Technical Bulletin

BT13H003GB-05

SCREWLine^3

Water-cooled liquid chillers

WDH-SL3 120.1 - 290.1 RANGE

EXCELLENCE version

Nominal cooling capacity from 325 kW to 782 kW

- Independent refrigeration circuits with twin screw compressor R-134a
- Eurovent efficiency Class A
- Modulating capacity control (stepless) up to 25% of the load
- Leaving temperature down to -12°C
- Temperature leaving the condenser up to +65°C
- Heat pump with water circuit change-over
- Total / partial recovery of the condensing heat

Clivet is taking part in the EUROVENT certification programme up to 1.500 kW. The products concerned appear in the certified products list of the EUROVENT www.eurovent-certification.com site.

Features and Benefits

Excellent operating economy

Cutting-edge energy efficiency in its category

- Eurovent Class A energy efficiency
- EER of up to 5.2 at full load operation
- ESEER of up to 5,6 at seasonal operation

Perfect matching of the supplied capacity to the load

- Modulating capacity control (stepless) down to 25% of the load
- Electronic expansion valve: it quickly adapts to the actual load, controls in a more precise and firmer way than mechanical thermostatic valves, controls the superheating and increases the efficiency and compressor lifetime

Superior heat exchange efficiency

- Dry expansion shell and tube evaporator at single pass in perfect counterflow: higher exchange efficiency

High efficiency version with economizer circuit in applications with high condensing temperature

- Chiller operation with dry-cooler rejection
- Heat pump operation with water circuit change-over

DST Control (Dynamic Supply Temperature) available for additional energy saving

Great application versatility

Two available versions according to the application

- Cooling only operation
- Heat pump operation with water circuit change-over

Hot water up to 65°C

Chilled water down to –8°C (Brine configuration). On request: chilled water down to –12°C

Environmental care

Ecological refrigerant R-134a

- It does not contain chlorine: ODP (Ozone Depletion Potential) equal to 0 Reduced quantity: it contributes to LEED credits for Green Buildings
- Reduced quantity: it contributes to LEED credits for Green Buildings

Safety against refrigerant leaks

- All pressure gauges and equipment are already on board
- PED Certification (Pressure Equipment Directive)

Easy and fast installation and start-up

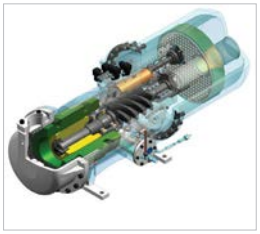
Compact design: the reduced width permits an easy access to plant rooms

Quick installation

- Easily accessible lifting points
- Simplified hydronic connections, Victaulic type
- Practical reference marks for entering and leaving water connections

Easy electrical connection:

- Just one power supply point for the unit
- Power supply to low voltage control devices integrated into the unit
- Multifunction phase monitor supplied as standard: it controls the presence and the correct phase sequences, verifies possible voltage anomalies (-10%), it automatically resets the unit operation, when the correct power supply is re-established
- User contacts are easily accessible and with connection details available on the Installation, Use and Maintenance Manual.



Absolute reliability

Compliance to the most restrictive quality standards

- CE label that certifies the whole operation process and the conformity to the security rules
- Eurovent Eurovent Certification
- Individual test to certify the correct operation prior to shipment

Double screw compressors with industrial quality

- Five long-life shaft bearings
- Just two rotating parts, protected against wear by an oil film
- Star-triangle start-up: longer life to the motor and current peak reduction
- Gradual activation of the capacity control valve
- Oil separator and electronic oil level sensor: proper lubrication in any operating condition
- Non return valve: no reverse rotation, no screw wearing

Uninterrupted operation

- Automatic compressor unloading whenever operating limits are approached: it avoids the unit to shut down
- Robust evaporator with redundant ice protection: temperature sensors and differential pressure switch
- Self-adaptive PID control (Proportional-Integral-Derivative): precise temperature control (+/- 1°C) also when fast load changes occur or compressors are activated

Automatic control

Integrated microprocessor control

- Automatic operation with best efficiency control
- Integrated diagnostics and alarm management
- Back-up of factory settings on static memory card for safe data protection and speed up control programming
- Automatic compressor sequencer to equalize operating time

Very user-friendly interface:

- Backlit graphic display
- Several languages available
- Multilevel menu, password protected

Integrated Energy management:

- Operation scheduler: the unit is activated only when capacity is needed
- Double set-point
- Demand limit (either 0-10V or 4-20 mA input) to limit the unit capacity to a predefined value

ECOSHARE function (option) for automatic teamworking (up to 7 units)

- Further saving: the group of units matches the load with global maximum efficiency
- Higher reliability: any fault on one unit does not stop operation on other units

Remote system management

- Standard volt-free contacts: remote on/off, compressor mode, refrigeration circuit enabled/disabled, set-point change, alarm
- Communication protocols to BMS: Modbus, BACnet-IP, LonWorks
- Clivet P-Matic, management system

Semplified maintenance

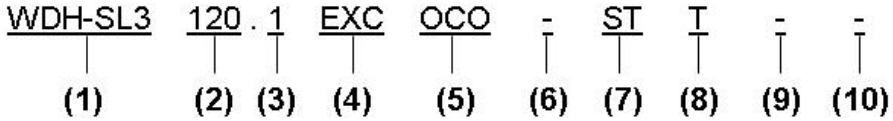
Fast operation on components

- Simplified access to all section requiring routine maintenance
- Pump-Down integrated function, with no-leak electronic expansion valve, discharge line shut-off valve, liquid line shut-off valve: refrigerant is stored in the condenser for simplified maintenance on the refrigeration circuit

Fast access to unit information

- Double reading of refrigerant pressures: digital on the user interface, analog on high pressure and low pressure manometers
- Ethernet connection to provide diagnostics and monitoring via PC

Unit configurability



(1) Range
WDH = Liquid chiller, water cooled, with screw compressors
SL3 = SCREWLine³ range

(2) Size
120 = Nominal compressor capacity (HP)

(3) Compressors
1 = Compressor quantity

(4) Energy efficiency
EXC = EXCELLENCE version: high energy efficiency

(5) Operation
OCO = Cooling only (standard)
OHI = Heat pump, water circuit change-over

(6) High condenser water temperature
- = High water temperature: not required (standard)
HWT = High water temperature

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

(8) Application
T = Cooling tower application (standard)
P = Groundwater application

(9) Energy recovery
- = Energy recovery: not required (standard)
D = Partial energy recovery (5% off condensing heat)
R = Total energy recovery (100% off condensing heat)

(10) Low evaporator water temperature
- = Low water temperature: not required (standard)
B = Low water temperature, down to –8°C (Brine)
'Very low water temperature', down to –12°C, is available on request

Option compatibility

REFERENCE	DESCRIPTION	120.1	140.1	160.1	180.1	200.1	220.1	250.1	270.1	290.1
CONFIGURATIONS AND MAIN ACCESSORIES										
B	Water low temperature	o	o	o	o	o	o	o	o	o
D	Partial energy recovery	o	o	o	o	o	o	o	o	o
R	Total energy recovery	o	o	o	o	o	o	o	o	o
B + D	Low water temperature + Partial energy recovery	o	o	o	o	o	o	o	o	o
B + R	Low water temperature + Total energy recovery	o	o	o	o	o	o	o	o	o
D + R	Partial energy recovery + Total energy recovery	X	X	X	X	X	X	X	X	X
T	Cooling tower application	o	o	o	o	o	o	o	o	o
P	Groundwater application	o	o	o	o	o	o	o	o	o
D + P	Partial energy recovery + Groundwater application	X	X	X	X	X	X	X	X	X
T + P	Cooling tower application + Groundwater application	X	X	X	X	X	X	X	X	X
T + OCO	Cooling tower application + Cool only operation	o	o	o	o	o	o	o	o	o
T + OHI	Cooling tower application + Operation with water circuit change-over	o	o	o	o	o	o	o	o	o
P + OCO	Groundwater application + Cool only operation	o	o	o	o	o	o	o	o	o
P + OHI	Groundwater application + Operation with water circuit change-over	X	X	X	X	X	X	X	X	X
PVSX + T + OCO	Pressure valve + Cooling tower application +Cool only operation	X	X	X	X	X	X	X	X	X
PVSX + T + OHI	Pressure valve + Cooling tower application +Operation with water circuit change-over	o	o	o	o	o	o	o	o	o
PVSX + P + OCO	Pressure valve + Groundwater application + Cool only operation	o	o	o	o	o	o	o	o	o
IVMSX + T + OCO	Modulating valve source side + Cooling tower application + Cool only operation	o	o	o	o	o	o	o	o	o
IVMSX + T + OHI	Modulating valve source side + Cooling tower application +Operation with water circuit change-over	o	o	o	o	o	o	o	o	o
IVMSX + P + OCO	Modulating valve source side + Groundwater application + Cool only operation	o	o	o	o	o	o	o	o	o

X Not available
o Optional

Considerations on the installation

OCO - Cool 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.

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

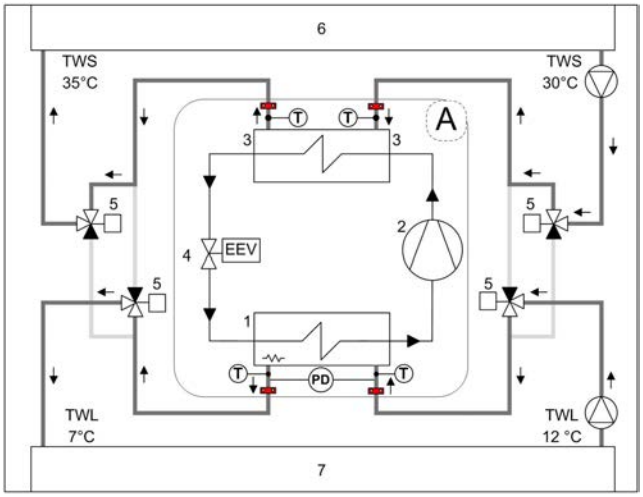
The Customer can change the operating mode using the interface on board the machine or the designated potential-free contact.

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 condenser. The probe installation is provided by the Customer. The connection cable length is 3m.

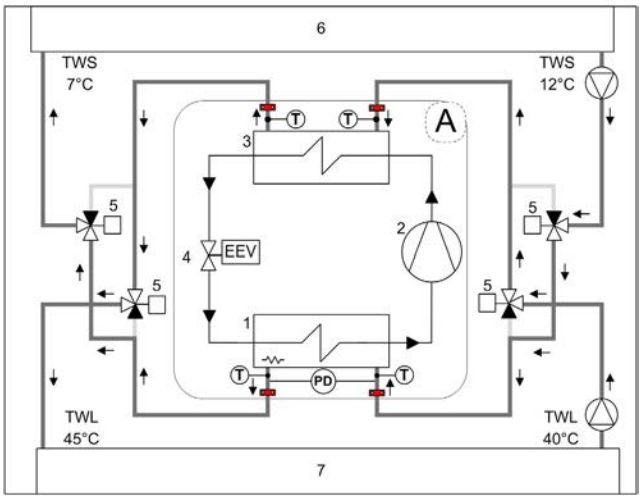
Operation mode: cooling



1. Internal exchanger (evaporator)
2. Compressor
3. External exchanger (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. Internal exchanger (evaporator)
2. Compressor
3. External exchanger (condenser)
4. Electronic expansion valve
5. Switching valves (provided by customer)
6. Thermal source (heat rejection)
7. Use (heat)

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

HWT - High water temperature

Enhanced efficiency version in applications with high condenser water temperature:

- Chiller operation (configuration OCO) with dry-cooler
- Heat Pump operation (configuration OHI), with leaving temperature extended up to 65°C

It includes:

- economizer: sub-cools the liquid leaving the condenser and reduces the compressor power input with two-stage refrigerant expansion
- liquid injection: safety device to cool down the compressor motor in worst conditions
- settings and safety equipment: suitable for this application

EN - Super-silenced 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.

The casings are secured to an aluminium frame and painted on the outside with polyester powder (RAL 9001).

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

T - Application with cooling tower (Standard)

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.

P - Application with groundwater

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 aqueduct).

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, 'T - Application with cooling tower'.

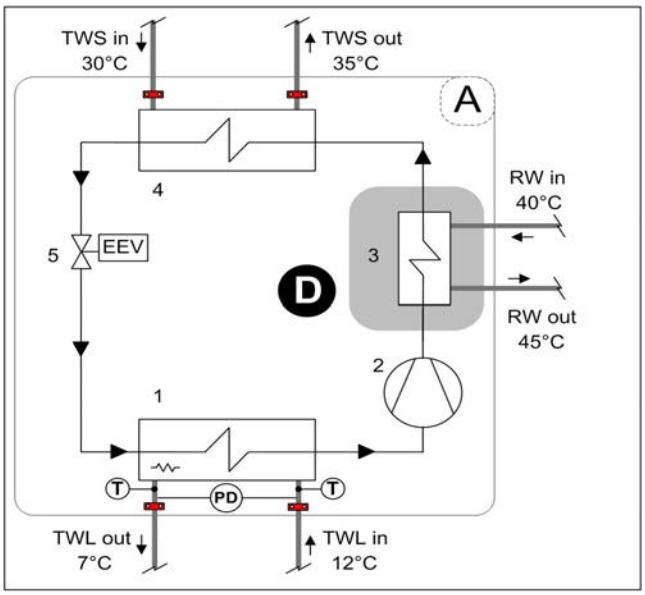
D - Partial energy recovery

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

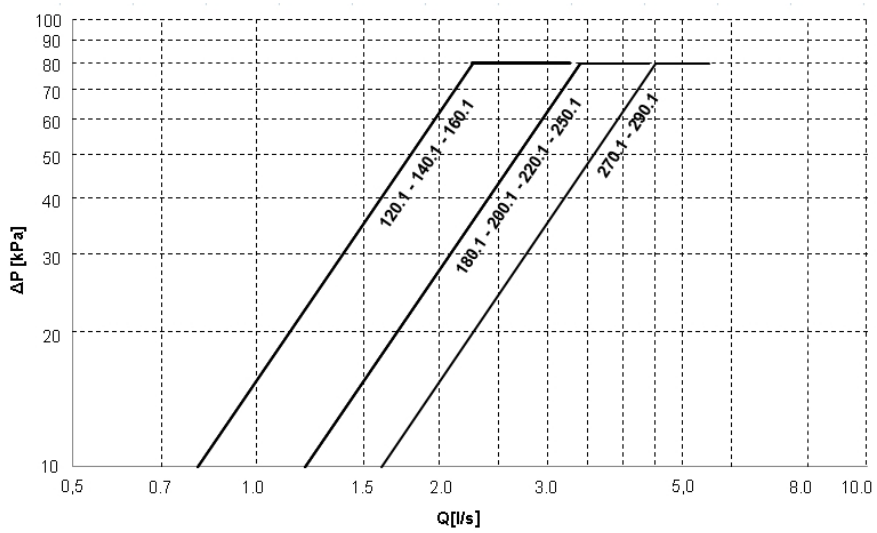
A - Unit supply limit
1 - Internal exchanger (evaporator)
2 - Compressor
3 - Recovery exchanger
4 - External exchanger (condenser)
5 - Expansion electronic valve

TWS in - Water inlet source side
TWS out - Water outlet source side
TWL in - Water inlet user side
TWL out - Water output user side
RW in - Recovery water inlet
RW out - Recovery water outlet
T - Temperature probe
PD - Differential pressure switch

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

Pressure drops of partial energy recovery exchanger

Version: Excellence



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

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.

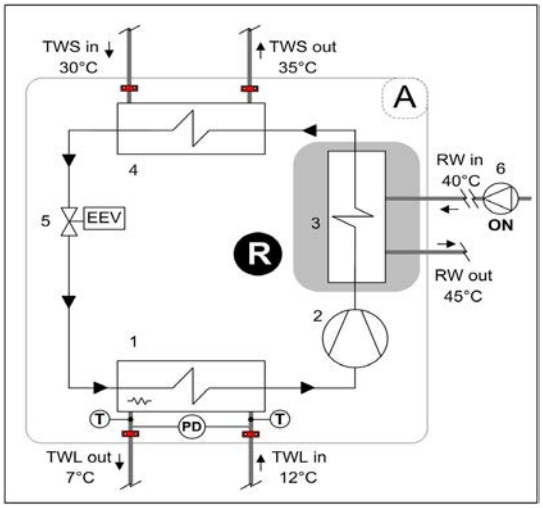
See the following example:

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.

To prevent constant switching in the unit's refrigeration circuit, it is necessary to install a storage tank with an adequate capacity in the system's hot water circuit.

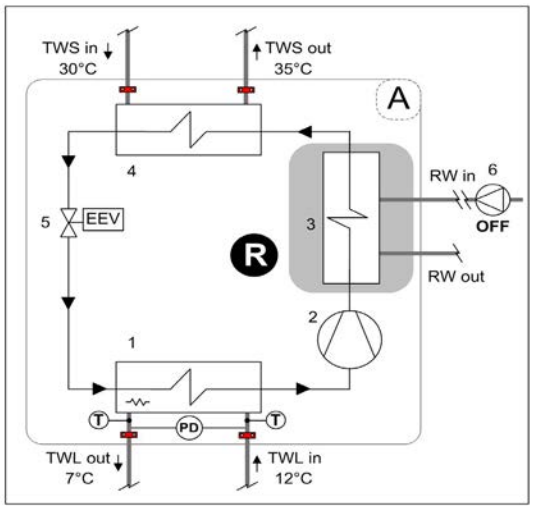
TOTAL OPERATING ENERGY RECOVERY

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



TOTAL NON-OPERATING ENERGY RECOVERY

When the recovery is achieved, the pump on the recovery side must be disabled.



R - Total recovery device
A - Unit supply limit

1 - Internal exchanger (evaporator)
2 - Compressor
3 - Recovery exchanger
4 - External exchanger (condenser)
5 - Expansion electronic valve
6 - Pump recovery side (supply and management provided by the Customer)

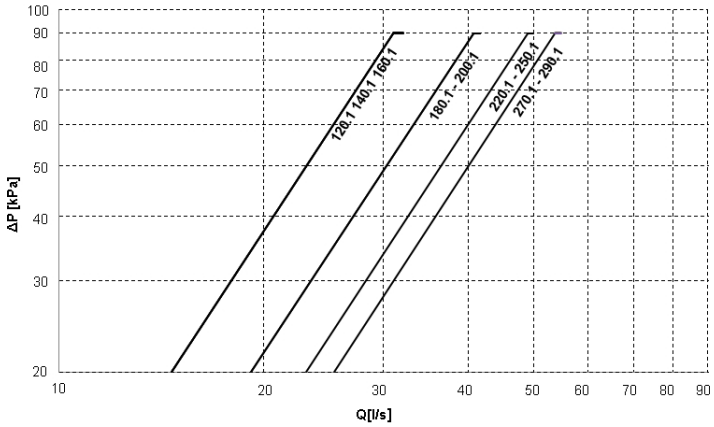
TWS in - Water inlet source side
TWS out - Water outlet source side
TWL in - Water inlet user side
TWL out - Water output user side
RW in - Recovery water inlet

RW out - Recovery water outlet

T - Temperature probe
PD - Differential pressure switch

Pressure drops of the total energy recovery exchanger

Version: Excellence



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)".

Application of the partial / total energy recovery

In almost all systems fitted with a chiller used to produce chilled water there is also the need to have hot water. The recovery of condensation heat is an efficient way of producing hot water while the chiller is in operation. It has the double benefit of both reducing the heat load to the condenser, thereby eliminating dissipation costs and generating free hot water, thereby reducing the costs of the auxiliary heater.

Application versatility of recovery devices

The hot water produced by heat recovery can be used in a number of ways: to reheat air in handling units, to preheat hot water for domestic use or industrial processes, to heat up water in swimming pools, showers and spas, to preheat hot water for laundries or industrial kitchens.

Post-heating in air handling units to control humidity levels in hospitals and labs

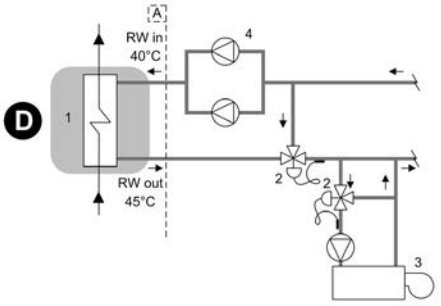
Preheating of hot water for domestic use or for industrial process

Heating of water in swimming pools, showers and SPAS

Preheating of hot water for laundries and industrial kitchens

Water heating up

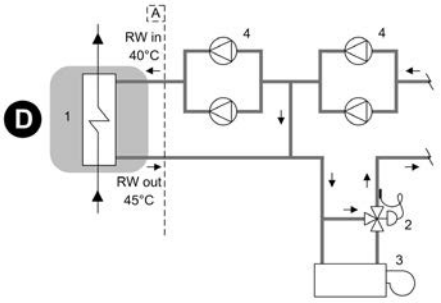
The heat recovery device can be used to cover the entire heat load required. The hot water supply temperature is controlled via a modulating control valve that needs to be fitted on the system at the outlet of the recovery unit. The auxiliary heating device is recommended to cover the thermal energy demand when the chiller is not in operation or is operating at part load.



Example of how heat recovery is used to cover the entire heat demand and control the operating temperature

Water preheating

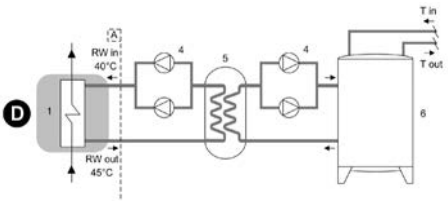
The heat recovery device can be used to preheat water at the inlet of the main heating device (e.g. boiler). In this case, the demand for hot water is greater than the amount of heat recovered by condensation and the recovery device only covers part of the required heat load. By preheating the water, heating consumption levels are therefore reduced and the main heating device has a lower installed power requirement.



Example of how heat recovery is used to preheat hot water in the system

Domestic hot water production

The heat recovery device can be used to produce water for domestic use. In order to prevent contamination of domestic water with the chiller's process fluid, it is necessary to insert an intermediate heat exchanger. Using an inertial heat storage tank allows to have a reserve of preheated water and enables the intermediate exchanger to operate more efficiently.



Example of how heat recovery is used to preheat hot water for domestic use

A - Unit supply limit
D - Partial energy recovery
1 - Recovery exchanger
2 - Control modulating valve
3 - Auxiliary heating device (ex.boiler)
4 - Electric pump with standby pump
5 - Intermediate heat exchanger
6 - Inertial heat storage
RW in - Recovery water inlet
RW out - Recovery water outlet
T in - Drinkable water inlet
T out - Drinkable water outlet to the auxiliary heater

The diagrams refer to partial energy recovery, though they also apply to total energy recovery (Clivet R). Please note that the diagrams are only meant as a guide.

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".

"The "Extremely low water temperature" option for the chilled wter production down to -12°C is available on request.

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

Example: Determine the performance with leaving water temperature –4°C for WDH-SL3 120.1 EXC B unit (Excellence' version, 'Water low temperature' configuration) with external exchanger water (condenser) 30 / 35 °C, 25% glycol

Reference: WDH-SL3 120.1 EXC cooling capacity = 326 kW, Compressor power input = 60.5 kW (from the performance table referred to condenser entering / leaving water temperature 30/35°C and the internal exchanger leaving water temperature (evaporator) 7°C)

From the correction factor table for water low temperature: 0.691 for the cooling capacity and 0.84 the compressor power input (leaving water temperature –4°C).

From the glycol correction factor : 0.971 for the cooling capacity , 1.055 for the compressor power input , 1.067 the glycol solution flow, 1.408 for the evaporator pressure drop (glycol 25%).

Calculation WDH-SL3 120.1 EXC B: Cooling capacity = 326 x 0.691 x 0.971 =219 kW, Compressor power input = 60.5 x 0.84 x 1.055 = 53.6 kW, Water flow-rate = 10.5 (calculated on 219 kW) x 1.067 = 11.2 l/s, Evaporator pressure drop = 18 (calculated on 11.2 l/s) x 1.408 = 25.3 kPa

Standard unit technical specifications

Compressor

Compact semi hermetic helicoidal twin screw compressors: the main screw (male, with five lobes) is driven directly by the electric motor, while the secondary screw (female with six vanes) is driven by the primary one.

Continuous modulation of the cooling capacity supplied with no-load start-up. The tightness is guaranteed by the extremely accurate tolerances in processing all the moving parts and specific oil circulation between the screws.

The free flow lubrication system resulting from pressure differences, is equipped with a highly efficient separator, level indicator and oil filter (replaceable).

An oil heater prevents excessive dilution of the oil by the refrigerant, and is automatically activated at all stages where the compressor is switched off.

Electronic control of the oil level shown on a graphical display

The asynchronous three-phase two-pole motor is suction gas cooled, reduced load start of star delta type.

Fully protected electronic module, with safety sensor for monitoring discharge temperature, sensors for monitoring maximum temperature of the windings, device to monitor the motor rotation direction and device to monitor absence of phase.

Cut-off valve on the discharge line of the refrigerant.

Filter on the supply line, at the compressor inlet.

Built-in attenuator and non return valve on the compressor's drain.

Automatic safety valve inside the compressor between the high pressure (HP) and low pressure (LP) areas.

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.

This is a single-step exchanger with perfect counter-current between the water and the refrigerant.

Moreover, it comes with a protection differential pressure switch on the water side and a coating made with closed-cell thermal-insulating material to prevent condensation and heat transfer towards the outside environment.

The exchanger water connections are quick type with splined joint.

Condenser

Shell and tube exchanger with cover side refrigerant and water in tubes. It is composed of a cover made of carbon steel. The integral finned tubes are made of copper, whereas the tube plates are made of carbon steel. They are provided with holes with grooves for the mechanical expansion of the tubes. The heads are removable to allow cleaning and maintenance of the exchanger. The water connections are available for connection with groundwater (P) or cooling tower (T). Specify use when ordering.

The exchanger water connections are quick type with splined joint.

In the Excellence version the exchanger is at single-step.

Refrigeration circuit

The units are designed with a refrigeration circuit equipped with:

- electronic expansion valve
- high pressure safety pressure switch
- low pressure safety valve (safety valve with shut-off valve sealed with lead, open for possible inspection)
- high pressure safety valve (safety valve with shut-off valve sealed with lead, open for possible inspection)
- high and low pressure gauges
- replaceable anti-acid solid cartridge dehydrator filter
- sight glass with moisture and liquid indicator
- cutoff valve on compressor supply
- cutoff valve on liquid line

Electrical panel

The capacity section includes:

- main door lock isolator switch (compulsory to have certification CE)
- isolating transformer for auxiliary circuit power supply
- compressor fuses and thermal overload relay
- compressor control contactor

The control section includes:

- derivative-integral-proportional control of the water temperature
- antifreeze protection
- unit switching on management by local or remote (serial)
- compressor overload protection and timer
- potential-free contacts for compressor status and enabling
- self-diagnosis system with immediate display of the error code
- prealarm function for water anti-ice and high refrigerant gas pressure
- compressor operating hour display
- multifunction phase monitor
- remote ON/OFF control
- remote HEAT/COOL control
- second set-point enabling by potential-free contact
- automatic compressor start rotation control
- relay for remote cumulative fault signal
- display of the set values, the error codes and the parameter index
- high refrigerant gas pressure pre-alarm function that in many cases prevents the unit from being shut-down
- inlet for demand limit (power input limitation according to a 0÷10V or 4-20 mA external signal)
- interface terminal with graphic display

Accessories

- Rubber antivibration mounts (separately supplied accessories)
- Progressive compressor start-up device (from size 120.1 to size 220.1)
- Compressor overload circuit breakers
- Power factor correction capacitors (cosfi > 0.9)
- Energy meter
- Set-point compensation with outdoor air temperature probe
- Set-point compensation with signal 0-10 V
- 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 (separately supplied accessories)
- Pressure valve (separately supplied accessories)

Test

All the units are factory-tested in specific steps, 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.

General technical data

Acoustic treatment: Standard (ST) - Super-silenced(EN)

Size			120.1	140.1	160.1	180.1	200.1	220.1	250.1	270.1	290.1
Cooling											
Cooling capacity	1	kW	326	394	431	505	551	615	670	739	785
Compressor power input	1	kW	60.5	72.9	80.4	92.8	101	113	124	137	147
Total power input	1	kW	61.0	73.4	80.9	93.3	102	114	125	138	148
Total recovery heating capacity	2	kW	359	438	480	558	609	680	743	818	871
Partial recovery heating capacity	2	kW	19.3	23.3	25.6	29.9	32.6	36.4	39.7	43.8	46.6
EER	1		5.34	5.36	5.33	5.41	5.41	5.41	5.37	5.37	5.31
Cooling capacity (EN14511:2013)	3	kW	325	392	430	504	550	613	668	736	782
Total power input (EN14511:2013)	3	kW	63.0	76.6	85.0	96.6	106	118	130	144	155
EER (EN 14511:2013)	3		5.15	5.12	5.05	5.22	5.19	5.19	5.13	5.13	5.05
ESEER			5,51	5,5	5,46	5,56	5,56	5,55	5,54	5,52	5,41
IPLV	4		6,23	6,19	6,17	6,25	6,28	6,26	6,23	6,22	6,09
Heating											
Heating capacity	5	kW	359	438	480	558	609	680	743	818	871
Compressor power input	5	kW	73.1	87.0	96.1	111	121	135	148	163	176
Total power input	5	kW	73.6	87.5	96.6	111	121	136	149	164	176
COP	5		4.89	5.00	4.97	5.02	5.03	5.01	4.99	4.99	4.94
Heating capacity (EN14511:2013)	6	kW	360	439	482	560	612	682	745	821	874
Total power input (EN14511:2013)	6	kW	75.3	90.2	99.9	114	125	139	153	169	182
COP (EN 14511:2013)	6		4.79	4.87	4.83	4.92	4.91	4.90	4.86	4.87	4.81
Compressor											
Type of compressors	7		DSW	DSW	DSW	DSW	DSW	DSW	DSW	DSW	DSW
No. of compressors		No	1	1	1	1	1	1	1	1	1
Rated power (C1)		HP	120	140	160	180	200	220	250	270	290
Std Capacity control steps		No	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
Oil charge (C1)		l	17.0	21.0	21.0	25.0	25.0	25.0	25.0	25.0	25.0
Refrigerant charge (C1)		kg	83	83	85	116	116	132	132	147	147
Refrigeration circuits		No	1	1	1	1	1	1	1	1	1
Internal exchanger (evaporator)											
Type of internal exchanger	8		S&T	S&T	S&T	S&T	S&T	S&T	S&T	S&T	S&T
Water flow-rate (User side)	1	l/s	15.6	18.8	20.6	24.1	26.3	29.4	32.0	35.3	37.5
Internal exchanger pressure drops	1	kPa	34	46	55	27	32	39	45	47	53
Water content		l	190	190	190	307	307	307	307	280	280
External exchanger (condenser)											
Type of external exchanger	8		S&T	S&T	S&T	S&T	S&T	S&T	S&T	S&T	S&T
Water flow-rate (Source Side)	1	l/s	18.5	22.3	24.5	28.6	31.2	34.8	38.0	41.9	44.5
External exchanger pressure drop	1	kPa	32	46	56	44	53	45	54	55	62
Water content		l	56.0	56.0	56.0	73.0	73.0	91.0	91.0	96.0	96.0
Quantity		No	1	1	1	1	1	1	1	1	1
Connections											
Water connections	9		5"	5"	5"	6"	6"	6"	6"	6"	6"
Water connections	10		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. Data referred to the following conditions: - internal exchanger (evaporator) = 12 / 7 °C - external exchanger (condenser) = 30/35°C. The data do not consider the pump share, required to overcome the pressure drop for the solution circulation inside the exchangers.
2. Recovery exchanger water=40/45°C
3. Data calculated in compliance with Standard EN 14511:2013 referred to the following conditions: - internal exchanger water = 12/7°C - external exchanger water = 30/35 °C
4. Data calculated in compliance with Standard ARI 550/590-2003 referred to the following conditions: internal exchanger water outlet = 6.7 °C. external exchanger water inlet = 29.4 °C
5. Data referred to the unit in the 'OHI - Operation with water circuit change-over'. Data referred to the following conditions: internal exchanger water = 12/7 °C. external exchanger water = 40/45 °C. The data do not consider the pump share, required to overcome the pressure drop for the solution circulation inside the exchangers.
6. Data calculated in compliance with Standard EN 14511:2013 referred to the following conditions: - external exchanger water = 40/45°C - external exchanger water = 12/7 °C
7. DSW = twin-screw compressor
8. S&T = shell and tube
9. Fittings with flexible joint and solder pipe connection. Internal exchanger (evaporator)
10. Fittings with flexible joint and solder pipe connection. Exchanger exchanger (condenser)

Electrical data

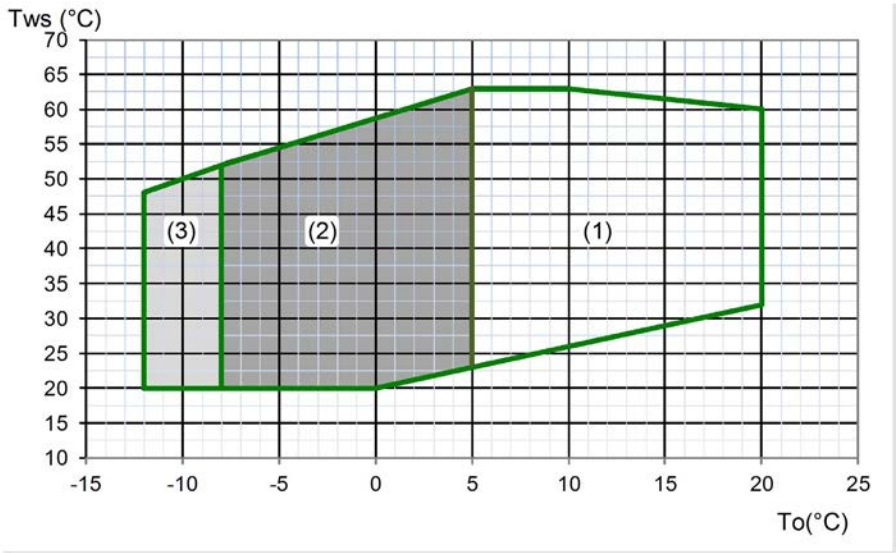
Acoustic treatment: Standard (ST) - Super-silenced (EN)

Size			120.1	140.1	160.1	180.1	200.1	220.1	250.1	270.1	290.1
F.L.A. - Full load current at max admissible conditions											
F.L.A. - Total		A	190	236	262	300	327	358	398	429	460
F.L.I. - Full load power input at max admissible conditions											
F.L.I. - Total		kW	118	142	157	180	196	220	241	265	284
M.I.C. Maximum inrush current											
M.I.C. - Value		A	266	262	328	422	422	493	602	717	850

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.

Operating range

Standard acoustic configuration (ST)



1. Standard unit
2. Operating range extension for unit in 'Low water temperature (Brine)' configuration'
3. Operating range extension (extremely low water temperature option available on request)

To (°C) = internal exchanger outlet water temperature (evaporator)

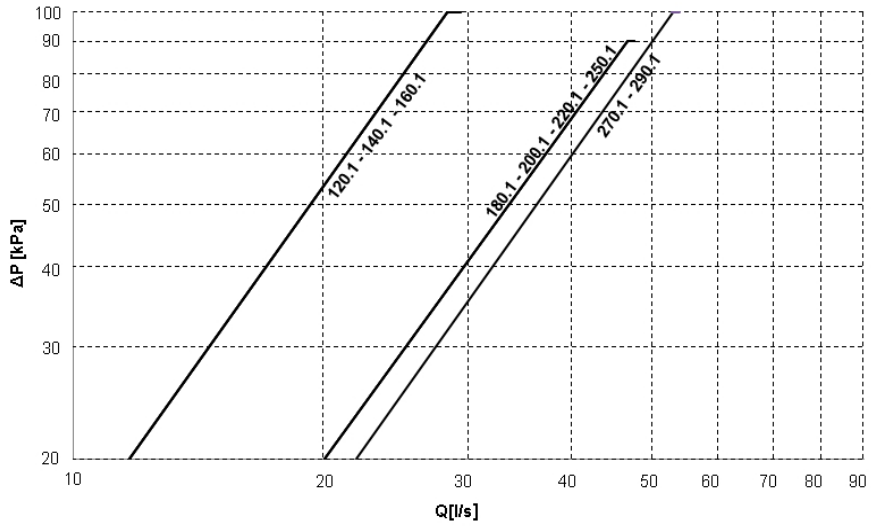
Tws (°C) = external exchanger outlet water temperature (condenser)

Performance in cooling / heating

Size	To (°C)	Entering / leaving external exchanger (condenser) water temperature (°C)																	
		25 / 30			30 / 35			35 / 40			40 / 45			45 / 50			58 / 63		
		kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt
120.1	5	319	56	375	303	59	362	285	65	350	265	72	337	246	80	326	198	101	299
	6	329	57	386	312	60	372	296	65	361	275	72	348	255	81	336	206	102	308
	7	342	58	400	326	60	386	307	66	373	286	73	359	267	81	348	217	103	320
	8	356	58	415	340	61	401	321	66	387	299	74	373	279	82	361	221	107	327
	9	370	59	429	353	62	415	334	67	401	312	74	387	291	83	374	224	110	335
	10	384	60	444	367	63	430	348	68	415	325	75	400	303	84	386	228	114	342
140.1	5	388	68	456	368	72	440	347	78	425	324	86	410	302	94	397	241	121	363
	6	400	69	468	380	72	452	358	79	436	337	86	423	315	95	410	252	122	374
	7	414	69	483	394	73	466	374	79	453	351	87	438	328	96	424	264	124	388
	8	430	70	501	410	74	484	389	80	469	365	88	453	342	97	439	268	129	396
	9	447	71	518	426	75	501	404	81	485	380	88	469	356	97	454	271	134	405
	10	463	72	535	443	76	518	419	82	501	395	89	484	370	98	468	275	139	413
160.1	5	426	75	501	404	79	483	381	86	467	356	95	451	333	104	438	266	134	400
	6	439	76	514	418	80	498	393	87	480	370	95	465	345	105	450	276	135	411
	7	455	76	531	431	80	512	410	88	498	384	96	480	359	106	465	289	136	425
	8	473	78	550	449	81	531	427	88	515	401	97	498	375	107	482	292	142	434
	9	491	79	569	467	82	550	443	89	532	418	98	516	392	108	499	294	148	443
	10	508	80	588	485	83	569	459	90	549	434	99	533	408	109	516	297	154	451
180.1	5	494	86	581	469	91	560	442	99	541	414	109	523	386	120	506	307	154	461
	6	510	87	598	484	92	576	459	100	559	430	110	540	402	121	523	321	156	477
	7	531	88	620	505	93	598	477	101	578	448	111	558	418	122	540	337	157	494
	8	551	90	641	525	94	619	497	102	598	467	112	578	436	123	559	341	164	504
	9	571	91	662	546	95	640	516	103	619	486	112	598	455	124	578	344	170	514
	10	591	92	683	566	96	662	536	104	640	505	113	618	473	125	598	348	177	524
200.1	5	538	94	632	511	99	610	481	108	589	450	119	569	421	131	552	336	168	504
	6	556	95	652	530	100	630	499	109	608	470	120	590	438	132	570	350	170	520
	7	580	96	676	551	101	653	521	110	631	489	121	609	456	133	589	368	171	539
	8	600	98	698	572	102	674	541	111	652	508	122	630	476	134	610	371	179	549
	9	621	99	720	593	104	696	561	112	673	527	123	650	496	135	631	374	186	560
	10	642	100	742	613	105	718	581	113	694	546	124	670	516	136	652	377	194	570
220.1	5	601	105	706	571	111	682	536	121	657	502	133	635	470	147	617	375	188	564
	6	619	106	725	588	112	699	556	122	678	522	134	656	486	147	633	392	190	582
	7	644	108	751	615	113	728	581	123	705	544	135	680	509	149	657	410	192	602
	8	668	109	777	638	114	753	604	124	728	566	136	703	531	150	681	416	199	615
	9	692	110	803	662	116	777	626	125	751	588	137	726	553	151	704	422	207	629
	10	716	112	828	685	117	802	648	126	775	610	138	749	575	152	727	427	215	643
250.1	5	654	115	769	621	122	743	586	133	719	551	146	697	514	161	675	410	207	617
	6	676	116	793	642	123	765	608	134	742	571	147	718	530	162	692	429	209	638
	7	703	118	821	670	124	794	630	135	765	594	148	743	558	163	721	449	211	660
	8	729	120	848	695	126	821	656	136	793	618	150	767	581	165	746	453	220	673
	9	755	121	876	721	127	848	682	138	820	641	151	792	604	166	770	457	229	686
	10	781	123	904	746	128	875	708	139	848	665	152	817	627	168	794	461	237	699
270.1	5	724	127	852	690	134	824	648	146	794	606	161	767	565	177	742	453	228	680
	6	748	129	876	710	136	845	672	148	820	631	162	793	587	178	766	472	230	701
	7	778	130	909	739	137	876	698	149	846	655	163	818	612	180	792	493	232	725
	8	807	132	939	768	139	907	726	150	877	682	165	847	638	181	819	498	242	740
	9	836	134	970	797	140	938	755	152	907	709	166	875	664	183	847	503	252	755
	10	865	136	1000	827	142	968	783	153	937	736	168	904	690	184	875	508	262	771
290.1	5	769	137	906	728	144	872	685	157	843	645	173	818	601	190	791	481	244	725
	6	791	138	929	750	146	896	711	159	869	669	174	844	625	192	817	503	247	749
	7	826	140	965	785	147	932	741	160	901	695	176	871	649	193	843	523	249	772
	8	855	142	997	814	149	963	771	162	932	724	177	902	677	195	872	528	260	788
	9	885	143	1028	844	151	994	801	163	964	753	179	932	705	197	902	533	271	804
	10	914	145	1060	873	152	1025	831	165	995	782	181	963	733	198	931	538	282	820

The data do not consider the pump share, required to overcome the pressure drop for the solution circulation inside the exchangers
kWf = Cooling capacity in kW
kWe = Electrical power absorbed by compressors (kW)
kWt = Thermal power in kW
To (°C) = internal exchanger (evaporator) water leaving temperature. Water temperature differential = 5°C

Internal exchanger pressure drops (evaporator)



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] = kWf / (4,186 x DT)

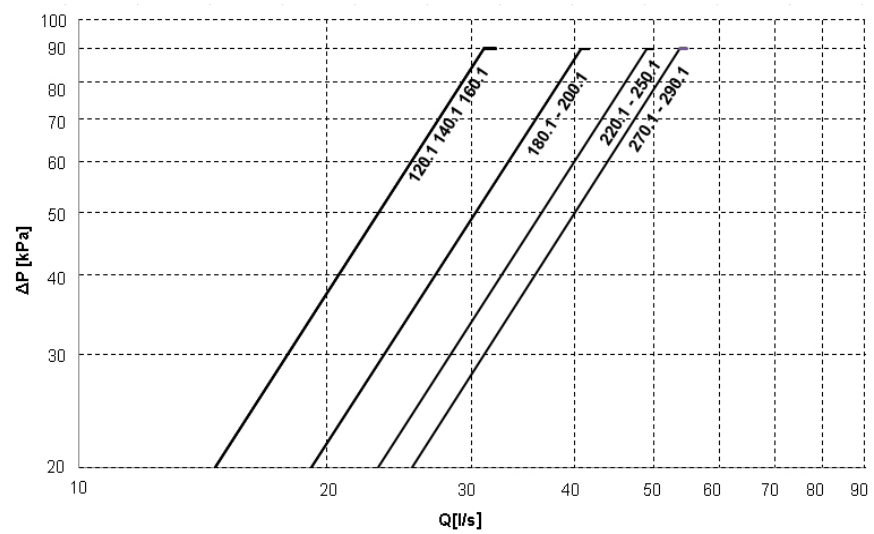
kWf = Cooling capacity in kW
DT = Temperature difference between inlet / outlet water

Admissible water flow-rates

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

		120.1	140.1	160.1	180.1	200.1	220.1	250.1	270.1	290.1
Qmin	[l/s]	11,7	11,7	11,7	20,1	20,1	20,1	20,1	21,9	21,9
Qmax	[l/s]	28,3	28,3	28,3	46,6	46,6	46,6	46,6	52,9	52,9

External exchanger pressure drop (condenser)



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 x DT)

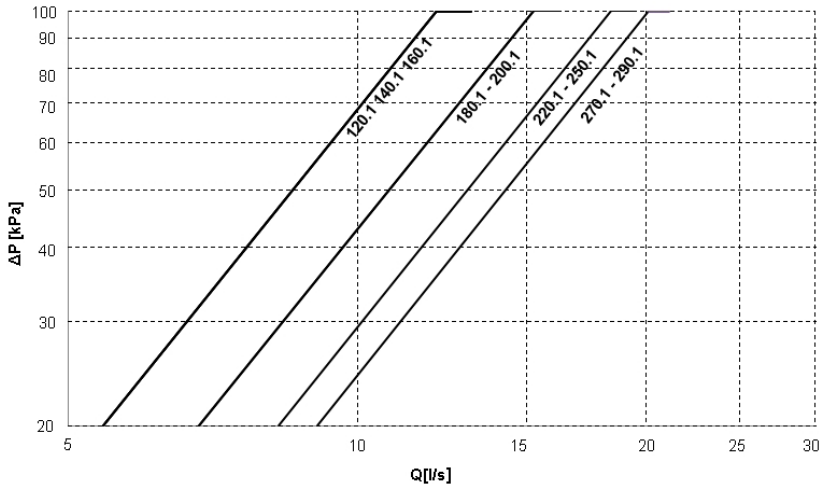
kWt = Heating capacity in kW
DT = Temperature difference between inlet / outlet water

Admissible water flow-rates

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

		120.1	140.1	160.1	180.1	200.1	220.1	250.1	270.1	290.1
Qmin	[l/s]	14,6	14,6	14,6	19,2	19,2	23,1	23,1	25,4	25,4
Qmax	[l/s]	31,0	31,0	31,0	40,6	40,6	48,9	48,9	53,6	53,6

External exchanger (condenser) pressure drop with groundwater



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 x 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

		120.1	140.1	160.1	180.1	200.1	220.1	250.1	270.1	290.1
Qmin	[l/s]	5,4	5,4	5,4	6,8	6,8	8,3	8,3	9,1	9,1
Qmax	[l/s]	12,1	12,1	12,1	15,2	15,2	18,3	18,3	20,1	20,1

Sound levels

Standard acoustic configuration (ST)

Size	Sound power level (dB)								Sound power level	Sound pressure level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
120.1	90	83	87	81	88	81	71	64	90	70
140.1	91	82	86	81	92	89	79	67	94	75
160.1	91	82	86	81	92	89	79	67	95	75
180.1	91	83	89	83	94	92	80	68	97	78
200.1	91	83	91	81	96	89	78	66	97	78
220.1	92	83	86	85	98	86	72	61	98	79
250.1	93	83	85	77	99	90	75	60	100	80
270.1	92	82	89	76	100	87	75	60	100	81
290.1	93	85	85	79	100	89	75	60	100	81

Acoustic configuration: Super-silenced (EN)

Size	Sound power level (dB)								Sound power level	Sound pressure level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
120.1	86	78	82	76	82	75	65	57	84	65
140.1	87	77	81	76	86	83	73	60	88	69
160.1	87	77	81	76	86	83	73	60	89	70
180.1	87	78	84	78	88	86	74	61	91	72
200.1	87	78	86	76	90	83	72	59	91	72
220.1	88	78	81	80	92	80	66	54	92	73
250.1	89	78	80	72	93	84	69	53	94	74
270.1	88	77	84	71	94	81	69	53	94	75
290.1	89	80	80	74	94	83	69	53	94	75

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

VERSION: HIGH TEMPERATURE

General technical data

Acoustic treatment: Standard (ST) - Super-silenced(EN)

Size			120.1	140.1	160.1	180.1	200.1	220.1	250.1	270.1	290.1
Cooling											
Cooling capacity	1	kW	339	410	453	526	575	641	701	771	821
Compressor power input	1	kW	62.6	75.8	83.8	96.5	105	118	129	142	153
Total power input	1	kW	63.1	76.3	84.3	97.0	106	118	130	143	153
Total recovery heating capacity	2	kW	387	471	518	600	656	731	801	881	939
Partial recovery heating capacity	2	kW	20.1	24.3	26.9	31.1	34.0	37.9	41.5	45.7	48.7
EER	1		5.37	5.37	5.38	5.42	5.43	5.42	5.40	5.40	5.35
Cooling capacity (EN14511:2013)	3	kW	338	409	451	525	573	639	698	768	818
Total power input (EN14511:2013)	3	kW	65.3	79.9	88.9	101	110	123	136	150	161
EER (EN 14511:2013)	3		5.17	5.11	5.08	5.21	5.20	5.19	5.14	5.14	5.07
ESEER			5.53	5.5	5.49	5.55	5.56	5.55	5.55	5.53	5.43
IPLV	4		6.25	6.18	6.2	6.25	6.28	6.26	6.25	6.23	6.11
Heating											
Heating capacity	5	kW	387	471	518	600	656	731	801	881	939
Compressor power input	5	kW	75.7	91.3	101	116	127	142	156	171	184
Total power input	5	kW	76.2	91.8	101	117	127	142	156	172	185
COP	5		5.08	5.13	5.11	5.15	5.16	5.15	5.13	5.13	5.08
Heating capacity (EN14511:2013)	6	kW	388	472	520	602	658	734	804	884	943
Total power input (EN14511:2013)	6	kW	78.2	95.0	105	120	131	146	161	178	192
COP (EN 14511:2013)	6		4.97	4.98	4.94	5.03	5.02	5.01	4.98	4.98	4.92
Compressor											
Type of compressors	7		DSW	DSW	DSW	DSW	DSW	DSW	DSW	DSW	DSW
No. of compressors		No	1	1	1	1	1	1	1	1	1
Rated power (C1)		HP	120	140	160	180	200	220	250	270	290
Std Capacity control steps		No	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
Oil charge (C1)		l	17.0	21.0	21.0	25.0	25.0	25.0	25.0	25.0	25.0
Refrigerant charge (C1)		kg	85	85	88	119	119	136	136	152	153
Refrigeration circuits		No	1	1	1	1	1	1	1	1	1
Internal exchanger (evaporator)											
Type of internal exchanger	8		S&T	S&T	S&T	S&T	S&T	S&T	S&T	S&T	S&T
Water flow-rate (User side)	1	l/s	16.2	19.6	21.7	25.1	27.5	30.6	33.5	36.9	39.2
Internal exchanger pressure drops	1	kPa	36	51	61	30	35	42	49	51	57
Water content		l	190	190	190	307	307	307	307	280	280
External exchanger (condenser)											
Type of external exchanger	8		S&T	S&T	S&T	S&T	S&T	S&T	S&T	S&T	S&T
Water flow-rate (Source Side)	1	l/s	19.2	23.2	25.7	29.7	32.5	36.3	39.7	43.7	46.5
External exchanger pressure drop	1	kPa	34	50	61	48	57	49	59	59	67
Water content		l	56.0	56.0	56.0	73.0	73.0	91.0	91.0	96.0	96.0
Quantity		No	1	1	1	1	1	1	1	1	1
Connections											
Water connections	9		5"	5"	5"	6"	6"	6"	6"	6"	6"
Water connections	10		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. Data referred to the following conditions: - internal exchanger (evaporator) = 12 / 7 °C - external exchanger (condenser) = 30/35°C. The data do not consider the pump share, required to overcome the pressure drop for the solution circulation inside the exchangers.
2. Recovery exchanger water=40/45°C
3. Data calculated in compliance with Standard EN 14511:2013 referred to the following conditions: - internal exchanger water = 12/7°C - external exchanger water = 30/35 °C
4. Data calculated in compliance with Standard ARI 550/590-2003 referred to the following conditions: internal exchanger water outlet = 6.7 °C. external exchanger water inlet = 29.4 °C
5. Data referred to the unit in the 'OHI - Operation with water circuit change-over'. Data referred to the following conditions: internal exchanger water = 12/7 °C. external exchanger water = 40/45 °C. The data do not consider the pump share, required to overcome the pressure drop for the solution circulation inside the exchangers.
6. Data calculated in compliance with Standard EN 14511:2013 referred to the following conditions: - external exchanger water = 40/45°C - external exchanger water = 12/7 °C
7. DSW = twin-screw compressor
8. S&T = shell and tube
9. Fittings with flexible joint and solder pipe connection. Internal exchanger (evaporator)
10. Fittings with flexible joint and solder pipe connection. Exchanger exchanger (condenser)

VERSION: HIGH TEMPERATURE

Electrical data

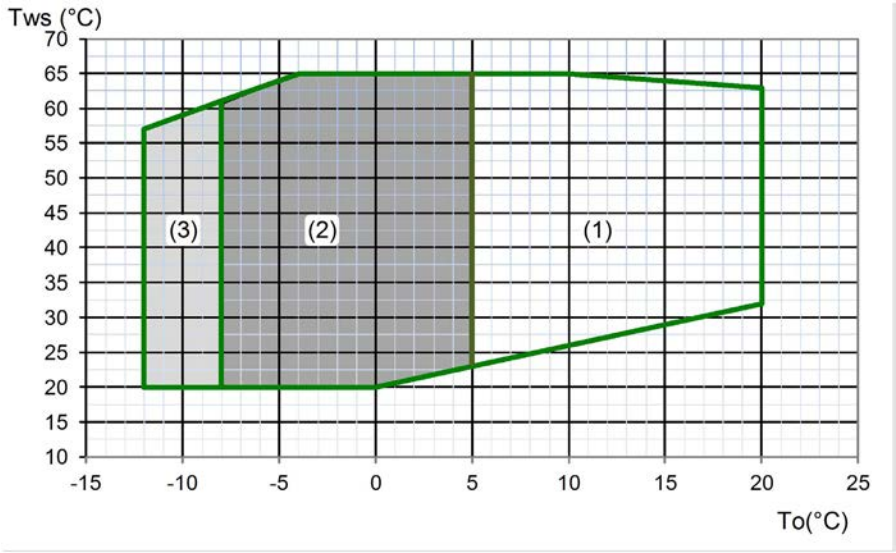
Acoustic treatment: Standard (ST) - Super-silenced (EN)

Size			120.1	140.1	160.1	180.1	200.1	220.1	250.1	270.1	290.1
F.L.A. - Full load current at max admissible conditions											
F.L.A. - Total		A	200	248	275	315	343	377	417	450	482
F.L.I. - Full load power input at max admissible conditions											
F.L.I. - Total		kW	124	149	165	189	206	231	253	278	298
M.I.C. Maximum inrush current											
M.I.C. - Value		A	266	262	328	422	422	493	602	717	850

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.

Operating range

Standard acoustic configuration (ST)



1. Standard unit
2. Operating range extension for unit in 'Low water temperature (Brine)' configuration'
3. Operating range extension (extremely low water temperature option available on request)

To (°C) = internal exchanger outlet water temperature (evaporator)

Tws (°C) = external exchanger outlet water temperature (condenser)

VERSION: HIGH TEMPERATURE

Performances in cooling / heating

Size	To (°C)	External exchanger (condenser) entering / leaving water temperature (°C)																	
		25 / 30			30 / 35			35 / 40			40 / 45			45 / 50			60 / 65		
		kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt	kWf	kWe	kWt
120.1	5	327	58	385	317	62	379	304	68	372	290	75	365	274	83	357	218	112	330
	6	337	58	395	326	62	388	315	68	383	301	75	376	285	83	369	226	113	339
	7	349	59	408	339	63	401	326	69	394	312	76	387	295	84	379	236	114	350
	8	362	59	421	351	63	415	338	69	408	324	76	400	308	84	392	247	115	362
	9	374	60	434	364	64	428	351	70	421	337	77	413	320	85	405	258	116	374
	10	387	61	448	377	64	441	364	70	434	349	77	426	332	85	418	269	117	385
140.1	5	399	70	468	386	75	461	370	82	452	353	90	443	334	100	434	264	136	400
	6	409	70	480	397	75	472	382	82	464	366	91	457	346	101	447	275	137	411
	7	423	71	494	410	76	486	397	83	480	379	91	471	360	101	461	287	138	425
	8	438	72	509	425	77	502	412	84	495	394	92	486	374	102	475	300	139	439
	9	452	73	525	441	77	518	426	84	510	408	93	501	388	103	490	313	140	453
	10	467	73	541	456	78	534	441	85	526	423	93	516	402	103	505	326	141	467
160.1	5	439	77	516	425	82	507	408	90	498	388	100	488	368	111	479	291	150	441
	6	450	78	528	438	83	521	420	91	511	402	100	503	381	111	492	302	151	453
	7	467	78	545	453	84	537	437	92	528	417	101	518	395	112	506	315	152	467
	8	483	79	562	469	85	554	453	93	546	433	102	535	411	113	523	329	153	483
	9	498	80	578	485	85	571	470	93	563	450	102	552	427	114	540	344	155	499
	10	514	81	595	501	86	587	487	94	581	466	103	569	443	114	557	359	156	514
180.1	5	508	89	597	493	95	588	472	104	576	451	115	565	426	127	553	336	172	508
	6	525	90	615	509	96	605	489	105	594	467	115	582	443	128	570	350	174	524
	7	543	90	633	526	97	622	506	105	612	484	116	600	459	129	587	367	175	542
	8	560	91	652	544	97	642	525	106	631	503	117	619	477	129	606	382	176	559
	9	578	92	671	563	98	661	543	107	651	521	117	638	495	130	625	398	178	576
	10	596	93	690	582	99	681	562	108	670	539	118	658	513	131	644	414	179	593
200.1	5	553	97	650	536	104	639	514	113	628	490	125	615	465	139	604	366	188	554
	6	571	98	668	555	104	659	532	114	646	510	126	636	483	140	622	384	190	573
	7	592	99	691	575	105	680	554	115	669	529	127	656	501	140	641	400	191	591
	8	611	100	711	594	106	700	573	116	689	548	128	675	520	141	662	417	192	609
	9	630	101	731	613	107	721	592	117	709	567	128	695	540	142	682	434	194	628
	10	650	102	751	633	108	741	611	118	729	586	129	715	559	144	702	451	195	646
220.1	5	617	108	725	599	116	715	574	127	701	547	140	687	520	155	675	411	210	621
	6	635	109	744	615	117	732	594	128	721	568	141	708	536	156	692	428	212	640
	7	658	110	768	641	118	759	618	129	747	590	142	731	558	157	715	446	214	660
	8	679	111	791	663	119	781	639	130	769	611	143	754	580	158	738	466	215	682
	9	701	112	813	684	120	803	661	131	791	633	143	776	602	159	761	486	217	703
	10	722	113	836	705	121	826	682	132	813	654	144	798	624	160	784	506	219	725
250.1	5	674	118	793	652	127	779	628	139	767	601	154	755	568	171	739	450	231	681
	6	695	120	815	674	128	802	650	140	790	622	155	776	585	171	757	470	233	703
	7	720	121	841	701	129	830	672	141	813	645	156	801	613	173	786	489	235	724
	8	744	122	866	724	130	855	697	143	839	668	157	825	636	174	810	510	237	747
	9	767	123	890	748	132	880	722	144	866	691	158	849	659	175	834	530	238	769
	10	791	125	915	772	133	904	747	145	892	714	159	873	681	176	858	551	240	791
270.1	5	746	131	876	724	140	864	694	153	847	661	169	830	624	187	811	493	254	747
	6	767	132	899	744	141	885	717	155	872	686	170	856	647	189	836	515	256	772
	7	796	133	929	771	142	914	742	156	898	710	171	881	672	190	862	537	258	795
	8	822	135	956	798	144	942	769	157	927	736	173	909	698	191	889	561	260	821
	9	847	136	983	825	145	970	797	159	955	763	174	937	724	193	916	584	262	846
	10	873	137	1011	853	146	999	824	160	984	789	175	965	749	194	944	608	264	872
290.1	5	793	140	933	766	150	916	735	165	900	704	182	885	664	201	865	527	273	800
	6	814	141	955	788	151	939	760	166	926	729	183	912	689	203	892	549	275	825
	7	846	143	989	821	153	974	789	168	956	754	184	939	714	204	918	570	277	847
	8	872	144	1016	847	154	1001	817	169	986	783	186	969	741	206	947	595	279	874
	9	898	146	1044	874	155	1029	845	170	1015	811	187	998	769	208	976	619	282	901
	10	924	147	1071	900	156	1056	872	172	1044	840	189	1028	796	209	1005	644	284	928

The data do not consider the pump share, required to overcome the pressure drop for the solution circulation inside the exchangers
kWf = Cooling capacity in kW
kWe = Electrical power absorbed by compressors (kW)
kWt = Thermal power in kW
To (°C) = internal exchanger (evaporator) water leaving temperature. Water temperature differential = 5°C

VERSION: HIGH TEMPERATURE

Sound levels

Standard acoustic configuration (ST)

Size	Sound power level (dB)								Sound power level	Sound pressure level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
120.1	90	83	87	81	88	81	71	64	90	70
140.1	91	82	86	81	92	89	79	67	94	75
160.1	91	82	86	81	92	89	79	67	95	75
180.1	91	83	89	83	94	92	80	68	97	78
200.1	91	83	91	81	96	89	78	66	97	78
220.1	92	83	86	85	98	86	72	61	98	79
250.1	93	83	85	77	99	90	75	60	100	80
270.1	92	82	89	76	100	87	75	60	100	81
290.1	93	85	85	79	100	89	75	60	100	81

Acoustic configuration: Super-silenced (EN)

Size	Sound power level (dB)								Sound power level	Sound pressure level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
120.1	86	78	82	76	82	75	65	57	84	65
140.1	87	77	81	76	86	83	73	60	88	69
160.1	87	77	81	76	86	83	73	60	89	70
180.1	87	78	84	78	88	86	74	61	91	72
200.1	87	78	86	76	90	83	72	59	91	72
220.1	88	78	81	80	92	80	66	54	92	73
250.1	89	78	80	72	93	84	69	53	94	74
270.1	88	77	84	71	94	81	69	53	94	75
290.1	89	80	80	74	94	83	69	53	94	75

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

Correction factors for glycol use

Internal exchanger (evaporator)

% 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	No	0,995	0,989	0,983	0,977	0,971	0,964	0,956	0,949
Compressor power input Factor	No	1,022	1,022	1,033	1,044	1,055	1,066	1,077	1,088
Internal exchanger glycol solution flow factor	No	1,013	1,026	1,039	1,053	1,067	1,082	1,097	1,113
Pressure drop Factor	No	1,078	1,153	1,233	1,318	1,408	1,503	1,603	1,708

External exchanger (condenser)

% 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	No	0,998	0,996	0,994	0,992	0,99	0,988	0,986	0,984
Compressor power input Factor	No	1,003	1,006	1,009	1,012	1,015	1,018	1,021	1,024
External exchanger glycol solution flow factor	No	1,015	1,031	1,047	1,064	1,081	1,099	1,117	1,136
Pressure drop Factor	No	1,121	1,225	1,339	1,463	1,597	1,741	1,895	2,059

Fouling Correction Factors

	Internal exchanger (evaporator)		External exchanger (condenser)	
m^2 °C / W	F1	FK1	F2	FK2
0.44 x 10 (-4)	1	1	1	1
0.88 x 10 (-4)	0,97	0,99	0,97	1,08
1.76 x 10 (-4)	0,94	0,98	0,92	1,05

F1 = Cooling capacity correction factors
FK1 = Compressor power input correction factor

F2 = Cooling capacity correction factors
FK2 = Compressor power input correction factor

Exchanger operating range

	Internal exchanger		External exchanger	
	DPr	DPw	DPr	DPw
PED (CE)	1650	1050	2500	1600

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 switch	[kPa]	2100	1550	–
Antifreeze protection	[°C]	3	5.5	–
High pressure safety valve	[kPa]	–	–	2500
Low pressure safety valve	[kPa]	–	–	1650
Max no. of compressor starts per hour	[n°]	–	–	6
Discharge safety thermostat	[°C]	–	–	120

Accessories

PFCP - Power-factor capacitors

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.

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 - Compressor magnetothermic circuit breakers

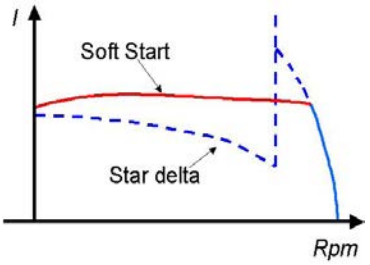
The magnetothermic circuit breakers are inserted instead of the fuses for the protection against the short circuit and overload. In case of intervention they do not have to be replaced, as it happens with fuses.

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.



(-------) INPUT CAPACITY WITHOUT THE SFSTR2 OPTION
(_____) INPUT CAPACITY WITH THE SFSTR2 OPTION

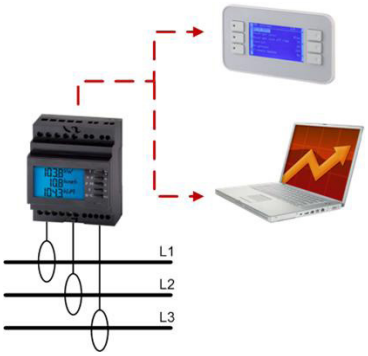
CONTA2 - Energy meter

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

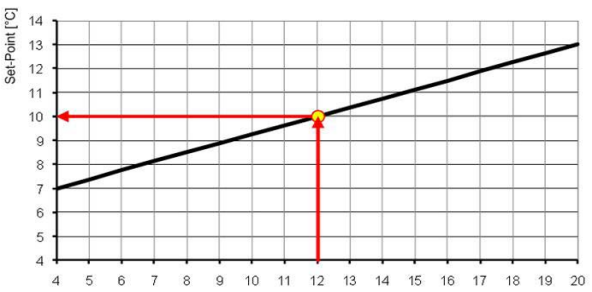
This device enables the set-point to be varied which is pre-set using an external 0÷10 V signal.

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.

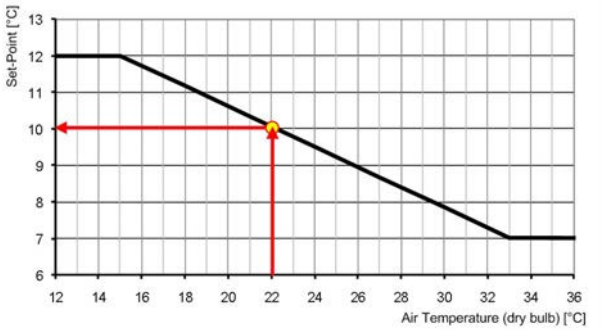
The device is installed and wired built-in the unit.



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.

Accessories separately supplied

PVSX - Pressure valve

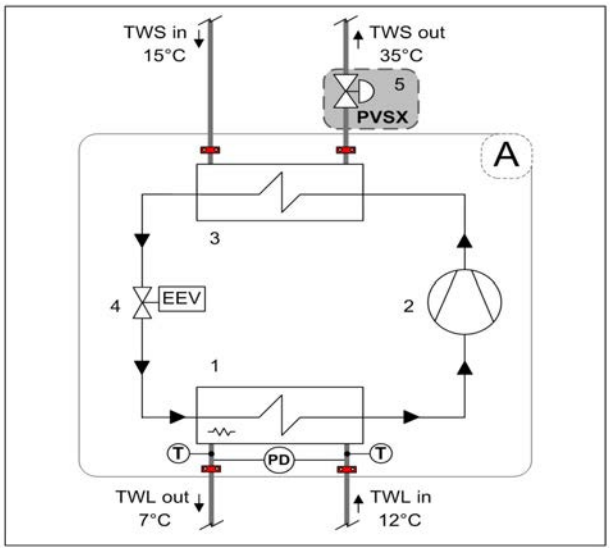
Recommended option in applications with disposable water with relatively low temperatures (well, groundwater, water mains). The two-way pressure valve with mechanical control is a modulating valve and is located at the output of the external exchanger (condenser).

Using this device reduces water consumption levels and keeps the unit in the expected operating range.

Warning: to allow for correct opening and closure the differential pressure value must be at least 250 kPa and not exceed 400 kPa.

Option not compatible with the unit in the 'OHI - Operation with water circuit change-over" configuration.

Option not compatible with sea water. In these cases fit an intermediate exchanger outside the unit.



1. Internal exchanger (evaporator)
2. Compressor
3. External exchanger (condenser)
4. Electronic expansion valve
5. Pressure valve (PVSX accessory)

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

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.

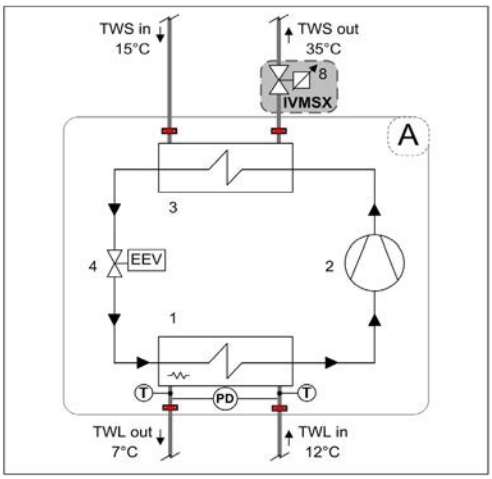
It operates in conjunction with the refrigeration circuit: the modulation via the 0-10V signal - based on the pressure of the refrigerant in the exchanger on the source side - reduces water consumption and ensures the units stays in the expected operating range.

Warning: to allow for correct opening and closure the differential pressure value must be at least 200 kPa.

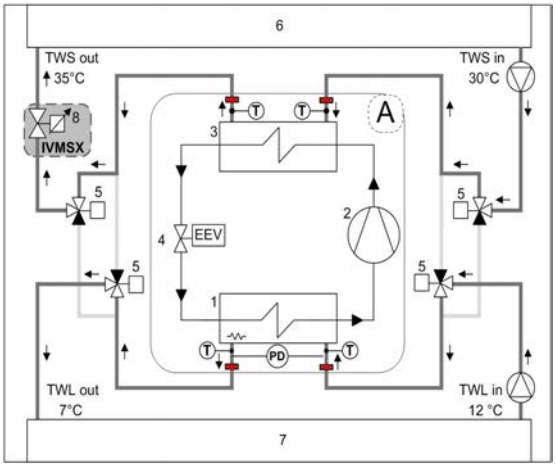
Option to be installed outside the unit on the water outlet pipe on the source side. The Customer is responsible for conducting the hydraulic and electrical connection. The Customer is responsible for the 230V AC power supply.

Option not compatible with sea water. In these cases fit an intermediate exchanger outside the unit.

Unit in "OCO - Cold only" configuration

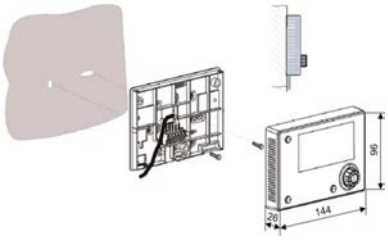


Unit in 'OHI - Operation with water circuit change-over' configuration



A - Unit supply limit
1 - Internal exchanger (evaporator)
2 - Compressor
3 - External exchanger (condenser)
4 - Expansion electronic valve
5 - Switching valve (provided by the Customer)
6 - Thermal source (heat rejection)
7 - User (cool)
8 - Modulating valve source side (IVMSX accessory)
T - water temperature probe
PD - Differential pressure switch
TWS in - Water inlet source side
TWS out - Water outlet source side
TWL in - Water inlet user side
TWL out - Water output user side

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 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.

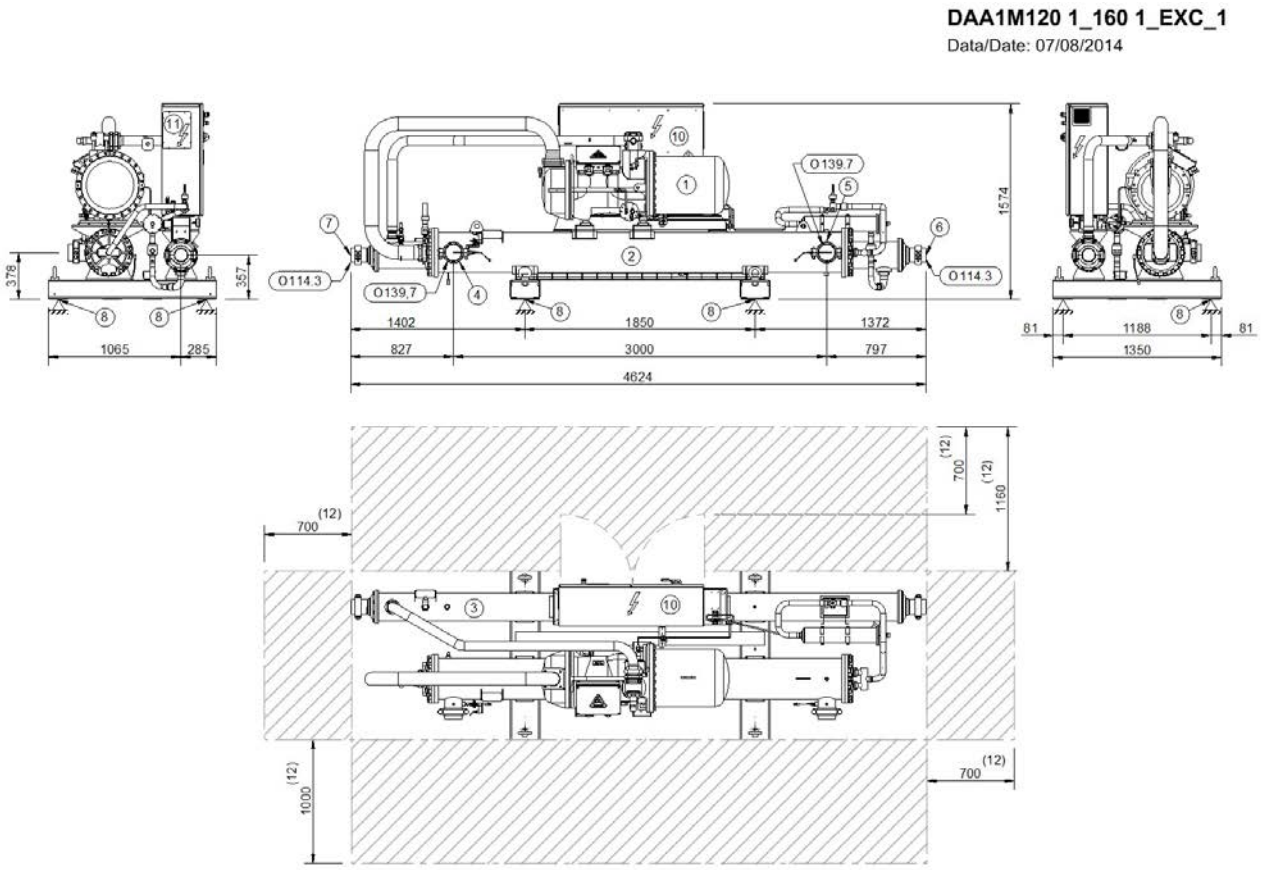
Power supply at 230V AC provided by Customer

AMRX - Rubber anti-vibrating dampers

The rubber antivibration mounts must be fixed to designated housings on the support stringers and are used to dampen vibrations produced by the machine, thereby reducing the noise transmitted to the support structures.

Dimensional drawings

120.1-160.1 Acoustic configuration: Standard (ST)



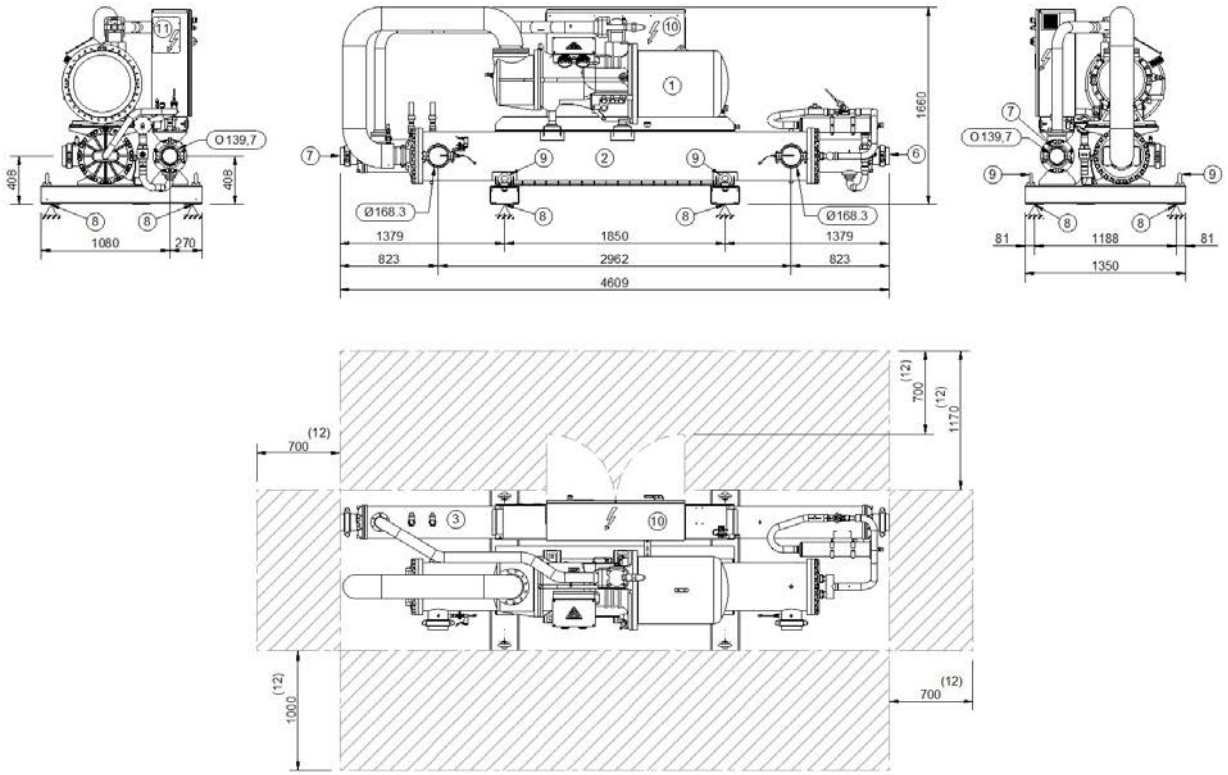
1. Compressor
2. Internal exchanger (evaporator)
3. External exchanger (condenser)
4. Internal exchanger water inlet
5. Internal exchanger water outlet
6. External exchanger water inlet
7. External exchanger water outlet
8. Antivibration fixing holes Ø 25mm
9. Lifting eyebolt
10. Electrical panel
11. Power input
12. Minimum dimension for Maintenance

Size		120.1	140.1	160.1
A - Length	mm	4624	4624	4624
B - Width	mm	1350	1350	1350
C - Height	mm	1574	1574	1574
Shipping weight	kg	2131	2211	2268
Operating weight	kg	2377	2457	2514

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

180.1-290.1 Acoustic configuration: Standard (ST)

DAA1M180 1_290 1_EXC_1
Data/Date: 07/07/2014



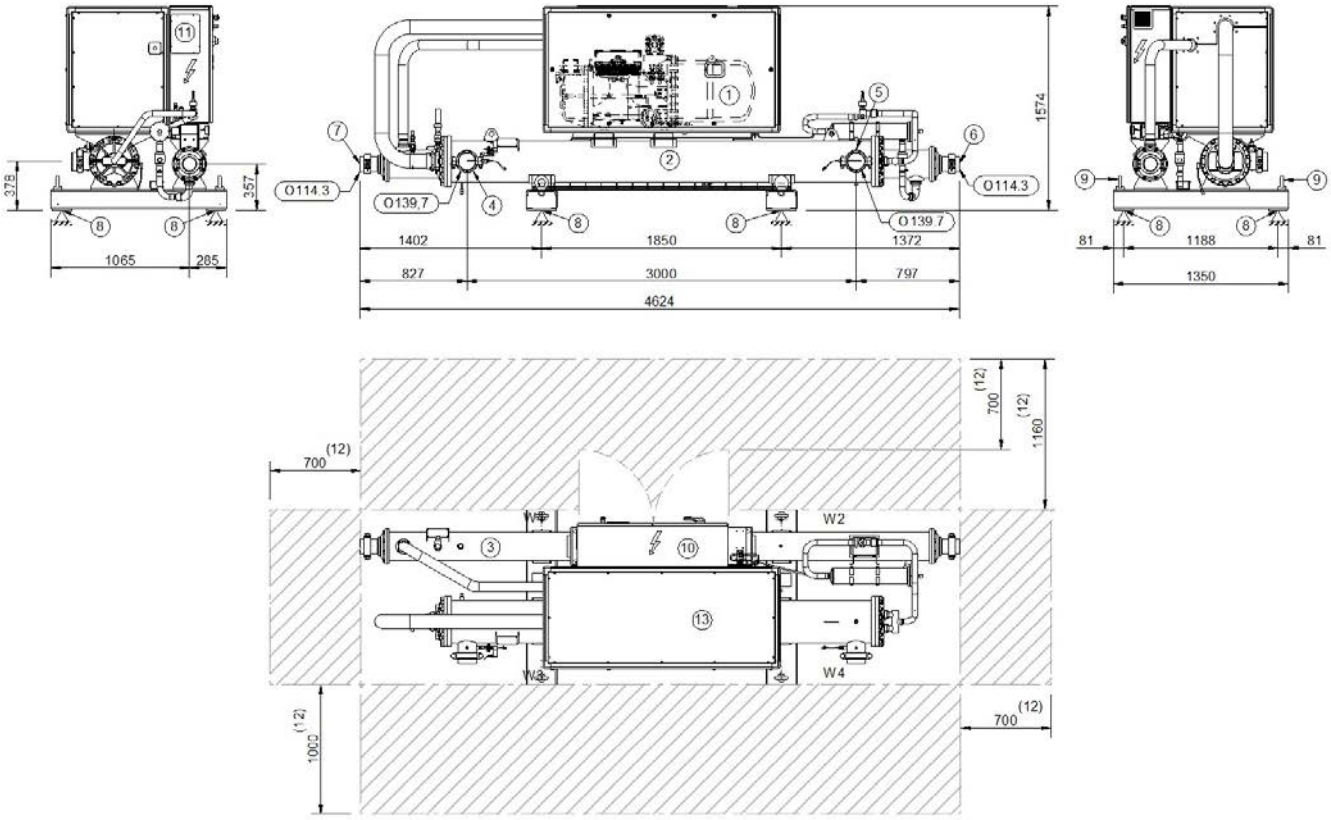
1. Compressor
2. Internal exchanger (evaporator)
3. External exchanger (condenser)
4. Internal exchanger water inlet
5. Internal exchanger water outlet
6. External exchanger water inlet
7. External exchanger water outlet
8. Antivibration fixing holes Ø 25mm
9. Lifting eyebolt
10. Electrical panel
11. Power input
12. Minimum dimension for Maintenance

Size		180.1	200.1	220.1	250.1	270.1	290.1
A - Length	mm	4609	4609	4609	4609	4609	4609
B - Width	mm	1350	1350	1350	1350	1350	1350
C - Height	mm	1660	1660	1660	1660	1660	1660
Shipping weight	kg	2883	2894	2954	3005	3154	3185
Operating weight	kg	3263	3274	3352	3403	3530	3561

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

120.1-160.1 Acoustic configuration: Super-silenced (EN)

DAA1M120 1_160 1_EXC_EN_1
Data/Date: 07/08/2014



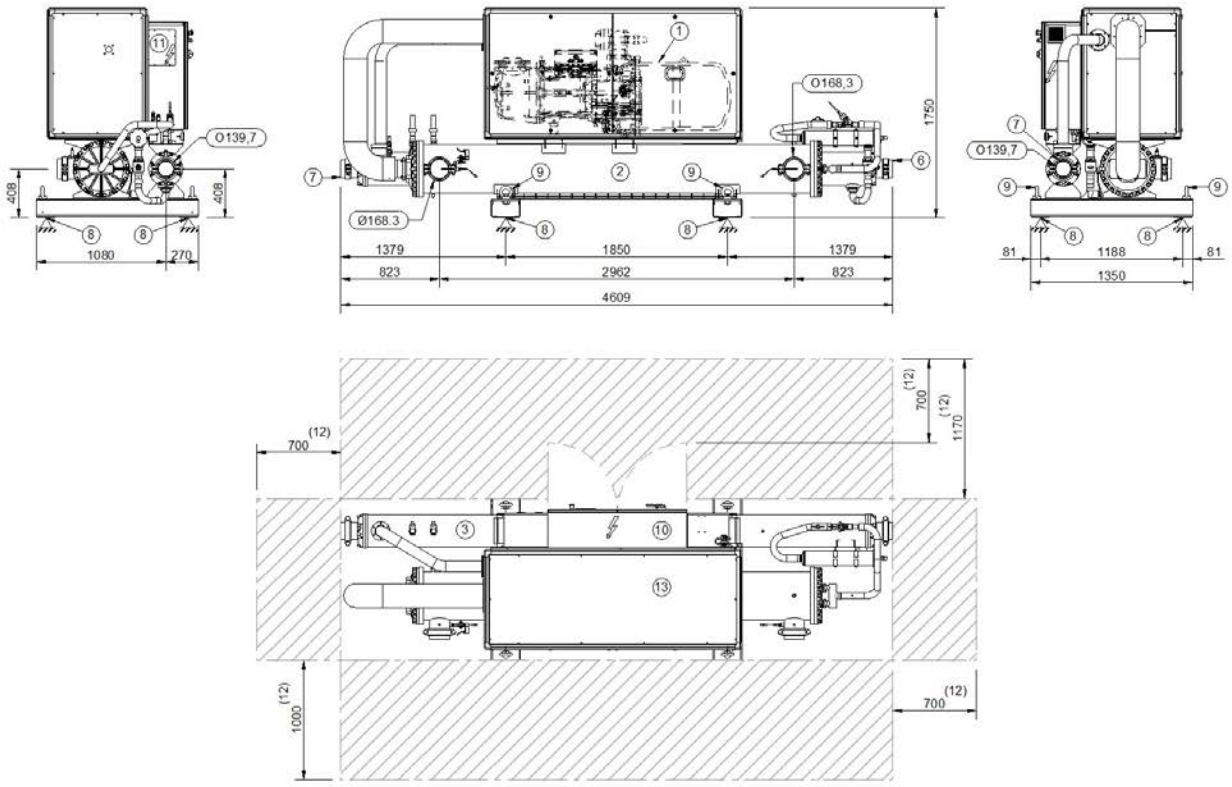
1. Compressor
2. Internal exchanger (evaporator)
3. External exchanger (condenser)
4. Internal exchanger water inlet
5. Internal exchanger water outlet
6. External exchanger water inlet
7. External exchanger water outlet
8. Antivibration fixing holes Ø 25mm
9. Lifting eyebolt
10. Electrical panel
11. Power input
12. Minimum dimension for Maintenance
13. Casing

Size		120.1	140.1	160.1
A - Length	mm	4624	4624	4624
B - Width	mm	1350	1350	1350
C - Height	mm	1574	1574	1574
Shipping weight	kg	2295	2404	2461
Operating weight	kg	2541	2650	2707

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

180.1-290.1 Acoustic configuration: Super-silenced (EN)

DAA1M180 1_290 1_EXC_EN_1
Data/Date: 07/07/2014



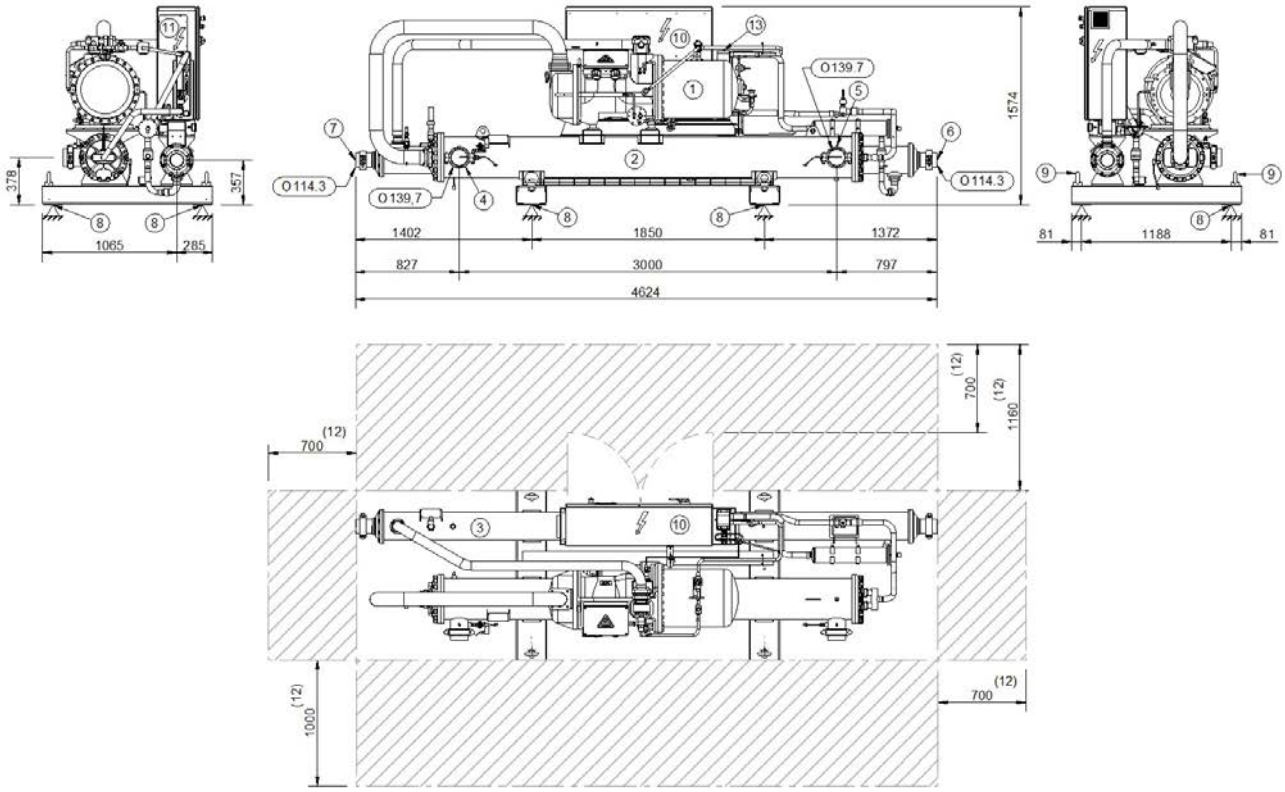
1. Compressor
2. Internal exchanger (evaporator)
3. External exchanger (condenser)
4. Internal exchanger water inlet
5. Internal exchanger water outlet
6. External exchanger water inlet
7. External exchanger water outlet
8. Antivibration fixing holes Ø 25mm
9. Lifting eyebolt
10. Electrical panel
11. Power input
12. Minimum dimension for Maintenance
13. Casing

Size		180.1	200.1	220.1	250.1	270.1	290.1
A - Length	mm	4609	4609	4609	4609	4609	4609
B - Width	mm	1350	1350	1350	1350	1350	1350
C - Height	mm	1750	1750	1750	1750	1750	1750
Shipping weight	kg	3106	3117	3177	3228	3377	3408
Operating weight	kg	3486	3497	3575	3626	3753	3784

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

120.1-160.1 Acoustic configuration: Standard (ST) - High temperature

DAA1M120 1_160 1_EXC_HWT_1
Data/Date: 07/08/2014



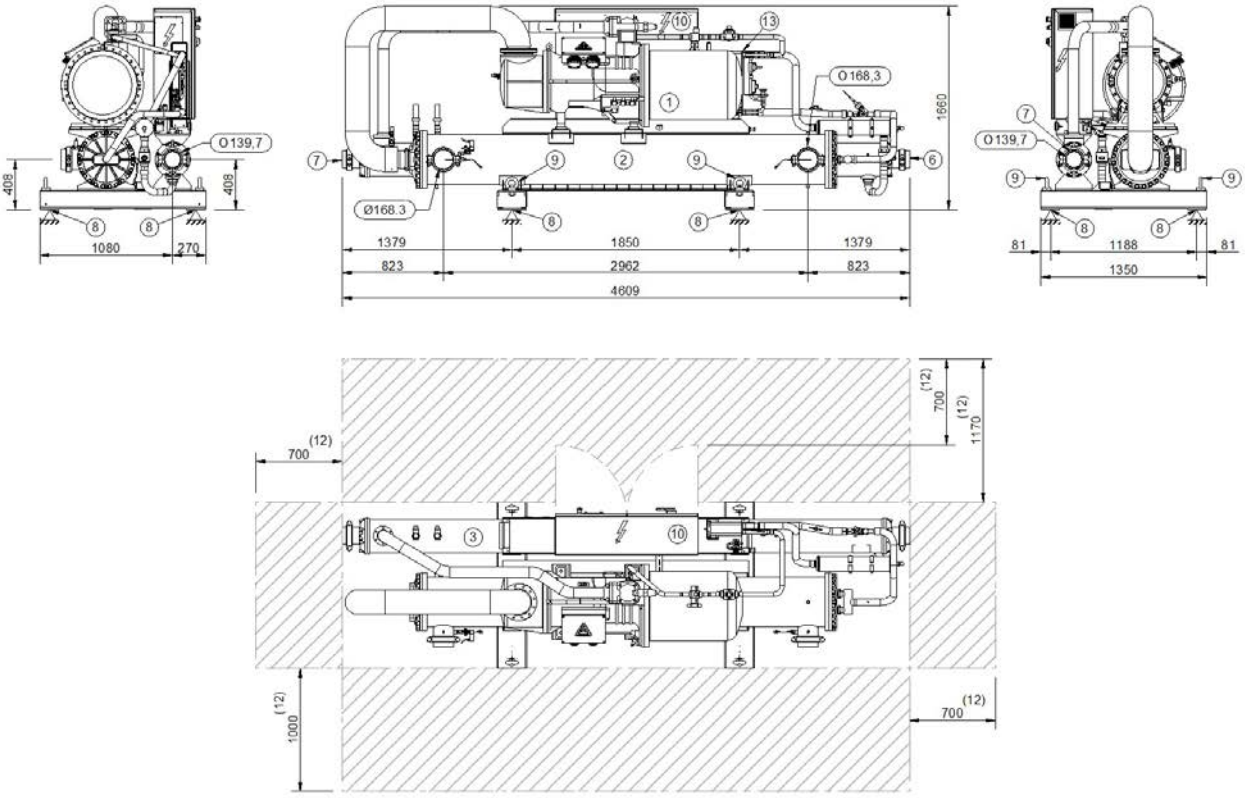
1. Compressor
2. Internal exchanger (evaporator)
3. External exchanger (condenser)
4. Internal exchanger water inlet
5. Internal exchanger water outlet
6. External exchanger water inlet
7. External exchanger water outlet
8. Antivibration fixing holes Ø 25mm
9. Lifting eyebolt
10. Electrical panel
11. Power input
12. Minimum dimension for Maintenance
13. Economiser exchanger

Size		120.1	140.1	160.1
A - Length	mm	4624	4624	4624
B - Width	mm	1350	1350	1350
C - Height	mm	1574	1574	1574
Shipping weight	kg	2181	2261	2330
Operating weight	kg	2427	2507	2576

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

180.1-290.1 Acoustic configuration: Standard (ST) - High temperature

DAA1M180 1_290 1_EXC_HWT_1
Data/Date: 07/07/2014



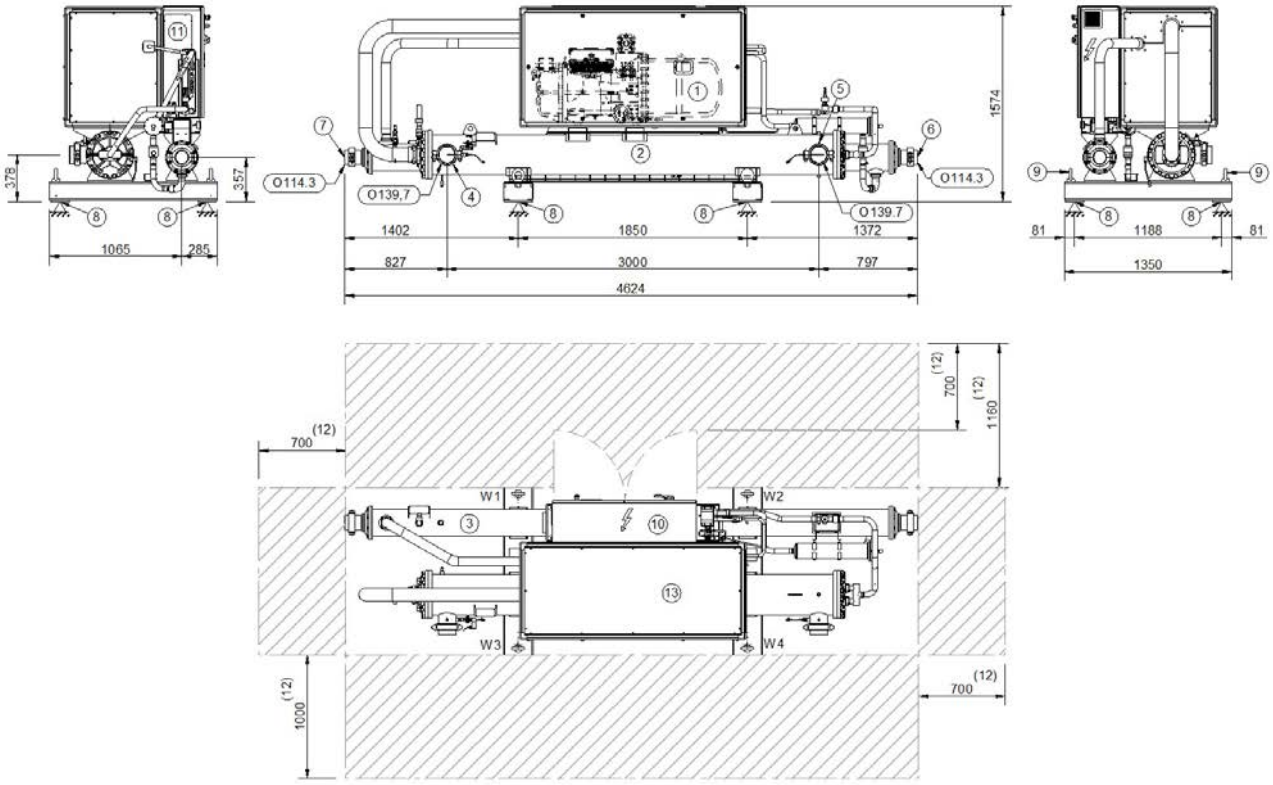
1. Compressor
2. Internal exchanger (evaporator)
3. External exchanger (condenser)
4. Internal exchanger water inlet
5. Internal exchanger water outlet
6. External exchanger water inlet
7. External exchanger water outlet
8. Antivibration fixing holes Ø 25mm
9. Lifting eyebolt
10. Electrical panel
11. Power input
12. Minimum dimension for Maintenance
13. Economiser exchanger

Size		180.1	200.1	220.1	250.1	270.1	290.1
A - Length	mm	4609	4609	4609	4609	4609	4609
B - Width	mm	1350	1350	1350	1350	1350	1350
C - Height	mm	1660	1660	1660	1660	1660	1660
Shipping weight	kg	2953	2964	3048	3099	3264	3315
Operating weight	kg	3333	3344	3446	3497	3640	3691

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

120.1-160.1 Acoustic configuration: Super-silenced (EN) - High temperature

DAA1M120 1_160 1_EXC_EN_HWT_1
Data/Date: 07/08/2014



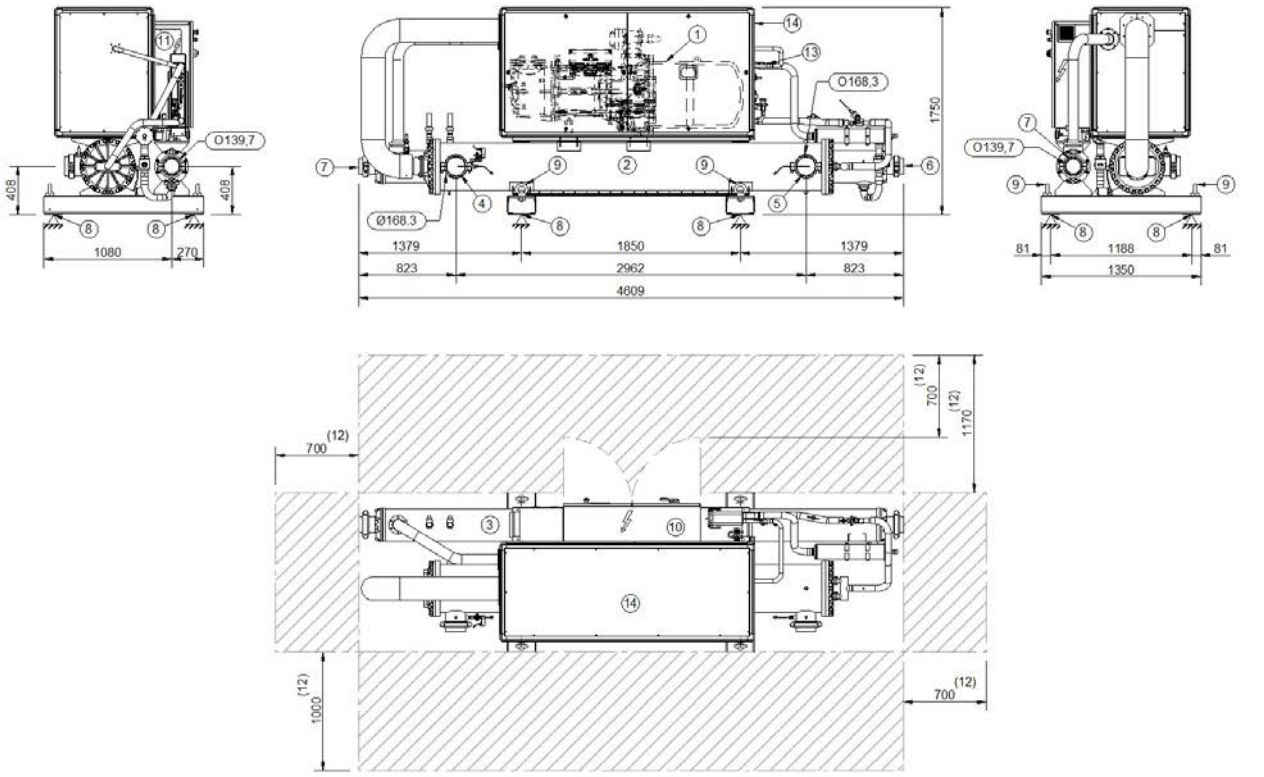
1. Compressor
2. Internal exchanger (evaporator)
3. External exchanger (condenser)
4. Internal exchanger water inlet
5. Internal exchanger water outlet
6. External exchanger water inlet
7. External exchanger water outlet
8. Antivibration fixing holes Ø 25mm
9. Lifting eyebolt
10. Electrical panel
11. Power input
12. Minimum dimension for Maintenance
13. Economiser exchanger
14. Casing

Size		120.1	140.1	160.1
A - Length	mm	4624	4624	4624
B - Width	mm	1350	1350	1350
C - Height	mm	1574	1574	1574
Shipping weight	kg	2345	2454	2523
Operating weight	kg	2591	2700	2769

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

180.1-290.1 Acoustic configuration: Super-silenced (EN) - High temperature

DAA1M180 1_290 1_EXC_EN_HWT_1
Data/Date: 07/07/2014



1. Compressor
2. Internal exchanger (evaporator)
3. External exchanger (condenser)
4. Internal exchanger water inlet
5. Internal exchanger water outlet
6. External exchanger water inlet
7. External exchanger water outlet
8. Antivibration fixing holes Ø 25mm
9. Lifting eyebolt
10. Electrical panel
11. Power input
12. Minimum dimension for Maintenance
13. Economiser exchanger
14. Casing

Size		180.1	200.1	220.1	250.1	270.1	290.1
A - Length	mm	4609	4609	4609	4609	4609	4609
B - Width	mm	1350	1350	1350	1350	1350	1350
C - Height	mm	1750	1750	1750	1750	1750	1750
Shipping weight	kg	3176	3187	3271	3322	3487	3538
Operating weight	kg	3556	3567	3669	3720	3863	3914

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

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