DAIKIN

Applied Systems

Technical Data

Air cooled inverter chiller, high efficiency, low sound

EEDEN13-415

EWAD-CZXL

TABLE OF CONTENTS

EWAD-CZXL

1 Features

- ESEER up to 5.24
- Inverter stepless single-screw compressor
- High efficiency, low sound levels
- Optimised for use with R-134a
- Wide operating range
- Extensive option list (heat recovery option available)
- Low starting current
- MicroTech III controller

2 Specifications

2-1 Technical Specifications					EWAD670CZ XL	EWAD740CZ XL	EWAD830CZ XL	EWAD900CZ XL	EWADC10CZ XL	EWADC11CZ XL	EWADC12CZ XL
Cooling capacity	Nom.			kW	668 (1)	734 (1)	828 (1)	898 (1)	1,033 (1)	1,090 (1)	1,232 (1)
Capacity control	Method				Stepless						
	Minimum capacity			%	20						
Power input	Cooling	Nom.		kW	249 (1)	239 (1)	269 (1)	309 (1)	343 (1)	380 (1)	404 (1)
EER					2.68 (1)	3.07 (1)		2.90 (1)	3.01 (1)	2.87 (1)	3.05 (1)
ESEER					4.64	4.72	4.89	4.88	4.91	4.70	
IPLV					5.47	5.68	5.72	5.79	5.73	5.56	5.58
Casing	Colour				Ivory white						
	Material				Galvanized and painted steel sheet						
Dimensions	Unit	Height		mm	2,540						
		Width		mm	2,285						
		Depth		mm	6,725		7,625		8,525		10,325
Weight	Unit			kg	6,170	6,280	6,900	7,150	7,720		8,850
	Operation weight			kg	6,430	6,530	7,140	7,390	8,160		9,240
Water heat exchanger	Type				Single pass shell & tube						
	Water volume			l	263	248	241		441		383
	Nominal water flow	Cooling		l/s	32.0	35.2	39.7	43.0	49.5	52.3	59.0
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	87	83	58	65	63	70	47
	Insulation material				Closed cell						
Air heat exchanger	Type				High efficiency fin and tube type with integral subcooler						
Fan	Quantity				10	12	14		16		20
	Type				Direct propeller						
	Diameter			mm	800						
	Air flow rate	Nom.		l/s	54,188	65,025	75,863		86,700		108,376
Fan motor	Drive				Direct on line						
	Input	Cooling		W	17,500	21,000	24,500		28,000		35,000
	Speed	Cooling	Nom.	rpm	900						
Sound power level	Cooling	Nom.		dBA	99		100				101
Sound pressure level	Cooling	Nom.		dBA	78						
Compressor	Type				asymmetric single screw compressor						
	Quantity				2						
	Starting method				Inverter driven						
	Oil	Charged volume		l	32		35	38			44
Operation range	Water side	Cooling	Min.	ºCDB	-8						
			Max.	ºCDB	15						
	Air side	Cooling	Min.	ºCDB	-18						
			Max.	ºCDB	50						
Refrigerant	Type				R-134a						
	Circuits	Quantity			2						
Refrigerant circuit	Charge			kg	141	161	178		200		235
Piping connections	Evaporator water inlet/outlet (OD)				168.3mm				219.1mm		
Safety devices	Item	01			High discharge pressure (pressure switch)						
		02			High discharge pressure (pressure transducer)						
		03			Low suction pressure (pressure transducer)						
		04			Compressor motor protection						
		05			High discharge temperature						
		06			Low oil pressure						
		07			Low pressure ratio						
		08			High oil filter pressure drop						
		09			Phase monitor						
		10			Emergency stop button						
		11			Water freeze protection controller						

2 Specifications

2-2 Technical Specifications					EWADC13CZXL	EWADC14CZXL	EWADC15CZXL	EWADC16CZXL	EWADC17CZXL	EWADC18CZXL
Cooling capacity	Nom.			kW	1,303 (1)	1,444 (1)	1,538 (1)	1,616 (1)	1,701 (1)	1,795 (1)
Capacity control	Method				Stepless					
	Minimum capacity			%	20			13		
Power input	Cooling	Nom.		kW	447 (1)	494 (1)	538 (1)	564 (1)	596 (1)	619 (1)
EER					2.92 (1)	2.93 (1)	2.86 (1)		2.85 (1)	2.90 (1)
ESEER					4.51	4.73	4.83	4.73	4.72	4.57
IPLV					5.45	5.61	5.75	5.85	5.76	5.45
Casing	Colour				Ivory white					
	Material				Galvanized and painted steel sheet					
Dimensions	Unit	Height		mm	2,540					
		Width		mm	2,285					
		Depth		mm	10,325	11,625	12,525		13,425	14,325
Weight	Unit			kg	9,250	9,880	10,220	11,790	12,610	13,340
	Operation weight			kg	9,640	10,260	10,600	12,640	13,460	14,210
Water heat exchanger	Type				Single pass shell & tube					
	Water volume			l	383	374		850		871
	Nominal water flow	Cooling		l/s	62.4	69.2	73.7	77.4	81.5	86.0
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	52	62	72	63	69	65
	Insulation material				Closed cell					
Air heat exchanger	Type				High efficiency fin and tube type with integral subcooler					
Fan	Quantity				20	22	24		26	28
	Type				Direct propeller					
	Diameter			mm	800					
	Air flow rate	Nom.		l/s	108,376	119,213	130,051	129,454	140,143	151,129
Fan motor	Drive				Direct on line					
	Input	Cooling		W	35,000	38,500	42,000		45,500	49,000
	Speed	Cooling	Nom.	rpm	900					
Sound power level	Cooling	Nom.		dBA	101			103		
Sound pressure level	Cooling	Nom.		dBA	78			80		
Compressor	Type				asymmetric single screw compressor					
	Quantity				2			3		
	Starting method				Inverter driven					
	Oil	Charged volume		l	50			57	63	69
Operation range	Water side	Cooling	Min.	°CDB	-8					
			Max.	°CDB	15					
	Air side	Cooling	Min.	°CDB	-18					
			Max.	°CDB	50					
Refrigerant	Type				R-134a					
	Circuits	Quantity			2			3		
Refrigerant circuit	Charge			kg	235	275	320	327	343	361
Piping connections	Evaporator water inlet/outlet (OD)				219.1mm			273mm		
Safety devices	Item	01			High discharge pressure (pressure switch)					
		02			High discharge pressure (pressure transducer)					
		03			Low suction pressure (pressure transducer)					
		04			Compressor motor protection					
		05			High discharge temperature					
		06			Low oil pressure					
		07			Low pressure ratio					
		08			High oil filter pressure drop					
		09			Phase monitor					
		10			Emergency stop button					
		11			Water freeze protection controller					

2 Specifications

2-3 Electrical Specifications				EWAD670CZ XL	EWAD740CZ XL	EWAD830CZ XL	EWAD900CZ XL	EWADC10CZ XL	EWADC11CZ XL	EWADC12CZ XL
Compressor	Phase			3~						
	Voltage		V	400						
	Voltage range	Min.	%	-10						
		Max.	%	10						
	Maximum running current		A	205	221		283		344	
	Starting method			VFD driven						
Compressor 2	Maximum running current		A	205	221	283		344		404
Power supply	Phase			3~						
	Frequency		Hz	50						
	Voltage		V	400						
	Voltage range	Min.	%	-10						
		Max.	%	10						
Unit	Maximum starting current		A	322	349	402	444	496	537	594
	Nominal running current (RLA)	Cooling	A	362	351	398	453	504	555	597
	Maximum running current		A	451	490	560	622	691	751	828
	Max unit current for wires sizing		A	494	537	614	683	758	825	909
Fans	Nominal running current (RLA)		A	40	48	56		64		80

Notes

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

(2) Sound pressure levels are measured at entering evaporator water temp. 12ºC; leaving evaporator water temp. 7ºC; ambient air temp. 35ºC; full load operation; Standard: ISO3744

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

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

(5) Nominal current in cooling mode: entering evaporator water temp. 12ºC; leaving evaporator water temp. 7ºC; ambient air temp. 35ºC. Compressor + fans current.

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

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

(8) Maximum current for wires sizing: (compressors full load ampere + fans current) x 1.1

2 Specifications

2-4 Electrical Specifications				EWADC13CZXL	EWADC14CZXL	EWADC15CZXL	EWADC16CZXL	EWADC17CZXL	EWADC18CZXL
Compressor	Phase			3~					
	Voltage		V	400					
	Voltage range	Min.	%	-10					
		Max.	%	10					
	Maximum running current		A	404		486	344		404
	Starting method			VFD driven					
Compressor 2	Maximum running current		A	404	486		344		404
Power supply	Phase			3~					
	Frequency		Hz	50					
	Voltage		V	400					
	Voltage range	Min.	%	-10					
		Max.	%	10					
Unit	Maximum starting current		A	635	708	762	844	901	957
	Nominal running current (RLA)	Cooling	A	656	724	789	826	873	908
	Maximum running current		A	889	978	1,068	1,127	1,196	1,265
	Max unit current for wires sizing		A	976	1,075	1,173	1,238	1,313	1,389
Fans	Nominal running current (RLA)		A	80	88	96		104	112

Notes

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

(2) Sound pressure levels are measured at entering evaporator water temp. 12ºC; leaving evaporator water temp. 7ºC; ambient air temp. 35ºC; full load operation; Standard: ISO3744

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

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

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3 Features and advantages

3 - 1 Features and Advantages

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
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.

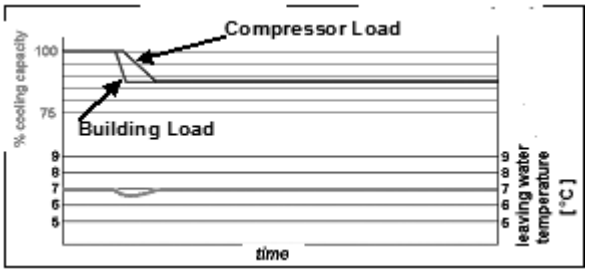
Quick comfort conditions
The ability to vary the output power in direct relation to the cooling requirements of the system, allow the possibility to achieve building comfort conditions much faster at start-up.

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.

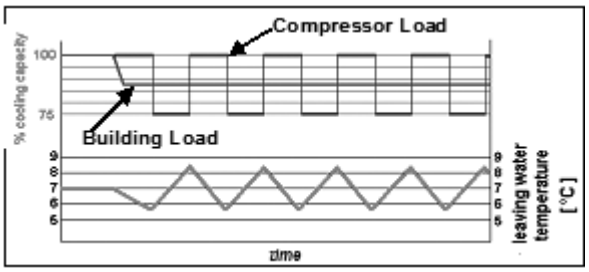
Redundancy
The range has two or three truly independent refrigerant circuits (depending on the size) guaranteeing (partial) cooling 'backup' even in case of maintenance activity

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.

FTA_1-2_Rev.00_1

3 Features and advantages

3 - 1 Features and Advantages

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 Standards	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 x EER100% + B x EER75% + C x EER50% + D x EER25%

	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.

FTA_1-2_Rev.00_2

4 General Characteristics

4 - 1 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 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

GNC_1-2-3-4_Rev.00_1

4 General Characteristics

4 - 1 General characteristics

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

GNC_1-2-3-4_Rev.00_2

4 General Characteristics

4 - 1 General characteristics

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

GNC_1-2-3-4_Rev.00_3

4 General Characteristics

4 - 1 General characteristics

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

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).

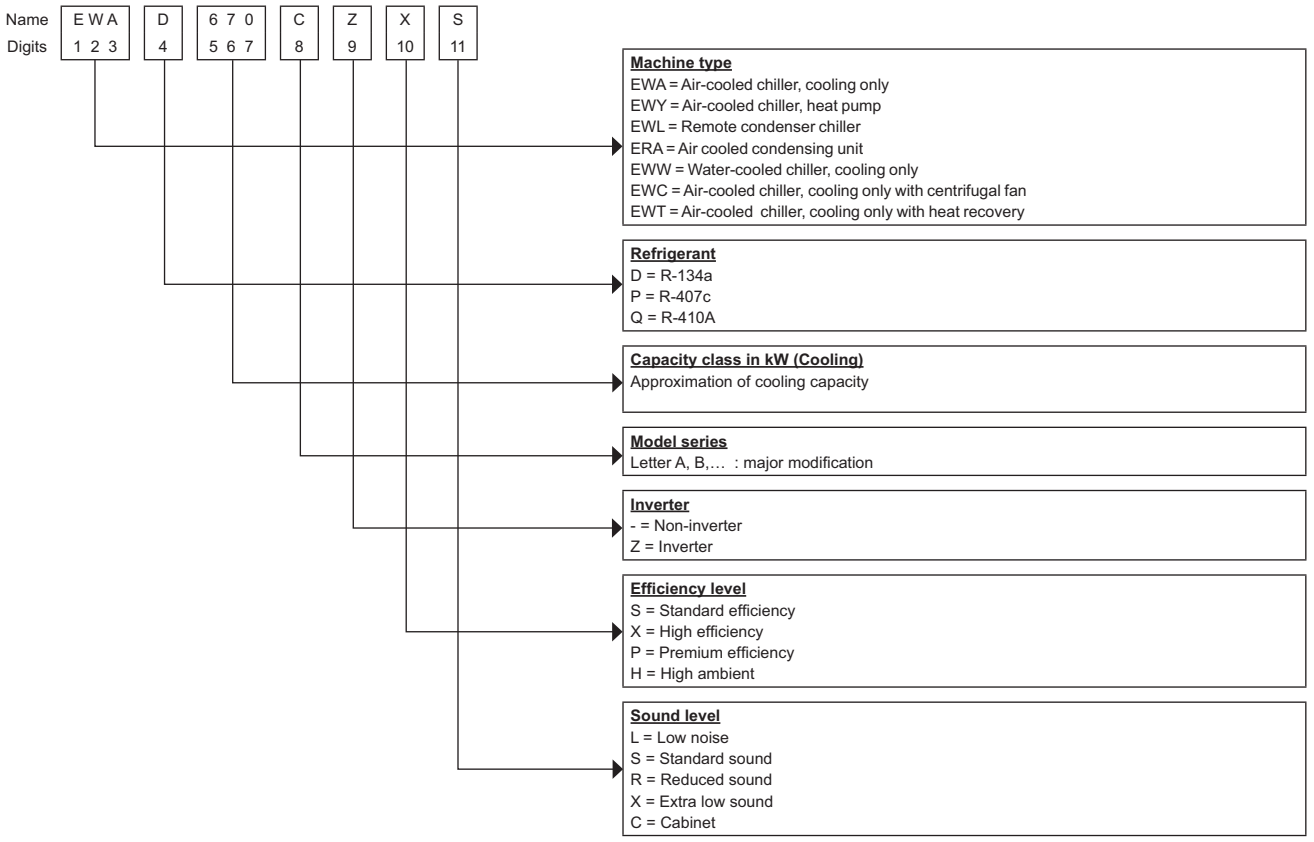
Witness test – Every unit is always tested at the test bench prior to the shipment. On request, a second test can be carried out, at customer's presence, in accordance with the procedures indicated on the test form. (Not available for units with glycol mixtures).

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

GNC_1-2-3-4_Rev.00_4

5 Nomenclature

5 - 1 Nomenclature



NMC_1_Rev.00_1

6 Capacity tables

6 - 1 Cooling Capacity Tables

EWAD670-C12CZXS/XL

Ta: Condenser inlet air temperature; Twout: Evaporator leaving water temperature (Δt 5°C);
CC: Cooling capacity; PI: Power input; qw: Fluid flow rate; dpw: Fluid pressure drop

	Condenser inlet air temperature	Twout																							
		5				7				9				11				13				15			
		CC	PI	qw	dpw	CC	PI	qw	dpw	CC	PI	qw	dpw	CC	PI	qw	dpw	CC	PI	qw	dpw	CC	PI	qw	dpw
Size	Ta	kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa
670	30	666	222	32.0	87	702	227	33.7	96	738	232	35.5	105	775	239	37.3	115	813	245	39.2	125	852	253	41.2	137
	35	632	244	30.3	79	668	249	32.0	87	702	255	33.8	96	737	262	35.5	105	773	269	37.3	114	811	276	39.1	125
	40	592	268	28.4	70	625	273	30.0	77	659	279	31.7	85	694	286	33.4	94	728	294	35.1	103	763	302	36.8	112
	46	535	299	25.6	58	565	304	27.1	64	592	302	28.4	70	607	277	29.2	74	627	262	30.2	78	647	248	31.2	83
	48	514	310	24.6	54	520	274	24.9	55	536	257	25.7	59	553	241	26.6	62	570	227	27.4	66	574	219	27.6	67
	50	457	256	21.9	44	469	239	22.4	46	482	223	23.1	48	489	220	23.4	50	505	207	24.2	53	513	189	24.7	54
740	30	727	213	34.8	81	774	219	37.2	91	825	225	39.7	102	871	232	42.0	113	921	239	44.4	125	972	248	46.9	139
	35	690	233	33.0	74	734	239	35.2	83	781	246	37.5	93	830	253	40.0	104	876	261	42.2	115	925	269	44.6	127
	40	647	255	31.0	66	688	261	33.0	74	732	268	35.1	82	778	275	37.4	92	827	284	39.8	103	872	293	42.0	114
	46	588	285	28.2	55	624	290	29.9	62	664	297	31.9	69	706	304	33.9	77	750	313	36.1	86	779	299	37.5	93
	48	567	295	27.1	52	601	300	28.8	58	639	307	30.6	64	668	298	32.1	70	687	276	33.1	74	706	255	34.0	77
	50	544	306	26.0	48	561	287	26.9	51	580	270	27.8	54	600	255	28.8	58	614	234	29.5	60	626	233	30.1	62
830	30	818	240	39.1	57	872	246	41.8	64	933	253	44.8	72	998	262	48.0	82	1066	272	51.3	92	1136	283	54.8	104
	35	778	263	37.2	52	828	269	39.7	58	882	276	42.3	65	943	285	45.3	74	1007	295	48.4	83	1073	306	51.7	94
	40	733	289	35.1	47	778	295	37.3	52	828	302	39.7	58	881	310	42.3	65	941	320	45.2	74	1003	331	48.3	83
	46	669	323	32.0	40	711	329	34.0	44	755	336	36.2	49	802	344	38.5	55	852	353	40.9	62	896	349	43.1	67
	48	645	335	30.8	37	685	341	32.8	41	728	348	34.9	46	765	341	36.7	51	803	335	38.6	55	839	327	40.3	60
	50	619	347	29.6	34	645	333	30.9	37	677	326	32.4	40	708	315	34.0	44	731	295	35.1	47	743	279	35.7	48
900	30	890	275	42.6	63	945	282	45.3	71	1008	290	48.4	80	1074	300	51.6	90	1144	310	55.1	101	1217	323	58.7	113
	35	846	302	40.5	58	898	309	43.0	65	953	317	45.7	72	1015	327	48.8	81	1080	338	52.0	91	1148	350	55.3	101
	40	796	332	38.1	52	843	339	40.4	58	894	347	42.9	64	948	356	45.5	71	1008	367	48.5	80	1072	380	51.6	90
	46	725	371	34.7	44	768	378	36.8	49	814	386	39.0	54	861	395	41.4	60	913	405	43.9	67	948	386	45.6	72
	48	698	385	33.4	41	740	392	35.4	46	784	400	37.6	51	812	378	39.0	54	836	352	40.2	57	864	334	41.6	61
	50	670	399	32.0	38	684	365	32.7	39	706	342	33.8	42	730	322	35.0	45	755	303	36.2	47	760	294	36.5	48
C10	30	1022	305	48.9	62	1091	314	52.3	70	1164	323	55.9	79	1239	334	59.6	88	1317	346	63.4	99	1397	360	67.3	110
	35	967	335	46.3	56	1033	343	49.5	63	1101	353	52.8	71	1173	364	56.3	80	1247	377	60.0	89	1323	391	63.8	100
	40	905	367	43.3	50	965	375	46.2	56	1029	385	49.4	63	1097	397	52.7	71	1167	409	56.1	79	1240	424	59.7	89
	46	820	409	39.2	42	873	417	41.8	47	930	427	44.6	52	992	438	47.6	59	1040	426	50.0	64	1089	416	52.4	70
	48	789	424	37.7	39	839	432	40.2	43	882	422	42.3	48	929	415	44.5	52	968	399	46.5	57	995	369	47.8	59
	50	745	420	35.6	35	776	404	37.1	38	811	390	38.9	41	841	368	40.3	44	861	352	41.3	46	882	324	42.4	48
C11	30	1083	338	51.9	69	1153	347	55.3	78	1226	358	58.9	87	1301	369	62.6	97	1379	382	66.4	108	1460	397	70.4	120
	35	1024	371	49.0	63	1090	380	52.3	70	1159	391	55.6	79	1231	403	59.2	88	1304	416	62.8	98	1381	432	66.5	109
	40	957	406	45.8	56	1018	415	48.8	62	1082	426	51.9	70	1150	439	55.2	78	1219	453	58.7	87	1291	469	62.2	96
	46	865	453	41.4	46	918	462	44.0	52	975	473	46.8	58	1037	485	49.8	64	1068	449	51.3	68	1098	415	52.8	72
	48	831	469	39.7	43	881	478	42.2	48	913	451	43.7	51	946	426	45.4	55	971	391	46.6	57	994	360	47.8	60
	50	774	448	37.0	38	789	408	37.7	39	814	383	39.0	42	841	359	40.3	44	856	357	41.1	46	876	328	42.1	48
C12	30	1221	360	58.4	46	1301	369	62.3	52	1385	380	66.4	58	1475	391	70.8	65	1567	404	75.3	73	1664	418	80.1	81
	35	1156	395	55.3	42	1232	404	59.0	47	1313	415	62.9	53	1398	427	67.1	59	1488	440	71.5	66	1581	455	76.1	74
	40	1084	433	51.8	37	1154	442	55.2	42	1231	453	59.0	47	1312	465	62.9	53	1398	479	67.2	59	1489	495	71.6	67
	46	986	482	47.1	31	1049	491	50.2	35	1119	502	53.6	40	1194	514	57.3	45	1272	521	61.0	50	1336	508	64.2	55
	48	950	499	45.4	29	1011	508	48.4	33	1074	511	51.4	37	1132	502	54.3	40	1189	488	57.0	44	1236	463	59.3	48
	50	914	517	43.6	27	952	496	45.5	30	1002	486	47.9	32	1045	465	50.1	35	1082	434	51.9	37	1106	410	53.1	39

NOTES - ANMERKUNGEN - Σημειώσεις - NOTAS - REMARQUES - NOTE - OPMERKINGEN - примечания

1 Fluid: Water
Fluid: Wasser
Υγρό: Νερό
Líquido: agua
Liquide: Eau
Fluido: Acqua
Vloeistof: Water
Жидкость: Вода

2 For working conditions where dpw values are in italic, please contact factory.
Für Arbeitsbedingungen mit kursiv gedruckten dpw-Werten, wenden Sie sich bitte an den Hersteller.
Για τις συνθήκες εργασίας όπου οι τιμές dpw είναι σε πλάγια γραφή, παρακαλούμε επικοινωνήστε με το εργοστάσιο.
Para las condiciones de funcionamiento en las que los valores dpw están en cursiva, póngase en contacto con la fábrica.
Pour les conditions de travail lorsque les valeurs dpw sont en italique, veuillez contacter l'usine.
Per le condizioni d'esercizio in cui i valori dpw sono riportati in corsivo, contattare il produttore.
Voor bedrijfsomstandigheden met schuingedrukte dpw-waarden, gelieve contact op te nemen met de fabriek.
Если условия работы соответствуют значениям dpw, указанным курсивом, обратитесь на завод-изготовитель.

SRC_1-2-3_Rev.01_1-2_(1-2)

6 Capacity tables

6 - 1 Cooling Capacity Tables

EWADC13-C18CZXS/XL

Ta: Condenser inlet air temperature; Twout: Evaporator leaving water temperature (Δt 5°C);
CC: Cooling capacity; PI: Power input; qw: Fluid flow rate; dpw: Fluid pressure drop

	Condenser inlet air temperature	Twout																							
		5				7				9				11				13				15			
		CC	PI	qw	dpw	CC	PI	qw	dpw	CC	PI	qw	dpw	CC	PI	qw	dpw	CC	PI	qw	dpw	CC	PI	qw	dpw
Size	Ta	kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa
C13	30	1300	398	62.2	52	1382	408	66.2	58	1465	419	70.3	65	1554	432	74.6	72	1649	446	79.3	80	1749	461	84.2	89
	35	1227	436	58.7	47	1303	447	62.4	52	1387	459	66.5	58	1472	472	70.7	65	1563	486	75.1	73	1660	502	79.9	81
	40	1149	477	54.9	41	1218	488	58.3	46	1296	500	62.1	52	1382	514	66.3	58	1470	528	70.6	65	1563	545	75.2	73
	46	1041	530	49.8	35	1106	540	52.9	39	1178	552	56.4	44	1256	566	60.2	49	1334	567	64.1	55	1382	526	66.4	58
	48	1003	548	47.9	32	1065	559	51.0	36	1126	556	53.9	40	1173	526	56.2	43	1210	484	58.1	46	1247	445	59.9	48
	50	964	567	46.0	30	985	519	47.1	31	1022	489	48.9	34	1050	447	50.3	35	1093	421	52.4	38	1110	407	53.3	39
C14	30	1439	439	68.8	61	1527	451	73.2	69	1622	464	77.9	77	1722	478	82.7	85	1826	494	87.9	95	1937	511	93.3	106
	35	1359	482	65.0	55	1444	494	69.2	62	1535	507	73.6	69	1632	522	78.4	78	1734	538	83.4	87	1840	556	88.6	97
	40	1267	527	60.6	49	1350	539	64.6	55	1437	553	68.9	61	1530	568	73.5	69	1630	585	78.3	77	1733	604	83.4	87
	46	1141	585	54.5	40	1217	597	58.3	45	1301	612	62.4	51	1392	628	66.8	58	1472	621	70.7	64	1520	567	73.1	68
	48	1095	605	52.3	37	1169	617	55.9	42	1246	624	59.7	47	1300	583	62.3	51	1348	538	64.7	55	1387	487	66.7	58
	50	1046	625	50.0	35	1080	574	51.7	37	1128	541	54.0	40	1168	496	56.0	42	1205	454	57.8	45	1221	433	58.6	46
C15	30	1530	478	73.3	71	1624	491	77.8	79	1723	506	82.7	89	1828	521	87.9	99	1939	538	93.3	110	2054	557	99.1	122
	35	1448	525	69.3	64	1538	538	73.7	72	1633	553	78.4	80	1735	569	83.4	90	1842	587	88.6	100	1954	606	94.2	112
	40	1349	575	64.5	57	1438	589	68.9	64	1530	604	73.4	71	1628	620	78.2	80	1731	638	83.3	90	1840	658	88.6	100
	46	1210	638	57.9	47	1294	653	62.0	53	1384	668	66.4	60	1481	686	71.1	67	1571	687	75.5	75	1619	619	77.9	79
	48	1158	660	55.3	43	1241	675	59.4	49	1330	691	63.7	55	1386	638	66.5	60	1441	589	69.2	64	1478	526	71.1	67
	50	1102	683	52.7	39	1147	628	54.9	42	1205	592	57.7	46	1252	544	60.0	50	1296	498	62.2	53	1309	469	62.9	54
C16	30	1605	502	76.8	62	1703	514	81.6	69	1803	528	86.5	77	1908	544	91.7	85	2018	561	97.1	94	2131	581	102.7	104
	35	1523	552	72.9	56	1616	564	77.4	63	1712	579	82.1	70	1811	595	87.0	78	1914	613	92.0	86	2022	633	97.3	95
	40	1427	605	68.2	50	1514	618	72.5	56	1605	633	77.0	62	1700	650	81.6	69	1797	669	86.4	77	1898	690	91.3	85
	46	1294	676	61.9	42	1370	689	65.6	47	1454	704	69.7	52	1543	722	74.0	58	1603	691	77.0	62	1651	645	79.4	66
	48	1246	701	59.5	39	1318	714	63.1	44	1371	684	65.7	47	1415	640	67.9	50	1466	605	70.4	53	1501	556	72.1	55
	50	1166	677	55.7	35	1192	622	57.0	36	1239	594	59.3	39	1264	542	60.6	40	1292	528	62.0	42	1314	494	63.1	43
C17	30	1693	530	81.0	68	1792	543	85.9	76	1895	557	91.0	84	2003	573	96.3	93	2116	590	101.9	103	2235	610	107.7	114
	35	1608	583	76.9	62	1701	596	81.5	69	1800	611	86.4	77	1902	627	91.4	85	2010	645	96.7	94	2123	665	102.3	104
	40	1509	640	72.2	56	1597	653	76.5	62	1690	668	81.1	68	1789	685	85.9	76	1891	704	90.9	84	1998	725	96.2	93
	46	1373	714	65.6	47	1452	727	69.5	52	1538	742	73.7	58	1631	760	78.3	64	1705	741	81.9	70	1768	707	85.0	74
	48	1322	740	63.2	44	1399	753	67.0	49	1459	730	69.9	52	1520	703	72.9	57	1576	665	75.7	60	1616	612	77.7	63
	50	1248	729	59.7	39	1282	679	61.3	41	1332	648	63.8	44	1367	599	65.6	47	1395	575	66.9	48	1434	533	68.9	51
C18	30	1790	551	85.7	65	1884	562	90.3	71	1983	575	95.2	78	2088	589	100.3	86	2199	604	105.8	94	2315	621	111.5	104
	35	1705	607	81.6	59	1795	619	86.0	65	1889	632	90.6	72	1990	646	95.6	79	2096	662	100.8	87	2208	680	106.3	95
	40	1608	667	76.9	53	1692	679	81.0	59	1783	693	85.5	64	1879	708	90.2	71	1981	724	95.2	78	2088	742	100.5	86
	46	1473	746	70.4	45	1552	758	74.3	50	1636	771	78.4	55	1727	787	82.9	61	1824	804	87.6	67	1907	790	91.7	73
	48	1423	773	68.0	43	1500	785	71.8	47	1583	799	75.9	52	1648	775	79.1	56	1714	746	82.3	60	1763	691	84.8	63
	50	1371	801	65.5	40	1417	768	67.8	42	1451	707	69.5	44	1498	665	71.9	47	1549	625	74.3	50	1576	580	75.7	52

NOTES - ANMERKUNGEN - Σημειώσεις - NOTAS - REMARQUES - NOTE - OPMERKINGEN - примечания

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SRC_1-2-3_Rev.01_1-2_(2-2)

6 Capacity tables

6 - 2 Partial Heat Recovery Capacity tables

Partial Heat Recovery Ratings

Version	Size	Version	Size		Partial Heat Recovery Leaving Water Temperature (°C)			Partial Heat Recovery LWT 45°C	
					45 (Δt=5°C)	50 (Δt=5°C)	55 (Δt=5°C)	Water Flow	Pressure Drops
					Hc (kW)	Hc (kW)	Hc (kW)	l/s	kPa
EWAD~CZXS EWAD~CZXL	670	EWAD~CZXR	640	Evaporator Leaving Temperature 7°C - Δt 5°C Condenser Inlet Air 35°C"	120	100	81,8	5,71	24
	740		700		127	106	86,6	6,05	26
	830		790		143	120	97,6	6,82	33
	900		850		157	132	108	7,52	40
	C10		980		179	151	123	8,57	51
	C11		C10		192	161	131	9,16	39
	C12		C11		213	179	146	10,17	48
	C13		C12		228	192	156	10,90	33
	C14		C13		253	212	173	12,07	41
	C15		C14		271	227	185	12,92	46
	C16		C15		284	239	194	13,59	39
	C17		C16		300	252	205	14,31	42
	C18		C17		314	264	215	15,02	46

cappart_1_Rev.00_1

6 Capacity tables

6 - 3 Total Heat Recovery Capacity Tables

Total 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

EWC / LWC	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	COP Hc
40/45	606	217	700	85%	6,01
	668	203	740	85%	6,94
	754	230	836	85%	6,91
	817	267	922	85%	6,51
	935	295	1046	85%	6,71
	986	329	1118	85%	6,39
	1117	347	1244	85%	6,81
	1179	386	1331	85%	6,50
	1307	426	1473	85%	6,52
	1393	465	1580	85%	6,39
	1467	491	1664	85%	6,38
	1547	517	1755	85%	6,38
	1640	537	1850	85%	6,50

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

EWC / LWC	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	COP Hc
40/50	578	220	678	85%	5,72
	637	205	716	85%	6,59
	719	233	809	85%	6,56
	779	270	892	85%	6,19
	891	298	1011	85%	6,38
	940	333	1082	85%	6,07
	1064	351	1203	85%	6,47
	1124	391	1288	85%	6,17
	1246	431	1425	85%	6,20
	1328	471	1529	85%	6,07
	1398	497	1611	85%	6,06
	1475	523	1698	85%	6,06
	1563	543	1790	85%	6,18

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

EWC / LWC	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	COP Hc
45/55	578	222	480	60%	4,76
	637	208	507	60%	5,50
	719	236	573	60%	5,48
	779	274	632	60%	5,16
	891	302	716	60%	5,32
	940	337	767	60%	5,06
	1064	355	852	60%	5,40
	1124	396	912	60%	5,15
	1246	437	1009	60%	5,17
	1328	477	1083	60%	5,06
	1398	503	1141	60%	5,05
	1475	530	1203	60%	5,05
	1563	550	1268	60%	5,15

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

EWC / LWC	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	COP Hc
50/60	578	222	280	35%	3,86
	637	208	296	35%	4,48
	719	236	334	35%	4,47
	779	274	368	35%	4,20
	891	302	418	35%	4,33
	940	337	447	35%	4,11
	1064	355	497	35%	4,40
	1124	396	532	35%	4,19
	1246	437	589	35%	4,20
	1328	477	632	35%	4,11
	1398	503	666	35%	4,10
	1475	530	702	35%	4,11
	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 m^2 °C/kW evaporator fouling factor

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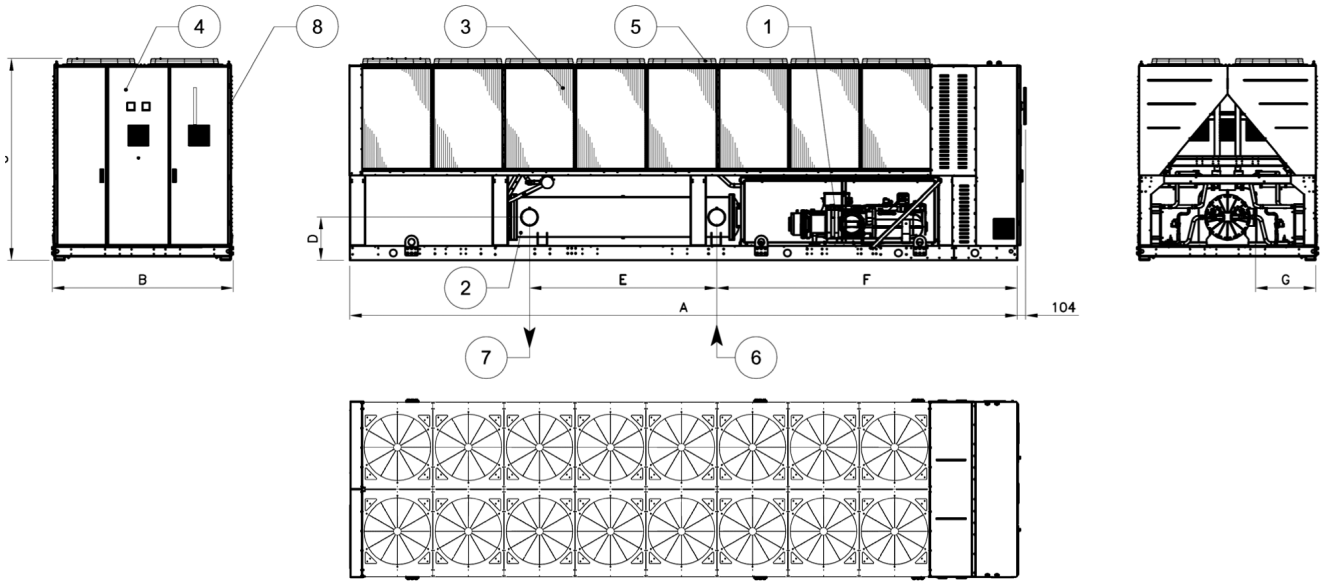
7 Dimensional drawings

7 - 1 Dimensional Drawings



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

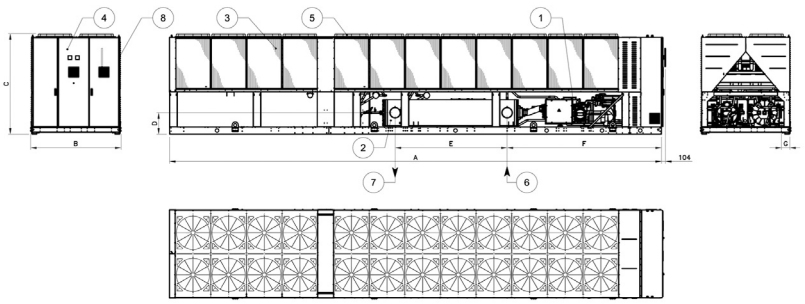
Models		Dimensions (mm)							
EWAD~CZXS/XL	EWAD~CZXR	A	B	C	D	E	F	G	Fans
670	640	6621	2285	2540	434	2412	3757	810	10
740	700	6621	2285	2540	434	2412	3757	810	12
830	790	7521	2285	2540	434	2412	3757	810	14
900	850	7521	2285	2540	434	2412	3757	810	14
C10	980	8421	2285	2540	542	2360	3794	758	16
C11	C10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

DMN_1-2_Rev.00_1

7 Dimensional drawings

7 - 1 Dimensional Drawings



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

Models		Dimensions (mm)							
EWAD~CZXS/XL	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

DMN_1-2_Rev.00_2

8 Sound data

8 - 1 Sound Level Data

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

NSL_1-2_Rev.00_1

8 Sound data

8 - 1 Sound Level Data

Sound pressure level correction factor for different distances

EWAD~CZXS / EWAD~CZXL / EWAD~CZXR

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

NSL_1-2_Rev.00_2

9 Installation

9 - 1 Installation Method

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.

9 Installation

9 - 1 Installation Method

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

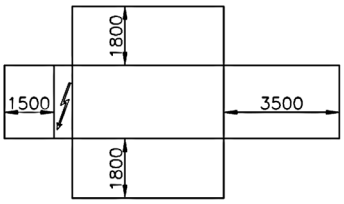


Fig. 1

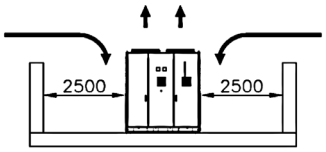


Fig. 2

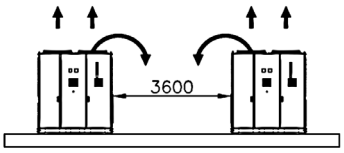


Fig. 3

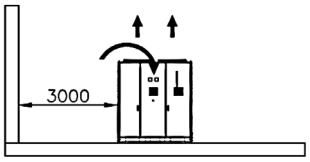


Fig. 4

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

INN_1-2_Rev.00_2

9 Installation

9 - 2 Water Charge, Flow and Quality

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.

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9 Installation

9 - 2 Water Charge, Flow and Quality

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, It has been envisaged the application of a device to limit frequent stops and restarts.

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

The minimum water content per unit should be calculated using this simplified formula:

For 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

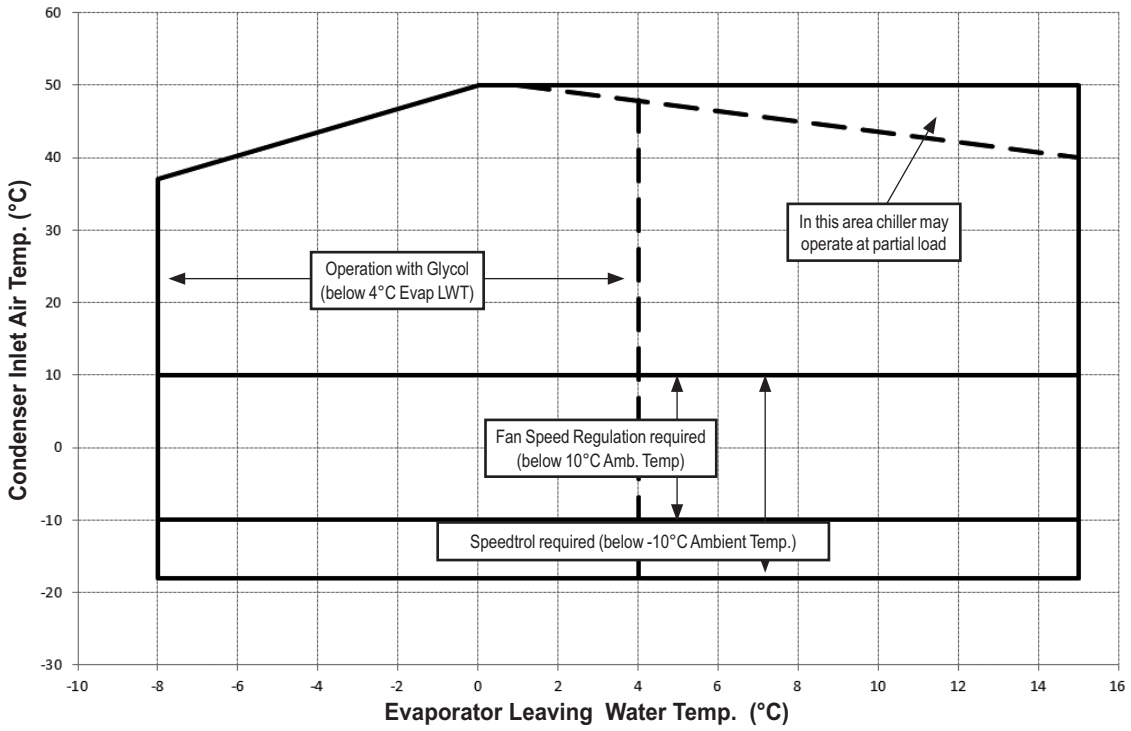
This formula is valid for:
- standard microprocessor parameters

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

waflowqua_1-2_Rev.00_2

10 Operation range

10 - 1 Operation Range



operange_1_Rev.00_1

10 Operation range

10 - 2 Correction Factors

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 m2 °C / kW"	"Cooling capacity correction factor"	"Power input correction factor"	"EER correction factor"
0,0176	1,000	1,000	1,000
0,0440	0,978	0,986	0,992
0,0880	0,957	0,974	0,983
0,1320	0,938	0,962	0,975

Table 3 - 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

operangecorr_1-2-3_Rev.00_1

10 Operation range

10 - 2 Correction Factors

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

10 Operation range

10 - 2 Correction Factors

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

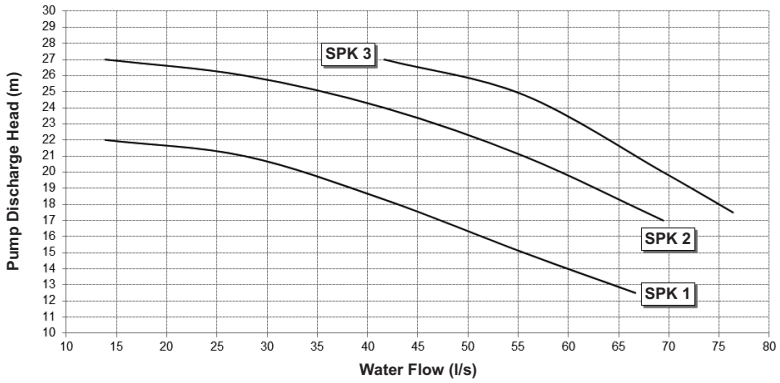
operangecorr_1-2-3_Rev.00_3

11 Hydraulic performance

11 - 1 Pump Characteristics

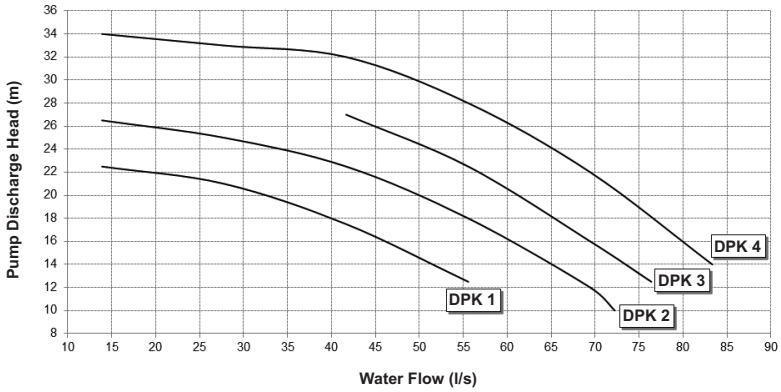
Water Pump Kit - Discharge Head

Single 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

Tzin 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

pump_1-2_Rev.00_1

11 Hydraulic performance

11 - 1 Pump Characteristics

Water Pump Kit - Combination Matrix

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

Single Pump			Double Pump			
SPK 1	**SPK 2**	**SPK 3**	**DPK 1**	**DPK 2**	**DPK 3**	**DPK 4**
X	X		X	X		
X	X		X	X		
X	X		X	X		
X	X		X	X		
X	X	X	X	X	X	X
X	X	X	X	X	X	X
X	X	X		X	X	X
X	X	X		X	X	X
X	X	X		X	X	X
		X			X	X

Water Pump Kit - 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

pump_1-2_Rev.00_2

11 Hydraulic performance

11 - 2 Total Heat Recovery Pressure Drop

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:

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

where:

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

How to use the formula: Example

The unit 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:

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

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

totheatpd_1_Rev.00_1

12 Specification text

12 - 1 Specification Text

Technical specification for air cooled chiller

GENERAL

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 R-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

SPC_1-2-3-4_Rev.00_1

12 Specification text

12 - 1 Specification Text

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).

SPC_1-2-3-4_Rev.00_2

12 Specification text

12 - 1 Specification Text

- ✓ 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

SPC_1-2-3-4_Rev.00_3

12 Specification text

12 - 1 Specification Text

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

SPC_1-2-3-4_Rev.00_4

In all of us, a green heart

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 N.V. participates in the Eurovent Certification programme for Air conditioners (AC), Liquid Chilling Packages (LCP) and Fan coil units (FCU), Check ongoing validity of certificate online: www.eurovent-certification.com or using: www.certiflash.com"

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