



Condenserless water chiller for  
outdoor or indoor installation .

# SPINChiller<sup>3</sup>

MSE-XSC3 90.4 - 160.4 RANGE

TECHNICAL BULLETIN



SIZE	90.4	100.4	110.4	120.4	140.4	160.4
COOLING CAPACITY kW	265	289	313	349	406	445

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# Features and benefits

## MSE-XSC3

The MSE-XSC3 units are liquid chillers with remote condensation.

Each unit is a real industrialized central cooling plant, able to provide liquid at a temperature controlled to use. It contains two refrigeration circuits with Multiscroll technology complete with electrical panel and microprocessor control. It can also contain the Hydropack pumping units, with on-off or inverter technology, and many other integrated features, including the free partial condensing heat recovery.

- ▶ Easy to use: the internal section includes all the main hydraulic components
- ▶ Double refrigeration circuit: high seasonal energy efficiency and high level of reliability
- ▶ Long life: all sensitive components are protected against the atmospheric agents
- ▶ Easy transport and positioning within new installations or for plant replacements

### Great Flexibility

MSE-XSC3 allows to reach a maximum equivalent length up to 50 meters with a maximum difference in height of +/-20 meters. This distance makes it possible to adapt to the most demanding architectural constraints. Moreover the unit can be installed in any position with any direction in any technical facilities. All it needs is 2,5 m2 surface area. The unit is also suitable for outdoor installation up to -10°C of external air temperature.

### Ideal for harsh climates

MSE-XSC3 is a condenserless liquid chiller, ideal solution for harsh climates. The connection with the remote condenser takes place through refrigeration lines. The whole hydraulic section instead is inside the technical facilities, away from frost and atmospheric agents, with the guarantee of operation even in the most extreme conditions.

### Easier maintenance

All the main functions are supplied by Clivet on board the units, already assembled and tested. The parts which are more vulnerable to wear and tear are housed in a soundproof protective compartment, thus extending their service life. The benefits of this are magnified if the unit is properly installed inside the building. This makes sense if you imagine how easily servicing can take place without having to worry about sheltering the parts, especially in places subject to extreme weather conditions.

### High efficiency all year round

MSE-XSC3 reduces yearly energy consumption thanks to its high part-load efficiency i.e., by far the most frequent condition throughout the system's life-cycle. To further increase energy efficiency in a system with several units operating on the same equipment, there is the innovative ECOSHARE feature, which automatically distributes the load and activates the necessary pumps.

### MultiScroll technology enhances part-load efficiency

Uses high efficiency Scroll compressors.

The advantages are:

- compressors manufactured in large ranges on an industrial scale with strict quality control inspections and maximum manufacturing reliability thanks to the high production volumes.
- every refrigeration circuit uses two Scroll compressors, depending on the different sizes of the unit. When two compressors are used, their sizes are different in order to obtain more control steps. This way, only the necessary energy is supplied.

The heat exchange surface is sized for full capacity operation. Under part load condition the compressors in operation make use of a much larger surface.

This entails a reduced condensation temperature and an increased evaporation temperature. This way, the compressor capacity consumption is reduced with respect to the yield thereby increasing the overall efficiency of the unit.

## Integrated microprocessor control

The sequential activation logics compressors allow:

- accurately following the load heating/cooling, supplying better comfort;
- reducing the number of compressor start-ups which is the main cause for wear and tear;
- extending the life-cycle of the components;
- **reducing time and costs for any repairs, thanks to the modularity of components.**

## Modularity

In the event of particularly large buildings requiring high capacities, it is advisable to use several units.

The units are designed to be connected in parallel in modular logic, thereby granting the following advantages:

- Increased flexibility, enhanced by the control that can adapt to the load
- Increased reliability, since the malfunction of one unit does not compromise the capacity supply of the other units.
- Increased efficiency, since energy is produced where and when required, according to the served area.
- The microprocessor control combined with ECOSHARE allows controlling up to 7 units in local network (1 Master unit and 6 Slave).

## Remote system management

- Standard volt-free contacts: remote on/off, compressor mode, refrigeration circuit enabled/disabled, set-point change and any remote alarms
- Communication protocols to BMS: Modbus, BACnet-IP, LonWorks

## Controlled power supply

Proper power supply ensures optimal unit operation and protects its many electrical components.

The phase monitor, standard supplied

- controls the presence and the exact sequence of the phases
- checks any voltage anomalies (-10%)
- automatically restarts the unit as soon as the proper power supply is restored.

The multifunction monitor, where limit values and the service schedule of Clivet's Technical Support can be modified.

## The built-in pumps are versatile, ready-for-use and reliable

The various solutions available are:

- HYDROPACK, the modular solution with two parallel pumps. Automatically reduces the water flow rate when in critical conditions, thereby preventing jams due to overloading, requiring the subsequent intervention of specialised technical personnel. It is very useful during start-ups, when restarting after operating breaks (e.g. at the weekend) or after a long period of inactivity.
- Inverter driven HYDROPACK allows water flow-rate-head calibration

Due to its modularity, HYDROPACK maintains good water flow in the system even in the event of one of the pumps being temporarily unavailable.

In fact, with a deactivated pump, the residual flow is: about 60% of the rated flow.

## Variable flow-rate advantages

Pumping energy for moving the water has an heavy impact on seasonal efficiency. The variable flow control is available for all units and drives to energy savings during partial load.

The control logic is based on keeping stable the water temperature entering and leaving difference, guaranteeing at the same time the best efficiency and a working envelope within an acceptable range for the heat exchanger (pressure losses).

The control logic applies to both flow-rate and compressor regulation thanks to steps. The possibility of independent pump management in case of failure is embedded in the unit keeping operative the system.

# Standard unit technical specifications

## Compressor

High efficiency hermetic orbiting scroll compressor complete with oil charge, motor over-temperature and over-current devices and protection against excessive gas discharge temperature with oil heater, which starts automatically, keeps the oil from being diluted by the refrigerant when the compressor stops. Compressors, fitted on rubber antivibration mounts to prevent transmission of noise and vibration, are connected in TANDEM on a single refrigerating circuit with biphasic oil equalisation, it allows to reach high efficiency at partial load. Uniform compression process with reduced number of moving parts which ensure very low levels of noise and vibration.

## Structure

Structure and base made entirely of sturdy sheet steel, thickness of 30/10 or 40/10, with the surface treatment in Zinc–Magnesium painted, for the parts in view, with polyester powder RAL 9001 that guarantees excellent mechanical characteristics and high corrosion strength over time.

## Panelling

External pre-painted zinc-magnesium paneling, thickness 15/10, with the surface treatment in Zinc–Magnesium painted with polyester powder RAL 9001 that ensures superior resistance to corrosion for outdoor installation and eliminates the need for periodical painting. The panels can be easily removed to fully access internal components and are lined with sound-proof material on the inside to contain the unit's sound levels.

## Internal exchanger

Direct expansion heat exchanger, braze-welded AISI 316 stainless steel plates, in pack without seals using copper as the brazing material, with low refrigerant charge and large exchange surface, complete with:

- external thermal insulation no-condensation, thickness 9,5 mm, in extruded elastomer foam with closed cells.
- differential pressure switch, water side
- antifreeze heater to protect the water side exchanger, preventing the formation of frost if the water temperature falls below a set value.
- Maximum operating pressure exchanger: 10 bar on the water side and 45 bar on the refrigerant side.

## Refrigeration circuit

Two independent refrigeration circuits, copper made and factory-assembled, welded with continuity metallic solution, completed with:

- replaceable antiacid dehydrator filter with solid cartridge;
- liquid flow and moisture indicator;
- electronic expansion valve;
- high pressure safety pressure switch;
- high pressure safety valve;
- low pressure safety valve;
- cutoff valve on liquid line;
- cutoff valve on compressor supply.
- thermal insulated of suction line with insulation material in highly flexible closed-cell elastomer based on EPDM rubber.

Each refrigeration circuit is pressure tested to check leaks.

## Electrical panel

Fully constructed and wired in accordance with EN 60204.

The capacity section includes:

- main door lock isolator switch;
- terminals main power (400V / 3Ph / 50Hz);
- isolating transformer for auxiliary circuit power supply (230V/24V);
- compressor circuit breaker;
- compressor control contactor.

The control section includes:

- interface terminal with graphic display;
- display of the set values, the error codes and the parameter index;
- ON/OFF and alarm reset buttons;
- proportional-integral-derivative water temperature control;

- daily, weekly programmer of temperature set-point and unit on/off;
- unit switching on management by local or remote (serial);
- antifreeze protection water side;
- compressor overload protection and timer;
- pre-alarm function for water antifreeze and high refrigerant gas pressure;
- self-diagnosis system with immediate display of the fault code;
- automatic rotation control for compressor starts;
- compressor operating hour display;
- remote ON/OFF control;
- relay for remote cumulative fault signal;
- input for demand limit (absorbed power limit according to an external 0÷10V signal);
- potential-free contacts for compressor status;
- digital input for double set-point enabling;
- electrical panel ventilation;
- multifunction phase monitor;

All device functions can be repeated with a normal portable PC connected to the unit with an Ethernet cable and equipped with an internet navigation browser. All electrical cables are colored and numbered in accordance with the wiring diagram

## Configurations

D - Partial energy recovery

B - Low water temperature

## Accessories - Hydronic assembly

- HYDROPACK (n.b.: other types are available by head)
- Inverter driven HYDROPACK
- Steel mesh mechanical strainer (accessory separately provided). Note: To be located at the exchanger inlet. We disclaim any liability and make the guarantee void, if an appropriate mechanical filter is not provided inside the system.

## Accessories

- High and low pressure gauges
- Cutoff valve on compressor supply and return
- Couple of manual shut-off valves (accessory provided separately)
- Electrical panel antifreeze protection
- Power factor correction capacitors (cosφ > 0.9)
- ECOSHARE function for the automatic management of a group of units
- Disposal for inrush current reduction (SOFT STARTER)
- Serial communication module for BACnet-IP supervisor
- Serial communication module for Modbus supervisor
- Serial communication module for LonWorks supervisor
- Remote control via microprocessor remote control (accessory separately supplied)
- Mains power supply unit (accessory separately supplied)
- Set-point compensation with 0-10 V signal
- Rubber antivibration mounts (supplied separately)
- Refrigerant leak detector with pump down function in the casing

## Test

Unit subjected to factory-tested in specific steps and test pressure of the piping of the refrigerant circuit (with nitrogen and hydrogen), before shipping them. After the approval, the moisture contents present in all circuits are analyzed, in order to ensure the respect of the limits set by the manufacturers of the different components.

**MSE-XSC3**      **100**   **.4**   **-**   **-**   **-**

|                    |                    |                    |                    |

**(1)**                    **(2)**   **(3)**   **(4)**   **(5)**   **(6)**

## (1) Range

MSE = Air-cooled liquid chiller  
XSC3 = SPINchiller<sup>3</sup>

## (2) Size

100 = Nominal compressor capacity (HP)

## (3) Compressor

4 = Compressor quantity

## (4) Condensation heat recovery

(-) recovery not required (standard)

D - Partial energy recovery

## (5) Low evaporator water temperature configuration

(-) Low water temperature: not required (standard)

B - Low water temperature, down to -8°C (Brine)

## (6) Pumping unit

(-) not required

2PM - Hydropack user side with no. 2 of pumps

2PMV- Hydropack user side with no. 2 of inverter pumps

## Unit equipment with outdoor air low temperatures

MINIMUM OUTDOOR AIR TEMPERATURE <sup>(1)</sup>		OPERATING UNIT <sup>(2)</sup>	UNIT IN STAND-BY <sup>(3)</sup> (fed unit)	UNIT IN STORAGE (unit not fed)
+11°C	1	✓ Standard unit	✓ Standard unit	✓ Standard unit
+2°C	2	✓ Standard unit	✓ Water empty unit or with glycol in an appropriate percentage ✓ Electrical panel antifreeze protection <sup>(4)</sup>	✓ Water empty unit or with glycol in an appropriate percentage
-7°C	3	✓ Glycol in an appropriate percentage ✓ Electrical panel antifreeze protection <sup>(4)</sup>		
-10°C	4	NOT POSSIBLE	✓ Water empty unit ✓ Electrical panel antifreeze protection <sup>(4)</sup>	NOT POSSIBLE

<sup>(1)</sup> In accordance with the site of installation or storage of the evaporating unit.

<sup>(2)</sup> Always respect the water output temperature and condensing temperature limits shown in the "Field of Use" chart for the unit.

<sup>(3)</sup> The water pumping unit must also be powered and connected to the unit as per the manual.





<sup>(4)</sup> Option available on request






Upon start-up of the unit, the temperature of the water or water with glycol must be within the operation range shown in the "Operating range" chart.

To determine the freeze point temperature of the water in accordance with the percentage of glycol, refer to the table "Correction Factors for Use with Glycol"

In outdoor air temperatures averaging less than -10° C, the unit can be stored for a maximum of 1 month.








# Built-in option

ACCESSORY		DESCRIPTION
MHP	High and low pressure gauges	It includes two liquid pressure gauges for the analog measurement of refrigerant pressures on suction and discharge lines of the compressors with pressure sockets installed in the unit in an easily accessible location. Device installed built-in the unit.
SDV	Cutoff valve on compressor supply and return	An option which integrates the supply cutoff valve, which is supplied as standard. The presence of the cock at the intake as well enables the compressors to be isolated and substituted without discharging the refrigerant from within the refrigeration circuit. This means that the extraordinary maintenance activities are facilitated. Device installed built-in the unit.
PFCP	Power-factor correction capacitors (cosfi > 0.9)	The component is necessary to lower the phase difference between current and voltage in the electromagnetic components of the unit (e.g. asynchronous motors). The component allows to put the cosfi power factor to values on average higher than 0.9, reducing the network reactive power. This often leads to an economic benefit which the energy provider grants to the final user. The device is installed and wired built-in the unit.
ECS	ECOSHARE function for the automatic management of a group of units	Device allows automatic management of units that operate on the same hydraulic circuit, by creating a local communication network. There are three control modes that can be set via a parameter during the units start-up. Two control modes distribute the heat load on the available units by following the distribution logic to benefit of efficiency levels at part load and one shift the supply water set-point temperature on the group of units.  Moreover: Mode 0 - shift the water set-point temperature and keeps all the pumps active; Mode 1 - distribute the heat load and keeps all the pumps active; Mode 2 - distribute the heat load and activates only the pumps of the unit required to operate.  The device allows for rotation based on the criterion of minimum wear and management of units in stand-by. In case of failure of one unit the load is distributed in the other units.  The units can be of various sizes but of the same type: all reversible heat pumps, or all air-cooled liquid chiller. The set of units is controlled by a Master unit. The local network can be extended up to 7 units (1 Master and 6 Slave).
		 The unit supplied with this device can also be equipped at the same time with the RCMRX option and one of the CMSC8 / CMSC9 / CMSC10 options.
SFSTR	Disposal for inrush current reduction	Electronic device which automatically starts up the compressors gradually, reducing the starting current for the unit by around 40% in comparison with the nominal value. This results in the reduction of the starting torque of the ON/OFF compressor, it is more protected from mechanical stresses leading to an increased life of the component. The noise is also reduced. Device installed and wired built-in the unit.
CMSC11	Serial communication module for BACnet-IP supervisor	Module allows the serial connection of the supervision system, using BACnet/IP as the communication protocol. It enables access to the complete list of operational variables, commands and alarms. Using this accessory every unit can dialogue with the main supervision systems. Device installed and wired built-in the unit.   The configuration and management activities for the BACnet networks are the responsibility of the client.   The total length of each serial line do not exceed 1000 meters and the line must be connected in bus typology (in/out)
CMSC9	Serial communication module for Modbus supervisor	Module allows the serial connection of the supervision system which uses the LonWorks communication protocol. It enables access to a list of operating variables, commands and alarms which comply with the Echelon® standard. Device installed and wired built-in the unit.   The total length of each serial line do not exceed 1000 meters and the line must be connected in bus typology (in/out)

ACCESSORY	DESCRIPTION
<b>CMSC10</b> <b>Serial communication module for LonWorks supervisor</b>	<p>Module allows the serial connection of the supervision system which uses the LonWorks communication protocol. It enables access to a list of operating variables, commands and alarms which comply with the Echelon® standard. Device installed and wired built-in the unit.</p> <p> The configuration and management activities for the LonWorks networks are the responsibility of the client.</p> <p> LonWorks technology uses the LonTalk® protocol for communicating between the network nodes. Contact the service supplier for further information.</p> <p> The total length of each serial line do not exceed 1000 meters and the line must be connected in bus typology (in/out)</p>
<b>SCP4</b> <b>Set-point compensation with 0-10 V signal</b>	<p>Device allows the changing of the preset set point by means to an external 0÷10 V signal. The interruption of the signal the set-point is at the nominal set value. The limit values can be changed within wide values. Device installed and wired built-in the unit.</p>
<b>IVFDT</b> <b>Inverter driven variable flow-rate user side control depending on the temperature differential (available only with option: 2PMV)</b>	<p>This option allows water flow-rate modulation to the unit during partial load conditions, maintaining stable the temperature difference between inlet and outlet to the heat exchanger. The option is available only when the unit thermoregulation is set on the return temperature. Designed for systems with primary circuit variable flow-rate systems decoupled from secondary circuit. With no building load the unit switches off the compressors while concerning pumps is possible to select:</p> <ul style="list-style-type: none"> <li>• Active pumps with minimum flow-rate, monitoring secondary circuit temperature variations</li> <li>• Pump switching off, periodically activating them (settable time) leading secondary circuit temperatures on primary circuit</li> <li>• Pump switching off and waiting for the user signal for activation (free potential)</li> </ul> <p>Flow-rate modulation is managed by embedded logic thanks to built-in flow-rate control device and temperature probes. This device is installed and wired.</p> <p> This option is available only with inverter driven HYDROPACK selected (2PMV)</p>
<b>CONTA2</b> <b>Energy meter</b>	<p>Allows to display and record the unit's main electrical parameters. The data can be displayed on the device display or via the supervisor through the specific protocol variables.. It is possible to control:</p> <ul style="list-style-type: none"> <li>- voltage (V),</li> <li>- absorbed current (A),</li> <li>- frequency (Hz),</li> <li>- cosφi,</li> <li>- power input (KW),</li> <li>- absorbed energy (KWh),</li> <li>- harmonic components (%).</li> </ul> <p>The device is installed and wired built-in the unit.</p> <p> On the device is present a serial port with Modbus protocol for the connection to the supervision system.</p>
<b>RPR</b> <b>Refrigerant drops detector</b>	<p>Leak detector device built-in installed it detects leaks of the internal refrigeration circuit</p>



# Accessories separately supplied

ACCESSORY	DESCRIPTION
IFWX	<b>Steel mesh strainer on the water side</b>
<p>The device stops the exchanger from being clogged by any impurities which are in the hydraulic circuit. The mechanical steel mesh strainer must be placed on the water input line. It can be easily dismantled for periodical maintenance and cleaning. It also includes:</p> <ul style="list-style-type: none"> <li>• cast-iron shut-off butterfly valve with quick connections and activation lever with a mechanical calibration lock;</li> <li>• quick connections with insulated casing.</li> </ul> <p> Installation provided by the the Costumer, externally to the unitr</p> <p> Check for the presence of the required hydraulic shut-off valves in the system, in order to undertake periodical maintenance</p>	
RCMRX	<b>Remote control via microprocessor remote control</b>
<p>This option allows to have full control over all the unit functions from a remote position. It can be easily installed on the wall and has the same aspect and functions of the user interface on the unit.</p> <p>The device must be installed on the wall with suitable plugs and connected to the unit (installation and wiring to be conducted by the Customer). Maximum remote control distance 350 m without auxiliary power supply. For distances greater than 350 m and in any case less than 700 m it is necessary to install the 'PSX - Mains power unit' accessory.</p> <p> Data and power supply serial connection cable n.1 twisted and shielded pair. Diameter of the individual conductor 0.8 mm.</p> <p> Installation provided by the the Costumer</p>	
PSX	<b>Mains power supply unit (available only with options: RCMRX)</b>
<p>The device allows the unit and the remote control to communicate with the user interface even when the serial line is longer than 350m. It must be connected to the serial line at a distance of 350m from the unit and allows to extend the length to 700m maximum in total. The device requires an external power supply at 230V AC.</p> <p> Power supply at 230V AC provided by Customer</p>	
AMRX	<b>Rubber antivibration mounts</b>
<p>The rubber antivibration mounts are attached in special housing on the support frame and serve to smooth the vibrations produced by the unit thus reducing the noise transmitted to the support structure.</p> <p> Installation provided by the the Costumer</p>	
CSVX	<b>Couple of manually operated shut-off valves</b>
<p>Kit composed of no. 2 cast-iron shut-off butterfly valves, it includes: fast fittings and activation lever with a mechanical calibration lock and no. 2 of Victaulic type quick connection with insulated casing to isolate the hydraulic circuit at the inlet and outlet.</p> <p> Installation provided by the the Costumer, externally to the unit</p>	

## performance

SIZE			90.4	100.4	110.4	120.4	140.4	160.4
► Coling capacity	(1)	[kW]	265	289	313	349	406	445
Compressor power input	(1)	[kW]	75,1	82,0	90,1	101	114	128
Total power input	(3)	[kW]	75,6	82,5	90,6	102	115	128
Partial recovery heating capacity	(2)	[kW]	66,7	72,1	79,9	89,4	103	114
EER	(1)	-	3,53	3,52	3,47	3,44	3,55	3,48
Water flow-rate (User Side)	(1)	[l/s]	12,7	13,8	15,0	16,7	19,4	21,2
Internal exchanger pressure drops	(1)	[kPa]	50	49	50	46	51	51

1. Data referred to the following conditions: internal exchanger water = 12/7 °C. condensing temperature 50 °C, equivalent length 5m, evaporator fouling factor =  $0.44 \times 10^{-4}$  m<sup>2</sup> K/W
2. Option. Recovery exchanger water=40/45°C
3. EER referred only to compressors

## contruction

SIZE			90.4	100.4	110.4	120.4	140.4	160.4
► Compressor								
Type of compressors	-		Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
Refrigerant	-		R-410A	R-410A	R-410A	R-410A	R-410A	R-410A
No. of compressors	Nr		4	4	4	4	4	4
Rated power (C1)	[HP]		45	50	55	60	70	80
Rated power (C2)	[HP]		45	50	55	60	70	80
Std Capacity control steps	-		6	6	6	4	6	4
Oil charge (C1)	[l]		10	11	13	13	13	13
Oil charge (C2)	[l]		10	11	13	13	13	13
► Refrigeration circuits	[Nr]		2	2	2	2	2	2
Internal exchanger								
Type of internal exchanger	1	-	PHE	PHE	PHE	PHE	PHE	PHE
Water content		[l]	20	22	24	29	32	37
► System water content	2	[l]	937	1196	1502	1819	1840	2367
Connections								
► Water fittings	-		4"	4"	4"	4"	4"	4"
► Power supply								
Standard power supply	[V]		430/3~/50	430/3~/50	430/3~/50	430/3~/50	430/3~/50	430/3~/50
Refrigerant connections								
► Gas line	4	[mm]	28	35	35	35	35	42
Liquid line	4	[mm]	35	35	35	35	42	42
Electrical data								
F.L.A. - Total		[kW]	106,5	117,4	127,0	144,6	165,8	187,0
F.L.I. - Total		[A]	180,6	191,9	208,7	237,5	266,5	295,5
M.I.C. - Value	3	[A]	431,0	442,3	459,1	487,9	586,4	615,4
M.I.C. - with soft start accessory	3	[A]	293,2	304,5	321,3	350,1	414,4	443,4

1. PHE = plate exchanger
2. Recommended system water content that does not consider the internal exchanger water content (evaporator). With outdoor air low temperature applications or low medium requested loads, the minimum installation water volume is obtained doubling the indicated value.
3. M.I.C.=Maximum unit starting current. The M.I.C. value is obtained adding the max. compressor starting current of the highest size to the power input at max. admissible

conditions (F.L.A.) of the remaining electric components. Electrical data refer to standard units; according to the installed accessories, the data can suffer some variations. Unbalance between phase max 2 %. Voltage variation: max +/- 10%.  
 4. Where not specified, the diameters of the supply and liquid lines are equal in both refrigeration circuits.

## sound levels

SIZE	SOUND POWER LEVEL Octave band (Hz)								SOUND POWER LEVEL	SOUND PRESSURE LEVEL
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
<b>90.4</b>	50	55	69	73	77	77	71	64	<b>82</b>	<b>64</b>
<b>100.4</b>	50	59	72	74	77	78	71	63	<b>82</b>	<b>64</b>
<b>110.4</b>	50	56	72	74	78	79	73	66	<b>83</b>	<b>65</b>
<b>120.4</b>	50	56	72	75	79	79	73	65	<b>84</b>	<b>66</b>
<b>140.4</b>	50	55	73	76	82	81	74	65	<b>86</b>	<b>68</b>
<b>160.4</b>	50	55	74	76	82	82	75	66	<b>86</b>	<b>68</b>

The sound pressure level refers to 1 m from the standard unit outer surface operating in open field and at full load. Measures are according to UNI EN ISO 9614-2 regulations.

Data referred to the following conditions.

- internal exchanger water = 12/7 °C
- Ambient temperature = 35 °C

# General technical data

## Admissible water flow-rates

Minimum (Qmin) and maximum (Qmax) admissible water flow for the unit to operate correctly.

SIZE		90.4	100.4	110.4	120.4	140.4	160.4
Qmin	[l/s]	6,7	7,4	8,0	9,3	10,1	11,5
Qmax	[l/s]	18,3	20,0	21,8	25,1	27,5	31,2

## Correction factors for glycol use

% ETHYLENE GLYCOL BY WEIGHT		5%	10%	15%	20%	25%	30%	35%	40%
Freezing temperature	°C	-2,0	-3,9	-6,5	-8,9	-11,8	-15,6	-19,0	-23,4
Safety temperature	°C	3,0	1,0	-1,0	-4,0	-6,0	-10,0	-14,0	-19,0
Cooling Capacity Factor	Nr	0,997	0,994	0,99	0,986	0,981	0,976	0,970	0,964
Compressor power input Factor	Nr	1,000	1,001	1,001	1,001	1,001	1,002	1,002	1,002
Internal exchanger glycol solution flow factor	Nr	1,003	1,010	1,020	1,033	1,05	1,072	1,095	1,124
Pressure drop Factor	Nr	0,989	0,983	0,979	0,980	0,984	0,993	1,004	1,020

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.

## Fouling Correction Factors

INTERNAL EXCHANGER (EVAPORATOR)		
m2 K/W	F1	FK1
0,44 x 10 (-4)	1,0	1,0
0,88 x 10 (-4)	0,97	0,99
1,76 x 10 (-4)	0,94	0,98

F1 = Cooling capacity correction factors

FK1 = Compressor power input correction factor

## Exchanger operating range

	DPr	DPw
<b>PED (CE) - Internal exchanger</b>	4500	1000
<b>PED (CE) - External exchanger</b>	4500	1000

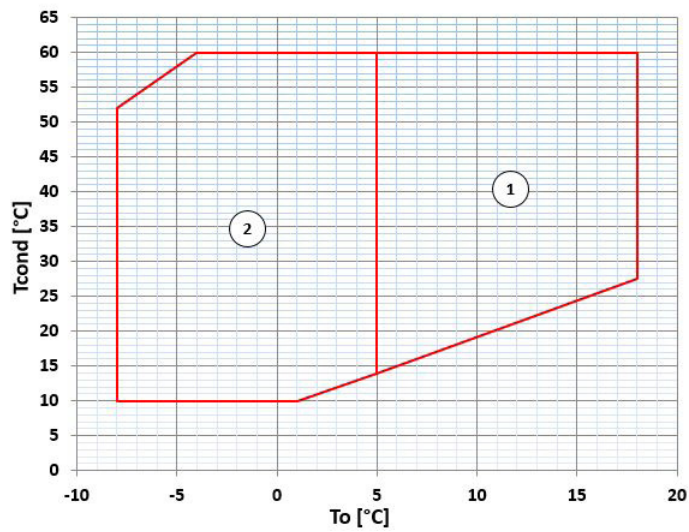
DPr = Maximum operating pressure on refrigerant side in kPa

DPw = Maximum operating pressure on water side in kPa

## Overload and control device calibrations

		OPEN	CLOSED	VALUE
High pressure safety pressure switch	[kPa]	4050	3300	-
Antifreeze protection	[°C]	3	5,5	-
High pressure safety valve	[kPa]	-	-	4500
Low pressure safety valve	[kPa]	-	-	2950
Max no. of compressor starts per hour	[n°]	-	-	10
High compressor discharge temperature safety thermostat	[°C]	-	-	140

## Operating range



$T_{cond}$  [°C] = condensing temperature with equivalent length equal to 5m and difference in level of 0m.  
 $T_o$  [°C] = internal exchanger outlet water temperature

1. Standard unit operating range.
2. Unit operating range in 'B - Low water temperature' configuration (40% ethylene glycol).

When choosing the remote condenser, take into account an adequate control system for the condensation that guarantees operation in any field of use.

# General technical data

## Cooling performance

SIZE	To (°C)	Condensing temperature									
		35		40		45		50		55	
		kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe
90.4	5	284	54,6	271	60,8	256	67,5	239	74,8	219	82,5
	6	295	54,6	281	60,8	267	67,6	250	74,9	231	82,7
	7	308	54,7	295	61,0	281	67,7	265	75,1	247	82,9
	10	344	55,2	330	61,3	313	67,9	293	74,9	268	82,4
	15	398	55,4	381	61,7	361	68,5	337	75,8	309	83,6
	18	445	55,5	427	61,8	406	68,8	381	76,3	351	84,4
100.4	5	308	59,8	293	66,4	277	73,8	259	81,9	238	90,7
	6	321	59,8	307	66,4	291	73,7	275	81,8	257	90,6
	7	334	59,9	320	66,5	305	73,9	289	82,0	271	90,8
	10	373	60,8	356	67,2	336	74,2	312	81,9	284	90,3
	15	436	61,6	417	67,9	396	74,9	371	82,8	342	91,4
	18	485	62,2	466	68,4	444	75,5	418	83,5	386	92,5
110.4	5	343	65,9	327	73,1	310	81,1	291	89,9	269	99,3
	6	357	66,1	342	73,3	325	81,3	306	90,1	285	99,6
	7	368	66,1	351	73,3	333	81,4	313	90,1	291	99,7
	10	415	66,8	397	73,8	376	81,5	350	89,9	319	99,1
	15	482	67,7	462	74,5	438	82,2	411	90,8	377	100,2
	18	555	63,8	535	69,7	513	76,5	488	84,4	457	93,3
120.4	5	384	73,8	367	82,0	348	91,1	328	101	305	112
	6	398	73,9	379	82,1	360	91,1	337	101	313	112
	7	411	74,1	392	82,2	371	91,3	349	101	324	112
	10	466	75,0	447	82,9	424	91,6	396	101	363	111
	15	540	76,0	517	83,8	491	92,6	459	102	420	113
	18	599	76,9	576	84,5	549	93,2	516	103	475	114
140.4	5	438	84,2	419	93,2	398	103	374	114	346	125
	6	453	84,5	433	93,5	411	103	386	114	357	126
	7	471	84,8	451	93,8	430	104	406	114	380	126
	10	526	86,4	503	95,0	475	104	442	115	401	126
	15	613	88,4	588	96,7	559	106	524	117	479	128
	18	679	90,0	651	98,0	617	107	574	118	520	129
160.4	5	489	94,4	468	104	445	115	418	127	387	140
	6	505	94,9	483	105	459	116	433	127	404	140
	7	523	95,4	500	105	474	116	445	128	412	141
	10	589	97,4	564	107	535	117	500	128	457	141
	15	684	100	657	109	626	119	588	131	541	143
	18	776	97,1	750	104	720	113	683	124	634	135

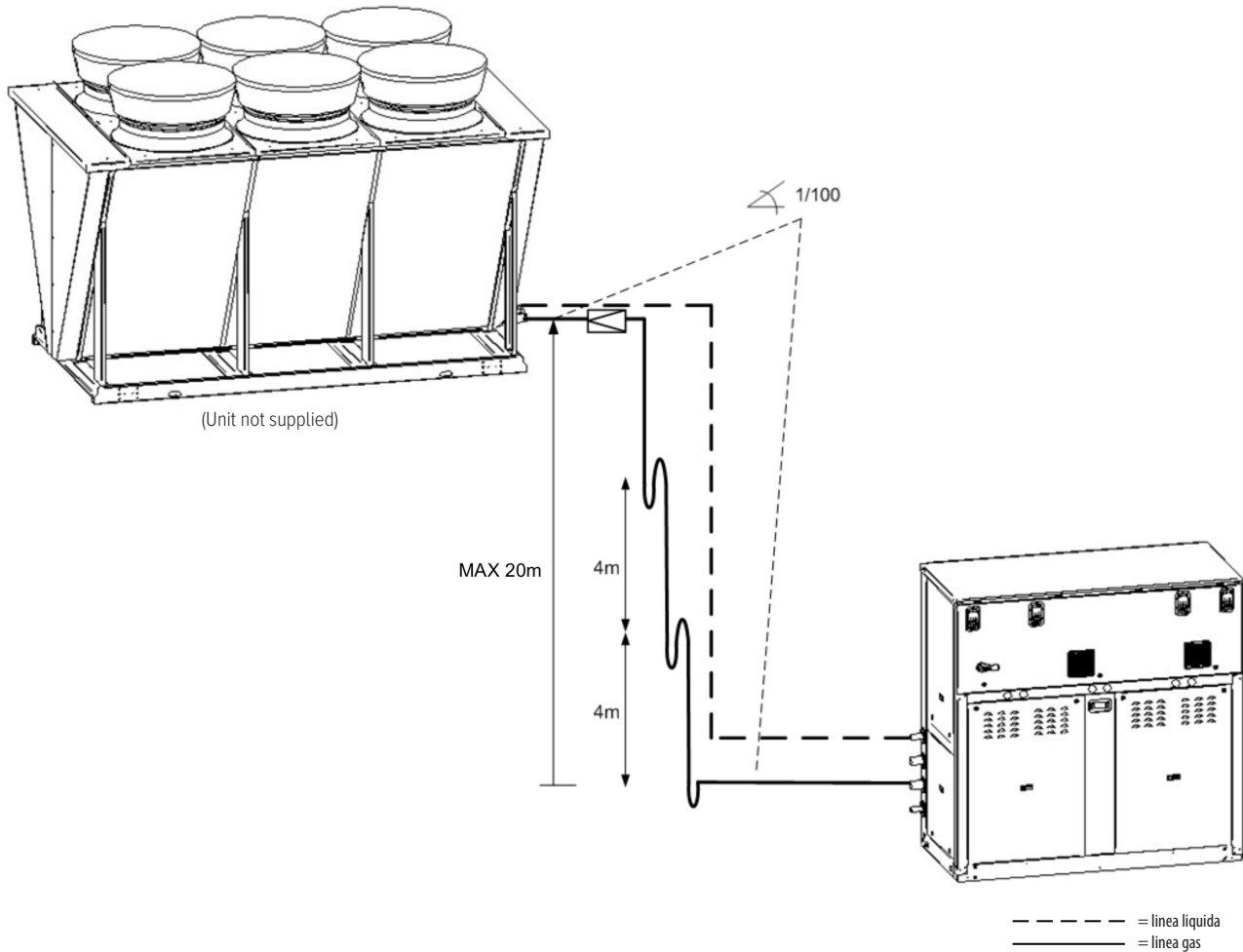
kWf = User side cooling capacity [kW]

kWe = Compressor power input [kW]

To = Leaving internal exchanger water temperature (°C)

## Maximum piping length and lift

	Total equivalent length (m)	Maximum height difference (m)
Water chiller is below remote condenser	50	+20
Water chiller is above remote condenser	50	-20










In the exemplifying connection diagram are represented only one supply piping (gas line) and one liquid piping. The number of lines must be doubled because the unit is equipped with a double refrigeration circuit.

- ⚠ Provide gradients in the horizontal sections (1/100). When the external unit is positioned higher than the internal unit provide siphons every 4 m in the vertical stretches.
- ⚠ It is recommended to add a supply non-return valve as in the figure, to avoid the liquid return to the compressor.
- ⚠ When the condenser is installed above the compressor the supply line must have a trap at the compressor level which drops to the floor. This will reduce the risk of condensed liquid refrigerant returning up the compressor line during shutdowns. In the vertical supply sections it is recommended to insert an oil collecting siphon to allow the oil to be drawn in the line, in addition to the pit at the base.
- ⚠ In the horizontal sections are recommended to create a slope towards the gas flow to facilitate the oil flow.

The equivalent length is the sum of the pipe effective length plus a length which is equal to the pressure drops distributed and concentrated. To determine the equivalent length refer to tables and data declared by the pipe supplier.

# Refrigerant connections

Table of located leaks

	Standard 90° bend	Wide radius 90° bend	Reduced radius 90° bend	Standard 45° bend	Reduced radius 45° bend	Standard 180° bend	Check valve
Diameter for pipe thickness							
mm	Equivalent length in m						
28x1,2	0,8	0,5	1,2	0,4	0,6	1,2	3,5
35x1,5	1,0	0,7	1,7	0,5	0,9	1,7	4,1
42x2,0	1,2	0,8	1,9	0,6	1,0	1,9	4,7
54x2,0	1,5	1,0	2,5	0,8	1,4	2,5	6,0

## Refrigerant charge unit

SIZE		90.4	100.4	110.4	120.4	140.4	160.4
C1	[kg]	6	6	6	6	6	9
C2	[kg]	6	6	6	6	6	8
C1+C2	[kg]	12	12	12	12	12	17

The unit is shipped charged with nitrogen, the indicated charge refers only to the evaporating unit including 5m equivalent of pipes and must be carried out during the start-up installation phase and is the Customer's responsibility.

## Additional refrigerant charge for various equivalent lengths

SIZE	CIRCUIT		Total equivalent lenght [m eq]					
			5	10	20	30	40	50
90.4	C1	[kg]	+0	+4	+12	+20	+28	+36
	C2	[kg]	+0	+4	+12	+20	+28	+36
100.4	C1	[kg]	+0	+4	+13	+21	+29	+38
	C2	[kg]	+0	+4	+13	+21	+29	+38
110.4	C1	[kg]	+0	+4	+13	+21	+29	+38
	C2	[kg]	+0	+4	+13	+21	+29	+38
120.4	C1	[kg]	+0	+4	+13	+21	+29	+38
	C2	[kg]	+0	+4	+13	+21	+29	+38
140.4	C1	[kg]	+0	+6	+17	+29	+40	+52
	C2	[kg]	+0	+6	+17	+29	+40	+52
160.4	C1	[kg]	+0	+6	+18	+29	+41	+53
	C2	[kg]	+0	+6	+18	+29	+41	+53

Additional indicative refrigerant charge for equivalent lengths greater than 5 metres.

Diameter of the Refrigerant line tubing equal to that of the inlet/outlet of the unit.

The final charge is to be the sum of the charge of the evaporating unit, the refrigerant piping and the condensate unit (being the responsibility of the Customer)..

The values shown in the tables are indicative and are to be evaluated throughout the installation phase.

## Notes - Warnings



The liquid and supply lines should be insulated to prevent heat exchanges that can compromise the correct refrigerating operation. The supply line must be properly insulated in case of possible contact with persons in order to avoid accidental burns.



The lack of insulation from vibrations could generate pipe breaks and refrigerant leaks.



The unit is shipped with nitrogen charge, the refrigerant charge has to be made during installation, at the start-up and is provided by the Customer.



The dimensioning of the connection refrigerant lines is very important for the proper operating and reliability of the system.



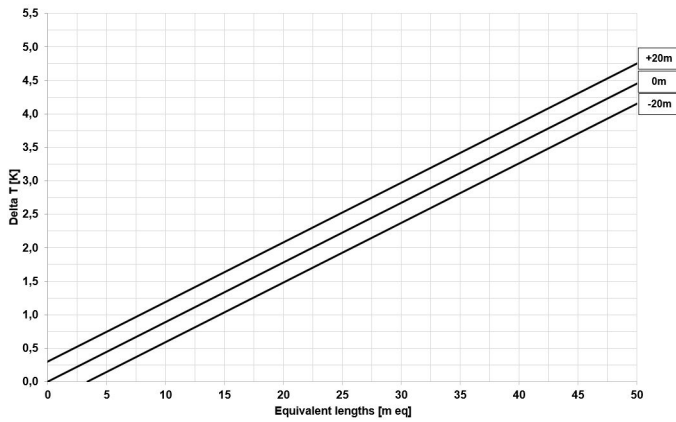
The connection must be made by a qualified refrigerator technician, respecting the local operations and good rules in force.



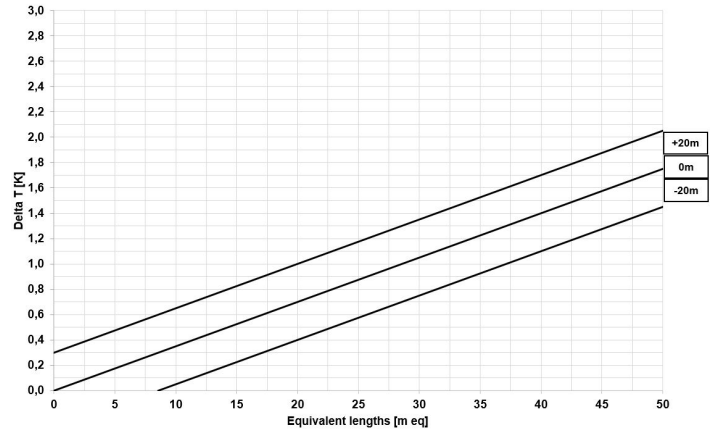
When laying the refrigeration lines, respecting the equivalent lengths declared in the documentation, the diameters to be used are respectively those of the inlet / outlet connections of the indoor unit.

## load loss in function of the equivalent length

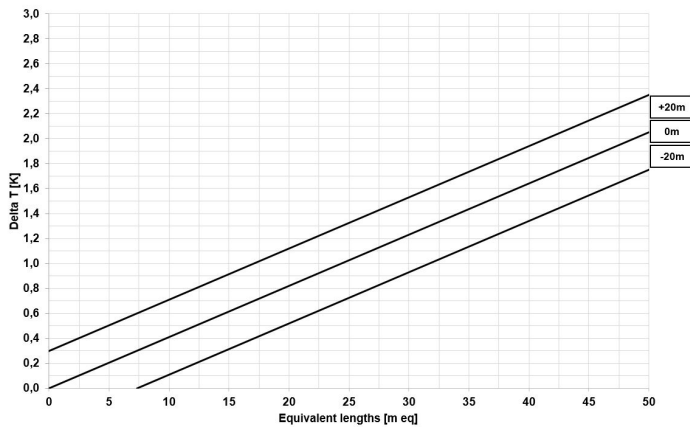
SIZE 90.4



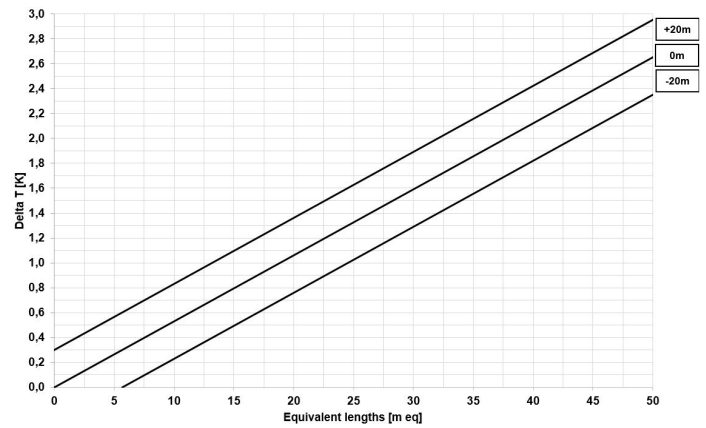
SIZE 100.4



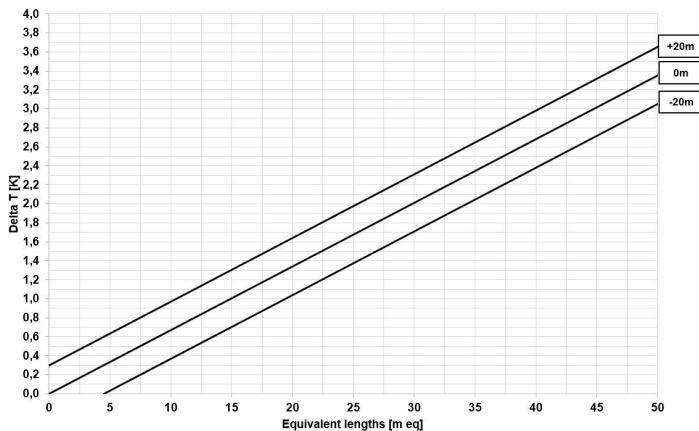
SIZE 110.4



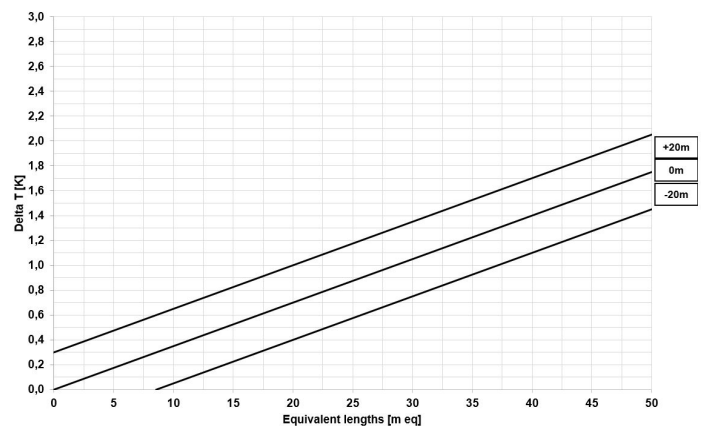
SIZE 120.4



SIZE 140.4



SIZE 160.4



**Delta T** = difference in temperature owing to load loss for the various equivalent lengths and height differences.

**Equivalent lengths** = sum of the actual length of the piping and the continuous and localised load loss of the refrigerant lines expressed in equivalent metres. For the calculation of the equivalent length, please refer to the tables or data declared by the tubing supplier.

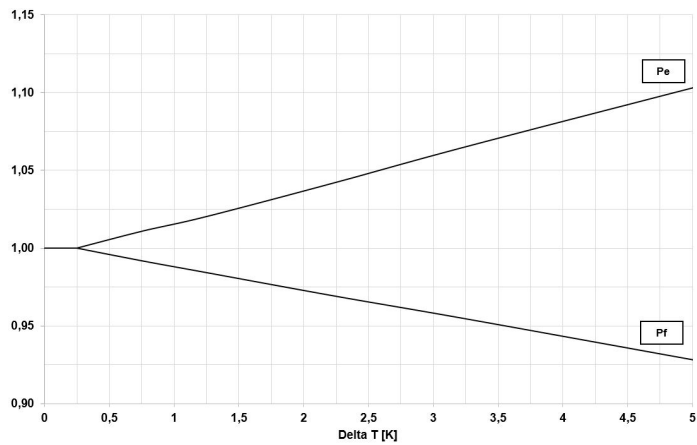
The curves of the graph refer to the various gradients between the unit and the remote condenser considered positive when the unit is under the condenser.

The Delta T value calculated should influence the power input and rendered by the unit, see the "Power Correction Factor" graph. There should also be a reduction in the "Fields of Use" influencing the condensing temperature.



# Refrigerant connections

## refrigerant piping performance correction factors



**$P_e$**  = curve of the correction factor of the electric load absorbed by the compressors due to the different  $\Delta T$  owing to the load losses of the refrigerant piping

**$P_f$**  = curve of the correction factor of the unit's cooling capacity due to the different  $\Delta T$  owing to the load losses of the refrigerant piping

**$\Delta T$**  = temperature difference due to the load losses defined by the graphs "Load Losses as a Function of Equivalent Length of the Refrigerant Piping"

## B - Low water temperature (Brine)

Configuration also known as "Brine". Enables an "unfreezable" solution to be cooled (for example, water and ethylene glycol in suitable quantities) up to a temperature of between +4°C and -8°C. It includes:

- suitable exchangers with extra-thick closed-cell insulation
- electronic expansion valve, functional calibration and safety devices suitable for particular uses.



During the selection phase it is necessary to indicate the required operating type, the unit will be optimised on the basis of this:

- Unit with single operating set-point (only at low temperature)
- Unit with double operating set-point



The unit in this configuration has a different operation range, indicated in the operating range section.



In low temperature operation, some staging steps could not be available.



The glycol concentration must be chosen based on the minimum temperature the water can reach. The presence of glycol influences pressure drops on the water side and the unit's output as indicated in the table reporting the "correction factors for use with glycol".

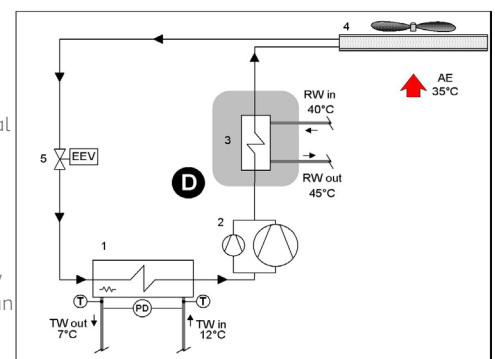
## D - Partial energy recovery

A configuration which enables the production of hot water free-of-charge while operating in the cooling mode, thanks to the partial recovery of condensation heat that would otherwise be disposed of into the external heat source.

This option is also known as "desuperheater". It is made up of a plate heat exchangers, suitable for recovering a part of the capacity dispersed by the unit (the dispersed heating capacity is equal to the sum of the cooling capacity and the electrical input capacity of the compressors).

The partial recovery device is considered to be operating when it is powered by the water flow which is to be heated. This condition improves the unit performance, since it reduces the condensation temperature: in nominal conditions the cooling capacity increases indicatively by 3.2% and the power input of the compressors is reduced by 3.6%.

When the temperature of the water to be heated is particularly low, it is opportune to insert a flow regulation valve in the hydraulic circuit, to maintain the recovery output temperature at higher than 35°C and thus avoid refrigerant condensation in the partial energy recovery device.



D - Partial recovery device

- 1 - Internal exchanger
- 2 - Compressors
- 3 - Recovery exchanger
- 4 - External exchanger
- 5 - Expansion electronic valve

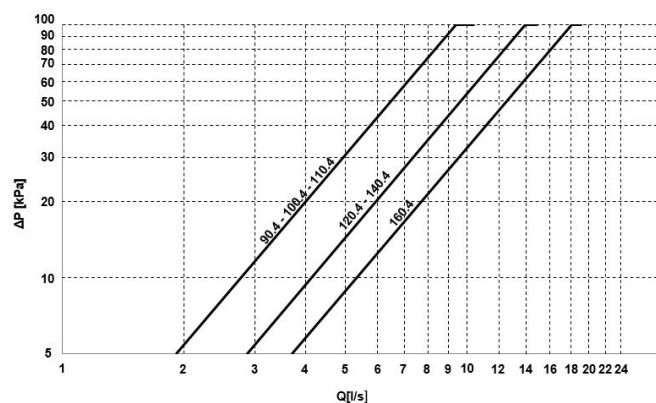
TW in chilled water inlet  
TW out chilled water outlet

RW in - Recovery water input  
RW out - Recovery water output

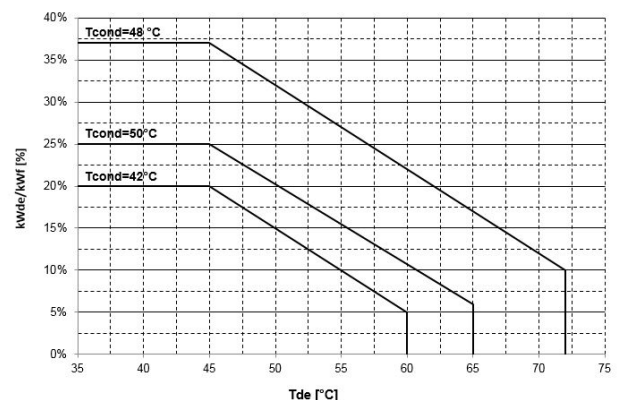
T - Temperature probe  
PD - Differential pressure switch  
AE Outdoor air

The power delivered by the partial recovery is 20% of the thermal power dissipation (cooling + electrical power absorbed by the compressors)

## Pressure drops of partial energy recovery exchanger



## Partial recovery heating capacity



Q = water flow-rate[l/s]  
DP = water side pressure drops (kPa)

kWde/kWf = Heat recovered/Cooling capacity [%]  
Tde = Heat recovering device outlet water temperature [°C]

# Hydronic assembly accessories

## 2PM - Hydronic assembly user side with 2 pumps

Option supplied on the unit. Pumping unit consisting of two parallel electric pumps with a self-adaptive modular activation logic. It enables the automatic reduction of the liquid flow rate in critical conditions, avoiding blocks due to overloading and consequential intervention work by specialised technical personnel.

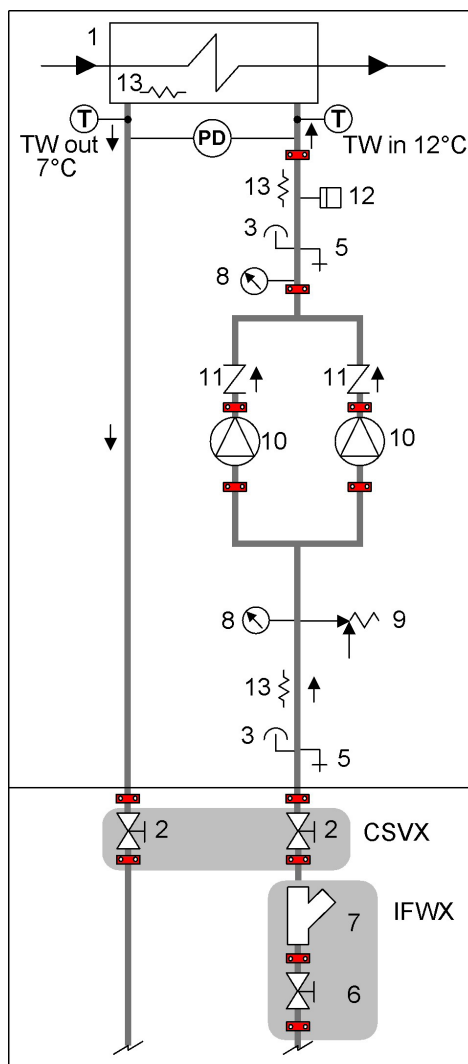
Centrifugal electric pump with impeller made with AISI 304 steel and AISI 304 stainless steel body or grey cast iron (depending on models).

Mechanical seal using ceramic, carbon and EPDM elastomer components.

Three-phase electric motor with IP44-protection. Complete with thermoformed insulated casing, quick connections with insulated casing, non return valve, safety valve, pressure gauges, system load safety pressure switch, stainless steel antifreeze immersion heaters located at the return and supply point.

The various models which are available can be differentiated by the system available pressure.

- ⚠ The 2PM option is supplied with a kit made up of 2 quick blind connections, for the removal of one pump in case of maintenance.
- ⚠ The installer have to provide hydraulic interceptions to the outside of the unit (option 'CSVX - A pair of manually operated shut-off valves') to facilitate any major maintenance operations



- 1 - Internal exchanger
- 2 - Cutoff valve
- 3 - Purge valve
- 5 - Drain cock
- 6 - Cutoff valve with quick joints
- 7 - Steel mesh strainer water side
- 8 - Manometer
- 9 - Safety valve (6 Bar)
- 10 - Packaged electric pump with high efficiency impeller
- 11 - Non return valve
- 12 - System safety pressure switch (prevents the pumps from operating if no water is present)
- 13 - Antifreeze heater

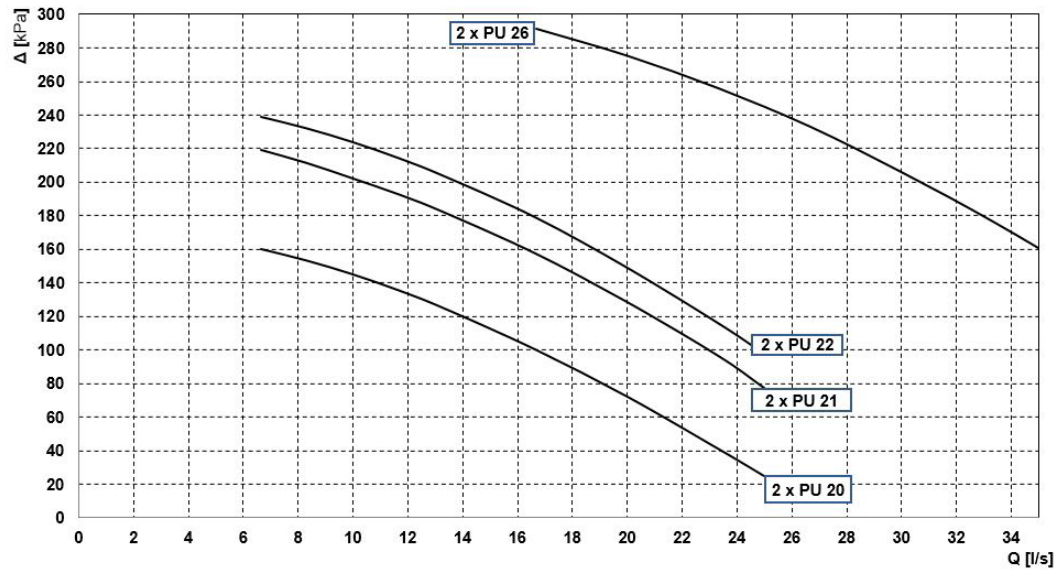
T - Temperature probe  
PD - Differential pressure switch

TW in chilled water inlet  
TW out chilled water outlet

IFWX = Steel mesh strainer water side  
CSVX - Couple of manual shut-off valves

**The grey area indicates further optional components.**

## Head



$Q$  [l/s] = water flow rate  
 $\Delta$  [kPa] = pump head



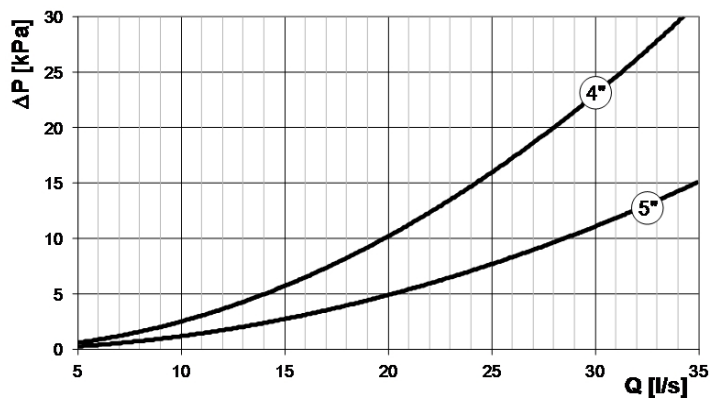
Caution: to obtain the available pressure values, you need to subtract the following from the head values represented in these diagrams:

- User side exchanger pressure drops
- IFVX accessory – Steel mesh filter on the water side (where applicable)

## Hydropack electrical data

PUMP	Nominal power [kW]	Nominal current [A]
2×PU20	2×1.8	2×3.4
2×PU21	2×2.9	2×4.8
2×PU22	2×3.3	2×5.6
2×PU26	2×5.5	2×10.4

## Steel mesh filter pressure drop



$Q$  = water flow rate (l/s)  
 $\Delta P$  = water side pressure drop (kPa)

# Hydronic assembly accessories

## 2PMV - Hydronic assembly user side with 2 inverter pumps

Option supplied on the unit. Pumping unit consisting of parallel electric pumps and controlled by inverter to adapt to the different application conditions. It enables the automatic reduction of the liquid flow rate in critical conditions, avoiding blocks due to overloading and consequential intervention work by specialised technical personnel.

Through the inverter calibration, standard supplied, it is possible to adapt the pump flow-rate/head to the installation feature.

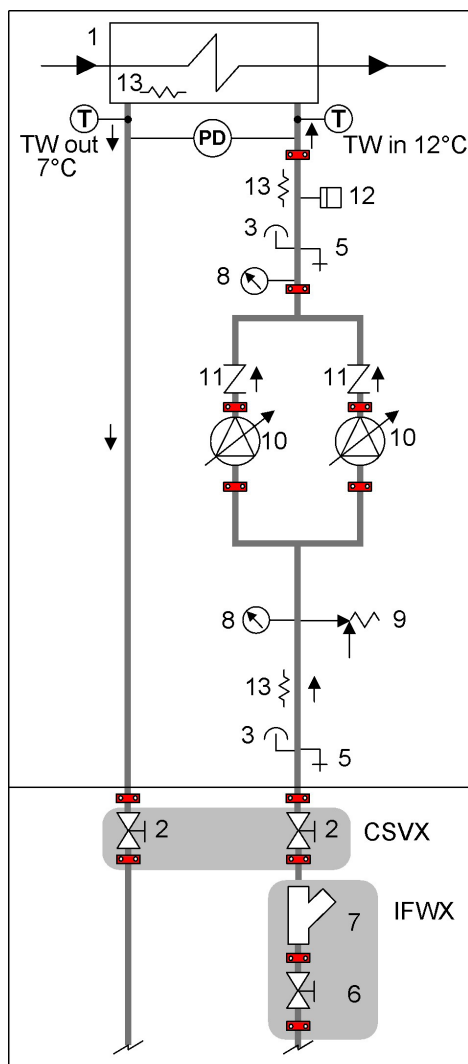
Centrifugal electric pump with impeller made with AISI 304 steel and AISI 304 stainless steel body or grey cast iron (depending on models).

Mechanical seal using ceramic, carbon and EPDM elastomer components.

Three-phase electric motor with IP44-protection. Complete with thermoformed insulated casing, quick connections with insulated casing, non return valve, safety valve, pressure gauges, system load safety pressure switch, stainless steel antifreeze immersion heaters located at the return and supply point.

In combination with the "IVFDT" - Variable flow-rate control option, it allows the water flow rate variation to the installation in part load operation to obtain the maximum unit efficiency and lower pumping unit consumption.

- ⚠ The 2PMV option is supplied with a kit made up of 2 quick blind connections, for the removal of one pump in case of maintenance.
- ⚠ The installer have to provide hydraulic interceptions to the outside of the unit (option 'CSVX - A pair of manually operated shut-off valves') to facilitate any major maintenance operations



- 1 - Internal exchanger
- 2 - Cutoff valve
- 3 - Purge valve
- 5 - Drain cock
- 6 - Cutoff valve with quick joints
- 7 - Steel mesh strainer water side
- 8 - Manometer
- 9 - Safety valve (6 Bar)
- 10 - Packaged electric pump with high efficiency impeller
- 11 - Non return valve
- 12 - System safety pressure switch (prevents the pumps from operating if no water is present)
- 13 - Antifreeze heater

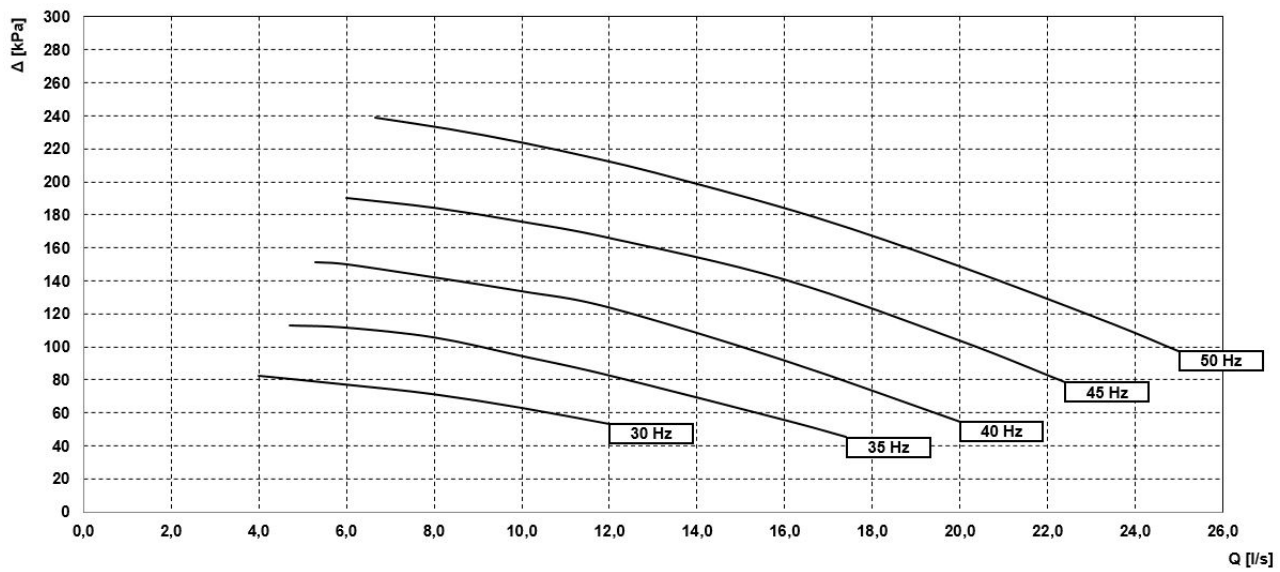
T - Temperature probe  
PD - Differential pressure switch

TW in chilled water inlet  
TW out chilled water outlet

IFWX = Steel mesh strainer water side  
CSVX - Couple of manual shut-off valves

**The grey area indicates further optional components.**

## Head - 2xPU22



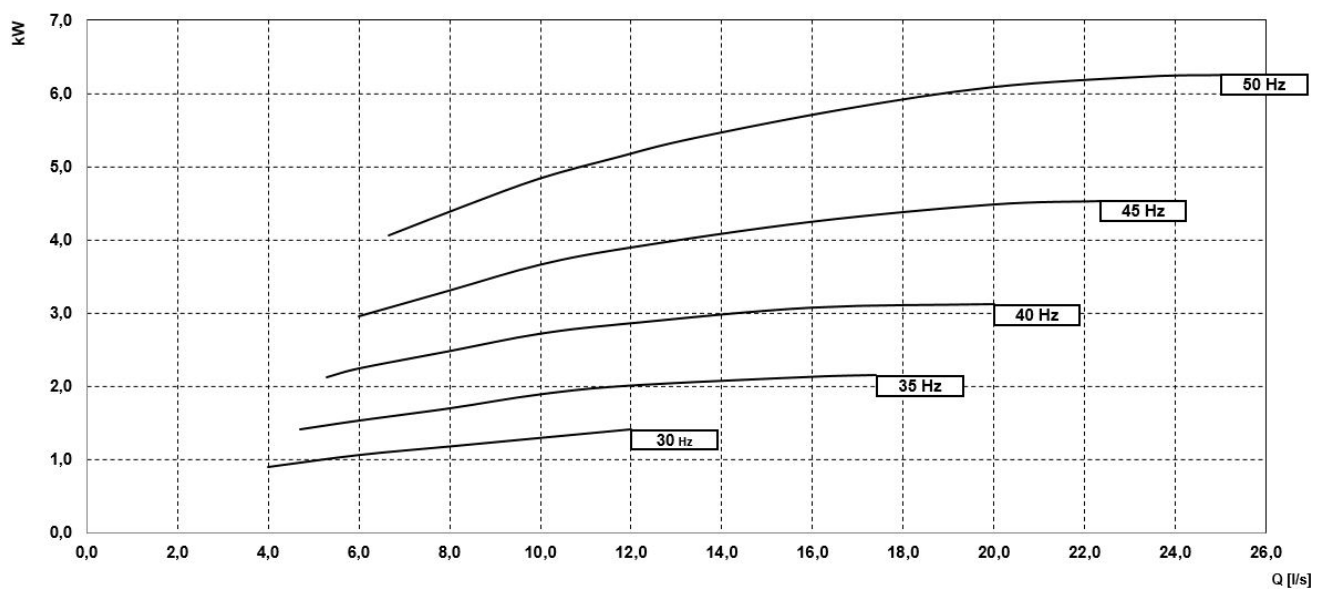
Q[l/s]= water flow rate  
 $\Delta$  [kPa] = pump head



Caution: to obtain the available pressure values, you need to subtract the following from the head values represented in these diagrams:

- User side exchanger pressure drops
- IFVX accessory –Steel mesh filter on the water side (where applicable)

## Power input - 2x PU22



Q[l/s]= water flow rate  
 kW = power input

# Option compatibility

## CONFIGURATIONS AND MAIN ACCESSORIES

REFERENCE	DESCRIPTION	90.4	100.4	110.4	120.4	140.4	160.4
<b>Configurations</b>							
B	Water low temperature	O	O	O	O	O	O
D	Partial energy recovery	O	O	O	O	O	O
B+D	Water low temperature + Partial energy recovery	O	O	O	O	O	O
<b>Built-in options</b>							
MHP	High and low pressure gauges	O	O	O	O	O	O
DV	Cutoff valve on compressor supply	S	S	S	S	S	S
SDV	Cutoff valve on compressor supply and return	O	O	O	O	O	O
CMSC10	Serial communication module for LonWorks supervisor	O	O	O	O	O	O
CMSC11	Serial communication module for BACnet-IP supervisor	O	O	O	O	O	O
CMSC9	Serial communication module for Modbus supervisor	O	O	O	O	O	O
CONTA2	Energy meter	O	O	O	O	O	O
ECS	ECOSHARE function for the automatic management of a group of units	O	O	O	O	O	O
RPR	Refrigerant drops detector	O	O	O	O	O	O
MF2	Multi-function phase monitor	S	S	S	S	S	S
SFSTR	Disposal for inrush current reduction	O	O	O	O	O	O
PFCP	Power factor correction capacitors (cosφ > 0,9)	O	O	O	O	O	O
SCP4	Set-point compensation with 0-10 V signal	O	O	O	O	O	O
<b>Accessories supplied separately</b>							
CSVX	Couple of manually operated shut-off valves	O	O	O	O	O	O
IFVX	Steel mesh strainer on the water side	O	O	O	O	O	O
RCMRX	Remote control via microprocessor control	O	O	O	O	O	O
PSX	Mains power supply (available only with options: RCMRX)	O	O	O	O	O	O
AMRX	Rubber antivibration mounts	O	O	O	O	O	O
<b>2PM - Hydropack user side with 2 pumps</b>							
PU20	Pump 20	O	O	O	O	X	X
PU21	Pump 21	O	O	O	O	O	O
PU22	Pump 22	O	O	O	O	O	O
PU26	Pump 26	X	X	X	X	O	O
<b>2PMV - Hydropack user side with no. 2 of inverter pumps</b>							
PU22	Pump 22	O	O	O	O	O	O
IVFDT	Inverter driven variable flow-rate user side control depending on the temperature differential (available only with options: 2PMV)	O	O	O	O	O	O

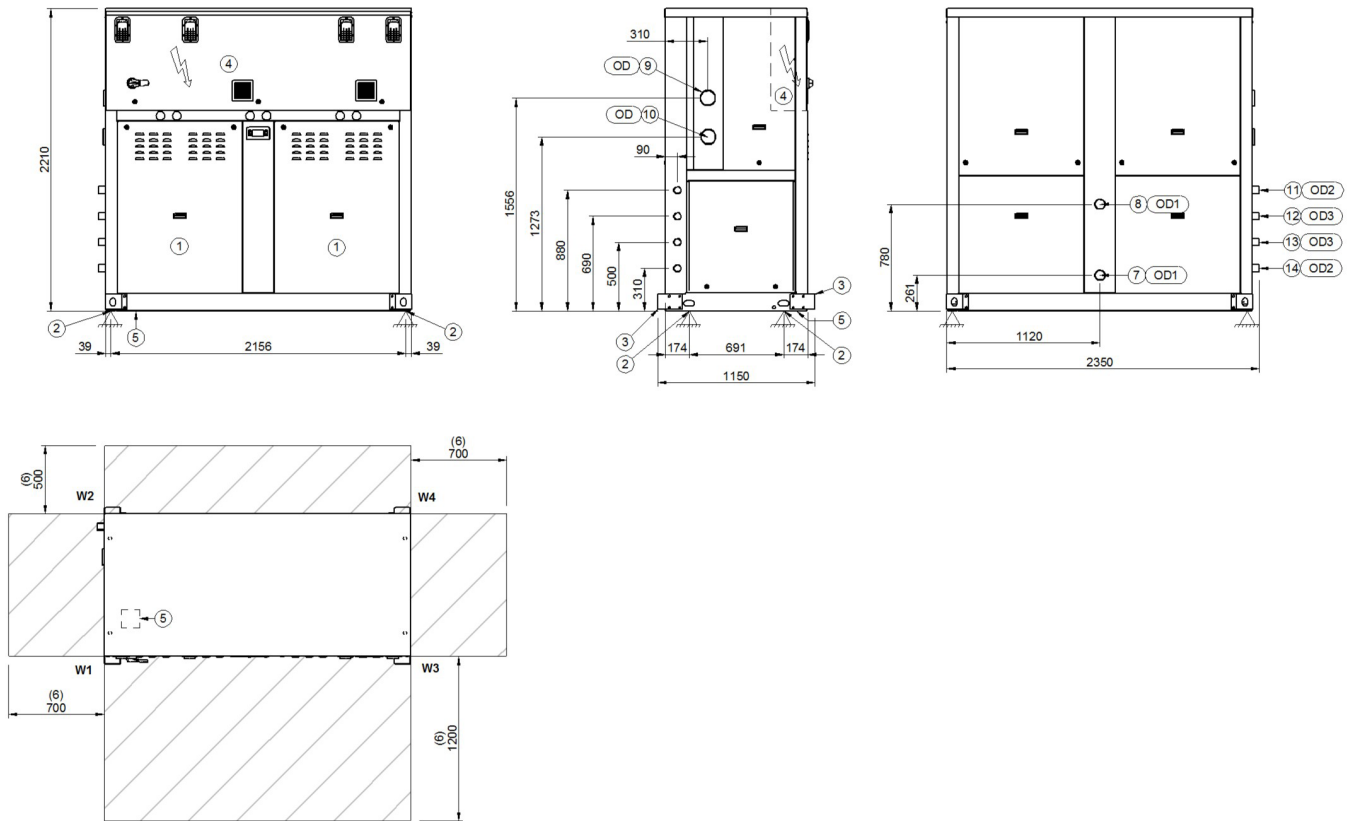
S Standard component

O Optional component

X Not available component

## Size 90.4 - 160.4

DAA5Y0001 REV00  
DATA/DATE 04/12/2019



- |  |  |
|--|--|
| 1. Compressors                           | 9. Water inlet user side without pumps / Water outlet user side with pumps (optional)  |
| 2. Unit fixing hole $\varnothing$ 15mm   | 10. Water inlet user side with pumps / Water outlet user side without pumps (optional) |
| 3. Lifting brackets (Removable)          | 11. Liquid line circuit 1  |
| 4. Electrical panel                      | 12. Gas line circuit 1   |
| 5. Power input                           | 13. Gas line circuit 2   |
| 6. Clearance access recommended          | 14. Liquid line circuit 2  |
| 7. Water inlet heat recovery (optional)  |  |
| 8. Water outlet heat recovery (optional) |  |

SIZE		90.4	100.4	110.4	120.4	140.4	160.4
OD (internal exchanger))	mm	114,3	114,3	114,3	114,3	114,3	114,3
OD1 (partial recovery)	mm	60,3	60,3	60,3	60,3	76,1	76,1
OD2 (liquid line)	mm	35	35	35	35	35	42
OD3 (gas line)	mm	28	35	35	35	42	42
W1 Support point	kg	399	453	471	486	498	509
W2 Support point	kg	303	336	348	359	369	379
W3 Support point	kg	421	470	486	502	517	530
W4 Support point	kg	324	352	363	375	389	400
Operation weight	kg	1447	1611	1668	1722	1773	1818
Shipping weight	kg	1385	1545	1595	1645	1685	1725



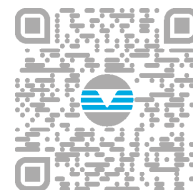
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