DAIKIN

Chillers

Commercial and Technical Data

Water Cooled Chillers

- **Wide capacity range (380kW – 2152kW)**
- **Ecological HFC R-410A refrigerant**
- **Indoor installations**
- **Independent refrigerant circuits with single screw compressor**
- **Two efficiency versions available**
- **New Microtech III controller**

ECDEN11-421

EWWQ-B-
380 - 2,152 kW

R-410A

Daikin Europe N.V.

About Daikin

Daikin has a worldwide reputation based on over 85 years' experience in the successful manufacture of high quality air conditioning equipment for industrial, commercial and residential use. Daikin's much envied quality quite simply stems from the close attention paid to design, production and testing, as well as aftersales support. To this end, every component is carefully selected and rigorously tested to verify its contribution to product quality and reliability.

New Daikin EWWQ-B- water cooled chiller range with upgraded controller

In order to upgrade the chiller portfolio with a superior control logic, Daikin enhances today the EWWQ-B- series incorporating the new Microtech III controller.

Microtech III ensures maximum efficiency and reliability, stable operating conditions and protection of critical components.

The new range is composed of 19 sizes and available in two efficiency versions (standard and high), with EER up to 5.09 and ESEER up to 6.28. Each unit is equipped with one or two R-410A refrigerant circuits, featuring shell & tube heat exchangers and single screw compressors with stepless capacity control, allowing the chiller to modulate its capacity from 100% to 12.5%.

Moreover, the range features an extensive option list including the heat recovery, the evaporator electric heater and the sound proof system.

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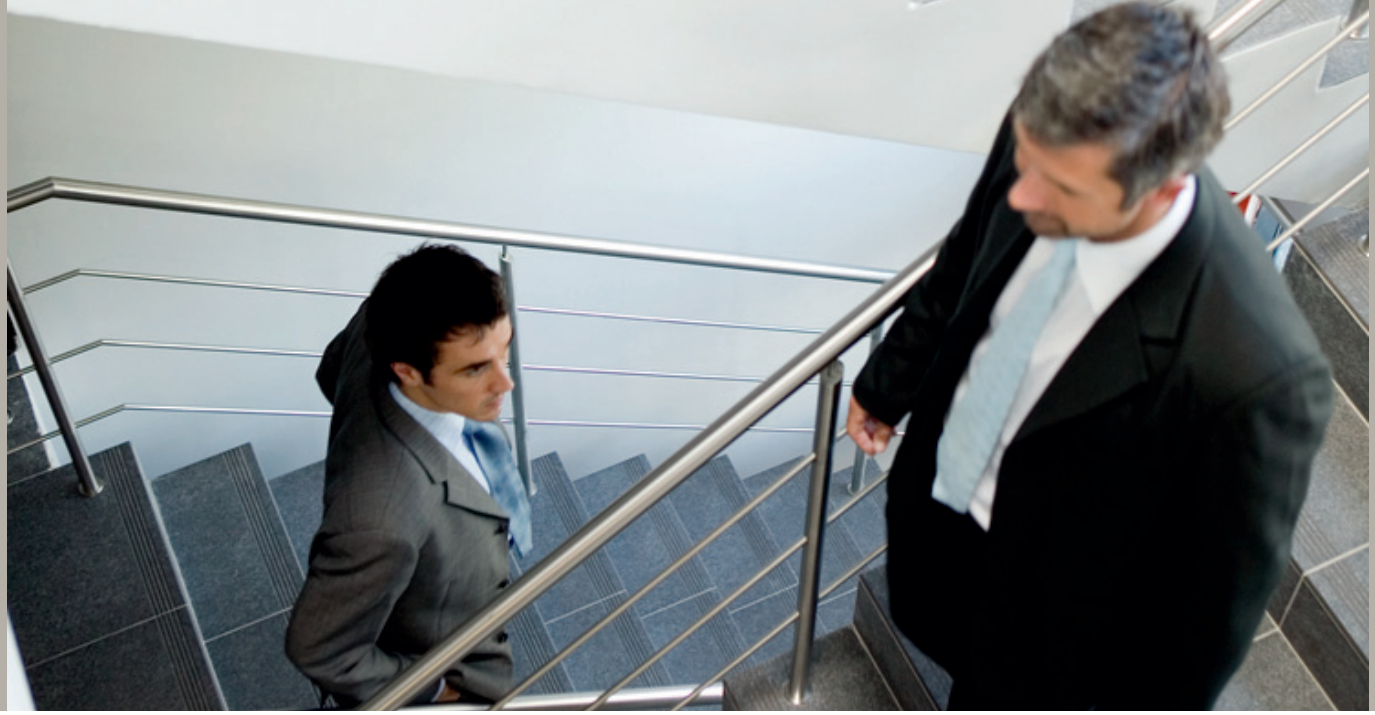

Chillers features

Application flexibility

The EWWQ-B- series is available in a wide range of capacities (380 - 2152kW), allowing project solutions for an extensive range of applications.
The most commonly serviced parts are easily accessible, simplifying maintenance and service. Moreover, the new chillers allow flexible integration into a wide range of control and building management systems.

High part load efficiency

The chiller provides remarkable energy efficiency at partial loads - ESEER up to 6.28 – resulting in considerable savings in system annual energy costs and ensuring low total cost of ownership throughout its operating life.

Compact design for indoor installations

Water cooled units are typically intended for indoor installation and operation, resulting in acoustic isolation and also zero impact on the building layout.
The EWWQ-B- range takes the advantage of refrigerant R410A's properties (basically the high thermal conductivity) to offer a great cooling effect by efficient compact units that work with a reduced number of compressors.

Superior control logic

The new Microtech III controller provides an easy to use control environmental. The control logic is designed to provide maximum efficiency, to continue operation in unusual operating conditions and to provide a history of unit operation. One of the greatest benefits is the easy interface with Lonwork, BACnet, Ethernet TCP/IP or Modbus communications.

Extensive option list

The base model includes several standard factory mounted options such as: electronic expansion valve, wye delta starter (y-d), general fault contactor, etc. Moreover, the new range features an extensive option list, including heat recovery, discharge and suction line shut off valve, soft starter, energy meter, etc.

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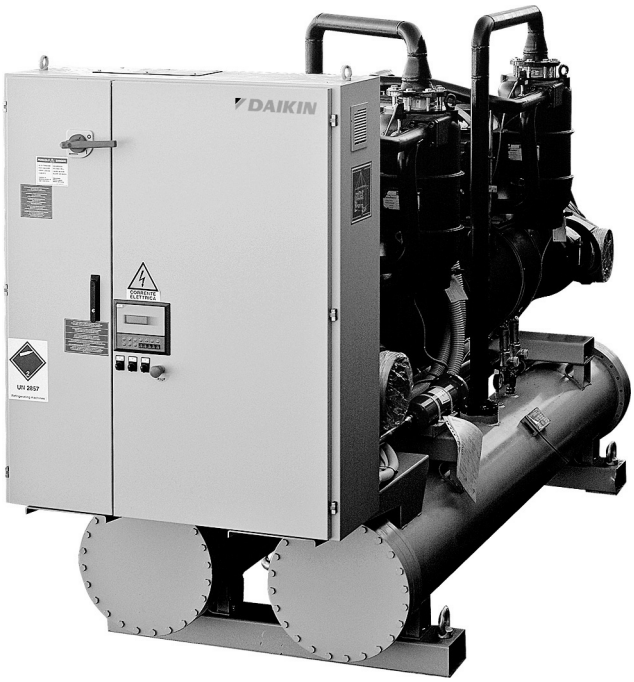
EWWQ-B-SS

1 Features

- All models are PED pressure vessel approved
- 1 or 2 stepless single-screw compressors
- 1 or 2 truly independent refrigerant circuits
- Shell and tube heat exchanger
- Optimised for use with R-410A
- Standard electronic expansion valve
- Compact design
- Partial heat recovery available
- MicroTech III controller



2 Features and advantages

The EWWQ~B- water cooled chillers, featuring 1 or 2 single screw compressors, are manufactured to satisfy the requirements of the consultants and the end user. Units are designed to minimise energy costs while maximising the refrigeration capacities. Daikin's chiller design experience, combined with outstanding features makes the EWWQ~B- chiller unmatched in the industry.

Seasonal quietness

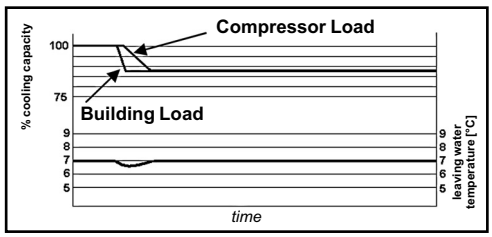
The compressor design with a single screw and twin rotors allows a constant gas flow. This compression process completely eliminates gas pulsations. The oil injection also results in significant mechanical noise reduction.

The twin gas compressor discharge chambers are designed to act as attenuators, based on the harmonic wave principle with destructive interference, thus always resulting equal to zero. The extremely low noise compressor performance affords the use of EWWQ~B- chiller for all applications.

The reduced number of vibrations produced from the EWWQ~B- chiller offers a surprisingly quiet operation eliminating the noise transmission through the structure and the chilled water piping system.

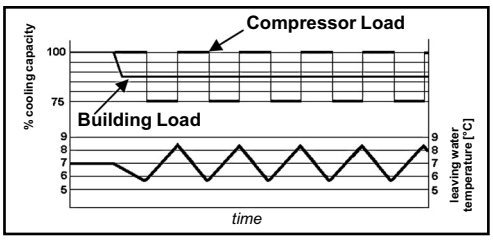
Infinitely capacity control

Cooling capacity control is infinitely variable by means of a screw compressor controlled by microprocessor system. Each unit has infinitely variable capacity control from 100% down to 25% (one compressor unit), down to 12.5% (two compressors units). This modulation allows the compressor capacity to exactly match the building cooling load without any leaving evaporator water temperature fluctuation. This chilled water temperature fluctuation is avoided only with a stepless control.



ELWT fluctuation with stepless capacity control

With a compressor load step control in fact, the compressor capacity, at partial loads, will be too high or too low compared to the building cooling load. The result is an increase in chiller energy costs, particularly at the part-load conditions at which the chiller operates most of the time.



ELWT fluctuation with steps capacity control (4 steps)

Units with stepless regulation offer benefits that the units with step regulation are unable to match. The ability to follow the system energy demand at any time and the possibility to provide steady outlet water temperature without deviations from the set-point, are the two points that allow you to understand how the optimum operating conditions of a system can be met only through the use of a unit with stepless regulation.

Unmatched serviceability

Field serviceability has not been sacrificed. Inspection covers allows visual inspection of the main screw and gaterotors

Outstanding reliability features

- Zero clearance fit between the gaterotor/s and main screw rotor virtually eliminates leakage between the high and low-pressure sides during compression. Special gaterotor material made from an advanced composite, temperature stable material makes a zero clearance design possible.
- The chiller is equipped with the most advanced means of refrigerant flow control available. An electronic expansion valve coupled with the MicroTech III controller's control logic provides excellent operating efficiencies both at full and part load operation.
- Infinite unloading matches compressor capacity to load.

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2 Features and advantages

- Full factory testing of the unit with water hookups helps provide a trouble-free start-up. Extensive quality control checks during testing means that each equipment protection and operating control is properly adjusted and operates correctly before it leaves the factory.
- The rugged design of the single-screw compressor allows it to be tolerant of liquid slugging. Screw chiller will start and operate under conditions that would often destroy other compressors.
- Very low loading enhances the bearing and compressor reliability. Balanced forces result in the elimination of the high loads inherent in twin-screw compressors.
- Integral to the basic design of the single-screw compressor, the main screw rotor shaft and the gaterotor shaft/s cross at right angles in the compressor. The result is ample space to locate heavy duty bearings and increase compressor reliability since no limitations are placed on bearing design as found in twin-screw compressors.

Code requirements – Safety and observant of laws/directives

All water cooled units are designed and manufactured in accordance with applicable selections of the following:

Construction of pressure vessel	97/23/EC (PED)
Machinery Directive	2006/42/EC
Low Voltage	2006/95/EC
Electromagnetic Compatibility	2004/108/EC
Electrical & Safety codes	EN 60204–1 / EN 60335-2-40
Manufacturing Quality Stds	UNI – EN ISO 9001:2004

Certifications

All units manufactured are CE marked, complying with European directives in force, concerning manufacturing and safety. On request units can be produced complying with laws in force in non European countries (ASME, GOST, etc.), and with other applications, such as naval (RINA, etc.).

Versions

EWWQ~B- is available in two different Efficiency Versions:

S: Standard Efficiency

19 sizes, covering a cooling capacity range from 380 up to 2050 kW, EER up to 4.64 and ESEER up to 5.64.

X: High Efficiency

17 sizes, covering a cooling capacity range from 422 up to 2152 kW, EER up to 5.09 and ESEER up to 6.28.

The EER (Energy Efficiency Ratio) is the ratio of the Cooling Capacity to the Power Input of the unit. The Power Input includes: the power input for operation of the compressor, the power input of all control and safety devices.

The ESEER (European Seasonal Energy Efficiency Ratio) is a weighed formula enabling to take into account the variation of EER with the load rate and the variation of water inlet condenser temperature.

$$ESEER = A \times EER_{100\%} + B \times EER_{75\%} + C \times EER_{50\%} + D \times EER_{25\%}$$

	A	B	C	D
Coefficient	0.03 (3%)	0.33 (33%)	0.41 (41%)	0.23 (23%)
Air inlet condenser temperature (°C)	30	26	22	18

Sound configuration

EWWQ~B- is available in standard sound level configuration:

S: Standard Noise

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3 General characteristics

General characteristics

Cabinet and structure
The cabinet is made of galvanized steel sheet and painted to provide a high resistance to corrosion. Colour Ivory White (Munsell code 5Y7.5/1) (±RAL7044).The base frame has eye-hook for lifting the unit with ropes for an easy installation. The weight is uniformly distributed along the profiles of the base and this facilitates the arrangement of the unit.

Screw compressors
The single-screw compressor has a well balanced compression mechanism which cancels the screw rotor load in both the radial and axial directions. Inherent to the basic single-screw compressor design is the virtually load-free operation that gives main bearing design life of 3-4 times greater than twin-screws, and eliminates expensive and complicated thrust balancing schemes. The two exactly opposed gate rotors create two exactly opposed compression cycles. Compression is made at the lower and upper parts of the screw rotor at the same time, thus cancelling the radial loads. Also, both ends of the screw rotor are subjected to suction pressure only, which cancels the axial loads and eliminates the huge thrust loads inherent in twin-screw compressors.
Oil injection is used for these compressors in order to get EER at high condensing pressure. EWWQ~B- units are provided with a high efficiency oil separator to maximise oil extraction.
Compressors have an infinitely variable capacity control down to 25% of its total capacity. This control is made by means of capacity slides controlled by microprocessors.
Standard start is star-delta type; soft start type is available as option.

Ecological R-410A refrigerant
The compressors have been designed to operate with R-410A, ecological refrigerant with zero ODP (Ozone Depletion Potential) and very low GWP (Global Warming Potential) that means low TEWI (Total Equivalent Warming Impact).

Evaporator
The units are equipped with a Direct Expansion shell & tube evaporator with copper tubes rolled into steel tubesheets. The evaporators are single-pass on both the refrigerant and water sides for pure counter-flow heat exchange and low refrigerant pressure drops. Both attributes contribute to the heat exchanger effectiveness and total unit's outstanding efficiency.
The external shell is covered with a 10mm closed cell insulation material. Each evaporator has 1 circuit for each compressor and is manufactured in accordance to PED approval. The evaporator water outlet connections are provided with Victaulic Kit (as standard).

Condensers
The units are equipped with Direct Expansion shell & tube condensers, with copper tubes rolled into steel tubesheets. The unit has independent condensers, one per circuit. is manufactured in accordance to PED approval. The condenser water outlet connections are provided with Victaulic Kit (as standard).
Condensers are provided with liquid shut-off valve and spring loaded relief valve.

Electronic expansion valve
The unit is equipped with the most advanced electronic expansion valves to achieve precise control of refrigerant mass flow. As today's system requires improved energy efficiency, tighter temperature control, wider range of operating conditions and incorporate features like remote monitoring and diagnostics, the application of electronic expansion valves becomes mandatory. Electronic expansion valve proposes features that make it unique: short opening and closing time, high resolution, positive shut-off function to eliminate use of additional solenoid valve, highly linear flow capacity, continuous modulation of mass flow without stress in the refrigerant circuit and corrosion resistance stainless steel body.
EEXV strength point is the capacity to work with lower ΔP between high and low pressure side, than a thermostatic expansion valve. The electronic expansion valve allows the system to work with low condenser pressure (winter time) without any refrigerant flow problems and with a perfect chilled water leaving temperature control.

Refrigerant Circuit
Each unit has independent refrigerant circuits and each one includes:
- Single screw compressor with external cyclonic oil separator

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3 General characteristics

- (Common) Evaporator
- Condenser
- Oil pressure transducer
- High and low pressure switches
- Moisture liquid indicator
- High efficiency oil separator
- Replaceable core filter-drier
- Electronic expansion valve

Electrical control panel

Power and control are located in the main panel that is manufactured to ensure protection against all weather conditions. The electrical panel is IP54 and (when opening the doors) internally protected with Plexiglas panel against possible accidental contact with electrical components (IP20). The main panel is fitted with a main switch interlocked door.

Power Section

The power section includes compressors fuses and control circuit transformer.

MicroTech III controller

The MicroTech III controller is installed as standard; it can be used to modify unit set-points and check control parameters. A built-in display shows chiller operating status plus temperatures and pressures of water, refrigerant, programmable values, set-points. A sophisticated software with predictive logic, selects the most energy efficient combination of compressors and EEXV to keep stable operating conditions to maximise chiller energy efficiency and reliability.
MicroTech III is able to protect critical components based on external signs from its system (such as motor temperatures, refrigerant gas and oil pressures, correct phase sequence, pressure switches and evaporator). The input coming from the high pressure switch cuts all digital output from the controller in less than 50ms, this is an additional security for the equipment.
Fast program cycle (200ms) for a precise monitoring of the system. Floating point calculations supported for increased accuracy in P/T conversions.

Control section - main features

- Management of the compressor stepless capacity.
- Chiller enabled to work in partial failure condition.
- Full routine operation at condition of:
  - high ambient temperature value
  - high thermal load
  - high evaporator entering water temperature (start-up)
- Display of evaporator entering/leaving water temperatures.
- Display of condensing-evaporating temperatures and pressures, suction and discharge superheat for each circuit.
- Leaving water evaporator temperature regulation. Temperature tolerance = 0 .1°C.
- Compressor and evaporator pumps hour counters.
- Display of Status Safety Devices.
- Number of starts and compressor working hours.
- Optimized management of compressor load.
- Re-start in case of power failure (automatic / manual).
- Soft Load (optimized management of the compressor load during the start-up).
- Start at high evaporator water temperature.
- Return Reset (Set Point Reset based on return water temperature).
- Set point Reset (optional).
- Application and system upgrade with commercial SD cards.
- Ethernet port for remote or local servicing using standard web browsers.
- Two different sets of default parameters could be stored for easy restore.

GNC_1-2-3-4-5_Rev.00_2

3 General characteristics

Safety device / logic for each refrigerant circuit

- High pressure (pressure switch).
- High pressure (transducer).
- Low pressure (transducer).
- High compressor discharge temperature.
- High motor winding temperature.
- Phase Monitor.
- Low pressure ratio.
- High oil pressure drop
- Low oil pressure.
- No pressure change at start.

System security

- Phase monitor.
- Low Ambient temperature lock-out.
- Freeze protection.

Regulation type

Proportional + integral + derivative regulation on the evaporator leaving water output probe.

MicroTech III

MicroTech III built-in terminal has the following features.

- 164x44 dots liquid crystal display with white back lighting. Supports Unicode fonts for multi-lingual.
- Key-pad consisting of 3 keys.
- Push'n'Roll control for an increased usability.
- Memory to protect the data.
- General faults alarm relays.
- Password access to modify the setting.
- Application security to prevent application tampering or hardware usability with third party applications.
- Service report displaying all running hours and general conditions.
- Alarm history memory to allow an easy fault analysis.

Supervising systems (on request)

MicroTech III remote control

MicroTech III is able to communicate to BMS (Building Management System) based on the most common protocols as:

- ModbusRTU
- LonWorks, now also based on the international 8040 Standard Chiller Profile and LonMark Technology
- BacNet BTP certifief over IP and MS/TP (class 4) (Native)

Chiller Sequencing

MicroTech III controller allows an easy plug-in sequencing technology based on digital or serial panel

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3 General characteristics

Digital Sequencing Panel
This panel is basically a step inserter that switches ON/OFF up to 11 units (chillers or heat pumps operating in the same cooling/heating mode) depending on the selected set point; the units are connected with the panel through standard cables and no serial card is requested.

Serial Sequencing Panel
Basically this panel sequences a chiller plant by switching on/off the units (up to 7 chillers) taking into account their running hours and the requested plant load, in order to optimise the number of working units for each condition; serial cards and shielded cables are requested to connect the panel with the units and, if installed, a BMS.

Standard accessories (supplied on basic unit)
Wye-Delta Compressor starter (Y-Δ) - For low inrush current and reduced starting torque.
Double set-point - Dual leaving water temperature set-points.
Phase monitor - The phase monitor controls that phases sequence is correct and controls phase loss.
Evaporator Victaulic Kit - Hydraulic joint with gasket for an easy and quick water connection.
Evaporator Water side design pressure 10 bar
Condenser Water side design pressure 16 bar
Electronic Expansion Valve
High Pressure Side Manometers
Hour Run meter - Digital compressors hour run meter
General fault contactor - Alarm relay.
Set-point reset, demand limit and alarm from external device - The leaving water temperature set-point can be overwritten with the following options: 4-20mA from external source (by user); outside ambient temperature; evaporator water temperature Δt. Moreover the device allow the user to limit the load of the unit by 4-20mA signal or by network system and the microprocessor is able to receive an alarm signal from an external device (pump etc… - user can decide if this alarm signal will stop the unit or not).
Double pressure relief valve with diverter (standard on high pressure side, available as option on low pressure side)

Options (on request)
Partial heat recovery - enabled through a shell & tube exchanger sited between the compressor and the condenser, completely dedicated to the heat recovery. These allow hot water to be produced up to a maximum temperature of 58°C.
Soft start - Electronic starting device to reduce the mechanical stress during compressor start-up
Brine version - Allows the unit to operate down to -8°C leaving liquid temperature (antifreeze required).
Compressor thermal overload relays - Safety devices against compressor motor overloading in addition to the normal protection envisaged by the electrical windings.
Under/Over Voltage - This device control the voltage value of power supply and stop the chiller if the value exceeds the allowed operating limits.
Energy Meter - This device allows to measure the energy absorbed by the chiller during its life. It is installed inside the control box mounted on a DIN rail and show on a digital display: Line-to-Line Voltage, Phase and Average Current, Active and Reactive Power, Active Energy, Frequency
Condenser power factor correction - Installed on the electrical control panel to ensure it conforms to the plant rules. (Daikin advices maximum 0.9).
Current limit / display - this option allows monitoring the chiller absorbed current with possibility to set a limit value. This option excludes the Demand Limit.
Compressors circuit breakers
20mm Evaporator/ Condenser Insulation
Condenser Victaulic Kit

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3 General characteristics

Condenser / evaporator double flange kit

Cu-Ni 90-10 exchangers - to work with sea water the heat exchangers are fitted with Cu-Ni tubes and special protection inside the end covers.

Evaporator electric heater - electric heater controlled by a thermostat to protect the evaporator from freezing down to -28°C ambient temperature, providing the power supply is on.

Evaporator flow switch supplied separately to be wired and installed on the evaporator water piping (by the customer).

Discharge line shut-off valves - installed on the discharge port of the compressor to facilitate maintenance operations.

Suction line shut off valve - installed on the suction port of the compressor to facilitate maintenance operation.

Container kit

Rubber type antivibration mounts - Supplied separately, these are positioned under the base of the unit during installation to reduce vibrations.

Sound Proof System - Made of sheet metal and internally insulated, the cabinet is “integral kind” (around the whole chiller, not only around the compressors) to reach the best performance in noise reduction.

Witness test - Every unit is always tested at the test bench prior to the shipment. On request, a second test can be carried out, at customer’s presence, in accordance with the procedures indicated on the test form. (not available for units with glycol mixtures).

Acoustic test – On request, a test can be carried out at customer’s presence (not available for units with glycol mixtures)

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4 Specifications

4-1 Technical Specifications					EWWQ 380B-SS	EWWQ 460B-SS	EWWQ 560B-SS	EWWQ 640B-SS	EWWQ 730B-SS	EWWQ 800B-SS	EWWQ 860B-SS	EWWQ 870B-SS	EWWQ 960B-SS
Cooling capacity	Nom.			kW	380 (1)	464 (1)	562 (1)	637 (1)	727 (1)	796 (1)	862 (1)	872 (1)	960 (1)
Capacity control	Method				Stepless								
	Minimum capacity			%	25							12.5	
Power input	Cooling	Nom.		kW	85.6 (1)	104 (1)	128 (1)	144 (1)	166 (1)	172 (1)	202 (1)	190 (1)	209 (1)
EER					4.44 (1)	4.46 (1)	4.40 (1)	4.41 (1)	4.37 (1)	4.64 (1)	4.26 (1)	4.59 (1)	4.60 (1)
ESEER					5.16	5.21	5.22		4.95	5.64	4.83	5.63	5.59
Casing	Colour				Ivory white								
	Material				Galvanized and painted steel sheet								
Dimensions	Unit	Height		mm	1,849		2,001		1,848	2,158	1,848	2,158	
		Width		mm	1,140		1,276		1,314	1,350	1,314	1,350	
		Depth		mm	3,373		3,454		3,535	5,020	2,001	5,020	
Weight	Unit			kg	1,933	1,967	2,283	2,332	2,407	3,921	2,427	3,949	3,988
	Operation weight			kg	2,135	2,169	2,543	2,628	2,777	4,422	2,795	4,463	4,496
Water heat exchanger - evaporator	Type				Shell and tube								
	Water volume			l	124	118	176	170	274	344	266	344	325
	Water flow rate	Nom.		l/s	18.2	22.2	26.8	30.4	34.7	38.0	41.2	41.7	45.9
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	47	63	43	46	53	52	48	62	57
	Insulation material				Closed cell foam elastomer								
Water heat exchanger - condenser	Type				Shell and tube								
	Water flow rate	Nom.		l/s	22.2	27.2	32.9	37.3	42.7	23.1	50.9	23.4	27.9
	Nominal water pressure drop	Cooling		kPa	58	62	66	63	15	62	19	62	65
	Nominal water pressure drop 2	Cooling		kPa	-					62	-	65	
	Insulation material				Expanded elastomer								
Sound power level	Cooling	Nom.		dBA	100.2	101.2	102.3		101.5	104.7	102.3	104.7	105.1
Sound pressure level	Cooling	Nom.		dBA	82.2	83.0	83.9		83.2	84	84.9	85.2	85
Compressor	Type				Semi-hermetic single screw compressor								
	Quantity				1					2	1	2	
	Oil	Charged volume		l	16					32	16	32	
Operation range	Evaporator	Cooling	Min.	°CDB	-4								
			Max.	°CDB	10								
	Condenser	Cooling	Min.	°CDB	25								
			Max.	°CDB	45								
Refrigerant	Type				R-410A								
	Charge			kg	80		90		80	-			
	Circuits	Quantity			1					2	1	2	
Refrigerant circuit	Charge			kg	-					80	90		85
Refrigerant circuit 2	Charge			kg	-					80	-	90	85
Safety devices	Item	01			High pressure switch								
		02			Low pressure switch								
		03			Emergency stop								
		04			High discharge temperature on the compressor								
		05			Phase monitor								
		06			Low pressure ratio								
		07			High oil pressure drop								
		08			Low oil pressure								

4-1 Technical Specifications				EWWQC11 B-SS	EWWQC12 B-SS	EWWQC13 B-SS	EWWQC14 B-SS	EWWQC15 B-SS	EWWQC16 B-SS	EWWQC17 B-SS	EWWQC19 B-SS	EWWQC20 B-SS
Cooling capacity	Nom.		kW	1,055 (1)	1,185 (1)	1,255 (1)	1,325 (1)	1,460 (1)	1,584 (1)	1,748 (1)	1,888 (1)	2,050 (1)
Capacity control	Method			Stepless								
	Minimum capacity		%	12.5								
Power input	Cooling	Nom.	kW	232 (1)	256 (1)	274 (1)	290 (1)	333 (1)	367 (1)	401 (1)	432 (1)	466 (1)
EER				4.55 (1)	4.62 (1)	4.59 (1)	4.56 (1)	4.38 (1)	4.32 (1)	4.36 (1)	4.37 (1)	4.40 (1)
ESEER				5.6	5.61	5.62	5.55	5.18		5.06	5.11	5.07
Casing	Colour			Ivory white								
	Material			Galvanized and painted steel sheet								

4 Specifications

4-1 Technical Specifications					EWWQC11 B-SS	EWWQC12 B-SS	EWWQC13 B-SS	EWWQC14 B-SS	EWWQC15 B-SS	EWWQC16 B-SS	EWWQC17 B-SS	EWWQC19 B-SS	EWWQC20 B-SS
Dimensions	Unit	Height		mm	2,378	2,455			2,495				
		Width		mm	1,350								
		Depth		mm	4,894	5,070			4,892			4,865	
Weight	Unit			kg	4,344	4,529	4,536	4,607	4,988	4,999	5,053	5,204	5,289
	Operation weight			kg	4,780	5,186	5,200	5,280	5,602	5,615	5,670	5,881	5,970
Water heat exchanger - evaporator	Type				Shell and tube								
	Water volume			l	325	538			505		495	539	527
	Water flow rate	Nom.		l/s	50.4	56.6	60	63.3	69.8	75.7	83.5	90.2	98.0
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	67	43	48	53	58	67	86	95	119
	Insulation material				Closed cell foam elastomer								
Water heat exchanger - condenser	Type				Shell and tube								
	Water flow rate	Nom.		l/s	27.6	34.3	33.4	38.4	42.6	42.7	51	50.8	59.8
	Nominal water pressure drop	Cooling		kPa	65	70		67	16				14
	Nominal water pressure drop 2	Cooling		kPa	67	70	67		16	18	16	14	
	Insulation material				Expanded elastomer								
Sound power level	Cooling	Nom.		dBA	104.7	105.2	106.5		105.8	106.2	106.6	107.1	107.5
Sound pressure level	Cooling	Nom.		dBA	86	86.5	86.9		86.2	86.6	87.0	87.5	87.9
Compressor	Type				Semi-hermetic single screw compressor								
	Quantity				2								
	Oil	Charged volume		l	32								
Operation range	Evaporator	Cooling	Min.	ºCDB	-4								
			Max.	ºCDB	10								
	Condenser	Cooling	Min.	ºCDB	25								
			Max.	ºCDB	45								
Refrigerant	Type				R-410A								
	Charge			kg	-								
	Circuits	Quantity			2								
Refrigerant circuit	Charge			kg	95	100			130				
Refrigerant circuit 2	Charge			kg	95	100			130				
Safety devices	Item	01			High pressure switch								
		02			Low pressure switch								
		03			Emergency stop								
		04			High discharge temperature on the compressor								
		05			Phase monitor								
		06			Low pressure ratio								
		07			High oil pressure drop								
		08			Low oil pressure								

4 Specifications

4-2 Electrical Specifications				EWWQ 380B-SS	EWWQ 460B-SS	EWWQ 560B-SS	EWWQ 640B-SS	EWWQ 730B-SS	EWWQ 800B-SS	EWWQ 860B-SS	EWWQ 870B-SS	EWWQ 960B-SS
Compressor	Phase			3~								
	Voltage		V	400								
	Voltage range	Min.	%	-10								
		Max.	%	10								
	Maximum running current		A	189	225	274	310	325	189	388	189	225
	Starting method			Wye-delta								
Compressor 2	Maximum running current		A	-					189	-	225	
Power supply	Phase			3~								
	Frequency		Hz	50								
	Voltage		V	400								
	Voltage range	Min.	%	-10								
		Max.	%	10								
Unit	Maximum starting current		A	455				656	610	656	638	
	Nominal running current (RLA)	Cooling	A	147	172	207	232	269	294	323	319	344
	Maximum running current		A	179	214	260	294	325	358	381	393	428
	Max unit current for wires sizing		A	197	235	286	324	357	416	419	432	470

4-2 Electrical Specifications				EWWQC11 B-SS	EWWQC12 B-SS	EWWQC13 B-SS	EWWQC14 B-SS	EWWQC15 B-SS	EWWQC16 B-SS	EWWQC17 B-SS	EWWQC19 B-SS	EWWQC20 B-SS
Compressor	Phase			3~								
	Voltage		V	400								
	Voltage range	Min.	%	-10								
		Max.	%	10								
	Maximum running current		A	225	274		310	325		388		458
	Starting method			Wye-delta								
Compressor 2	Maximum running current		A	274		310		325	388		458	
Power supply	Phase			3~								
	Frequency		Hz	50								
	Voltage		V	400								
	Voltage range	Min.	%	-10								
		Max.	%	10								
Unit	Maximum starting current		A	638	676	705		933	984		1,035	
	Nominal running current (RLA)	Cooling	A	379	414	439	464	538	592	646	701	756
	Maximum running current		A	474	522	556	589	650	706	764	824	886
	Max unit current for wires sizing		A	522	574	611	648	715	778	840	906	975

Notes

(1) Cooling: entering evaporator water temp. 12ºC; leaving evaporator water temp. 7ºC; entering condenser water temp. 30ºC; leaving condenser water temp. 35ºC; full load operation.

(2) Sound level data are measured at entering evaporator water temp. 12ºC; leaving evaporator water temp. 7ºC; entering condenser water temp. 30ºC; leaving condenser water temp. 35ºC; full load operation; standard: ISO3744

(3) Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.

(4) Maximum starting current: starting current of biggest compressor + current of the other compressor at 75 % of maximum load

(5) Nominal current in cooling mode: entering evaporator water temp. 12ºC; leaving evaporator water temp. 7ºC; entering condenser water temp. 30ºC; leaving condenser water temp. 35ºC; compressors.

(6) Maximum running current is based on max compressor absorbed current in its envelope

(7) Maximum unit current for wires sizing is based on minimum allowed voltage.

(8) Maximum current for wires sizing: compressor full load ampere x 1.1

5 Nomenclature

5 - 1 Nomenclature

Name	E W W	Q	3 8 0	B	-	S	S	0	0 1
Digits	1 2 3	4	5 6 7	8	9	10	11	12	13 14

Machine type
EWA = Air-cooled chiller, cooling only
EWY = Air-cooled chiller, heat pump
EWL = Remote condenser chiller
ERA = Air cooled condensing unit
EWW = Water-cooled chiller, cooling only
EWC = Air-cooled chiller, cooling only with centrifugal fan
EWT = Air-cooled chiller, cooling only with heat recovery

Refrigerant
D = R-134a
P = R-407c
Q = R-410

Capacity class in kW (Cooling)
Always 3-digit code
Idem as previous

Model series
Letter A, B,… : major modification

Inverter
- = Non-inverter
Z = Inverter

Efficiency level
S = Standard efficiency
X = High efficiency
P = Premium efficiency (N.A for this range)

Sound level
S = Standard noise
L = Low noise (N.A for this range)
R = Reduced noise (N.A for this range)
X = Extra low noise (N.A for this range)
C = Cabinet (N.A for this range)

Warranty
0 = 1 year of warranty
B = 2 years of warranty
C = 3 years of warranty
... = ... years of warranty

Sequential number
000 = Base model
001 = First order for this model (1 or more units)
002 = Second order for this model (1 or more units)
... = ... order for this model
B01 = First order for this model + 1 year warranty
B02 = Second order for this model (1 or more units)
... = ... order for this model

NMC_Rev.00

6 Capacity tables

6 - 1 Cooling Capacity Tables

EWWQ380-800B-SS

	ELWT (°C)	Entering Condenser Water Temperature (°C)															
		15		20		25		30		35		40		45		50	
		Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)
380	4					370	74.9	347	84.0	322	93.8	295	104				
	5					381	75.0	358	84.2	332	93.9	305	104				
	6					392	75.2	369	84.4	343	94.1	315	104				
	7					403	75.3	380	84.5	354	94.2	326	105				
	8					415	75.4	391	84.7	365	94.4	336	105				
	9							402	84.8	376	94.6	347	105				
	10							414	84.9	387	94.7	358	105				
460	4					452	90.9	424	102	394	114	361	126				
	5					465	91.1	437	102	406	114	374	127				
	6					478	91.2	451	102	419	114	386	127				
	7					492	91.4	464	103	433	114	399	127				
	8					506	91.6	477	103	446	115	412	127				
	9							491	103	459	115	425	127				
	10							505	103	472	115	438	127				
560	4					548	112	515	125	478	140	440	155				
	5					564	112	530	126	494	140	454	156				
	6					581	112	546	126	509	140	469	156				
	7					597	112	563	126	525	141	484	156				
	8					615	112	579	126	541	141	500	156				
	9							596	126	557	141	515	157				
	10							613	127	573	141	531	157				
640	4					620	126	583	142	541	158	497	176				
	5					639	127	600	142	559	159	514	176				
	6					657	127	619	142	576	159	531	176				
	7					676	127	637	143	594	159	548	177				
	8					695	127	655	143	612	159	566	177				
	9							674	143	630	160	584	177				
	10							694	143	649	160	601	177				
730	4					701	146	660	161	617	177	573	194				
	5					724	147	682	162	639	178	593	195				
	6					747	148	705	163	660	179	613	196				
	7					771	149	728	164	682	180	634	198				
	8					795	149	751	165	704	181	655	198				
	9							775	166	727	182	677	199				
	10							798	166	750	182	699	200				
800	4					774	150	725	168	671	188	614	208				
	5					798	150	748	169	693	188	636	209				
	6					823	151	772	169	716	188	657	209				
	7					848	151	796	169	739	189	680	209				
	8					874	151	821	170	763	189	702	210				
	9							846	170	787	189	725	210				
	10							871	170	811	190	749	210				

NOTES

1 Cc (cooling capacity) - Pi (unit power input) – ELWT (Evaporator leaving water temperature – Δt 5°C) - Condenser Water temperature Δt 5°C
2 Data are referred to 0.0176 m^2 °C/kW evaporator fouling factor
3 Data are referred to 0.0440 m^2 °C/kW condenser fouling factor

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6 Capacity tables

6 - 1 Cooling Capacity Tables

EWWQ860-C12B-SS

	ELWT (°C)	Entering Condenser Water Temperature (°C)															
		15		20		25		30		35		40		45		50	
		Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)
860	4					832	177	783	195	732	213	678	231				
	5					858	178	809	197	757	215	702	233				
	6					886	180	835	198	782	216	726	234				
	7					913	181	862	199	808	218	750	236				
	8					941	182	889	201	834	219	775	237				
	9							916	202	860	221	800	239				
	10							944	203	887	222	825	240				
870	4					849	166	796	186	738	208	676	231				
	5					875	166	821	187	762	208	700	231				
	6					902	167	847	187	787	209	723	231				
	7					929	167	873	187	812	209	747	232				
	8					956	167	899	188	837	209	772	232				
	9							926	188	863	210	797	232				
	10							954	188	890	210	822	233				
960	4					934	182	875	205	811	228	743	253				
	5					963	183	903	205	838	229	769	254				
	6					992	183	932	205	865	229	795	254				
	7					1022	183	960	206	893	229	822	255				
	8					1052	184	989	206	921	230	849	255				
	9							1019	207	950	230	876	255				
	10							1049	207	979	231	904	256				
C10	4					973	210	916	232	855	253	793	274				
	5					1004	212	946	233	884	255	821	276				
	6					1036	214	976	235	914	257	849	278				
	7					1068	215	1007	237	944	259	877	280				
	8					1101	217	1038	239	974	261	906	282				
	9							1071	241	1004	263	936	284				
	10							1103	243	1035	265	966	286				
C11	4					1027	203	964	228	895	254	821	282				
	5					1058	203	994	228	924	254	849	283				
	6					1089	204	1024	228	953	255	877	283				
	7					1120	204	1055	229	983	255	906	283				
	8					1152	204	1086	229	1013	256	935	284				
	9							1118	230	1044	256	965	284				
	10							1150	230	1075	256	995	285				
C12	4					1153	224	1079	251	999	280	914	311				
	5					1189	224	1114	252	1032	281	946	312				
	6					1224	225	1149	252	1066	281	979	312				
	7					1260	225	1185	253	1101	282	1012	313				
	8					1297	226	1221	253	1137	282	1046	313				
	9							1257	254	1173	283	1080	314				
	10							1294	254	1208	283	1115	314				

NOTES

1 Cc (cooling capacity) - Pi (unit power input) – ELWT (Evaporator leaving water temperature – Δt 5°C) - Condenser Water temperature Δt 5°C
2 Data are referred to 0.0176 m^2 °C/kW evaporator fouling factor
3 Data are referred to 0.0440 m^2 °C/kW condenser fouling factor

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6 Capacity tables

6 - 1 Cooling Capacity Tables

EWWQC13-C20B-SS

	ELWT (°C)	Entering Condenser Water Temperature (°C)															
		15		20		25		30		35		40		45		50	
		Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)
C13	4					1221	239	1145	268	1061	299	972	332				
	5					1258	239	1181	269	1096	299	1006	333				
	6					1296	240	1218	269	1132	300	1040	333				
	7					1334	240	1255	270	1168	301	1075	334				
	8					1373	241	1292	270	1204	301	1111	334				
	9							1330	270	1242	302	1147	335				
	10							1369	271	1279	302	1183	335				
C14	4					1289	254	1211	285	1123	318	1030	353				
	5					1328	254	1248	285	1161	318	1065	354				
	6					1367	255	1286	286	1198	319	1101	354				
	7					1407	255	1324	286	1235	319	1138	354				
	8					1448	255	1364	287	1272	320	1176	355				
	9							1403	287	1311	320	1213	355				
	10							1444	288	1350	321	1250	356				
C15	4					1405	292	1323	323	1237	354	1148	389				
	5					1450	294	1367	325	1280	357	1188	391				
	6					1497	296	1412	327	1323	359	1229	393				
	7					1544	298	1458	328	1366	361	1271	395				
	8					1592	299	1504	330	1411	362	1313	397				
	9							1551	331	1456	364	1356	399				
	10							1599	333	1502	365	1400	400				
C16	4					1546	322	1457	355	1364	390	1265	425				
	5					1595	324	1505	358	1409	392	1308	427				
	6					1645	327	1553	360	1456	395	1353	430				
	7					1696	329	1602	363	1503	397	1398	432				
	8					1747	330	1652	365	1551	400	1444	435				
	9							1703	367	1600	402	1490	437				
	10							1754	368	1649	403	1538	439				
C17	4					1701	351	1604	387	1501	424	1392	459				
	5					1755	353	1657	390	1552	427	1440	462				
	6					1810	355	1710	392	1603	429	1489	465				
	7					1866	358	1764	395	1655	432	1539	468				
	8					1923	360	1819	397	1707	435	1589	471				
	9							1874	400	1761	437	1640	474				
	10							1931	402	1815	440	1692	476				
C19	4					1840	379	1737	418	1627	458	1512	498				
	5					1898	381	1793	421	1681	461	1564	501				
	6					1956	384	1849	424	1736	465	1616	504				
	7					2016	386	1907	427	1792	468	1670	507				
	8					2076	388	1965	429	1848	471	1724	510				
	9							2024	432	1905	473	1779	513				
	10							2084	434	1963	476	1834	516				
C20	4					1997	407	1885	450	1766	494	1644	537				
	5					2060	410	1945	453	1825	497	1700	540				
	6					2124	413	2007	456	1885	501	1757	544				
	7					2187	415	2070	459	1945	504	1815	547				
	8					2252	418	2133	462	2006	507	1874	551				
	9							2196	465	2068	510	1934	554				
	10							2260	468	2131	514	1994	558				

NOTES

1 Cc (cooling capacity) - Pi (unit power input) – ELWT (Evaporator leaving water temperature – Δt 5°C) - Condenser Water temperature Δt 5°C
2 Data are referred to 0.0176 m2 °C/kW evaporator fouling factor
3 Data are referred to 0.0440 m2 °C/kW condenser fouling factor

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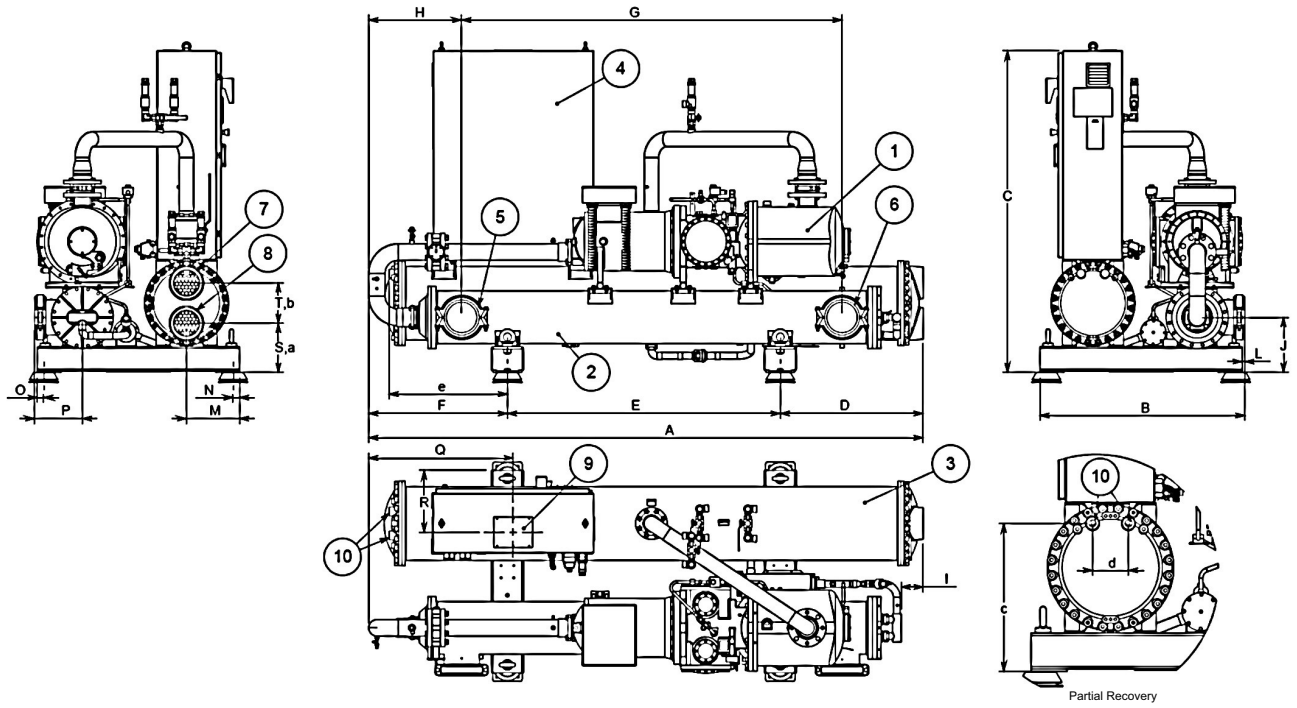
7 Dimensional drawings

7 - 1 Dimensional Drawings



Models	Dimensions (mm)									
EWWQ~B-SS	A	B	C	D	E	F	G	H	I	J
380	3373	1140	1849	849	1800	724	2430	479	122	323
460	3373	1140	1849	849	1800	724	2430	479	122	323
560	3454	1276	2001	890	1700	864	2370	579	136	342
640	3454	1276	2001	890	1700	864	2370	579	136	342

EWWQ~B-SS	L	M	N	O	P	Q	R	S	T
380	13	305	40	40	294	773	360	254	200
460	13	305	40	40	294	773	360	254	200
560	16	330	56	40	297	900	385	305	252
640	16	330	56	40	297	900	385	305	252

LEGEND

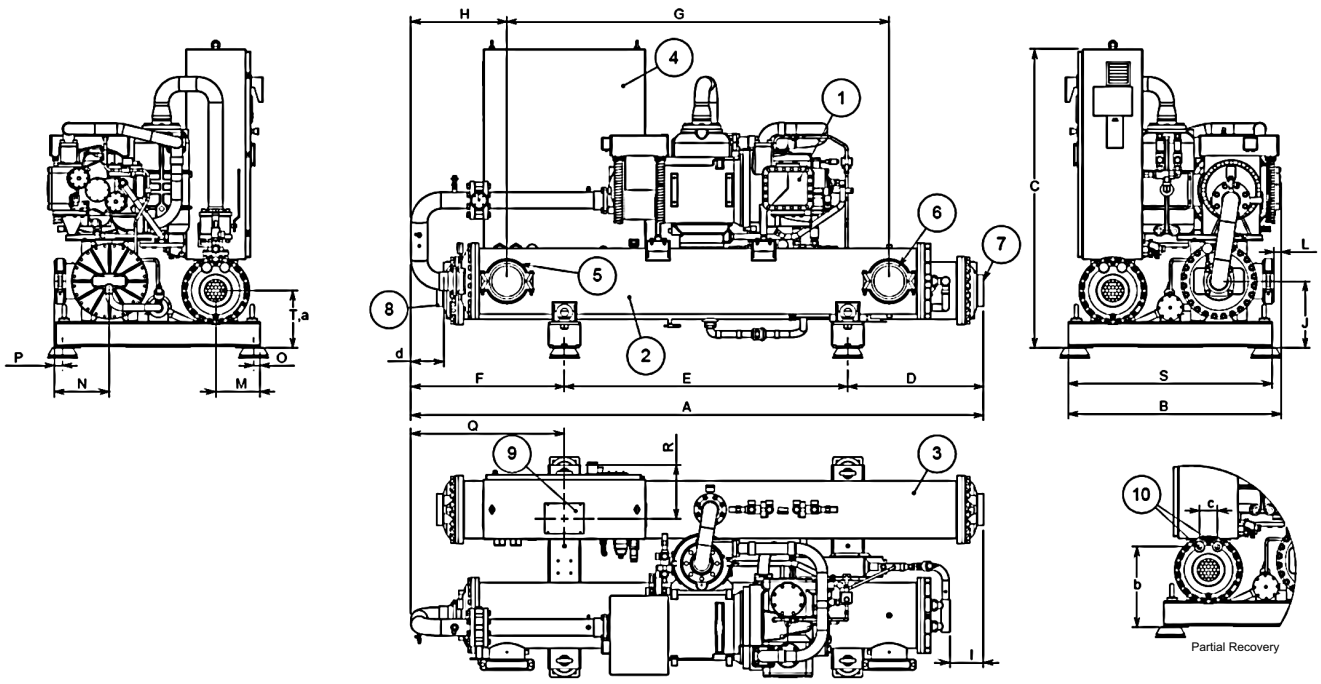
1. Compressor
2. Evaporator
3. Condenser
4. Electrical panel
5. Evaporator water inlet
6. Evaporator water outlet
7. Condenser water inlet
8. Condenser water outlet
9. Power connections slot
10. Partial heat recovery connection (optional)

Models	Partial heat recovery dimensions (mm)				
EWWQ~B-SS	a	b	c	d	e
380	269	138	497	112	688
460	269	138	497	112	688
560	300	210	615	150	737
640	300	210	615	150	737

DMN_1-2-3-4-5-6-7-8_Rev.00_1

7 Dimensional drawings

7 - 1 Dimensional Drawings



Models	Dimensions (mm)									
EWWQ~B-SS	A	B	C	D	E	F	G	H	I	J
730	3535	1314	1848	838	1750	947	2360	592	210	412
860	2001	1314	1848	838	1750	947	2360	592	210	412
C10	2001	1314	1848	838	1750	947	2360	592	210	412

EWWQ~B-SS	L	M	N	O	P	Q	R	S	T
730	44	275	340	40	50	946	330	1260	354
860	44	275	340	40	50	946	330	1260	354
C10	44	275	340	40	50	946	330	1260	305

LEGEND

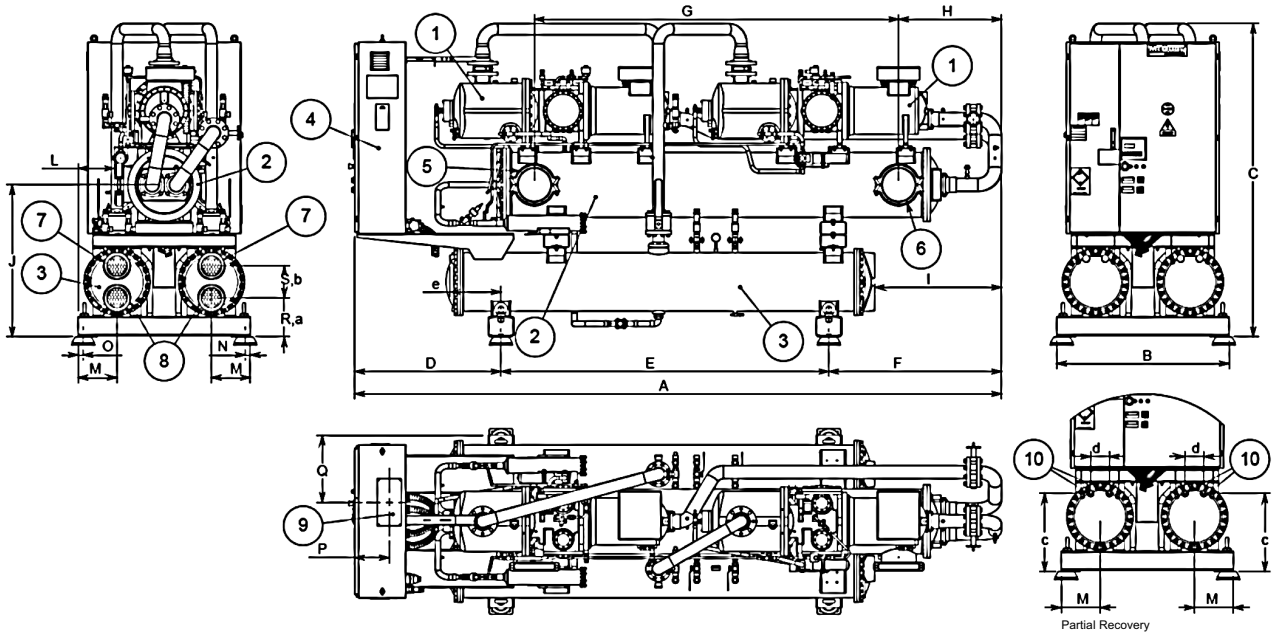
1. Compressor
2. Evaporator
3. Condenser
4. Electrical panel
5. Evaporator water inlet
6. Evaporator water outlet
7. Condenser water inlet
8. Condenser water outlet
9. Power connections slot
10. Partial heat recovery connection (optional)

Models	Partial heat recovery dimensions (mm)			
EWWQ~B-SS	a	b	c	d
730	354	497	112	200
860	354	497	112	200
C10	354	497	112	200

DMN_1-2-3-4-5-6-7-8_Rev.00_2

7 Dimensional drawings

7 - 1 Dimensional Drawings



Models	Dimensions (mm)									
EWWQ~B-SS	A	B	C	D	E	F	G	H	I	J
800	5020	1350	2158	1117	2555	1348	2910	729	958	900
870	5020	1350	2158	1117	2555	1348	2910	729	958	900
960	5020	1350	2158	1117	2555	1348	2910	729	958	900
C11	4894	1350	2378	1127	2555	1211	2910	592	819	1153
C12	5070	1350	2455	1147	2570	1353	2656	805	996	1191
C13	5070	1350	2455	1147	2570	1353	2656	805	996	1191
C14	5070	1350	2455	1147	2570	1353	2656	805	996	1191

EWWQ~B-SS	L	M	N	O	P	Q	R	S
800	337	250	40	40	272	525	254	200
870	337	250	40	40	272	525	254	200
960	337	250	40	40	272	525	254	200
C11	337	305	40	40	272	525	305	252
C12	286	305	40	40	272	525	305	252
C13	286	305	40	40	272	525	305	252
C14	286	305	40	40	272	525	305	252

LEGEND

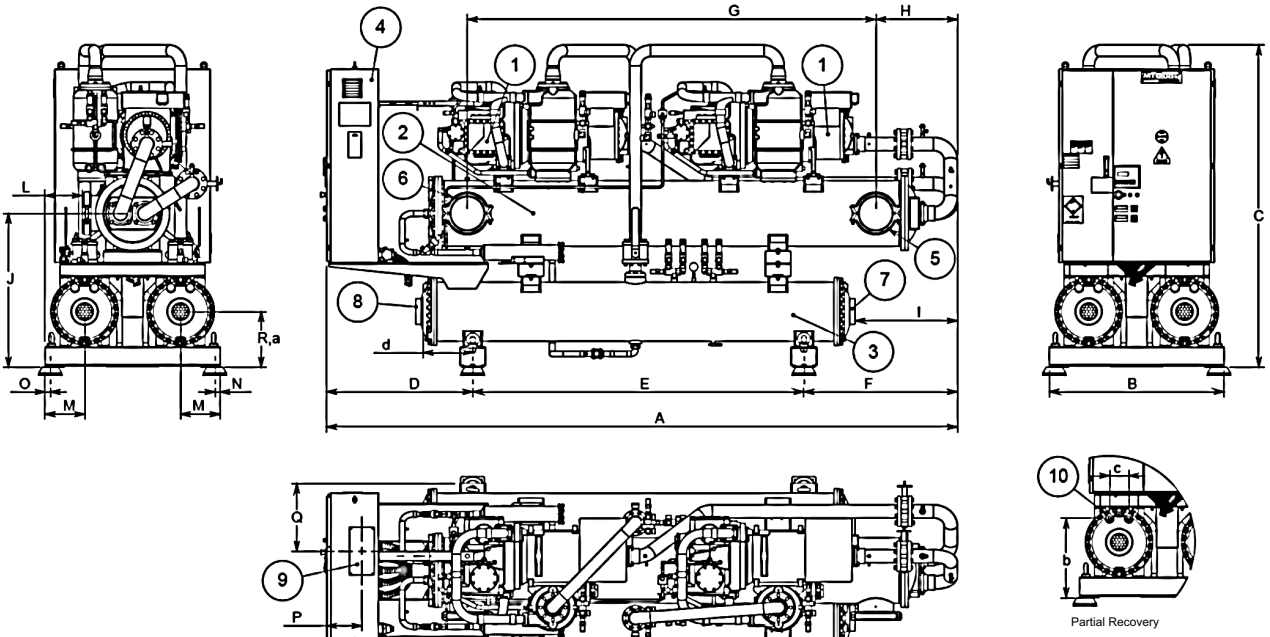
1. Compressor
2. Evaporator
3. Condenser
4. Electrical panel
5. Evaporator water inlet
6. Evaporator water outlet
7. Condenser water inlet
8. Condenser water outlet
9. Power connections slot
10. Partial heat recovery connection (optional)

Models	Partial heat recovery dimensions (mm)				
EWWQ~B-SS	a	b	c	d	e
800	269	138	497	112	380
870	269	138	497	112	380
960	269	138	497	112	380
C11	300	210	615	150	380
C12	300	210	615	150	400
C13	300	210	615	150	400
C14	300	210	615	150	400

DMN_1-2-3-4-5-6-7-8_Rev.00_3

7 Dimensional drawings

7 - 1 Dimensional Drawings



Models	Dimensions (mm)									
EWWQ~B-SS	A	B	C	D	E	F	G	H	I	J
C15	4829	1350	2495	1056	2555	1218	2856	626	824	1191
C16	4829	1350	2495	1056	2555	1218	2856	626	824	1191
C17	4829	1350	2495	1056	2555	1218	2856	626	824	1191
C19	4865	1350	2495	1127	2555	1183	3150	629	789	1191
C20	4865	1350	2495	1127	2555	1183	3150	629	789	1191

EWWQ~B-SS	L	M	N	O	P	Q	R
C15	286	305	40	40	272	525	431
C16	286	305	40	40	272	525	431
C17	286	305	40	40	272	525	431
C19	286	305	40	40	272	525	431
C20	286	305	40	40	272	525	431

LEGEND

1. Compressor
2. Evaporator
3. Condenser
4. Electrical panel
5. Evaporator water inlet
6. Evaporator water outlet
7. Condenser water inlet
8. Condenser water outlet
9. Power connections slot
10. Partial heat recovery connection (optional)

Models	Partial heat recovery dimensions (mm)			
EWWQ~B-SS	a	b	c	d
C15	431	615	150	382
C16	431	615	150	382
C17	431	615	150	382
C19	431	615	150	382
C20	431	615	150	382

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8 Sound data

8 - 1 Sound Level Data

Sound Level

EWWQ~B-SS

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10^{-5} Pa)									Power
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)
380	55.1	59.4	71.6	84.1	71.9	72.5	58.5	53.2	**82.2**	**100.2**
460	55.9	60.2	72.4	84.9	72.7	73.3	59.3	54.0	**83.0**	**101.2**
560	56.8	61.1	73.3	85.8	73.6	74.2	60.2	54.9	**83.9**	**102.3**
640	56.8	61.1	73.3	85.8	73.6	74.2	60.2	54.9	**83.9**	**102.3**
730	56.1	60.4	72.6	85.1	72.9	73.5	59.5	54.2	**83.2**	**101.5**
800	56.9	61.2	73.4	85.9	73.7	74.3	60.3	55.0	**84.0**	**104.7**
860	57.8	62.1	74.3	86.8	74.6	75.2	61.2	55.9	**84.9**	**102.3**
870	58.1	62.4	74.6	87.1	74.9	75.5	61.5	56.2	**85.2**	**104.7**
960	58.1	62.4	74.6	87.1	74.9	75.5	61.5	56.2	**85.2**	**105.1**
C10	58.5	62.8	75.0	87.5	75.3	75.9	61.9	56.6	**85.6**	**103.2**
C11	58.9	63.2	75.4	87.9	75.7	76.3	62.3	57.0	**86.0**	**104.7**
C12	59.4	63.7	75.9	88.4	76.2	76.8	62.8	57.5	**86.5**	**105.2**
C13	59.8	64.1	76.3	88.8	76.6	77.2	63.2	57.9	**86.9**	**106.5**
C14	59.8	64.1	76.3	88.8	76.6	77.2	63.2	57.9	**86.9**	**106.5**
C15	59.1	63.4	75.6	88.1	75.9	76.5	62.5	57.2	**86.2**	**105.8**
C16	59.5	63.8	76.0	88.5	76.3	76.9	62.9	57.6	**86.6**	**106.2**
C17	59.9	64.2	76.4	88.9	76.7	77.3	63.3	58.0	**87.0**	**106.6**
C19	60.4	64.7	76.9	89.4	77.2	77.8	63.8	58.5	**87.5**	**107.1**
C20	60.8	65.1	77.3	89.8	77.6	78.2	64.2	58.9	**87.9**	**107.5**

NOTE

The values are according to ISO 3744 and are referred to: evaporator 12/7° C. condenser 30/35° C. full load operation

EWWQ~B-XS

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10^{-5} Pa)									Power
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)
420	55.1	59.4	71.6	84.1	71.9	72.5	58.5	53.2	**82.2**	**100.9**
520	55.9	60.2	72.4	84.9	72.7	73.3	59.3	54.0	**83.0**	**101.7**
640	56.8	61.1	73.3	85.8	73.6	74.2	60.2	54.9	**83.9**	**102.6**
730	56.8	61.1	73.3	85.8	73.6	74.2	60.2	54.9	**83.9**	**102.7**
800	56.1	60.4	72.6	85.1	72.9	73.5	59.5	54.2	**83.2**	**102.0**
970	56.9	61.2	73.4	85.9	73.7	74.3	60.3	55.0	**84.0**	**102.9**
C10	58.5	62.8	75.0	87.5	75.3	75.9	61.9	56.6	**85.6**	**105.2**
C11	57.8	62.1	74.3	86.8	74.6	75.2	61.2	55.9	**84.9**	**103.8**
C12	58.9	63.2	75.4	87.9	75.7	76.3	62.3	57.0	**86.0**	**105.6**
C13	59.4	63.7	75.9	88.4	76.2	76.8	62.8	57.5	**86.5**	**106.1**
C14	59.8	64.1	76.3	88.8	76.6	77.2	63.2	57.9	**86.9**	**106.5**
C15	59.8	64.1	76.3	88.8	76.6	77.2	63.2	57.9	**86.9**	**106.5**
C16	59.1	63.4	75.6	88.1	75.9	76.5	62.5	57.2	**86.2**	**105.8**
C17	59.5	63.8	76.0	88.5	76.3	76.9	62.9	57.6	**86.6**	**106.2**
C19	59.9	64.2	76.4	88.9	76.7	77.3	63.3	58.0	**87.0**	**106.6**
C20	60.4	64.7	76.9	89.4	77.2	77.8	63.8	58.5	**87.5**	**107.1**
C21	60.8	65.1	77.3	89.8	77.6	78.2	64.2	58.9	**87.9**	**107.5**

NOTE

The values are according to ISO 3744 and are referred to: evaporator 12/7° C. condenser 30/35° C. full load operation

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8 Sound data

8 - 1 Sound Level Data

Sound Level

EWWQ~B-SS

Unit size	Distance					
	1m	5m	10m	15m	20m	25m
380	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
460	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
560	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
640	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
730	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
800	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
860	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
870	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
960	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C10	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
C11	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C12	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C13	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C14	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C15	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C16	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C17	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C19	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C20	0.0	-7.5	-12.2	-15.3	-17.5	-19.3

NOTE
The values are dB(A) (pressure level).

EWWQ~B-XS

Unit size	Distance					
	1m	5m	10m	15m	20m	25m
420	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
520	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
640	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
730	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
800	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
970	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
C10	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C11	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
C12	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C13	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C14	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C15	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C16	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C17	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C19	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C20	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C21	0.0	-7.5	-12.2	-15.3	-17.5	-19.3

NOTE
The values are dB(A) (pressure level).

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9 Installation

9 - 1 Installation Method

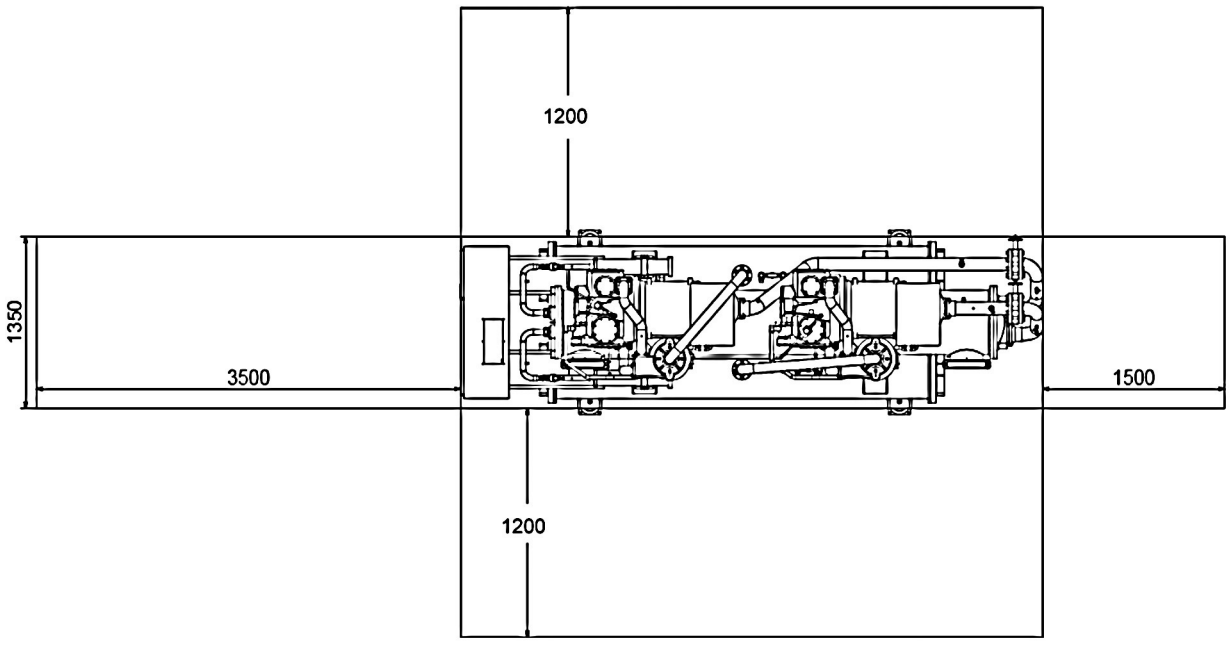
Installation notes

Warning
Installation and maintenance are to be performed only by qualified personnel who are familiar with local codes and regulations, and who are experienced with this type of equipment. Must be avoided the unit installation in places that could be considered dangerous for all the maintenance operations.

Handling
The chiller is mounted on heavy wooden skids to protect the unit from accidental damage and to permit easy handling and moving. It is recommended that all moving and handling be performed with the skids under the unit when possible and that the skids not be removed until the unit is in the final location.
If the unit must be hoisted, it is necessary to lift the unit by attaching cables or chains at the lifting holes in the evaporator tube sheets. Spreader bars must be used to protect the control cabinet and the other areas of the chiller.

Location
A leveled and sufficiently strong floor is required. If necessary, additional structural members should be provided to transfer the weight of the unit to the nearest beams.
Rubber-in-shear isolators can be furnished and field placed under each corner of the package. A rubber anti–skid pad should be used under isolators if hold-down bolts are not used. Vibration isolator in all water piping connected to the chiller is recommended to avoid straining the piping and transmitting vibration and noise.

Minimum space requirements
Every side of the machine must be accessible for all post-installation maintenance activities. The minimum space required is shown on the following drawing:



Minimum clearance requirements for machine maintenance

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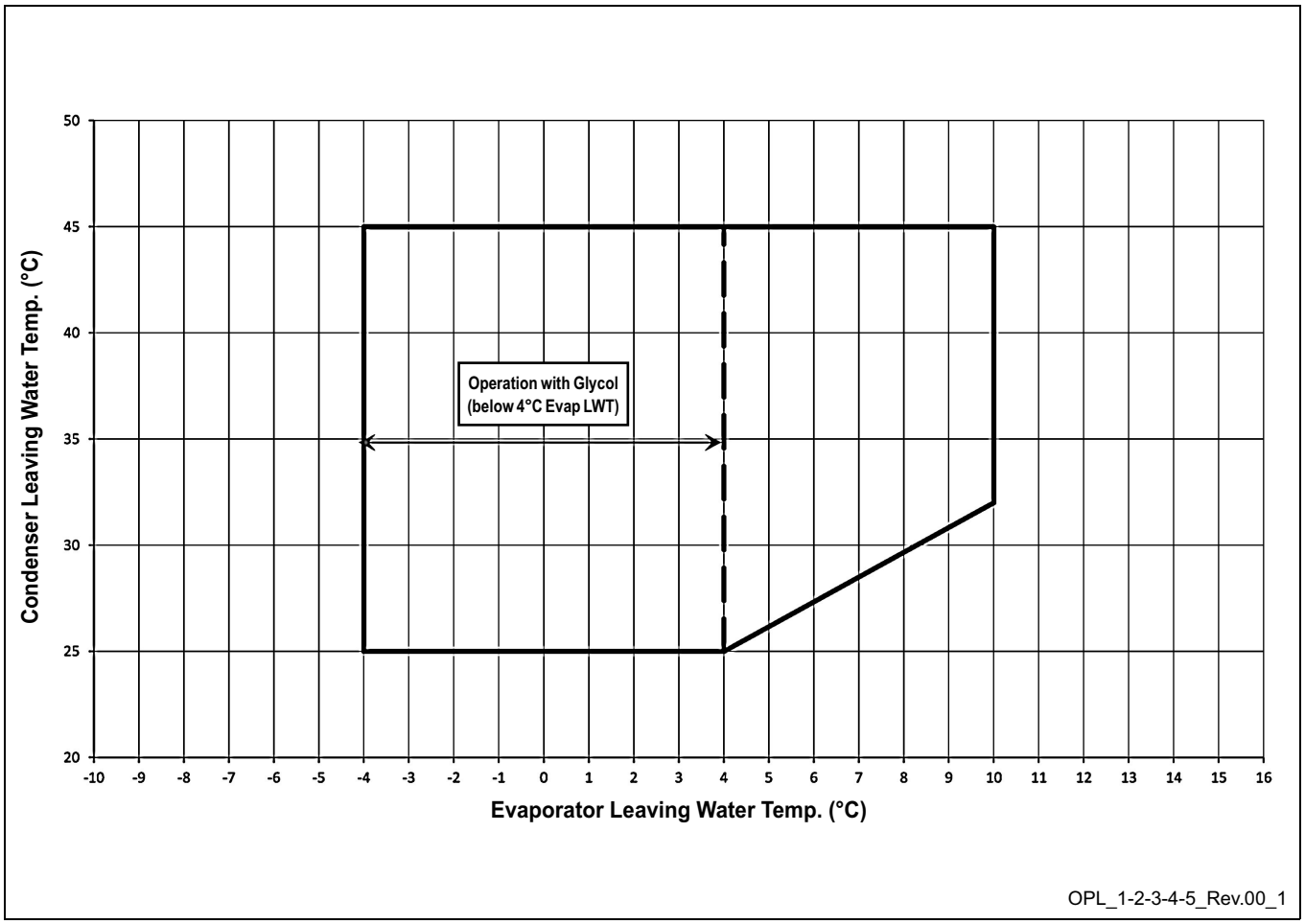
10 Operation range

10 - 1 Operation Range



10 Operation range

10 - 1 Operation Range

Table 1 - Evaporator minimum and maximum water Δt

Max evaporator water Δt	°C	6
Min evaporator water Δt	°C	4
Min condenser water Δt	°C	4
Max condenser water Δt	°C	8

Table 2 - Evaporator fouling factors

Fouling factors m^2 °C / kW	Cooling capacity correction factor	Power input correction factor	EER correction factor
0.0176	1.000	1.000	1.000
0.0440	0.978	0.986	0.992
0.0880	0.957	0.974	0.983
0.1320	0.938	0.962	0.975

Table 3 - Condenser fouling factors

Fouling factors m^2 °C / kW	Cooling capacity correction factor	Power input correction factor	EER correction factor
0.0176	1.000	1.000	1.000
0.0440	0.978	0.986	0.992
0.0880	0.957	0.974	0.983
0.1320	0.938	0.962	0.975

Table 4.1 - Minimum glycol percentage for low water temperature

Evaporator Leaving Water Temperature (°C)	2	0	-2	-4	-6	-8
Ethylene glycol (%)	10	20	20	20	30	30
Propylene glycol (%)	10	20	20	30	30	30

Note: Minimum glycol percentage to be used with evaporator leaving water temperature below 4°C to prevent freezing of water circuit.

Table 4.2 - Minimum glycol percentage for low air temperature

Air Ambient Temperature (°C) (2)	-3	-8	-15	-23	-35
Ethylene glycol (%) (1)	10%	20%	30%	40%	50%
Air Ambient Temperature (°C) (2)	-3	-7	-12	-20	-32
Propylene glycol (%) (1)	10%	20%	30%	40%	50%

Note (1): Minimum glycol percentage to prevent freezing of water circuit at indicated air ambient temperature

Note (2): Air ambient temperature do exceed the operating limits of the unit, as protection of water circuit may be needed in winter season at non-working conditions

Table 5 - Correction factors for low evaporator leaving water temperature

Evaporator Leaving Water Temperature (°C)	2	0	-2	-4	-6	-8
Cooling Capacity	0.842	0.785	0.725	0.670	0.613	0.562
Compressor Power Input	0.950	0.940	0.920	0.890	0.870	0.840

Note: Correction factors have to be applied at working conditions: evaporator leaving water temperature 7°C

Table 6 - Correction factors for water and glycol mixture

	Ethylene Glycol (%)	10%	20%	30%	40%	50%
Ethylene Glycol	Cooling Capacity	0.991	0.982	0.972	0.961	0.946
	Compressor Power Input	0.996	0.992	0.986	0.976	0.966
	Flow Rate (Δt)	1.013	1.04	1.074	1.121	1.178
	Evaporator Pressure Drop	1.070	1.129	1.181	1.263	1.308
Propylene Glycol	Cooling Capacity	0.985	0.964	0.932	0.889	0.846
	Compressor Power Input	0.993	0.983	0.969	0.948	0.929
	Flow Rate (Δt)	1.017	1.032	1.056	1.092	1.139
	Evaporator Pressure Drop	1.120	1.272	1.496	1.792	2.128

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10 Operation range

10 - 1 Operation Range

A) Mixture Water and Glycol --- Evaporator leaving water temperature > 4°C

- depending from the type and percentage (%) of glycol filled in the circuit (see table 4.2 and 6)
- multiply the Cooling Capacity, the Compressor Power Input by the Correction factor of Table 6
- starting from this new value of Cooling Capacity, calculate the Flow Rate (l/s) and the Evaporatore Pressure Drop (kPa)
- now multiply the new Flow Rate and the new Evaporator Pressure Drop by the Correction Factors of Table 6

Example

Unit Size:	**EWWQ380B-SS**
Mixture:	Water
Working condition:	ELWT 12/7°C – CLWT 30/35°C
- Cooling capacity:	380 kW
- Power input:	84.5 kW
- Flow rate (Δt 5°C):	18.2 l/s
- Evaporator pressure drop:	47 kPa
Mixture:	Water + Ethylene Glycol 30% (for a winter air temperature up to -15°C)
Working condition:	ELWT 12/7°C – CLWT 30/35°C
- Cooling capacity:	380 x 0.972 = 369 kW
- Power input:	84.5 x 0.986 = 83.3 kW
- Flow rate (Δt 5°C):	17.6 (referred to 369 kW) x 1.074 = 18.9 l/s
- Evaporator pressure drop:	44 (referred to 17.6 l/s) x 1.181 = 52kPa

B) Mixture Water and Glycol --- Evaporator leaving water temperature < 4°C

- depending from the type and percentage (%) of glycol filled in the circuit (see table 4.1 and 4.2 and table 6)
- depending from the evaporator leaving water temperature (see table 5)
- multiply the Cooling Capacity, the Compressor Power Input by the Correction factor of Table 5 and Table 6
- starting from this new value of Cooling Capacity, calculate the Flow Rate (l/s) and the Evaporatore Pressure Drop (kPa)
- now multiply the new Flow Rate and the new Evaporator Pressure Drop by the Correction Factors of Table 6

Example

Unit Size:	**EWWQ380B-SS**
Mixture:	Water
Standard working condition	ELWT 12/7°C – CLWT 35/40°C
- Cooling capacity:	354 kW
- Power input:	94.2 kW
- Flow rate (Δt 5°C):	16.9 l/s
- Evaporator pressure drop:	41 kPa
Mixture:	Water + Glycol 30% (for a low evaporator leaving temperature of -1/-6°C)
Working condition:	ELWT 2/-3°C – CLWT 35/40°C
- Cooling capacity:	354 x 0.670 x 0.932 = 221 kW
- Power input:	94.2 x 0.890 x 0.969 = 81 kW
- Flow rate (Δt 5°C):	10.56 l/s (referred to 221 kW) x 1.056 = 11.2 l/s
- Evaporator pressure drop:	19 kPa (referred to 11.2 l/s) x 1.496 = 29 kPa

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10 Operation range

10 - 1 Operation Range

Items (1) (5)			Cooling Water			Cooled Water		Heated water (2)				Tendency if out of criteria
			Circulating System		Once Flow			Low temperature		High temperature		
			Circulating water	Supply water (4)	Flowing water	Circulating water [Below 20°C]	Supply water (4)	Circulating water [20°C ~ 60°C]	Supply water (4)	Circulating water [60°C ~ 80°C]	Supply water (4)	
Items to be controlled:	pH	at 25°C	6.5 ~ 8.2	6.0 ~ 8.0	6.0 ~ 8.0	6.0 ~ 8.0	6.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	Corrosion + Scale
	Electrical conductivity	[mS/m] at 25°C	Below 80	Below 30	Below 40	Below 40	Below 30	Below 30	Below 30	Below 30	Below 30	Corrosion + Scale
		(µS/cm) at 25°C	(Below 800)	(Below 300)	(Below 400)	(Below 400)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	Corrosion + Scale
	Chloride ion	[mgCl2-/l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	Sulfate ion	[mgSO2-4/l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	M-alkalinity (pH4.8)	[mgCaCO3/l]	Below 100	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Total hardness	[mgCaCO3/l]	Below 200	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Scale
	Calcium harness	[mgCaCO3/l]	Below 150	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Silca ion	[mgSiO2/l]	Below 50	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Scale
Items to be referred to	Iron	[mgFe/l]	Below 1.0	Below 0.3	Below 1.0	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Corrosion + Scale
	Copper	[mgCu/l]	Below 0.3	Below 0.1	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 0.1	Below 1.0	Below 0.1	Corrosion
	Sulfite ion	[mgS2-/l]	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Corrosion
	Ammonium ion	[mgNH+4/l]	Below 1.0	Below 0.1	Below 1.0	Below 1.0	Below 0.1	Below 0.3	Below 0.1	Below 0.1	Below 0.1	Corrosion
	Remaining chloride	[mgCL/l]	Below 0.3	Below 0.3	Below 0.3	Below 0.3	Below 0.3	Below 0.25	Below 0.3	Below 0.1	Below 0.3	Corrosion
	Free carbide	[mgCO2/l]	Below 4.0	Below 4.0	Below 4.0	Below 4.0	Below 4.0	Below 0.4	Below 4.0	Below 0.4	Below 4.0	Corrosion
	Stability index		6.0 ~ 7.0	---	---	---	---	---	---	---	---	Corrosion + Scale

NOTES

1. Names, definitions and units are according to JIS K 0101. Units and figures between brackets are old units published as reference only.
2. In case of using heated water (more than 40°C), corrosion is generally noticeable.
   Especially when the iron materials is in direct contact with water without any protection shields, it is desireable to give the valid measure for corrosion. E.g. chemical measure.
3. In the cooling water using hermetic cooling tower, close circuit water is according to heated water standard, and scattered water is according to cooling water standard.
4. Supply water is considered drink water, industrial water and ground water except for genuine water, neutral water and soft water.
5. The above mentioned items are representable items in corrosion and scale cases.

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10 Operation range

10 - 1 Operation Range

The cooled water distribution circuits should have minimum water content to avoid excessive compressors start and stop.
In fact, each time the compressor starts up, an excessive quantity of oil goes from the compressor sump and simultaneously there is a rise in the temperature of the compressor motor's stator due to the inrush current during the start-up.
To prevent damage to the compressors, it has been envisaged the application of a device to limit frequent stops and restarts.

During the span of one hour there will be no more than 6 starts of the compressor. The plant side should therefore ensure that the overall water content allows a more constant functioning of the unit and consequently greater environmental comfort.
The minimum water content per unit should be calculated using this simplified formula:

For 1 compressor unit
M (liters) = (0.94 x ΔT(°C) + 5.87) x P(kW)

For 2 compressor unit
M (liters) = (0.1595 x ΔT(°C) + 3.0825) x P(kW)

For 3 compressor unit
M (liters) = (0.0443 x ΔT(°C) + 1.6202) x P(kW)

where:

M	minimum water content per unit expressed in litres
P	Cooling Capacity of the unit expressed in kW
ΔT	evaporator entering / leaving water temperature difference expressed in °C

This formula is valid for:
- standard microprocessor parameters

For more accurate determination of quantity of water, it is advisable to contact the designer of the plant.

OPL_1-2-3-4-5_Rev.00_5

11 Hydraulic performance

11 - 1 Water Pressure Drop Curve Evaporator

EWWQ~B-SS

	380	460	560	640	730	800	860	870	960	C10	C11	C12	C13	C14	C15	C16	C17	C19	C20
Cooling Capacity (kW)	380	464	562	637	727	796	862	872	960	1007	1055	1185	1255	1325	1460	1584	1748	1888	2050
Water Flow (l/s) - Evaporator	18.2	22.2	26.8	30.4	34.7	38.0	41.2	41.7	45.9	48.1	50.4	56.6	60.0	63.3	69.8	75.7	83.5	90.2	98.0
Evaporator Pressure Drops (kPa)	47	63	43	46	53	52	48	62	57	55	67	43	48	53	58	67	86	95	119
Water Flow (l/s) - Condenser	22.2	27.2	32.9	37.3	42.7	1) 23.1 2) 23.1	50.87	1) 23.4 2) 27.4	1) 27.9 2) 27.9	59.6	1) 27.6 2) 33.6	1) 34.3 2) 34.3	1) 33.4 2) 39.2	1) 38.4 2) 38.4	1) 42.6 2) 42.6	1) 42.7 2) 50.2	1) 51.0 2) 51.0	1) 50.8 2) 59.8	1) 59.8 2) 59.8
Condenser Pressure Drops (kPa)	58	62	66	63	15	1) 62 2) 62	19	1) 62 2) 65	1) 65 2) 65	25	1) 65 2) 67	1) 70 2) 70	1) 70 2) 67	1) 67 2) 67	1) 16 2) 16	1) 16 2) 18	1) 16 2) 16	1) 16 2) 14	1) 14 2) 14

NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser water inlet: 30/35°C

EWWQ~B-XS

	420	520	640	730	800	970	C10	C11	C12	C13	C14	C15	C16	C17	C19	C20	C21
Cooling Capacity (kW)	422	516	639	725	801	973	1037	1116	1158	1270	1369	1449	1573	1733	1863	2020	2152
Water Flow (l/s) - Evaporator	20.2	24.6	30.5	34.6	38.3	46.5	49.6	53.3	55.3	60.7	65.4	69.2	75.1	82.8	89.0	96.5	102.8
Evaporator Pressure Drops (kPa)	56.8	70.2	73.1	65.5	57.8	54.9	54.9	70.3	64.5	55.9	68.4	76.2	71.3	90.6	92.6	114.7	129.2
Water Flow (l/s) - Condenser	24.2	29.5	36.5	41.4	45.8	55.7	1) 29.5 2) 29.5	64.2	1) 29.6 2) 36.3	1) 36.3 2) 36.3	1) 36.7 2) 41.2	1) 41.2 2) 41.2	1) 44.9 2) 44.9	1) 44.6 2) 54.4	1) 53.3 2) 53.3	1) 53.2 2) 62.6	1) 61.9 2) 61.9
Condenser Pressure Drops (kPa)	50	40	41	46	60	64	1) 39 2) 39	84	1) 35 2) 48	1) 48 2) 48	1) 49 2) 46	1) 46 2) 46	1) 43 2) 43	1) 43 2) 62	1) 60 2) 60	1) 52 2) 79	1) 78 2) 78

NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser water inlet: 30/35°C

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Evaporator and Condenser Pressure Drops

To determinate the evaporator or condenser pressure drop for different versions or at different working conditions, please refer to the following formula:

$$PD_2\ (kPa) = PD_1\ (kPa) \times \left(\frac{Q_2\ (l/s)}{Q_1\ (l/s)} \right)^{1.8}$$

where:

- PD_2 Pressure drop to be determinate (kPa)
- PD_1 Pressure drop at nominal condition (kPa)
- Q_2 water flow at new working condition (l/s)
- Q_1 water flow at nominal condition (l/s)

How to use the formula: Example (evaporator)

The unit EWWQ380B-SS has been selected for working at the following conditions:
- evaporator water in/out: 11/6°C
- condenser water in/out: 30/35°C

The cooling capacity at these working conditions is: 369 kW
The evaporator water flow at these working conditions is: 17.6 l/s

The unit EWWQ380B-SS at nominal working conditions has the following data:
- evaporator water in/out: 12/7°C
- condenser water in/out: 30/35°C

The cooling capacity at these working conditions is: 380 kW
The evaporator water flow at these working conditions is: 18.2 l/s
The evaporator pressure drop at these working conditions is: 47 kPa

The pressure drop at the selected working condition will be:

$$PD_2\ (kPa) = 47\ (kPa) \times \left(\frac{17.6\ (l/s)}{18.2\ (l/s)} \right)^{1.8}$$

$$PD_2\ (kPa) = 44\ (kPa)$$

NOTE - Important

If the calculated evaporator water pressure drop is below 10 kPa or above 100 kPa please contact the factory for dedicated evaporator.

EPD_1-2_Rev.00_2

11 Hydraulic performance

11 - 1 Water Pressure Drop Curve Evaporator

EWWQ~B-SS

	380	460	560	640	730	800	860	870	960	C10	C11	C12	C13	C14	C15	C16	C17	C19	C20
Heating Capacity (kW)	54.2	66.2	83.0	89	119	114	146	129	137	175	157	172	185.3	194	254.4	282	301	318.7	344.4
Water Flow (l/s)	2.59	3.16	3.97	4.25	5.70	5.46	6.95	6.18	6.56	8.34	7.52	8.23	8.85	9.27	12.2	13.5	14.4	15.2	16.5
Heat Recovery Pressure Drops (kPa)	34	45	32	34	39	38	35	45	41	40	49	32	35	39	42	49	62	69	86

NOTE

Water flow and pressure drop referred to nominal codition: evaporator water in/out: 12/7°C – condenser water in/out:30/35°C – water heat recovery in/out 40/45°C

EWWQ~B-XS

	420	520	640	730	800	970	C10	C11	C12	C13	C14	C15	C16	C17	C19	C20	C21
Heating Capacity (kW)	54.4	65.5	77.4	93.6	106	125	132	152	149	163	175	183	203	228	253	276	302
Water Flow (l/s)	2.60	3.13	3.70	4.47	5.08	5.99	6.28	7.28	7.11	7.80	8.38	8.72	9.71	10.9	12.1	13.2	14.4
Heat Recovery Pressure Drops (kPa)	41	51	53	47	42	40	40	51	47	41	50	55	52	66	67	84	94

NOTE

Water flow and pressure drop referred to nominal codition: evaporator water in/out: 12/7°C – condenser water in/out:30/35°C – water heat recovery in/out 40/45°C

OPT_1-2-3-4_Rev.00_3

To determinate the pressure drop for different versions or at different working conditions, please refer to the following formula:

$$PD_2\ (kPa) = PD_1\ (kPa) \times \left(\frac{Q_2\ (l/s)}{Q_1\ (l/s)} \right)^{1.80}$$

where:

- PD_2 Pressure drop to be determinate (kPa)
- PD_1 Pressure drop at nominal condition (kPa)
- Q_2 water flow at new working condition (l/s)
- Q_1 water flow at nominal condition (l/s)

How to use the formula: Example

The unit EWWQ380B-SS has been selected for working at the following conditions:
- evaporator water in/out: 12/7°C
- condenser water in/out: 30/35°C
- Partial heat recovery leaving water temperature 45/50°C

The heating capacity at these working conditions is: 38.5 Kw
The water flow at these working conditions is: 1.84 l/s

The unit EWWQ380B-SS at nominal working conditions has the following data:
- evaporator water in/out: 12/7°C
- condenser water in/out: 30/35°C
- Partial heat recovery leaving water temperature 40/45°C

The heating capacity at these working conditions is: 54.2 kW
The water flow at these working conditions is: 2.59 l/s
The pressure drop at these working conditions is: 34 kPa

The pressure drop at the selected working condition will be:

$$PD_2\ (kPa) = 34\ (kPa) \times \left(\frac{1.84\ (l/s)}{2.59\ (l/s)} \right)^{1.80}$$

$$PD_2\ (kPa) = 18\ (kPa)$$

OPT_1-2-3-4_Rev.00_4

11 Hydraulic performance

11 - 1 Water Pressure Drop Curve Evaporator

EWWQ~B-SS

	Heat Recovery Leaving Water Temperature (Δ=5°C)		
	45	50	55
	Hc (kW)	Hc (kW)	Hc (kW)
380	54.2	38.5	23.6
460	66.2	48.0	30.6
560	83.0	60.3	38.5
640	88.9	64.6	41.1
730	119	89.7	61.4
800	114	81.4	49.9
860	146	113	79.9
870	129	93.9	60.2
960	137	99.3	63.0
C10	175	137	101
C11	157	115	74.1
C12	172	122	74.1
C13	185	135	86.6
C14	194	138	83.7
C15	254	191	131
C16	282	214	150
C17	301	227	156
C19	319	241	166
C20	344	258	176

NOTES

- Evaporator Leaving Water Temperature 7°C - ΔT = 5°C
- Condenser Leaving Water Temperature 35°C -ΔT= 5°C

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12 Specification text

12 - 1 Specification Text

Technical Specification for Water Cooled Screw Chiller

GENERAL

The water cooled screw chiller will be designed and manufactured in accordance with following European directives:

Construction of pressure vessel	97/23/EC (PED)
Machinery Directive	2006/42/EC
Low Voltage	2006/95/EC
Electromagnetic Compatibility	2004/108/EC
Electrical & Safety codes	EN 60204–1 / EN 60335-2-40
Manufacturing Quality Stds	UNI – EN ISO 9001:2004

The unit will be tested at full load in the factory at the nominal working conditions and water temperatures. Before shipment a full test will be held to avoid any losses.

Chiller will be delivered to the job site completely assembled and charged with right refrigerant and oil quantity.

Comply with the manufacturer instructions for rigging and handling equipment.

The unit will be able to start up and operate as standard at full load and condenser entering fluid temperature from …. °C to …. °C with an evaporator leaving fluid temperature between …. °C and …. °C.

All units published performances have to be certified by **Eurovent.**

REFRIGERANT

Only R-410A will be accepted.

PERFORMANCE

- ✓ Number of water cooled screw chiller: .....
- ✓ Cooling capacity for single water cooled screw chiller: ..... kW
- ✓ Power input for single water cooled screw chiller in cooling mode: ..... kW
- ✓ Shell & tube evaporator entering water temperature in cooling mode: ..... °C
- ✓ Shell & tube evaporator leaving water temperature in cooling mode: ..... °C
- ✓ Shell & tube evaporator water flow: ..... l/s
- ✓ Shell & tube condenser entering water temperature in cooling mode: ..... °C
- ✓ Shell & tube condenser leaving water temperature in cooling mode: ..... °C
- ✓ Shell & tube condenser water flow: ..... l/s
- ✓ The unit should work with electricity in range 400V ±10%, 3ph, 50Hz without neutral and shall only have one power connection point.

UNIT DESCRIPTION

Chiller shall include as standard: 1 or 2 independent refrigerant circuits, semi-hermetic rotary single screw compressors, electronic expansion device (EEXV), refrigerant direct expansion shell & tube heat exchangers, R-410A refrigerant, lubrication system, motor starting components, control system and all components necessary for safe and stable unit operation.

Chiller will be factory assembled on a robust base-frame made of zinc coated steel, protected by an epoxy paint.

NOISE LEVEL AND VIBRATIONS

Sound pressure level at 1 meter distance in free field, semispheric conditions, shall not exceed ……dB(A). The sound pressure levels must be rated in accordance to ISO 3744.
Other types of rating unacceptable. Vibration level should not exceed 2 mm/s.

DIMENSIONS

Unit dimensions shall not exceed following indications

- ✓ unit length ..... mm,
- ✓ unit width ..... mm,
- ✓ unit height ..... mm.

SPC_1-2-3_Rev.00_1

12 Specification text

12 - 1 Specification Text

CHILLER COMPONENTS

Compressors

- ✓ Semi-hermetic, single-screw type with one main helical rotor meshing with gaterotor. The gaterotor will be constructed of a carbon impregnated engineered composite material. The gaterotor supports will be constructed of cast iron.
- ✓ The oil injection shall be used in order to get high EER (Energy Efficiency Ratio) also at high condensing pressure and low sound pressure levels in each load condition.
- ✓ Refrigerant system differential pressure shall provide oil flow through service replaceable, 0.5 micron, full flow, cartridge type oil filter internal to compressor.
- ✓ Refrigerant system differential pressure shall provide oil injection on all moving compressor parts to correctly lubricate them. Electrical oil pump lubricating system is not acceptable.
- ✓ The compressor's oil cooling must be realized, when necessary, by refrigerant liquid injection. External dedicated heat exchanger and additional piping to carry the oil from the compressor to heat exchanger and viceversa will not be accepted.
- ✓ The compressor shall be provided with an external, high efficiency, cyclonic type oil separator and with built-in oil filter, cartridge type.
- ✓ The compressor shall be direct electrical driven, without gear transmission between the screw and the electrical motor.
- ✓ Shall be present two thermal protection realized by a thermistor for high temperature protection: one temperature sensor to protect electrical motor and another sensor to protect unit and lubricating oil from high discharge gas temperature.
- ✓ The compressor shall be equipped with an electric oil-crankcase heater.
- ✓ Compressor shall be fully field serviceable. Compressor that must be removed and returned to the factory for service shall be unacceptable.

Cooling capacity control system

- ✓ Each unit will have a microprocessor for the control of compressor slide valve's position and the instantaneous RPM value of the motor.
- ✓ The unit capacity control shall be infinitely modulating, from 100% down to 25% for each circuit (from 100% down to 12.5% of full load for unit with 2 compressors). The chiller shall be capable of stable operation to a minimum of 12.5% of full load without hot gas bypass.
- ✓ Step unloading unacceptable because of evaporator leaving water temperature fluctuation and low unit efficiency at partial load.
- ✓ The system shall stage the unit based on the leaving evaporator water temperature that shall be controlled by a PID (Proportional Integral Derivative) loop.
- ✓ Unit control logic shall manage frequency level of the compressor electric motor to exactly match plant load request in order to keep the set point constant for delivered chilled water temperature. In this operating condition unit control logic shall modulate electrical frequency level in a range lower and upper the nominal electrical network value fixed at 50 Hz.
- ✓ The microprocessor unit control shall detect conditions that approach protective limits and take self-corrective action prior to an alarm occurring. The system shall automatically reduce chiller capacity when any of the following parameters are outside their normal operating range:
  - ○ High condenser pressure
  - ○ Low evaporating refrigerant temperature
  - ○ High compressor motor amps

Evaporator

- ✓ The units shall be supplied with shell and tubes counter-flow heat exchanger with single refrigerant pass. It will be refrigerant direct expansion type with refrigerant inside the tubes and water outside (shell side). It will include carbon steel tube sheets, with straight copper tubes internally wound for higher efficiencies, expanded on the tube plates.
- ✓ The evaporator will have 2 circuits, one for each compressor and shall be single refrigerant pass.
- ✓ The water connections shall be VICTAULIC type connections as standard to ensure quick mechanical disconnection between the unit and the hydronic network.
- ✓ Evaporator is manufactured in accordance to PED approval.

SPC_1-2-3_Rev.00_2

12 Specification text

12 - 1 Specification Text

Condensers

- ✓ Condensers will be shell and cleanable, through-tube type.
- ✓ The unit will have one condenser per circuit.
- ✓ Each condenser shall have a carbon steel and seamless, integrally finned high efficiency copper tubes, roll expanded into heavy carbon steel tube sheets.
- ✓ Water heads shall be removable and include vent and drain plugs.
- ✓ Condensers will come complete with liquid shut-off valve, spring loaded relief valve.

Refrigerant circuit

Each circuit shall include as standard: electronic expansion device piloted by unit's microprocessor control, compressor discharge shut-off valve, suction line shut-off valve, replaceable core filter-drier, sight glass with moisture indicator and insulated suction line.

Control panel

- ✓ Field power connection, control interlock terminals, and unit control system should be centrally located in an electric panel (IP 54). Power and starting controls should be separate from safety and operating controls in different compartments of the same panel.
- ✓ Starting shall be Wye-Delta type as standard.
- ✓ Operating and safety controls should include energy saving control; emergency stop switch; overload protection for compressor motor; high and low pressure cut-out switch (for each refrigerant circuit); anti-freeze thermostat; cut-out switch for each compressor.
- ✓ All of the information regarding the unit will be reported on a display and with the internal built-in calendar and clock that will switch the unit ON/OFF during day time all year long.
- ✓ The following features and functions shall be included:

  - **resetting chilled water temperature** by controlling the return water temperature or by a remote 4-20 mA DC signal or by controlling the external ambient temperature;
  - **soft load function** to prevent the system from operating at full load during the chilled fluid pulldown period;
  - **password protection** of critical parameters of control;
  - **start-to-start and stop-to-star timers** to provide minimum compressor off-time with maximum motor protection;
  - **communication capability** with a PC or remote monitoring;
  - **discharge pressure control** through intelligent cycling of condenser fans;
  - **lead-lag selection** by manual or automatically by circuit run hours;
  - **double set point** for brine unit version;
  - **scheduling** via internal time clock to allow programming of a yearly start-stop schedule accommodating weekends and holidays.

Optional High Level Communications Interface

The controller as a minimum shall be capable of providing the data shown in the above list, using the following options:

- RS485 Serial card
- RS232 Serial card
- LonWorks interface to FTT10A Transceiver.
- BACnet Compatible
- Use of Compass Points (manufactured by North Communications) to allow communications with such as Honeywell, Satchwell, Johnson Controls, Trend etc.

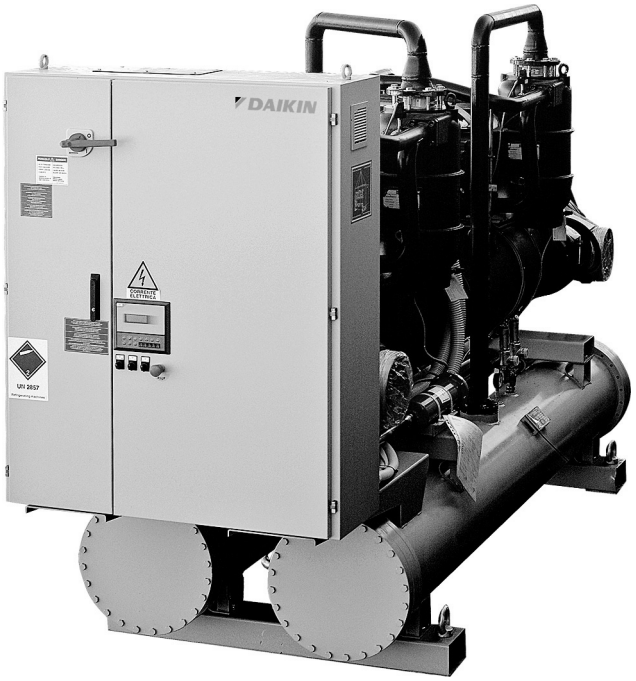
SPC_1-2-3-4_Rev.00_3

TABLE OF CONTENTS

EWWQ-B-XS

1 Features

- High efficiency
- All models are PED pressure vessel approved
- 1 or 2 stepless single-screw compressors
- 1 or 2 truly independent refrigerant circuits
- Shell and tube heat exchanger
- Optimised for use with R-410A
- Standard electronic expansion valve
- Compact design
- Partial heat recovery available
- MicroTech III controller



2 Features and advantages

The EWWQ~B- water cooled chillers, featuring 1 or 2 single screw compressors, are manufactured to satisfy the requirements of the consultants and the end user. Units are designed to minimise energy costs while maximising the refrigeration capacities. Daikin's chiller design experience, combined with outstanding features makes the EWWQ~B- chiller unmatched in the industry.

Seasonal quietness

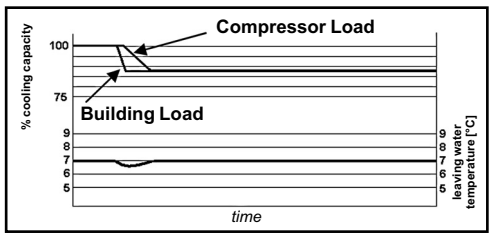
The compressor design with a single screw and twin rotors allows a constant gas flow. This compression process completely eliminates gas pulsations. The oil injection also results in significant mechanical noise reduction.

The twin gas compressor discharge chambers are designed to act as attenuators, based on the harmonic wave principle with destructive interference, thus always resulting equal to zero. The extremely low noise compressor performance affords the use of EWWQ~B- chiller for all applications.

The reduced number of vibrations produced from the EWWQ~B- chiller offers a surprisingly quiet operation eliminating the noise transmission through the structure and the chilled water piping system.

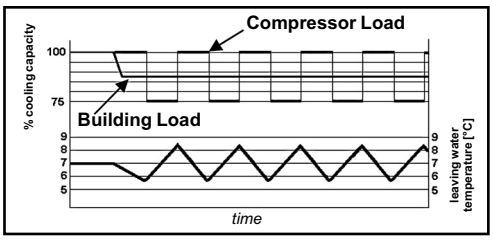
Infinitely capacity control

Cooling capacity control is infinitely variable by means of a screw compressor controlled by microprocessor system. Each unit has infinitely variable capacity control from 100% down to 25% (one compressor unit), down to 12.5% (two compressors units). This modulation allows the compressor capacity to exactly match the building cooling load without any leaving evaporator water temperature fluctuation. This chilled water temperature fluctuation is avoided only with a stepless control.



ELWT fluctuation with stepless capacity control

With a compressor load step control in fact, the compressor capacity, at partial loads, will be too high or too low compared to the building cooling load. The result is an increase in chiller energy costs, particularly at the part-load conditions at which the chiller operates most of the time.



ELWT fluctuation with steps capacity control (4 steps)

Units with stepless regulation offer benefits that the units with step regulation are unable to match. The ability to follow the system energy demand at any time and the possibility to provide steady outlet water temperature without deviations from the set-point, are the two points that allow you to understand how the optimum operating conditions of a system can be met only through the use of a unit with stepless regulation.

Unmatched serviceability

Field serviceability has not been sacrificed. Inspection covers allows visual inspection of the main screw and gaterotors

Outstanding reliability features

- Zero clearance fit between the gaterotor/s and main screw rotor virtually eliminates leakage between the high and low-pressure sides during compression. Special gaterotor material made from an advanced composite, temperature stable material makes a zero clearance design possible.
- The chiller is equipped with the most advanced means of refrigerant flow control available. An electronic expansion valve coupled with the MicroTech III controller's control logic provides excellent operating efficiencies both at full and part load operation.
- Infinite unloading matches compressor capacity to load.

FTA_1-2_Rev.00_1

2 Features and advantages

- Full factory testing of the unit with water hookups helps provide a trouble-free start-up. Extensive quality control checks during testing means that each equipment protection and operating control is properly adjusted and operates correctly before it leaves the factory.
- The rugged design of the single-screw compressor allows it to be tolerant of liquid slugging. Screw chiller will start and operate under conditions that would often destroy other compressors.
- Very low loading enhances the bearing and compressor reliability. Balanced forces result in the elimination of the high loads inherent in twin-screw compressors.
- Integral to the basic design of the single-screw compressor, the main screw rotor shaft and the gaterotor shaft/s cross at right angles in the compressor. The result is ample space to locate heavy duty bearings and increase compressor reliability since no limitations are placed on bearing design as found in twin-screw compressors.

Code requirements – Safety and observant of laws/directives

All water cooled units are designed and manufactured in accordance with applicable selections of the following:

Construction of pressure vessel	97/23/EC (PED)
Machinery Directive	2006/42/EC
Low Voltage	2006/95/EC
Electromagnetic Compatibility	2004/108/EC
Electrical & Safety codes	EN 60204–1 / EN 60335-2-40
Manufacturing Quality Stds	UNI – EN ISO 9001:2004

Certifications

All units manufactured are CE marked, complying with European directives in force, concerning manufacturing and safety. On request units can be produced complying with laws in force in non European countries (ASME, GOST, etc.), and with other applications, such as naval (RINA, etc.).

Versions

EWWQ~B- is available in two different Efficiency Versions:

S: Standard Efficiency
19 sizes, covering a cooling capacity range from 380 up to 2050 kW, EER up to 4.64 and ESEER up to 5.64.

X: High Efficiency
17 sizes, covering a cooling capacity range from 422 up to 2152 kW, EER up to 5.09 and ESEER up to 6.28.

The EER (Energy Efficiency Ratio) is the ratio of the Cooling Capacity to the Power Input of the unit. The Power Input includes: the power input for operation of the compressor, the power input of all control and safety devices.

The ESEER (European Seasonal Energy Efficiency Ratio) is a weighed formula enabling to take into account the variation of EER with the load rate and the variation of water inlet condenser temperature.

$$ESEER = A \times EER_{100\%} + B \times EER_{75\%} + C \times EER_{50\%} + D \times EER_{25\%}$$

	A	B	C	D
Coefficient	0.03 (3%)	0.33 (33%)	0.41 (41%)	0.23 (23%)
Air inlet condenser temperature (°C)	30	26	22	18

Sound configuration

EWWQ~B- is available in standard sound level configuration:

S: Standard Noise

FTA_1-2_Rev.00_2

3 General characteristics

General characteristics

Cabinet and structure
The cabinet is made of galvanized steel sheet and painted to provide a high resistance to corrosion. Colour Ivory White (Munsell code 5Y7.5/1) (±RAL7044).The base frame has eye-hook for lifting the unit with ropes for an easy installation. The weight is uniformly distributed along the profiles of the base and this facilitates the arrangement of the unit.

Screw compressors
The single-screw compressor has a well balanced compression mechanism which cancels the screw rotor load in both the radial and axial directions. Inherent to the basic single-screw compressor design is the virtually load-free operation that gives main bearing design life of 3-4 times greater than twin-screws, and eliminates expensive and complicated thrust balancing schemes. The two exactly opposed gate rotors create two exactly opposed compression cycles. Compression is made at the lower and upper parts of the screw rotor at the same time, thus cancelling the radial loads. Also, both ends of the screw rotor are subjected to suction pressure only, which cancels the axial loads and eliminates the huge thrust loads inherent in twin-screw compressors.
Oil injection is used for these compressors in order to get EER at high condensing pressure. EWWQ~B- units are provided with a high efficiency oil separator to maximise oil extraction.
Compressors have an infinitely variable capacity control down to 25% of its total capacity. This control is made by means of capacity slides controlled by microprocessors.
Standard start is star-delta type; soft start type is available as option.

Ecological R-410A refrigerant
The compressors have been designed to operate with R-410A, ecological refrigerant with zero ODP (Ozone Depletion Potential) and very low GWP (Global Warming Potential) that means low TEWI (Total Equivalent Warming Impact).

Evaporator
The units are equipped with a Direct Expansion shell & tube evaporator with copper tubes rolled into steel tubesheets. The evaporators are single-pass on both the refrigerant and water sides for pure counter-flow heat exchange and low refrigerant pressure drops. Both attributes contribute to the heat exchanger effectiveness and total unit's outstanding efficiency.
The external shell is covered with a 10mm closed cell insulation material. Each evaporator has 1 circuit for each compressor and is manufactured in accordance to PED approval. The evaporator water outlet connections are provided with Victaulic Kit (as standard).

Condensers
The units are equipped with Direct Expansion shell & tube condensers, with copper tubes rolled into steel tubesheets. The unit has independent condensers, one per circuit. is manufactured in accordance to PED approval. The condenser water outlet connections are provided with Victaulic Kit (as standard).
Condensers are provided with liquid shut-off valve and spring loaded relief valve.

Electronic expansion valve
The unit is equipped with the most advanced electronic expansion valves to achieve precise control of refrigerant mass flow. As today's system requires improved energy efficiency, tighter temperature control, wider range of operating conditions and incorporate features like remote monitoring and diagnostics, the application of electronic expansion valves becomes mandatory. Electronic expansion valve proposes features that make it unique: short opening and closing time, high resolution, positive shut-off function to eliminate use of additional solenoid valve, highly linear flow capacity, continuous modulation of mass flow without stress in the refrigerant circuit and corrosion resistance stainless steel body.
EEXV strength point is the capacity to work with lower ΔP between high and low pressure side, than a thermostatic expansion valve. The electronic expansion valve allows the system to work with low condenser pressure (winter time) without any refrigerant flow problems and with a perfect chilled water leaving temperature control.

Refrigerant Circuit
Each unit has independent refrigerant circuits and each one includes:
- Single screw compressor with external cyclonic oil separator

GNC_1-2-3-4-5_Rev.00_1

3 General characteristics

- (Common) Evaporator
- Condenser
- Oil pressure transducer
- High and low pressure switches
- Moisture liquid indicator
- High efficiency oil separator
- Replaceable core filter-drier
- Electronic expansion valve

Electrical control panel

Power and control are located in the main panel that is manufactured to ensure protection against all weather conditions. The electrical panel is IP54 and (when opening the doors) internally protected with Plexiglas panel against possible accidental contact with electrical components (IP20). The main panel is fitted with a main switch interlocked door.

Power Section

The power section includes compressors fuses and control circuit transformer.

MicroTech III controller

The MicroTech III controller is installed as standard; it can be used to modify unit set-points and check control parameters. A built-in display shows chiller operating status plus temperatures and pressures of water, refrigerant, programmable values, set-points. A sophisticated software with predictive logic, selects the most energy efficient combination of compressors and EEXV to keep stable operating conditions to maximise chiller energy efficiency and reliability.
MicroTech III is able to protect critical components based on external signs from its system (such as motor temperatures, refrigerant gas and oil pressures, correct phase sequence, pressure switches and evaporator). The input coming from the high pressure switch cuts all digital output from the controller in less than 50ms, this is an additional security for the equipment.
Fast program cycle (200ms) for a precise monitoring of the system. Floating point calculations supported for increased accuracy in P/T conversions.

Control section - main features

- Management of the compressor stepless capacity.
- Chiller enabled to work in partial failure condition.
- Full routine operation at condition of:
  - high ambient temperature value
  - high thermal load
  - high evaporator entering water temperature (start-up)
- Display of evaporator entering/leaving water temperatures.
- Display of condensing-evaporating temperatures and pressures, suction and discharge superheat for each circuit.
- Leaving water evaporator temperature regulation. Temperature tolerance = 0 .1°C.
- Compressor and evaporator pumps hour counters.
- Display of Status Safety Devices.
- Number of starts and compressor working hours.
- Optimized management of compressor load.
- Re-start in case of power failure (automatic / manual).
- Soft Load (optimized management of the compressor load during the start-up).
- Start at high evaporator water temperature.
- Return Reset (Set Point Reset based on return water temperature).
- Set point Reset (optional).
- Application and system upgrade with commercial SD cards.
- Ethernet port for remote or local servicing using standard web browsers.
- Two different sets of default parameters could be stored for easy restore.

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3 General characteristics

Safety device / logic for each refrigerant circuit

- High pressure (pressure switch).
- High pressure (transducer).
- Low pressure (transducer).
- High compressor discharge temperature.
- High motor winding temperature.
- Phase Monitor.
- Low pressure ratio.
- High oil pressure drop
- Low oil pressure.
- No pressure change at start.

System security

- Phase monitor.
- Low Ambient temperature lock-out.
- Freeze protection.

Regulation type

Proportional + integral + derivative regulation on the evaporator leaving water output probe.

MicroTech III

MicroTech III built-in terminal has the following features.

- 164x44 dots liquid crystal display with white back lighting. Supports Unicode fonts for multi-lingual.
- Key-pad consisting of 3 keys.
- Push'n'Roll control for an increased usability.
- Memory to protect the data.
- General faults alarm relays.
- Password access to modify the setting.
- Application security to prevent application tampering or hardware usability with third party applications.
- Service report displaying all running hours and general conditions.
- Alarm history memory to allow an easy fault analysis.

Supervising systems (on request)

MicroTech III remote control

MicroTech III is able to communicate to BMS (Building Management System) based on the most common protocols as:

- ModbusRTU
- LonWorks, now also based on the international 8040 Standard Chiller Profile and LonMark Technology
- BacNet BTP certifief over IP and MS/TP (class 4) (Native)

Chiller Sequencing

MicroTech III controller allows an easy plug-in sequencing technology based on digital or serial panel

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3 General characteristics

Digital Sequencing Panel
This panel is basically a step inserter that switches ON/OFF up to 11 units (chillers or heat pumps operating in the same cooling/heating mode) depending on the selected set point; the units are connected with the panel through standard cables and no serial card is requested.

Serial Sequencing Panel
Basically this panel sequences a chiller plant by switching on/off the units (up to 7 chillers) taking into account their running hours and the requested plant load, in order to optimise the number of working units for each condition; serial cards and shielded cables are requested to connect the panel with the units and, if installed, a BMS.

Standard accessories (supplied on basic unit)
Wye-Delta Compressor starter (Y-Δ) - For low inrush current and reduced starting torque.
Double set-point - Dual leaving water temperature set-points.
Phase monitor - The phase monitor controls that phases sequence is correct and controls phase loss.
Evaporator Victaulic Kit - Hydraulic joint with gasket for an easy and quick water connection.
Evaporator Water side design pressure 10 bar
Condenser Water side design pressure 16 bar
Electronic Expansion Valve
High Pressure Side Manometers
Hour Run meter - Digital compressors hour run meter
General fault contactor - Alarm relay.
Set-point reset, demand limit and alarm from external device - The leaving water temperature set-point can be overwritten with the following options: 4-20mA from external source (by user); outside ambient temperature; evaporator water temperature Δt. Moreover the device allow the user to limit the load of the unit by 4-20mA signal or by network system and the microprocessor is able to receive an alarm signal from an external device (pump etc… - user can decide if this alarm signal will stop the unit or not).
Double pressure relief valve with diverter (standard on high pressure side, available as option on low pressure side)

Options (on request)
Partial heat recovery - enabled through a shell & tube exchanger sited between the compressor and the condenser, completely dedicated to the heat recovery. These allow hot water to be produced up to a maximum temperature of 58°C.
Soft start - Electronic starting device to reduce the mechanical stress during compressor start-up
Brine version - Allows the unit to operate down to -8°C leaving liquid temperature (antifreeze required).
Compressor thermal overload relays - Safety devices against compressor motor overloading in addition to the normal protection envisaged by the electrical windings.
Under/Over Voltage - This device control the voltage value of power supply and stop the chiller if the value exceeds the allowed operating limits.
Energy Meter - This device allows to measure the energy absorbed by the chiller during its life. It is installed inside the control box mounted on a DIN rail and show on a digital display: Line-to-Line Voltage, Phase and Average Current, Active and Reactive Power, Active Energy, Frequency
Condenser power factor correction - Installed on the electrical control panel to ensure it conforms to the plant rules. (Daikin advices maximum 0.9).
Current limit / display - this option allows monitoring the chiller absorbed current with possibility to set a limit value. This option excludes the Demand Limit.
Compressors circuit breakers
20mm Evaporator/ Condenser Insulation
Condenser Victaulic Kit

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3 General characteristics

Condenser / evaporator double flange kit

Cu-Ni 90-10 exchangers - to work with sea water the heat exchangers are fitted with Cu-Ni tubes and special protection inside the end covers.

Evaporator electric heater - electric heater controlled by a thermostat to protect the evaporator from freezing down to -28°C ambient temperature, providing the power supply is on.

Evaporator flow switch supplied separately to be wired and installed on the evaporator water piping (by the customer).

Discharge line shut-off valves - installed on the discharge port of the compressor to facilitate maintenance operations.

Suction line shut off valve - installed on the suction port of the compressor to facilitate maintenance operation.

Container kit

Rubber type antivibration mounts - Supplied separately, these are positioned under the base of the unit during installation to reduce vibrations.

Sound Proof System - Made of sheet metal and internally insulated, the cabinet is “integral kind” (around the whole chiller, not only around the compressors) to reach the best performance in noise reduction.

Witness test - Every unit is always tested at the test bench prior to the shipment. On request, a second test can be carried out, at customer’s presence, in accordance with the procedures indicated on the test form. (not available for units with glycol mixtures).

Acoustic test – On request, a test can be carried out at customer’s presence (not available for units with glycol mixtures)

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4 Specifications

4-1 Technical Specifications					EWWQ420B-XS	EWWQ520B-XS	EWWQ640B-XS	EWWQ730B-XS	EWWQ800B-XS	EWWQ970B-XS
Cooling capacity	Nom.			kW	422 (1)	516 (1)	639 (1)	725 (1)	801 (1)	973 (1)
Capacity control	Method				Stepless					
	Minimum capacity			%	25					
Power input	Cooling	Nom.		kW	84.9 (1)	102 (1)	126 (1)	143 (1)	159 (1)	193 (1)
EER					4.97 (1)	5.03 (1)	5.09 (1)	5.07 (1)	5.05 (1)	
ESEER					5.86	5.88	5.97	5.95	5.89	5.66
Casing	Colour				Ivory white					
	Material				Galvanized and painted steel sheet					
Dimensions	Unit	Height		mm	2,001				2,003	
		Width		mm	1,276			1,268	1,314	1,446
		Depth		mm	3,863			3,878		3,919
Weight	Unit			kg	2,322	2,403	2,464	2,738	2,407	2,427
	Operation weight			kg	2,594	2,685	2,745	3,158	2,815	3,056
Water heat exchanger - evaporator	Type				Shell and tube					
	Water volume			l	220	213	200	334	325	538
	Water flow rate	Nom.		l/s	20.2	24.6	30.5	34.6	38.3	46.5
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	57	70	73	65	58	55
	Insulation material				Closed cell foam elastomer					
Water heat exchanger - condenser	Type				Shell and tube					
	Water flow rate	Nom.		l/s	24.2	29.5	36.5	41.4	45.8	55.7
	Nominal water pressure drop	Cooling		kPa	50	40	41	46	60	64
	Nominal water pressure drop 2	Cooling		kPa	-					
	Insulation material				Expanded elastomer					
Sound power level	Cooling	Nom.		dBA	100.9	101.7	102.6	102.7	102.0	102.9
Sound pressure level	Cooling	Nom.		dBA	82.2	83.0	83.9		83.2	84.0
Compressor	Type				Semi-hermetic single screw compressor					
	Quantity				1					
	Oil	Charged volume		l	16					
Compressor 2	Oil	Charged volume		l	-					
Operation range	Evaporator	Cooling	Min.	°CDB	-4					
			Max.	°CDB	10					
	Condenser	Cooling	Min.	°CDB	25					
			Max.	°CDB	45					
Refrigerant	Type				R-410A					
	Circuits	Quantity			1					
Refrigerant circuit	Charge			kg	95				110	130
Refrigerant circuit 2	Charge			kg	-					
Safety devices	Item	01			High pressure switch					
		02			Low pressure switch					
		03			Emergency stop					
		04			High discharge temperature on the compressor					
		05			Phase monitor					
		06			Low pressure ratio					
		07			High oil pressure drop					
		08			Low oil pressure					

4-1 Technical Specifications				EWWQC10 B-XS	EWWQC11 B-XS	EWWQC12 B-XS	EWWQC13 B-XS	EWWQC14 B-XS	EWWQC15 B-XS	EWWQC16 B-XS	EWWQC17 B-XS	EWWQC19 B-XS	EWWQC20 BX-S	EWWQC21 B-XS
Cooling capacity	Nom.		kW	1,037 (1)	1,116 (1)	1,158 (1)	1,270 (1)	1,369 (1)	1,449 (1)	1,573 (1)	1,733 (1)	1,863 (1)	2,020 (1)	2,152 (1)
Capacity control	Method						Stepless							
	Minimum capacity		%	12.5	25	12.5	12.5							
Power input	Cooling	Nom.	kW	205 (1)	227 (1)	228 (1)	252 (1)	269 (1)	286 (1)	315 (1)	349 (1)	382 (1)	417 (1)	451 (1)
EER				5.06 (1)	4.91 (1)	5.07 (1)	5.04 (1)	5.08 (1)	5.07 (1)	4.99 (1)	4.96 (1)	4.87 (1)	4.84 (1)	4.77 (1)
ESEER				6.18	5.54	6.13	6.13	6.28	6.23	5.92	6	5.73	5.78	5.64
Casing	Colour						Ivory white							
	Material						Galvanized and painted steel sheet							

4 Specifications

4-1 Technical Specifications					EWWQC10 B-XS	EWWQC11 B-XS	EWWQC12 B-XS	EWWQC13 B-XS	EWWQC14 B-XS	EWWQC15 B-XS	EWWQC16 B-XS	EWWQC17 B-XS	EWWQC19 B-XS	EWWQC20 BX-S	EWWQC21 B-XS
Dimensions	Unit	Height		mm	2,454	2,003	2,454	2,454			2,495				
		Width		mm	1,350	1,446	1,350	1,350							
		Depth		mm	5,219	3,919	5,219	5,219			4,829			4,865	
Weight	Unit			kg	4,775	2,457	4,831	4,873	4,919	4,969	5,117		5,388	5,408	5,414
	Operation weight			kg	5,431	3,086	5,479	5,512	5,546	5,606	5,794	5,843	6,110	6,118	6,124
Water heat exchanger - evaporator	Type							Shell and tube							
	Water volume			l	587	538	575	563	551		495	484	535	527	
	Water flow rate	Nom.		l/s	49.6	53.3	55.3	60.7	65.4	69.2	75.1	82.8	89.0	96.5	102.8
	Nominal water pressure drop	Cooling	Heat exchanger	kPa		70	65	56	68	76	71	91	93	115	129
	Insulation material							Closed cell foam elastomer							
Water heat exchanger - condenser	Type							Shell and tube							
	Water flow rate	Nom.		l/s	29.5	64.2	29.6	36.3	36.7	41.2	44.9	44.6	53.3	53.2	61.9
	Nominal water pressure drop	Cooling		kPa	39	84	35	48	49	46	43		60	52	78
	Nominal water pressure drop 2	Cooling		kPa	39	-	48	48	46		43	62	60	79	78
	Insulation material							Expanded elastomer							
Sound power level	Cooling	Nom.		dBA	105.2	103.8	105.6	106.1	106.5		105.8	106.2	106.6	107.1	107.5
Sound pressure level	Cooling	Nom.		dBA	85.6	84.9	86.0	86.5	86.9		86.2	86.6	87.0	87.5	87.9
Compressor	Type							Semi-hermetic single screw compressor							
	Quantity				2	1	2	2							
	Oil	Charged volume		l	32	16	32	32							
Compressor 2	Oil	Charged volume		l	32	-	32	32							
Operation range	Evaporator	Cooling	Min.	ºCDB				-4							
			Max.	ºCDB				10							
	Condenser	Cooling	Min.	ºCDB				25							
			Max.	ºCDB				45							
Refrigerant	Type							R-410A							
	Circuits	Quantity			2	1	2	2							
Refrigerant circuit	Charge			kg	120	130	120	120			130				
Refrigerant circuit 2	Charge			kg	120	-	120	120			130				
Safety devices	Item	01						High pressure switch							
		02						Low pressure switch							
		03						Emergency stop							
		04						High discharge temperature on the compressor							
		05						Phase monitor							
		06						Low pressure ratio							
		07						High oil pressure drop							
		08						Low oil pressure							

4-2 Electrical Specifications				EWWQ420B-XS	EWWQ520B-XS	EWWQ640B-XS	EWWQ730B-XS	EWWQ800B-XS	EWWQ970B-XS
Compressor	Phase			3~					
	Voltage		V	400					
	Voltage range	Min.	%	-10					
		Max.	%	10					
	Maximum running current		A	189	225	274	310	325	388
	Starting method			Wye-delta					
Compressor 2	Maximum running current		A	-					
Power supply	Phase			3~					
	Frequency		Hz	50					
	Voltage		V	400					
	Voltage range	Min.	%	-10					
		Max.	%	10					

4 Specifications

4-2 Electrical Specifications				EWWQ420B-XS	EWWQ520B-XS	EWWQ640B-XS	EWWQ730B-XS	EWWQ800B-XS	EWWQ970B-XS
Unit	Maximum starting current		A	455				656	
	Nominal running current (RLA)	Cooling	A	146	170	205	230	258	310
	Maximum running current		A	178	211	256	291	316	376
	Max unit current for wires sizing		A	195	232	282	320	348	414

4-2 Electrical Specifications				EWWQC10 B-XS	EWWQC11 B-XS	EWWQC12 B-XS	EWWQC13 B-XS	EWWQC14 B-XS	EWWQC15 B-XS	EWWQC16 B-XS	EWWQC17 B-XS	EWWQC19 B-XS	EWWQC20 BX-S	EWWQC21 B-XS
Compressor	Phase						3~							
	Voltage		V				400							
	Voltage range	Min.	%				-10							
		Max.	%				10							
	Maximum running current		A	225	458	225	274		310	325		388		458
	Starting method						Wye-delta							
Compressor 2	Maximum running current		A	225	-	274	274	310		325	388		458	
Power supply	Phase						3~							
	Frequency		Hz				50							
	Voltage		V				400							
	Voltage range	Min.	%				-10							
		Max.	%				10							
Unit	Maximum starting current		A	636	656	674	674	702		925	979		1,032	
	Nominal running current (RLA)	Cooling	A	340	360	375	410	435	460	516	568	620	670	720
	Maximum running current		A	422	442	467	514		548	629	689	749	814	877
	Max unit current for wires sizing		A	464	486	514	566	603	639	692	758	824	895	965

Notes

(1) Cooling: entering evaporator water temp. 12ºC; leaving evaporator water temp. 7ºC; entering condenser water temp. 30ºC; leaving condenser water temp. 35ºC; full load operation.

(2) Sound level data are measured at entering evaporator water temp. 12ºC; leaving evaporator water temp. 7ºC; entering condenser water temp. 30ºC; leaving condenser water temp. 35ºC; full load operation; standard: ISO3744

(3) Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.

(4) Maximum starting current: starting current of biggest compressor + current of the other compressor at 75 % of maximum load

(5) Nominal current in cooling mode: entering evaporator water temp. 12ºC; leaving evaporator water temp. 7ºC; entering condenser water temp. 30ºC; leaving condenser water temp. 35ºC; compressors.

(6) Maximum running current is based on max compressor absorbed current in its envelope

(7) Maximum unit current for wires sizing is based on minimum allowed voltage.

(8) Maximum current for wires sizing: compressor full load ampere x 1.1

5 Capacity tables

5 - 1 Cooling Capacity Tables

EWWQ420-970B-XS

	ELWT (°C)	Entering Condenser Water Temperature (°C)															
		15		20		25		30		35		40		45		50	
		Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)
420	4					409	74.3	383	83.4	355	93.0	324	103				
	5					423	74.4	396	83.6	367	93.2	336	103				
	6					436	74.5	409	83.7	379	93.3	348	104				
	7					450	74.6	422	83.8	392	93.4	360	104				
	8					464	74.7	435	83.9	404	93.6	372	104				
	9							449	84.0	418	93.7	384	104				
	10							463	84.1	431	93.9	397	104				
520	4					500	89.6	469	101	434	113	398	125				
	5					516	89.7	484	101	449	113	412	125				
	6					533	89.8	500	101	464	113	426	125				
	7					549	89.9	516	101	479	113	441	125				
	8					566	90.0	532	101	495	113	456	126				
	9							549	101	511	113	471	126				
	10							565	101	527	113	487	126				
640	4					620	110	581	123	538	138	493	153				
	5					640	110	600	124	556	138	510	154				
	6					660	110	619	124	575	138	528	154				
	7					681	110	639	124	594	138	546	154				
	8					702	110	660	124	613	139	565	154				
	9							680	124	633	139	584	154				
	10							702	124	653	139	603	154				
730	4					704	125	659	140	610	157	559	174				
	5					726	125	680	141	631	157	579	174				
	6					749	125	703	141	652	157	599	175				
	7					773	125	725	141	674	157	619	175				
	8					796	125	748	141	696	158	640	175				
	9							772	141	718	158	662	175				
	10							796	141	741	158	684	175				
800	4					770	139	728	154	684	170	638	187				
	5					795	140	752	155	707	171	660	188				
	6					820	140	776	156	730	172	682	189				
	7					845	141	801	156	754	172	705	189				
	8					871	141	826	157	778	173	728	190				
	9							852	157	803	173	751	190				
	10							878	157	828	174	775	190				
970	4					934	168	881	187	825	205	766	224				
	5					965	169	911	188	854	207	793	225				
	6					997	170	941	189	883	208	821	226				
	7					1030	171	973	190	913	209	849	228				
	8					1063	172	1004	191	943	210	878	229				
	9							1037	192	974	211	908	230				
	10							1070	192	1006	212	938	231				

NOTES

1 Cc (cooling capacity) - Pi (unit power input) – ELWT (Evaporator leaving water temperature – Δt 5°C) - Condenser Water temperature Δt 5°C
2 Data are referred to 0.0176 m^2 °C/kW evaporator fouling factor
3 Data are referred to 0.0440 m^2 °C/kW condenser fouling factor

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5 Capacity tables

5 - 1 Cooling Capacity Tables

EWWQC10-C15B-XS

	ELWT (°C)	Entering Condenser Water Temperature (°C)															
		15		20		25		30		35		40		45		50	
		Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)
C10	4					1005	179	943	202	875	225	803	251				
	5					1037	179	974	202	905	226	831	251				
	6					1070	179	1006	202	935	226	860	251				
	7					1103	180	1038	202	966	226	889	252				
	8					1137	180	1071	203	997	227	919	252				
	9							1104	203	1030	227	950	252				
	10							1138	203	1062	227	982	252				
C11	4					1074	199	1013	220	949	242	883	264				
	5					1108	200	1047	221	982	243	914	265				
	6					1143	201	1082	223	1015	245	946	267				
	7					1178	202	1115	224	1049	247	978	269				
	8					1214	204	1150	226	1083	248	1011	270				
	9							1185	227	1116	250	1044	272				
	10							1221	228	1150	251	1078	274				
C12	4					1123	200	1052	224	975	251	893	279				
	5					1159	200	1087	225	1008	251	924	279				
	6					1196	200	1122	225	1042	251	956	279				
	7					1234	200	1158	225	1076	251	989	279				
	8					1272	200	1195	225	1111	252	1023	280				
	9							1232	226	1147	252	1057	280				
	10							1270	226	1184	252	1092	280				
C13	4					1233	220	1155	248	1070	277	980	308				
	5					1273	221	1193	248	1106	277	1015	308				
	6					1313	221	1232	248	1143	277	1050	308				
	7					1354	221	1271	249	1181	278	1086	309				
	8					1395	221	1311	249	1220	278	1123	309				
	9							1352	249	1259	279	1160	309				
	10							1394	250	1299	279	1198	310				
C14	4					1328	235	1243	264	1152	295	1055	328				
	5					1370	235	1284	265	1191	296	1092	328				
	6					1413	236	1326	265	1231	296	1130	329				
	7					1458	236	1368	265	1271	296	1169	329				
	8					1503	236	1412	266	1313	297	1209	330				
	9							1456	266	1355	297	1249	330				
	10							1501	266	1398	297	1290	330				
C15	4					1405	250	1316	281	1220	314	1118	349				
	5					1450	250	1360	281	1261	314	1157	349				
	6					1495	250	1404	282	1303	314	1197	349				
	7					1541	251	1448	282	1346	315	1238	350				
	8					1588	251	1493	282	1390	315	1280	350				
	9							1540	283	1435	316	1323	350				
	10							1587	283	1480	316	1366	351				

NOTES

1 Cc (cooling capacity) - Pi (unit power input) – ELWT (Evaporator leaving water temperature – Δt 5°C) - Condenser Water temperature Δt 5°C
2 Data are referred to 0.0176 m^2 °C/kW evaporator fouling factor
3 Data are referred to 0.0440 m^2 °C/kW condenser fouling factor

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5 Capacity tables

5 - 1 Cooling Capacity Tables

EWWQC16-C21B-XS

	ELWT (°C)	Entering Condenser Water Temperature (°C)															
		15		20		25		30		35		40		45		50	
		Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)
C16	4					1523	276	1438	306	1348	337	1252	371				
	5					1573	277	1487	308	1395	339	1297	372				
	6					1625	278	1536	309	1443	341	1344	374				
	7					1677	279	1587	311	1492	342	1391	376				
	8					1730	280	1638	312	1541	344	1439	377				
	9							1691	313	1591	344	1487	378				
	10							1743	313	1643	345	1536	379				
C17	4					1680	305	1586	339	1487	373	1383	408				
	5					1735	307	1640	341	1539	375	1432	410				
	6					1791	309	1694	343	1591	377	1482	412				
	7					1848	310	1749	344	1644	379	1533	415				
	8					1906	311	1805	346	1698	381	1585	416				
	9							1862	347	1753	382	1637	418				
	10							1920	348	1809	383	1691	419				
C19	4					1807	334	1708	371	1604	408	1492	444				
	5					1865	336	1765	373	1658	410	1544	447				
	6					1925	338	1822	375	1713	413	1597	450				
	7					1985	340	1880	377	1769	415	1650	452				
	8					2045	342	1939	379	1826	417	1705	455				
	9							1999	381	1883	419	1760	457				
	10							2059	382	1942	421	1816	459				
C20	4					1961	365	1853	404	1739	445	1620	485				
	5					2023	367	1914	407	1798	447	1675	488				
	6					2087	369	1975	409	1857	450	1732	491				
	7					2151	371	2038	411	1917	453	1790	494				
	8					2216	373	2101	414	1979	455	1849	496				
	9							2165	416	2041	458	1909	499				
	10							2229	418	2103	460	1969	502				
C21	4					2092	395	1978	437	1857	480	1731	524				
	5					2158	397	2041	440	1919	484	1790	527				
	6					2224	399	2106	442	1981	487	1850	531				
	7					2291	402	2172	445	2044	490	1912	534				
	8					2358	404	2238	448	2109	493	1974	537				
	9							2304	450	2174	496	2036	540				
	10							2372	453	2240	499	2100	544				

NOTES

1 Cc (cooling capacity) - Pi (unit power input) – ELWT (Evaporator leaving water temperature – Δt 5°C) - Condenser Water temperature Δt 5°C
2 Data are referred to 0.0176 m² °C/kW evaporator fouling factor
3 Data are referred to 0.0440 m² °C/kW condenser fouling factor

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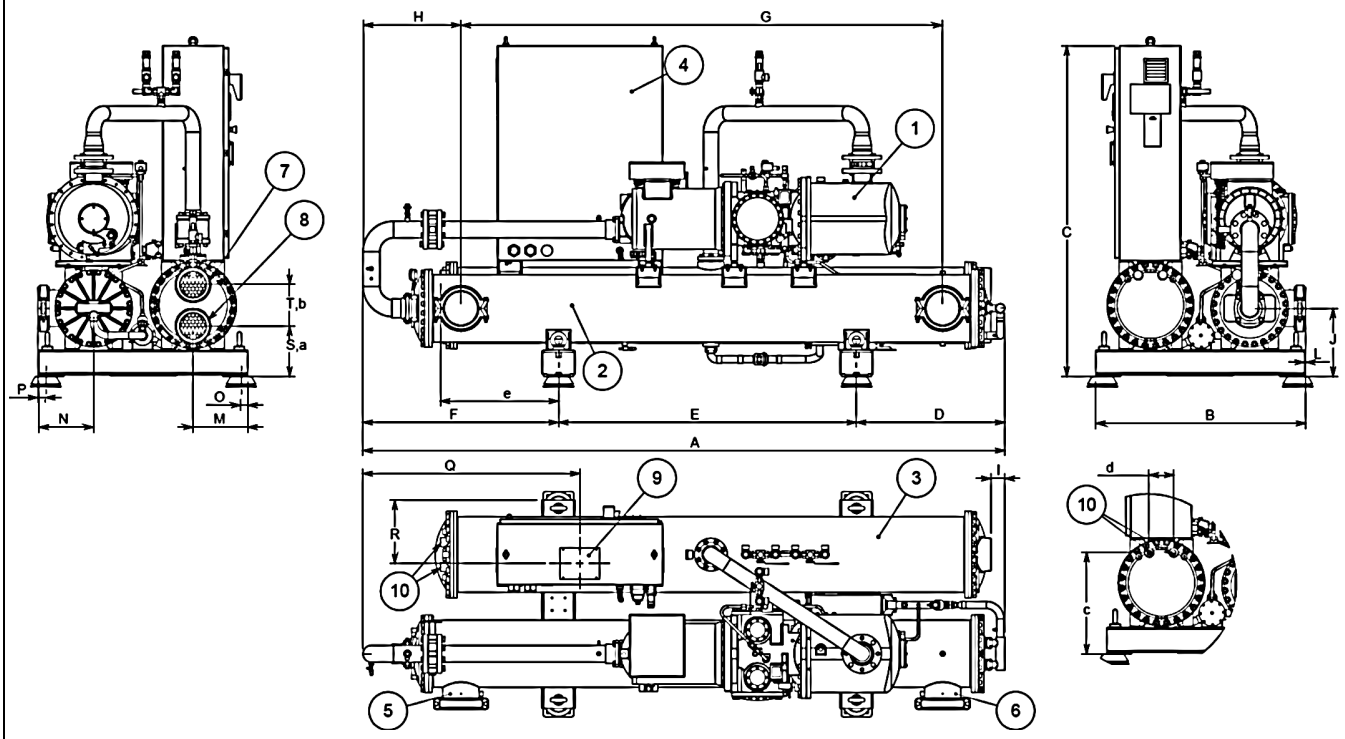
6 Dimensional drawings

6 - 1 Dimensional Drawings



Models	Dimensions (mm)									
EWWQ~B-XS	A	B	C	D	E	F	G	H	I	J
420	3863	1276	2001	924	1800	1134	2920	579	112	342
520	3863	1276	2001	924	1800	1134	2920	579	112	342
640	3863	1276	2001	924	1800	1134	2920	579	112	342
730	3878	1268	2001	897	1800	1181	2910	592	84	412

EWWQ~B-XS	L	M	N	O	P	Q	R	S	T
420	16	330	346	40	56	1118	385	305	252
520	16	330	346	40	56	1118	385	305	252
640	16	330	346	40	56	1118	385	305	252
730	8	330	338	40	48	1310	385	305	252

LEGEND

1. Compressor
2. Evaporator
3. Condenser
4. Electrical panel
5. Evaporator water inlet
6. Evaporator water outlet
7. Condenser water inlet
8. Condenser water outlet
9. Power connections slot
10. Partial heat recovery connection (optional)

Models	Partial heat recovery dimensions (mm)				
EWWQ~B-XS	a	b	c	d	e
420	301	210	615	150	715
520	301	210	615	150	715
640	301	210	615	150	715
730	301	210	615	150	715

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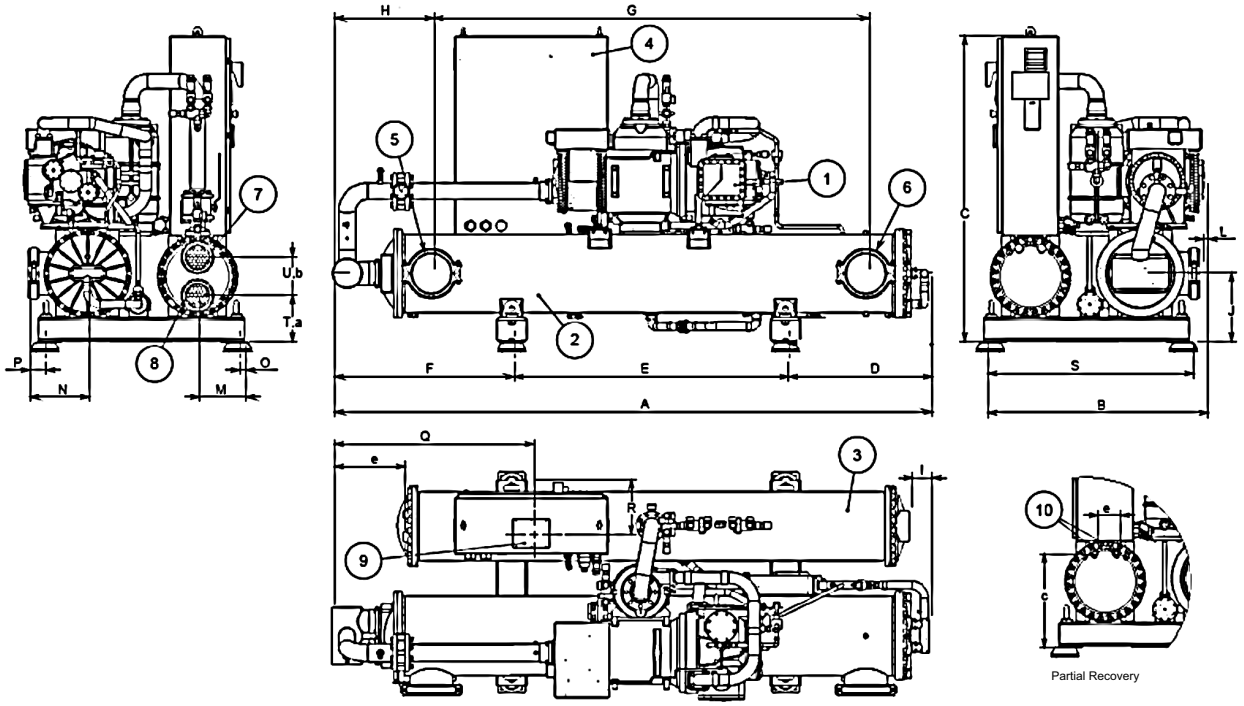
6 Dimensional drawings

6 - 1 Dimensional Drawings



Models	Dimensions (mm)									
EWWQ~B-XS	A	B	C	D	E	F	G	H	I	J
800	3878	1314	2003	930	1800	1147	2910	592	119	412
970	3919	1446	2003	930	1800	1179	2856	651	128	450
C11	3919	1446	2003	941	1800	1179	2856	651	128	450

EWWQ~B-XS	L	M	N	O	P	Q	R	S	T	U
800	46	330	338	40	48	1140	385	1260	305	252
970	30	305	389	40	106	1307	360	1350	305	252
C11	30	305	389	40	106	1307	360	1350	305	252

LEGEND

1. Compressor
2. Evaporator
3. Condenser
4. Electrical panel
5. Evaporator water inlet
6. Evaporator water outlet
7. Condenser water inlet
8. Condenser water outlet
9. Power connections slot
10. Partial heat recovery connection (optional)

Models	Partial heat recovery dimensions (mm)				
EWWQ~B-XS	a	b	c	d	e
800	301	210	497	112	200
970	301	210	615	150	464
C11	301	210	615	150	464

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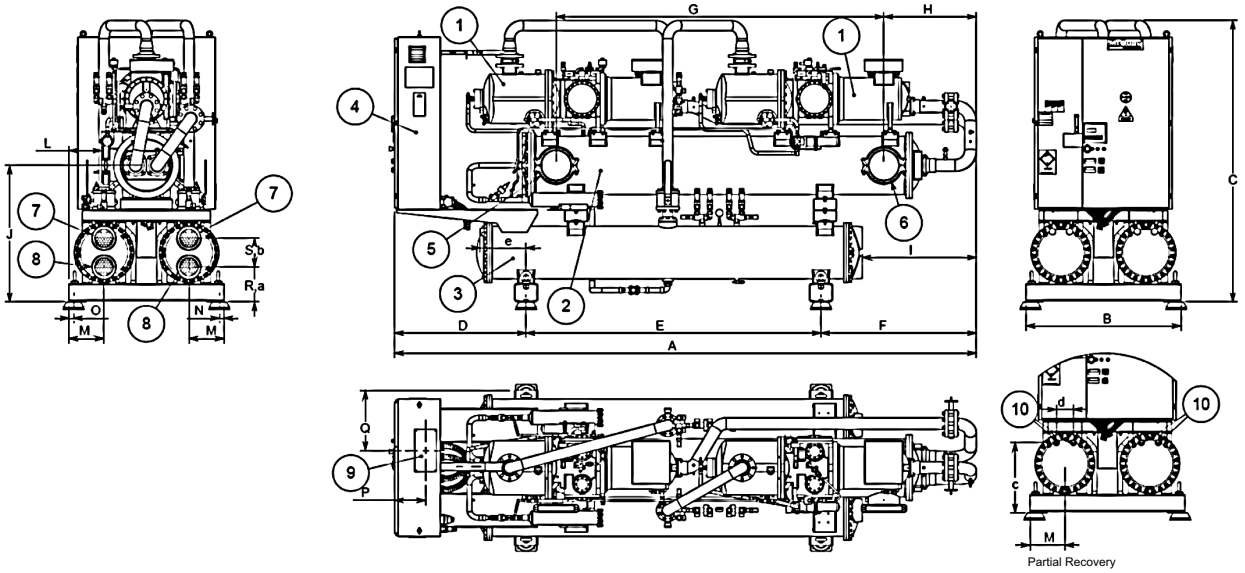
6 Dimensional drawings

6 - 1 Dimensional Drawings



Models	Dimensions (mm)									
EWWQ~B-XS	A	B	C	D	E	F	G	H	I	J
C10	5219	1350	2454	1147	2570	1503	3150	808	1146	1191
C12	5219	1350	2454	1147	2570	1503	3150	808	1146	1191
C13	5219	1350	2454	1147	2570	1503	3150	808	1146	1191
C14	5219	1350	2454	1147	2570	1503	3150	808	1146	1191
C15	5219	1350	2454	1147	2570	1503	3150	808	1146	1191

EWWQ~B-XS	L	M	N	O	P	Q	R	S
C10	337	305	40	40	272	525	305	252
C12	337	305	40	40	272	525	305	252
C13	337	305	40	40	272	525	305	252
C14	337	305	40	40	272	525	305	252
C15	286	305	40	40	272	525	305	252

LEGEND

1. Compressor
2. Evaporator
3. Condenser
4. Electrical panel
5. Evaporator water inlet
6. Evaporator water outlet
7. Condenser water inlet
8. Condenser water outlet
9. Power connections slot
10. Partial heat recovery connection (optional)

Models	Partial heat recovery dimensions (mm)				
EWWQ~B-XS	a	b	c	d	e
C10	300	210	615	150	400
C12	300	210	615	150	400
C13	300	210	615	150	400
C14	300	210	615	150	400
C15	300	210	615	150	400

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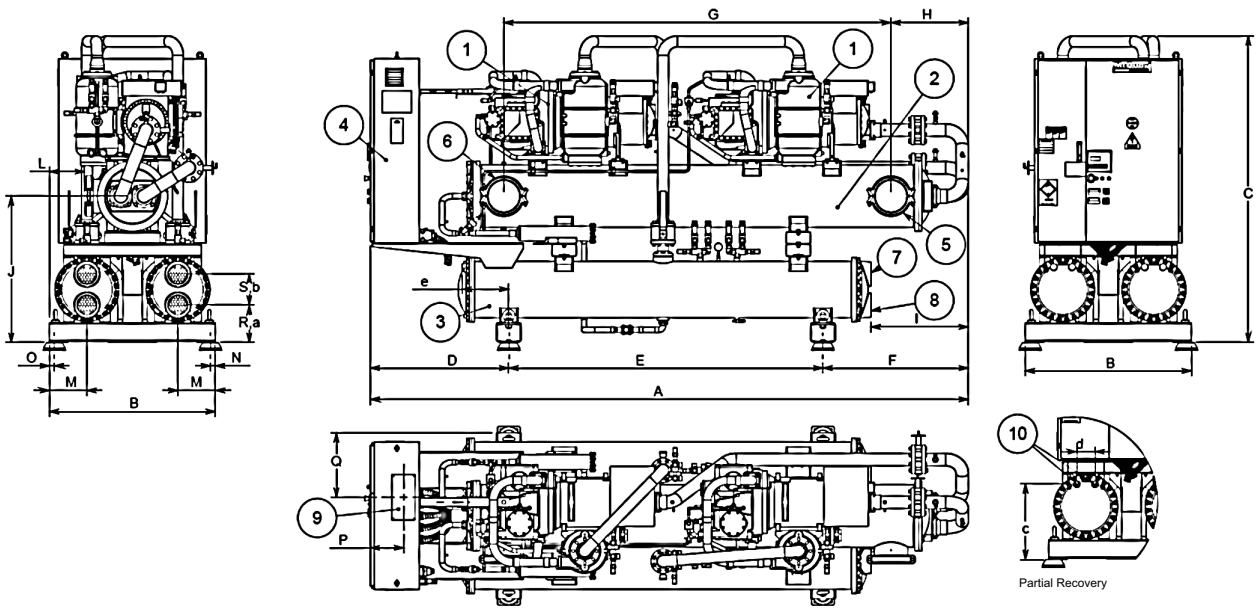
6 Dimensional drawings

6 - 1 Dimensional Drawings



Models	Dimensions (mm)									
EWWQ~B-XS	A	B	C	D	E	F	G	H	I	J
C16	4829	1350	2495	1056	2555	1218	2856	626	824	1191
C17	4829	1350	2495	1056	2555	1218	2856	626	824	1191
C19	4829	1350	2495	1056	2555	1218	2856	626	824	1191
C20	4829	1350	2495	1127	2555	1183	3150	629	789	1191
C21	4829	1350	2495	1127	2555	1183	3150	629	789	1191

EWWQ~B-XS	L	M	N	O	P	Q	R	S
C16	286	305	40	40	272	525	305	252
C17	286	305	40	40	272	525	305	252
C19	286	305	40	40	272	525	305	252
C20	286	305	40	40	272	525	305	252
C21	286	305	40	40	272	525	305	252

LEGEND

1. Compressor
2. Evaporator
3. Condenser
4. Electrical panel
5. Evaporator water inlet
6. Evaporator water outlet
7. Condenser water inlet
8. Condenser water outlet
9. Power connections slot
10. Partial heat recovery connection (optional)

Models	Partial heat recovery dimensions (mm)				
EWWQ~B-XS	a	b	c	d	e
C16	301	210	615	150	380
C17	301	210	615	150	380
C19	301	210	615	150	380
C20	301	210	615	150	380
C21	301	210	615	150	380

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7 Sound data

7 - 1 Sound Level Data

Sound Level

EWWQ~B-SS

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10^{-5} Pa)									Power
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)
380	55.1	59.4	71.6	84.1	71.9	72.5	58.5	53.2	**82.2**	**100.2**
460	55.9	60.2	72.4	84.9	72.7	73.3	59.3	54.0	**83.0**	**101.2**
560	56.8	61.1	73.3	85.8	73.6	74.2	60.2	54.9	**83.9**	**102.3**
640	56.8	61.1	73.3	85.8	73.6	74.2	60.2	54.9	**83.9**	**102.3**
730	56.1	60.4	72.6	85.1	72.9	73.5	59.5	54.2	**83.2**	**101.5**
800	56.9	61.2	73.4	85.9	73.7	74.3	60.3	55.0	**84.0**	**104.7**
860	57.8	62.1	74.3	86.8	74.6	75.2	61.2	55.9	**84.9**	**102.3**
870	58.1	62.4	74.6	87.1	74.9	75.5	61.5	56.2	**85.2**	**104.7**
960	58.1	62.4	74.6	87.1	74.9	75.5	61.5	56.2	**85.2**	**105.1**
C10	58.5	62.8	75.0	87.5	75.3	75.9	61.9	56.6	**85.6**	**103.2**
C11	58.9	63.2	75.4	87.9	75.7	76.3	62.3	57.0	**86.0**	**104.7**
C12	59.4	63.7	75.9	88.4	76.2	76.8	62.8	57.5	**86.5**	**105.2**
C13	59.8	64.1	76.3	88.8	76.6	77.2	63.2	57.9	**86.9**	**106.5**
C14	59.8	64.1	76.3	88.8	76.6	77.2	63.2	57.9	**86.9**	**106.5**
C15	59.1	63.4	75.6	88.1	75.9	76.5	62.5	57.2	**86.2**	**105.8**
C16	59.5	63.8	76.0	88.5	76.3	76.9	62.9	57.6	**86.6**	**106.2**
C17	59.9	64.2	76.4	88.9	76.7	77.3	63.3	58.0	**87.0**	**106.6**
C19	60.4	64.7	76.9	89.4	77.2	77.8	63.8	58.5	**87.5**	**107.1**
C20	60.8	65.1	77.3	89.8	77.6	78.2	64.2	58.9	**87.9**	**107.5**

NOTE

The values are according to ISO 3744 and are referred to: evaporator 12/7° C. condenser 30/35° C. full load operation

EWWQ~B-XS

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10^{-5} Pa)									Power
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)
420	55.1	59.4	71.6	84.1	71.9	72.5	58.5	53.2	**82.2**	**100.9**
520	55.9	60.2	72.4	84.9	72.7	73.3	59.3	54.0	**83.0**	**101.7**
640	56.8	61.1	73.3	85.8	73.6	74.2	60.2	54.9	**83.9**	**102.6**
730	56.8	61.1	73.3	85.8	73.6	74.2	60.2	54.9	**83.9**	**102.7**
800	56.1	60.4	72.6	85.1	72.9	73.5	59.5	54.2	**83.2**	**102.0**
970	56.9	61.2	73.4	85.9	73.7	74.3	60.3	55.0	**84.0**	**102.9**
C10	58.5	62.8	75.0	87.5	75.3	75.9	61.9	56.6	**85.6**	**105.2**
C11	57.8	62.1	74.3	86.8	74.6	75.2	61.2	55.9	**84.9**	**103.8**
C12	58.9	63.2	75.4	87.9	75.7	76.3	62.3	57.0	**86.0**	**105.6**
C13	59.4	63.7	75.9	88.4	76.2	76.8	62.8	57.5	**86.5**	**106.1**
C14	59.8	64.1	76.3	88.8	76.6	77.2	63.2	57.9	**86.9**	**106.5**
C15	59.8	64.1	76.3	88.8	76.6	77.2	63.2	57.9	**86.9**	**106.5**
C16	59.1	63.4	75.6	88.1	75.9	76.5	62.5	57.2	**86.2**	**105.8**
C17	59.5	63.8	76.0	88.5	76.3	76.9	62.9	57.6	**86.6**	**106.2**
C19	59.9	64.2	76.4	88.9	76.7	77.3	63.3	58.0	**87.0**	**106.6**
C20	60.4	64.7	76.9	89.4	77.2	77.8	63.8	58.5	**87.5**	**107.1**
C21	60.8	65.1	77.3	89.8	77.6	78.2	64.2	58.9	**87.9**	**107.5**

NOTE

The values are according to ISO 3744 and are referred to: evaporator 12/7° C. condenser 30/35° C. full load operation

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7 Sound data

7 - 1 Sound Level Data

Sound Level

EWWQ~B-SS

Unit size	Distance					
	1m	5m	10m	15m	20m	25m
380	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
460	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
560	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
640	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
730	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
800	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
860	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
870	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
960	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C10	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
C11	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C12	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C13	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C14	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C15	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C16	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C17	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C19	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C20	0.0	-7.5	-12.2	-15.3	-17.5	-19.3

NOTE
The values are dB(A) (pressure level).

EWWQ~B-XS

Unit size	Distance					
	1m	5m	10m	15m	20m	25m
420	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
520	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
640	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
730	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
800	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
970	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
C10	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C11	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
C12	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C13	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C14	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C15	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C16	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C17	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C19	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C20	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C21	0.0	-7.5	-12.2	-15.3	-17.5	-19.3

NOTE
The values are dB(A) (pressure level).

NSL_1-2_Rev.00_2

8 Installation

8 - 1 Installation Method

Installation notes

Warning

Installation and maintenance are to be performed only by qualified personnel who are familiar with local codes and regulations, and who are experienced with this type of equipment. Must be avoided the unit installation in places that could be considered dangerous for all the maintenance operations.

Handling

The chiller is mounted on heavy wooden skids to protect the unit from accidental damage and to permit easy handling and moving. It is recommended that all moving and handling be performed with the skids under the unit when possible and that the skids not be removed until the unit is in the final location.

If the unit must be hoisted, it is necessary to lift the unit by attaching cables or chains at the lifting holes in the evaporator tube sheets. Spreader bars must be used to protect the control cabinet and the other areas of the chiller.

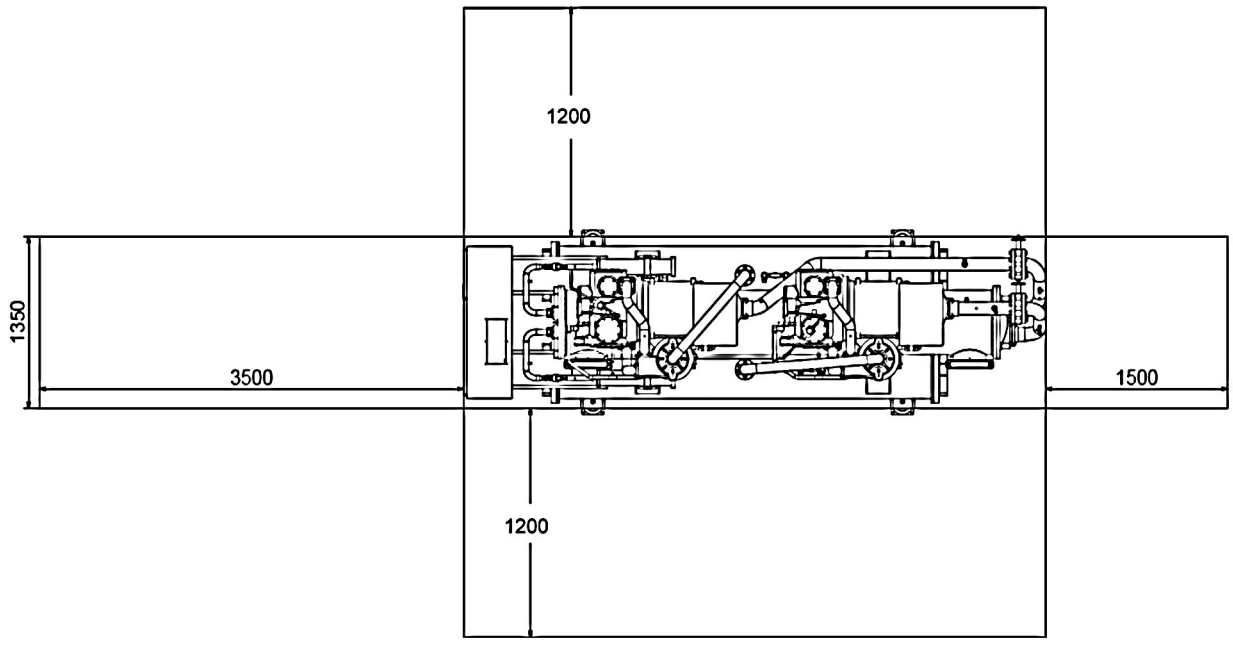
Location

A leveled and sufficiently strong floor is required. If necessary, additional structural members should be provided to transfer the weight of the unit to the nearest beams.

Rubber-in-shear isolators can be furnished and field placed under each corner of the package. A rubber anti–skid pad should be used under isolators if hold-down bolts are not used. Vibration isolator in all water piping connected to the chiller is recommended to avoid straining the piping and transmitting vibration and noise.

Minimum space requirements

Every side of the machine must be accessible for all post-installation maintenance activities. The minimum space required is shown on the following drawing:

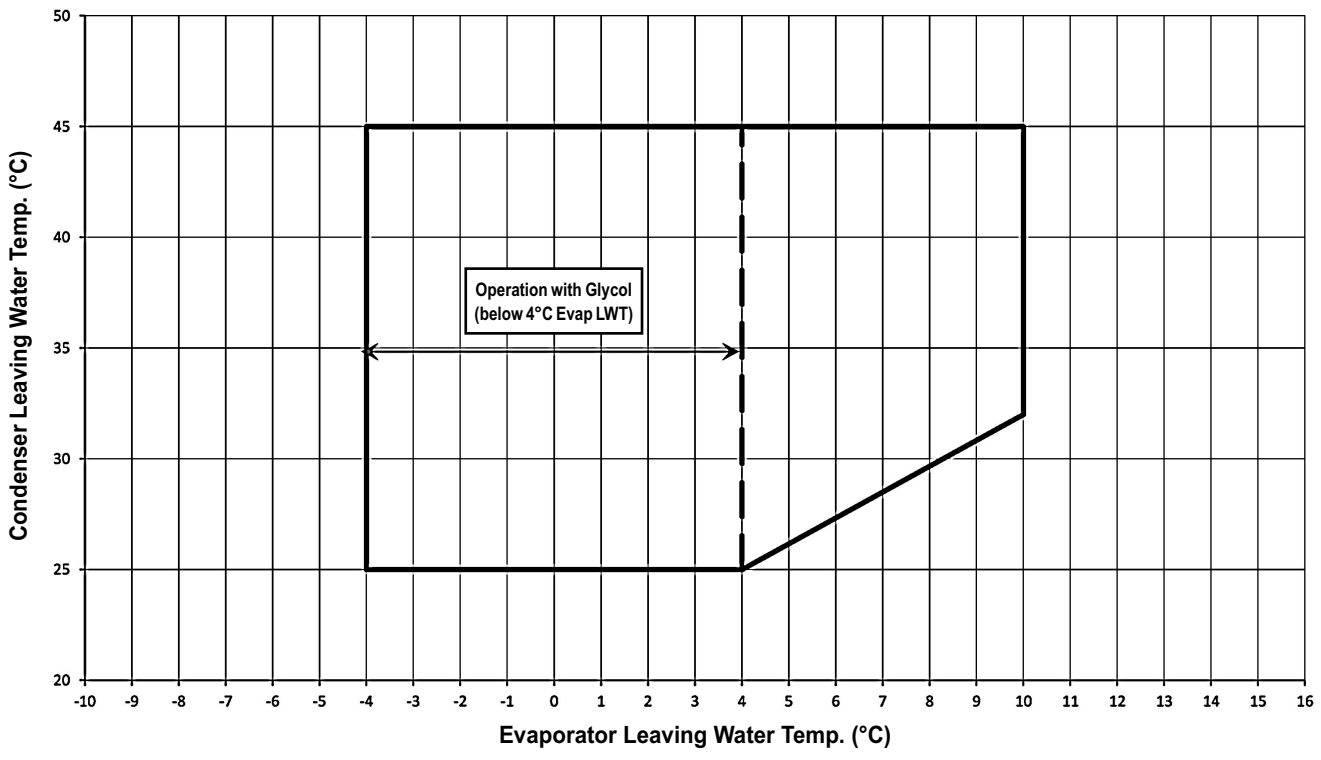


Minimum clearance requirements for machine maintenance

INN_Rev.00_1

9 Operation range

9 - 1 Operation Range



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9 Operation range

9 - 1 Operation Range

Table 1 - Evaporator minimum and maximum water Δt

Max evaporator water Δt	°C	6
Min evaporator water Δt	°C	4
Min condenser water Δt	°C	4
Max condenser water Δt	°C	8

Table 2 - Evaporator fouling factors

Fouling factors m² °C / kW	Cooling capacity correction factor	Power input correction factor	EER correction factor
0.0176	1.000	1.000	1.000
0.0440	0.978	0.986	0.992
0.0880	0.957	0.974	0.983
0.1320	0.938	0.962	0.975

Table 3 - Condenser fouling factors

Fouling factors m² °C / kW	Cooling capacity correction factor	Power input correction factor	EER correction factor
0.0176	1.000	1.000	1.000
0.0440	0.978	0.986	0.992
0.0880	0.957	0.974	0.983
0.1320	0.938	0.962	0.975

Table 4.1 - Minimum glycol percentage for low water temperature

Evaporator Leaving Water Temperature (°C)	2	0	-2	-4	-6	-8
Ethylene glycol (%)	10	20	20	20	30	30
Propylene glycol (%)	10	20	20	30	30	30

Note: Minimum glycol percentage to be used with evaporator leaving water temperature below 4°C to prevent freezing of water circuit.

Table 4.2 - Minimum glycol percentage for low air temperature

Air Ambient Temperature (°C) (2)	-3	-8	-15	-23	-35
Ethylene glycol (%) (1)	10%	20%	30%	40%	50%
Air Ambient Temperature (°C) (2)	-3	-7	-12	-20	-32
Propylene glycol (%) (1)	10%	20%	30%	40%	50%

Note (1): Minimum glycol percentage to prevent freezing of water circuit at indicated air ambient temperature

Note (2): Air ambient temperature do exceed the operating limits of the unit, as protection of water circuit may be needed in winter season at non-working conditions

Table 5 - Correction factors for low evaporator leaving water temperature

Evaporator Leaving Water Temperature (°C)	2	0	-2	-4	-6	-8
Cooling Capacity	0.842	0.785	0.725	0.670	0.613	0.562
Compressor Power Input	0.950	0.940	0.920	0.890	0.870	0.840

Note: Correction factors have to be applied at working conditions: evaporator leaving water temperature 7°C

Table 6 - Correction factors for water and glycol mixture

	Ethylene Glycol (%)	10%	20%	30%	40%	50%
Ethylene Glycol	Cooling Capacity	0.991	0.982	0.972	0.961	0.946
	Compressor Power Input	0.996	0.992	0.986	0.976	0.966
	Flow Rate (Δt)	1.013	1.04	1.074	1.121	1.178
	Evaporator Pressure Drop	1.070	1.129	1.181	1.263	1.308
Propylene Glycol	Cooling Capacity	0.985	0.964	0.932	0.889	0.846
	Compressor Power Input	0.993	0.983	0.969	0.948	0.929
	Flow Rate (Δt)	1.017	1.032	1.056	1.092	1.139
	Evaporator Pressure Drop	1.120	1.272	1.496	1.792	2.128

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9 Operation range

9 - 1 Operation Range

A) Mixture Water and Glycol --- Evaporator leaving water temperature > 4°C
- depending from the type and percentage (%) of glycol filled in the circuit (see table 4.2 and 6)
- multiply the Cooling Capacity, the Compressor Power Input by the Correction factor of Table 6
- starting from this new value of Cooling Capacity, calculate the Flow Rate (l/s) and the Evaporatore Pressure Drop (kPa)
- now multiply the new Flow Rate and the new Evaporator Pressure Drop by the Correction Factors of Table 6

Example

Unit Size:	**EWWQ380B-SS**
Mixture:	Water
Working condition:	ELWT 12/7°C – CLWT 30/35°C
- Cooling capacity:	380 kW
- Power input:	84.5 kW
- Flow rate (Δt 5°C):	18.2 l/s
- Evaporator pressure drop:	47 kPa
Mixture:	Water + Ethylene Glycol 30% (for a winter air temperature up to -15°C)
Working condition:	ELWT 12/7°C – CLWT 30/35°C
- Cooling capacity:	380 x 0.972 = 369 kW
- Power input:	84.5 x 0.986 = 83.3 kW
- Flow rate (Δt 5°C):	17.6 (referred to 369 kW) x 1.074 = 18.9 l/s
- Evaporator pressure drop:	44 (referred to 17.6 l/s) x 1.181 = 52kPa

B) Mixture Water and Glycol --- Evaporator leaving water temperature < 4°C
- depending from the type and percentage (%) of glycol filled in the circuit (see table 4.1 and 4.2 and table 6)
- depending from the evaporator leaving water temperature (see table 5)
- multiply the Cooling Capacity, the Compressor Power Input by the Correction factor of Table 5 and Table 6
- starting from this new value of Cooling Capacity, calculate the Flow Rate (l/s) and the Evaporatore Pressure Drop (kPa)
- now multiply the new Flow Rate and the new Evaporator Pressure Drop by the Correction Factors of Table 6

Example

Unit Size:	**EWWQ380B-SS**
Mixture:	Water
Standard working condition	ELWT 12/7°C – CLWT 35/40°C
- Cooling capacity:	354 kW
- Power input:	94.2 kW
- Flow rate (Δt 5°C):	16.9 l/s
- Evaporator pressure drop:	41 kPa
Mixture:	Water + Glycol 30% (for a low evaporator leaving temperature of -1/-6°C)
Working condition:	ELWT 2/-3°C – CLWT 35/40°C
- Cooling capacity:	354 x 0.670 x 0.932 = 221 kW
- Power input:	94.2 x 0.890 x 0.969 = 81 kW
- Flow rate (Δt 5°C):	10.56 l/s (referred to 221 kW) x 1.056 = 11.2 l/s
- Evaporator pressure drop:	19 kPa (referred to 11.2 l/s) x 1.496 = 29 kPa

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9 Operation range

9 - 1 Operation Range

Items (1) (5)			Cooling Water			Cooled Water		Heated water (2)				Tendency if out of criteria
			Circulating System		Once Flow			Low temperature		High temperature		
			Circulating water	Supply water (4)	Flowing water	Circulating water [Below 20°C]	Supply water (4)	Circulating water [20°C ~ 60°C]	Supply water (4)	Circulating water [60°C ~ 80°C]	Supply water (4)	
Items to be controlled:	pH	at 25°C	6.5 ~ 8.2	6.0 ~ 8.0	6.0 ~ 8.0	6.0 ~ 8.0	6.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	Corrosion + Scale
	Electrical conductivity	[mS/m] at 25°C	Below 80	Below 30	Below 40	Below 40	Below 30	Below 30	Below 30	Below 30	Below 30	Corrosion + Scale
		(µS/cm) at 25°C	(Below 800)	(Below 300)	(Below 400)	(Below 400)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	Corrosion + Scale
	Chloride ion	[mgCl2-/l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	Sulfate ion	[mgSO2-4/l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	M-alkalinity (pH4.8)	[mgCaCO3/l]	Below 100	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Total hardness	[mgCaCO3/l]	Below 200	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Scale
	Calcium harness	[mgCaCO3/l]	Below 150	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Silca ion	[mgSiO2/l]	Below 50	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Scale
Items to be referred to	Iron	[mgFe/l]	Below 1.0	Below 0.3	Below 1.0	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Corrosion + Scale
	Copper	[mgCu/l]	Below 0.3	Below 0.1	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 0.1	Below 1.0	Below 0.1	Corrosion
	Sulfite ion	[mgS2-/l]	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Corrosion
	Ammonium ion	[mgNH+4/l]	Below 1.0	Below 0.1	Below 1.0	Below 1.0	Below 0.1	Below 0.3	Below 0.1	Below 0.1	Below 0.1	Corrosion
	Remaining chloride	[mgCL/l]	Below 0.3	Below 0.3	Below 0.3	Below 0.3	Below 0.3	Below 0.25	Below 0.3	Below 0.1	Below 0.3	Corrosion
	Free carbide	[mgCO2/l]	Below 4.0	Below 4.0	Below 4.0	Below 4.0	Below 4.0	Below 0.4	Below 4.0	Below 0.4	Below 4.0	Corrosion
	Stability index		6.0 ~ 7.0	---	---	---	---	---	---	---	---	Corrosion + Scale

NOTES

1. Names, definitions and units are according to JIS K 0101. Units and figures between brackets are old units published as reference only.
2. In case of using heated water (more than 40°C), corrosion is generally noticeable.
   Especially when the iron materials is in direct contact with water without any protection shields, it is desireable to give the valid measure for corrosion. E.g. chemical measure.
3. In the cooling water using hermetic cooling tower, close circuit water is according to heated water standard, and scattered water is according to cooling water standard.
4. Supply water is considered drink water, industrial water and ground water except for genuine water, neutral water and soft water.
5. The above mentioned items are representable items in corrosion and scale cases.

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9 Operation range

9 - 1 Operation Range

The cooled water distribution circuits should have minimum water content to avoid excessive compressors start and stop.
In fact, each time the compressor starts up, an excessive quantity of oil goes from the compressor sump and simultaneously there is a rise in the temperature of the compressor motor's stator due to the inrush current during the start-up.
To prevent damage to the compressors, it has been envisaged the application of a device to limit frequent stops and restarts.

During the span of one hour there will be no more than 6 starts of the compressor. The plant side should therefore ensure that the overall water content allows a more constant functioning of the unit and consequently greater environmental comfort.
The minimum water content per unit should be calculated using this simplified formula:

For 1 compressor unit
M (liters) = (0.94 x ΔT(°C) + 5.87) x P(kW)

For 2 compressor unit
M (liters) = (0.1595 x ΔT(°C) + 3.0825) x P(kW)

For 3 compressor unit
M (liters) = (0.0443 x ΔT(°C) + 1.6202) x P(kW)

where:

M	minimum water content per unit expressed in litres
P	Cooling Capacity of the unit expressed in kW
ΔT	evaporator entering / leaving water temperature difference expressed in °C

This formula is valid for:
- standard microprocessor parameters

For more accurate determination of quantity of water, it is advisable to contact the designer of the plant.

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10 Hydraulic performance

10 - 1 Water Pressure Drop Curve Evaporator

EWWQ~B-SS

	380	460	560	640	730	800	860	870	960	C10	C11	C12	C13	C14	C15	C16	C17	C19	C20
Cooling Capacity (kW)	380	464	562	637	727	796	862	872	960	1007	1055	1185	1255	1325	1460	1584	1748	1888	2050
Water Flow (l/s) - Evaporator	18.2	22.2	26.8	30.4	34.7	38.0	41.2	41.7	45.9	48.1	50.4	56.6	60.0	63.3	69.8	75.7	83.5	90.2	98.0
Evaporator Pressure Drops (kPa)	47	63	43	46	53	52	48	62	57	55	67	43	48	53	58	67	86	95	119
Water Flow (l/s) - Condenser	22.2	27.2	32.9	37.3	42.7	1) 23.1 2) 23.1	50.87	1) 23.4 2) 27.4	1) 27.9 2) 27.9	59.6	1) 27.6 2) 33.6	1) 34.3 2) 34.3	1) 33.4 2) 39.2	1) 38.4 2) 38.4	1) 42.6 2) 42.6	1) 42.7 2) 50.2	1) 51.0 2) 51.0	1) 50.8 2) 59.8	1) 59.8 2) 59.8
Condenser Pressure Drops (kPa)	58	62	66	63	15	1) 62 2) 62	19	1) 62 2) 65	1) 65 2) 65	25	1) 65 2) 67	1) 70 2) 70	1) 70 2) 67	1) 67 2) 67	1) 16 2) 16	1) 16 2) 18	1) 16 2) 16	1) 16 2) 14	1) 14 2) 14

NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser water inlet: 30/35°C

EWWQ~B-XS

	420	520	640	730	800	970	C10	C11	C12	C13	C14	C15	C16	C17	C19	C20	C21
Cooling Capacity (kW)	422	516	639	725	801	973	1037	1116	1158	1270	1369	1449	1573	1733	1863	2020	2152
Water Flow (l/s) - Evaporator	20.2	24.6	30.5	34.6	38.3	46.5	49.6	53.3	55.3	60.7	65.4	69.2	75.1	82.8	89.0	96.5	102.8
Evaporator Pressure Drops (kPa)	56.8	70.2	73.1	65.5	57.8	54.9	54.9	70.3	64.5	55.9	68.4	76.2	71.3	90.6	92.6	114.7	129.2
Water Flow (l/s) - Condenser	24.2	29.5	36.5	41.4	45.8	55.7	1) 29.5 2) 29.5	64.2	1) 29.6 2) 36.3	1) 36.3 2) 36.3	1) 36.7 2) 41.2	1) 41.2 2) 41.2	1) 44.9 2) 44.9	1) 44.6 2) 54.4	1) 53.3 2) 53.3	1) 53.2 2) 62.6	1) 61.9 2) 61.9
Condenser Pressure Drops (kPa)	50	40	41	46	60	64	1) 39 2) 39	84	1) 35 2) 48	1) 48 2) 48	1) 49 2) 46	1) 46 2) 46	1) 43 2) 43	1) 43 2) 62	1) 60 2) 60	1) 52 2) 79	1) 78 2) 78

NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser water inlet: 30/35°C

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Evaporator and Condenser Pressure Drops

To determinate the evaporator or condenser pressure drop for different versions or at different working conditions, please refer to the following formula:

$$PD_2\ (kPa) = PD_1\ (kPa) \times \left(\frac{Q_2\ (l/s)}{Q_1\ (l/s)} \right)^{1.8}$$

where:

- PD_2 Pressure drop to be determinate (kPa)
- PD_1 Pressure drop at nominal condition (kPa)
- Q_2 water flow at new working condition (l/s)
- Q_1 water flow at nominal condition (l/s)

How to use the formula: Example (evaporator)

The unit EWWQ380B-SS has been selected for working at the following conditions:
- evaporator water in/out: 11/6°C
- condenser water in/out: 30/35°C

The cooling capacity at these working conditions is: 369 kW
The evaporator water flow at these working conditions is: 17.6 l/s

The unit EWWQ380B-SS at nominal working conditions has the following data:
- evaporator water in/out: 12/7°C
- condenser water in/out: 30/35°C

The cooling capacity at these working conditions is: 380 kW
The evaporator water flow at these working conditions is: 18.2 l/s
The evaporator pressure drop at these working conditions is: 47 kPa

The pressure drop at the selected working condition will be:

$$PD_2\ (kPa) = 47\ (kPa) \times \left(\frac{17.6\ (l/s)}{18.2\ (l/s)} \right)^{1.8}$$

$$PD_2\ (kPa) = 44\ (kPa)$$

NOTE - Important

If the calculated evaporator water pressure drop is below 10 kPa or above 100 kPa please contact the factory for dedicated evaporator.

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10 Hydraulic performance

10 - 1 Water Pressure Drop Curve Evaporator

EWWQ~B-SS

	380	460	560	640	730	800	860	870	960	C10	C11	C12	C13	C14	C15	C16	C17	C19	C20
Heating Capacity (kW)	54.2	66.2	83.0	89	119	114	146	129	137	175	157	172	185.3	194	254.4	282	301	318.7	344.4
Water Flow (l/s)	2.59	3.16	3.97	4.25	5.70	5.46	6.95	6.18	6.56	8.34	7.52	8.23	8.85	9.27	12.2	13.5	14.4	15.2	16.5
Heat Recovery Pressure Drops (kPa)	34	45	32	34	39	38	35	45	41	40	49	32	35	39	42	49	62	69	86

NOTE

Water flow and pressure drop referred to nominal codition: evaporator water in/out: 12/7°C – condenser water in/out:30/35°C – water heat recovery in/out 40/45°C

EWWQ~B-XS

	420	520	640	730	800	970	C10	C11	C12	C13	C14	C15	C16	C17	C19	C20	C21
Heating Capacity (kW)	54.4	65.5	77.4	93.6	106	125	132	152	149	163	175	183	203	228	253	276	302
Water Flow (l/s)	2.60	3.13	3.70	4.47	5.08	5.99	6.28	7.28	7.11	7.80	8.38	8.72	9.71	10.9	12.1	13.2	14.4
Heat Recovery Pressure Drops (kPa)	41	51	53	47	42	40	40	51	47	41	50	55	52	66	67	84	94

NOTE

Water flow and pressure drop referred to nominal codition: evaporator water in/out: 12/7°C – condenser water in/out:30/35°C – water heat recovery in/out 40/45°C

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To determinate the pressure drop for different versions or at different working conditions, please refer to the following formula:

$$PD_2\ (kPa) = PD_1\ (kPa) \times \left(\frac{Q_2\ (l/s)}{Q_1\ (l/s)} \right)^{1.80}$$

where:

PD_2 Pressure drop to be determinate (kPa)
PD_1 Pressure drop at nominal condition (kPa)
Q_2 water flow at new working condition (l/s)
Q_1 water flow at nominal condition (l/s)

How to use the formula: Example

The unit EWWQ380B-SS has been selected for working at the following conditions:
- evaporator water in/out: 12/7°C
- condenser water in/out: 30/35°C
- Partial heat recovery leaving water temperature 45/50°C

The heating capacity at these working conditions is: 38.5 Kw
The water flow at these working conditions is: 1.84 l/s

The unit EWWQ380B-SS at nominal working conditions has the following data:
- evaporator water in/out: 12/7°C
- condenser water in/out: 30/35°C
- Partial heat recovery leaving water temperature 40/45°C

The heating capacity at these working conditions is: 54.2 kW
The water flow at these working conditions is: 2.59 l/s
The pressure drop at these working conditions is: 34 kPa

The pressure drop at the selected working condition will be:

$$PD_2\ (kPa) = 34\ (kPa) \times \left(\frac{1.84\ (l/s)}{2.59\ (l/s)} \right)^{1.80}$$

$$PD_2\ (kPa) = 18\ (kPa)$$

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10 Hydraulic performance

10 - 1 Water Pressure Drop Curve Evaporator

EWWQ~B-XS

	Heat Recovery Leaving Water Temperature (Δ=5°C)		
	45	50	55
	Hc (kW)	Hc (kW)	Hc (kW)
420	54.4	37.5	21.3
520	65.5	45.9	27.1
640	77.4	52.4	28.5
730	93.6	65.3	38.3
800	106	76.0	47.1
970	125	86.0	48.5
C10	132	89.7	50.0
C11	152	110	69.1
C12	149	104	60.4
C13	163	112	63.0
C14	175	122	71.5
C15	183	124	67.5
C16	203	140	79.6
C17	228	162	98.1
C19	253	178	106
C20	276	199	126
C21	302	217	136

NOTES

- Evaporator Leaving Water Temperature 7°C - ΔT = 5°C
- Condenser Leaving Water Temperature 35°C -ΔT= 5°C

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11 Specification text

11 - 1 Specification Text

Technical Specification for Water Cooled Screw Chiller

GENERAL

The water cooled screw chiller will be designed and manufactured in accordance with following European directives:

Construction of pressure vessel	97/23/EC (PED)
Machinery Directive	2006/42/EC
Low Voltage	2006/95/EC
Electromagnetic Compatibility	2004/108/EC
Electrical & Safety codes	EN 60204–1 / EN 60335-2-40
Manufacturing Quality Stds	UNI – EN ISO 9001:2004

The unit will be tested at full load in the factory at the nominal working conditions and water temperatures. Before shipment a full test will be held to avoid any losses.

Chiller will be delivered to the job site completely assembled and charged with right refrigerant and oil quantity.

Comply with the manufacturer instructions for rigging and handling equipment.

The unit will be able to start up and operate as standard at full load and condenser entering fluid temperature from …. °C to …. °C with an evaporator leaving fluid temperature between …. °C and …. °C.

All units published performances have to be certified by **Eurovent.**

REFRIGERANT

Only R-410A will be accepted.

PERFORMANCE

- ✓ Number of water cooled screw chiller: .....
- ✓ Cooling capacity for single water cooled screw chiller: ..... kW
- ✓ Power input for single water cooled screw chiller in cooling mode: ..... kW
- ✓ Shell & tube evaporator entering water temperature in cooling mode: ..... °C
- ✓ Shell & tube evaporator leaving water temperature in cooling mode: ..... °C
- ✓ Shell & tube evaporator water flow: ..... l/s
- ✓ Shell & tube condenser entering water temperature in cooling mode: ..... °C
- ✓ Shell & tube condenser leaving water temperature in cooling mode: ..... °C
- ✓ Shell & tube condenser water flow: ..... l/s
- ✓ The unit should work with electricity in range 400V ±10%, 3ph, 50Hz without neutral and shall only have one power connection point.

UNIT DESCRIPTION

Chiller shall include as standard: 1 or 2 independent refrigerant circuits, semi-hermetic rotary single screw compressors, electronic expansion device (EEXV), refrigerant direct expansion shell & tube heat exchangers, R-410A refrigerant, lubrication system, motor starting components, control system and all components necessary for safe and stable unit operation.

Chiller will be factory assembled on a robust base-frame made of zinc coated steel, protected by an epoxy paint.

NOISE LEVEL AND VIBRATIONS

Sound pressure level at 1 meter distance in free field, semispheric conditions, shall not exceed ……dB(A). The sound pressure levels must be rated in accordance to ISO 3744.
Other types of rating unacceptable. Vibration level should not exceed 2 mm/s.

DIMENSIONS

Unit dimensions shall not exceed following indications

- ✓ unit length ..... mm,
- ✓ unit width ..... mm,
- ✓ unit height ..... mm.

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11 Specification text

11 - 1 Specification Text

CHILLER COMPONENTS

Compressors

- ✓ Semi-hermetic, single-screw type with one main helical rotor meshing with gaterotor. The gaterotor will be constructed of a carbon impregnated engineered composite material. The gaterotor supports will be constructed of cast iron.
- ✓ The oil injection shall be used in order to get high EER (Energy Efficiency Ratio) also at high condensing pressure and low sound pressure levels in each load condition.
- ✓ Refrigerant system differential pressure shall provide oil flow through service replaceable, 0.5 micron, full flow, cartridge type oil filter internal to compressor.
- ✓ Refrigerant system differential pressure shall provide oil injection on all moving compressor parts to correctly lubricate them. Electrical oil pump lubricating system is not acceptable.
- ✓ The compressor's oil cooling must be realized, when necessary, by refrigerant liquid injection. External dedicated heat exchanger and additional piping to carry the oil from the compressor to heat exchanger and viceversa will not be accepted.
- ✓ The compressor shall be provided with an external, high efficiency, cyclonic type oil separator and with built-in oil filter, cartridge type.
- ✓ The compressor shall be direct electrical driven, without gear transmission between the screw and the electrical motor.
- ✓ Shall be present two thermal protection realized by a thermistor for high temperature protection: one temperature sensor to protect electrical motor and another sensor to protect unit and lubricating oil from high discharge gas temperature.
- ✓ The compressor shall be equipped with an electric oil-crankcase heater.
- ✓ Compressor shall be fully field serviceable. Compressor that must be removed and returned to the factory for service shall be unacceptable.

Cooling capacity control system

- ✓ Each unit will have a microprocessor for the control of compressor slide valve's position and the instantaneous RPM value of the motor.
- ✓ The unit capacity control shall be infinitely modulating, from 100% down to 25% for each circuit (from 100% down to 12.5% of full load for unit with 2 compressors). The chiller shall be capable of stable operation to a minimum of 12.5% of full load without hot gas bypass.
- ✓ Step unloading unacceptable because of evaporator leaving water temperature fluctuation and low unit efficiency at partial load.
- ✓ The system shall stage the unit based on the leaving evaporator water temperature that shall be controlled by a PID (Proportional Integral Derivative) loop.
- ✓ Unit control logic shall manage frequency level of the compressor electric motor to exactly match plant load request in order to keep the set point constant for delivered chilled water temperature. In this operating condition unit control logic shall modulate electrical frequency level in a range lower and upper the nominal electrical network value fixed at 50 Hz.
- ✓ The microprocessor unit control shall detect conditions that approach protective limits and take self-corrective action prior to an alarm occurring. The system shall automatically reduce chiller capacity when any of the following parameters are outside their normal operating range:
  - ○ High condenser pressure
  - ○ Low evaporating refrigerant temperature
  - ○ High compressor motor amps

Evaporator

- ✓ The units shall be supplied with shell and tubes counter-flow heat exchanger with single refrigerant pass. It will be refrigerant direct expansion type with refrigerant inside the tubes and water outside (shell side). It will include carbon steel tube sheets, with straight copper tubes internally wound for higher efficiencies, expanded on the tube plates.
- ✓ The evaporator will have 2 circuits, one for each compressor and shall be single refrigerant pass.
- ✓ The water connections shall be VICTAULIC type connections as standard to ensure quick mechanical disconnection between the unit and the hydronic network.
- ✓ Evaporator is manufactured in accordance to PED approval.

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11 Specification text

11 - 1 Specification Text

Condensers

- ✓ Condensers will be shell and cleanable, through-tube type.
- ✓ The unit will have one condenser per circuit.
- ✓ Each condenser shall have a carbon steel and seamless, integrally finned high efficiency copper tubes, roll expanded into heavy carbon steel tube sheets.
- ✓ Water heads shall be removable and include vent and drain plugs.
- ✓ Condensers will come complete with liquid shut-off valve, spring loaded relief valve.

Refrigerant circuit

Each circuit shall include as standard: electronic expansion device piloted by unit's microprocessor control, compressor discharge shut-off valve, suction line shut-off valve, replaceable core filter-drier, sight glass with moisture indicator and insulated suction line.

Control panel

- ✓ Field power connection, control interlock terminals, and unit control system should be centrally located in an electric panel (IP 54). Power and starting controls should be separate from safety and operating controls in different compartments of the same panel.
- ✓ Starting shall be Wye-Delta type as standard.
- ✓ Operating and safety controls should include energy saving control; emergency stop switch; overload protection for compressor motor; high and low pressure cut-out switch (for each refrigerant circuit); anti-freeze thermostat; cut-out switch for each compressor.
- ✓ All of the information regarding the unit will be reported on a display and with the internal built-in calendar and clock that will switch the unit ON/OFF during day time all year long.
- ✓ The following features and functions shall be included:

  - **resetting chilled water temperature** by controlling the return water temperature or by a remote 4-20 mA DC signal or by controlling the external ambient temperature;
  - **soft load function** to prevent the system from operating at full load during the chilled fluid pulldown period;
  - **password protection** of critical parameters of control;
  - **start-to-start and stop-to-star timers** to provide minimum compressor off-time with maximum motor protection;
  - **communication capability** with a PC or remote monitoring;
  - **discharge pressure control** through intelligent cycling of condenser fans;
  - **lead-lag selection** by manual or automatically by circuit run hours;
  - **double set point** for brine unit version;
  - **scheduling** via internal time clock to allow programming of a yearly start-stop schedule accommodating weekends and holidays.

Optional High Level Communications Interface

The controller as a minimum shall be capable of providing the data shown in the above list, using the following options:

- RS485 Serial card
- RS232 Serial card
- LonWorks interface to FTT10A Transceiver.
- BACnet Compatible
- Use of Compass Points (manufactured by North Communications) to allow communications with such as Honeywell, Satchwell, Johnson Controls, Trend etc.

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Daikin's unique position as a manufacturer of air conditioning equipment, compressors and refrigerants has led to its close involvement in environmental issues. For several years Daikin has had the intention to become a leader in the provision of products that have limited impact on the environment. This challenge demands the eco design and development of a wide range of products and an energy management system, resulting in energy conservation and a reduction of waste.

Daikin products are distributed by:

Daikin Europe N.V. participates in the Eurovent Certification Programme for Air Conditioners (AC), Liquid Chilling Packages (LCP) and Fan Coil Units (FC); the certified data of certified models are listed in the Eurovent Directory. Multi units are Eurovent certified for combinations up to 2 indoor units.

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DAIKIN EUROPE N.V. Naamloze Vennootschap - Zandvoordestraat 300, B-8400 Oostende - Belgium - www.daikin.eu - BE 0412 120 336 - RPR Oostende