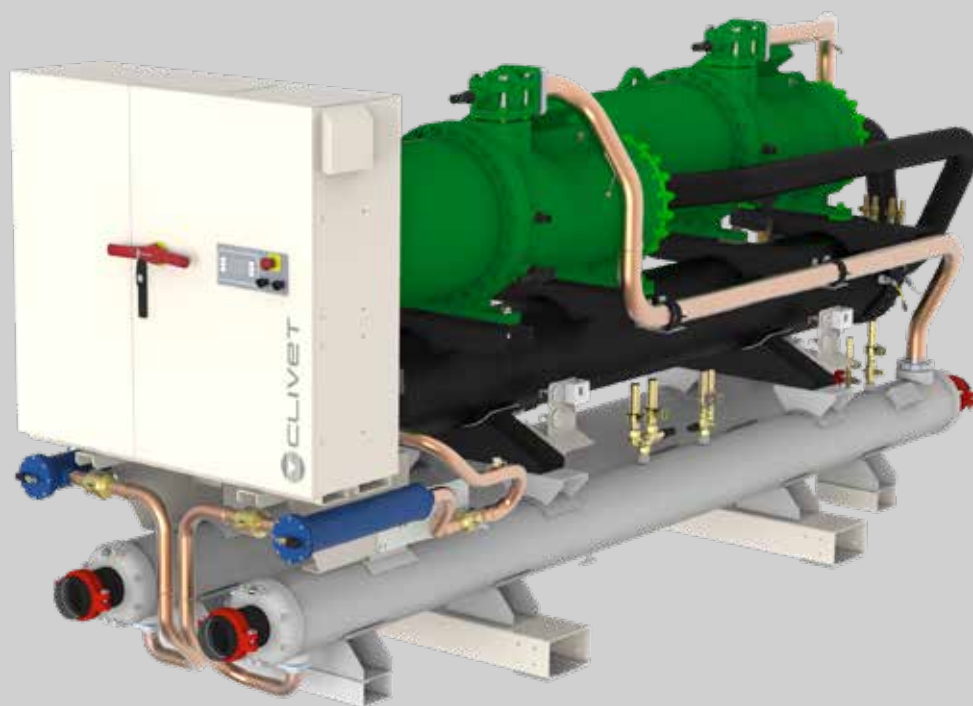


*Water-cooled liquid chillers
for indoor installation*

SCREWLine⁴ WDH-SB4 220.2-580.2 RANGE



TECHNICAL BULLETIN



SIZE	220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
COOLING CAPACITY KW	573	614	707	867	979	1125	1300	1370	1500

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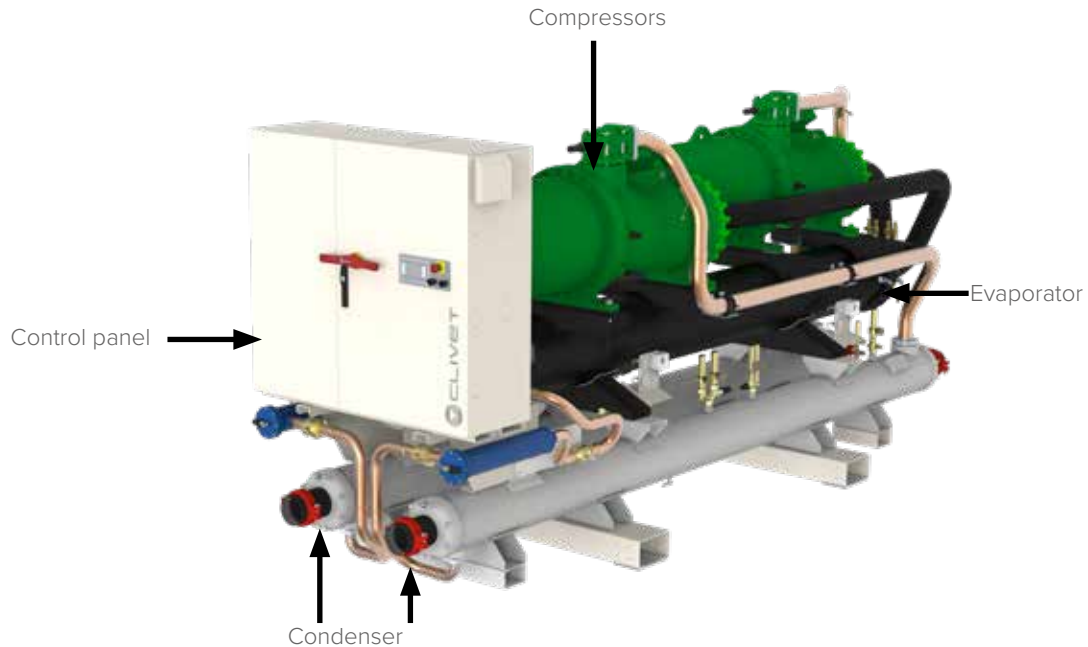
Clivet participates in the ECP Programme for "Liquid Chillers and Hydronic Heat Pumps".
Check ongoing validity of certificate on www.eurovent-certification.com"

Features and benefits

WDH-SB4:

Water-cooled liquid chillers for cooling tower and dry cooler applications, range 573-1500 kW

Indoor unit for the production of chilled water with semi-hermetic screw compressors optimized for working with low compression ratios, condenser and evaporator tube bundle, electronic expansion valve, R-134a refrigerant.



Energy efficiency

The WDH-SB4 series offers high-efficiency performance with both full and partial load, guaranteeing minimum operating costs and a quick return on investment:

- EER of up to 5,48
- SEER up to 6,53 which makes it compliant with Directive ERP 2021

Installation flexibility

Compact design that allows greater flexibility during installation both for new and existing systems and greater ease of handling and positioning in small spaces.

Adaptability

Maximum adaptability to the needs of the system:

- Minimum capacity modulation up to 25%
- Three versions available: cooling only operation, operation with water circuit change-over, heating only operation at high temperature
- Energy-saving solutions thanks to partial or total heat recovery
- Ideal for industrial applications, thanks to the production of chilled water up to -8°C (BRINE option)
- Extended operating range
- Two levels of silence: Standard and Super Silenced

Reliability

The WDH-SB4 series is made with:

- Two independent refrigerating circuits that guarantee continuous operation
- Double-screw compressors with long-life bearings, gradual star-delta or part-winding start-up, oil separator that guarantees correct lubrication in all operating conditions, non-return valve that prevents counter-rotation and wear of the screw
- Evaporator with double antifreeze protection: temperature probes and differential pressure switch

Compressor

Compact semi-hermetic compressor with double helical screw: the main rotor (male, with five lobes) is directly driven by the electric motor, while the secondary rotor (female, with six vanes) is driven by the primary rotor. Continuous modulation of the dispensed cooling capacity, with no-load start-up. Tightness is guaranteed by precisely fitting clearances in the mechanical processing of all moving parts and by a special system of oil circulation between the rotors. Spontaneous-circulation lubrication system through pressure difference, coupled with a high-efficiency separator, level indicator and oil filter (replaceable). Oil heater with electric element for preventing excessive dilution of the refrigerant, automatically inserted in all phases during which the compressor is turned off.

Three-phase asynchronous motor with two poles, cooled by the extracted gas, with star/delta reduced-load start-up. Integrated electronic protection module with discharge temperature safety sensor, maximum temperature sensors for windings, motor rotation sensor and phase monitoring device. Cut-off valve on refrigerant discharge line. Filter on suction line at compressor input point. Integrated silencer and non-return valve on compressor discharge outlet. Automatic safety valve inside compressor between high (HP) and low (LP) pressure areas.

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.

Evaporator

Direct expansion exchanger with refrigerant side independent circuit for each compressor. The exchanger is composed of a cover made of carbon steel. The tubes, anchored to the tube plate by mechanical expansion, are made of copper, high efficiency, internally rifled to improve thermal exchange and specially designed for use with modern ecological refrigerants. It also includes a water side protection differential switch, an anti-freeze heating element to protect against icing, and covering in closed-cell thermo-insulating material that prevents the formation of condensation and heat exchange with the exterior.

The water connections of the exchanger are quick-release with splined joint.

Condenser

Direct expansion shell and tube evaporator (refrigerant on jacket side and water inside pipes). Carbon-steel jacket with high-efficiency copper pipes fully threaded to optimise the exchange of heat and anchored mechanically to a pipe plate by mandrel, specially designed for use with modern environmentally friendly refrigerants. Removable heads to enable cleaning and maintenance on the exchanger. Max. exchanger operating pressure water side: 10 bar. Quick-fit plumbing connections with grooved joint.

Refrigeration circuit

Two independent refrigeration circuits made of copper, brazed and factory-assembled, complete with:

- anti-acid dehydrator filter with solid cartridge complete with quick-fit connector for refrigerant;
- high-pressure safety pressure switch;
- low pressure transducer;
- refrigerant temperature probe
- electronic expansion valve;
- high and low pressure gauges;
- high pressure safety valve (safety valve with sealed tap open for inspection);
- low pressure safety valve (safety valve with sealed tap open for inspection);
- liquid flow and humidity indicator;
- cut-off valve on compressor supply circuit;
- cut-off valve on liquid line.

Suction pipes thermally insulated with highly flexible EPDM rubber closed-cell elastomer insulation. Each cooling circuit is tested under pressure for leaks and is supplied complete with load of refrigerant gas.

Electrical panel

Entirely manufactured and wired in conformity to the EN 60204 standard. The power section includes:

- door locking main circuit breaker;
- main power supply terminals (400 V/3 Ph/50 Hz);
- insulation transformer for powering the auxiliary circuit (230 V/24 V);
- fuses and thermal relays for protecting the compressors;
- compressor control contactor;

The control section includes:

- interface terminal with graphic display;
- set values, error codes and parameters can be displayed;
- proportional-integral-derivative adjustment of water temperature;
- management of unit start-up from local or remote device;
- ON/OFF keys and alarm reset;
- daily, weekly temperature set point and start-up/shutdown scheduler;
- anti-freeze protection water side;
- compressor protection and timer;
- pre-alarm function for water anti-frost and refrigerant gas high pressure functions;
- self-diagnosis system with instant error code visualisation;
- control of compressor start-up automatic rotation;
- visualisation of no. of hours of compressor operation;
- remote ON/OFF control;
- remote relay to signal cumulative alarms;
- demand limit input (absorbed power limit depending on external signal 0÷10V or 4÷20 mA);
- potential-free contacts for compressor status;
- digital input to enable double set point;
- multifunctional phase monitor;
- refrigerant gas high pressure pre-alarm function (prevents automatic unit shutdown in many cases);
- remote HEAT/COOL command.

All device functions can be replicated with a normal laptop computer connected to the unit via an Ethernet cable and with a browser. All electrical cables are coloured and numbered according to the wiring diagram.

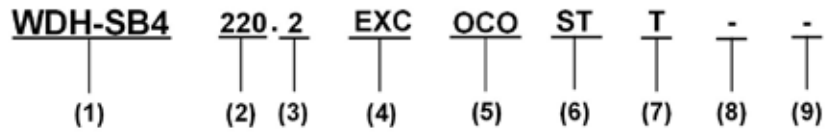
Accessories

- Rubber antivibration mounts (separately supplied accessories)
- Progressive compressor start-up device
- Compressor overload circuit breakers
- Power factor correction capacitors (cosφ > 0.9)
- Energy meter
- Set-point compensation with outdoor air temperature probe
- Set-point compensation with signal 0-10 V
- Set-point compensation with signal 4-20 mA
- BACnet-IP serial communication module
- LonWorks serial communication module
- Modbus serial communication module
- Remote microprocessor control unit (separately supplied accessories)
- Mains power supply unit (accessory separately supplied)
- ECOSHARE function
- Modulating valve source side (accessory separately supplied)
- Switching valve with dual safety valves
- Refrigerant leak detector
- High and low pressure gauges
- Steel mesh strainer

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.

Unit configuration



(1) Range

WDH = Water cooled liquid chiller with screw compressors
SB4 = SCREWLine⁴ Range

(2) Size

220 = Nominal compressor capacity (HP)

(3) Compressors

.2 = Compressors

(4) Energy version

EXC = EXCELLENCE version: high energy efficiency

(5) Operation

OCO = Cooling only operation (standard)
OHI = Operation with water circuit change-over
OHO = Heating only operation

(6) Acoustic configuration

ST = Standard acoustic configuration (standard)
EN = Super-silenced acoustic configuration

(7) Condenser

CO1OP = 1 pass condenser with opposit water connection
CO2P = 2 pass condenser

(8) Energy recovery

(-) = Energy recovery: not required (standard)
D = Partial energy recovery (6% off condensing heat)
R = Total energy recovery (100% off condensing heat)

(9) Low evaporator water temperature

(-) = Low water temperature: not required (standard)
B = Low water temperature, down to -8°C (Brine)

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 0.90, 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.

CMSC9 **Serial communication module for Modbus supervisor**
This enables the serial connection of the supervision system, using Modbus 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.
The device is 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)

CMSC10 **Serial communication module for LonWorks supervisor**
This enables 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.
The device is installed and wired built-in the unit.

- ⚠ The configuration and management activities for the LonWorks networks are the responsibility of the client.
- ⚠ LonWorks technology uses the LonTalk® protocol for communicating between the network nodes. Contact the service supplier for further information.
- ⚠ The total length of each serial line do not exceed 1000 meters and the line must be connected in bus typology (in/out)

CMSC11 **Serial communication module for BACnet-IP supervisor**
Allows the serial connection to supervision systems by using BACnet-IP as a communication protocol. It allows the access to the entire list of operating variables, controls and alarms. With this accessory every unit can communicate with the main supervision systems.
The device is 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)

ECS **ECOSHARE function for the automatic management of a group of units**
The device allows automatic management of units that operate on the same hydraulic circuit, by creating a local communication network.
There are two control modes that can be set via a parameter during the activation stage. They both distribute the heat load on the available units by following the distribution logic to benefit from efficiency levels at part load.
Moreover:
Mode 1 - it keeps all the pumps active
Mode 2 - it 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. There are various unit sizes. Every unit must be fitted with the ECOSHARE feature. 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 CMSC9 / CMSC10 / CMSC11 options.

CBS **Overload circuit brakers**
The magnetothermic circuit breakers are inserted instead of the fuses for the protection against the short circuit and overload. In case of intervention they do not have to be replaced, as it happens with fuses.

SFSTR2 **Progressive compressor start-up device**
This option is also called 'Soft starter'. Electronic device that automatically and gradually starts the compressors, thereby reducing the current peak generated in star-triangle start-ups and therefore reduces the mechanical stress on the motor and the electrodynamic stress on the power cables and on the mains.
The device is installed and wired built-in the unit.

⚠ Check availability and compatibility of 'SFSTR2 - Progressive compressor start-up device' with the other accessories in the "Option compatibility" table.

Built-in options

CONTA2

Energy meter

Allows to display and record the unit's main electrical parameters. The data can be displayed with the user interface on the unit or via the supervisor through the specific protocol variables.

It is possible to control:

- voltage (V),
- absorbed current (A),
- frequency (Hz),
- cosfi,
- power input (KW),
- absorbed energy (KWh),
- harmonic components (%).

The device is installed and wired built-in the unit.

 Only the following parameters are available on the LonWorks protocol: power input (kW) and absorbed energy (kWh).

SCP4

Set-point compensation with 0-10 V signal

This device enables the set-point to be varied which is pre-set using an external 0÷10 V signal.

The device is installed and wired built-in the unit.

SPC1

Set-point compensation with 4-20mA signal

This device enables the set-point to be varied which is pre-set using an external 4-20mA signal.


The device is installed and wired built-in the unit.

SPC2

Set-point compensation with outdoor air temperature probe

This device enables the set-point to be varied automatically which is pre-set depending on the outdoor air temperature. This device enables the liquid flow temperature to be obtained, which varies depending on external conditions, enabling energy savings throughout the entire system.

The device is installed and wired built-in the unit.

 The device includes a probe controlled remotely from outside to measure the outdoor air temperature. (Installation to be carried out by the customer). The connection cable length is 16 m.

RDVS

Switching valve with dual safety valves

Allows maintenance or replacement of the safety valve without draining the unit. Two pressure relief valves (each valve is sized according to 13136 clause 6.2) connected via a changeover valve are provided.

RPR

Refrigerant leak detector

Leak detector device built-in installed and placed inside the compressor box, it detects leaks of the internal refrigeration circuit.

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.

The accessory is built-in the unit.

IVMSX

Modulating valve source side

Recommended option in applications with disposable water with relatively low temperatures (well, groundwater, water mains). The two-way modulating motorised valve is located on the thermal source side and is controlled by the unit. It operates in conjunction with the refrigeration circuit: the modulation via the 0-10V signal - based on the pressure of the refrigerant in the exchanger on the source side - reduces water consumption and ensures the units stays in the expected operating range.

Unit in "OCO - Cold only" configuration

The kit includes two valves, one for each circuit.

The two-way valves are three-way type with a closed way.

They can also be used as three-way, by removing the cap closure

Unit in "OHI - Operation with water circuit change-over" configuration

The kit consists of a single valve managed by the unit according to the operating pressures of both circuits.

For sizes 220.2-240.2, three-way valves with one closed port are used, for the other sizes two-way valves are used.

The valves, if not supplied by CLIVET, must have a fast stroke actuator, with an actuation times of 35 sec.

- ⚠ Warning: to allow for correct opening and closure the differential pressure value must be at least 200 kPa.
- ⚠ Option to be installed outside the unit on the water outlet pipe on the source side. The Customer is responsible for conducting the hydraulic and electrical connection. The Customer is responsible for the 230V AC power supply.
- ⚠ Option not compatible with sea water. In these cases fit an intermediate exchanger outside the unit.

RCMRX

Remote control via microprocessor remote control

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.

- ⚠ 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.
- ⚠ 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.
- ⚠ Data and power supply serial connection cable n.1 twisted and shielded pair. Diameter of the individual conductor 0.8 mm.

PSX

Mains power supply unit

The device allows the unit and the remote control to communicate with the user interface even when the serial line is longer than 350 m.

It must be connected to the serial line at a distance of 350 m from the unit and allows to extend the length to 700 m maximum in total. The device requires an external power supply at 230V AC.

- ⚠ Power supply at 230V AC provided by Customer.
- ⚠ Installation is a responsibility of the Customer.

AMRX

Rubber antivibration mounts

Mat in thermoplastic elastomer composed of 4 inner layers. Hardness 45 ShA, thickness 37.5 mm.

Thermoplastic Elastomer is ideal for temperature range -45° C to 110° C.

It has a high resistance to aging, pollutants, hydrocarbons, saline mists, UV rays and detergents and is composed of recyclable material.

High degree of thermal and electrical insulation.

IFWX

Steel mesh strainer on the water side

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:

- cast-iron shut-off butterfly valve with quick connections and activation lever with a mechanical calibration lock;
- quick connections with insulated casing.

- ⚠ Installation is the responsibility of the Client, externally to the unit.
- ⚠ Check for the presence of the required hydraulic shut-off valves in the system, in order to undertake periodical maintenance.

Configurations

OCO - Cooling only operation (Standard)

Configuration that allows the water - water unit to operate with the thermoregulation active when chilled water is produced at a controlled temperature.

OHO - Heating only operation

Configuration that allows operation as water-water heat pump to produce hot water for civil and industrial use.

OHI - Operation with water circuit change-over

Configuration that allows operation as water-water heat pump to produce hot water for civil and industrial use.

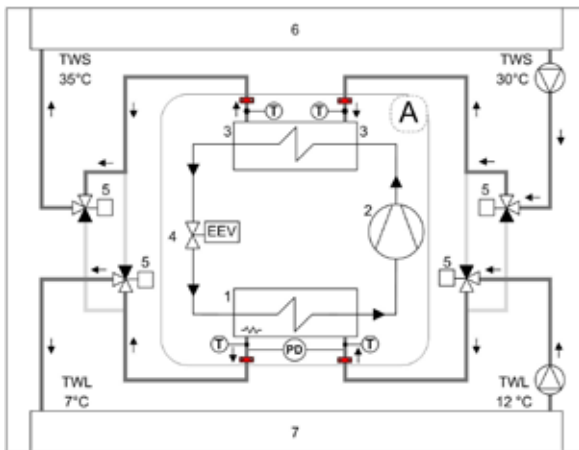
It consists of:

- suitable exchangers with extra-thick closed-cell insulation
- temperature probes at the exchanger's water inlet and outlet.

The system must be fitted with switching valves. The hydraulic switching must be carried out when the unit's operating mode is changed. In summer operation mode, the unit automatically controls the evaporation temperature based on the selected set-point value. Likewise, in winter operation mode, the unit automatically adjusts the condensation temperature based on the selected set-point value and checks the temperature on the evaporator to prevent the water from freezing.

- ⚠ The Customer is responsible for installing and managing the hydraulic switching valve
- ⚠ The Customer can change the operating mode using the interface on board the machine or the designated potential-free contact.
- ⚠ Possible non-freeze solutions must be fitted both on the utilisation circuit and the source circuit, as hydraulic switching involves mixing fluids.
- ⚠ During operation with Dry coolers or Evaporative towers, the temperatures of the fluid on the source side need to be always positive as there is no defrosting function.
- ⚠ The device includes two temperature probes to be positioned at the input and output of the connection manifold between the two condensers. The manifolds and the probe installation are provided by the Customer. The connection cable length is 3m.

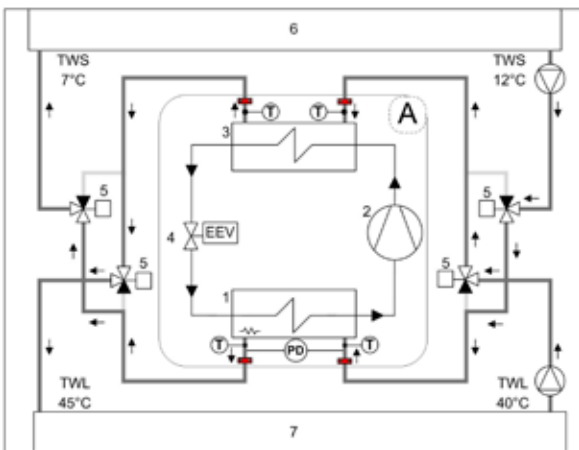
Operation mode: cooling



1. Evaporator
2. Compressor
3. Condenser
4. Electronic expansion valve
5. Switching valves (provided by Customer)
6. Thermal source (heat rejection)
7. Use (cold)

T - Water temperature probe
 PD - Differential pressure switch
 TWS - Water source side
 TWL - Water user side

Operation mode: heating



1. Evaporator
2. Compressor
3. Condenser
4. Electronic expansion valve
5. Switching valves (provided by Customer)
6. Thermal source (heat rejection)
7. Use (cold)

T - Water temperature probe
 PD - Differential pressure switch
 TWS - Water source side
 TWL - Water user side

EN - Super-silenced acoustic configuration

Configuration used to increase the unit's silent operation by acting on the source of the noise. It consists of suitable steel casings lined with high-density material designed to provide sound insulation. Equipped with sound-proof cover coating which envelop the compressors.

⚠ To assess the quality of the soundproofing benefit, refer to the 'Sound levels' tables.

B - Water low 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 operating field, which was reported in the previous pages.
- ⚠ 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".

Correction factor for water low temperature

Evaporator outlet water temperature factor	2	0	-2	-4
Cooling capacity factor	0.860	0.803	0.749	0.691
Compressor power input factor	0.896	0.878	0.859	0.840

⚠ The correction coefficients must be applied to condition: internal exchanger water (evaporator) = 12 / 7 °C.

CO1OP - 1 pass condenser with opposit water connection

This is the configuration in which the unit is sized to operate with a rated temperature differential of 5°C on the source side exchanger (condenser) and therefore, with water flow-rates typical of cooling towers and evaporative coolers.

⚠ In 'OHI - Operation with reversability on the water circuit' mode and source water temperature relatively low provide the 'IVMSX - Modulating valve source side' accessory.

CO2P - 2 pass condenser

This is the configuration in which the unit is sized to operate with an high temperature differential (usually DT = 15°C) on the source side exchanger (condenser) and therefore, with reduced water flow-rates typical of the disposable water applications (well, ground water or water mains). It consists of a source side exchanger where the water passes through a number of times before being released to the source.

- ⚠ Option not compatible with 'OHI - Operation with water circuit change-over'.
- ⚠ In the 'OHI = Operation with water circuit change-over' mode and relatively low source water temperatures (well, groundwater, water mains), configure the unit with the 'IVMSX - Source side modulating valve' accessory together with the standard configuration, "CO1OP - 1 pass condenser with opposit water connection".

Configurations

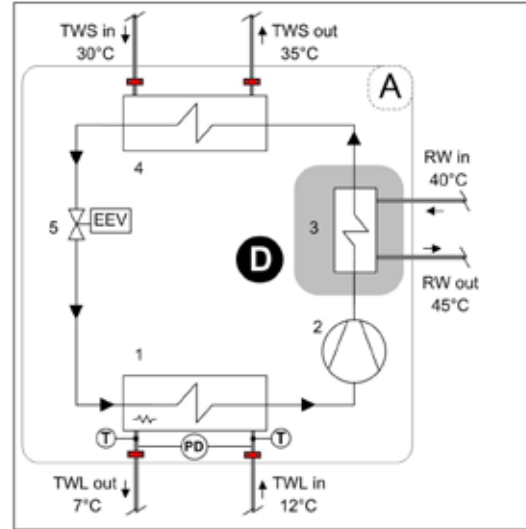
D - Partial energy recovery

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 called 'desuperheater'. It consists of shell and tube heat exchangers, suitable to recover part of the unit heating capacity (equal to the sum of the cooling capacity and the capacity absorbed by 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 wise to insert a flow control valve into the system hydraulic circuit, in order to maintain the temperature at the recovery output at above 35°C and thus avoid the condensation of the refrigerant into the partial energy recovery device.



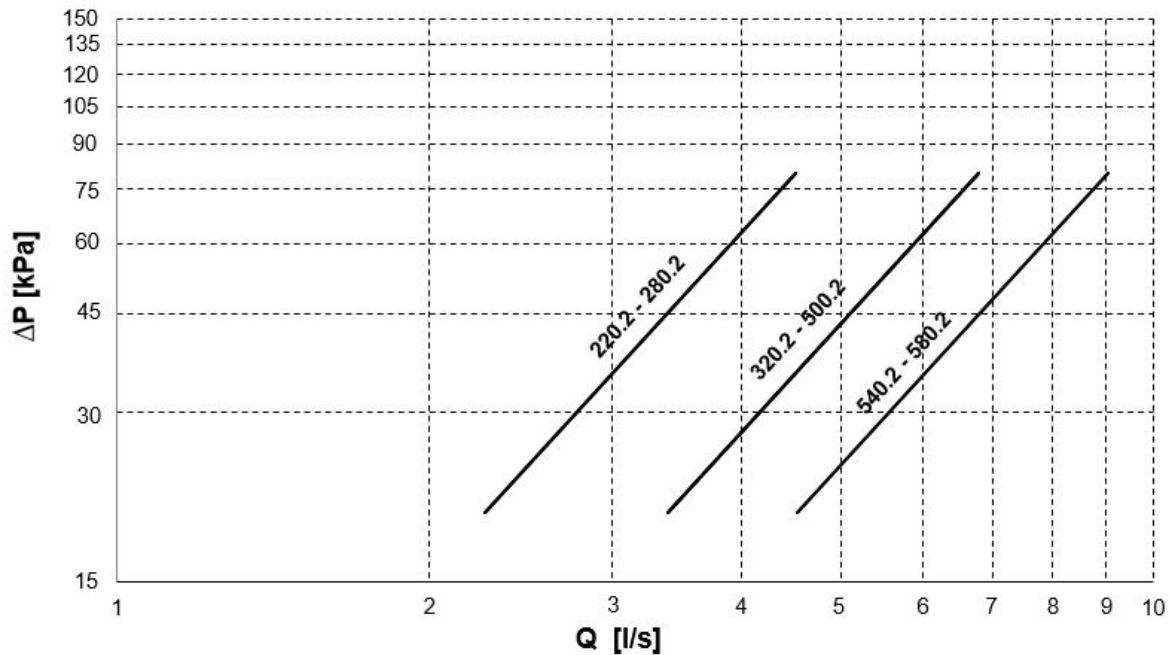
D - Partial recovery device

- A - Unit supply limit
- 1 - Evaporator
- 2 - Compressor
- 3 - Recovery exchanger
- 4 - Condenser
- 5 - Expansion electronic valve
- TWS in - Condenser water inlet

- TWS out - Condenser water outlet
- TWL in - Evaporator water inlet
- TWL out - Evaporator water outlet

- RW in - Recovery water inlet
- RW out - Recovery water outlet
- T - Temperature probe
- PD - Differential pressure switch

Pressure drops of partial energy recovery exchanger



Q = Water flow rate (l/s)

DP = Water side pressure drops (kPa)

⚠ The maximum capacity available from the partial recovery is equal to the 5% of the rejected heating capacity (cooling capacity + compressor power input)

Admissible water flow rates

Min. (Qmin) and max. (Qmax) water flow-rates admissibles for the correct unit operation.

SIZE		220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
Qmin	[l/s]	2,3	2,3	2,3	3,4	3,4	3,4	3,4	4,5	4,5
Qmax	[l/s]	4,5	4,5	4,5	6,8	6,8	6,8	6,8	9,0	9,0

R - Total energy recovery

Configuration that allows to produce free hot water during the cooling operation, thanks to the total condensation heat recovery of all that would otherwise be disposed of on the external thermal source. This solution increases the system's overall efficiency in all cases where large amounts of hot water need to be generated.

It consists of shell and tube exchangers suitable to recover all the heating capacity of the unit (equal to the sum of the cooling capacity and the electrical power absorbed by the compressors).

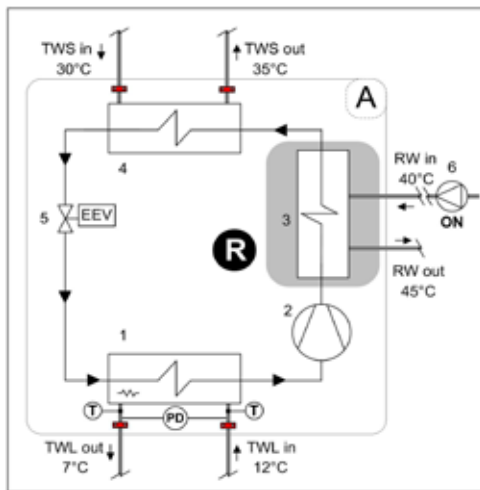
Hot water availability is always subordinate to the production of chilled water.

See the following example:

1. cooling capacity request = 100% / Heating capacity request = 0% >Production only of cooling capacity;
2. cooling capacity request = 100% / Heating capacity request = 0% >Production of cooling and heating capacity by recovery;
3. cooling capacity request = 50% / Heating capacity request = 100% >Production of cooling and heating capacity by recovery, equal to the 50% of the requested heating capacity.

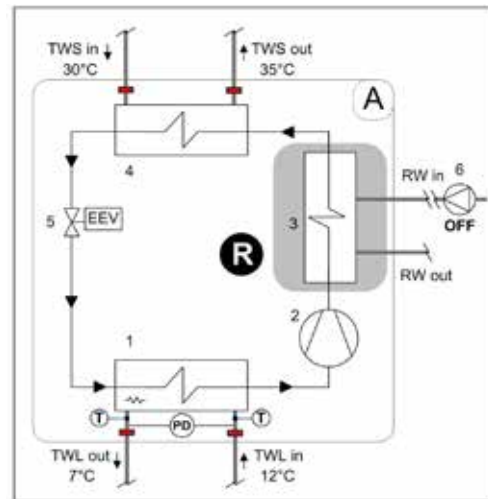
TOTAL ENERGY RECOVERY IN OPERATION

The pump on the recovery exchanger must be activated when hot water is required. Condensation takes place entirely in the recovery circuit.



TOTAL ENERGY RECOVERY NOT IN OPERATION

The pump on the recovery exchanger must be deactivated when hot water is required.



R - Total recovery device

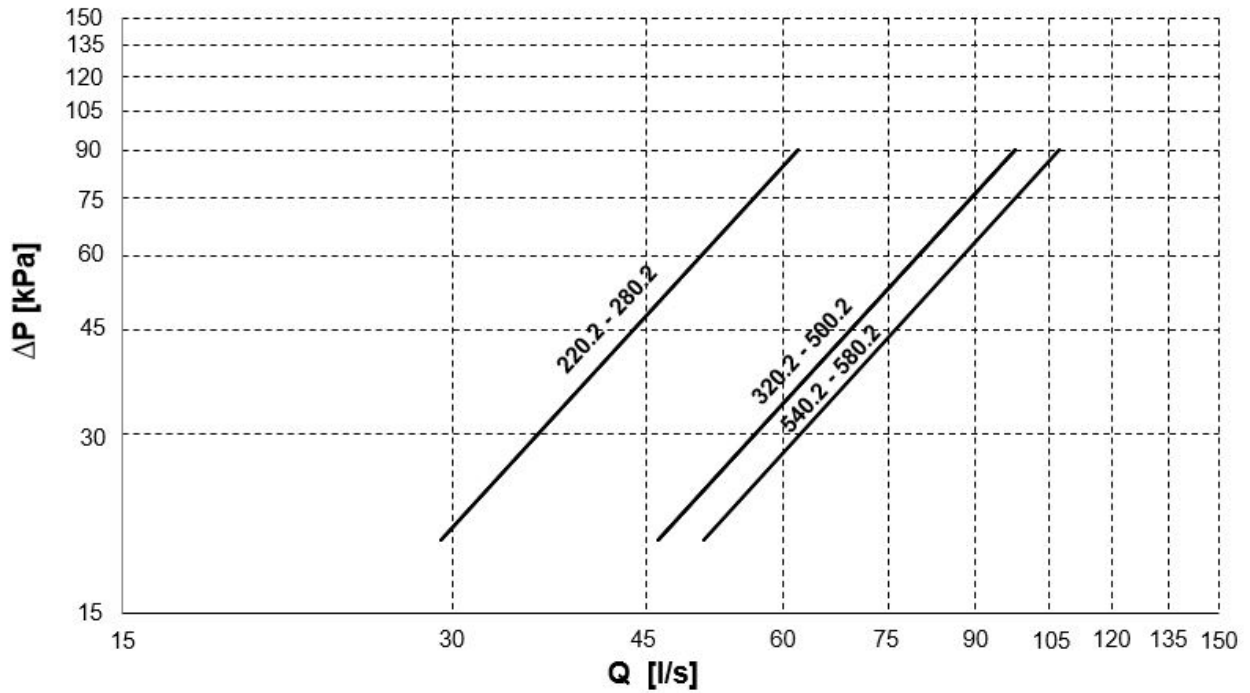
- A - Unit supply limit
- 1 - Evaporator
- 2 - Compressor
- 3 - Recovery exchanger
- 4 - Condenser
- 5 - Expansion electronic valve
- 6 - Recovery side pump (supply and management by the customer)

- TWS in - Condenser water inlet
- TWS out - Condenser water outlet
- TWL in - Evaporator water inlet
- TWL out - Evaporator water outlet

- RW in - Recovery water inlet
- RW out - Recovery water outlet
- T - Temperature probe
- PD - Differential pressure switch

Configurations

Pressure drops of the total energy recovery exchanger



Q = Water flow rate (l/s)
 DP = Water side pressure drops (kPa)

⚠ The return exchanger outlet water has the same temperature limits shown in the operating range of the standard unit under this entry: "TWS (°C) = external exchanger leaving water temperature (condenser)".

Admissible water flow rates

Min. (Qmin) and max. (Qmax) water flow-rates admissibles for the correct unit operation.

SIZE		220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
Qmin	[l/s]	29,3	29,3	29,3	46,2	46,2	46,2	46,2	50,8	50,8
Qmax	[l/s]	62,0	62,0	62,0	97,7	97,7	97,7	97,7	107,2	107,2

Performance - OCO - OHI version

SIZE			220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
Cooling											
Cooling capacity	1	[kW]	573	614	707	867	979	1125	1300	1370	1500
Compressor power input	1	[kW]	105	116	133	160	182	205	235	264	294
Total power input	2	[kW]	106	116	133	160	182	205	235	265	294
Partial recovery heating capacity	3	[kW]	33,9	36,5	42,0	51,3	58,0	66,5	76,7	81,7	89,7
Total recovery heating capacity	3	[kW]	645	699	803	972	1100	1267	1458	1541	1695
EER	1		5,41	5,28	5,30	5,42	5,37	5,50	5,53	5,17	5,10
Water flow rate (User side)	1	[l/s]	27,4	29,3	33,8	41,4	46,8	53,7	62,1	65,5	71,7
Pressure drops (User side)	1	[kPa]	35,4	39,9	42,2	36,2	44,3	54,7	43,4	25,0	29,0
Water flow rate (Source side)	1	[l/s]	32,4	34,9	40,1	49,1	55,4	63,6	73,3	78,1	85,7
Pressure drops (Source side)	1	[kPa]	23,2	26,9	35,6	21,4	27,3	36,0	47,9	45,0	54,3
Cooling capacity (EN14511:2018)	4	[kW]	572	613	706	867	978	1124	1299	1369	1499
Total power input (EN14511:2018)	4	[kW]	110	121	139	166	189	215	246	272	303
EER (EN 14511:2018)	4		5,21	5,08	5,08	5,23	5,17	5,22	5,29	5,03	4,94
SEER	8		6,43	6,53	6,52	6,47	6,38	6,43	6,44	6,38	6,38
Cooling capacity (AHRI 551/591)	5	[kW]	573	614	707	867	979	1125	1300	1370	1500
Total power input (AHRI 551/591)	5	[kW]	106	116	133	160	182	205	235	265	294
COP _r	5		5,41	5,28	5,30	5,42	5,37	5,50	5,53	5,17	5,10
IPLV	5		6,77	7,03	7,08	6,96	6,95	7,12	7,15	7,01	6,94
Heating											
Heating capacity	6	[kW]	645	699	803	972	1100	1267	1458	1541	1695
Compressor power input	6	[kW]	134	147	169	200	228	258	294	329	365
Total power input	2	[kW]	134	148	169	201	229	258	294	329	365
COP	6		4,81	4,74	4,75	4,84	4,81	4,91	4,95	4,68	4,64
Water flow rate (User side)	6	[l/s]	30,8	33,4	38,4	46,4	52,5	60,6	69,6	73,6	81,0
Pressure drops (User side)	6	[kPa]	21,8	25,7	33,9	19,9	25,5	33,9	44,9	42,2	51,2
Water flow rate (Source side)	6	[l/s]	24,4	26,4	30,3	36,9	41,6	48,2	55,6	58,0	63,6
Pressure drops (Source side)	6	[kPa]	30,2	34,5	36,2	30,8	37,8	47,1	37,4	21,5	25,0
Heating capacity (EN14511:2018)	7	[kW]	646	700	804	972	1100	1268	1458	1542	1696
Total power input (EN14511:2018)	7	[kW]	138	152	175	206	235	267	305	339	377
COP (EN 14511:2018)	7		4,68	4,60	4,60	4,71	4,67	4,74	4,78	4,55	4,50

The Product is compliant with the Erp (Energy Related Products) European Directive. It includes the Commission delegated Regulation (EU) No 2016/2281, also known as Ecodesign LOT21 «It contains fluorinated greenhouse gases» (GWP 1430)

1. Data referred to the following conditions: Evaporator water temperature = 12/7 °C. Condenser water temperature = 30/35 °C. Evaporator fouling factor = $0.44 \times 10^{(-4)}$ m² K/W
2. The Total Power Input value does not take into account the part related to the pumps and required to overcome the pressure drops for the circulation of the solution inside the exchangers.
3. Option. Recovery exchanger water temperature = 40/45°C.
4. Data calculated in conformity to the EN 14511:2018 referred to the following conditions: Evaporator water temperature = 12/7°C. Condenser water temperature = 30/35°C.
5. Data compliant to Standard AHRI 551/591 referred to the following conditions: Evaporator water temperature = 12/7°C. Water flow rate 0,043 l/s per kW. Condenser water temperature = 30/35°C. Evaporator fouling factor $0.44 \times 10^{(-4)}$ m² K/W
6. Data referred to the following conditions: Condenser water temperature = 40/45°C. Evaporator water temperature = 12/7°C. Evaporator fouling factor $0.44 \times 10^{(-4)}$ m² K/W
7. Data calculated in conformity to the EN 14511:2018 referred to the following conditions: Condenser water temperature = 40/45°C. Evaporator water temperature = 12/7°C.
8. Data calculated in compliance with Standard EN 14825:2016

General technical data

Construction - OCO - OHI Version

SIZE		220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
Compressor										
Type of compressors	1	DSW								
Refrigerant		R-134a								
No. of compressors	[Nr]	2								
Rated power (C1)	[HP]	110	125	140	160	180	210	240	280	320
Rated power (C2)	[HP]	110	125	140	160	180	210	240	280	320
Std Capacity control steps	2	25%-100%	25%-100%	25%-100%	25%-100%	25%-100%	25%-100%	25%-100%	25%-100%	25%-100%
Oil charge (C1)	l	22	19	19	30	30	30	30	32	32
Oil charge (C2)	l	22	19	19	30	30	30	30	32	32
Refrigerant charge (C1)	3 [Kg]	45	45	50	65	65	70	75	75	80
Refrigerant charge (C2)	3 [Kg]	45	45	50	65	65	70	75	75	80
Refrigeration circuits	[Nr]	2								
Internal exchanger (evaporator)										
No. of exchanger		1								
Type of internal exchanger	4	S&T								
Water content	l	307	307	280	481	481	514	917	917	917
Minimum system water content	5	5963	6389	7396	8820	10181	11728	13615	14605	15607
External exchanger (condenser)										
No. of exchanger	[Nr]	2								
Type of external exchanger	4	S&T								
Water content	l	112	112	112	182	182	182	182	192	192
Connections										
Evaporator water connections		6"	6"	6"	8"	8"	8"	10"	10"	10"
Condenser water connections		4"	4"	4"	5"	5"	5"	5"	5"	5"
Power supply										
Standard power supply	[V]	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50

1. DSW = Double-screw compressors
2. The unit is able to modulate STEPLESS continuously. The following data refers to a continuous operation of the unit.
3. Indicative values for standard units with possible variation / - 10%. Actual data are shown on the unit's matricular label.
4. S&T = Shell and tube
5. The calculated water volume to the system does not consider the volume of water contained in the internal exchanger. With applications at low outdoor air temperature or low average loads requested, the minimum water volume to the system is obtained by increasing the indicated value by 40%.

Electrical data - OCO - OHI Version

SIZE		220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
F.L.A. - Full load current at max admissible conditions										
F.L.A. - Total	[A]	309	335	379	430	476	562	634	748	776
F.L.I. - Full load power input at max admissible conditions										
F.L.I. - Total	[kW]	188	202	230	265	298	344	389	459	474
M.I.C. Maximum inrush current										
M.I.C. - Value	[A]	632	738	807	533	644	797	888	1187	1208
M.I.C. with soft start accessory	[A]	409	500	597	622	624	766	981	1122	1143

Power supply: 400/3/50 Hz. Voltage variation: max. +/-10%)

Voltage unbalance between phases: max 2 %

Electrical data refer to standard units; according to the installed accessories, the data can suffer some variations.

Sound levels (ST) - OCO - OHI Version

Size	Sound power level								Sound pressure level dB(A)	Sound power level dB(A)
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000		
220.2	72	70	93	101	91	88	75	63	80	99
240.2	70	74	92	100	96	91	78	70	81	100
280.2	65	75	92	97	97	94	77	64	81	100
320.2	74	84	98	98	98	91	89	76	82	101
360.2	75	85	98	99	98	92	87	77	82	101
440.2	82	73	101	98	100	92	83	74	83	103
500.2	103	96	93	103	99	94	83	77	83	103
540.2	77	87	99	103	102	96	82	64	85	105
580.2	81	76	99	103	102	94	83	70	85	105

Sound levels (EN) - OCO - OHI Version

Size	Sound power level								Sound pressure level dB(A)	Sound power level dB(A)
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000		
220.2	71	69	96	95	88	78	71	60	76	95
240.2	68	72	95	94	93	81	75	67	77	96
280.2	63	74	95	91	94	84	73	60	77	96
320.2	72	83	100	92	95	81	85	72	78	98
360.2	73	84	101	93	94	81	83	73	78	98
440.2	80	72	103	92	97	82	80	70	80	100
500.2	102	96	98	98	97	85	81	75	80	100
540.2	75	85	102	97	98	86	79	60	81	101
580.2	79	74	101	97	99	84	79	66	81	101

Sound levels refer to full load units, in test nominal conditions. The sound pressure level refers to 1 m. from the unit outer surface operating in open field.

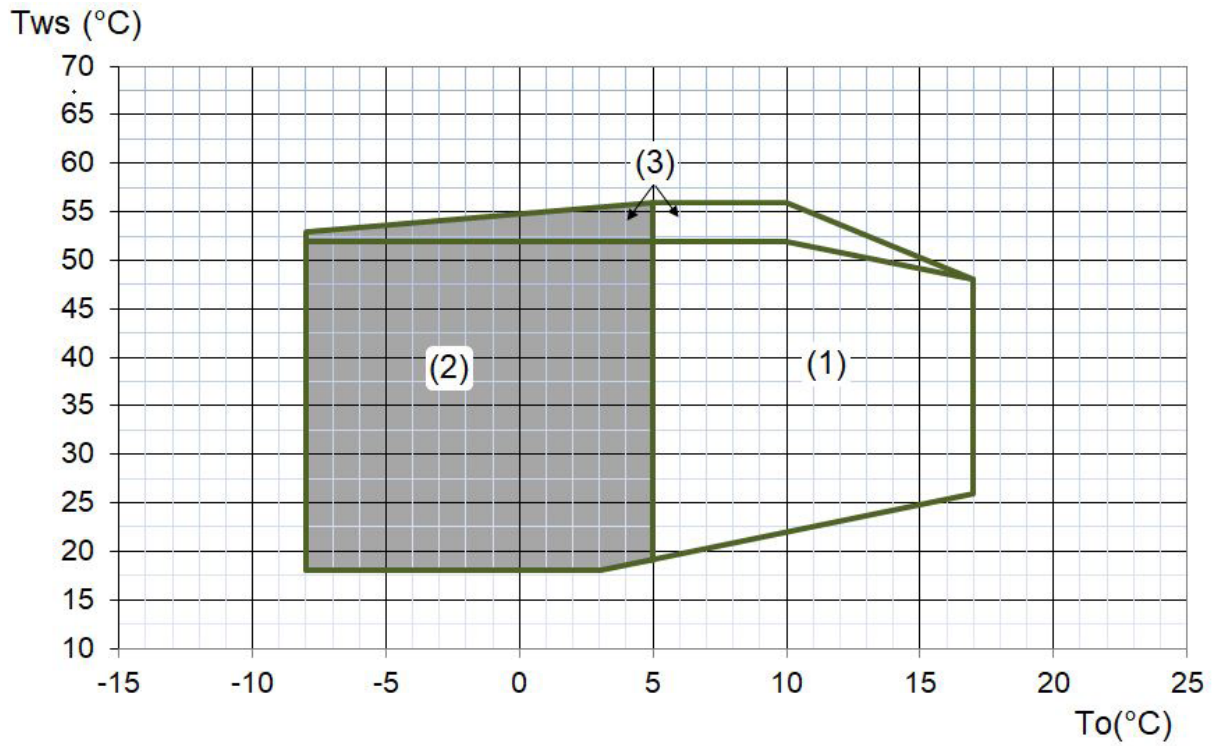
Measurements are carried out in compliance with UNI EN ISO 9614-1

The sound power data is not certified by Eurovent.

Data referred to the following conditions: internal exchanger water = 12/7°C; external exchanger water = 30/35°C.

General technical data

Operating range - OCO - OHI Version



1. Standard unit
2. Operation range extension for unit in 'Low water temperature (Brine)' configuration'
3. Operating range with automatic staging of the compressor capacity.

To (°C) = Evaporator outlet water temperature
Tws (°C) = Condenser outlet water temperature

Performance - OHO Version

SIZE			220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
Cooling											
Cooling capacity	1	[kW]	625	668	817	898	1021	1264	1391	1521	1612
Compressor power input	1	[kW]	117	125	151	167	192	235	259	284	305
Total power input	2	[kW]	117	125	152	168	192	236	260	284	305
Partial recovery heating capacity	3	[kW]	37,1	39,7	48,4	53,3	60,7	75,0	82,5	90,3	95,9
Total recovery heating capacity	3	[kW]	715	767	938	1033	1178	1453	1591	1739	1857
EER	1		5,34	5,34	5,38	5,35	5,32	5,36	5,35	5,36	5,29
Water flow rate (User side)	1	[l/s]	29,9	31,9	39,0	42,9	48,8	60,4	66,5	72,7	77,0
Pressure drops (User side)	1	[kPa]	43,3	48,5	57,1	40,3	50,0	69,9	50,8	31,2	34,4
Water flow rate (Source side)	1	[l/s]	35,4	37,9	46,2	50,9	57,9	71,6	78,8	86,2	91,6
Pressure drops (Source side)	1	[kPa]	29,3	33,5	50,0	24,3	31,5	48,3	58,5	58,0	65,5
Cooling capacity (EN14511:2018)	4	[kW]	623	665	813	894	1019	1259	1388	1518	1608
Total power input (EN14511:2018)	4	[kW]	121	129	159	177	198	246	269	294	317
EER (EN 14511:2018)	4		5,16	5,14	5,12	5,06	5,14	5,12	5,17	5,16	5,08
SEER	8		5,50	5,46	5,52	5,39	5,56	5,45	5,59	5,72	5,74
Cooling capacity (AHRI 551/591)	5	[kW]	625	668	817	898	1021	1264	1391	1521	1612
Total power input (AHRI 551/591)	5	[kW]	117	125	151	167	192	235	259	284	305
COP _r	5		5,34	5,34	5,41	5,38	5,32	5,38	5,37	5,36	5,29
IPLV	5		6,52	6,56	6,49	6,46	6,56	6,51	6,55	6,56	6,39
Heating											
Heating capacity	6	[kW]	715	767	938	1033	1178	1453	1591	1739	1857
Compressor power input	6	[kW]	140	151	183	202	231	283	312	341	368
Total power input	2	[kW]	141	151	183	202	232	284	313	342	368
COP	6		5,09	5,07	5,13	5,10	5,09	5,12	5,09	5,09	5,04
Water flow rate (User side)	6	[l/s]	34,2	36,7	44,8	49,3	56,3	69,4	76,0	83,1	88,7
Pressure drops (User side)	6	[kPa]	27,3	31,4	47,0	22,8	29,7	45,3	54,4	53,8	61,5
Water flow rate (Source side)	6	[l/s]	27,5	29,4	36,1	39,7	45,2	55,9	61,1	66,8	71,2
Pressure drops (Source side)	6	[kPa]	37,6	42,3	49,9	35,4	44,1	61,4	44,3	27,1	30,2
Heating capacity (EN14511:2018)	7	[kW]	717	769	941	1037	1182	1458	1597	1745	1865
Total power input (EN14511:2018)	7	[kW]	144	155	189	210	237	293	320	350	378
COP (EN 14511:2018)	7		4,99	4,96	4,98	4,94	4,98	4,98	4,99	4,98	4,93

The Product is compliant with the Erp (Energy Related Products) European Directive. It includes the Commission delegated Regulation (EU) No 2016/2281, also known as Ecodesign LOT21 «It contains fluorinated greenhouse gases» (GWP 1430)

1. Data referred to the following conditions: Evaporator water temperature = 12/7 °C. Condenser water temperature = 30/35 °C. Evaporator fouling factor = $0,44 \times 10^{(-4)}$ m² K/W
2. The Total Power Input value does not take into account the part related to the pumps and required to overcome the pressure drops for the circulation of the solution inside the exchangers.
3. Option. Recovery exchanger water temperature = 40/45°C.
4. Data calculated in conformity to the EN 14511:2018 referred to the following conditions: Evaporator water temperature = 12/7°C. Condenser water temperature = 30/35°C.
5. Data compliant to Standard AHRI 551/591 referred to the following conditions: Evaporator water temperature = 12/7°C. Water flow rate 0,043 l/s per kW. Condenser water temperature = 30/35°C. Evaporator fouling factor $0,44 \times 10^{(-4)}$ m² K/W
6. Data referred to the following conditions: Condenser water temperature = 40/45°C. Evaporator water temperature = 12/7°C. Evaporator fouling factor $0,44 \times 10^{(-4)}$ m² K/W
7. Data calculated in conformity to the EN 14511:2018 referred to the following conditions: Condenser water temperature = 40/45°C. Evaporator water temperature = 12/7°C.
8. Data calculated in compliance with Standard EN 14825:2016

General technical data

Construction - OHO Version

GRANDEZZE		220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
Compressore										
Type of compressors	1	DSW								
Refrigerant		R-134a								
No. of compressors	[Nr]	2								
Rated power (C1)	[HP]	110	120	140	160	180	220	250	270	290
Rated power (C2)	[HP]	110	120	140	160	180	220	250	270	290
Std Capacity control steps	2	25%-100%	25%-100%	25%-100%	25%-100%	25%-100%	25%-100%	25%-100%	25%-100%	25%-100%
Oil charge (C1)	l	17	17	21	21	25	25	25	25	25
Oil charge (C2)	l	17	17	21	21	25	25	25	25	25
Refrigerant charge (C1)	3 [Kg]	62	62	65	65	70	77	80	90	95
Refrigerant charge (C2)	3 [Kg]	62	62	65	65	70	77	80	90	95
Refrigeration circuits	[Nr]	2								
Internal exchanger (evaporator)										
No. of exchanger		1								
Type of internal exchanger	4	S&T								
Water content	l	307	307	280	481	481	514	917	917	917
Minimum system water content	5	6563	7014	8579	9429	10721	13272	14606	15971	16926
External exchanger (condenser)										
No. of exchanger	[Nr]	2								
Type of external exchanger	4	S&T								
Water content	l	112	112	112	182	182	182	182	192	192
Connections										
Evaporator water connections		6"	6"	6"	8"	8"	8"	10"	10"	10"
Condenser water connections		4"	4"	4"	5"	5"	5"	5"	5"	5"
Power supply										
Standard power supply	[V]	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50

1. DSW = Double-screw compressors
2. The unit is able to modulate STEPLESS continuously. The following data refers to a continuous operation of the unit.
3. Indicative values for standard units with possible variation / - 10%. Actual data are shown on the unit's matricular label.
4. S&T = Shell and tube
5. The calculated water volume to the system does not consider the volume of water contained in the internal exchanger. With applications at low outdoor air temperature or low average loads requested, the minimum water volume to the system is obtained by increasing the indicated value by 40%.

Electrical data - OHO Version

SIZE		220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
F.L.A. Corrente assorbita alle massime condizioni ammesse										
F.L.A. - Total	[A]	373	399	496	550	630	754	834	900	965
F.L.I. Potenza assorbita a pieno carico (alle max condizioni ammesse)										
F.L.I. - Total	[kW]	232	248	298	329	378	462	506	555	595
M.I.C. Massima corrente di spunto dell'unità										
M.I.C. - Value	[A]	406	416	448	535	658	776	915	1055	1212
M.I.C. con accessorio soft start	[A]	595	610	631	762	979	1135	1339	1628	1812

Power supply: 400/3/50 Hz. Voltage variation: max. +/-10%

Voltage unbalance between phases: max 2 %

Electrical data refer to standard units; according to the installed accessories, the data can suffer some variations.

Sound levels - ST - OHO Version

Size	Sound power level								Sound pressure level dB(A)	Sound power level dB(A)
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000		
220.2	93	87	92	83	91	83	72	61	73	93
240.2	93	87	91	84	91	84	75	68	73	93
280.2	94	85	90	85	95	93	82	70	78	98
320.2	94	85	90	85	95	93	82	71	78	98
360.2	95	86	93	87	97	85	84	72	81	100
440.2	79	78	95	102	99	88	75	70	83	102
500.2	81	80	96	95	101	93	80	71	83	103
540.2	81	79	99	95	103	91	80	71	84	104
580.2	82	82	96	98	103	93	80	71	84	104

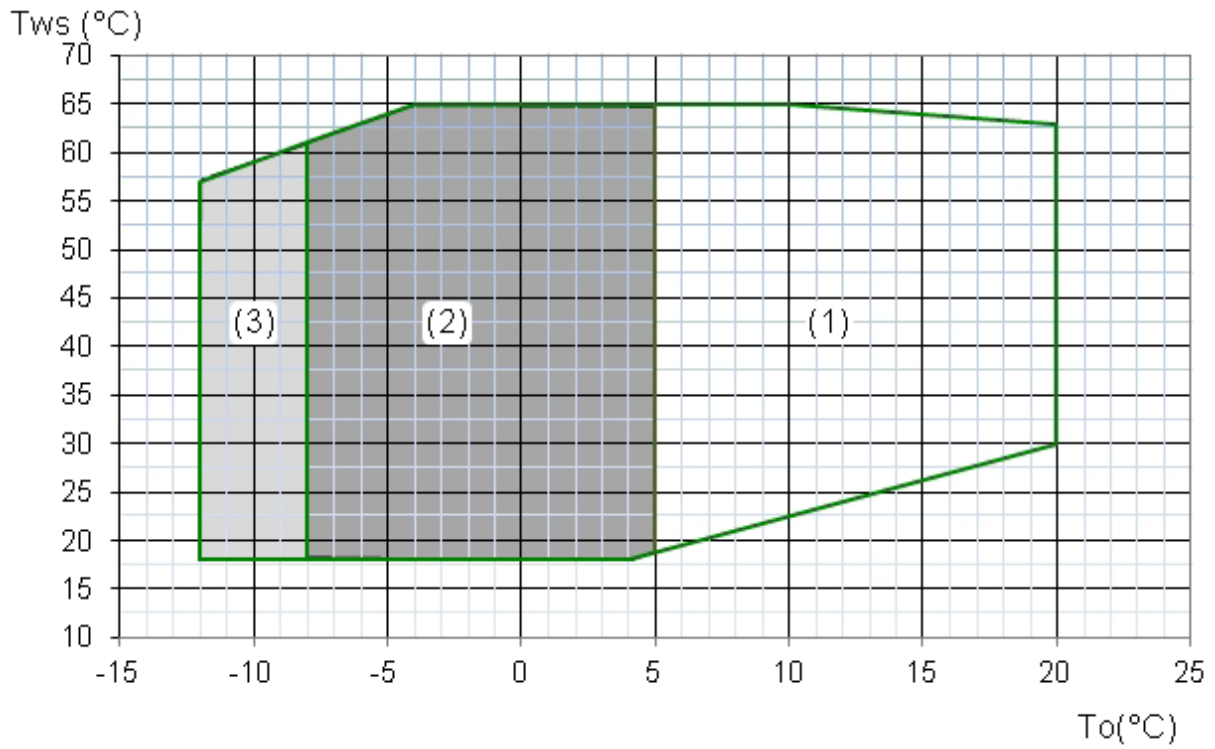
Sound levels - EN - OHO Version

Size	Sound power level								Sound pressure level dB(A)	Sound power level dB(A)
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000		
220.2	89	82	87	78	85	77	66	54	68	87
240.2	89	82	86	79	85	78	69	61	68	87
280.2	90	80	85	80	89	87	76	63	72	92
320.2	90	80	85	80	89	87	76	64	73	92
360.2	91	81	88	82	91	89	78	65	75	94
440.2	75	73	90	97	93	82	70	63	77	97
500.2	77	75	91	90	96	87	74	64	77	97
540.2	77	74	95	90	97	85	74	64	78	98
580.2	78	77	91	93	97	87	74	64	78	98

Sound levels refer to full load units, in test nominal conditions. The sound pressure level refers to 1 m. from the unit outer surface operating in open field. Measurements are carried out according to the UNI EN ISO 9614-2 standard, in compliance with the EUROVENT 8/1 certification. Data referred to the following conditions: internal exchanger water = 12/7°C; external exchanger water = 30/35°C.

General technical data

Operating range - OHO Version



1. Standard unit
2. Operation range extension for unit in 'Low water temperature (Brine)' configuration'
3. Operating range with automatic staging of the compressor capacity.

To (°C) = Evaporator outlet water temperature
Tws (°C) = Condenser outlet water temperature

Correction factors for ethylene glycol use

% ETHYLENE GLYCOL BY WEIGHT		5%	10%	15%	20%	25%	30%	35%	40%	45%	50%
Freezing temperature	°C	-2,0	-3,9	-6,5	-8,9	-11,8	-15,6	-19	-23,4	-27,8	-32,7
Safety temperature	°C	3	1	-1	-4	-6	-10	-14	-19	-23,8	-29,4
Evaporator cooling Capacity Factor	-	0,995	0,989	0,983	0,977	0,971	0,964	0,956	0,949	0,941	0,933
Compressor power input Factor (evaporator)	-	0,998	0,997	0,995	0,994	0,992	0,990	0,989	0,987	0,986	0,984
Evaporator pressure drop Factor	-	1,041	1,085	1,131	1,180	1,231	1,285	1,341	1,400	1,461	1,525
Condenser cooling Capacity Factor	-	0,998	0,996	0,994	0,992	0,990	0,988	0,986	0,984	0,982	0,980
Compressor power input Factor (condenser)	-	1,003	1,006	1,009	1,012	1,015	1,018	1,021	1,024	1,027	1,030
Condenser heating Capacity Factor	-	0,999	0,998	0,997	0,996	0,995	0,994	0,993	0,992	0,991	0,990
Condenser pressure drop Factor	-	1,037	1,077	1,118	1,162	1,208	1,257	1,307	1,360	1,415	1,473

Correction factors for propylene glycol use

% PROPYLENE GLYCOL BY WEIGHT		5%	10%	15%	20%	25%	30%	35%	40%	45%	50%
Freezing temperature	°C	-2,0	-3,9	-6,5	-8,9	-11,8	-15,6	-19	-23,4	-27,8	-32,7
Safety temperature	°C	3	1	-1	-4	-6	-10	-14	-19	-23,8	-29,4
Evaporator cooling Capacity Factor	-	0,993	0,985	0,977	0,968	0,958	0,947	0,936	0,925	0,912	0,899
Compressor power input Factor (evaporator)	-	0,998	0,995	0,993	0,990	0,987	0,983	0,980	0,976	0,972	0,968
Evaporator pressure drop Factor	-	1,052	1,108	1,170	1,237	1,309	1,386	1,467	1,554	1,646	1,743
Condenser cooling Capacity Factor	-	0,996	0,992	0,987	0,982	0,977	0,971	0,965	0,959	0,952	0,945
Compressor power input Factor (condenser)	-	1,004	1,007	1,011	1,014	1,018	1,021	1,025	1,028	1,032	1,035
Condenser heating Capacity Factor	-	0,998	0,996	0,994	0,991	0,988	0,984	0,980	0,976	0,971	0,966
Condenser pressure drop Factor	-	1,047	1,098	1,153	1,213	1,278	1,347	1,421	1,499	1,581	1,669

Fouling Correction Factors

SIZE	Condenser		Evaporator	
M2 C / W	F1	FK1	F2	FK2
0.44 X 10 (-4)	1,0	1,0	1,0	1,0
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

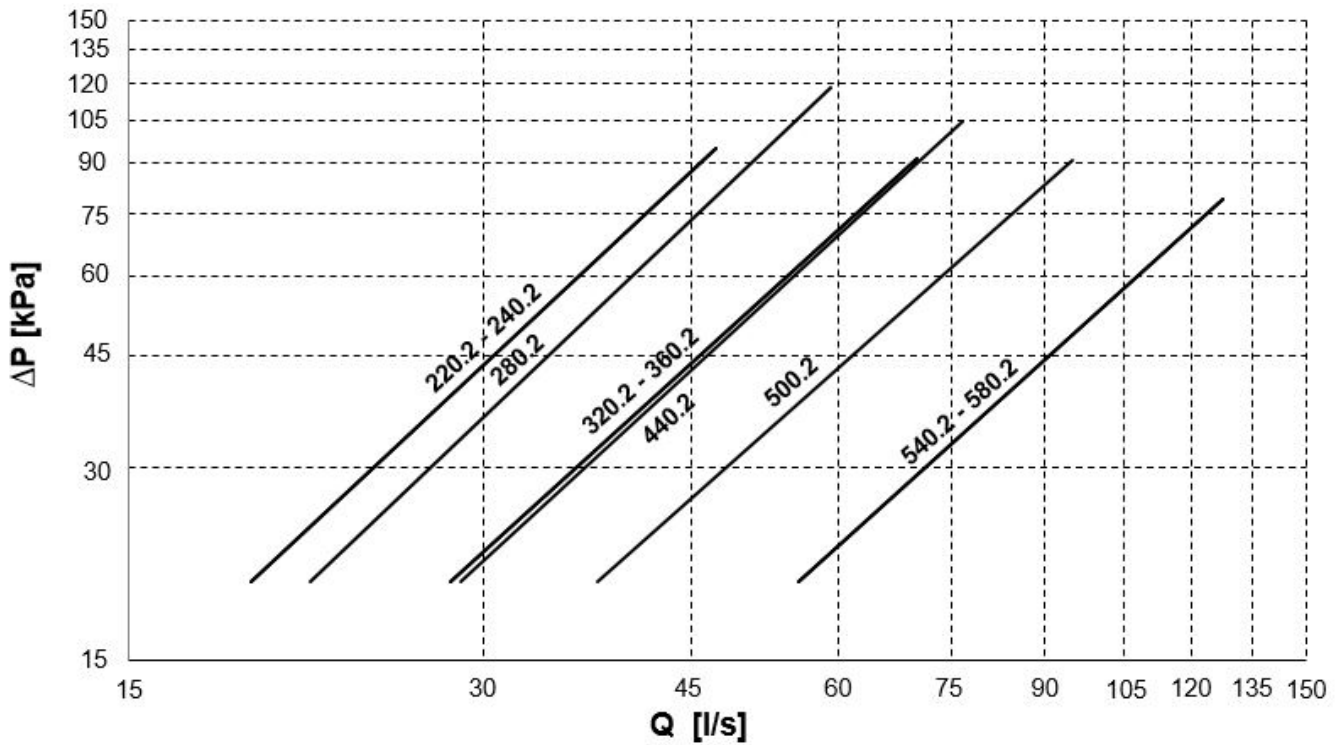
F1 = Cooling power correction factor
 FK1 = Compressor power input correction factor
 F2 = Cooling power correction factor
 FK2 = Compressor power input correction factor

Overload and control device calibrations

		OPEN	CLOSE	VALUE
High pressure switch	[kPa]	1580	1280	-
Antifreeze protection	[°C]	4	5,5	-
High pressure safety valve	[kPa]	-	-	2500
Low pressure safety valve	[kPa]	-	-	1650 (1600)
Max no. of compressor starts per hour	[n°]	-	-	6
Discharge safety thermostat	[°C]	-	-	120

General technical data

Evaporator pressure drops



The pressure drops are calculated considering a water temperature of 7°C

Q = Water flow rate [l/s]
DP = Water side pressure drops [kPa]

The water flow rate must be calculated with the following formula

$$Q [l/s] = kWt / (4,186 \times DT)$$

kWt = Heating capacity in kW
DT = Temperature difference between inlet / outlet water

Admissible water flow rates

Min. (Qmin) and max. (Qmax) water flow-rates admissibles for the correct unit operation.

SIZE		220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
Qmin	[l/s]	19,0	19,0	21,4	28,2	28,2	28,7	37,5	55,6	55,6
Qmax	[l/s]	47,2	47,2	59,2	70,0	70,0	76,7	95,0	127,2	127,2

Minimum system water content

For a proper functioning of the unit a minimum water content has to be provided to the system, using the formula:
Minimum water content [l] = 10 x kWf (air conditioning application)
= 14 x kWf (application with low outdoor temperature or low loads required)

kWf = Nominal cooling capacity unit

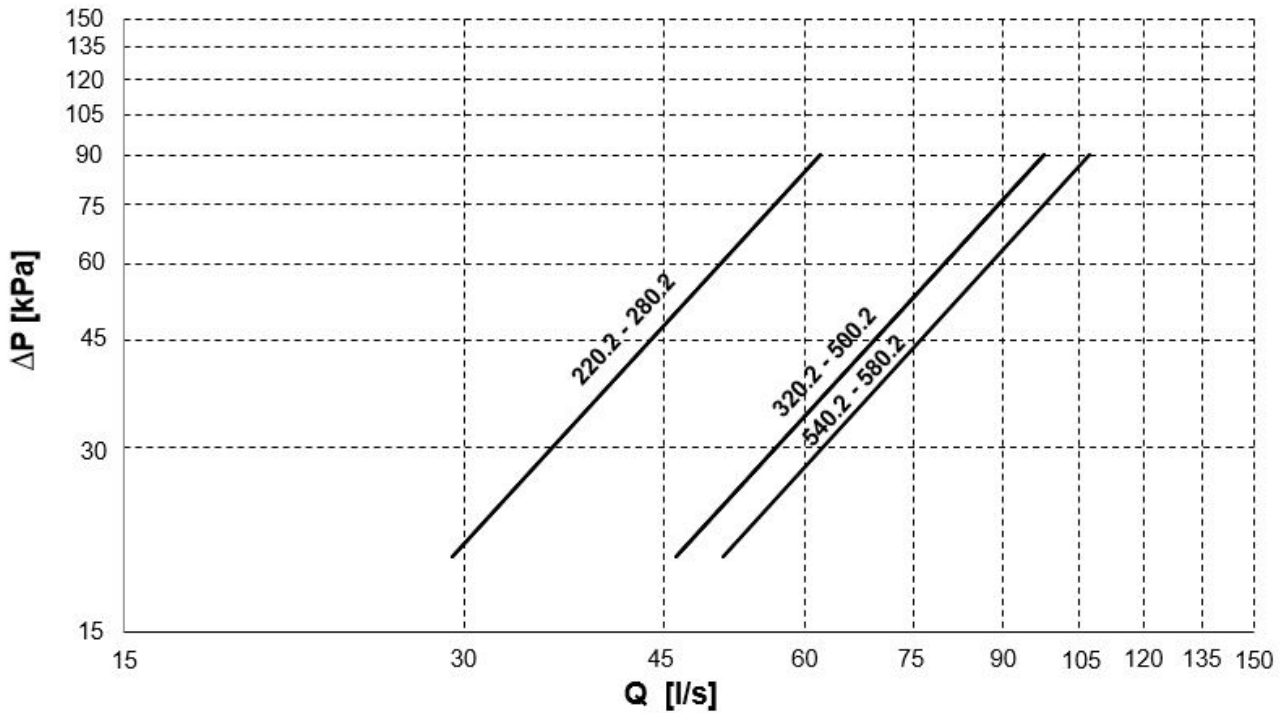
⚠ Volume calculated does not consider internal heat exchanger (evaporator) water content.

Exchanger operating range

	Internal exchanger		External exchanger	
	DP _r (500.2-540.2-580.2)	DP _w	DP _r	DP _w
PED (CE)	1650 (1600)	1050	2500	1600

DP_r = Max. operating pressure refrigerant gas side
DP_w = Max. operating pressure water side (utility)

1 pass condenser pressure drops



The pressure drops are calculated considering a water temperature of 7°C

Q = Water flow rate [l/s]

DP = Water side pressure drops [kPa]

The water flow rate must be calculated with the following formula

$$Q \text{ [l/s]} = \text{kWt} / (4,186 \times \text{DT})$$

kWt = Heating capacity in kW

DT = Temperature difference between inlet / outlet water

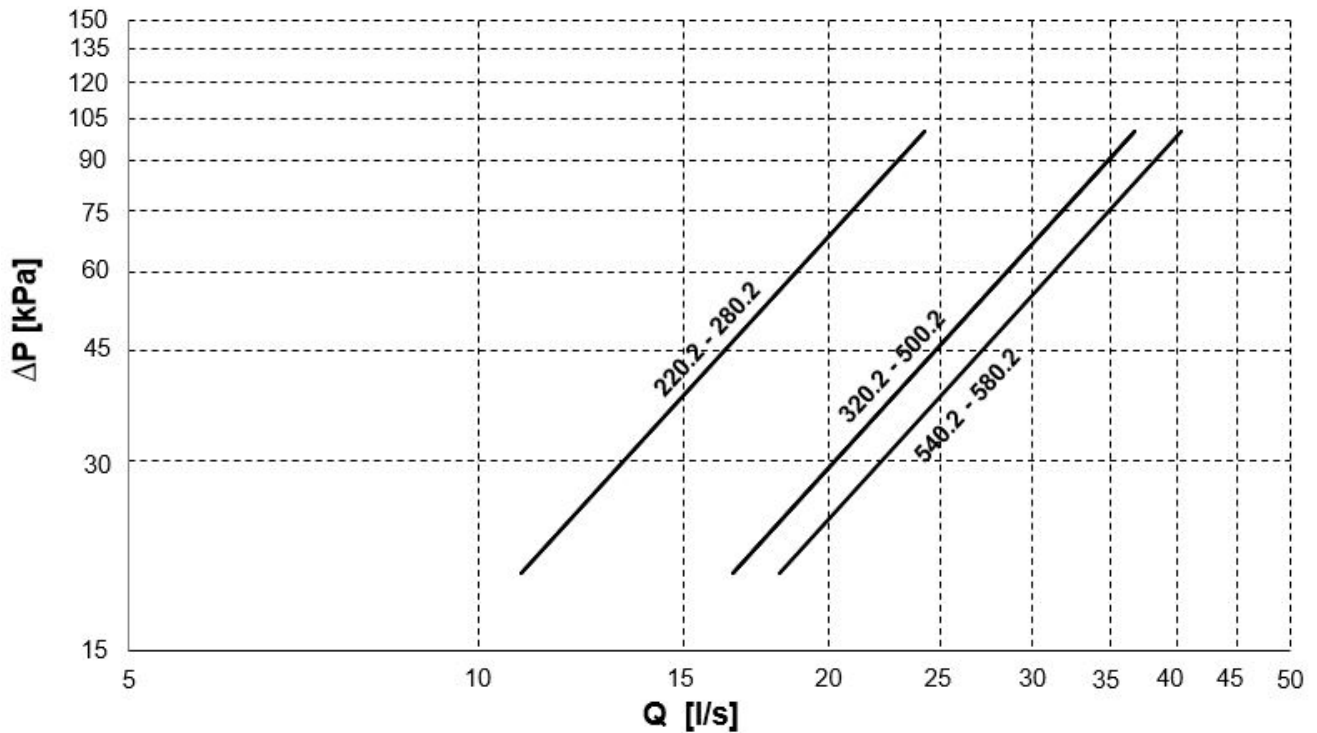
Admissible water flow rates

Min. (Qmin) and max. (Qmax) water flow-rates admissibles for the correct unit operation.

SIZE		220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
Qmin	[l/s]	29,3	29,3	29,3	46,2	46,2	46,2	46,2	50,8	50,8
Qmax	[l/s]	62,0	62,0	62,0	97,7	97,7	97,7	97,7	107,2	107,2

General technical data

2 pass condenser pressure drops



The pressure drops are calculated considering a water temperature of 7°C

Q = Water flow rate [l/s]

DP = Water side pressure drops [kPa]

The water flow rate must be calculated with the following formula

$$Q \text{ [l/s]} = \text{kWt} / (4,186 \times \text{DT})$$

kWt = Heating capacity in kW

DT = Temperature difference between inlet / outlet water

Admissible water flow rates

Min. (Qmin) and max. (Qmax) water flow-rates admissibles for the correct unit operation.

SIZE		220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
Qmin	[l/s]	10,9	10,9	10,9	16,5	16,5	16,5	16,5	18,1	18,1
Qmax	[l/s]	24,2	24,2	24,2	36,7	36,7	36,7	36,7	40,2	40,2

OCO - OHI Version

Size	To (°C)	Condenser outlet temperature [°C]																	
		30			35			40			45			50			52		
		kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt
220.2	5	557	93,3	650	531	105	636	503	118	622	473	133	606	442	149	591	430	155	585
	6	576	93,4	669	549	105	654	520	119	639	490	133	623	459	149	608	446	155	601
	7	600	93,5	693	573	105	678	543	119	662	511	134	645	479	149	628	465	156	621
	10	665	93,6	759	636	106	742	604	120	724	570	135	705	535	150	685	520	157	677
	15	788	93,5	881	753	107	860	717	121	838	678	136	814	638	152	790	621	159	780
	18	865	93,3	958	826	106	933	788	121	909	746	137	884	705	154	859	688	160	848
240.2	5	597	103	700	570	115	686	542	130	672	512	146	658	481	164	645	468	172	650
	6	618	103	721	590	115	705	560	130	690	529	147	676	498	165	663	485	172	657
	7	642	103	745	614	116	730	584	130	714	552	147	699	520	165	685	507	173	680
	10	712	103	815	680	117	797	649	131	780	615	148	763	581	166	746	566	174	740
	15	840	104	945	806	118	923	769	133	902	730	150	880	692	168	860	675	176	851
	18	922	105	1027	885	118	1003	845	134	979	802	151	953	762	169	932	745	177	923
280.2	5	689	117	806	656	132	789	623	149	772	588	168	756	552	188	740	537	197	734
	6	714	117	832	681	133	813	646	149	796	610	168	778	573	189	762	558	197	755
	7	741	118	859	707	133	840	672	150	821	635	169	803	597	189	786	582	198	779
	10	820	119	939	784	134	918	747	151	897	706	170	877	667	190	857	650	199	849
	15	977	120	1097	935	135	1070	890	153	1043	844	172	1017	797	193	990	777	202	980
	18	1075	120	1195	1029	137	1165	982	154	1136	933	174	1107	883	195	1078	862	205	1067
320.2	5	844	142	986	804	159	963	760	178	938	712	199	912	662	222	884	641	232	872
	6	876	142	1018	833	159	993	788	178	966	739	200	939	688	223	911	667	232	899
	7	909	143	1052	867	160	1027	821	179	1000	771	200	972	718	224	942	696	233	929
	10	1005	143	1148	960	161	1121	912	180	1092	858	202	1060	801	226	1026	777	235	1012
	15	1197	145	1342	1146	163	1309	1090	183	1273	1028	205	1234	962	229	1191	935	239	1174
	18	1317	146	1462	1263	164	1427	1203	185	1387	1135	207	1343	1068	232	1299	1039	242	1281
360.2	5	952	161	1113	908	181	1088	859	202	1062	806	227	1033	749	253	1002	725	264	989
	6	991	162	1153	944	181	1126	893	203	1096	837	227	1064	777	254	1031	753	265	1018
	7	1025	162	1188	979	182	1160	928	204	1131	872	228	1100	812	254	1066	787	265	1052
	10	1134	163	1297	1083	183	1266	1028	205	1233	968	230	1198	905	257	1161	878	268	1146
	15	1348	165	1513	1291	186	1477	1229	209	1438	1161	234	1395	1088	261	1350	1058	273	1330
	18	1484	166	1650	1422	187	1610	1356	211	1566	1283	237	1520	1206	264	1470	1172	276	1448
440.2	5	1095	182	1277	1044	204	1248	992	228	1220	935	256	1191	876	285	1161	851	298	1149
	6	1136	183	1319	1084	205	1289	1030	229	1259	972	257	1229	912	286	1198	887	299	1186
	7	1177	184	1361	1125	205	1330	1069	230	1299	1010	258	1267	948	287	1235	922	300	1222
	10	1307	186	1492	1250	208	1458	1188	233	1422	1125	261	1386	1058	291	1350	1031	304	1335
	15	1518	189	1707	1454	212	1666	1388	238	1625	1318	266	1584	1244	297	1541	1214	310	1523
	18	1634	190	1823	1571	213	1785	1505	240	1745	1435	269	1704	1363	300	1663	1331	314	1645
500.2	5	1266	208	1474	1207	232	1439	1144	260	1404	1076	291	1368	1007	325	1332	980	339	1318
	6	1311	209	1520	1250	233	1483	1184	262	1446	1116	292	1409	1046	326	1372	1016	340	1356
	7	1363	210	1572	1300	235	1534	1233	263	1496	1164	294	1458	1091	327	1419	1062	342	1403
	10	1511	212	1723	1443	238	1681	1373	266	1639	1298	298	1595	1220	332	1551	1187	346	1533
	15	1791	216	2007	1712	243	1955	1629	272	1902	1543	305	1847	1451	340	1791	1413	355	1767
	18	1880	217	2097	1884	246	2129	1797	276	2073	1704	309	2014	1607	345	1952	1568	360	1928
540.2	5	1348	234	1582	1278	262	1540	1205	293	1498	1128	326	1454	1054	358	1413	1019	374	1393
	6	1394	235	1629	1321	263	1584	1244	294	1538	1167	327	1495	1089	360	1449	1054	376	1429
	7	1443	236	1679	1370	264	1634	1294	295	1589	1213	329	1541	1135	362	1497	1098	378	1475
	10	1613	239	1852	1536	268	1803	1453	299	1752	1365	333	1699	1280	367	1647	1239	383	1623
	15	1926	242	2168	1835	272	2107	1739	305	2043	1635	340	1976	1531	376	1907	1484	392	1876
	18	2119	244	2362	2020	275	2295	1918	308	2226	1808	344	2152	1693	382	2075	1643	398	2041
580.2	5	1475	260	1735	1400	291	1691	1323	325	1647	1239	361	1601	1158	398	1556	1119	416	1535
	6	1529	261	1791	1451	292	1743	1368	326	1694	1281	363	1643	1198	400	1598	1159	417	1576
	7	1577	262	1840	1500	294	1793	1417	328	1745	1331	365	1695	1245	402	1646	1204	420	1624
	10	1774	265	2039	1685	297	1982	1590	332	1922	1495	370	1865	1402	408	1810	1358	426	1784
	15	2104	271	2374	2005	304	2309	1902	339	2242	1792	378	2170	1676	419	2096	1626	437	2064
	18	2314	273	2587	2207	307	2514	2096	344	2440	1976	384	2360	1851	426	2277	1798	444	2242

To (°C) = Evaporator outlet water temperature

kWf = Cooling capacity [kW]

kWe = Electrical power absorbed by compressors [kW]

kWt = Heating capacity [kW]

Water temperature differential = 5°C

Performances

OHO Version

Size	To (°C)	Condenser outlet temperature [°C]																	
		30			35			40			45			50			65		
		kWt	kWe	kWf	kWt	kWe	kWf	kWt	kWe	kWf	kWt	kWe	kWf	kWt	kWe	kWf	kWt	kWe	kWf
220.2	5	708	107	602	700	116	585	685	126	559	674	139	536	660	154	507	611	209	403
	6	726	108	618	715	116	599	705	127	579	695	140	555	680	155	526	630	210	420
	7	752	109	643	740	117	624	729	128	602	715	140	575	704	156	549	649	212	438
	10	818	112	707	812	120	693	799	130	669	784	143	642	768	158	610	712	216	497
	15	957	119	839	946	126	821	924	135	789	912	148	765	889	163	727	822	223	599
	20	1158	129	1030	1093	132	961	1043	141	902	1026	152	874	1010	168	843	936	231	706
240.2	5	757	115	643	748	123	625	735	136	600	720	150	571	708	166	543	655	224	431
	6	778	116	663	767	124	644	758	136	622	742	150	592	729	167	563	676	226	450
	7	804	116	688	791	125	666	782	137	645	767	151	616	751	167	584	698	228	470
	10	879	120	759	868	128	741	852	140	713	841	154	687	824	170	654	763	233	530
	15	1022	126	896	999	134	866	980	145	835	970	159	812	956	176	780	879	240	639
	20	1145	132	1013	1128	140	989	1116	152	965	1101	164	937	1078	182	897	999	248	751
280.2	5	927	139	788	914	150	765	897	164	734	880	181	699	864	200	664	797	272	525
	6	950	140	810	937	151	787	925	165	761	906	182	725	890	202	689	823	274	549
	7	981	142	840	965	151	814	955	166	790	938	183	756	917	203	715	844	276	569
	10	1069	146	923	1060	156	905	1042	170	872	1023	186	837	1001	206	795	926	282	644
	15	1237	154	1084	1218	163	1055	1203	178	1026	1187	194	994	1161	215	947	1071	293	779
	20	1402	161	1242	1377	171	1207	1356	185	1171	1334	201	1134	1312	223	1090	1212	304	908
320.2	5	1021	154	868	1007	165	842	990	181	809	968	200	769	950	222	729	879	300	579
	6	1048	155	893	1035	167	868	1013	182	832	998	201	797	979	223	757	903	303	601
	7	1076	156	920	1062	167	895	1051	184	867	1033	202	831	1009	224	785	930	305	626
	10	1174	161	1013	1160	172	988	1146	189	958	1124	207	918	1106	229	877	1020	312	708
	15	1359	169	1191	1335	180	1156	1317	197	1121	1294	214	1081	1280	238	1042	1173	324	850
	20	1547	177	1370	1518	189	1330	1494	205	1289	1473	223	1251	1441	247	1194	1327	337	990
360.2	5	1165	176	989	1146	189	957	1129	208	922	1107	229	878	1088	254	835	1002	343	659
	6	1198	178	1021	1179	191	989	1162	209	954	1142	230	912	1115	255	860	1032	346	687
	7	1231	179	1052	1211	192	1020	1196	210	986	1178	231	947	1154	257	898	1064	349	716
	10	1347	185	1162	1331	197	1135	1313	215	1098	1286	236	1051	1264	261	1003	1168	357	811
	15	1537	193	1344	1529	204	1325	1511	223	1289	1490	243	1248	1458	269	1189	1350	367	984
	20	1753	201	1552	1726	214	1513	1705	232	1473	1677	251	1426	1650	279	1371	1527	382	1146
440.2	5	1433	216	1218	1414	232	1182	1393	254	1139	1363	280	1083	1338	311	1028	1233	421	812
	6	1466	217	1249	1446	233	1213	1425	256	1170	1403	282	1122	1374	312	1063	1273	424	849
	7	1515	220	1295	1495	235	1260	1476	258	1218	1453	283	1170	1419	314	1105	1310	427	883
	10	1650	226	1424	1630	241	1390	1613	263	1350	1586	289	1298	1549	320	1230	1437	438	1000
	15	1854	237	1617	1838	251	1587	1837	275	1563	1826	300	1527	2160	332	1828	1658	453	1205
	20	2075	248	1827	2056	263	1793	2056	287	1770	2055	311	1745	2452	345	2107	1870	471	1400
500.2	5	1575	238	1338	1553	256	1298	1524	280	1245	1500	309	1192	1468	342	1127	1352	463	889
	6	1622	240	1383	1601	258	1344	1570	282	1288	1545	311	1235	1512	344	1169	1393	467	927
	7	1672	243	1430	1648	259	1389	1624	284	1340	1591	312	1279	1557	346	1211	1437	471	967
	10	1823	250	1573	1806	267	1540	1776	292	1485	1745	320	1425	1705	354	1352	1577	482	1095
	15	2109	261	1849	2073	277	1797	2047	303	1745	2016	330	1687	1967	366	1602	1810	498	1313
	20	2393	273	2121	2346	291	2056	2307	316	1992	2268	341	1927	2231	380	1851	2055	519	1536
540.2	5	1726	260	1466	1703	280	1423	1667	306	1361	1640	338	1303	1603	374	1229	1482	507	975
	6	1775	262	1513	1752	282	1471	1716	308	1408	1690	340	1350	1652	377	1275	1530	512	1019
	7	1825	265	1560	1803	284	1519	1776	311	1465	1739	342	1397	1708	379	1329	1575	515	1061
	10	1988	273	1715	1963	291	1672	1941	319	1622	1907	350	1558	1863	388	1476	1720	527	1194
	15	2294	284	2010	2256	303	1954	2229	331	1898	2191	360	1831	2148	400	1749	2014	550	1464
	20	2583	298	2285	2551	317	2235	2530	346	2185	2471	374	2097	2438	416	2022	2308	578	1730
580.2	5	1834	279	1556	1810	301	1510	1782	330	1453	1743	363	1380	1710	402	1308	1581	545	1037
	6	1886	282	1605	1862	303	1560	1822	332	1491	1794	365	1429	1762	405	1357	1630	549	1081
	7	1940	284	1656	1914	305	1609	1890	335	1555	1857	368	1490	1813	408	1405	1680	554	1127
	10	2115	293	1823	2092	313	1780	2054	343	1711	2028	377	1652	1985	418	1568	1841	568	1273
	15	2435	305	2131	2394	324	2070	2364	356	2009	2329	388	1942	2283	431	1852	2111	588	1523
	20	2771	321	2451	2713	341	2373	2664	371	2294	2629	404	2225	2576	448	2128	2393	613	1780

To (°C) = Evaporator outlet water temperature

kWf = Cooling capacity [kW]

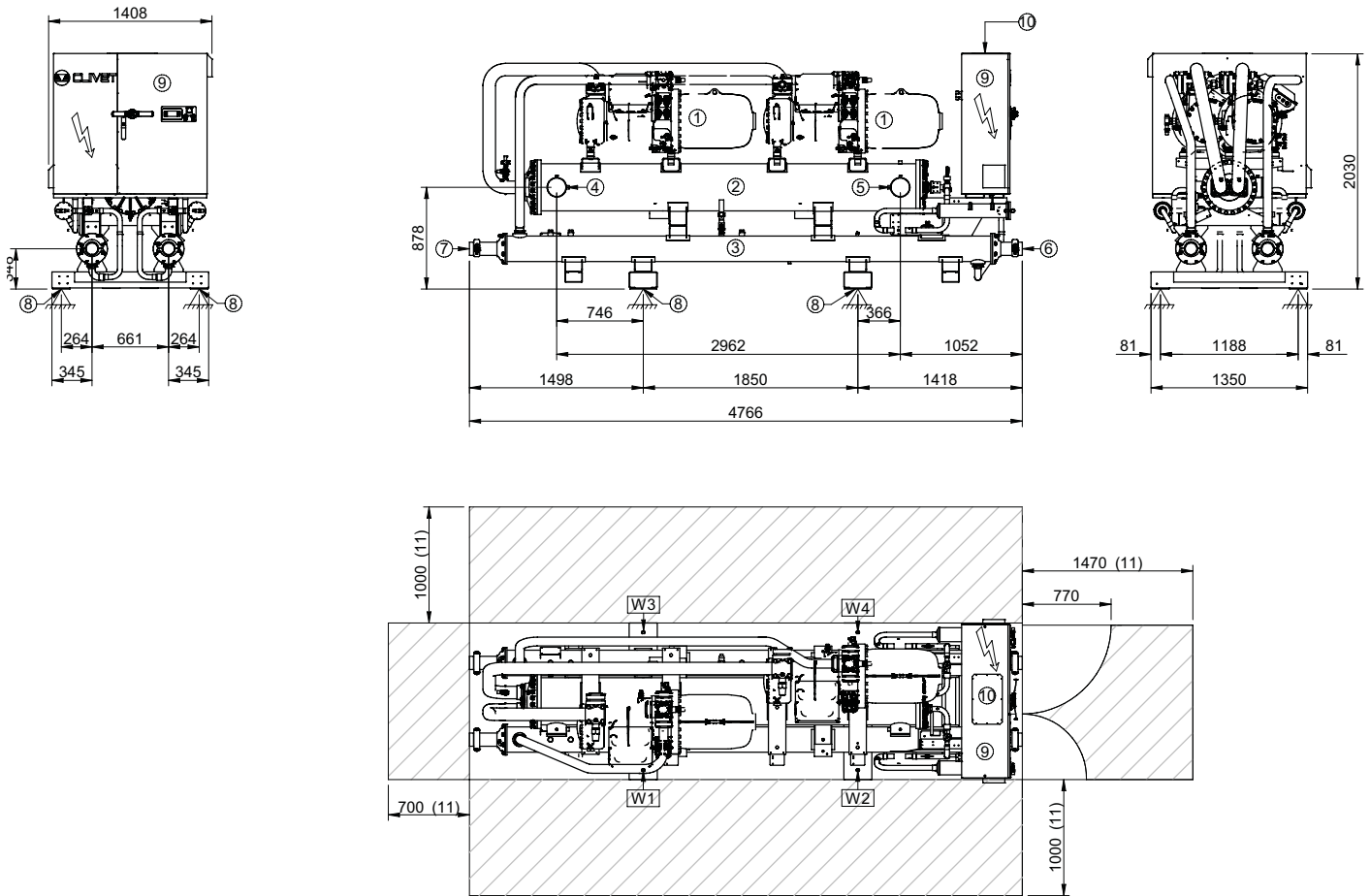
kWe = Electrical power absorbed by compressors [kW]

kWt = Heating capacity [kW]

Water temperature differential = 5°C

Dimensional Drawing

DAAB40001_00
DATA/DATE 11/05/2021



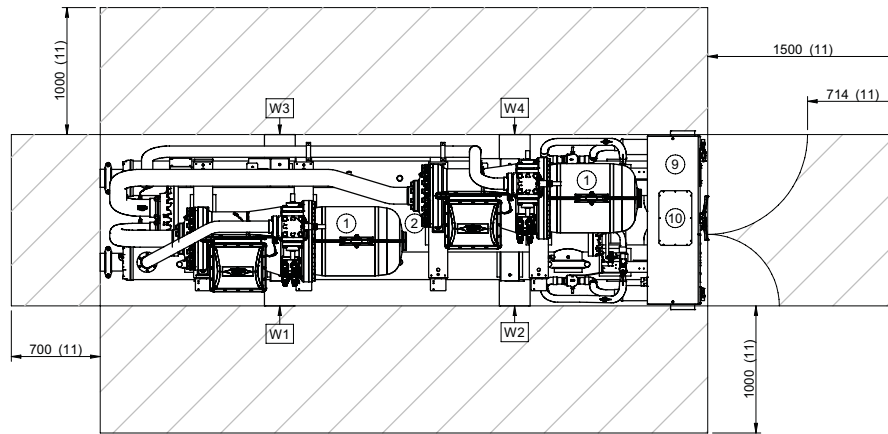
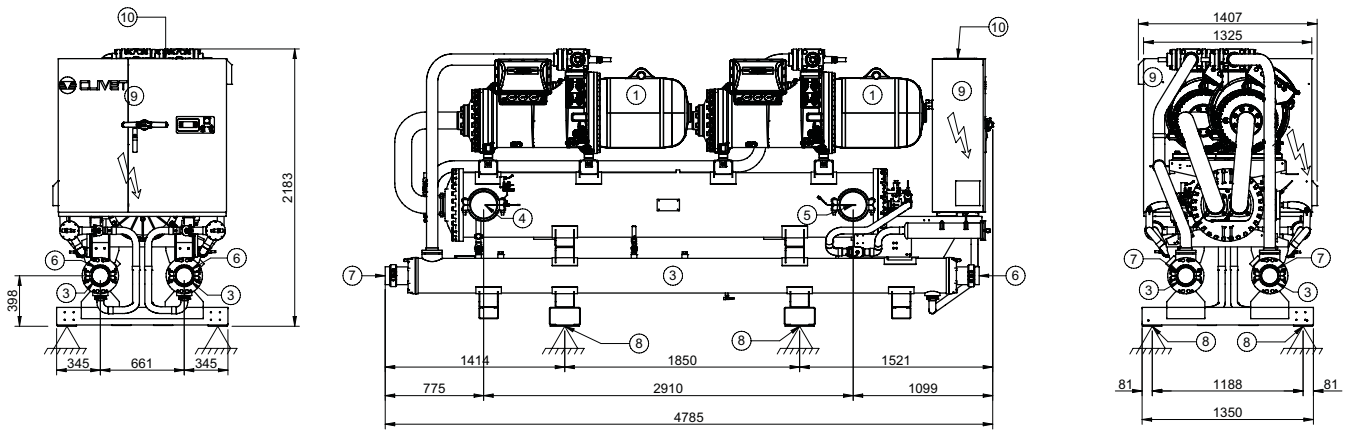
- | | |
|------------------------------------|---------------------------------------|
| 1. Compressor | 7. External exchanger water outlet |
| 2. Evaporator | 8. Anti-vibration mounting holes Ø25 |
| 3. Condenser | 9. Lifting tubes |
| 4. Internal exchanger water inlet | 10. Electrical panel |
| 5. Internal exchanger water outlet | 11. Power input |
| 6. External exchanger water inlet | 12. Minimum dimension for Maintenance |

SIZE		220.2	240.2	280.2
A - Length	mm	4766	4766	4766
B - Depth	mm	1350	1350	1350
C - Height	mm	2030	2030	2030
W1 Support point - EN	Kg	1147	1152	1161
W2 Support point - EN	Kg	981	986	995
W3 Support point - EN	Kg	893	896	902
W4 Support point - EN	Kg	1238	1245	1258
W1 Support point - ST	Kg	1105	1110	1119
W2 Support point - ST	Kg	943	948	958
W3 Support point - ST	Kg	874	876	882
W4 Support point - ST	Kg	1177	1185	1198
Operating weight - EN	kg	4259	4279	4316
Shipping weight - EN	kg	3840	3860	3924
Operating weight - ST	kg	4099	4119	4156
Shipping weight - ST	kg	3680	3700	3764

The presence of optional accessories may result in a substantial variation of the weights shown in the table.

Dimensionali Drawing

DAAB40002_01
DATA/DATE 11/05/2021



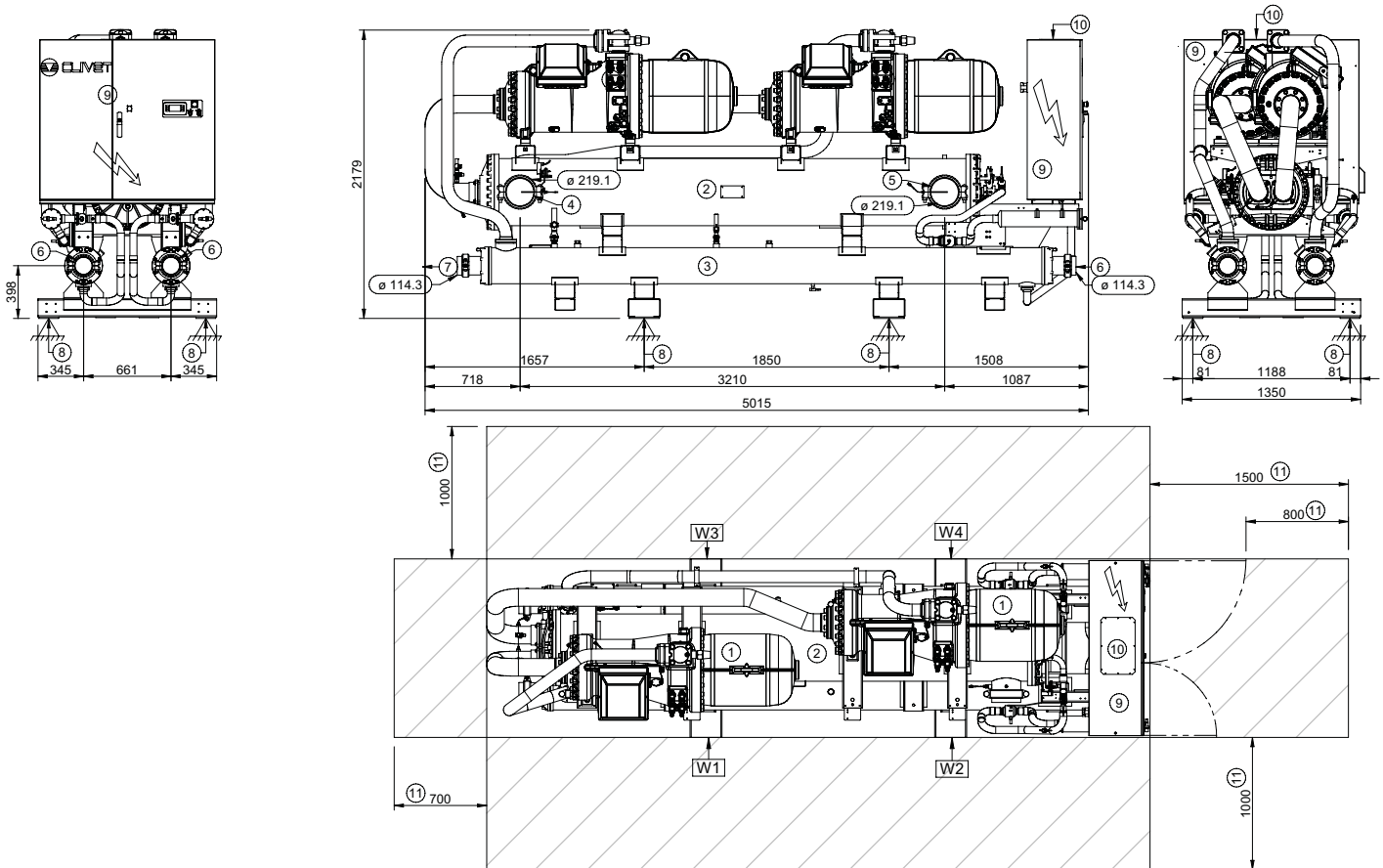
- | | |
|------------------------------------|---------------------------------------|
| 1. Compressor | 7. External exchanger water outlet |
| 2. Evaporator | 8. Anti-vibration mounting holes Ø25 |
| 3. Condenser | 9. Lifting tubes |
| 4. Internal exchanger water inlet | 10. Electrical panel |
| 5. Internal exchanger water outlet | 11. Power input |
| 6. External exchanger water inlet | 12. Minimum dimension for Maintenance |

SIZE		320.2	360.2
A - Length	mm	4785	4785
B - Depth	mm	1350	1350
C - Height	mm	2183	2183
W1 Support point - EN	Kg	1658	1566
W2 Support point - EN	Kg	1429	1532
W3 Support point - EN	Kg	1253	1131
W4 Support point - EN	Kg	1814	1946
W1 Support point - ST	Kg	1578	1583
W2 Support point - ST	Kg	1358	1363
W3 Support point - ST	Kg	1216	1219
W4 Support point - ST	Kg	1702	1709
Operating weight - EN	kg	6154	6174
Shipping weight - EN	kg	5497	5517
Operating weight - ST	kg	5854	5874
Shipping weight - ST	kg	5197	5217

The presence of optional accessories may result in a substantial variation of the weights shown in the table.

Dimensional Drawing

DAAB40003_00
DATA/DATE 11/05/2021



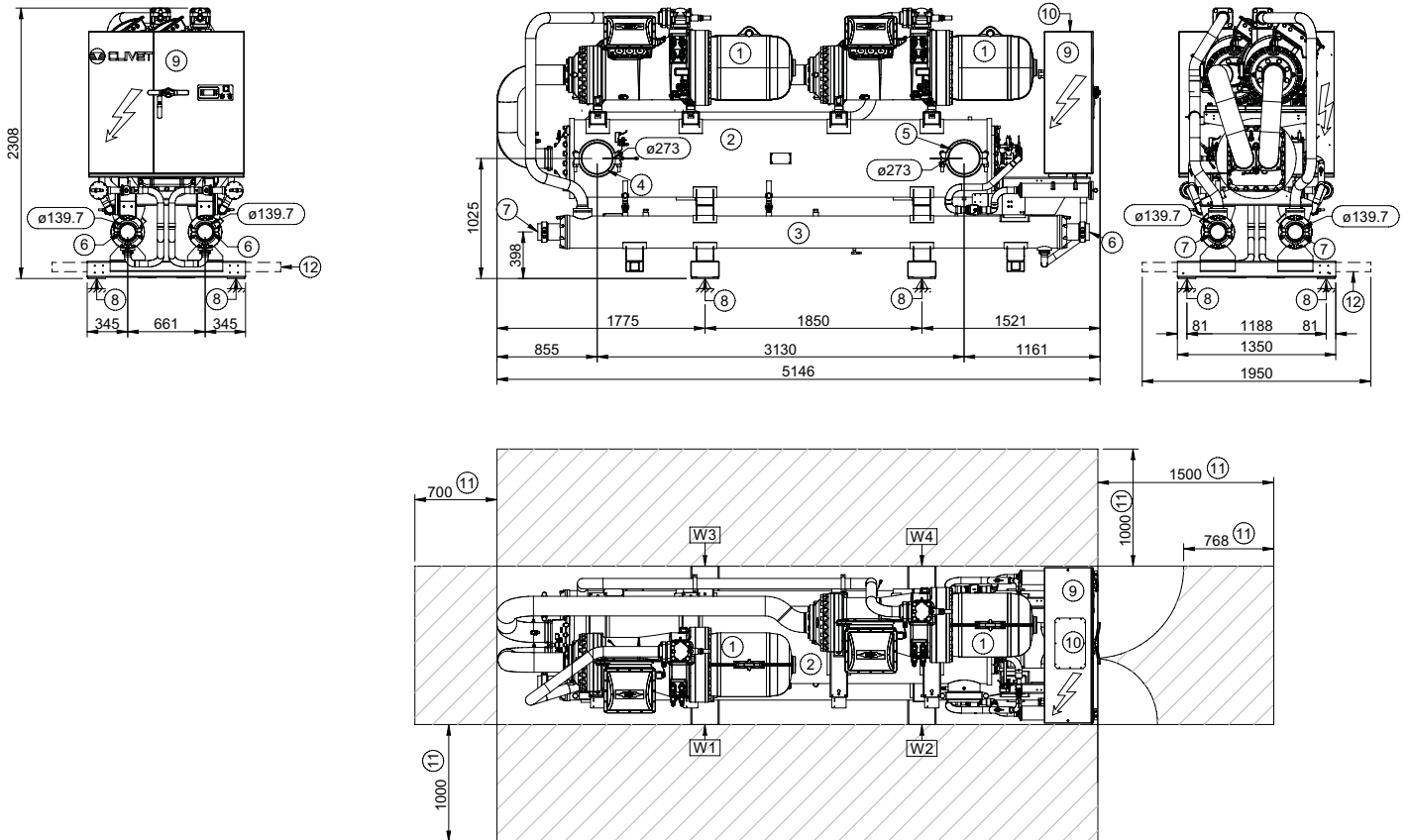
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|------------------------------------|---------------------------------------|
| 1. Compressor | 7. External exchanger water outlet |
| 2. Evaporator | 8. Anti-vibration mounting holes Ø25 |
| 3. Condenser | 9. Lifting tubes |
| 4. Internal exchanger water inlet | 10. Electrical panel |
| 5. Internal exchanger water outlet | 11. Power input |
| 6. External exchanger water inlet | 12. Minimum dimension for Maintenance |

SIZE		440.2
A - Length	mm	5015
B - Depth	mm	1350
C - Height	mm	2179
W1 Support point - EN	Kg	1476
W2 Support point - EN	Kg	1690
W3 Support point - EN	Kg	1005
W4 Support point - EN	Kg	2133
W1 Support point - ST	Kg	1412
W2 Support point - ST	Kg	1603
W3 Support point - ST	Kg	987
W4 Support point - ST	Kg	2001
Operating weight - EN	kg	6304
Shipping weight - EN	kg	5647
Operating weight - ST	kg	6004
Shipping weight - ST	kg	5347

The presence of optional accessories may result in a substantial variation of the weights shown in the table.

Dimensional Drawing

DAAB40004_00
DATA/DATE 11/05/2021



- | | |
|------------------------------------|---------------------------------------|
| 1. Compressor | 7. External exchanger water outlet |
| 2. Evaporator | 8. Anti-vibration mounting holes Ø25 |
| 3. Condenser | 9. Lifting tubes |
| 4. Internal exchanger water inlet | 10. Electrical panel |
| 5. Internal exchanger water outlet | 11. Power input |
| 6. External exchanger water inlet | 12. Minimum dimension for Maintenance |

SIZE		500.2	540.2	580.2
A - Length	mm	5146	5146	5146
B - Depth	mm	1350	1350	1350
C - Height	mm	2308	2308	2308
W1 Support point - EN	Kg	1609	1663	1681
W2 Support point - EN	Kg	1777	1837	1859
W3 Support point - EN	Kg	1112	1136	1141
W4 Support point - EN	Kg	2255	2345	2379
W1 Support point - ST	Kg	1539	1593	1612
W2 Support point - ST	Kg	1696	1756	1778
W3 Support point - ST	Kg	1092	1116	1121
W4 Support point - ST	Kg	2126	2216	2250
Operating weight - EN	kg	6753	6981	7061
Shipping weight - EN	kg	6096	6308	6388
Operating weight - ST	kg	6453	6681	6761
Shipping weight - ST	kg	5796	6008	6088

The presence of optional accessories may result in a substantial variation of the weights shown in the table.

Option compatibility

REFERENCE	DESCRIPTION	220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
CONFIGURATIONS AND MAIN ACCESSORIES										
B	Water low temperature	0	0	0	0	0	0	0	0	0
D	Partial energy recovery	0	0	0	0	0	0	0	0	0
R	Total energy recovery	0	0	0	0	0	0	0	0	0
B + D	Low water temperature + Partial energy recovery	0	0	0	0	0	0	0	0	0
B + R	Low water temperature + Total energy recovery	0	0	0	0	0	0	0	0	0
D + R	Partial energy recovery + Total energy recovery	x	x	x	x	x	x	x	x	x
CO1OP	1 pass condenser with opposit water connection	0	0	0	0	0	0	0	0	0
CO2P	2 pass condenser	0	0	0	0	0	0	0	0	0
D + CO2P	Partial energy recoverye + 2 pass condenser	x	x	x	x	x	x	x	x	x
CO1OP + CO2P	1 pass condenser with opposit water connection + 2 pass condenser	x	x	x	x	x	x	x	x	x
OCO + HWT	Cooling only operation + High water temperature	x	x	x	x	x	x	x	x	x
OHI + HWT	Operation with wter circuit change-over + High water temperature	x	x	x	x	x	x	x	x	x
OHO + HWT	Heating only operation + High water temperature	0	0	0	0	0	0	0	0	0
CO1OP + OCO	1 pass condenser with opposit water connection + Cooling only operation	0	0	0	0	0	0	0	0	0
CO1OP + OHI	1 pass condenser with opposit water connection + operation with wter circuit change-over	0	0	0	0	0	0	0	0	0
CO1OP + OHO	1 pass condenser with opposit water connection + Heating only operation	0	0	0	0	0	0	0	0	0
CO2P + OCO	2 pass condenser + Cooling only operation	0	0	0	0	0	0	0	0	0
CO2P + OHI	2 pass condenser + operation with wter circuit change-over	x	x	x	x	x	x	x	x	x
CO2P + OHO	2 pass condenser + Heating only operation	0	0	0	0	0	0	0	0	0
IVMSX + CO1OP + OCO	Modulating valve source side + 1 pass condenser with opposit water connection + Cooling only operation	0	0	0	0	0	0	0	0	0
IVMSX + CO1OP + OHI	Modulating valve source side + 1 pass condenser with opposit water connection + operation with wter circuit change-over	0	0	0	0	0	0	0	0	0
IVMSX + CO1OP + OHO	Modulating valve source side + 1 pass condenser with opposit water connection + Heating only operation	0	0	0	0	0	0	0	0	0
IVMSX + CO2P + OCO	Modulating valve source side + 2 pass condenser + Cooling only operation	0	0	0	0	0	0	0	0	0
IVMSX + CO2P + OHO	Modulating valve source side + 2 pass condenser + Cooling only operation	0	0	0	0	0	0	0	0	0

X Not available

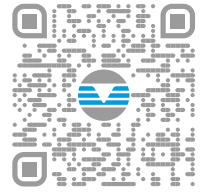
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Tel. +39 0439 3131 - info@clivet.it

CLIVET GMBH

Hummelsbütteler Steindamm 84,
22851 Norderstedt, Germany
Tel. +49 40 325957-0 - info.de@clivet.com

Clivet Group UK LTD

Units F5 & F6 Railway Triangle,
Portsmouth, Hampshire PO6 1TG
Tel. +44 02392 381235 -
Enquiries@Clivetgroup.co.uk

CLIVET LLC

Office 508-511, Elektrozavodskaya st. 24,
Moscow, Russian Federation, 107023
Tel. +7495 6462009 - info.ru@clivet.com

CLIVET MIDEAST FZCO

Dubai Silicon Oasis (DSO) Headquarter Building,
Office EG-05, P.O Box-342009, Dubai, UAE
Tel. +9714 3208499 - info@clivet.ae

Clivet South East Europe

Jarušćica 9b
10000, Zagreb, Croatia
Tel. +3851 222 8784 - info.see@clivet.com

CLIVET France

10, rue du Fort de Saint Cyr - 78180 Montigny le
Bretonneux, France
info.fr@clivet.com

Clivet Airconditioning Systems Pvt Ltd

Office No.501 & 502,5th Floor, Commercial -I,
Kohinoor City, Old Premier Compound, Off LBS
Marg, Kirool Road, Kurla West, Mumbai
Maharashtra 400070, India
Tel. +91 22 30930200 - sales.india@clivet.com

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