

ELFOEnergy Ground

Water cooled heat pump for indoors installation

WSHN-EE 17-121 RANGE

Nominal heating capacity (**W10/W45**) from 6,68 kW to 38,7 kW

Nominal cooling capacity (**W35/W7**) from 6,23 kW to 33,1 kW



► VERSATILITY OF USE

thanks to its special construction ELFOENERGY can be used both for traditional system and radiant panel system for heating and cooling.

► SELF ADAPTING

the evolved electronics adapts the operating parameters of the chiller to the load conditions of the system it is installed in, optimizing consumption, efficiency and the working life of the components;

► REDUCED ENERGY CONSUMPTION

► OPTIMIZED FOR HATING

the unit was designed principally to be used during winter operation. Performances are therefore maximized to obtain an higher efficiency than traditional heat pumps.

► COMPLETE HYDRONIC ASSEMBLY SUPPLIED AS STANDARD



Clivet is participating in the EUROVENT Certification Programme "Liquid Chilling Packages". Products are listed in the EUROVENT Directory of Certified Products and in the site www.eurovent-certification.com. Eurovent Chillers Certification Programme covers air cooled packaged chillers up to 600 kW and water cooled packaged chillers up to 1500 kW.

Operation versatility

The WSH/N-EE units have been studied to be used in the different existent system types without compromising the energy efficiency or operating level.

User side

Thanks to its special construction characteristics, the units can be used in traditional systems with terminal units, or in systems with underfloor serpentine for heating and cooling, producing water directly at the temperature required for this particular kind of system.

The units are equipped with a hydronic kit on the user side (standard).

The units can also be used to heat sanitary water provided they're supplied with a dedicated components to carry out this function.

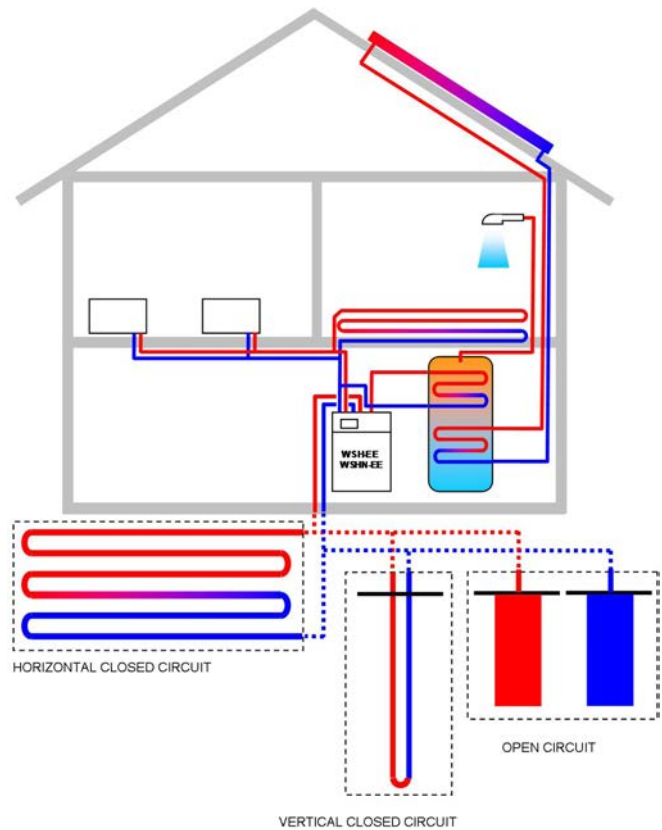
If there is the requirement to heat sanitary water, the electronic control will or will not give priority to this requirement based on the initial setting and automatically setting the temperature of the water to be produced.

Source side

The WSHN-EE units (heat pump), WSH-EE ((only cool or with reversibility on the hydraulic circuit) are studied for the energy exploitation in the ground and in the water.

These units are studied to be used with closed circuits through horizontal or vertical probes, that contain water with antifreeze solution or with open circuits with water to waste (well, etc.).

The units can be supplied with hydronic kit source side (optional).



Complete unit and advanced control allow the system simplification and reduced dimensions

Hydronic assembly

The series WSH/N-EE has in the standard supply the hydronic assembly user side. The variable flow-rate circulator assures the best operation of the unit even under the most critical conditions for the system, and enables to control the summer/winter operation change in reduced times.

The units can also be required with hydronic assembly source side (optional).



Modulating valve

The units can extend their field of operation by modulating the source side water flow rate based on the temperature through a modulating valve (optional) managed by the electronic control.

This solution makes it possible to simplify the system rather than using the traditional pressure switch valve and the motorized bypass valve.



Gliding temperature

The smart electronics designed to optimize the compressor switching on/off cycles dramatically reduces both the operating transients, the time spent for each compressor switching-on to get the highest yield, and the harmful and expensive pickup currents.

The adjustment based on this concept of SLIDING TEMPERATURES steadily searches for the best balance between power to be supplied and energy spent to produce it

In this way the accumulation is no longer needed, with obvious advantages as for electric consumption, space recovery and removal of heat dispersions.



System heart electronic control

ELFOENERGY electronic control allows the several element management of the system:

- control of possible integrative elements (electric heaters, boilers, etc.); hot sanitary water
- production control; mixed system control (fan coil/radiators and underfloor heating).



Low noise is a duty

Noise is one of the most critical factors of this unit type.

The use of special constructional solutions and the use of special materials for the acoustic insulation allowed the sound level reduction.



Water filters fitted as standard

Water filters source and user side supplied as standard complete the accessories and components ELFOENERGY is standard equipped with.



Standard-supplied user keypad

ELFOENERGY is supplied complete with remote user keypad, for the best control on the room comfort.

- Electric - refrigerating - water alarm signals
- Check comfort-economic-test control
- SUMMER-WINTER-OFF signals
- SUMMER-WINTER-OFF control



Standard unit technical specifications

Compressor

Hermetic orbiting scroll compressor complete with motor over-temperature and over-current devices and protection against excessive gas discharge temperature. Fitted on rubber antivibration mounts and complete with oil charge.

Resistance heater for oil heating to prevent excessive dilution by the refrigerant, automatically activated whenever the compressor is off.

(size 81-91-101-121)

Structure

The base is assembled with a hot-galvanized steel frame (Z 200 g/m²). The internal structure is a frame made from «ALUZINK» metal plate. The alloy coating the Aluzink ensures excellent corrosion strength, thanks to the galvanic protection typical of the combination of aluminium and zinc.

Panelling

The casing is made of prepainted steel sheet panels, completely lined with thermo-acoustic insulation with a class 1 fire resistance. The side panels are easily removable for total accessibility to the inside of the unit.

Internal exchanger

Direct expansion heat exchanger with braze welded stainless steel INOX AISI 316 plates and complete with external thermal/anti-condensation insulation.

External exchanger

Direct expansion heat exchanger with braze welded stainless steel INOX AISI 316 plates and complete with external thermal/anti-condensation insulation

Refrigeration circuit

Refrigeration circuit with:

- 4-way reverse cycle valve
- filter dryer
- thermostatic expansion valves with equalizer
- high pressure safety pressure switch
- low pressure safety switch
- pressure probes

Electrical panel

The capacity section includes:

- auxiliary circuit fuse
- compressor control contactor
- pump control source side
- compressor overload cutout switch

The control section includes:

- compressor overload protection and timer
- relay for remote cumulative fault signal
- terminals for double set point
- terminals of relè connection, for integrative elements' control
- electronic for Elfo Control system (optional)

REMOTE KEYPAD FOR USER

remotable control keypad, including:

- ON/OFF and alarm reset buttons
- heating and cooling operating mode buttons
- SLEEP button for optimised night-time operation
- signal led electric circuit alarm
- signal led refrigerant circuit alarm
- water circuit alarm signal led

Water circuit

User side

- group of manual water charge with gauge
- variable flow-rate circulator (size 17-91)
- fixed flow-rate circulator (size 101-121)
- diaphragm expansion vessel
- water side safety valve
- drain valve
- flow Switch

(size 17-21-25-31-41-51)

- differential pressure switch, water side

(size 61-71-81-91-101-121)

- Steel mesh strainer

Source side

- flow Switch

(size 17-21-25-31-41-51)

- differential pressure switch, water side

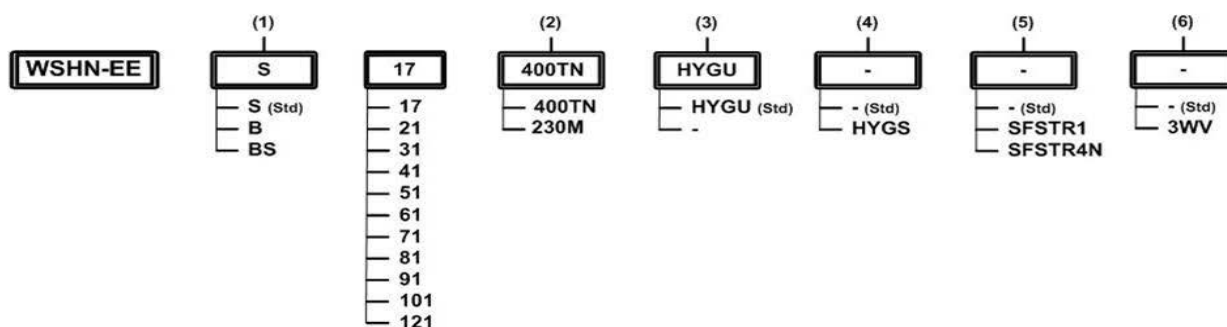
(size 61-71-81-91-101-121)

- drain valve
- steel mesh strainer

Accessories separately supplied

- IVMSX - Source side modulating valve
- IVWX - Water side motorized valve
- PMX - Phase monitor
- CMMBX - Serial communication module to supervisor (MODBUS)
- SCP3X - Set point compensation according to the outside enthalpy
- SPCX - Set point compensation with outside temperature probe
- PBLC1X - Service keypad (cable from 1,5 metres)
- KITERAX - Electronic wall-mounting room thermostat
- KDT3VX - Double temperature control kit, set point compensation with 4-20mA, 3 ways valve control
- ACS500X - 500 litres sanitary hot water tank
- ACS300X - 300 litres sanitary hot water tank
- ACS5SX - 500 litres sanitary hot water tank with solar coil
- ACS3SX - 300 litres sanitary hot water tank with solar coil
- 3DHWX - Three-way valve for domestic hot water
- CACSX - Domestic hot water kit control (available only with options: CMMBX)
- KSAX - 100 litres hydraulic breaker
- KTFL1X - Water connection hoses with 1" connections
- KTFL2X - Water connection hoses with 1 1/4" connections
- KVICX - Boiler control kit
- KVMSP1X - Radiant panels management kit with 1" connections
- KVMSP2X - Kit for management of radiant oanel with connections of 1 1/4"
- AMRX - Rubber antivibration mounts

Configuration Code



(1) Version

S - Standard version

B - Water low temperature

this version permits units operation with glycol solution temperature from +5°C to -8°C.

BS - Water low temperature source side

Prearrangement for use of source side water, with temperature conditions lower than +5°C.

(2) Voltage

400TN - Supply voltage 400/3/50+N

From size 17 to 31: optional

From size 41 to 121: standard

230M - Supply voltage 230/1/50

From size 17 to 31: standard

only size 41-51 optional

(3) Utility side hydronic unit

HYGU - User side hydronic assembly (standard)

(-) not required

(4) Hydronic assembly source side

(-) not required (standard)

HYGS - Hydronic group source side

(5) Soft starter

(-) not required (standard)

SFSTR1 - Disposal for inrush current reduction, for unit 230/1/50 (from size 17 to 51)

SFSTR4N - Disposal for inrush current reduction, for unit 400/3/50+N (from size 17 to 121)

(6) 3-way valve

(-) not required (standard)

3WV - Three-way valve

General technical data

Size			17	21	31	41	51	61	71	81	91	101	121
Radiant Panel													
Heating													
Heating capacity (EN14511:2013)	1	kW	6,95	7,49	9,50	12,0	16,0	19,5	24,7	26,7	30,8	36,2	41,2
Total power input (EN14511:2013)	1	kW	1,35	1,47	1,83	2,34	3,10	3,83	4,81	5,21	6,04	7,09	8,01
COP (EN14511:2013)	1		5,15	5,10	5,19	5,11	5,16	5,10	5,13	5,12	5,10	5,11	5,14
ErP Space Heating Energy Class - AVERAGE Climate - W35	9		A+++	A+++	A+++	A+++	A+++	A+++	A+++	A+++	A+++	A+++	A+++
SCOP - AVERAGE Climate - W35	10		5,66	5,77	6,01	6,04	5,93	5,92	5,86	5,80	5,45	6,28	6,09
Cooling													
Cooling capacity (EN14511:2013)	4	kW	8,37	9,05	10,8	14,0	17,8	22,1	27,1	29,8	33,8	38,1	42,8
Total power input (EN14511:2013)	4	kW	1,51	1,70	2,01	2,49	3,32	4,30	5,28	5,65	6,46	7,46	8,39
EER (EN14511:2013)	4		5,52	5,32	5,37	5,64	5,35	5,14	5,13	5,27	5,22	5,11	5,10
Unità terminali													
Heating													
Heating capacity (EN14511:2013)	2	kW	6,68	7,27	8,83	11,5	15,6	18,9	23,6	25,1	29,3	34,2	38,7
Total power input (EN14511:2013)	2	kW	1,59	1,73	2,43	3,01	3,96	4,82	5,94	6,62	7,46	8,85	9,76
COP (EN14511:2013)	2		4,19	4,19	3,63	3,81	3,94	3,92	3,97	3,79	3,93	3,87	3,97
Cooling													
Cooling capacity (EN14511:2013)	5	kW	6,23	6,57	8,05	10,8	13,2	16,3	20,7	22,3	25,8	29,5	33,1
Total power input (EN14511:2013)	5	kW	1,54	1,67	2,04	2,47	3,37	4,21	5,09	5,23	6,25	7,39	8,15
EER (EN14511:2013)	5		4,04	3,93	3,95	4,39	3,93	3,87	4,07	4,27	4,13	4,00	4,06
SEER	10		2,35	2,41	2,69	3,01	3,16	3,17	3,55	3,70	3,69	3,66	3,50
Radiatori													
Heating													
Heating capacity (EN14511:2013)	3		6,36	7,07	8,57	10,9	14,8	17,4	22,3	23,6	27,9	31,9	36,7
Total power input (EN14511:2013)	3		2,06	2,15	3,23	3,82	5,03	6,11	7,47	8,35	9,05	11,0	11,8
COP (EN14511:2013)	3		3,09	3,29	2,66	2,85	2,94	2,85	2,99	2,83	3,08	2,91	3,11
ErP Space Heating Energy Class - AVERAGE Climate - W55	9		A+++	A+++	A++	A++	A+++	A+++	A+++	A++	A+++	A++	A+++
SCOP - AVERAGE Climate - W55	10		4,14	4,15	3,79	3,93	4,04	3,94	4,05	3,88	4,12	3,92	4,06
Compressor													
Type of compressors			SCROLL	SCROLL	SCROLL	SCROLL	SCROLL	SCROLL	SCROLL	SCROLL	SCROLL	SCROLL	SCROLL
Refrigerant			R-410A	R-410A	R-410A	R-410A	R-410A	R-410A	R-410A	R-410A	R-410A	R-410A	R-410A
No. of compressors		Nr	1	1	1	1	1	1	1	1	1	1	1
Std Capacity control steps		Nr	1	1	1	1	1	1	1	1	1	1	1
Oil charge (C1)		l	1,1	1,1	1,25	1,25	1,95	1,66	1,77	2,51	3,25	3,25	3,25
Refrigerant charge (C1)		kg	0,9	0,9	1,1	1,1	1,2	1,5	1,9	2,5	3,2	3,0	3,3
Refrigeration circuits		Nr	1	1	1	1	1	1	1	1	1	1	1
Internal exchanger													
Type of internal exchanger	6		PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE
No. of internal exchangers		Nr	1	1	1	1	1	1	1	1	1	1	1
Water flow rate (Internal Exchanger)	5	l/s	0,30	0,31	0,38	0,52	0,63	0,78	0,99	1,07	1,23	1,41	1,58
Max water flow-rate	5	l/s	0,48	0,51	0,62	0,83	1,04	1,28	1,59	1,76	2,04	2,31	2,58
Useful pump discharge head	5	kPa	58	58	56	47	39	62	54	50	44	155	132
Water content		l	0,59	0,59	0,76	0,76	0,92	1,12	2,16	2,54	2,91	2,91	3,20
External exchanger													
Type of external exchanger	6		PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE
No. of external exchangers			1	1	1	1	1	1	1	1	1	1	1
Water flow rate (External Exchanger)	5	l/s	0,36	0,38	0,47	0,62	0,78	0,95	1,20	1,29	1,50	1,72	1,93
Max water flow-rate	5	l/s	0,59	0,64	0,77	1,02	1,29	1,59	1,97	2,14	2,50	2,85	3,18
External exchanger pressure drop	5	kPa	21	23	22	31	34	35	59	52	53	60	65
Connections													
Water fittings	5		1" GAS F	1" GAS F	1" GAS F	1" GAS F	1" GAS F	1" GAS F	1" GAS F	1" GAS F	1" GAS F	1" GAS F	1" GAS F
Water circuit													
Max water side pressure		kPa	550	550	550	550	550	550	550	550	550	550	550
Safety valve calibration		kPa	600	600	600	600	600	600	600	600	600	600	600
Expansion vessel													
Expansion vessel capacity		l	1	1	1	1	2	2	2	2	2	2	2
No. of expansion vessels		Nr	1	1	1	1	1	1	1	1	1	1	1
Power supply													
Standard power supply		V	230/1/50	230/1/50	230/1/50	400/3/50+N	400/3/50+N	400/3/50+N	400/3/50+N	400/3/50+N	400/3/50+N	400/3/50+N	400/3/50+N

The Product is compliant with the Erp (Energy Related Products) European Directive. It includes the Commission delegated Regulation (EU) No 811/2013 (rate heat output ≤70 kW at specified reference conditions) and the Commission delegated Regulation (EU) No 813/2013 (rated heat output ≤400 kW at specified reference conditions).

'Contains fluorinated greenhouse gases' (GWP 2087,5)

(1) Data calculated in compliance with Standard EN 14511:2013 referred to the following conditions: Internal exchanger water temperature = 30/35°C. Entering external exchanger air temperature = 10/7°C

(2) Data calculated in compliance with Standard EN 14511:2013 referred to the following conditions: Internal exchanger water temperature = 40/45°C. Entering external exchanger air temperature = 10/7°C

(3) Data calculated in compliance with Standard EN 14511:2013 referred to the following conditions: Internal exchanger water temperature = 45/55°C. Entering external exchanger air temperature = 10/7°C

(4) Data calculated in compliance with Standard EN 14511:2013 referred to the following conditions: Internal exchanger water temperature = 23/18°C. Entering external exchanger air temperature = 30/35°C

(5) Data calculated in compliance with Standard EN 14511:2013 referred to the following conditions: Internal exchanger water temperature = 12/7°C. Entering external exchanger air temperature = 30/35°C

(6) PHE = plates

(7) Water fitting on both source side and utility side

(8) data referred to user side

(9) Seasonal Space Heating Energy Efficiency Class according to Commission delegated Regulation (EU) No 811/2013. W = Water outlet temperature (°C)

(10) Data calculated according to the EN 14825:2016 Regulation

Electrical data

Supply voltage 230/1/50

Size			17	21	31	41	51
F.L.A. - Full load current ad max admissible conditions							
F.L.A. - Compressor 1		A	12,9	15,1	18,6	21,1	27,7
F.L.A. - Pump		A	0,95	0,95	0,95	0,95	0,95
F.L.A. - Total		A	13,9	16,0	19,6	22,1	28,7
L.R.A. - Locked rotor amperes							
L.R.A. - Compressore 1		A	58,0	67,0	98,0	128	116
F.L.I. - Full load power input at max admissible condition							
F.L.I. - Compressor 1		kW	2,77	3,27	3,92	4,71	5,79
F.L.I. - Pump		kW	0,20	0,20	0,20	0,20	0,20
F.L.I. - Total		kW	2,97	3,47	4,12	4,91	5,99
M.I.C. - Maximum inrush current							
M.I.C. - Value		A	59,0	68,0	99,0	129	116

Power supply 230/1/50 +/-10%

Voltage unbalance between phases: max 2 %

Supply voltage: 400/3/50+N

Size			17	21	31	41	51	61	71	81	91	101	121
F.L.A. - Full load current ad max admissible conditions													
F.L.A. - Compressor 1		A	4,40	5,39	6,67	7,34	10,1	11,2	14,3	15,5	17,5	20,7	23,0
F.L.A. - Pump		A	0,95	0,95	0,95	0,95	0,95	1,95	1,95	1,95	1,95	3,81	3,81
F.L.A. - Total		A	5,35	6,34	7,62	8,29	11,0	13,2	16,3	17,5	19,4	24,5	26,8
L.R.A. Starting current													
L.R.A. Compressor 1		A	26,0	38,0	46,0	43,0	64,0	74,0	101	95,0	111	118	118
F.L.I. - Full load power input at max admissible conditions													
F.L.I. - Compressor 1		kW	2,78	3,16	3,85	4,41	6,11	6,65	8,30	9,10	10,2	12,0	13,5
F.L.I. - Pump		kW	0,20	0,20	0,20	0,20	0,20	0,40	0,40	0,40	0,40	0,55	0,55
F.L.I. - Total		kW	2,98	3,36	4,05	4,61	6,31	7,05	8,70	9,50	10,6	12,6	14,1
M.I.C. - Maximum inrush current													
M.I.C. - Value		A	27,0	39,0	47,0	44,0	65,0	76,0	103	97,0	113	122	122

Power supply 230/1/50 +/-10%

Voltage unbalance between phases: max 2 %

Sound levels

Size	Sound power level (dB)								Sound pressure level	Sound power level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
17	78	69	55	46	47	40	34	29	43	57
21	78	69	56	48	47	38	35	32	43	57
31	79	67	57	51	49	41	41	35	44	57
41	78	70	59	50	47	43	38	34	44	58
51	77	69	61	54	49	41	39	36	45	58
61	78	67	62	55	54	46	43	38	46	60
71	77	72	65	62	53	47	44	38	49	63
81	78	73	66	63	54	48	45	39	50	64
91	81	68	68	65	56	52	49	45	51	65
101	79	75	68	63	56	55	49	44	52	66
121	80	74	70	65	58	55	51	45	53	67

Measures according to ISO 3744 regulations, with respect to the EUROVENT 8/1 certification.

The sound pressure level refers to a distance of 1m from the outer surface of the unit operating in an open field.

Data referred to the following conditions:

internal exchanger water = 12/7°C

external exchanger water = 30/35°C

Operating range

Cooling

Size			17	21	31	41	51	61	71	81	91	101	121
External exchanger													
Min. water inlet temperature	1	°C	15	15	15	15	15	15	15	15	15	15	15
Min. water inlet temperature	2	°C	6	6	6	6	6	6	6	6	6	6	6
Max. leaving water temperature	3	°C	55	55	55	55	55	55	55	55	55	55	55
Min. leaving water temperature		°C	28	28	28	28	28	28	28	28	28	28	28
Water thermal head (min / max)		°C	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16
Internal exchanger													
Max inlet water temperature		°C	24	24	24	24	24	24	24	24	24	24	24
Max. leaving water temperature		°C	18	18	18	18	18	18	18	18	18	18	18
Min. leaving water temperature	4	°C	5	5	5	5	5	5	5	5	5	5	5
Water thermal head (min / max)		°C	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8

Heating

External exchanger													
Max. leaving water temperature		°C	18	18	18	18	18	18	18	18	18	18	18
Min. leaving water temperature	5	°C	5	5	5	5	5	5	5	5	5	5	5
Internal exchanger													
Max. leaving water temperature	6	°C	60	60	60	60	60	60	60	60	60	60	60
Water thermal head (min / max)		°C	3 / 8	3 / 8	3 / 8	3 / 8	3 / 8	3 / 8	3 / 8	3 / 8	3 / 8	3 / 8	3 / 8

internal exchanger = exchanger user side
external exchanger = source side exchanger

- (1) Standard unit
- (2) The limit is referred to the use of a modulating or pressostatic valve, at the external exchanger inlet.
- (3) Internal exchanger water = 12/7°C
- (4) Antifreeze set-point
- (5) Antifreeze set-point
- (7) External exchanger inlet water = 10°C
- Dt water 4°C

Correction factors for glycol use

% ethylene glycol by weight		5%	10%	15%	20%	25%	30%	35%	40%
Freezing temperature	°C	-2,00	-3,9	-6,5	-8,9	-11,8	-15,6	-19	-23,4
Safety temperature	°C	3	1	-1	-4	-6	-10	-14	-19
Cooling Capacity Factor	Nr	1,00	0,99	0,985	0,981	0,977	0,974	0,971	0,968
Compressor power input Factor	Nr	0,997	0,993	0,99	0,988	0,986	0,984	0,982	0,981
Internal exchanger glycol solution flow factor	Nr	1,003	1,01	1,02	1,033	1,05	1,072	1,095	1,124
Pressure drop Factor	Nr	1,029	1,06	1,09	1,118	1,149	1,182	1,211	1,243

The correction factors shown refer to water and glycol ethylene mixes used to prevent the formation of frost on the exchangers in the water circuit during inactivity in winter.

Fouling Correction Factors

m² °C/W	Internal exchanger		External exchanger	
	F1	FK1	F2	FK2
0.44 x 10 ⁻⁴	1	1	1	1
0.88 x 10 ⁻⁴	0,97	0,99	0,97	1,08
1.76 x 10 ⁻⁴	0,94	0,98	0,92	1,05

The cooling performance values provided in the tables are based on the external exchanger having clean plates (fouling factor 1). For different fouling factor values, multiply the performance by the coefficients shown in the table.

F1 = Cooling capacity correction factors

FK1 = Compressor power input correction factor

F2 = Cooling capacity correction factors

FK2 = Compressors input power correction factors

Unit performances for geothermal system

Size		17		21		21		41		51		61		71		81		91		101		121	
		W35	W50	W35	W50	W35	W50	W35	W50	W35	W50	W35	W50	W35	W50	W35	W50	W35	W50	W35	W50	W35	W50
kWt (kW)	B0	5,57	5,32	6,00	5,82	7,45	7,12	9,56	9,18	12,7	12,3	15,6	14,8	19,7	18,7	21	19,9	24,5	23,2	28,9	27,1	32,7	30,8
kWe (kW)	B0	1,17	1,57	1,27	1,69	1,62	2,51	2,09	3,06	2,69	4	3,3	4,79	4,13	5,91	4,57	6,61	5,26	7,33	5,99	8,57	6,69	9,29
COP EN14511:2008		4,51	n.a.	4,50	n.a.	4,51	n.a.	4,56	n.a.	4,67	n.a.	4,74	n.a.	4,78	n.a.	4,7	n.a.	4,81	n.a.	5,06	n.a.	5,07	n.a.
EER EN14511:2008	W23/B35	5,23	n.a.	5,11	n.a.	5,08	n.a.	5,26	n.a.	5,19	n.a.	5,04	n.a.	5,02	n.a.	5,12	n.a.	5,08	n.a.	5,02	n.a.	5,05	n.a.

kWt = Heating capacity (kW)

kWe = Electrical power absorbed by compressors (kW)

B0 = external exchanger inlet water temperature 0°C

W35 = temperature water from internal exchanger 35°C

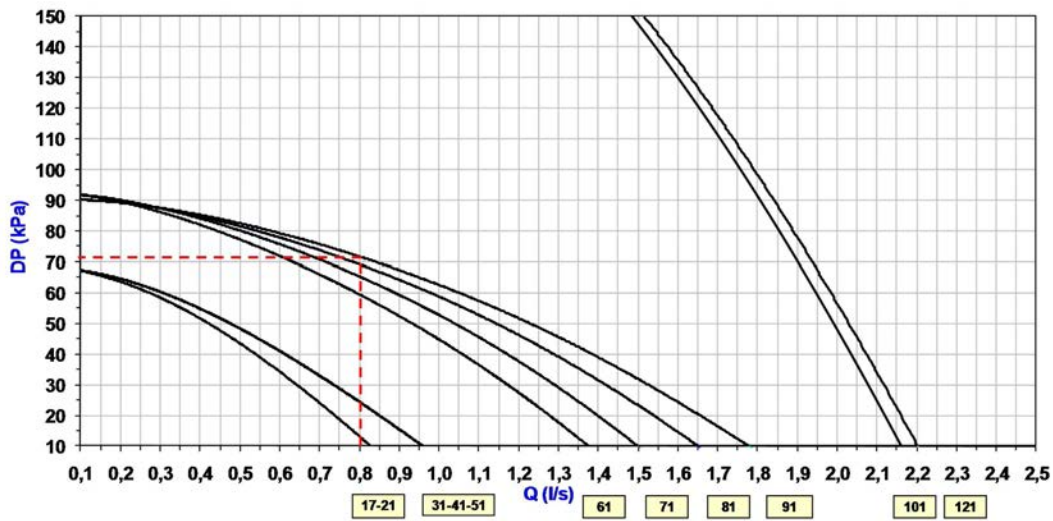
% weight ethylene glycol = 30%

internal exchanger = exchanger user side

external exchanger = source side exchanger

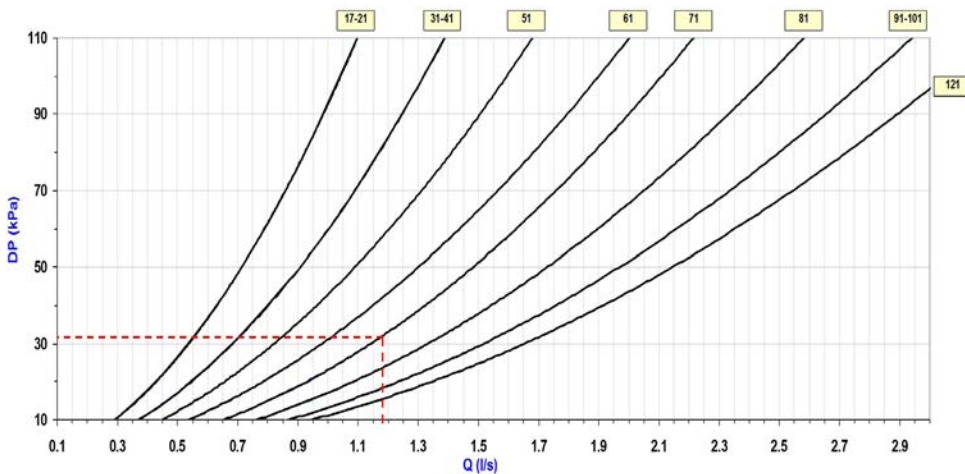
The table summarizes the values of COP and EER calculated in accordance with the law EN 14511:2008

Pump performance



User side pump (standard)
 Q = Water flow-rate [l/s]
 DP = Available pressure [kPa]
 The heads are intended as available at the unit connections

Exchanger pressure drops



Q = Water flow rate [l/s]
 Dp = Pressure drop
 The data are referred both to internal and external exchanger, as equal.

Internal exchanger admissible water flow rates

Size		17	21	31	41	51	61	71	81	91	101	121
Minimum flow	l/s	0,29	0,29	0,37	0,37	0,45	0,54	0,65	0,76	0,87	0,87	0,95
Maximum flow-rate	l/s	1,10	1,10	1,35	1,35	1,66	1,97	2,20	2,56	2,93	2,93	3,20

External exchanger admissible water flow rates

Size		17	21	31	41	51	61	71	81	91	101	121
Minimum flow	l/s	0,1	0,1	0,2	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,3
Maximum flow-rate	l/s	1,10	1,10	1,35	1,35	1,66	1,97	2,20	2,56	2,93	2,93	3,20

Performances in cooling

Application Terminal Units - Size 17 - 71

Size	To (°C)	External exchanger water outlet temperature (°C)														
		30			35			40			45			50		
		kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt
17	6	6,32	1,13	7,50	5,85	1,38	7,20	5,45	1,60	7,10	5,11	1,80	6,90	4,85	1,97	6,80
	7	6,62	1,13	7,80	6,13	1,38	7,50	5,72	1,60	7,30	5,37	1,80	7,20	5,09	1,97	7,10
	8	6,92	1,13	8,10	6,41	1,38	7,80	5,98	1,61	7,60	5,62	1,80	7,40	5,34	1,97	7,30
	9	7,22	1,14	8,40	6,69	1,39	8,10	6,24	1,61	7,90	5,87	1,80	7,70	5,58	1,97	7,60
	10	7,51	1,14	8,70	6,97	1,39	8,40	6,50	1,61	8,10	6,12	1,80	7,90	5,82	1,96	7,80
	11	7,81	1,14	9,00	7,24	1,39	8,60	6,76	1,61	8,40	6,37	1,80	8,20	6,06	1,96	8,00
21	6	6,57	1,30	7,90	6,19	1,51	7,70	5,84	1,72	7,60	5,53	1,92	7,50	5,24	2,11	7,30
	7	6,86	1,30	8,20	6,47	1,51	8,00	6,11	1,72	7,80	5,79	1,92	7,70	5,49	2,11	7,60
	8	7,15	1,31	8,50	6,75	1,52	8,30	6,38	1,72	8,10	6,04	1,92	8,00	5,74	2,11	7,80
	9	7,44	1,31	8,80	7,03	1,52	8,60	6,64	1,72	8,40	6,30	1,92	8,20	5,98	2,11	8,10
	10	7,72	1,32	9,00	7,30	1,52	8,80	6,91	1,72	8,60	6,55	1,92	8,50	6,23	2,10	8,30
	11	8,00	1,33	9,30	7,57	1,53	9,10	7,17	1,73	8,90	6,80	1,92	8,70	6,47	2,10	8,60
31	6	7,99	1,72	9,70	7,70	1,88	9,60	7,26	2,14	9,40	6,68	2,52	9,20	5,95	3,00	9,00
	7	8,24	1,72	10,0	7,94	1,88	9,80	7,48	2,14	9,60	6,89	2,52	9,40	6,14	2,99	9,10
	8	8,50	1,71	10,2	8,19	1,87	10,1	7,72	2,14	9,90	7,11	2,51	9,60	6,34	2,99	9,30
	9	8,78	1,71	10,5	8,46	1,87	10,3	7,98	2,14	10,1	7,35	2,51	9,90	6,56	2,98	9,50
	10	9,08	1,71	10,8	8,75	1,87	10,6	8,25	2,14	10,4	7,61	2,51	10,1	6,80	2,98	9,80
	11	9,40	1,70	11,1	9,05	1,87	10,9	8,55	2,14	10,7	7,88	2,50	10,4	7,06	2,97	10,0
41	6	10,7	2,13	12,8	10,4	2,30	12,7	9,84	2,56	12,4	9,17	2,91	12,1	8,34	3,35	11,7
	7	11,0	2,13	13,1	10,7	2,30	13,0	10,1	2,56	12,7	9,45	2,91	12,4	8,60	3,35	12,0
	8	11,4	2,13	13,5	11,0	2,30	13,3	10,5	2,56	13,1	9,75	2,91	12,7	8,88	3,36	12,2
	9	11,8	2,13	13,9	11,4	2,30	13,7	10,8	2,57	13,4	10,1	2,92	13,0	9,18	3,36	12,5
	10	12,2	2,13	14,3	11,7	2,30	14,0	11,2	2,57	13,8	10,4	2,92	13,3	9,50	3,36	12,9
	11	12,6	2,13	14,7	12,1	2,31	14,4	11,5	2,57	14,1	10,8	2,93	13,7	9,85	3,37	13,2
51	6	13,4	2,79	16,2	12,7	3,15	15,9	12,0	3,57	15,6	11,2	4,03	15,2	10,5	4,55	15,1
	7	13,8	2,80	16,6	13,1	3,16	16,3	12,4	3,57	16,0	11,6	4,03	15,6	10,8	4,55	15,4
	8	14,2	2,81	17,0	13,5	3,17	16,7	12,8	3,58	16,4	12,0	4,03	16,0	11,2	4,54	15,7
	9	14,7	2,81	17,5	13,9	3,18	17,1	13,2	3,58	16,8	12,4	4,04	16,4	11,5	4,54	16,0
	10	15,1	2,82	17,9	14,4	3,19	17,6	13,6	3,59	17,2	12,8	4,04	16,8	11,9	4,53	16,4
	11	15,6	2,83	18,4	14,8	3,20	18,0	14,0	3,60	17,6	13,2	4,05	17,3	12,3	4,53	16,8
61	6	16,4	3,46	19,9	15,6	3,84	19,4	14,6	4,30	18,9	13,5	4,85	18,4	12,3	5,47	17,8
	7	16,9	3,47	20,4	16,1	3,85	20,0	15,1	4,32	19,4	14,0	4,86	18,9	12,8	5,49	18,3
	8	17,5	3,49	21,0	16,6	3,87	20,5	15,6	4,33	19,9	14,4	4,88	19,3	13,2	5,50	18,7
	9	18,0	3,50	21,5	17,1	3,88	21,0	16,1	4,35	20,5	14,9	4,89	19,8	13,6	5,51	19,1
	10	18,6	3,52	22,1	17,7	3,90	21,6	16,6	4,36	21,0	15,4	4,91	20,3	14,1	5,53	19,6
	11	19,2	3,53	22,7	18,3	3,92	22,2	17,2	4,38	21,6	15,9	4,92	20,8	14,6	5,54	20,1
71	6	21,0	4,09	25,1	19,9	4,62	24,5	18,7	5,21	23,9	17,4	5,88	23,3	16,1	6,61	22,7
	7	21,7	4,12	25,8	20,5	4,64	25,1	19,3	5,23	24,5	18,0	5,90	23,9	16,7	6,63	23,3
	8	22,4	4,14	26,5	21,2	4,66	25,9	19,9	5,26	25,2	18,6	5,92	24,5	17,2	6,65	23,9
	9	23,1	4,17	27,3	21,9	4,69	26,6	20,6	5,28	25,9	19,2	5,94	25,1	17,8	6,68	24,5
	10	23,8	4,20	28,0	22,6	4,72	27,3	21,3	5,31	26,6	19,9	5,97	25,9	18,4	6,70	25,1
	11	24,5	4,23	28,7	23,3	4,74	28,0	22,0	5,33	27,3	20,5	5,99	26,5	19,0	6,73	25,7

kWf = Cooling capacity in kW

kWe = Compressor power input in kW

kWt = Heating capacity to the external exchanger(kW)

To = Leaving internal exchanger water temperature (°C)

Performances in cooling

Application Terminal Units - Size 81 - 121

Size	To (°C)	External exchanger water outlet temperature (°C)														
		30			35			40			45			50		
		kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt
81	6	22,5	4,24	26,7	21,4	4,77	26,2	20,2	5,40	25,6	18,7	6,13	24,8	17,1	6,96	24,1
	7	23,2	4,26	27,5	22,1	4,79	26,9	20,8	5,42	26,2	19,4	6,14	25,5	17,7	6,97	24,7
	8	24,0	4,28	28,3	22,8	4,81	27,6	21,5	5,43	26,9	20,0	6,15	26,2	18,3	6,97	25,3
	9	24,7	4,30	29,0	23,5	4,82	28,3	22,2	5,44	27,6	20,7	6,16	26,9	18,9	6,98	25,9
	10	25,4	4,33	29,7	24,3	4,85	29,2	22,9	5,46	28,4	21,3	6,18	27,5	19,6	6,99	26,6
	11	26,2	4,35	30,6	25,0	4,87	29,9	23,6	5,48	29,1	22,0	6,19	28,2	20,2	6,99	27,2
91	6	26,1	5,16	31,3	24,8	5,77	30,6	23,4	6,44	29,8	21,9	7,19	29,1	20,4	8,01	28,4
	7	27,0	5,18	32,2	25,6	5,79	31,4	24,1	6,46	30,6	22,6	7,21	29,8	21,1	8,02	29,1
	8	27,8	5,21	33,0	26,4	5,81	32,2	24,9	6,49	31,4	23,4	7,23	30,6	21,8	8,04	29,8
	9	28,7	5,24	33,9	27,2	5,84	33,0	25,7	6,51	32,2	24,1	7,25	31,4	22,6	8,07	30,7
	10	29,6	5,26	34,9	28,1	5,86	34,0	26,5	6,54	33,0	24,9	7,28	32,2	23,3	8,10	31,4
	11	30,5	5,29	35,8	28,9	5,89	34,8	27,3	6,57	33,9	25,7	7,31	33,0	24,1	8,13	32,2
101	6	29,7	5,98	35,7	28,2	6,74	34,9	26,4	7,59	34,0	24,5	8,55	33,1	22,4	9,60	32,0
	7	30,6	6,01	36,6	29,0	6,77	35,8	27,3	7,62	34,9	25,3	8,57	33,9	23,1	9,63	32,7
	8	31,5	6,04	37,5	29,9	6,80	36,7	28,1	7,65	35,8	26,1	8,60	34,7	23,9	9,65	33,6
	9	32,5	6,08	38,6	30,8	6,83	37,6	29,0	7,68	36,7	27,0	8,63	35,6	24,7	9,68	34,4
	10	33,4	6,11	39,5	31,8	6,86	38,7	29,9	7,71	37,6	27,8	8,66	36,5	25,5	9,71	35,2
	11	34,4	6,14	40,5	32,7	6,90	39,6	30,8	7,75	38,6	28,7	8,70	37,4	26,4	9,74	36,1
121	6	31,6	6,71	38,3	30,0	7,46	37,5	28,3	8,32	36,6	26,4	9,31	35,7	24,3	10,4	34,7
	7	32,5	6,74	39,2	31,0	7,48	38,5	29,2	8,33	37,5	27,3	9,31	36,6	25,2	10,4	35,6
	8	33,6	6,76	40,4	32,0	7,50	39,5	30,2	8,35	38,6	28,2	9,32	37,5	26,1	10,4	36,5
	9	34,6	6,78	41,4	33,0	7,52	40,5	31,2	8,37	39,6	29,2	9,33	38,5	26,9	10,4	37,3
	10	35,7	6,81	42,5	34,0	7,54	41,5	32,2	8,38	40,6	30,1	9,34	39,4	27,8	10,4	38,2
	11	36,7	6,84	43,5	35,1	7,56	42,7	33,2	8,40	41,6	31,1	9,35	40,5	28,7	10,4	39,1

kWf = Cooling capacity in kW

kWe = Compressor power input in kW

kWt = Heating capacity to the external exchanger(kW)

To = Leaving internal exchanger water temperature (°C)

Performance in Heating

Application: Terminal units - Radiant panels - Size 17 - 61

Size	To °C	Internal exchanger water outlet temperature (°C)									
		35		40		45		50		55	
		kWt	kWe	kWt	kWe	kWt	kWe	kWt	kWe	kWt	kWe
17	6	7,05	1,25	6,92	1,35	6,78	1,50	6,61	1,69	6,43	1,92
	7	7,25	1,25	7,12	1,36	6,96	1,50	6,79	1,69	6,59	1,92
	8	7,45	1,26	7,31	1,36	7,15	1,50	6,97	1,69	6,76	1,92
	9	7,65	1,26	7,51	1,36	7,34	1,51	7,15	1,69	6,93	1,92
	10	7,86	1,26	7,71	1,37	7,53	1,51	7,33	1,69	7,10	1,91
	11	8,06	1,27	7,91	1,37	7,73	1,51	7,51	1,69	7,27	1,91
	12	8,27	1,27	8,12	1,37	7,92	1,51	7,70	1,69	7,44	1,91
21	6	7,60	1,37	7,48	1,49	7,37	1,64	7,25	1,82	7,14	2,01
	7	7,81	1,37	7,68	1,49	7,56	1,64	7,43	1,81	7,31	2,01
	8	8,01	1,37	7,88	1,49	7,75	1,64	7,62	1,81	7,49	2,00
	9	8,22	1,37	8,08	1,50	7,94	1,64	7,81	1,81	7,67	2,00
	10	8,43	1,38	8,29	1,50	8,14	1,64	8,00	1,81	7,85	1,99
	11	8,64	1,38	8,49	1,50	8,34	1,64	8,19	1,80	8,03	1,99
	12	8,86	1,39	8,70	1,50	8,54	1,64	8,38	1,80	8,22	1,99
31	6	9,42	1,74	9,17	2,02	8,95	2,34	8,78	2,70	8,65	3,10
	7	9,67	1,74	9,40	2,02	9,16	2,34	8,97	2,69	8,82	3,09
	8	9,93	1,74	9,64	2,02	9,39	2,33	9,18	2,69	9,02	3,08
	9	10,2	1,74	9,90	2,01	9,64	2,33	9,42	2,68	9,24	3,07
	10	10,5	1,73	10,2	2,01	9,91	2,32	9,69	2,67	9,49	3,06
	11	10,7	1,73	10,5	2,01	10,2	2,32	9,97	2,67	9,76	3,05
	12	11,0	1,73	10,8	2,01	10,5	2,32	10,3	2,66	10,1	3,04
41	6	12,1	2,24	11,9	2,56	11,6	2,91	11,3	3,28	11,0	3,68
	7	12,4	2,24	12,2	2,56	11,9	2,91	11,6	3,29	11,3	3,68
	8	12,8	2,24	12,5	2,57	12,2	2,92	11,9	3,29	11,6	3,68
	9	13,1	2,24	12,8	2,57	12,5	2,92	12,2	3,29	11,9	3,69
	10	13,5	2,25	13,2	2,57	12,9	2,92	12,5	3,29	12,1	3,69
	11	13,9	2,25	13,6	2,58	13,2	2,93	12,8	3,30	12,4	3,69
	12	14,4	2,25	13,9	2,58	13,5	2,93	13,1	3,30	12,7	3,69
51	6	16,1	2,88	15,9	3,32	15,7	3,79	15,3	4,30	14,9	4,85
	7	16,5	2,88	16,3	3,32	16,0	3,79	15,6	4,29	15,2	4,83
	8	16,9	2,89	16,6	3,33	16,3	3,79	15,9	4,29	15,5	4,81
	9	17,3	2,90	17,0	3,33	16,7	3,79	16,3	4,28	15,9	4,80
	10	17,8	2,91	17,5	3,34	17,0	3,80	16,6	4,28	16,2	4,79
	11	18,4	2,92	17,9	3,35	17,4	3,80	17,0	4,28	16,6	4,77
	12	18,9	2,94	18,4	3,36	17,8	3,81	17,4	4,27	16,9	4,76
61	6	19,7	3,53	19,5	4,00	19,1	4,54	18,5	5,13	17,6	5,79
	7	20,3	3,55	20,0	4,01	19,5	4,55	18,8	5,14	18,0	5,80
	8	21,0	3,56	20,5	4,03	19,9	4,56	19,2	5,15	18,4	5,81
	9	21,7	3,58	21,1	4,04	20,4	4,57	19,7	5,16	18,8	5,82
	10	22,4	3,60	21,7	4,06	20,9	4,58	20,1	5,17	19,3	5,83
	11	23,0	3,61	22,2	4,07	21,4	4,59	20,6	5,18	19,8	5,84
	12	23,7	3,63	22,9	4,09	22,0	4,61	21,2	5,19	20,3	5,84

kWt = Heating capacity (kW)

kWe = Compressor power input in kW

To = external exchanger outlet water temperature (°C)

Performance in Heating

Application: Terminal units - Radiant panels - Size 71 - 121

Size	To °C	Internal exchanger water outlet temperature (°C)									
		35		40		45		50		55	
		kWt	kWe	kWt	kWe	kWt	kWe	kWt	kWe	kWt	kWe
71	6	25,0	4,41	24,4	4,97	23,8	5,61	23,1	6,33	22,5	7,13
	7	25,6	4,43	25,0	4,99	24,4	5,62	23,7	6,34	23,0	7,15
	8	26,3	4,46	25,7	5,01	25,0	5,64	24,3	6,36	23,6	7,16
	9	27,1	4,48	26,4	5,03	25,7	5,66	24,9	6,38	24,2	7,18
	10	27,8	4,50	27,1	5,05	26,4	5,69	25,6	6,40	24,7	7,20
	11	28,6	4,53	27,9	5,08	27,1	5,71	26,2	6,42	25,4	7,22
	12	29,4	4,56	28,6	5,10	27,8	5,73	26,9	6,45	26,0	7,24
81	6	26,5	4,89	26,0	5,52	25,3	6,25	24,6	7,09	23,8	8,04
	7	27,3	4,91	26,6	5,53	26,0	6,26	25,2	7,10	24,3	8,05
	8	28,0	4,92	27,3	5,55	26,6	6,28	25,8	7,11	24,9	8,05
	9	28,7	4,94	28,1	5,57	27,3	6,29	26,4	7,12	25,4	8,05
	10	29,5	4,97	28,8	5,59	28,0	6,31	27,1	7,13	26,0	8,05
	11	30,3	4,99	29,6	5,61	28,7	6,32	27,7	7,14	26,6	8,05
	12	31,1	5,01	30,3	5,63	29,4	6,34	28,4	7,15	27,2	8,05
91	6	31,0	5,62	30,3	6,31	29,5	7,05	28,8	7,86	28,1	8,72
	7	31,8	5,65	31,0	6,33	30,3	7,07	29,5	7,87	28,8	8,74
	8	32,7	5,67	31,8	6,35	31,0	7,09	30,3	7,90	29,6	8,76
	9	33,6	5,70	32,7	6,38	31,8	7,12	31,1	7,92	30,4	8,78
	10	34,4	5,72	33,5	6,40	32,6	7,15	31,9	7,95	31,3	8,82
	11	35,4	5,75	34,3	6,43	33,5	7,17	32,8	7,99	32,2	8,86
	12	36,3	5,78	35,2	6,46	34,3	7,21	33,6	8,02	33,2	8,91
101	6	36,7	6,41	35,7	7,25	34,7	8,17	33,5	9,19	32,3	10,3
	7	37,7	6,43	36,7	7,27	35,6	8,19	34,4	9,21	33,1	10,3
	8	38,7	6,46	37,6	7,29	36,5	8,22	35,3	9,23	33,9	10,3
	9	39,7	6,49	38,6	7,32	37,4	8,24	36,2	9,25	34,8	10,3
	10	40,7	6,52	39,6	7,35	38,4	8,27	37,1	9,28	35,6	10,4
	11	41,8	6,55	40,6	7,38	39,4	8,30	38,0	9,30	36,5	10,4
	12	42,9	6,58	41,7	7,41	40,4	8,33	39,0	9,33	37,4	10,4
121	6	41,6	7,18	40,3	8,01	39,1	8,95	38,1	9,98	37,1	11,1
	7	42,6	7,19	41,6	8,03	40,5	8,96	39,3	9,98	38,0	11,1
	8	43,6	7,21	42,9	8,04	41,9	8,97	40,5	9,98	38,9	11,1
	9	44,7	7,22	44,2	8,06	43,2	8,98	41,7	9,99	39,8	11,1
	10	45,8	7,24	45,4	8,07	44,4	8,99	42,8	9,99	40,6	11,1
	11	46,9	7,26	46,7	8,09	45,7	9,00	43,9	10,0	41,4	11,1
	12	48,1	7,28	47,9	8,10	46,9	9,01	44,9	10,0	42,1	11,1

kWt = Heating capacity (kW)

kWe = Compressor power input in kW

To = external exchanger outlet water temperature (°C)

Performances in cooling

Application: Unit for radiant panels - Size 17 - 71

Size	To (°C)	External exchanger outlet water temperature (°C)																	
		30			33			35			40			45			50		
		kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt
17	13	7,68	1,15	8,80	7,41	1,27	8,70	7,23	1,35	8,60	6,83	1,54	8,40	6,46	1,71	8,20	6,14	1,87	8,00
	14	7,91	1,15	9,10	7,63	1,28	8,90	7,45	1,36	8,80	7,04	1,54	8,60	6,67	1,72	8,40	6,34	1,87	8,20
	15	8,13	1,16	9,30	7,85	1,28	9,10	7,67	1,36	9,00	7,24	1,54	8,80	6,87	1,72	8,60	6,53	1,87	8,40
	16	8,35	1,16	9,50	8,06	1,28	9,30	7,87	1,36	9,20	7,44	1,55	9,00	7,06	1,72	8,80	—	—	—
	17	8,55	1,17	9,70	8,26	1,29	9,60	8,07	1,36	9,40	7,63	1,55	9,20	7,24	1,71	9,00	—	—	—
	18	8,75	1,17	9,90	8,45	1,29	9,70	8,26	1,37	9,60	7,82	1,55	9,40	7,42	1,71	9,10	—	—	—
21	13	8,46	1,30	9,80	8,14	1,44	9,60	7,94	1,53	9,50	7,50	1,73	9,20	7,16	1,91	9,10	6,90	2,06	9,00
	14	8,69	1,31	10,0	8,36	1,44	9,80	8,16	1,53	9,70	7,72	1,73	9,50	7,37	1,91	9,30	7,11	2,06	9,20
	15	8,92	1,31	10,2	8,58	1,45	10,0	8,37	1,54	9,90	7,92	1,74	9,70	7,57	1,91	9,50	7,30	2,06	9,40
	16	9,13	1,32	10,5	8,78	1,46	10,2	8,57	1,54	10,1	8,12	1,74	9,90	7,76	1,91	9,70	—	—	—
	17	9,32	1,33	10,7	8,98	1,46	10,4	8,76	1,55	10,3	8,30	1,74	10,0	7,93	1,92	9,80	—	—	—
	18	9,50	1,33	10,8	9,15	1,47	10,6	8,94	1,55	10,5	8,47	1,75	10,2	8,10	1,92	10,0	—	—	—
31	13	9,60	1,73	11,3	9,45	1,80	11,3	9,31	1,88	11,2	8,80	2,15	11,0	8,07	2,54	10,6	7,13	3,04	10,2
	14	9,88	1,72	11,6	9,71	1,80	11,5	9,56	1,88	11,4	9,06	2,15	11,2	8,37	2,53	10,9	7,49	3,03	10,5
	15	10,2	1,72	11,9	9,99	1,80	11,8	9,83	1,88	11,7	9,33	2,15	11,5	8,65	2,53	11,2	7,82	3,03	10,9
	16	10,5	1,72	12,2	10,3	1,80	12,1	10,1	1,88	12,0	9,60	2,15	11,8	8,92	2,53	11,5	8,09	3,02	11,1
	17	10,8	1,72	12,5	10,6	1,80	12,4	10,4	1,88	12,3	9,87	2,15	12,0	9,18	2,53	11,7	8,33	3,02	11,4
	18	11,1	1,71	12,8	10,9	1,80	12,7	10,7	1,88	12,6	10,2	2,15	12,4	—	—	—	—	—	—
41	13	12,5	2,11	14,6	12,3	2,20	14,5	12,1	2,29	14,4	11,5	2,60	14,1	10,6	3,02	13,6	9,44	3,56	13,0
	14	12,9	2,11	15,0	12,7	2,20	14,9	12,5	2,29	14,8	11,8	2,60	14,4	10,9	3,02	13,9	9,77	3,56	13,3
	15	13,3	2,11	15,4	13,0	2,21	15,2	12,8	2,30	15,1	12,1	2,60	14,7	11,2	3,02	14,2	10,1	3,56	13,7
	16	13,7	2,10	15,8	13,4	2,21	15,6	13,2	2,30	15,5	12,5	2,60	15,1	11,5	3,03	14,5	10,4	3,56	14,0
	17	14,1	2,10	16,2	13,8	2,21	16,0	13,6	2,30	15,9	12,8	2,61	15,4	11,9	3,03	14,9	10,6	3,56	14,2
	18	14,5	2,10	16,6	14,2	2,21	16,4	14,0	2,30	16,3	13,2	2,61	15,8	—	—	—	—	—	—
51	13	16,3	2,65	19,0	15,8	2,85	18,7	15,5	2,99	18,5	14,8	3,36	18,2	14,0	3,77	17,8	13,1	4,22	17,3
	14	16,7	2,66	19,4	16,3	2,86	19,2	16,0	3,00	19,0	15,2	3,37	18,6	14,4	3,78	18,2	13,5	4,22	17,7
	15	17,2	2,66	19,9	16,7	2,87	19,6	16,4	3,01	19,4	15,6	3,39	19,0	14,8	3,79	18,6	13,9	4,22	18,1
	16	17,6	2,67	20,3	17,2	2,88	20,1	16,8	3,02	19,8	16,0	3,40	19,4	15,2	3,80	19,0	14,3	4,22	18,5
	17	18,1	2,68	20,8	17,6	2,89	20,5	17,3	3,03	20,3	16,4	3,41	19,8	15,6	3,80	19,4	14,7	4,22	18,9
	18	18,6	2,69	21,3	18,1	2,90	21,0	17,7	3,04	20,7	16,9	3,42	20,3	16,0	3,81	19,8	15,1	4,23	19,3
61	13	20,0	3,46	23,5	19,5	3,64	23,1	19,1	3,79	22,9	18,1	4,24	22,3	16,8	4,80	21,6	15,2	5,47	20,7
	14	20,6	3,47	24,1	20,1	3,66	23,8	19,7	3,80	23,5	18,6	4,25	22,9	17,3	4,81	22,1	15,7	5,48	21,2
	15	21,1	3,48	24,6	20,6	3,67	24,3	20,2	3,82	24,0	19,1	4,26	23,4	17,7	4,82	22,5	16,1	5,49	21,6
	16	21,7	3,50	25,2	21,2	3,69	24,9	20,8	3,84	24,6	19,6	4,28	23,9	18,2	4,83	23,0	16,6	5,50	22,1
	17	22,3	3,52	25,8	21,7	3,71	25,4	21,3	3,86	25,2	20,2	4,30	24,5	18,7	4,85	23,6	17,1	5,51	22,6
	18	22,9	3,54	26,4	22,3	3,73	26,0	21,9	3,88	25,8	20,7	4,32	25,0	19,2	4,86	24,1	17,5	5,52	23,0
71	13	24,7	4,11	28,8	23,9	4,43	28,3	23,4	4,65	28,1	22,1	5,26	27,4	20,7	5,93	26,6	19,2	6,66	25,9
	14	25,4	4,13	29,5	24,6	4,45	29,1	24,1	4,68	28,8	22,8	5,29	28,1	21,3	5,96	27,3	19,8	6,69	26,5
	15	26,1	4,16	30,3	25,3	4,48	29,8	24,8	4,70	29,5	23,4	5,31	28,7	22,0	5,98	28,0	20,4	6,71	27,1
	16	26,8	4,19	31,0	26,0	4,51	30,5	25,5	4,73	30,2	24,1	5,33	29,4	22,6	6,00	28,6	21,0	6,74	27,7
	17	27,5	4,22	31,7	26,7	4,53	31,2	26,2	4,76	31,0	24,8	5,36	30,2	23,2	6,02	29,2	21,6	6,76	28,4
	18	28,2	4,25	32,5	27,4	4,56	32,0	26,9	4,79	31,7	25,4	5,38	30,8	23,9	6,05	30,0	22,2	6,77	29,0

kWf = Cooling capacity in kW

kWe = Compressor power input in kW

kWt = Heating capacity to the external exchanger(kW)

To = Leaving internal exchanger water temperature (°C)

Performances in cooling

Application: Unit for radiant panels - Size 81 - 121

Size	To (°C)	External exchanger outlet water temperature (°C)																	
		30			33			35			40			45			50		
		kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt
81	13	26,9	4,49	31,4	26,3	4,80	31,1	25,8	5,03	30,8	24,4	5,66	30,1	22,7	6,38	29,1	20,9	7,19	28,1
	14	27,6	4,52	32,1	27,0	4,83	31,8	26,5	5,06	31,6	25,1	5,69	30,8	23,4	6,40	29,8	21,5	7,20	28,7
	15	28,4	4,55	33,0	27,7	4,86	32,6	27,2	5,09	32,3	25,8	5,71	31,5	24,1	6,42	30,5	22,1	7,21	29,3
	16	29,2	4,58	33,8	28,5	4,89	33,4	28,0	5,12	33,1	26,5	5,74	32,2	24,8	6,44	31,2	22,7	7,22	29,9
	17	30,0	4,61	34,6	29,3	4,92	34,2	28,8	5,14	33,9	27,3	5,76	33,1	25,5	6,45	32,0	23,4	7,22	30,6
	18	30,8	4,64	35,4	30,1	4,95	35,1	29,6	5,17	34,8	28,1	5,78	33,9	26,2	6,46	32,7	24,0	7,23	31,2
91	13	30,5	5,20	35,7	29,6	5,54	35,1	29,0	5,79	34,8	27,4	6,45	33,9	25,9	7,18	33,1	24,4	7,99	32,4
	14	31,4	5,23	36,6	30,5	5,57	36,1	29,8	5,82	35,6	28,2	6,48	34,7	26,7	7,22	33,9	25,2	8,03	33,2
	15	32,4	5,26	37,7	31,4	5,60	37,0	30,7	5,85	36,6	29,1	6,51	35,6	27,5	7,25	34,8	26,0	8,08	34,1
	16	33,4	5,30	38,7	32,3	5,63	37,9	31,6	5,88	37,5	30,0	6,54	36,5	28,4	7,29	35,7	26,8	8,13	34,9
	17	34,5	5,32	39,8	33,3	5,66	39,0	32,6	5,91	38,5	30,9	6,58	37,5	29,3	7,34	36,6	27,7	8,19	35,9
	18	35,6	5,35	41,0	34,4	5,69	40,1	33,6	5,94	39,5	31,9	6,61	38,5	30,2	7,39	37,6	28,7	8,26	37,0
101	13	34,0	5,96	40,0	33,1	6,39	39,5	32,4	6,69	39,1	30,6	7,52	38,1	28,6	8,45	37,1	26,4	9,46	35,9
	14	35,0	5,99	41,0	34,0	6,42	40,4	33,3	6,73	40,0	31,5	7,56	39,1	29,4	8,48	37,9	27,2	9,49	36,7
	15	36,0	6,02	42,0	35,0	6,46	41,5	34,3	6,77	41,1	32,4	7,60	40,0	30,4	8,51	38,9	28,1	9,52	37,6
	16	37,0	6,06	43,1	36,0	6,50	42,5	35,3	6,80	42,1	33,4	7,63	41,0	31,3	8,55	39,9	29,0	9,56	38,6
	17	38,1	6,10	44,2	37,1	6,53	43,6	36,4	6,84	43,2	34,4	7,67	42,1	32,3	8,59	40,9	29,9	9,61	39,5
	18	39,2	6,14	45,3	38,2	6,57	44,8	37,5	6,87	44,4	35,5	7,71	43,2	33,3	8,64	41,9	30,9	9,66	40,6
121	13	38,5	6,72	45,2	37,5	7,14	44,6	36,8	7,43	44,2	34,9	8,26	43,2	32,7	9,20	41,9	30,3	10,3	40,6
	14	39,6	6,75	46,4	38,6	7,16	45,8	37,9	7,46	45,4	35,9	8,28	44,2	33,7	9,21	42,9	31,2	10,3	41,5
	15	40,7	6,78	47,5	39,7	7,18	46,9	39,0	7,48	46,5	37,0	8,29	45,3	34,7	9,22	43,9	32,1	10,3	42,4
	16	41,9	6,81	48,7	40,9	7,21	48,1	40,1	7,50	47,6	38,1	8,31	46,4	35,7	9,23	44,9	33,1	10,3	43,4
	17	43,0	6,84	49,8	42,0	7,24	49,2	41,3	7,53	48,8	39,2	8,33	47,5	36,8	9,24	46,0	34,0	10,3	44,3
	18	44,2	6,87	51,1	43,2	7,27	50,5	42,4	7,55	50,0	40,3	8,35	48,7	37,8	9,25	47,1	35,0	10,3	45,3

kWf = Cooling capacity in kW

kWe = Compressor power input in kW

kWt = Heating capacity to the external exchanger(kW)

To = Leaving internal exchanger water temperature (°C)

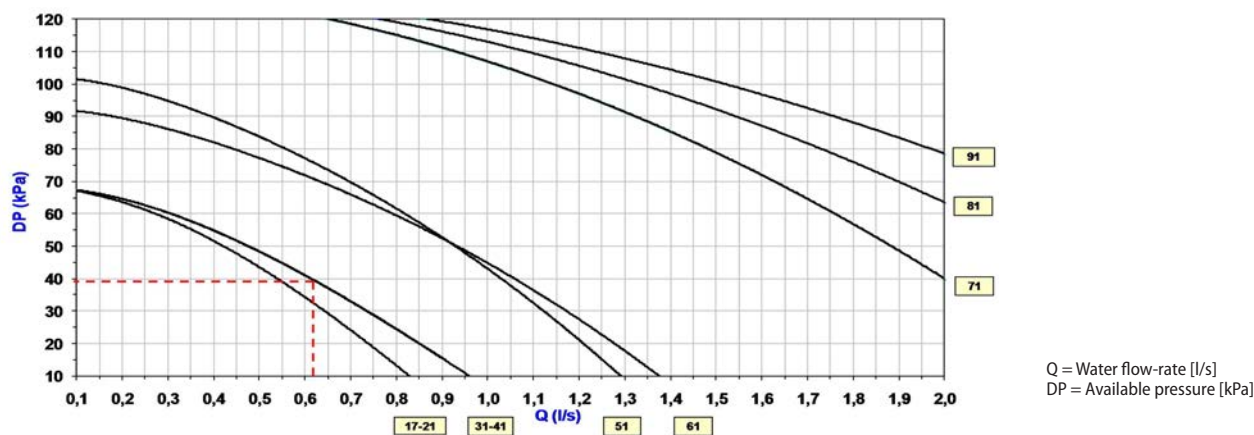
Built-in configuration options

(-) Unit without hydronic assembly user side

The unit can be requested without circulating pump, expansion vessel, safety valve water side and filling assembly.

HYGS - Hydronic group source side

Configuration not available for sizes 101 and 121



SFSTR1 - Disposal for inrush current reduction, for unit 230/1/50

Starting up a motor directly can overload the electricity network, with start-up currents up to 8 times the nominal current. Thanks to the breakaway current reduction device, start-up takes place gradually, with the start-up current being limited during this period of time. The start-up current can therefore be reduced to 3.5 - 4 times the nominal current, meaning that the power systems and protection devices can be sized with lower parameters.

Available for sizes 17 to 51.

SFSTR4N - Disposal for inrush current reduction, for unit 400/3/50+N

Starting up a motor directly can overload the electricity network, with start-up currents up to 8 times the nominal current. Thanks to the breakaway current reduction device, start-up takes place gradually, with the start-up current being limited during this period of time. The start-up current can therefore be reduced to 3.5 - 4 times the nominal current, meaning that the power systems and protection devices can be sized with lower parameters.

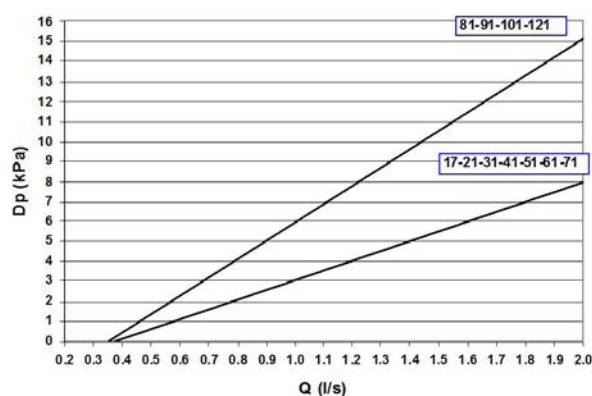
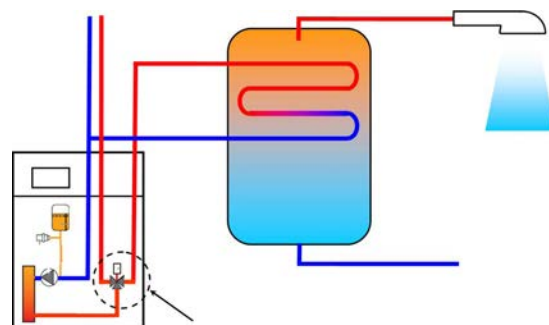
Available for all size.

3WV - Three-way valve

The unit is supplied with an on/off 3-way valve for the water flow-rate deviation to a DHW heating storage tank, and corresponding electronic board to control the valve.

The 3-way valve is activated with the closure of a potential-free contact in the unit's electrical panel.

As soon as this function is enabled, the set point of the unit is placed at the value established by the appropriate parameter in the electronic control.



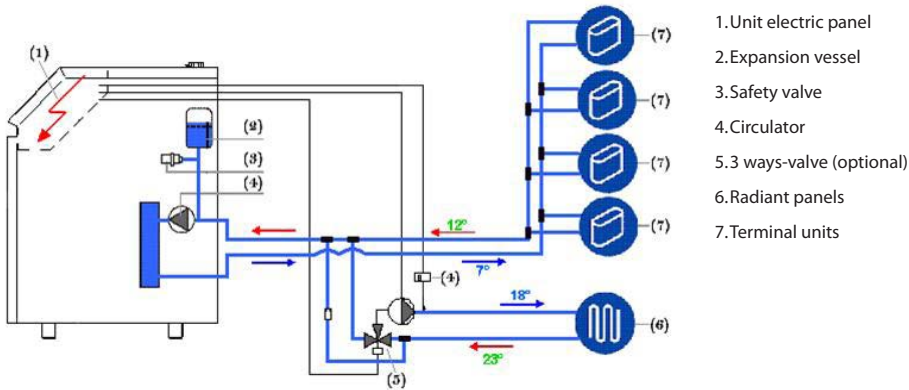
KDT3V - Double temperature control kit, set point compensation with 4-20mA, 3 ways valve

It is an expansion card that is connected to the unit standard electronic system. It allows:

(1) Double temperature control kit

High and low temperature control for mixed systems underfloor piping - fan coil/radiators (these ones in heating only) thanks to the systems mixing valve, pump and outlet probe control. Thanks to parameters set on the electronics (set by the service keyboard) it is possible to set the climatic curve, that allows the outlet temperature decrease to the underfloor system according to the outdoor air temperature.

Humidity control and all additional regulations/controls are excluded from the Clivet supply.

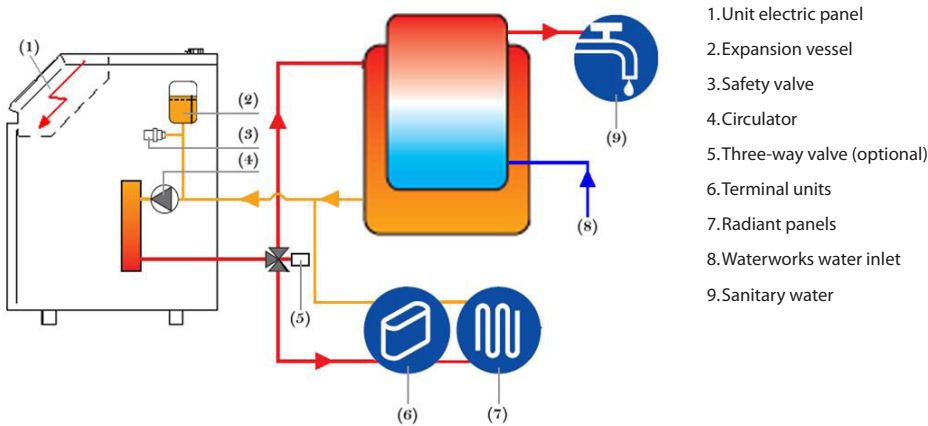


(2) Set point compensation with 4-20 mA signal

Dynamic set point variation on the basis of a WATER RESET signal (4-20 mA) from an external device.

(3) 3-way valve

On/off 3-way valve control for water flow-rate deviation to an heating storage tank of DHW. The 3-way valve is activated by closing the potential-free contacts present in the unit electrical panel. When this function is enabled, the unit set point is set on the value fixed by the parameter in the electronic control.



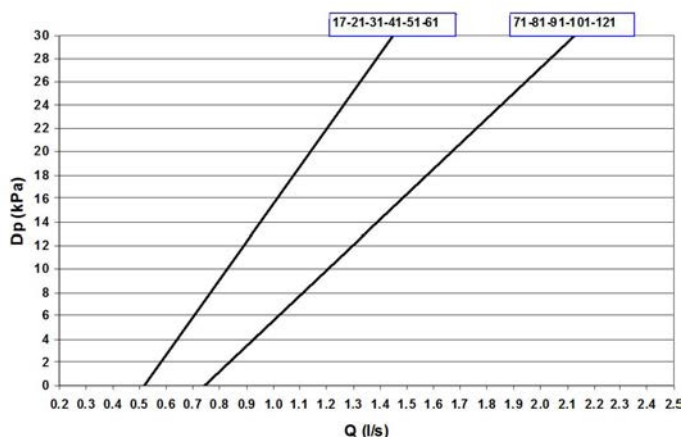
Accessories separately supplied

IVMSX - Source side modulating valve

If the temperature of the entering water at the heat exchanger on the source side is less than 15°C it is advisable to reduce the flow-rate of the water to allow proper operation of the unit. The modulating valve, installed at the inlet of the heat exchanger in the source side, modulates the water flow-rate via a 0-10V signal generated by the electronic control of the unit.

When unit is off the valve is completely closed, allowing water saving.

The modulating valve is the simplest solution as compared to traditional pressure switch valve which must always be used in conjunction with a motorized bypass valve.



Q = Water flow [l/s]
Dp = Pressure drop [kPa]

IVWX - Source side motorized valve

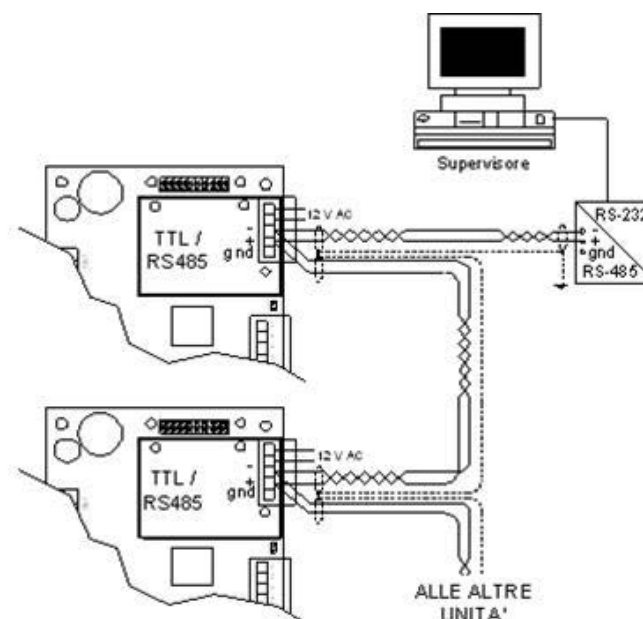
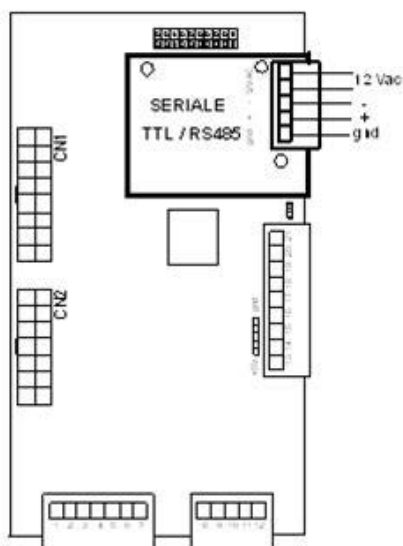
Motorised two-way valve at the exchanger outlet on the water side. The operation of the valve is linked to the operation of the refrigerant circuit, that is, when the compressor is off the valve is closed, and when the compressor is on the valve is open.

PMX - Phase monitor

The phase monitor allows to check the right presence of electric supply phases for 400/3/50 units.

CMMBX - Serial communication module to supervisor (MODBUS)

The serial communications module with supervisor (Modbus) provides the unit with an RS 485 outlet. This makes it possible to obtain remote service and supervision with standard Modbus protocol. Connection to a PC must be via an RS485/232 converter; the serial RS232 allows maximum length of 10 metres. The serial communication module (Modbus) is necessary if the unit is connected to ELFOCONTROL.



SCP3X - Set point compensation according to the outside enthalpy

It allows to modulate the unit set point according to the external enthalpy optimizing the unit energy efficiency. The humidity probe is electronically connected to the main control module present in the unit.



SPCX - Set point compensation with outside temperature probe

Set point compensation by air temperature probe varies the value of the set point according to the outside air temperature, allowing energy savings

The probe is connected to the principal unit control module and the connection cable length is of 20 metres.



PBLC1X - Service keypad (cable from 1,5 metres)

The service keyboard is necessary for the unit programming and setting. These operations must be done by qualified personnel without compromising the operation of the whole unit. The service keyboard is supplied with a connection cable of 1,5 m length.



KITERAX - Electronic wall-mounting room thermostat

Wall-mounted weekly electronic timer thermostat with summer, winter night adjustment. Range of adjustment +2°C/+35°C. Dimensions 123X88X23.



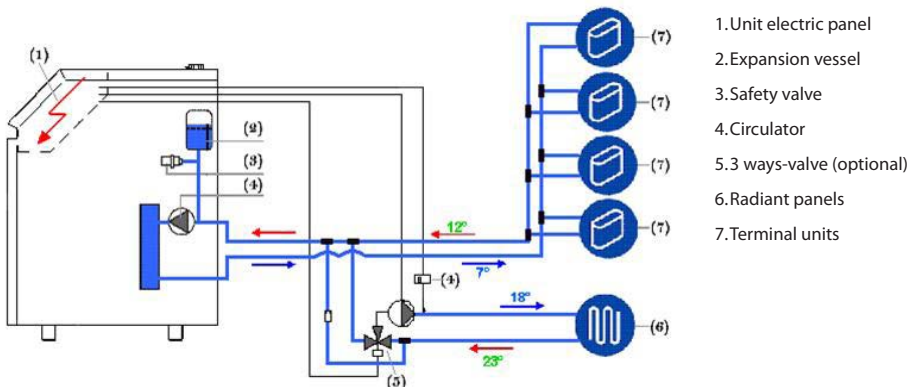
KDT3VX - Double temperature control kit, set point compensation with 4-20mA, 3 ways valve

It is an expansion card that is connected to the unit standard electronic system. It allows:

(1) Double temperature control kit

High and low temperature control for mixed systems underfloor piping - fan coil/radiators (these ones in heating only) thanks to the systems mixing valve, pump and outlet probe control. Thanks to parameters set on the electronics (set by the service keyboard) it is possible to set the climatic curve, that allows the outlet temperature decrease to the underfloor system according to the outdoor air temperature.

Humidity control and all additional regulations/controls are excluded from the Clivet supply.

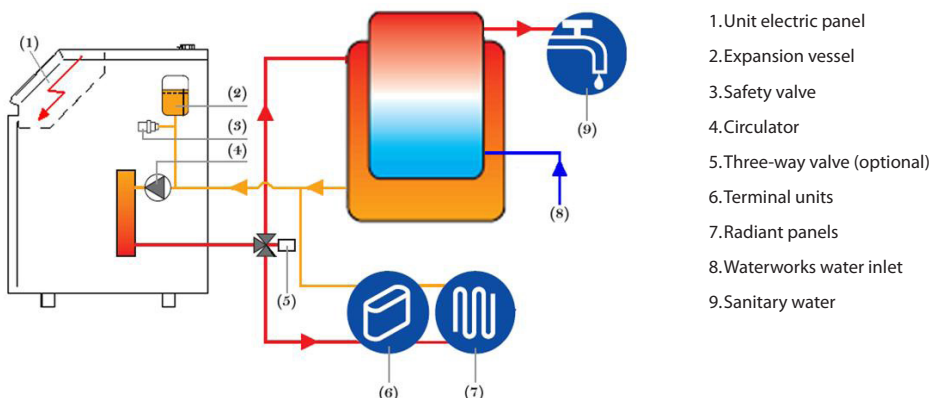


(2) Set point compensation with 4-20 mA signal

Dynamic set point variation on the basis of a WATER RESET signal (4-20 mA) from an external device.

(3) 3-way valve

On/off 3-way valve control for water flow-rate deviation to an heating storage tank of DHW. The 3-way valve is activated by closing the potential-free contacts present in the unit electrical panel. When this function is enabled, the unit set point is set on the value fixed by the parameter in the electronic control.



ACS500X - 500 litres sanitary hot water tank

Carbon steel storage tank, glass lining process in accordance with DIN 4753.3, external 50 mm rigid polyurethane insulation, 6 sq m exchange coil suitable for heat pumps (max. 25 kW), maximum working pressure 6 bar, equipped with anodic protection and 3 kW electric heater (single phase) with safety thermostat. Controller not included.

Suitable for sizes 18 - 81

Size of the 500-litre boiler: 750x1690mm

Control not included, see CACSX option



ACS300X - 300 litres sanitary hot water tank

Carbon steel storage tank, glass lining process in accordance with DIN 4753.3, external 50 mm rigid polyurethane insulation, 4 sq m exchange coil suitable for heat pumps (max. 10 kW), maximum operating pressure 6 bar, equipped with anodic protection and 2 kW electric heater (single phase) with safety thermostat. Controller not included.

Suitable for sizes 17 - 41.

Size of the 300-litre boiler: 600x1615mm.

Control not included, see CACSX option.

ACS5SX - 500 litres sanitary hot water tank with solar coil

Carbon steel storage tank, glass lining process in accordance with DIN 4753.3, external 50 mm rigid polyurethane insulation, upper 4,9 sq m exchange coil suitable for heat pumps (max. kW), lower 1,8 sq m exchange coil for thermal solar panels, maximum working pressure 6 bar, equipped with anodic protection and 3 kW electric heater (single phase) with safety thermostat. Controller not included.

Suitable for sizes 18 - 81.

Size of the 500-litre boiler: 750x1690mm.

Control not included, see CACSX option.



ACS3SX - 300 litres sanitary hot water tank with solar coil

Carbon steel storage tank, glass lining process in accordance with DIN 4753.3, external 50 mm rigid polyurethane insulation, upper 3,7 sq m exchange coil suitable for heat pumps (max. 10 kW), lower 1,2 sq m exchange coil for thermal solar panels, maximum operating pressure 6 bar, equipped with anodic protection and 2 kW electric heater (single phase) with safety thermostat.

Suitable for sizes 17 - 41.

Size of the 300-litre boiler: 600x1615mm.

Control not included, see CACSX option.

3DHWX - Three-way valve for domestic hot water

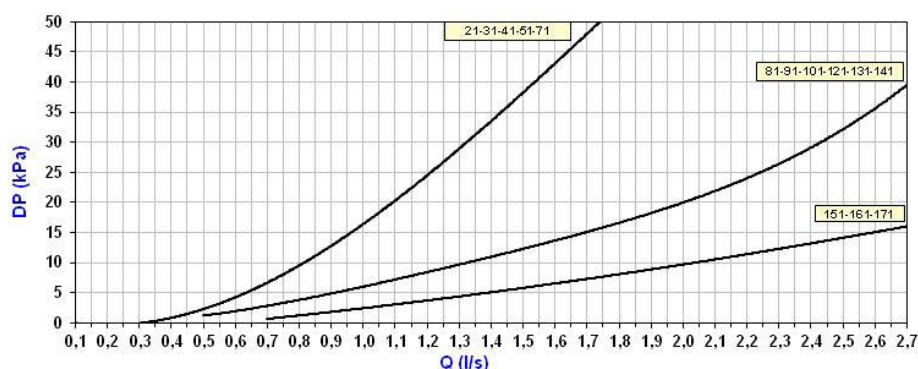
The 3-way switching valve for the deviation of the water flow to a DHW heating storage tank is separately supplied.

If the DHW temperature does not reach the set-point, the CACSX module sends a signal to the unit to produce domestic hot water.

The unit controller closes a digital output to control the flow diverter valve from the installation to the tank till the achievement of the DHW Set-point set in the CACSX module.

It is compulsory to control the 3-way valve to select the KDT3VX option in combination with this option.

3-way valve pressure drop



DP = Available pressure [kPa]
Q = Water flow-rate [l/s]

CACSX - Domestic hot water kit control (available only with options: CMMBX)

The module makes it possible to control the temperature of a domestic hot water tank.

The adjustment module comes with 2 temperature probes, 1 safety thermostat, power circuit and heating element control with protections against short circuits (the heating element is not provided by Clivet) and the installation box.

As opposed to the control of domestic hot water performed directly by the machine electronics, the kit makes it possible to set re-fill time periods and anti-legionella cycles, and to manage a re-circulation pump on the storage tank.

The storage tank must be suitably sized based on the combination with the selected heat pump.

To manage the domestic hot water it is necessary to select the CMMBX option in combination with this option.



KSAX - 100-litre circuit breaker

Storage tank Fe360b and anti-corrosion treatment with organic enamelling, external insulation with polyurethane and polyethylene mat, thickness 50 mm maximum of operation 6 bar.

Diameter 500 mm Height 900 mm 8 connections.

Available for all sizes.



KTFL1X - Water connection hoses with 1" connections

The kit is composed of: Two hoses, length 300 and diameter 1", required for connection of the unit to the system.

This kit can be used for heat pumps from 4 to 18kW.

Available for size 17 - 71.



KTFL2X - Water connection hoses with 1 1/4" connections

The kit is composed of: two hoses, length 300 and diameter 1 1/4", required for connection of the machine to the system. This kit can be used for heat pumps from 19 to 30kW.

Available for all sizes.



KVICX - Boiler control kit

The kit is composed of:

- Pair of two way motorized valves for boiler cut-off
- Pair of two way motorized valves for heat pump cut-off
- Valve control electrical junction box

It is advisable to use the KSAX hydraulic separator.



KVMSP1X - Radiant panels management kit with 1" connections

KVMSP2X - Kit for management of radiant panels with connections of 1 1/4"

KVMSP1X the kit is made up of:

- 1" Mixer valve with three-point modulating actuator
- Power box and modulating valve connection
- Temperature probe to be installed on the outlet of the radiator panels (l=20metres)
- Thermostat of maximum temperature 55°C
- Control for circulation pump to the radiator panel

Available for size 17 - 51.



KVMSP2X: the kit is made up of:

- 1 1/4" Mixer valve with three-point modulating actuator
- Power box and modulating valve connection
- Temperature probe to be installed on the outlet of the radiator panels (l=20metres)
- Thermostat of maximum temperature 55°C
- Control for circulation pump to the radiator panel

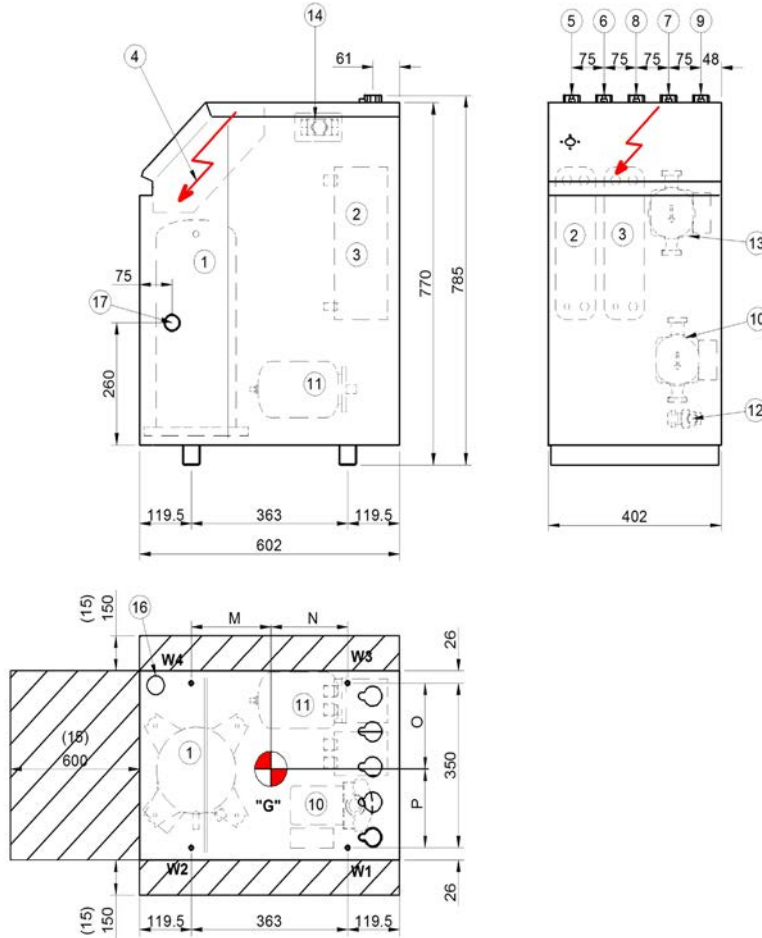
Available for all sizes.



AMRX - Rubber antivibration mounts

The rubber antivibration mounts reduce the vibrations of compressor during its operation and they are installed at the base toe.

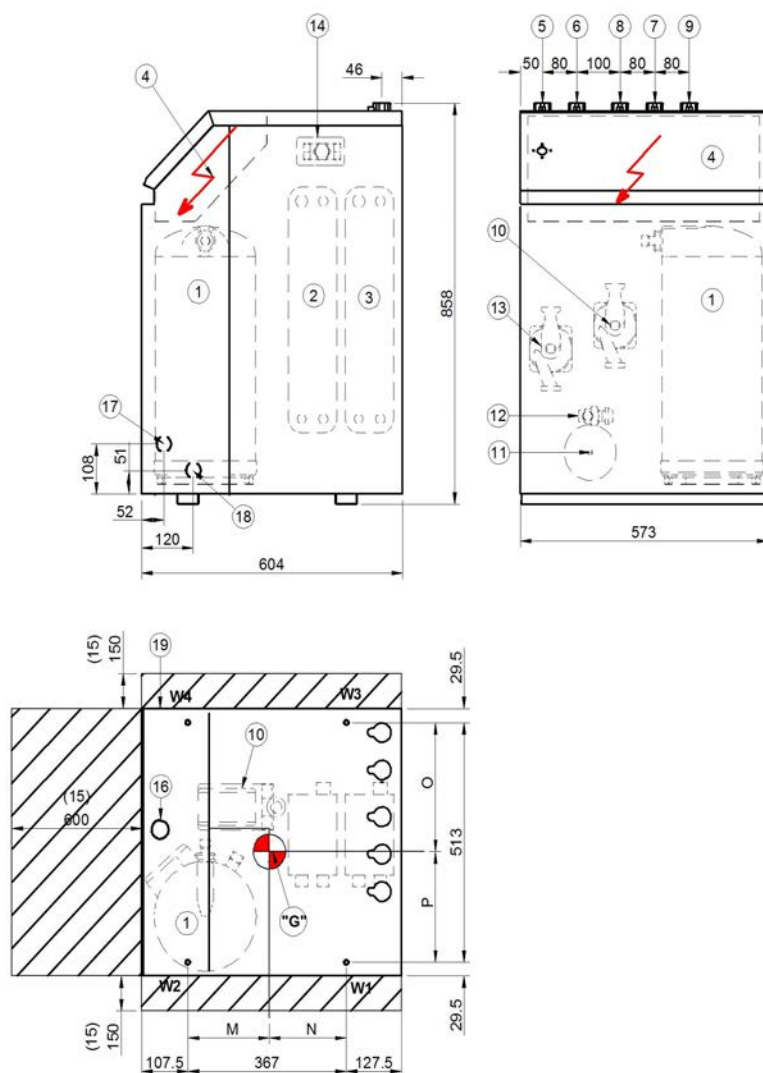
Dimensional drawings



1. Compressor
 2. Internal exchanger = exchanger user side
 3. External exchanger = source side exchanger
 4. Electrical panel
 5. Internal exchanger water inlet
 6. Internal exchanger water outlet
 7. External exchanger water inlet
 8. External exchanger water outlet
 9. Sanitary water outlet 1" F GAS (optional)
 10. User side pump (standard)
 11. Expansion vessel
 12. Water side safety valve
 13. Source side pump (optional)
 14. Three-way valve (optional)
 15. Clearance access recommended
 16. Power input
 17. 1/2" gas charge fitting
- G) Centre of gravity

Size			17	21	31	41	51
M		mm	193	190	195	193	176
N		mm	173	173	173	170	187
O		mm	169	170	172	168	171
P		mm	181	180	182	182	179
Length		mm	402	402	402	402	402
Depth		mm	602	602	602	602	602
Height		mm	785	785	785	785	785
W1		kg	22	21	24	25	26
W2		kg	16	19	17	17	21
W3		kg	24	22	26	27	27
W4		kg	18	20	19	19	22
Operating weight		kg	81	83	86	90	98
Shipping weight		kg	79	81	84	88	96

Dimensional drawings



1. Compressor
2. Internal exchanger = exchanger user side
3. External exchanger = source side exchanger
4. Electrical panel
5. Internal exchanger water inlet
6. Internal exchanger water outlet
7. External exchanger water inlet
8. External exchanger water outlet
9. Sanitary water outlet 1" F GAS (optional)
10. User side pump (standard)
11. Expansion vessel
12. Water side safety valve
13. Source side pump (optional)
14. Three-way valve (optional)
15. Clearance access recommended
16. Power input
17. 1/2" gas charge fitting (size 61-71-81-91)
18. 1/2" gas charge fitting

Size			61	71	81	91	101	121
M		mm	154	167	178	185	187	189
N		mm	213	200	191	182	180	178
O		mm	286	300	330	336	339	334
P		mm	227	213	186	177	174	179
Length		mm	573	573	573	573	573	573
Depth		mm	604	604	604	604	604	604
Height		mm	858	858	858	858	858	858
W1		kg	20	30	44	56	58	61
W2		kg	45	47	53	54	54	53
W3		kg	15	20	23	27	27	30
W4		kg	35	32	27	26	25	26
Operating weight		kg	115	129	147	163	164	170
Shipping weight		kg	112	126	143	159	160	166

**CLIVET SPA**

Via Camp Lonc 25, Z.I. Villapaiera - 32032 Feltre (BL) - Italy
Tel. + 39 0439 3131 - Fax + 39 0439 313300 - info@clivet.it

CLIVET GROUP UK Limited

4 Kingdom Close, Segensworth East - Fareham, Hampshire - PO15 5TJ - United Kingdom
Tel. + 44 (0) 1489 572238 - Fax + 44 (0) 1489 573033 - enquiries@clivetgroup.co.uk

CLIVET GROUP UK Limited (Operations)

Units F5&F6 Railway Triangle Ind Est, Walton Road - Portsmouth, Hampshire - PO6 1TG - United Kingdom
Tel. +44 (0) 2392 381235 - Fax. +44 (0) 2392 381243 - service@clivetgroup.co.uk

CLIVET ESPAÑA S.A.U.

C/ Bac de Roda, 36 - 08019 Barcelona - España
Tel: +34 93 8606248 - Fax +34 93 8855392 - info@clivet.es

Av.Manoteras Nº 38, Oficina C303 - 28050 Madrid - España
Tel. +34 91 6658280 - Fax +34 91 6657806 - info@clivet.es

CLIVET GmbH

Hummelsbütteler Steindamm 84, 22851 Norderstedt - Germany
Tel. + 49 (0) 40 32 59 57-0 - Fax + 49 (0) 40 32 59 57-194 - info.de@clivet.com

CLIVET RUSSIA

Elektrozavodskaya st. 24, office 509 - 107023, Moscow, Russia
Tel. + 74956462009 - Fax + 74956462009 - info.ru@clivet.com

CLIVET MIDEAST FZCO

Dubai Silicon Oasis (DSO), High Bay Complex, Office N. 20, PO BOX 342009, Dubai, UAE
Tel. + 9714 3208499 - Fax + 9714 3208216 - info@clivet.ae

CLIVET AIRCONDITIONING SYSTEMS PRIVATE LIMITED

501/502, Commercial-1, Kohinoor City, Old Premier Compound, Kirol Road, Off L B S Marg, Kurla West - Mumbai 400 070 - India
info.in@clivet.com

www.clivet.com
www.clivetlive.com

A Group Company of

