Chillers

Commercial and Technical Data

Inverter Air Cooled Chiller

www.daikin.eu

EWAD-CZ

Index

Features and benefits

High part load efficiency
High efficiency at full load, but especially maximum efficiency at part load conditions - which is the majority of the operating time of a chiller - are the factors that allow considerable savings in a system's annual energy costs.

With the objective of bringing down these operating costs and improving a building's economical management, this inverter range has been designed to optimize the seasonal energy efficiency (ESEER).

Seasonal quietness Seasonal quietness
Very low sound levels in part load conditions are achieved by varying the fan speed, but especially thanks to the variation of compressor frequency, which ensure the minimum sound level at all the time.

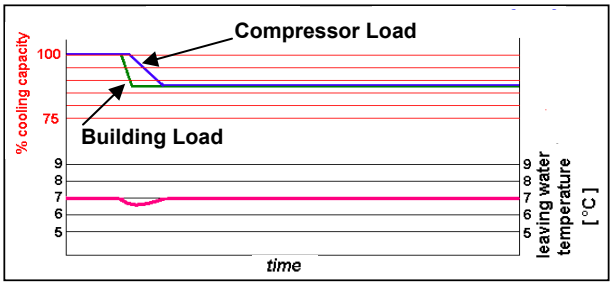
Quick comfort conditions
The ability to vary the output power in direct relation to the cooling requirements of the system, allow the possibility to achieve building comfort conditions much faster at start-up.

Low starting current
No current spikes at start-up. The starting current is always lower than current absorbed in the maximum operating conditions (FLA).

Power factor always > 0.95
This inverter range can operate always with a power factor > 0.95, which allows building owners to avoid power factor penalties and decrease electrical losses in cable and transformers.

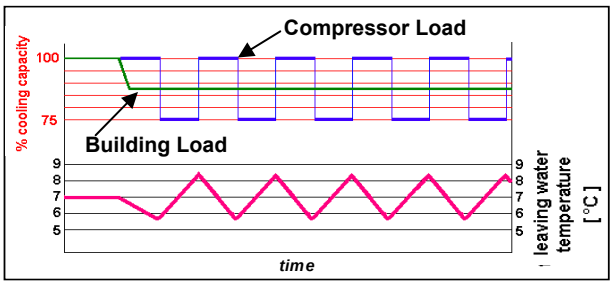
Redundancy
The range has two or three truly independent refrigerant circuits (depending on the size) guaranteeing (partial) cooling 'backup' even in case of maintenance activity

Infinitely capacity control
Cooling capacity control is infinitely variable by means of a Inverter driven screw compressor controlled by microprocessor system. Each unit has infinitely variable capacity control from 100% down to 13,5%. 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 steps capacity control

In the case that a compressor with load step control is used, 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.
Only a chiller with step-less regulation, is able to follow the system cooling demand at any time and to deliver chilled water at set-point.

Code requirements – Safety and observant of laws/directives
The range is 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.).

Efficiency and sound configuration

The range is available in multiple sound versions:

	Sound level			
Efficiency level	Standard	Low	Reduced	Extra low
High efficiency	EWAD~CZXS	EWAD~CZXL	EWAD~CZXR	N.A.

Versions

The range is available as high efficiency version:

X: High efficiency
13 sizes to cover a range from 635 up to 1802 kW with an ESEER up to 5.8

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 power input for fans.

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 air 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	35°C	30°C	25°C	20°C

Sound levels

The range is available in three different sound level configurations:

S: Standard sound
Condenser fan rotating at 900 rpm

L: Low sound
Condenser fan rotating at 900 rpm, compressor sound enclosure and flexible discharge piping.

R: Reduced sound
Condenser fan rotating at 700 rpm, compressor sound enclosure and flexible discharge piping.

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 an eye-hook to lift 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.

Inverter driven screw compressors with integrated oil separator
The compressor is semi-hermetic, single-screw type with gate-rotor made with the latest high-strength fibre reinforced star material. Each compressor has one inverter, which is managed by the unit microprocessor for infinitely modulating the capacity. An integrated high efficiency oil separator maximizes the oil separation and standard start is Inverter type.

Ecological HFC R-134a refrigerant
The compressors have been designed to operate with R-134a, ecological refrigerant with zero ODP (Ozone Depletion Potential) and very low GWP (Global Warming Potential), resulting in low TEWI (Total Equivalent Warming Impact).

Evaporator
The unit is equipped with a direct expansion shell&tube evaporator with copper tubes rolled into steel tubesheets. The evaporator is single-pass on both the refrigerant and water side 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 20mm closed cell insulation material and the evaporator water outlet connections are provided with victaulic kit (as standard). The evaporator has 2 or 3 circuits, one for each compressor and is manufactured in accordance to PED approval.

Condenser coils
The condenser is manufactured with internally enhanced seamless copper tubes arranged in a staggered row pattern and mechanically expanded into lanced and rippled aluminium condenser fins with full fin collars. An integral sub-cooler circuit provides sub-cooling to effectively eliminate liquid flashing and increase cooling capacity without increasing the power input.

Condenser coil fans
The condenser fans are propeller type with high efficiency design blades to maximize performances. The material of the blades is glass reinforced resin and each fan is protected by a guard. Fan motors are protected by circuit breakers (installed inside the electrical panel as a standard) and are IP54.

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 valves possess unique features: short opening and closing time, high resolution, positive shut-off function to eliminate use of additional solenoid valve, continuous modulation of mass flow without stress in the refrigerant circuit and corrosion resistance stainless steel body.
Electronic expansion valves are typically working 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 2 or 3 independent refrigerant circuits and each circuit includes:

- Inverter driven screw compressor with integrated oil separator
- Air cooled condenser
- Electronic expansion valve
- Evaporator
- Discharge line shut off valve
- Liquid line shut off valve
- Suction line shut off valve (optional)
- Sight glass with moisture indicator
- Filter drier
- Charging valves
- High pressure switch
- High and low pressure transducers

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 a 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 compressor inverter, fan circuit breaker, fan contactors and control circuit transformer.

MicroTech III controller

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 and air, programmable values, set-points. A sophisticated software with predictive logic, selects the most energy efficient combination of compressors, EEXV and condenser fans 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 capacity, inverter, and fans modulation
- 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 temperature
- Display of outdoor ambient temperature
- Display of condensing-evaporating temperature and pressure, suction and discharge superheat for each circuit
- Leaving water evaporator temperature regulation (temperature tolerance = 0,1°C)
- Compressor and evaporator pumps hours counter
- Display of Status Safety Devices
- Number of starts and compressor working hours
- Optimized management of compressor load
- Fan management according to condensing pressure
- 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)
- OAT (Outside ambient temperature) reset
- 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

Safety device / logic for each refrigerant circuit

- High pressure (pressure switch)
- High pressure (transducer)
- Low pressure (transducer)
- Fans circuit breaker
- 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 such 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).
- Ethernet TCP/IP.

Standard accessories (supplied on basic unit)

Double setpoint – Dual leaving water temperature setpoints.

Compressor thermal relays – Safety devices against compressor motor overloading. This device together with internal motor protection (standard) guarantee the best safety system for compressor motor.

Phase monitor – The phase monitor controls that phases sequence is correct and controls phase loss.

Inverter compressor starter

Evaporator victaulic kit – Hydraulic joint with gasket for an easy and quick water connection.

20mm evaporator insulation – The external shell is covered with a 20mm closed cell insulation material.

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.

Electronic expansion valve

Discharge line shut off valves – Installed on the discharge port of the compressor to facilitate maintenance operation.

Ambient temperature sensor and setpoint reset of leaving water temperature

Hour run meter – available for compressor

General fault contactor – Alarm relay.

Set-point reset – 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.

Demand limit – User can limit the load of the unit by 4-20mA signal or by network system

Alarm from external device – Microprocessor is able to receive an alarm signal from an external device (eg. pump, etc…). User can decide if this alarm signal will stop or not the unit.

Fan circuit breakers – Safety device against motor overloading and short circuit

Main switch interlock door

Emergency stop

Options (on request)

Total heat recovery – Produced with plate to plate heat exchangers to produce hot water.

Partial heat recovery – Produced with plate to plate heat exchangers to produce hot water.

Brine version – Allows the unit to operate down to -8°C leaving liquid temperature (antifreeze required).

Under/Over voltage control – This device control the voltage value of power supply and stop the chiller if the value exceeds the allowed operating limits.

Ampere / Volt meter – Device installed inside the control box showing ampere and volt values

Current limit display – To limit maximum absorbed current of the unit whenever is required

Evaporator flange kit

Speedtrol – Continuous fan speed modulation on the first fan of each circuit. It allows the unit working with air temperature down to –18°C.

Condenser coil guards

Evaporator area guards

Cu-Cu condensing coils – To give better protection against corrosion by aggressive environments.

Cu-Cu-Sn condensing coils – To give better protection against corrosion in aggressive environments and by salty air.

Alucoat condensing coils – Fins are protected by a special acrylic paint with a high resistance to corrosion.

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

Suction line shut off valves – Installed on the suction port of the compressor to facilitate maintenance operation.

High pressure side manometers

Container kit

Rubber type antivibration mounts – Supplied separately, these are positioned under the base of the unit during installation. Ideal to reduce the vibrations when the unit is floor mounted.

Spring type antivibration mounts – Supplied separately, these are positioned under the base of the unit during installation. Ideal for dampening vibrations for installation on roofs and metallic structures.

Hydronic Kit (single water pump) – Hydronic kit consists of: single direct driven centrifugal pump, water filling system with pressure gauge, safety valve, drain valve. The motor pump is protected by a circuit breaker installed in control panel. The kit is assembled and wired to the control panel. The pipe and pump are protected from freezing with an additional electrical heater.

Hydronic Kit (twin water pumps) – Hydronic kit consists of: twin direct driven centrifugal pumps, water filling system with pressure gauge, safety valve, drain valve. The motor pump is protected by a circuit breaker installed in control panel. The kit is assembled and wired to the control panel. The pipe and pumps are protected from freezing with an additional electrical heater.

Double pressure relief valve with diverter

Compressors circuit breakers

Fan speed regulation (includes fan silent mode) – To control the fan speed revolution for smooth operating control of the unit. This option improves the sound level of the unit during low ambient temperature operation.

Refrigerant recovery tank – This option allows to stock refrigerant charge of 1 circuit for maintenance operation. Liquid receiver includes in/out shut-off valve and reliefe valve.

Evaporator right water connections

Evaporator right water connections

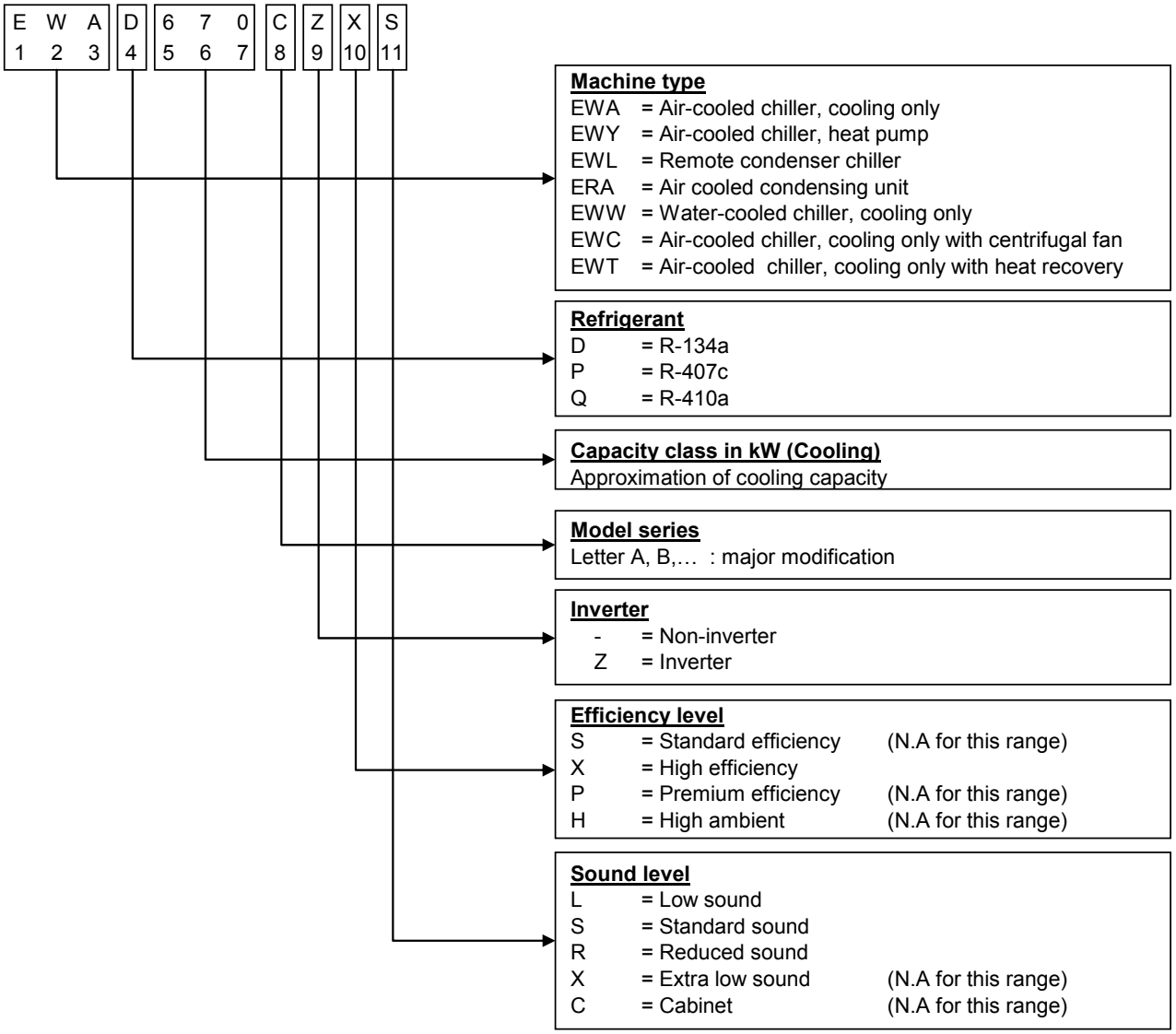
Ground fault protection – To shut down the entire unit if a ground fault condition is detected.

Rapid restart – It allows the unit to start as fast as 30 seconds after power is restored (in case of power failure).

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).

Nomenclature



Specifications

EWAD-CZXS & EWAD-CZXL

TECHNICAL SPECIFICATIONS	EWAD-CZXS / EWAD-CZXL			670	740	830	900	C10
Capacity (1)	Cooling		kW	672	738	832	902	1037
Capacity control	Type		---	Stepless				
	Minimum capacity		%	20	20	20	20	20
Unit power input (1)	Cooling		kW	245	235	266	305	339
EER (1)			---	2.74	3.14	3.13	2.96	3.06
ESEER			---	5.07	5.13	5.20	5.22	5.24
IPLV			---	5.47	5.68	5.72	5.79	5.73
Casing	Colour		---	Ivory White				
	Material		---	Galvanized and painted steel sheet				
Dimensions	Unit	Height	mm	2540	2540	2540	2540	2540
		Width	mm	2285	2285	2285	2285	2285
		Length	mm	6725	6725	7625	7625	8525
Weight (XS)	Unit		kg	5880	6000	6620	6870	7440
	Operating Weight		kg	6140	6250	6860	7110	7880
Weight (XL)	Unit		kg	6170	6280	6900	7150	7720
	Operating Weight		kg	6430	6530	7140	7390	8160
Water heat exchanger	Type		---	Single Pass Shell&Tube				
	Water volume		l	263	248	241	241	441
	Nominal water flow rate	Cooling	l/s	32.00	35.20	39.70	43.00	49.50
	Nominal Water pressure drop	Cooling	kPa	80	75	55	64	63
	Insulation material			Closed cell				
Air heat exchanger	Type		---	High efficiency fin and tube type with integral subcooler				
Fan	Type		---	Direct propeller type				
	Drive		---	DOL				
	Diameter		mm	800	800	800	800	800
	Nominal air flow		l/s	54188	65025	75863	75863	86700
	Model	Quantity	No.	10	12	14	14	16
		Speed	rpm	900	900	900	900	900
		Motor input	kW	1.75	1.75	1.75	1.75	1.75
Compressor	Type		---	Semi-hermetic single screw compressor Inverter driven				
	Oil charge		l	32	32	35	38	38
	Quantity		No.	2	2	2	2	2
Sound level (XS)	Sound Power	Cooling	dB(A)	102.1	102.2	102.5	102.5	102.9
	Sound Pressure (2)	Cooling	dB(A)	81.0	81.0	81.1	81.1	81.1
Sound level (XL)	Sound Power	Cooling	dB(A)	98.6	99.2	99.5	99.5	99.9
	Sound Pressure (2)	Cooling	dB(A)	77.5	78.0	78.1	78.1	78.1
Refrigerant circuit	Refrigerant type		---	R-134a	R-134a	R-134a	R-134a	R-134a
	Refrigerant charge		kg.	141	161	178	178	200
	N. of circuits		No.	2	2	2	2	2
Piping connections	Evaporator water inlet/outlet		mm	168.3	168.3	168.3	168.3	219.1
Safety devices	High discharge pressure (pressure switch)							
	High discharge pressure (pressure transducer)							
	Low suction pressure (pressure transducer)							
	Compressor motor protection							
	High discharge temperature							
	Low oil pressure							
	Low pressure ratio							
	High oil filter pressure drop							
	Phase monitor							
	Emergency stop button							
	Water freeze protection controller							
Notes (1)	Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12/7°C; ambient 35°C, unit at full load operation.							
Notes (2)	The values are according to ISO 3744 and are referred to: evaporator 12/7°C, ambient 35°C, full load operation.							

TECHNICAL SPECIFICATIONS	EWAD-CZXS / EWAD-CZXL			C11	C12	C13	C14	C15
Capacity (1)	Cooling		kW	1095	1236	1308	1450	1545
Capacity control	Type		---	Stepless				
	Minimum capacity		%	20	20	20	20	20
Unit power input (1)	Cooling		kW	375	400	442	488	531
EER (1)			---	2.92	3.09	2.96	2.97	2.91
ESEER			---	5.03	4.93	4.74	5.02	5.17
IPLV			---	5.56	5.58	5.45	5.61	5.75
Casing	Colour		---	Ivory White				
	Material		---	Galvanized and painted steel sheet				
Dimensions	Unit	Height	mm	2540	2540	2540	2540	2540
		Width	mm	2285	2285	2285	2285	2285
		Length	mm	8525	10325	10325	11625	12525
Weight (ST)	Unit		kg	7440	8570	8970	9600	9940
	Operating Weight		kg	7880	8960	9360	9980	10320
Weight (LN)	Unit		kg	7720	8850	9250	9880	10220
	Operating Weight		kg	8160	9240	9640	10260	10600
Water heat exchanger	Type		---	Single Pass Shell&Tube				
	Water volume		l	441	383	383	374	374
	Nominal water flow rate	Cooling	l/s	52.30	59.00	62.40	69.20	73.70
	Nominal Water pressure drop	Cooling	kPa	69	46	51	61	71
	Insulation material			Closed cell				
Air heat exchanger	Type		---	High efficiency fin and tube type with integral subcooler				
Fan	Type		---	Direct propeller type				
	Drive		---	DOL				
	Diameter		mm	800	800	800	800	800
	Nominal air flow		l/s	86700	108376	108376	119213	130051
	Model	Quantity	No.	16	20	20	22	24
		Speed	rpm	900	900	900	900	900
		Motor input	kW	1.75	1.75	1.75	1.75	1.75
Compressor	Type		---	Semi-hermetic single screw compressor Inverter driven				
	Oil charge		l	38	44	50	50	50
	Quantity		No.	2	2	2	2	2
Sound level (XS)	Sound Power	Cooling	dB(A)	102.9	103.5	103.5	104.1	104.1
	Sound Pressure (2)	Cooling	dB(A)	81.1	81.2	81.2	81.2	81.2
Sound level (XL)	Sound Power	Cooling	dB(A)	99.9	100.5	100.5	101.1	101.1
	Sound Pressure (2)	Cooling	dB(A)	78.1	78.2	78.2	78.2	78.2
Refrigerant circuit	Refrigerant type		---	R-134a	R-134a	R-134a	R-134a	R-134a
	Refrigerant charge		kg.	200	235	235	275	320
	N. of circuits		No.	2	2	2	2	2
Piping connections	Evaporator water inlet/outlet		mm	219.1	219.1	219.1	219.1	219.1
Safety devices	High discharge pressure (pressure switch)							
	High discharge pressure (pressure transducer)							
	Low suction pressure (pressure transducer)							
	Compressor motor protection							
	High discharge temperature							
	Low oil pressure							
	Low pressure ratio							
	High oil filter pressure drop							
	Phase monitor							
	Emergency stop button							
	Water freeze protection controller							
Notes (1)	Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12/7°C; ambient 35°C, unit at full load operation.							
Notes (2)	The values are according to ISO 3744 and are referred to: evaporator 12/7°C, ambient 35°C, full load operation.							

TECHNICAL SPECIFICATIONS	EWAD-CZXS / EWAD-CZXL			C16	C17	C18		
Capacity (1)	Cooling		kW	1622	1709	1802		
Capacity control	Type		---	Stepless				
	Minimum capacity		%	13	13	13		
Unit power input (1)	Cooling		kW	558	588	611		
EER (1)			---	2.91	2.90	2.95		
ESEER			---	5.03	5.03	4.85		
IPLV			---	5.85	5.76	5.45		
Casing	Colour		---	Ivory White				
	Material		---	Galvanized and painted steel sheet				
Dimensions	Unit	Height	mm	2540	2540	2540		
		Width	mm	2285	2285	2285		
		Length	mm	12525	13425	14325		
Weight (ST)	Unit		kg	11370	12190	12920		
	Operating Weight		kg	12220	13040	13790		
Weight (LN)	Unit		kg	11790	12610	13340		
	Operating Weight		kg	12640	13460	14210		
Water heat exchanger	Type		---	Single Pass Shell&Tube				
	Water volume		l	850	850	871		
	Nominal water flow rate	Cooling	l/s	77.40	81.50	86.00		
	Nominal Water pressure drop	Cooling	kPa	62	68	64		
	Insulation material			Closed cell				
Air heat exchanger	Type		---	High efficiency fin and tube type with integral subcooler				
Fan	Type		---	Direct propeller type				
	Drive		---	DOL				
	Diameter		mm	800	800	800		
	Nominal air flow		l/s	129454	140143	151129		
	Model	Quantity	No.	24	26	28		
		Speed	rpm	900	900	900		
		Motor input	kW	1.75	1.75	1.75		
Compressor	Type		---	Semi-hermetic single screw compressor Inverter driven				
	Oil charge		l	57	63	69		
	Quantity		No.	3	3	3		
Sound level (XS)	Sound Power	Cooling	dB(A)	105.8	106.0	106.2		
	Sound Pressure (2)	Cooling	dB(A)	82.8	82.9	82.9		
Sound level (XL)	Sound Power	Cooling	dB(A)	102.8	103.0	103.2		
	Sound Pressure (2)	Cooling	dB(A)	79.8	79.9	79.9		
Refrigerant circuit	Refrigerant type		---	R-134a	R-134a	R-134a		
	Refrigerant charge		kg.	327	343	361		
	N. of circuits		No.	3	3	3		
Piping connections	Evaporator water inlet/outlet		mm	273.0	273.0	273.0		
Safety devices	High discharge pressure (pressure switch)							
	High discharge pressure (pressure transducer)							
	Low suction pressure (pressure transducer)							
	Compressor motor protection							
	High discharge temperature							
	Low oil pressure							
	Low pressure ratio							
	High oil filter pressure drop							
	Phase monitor							
	Emergency stop button							
	Water freeze protection controller							
Notes (1)	Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12/7°C; ambient 35°C, unit at full load operation.							
Notes (2)	The values are according to ISO 3744 and are referred to: evaporator 12/7°C, ambient 35°C, full load operation.							

ELECTRICAL SPECIFICATIONS	EWAD-CZXS / EWAD-CZXL			670	740	830	900	C10
Power Supply	Phase		---	3	3	3	3	3
	Frequency		Hz	50	50	50	50	50
	Voltage		V	400	400	400	400	400
	Voltage Tolerance	Minimum	%	-10%	-10%	-10%	-10%	-10%
		Maximum	%	+10%	+10%	+10%	+10%	+10%
Unit	Maximum starting current		A	322	349	402	444	496
	Nominal running current cooling		A	362	351	398	453	504
	Maximum running current		A	451	490	560	622	691
	Maximum current for wires sizing		A	494	537	614	683	758
Fans	Nominal running current in cooling		A	40	48	56	56	64
Compressor	Phase		No.	3	3	3	3	3
	Voltage		V	400	400	400	400	400
	Voltage Tolerance	Minimum	%	-10%	-10%	-10%	-10%	-10%
		Maximum	%	+10%	+10%	+10%	+10%	+10%
	Maximum running current		A	205+205	221+221	221+283	283+283	283+344
	Starting method		---	VFD				

ELECTRICAL SPECIFICATIONS	EWAD-CZXS / EWAD-CZXL			C11	C12	C13	C14	C15
Power Supply	Phase		---	3	3	3	3	3
	Frequency		Hz	50	50	50	50	50
	Voltage		V	400	400	400	400	400
	Voltage Tolerance	Minimum	%	-10%	-10%	-10%	-10%	-10%
		Maximum	%	+10%	+10%	+10%	+10%	+10%
Unit	Maximum starting current		A	537	594	635	708	762
	Nominal running current cooling		A	555	597	656	724	789
	Maximum running current		A	751	828	889	978	1068
	Maximum current for wires sizing		A	825	909	976	1075	1173
Fans	Nominal running current in cooling		A	64	80	80	88	96
Compressor	Phase		No.	3	3	3	3	3
	Voltage		V	400	400	400	400	400
	Voltage Tolerance	Minimum	%	-10%	-10%	-10%	-10%	-10%
		Maximum	%	+10%	+10%	+10%	+10%	+10%
	Maximum running current		A	344+344	344+404	404+404	404+486	486+486
	Starting method		---	VFD				

ELECTRICAL SPECIFICATIONS	EWAD-CZXS / EWAD-CZXL			C16	C17	C18		
Power Supply	Phase		---	3	3	3		
	Frequency		Hz	50	50	50		
	Voltage		V	400	400	400		
	Voltage Tolerance	Minimum	%	-10%	-10%	-10%		
		Maximum	%	+10%	+10%	+10%		
Unit	Maximum starting current		A	844	901	957		
	Nominal running current cooling		A	826	873	908		
	Maximum running current		A	1127	1196	1265		
	Maximum current for wires sizing		A	1238	1313	1389		
Fans	Nominal running current in cooling		A	96	104	112		
Compressor	Phase		No.	3	3	3		
	Voltage		V	400	400	400		
	Voltage Tolerance	Minimum	%	-10%	-10%	-10%		
		Maximum	%	+10%	+10%	+10%		
	Maximum running current		A	344+344+344	344+344+404	404+404+344		
	Starting method		---	VFD				

Notes	Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.
	Maximum starting current: starting current of biggest compressor + current of the compressor at 75% maximum load + fans current for the circuit at 75%.
	Nominal current in cooling mode is referred to the following conditions: evaporator 12°C/7°C; ambient 35°C; compressors + fans current.
	Maximum running current is based on max compressor absorbed current in its envelope and max fans absorbed current.
	Maximum unit current for wires sizing is based on minimum allowed voltage.
	Maximum current for wires sizing: (compressors full load ampere + fans current) x 1,1.

EWAD-CZXR

TECHNICAL SPECIFICATIONS			EWAD-CZXR	640	700	790	850	980
Capacity (1)	Cooling		kW	635	700	789	852	976
Capacity control	Type		---	Stepless				
	Minimum capacity		%	20	20	20	20	20
Unit power input (1)	Cooling		kW	260	242	271	314	347
EER (1)			---	2.44	2.89	2.91	2.71	2.81
ESEER			---	5.52	5.71	5.76	5.76	5.79
IPLV			---	5.94	6.14	6.32	6.37	6.34
Casing	Colour		---	Ivory White				
	Material		---	Galvanized and painted steel sheet				
Dimensions	Unit	Height	mm	2540	2540	2540	2540	2540
		Width	mm	2285	2285	2285	2285	2285
		Length	mm	6725	6725	7625	7625	8525
Weight	Unit		kg	6170	6470	7100	7360	7950
	Operating Weight		kg	6430	6720	7340	7600	8390
Water heat exchanger	Type		---	Single Pass Shell&Tube				
	Water volume		l	263	248	241	241	441
	Nominal water flow rate	Cooling	l/s	30.30	33.40	37.60	40.70	46.60
	Nominal Water pressure drop	Cooling	kPa	73	69	51	58	57
	Insulation material			Closed cell				
Air heat exchanger	Type		---	High efficiency fin and tube type with integral subcooler				
Fan	Type		---	Direct propeller type				
	Drive		---	DOL				
	Diameter		mm	800	800	800	800	800
	Nominal air flow		l/s	41536	49843	58151	58151	66458
	Model	Quantity	No.	10	12	14	14	16
		Speed	rpm	700	700	700	700	700
		Motor input	kW	0.78	0.78	0.78	0.78	0.78
Compressor	Type		---	Semi-hermetic single screw compressor Inverter driven				
	Oil charge		l	32	32	35	38	38
	Quantity		No.	2	2	2	2	2
Sound level	Sound Power	Cooling	dB(A)	94.6	95.2	95.5	95.5	95.9
	Sound Pressure (2)	Cooling	dB(A)	73.5	74.0	74.1	74.1	74.1
Refrigerant circuit	Refrigerant type		---	R-134a	R-134a	R-134a	R-134a	R-134a
	Refrigerant charge		kg.	141	161	178	178	200
	N. of circuits		No.	2	2	2	2	2
Piping connections	Evaporator water inlet/outlet		mm	168.3	168.3	168.3	168.3	219.1
Safety devices	High discharge pressure (pressure switch)							
	High discharge pressure (pressure transducer)							
	Low suction pressure (pressure transducer)							
	Compressor motor protection							
	High discharge temperature							
	Low oil pressure							
	Low pressure ratio							
	High oil filter pressure drop							
	Phase monitor							
	Emergency stop button							
	Water freeze protection controller							
Notes (1)	Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12/7°C; ambient 35°C, unit at full load operation.							
Notes (2)	The values are according to ISO 3744 and are referred to: evaporator 12/7°C, ambient 35°C, full load operation.							

TECHNICAL SPECIFICATIONS			EWAD-CZXR	C10	C11	C12	C13	C14
Capacity (1)	Cooling		kW	1031	1170	1235	1332	1443
Capacity control	Type		---	Stepless				
	Minimum capacity		%	20	20	20	20	20
Unit power input (1)	Cooling		kW	388	408	455	524	589
EER (1)			---	2.65	2.86	2.71	2.55	2.45
ESEER			---	5.49	5.41	5.05	5.45	5.60
IPLV			---	6.05	5.96	5.67	6.03	6.21
Casing	Colour		---	Ivory White				
	Material		---	Galvanized and painted steel sheet				
Dimensions	Unit	Height	mm	2540	2540	2540	2540	2540
		Width	mm	2285	2285	2285	2285	2285
		Length	mm	8525	10325	10325	11625	12525
Weight (ST)	Unit		kg	7950	9120	9530	10180	10530
	Operating Weight		kg	8390	9500	9920	10550	10910
Water heat exchanger	Type		---	Single Pass Shell&Tube				
	Water volume		l	441	383	383	374	374
	Nominal water flow rate	Cooling	l/s	49.20	55.80	58.90	63.60	68.80
	Nominal Water pressure drop	Cooling	kPa	63	43	47	53	59
	Insulation material			Closed cell				
Air heat exchanger	Type		---	High efficiency fin and tube type with integral subcooler				
Fan	Type		---	Direct propeller type				
	Drive		---	DOL				
	Diameter		mm	800	800	800	800	800
	Nominal air flow		l/s	66458	83072	83072	83072	83072
	Model	Quantity	No.	16	20	20	22	24
		Speed	rpm	700	700	700	700	700
		Motor input	kW	0.784	0.784	0.784	0.784	0.784
Compressor	Type		---	Semi-hermetic single screw compressor Inverter driven				
	Oil charge		l	38	44	50	50	50
	Quantity		No.	2	2	2	2	2
Sound level (ST)	Sound Power	Cooling	dB(A)	95.9	96.5	96.5	97.1	97.1
	Sound Pressure (2)	Cooling	dB(A)	74.1	74.2	74.2	74.2	74.2
Refrigerant circuit	Refrigerant type		---	R-134a	R-134a	R-134a	R-134a	R-134a
	Refrigerant charge		kg.	200	235	235	275	320
	N. of circuits		No.	2	2	2	2	2
Piping connections	Evaporator water inlet/outlet		mm	219.1	219.1	219.1	219.1	219.1
Safety devices	High discharge pressure (pressure switch)							
	High discharge pressure (pressure transducer)							
	Low suction pressure (pressure transducer)							
	Compressor motor protection							
	High discharge temperature							
	Low oil pressure							
	Low pressure ratio							
	High oil filter pressure drop							
	Phase monitor							
	Emergency stop button							
	Water freeze protection controller							
Notes (1)	Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12/7°C; ambient 35°C, unit at full load operation.							
Notes (2)	The values are according to ISO 3744 and are referred to: evaporator 12/7°C, ambient 35°C, full load operation.							

TECHNICAL SPECIFICATIONS			EWAD-CZXR	C15	C16	C17		
Capacity (1)	Cooling		kW	1545	1631	1712		
Capacity control	Type		---	Stepless				
	Minimum capacity		%	13	13	13		
Unit power input (1)	Cooling		kW	580	610	631		
EER (1)			---	2.66	2.67	2.71		
ESEER			---	5.51	5.33	5.19		
IPLV			---	6.28	6.03	5.91		
Casing	Colour		---	Ivory White				
	Material		---	Galvanized and painted steel sheet				
Dimensions	Unit	Height	mm	2540	2540	2540		
		Width	mm	2285	2285	2285		
		Length	mm	12525	13425	14325		
Weight (ST)	Unit		kg	12150	12990	13740		
	Operating Weight		kg	13000	13840	14610		
Water heat exchanger	Type		---	Single Pass Shell&Tube				
	Water volume		l	850	850	871		
	Nominal water flow rate	Cooling	l/s	73.70	77.80	81.70		
	Nominal Water pressure drop	Cooling	kPa	57	62	59		
	Insulation material			Closed cell				
Air heat exchanger	Type		---	High efficiency fin and tube type with integral subcooler				
Fan	Type		---	Direct propeller type				
	Drive		---	DOL				
	Diameter		mm	800	800	800		
	Nominal air flow		l/s	99687	107994	116301		
	Model	Quantity	No.	24	26	28		
		Speed	rpm	700	700	700		
		Motor input	kW	0.784	0.784	0.784		
Compressor	Type		---	Semi-hermetic single screw compressor Inverter driven				
	Oil charge		l	57	63	69		
	Quantity		No.	3	3	3		
Sound level (ST)	Sound Power	Cooling	dB(A)	98.8	99.0	99.2		
	Sound Pressure (2)	Cooling	dB(A)	75.8	75.9	75.9		
Refrigerant circuit	Refrigerant type		---	R-134a	R-134a	R-134a		
	Refrigerant charge		kg.	327	343	361		
	N. of circuits		No.	3	3	3		
Piping connections	Evaporator water inlet/outlet		mm	273.0	273.0	273.0		
Safety devices	High discharge pressure (pressure switch)							
	High discharge pressure (pressure transducer)							
	Low suction pressure (pressure transducer)							
	Compressor motor protection							
	High discharge temperature							
	Low oil pressure							
	Low pressure ratio							
	High oil filter pressure drop							
	Phase monitor							
	Emergency stop button							
	Water freeze protection controller							
Notes (1)	Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12/7°C; ambient 35°C, unit at full load operation.							
Notes (2)	The values are according to ISO 3744 and are referred to: evaporator 12/7°C, ambient 35°C, full load operation.							

ELECTRICAL SPECIFICATIONS			EWAD-CZXR	640	700	790	850	980
Power Supply	Phase		---	3	3	3	3	3
	Frequency		Hz	50	50	50	50	50
	Voltage		V	400	400	400	400	400
	Voltage Tolerance	Minimum	%	-10%	-10%	-10%	-10%	-10%
		Maximum	%	+10%	+10%	+10%	+10%	+10%
Unit	Maximum starting current		A	315	340	393	434	485
	Nominal running current cooling		A	383	360	405	466	516
	Maximum running current		A	437	473	540	602	668
	Maximum current for wires sizing		A	480	520	594	663	735
Fans	Nominal running current in cooling		A	26	31.2	36.4	36.4	41.6
Compressor	Phase		No.	3	3	3	3	3
	Voltage		V	400	400	400	400	400
	Voltage Tolerance	Minimum	%	-10%	-10%	-10%	-10%	-10%
		Maximum	%	+10%	+10%	+10%	+10%	+10%
	Maximum running current		A	205+205	221+221	221+283	283+283	283+344
	Starting method		---	VFD				

ELECTRICAL SPECIFICATIONS			EWAD-CZXR	C10	C11	C12	C13	C14
Power Supply	Phase		---	3	3	3	3	3
	Frequency		Hz	50	50	50	50	50
	Voltage		V	400	400	400	400	400
	Voltage Tolerance	Minimum	%	-10%	-10%	-10%	-10%	-10%
		Maximum	%	+10%	+10%	+10%	+10%	+10%
Unit	Maximum starting current		A	526	580	621	686	740
	Nominal running current cooling		A	574	608	674	771	864
	Maximum running current		A	729	800	861	942	1024
	Maximum current for wires sizing		A	803	881	948	1039	1129
Fans	Nominal running current in cooling		A	41.6	52	52	52	52
Compressor	Phase		No.	3	3	3	3	3
	Voltage		V	400	400	400	400	400
	Voltage Tolerance	Minimum	%	-10%	-10%	-10%	-10%	-10%
		Maximum	%	+10%	+10%	+10%	+10%	+10%
	Maximum running current		A	344+344	344+404	404+404	404+486	486+486
	Starting method		---	VFD				

ELECTRICAL SPECIFICATIONS			EWAD-CZXR	C15	C16	C17		
Power Supply	Phase		---	3	3	3		
	Frequency		Hz	50	50	50		
	Voltage		V	400	400	400		
	Voltage Tolerance	Minimum	%	-10%	-10%	-10%		
		Maximum	%	+10%	+10%	+10%		
Unit	Maximum starting current		A	822	876	929		
	Nominal running current cooling		A	856	902	936		
	Maximum running current		A	1093	1159	1225		
	Maximum current for wires sizing		A	1204	1277	1350		
Fans	Nominal running current in cooling		A	62	68	73		
Compressor	Phase		No.	3	3	3		
	Voltage		V	400	400	400		
	Voltage Tolerance	Minimum	%	-10%	-10%	-10%		
		Maximum	%	+10%	+10%	+10%		
	Maximum running current		A	344+344+344	344+344+404	404+404+344		
	Starting method		---	VFD				

Notes	Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.
	Maximum starting current: starting current of biggest compressor + current of the compressor at 75% maximum load + fans current for the circuit at 75%.
	Nominal current in cooling mode is referred to the following conditions: evaporator 12°C/7°C; ambient 35°C; compressors + fans current.
	Maximum running current is based on max compressor absorbed current in its envelope and max fans absorbed current.
	Maximum unit current for wires sizing is based on minimum allowed voltage.
	Maximum current for wires sizing: (compressors full load ampere + fans current) x 1,1.

Sound levels

EWAD~CZXS

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)
670	64.1	65.4	72.2	76.8	78.5	72.3	68.1	59.0	**102.1**	**81.0**
740	64.2	65.5	72.2	76.8	78.5	72.4	68.2	59.0	**102.2**	**81.0**
830	64.2	65.5	72.2	76.8	78.5	72.4	68.2	59.1	**102.5**	**81.1**
900	64.2	65.5	72.2	76.8	78.5	72.4	68.2	59.1	**102.5**	**81.1**
C10	64.2	65.5	72.3	76.9	78.6	72.4	68.2	59.1	**102.9**	**81.1**
C11	64.2	65.5	72.3	76.9	78.6	72.4	68.2	59.1	**102.9**	**81.1**
C12	64.3	65.6	72.3	76.9	78.6	72.5	68.3	59.2	**103.5**	**81.2**
C13	64.3	65.6	72.3	76.9	78.6	72.5	68.3	59.2	**103.5**	**81.2**
C14	64.3	65.6	72.3	76.9	78.6	72.5	68.3	59.2	**104.1**	**81.2**
C15	64.3	65.7	72.4	77.0	78.7	72.5	68.3	59.2	**104.1**	**81.2**
C16	66.0	67.3	74.0	78.6	80.3	74.2	70.0	60.8	**105.8**	**82.8**
C17	66.0	67.3	74.0	78.6	80.3	74.2	70.0	60.9	**106.0**	**82.9**
C18	66.0	67.3	74.0	78.6	80.3	74.2	70.0	60.9	**106.2**	**82.9**

The values are according to ISO 3744 and are referred to: evaporator 12/7° C, air ambient 35° C, full load operation

EWAD~CZXL

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)
670	60.6	61.9	68.7	73.3	75.0	68.8	64.6	55.5	**98.6**	**77.5**
740	61.2	62.5	69.2	73.8	75.5	69.4	65.2	56.0	**99.2**	**78.0**
830	61.2	62.5	69.2	73.8	75.5	69.4	65.2	56.1	**99.5**	**78.1**
900	61.2	62.5	69.2	73.8	75.5	69.4	65.2	56.1	**99.5**	**78.1**
C10	61.2	62.5	69.3	73.9	75.6	69.4	65.2	56.1	**99.9**	**78.1**
C11	61.2	62.5	69.3	73.9	75.6	69.4	65.2	56.1	**99.9**	**78.1**
C12	61.3	62.6	69.3	73.9	75.6	69.5	65.3	56.2	**100.5**	**78.2**
C13	61.3	62.6	69.3	73.9	75.6	69.5	65.3	56.2	**100.5**	**78.2**
C14	61.3	62.6	69.3	73.9	75.6	69.5	65.3	56.2	**101.1**	**78.2**
C15	61.3	62.7	69.4	74.0	75.7	69.5	65.3	56.2	**101.1**	**78.2**
C16	63.0	64.3	71.0	75.6	77.3	71.2	67.0	57.8	**102.8**	**79.8**
C17	63.0	64.3	71.0	75.6	77.3	71.2	67.0	57.9	**103.0**	**79.9**
C18	63.0	64.3	71.0	75.6	77.3	71.2	67.0	57.9	**103.2**	**79.9**

The values are according to ISO 3744 and are referred to: evaporator 12/7° C, air ambient 35° C, full load operation

EWAD~CZXR

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)
640	56.6	57.9	64.7	69.3	71.0	64.8	60.6	51.5	**94.6**	**73.5**
700	57.2	58.5	65.2	69.8	71.5	65.4	61.2	52.0	**95.2**	**74.0**
790	57.2	58.5	65.2	69.8	71.5	65.4	61.2	52.1	**95.5**	**74.1**
850	57.2	58.5	65.2	69.8	71.5	65.4	61.2	52.1	**95.5**	**74.1**
980	57.2	58.5	65.3	69.9	71.6	65.4	61.2	52.1	**95.9**	**74.1**
C10	57.2	58.5	65.3	69.9	71.6	65.4	61.2	52.1	**95.9**	**74.1**
C11	57.3	58.6	65.3	69.9	71.6	65.5	61.3	52.2	**96.5**	**74.2**
C12	57.3	58.6	65.3	69.9	71.6	65.5	61.3	52.2	**96.5**	**74.2**
C13	57.3	58.6	65.3	69.9	71.6	65.5	61.3	52.2	**97.1**	**74.2**
C14	57.3	58.7	65.4	70.0	71.7	65.5	61.3	52.2	**97.1**	**74.2**
C15	59.0	60.3	67.0	71.6	73.3	67.2	63.0	53.8	**98.8**	**75.8**
C16	59.0	60.3	67.0	71.6	73.3	67.2	63.0	53.9	**99.0**	**75.9**
C17	59.0	60.3	67.0	71.6	73.3	67.2	63.0	53.9	**99.2**	**75.9**

The values are according to ISO 3744 and are referred to: evaporator 12/7° C, air ambient 35° C, full load operation

Sound pressure level correction factor for different distances

Unit size			Distance						
EWAD~CZ-XS	EWAD~CZ-XL	EWAD~CZ-XR	1m	5m	10m	15m	20m	25m	50m
670	**670**	**640**	0.0	7.0	11.5	14.4	16.6	18.4	24.0
740	**740**	**700**	0.0	7.0	11.5	14.4	16.6	18.4	24.0
830	**830**	**790**	0.0	6.8	11.3	14.2	16.4	18.1	23.7
900	**900**	**850**	0.0	6.8	11.3	14.2	16.4	18.1	23.7
C10	**C10**	**980**	0.0	6.6	11.0	13.9	16.1	17.9	23.4
C11	**C11**	**C10**	0.0	6.6	11.0	13.9	16.1	17.9	23.4
C12	**C12**	**C11**	0.0	6.4	10.7	13.5	15.7	17.4	22.9
C13	**C13**	**C12**	0.0	6.4	10.7	13.5	15.7	17.4	22.9
C14	**C14**	**C13**	0.0	6.1	10.3	13.1	15.2	16.9	22.4
C15	**C15**	**C14**	0.0	6.1	10.3	13.1	15.2	16.9	22.4
C16	**C16**	**C15**	0.0	6.1	10.3	13.1	15.2	16.9	22.4
C17	**C17**	**C16**	0.0	6.0	10.2	12.9	15.0	16.7	22.2
C18	**C18**	**C17**	0.0	6.0	10.0	12.8	14.9	16.6	22.0

Values are dB(A) (pressure level)

Reduction to be applied to standard, low and reduced noise levels

Operating limits

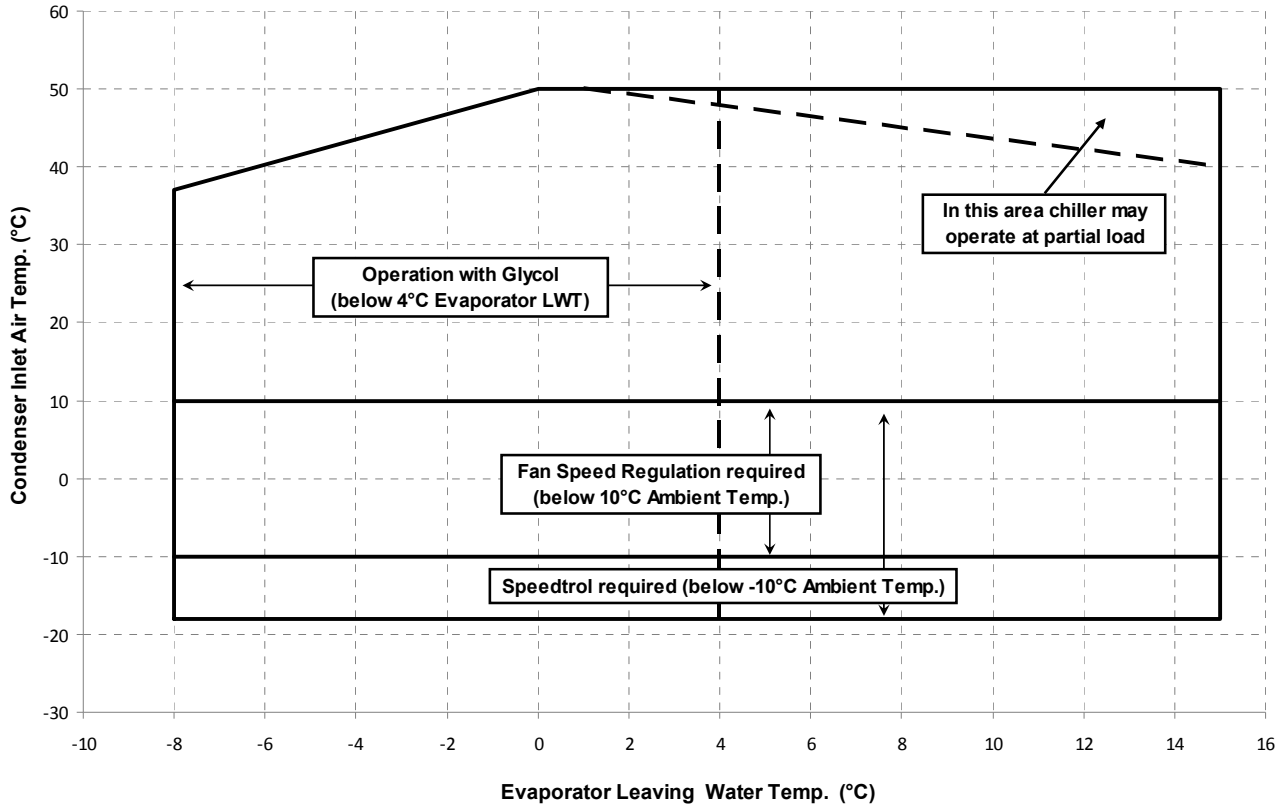


Table 1 - Evaporator minimum and maximum water Δt

Max evaporator water Δt	**°C**	**8**
Min evaporator water Δt	**°C**	**4**

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 - Altitude correction factors

Elevation above sea level (m)	0	300	600	900	1200	1500	1800
Barometric pressure (mbar)	1013	977	942	908	875	843	812
Cooling capacity correction factor	1.000	0.993	0.986	0.979	0.973	0.967	0.960
Power input correction factor	1.000	1.005	1.009	1.015	1.021	1.026	1.031
Maximum Ambient Temperature	1.000	1.000	1.000	1.000	0.992	0.980	0.968

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

How to use the correction factors proposed in the previous tables

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:	**EWAD670CZXS**
Mixture:	Water
Working condition:	ELWT 12/7°C – Condenser inlet air temperature 35°C
- Cooling capacity:	672 kW
- Power input:	245 kW
- Flow rate (Δt 5°C):	32.00 l/s
- Evaporator pressure drop:	80 kPa
Mixture:	Water + Ethylene Glycol 30% (for a winter air temperature up to -15°C)
Working condition:	ELWT 12/7°C – Condenser inlet air temperature 35°C
- Cooling capacity:	672 x 0.972 = 653 kW
- Power input:	245 x 0.986 = 242 kW
- Flow rate (Δt 5°C):	31.19 (referred to 653 kW) x 1.074 = 33.50 l/s
- Evaporator pressure drop:	76.25 (referred to 31.19 l/s) x 1.181 = 90.06 kPa

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:	**EWAD670CZXS**
Mixture:	Water
Standard working condition	ELWT 12/7°C – Condenser inlet air temperature 30°C
- Cooling capacity:	710 kW
- Power input:	219 kW
- Flow rate (Δt 5°C):	33.90 l/s
- Evaporator pressure drop:	88 kPa
Mixture:	Water + Glycol 30% (for a low evaporator leaving temperature of -1/-6°C)
Working condition:	ELWT -1/-6°C – Condenser inlet air temperature 30°C
- Cooling capacity:	710 x 0.613 x 0.972 = 423 kW
- Power input:	219 x 0.870 x 0.986 = 188 kW
- Flow rate (Δt 5°C):	20.22 l/s (referred to 423 kW) x 1.074 = 21.72 l/s
- Evaporator pressure drop:	38.28 kPa (referred to 20.00 l/s) x 1.181 = 45.21 kPa

Table 7 - Available fan static pressure correction factors

External Static Pressure (Pa)	0	10	20	30	40	50	60	70	80	90	100
Cooling Capacity (kW) Correction factor	1.000	0.998	0.996	0.995	0.993	0.992	0.991	0.989	0.986	0.985	0.982
Compr. Power Input (kW) Correction factor	1.000	1.004	1.009	1.012	1.018	1.021	1.024	1.027	1.034	1.039	1.045
Reduction of Max CIAT (°C)	1.000	-0.3	-0.5	-0.7	-1.0	-1.1	-1.3	-1.6	-1.8	2.1	-2.4

CIAT: Condenser Inlet Air Temperature

External Static Pressure (Pa)	0	10	20	30	40	50	60	70
Cooling Capacity (kW) Correction factor	1.000	0.996	0.991	0.985	0.978	0.97	0.954	0.927
Compr. Power Input (kW) Correction factor	1.000	1.005	1.012	1.02	1.028	1.039	1.058	1.092
Reduction of Max CIAT (°C)	1.000	-0.3	-0.7	-1.1	-1.6	-2.2	-3.3	-5.1

CIAT: Condenser Inlet Air Temperature

How to use the correction factors proposed in the previous tables

Example

Unit Size:	**EWAD670CZXS**
- External static pressure	**0 Pa**
- Working condition:	ELWT 12/7°C – Condenser inlet air temperature 35°C
- Cooling capacity:	672 kW
- Power input:	245 kW
- Maximum CIAT	50°C (see graphic operating limit)
- External static pressure	**40 Pa**
- Working condition:	ELWT 12/7°C – Condenser inlet air temperature 35°C
- Cooling capacity:	672 x 0.978 = 657 kW
- Power input:	245 x 1.028= 252 kW
- Maximum CIAT	50 - 1.6 = 48.4°C

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	6.8 - 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 80	Below 80	Below 30	Below 30	Below 30	Below 30	Corrosion + Scale
		(µS/cm) at 25°C	(Below 800)	(Below 300)	(Below 400)	(Below 800)	(Below 800)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	Corrosion + Scale
	Chloride ion	[mgCl^{2-}/l]	Below 200	Below 50	Below 50	Below 200	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	Sulfate ion	[mgSO^{2-}_4/l]	Below 200	Below 50	Below 50	Below 200	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	M-alkalinity (pH4.8)	[mg$CaCO_3$/l]	Below 100	Below 50	Below 50	Below 100	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Total hardness	[mg$CaCO_3$/l]	Below 200	Below 70	Below 70	Below 200	Below 70	Below 70	Below 70	Below 70	Below 70	Scale
	Calcium harness	[mg$CaCO_3$/l]	Below 150	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Silca ion	[mgSiO_2/l]	Below 50	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Scale
	Oxygen	(mg O2 /l)	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Corrosion
	Particole size	(mm)	Below 0.5	Below 0.5	Below 0.5	Below 0.5	Below 0.6	Below 0.5	Below 0.6	Below 0.5	Below 0.6	Erosion
	Total dissolved solids	(mg / l)	Below 1000	Below 1000	Below 1000	Below 1000	Below 1001	Below 1000	Below 1001	Below 1000	Below 1001	Erosion
	Ethykene, Propylene Glycol (weight conc.)		Below 60%	Below 60%	---	Below 60%	Below 60%	Below 60%	Below 60%	Below 60%	Below 60%	--
Items to be referred to:	Nitrate ion	(mg NO3- /l)	Below 100	Below 100	Below 100	Below 100	Below 101	Below 100	Below 101	Below 100	Below 101	Corrosion
	TOC Total organic carbon	(mg /l)	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Scale
	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	[mgS^{2-}/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	[mgCO_2/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

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.
6 The limits above have to be considered as a general prescription and con not totallu assure the absence of corrossion and erosion.
Some particular combinations of elements or the presence of components not listed in the table or factors not considered may trigger corrosion phenomena.

Water content in cooling circuits

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, McQuay has 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 with a certain approximation using this simplified formula:

For 2 compressors unit

M (liters) = (0.1595 x ΔT(°C) + 3.0825) x P(kW)

For 3 compressors 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.

Standard ratings

EWAD~CZXS/XL

		670							740						
		Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)						
ELWT (°C)		25	30	35	40	46	48	50	25	30	35	40	46	48	50
4	Cc (kW)	686	651	614	578	545	538	481	749	711	669	628	586	575	567
	Pi (kW)	189	212	239	270	316	333	283	183	204	228	257	297	313	329
	Qwe (l/s)	32.70	31.00	29.20	27.50	25.90	25.60	22.90	35.70	33.90	31.90	29.90	27.90	27.40	27.00
	Pdwe (kPa)	82	75	68	61	54	53	44	77	70	62	56	49	48	46
5	Cc (kW)	706	671	633	597	562	548	482	774	735	692	649	606	594	586
	Pi (kW)	191	214	241	272	317	324	266	186	206	230	259	299	314	330
	Qwe (l/s)	33.70	32.00	30.10	28.40	26.80	26.10	23.00	36.90	35.00	33.00	30.90	28.90	28.30	27.90
	Pdwe (kPa)	87	79	71	64	58	55	44	81	74	66	59	52	51	49
6	Cc (kW)	726	690	652	615	581	551	491	799	759	715	671	626	614	589
	Pi (kW)	193	216	243	274	318	306	258	188	209	233	260	300	315	312
	Qwe (l/s)	34.60	32.90	31.10	29.30	27.70	26.30	23.40	38.10	36.20	34.10	32.00	29.90	29.30	28.10
	Pdwe (kPa)	92	84	75	68	61	56	45	86	78	70	63	56	54	50
7	Cc (kW)	745	710	672	634	599	554	500	826	783	738	694	647	635	601
	Pi (kW)	195	219	245	276	320	289	251	191	211	235	262	301	316	305
	Qwe (l/s)	35.50	33.90	32.00	30.30	28.60	26.40	23.80	39.40	37.40	35.20	33.10	30.90	30.30	28.70
	Pdwe (kPa)	96	88	80	72	65	56	47	91	83	75	67	59	57	52
8	Cc (kW)	764	729	691	654	618	564	508	854	808	762	716	668	656	613
	Pi (kW)	198	221	248	278	321	281	244	193	213	237	264	303	318	297
	Qwe (l/s)	36.50	34.80	33.00	31.20	29.50	26.90	24.30	40.80	38.60	36.40	34.20	31.90	31.30	29.20
	Pdwe (kPa)	101	92	84	76	69	58	48	97	88	79	71	63	60	53
9	Cc (kW)	784	748	711	673	629	575	517	880	835	787	740	690	677	624
	Pi (kW)	200	223	250	280	314	274	237	196	216	240	267	305	319	290
	Qwe (l/s)	37.40	35.70	34.00	32.20	30.10	27.40	24.70	42.00	39.90	37.60	35.30	33.00	32.30	29.80
	Pdwe (kPa)	105	97	88	80	71	60	50	103	93	84	75	66	64	55
10	Cc (kW)	804	767	730	693	641	585	517	904	863	812	764	713	699	628
	Pi (kW)	203	226	252	282	306	267	223	199	219	242	269	307	321	274
	Qwe (l/s)	38.40	36.70	34.90	33.10	30.60	28.00	24.70	43.20	41.20	38.80	36.50	34.10	33.40	30.00
	Pdwe (kPa)	110	101	93	84	73	62	50	108	99	89	80	70	68	56
11	Cc (kW)	824	787	749	713	645	587	519	930	887	838	788	736	713	640
	Pi (kW)	205	228	255	285	290	252	230	201	222	245	271	309	314	268
	Qwe (l/s)	39.40	37.60	35.80	34.10	30.80	28.10	24.80	44.50	42.40	40.10	37.70	35.20	34.10	30.60
	Pdwe (kPa)	115	106	97	89	74	63	50	114	104	94	84	75	70	58
12	Cc (kW)	844	807	768	732	657	598	528	956	911	866	813	760	728	652
	Pi (kW)	208	231	257	287	283	246	224	204	225	248	274	311	307	262
	Qwe (l/s)	40.40	38.60	36.70	35.00	31.40	28.60	25.30	45.70	43.60	41.40	38.90	36.30	34.80	31.20
	Pdwe (kPa)	121	111	102	93	77	65	52	119	110	100	89	79	73	60
13	Cc (kW)	865	826	787	750	669	608	530	983	937	889	839	784	734	655
	Pi (kW)	210	233	260	290	277	240	212	207	227	251	277	313	292	248
	Qwe (l/s)	41.40	39.50	37.70	35.90	32.00	29.10	25.30	47.00	44.80	42.50	40.20	37.50	35.10	31.30
	Pdwe (kPa)	126	116	106	98	79	67	52	126	115	105	95	84	74	60
14	Cc (kW)	886	847	807	769	673	619	539	1010	963	913	867	808	748	667
	Pi (kW)	213	236	262	292	262	234	206	210	230	254	280	316	286	242
	Qwe (l/s)	42.40	40.50	38.60	36.80	32.20	29.60	25.80	48.30	46.10	43.70	41.50	38.70	35.80	31.90
	Pdwe (kPa)	132	121	111	102	80	69	54	132	121	110	100	88	77	63
15	Cc (kW)	907	867	827	788	685	620	549	1037	989	939	890	833	754	680
	Pi (kW)	216	239	265	295	257	221	202	213	233	257	283	319	272	237
	Qwe (l/s)	43.40	41.50	39.60	37.70	32.80	29.70	26.30	49.70	47.30	44.90	42.60	39.90	36.10	32.50
	Pdwe (kPa)	138	127	116	107	83	69	56	139	127	116	105	93	78	65

Cc (cooling capacity) - Pi (unit power input)
Qwe (evaporator water flow) - Pdwe (evaporator pressure drop)
ELWT (evaporator leaving water temperature – Δt 5°C).
Data are referred to 0,0176 m2 °C/kW evaporator fouling factor

		830							900						
		Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)						
ELWT (°C)		25	30	35	40	46	48	50	25	30	35	40	46	48	50
4	Cc (kW)	842	798	753	708	661	649	641	917	868	818	770	722	712	706
	Pi (kW)	210	232	257	286	326	341	357	241	266	294	325	367	383	399
	Qwe (l/s)	40.10	38.00	35.90	33.70	31.50	30.90	30.50	43.70	41.30	39.00	36.70	34.40	33.90	33.60
	Pdwe (kPa)	56	51	46	41	36	35	34	65	59	53	48	43	41	41
5	Cc (kW)	870	826	778	732	684	672	652	948	898	845	796	747	736	709
	Pi (kW)	213	235	260	289	329	344	349	245	270	297	328	371	386	382
	Qwe (l/s)	41.50	39.40	37.10	34.90	32.60	32.00	31.10	45.20	42.80	40.30	37.90	35.60	35.10	33.80
	Pdwe (kPa)	60	54	49	44	39	37	35	69	63	57	51	45	44	41
6	Cc (kW)	904	854	804	756	707	694	663	984	927	873	821	771	760	705
	Pi (kW)	216	238	263	292	331	346	340	249	273	301	332	375	390	359
	Qwe (l/s)	43.10	40.70	38.30	36.10	33.70	33.10	31.60	46.90	44.20	41.60	39.20	36.80	36.20	33.60
	Pdwe (kPa)	64	58	52	46	41	40	37	74	67	60	54	48	47	41
7	Cc (kW)	939	884	832	781	730	716	675	1021	960	902	847	795	783	712
	Pi (kW)	220	241	266	294	334	349	332	253	277	305	336	378	394	347
	Qwe (l/s)	44.80	42.20	39.70	37.30	34.80	34.20	32.20	48.70	45.80	43.00	40.40	37.90	37.30	34.00
	Pdwe (kPa)	68	61	55	49	43	42	38	79	71	64	57	51	49	42
8	Cc (kW)	975	917	858	806	753	739	692	1059	995	930	874	819	806	724
	Pi (kW)	224	245	269	297	336	351	330	258	282	309	340	382	397	340
	Qwe (l/s)	46.50	43.80	41.00	38.50	35.90	35.30	33.00	50.50	47.50	44.40	41.70	39.10	38.50	34.60
	Pdwe (kPa)	73	66	58	52	46	44	40	85	76	67	60	54	52	43
9	Cc (kW)	1013	951	889	834	777	757	710	1098	1031	963	903	844	815	732
	Pi (kW)	228	249	273	300	339	348	327	263	287	314	344	386	385	329
	Qwe (l/s)	48.40	45.40	42.50	39.80	37.10	36.20	33.90	52.50	49.20	46.00	43.10	40.30	38.90	34.90
	Pdwe (kPa)	78	70	62	55	49	47	41	91	81	72	64	57	53	44
10	Cc (kW)	1051	987	922	860	801	772	723	1140	1068	997	931	869	826	741
	Pi (kW)	233	253	277	304	342	340	320	268	292	319	348	390	374	318
	Qwe (l/s)	50.20	47.20	44.00	41.10	38.30	36.90	34.60	54.50	51.00	47.70	44.50	41.50	39.50	35.40
	Pdwe (kPa)	84	75	66	59	52	48	43	97	86	76	67	60	54	45
11	Cc (kW)	1091	1024	956	890	828	792	743	1182	1107	1033	963	897	838	752
	Pi (kW)	237	258	281	307	345	338	318	274	297	324	353	394	362	308
	Qwe (l/s)	52.20	48.90	45.70	42.60	39.60	37.90	35.50	56.50	52.90	49.40	46.00	42.90	40.00	35.90
	Pdwe (kPa)	90	80	71	62	55	51	45	104	92	81	72	63	56	46
12	Cc (kW)	1133	1062	991	923	854	809	754	1227	1148	1071	998	925	851	764
	Pi (kW)	242	262	285	312	348	331	308	279	303	329	359	399	352	299
	Qwe (l/s)	54.20	50.80	47.40	44.10	40.80	38.70	36.10	58.70	54.90	51.20	47.70	44.20	40.70	36.50
	Pdwe (kPa)	96	86	76	67	58	53	46	111	99	87	77	67	58	47
13	Cc (kW)	1175	1102	1028	957	877	831	761	1273	1191	1110	1034	946	866	772
	Pi (kW)	247	268	290	316	347	330	293	286	309	335	365	393	341	285
	Qwe (l/s)	56.20	52.70	49.20	45.80	42.00	39.70	36.40	60.90	57.00	53.10	49.50	45.30	41.40	36.90
	Pdwe (kPa)	103	92	81	71	61	55	47	119	105	93	82	70	59	48
14	Cc (kW)	1219	1142	1066	993	899	850	770	1320	1235	1151	1072	961	878	773
	Pi (kW)	253	273	296	321	340	323	292	292	316	342	371	378	327	288
	Qwe (l/s)	58.30	54.70	51.00	47.50	43.00	40.70	36.80	63.20	59.10	55.10	51.30	46.00	42.00	37.00
	Pdwe (kPa)	110	98	86	76	64	57	48	127	113	99	87	72	61	48
15	Cc (kW)	1264	1185	1106	1030	922	870	779	1370	1281	1194	1112	978	892	786
	Pi (kW)	259	279	301	326	335	318	279	299	323	349	377	363	313	276
	Qwe (l/s)	60.50	56.70	52.90	49.30	44.10	41.60	37.30	65.60	61.30	57.20	53.20	46.80	42.70	37.60
	Pdwe (kPa)	117	104	92	81	67	60	49	136	120	106	93	74	63	50

Cc (cooling capacity) - Pi (unit power input)
Qwe (evaporator water flow) - Pdwe (evaporator pressure drop)
ELWT (evaporator leaving water temperature – Δt 5°C).
Data are referred to 0,0176 m2 °C/kW evaporator fouling factor

		C10							C11						
		Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)						
ELWT (°C)		25	30	35	40	46	48	50	25	30	35	40	46	48	50
4	Cc (kW)	1056	996	933	871	809	794	765	1120	1058	992	929	864	848	802
	Pi (kW)	268	295	325	358	403	420	418	296	327	360	397	448	467	448
	Qwe (l/s)	50.30	47.40	44.40	41.50	38.50	37.80	36.40	53.40	50.40	47.30	44.20	41.20	40.40	38.20
	Pdwe (kPa)	65	58	52	46	40	39	36	72	65	58	51	45	44	39
5	Cc (kW)	1094	1032	966	902	837	821	779	1155	1092	1025	960	894	877	805
	Pi (kW)	273	300	330	363	408	424	410	301	331	365	402	453	472	427
	Qwe (l/s)	52.10	49.20	46.00	43.00	39.90	39.10	37.10	55.10	52.00	48.80	45.80	42.60	41.80	38.40
	Pdwe (kPa)	69	62	55	49	43	41	37	76	69	61	54	48	46	40
6	Cc (kW)	1134	1069	1001	935	866	849	794	1192	1127	1060	993	924	906	809
	Pi (kW)	278	304	334	367	412	429	402	306	336	370	407	458	477	407
	Qwe (l/s)	54.10	51.00	47.70	44.60	41.30	40.50	37.80	56.80	53.80	50.50	47.40	44.00	43.20	38.60
	Pdwe (kPa)	74	66	59	52	45	44	39	80	73	65	58	51	49	40
7	Cc (kW)	1174	1107	1037	968	896	866	809	1229	1165	1095	1027	955	913	813
	Pi (kW)	282	309	339	372	417	420	394	311	341	375	412	463	456	388
	Qwe (l/s)	56.00	52.80	49.50	46.20	42.80	41.30	38.60	58.70	55.60	52.30	49.00	45.60	43.60	38.80
	Pdwe (kPa)	78	71	63	55	48	45	40	85	77	69	62	54	50	40
8	Cc (kW)	1216	1147	1074	1003	928	890	824	1269	1202	1132	1062	987	932	829
	Pi (kW)	287	314	344	377	421	418	387	315	346	380	417	468	448	380
	Qwe (l/s)	58.10	54.70	51.30	47.90	44.30	42.50	39.40	60.60	57.40	54.00	50.70	47.10	44.50	39.60
	Pdwe (kPa)	84	75	67	59	51	48	42	90	82	73	65	57	52	42
9	Cc (kW)	1259	1187	1113	1039	959	908	836	1308	1240	1169	1097	1018	939	844
	Pi (kW)	292	319	349	382	426	410	375	320	351	385	423	474	428	373
	Qwe (l/s)	60.10	56.70	53.10	49.60	45.80	43.40	39.90	62.50	59.20	55.80	52.40	48.60	44.80	40.30
	Pdwe (kPa)	89	80	71	63	55	50	43	95	87	78	69	61	52	43
10	Cc (kW)	1302	1229	1152	1075	992	933	846	1349	1279	1206	1132	1050	957	846
	Pi (kW)	297	324	354	387	432	409	363	325	356	390	428	480	421	356
	Qwe (l/s)	62.20	58.70	55.00	51.40	47.40	44.60	40.40	64.40	61.10	57.60	54.10	50.20	45.70	40.40
	Pdwe (kPa)	95	85	76	67	58	52	44	101	92	82	74	64	54	44
11	Cc (kW)	1346	1271	1192	1113	1014	953	859	1390	1318	1243	1167	1059	962	861
	Pi (kW)	303	330	360	393	424	402	352	330	361	396	434	460	403	349
	Qwe (l/s)	64.40	60.70	57.00	53.20	48.50	45.60	41.00	66.40	63.00	59.40	55.80	50.60	46.00	41.10
	Pdwe (kPa)	101	91	81	71	60	54	45	106	97	87	78	65	55	45
12	Cc (kW)	1391	1313	1232	1151	1043	974	872	1431	1357	1280	1201	1079	979	874
	Pi (kW)	308	336	366	399	424	397	342	335	367	402	441	454	397	344
	Qwe (l/s)	66.50	62.80	58.90	55.00	49.90	46.60	41.70	68.40	64.90	61.20	57.50	51.60	46.80	41.80
	Pdwe (kPa)	107	96	86	76	64	56	46	112	102	92	82	68	57	46
13	Cc (kW)	1437	1356	1273	1190	1066	984	872	1473	1396	1316	1235	1085	981	861
	Pi (kW)	314	342	372	406	418	381	337	341	373	408	448	436	379	347
	Qwe (l/s)	68.80	64.90	60.90	56.90	51.00	47.10	41.70	70.50	66.80	63.00	59.10	51.90	46.90	41.20
	Pdwe (kPa)	113	102	91	81	66	57	46	118	107	97	86	68	57	45
14	Cc (kW)	1484	1400	1314	1229	1096	1001	886	1515	1435	1352	1269	1102	995	874
	Pi (kW)	320	348	379	413	418	371	328	347	379	415	455	430	374	342
	Qwe (l/s)	71.00	67.00	62.90	58.80	52.40	47.90	42.40	72.50	68.70	64.70	60.70	52.70	47.60	41.80
	Pdwe (kPa)	120	108	96	85	70	59	48	125	113	102	91	70	58	46
15	Cc (kW)	1531	1444	1356	1268	1114	1018	901	1557	1474	1388	1301	1105	1008	885
	Pi (kW)	327	355	386	420	408	362	319	353	386	423	463	413	370	338
	Qwe (l/s)	73.30	69.20	64.90	60.70	53.30	48.80	43.10	74.50	70.60	66.50	62.30	52.90	48.30	42.40
	Pdwe (kPa)	127	114	102	90	72	61	49	131	119	106	95	71	60	47

Cc (cooling capacity) - Pi (unit power input)
Qwe (evaporator water flow) - Pdwe (evaporator pressure drop)
ELWT (evaporator leaving water temperature – Δt 5°C).
Data are referred to 0,0176 m2 °C/kW evaporator fouling factor

		C12							C13						
		Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)						
ELWT (°C)		25	30	35	40	46	48	50	25	30	35	40	46	48	50
4	Cc (kW)	1255	1187	1116	1045	972	953	938	1334	1259	1185	1111	1038	1021	1011
	Pi (kW)	317	350	385	424	477	497	517	350	385	425	468	527	549	572
	Qwe (l/s)	59.80	56.60	53.20	49.80	46.30	45.40	44.70	63.50	60.00	56.40	52.90	49.40	48.70	48.10
	Pdwe (kPa)	48	43	38	34	30	29	28	53	48	43	38	34	33	32
5	Cc (kW)	1297	1228	1154	1082	1005	985	954	1380	1303	1224	1149	1073	1054	1013
	Pi (kW)	322	355	390	429	482	502	507	355	391	430	474	532	554	546
	Qwe (l/s)	61.80	58.50	55.00	51.60	47.90	46.90	45.50	65.70	62.10	58.30	54.80	51.10	50.30	48.30
	Pdwe (kPa)	50	46	41	36	32	31	29	56	51	45	41	36	35	32
6	Cc (kW)	1340	1271	1194	1120	1040	1018	965	1425	1347	1265	1188	1109	1089	1003
	Pi (kW)	327	360	395	434	487	506	489	360	397	436	480	538	559	507
	Qwe (l/s)	63.90	60.60	56.90	53.40	49.60	48.60	46.00	67.90	64.30	60.30	56.70	52.90	51.90	47.80
	Pdwe (kPa)	54	49	44	39	34	33	30	60	54	48	43	38	37	32
7	Cc (kW)	1384	1313	1236	1159	1076	1053	991	1469	1393	1308	1228	1147	1125	1023
	Pi (kW)	332	365	400	439	492	512	487	366	402	442	485	544	565	498
	Qwe (l/s)	66.00	62.70	59.00	55.30	51.40	50.30	47.30	70.10	66.40	62.40	58.60	54.70	53.70	48.80
	Pdwe (kPa)	57	52	46	41	36	35	31	63	57	51	46	41	39	33
8	Cc (kW)	1430	1357	1279	1199	1113	1083	1010	1515	1437	1353	1268	1185	1149	1029
	Pi (kW)	337	370	406	445	498	509	478	371	408	448	491	550	556	475
	Qwe (l/s)	68.30	64.80	61.00	57.20	53.20	51.70	48.20	72.30	68.60	64.60	60.50	56.60	54.90	49.10
	Pdwe (kPa)	60	55	49	44	38	37	32	67	61	55	49	43	41	33
9	Cc (kW)	1477	1402	1322	1240	1151	1112	1038	1562	1481	1398	1312	1224	1174	1050
	Pi (kW)	342	375	411	450	503	507	476	377	414	454	498	556	547	467
	Qwe (l/s)	70.60	66.90	63.10	59.20	55.00	53.10	49.60	74.60	70.70	66.80	62.60	58.40	56.10	50.10
	Pdwe (kPa)	64	58	52	47	41	38	34	71	64	58	52	46	42	35
10	Cc (kW)	1524	1448	1365	1282	1189	1135	1059	1609	1527	1442	1356	1263	1184	1071
	Pi (kW)	347	380	416	456	509	498	468	382	420	460	505	563	524	458
	Qwe (l/s)	72.80	69.20	65.20	61.30	56.80	54.20	50.60	76.90	72.90	68.90	64.80	60.30	56.60	51.20
	Pdwe (kPa)	68	62	56	50	43	40	35	75	68	61	55	48	43	36
11	Cc (kW)	1571	1494	1409	1324	1228	1165	1066	1657	1573	1485	1400	1305	1208	1077
	Pi (kW)	352	386	422	462	515	497	448	388	426	467	511	570	515	437
	Qwe (l/s)	75.10	71.40	67.30	63.30	58.70	55.70	50.90	79.20	75.20	71.00	66.90	62.40	57.80	51.50
	Pdwe (kPa)	72	65	59	53	46	42	36	79	72	65	58	51	45	36
12	Cc (kW)	1619	1539	1453	1366	1268	1187	1086	1706	1619	1530	1443	1348	1218	1098
	Pi (kW)	358	391	428	468	522	489	441	394	432	473	518	577	493	430
	Qwe (l/s)	77.40	73.60	69.50	65.30	60.60	56.80	51.90	81.60	77.40	73.10	69.00	64.40	58.30	52.50
	Pdwe (kPa)	76	69	62	56	49	43	37	83	76	68	61	54	45	38
13	Cc (kW)	1668	1585	1497	1407	1292	1216	1091	1755	1666	1575	1486	1362	1242	1102
	Pi (kW)	363	397	435	475	514	489	422	400	439	480	525	554	485	410
	Qwe (l/s)	79.80	75.80	71.60	67.30	61.80	58.20	52.20	84.00	79.70	75.30	71.10	65.20	59.40	52.70
	Pdwe (kPa)	80	73	66	59	50	45	37	87	80	72	65	55	47	38
14	Cc (kW)	1717	1631	1541	1450	1316	1236	1081	1805	1714	1620	1529	1375	1250	1066
	Pi (kW)	369	403	441	482	506	482	445	407	445	487	532	531	464	461
	Qwe (l/s)	82.20	78.10	73.70	69.40	63.00	59.10	51.70	86.40	82.00	77.50	73.20	65.80	59.80	51.00
	Pdwe (kPa)	84	77	69	62	52	47	37	92	84	76	68	56	48	36
15	Cc (kW)	1766	1677	1584	1491	1347	1243	1085	1855	1762	1666	1573	1402	1257	1072
	Pi (kW)	375	410	448	490	507	463	428	414	452	494	540	524	444	443
	Qwe (l/s)	84.50	80.30	75.90	71.40	64.50	59.50	51.90	88.80	84.30	79.80	75.30	67.10	60.20	51.30
	Pdwe (kPa)	89	81	73	65	54	47	37	97	88	80	72	58	48	36

Cc (cooling capacity) - Pi (unit power input)
Qwe (evaporator water flow) - Pdwe (evaporator pressure drop)
ELWT (evaporator leaving water temperature – Δt 5°C).
Data are referred to 0,0176 m2 °C/kW evaporator fouling factor

		C14							C15						
		Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)						
ELWT (°C)		25	30	35	40	46	48	50	25	30	35	40	46	48	50
4	Cc (kW)	1478	1398	1311	1227	1143	1124	1111	1575	1492	1399	1309	1219	1198	1183
	Pi (kW)	386	426	469	516	580	604	629	420	464	511	563	633	658	685
	Qwe (l/s)	70.40	66.60	62.50	58.40	54.50	53.50	52.90	75.00	71.00	66.60	62.40	58.10	57.00	56.40
	Pdwe (kPa)	63	57	51	45	40	38	38	73	66	59	52	46	45	44
5	Cc (kW)	1527	1445	1357	1270	1183	1162	1110	1626	1540	1448	1356	1263	1240	1192
	Pi (kW)	392	432	475	523	587	610	594	426	470	518	570	639	665	655
	Qwe (l/s)	72.80	68.90	64.70	60.50	56.40	55.40	52.90	77.50	73.40	69.00	64.60	60.20	59.10	56.80
	Pdwe (kPa)	67	60	54	48	42	41	38	77	70	63	56	49	48	44
6	Cc (kW)	1577	1492	1404	1315	1225	1203	1109	1678	1590	1497	1403	1308	1284	1186
	Pi (kW)	397	438	481	529	593	616	559	432	476	525	577	647	672	610
	Qwe (l/s)	75.20	71.20	66.90	62.70	58.40	57.40	52.90	80.00	75.80	71.40	66.90	62.40	61.20	56.60
	Pdwe (kPa)	71	64	57	51	45	43	38	82	74	67	59	52	51	44
7	Cc (kW)	1628	1541	1450	1361	1268	1244	1124	1731	1640	1545	1452	1353	1329	1197
	Pi (kW)	403	444	488	536	600	623	541	439	483	531	584	654	679	583
	Qwe (l/s)	77.70	73.50	69.20	64.90	60.50	59.40	53.60	82.60	78.20	73.70	69.30	64.60	63.40	57.10
	Pdwe (kPa)	75	68	61	54	48	46	39	87	79	71	63	56	54	45
8	Cc (kW)	1678	1590	1497	1407	1312	1272	1141	1784	1691	1594	1500	1400	1359	1224
	Pi (kW)	410	450	494	543	607	613	524	445	490	538	591	661	669	572
	Qwe (l/s)	80.10	75.90	71.50	67.20	62.60	60.70	54.50	85.20	80.70	76.10	71.60	66.80	64.90	58.40
	Pdwe (kPa)	79	72	65	58	51	48	40	92	83	75	67	59	56	47
9	Cc (kW)	1730	1640	1545	1454	1357	1285	1158	1838	1743	1644	1548	1448	1375	1235
	Pi (kW)	416	457	501	550	614	587	507	452	497	546	599	669	641	547
	Qwe (l/s)	82.60	78.30	73.80	69.40	64.80	61.40	55.30	87.80	83.20	78.50	73.90	69.10	65.70	59.00
	Pdwe (kPa)	84	76	68	61	54	49	41	97	88	79	71	63	57	47
10	Cc (kW)	1782	1690	1594	1500	1402	1314	1175	1893	1796	1695	1597	1496	1406	1263
	Pi (kW)	422	463	508	557	621	578	492	459	504	553	606	677	631	537
	Qwe (l/s)	85.10	80.70	76.20	71.70	67.00	62.80	56.10	90.50	85.80	81.00	76.30	71.50	67.20	60.30
	Pdwe (kPa)	88	80	72	65	57	51	42	102	93	84	75	67	60	49
11	Cc (kW)	1834	1741	1644	1548	1448	1328	1191	1949	1849	1746	1647	1544	1422	1273
	Pi (kW)	429	470	515	564	629	553	475	466	511	561	614	685	604	512
	Qwe (l/s)	87.70	83.20	78.60	74.00	69.20	63.50	56.90	93.10	88.40	83.50	78.70	73.80	67.90	60.80
	Pdwe (kPa)	93	85	77	69	61	52	43	108	98	88	79	71	61	50
12	Cc (kW)	1887	1792	1693	1596	1479	1348	1207	2005	1903	1799	1698	1577	1436	1300
	Pi (kW)	435	477	522	572	620	537	461	473	519	568	622	675	578	503
	Qwe (l/s)	90.30	85.70	81.00	76.30	70.70	64.50	57.70	95.90	91.00	86.00	81.20	75.40	68.70	62.20
	Pdwe (kPa)	98	89	81	73	63	54	44	113	103	93	84	74	62	52
13	Cc (kW)	1941	1843	1743	1645	1503	1368	1213	2062	1958	1852	1749	1611	1467	1291
	Pi (kW)	442	484	530	579	603	521	459	480	526	576	630	665	568	506
	Qwe (l/s)	92.90	88.20	83.40	78.70	71.90	65.50	58.00	98.60	93.70	88.60	83.70	77.10	70.20	61.80
	Pdwe (kPa)	103	94	85	77	65	55	44	119	109	98	89	77	65	51
14	Cc (kW)	1995	1895	1793	1694	1526	1379	1193	2119	2013	1905	1801	1629	1481	1301
	Pi (kW)	449	491	537	587	586	498	467	488	534	584	639	638	543	484
	Qwe (l/s)	95.50	90.70	85.80	81.00	73.00	66.00	57.10	101.40	96.40	91.20	86.20	78.00	70.90	62.30
	Pdwe (kPa)	109	99	90	81	67	56	43	125	114	103	93	78	66	52
15	Cc (kW)	2050	1948	1844	1743	1541	1406	1216	2177	2069	1959	1853	1647	1510	1329
	Pi (kW)	456	499	545	595	562	490	460	495	542	593	647	611	534	475
	Qwe (l/s)	98.20	93.30	88.30	83.40	73.80	67.30	58.20	104.20	99.10	93.80	88.70	78.80	72.30	63.60
	Pdwe (kPa)	114	104	94	85	68	58	45	132	120	109	99	80	68	54

Cc (cooling capacity) - Pi (unit power input)
Qwe (evaporator water flow) - Pdwe (evaporator pressure drop)
ELWT (evaporator leaving water temperature – Δt 5°C).
Data are referred to 0,0176 m2 °C/kW evaporator fouling factor

		C16							C17						
		Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)						
ELWT (°C)		25	30	35	40	46	48	50	25	30	35	40	46	48	50
4	Cc (kW)	1659	1571	1476	1384	1292	1268	1212	1743	1654	1558	1464	1370	1347	1297
	Pi (kW)	439	486	537	593	670	698	682	463	513	567	627	708	737	730
	Qwe (l/s)	79.00	74.80	70.30	65.90	61.50	60.40	57.70	83.00	78.80	74.20	69.70	65.20	64.10	61.80
	Pdwe (kPa)	64	58	52	46	41	40	37	70	64	57	51	45	44	41
5	Cc (kW)	1707	1618	1523	1429	1333	1309	1212	1794	1703	1607	1511	1413	1389	1315
	Pi (kW)	446	493	544	600	676	705	645	471	520	574	634	715	744	712
	Qwe (l/s)	81.30	77.10	72.60	68.10	63.50	62.40	57.80	85.50	81.20	76.60	72.00	67.40	66.20	62.70
	Pdwe (kPa)	68	61	55	49	43	42	37	74	67	61	54	48	47	42
6	Cc (kW)	1756	1667	1573	1477	1377	1351	1218	1847	1755	1657	1560	1458	1432	1320
	Pi (kW)	453	500	551	607	683	712	615	477	527	581	641	722	751	679
	Qwe (l/s)	83.70	79.50	75.00	70.40	65.70	64.40	58.10	88.10	83.70	79.00	74.40	69.50	68.30	63.00
	Pdwe (kPa)	71	65	58	52	46	44	37	78	71	64	58	51	49	43
7	Cc (kW)	1808	1719	1622	1526	1422	1372	1241	1901	1808	1709	1610	1505	1455	1338
	Pi (kW)	460	507	558	614	691	693	603	484	534	588	648	729	733	659
	Qwe (l/s)	86.30	82.00	77.40	72.80	67.80	65.50	59.20	90.70	86.30	81.50	76.80	71.80	69.40	63.80
	Pdwe (kPa)	75	69	62	55	49	46	38	82	75	68	61	54	51	44
8	Cc (kW)	1862	1770	1673	1576	1468	1394	1246	1957	1862	1761	1661	1553	1490	1345
	Pi (kW)	467	513	565	621	698	675	575	491	541	596	656	737	728	628
	Qwe (l/s)	88.90	84.50	79.90	75.20	70.10	66.50	59.50	93.40	88.90	84.10	79.30	74.10	71.10	64.20
	Pdwe (kPa)	79	72	65	59	52	47	39	87	79	72	65	57	53	44
9	Cc (kW)	1917	1823	1725	1625	1515	1421	1269	2015	1917	1815	1712	1601	1525	1369
	Pi (kW)	473	520	572	629	706	663	564	498	548	603	663	745	723	617
	Qwe (l/s)	91.50	87.10	82.40	77.60	72.30	67.90	60.60	96.20	91.60	86.70	81.80	76.50	72.80	65.40
	Pdwe (kPa)	84	76	69	62	55	49	40	91	84	76	68	60	55	46
10	Cc (kW)	1973	1877	1776	1675	1561	1431	1291	2073	1974	1869	1764	1650	1542	1394
	Pi (kW)	480	527	579	637	715	634	553	505	555	610	671	753	699	605
	Qwe (l/s)	94.30	89.70	84.90	80.00	74.60	68.40	61.70	99.10	94.30	89.30	84.30	78.80	73.70	66.60
	Pdwe (kPa)	88	81	73	66	58	49	41	96	88	80	72	64	57	47
11	Cc (kW)	2031	1932	1828	1724	1596	1457	1293	2133	2031	1923	1816	1687	1571	1398
	Pi (kW)	487	534	587	645	711	624	527	512	563	618	680	749	687	577
	Qwe (l/s)	97.10	92.30	87.40	82.40	76.30	69.60	61.80	102.00	97.10	91.90	86.80	80.60	75.10	66.80
	Pdwe (kPa)	93	85	77	69	60	51	41	101	93	84	76	66	58	47
12	Cc (kW)	2089	1987	1880	1773	1624	1464	1313	2194	2088	1978	1868	1723	1580	1421
	Pi (kW)	494	542	595	654	700	597	518	520	570	626	688	745	658	567
	Qwe (l/s)	99.90	95.00	89.90	84.80	77.60	70.00	62.80	104.90	99.90	94.60	89.30	82.40	75.60	68.00
	Pdwe (kPa)	98	89	81	73	62	52	42	107	98	89	80	69	59	49
13	Cc (kW)	2148	2043	1933	1821	1634	1487	1307	2255	2146	2033	1919	1749	1607	1411
	Pi (kW)	502	550	603	663	672	588	519	527	578	635	697	730	647	560
	Qwe (l/s)	102.80	97.70	92.40	87.10	78.20	71.10	62.50	107.90	102.70	97.20	91.80	83.70	76.90	67.50
	Pdwe (kPa)	103	94	85	76	63	53	42	112	103	93	84	71	61	48
14	Cc (kW)	2208	2099	1985	1869	1660	1509	1313	2317	2205	2088	1971	1784	1626	1433
	Pi (kW)	510	558	612	673	664	580	516	535	587	644	707	727	631	551
	Qwe (l/s)	105.70	100.50	95.00	89.40	79.40	72.20	62.80	110.90	105.50	99.90	94.30	85.40	77.80	68.60
	Pdwe (kPa)	108	99	89	80	65	54	42	118	108	98	88	74	62	50
15	Cc (kW)	2268	2155	2036	1916	1666	1509	1329	2379	2264	2143	2022	1801	1637	1453
	Pi (kW)	518	567	622	683	637	556	509	543	596	654	717	705	611	543
	Qwe (l/s)	108.60	103.20	97.50	91.70	79.80	72.30	63.60	113.90	108.40	102.60	96.80	86.20	78.40	69.60
	Pdwe (kPa)	113	104	94	84	65	55	43	124	113	102	92	75	63	51

Cc (cooling capacity) - Pi (unit power input)
Qwe (evaporator water flow) - Pdwe (evaporator pressure drop)
ELWT (evaporator leaving water temperature – Δt 5°C).
Data are referred to 0,0176 m2 °C/kW evaporator fouling factor

		C18						
		Condenser Inlet Air Temperature (°C)						
ELWT (°C)		25	30	35	40	46	48	50
4	Cc (kW)	1836	1748	1654	1564	1471	1450	1390
	Pi (kW)	479	533	591	655	741	772	755
	Qwe (l/s)	87.50	83.30	78.80	74.50	70.10	69.00	66.20
	Pdwe (kPa)	66	60	54	49	44	43	40
5	Cc (kW)	1886	1797	1702	1609	1514	1491	1459
	Pi (kW)	486	539	598	662	748	779	793
	Qwe (l/s)	89.90	85.70	81.10	76.70	72.20	71.10	69.50
	Pdwe (kPa)	69	63	57	52	46	45	43
6	Cc (kW)	1938	1848	1751	1656	1560	1535	1476
	Pi (kW)	493	546	605	669	754	786	772
	Qwe (l/s)	92.40	88.10	83.50	79.00	74.40	73.20	70.40
	Pdwe (kPa)	72	66	60	55	49	48	44
7	Cc (kW)	1992	1900	1802	1705	1605	1580	1468
	Pi (kW)	500	553	611	675	761	793	722
	Qwe (l/s)	95.00	90.60	86.00	81.30	76.60	75.40	70.00
	Pdwe (kPa)	76	70	64	58	52	50	44
8	Cc (kW)	2047	1953	1854	1755	1652	1620	1481
	Pi (kW)	506	560	618	682	768	793	695
	Qwe (l/s)	97.70	93.20	88.50	83.80	78.90	77.30	70.70
	Pdwe (kPa)	80	74	67	61	54	53	45
9	Cc (kW)	2104	2008	1906	1806	1700	1661	1507
	Pi (kW)	513	566	625	690	776	794	682
	Qwe (l/s)	100.50	95.90	91.00	86.30	81.20	79.30	72.00
	Pdwe (kPa)	84	77	70	64	57	55	46
10	Cc (kW)	2162	2064	1960	1858	1748	1697	1528
	Pi (kW)	519	573	632	697	783	789	664
	Qwe (l/s)	103.30	98.60	93.60	88.80	83.50	81.10	73.00
	Pdwe (kPa)	88	81	74	67	60	57	47
11	Cc (kW)	2221	2120	2015	1910	1798	1715	1541
	Pi (kW)	526	580	639	704	791	761	638
	Qwe (l/s)	106.20	101.40	96.30	91.30	85.90	82.00	73.70
	Pdwe (kPa)	93	85	78	71	64	58	48
12	Cc (kW)	2281	2178	2070	1963	1847	1739	1567
	Pi (kW)	533	587	647	712	799	742	627
	Qwe (l/s)	109.10	104.20	99.00	93.90	88.30	83.20	74.90
	Pdwe (kPa)	97	90	82	74	67	60	50
13	Cc (kW)	2341	2236	2126	2016	1892	1757	1586
	Pi (kW)	540	595	654	720	801	716	610
	Qwe (l/s)	112.00	107.00	101.70	96.50	90.50	84.00	75.90
	Pdwe (kPa)	102	94	86	78	70	61	51
14	Cc (kW)	2403	2295	2182	2070	1931	1786	1590
	Pi (kW)	547	602	662	729	798	704	596
	Qwe (l/s)	115.00	109.90	104.40	99.10	92.40	85.50	76.10
	Pdwe (kPa)	107	99	90	82	72	63	51
15	Cc (kW)	2465	2355	2239	2124	1976	1795	1614
	Pi (kW)	555	610	671	737	801	674	586
	Qwe (l/s)	118.00	112.70	107.20	101.70	94.60	85.90	77.30
	Pdwe (kPa)	112	103	94	86	75	63	52

Cc (cooling capacity) - Pi (unit power input)
Qwe (evaporator water flow) - Pdwe (evaporator pressure drop)
ELWT (evaporator leaving water temperature – Δt 5°C).
Data are referred to 0,0176 m2 °C/kW evaporator fouling factor

EWAD~CZXR

		640							700						
		Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)						
ELWT (°C)		25	30	35	40	46	48	50	25	30	35	40	46	48	50
4	Cc (kW)	653	617	581	549	493	436	382	717	677	636	598	564	542	476
	Pi (kW)	197	222	252	288	288	238	215	185	208	235	266	311	309	251
	Qwe (l/s)	31.10	29.40	27.70	26.20	23.50	20.80	18.20	34.20	32.30	30.30	28.50	26.90	25.80	22.70
	Pdwe (kPa)	77	69	62	56	46	37	29	72	65	58	52	47	44	34
5	Cc (kW)	672	635	599	567	495	444	388	740	699	657	618	583	545	484
	Pi (kW)	199	225	255	290	270	230	208	188	211	237	268	313	291	244
	Qwe (l/s)	32.00	30.30	28.50	27.00	23.60	21.20	18.50	35.30	33.30	31.30	29.50	27.80	26.00	23.10
	Pdwe (kPa)	81	73	66	60	47	38	30	76	69	62	55	50	44	36
6	Cc (kW)	691	653	617	585	504	451	395	764	721	678	638	602	548	493
	Pi (kW)	202	228	257	292	262	223	202	191	213	239	270	314	274	236
	Qwe (l/s)	32.90	31.20	29.40	27.90	24.00	21.50	18.80	36.40	34.40	32.30	30.40	28.70	26.10	23.50
	Pdwe (kPa)	85	77	69	63	48	40	31	81	73	65	58	53	44	37
7	Cc (kW)	710	672	635	603	505	459	401	787	744	700	659	614	558	501
	Pi (kW)	205	230	260	295	246	216	196	193	216	242	272	306	266	229
	Qwe (l/s)	33.90	32.10	30.30	28.80	24.10	21.90	19.10	37.60	35.50	33.40	31.40	29.30	26.60	23.90
	Pdwe (kPa)	90	81	73	67	49	41	32	85	77	69	62	55	46	38
8	Cc (kW)	728	691	654	621	514	459	408	812	767	722	680	626	568	509
	Pi (kW)	208	233	263	297	239	222	190	196	219	245	275	299	259	223
	Qwe (l/s)	34.70	33.00	31.20	29.60	24.50	21.90	19.50	38.70	36.60	34.50	32.50	29.90	27.10	24.30
	Pdwe (kPa)	94	85	77	70	50	41	33	90	82	73	66	57	48	39
9	Cc (kW)	746	710	672	639	523	467	414	838	791	745	702	638	579	518
	Pi (kW)	210	236	266	300	232	216	184	200	222	248	277	291	252	216
	Qwe (l/s)	35.60	33.90	32.10	30.50	25.00	22.30	19.80	40.00	37.80	35.60	33.50	30.50	27.60	24.70
	Pdwe (kPa)	98	90	81	74	52	42	34	96	86	77	70	59	49	40
10	Cc (kW)	764	728	691	658	532	476	421	864	815	768	724	642	589	511
	Pi (kW)	213	239	269	303	226	210	178	203	225	251	280	276	246	216
	Qwe (l/s)	36.50	34.80	33.00	31.40	25.40	22.70	20.10	41.30	38.90	36.70	34.60	30.70	28.20	24.40
	Pdwe (kPa)	102	94	86	78	53	44	35	101	91	82	74	59	51	39
11	Cc (kW)	783	746	710	677	541	476	427	887	841	791	747	655	591	520
	Pi (kW)	216	242	272	306	219	197	173	206	229	254	283	269	232	210
	Qwe (l/s)	37.40	35.60	33.90	32.30	25.90	22.80	20.40	42.40	40.20	37.80	35.70	31.30	28.30	24.90
	Pdwe (kPa)	107	98	90	82	55	44	36	106	96	86	78	61	51	41
12	Cc (kW)	802	764	728	695	550	485	434	910	866	815	770	667	602	530
	Pi (kW)	219	245	274	309	213	192	168	209	232	257	286	263	226	204
	Qwe (l/s)	38.30	36.50	34.80	33.30	26.30	23.20	20.70	43.50	41.40	39.00	36.80	31.90	28.80	25.30
	Pdwe (kPa)	112	103	94	87	57	45	37	111	102	91	82	64	53	42
13	Cc (kW)	821	782	746	701	544	493	440	935	888	841	793	671	613	531
	Pi (kW)	222	248	277	292	213	187	163	213	235	260	289	248	220	193
	Qwe (l/s)	39.30	37.40	35.70	33.50	26.00	23.60	21.10	44.70	42.50	40.20	37.90	32.10	29.30	25.40
	Pdwe (kPa)	117	107	98	88	56	47	38	117	107	97	87	64	55	42
14	Cc (kW)	840	801	764	714	554	501	447	959	912	866	817	684	606	540
	Pi (kW)	226	251	281	286	208	182	158	216	238	264	292	243	219	188
	Qwe (l/s)	40.20	38.30	36.50	34.10	26.50	24.00	21.40	45.90	43.60	41.40	39.10	32.70	29.00	25.80
	Pdwe (kPa)	122	112	103	91	58	48	39	122	112	102	92	67	54	44
15	Cc (kW)	859	820	782	725	556	501	444	985	936	888	842	688	617	550
	Pi (kW)	229	255	284	280	196	171	148	220	242	267	296	230	214	183
	Qwe (l/s)	41.10	39.20	37.40	34.70	26.60	24.00	21.30	47.10	44.80	42.50	40.30	32.90	29.60	26.30
	Pdwe (kPa)	127	117	107	93	58	48	39	128	117	107	97	67	55	45

Cc (cooling capacity) - Pi (unit power input)
Qwe (evaporator water flow) - Pdwe (evaporator pressure drop)
ELWT (evaporator leaving water temperature – Δt 5°C).
Data are referred to 0,0176 m2 °C/kW evaporator fouling factor

		790							850						
		Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)						
ELWT (°C)		25	30	35	40	46	48	50	25	30	35	40	46	48	50
4	Cc (kW)	806	763	718	676	638	607	560	874	825	777	733	700	647	562
	Pi (kW)	210	234	262	293	337	325	302	245	271	301	334	381	343	278
	Qwe (l/s)	38.40	36.30	34.20	32.20	30.40	28.90	26.70	41.60	39.30	37.00	34.90	33.40	30.80	26.80
	Pdwe (kPa)	53	48	43	38	35	32	27	61	55	49	45	41	36	28
5	Cc (kW)	834	787	741	699	660	617	566	904	852	802	758	724	648	570
	Pi (kW)	214	237	265	296	340	317	289	249	276	305	339	386	326	272
	Qwe (l/s)	39.70	37.50	35.30	33.30	31.50	29.40	27.00	43.10	40.60	38.20	36.10	34.50	30.90	27.20
	Pdwe (kPa)	56	51	45	41	37	33	28	65	58	52	47	43	36	28
6	Cc (kW)	860	813	765	721	672	627	571	932	879	827	782	721	648	578
	Pi (kW)	217	241	268	299	331	310	278	253	280	310	343	362	309	265
	Qwe (l/s)	41.00	38.80	36.50	34.40	32.00	29.90	27.30	44.40	41.90	39.40	37.30	34.40	30.90	27.60
	Pdwe (kPa)	59	54	48	43	38	34	28	69	62	55	50	43	36	29
7	Cc (kW)	891	840	789	744	683	642	577	964	908	852	805	728	658	578
	Pi (kW)	221	245	271	302	323	307	278	258	285	314	348	350	302	275
	Qwe (l/s)	42.50	40.10	37.60	35.50	32.60	30.60	27.50	46.00	43.30	40.70	38.40	34.80	31.40	27.60
	Pdwe (kPa)	63	57	51	46	39	35	29	73	65	58	53	44	37	29
8	Cc (kW)	923	866	814	767	700	658	583	998	935	879	829	741	669	587
	Pi (kW)	226	248	275	305	321	305	267	264	289	319	352	343	296	269
	Qwe (l/s)	44.10	41.30	38.90	36.60	33.40	31.40	27.80	47.60	44.60	42.00	39.60	35.40	31.90	28.00
	Pdwe (kPa)	68	60	54	48	41	37	30	78	69	62	56	45	38	30
9	Cc (kW)	956	896	841	791	713	670	594	1032	967	907	854	745	680	593
	Pi (kW)	230	253	279	309	313	298	261	269	295	324	357	326	290	259
	Qwe (l/s)	45.70	42.80	40.20	37.80	34.10	32.00	28.40	49.30	46.20	43.30	40.80	35.60	32.50	28.30
	Pdwe (kPa)	72	64	57	51	42	38	31	83	73	66	59	46	39	31
10	Cc (kW)	990	928	866	816	732	674	601	1068	1000	934	880	759	683	600
	Pi (kW)	235	257	283	313	311	282	251	275	300	329	362	320	275	250
	Qwe (l/s)	47.30	44.30	41.40	39.00	35.00	32.20	28.70	51.00	47.80	44.60	42.00	36.30	32.60	28.70
	Pdwe (kPa)	77	68	60	54	45	38	31	88	78	69	62	48	39	31
11	Cc (kW)	1026	960	897	842	751	688	613	1105	1034	966	908	770	697	614
	Pi (kW)	240	262	287	317	310	276	245	281	306	335	367	310	270	245
	Qwe (l/s)	49.00	45.90	42.90	40.30	35.90	32.90	29.30	52.80	49.40	46.20	43.40	36.80	33.30	29.30
	Pdwe (kPa)	82	73	64	57	47	40	32	94	83	73	66	49	41	32
12	Cc (kW)	1062	994	928	867	766	693	616	1144	1069	998	935	782	694	619
	Pi (kW)	245	267	292	321	303	274	232	287	313	341	372	300	272	233
	Qwe (l/s)	50.80	47.50	44.40	41.50	36.60	33.20	29.50	54.70	51.10	47.70	44.70	37.40	33.20	29.60
	Pdwe (kPa)	87	77	68	61	48	40	33	100	88	78	69	50	41	33
13	Cc (kW)	1099	1029	960	898	783	700	630	1184	1106	1033	967	791	703	630
	Pi (kW)	251	273	297	325	298	261	228	294	319	347	379	286	259	225
	Qwe (l/s)	52.60	49.20	45.90	42.90	37.40	33.50	30.20	56.60	52.90	49.40	46.20	37.80	33.60	30.10
	Pdwe (kPa)	93	82	73	64	50	41	34	106	94	83	74	51	42	34
14	Cc (kW)	1137	1065	994	929	796	713	640	1225	1145	1068	1000	806	714	637
	Pi (kW)	257	279	303	331	288	252	219	301	327	354	385	277	247	214
	Qwe (l/s)	54.40	51.00	47.60	44.50	38.10	34.10	30.60	58.60	54.80	51.10	47.90	38.60	34.20	30.50
	Pdwe (kPa)	99	88	78	69	52	43	35	113	100	88	78	53	43	35
15	Cc (kW)	1177	1102	1029	957	796	721	640	1268	1185	1106	1030	803	725	651
	Pi (kW)	263	285	309	331	278	240	214	309	334	362	387	276	236	207
	Qwe (l/s)	56.30	52.80	49.30	45.80	38.10	34.50	30.70	60.70	56.70	52.90	49.30	38.50	34.70	31.20
	Pdwe (kPa)	105	93	83	72	52	43	35	120	106	94	83	53	44	36

Cc (cooling capacity) - Pi (unit power input)
Qwe (evaporator water flow) - Pdwe (evaporator pressure drop)
ELWT (evaporator leaving water temperature – Δt 5°C).
Data are referred to 0,0176 m2 °C/kW evaporator fouling factor

		980							C10						
		Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)						
ELWT (°C)		25	30	35	40	46	48	50	25	30	35	40	46	48	50
4	Cc (kW)	1004	943	882	826	773	724	644	1063	999	936	879	819	731	640
	Pi (kW)	272	300	332	367	410	382	326	303	336	371	411	454	381	317
	Qwe (l/s)	47.80	44.90	42.00	39.40	36.80	34.50	30.70	50.60	47.60	44.60	41.90	39.00	34.80	30.50
	Pdwe (kPa)	60	54	48	42	37	33	27	67	60	53	47	42	34	27
5	Cc (kW)	1039	975	912	855	787	737	645	1095	1031	967	908	824	732	641
	Pi (kW)	277	305	337	372	401	374	323	309	341	377	417	432	362	328
	Qwe (l/s)	49.50	46.50	43.50	40.70	37.50	35.10	30.70	52.20	49.10	46.10	43.30	39.30	34.90	30.50
	Pdwe (kPa)	64	57	51	45	39	34	27	70	63	56	50	42	34	27
6	Cc (kW)	1075	1009	944	884	802	745	656	1130	1064	998	938	829	746	652
	Pi (kW)	282	311	342	377	393	361	316	315	347	383	423	411	354	321
	Qwe (l/s)	51.20	48.10	45.00	42.20	38.30	35.50	31.30	53.90	50.70	47.60	44.70	39.50	35.60	31.10
	Pdwe (kPa)	68	61	54	48	40	35	28	74	67	60	53	43	35	28
7	Cc (kW)	1112	1044	976	914	818	753	668	1165	1098	1031	969	834	760	664
	Pi (kW)	288	316	347	383	385	349	310	320	353	388	429	391	347	314
	Qwe (l/s)	53.10	49.80	46.60	43.60	39.00	35.90	31.90	55.60	52.40	49.20	46.20	39.80	36.20	31.70
	Pdwe (kPa)	72	65	57	51	42	36	29	79	71	63	56	43	36	29
8	Cc (kW)	1150	1080	1010	945	839	767	674	1201	1133	1064	1000	850	773	665
	Pi (kW)	293	322	353	388	383	342	298	326	358	394	435	384	340	298
	Qwe (l/s)	54.90	51.50	48.20	45.10	40.10	36.60	32.20	57.30	54.10	50.80	47.70	40.60	36.90	31.80
	Pdwe (kPa)	77	69	61	54	44	37	29	83	75	67	60	45	38	29
9	Cc (kW)	1189	1117	1044	977	850	770	681	1237	1168	1098	1032	855	775	677
	Pi (kW)	299	328	359	394	371	325	288	332	364	401	441	365	322	292
	Qwe (l/s)	56.80	53.30	49.90	46.60	40.60	36.80	32.50	59.10	55.80	52.40	49.30	40.80	37.00	32.30
	Pdwe (kPa)	82	73	65	57	45	37	30	88	79	71	63	45	38	30
10	Cc (kW)	1228	1154	1080	1009	868	780	694	1274	1203	1131	1063	870	776	688
	Pi (kW)	305	334	365	400	365	328	282	337	371	407	448	358	334	286
	Qwe (l/s)	58.70	55.10	51.60	48.20	41.50	37.30	33.20	60.90	57.50	54.10	50.80	41.60	37.10	32.90
	Pdwe (kPa)	87	77	69	61	46	38	31	93	84	75	67	47	38	31
11	Cc (kW)	1268	1192	1116	1043	881	785	697	1311	1239	1165	1094	885	778	699
	Pi (kW)	311	340	372	407	354	313	280	343	377	414	456	352	318	280
	Qwe (l/s)	60.60	57.00	53.30	49.80	42.10	37.50	33.30	62.70	59.20	55.70	52.30	42.30	37.20	33.40
	Pdwe (kPa)	92	82	73	65	48	39	31	98	88	79	70	48	38	31
12	Cc (kW)	1308	1230	1152	1076	888	796	706	1348	1273	1197	1124	887	790	708
	Pi (kW)	318	347	379	414	338	303	271	350	384	421	463	335	313	275
	Qwe (l/s)	62.60	58.80	55.10	51.50	42.50	38.10	33.80	64.50	60.90	57.30	53.80	42.40	37.80	33.90
	Pdwe (kPa)	97	87	77	68	48	40	32	103	93	83	74	48	39	32
13	Cc (kW)	1349	1269	1188	1111	902	808	709	1385	1308	1230	1154	899	802	704
	Pi (kW)	324	354	386	422	328	294	258	357	391	429	472	330	308	261
	Qwe (l/s)	64.50	60.70	56.90	53.10	43.20	38.70	33.90	66.30	62.60	58.80	55.20	43.00	38.40	33.70
	Pdwe (kPa)	103	92	82	72	50	41	32	108	97	87	78	50	40	32
14	Cc (kW)	1390	1308	1225	1135	910	808	719	1422	1342	1261	1162	898	800	712
	Pi (kW)	331	361	394	416	328	289	250	364	399	437	453	344	293	256
	Qwe (l/s)	66.50	62.60	58.60	54.30	43.50	38.70	34.40	68.00	64.20	60.30	55.60	43.00	38.30	34.10
	Pdwe (kPa)	109	97	87	75	51	41	33	113	102	91	79	49	40	33
15	Cc (kW)	1432	1347	1262	1164	919	821	729	1458	1375	1291	1179	897	809	718
	Pi (kW)	339	369	402	418	315	281	243	371	407	446	448	329	289	252
	Qwe (l/s)	68.50	64.50	60.40	55.70	44.00	39.30	34.90	69.80	65.80	61.80	56.40	43.00	38.70	34.40
	Pdwe (kPa)	115	103	91	79	52	42	34	118	107	95	81	49	41	33

Cc (cooling capacity) - Pi (unit power input)
Qwe (evaporator water flow) - Pdwe (evaporator pressure drop)
ELWT (evaporator leaving water temperature – Δt 5°C).
Data are referred to 0,0176 m2 °C/kW evaporator fouling factor

		C11							C12						
		Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)						
ELWT (°C)		25	30	35	40	46	48	50	25	30	35	40	46	48	50
4	Cc (kW)	1198	1130	1060	994	935	888	810	1268	1195	1122	1055	1003	925	804
	Pi (kW)	320	354	391	432	490	471	422	356	394	435	481	546	490	398
	Qwe (l/s)	57.10	53.80	50.50	47.40	44.60	42.30	38.60	60.40	56.90	53.40	50.30	47.80	44.10	38.30
	Pdwe (kPa)	44	40	36	32	28	26	22	49	44	40	35	32	28	22
5	Cc (kW)	1238	1167	1095	1028	966	903	812	1310	1233	1159	1090	1034	927	816
	Pi (kW)	325	359	397	438	495	462	401	362	400	442	488	552	466	389
	Qwe (l/s)	59.00	55.60	52.20	49.00	46.00	43.00	38.70	62.40	58.80	55.30	52.00	49.30	44.20	38.90
	Pdwe (kPa)	47	42	38	34	30	27	22	52	47	42	38	34	28	22
6	Cc (kW)	1279	1205	1132	1063	977	919	827	1354	1273	1196	1127	1026	929	830
	Pi (kW)	331	365	402	444	477	452	393	369	406	448	495	511	443	381
	Qwe (l/s)	61.00	57.50	54.00	50.70	46.60	43.80	39.40	64.50	60.70	57.10	53.70	48.90	44.30	39.60
	Pdwe (kPa)	50	45	40	36	31	28	23	55	50	44	40	34	28	23
7	Cc (kW)	1320	1246	1170	1099	1003	937	815	1397	1315	1235	1164	1046	946	801
	Pi (kW)	337	371	408	450	475	444	400	375	413	455	502	502	434	414
	Qwe (l/s)	63.00	59.40	55.80	52.40	47.80	44.70	38.90	66.60	62.70	58.90	55.50	49.90	45.20	38.20
	Pdwe (kPa)	53	48	43	38	32	29	22	59	53	47	42	35	29	22
8	Cc (kW)	1362	1287	1209	1135	1023	950	831	1438	1358	1275	1201	1054	965	818
	Pi (kW)	342	377	414	456	466	430	394	382	420	462	508	478	426	409
	Qwe (l/s)	65.00	61.40	57.70	54.20	48.80	45.30	39.70	68.70	64.80	60.80	57.30	50.30	46.00	39.00
	Pdwe (kPa)	56	51	45	41	34	29	23	62	56	50	45	35	30	22
9	Cc (kW)	1405	1328	1249	1173	1050	961	836	1481	1400	1316	1239	1075	969	824
	Pi (kW)	348	383	421	462	465	415	376	388	427	469	516	470	404	392
	Qwe (l/s)	67.10	63.40	59.60	56.00	50.10	45.90	39.90	70.70	66.90	62.90	59.20	51.40	46.30	39.40
	Pdwe (kPa)	59	54	48	43	35	30	23	65	59	53	47	37	30	23
10	Cc (kW)	1449	1370	1289	1211	1070	974	852	1524	1442	1359	1279	1083	987	840
	Pi (kW)	354	389	427	469	457	402	370	395	434	477	523	447	396	387
	Qwe (l/s)	69.20	65.40	61.60	57.90	51.10	46.50	40.70	72.80	68.90	64.90	61.10	51.70	47.20	40.20
	Pdwe (kPa)	63	57	51	46	36	31	24	69	62	56	50	37	32	24
11	Cc (kW)	1493	1412	1329	1249	1091	961	861	1568	1483	1401	1320	1105	944	845
	Pi (kW)	361	396	434	476	450	415	359	402	441	485	531	440	429	370
	Qwe (l/s)	71.40	67.50	63.50	59.70	52.20	46.00	41.20	74.90	70.90	66.90	63.10	52.80	45.10	40.40
	Pdwe (kPa)	66	60	54	48	38	30	25	73	66	59	53	39	29	24
12	Cc (kW)	1536	1454	1369	1288	1104	979	869	1612	1526	1441	1361	1112	962	860
	Pi (kW)	367	403	441	484	436	409	348	409	449	492	540	419	423	365
	Qwe (l/s)	73.50	69.50	65.50	61.60	52.80	46.80	41.50	77.10	73.00	68.90	65.10	53.20	46.00	41.10
	Pdwe (kPa)	70	63	57	51	39	31	25	76	69	62	56	39	30	25
13	Cc (kW)	1580	1496	1409	1325	1119	983	869	1657	1569	1482	1402	1133	968	862
	Pi (kW)	374	410	449	492	423	392	346	416	456	500	548	411	406	348
	Qwe (l/s)	75.60	71.60	67.40	63.40	53.50	47.00	41.60	79.30	75.00	70.90	67.10	54.20	46.30	41.20
	Pdwe (kPa)	74	67	60	54	40	31	25	80	73	66	59	40	31	25
14	Cc (kW)	1624	1538	1450	1363	1130	999	882	1702	1612	1523	1441	1138	985	875
	Pi (kW)	381	417	457	500	411	386	341	424	464	509	557	391	400	343
	Qwe (l/s)	77.70	73.60	69.40	65.20	54.10	47.80	42.20	81.50	77.10	72.90	69.00	54.40	47.10	41.90
	Pdwe (kPa)	77	70	63	56	40	32	26	84	76	69	62	41	31	25
15	Cc (kW)	1669	1579	1489	1394	1112	1000	888	1748	1655	1565	1469	1099	988	888
	Pi (kW)	388	425	465	501	429	370	331	432	473	517	549	444	383	337
	Qwe (l/s)	79.90	75.60	71.30	66.70	53.20	47.90	42.50	83.70	79.20	74.90	70.30	52.60	47.30	42.50
	Pdwe (kPa)	81	74	66	59	39	32	26	88	80	72	65	38	32	26

Cc (cooling capacity) - Pi (unit power input)
Qwe (evaporator water flow) - Pdwe (evaporator pressure drop)
ELWT (evaporator leaving water temperature – Δt 5°C).
Data are referred to 0,0176 m2 °C/kW evaporator fouling factor

		C13							C14						
		Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)						
ELWT (°C)		25	30	35	40	46	48	50	25	30	35	40	46	48	50
4	Cc (kW)	1372	1289	1208	1140	1013	912	799	1488	1396	1310	1241	1037	927	809
	Pi (kW)	409	452	499	552	530	477	397	460	508	561	621	513	479	396
	Qwe (l/s)	65.40	61.40	57.50	54.30	48.20	43.40	38.10	70.90	66.50	62.40	59.10	49.40	44.10	38.50
	Pdwe (kPa)	56	50	44	40	32	27	21	63	56	50	45	33	27	21
5	Cc (kW)	1416	1331	1248	1178	1032	922	813	1535	1441	1354	1283	1058	931	825
	Pi (kW)	417	460	507	560	520	460	388	469	517	570	630	503	454	387
	Qwe (l/s)	67.50	63.40	59.50	56.20	49.20	43.90	38.80	73.10	68.70	64.50	61.10	50.40	44.40	39.30
	Pdwe (kPa)	59	53	47	43	34	27	22	66	59	53	48	34	27	22
6	Cc (kW)	1460	1374	1290	1218	1038	933	828	1580	1487	1398	1326	1064	951	841
	Pi (kW)	424	468	515	568	494	444	380	478	526	580	640	477	445	378
	Qwe (l/s)	69.60	65.50	61.50	58.10	49.50	44.50	39.50	75.40	70.90	66.60	63.30	50.70	45.30	40.10
	Pdwe (kPa)	63	56	50	45	34	28	23	70	63	56	51	34	28	22
7	Cc (kW)	1504	1418	1332	1259	1052	952	821	1627	1533	1443	1370	1086	971	857
	Pi (kW)	432	476	524	577	478	435	392	486	536	589	650	467	436	370
	Qwe (l/s)	71.80	67.60	63.60	60.10	50.20	45.40	39.20	77.60	73.10	68.80	65.40	51.80	46.30	40.90
	Pdwe (kPa)	66	59	53	48	35	29	22	74	66	59	54	36	29	23
8	Cc (kW)	1550	1461	1376	1294	1074	956	838	1674	1578	1489	1401	1109	976	874
	Pi (kW)	440	484	532	576	469	413	385	495	545	600	641	458	413	361
	Qwe (l/s)	74.00	69.70	65.70	61.80	51.30	45.60	40.00	79.90	75.30	71.10	66.90	53.00	46.60	41.70
	Pdwe (kPa)	70	63	56	51	36	29	23	78	70	63	56	37	29	24
9	Cc (kW)	1596	1505	1419	1329	1081	976	850	1721	1624	1535	1432	1101	997	891
	Pi (kW)	448	492	541	575	466	405	373	505	555	610	631	461	405	353
	Qwe (l/s)	76.20	71.90	67.80	63.50	51.60	46.60	40.60	82.20	77.60	73.30	68.40	52.60	47.60	42.60
	Pdwe (kPa)	74	66	60	53	37	30	24	82	74	66	59	37	31	25
10	Cc (kW)	1641	1550	1462	1358	1090	987	858	1769	1671	1580	1449	1110	1001	890
	Pi (kW)	456	501	550	565	443	390	360	514	565	620	603	438	383	333
	Qwe (l/s)	78.40	74.10	69.90	64.90	52.10	47.20	41.00	84.50	79.80	75.50	69.20	53.00	47.80	42.50
	Pdwe (kPa)	78	70	63	55	37	31	24	86	77	70	60	37	31	25
11	Cc (kW)	1687	1595	1506	1386	1113	975	868	1818	1718	1626	1465	1134	1022	907
	Pi (kW)	465	510	559	555	435	403	348	524	575	630	576	430	376	325
	Qwe (l/s)	80.60	76.20	72.00	66.30	53.20	46.60	41.50	86.90	82.10	77.70	70.00	54.20	48.80	43.30
	Pdwe (kPa)	82	74	67	57	39	30	25	90	81	74	61	39	32	26
12	Cc (kW)	1734	1640	1550	1422	1120	994	883	1867	1766	1673	1496	1141	1042	923
	Pi (kW)	473	519	569	555	414	396	341	534	585	641	567	408	368	318
	Qwe (l/s)	82.90	78.40	74.10	68.00	53.50	47.50	42.20	89.30	84.40	80.00	71.60	54.60	49.80	44.10
	Pdwe (kPa)	86	78	70	60	39	32	26	95	86	78	64	39	33	27
13	Cc (kW)	1780	1685	1595	1450	1142	998	882	1917	1814	1720	1512	1165	1043	918
	Pi (kW)	482	528	578	546	406	377	324	544	596	652	541	400	347	299
	Qwe (l/s)	85.20	80.60	76.30	69.40	54.60	47.70	42.20	91.70	86.80	82.30	72.30	55.70	49.90	43.90
	Pdwe (kPa)	90	82	74	62	41	32	25	99	90	82	65	41	33	26
14	Cc (kW)	1828	1731	1640	1478	1147	1016	896	1967	1863	1768	1526	1170	1063	932
	Pi (kW)	491	538	588	538	386	370	317	555	607	663	516	379	340	292
	Qwe (l/s)	87.50	82.80	78.50	70.80	54.90	48.60	42.90	94.10	89.20	84.60	73.00	56.00	50.80	44.60
	Pdwe (kPa)	94	86	78	64	41	33	26	104	94	86	66	41	34	27
15	Cc (kW)	1875	1777	1678	1500	1138	1016	909	2018	1913	1804	1555	1192	1060	945
	Pi (kW)	501	547	588	523	409	352	311	566	618	655	507	372	320	284
	Qwe (l/s)	89.80	85.10	80.30	71.80	54.50	48.70	43.50	96.60	91.60	86.40	74.40	57.10	50.70	45.30
	Pdwe (kPa)	99	90	81	66	40	33	27	109	99	89	68	42	34	28

Cc (cooling capacity) - Pi (unit power input)
Qwe (evaporator water flow) - Pdwe (evaporator pressure drop)
ELWT (evaporator leaving water temperature – Δt 5°C).
Data are referred to 0,0176 m2 °C/kW evaporator fouling factor

		C15							C16						
		Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)						
ELWT (°C)		25	30	35	40	46	48	50	25	30	35	40	46	48	50
4	Cc (kW)	1591	1499	1407	1324	1237	1106	969	1677	1583	1489	1404	1322	1197	1054
	Pi (kW)	452	501	555	615	680	572	476	475	528	585	649	724	625	522
	Qwe (l/s)	75.80	71.40	67.00	63.10	58.90	52.70	46.20	79.90	75.40	70.90	66.90	63.00	57.00	50.20
	Pdwe (kPa)	60	53	48	43	38	31	24	65	59	53	48	43	36	28
5	Cc (kW)	1636	1545	1451	1366	1244	1108	971	1724	1630	1534	1447	1341	1206	1061
	Pi (kW)	460	509	563	623	647	542	492	483	536	593	657	705	601	528
	Qwe (l/s)	78.00	73.60	69.10	65.10	59.30	52.80	46.30	82.20	77.70	73.10	69.00	63.90	57.50	50.60
	Pdwe (kPa)	63	56	50	45	38	31	24	69	62	56	50	44	36	29
6	Cc (kW)	1684	1591	1497	1409	1251	1128	988	1774	1679	1582	1492	1354	1220	1079
	Pi (kW)	468	517	571	632	616	531	482	491	544	602	666	679	581	517
	Qwe (l/s)	80.30	75.90	71.40	67.20	59.70	53.80	47.10	84.60	80.10	75.40	71.20	64.60	58.20	51.50
	Pdwe (kPa)	66	60	53	48	39	32	25	73	66	59	53	45	37	30
7	Cc (kW)	1733	1639	1545	1454	1258	1149	1006	1826	1728	1631	1539	1362	1242	1098
	Pi (kW)	476	525	580	640	585	520	471	499	552	610	674	647	569	506
	Qwe (l/s)	82.70	78.20	73.70	69.40	60.00	54.80	48.00	87.10	82.50	77.80	73.40	65.00	59.30	52.40
	Pdwe (kPa)	70	63	57	51	39	33	26	76	69	62	56	45	38	31
8	Cc (kW)	1783	1689	1592	1500	1282	1170	1008	1878	1780	1680	1586	1381	1258	1080
	Pi (kW)	483	533	588	649	574	509	447	507	560	619	683	627	551	501
	Qwe (l/s)	85.10	80.60	76.00	71.60	61.20	55.80	48.10	89.60	84.90	80.20	75.70	65.90	60.00	51.50
	Pdwe (kPa)	73	66	60	54	41	34	26	80	73	66	59	46	39	30
9	Cc (kW)	1834	1738	1640	1546	1306	1172	1025	1931	1831	1729	1634	1406	1268	1099
	Pi (kW)	491	541	597	659	564	483	437	516	569	628	693	616	529	492
	Qwe (l/s)	87.60	83.00	78.30	73.80	62.30	56.00	49.00	92.20	87.40	82.60	78.00	67.20	60.50	52.50
	Pdwe (kPa)	77	70	63	57	42	34	27	85	77	69	63	48	40	31
10	Cc (kW)	1886	1788	1688	1591	1311	1173	1042	1986	1883	1780	1682	1420	1278	1113
	Pi (kW)	499	550	606	668	536	501	429	524	578	637	702	593	537	478
	Qwe (l/s)	90.10	85.40	80.60	76.00	62.60	56.10	49.80	94.90	90.00	85.00	80.30	67.90	61.10	53.20
	Pdwe (kPa)	81	74	67	60	42	35	28	89	81	73	66	49	40	31
11	Cc (kW)	1939	1837	1735	1636	1333	1177	1058	2041	1935	1830	1729	1438	1282	1131
	Pi (kW)	508	559	615	678	526	477	420	532	587	646	712	575	511	470
	Qwe (l/s)	92.70	87.80	82.90	78.20	63.70	56.20	50.60	97.50	92.50	87.40	82.60	68.70	61.30	54.10
	Pdwe (kPa)	85	78	70	63	44	35	29	94	85	77	69	50	41	32
12	Cc (kW)	1992	1887	1782	1680	1354	1195	1072	2096	1988	1879	1776	1462	1279	1143
	Pi (kW)	516	568	625	689	517	469	412	541	596	656	723	565	528	456
	Qwe (l/s)	95.30	90.30	85.20	80.30	64.70	57.10	51.30	100.20	95.10	89.90	84.90	69.90	61.20	54.70
	Pdwe (kPa)	90	81	73	66	45	36	29	98	89	81	73	51	40	33
13	Cc (kW)	2046	1937	1828	1723	1354	1212	1066	2152	2041	1929	1823	1466	1294	1146
	Pi (kW)	525	578	636	701	493	461	391	551	606	667	734	538	514	439
	Qwe (l/s)	97.90	92.70	87.50	82.40	64.80	58.00	51.00	102.90	97.60	92.30	87.20	70.10	61.90	54.80
	Pdwe (kPa)	94	85	77	69	45	37	29	103	94	85	77	52	41	33
14	Cc (kW)	2099	1987	1874	1750	1352	1227	1077	2208	2093	1978	1859	1474	1313	1160
	Pi (kW)	535	588	647	692	514	454	385	560	616	678	732	548	507	432
	Qwe (l/s)	100.40	95.10	89.70	83.70	64.70	58.70	51.60	105.70	100.20	94.70	89.00	70.50	62.80	55.50
	Pdwe (kPa)	99	89	80	71	45	38	30	108	98	89	79	52	42	34
15	Cc (kW)	2152	2036	1918	1775	1369	1223	1087	2264	2146	2027	1894	1488	1312	1166
	Pi (kW)	545	599	659	684	507	433	378	571	627	689	731	534	484	420
	Qwe (l/s)	103.00	97.50	91.80	85.00	65.60	58.50	52.00	108.40	102.70	97.10	90.70	71.20	62.80	55.80
	Pdwe (kPa)	103	93	84	73	46	37	30	113	103	93	82	53	42	34

Cc (cooling capacity) - Pi (unit power input)
Qwe (evaporator water flow) - Pdwe (evaporator pressure drop)
ELWT (evaporator leaving water temperature – Δt 5°C).
Data are referred to 0,0176 m2 °C/kW evaporator fouling factor

		C17						
		Condenser Inlet Air Temperature (°C)						
ELWT (°C)		25	30	35	40	46	48	50
4	Cc (kW)	1757	1666	1575	1492	1412	1297	1155
	Pi (kW)	490	546	608	676	755	667	566
	Qwe (l/s)	83.70	79.40	75.00	71.00	67.30	61.80	55.00
	Pdwe (kPa)	62	56	51	46	42	36	29
5	Cc (kW)	1805	1712	1619	1535	1453	1337	1171
	Pi (kW)	498	554	616	684	764	675	567
	Qwe (l/s)	86.00	81.60	77.20	73.20	69.30	63.70	55.80
	Pdwe (kPa)	65	59	53	48	44	38	30
6	Cc (kW)	1853	1760	1665	1580	1484	1344	1184
	Pi (kW)	505	562	623	692	759	647	550
	Qwe (l/s)	88.40	83.90	79.40	75.30	70.80	64.10	56.50
	Pdwe (kPa)	68	62	56	51	46	38	30
7	Cc (kW)	1904	1809	1712	1625	1503	1360	1204
	Pi (kW)	513	570	631	700	738	628	537
	Qwe (l/s)	90.80	86.30	81.70	77.50	71.70	64.90	57.40
	Pdwe (kPa)	71	65	59	54	47	39	31
8	Cc (kW)	1955	1858	1761	1671	1517	1370	1181
	Pi (kW)	521	577	640	708	709	602	568
	Qwe (l/s)	93.30	88.70	84.10	79.80	72.40	65.40	56.40
	Pdwe (kPa)	75	68	62	56	47	40	30
9	Cc (kW)	2008	1909	1810	1718	1526	1393	1204
	Pi (kW)	528	585	648	717	676	589	559
	Qwe (l/s)	95.90	91.20	86.40	82.00	72.90	66.50	57.50
	Pdwe (kPa)	79	72	65	59	48	41	31
10	Cc (kW)	2062	1961	1860	1766	1552	1417	1211
	Pi (kW)	536	594	656	726	663	577	535
	Qwe (l/s)	98.50	93.70	88.90	84.40	74.20	67.70	57.80
	Pdwe (kPa)	83	75	69	62	50	42	32
11	Cc (kW)	2116	2013	1910	1814	1579	1415	1232
	Pi (kW)	544	602	665	735	651	557	526
	Qwe (l/s)	101.20	96.20	91.30	86.70	75.50	67.70	58.90
	Pdwe (kPa)	87	79	72	66	51	42	33
12	Cc (kW)	2172	2066	1961	1862	1587	1439	1241
	Pi (kW)	553	611	674	744	619	546	507
	Qwe (l/s)	103.80	98.80	93.80	89.10	75.90	68.80	59.40
	Pdwe (kPa)	91	83	76	69	52	43	33
13	Cc (kW)	2228	2120	2012	1911	1613	1400	1260
	Pi (kW)	561	619	684	754	608	574	499
	Qwe (l/s)	106.60	101.40	96.30	91.40	77.20	67.00	60.30
	Pdwe (kPa)	95	87	79	72	53	41	34
14	Cc (kW)	2284	2174	2064	1960	1625	1422	1266
	Pi (kW)	570	629	693	765	584	565	480
	Qwe (l/s)	109.30	104.00	98.80	93.80	77.80	68.00	60.60
	Pdwe (kPa)	99	91	83	76	54	42	34
15	Cc (kW)	2341	2228	2116	2004	1637	1432	1283
	Pi (kW)	579	638	703	768	578	546	472
	Qwe (l/s)	112.10	106.70	101.30	96.00	78.40	68.50	61.40
	Pdwe (kPa)	104	95	87	79	55	43	35

Cc (cooling capacity) - Pi (unit power input)
Qwe (evaporator water flow) - Pdwe (evaporator pressure drop)
ELWT (evaporator leaving water temperature – Δt 5°C).
Data are referred to 0,0176 m2 °C/kW evaporator fouling factor

Options

Total heat recovery ratings

Version	Size	Version	Size	EWC / LWC	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	COP Hc
EWAD~CZXS EWAD~CZXL	670	EWAD~CZXR	640	40/45	606	217	700	85%	6.01
	740		700		668	203	740	85%	6.94
	830		790		754	230	836	85%	6.91
	900		850		817	267	922	85%	6.51
	C10		980		935	295	1046	85%	6.71
	C11		C10		986	329	1118	85%	6.39
	C12		C11		1117	347	1244	85%	6.81
	C13		C12		1179	386	1331	85%	6.50
	C14		C13		1307	426	1473	85%	6.52
	C15		C14		1393	465	1580	85%	6.39
	C16		C15		1467	491	1664	85%	6.38
	C17		C16		1547	517	1755	85%	6.38
	C18		C17		1640	537	1850	85%	6.50

Version	Size	Version	Size	EWC / LWC	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	COP Hc
EWAD~CZXS EWAD~CZXL	670	EWAD~CZXR	640	40/50	578	220	678	85%	5.72
	740		700		637	205	716	85%	6.59
	830		790		719	233	809	85%	6.56
	900		850		779	270	892	85%	6.19
	C10		980		891	298	1011	85%	6.38
	C11		C10		940	333	1082	85%	6.07
	C12		C11		1064	351	1203	85%	6.47
	C13		C12		1124	391	1288	85%	6.17
	C14		C13		1246	431	1425	85%	6.20
	C15		C14		1328	471	1529	85%	6.07
	C16		C15		1398	497	1611	85%	6.06
	C17		C16		1475	523	1698	85%	6.06
	C18		C17		1563	543	1790	85%	6.18

Version	Size	Version	Size	EWC / LWC	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	COP Hc
EWAD~CZXS EWAD~CZXL	670	EWAD~CZXR	640	45/55	578	222	480	60%	4.76
	740		700		637	208	507	60%	5.50
	830		790		719	236	573	60%	5.48
	900		850		779	274	632	60%	5.16
	C10		980		891	302	716	60%	5.32
	C11		C10		940	337	767	60%	5.06
	C12		C11		1064	355	852	60%	5.40
	C13		C12		1124	396	912	60%	5.15
	C14		C13		1246	437	1009	60%	5.17
	C15		C14		1328	477	1083	60%	5.06
	C16		C15		1398	503	1141	60%	5.05
	C17		C16		1475	530	1203	60%	5.05
	C18		C17		1563	550	1268	60%	5.15

Version	Size	Version	Size	EWC / LWC	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	COP Hc
EWAD~CZXS EWAD~CZXL	670	EWAD~CZXR	640	50/60	578	222	280	35%	3.86
	740		700		637	208	296	35%	4.48
	830		790		719	236	334	35%	4.47
	900		850		779	274	368	35%	4.20
	C10		980		891	302	418	35%	4.33
	C11		C10		940	337	447	35%	4.11
	C12		C11		1064	355	497	35%	4.40
	C13		C12		1124	396	532	35%	4.19
	C14		C13		1246	437	589	35%	4.20
	C15		C14		1328	477	632	35%	4.11
	C16		C15		1398	503	666	35%	4.10
	C17		C16		1475	530	702	35%	4.11
	C18		C17		1563	550	739	35%	4.19

Notes:
Cc (cooling capacity
Pi (unit power input)
Hc (heating heat recovery capacity)
%Hc (percentage heat recovered)
COP Hc (coefficent of performance during heat recovery = (cooling+ heating capacity) / power input)
EWC (Entering water heat recovery condenser)
LWC (Leaving water heat recovery condenser)

Data refers to:
LWE (Leaving water evaporator) = 7°C
Same evaporator flow as for nominal cooling operation
Condenser Inlet Air Temperature = 35°C
0,0176 m2 °C/kW evaporator fouling factor

Partial heat recovery ratings

Version	Size
EWAD~CZXS EWAD~CZXL	670
	740
	830
	900
	C10
	C11
	C12
	C13
	C14
	C15
	C16
	C17
	C18

Version	Size
EWAD~CZXR	640
	700
	790
	850
	980
	C10
	C11
	C12
	C13
	C14
	C15
	C16
	C17

Evaporator Leaving Temperature 7°C - Δt 5°C / Condenser Inlet Air 35°C	Partial Heat Recovery Leaving Water Temperature (°C)		
	45 (Δt=5°C)	50 (Δt=5°C)	55 (Δt=5°C)
	Hc (kW)	Hc (kW)	Hc (kW)
	120	100	81.8
	127	106	86.6
	143	120	97.6
	157	132	108
	179	151	123
	192	161	131
	213	179	146
	228	192	156
	253	212	173
	271	227	185
	284	239	194
	300	252	205
	314	264	215

Partial Heat Rrecovery LWT 45°C	
Water Flow	Pressure Drops
l/s	kPa
5.71	24
6.05	26
6.82	33
7.52	40
8.57	51
9.16	39
10.17	48
10.90	33
12.07	41
12.92	46
13.59	39
14.31	42
15.02	46

Total and partial heat recovery pressure drops

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

$$\mathbf{PD_2}\ (\text{kPa}) = \mathbf{PD_1}\ (\text{kPa}) \times \left(\frac{\mathbf{Q_2}\ (\text{l/s})}{\mathbf{Q_1}\ (\text{l/s})} \right)^{\mathbf{1.87}}$$

where:

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

How to use the formula: Example

The unit EWAD670CZXS has been selected for working at the following conditions:
- Partial heat recovery leaving water temperature 50/55°C

The heating capacity at these working conditions is: 81.8 kW
The water flow at these working conditions is: 3.91 l/s

The unit EWAD670CZXS at nominal working conditions has the following data:
- Partial heat recovery leaving water temperature 40/45°C
- condenser air inlet: 35°C

The heating capacity at these working conditions is: 120 kW
The water flow at these working conditions is: 5.71 l/s
The pressure drop at these working conditions is: 24 kPa

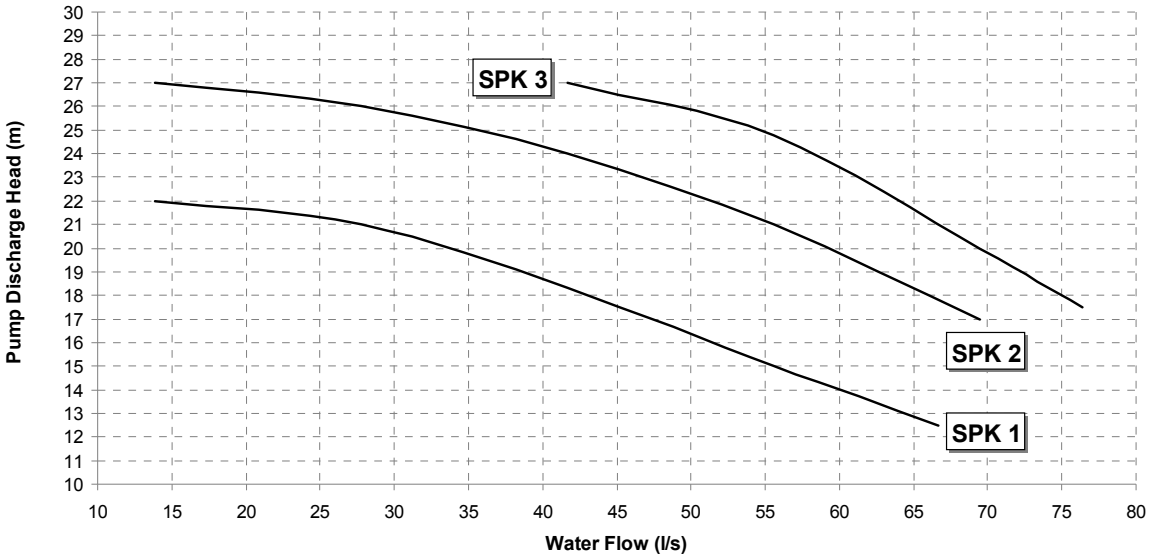
The pressure drop at the selected working condition will be:

$$\mathbf{PD_2}\ (\text{kPa}) = \mathbf{24}\ (\text{kPa}) \times \left(\frac{\mathbf{3.91}\ (\text{l/s})}{\mathbf{5.71}\ (\text{l/s})} \right)^{\mathbf{1.87}}$$

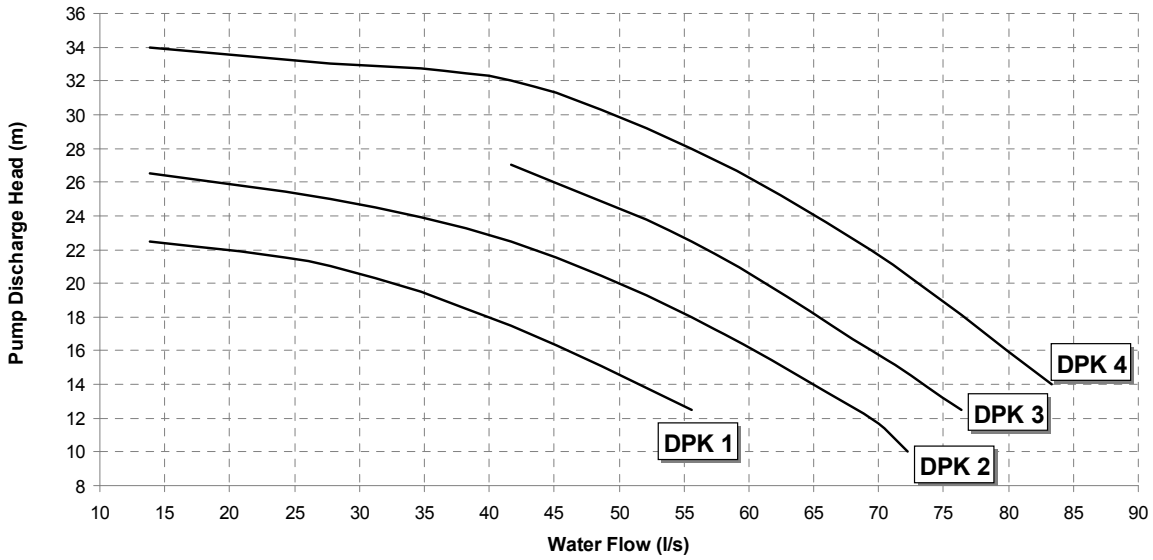
$$\mathbf{PD_2}\ (\text{kPa}) = \mathbf{12}\ (\text{kPa})$$

Water Pump Kit

Single Pump (2 poles) - Discharge Head



Twin Pump (2 poles) - Discharge Head



Note
- the above curves are referred to the discharge head of the pump only
- when selecting the pump you have to consider the installation and evaporator pressure drops
- when using mixture of water and glycol please contact the factory as above specification can change

Combination Matrix

Version	Size	Version	Size	Single Pump			Double Pump			
				SPK 1	SPK 2	SPK 3	DPK 1	DPK 2	DPK 3	DPK 4
EWAD~CZXS EWAD~CZXL	670	EWAD~CZXR	640	X	X		X	X		
	740		700	X	X		X	X		
	830		790	X	X		X	X		
	900		850	X	X		X	X		
	C10		980	X	X	X	X	X	X	X
	C11		C10	X	X	X	X	X	X	X
	C12		C11	X	X	X		X	X	X
	C13		C12	X	X	X		X	X	X
	C14		C13	X	X	X		X	X	X
	C15		C14			X			X	X
	C16		C15							
	C17		C16							
	C18		C17							

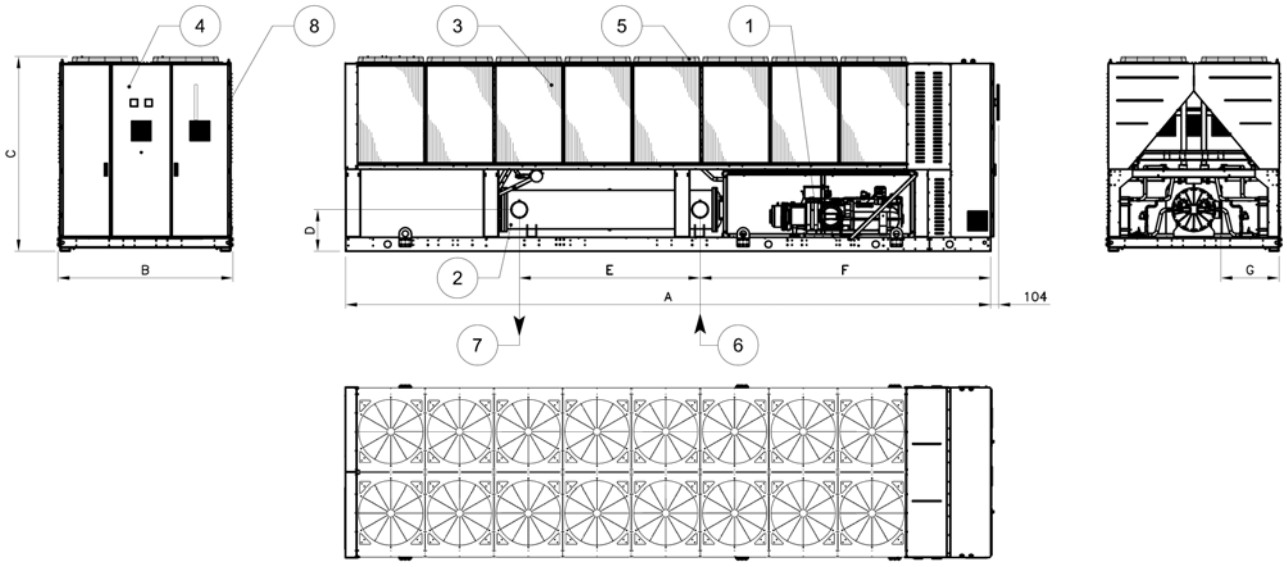
Technical Information

		Pump Motor Power (kW)	Pump Motor Current (A)	Power supply (V-ph-Hz)	PN	Motor Protection	Insulation (Class)	Working Temp. (°C)
Single Pump	SPK 1	11.0	20.0	400V-3ph-50hz	16	IP55	class F	-20 +140
	SPK 2	15.0	26.5	400V-3ph-50hz	16	IP55	class F	-20 +140
	SPK 3	18.5	32.5	400V-3ph-50hz	16	IP55	class F	-20 +140
Double Pump	DPK 1	11.0	20.0	400V-3ph-50hz	16	IP55	class F	-20 +140
	DPK 2	15.0	26.5	400V-3ph-50hz	16	IP55	class F	-20 +140
	DPK 3	18.5	32.5	400V-3ph-50hz	16	IP55	class F	-20 +140
	DPK 4	22.0	39.0	400V-3ph-50hz	16	IP55	class F	-20 +140

Note
- when using mixture of water and glycol please contact the factory as above specification can change

Dimensions

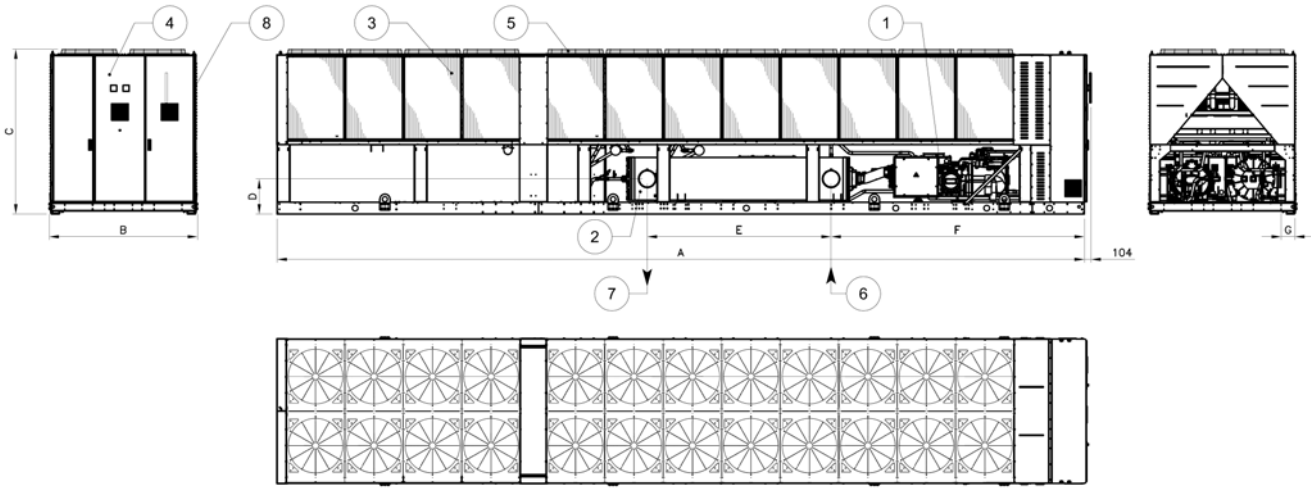
EWAD~CZ-XS/XN/XR



The drawing is for illustration only. Please refer to the table below for unit dimensions.

Models		Dimensions (mm)							
EWAD~CZXS/XN	**EWAD~CZXR**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**Fans**
670	**640**	6621	2285	2540	434	2412	3757	810	10
740	**700**	6621	2285	2540	434	2412	3757	810	12
830	**790**	7521	2285	2540	434	2412	3757	810	14
900	**850**	7521	2285	2540	434	2412	3757	810	14
C10	**980**	8421	2285	2540	542	2360	3794	758	16
C11	**C10**	8421	2285	2540	542	2360	3794	758	16
C12	**C11**	9321	2285	2540	542	2360	3794	758	20
C13	**C12**	9321	2285	2540	542	2360	3794	758	20

LEGEND
1. Compressor
2. Evaporator
3. Condenser coil
4. Electrical panel
5. Fan
6. Evaporator water inlet
7. Evaporator water outlet
8. Power connections slot



The drawing is for illustration only. Please refer to the table below for unit dimensions.

Models		Dimensions (mm)							
EWAD~CZXS/XN	**EWAD~CZXR**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**Fans**
C14	**C13**	11521	2285	2540	542	2360	3794	758	22
C15	**C14**	12421	2285	2540	542	2360	3794	758	24
C16	**C15**	12421	2285	2540	542	2830	3896	208	24
C17	**C16**	13321	2285	2540	542	2830	3896	208	26
C18	**C17**	14221	2285	2540	542	2830	3896	208	28

LEGEND

1. Compressor
2. Evaporator
3. Condenser coil
4. Electrical panel
5. Fan
6. Evaporator water inlet
7. Evaporator water outlet
8. Power connections slot

Installation notes

Warning

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

Handling

Care should be taken to avoid rough handling or shock due to dropping the unit. Do not push or pull the unit from anything other than the base frame. Never allow the unit to fall during unloading or moving as this may result in serious damage. To lift the unit, rings are provided in the base frame of the unit. Spreader bar and cables should be arranged to prevent damage to the condenser coil or unit cabinet.

Location

The units are produced for outside installation on roofs, floors or below ground level on condition that the area is free from obstacles for the passage of the condenser air. The unit should be positioned on solid foundations and perfectly level; in the case of installation on roofs or floors, it may be advisable to arrange the use of suitable weight distribution beams. When the units are installed on the ground, a concrete base at least 250 mm wider and longer than the unit's footprint should be laid. Furthermore, this base should withstand the unit weight mentioned in the technical data table.

Space requirements

The units are air-cooled, then it is important to respect the minimum distances which guarantee the best ventilation of the condenser coils. Limitations of space reducing the air flow could cause significant reductions in cooling capacity and an increase in electricity consumption.
To determinate unit placement, careful consideration must be given to assure a sufficient air flow across the condenser heat transfer surface. Two conditions must be avoided to achieve the best performance: warm air recirculation and coil starvation.
Both these conditions cause an increase of condensing pressures that results in reductions in unit efficiency and capacity.
Moreover the unique microprocessor has the ability to calculate the operating environment of the air cooled chiller and the capacity to optimize its performance staying on-line during abnormal conditions.
Each side of the unit must be accessible after installation for periodic service. Fig.1 shows you minimum recommended clearance requirements.
Vertical condenser air discharge must be unobstructed because the unit would have its capacity and efficiency significantly reduced.
If the units are positioned in places surrounded by walls or obstacles of the same height as the units, the units should be at least 2500 mm from obstacles (fig.2). In the event the obstacles are higher than the units, the units should be at least 3000 mm from the obstacle (fig.4). Units installed closer than the minimum recommended distance to a wall or other vertical riser may experience a combination of coil starvation and warm air recirculation, thus causing reduction in unit capacity and efficiency reductions. The microprocessor control is proactive in response "of design condition". In the case of single or compounded influences restricting airflow to the unit, the microprocessor will act to keep the compressor(s) running (at reduced capacity) rather than allowing a shut-off on high discharge pressure.
When two or more units are positioned side by side it is recommended that the condenser coils are at least 3600 mm distance from one another (fig.3); strong wind could be the cause of air warm recirculation.
For other installation solutions, consult our technicians.

The above recommended information are representative of general installation. A specific evaluation should be done by contractor depending on the case.

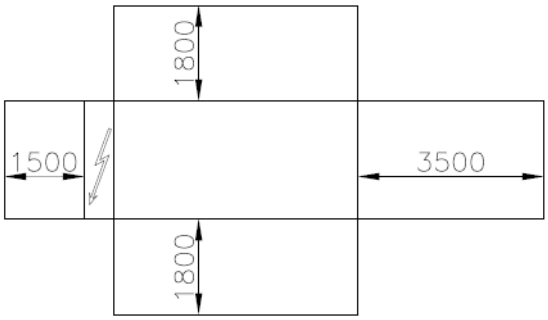


Fig. 1

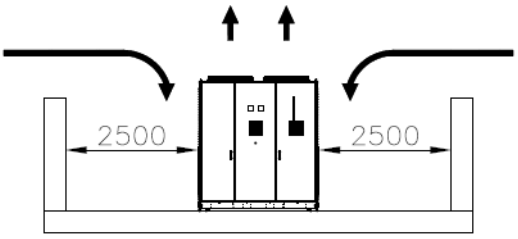


Fig. 2

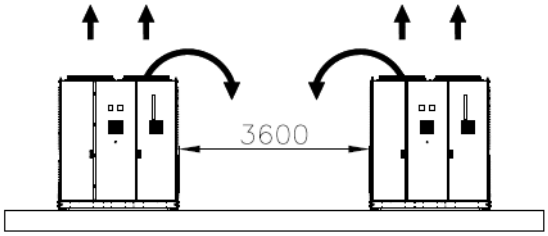


Fig. 3

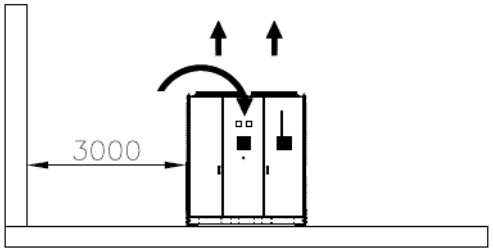


Fig. 4

Acoustic protection

When noise level must meet special requirements, it is necessary to pay the maximum attention to ensure the perfect insulation of the unit from the support base by applying appropriate vibration-dampening devices on the unit, on the water pipes and on the electrical connections.

Storage

The environment conditions have to be in the following limits:

Minimum ambient temperature:	-20°C
Maximum ambient temperature:	+57°C
Maximum R.H.:	95% not condensing

Technical specification for air cooled chiller

Genaral

The chiller will be designed and manufactured in accordance with the 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 Standards	UNI – EN ISO 9001:2004

To avoid any losses, the unit will be tested at full load in the factory (at the nominal working conditions and water temperatures). The chiller will be delivered to the job site completely assembled and charged with refrigerant and oil. The installation of the chiller must comply with the manufacturer's instructions for rigging and handling equipment.

The unit will be able to start up and operate (as standard) at full load with:
- outside air temperature from ..... °C to ..... °C
- evaporator leaving fluid temperature between ..... °C and ..... °C

Refrigerant

Only HFC 134a can be used.

Performance

- ✓ Number of chiller(s) : ..... unit(s)
- ✓ Cooling capacity for single chiller : ..... kW
- ✓ Power input for single chiller in cooling mode : ..... kW
- ✓ Heat exchanger entering water temperature in cooling mode : ..... °C
- ✓ Heat exchanger leaving water temperature in cooling mode : ..... °C
- ✓ Heat exchanger water flow : ..... l/s
- ✓ Nominal outside working ambient temperature in cooling mode : ..... °C

Operating voltage range should be 400V ±10%, 3ph, 50Hz, voltage unbalance maximum 3%, without neutral conductor and shall only have one power connection point.

Unit description

The chiller includes as standard not less than: two or three independent refrigerant circuits (depending on the size), semi-hermetic asymmetric type rotary single screw compressors, air cooled variable electrical frequency driver for each compressor (VFD), electronic expansion device (EEXV), refrigerant direct expansion 'shell&tube' heat exchanger, air-cooled condenser section, R-134a refrigerant, lubrication system, motor starting components, discharge line shut-off valve, control system and all components necessary for a safe and stable unit operation.

The chiller will be factory assembled on a robust base frame made of galvanized steel, protected by an epoxy paint.

Sound 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 can not be used).

Vibration on the base frame should not exceed 2 mm/s.

Dimensions

Unit dimensions shall not exceed following indications:
- Unit length..... mm
- Unit width ..... mm
- Unit height..... mm

Chiller components

Compressors

- ✓ Semi-hermetic, single-screw asymmetric type with one main helical rotor meshing with two diametrical opposed gaterotors. The gaterotors' contact elements shall be constructed of composite material designed for extended life. Electrical motor shall be 2-pole, semi-hermetic, squirrel-cage induction type and cooled by suction gas.
- ✓ 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.
- ✓ The compressor shall be provided with a built in, high efficiency, mesh type oil separator and oil filter.
- ✓ Refrigerant system differential pressure shall provide oil injection on all moving compressor parts to correctly lubricate them. Electrical oil pump lubricating system is not allowed.
- ✓ Compressor cooling must be done by refrigerant liquid injection. An external dedicated heat exchanger and additional piping to carry the oil from compressor to heat exchanger and viceversa is not allowed.
- ✓ The compressor shall be direct electrical driven, without gear transmission between the screw and the electrical motor.
- ✓ The compressor casing shall be provided with ports to realize economized refrigerant cycles.
- ✓ The compressor must be protected by a temperature sensor for high discharge temperature and an electrical motor thermistor for high winding temperature.
- ✓ The compressor shall be equipped with an electric oil heater.
- ✓ The 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 chiller will have a microprocessor for the control of the compressor capacity through inverter and the instantaneous RPM value of the motor.
- ✓ The unit capacity control shall be infinitely modulating, from 100% down to 40% for each circuit. The chiller shall be capable of stable operation to a minimum of 13.5% of full load without hot gas bypass.
- ✓ The system shall control the unit based on the leaving evaporator water temperature that shall be controlled by PID (Proportional Integral Derivative) logic.
- ✓ Unit control logic shall to manage frequency level of the compressor electric motor to exactly match plant load request in order to keep constant the set point for delivered chilled or hot 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 the chiller capacity when any of the following parameters are outside their normal operating range:
    - o High condenser pressure
    - o Low evaporating refrigerant temperature

Unit-mounted Variable Frequency Driver (VFD) and Electrical Requirement

- ✓ All interconnecting wiring between the VFD and the chiller shall be factory-installed. Customer electrical connection for compressor motor power shall be limited to main power leads to the single point power connection located into electrical panel.
- ✓ The VFD shall be air cooled type. Water cooled design or refrigerant cooled design are not acceptable.
- ✓ The VFD full load efficiency shall meet or exceed 97% at 100% VFD rated capacity.
- ✓ Base motor frequency shall permit motor to be utilized at nameplate voltage. Adjustable frequency range, monitored by unit's microprocessor control, shall permit a stable unit capacity control down to 13.5% without hot-gas bypass.
- ✓ Starting current for the compressor shall not exceed nominal compressor load amps.
- ✓ Unit power factor shall be not less than 0.95 on entire unit capacity range, from 100% down to 13.5%.

Evaporator

- ✓ The units shall be equipped with a Direct Expansion shell&tube evaporator with copper tubes rolled into steel tubesheets. The evaporator shall be single-pass on both the refrigerant and water sides for pure counter-flow heat exchange and low refrigerant pressure drops.
- ✓ The external shell shall be linked with an electrical heater to prevent freezing down to -28°C ambient temperature, controlled by a thermostat and shall be insulated with flexible, closed cell polyurethane insulation material (20-mm thick).

- ✓ The evaporator will have 2 or 3 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.

Condenser coil

- ✓ The condenser coils are constructed with internally finned seamless copper tubes and arranged in a staggered row pattern and mechanically expanded into lanced and rippled aluminium fins with full fin collars for higher efficiencies. The space between the fins is given by a collar that will increase the surface area in connection with the tubes, protecting them from ambient corrosion.
- ✓ The condenser coils will have an integral subcooler circuit that provides sufficient subcooling to effectively eliminate the possibility of liquid flashing and increase the unit's efficiency with 5% to 7% without increasing in energy consumption.
- ✓ The condenser coils shall be leak-tested and submitted to a pressure test with dry air.

Condenser fans

- ✓ The condenser fans used in conjunction with the condenser coils, shall be propeller type with glass reinforced resin blades for higher efficiencies and lower sound. Each fan shall be protected by a fan guard.
- ✓ The air discharge shall be vertical and each fan must be coupled to the electrical motor, supplied as standard to IP54 and capable to work to ambient temperatures of - 20°C to + 65°C.
- ✓ The condenser fans shall have as a standard a thermally protection by internal thermal motor protection and protected by circuit braker installed inside the electrical panel as a standard.

Refrigerant circuit

- ✓ The unit shall have two or three independent refrigerant circuits (depending on the size) and one variable electrical frequency driver per compressor (VFD).
- ✓ Each circuit shall include as standard: electronic expansion device piloted by unit’s microprocessor control, compressor discharge shut-off valve, replaceable core filter-drier, sight glass with moisture indicator and insulated suction line.

Condensation control

- ✓ The units will be provided with an automatic control for condensing pressure which ensures the working at low external temperatures down to - ..... °C, to maintain condensing pressure.
- ✓ The compressor automatically unloads when abnormal high condensing pressure is detected. This to prevent the shutdown of the refrigerant circuit (shutdown of the unit) due to a high-pressure fault.

Low sound unit configurations (on request)

- ✓ The unit compressor shall be connected with unit’s metal base frame by rubber antivibration supports to prevent the transmission of vibrations to all metal unit structure, in order to control the unit sound.
- ✓ The chiller shall be provided with an acoustical compressor enclosure. This enclosure shall be realized with a light, corrosion resisting aluminium structure and metal panels. The compressor sound-proof enclosure shall be internally fitted with flexible, multi-layer, high density materials.

Hydronic kit options (on request)

- ✓ The hydronic module shall be integrated in the chiller chassis without increasing its dimensions and includes the following elements: centrifugal water pump with three-phase motor equipped with internal over-temperature protection, safety relief valve and filling kit.
- ✓ The water piping shall be protected against corrosion and equipped with drain and purge plugs. The customer connections shall be victaulic connections. The piping shall be fully insulated to prevent condensation (pump insulation using polyurethane foam).
- ✓ A choice of two pump types shall be available:
    - o in-line single pump
    - o in-line twin pumps

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 separated from safety and operating controls in different compartments of the same panel.
- ✓ Starting will be inverter type.
- ✓ 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:
    - o leaving water temperature reset by controlling the water temperature Δt, by a remote 4-20mA DC signal or by controlling the external ambient temperature;
    - o soft load function to prevent the system from operating at full load during the chilled fluid pulldown period;
    - o password protection of critical parameters of control;
    - o start-to-start and stop-to-start timers to provide minimum compressor off-time with maximum motor protection;
    - o communication capability with a PC or remote monitoring;
    - o discharge pressure control through intelligent cycling of condenser fans;
    - o lead-lag selection manual or automatically by circuit run hours;
    - o double set point for brine unit version;
    - o scheduling via internal time clock to allow programming of a yearly start-stop schedule accommodating weekends and holidays.

Optional High Level Communications Interface

- ✓ The chiller is able to communicate to BMS (Building Management System) based on the most common protocols as:
    - o ModbusRTU
    - o LonWorks, now also based on the international 8040 Standard Chiller Profile and LonMark Technology
    - o BacNet BTP certifief over IP and MS/TP (class 4) (Native)
    - o Ethernet TCP/IP

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 Europe NV 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.

FSC

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