump *		1.5					bar

* Pressure should be measured at unit inlet, downstream of water filter. In the units with integrated circulation pump the minimum pressure indicated is necessary to guarantee at pump suction a pressure higher than the minimum value required in order to avoid cavitation problems (NPSH).

NOMINAL Performances

	HEATING	A	W	60	70	80	90	100	
A7W35	Heating capacity	7	35	57,2	67,3	75,1	84,7	99,0	kW
	Power input			12,3	14,6	16,3	18,4	21,6	kW
	COP			4,65	4,61	4,61	4,60	4,58	-
	Plant side water flow rate			9854	11613	12964	14606	17068	l/h
	Plant side pressure drops			29	27	23	29	28	kPa
A7W45	Heating capacity	7	45	57,9	68,1	76,0	85,7	100	kW
	Power input			15,6	18,6	20,8	23,4	27,5	kW
	COP			3,71	3,66	3,65	3,66	3,64	-
	Plant side water flow rate			10006	11792	13164	14831	17331	l/h
	Plant side pressure drops			30	27	24	29	29	kPa
A7W55	Heating capacity	7	55	58,8	69,2	77,3	87,1	102	kW
	Power input			19,1	22,8	25,6	28,7	33,7	kW
	COP			3,08	3,04	3,02	3,03	3,03	-
	Plant side water flow rate			6389	7530	8406	9470	11067	l/h
	Plant side pressure drops			13	12	11	13	13	kPa
A7W65	Heating capacity	7	65	60,1	70,8	79,0	89,1	104	kW
	Power input			23,8	28,4	31,9	35,8	42,1	kW
	COP			2,53	2,49	2,48	2,49	2,47	-
	Plant side water flow rate			5250	6188	6907	7782	9094	l/h
	Plant side pressure drops			9	8	7	9	9	kPa
A2W35	Heating capacity	2	35	48,2	56,8	63,4	71,4	83,4	kW
	Power input			12,3	14,6	16,3	18,4	21,6	kW
	COP			3,92	3,89	3,89	3,88	3,86	-
	Plant side water flow rate			8313	9798	10937	12322	14400	l/h
	Plant side pressure drops			21	19	17	21	21	kPa
A2W45	Heating capacity	2	45	49,0	57,7	64,4	72,6	84,8	kW
	Power input			15,6	18,6	20,9	23,4	27,5	kW
	COP			3,14	3,10	3,08	3,10	3,08	-
	Plant side water flow rate			8476	9990	11152	12564	14682	l/h
	Plant side pressure drops			22	20	18	22	21	kPa
A2W55	Heating capacity	2	55	50,0	58,9	65,7	74,1	86,6	kW
	Power input			19,2	22,8	25,6	28,7	33,8	kW
	COP			2,60	2,58	2,57	2,58	2,56	-
	Plant side water flow rate			5437	6408	7154	8060	9418	l/h
	Plant side pressure drops			9	9	8	10	10	kPa
A2W65	Heating capacity	2	65	51,4	60,6	67,6	76,2	89,1	kW
	Power input			23,9	28,5	31,9	35,8	42,1	kW
	COP			2,15	2,13	2,12	2,13	2,12	-
	Plant side water flow rate			4493	5296	5912	6660	7783	l/h
	Plant side pressure drops			7	6	6	7	7	kPa
A-2W35	Heating capacity	-2	35	45,2	53,2	59,4	66,9	78,2	kW
	Power input			12,3	14,6	16,4	18,4	21,6	kW
	COP			3,67	3,64	3,62	3,64	3,62	-
	Plant side water flow rate			7790	9180	10248	11546	13493	l/h
	Plant side pressure drops			19	17	15	19	18	kPa
A-2W45	Heating capacity	-2	45	46,0	54,2	60,5	68,2	79,6	kW
	Power input			15,7	18,6	20,9	23,4	27,6	kW
	COP			2,93	2,91	2,89	2,91	2,88	-
	Plant side water flow rate			7965	9388	10479	11807	13797	l/h
	Plant side pressure drops			19	18	16	19	19	kPa
A-2W55	Heating capacity	-2	55	47,1	55,5	62,0	69,8	81,6	kW
	Power input			19,2	22,9	25,7	28,8	33,9	kW
	COP			2,45	2,42	2,41	2,42	2,41	-
	Plant side water flow rate			5126	6041	6743	7597	8878	l/h
	Plant side pressure drops			8	8	7	9	9	kPa
A-2W65	Heating capacity	-2	65	48,6	57,3	64,0	72,1	84,2	kW
	Power input			23,9	28,5	32,0	35,9	42,2	kW
	COP			2,03	2,01	2,00	2,01	2,00	-
	Plant side water flow rate			4250	5009	5592	6300	7362	l/h
	Plant side pressure drops			6	6	5	6	6	kPa

NOMINAL Performances

	HEATING	A	W	60	70	80	90	100	
A-7W35	Heating capacity	-7	35	41,2	48,5	54,1	61,0	71,3	kW
	Power input			12,3	14,6	16,4	18,4	21,7	kW
	COP			3,35	3,32	3,30	3,32	3,29	-
	Plant side water flow rate			7106	8375	9349	10533	12309	l/h
	Plant side pressure drops			16	15	13	16	16	kPa
A-7W45	Heating capacity	-7	45	42,2	49,7	55,4	62,5	73,0	kW
	Power input			15,7	18,6	20,9	23,5	27,6	kW
	COP			2,69	2,67	2,65	2,66	2,64	-
	Plant side water flow rate			7300	8603	9604	10820	12644	l/h
	Plant side pressure drops			16	15	13	17	16	kPa
A-7W55	Heating capacity	-7	55	43,4	51,1	57,1	64,3	75,1	kW
	Power input			19,2	22,9	25,7	28,8	33,9	kW
	COP			2,26	2,23	2,22	2,23	2,22	-
	Plant side water flow rate			4720	5563	6210	6996	8176	l/h
	Plant side pressure drops			7	7	6	8	7	kPa
A-7W65	Heating capacity	-7	65	45,0	53,1	59,2	66,7	78,0	kW
	Power input			23,9	28,5	32,0	35,9	42,2	kW
	COP			1,88	1,86	1,85	1,86	1,85	-
	Plant side water flow rate			3935	4638	5177	5833	6816	l/h
	Plant side pressure drops			5	5	4	5	5	kPa

	COOLING	A	W	60	70	80	90	100	
A35W7	Cooling capacity	35	7	44,8	52,8	58,9	66,4	77,7	kW
	Power input			14,2	16,9	19,0	21,3	25,0	kW
	EER			3,15	3,12	3,10	3,12	3,11	-
	Plant side water flow rate			7723	9095	10142	11429	13369	l/h
	Plant side pressure drops			18	17	15	19	18	kPa
A35W18	Cooling capacity	35	18	59,2	69,8	77,8	87,7	103	kW
	Power input			15,3	18,3	20,5	23,1	27,1	kW
	EER			3,87	3,81	3,80	3,80	3,80	-
	Plant side water flow rate			10258	12082	13472	15182	17758	l/h
	Plant side pressure drops			31	29	25	31	31	kPa
A25W7	Cooling capacity	25	7	50,2	59,2	66,0	74,4	87,0	kW
	Power input			12,1	14,4	16,2	18,2	21,4	kW
	EER			4,15	4,11	4,07	4,09	4,07	-
	Plant side water flow rate			8659	10199	11372	12816	14990	l/h
	Plant side pressure drops			23	21	18	23	22	kPa
A25W18	Cooling capacity	25	18	65,1	76,7	85,6	96,4	113	kW
	Power input			13,3	15,8	17,7	20,0	23,4	kW
	EER			4,89	4,85	4,84	4,82	4,83	-
	Plant side water flow rate			11280	13285	14814	16694	19527	l/h
	Plant side pressure drops			37	34	30	37	36	kPa

Data declared according to EN 14511. The data are related to units without options or accessories.

A7W35	=	source :	air in 7°C db 6°C wb	plant :	water in 30°C out 35°C	A-7W35	=	source :	air in -7°C db -8°C wb	plant :	water in 30°C out 35°C
A7W45	=	source :	air in 7°C db 6°C wb	plant :	water in 40°C out 45°C	A-7W45	=	source :	air in -7°C db -8°C wb	plant :	water in 40°C out 45°C
A7W55	=	source :	air in 7°C db 6°C wb	plant :	water in 47°C out 55°C	A-7W55	=	source :	air in -7°C db -8°C wb	plant :	water in 47°C out 55°C
A7W65	=	source :	air in 7°C db 6°C wb	plant :	water in 55°C out 65°C	A-7W65	=	source :	air in -7°C db -8°C wb	plant :	water in 55°C out 65°C
A2W35	=	source :	air in 2°C db 1°C wb	plant :	water in 30°C out 35°C	A35W7	=	source :	air in 35°C db	plant :	water in 12°C out 7°C
A2W45	=	source :	air in 2°C db 1°C wb	plant :	water in 40°C out 45°C	A35W18	=	source :	air in 35°C db	plant :	water in 23°C out 18°C
A2W55	=	source :	air in 2°C db 1°C wb	plant :	water in 47°C out 55°C	A25W7	=	source :	air in 25°C db	plant :	water in 12°C out 7°C
A2W65	=	source :	air in 2°C db 1°C wb	plant :	water in 55°C out 65°C	A25W18	=	source :	air in 25°C db	plant :	water in 23°C out 18°C
A-2W35	=	source :	air in -2°C db -3°C wb	plant :	water in 30°C out 35°C						
A-2W45	=	source :	air in -2°C db -3°C wb	plant :	water in 40°C out 45°C						
A-2W55	=	source :	air in -2°C db -3°C wb	plant :	water in 47°C out 55°C						
A-2W65	=	source :	air in -2°C db -3°C wb	plant :	water in 55°C out 65°C						

Performances in Heating Mode

Model	Water outlet temperature	Outdoor air temperature													
		Tdb	-20	-15	-7	-4	-2	0	2	7	12	20	35	42	°C
		Twb	-21	-16	-8	-5	-3	-1	1	6	10	15	24	28	°C
60	68 (ΔT 10°C)	Heating capacity	35,0	38,6	45,6	47,9	49,2	50,5	51,9	60,6	65,1	70,7	80,0	83,8	kW
		Power input	25,7	25,7	25,7	25,7	25,7	25,7	25,7	25,7	25,6	25,6	25,5	25,4	kW
		COP	1,36	1,50	1,77	1,86	1,91	1,96	2,02	2,36	2,54	2,76	3,14	3,30	-
	65	Heating capacity	34,1	37,8	44,9	47,2	48,5	49,8	51,2	59,9	64,5	70,1	79,5	83,3	kW
		Power input	25,4	25,5	25,5	25,5	25,5	25,5	25,5	25,5	25,5	25,5	25,5	25,5	kW
		COP	1,34	1,48	1,76	1,85	1,90	1,95	2,01	2,35	2,53	2,75	3,12	3,27	-
	60	Heating capacity	33,1	36,8	44,0	46,4	47,7	49,0	50,5	59,2	63,9	69,5	79,0	82,7	kW
		Power input	22,5	22,6	22,6	22,6	22,6	22,6	22,6	22,6	22,6	22,6	22,6	22,5	kW
		COP	1,47	1,63	1,95	2,05	2,11	2,17	2,23	2,62	2,83	3,08	3,50	3,68	-
	55	Heating capacity	32,2	36,0	43,3	45,7	47,0	48,4	49,9	58,7	63,4	69,0	78,6	82,3	kW
		Power input	19,9	20,0	20,0	20,0	20,0	20,0	20,0	20,0	20,0	20,0	19,9	19,9	kW
		COP	1,62	1,80	2,16	2,28	2,35	2,42	2,50	2,94	3,17	3,45	3,95	4,14	-
	50	Heating capacity	31,4	35,3	42,7	45,1	46,5	47,9	49,4	58,2	63,0	68,7	78,2	82,0	kW
		Power input	17,6	17,7	17,7	17,7	17,7	17,7	17,7	17,7	17,7	17,7	17,6	17,6	kW
		COP	1,78	1,99	2,41	2,55	2,63	2,71	2,79	3,29	3,56	3,88	4,44	4,66	-
	45	Heating capacity	30,6	34,6	42,2	44,6	46,0	47,4	49,0	57,9	62,6	68,3	78,0	81,8	kW
		Power input	15,6	15,6	15,7	15,7	15,6	15,6	15,6	15,6	15,6	15,6	15,6	15,6	kW
		COP	1,96	2,22	2,69	2,84	2,93	3,04	3,14	3,71	4,01	4,38	5,00	5,24	-
	40	Heating capacity	30,0	34,0	41,7	44,2	45,6	47,0	48,6	57,5	62,3	68,1	77,7	81,6	kW
		Power input	13,8	13,9	13,9	13,9	13,9	13,9	13,8	13,9	13,8	13,8	13,8	13,8	kW
		COP	2,17	2,45	3,00	3,18	3,28	3,38	3,52	4,14	4,51	4,93	5,63	5,91	-
	35	Heating capacity	29,3	33,4	41,2	43,7	45,2	46,6	48,2	57,2	62,0	67,8	77,5	81,4	kW
		Power input	12,20	12,30	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,2	12,2	12,2	kW
		COP	2,40	2,72	3,35	3,55	3,67	3,79	3,92	4,65	5,04	5,56	6,35	6,67	-
	30	Heating capacity	28,6	32,8	40,7	43,3	44,7	46,2	47,8	56,8	61,7	67,5	77,3	81,1	kW
		Power input	10,80	10,90	10,90	10,90	10,90	10,90	10,90	10,90	10,90	10,9	10,8	10,8	kW
		COP	2,65	3,01	3,73	3,97	4,10	4,24	4,39	5,21	5,66	6,19	7,16	7,51	-

Model	Water outlet temperature	Outdoor air temperature													
		Tdb	-20	-15	-7	-4	-2	0	2	7	12	20	35	42	°C
		Twb	-21	-16	-8	-5	-3	-1	1	6	10	15	24	28	°C
70	68 (ΔT 10°C)	Heating capacity	41,2	45,5	53,7	56,5	58,0	59,5	61,2	71,4	76,8	83,3	94,3	98,7	kW
		Power input	30,6	30,7	30,7	30,7	30,6	30,6	30,6	30,6	30,5	30,5	30,3	30,3	kW
		COP	1,35	1,48	1,75	1,84	1,90	1,94	2,00	2,33	2,52	2,73	3,11	3,26	-
	65	Heating capacity	40,2	44,5	52,9	55,6	57,1	58,6	60,4	70,6	76,0	82,6	93,6	98,1	kW
		Power input	30,3	30,4	30,4	30,4	30,4	30,4	30,4	30,4	30,4	30,3	30,3	30,3	kW
		COP	1,33	1,46	1,74	1,83	1,88	1,93	1,99	2,32	2,50	2,73	3,09	3,24	-
	60	Heating capacity	39,0	43,4	51,9	54,7	56,2	57,8	59,5	69,8	75,3	81,9	93,0	97,4	kW
		Power input	26,8	26,9	26,9	26,9	26,9	26,9	26,9	26,9	26,9	26,8	26,8	26,8	kW
		COP	1,46	1,61	1,93	2,03	2,09	2,15	2,21	2,59	2,80	3,06	3,47	3,63	-
	55	Heating capacity	37,9	42,4	51,0	53,9	55,4	57,0	58,8	69,1	74,7	81,3	92,5	97,0	kW
		Power input	23,7	23,8	23,8	23,8	23,8	23,8	23,8	23,8	23,8	23,7	23,7	23,7	kW
		COP	1,60	1,78	2,14	2,26	2,33	2,39	2,47	2,90	3,14	3,43	3,90	4,09	-
	50	Heating capacity	37,0	41,5	50,3	53,2	54,8	56,4	58,2	68,6	74,2	80,9	92,1	96,6	kW
		Power input	21,0	21,0	21,1	21,1	21,1	21,0	21,0	21,0	21,0	21,0	20,9	20,9	kW
		COP	1,76	1,98	2,38	2,52	2,60	2,69	2,77	3,27	3,53	3,85	4,41	4,62	-
	45	Heating capacity	36,1	40,8	49,7	52,6	54,2	55,9	57,7	68,1	73,7	80,5	91,8	96,3	kW
		Power input	18,6	18,6	18,6	18,6	18,6	18,6	18,6	18,6	18,6	18,6	18,5	18,5	kW
		COP	1,94	2,19	2,67	2,83	2,91	3,01	3,10	3,66	3,96	4,33	4,96	5,21	-
	40	Heating capacity	35,3	40,1	49,1	52,0	53,7	55,4	57,2	67,7	73,4	80,2	91,6	96,1	kW
		Power input	16,5	16,5	16,5	16,5	16,5	16,5	16,5	16,5	16,5	16,4	16,4	16,4	kW
		COP	2,14	2,43	2,98	3,15	3,25	3,36	3,47	4,10	4,45	4,89	5,59	5,86	-
	35	Heating capacity	34,5	39,4	48,5	51,5	53,2	54,9	56,8	67,3	73,0	79,9	91,3	95,8	kW
		Power input	14,6	14,6	14,6	14,6	14,6	14,6	14,6	14,6	14,6	14,5	14,5	14,5	kW
		COP	2,36	2,70	3,32	3,53	3,64	3,76	3,89	4,61	5,00	5,51	6,30	6,61	-
	30	Heating capacity	33,7	38,7	47,9	51,0	52,7	54,4	56,3	66,9	72,6	79,5	91,0	95,6	kW
		Power input	12,90	12,9	13,0	13,0	12,9	12,9	12,9	12,9	12,9	12,9	12,8	12,8	kW
		COP	2,61	3,00	3,68	3,92	4,09	4,22	4,36	5,19	5,63	6,16	7,11	7,47	-

Data declared applying corrections according to EN 14511 and considering a ΔT of 5°C between water inlet and outlet of the unit.
The data are related to units without options or accessories.

Performances in Heating Mode

Model	Water outlet temperature	Outdoor air temperature													
		Tdb	-20	-15	-7	-4	-2	0	2	7	12	20	35	42	°C
		Twb	-21	-16	-8	-5	-3	-1	1	6	10	15	24	28	°C
80	68 (ΔT 10°C)	Heating capacity	46,0	50,7	60,0	63,0	64,7	66,4	68,3	79,7	85,7	93,0	105,0	110,0	kW
		Power input	34,4	34,4	34,4	34,4	34,4	34,4	34,4	34,3	34,2	34,2	34,0	34,0	kW
		COP	1,34	1,47	1,74	1,83	1,88	1,93	1,99	2,32	2,51	2,72	3,09	3,24	-
	65	Heating capacity	44,9	49,7	59,0	62,0	63,7	65,4	67,4	78,8	84,8	92,1	104,0	109,0	kW
		Power input	34,0	34,1	34,1	34,1	34,1	34,1	34,0	34,0	34,0	34,0	33,9	33,9	kW
		COP	1,32	1,46	1,73	1,82	1,87	1,92	1,98	2,32	2,49	2,71	3,07	3,22	-
	60	Heating capacity	43,5	48,4	57,9	61,0	62,7	64,4	66,4	77,9	84,0	91,3	104,0	109,0	kW
		Power input	30,1	30,2	30,2	30,2	30,2	30,1	30,1	30,1	30,1	30,1	30,0	30,0	kW
		COP	1,45	1,60	1,92	2,02	2,08	2,14	2,21	2,59	2,79	3,03	3,47	3,63	-
	55	Heating capacity	42,3	47,3	56,9	60,1	61,8	63,6	65,6	77,1	83,3	90,7	103,0	108,0	kW
		Power input	26,6	26,7	26,7	26,7	26,7	26,7	26,7	26,6	26,6	26,6	26,5	26,5	kW
		COP	1,59	1,77	2,13	2,25	2,31	2,38	2,46	2,90	3,13	3,41	3,89	4,08	-
	50	Heating capacity	41,2	46,4	56,1	59,3	61,1	62,9	65,0	76,5	82,7	90,2	103,0	108,0	kW
		Power input	23,6	23,6	23,6	23,6	23,6	23,6	23,6	23,6	23,5	23,5	23,4	23,4	kW
		COP	1,75	1,97	2,38	2,51	2,59	2,67	2,75	3,24	3,52	3,84	4,40	4,62	-
	45	Heating capacity	40,3	45,5	55,4	58,7	60,5	62,3	64,4	76,0	82,3	89,8	102,0	107,0	kW
		Power input	20,9	20,9	20,9	20,9	20,9	20,9	20,9	20,8	20,8	20,8	20,7	20,7	kW
		COP	1,93	2,18	2,65	2,81	2,89	2,98	3,08	3,65	3,96	4,32	4,93	5,17	-
	40	Heating capacity	39,4	44,7	54,8	58,1	59,9	61,8	63,9	75,6	81,9	89,4	102,0	107,0	kW
		Power input	18,5	18,5	18,5	18,5	18,5	18,5	18,5	18,4	18,4	18,4	18,3	18,3	kW
		COP	2,13	2,42	2,96	3,14	3,24	3,34	3,45	4,11	4,45	4,86	5,57	5,85	-
	35	Heating capacity	38,5	43,9	54,1	57,5	59,4	61,3	63,4	75,1	81,5	89,1	102,0	107,0	kW
		Power input	16,3	16,4	16,4	16,4	16,4	16,4	16,3	16,3	16,3	16,3	16,2	16,2	kW
		COP	2,36	2,68	3,30	3,51	3,62	3,74	3,89	4,61	5,00	5,47	6,30	6,60	-
	30	Heating capacity	37,6	43,2	53,5	56,9	58,8	60,7	62,8	74,7	81,1	88,7	102,0	107,0	kW
		Power input	14,5	14,5	14,5	14,5	14,5	14,5	14,5	14,5	14,4	14,4	14,3	14,3	kW
		COP	2,59	2,98	3,69	3,92	4,06	4,19	4,33	5,15	5,63	6,16	7,13	7,48	-

Model	Water outlet temperature	Outdoor air temperature													
		Tdb	-20	-15	-7	-4	-2	0	2	7	12	20	35	42	°C
		Twb	-21	-16	-8	-5	-3	-1	1	6	10	15	24	28	°C
90	68 (ΔT 10°C)	Heating capacity	51,8	57,2	67,6	71,0	72,9	74,8	77,0	89,8	96,6	105,0	119	124	kW
		Power input	38,6	38,6	38,6	38,6	38,6	38,6	38,5	38,5	38,4	38,3	38,2	38,1	kW
		COP	1,34	1,48	1,75	1,84	1,89	1,94	2,00	2,33	2,52	2,74	3,12	3,25	-
	65	Heating capacity	50,5	56,0	66,5	69,9	71,8	73,7	75,9	88,8	95,6	104,0	118	123	kW
		Power input	38,1	38,2	38,3	38,3	38,2	38,2	38,2	38,2	38,2	38,2	38,1	38,1	kW
		COP	1,33	1,47	1,74	1,83	1,88	1,93	1,99	2,32	2,50	2,72	3,10	3,23	-
	60	Heating capacity	49,0	54,5	65,2	68,7	70,7	72,6	74,8	87,8	94,6	103,0	117	123	kW
		Power input	33,8	33,8	33,9	33,9	33,9	33,8	33,8	33,8	33,8	33,8	33,7	33,7	kW
		COP	1,45	1,61	1,92	2,03	2,09	2,15	2,21	2,60	2,80	3,05	3,47	3,65	-
	55	Heating capacity	47,7	53,3	64,2	67,7	69,7	71,7	74,0	86,9	93,9	102,0	116	122	kW
		Power input	29,9	29,9	30,0	30,0	30,0	29,9	29,9	29,9	29,9	29,9	29,8	29,8	kW
		COP	1,60	1,78	2,14	2,26	2,32	2,40	2,47	2,91	3,14	3,41	3,89	4,09	-
	50	Heating capacity	46,5	52,2	63,3	66,9	68,9	70,9	73,2	86,3	93,3	102,0	116	121	kW
		Power input	26,4	26,5	26,5	26,5	26,5	26,5	26,5	26,5	26,4	26,4	26,4	26,3	kW
		COP	1,76	1,97	2,39	2,52	2,60	2,68	2,76	3,26	3,53	3,86	4,39	4,60	-
	45	Heating capacity	45,4	51,3	62,5	66,1	68,2	70,2	72,6	85,7	92,7	101,0	115	121	kW
		Power input	23,4	23,4	23,5	23,5	23,4	23,4	23,4	23,4	23,4	23,4	23,3	23,3	kW
		COP	1,94	2,19	2,66	2,81	2,91	3,00	3,10	3,66	3,96	4,32	4,94	5,19	-
	40	Heating capacity	44,4	50,4	61,7	65,5	67,5	69,6	72,0	85,2	92,3	101,0	115	121	kW
		Power input	20,7	20,8	20,8	20,8	20,8	20,7	20,7	20,7	20,7	20,7	20,6	20,6	kW
		COP	2,14	2,42	2,97	3,15	3,25	3,36	3,48	4,12	4,46	4,88	5,58	5,87	-
	35	Heating capacity	43,4	49,5	61,0	64,8	66,9	69,0	71,4	84,7	91,8	100,0	115	121	kW
		Power input	18,3	18,4	18,4	18,4	18,4	18,4	18,4	18,4	18,3	18,3	18,2	18,2	kW
		COP	2,37	2,69	3,32	3,52	3,64	3,75	3,88	4,60	5,02	5,46	6,32	6,65	-
	30	Heating capacity	42,4	48,6	60,3	64,1	66,3	68,4	70,8	84,2	91,4	100,0	114	120	kW
		Power input	16,3	16,3	16,3	16,3	16,3	16,3	16,3	16,3	16,2	16,2	16,1	16,1	kW
		COP	2,60	2,98	3,70	3,93	4,07	4,20	4,34	5,17	5,64	6,17	7,08	7,45	-

Data declared applying corrections according to EN 14511 and considering a ΔT of 5°C between water inlet and outlet of the unit.
The data are related to units without options or accessories.

Performances in Heating Mode

Model	Water outlet temperature	Outdoor air temperature													
		Tdb	-20	-15	-7	-4	-2	0	2	7	12	20	35	42	°C
		Twb	-21	-16	-8	-5	-3	-1	1	6	10	15	24	28	°C
100	68 (ΔT 10°C)	Heating capacity	60,5	66,8	79,0	83,0	85,2	87,4	89,9	105,0	113,0	122,0	139	145	kW
		Power input	45,4	45,4	45,4	45,4	45,4	45,4	45,3	45,3	45,2	45,1	44,9	44,9	kW
		COP	1,33	1,47	1,74	1,83	1,88	1,93	1,98	2,32	2,50	2,71	3,10	3,23	-
	65	Heating capacity	59,1	65,4	77,7	81,7	83,9	86,2	88,7	104,0	112,0	121,0	138	144	kW
		Power input	44,9	45,0	45,0	45,0	45,0	45,0	44,9	45,0	44,9	44,9	44,8	44,8	kW
		COP	1,32	1,45	1,73	1,82	1,86	1,92	1,98	2,31	2,49	2,69	3,08	3,21	-
	60	Heating capacity	57,3	63,7	76,2	80,3	82,6	84,9	87,4	103,0	111,0	120,0	137	143	kW
		Power input	39,7	39,8	39,8	39,8	39,8	39,8	39,8	39,8	39,7	39,7	39,6	39,6	kW
		COP	1,44	1,60	1,91	2,02	2,08	2,13	2,20	2,59	2,80	3,02	3,46	3,61	-
	55	Heating capacity	55,7	62,3	75,0	79,1	81,4	83,8	86,4	102,0	110,0	119,0	136	142	kW
		Power input	35,2	35,2	35,3	35,2	35,2	35,2	35,2	35,2	35,2	35,1	35,0	35,0	kW
		COP	1,58	1,77	2,12	2,25	2,31	2,38	2,45	2,90	3,12	3,39	3,89	4,06	-
	50	Heating capacity	54,3	61,0	73,9	78,1	80,5	82,9	85,5	101,0	109,0	119	135	142	kW
		Power input	31,1	31,2	31,2	31,2	31,2	31,1	31,1	31,1	31,1	31,0	31,0	30,9	kW
		COP	1,75	1,96	2,37	2,50	2,58	2,67	2,75	3,25	3,50	3,84	4,35	4,60	-
	45	Heating capacity	53,0	59,9	73,0	77,3	79,6	82,1	84,8	100,0	108,0	118	135	141	kW
		Power input	27,5	27,6	27,6	27,6	27,6	27,6	27,5	27,5	27,5	27,4	27,4	27,3	kW
		COP	1,93	2,17	2,64	2,80	2,88	2,97	3,08	3,64	3,93	4,31	4,93	5,16	-
	40	Heating capacity	51,9	58,9	72,1	76,5	78,9	81,4	84,1	99,5	108,0	118	135	141	kW
		Power input	24,4	24,4	24,4	24,4	24,4	24,4	24,4	24,4	24,3	24,3	24,2	24,2	kW
		COP	2,13	2,41	2,95	3,14	3,23	3,34	3,45	4,08	4,44	4,86	5,58	5,83	-
	35	Heating capacity	50,7	57,9	71,3	75,7	78,2	80,7	83,4	99,0	107,0	117	134	141	kW
		Power input	21,6	21,6	21,7	21,6	21,6	21,6	21,6	21,6	21,5	21,5	21,4	21,4	kW
		COP	2,35	2,68	3,29	3,50	3,62	3,74	3,86	4,58	4,98	5,44	6,26	6,59	-
	30	Heating capacity	49,6	56,8	70,4	74,9	77,4	79,9	82,8	98,3	107,0	117	134	140	kW
		Power input	19,1	19,2	19,2	19,2	19,2	19,1	19,1	19,1	19,1	19,0	18,9	18,9	kW
		COP	2,60	2,96	3,67	3,90	4,03	4,18	4,34	5,15	5,60	6,16	7,09	7,41	-

Data declared applying corrections according to EN 14511 and considering a ΔT of 5°C between water inlet and outlet of the unit.
The data are related to units without options or accessories.

Performances in Cooling Mode

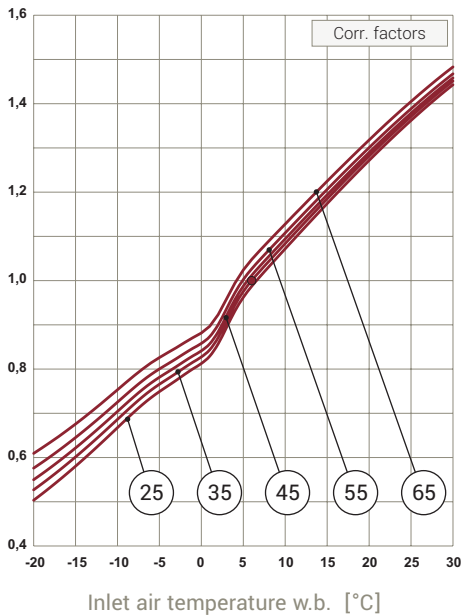
Model	Water outlet temperature	Outdoor air temperature									
		Tdb	15	20	25	30	35	40	45	50	°C
		Twb	-	-	-	-	-	-	-	-	°C
60	18	Cooling capacity	68,3	67,0	65,1	62,5	59,2	55,0	49,9	43,7	kW
		Power input	11,9	12,5	13,3	14,2	15,3	16,6	18,1	19,7	kW
		EER	5,74	5,36	4,89	4,40	3,87	3,31	2,76	2,22	-
	12	Cooling capacity	61,5	60,2	58,3	55,9	52,7	48,6	43,6	37,6	kW
		Power input	11,3	11,9	12,7	13,7	14,8	16,1	17,5	19,2	kW
		EER	5,44	5,06	4,59	4,08	3,56	3,02	2,49	1,96	-
	7	Cooling capacity	53,2	52,0	50,2	47,9	44,8	40,9	36,1	30,2	kW
		Power input	10,70	11,3	12,1	13,1	14,2	15,5	16,9	18,6	kW
		EER	4,97	4,60	4,15	3,66	3,15	2,64	2,14	1,62	-
70	18	Cooling capacity	80,5	78,9	76,7	73,7	69,8	64,8	58,8	51,4	kW
		Power input	14,1	14,9	15,8	16,9	18,3	19,8	21,5	23,5	kW
		EER	5,71	5,30	4,85	4,36	3,81	3,27	2,73	2,19	-
	12	Cooling capacity	72,4	70,9	68,8	65,8	62,1	57,3	51,4	44,3	kW
		Power input	13,4	14,2	15,1	16,3	17,6	19,1	20,9	22,8	kW
		EER	5,40	4,99	4,56	4,04	3,53	3,00	2,46	1,94	-
	7	Cooling capacity	62,7	61,2	59,2	56,4	52,8	48,2	42,5	35,6	kW
		Power input	12,7	13,5	14,4	15,5	16,9	18,4	20,2	22,1	kW
		EER	4,94	4,53	4,11	3,64	3,12	2,62	2,10	1,61	-
80	18	Cooling capacity	89,8	88,1	85,6	82,2	77,8	72,3	65,6	57,4	kW
		Power input	15,8	16,7	17,7	19,0	20,5	22,2	24,2	26,4	kW
		EER	5,68	5,28	4,84	4,33	3,80	3,26	2,71	2,17	-
	12	Cooling capacity	80,8	79,1	76,7	73,5	69,2	63,9	57,3	49,4	kW
		Power input	15,0	15,9	17,0	18,3	19,8	21,5	23,5	25,7	kW
		EER	5,39	4,97	4,51	4,02	3,49	2,97	2,44	1,92	-
	7	Cooling capacity	69,9	68,3	66,0	63,0	58,9	53,8	47,4	39,7	kW
		Power input	14,2	15,1	16,2	17,5	19,0	20,7	22,7	24,9	kW
		EER	4,92	4,52	4,07	3,60	3,10	2,60	2,09	1,59	-
90	18	Cooling capacity	101,0	99,2	96,4	92,6	87,7	81,5	73,9	64,6	kW
		Power input	17,8	18,8	20,0	21,4	23,1	25,0	27,2	29,7	kW
		EER	5,67	5,28	4,82	4,33	3,80	3,26	2,72	2,18	-
	12	Cooling capacity	91,0	89,1	86,4	82,8	78,0	72,0	64,6	55,6	kW
		Power input	16,9	17,9	19,1	20,5	22,2	24,2	26,4	28,8	kW
		EER	5,38	4,98	4,52	4,04	3,51	2,98	2,45	1,93	-
	7	Cooling capacity	78,7	77,0	74,4	70,9	66,4	60,6	53,4	44,7	kW
		Power input	16,0	17,0	18,2	19,6	21,3	23,3	25,5	28,0	kW
		EER	4,92	4,53	4,09	3,62	3,12	2,60	2,09	1,60	-
100	18	Cooling capacity	118	116	113	108	103,0	95,3	86,4	75,6	kW
		Power input	20,9	22,0	23,4	25,1	27,1	29,4	32,0	34,9	kW
		EER	5,65	5,27	4,83	4,30	3,80	3,24	2,70	2,17	-
	12	Cooling capacity	106,0	104,0	101,0	96,8	91,3	84,2	75,6	65,1	kW
		Power input	19,9	21,0	22,4	24,1	26,1	28,4	31,0	33,9	kW
		EER	5,33	4,95	4,51	4,02	3,50	2,96	2,44	1,92	-
	7	Cooling capacity	92,1	90,0	87,0	83,0	77,7	70,9	62,5	52,3	kW
		Power input	18,8	19,9	21,4	23,1	25,0	27,3	29,9	32,9	kW
		EER	4,90	4,52	4,07	3,59	3,11	2,60	2,09	1,59	-

Data declared applying corrections according to EN 14511 and considering a ΔT of 5°C between water inlet and outlet of the unit.
The data are related to units without options or accessories.

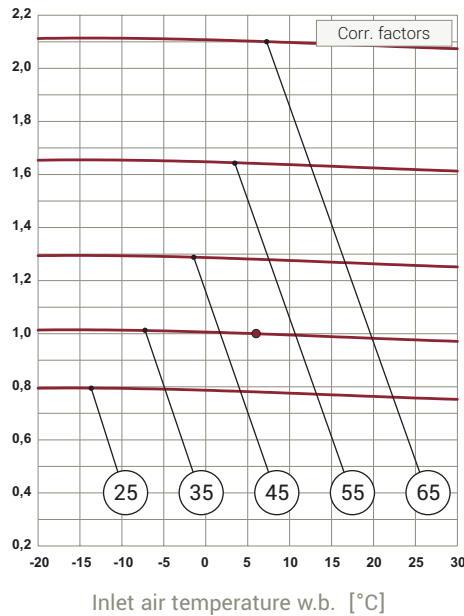
Heating and Cooling - Corrective Factors

HEATING performances

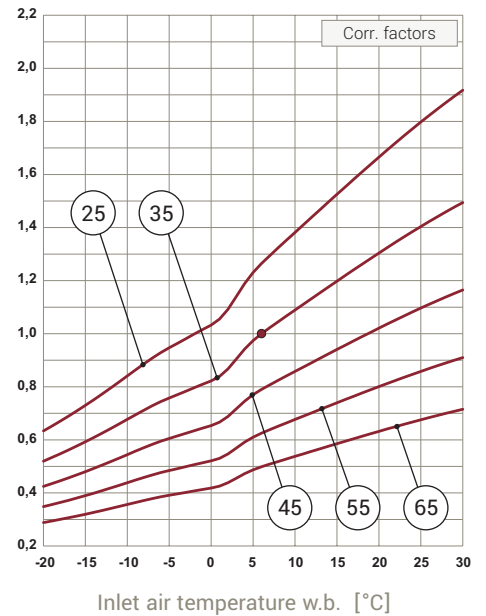
Heating capacity



Power input

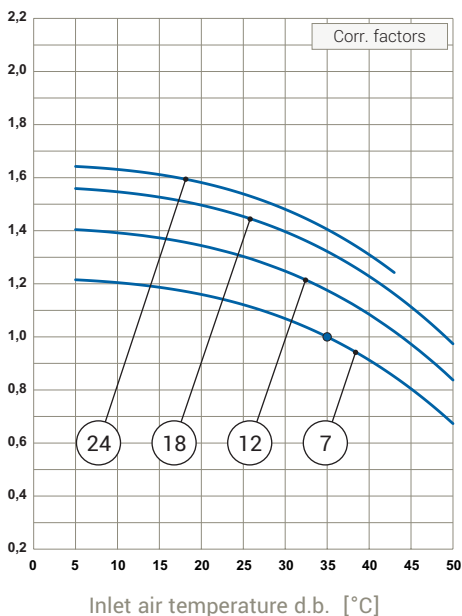


Efficiency - COP

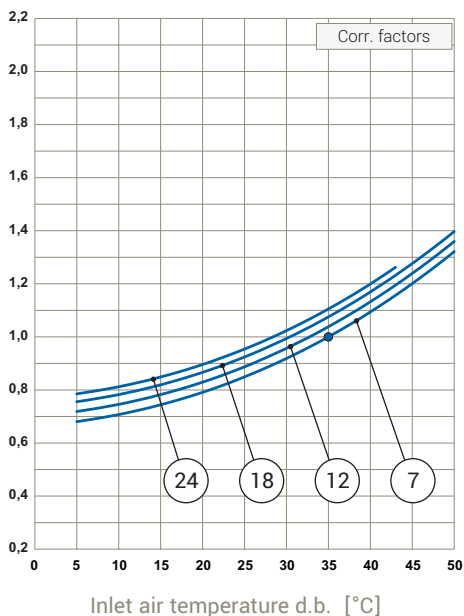


COOLING performances

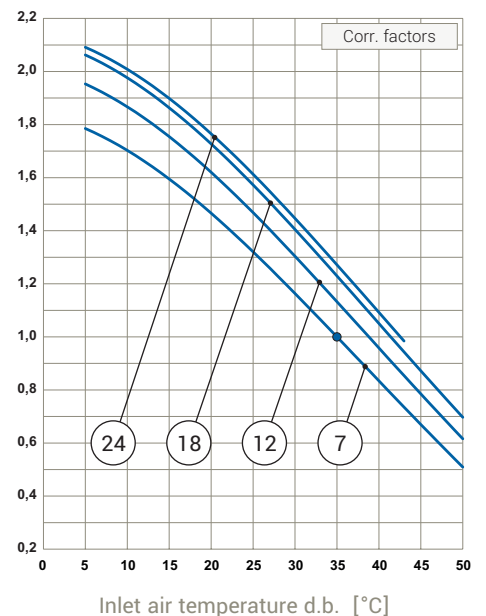
Cooling capacity



Power input



Efficiency - EER



The graphs provide the **corrective factors** to be applied to the **NOMINAL** performances in order to obtain the performances in the selected operating conditions. The curves are parameterized according to the outlet water temperature on the plant sidewith a ΔT equal to 5°C.

Nominal reference conditions :

heating :
A7W35

cooling :
A35W7

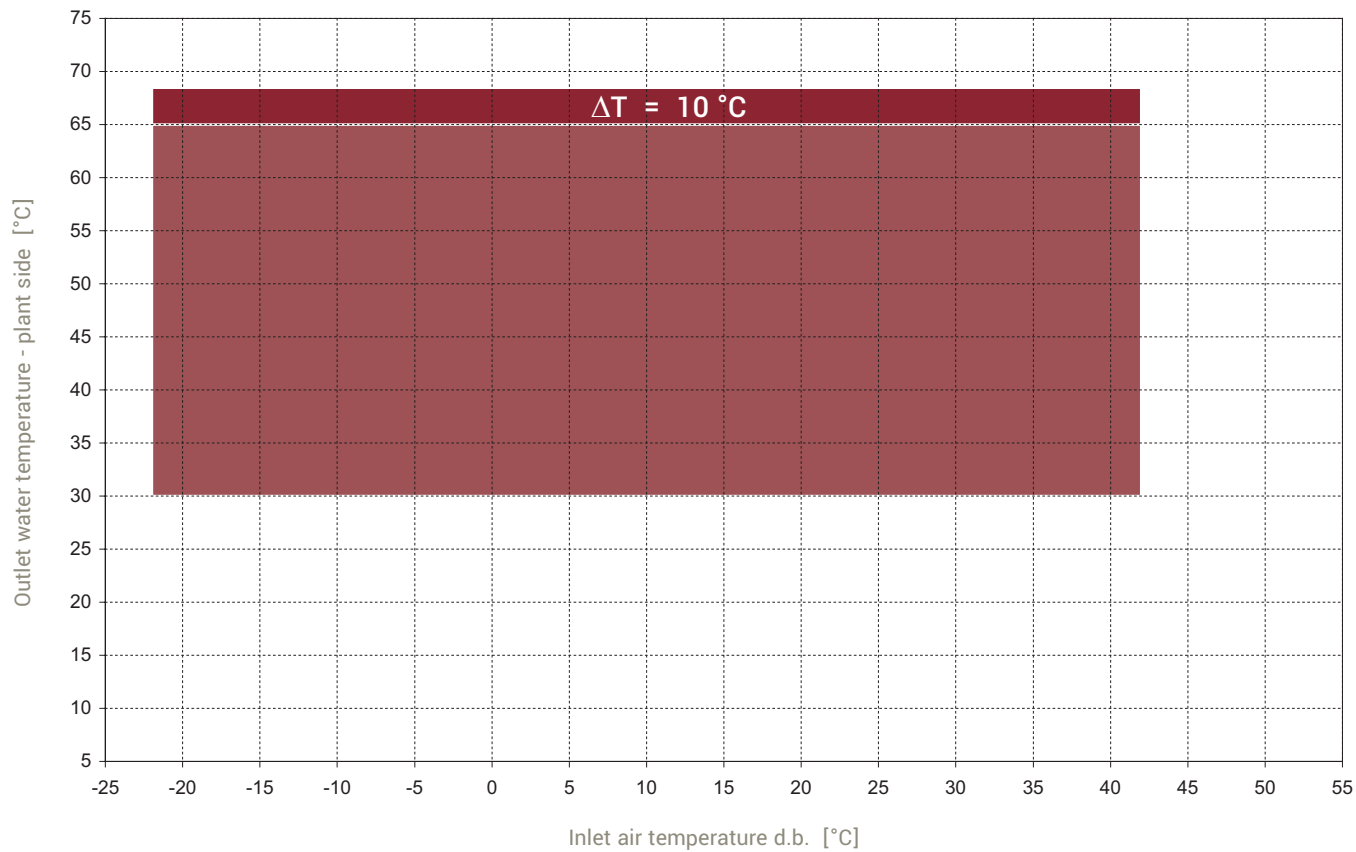
source : air in 7°C db 6°C wb
plant : water in 30°C out 35°C

source : air in 35°C db
plant : water in 12°C out 7°C

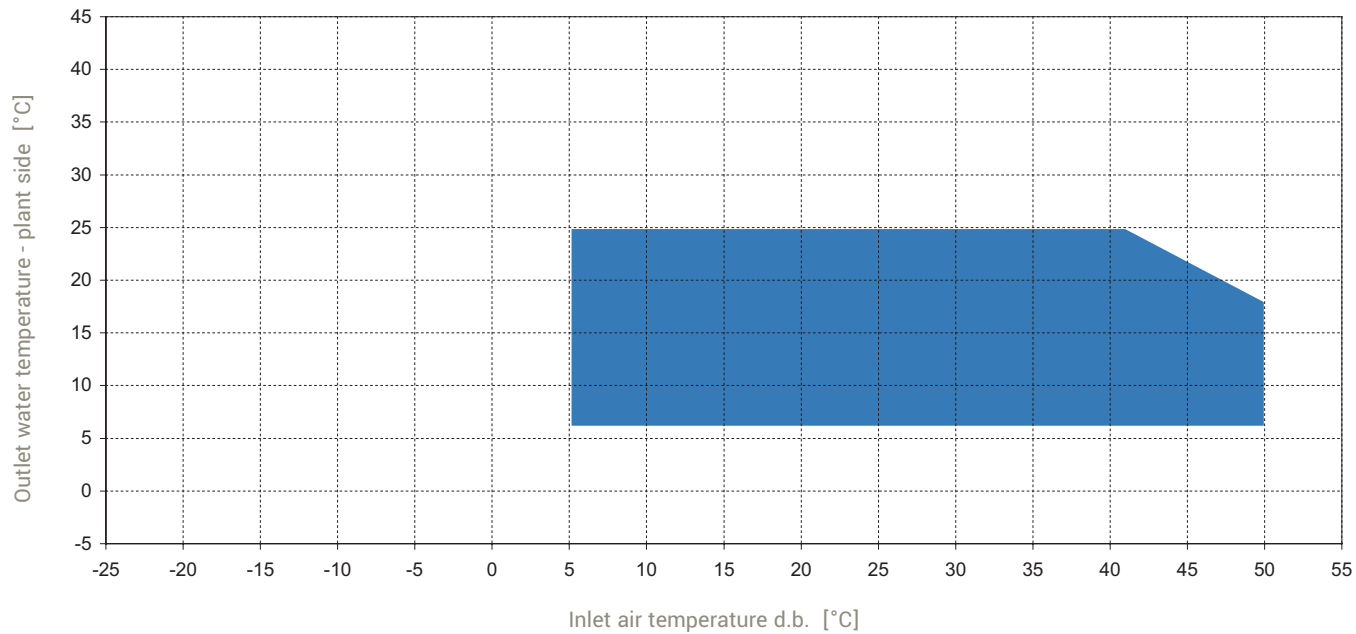
Operating Range

The graphs reported below show the operating area inside which the correct working of the unit is guaranteed. The darker area is allowed only with a ΔT of 10°C between water inlet and water outlet on the plant side.

HEATING



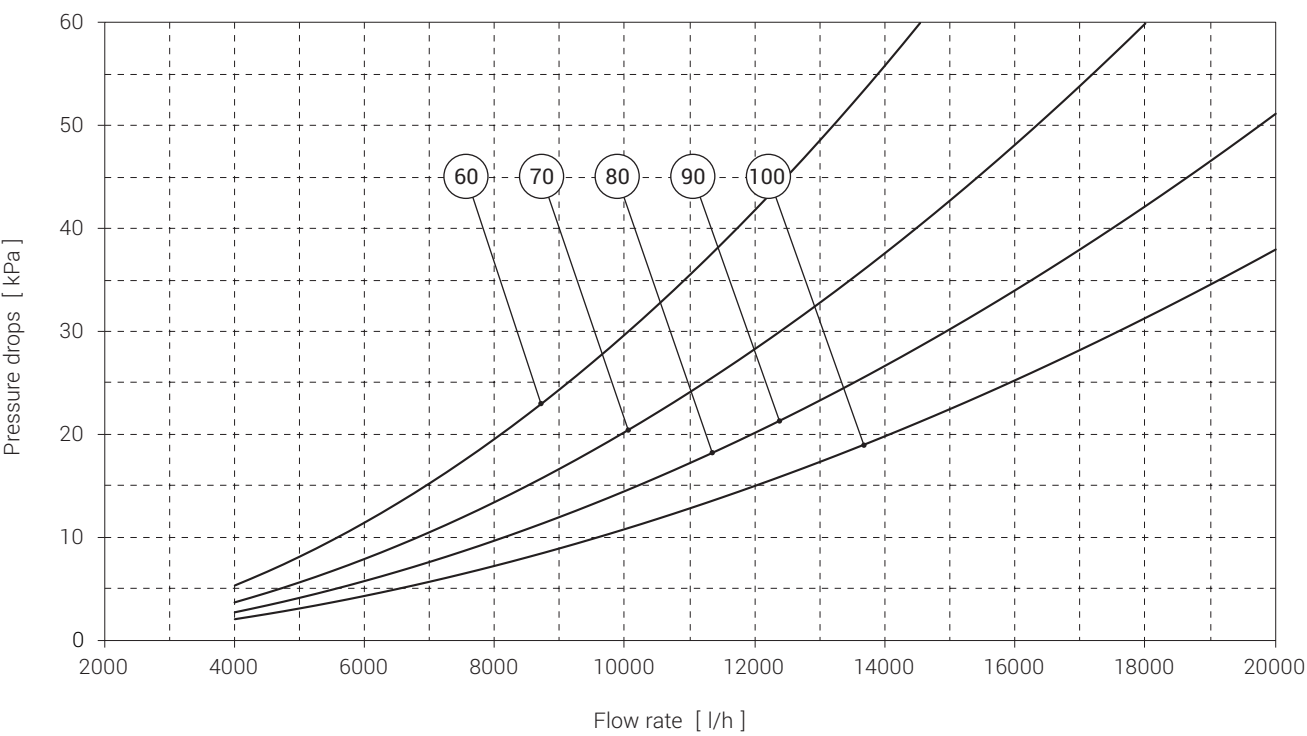
COOLING



Temperature difference between water inlet and outlet		Plant side	Source side	
ΔT max	Maximum value	10	-	°C
ΔT min	Minimum value	3	-	°C

HYDRAULIC Performances

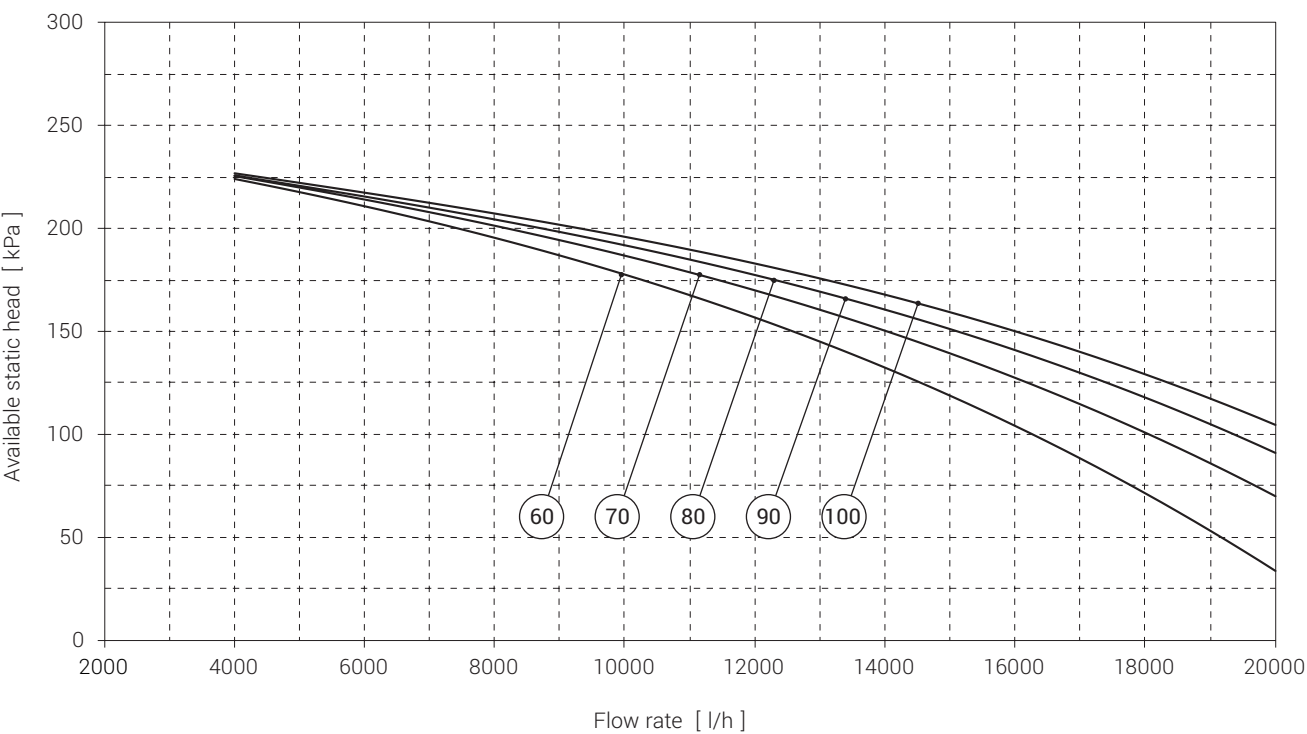
ASHP Pressure Drop - ASHP Only



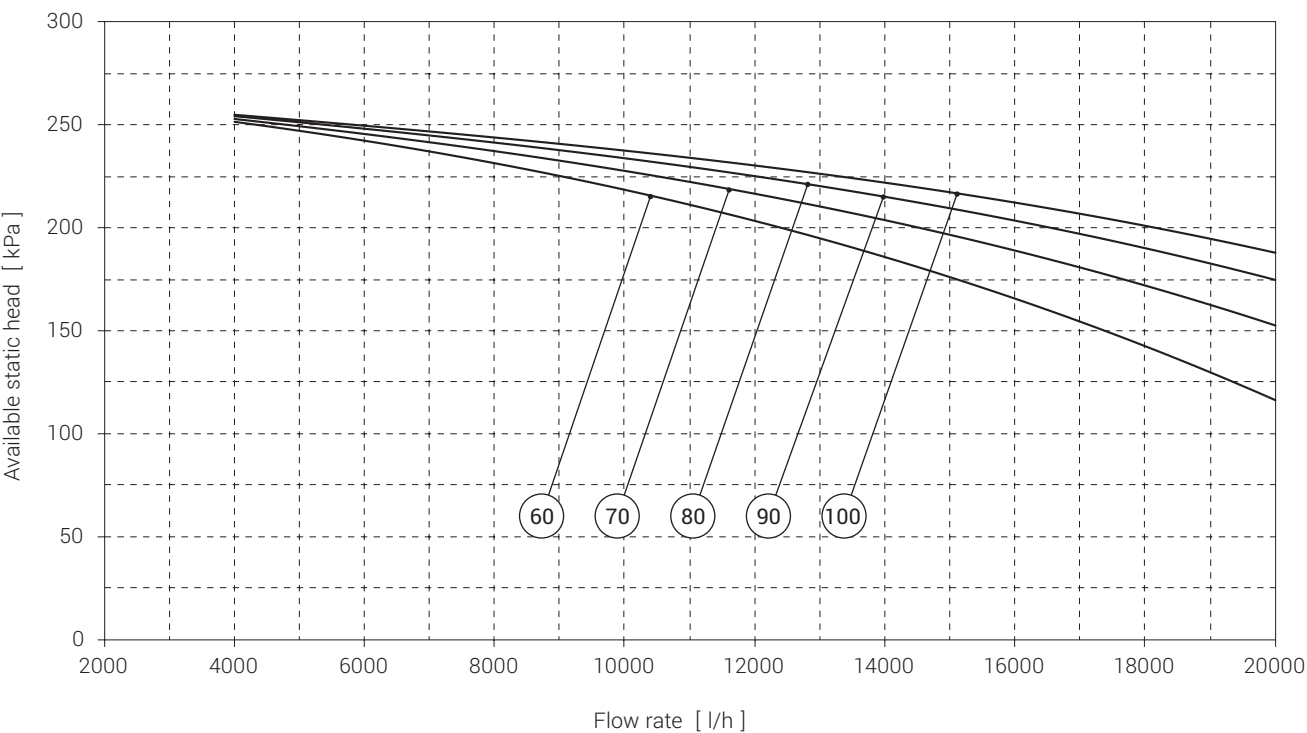
The graphs are referred to units operating with water at 10°C (density 1000 kg/m³).
In the graphs the water filter pressure drops are not taken into consideration.

HYDRAULIC Performances

Available Static Head after ASHP - Modulating Pump (Standard Supply)



Available Static Head after ASHP - High Head Pump (Additional Option)



Recommended Water Filter	60	70	80	90	100	
DN	50 (2")	50 (2")	50 (2")	50 (2")	50 (2")	-
Kvs	37	37	37	37	37	m³/h

Other Technical Data

Acoustic Performances

	Mod	Sound power levels [dB] by octave bands [Hz]								Sound power level		Sound pressure level		
		63	125	250	500	1000	2000	4000	8000	dB	dB(A)	1m	5m	10m
Low noise	60	81.4	79.3	77.6	73.9	70.4	66.2	60.5	53.0	85	76	59	49	44
	70	81.9	79.8	78.1	74.4	70.9	66.7	61.0	53.5	86	77	59	50	45
	80	82.3	80.2	78.5	74.8	71.3	67.1	61.4	53.9	86	77	60	50	45
	90	82.9	80.8	79.1	75.4	71.9	67.7	62.0	54.5	87	78	60	51	46
	100	83.8	81.7	80.0	76.3	72.8	68.6	62.9	55.4	87	78	61	52	47

Reference conditions

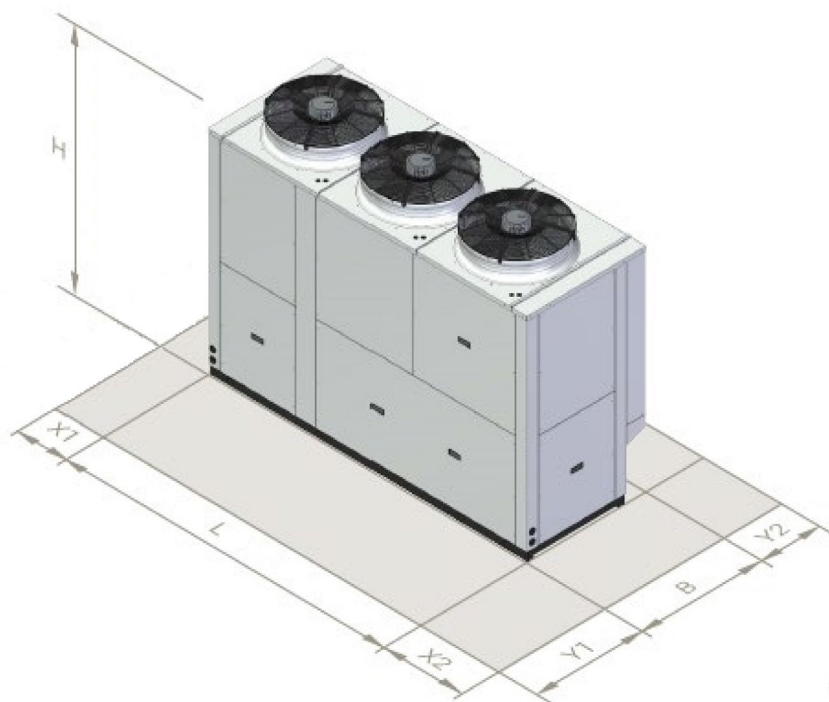
Performances related to units operating in heating mode at nominal conditions A7W35.

Unit placed in free field on reflecting surface (directional factor equal to 2).

The sound power level is measured according to ISO 3744 standard.

The sound pressure level is calculated according to ISO 3744 at various distances from the external surface of the unit.

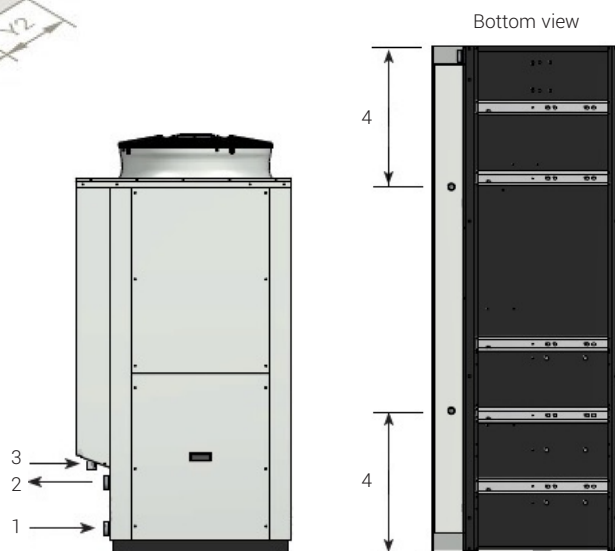
Overall Dimensions & Minimum Clearances



Overall Dimensions & Clearances						
	60	70	80	90	100	
L	2480	2480	2480	3230	3230	mm
B	930	930	930	930	930	mm
H	1830	1830	1830	1830	1830	mm
X1	200	200	200	200	200	mm
X2	500	500	500	500	500	mm
Y1	1000	1000	1000	1000	1000	mm
Y2	500	500	500	500	500	mm

Transport Dimensions						
	60	70	80	90	100	
L	2550	2550	2550	3300	3300	mm
B	1000	1000	1000	1000	1000	mm
H	2000	2000	2000	2000	2000	mm

Hydraulic Fittings		60	70	80	90	100
1	Plant side INLET			G 2" M		
2	Plant side OUTLET			G 2" M		
3	Condensate waste outlet			G 1" M		
4	To centre of condensate waste		690mm		1065mm	



Other Technical Data

Electrical Data

Standard Supply

The below measurements are based on what is supplied as standard within each S-ASX-VP ASHP, which includes the internal modulating primary shunt pump.

	ASHP with Modulating Shunt Pump	60	70	80	90	100	
	Power supply	400V - 3N - 50Hz	400V - 3N - 50Hz	400V - 3N - 50Hz	400V - 3N - 50Hz	400V - 3N - 50Hz	-
	FLA Maximum total current input	51.5	60.5	72.3	77.5	84.9	A
	FLI Maximum total power input	30.72	36.12	40.31	44.12	49.12	kW
	MIC Maximum total start current with soft starter	86	104	127	132	140	A

Additional Option - High Head Pump

The only additional option available that will alter the electrical data is replacing the internal modulating shunt pump with a "high head" pump to overcome the resistance within the primary circuit which the standard modulating pump is unable to.

	Option : High Head Pump - Additional Power	60	70	80	90	100	
	Power supply	400V - 3 - 50Hz	400V - 3 - 50Hz	400V - 3 - 50Hz	400V - 3 - 50Hz	400V - 3 - 50Hz	-
	FLA Maximum total current input	54.1	63.1	74.9	80.1	87.5	A
	FLI Maximum total power input	32.44	37.84	42.04	45.84	50.84	kW

The main power supply to each S-ASX-VP ASHP **MUST** be protected with a breaker external to the ASHP and rated to cover the above requirements (commonly rated to the next size up).

For example, with a S-ASX-VP 90 with the standard modulating pump, the maximum draw off is 77.5A therefore the next size up for the breaker size would be 80A.

We would also recommend the type of breaker to be either a type C or D because of the inrush of current for less than a second to activate the compressors (maximum total start current with soft starter) and the type of electrical components used within the ASHP.

Please see the "Electrical Connections" chapter for recommended cabling size.

Weights

	Components Weight	60	70	80	90	100	
	ASHP only R - Heating and cooling	616	628	634	763	774	kg
Options	Acoustic setting up S - Low noise acoustic setting up	55	55	55	67	67	kg
	Internal shunt pump Modulating pump	34	34	34	36	36	kg
	Option High head pump	25	25	25	26	26	kg

	Transport Weight	60	70	80	90	100	
	ASHP only R - Heating and cooling	634	646	652	783	794	kg
Options	Acoustic setting up S - Low noise acoustic setting up	55	55	55	67	67	kg
	Internal shunt pump Modulating pump	34	34	34	36	36	kg
	Option High head pump	25	25	25	26	26	kg

	Operating Weight	60	70	80	90	100	
	ASHP only R - Heating and cooling	630	643	651	788	801	kg
Options	Acoustic setting up S - Low noise acoustic setting up	55	55	55	67	67	kg
	Internal shunt pump Modulating pump	36	36	36	39	39	kg
	Option High head pump	27	27	27	29	29	kg

Receiving and Positioning

Receiving

Check on Receiving

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

Safety Instructions

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

Handling

Before handling the unit, check the weight of the unit, reported both on the data plate and on the technical documentation. Make sure the unit to be handled with care avoiding any kind of collision that could damage the operating parts of the unit. On the packaging of the unit are reported all the instructions necessary for a correct handling during storing and installation. The unit is supplied on pallet or wood supports suitable for the transport. It is advisable to place protective material between the truck and the unit to avoid damages to the unit. Prevent the unit or parts of it from falling down.

Storing

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

Do not stack the units.

Maximum temperature = 47 °C

Minimum temperature = -22 °C

Humidity = 90 %

Packaging Removal

Remove the packaging taking care not to damage the unit.

Check for any visible damage.

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

Positioning

Installation Site

Verify that the support surface can bear the weight of the selected unit and that it is perfectly horizontal.

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

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

IMPORTANT : The unit must be installed according to the requirements of local regulations in force in the place of installation, in particular taking into account the category of occupation of the premises and the safety class of the refrigerant.

Vibration Dampers - Mandatory Installation

In order to limit the vibrations transmitted by the unit it is possible to place, between the unit base and the support surface, a strip of hard rubber or, if a higher level of insulation is required, vibration dampers (supplied with ASHP).

Moreover in order to guarantee to avoid vibration propagation along the hydraulic pipes flexible pipes are suggested.

Installation in Saline Environments

The unit is NOT suitable for installation in saline environments despite having hydrophilic aluminum coils that provide greater resistance to corrosion than natural aluminum coils.

To increase the protection in such environments, special surface protection treatments are required on the coil (contact pre-sales service for further information).

Installation in Areas Subject to Snow

In case of heavy snow, the coil may become clogged and require manual cleaning to restore normal operation.

In environments with frequent snowfalls, consider protecting the coil from snow accumulation by raising the heat pump from the ground and/or installing protective caps.

Frost Protection

In case of outdoor installation or in an environment where the air temperature can drop below 0°C, it is necessary to protect the fluid contained in the hydraulic circuit from the risk of freezing.

The control system of the unit includes a series of algorithms that ensure the protection of the unit.

If the unit is not electrically powered for long periods of time and with external temperatures below 0°C, it is however necessary to empty the hydraulic circuit to prevent it from freezing.

Alternatively, it is possible to use a mixture of water and glycol with an adequate concentration according to the minimum expected outdoor air temperature (see paragraph "Hydraulic connections").

Connections

Hydraulic Connections

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

The hydraulic circuit (on the plant side) must be equipped with a safety valve. To maintain the circuit under pressure a self-filling group, that automatically fills the circuit, can be installed.

It is MANDATORY to install a water FILTER on the unit inlet in order to avoid the entrance of foreign substances, otherwise warranty rights are lost. The filter must guarantee a degree of protection at least equal to the one of a mesh filter with hole diameter of 1 mm.

Calibration of Water Flow Rate

It is always necessary to guarantee the correct water flow rate through the internal condenser plate heat exchanger of the ASHP.

Each ASHP comes with an internal modulating shunt pump sized to overcome the resistance of the ASHP PHE and flow directly to either a thermal store or an indirect DHW cylinder.

There is NO requirement for either commissioning valves or in-line primary pump sets.

To protect the ASHP, each appliance is installed with a differential water flow pressure switch that locks out the unit if the water flow is too low. The water flow rate values at which the differential switch trips out are indicated in the table below.

It is MANDATORY to install a non return valve on each ASHP flow pipework.

Requirements for the Hydraulic Plant Realisation

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

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

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

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

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

In closed vessel systems, the installation of an adequate expansion vessel is recommended to compensate for the thermal expansion of the water.

It is MANDATORY for a multiple ASHP installation, the primary common flow & return headers between the ASHP's and the thermal store(s) must be installed on a reverse return setup.

Reference Values for the System Water

The characteristics of the water used in the system must comply with the values indicated in the table. Otherwise warranty rights will be lost.

Reference values		
pH	7,5 ... 9,0	-
Total hardness	0,5 ... 15	°f
Electric conductivity	< 800	µS/cm
Cl ⁻	< 50	ppm
Fe ³⁺	< 0,5	ppm
Other components	< 0,1	ppm

Use of Water and Glycol Solutions

The unit can work with solutions of water and ethylene or propylene glycol up to 35% concentration by volume.

Using water and glycol solutions the performance of the unit compared to operation with water will be reduced. It is therefore recommended to use the percentage of glycol strictly necessary to protect the unit down to the minimum expected outdoor air temperature.

Condensate Drain

All the units are equipped with a drain for the condensate generated by the finned coil during normal heating operation. The connection of the drain is mandatory to avoid the accumulation of water around the unit and the possible formation of ice sheets.

MINIMUM water volume of the system

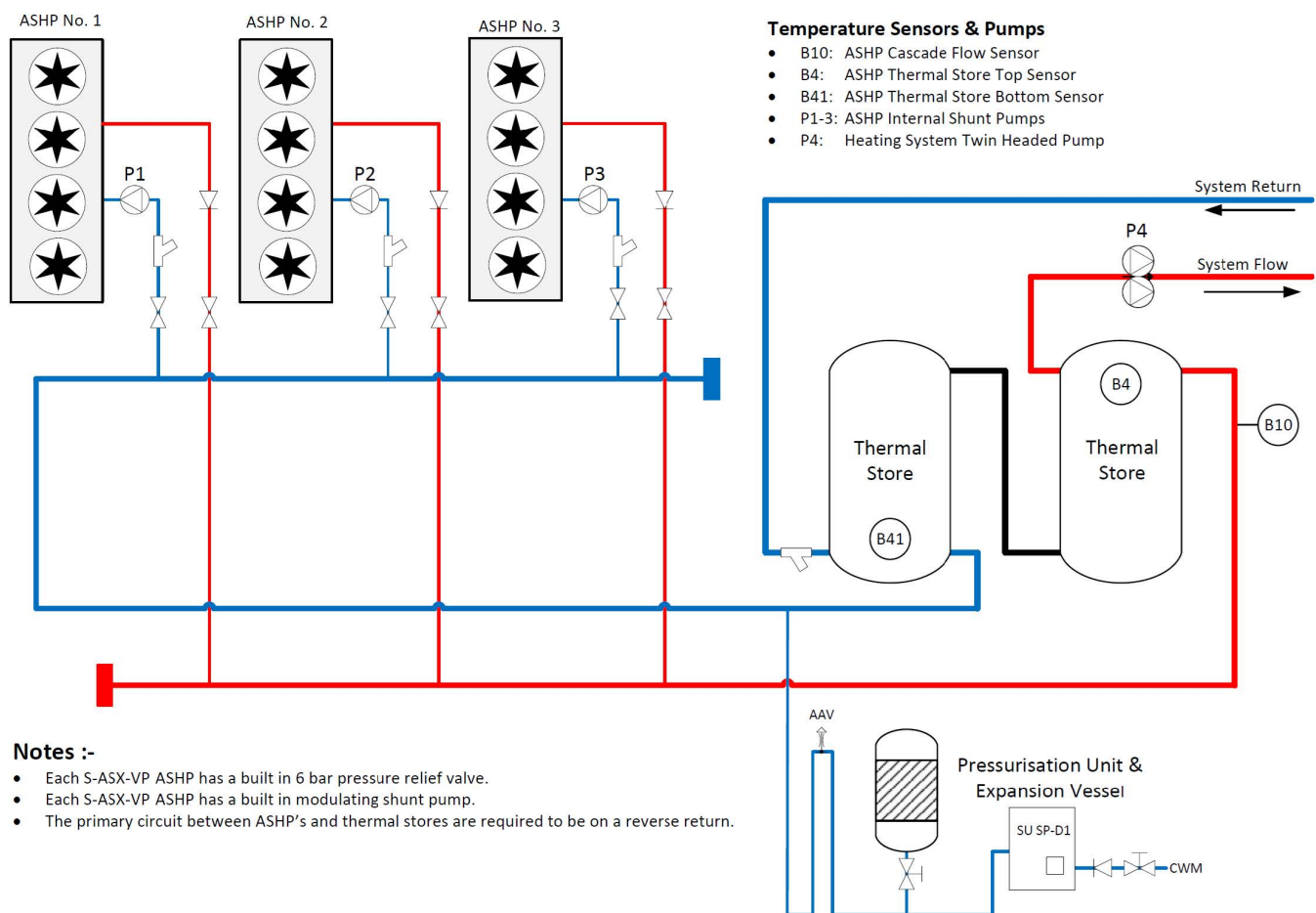
It is recommended to check that the minimum amount of water available for the unit operation, regardless of the state of the system (closing/opening of the distribution circuits) does not fall in any operating condition below **10 litres per kW** of nominal heating capacity at outside air temperature of 7°C.

In this way it is possible to guarantee a sufficient stability of the water temperature and avoid to generate situations that are potentially dangerous for the unit or in any case not very comfortable for the user.

Differential Pressure Switch Threshold	60	70	80	90	100	
Water Flow Rate	3000	3600	4300	4300	5000	l/h

Connections

ASHP Basic Schematic - Example of CH Operation



Primary Circuit

The primary circuit is known as the circuit starting from the S-ASX-VP air source heat pumps to the thermal store.

With each S-ASX-VP ASHP having an internal modulating shunt pump, there is no requirement to install any components to influence the primary flow rate such as commissioning sets within the primary circuit. This will prevent the correct operation of the modulating pumps leading to the incorrect flow rate being achieved through the ASHP's and possible non warranty failures.

Primary Pipework Sizing

The primary pipework as mandatory requires to be sized to a 5°C dT flow rate based on the ASHP(s) full output at the required flow temperature with the outside air temperature at 7°C, and it is recommended to follow the guidance of CIBSE for selecting pipework sizes which is currently as follows:

1. Pipework velocities to be 0.75 to 1.15 m/sec for 15 – 50mm diameter pipework.
2. Pipework velocities to be 1.25 to 3.0m/sec for 50mm+ diameter pipework.
3. Pipework pressure drop to be 360 pa/m maximum.
4. End of system component pressure drop of 28kPa maximum (thermal store).

Multiple Thermal Stores

Where multiple thermal stores are installed, the requirement is to install the thermal stores in series as shown in the above schematic.

The total volume of the thermal stores as a minimum must be sized to the total ASHP's **nominal** output (based on the required flow temperature with the outside air temperature at 7°C) multiplied by 10 litres. For example, the nominal output of 2 x S-ASX-VP 70's at A7W65 is 141.2kW (70.6kW each) multiplied by 10 is 1,412 litres = Nearest match is 1,500 litres.

The thermal store with the flow pipework installed (primary and secondary system) must have the B4 temperature sensor fitted and the thermal store with the return pipework installed (primary and secondary system) must have the B41 temperature sensor fitted.

Connections

Electrical Connections

The electrical wirings must be carried out by qualified personnel according to the regulations in force at the installation time in the country of installation.



Before starting any work on the electrical circuit make sure that the unit power supply line is disconnected at the start.

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

Power Supply System

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

- For **single phase** power supply : **230V - 1 - 50Hz**
from a single phase voltage system provided with neutral conductor and separated earth wire :
 $V = 230\text{ V} \pm 10\%$ $f = 50\text{ Hz}$
- For **three phase** power supply : **400V - 3N - 50Hz**
from a symmetrical three phase voltage system with neutral conductor and separated earth wire :
 $V = 400\text{ V} \pm 10\%$ $f = 50\text{ Hz}$
- For **three phase** power supply : **400V - 3 - 50Hz**
from a symmetrical three phase voltage system with separated earth wire :
 $V = 400\text{ V} \pm 10\%$ $f = 50\text{ Hz}$

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

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

Unit Power Supply

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

It is necessary to provide an adequate earth connection. The manufacturer cannot be considered responsible for any damage caused by inadequate or faulty grounding.

It is recommended to use cables with a section NOT LOWER than that shown in the table, in any case respecting the regulations in force.

It is recommended to keep the supply line as short as possible.

Upstream Protection

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

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

Connections Available for the User

The electrical board of the unit contains some terminals dedicated to the connection of external switches or probes. Carry out all the necessary connections in order to realise the desired plant following the instructions reported in the section "Inputs and outputs".

ATTENTION

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

	ASHP without Options	60	70	80	90	100	
Three phase	Power supply	400V - 3N - 50Hz	400V - 3N - 50Hz	400V - 3N - 50Hz	400V - 3N - 50Hz	400V - 3N - 50Hz	-
	MINIMUM recommended section	16,0	16,0	16,0	25,0	25,0	mm ²

Start Up

Preliminary Checks

The following operations must be carried out only by properly qualified and trained personnel with the help of suitable equipment (see "Maintenance" paragraph). To make the contractual warranty effective, start up must be carried out by authorised service centers.

Before calling the service centre it is advisable to make sure that all the installation steps have been completed (positioning, electrical connections, hydraulic connections...) and the risk assessment of the installation (if needed) has been completed by the installation supervisor.

Preliminary checks before turning on

1. Verify that :
 - The unit has not suffered visible damages due to transport or positioning
 - The unit is placed on an horizontal surface able to bear its weight.
 - The minimum operating area is respected.
 - The ambient conditions comply with the provided operating limits.
 - The hydraulic and electrical connections has been carried out correctly.
 - The hydraulic circuit has been charged and vented.
 - No leakage are present around the unit inside the defined safety area.
2. Disconnect the power supply line at the start and verify that :
 - The unit power supply line complies with the regulations in force.
 - The screws fastening the electrical cables to the components inside the electrical panel of the unit are well tightened (vibrations during transport phases could have caused some loosening).
3. Connect the unit power supply line and verify that :
 - The voltage of the power supply line complies with the nominal one of the unit.
 - For three phase power supply units, the unbalance between the phases is lower than 2% (a higher value produces an excessive current input on one or more phases causing possible damages to the electrical components of the unit).

NOTE : Example of phase unbalance calculation

- Read the value of the three line voltages using a voltmeter :
line voltage between phases L_1 and L_2 : $V_{1-2} = 390$ V
line voltage between phases L_2 and L_3 : $V_{2-3} = 397$ V
line voltage between phases L_3 and L_1 : $V_{3-1} = 395$ V
- Calculate the difference between the maximum and minimum value of the measured line voltages :
$$\Delta V_{\max} = \max (V_{1-2} ; V_{2-3} ; V_{3-1}) - \min (V_{1-2} ; V_{2-3} ; V_{3-1}) =$$
$$= V_{2-3} - V_{1-2} = 397 - 390 = 7 \text{ V}$$
- Calculate the average line voltage value :
$$\Delta_{\text{average}} = (V_{1-2} + V_{2-3} + V_{3-1}) / 3 = (390 + 397 + 395) / 3 = 394 \text{ V}$$
- Calculate the percentage unbalance value :
$$\Delta V_{\max} / V_{\text{average}} \times 100 = 7 / 394 \times 100 = 1,78 \% < 2 \%$$

Unit Start Up

Set date and time :

- Select menu "Service" ()
- Select "Regional settings"
- Modify "Time" and "Date"

To activate the unit in heating or cooling mode enable one of the available digital contacts in order to require the unit to work :

- **VK1 : Heating request**
- **VK2 : Cooling request**

In order to set the set point associated to each request see paragraph "Main functions".

In order to trigger domestic hot water tank charging, select menu "Domestic hot water" () and set operating mode as "On".

Verify that the nominal set point is lower than the temperature read by the control system.

Verify if an active request is present for the heat pump :

- Select menu "Info" ()
- Select page "Heat pump"
- Verify the "Setpoint" value :
 - If no numeric value is displayed ($--^{\circ}\text{C}$) means that no request is present that require the heat pump to work. Verify again the set point selected for the active request.
 - If a numeric value is displayed means that a request is active and the heat pump is going to start.

Wait the unit and the compressor to start (symbol  on the status bar). Verify that the water temperature on the outlet and inlet of the unit are correct for the active request. Wait that the active request is satisfied and verify that no alarms are tripped (indicated by the symbol  on the status bar).

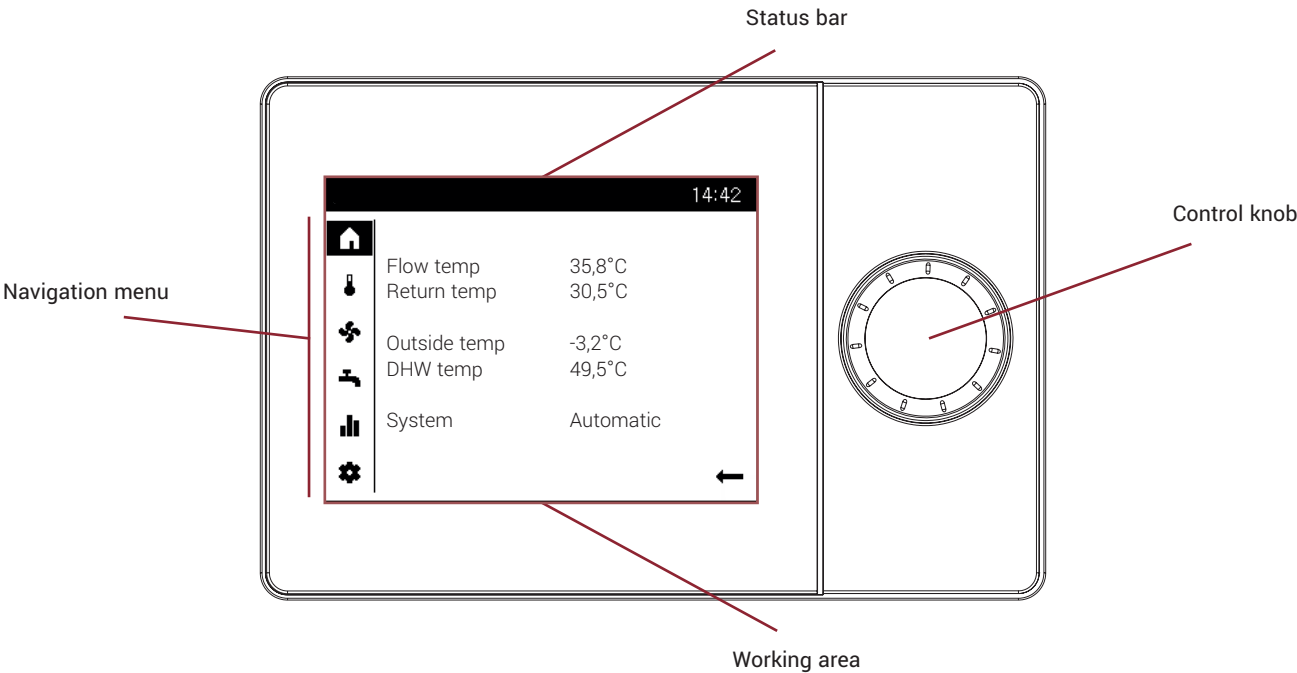


Compressor carter electrical heater

The heat pump control system manages the activation of an electrical heater placed around the compressor that is activated in order to keep the temperature of the oil contained in the compressor carter high enough to avoid any liquid strokes or poor lubrication at start-up.

In the case of startups with outdoor air temperature below 0°C , it is recommended to power up the unit at least 8 hours before starting the compressor.

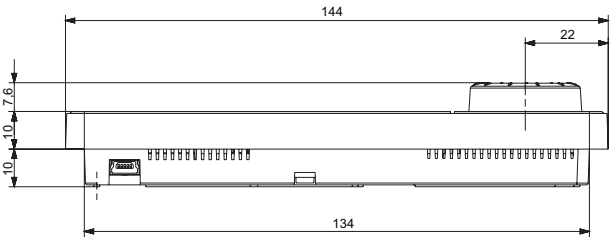
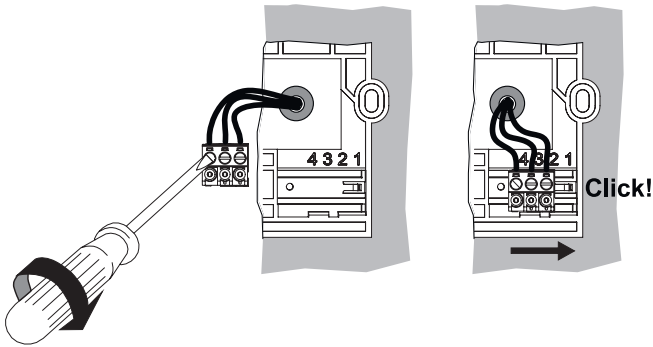
Control System



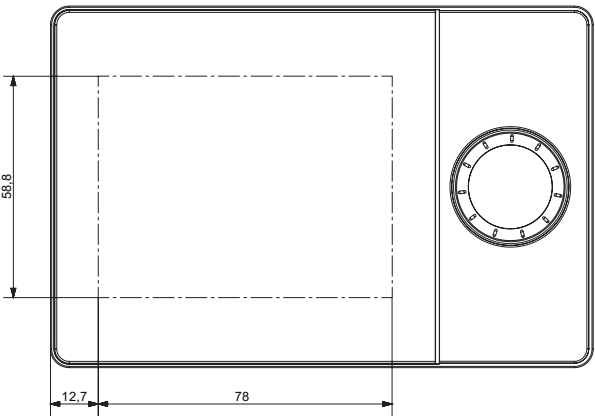
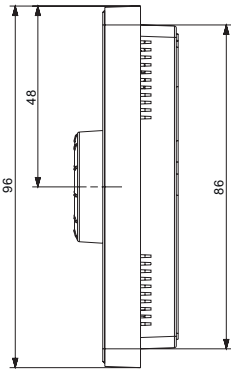
User Interface

The unit can be managed by means of the remote user interface, equipped with a “push and roll” control knob that allows to navigate inside the different menus and to visualize and modify all the parameters.

Mandatory - Each ASHP user interface must be connected to its own ASHP and be installed within the installation plant room.



1	G+ (DC +12V)
2	CL- (GND)
3	CL+ (BSB)



Connect the remote user interface to the unit controller using a 3-wire cable with a minimum section of 0,5 mm² and a maximum length of 200 metres. The remote user interface communicates with the unit controller via the BSB communication bus (see paragraph “Inputs and Outputs” for details on the connection).

Control System

Temperature Sensors

Each unit can be equipped with temperature sensors to be placed outside the unit to monitor the temperature of the various points of the system necessary to enable the management of these components.

It is recommended to install these sensors in such a way that the detected temperature is as correct as possible, possibly using immersion wells, conductive paste or insulating tapes.

The characteristic curve of the temperature sensors used is shown in the table.

To check if the probe is working properly, check the correspondence between the actual temperature and the electrical resistance value (measured by a multimeter).

T [°C]	R [Ω]	T [°C]	R [Ω]	T [°C]	R [Ω]
-30	175203	50	3605	130	298
-25	129289	55	2989	135	262
-20	96360	60	2490	140	232
-15	72502	65	2084	145	206
-10	55047	70	1753	150	183
-5	42158	75	1481	155	163
0	32555	80	1256	160	145
5	25339	85	1070	165	130
10	19873	90	915	170	117
15	15699	95	786	175	105
20	12488	100	677	180	95
25	10000	105	586	185	85
30	8059	110	508	190	77
35	6535	115	443	195	70
40	5330	120	387	200	64
45	4372	125	339		

If it is necessary to lengthen the probe, use a copper cable with a minimum section not less than that shown in the table.

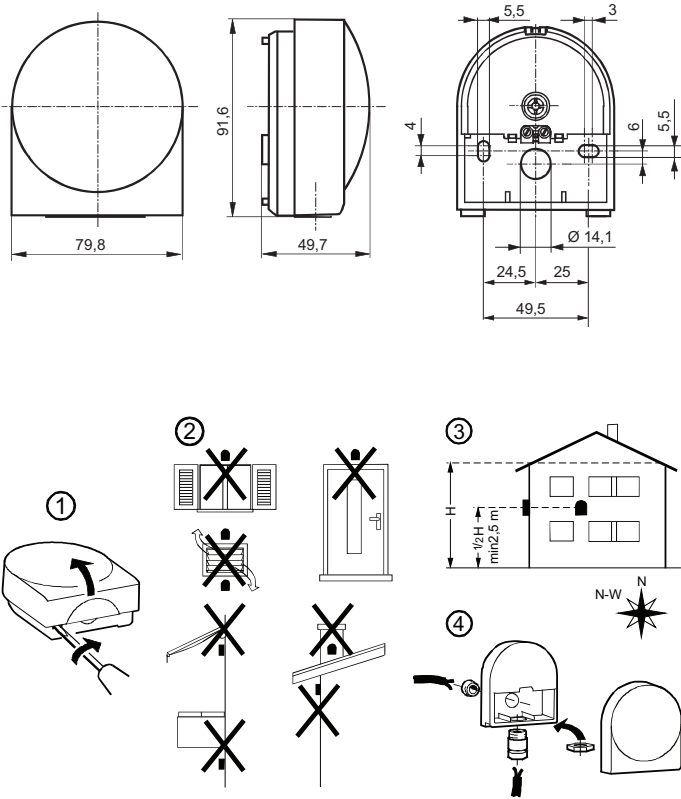
Maximum length	40	60	80	120
Minimum section	0,5	0,75	1,0	1,5

Outdoor Air Sensor

Each unit is supplied with an outdoor air temperature sensor that must be installed outdoor and connected to the heat pump controller (input B9).

The sensor is used to enable the antifreeze protection function and to calculate the flow temperature set point according to the climatic curves set for the heating and cooling circuits.

Follow the instructions reported below to install properly the sensor.



Control System

Navigation Menu

The navigation menu consists of a series of icons arranged vertically on the left side of the display. Navigation within the menu is done by moving the cursor, represented by a frame that wraps the icon above the selected element, by turning the control knob. The information shown on the display updates according to the selected menu. By pressing the knob, the cursor enters the selected menu by positioning itself on the editable items displayed in the work area.

Menu “End User”

The menu visible when the control is started is the menu dedicated to the end user. It is always possible to return the display to this menu by keeping the knob pressed for a few seconds. However, after 8 minutes of inactivity, the device automatically returns to the home page. Only menus associated with enabled functions are displayed.

	Home	Plant status
	Heating Cooling zones	Heating and cooling circuits status
	Domestic hot water	Domestic hot water status
	Info	Messagges : errors / events Heat pump status Operating plant status
	Settings	Settings : date, time, language Special operations Login to “Expert” menu

Menu “Expert”

Besides the “Enduser” menu, an “Expert” menu is available which allows access to a greater number of information and settings. To access this menu, from the “Enduser” menu, enter the Settings menu  and select the “Expert” item in the working area. A menu appears prompting you to select a user type and set a password if required.

User	Password
Enduser	-
Commissioning	-
Engineer	-
OEM	Reserved

Once logged into the “Expert” menu, the navigation menu is updated and new menus are displayed.

	Diagnostics	Diagnostics and tests for the plant
	Maintenance	Control and regulation functions through access to the complete parameter list
	Info	Messagges : errors / events Heat pump status Operating plant status
	Settings	Settings : date, time, language Special operations Login to “Expert” menu

Status Bar

The status bar shows the following informations :

-	Date
-	Time
	Active alarm
	Active compressor / Active supplementary source
	Active maintenance

Control System



Menu “Expert” - Diagnostics

The following functions are available in the “Diagnostics” menu :

- **Test Input/Output**
It allows to force the activation of the controller outputs and view the status of all the inputs.
To activate the digital outputs (QX) use parameter 7700 and select the output corresponding to the load to be activated (see table “Inputs and Outputs”).
To activate the analog outputs (UX) use the parameter corresponding to the analog output corresponding to the load to be activated (see table “Inputs and Outputs”).
To activate the electronic valves directly managed by the controller (WX), use the parameter corresponding to the output corresponding to the valve to be activated (see table “Inputs and Outputs”).
- **Communication**
Allows to view the parameters relating to communication on the LPB bus (communication with other controllers in cascade).
- **Simulation**
Allows to simulate the value read by the outdoor air sensor.
- **Source**
Allows to view all the available information on the operating status of the heat generators managed by the controller (heat pump, solar panels, additional generators ...).
- **Consumer**
It allows to view all the information available on the operating status of the system (distribution circuits, accumulations, DHW, external air temperature ...).
- **Error history**
Allows you to view the history of the last 10 alarms.
- **Version**
Allows to view the firmware version of the controller and of the remote user interface.

- **Commissioning Wizard**
Provides a guide to the user interface configuration and to the system configuration (NOT necessary).
- **Refresh Operator Unit**
Allows to update the main screens of the end user menu to adapt them to the new configuration set in the parameters menu. This line appears automatically only if a refresh is required.

Complete Parameter List

All the parameters of the controller can be visualized and modified within the complete parameter list, accessible via the “Expert

“Maintenance” Menu.

The parameters are grouped into different submenus and are all identified by a numerical code. Each submenu can consist of several pages indicated at the top right under the status bar. The menus that are not relevant depending on the configuration of the heat pump and the system are automatically hidden.

Menu	Parameters
Time of day and date	1 - 6
Operator section	20 - 70
Time program heating circuit 1	500 - 516
Time program cooling circuit 2	520 - 536
Time program 4 / ACS	560 - 576
Heating circuit 1	700 - 900
Cooling circuit 2	1201 - 1269
Domestic hot water	1600 - 1680
Consumer circuit 1 (VK1)	1854 - 1880
Consumer circuit 2 (VK2)	1904 - 1930
Heat pump	2776 - 3080
Supplementary source	3690 - 3755
Buffer	4705 - 4831
Domestic hot water tank	5007 - 5179
Configuration	5700 - 6298
LPB system	6600 - 6650
Fault (Alarms)	6710 - 6820
Service / Special operations	7070 - 7226
Configuration extension modules	7300 - 7512
Input / output test	7700 - 7952
State	8000 - 8070
Diagnostics hest generation	8395 - 8586
Diagnostics consumers	8700 - 9058



Menu “Expert” - Maintenance

The following functions are available in the “Maintenance” menu:

- **Complete Parameter List**
Provides access to the list of all the parameters of the controller. The visibility of the parameters depends on the type of user with whom the menu was accessed.
After a change in the configuration of the unit, it is necessary to exit and re-enter the complete parameter list to allow it to be updated and to display or hide the menus relevant to the new configuration. During this operation, which may last a few minutes, the message “Operator unit being refreshed” appears on the display.

Control System

Main Functions

Management by means of Digital Inputs

The unit can be managed by means of digital inputs :

- **VK1 : Heating Request (fixed set point)**
When the input is active the heat pump is activated in heating mode with a fixed set point on the water outlet (par 1859).
- **VK2 : Cooling Request (fixed set point)**
When the input is active the heat pump is activated in cooling mode with a fixed set point on the water outlet (par 1909).

NB. Each digital input generates an independent request. If several digital inputs are active at the same time, the requests are combined each other to obtain a single request to be forwarded to the heat pump. Heating requests always have priority over cooling ones.



Heating and cooling circuits

The heat pump controller can manage heating and cooling distribution circuits with the possibility to define :

- Climatic curves
- Daily and weekly time tables

HEATING

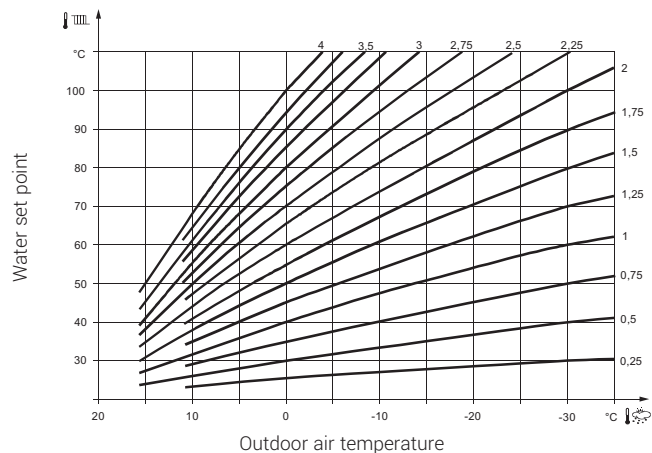
The temperature set point of the water to be sent to the **heating circuit** terminals is calculated as a function of the outdoor air temperature through a parameterisable climatic curve.

The climatic curve is defined by two parameters :

- **Slope** (par 720) : defines the shape of the climatic curve as indicated in the graph.
- **Displacement** (par 721) : allows you to vertically translate the curve defined by the selected slope.

The climatic curve is defined for an ambient set point of 20°C. If this set point is changed, the set point of the water to be sent to the terminals is changed accordingly.

The set point calculated by the climatic curve is however limited between a minimum (par 740) and a maximum (par 741) value.



Par	Description	Default value
720	Heating curve slope	0,80
721	Heating curve displacement	0,0 °C
740	Flow temp setpoint min	25 °C
741	Flow temp setpoint max	70 °C

Control System

COOLING

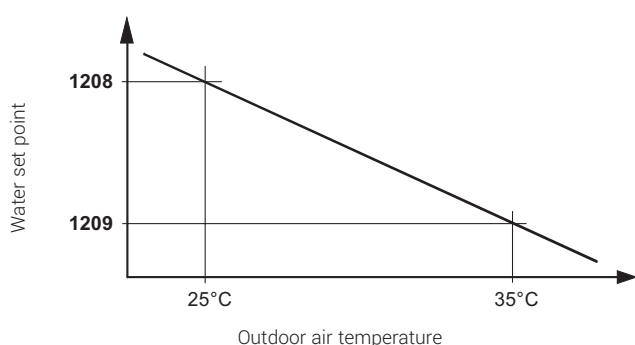
The temperature set point of the water to be sent to the **cooling circuit** terminals is calculated as a function of the outdoor air temperature through a parameterisable climatic curve.

The climatic curve is defined by two parameters :

- **Set point at 25°C** (par 1208) : Defines the water set point at an outdoor air temperature of 25°C.
- **Set point at 35°C** (par 1209) : Defines the water set point at an outdoor air temperature of 35°C.

The climatic curve is defined for an ambient set point of 25°C. If this set point is changed, the set point of the water to be sent to the terminals is changed accordingly.

The minimum value of the set point calculated by the climatic curve is however limited (par 1223 and par 1224).



Par	Description	Default value
1208	Flow temp setp at 25°C	16 °C
1209	Flow temp setp at 35°C	16 °C
1223	Flow temp setp min at 25°C	6 °C
1224	Flow temp setp min at 35°C	6 °C

SPACE HEATING/COOLING BUFFER WATER TANK

The controller of the unit allows to manage the temperature of an inertial storage tank that acts as a hydraulic circuit breaker between the distribution circuits (heating and cooling) and the heat generators (heat pump and possible boiler) by means of two temperature probes to be positioned in the upper (**B4**) and lower (**B41**) part of the storage tank.

All the heating and cooling requests are combined and generate a set point for the buffer storage tank. If this set point is not satisfied, a heating or cooling request is sent to the available generators.

Both probes are considered to evaluate the achievement of the set point. For the lower probe it is possible to consider a different set point by setting a differential (parameter 4735) compared to the set point calculated for the upper probe in order to take advantage of any stratification within the tank.

Par	Description	Default value
4735	Setpoint reduction B42/B41	0 °C



Supplementary Source

The heat pump controller can manage the integration of a supplementary heat generator (boiler) for both heating and domestic hot water production.

If the heat pump is not able to satisfy the requests autonomously, a digital output (**K32**) is activated which can be used to enable a supplementary heat generator.

Par	Description	Default value
2910	Release above outside temp	---
3700	Release below outside temp	---

It is possible to limit the enabling of the supplementary generator and also of the heat pump, depending on the outdoor air temperature in order to create a **bivalent system**.

The supplementary source can be enabled below a settable outdoor air temperature (parameter 3700) while the heat pump can be enabled above a settable outdoor air temperature (parameter 2910). In the temperature range in which both generators are enabled, the heat pump has priority and the supplementary source is activated only in integration, if necessary.



Condensate Coil Tray Electrical Heater

The heat pump controller can manage the activation of an electrical heater or a heating cable to be placed on the condensate tray or in the drain pipe to prevent ice formations from obstructing the draining during winter.

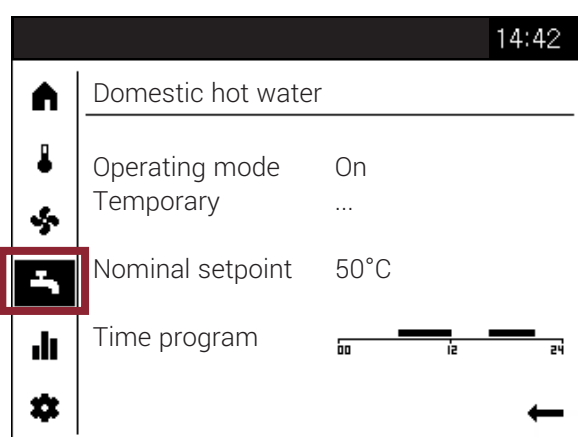
When the outdoor air temperature falls below 2°C, a digital output (**K41**) is activated during the defrost cycles and remains active for up to 3 minutes after the end of the cycle.

Control System



Domestic Hot Water

The heat pump controller can manage domestic hot water production. To enable this function, a temperature sensor (B3) must be placed on the domestic hot water storage tank and connected to the unit controller (see paragraph "Inputs and outputs"). When the function is enabled in the "Enduser" navigation menu, the associated icon appears which allows to directly set the operating mode, the nominal set point and, if needed, the time program for domestic hot water. All the other parameters about domestic hot water function can be modified by entering the complete parameter list in the "Domestic hot water" menu.



By setting the operating mode to "On" the heat pump will keep the storage tank temperature close to the nominal set point activating a three way valve (Q3) to divert the flow of the heat pump from the heating / cooling circuits towards the domestic hot water storage tank.

Par	Description	Default value
1600	Operating mode	Off
1610	Nominal set point	50 °C
1612	Reduced set point	40 °C
1620	Release	24 h/day

Usually the domestic hot water function is enabled 24 hours a day with nominal set point. It is possible to alternate the storage tank set point between the nominal and the reduced one setting a daily and weekly time program dedicated to the domestic hot water function. To enable this function, set parameter 1620 to "Time program 4 / DHW".

After a refresh of the operator unit, the line related to the domestic hot water time program will become selectable and editable.

It is possible to manage the **anti legionella function** to periodically perform heating cycles of the domestic hot water storage tank up to a higher temperature than the nominal set point.

Before enabling this function, it is recommended to check that the heat pump, possibly with the integration of the additional heat generator, can reach the set point temperature set for the cycle.

All the parameters about anti-legionella function can be modified by entering the complete parameter list in the "Domestic hot water" menu.

Par	Description	Default value
1640	Legionella funct	Off
1641	Legionella funct periodcally	3 days
1642	Legionella funct weekday	Monday
1644	Legionella funct time	05.00
1645	Legionella funct setpoint	65 °C
1646	Legionella funct duration	30 min

To enable the function, set parameter 1640 to the value :

- **Periodically** : the cycle is performed at fixed intervals of days. The interval is defined by parameter 1641.
- **Fixed weekday** : the cycle is performed on the day of the week defined by parameter 1642.

The anti-legionella cycle begins, on the scheduled day, at the time indicated by parameter 1644. The temperature of the domestic hot water storage tank is increased up to the required set point (parameter 1645) and maintained for the required period (parameter 1646).

DISCHARGING PROTECTION VALVE

The controller of the unit allows to manage, besides the three way valve (Q3) which diverts the flow of hot water between heating and domestic hot water storage tank, also another three way valve (Q33) to be installed downstream of the first one to avoid to send water inside the storage tank that is not hot enough to heat the storage tank.

Use of the digital output Q33

The three way valve Q33 can be controlled via a digital output (two position valve). The controller opens the three way valve only when the heat pump flow temperature (B21) is higher than the storage temperature (B3).

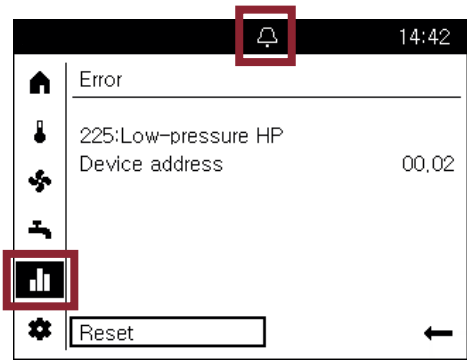
Use of the analog output Q33 and sensor B36

The three way valve Q33 can be controlled via an analog output (modulating valve). The controller adjusts the opening of the three way valve in order to keep the storage tank charging temperature (B36) higher than the storage tank temperature (B3).

Control System

Alarms

When an alarm is active the alarm symbol appears on the status bar. The details of the alarm are visible in the INFO menu.



- To reset the alarm :
- Select "Reset" with the control knob.
 - Press the control knob and the text changes to "Confirm."
 - Press the control knob again to reset the alarm.

Alarm Output

When an alarm is active, a digital output of the controller of the unit (**K10 / K46**) is activated which can be used to communicate to an external device the presence of an active alarm (see paragraph "Inputs and outputs").

The alarm output is deactivated when the alarm is reset. It is possible to deactivate only the alarm output (without resetting the alarm) via parameter 6710 (accessible from the complete parameter list).

Alarms Log

To see the Alarm log enter the "Fault" menu (parameters 6800-6819). The controller stores the last 10 events. The last event is stored deleting the oldest one.

As soon as an alarm is triggered, the Alarm log stores the event with the following informations :

1	Alarm number (history)
2	Time and date of the alarm
3	Alarm code
4	Alarm description

Alarm Reset

- There are three groups of alarms according to the type of reset :
- **Manual reset (M)** : when the alarm is no more active it is necessary to reset it manually. It is advisable to verify accurately the cause that originated the alarm and to make sure that the problem has been solved before restarting the unit.
 - **Automatic reset (A)** : as soon as the alarm is no more active, the unit is automatically reset.
 - **Automatic reset with events (R)** : the alarm is automatically reset only if the number of events in an hour is less than a fixed threshold. Otherwise a manual reset is required.

Control System

Alarms Table

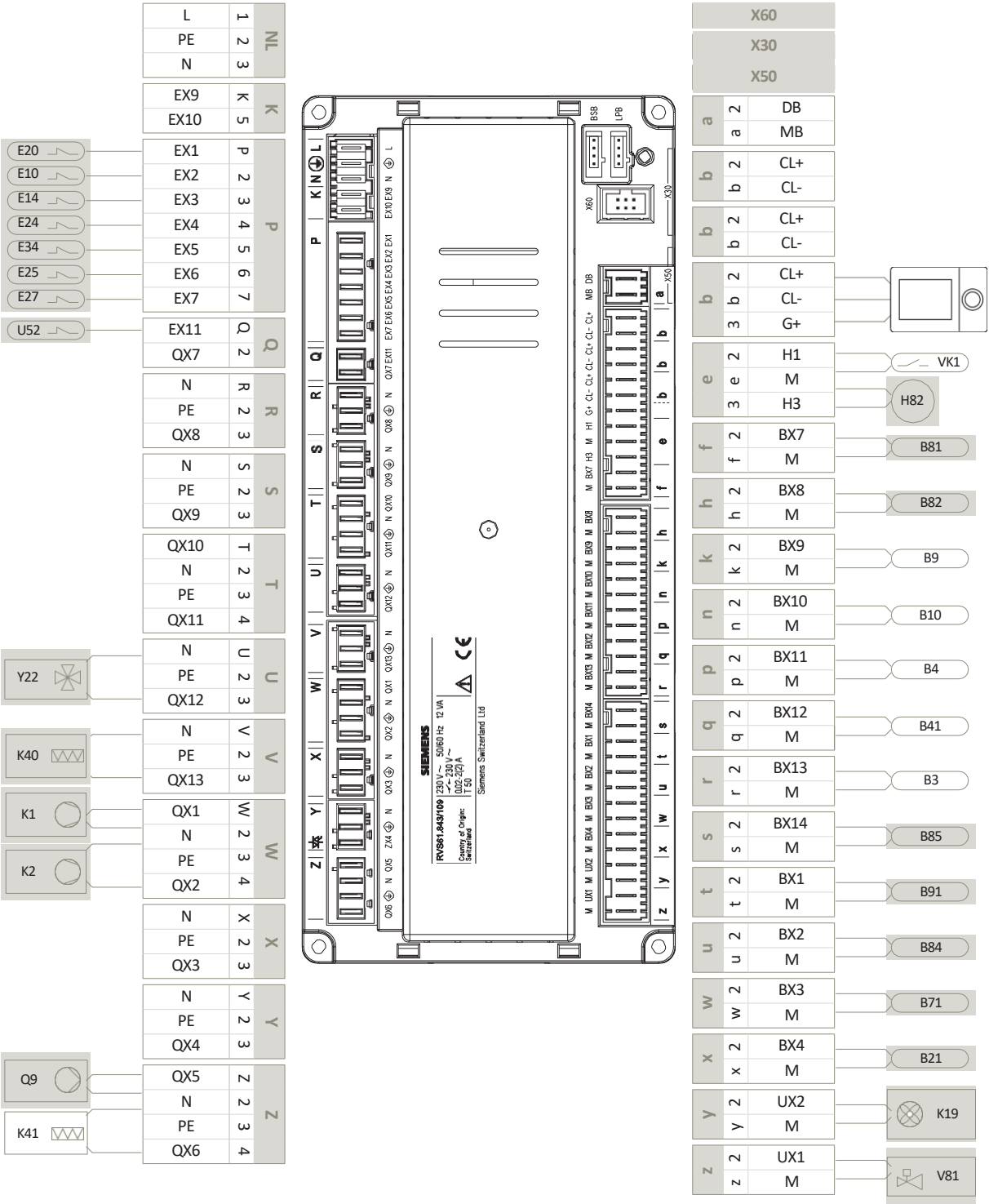
Code	Description	Reset	Input	Unit locked	Solution
10	Outdoor air temperature sensor	A	B9	No	Verify sensor connection
33	User side heat pump outlet temperature sensor	A	B21	No	Verify sensor connection
35	Source side heat pump inlet temperature sensor	A	B91	Yes	Verify sensor connection
36	Compressor 1 outlet temperature sensor	A	B81	No	Verify sensor connection
37	Compressor 2 outlet temperature sensor	A	B82	No	Verify sensor connection
39	Evaporator temperature sensor (coil)	A	B84	Yes	Verify sensor connection
44	User side heat pump inlet temperature sensor	A	B71	No	Verify sensor connection
50	DHW tank sensor 1 sensor	A	B3	No	Verify sensor connection
70	Buffer tank sensor 1 sensor	A	B4	No	Verify sensor connection
71	Buffer tank sensor 2 sensor	A	B41	No	Verify sensor connection
83	BSB short circuit	A	-	No	Verify connection cable with remote user interface and extension modules
84	BSB address collision	A	-	No	Verify configuration of remote user interface and extension modules
106	Source temperature too low	M	-	Yes	Verify sensor B91 connection Verify if the outdoor air temperature is inside the operating range
107	High temperature compressor 1 outlet	R	-	Yes	Verify sensor B81 connection Verify refrigerant leaks
108	High temperature compressor 2 outlet	R	-	Yes	Verify sensor B82 connection Verify refrigerant leaks
134	Phase sequence controller alarm	R	E20	Yes	Verify presence and sequence of power supply phases
138	Heat pump control sensor missing	A	-	Yes	Verify if all the sensor are connected and that the value read is reasonable Verify the configuration of all the inputs (see table "Inputs/Outputs")
146	Configuration error	A	-	No	Verify configuration parameters
201	Frost protection alarm	M	B21	Yes	Verify sensor B21 connection Verify that the unit can work on a water volume high enough to guarantee a proper unit working (see paragraph "Hydraulic connections")
204	Fans thermal protection	R	E14	Yes	Verify fans connection and their thermal protection inside the electrical panel of the unit
222	High pressure	R	H83	Yes	Verify the setting of the maximum water outlet temperature (according to the ΔT value adopted) Verify expansion valve connection (V81) Verify high pressure sensor connection (H83)
223	High pressure on start heating circuit	M	H83	Yes	
224	High pressure on start DHW	M	H83	Yes	
225	Low pressure	R	H82	Yes	Verify refrigerant leaks with a refrigerant leak detector If the alarm appears in cooling mode verify the water temperature, the set point adopted and that the unit can work on a water volume high enough to guarantee a proper unit working (see paragraph "Hydraulic connections")

Control System

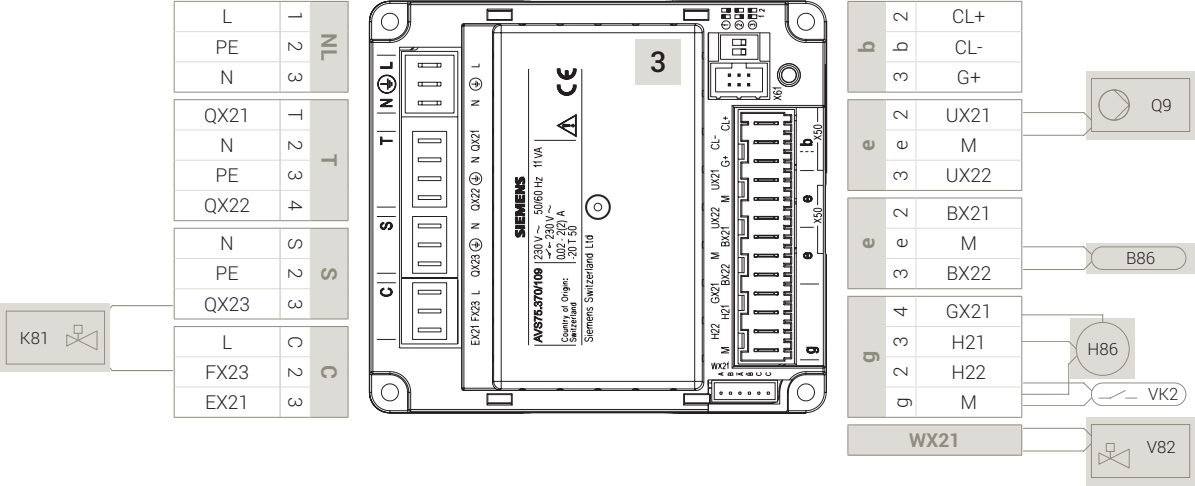
Code	Description	Reset	Input	Unit locked	Solution
247	Defrost alarm	R	-	Yes	Verify coil status and, if frozen, force a defrost cycle (parameter 7153) Verify refrigerant leaks with a refrigerant leak detector
320	DHW charging temperature sensor	A	B36	Yes	Verify sensor connection
324	Bx sensors with the same function	A	-	No	Two inputs are configured in the same way Verify Bx inputs configuration
325	Bx sensors with the same function on extension modules	A	-	No	
330	BX1 no function	A	-	No	Sensor connected but not configured Verify input configuration
331	BX2 no function	A	-	No	
332	BX3 no function	A	-	No	
333	BX4 no function	A	-	No	
335	BX21 no function	A	-	No	
336	BX22 no function	A	-	No	
356	User side flow switch	R	E24	Yes	Flow lack on the user side heat exchanger Verify that the system is well vented Verify pump connection Verify if the water filter is clean
358	Soft starter compressor 1 alarm	R	E25	Yes	Verify soft starter status Verify that the power supply voltage is inside the recommended limits (see paragraph "Electrical connections"). The alarm trips also to indicate a too low voltage power supply.
361	Sensor B91 missing	A	-	No	Verify sensor connection
363	Sensor B84 missing	A	-	No	Verify sensor connection
373	Extension module 3	A	-	No	Verify connection between main controller and extension modules
447	BX6 no function	A	-	No	Sensor connected but not configured Verify input configuration
452	H1 no function	A	-	No	Input connected but not configured Verify input configuration
453	H3 no function	A	-	No	
457	BX7 no function	A	-	No	Sensor connected but not configured Verify input configuration
462	BX8 no function	A	-	No	
463	BX9 no function	A	-	No	
464	BX10 no function	A	-	No	
465	BX11 no function	A	-	No	
466	BX12 no function	A	-	No	
467	BX13 no function	A	-	No	
468	BX14 no function	A	-	No	
469	HX21 no function	A	-	No	Input connected but not configured Verify input configuration
470	HX22 no function	A	-	No	
476	Compressor inlet temperature sensor	A	B85	Yes	Verify sensor connection
477	Evaporating pressure sensor	A	H82	Yes	Verify sensor connection
480	EVI inlet temperature sensor	A	B86	Yes	Verify sensor connection
481	Evaporating EVI pressure sensor	A	H86	Yes	Verify sensor connection
483	Soft starter compressor 2 alarm	R	E27	Yes	Verify soft starter status
488	Condensing pressure sensor	A	H83	Yes	Verify sensor connection
491	Maximum evaporating temperature	R	-	Yes	In heating mode : verify if the outdoor air temperature is inside the allowed operating range In cooling mode : verify if the water temperature is inside the allowed operating range
495	Modbus no communication	A	-	No	Verify Modbus port configuration
500	Modbus configuration error	A	-	No	
505	Expansion valve	M	-	Yes	Verify expansion valve connection (V81)

Control System

Inputs and Outputs



Control System

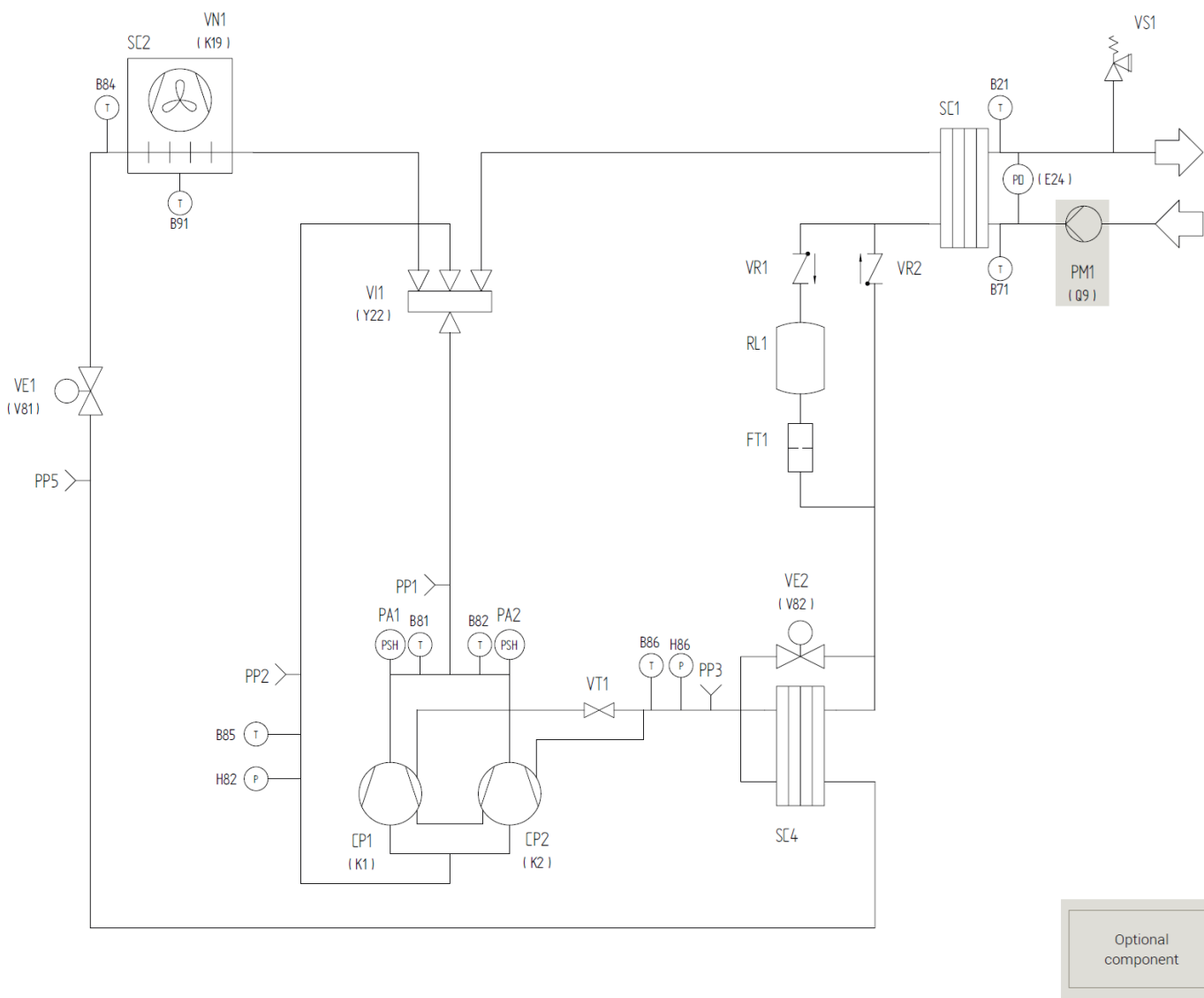


Control System

Inputs and Outputs Table

	ID	Use	Description	Features	To be wired
Analog inputs	BX1	B91	Source side air inlet temperature	NTC	-
	BX2	B84	Coil temperature	NTC	-
	BX3	B71	User side water inlet temperature	NTC	-
	BX4	B21	User side water outlet temperature	NTC	-
	BX7	B81	Compressor 1 outlet temperature	NTC	-
	BX8	B82	Compressor 2 outlet temperature	NTC	-
	BX9	B9	Outdoor air temperature	NTC	x
	BX10	-	-	NTC	-
	BX11	-	-	NTC	-
	BX12	-	-	NTC	-
	BX13	-	-	NTC	-
	BX14	B85	Compressor inlet temperature	NTC	-
	BX21 mod3	-	-	NTC	-
	BX22 mod3	B86	Injection inlet temperature	NTC	-
Analog / digital inputs	H1	VK1	Heating request	voltage free digital input	x
	H3	H82	Compressor inlet pressure	ratio metric sensor 0-5 V	-
	H21 mod3	H86	Injection inlet pressure	ratio metric sensor 0-5 V	-
	H22 mod3	VK2	Cooling request	voltage free digital input	x
Digital inputs	EX1	E20	Phase sequence controller alarm	230 Vac digital input	-
	EX2	E10	High pressure switch	230 Vac digital input	-
	EX3	E14	Fans thermal protection	230 Vac digital input	-
	EX4	E24	User side flow switch	230 Vac digital input	-
	EX5	E34	Electronic expansion valve driver alarm	230 Vac digital input	-
	EX6	E25	Soft starter compressor 1 alarm	230 Vac digital input	-
	EX7	E27	Soft starter compressor 2 alarm	230 Vac digital input	-
	EX9	-	-	230 Vac digital input	-
	EX10	-	-	230 Vac digital input	-
	EX11	U52	User pump inverter alarm	230 Vac digital input	-
	EX21 mod 3	-	-	230 Vac digital input	-
Analog outputs	UX1	V81	Electronic expansion valve	0-10 Vdc	-
	UX2	K19	Fans	0-10 Vdc	-
	UX21 mod3	Q9	User side pump	0-10 Vdc	-
	UX22 mod3	-	-	0-10 Vdc	-
	WX21 mod3	V82	EVI electronic expansion valve (injection)	unipolar EEV	-
Digital outputs	QX1	K1	Compressor 1	2A - 230 Vac	-
	QX2	K2	Compressor 2	2A - 230 Vac	-
	QX3	-	-	2A - 230 Vac	-
	ZX4	-	-	2A - 230 Vac	-
	QX5	Q9	User side pump	2A - 230 Vac	-
	QX6	K41	Condensate tray electrical heater	2A - 230 Vac	x
	QX7	-	-	2A - 230 Vac	-
	QX8	-	-	2A - 230 Vac	-
	QX9	-	-	2A - 230 Vac	-
	QX10	-	-	2A - 230 Vac	-
	QX11	-	-	2A - 230 Vac	-
	QX12	Y22	Cycle reversing valve	2A - 230 Vac	-
	QX13	K40	Compressor carter electrical heater	2A - 230 Vac	-
	QX21 mod3	-	-	2A - 230 Vac	-
	QX22 mod3	-	-	2A - 230 Vac	-
	QX23 mod3	K81	Electronic expansion valve driver enable	voltage free digital output	-

Operating Diagram



CP	Compressor
SC1	User side heat exchanger
SC2	Source side heat exchanger
SC4	Economizer heat exchanger
RL	Liquid receiver
VE	Expansion valve
VI	Cycle reversing valve
VR	Non return valve

VT	Shut off valve
FT	Filter
VN	Fan
PM	Pump
PA	High pressure sensor
PD	Differential pressure sensor
PP	Pressure intake
Hx	Pressure sensor
Bx	Temperature sensor

Cascade Management

If multiple heat pumps are installed in a system, then **STREBEL** recommends installing them utilising the built-in cascade management system in order to optimise the efficiency of the heat pumps along with the complete system. When using the integrated cascade control, a maximum of 16 heat pumps can be controlled. When using the cascade control, the demand signal, temperature sensors, DHW three-way valve and any immersion heaters need to wire back to the 'Master' heat pump.

Cascade management is a function already embedded in the controller of each heat pump and allows to coordinate the operating mode of more units (up to 16) in heating, cooling, and domestic hot water production. It is possible to use inside the same cascade heat pumps of different capacity.

The heat pumps are activated in a sequence according to the thermal requests coming from the plant with a logic which integrate during the time the difference between the required set point and the temperature actually reached. A common flow temperature sensor (B10) is required for an optimised cascade management.

The heat pump activation sequence changes automatically according to the operating hours of each heat pump in order to guarantee a balanced use of all the units. As an alternative it is possible to define a fixed activation sequence or exclude from the automatic rotation the first or the last heat pump to be used.

If double compressor units are used in the cascade, the first compressor of each heat pump is activated in sequence, and after that, if necessary, also the second compressor is activated, in order to optimize the part load efficiency of each unit.

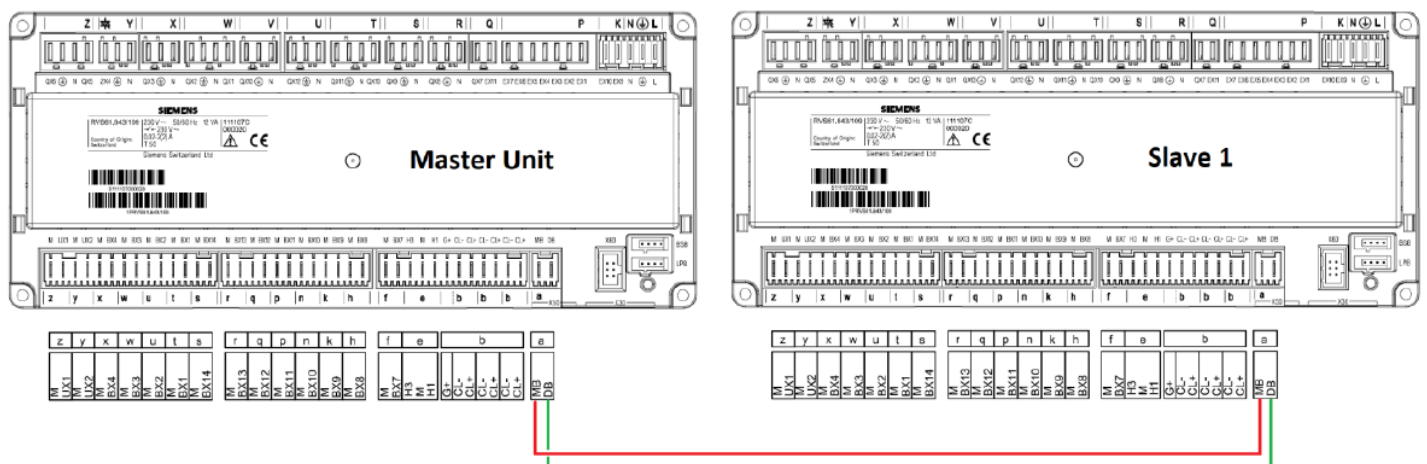
The defrost cycles of the heat pumps are moreover managed in order to avoid more units to defrost at the same time.

All the heat pumps share the same outdoor air temperature sensor that can be connected to any of the heat pumps of the cascade.

The heat pumps in cascade communicate by means of a 2-wire bus (LPB bus). Each heat pump has its own address on the bus. The heat pump with address 1 is conventionally called "master" even if in reality each heat pump becomes master in rotation.

Cascade Wiring

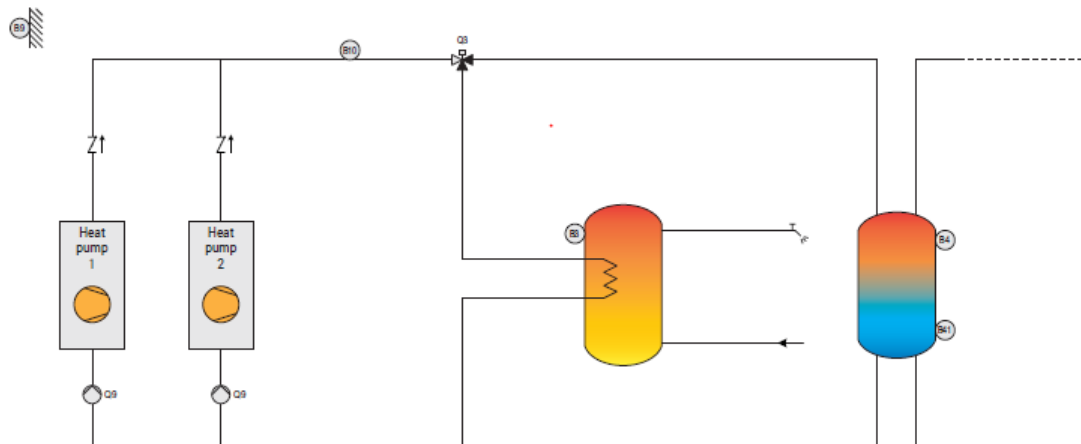
The cascade wiring needs to be completed by a qualified electrician, Using terminals MB & DB on each heat pump main controller, daisy chain the together as shown below.



If a third heat pump is to be added, daisy chain the same terminals from "slave 1" and so on.

Cascade Management

The following setup is for a 2 x S-ASX-VP 60 – 100 cascade setup:

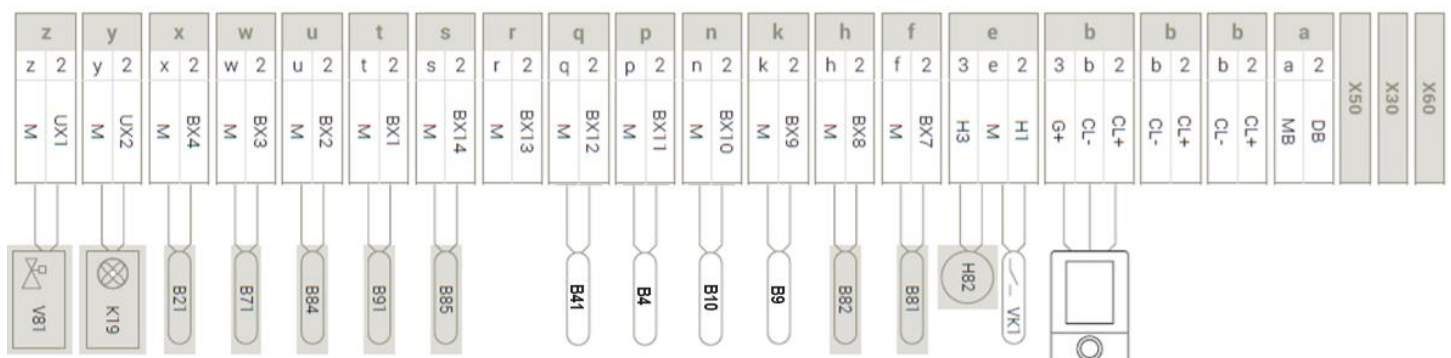
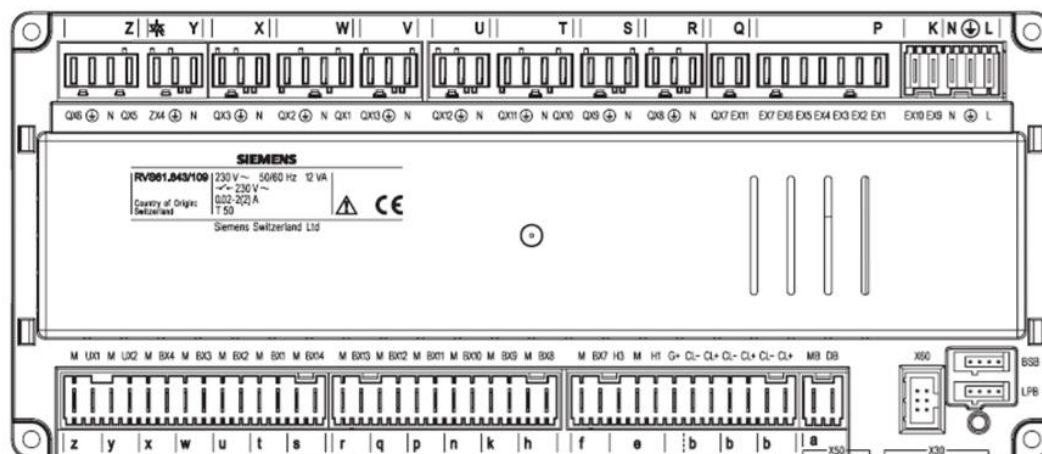


Drawing Number	Part Description
B9	Outside Air Temperature Sensor
B10	Common Flow Temperature Sensor
Q3	DHW Three Way Valve
B3	DHW Tank Temperature Sensor
B4	Thermal Store / Buffer Vessel Flow Temperature Sensor
B41	Thermal Store / Buffer Vessel Return Temperature Sensor

Master Heat Pump Wiring

The following two wiring diagram shows the required wiring to the “master” heat pump to the sensors and the DHW three-way valve shown in the above setup.

Diagram 1: Main Controller within Master ASHP



Maintenance

F-Gas Integrity Test - Mandatory Requirement

In accordance to current UK regulations, available to view on the UK Governments website, the client / end user is responsible for arranging the F-Gas equipment to be F-Gas integrity tested.

This can be viewed on the UK Governments website by either clicking on the below links or typing in the below address on a web browser:

- www.gov.uk/guidance/checking-f-gas-equipment-for-leaks
- www.gov.uk/guidance/calculate-the-carbon-dioxide-equivalent-quantity-of-an-f-gas

Based on the type of refrigerant and the total refrigerant charge, each S-ASX-VP requires this integrity test to be completed **every 12 months**. This test is a mandatory requirement and is in addition to the routine maintenance.

Routine Maintenance - Mandatory Requirement

For a good, safe and long-time operation of the S-ASX-VP ASHP, the requirement is to carry out maintenance / servicing of the ASHP at least once a year.

Structure

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

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

Hydraulic Plant

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

Electrical Plant

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

Fans

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

Finned Coil

Verify that the surface of the coil is clean. Remove all the impurities (leaves, dirt, dust..) using a brush or a compressed air jet. If the aluminum fins are damaged comb the coil with a special tool until the damage is completely eliminated.

Verify that during the defrosting cycles the drainage of the water from the coil occurs properly and that the drainage fitting is not clogged. If the flow is not correct, with low outdoor temperature, a layer of ice could be generated and the operating of the unit could be compromised.

Service and Repair

Not ordinary maintenance, service and repair activities must be carried out only by highly qualified operators who have specific knowledge on the unit.

Before performing repair operations power to the unit must be cut out and all the panels of the unit should be open. Tests during unit operation must be carried out with all the safety devices active.

Strebel Service Offer

Our Service department can be contacted either by phone on 01276 685422 or email to technical@strebel.co.uk to arrange the service of the S-ASX-VP's to our manufacturer instructions and complete F-Gas integrity test to UK regulations as a combined package

Safety

Accessing the Unit

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

Residual Risks

The units are designed and manufactured in such a way as to minimize the risks for people and the place where the units are installed. The residual risks, which are impossible to eliminate during the design process and which are beyond the manufacturer's control, are described below together with the indications necessary for their neutralization. The residual risks are a potential source of danger for people, so the given indications must be scrupulously adopted.

Unit Disposal

To dispose of the unit it is necessary to contact qualified personnel.

The unit contains refrigerant gas and lubricating oil. During the scrapping, such fluids must be recovered as well as any other part of the machine, and disposed of according to the national and local regulations in force in the country where the unit is installed. The unit must not be abandoned when scrapped.

The unit contains electrical and electronic equipment that can not be disposed of through normal urban collection channels. These appliances must also be disposed of separately according to the national and local regulations in force in the country where the unit is installed.

The unit packaging must also be disposed / recycled according to the national and local regulations in force in the country in which the unit is installed



Residual risk	Precautions	
GENERAL RISKS The unit contains components that can cause damage to people or property in the event of contact. The compressor can create burns in the event of contact. The pipes of the refrigeration circuit can cause burns or frost burns in case of contact or refrigerant leakage. Contact with live parts of the electrical circuit can cause burns and / or electric shock. Contact with the finned batteries can cause cutting injuries. The unit has moving parts such as fans that can cause damage to people or property in the event of contact.	Make the area where the unit is installed accessible only to authorised personnel. Verify that any intervention on the unit is carried out by qualified technical personnel, respecting all current and applicable safety regulations in accordance with the national legislation of the country of installation. Always wear the personal protective equipment required by current and applicable safety regulations in accordance with the national legislation of the country of installation. Use protective gloves to avoid contact with the compressor, parts of the cooling circuit and finned batteries. Switch OFF the power supply line to the unit before performing any operation inside the unit Do not remove the guards for moving parts before checking them for shutdown and taking precautions to prevent them from operating. Check that all the protections provided on the equipment are correctly fitted before starting the unit	
HANDLING Handling of the unit, if not carried out with all the necessary protections and with the necessary caution, could cause the unit to fall or overturn, with consequent potential serious damages to people or things, and / or to the equipment itself.	Handle the equipment according to the instructions in this manual, and in accordance with local regulations.	
INSTALLATION An incorrect installation can cause damage due to people or things.	Make sure that the installation is carried out by qualified technical personnel, respecting all the safety regulations in force and applicable in accordance with the national legislation of the country of installation to avoid malfunctions and damage to the equipment, people or things. Check that the unit is installed in a place suitable for the use for which it was intended, indicated in this manual. Comply with all applicable and applicable regulations for the place of installation of the unit, in accordance with the national legislation of the country of installation. The assessment of the fire risk relative to the place of installation and the relative assessment that any fire protection systems near the unit are suitable is the responsibility of the user. Check the positioning and anchoring of the unit. The installation site must be adequate to support the weight of the equipment. Anchoring must be carried out in such a way as to prevent falls and overturning. Make the installation area accessible only to authorized personnel. Check that all the closing and protection panels of the unit are always properly mounted and fixed.	

Safety

Residual risk	Precautions	
ELECTRIC CONNECTIONS The connection of the unit to the electrical network carried out incorrectly may result in electric shocks, electric shocks, burns, intoxication, fires.	Verify that the installation is carried out by qualified technical personnel, respecting all current and applicable safety regulations in accordance with the national legislation of the country of installation and the indications provided in this manual for the electrical connection. Verify that the sizing of cables and protections is adequate to the characteristics of the equipment. Check the ground connection. Check the correct installation of the protections on the unit to avoid contact with live parts. Disconnect the power supply line and verify that no potentially live parts are present before removing shields and guards from the equipment, in case of maintenance or before performing any operation inside the unit.	 
REFRIGERANT The unit contains refrigerant gas under pressure as indicated in this manual. Refrigerant leakage may occur due, as an example not exhaustive, to the intervention of adequately prepared safety guards, incorrect installation or movement ...	Any operation on the parts under pressure must be performed by qualified technical personnel. In case of refrigerant leakage, consult the "safety data sheet" of the refrigerant given in this manual. In case of need of intervention on the refrigeration circuit, carry out the disposal and / or recovery of the refrigerant as indicated by the regulations in force in accordance with the national legislation of the country of installation. Check that the unit is installed in a place suitable for the use for which it was intended, indicated in this manual. Comply with all applicable and applicable regulations for the place of installation of the unit, in accordance with the national legislation of the country of installation.	
HYDRAULIC PARTS Improper installation of hydraulic connections can result in water leaks with damage to people or property, and short circuits in the electrical parts of the unit.	Verify that the installation is carried out respecting the instructions provided in this manual for the hydraulic connection, and respecting all current and applicable safety regulations in accordance with the national legislation of the country of installation. Do not exceed the maximum allowable pressure (PS) of the hydraulic circuit shown in this manual.	
TRANSPORT AND STORAGE The unit is loaded with refrigerant gas under pressure. Improper transport can cause damage to the unit and damage to the refrigerant circuit with loss of refrigerant.	During transport and storage check that the unit is kept within the temperature limits specified in this manual. Comply with regulations for transporting equipment under pressure. During the installation of the unit, check for leaks in the circuit.	

Refrigerant Safety Card

1 IDENTIFICATION OF THE SUBSTANCE/MIXTURE

Product **R 410 A**
Relevant identified uses Industrial and professional use.
Use as refrigerant.

2 HAZARDS IDENTIFICATION

- 2.1 Classification of the substance or mixture
Classification according to Regulation (EC) No. 1272/2008 [CLP]
Physical hazards Gases under pressure : Liquefied gas H280
- 2.2 Label elements
Labelling according to Regulation (EC) No. 1272/2008 [CLP]
Hazard pictograms (CLP) : GHS04
Signal word (CLP) : Warning
Hazard statements (CLP) : H280 Contains gas under pressure; may explode if heated
Precautionary statements (CLP) : P403 – Store in a well ventilated place

3 COMPOSITION/INFORMATION ON INGREDIENTS

- 3.2 Mixtures
- | | | |
|-----------------------|--|--------------|
| Difluoromethane (R32) | 50 % in weight
H220 - Flam. gas 1
H280 - Press. gas (liq.) | CAS 354-33-6 |
| Pentafluoroethane | 50 % in weight
H280 - Press. gas (liq.) | CAS 75-10-5 |

4 FIRST AID MEASURES

- 4.1 Description of first aid measures
Inhalation : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Perform cardiopulmonary resuscitation if breathing stopped.
Skin contact : For liquid spillage - flush with water for at least 15 minutes.
Eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes.
Ingestion : Ingestion is not considered a potential route of exposure.
- 4.2 Most important symptoms and effects, both acute and delayed : Refer to section 11.
- 4.3 Indication of any immediate medical attention and special treatment needed : Obtain medical assistance.

5 FIREFIGHTING MEASURES

- 5.1 Extinguishing media
Suitable extinguishing media : Water spray or fog
Unsuitable extinguishing media : Do not use water jet to extinguish
- 5.2 Special hazards arising from the substance or mixture
Specific hazards : Exposure to fire may cause containers to rupture/explode.
Hazardous combustion products : If involved in a fire the following toxic and/or corrosive fumes may be produced by thermal decomposition: Carbonyl fluoride, Hydrogen fluoride, Carbon monoxide.
- 5.3 Advice for firefighters
Specific methods : Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas receptacles to rupture. Cool endangered receptacles with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems. If possible, stop flow of product. Use water spray or fog to knock down fire fumes if possible. Move containers away from the fire area if this can be done without risk.
Special protective equipment for fire fighters : Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters. Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask. Standard EN 469 - Protective clothing for firefighters. Standard - EN 659: Protective gloves for firefighters.

6 ACCIDENTAL RELEASE MEASURES

- 6.1 Personal precautions, protective equipment and emergency procedures
Try to stop release. Evacuate area. Monitor concentration of released product. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Ensure adequate air ventilation. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Act in accordance with local emergency plan. Stay upwind.
- 6.2 Environmental precautions : Try to stop release.
- 6.3 Methods and material for containment and cleaning up : Ventilate area.
- 6.4 Reference to other sections : See also sections 8 and 13.

7 HANDLING AND STORAGE

- 7.1 Precautions for safe handling
Safe use of the product : Do not breathe gas. Avoid release of product into atmosphere. The product must be handled in accordance with good industrial hygiene and safety procedures. Only experienced and properly instructed persons should handle gases under pressure. Consider pressure relief device(s) in gas installations. Ensure the complete gas system was (or is regularly) checked for leaks before use. Do not smoke while handling product. Avoid exposure, obtain special instructions before use. Protect eyes, face and skin from liquid splashes. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt. Installation of a cross purge assembly between the cylinder and the regulator is recommended. Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service.
Safe handling of the gas receptacle : Refer to supplier's container handling instructions. Do not allow backfeed into the container. Protect cylinders from physical damage; do not drag, roll, slide or drop. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Keep container valve outlets clean and free from contaminants particularly oil and water. Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to transfer gases from one cylinder/ container to another. Never use direct flame or electrical heating devices to raise the pressure of a container. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. Containers should be stored in the vertical position and properly secured to prevent them from falling over.

- 7.2 Conditions for safe storage, including any incompatibilities
Observe all regulations and local requirements regarding storage of containers. Containers should not be stored in conditions likely to encourage corrosion. Container valve guards or caps should be in place. Containers should be stored in the vertical position and properly secured to prevent them from falling over. Stored containers should be periodically checked for general condition and leakage. Keep container below 50°C in a well ventilated place. Store containers in location free from fire risk and away from sources of heat and ignition. Keep away from combustible materials.

- 7.3 Specific end use(s) : None

8 EXPOSURE CONTROLS / PERSONAL PROTECTION

- 8.1 Control parameters
OEL (Occupational Exposure Limits) : No data available
Difluoromethane (R32) (75-10-5)
DNEL: Derived no effect level (Workers)
Long-term - systemic effects, inhalation : 7035 mg/m³
PNEC: Predicted no effect concentration
Aqua (freshwater) : 0,142 mg/l
Aquatic, intermittent releases : 1,42 mg/l
Sediment, freshwater : 0,534 mg/kg dwf

- 8.2 Exposure controls

8.2.1 Appropriate engineering controls

Product to be handled in a closed system and under strictly controlled conditions. Provide adequate general and local exhaust ventilation. Preferably use permanent leak-tight installations (e.g. welded pipes). Systems under pressure should be regularly checked for leakages. Ensure exposure is below occupational exposure limits (where available). Gas detectors should be used when toxic gases may be released. Consider the use of a work permit system e.g. for maintenance activities.

8.2.2 Individual protection measures, e.g. personal protective equipment

A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk. The following recommendations should be considered: PPE compliant to the recommended EN/ISO standards should be selected.

Eye/face protection : Wear safety glasses with side shields. Wear goggles and a face shield when transfilling or breaking transfer connections. Standard EN 166 - Personal eye-protection – specifications.

Skin protection

Hand protection : Wear working gloves when handling gas containers. Standard EN 388 - Protective gloves against mechanical risk.

Other : Wear safety shoes while handling containers. Standard EN ISO 20345 - Personal protective equipment - Safety footwear.

Respiratory protection. Gas filters may be used if all surrounding conditions e.g. type and concentration of the contaminant(s) and duration of use are known. Use gas filters with full face mask, where exposure limits may be exceeded for a short-term period, e.g. connecting or disconnecting containers. Consult respiratory device supplier's product information for the selection of the appropriate device. Gas filters do not protect against oxygen deficiency. Standard EN 14387 - Gas filter(s), combined filter(s) and full face mask - EN 136. Keep self contained breathing apparatus readily available for emergency use. Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask. Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.

Thermal hazards : Wear cold insulating gloves when transfilling or breaking transfer connections. Standard EN 511 - Cold insulating gloves.

8.2.3 Environmental exposure controls

Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

9 PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance
Physical state at 20°C / 101.3kPa : Gas
Colour : Colourless
Odour : There may be no odour warning properties, odour is subjective and inadequate to warn of overexposure. Mixture contains one or more component(s) which have the following odour(s): Ethereal.
Odour threshold : Odour threshold is subjective and inadequate to warn of overexposure.
pH value : Not applicable.
Molar mass : Not applicable for gas mixtures.
Melting point : Not applicable for gas mixtures.
Boiling point : Not applicable for gas mixtures.
Flash point : Not applicable for gas mixtures.

Refrigerant Safety Card

Evaporation rate (ether=1) :		Not applicable for gas mixtures.
Flammability range :		Non flammable.
Vapour pressure [20°C] :		No reliable data available.
Vapour pressure [50°C] :		No reliable data available.
Relative density, gas (air=1) :		Heavier than air.
Solubility in water :		No data available.
Partition coefficient n-octanol/water [log Kow] :		Not applicable for gas mixtures.
Auto-ignition temperature :		Non inflammable.
Viscosity [20°C] :		Not applicable.
Explosive Properties :		Not applicable.
Oxidising Properties :		Not applicable.
9.2	Other information	
	Other data : Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.	
10	STABILITY AND REACTIVITY	
10.1	Reactivity : No reactivity hazard other than the effects described in sub-sections below.	
10.2	Chemical stability : Stable under normal conditions.	
10.3	Possibility of hazardous reactions : None.	
10.4	Conditions to avoid : Keep away from heat/sparks/open flames/hot surfaces. – No smoking.	
10.5	Incompatible materials : None.	
10.6	Hazardous decomposition products : under normal conditions of storage and use, hazardous decomposition products should not be produced.	
11	TOXICOLOGICAL INFORMATION	
11.1	Information on toxicological effects	
	Acute toxicity : Toxic by inhalation.	
	Difluoromethane (R32) (75-10-5)	
	LC50 inhalation rat (ppm)	No data available.
	Pentafluoroethane (354-33-6)	
	LC50 inhalation rat (ppm)	805 ppm/4h
	Skin corrosion/irritation : No known effects from this product.	
	Serious eye damage/irritation : No known effects from this product.	
	Respiratory or skin sensitisation : No known effects from this product.	
	Germ cell mutagenicity : No known effects from this product.	
	Carcinogenicity : No known effects from this product.	
	Toxic for reproduction : Fertility : No known effects from this product.	
	Toxic for reproduction : unborn child : No known effects from this product.	
	STOT-single exposure : No known effects from this product.	
	STOT-repeated exposure : No known effects from this product.	
	Aspiration hazard : Not applicable for gases and gas mixtures.	
12	ECOLOGICAL INFORMATION	
12.1	Toxicity	
	Assessment :	Classification criteria are not met.
	EC50 48h - Daphnia magna [mg/l]	No data available.
	EC50 72h - Algae [mg/l]	No data available.
	LC50 96h - Fish [mg/l]	No data available.
	Difluoromethane (R32) (75-10-5)	
	EC50 48h - Daphnia magna [mg/l]	142 mg/l
	EC50 72h - Algae [mg/l]	652 mg/l
	LC50 96h - Fish [mg/l]	1507 mg/l
	Pentafluoroethane (354-33-6)	
	EC50 48h - Daphnia magna [mg/l]	> 100 mg/l
	EC50 72h - Algae [mg/l]	142 mg/l
	LC50 96h - Fish [mg/l]	109 mg/l
12.2	Persistence and degradability	Assessment : No data available.
12.3	Bioaccumulative potential	Assessment : No data available.
12.4	Mobility in soil	Assessment : No data available.
12.5	Results of PBT and vPvB assessment	
	Assessment :	Not classified as PBT or vPvB.
12.6	Other adverse effects	
	Effect on the ozone layer :	None.
	Effect on global warming :	Contains fluorinated greenhouse gases. Calculated GWP of mixture : 2646.03 For quantities refer to cylinder label.
13	DISPOSAL CONSIDERATIONS	
13.1	Waste treatment methods : Contact supplier if guidance is required. Must not be discharged to atmosphere. Ensure that the emission levels from local regulations or operating permits are not exceeded. Refer to the EIGA code of practice Doc.30 "Disposal of Gases", downloadable at http://www.eiga.org for more guidance on suitable disposal methods.	
	List of hazardous waste codes : 16 05 04*: Gases in pressure containers (including halons) containing dangerous substances.	
13.2	Additional information	None.
14	TRANSPORT INFORMATION	
14.1	UN number	1078
14.2	UN proper shipping name	
	Transport by road/rail (ADR/RID) :	
	REFRIGERANT GAS, N.O.S. (Difluoromethane (R32), Pentafluoroethane)	
	Transport by air (ICAO-TI / IATA-DGR) :	
	REFRIGERANT GAS, N.O.S. (Difluoromethane (R32), Pentafluoroethane)	
	Transport by sea (IMDG) :	
	REFRIGERANT GAS, N.O.S. (Difluoromethane (R32), Pentafluoroethane)	
14.3	Transport hazard class(es)	
	Labelling :	2.2 : Non-flammable, non-toxic gases
	Transport by road/rail (ADR/RID)	
	Class :	2
	Classification code :	2A
	Hazard identification number :	20
	Tunnel Restriction :	C/E - Tank carriage : Passage forbidden through tunnels of category C, D and E. Other carriage : Passage forbidden through tunnels of category E
	Transport by air (ICAO-TI / IATA-DGR)	
	Class / Div. (Sub. risk(s)):	2.2
	Transport by sea (IMDG)	
	Class / Div. (Sub. risk(s)):	2.2
	Emergency Schedule (EmS) – Fire :	F-C
	Emergency Schedule (EmS) – Spillage :	S-V
14.4	Packing group	
	Transport by road/rail (ADR/RID) :	Not applicable
	Transport by air (ICAO-TI / IATA-DGR) :	Not applicable
	Transport by sea (IMDG) :	Not applicable
14.5	Environmental hazards	
	Transport by road/rail (ADR/RID) :	None.
	Transport by air (ICAO-TI / IATA-DGR) :	None.
	Transport by sea (IMDG) :	None.
14.6	Special precautions for user	
	Packing Instruction(s)	
	Transport by road/rail (ADR/RID)	P200
	Transport by air (ICAO-TI / IATA-DGR)	
	Passenger and Cargo Aircraft :	200
	Cargo Aircraft only :	200
	Transport by sea (IMDG) :	P200
	Special transport precautions : Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency.	
	Before transporting product containers:	
	- Ensure there is adequate ventilation.	
	- Ensure that containers are firmly secured.	
	- Ensure cylinder valve is closed and not leaking.	
	- Ensure valve outlet cap nut or plug (where provided) is correctly fitted.	
	- Ensure valve protection device (where provided) is correctly fitted.	
14.7	Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not applicable.	
15	REGULATORY INFORMATION	
15.1	Safety, health and environmental regulations/legislation specific for the substance or mixture	
	EU-Regulations	Seveso Directive : 2012/18/EU (Seveso III) : Covered.
	National regulations	
	National legislation : Ensure all national/local regulations are observed.	
	Water hazard class (WGK) (WGK) :	
	-	
15.2	Chemical safety assessment : A CSA does not need to be carried out for this product.	
16	OTHER INFORMATION	
	Indication of changes : Revised safety data sheet in accordance with commission regulation (EU) No 2015/830.	
	Training advice : Users of breathing apparatus must be trained. Ensure operators understand the toxicity hazard. Receptacle under pressure.	
	Further information : This Safety Data Sheet has been established in accordance with the applicable European Union legislation. Classification in accordance with the calculation methods of Regulation (EC) 1272/2008 CLP.	
	Full text of H- and EUH-statements	
	Acute toxicity (inhalation:gas) Not classified	
	Flam. Gas 1	Flammable gases, Category 1
	Press. Gas (Liq.)	Gases under pressure : Liquefied gas
	H220	Extremely flammable gas
	H280	Contains gas under pressure; may explode if heated
DISCLAIMER OF LIABILITY. Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out. Details given in this document are believed to be correct at the time of going to press. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.		

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