DAIKIN

Applied Systems

Technical Data

Air cooled inverter chiller, high efficiency, reduced sound

EEDEN13-415

EWAD-CZXR

TABLE OF CONTENTS

EWAD-CZXR

1 Features

- ESEER up to 5.8
- Inverter stepless single-screw compressor
- High efficiency, reduced 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					EWAD640CZXR	EWAD700CZXR	EWAD790CZXR	EWAD850CZXR	EWAD980CZXR	EWADC10CZXR	EWADC11CZXR
Cooling capacity	Nom.			kW	631 (1)	696 (1)	786 (1)	849 (1)	972 (1)	1,027 (1)	1,166 (1)
Capacity control	Method				Stepless						
	Minimum capacity			%	20						
Power input	Cooling	Nom.		kW	264 (1)	246 (1)	274 (1)	318 (1)	351 (1)	393 (1)	412 (1)
EER					2.40 (1)	2.83 (1)	2.86 (1)	2.67 (1)	2.77 (1)	2.61 (1)	2.83 (1)
ESEER					5.04	5.23	5.39	5.36	5.41	5.11	5.15
IPLV					5.94	6.14	6.32	6.37	6.34	6.05	5.96
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	6,470	7,100	7,360	7,950		9,120
	Operation weight			kg	6,430	6,720	7,340	7,600	8,390		9,500
Water heat exchanger	Type				Single pass shell & tube						
	Water volume			l	263	248	241		441		383
	Nominal water flow	Cooling		l/s	30.3	33.4	37.6	40.7	46.6	49.2	55.8
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	79	76	54	59	58	64	43
	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	41,536	49,843	58,151		66,458		83,072
Fan motor	Drive				Direct on line						
	Input	Cooling		W	7,800	9,400	11,000	11	12,500		15,700
	Speed	Cooling	Nom.	rpm	700						
Sound power level	Cooling	Nom.		dBA	95		96				97
Sound pressure level	Cooling	Nom.		dBA	74						
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					EWADC12CZXR	EWADC13CZXR	EWADC14CZXR	EWADC15CZXR	EWADC16CZXR	EWADC17CZXR
Cooling capacity	Nom.			kW	1,231 (1)	1,327 (1)	1,437 (1)	1,539 (1)	1,624 (1)	1,706 (1)
Capacity control	Method				Stepless					
	Minimum capacity			%	20			13		
Power input	Cooling	Nom.		kW	459 (1)	493 (1)	523 (1)	585 (1)	617 (1)	638 (1)
EER					2.68 (1)	2.69 (1)	2.75 (1)	2.63 (1)		2.67 (1)
ESEER					4.80	5.12	5.22	5.18	4.98	4.88
IPLV					5.67	6.03	6.21	6.28	6.03	5.91
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	9,530	10,180	10,530	12,150	12,990	13,740
	Operation weight			kg	9,920	10,550	10,910	13,000	13,840	14,610
Water heat exchanger	Type				Single pass shell & tube					
	Water volume			l	383	374		850		871
	Nominal water flow	Cooling		l/s	58.9	63.6	68.8	73.7	77.8	81.7
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	48	57	66	57	63	60
	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	83,072	91,379	99,687		107,994	116,301
Fan motor	Drive				Direct on line					
	Input	Cooling		W	15,700	17,300	18,800		20,400	22,000
	Speed	Cooling	Nom.	rpm	700					
Sound power level	Cooling	Nom.		dBA	97			99		
Sound pressure level	Cooling	Nom.		dBA	74			76		
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				EWAD640CZ XR	EWAD700CZ XR	EWAD790CZ XR	EWAD850CZ XR	EWAD980CZ XR	EWADC10CZ XR	EWADC11CZ XR
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	315	340	393	434	485	526	580
	Nominal running current (RLA)	Cooling	A	383	360	405	466	516	574	608
	Maximum running current		A	437	473	540	602	668	729	800
	Max unit current for wires sizing		A	480	520	594	663	735	803	881
Fans	Nominal running current (RLA)		A	26	31.2	36.4		41.6		52

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				EWADC12CZXR	EWADC13CZXR	EWADC14CZXR	EWADC15CZXR	EWADC16CZXR	EWADC17CZXR
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	621	686	740	822	876	929
	Nominal running current (RLA)	Cooling	A	674	771	864	856	902	936
	Maximum running current		A	861	942	1,024	1,093	1,159	1,225
	Max unit current for wires sizing		A	948	1,039	1,129	1,204	1,277	1,350
Fans	Nominal running current (RLA)		A	52			62	68	73

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

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.

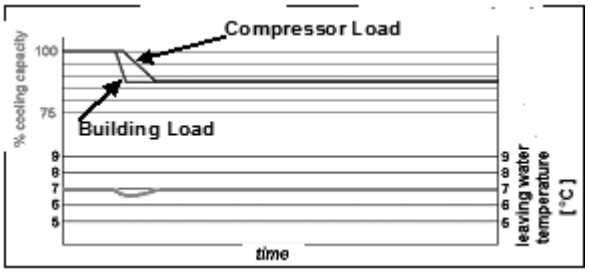
Quick comfort conditions
The ability to vary the output power in direct relation to the cooling requirements of the system, allow the possibility to achieve building comfort conditions much faster at start-up.

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.

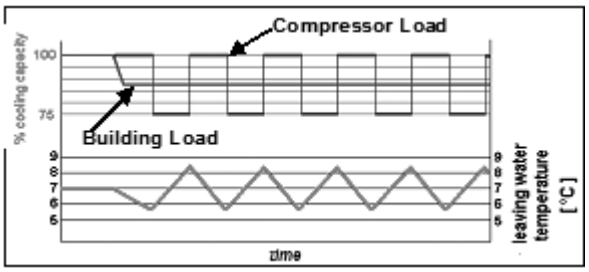
Redundancy
The range has two or three truly independent refrigerant circuits (depending on the size) guaranteeing (partial) cooling 'backup' even in case of maintenance activity

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).

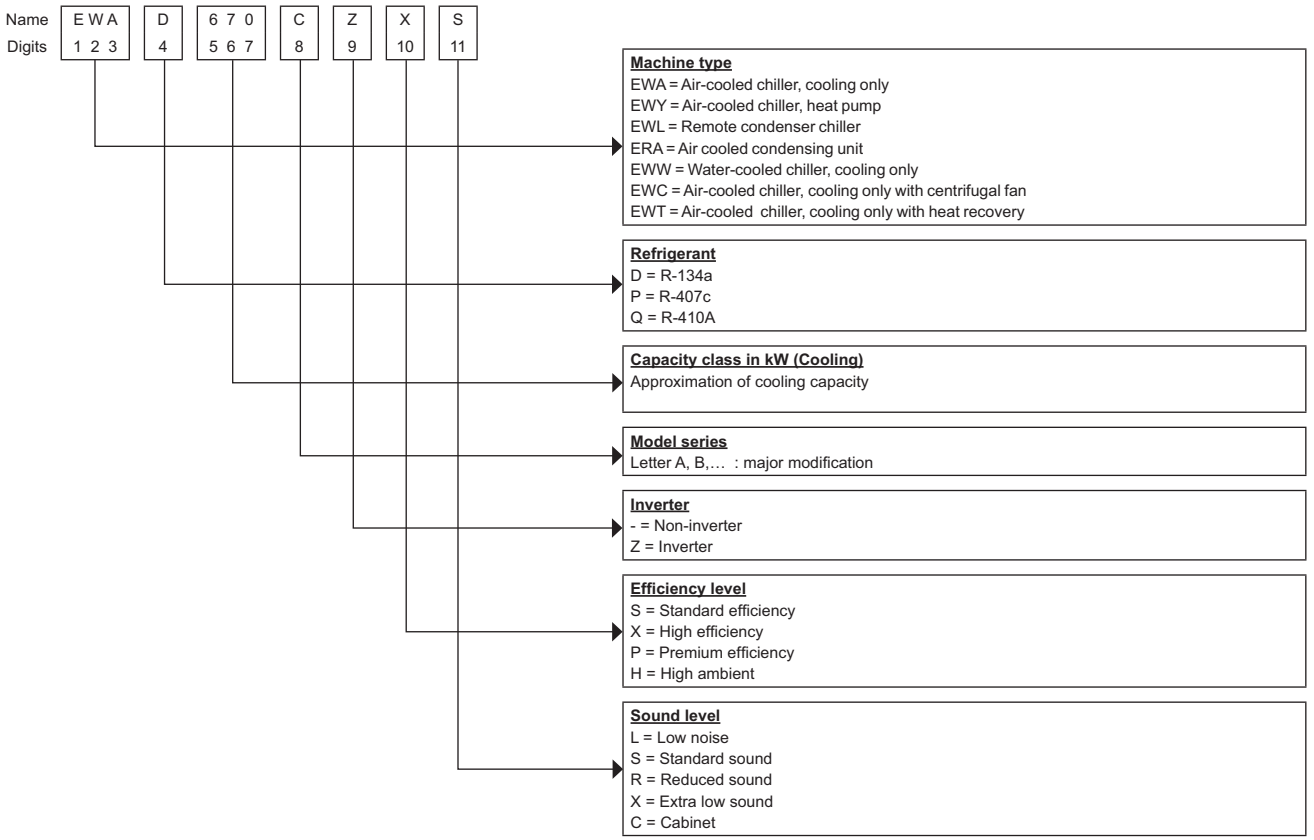
Witness test – Every unit is always tested at the test bench prior to the shipment. On request, a second test can be carried out, at customer's presence, in accordance with the procedures indicated on the test form. (Not available for units with glycol mixtures).

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

EWAD640-C11CZXR

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
640	30	638	233	30.6	80	672	240	32.3	88	705	247	33.9	97	739	254	35.6	105	773	262	37.3	115	809	271	39.0	125
	35	599	257	28.7	72	631	264	30.3	79	664	271	31.9	87	696	279	33.5	95	729	287	35.1	103	762	297	36.8	112
	40	555	282	26.6	62	584	289	28.0	69	614	296	29.5	75	646	305	31.1	83	668	288	32.1	88	685	265	33.0	92
	46	471	263	22.5	46	484	245	23.2	49	499	228	23.9	52	513	213	24.6	54	516	204	24.8	55	532	192	25.6	58
	48	421	219	20.1	38	435	209	20.8	40	440	206	21.1	41	454	192	21.8	44	467	179	22.4	46	480	168	23.1	48
	50	368	198	17.6	30	381	189	18.2	32	396	181	19.0	34	406	168	19.5	36	416	156	20.0	37	425	145	20.4	39
700	30	696	218	33.4	76	739	224	35.5	85	786	232	37.8	95	832	240	40.0	105	876	249	42.2	116	923	258	44.5	127
	35	656	239	31.4	68	696	246	33.4	76	738	253	35.5	85	783	262	37.7	94	828	272	39.9	105	871	282	42.0	115
	40	610	262	29.2	60	647	269	31.0	66	685	276	32.9	74	726	285	34.9	82	769	295	37.0	91	815	307	39.3	102
	46	549	293	26.2	49	575	291	27.6	54	595	273	28.5	57	616	258	29.6	61	631	236	30.3	64	653	223	31.4	68
	48	509	271	24.3	43	524	253	25.1	45	540	237	25.9	48	558	222	26.8	51	561	214	26.9	52	580	202	27.9	55
	50	453	228	21.7	35	470	219	22.5	37	476	215	22.8	38	491	202	23.6	41	500	183	24.0	42	515	172	24.7	44
790	30	783	243	37.5	54	833	250	39.9	60	886	258	42.5	67	945	267	45.4	75	1006	278	48.4	85	1069	291	51.5	95
	35	741	268	35.5	48	786	274	37.6	54	834	282	40,0	60	886	292	42.5	67	943	303	45.3	75	1002	315	48.2	84
	40	693	295	33.1	43	734	301	35.1	48	777	309	37.3	53	824	318	39.6	59	873	329	42.0	65	928	342	44.7	73
	46	624	330	29.8	35	655	326	31.4	39	687	318	32.9	42	721	313	34.6	46	746	296	35.8	49	765	272	36.8	52
	48	588	321	28.1	32	611	308	29.3	34	638	297	30.6	37	656	275	31.5	39	671	263	32.2	41	687	240	33.0	42
	50	538	291	25.7	27	550	267	26.3	28	562	257	26.9	30	581	240	27.8	31	600	225	28.8	33	611	215	29.3	34
850	30	850	281	40.7	59	900	289	43.2	66	955	298	45.8	74	1014	309	48.7	82	1076	321	51.8	92	1140	335	55.0	102
	35	803	310	38.4	54	849	318	40.7	59	898	327	43.1	66	951	337	45.7	73	1008	350	48.5	81	1068	364	51.4	91
	40	749	341	35.8	47	791	349	37.9	52	835	358	40.1	58	883	368	42.4	64	932	380	44.8	71	988	395	47.5	79
	46	672	382	32.1	39	699	368	33.4	42	722	345	34.6	44	747	324	35.8	47	772	305	37.1	50	788	279	37.9	52
	48	623	353	29.8	34	635	319	30.4	35	657	303	31.5	37	674	279	32.3	39	686	276	32.9	41	701	252	33.6	42
	50	555	296	26.5	28	568	275	27.2	29	575	270	27.5	29	593	253	28.4	31	611	236	29.3	33	629	221	30.2	35
980	30	973	311	46.5	58	1036	321	49.6	65	1102	332	52.9	73	1170	344	56.2	81	1241	358	59.7	90	1313	374	63.2	100
	35	914	342	43.7	52	972	351	46.6	58	1034	363	49.6	65	1098	375	52.8	72	1165	390	56.0	81	1233	406	59.4	89
	40	849	375	40.6	45	901	385	43.2	50	957	396	45.9	56	1017	409	48.8	63	1079	424	51.9	70	1133	420	54.5	77
	46	756	412	36.1	37	788	395	37.7	40	826	387	39.6	43	861	370	41.3	47	888	344	42.6	49	904	325	43.4	51
	48	701	383	33.5	32	730	368	34.9	34	754	345	36.1	37	769	328	36.9	38	793	304	38.0	40	820	286	39.4	43
	50	632	337	30.2	27	644	322	30.8	28	669	305	32,0	29	690	285	33.1	31	703	271	33.7	32	719	250	34.5	34
C10	30	1032	348	49.4	64	1095	359	52.5	72	1162	371	55.8	80	1230	385	59.1	89	1299	400	62.5	98	1371	417	66.1	109
	35	968	382	46.3	57	1027	393	49.2	64	1088	405	52.2	71	1152	419	55.4	79	1218	435	58.6	87	1285	453	61.9	96
	40	896	419	42.9	50	949	430	45.4	55	1005	442	48.2	62	1064	456	51.1	68	1126	473	54.1	76	1168	451	56.2	81
	46	792	454	37.9	40	810	412	38.8	42	838	386	40.1	44	866	363	41.5	47	895	341	43.0	50	902	330	43.4	51
	48	711	382	34.0	33	739	367	35.4	35	762	342	36.5	37	764	327	36.6	38	790	308	37.9	40	817	289	39.2	42
	50	635	329	30.3	27	640	322	30.6	27	667	309	31.9	29	688	289	32.9	31	708	270	34.0	33	715	243	34.3	33
C11	30	1166	365	55.7	43	1240	376	59.4	48	1318	388	63.2	54	1400	401	67.2	60	1486	416	71.4	67	1575	433	75.7	75
	35	1098	401	52.5	39	1166	412	55.8	43	1240	424	59.4	48	1319	438	63.3	54	1401	454	67.3	61	1486	471	71.5	67
	40	1022	440	48.8	34	1085	451	51.9	38	1153	463	55.2	43	1227	477	58.9	48	1306	494	62.7	53	1384	504	66.5	59
	46	920	490	44.0	28	968	485	46.3	31	1016	475	48.6	34	1064	460	51.0	37	1101	429	52.8	39	1126	405	54.1	41
	48	864	471	41.3	25	903	459	43.2	27	939	437	45,0	29	970	405	46.5	31	994	386	47.7	33	1021	353	49.0	34
	50	789	428	37.7	21	813	399	38.9	23	833	383	39.9	24	858	353	41.1	25	876	335	42.0	26	901	310	43.2	27

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_3_(1-2)

6 Capacity tables

6 - 1 Cooling Capacity Tables

EWADC12-C17CZXR

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
C12	30	1238	407	59.2	48	1313	419	62.9	54	1393	433	66.8	60	1474	448	70.7	66	1561	464	75.0	73	1653	482	79.5	82
	35	1164	447	55.6	43	1231	459	58.9	48	1307	473	62.6	53	1388	489	66.6	59	1471	505	70.7	66	1559	524	75.0	73
	40	1080	489	51.6	38	1144	502	54.7	42	1212	515	58.1	46	1289	531	61.8	52	1373	549	66.0	58	1449	552	69.7	64
	46	969	543	46.3	31	1009	524	48.3	33	1047	493	50.1	36	1079	451	51.7	38	1111	411	53.3	40	1128	397	54.1	41
	48	890	488	42.5	26	917	456	43.9	28	949	426	45.4	30	984	399	47.2	32	997	384	47.8	33	1026	350	49.3	34
	50	791	409	37.8	21	822	392	39.3	23	835	387	40.0	24	856	351	41.0	25	889	328	42.6	27	906	296	43.5	28
C13	30	1334	437	63.8	57	1414	450	67.7	63	1499	465	71.9	71	1589	481	76.3	79	1683	499	80.9	87	1781	518	85.8	97
	35	1250	479	59.8	51	1327	493	63.6	57	1408	508	67.5	63	1494	525	71.7	70	1586	543	76.2	78	1681	564	80.9	87
	40	1155	524	55.2	44	1227	538	58.7	49	1306	554	62.6	55	1389	571	66.7	62	1477	590	71.0	69	1560	596	75.1	76
	46	1026	581	49.0	35	1076	562	51.5	39	1119	523	53.6	42	1159	477	55.6	44	1198	436	57.5	47	1220	421	58.6	49
	48	949	538	45.3	31	978	489	46.8	33	1020	458	48.8	35	1052	416	50.4	37	1065	395	51.1	38	1104	365	53.0	41
	50	841	446	40.2	25	877	421	41.9	27	887	403	42.5	27	920	371	44.1	29	959	347	46.0	32	982	313	47.1	33
C14	30	1444	463	69.1	66	1529	477	73.3	74	1620	493	77.8	82	1716	510	82.5	91	1817	529	87.4	101	1922	549	92.6	112
	35	1353	508	64.7	59	1437	523	68.8	66	1523	539	73.1	73	1615	557	77.6	82	1712	576	82.4	91	1814	597	87.4	101
	40	1248	556	59.7	51	1327	571	63.6	57	1413	588	67.8	64	1502	607	72.1	72	1595	626	76.7	80	1693	648	81.5	89
	46	1100	616	52.6	41	1161	598	55.6	45	1218	564	58.4	49	1256	502	60.3	52	1300	459	62.4	55	1327	443	63.8	57
	48	1025	586	49.0	36	1056	520	50.5	38	1108	488	53.1	41	1149	444	55.1	44	1161	416	55.7	45	1198	379	57.6	48
	50	908	480	43.4	29	948	448	45.3	31	966	430	46.3	32	1001	390	48.0	34	1046	365	50.2	37	1073	330	51.5	39
C15	30	1546	518	73.9	58	1636	533	78.4	64	1729	549	82.9	71	1824	568	87.6	78	1923	588	92.5	86	2026	611	97.5	95
	35	1453	570	69.5	52	1539	585	73.7	57	1626	602	78.0	63	1717	622	82.4	70	1809	643	86.9	77	1904	667	91.7	85
	40	1349	627	64.5	45	1425	641	68.2	50	1507	659	72.3	55	1592	679	76.4	61	1680	701	80.7	67	1750	686	84.2	73
	46	1198	680	57.2	36	1224	617	58.6	38	1263	578	60.5	40	1304	542	62.5	43	1346	509	64.6	45	1356	492	65.1	46
	48	1087	591	51.9	31	1118	549	53.5	32	1152	512	55.1	34	1155	490	55.4	34	1195	460	57.3	36	1232	433	59.2	39
	50	961	493	45.9	24	969	483	46.3	25	1010	464	48.3	27	1041	433	49.8	28	1071	404	51.4	30	1101	377	52.8	31
C16	30	1633	546	78.1	64	1724	561	82.6	70	1819	578	87.3	78	1919	596	92.2	86	2023	617	97.3	95	2131	640	102.6	104
	35	1538	601	73.6	57	1624	617	77.8	63	1714	634	82.2	70	1809	653	86.9	77	1906	674	91.7	85	2009	698	96.7	93
	40	1430	660	68.4	50	1510	676	72.3	55	1594	693	76.4	61	1684	713	80.8	68	1777	736	85.4	75	1861	734	89.5	81
	46	1278	724	61.1	41	1318	680	63.1	43	1361	637	65.2	46	1407	598	67.5	49	1450	555	69.6	52	1477	531	71.0	54
	48	1175	651	56.1	35	1204	600	57.6	37	1241	560	59.4	39	1260	531	60.4	40	1292	503	62.0	42	1331	467	63.9	44
	50	1039	539	49.6	28	1054	517	50.4	29	1087	502	52.0	31	1123	468	53.8	33	1159	437	55.6	35	1188	404	57.0	36
C17	30	1716	565	82.1	61	1803	579	86.4	67	1895	594	90.9	73	1992	611	95.7	80	2094	629	100.7	88	2201	649	106.0	96
	35	1624	624	77.7	55	1706	638	81.7	60	1793	654	86.0	66	1885	671	90.5	72	1983	689	95.3	79	2085	710	100.3	87
	40	1520	687	72.7	49	1596	701	76.4	53	1678	717	80.5	59	1766	734	84.8	64	1859	754	89.3	71	1957	776	94.1	78
	46	1375	768	65.7	41	1432	756	68.5	44	1476	709	70.7	46	1525	665	73.1	49	1575	624	75.6	52	1616	591	77.6	55
	48	1286	721	61.4	36	1311	659	62.7	37	1349	615	64.6	39	1395	579	66.9	42	1430	546	68.6	44	1456	522	69.9	45
	50	1140	594	54.5	29	1165	565	55.7	30	1185	547	56.7	31	1225	511	58.7	33	1266	477	60.7	35	1294	435	62.1	37

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_3_(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

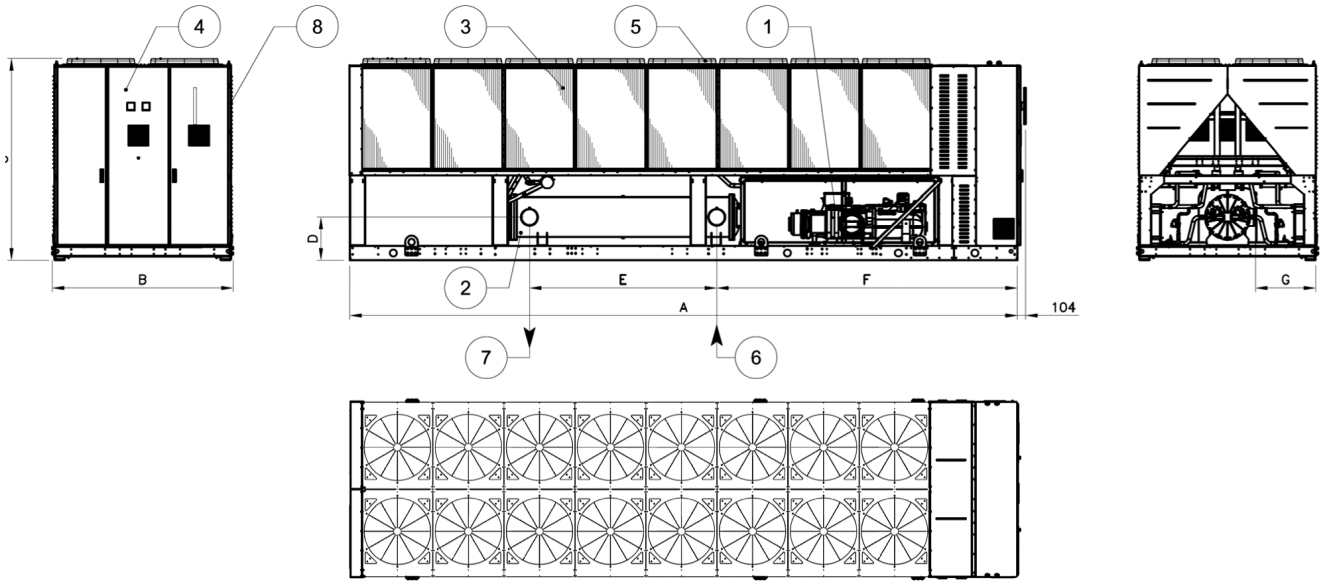
Notes:
Cc (cooling capacity
Pi (unit power input)
Hc (heating heat recovery capacity)
%Hc (percentage heat recovered)
COP Hc (coefficent of performance during heat recovery = (cooling+ heating capacity) / power input)
EWC (Entering water heat recovery condenser)
LWC (Leaving water heat recovery condenser)

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

captot_1_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.

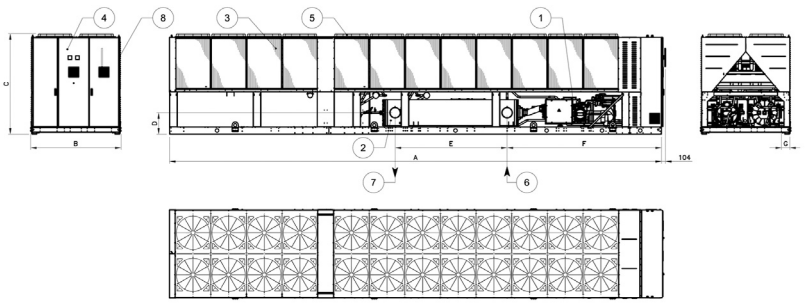
Models		Dimensions (mm)							
EWAD~CZXS/XL	EWAD~CZXR	A	B	C	D	E	F	G	Fans
670	640	6621	2285	2540	434	2412	3757	810	10
740	700	6621	2285	2540	434	2412	3757	810	12
830	790	7521	2285	2540	434	2412	3757	810	14
900	850	7521	2285	2540	434	2412	3757	810	14
C10	980	8421	2285	2540	542	2360	3794	758	16
C11	C10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

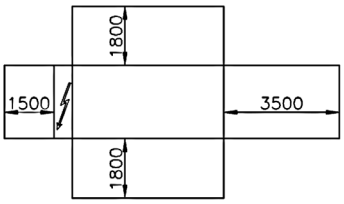


Fig. 1

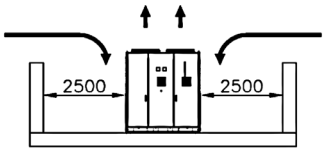


Fig. 2

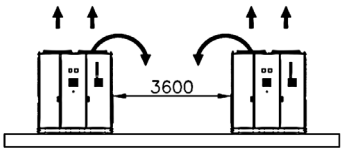


Fig. 3

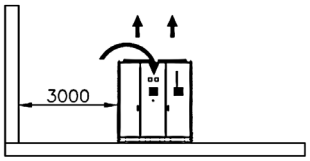


Fig. 4

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.

waflowqua_1-2_Rev.00_1

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

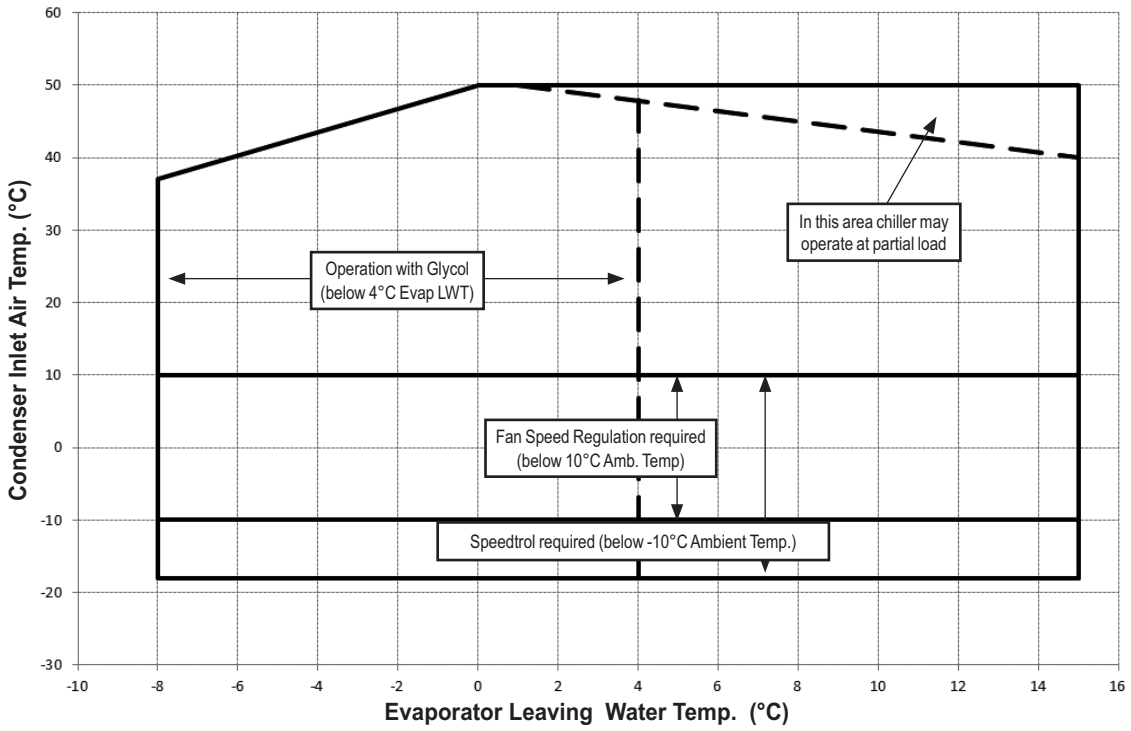
This formula is valid for:
- standard microprocessor parameters

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

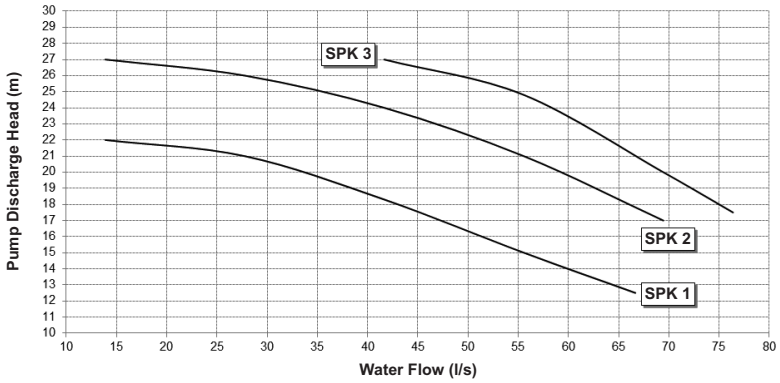
operangecorr_1-2-3_Rev.00_3

11 Hydraulic performance

11 - 1 Pump Characteristics

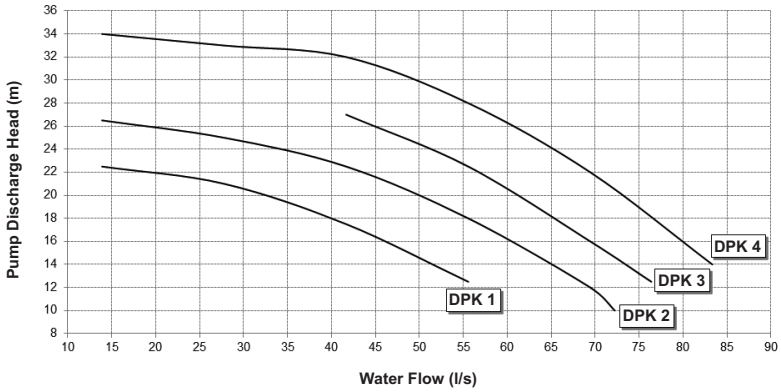
Water Pump Kit - Discharge Head

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"

BARCODE

Daikin products are distributed by:

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

EEDEN13-415 • 10/12 • Copyright Daikin
The present publication supersedes EEDEN12-415