

## Chillers

# Commercial and Technical Data

### Air Cooled Chiller

- » **Wide capacity range  
(180 kW - 620 kW)**
- » **Multiple efficiency and  
sound versions**
- » **Single screw compressors**
- » **New Microtech III  
controller**
- » **Large operation range  
(ambient down to -18°C)**
- » **Water supply down  
to -15°C**



ECDEN11-414

EWAD~D-  
180~620 kW

**R-134a**



Daikin Europe N.V.

## About Daikin

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

## Daikin's dual circuit 'EWAD~D-' range – a small package for a big chiller –

Daikin's 'EWAD~D-' range has been designed to provide innovative installation solutions, guarantee absolute comfort and compete with HVAC industry standards for operating efficiency.

The 'EWAD~D-' range, available in multiple efficiency and sound versions, incorporates new generation single screw compressors (for part of the range) that result in higher partial load efficiency levels (ESEER up to 4.11), ensuring a lower total cost of ownership over the life of the chiller.

The units are able to supply water down to -15°C and may even operate in ambient temperatures down to -18°C. Moreover, the new range features a compact design and extensive option list (total and partial heat recovery option available).



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# The new dual circuit chiller features

## Application flexibility

The EWAD~D- series is available in multiple efficiency and sound level versions, including a variety of capacities sizes (from 180 kW up to 620 kW), making it an ideal match for flexible solutions in a wide range of building applications.

## Large operation range

The new range is available for ambient operating temperatures of -18°C up to 48°C (depending on the version), with the ability to supply water down to -15°C, making the chiller models suitable for comfort and process cooling applications in all climates.

## Extensive option list

The base model includes several standard factory mounted options, such as: electronic expansion valve, wye delta starter, phase monitor, hour run meter, etc. Moreover, the new range features an extensive option list, including: total and partial heat recovery, soft starter, different coil and pump types, etc.

## Redundancy

EWAD~D- has two truly independent refrigerant circuits in every size, in order to assure maximum safety for any maintenance, whether planned or not.

## Meets any acoustic need

Maximum flexibility in offering a range with 4 different sound level versions - thanks to the combination of acoustic solutions, such as low fan rotation speed and a soundproof compressor casing - in order to meet any installation need.

## Superior control logic

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

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# 1 Features

- Standard efficiency version
- Standard sound level configuration: condenser fan rotating at 890 rpm, rubber antivibration under compressor
- Stepless single-screw compressor
- Optimised for use with R-134a
- MicroTech III controller
- Large operation range (ambient temperature down to -18°C)

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## 2 Features and advantages

### Features and advantages

#### Low operating cost

This chiller range is the result of careful design, aimed to optimize the energy efficiency of the chillers, with the objective of bringing down operating costs and improving installation profitability, effectiveness and economical management.

The chillers feature a high efficiency single rotor screw compressor design, large condenser coil surface area for maximum heat transfer and low discharge pressure, advanced technology condenser fans and a 'plate to plate' or 'shell&tube' evaporator with low refrigerant pressure drops.

#### Low operating sound levels

Very low sound levels both at full load and part load conditions are achieved by the latest compressor design and by a unique new fan that moves large volume of air at exceptionally low sound levels and by the virtually vibration-free operation.

#### Excellent serviceability

Field serviceability has not been sacrificed to meet design performance objectives. The compressor is equipped with discharge, liquid and suction shut off valves. The compressor and serviceable components such as filter-driers are located on the outside edges of the base allowing, together with the shape of the coil, an easy access for inspection and service. Moreover, the MicroTech III controller gives detailed information on the causes of an alarm or fault.

#### Proven reliability

Full factory testing of every unit with water hook-up helps in providing a trouble-free start-up. Extensive quality control checks during testing means that each equipment protection and operating control is properly adjusted and operates correctly before it leaves the factory.

#### Infinite capacity control

Cooling capacity control is infinitely variable by means of a single screw compressor controlled by microprocessor system. Each unit has infinitely variable capacity control from 100% down to 12.5%. This modulation allows the compressor capacity to exactly match the building cooling load. Chilled water temperature fluctuation is avoided only with a stepless control.

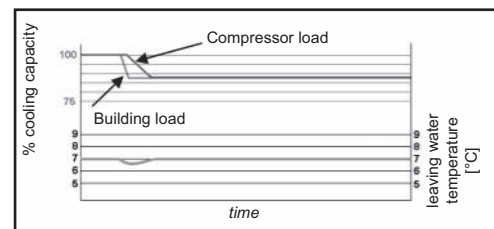
In the case that the compressor with load step control is used, the compressor capacity, at partial loads, will be too high or too low compared to the building cooling load. The result is an increase in chiller energy costs, particularly at the part-load conditions at which the chiller operates most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

Units with stepless regulation offer benefits that the units with step regulation are unable to match.

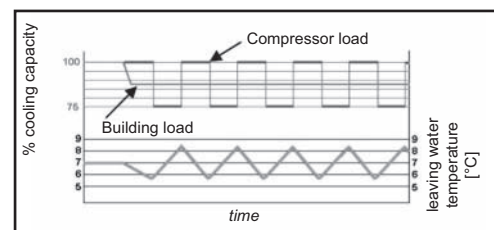
Only a chiller with step-less regulation, is able to follow the system cooling demand at any time and to deliver chilled water at set-point.

#### Superior control logic

The new MicroTech III controller provides an easy to use control environmental. The control logic is designed to provide maximum efficiency and a history of unit operation. One of the greatest benefits is the easy interface with LonWorks, Bacnet, Ethernet TCP/IP or Modbus communications.



ELWT fluctuation with stepless capacity control



ELWT fluctuation with steps capacity control (4 steps)

## 2 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 Stds	UNI – EN ISO 9001:2004

### Certifications

All units manufactured by Daikin 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 for other applications, such as naval (RINA, etc.).

### Efficiency and sound configuration

The range is available in multiple efficiency and sound versions:

Efficiency level	Sound level			
	Standard	Low	Reduced	Extra low
Standard efficiency	EWAD~D-SS	EWAD~D-SL	EWAD~D-SR	EWAD~D-SX
High efficiency	EWAD~D-XS	N.A.	EWAD~D-XR	N.A.
High ambient	EWAD~D-HS	N.A.	N.A.	N.A.

### Versions

The range is available in three versions:

#### S: Standard efficiency

7 sizes to cover a range from 389 up to 578 kW with an EER up to 2.03 and an ESEER up to 3.56 (data refers to Standard sound configuration)

#### X: High efficiency

11 sizes to cover a range from 247 up to 622 kW with an EER up to 3.20 and an ESEER up to 4.01 (data refers to Standard sound configuration)

#### H: High ambient temperature

15 sizes to cover a range from 195 up to 587 kW with an EER up to 3.07 and an ESEER up to 3.79 (data refers to Standard sound configuration)

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 weighted formula enabling to take into account the variation of EER with the load rate and the variation of air inlet condenser temperature.

$$\text{ESEER} = (A \times \text{EER}100\%) + (B \times \text{EER}75\%) + (C \times \text{EER}50\%) + (D \times \text{EER}25\%)$$

	A	B	C	D
Coefficient	0.03 (3%)	0.33 (33%)	0.41 (41%)	0.23 (23%)
Air inlet condenser temperature	35°C	30°C	25°C	20°C

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## 2 Features and advantages

### Sound levels

The range is available in four different sound level configurations:

**S:** Standard sound

Condenser fan rotating at 890 rpm, rubber antivibration under compressor

**L:** Low sound

Condenser fan rotating at 900 rpm (EWAD180-370D-SL) and 705 rpm (EWAD400-530D-SL), rubber antivibration under compressor.

**R:** Reduced sound

Condenser fan rotating at 680 rpm (EWAD180-370D-SR) and 705 rpm (EWAD400-530D-SR), rubber antivibration under compressor, compressor sound enclosure.

**X:** Extra low sound

Condenser fan rotating at 500 rpm, rubber antivibration under compressor, compressor and evaporator sound enclosure.

## 3 General characteristics

### General characteristics

#### Cabinet and structure

The cabinet is made of galvanized steel sheet and painted to provide a high resistance to corrosion. Colour Ivory White (Munsell code 5Y7.5/1) ( $\pm$ 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.

#### Screw compressors with integrated oil separator

The range features two types of single-screw compressors:

A) The compressor is semi-hermetic, single-screw type with gate-rotors made of carbon impregnated engineered composite material. The compressor has one slide managed by the unit microprocessor for infinitely modulating the capacity between 100% to 25%. An integrated high efficiency oil separator maximizes the oil separation and standard start is Wye-delta (Y- $\Delta$ ) type.

This compressor is offered on following models:

- EWAD180~370D-SL
- EWAD180~370D-SR
- EWAD210~310D-SX
- EWAD250~400D-XS
- EWAD240~390D-XR
- EWAD200~380D-HS

B) The compressor is semi-hermetic, single-screw type with gate-rotor made with the latest high-strength fibre reinforced star material. The compressor has an asymmetric slide regulation managed by the unit controller for infinitely modulating capacity from 100% to 25%. An integrated high efficiency oil separator maximizes the oil separation and standard start is Wye-delta (Y- $\Delta$ ) type.

This compressor is offered on following models:

- EWAD390~580D-SS
- EWAD400~530D-SL
- EWAD400~530D-SR
- EWAD370~490D-SX
- EWAD470~620D-XS
- EWAD460~600D-XR
- EWAD420~590D-HS

#### 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

For size EWAD180~200D-SL, EWAD180~190D-SR and EWAD200~210D-HS

The units are equipped with a direct expansion plate to plate type evaporator. This heat exchanger is made of stainless steel brazed plates and is covered with a 20mm closed cell insulation material. The exchanger is equipped with a heater for protection against freezing down to  $-28^{\circ}\text{C}$  and evaporator water outlet connections of 3". Each evaporator has 2 circuits, one for each compressor and is manufactured in accordance to PED approval. Water pressure differential switch on evaporator standard factory mounted. Water filter is standard.

All the other units are equipped with a Direct Expansion shell&tube evaporator with copper tubes rolled into steel tubesheets. The evaporators are single-pass on both the refrigerant and water sides for pure counter-flow heat exchange and low refrigerant pressure drops. Both attributes contribute to the heat exchanger effectiveness and total unit's outstanding efficiency.

The external shell is covered with a 10mm closed cell insulation material and the evaporator water outlet connections are provided with victaulic kit (as standard). Each evaporator has 2 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.

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### 3 General characteristics

#### Condenser coil fans

Fan 710 mm diameter

The condenser fans are propeller type with wing-profile blades for achieving better performance. Each fan is protected by a guard.

Fan 800 mm diameter

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  $\Delta P$  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 independent refrigerant circuits and each one includes:

- 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
- Sight glass with moisture indicator
- Filter drier
- Charging valves
- High pressure switch
- High and low pressure transducers

#### Electrical control panel

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

#### Power Section

The power section includes compressors fuses, 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.

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## 3 General characteristics

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### Control section - main features

- Management of the compressor stepless capacity and fans modulation.
- Chiller enabled to work in partial failure condition.
- Full routine operation at condition of:
  - high ambient temperature value
  - high thermal load
  - high evaporator entering water temperature (start-up)
- Display of evaporator entering/leaving water temperature.
- Display of Outdoor Ambient Temperature.
- Display of condensing-evaporating temperature and pressure, suction and discharge superheat for each circuit.
- Leaving water evaporator temperature regulation (temperature tolerance = 0.1°C)
- Compressor and evaporator pumps hours counter.
- Display of Status Safety Devices.
- Number of starts and compressor working hours.
- Optimized management of compressor load.
- Fan management according to condensing pressure.
- Re-start in case of power failure (automatic / manual).
- Soft Load (optimized management of the compressor load during the start-up).
- Start at high evaporator water temperature.
- Return Reset (Set Point Reset based on return water temperature).
- OAT (Outside Ambient temperature) Reset.
- Set point Reset (optional).
- Application and system upgrade with commercial SD cards.
- Ethernet port for remote or local servicing using standard web browsers.
- Two different sets of default parameters could be stored for easy restore.

### Safety device / logic for each refrigerant circuit

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

### System security

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

### Regulation type

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

### 3 General characteristics

#### Condensing pressure

Condensing pressure can be controlled in according to the entering air temperature to the condenser coil. The fans can be managed either with steps, or with a 0/10V modulating signal or with a mixed 0/10V + Steps strategy to cover all possible operational conditions.

#### MicroTech III

MicroTech III built-in terminal has the following features:

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

#### Supervising systems (on request)

##### MicroTech III remote control

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

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

#### Standard options (supplied on basic unit)

**Evaporator victaulic kit** – Not available on units EWAD180~200D-SL, EWAD180~190D-SR and EWAD200~210D-HS

**Evaporator water design pressure (10Bar)**

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

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

**Wye-Delta Compressors starter (Y-Δ)** – For low inrush current and reduced starting torque.

**Double set-point** – Dual leaving water temperature set-points.

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

**Water pressure differential switch on evaporator** – Not available on units EWAD390~580D-SS, EWAD230~530D-SL, EWAD220~530D-SR, EWAD210~490D-SX, EWAD250~620D-XS, EWAD240~600D-XR, EWAD230~590D-HS

**Evaporator electric heater type** – 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 device**

**20 mm evaporator insulation** – Only for EWAD180~200D-SL, EWAD180~190D-SR, EWAD210D-SX and EWAD200~210D-HS

**Ambient outside temperature sensor and set-point reset**

**Hour run meter**

**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  $\Delta t$ .

**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 (pump etc...). User can decide if this alarm signal will stop the unit or not.

**Fans circuit breakers** – Safety device against motor overloading and short circuit

**Main switch interlock door**

## 3 General characteristics

### Options (on request)

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

#### **Total heat recovery (1 circuit)**

**Partial heat recovery** – Plate to plate heat exchangers installed between the compressor discharge and the condenser coil, allowing producing hot water.

**Brine version** – Allows the unit to operate down to -15°C leaving liquid temperature (antifreeze required).

**Evaporator flanged connections** – Not available for EWAD180~200D-SL, EWAD180~190D-SR, EWAD210D-SX and EWAD200~210D-HS

#### **Condenser coil 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.

**Hydronic Kit (single water pump - low or high lifting)** – (N.A. on EWAD210~490D-SX) Hydronic kit consists of: single direct driven centrifugal pump, water filling system with pressure gauge, safety valve, drain valve. The pump motor 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 - low or high lifting)** – (N.A. on EWAD180~190D-SR and on EWAD210~490D-SX). 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**

**Soft starter** – Electronic starting device to reduce the mechanical stress during compressor start-up.

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

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

**Energy Meter** – This device allows to measure the energy absorbed by the chiller during its life. It is installed inside the control box mounted on a DIN rail and show on a digital display: Line-to-Line Voltage, Phase and Average Current, Active and Reactive Power, Active Energy, Frequency.

**Capacitors for power factor correction** – To increase the operating power factor of the unit at nominal operating conditions. The capacitors are “dry” self-regenerating type with over pressure disconnecting safety device insulated with a no toxic dielectric mix with no PCB or PCT.

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

#### **Fan silent mode**

**Speedtrol** – (N.A. on EWAD210~490D-SX) Continuous fan speed modulation on the first fan of each circuit. It allows the unit working with air temperature down to -18°C.

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

#### **High pressure side manometers (one per circuit)**

#### **Compressors circuit breakers**

**Fan speed regulation** – Standard option for EWAD~D-SX

To control the fan speed revolution for smooth operating control of the unit. During low ambient temperature operation, this option improves also the sound level of the unit. With “Fan speed regulation” option, by different microprocessor setting, it is also possible to set the “Fan Silent Mode” configuration. It means that the microprocessor clock switches the fan at low speed according to the client setting (i.e. Night & Day), providing that the ambient temperature/condensing pressure is allowing the speed change. It allows a perfect condensing control down to -10°C.



### 3 General characteristics

**Rubber type anti vibration mounts** – Supplied separately, these are positioned under the base of the unit during installation to reduce vibrations.

**Spring type anti vibration 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.

**External tank without cabinet (500 L / 1000 L)**

**External tank with cabinet (500 L / 1000 L)**

**Container kit**

**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 (please contact the factory) (This test is not available for units with glycol mixtures).

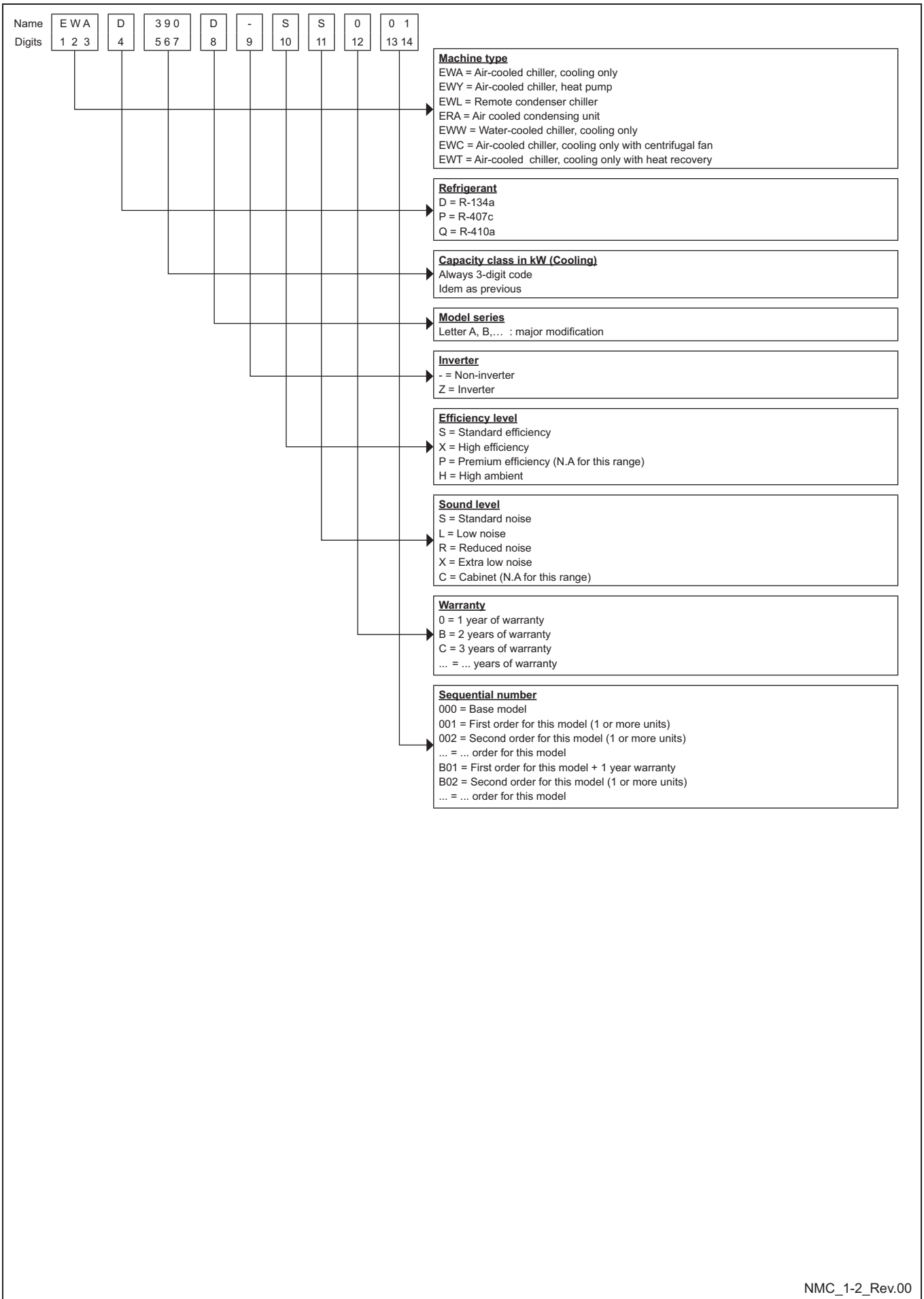
**Acoustic test** – On request, a test can be carried out, at customer's presence (please contact the factory) (This test is not available for units with glycol mixtures).

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# 4 Nomenclature

## 4 - 1 Nomenclature

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# 5 Specifications

5-1 Technical Specifications					EWAD390D-SS	EWAD440D-SS	EWAD470D-SS	EWAD510D-SS	EWAD530D-SS	EWAD560D-SS
Cooling capacity	Nom.		kW	389 (1)	436 (1)	466 (1)	502 (1)	532 (1)	556 (1)	
Capacity control	Method			Stepless						
	Minimum capacity		%	12.5						
Power input	Cooling	Nom.	kW	152 (1)	164 (1)	167 (1)	184 (1)	194 (1)	205 (1)	
EER				2.56 (1)	2.66 (1)	2.79 (1)	2.73 (1)	2.74 (1)	2.72 (1)	
ESEER				3.36	3.54	3.55	3.52		3.56	
IPLV				3.75	3.86	3.88	3.85	3.93	4.11	
Casing	Colour			Ivory white						
	Material			Galvanized and painted steel sheet						
Dimensions	Unit	Height	mm	2,223						
		Width	mm	2,234						
		Depth	mm	3,139	4,040					
Weight	Unit		kg	2,960	4,030	4,220	4,230			
	Operation weight		kg	3,090	4,195	4,395				
Water heat exchanger	Type			Single pass shell & tube						
	Water volume		l	130	165	175	165			
	Nominal water flow	Cooling	l/s	18.60	20.80	22.20	24.00	25.40	26.50	
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	46	38	67	47	52	57
	Insulation material			Closed cell						
Air heat exchanger	Type			High efficiency fin and tube type with integral subcooler						
Fan	Quantity			6			8			
	Type			Direct propeller						
	Diameter		mm	800						
	Air flow rate	Nom.	l/s	32,772	31,729	43,696				
	Speed		rpm	890						
Fan motor	Drive			DOL						
	Input	Cooling	W	1,750						
Sound power level	Cooling	Nom.	dBA	95.8	96.7	96	96.7	98.2	98.7	
Sound pressure level	Cooling	Nom.	dBA	76.5	77.0			78.5	79.0	
Compressor	Type			Semi-hermetic single screw compressor						
	Quantity			2						
	Oil	Charged volume	l	26	32					
Operation range	Water side	Cooling	Min.	°CDB	-15					
			Max.	°CDB	15					
	Air side	Cooling	Min.	°CDB	-18					
			Max.	°CDB	48					
Refrigerant	Type			R-134a						
	Circuits	Quantity		2						
Refrigerant circuit	Charge		kg	56	60	70	76	82	87	
Piping connections	Evaporator water inlet/outlet			139.7mm						
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	Water freeze protection controller							

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# 5 Specifications

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5-1 Technical Specifications					EWAD580D-SS					
Cooling capacity	Nom.			kW	578 (1)					
Capacity control	Method				Stepless					
	Minimum capacity			%	12.5					
Power input	Cooling	Nom.		kW	197 (1)					
EER					2.93 (1)					
ESEER					3.39					
IPLV					3.95					
Casing	Colour				Ivory white					
	Material				Galvanized and painted steel sheet					
Dimensions	Unit	Height		mm	2,223					
		Width		mm	2,234					
		Depth		mm	4,040					
Weight	Unit			kg	4,235					
	Operation weight			kg	4,395					
Water heat exchanger	Type				Single pass shell & tube					
	Water volume			l	160					
	Nominal water flow	Cooling		l/s	27.60					
	Nominal water pressure drop	Cooling	Heat exchanger		kPa	51				
		Insulation material				Closed cell				
Air heat exchanger	Type				High efficiency fin and tube type with integral subcooler					
Fan	Quantity				8					
	Type				Direct propeller					
	Diameter			mm	800					
	Air flow rate	Nom.		l/s	42,306					
	Speed			rpm	890					
Fan motor	Drive				DOL					
	Input	Cooling	W		1,750					
Sound power level	Cooling	Nom.		dBA	98.7					
Sound pressure level	Cooling	Nom.		dBA	79.0					
Compressor	Type				Semi-hermetic single screw compressor					
	Quantity				2					
	Oil	Charged volume		l	32					
Operation range	Water side	Cooling	Min.	°CDB	-15					
			Max.	°CDB	15					
	Air side	Cooling	Min.	°CDB	-18					
			Max.	°CDB	48					
Refrigerant	Type				R-134a					
	Circuits	Quantity			2					
Refrigerant circuit	Charge			kg	92					
Piping connections	Evaporator water inlet/outlet				139.7mm					
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			Water freeze protection controller					

## 5 Specifications

5-2 Electrical Specifications			EWAD390D-SS	EWAD440D-SS	EWAD470D-SS	EWAD510D-SS	EWAD530D-SS	EWAD560D-SS	
Compressor	Phase		3~						
	Voltage		V		400				
	Voltage range	Min.	%		-10				
		Max.	%		10				
	Maximum running current		A	140	153	174	174	185	
	Starting method		Wye-delta						
Compressor 2	Maximum running current		A	147	153	174	185		
Power supply	Phase		3~						
	Frequency		Hz		50				
	Voltage		V		400				
	Voltage range	Min.	%		-10				
		Max.	%		10				
Unit	Maximum starting current		A	418	464	485	494		
	Nominal running current (RLA)	Cooling	A	254	274	281	306	321	336
			A	312	329	358	379	390	401
	Max unit current for wires sizing		A	343	362	394	417	429	441
Fans	Nominal running current (RLA)		A	24		32			

5-2 Electrical Specifications			EWAD580D-SS						
Compressor	Phase		3~						
	Voltage		V		400				
	Voltage range	Min.	%		-10				
		Max.	%		10				
	Maximum running current		A	185					
	Starting method		Wye-delta						
Compressor 2	Maximum running current		A	185					
Power supply	Phase		3~						
	Frequency		Hz		50				
	Voltage		V		400				
	Voltage range	Min.	%		-10				
		Max.	%		10				
Unit	Maximum starting current		A	494					
	Nominal running current (RLA)	Cooling	A	324					
			A	401					
	Max unit current for wires sizing		A	441					
Fans	Nominal running current (RLA)		A	32					

### Notes

- (1)Cooling: entering evaporator water temp. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C; full load operation.
- (2)Sound pressure levels are measured at entering evaporator water temp. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C; 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. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C. 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

# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

EWAD-D-SS

ELWT (°C)		390						440						470						510									
		Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)									
		25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46
4	Cc (kW)	395	378	358	332	320	307	290	446	425	400	371	351	322	291	471	452	429	396	377	352	325	511	488	462	431	406	376	344
	Pi (kW)	121	133	146	160	167	174	176	132	144	157	173	176	172	166	134	147	162	174	177	176	173	148	162	177	195	197	195	190
	Qwe (l/s)	18.8	18	17	15.8	15.2	14.6	13.8	21.3	20.2	19.1	17.7	16.7	15.4	13.9	22.4	21.5	20.5	18.9	18	16.8	15.5	24.3	23.3	22	20.5	19.4	17.9	16.4
	Pdwe (kPa)	46.6	43.2	39	34.1	31.9	29.7	26.7	39.4	36	32.4	28.2	25.6	21.9	18.3	67.6	62.7	57.3	49.6	45.4	40	34.6	48.5	44.7	40.4	35.7	32.1	28	23.7
5	Cc (kW)	406	390	368	341	329	316	295	459	437	412	382	369	348	317	484	464	441	414	396	376	349	525	502	475	444	429	407	374
	Pi (kW)	123	135	148	163	169	176	175	134	146	159	175	182	186	180	136	149	163	180	183	186	184	150	164	179	197	205	209	205
	Qwe (l/s)	19.4	18.6	17.5	16.3	15.7	15.1	14.1	21.9	20.8	19.6	18.2	17.6	16.6	15.1	23.1	22.1	21	19.7	18.9	17.9	16.6	25	23.9	22.7	21.1	20.5	19.4	17.8
	Pdwe (kPa)	49.1	45.5	41.1	35.9	33.6	31.3	27.7	41.5	38	34.1	29.8	28	25.3	21.3	71.1	65.9	60.2	53.6	49.6	45.2	39.5	51	47	42.6	37.7	35.5	32.2	27.6
6	Cc (kW)	418	401	379	351	338	325	301	472	450	424	394	380	366	346	497	477	454	427	413	395	375	539	516	489	457	442	427	403
	Pi (kW)	125	137	150	165	171	178	175	136	148	162	178	184	192	197	138	150	165	182	189	193	196	152	166	182	200	208	216	220
	Qwe (l/s)	19.9	19.1	18.1	16.7	16.1	15.5	14.4	22.5	21.5	20.2	18.8	18.1	17.4	16.5	23.7	22.7	21.6	20.3	19.7	18.8	17.9	25.7	24.6	23.3	21.8	21.1	20.3	19.2
	Pdwe (kPa)	51.8	48	43.3	37.8	35.4	32.9	28.7	43.7	40.1	36	31.5	29.6	27.6	25	74.6	69.2	63.3	56.7	53.6	49.3	45	53.5	49.4	44.9	39.7	37.4	35.1	31.7
7	Cc (kW)	430	412	389	361	348	332	308	485	463	436	405	392	377	359	510	489	466	438	426	413	392	553	529	502	470	455	439	422
	Pi (kW)	127	139	152	167	174	179	175	138	150	164	180	187	194	201	140	152	167	184	191	199	202	154	168	184	202	210	218	227
	Qwe (l/s)	20.5	19.7	18.6	17.2	16.6	15.8	14.7	23.2	22.1	20.8	19.3	18.7	18	17.1	24.3	23.3	22.2	20.9	20.3	19.7	18.7	26.4	25.3	24.0	22.4	21.7	21	20.1
	Pdwe (kPa)	54.5	50.5	45.6	39.7	37.2	34.2	29.8	45.9	42.1	37.9	33.2	31.2	29.1	26.7	78.3	72.6	66.5	59.6	56.6	53.5	48.8	56.1	51.8	47.1	41.8	39.5	37	34.5
8	Cc (kW)	442	424	400	371	357	338	313	498	475	448	417	403	388	362	523	502	478	450	438	424	410	567	543	516	483	468	452	435
	Pi (kW)	129	141	154	170	176	178	175	140	152	166	182	189	196	196	142	154	169	186	193	201	209	156	170	186	204	212	221	229
	Qwe (l/s)	21.1	20.2	19.1	17.7	17.1	16.1	14.9	23.8	22.7	21.4	19.9	19.2	18.5	17.3	25	24	22.8	21.5	20.9	20.2	19.6	27.1	25.9	24.6	23	22.3	21.6	20.7
	Pdwe (kPa)	57.4	53.1	47.9	41.7	39.1	35.4	30.8	48.2	44.3	39.9	35	32.9	30.7	27.1	82.1	76.2	69.7	62.5	59.4	56.2	52.8	58.8	54.3	49.5	43.9	41.5	39	36.4
9	Cc (kW)	455	435	411	381	367	344	317	511	488	461	429	414	399	366	537	515	490	462	449	436	421	582	557	529	496	481	464	447
	Pi (kW)	131	143	157	172	179	178	172	142	154	168	184	191	199	193	143	156	171	188	195	203	211	159	172	188	207	215	223	232
	Qwe (l/s)	21.7	20.8	19.6	18.2	17.5	16.4	15.1	24.4	23.3	22	20.5	19.8	19.1	17.5	25.6	24.6	23.4	22.1	21.5	20.8	20.1	27.8	26.6	25.3	23.7	23	22.2	21.4
	Pdwe (kPa)	60.3	55.8	50.3	43.8	41	36.6	31.4	50.5	46.4	41.9	36.8	34.6	32.4	27.7	85.9	79.8	73.1	65.6	62.4	59	55.5	61.5	56.9	51.8	46.1	43.6	41	38.3
10	Cc (kW)	467	447	422	390	376	350	320	524	500	473	440	426	410	368	550	528	503	474	461	447	432	596	571	542	509	493	477	450
	Pi (kW)	133	145	159	175	181	177	170	144	157	171	187	194	201	187	145	158	173	189	197	205	213	161	175	191	209	217	225	227
	Qwe (l/s)	22.3	21.4	20.1	18.7	18	16.7	15.3	25	23.9	22.6	21	20.3	19.6	17.6	26.3	25.2	24	22.6	22	21.4	20.7	28.5	27.3	25.9	24.3	23.6	22.8	21.5
	Pdwe (kPa)	63.4	58.5	52.7	45.9	42.9	37.7	32.1	52.9	48.7	43.9	38.6	36.4	34	27.9	90	83.5	76.5	68.7	65.4	61.9	58.2	64.4	59.5	54.2	48.3	45.8	43.1	38.7
11	Cc (kW)	480	459	432	400	383	357	324	537	513	485	452	437	417	368	564	541	516	486	473	459	442	611	585	556	522	506	490	454
	Pi (kW)	135	148	162	177	181	178	167	146	159	173	189	196	200	181	147	160	175	192	199	207	214	163	177	193	211	219	228	223
	Qwe (l/s)	22.9	21.9	20.7	19.1	18.3	17.1	15.5	25.7	24.5	23.2	21.6	20.9	19.9	17.6	27	25.9	24.7	23.2	22.6	21.9	21.1	29.2	28	26.6	24.9	24.2	23.4	21.7
	Pdwe (kPa)	66.5	61.4	55.2	48	44.3	39.1	32.8	55.3	50.9	46	40.5	38.2	35.1	28.1	94.1	87.4	80.1	72	68.5	64.8	60.8	67.3	62.3	56.7	50.6	48	45.2	39.5
12	Cc (kW)	492	471	443	410	389	363	321	550	526	497	464	449	419	369	578	555	529	498	485	470	450	626	599	569	535	519	502	456
	Pi (kW)	137	150	164	180	181	177	170	149	161	175	192	199	196	175	149	162	177	194	201	209	214	165	179	195	214	222	230	217
	Qwe (l/s)	23.5	22.5	21.2	19.6	18.6	17.3	15.4	26.3	25.1	23.8	22.2	21.5	20	17.6	27.6	26.5	25.3	23.8	23.2	22.5	21.5	29.9	28.7	27.2	25.6	24.8	24	21.8
	Pdwe (kPa)	69.7	64.3	57.8	50.2	45.6	40.2	32.4	57.8	53.2	48.1	42.5	40.1	35.4	28.1	98.3	91.4	83.7	75.3	71.6	67.9	62.8	70.3	65.1	59.3	52.9	50.2	47.3	39.8
13	Cc (kW)	505	482	454	420	396	366	324	564	538	509	475	460	418	368	592	568	541	510	497	482	457	641	614	583	547	532	515	454
	Pi (kW)	140	152	167	183	181	175	167	151	163	178	194	201	189	169	151	164	179	196	203	211	212	168	182	198	216	224	233	209
	Qwe (l/s)	24.2	23.1	21.7	20.1	18.9	17.5	15.5	27	25.7	24.4	22.7	22	20	17.6	28.3	27.2	25.9	24.4	23.8	23.1	21.9	30.7	29.4	27.9	26.2	25.4	24.6	21.7
	Pdwe (kPa)	73.1	67.3	60.4	52.5	47.2	41	32.9	60.4	55.6	50.3	44.4	41.9	35.2	28	102.7	95.5	87.5	78.7	74.9	71	64.5	73.4	67.9	61.9	55.3	52.5	49.5	39.5
14	Cc (kW)	518	494	465	429	402	370	327	577	551	521	487	472	418	363	606	582	554	523	509	494	463	656	628	597	561	545	517	454
	Pi (kW)	142	155	169	184	181	173	163	153	166	180	197	204	183	161	153	166	181	198	205	213	210	170	184	201	219	227	228	202
	Qwe (l/s)	24.8	23.7	22.3	20.5	19.2	17.7	15.6	27.6	26.4	25	23.3	22.6	20	17.4	29	27.8	26.5	25	24.3	23.6	22.2	31.4	30.1	28.6	26.8	26.1	24.8	21.7
	Pdwe (kPa)	76.5	70.4	63.1	54.5	48.5	41.8	33.4	63	58	52.5	46.5	43.9	35.3	27.4	107.2	99.7	91.4	82.2	78.3	74.2	66.2	76.6	70.9	64.6	57.7	54.8	49.9	39.5
15	Cc (kW)	531	506	476	436	409	372	329	590	564	533	499	471	415	361	620	596	568	535	521	506	470	671	643	611	574	557	519	449
	Pi (kW)	144	157	172	184	181	169	160	156	168	183	199	198	175	154	156	168	183	200	208	215	208	173	187	203	222	230	223	193
	Qwe (l/s)	25.4	24.2</																										



# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

EWAD-D-SS

		530						560						580								
		Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)								
ELWT (°C)		25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46
4	Cc (kW)	533	514	492	444	416	387	344	550	536	517	453	421	393	341	568	553	535	497	468	435	398
	Pi (kW)	154	169	188	197	196	194	190	160	178	199	200	196	194	190	155	172	191	207	208	205	199
	Qwe (l/s)	25.4	24.5	23.4	21.1	19.8	18.4	16.4	26.2	25.5	24.6	21.6	20.1	18.7	16.2	27	26.4	25.5	23.7	22.3	20.7	19
	Pdwe (kPa)	52.3	49	45.2	37.6	33.4	29.3	23.7	56.2	53.6	50.2	39.5	34.8	30.7	23.7	49.5	47.2	44.5	38.9	35	30.7	26.2
5	Cc (kW)	547	528	505	463	442	415	382	564	549	530	478	450	418	386	582	568	549	525	499	466	429
	Pi (kW)	156	171	190	203	207	207	202	162	180	200	210	210	206	201	156	174	193	216	220	218	212
	Qwe (l/s)	26.1	25.2	24.1	22.1	21.1	19.8	18.2	26.9	26.2	25.3	22.8	21.5	19.9	18.4	27.8	27.1	26.2	25	23.8	22.2	20.4
	Pdwe (kPa)	54.8	51.4	47.5	40.6	37.3	33.3	28.7	58.8	56.1	52.5	43.7	39.2	34.4	29.7	51.8	49.5	46.7	42.9	39.2	34.7	29.8
6	Cc (kW)	561	542	518	484	461	439	409	578	563	543	507	475	447	411	597	582	564	538	526	496	462
	Pi (kW)	158	173	192	211	214	217	216	164	182	202	223	221	220	213	158	176	195	218	229	231	228
	Qwe (l/s)	26.8	25.8	24.7	23.1	22	20.9	19.5	27.6	26.8	25.9	24.2	22.7	21.3	19.6	28.5	27.8	26.9	25.7	25.1	23.6	22
	Pdwe (kPa)	57.4	53.9	49.8	44	40.3	36.9	32.5	61.5	58.6	54.9	48.5	43.3	38.7	33.3	54.3	51.9	48.9	45	43.1	38.8	34.2
7	Cc (kW)	575	556	532	501	481	459	432	592	576	556	528	503	474	438	612	597	578	552	539	525	494
	Pi (kW)	160	176	194	216	222	226	227	166	184	205	230	234	234	228	160	178	197	220	231	243	245
	Qwe (l/s)	27.5	26.5	25.4	23.9	23	21.9	20.6	28.3	27.5	26.5	25.2	24	22.6	20.9	29.2	28.5	27.6	26.3	25.7	25	23.6
	Pdwe (kPa)	60.1	56.5	52.1	46.9	43.6	40	36	64.3	61.2	57.4	52.3	47.9	43.1	37.4	56.8	54.2	51.2	47.1	45.2	43.1	38.6
8	Cc (kW)	590	569	545	514	500	477	443	607	590	569	541	527	498	447	627	611	592	566	553	538	507
	Pi (kW)	162	178	196	218	228	233	227	168	186	207	232	245	246	226	162	180	199	222	233	245	246
	Qwe (l/s)	28.2	27.2	26	24.5	23.9	22.8	21.1	29	28.2	27.2	25.6	25.2	23.8	21.3	29.9	29.2	28.2	27	26.4	25.7	24.2
	Pdwe (kPa)	62.9	59.1	54.6	49.1	46.7	43	37.6	67.2	64	59.9	54.6	52.2	47.1	38.8	59.4	56.7	53.5	49.3	47.3	45.1	40.5
9	Cc (kW)	604	583	558	527	512	487	452	621	604	582	553	539	504	452	643	626	606	579	566	552	510
	Pi (kW)	164	180	198	220	230	232	226	170	188	209	235	247	243	222	164	182	201	224	235	247	240
	Qwe (l/s)	28.9	27.9	26.7	25.2	24.5	23.2	21.6	29.7	28.8	27.8	26.4	25.8	24.1	21.6	30.7	29.9	28.9	27.7	27	26.3	24.4
	Pdwe (kPa)	65.8	61.7	57	51.4	48.9	44.6	39	70.1	66.7	62.5	57	54.4	48.2	39.7	62.1	59.2	55.8	51.5	49.5	47.2	41
10	Cc (kW)	619	597	572	540	525	495	454	635	618	595	566	552	507	454	658	641	620	593	580	565	513
	Pi (kW)	166	182	201	222	232	231	221	172	190	211	237	249	237	215	166	184	203	226	237	249	234
	Qwe (l/s)	29.6	28.5	27.3	25.8	25.1	23.6	21.7	30.4	29.5	28.5	27	26.4	24.2	21.7	31.4	30.6	29.6	28.3	27.7	27	24.5
	Pdwe (kPa)	68.7	64.5	59.6	53.7	51.1	45.9	39.3	73.2	69.6	65.1	59.4	56.7	48.8	39.9	64.9	61.9	58.3	53.7	51.6	49.3	41.4
11	Cc (kW)	634	612	585	553	538	502	457	650	632	609	579	564	510	454	674	656	635	607	593	578	515
	Pi (kW)	168	185	203	225	235	229	215	174	193	214	239	251	231	208	168	186	206	229	239	251	228
	Qwe (l/s)	30.3	29.2	28	26.4	25.7	24	21.8	31.1	30.2	29.1	27.7	27	24.4	21.7	32.2	31.4	30.3	29	28.4	27.6	24.6
	Pdwe (kPa)	71.7	67.3	62.2	56.1	53.4	47.2	39.8	76.3	72.5	67.8	61.9	59.1	49.2	40	67.7	64.5	60.8	56	53.8	51.4	41.8
12	Cc (kW)	648	626	599	566	546	509	456	665	646	622	591	568	512	453	689	671	649	620	607	582	517
	Pi (kW)	171	187	205	227	234	227	217	177	195	216	241	246	224	218	170	189	208	231	241	246	222
	Qwe (l/s)	31	29.9	28.6	27	26.1	24.4	21.8	31.8	30.9	29.8	28.3	27.1	24.5	21.6	33	32.1	31	29.7	29	27.8	24.7
	Pdwe (kPa)	74.8	70.2	64.8	58.5	54.9	48.5	39.8	79.5	75.5	70.6	64.4	59.8	49.6	39.8	70.6	67.3	63.3	58.4	56.1	52	42
13	Cc (kW)	663	640	612	579	554	516	454	680	660	636	604	571	513	450	705	687	664	634	620	585	518
	Pi (kW)	173	189	208	230	232	225	209	179	197	218	244	241	218	209	172	191	210	233	244	241	216
	Qwe (l/s)	31.7	30.6	29.3	27.7	26.5	24.7	21.7	32.5	31.6	30.4	28.9	27.3	24.5	21.6	33.7	32.8	31.7	30.3	29.7	28	24.8
	Pdwe (kPa)	78	73.2	67.6	61	56.4	49.7	39.5	82.8	78.6	73.4	67	60.4	49.8	39.5	73.6	70.1	65.9	60.8	58.4	52.5	42.2
14	Cc (kW)	679	655	626	592	561	518	454	695	675	650	617	573	513	450	721	702	678	648	634	587	514
	Pi (kW)	175	192	210	232	231	220	202	181	200	221	246	236	212	203	175	193	213	236	246	236	207
	Qwe (l/s)	32.5	31.3	30	28.3	26.9	24.8	21.7	33.2	32.3	31.1	29.5	27.4	24.6	21.6	34.5	33.6	32.5	31	30.3	28.1	24.6
	Pdwe (kPa)	81.3	76.2	70.4	63.5	57.8	49.9	39.5	86.1	81.7	76.3	69.6	60.9	50	39.5	76.7	73	68.6	63.3	60.8	52.9	41.6
15	Cc (kW)	694	669	640	605	569	519	450	710	689	663	630	575	515	446	737	717	693	662	648	585	518
	Pi (kW)	178	194	213	235	230	223	193	184	202	224	249	231	223	193	177	196	215	238	248	229	221
	Qwe (l/s)	33.2	32	30.6	29	27.2	24.8	21.5	34	33	31.8	30.2	27.5	24.6	21.3	35.3	34.3	33.2	31.7	31	28	24.8
	Pdwe (kPa)	84.6	79.3	73.2	66.1	59.2	50.2	38.8	89.6	84.9	79.3	72.3	61.3	50.2	38.8	79.8	76.0	71.4	65.8	63.2	52.6	42.3

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# 6 Capacity tables

## 6 - 2 Partial Heat Recovery Capacity tables

### Partial Heat Recovery Ratings EWAD-D-S

EWAC / LWC	*Model EWAD-D-SS*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
50/60	390	332	161	173	35%	3.13
	440	373	172	191	35%	3.27
	470	403	189	207	35%	3.24
	510	432	206	223	35%	3.18
	530	461	219	238	35%	3.19
	560	486	233	216	30%	3.01
	580	508	225	191	26%	3.10

EWAC / LWC	*Model EWAD-D-SL*	*Model EWAD-D-SR*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
50/60	180	180	159	80.0	84	35%	3.03
	200	190	171	78.4	87	35%	3.30
	230	220	196	83.3	98	35%	3.52
	250	240	213	92.2	107	35%	3.48
	260	250	227	105	116	35%	3.28
	280	270	240	112	123	35%	3.23
	300	280	259	124	134	35%	3.18
	320	310	281	128	123	30%	3.15
	370	370	329	141	122	26%	3.20
	400	400	373	172	191	35%	3.27
	440	440	403	189	207	35%	3.24
	480	480	432	206	223	35%	3.18
	510	510	461	219	238	35%	3.19
	530	530	486	233	216	30%	3.01

EWAC / LWC	*Model EWAD-D-SX*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
50/60	210	171	78.4	87	35%	3.30
	230	196	83.3	98	35%	3.52
	250	213	92.2	107	35%	3.48
	270	227	105	116	35%	3.28
	290	240	112	123	35%	3.23
	300	259	124	134	35%	3.18
	310	281	128	123	30%	3.15
	370	332	161	173	35%	3.13
	410	373	172	191	35%	3.27
	450	403	189	207	35%	3.24
	490	432	206	223	35%	3.18

#### NOTES

- Cc (cooling capacity)
- Pi (unit power input)
- Hc (heating heat recovery capacity)
- %Hc (percentage heat recovered)
- EER Hc (coefficient of performance during heat recovery = (cooling+ heating capacity) / power input)
- EWAC (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<sup>2</sup> °C/kW evaporator fouling factor

# 6 Capacity tables

## 6 - 3 Total Heat Recovery Capacity tables

### Total Heat Recovery Ratings EWAD-D-S

EWC / LWC	*Model EWAD-D-SS*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
40/45	390	348	154	427	85%	5.02
	440	391	165	473	85%	5.23
	470	423	183	515	85%	5.13
	510	453	200	555	85%	5.05
	530	484	213	592	85%	5.06
	560	510	226	552	75%	4.70
	580	533	219	488	65%	4.67
40/50	390	332	156	415	85%	4.79
	440	373	167	459	85%	4.99
	470	403	185	500	85%	4.89
	510	432	202	539	85%	4.81
	530	461	215	575	85%	4.82
	560	486	228	536	75%	4.47
	580	508	221	474	65%	4.44
45/55	390	332	158	294	60%	3.97
	440	373	169	325	60%	4.13
	470	403	187	354	60%	4.06
	510	432	204	382	60%	3.99
	530	461	217	407	60%	4.00
	560	486	231	358	50%	3.66
	580	508	223	314	43%	3.68

EWC / LWC	*Model EWAD-D-SL*	*Model EWAD-D-SR*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc	
40/45	180	180	167	76.7	207	85%	4.88	
	200	190	179	75.1	216	85%	5.27	
	230	220	205	80.0	243	85%	5.60	
	250	240	224	88.4	265	85%	5.54	
	260	250	238	102	289	85%	5.19	
	280	270	251	109	306	85%	5.12	
	300	280	272	120	333	85%	5.04	
	320	310	294	124	314	75%	4.89	
	370	370	345	137	314	65%	4.81	
	400	400	391	165	473	85%	5.23	
	440	440	423	183	515	85%	5.13	
	480	480	453	200	555	85%	5.05	
	510	510	484	213	592	85%	5.06	
	530	530	510	226	552	75%	4.70	
	40/50	180	180	159	77.5	201	85%	4.65
		200	190	171	75.9	210	85%	5.02
		230	220	196	80.8	235	85%	5.33
250		240	213	89.3	257	85%	5.27	
260		250	227	103	281	85%	4.94	
280		270	240	110	297	85%	4.88	
300		280	259	121	323	85%	4.81	
320		310	281	125	305	75%	4.66	
370		370	329	138	304	65%	4.58	
400		400	373	167	459	85%	4.99	
440		440	403	185	500	85%	4.89	
480		480	432	202	539	85%	4.81	
510		510	461	215	575	85%	4.82	
530		530	496	228	536	75%	4.47	
45/55		180	180	159	78.4	143	60%	3.85
		200	190	171	76.8	149	60%	4.16
		230	220	196	81.7	167	60%	4.43
	250	240	213	90.4	182	60%	4.38	
	260	250	227	104	199	60%	4.11	
	280	270	240	111	210	60%	4.05	
	300	280	259	122	229	60%	3.99	
	320	310	281	127	204	50%	3.82	
	370	370	329	140	202	43%	3.80	
	400	400	373	169	325	60%	4.13	
	440	440	403	187	354	60%	4.06	
	480	480	432	204	382	60%	3.99	
	510	510	461	217	407	60%	4.00	
	530	530	486	231	358	50%	3.66	

EWC / LWC	*Model EWAD-D-SX*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
40/45	210	179	75.1	216	85%	5.27
	230	205	80.0	243	85%	5.60
	250	224	88.4	265	85%	5.54
	270	238	102	289	85%	5.19
	290	251	109	306	85%	5.12
	300	272	120	333	85%	5.04
	310	294	124	314	75%	4.89
	370	348	154	427	85%	5.02
	410	391	165	473	85%	5.23
	450	423	183	515	85%	5.13
40/50	210	171	75.9	210	85%	5.02
	230	196	80.8	235	85%	5.33
	250	213	89.3	257	85%	5.27
	270	227	103	281	85%	4.94
	290	240	110	297	85%	4.88
	300	259	121	323	85%	4.81
	310	281	125	305	75%	4.66
	370	332	156	415	85%	4.79
	410	373	167	459	85%	4.99
	450	403	185	500	85%	4.89
45/55	210	171	76.8	149	60%	4.16
	230	196	81.7	167	60%	4.43
	250	213	90.4	182	60%	4.38
	270	227	104	199	60%	4.11
	280	240	111	210	60%	4.05
	300	259	122	229	60%	3.99
	310	281	127	204	50%	3.82
	370	332	158	294	60%	3.97
	410	373	169	325	60%	4.13
	450	403	187	354	60%	4.06

**NOTES**

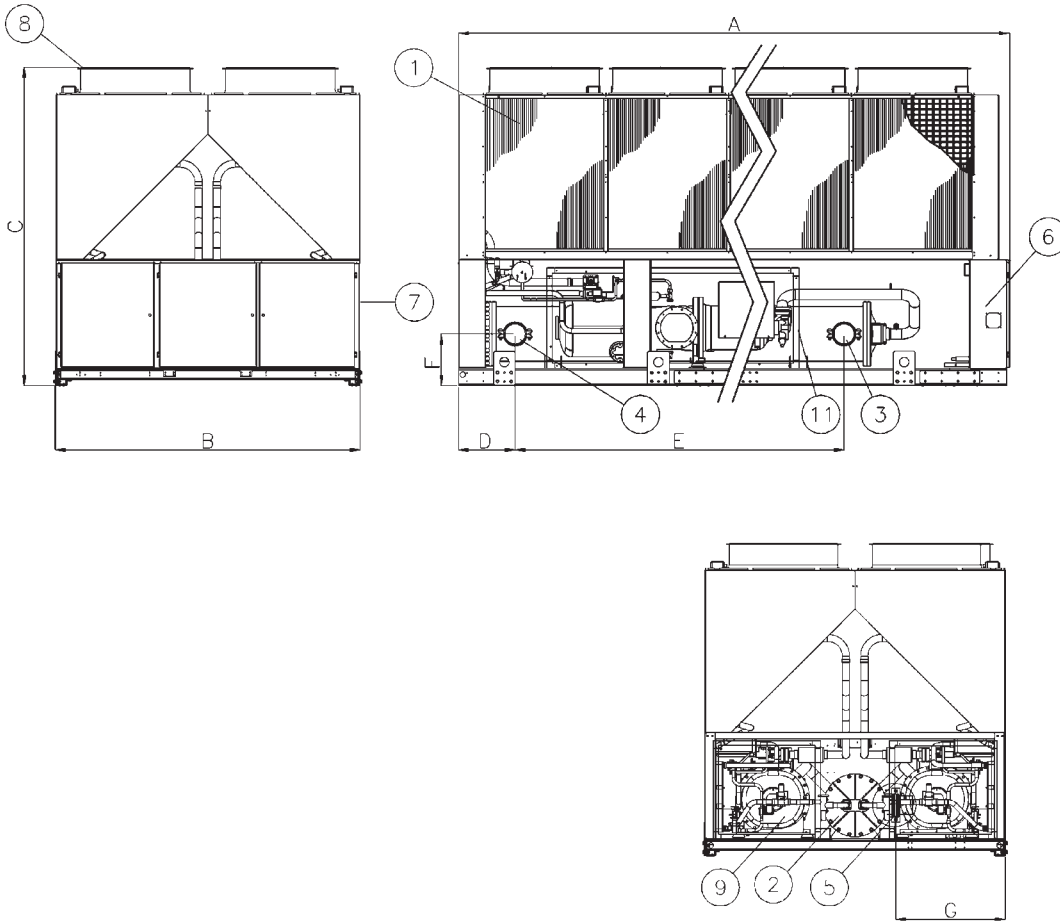
- Cc (cooling capacity)
- Pi (unit power input)
- Hc (heating heat recovery capacity)
- %Hc (percentage heat recovered)
- EER Hc (coefficient of performance during heat recovery = (cooling+ heating capacity) / power input)
- EWC (Entering water heat recovery condenser)
- LWC (Leaving water heat recovery 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<sup>2</sup> °C/kW evaporator fouling factor

# 7 Dimensional drawings

## 7 - 1 Dimensional Drawings

Dimensions EWAD~D-



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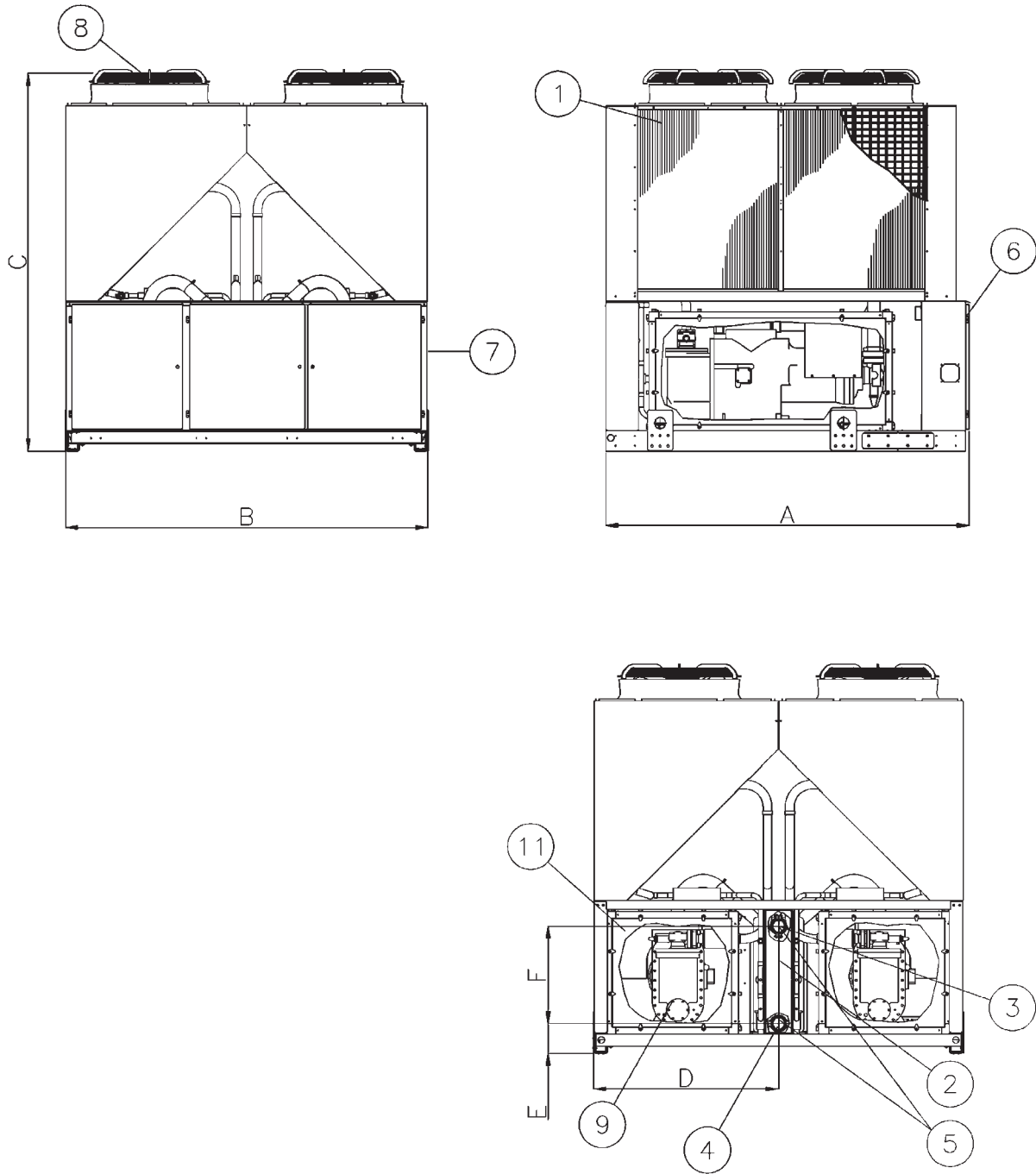
Models	Dimensions (mm)						
	A	B	C	D	E	F	G
EWAD							
EWAD390D-SS	3139	2234	2223	392	1875	339	873
EWAD440~580D-SS	4040	2234	2223	392	2450	339	855
EWAD230~300D-SL	3139	2234	2355	374	1911	339	873
EWAD320D-SL	4040	2234	2355	374	2486	339	873
EWAD400~530D-SL	4040	2234	2223	392	2450	339	855
EWAD220~280D-SR	3139	2234	2355	374	1911	339	873
EWAD310D-SR	4040	2234	2355	374	2486	339	873
EWAD400~530D-SR	4040	2234	2223	392	2450	339	855
EWAD210D-SX	3139	2234	2420	374	1911	339	873
EWAD230~310D-SX	4040	2234	2420	374	2486	339	873
EWAD370~490D-SX	4040	2234	2420	392	2450	339	873
EWAD250D-XS	3138	2234	2355	374	1911	339	873
EWAD280~400D-XS	4040	2234	2355	374	2486	339	873
EWAD470D-XS	4040	2234	2223	414	2412	379	873
EWAD520~620D-XS	4940	2234	2223	414	2412	379	815
EWAD240D-XR	3138	2234	2355	374	1911	339	873
EWAD270~390D-XR	4040	2234	2355	374	2486	339	873
EWAD460D-XR	4040	2234	2223	414	2412	379	873
EWAD510~600D-XR	4940	2234	2223	414	2412	379	815
EWAD230~310D-HS	3339	2234	2223	374	1911	339	873
EWAD340~380D-HS	4040	2234	2223	374	2486	339	873
EWAD420~590D-HS	4040	2234	2223	392	2450	339	873

**LEGEND**

- 1 – Condenser Coil
- 2 – Water heat exchanger (evaporator)
- 3 – Evaporator water inlet
- 4 – Evaporator water outlet
- 5 – Victaulic connection
- 6 – Operating and control panel
- 7 – Slot for power and control connection
- 8 – Fan
- 9 – Compressor

# 7 Dimensional drawings

## 7 - 1 Dimensional Drawings



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Models	Dimensions (mm)					
	A	B	C	D	E	F
EWAD180~200D-SL	2239	2234	2355	1117	181	590
EWAD180~190D-SR	2239	2234	2355	1117	181	590
EWAD200~210D-HS	2223	2234	2223	1117	181	590

**LEGEND**

- 1 – Condenser Coil
- 2 – Water heat exchanger (evaporator)
- 3 – Evaporator water inlet
- 4 – Evaporator water outlet
- 5 – Victaulic connection
- 6 – Operating and control panel
- 7 – Slot for power and control connection
- 8 – Fan
- 9 – Compressor

DMN\_1a-2a\_Rev.01\_2

# 8 Sound data

## 8 - 1 Sound Level Data

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### Sound Level

#### EWAD-D-SS

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)									Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)	
390	62.5	71.5	70.0	76.5	68.0	70.5	58.0	49.9	76.5	95.8	
440	62.5	71.5	71.0	76.5	69.5	71.0	58.0	51.0	77.0	96.7	
470	62.5	71.5	71.0	76.5	69.5	71.0	58.0	51.0	77.0	96.7	
510	62.5	71.5	71.0	76.5	69.5	71.0	58.0	51.0	77.0	96.7	
530	64.0	73.0	73.0	78.0	71.0	72.5	59.5	52.5	78.5	98.2	
560	64.5	73.5	73.5	78.5	71.5	73.0	60.0	53.0	79.0	98.7	
580	64.5	73.5	73.5	78.5	71.5	73.0	60.0	53.0	79.0	98.7	

#### NOTES

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

#### EWAD-D-SL

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)									Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)	
180	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	93.7	
200	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	93.7	
230	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.3	
250	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.3	
260	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.3	
280	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.3	
300	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.3	
320	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.7	
370	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	97.2	
400	60.0	69.0	68.5	74.0	67.0	68.5	55.5	48.5	74.5	94.2	
440	60.0	69.0	68.5	74.0	67.0	68.5	55.5	48.5	74.5	94.2	
480	60.0	69.0	68.5	74.0	67.0	68.5	55.5	48.5	74.5	94.2	
510	61.5	70.5	70.5	75.5	68.5	70.0	57.0	50.0	76.0	95.7	
530	62.0	71.0	71.0	76.0	69.0	70.5	57.5	50.5	76.5	96.2	

#### NOTES

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

#### EWAD-D-SR

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)									Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)	
180	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	88.7	
190	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	88.7	
220	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.3	
240	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.3	
250	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.3	
270	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.3	
280	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.3	
310	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.7	
370	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	92.2	
400	56.5	69.5	69.0	71.0	65.0	61.0	53.5	43.5	71.0	90.7	
440	56.5	69.5	69.0	71.0	65.0	61.0	53.5	43.5	71.0	90.7	
480	56.5	69.5	69.0	71.0	65.0	61.0	53.5	43.5	71.0	90.7	
510	58.0	71.0	70.5	72.5	66.5	62.5	55.0	45.0	72.5	92.2	
530	58.5	71.5	71.0	73.0	67.0	63.0	55.5	45.5	73.0	92.7	

#### NOTES

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



## 8 Sound data

### 8 - 1 Sound Level Data

#### Sound pressure reduction values for different distances

##### EWAD-D-SS

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
390	0.0	-8.1	-13.0	-16.1	-18.3	-20.2	-25.9
440	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
470	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
510	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
530	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
560	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
580	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4

#### NOTES

Values are dB(A) (pressure level)

##### EWAD-D-SL

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
180	0.0	-8.3	-13.3	-16.4	-18.7	-20.5	-26.3
200	0.0	-8.3	-13.3	-16.4	-18.7	-20.5	-26.3
230	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
250	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
260	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
280	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
300	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
320	0.0	-8.1	-13.0	-16.1	-18.3	-20.2	-25.9
370	0.0	-8.1	-13.0	-16.1	-18.3	-20.2	-25.9
400	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
440	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
480	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
510	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
530	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4

#### NOTES

Values are dB(A) (pressure level)

##### EWAD-D-SR

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
180	0.0	-8.3	-13.3	-16.4	-18.7	-20.5	-26.3
190	0.0	-8.3	-13.3	-16.4	-18.7	-20.5	-26.3
220	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
240	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
250	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
270	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
280	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
310	0.0	-8.1	-13.0	-16.1	-18.3	-20.2	-25.9
370	0.0	-8.1	-13.0	-16.1	-18.3	-20.2	-25.9
400	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
440	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
480	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
510	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
530	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4

#### NOTES

Values are dB(A) (pressure level)

## 9 Installation

### 9 - 1 Installation Method

#### Installation notes

##### Warning

Installation and maintenance of the unit must be performed only by qualified personnel who have knowledge with local codes and regulations, and experience with this type of equipment. The unit must be installed to allow all the maintenance operations.

##### Handling

Care should be taken to avoid rough handling or shock due to dropping of 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 result in reductions in unit efficiency and capacity.

Moreover the unique microprocessor has the ability to analyse the operating environment of the air cooled chiller and to optimize its performance to stay 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.3). 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 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.4); 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 for general installation. A specific evaluation should be done by contractor depending on the case.

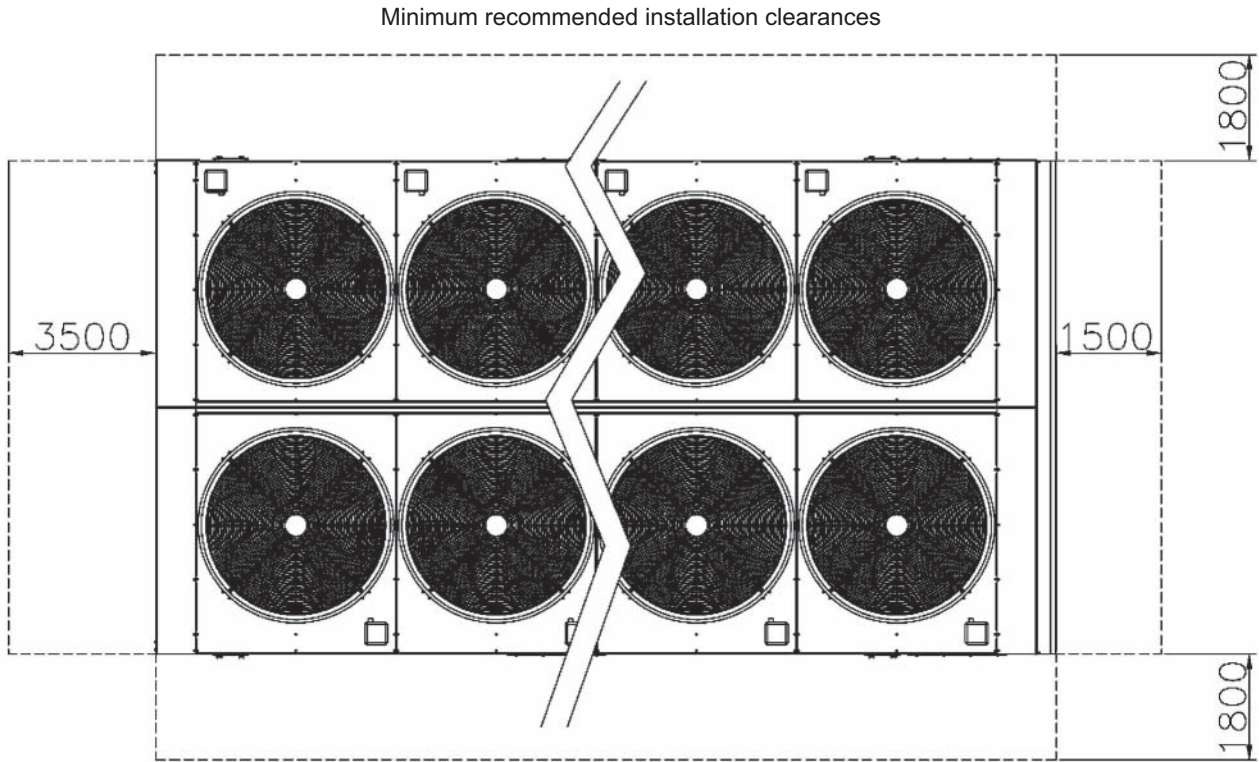


Fig. 1

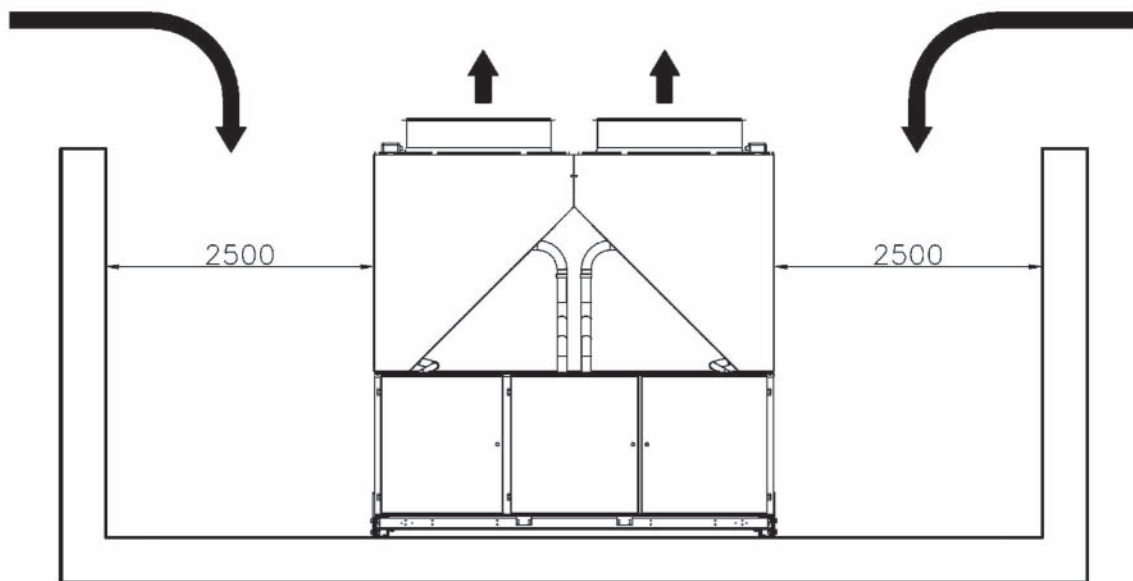


Fig. 2

## 9 Installation

### 9 - 1 Installation Method

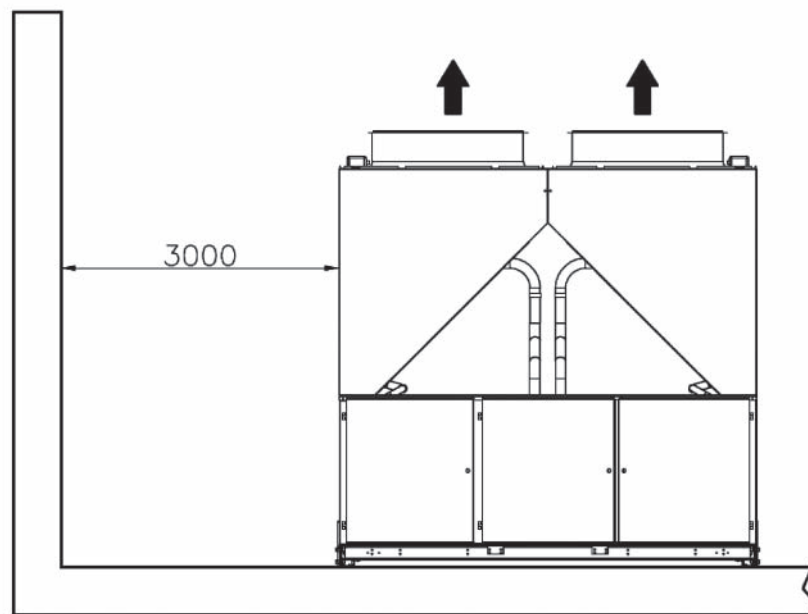


Fig. 3

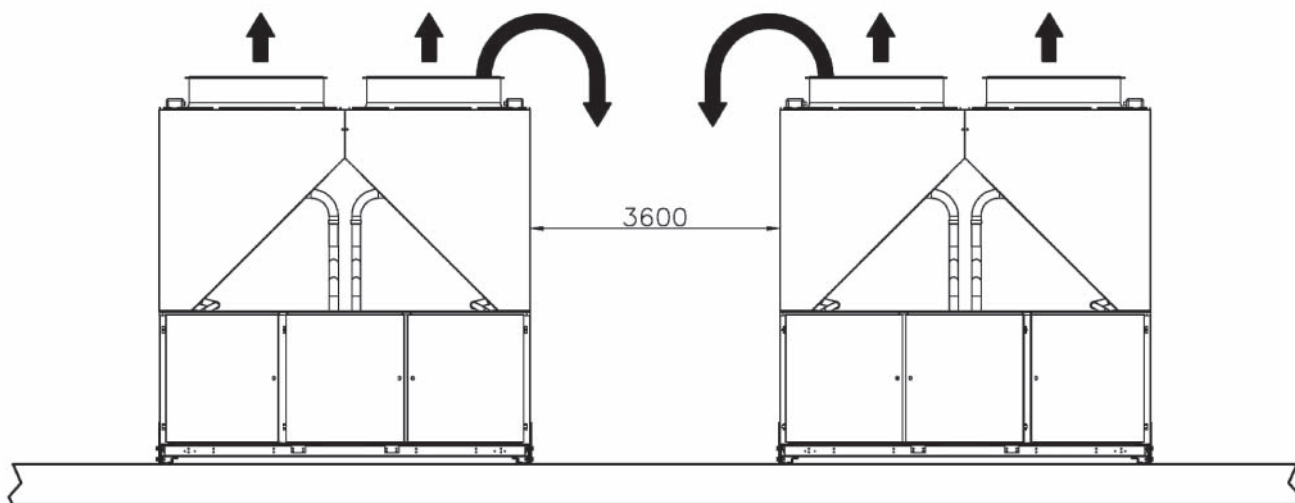


Fig. 4

#### 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

# 10 Operation range

## 10 - 1 Operation Range

**Table 1 - Evaporator minimum and maximum water Δt**

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

**Table 2 - Evaporator fouling factors**

Fouling factors m <sup>2</sup> °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 - Air heat exchanger - 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 operating altitude is 2000 m above sea level.

- Contact factory in case the unit has to be installed at altitudes between 1000 and 2000 m above sea level.

**Table 4.1 - Minimum glycol percentage for low water temperature**

EWLT (°C)	2	0	-2	-4	-6	-8	-10	-12	-15
Ethylene glycol (%)	10	20	20	20	30	30	30	40	40
Propylene glycol (%)	10	20	20	30	30	30	40	40	40

- ELWT (Evaporator Leaving Water Temperature (°C)).

- 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 ambient temperature**

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

- Minimum glycol percentage to prevent freezing of water circuit at indicated air ambient temperature.

- 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 (EWLT < 4°C)**

EWLT (°C)	-4	-6	-8	-10	-12	-15
Cooling Capacity	0.670	0.613	0.562	0.510	0.455	0.375
Compressor Power Input	0.890	0.870	0.840	0.798	0.755	0.680

- ELWT (Evaporator Leaving Water Temperature (°C)).

- 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

- Contact factory for water temperature out of operating limits.

# 10 Operation range

## 10 - 1 Operation Range

1  
10

### 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: **EWAD390D-SS**

Mixture: Water  
 Working condition: ELWT 12/7°C – Condenser inlet air temperature 35°C  
 - Cooling capacity: 389 kW  
 - Power input: 152 kW  
 - Flow rate (Δt 5°C): 18.60 l/s  
 - Evaporator pressure drop: 46 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: 389 x 0.972 = 378 kW  
 - Power input: 152 x 0.986 = 150 kW  
 - Flow rate (Δt 5°C): 18 (referred to 378 kW) x 1.074 = 19.33 l/s  
 - Evaporator pressure drop: 49 (refererd to 19.33 l/s) x 1.181 = 58 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: **EWAD390D-SS**

Mixture: Water  
 Standard working condition: ELWT 12/7°C – Condenser inlet air temperature 30°C  
 - Cooling capacity: 412 kW  
 - Power input: 139 kW  
 - Flow rate (Δt 5°C): 19.7 l/s  
 - Evaporator pressure drop: 51 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: 412 x 0.613 x 0.972 = 245 kW  
 - Power input: 139 x 0.870 x 0.986 = 119 kW  
 - Flow rate (Δt 5°C): 11.71 l/s (referred to 245 kW) x 1.074 = 12.58 l/s  
 - Evaporator pressure drop: 23 kPa (referred to 12.58 l/s) x 1.181 = 27 kPa

# 10 Operation range

## 10 - 1 Operation Range

Table 7.1 - 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

ESP table refers to fan diameter Ø800, available on units as follows:

EWAD390~580D-SS  
EWAD470~620D-XS  
EWAD420~590D-HS

Table 7.2 - Available fan static pressure correction factors

"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

ESP table refers to fan diameter Ø800, available on units as follows:

EWAD320~530D-SL/SR  
EWAD460~600D-XR

### How to use the Correction factors proposed in the previous tables

#### Example

Unit Size: **EWAD390D-SS**

- External static pressure **0 Pa**
- Working condition: ELWT 12/7°C – Condenser inlet air temperature 35°C
- Cooling capacity: 389 kW
- Power input: 152 kW
- Maximum CIAT 48°C (see graphic operating limit)

- External static pressure **40 Pa**
- Working condition: ELWT 12/7°C – Condenser inlet air temperature 35°C
- Cooling capacity: 389 x 0.993 = 386 kW
- Power input: 152 x 1.018 = 155 kW
- Maximum CIAT 48 - 1.0 = 47°C

# 10 Operation range

## 10 - 1 Operation Range

### Water charge, flow and quality

Items <sup>(1)(5)</sup>	Cooling Water			Cooled Water		Heated water <sup>(2)</sup>				Tendency if out of criteria			
	Circulating System		Once Flow	Cooled Water		Low temperature		High temperature					
	Circulating water	Supply water <sup>(4)</sup>	Flowing water	Circulating water [Below 20°C]	Supply water <sup>(4)</sup>	Circulating water [20°C ~ 60°C]	Supply water <sup>(4)</sup>	Circulating water [60°C ~ 80°C]	Supply water <sup>(4)</sup>				
Items to be controlled:	pH	at 25°C	6.5 ~ 8.2	6.0 ~ 8.0	6.0 ~ 8.0	6.0 ~ 8.0	6.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	Corrosion + Scale	
	Electrical conductivity	[mS/m] at 25°C	Below 80	Below 30	Below 40	Below 40	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Corrosion + Scale
		[µS/cm] at 25°C	(Below 800)	(Below 300)	(Below 400)	(Below 400)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	Corrosion + Scale
	Chloride ion	[mgCl <sup>-</sup> /l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	Sulfate ion	[mgSO <sub>4</sub> <sup>2-</sup> /l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	M-alkalinity (pH4.8)	[mgCaCO <sub>3</sub> /l]	Below 100	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Total hardness	[mgCaCO <sub>3</sub> /l]	Below 200	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Scale
	Calcium hardness	[mgCaCO <sub>3</sub> /l]	Below 150	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Silica ion	[mgSiO <sub>2</sub> /l]	Below 50	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Scale
Items to be referred to	Iron	[mgFe/l]	Below 1.0	Below 0.3	Below 1.0	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Below 1.0	Below 0.3	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	Below 0.1	Corrosion
	Sulfite ion	[mgS <sup>2-</sup> /l]	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Corrosion
	Ammonium ion	[mgNH <sub>4</sub> <sup>+</sup> /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	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	Below 0.3	Corrosion
	Free carbide	[mgCO <sub>2</sub> /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	Below 4.0	Corrosion
	Stability index		6.0 ~ 7.0	---	---	---	---	---	---	---	---	---	Corrosion + Scale

#### NOTES

- Names, definitions and units are according to JIS K 0101. Units and figures between brackets are old units published as reference only.
- 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 desirable to give the valid measure for corrosion. E.g. chemical measure.
- 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.
- Supply water is considered drink water, industrial water and ground water except for genuine water, neutral water and soft water.
- The above mentioned items are representable items in corrosion and scale cases.

OPL\_1-2-3-4-5-6\_Rev.00\_4



## 10 Operation range

### 10 - 1 Operation Range

#### 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

$$M \text{ (liters)} = ( 0.1595 \times \Delta T(^{\circ}\text{C}) + 3.0825 ) \times P(\text{kW})$$

where:

- M minimum water content per unit expressed in litres
- P Cooling Capacity of the unit expressed in kW
- $\Delta T$  evaporator entering / leaving water temperature difference expressed in  $^{\circ}\text{C}$

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.

## 10 Operation range

### 10 - 1 Operation Range

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#### Water content in cooling circuits

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$\Delta T$	evaporator entering / leaving water temperature difference expressed in °C

This formula is valid for:

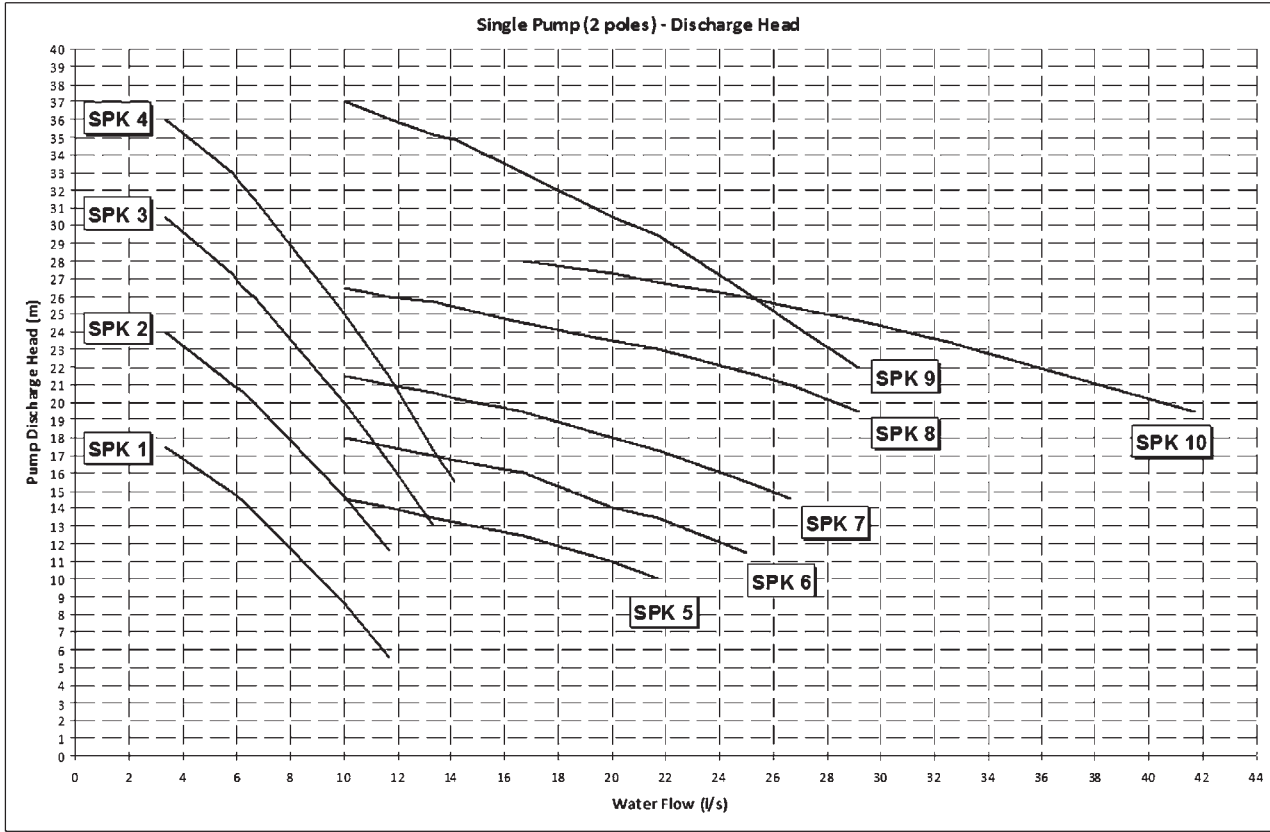
- standard microprocessor parameters

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

# 11 Hydraulic performance

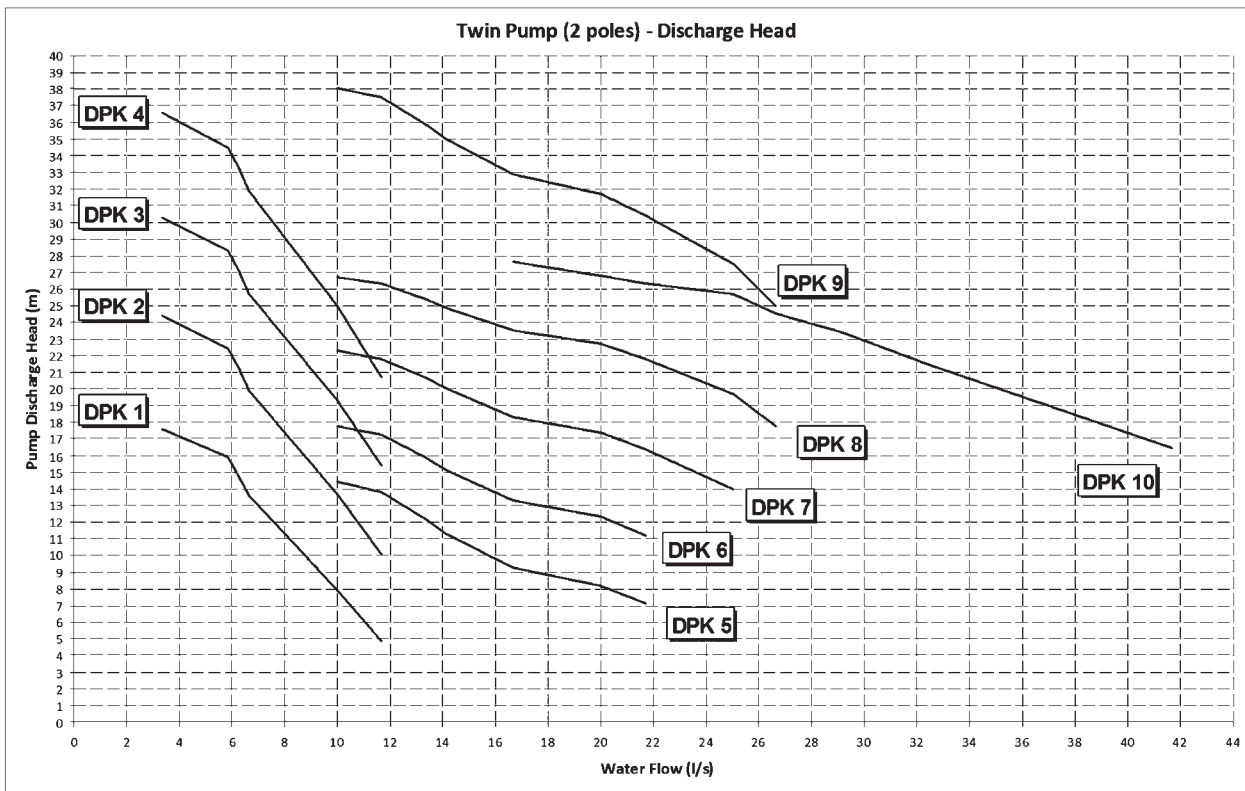
## 11 - 1 Pump Characteristics

Water Pump Kit - Available External Static Pressure



OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_6 (1/2)

Water Pump Kit - Available External Static Pressure



OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_6 (2/2)

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

1  
11

Water Pump Kit - Combination Matrix

Version	Size	Single Pump										
		SPK 1	SPK 2	SPK 3	SPK 4	SPK 5	SPK 6	SPK 7	SPK 8	SPK 9	SPK 10	
EWAD-D-SS	390						X	X	X	X	X	
	440						X	X	X	X	X	
	470						X	X	X	X	X	
	510						X	X	X	X	X	
	530							X	X	X	X	
	560							X	X	X	X	
	580							X	X	X	X	
	580							X	X	X	X	
EWAD-D-SL	180	X	X	X	X							
	200	X	X	X	X							
	230		X	X	X							
	250		X	X	X							
	260			X	X							
	280				X							
	300			X	X							
	320					X				X		
	370					X				X		
	400					X				X		
	440					X				X		
	480					X				X		
	510					X				X		
	530									X		
EWAD-D-SR	180	X	X	X	X							
	190	X	X	X	X							
	220		X	X	X				X	X		
	240		X	X	X				X	X		
	250			X	X				X	X		
	270			X	X				X	X		
	280			X	X				X	X		
	310				X				X	X		
	370				X				X	X		
	400				X				X	X		
	440				X				X	X		
	480				X				X	X		
	510				X				X	X		
	530								X	X		
EWAD-D-SX	210		X	X	X							
	230		X	X	X							
	250		X	X	X							
	270			X	X							
	290			X	X							
	300				X							
	310				X							
	370				X						X	
	410				X						X	
	450				X						X	
	490				X						X	
	250			X	X							
	280			X	X							
	300				X							
EWAD-D-XS	330				X							
	350				X						X	
	380				X						X	
	400				X						X	
	470				X						X	
	520				X						X	
	580										X	
	620										X	
	EWAD-D-XR	240		X	X	X				X	X	
		270			X	X				X	X	
300					X				X	X		
320					X				X	X		
350					X				X	X		
370					X				X	X		
390					X				X	X		
460					X				X	X		
510					X				X	X		
560									X	X		
EWAD-D-HS	200		X	X	X							
	210		X	X	X							
	230		X	X	X							
	260			X	X							
	270			X	X							
	290			X	X							
	310				X							
	340				X							
	360				X						X	
	420				X						X	
	450				X						X	
	480				X						X	
	510				X						X	
	550										X	
590										X		

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

Water Pump Kit - Combination Matrix

Version	Size	Double Pump									
		DPK 1	DPK 2	DPK 3	DPK 4	DPK 5	DPK 6	DPK 7	DPK 8	DPK 9	DPK 10
EWAD-D-SS	390						X	X	X	X	X
	440						X	X	X	X	X
	470							X	X	X	X
	510							X	X	X	X
	530								X	X	X
	560								X	X	X
	580									X	X
EWAD-D-SL	180	X	X	X	X						
	200	X	X	X	X						
	230		X	X	X						
	250		X	X	X						
	260										
	280						X	X	X	X	
	300					X	X	X	X	X	
	320					X	X	X	X	X	
	370						X	X	X	X	X
	400						X	X	X	X	X
	440						X	X	X	X	X
	480						X	X	X	X	X
	510						X	X	X	X	X
530								X	X	X	
EWAD-D-SR	180	X	X	X	X						
	190	X	X	X	X						
	220		X	X	X		X	X	X	X	
	240		X	X	X		X	X	X	X	
	250						X	X	X	X	
	270						X	X	X	X	
	280						X	X	X	X	
	310						X	X	X	X	
	370						X	X	X	X	X
	400						X	X	X	X	X
	440						X	X	X	X	X
	480						X	X	X	X	X
	510						X	X	X	X	X
530								X	X	X	
EWAD-D-SX	210		X	X	X						
	230		X	X	X	X	X	X	X		
	250		X	X	X	X	X	X	X		
	270		X	X	X	X	X	X	X		
	290			X	X	X	X	X	X		
	300				X	X	X	X	X		
	310				X	X	X	X	X		
	370				X	X	X	X	X		X
	410				X	X	X	X	X		X
	450				X	X	X	X	X		X
	490					X	X	X	X		X
	250					X	X	X	X		
	280				X	X	X	X	X		
300				X	X	X	X	X			
330				X	X	X	X	X			
350					X	X	X	X		X	
380						X	X	X		X	
400						X	X	X		X	
470						X	X	X		X	
520						X	X	X		X	
580										X	
620										X	
EWAD-D-XR	240		X	X	X		X	X	X	X	
	270					X	X	X	X	X	
	300					X	X	X	X	X	
	320					X	X	X	X	X	
	350					X	X	X	X	X	
	370						X	X	X	X	
	390						X	X	X	X	X
	460						X	X	X	X	X
	510						X	X	X	X	X
	560										X
600										X	
EWAD-D-HS	200	X	X	X	X						
	210	X	X	X	X						
	230		X	X	X						
	260						X	X	X	X	
	270						X	X	X	X	
	290					X	X	X	X	X	
	310						X	X	X	X	
	340						X	X	X	X	
	380						X	X	X	X	X
	420						X	X	X	X	X
	450						X	X	X	X	X
	480						X	X	X	X	X
	510						X	X	X	X	X
550								X	X	X	
590									X	X	

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

### 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	1.5	3.5	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 2	2.2	5.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 3	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 4	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 5	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 6	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 7	5.5	10.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 8	7.5	13.7	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 9	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 10	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
Double Pump	DPK 1	1.5	3.5	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 2	2.2	5.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 3	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 4	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 5	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 6	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 7	5.5	10.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 8	7.5	13.7	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 9	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 10	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130

#### NOTES

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

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_7

# 11 Hydraulic performance

## 11 - 2 Total and Partial Heat Recovery Pressure Drop

### Total and Partial Heat Recovery Pressure Drops

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

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

where:

- PD<sub>2</sub> Pressure drop to be determinate (kPa)
- PD<sub>1</sub> Pressure drop at nominal condition (kPa)
- Q<sub>2</sub> water flow at new working condition (l/s)
- Q<sub>1</sub> water flow at nominal condition (l/s)

### How to use the formula: Example

The unit EWAD390D-SS has been selected for working at the following conditions:  
 - Total heat recovery leaving water temperature 40/50°C  
 The heating capacity at these working conditions is: 415 kW  
 The water flow at these working conditions is: 9.91 l/s

The unit EWAD390D-SS at nominal working conditions has the following data:  
 - Total heat recovery leaving water temperature 40/45°C  
 - condenser air inlet: 35°C  
 The heating capacity at these working conditions is: 427 kW  
 The water flow at these working conditions is: 20.41 l/s  
 The pressure drop at these working conditions is: 37 kPa

The pressure drop at the selected working condition will be:

$$PD_2 \text{ (kPa)} = 37 \text{ (kPa)} \times \left( \frac{9.91 \text{ (l/s)}}{20.41 \text{ (l/s)}} \right)^{1.80}$$

$$PD_2 \text{ (kPa)} = 10 \text{ (kPa)}$$

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_5

### Partial Total Heat Recovery pressure drops

EWAD-D-SS	390	440	470	510	530	560	580
Heating Capacity (kW)	427	473	515	555	592	552	488
Water Flow (l/s)	20.41	22.59	24.61	26.52	28.28	26.36	23.33
Heat Recovery Pressure Drops (kPa)	37	13	15	17	19	14	11

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – saturated discharge temperature 45°C – water heat recovery in/out 40/45°C

EWAD-D-SL	180	200	230	250	260	280	300	320	370	400	440	480	510	530
EWAD-D-SR	180	190	220	240	250	270	280	310	370	400	440	480	510	530
Heating Capacity (kW)	207	216	243	265	289	306	333	314	314	473	515	555	592	552
Water Flow (l/s)	9.89	10.34	11.59	12.68	13.82	14.63	15.91	15.00	14.98	22.59	24.61	26.52	28.28	26.36
Heat Recovery Pressure Drops (kPa)	23	25	28	28	31	31	35	26	23	13	15	17	19	14

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – saturated discharge temperature 45°C – water heat recovery in/out 40/45°C

EWAD-D-SX	210	230	250	270	290	300	310	370	410	450	490
Heating Capacity (kW)	216	243	265	289	306	333	314	427	473	515	555
Water Flow (l/s)	10.34	11.59	12.68	13.82	14.63	15.91	15.00	20.41	22.59	24.61	26.52
Heat Recovery Pressure Drops (kPa)	25	28	28	31	31	35	26	37	13	15	17

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – saturated discharge temperature 45°C – water heat recovery in/out 40/45°C

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_3 (1/3)

# 11 Hydraulic performance

## 11 - 2 Total and Partial Heat Recovery Pressure Drop

### Partial Heat Recovery pressure drops

EWAD-D-SS	390	440	470	510	530	560	580
Heating Capacity (kW)	173	191	207	223	238	216	191
Water Flow (l/s)	8.25	9.12	9.90	10.67	11.38	10.30	9.11
Heat Recovery Pressure Drops (kPa)	7	2	3	3	3	2	2

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser air inlet 35°C – water heat recovery in/out 50/60°C

EWAD-D-SL	180	200	230	250	260	280	300	320	370	400	440	480	510	530
EWAD-D-SR	180	190	220	240	250	270	280	310	370	400	440	480	510	530
Heating Capacity (kW)	84	87	98	107	116	123	134	123	122	191	207	223	238	216
Water Flow (l/s)	4.00	4.17	4.67	5.11	5.55	5.88	6.40	5.86	5.84	9.12	9.90	10.67	11.38	10.30
Heat Recovery Pressure Drops (kPa)	4	5	5	6	6	6	7	5	4	2	3	3	3	2

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser air inlet 35°C – water heat recovery in/out 50/60°C

EWAD-D-SX	210	230	250	270	290	300	310	370	410	450	490
Heating Capacity (kW)	87	98	107	116	123	134	123	173	191	207	223
Water Flow (l/s)	4.17	4.67	5.11	5.55	5.88	6.40	5.86	8.25	9.12	9.90	10.67
Heat Recovery Pressure Drops (kPa)	5	5	6	6	6	7	5	7	2	3	3

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser air inlet 35°C – water heat recovery in/out 50/60°C

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_4 (1/3)



# 12 Specification text

## 12 - 1 Specification Text

### Technical Specification for Water Cooled Screw Chiller

#### GENERAL

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

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

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 air cooled screw chiller(s) : ..... unit(s)
- ✓ Cooling capacity for single air cooled screw chiller : ..... kW
- ✓ Power input for single air cooled screw 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 independent refrigerant circuits, semi-hermetic type rotary single screw compressor, electronic expansion device (EEXV), refrigerant ‘plate to plate’ or ‘shell&tube’ heat exchanger (depending on the size), air-cooled condenser section, R-134a refrigerant, lubrication system, motor starting components, discharge line shut-off valve, suction 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.

#### NOISE LEVEL AND VIBRATIONS

Sound pressure level at 1 meter distance in free field, semispheric conditions, shall not exceed .....dB(A). The sound pressure levels must be rated in accordance to ISO 3744 (other types of rating can not be used).

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

## 12 Specification text

### 12 - 1 Specification Text

#### DIMENSIONS

Unit dimensions shall not exceed following indications:

- Unit length ..... mm
- Unit width ..... mm
- Unit height ..... mm

#### CHILLER COMPONENTS

##### Compressors

- ✓ The compressor is semi-hermetic, single-screw type with gate-rotors made of carbon impregnated engineered composite material or the latest high-strength fibre reinforced star material (depending on the size). The gaterotor supports will be constructed of cast iron.
- ✓ The oil injection shall be used in order to get high EER (Energy Efficiency Ratio) also at high condensing pressure and low sound pressure levels in each load condition.
- ✓ 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 slide valve position.
- ✓ The unit capacity control shall be infinitely modulating, from 100% down to 25% for each circuit. The chiller shall be capable of stable operation to a minimum of 12.5% 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.
- ✓ The unit control logic shall manage the compressor slides to exactly match the plant load request in order to keep constant the set point for delivered chilled water temperature.
- ✓ 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:
  - High condenser pressure
  - Low evaporating refrigerant temperature

##### Evaporator

- ✓ The units shall be equipped (depending on the size) with a 'plate to plate' or 'shell&tube' evaporator:
  - The 'plate to plate' evaporator is made of stainless steel brazed plates and is covered with a 20mm closed cell insulation material. The exchanger is equipped with a heater for protection against freezing down to -28°C and evaporator water outlet connections of 3". Each evaporator has 1 circuit (one compressor) and the water filter is standard.
  - The 'shell&tube' evaporator is made with copper tubes rolled into steel tubesheets. The evaporators are single-pass on both the refrigerant and water sides for pure counter-flow heat exchange and low refrigerant pressure drops. The external shell is covered with a 10mm closed cell insulation material and the evaporator water outlet connections are provided with victaulic kit (as standard). Each evaporator has 2 circuits, one for each compressor and the water filter is standard.
- ✓ The evaporator is manufactured in accordance to PED approval.

## 12 Specification text

### 12 - 1 Specification Text

#### 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 breaker installed inside the electrical panel as a standard.

#### Refrigerant circuit

- ✓ The unit shall have two independent refrigerant circuits.
- ✓ Each circuit shall include as standard: electronic expansion device piloted by unit's microprocessor control, compressor discharge shut-off valve, suction 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:
  - in-line single pump low and high lifting
  - in-line twin pumps low and high lifting

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

#### Optional High Level Communications Interface

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

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# 1 Features

- Standard efficiency version
- Low sound level configuration: condenser fan rotating at 900 rpm (EWAD180-370D-SL) and 705 rpm (EWAD400-530D-SL), rubber antivibration under compressor
- Stepless single-screw compressor
- Optimised for use with R-134a
- MicroTech III controller
- Large operation range (ambient temperature down to -18°C)

2  
1



## 2 Features and advantages

### Features and advantages

#### Low operating cost

This chiller range is the result of careful design, aimed to optimize the energy efficiency of the chillers, with the objective of bringing down operating costs and improving installation profitability, effectiveness and economical management.

The chillers feature a high efficiency single rotor screw compressor design, large condenser coil surface area for maximum heat transfer and low discharge pressure, advanced technology condenser fans and a 'plate to plate' or 'shell&tube' evaporator with low refrigerant pressure drops.

#### Low operating sound levels

Very low sound levels both at full load and part load conditions are achieved by the latest compressor design and by a unique new fan that moves large volume of air at exceptionally low sound levels and by the virtually vibration-free operation.

#### Excellent serviceability

Field serviceability has not been sacrificed to meet design performance objectives. The compressor is equipped with discharge, liquid and suction shut off valves. The compressor and serviceable components such as filter-driers are located on the outside edges of the base allowing, together with the shape of the coil, an easy access for inspection and service. Moreover, the MicroTech III controller gives detailed information on the causes of an alarm or fault.

#### Proven reliability

Full factory testing of every unit with water hook-up helps in providing a trouble-free start-up. Extensive quality control checks during testing means that each equipment protection and operating control is properly adjusted and operates correctly before it leaves the factory.

#### Infinite capacity control

Cooling capacity control is infinitely variable by means of a single screw compressor controlled by microprocessor system. Each unit has infinitely variable capacity control from 100% down to 12.5%. This modulation allows the compressor capacity to exactly match the building cooling load. Chilled water temperature fluctuation is avoided only with a stepless control.

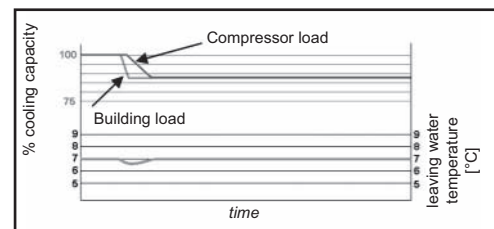
In the case that the compressor with load step control is used, the compressor capacity, at partial loads, will be too high or too low compared to the building cooling load. The result is an increase in chiller energy costs, particularly at the part-load conditions at which the chiller operates most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

Units with stepless regulation offer benefits that the units with step regulation are unable to match.

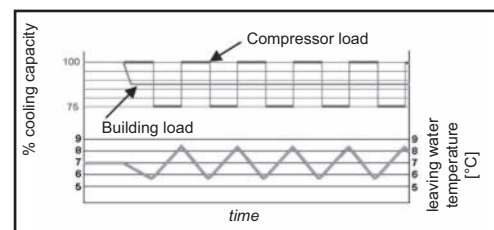
Only a chiller with step-less regulation, is able to follow the system cooling demand at any time and to deliver chilled water at set-point.

#### Superior control logic

The new MicroTech III controller provides an easy to use control environmental. The control logic is designed to provide maximum efficiency and a history of unit operation. One of the greatest benefits is the easy interface with LonWorks, Bacnet, Ethernet TCP/IP or Modbus communications.



ELWT fluctuation with stepless capacity control



ELWT fluctuation with steps capacity control (4 steps)

## 2 Features and advantages

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### Code requirements – Safety and observant of laws/directives

The range is designed and manufactured in accordance with applicable selections of the following:

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

### Certifications

All units manufactured by Daikin 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 for other applications, such as naval (RINA, etc.).

### Efficiency and sound configuration

The range is available in multiple efficiency and sound versions:

Efficiency level	Sound level			
	Standard	Low	Reduced	Extra low
Standard efficiency	EWAD~D-SS	EWAD~D-SL	EWAD~D-SR	EWAD~D-SX
High efficiency	EWAD~D-XS	N.A.	EWAD~D-XR	N.A.
High ambient	EWAD~D-HS	N.A.	N.A.	N.A.

### Versions

The range is available in three versions:

#### S: Standard efficiency

7 sizes to cover a range from 389 up to 578 kW with an EER up to 2.03 and an ESEER up to 3.56 (data refers to Standard sound configuration)

#### X: High efficiency

11 sizes to cover a range from 247 up to 622 kW with an EER up to 3.20 and an ESEER up to 4.01 (data refers to Standard sound configuration)

#### H: High ambient temperature

15 sizes to cover a range from 195 up to 587 kW with an EER up to 3.07 and an ESEER up to 3.79 (data refers to Standard sound configuration)

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 weighted formula enabling to take into account the variation of EER with the load rate and the variation of air inlet condenser temperature.

$$\text{ESEER} = (A \times \text{EER}100\%) + (B \times \text{EER}75\%) + (C \times \text{EER}50\%) + (D \times \text{EER}25\%)$$

	A	B	C	D
Coefficient	0.03 (3%)	0.33 (33%)	0.41 (41%)	0.23 (23%)
Air inlet condenser temperature	35°C	30°C	25°C	20°C

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## 2 Features and advantages

### Sound levels

The range is available in four different sound level configurations:

**S:** Standard sound

Condenser fan rotating at 890 rpm, rubber antivibration under compressor

**L:** Low sound

Condenser fan rotating at 900 rpm (EWAD180-370D-SL) and 705 rpm (EWAD400-530D-SL), rubber antivibration under compressor.

**R:** Reduced sound

Condenser fan rotating at 680 rpm (EWAD180-370D-SR) and 705 rpm (EWAD400-530D-SR), rubber antivibration under compressor, compressor sound enclosure.

**X:** Extra low sound

Condenser fan rotating at 500 rpm, rubber antivibration under compressor, compressor and evaporator sound enclosure.

## 3 General characteristics

### General characteristics

#### Cabinet and structure

The cabinet is made of galvanized steel sheet and painted to provide a high resistance to corrosion. Colour Ivory White (Munsell code 5Y7.5/1) ( $\pm$ 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.

#### Screw compressors with integrated oil separator

The range features two types of single-screw compressors:

A) The compressor is semi-hermetic, single-screw type with gate-rotors made of carbon impregnated engineered composite material. The compressor has one slide managed by the unit microprocessor for infinitely modulating the capacity between 100% to 25%. An integrated high efficiency oil separator maximizes the oil separation and standard start is Wye-delta (Y- $\Delta$ ) type.

This compressor is offered on following models:

- EWAD180~370D-SL
- EWAD180~370D-SR
- EWAD210~310D-SX
- EWAD250~400D-XS
- EWAD240~390D-XR
- EWAD200~380D-HS

B) The compressor is semi-hermetic, single-screw type with gate-rotor made with the latest high-strength fibre reinforced star material. The compressor has an asymmetric slide regulation managed by the unit controller for infinitely modulating capacity from 100% to 25%. An integrated high efficiency oil separator maximizes the oil separation and standard start is Wye-delta (Y- $\Delta$ ) type.

This compressor is offered on following models:

- EWAD390~580D-SS
- EWAD400~530D-SL
- EWAD400~530D-SR
- EWAD370~490D-SX
- EWAD470~620D-XS
- EWAD460~600D-XR
- EWAD420~590D-HS

#### 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

For size EWAD180~200D-SL, EWAD180~190D-SR and EWAD200~210D-HS

The units are equipped with a direct expansion plate to plate type evaporator. This heat exchanger is made of stainless steel brazed plates and is covered with a 20mm closed cell insulation material. The exchanger is equipped with a heater for protection against freezing down to  $-28^{\circ}\text{C}$  and evaporator water outlet connections of 3". Each evaporator has 2 circuits, one for each compressor and is manufactured in accordance to PED approval. Water pressure differential switch on evaporator standard factory mounted. Water filter is standard.

All the other units are equipped with a Direct Expansion shell&tube evaporator with copper tubes rolled into steel tubesheets. The evaporators are single-pass on both the refrigerant and water sides for pure counter-flow heat exchange and low refrigerant pressure drops. Both attributes contribute to the heat exchanger effectiveness and total unit's outstanding efficiency.

The external shell is covered with a 10mm closed cell insulation material and the evaporator water outlet connections are provided with victaulic kit (as standard). Each evaporator has 2 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.

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## 3 General characteristics

### Condenser coil fans

Fan 710 mm diameter

The condenser fans are propeller type with wing-profile blades for achieving better performance. Each fan is protected by a guard.

Fan 800 mm diameter

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  $\Delta P$  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 independent refrigerant circuits and each one includes:

- 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
- Sight glass with moisture indicator
- Filter drier
- Charging valves
- High pressure switch
- High and low pressure transducers

### Electrical control panel

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

### Power Section

The power section includes compressors fuses, 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.

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## 3 General characteristics

### Control section - main features

- Management of the compressor stepless capacity and fans modulation.
- Chiller enabled to work in partial failure condition.
- Full routine operation at condition of:
  - high ambient temperature value
  - high thermal load
  - high evaporator entering water temperature (start-up)
- Display of evaporator entering/leaving water temperature.
- Display of Outdoor Ambient Temperature.
- Display of condensing-evaporating temperature and pressure, suction and discharge superheat for each circuit.
- Leaving water evaporator temperature regulation (temperature tolerance = 0.1°C)
- Compressor and evaporator pumps hours counter.
- Display of Status Safety Devices.
- Number of starts and compressor working hours.
- Optimized management of compressor load.
- Fan management according to condensing pressure.
- Re-start in case of power failure (automatic / manual).
- Soft Load (optimized management of the compressor load during the start-up).
- Start at high evaporator water temperature.
- Return Reset (Set Point Reset based on return water temperature).
- OAT (Outside Ambient temperature) Reset.
- Set point Reset (optional).
- Application and system upgrade with commercial SD cards.
- Ethernet port for remote or local servicing using standard web browsers.
- Two different sets of default parameters could be stored for easy restore.

### Safety device / logic for each refrigerant circuit

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

### System security

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

### Regulation type

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

## 3 General characteristics

### Condensing pressure

Condensing pressure can be controlled in according to the entering air temperature to the condenser coil. The fans can be managed either with steps, or with a 0/10V modulating signal or with a mixed 0/10V + Steps strategy to cover all possible operational conditions.

### MicroTech III

MicroTech III built-in terminal has the following features:

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

### Supervising systems (on request)

#### MicroTech III remote control

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

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

### Standard options (supplied on basic unit)

**Evaporator victaulic kit** – Not available on units EWAD180~200D-SL, EWAD180~190D-SR and EWAD200~210D-HS

**Evaporator water design pressure (10Bar)**

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

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

**Wye-Delta Compressors starter (Y-Δ)** – For low inrush current and reduced starting torque.

**Double set-point** – Dual leaving water temperature set-points.

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

**Water pressure differential switch on evaporator** – Not available on units EWAD390~580D-SS, EWAD230~530D-SL, EWAD220~530D-SR, EWAD210~490D-SX, EWAD250~620D-XS, EWAD240~600D-XR, EWAD230~590D-HS

**Evaporator electric heater type** – 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 device**

**20 mm evaporator insulation** – Only for EWAD180~200D-SL, EWAD180~190D-SR, EWAD210D-SX and EWAD200~210D-HS

**Ambient outside temperature sensor and set-point reset**

**Hour run meter**

**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  $\Delta t$ .

**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 (pump etc...). User can decide if this alarm signal will stop the unit or not.

**Fans circuit breakers** – Safety device against motor overloading and short circuit

**Main switch interlock door**

## 3 General characteristics

### Options (on request)

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

#### **Total heat recovery (1 circuit)**

**Partial heat recovery** – Plate to plate heat exchangers installed between the compressor discharge and the condenser coil, allowing producing hot water.

**Brine version** – Allows the unit to operate down to -15°C leaving liquid temperature (antifreeze required).

**Evaporator flanged connections** – Not available for EWAD180~200D-SL, EWAD180~190D-SR, EWAD210D-SX and EWAD200~210D-HS

#### **Condenser coil 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.

**Hydronic Kit (single water pump - low or high lifting)** – (N.A. on EWAD210~490D-SX) Hydronic kit consists of: single direct driven centrifugal pump, water filling system with pressure gauge, safety valve, drain valve. The pump motor 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 - low or high lifting)** – (N.A. on EWAD180~190D-SR and on EWAD210~490D-SX). 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**

**Soft starter** – Electronic starting device to reduce the mechanical stress during compressor start-up.

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

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

**Energy Meter** – This device allows to measure the energy absorbed by the chiller during its life. It is installed inside the control box mounted on a DIN rail and show on a digital display: Line-to-Line Voltage, Phase and Average Current, Active and Reactive Power, Active Energy, Frequency.

**Capacitors for power factor correction** – To increase the operating power factor of the unit at nominal operating conditions. The capacitors are “dry” self-regenerating type with over pressure disconnecting safety device insulated with a no toxic dielectric mix with no PCB or PCT.

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

#### **Fan silent mode**

**Speedtrol** – (N.A. on EWAD210~490D-SX) Continuous fan speed modulation on the first fan of each circuit. It allows the unit working with air temperature down to -18°C.

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

#### **High pressure side manometers (one per circuit)**

#### **Compressors circuit breakers**

**Fan speed regulation** – Standard option for EWAD~D-SX

To control the fan speed revolution for smooth operating control of the unit. During low ambient temperature operation, this option improves also the sound level of the unit. With “Fan speed regulation” option, by different microprocessor setting, it is also possible to set the “Fan Silent Mode” configuration. It means that the microprocessor clock switches the fan at low speed according to the client setting (i.e. Night & Day), providing that the ambient temperature/condensing pressure is allowing the speed change. It allows a perfect condensing control down to -10°C.

### 3 General characteristics

**Rubber type anti vibration mounts** – Supplied separately, these are positioned under the base of the unit during installation to reduce vibrations.

**Spring type anti vibration 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.

**External tank without cabinet (500 L / 1000 L)**

**External tank with cabinet (500 L / 1000 L)**

**Container kit**

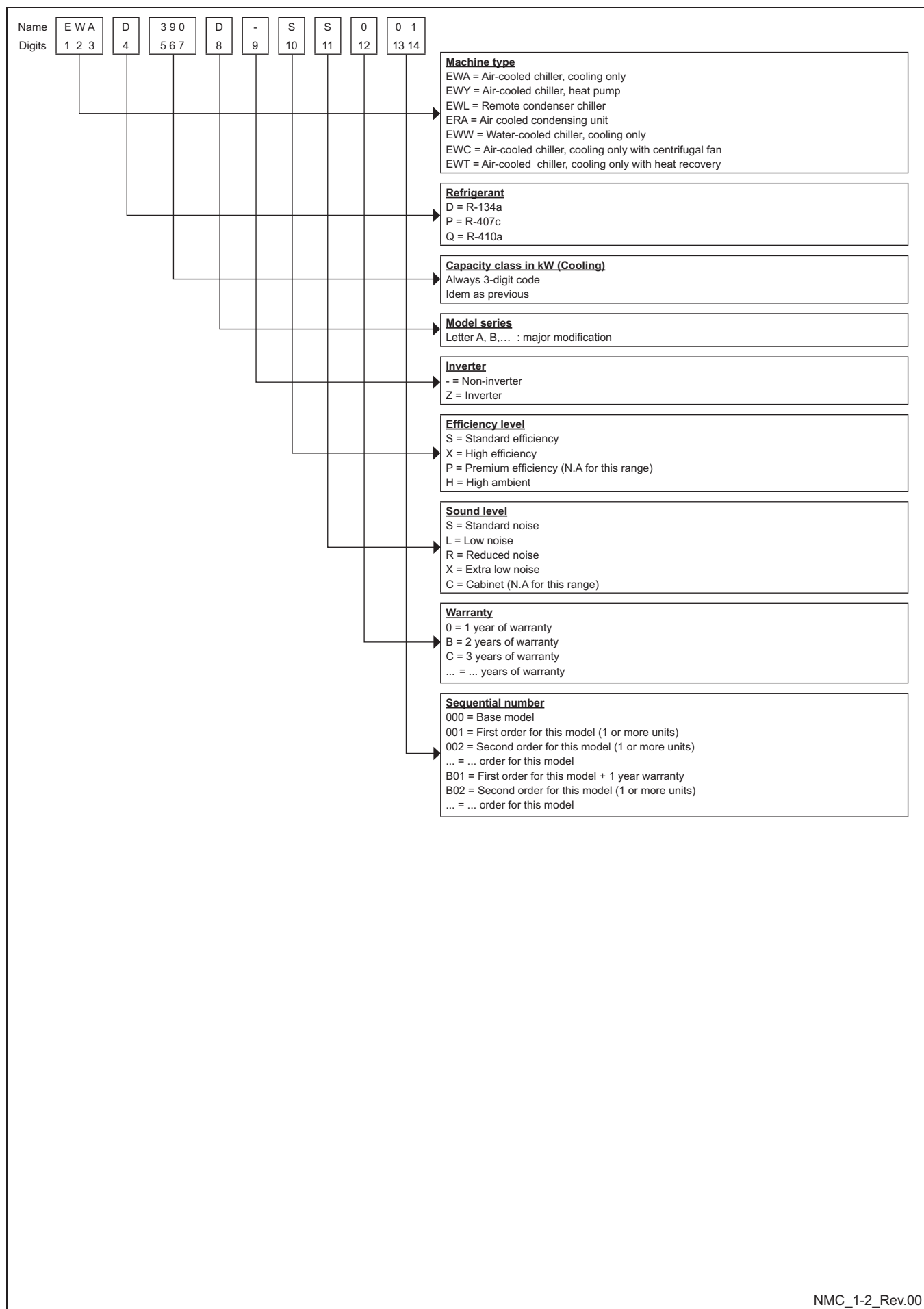
**Witness test** – Every unit is always tested at the test bench prior to the shipment. On request, a second test can be carried out, at customer's presence, in accordance with the procedures indicated on the test form (please contact the factory) (This test is not available for units with glycol mixtures).

**Acoustic test** – On request, a test can be carried out, at customer's presence (please contact the factory) (This test is not available for units with glycol mixtures).

# 4 Nomenclature

## 4 - 1 Nomenclature

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## 5 Specifications

5-1 Technical Specifications				EWAD180D-SL	EWAD200D-SL	EWAD230D-SL	EWAD250D-SL	EWAD260D-SL	EWAD280D-SL	
Cooling capacity	Nom.		kW	184 (1)	198 (1)	225 (1)	245 (1)	261 (1)	275 (1)	
Capacity control	Method			Stepless						
	Minimum capacity		%	12.5						
Power input	Cooling	Nom.	kW	81.4 (1)	79.7 (1)	84.5 (1)	93.4 (1)	101 (1)	108 (1)	
EER				2.26 (1)	2.48 (1)	2.66 (1)	2.62 (1)	2.58 (1)	2.54 (1)	
ESEER				3.00	3.12	3.31	3.21	3.26	3.23	
IPLV				3.43	3.56	3.73	3.63	3.66	3.63	
Casing	Colour			Ivory white						
	Material			Galvanized and painted steel sheet						
Dimensions	Unit	Height	mm	2,355						
		Width	mm	2,234						
		Depth	mm	2,239			3,139			
Weight	Unit		kg	2,475	2,470	2,860				
	Operation weight		kg	2,500			2,960			
Water heat exchanger	Type			Plate to plate			Single pass shell & tube			
	Water volume		l	25	30	100				
	Nominal water flow	Cooling	l/s	8.80	9.40	10.70	11.70	12.50	13.10	
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	29	22	58	49	54	59
	Insulation material			Closed cell						
Air heat exchanger	Type			High efficiency fin and tube type with integral subcooler						
Fan	Quantity			4			6			
	Type			Direct propeller						
	Diameter		mm	710						
	Air flow rate	Nom.	l/s	15,295	14,868	22,943	22,623	22,302		
	Speed		rpm	900						
Fan motor	Drive			DOL						
	Input	Cooling	W	1,230						
Sound power level	Cooling	Nom.	dBA	93.7			94.3			
Sound pressure level	Cooling	Nom.	dBA	75.0						
Compressor	Type			Semi-hermetic single screw compressor						
	Quantity			2						
	Oil	Charged volume		l						
Operation range	Water side	Cooling	Min.	°CDB		-15				
			Max.	°CDB		15				
	Air side	Cooling	Min.	°CDB		-18				
			Max.	°CDB		48				
Refrigerant	Type			R-134a						
	Circuits	Quantity		2						
Refrigerant circuit	Charge		kg	36	42	48	50	54	58	
Piping connections	Evaporator water inlet/outlet			88.9			114.3			
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	Water freeze protection controller							

## 5 Specifications

5-1 Technical Specifications					EWAD300D-SL	EWAD320D-SL	EWAD370D-SL	EWAD400D-SL	EWAD440D-SL	EWAD480D-SL
Cooling capacity	Nom.		kW	298 (1)	321 (1)	370 (1)	404 (1)	440 (1)	477 (1)	
Capacity control	Method			Stepless						
	Minimum capacity		%	12.5						
Power input	Cooling	Nom.	kW	119 (1)	123 (1)	133 (1)	169 (1)	170 (1)	186 (1)	
EER				2.50 (1)	2.60 (1)	2.78 (1)	2.39 (1)	2.59 (1)	2.57 (1)	
ESEER				3.20	3.24	3.41	3.65	3.67	3.57	
IPLV				3.59	3.62	3.84	3.85	4.05	3.93	
Casing	Colour			Ivory white						
	Material			Galvanized and painted steel sheet						
Dimensions	Unit	Height	mm	2,355			2,223			
		Width	mm	2,234						
		Depth	mm	3,139	4,040					
Weight	Unit		kg	2,860	3,187		4,030	4,220	4,230	
	Operation weight		kg	2,960	3,300		4,195	4,395		
Water heat exchanger	Type			Single pass shell & tube						
	Water volume		l	100	130		165	170		
	Nominal water flow	Cooling	l/s	14.20	15.30	17.70	19.30	21.00	22.80	
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	60	55	67	48	62	54
	Insulation material			Closed cell						
Air heat exchanger	Type			High efficiency fin and tube type with integral subcooler						
Fan	Quantity			6	8		6	8		
	Type			Direct propeller						
	Diameter		mm	710			800			
	Air flow rate	Nom.	l/s	22,302	30,591		24,432	33,494		
	Speed		rpm	900			705			
Fan motor	Drive			DOL						
	Input	Cooling	W	1,230			780			
Sound power level	Cooling	Nom.	dBA	94.3	94.7	97.2	94.2			
Sound pressure level	Cooling	Nom.	dBA	75.0		77.5	74.5			
Compressor	Type			Semi-hermetic single screw compressor						
	Quantity			2						
	Oil	Charged volume	l	26			32			
Operation range	Water side	Cooling	Min.	°CDB	-15					
			Max.	°CDB	15					
	Air side	Cooling	Min.	°CDB	-18					
			Max.	°CDB	48					
Refrigerant	Type			R-134a						
	Circuits	Quantity			2					
Refrigerant circuit	Charge		kg	58	66	70	76	82		
Piping connections	Evaporator water inlet/outlet			114.3	139.7					
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	Water freeze protection controller							

## 5 Specifications

5-1 Technical Specifications					EWAD510D-SL		EWAD530D-SL	
Cooling capacity	Nom.				kW		505 (1)	533 (1)
Capacity control	Method				Stepless			
	Minimum capacity				%			
Power input	Cooling	Nom.			kW		203 (1)	195 (1)
EER							2.49 (1)	2.73 (1)
ESEER							3.67	3.77
IPLV							4.07	4.14
Casing	Colour				Ivory white			
	Material				Galvanized and painted steel sheet			
Dimensions	Unit	Height			mm		2,223	
		Width			mm		2,234	
		Depth			mm		4,040	
Weight	Unit				kg		4,230	4,235
	Operation weight				kg		4,395	
Water heat exchanger	Type				Single pass shell & tube			
	Water volume				l		165	160
	Nominal water flow	Cooling			l/s		24.10	25.40
	Nominal water pressure drop	Cooling	Heat exchanger		kPa		48	43
	Insulation material				Closed cell			
Air heat exchanger	Type				High efficiency fin and tube type with integral subcooler			
Fan	Quantity				8			
	Type				Direct propeller			
	Diameter				mm		800	
	Air flow rate	Nom.			l/s		33,494	32,576
	Speed				rpm		705	
Fan motor	Drive				DOL			
	Input	Cooling			W		780	
Sound power level	Cooling	Nom.			dBA		95.7	96.2
Sound pressure level	Cooling	Nom.			dBA		76.0	76.5
Compressor	Type				Semi-hermetic single screw compressor			
	Quantity				2			
	Oil	Charged volume			l		32	
Operation range	Water side	Cooling	Min.		°CDB		-15	
			Max.		°CDB		15	
	Air side	Cooling	Min.		°CDB		-18	
			Max.		°CDB		48	
Refrigerant	Type				R-134a			
	Circuits	Quantity			2			
Refrigerant circuit	Charge				kg		84	86
Piping connections	Evaporator water inlet/outlet				139.7			
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		Water freeze protection controller				

## 5 Specifications

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5-2 Electrical Specifications				EWAD180D-SL	EWAD200D-SL	EWAD230D-SL	EWAD250D-SL	EWAD260D-SL	EWAD280D-SL	
Compressor	Phase			3~						
	Voltage		V	400						
	Voltage range	Min.	%	-10						
		Max.	%	10						
	Maximum running current		A	78		94		105		
	Starting method			Wye-delta						
Compressor 2	Maximum running current		A	78		94		105		
Power supply	Phase			3~						
	Frequency		Hz	50						
	Voltage		V	400						
	Voltage range	Min.	%	-10						
		Max.	%	10						
Unit	Maximum starting current		A	218		234		277		286
	Nominal running current (RLA)	Cooling	A	135	133	141	155	166	176	
			A	165		186	202	213	223	
	Max unit current for wires sizing		A	181		204	222	234	246	
Fans	Nominal running current (RLA)		A	9		13				

5-2 Electrical Specifications				EWAD300D-SL	EWAD320D-SL	EWAD370D-SL	EWAD400D-SL	EWAD440D-SL	EWAD480D-SL
Compressor	Phase			3~					
	Voltage		V	400					
	Voltage range	Min.	%	-10					
		Max.	%	10					
	Maximum running current		A	105	119	125	153		174
	Starting method			Wye-delta					
Compressor 2	Maximum running current		A	119		125	153	174	
Power supply	Phase			3~					
	Frequency		Hz	50					
	Voltage		V	400					
	Voltage range	Min.	%	-10					
		Max.	%	10					
Unit	Maximum starting current		A	297	300	304	460	479	
	Nominal running current (RLA)	Cooling	A	192	200	214	281	285	308
			A	238	257	269	321	347	368
	Max unit current for wires sizing		A	262	283	296	353	382	405
Fans	Nominal running current (RLA)		A	13	18		16	21	

# 5 Specifications

5-2 Electrical Specifications			EWAD510D-SL	EWAD530D-SL	
Compressor	Phase		3~		
	Voltage		400		
	Voltage range	Min.	%	-10	
		Max.	%	10	
	Maximum running current		A	174	
	Starting method		Wye-delta		
Compressor 2	Maximum running current		A	185	
Power supply	Phase		3~		
	Frequency		Hz	50	
	Voltage		V	400	
	Voltage range	Min.	%	-10	
		Max.	%	10	
Unit	Maximum starting current		A	488	
	Nominal running current (RLA)	Cooling	A	334	323
			A	379	
	Max unit current for wires sizing		A	417	
Fans	Nominal running current (RLA)		A	21	

**Notes**

- (1)Cooling: entering evaporator water temp. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C; full load operation.
- (2)Sound pressure levels are measured at entering evaporator water temp. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C; 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. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C. 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

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# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

2  
6

EWAD-D-SL

ELWT (°C)		180						200						230						250									
		Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)									
		25	30	35	40	42	46	25	30	35	40	42	46	25	30	35	40	42	46	25	30	35	40	42	46				
4	Cc (kW)	187	178	168	157	153	148	143	200	191	180	169	164	159	154	226	216	205	193	189	184	178	247	236	224	211	206	200	194
	Pi (kW)	66	72	78	85	88	91	94	64	70	76	83	86	89	92	69	75	81	89	92	95	98	76	83	90	98	101	105	108
	Qwe (l/s)	8.9	8.5	8	7.5	7.3	7	6.8	9.5	9.1	8.6	8	7.8	7.6	7.3	10.8	10.3	9.8	9.2	9	8.7	8.5	11.7	11.2	10.7	10	9.8	9.5	9.3
	Pdwe (kPa)	29.7	27.1	24.5	21.7	20.6	19.5	18.4	22.3	20.3	18.3	16.3	15.5	14.7	13.9	58.1	53.5	48.7	43.9	41.9	39.9	37.9	49.5	45.6	41.6	37.3	35.6	33.9	32.2
5	Cc (kW)	193	183	173	162	158	153	148	206	197	186	174	170	165	160	233	223	212	200	195	190	185	254	243	231	218	212	207	201
	Pi (kW)	67	73	79	86	89	92	95	65	71	77	84	87	90	93	70	76	82	90	93	96	99	77	84	91	99	103	106	110
	Qwe (l/s)	9.2	8.7	8.3	7.7	7.5	7.3	7.1	9.8	9.4	8.9	8.3	8.1	7.8	7.6	11.1	10.6	10.1	9.5	9.3	9	8.8	12.1	11.6	11	10.4	10.1	9.9	9.6
	Pdwe (kPa)	31.4	28.7	25.9	23.1	21.9	20.7	19.6	23.5	21.5	19.4	17.3	16.5	15.6	14.8	61.3	56.6	51.6	46.6	44.6	42.5	40.4	52.2	48.2	44	39.6	37.8	36.1	34.3
6	Cc (kW)	198	189	179	168	163	158	153	212	203	192	180	175	170	165	240	229	218	206	201	196	191	261	250	238	225	219	214	208
	Pi (kW)	68	74	80	87	90	93	96	66	72	79	85	88	91	94	71	77	83	91	94	97	100	78	85	92	100	104	107	111
	Qwe (l/s)	9.5	9	8.5	8	7.8	7.5	7.3	10.1	9.7	9.1	8.6	8.4	8.1	7.9	11.4	10.9	10.4	9.8	9.6	9.4	9.1	12.5	11.9	11.3	10.7	10.5	10.2	9.9
	Pdwe (kPa)	33.1	30.3	27.4	24.5	23.2	22	20.8	24.6	22.8	20.6	18.4	17.5	16.6	15.7	64.7	59.8	54.6	49.4	47.3	45.1	43	54.9	50.8	46.5	42	40.1	38.3	36.4
7	Cc (kW)	204	194	184	173	168	164	155	218	208	198	186	181	176	171	247	236	225	213	208	203	197	269	257	245	232	226	221	215
	Pi (kW)	69	75	81	88	91	94	94	67	73	80	87	89	92	95	72	78	84	92	95	98	101	79	86	93	102	105	109	112
	Qwe (l/s)	9.7	9.3	8.8	8.3	8	7.8	7.4	10.4	9.9	9.4	8.9	8.6	8.4	8.1	11.8	11.3	10.7	10.2	9.9	9.7	9.4	12.8	12.3	11.7	11.1	10.8	10.5	10.2
	Pdwe (kPa)	34.9	31.9	28.9	25.9	24.6	23.4	21.1	25.9	23.9	21.8	19.5	18.6	17.7	16.7	68.2	63.1	57.8	52.3	50.1	47.9	45.6	57.8	53.5	49.0	44.4	42.5	40.6	38.6
8	Cc (kW)	210	200	189	178	174	169	156	225	214	204	192	187	182	176	254	243	232	220	214	209	204	276	264	252	239	233	228	222
	Pi (kW)	70	76	83	90	93	96	92	68	74	81	88	91	94	97	72	79	86	93	96	99	102	80	87	95	103	106	110	113
	Qwe (l/s)	10	9.6	9	8.5	8.3	8.1	7.5	10.7	10.2	9.7	9.2	8.9	8.7	8.4	12.1	11.6	11.1	10.5	10.2	10	9.7	13.2	12.6	12	11.4	11.1	10.9	10.6
	Pdwe (kPa)	36.7	33.7	30.5	27.3	26.1	24.8	21.6	27.4	25.1	23	20.6	19.7	18.7	17.8	71.8	66.5	61	55.3	53	50.7	48.4	60.8	56.3	51.7	46.9	45	43	40.9
9	Cc (kW)	216	206	195	184	179	174	158	231	220	209	198	193	188	179	261	250	239	226	221	216	210	284	272	259	246	240	235	229
	Pi (kW)	71	77	84	91	94	97	91	70	75	82	89	92	95	95	73	80	87	94	97	100	104	81	88	96	104	108	111	115
	Qwe (l/s)	10.3	9.8	9.3	8.8	8.5	8.3	7.6	11	10.5	10	9.4	9.2	9	8.5	12.5	11.9	11.4	10.8	10.6	10.3	10	13.5	13	12.4	11.7	11.5	11.2	10.9
	Pdwe (kPa)	38.6	35.4	32.2	28.9	27.5	26.2	22.1	28.9	26.5	24.2	21.8	20.8	19.8	18.2	75.6	70	64.3	58.5	56.1	53.7	51.2	63.9	59.2	54.4	49.4	47.4	45.4	43.3
10	Cc (kW)	222	212	201	189	184	177	160	238	227	215	204	199	193	181	268	257	245	233	228	222	217	291	279	267	253	247	242	236
	Pi (kW)	72	78	85	92	95	96	89	71	77	83	90	93	96	94	75	81	88	95	98	102	105	82	89	97	105	109	112	116
	Qwe (l/s)	10.6	10.1	9.6	9	8.8	8.5	7.6	11.4	10.8	10.3	9.7	9.5	9.2	8.6	12.8	12.3	11.7	11.1	10.9	10.6	10.4	13.9	13.3	12.7	12.1	11.8	11.5	11.3
	Pdwe (kPa)	40.5	37.3	33.9	30.4	29	27	22.5	30.5	27.9	25.3	23	22	21	18.5	79.5	73.7	67.7	61.7	59.2	56.7	54.2	67.1	62.2	57.2	52.1	50	47.9	45.8
11	Cc (kW)	227	217	206	195	190	179	161	245	233	221	209	204	199	182	276	264	252	240	235	229	224	299	287	274	260	254	248	242
	Pi (kW)	73	80	86	93	96	95	88	72	78	84	91	94	97	92	76	82	89	96	99	103	106	83	90	98	107	110	114	118
	Qwe (l/s)	10.9	10.4	9.9	9.3	9.1	8.6	7.7	11.7	11.2	10.6	10	9.8	9.5	8.7	13.2	12.6	12.1	11.5	11.2	11	10.7	14.3	13.7	13.1	12.4	12.2	11.9	11.6
	Pdwe (kPa)	42.5	39.1	35.7	32.1	30.6	27.6	22.8	32.1	29.4	26.7	24.2	23.2	22.2	18.9	83.5	77.5	71.3	65	62.4	59.9	57.3	70.4	65.3	60.1	54.8	52.6	50.4	48.2
12	Cc (kW)	233	223	212	200	195	181	162	252	240	228	215	210	205	184	283	272	260	247	241	236	230	307	294	281	267	262	256	249
	Pi (kW)	74	81	88	95	98	93	86	73	79	86	93	96	99	91	77	83	90	97	101	104	107	84	92	99	108	111	115	119
	Qwe (l/s)	11.2	10.7	10.1	9.6	9.3	8.6	7.7	12.1	11.5	10.9	10.3	10	9.8	8.8	13.5	13	12.4	11.8	11.5	11.3	11	14.7	14.1	13.5	12.8	12.5	12.2	11.9
	Pdwe (kPa)	44.5	41	37.4	33.8	32.2	28.1	23.1	33.8	31	28.2	25.4	24.3	23.3	19.2	87.7	81.4	75	68.4	65.7	63.1	60.4	73.8	68.5	63.1	57.6	55.3	53.1	50.8
13	Cc (kW)	239	229	218	206	201	182	163	259	247	234	221	215	206	185	291	279	267	254	248	243	237	315	302	289	275	269	263	256
	Pi (kW)	76	82	89	96	99	92	84	74	80	87	94	97	96	89	78	84	91	99	102	105	109	86	93	101	109	113	116	120
	Qwe (l/s)	11.5	10.9	10.4	9.8	9.6	8.7	7.8	12.4	11.8	11.2	10.6	10.3	9.8	8.9	13.9	13.3	12.8	12.1	11.9	11.6	11.3	15.1	14.5	13.8	13.1	12.9	12.6	12.3
	Pdwe (kPa)	46.7	43	39.3	35.5	33.9	28.5	23.3	35.5	32.7	29.7	26.7	25.5	23.5	19.4	92	85.5	78.8	72	69.2	66.4	63.6	77.3	71.8	66.2	60.5	58.1	55.8	53.4
14	Cc (kW)	246	235	223	211	203	183	165	265	254	241	227	222	207	186	298	287	274	261	255	249	244	323	310	296	282	276	270	264
	Pi (kW)	77	83	90	97	98	90	83	75	82	88	95	98	95	87	79	85	92	100	103	106	110	87	94	102	111	114	118	122
	Qwe (l/s)	11.8	11.2	10.7	10.1	9.7	8.8	7.9	12.7	12.2	11.5	10.9	10.6	9.9	8.9	14.3	13.7	13.1	12.5	12.2	11.9	11.7	15.4	14.8	14.2	13.5	13.2	12.9	12.6
	Pdwe (kPa)	48.9	45	41.2	37.3	34.5	28.9	23.9	37.2	34.3	31.3	28.1	26.9	23.8	19.6	96.5	89.7	82.7	75.6	72.8	69.9	67	80.9	75.2	69.4	63.4	61	58.6	56.2
15	Cc (kW)	252	241	229	217	204	184	165	272	261	248	234	228	209	189	306	294	281	268	262	256	248	331	318	304	289	283	277	266
	Pi (kW)	78	84	91	99	96	88	82	77	83	90	97	100	93	86	80	86	94	101	104	108	110	88	95	103	112	116	119	120
	Qwe (l/s)	12.1	11.5	11	10.4	9.8	8.8	7.9	13	12.5	11.9	11.2	10.9	10	9	14.7	14.1	13.5	12.8	12.5	12.3	11.9	15.8	15.2	14.6	13.9	13.6	13.3	12.7
	Pdwe (kPa)	51.2	47.1	43.1	39.1	35.1	29.2	24	39	36	32.9	29.6	28.3	24.1	20.1	101.1	94	86.8	79.4	76.4	73.4	69.2							

# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

EWAD-D-SL

ELWT (°C)		260							280							300							320						
		Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)						
		25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46
4	Cc (kW)	263	251	239	225	220	214	207	277	265	252	238	232	226	219	302	288	273	257	250	243	236	323	310	295	279	272	265	258
	Pi (kW)	82	89	97	106	110	114	117	87	95	104	114	118	122	126	96	105	115	125	129	134	138	100	109	119	130	134	139	144
	Qwe (l/s)	12.5	12	11.4	10.7	10.5	10.2	9.9	13.2	12.6	12	11.3	11	10.7	10.4	14.4	13.7	13	12.2	11.9	11.6	11.2	15.4	14.7	14	13.3	12.9	12.6	12.3
	Pdwe (kPa)	54.5	50.2	45.8	41.2	39.4	37.5	35.5	59.7	55	50.2	45.3	43.3	41.2	39	60.6	55.6	50.5	45.2	43.1	40.9	38.7	55.6	51.6	47.2	42.6	40.8	38.9	37
5	Cc (kW)	271	259	246	233	227	221	215	285	273	260	245	239	233	227	311	297	281	265	258	251	244	331	318	304	287	280	273	266
	Pi (kW)	83	90	99	107	111	115	119	88	97	105	115	119	123	127	98	106	116	126	131	135	140	101	110	120	131	136	140	145
	Qwe (l/s)	12.9	12.3	11.7	11.1	10.8	10.5	10.2	13.6	13	12.4	11.7	11.4	11.1	10.8	14.8	14.1	13.4	12.6	12.3	12	11.6	15.8	15.2	14.5	13.7	13.4	13	12.7
	Pdwe (kPa)	57.4	53	48.4	43.7	41.8	39.8	37.8	62.8	58	53	47.9	45.8	43.7	41.5	63.8	58.7	53.4	47.9	45.7	43.5	41.2	58.4	54.3	49.8	45.1	43.2	41.2	39.3
6	Cc (kW)	278	266	254	240	234	228	222	293	281	267	253	247	241	234	319	305	290	273	266	259	252	340	327	312	296	289	282	275
	Pi (kW)	84	92	100	109	112	116	120	90	98	107	116	120	125	129	99	108	118	128	132	137	142	102	112	122	133	137	142	147
	Qwe (l/s)	13.3	12.7	12.1	11.4	11.2	10.9	10.6	14	13.4	12.7	12.1	11.8	11.5	11.2	15.2	14.6	13.8	13	12.7	12.4	12	16.2	15.6	14.9	14.1	13.8	13.4	13.1
	Pdwe (kPa)	60.4	55.8	51.1	46.2	44.2	42.2	40.1	66.1	61.1	55.9	50.6	48.5	46.3	44.1	67.2	61.9	56.4	50.7	48.4	46.1	43.7	61.2	56.9	52.5	47.7	45.7	43.6	41.6
7	Cc (kW)	286	274	261	247	241	235	229	301	289	275	260	254	248	241	328	314	298	282	275	267	259	349	335	321	305	298	291	283
	Pi (kW)	85	93	101	110	114	118	122	91	99	108	118	122	126	130	100	109	119	130	134	139	143	104	113	123	134	139	143	148
	Qwe (l/s)	13.6	13.1	12.5	11.8	11.5	11.2	10.9	14.4	13.8	13.1	12.4	12.1	11.8	11.5	15.7	15	14.2	13.4	13.1	12.8	12.4	16.6	16	15.3	14.6	14.2	13.9	13.5
	Pdwe (kPa)	63.6	58.8	53.9	48.8	46.8	44.7	42.5	69.5	64.3	58.9	53.4	51.2	48.9	46.6	70.7	65.1	59.5	53.6	51.2	48.8	46.1	64.1	59.7	55.2	50.3	48.2	46.1	44
8	Cc (kW)	294	282	268	254	249	242	236	310	297	283	268	262	255	249	337	323	307	290	283	276	265	358	344	329	314	307	299	292
	Pi (kW)	86	94	102	111	115	119	123	92	100	109	119	123	128	132	102	111	121	131	136	140	142	105	114	125	136	140	145	150
	Qwe (l/s)	14	13.4	12.8	12.1	11.9	11.6	11.3	14.8	14.2	13.5	12.8	12.5	12.2	11.9	16.1	15.4	14.7	13.8	13.5	13.2	12.6	17.1	16.4	15.7	15	14.6	14.3	13.9
	Pdwe (kPa)	66.8	61.8	56.7	51.5	49.4	47.2	45	73	67.6	62	56.3	54	51.6	49.3	74.2	68.5	62.6	56.5	54.1	51.6	47.9	67.1	62.6	57.9	53	50.9	48.7	46.5
9	Cc (kW)	302	289	276	262	256	250	243	318	305	291	276	269	263	256	347	332	316	299	291	284	270	366	353	338	322	316	308	301
	Pi (kW)	87	95	104	113	116	120	124	93	102	111	121	125	129	133	103	112	122	133	138	142	142	106	116	126	137	142	147	152
	Qwe (l/s)	14.4	13.8	13.2	12.5	12.2	11.9	11.6	15.2	14.6	13.9	13.2	12.9	12.6	12.2	16.6	15.8	15.1	14.3	13.9	13.6	12.9	17.5	16.8	16.1	15.4	15.1	14.7	14.4
	Pdwe (kPa)	70.2	65	59.7	54.3	52.1	49.8	47.6	76.7	71	65.3	59.3	56.9	54.4	52	78	72	65.9	59.6	57	54.4	49.8	70.1	65.5	60.6	55.6	53.6	51.4	49.1
10	Cc (kW)	310	297	284	269	263	257	251	326	313	299	283	277	271	264	356	341	324	307	300	292	276	375	362	347	331	324	317	310
	Pi (kW)	89	96	105	114	118	122	126	95	103	112	122	126	130	135	105	114	124	135	139	144	141	108	117	127	139	144	148	153
	Qwe (l/s)	14.8	14.2	13.6	12.9	12.6	12.3	12	15.6	15	14.3	13.5	13.2	12.9	12.6	17	16.3	15.5	14.7	14.3	14	13.2	17.9	17.3	16.6	15.8	15.5	15.1	14.8
	Pdwe (kPa)	73.6	68.3	62.8	57.1	54.8	52.5	50.2	80.4	74.6	68.6	62.4	59.9	57.3	54.8	81.8	75.6	69.2	62.7	60.1	57.4	51.7	73.3	68.5	63.5	58.3	56.2	54.1	51.8
11	Cc (kW)	318	305	291	277	271	264	258	335	321	307	291	285	278	271	365	350	333	316	308	300	281	385	370	355	339	332	325	318
	Pi (kW)	90	98	106	115	119	123	127	96	104	114	124	128	132	136	106	116	126	137	141	145	141	109	118	129	140	145	150	155
	Qwe (l/s)	15.2	14.6	13.9	13.2	12.9	12.6	12.3	16	15.4	14.7	13.9	13.6	13.3	13	17.5	16.7	15.9	15.1	14.7	14.3	13.4	18.4	17.7	17	16.2	15.9	15.5	15.2
	Pdwe (kPa)	77.2	71.6	65.9	60.1	57.7	55.3	52.9	84.3	78.2	72	65.6	63	60.3	57.7	85.8	79.3	72.7	66	63.2	60.1	53.5	76.6	71.6	66.4	61.1	58.9	56.7	54.4
12	Cc (kW)	326	313	299	284	278	272	265	344	330	315	299	293	286	279	375	359	342	324	317	305	284	394	379	364	348	341	334	326
	Pi (kW)	91	99	108	117	121	125	129	97	106	115	125	129	134	138	108	117	127	138	143	145	139	110	120	130	142	147	152	157
	Qwe (l/s)	15.6	15	14.3	13.6	13.3	13	12.7	16.4	15.8	15.1	14.3	14	13.7	13.3	17.9	17.2	16.4	15.5	15.1	14.6	13.6	18.8	18.1	17.4	16.6	16.3	16	15.6
	Pdwe (kPa)	80.9	75.1	69.2	63.1	60.6	58.2	55.6	88.3	82	75.5	68.9	66.2	63.4	60.7	89.9	83.2	76.3	69.3	66.4	62.2	54.7	79.9	74.8	69.4	63.9	61.6	59.4	57.1
13	Cc (kW)	335	321	307	292	286	279	272	352	338	323	307	301	294	285	384	368	351	333	325	311	287	403	388	373	356	349	342	335
	Pi (kW)	92	100	109	118	122	126	130	99	107	117	127	131	135	139	110	119	129	140	145	144	137	112	121	132	143	148	153	158
	Qwe (l/s)	16	15.4	14.7	14	13.7	13.4	13	16.9	16.2	15.5	14.7	14.4	14.1	13.6	18.4	17.6	16.8	15.9	15.6	14.9	13.7	19.3	18.6	17.8	17	16.7	16.4	16
	Pdwe (kPa)	84.7	78.7	72.6	66.3	63.7	61.1	58.2	92.4	85.9	79.2	72.3	69.5	66.7	63.1	94.1	87.1	80	72.7	69.8	64.3	55.5	83.4	78.1	72.5	66.8	64.5	62.1	59.7
14	Cc (kW)	343	330	315	300	293	287	277	361	347	332	315	309	302	288	394	378	360	342	334	316	289	412	397	382	365	358	351	343
	Pi (kW)	94	102	110	120	124	128	129	100	109	118	128	132	137	136	111	121	131	142	147	144	135	113	123	133	145	150	155	160
	Qwe (l/s)	16.4	15.8	15.1	14.4	14	13.7	13.2	17.3	16.6	15.9	15.1	14.8	14.4	13.8	18.8	18.1	17.2	16.4	16	15.1	13.9	19.7	19	18.3	17.5	17.1	16.8	16.4
	Pdwe (kPa)	88.6	82.4	76	69.5	66.8	64.2	60.1	96.7	89.9	82.9	75.8	72.9	70	64.2	98.4	91.2	83.8	76.3	73.2	66.4	56.6	86.9	81.4	75.7	69.8	67.4	65	62.5
15	Cc (kW)	352	338	323	308	301	295	279	370	356	340	324	317	310	290	404	387	369	351	342	322	291	422	407	391	374	367	359	352
	Pi (kW)	95	103	112	121	125	129	127	101	110	120	130	134	138	134	113	122	133	144	148	143	133	114	124	135	147	152	157	162
	Qwe (l/s)	16.8	16.2	15.5	14.7	14.4	14.1	13.4	17.7	17	16.3	15.5	15.2	14.8</															

# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

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EWAD-D-SL

		370						400						440								
		Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)								
ELWT (°C)		25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46
4	Cc (kW)	362	353	343	332	326	320	314	422	398	372	317	296	273	250	450	430	404	361	336	312	286
	Pi (kW)	106	117	129	142	148	153	159	133	147	162	160	158	154	149	134	148	163	169	167	165	160
	Qwe (l/s)	17.2	16.8	16.4	15.8	15.5	15.2	14.9	20.1	19	17.7	15.1	14.1	13	11.9	21.5	20.5	19.3	17.2	16	14.8	13.6
	Pdwe (kPa)	64.5	61.9	58.8	55.1	53.5	51.8	49.9	51.1	46.1	40.7	30.5	27	23.4	20	64.6	59.5	53.2	43.4	38.2	33.3	28.5
5	Cc (kW)	370	362	352	340	335	329	323	434	410	382	339	314	291	268	463	442	418	381	359	333	306
	Pi (kW)	107	118	131	144	149	155	160	136	149	164	172	169	165	160	136	150	166	177	179	175	171
	Qwe (l/s)	17.7	17.3	16.8	16.2	16	15.7	15.4	20.7	19.5	18.2	16.1	15	13.9	12.8	22	21	19.9	18.1	17.1	15.9	14.6
	Pdwe (kPa)	67.4	64.7	61.6	57.8	56.2	54.5	52.6	53.9	48.6	42.9	34.5	30.1	26.3	22.6	67.9	62.4	56.5	47.8	43.1	37.6	32.2
6	Cc (kW)	379	371	361	349	344	338	332	447	422	393	360	335	309	285	475	453	429	396	377	355	329
	Pi (kW)	108	120	132	145	151	156	162	138	151	167	184	182	176	172	138	152	168	183	186	187	184
	Qwe (l/s)	18.1	17.7	17.2	16.6	16.4	16.1	15.8	21.3	20.1	18.7	17.2	16	14.7	13.6	22.6	21.6	20.4	18.9	18	16.9	15.7
	Pdwe (kPa)	70.4	67.7	64.4	60.6	59	57.2	55.3	56.8	51.2	45.2	38.6	33.9	29.2	25.4	71.2	65.5	59.3	51.3	47.1	42.3	36.8
7	Cc (kW)	388	380	370	358	353	347	341	459	433	404	371	356	323	290	487	465	440	410	394	374	351
	Pi (kW)	110	121	133	147	152	158	164	141	154	169	186	194	184	169	140	154	170	188	194	196	197
	Qwe (l/s)	18.5	18.1	17.7	17.1	16.8	16.5	16.3	21.9	20.7	19.3	17.7	17	15.4	13.8	23.2	22.2	21.0	19.6	18.8	17.9	16.8
	Pdwe (kPa)	73.4	70.7	67.4	63.5	61.8	60	58.1	59.8	53.9	47.5	40.6	37.8	31.8	26.2	74.6	68.7	62.1	54.8	51	46.4	41.5
8	Cc (kW)	397	389	379	367	362	356	350	472	445	415	381	362	327	293	500	477	451	421	408	390	365
	Pi (kW)	111	122	135	148	154	159	165	143	156	172	189	193	180	165	142	156	172	190	198	204	201
	Qwe (l/s)	19	18.6	18.1	17.5	17.3	17	16.7	22.5	21.3	19.8	18.2	17.3	15.6	14	23.8	22.8	21.5	20.1	19.5	18.6	17.4
	Pdwe (kPa)	76.6	73.8	70.4	66.4	64.7	62.8	60.9	62.9	56.6	49.9	42.7	39	32.5	26.6	78.1	71.9	65.1	57.5	54.2	50.1	44.3
9	Cc (kW)	406	398	388	376	370	365	359	485	458	426	391	365	330	295	512	489	463	432	418	399	369
	Pi (kW)	112	124	136	150	155	161	167	146	159	174	191	189	176	160	144	158	174	193	201	204	198
	Qwe (l/s)	19.4	19	18.5	18	17.7	17.4	17.1	23.2	21.9	20.4	18.7	17.4	15.8	14.1	24.5	23.4	22.1	20.6	20	19	17.6
	Pdwe (kPa)	79.9	77	73.5	69.4	67.6	65.7	63.7	66.1	59.5	52.4	44.8	39.5	33.1	27	81.8	75.3	68.1	60.2	56.8	52.1	45.3
10	Cc (kW)	416	407	397	385	380	374	361	498	470	438	401	369	331	294	525	501	474	443	429	406	372
	Pi (kW)	113	125	138	151	157	163	164	149	162	177	194	185	170	153	147	160	176	195	203	203	194
	Qwe (l/s)	19.9	19.5	19	18.4	18.1	17.9	17.3	23.8	22.4	20.9	19.2	17.6	15.8	14.1	25.1	23.9	22.7	21.2	20.5	19.4	17.8
	Pdwe (kPa)	83.2	80.2	76.7	72.5	70.7	68.7	66.6	69.4	62.4	55	47	40.3	33.3	26.9	85.5	78.7	71.3	63	59.5	53.9	46.1
11	Cc (kW)	425	416	406	394	389	383	363	511	482	449	408	370	334	296	538	513	486	454	439	413	373
	Pi (kW)	115	126	139	153	158	164	161	151	165	180	194	180	165	148	149	163	179	197	205	202	187
	Qwe (l/s)	20.3	19.9	19.4	18.8	18.6	18.3	17.4	24.4	23	21.5	19.5	17.7	16	14.1	25.7	24.5	23.2	21.7	21	19.8	17.8
	Pdwe (kPa)	86.6	83.6	79.9	75.7	73.8	71.8	65.4	72.8	65.5	57.6	48.4	40.7	33.8	27.1	89.3	82.3	74.5	65.9	62.2	55.7	46.4
12	Cc (kW)	434	426	416	403	398	392	365	525	495	461	410	371	334	293	550	526	498	465	449	419	374
	Pi (kW)	116	128	140	154	160	166	158	154	167	183	189	174	159	140	151	165	181	199	207	200	181
	Qwe (l/s)	20.8	20.4	19.9	19.3	19	18.7	17.5	25.1	23.7	22	19.6	17.8	16	14	26.3	25.1	23.8	22.2	21.5	20	17.9
	Pdwe (kPa)	90.1	87	83.3	78.9	77	75	66	76.2	68.6	60.3	48.9	40.9	33.8	26.8	93.3	85.9	77.8	68.8	64.7	57.2	46.5
13	Cc (kW)	444	435	425	413	407	401	369	538	507	472	414	372	333	290	563	538	509	476	456	424	375
	Pi (kW)	117	129	142	156	162	168	157	157	170	186	186	168	152	133	153	167	183	202	205	198	175
	Qwe (l/s)	21.2	20.8	20.3	19.7	19.5	19.2	17.6	25.7	24.3	22.6	19.8	17.8	15.9	13.9	26.9	25.7	24.4	22.8	21.8	20.3	17.9
	Pdwe (kPa)	93.7	90.6	86.7	82.3	80.3	78.2	67.2	79.8	71.8	63.1	49.8	41	33.6	26.3	97.3	89.7	81.2	71.8	66.5	58.3	46.7
14	Cc (kW)	453	445	434	422	416	410	370	551	520	484	413	371	330	286	576	551	521	487	463	425	374
	Pi (kW)	119	131	143	157	163	169	154	160	173	189	178	161	145	125	156	170	186	204	204	192	168
	Qwe (l/s)	21.7	21.3	20.8	20.2	19.9	19.6	17.7	26.4	24.9	23.2	19.7	17.8	15.8	13.7	27.6	26.4	24.9	23.3	22.2	20.3	17.9
	Pdwe (kPa)	97.4	94.2	90.3	85.7	83.7	81.5	67.6	83.5	75	66	49.5	40.9	33.2	25.6	101.5	93.5	84.7	74.9	68.5	58.6	46.5
15	Cc (kW)	463	454	444	431	426	412	373	565	532	496	413	370	327	280	590	563	533	498	469	425	368
	Pi (kW)	120	132	145	159	165	167	152	163	176	192	172	154	137	117	158	172	188	207	203	185	158
	Qwe (l/s)	22.1	21.7	21.2	20.6	20.4	19.7	17.9	27	25.5	23.7	19.8	17.7	15.7	13.4	28.2	27	25.5	23.9	22.5	20.4	17.6
	Pdwe (kPa)	101.2	97.9	93.9	89.2	87.1	82.3	68.7	87.2	78.4	68.9	49.6	40.7	32.6	24.7	105.8	97.4	88.2	78.1	70.2	58.7	45.3



# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

EWAD-D-SL

ELWT (°C)		480							510							530						
		Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)						
		25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46
4	Cc (kW)	491	468	442	383	358	330	301	516	495	456	396	359	331	300	539	518	492	437	409	366	333
	Pi (kW)	146	161	179	180	178	174	169	157	175	187	188	185	181	174	153	169	188	195	194	189	183
	Qwe (l/s)	23.4	22.3	21	18.3	17	15.7	14.3	24.6	23.6	21.7	18.9	17.1	15.7	14.3	25.7	24.7	23.4	20.8	19.5	17.4	15.9
	Pdwe (kPa)	56.7	52.1	46.9	36.3	32.1	27.7	23.6	50.1	46.4	40.1	31.2	26.1	22.5	18.8	44.2	41.1	37.5	30.3	26.8	22	18.6
5	Cc (kW)	503	480	453	407	381	353	322	529	507	474	421	393	354	322	554	532	506	458	434	403	360
	Pi (kW)	148	164	181	191	190	186	179	159	177	194	201	198	193	186	155	171	190	203	205	203	198
	Qwe (l/s)	24	22.9	21.6	19.4	18.2	16.8	15.3	25.2	24.2	22.6	20.1	18.7	16.9	15.4	26.4	25.4	24.1	21.9	20.7	19.2	17.1
	Pdwe (kPa)	59.3	54.7	49.2	40.5	36	31.3	26.5	52.5	48.7	43.1	34.8	30.7	25.4	21.5	46.4	43.2	39.4	33	30	26.2	21.3
6	Cc (kW)	515	492	465	430	404	375	344	542	520	491	440	417	385	347	568	546	519	479	455	428	395
	Pi (kW)	150	166	183	202	202	198	192	162	179	200	209	210	205	202	157	174	193	212	214	215	210
	Qwe (l/s)	24.6	23.5	22.2	20.5	19.3	17.9	16.4	25.9	24.8	23.4	21	19.9	18.4	16.5	27.1	26.1	24.8	22.9	21.7	20.4	18.8
	Pdwe (kPa)	62.1	57.2	51.6	44.8	40	35.1	30	54.9	51	46	37.8	34.2	29.7	24.6	48.6	45.3	41.4	35.8	32.6	29.2	25.3
7	Cc (kW)	528	504	477	444	428	399	369	556	533	505	458	436	405	358	583	560	533	498	475	447	409
	Pi (kW)	152	168	186	206	215	213	207	164	182	203	216	220	216	204	160	176	195	218	223	222	213
	Qwe (l/s)	25.2	24.1	22.8	21.2	20.4	19.1	17.6	26.5	25.4	24.1	21.8	20.8	19.3	17.1	27.8	26.7	25.4	23.8	22.7	21.3	19.5
	Pdwe (kPa)	64.9	59.8	54.0	47.4	44.5	39.3	34	57.4	53.3	48.4	40.5	37.1	32.5	26	51	47.5	43.4	38.4	35.3	31.6	26.9
8	Cc (kW)	540	517	489	455	440	417	375	569	546	517	476	447	410	364	598	575	547	511	488	455	413
	Pi (kW)	155	170	188	208	217	221	204	167	184	205	226	222	211	201	162	178	198	221	225	220	209
	Qwe (l/s)	25.8	24.7	23.3	21.7	21	19.9	17.9	27.2	26.1	24.7	22.7	21.3	19.6	17.4	28.5	27.4	26.1	24.4	23.3	21.7	19.7
	Pdwe (kPa)	67.7	62.4	56.5	49.7	46.7	42.4	35.1	60	55.7	50.5	43.6	38.9	33.3	26.8	53.4	49.7	45.4	40.3	37	32.6	27.5
9	Cc (kW)	553	529	500	466	451	422	379	583	559	530	484	454	410	365	612	589	560	524	496	464	410
	Pi (kW)	157	172	190	211	219	217	200	169	187	208	224	220	213	194	164	181	200	223	223	220	208
	Qwe (l/s)	26.4	25.2	23.9	22.3	21.5	20.1	18.1	27.8	26.7	25.3	23.1	21.7	19.6	17.4	29.2	28.1	26.7	25	23.7	22.1	19.6
	Pdwe (kPa)	70.7	65.1	59	51.9	48.9	43.4	35.7	62.7	58.1	52.8	44.9	40	33.3	27	55.8	52	47.5	42.2	38.2	33.8	27.1
10	Cc (kW)	566	541	512	478	462	424	379	596	572	542	493	462	412	368	627	603	574	538	506	467	411
	Pi (kW)	159	175	193	213	222	211	192	172	190	211	224	219	207	189	167	184	203	226	223	215	202
	Qwe (l/s)	27	25.8	24.5	22.8	22.1	20.3	18.1	28.5	27.3	25.9	23.6	22.1	19.7	17.6	30	28.8	27.4	25.7	24.2	22.3	19.7
	Pdwe (kPa)	73.7	67.9	61.5	54.3	51.1	43.8	35.9	65.4	60.6	55	46.4	41.2	33.6	27.4	58.3	54.3	49.6	44.1	39.6	34.3	27.3
11	Cc (kW)	579	553	524	489	473	428	382	610	585	554	501	465	413	367	642	617	587	547	514	469	415
	Pi (kW)	161	177	195	216	224	207	187	174	192	213	222	213	200	181	169	186	206	226	222	209	197
	Qwe (l/s)	27.7	26.4	25	23.4	22.6	20.5	18.3	29.2	28	26.5	23.9	22.2	19.7	17.6	30.7	29.5	28.1	26.2	24.5	22.4	19.8
	Pdwe (kPa)	76.8	70.8	64.1	56.7	53.4	44.6	36.4	68.1	63.2	57.4	47.7	41.8	33.8	27.4	60.8	56.7	51.8	45.7	40.7	34.5	27.7
12	Cc (kW)	592	566	535	500	478	429	381	624	598	567	508	466	414	366	657	632	601	556	521	467	411
	Pi (kW)	164	179	197	218	222	200	179	177	195	216	220	207	193	173	172	189	208	225	220	210	187
	Qwe (l/s)	28.3	27	25.6	23.9	22.8	20.5	18.2	29.8	28.6	27.1	24.3	22.3	19.8	17.5	31.4	30.2	28.7	26.6	24.9	22.3	19.7
	Pdwe (kPa)	79.9	73.7	66.7	59	54.4	44.8	36.3	71	65.8	59.7	49	42	33.9	27.2	63.4	59.1	54	46.9	41.8	34.3	27.3
13	Cc (kW)	605	578	547	511	480	430	380	638	611	579	514	465	413	363	672	646	615	564	528	468	410
	Pi (kW)	166	182	200	221	216	193	171	180	198	219	219	209	185	165	175	192	211	224	218	203	180
	Qwe (l/s)	28.9	27.7	26.2	24.4	23	20.5	18.2	30.5	29.2	27.7	24.6	22.3	19.8	17.4	32.2	30.9	29.4	27	25.3	22.4	19.6
	Pdwe (kPa)	83.2	76.7	69.5	61.4	54.9	44.9	36	73.9	68.5	62.1	50.2	41.9	33.8	26.8	66.1	61.6	56.3	48.2	42.8	34.5	27.2
14	Cc (kW)	618	591	559	522	482	429	377	652	624	591	517	466	412	359	687	660	628	572	526	468	408
	Pi (kW)	168	184	203	223	210	186	163	182	201	222	214	202	178	156	177	194	214	223	210	197	172
	Qwe (l/s)	29.6	28.3	26.8	25	23	20.5	18	31.2	29.9	28.3	24.7	22.3	19.7	17.2	32.9	31.6	30.1	27.4	25.2	22.4	19.5
	Pdwe (kPa)	86.5	79.7	72.2	63.9	55.2	44.9	35.5	76.9	71.2	64.6	50.7	42.1	33.6	26.3	68.9	64.1	58.6	49.4	42.6	34.5	26.9
15	Cc (kW)	631	603	571	534	483	428	372	666	638	604	518	463	409	354	703	675	642	577	528	464	400
	Pi (kW)	171	187	205	226	204	178	154	185	204	225	208	193	170	148	180	197	217	220	214	187	162
	Qwe (l/s)	30.2	28.9	27.3	25.5	23.1	20.5	17.8	31.9	30.5	28.9	24.8	22.2	19.6	16.9	33.6	32.3	30.7	27.6	25.3	22.2	19.1
	Pdwe (kPa)	89.9	82.9	75.1	66.5	55.5	44.6	34.8	80	74	67.1	50.9	41.6	33.3	25.6	71.7	66.7	61	50.3	42.9	33.9	26

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# 6 Capacity tables

## 6 - 2 Partial Heat Recovery Capacity tables

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**Partial Heat Recovery Ratings**  
**EWAD-D-S**

EWAC / LWC	*Model EWAD-D-SS*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
50/60	390	332	161	173	35%	3.13
	440	373	172	191	35%	3.27
	470	403	189	207	35%	3.24
	510	432	206	223	35%	3.18
	530	461	219	238	35%	3.19
	560	486	233	216	30%	3.01
	580	508	225	191	26%	3.10

EWAC / LWC	*Model EWAD-D-SL*	*Model EWAD-D-SR*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
50/60	180	180	159	80.0	84	35%	3.03
	200	190	171	78.4	87	35%	3.30
	230	220	196	83.3	98	35%	3.52
	250	240	213	92.2	107	35%	3.48
	260	250	227	105	116	35%	3.28
	280	270	240	112	123	35%	3.23
	300	280	259	124	134	35%	3.18
	320	310	281	128	123	30%	3.15
	370	370	329	141	122	26%	3.20
	400	400	373	172	191	35%	3.27
	440	440	403	189	207	35%	3.24
	480	480	432	206	223	35%	3.18
	510	510	461	219	238	35%	3.19
	530	530	486	233	216	30%	3.01

EWAC / LWC	*Model EWAD-D-SX*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
50/60	210	171	78.4	87	35%	3.30
	230	196	83.3	98	35%	3.52
	250	213	92.2	107	35%	3.48
	270	227	105	116	35%	3.28
	290	240	112	123	35%	3.23
	300	259	124	134	35%	3.18
	310	281	128	123	30%	3.15
	370	332	161	173	35%	3.13
	410	373	172	191	35%	3.27
	450	403	189	207	35%	3.24
	490	432	206	223	35%	3.18

**NOTES**

- Cc (cooling capacity)
- Pi (unit power input)
- Hc (heating heat recovery capacity)
- %Hc (percentage heat recovered)
- EER Hc (coefficient of performance during heat recovery = (cooling+ heating capacity) / power input)
- EWAC (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<sup>2</sup> °C/kW evaporator fouling factor

# 6 Capacity tables

## 6 - 3 Total Heat Recovery Capacity Tables

### Total Heat Recovery Ratings EWAD-D-S

EWC / LWC	*Model EWAD-D-SS*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
40/45	390	348	154	427	85%	5.02
	440	391	165	473	85%	5.23
	470	423	183	515	85%	5.13
	510	453	200	555	85%	5.05
	530	484	213	592	85%	5.06
	560	510	226	552	75%	4.70
	580	533	219	488	65%	4.67
40/50	390	332	156	415	85%	4.79
	440	373	167	459	85%	4.99
	470	403	185	500	85%	4.89
	510	432	202	539	85%	4.81
	530	461	215	575	85%	4.82
	560	486	228	536	75%	4.47
	580	508	221	474	65%	4.44
45/55	390	332	158	294	60%	3.97
	440	373	169	325	60%	4.13
	470	403	187	354	60%	4.06
	510	432	204	382	60%	3.99
	530	461	217	407	60%	4.00
	560	486	231	358	50%	3.66
	580	508	223	314	43%	3.68

EWC / LWC	*Model EWAD-D-SL*	*Model EWAD-D-SR*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
40/45	180	180	167	76.7	207	85%	4.88
	200	190	179	75.1	216	85%	5.27
	230	220	205	80.0	243	85%	5.60
	250	240	224	88.4	265	85%	5.54
	260	250	238	102	289	85%	5.19
	280	270	251	109	306	85%	5.12
	300	280	272	120	333	85%	5.04
	320	310	294	124	314	75%	4.89
	370	370	345	137	314	65%	4.81
	400	400	391	165	473	85%	5.23
	440	440	423	183	515	85%	5.13
	480	480	453	200	555	85%	5.05
	510	510	484	213	592	85%	5.06
	530	530	510	226	552	75%	4.70
	180	180	159	77.5	201	85%	4.65
	200	190	171	75.9	210	85%	5.02
	230	220	196	80.8	235	85%	5.33
250	240	213	89.3	257	85%	5.27	
260	250	227	103	281	85%	4.94	
280	270	240	110	297	85%	4.88	
300	280	259	121	323	85%	4.81	
320	310	281	125	305	75%	4.66	
370	370	329	138	304	65%	4.58	
400	400	373	167	459	85%	4.99	
440	440	403	185	500	85%	4.89	
480	480	432	202	539	85%	4.81	
510	510	461	215	575	85%	4.82	
530	530	496	228	536	75%	4.47	
180	180	159	78.4	143	60%	3.85	
200	190	171	76.8	149	60%	4.16	
230	220	196	81.7	167	60%	4.43	
250	240	213	90.4	182	60%	4.38	
260	250	227	104	199	60%	4.11	
280	270	240	111	210	60%	4.05	
300	280	259	122	229	60%	3.99	
320	310	281	127	204	50%	3.82	
370	370	329	140	202	43%	3.80	
400	400	373	169	325	60%	4.13	
440	440	403	187	354	60%	4.06	
480	480	432	204	382	60%	3.99	
510	510	461	217	407	60%	4.00	
530	530	486	231	358	50%	3.66	

EWC / LWC	*Model EWAD-D-SX*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
40/45	210	179	75.1	216	85%	5.27
	230	205	80.0	243	85%	5.60
	250	224	88.4	265	85%	5.54
	270	238	102	289	85%	5.19
	290	251	109	306	85%	5.12
	300	272	120	333	85%	5.04
	310	294	124	314	75%	4.89
	370	348	154	427	85%	5.02
	410	391	165	473	85%	5.23
	450	423	183	515	85%	5.13
490	453	200	555	85%	5.05	
210	171	75.9	210	85%	5.02	
230	196	80.8	235	85%	5.33	
250	213	89.3	257	85%	5.27	
270	227	103	281	85%	4.94	
290	240	110	297	85%	4.88	
300	259	121	323	85%	4.81	
310	281	125	305	75%	4.66	
370	332	156	415	85%	4.79	
410	373	167	459	85%	4.99	
450	403	185	500	85%	4.89	
490	432	202	539	85%	4.81	
210	171	76.8	149	60%	4.16	
230	196	81.7	167	60%	4.43	
250	213	90.4	182	60%	4.38	
270	227	104	199	60%	4.11	
290	240	111	210	60%	4.05	
300	259	122	229	60%	3.99	
310	281	127	204	50%	3.82	
370	332	158	294	60%	3.97	
410	373	169	325	60%	4.13	
450	403	187	354	60%	4.06	
490	432	204	382	60%	3.99	

**NOTES**

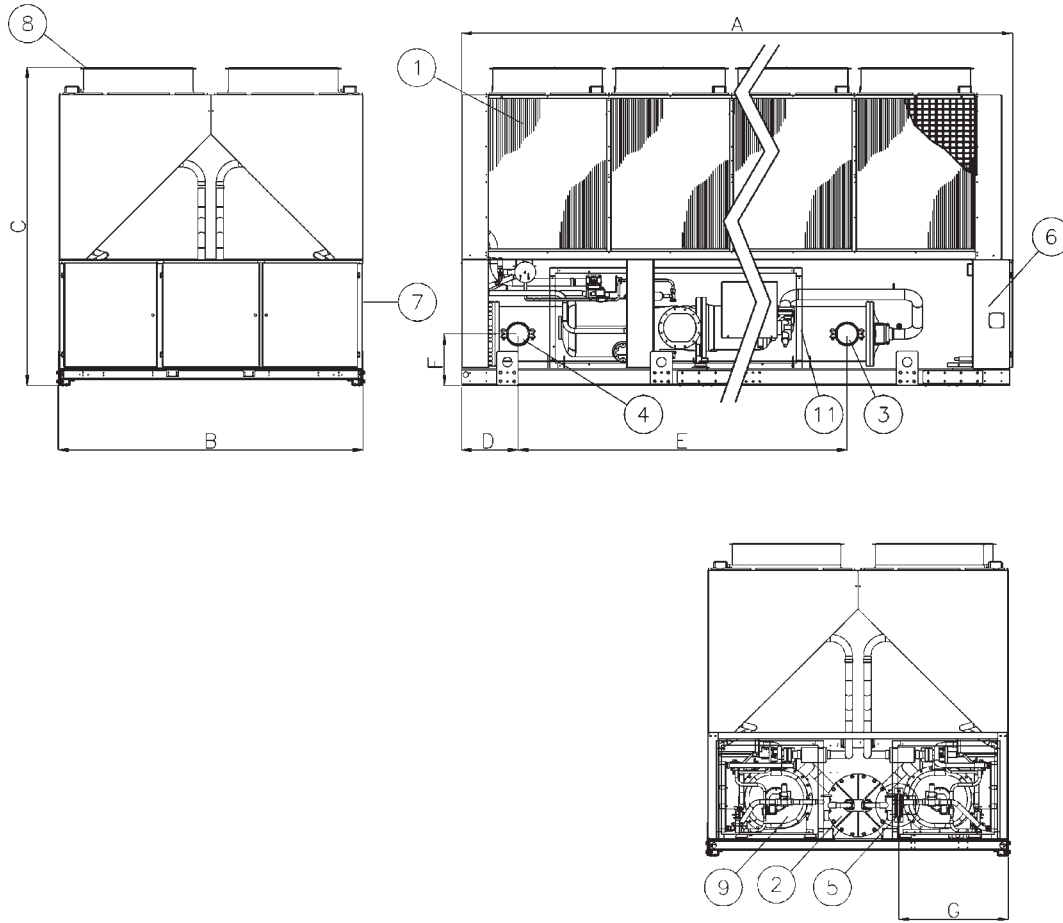
- Cc (cooling capacity)
- Pi (unit power input)
- Hc (heating heat recovery capacity)
- %Hc (percentage heat recovered)
- EER Hc (coefficient of performance during heat recovery = (cooling+ heating capacity) / power input)
- EWC (Entering water heat recovery condenser)
- LWC (Leaving water heat recovery 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<sup>2</sup> °C/kW evaporator fouling factor

# 7 Dimensional drawings

## 7 - 1 Dimensional Drawings

Dimensions EWAD~D-



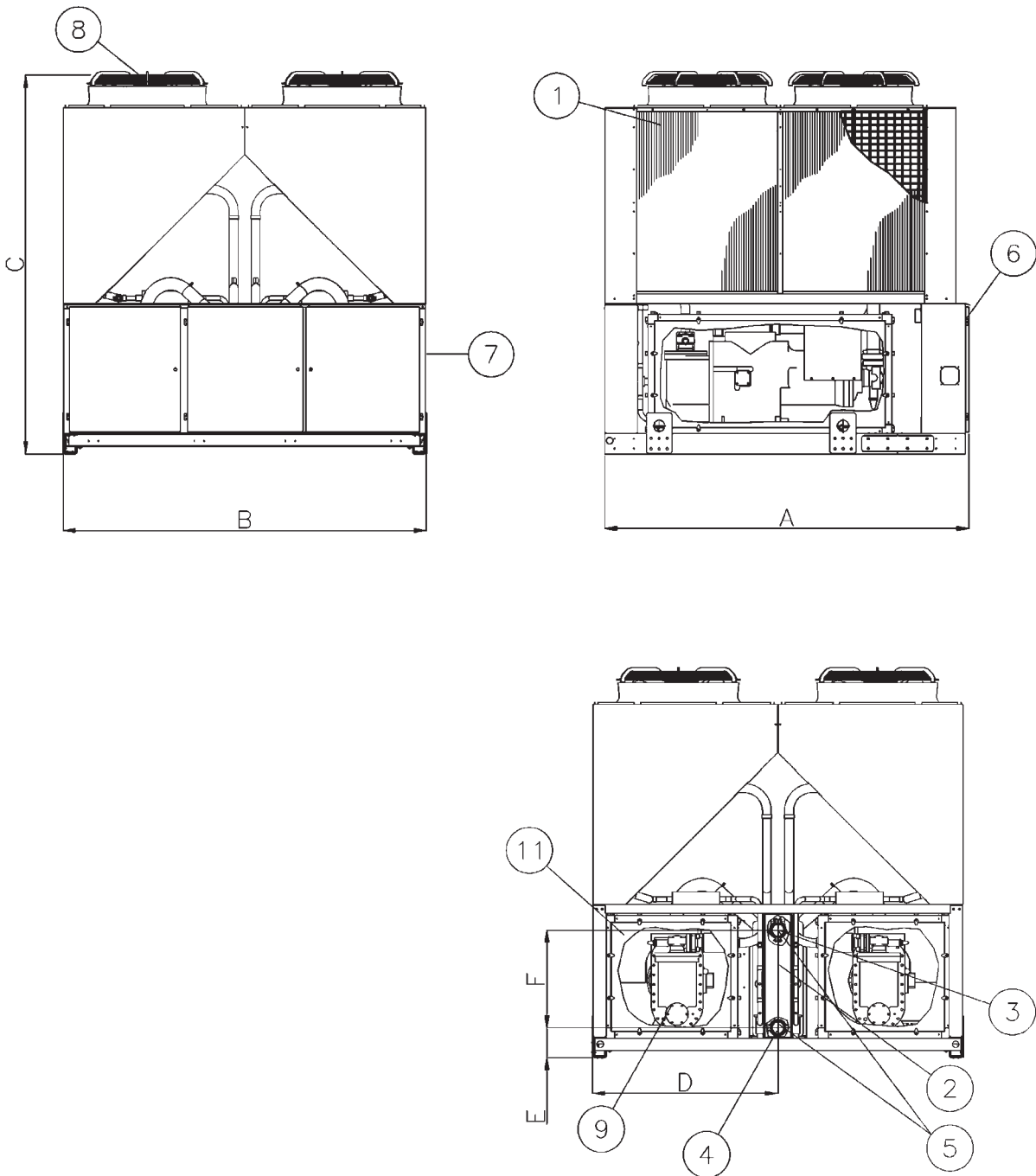
Models	Dimensions (mm)						
	A	B	C	D	E	F	G
EWAD							
EWAD390D-SS	3139	2234	2223	392	1875	339	873
EWAD440~580D-SS	4040	2234	2223	392	2450	339	855
EWAD230~300D-SL	3139	2234	2355	374	1911	339	873
EWAD320D-SL	4040	2234	2355	374	2486	339	873
EWAD400~530D-SL	4040	2234	2223	392	2450	339	855
EWAD220~280D-SR	3139	2234	2355	374	1911	339	873
EWAD310D-SR	4040	2234	2355	374	2486	339	873
EWAD400~530D-SR	4040	2234	2223	392	2450	339	855
EWAD210D-SX	3139	2234	2420	374	1911	339	873
EWAD230~310D-SX	4040	2234	2420	374	2486	339	873
EWAD370~490D-SX	4040	2234	2420	392	2450	339	873
EWAD250D-XS	3138	2234	2355	374	1911	339	873
EWAD280~400D-XS	4040	2234	2355	374	2486	339	873
EWAD470D-XS	4040	2234	2223	414	2412	379	873
EWAD520~620D-XS	4940	2234	2223	414	2412	379	815
EWAD240D-XR	3138	2234	2355	374	1911	339	873
EWAD270~390D-XR	4040	2234	2355	374	2486	339	873
EWAD460D-XR	4040	2234	2223	414	2412	379	873
EWAD510~600D-XR	4940	2234	2223	414	2412	379	815
EWAD230~310D-HS	3339	2234	2223	374	1911	339	873
EWAD340~380D-HS	4040	2234	2223	374	2486	339	873
EWAD420~590D-HS	4040	2234	2223	392	2450	339	873

**LEGEND**

- 1 – Condenser Coil
- 2 – Water heat exchanger (evaporator)
- 3 – Evaporator water inlet
- 4 – Evaporator water outlet
- 5 – Victaulic connection
- 6 – Operating and control panel
- 7 – Slot for power and control connection
- 8 – Fan
- 9 – Compressor

# 7 Dimensional drawings

## 7 - 1 Dimensional Drawings



Models	Dimensions (mm)					
	A	B	C	D	E	F
EWAD180~200D-SL	2239	2234	2355	1117	181	590
EWAD180~190D-SR	2239	2234	2355	1117	181	590
EWAD200~210D-HS	2223	2234	2223	1117	181	590

**LEGEND**

- 1 – Condenser Coil
- 2 – Water heat exchanger (evaporator)
- 3 – Evaporator water inlet
- 4 – Evaporator water outlet
- 5 – Victaulic connection
- 6 – Operating and control panel
- 7 – Slot for power and control connection
- 8 – Fan
- 9 – Compressor

DMN\_1a-2a\_Rev.01\_2

## 8 Sound data

### 8 - 1 Sound Level Data

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#### Sound Level

##### EWAD-D-SS

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)									Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)	
390	62.5	71.5	70.0	76.5	68.0	70.5	58.0	49.9	76.5	95.8	
440	62.5	71.5	71.0	76.5	69.5	71.0	58.0	51.0	77.0	96.7	
470	62.5	71.5	71.0	76.5	69.5	71.0	58.0	51.0	77.0	96.7	
510	62.5	71.5	71.0	76.5	69.5	71.0	58.0	51.0	77.0	96.7	
530	64.0	73.0	73.0	78.0	71.0	72.5	59.5	52.5	78.5	98.2	
560	64.5	73.5	73.5	78.5	71.5	73.0	60.0	53.0	79.0	98.7	
580	64.5	73.5	73.5	78.5	71.5	73.0	60.0	53.0	79.0	98.7	

#### NOTES

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

##### EWAD-D-SL

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)									Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)	
180	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	93.7	
200	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	93.7	
230	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.3	
250	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.3	
260	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.3	
280	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.3	
300	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.3	
320	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.7	
370	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	97.2	
400	60.0	69.0	68.5	74.0	67.0	68.5	55.5	48.5	74.5	94.2	
440	60.0	69.0	68.5	74.0	67.0	68.5	55.5	48.5	74.5	94.2	
480	60.0	69.0	68.5	74.0	67.0	68.5	55.5	48.5	74.5	94.2	
510	61.5	70.5	70.5	75.5	68.5	70.0	57.0	50.0	76.0	95.7	
530	62.0	71.0	71.0	76.0	69.0	70.5	57.5	50.5	76.5	96.2	

#### NOTES

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

##### EWAD-D-SR

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)									Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)	
180	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	88.7	
190	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	88.7	
220	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.3	
240	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.3	
250	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.3	
270	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.3	
280	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.3	
310	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.7	
370	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	92.2	
400	56.5	69.5	69.0	71.0	65.0	61.0	53.5	43.5	71.0	90.7	
440	56.5	69.5	69.0	71.0	65.0	61.0	53.5	43.5	71.0	90.7	
480	56.5	69.5	69.0	71.0	65.0	61.0	53.5	43.5	71.0	90.7	
510	58.0	71.0	70.5	72.5	66.5	62.5	55.0	45.0	72.5	92.2	
530	58.5	71.5	71.0	73.0	67.0	63.0	55.5	45.5	73.0	92.7	

#### NOTES

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

## 8 Sound data

### 8 - 1 Sound Level Data

**Sound pressure reduction values for different distances**

**EWAD-D-SS**

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
390	0.0	-8.1	-13.0	-16.1	-18.3	-20.2	-25.9
440	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
470	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
510	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
530	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
560	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
580	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4

**NOTES**

Values are dB(A) (pressure level)

**EWAD-D-SL**

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
180	0.0	-8.3	-13.3	-16.4	-18.7	-20.5	-26.3
200	0.0	-8.3	-13.3	-16.4	-18.7	-20.5	-26.3
230	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
250	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
260	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
280	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
300	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
320	0.0	-8.1	-13.0	-16.1	-18.3	-20.2	-25.9
370	0.0	-8.1	-13.0	-16.1	-18.3	-20.2	-25.9
400	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
440	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
480	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
510	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
530	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4

**NOTES**

Values are dB(A) (pressure level)

**EWAD-D-SR**

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
180	0.0	-8.3	-13.3	-16.4	-18.7	-20.5	-26.3
190	0.0	-8.3	-13.3	-16.4	-18.7	-20.5	-26.3
220	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
240	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
250	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
270	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
280	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
310	0.0	-8.1	-13.0	-16.1	-18.3	-20.2	-25.9
370	0.0	-8.1	-13.0	-16.1	-18.3	-20.2	-25.9
400	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
440	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
480	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
510	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
530	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4

**NOTES**

Values are dB(A) (pressure level)

## 9 Installation

### 9 - 1 Installation Method

#### Installation notes

##### Warning

Installation and maintenance of the unit must be performed only by qualified personnel who have knowledge with local codes and regulations, and experience with this type of equipment. The unit must be installed to allow all the maintenance operations.

##### Handling

Care should be taken to avoid rough handling or shock due to dropping of 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 result in reductions in unit efficiency and capacity.

Moreover the unique microprocessor has the ability to analyse the operating environment of the air cooled chiller and to optimize its performance to stay 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.3). 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 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.4); 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 for general installation. A specific evaluation should be done by contractor depending on the case.

Minimum recommended installation clearances

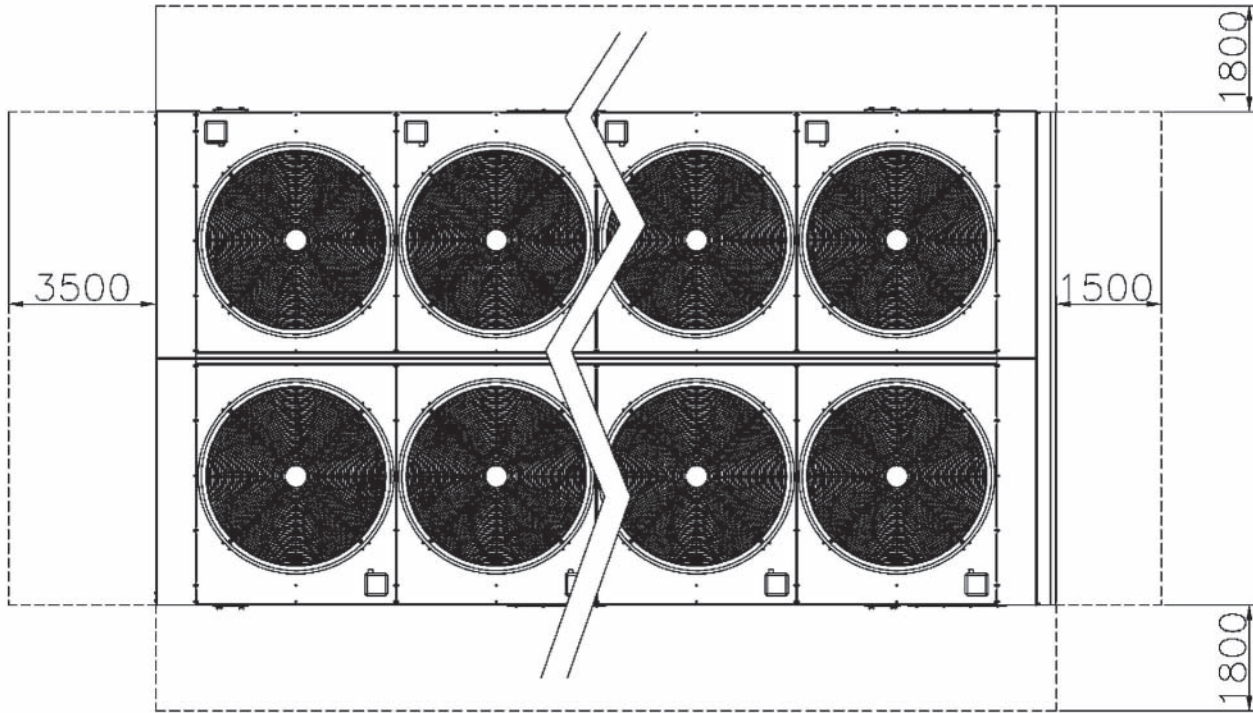


Fig. 1

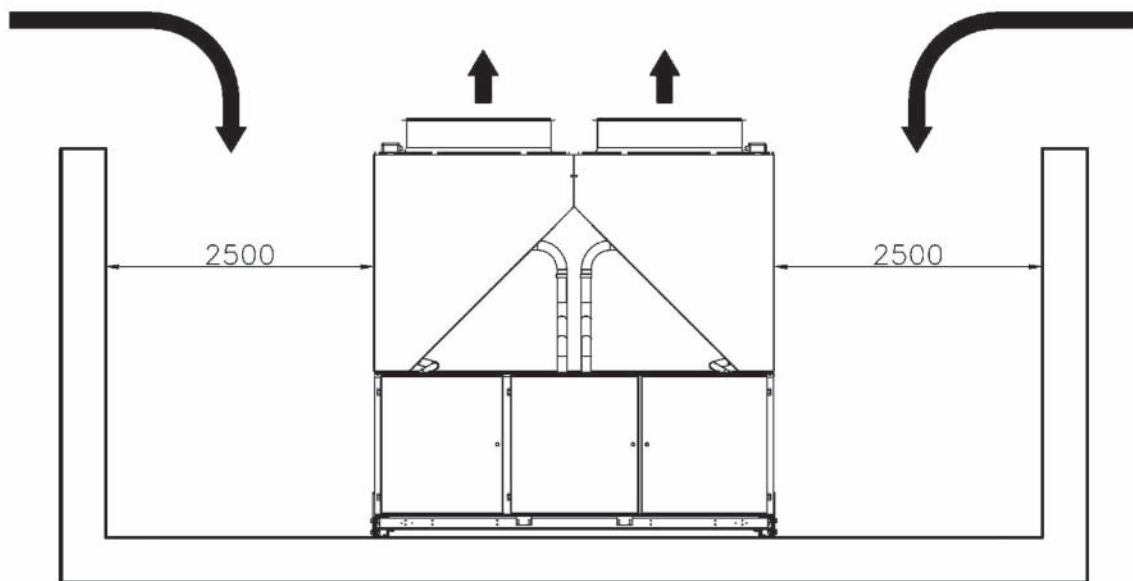


Fig. 2

## 9 Installation

### 9 - 1 Installation Method

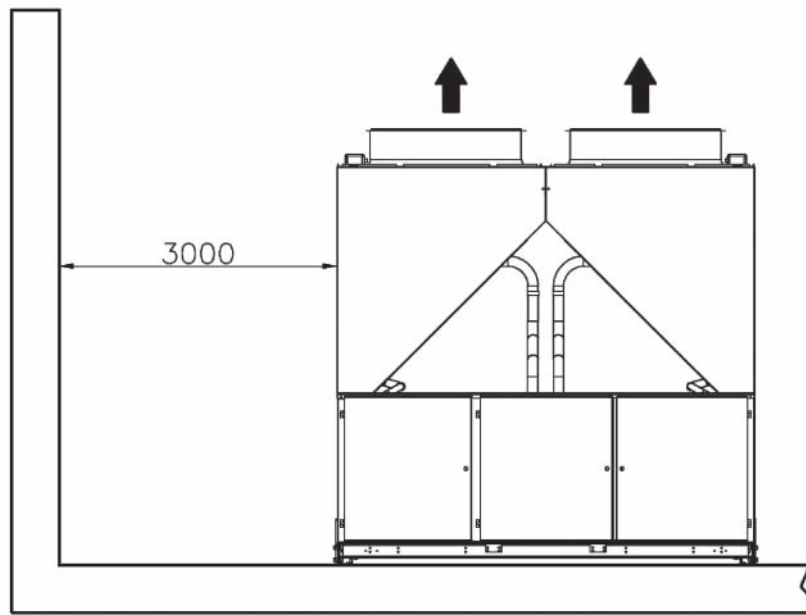


Fig. 3

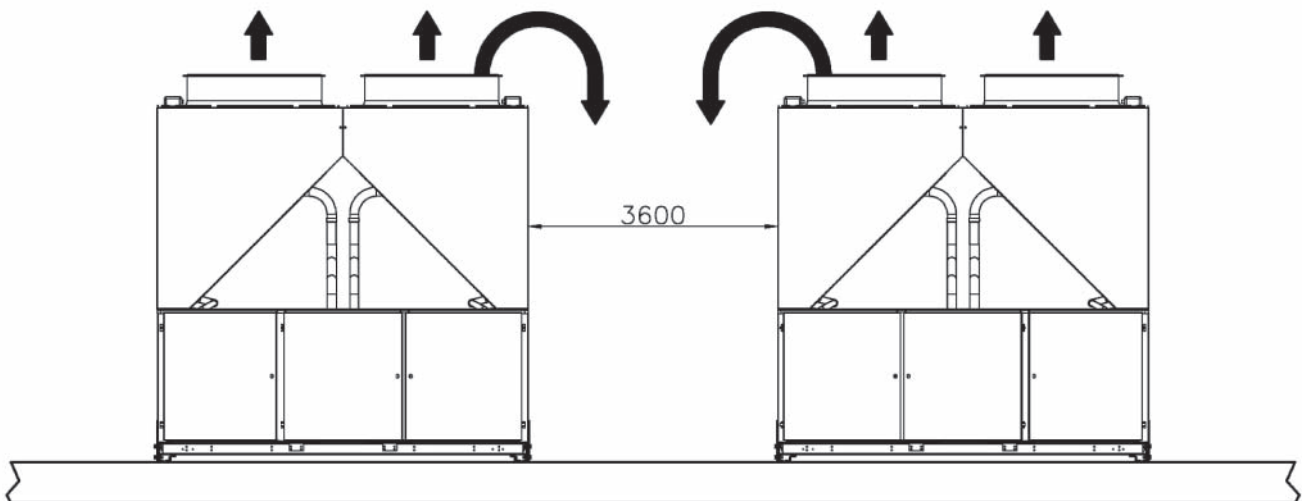


Fig. 4

#### 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

# 10 Operation range

## 10 - 1 Operation Range

**Table 1 - Evaporator minimum and maximum water Δt**

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

**Table 2 - Evaporator fouling factors**

Fouling factors m <sup>2</sup> °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 - Air heat exchanger - 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 operating altitude is 2000 m above sea level.
- Contact factory in case the unit has to be installed at altitudes between 1000 and 2000 m above sea level.

**Table 4.1 - Minimum glycol percentage for low water temperature**

EWLT (°C)	2	0	-2	-4	-6	-8	-10	-12	-15
Ethylene glycol (%)	10	20	20	20	30	30	30	40	40
Propylene glycol (%)	10	20	20	30	30	30	40	40	40

- ELWT (Evaporator Leaving Water Temperature (°C)).
- 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 ambient temperature**

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

- Minimum glycol percentage to prevent freezing of water circuit at indicated air ambient temperature.
- 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 (EWLT < 4°C)**

EWLT (°C)	-4	-6	-8	-10	-12	-15
Cooling Capacity	0.670	0.613	0.562	0.510	0.455	0.375
Compressor Power Input	0.890	0.870	0.840	0.798	0.755	0.680

- ELWT (Evaporator Leaving Water Temperature (°C)).
- 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

- Contact factory for water temperature out of operating limits.

## 10 Operation range

### 10 - 1 Operation Range

2  
10

#### 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: **EWAD390D-SS**

Mixture: Water  
 Working condition: ELWT 12/7°C – Condenser inlet air temperature 35°C  
 - Cooling capacity: 389 kW  
 - Power input: 152 kW  
 - Flow rate ( $\Delta t$  5°C): 18.60 l/s  
 - Evaporator pressure drop: 46 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:  $389 \times 0.972 = 378$  kW  
 - Power input:  $152 \times 0.986 = 150$  kW  
 - Flow rate ( $\Delta t$  5°C):  $18$  (referred to 378 kW)  $\times 1.074 = 19.33$  l/s  
 - Evaporator pressure drop:  $49$  (refererd to 19.33 l/s)  $\times 1.181 = 58$  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: **EWAD390D-SS**

Mixture: Water  
 Standard working condition ELWT 12/7°C – Condenser inlet air temperature 30°C  
 - Cooling capacity: 412 kW  
 - Power input: 139 kW  
 - Flow rate ( $\Delta t$  5°C): 19.7 l/s  
 - Evaporator pressure drop: 51 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:  $412 \times 0.613 \times 0.972 = 245$  kW  
 - Power input:  $139 \times 0.870 \times 0.986 = 119$  kW  
 - Flow rate ( $\Delta t$  5°C):  $11.71$  l/s (referred to 245 kW)  $\times 1.074 = 12.58$  l/s  
 - Evaporator pressure drop:  $23$  kPa (referred to 12.58 l/s)  $\times 1.181 = 27$  kPa

# 10 Operation range

## 10 - 1 Operation Range

Table 7.1 - 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

ESP table refers to fan diameter Ø800, available on units as follows:

EWAD390~580D-SS  
EWAD470~620D-XS  
EWAD420~590D-HS

Table 7.2 - Available fan static pressure correction factors

"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

ESP table refers to fan diameter Ø800, available on units as follows:

EWAD320~530D-SL/SR  
EWAD460~600D-XR

### How to use the Correction factors proposed in the previous tables

#### Example

Unit Size: **EWAD390D-SS**

- External static pressure **0 Pa**
- Working condition: ELWT 12/7°C – Condenser inlet air temperature 35°C
- Cooling capacity: 389 kW
- Power input: 152 kW
- Maximum CIAT 48°C (see graphic operating limit)

- External static pressure **40 Pa**
- Working condition: ELWT 12/7°C – Condenser inlet air temperature 35°C
- Cooling capacity:  $389 \times 0.993 = 386 \text{ kW}$
- Power input:  $152 \times 1.018 = 155 \text{ kW}$
- Maximum CIAT  $48 - 1.0 = 47^\circ\text{C}$

# 10 Operation range

## 10 - 1 Operation Range

### Water charge, flow and quality

Items <sup>(1)(5)</sup>	Cooling Water					Cooled Water		Heated water <sup>(2)</sup>				Tendency if out of criteria	
	Circulating System		Once Flow					Low temperature		High temperature			
	Circulating water	Supply water <sup>(4)</sup>	Flowing water	Circulating water [Below 20°C]	Supply water <sup>(4)</sup>	Circulating water [20°C ~ 60°C]	Supply water <sup>(4)</sup>	Circulating water [60°C ~ 80°C]	Supply water <sup>(4)</sup>				
Items to be controlled:	pH	at 25°C	6.5 ~ 8.2	6.0 ~ 8.0	6.0 ~ 8.0	6.0 ~ 8.0	6.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	Corrosion + Scale	
	Electrical conductivity	[mS/m] at 25°C	Below 80	Below 30	Below 40	Below 40	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Corrosion + Scale
		[µS/cm] at 25°C	(Below 800)	(Below 300)	(Below 400)	(Below 400)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	Corrosion + Scale
	Chloride ion	[mgCl <sup>-</sup> /l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	Sulfate ion	[mgSO <sub>4</sub> <sup>2-</sup> /l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	M-alkalinity (pH4.8)	[mgCaCO <sub>3</sub> /l]	Below 100	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Total hardness	[mgCaCO <sub>3</sub> /l]	Below 200	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Scale
	Calcium hardness	[mgCaCO <sub>3</sub> /l]	Below 150	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
Silica ion	[mgSiO <sub>2</sub> /l]	Below 50	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Scale	
Items to be referred to	Iron	[mgFe/l]	Below 1.0	Below 0.3	Below 1.0	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Below 1.0	Below 0.3	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	Below 0.1	Corrosion
	Sulfite ion	[mgS <sup>2-</sup> /l]	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Corrosion
	Ammonium ion	[mgNH <sub>4</sub> <sup>+</sup> /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	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	Below 0.3	Corrosion
	Free carbide	[mgCO <sub>2</sub> /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	Below 4.0	Corrosion
	Stability index		6.0 ~ 7.0	---	---	---	---	---	---	---	---	---	Corrosion + Scale

### NOTES

- Names, definitions and units are according to JIS K 0101. Units and figures between brackets are old units published as reference only.
- 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 desirable to give the valid measure for corrosion. E.g. chemical measure.
- 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.
- Supply water is considered drink water, industrial water and ground water except for genuine water, neutral water and soft water.
- The above mentioned items are representable items in corrosion and scale cases.

OPL\_1-2-3-4-5-6\_Rev.00\_4

## 10 Operation range

### 10 - 1 Operation Range

#### 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

$$M \text{ (liters)} = ( 0.1595 \times \Delta T(^{\circ}\text{C}) + 3.0825 ) \times P \text{ (kW)}$$

where:

- M minimum water content per unit expressed in litres
- P Cooling Capacity of the unit expressed in kW
- $\Delta T$  evaporator entering / leaving water temperature difference expressed in  $^{\circ}\text{C}$

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.

## 10 Operation range

### 10 - 1 Operation Range

2  
10

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This formula is valid for:

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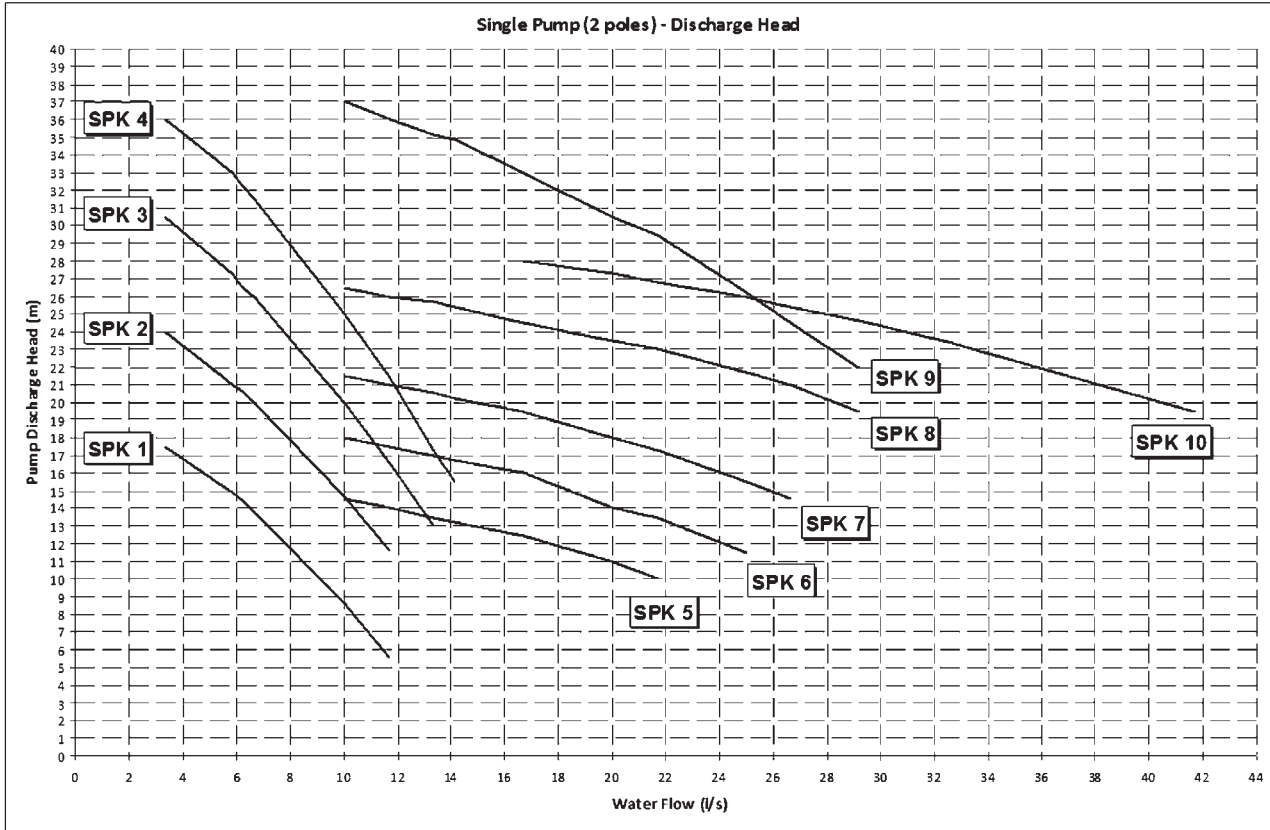
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# 11 Hydraulic performance

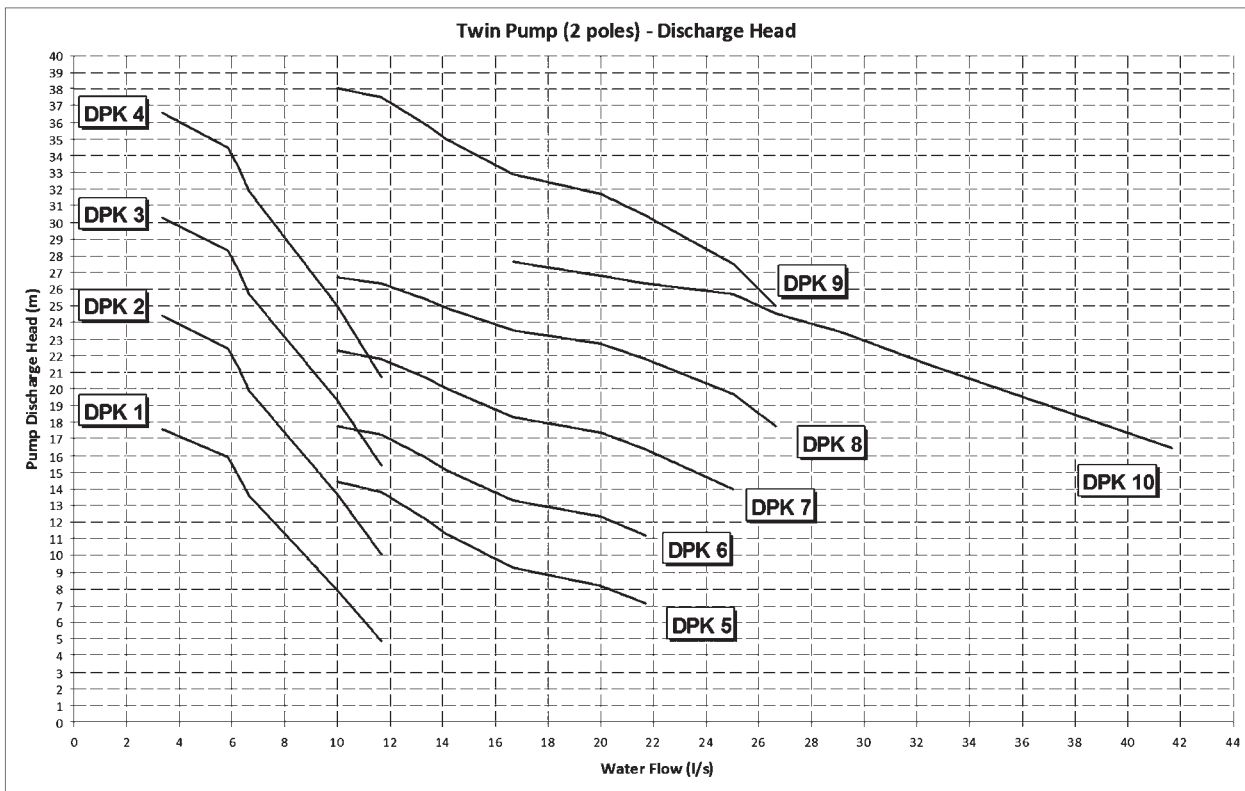
## 11 - 1 Pump Characteristics

Water Pump Kit - Available External Static Pressure



OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_6 (1/2)

Water Pump Kit - Available External Static Pressure



OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_6 (2/2)

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

2  
11

Water Pump Kit - Combination Matrix

Version	Size	Single Pump										
		SPK 1	SPK 2	SPK 3	SPK 4	SPK 5	SPK 6	SPK 7	SPK 8	SPK 9	SPK 10	
EWAD-D-SS	390						X	X	X	X	X	
	440						X	X	X	X	X	
	470						X	X	X	X	X	
	510						X	X	X	X	X	
	530							X	X	X	X	
	560							X	X	X	X	
	580							X	X	X	X	
	580								X	X	X	
EWAD-D-SL	180	X	X	X	X							
	200	X	X	X	X							
	230		X	X	X							
	250		X	X	X							
	260			X	X							
	280				X	X						
	300			X	X	X						
	320					X	X			X		
	370					X	X	X	X	X	X	
	400					X	X	X	X	X	X	
	440						X	X	X	X	X	
	480						X	X	X	X	X	
	510						X	X	X	X	X	
	530							X	X	X	X	
	EWAD-D-SR	180	X	X	X	X						
190		X	X	X	X							
220			X	X	X		X	X	X	X		
240			X	X	X		X	X	X	X		
250				X	X		X	X	X	X		
270				X	X		X	X	X	X		
280				X	X		X	X	X	X		
310					X		X	X	X	X		
370					X	X	X	X	X	X	X	
400					X	X	X	X	X	X	X	
440						X	X	X	X	X	X	
480						X	X	X	X	X	X	
510						X	X	X	X	X	X	
530							X	X	X	X	X	
EWAD-D-SX		210		X	X	X						
	230		X	X	X	X	X	X	X			
	250		X	X	X	X	X	X	X			
	270			X	X	X	X	X	X			
	290				X	X	X	X	X			
	300				X	X	X	X	X			
	310				X	X	X	X	X			
	370				X	X	X	X	X		X	
	410				X	X	X	X	X		X	
	450				X	X	X	X	X		X	
	490				X	X	X	X	X		X	
	250			X	X	X	X	X	X			
	280			X	X	X	X	X	X			
	300				X	X	X	X	X			
	330				X	X	X	X	X			
350				X	X	X	X	X		X		
380				X	X	X	X	X		X		
400				X	X	X	X	X		X		
470					X	X	X	X		X		
520					X	X	X	X		X		
580							X	X		X		
620								X		X		
EWAD-D-XR	240		X	X	X	X	X	X	X			
	270			X	X	X	X	X	X			
	300				X	X	X	X	X			
	320				X	X	X	X	X			
	350				X	X	X	X	X			
	370				X	X	X	X	X			
	390				X	X	X	X	X		X	
	460					X	X	X	X		X	
	510					X	X	X	X		X	
	560							X	X		X	
	600								X		X	
	EWAD-D-HS	200		X	X	X						
		210		X	X	X						
		230		X	X	X	X	X	X	X		
		260			X	X	X	X	X	X		
270				X	X	X	X	X	X			
290					X	X	X	X	X			
310					X	X	X	X	X			
340					X	X	X	X	X			
360					X	X	X	X	X		X	
420					X	X	X	X	X		X	
450						X	X	X	X		X	
480						X	X	X	X		X	
510						X	X	X	X		X	
550							X	X	X		X	
590								X	X		X	

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

Water Pump Kit - Combination Matrix

Version	Size	Double Pump									
		DPK 1	DPK 2	DPK 3	DPK 4	DPK 5	DPK 6	DPK 7	DPK 8	DPK 9	DPK 10
EWAD-D-SS	390						X	X	X	X	X
	440						X	X	X	X	X
	470							X	X	X	X
	510							X	X	X	X
	530								X	X	X
	560								X	X	X
	580									X	X
EWAD-D-SL	180	X	X	X	X						
	200	X	X	X	X						
	230		X	X	X						
	250		X	X	X						
	260										
	280						X	X	X	X	
	300					X	X	X	X	X	
	320						X	X	X	X	
	370						X	X	X	X	X
	400						X	X	X	X	X
	440						X	X	X	X	X
	480							X	X	X	X
	510							X	X	X	X
530								X	X	X	
EWAD-D-SR	180	X	X	X	X						
	190	X	X	X	X						
	220		X	X	X					X	
	240		X	X	X					X	
	250						X	X	X	X	
	270						X	X	X	X	
	280						X	X	X	X	
	310						X	X	X	X	
	370						X	X	X	X	X
	400						X	X	X	X	X
	440						X	X	X	X	X
	480							X	X	X	X
	510							X	X	X	X
530								X	X	X	
EWAD-D-SX	210		X	X	X						
	230		X	X	X	X	X	X	X		
	250		X	X	X	X	X	X	X		
	270			X	X	X	X	X	X		
	290				X	X	X	X	X		
	300				X	X	X	X	X		
	310				X	X	X	X	X		
	370				X	X	X	X	X		X
	410				X	X	X	X	X		X
	450				X	X	X	X	X		X
	490					X	X	X	X		X
	250					X	X	X	X		
	280				X	X	X	X	X		
300				X	X	X	X	X			
330				X	X	X	X	X			
350					X	X	X	X		X	
380						X	X	X		X	
400						X	X	X		X	
470							X	X		X	
520							X	X		X	
580								X		X	
620										X	
EWAD-D-XR	240		X	X	X		X	X	X	X	
	270					X	X	X	X	X	
	300					X	X	X	X	X	
	320					X	X	X	X	X	
	350						X	X	X	X	
	370						X	X	X	X	
	390						X	X	X	X	X
	460							X	X	X	X
	510							X	X	X	X
	560								X		X
EWAD-D-HS	200	X	X	X	X						
	210	X	X	X	X						
	230		X	X	X						
	260						X	X	X	X	
	270						X	X	X	X	
	290					X	X	X	X	X	
	310						X	X	X	X	
	340						X	X	X	X	
	380						X	X	X	X	X
	420						X	X	X	X	X
	450						X	X	X	X	X
	480							X	X	X	X
	510							X	X	X	X
550								X	X	X	
590									X	X	

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

2  
11

### 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	1.5	3.5	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 2	2.2	5.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 3	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 4	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 5	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 6	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 7	5.5	10.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 8	7.5	13.7	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 9	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 10	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
Double Pump	DPK 1	1.5	3.5	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 2	2.2	5.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 3	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 4	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 5	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 6	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 7	5.5	10.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 8	7.5	13.7	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 9	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 10	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130

#### NOTES

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

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_7

# 11 Hydraulic performance

## 11 - 2 Total and Partial Heat Recovery Pressure Drop

### Total and Partial Heat Recovery Pressure Drops

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

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

where:

- PD<sub>2</sub> Pressure drop to be determinate (kPa)
- PD<sub>1</sub> Pressure drop at nominal condition (kPa)
- Q<sub>2</sub> water flow at new working condition (l/s)
- Q<sub>1</sub> water flow at nominal condition (l/s)

### How to use the formula: Example

The unit EWAD390D-SS has been selected for working at the following conditions:

- Total heat recovery leaving water temperature 40/50°C
- The heating capacity at these working conditions is: 415 kW
- The water flow at these working conditions is: 9.91 l/s

The unit EWAD390D-SS at nominal working conditions has the following data:

- Total heat recovery leaving water temperature 40/45°C
- condenser air inlet: 35°C
- The heating capacity at these working conditions is: 427 kW
- The water flow at these working conditions is: 20.41 l/s
- The pressure drop at these working conditions is: 37 kPa

The pressure drop at the selected working condition will be:

$$PD_2 \text{ (kPa)} = 37 \text{ (kPa)} \times \left( \frac{9.91 \text{ (l/s)}}{20.41 \text{ (l/s)}} \right)^{1.80}$$

$$PD_2 \text{ (kPa)} = 10 \text{ (kPa)}$$

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_5

### Partial Total Heat Recovery pressure drops

EWAD-D-SS	390	440	470	510	530	560	580
Heating Capacity (kW)	427	473	515	555	592	552	488
Water Flow (l/s)	20.41	22.59	24.61	26.52	28.28	26.36	23.33
Heat Recovery Pressure Drops (kPa)	37	13	15	17	19	14	11

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – saturated discharge temperature 45°C – water heat recovery in/out 40/45°C

EWAD-D-SL	180	200	230	250	260	280	300	320	370	400	440	480	510	530
EWAD-D-SR	180	190	220	240	250	270	280	310	370	400	440	480	510	530
Heating Capacity (kW)	207	216	243	265	289	306	333	314	314	473	515	555	592	552
Water Flow (l/s)	9.89	10.34	11.59	12.68	13.82	14.63	15.91	15.00	14.98	22.59	24.61	26.52	28.28	26.36
Heat Recovery Pressure Drops (kPa)	23	25	28	28	31	31	35	26	23	13	15	17	19	14

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – saturated discharge temperature 45°C – water heat recovery in/out 40/45°C

EWAD-D-SX	210	230	250	270	290	300	310	370	410	450	490
Heating Capacity (kW)	216	243	265	289	306	333	314	427	473	515	555
Water Flow (l/s)	10.34	11.59	12.68	13.82	14.63	15.91	15.00	20.41	22.59	24.61	26.52
Heat Recovery Pressure Drops (kPa)	25	28	28	31	31	35	26	37	13	15	17

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – saturated discharge temperature 45°C – water heat recovery in/out 40/45°C

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_3 (1/3)

# 11 Hydraulic performance

## 11 - 2 Total and Partial Heat Recovery Pressure Drop

### Partial Heat Recovery pressure drops

EWAD-D-SS	390	440	470	510	530	560	580
Heating Capacity (kW)	173	191	207	223	238	216	191
Water Flow (l/s)	8.25	9.12	9.90	10.67	11.38	10.30	9.11
Heat Recovery Pressure Drops (kPa)	7	2	3	3	3	2	2

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser air inlet 35°C – water heat recovery in/out 50/60°C

EWAD-D-SL	180	200	230	250	260	280	300	320	370	400	440	480	510	530
EWAD-D-SR	180	190	220	240	250	270	280	310	370	400	440	480	510	530
Heating Capacity (kW)	84	87	98	107	116	123	134	123	122	191	207	223	238	216
Water Flow (l/s)	4.00	4.17	4.67	5.11	5.55	5.88	6.40	5.86	5.84	9.12	9.90	10.67	11.38	10.30
Heat Recovery Pressure Drops (kPa)	4	5	5	6	6	6	7	5	4	2	3	3	3	2

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser air inlet 35°C – water heat recovery in/out 50/60°C

EWAD-D-SX	210	230	250	270	290	300	310	370	410	450	490
Heating Capacity (kW)	87	98	107	116	123	134	123	173	191	207	223
Water Flow (l/s)	4.17	4.67	5.11	5.55	5.88	6.40	5.86	8.25	9.12	9.90	10.67
Heat Recovery Pressure Drops (kPa)	5	5	6	6	6	7	5	7	2	3	3

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser air inlet 35°C – water heat recovery in/out 50/60°C

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_4 (1/3)

# 12 Specification text

## 12 - 1 Specification Text

### Technical Specification for Water Cooled Screw Chiller

#### GENERAL

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

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

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 air cooled screw chiller(s) : ..... unit(s)
- ✓ Cooling capacity for single air cooled screw chiller : ..... kW
- ✓ Power input for single air cooled screw 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 independent refrigerant circuits, semi-hermetic type rotary single screw compressor, electronic expansion device (EEXV), refrigerant ‘plate to plate’ or ‘shell&tube’ heat exchanger (depending on the size), air-cooled condenser section, R-134a refrigerant, lubrication system, motor starting components, discharge line shut-off valve, suction 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.

#### NOISE LEVEL AND VIBRATIONS

Sound pressure level at 1 meter distance in free field, semispheric conditions, shall not exceed .....dB(A). The sound pressure levels must be rated in accordance to ISO 3744 (other types of rating can not be used).

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

## 12 Specification text

### 12 - 1 Specification Text

2  
12

#### DIMENSIONS

Unit dimensions shall not exceed following indications:

- Unit length ..... mm
- Unit width ..... mm
- Unit height ..... mm

#### CHILLER COMPONENTS

##### Compressors

- ✓ The compressor is semi-hermetic, single-screw type with gate-rotors made of carbon impregnated engineered composite material or the latest high-strength fibre reinforced star material (depending on the size). The gaterotor supports will be constructed of cast iron.
- ✓ The oil injection shall be used in order to get high EER (Energy Efficiency Ratio) also at high condensing pressure and low sound pressure levels in each load condition.
- ✓ 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 slide valve position.
- ✓ The unit capacity control shall be infinitely modulating, from 100% down to 25% for each circuit. The chiller shall be capable of stable operation to a minimum of 12.5% 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.
- ✓ The unit control logic shall manage the compressor slides to exactly match the plant load request in order to keep constant the set point for delivered chilled water temperature.
- ✓ 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:
  - High condenser pressure
  - Low evaporating refrigerant temperature

##### Evaporator

- ✓ The units shall be equipped (depending on the size) with a 'plate to plate' or 'shell&tube' evaporator:
  - The 'plate to plate' evaporator is made of stainless steel brazed plates and is covered with a 20mm closed cell insulation material. The exchanger is equipped with a heater for protection against freezing down to -28°C and evaporator water outlet connections of 3". Each evaporator has 1 circuit (one compressor) and the water filter is standard.
  - The 'shell&tube' evaporator is made with copper tubes rolled into steel tubesheets. The evaporators are single-pass on both the refrigerant and water sides for pure counter-flow heat exchange and low refrigerant pressure drops. The external shell is covered with a 10mm closed cell insulation material and the evaporator water outlet connections are provided with victaulic kit (as standard). Each evaporator has 2 circuits, one for each compressor and the water filter is standard.
- ✓ The evaporator is manufactured in accordance to PED approval.



## 12 Specification text

### 12 - 1 Specification Text

#### 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 breaker installed inside the electrical panel as a standard.

#### Refrigerant circuit

- ✓ The unit shall have two independent refrigerant circuits.
- ✓ Each circuit shall include as standard: electronic expansion device piloted by unit's microprocessor control, compressor discharge shut-off valve, suction 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:
  - in-line single pump low and high lifting
  - in-line twin pumps low and high lifting

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

### **Optional High Level Communications Interface**

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

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# 1 Features

- Standard efficiency version
- Reduced sound level configuration: condenser fan rotating at 680 rpm (EWAD180-370D-SR) and 705 rpm (EWAD400-530D-SR), rubber antivibration under compressor, compressor sound enclosure.
- Stepless single-screw compressor
- Optimised for use with R-134a
- MicroTech III controller
- Large operation range (ambient temperature down to -18°C)



3

1

## 2 Features and advantages

### Features and advantages

#### Low operating cost

This chiller range is the result of careful design, aimed to optimize the energy efficiency of the chillers, with the objective of bringing down operating costs and improving installation profitability, effectiveness and economical management.

The chillers feature a high efficiency single rotor screw compressor design, large condenser coil surface area for maximum heat transfer and low discharge pressure, advanced technology condenser fans and a 'plate to plate' or 'shell&tube' evaporator with low refrigerant pressure drops.

#### Low operating sound levels

Very low sound levels both at full load and part load conditions are achieved by the latest compressor design and by a unique new fan that moves large volume of air at exceptionally low sound levels and by the virtually vibration-free operation.

#### Excellent serviceability

Field serviceability has not been sacrificed to meet design performance objectives. The compressor is equipped with discharge, liquid and suction shut off valves. The compressor and serviceable components such as filter-driers are located on the outside edges of the base allowing, together with the shape of the coil, an easy access for inspection and service. Moreover, the MicroTech III controller gives detailed information on the causes of an alarm or fault.

#### Proven reliability

Full factory testing of every unit with water hook-up helps in providing a trouble-free start-up. Extensive quality control checks during testing means that each equipment protection and operating control is properly adjusted and operates correctly before it leaves the factory.

#### Infinite capacity control

Cooling capacity control is infinitely variable by means of a single screw compressor controlled by microprocessor system. Each unit has infinitely variable capacity control from 100% down to 12.5%. This modulation allows the compressor capacity to exactly match the building cooling load. Chilled water temperature fluctuation is avoided only with a stepless control.

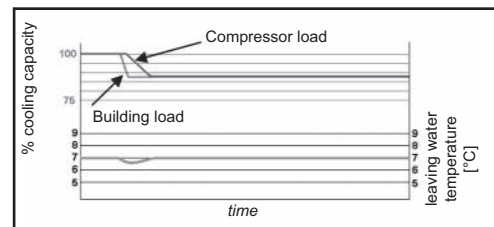
In the case that the compressor with load step control is used, the compressor capacity, at partial loads, will be too high or too low compared to the building cooling load. The result is an increase in chiller energy costs, particularly at the part-load conditions at which the chiller operates most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

Units with stepless regulation offer benefits that the units with step regulation are unable to match.

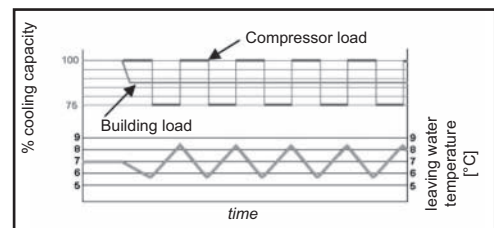
Only a chiller with step-less regulation, is able to follow the system cooling demand at any time and to deliver chilled water at set-point.

#### Superior control logic

The new MicroTech III controller provides an easy to use control environmental. The control logic is designed to provide maximum efficiency and a history of unit operation. One of the greatest benefits is the easy interface with LonWorks, Bacnet, Ethernet TCP/IP or Modbus communications.



ELWT fluctuation with stepless capacity control



ELWT fluctuation with steps capacity control (4 steps)

## 2 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 Stds	UNI – EN ISO 9001:2004

### Certifications

All units manufactured by Daikin 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 for other applications, such as naval (RINA, etc.).

### Efficiency and sound configuration

The range is available in multiple efficiency and sound versions:

Efficiency level	Sound level			
	Standard	Low	Reduced	Extra low
Standard efficiency	EWAD~D-SS	EWAD~D-SL	EWAD~D-SR	EWAD~D-SX
High efficiency	EWAD~D-XS	N.A.	EWAD~D-XR	N.A.
High ambient	EWAD~D-HS	N.A.	N.A.	N.A.

### Versions

The range is available in three versions:

#### S: Standard efficiency

7 sizes to cover a range from 389 up to 578 kW with an EER up to 2.03 and an ESEER up to 3.56 (data refers to Standard sound configuration)

#### X: High efficiency

11 sizes to cover a range from 247 up to 622 kW with an EER up to 3.20 and an ESEER up to 4.01 (data refers to Standard sound configuration)

#### H: High ambient temperature

15 sizes to cover a range from 195 up to 587 kW with an EER up to 3.07 and an ESEER up to 3.79 (data refers to Standard sound configuration)

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 weighted formula enabling to take into account the variation of EER with the load rate and the variation of air inlet condenser temperature.

$$\text{ESEER} = (A \times \text{EER}100\%) + (B \times \text{EER}75\%) + (C \times \text{EER}50\%) + (D \times \text{EER}25\%)$$

	A	B	C	D
Coefficient	0.03 (3%)	0.33 (33%)	0.41 (41%)	0.23 (23%)
Air inlet condenser temperature	35°C	30°C	25°C	20°C

FTA\_1-2-3a\_Rev.01\_2

## 2 Features and advantages

### Sound levels

The range is available in four different sound level configurations:

**S:** Standard sound

Condenser fan rotating at 890 rpm, rubber antivibration under compressor

**L:** Low sound

Condenser fan rotating at 900 rpm (EWAD180-370D-SL) and 705 rpm (EWAD400-530D-SL), rubber antivibration under compressor.

**R:** Reduced sound

Condenser fan rotating at 680 rpm (EWAD180-370D-SR) and 705 rpm (EWAD400-530D-SR), rubber antivibration under compressor, compressor sound enclosure.

**X:** Extra low sound

Condenser fan rotating at 500 rpm, rubber antivibration under compressor, compressor and evaporator sound enclosure.

## 3 General characteristics

### General characteristics

#### Cabinet and structure

The cabinet is made of galvanized steel sheet and painted to provide a high resistance to corrosion. Colour Ivory White (Munsell code 5Y7.5/1) ( $\pm$ 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.

#### Screw compressors with integrated oil separator

The range features two types of single-screw compressors:

A) The compressor is semi-hermetic, single-screw type with gate-rotors made of carbon impregnated engineered composite material. The compressor has one slide managed by the unit microprocessor for infinitely modulating the capacity between 100% to 25%. An integrated high efficiency oil separator maximizes the oil separation and standard start is Wye-delta (Y- $\Delta$ ) type.

This compressor is offered on following models:

- EWAD180~370D-SL
- EWAD180~370D-SR
- EWAD210~310D-SX
- EWAD250~400D-XS
- EWAD240~390D-XR
- EWAD200~380D-HS

B) The compressor is semi-hermetic, single-screw type with gate-rotor made with the latest high-strength fibre reinforced star material. The compressor has an asymmetric slide regulation managed by the unit controller for infinitely modulating capacity from 100% to 25%. An integrated high efficiency oil separator maximizes the oil separation and standard start is Wye-delta (Y- $\Delta$ ) type.

This compressor is offered on following models:

- EWAD390~580D-SS
- EWAD400~530D-SL
- EWAD400~530D-SR
- EWAD370~490D-SX
- EWAD470~620D-XS
- EWAD460~600D-XR
- EWAD420~590D-HS

#### 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

For size EWAD180~200D-SL, EWAD180~190D-SR and EWAD200~210D-HS

The units are equipped with a direct expansion plate to plate type evaporator. This heat exchanger is made of stainless steel brazed plates and is covered with a 20mm closed cell insulation material. The exchanger is equipped with a heater for protection against freezing down to  $-28^{\circ}\text{C}$  and evaporator water outlet connections of 3". Each evaporator has 2 circuits, one for each compressor and is manufactured in accordance to PED approval. Water pressure differential switch on evaporator standard factory mounted. Water filter is standard.

All the other units are equipped with a Direct Expansion shell&tube evaporator with copper tubes rolled into steel tubesheets. The evaporators are single-pass on both the refrigerant and water sides for pure counter-flow heat exchange and low refrigerant pressure drops. Both attributes contribute to the heat exchanger effectiveness and total unit's outstanding efficiency.

The external shell is covered with a 10mm closed cell insulation material and the evaporator water outlet connections are provided with victaulic kit (as standard). Each evaporator has 2 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.

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### 3 General characteristics

#### Condenser coil fans

Fan 710 mm diameter

The condenser fans are propeller type with wing-profile blades for achieving better performance. Each fan is protected by a guard.

Fan 800 mm diameter

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  $\Delta P$  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 independent refrigerant circuits and each one includes:

- 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
- Sight glass with moisture indicator
- Filter drier
- Charging valves
- High pressure switch
- High and low pressure transducers

#### Electrical control panel

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

#### Power Section

The power section includes compressors fuses, 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.

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## 3 General characteristics

### Control section - main features

- Management of the compressor stepless capacity and fans modulation.
- Chiller enabled to work in partial failure condition.
- Full routine operation at condition of:
  - high ambient temperature value
  - high thermal load
  - high evaporator entering water temperature (start-up)
- Display of evaporator entering/leaving water temperature.
- Display of Outdoor Ambient Temperature.
- Display of condensing-evaporating temperature and pressure, suction and discharge superheat for each circuit.
- Leaving water evaporator temperature regulation (temperature tolerance = 0.1°C)
- Compressor and evaporator pumps hours counter.
- Display of Status Safety Devices.
- Number of starts and compressor working hours.
- Optimized management of compressor load.
- Fan management according to condensing pressure.
- Re-start in case of power failure (automatic / manual).
- Soft Load (optimized management of the compressor load during the start-up).
- Start at high evaporator water temperature.
- Return Reset (Set Point Reset based on return water temperature).
- OAT (Outside Ambient temperature) Reset.
- Set point Reset (optional).
- Application and system upgrade with commercial SD cards.
- Ethernet port for remote or local servicing using standard web browsers.
- Two different sets of default parameters could be stored for easy restore.

### Safety device / logic for each refrigerant circuit

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

### System security

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

### Regulation type

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

### 3 General characteristics

#### Condensing pressure

Condensing pressure can be controlled in according to the entering air temperature to the condenser coil. The fans can be managed either with steps, or with a 0/10V modulating signal or with a mixed 0/10V + Steps strategy to cover all possible operational conditions.

#### MicroTech III

MicroTech III built-in terminal has the following features:

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

#### Supervising systems (on request)

##### MicroTech III remote control

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

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

#### Standard options (supplied on basic unit)

**Evaporator victaulic kit** – Not available on units EWAD180~200D-SL, EWAD180~190D-SR and EWAD200~210D-HS

**Evaporator water design pressure (10Bar)**

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

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

**Wye-Delta Compressors starter (Y-Δ)** – For low inrush current and reduced starting torque.

**Double set-point** – Dual leaving water temperature set-points.

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

**Water pressure differential switch on evaporator** – Not available on units EWAD390~580D-SS, EWAD230~530D-SL, EWAD220~530D-SR, EWAD210~490D-SX, EWAD250~620D-XS, EWAD240~600D-XR, EWAD230~590D-HS

**Evaporator electric heater type** – 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 device**

**20 mm evaporator insulation** – Only for EWAD180~200D-SL, EWAD180~190D-SR, EWAD210D-SX and EWAD200~210D-HS

**Ambient outside temperature sensor and set-point reset**

**Hour run meter**

**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  $\Delta t$ .

**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 (pump etc...). User can decide if this alarm signal will stop the unit or not.

**Fans circuit breakers** – Safety device against motor overloading and short circuit

**Main switch interlock door**

### 3 General characteristics

#### Options (on request)

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

#### **Total heat recovery (1 circuit)**

**Partial heat recovery** – Plate to plate heat exchangers installed between the compressor discharge and the condenser coil, allowing producing hot water.

**Brine version** – Allows the unit to operate down to -15°C leaving liquid temperature (antifreeze required).

**Evaporator flanged connections** – Not available for EWAD180~200D-SL, EWAD180~190D-SR, EWAD210D-SX and EWAD200~210D-HS

#### **Condenser coil 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.

**Hydronic Kit (single water pump - low or high lifting)** – (N.A. on EWAD210~490D-SX) Hydronic kit consists of: single direct driven centrifugal pump, water filling system with pressure gauge, safety valve, drain valve. The pump motor 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 - low or high lifting)** – (N.A. on EWAD180~190D-SR and on EWAD210~490D-SX). 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**

**Soft starter** – Electronic starting device to reduce the mechanical stress during compressor start-up.

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

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

**Energy Meter** – This device allows to measure the energy absorbed by the chiller during its life. It is installed inside the control box mounted on a DIN rail and show on a digital display: Line-to-Line Voltage, Phase and Average Current, Active and Reactive Power, Active Energy, Frequency.

**Capacitors for power factor correction** – To increase the operating power factor of the unit at nominal operating conditions. The capacitors are “dry” self-regenerating type with over pressure disconnecting safety device insulated with a no toxic dielectric mix with no PCB or PCT.

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

#### **Fan silent mode**

**Speedtrol** – (N.A. on EWAD210~490D-SX) Continuous fan speed modulation on the first fan of each circuit. It allows the unit working with air temperature down to -18°C.

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

#### **High pressure side manometers (one per circuit)**

#### **Compressors circuit breakers**

**Fan speed regulation** – Standard option for EWAD~D-SX

To control the fan speed revolution for smooth operating control of the unit. During low ambient temperature operation, this option improves also the sound level of the unit. With “Fan speed regulation” option, by different microprocessor setting, it is also possible to set the “Fan Silent Mode” configuration. It means that the microprocessor clock switches the fan at low speed according to the client setting (i.e. Night & Day), providing that the ambient temperature/condensing pressure is allowing the speed change. It allows a perfect condensing control down to -10°C.

### 3 General characteristics

**Rubber type anti vibration mounts** – Supplied separately, these are positioned under the base of the unit during installation to reduce vibrations.

**Spring type anti vibration 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.

**External tank without cabinet (500 L / 1000 L)**

**External tank with cabinet (500 L / 1000 L)**

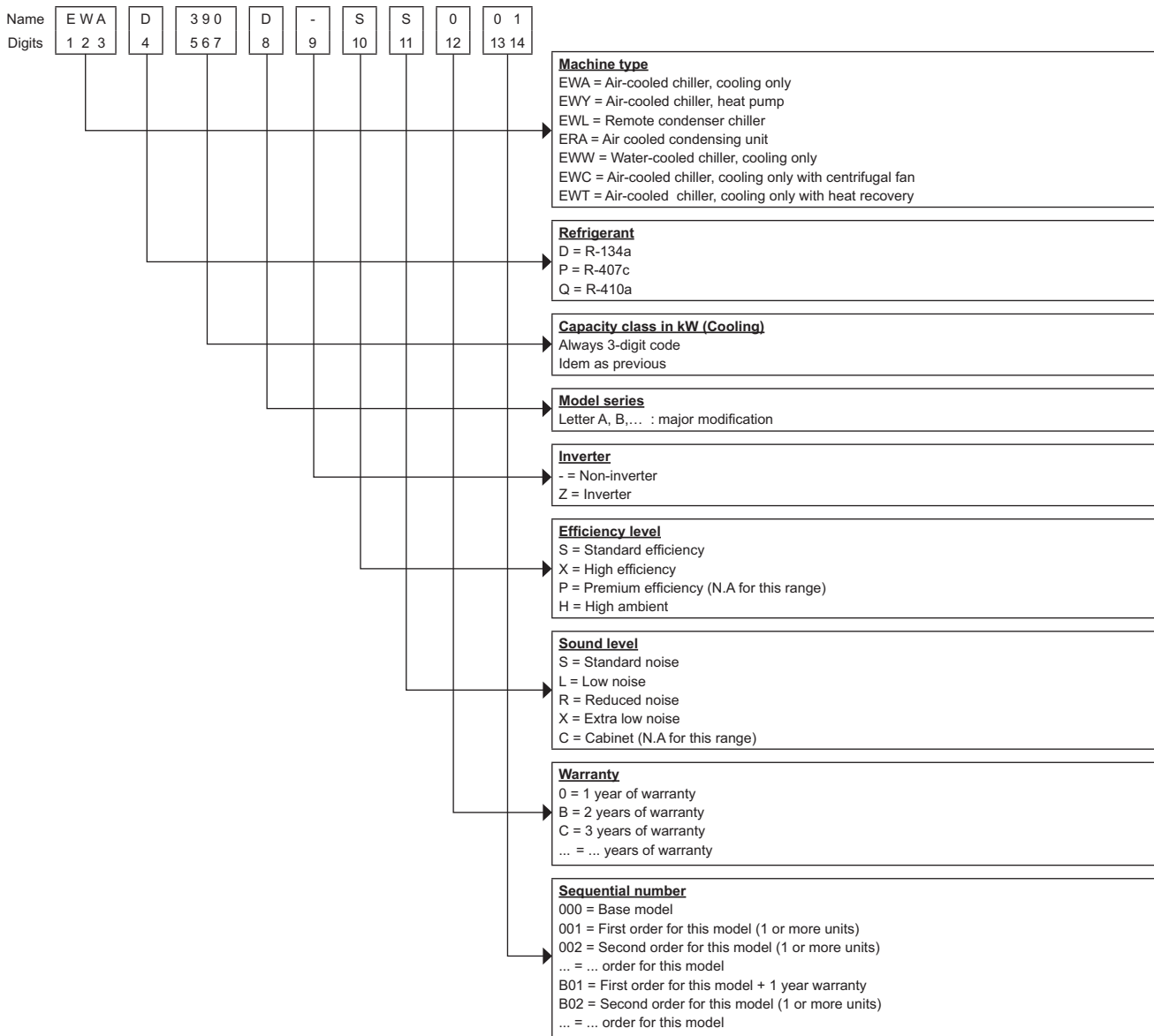
**Container kit**

**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 (please contact the factory) (This test is not available for units with glycol mixtures).

**Acoustic test** – On request, a test can be carried out, at customer's presence (please contact the factory) (This test is not available for units with glycol mixtures).

# 4 Nomenclature

## 4 - 1 Nomenclature



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## 5 Specifications

5-1 Technical Specifications				EWAD180D-SR	EWAD190D-SR	EWAD220D-SR	EWAD240D-SR	EWAD250D-SR	EWAD270D-SR	
Cooling capacity	Nom.		kW	177 (1)	190 (1)	219 (1)	238 (1)	252 (1)	265 (1)	
Capacity control	Method			Stepless						
	Minimum capacity		%	12.5						
Power input	Cooling	Nom.	kW	84.0 (1)	82.7 (1)	85.2 (1)	94.7 (1)	103 (1)	111 (1)	
EER				2.11 (1)	2.30 (1)	2.57 (1)	2.51 (1)	2.44 (1)	2.38 (1)	
ESEER				2.89	3.00	3.34	3.21	3.23	3.16	
IPLV				3.29	3.42	3.74	3.59		3.56	
Casing	Colour			Ivory white						
	Material			Galvanized and painted steel sheet						
Dimensions	Unit	Height	mm	2,355						
		Width	mm	2,234						
		Depth	mm	2,239			3,139			
Weight	Unit		kg	2,620			2,890			
	Operation weight		kg	2,650			3,100			
Water heat exchanger	Type			Plate to plate			Single pass shell & tube			
	Water volume		l	25	30	100				
	Nominal water flow	Cooling	l/s	8.50	9.10	10.40	11.30	12.00	12.60	
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	27	20	55	47	51	55
	Insulation material			Closed cell						
Air heat exchanger	Type			High efficiency fin and tube type with integral subcooler						
Fan	Quantity			4			6			
	Type			Direct propeller						
	Diameter		mm	710						
	Air flow rate	Nom.	l/s	12,389	11,928	18,583		18,237	17,892	
	Speed		rpm	680						
Fan motor	Drive			DOL						
	Input	Cooling	W	870						
Sound power level	Cooling	Nom.	dBA	88.7			89.3			
Sound pressure level	Cooling	Nom.	dBA	70.0						
Compressor	Type			Semi-hermetic single screw compressor						
	Quantity			2						
	Oil	Charged volume		l						
Operation range	Water side	Cooling	Min.	°CDB		-15				
			Max.	°CDB		15				
	Air side	Cooling	Min.	°CDB		-18				
			Max.	°CDB		48				
Refrigerant	Type			R-134a						
	Charge		kg	36	42	48	50	54	58	
	Circuits	Quantity		2						
Piping connections	Evaporator water inlet/outlet			88.9			114.3			
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	Water freeze protection controller							

# 5 Specifications

5-1 Technical Specifications					EWAD280D-SR	EWAD310D-SR	EWAD370D-SR	EWAD400D-SR	EWAD440D-SR	EWAD480D-SR
Cooling capacity	Nom.		kW	278 (1)	312 (1)	366 (1)	404 (1)	440 (1)	477 (1)	
Capacity control	Method		Stepless							
	Minimum capacity		%	12.5						
Power input	Cooling	Nom.	kW	122 (1)	125 (1)	138 (1)	169 (1)	170 (1)	186 (1)	
EER				2.28 (1)	2.49 (1)	2.65 (1)	2.39 (1)	2.59 (1)	2.57 (1)	
ESEER				3.13	3.25	3.42	3.65	3.67	3.57	
IPLV				3.53	3.70	3.88	3.90	4.05	3.93	
Casing	Colour		Ivory white							
	Material		Galvanized and painted steel sheet							
Dimensions	Unit	Height	mm	2,355			2,223			
		Width	mm	2,234						
		Depth	mm	3,139	4,040					
Weight	Unit		kg	2,890	3,335		4,040	4,240		
	Operation weight		kg	3,100	3,450		4,342	4,542		
Water heat exchanger	Type			Single pass shell & tube						
	Water volume		l	100	130		165	170		
	Nominal water flow	Cooling	l/s	13.30	14.90	17.40	19.30	21.00	22.80	
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	55	53	65	48	62	54
	Insulation material			Closed cell						
Air heat exchanger	Type			High efficiency fin and tube type with integral subcooler						
Fan	Quantity			6	8		6	8		
	Type			Direct propeller						
	Diameter		mm	710	800					
	Air flow rate	Nom.	l/s	17,892	24,777		24,432	33,494		
	Speed		rpm	680			705			
Fan motor	Drive			DOL						
	Input	Cooling	W	870			780			
Sound power level	Cooling	Nom.	dBA	89.3	89.7	92.2	90.7			
Sound pressure level	Cooling	Nom.	dBA	70.0		72.5	71.0			
Compressor	Type			Semi-hermetic single screw compressor						
	Quantity			2						
	Oil	Charged volume	l	26			32			
Operation range	Water side	Cooling	Min.	°CDB	-15					
			Max.	°CDB	15					
	Air side	Cooling	Min.	°CDB	-18					
			Max.	°CDB	48					
Refrigerant	Type			R-134a						
	Charge		kg	58		66	70	76	82	
	Circuits	Quantity		2						
Piping connections	Evaporator water inlet/outlet			114.3	139.7					
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	Water freeze protection controller							



## 5 Specifications

5-1 Technical Specifications					EWAD510D-SR		EWAD530D-SR		
Cooling capacity	Nom.		kW		505 (1)		533 (1)		
Capacity control	Method			Stepless					
	Minimum capacity		%	12.5					
Power input	Cooling	Nom.	kW	203 (1)		195 (1)			
EER				2.49 (1)		2.73 (1)			
ESEER				3.67		3.77			
IPLV				4.07		4.14			
Casing	Colour			Ivory white					
	Material			Galvanized and painted steel sheet					
Dimensions	Unit	Height	mm	2,223					
		Width	mm	2,234					
		Depth	mm	4,040					
Weight	Unit		kg	4,240					
	Operation weight		kg	4,542					
Water heat exchanger	Type			Single pass shell & tube					
	Water volume		l	165		160			
	Nominal water flow	Cooling	l/s	24.10		25.40			
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	48		43		
	Insulation material			Closed cell					
Air heat exchanger	Type			High efficiency fin and tube type with integral subcooler					
Fan	Quantity			8					
	Type			Direct propeller					
	Diameter		mm	800					
	Air flow rate	Nom.	l/s	33,494		32,576			
	Speed		rpm	705					
Fan motor	Drive			DOL					
	Input	Cooling	W	780					
Sound power level	Cooling	Nom.	dBA	92.2		92.7			
Sound pressure level	Cooling	Nom.	dBA	72.5		73.0			
Compressor	Type			Semi-hermetic single screw compressor					
	Quantity			2					
	Oil	Charged volume		l	32				
Operation range	Water side	Cooling	Min.	°CDB	-15				
			Max.	°CDB	15				
	Air side	Cooling	Min.	°CDB	-18				
			Max.	°CDB	48				
Refrigerant	Type			R-134a					
	Charge		kg	84		86			
	Circuits	Quantity		2					
Piping connections	Evaporator water inlet/outlet			139.7					
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		Water freeze protection controller					

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## 5 Specifications

5-2 Electrical Specifications				EWAD180D-SR	EWAD190D-SR	EWAD220D-SR	EWAD240D-SR	EWAD250D-SR	EWAD270D-SR	
Compressor	Phase			3~						
	Voltage		V	400						
	Voltage range	Min.	%	-10						
		Max.	%	10						
	Maximum running current		A	78			94		105	
	Starting method			Wye-delta						
Compressor 2	Maximum running current		A	78		94		105		
Power supply	Phase			3~						
	Frequency		Hz	50						
	Voltage		V	400						
	Voltage range	Min.	%	-10						
		Max.	%	10						
Unit	Maximum starting current		A	217		231		275		283
	Nominal running current (RLA)	Cooling	A	140	138	143	157	169	181	
			A	162		181	198	208	219	
	Max unit current for wires sizing		A	178		199	217	229	241	
Fans	Nominal running current (RLA)		A	6		9				

5-2 Electrical Specifications				EWAD280D-SR	EWAD310D-SR	EWAD370D-SR	EWAD400D-SR	EWAD440D-SR	EWAD480D-SR	
Compressor	Phase			3~						
	Voltage		V	400						
	Voltage range	Min.	%	-10						
		Max.	%	10						
	Maximum running current		A	105	119	125	153		174	
	Starting method			Wye-delta						
Compressor 2	Maximum running current		A	119		125	153	174		
Power supply	Phase			3~						
	Frequency		Hz	50						
	Voltage		V	400						
	Voltage range	Min.	%	-10						
		Max.	%	10						
Unit	Maximum starting current		A	295	297	301	460	479		
	Nominal running current (RLA)	Cooling	A	199	203	219	281	285	308	
			A	233	251	263	321	347	368	
	Max unit current for wires sizing		A	257	276	289	353	382	405	
Fans	Nominal running current (RLA)		A	9	12		16	21		

# 5 Specifications

5-2 Electrical Specifications				EWAD510D-SR	EWAD530D-SR
Compressor	Phase			3~	
	Voltage		V	400	
	Voltage range	Min.	%	-10	
		Max.	%	10	
	Maximum running current		A	174	
	Starting method			Wye-delta	
Compressor 2	Maximum running current		A	185	
Power supply	Phase			3~	
	Frequency		Hz	50	
	Voltage		V	400	
	Voltage range	Min.	%	-10	
		Max.	%	10	
Unit	Maximum starting current		A	488	
	Nominal running current (RLA)	Cooling	A	334	323
			A	379.0	
	Max unit current for wires sizing		A	417	
Fans	Nominal running current (RLA)		A	21	

**Notes**

- (1)Cooling: entering evaporator water temp. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C; full load operation.
- (2)Sound pressure levels are measured at entering evaporator water temp. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C; 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. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C. 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

# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

### EWAD-D-SR

ELWT (°C)		180						190						220						240									
		Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)									
		25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46
4	Cc (kW)	182	172	162	151	146	141	127	195	184	173	161	157	152	140	221	211	200	188	183	178	172	241	230	217	204	198	193	187
	Pi (kW)	67	74	80	87	90	93	86	66	72	79	86	89	91	88	69	75	82	89	92	95	99	76	83	91	99	102	106	110
	Qwe (l/s)	8.7	8.2	7.7	7.2	7	6.7	6.1	9.3	8.8	8.3	7.7	7.5	7.2	6.7	10.5	10	9.5	8.9	8.7	8.5	8.2	11.5	10.9	10.3	9.7	9.4	9.2	8.9
	Pdwe (kPa)	28.1	25.5	22.8	20.1	19	17.9	14.8	20.9	18.9	16.9	14.9	14.1	13.3	11.5	55.9	51.3	46.5	41.6	39.7	37.7	35.6	47.6	43.6	39.5	35.3	33.6	31.8	30.1
5	Cc (kW)	187	177	167	156	151	143	128	200	190	179	167	162	157	142	228	217	206	194	189	184	178	248	236	224	211	205	199	193
	Pi (kW)	69	75	81	88	91	92	84	68	74	80	87	90	93	87	70	76	83	90	93	97	100	77	85	92	100	104	107	111
	Qwe (l/s)	8.9	8.5	8	7.4	7.2	6.8	6.1	9.6	9.1	8.5	8	7.7	7.5	6.8	10.9	10.4	9.8	9.2	9	8.8	8.5	11.8	11.3	10.7	10	9.8	9.5	9.2
	Pdwe (kPa)	29.6	26.9	24.2	21.3	20.1	18.4	14.9	22.1	20	18	15.9	15	14.2	11.8	59	54.2	49.3	44.2	42.1	40.1	38	50.1	46.1	41.8	37.4	35.6	33.8	32
6	Cc (kW)	193	183	172	161	156	145	130	206	196	184	172	167	160	144	235	224	213	200	195	190	184	255	243	231	217	212	206	200
	Pi (kW)	70	76	83	90	93	89	83	69	75	81	88	91	92	85	71	77	84	91	95	98	101	79	86	93	102	105	109	112
	Qwe (l/s)	9.2	8.7	8.2	7.7	7.4	6.9	6.2	9.8	9.3	8.8	8.2	8	7.6	6.8	11.2	10.7	10.1	9.6	9.3	9.1	8.8	12.1	11.6	11	10.4	10.1	9.8	9.5
	Pdwe (kPa)	31.2	28.4	25.5	22.6	21.4	18.6	15.5	23.2	21.2	19	16.8	15.9	14.7	12.1	62.2	57.3	52.1	46.9	44.7	42.6	40.4	52.7	48.5	44.2	39.6	37.7	35.9	34
7	Cc (kW)	198	188	177	166	161	146	132	212	202	190	178	173	161	145	241	231	219	207	202	196	191	262	250	238	224	218	212	206
	Pi (kW)	71	77	84	91	94	88	82	70	76	83	90	93	90	84	72	78	85	93	96	99	102	80	87	95	103	106	110	114
	Qwe (l/s)	9.4	9	8.5	7.9	7.7	7	6.3	10.1	9.6	9.1	8.5	8.2	7.7	6.9	11.5	11	10.4	9.9	9.6	9.4	9.1	12.5	11.9	11.3	10.7	10.4	10.1	9.8
	Pdwe (kPa)	32.9	29.9	26.9	23.9	22.6	19.1	15.7	24.4	22.3	20.1	17.8	16.9	14.9	12.4	65.6	60.4	55.1	49.6	47.4	45.2	42.9	55.5	51.1	46.6	41.9	40	38	36.1
8	Cc (kW)	204	193	182	171	164	148	133	217	207	196	183	178	163	146	248	237	226	213	208	202	197	269	257	245	231	225	219	213
	Pi (kW)	72	79	85	93	94	86	80	71	77	84	91	94	89	82	73	79	86	94	97	100	104	81	88	96	104	108	112	115
	Qwe (l/s)	9.7	9.2	8.7	8.2	7.8	7.1	6.3	10.4	9.9	9.3	8.8	8.5	7.8	7	11.8	11.3	10.8	10.2	9.9	9.7	9.4	12.8	12.3	11.7	11	10.7	10.5	10.2
	Pdwe (kPa)	34.6	31.5	28.4	25.2	23.4	19.5	16	25.5	23.5	21.2	18.8	17.9	15.2	12.6	69	63.6	58.1	52.4	50.1	47.8	45.5	58.3	53.7	49.1	44.3	42.3	40.3	38.2
9	Cc (kW)	209	199	188	176	165	149	133	224	213	202	189	181	165	148	255	244	232	219	214	209	201	276	264	251	238	232	226	215
	Pi (kW)	73	80	87	94	91	85	79	72	78	85	92	94	87	81	74	81	88	95	98	102	103	82	89	97	106	109	113	114
	Qwe (l/s)	10	9.5	9	8.4	7.9	7.1	6.4	10.7	10.2	9.6	9	8.7	7.9	7	12.2	11.7	11.1	10.5	10.2	10	9.6	13.2	12.6	12	11.4	11.1	10.8	10.3
	Pdwe (kPa)	36.4	33.2	29.9	26.6	23.7	19.8	16.2	26.9	24.6	22.4	19.9	18.5	15.5	12.7	72.6	67	61.2	55.4	53	50.6	47.3	61.2	56.5	51.6	46.7	44.7	42.6	39.1
10	Cc (kW)	215	204	193	181	167	151	135	230	218	207	195	183	166	148	262	251	239	226	221	215	205	284	271	258	244	239	233	218
	Pi (kW)	75	81	88	95	90	83	78	74	80	87	94	92	86	79	75	82	89	96	100	103	102	83	91	99	107	111	114	112
	Qwe (l/s)	10.3	9.8	9.2	8.6	8	7.2	6.5	11	10.4	9.9	9.3	8.8	7.9	7.1	12.5	12	11.4	10.8	10.5	10.3	9.8	13.6	13	12.3	11.7	11.4	11.1	10.4
	Pdwe (kPa)	38.2	34.9	31.5	28	24.2	20.1	16.6	28.4	25.8	23.5	21	18.9	15.8	12.9	76.3	70.4	64.5	58.4	55.9	53.4	48.8	64.2	59.3	54.3	49.1	47	44.9	39.9
11	Cc (kW)	220	210	198	184	168	153	136	237	224	212	200	185	167	150	269	258	245	233	227	221	209	291	279	265	251	245	239	220
	Pi (kW)	76	83	89	95	88	82	76	75	81	88	95	91	84	78	76	83	90	98	101	104	102	85	92	100	109	112	116	110
	Qwe (l/s)	10.5	10	9.5	8.8	8	7.3	6.5	11.3	10.7	10.2	9.6	8.9	8	7.2	12.9	12.3	11.7	11.1	10.9	10.6	10	13.9	13.3	12.7	12	11.7	11.4	10.5
	Pdwe (kPa)	40	36.6	33.1	28.9	24.6	20.7	16.7	29.8	27.2	24.6	22.1	19.2	16	13.2	80.1	74	67.8	61.5	58.9	56.4	50.6	67.3	62.2	57	51.6	49.5	47.3	40.6
12	Cc (kW)	226	215	204	186	169	153	137	243	231	218	205	187	170	151	276	265	252	239	234	228	213	299	286	272	258	252	246	222
	Pi (kW)	77	84	91	93	87	81	75	76	83	89	96	89	83	77	77	84	91	99	102	106	102	86	93	101	110	114	117	108
	Qwe (l/s)	10.8	10.3	9.7	8.9	8.1	7.3	6.6	11.6	11	10.4	9.8	8.9	8.1	7.2	13.2	12.7	12.1	11.4	11.2	10.9	10.2	14.3	13.7	13	12.3	12.1	11.8	10.6
	Pdwe (kPa)	41.9	38.4	34.7	29.4	24.9	20.9	17	31.4	28.6	25.8	23	19.5	16.4	13.3	84.1	77.7	71.3	64.7	62	59.4	52.4	70.5	65.2	59.8	54.2	52	49.7	41.3
13	Cc (kW)	232	221	209	187	172	155	138	250	237	224	207	188	171	152	284	272	259	246	240	231	217	306	293	280	265	259	248	223
	Pi (kW)	79	85	92	92	86	80	74	78	84	91	94	87	81	76	79	85	93	100	104	105	102	87	95	103	111	115	116	106
	Qwe (l/s)	11.1	10.6	10	9	8.2	7.4	6.6	12	11.4	10.7	9.9	9	8.2	7.3	13.6	13	12.4	11.8	11.5	11.1	10.4	14.7	14	13.4	12.7	12.4	11.9	10.7
	Pdwe (kPa)	43.8	40.2	36.4	29.9	25.6	21.4	17.3	33	30	27.1	23.4	19.8	16.6	13.5	88.1	81.6	74.8	68	65.3	61.1	54.5	73.9	68.3	62.7	56.9	54.6	50.6	41.8
14	Cc (kW)	237	226	214	189	173	156	140	256	244	230	208	189	171	154	291	279	266	252	247	236	221	314	301	287	272	266	250	225
	Pi (kW)	80	87	94	90	84	78	73	79	85	92	93	86	80	75	80	87	94	102	105	104	101	88	96	104	113	117	114	104
	Qwe (l/s)	11.4	10.8	10.3	9	8.3	7.5	6.7	12.3	11.7	11	10	9.1	8.2	7.4	13.9	13.4	12.7	12.1	11.8	11.3	10.6	15	14.4	13.7	13	12.7	12	10.7
	Pdwe (kPa)	45.8	42	38.2	30.4	25.8	21.4	17.6	34.5	31.6	28.5	23.7	20	16.7	13.8	92.4	85.5	78.5	71.4	68.6	63.1	56.2	77.3	71.5	65.7	59.7	57.3	51.4	42.3
15	Cc (kW)	243	232	220	190	173	157	141	263	250	237	210	192	173	155	299	286	273	259	253	240	223	322	308	294	279	273	252	227
	Pi (kW)	81	88	95	89	82	77	72	80	87	94	91	85	79	74	81	88	95	103	106	104	100	90	97	106	115	118	112	103
	Qwe (l/s)	11.6	11.1	10.5	9.1	8.3	7.5	6.7	12.6	12	11.3	10	9.2	8.3	7.4	14.3	13.7	13.1	12.4	12.1	11.5	10.7	15.4	14.8	14.1	13.4	13.1	12.1	10.9
	Pdwe (kPa)	47.9	43.9	39.9	30.7	26	21.9	17.9	36.1	33.1	29.9	24	20.5	17	14	96.7	89.6	82.3	75	72	65.1	57.2	80.8	74.8	68.8	62.6	60.1	52.1	43.3

# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

EWAD-D-SR

ELWT (°C)		250						270						280						310									
		Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)									
		25	30	35	40	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46	
4	Cc (kW)	256	244	231	217	211	205	198	269	256	243	228	222	215	208	284	270	255	238	231	224	208	315	301	286	269	262	255	248
	Pi (kW)	83	91	99	108	112	116	120	89	98	107	116	121	125	129	98	107	117	127	132	135	132	101	110	120	131	136	140	145
	Qwe (l/s)	12.2	11.6	11	10.3	10	9.8	9.5	12.8	12.2	11.6	10.9	10.6	10.2	9.9	13.5	12.9	12.1	11.4	11	10.6	9.9	15	14.4	13.6	12.8	12.5	12.2	11.8
	Pdwe (kPa)	52	47.7	43.3	38.6	36.7	34.8	32.9	56.7	52	47.2	42.1	40	37.9	35.8	57.1	52.1	46.9	41.6	39.5	37.1	32.7	53.6	49.4	44.9	40.4	38.5	36.6	34.7
5	Cc (kW)	263	251	238	224	218	212	205	277	264	250	235	229	222	215	292	278	262	246	239	229	212	324	310	295	278	271	263	256
	Pi (kW)	84	92	101	110	113	117	121	91	99	108	118	122	126	131	100	109	118	129	133	135	131	102	112	122	133	137	142	147
	Qwe (l/s)	12.5	12	11.3	10.7	10.4	10.1	9.8	13.2	12.6	11.9	11.2	10.9	10.6	10.3	13.9	13.2	12.5	11.7	11.4	10.9	10.1	15.4	14.8	14	13.2	12.9	12.6	12.2
	Pdwe (kPa)	54.8	50.3	45.7	40.9	39	37	35	59.7	54.8	49.8	44.6	42.5	40.3	38.1	60.2	55	49.6	44.1	41.9	38.8	33.7	56.2	52	47.4	42.7	40.8	38.8	36.9
6	Cc (kW)	271	258	245	231	225	218	211	284	271	257	242	236	229	220	300	286	270	253	246	234	215	332	318	303	286	279	272	264
	Pi (kW)	86	93	102	111	115	119	122	92	100	110	120	124	128	130	101	110	120	131	135	135	131	102	112	122	133	137	142	149
	Qwe (l/s)	12.9	12.3	11.7	11	10.7	10.4	10	13.6	12.9	12.3	11.6	11.3	10.9	10.5	14.3	13.6	12.9	12.1	11.8	11.2	10.2	15.8	15.2	14.5	13.6	13.3	13	12.6
	Pdwe (kPa)	57.7	53	48.3	43.3	41.3	39.2	36.7	62.8	57.7	52.5	47.1	44.9	42.7	39.5	63.3	57.9	52.4	46.6	44.3	40.4	34.6	58.9	54.7	50	45.1	43.1	41.1	39.1
7	Cc (kW)	278	266	252	238	232	225	215	292	279	265	250	243	237	223	309	294	278	261	254	239	217	340	327	312	295	287	280	272
	Pi (kW)	87	95	103	112	116	120	121	93	102	111	121	125	130	128	103	112	122	133	137	134	126	105	115	125	136	141	146	151
	Qwe (l/s)	13.3	12.7	12.0	11.3	11.1	10.8	10.3	13.9	13.3	12.6	11.9	11.6	11.3	10.6	14.7	14	13.3	12.5	12.1	11.4	10.4	16.2	15.6	14.9	14.1	13.7	13.4	13
	Pdwe (kPa)	60.6	55.8	50.8	45.7	43.6	41.5	38.3	66	60.7	55.2	49.7	47.4	45.2	40.5	66.5	60.9	55.2	49.2	46.8	41.8	35.3	61.7	57.3	52.7	47.6	45.5	43.4	41.3
8	Cc (kW)	286	273	259	245	239	232	219	300	287	272	257	250	244	224	317	302	286	269	259	243	219	349	335	320	303	296	288	281
	Pi (kW)	88	96	105	114	118	122	120	95	103	113	123	127	131	125	104	114	124	135	137	133	124	106	116	127	138	143	148	153
	Qwe (l/s)	13.6	13	12.4	11.7	11.4	11.1	10.5	14.3	13.7	13	12.3	11.9	11.6	10.7	15.1	14.4	13.7	12.8	12.4	11.6	10.5	16.7	16	15.3	14.5	14.1	13.8	13.4
	Pdwe (kPa)	63.7	58.7	53.5	48.2	46.1	43.9	39.6	69.2	63.8	58.1	52.3	50	47.6	40.9	69.8	64	58.1	52	48.7	43.4	35.9	64.6	60	55.2	50.2	48	45.8	43.6
9	Cc (kW)	293	280	267	252	246	239	222	308	294	280	264	258	251	226	325	310	294	277	265	247	221	358	343	328	312	305	297	286
	Pi (kW)	89	97	106	115	119	123	118	96	105	114	124	129	133	122	106	115	126	137	137	132	121	108	118	128	140	145	149	152
	Qwe (l/s)	14	13.4	12.7	12	11.7	11.4	10.6	14.7	14.1	13.4	12.6	12.3	12	10.8	15.5	14.8	14	13.2	12.6	11.8	10.5	17.1	16.4	15.7	14.9	14.5	14.2	13.6
	Pdwe (kPa)	66.8	61.6	56.3	50.8	48.6	46.3	40.4	72.6	66.9	61.1	55.1	52.6	50.2	41.7	73.3	67.2	61.1	54.7	50.5	44.5	36.5	67.5	62.8	57.9	52.8	50.6	48.3	45.1
10	Cc (kW)	301	288	274	259	253	245	224	316	302	287	271	265	255	228	334	319	302	285	270	249	223	366	352	337	320	313	306	287
	Pi (kW)	91	99	108	117	121	124	116	98	106	116	126	130	132	120	108	117	127	138	136	130	120	109	119	130	141	146	151	148
	Qwe (l/s)	14.4	13.8	13.1	12.4	12.1	11.7	10.7	15.1	14.4	13.7	13	12.6	12.2	10.9	16	15.2	14.4	13.6	12.9	11.9	10.7	17.5	16.8	16.1	15.3	15	14.6	13.7
	Pdwe (kPa)	70.1	64.7	59.1	53.4	51.1	48.3	41.2	76.1	70.2	64.1	57.9	55.4	51.8	42.4	76.8	70.5	64.1	57.6	52.3	45.3	37.2	70.5	65.6	60.6	55.3	53.2	50.9	45.4
11	Cc (kW)	309	295	281	266	260	250	227	324	310	295	279	272	258	232	343	327	310	291	275	251	225	375	360	345	328	321	314	289
	Pi (kW)	92	100	109	119	123	124	115	99	108	117	128	132	130	119	110	119	129	139	136	127	118	111	121	131	143	148	153	145
	Qwe (l/s)	14.8	14.1	13.4	12.7	12.4	11.9	10.8	15.5	14.8	14.1	13.3	13	12.3	11.1	16.4	15.6	14.8	13.9	13.1	12	10.8	17.9	17.2	16.5	15.7	15.4	15	13.8
	Pdwe (kPa)	73.4	67.8	62	56.1	53.8	50	42.1	79.7	73.6	67.3	60.8	58.2	52.8	43.6	80.4	73.9	67.3	59.9	54.2	46	37.9	73.6	68.6	63.3	57.9	55.7	53.5	46.2
12	Cc (kW)	317	303	289	273	267	254	228	332	318	303	286	279	260	233	351	335	318	296	279	254	226	384	369	353	336	329	322	292
	Pi (kW)	94	102	111	120	124	123	113	101	109	119	129	134	128	117	111	121	131	139	135	126	115	112	122	133	145	150	155	143
	Qwe (l/s)	15.1	14.5	13.8	13.1	12.8	12.1	10.9	15.9	15.2	14.5	13.7	13.4	12.4	11.2	16.8	16	15.2	14.2	13.3	12.1	10.8	18.4	17.6	16.9	16.1	15.7	15.4	14
	Pdwe (kPa)	76.9	71	65.1	58.9	56.5	51.7	42.7	83.5	77.1	70.5	63.8	61.1	53.7	44.2	84.2	77.4	70.5	61.9	55.7	46.9	38.1	76.8	71.6	66.2	60.6	58.3	56	46.9
13	Cc (kW)	325	311	296	281	274	256	230	341	326	310	294	287	262	234	360	344	326	301	281	255	229	393	378	362	345	337	327	296
	Pi (kW)	95	103	112	122	126	121	111	102	111	121	131	136	126	115	113	123	133	138	133	123	114	114	124	135	147	152	154	142
	Qwe (l/s)	15.5	14.9	14.2	13.4	13.1	12.3	11	16.3	15.6	14.8	14.1	13.7	12.5	11.2	17.2	16.4	15.6	14.4	13.5	12.2	10.9	18.8	18.1	17.3	16.5	16.1	15.6	14.2
	Pdwe (kPa)	80.4	74.4	68.2	61.8	59.3	52.5	43.2	87.3	80.7	73.9	66.9	64.1	54.5	44.6	88.1	81	73.9	63.9	56.5	47.3	38.9	80.1	74.7	69.1	63.3	61	57.5	48.1
14	Cc (kW)	333	319	304	288	279	258	232	349	334	318	301	290	264	237	369	352	335	306	284	258	230	402	386	370	353	346	329	298
	Pi (kW)	96	105	114	123	126	119	109	104	113	122	133	134	123	113	115	125	135	138	131	122	112	115	125	137	148	153	152	139
	Qwe (l/s)	15.9	15.3	14.5	13.8	13.3	12.4	11.1	16.7	16	15.2	14.4	13.9	12.6	11.3	17.6	16.9	16	14.7	13.6	12.3	11	19.2	18.5	17.7	16.9	16.5	15.8	14.2
	Pdwe (kPa)	84.1	77.8	71.4	64.8	61.2	53.3	43.9	91.2	84.4	77.3	70.1	65.2	55.2	45.5	92	84.7	77.3	65.9	57.6	48.4	39.3	83.5	77.9	72.1	66.1	63.7	58.3	48.6
15	Cc (kW)	341	327	311	295	284	260	234	357	342	326	309	292	265	238	378	361	343	311	286	259	232	411	395	379	361	354	331	299
	Pi (kW)	98	106	115	125	125	117	107	105	114	124	135	131	121	111	117	127	137	138	129	119	111	117	127	138	150	155	149	136
	Qwe (l/s)	16.3	15.6	14.9	14.1	13.6	12.4	11.2	17.1	16.4	15.6	14.8																	

# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

EWAD-D-SR

ELWT (°C)		370						400						440								
		Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)								
		25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46
4	Cc (kW)	360	350	339	326	320	313	294	422	398	372	317	296	273	250	450	430	404	361	336	312	286
	Pi (kW)	109	121	133	146	152	158	154	133	147	162	160	158	154	149	134	148	163	169	167	165	160
	Qwe (l/s)	17.1	16.7	16.2	15.5	15.2	14.9	14	20.1	19	17.7	15.1	14.1	13	11.9	21.5	20.5	19.3	17.2	16	14.8	13.6
	Pdwe (kPa)	63.1	60.2	56.8	52.9	51.1	49.1	44	51.1	46.1	40.7	30.5	27	23.4	20	64.6	59.5	53.2	43.4	38.2	33.3	28.5
5	Cc (kW)	368	359	348	335	329	322	297	434	410	382	339	314	291	268	463	442	418	381	359	333	306
	Pi (kW)	110	122	135	148	154	159	152	136	149	164	172	169	165	160	136	150	166	177	179	175	171
	Qwe (l/s)	17.6	17.1	16.6	16	15.7	15.4	14.2	20.7	19.5	18.2	16.1	15	13.9	12.8	22	21	19.9	18.1	17.1	15.9	14.6
	Pdwe (kPa)	65.9	63	59.5	55.5	53.7	51.8	44.8	53.9	48.6	42.9	34.5	30.1	26.3	22.6	67.9	62.4	56.5	47.8	43.1	37.6	32.2
6	Cc (kW)	377	368	357	343	337	331	300	447	422	393	360	335	309	285	475	453	429	396	377	355	329
	Pi (kW)	112	123	136	150	155	161	149	138	151	167	184	182	176	172	138	152	168	183	186	187	184
	Qwe (l/s)	18	17.5	17	16.4	16.1	15.8	14.3	21.3	20.1	18.7	17.2	16	14.7	13.6	22.6	21.6	20.4	18.9	18	16.9	15.7
	Pdwe (kPa)	68.9	65.8	62.3	58.2	56.4	54.5	45.5	56.8	51.2	45.2	38.6	33.9	29.2	25.4	71.2	65.5	59.3	51.3	47.1	42.3	36.8
7	Cc (kW)	386	377	366	352	346	336	304	459	433	404	371	356	323	290	487	465	440	410	394	374	351
	Pi (kW)	113	125	138	151	157	160	147	141	154	169	186	194	184	169	140	154	170	188	194	196	197
	Qwe (l/s)	18.4	18	17.4	16.8	16.5	16	14.5	21.9	20.7	19.3	17.7	17	15.4	13.8	23.2	22.2	21.0	19.6	18.8	17.9	16.8
	Pdwe (kPa)	71.9	68.8	65.1	60.9	59	56	46.7	59.8	53.9	47.5	40.6	37.8	31.8	26.2	74.6	68.7	62.1	54.8	51	46.4	41.5
8	Cc (kW)	395	386	374	361	355	339	306	472	445	415	381	362	327	293	500	477	451	421	408	390	365
	Pi (kW)	114	126	139	153	159	157	145	143	156	172	189	193	180	165	142	156	172	190	198	204	201
	Qwe (l/s)	18.9	18.4	17.9	17.2	16.9	16.2	14.6	22.5	21.3	19.8	18.2	17.3	15.6	14	23.8	22.8	21.5	20.1	19.5	18.6	17.4
	Pdwe (kPa)	75	71.8	68	63.7	61.8	58.8	47.2	62.9	56.6	49.9	42.7	39	32.5	26.6	78.1	71.9	65.1	57.5	54.2	50.1	44.3
9	Cc (kW)	404	395	383	370	364	343	307	485	458	426	391	365	330	295	512	489	463	432	418	399	369
	Pi (kW)	116	128	141	155	161	156	142	146	159	174	191	189	176	160	144	158	174	193	201	204	198
	Qwe (l/s)	19.3	18.8	18.3	17.7	17.4	16.4	14.6	23.2	21.9	20.4	18.7	17.4	15.8	14.1	24.5	23.4	22.1	20.6	20	19	17.6
	Pdwe (kPa)	78.2	74.9	71	66.6	64.7	58.2	47.6	66.1	59.5	52.4	44.8	39.5	33.1	27	81.8	75.3	68.1	60.2	56.8	52.1	45.3
10	Cc (kW)	413	404	392	379	373	345	310	498	470	438	401	369	331	294	525	501	474	443	429	406	372
	Pi (kW)	117	129	143	157	163	153	140	149	162	177	194	185	170	153	147	160	176	195	203	203	194
	Qwe (l/s)	19.7	19.3	18.7	18.1	17.8	16.5	14.8	23.8	22.4	20.9	19.2	17.6	15.8	14.1	25.1	23.9	22.7	21.2	20.5	19.4	17.8
	Pdwe (kPa)	81.4	78.1	74.1	69.6	67.6	58.8	48.5	69.4	62.4	55	47	40.3	33.3	26.9	85.5	78.7	71.3	63	59.5	53.9	46.1
11	Cc (kW)	422	413	401	388	381	346	313	511	482	449	408	370	334	296	538	513	486	454	439	413	373
	Pi (kW)	119	131	144	159	165	150	138	151	165	180	194	180	165	148	149	163	179	197	205	202	187
	Qwe (l/s)	20.2	19.7	19.2	18.5	18.2	16.6	15	24.4	23	21.5	19.5	17.7	16	14.1	25.7	24.5	23.2	21.7	21	19.8	17.8
	Pdwe (kPa)	84.8	81.3	77.3	72.6	70.5	59.3	49.4	72.8	65.5	57.6	48.4	40.7	33.8	27.1	89.3	82.3	74.5	65.9	62.2	55.7	46.4
12	Cc (kW)	432	422	410	397	384	350	304	525	495	461	410	371	334	293	550	526	498	465	449	419	374
	Pi (kW)	120	133	146	160	162	148	145	154	167	183	189	174	159	140	151	165	181	199	207	200	181
	Qwe (l/s)	20.6	20.2	19.6	19	18.4	16.7	14.5	25.1	23.7	22	19.6	17.8	16	14	26.3	25.1	23.8	22.2	21.5	20	17.9
	Pdwe (kPa)	88.2	84.7	80.5	75.7	71.4	60.4	46.9	76.2	68.6	60.3	48.9	40.9	33.8	26.8	93.3	85.9	77.8	68.8	64.7	57.2	46.5
13	Cc (kW)	441	431	420	406	386	351	308	538	507	472	414	372	333	290	563	538	509	476	456	424	375
	Pi (kW)	122	134	148	162	159	145	144	157	170	186	186	168	152	133	153	167	183	202	205	198	175
	Qwe (l/s)	21.1	20.6	20.1	19.4	18.5	16.8	14.7	25.7	24.3	22.6	19.8	17.8	15.9	13.9	26.9	25.7	24.4	22.8	21.8	20.3	17.9
	Pdwe (kPa)	91.7	88.1	83.8	78.9	72.1	60.7	48.1	79.8	71.8	63.1	49.8	41	33.6	26.3	97.3	89.7	81.2	71.8	66.5	58.3	46.7
14	Cc (kW)	450	441	429	415	387	353	310	551	520	484	413	371	330	286	576	551	521	487	463	425	374
	Pi (kW)	123	136	150	164	156	144	141	160	173	189	178	161	145	125	156	170	186	204	204	192	168
	Qwe (l/s)	21.6	21.1	20.5	19.8	18.5	16.9	14.8	26.4	24.9	23.2	19.7	17.8	15.8	13.7	27.6	26.4	24.9	23.3	22.2	20.3	17.9
	Pdwe (kPa)	95.3	91.6	87.2	82.1	72.6	61.6	48.6	83.5	75	66	49.5	40.9	33.2	25.6	101.5	93.5	84.7	74.9	68.5	58.6	46.5
15	Cc (kW)	460	450	438	424	391	356	311	565	532	496	413	370	327	280	590	563	533	498	469	425	368
	Pi (kW)	125	138	151	166	154	142	138	163	176	192	172	154	137	117	158	172	188	207	203	185	158
	Qwe (l/s)	22	21.5	21	20.3	18.7	17	14.9	27	25.5	23.7	19.8	17.7	15.7	13.4	28.2	27	25.5	23.9	22.5	20.4	17.6
	Pdwe (kPa)	99	95.2	90.7	85.5	73.9	62.4	49	87.2	78.4	68.9	49.6	40.7	32.6	24.7	105.8	97.4	88.2	78.1	70.2	58.7	45.3

# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

EWAD-D-SR

ELWT (°C)		480							510							530						
		Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)						
		25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46
4	Cc (kW)	491	468	442	383	358	330	301	516	495	456	396	359	331	300	539	518	492	437	409	366	333
	Pi (kW)	146	161	179	180	178	174	169	157	175	187	188	185	181	174	153	169	188	195	194	189	183
	Qwe (l/s)	23.4	22.3	21	18.3	17	15.7	14.3	24.6	23.6	21.7	18.9	17.1	15.7	14.3	25.7	24.7	23.4	20.8	19.5	17.4	15.9
	Pdwe (kPa)	56.7	52.1	46.9	36.3	32.1	27.7	23.6	50.1	46.4	40.1	31.2	26.1	22.5	18.8	44.2	41.1	37.5	30.3	26.8	22	18.6
5	Cc (kW)	503	480	453	407	381	353	322	529	507	474	421	393	354	322	554	532	506	458	434	403	360
	Pi (kW)	148	164	181	191	190	186	179	159	177	194	201	198	193	186	155	171	190	203	205	203	198
	Qwe (l/s)	24	22.9	21.6	19.4	18.2	16.8	15.3	25.2	24.2	22.6	20.1	18.7	16.9	15.4	26.4	25.4	24.1	21.9	20.7	19.2	17.1
	Pdwe (kPa)	59.3	54.7	49.2	40.5	36	31.3	26.5	52.5	48.7	43.1	34.8	30.7	25.4	21.5	46.4	43.2	39.4	33	30	26.2	21.3
6	Cc (kW)	515	492	465	430	404	375	344	542	520	491	440	417	385	347	568	546	519	479	455	428	395
	Pi (kW)	150	166	183	202	202	198	192	162	179	200	209	210	205	202	157	174	193	212	214	215	210
	Qwe (l/s)	24.6	23.5	22.2	20.5	19.3	17.9	16.4	25.9	24.8	23.4	21	19.9	18.4	16.5	27.1	26.1	24.8	22.9	21.7	20.4	18.8
	Pdwe (kPa)	62.1	57.2	51.6	44.8	40	35.1	30	54.9	51	46	37.8	34.2	29.7	24.6	48.6	45.3	41.4	35.8	32.6	29.2	25.3
7	Cc (kW)	528	504	477	444	428	399	369	556	533	505	458	436	405	358	583	560	533	498	475	447	409
	Pi (kW)	152	168	186	206	215	213	207	164	182	203	216	220	216	204	160	176	195	218	223	222	213
	Qwe (l/s)	25.2	24.1	22.8	21.2	20.4	19.1	17.6	26.5	25.4	24.1	21.8	20.8	19.3	17.1	27.8	26.7	25.4	23.8	22.7	21.3	19.5
	Pdwe (kPa)	64.9	59.8	54.0	47.4	44.5	39.3	34	57.4	53.3	48.4	40.5	37.1	32.5	26	51	47.5	43.4	38.4	35.3	31.6	26.9
8	Cc (kW)	540	517	489	455	440	417	375	569	546	517	476	447	410	364	598	575	547	511	488	455	413
	Pi (kW)	155	170	188	208	217	221	204	167	184	205	226	222	211	201	162	178	198	221	225	220	209
	Qwe (l/s)	25.8	24.7	23.3	21.7	21	19.9	17.9	27.2	26.1	24.7	22.7	21.3	19.6	17.4	28.5	27.4	26.1	24.4	23.3	21.7	19.7
	Pdwe (kPa)	67.7	62.4	56.5	49.7	46.7	42.4	35.1	60	55.7	50.5	43.6	38.9	33.3	26.8	53.4	49.7	45.4	40.3	37	32.6	27.5
9	Cc (kW)	553	529	500	466	451	422	379	583	559	530	484	454	410	365	612	589	560	524	496	464	410
	Pi (kW)	157	172	190	211	219	217	200	169	187	208	224	220	213	194	164	181	200	223	223	220	208
	Qwe (l/s)	26.4	25.2	23.9	22.3	21.5	20.1	18.1	27.8	26.7	25.3	23.1	21.7	19.6	17.4	29.2	28.1	26.7	25	23.7	22.1	19.6
	Pdwe (kPa)	70.7	65.1	59	51.9	48.9	43.4	35.7	62.7	58.1	52.8	44.9	40	33.3	27	55.8	52	47.5	42.2	38.2	33.8	27.1
10	Cc (kW)	566	541	512	478	462	424	379	596	572	542	493	462	412	368	627	603	574	538	506	467	411
	Pi (kW)	159	175	193	213	222	211	192	172	190	211	224	219	207	189	167	184	203	226	223	215	202
	Qwe (l/s)	27	25.8	24.5	22.8	22.1	20.3	18.1	28.5	27.3	25.9	23.6	22.1	19.7	17.6	30	28.8	27.4	25.7	24.2	22.3	19.7
	Pdwe (kPa)	73.7	67.9	61.5	54.3	51.1	43.8	35.9	65.4	60.6	55	46.4	41.2	33.6	27.4	58.3	54.3	49.6	44.1	39.6	34.3	27.3
11	Cc (kW)	579	553	524	489	473	428	382	610	585	554	501	465	413	367	642	617	587	547	514	469	415
	Pi (kW)	161	177	195	216	224	207	187	174	192	213	222	213	200	181	169	186	206	226	222	209	197
	Qwe (l/s)	27.7	26.4	25	23.4	22.6	20.5	18.3	29.2	28	26.5	23.9	22.2	19.7	17.6	30.7	29.5	28.1	26.2	24.5	22.4	19.8
	Pdwe (kPa)	76.8	70.8	64.1	56.7	53.4	44.6	36.4	68.1	63.2	57.4	47.7	41.8	33.8	27.4	60.8	56.7	51.8	45.7	40.7	34.5	27.7
12	Cc (kW)	592	566	535	500	478	429	381	624	598	567	508	466	414	366	657	632	601	556	521	467	411
	Pi (kW)	164	179	197	218	222	200	179	177	195	216	220	207	193	173	172	189	208	225	220	210	187
	Qwe (l/s)	28.3	27	25.6	23.9	22.8	20.5	18.2	29.8	28.6	27.1	24.3	22.3	19.8	17.5	31.4	30.2	28.7	26.6	24.9	22.3	19.7
	Pdwe (kPa)	79.9	73.7	66.7	59	54.4	44.8	36.3	71	65.8	59.7	49	42	33.9	27.2	63.4	59.1	54	46.9	41.8	34.3	27.3
13	Cc (kW)	605	578	547	511	480	430	380	638	611	579	514	465	413	363	672	646	615	564	528	468	410
	Pi (kW)	166	182	200	221	216	193	171	180	198	219	219	209	185	165	175	192	211	224	218	203	180
	Qwe (l/s)	28.9	27.7	26.2	24.4	23	20.5	18.2	30.5	29.2	27.7	24.6	22.3	19.8	17.4	32.2	30.9	29.4	27	25.3	22.4	19.6
	Pdwe (kPa)	83.2	76.7	69.5	61.4	54.9	44.9	36	73.9	68.5	62.1	50.2	41.9	33.8	26.8	66.1	61.6	56.3	48.2	42.8	34.5	27.2
14	Cc (kW)	618	591	559	522	482	429	377	652	624	591	517	466	412	359	687	660	628	572	526	468	408
	Pi (kW)	168	184	203	223	210	186	163	182	201	222	214	202	178	156	177	194	214	223	210	197	172
	Qwe (l/s)	29.6	28.3	26.8	25	23	20.5	18	31.2	29.9	28.3	24.7	22.3	19.7	17.2	32.9	31.6	30.1	27.4	25.2	22.4	19.5
	Pdwe (kPa)	86.5	79.7	72.2	63.9	55.2	44.9	35.5	76.9	71.2	64.6	50.7	42.1	33.6	26.3	68.9	64.1	58.6	49.4	42.6	34.5	26.9
15	Cc (kW)	631	603	571	534	483	428	372	666	638	604	518	463	409	354	703	675	642	577	528	464	400
	Pi (kW)	171	187	205	226	204	178	154	185	204	225	208	193	170	148	180	197	217	220	214	187	162
	Qwe (l/s)	30.2	28.9	27.3	25.5	23.1	20.5	17.8	31.9	30.5	28.9	24.8	22.2	19.6	16.9	33.6	32.3	30.7	27.6	25.3	22.2	19.1
	Pdwe (kPa)	89.9	82.9	75.1	66.5	55.5	44.6	34.8	80	74	67.1	50.9	41.6	33.3	25.6	71.7	66.7	61	50.3	42.9	33.9	26

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## 6 Capacity tables

### 6 - 2 Partial Heat Recovery Capacity tables

#### Partial Heat Recovery Ratings EWAD-D-S

EWAC / LWC	*Model EWAD-D-SS*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
50/60	390	332	161	173	35%	3.13
	440	373	172	191	35%	3.27
	470	403	189	207	35%	3.24
	510	432	206	223	35%	3.18
	530	461	219	238	35%	3.19
	560	486	233	216	30%	3.01
	580	508	225	191	26%	3.10

EWAC / LWC	*Model EWAD-D-SL*	*Model EWAD-D-SR*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
50/60	180	180	159	80.0	84	35%	3.03
	200	190	171	78.4	87	35%	3.30
	230	220	196	83.3	98	35%	3.52
	250	240	213	92.2	107	35%	3.48
	260	250	227	105	116	35%	3.28
	280	270	240	112	123	35%	3.23
	300	280	259	124	134	35%	3.18
	320	310	281	128	123	30%	3.15
	370	370	329	141	122	26%	3.20
	400	400	373	172	191	35%	3.27
	440	440	403	189	207	35%	3.24
	480	480	432	206	223	35%	3.18
	510	510	461	219	238	35%	3.19
	530	530	486	233	216	30%	3.01

EWAC / LWC	*Model EWAD-D-SX*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
50/60	210	171	78.4	87	35%	3.30
	230	196	83.3	98	35%	3.52
	250	213	92.2	107	35%	3.48
	270	227	105	116	35%	3.28
	290	240	112	123	35%	3.23
	300	259	124	134	35%	3.18
	310	281	128	123	30%	3.15
	370	332	161	173	35%	3.13
	410	373	172	191	35%	3.27
	450	403	189	207	35%	3.24
	490	432	206	223	35%	3.18

#### NOTES

Cc (cooling capacity)  
 Pi (unit power input)  
 Hc (heating heat recovery capacity)  
 %Hc (percentage heat recovered)  
 EER Hc (coefficient of performance during heat recovery = (cooling+ heating capacity) / power input)  
 EWAC (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<sup>2</sup> °C/kW evaporator fouling factor



# 6 Capacity tables

## 6 - 3 Total Heat Recovery Capacity Tables

### Total Heat Recovery Ratings EWAD-D-S

EWC / LWC	*Model EWAD-D-SS*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
40/45	390	348	154	427	85%	5.02
	440	391	165	473	85%	5.23
	470	423	183	515	85%	5.13
	510	453	200	555	85%	5.05
	530	484	213	592	85%	5.06
	560	510	226	552	75%	4.70
	580	533	219	488	65%	4.67
40/50	390	332	156	415	85%	4.79
	440	373	167	459	85%	4.99
	470	403	185	500	85%	4.89
	510	432	202	539	85%	4.81
	530	461	215	575	85%	4.82
	560	486	228	536	75%	4.47
	580	508	221	474	65%	4.44
45/55	390	332	158	294	60%	3.97
	440	373	169	325	60%	4.13
	470	403	187	354	60%	4.06
	510	432	204	382	60%	3.99
	530	461	217	407	60%	4.00
	560	486	231	358	50%	3.66
	580	508	223	314	43%	3.68

EWC / LWC	*Model EWAD-D-SL*	*Model EWAD-D-SR*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
40/45	180	180	167	76.7	207	85%	4.88
	200	190	179	75.1	216	85%	5.27
	230	220	205	80.0	243	85%	5.60
	250	240	224	88.4	265	85%	5.54
	260	250	238	102	289	85%	5.19
	280	270	251	109	306	85%	5.12
	300	280	272	120	333	85%	5.04
	320	310	294	124	314	75%	4.89
	370	370	345	137	314	65%	4.81
	400	400	391	165	473	85%	5.23
	440	440	423	183	515	85%	5.13
	480	480	453	200	555	85%	5.05
	510	510	484	213	592	85%	5.06
	530	530	510	226	552	75%	4.70
	40/50	180	180	159	77.5	201	85%
200		190	171	75.9	210	85%	5.02
230		220	196	80.8	235	85%	5.33
250		240	213	89.3	257	85%	5.27
260		250	227	103	281	85%	4.94
280		270	240	110	297	85%	4.88
300		280	259	121	323	85%	4.81
320		310	281	125	305	75%	4.66
370		370	329	138	304	65%	4.58
400		400	373	167	459	85%	4.99
440		440	403	185	500	85%	4.89
480		480	432	202	539	85%	4.81
510		510	461	215	575	85%	4.82
530		530	496	228	536	75%	4.47
45/55		180	180	159	78.4	143	60%
	200	190	171	76.8	149	60%	4.16
	230	220	196	81.7	167	60%	4.43
	250	240	213	90.4	182	60%	4.38
	260	250	227	104	199	60%	4.11
	280	270	240	111	210	60%	4.05
	300	280	259	122	229	60%	3.99
	320	310	281	127	204	50%	3.82
	370	370	329	140	202	43%	3.80
	400	400	373	169	325	60%	4.13
	440	440	403	187	354	60%	4.06
	480	480	432	204	382	60%	3.99
	510	510	461	217	407	60%	4.00
	530	530	486	231	358	50%	3.66

EWC / LWC	*Model EWAD-D-SX*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
40/45	210	179	75.1	216	85%	5.27
	230	205	80.0	243	85%	5.60
	250	224	88.4	265	85%	5.54
	270	238	102	289	85%	5.19
	290	251	109	306	85%	5.12
	300	272	120	333	85%	5.04
	310	294	124	314	75%	4.89
40/50	370	348	154	427	85%	5.02
	410	391	165	473	85%	5.23
	450	423	183	515	85%	5.13
	490	453	200	555	85%	5.05
	210	171	75.9	210	85%	5.02
	230	196	80.8	235	85%	5.33
	250	213	89.3	257	85%	5.27
	270	227	103	281	85%	4.94
	290	240	110	297	85%	4.88
	300	259	121	323	85%	4.81
	310	281	125	305	75%	4.66
	370	332	156	415	85%	4.79
	410	373	167	459	85%	4.99
	450	403	185	500	85%	4.89
	490	432	202	539	85%	4.81
45/55	210	171	76.8	149	60%	4.16
	230	196	81.7	167	60%	4.43
	250	213	90.4	182	60%	4.38
	270	227	104	199	60%	4.11
	280	240	111	210	60%	4.05
	300	259	122	229	60%	3.99
	310	281	127	204	50%	3.82
370	332	158	294	60%	3.97	
410	373	169	325	60%	4.13	
450	403	187	354	60%	4.06	
490	432	204	382	60%	3.99	

### NOTES

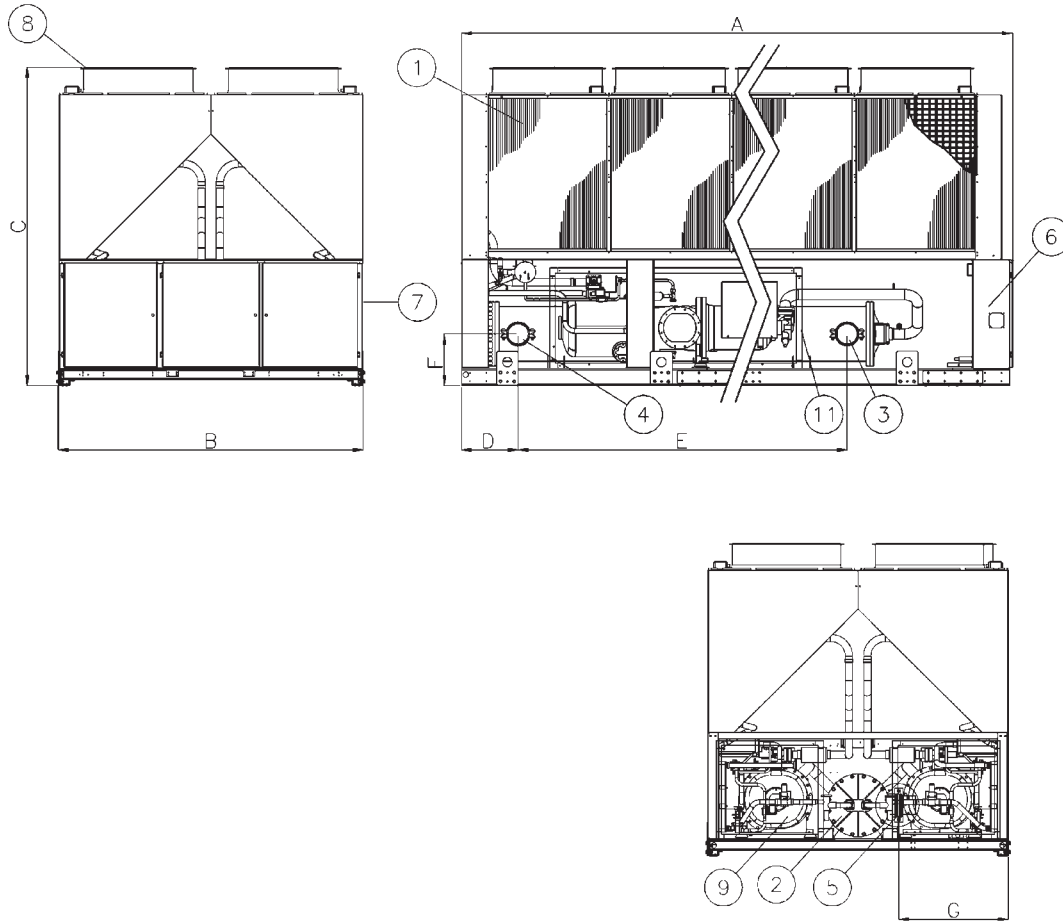
- Cc (cooling capacity)
- Pi (unit power input)
- Hc (heating heat recovery capacity)
- %Hc (percentage heat recovered)
- EER Hc (coefficient of performance during heat recovery = (cooling+ heating capacity) / power input)
- EWC (Entering water heat recovery condenser)
- LWC (Leaving water heat recovery 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<sup>2</sup> °C/kW evaporator fouling factor

# 7 Dimensional drawings

## 7 - 1 Dimensional Drawings

Dimensions EWAD~D-



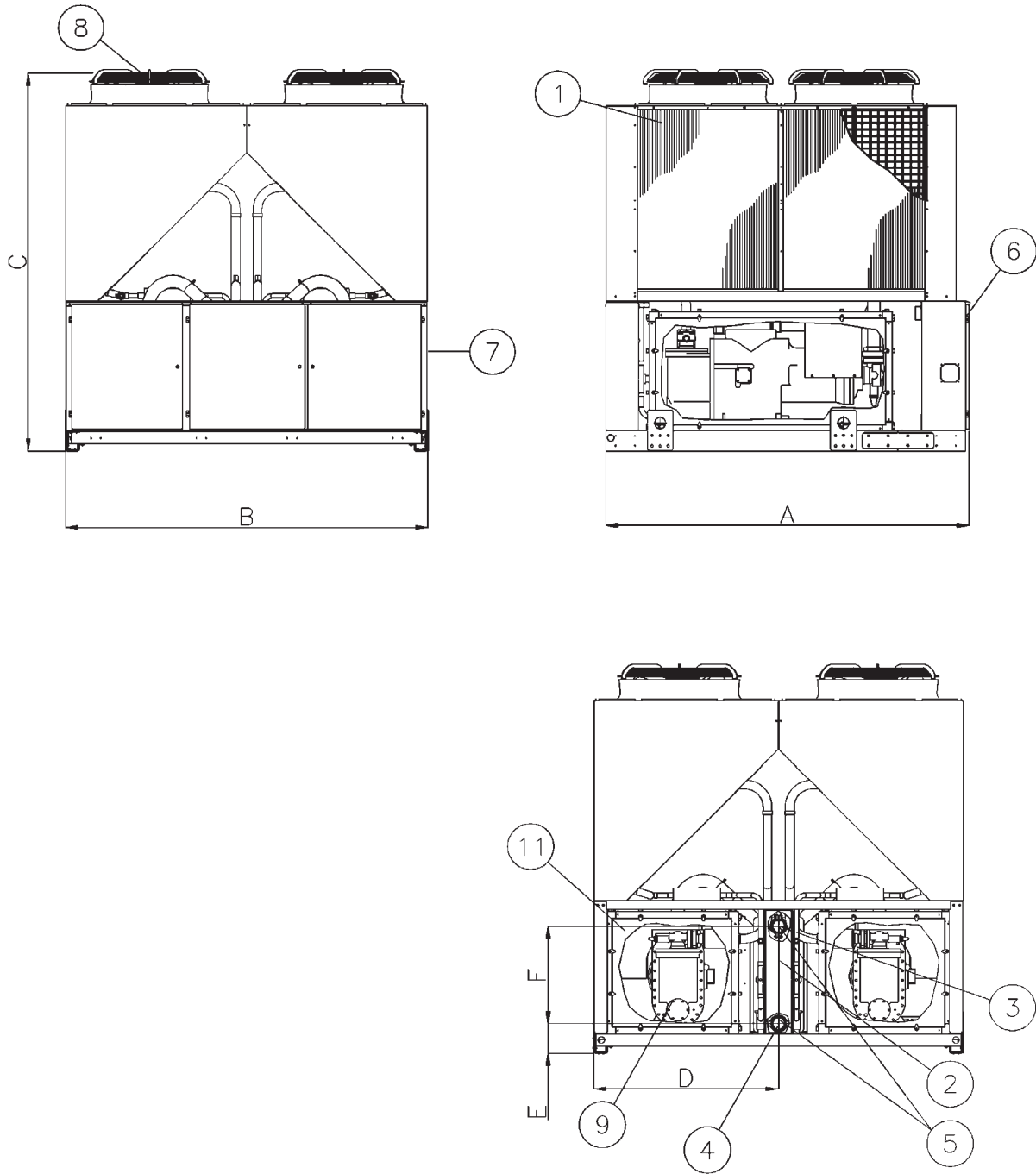
Models	Dimensions (mm)						
	A	B	C	D	E	F	G
EWAD							
EWAD390D-SS	3139	2234	2223	392	1875	339	873
EWAD440~580D-SS	4040	2234	2223	392	2450	339	855
EWAD230~300D-SL	3139	2234	2355	374	1911	339	873
EWAD320D-SL	4040	2234	2355	374	2486	339	873
EWAD400~530D-SL	4040	2234	2223	392	2450	339	855
EWAD220~280D-SR	3139	2234	2355	374	1911	339	873
EWAD310D-SR	4040	2234	2355	374	2486	339	873
EWAD400~530D-SR	4040	2234	2223	392	2450	339	855
EWAD210D-SX	3139	2234	2420	374	1911	339	873
EWAD230~310D-SX	4040	2234	2420	374	2486	339	873
EWAD370~490D-SX	4040	2234	2420	392	2450	339	873
EWAD250D-XS	3138	2234	2355	374	1911	339	873
EWAD280~400D-XS	4040	2234	2355	374	2486	339	873
EWAD470D-XS	4040	2234	2223	414	2412	379	873
EWAD520~620D-XS	4940	2234	2223	414	2412	379	815
EWAD240D-XR	3138	2234	2355	374	1911	339	873
EWAD270~390D-XR	4040	2234	2355	374	2486	339	873
EWAD460D-XR	4040	2234	2223	414	2412	379	873
EWAD510~600D-XR	4940	2234	2223	414	2412	379	815
EWAD230~310D-HS	3339	2234	2223	374	1911	339	873
EWAD340~380D-HS	4040	2234	2223	374	2486	339	873
EWAD420~590D-HS	4040	2234	2223	392	2450	339	873

**LEGEND**

- 1 – Condenser Coil
- 2 – Water heat exchanger (evaporator)
- 3 – Evaporator water inlet
- 4 – Evaporator water outlet
- 5 – Victaulic connection
- 6 – Operating and control panel
- 7 – Slot for power and control connection
- 8 – Fan
- 9 – Compressor

# 7 Dimensional drawings

## 7 - 1 Dimensional Drawings



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Models	Dimensions (mm)					
	A	B	C	D	E	F
EWAD180~200D-SL	2239	2234	2355	1117	181	590
EWAD180~190D-SR	2239	2234	2355	1117	181	590
EWAD200~210D-HS	2223	2234	2223	1117	181	590

**LEGEND**

- 1 – Condenser Coil
- 2 – Water heat exchanger (evaporator)
- 3 – Evaporator water inlet
- 4 – Evaporator water outlet
- 5 – Victaulic connection
- 6 – Operating and control panel
- 7 – Slot for power and control connection
- 8 – Fan
- 9 – Compressor

DMN\_1a-2a\_Rev.01\_2

## 8 Sound data

### 8 - 1 Sound Level Data

#### Sound Level

##### EWAD-D-SS

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)								Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)
390	62.5	71.5	70.0	76.5	68.0	70.5	58.0	49.9	76.5	95.8
440	62.5	71.5	71.0	76.5	69.5	71.0	58.0	51.0	77.0	96.7
470	62.5	71.5	71.0	76.5	69.5	71.0	58.0	51.0	77.0	96.7
510	62.5	71.5	71.0	76.5	69.5	71.0	58.0	51.0	77.0	96.7
530	64.0	73.0	73.0	78.0	71.0	72.5	59.5	52.5	78.5	98.2
560	64.5	73.5	73.5	78.5	71.5	73.0	60.0	53.0	79.0	98.7
580	64.5	73.5	73.5	78.5	71.5	73.0	60.0	53.0	79.0	98.7

#### NOTES

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

##### EWAD-D-SL

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)								Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)
180	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	93.7
200	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	93.7
230	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.3
250	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.3
260	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.3
280	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.3
300	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.3
320	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.7
370	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	97.2
400	60.0	69.0	68.5	74.0	67.0	68.5	55.5	48.5	74.5	94.2
440	60.0	69.0	68.5	74.0	67.0	68.5	55.5	48.5	74.5	94.2
480	60.0	69.0	68.5	74.0	67.0	68.5	55.5	48.5	74.5	94.2
510	61.5	70.5	70.5	75.5	68.5	70.0	57.0	50.0	76.0	95.7
530	62.0	71.0	71.0	76.0	69.0	70.5	57.5	50.5	76.5	96.2

#### NOTES

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

##### EWAD-D-SR

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)								Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)
180	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	88.7
190	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	88.7
220	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.3
240	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.3
250	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.3
270	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.3
280	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.3
310	76.4	69.4	66.3	70.8	62.6	58.2	50.4	57.1	70.0	89.7
370	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	92.2
400	56.5	69.5	69.0	71.0	65.0	61.0	53.5	43.5	71.0	90.7
440	56.5	69.5	69.0	71.0	65.0	61.0	53.5	43.5	71.0	90.7
480	56.5	69.5	69.0	71.0	65.0	61.0	53.5	43.5	71.0	90.7
510	58.0	71.0	70.5	72.5	66.5	62.5	55.0	45.0	72.5	92.2
530	58.5	71.5	71.0	73.0	67.0	63.0	55.5	45.5	73.0	92.7

#### NOTES

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

## 8 Sound data

### 8 - 1 Sound Level Data

#### Sound pressure reduction values for different distances

##### EWAD-D-SS

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
390	0.0	-8.1	-13.0	-16.1	-18.3	-20.2	-25.9
440	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
470	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
510	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
530	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
560	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
580	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4

#### NOTES

Values are dB(A) (pressure level)

##### EWAD-D-SL

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
180	0.0	-8.3	-13.3	-16.4	-18.7	-20.5	-26.3
200	0.0	-8.3	-13.3	-16.4	-18.7	-20.5	-26.3
230	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
250	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
260	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
280	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
300	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
320	0.0	-8.1	-13.0	-16.1	-18.3	-20.2	-25.9
370	0.0	-8.1	-13.0	-16.1	-18.3	-20.2	-25.9
400	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
440	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
480	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
510	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
530	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4

#### NOTES

Values are dB(A) (pressure level)

##### EWAD-D-SR

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
180	0.0	-8.3	-13.3	-16.4	-18.7	-20.5	-26.3
190	0.0	-8.3	-13.3	-16.4	-18.7	-20.5	-26.3
220	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
240	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
250	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
270	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
280	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
310	0.0	-8.1	-13.0	-16.1	-18.3	-20.2	-25.9
370	0.0	-8.1	-13.0	-16.1	-18.3	-20.2	-25.9
400	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
440	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
480	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
510	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
530	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4

#### NOTES

Values are dB(A) (pressure level)

## 9 Installation

### 9 - 1 Installation Method

#### Installation notes

##### Warning

Installation and maintenance of the unit must be performed only by qualified personnel who have knowledge with local codes and regulations, and experience with this type of equipment. The unit must be installed to allow all the maintenance operations.

##### Handling

Care should be taken to avoid rough handling or shock due to dropping of 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 result in reductions in unit efficiency and capacity.

Moreover the unique microprocessor has the ability to analyse the operating environment of the air cooled chiller and to optimize its performance to stay 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.3). 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 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.4); 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 for general installation. A specific evaluation should be done by contractor depending on the case.

Minimum recommended installation clearances

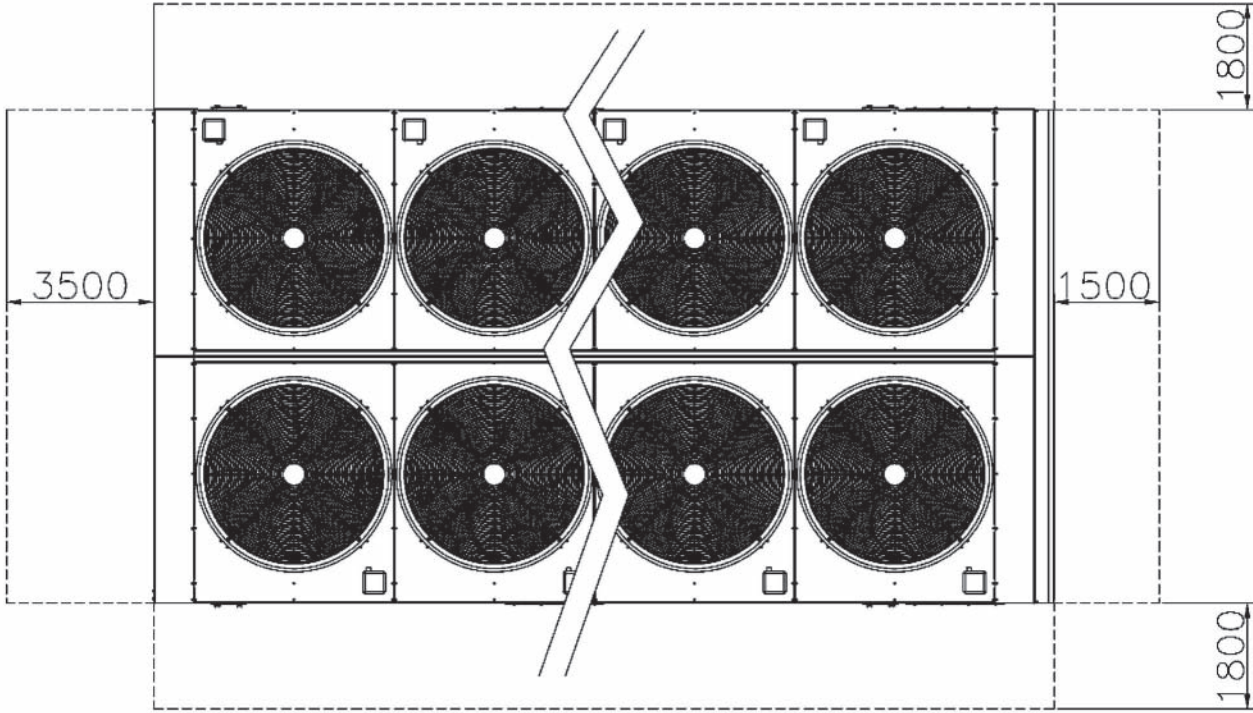


Fig. 1

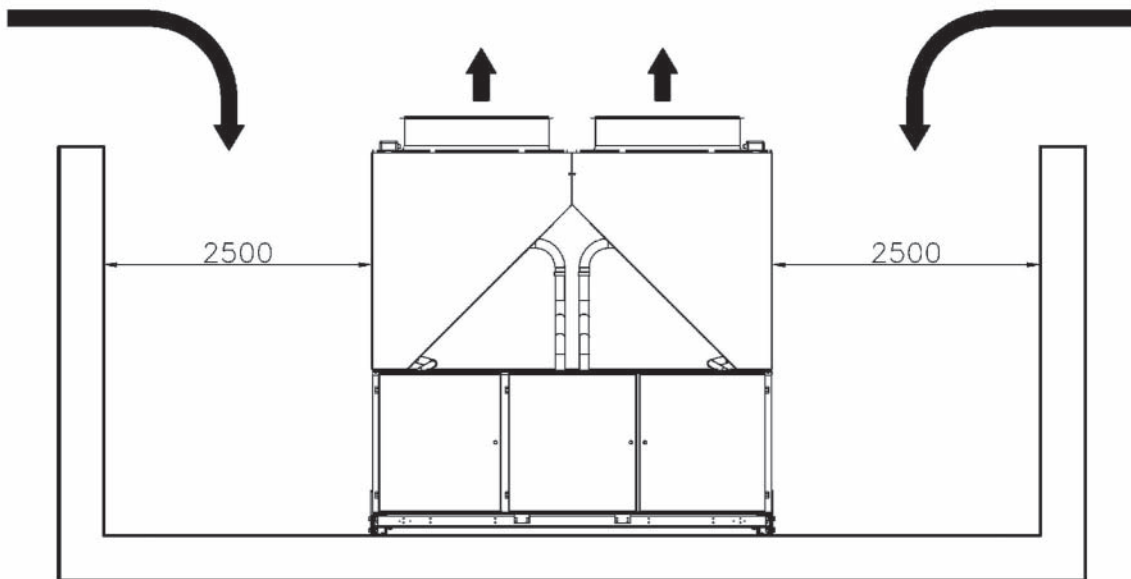


Fig. 2

## 9 Installation

### 9 - 1 Installation Method

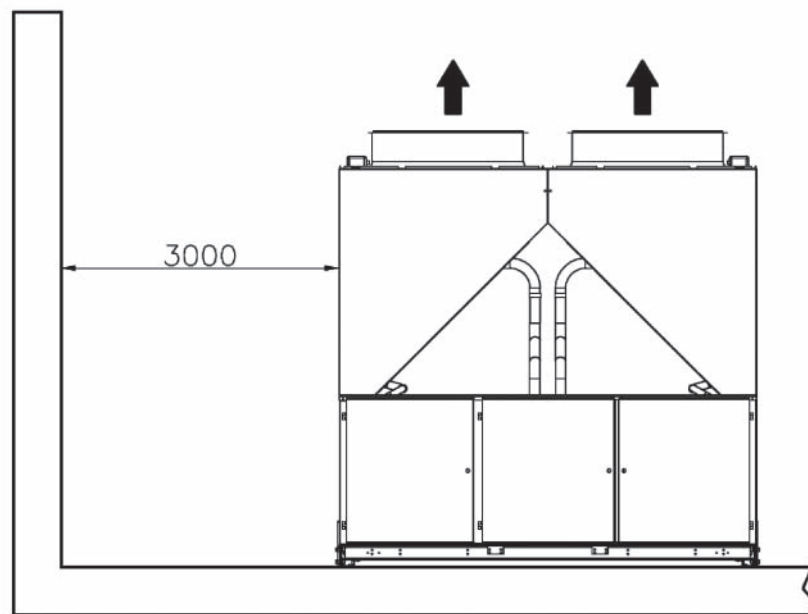


Fig. 3

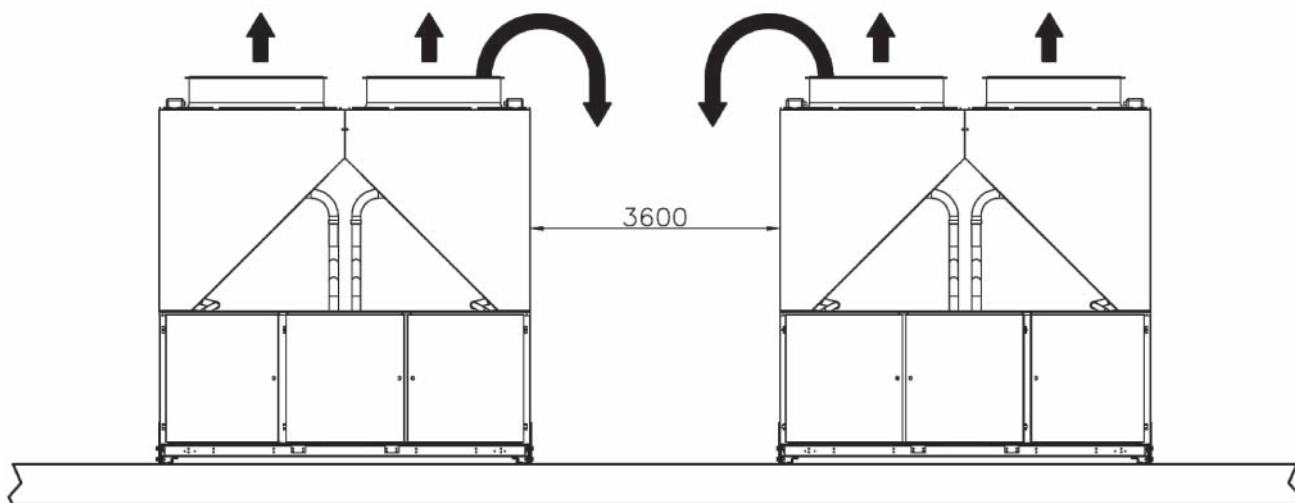


Fig. 4

#### 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



# 10 Operation range

## 10 - 1 Operation Range

**Table 1 - Evaporator minimum and maximum water Δt**

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

**Table 2 - Evaporator fouling factors**

Fouling factors m <sup>2</sup> °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 - Air heat exchanger - 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 operating altitude is 2000 m above sea level.
- Contact factory in case the unit has to be installed at altitudes between 1000 and 2000 m above sea level.

**Table 4.1 - Minimum glycol percentage for low water temperature**

EWLT (°C)	2	0	-2	-4	-6	-8	-10	-12	-15
Ethylene glycol (%)	10	20	20	20	30	30	30	40	40
Propylene glycol (%)	10	20	20	30	30	30	40	40	40

- ELWT (Evaporator Leaving Water Temperature (°C)).
- 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 ambient temperature**

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

- Minimum glycol percentage to prevent freezing of water circuit at indicated air ambient temperature.
- 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 (EWLT < 4°C)**

EWLT (°C)	-4	-6	-8	-10	-12	-15
Cooling Capacity	0.670	0.613	0.562	0.510	0.455	0.375
Compressor Power Input	0.890	0.870	0.840	0.798	0.755	0.680

- ELWT (Evaporator Leaving Water Temperature (°C)).
- 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

- Contact factory for water temperature out of operating limits.

# 10 Operation range

## 10 - 1 Operation Range

### 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: **EWAD390D-SS**

Mixture: Water  
 Working condition: ELWT 12/7°C – Condenser inlet air temperature 35°C  
 - Cooling capacity: 389 kW  
 - Power input: 152 kW  
 - Flow rate (Δt 5°C): 18.60 l/s  
 - Evaporator pressure drop: 46 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:  $389 \times 0.972 = 378 \text{ kW}$   
 - Power input:  $152 \times 0.986 = 150 \text{ kW}$   
 - Flow rate (Δt 5°C):  $18 \text{ (referred to } 378 \text{ kW)} \times 1.074 = 19.33 \text{ l/s}$   
 - Evaporator pressure drop:  $49 \text{ (referred to } 19.33 \text{ l/s)} \times 1.181 = 58 \text{ kPa}$

#### 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: **EWAD390D-SS**

Mixture: Water  
 Standard working condition: ELWT 12/7°C – Condenser inlet air temperature 30°C  
 - Cooling capacity: 412 kW  
 - Power input: 139 kW  
 - Flow rate (Δt 5°C): 19.7 l/s  
 - Evaporator pressure drop: 51 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:  $412 \times 0.613 \times 0.972 = 245 \text{ kW}$   
 - Power input:  $139 \times 0.870 \times 0.986 = 119 \text{ kW}$   
 - Flow rate (Δt 5°C):  $11.71 \text{ l/s (referred to } 245 \text{ kW)} \times 1.074 = 12.58 \text{ l/s}$   
 - Evaporator pressure drop:  $23 \text{ kPa (referred to } 12.58 \text{ l/s)} \times 1.181 = 27 \text{ kPa}$

# 10 Operation range

## 10 - 1 Operation Range

Table 7.1 - 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

ESP table refers to fan diameter Ø800, available on units as follows:

EWAD390~580D-SS  
EWAD470~620D-XS  
EWAD420~590D-HS

Table 7.2 - Available fan static pressure correction factors

"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

ESP table refers to fan diameter Ø800, available on units as follows:

EWAD320~530D-SL/SR  
EWAD460~600D-XR

### How to use the Correction factors proposed in the previous tables

#### Example

Unit Size: **EWAD390D-SS**

- External static pressure **0 Pa**
- Working condition: ELWT 12/7°C – Condenser inlet air temperature 35°C
- Cooling capacity: 389 kW
- Power input: 152 kW
- Maximum CIAT 48°C (see graphic operating limit)

- External static pressure **40 Pa**
- Working condition: ELWT 12/7°C – Condenser inlet air temperature 35°C
- Cooling capacity:  $389 \times 0.993 = 386 \text{ kW}$
- Power input:  $152 \times 1.018 = 155 \text{ kW}$
- Maximum CIAT  $48 - 1.0 = 47^\circ\text{C}$

# 10 Operation range

## 10 - 1 Operation Range

### Water charge, flow and quality

Items <sup>(1)(5)</sup>		Cooling Water				Cooled Water		Heated water <sup>(2)</sup>				Tendency if out of criteria	
		Circulating System		Once Flow	Low temperature			High temperature					
		Circulating water	Supply water <sup>(4)</sup>		Flowing water	Circulating water [Below 20°C]	Supply water <sup>(4)</sup>	Circulating water [20°C ~ 60°C]	Supply water <sup>(4)</sup>	Circulating water [60°C ~ 80°C]	Supply water <sup>(4)</sup>		
Items to be controlled:	pH	at 25°C		6.5 ~ 8.2	6.0 ~ 8.0	6.0 ~ 8.0	6.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	Corrosion + Scale	
	Electrical conductivity	[mS/m] at 25°C	Below 80	Below 30	Below 40	Below 40	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Corrosion + Scale
		[µS/cm] at 25°C	(Below 800)	(Below 300)	(Below 400)	(Below 400)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	Corrosion + Scale
	Chloride ion	[mgCl <sup>-</sup> /l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	Sulfate ion	[mgSO <sub>4</sub> <sup>2-</sup> /l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	M-alkalinity (pH4.8)	[mgCaCO <sub>3</sub> /l]	Below 100	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Total hardness	[mgCaCO <sub>3</sub> /l]	Below 200	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Scale
	Calcium harness	[mgCaCO <sub>3</sub> /l]	Below 150	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
Silica ion	[mgSiO <sub>2</sub> /l]	Below 50	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Scale	
Items to be referred to	Iron	[mgFe/l]	Below 1.0	Below 0.3	Below 1.0	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Below 1.0	Below 0.3	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	Below 0.1	Corrosion
	Sulfite ion	[mgS <sup>2-</sup> /l]	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Corrosion
	Ammonium ion	[mgNH <sub>4</sub> <sup>+</sup> /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	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	Below 0.3	Corrosion
	Free carbide	[mgCO <sub>2</sub> /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	Below 4.0	Corrosion
	Stability index		6.0 ~ 7.0	---	---	---	---	---	---	---	---	---	Corrosion + Scale

### NOTES

- Names, definitions and units are according to JIS K 0101. Units and figures between brackets are old units published as reference only.
- 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 desirable to give the valid measure for corrosion. E.g. chemical measure.
- 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.
- Supply water is considered drink water, industrial water and ground water except for genuine water, neutral water and soft water.
- The above mentioned items are representable items in corrosion and scale cases.

OPL\_1-2-3-4-5-6\_Rev.00\_4

## 10 Operation range

### 10 - 1 Operation Range

#### 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

$$M \text{ (liters)} = ( 0.1595 \times \Delta T(^{\circ}\text{C}) + 3.0825 ) \times P(\text{kW})$$

where:

- M minimum water content per unit expressed in litres
- P Cooling Capacity of the unit expressed in kW
- $\Delta T$  evaporator entering / leaving water temperature difference expressed in  $^{\circ}\text{C}$

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.

## 10 Operation range

### 10 - 1 Operation Range

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This formula is valid for:

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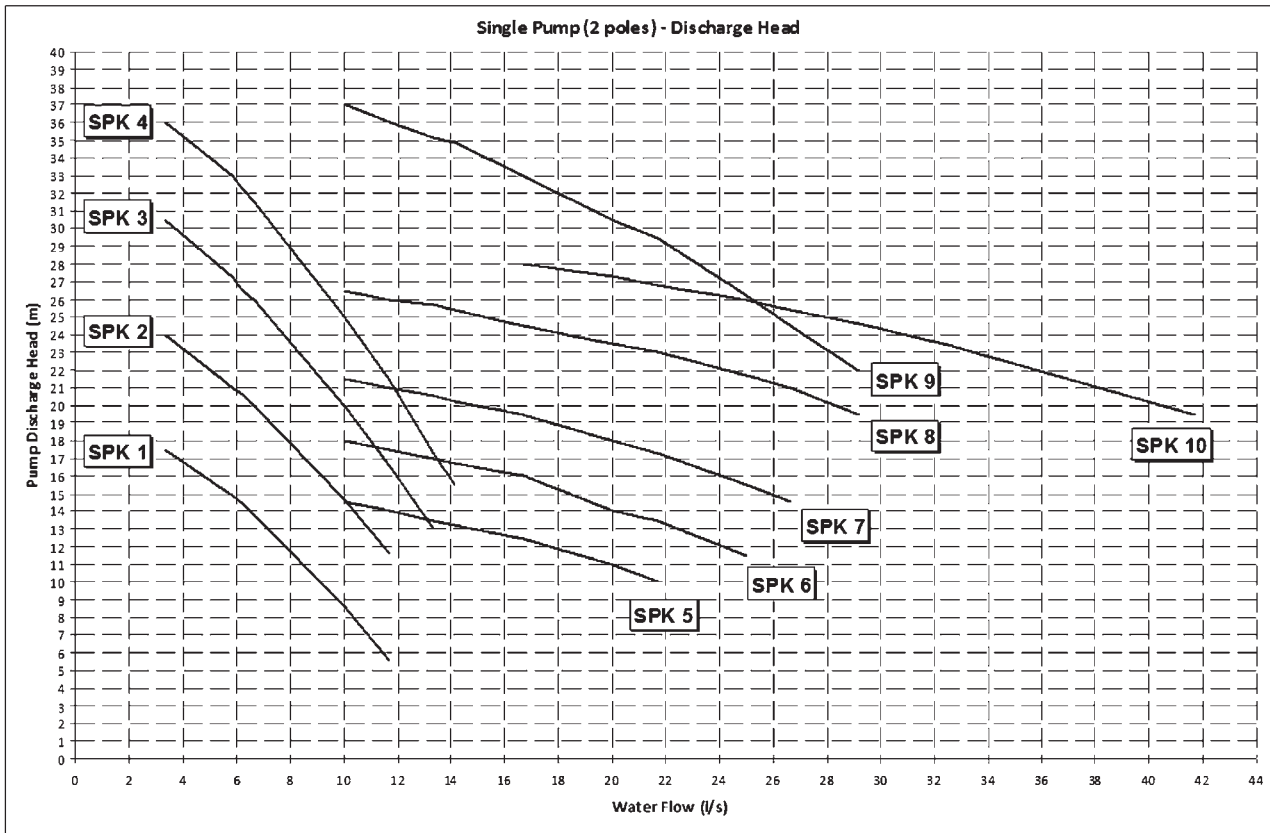
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# 11 Hydraulic performance

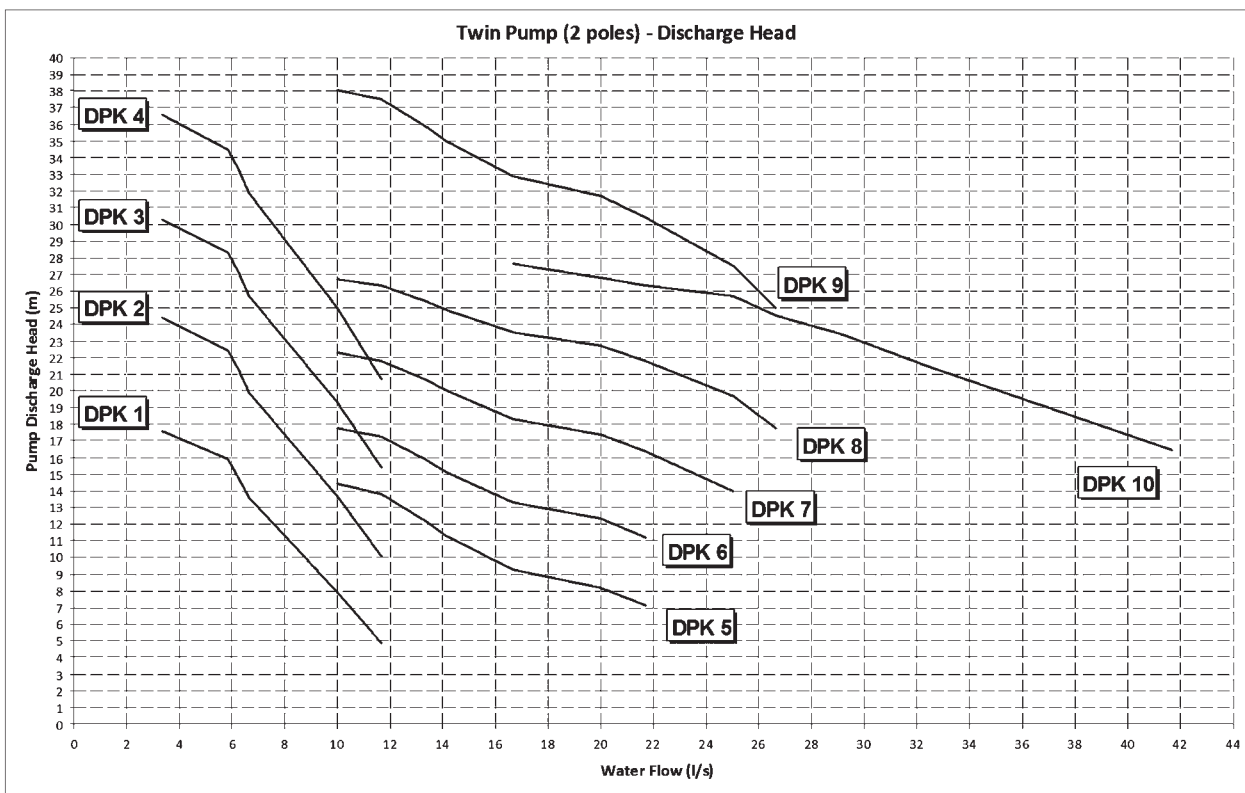
## 11 - 1 Pump Characteristics

Water Pump Kit - Available External Static Pressure



OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_6 (1/2)

Water Pump Kit - Available External Static Pressure



OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_6 (2/2)

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

Water Pump Kit - Combination Matrix

Version	Size	Single Pump									
		SPK 1	SPK 2	SPK 3	SPK 4	SPK 5	SPK 6	SPK 7	SPK 8	SPK 9	SPK 10
EWAD-D-SS	390						X	X	X	X	X
	440						X	X	X	X	X
	470						X	X	X	X	X
	510						X	X	X	X	X
	530							X	X	X	X
	560							X	X	X	X
	580							X	X	X	X
	580							X	X	X	X
EWAD-D-SL	180	X	X	X	X						
	200	X	X	X	X						
	230		X	X	X						
	250		X	X	X						
	260			X	X						
	280				X						
	300				X						
	320					X				X	
	370					X				X	
	400					X				X	
	440						X			X	
	480						X			X	
	510						X			X	
	530						X			X	
EWAD-D-SR	180	X	X	X	X						
	190	X	X	X	X						
	220		X	X	X					X	
	240		X	X	X					X	
	250			X	X					X	
	270			X	X					X	
	280			X	X					X	
	310				X					X	
	370					X				X	
	400					X				X	
	440						X			X	
	480						X			X	
	510						X			X	
	530						X			X	
EWAD-D-SX	210		X	X	X						
	230		X	X	X					X	
	250		X	X	X					X	
	270			X	X					X	
	290				X					X	
	300				X					X	
	310				X					X	
	370				X					X	
	410				X					X	
	450				X					X	
	490				X					X	
	250			X	X					X	
	280			X	X					X	
	300				X					X	
EWAD-D-XS	330				X				X		
	350				X				X		
	380				X				X		
	400				X				X		
	470					X			X		
	520					X			X		
	580								X		
	620								X		
	240		X	X	X	X			X	X	
	270			X	X	X			X	X	
300				X	X			X	X		
320				X	X			X	X		
350				X	X			X	X		
370				X	X			X	X		
390				X	X			X	X		
460					X			X	X		
510					X			X	X		
560								X	X		
600								X	X		
EWAD-D-XR	200		X	X	X						
	210		X	X	X						
	230		X	X	X						
	260			X	X						
	270			X	X						
	290			X	X						
	310				X						
	340				X						
	360				X						
	420				X						
	450				X						
	480				X						
510				X							
550					X						
590						X					
EWAD-D-HS	200		X	X	X						
	210		X	X	X						
	230		X	X	X						
	260			X	X						
	270			X	X						
	290			X	X						
	310				X						
	340				X						
	360				X						
	420				X						
	450				X						
	480				X						
	510				X						
	550					X					
590						X					

3  
11



# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

Water Pump Kit - Combination Matrix

Version	Size	Double Pump									
		DPK 1	DPK 2	DPK 3	DPK 4	DPK 5	DPK 6	DPK 7	DPK 8	DPK 9	DPK 10
EWAD-D-SS	390						X	X	X	X	X
	440						X	X	X	X	X
	470							X	X	X	X
	510							X	X	X	X
	530								X	X	X
	560								X	X	X
	580									X	X
EWAD-D-SL	180	X	X	X	X						
	200	X	X	X	X						
	230		X	X	X						
	250		X	X	X						
	260						X	X	X	X	
	280					X	X	X	X	X	
	300					X	X	X	X	X	
	320					X	X	X	X	X	
	370						X	X	X	X	X
	400						X	X	X	X	X
	440						X	X	X	X	X
	480							X	X	X	X
	510							X	X	X	X
530								X	X	X	
EWAD-D-SR	180	X	X	X	X						
	190	X	X	X	X						
	220		X	X	X		X	X	X	X	
	240		X	X	X		X	X	X	X	
	250						X	X	X	X	
	270						X	X	X	X	
	280						X	X	X	X	
	310						X	X	X	X	
	370						X	X	X	X	X
	400						X	X	X	X	X
	440						X	X	X	X	X
	480						X	X	X	X	X
	510						X	X	X	X	X
530							X	X	X	X	
EWAD-D-SX	210		X	X	X						
	230		X	X	X	X	X	X	X		
	250		X	X	X	X	X	X	X		
	270			X	X	X	X	X	X		
	290				X	X	X	X	X		
	300				X	X	X	X	X		
	310				X	X	X	X	X		
	370				X	X	X	X	X		X
	410				X	X	X	X	X		X
	450				X	X	X	X	X		X
	490					X	X	X	X		X
	250					X	X	X	X		
	280				X	X	X	X	X		
300				X	X	X	X	X			
330				X	X	X	X	X			
350					X	X	X	X		X	
380						X	X	X		X	
400						X	X	X		X	
470						X	X	X		X	
520						X	X	X		X	
580										X	
620										X	
EWAD-D-XR	240		X	X	X		X	X	X	X	
	270					X	X	X	X	X	
	300					X	X	X	X	X	
	320					X	X	X	X	X	
	350					X	X	X	X	X	
	370					X	X	X	X	X	
	390					X	X	X	X	X	X
	460						X	X	X	X	X
	510						X	X	X	X	X
	560										X
600										X	
EWAD-D-HS	200	X	X	X	X						
	210	X	X	X	X						
	230		X	X	X						
	260						X	X	X	X	
	270						X	X	X	X	
	290					X	X	X	X	X	
	310					X	X	X	X	X	
	340						X	X	X	X	
	380						X	X	X	X	X
	420						X	X	X	X	X
	450						X	X	X	X	X
	480						X	X	X	X	X
	510						X	X	X	X	X
550							X	X	X	X	
590								X	X	X	

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

### 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	1.5	3.5	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 2	2.2	5.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 3	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 4	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 5	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 6	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 7	5.5	10.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 8	7.5	13.7	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 9	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 10	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
Double Pump	DPK 1	1.5	3.5	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 2	2.2	5.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 3	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 4	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 5	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 6	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 7	5.5	10.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 8	7.5	13.7	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 9	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 10	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130

#### NOTES

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

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_7

# 11 Hydraulic performance

## 11 - 2 Total and Partial Heat Recovery Pressure Drop

### Total and Partial Heat Recovery Pressure Drops

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

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

where:

- PD<sub>2</sub> Pressure drop to be determinate (kPa)
- PD<sub>1</sub> Pressure drop at nominal condition (kPa)
- Q<sub>2</sub> water flow at new working condition (l/s)
- Q<sub>1</sub> water flow at nominal condition (l/s)

### How to use the formula: Example

The unit EWAD390D-SS has been selected for working at the following conditions:  
 - Total heat recovery leaving water temperature 40/50°C  
 The heating capacity at these working conditions is: 415 kW  
 The water flow at these working conditions is: 9.91 l/s

The unit EWAD390D-SS at nominal working conditions has the following data:  
 - Total heat recovery leaving water temperature 40/45°C  
 - condenser air inlet: 35°C  
 The heating capacity at these working conditions is: 427 kW  
 The water flow at these working conditions is: 20.41 l/s  
 The pressure drop at these working conditions is: 37 kPa

The pressure drop at the selected working condition will be:

$$PD_2 \text{ (kPa)} = 37 \text{ (kPa)} \times \left( \frac{9.91 \text{ (l/s)}}{20.41 \text{ (l/s)}} \right)^{1.80}$$

$$PD_2 \text{ (kPa)} = 10 \text{ (kPa)}$$

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_5

### Partial Total Heat Recovery pressure drops

EWAD-D-SS	390	440	470	510	530	560	580
Heating Capacity (kW)	427	473	515	555	592	552	488
Water Flow (l/s)	20.41	22.59	24.61	26.52	28.28	26.36	23.33
Heat Recovery Pressure Drops (kPa)	37	13	15	17	19	14	11

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – saturated discharge temperature 45°C – water heat recovery in/out 40/45°C

EWAD-D-SL	180	200	230	250	260	280	300	320	370	400	440	480	510	530
EWAD-D-SR	180	190	220	240	250	270	280	310	370	400	440	480	510	530
Heating Capacity (kW)	207	216	243	265	289	306	333	314	314	473	515	555	592	552
Water Flow (l/s)	9.89	10.34	11.59	12.68	13.82	14.63	15.91	15.00	14.98	22.59	24.61	26.52	28.28	26.36
Heat Recovery Pressure Drops (kPa)	23	25	28	28	31	31	35	26	23	13	15	17	19	14

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – saturated discharge temperature 45°C – water heat recovery in/out 40/45°C

EWAD-D-SX	210	230	250	270	290	300	310	370	410	450	490
Heating Capacity (kW)	216	243	265	289	306	333	314	427	473	515	555
Water Flow (l/s)	10.34	11.59	12.68	13.82	14.63	15.91	15.00	20.41	22.59	24.61	26.52
Heat Recovery Pressure Drops (kPa)	25	28	28	31	31	35	26	37	13	15	17

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – saturated discharge temperature 45°C – water heat recovery in/out 40/45°C

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_3 (1/3)

# 11 Hydraulic performance

## 11 - 2 Total and Partial Heat Recovery Pressure Drop

### Partial Heat Recovery pressure drops

EWAD-D-SS	390	440	470	510	530	560	580
Heating Capacity (kW)	173	191	207	223	238	216	191
Water Flow (l/s)	8.25	9.12	9.90	10.67	11.38	10.30	9.11
Heat Recovery Pressure Drops (kPa)	7	2	3	3	3	2	2

**NOTES**

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser air inlet 35°C – water heat recovery in/out 50/60°C

EWAD-D-SL	180	200	230	250	260	280	300	320	370	400	440	480	510	530
EWAD-D-SR	180	190	220	240	250	270	280	310	370	400	440	480	510	530
Heating Capacity (kW)	84	87	98	107	116	123	134	123	122	191	207	223	238	216
Water Flow (l/s)	4.00	4.17	4.67	5.11	5.55	5.88	6.40	5.86	5.84	9.12	9.90	10.67	11.38	10.30
Heat Recovery Pressure Drops (kPa)	4	5	5	6	6	6	7	5	4	2	3	3	3	2

**NOTES**

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser air inlet 35°C – water heat recovery in/out 50/60°C

EWAD-D-SX	210	230	250	270	290	300	310	370	410	450	490
Heating Capacity (kW)	87	98	107	116	123	134	123	173	191	207	223
Water Flow (l/s)	4.17	4.67	5.11	5.55	5.88	6.40	5.86	8.25	9.12	9.90	10.67
Heat Recovery Pressure Drops (kPa)	5	5	6	6	6	7	5	7	2	3	3

**NOTES**

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser air inlet 35°C – water heat recovery in/out 50/60°C

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_4 (1/3)

## 12 Specification text

### 12 - 1 Specification Text

#### Technical Specification for Water Cooled Screw Chiller

##### GENERAL

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

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

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 air cooled screw chiller(s) : ..... unit(s)
- ✓ Cooling capacity for single air cooled screw chiller : ..... kW
- ✓ Power input for single air cooled screw 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 independent refrigerant circuits, semi-hermetic type rotary single screw compressor, electronic expansion device (EEXV), refrigerant 'plate to plate' or 'shell&tube' heat exchanger (depending on the size), air-cooled condenser section, R-134a refrigerant, lubrication system, motor starting components, discharge line shut-off valve, suction 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.

##### NOISE LEVEL AND VIBRATIONS

Sound pressure level at 1 meter distance in free field, semispheric conditions, shall not exceed .....dB(A). The sound pressure levels must be rated in accordance to ISO 3744 (other types of rating can not be used).

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

## 12 Specification text

### 12 - 1 Specification Text

#### DIMENSIONS

Unit dimensions shall not exceed following indications:

- Unit length ..... mm
- Unit width ..... mm
- Unit height ..... mm

#### CHILLER COMPONENTS

##### Compressors

- ✓ The compressor is semi-hermetic, single-screw type with gate-rotors made of carbon impregnated engineered composite material or the latest high-strength fibre reinforced star material (depending on the size). The gaterotor supports will be constructed of cast iron.
- ✓ The oil injection shall be used in order to get high EER (Energy Efficiency Ratio) also at high condensing pressure and low sound pressure levels in each load condition.
- ✓ 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 slide valve position.
- ✓ The unit capacity control shall be infinitely modulating, from 100% down to 25% for each circuit. The chiller shall be capable of stable operation to a minimum of 12.5% 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.
- ✓ The unit control logic shall manage the compressor slides to exactly match the plant load request in order to keep constant the set point for delivered chilled water temperature.
- ✓ 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:
  - High condenser pressure
  - Low evaporating refrigerant temperature

##### Evaporator

- ✓ The units shall be equipped (depending on the size) with a 'plate to plate' or 'shell&tube' evaporator:
  - The 'plate to plate' evaporator is made of stainless steel brazed plates and is covered with a 20mm closed cell insulation material. The exchanger is equipped with a heater for protection against freezing down to -28°C and evaporator water outlet connections of 3". Each evaporator has 1 circuit (one compressor) and the water filter is standard.
  - The 'shell&tube' evaporator is made with copper tubes rolled into steel tubesheets. The evaporators are single-pass on both the refrigerant and water sides for pure counter-flow heat exchange and low refrigerant pressure drops. The external shell is covered with a 10mm closed cell insulation material and the evaporator water outlet connections are provided with victaulic kit (as standard). Each evaporator has 2 circuits, one for each compressor and the water filter is standard.
- ✓ The evaporator is manufactured in accordance to PED approval.

## 12 Specification text

### 12 - 1 Specification Text

#### 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 breaker installed inside the electrical panel as a standard.

#### Refrigerant circuit

- ✓ The unit shall have two independent refrigerant circuits.
- ✓ Each circuit shall include as standard: electronic expansion device piloted by unit's microprocessor control, compressor discharge shut-off valve, suction 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:
  - in-line single pump low and high lifting
  - in-line twin pumps low and high lifting

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

#### Optional High Level Communications Interface

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



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# 1 Features

- Standard efficiency version
- Extra low sound level configuration: condenser fan rotating at 500 rpm, rubber antivibration under compressor, compressor and evaporator sound enclosure
- Stepless single-screw compressor
- Optimised for use with R-134a
- MicroTech III controller
- Large operation range (ambient temperature down to -18°C)



4

1

## 2 Features and advantages

### Features and advantages

#### Low operating cost

This chiller range is the result of careful design, aimed to optimize the energy efficiency of the chillers, with the objective of bringing down operating costs and improving installation profitability, effectiveness and economical management.

The chillers feature a high efficiency single rotor screw compressor design, large condenser coil surface area for maximum heat transfer and low discharge pressure, advanced technology condenser fans and a 'plate to plate' or 'shell&tube' evaporator with low refrigerant pressure drops.

#### Low operating sound levels

Very low sound levels both at full load and part load conditions are achieved by the latest compressor design and by a unique new fan that moves large volume of air at exceptionally low sound levels and by the virtually vibration-free operation.

#### Excellent serviceability

Field serviceability has not been sacrificed to meet design performance objectives. The compressor is equipped with discharge, liquid and suction shut off valves. The compressor and serviceable components such as filter-driers are located on the outside edges of the base allowing, together with the shape of the coil, an easy access for inspection and service. Moreover, the MicroTech III controller gives detailed information on the causes of an alarm or fault.

#### Proven reliability

Full factory testing of every unit with water hook-up helps in providing a trouble-free start-up. Extensive quality control checks during testing means that each equipment protection and operating control is properly adjusted and operates correctly before it leaves the factory.

#### Infinite capacity control

Cooling capacity control is infinitely variable by means of a single screw compressor controlled by microprocessor system. Each unit has infinitely variable capacity control from 100% down to 12.5%. This modulation allows the compressor capacity to exactly match the building cooling load. Chilled water temperature fluctuation is avoided only with a stepless control.

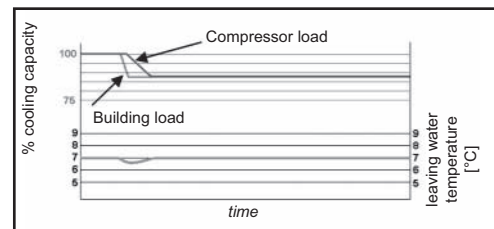
In the case that the compressor with load step control is used, the compressor capacity, at partial loads, will be too high or too low compared to the building cooling load. The result is an increase in chiller energy costs, particularly at the part-load conditions at which the chiller operates most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

Units with stepless regulation offer benefits that the units with step regulation are unable to match.

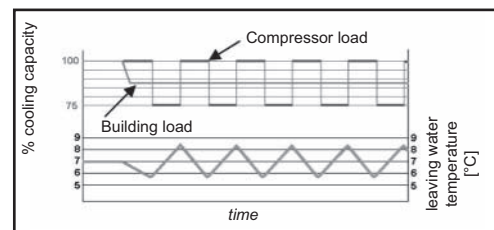
Only a chiller with step-less regulation, is able to follow the system cooling demand at any time and to deliver chilled water at set-point.

#### Superior control logic

The new MicroTech III controller provides an easy to use control environment. The control logic is designed to provide maximum efficiency and a history of unit operation. One of the greatest benefits is the easy interface with LonWorks, Bacnet, Ethernet TCP/IP or Modbus communications.



ELWT fluctuation with stepless capacity control



ELWT fluctuation with steps capacity control (4 steps)

## 2 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 Stds	UNI – EN ISO 9001:2004

### Certifications

All units manufactured by Daikin 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 for other applications, such as naval (RINA, etc.).

### Efficiency and sound configuration

The range is available in multiple efficiency and sound versions:

Efficiency level	Sound level			
	Standard	Low	Reduced	Extra low
Standard efficiency	EWAD~D-SS	EWAD~D-SL	EWAD~D-SR	EWAD~D-SX
High efficiency	EWAD~D-XS	N.A.	EWAD~D-XR	N.A.
High ambient	EWAD~D-HS	N.A.	N.A.	N.A.

### Versions

The range is available in three versions:

**S:** Standard efficiency

7 sizes to cover a range from 389 up to 578 kW with an EER up to 2.03 and an ESEER up to 3.56 (data refers to Standard sound configuration)

**X:** High efficiency

11 sizes to cover a range from 247 up to 622 kW with an EER up to 3.20 and an ESEER up to 4.01 (data refers to Standard sound configuration)

**H:** High ambient temperature

15 sizes to cover a range from 195 up to 587 kW with an EER up to 3.07 and an ESEER up to 3.79 (data refers to Standard sound configuration)

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 weighted formula enabling to take into account the variation of EER with the load rate and the variation of air inlet condenser temperature.

$$ESEER = (A \times EER100\%) + (B \times EER75\%) + (C \times EER50\%) + (D \times EER25\%)$$

	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

## 2 Features and advantages

### Sound levels

The range is available in four different sound level configurations:

**S:** Standard sound

Condenser fan rotating at 890 rpm, rubber antivibration under compressor

**L:** Low sound

Condenser fan rotating at 900 rpm (EWAD180-370D-SL) and 705 rpm (EWAD400-530D-SL), rubber antivibration under compressor.

**R:** Reduced sound

Condenser fan rotating at 680 rpm (EWAD180-370D-SR) and 705 rpm (EWAD400-530D-SR), rubber antivibration under compressor, compressor sound enclosure.

**X:** Extra low sound

Condenser fan rotating at 500 rpm, rubber antivibration under compressor, compressor and evaporator sound enclosure.

## 3 General characteristics

### General characteristics

#### Cabinet and structure

The cabinet is made of galvanized steel sheet and painted to provide a high resistance to corrosion. Colour Ivory White (Munsell code 5Y7.5/1) ( $\pm$ 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.

#### Screw compressors with integrated oil separator

The range features two types of single-screw compressors:

A) The compressor is semi-hermetic, single-screw type with gate-rotors made of carbon impregnated engineered composite material. The compressor has one slide managed by the unit microprocessor for infinitely modulating the capacity between 100% to 25%. An integrated high efficiency oil separator maximizes the oil separation and standard start is Wye-delta (Y- $\Delta$ ) type.

This compressor is offered on following models:

- EWAD180~370D-SL
- EWAD180~370D-SR
- EWAD210~310D-SX
- EWAD250~400D-XS
- EWAD240~390D-XR
- EWAD200~380D-HS

B) The compressor is semi-hermetic, single-screw type with gate-rotor made with the latest high-strength fibre reinforced star material. The compressor has an asymmetric slide regulation managed by the unit controller for infinitely modulating capacity from 100% to 25%. An integrated high efficiency oil separator maximizes the oil separation and standard start is Wye-delta (Y- $\Delta$ ) type.

This compressor is offered on following models:

- EWAD390~580D-SS
- EWAD400~530D-SL
- EWAD400~530D-SR
- EWAD370~490D-SX
- EWAD470~620D-XS
- EWAD460~600D-XR
- EWAD420~590D-HS

#### 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

For size EWAD180~200D-SL, EWAD180~190D-SR and EWAD200~210D-HS

The units are equipped with a direct expansion plate to plate type evaporator. This heat exchanger is made of stainless steel brazed plates and is covered with a 20mm closed cell insulation material. The exchanger is equipped with a heater for protection against freezing down to  $-28^{\circ}\text{C}$  and evaporator water outlet connections of 3". Each evaporator has 2 circuits, one for each compressor and is manufactured in accordance to PED approval. Water pressure differential switch on evaporator standard factory mounted. Water filter is standard.

All the other units are equipped with a Direct Expansion shell&tube evaporator with copper tubes rolled into steel tubesheets. The evaporators are single-pass on both the refrigerant and water sides for pure counter-flow heat exchange and low refrigerant pressure drops. Both attributes contribute to the heat exchanger effectiveness and total unit's outstanding efficiency.

The external shell is covered with a 10mm closed cell insulation material and the evaporator water outlet connections are provided with victaulic kit (as standard). Each evaporator has 2 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.

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### 3 General characteristics

#### Condenser coil fans

Fan 710 mm diameter

The condenser fans are propeller type with wing-profile blades for achieving better performance. Each fan is protected by a guard.

Fan 800 mm diameter

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  $\Delta P$  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 independent refrigerant circuits and each one includes:

- 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
- Sight glass with moisture indicator
- Filter drier
- Charging valves
- High pressure switch
- High and low pressure transducers

#### Electrical control panel

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

#### Power Section

The power section includes compressors fuses, 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.

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## 3 General characteristics

### Control section - main features

- Management of the compressor stepless capacity and fans modulation.
- Chiller enabled to work in partial failure condition.
- Full routine operation at condition of:
  - high ambient temperature value
  - high thermal load
  - high evaporator entering water temperature (start-up)
- Display of evaporator entering/leaving water temperature.
- Display of Outdoor Ambient Temperature.
- Display of condensing-evaporating temperature and pressure, suction and discharge superheat for each circuit.
- Leaving water evaporator temperature regulation (temperature tolerance = 0.1°C)
- Compressor and evaporator pumps hours counter.
- Display of Status Safety Devices.
- Number of starts and compressor working hours.
- Optimized management of compressor load.
- Fan management according to condensing pressure.
- Re-start in case of power failure (automatic / manual).
- Soft Load (optimized management of the compressor load during the start-up).
- Start at high evaporator water temperature.
- Return Reset (Set Point Reset based on return water temperature).
- OAT (Outside Ambient temperature) Reset.
- Set point Reset (optional).
- Application and system upgrade with commercial SD cards.
- Ethernet port for remote or local servicing using standard web browsers.
- Two different sets of default parameters could be stored for easy restore.

### Safety device / logic for each refrigerant circuit

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

### System security

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

### Regulation type

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



### 3 General characteristics

#### Condensing pressure

Condensing pressure can be controlled in according to the entering air temperature to the condenser coil. The fans can be managed either with steps, or with a 0/10V modulating signal or with a mixed 0/10V + Steps strategy to cover all possible operational conditions.

#### MicroTech III

MicroTech III built-in terminal has the following features:

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

#### Supervising systems (on request)

##### MicroTech III remote control

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

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

#### Standard options (supplied on basic unit)

**Evaporator victaulic kit** – Not available on units EWAD180~200D-SL, EWAD180~190D-SR and EWAD200~210D-HS

**Evaporator water design pressure (10Bar)**

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

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

**Wye-Delta Compressors starter (Y-Δ)** – For low inrush current and reduced starting torque.

**Double set-point** – Dual leaving water temperature set-points.

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

**Water pressure differential switch on evaporator** – Not available on units EWAD390~580D-SS, EWAD230~530D-SL, EWAD220~530D-SR, EWAD210~490D-SX, EWAD250~620D-XS, EWAD240~600D-XR, EWAD230~590D-HS

**Evaporator electric heater type** – 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 device**

**20 mm evaporator insulation** – Only for EWAD180~200D-SL, EWAD180~190D-SR, EWAD210D-SX and EWAD200~210D-HS

**Ambient outside temperature sensor and set-point reset**

**Hour run meter**

**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  $\Delta t$ .

**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 (pump etc...). User can decide if this alarm signal will stop the unit or not.

**Fans circuit breakers** – Safety device against motor overloading and short circuit

**Main switch interlock door**

## 3 General characteristics

### Options (on request)

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

#### **Total heat recovery (1 circuit)**

**Partial heat recovery** – Plate to plate heat exchangers installed between the compressor discharge and the condenser coil, allowing producing hot water.

**Brine version** – Allows the unit to operate down to -15°C leaving liquid temperature (antifreeze required).

**Evaporator flanged connections** – Not available for EWAD180~200D-SL, EWAD180~190D-SR, EWAD210D-SX and EWAD200~210D-HS

#### **Condenser coil 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.

**Hydronic Kit (single water pump - low or high lifting)** – (N.A. on EWAD210~490D-SX) Hydronic kit consists of: single direct driven centrifugal pump, water filling system with pressure gauge, safety valve, drain valve. The pump motor 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 - low or high lifting)** – (N.A. on EWAD180~190D-SR and on EWAD210~490D-SX). 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**

**Soft starter** – Electronic starting device to reduce the mechanical stress during compressor start-up.

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

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

**Energy Meter** – This device allows to measure the energy absorbed by the chiller during its life. It is installed inside the control box mounted on a DIN rail and show on a digital display: Line-to-Line Voltage, Phase and Average Current, Active and Reactive Power, Active Energy, Frequency.

**Capacitors for power factor correction** – To increase the operating power factor of the unit at nominal operating conditions. The capacitors are “dry” self-regenerating type with over pressure disconnecting safety device insulated with a no toxic dielectric mix with no PCB or PCT.

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

#### **Fan silent mode**

**Speedtrol** – (N.A. on EWAD210~490D-SX) Continuous fan speed modulation on the first fan of each circuit. It allows the unit working with air temperature down to -18°C.

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

#### **High pressure side manometers (one per circuit)**

#### **Compressors circuit breakers**

**Fan speed regulation** – Standard option for EWAD~D-SX

To control the fan speed revolution for smooth operating control of the unit. During low ambient temperature operation, this option improves also the sound level of the unit. With “Fan speed regulation” option, by different microprocessor setting, it is also possible to set the “Fan Silent Mode” configuration. It means that the microprocessor clock switches the fan at low speed according to the client setting (i.e. Night & Day), providing that the ambient temperature/condensing pressure is allowing the speed change. It allows a perfect condensing control down to -10°C.

### 3 General characteristics

**Rubber type anti vibration mounts** – Supplied separately, these are positioned under the base of the unit during installation to reduce vibrations.

**Spring type anti vibration 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.

**External tank without cabinet (500 L / 1000 L)**

**External tank with cabinet (500 L / 1000 L)**

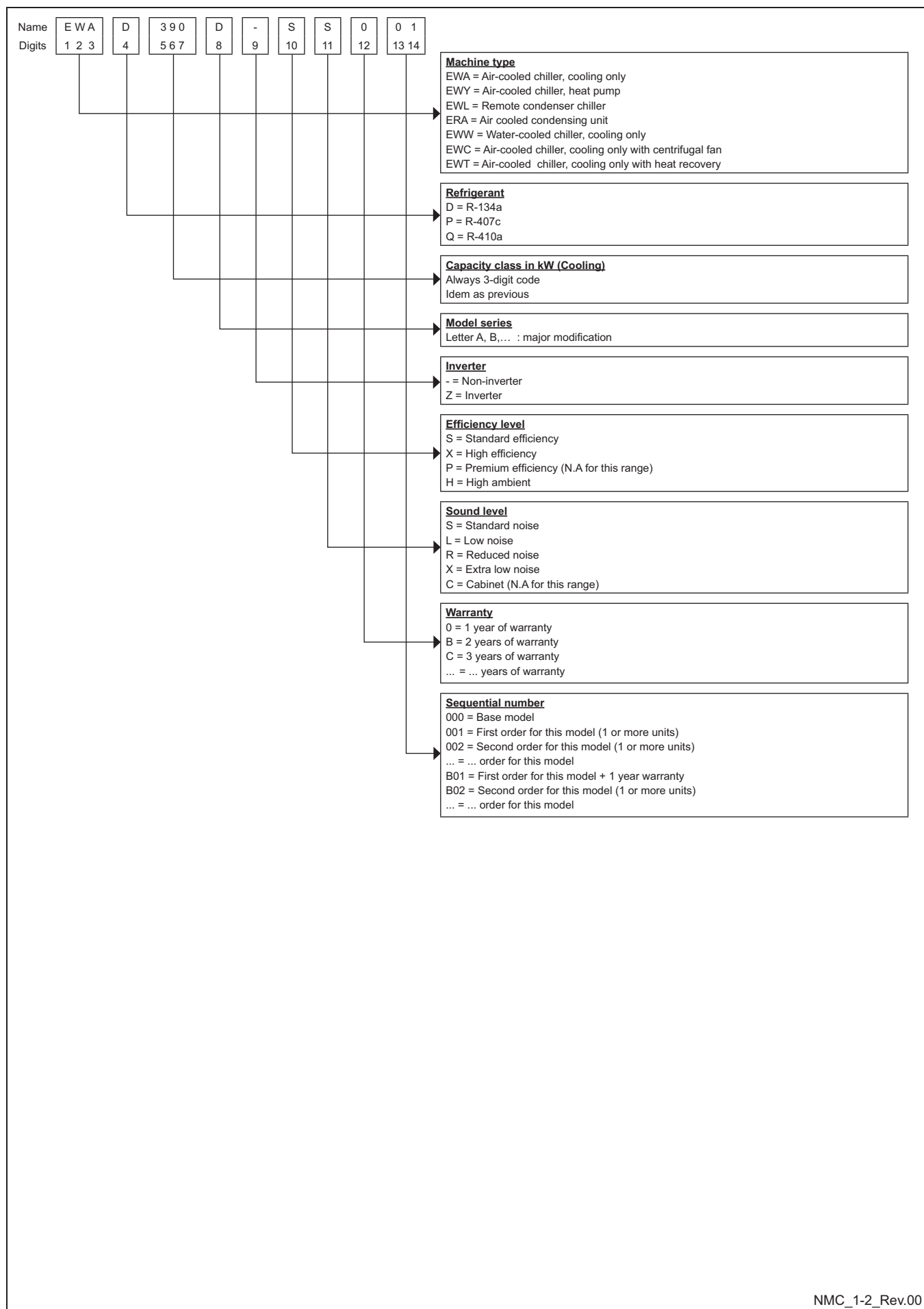
**Container kit**

**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 (please contact the factory) (This test is not available for units with glycol mixtures).

**Acoustic test** – On request, a test can be carried out, at customer's presence (please contact the factory) (This test is not available for units with glycol mixtures).

# 4 Nomenclature

## 4 - 1 Nomenclature



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4

## 5 Specifications

5-1 Technical Specifications					EWAD210D-SX	EWAD230D-SX	EWAD250D-SX	EWAD270D-SX	EWAD290D-SX	EWAD300D-SX
Cooling capacity	Nom.		kW	203 (1)	231 (1)	253 (1)	271 (1)	286 (1)	299 (1)	
Capacity control	Method		Stepless							
	Minimum capacity		%	12.5						
Power input	Cooling	Nom.	kW	79.9 (1)	85.2 (1)	93.5 (1)	104 (1)	114 (1)	126 (1)	
EER				2.54 (1)	2.71 (1)	2.70 (1)	2.59 (1)	2.50 (1)	2.37 (1)	
ESEER				3.39	3.63	3.52	3.55	3.44	3.39	
IPLV				3.82	4.08	3.99	4.01	3.92	3.84	
Casing	Colour		Ivory white							
	Material		Galvanized and painted steel sheet							
Dimensions	Unit	Height	mm	2,420						
		Width	mm	2,234						
		Depth	mm	3,139	4,040					
Weight	Unit		kg	3,110	3,475		3,425	3,430		
	Operation weight		kg	3,200	3,590					
Water heat exchanger	Type		Single pass shell & tube							
	Water volume		l	90	115		165	160		
	Nominal water flow	Cooling	l/s	9.70	11.00	12.10	12.90	13.70	14.30	
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	45	34	38		35	38
Insulation material			Closed cell							
Air heat exchanger	Type		High efficiency fin and tube type with integral subcooler							
Fan	Quantity			6	8					
	Type		Direct propeller							
	Diameter		mm	710						
	Air flow rate	Nom.	l/s	12,876	17,893	17,169				
	Speed		rpm	500						
Fan motor	Drive		DOL							
	Input	Cooling	W	450						
Sound power level	Cooling	Nom.	dBA	84.3	84.7					
Sound pressure level	Cooling	Nom.	dBA	65.0						
Compressor	Type		Semi-hermetic single screw compressor							
	Quantity		2							
	Oil	Charged volume	l	26						
Operation range	Water side	Cooling	Min.	°CDB	-15					
			Max.	°CDB	15					
	Air side	Cooling	Min.	°CDB	-18					
			Max.	°CDB	48					
Refrigerant	Type		R-134a							
	Circuits	Quantity	2							
Refrigerant circuit	Charge		kg	56	60					
Piping connections	Evaporator water inlet/outlet		114.3							
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	Water freeze protection controller							

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## 5 Specifications

5-1 Technical Specifications				EWAD310D-SX	EWAD370D-SX	EWAD410D-SX	EWAD450D-SX	EWAD490D-SX	
Cooling capacity	Nom.		kW	309 (1)	370 (1)	413 (1)	451 (1)	492 (1)	
Capacity control	Method			Stepless					
	Minimum capacity		%	12.5					
Power input	Cooling	Nom.	kW	136 (1)	148 (1)	169 (1)	173 (1)	187 (1)	
EER				2.27 (1)	2.49 (1)	2.44 (1)	2.60 (1)	2.63 (1)	
ESEER				3.25	3.24	3.49	3.61	3.58	
IPLV				3.69	4.03	3.90	3.96	3.89	
Casing	Colour			Ivory white					
	Material			Galvanized and painted steel sheet					
Dimensions	Unit	Height	mm	2,420					
		Width	mm	2,234					
		Depth	mm	4,040		4,940			
Weight	Unit		kg	3,430	3,560	4,302	4,506	4,581	
	Operation weight		kg	3,590	3,735	4,472	4,676	4,746	
Water heat exchanger	Type			Single pass shell & tube					
	Water volume		l	160	175	170		165	
	Nominal water flow	Cooling		l/s	14.70	17.70	19.70	21.50	23.50
		Cooling	Heat exchanger	kPa	41	45	44	50	45
	Insulation material			Closed cell					
Air heat exchanger	Type			High efficiency fin and tube type with integral subcooler					
Fan	Quantity			8		9		10	
	Type			Direct propeller					
	Diameter		mm	710	800				
	Air flow rate	Nom.	l/s	17,169	26,496		28,981	33,120	
	Speed		rpm	500					
Fan motor	Drive			DOL					
	Input	Cooling	W	450	600				
Sound power level	Cooling	Nom.	dBA	84.7			85.7	86.2	
Sound pressure level	Cooling	Nom.	dBA	65.0			65.5	66.0	
Compressor	Type			Semi-hermetic single screw compressor					
	Quantity			2					
	Oil	Charged volume		l	26	32			
Operation range	Water side	Cooling	Min.	°CDB	-15				
			Max.	°CDB	15				
	Air side	Cooling	Min.	°CDB	-18				
			Max.	°CDB	48				
Refrigerant	Type			R-134a					
	Circuits	Quantity		2					
Refrigerant circuit	Charge		kg	60	65	70	76	82	
Piping connections	Evaporator water inlet/outlet			114.3	139.7				
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		Water freeze protection controller					

## 5 Specifications

5-2 Electrical Specifications				EWAD210D-SX	EWAD230D-SX	EWAD250D-SX	EWAD270D-SX	EWAD290D-SX	EWAD300D-SX
Compressor	Phase			3~					
	Voltage		V	400					
	Voltage range	Min.	%	-10					
		Max.	%	10					
	Maximum running current		A	78	94		105		
	Starting method			Wye-delta					
Compressor 2	Maximum running current		A	78	94		105		119
Power supply	Phase			3~					
	Frequency		Hz	50					
	Voltage		V	400					
	Voltage range	Min.	%	-10					
		Max.	%	10					
	Unit	Maximum starting current		A	218	232		275	284
Nominal running current (RLA)		Cooling	A	135	143	157	173	188	204
			A	163	182	199	209	220	235
Max unit current for wires sizing		A	180	201	219	230	242	258	
Fans	Nominal running current (RLA)		A	8		10			

5-2 Electrical Specifications				EWAD310D-SX	EWAD370D-SX	EWAD410D-SX	EWAD450D-SX	EWAD490D-SX	
Compressor	Phase			3~					
	Voltage		V	400					
	Voltage range	Min.	%	-10					
		Max.	%	10					
	Maximum running current		A	119	140	153		174	
	Starting method			Wye-delta					
Compressor 2	Maximum running current		A	119	140	153	174		
Power supply	Phase			3~					
	Frequency		Hz	50					
	Voltage		V	400					
	Voltage range	Min.	%	-10					
		Max.	%	10					
	Unit	Maximum starting current		A	296	406	457	475	
Nominal running current (RLA)		Cooling	A	220	231	272	280	298	
			A	249	290	315	338	360	
Max unit current for wires sizing		A	274	319	347	371	395		
Fans	Nominal running current (RLA)		A	10		11		13	

### Notes

- (1)Cooling: entering evaporator water temp. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C; full load operation.
- (2)Sound pressure levels are measured at entering evaporator water temp. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C; 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. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C. 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

# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

### EWAD-D-SX

ELWT (°C)		210						230						250						270									
		Luchttemperatuur aan de ingang van de condensor (°C)						Luchttemperatuur aan de ingang van de condensor (°C)						Luchttemperatuur aan de ingang van de condensor (°C)						Luchttemperatuur aan de ingang van de condensor (°C)									
		25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46
4	Cc (kW)	206	196	185	173	168	163	158	233	222	211	199	194	188	183	255	244	232	218	212	207	201	275	262	247	232	225	219	212
	Pi (kW)	64	70	76	83	86	89	92	69	75	82	89	92	96	99	75	82	90	98	102	105	109	84	92	100	109	113	116	120
	Qwe (l/s)	9,8	9,3	8,8	8,2	8	7,8	7,5	11,1	10,6	10,1	9,5	9,2	9	8,7	12,2	11,6	11	10,4	10,1	9,8	9,6	13,1	12,5	11,8	11	10,7	10,4	10,1
	Pdwe (kPa)	45,9	41,8	37,7	33,5	31,7	30	28,3	34,2	31,5	28,7	25,7	24,5	23,4	22,1	38,7	35,6	32,4	29,1	27,7	26,4	25	39,3	35,9	32,5	28,9	27,5	26	24,6
5	Cc (kW)	213	202	191	179	174	169	163	240	229	218	205	200	195	189	263	251	239	225	219	213	207	283	270	255	240	233	226	217
	Pi (kW)	65	71	77	84	87	90	93	70	76	83	90	94	97	100	76	83	91	99	103	106	110	85	93	101	110	114	118	120
	Qwe (l/s)	10,1	9,6	9,1	8,5	8,3	8	7,8	11,4	10,9	10,4	9,8	9,5	9,3	9	12,5	12	11,4	10,7	10,5	10,2	9,9	13,5	12,8	12,2	11,4	11,1	10,8	10,3
	Pdwe (kPa)	48,5	44,3	39,9	35,6	33,8	32	30,2	36,1	33,2	30,3	27,3	26,1	24,8	23,6	40,7	37,5	34,2	30,8	29,4	28	26,6	41,4	37,9	34,4	30,7	29,2	27,7	25,7
6	Cc (kW)	219	208	197	185	180	174	168	247	236	224	212	207	201	196	270	258	246	232	226	220	214	291	278	263	247	241	234	221
	Pi (kW)	66	72	79	86	88	91	94	71	77	84	92	95	98	101	77	85	92	101	104	108	112	87	94	103	112	116	120	119
	Qwe (l/s)	10,4	9,9	9,4	8,8	8,6	8,3	8	11,8	11,3	10,7	10,1	9,9	9,6	9,3	12,9	12,3	11,7	11,1	10,8	10,5	10,2	13,9	13,2	12,5	11,8	11,5	11,1	10,6
	Pdwe (kPa)	51,3	46,8	42,3	37,7	35,9	34	31,9	38	35,1	32	28,9	27,6	26,3	25	42,8	39,5	36,1	32,6	31,2	29,7	28,2	43,6	40	36,3	32,5	30,9	29,4	26,6
7	Cc (kW)	225	215	203	191	186	180	170	253	243	231	219	213	208	202	277	265	253	239	233	227	221	299	286	271	255	248	241	226
	Pi (kW)	67	73	80	87	90	93	92	72	78	85	93	96	99	103	78	86	94	102	106	109	113	88	96	104	114	117	121	119
	Qwe (l/s)	10,8	10,2	9,7	9,1	8,9	8,6	8,1	12,1	11,6	11	10,4	10,2	9,9	9,6	13,2	12,7	12,1	11,4	11,1	10,8	10,5	14,3	13,6	12,9	12,2	11,8	11,5	10,8
	Pdwe (kPa)	54	49,4	44,7	39,9	38	36,1	32,6	39,9	36,9	33,8	30,6	29,3	27,9	26,6	44,9	41,6	38	34,4	32,9	31,4	29,9	45,9	42,2	38,3	34,4	32,8	31,1	27,8
8	Cc (kW)	232	221	209	197	191	186	172	260	250	238	225	220	214	209	284	272	260	246	240	234	228	308	294	279	263	256	248	231
	Pi (kW)	68	75	81	88	91	94	91	73	79	86	94	97	101	104	80	87	95	103	107	111	114	89	97	106	115	119	123	119
	Qwe (l/s)	11,1	10,6	10	9,4	9,1	8,9	8,2	12,4	11,9	11,4	10,7	10,5	10,2	10	13,6	13	12,4	11,7	11,5	11,2	10,9	14,7	14	13,3	12,5	12,2	11,8	11
	Pdwe (kPa)	56,8	52,2	47,2	42,2	40,2	38,2	33,3	41,9	38,8	35,6	32,3	30,9	29,5	28,2	47	43,6	40	36,3	34,7	33,2	31,6	48,2	44,4	40,4	36,3	34,7	32,8	28,9
9	Cc (kW)	238	227	215	203	197	192	174	267	256	245	232	226	221	215	291	280	267	253	247	241	235	316	302	287	270	264	253	235
	Pi (kW)	70	76	82	89	92	95	89	74	80	88	95	99	102	105	81	88	96	105	108	112	116	91	99	108	117	121	122	118
	Qwe (l/s)	11,4	10,9	10,3	9,7	9,4	9,2	8,3	12,8	12,2	11,7	11,1	10,8	10,5	10,3	13,9	13,4	12,7	12,1	11,8	11,5	11,2	15,1	14,4	13,7	12,9	12,6	12,1	11,2
	Pdwe (kPa)	59,8	54,9	49,8	44,6	42,6	40,5	34	44	40,8	37,5	34	32,6	31,2	29,8	49,2	45,7	42	38,2	36,6	35	33,4	50,6	46,7	42,5	38,3	36,6	33,9	29,8
10	Cc (kW)	245	234	222	209	203	195	176	274	263	251	239	233	227	219	298	287	274	260	254	248	239	324	310	295	278	271	258	237
	Pi (kW)	71	77	84	91	94	95	88	75	81	89	97	100	103	104	82	89	97	106	110	113	115	92	100	109	119	123	121	115
	Qwe (l/s)	11,7	11,2	10,6	10	9,7	9,3	8,4	13,1	12,6	12	11,4	11,1	10,9	10,5	14,3	13,7	13,1	12,4	12,1	11,8	11,4	15,5	14,8	14,1	13,3	13	12,3	11,3
	Pdwe (kPa)	62,8	57,7	52,5	47,1	44,9	41,8	34,6	46,1	42,8	39,4	35,9	34,4	32,9	30,7	51,4	47,8	44,1	40,2	38,5	36,8	34,4	53	49	44,7	40,4	38,6	35,1	30,1
11	Cc (kW)	251	240	228	215	209	197	177	281	270	258	245	240	234	223	306	294	281	267	261	255	241	332	318	303	286	279	263	239
	Pi (kW)	72	78	85	92	95	93	86	76	83	90	98	101	104	104	83	90	99	107	111	115	113	94	102	111	120	124	121	114
	Qwe (l/s)	12	11,5	10,9	10,3	10	9,4	8,5	13,4	12,9	12,3	11,7	11,5	11,2	10,7	14,6	14	13,4	12,8	12,5	12,2	11,5	15,9	15,2	14,5	13,7	13,3	12,6	11,4
	Pdwe (kPa)	65,9	60,6	55,2	49,7	47,4	42,6	35,1	48,2	44,8	41,3	37,7	36,2	34,7	31,8	53,7	50	46,2	42,2	40,5	38,8	35,1	55,5	51,3	47	42,5	40,6	36,4	30,8
12	Cc (kW)	258	247	234	221	216	199	178	288	277	265	252	246	241	227	313	301	288	274	268	262	243	340	326	311	294	284	267	241
	Pi (kW)	73	79	86	93	96	92	84	77	84	91	99	102	106	104	84	92	100	109	112	116	111	95	103	112	122	124	121	112
	Qwe (l/s)	12,3	11,8	11,2	10,6	10,3	9,5	8,5	13,8	13,2	12,7	12	11,8	11,5	10,9	15	14,4	13,8	13,1	12,8	12,5	11,6	16,3	15,6	14,9	14,1	13,6	12,8	11,5
	Pdwe (kPa)	69,2	63,6	58	52,3	50	43,4	35,5	50,4	46,9	43,3	39,6	38,1	36,5	32,9	56,1	52,3	48,3	44,2	42,5	40,7	36,6	58	53,8	49,3	44,6	42	37,6	31,2
13	Cc (kW)	265	253	241	227	220	201	179	295	284	272	258	253	247	231	320	308	295	281	275	269	245	348	334	319	302	290	271	243
	Pi (kW)	74	81	88	95	97	90	83	78	85	92	100	104	107	103	85	93	101	110	114	118	109	97	105	114	124	124	120	110
	Qwe (l/s)	12,7	12,1	11,5	10,9	10,5	9,6	8,6	14,1	13,6	13	12,4	12,1	11,8	11,1	15,3	14,7	14,1	13,4	13,2	12,9	11,7	16,7	16	15,3	14,5	13,9	13	11,6
	Pdwe (kPa)	72,5	66,8	60,9	55	52,1	44	35,8	52,6	49,1	45,4	41,5	39,9	38,3	34	58,6	54,6	50,5	46,3	44,5	42,7	36,1	60,6	56,2	51,6	46,9	43,4	38,6	31,7
14	Cc (kW)	272	260	247	233	222	202	181	302	291	278	265	260	252	236	328	315	302	288	282	274	247	356	342	327	310	295	273	244
	Pi (kW)	76	82	89	96	95	89	82	79	86	93	102	105	107	103	86	94	102	111	115	118	107	98	107	116	126	123	118	108
	Qwe (l/s)	13	12,4	11,8	11,2	10,6	9,7	8,7	14,4	13,9	13,3	12,7	12,4	12	11,3	15,7	15,1	14,5	13,8	13,5	13,1	11,8	17,1	16,4	15,6	14,8	14,1	13,1	11,7
	Pdwe (kPa)	75,9	70	63,9	57,8	52,9	44,6	36,7	54,9	51,3	47,5	43,5	41,9	39,6	35,3	61,1	57	52,7	48,4	46,6	44,3	36,6	63,2	58,7	54	49,1	44,8	39,1	31,9
15	Cc (kW)	279	266	253	240	224	203	182	309	297	285	272	266	256	240	335	323	309	295	289	277	250	365	350	335	316	299	275	247
	Pi (kW)	77	83	90	98	94	87	80	80	87	95	103	106	106	103	88	95	104	113	117	116	106	99	108	117	126	123	116	107
	Qwe (l/s)	13,3	12,8	12,1	11,5	10,7	9,7	8,7	14,8	14,2	13,6	13	12																



# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

### EWAD-D-SX

ELWT (°C)		290						300						310						370									
		Luchttemperatuur aan de ingang van de condensor (°C)						Luchttemperatuur aan de ingang van de condensor (°C)						Luchttemperatuur aan de ingang van de condensor (°C)						Luchttemperatuur aan de ingang van de condensor (°C)									
		25	30	35	40	42	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46	
4	Cc (kW)	292	276	260	243	236	229	220	306	290	273	254	247	236	218	317	300	282	262	254	240	214	380	362	340	313	301	288	274
	Pi (kW)	92	100	109	119	123	127	130	101	110	120	131	135	137	133	109	119	129	141	145	144	133	118	129	142	156	162	169	175
	Qwe (l/s)	13.9	13.2	12.4	11.6	11.2	10.9	10.5	14.6	13.8	13	12.1	11.7	11.2	10.4	15.1	14.3	13.4	12.5	12.1	11.4	10.2	18.1	17.2	16.2	14.9	14.3	13.7	13.1
	Pdwe (kPa)	36	32.7	29.3	26	24.6	23.2	21.6	39.1	35.5	31.8	28	26.5	24.4	21.3	42.4	38.4	34.3	30.1	28.5	25.6	21	46.6	42.6	38.1	32.9	30.6	28.3	25.9
5	Cc (kW)	301	285	269	251	244	237	223	316	299	282	263	255	241	221	327	309	291	271	263	243	217	391	372	350	323	310	297	283
	Pi (kW)	94	102	111	120	124	129	128	103	112	122	133	137	136	130	111	121	132	143	148	142	131	120	131	144	158	165	171	178
	Qwe (l/s)	14.3	13.6	12.8	12	11.6	11.3	10.6	15	14.3	13.4	12.5	12.2	11.5	10.5	15.6	14.7	13.9	12.9	12.5	11.6	10.3	18.6	17.7	16.7	15.4	14.8	14.2	13.5
	Pdwe (kPa)	38.1	34.6	31.1	27.6	26.2	24.7	22.2	41.4	37.6	33.7	29.7	28.2	25.5	21.8	44.8	40.6	36.3	32	30.2	26.3	21.4	49.1	44.9	40.2	34.7	32.4	29.9	27.4
6	Cc (kW)	310	294	277	260	252	245	226	325	308	290	271	263	247	224	336	319	300	280	271	246	219	402	383	360	332	320	306	292
	Pi (kW)	95	104	113	122	126	130	126	105	114	124	135	139	136	128	113	123	134	145	150	140	128	122	133	146	161	167	174	180
	Qwe (l/s)	14.8	14	13.2	12.4	12	11.7	10.8	15.5	14.7	13.9	12.9	12.6	11.8	10.7	16	15.2	14.3	13.3	12.9	11.7	10.4	19.2	18.3	17.2	15.8	15.2	14.6	13.9
	Pdwe (kPa)	40.2	36.6	33	29.3	27.8	26.3	22.8	43.7	39.7	35.6	31.5	29.9	26.6	22.3	47.2	42.8	38.4	33.9	32.1	27	21.8	51.6	47.3	42.3	36.6	34.2	31.6	29
7	Cc (kW)	319	303	286	268	260	253	227	335	318	299	280	269	253	226	346	328	309	288	275	249	223	413	393	370	342	329	315	300
	Pi (kW)	97	105	114	124	128	132	122	107	116	126	137	139	136	126	115	125	136	148	148	137	127	124	135	148	163	169	176	183
	Qwe (l/s)	15.2	14.5	13.7	12.8	12.4	12.1	10.8	16	15.2	14.3	13.4	12.9	12	10.8	16.5	15.6	14.7	13.8	13.1	11.9	10.6	19.7	18.8	17.7	16.3	15.7	15	14.3
	Pdwe (kPa)	42.4	38.7	34.9	31	29.5	27.9	23	46	41.9	37.7	33.4	31.1	27.7	22.7	49.7	45.2	40.5	35.8	32.9	27.5	22.5	54.2	49.7	44.5	38.6	36	33.3	30.6
8	Cc (kW)	328	312	295	277	269	256	229	344	327	308	289	274	255	228	355	337	318	297	276	251	224	424	404	380	351	338	324	304
	Pi (kW)	99	107	116	126	130	131	120	109	118	128	139	138	134	123	117	127	138	150	144	135	125	125	137	151	165	172	179	180
	Qwe (l/s)	15.7	14.9	14.1	13.2	12.8	12.2	10.9	16.4	15.6	14.7	13.8	13.1	12.2	10.9	17	16.1	15.2	14.2	13.2	12	10.7	20.2	19.3	18.1	16.8	16.1	15.5	14.5
	Pdwe (kPa)	44.7	40.8	36.9	32.8	31.2	28.6	23.4	48.4	44.1	39.8	35.3	32.2	28.3	23.1	52.3	47.6	42.8	37.9	33.2	28	22.8	56.9	52.1	46.7	40.5	37.8	35.1	31.4
9	Cc (kW)	338	321	304	285	277	259	231	354	336	318	298	280	258	230	365	347	327	306	279	253	225	435	414	390	361	347	333	307
	Pi (kW)	100	109	118	128	132	128	118	111	120	130	141	138	131	121	119	130	141	152	142	132	122	127	139	153	168	174	181	175
	Qwe (l/s)	16.1	15.3	14.5	13.6	13.2	12.4	11	16.9	16.1	15.2	14.2	13.4	12.3	11	17.4	16.6	15.6	14.6	13.3	12.1	10.7	20.8	19.8	18.6	17.2	16.6	15.9	14.6
	Pdwe (kPa)	47.1	43	38.9	34.7	33	29.2	23.8	50.9	46.5	41.9	37.3	33.4	28.8	23.4	54.9	50	45	40	33.9	28.5	23	59.6	54.6	49	42.6	39.8	36.8	31.8
10	Cc (kW)	347	330	313	294	286	261	235	363	346	327	304	286	260	233	375	356	336	310	282	255	228	446	425	400	370	356	342	310
	Pi (kW)	102	111	120	130	134	126	117	113	122	133	141	138	129	120	121	132	143	150	139	130	120	129	141	155	170	177	184	172
	Qwe (l/s)	16.6	15.8	14.9	14	13.7	12.5	11.2	17.4	16.5	15.6	14.5	13.6	12.4	11.1	17.9	17	16.1	14.8	13.5	12.2	10.9	21.3	20.3	19.1	17.7	17	16.3	14.8
	Pdwe (kPa)	49.5	45.3	41	36.6	34.9	29.7	24.5	53.5	48.9	44.2	38.7	34.7	29.3	24	57.6	52.5	47.4	40.8	34.4	28.8	23.5	62.4	57.2	51.3	44.6	41.7	38.7	32.5
11	Cc (kW)	357	340	322	302	291	264	236	373	355	336	309	289	262	235	385	366	346	311	284	256	231	457	435	410	379	366	349	313
	Pi (kW)	104	113	122	132	134	124	115	115	124	135	140	136	127	118	124	134	145	146	136	127	119	131	144	157	173	180	185	169
	Qwe (l/s)	17	16.2	15.4	14.5	13.9	12.6	11.3	17.8	17	16.1	14.7	13.8	12.5	11.2	18.4	17.5	16.5	14.8	13.6	12.3	11	21.8	20.8	19.6	18.1	17.5	16.7	15
	Pdwe (kPa)	52	47.7	43.2	38.7	36	30.2	24.8	56.1	51.3	46.4	39.9	35.5	29.6	24.4	60.4	55.1	49.8	41.1	34.9	29.1	24	65.3	59.8	53.7	46.7	43.7	40.2	33.1
12	Cc (kW)	366	349	331	311	293	266	237	383	365	345	314	293	264	235	394	375	355	313	288	260	230	468	446	420	389	375	353	316
	Pi (kW)	106	115	124	134	132	122	112	117	127	137	140	135	125	115	126	136	148	144	135	126	116	133	146	160	176	182	182	166
	Qwe (l/s)	17.5	16.7	15.8	14.9	14	12.7	11.3	18.3	17.4	16.5	15	14	12.6	11.2	18.9	17.9	17	15	13.8	12.4	11	22.4	21.3	20.1	18.6	17.9	16.9	15.1
	Pdwe (kPa)	54.6	50.1	45.4	40.7	36.6	30.6	25	58.8	53.9	48.8	41.2	36.3	30.2	24.5	63.2	57.8	52.3	41.8	35.9	29.8	24	68.2	62.5	56.1	48.9	45.7	41	33.7
13	Cc (kW)	376	358	340	320	296	267	240	393	374	354	320	295	265	238	404	385	364	316	289	260	232	479	457	430	398	384	356	321
	Pi (kW)	108	116	126	136	129	119	111	119	129	139	140	132	122	114	128	139	150	141	133	123	115	136	148	162	178	185	179	164
	Qwe (l/s)	18	17.1	16.3	15.3	14.2	12.8	11.5	18.8	17.9	17	15.3	14.1	12.7	11.4	19.3	18.4	17.4	15.1	13.8	12.4	11.1	22.9	21.8	20.6	19	18.4	17.1	15.3
	Pdwe (kPa)	57.2	52.5	47.7	42.8	37.2	31	25.5	61.6	56.5	51.2	42.6	36.7	30.4	25	66.1	60.5	54.8	42.3	36.2	29.9	24.4	71.3	65.3	58.5	51	47.8	41.8	34.6
14	Cc (kW)	386	368	349	325	298	268	240	402	384	364	324	296	267	239	414	395	374	320	290	263	234	491	467	440	407	393	360	323
	Pi (kW)	109	118	128	136	127	117	109	121	131	142	139	129	120	112	130	141	153	140	130	121	113	138	150	165	181	188	176	161
	Qwe (l/s)	18.5	17.6	16.7	15.5	14.3	12.8	11.5	19.3	18.4	17.4	15.5	14.2	12.8	11.4	19.8	18.9	17.9	15.3	13.9	12.6	11.2	23.5	22.4	21	19.5	18.8	17.2	15.4
	Pdwe (kPa)	59.9	55.1	50.1	44	37.7	31.2	25.6	64.4	59.1	53.7	43.7	37.1	30.8	25.2	69	63.3	57.4	43.4	36.5	30.4	24.7	74.4	68.1	61	53.2	49.8	42.5	35
15	Cc (kW)	395	377	358	328	300	272	243	412	393	373	327	299	270	241	424	404	383	322	294	265	236	502	478	450	417	396	363	324
	Pi (kW)	111	120	130	134	125	116	107	123	133	144	137	128	119	110	133	143	155	137	129	120	112	140	153	167	183	187	172	158
	Qwe (l/s)	18.9																											

# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

### EWAD-D-SX

ELWT (°C)		410						450						490								
		Luchttemperatuur aan de ingang van de condensor (°C)						Luchttemperatuur aan de ingang van de condensor (°C)						Luchttemperatuur aan de ingang van de condensor (°C)								
		25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46
4	Cc (kW)	428	406	381	330	305	281	254	463	442	417	368	342	316	288	505	481	453	409	380	351	318
	Pi (kW)	133	147	162	164	161	156	149	137	151	167	173	170	167	161	148	163	180	193	190	186	179
	Qwe (l/s)	20,4	19,4	18,1	15,7	14,5	13,4	12,1	22,1	21	19,8	17,5	16,3	15	13,7	24,1	22,9	21,6	19,5	18,1	16,7	15,2
	Pdwe (kPa)	46,7	42,5	37,8	29,3	25,4	21,8	18,2	52,4	48,1	43,2	34,6	30,3	26,3	22,3	46,9	42,9	38,5	32,1	28	24,3	20,4
5	Cc (kW)	440	418	391	353	326	301	273	475	454	428	392	365	338	308	519	495	466	432	407	377	345
	Pi (kW)	135	149	165	176	172	168	161	139	153	169	184	182	178	172	150	165	182	201	203	200	194
	Qwe (l/s)	20,9	19,9	18,7	16,8	15,5	14,3	13	22,7	21,6	20,4	18,7	17,4	16,1	14,7	24,7	23,6	22,2	20,6	19,4	18	16,4
	Pdwe (kPa)	49	44,7	39,8	33	28,6	24,7	20,8	54,9	50,5	45,5	38,8	34,1	29,7	25,2	49,3	45,1	40,5	35,4	31,8	27,7	23,6
6	Cc (kW)	451	429	402	371	349	322	295	487	465	439	408	389	360	332	533	508	479	444	429	405	370
	Pi (kW)	138	151	167	185	186	181	175	141	155	171	190	194	191	186	153	168	184	204	212	216	209
	Qwe (l/s)	21,5	20,4	19,2	17,7	16,7	15,4	14,1	23,2	22,2	21	19,5	18,5	17,2	15,8	25,4	24,2	22,8	21,2	20,4	19,3	17,7
	Pdwe (kPa)	51,4	46,9	41,8	36,1	32,4	28	23,9	57,5	52,9	47,7	41,8	38,3	33,4	28,8	51,7	47,4	42,6	37,2	34,9	31,6	26,8
7	Cc (kW)	462	440	413	381	367	339	304	500	477	451	419	405	386	351	547	522	492	457	441	424	389
	Pi (kW)	140	153	169	187	195	191	176	143	157	173	192	200	206	196	155	170	187	206	215	224	217
	Qwe (l/s)	22,1	21	19,7	18,2	17,5	16,2	14,5	23,8	22,8	21,5	20	19,3	18,4	16,8	26,1	24,9	23,5	21,8	21	20,2	18,5
	Pdwe (kPa)	53,8	49,2	43,9	38	35,5	30,8	25,3	60,2	55,4	50	43,9	41,2	37,7	31,9	54,1	49,7	44,8	39,2	36,8	34,3	29,3
8	Cc (kW)	474	451	424	391	377	343	309	512	489	462	430	416	396	358	561	535	505	469	453	436	393
	Pi (kW)	142	156	172	189	197	187	174	145	159	176	194	202	207	195	157	172	189	209	217	226	213
	Qwe (l/s)	22,6	21,5	20,2	18,7	18	16,4	14,8	24,4	23,3	22,1	20,5	19,8	18,9	17,1	26,8	25,5	24,1	22,4	21,6	20,8	18,8
	Pdwe (kPa)	56,3	51,4	46	39,9	37,2	31,5	26,1	62,9	57,9	52,4	46	43,3	39,6	33,1	56,7	52,1	47	41,2	38,7	36,1	30
9	Cc (kW)	485	462	434	401	385	347	310	524	501	474	441	427	403	362	575	548	518	482	466	443	398
	Pi (kW)	144	158	174	192	198	183	167	147	161	178	197	205	206	191	160	175	192	212	220	226	209
	Qwe (l/s)	23,2	22,1	20,7	19,2	18,4	16,6	14,8	25	23,9	22,6	21,1	20,4	19,3	17,3	27,4	26,2	24,7	23	22,2	21,2	19
	Pdwe (kPa)	58,7	53,8	48,2	41,8	38,7	32,1	26,2	65,6	60,5	54,7	48,2	45,4	41	33,8	59,3	54,5	49,2	43,2	40,6	37,2	30,6
10	Cc (kW)	496	473	445	412	387	351	312	536	513	485	452	438	408	364	589	562	531	494	478	446	399
	Pi (kW)	146	160	176	194	193	179	162	149	164	180	199	207	203	185	162	177	195	214	223	220	202
	Qwe (l/s)	23,7	22,6	21,3	19,7	18,5	16,7	14,9	25,6	24,5	23,2	21,6	20,9	19,5	17,4	28,1	26,8	25,4	23,6	22,8	21,3	19,1
	Pdwe (kPa)	61,3	56,2	50,3	43,8	39,2	32,7	26,6	68,5	63,2	57,2	50,4	47,5	41,8	34,1	62	57	51,5	45,3	42,6	37,6	30,8
11	Cc (kW)	508	484	455	422	391	351	311	548	524	496	463	445	411	366	603	575	544	507	490	451	399
	Pi (kW)	148	163	179	197	190	173	155	151	166	183	201	207	198	179	165	180	197	217	226	216	194
	Qwe (l/s)	24,3	23,1	21,8	20,2	18,7	16,8	14,9	26,2	25,1	23,7	22,1	21,3	19,6	17,5	28,8	27,5	26	24,2	23,4	21,5	19,1
	Pdwe (kPa)	63,8	58,5	52,5	45,8	39,9	32,9	26,5	71,4	65,8	59,7	52,7	49,1	42,4	34,4	64,8	59,5	53,8	47,4	44,6	38,3	30,8
12	Cc (kW)	519	495	466	432	393	351	309	561	536	508	474	452	412	367	617	589	557	519	502	452	399
	Pi (kW)	151	165	181	199	185	166	148	154	168	185	204	206	192	173	167	183	200	220	228	210	187
	Qwe (l/s)	24,8	23,6	22,3	20,7	18,8	16,8	14,8	26,8	25,6	24,3	22,7	21,6	19,7	17,5	29,5	28,2	26,6	24,8	24	21,6	19,1
	Pdwe (kPa)	66,5	60,9	54,8	47,8	40,2	32,9	26,2	74,4	68,6	62,2	55	50,4	42,6	34,6	67,6	62,1	56,1	49,5	46,7	38,6	30,8
13	Cc (kW)	531	505	477	434	394	351	307	573	548	519	485	458	415	365	632	603	570	532	507	453	397
	Pi (kW)	153	167	184	195	179	159	140	156	171	187	206	204	188	166	170	185	203	223	226	203	179
	Qwe (l/s)	25,4	24,2	22,8	20,8	18,8	16,8	14,7	27,4	26,2	24,8	23,2	21,9	19,9	17,5	30,2	28,8	27,3	25,4	24,3	21,7	19
	Pdwe (kPa)	69,2	63,4	57	48,2	40,4	32,8	25,8	77,4	71,4	64,7	57,3	51,7	43,3	34,4	70,5	64,8	58,6	51,7	47,5	38,7	30,6
14	Cc (kW)	542	516	487	436	394	349	303	586	560	531	495	463	414	361	646	617	583	544	506	450	394
	Pi (kW)	155	170	186	190	173	152	133	158	173	190	208	202	180	157	173	188	206	225	218	194	171
	Qwe (l/s)	25,9	24,7	23,3	20,9	18,9	16,7	14,5	28	26,8	25,4	23,7	22,2	19,8	17,3	30,9	29,5	27,9	26	24,2	21,5	18,9
	Pdwe (kPa)	72	65,9	59,3	48,6	40,5	32,5	25,2	80,5	74,3	67,4	59,4	52,7	43	33,7	73,5	67,6	61	53,9	47,4	38,3	30,2
15	Cc (kW)	554	527	497	437	393	346	297	598	572	542	502	464	411	358	661	631	596	556	508	448	386
	Pi (kW)	158	172	189	185	166	145	125	161	175	192	207	197	172	149	175	191	208	228	212	186	160
	Qwe (l/s)	26,5	25,3	23,8	20,9	18,8	16,6	14,2	28,7	27,4	25,9	24	22,2	19,7	17,1	31,6	30,2	28,5	26,6	24,3	21,5	18,5
	Pdwe (kPa)	74,8	68,5	61,6	48,8	40,4	32,1	24,4	83,7	77,2	70	60,9	53	42,6	33,1	76,6	70,4	63,6	56,2	47,6	38,1	29,1

## 6 Capacity tables

### 6 - 2 Partial Heat Recovery Capacity tables

#### Partial Heat Recovery Ratings

#### EWAD-D-S

EW / LWC	*Model EWAD-D-SS*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
50/60	390	332	161	173	35%	3.13
	440	373	172	191	35%	3.27
	470	403	189	207	35%	3.24
	510	432	206	223	35%	3.18
	530	461	219	238	35%	3.19
	560	486	233	216	30%	3.01
	580	508	225	191	26%	3.10

EW / LWC	*Model EWAD-D-SL*	*Model EWAD-D-SR*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
50/60	180	180	159	80.0	84	35%	3.03
	200	190	171	78.4	87	35%	3.30
	230	220	196	83.3	98	35%	3.52
	250	240	213	92.2	107	35%	3.48
	260	250	227	105	116	35%	3.28
	280	270	240	112	123	35%	3.23
	300	280	259	124	134	35%	3.18
	320	310	281	128	123	30%	3.15
	370	370	329	141	122	26%	3.20
	400	400	373	172	191	35%	3.27
	440	440	403	189	207	35%	3.24
	480	480	432	206	223	35%	3.18
	510	510	461	219	238	35%	3.19
	530	530	486	233	216	30%	3.01

EW / LWC	*Model EWAD-D-SX*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
50/60	210	171	78.4	87	35%	3.30
	230	196	83.3	98	35%	3.52
	250	213	92.2	107	35%	3.48
	270	227	105	116	35%	3.28
	290	240	112	123	35%	3.23
	300	259	124	134	35%	3.18
	310	281	128	123	30%	3.15
	370	332	161	173	35%	3.13
	410	373	172	191	35%	3.27
	450	403	189	207	35%	3.24
	490	432	206	223	35%	3.18

#### NOTES

Cc (cooling capacity)

Pi (unit power input)

Hc (heating heat recovery capacity)

%Hc (percentage heat recovered)

EER Hc (coefficient of performance during heat recovery = (cooling+ heating capacity) / power input)

EW (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<sup>2</sup> °C/kW evaporator fouling factor

# 6 Capacity tables

## 6 - 3 Total Heat Recovery Capacity Tables

### Total Heat Recovery Ratings EWAD-D-S

EWC / LWC	*Model EWAD-D-SS*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
40/45	390	348	154	427	85%	5.02
	440	391	165	473	85%	5.23
	470	423	183	515	85%	5.13
	510	453	200	555	85%	5.05
	530	484	213	592	85%	5.06
	560	510	226	552	75%	4.70
	580	533	219	488	65%	4.67
	590	332	156	415	85%	4.79
40/50	440	373	167	459	85%	4.99
	470	403	185	500	85%	4.89
	510	432	202	539	85%	4.81
	530	461	215	575	85%	4.82
	560	486	228	536	75%	4.47
	580	508	221	474	65%	4.44
	590	332	158	294	60%	3.97
	440	373	169	325	60%	4.13
45/55	470	403	187	354	60%	4.06
	510	432	204	382	60%	3.99
	530	461	217	407	60%	4.00
	560	486	231	358	50%	3.66
	580	508	223	314	43%	3.68

EWC / LWC	*Model EWAD-D-SL*	*Model EWAD-D-SR*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc	
40/45	180	180	167	76.7	207	85%	4.88	
	200	190	179	75.1	216	85%	5.27	
	230	220	205	80.0	243	85%	5.60	
	250	240	224	88.4	265	85%	5.54	
	260	250	238	102	289	85%	5.19	
	280	270	251	109	306	85%	5.12	
	300	280	272	120	333	85%	5.04	
	320	310	294	124	314	75%	4.89	
	370	370	345	137	314	65%	4.81	
	400	400	391	165	473	85%	5.23	
	440	440	423	183	515	85%	5.13	
	480	480	453	200	555	85%	5.05	
	510	510	484	213	592	85%	5.06	
	530	530	510	226	552	75%	4.70	
	180	180	159	77.5	201	85%	4.65	
	40/50	200	190	171	75.9	210	85%	5.02
230		220	196	80.8	235	85%	5.33	
250		240	213	89.3	257	85%	5.27	
260		250	227	103	281	85%	4.94	
280		270	240	110	297	85%	4.88	
300		280	259	121	323	85%	4.81	
320		310	281	125	305	75%	4.66	
370		370	329	138	304	65%	4.58	
400		400	373	167	459	85%	4.99	
440		440	403	185	500	85%	4.89	
480		480	432	202	539	85%	4.81	
510		510	461	215	575	85%	4.82	
530		530	486	228	536	75%	4.47	
180		180	159	78.4	143	60%	3.85	
45/55		200	190	171	76.8	149	60%	4.16
		230	220	196	81.7	167	60%	4.43
	250	240	213	90.4	182	60%	4.38	
	260	250	227	104	199	60%	4.11	
	280	270	240	111	210	60%	4.05	
	300	280	259	122	229	60%	3.99	
	320	310	281	127	204	50%	3.82	
	370	370	329	140	202	43%	3.80	
	400	400	373	169	325	60%	4.13	
	440	440	403	187	354	60%	4.06	
	480	480	432	204	382	60%	3.99	
	510	510	461	217	407	60%	4.00	
	530	530	486	231	358	50%	3.66	

EWC / LWC	*Model EWAD-D-SX*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc	
40/45	210	179	75.1	216	85%	5.27	
	230	205	80.0	243	85%	5.60	
	250	224	88.4	265	85%	5.54	
	270	238	102	289	85%	5.19	
	290	251	109	306	85%	5.12	
	300	272	120	333	85%	5.04	
	310	294	124	314	75%	4.89	
	370	348	154	427	85%	5.02	
	410	391	165	473	85%	5.23	
	450	423	183	515	85%	5.13	
	490	453	200	555	85%	5.05	
	210	171	75.9	210	85%	5.02	
	40/50	230	196	80.8	235	85%	5.33
		250	213	89.3	257	85%	5.27
		270	227	103	281	85%	4.94
		290	240	110	297	85%	4.88
300		259	121	323	85%	4.81	
310		281	125	305	75%	4.66	
370		332	156	415	85%	4.79	
410		373	167	459	85%	4.99	
450		403	185	500	85%	4.89	
490		432	202	539	85%	4.81	
210		171	76.8	149	60%	4.16	
45/55		230	196	81.7	167	60%	4.43
		250	213	90.4	182	60%	4.38
		270	227	104	199	60%	4.11
		290	240	111	210	60%	4.05
		300	259	122	229	60%	3.99
	310	281	127	204	50%	3.82	
	370	332	158	294	60%	3.97	
	410	373	169	325	60%	4.13	
	450	403	187	354	60%	4.06	
	490	432	204	382	60%	3.99	

### NOTES

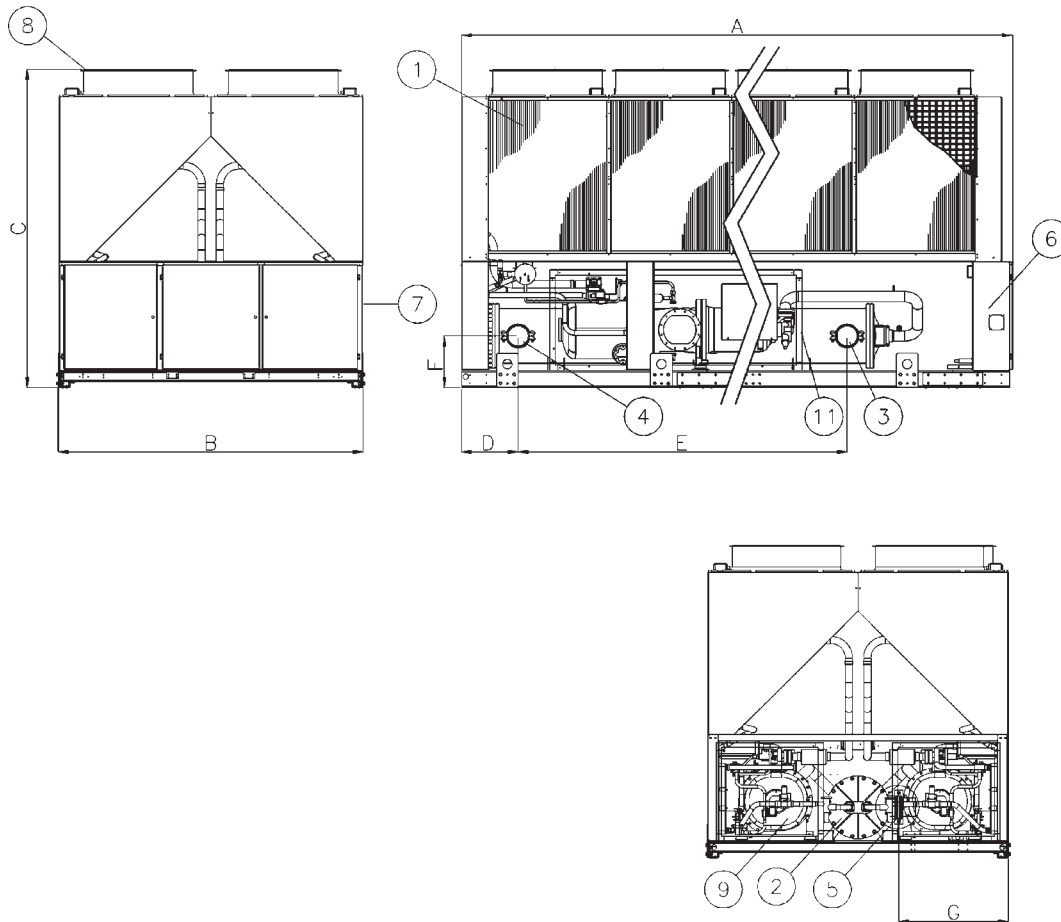
- Cc (cooling capacity)
- Pi (unit power input)
- Hc (heating heat recovery capacity)
- %Hc (percentage heat recovered)
- EER Hc (coefficient of performance during heat recovery = (cooling+ heating capacity) / power input)
- EWC (Entering water heat recovery condenser)
- LWC (Leaving water heat recovery 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<sup>2</sup> °C/kW evaporator fouling factor

# 7 Dimensional drawings

## 7 - 1 Dimensional Drawings

Dimensions EWAD~D-



4  
7

Models	Dimensions (mm)						
	A	B	C	D	E	F	G
EWAD							
EWAD390D-SS	3139	2234	2223	392	1875	339	873
EWAD440~580D-SS	4040	2234	2223	392	2450	339	855
EWAD230~300D-SL	3139	2234	2355	374	1911	339	873
EWAD320D-SL	4040	2234	2355	374	2486	339	873
EWAD400~530D-SL	4040	2234	2223	392	2450	339	855
EWAD220~280D-SR	3139	2234	2355	374	1911	339	873
EWAD310D-SR	4040	2234	2355	374	2486	339	873
EWAD400~530D-SR	4040	2234	2223	392	2450	339	855
EWAD210D-SX	3139	2234	2420	374	1911	339	873
EWAD230~310D-SX	4040	2234	2420	374	2486	339	873
EWAD370~490D-SX	4040	2234	2420	392	2450	339	873
EWAD250D-XS	3138	2234	2355	374	1911	339	873
EWAD280~400D-XS	4040	2234	2355	374	2486	339	873
EWAD470D-XS	4040	2234	2223	414	2412	379	873
EWAD520~620D-XS	4940	2234	2223	414	2412	379	815
EWAD240D-XR	3138	2234	2355	374	1911	339	873
EWAD270~390D-XR	4040	2234	2355	374	2486	339	873
EWAD460D-XR	4040	2234	2223	414	2412	379	873
EWAD510~600D-XR	4940	2234	2223	414	2412	379	815
EWAD230~310D-HS	3339	2234	2223	374	1911	339	873
EWAD340~380D-HS	4040	2234	2223	374	2486	339	873
EWAD420~590D-HS	4040	2234	2223	392	2450	339	873

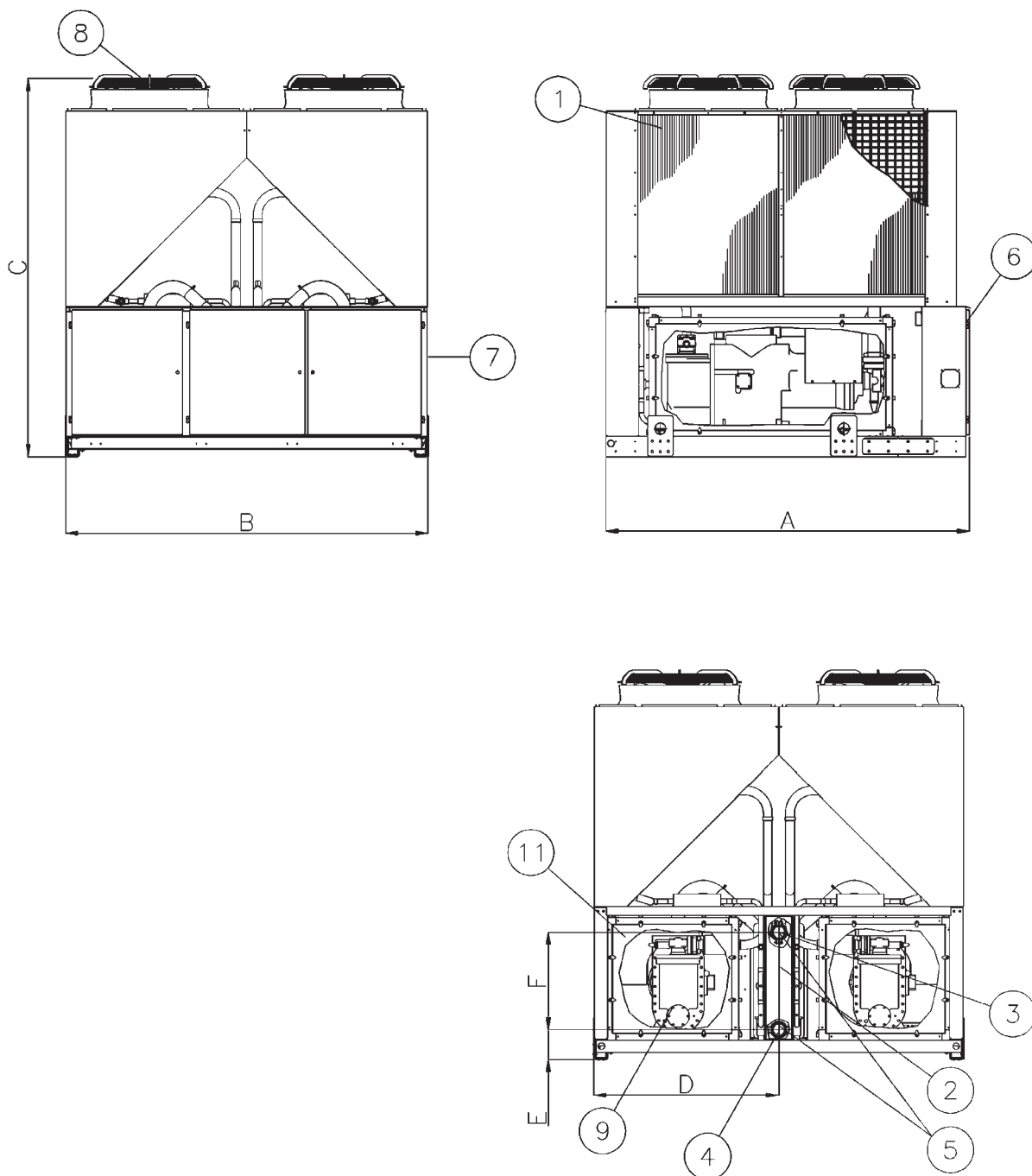
**LEGEND**

- 1 – Condenser Coil
- 2 – Water heat exchanger (evaporator)
- 3 – Evaporator water inlet
- 4 – Evaporator water outlet
- 5 – Victaulic connection
- 6 – Operating and control panel
- 7 – Slot for power and control connection
- 8 – Fan
- 9 – Compressor

DMN\_1a-2a\_Rev01\_1

## 7 Dimensional drawings

### 7 - 1 Dimensional Drawings



Models	Dimensions (mm)					
EWAD	A	B	C	D	E	F
EWAD180~200D-SL	2239	2234	2355	1117	181	590
EWAD180~190D-SR	2239	2234	2355	1117	181	590
EWAD200~210D-HS	2223	2234	2223	1117	181	590

#### LEGEND

- 1 – Condenser Coil
- 2 – Water heat exchanger (evaporator)
- 3 – Evaporator water inlet
- 4 – Evaporator water outlet
- 5 – Victaulic connection
- 6 – Operating and control panel
- 7 – Slot for power and control connection
- 8 – Fan
- 9 – Compressor

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## 8 Sound data

### 8 - 1 Sound Level Data

#### EWAD-D-SX

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)									Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)	
210	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.3	
230	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
250	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
270	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
290	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
300	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
310	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
370	62.0	60.0	63.5	63.0	60.0	58.0	47.0	36.5	65.0	84.7	
410	62.0	60.0	63.5	63.0	60.0	58.0	47.0	36.5	65.0	84.7	
450	63.5	59.5	63.5	62.5	60.5	59.5	46.5	37.0	65.5	85.7	
490	62.0	59.0	64.0	65.0	59.5	59.0	50.5	39.5	66.0	86.2	

#### NOTES

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

#### EWAD-D-XS

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)									Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)	
250	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	96.8	
280	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	97.2	
300	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	97.2	
330	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	97.2	
350	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	97.2	
380	81.0	76.4	74.4	80.7	70.2	67.4	58.8	52.9	79.0	98.7	
400	81.0	76.4	74.4	80.7	70.2	67.4	58.8	52.9	79.0	98.7	
470	64.5	73.5	73.0	78.5	71.5	73.0	60.0	53.0	79.0	98.7	
520	64.5	73.5	73.5	78.5	71.5	73.0	60.0	53.0	79.0	99.2	
580	64.5	73.5	73.5	78.5	71.6	73.1	60.0	53.0	79.0	99.2	
620	64.5	73.5	73.5	78.5	71.5	73.0	60.0	53.0	79.0	99.2	

#### NOTES

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

#### EWAD-D-XR

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)									Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)	
240	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	91.8	
270	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	92.2	
300	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	92.2	
320	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	92.2	
350	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	92.2	
370	79.1	73.4	70.2	74.4	66.6	62.2	55.2	48.4	73.5	93.2	
390	79.1	73.4	70.2	74.4	66.6	62.2	55.2	48.4	73.5	93.2	
460	59.0	68.0	67.5	73.0	66.0	67.5	54.5	47.5	73.5	93.2	
510	59.0	68.0	68.0	73.0	66.0	67.5	54.5	47.5	73.5	93.7	
560	59.0	68.0	68.0	73.0	66.1	67.6	54.5	47.5	73.5	93.7	
600	59.0	68.0	68.0	73.0	66.0	67.5	54.5	47.5	73.5	93.7	

#### NOTES

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

## 8 Sound data

### 8 - 1 Sound Level Data

#### EWAD-D-SX

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
210	0.0	-8.0	-12.8	-15.9	-18.2	-20.0	-25.7
230	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
250	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
270	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
290	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
300	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
310	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
370	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
410	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
450	0.0	-7.4	-12.1	-15.2	-17.4	-19.2	-24.9
490	0.0	-7.4	-12.1	-15.2	-17.4	-19.2	-24.9

#### NOTES

Values are dB(A) (pressure level)

#### EWAD-D-XS

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
250	0.0	-8.0	-12.9	-16.0	-18.2	18.2	-25.8
280	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
300	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
330	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
350	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
380	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
400	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
470	0.0	-7.8	-12.6	-15.7	-17.9	17.9	-25.4
520	0.0	-7.5	-12.3	-15.3	-17.6	17.6	-25.0
580	0.0	-7.5	-12.3	-15.3	-17.6	17.6	-25.0
620	0.0	-7.5	-12.3	-15.3	-17.6	17.6	-25.0

#### NOTES

Values are dB(A) (pressure level)

#### EWAD-D-XR

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
240	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
270	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
300	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
320	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
350	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
370	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
390	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
460	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
510	0.0	-7.5	-12.3	-15.3	-17.6	-19.3	-25.0
560	0.0	-7.5	-12.3	-15.3	-17.6	-19.3	-25.0
600	0.0	-7.5	-12.3	-15.3	-17.6	-19.3	-25.0

#### NOTES

Values are dB(A) (pressure level)



## 9 Installation

### 9 - 1 Installation Method

#### Installation notes

##### Warning

Installation and maintenance of the unit must to be performed only by qualified personnel who have knowledge with local codes and regulations, and experience with this type of equipment. The unit must be installed to allow all the maintenance operations.

##### Handling

Care should be taken to avoid rough handling or shock due to dropping of 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 result in reductions in unit efficiency and capacity.

Moreover the unique microprocessor has the ability to analyse the operating environment of the air cooled chiller and to optimize its performance to stay 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.3). 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 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.4); 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 for general installation. A specific evaluation should be done by contractor depending on the case.

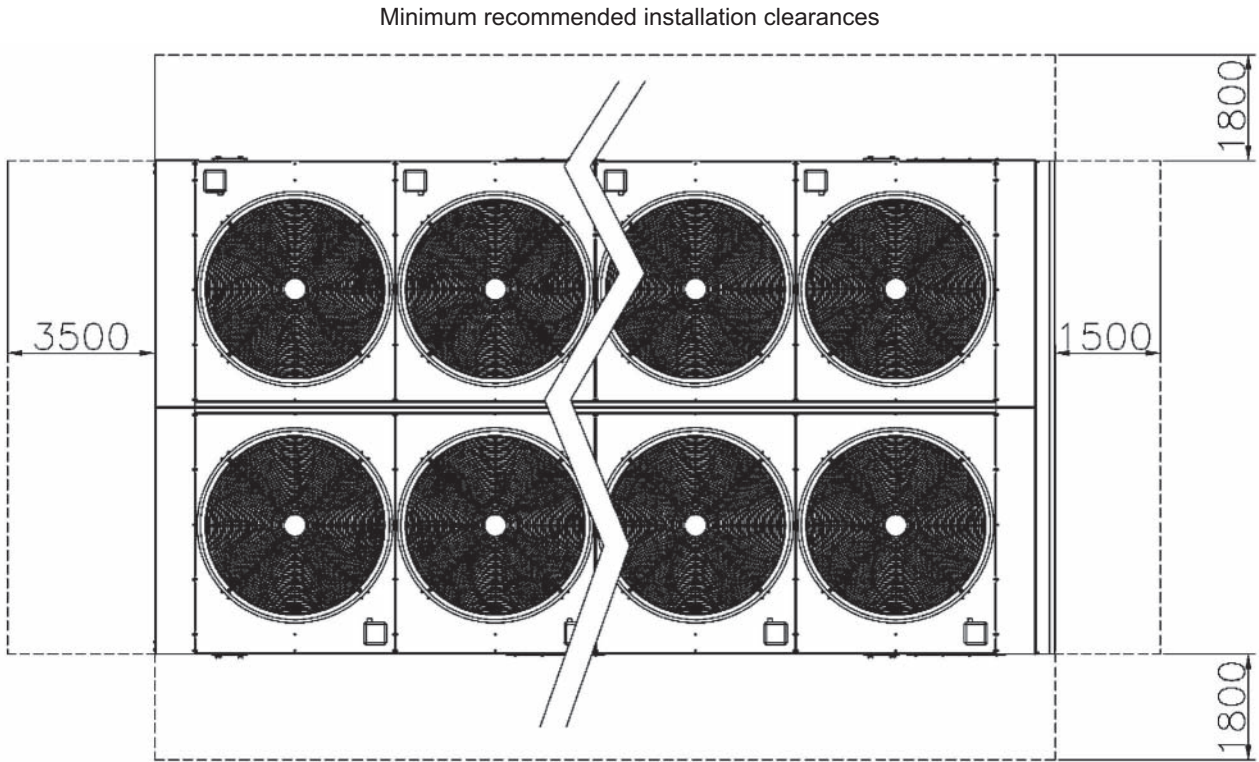


Fig. 1

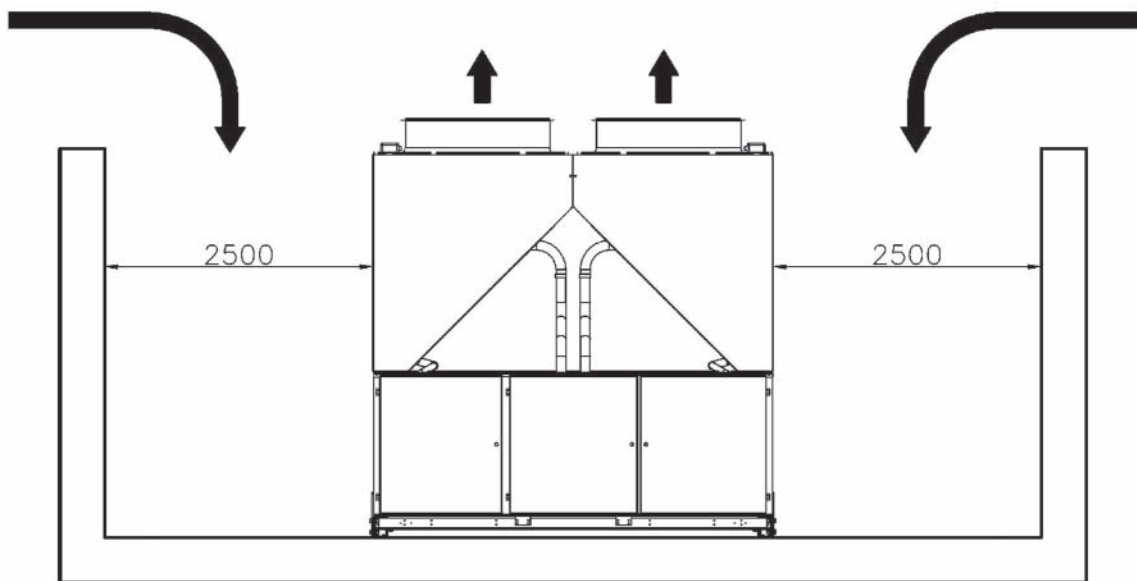


Fig. 2

## 9 Installation

### 9 - 1 Installation Method

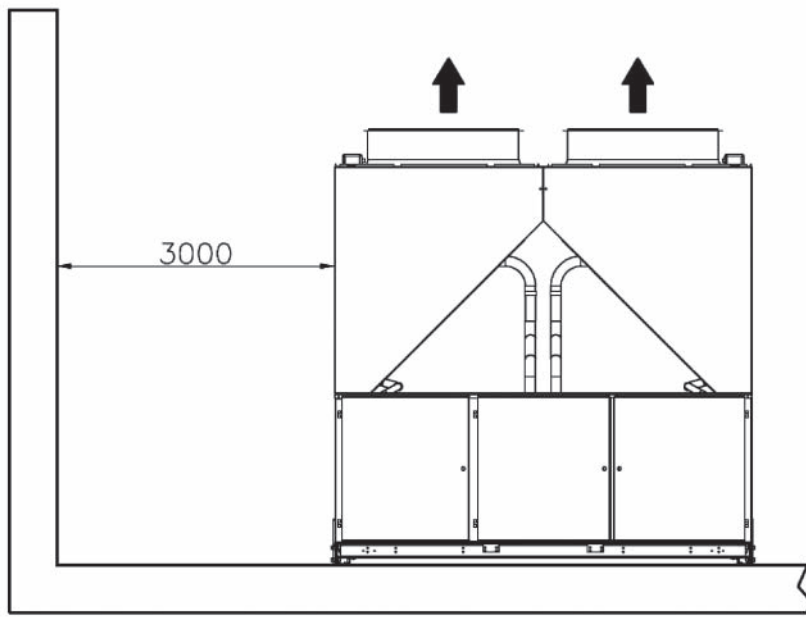


Fig. 3

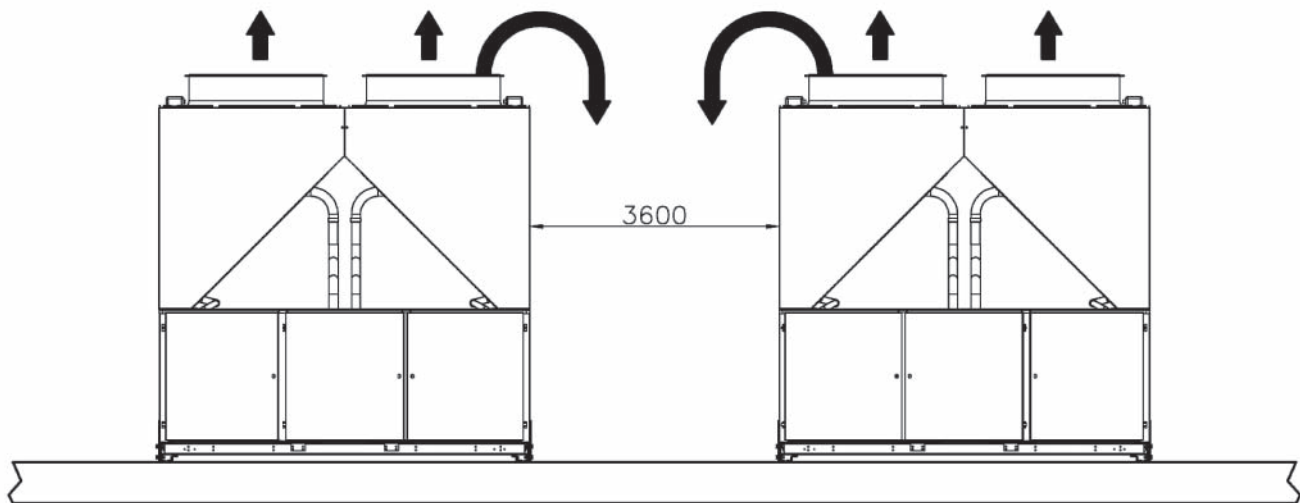


Fig. 4

#### 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

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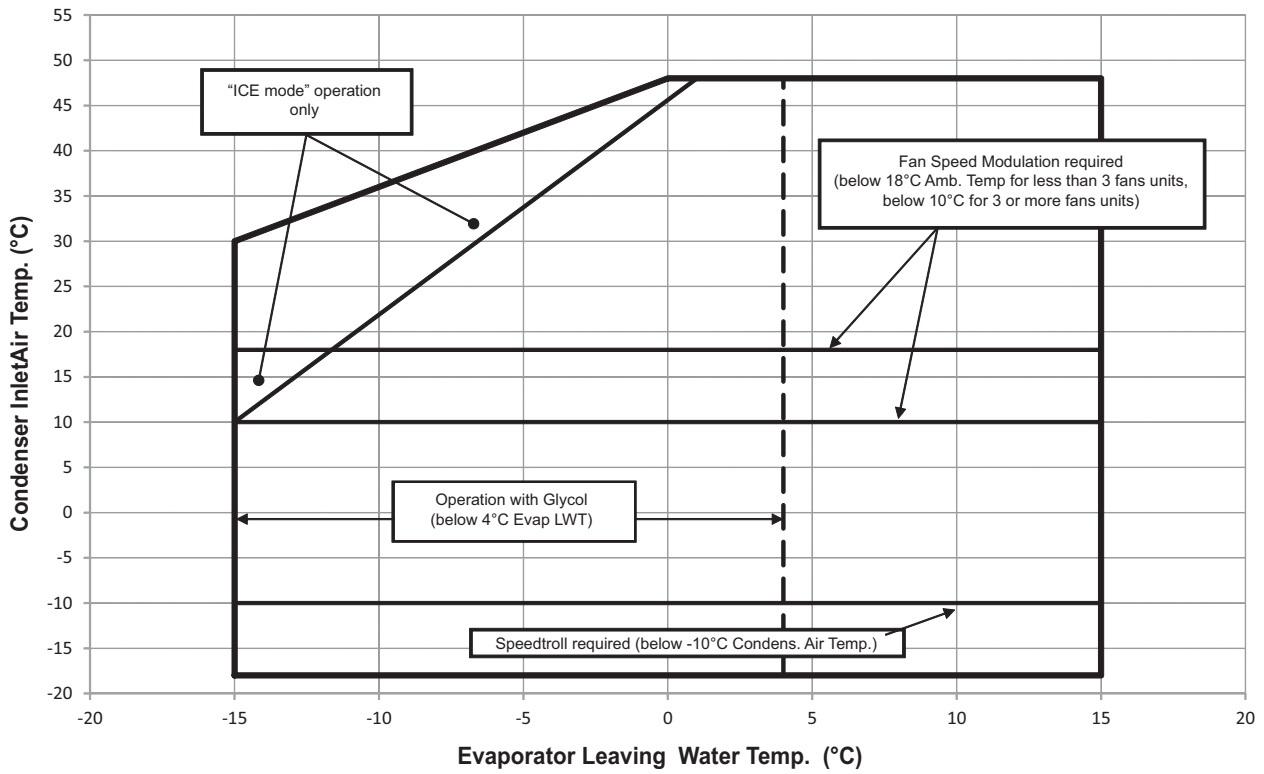
# 10 Operation range

## 10 - 1 Operation Range

4

10

**Operating Limits**  
EWAD~D-



OPL\_1-2-3-4-5-6\_Rev.00\_1

# 10 Operation range

## 10 - 1 Operation Range

**Table 1 - Evaporator minimum and maximum water Δt**

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

**Table 2 - Evaporator fouling factors**

Fouling factors m <sup>2</sup> °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 - Air heat exchanger - 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 operating altitude is 2000 m above sea level.
- Contact factory in case the unit has to be installed at altitudes between 1000 and 2000 m above sea level.

**Table 4.1 - Minimum glycol percentage for low water temperature**

EWLT (°C)	2	0	-2	-4	-6	-8	-10	-12	-15
Ethylene glycol (%)	10	20	20	20	30	30	30	40	40
Propylene glycol (%)	10	20	20	30	30	30	40	40	40

- ELWT (Evaporator Leaving Water Temperature (°C)).
- 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 ambient temperature**

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

- Minimum glycol percentage to prevent freezing of water circuit at indicated air ambient temperature.
- 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 (EWLT < 4°C)**

EWLT (°C)	-4	-6	-8	-10	-12	-15
Cooling Capacity	0.670	0.613	0.562	0.510	0.455	0.375
Compressor Power Input	0.890	0.870	0.840	0.798	0.755	0.680

- ELWT (Evaporator Leaving Water Temperature (°C)).
- 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

- Contact factory for water temperature out of operating limits.

# 10 Operation range

## 10 - 1 Operation Range

### 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: **EWAD390D-SS**

Mixture: Water  
 Working condition: ELWT 12/7°C – Condenser inlet air temperature 35°C  
 - Cooling capacity: 389 kW  
 - Power input: 152 kW  
 - Flow rate (Δt 5°C): 18.60 l/s  
 - Evaporator pressure drop: 46 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:  $389 \times 0.972 = 378 \text{ kW}$   
 - Power input:  $152 \times 0.986 = 150 \text{ kW}$   
 - Flow rate (Δt 5°C):  $18 \text{ (referred to } 378 \text{ kW)} \times 1.074 = 19.33 \text{ l/s}$   
 - Evaporator pressure drop:  $49 \text{ (referred to } 19.33 \text{ l/s)} \times 1.181 = 58 \text{ kPa}$

#### 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: **EWAD390D-SS**

Mixture: Water  
 Standard working condition: ELWT 12/7°C – Condenser inlet air temperature 30°C  
 - Cooling capacity: 412 kW  
 - Power input: 139 kW  
 - Flow rate (Δt 5°C): 19.7 l/s  
 - Evaporator pressure drop: 51 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:  $412 \times 0.613 \times 0.972 = 245 \text{ kW}$   
 - Power input:  $139 \times 0.870 \times 0.986 = 119 \text{ kW}$   
 - Flow rate (Δt 5°C):  $11.71 \text{ l/s (referred to } 245 \text{ kW)} \times 1.074 = 12.58 \text{ l/s}$   
 - Evaporator pressure drop:  $23 \text{ kPa (referred to } 12.58 \text{ l/s)} \times 1.181 = 27 \text{ kPa}$

# 10 Operation range

## 10 - 1 Operation Range

Table 7.1 - 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

ESP table refers to fan diameter Ø800, available on units as follows:

EWAD390~580D-SS  
EWAD470~620D-XS  
EWAD420~590D-HS

Table 7.2 - Available fan static pressure correction factors

"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

ESP table refers to fan diameter Ø800, available on units as follows:

EWAD320~530D-SL/SR  
EWAD460~600D-XR

### How to use the Correction factors proposed in the previous tables

#### Example

Unit Size:

**EWAD390D-SS**

- External static pressure                    **0 Pa**
- Working condition:                        ELWT 12/7°C – Condenser inlet air temperature 35°C
- Cooling capacity:                            389 kW
- Power input:                                 152 kW
- Maximum CIAT                                48°C (see graphic operating limit)

- External static pressure                    **40 Pa**
- Working condition:                        ELWT 12/7°C – Condenser inlet air temperature 35°C
- Cooling capacity:                             $389 \times 0.993 = 386 \text{ kW}$
- Power input:                                  $152 \times 1.018 = 155 \text{ kW}$
- Maximum CIAT                                 $48 - 1.0 = 47^\circ\text{C}$

# 10 Operation range

## 10 - 1 Operation Range

### Water charge, flow and quality

Items <sup>(1)(5)</sup>		Cooling Water			Cooled Water		Heated water <sup>(2)</sup>				Tendency if out of criteria		
		Circulating System		Once Flow			Low temperature		High temperature				
		Circulating water	Supply water <sup>(4)</sup>		Flowing water	Circulating water [Below 20°C]	Supply water <sup>(4)</sup>	Circulating water [20°C ~ 60°C]	Supply water <sup>(4)</sup>	Circulating water [60°C ~ 80°C]		Supply water <sup>(4)</sup>	
Items to be controlled:	pH	at 25°C	6.5 ~ 8.2	6.0 ~ 8.0	6.0 ~ 8.0	6.0 ~ 8.0	6.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	Corrosion + Scale	
	Electrical conductivity	[mS/m] at 25°C	Below 80	Below 30	Below 40	Below 40	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Corrosion + Scale
		[μS/cm] at 25°C	(Below 800)	(Below 300)	(Below 400)	(Below 400)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	Corrosion + Scale
	Chloride ion	[mgCl <sup>2</sup> /l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	Sulfate ion	[mgSO <sub>4</sub> <sup>2-</sup> /l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	M-alkalinity (pH4.8)	[mgCaCO <sub>3</sub> /l]	Below 100	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Total hardness	[mgCaCO <sub>3</sub> /l]	Below 200	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Scale
	Calcium harness	[mgCaCO <sub>3</sub> /l]	Below 150	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
Silica ion	[mgSiO <sub>2</sub> /l]	Below 50	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Scale	
Items to be referred to	Iron	[mgFe/l]	Below 1.0	Below 0.3	Below 1.0	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Below 1.0	Below 0.3	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	Below 0.1	Corrosion
	Sulfite ion	[mgS <sup>2-</sup> /l]	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Corrosion
	Ammonium ion	[mgNH <sub>4</sub> <sup>+</sup> /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	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	Below 0.3	Corrosion
	Free carbide	[mgCO <sub>2</sub> /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	Below 4.0	Corrosion
	Stability index		6.0 ~ 7.0	---	---	---	---	---	---	---	---	---	Corrosion + Scale

### NOTES

- Names, definitions and units are according to JIS K 0101. Units and figures between brackets are old units published as reference only.
- 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 desirable to give the valid measure for corrosion. E.g. chemical measure.
- 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.
- Supply water is considered drink water, industrial water and ground water except for genuine water, neutral water and soft water.
- The above mentioned items are representable items in corrosion and scale cases.

OPL\_1-2-3-4-5-6\_Rev.00\_5



## 10 Operation range

### 10 - 1 Operation Range

#### 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

$$M \text{ (liters)} = ( 0.1595 \times \Delta T(^{\circ}\text{C}) + 3.0825 ) \times P(\text{kW})$$

where:

- M minimum water content per unit expressed in litres
- P Cooling Capacity of the unit expressed in kW
- $\Delta T$  evaporator entering / leaving water temperature difference expressed in  $^{\circ}\text{C}$

This formula is valid for:

- standard microprocessor parameters

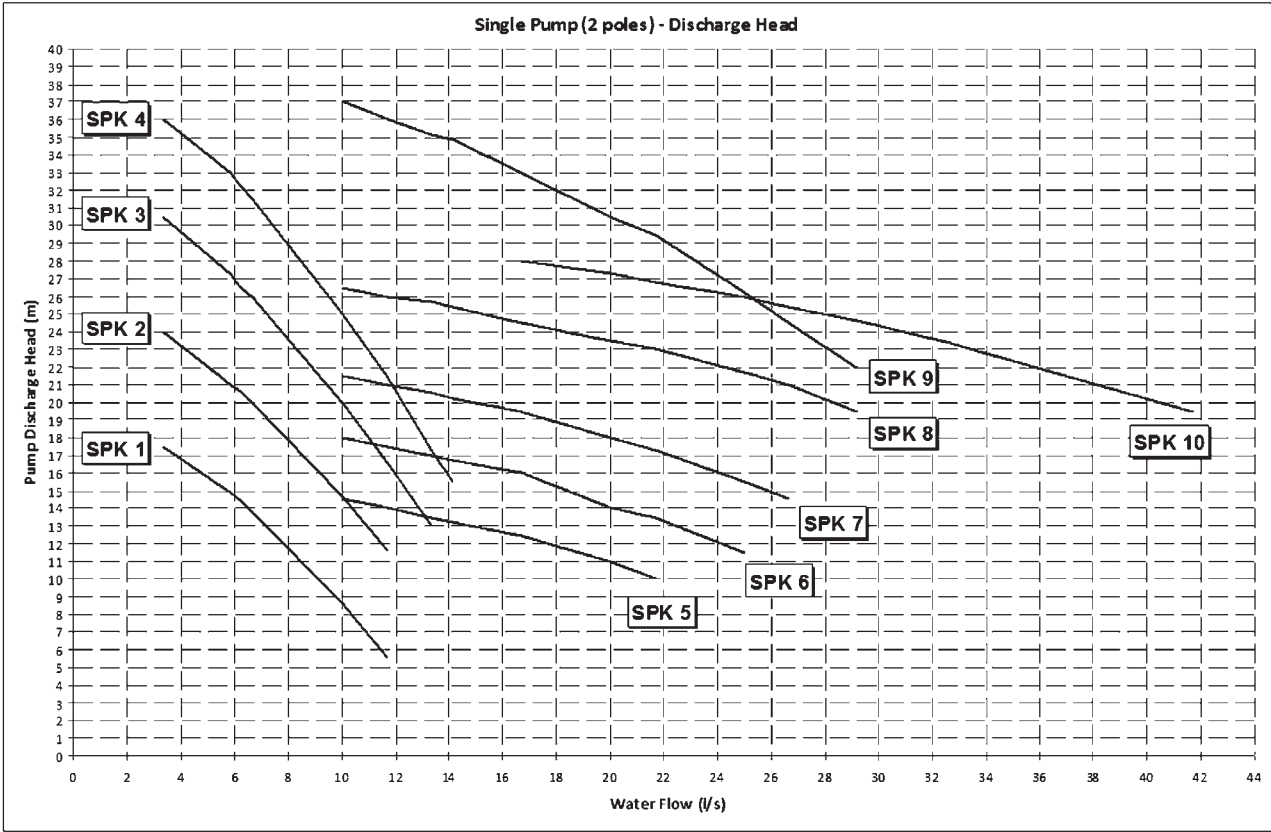
For more accurate determination of quantity of water, it is advisable to contact the designer of the plant.

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

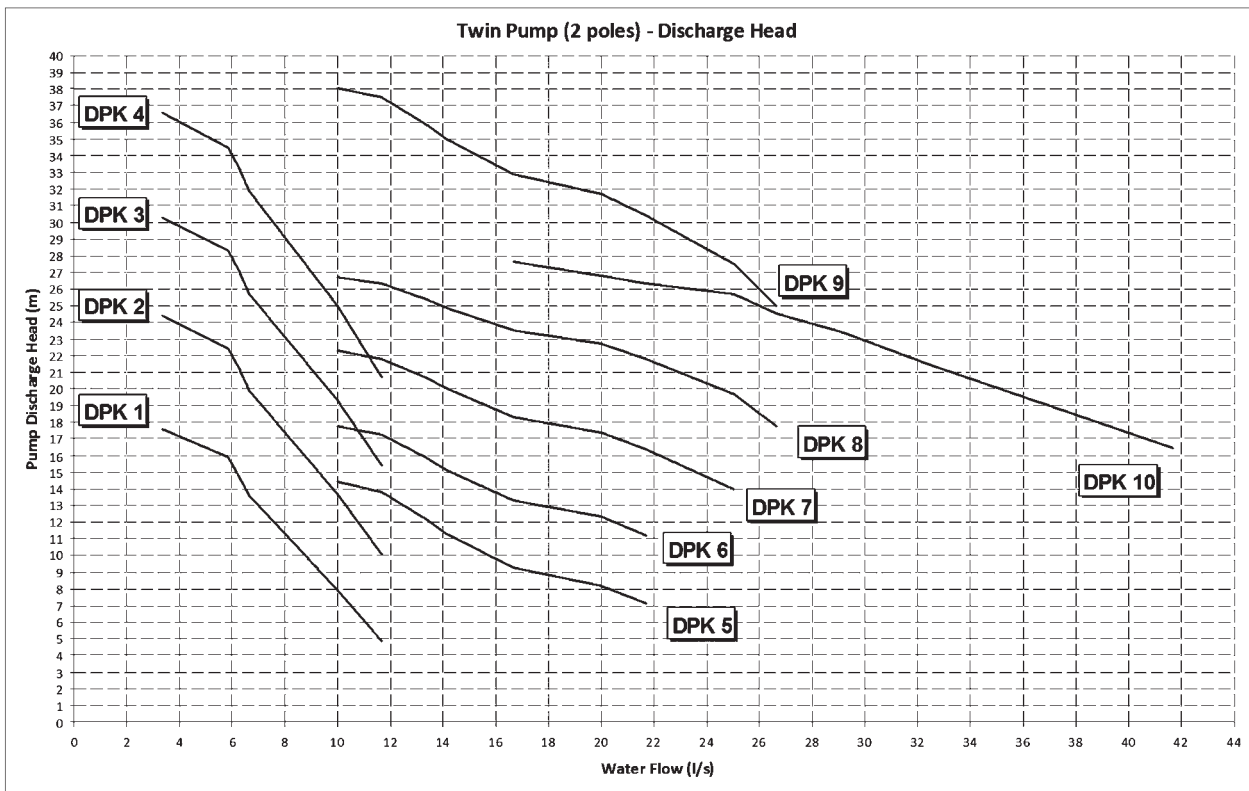
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Water Pump Kit - Available External Static Pressure



OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_6 (1/2)

Water Pump Kit - Available External Static Pressure



OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_6 (2/2)

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

Water Pump Kit - Combination Matrix		Single Pump										
Version	Size	SPK 1	SPK 2	SPK 3	SPK 4	SPK 5	SPK 6	SPK 7	SPK 8	SPK 9	SPK 10	
EWAD-D-SS	390						X	X	X	X	X	
	440						X	X	X	X	X	
	470						X	X	X	X	X	
	510						X	X	X	X	X	
	530							X	X	X	X	
	560							X	X	X	X	
	580								X	X	X	
EWAD-D-SL	180	X	X	X	X							
	200	X	X	X	X							
	230		X	X	X							
	250		X	X	X		X	X	X	X		
	260			X	X		X	X	X	X		
	280				X		X	X	X	X		
	300			X	X		X	X	X	X		
	320					X	X	X	X	X		
	370					X	X	X	X	X	X	
	400					X	X	X	X	X	X	
	440						X	X	X	X	X	
	480						X	X	X	X	X	
	510						X	X	X	X	X	
530							X	X	X	X		
EWAD-D-SR	180	X	X	X	X							
	190	X	X	X	X							
	220		X	X	X		X	X	X	X		
	240		X	X	X		X	X	X	X		
	250			X	X		X	X	X	X		
	270			X	X		X	X	X	X		
	280			X	X		X	X	X	X		
	310				X		X	X	X	X		
	370					X	X	X	X	X	X	
	400					X	X	X	X	X	X	
	440						X	X	X	X	X	
	480						X	X	X	X	X	
	510							X	X	X	X	
530								X	X	X		
EWAD-D-SX	210		X	X	X							
	230		X	X	X	X	X	X	X	X		
	250			X	X	X	X	X	X	X		
	270			X	X	X	X	X	X	X		
	290				X	X	X	X	X	X		
	300					X	X	X	X	X		
	310					X	X	X	X	X		
	370					X	X	X	X	X	X	
	410					X	X	X	X	X	X	
	450					X	X	X	X	X	X	
	490					X	X	X	X	X	X	
	250			X	X	X	X	X	X	X		
	280			X	X	X	X	X	X	X		
300					X	X	X	X	X			
330					X	X	X	X	X			
350					X	X	X	X	X	X		
380					X	X	X	X	X	X		
400					X	X	X	X	X	X		
470						X	X	X	X	X		
520						X	X	X	X	X		
580								X	X	X		
620									X	X		
EWAD-D-XR	240		X	X	X	X	X	X	X	X		
	270			X	X	X	X	X	X	X		
	300					X	X	X	X	X		
	320					X	X	X	X	X		
	350					X	X	X	X	X		
	370					X	X	X	X	X		
	390				X		X	X	X	X	X	
	460						X	X	X	X	X	
	510						X	X	X	X	X	
	560								X	X	X	
	600								X	X	X	
	EWAD-D-HS	200		X	X	X						
		210		X	X	X						
230			X	X	X	X	X	X	X	X		
260				X	X	X	X	X	X	X		
270				X	X	X	X	X	X	X		
290					X	X	X	X	X	X		
310						X	X	X	X	X		
340						X	X	X	X	X		
380						X	X	X	X	X	X	
420						X	X	X	X	X	X	
450							X	X	X	X	X	
480							X	X	X	X	X	
510							X	X	X	X	X	
550							X	X	X	X		
590								X	X	X		

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

Water Pump Kit - Combination Matrix

Version	Size	Double Pump										
		DPK 1	DPK 2	DPK 3	DPK 4	DPK 5	DPK 6	DPK 7	DPK 8	DPK 9	DPK 10	
EWAD-D-SS	390						X	X	X	X	X	
	440						X	X	X	X	X	
	470							X	X	X	X	
	510							X	X	X	X	
	530								X	X	X	
	560								X	X	X	
	580									X	X	
	580										X	
EWAD-D-SL	180	X	X	X	X							
	200	X	X	X	X							
	230		X	X	X							
	250		X	X	X							
	260						X	X		X		
	280					X	X	X		X		
	300					X	X	X		X		
	320					X	X	X		X		
	370						X	X	X		X	
	400						X	X	X		X	
	440						X	X	X		X	
	480							X	X	X	X	
	510							X	X	X	X	
530								X	X	X		
EWAD-D-SR	180	X	X	X	X							
	190	X	X	X	X							
	220		X	X	X		X	X		X		
	240		X	X	X		X	X		X		
	250						X	X		X		
	270						X	X		X		
	280						X	X		X		
	310						X	X		X		
	370						X	X	X		X	
	400						X	X	X		X	
	440						X	X	X		X	
	480							X	X	X	X	
	510							X	X	X	X	
530								X	X	X		
EWAD-D-SX	210		X	X	X							
	230		X	X	X	X	X	X	X			
	250		X	X	X	X	X	X	X			
	270			X	X	X	X	X	X			
	290				X	X	X	X	X			
	300					X	X	X	X			
	310					X	X	X	X			
	370					X	X	X	X		X	
	410					X	X	X	X		X	
	450					X	X	X	X		X	
	490						X	X	X		X	
	250						X	X	X			
	280					X	X	X	X			
300					X	X	X	X				
330					X	X	X	X				
350						X	X	X		X		
380						X	X	X		X		
400						X	X	X		X		
470							X	X	X	X		
520							X	X	X	X		
580										X		
620										X		
EWAD-D-XR	240		X	X	X		X	X	X	X		
	270					X	X	X	X	X		
	300					X	X	X	X	X		
	320					X	X	X	X	X		
	350						X	X	X	X		
	370						X	X	X	X		
	390						X	X	X	X		
	460							X	X	X		
	510							X	X	X		
	560										X	
	600										X	
	EWAD-D-HS	200	X	X	X	X						
		210	X	X	X	X						
230			X	X	X							
260							X	X	X	X		
270							X	X	X	X		
290						X	X	X	X	X		
310							X	X	X	X		
340							X	X	X	X		
360							X	X	X	X		
420							X	X	X	X	X	
450							X	X	X	X	X	
480								X	X	X	X	
510								X	X	X	X	
550								X	X	X		
590									X	X		

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

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	1.5	3.5	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 2	2.2	5.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 3	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 4	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 5	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 6	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 7	5.5	10.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 8	7.5	13.7	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 9	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 10	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
Double Pump	DPK 1	1.5	3.5	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 2	2.2	5.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 3	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 4	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 5	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 6	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 7	5.5	10.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 8	7.5	13.7	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 9	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 10	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130

**NOTES**

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

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_7

# 11 Hydraulic performance

## 11 - 2 Total and Partial 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:

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

where:

- PD<sub>2</sub> Pressure drop to be determinate (kPa)
- PD<sub>1</sub> Pressure drop at nominal condition (kPa)
- Q<sub>2</sub> water flow at new working condition (l/s)
- Q<sub>1</sub> water flow at nominal condition (l/s)

### How to use the formula: Example

The unit EWAD390D-SS has been selected for working at the following conditions:

- Total heat recovery leaving water temperature 40/50°C
- The heating capacity at these working conditions is: 415 kW
- The water flow at these working conditions is: 9.91 l/s

The unit EWAD390D-SS at nominal working conditions has the following data:

- Total heat recovery leaving water temperature 40/45°C
- condenser air inlet: 35°C
- The heating capacity at these working conditions is: 427 kW
- The water flow at these working conditions is: 20.41 l/s
- The pressure drop at these working conditions is: 37 kPa

The pressure drop at the selected working condition will be:

$$PD_2 \text{ (kPa)} = 37 \text{ (kPa)} \times \left( \frac{9.91 \text{ (l/s)}}{20.41 \text{ (l/s)}} \right)^{1.80}$$

$$PD_2 \text{ (kPa)} = 10 \text{ (kPa)}$$

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_5

### Total Heat Recovery pressure drops

EWAD-D-SS	390	440	470	510	530	560	580
Heating Capacity (kW)	427	473	515	555	592	552	488
Water Flow (l/s)	20.41	22.59	24.61	26.52	28.28	26.36	23.33
Heat Recovery Pressure Drops (kPa)	37	13	15	17	19	14	11

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – saturated discharge temperature 45°C – water heat recovery in/out 40/45°C

EWAD-D-SL	180	200	230	250	260	280	300	320	370	400	440	480	510	530
EWAD-D-SR	180	190	220	240	250	270	280	310	370	400	440	480	510	530
Heating Capacity (kW)	207	216	243	265	289	306	333	314	314	473	515	555	592	552
Water Flow (l/s)	9.89	10.34	11.59	12.68	13.82	14.63	15.91	15.00	14.98	22.59	24.61	26.52	28.28	26.36
Heat Recovery Pressure Drops (kPa)	23	25	28	28	31	31	35	26	23	13	15	17	19	14

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – saturated discharge temperature 45°C – water heat recovery in/out 40/45°C

EWAD-D-SX	210	230	250	270	290	300	310	370	410	450	490
Heating Capacity (kW)	216	243	265	289	306	333	314	427	473	515	555
Water Flow (l/s)	10.34	11.59	12.68	13.82	14.63	15.91	15.00	20.41	22.59	24.61	26.52
Heat Recovery Pressure Drops (kPa)	25	28	28	31	31	35	26	37	13	15	17

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – saturated discharge temperature 45°C – water heat recovery in/out 40/45°C

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_3 (1/3)

# 11 Hydraulic performance

## 11 - 2 Total and Partial Heat Recovery Pressure Drop

### Partial Heat Recovery pressure drops

EWAD-D-SS	390	440	470	510	530	560	580
Heating Capacity (kW)	173	191	207	223	238	216	191
Water Flow (l/s)	8.25	9.12	9.90	10.67	11.38	10.30	9.11
Heat Recovery Pressure Drops (kPa)	7	2	3	3	3	2	2

**NOTES**

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser air inlet 35°C – water heat recovery in/out 50/60°C

EWAD-D-SL	180	200	230	250	260	280	300	320	370	400	440	480	510	530
EWAD-D-SR	180	190	220	240	250	270	280	310	370	400	440	480	510	530
Heating Capacity (kW)	84	87	98	107	116	123	134	123	122	191	207	223	238	216
Water Flow (l/s)	4.00	4.17	4.67	5.11	5.55	5.88	6.40	5.86	5.84	9.12	9.90	10.67	11.38	10.30
Heat Recovery Pressure Drops (kPa)	4	5	5	6	6	6	7	5	4	2	3	3	3	2

**NOTES**

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser air inlet 35°C – water heat recovery in/out 50/60°C

EWAD-D-SX	210	230	250	270	290	300	310	370	410	450	490
Heating Capacity (kW)	87	98	107	116	123	134	123	173	191	207	223
Water Flow (l/s)	4.17	4.67	5.11	5.55	5.88	6.40	5.86	8.25	9.12	9.90	10.67
Heat Recovery Pressure Drops (kPa)	5	5	6	6	6	7	5	7	2	3	3

**NOTES**

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser air inlet 35°C – water heat recovery in/out 50/60°C

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_4 (1/3)

## 12 Specification text

### 12 - 1 Specification Text

#### Technical Specification for Water Cooled Screw Chiller

##### GENERAL

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

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

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 air cooled screw chiller(s) : ..... unit(s)
- ✓ Cooling capacity for single air cooled screw chiller : ..... kW
- ✓ Power input for single air cooled screw 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 independent refrigerant circuits, semi-hermetic type rotary single screw compressor, electronic expansion device (EEXV), refrigerant 'plate to plate' or 'shell&tube' heat exchanger (depending on the size), air-cooled condenser section, R-134a refrigerant, lubrication system, motor starting components, discharge line shut-off valve, suction 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.

##### NOISE LEVEL AND VIBRATIONS

Sound pressure level at 1 meter distance in free field, semispheric conditions, shall not exceed .....dB(A). The sound pressure levels must be rated in accordance to ISO 3744 (other types of rating can not be used).

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



# 12 Specification text

## 12 - 1 Specification Text

### Technical Specification for Water Cooled Screw Chiller

#### GENERAL

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

Construction of pressure vessel	97/23/EC (PED)
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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 air cooled screw chiller(s) : ..... unit(s)
- ✓ Cooling capacity for single air cooled screw chiller : ..... kW
- ✓ Power input for single air cooled screw 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 independent refrigerant circuits, semi-hermetic type rotary single screw compressor, electronic expansion device (EEXV), refrigerant ‘plate to plate’ or ‘shell&tube’ heat exchanger (depending on the size), air-cooled condenser section, R-134a refrigerant, lubrication system, motor starting components, discharge line shut-off valve, suction 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.

#### NOISE LEVEL AND VIBRATIONS

Sound pressure level at 1 meter distance in free field, semispheric conditions, shall not exceed .....dB(A). The sound pressure levels must be rated in accordance to ISO 3744 (other types of rating can not be used).

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

## 12 Specification text

### 12 - 1 Specification Text

#### DIMENSIONS

Unit dimensions shall not exceed following indications:

- Unit length ..... mm
- Unit width ..... mm
- Unit height ..... mm

#### CHILLER COMPONENTS

##### Compressors

- ✓ The compressor is semi-hermetic, single-screw type with gate-rotors made of carbon impregnated engineered composite material or the latest high-strength fibre reinforced star material (depending on the size). The gaterotor supports will be constructed of cast iron.
- ✓ The oil injection shall be used in order to get high EER (Energy Efficiency Ratio) also at high condensing pressure and low sound pressure levels in each load condition.
- ✓ 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 slide valve position.
- ✓ The unit capacity control shall be infinitely modulating, from 100% down to 25% for each circuit. The chiller shall be capable of stable operation to a minimum of 12.5% 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.
- ✓ The unit control logic shall manage the compressor slides to exactly match the plant load request in order to keep constant the set point for delivered chilled water temperature.
- ✓ 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:
  - High condenser pressure
  - Low evaporating refrigerant temperature

##### Evaporator

- ✓ The units shall be equipped (depending on the size) with a 'plate to plate' or 'shell&tube' evaporator:
  - The 'plate to plate' evaporator is made of stainless steel brazed plates and is covered with a 20mm closed cell insulation material. The exchanger is equipped with a heater for protection against freezing down to -28°C and evaporator water outlet connections of 3". Each evaporator has 1 circuit (one compressor) and the water filter is standard.
  - The 'shell&tube' evaporator is made with copper tubes rolled into steel tubesheets. The evaporators are single-pass on both the refrigerant and water sides for pure counter-flow heat exchange and low refrigerant pressure drops. The external shell is covered with a 10mm closed cell insulation material and the evaporator water outlet connections are provided with victaulic kit (as standard). Each evaporator has 2 circuits, one for each compressor and the water filter is standard.
- ✓ The evaporator is manufactured in accordance to PED approval.

## 12 Specification text

### 12 - 1 Specification Text

#### 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 breaker installed inside the electrical panel as a standard.

#### Refrigerant circuit

- ✓ The unit shall have two independent refrigerant circuits.
- ✓ Each circuit shall include as standard: electronic expansion device piloted by unit's microprocessor control, compressor discharge shut-off valve, suction 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:
  - in-line single pump low and high lifting
  - in-line twin pumps low and high lifting

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

#### Optional High Level Communications Interface

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

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# 1 Features

- High efficiency
- Standard sound level configuration: condenser fan rotating at 900 rpm (EWAD250-350D-XS) and 890 rpm (EWAD380-620D-XS), rubber antivibration under compressor
- Stepless single-screw compressor
- Optimised for use with R-134a
- MicroTech III controller
- Large operation range (ambient temperature down to -18°C)



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## 2 Features and advantages

### Features and advantages

#### Low operating cost

This chiller range is the result of careful design, aimed to optimize the energy efficiency of the chillers, with the objective of bringing down operating costs and improving installation profitability, effectiveness and economical management.

The chillers feature a high efficiency single rotor screw compressor design, large condenser coil surface area for maximum heat transfer and low discharge pressure, advanced technology condenser fans and a 'plate to plate' or 'shell&tube' evaporator with low refrigerant pressure drops.

#### Low operating sound levels

Very low sound levels both at full load and part load conditions are achieved by the latest compressor design and by a unique new fan that moves large volume of air at exceptionally low sound levels and by the virtually vibration-free operation.

#### Excellent serviceability

Field serviceability has not been sacrificed to meet design performance objectives. The compressor is equipped with discharge, liquid and suction shut off valves. The compressor and serviceable components such as filter-driers are located on the outside edges of the base allowing, together with the shape of the coil, an easy access for inspection and service. Moreover, the MicroTech III controller gives detailed information on the causes of an alarm or fault.

#### Proven reliability

Full factory testing of every unit with water hook-up helps in providing a trouble-free start-up. Extensive quality control checks during testing means that each equipment protection and operating control is properly adjusted and operates correctly before it leaves the factory.

#### Infinite capacity control

Cooling capacity control is infinitely variable by means of a single screw compressor controlled by microprocessor system. Each unit has infinitely variable capacity control from 100% down to 12.5%. This modulation allows the compressor capacity to exactly match the building cooling load. Chilled water temperature fluctuation is avoided only with a stepless control.

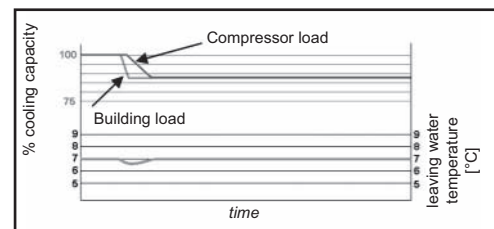
In the case that the compressor with load step control is used, the compressor capacity, at partial loads, will be too high or too low compared to the building cooling load. The result is an increase in chiller energy costs, particularly at the part-load conditions at which the chiller operates most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

Units with stepless regulation offer benefits that the units with step regulation are unable to match.

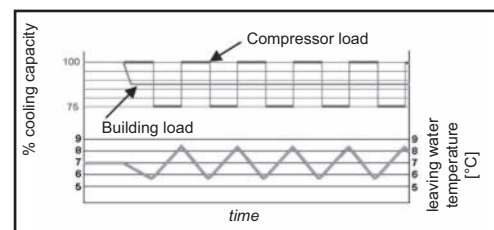
Only a chiller with step-less regulation, is able to follow the system cooling demand at any time and to deliver chilled water at set-point.

#### Superior control logic

The new MicroTech III controller provides an easy to use control environmental. The control logic is designed to provide maximum efficiency and a history of unit operation. One of the greatest benefits is the easy interface with LonWorks, Bacnet, Ethernet TCP/IP or Modbus communications.



ELWT fluctuation with stepless capacity control



ELWT fluctuation with steps capacity control (4 steps)

## 2 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 Stds	UNI – EN ISO 9001:2004

### Certifications

All units manufactured by Daikin 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 for other applications, such as naval (RINA, etc.).

### Efficiency and sound configuration

The range is available in multiple efficiency and sound versions:

Efficiency level	Sound level			
	Standard	Low	Reduced	Extra low
Standard efficiency	EWAD~D-SS	EWAD~D-SL	EWAD~D-SR	EWAD~D-SX
High efficiency	EWAD~D-XS	N.A.	EWAD~D-XR	N.A.
High ambient	EWAD~D-HS	N.A.	N.A.	N.A.

### Versions

The range is available in three versions:

#### S: Standard efficiency

7 sizes to cover a range from 389 up to 578 kW with an EER up to 2.03 and an ESEER up to 3.56 (data refers to Standard sound configuration)

#### X: High efficiency

11 sizes to cover a range from 247 up to 622 kW with an EER up to 3.20 and an ESEER up to 4.01 (data refers to Standard sound configuration)

#### H: High ambient temperature

15 sizes to cover a range from 195 up to 587 kW with an EER up to 3.07 and an ESEER up to 3.79 (data refers to Standard sound configuration)

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 weighted formula enabling to take into account the variation of EER with the load rate and the variation of air inlet condenser temperature.

$$\text{ESEER} = (A \times \text{EER}100\%) + (B \times \text{EER}75\%) + (C \times \text{EER}50\%) + (D \times \text{EER}25\%)$$

	A	B	C	D
Coefficient	0.03 (3%)	0.33 (33%)	0.41 (41%)	0.23 (23%)
Air inlet condenser temperature	35°C	30°C	25°C	20°C

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## 2 Features and advantages

### Sound levels

The range is available in four different sound level configurations:

**S:** Standard sound

Condenser fan rotating at 890 rpm, rubber antivibration under compressor

**L:** Low sound

Condenser fan rotating at 900 rpm (EWAD180-370D-SL) and 705 rpm (EWAD400-530D-SL), rubber antivibration under compressor.

**R:** Reduced sound

Condenser fan rotating at 680 rpm (EWAD180-370D-SR) and 705 rpm (EWAD400-530D-SR), rubber antivibration under compressor, compressor sound enclosure.

**X:** Extra low sound

Condenser fan rotating at 500 rpm, rubber antivibration under compressor, compressor and evaporator sound enclosure.

## 3 General characteristics

### General characteristics

#### Cabinet and structure

The cabinet is made of galvanized steel sheet and painted to provide a high resistance to corrosion. Colour Ivory White (Munsell code 5Y7.5/1) ( $\pm$ 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.

#### Screw compressors with integrated oil separator

The range features two types of single-screw compressors:

A) The compressor is semi-hermetic, single-screw type with gate-rotors made of carbon impregnated engineered composite material. The compressor has one slide managed by the unit microprocessor for infinitely modulating the capacity between 100% to 25%. An integrated high efficiency oil separator maximizes the oil separation and standard start is Wye-delta (Y- $\Delta$ ) type.

This compressor is offered on following models:

- EWAD180~370D-SL
- EWAD180~370D-SR
- EWAD210~310D-SX
- EWAD250~400D-XS
- EWAD240~390D-XR
- EWAD200~380D-HS

B) The compressor is semi-hermetic, single-screw type with gate-rotor made with the latest high-strength fibre reinforced star material. The compressor has an asymmetric slide regulation managed by the unit controller for infinitely modulating capacity from 100% to 25%. An integrated high efficiency oil separator maximizes the oil separation and standard start is Wye-delta (Y- $\Delta$ ) type.

This compressor is offered on following models:

- EWAD390~580D-SS
- EWAD400~530D-SL
- EWAD400~530D-SR
- EWAD370~490D-SX
- EWAD470~620D-XS
- EWAD460~600D-XR
- EWAD420~590D-HS

#### 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

For size EWAD180~200D-SL, EWAD180~190D-SR and EWAD200~210D-HS

The units are equipped with a direct expansion plate to plate type evaporator. This heat exchanger is made of stainless steel brazed plates and is covered with a 20mm closed cell insulation material. The exchanger is equipped with a heater for protection against freezing down to  $-28^{\circ}\text{C}$  and evaporator water outlet connections of 3". Each evaporator has 2 circuits, one for each compressor and is manufactured in accordance to PED approval. Water pressure differential switch on evaporator standard factory mounted. Water filter is standard.

All the other units are equipped with a Direct Expansion shell&tube evaporator with copper tubes rolled into steel tubesheets. The evaporators are single-pass on both the refrigerant and water sides for pure counter-flow heat exchange and low refrigerant pressure drops. Both attributes contribute to the heat exchanger effectiveness and total unit's outstanding efficiency.

The external shell is covered with a 10mm closed cell insulation material and the evaporator water outlet connections are provided with victaulic kit (as standard). Each evaporator has 2 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.

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### 3 General characteristics

#### Condenser coil fans

Fan 710 mm diameter

The condenser fans are propeller type with wing-profile blades for achieving better performance. Each fan is protected by a guard.

Fan 800 mm diameter

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  $\Delta P$  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 independent refrigerant circuits and each one includes:

- 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
- Sight glass with moisture indicator
- Filter drier
- Charging valves
- High pressure switch
- High and low pressure transducers

#### Electrical control panel

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

#### Power Section

The power section includes compressors fuses, 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.

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## 3 General characteristics

### Control section - main features

- Management of the compressor stepless capacity and fans modulation.
- Chiller enabled to work in partial failure condition.
- Full routine operation at condition of:
  - high ambient temperature value
  - high thermal load
  - high evaporator entering water temperature (start-up)
- Display of evaporator entering/leaving water temperature.
- Display of Outdoor Ambient Temperature.
- Display of condensing-evaporating temperature and pressure, suction and discharge superheat for each circuit.
- Leaving water evaporator temperature regulation (temperature tolerance = 0.1°C)
- Compressor and evaporator pumps hours counter.
- Display of Status Safety Devices.
- Number of starts and compressor working hours.
- Optimized management of compressor load.
- Fan management according to condensing pressure.
- Re-start in case of power failure (automatic / manual).
- Soft Load (optimized management of the compressor load during the start-up).
- Start at high evaporator water temperature.
- Return Reset (Set Point Reset based on return water temperature).
- OAT (Outside Ambient temperature) Reset.
- Set point Reset (optional).
- Application and system upgrade with commercial SD cards.
- Ethernet port for remote or local servicing using standard web browsers.
- Two different sets of default parameters could be stored for easy restore.

### Safety device / logic for each refrigerant circuit

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

### System security

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

### Regulation type

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

### 3 General characteristics

#### Condensing pressure

Condensing pressure can be controlled in according to the entering air temperature to the condenser coil. The fans can be managed either with steps, or with a 0/10V modulating signal or with a mixed 0/10V + Steps strategy to cover all possible operational conditions.

#### MicroTech III

MicroTech III built-in terminal has the following features:

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

#### Supervising systems (on request)

##### MicroTech III remote control

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

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

#### Standard options (supplied on basic unit)

**Evaporator victaulic kit** – Not available on units EWAD180~200D-SL, EWAD180~190D-SR and EWAD200~210D-HS

**Evaporator water design pressure (10Bar)**

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

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

**Wye-Delta Compressors starter (Y-Δ)** – For low inrush current and reduced starting torque.

**Double set-point** – Dual leaving water temperature set-points.

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

**Water pressure differential switch on evaporator** – Not available on units EWAD390~580D-SS, EWAD230~530D-SL, EWAD220~530D-SR, EWAD210~490D-SX, EWAD250~620D-XS, EWAD240~600D-XR, EWAD230~590D-HS

**Evaporator electric heater type** – 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 device**

**20 mm evaporator insulation** – Only for EWAD180~200D-SL, EWAD180~190D-SR, EWAD210D-SX and EWAD200~210D-HS

**Ambient outside temperature sensor and set-point reset**

**Hour run meter**

**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  $\Delta t$ .

**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 (pump etc...). User can decide if this alarm signal will stop the unit or not.

**Fans circuit breakers** – Safety device against motor overloading and short circuit

**Main switch interlock door**

### 3 General characteristics

#### Options (on request)

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

#### **Total heat recovery (1 circuit)**

**Partial heat recovery** – Plate to plate heat exchangers installed between the compressor discharge and the condenser coil, allowing producing hot water.

**Brine version** – Allows the unit to operate down to -15°C leaving liquid temperature (antifreeze required).

**Evaporator flanged connections** – Not available for EWAD180~200D-SL, EWAD180~190D-SR, EWAD210D-SX and EWAD200~210D-HS

#### **Condenser coil 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.

**Hydronic Kit (single water pump - low or high lifting)** – (N.A. on EWAD210~490D-SX) Hydronic kit consists of: single direct driven centrifugal pump, water filling system with pressure gauge, safety valve, drain valve. The pump motor 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 - low or high lifting)** – (N.A. on EWAD180~190D-SR and on EWAD210~490D-SX). 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**

**Soft starter** – Electronic starting device to reduce the mechanical stress during compressor start-up.

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

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

**Energy Meter** – This device allows to measure the energy absorbed by the chiller during its life. It is installed inside the control box mounted on a DIN rail and show on a digital display: Line-to-Line Voltage, Phase and Average Current, Active and Reactive Power, Active Energy, Frequency.

**Capacitors for power factor correction** – To increase the operating power factor of the unit at nominal operating conditions. The capacitors are “dry” self-regenerating type with over pressure disconnecting safety device insulated with a no toxic dielectric mix with no PCB or PCT.

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

#### **Fan silent mode**

**Speedtrol** – (N.A. on EWAD210~490D-SX) Continuous fan speed modulation on the first fan of each circuit. It allows the unit working with air temperature down to -18°C.

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

#### **High pressure side manometers (one per circuit)**

#### **Compressors circuit breakers**

**Fan speed regulation** – Standard option for EWAD~D-SX

To control the fan speed revolution for smooth operating control of the unit. During low ambient temperature operation, this option improves also the sound level of the unit. With “Fan speed regulation” option, by different microprocessor setting, it is also possible to set the “Fan Silent Mode” configuration. It means that the microprocessor clock switches the fan at low speed according to the client setting (i.e. Night & Day), providing that the ambient temperature/condensing pressure is allowing the speed change. It allows a perfect condensing control down to -10°C.

### 3 General characteristics

**Rubber type anti vibration mounts** – Supplied separately, these are positioned under the base of the unit during installation to reduce vibrations.

**Spring type anti vibration 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.

**External tank without cabinet (500 L / 1000 L)**

**External tank with cabinet (500 L / 1000 L)**

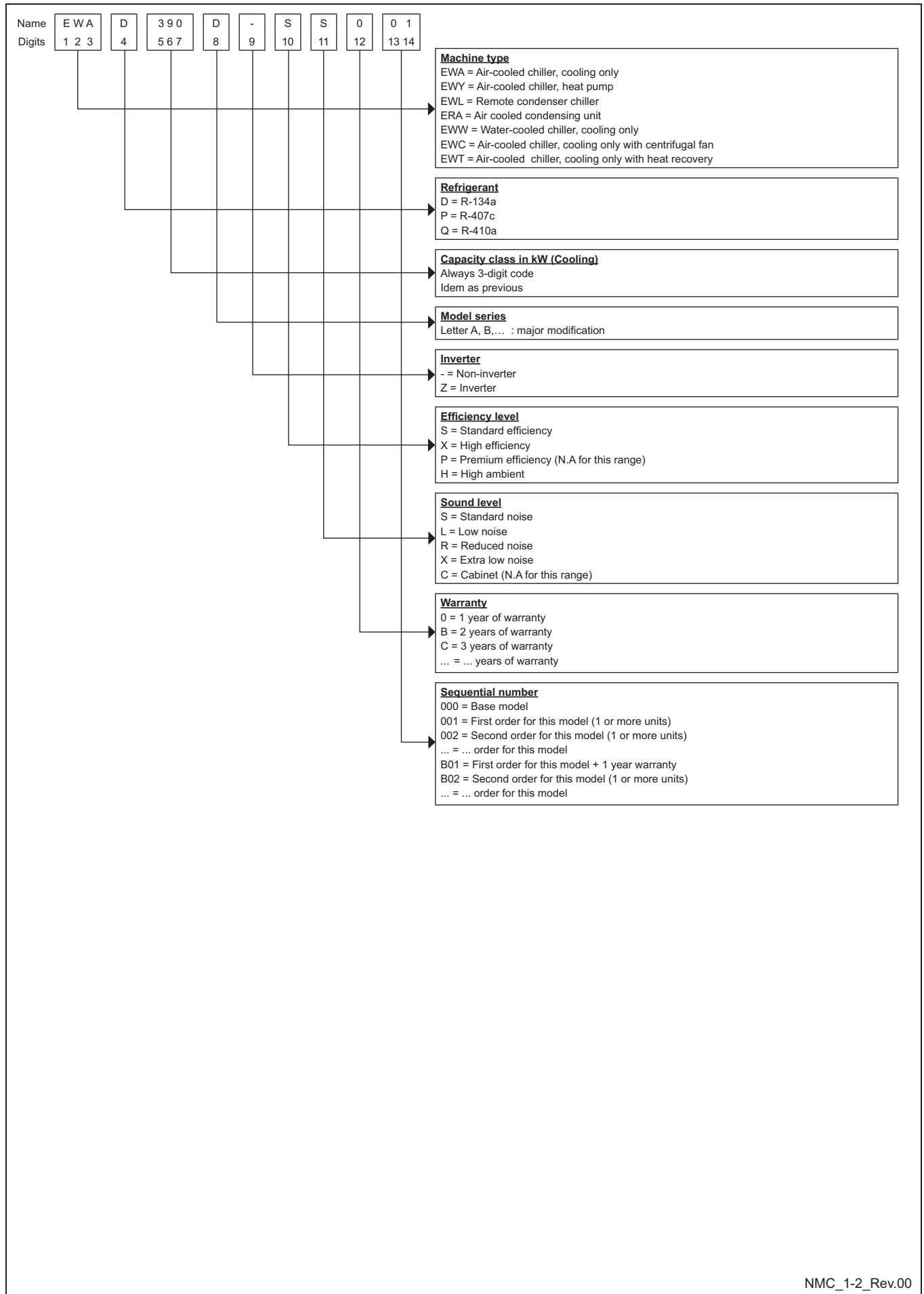
**Container kit**

**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 (please contact the factory) (This test is not available for units with glycol mixtures).

**Acoustic test** – On request, a test can be carried out, at customer's presence (please contact the factory) (This test is not available for units with glycol mixtures).

# 4 Nomenclature

## 4 - 1 Nomenclature



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## 5 Specifications

5-1 Technical Specifications					EWAD250D-XS	EWAD280D-XS	EWAD300D-XS	EWAD330D-XS	EWAD350D-XS	EWAD380D-XS
Cooling capacity	Nom.		kW	247 (1)	275 (1)	302 (1)	327 (1)	351 (1)	376 (1)	
Capacity control	Method			Stepless						
	Minimum capacity		%	12.5						
Power input	Cooling	Nom.	kW	79.1 (1)	87.1 (1)	94.1 (1)	104 (1)	113 (1)	120 (1)	
EER				3.12 (1)	3.16 (1)	3.20 (1)	3.15 (1)	3.12 (1)	3.14 (1)	
ESEER				3.56	3.60	3.62	3.85	3.67	3.58	
IPLV				3.98	4.00		4.08	4.07	4.06	
Casing	Colour			Ivory white						
	Material			Galvanized and painted steel sheet						
Dimensions	Unit	Height	mm	2,355						
		Width	mm	2,234						
		Depth	mm	3,138	4,040					
Weight	Unit		kg	2,905	3,285		3,235	3,240		
	Operation weight		kg	3,000	3,400					
Water heat exchanger	Type			Single pass shell & tube						
	Water volume		l	95	115		165	160		
	Nominal water flow	Cooling	l/s	11.80	13.10	14.40	15.60	16.70	17.90	
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	48	45	49	46	51	58
	Insulation material			Closed cell						
Air heat exchanger	Type			High efficiency fin and tube type with integral subcooler						
Fan	Quantity			6	8					
	Type			Direct propeller						
	Diameter		mm	710						
	Air flow rate	Nom.	l/s	22,302	30,591	29,736		43,001		
	Speed		rpm	900					890	
Fan motor	Drive			DOL						
	Input	Cooling	W	1,230				1,750		
Sound power level	Cooling	Nom.	dBA	96.8	97.2			98.7		
Sound pressure level	Cooling	Nom.	dBA	77.5					79.0	
Compressor	Type			Semi-hermetic single screw compressor						
	Quantity			2						
	Oil	Charged volume		l						26
Operation range	Water side	Cooling	Min.	°CDB	-15					
			Max.	°CDB	15					
	Air side	Cooling	Min.	°CDB	-18					
			Max.	°CDB	48					
Refrigerant	Type			R-134a						
	Circuits	Quantity		2						
Refrigerant circuit	Charge		kg	58	66	76		73		
Piping connections	Evaporator water inlet/outlet			114.3						
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	Water freeze protection controller							

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## 5 Specifications

5-1 Technical Specifications				EWAD400D-XS	EWAD470D-XS	EWAD520D-XS	EWAD580D-XS	EWAD620D-XS			
Cooling capacity	Nom.			kW	401 (1)	469 (1)	524 (1)	575 (1)	622 (1)		
Capacity control	Method			Stepless							
	Minimum capacity				%				12.5		
Power input	Cooling	Nom.			kW	127 (1)	150 (1)	166 (1)	181 (1)	194 (1)	
EER						3.16 (1)	3.12 (1)	3.15 (1)	3.18 (1)	3.20 (1)	
ESEER						3.59	3.84	4.00	4.01	3.88	
IPLV						3.98	4.16	4.81	4.83	4.61	
Casing	Colour			Ivory white							
	Material			Galvanized and painted steel sheet							
Dimensions	Unit	Height			mm	2,355	2,223				
		Width			mm	2,234					
		Depth			mm	4,040		4,940			
Weight	Unit				kg	3,240	3,510	4,670	4,685		
	Operation weight				kg	3,400	3,780	4,940			
Water heat exchanger	Type			Single pass shell & tube							
	Water volume				l	160	270		255		
	Nominal water flow	Cooling			l/s	19.10	22.40	25.00	27.40	29.70	
	Nominal water pressure drop	Cooling	Heat exchanger			kPa	64	47	63	56	38
		Insulation material			Closed cell						
Air heat exchanger	Type			High efficiency fin and tube type with integral subcooler							
Fan	Quantity					8		10			
	Type			Direct propeller							
	Diameter				mm	710	800				
	Air flow rate	Nom.			l/s	42,306	43,696	54,620			
	Speed				rpm	890					
Fan motor	Drive			DOL							
	Input	Cooling			W	1,750					
Sound power level	Cooling	Nom.			dBA	98.7		99.2			
Sound pressure level	Cooling	Nom.			dBA	79.0					
Compressor	Type			Semi-hermetic single screw compressor							
	Quantity			2							
	Oil	Charged volume				l	26		32		
Operation range	Water side	Cooling	Min.			°CDB	-15				
			Max.			°CDB	15				
	Air side	Cooling	Min.			°CDB	-18				
			Max.			°CDB	48				
Refrigerant	Type			R-134a							
	Circuits	Quantity		2							
Refrigerant circuit	Charge				kg	76	86	100			
Piping connections	Evaporator water inlet/outlet					114.3	168.3				
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		Water freeze protection controller							

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## 5 Specifications

5-2 Electrical Specifications				EWAD250D-XS	EWAD280D-XS	EWAD300D-XS	EWAD330D-XS	EWAD350D-XS	EWAD380D-XS	
Compressor	Phase			3~						
	Voltage		V	400						
	Voltage range	Min.	%	-10						
		Max.	%	10						
	Maximum running current		A	82		99		110		
	Starting method			Wye-delta						
Compressor 2	Maximum running current		A	82	99		110		125	
Power supply	Phase			3~						
	Frequency		Hz	50						
	Voltage		V	400						
	Voltage range	Min.	%	-10						
		Max.	%	10						
Unit	Maximum starting current		A	224	240		283	292	311	
	Nominal running current (RLA)	Cooling	A	132	145	158	172	185	203	
			A	177	199	216	227	238	267	
	Max unit current for wires sizing		A	195	219	237	250	262	294	
Fans	Nominal running current (RLA)		A	13.44	17.92				32	

5-2 Electrical Specifications				EWAD400D-XS	EWAD470D-XS	EWAD520D-XS	EWAD580D-XS	EWAD620D-XS
Compressor	Phase			3~				
	Voltage		V	400				
	Voltage range	Min.	%	-10				
		Max.	%	10				
	Maximum running current		A	125	147	162	185	
	Starting method			Wye-delta				
Compressor 2	Maximum running current		A	125	147	162		185
Power supply	Phase			3~				
	Frequency		Hz	50				
	Voltage		V	400				
	Voltage range	Min.	%	-10				
		Max.	%	10				
Unit	Maximum starting current		A	311	422	480	498	
	Nominal running current (RLA)	Cooling	A	213	253	283	305	324
			A	283	327	364	387	409
	Max unit current for wires sizing		A	311	360	401	425	450
Fans	Nominal running current (RLA)		A	32			40	

### Notes

- (1)Cooling: entering evaporator water temp. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C; full load operation.
- (2)Sound pressure levels are measured at entering evaporator water temp. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C; 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. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C. 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

# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

### EWAD-D-XS

ELWT (°C)		250						280						300						330									
		Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)									
		25	30	35	40	43	46	48	25	30	35	40	43	46	48	25	30	35	40	43	46	48	25	30	35	40	43	46	48
4	Cc (kW)	238	233	227	219	214	208	204	265	260	254	247	241	235	231	290	284	277	269	263	256	251	314	308	299	289	282	275	269
	Pi (kW)	63	70	77	84	89	94	97	70	77	85	93	98	104	108	76	83	91	100	106	112	116	83	91	100	110	116	123	127
	Qwe (l/s)	11.3	11.1	10.8	10.4	10.2	9.9	9.7	12.6	12.4	12.1	11.7	11.5	11.2	11	13.8	13.5	13.2	12.8	12.5	12.2	12	15	14.7	14.3	13.8	13.5	13.1	12.8
	Pdwe (kPa)	45	43.3	41.2	38.7	37	35.2	33.9	41.9	40.6	38.9	36.8	35.4	33.8	32.7	45.4	43.8	41.9	39.6	38.1	36.3	35.1	42.8	41.2	39.2	36.9	35.3	33.5	32.3
5	Cc (kW)	245	240	234	226	221	215	210	272	267	261	254	248	243	238	298	292	285	277	271	264	260	324	317	309	298	291	284	278
	Pi (kW)	64	70	77	85	90	95	98	71	78	86	94	99	105	109	76	84	92	101	107	113	117	84	92	101	111	117	124	128
	Qwe (l/s)	11.7	11.4	11.1	10.8	10.5	10.2	10	13	12.7	12.4	12.1	11.8	11.6	11.4	14.2	13.9	13.6	13.2	12.9	12.6	12.4	15.4	15.1	14.7	14.2	13.9	13.5	13.2
	Pdwe (kPa)	47.2	45.6	43.5	40.9	39.2	37.3	36	43.9	42.5	40.8	38.8	37.3	35.8	34.6	47.7	46	44.1	41.8	40.2	38.4	37.2	45.1	43.5	41.4	39	37.4	35.6	34.3
6	Cc (kW)	251	246	240	233	227	222	217	279	274	268	261	255	250	246	306	300	293	285	279	272	268	333	326	318	308	301	293	287
	Pi (kW)	65	71	78	86	91	96	99	72	79	86	95	100	106	109	77	85	93	102	108	114	118	85	93	103	112	119	125	130
	Qwe (l/s)	12	11.8	11.5	11.1	10.8	10.6	10.4	13.3	13.1	12.8	12.4	12.2	11.9	11.7	14.6	14.3	14	13.6	13.3	13	12.8	15.9	15.5	15.2	14.7	14.3	14	13.7
	Pdwe (kPa)	49.6	47.9	45.8	43.2	41.4	39.5	38.2	46	44.6	42.8	40.7	39.3	37.7	36.6	50	48.4	46.4	44	42.4	40.6	39.3	47.5	45.8	43.7	41.3	39.6	37.7	36.4
7	Cc (kW)	258	253	247	240	234	228	224	286	281	275	268	263	257	253	314	308	302	293	287	281	276	342	335	327	317	310	302	296
	Pi (kW)	65	72	79	87	92	97	100	72	79	87	96	101	107	110	78	86	94	103	109	115	119	86	94	104	114	120	126	131
	Qwe (l/s)	12.3	12.1	11.8	11.4	11.2	10.9	10.7	13.6	13.4	13.1	12.8	12.5	12.3	12.1	15	14.7	14.4	14	13.7	13.4	13.2	16.3	16	15.6	15.1	14.8	14.4	14.1
	Pdwe (kPa)	52	50.3	48.1	45.5	43.8	41.8	40.4	48.1	46.7	44.9	42.8	41.3	39.7	38.5	52.4	50.8	48.8	46.3	44.7	42.8	41.5	49.9	48.2	46.1	43.6	41.8	40	38.6
8	Cc (kW)	265	260	254	246	241	235	231	293	288	282	275	270	264	260	322	316	310	301	295	289	284	351	345	336	326	319	311	306
	Pi (kW)	66	73	80	88	93	98	101	73	80	88	96	102	107	111	79	87	95	104	110	116	120	87	96	105	115	121	128	132
	Qwe (l/s)	12.6	12.4	12.1	11.8	11.5	11.2	11	14	13.7	13.5	13.1	12.9	12.6	12.4	15.4	15.1	14.8	14.4	14.1	13.8	13.6	16.8	16.4	16.1	15.6	15.2	14.9	14.6
	Pdwe (kPa)	54.5	52.7	50.5	47.9	46.1	44.1	42.7	50.2	48.8	47	44.9	43.4	41.7	40.6	54.9	53.2	51.2	48.7	47	45.1	43.8	52.4	50.7	48.5	45.9	44.2	42.2	40.9
9	Cc (kW)	271	267	261	253	248	242	238	300	295	289	282	277	271	267	329	324	318	309	304	297	292	361	354	346	336	329	321	315
	Pi (kW)	67	73	81	89	94	99	102	74	81	89	97	103	108	112	80	88	96	105	111	117	121	88	97	106	116	123	129	134
	Qwe (l/s)	13	12.7	12.4	12.1	11.8	11.6	11.4	14.3	14.1	13.8	13.5	13.2	12.9	12.7	15.7	15.5	15.2	14.8	14.5	14.2	14	17.2	16.9	16.5	16	15.7	15.3	15.1
	Pdwe (kPa)	57.1	55.3	53	50.3	48.5	46.5	45.1	52.5	51	49.2	47	45.5	43.8	42.6	57.3	55.7	53.7	51.2	49.4	47.5	46.2	55	53.2	51	48.4	46.6	44.6	43.2
10	Cc (kW)	278	273	267	260	255	249	245	307	302	296	289	284	278	274	337	332	325	318	312	305	300	370	363	355	345	338	330	325
	Pi (kW)	68	74	82	89	94	100	103	75	82	89	98	104	109	113	81	88	97	106	112	118	123	89	98	107	117	124	131	135
	Qwe (l/s)	13.3	13.1	12.8	12.4	12.2	11.9	11.7	14.6	14.4	14.1	13.8	13.6	13.3	13.1	16.1	15.9	15.5	15.2	14.9	14.6	14.4	17.7	17.4	17	16.5	16.2	15.8	15.5
	Pdwe (kPa)	59.8	57.9	55.6	52.8	51	48.9	47.4	54.7	53.2	51.4	49.2	47.6	45.9	44.7	59.8	58.1	56.1	53.7	51.9	50	48.6	57.7	55.8	53.6	50.9	49	47	45.6
11	Cc (kW)	285	280	274	267	262	256	252	314	309	303	296	291	285	281	345	340	333	325	320	313	309	379	373	365	355	348	340	333
	Pi (kW)	69	75	82	90	95	101	104	75	82	90	99	104	110	114	82	89	98	107	113	119	124	90	99	108	119	125	132	136
	Qwe (l/s)	13.6	13.4	13.1	12.8	12.5	12.2	12	15	14.8	14.5	14.1	13.9	13.6	13.4	16.5	16.2	15.9	15.6	15.3	15	14.8	18.1	17.8	17.4	17	16.6	16.2	15.9
	Pdwe (kPa)	62.6	60.6	58.3	55.4	53.5	51.4	49.9	57	55.5	53.7	51.4	49.8	48.1	46.9	62.3	60.6	58.6	56.1	54.4	52.5	51.1	60.4	58.5	56.2	53.5	51.6	49.5	47.7
12	Cc (kW)	292	287	281	274	268	263	258	321	316	310	303	298	292	288	353	348	341	333	328	322	317	389	382	374	364	357	349	338
	Pi (kW)	69	76	83	91	96	102	105	76	83	91	100	105	111	115	82	90	99	108	114	120	125	92	100	110	120	127	133	135
	Qwe (l/s)	14	13.7	13.5	13.1	12.8	12.6	12.4	15.3	15.1	14.8	14.5	14.3	14	13.8	16.9	16.6	16.3	15.9	15.7	15.4	15.2	18.6	18.3	17.9	17.4	17.1	16.7	16.2
	Pdwe (kPa)	65.4	63.5	61	58.1	56.1	53.9	52.4	59.4	57.9	56	53.7	52.1	50.3	49.1	64.9	63.2	61.1	58.6	56.9	55	53.6	63.2	61.3	58.9	56.1	54.2	52.1	49.2
13	Cc (kW)	300	295	288	281	276	270	265	328	323	317	310	305	300	295	361	355	349	341	336	329	325	399	392	384	374	367	359	345
	Pi (kW)	70	77	84	92	97	103	106	77	84	92	101	106	112	116	83	91	100	109	115	122	126	93	101	111	121	128	135	135
	Qwe (l/s)	14.3	14.1	13.8	13.4	13.2	12.9	12.7	15.7	15.5	15.2	14.8	14.6	14.3	14.1	17.3	17	16.7	16.3	16.1	15.8	15.5	19.1	18.8	18.4	17.9	17.5	17.2	16.5
	Pdwe (kPa)	68.4	66.3	63.8	60.8	58.8	56.6	55	61.9	60.3	58.3	56	54.4	52.6	51.3	67.6	65.9	63.7	61.1	59.4	57.4	56	66.1	64.1	61.7	58.8	56.8	54.7	51
14	Cc (kW)	307	302	296	288	283	277	272	335	330	325	317	312	307	303	369	363	357	349	343	337	333	408	402	393	383	376	368	350
	Pi (kW)	71	78	85	93	98	104	107	78	85	93	102	107	113	117	84	92	101	110	116	123	127	94	103	112	123	129	136	135
	Qwe (l/s)	14.7	14.4	14.1	13.8	13.5	13.2	13	16	15.8	15.5	15.2	14.9	14.7	14.5	17.6	17.4	17.1	16.7	16.4	16.1	15.9	19.5	19.2	18.8	18.3	18	17.6	16.8
	Pdwe (kPa)	71.4	69.3	66.8	63.7	61.6	59.3	57.7	64.4	62.8	60.8	58.4	56.7	54.9	53.6	70.4	68.6	66.4	63.8	61.9	60	58.5	69.1	67	64.6	61.6	59.6	57.4	52.4
15	Cc (kW)	314	309	303	295	290	284	274	342	338	332	325	320	314	310	377	372	365	357	351	345	341	418	411	403	393	386	378	357
	Pi (kW)	72	79	86	94	99	105	106	79	86	94	102	108	114	118	85	93	102	111	117	124	128	95	104	113	124	131	138	135
	Qwe (l/s)	15	14.8	14.5	14.1	13.9	13.6	13.1	16.4	16.2	15.9	15.5	15.3	15	14.8	18	17.8	17.5	17.1	16.8	16.5	16.3							

# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

EWAD-D-XS

ELWLT (°C)		350							380							400							470						
		Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)							Condenser Inlet Air Temperature (°C)						
		25	30	35	40	43	46	48	25	30	35	40	43	46	48	25	30	35	40	43	46	48	25	30	35	40	43	46	48
4	Cc (kW)	338	331	322	311	303	294	288	362	354	345	334	327	318	312	386	378	369	357	349	340	334	455	445	430	407	390	370	355
	Pi (kW)	90	99	109	120	126	133	138	97	106	116	127	135	142	147	102	112	123	135	143	151	156	120	132	145	159	169	179	186
	Qwe (l/s)	16.1	15.8	15.3	14.8	14.4	14	13.7	17.2	16.9	16.5	15.9	15.6	15.2	14.9	18.4	18	17.6	17	16.6	16.2	15.9	21.7	21.2	20.5	19.4	18.6	17.6	16.9
	Pdwe (kPa)	47.5	45.6	43.4	40.7	38.9	36.9	35.5	53.5	51.6	49.3	46.5	44.7	42.6	41.1	59.2	57.1	54.5	51.5	49.4	47.1	45.5	44.8	43.1	40.4	36.7	34	30.9	28.7
5	Cc (kW)	348	341	331	320	313	304	298	372	364	356	345	337	329	323	397	389	380	368	360	351	345	469	469	443	420	402	382	366
	Pi (kW)	91	100	110	121	128	135	139	98	107	117	129	136	143	148	103	113	124	136	144	152	157	122	133	147	161	171	181	189
	Qwe (l/s)	16.6	16.2	15.8	15.3	14.9	14.5	14.2	17.7	17.4	16.9	16.4	16.1	15.7	15.4	18.9	18.5	18.1	17.5	17.2	16.7	16.4	22.3	21.9	21.1	20	19.2	18.2	17.4
	Pdwe (kPa)	50	48.1	45.8	43	41.2	39.2	37.7	56.3	54.4	52	49.2	47.2	45.1	43.6	62.2	60	57.5	54.3	52.2	49.9	48.3	47.3	45.5	42.7	38.8	35.9	32.6	30.3
6	Cc (kW)	358	350	341	330	322	314	307	382	375	366	355	347	339	333	407	400	390	379	371	362	355	482	472	456	432	414	393	377
	Pi (kW)	92	101	111	122	129	136	141	99	108	119	130	137	145	150	104	114	126	138	145	153	159	123	135	148	163	173	183	191
	Qwe (l/s)	17.1	16.7	16.3	15.7	15.4	15	14.7	18.2	17.9	17.4	16.9	16.6	16.2	15.9	19.4	19.1	18.6	18.1	17.7	17.3	16.9	23	22.5	21.7	20.6	19.7	18.7	18
	Pdwe (kPa)	52.6	50.6	48.3	45.5	43.6	41.5	40	59.1	57.2	54.8	51.9	49.9	47.8	46.2	65.2	63.1	60.5	57.3	55.1	52.8	51.1	49.8	47.9	45	40.9	37.9	34.5	32
7	Cc (kW)	367	360	351	340	332	324	317	392	385	376	365	358	349	343	418	410	401	390	382	373	366	496	486	469	445	426	404	388
	Pi (kW)	93	102	113	124	130	138	142	100	109	120	131	138	146	151	105	116	127	139	147	155	160	125	137	150	165	175	186	193
	Qwe (l/s)	17.5	17.2	16.7	16.2	15.8	15.4	15.1	18.7	18.4	17.9	17.4	17.1	16.7	16.4	19.9	19.6	19.1	18.6	18.2	17.8	17.5	23.7	23.2	22.4	21.2	20.3	19.3	18.5
	Pdwe (kPa)	55.2	53.2	50.8	48	46	43.9	42.4	62	60	57.6	54.7	52.7	50.5	48.9	68.4	66.2	63.5	60.3	58.1	55.7	54	52.5	50.5	47.4	43.1	39.9	36.3	33.7
8	Cc (kW)	377	370	361	350	342	333	327	402	395	386	376	368	360	354	428	421	412	400	393	384	377	510	500	482	457	438	416	397
	Pi (kW)	94	104	114	125	132	139	144	101	110	121	132	140	147	152	106	117	128	140	148	156	162	127	139	152	167	177	188	194
	Qwe (l/s)	18	17.7	17.2	16.7	16.3	15.9	15.6	19.2	18.9	18.4	17.9	17.6	17.2	16.9	20.5	20.1	19.7	19.1	18.7	18.3	18	24.4	23.8	23	21.8	20.9	19.9	18.9
	Pdwe (kPa)	58	55.9	53.5	50.6	48.6	46.4	44.8	65.1	63	60.5	57.6	55.5	53.3	51.7	67.6	65.4	62.7	59.5	57.2	54.8	53	55.2	53.2	49.9	45.3	42	38.2	35.1
9	Cc (kW)	387	380	371	360	352	343	337	412	405	397	386	379	370	364	439	432	423	411	403	395	388	524	513	496	470	450	428	400
	Pi (kW)	96	105	115	126	133	141	145	102	111	122	134	141	149	154	107	118	129	142	150	158	163	128	141	154	170	180	190	190
	Qwe (l/s)	18.5	18.1	17.7	17.2	16.8	16.4	16.1	19.7	19.4	18.9	18.4	18.1	17.7	17.4	21	20.6	20.2	19.6	19.3	18.8	18.5	25	24.5	23.7	22.4	21.5	20.4	19.1
	Pdwe (kPa)	60.8	58.7	56.2	53.2	51.2	49	47.4	68.2	66.1	63.5	60.5	58.4	56.1	54.5	75	72.7	69.9	66.6	64.3	61.8	60.1	58.1	55.9	52.4	47.7	44.2	40.2	35.7
10	Cc (kW)	397	390	381	370	362	353	347	423	416	407	396	389	381	375	450	443	434	422	414	406	399	539	527	509	483	463	439	406
	Pi (kW)	97	106	117	128	135	142	147	103	113	123	135	142	150	155	109	119	131	143	151	159	165	130	143	156	172	182	193	189
	Qwe (l/s)	19	18.6	18.2	17.7	17.3	16.9	16.6	20.2	19.9	19.5	18.9	18.6	18.2	17.9	21.5	21.2	20.7	20.2	19.8	19.4	19.1	25.7	25.2	24.3	23.1	22.1	21	19.4
	Pdwe (kPa)	63.7	61.5	59	55.9	53.8	51.5	49.9	71.3	69.2	66.6	63.5	61.4	59.1	57.4	78.5	76.1	73.3	69.9	67.5	65	63.2	61	58.7	55.1	50	46.4	42.2	36.7
11	Cc (kW)	407	400	391	380	372	363	354	433	426	418	407	400	391	385	462	454	445	433	425	417	410	553	541	522	495	475	451	409
	Pi (kW)	98	107	118	129	136	144	147	104	114	125	136	144	151	157	110	120	132	144	152	161	166	132	145	158	174	184	195	185
	Qwe (l/s)	19.5	19.1	18.7	18.1	17.8	17.4	16.9	20.7	20.4	20	19.5	19.1	18.7	18.4	22.1	21.7	21.3	20.7	20.3	19.9	19.6	26.5	25.9	25	23.7	22.7	21.6	19.5
	Pdwe (kPa)	66.6	64.5	61.8	58.7	56.6	54.2	51.9	74.6	72.4	69.8	66.6	64.4	62.1	60.3	82.1	79.7	76.7	73.2	70.9	68.3	66.4	64	61.6	57.8	52.5	48.6	44.3	37.1
12	Cc (kW)	417	410	401	390	382	373	366	444	437	428	418	410	402	396	473	465	456	444	436	428	421	568	556	536	508	487	463	411
	Pi (kW)	99	109	119	131	138	145	145	105	115	126	138	145	153	158	111	122	133	146	154	162	168	134	147	161	176	187	198	182
	Qwe (l/s)	20	19.6	19.2	18.6	18.3	17.8	17	21.2	20.9	20.5	20	19.6	19.2	18.9	22.6	22.2	21.8	21.2	20.9	20.5	20.1	27.2	26.6	25.6	24.3	23.3	22.1	19.6
	Pdwe (kPa)	69.6	67.4	64.8	61.6	59.4	57	52.4	78	75.8	73.1	69.8	67.6	65.2	63.4	85.8	83.3	80.3	76.7	74.3	71.6	69.7	67.2	64.6	60.5	55	50.9	46.5	37.5
13	Cc (kW)	427	420	411	400	392	383	361	455	448	439	428	421	412	406	484	477	467	456	448	439	432	583	570	550	521	499	466	416
	Pi (kW)	100	110	121	132	139	147	144	106	116	127	139	147	154	160	112	123	135	147	155	164	170	136	149	163	179	189	194	180
	Qwe (l/s)	20.4	20.1	19.6	19.1	18.7	18.3	17.3	21.8	21.4	21	20.5	20.1	19.7	19.4	23.2	22.8	22.3	21.8	21.4	21	20.7	27.9	27.3	26.3	24.9	23.9	22.3	19.9
	Pdwe (kPa)	72.8	70.5	67.7	64.5	62.3	59.8	53.6	81.5	79.2	76.4	73.1	70.8	68.3	66.5	89.6	87	84	80.3	77.8	75	73.1	70.4	67.6	63.4	57.5	53.3	47	38.3
14	Cc (kW)	438	430	421	410	402	393	362	466	459	450	439	431	423	417	496	488	479	467	459	450	444	598	584	563	534	512	471	417
	Pi (kW)	102	111	122	133	141	148	141	108	118	128	140	148	156	161	113	124	136	149	157	165	171	138	151	165	181	192	193	176
	Qwe (l/s)	20.9	20.6	20.1	19.6	19.2	18.8	17.3	22.3	21.9	21.5	21	20.6	20.2	20	23.7	23.4	22.9	22.3	22	21.5	21.2	28.6	28	27	25.5	24.5	22.6	19.9
	Pdwe (kPa)	76	73.7	70.8	67.5	65.2	62.7	53.9	85.1	82.7	79.9	76.5	74.1	71.6	69.7	93.5	90.9	87.7	84	81.4	78.6	76.6	73.7	70.8	66.3	60.1	55.8	48.1	38.5
15	Cc (kW)	448	440	431	420	412	403	365	477	470	461	450	442	434	428	507	500	490	478	470	461	455	612	599	577	547	524	474	421
	Pi (kW)	103	113	123	135	142	150	140	109	119	130	142	149	157	163	115	126	137	150	158	167	173	14						

# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

### EWAD-D-XS

ELWT (°C)		520						580						620								
		Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)								
		25	30	35	40	43	46	48	25	30	35	40	43	46	48	25	30	35	40	43	46	48
4	Cc (kW)	508	495	481	462	448	424	383	560	545	528	505	489	444	403	608	591	573	548	525	463	415
	Pi (kW)	131	146	161	178	190	201	194	142	158	175	194	207	209	203	153	170	188	209	223	216	206
	Qwe (l/s)	24.2	23.6	22.9	22	21.3	20.2	18.2	26.7	25.9	25.1	24.1	23.3	21.1	19.2	28.9	28.2	27.3	26.1	25	22.1	19.7
	Pdwe (kPa)	59.3	56.7	53.7	50	47.3	42.9	35.7	53.4	50.9	48	44.5	41.8	35.2	29.5	36.2	34.5	32.6	30.1	27.9	22.2	18.2
5	Cc (kW)	523	510	495	476	461	444	424	576	561	543	521	503	474	442	625	608	589	564	545	504	455
	Pi (kW)	132	148	163	180	191	205	212	144	160	177	196	209	219	219	155	172	190	211	226	233	224
	Qwe (l/s)	24.9	24.3	23.6	22.7	22	21.2	20.2	27.5	26.7	25.9	24.8	24	22.6	21.1	29.8	29	28.1	26.9	26	24	21.7
	Pdwe (kPa)	62.6	59.8	56.7	52.8	49.9	46.6	43	56.4	53.7	50.7	46.9	44.2	39.7	34.9	38.2	36.4	34.3	31.7	29.8	25.9	21.6
6	Cc (kW)	538	525	509	490	475	457	444	593	577	559	536	518	497	473	642	625	605	580	560	537	498
	Pi (kW)	134	149	165	181	193	206	216	146	162	179	198	211	226	232	157	174	192	213	228	245	244
	Qwe (l/s)	25.7	25	24.3	23.3	22.6	21.8	21.2	28.3	27.5	26.7	25.5	24.7	23.7	22.6	30.6	29.8	28.9	27.6	26.7	25.6	23.8
	Pdwe (kPa)	66	63	59.7	55.6	52.6	49.2	46.6	59.4	56.6	53.4	49.5	46.6	43.3	39.6	40.1	38.2	36.1	33.3	31.4	29.1	25.4
7	Cc (kW)	554	540	524	504	489	471	457	610	594	575	551	533	512	487	660	642	622	596	576	552	517
	Pi (kW)	135	151	166	183	195	208	218	147	164	181	199	213	227	233	159	176	194	215	230	247	248
	Qwe (l/s)	26.4	25.8	25	24	23.3	22.5	21.8	29.1	28.3	27.4	26.3	25.4	24.4	23.2	31.5	30.6	29.7	28.4	27.5	26.4	24.7
	Pdwe (kPa)	69.4	66.4	62.9	58.6	55.4	51.9	49.2	62.5	59.6	56.2	52.1	49.1	45.6	41.7	42.1	40.1	37.9	35	33	30.6	27.1
8	Cc (kW)	569	555	539	518	502	484	470	627	610	591	566	548	527	496	677	659	638	612	591	568	524
	Pi (kW)	136	153	168	185	196	209	219	149	166	183	202	214	229	231	161	178	197	217	232	248	245
	Qwe (l/s)	27.2	26.5	25.7	24.7	24	23.1	22.5	29.9	29.1	28.2	27	26.2	25.1	23.7	32.3	31.5	30.5	29.2	28.2	27.1	25
	Pdwe (kPa)	73.1	69.8	66.1	61.6	58.3	54.6	51.8	65.7	62.6	59.1	54.8	51.6	48.1	43.1	44.2	42.1	39.7	36.8	34.6	32.2	27.9
9	Cc (kW)	585	570	553	532	516	498	484	644	627	607	582	563	542	505	695	677	655	628	607	583	527
	Pi (kW)	138	155	170	187	198	211	221	151	168	185	204	217	231	229	163	181	199	219	234	250	239
	Qwe (l/s)	27.9	27.2	26.4	25.4	24.7	23.8	23.1	30.8	29.9	29	27.8	26.9	25.9	24.1	33.2	32.3	31.3	30	29	27.8	25.2
	Pdwe (kPa)	76.7	73.4	69.5	64.8	61.3	57.4	54.6	69.1	65.8	62.1	57.6	54.3	50.6	44.5	46.4	44.1	41.6	38.6	36.3	33.8	28.2
10	Cc (kW)	600	586	568	547	530	512	497	662	644	623	598	579	556	513	713	694	672	644	623	598	530
	Pi (kW)	140	156	172	189	200	213	222	153	170	187	206	219	233	227	165	183	201	222	236	252	233
	Qwe (l/s)	28.7	28	27.2	26.1	25.3	24.4	23.8	31.6	30.8	29.8	28.6	27.6	26.6	24.5	34.1	33.2	32.1	30.7	29.8	28.6	25.3
	Pdwe (kPa)	80.5	77	73	68	64.4	60.4	57.4	72.5	69.1	65.2	60.4	57	53.1	45.9	48.5	46.2	43.6	40.4	38.1	35.4	28.5
11	Cc (kW)	616	601	583	561	545	525	507	679	661	640	613	594	566	519	730	711	688	660	639	606	527
	Pi (kW)	141	158	174	191	202	215	223	155	173	190	208	221	232	224	167	185	203	224	238	251	225
	Qwe (l/s)	29.4	28.7	27.9	26.8	26	25.1	24.2	32.4	31.6	30.6	29.3	28.4	27	24.8	34.9	34	32.9	31.5	30.5	29	25.2
	Pdwe (kPa)	84.4	80.7	76.5	71.3	67.6	63.4	59.5	76	72.5	68.3	63.3	59.8	54.8	46.9	50.7	48.4	45.6	42.2	39.8	36.3	28.2
12	Cc (kW)	632	617	598	576	559	539	510	696	678	656	629	609	574	517	748	728	706	676	654	605	528
	Pi (kW)	143	160	176	193	204	217	219	157	175	192	211	223	231	217	169	187	206	226	241	243	219
	Qwe (l/s)	30.2	29.5	28.6	27.5	26.7	25.8	24.4	33.3	32.4	31.4	30.1	29.1	27.5	24.7	35.8	34.8	33.7	32.3	31.3	28.9	25.3
	Pdwe (kPa)	88.4	84.6	80.1	74.8	70.9	66.5	60.1	79.6	75.9	71.6	66.4	62.7	56.3	46.5	53	50.5	47.7	44.2	41.6	36.2	28.3
13	Cc (kW)	648	632	614	590	573	553	509	714	695	673	645	625	581	513	766	745	722	692	670	608	523
	Pi (kW)	144	162	178	195	206	219	213	159	177	194	213	225	228	209	171	190	208	229	243	239	210
	Qwe (l/s)	31	30.2	29.3	28.2	27.4	26.5	24.3	34.1	33.2	32.2	30.9	29.9	27.8	24.6	36.6	35.7	34.5	33.1	32.1	29.1	25
	Pdwe (kPa)	92.4	88.5	83.9	78.2	74.3	69.7	59.9	83.3	79.4	74.9	69.5	65.6	57.5	46	55.3	52.7	49.7	46.1	43.5	36.5	27.9
14	Cc (kW)	664	647	629	605	588	568	506	731	712	689	661	641	587	515	784	763	739	709	686	605	529
	Pi (kW)	146	164	180	197	209	221	206	161	179	197	215	228	225	213	173	192	211	231	246	231	223
	Qwe (l/s)	31.8	31	30.1	28.9	28.1	27.2	24.2	35	34.1	33	31.6	30.7	28.1	24.7	37.5	36.5	35.3	33.9	32.8	29	25.3
	Pdwe (kPa)	96.6	92.5	87.7	81.8	77.7	72.9	59.4	87	83	78.3	72.7	68.6	58.6	46.4	57.7	55	51.9	48.1	45.4	36.2	28.5
15	Cc (kW)	680	663	644	620	602	582	499	748	729	706	677	656	592	511	802	781	755	724	702	601	521
	Pi (kW)	148	166	183	200	211	223	198	163	181	199	218	230	222	206	175	194	213	234	248	223	213
	Qwe (l/s)	32.5	31.7	30.8	29.7	28.8	27.8	23.9	35.8	34.9	33.8	32.4	31.4	28.4	24.5	38.4	37.4	36.2	34.7	33.6	28.8	25
	Pdwe (kPa)	101	96.6	91.6	85.5	81.1	76.3	57.8	90.7	86.6	81.8	75.9	71.7	59.6	45.8	60.2	57.3	54	50.1	47.4	35.8	27.7

## 6 Capacity tables

### 6 - 2 Partial Heat Recovery Capacity tables

**Partial Heat Recovery Ratings**  
EWAD-D-X

EWC / LWC	*Model EWAD-D-XS*	*Model EWAD-D-XR*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
50/60	250	240	220	72.2	102	35%	4.47
	280	270	246	87.0	117	35%	4.17
	300	300	270	98.6	129	35%	4.04
	330	320	292	108	140	35%	3.98
	350	350	313	118	151	35%	3.93
	380	370	336	125	138	30%	3.79
	400	390	359	134	128	26%	3.63
	470	460	409	158	198	35%	3.85
	520	510	463	175	223	35%	3.93
	580	560	507	190	209	30%	3.76
	620	600	548	207	196	26%	3.59

**NOTES**

Cc (cooling capacity)  
 Pi (unit power input)  
 Hc (heating heat recovery capacity)  
 %Hc (percentage heat recovered)  
 EER Hc (coefficient 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<sup>2</sup> °C/kW evaporator fouling factor

## 6 Capacity tables

### 6 - 3 Total Heat Recovery Capacity Tables

#### Total Heat Recovery Ratings EWAD-D-X

EW / LWC	*Model EWAD-D-XS*	*Model EWAD-D-XR*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
40/45	250	240	231	69.3	255	85%	7.02
	280	270	258	83.5	291	85%	6.57
	300	300	283	95.8	322	85%	6.31
	330	320	306	105	350	85%	6.22
	350	350	328	114	376	85%	6.15
	380	370	353	121	396	75%	5.83
	400	390	376	130	329	65%	5.42
	470	460	429	153	495	85%	6.03
	520	510	486	170	558	85%	6.14
	580	560	532	185	537	75%	5.78
	620	600	575	201	504	65%	5.36
	250	240	220	70.1	247	85%	6.67
280	270	246	84.4	281	85%	6.25	
300	300	270	96.7	311	85%	6.01	
330	320	292	106	338	85%	5.92	
350	350	313	116	364	85%	5.85	
380	370	336	123	344	75%	5.54	
400	390	359	131	318	65%	5.15	
470	460	409	155	479	85%	5.74	
520	510	463	172	540	85%	5.85	
580	560	507	187	520	75%	5.50	
620	600	548	203	488	65%	5.10	
250	240	220	70.9	175	60%	5.58	
280	270	246	85.3	199	60%	5.22	
300	300	270	97.6	220	60%	5.02	
330	320	292	107	239	60%	4.94	
350	350	313	117	258	60%	4.89	
380	370	336	124	230	50%	4.57	
400	390	359	133	211	43%	4.30	
470	460	409	156	339	60%	4.79	
520	510	463	173	382	60%	4.88	
580	560	507	189	348	50%	4.53	
620	600	548	205	324	43%	4.25	

#### NOTES

Cc (cooling capacity)  
 Pi (unit power input)  
 Hc (heating heat recovery capacity)  
 %Hc (percentage heat recovered)  
 EER Hc (coefficient of performance during heat recovery = (cooling+ heating capacity) / power input)  
 EW (Entering water heat recovery condenser)  
 LW (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<sup>2</sup> °C/kW evaporator fouling factor

5

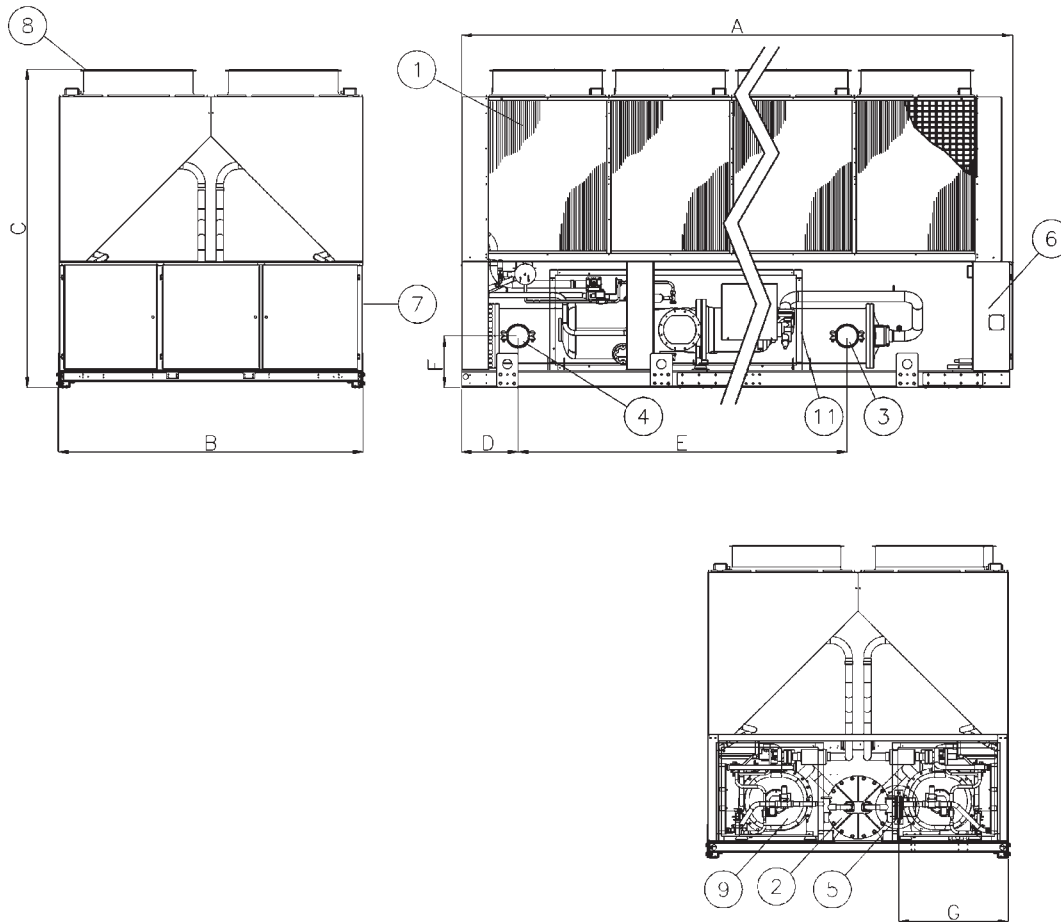
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# 7 Dimensional drawings

## 7 - 1 Dimensional Drawings

Dimensions EWAD~D-



5  
7

Models	Dimensions (mm)						
	A	B	C	D	E	F	G
EWAD							
EWAD390D-SS	3139	2234	2223	392	1875	339	873
EWAD440~580D-SS	4040	2234	2223	392	2450	339	855
EWAD230~300D-SL	3139	2234	2355	374	1911	339	873
EWAD320D-SL	4040	2234	2355	374	2486	339	873
EWAD400~530D-SL	4040	2234	2223	392	2450	339	855
EWAD220~280D-SR	3139	2234	2355	374	1911	339	873
EWAD310D-SR	4040	2234	2355	374	2486	339	873
EWAD400~530D-SR	4040	2234	2223	392	2450	339	855
EWAD210D-SX	3139	2234	2420	374	1911	339	873
EWAD230~310D-SX	4040	2234	2420	374	2486	339	873
EWAD370~490D-SX	4040	2234	2420	392	2450	339	873
EWAD250D-XS	3138	2234	2355	374	1911	339	873
EWAD280~400D-XS	4040	2234	2355	374	2486	339	873
EWAD470D-XS	4040	2234	2223	414	2412	379	873
EWAD520~620D-XS	4940	2234	2223	414	2412	379	815
EWAD240D-XR	3138	2234	2355	374	1911	339	873
EWAD270~390D-XR	4040	2234	2355	374	2486	339	873
EWAD460D-XR	4040	2234	2223	414	2412	379	873
EWAD510~600D-XR	4940	2234	2223	414	2412	379	815
EWAD230~310D-HS	3339	2234	2223	374	1911	339	873
EWAD340~380D-HS	4040	2234	2223	374	2486	339	873
EWAD420~590D-HS	4040	2234	2223	392	2450	339	873

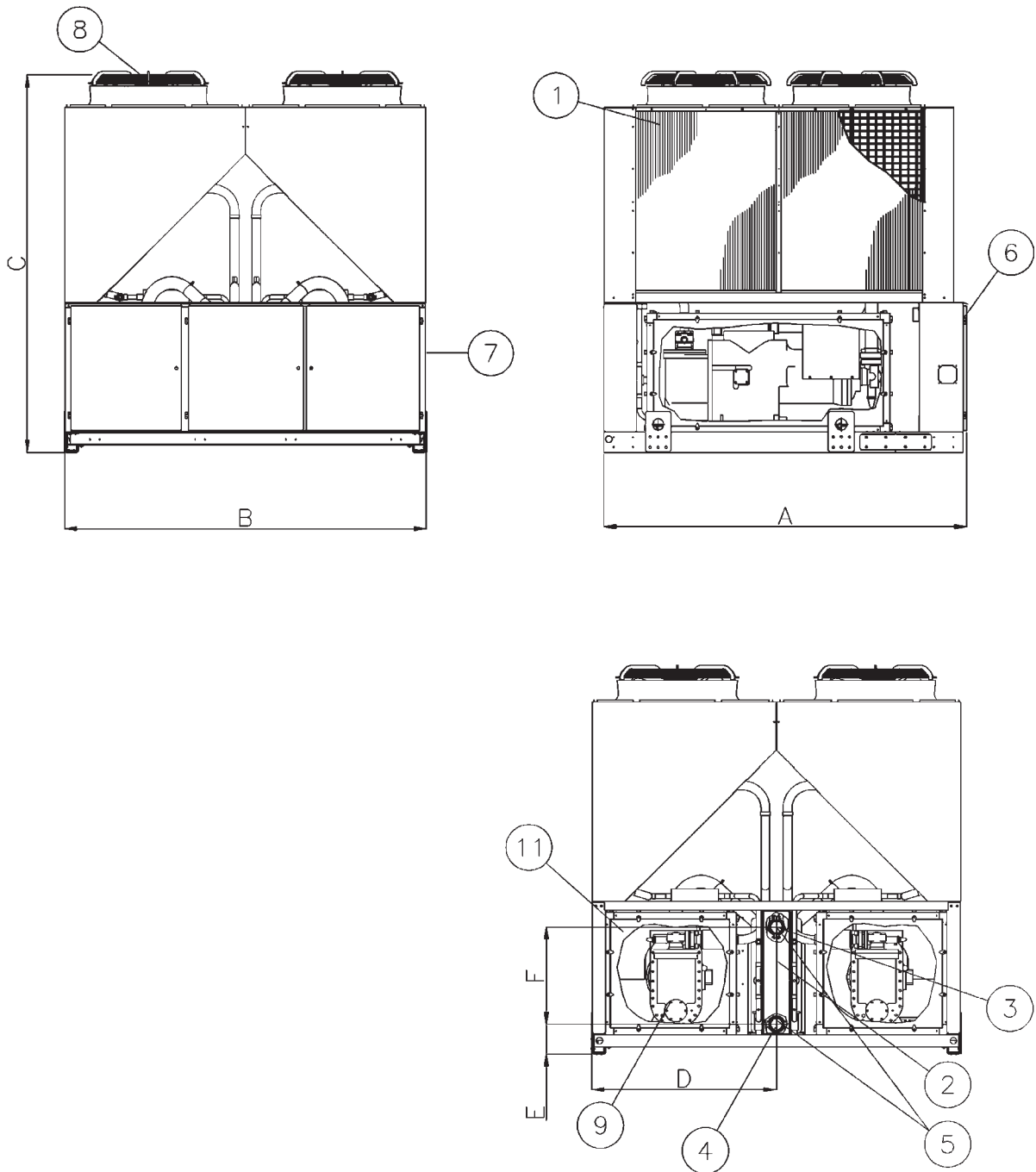
**LEGEND**

- 1 – Condenser Coil
- 2 – Water heat exchanger (evaporator)
- 3 – Evaporator water inlet
- 4 – Evaporator water outlet
- 5 – Victaulic connection
- 6 – Operating and control panel
- 7 – Slot for power and control connection
- 8 – Fan
- 9 – Compressor

DMN\_1a-2a\_Rev01\_1

## 7 Dimensional drawings

### 7 - 1 Dimensional Drawings



5  
7

Models	Dimensions (mm)					
EWAD	A	B	C	D	E	F
EWAD180~200D-SL	2239	2234	2355	1117	181	590
EWAD180~190D-SR	2239	2234	2355	1117	181	590
EWAD200~210D-HS	2223	2234	2223	1117	181	590

#### LEGEND

- 1 – Condenser Coil
- 2 – Water heat exchanger (evaporator)
- 3 – Evaporator water inlet
- 4 – Evaporator water outlet
- 5 – Victaulic connection
- 6 – Operating and control panel
- 7 – Slot for power and control connection
- 8 – Fan
- 9 – Compressor

DMN\_1a-2a\_Rev.01\_2

## 8 Sound data

### 8 - 1 Sound Level Data

#### EWAD-D-SX

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)									Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)	
210	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.3	
230	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
250	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
270	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
290	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
300	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
310	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
370	62.0	60.0	63.5	63.0	60.0	58.0	47.0	36.5	65.0	84.7	
410	62.0	60.0	63.5	63.0	60.0	58.0	47.0	36.5	65.0	84.7	
450	63.5	59.5	63.5	62.5	60.5	59.5	46.5	37.0	65.5	85.7	
490	62.0	59.0	64.0	65.0	59.5	59.0	50.5	39.5	66.0	86.2	

#### NOTES

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

#### EWAD-D-XS

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)									Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)	
250	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	96.8	
280	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	97.2	
300	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	97.2	
330	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	97.2	
350	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	97.2	
380	81.0	76.4	74.4	80.7	70.2	67.4	58.8	52.9	79.0	98.7	
400	81.0	76.4	74.4	80.7	70.2	67.4	58.8	52.9	79.0	98.7	
470	64.5	73.5	73.0	78.5	71.5	73.0	60.0	53.0	79.0	98.7	
520	64.5	73.5	73.5	78.5	71.5	73.0	60.0	53.0	79.0	99.2	
580	64.5	73.5	73.5	78.5	71.6	73.1	60.0	53.0	79.0	99.2	
620	64.5	73.5	73.5	78.5	71.5	73.0	60.0	53.0	79.0	99.2	

#### NOTES

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

#### EWAD-D-XR

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)									Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)	
240	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	91.8	
270	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	92.2	
300	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	92.2	
320	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	92.2	
350	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	92.2	
370	79.1	73.4	70.2	74.4	66.6	62.2	55.2	48.4	73.5	93.2	
390	79.1	73.4	70.2	74.4	66.6	62.2	55.2	48.4	73.5	93.2	
460	59.0	68.0	67.5	73.0	66.0	67.5	54.5	47.5	73.5	93.2	
510	59.0	68.0	68.0	73.0	66.0	67.5	54.5	47.5	73.5	93.7	
560	59.0	68.0	68.0	73.0	66.1	67.6	54.5	47.5	73.5	93.7	
600	59.0	68.0	68.0	73.0	66.0	67.5	54.5	47.5	73.5	93.7	

#### NOTES

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

## 8 Sound data

### 8 - 1 Sound Level Data

#### EWAD-D-SX

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
210	0.0	-8.0	-12.8	-15.9	-18.2	-20.0	-25.7
230	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
250	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
270	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
290	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
300	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
310	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
370	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
410	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
450	0.0	-7.4	-12.1	-15.2	-17.4	-19.2	-24.9
490	0.0	-7.4	-12.1	-15.2	-17.4	-19.2	-24.9

#### NOTES

Values are dB(A) (pressure level)

#### EWAD-D-XS

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
250	0.0	-8.0	-12.9	-16.0	-18.2	18.2	-25.8
280	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
300	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
330	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
350	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
380	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
400	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
470	0.0	-7.8	-12.6	-15.7	-17.9	17.9	-25.4
520	0.0	-7.5	-12.3	-15.3	-17.6	17.6	-25.0
580	0.0	-7.5	-12.3	-15.3	-17.6	17.6	-25.0
620	0.0	-7.5	-12.3	-15.3	-17.6	17.6	-25.0

#### NOTES

Values are dB(A) (pressure level)

#### EWAD-D-XR

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
240	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
270	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
300	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
320	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
350	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
370	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
390	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
460	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
510	0.0	-7.5	-12.3	-15.3	-17.6	-19.3	-25.0
560	0.0	-7.5	-12.3	-15.3	-17.6	-19.3	-25.0
600	0.0	-7.5	-12.3	-15.3	-17.6	-19.3	-25.0

#### NOTES

Values are dB(A) (pressure level)

## 9 Installation

### 9 - 1 Installation Method

#### Installation notes

##### Warning

Installation and maintenance of the unit must to be performed only by qualified personnel who have knowledge with local codes and regulations, and experience with this type of equipment. The unit must be installed to allow all the maintenance operations.

##### Handling

Care should be taken to avoid rough handling or shock due to dropping of 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 result in reductions in unit efficiency and capacity.

Moreover the unique microprocessor has the ability to analyse the operating environment of the air cooled chiller and to optimize its performance to stay 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.3). 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 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.4); 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 for general installation. A specific evaluation should be done by contractor depending on the case.

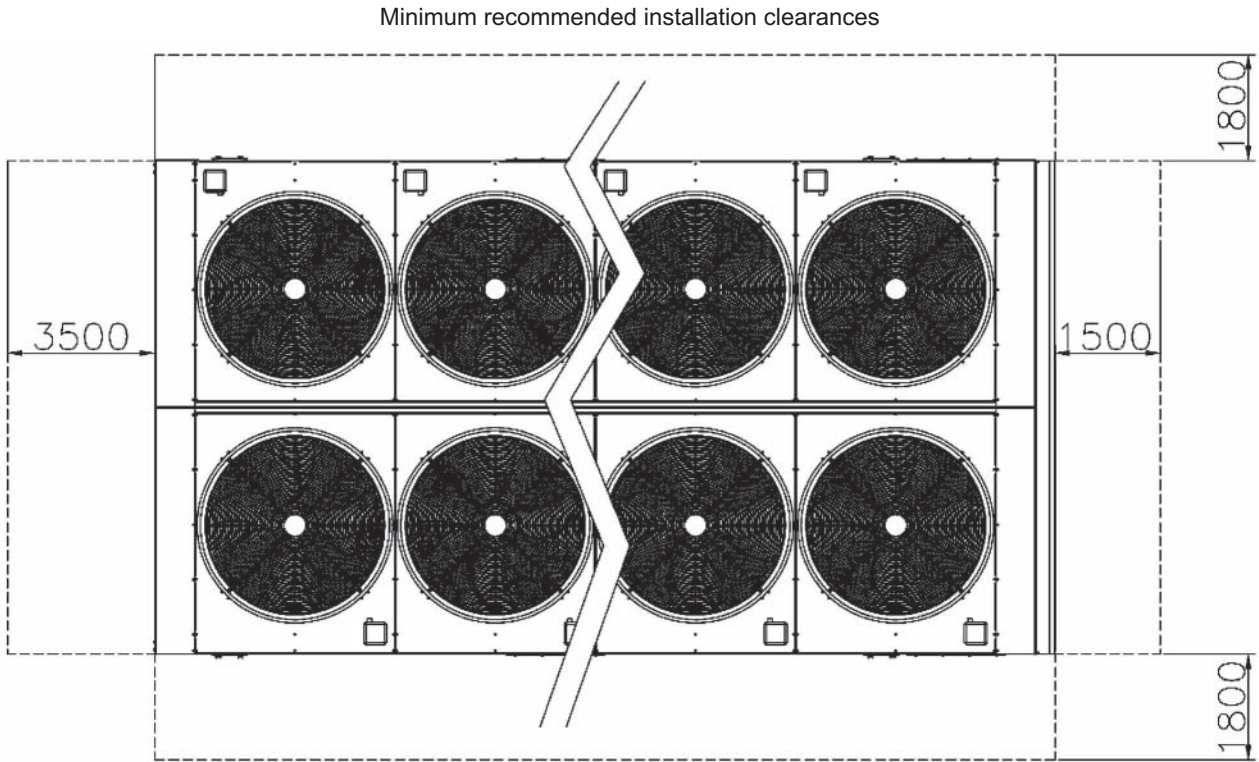


Fig. 1

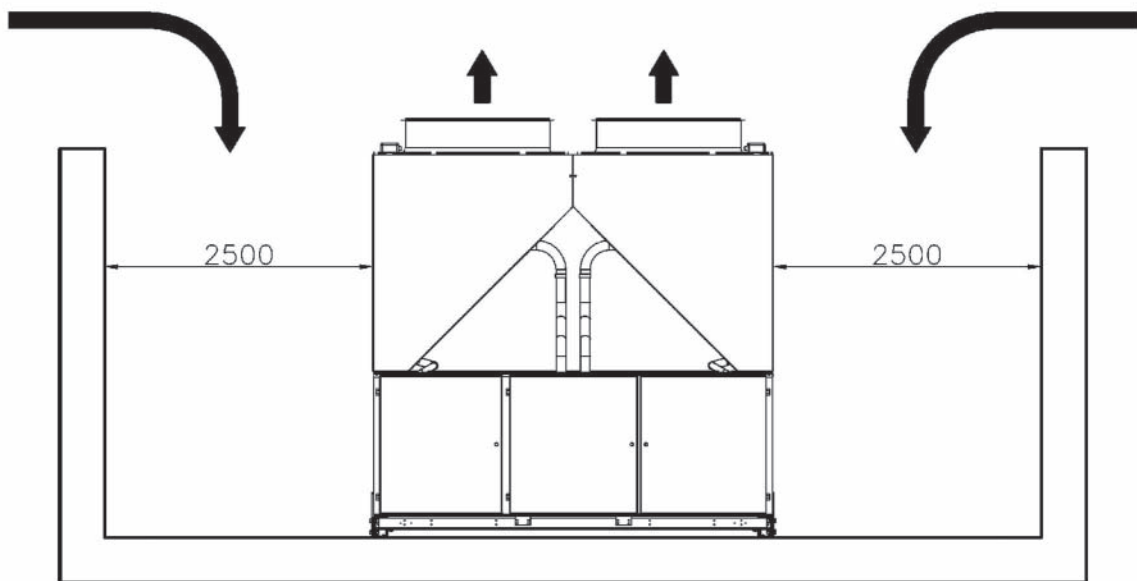


Fig. 2

## 9 Installation

### 9 - 1 Installation Method

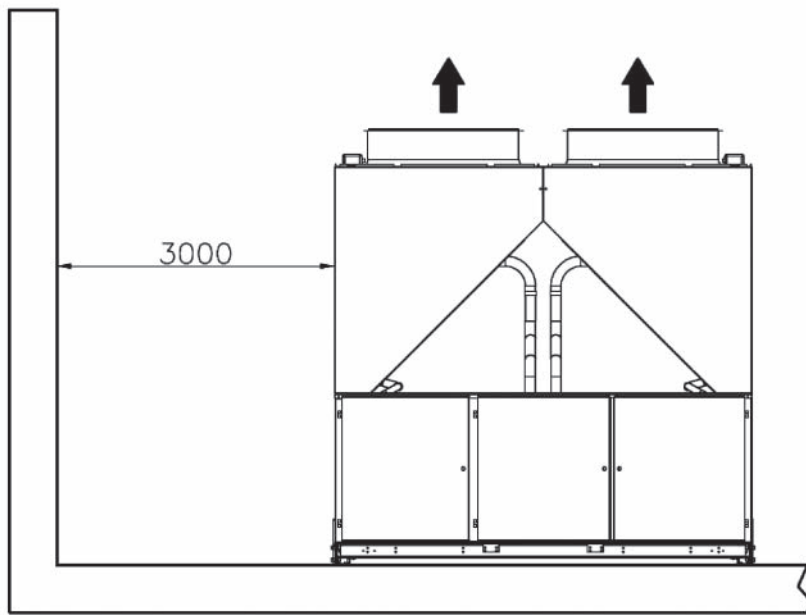


Fig. 3

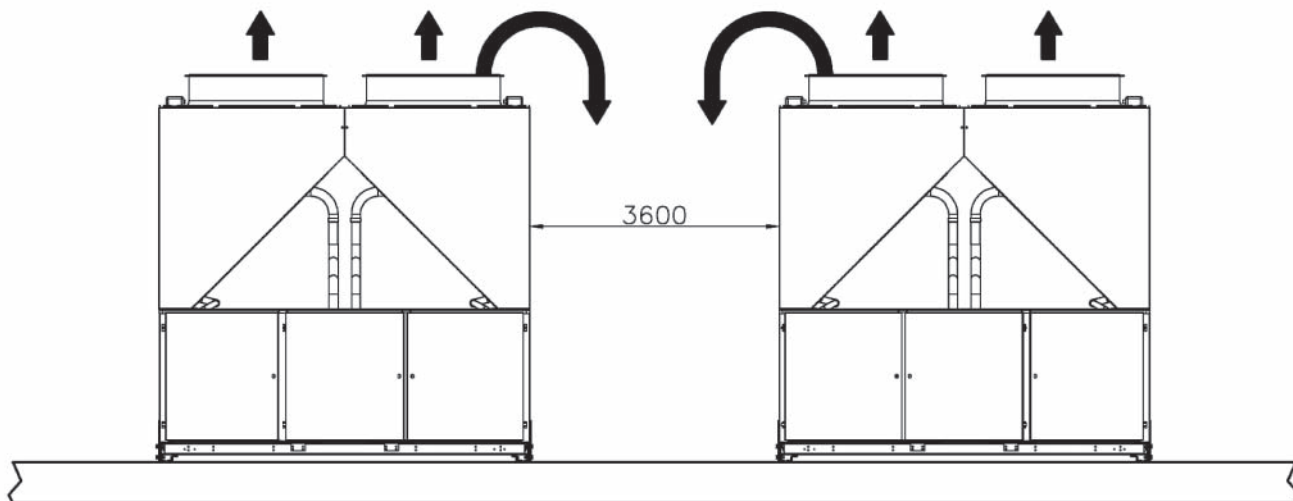


Fig. 4

#### 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

# 10 Operation range

## 10 - 1 Operation Range

<b>Air Ambient Temperature (°C) (2)</b>	-3	-8	-15	-20
<b>Ethylene glycol (%) (1)</b>	10%	20%	30%	40%
<b>Air Ambient Temperature (°C) (2)</b>	-3	-7	-12	-20
<b>Propylene glycol (%) (1)</b>	10%	20%	30%	40%

- Minimum glycol percentage to prevent freezing of water circuit at indicated air ambient temperature.

- 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 (EWLT < 4°C)**

<b>EWLT (°C)</b>	-4	-6	-8	-10	-12	-15
<b>Cooling Capacity</b>	0.670	0.613	0.562	0.510	0.455	0.375
<b>Compressor Power Input</b>	0.890	0.870	0.840	0.798	0.755	0.680

- ELWT (Evaporator Leaving Water Temperature (°C).

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

**Table 6 - Correction factors for water and glycol mixture**

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

- Contact factory for water temperature out of operating limits.

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# 10 Operation range

## 10 - 1 Operation Range

**Table 1 - Evaporator minimum and maximum water Δt**

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

**Table 2 - Evaporator fouling factors**

Fouling factors m <sup>2</sup> °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 - Air heat exchanger - 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 operating altitude is 2000 m above sea level.
- Contact factory in case the unit has to be installed at altitudes between 1000 and 2000 m above sea level.

**Table 4.1 - Minimum glycol percentage for low water temperature**

EWLT (°C)	2	0	-2	-4	-6	-8	-10	-12	-15
Ethylene glycol (%)	10	20	20	20	30	30	30	40	40
Propylene glycol (%)	10	20	20	30	30	30	40	40	40

- ELWT (Evaporator Leaving Water Temperature (°C)).
- 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 ambient temperature**

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

- Minimum glycol percentage to prevent freezing of water circuit at indicated air ambient temperature.
- 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 (EWLT < 4°C)**

EWLT (°C)	-4	-6	-8	-10	-12	-15
Cooling Capacity	0.670	0.613	0.562	0.510	0.455	0.375
Compressor Power Input	0.890	0.870	0.840	0.798	0.755	0.680

- ELWT (Evaporator Leaving Water Temperature (°C)).
- 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

- Contact factory for water temperature out of operating limits.

## 10 Operation range

### 10 - 1 Operation Range

#### 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: **EWAD390D-SS**

Mixture: Water  
 Working condition: ELWT 12/7°C – Condenser inlet air temperature 35°C  
 - Cooling capacity: 389 kW  
 - Power input: 152 kW  
 - Flow rate ( $\Delta t$  5°C): 18.60 l/s  
 - Evaporator pressure drop: 46 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:  $389 \times 0.972 = 378$  kW  
 - Power input:  $152 \times 0.986 = 150$  kW  
 - Flow rate ( $\Delta t$  5°C):  $18$  (referred to 378 kW)  $\times 1.074 = 19.33$  l/s  
 - Evaporator pressure drop:  $49$  (refererd to 19.33 l/s)  $\times 1.181 = 58$  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: **EWAD390D-SS**

Mixture: Water  
 Standard working condition: ELWT 12/7°C – Condenser inlet air temperature 30°C  
 - Cooling capacity: 412 kW  
 - Power input: 139 kW  
 - Flow rate ( $\Delta t$  5°C): 19.7 l/s  
 - Evaporator pressure drop: 51 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:  $412 \times 0.613 \times 0.972 = 245$  kW  
 - Power input:  $139 \times 0.870 \times 0.986 = 119$  kW  
 - Flow rate ( $\Delta t$  5°C):  $11.71$  l/s (referred to 245 kW)  $\times 1.074 = 12.58$  l/s  
 - Evaporator pressure drop:  $23$  kPa (referred to 12.58 l/s)  $\times 1.181 = 27$  kPa

# 10 Operation range

## 10 - 1 Operation Range

Table 7.1 - 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

ESP table refers to fan diameter Ø800, available on units as follows:

EWAD390~580D-SS  
EWAD470~620D-XS  
EWAD420~590D-HS

Table 7.2 - Available fan static pressure correction factors

"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

ESP table refers to fan diameter Ø800, available on units as follows:

EWAD320~530D-SL/SR  
EWAD460~600D-XR

### How to use the Correction factors proposed in the previous tables

#### Example

Unit Size:

**EWAD390D-SS**

- External static pressure                   **0 Pa**
- Working condition:                       ELWT 12/7°C – Condenser inlet air temperature 35°C
- Cooling capacity:                         389 kW
- Power input:                               152 kW
- Maximum CIAT                             48°C (see graphic operating limit)

- External static pressure                   **40 Pa**
- Working condition:                       ELWT 12/7°C – Condenser inlet air temperature 35°C
- Cooling capacity:                         389 x 0.993 = 386 kW
- Power input:                               152 x 1.018 = 155 kW
- Maximum CIAT                             48 - 1.0 = 47°C

# 10 Operation range

## 10 - 1 Operation Range

### Water charge, flow and quality

Items <sup>(1)</sup> (5)		Cooling Water			Cooled Water		Heated water <sup>(2)</sup>				Tendency if out of criteria		
		Circulating System		Once Flow	Circulating water [Below 20°C]		Low temperature [20°C ~ 60°C]		High temperature [60°C ~ 80°C]				
		Circulating water	Supply water <sup>(4)</sup>	Flowing water	Circulating water	Supply water <sup>(4)</sup>	Circulating water	Supply water <sup>(4)</sup>	Circulating water	Supply water <sup>(4)</sup>			
Items to be controlled:	pH	at 25°C	6.5 ~ 8.2	6.0 ~ 8.0	6.0 ~ 8.0	6.0 ~ 8.0	6.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	Corrosion + Scale	
	Electrical conductivity	[mS/m] at 25°C	Below 80	Below 30	Below 40	Below 40	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Corrosion + Scale
		[µS/cm] at 25°C	(Below 800)	(Below 300)	(Below 400)	(Below 400)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	Corrosion + Scale
	Chloride ion	[mgCl <sup>-</sup> /l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	Sulfate ion	[mgSO <sub>4</sub> <sup>2-</sup> /l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	M-alkalinity (pH4.8)	[mgCaCO <sub>3</sub> /l]	Below 100	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Total hardness	[mgCaCO <sub>3</sub> /l]	Below 200	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Scale
	Calcium harness	[mgCaCO <sub>3</sub> /l]	Below 150	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
Silica ion	[mgSiO <sub>2</sub> /l]	Below 50	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Scale	
Items to be referred to	Iron	[mgFe/l]	Below 1.0	Below 0.3	Below 1.0	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Below 1.0	Below 0.3	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	Below 0.1	Corrosion
	Sulfite ion	[mgS <sup>2-</sup> /l]	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Corrosion
	Ammonium ion	[mgNH <sub>4</sub> <sup>+</sup> /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	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	Below 0.3	Corrosion
	Free carbide	[mgCO <sub>2</sub> /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	Below 4.0	Corrosion
	Stability index		6.0 ~ 7.0	---	---	---	---	---	---	---	---	---	Corrosion + Scale

#### NOTES

- Names, definitions and units are according to JIS K 0101. Units and figures between brackets are old units published as reference only.
- 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 desirable to give the valid measure for corrosion. E.g. chemical measure.
- 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.
- Supply water is considered drink water, industrial water and ground water except for genuine water, neutral water and soft water.
- The above mentioned items are representable items in corrosion and scale cases.

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## 10 Operation range

### 10 - 1 Operation Range

#### 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

$$M \text{ (liters)} = ( 0.1595 \times \Delta T(^{\circ}\text{C}) + 3.0825 ) \times P(\text{kW})$$

where:

- M minimum water content per unit expressed in litres
- P Cooling Capacity of the unit expressed in kW
- $\Delta T$  evaporator entering / leaving water temperature difference expressed in  $^{\circ}\text{C}$

This formula is valid for:

- standard microprocessor parameters

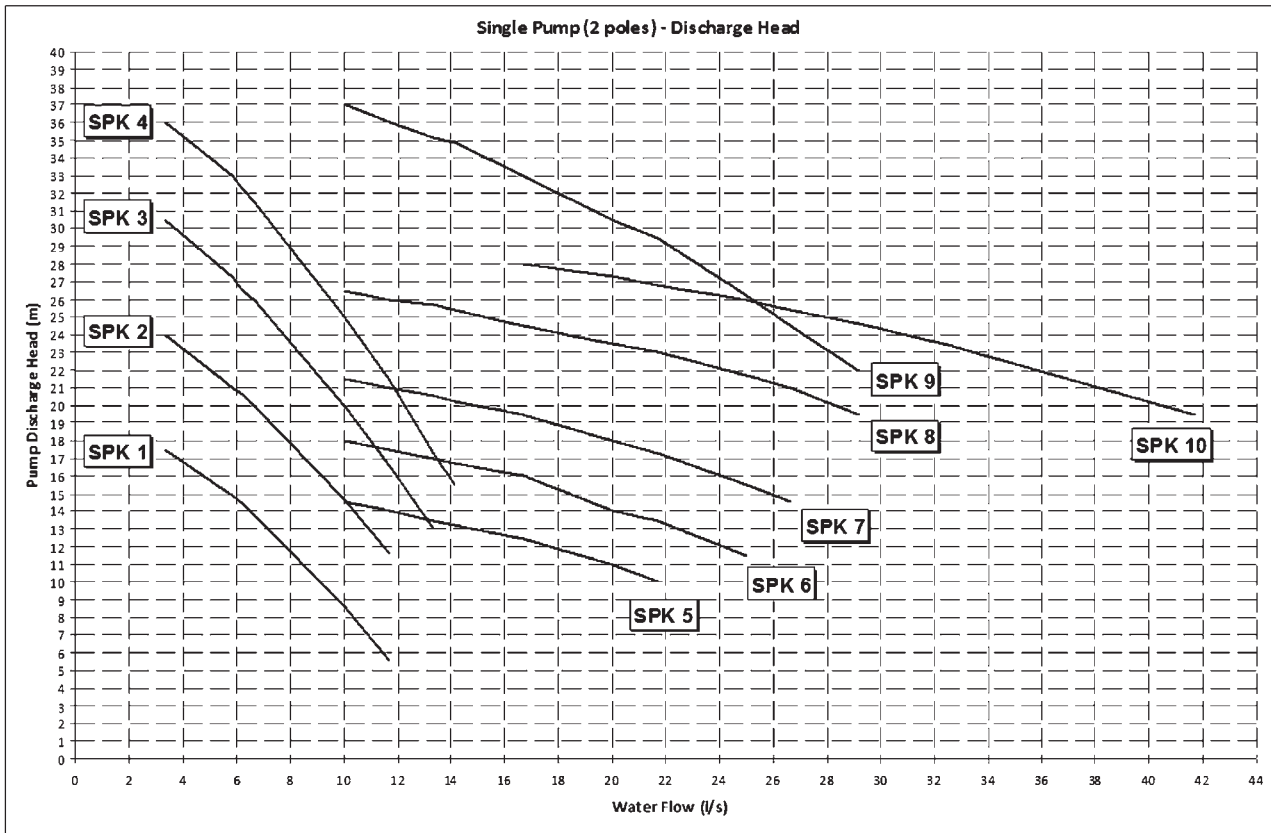
For more accurate determination of quantity of water, it is advisable to contact the designer of the plant.

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

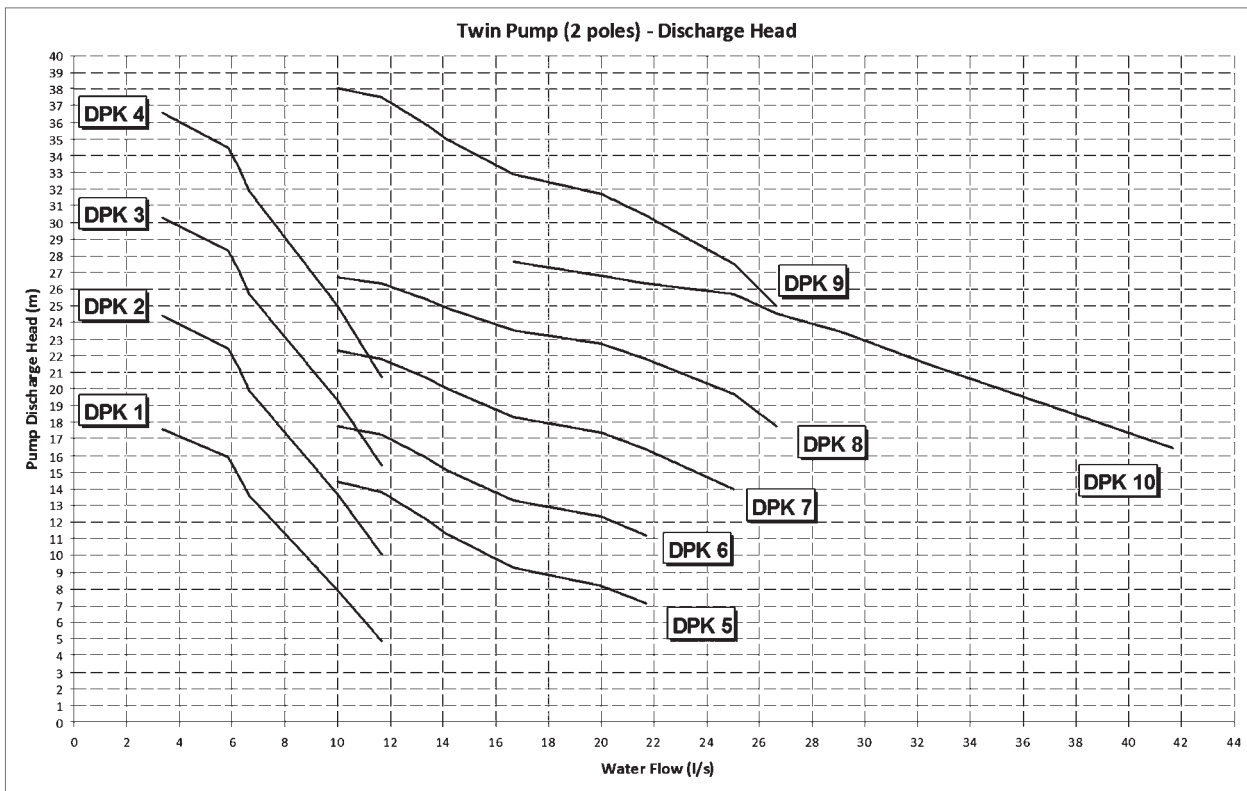
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Water Pump Kit - Available External Static Pressure



OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_6 (1/2)

Water Pump Kit - Available External Static Pressure



OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_6 (2/2)

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

Water Pump Kit - Combination Matrix

Version	Size	Single Pump										
		SPK 1	SPK 2	SPK 3	SPK 4	SPK 5	SPK 6	SPK 7	SPK 8	SPK 9	SPK 10	
EWAD-D-SS	390						X	X	X	X	X	
	440						X	X	X	X	X	
	470						X	X	X	X	X	
	510						X	X	X	X	X	
	530							X	X	X	X	
	560							X	X	X	X	
	580							X	X	X	X	
	580							X	X	X	X	
EWAD-D-SL	180	X	X	X	X							
	200	X	X	X	X							
	230		X	X	X							
	250		X	X	X		X	X	X	X		
	260			X	X		X	X	X	X		
	280				X	X	X	X	X	X		
	300			X	X	X	X	X	X	X		
	320					X	X	X	X	X		
	370					X	X	X	X	X	X	
	400					X	X	X	X	X	X	
	440						X	X	X	X	X	
	480						X	X	X	X	X	
	510						X	X	X	X	X	
	530							X	X	X	X	
EWAD-D-SR	180	X	X	X	X							
	190	X	X	X	X							
	220		X	X	X		X	X	X	X		
	240		X	X	X		X	X	X	X		
	250			X	X		X	X	X	X		
	270			X	X		X	X	X	X		
	280			X	X		X	X	X	X		
	310					X	X	X	X	X		
	370					X	X	X	X	X	X	
	400					X	X	X	X	X	X	
	440						X	X	X	X	X	
	480						X	X	X	X	X	
	510						X	X	X	X	X	
	530							X	X	X	X	
EWAD-D-SX	210		X	X	X							
	230		X	X	X	X	X	X	X	X		
	250			X	X	X	X	X	X	X		
	270			X	X	X	X	X	X	X		
	290				X	X	X	X	X	X		
	300					X	X	X	X	X		
	310					X	X	X	X	X		
	370					X	X	X	X	X	X	
	410					X	X	X	X	X	X	
	450					X	X	X	X	X	X	
	490					X	X	X	X	X	X	
	250			X	X	X	X	X	X	X		
	280			X	X	X	X	X	X	X		
	300					X	X	X	X	X		
EWAD-D-XS	330					X	X	X	X			
	350					X	X	X	X		X	
	380					X	X	X	X		X	
	400					X	X	X	X		X	
	470						X	X	X		X	
	520						X	X	X		X	
	580							X	X		X	
	620								X		X	
	EWAD-D-XR	240		X	X	X	X	X	X	X		
		270			X	X	X	X	X	X		
300					X	X	X	X	X			
320					X	X	X	X	X			
350					X	X	X	X	X			
370					X	X	X	X	X			
390					X	X	X	X	X		X	
460						X	X	X	X		X	
510						X	X	X	X		X	
560							X	X	X		X	
EWAD-D-HS	200		X	X	X							
	210		X	X	X							
	230		X	X	X	X	X	X	X			
	260			X	X	X	X	X	X			
	270			X	X	X	X	X	X			
	290				X	X	X	X	X			
	310				X	X	X	X	X			
	340				X	X	X	X	X			
	380				X	X	X	X	X		X	
	420					X	X	X	X		X	
	450					X	X	X	X		X	
	480					X	X	X	X		X	
	510					X	X	X	X		X	
	550						X	X	X		X	
590							X	X		X		

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

Water Pump Kit - Combination Matrix

Version	Size	Double Pump										
		DPK 1	DPK 2	DPK 3	DPK 4	DPK 5	DPK 6	DPK 7	DPK 8	DPK 9	DPK 10	
EWAD-D-SS	390						X	X	X	X	X	
	440						X	X	X	X	X	
	470							X	X	X	X	
	510							X	X	X	X	
	530								X	X	X	
	560								X	X	X	
	580									X	X	
EWAD-D-SL	180	X	X	X	X							
	200	X	X	X	X							
	230		X	X	X							
	250											
	260						X	X		X		
	280					X	X	X		X		
	300					X	X	X		X		
	320						X	X		X		
	370						X	X		X	X	
	400						X	X		X	X	
	440						X	X		X	X	
	480							X	X	X	X	
	510							X	X	X	X	
530								X	X	X		
EWAD-D-SR	180	X	X	X	X							
	190	X	X	X	X							
	220		X	X	X		X	X		X		
	240		X	X	X		X	X		X		
	250						X	X		X		
	270						X	X		X		
	280						X	X		X		
	310						X	X		X		
	370						X	X		X	X	
	400						X	X		X	X	
	440						X	X		X	X	
	480							X	X	X	X	
	510							X	X	X	X	
530								X	X	X		
EWAD-D-SX	210		X	X	X							
	230		X	X	X	X	X	X	X			
	250			X	X	X	X	X	X			
	270			X	X	X	X	X	X			
	290				X	X	X	X	X			
	300					X	X	X	X			
	310					X	X	X	X			
	370					X	X	X	X		X	
	410					X	X	X	X		X	
	450					X	X	X	X		X	
	490						X	X	X		X	
	250		X	X	X		X	X	X			
	280					X	X	X	X			
300					X	X	X	X				
330				X		X	X	X				
350					X	X	X	X		X		
380						X	X	X		X		
400						X	X	X		X		
470							X	X		X		
520							X	X		X		
580										X		
620										X		
EWAD-D-XR	240		X	X	X		X	X	X			
	270					X	X	X	X			
	300					X	X	X	X			
	320					X	X	X	X			
	350						X	X	X			
	370						X	X	X			
	390						X	X	X		X	
	460							X	X		X	
	510							X	X		X	
	560								X		X	
	600										X	
	EWAD-D-HS	200	X	X	X	X						
		210	X	X	X	X						
230			X	X	X							
260												
270												
290						X	X	X	X			
310						X	X	X	X			
340							X	X	X			
360							X	X	X		X	
420							X	X	X		X	
450							X	X	X		X	
480								X	X		X	
510								X	X		X	
550								X		X		
590										X		

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# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

### 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	1.5	3.5	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 2	2.2	5.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 3	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 4	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 5	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 6	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 7	5.5	10.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 8	7.5	13.7	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 9	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 10	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
Double Pump	DPK 1	1.5	3.5	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 2	2.2	5.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 3	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 4	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 5	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 6	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 7	5.5	10.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 8	7.5	13.7	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 9	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 10	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130

#### NOTES

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

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_7

# 11 Hydraulic performance

## 11 - 2 Total and Partial 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:

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

where:

- PD<sub>2</sub> Pressure drop to be determinate (kPa)
- PD<sub>1</sub> Pressure drop at nominal condition (kPa)
- Q<sub>2</sub> water flow at new working condition (l/s)
- Q<sub>1</sub> water flow at nominal condition (l/s)

### How to use the formula: Example

The unit EWAD390D-SS has been selected for working at the following conditions:

- Total heat recovery leaving water temperature 40/50°C
- The heating capacity at these working conditions is: 415 kW
- The water flow at these working conditions is: 9.91 l/s

The unit EWAD390D-SS at nominal working conditions has the following data:

- Total heat recovery leaving water temperature 40/45°C
- condenser air inlet: 35°C
- The heating capacity at these working conditions is: 427 kW
- The water flow at these working conditions is: 20.41 l/s
- The pressure drop at these working conditions is: 37 kPa

The pressure drop at the selected working condition will be:

$$PD_2 \text{ (kPa)} = 37 \text{ (kPa)} \times \left( \frac{9.91 \text{ (l/s)}}{20.41 \text{ (l/s)}} \right)^{1.80}$$

$$PD_2 \text{ (kPa)} = 10 \text{ (kPa)}$$

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_5

### Total Heat Recovery pressure drops

	EWAD-D-XS	250	280	300	330	350	380	400	470	520	580	620
	EWAD-D-XR	240	270	300	320	350	370	390	460	510	560	600
Heating Capacity (kW)		255	291	322	350	376	356	329	495	558	537	504
Water Flow (l/s)		12.21	13.88	15.37	16.70	17.97	16.99	15.72	23.65	26.64	25.68	24.10
Heat Recovery Pressure Drops (kPa)		26	32	34	37	37	31	25	41	17	15	11

### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – saturated discharge temperature 45°C – water heat recovery in/out 40/45°C

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_3 (2/3)

# 11 Hydraulic performance

## 11 - 2 Total and Partial Heat Recovery Pressure Drop

### Partial Heat Recovery pressure drops

	EWAD-D-XS	250	280	300	330	350	380	400	470	520	580	620
	EWAD-D-XR	240	270	300	320	350	370	390	460	510	560	600
Heating Capacity (kW)		102	117	129	140	151	138	128	198	223	209	196
Water Flow (l/s)		4.89	5.57	6.16	6.69	7.20	6.61	6.12	9.48	10.67	9.99	9.38
Heat Recovery Pressure Drops (kPa)		5	6	7	7	7	6	5	8	3	3	2

### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser air inlet 35°C – water heat recovery in/out 50/60°C

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_4 (2/3)

## 12 Specification text

### 12 - 1 Specification Text

#### Technical Specification for Water Cooled Screw Chiller

##### GENERAL

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

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

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 air cooled screw chiller(s) : ..... unit(s)
- ✓ Cooling capacity for single air cooled screw chiller : ..... kW
- ✓ Power input for single air cooled screw 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 independent refrigerant circuits, semi-hermetic type rotary single screw compressor, electronic expansion device (EEXV), refrigerant 'plate to plate' or 'shell&tube' heat exchanger (depending on the size), air-cooled condenser section, R-134a refrigerant, lubrication system, motor starting components, discharge line shut-off valve, suction 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.

##### NOISE LEVEL AND VIBRATIONS

Sound pressure level at 1 meter distance in free field, semispheric conditions, shall not exceed .....dB(A). The sound pressure levels must be rated in accordance to ISO 3744 (other types of rating can not be used).

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

## 12 Specification text

### 12 - 1 Specification Text

#### DIMENSIONS

Unit dimensions shall not exceed following indications:

- Unit length ..... mm
- Unit width ..... mm
- Unit height ..... mm

#### CHILLER COMPONENTS

##### Compressors

- ✓ The compressor is semi-hermetic, single-screw type with gate-rotors made of carbon impregnated engineered composite material or the latest high-strength fibre reinforced star material (depending on the size). The gaterotor supports will be constructed of cast iron.
- ✓ The oil injection shall be used in order to get high EER (Energy Efficiency Ratio) also at high condensing pressure and low sound pressure levels in each load condition.
- ✓ 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 slide valve position.
- ✓ The unit capacity control shall be infinitely modulating, from 100% down to 25% for each circuit. The chiller shall be capable of stable operation to a minimum of 12.5% 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.
- ✓ The unit control logic shall manage the compressor slides to exactly match the plant load request in order to keep constant the set point for delivered chilled water temperature.
- ✓ 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:
  - High condenser pressure
  - Low evaporating refrigerant temperature

##### Evaporator

- ✓ The units shall be equipped (depending on the size) with a 'plate to plate' or 'shell&tube' evaporator:
  - The 'plate to plate' evaporator is made of stainless steel brazed plates and is covered with a 20mm closed cell insulation material. The exchanger is equipped with a heater for protection against freezing down to -28°C and evaporator water outlet connections of 3". Each evaporator has 1 circuit (one compressor) and the water filter is standard.
  - The 'shell&tube' evaporator is made with copper tubes rolled into steel tubesheets. The evaporators are single-pass on both the refrigerant and water sides for pure counter-flow heat exchange and low refrigerant pressure drops. The external shell is covered with a 10mm closed cell insulation material and the evaporator water outlet connections are provided with victaulic kit (as standard). Each evaporator has 2 circuits, one for each compressor and the water filter is standard.
- ✓ The evaporator is manufactured in accordance to PED approval.

SPC\_1-2-3-4\_Rev.00\_2

## 12 Specification text

### 12 - 1 Specification Text

#### 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 thermal protection by internal thermal motor protection and protected by circuit breaker installed inside the electrical panel as a standard.

#### Refrigerant circuit

- ✓ The unit shall have two independent refrigerant circuits.
- ✓ Each circuit shall include as standard: electronic expansion device piloted by unit's microprocessor control, compressor discharge shut-off valve, suction 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:
  - in-line single pump low and high lifting
  - in-line twin pumps low and high lifting

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

#### Optional High Level Communications Interface

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





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# 1 Features

- High efficiency
- Reduced sound level configuration: condenser fan rotating at 680 rpm (EWAD240-350D-XR) and 705 rpm (EWAD370-600D-XR), rubber antivibration under compressor, compressor sound enclosure.
- Stepless single-screw compressor
- Optimised for use with R-134a
- MicroTech III controller
- Large operation range (ambient temperature down to -18°C)



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## 2 Features and advantages

### Features and advantages

#### Low operating cost

This chiller range is the result of careful design, aimed to optimize the energy efficiency of the chillers, with the objective of bringing down operating costs and improving installation profitability, effectiveness and economical management.

The chillers feature a high efficiency single rotor screw compressor design, large condenser coil surface area for maximum heat transfer and low discharge pressure, advanced technology condenser fans and a 'plate to plate' or 'shell&tube' evaporator with low refrigerant pressure drops.

#### Low operating sound levels

Very low sound levels both at full load and part load conditions are achieved by the latest compressor design and by a unique new fan that moves large volume of air at exceptionally low sound levels and by the virtually vibration-free operation.

#### Excellent serviceability

Field serviceability has not been sacrificed to meet design performance objectives. The compressor is equipped with discharge, liquid and suction shut off valves. The compressor and serviceable components such as filter-driers are located on the outside edges of the base allowing, together with the shape of the coil, an easy access for inspection and service. Moreover, the MicroTech III controller gives detailed information on the causes of an alarm or fault.

#### Proven reliability

Full factory testing of every unit with water hook-up helps in providing a trouble-free start-up. Extensive quality control checks during testing means that each equipment protection and operating control is properly adjusted and operates correctly before it leaves the factory.

#### Infinite capacity control

Cooling capacity control is infinitely variable by means of a single screw compressor controlled by microprocessor system. Each unit has infinitely variable capacity control from 100% down to 12.5%. This modulation allows the compressor capacity to exactly match the building cooling load. Chilled water temperature fluctuation is avoided only with a stepless control.

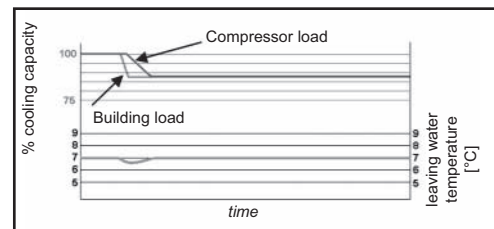
In the case that the compressor with load step control is used, the compressor capacity, at partial loads, will be too high or too low compared to the building cooling load. The result is an increase in chiller energy costs, particularly at the part-load conditions at which the chiller operates most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

Units with stepless regulation offer benefits that the units with step regulation are unable to match.

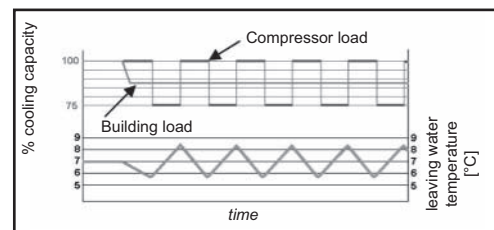
Only a chiller with step-less regulation, is able to follow the system cooling demand at any time and to deliver chilled water at set-point.

#### Superior control logic

The new MicroTech III controller provides an easy to use control environmental. The control logic is designed to provide maximum efficiency and a history of unit operation. One of the greatest benefits is the easy interface with LonWorks, Bacnet, Ethernet TCP/IP or Modbus communications.



ELWT fluctuation with stepless capacity control



ELWT fluctuation with steps capacity control (4 steps)

## 2 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 Stds	UNI – EN ISO 9001:2004

### Certifications

All units manufactured by Daikin 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 for other applications, such as naval (RINA, etc.).

### Efficiency and sound configuration

The range is available in multiple efficiency and sound versions:

Efficiency level	Sound level			
	Standard	Low	Reduced	Extra low
Standard efficiency	EWAD~D-SS	EWAD~D-SL	EWAD~D-SR	EWAD~D-SX
High efficiency	EWAD~D-XS	N.A.	EWAD~D-XR	N.A.
High ambient	EWAD~D-HS	N.A.	N.A.	N.A.

### Versions

The range is available in three versions:

**S:** Standard efficiency

7 sizes to cover a range from 389 up to 578 kW with an EER up to 2.03 and an ESEER up to 3.56 (data refers to Standard sound configuration)

**X:** High efficiency

11 sizes to cover a range from 247 up to 622 kW with an EER up to 3.20 and an ESEER up to 4.01 (data refers to Standard sound configuration)

**H:** High ambient temperature

15 sizes to cover a range from 195 up to 587 kW with an EER up to 3.07 and an ESEER up to 3.79 (data refers to Standard sound configuration)

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 weighted formula enabling to take into account the variation of EER with the load rate and the variation of air inlet condenser temperature.

$$ESEER = (A \times EER100\%) + (B \times EER75\%) + (C \times EER50\%) + (D \times EER25\%)$$

	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

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## 2 Features and advantages

### Sound levels

The range is available in four different sound level configurations:

**S:** Standard sound

Condenser fan rotating at 890 rpm, rubber antivibration under compressor

**L:** Low sound

Condenser fan rotating at 900 rpm (EWAD180-370D-SL) and 705 rpm (EWAD400-530D-SL), rubber antivibration under compressor.

**R:** Reduced sound

Condenser fan rotating at 680 rpm (EWAD180-370D-SR) and 705 rpm (EWAD400-530D-SR), rubber antivibration under compressor, compressor sound enclosure.

**X:** Extra low sound

Condenser fan rotating at 500 rpm, rubber antivibration under compressor, compressor and evaporator sound enclosure.

## 3 General characteristics

### General characteristics

#### Cabinet and structure

The cabinet is made of galvanized steel sheet and painted to provide a high resistance to corrosion. Colour Ivory White (Munsell code 5Y7.5/1) ( $\pm$ 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.

#### Screw compressors with integrated oil separator

The range features two types of single-screw compressors:

A) The compressor is semi-hermetic, single-screw type with gate-rotors made of carbon impregnated engineered composite material. The compressor has one slide managed by the unit microprocessor for infinitely modulating the capacity between 100% to 25%. An integrated high efficiency oil separator maximizes the oil separation and standard start is Wye-delta (Y- $\Delta$ ) type.

This compressor is offered on following models:

- EWAD180~370D-SL
- EWAD180~370D-SR
- EWAD210~310D-SX
- EWAD250~400D-XS
- EWAD240~390D-XR
- EWAD200~380D-HS

B) The compressor is semi-hermetic, single-screw type with gate-rotor made with the latest high-strength fibre reinforced star material. The compressor has an asymmetric slide regulation managed by the unit controller for infinitely modulating capacity from 100% to 25%. An integrated high efficiency oil separator maximizes the oil separation and standard start is Wye-delta (Y- $\Delta$ ) type.

This compressor is offered on following models:

- EWAD390~580D-SS
- EWAD400~530D-SL
- EWAD400~530D-SR
- EWAD370~490D-SX
- EWAD470~620D-XS
- EWAD460~600D-XR
- EWAD420~590D-HS

#### 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

For size EWAD180~200D-SL, EWAD180~190D-SR and EWAD200~210D-HS

The units are equipped with a direct expansion plate to plate type evaporator. This heat exchanger is made of stainless steel brazed plates and is covered with a 20mm closed cell insulation material. The exchanger is equipped with a heater for protection against freezing down to  $-28^{\circ}\text{C}$  and evaporator water outlet connections of 3". Each evaporator has 2 circuits, one for each compressor and is manufactured in accordance to PED approval. Water pressure differential switch on evaporator standard factory mounted. Water filter is standard.

All the other units are equipped with a Direct Expansion shell&tube evaporator with copper tubes rolled into steel tubesheets. The evaporators are single-pass on both the refrigerant and water sides for pure counter-flow heat exchange and low refrigerant pressure drops. Both attributes contribute to the heat exchanger effectiveness and total unit's outstanding efficiency.

The external shell is covered with a 10mm closed cell insulation material and the evaporator water outlet connections are provided with victaulic kit (as standard). Each evaporator has 2 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.

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### 3 General characteristics

#### Condenser coil fans

Fan 710 mm diameter

The condenser fans are propeller type with wing-profile blades for achieving better performance. Each fan is protected by a guard.

Fan 800 mm diameter

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  $\Delta P$  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 independent refrigerant circuits and each one includes:

- 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
- Sight glass with moisture indicator
- Filter drier
- Charging valves
- High pressure switch
- High and low pressure transducers

#### Electrical control panel

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

#### Power Section

The power section includes compressors fuses, 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.

GNC\_1a-2-3-4-5-6\_Rev.01\_2

## 3 General characteristics

### Control section - main features

- Management of the compressor stepless capacity and fans modulation.
- Chiller enabled to work in partial failure condition.
- Full routine operation at condition of:
  - high ambient temperature value
  - high thermal load
  - high evaporator entering water temperature (start-up)
- Display of evaporator entering/leaving water temperature.
- Display of Outdoor Ambient Temperature.
- Display of condensing-evaporating temperature and pressure, suction and discharge superheat for each circuit.
- Leaving water evaporator temperature regulation (temperature tolerance = 0.1°C)
- Compressor and evaporator pumps hours counter.
- Display of Status Safety Devices.
- Number of starts and compressor working hours.
- Optimized management of compressor load.
- Fan management according to condensing pressure.
- Re-start in case of power failure (automatic / manual).
- Soft Load (optimized management of the compressor load during the start-up).
- Start at high evaporator water temperature.
- Return Reset (Set Point Reset based on return water temperature).
- OAT (Outside Ambient temperature) Reset.
- Set point Reset (optional).
- Application and system upgrade with commercial SD cards.
- Ethernet port for remote or local servicing using standard web browsers.
- Two different sets of default parameters could be stored for easy restore.

### Safety device / logic for each refrigerant circuit

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

### System security

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

### Regulation type

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



### 3 General characteristics

#### Condensing pressure

Condensing pressure can be controlled in according to the entering air temperature to the condenser coil. The fans can be managed either with steps, or with a 0/10V modulating signal or with a mixed 0/10V + Steps strategy to cover all possible operational conditions.

#### MicroTech III

MicroTech III built-in terminal has the following features:

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

#### Supervising systems (on request)

##### MicroTech III remote control

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

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

#### Standard options (supplied on basic unit)

**Evaporator victaulic kit** – Not available on units EWAD180~200D-SL, EWAD180~190D-SR and EWAD200~210D-HS

**Evaporator water design pressure (10Bar)**

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

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

**Wye-Delta Compressors starter (Y-Δ)** – For low inrush current and reduced starting torque.

**Double set-point** – Dual leaving water temperature set-points.

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

**Water pressure differential switch on evaporator** – Not available on units EWAD390~580D-SS, EWAD230~530D-SL, EWAD220~530D-SR, EWAD210~490D-SX, EWAD250~620D-XS, EWAD240~600D-XR, EWAD230~590D-HS

**Evaporator electric heater type** – 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 device**

**20 mm evaporator insulation** – Only for EWAD180~200D-SL, EWAD180~190D-SR, EWAD210D-SX and EWAD200~210D-HS

**Ambient outside temperature sensor and set-point reset**

**Hour run meter**

**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  $\Delta t$ .

**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 (pump etc...). User can decide if this alarm signal will stop the unit or not.

**Fans circuit breakers** – Safety device against motor overloading and short circuit

**Main switch interlock door**

### 3 General characteristics

#### Options (on request)

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

#### **Total heat recovery (1 circuit)**

**Partial heat recovery** – Plate to plate heat exchangers installed between the compressor discharge and the condenser coil, allowing producing hot water.

**Brine version** – Allows the unit to operate down to -15°C leaving liquid temperature (antifreeze required).

**Evaporator flanged connections** – Not available for EWAD180~200D-SL, EWAD180~190D-SR, EWAD210D-SX and EWAD200~210D-HS

#### **Condenser coil 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.

**Hydronic Kit (single water pump - low or high lifting)** – (N.A. on EWAD210~490D-SX) Hydronic kit consists of: single direct driven centrifugal pump, water filling system with pressure gauge, safety valve, drain valve. The pump motor 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 - low or high lifting)** – (N.A. on EWAD180~190D-SR and on EWAD210~490D-SX). 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**

**Soft starter** – Electronic starting device to reduce the mechanical stress during compressor start-up.

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

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

**Energy Meter** – This device allows to measure the energy absorbed by the chiller during its life. It is installed inside the control box mounted on a DIN rail and show on a digital display: Line-to-Line Voltage, Phase and Average Current, Active and Reactive Power, Active Energy, Frequency.

**Capacitors for power factor correction** – To increase the operating power factor of the unit at nominal operating conditions. The capacitors are “dry” self-regenerating type with over pressure disconnecting safety device insulated with a no toxic dielectric mix with no PCB or PCT.

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

#### **Fan silent mode**

**Speedtrol** – (N.A. on EWAD210~490D-SX) Continuous fan speed modulation on the first fan of each circuit. It allows the unit working with air temperature down to -18°C.

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

#### **High pressure side manometers (one per circuit)**

#### **Compressors circuit breakers**

**Fan speed regulation** – Standard option for EWAD~D-SX

To control the fan speed revolution for smooth operating control of the unit. During low ambient temperature operation, this option improves also the sound level of the unit. With “Fan speed regulation” option, by different microprocessor setting, it is also possible to set the “Fan Silent Mode” configuration. It means that the microprocessor clock switches the fan at low speed according to the client setting (i.e. Night & Day), providing that the ambient temperature/condensing pressure is allowing the speed change. It allows a perfect condensing control down to -10°C.

### 3 General characteristics

**Rubber type anti vibration mounts** – Supplied separately, these are positioned under the base of the unit during installation to reduce vibrations.

**Spring type anti vibration 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.

**External tank without cabinet (500 L / 1000 L)**

**External tank with cabinet (500 L / 1000 L)**

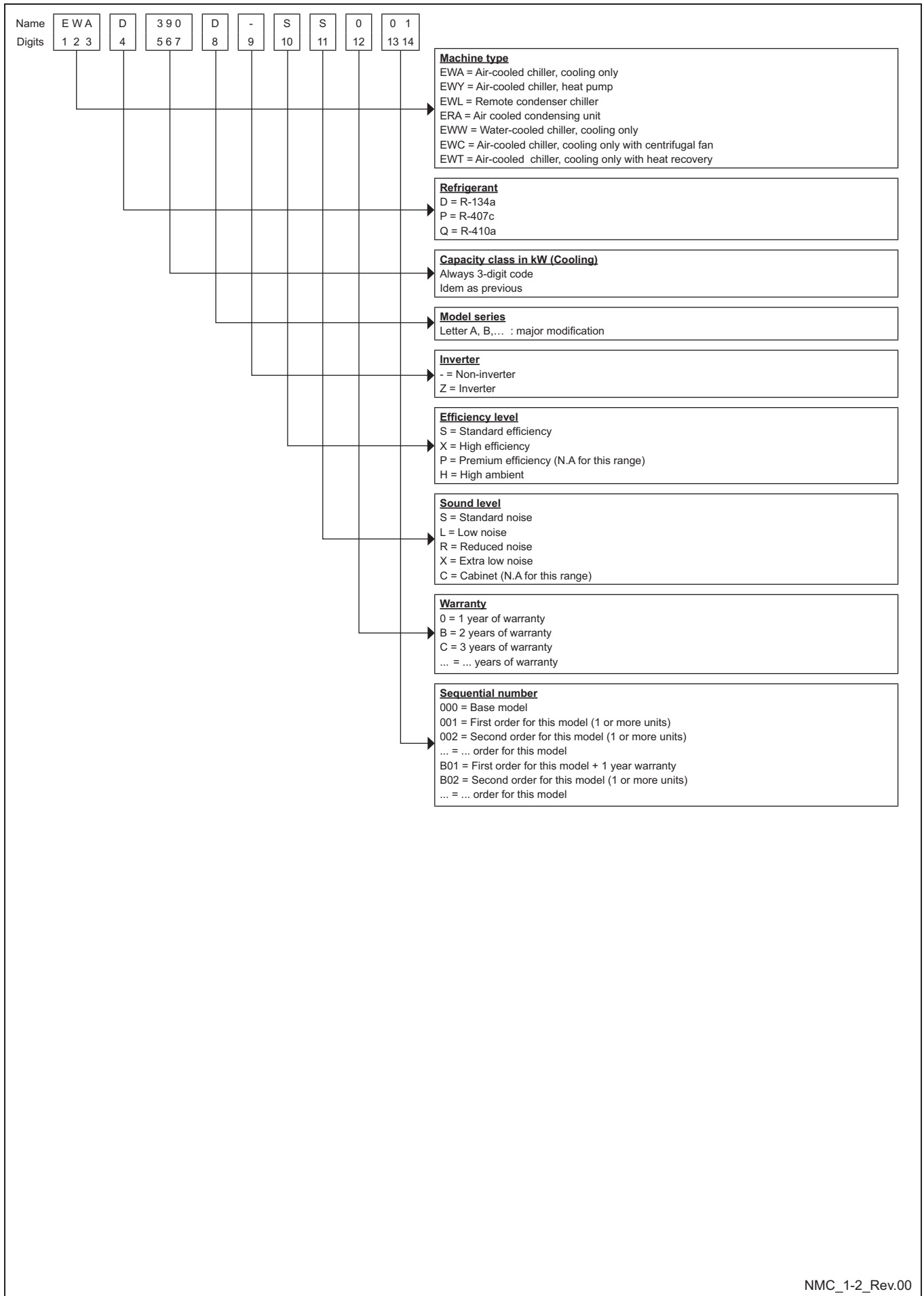
**Container kit**

**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 (please contact the factory) (This test is not available for units with glycol mixtures).

**Acoustic test** – On request, a test can be carried out, at customer's presence (please contact the factory) (This test is not available for units with glycol mixtures).

# 4 Nomenclature

## 4 - 1 Nomenclature



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## 5 Specifications

5-1 Technical Specifications				EWAD240D-XR	EWAD270D-XR	EWAD300D-XR	EWAD320D-XR	EWAD350D-XR	EWAD370D-XR	
Cooling capacity	Nom.		kW	243 (1)	272 (1)	296 (1)	322 (1)	345 (1)	370 (1)	
Capacity control	Method			Stepless						
	Minimum capacity		%	12.5						
Power input	Cooling	Nom.	kW	80.6 (1)	87.0 (1)	95.1 (1)	106 (1)	115 (1)	119 (1)	
EER				3.01 (1)	3.12 (1)	3.11 (1)	3.05 (1)	2.99 (1)	3.12 (1)	
ESEER				3.63	3.70	3.69	3.82	3.71	4.01	
IPLV				4.03	4.11	4.12	4.17	4.13	4.28	
Casing	Colour			Ivory white						
	Material			Galvanized and painted steel sheet						
Dimensions	Unit	Height	mm	2,355						
		Width	mm	2,234						
		Depth	mm	3,138	4,040					
Weight	Unit		kg	3,005	3,385		3,335	3,340		
	Operation weight		kg	3,100	3,500					
Water heat exchanger	Type			Single pass shell & tube						
	Water volume		l	95	115		165	160		
	Nominal water flow	Cooling	l/s	11.60	13.00	14.10	15.40	16.40	17.70	
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	47	44	48	45	49	56
	Insulation material			Closed cell						
Air heat exchanger	Type			High efficiency fin and tube type with integral subcooler						
Fan	Quantity			6	8					
	Type			Direct propeller						
	Diameter		mm	710						
	Air flow rate	Nom.	l/s	17,892	24,777	23,856		33,035		
	Speed		rpm	680						
Fan motor	Drive			DOL						
	Input	Cooling	W	870					780	
Sound power level	Cooling	Nom.	dBA	91.8	92.2				93.2	
Sound pressure level	Cooling	Nom.	dBA	72.5					73.5	
Compressor	Type			Semi-hermetic single screw compressor						
	Quantity			2						
	Oil	Charged volume		l	26					
Operation range	Water side	Cooling	Min.	°CDB	-15					
			Max.	°CDB	15					
	Air side	Cooling	Min.	°CDB	-18					
			Max.	°CDB	48					
Refrigerant	Type			R-134a						
	Circuits	Quantity		2						
Refrigerant circuit	Charge		kg	60	68	80				
Piping connections	Evaporator water inlet/outlet			114.3						
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		Water freeze protection controller						

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## 5 Specifications

5-1 Technical Specifications				EWAD390D-XR	EWAD460D-XR	EWAD510D-XR	EWAD560D-XR	EWAD600D-XR	
Cooling capacity	Nom.		kW	394 (1)	455 (1)	512 (1)	561 (1)	600 (1)	
Capacity control	Method			Stepless					
	Minimum capacity		%	12.5					
Power input	Cooling	Nom.	kW	127 (1)	152 (1)	167 (1)	183 (1)	198 (1)	
EER				3.10 (1)	2.99 (1)	3.07 (1)		3.03 (1)	
ESEER				3.82	3.89	4.11		3.93	
IPLV				4.25	4.36	4.79	4.78	4.47	
Casing	Colour			Ivory white					
	Material			Galvanized and painted steel sheet					
Dimensions	Unit	Height	mm	2,355	2,223				
		Width	mm	2,234					
		Depth	mm	4,040		4,940			
Weight	Unit		kg	3,340	3,610	4,770	4,785		
	Operation weight		kg	3,500	3,880	5,040			
Water heat exchanger	Type			Single pass shell & tube					
	Water volume		l	160	270		255		
	Nominal water flow	Cooling	l/s	18.80	21.70	24.40	26.80	28.60	
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	56	45	60	54	36
		Insulation material			Closed cell				
Air heat exchanger	Type			High efficiency fin and tube type with integral subcooler					
Fan	Quantity			8		10			
	Type			Direct propeller					
	Diameter		mm	710	800				
	Air flow rate	Nom.	l/s	32,576	33,494	41,867			
	Speed		rpm	705					
Fan motor	Drive			DOL					
	Input	Cooling	W	780					
Sound power level	Cooling	Nom.	dBA	93.2		93.7			
Sound pressure level	Cooling	Nom.	dBA	73.5					
Compressor	Type			Semi-hermetic single screw compressor					
	Quantity			2					
	Oil	Charged volume	l	26	32				
Operation range	Water side	Cooling	Min.	°CDB	-15				
			Max.	°CDB	15				
	Air side	Cooling	Min.	°CDB	-18				
			Max.	°CDB	48				
Refrigerant	Type			R-134a					
	Circuits	Quantity		2					
Refrigerant circuit	Charge		kg	80		104			
Piping connections	Evaporator water inlet/outlet			114.3	168.3				
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	Water freeze protection controller						

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## 5 Specifications

5-2 Electrical Specifications				EWAD240D-XR	EWAD270D-XR	EWAD300D-XR	EWAD320D-XR	EWAD350D-XR	EWAD370D-XR
Compressor	Phase			3~					
	Voltage		V	400					
	Voltage range	Min.	%	-10					
		Max.	%	10					
	Maximum running current		A	82	99		110		
Starting method			Wye-delta						
Compressor 2	Maximum running current		A	82	99		110		125
Power supply	Phase			3~					
	Frequency		Hz	50					
	Voltage		V	400					
	Voltage range	Min.	%	-10					
		Max.	%	10					
Unit	Maximum starting current		A	221	237		280	289	306
	Nominal running current (RLA)	Cooling	A	134	144	160	175	188	200
			A	173	193	210	221	232	256
	Max unit current for wires sizing		A	190	212	231	243	255	282
Fans	Nominal running current (RLA)		A	9	12				20.8

5-2 Electrical Specifications				EWAD390D-XR	EWAD460D-XR	EWAD510D-XR	EWAD560D-XR	EWAD600D-XR
Compressor	Phase			3~				
	Voltage		V	400				
	Voltage range	Min.	%	-10				
		Max.	%	10				
	Maximum running current		A	125	147	162	185	
Starting method			Wye-delta					
Compressor 2	Maximum running current		A	125	147	162		185
Power supply	Phase			3~				
	Frequency		Hz	50				
	Voltage		V	400				
	Voltage range	Min.	%	-10				
		Max.	%	10				
Unit	Maximum starting current		A	306	417	473	491	
	Nominal running current (RLA)	Cooling	A	213	256	283	308	330
			A	272	316	350	373	395
	Max unit current for wires sizing		A	299	347	385	410	435
Fans	Nominal running current (RLA)		A	20.8			26	

### Notes

- (1)Cooling: entering evaporator water temp. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C; full load operation.
- (2)Sound pressure levels are measured at entering evaporator water temp. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C; 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. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C. 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

# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

EWAD-D-XR

ELWT (°C)		240						270						300						320									
		Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)									
		25	30	35	40	43	46	48	25	30	35	40	43	46	48	25	30	35	40	43	46	48	25	30	35	40	43	46	48
4	Cc (kW)	236	230	223	214	208	202	198	263	258	251	243	237	231	226	286	280	272	263	256	249	244	312	304	295	284	276	267	260
	Pi (kW)	64	71	78	86	90	95	99	69	77	84	93	98	104	108	76	83	92	101	107	113	117	84	92	102	112	118	124	128
	Qwe (l/s)	11,2	10,9	10,6	10,2	9,9	9,6	9,4	12,5	12,3	12	11,6	11,3	11	10,8	13,6	13,3	13	12,5	12,2	11,9	11,6	14,8	14,5	14	13,5	13,1	12,7	12,4
	Pdwe (kPa)	44,1	42,2	39,9	37,2	35,4	33,5	32,1	41,4	39,9	38,1	35,9	34,4	32,7	31,6	44,6	42,9	40,8	38,3	36,6	34,8	33,5	42	40,2	38	35,5	33,7	31,9	30,4
5	Cc (kW)	242	236	229	221	215	209	204	270	264	258	250	244	238	233	294	287	280	270	264	257	252	321	313	304	292	285	276	266
	Pi (kW)	65	71	79	87	91	97	100	70	77	85	94	99	105	109	77	84	93	102	108	114	118	85	93	103	113	119	126	128
	Qwe (l/s)	11,5	11,3	10,9	10,5	10,2	9,9	9,7	12,9	12,6	12,3	11,9	11,6	11,3	11,1	14	13,7	13,3	12,9	12,6	12,2	12	15,3	14,9	14,5	13,9	13,6	13,2	12,7
	Pdwe (kPa)	46,4	44,5	42,1	39,3	37,5	35,5	34,1	43,4	41,9	40	37,8	36,3	34,6	33,4	46,9	45,1	43	40,4	38,7	36,9	35,5	44,3	42,4	40,2	37,5	35,8	33,8	31,6
6	Cc (kW)	249	243	236	228	222	215	211	277	271	265	257	251	245	240	302	295	288	278	272	265	260	330	322	313	302	294	285	272
	Pi (kW)	65	72	80	88	93	98	101	71	78	86	95	100	106	110	77	85	94	103	109	115	119	86	95	104	114	121	127	127
	Qwe (l/s)	11,9	11,6	11,3	10,9	10,6	10,3	10	13,2	12,9	12,6	12,2	12	11,7	11,5	14,4	14,1	13,7	13,3	13	12,6	12,4	15,7	15,4	14,9	14,4	14	13,6	12,9
	Pdwe (kPa)	48,7	46,7	44,4	41,6	39,6	37,6	36,2	45,4	43,9	42	39,8	38,2	36,5	35,3	49,2	47,4	45,2	42,6	40,8	38,9	37,6	46,6	44,7	42,4	39,7	37,9	35,9	32,9
7	Cc (kW)	255	250	243	234	228	222	214	283	278	272	264	258	252	247	309	303	296	286	280	273	267	339	331	322	311	303	294	277
	Pi (kW)	66	73	81	89	94	99	100	72	79	87	96	101	107	111	78	86	95	104	110	116	121	87	96	106	116	122	129	127
	Qwe (l/s)	12,2	11,9	11,6	11,2	10,9	10,6	10,2	13,5	13,3	13	12,6	12,3	12	11,8	14,8	14,5	14,1	13,7	13,3	13	12,8	16,2	15,8	15,4	14,8	14,4	14	13,2
	Pdwe (kPa)	51,1	49,1	46,7	43,8	41,9	39,8	37,3	47,5	46	44	41,7	40,2	38,5	37,2	51,6	49,8	47,5	44,9	43	41,1	39,7	48,9	47	44,7	41,9	40	38	34,1
8	Cc (kW)	262	256	249	241	235	229	216	290	285	279	271	265	259	254	317	311	304	294	288	281	275	348	340	331	320	312	303	282
	Pi (kW)	67	74	82	90	95	100	99	72	80	88	97	102	108	112	79	87	96	106	112	118	122	88	97	107	117	124	130	126
	Qwe (l/s)	12,5	12,2	11,9	11,5	11,2	10,9	10,3	13,9	13,6	13,3	12,9	12,7	12,4	12,1	15,1	14,9	14,5	14	13,7	13,4	13,1	16,6	16,2	15,8	15,4	14,9	14,5	13,5
	Pdwe (kPa)	53,5	51,5	49,7	46,1	44,2	42	37,9	49,7	48,1	46,1	43,8	42,2	40,4	39,2	54	52,2	49,9	47,2	45,3	43,3	41,9	51,4	49,4	47	44,2	42,3	40,2	35,2
9	Cc (kW)	268	263	256	248	242	236	218	297	292	285	278	272	266	261	325	319	312	302	296	289	283	357	350	340	329	321	309	287
	Pi (kW)	68	75	82	91	96	101	97	73	81	89	98	103	109	112	80	88	97	107	113	119	123	90	98	108	119	125	130	126
	Qwe (l/s)	12,8	12,6	12,2	11,8	11,6	11,3	10,4	14,2	13,9	13,6	13,3	13	12,7	12,4	15,5	15,2	14,9	14,4	14,1	13,8	13,5	17,1	16,7	16,2	15,7	15,3	14,8	13,7
	Pdwe (kPa)	56,1	54	51,5	48,5	46,5	44,3	38,4	51,9	50,2	48,3	45,9	44,3	42,5	41	56,4	54,6	52,3	49,6	47,7	45,6	44,1	54	51,9	49,4	46,5	44,6	41,6	36,4
10	Cc (kW)	275	270	263	254	249	242	219	304	299	292	285	279	273	265	333	327	319	310	304	297	287	367	359	350	338	330	314	289
	Pi (kW)	69	76	83	92	97	102	95	74	81	90	98	104	110	112	81	89	98	108	114	120	122	91	100	110	120	127	129	123
	Qwe (l/s)	13,2	12,9	12,6	12,2	11,9	11,6	10,5	14,5	14,3	14	13,6	13,3	13	12,7	15,9	15,6	15,3	14,8	14,5	14,2	13,7	17,5	17,2	16,7	16,2	15,8	15	13,8
	Pdwe (kPa)	58,7	56,6	54	50,9	48,8	46,6	38,9	54,1	52,5	50,4	48	46,4	44,5	42,2	58,9	57	54,8	52	50,1	48	45,3	56,6	54,5	51,9	48,9	46,9	42,9	36,8
11	Cc (kW)	282	277	270	261	255	249	222	311	306	299	292	286	280	270	340	334	327	318	312	305	289	376	368	359	348	340	320	291
	Pi (kW)	70	77	84	93	98	103	94	75	82	91	99	105	111	112	82	90	99	109	115	122	120	92	101	111	122	128	129	122
	Qwe (l/s)	13,5	13,2	12,9	12,5	12,2	11,9	10,6	14,9	14,6	14,3	13,9	13,7	13,4	12,9	16,3	16	15,6	15,2	14,9	14,6	13,8	18	17,6	17,2	16,6	16,2	15,3	13,9
	Pdwe (kPa)	61,4	59,2	56,5	53,4	51,3	49	39,8	56,4	54,7	52,7	50,2	48,5	46,7	43,8	61,4	59,5	57,2	54,4	52,5	50,4	48,8	59,2	57,1	54,5	51,4	49,3	44,2	37,3
12	Cc (kW)	289	283	276	268	262	250	222	318	313	306	299	293	287	274	348	342	335	326	320	313	293	385	378	368	357	349	326	291
	Pi (kW)	71	78	85	94	99	102	92	76	83	91	100	106	112	111	83	91	100	110	116	123	119	93	102	112	123	130	129	119
	Qwe (l/s)	13,8	13,6	13,2	12,8	12,5	12	10,6	15,2	15	14,7	14,3	14	13,7	13,1	16,6	16,4	16	15,6	15,3	15	14	18,4	18,1	17,6	17,1	16,7	15,6	13,9
	Pdwe (kPa)	64,2	61,9	59,2	56	53,8	49,6	40	58,7	57	54,9	52,4	50,7	48,8	45	64	62	59,6	56,8	54,9	52,8	46,8	62	59,8	57,1	54	51,8	45,9	37,5
13	Cc (kW)	296	290	283	275	269	252	224	325	320	314	306	300	294	278	356	350	342	334	327	321	294	395	387	378	366	358	331	294
	Pi (kW)	72	79	87	95	100	100	91	77	84	92	101	107	113	110	84	92	101	111	118	124	117	95	104	114	125	131	128	118
	Qwe (l/s)	14,2	13,9	13,6	13,1	12,9	12	10,7	15,6	15,3	15	14,6	14,4	14,1	13,3	17	16,7	16,4	16	15,7	15,3	14	18,9	18,5	18,1	17,5	17,1	15,8	14,1
	Pdwe (kPa)	67,1	64,8	61,9	58,6	56,4	50	40,7	61,2	59,4	57,3	54,7	52,9	51	46,1	66,6	64,6	62,2	59,3	57,4	55,3	47,2	64,8	62,5	59,8	56,6	54,4	47,2	38,2
14	Cc (kW)	303	297	290	282	276	253	224	332	327	321	313	307	301	283	364	358	350	341	335	328	294	405	397	387	376	368	333	292
	Pi (kW)	73	80	88	96	101	98	89	78	85	93	102	108	114	110	85	93	103	112	119	125	115	96	105	115	126	133	127	120
	Qwe (l/s)	14,5	14,2	13,9	13,5	13,2	12,1	10,7	15,9	15,7	15,3	15	14,7	14,4	13,5	17,4	17,1	16,8	16,3	16	15,7	14,1	19,4	19	18,5	18	17,6	16	14
	Pdwe (kPa)	70,1	67,7	64,8	61,3	59	50,4	40,7	63,6	61,8	59,7	57	55,2	53,3	47,6	69,3	67,3	64,8	61,9	59,9	57,7	47,4	67,7	65,4	62,6	59,3	57	47,8	37,6
15	Cc (kW)	310	305	297	289	283	255	226	340	334	328	320	314	306	287	372	366	358	349	343	334	297	414	406	397	385	374	335	294
	Pi (kW)	74	81	89	97	103	97	88	78	86	94	103	109	114	110	86	95	104	114	120	126	113	97	107	117	128	133	125	118
	Qwe (l/s)	14,9	14,6	14,2	13,8	13,5	12,2	10,8	16,3	16	15,7	15,3	15	14,7	13,8	17,8	17,5	17,1	16,7	16,4	16	14,2	19,8	19,5	19	18,4	17,9	16	14,1
	Pdwe (kPa)	73,1																											



# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

EWAD-D-XR

ELWT (°C)		350						370						390						460									
		Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)									
		25	30	35	40	43	46	48	25	30	35	40	43	46	48	25	30	35	40	43	46	48	25	30	35	40	43	46	48
4	Cc (kW)	335	326	316	303	295	285	277	358	350	340	328	320	311	304	381	373	362	349	341	331	323	450	437	418	391	371	349	319
	Pi (kW)	91	101	111	122	129	136	139	94	104	115	126	134	141	146	100	111	123	135	143	151	156	119	132	146	161	171	182	176
	Qwe (l/s)	15.9	15.5	15	14.5	14	13.6	13.2	17	16.7	16.2	15.6	15.2	14.8	14.5	18.2	17.8	17.3	16.6	16.2	15.8	15.4	21.5	20.8	19.9	18.6	17.7	16.6	15.2
	Pdwe (kPa)	46.5	44.4	41.9	39	37	34.9	33	52.7	50.6	48	45	43	40.8	39.2	52.2	50.1	47.5	44.6	42.6	40.3	38.8	43.8	41.6	38.3	34	31	27.7	23.6
5	Cc (kW)	344	336	325	313	304	295	280	368	360	350	338	330	321	314	392	384	373	360	351	341	334	464	450	430	403	382	359	322
	Pi (kW)	92	102	112	123	130	137	137	95	105	116	128	135	143	148	102	112	124	137	144	153	158	121	134	148	163	174	184	173
	Qwe (l/s)	16.4	16	15.5	14.9	14.5	14.1	13.3	17.5	17.2	16.7	16.1	15.7	15.3	15	18.7	18.3	17.8	17.2	16.7	16.3	15.9	22.1	21.5	20.5	19.2	18.2	17.1	15.4
	Pdwe (kPa)	48.9	46.8	44.2	41.2	39.2	37	33.7	55.4	53.3	50.7	47.6	45.5	43.3	41.6	54.9	52.8	50.1	47.1	45	42.8	41.2	46.3	43.9	40.4	35.9	32.7	29.2	24
6	Cc (kW)	354	345	335	322	314	304	282	378	370	360	348	340	331	324	403	394	384	371	362	352	345	477	463	443	414	393	367	325
	Pi (kW)	94	103	114	125	132	139	134	96	106	118	129	137	144	150	103	114	126	138	146	154	160	123	136	150	166	176	185	170
	Qwe (l/s)	16.9	16.5	16	15.4	15	14.5	13.5	18	17.6	17.2	16.6	16.2	15.8	15.5	19.2	18.8	18.3	17.7	17.3	16.8	16.5	22.8	22.1	21.1	19.7	18.8	17.5	15.5
	Pdwe (kPa)	51.4	49.3	46.6	43.6	41.5	39.3	34.3	58.2	56	53.4	50.2	48.1	45.8	44.2	57.6	55.4	52.8	49.7	47.6	45.3	43.6	48.8	46.2	42.6	37.8	34.4	30.5	24.5
7	Cc (kW)	363	355	345	332	323	314	285	388	380	370	358	350	341	334	413	405	394	382	373	363	356	491	476	455	426	404	371	328
	Pi (kW)	95	105	115	126	133	141	132	98	108	119	131	138	146	151	104	115	127	140	148	156	162	125	138	152	168	178	182	166
	Qwe (l/s)	17.3	16.9	16.4	15.8	15.4	15	13.6	18.5	18.1	17.7	17.1	16.7	16.3	16	19.7	19.3	18.8	18.2	17.8	17.3	17	23.4	22.7	21.7	20.3	19.3	17.7	15.6
	Pdwe (kPa)	54	51.8	49.2	46	43.8	41.5	34.8	61	58.8	56.2	53	50.8	48.4	46.7	60.4	58.2	55.6	52.4	50.2	47.8	46.2	51.3	48.6	44.8	39.7	36.2	31	24.8
8	Cc (kW)	373	365	354	342	333	324	286	398	390	380	369	360	351	345	424	416	405	392	384	374	367	505	490	467	437	415	375	332
	Pi (kW)	96	106	117	128	135	142	130	99	109	120	132	140	148	153	106	117	129	141	149	158	164	127	140	154	171	181	178	164
	Qwe (l/s)	17.8	17.4	16.9	16.3	15.9	15.4	13.7	19	18.6	18.2	17.6	17.2	16.8	16.4	20.2	19.8	19.3	18.7	18.3	17.8	17.5	24.1	23.4	22.3	20.9	19.8	17.9	15.9
	Pdwe (kPa)	56.7	54.4	51.7	48.5	46.3	43.9	35.2	64	61.7	59	55.7	53.5	51.1	49.4	63.4	61.1	58.4	55.1	52.9	50.5	48.8	54	51.1	47.1	41.7	38	31.6	25.4
9	Cc (kW)	383	374	364	352	343	326	290	408	400	391	379	371	362	355	435	426	416	403	394	385	372	518	503	480	449	426	377	334
	Pi (kW)	98	107	118	130	137	140	128	100	110	122	134	141	149	155	107	118	130	143	151	160	162	129	142	157	173	184	175	161
	Qwe (l/s)	18.3	17.9	17.4	16.8	16.4	15.6	13.8	19.5	19.1	18.7	18.1	17.7	17.3	16.9	20.8	20.4	19.9	19.3	18.8	18.4	17.8	24.8	24	22.9	21.4	20.4	18	15.9
	Pdwe (kPa)	59.5	57.1	54.3	51	48.8	44.6	36.1	67.1	64.7	61.9	58.6	56.3	53.9	52.1	66.4	64.1	61.2	57.9	55.7	53.2	50.1	56.7	53.7	49.4	43.8	39.9	32	25.7
10	Cc (kW)	393	384	374	361	353	328	291	419	411	401	389	381	372	361	446	437	427	414	405	396	375	532	516	492	461	437	380	338
	Pi (kW)	99	109	120	131	138	138	126	101	112	123	135	143	151	154	108	120	132	145	153	161	160	131	144	159	176	186	171	159
	Qwe (l/s)	18.8	18.4	17.9	17.3	16.8	15.7	13.9	20	19.6	19.2	18.6	18.2	17.8	17.3	21.3	20.9	20.4	19.8	19.4	18.9	17.9	25.4	24.7	23.5	22	20.9	18.1	16.1
	Pdwe (kPa)	62.3	59.9	57	53.6	51.3	45.1	36.3	70.2	67.8	64.9	61.5	59.2	56.7	53.8	69.5	67.1	64.2	60.8	58.5	56	50.7	59.5	56.3	51.7	45.9	41.8	32.4	26.2
11	Cc (kW)	403	394	384	371	362	330	294	429	421	411	399	391	382	363	457	448	438	425	416	406	376	546	529	505	472	448	384	329
	Pi (kW)	100	110	121	133	140	135	124	103	113	124	137	145	153	152	110	121	133	146	155	163	157	133	147	162	178	189	170	166
	Qwe (l/s)	19.2	18.8	18.3	17.7	17.3	15.8	14.1	20.5	20.1	19.7	19.1	18.7	18.3	17.4	21.8	21.4	20.9	20.3	19.9	19.4	18	26.1	25.3	24.1	22.6	21.4	18.4	15.7
	Pdwe (kPa)	65.2	62.7	59.8	56.3	53.9	45.5	37	73.4	71	68	64.5	62.2	59.6	54.4	72.5	70.2	67.3	63.8	61.4	58.8	51.2	62.4	59	54.2	48	43.7	33.1	25.1
12	Cc (kW)	413	404	394	381	372	334	294	440	432	422	410	402	392	365	467	459	449	436	427	417	378	560	543	518	484	454	386	332
	Pi (kW)	102	112	123	135	142	134	122	104	114	126	138	146	154	149	111	122	135	148	156	165	154	135	149	164	181	188	166	163
	Qwe (l/s)	19.7	19.3	18.8	18.2	17.8	16	14	21	20.6	20.2	19.6	19.2	18.8	17.5	22.3	21.9	21.5	20.9	20.4	20	18.1	26.8	26	24.7	23.1	21.7	18.4	15.9
	Pdwe (kPa)	68.2	65.6	62.6	59	56.6	46.5	37	76.8	74.2	71.2	67.6	65.2	62.5	54.9	75.7	73.2	70.3	66.8	64.4	61.7	51.6	65.4	61.8	56.7	50.2	44.8	33.4	25.5
13	Cc (kW)	423	414	403	391	382	334	296	450	442	432	420	412	403	369	478	470	459	447	438	428	382	575	556	530	496	457	390	335
	Pi (kW)	103	113	124	136	144	131	120	105	116	127	140	148	156	147	112	124	136	150	158	167	152	138	152	167	184	184	164	160
	Qwe (l/s)	20.2	19.8	19.3	18.7	18.3	16	14.2	21.5	21.2	20.7	20.1	19.7	19.3	17.7	22.9	22.5	22	21.4	21	20.5	18.3	27.5	26.6	25.4	23.7	21.9	18.6	16
	Pdwe (kPa)	71.2	68.6	65.5	61.8	59.4	46.8	37.6	80.2	77.6	74.5	70.8	68.3	65.6	56.1	78.9	76.4	73.4	69.9	67.4	64.8	52.6	68.4	64.6	59.2	52.4	45.3	34	25.9
14	Cc (kW)	433	424	413	401	392	338	291	461	453	443	431	422	413	370	489	481	470	458	449	430	382	589	570	543	507	460	393	337
	Pi (kW)	105	115	126	138	145	130	127	107	117	129	142	150	158	144	114	125	138	151	160	164	149	140	154	169	186	181	162	157
	Qwe (l/s)	20.7	20.3	19.8	19.2	18.7	16.2	13.9	22.1	21.7	21.2	20.6	20.2	19.8	17.7	23.4	23	22.5	21.9	21.5	20.6	18.3	28.2	27.3	26	24.3	22	18.8	16.1
	Pdwe (kPa)	74.4	71.7	68.4	64.7	62.2	47.6	36.4	83.7	81	77.8	74.1	71.5	68.7	56.3	82.3	79.7	76.6	73	70.5	65.3	52.8	71.6	67.5	61.8	54.7	45.8	34.6	26.2
15	Cc (kW)	443	434	423	410	396	338	293	472	464	454	441	433	419	374	500	492	481	469	460	432	386	603	583	555	519	464	397	341
	Pi (kW)	106	116	128	140	145	127	125	108	119	131	143	151	157	143	115	127	140	153	162	161	147	142	156	172	189	179	160	155
	Qwe (l/s)	21.2	20.8	20.3	19.6	19	16.2	14	22.6	22.2	21.7	2																	

# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

EWAD-D-XR

ELWT (°C)		510						560						600								
		Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)								
		25	30	35	40	43	46	48	25	30	35	40	43	46	48	25	30	35	40	43	46	48
4	Cc (kW)	501	487	471	449	429	374	337	551	535	516	488	451	391	342	593	575	553	520	461	400	343
	Pi (kW)	130	145	161	180	192	184	176	142	158	176	197	200	190	183	154	171	191	214	205	194	189
	Qwe (l/s)	23.8	23.2	22.4	21.4	20.4	17.8	16.1	26.3	25.5	24.6	23.2	21.5	18.6	16.3	28.2	27.4	26.4	24.8	21.9	19.1	16.3
	Pdwe (kPa)	57.9	55.1	51.8	47.5	43.8	34.2	28.4	51.9	49.2	46	41.6	36.1	28	22	35.2	33.3	31.1	27.8	22.3	17.3	13.1
5	Cc (kW)	515	501	484	462	445	410	370	568	551	531	504	475	425	383	609	591	569	539	499	435	392
	Pi (kW)	132	147	163	181	195	201	192	144	161	178	199	209	206	197	156	174	193	217	224	211	201
	Qwe (l/s)	24.6	23.9	23.1	22	21.2	19.5	17.6	27.1	26.3	25.3	24	22.6	20.3	18.3	29	28.2	27.1	25.7	23.8	20.7	18.7
	Pdwe (kPa)	61	58.1	54.6	50.1	46.8	40.4	33.6	54.7	51.9	48.5	44.1	39.7	32.5	27	37	35.1	32.7	29.7	25.9	20.2	16.7
6	Cc (kW)	530	516	498	475	458	437	402	584	567	546	518	497	458	415	626	608	584	554	531	472	422
	Pi (kW)	134	149	165	183	197	212	209	147	163	180	201	217	221	212	159	176	196	219	236	231	216
	Qwe (l/s)	25.3	24.6	23.7	22.7	21.8	20.9	19.2	27.8	27	26	24.7	23.7	21.8	19.8	29.8	29	27.9	26.4	25.3	22.5	20.1
	Pdwe (kPa)	64.3	61.2	57.5	52.8	49.4	45.5	39.1	57.7	54.7	51	46.5	43.2	37.2	31.1	38.9	36.9	34.4	31.2	28.9	23.4	19.1
7	Cc (kW)	545	530	512	488	471	450	405	600	583	561	533	511	468	417	643	624	600	569	545	482	427
	Pi (kW)	135	151	167	185	198	213	204	149	165	183	204	219	220	206	161	179	198	222	239	230	211
	Qwe (l/s)	26	25.3	24.4	23.3	22.5	21.5	19.3	28.6	27.8	26.8	25.4	24.4	22.3	19.9	30.7	29.8	28.6	27.1	26	23	20.4
	Pdwe (kPa)	67.6	64.4	60.4	55.5	51.9	47.9	39.6	60.7	57.5	53.7	48.9	45.5	38.7	31.5	40.8	38.7	36.1	32.7	30.4	24.3	19.6
8	Cc (kW)	560	545	526	502	484	463	411	617	599	576	547	526	477	422	659	640	616	583	560	485	428
	Pi (kW)	137	153	169	187	200	215	200	151	167	185	206	221	219	202	163	181	201	224	241	224	204
	Qwe (l/s)	26.7	26	25.1	23.9	23.1	22.1	19.6	29.4	28.6	27.5	26.1	25.1	22.8	20.2	31.5	30.5	29.4	27.9	26.7	23.2	20.4
	Pdwe (kPa)	71.1	67.6	63.5	58.3	54.6	50.4	40.7	63.7	60.4	56.4	51.4	47.8	40.2	32.2	42.8	40.5	37.8	34.3	31.8	24.6	19.7
9	Cc (kW)	575	560	540	515	497	466	409	633	615	592	562	540	480	418	676	656	631	599	574	487	423
	Pi (kW)	139	155	171	189	202	211	193	153	170	188	208	223	214	201	166	183	203	227	243	217	211
	Qwe (l/s)	27.5	26.7	25.8	24.6	23.7	22.3	19.5	30.3	29.4	28.3	26.8	25.8	22.9	19.9	32.3	31.3	30.1	28.6	27.4	23.3	20.2
	Pdwe (kPa)	74.7	71	66.7	61.2	57.3	51.1	40.5	66.9	63.4	59.2	53.9	50.2	40.6	31.6	44.8	42.4	39.6	36	33.4	24.8	19.3
10	Cc (kW)	590	575	555	529	510	469	411	650	631	607	577	549	483	419	694	673	647	614	582	489	424
	Pi (kW)	141	157	173	192	204	207	187	155	172	190	211	222	209	195	168	186	206	229	241	211	205
	Qwe (l/s)	28.2	27.5	26.5	25.3	24.4	22.4	19.6	31.1	30.1	29	27.6	26.2	23.1	20	33.1	32.1	30.9	29.3	27.8	23.4	20.3
	Pdwe (kPa)	78.3	74.5	69.9	64.2	60.2	51.7	40.7	70.2	66.5	62	56.5	51.7	41	31.8	46.9	44.4	41.4	37.6	34.2	25	19.4
11	Cc (kW)	606	589	569	543	524	471	411	667	647	623	592	558	484	419	710	689	662	628	585	490	425
	Pi (kW)	143	159	176	194	207	202	182	158	175	193	213	221	203	189	171	189	208	232	236	204	198
	Qwe (l/s)	29	28.2	27.2	25.9	25	22.5	19.6	31.9	30.9	29.8	28.3	26.7	23.1	20	33.9	32.9	31.7	30	28	23.4	20.3
	Pdwe (kPa)	82	78.1	73.3	67.3	63.1	52.2	40.8	73.6	69.7	65	59.2	53.3	41.3	31.9	49	46.4	43.2	39.3	34.6	25.1	19.4
12	Cc (kW)	621	604	583	556	537	470	411	684	664	638	606	564	481	419	727	706	678	643	584	489	420
	Pi (kW)	145	162	178	196	209	196	191	160	177	195	216	218	204	190	173	191	211	234	229	215	189
	Qwe (l/s)	29.7	28.9	27.9	26.6	25.7	22.5	19.7	32.7	31.7	30.5	29	27	23	20	34.8	33.7	32.4	30.8	27.9	23.4	20.1
	Pdwe (kPa)	85.9	81.7	76.7	70.5	66.1	51.9	40.8	77	72.9	68	62	54.4	40.9	31.8	51.1	48.5	45.1	41	34.5	25	19.1
13	Cc (kW)	636	619	598	570	550	471	409	701	680	654	621	572	482	415	744	722	694	658	586	486	419
	Pi (kW)	147	164	180	199	211	191	184	163	180	198	219	216	199	181	176	194	214	237	223	206	181
	Qwe (l/s)	30.4	29.6	28.6	27.3	26.3	22.5	19.6	33.5	32.5	31.3	29.7	27.4	23.1	19.8	35.6	34.5	33.2	31.5	28	23.3	20
	Pdwe (kPa)	89.8	85.4	80.2	73.7	69.1	52.1	40.5	80.5	76.2	71.1	64.8	55.9	41.1	31.3	53.4	50.5	47.1	42.8	34.7	24.8	18.9
14	Cc (kW)	652	634	612	584	564	467	405	718	696	670	636	578	478	411	761	738	710	673	583	483	411
	Pi (kW)	150	166	183	201	214	184	176	165	183	201	221	214	191	174	178	197	217	240	215	198	171
	Qwe (l/s)	31.2	30.3	29.3	28	27	22.3	19.4	34.3	33.3	32.1	30.4	27.6	22.9	19.7	36.4	35.3	34	32.2	27.9	23.1	19.7
	Pdwe (kPa)	93.8	89.2	83.7	77	72.3	51.4	39.9	84	79.6	74.2	67.6	56.9	40.5	30.8	55.6	52.6	49	44.6	34.4	24.5	18.4
15	Cc (kW)	667	649	627	598	570	462	400	734	713	685	649	579	473	402	778	754	725	689	584	477	402
	Pi (kW)	152	169	185	204	212	176	168	168	185	204	223	209	182	164	181	200	220	243	210	188	161
	Qwe (l/s)	31.9	31.1	30	28.6	27.3	22.1	19.2	35.2	34.1	32.8	31.1	27.7	22.7	19.3	37.3	36.1	34.7	33	27.9	22.9	19.2
	Pdwe (kPa)	97.9	93.1	87.4	80.4	73.7	50.5	39	87.6	83	77.4	70.2	57.2	39.7	29.7	57.9	54.8	51	46.5	34.5	24	17.6

## 6 Capacity tables

### 6 - 2 Partial Heat Recovery Capacity tables

**Partial Heat Recovery Ratings**  
**EWAD-D-X**

EWC / LWC	*Model EWAD-D-XS*	*Model EWAD-D-XR*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
50/60	250	240	220	72.2	102	35%	4.47
	280	270	246	87.0	117	35%	4.17
	300	300	270	98.6	129	35%	4.04
	330	320	292	108	140	35%	3.98
	350	350	313	118	151	35%	3.93
	380	370	336	125	138	30%	3.79
	400	390	359	134	128	26%	3.63
	470	460	409	158	198	35%	3.85
	520	510	463	175	223	35%	3.93
	580	560	507	190	209	30%	3.76
	620	600	548	207	196	26%	3.59

**NOTES**

Cc (cooling capacity)  
 Pi (unit power input)  
 Hc (heating heat recovery capacity)  
 %Hc (percentage heat recovered)  
 EER Hc (coefficient 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<sup>2</sup> °C/kW evaporator fouling factor

# 6 Capacity tables

## 6 - 3 Total Heat Recovery Capacity Tables

### Total Heat Recovery Ratings EWAD-D-X

EW / LWC	*Model EWAD-D-XS	*Model EWAD-D-XR	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
40/45	250	240	231	69.3	255	85%	7.02
	280	270	258	83.5	291	85%	6.57
	300	300	283	95.8	322	85%	6.31
	330	320	306	105	350	85%	6.22
	350	350	328	114	376	85%	6.15
	380	370	353	121	396	75%	5.83
	400	390	376	130	329	65%	5.42
	470	460	429	153	495	85%	6.03
	520	510	486	170	558	85%	6.14
	580	560	532	185	537	75%	5.78
	620	600	575	201	504	65%	5.36
	250	240	220	70.1	247	85%	6.67
280	270	246	84.4	281	85%	6.25	
300	300	270	96.7	311	85%	6.01	
330	320	292	106	338	85%	5.92	
350	350	313	116	364	85%	5.85	
380	370	336	123	344	75%	5.54	
400	390	359	131	318	65%	5.15	
470	460	409	155	479	85%	5.74	
520	510	463	172	540	85%	5.85	
580	560	507	187	520	75%	5.50	
620	600	548	203	488	65%	5.10	
250	240	220	70.9	175	60%	5.58	
280	270	246	85.3	199	60%	5.22	
300	300	270	97.6	220	60%	5.02	
330	320	292	107	239	60%	4.94	
350	350	313	117	258	60%	4.89	
380	370	336	124	230	50%	4.57	
400	390	359	133	211	43%	4.30	
470	460	409	156	339	60%	4.79	
520	510	463	173	382	60%	4.88	
580	560	507	189	348	50%	4.53	
620	600	548	205	324	43%	4.25	

### NOTES

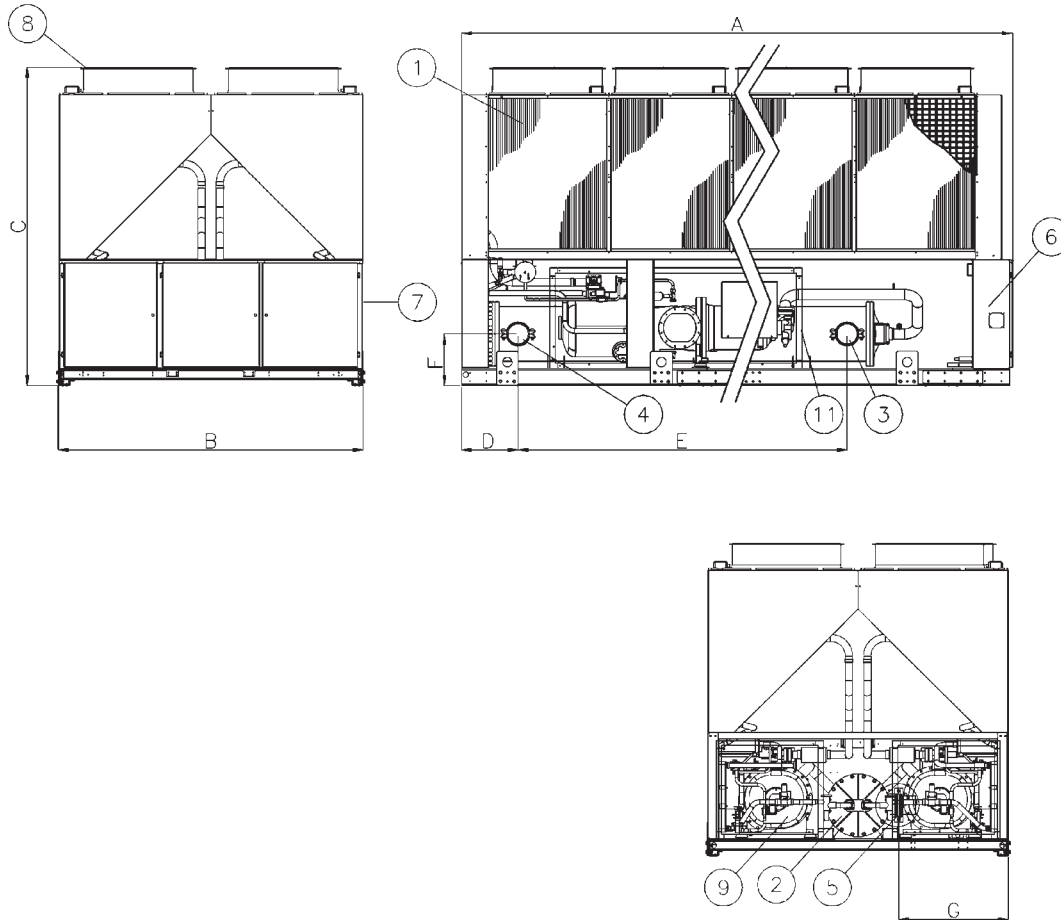
- Cc (cooling capacity)
- Pi (unit power input)
- Hc (heating heat recovery capacity)
- %Hc (percentage heat recovered)
- EER Hc (coefficient of performance during heat recovery = (cooling+ heating capacity) / power input)
- EW (Entering water heat recovery condenser)
- LWC (Leaving water heat recovery 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<sup>2</sup> °C/kW evaporator fouling factor

# 7 Dimensional drawings

## 7 - 1 Dimensional Drawings

Dimensions EWAD~D-



6  
7

Models	Dimensions (mm)						
	A	B	C	D	E	F	G
EWAD							
EWAD390D-SS	3139	2234	2223	392	1875	339	873
EWAD440~580D-SS	4040	2234	2223	392	2450	339	855
EWAD230~300D-SL	3139	2234	2355	374	1911	339	873
EWAD320D-SL	4040	2234	2355	374	2486	339	873
EWAD400~530D-SL	4040	2234	2223	392	2450	339	855
EWAD220~280D-SR	3139	2234	2355	374	1911	339	873
EWAD310D-SR	4040	2234	2355	374	2486	339	873
EWAD400~530D-SR	4040	2234	2223	392	2450	339	855
EWAD210D-SX	3139	2234	2420	374	1911	339	873
EWAD230~310D-SX	4040	2234	2420	374	2486	339	873
EWAD370~490D-SX	4040	2234	2420	392	2450	339	873
EWAD250D-XS	3138	2234	2355	374	1911	339	873
EWAD280~400D-XS	4040	2234	2355	374	2486	339	873
EWAD470D-XS	4040	2234	2223	414	2412	379	873
EWAD520~620D-XS	4940	2234	2223	414	2412	379	815
EWAD240D-XR	3138	2234	2355	374	1911	339	873
EWAD270~390D-XR	4040	2234	2355	374	2486	339	873
EWAD460D-XR	4040	2234	2223	414	2412	379	873
EWAD510~600D-XR	4940	2234	2223	414	2412	379	815
EWAD230~310D-HS	3339	2234	2223	374	1911	339	873
EWAD340~380D-HS	4040	2234	2223	374	2486	339	873
EWAD420~590D-HS	4040	2234	2223	392	2450	339	873

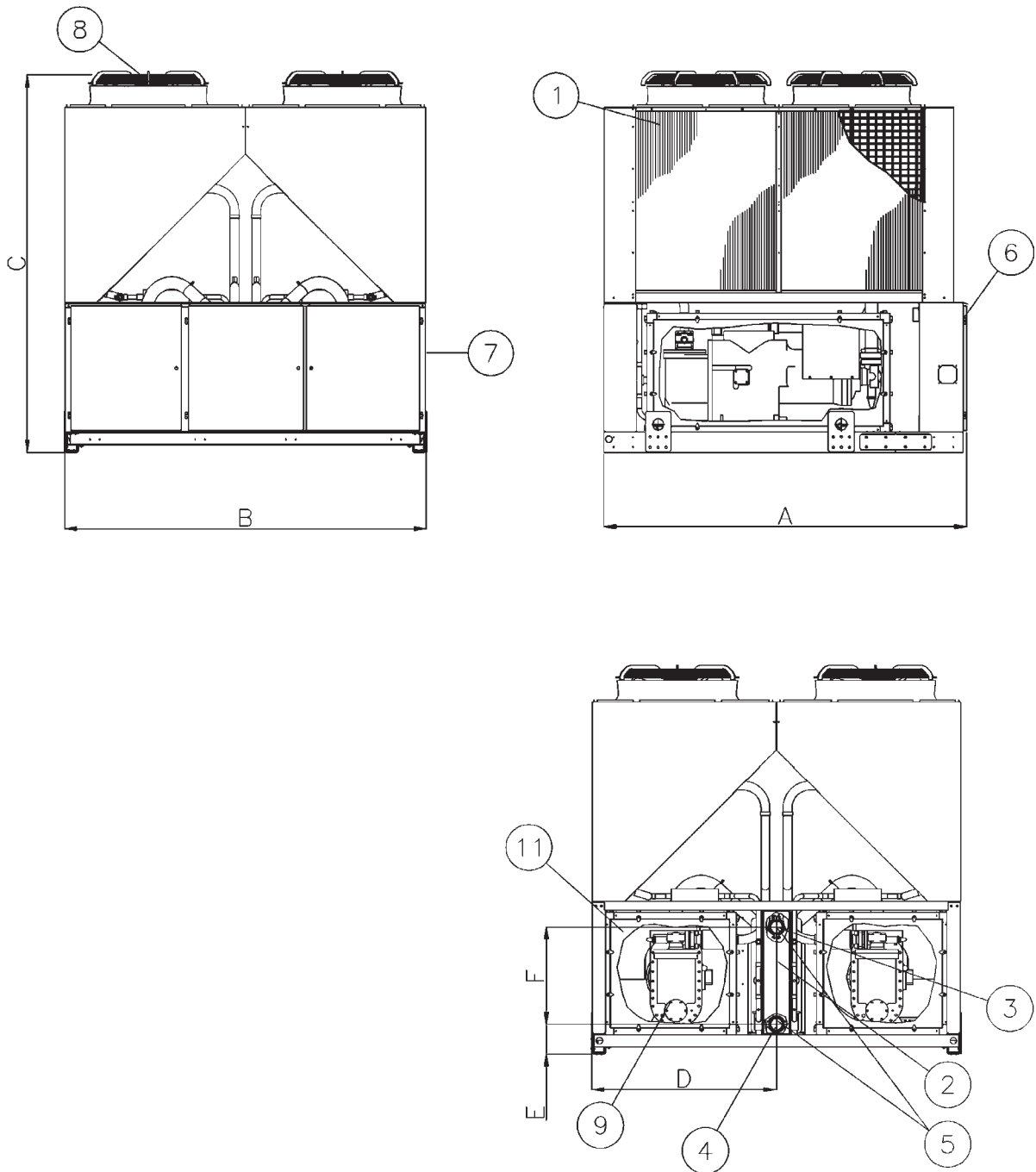
**LEGEND**

- 1 – Condenser Coil
- 2 – Water heat exchanger (evaporator)
- 3 – Evaporator water inlet
- 4 – Evaporator water outlet
- 5 – Victaulic connection
- 6 – Operating and control panel
- 7 – Slot for power and control connection
- 8 – Fan
- 9 – Compressor

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# 7 Dimensional drawings

## 7 - 1 Dimensional Drawings



6  
7

Models	Dimensions (mm)					
	A	B	C	D	E	F
EWAD180~200D-SL	2239	2234	2355	1117	181	590
EWAD180~190D-SR	2239	2234	2355	1117	181	590
EWAD200~210D-HS	2223	2234	2223	1117	181	590

**LEGEND**

- 1 – Condenser Coil
- 2 – Water heat exchanger (evaporator)
- 3 – Evaporator water inlet
- 4 – Evaporator water outlet
- 5 – Victaulic connection
- 6 – Operating and control panel
- 7 – Slot for power and control connection
- 8 – Fan
- 9 – Compressor

DMN\_1a-2a\_Rev.01\_2

## 8 Sound data

### 8 - 1 Sound Level Data

#### EWAD-D-SX

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)									Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)	
210	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.3	
230	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
250	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
270	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
290	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
300	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
310	68.5	60.1	65.1	65.1	57.9	55.4	42.3	35.8	65.0	84.7	
370	62.0	60.0	63.5	63.0	60.0	58.0	47.0	36.5	65.0	84.7	
410	62.0	60.0	63.5	63.0	60.0	58.0	47.0	36.5	65.0	84.7	
450	63.5	59.5	63.5	62.5	60.5	59.5	46.5	37.0	65.5	85.7	
490	62.0	59.0	64.0	65.0	59.5	59.0	50.5	39.5	66.0	86.2	

#### NOTES

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

#### EWAD-D-XS

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)									Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)	
250	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	96.8	
280	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	97.2	
300	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	97.2	
330	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	97.2	
350	79.5	74.9	72.9	79.2	68.7	65.9	57.3	51.4	77.5	97.2	
380	81.0	76.4	74.4	80.7	70.2	67.4	58.8	52.9	79.0	98.7	
400	81.0	76.4	74.4	80.7	70.2	67.4	58.8	52.9	79.0	98.7	
470	64.5	73.5	73.0	78.5	71.5	73.0	60.0	53.0	79.0	98.7	
520	64.5	73.5	73.5	78.5	71.5	73.0	60.0	53.0	79.0	99.2	
580	64.5	73.5	73.5	78.5	71.6	73.1	60.0	53.0	79.0	99.2	
620	64.5	73.5	73.5	78.5	71.5	73.0	60.0	53.0	79.0	99.2	

#### NOTES

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

#### EWAD-D-XR

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10 <sup>-5</sup> Pa)									Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)	
240	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	91.8	
270	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	92.2	
300	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	92.2	
320	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	92.2	
350	78.9	72.4	69.2	73.4	65.6	61.2	54.2	47.4	72.5	92.2	
370	79.1	73.4	70.2	74.4	66.6	62.2	55.2	48.4	73.5	93.2	
390	79.1	73.4	70.2	74.4	66.6	62.2	55.2	48.4	73.5	93.2	
460	59.0	68.0	67.5	73.0	66.0	67.5	54.5	47.5	73.5	93.2	
510	59.0	68.0	68.0	73.0	66.0	67.5	54.5	47.5	73.5	93.7	
560	59.0	68.0	68.0	73.0	66.1	67.6	54.5	47.5	73.5	93.7	
600	59.0	68.0	68.0	73.0	66.0	67.5	54.5	47.5	73.5	93.7	

#### NOTES

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

## 8 Sound data

### 8 - 1 Sound Level Data

#### EWAD-D-SX

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
210	0.0	-8.0	-12.8	-15.9	-18.2	-20.0	-25.7
230	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
250	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
270	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
290	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
300	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
310	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
370	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
410	0.0	-7.7	-12.4	-15.5	-17.8	-19.6	-25.3
450	0.0	-7.4	-12.1	-15.2	-17.4	-19.2	-24.9
490	0.0	-7.4	-12.1	-15.2	-17.4	-19.2	-24.9

#### NOTES

Values are dB(A) (pressure level)

#### EWAD-D-XS

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
250	0.0	-8.0	-12.9	-16.0	-18.2	18.2	-25.8
280	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
300	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
330	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
350	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
380	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
400	0.0	-7.7	-12.5	-15.6	-17.8	17.8	-25.3
470	0.0	-7.8	-12.6	-15.7	-17.9	17.9	-25.4
520	0.0	-7.5	-12.3	-15.3	-17.6	17.6	-25.0
580	0.0	-7.5	-12.3	-15.3	-17.6	17.6	-25.0
620	0.0	-7.5	-12.3	-15.3	-17.6	17.6	-25.0

#### NOTES

Values are dB(A) (pressure level)

#### EWAD-D-XR

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
240	0.0	-8.0	-12.9	-16.0	-18.2	-20.0	-25.8
270	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
300	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
320	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
350	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
370	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
390	0.0	-7.7	-12.5	-15.6	-17.8	-19.6	-25.3
460	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
510	0.0	-7.5	-12.3	-15.3	-17.6	-19.3	-25.0
560	0.0	-7.5	-12.3	-15.3	-17.6	-19.3	-25.0
600	0.0	-7.5	-12.3	-15.3	-17.6	-19.3	-25.0

#### NOTES

Values are dB(A) (pressure level)



## 9 Installation

### 9 - 1 Installation Method

#### Installation notes

##### Warning

Installation and maintenance of the unit must be performed only by qualified personnel who have knowledge with local codes and regulations, and experience with this type of equipment. The unit must be installed to allow all the maintenance operations.

##### Handling

Care should be taken to avoid rough handling or shock due to dropping of 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 result in reductions in unit efficiency and capacity.

Moreover the unique microprocessor has the ability to analyse the operating environment of the air cooled chiller and to optimize its performance to stay 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.3). 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 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.4); 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 for general installation. A specific evaluation should be done by contractor depending on the case.

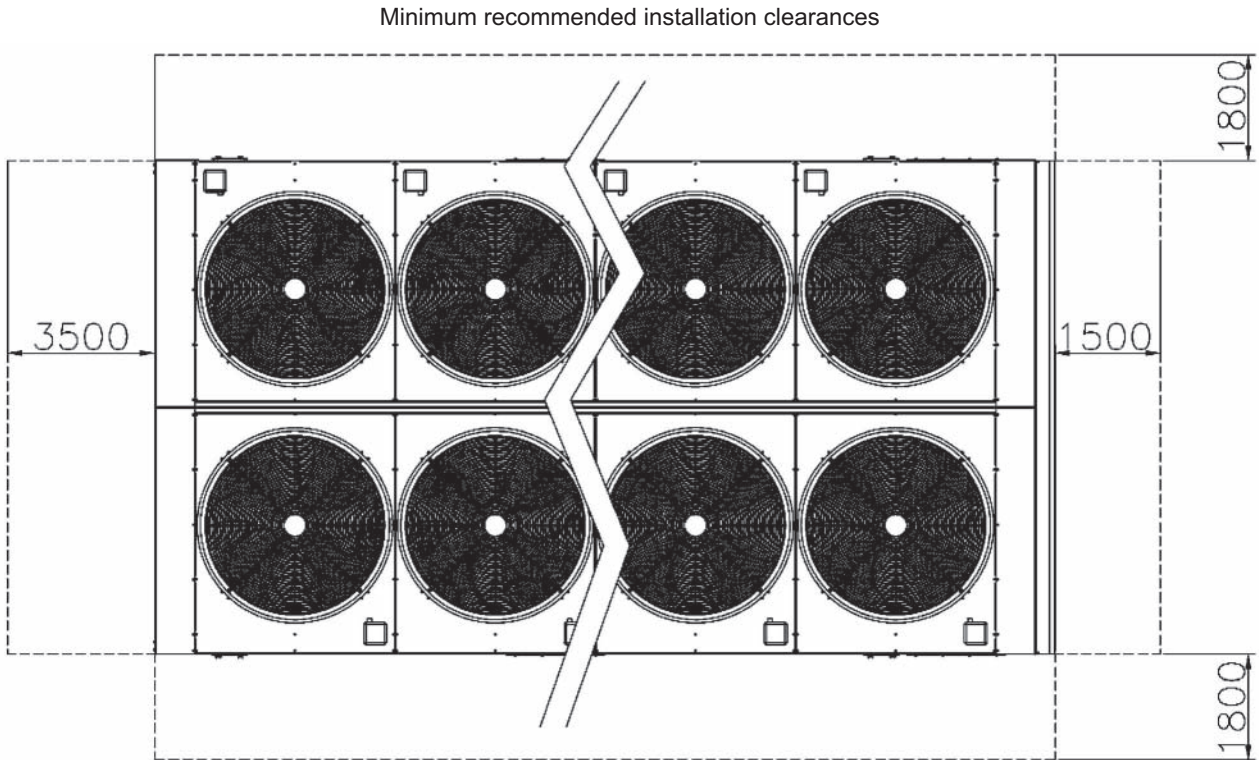


Fig. 1

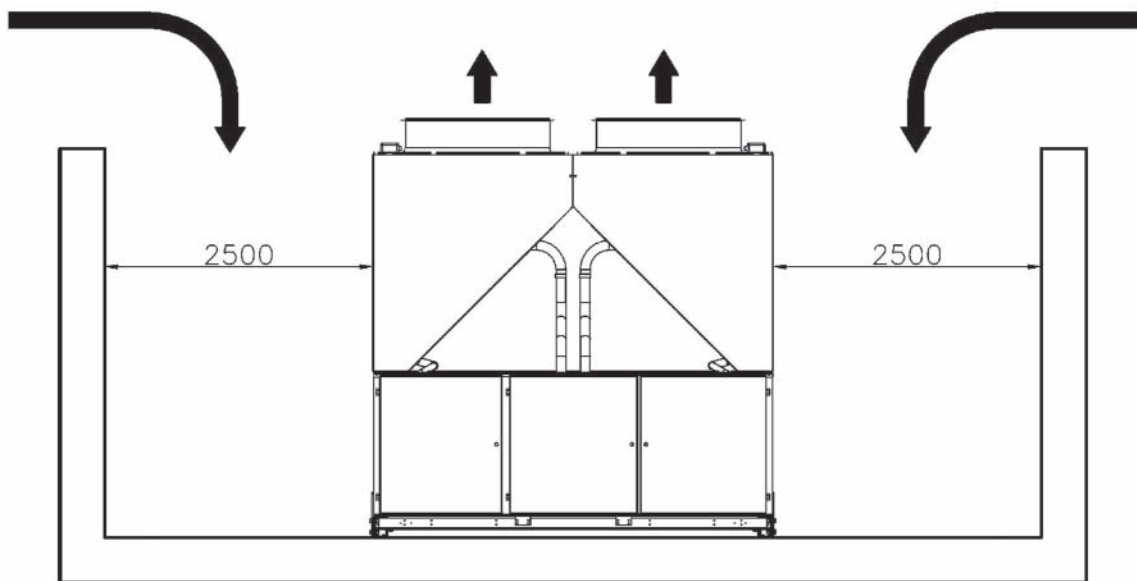


Fig. 2

## 9 Installation

### 9 - 1 Installation Method

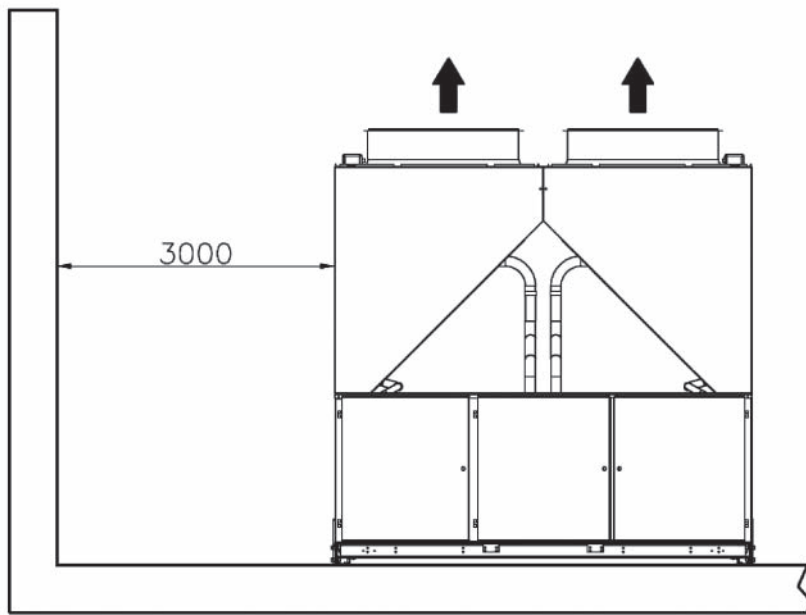


Fig. 3

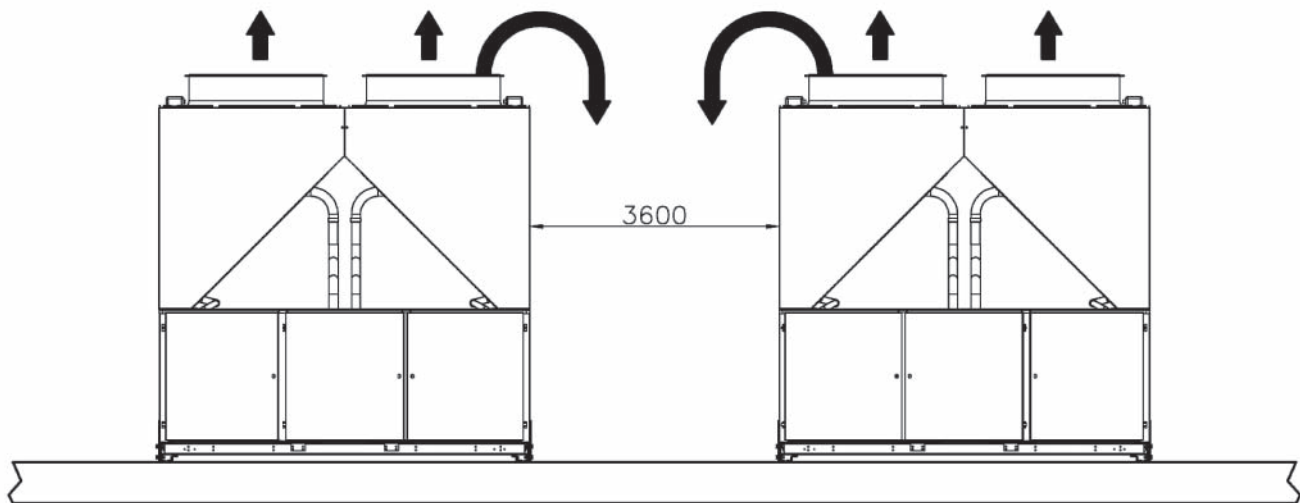


Fig. 4

#### 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

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# 10 Operation range

## 10 - 1 Operation Range

**Table 1 - Evaporator minimum and maximum water Δt**

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

**Table 2 - Evaporator fouling factors**

Fouling factors m <sup>2</sup> °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 - Air heat exchanger - 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 operating altitude is 2000 m above sea level.

- Contact factory in case the unit has to be installed at altitudes between 1000 and 2000 m above sea level.

**Table 4.1 - Minimum glycol percentage for low water temperature**

EWLT (°C)	2	0	-2	-4	-6	-8	-10	-12	-15
Ethylene glycol (%)	10	20	20	20	30	30	30	40	40
Propylene glycol (%)	10	20	20	30	30	30	40	40	40

- ELWT (Evaporator Leaving Water Temperature (°C)).

- 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 ambient temperature**

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

- Minimum glycol percentage to prevent freezing of water circuit at indicated air ambient temperature.

- 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 (EWLT < 4°C)**

EWLT (°C)	-4	-6	-8	-10	-12	-15
Cooling Capacity	0.670	0.613	0.562	0.510	0.455	0.375
Compressor Power Input	0.890	0.870	0.840	0.798	0.755	0.680

- ELWT (Evaporator Leaving Water Temperature (°C)).

- 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

- Contact factory for water temperature out of operating limits.

# 10 Operation range

## 10 - 1 Operation Range

### 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 Evaporator 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: **EWAD390D-SS**

Mixture: Water  
 Working condition: ELWT 12/7°C – Condenser inlet air temperature 35°C  
 - Cooling capacity: 389 kW  
 - Power input: 152 kW  
 - Flow rate ( $\Delta t$  5°C): 18.60 l/s  
 - Evaporator pressure drop: 46 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:  $389 \times 0.972 = 378$  kW  
 - Power input:  $152 \times 0.986 = 150$  kW  
 - Flow rate ( $\Delta t$  5°C):  $18$  (referred to 378 kW)  $\times 1.074 = 19.33$  l/s  
 - Evaporator pressure drop:  $49$  (referred to 19.33 l/s)  $\times 1.181 = 58$  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 Evaporator 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: **EWAD390D-SS**

Mixture: Water  
 Standard working condition: ELWT 12/7°C – Condenser inlet air temperature 30°C  
 - Cooling capacity: 412 kW  
 - Power input: 139 kW  
 - Flow rate ( $\Delta t$  5°C): 19.7 l/s  
 - Evaporator pressure drop: 51 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:  $412 \times 0.613 \times 0.972 = 245$  kW  
 - Power input:  $139 \times 0.870 \times 0.986 = 119$  kW  
 - Flow rate ( $\Delta t$  5°C):  $11.71$  l/s (referred to 245 kW)  $\times 1.074 = 12.58$  l/s  
 - Evaporator pressure drop:  $23$  kPa (referred to 12.58 l/s)  $\times 1.181 = 27$  kPa

# 10 Operation range

## 10 - 1 Operation Range

Table 7.1 - 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

ESP table refers to fan diameter Ø800, available on units as follows:

EWAD390~580D-SS  
EWAD470~620D-XS  
EWAD420~590D-HS

Table 7.2 - Available fan static pressure correction factors

"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

ESP table refers to fan diameter Ø800, available on units as follows:

EWAD320~530D-SL/SR  
EWAD460~600D-XR

### How to use the Correction factors proposed in the previous tables

#### Example

Unit Size:

**EWAD390D-SS**

**- External static pressure**

**0 Pa**

- Working condition:

ELWT 12/7°C – Condenser inlet air temperature 35°C

- Cooling capacity:

389 kW

- Power input:

152 kW

- Maximum CIAT

48°C (see graphic operating limit)

**- External static pressure**

**40 Pa**

- Working condition:

ELWT 12/7°C – Condenser inlet air temperature 35°C

- Cooling capacity:

389 x 0.993 = 386 kW

- Power input:

152 x 1.018 = 155 kW

- Maximum CIAT

48 - 1.0 = 47°C

# 10 Operation range

## 10 - 1 Operation Range

### Water charge, flow and quality

Items <sup>(1) (5)</sup>		Cooling Water			Cooled Water		Heated water <sup>(2)</sup>				Tendency if out of criteria		
		Circulating System		Once Flow			Low temperature		High temperature				
		Circulating water	Supply water <sup>(4)</sup>		Flowing water	Circulating water [Below 20°C]	Supply water <sup>(4)</sup>	Circulating water [20°C ~ 60°C]	Supply water <sup>(4)</sup>	Circulating water [60°C ~ 80°C]		Supply water <sup>(4)</sup>	
Items to be controlled:	pH	at 25°C		6.5 ~ 8.2	6.0 ~ 8.0	6.0 ~ 8.0	6.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	Corrosion + Scale	
	Electrical conductivity	[mS/m] at 25°C	Below 80	Below 30	Below 40	Below 40	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Corrosion + Scale
		(μS/cm) at 25°C	(Below 800)	(Below 300)	(Below 400)	(Below 400)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	Corrosion + Scale
	Chloride ion	[mgCl <sup>-</sup> /l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	Sulfate ion	[mgSO <sub>4</sub> <sup>2-</sup> /l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	M-alkalinity (pH4.8)	[mgCaCO <sub>3</sub> /l]	Below 100	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Total hardness	[mgCaCO <sub>3</sub> /l]	Below 200	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Scale
	Calcium hardness	[mgCaCO <sub>3</sub> /l]	Below 150	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
Silica ion	[mgSiO <sub>2</sub> /l]	Below 50	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Scale	
Items to be referred to	Iron	[mgFe/l]	Below 1.0	Below 0.3	Below 1.0	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Below 1.0	Below 0.3	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	Below 0.1	Corrosion
	Sulfite ion	[mgS <sup>2-</sup> /l]	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Corrosion
	Ammonium ion	[mgNH <sub>4</sub> <sup>+</sup> /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	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	Below 0.3	Corrosion
	Free carbide	[mgCO <sub>2</sub> /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	Below 4.0	Corrosion
	Stability index		6.0 ~ 7.0	---	---	---	---	---	---	---	---	---	Corrosion + Scale

### NOTES

- Names, definitions and units are according to JIS K 0101. Units and figures between brackets are old units published as reference only.
- 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 desirable to give the valid measure for corrosion. E.g. chemical measure.
- 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.
- Supply water is considered drink water, industrial water and ground water except for genuine water, neutral water and soft water.
- The above mentioned items are representable items in corrosion and scale cases.

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## 10 Operation range

### 10 - 1 Operation Range

#### 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

$$M \text{ (liters)} = ( 0.1595 \times \Delta T(^{\circ}\text{C}) + 3.0825 ) \times P(\text{kW})$$

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.



## 10 Operation range

### 10 - 1 Operation Range

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where:

- M minimum water content per unit expressed in litres
- P Cooling Capacity of the unit expressed in kW
- $\Delta T$  evaporator entering / leaving water temperature difference expressed in  $^{\circ}\text{C}$

This formula is valid for:

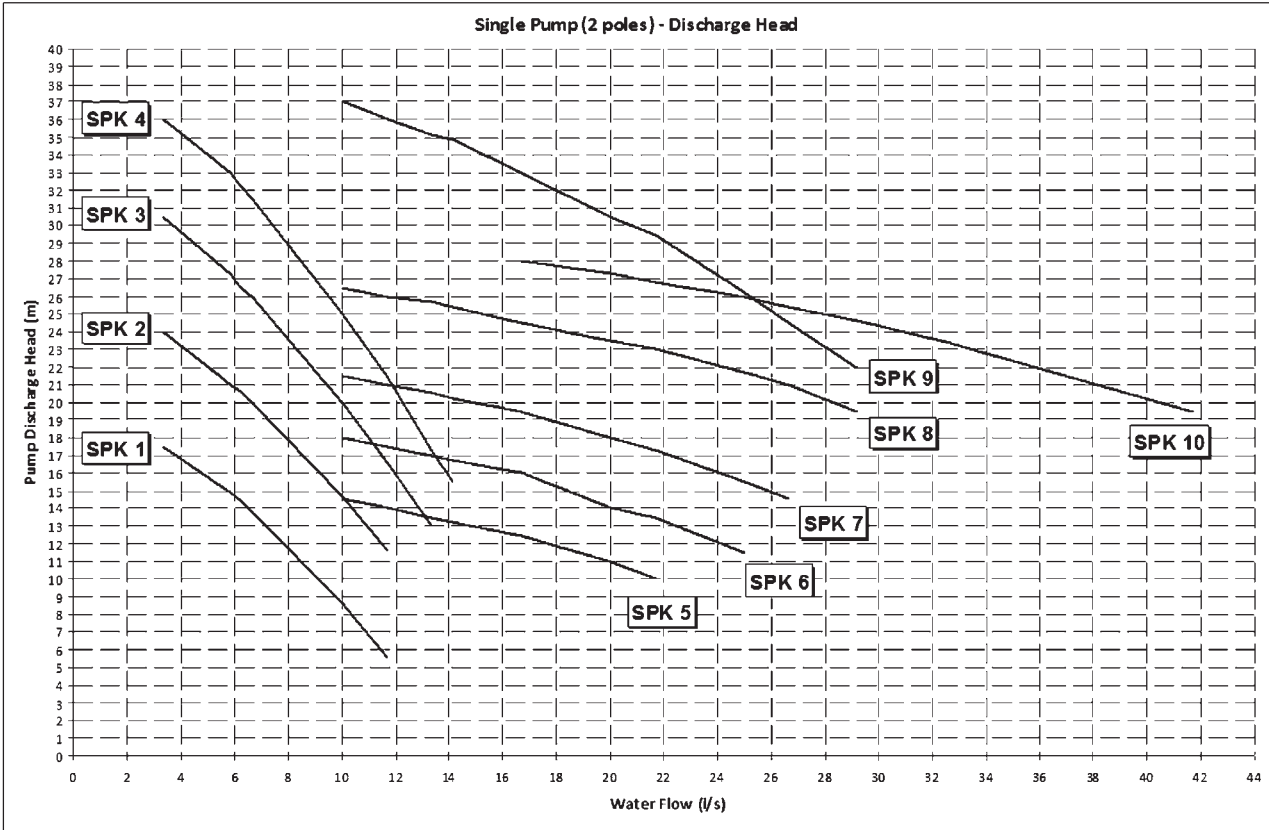
- standard microprocessor parameters

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

# 11 Hydraulic performance

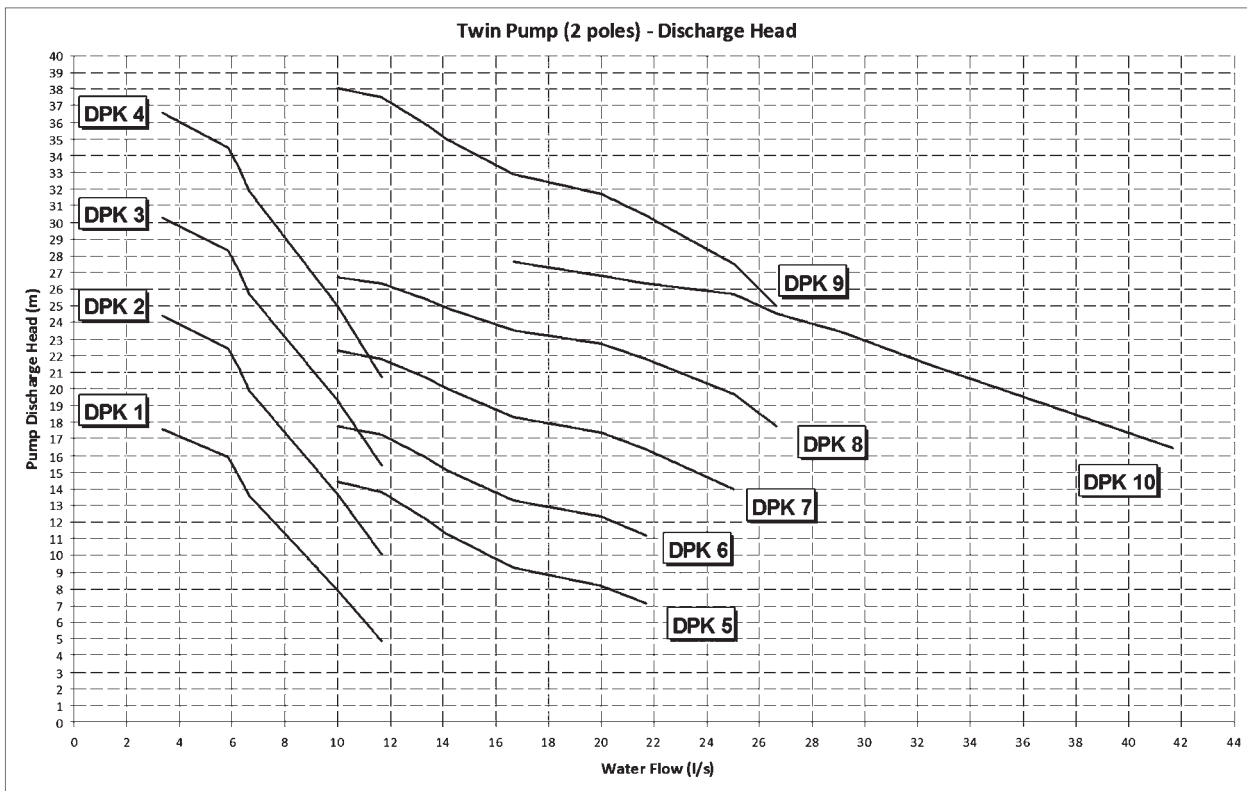
## 11 - 1 Pump Characteristics

Water Pump Kit - Available External Static Pressure



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Water Pump Kit - Available External Static Pressure



OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_6 (2/2)

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

Water Pump Kit - Combination Matrix

Version	Size	Single Pump										
		SPK 1	SPK 2	SPK 3	SPK 4	SPK 5	SPK 6	SPK 7	SPK 8	SPK 9	SPK 10	
EWAD-D-SS	390						X	X	X	X	X	
	440						X	X	X	X	X	
	470						X	X	X	X	X	
	510						X	X	X	X	X	
	530							X	X	X	X	
	560							X	X	X	X	
	580							X	X	X	X	
EWAD-D-SL	180	X	X	X	X							
	200	X	X	X	X							
	230		X	X	X							
	250		X	X	X		X	X	X	X		
	260			X	X		X	X	X	X		
	280			X	X		X	X	X	X		
	300			X	X		X	X	X	X		
	320					X	X	X	X	X		
	370					X	X	X	X	X	X	
	400					X	X	X	X	X	X	
	440						X	X	X	X	X	
	480						X	X	X	X	X	
	510						X	X	X	X	X	
530							X	X	X	X		
EWAD-D-SR	180	X	X	X	X							
	190	X	X	X	X							
	220		X	X	X		X	X	X	X		
	240		X	X	X		X	X	X	X		
	250			X	X		X	X	X	X		
	270			X	X		X	X	X	X		
	280			X	X		X	X	X	X		
	310					X	X	X	X	X		
	370					X	X	X	X	X	X	
	400					X	X	X	X	X	X	
	440						X	X	X	X	X	
	480						X	X	X	X	X	
	510						X	X	X	X	X	
530							X	X	X	X		
EWAD-D-SX	210		X	X	X							
	230		X	X	X	X	X	X	X	X		
	250		X	X	X	X	X	X	X	X		
	270		X	X	X	X	X	X	X	X		
	290			X	X	X	X	X	X	X		
	300				X	X	X	X	X	X		
	310				X	X	X	X	X	X		
	370				X	X	X	X	X	X	X	
	410				X	X	X	X	X	X	X	
	450				X	X	X	X	X	X	X	
	490				X	X	X	X	X	X	X	
	250			X	X	X	X	X	X	X		
	280			X	X	X	X	X	X	X		
300				X	X	X	X	X	X			
330				X	X	X	X	X	X			
350				X	X	X	X	X	X	X		
380				X	X	X	X	X	X	X		
400				X	X	X	X	X	X	X		
470					X	X	X	X	X	X		
520					X	X	X	X	X	X		
580							X	X	X	X		
620								X	X	X		
EWAD-D-XR	240		X	X	X	X	X	X	X	X		
	270			X	X	X	X	X	X	X		
	300				X	X	X	X	X	X		
	320				X	X	X	X	X	X		
	350				X	X	X	X	X	X		
	370				X	X	X	X	X	X	X	
	390				X	X	X	X	X	X	X	
	460					X	X	X	X	X	X	
	510					X	X	X	X	X	X	
	560						X	X	X	X	X	
	600							X	X	X	X	
	EWAD-D-HS	200		X	X	X						
		210		X	X	X						
230			X	X	X	X	X	X	X	X		
260				X	X	X	X	X	X	X		
270				X	X	X	X	X	X	X		
290					X	X	X	X	X	X		
310					X	X	X	X	X	X		
340					X	X	X	X	X	X		
380					X	X	X	X	X	X	X	
420					X	X	X	X	X	X	X	
450						X	X	X	X	X	X	
480						X	X	X	X	X	X	
510						X	X	X	X	X	X	
550						X	X	X	X	X		
590							X	X	X	X		

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

Water Pump Kit - Combination Matrix

Version	Size	Double Pump										
		DPK 1	DPK 2	DPK 3	DPK 4	DPK 5	DPK 6	DPK 7	DPK 8	DPK 9	DPK 10	
EWAD-D-SS	390						X	X	X	X	X	
	440						X	X	X	X	X	
	470							X	X	X	X	
	510							X	X	X	X	
	530								X	X	X	
	560								X	X	X	
	580									X	X	
EWAD-D-SL	180	X	X	X	X							
	200	X	X	X	X							
	230		X	X	X							
	250						X	X		X		
	260							X		X		
	280					X	X	X		X		
	300					X	X	X		X		
	320						X	X		X		
	370						X	X		X	X	
	400						X	X		X	X	
	440						X	X		X	X	
	480							X	X	X	X	
	510							X	X	X	X	
530								X	X	X		
EWAD-D-SR	180	X	X	X	X							
	190	X	X	X	X							
	220		X	X	X		X	X		X		
	240		X	X	X		X	X		X		
	250						X	X		X		
	270						X	X		X		
	280						X	X		X		
	310						X	X		X		
	370						X	X		X	X	
	400						X	X		X	X	
	440						X	X		X	X	
	480							X	X	X	X	
	510							X	X	X	X	
530								X	X	X		
EWAD-D-SX	210		X	X	X							
	230		X	X	X	X	X	X	X			
	250			X	X	X	X	X	X			
	270			X	X	X	X	X	X			
	290				X	X	X	X	X			
	300					X	X	X	X			
	310					X	X	X	X			
	370					X	X	X	X		X	
	410					X	X	X	X		X	
	450					X	X	X	X		X	
	490						X	X	X		X	
	250						X	X	X			
	280					X	X	X	X			
300					X	X	X	X				
330					X	X	X	X				
350						X	X	X		X		
380						X	X	X		X		
400						X	X	X		X		
470							X	X		X		
520							X	X		X		
580										X		
620										X		
EWAD-D-XR	240		X	X	X		X	X	X			
	270					X	X	X	X			
	300					X	X	X	X			
	320					X	X	X	X			
	350						X	X	X			
	370						X	X	X			
	390						X	X	X		X	
	460							X	X		X	
	510							X	X		X	
	560										X	
	600										X	
	EWAD-D-HS	200	X	X	X	X						
		210	X	X	X	X						
230			X	X	X							
260							X	X	X			
270							X	X	X			
290						X	X	X	X			
310							X	X	X			
340							X	X	X			
360							X	X	X		X	
420							X	X	X		X	
450							X	X	X		X	
480								X	X		X	
510								X	X		X	
550								X		X		
590										X		

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11

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

### 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	1.5	3.5	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 2	2.2	5.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 3	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 4	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 5	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 6	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 7	5.5	10.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 8	7.5	13.7	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 9	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 10	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
Double Pump	DPK 1	1.5	3.5	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 2	2.2	5.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 3	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 4	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 5	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 6	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 7	5.5	10.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 8	7.5	13.7	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 9	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 10	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130

#### NOTES

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

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# 11 Hydraulic performance

## 11 - 2 Total and Partial 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:

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

where:

- PD<sub>2</sub> Pressure drop to be determinate (kPa)
- PD<sub>1</sub> Pressure drop at nominal condition (kPa)
- Q<sub>2</sub> water flow at new working condition (l/s)
- Q<sub>1</sub> water flow at nominal condition (l/s)

### How to use the formula: Example

The unit EWAD390D-SS has been selected for working at the following conditions:

- Total heat recovery leaving water temperature 40/50°C
- The heating capacity at these working conditions is: 415 kW
- The water flow at these working conditions is: 9.91 l/s

The unit EWAD390D-SS at nominal working conditions has the following data:

- Total heat recovery leaving water temperature 40/45°C
- condenser air inlet: 35°C
- The heating capacity at these working conditions is: 427 kW
- The water flow at these working conditions is: 20.41 l/s
- The pressure drop at these working conditions is: 37 kPa

The pressure drop at the selected working condition will be:

$$PD_2 \text{ (kPa)} = 37 \text{ (kPa)} \times \left( \frac{9.91 \text{ (l/s)}}{20.41 \text{ (l/s)}} \right)^{1.80}$$

$$PD_2 \text{ (kPa)} = 10 \text{ (kPa)}$$

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_5

### Total Heat Recovery pressure drops

	EWAD~D-XS	250	280	300	330	350	380	400	470	520	580	620
	EWAD~D-XR	240	270	300	320	350	370	390	460	510	560	600
Heating Capacity (kW)		255	291	322	350	376	356	329	495	558	537	504
Water Flow (l/s)		12.21	13.88	15.37	16.70	17.97	16.99	15.72	23.65	26.64	25.68	24.10
Heat Recovery Pressure Drops (kPa)		26	32	34	37	37	31	25	41	17	15	11

### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – saturated discharge temperature 45°C – water heat recovery in/out 40/45°C

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_3 (2/3)

# 11 Hydraulic performance

## 11 - 2 Total and Partial Heat Recovery Pressure Drop

### Partial Heat Recovery pressure drops

	EWAD-D-XS	250	280	300	330	350	380	400	470	520	580	620
	EWAD-D-XR	240	270	300	320	350	370	390	460	510	560	600
Heating Capacity (kW)		102	117	129	140	151	138	128	198	223	209	196
Water Flow (l/s)		4.89	5.57	6.16	6.69	7.20	6.61	6.12	9.48	10.67	9.99	9.38
Heat Recovery Pressure Drops (kPa)		5	6	7	7	7	6	5	8	3	3	2

### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser air inlet 35°C – water heat recovery in/out 50/60°C

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_4 (2/3)

# 12 Specification text

## 12 - 1 Specification Text

### Technical Specification for Water Cooled Screw Chiller

#### GENERAL

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

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

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 air cooled screw chiller(s) : ..... unit(s)
- ✓ Cooling capacity for single air cooled screw chiller : ..... kW
- ✓ Power input for single air cooled screw 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 independent refrigerant circuits, semi-hermetic type rotary single screw compressor, electronic expansion device (EEXV), refrigerant 'plate to plate' or 'shell&tube' heat exchanger (depending on the size), air-cooled condenser section, R-134a refrigerant, lubrication system, motor starting components, discharge line shut-off valve, suction 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.

#### NOISE LEVEL AND VIBRATIONS

Sound pressure level at 1 meter distance in free field, semispheric conditions, shall not exceed .....dB(A). The sound pressure levels must be rated in accordance to ISO 3744 (other types of rating can not be used).

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



## 12 Specification text

### 12 - 1 Specification Text

#### DIMENSIONS

Unit dimensions shall not exceed following indications:

- Unit length ..... mm
- Unit width ..... mm
- Unit height ..... mm

#### CHILLER COMPONENTS

##### Compressors

- ✓ The compressor is semi-hermetic, single-screw type with gate-rotors made of carbon impregnated engineered composite material or the latest high-strength fibre reinforced star material (depending on the size). The gaterotor supports will be constructed of cast iron.
- ✓ The oil injection shall be used in order to get high EER (Energy Efficiency Ratio) also at high condensing pressure and low sound pressure levels in each load condition.
- ✓ 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 slide valve position.
- ✓ The unit capacity control shall be infinitely modulating, from 100% down to 25% for each circuit. The chiller shall be capable of stable operation to a minimum of 12.5% 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.
- ✓ The unit control logic shall manage the compressor slides to exactly match the plant load request in order to keep constant the set point for delivered chilled water temperature.
- ✓ 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:
  - High condenser pressure
  - Low evaporating refrigerant temperature

##### Evaporator

- ✓ The units shall be equipped (depending on the size) with a 'plate to plate' or 'shell&tube' evaporator:
  - The 'plate to plate' evaporator is made of stainless steel brazed plates and is covered with a 20mm closed cell insulation material. The exchanger is equipped with a heater for protection against freezing down to -28°C and evaporator water outlet connections of 3". Each evaporator has 1 circuit (one compressor) and the water filter is standard.
  - The 'shell&tube' evaporator is made with copper tubes rolled into steel tubesheets. The evaporators are single-pass on both the refrigerant and water sides for pure counter-flow heat exchange and low refrigerant pressure drops. The external shell is covered with a 10mm closed cell insulation material and the evaporator water outlet connections are provided with victaulic kit (as standard). Each evaporator has 2 circuits, one for each compressor and the water filter is standard.
- ✓ The evaporator is manufactured in accordance to PED approval.

SPC\_1-2-3-4\_Rev.00\_2

## 12 Specification text

### 12 - 1 Specification Text

#### 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 thermal protection by internal thermal motor protection and protected by circuit breaker installed inside the electrical panel as a standard.

#### Refrigerant circuit

- ✓ The unit shall have two independent refrigerant circuits.
- ✓ Each circuit shall include as standard: electronic expansion device piloted by unit's microprocessor control, compressor discharge shut-off valve, suction 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:
  - in-line single pump low and high lifting
  - in-line twin pumps low and high lifting

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

#### Optional High Level Communications Interface

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



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# 1 Features

- High ambient
- Standard sound level configuration: condenser fan rotating at 890 rpm, rubber antivibration under compressor
- Stepless single-screw compressor
- Optimised for use with R-134a
- MicroTech III controller
- Large operation range (ambient temperature down to -18°C)



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## 2 Features and advantages

### Features and advantages

#### Low operating cost

This chiller range is the result of careful design, aimed to optimize the energy efficiency of the chillers, with the objective of bringing down operating costs and improving installation profitability, effectiveness and economical management.

The chillers feature a high efficiency single rotor screw compressor design, large condenser coil surface area for maximum heat transfer and low discharge pressure, advanced technology condenser fans and a 'plate to plate' or 'shell&tube' evaporator with low refrigerant pressure drops.

#### Low operating sound levels

Very low sound levels both at full load and part load conditions are achieved by the latest compressor design and by a unique new fan that moves large volume of air at exceptionally low sound levels and by the virtually vibration-free operation.

#### Excellent serviceability

Field serviceability has not been sacrificed to meet design performance objectives. The compressor is equipped with discharge, liquid and suction shut off valves. The compressor and serviceable components such as filter-driers are located on the outside edges of the base allowing, together with the shape of the coil, an easy access for inspection and service. Moreover, the MicroTech III controller gives detailed information on the causes of an alarm or fault.

#### Proven reliability

Full factory testing of every unit with water hook-up helps in providing a trouble-free start-up. Extensive quality control checks during testing means that each equipment protection and operating control is properly adjusted and operates correctly before it leaves the factory.

#### Infinite capacity control

Cooling capacity control is infinitely variable by means of a single screw compressor controlled by microprocessor system. Each unit has infinitely variable capacity control from 100% down to 12.5%. This modulation allows the compressor capacity to exactly match the building cooling load. Chilled water temperature fluctuation is avoided only with a stepless control.

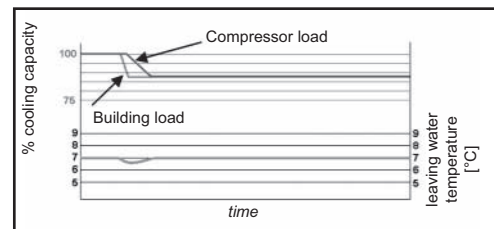
In the case that the compressor with load step control is used, the compressor capacity, at partial loads, will be too high or too low compared to the building cooling load. The result is an increase in chiller energy costs, particularly at the part-load conditions at which the chiller operates most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

Units with stepless regulation offer benefits that the units with step regulation are unable to match.

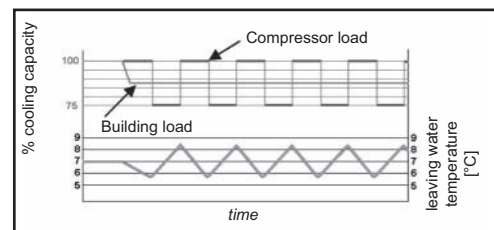
Only a chiller with step-less regulation, is able to follow the system cooling demand at any time and to deliver chilled water at set-point.

#### Superior control logic

The new MicroTech III controller provides an easy to use control environment. The control logic is designed to provide maximum efficiency and a history of unit operation. One of the greatest benefits is the easy interface with LonWorks, Bacnet, Ethernet TCP/IP or Modbus communications.



ELWT fluctuation with stepless capacity control



ELWT fluctuation with steps capacity control (4 steps)

## 2 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 Stds	UNI – EN ISO 9001:2004

### Certifications

All units manufactured by Daikin 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 for other applications, such as naval (RINA, etc.).

### Efficiency and sound configuration

The range is available in multiple efficiency and sound versions:

Efficiency level	Sound level			
	Standard	Low	Reduced	Extra low
Standard efficiency	EWAD~D-SS	EWAD~D-SL	EWAD~D-SR	EWAD~D-SX
High efficiency	EWAD~D-XS	N.A.	EWAD~D-XR	N.A.
High ambient	EWAD~D-HS	N.A.	N.A.	N.A.

### Versions

The range is available in three versions:

**S:** Standard efficiency

7 sizes to cover a range from 389 up to 578 kW with an EER up to 2.03 and an ESEER up to 3.56 (data refers to Standard sound configuration)

**X:** High efficiency

11 sizes to cover a range from 247 up to 622 kW with an EER up to 3.20 and an ESEER up to 4.01 (data refers to Standard sound configuration)

**H:** High ambient temperature

15 sizes to cover a range from 195 up to 587 kW with an EER up to 3.07 and an ESEER up to 3.79 (data refers to Standard sound configuration)

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 weighted formula enabling to take into account the variation of EER with the load rate and the variation of air inlet condenser temperature.

$$\text{ESEER} = (A \times \text{EER}100\%) + (B \times \text{EER}75\%) + (C \times \text{EER}50\%) + (D \times \text{EER}25\%)$$

	A	B	C	D
Coefficient	0.03 (3%)	0.33 (33%)	0.41 (41%)	0.23 (23%)
Air inlet condenser temperature	35°C	30°C	25°C	20°C

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## 2 Features and advantages

### Sound levels

The range is available in four different sound level configurations:

**S:** Standard sound

Condenser fan rotating at 890 rpm, rubber antivibration under compressor

**L:** Low sound

Condenser fan rotating at 900 rpm (EWAD180-370D-SL) and 705 rpm (EWAD400-530D-SL), rubber antivibration under compressor.

**R:** Reduced sound

Condenser fan rotating at 680 rpm (EWAD180-370D-SR) and 705 rpm (EWAD400-530D-SR), rubber antivibration under compressor, compressor sound enclosure.

**X:** Extra low sound

Condenser fan rotating at 500 rpm, rubber antivibration under compressor, compressor and evaporator sound enclosure.

## 3 General characteristics

### General characteristics

#### Cabinet and structure

The cabinet is made of galvanized steel sheet and painted to provide a high resistance to corrosion. Colour Ivory White (Munsell code 5Y7.5/1) ( $\pm$ 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.

#### Screw compressors with integrated oil separator

The range features two types of single-screw compressors:

A) The compressor is semi-hermetic, single-screw type with gate-rotors made of carbon impregnated engineered composite material. The compressor has one slide managed by the unit microprocessor for infinitely modulating the capacity between 100% to 25%. An integrated high efficiency oil separator maximizes the oil separation and standard start is Wye-delta (Y- $\Delta$ ) type.

This compressor is offered on following models:

- EWAD180~370D-SL
- EWAD180~370D-SR
- EWAD210~310D-SX
- EWAD250~400D-XS
- EWAD240~390D-XR
- EWAD200~380D-HS

B) The compressor is semi-hermetic, single-screw type with gate-rotor made with the latest high-strength fibre reinforced star material. The compressor has an asymmetric slide regulation managed by the unit controller for infinitely modulating capacity from 100% to 25%. An integrated high efficiency oil separator maximizes the oil separation and standard start is Wye-delta (Y- $\Delta$ ) type.

This compressor is offered on following models:

- EWAD390~580D-SS
- EWAD400~530D-SL
- EWAD400~530D-SR
- EWAD370~490D-SX
- EWAD470~620D-XS
- EWAD460~600D-XR
- EWAD420~590D-HS

#### 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

For size EWAD180~200D-SL, EWAD180~190D-SR and EWAD200~210D-HS

The units are equipped with a direct expansion plate to plate type evaporator. This heat exchanger is made of stainless steel brazed plates and is covered with a 20mm closed cell insulation material. The exchanger is equipped with a heater for protection against freezing down to  $-28^{\circ}\text{C}$  and evaporator water outlet connections of 3". Each evaporator has 2 circuits, one for each compressor and is manufactured in accordance to PED approval. Water pressure differential switch on evaporator standard factory mounted. Water filter is standard.

All the other units are equipped with a Direct Expansion shell&tube evaporator with copper tubes rolled into steel tubesheets. The evaporators are single-pass on both the refrigerant and water sides for pure counter-flow heat exchange and low refrigerant pressure drops. Both attributes contribute to the heat exchanger effectiveness and total unit's outstanding efficiency.

The external shell is covered with a 10mm closed cell insulation material and the evaporator water outlet connections are provided with victaulic kit (as standard). Each evaporator has 2 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.

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### 3 General characteristics

#### Condenser coil fans

Fan 710 mm diameter

The condenser fans are propeller type with wing-profile blades for achieving better performance. Each fan is protected by a guard.

Fan 800 mm diameter

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  $\Delta P$  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 independent refrigerant circuits and each one includes:

- 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
- Sight glass with moisture indicator
- Filter drier
- Charging valves
- High pressure switch
- High and low pressure transducers

#### Electrical control panel

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

#### Power Section

The power section includes compressors fuses, 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.

GNC\_1a-2-3-4-5-6\_Rev.01\_2

## 3 General characteristics

### Control section - main features

- Management of the compressor stepless capacity and fans modulation.
- Chiller enabled to work in partial failure condition.
- Full routine operation at condition of:
  - high ambient temperature value
  - high thermal load
  - high evaporator entering water temperature (start-up)
- Display of evaporator entering/leaving water temperature.
- Display of Outdoor Ambient Temperature.
- Display of condensing-evaporating temperature and pressure, suction and discharge superheat for each circuit.
- Leaving water evaporator temperature regulation (temperature tolerance = 0.1°C)
- Compressor and evaporator pumps hours counter.
- Display of Status Safety Devices.
- Number of starts and compressor working hours.
- Optimized management of compressor load.
- Fan management according to condensing pressure.
- Re-start in case of power failure (automatic / manual).
- Soft Load (optimized management of the compressor load during the start-up).
- Start at high evaporator water temperature.
- Return Reset (Set Point Reset based on return water temperature).
- OAT (Outside Ambient temperature) Reset.
- Set point Reset (optional).
- Application and system upgrade with commercial SD cards.
- Ethernet port for remote or local servicing using standard web browsers.
- Two different sets of default parameters could be stored for easy restore.

### Safety device / logic for each refrigerant circuit

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

### System security

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

### Regulation type

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

### 3 General characteristics

#### Condensing pressure

Condensing pressure can be controlled in according to the entering air temperature to the condenser coil. The fans can be managed either with steps, or with a 0/10V modulating signal or with a mixed 0/10V + Steps strategy to cover all possible operational conditions.

#### MicroTech III

MicroTech III built-in terminal has the following features:

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

#### Supervising systems (on request)

##### MicroTech III remote control

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

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

#### Standard options (supplied on basic unit)

**Evaporator victaulic kit** – Not available on units EWAD180~200D-SL, EWAD180~190D-SR and EWAD200~210D-HS

**Evaporator water design pressure (10Bar)**

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

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

**Wye-Delta Compressors starter (Y-Δ)** – For low inrush current and reduced starting torque.

**Double set-point** – Dual leaving water temperature set-points.

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

**Water pressure differential switch on evaporator** – Not available on units EWAD390~580D-SS, EWAD230~530D-SL, EWAD220~530D-SR, EWAD210~490D-SX, EWAD250~620D-XS, EWAD240~600D-XR, EWAD230~590D-HS

**Evaporator electric heater type** – 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 device**

**20 mm evaporator insulation** – Only for EWAD180~200D-SL, EWAD180~190D-SR, EWAD210D-SX and EWAD200~210D-HS

**Ambient outside temperature sensor and set-point reset**

**Hour run meter**

**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  $\Delta t$ .

**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 (pump etc...). User can decide if this alarm signal will stop the unit or not.

**Fans circuit breakers** – Safety device against motor overloading and short circuit

**Main switch interlock door**

### 3 General characteristics

#### Options (on request)

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

#### **Total heat recovery (1 circuit)**

**Partial heat recovery** – Plate to plate heat exchangers installed between the compressor discharge and the condenser coil, allowing producing hot water.

**Brine version** – Allows the unit to operate down to -15°C leaving liquid temperature (antifreeze required).

**Evaporator flanged connections** – Not available for EWAD180~200D-SL, EWAD180~190D-SR, EWAD210D-SX and EWAD200~210D-HS

#### **Condenser coil 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.

**Hydronic Kit (single water pump - low or high lifting)** – (N.A. on EWAD210~490D-SX) Hydronic kit consists of: single direct driven centrifugal pump, water filling system with pressure gauge, safety valve, drain valve. The pump motor 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 - low or high lifting)** – (N.A. on EWAD180~190D-SR and on EWAD210~490D-SX). 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**

**Soft starter** – Electronic starting device to reduce the mechanical stress during compressor start-up.

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

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

**Energy Meter** – This device allows to measure the energy absorbed by the chiller during its life. It is installed inside the control box mounted on a DIN rail and show on a digital display: Line-to-Line Voltage, Phase and Average Current, Active and Reactive Power, Active Energy, Frequency.

**Capacitors for power factor correction** – To increase the operating power factor of the unit at nominal operating conditions. The capacitors are “dry” self-regenerating type with over pressure disconnecting safety device insulated with a no toxic dielectric mix with no PCB or PCT.

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

#### **Fan silent mode**

**Speedtrol** – (N.A. on EWAD210~490D-SX) Continuous fan speed modulation on the first fan of each circuit. It allows the unit working with air temperature down to -18°C.

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

#### **High pressure side manometers (one per circuit)**

#### **Compressors circuit breakers**

**Fan speed regulation** – Standard option for EWAD~D-SX

To control the fan speed revolution for smooth operating control of the unit. During low ambient temperature operation, this option improves also the sound level of the unit. With “Fan speed regulation” option, by different microprocessor setting, it is also possible to set the “Fan Silent Mode” configuration. It means that the microprocessor clock switches the fan at low speed according to the client setting (i.e. Night & Day), providing that the ambient temperature/condensing pressure is allowing the speed change. It allows a perfect condensing control down to -10°C.

### 3 General characteristics

**Rubber type anti vibration mounts** – Supplied separately, these are positioned under the base of the unit during installation to reduce vibrations.

**Spring type anti vibration 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.

**External tank without cabinet (500 L / 1000 L)**

**External tank with cabinet (500 L / 1000 L)**

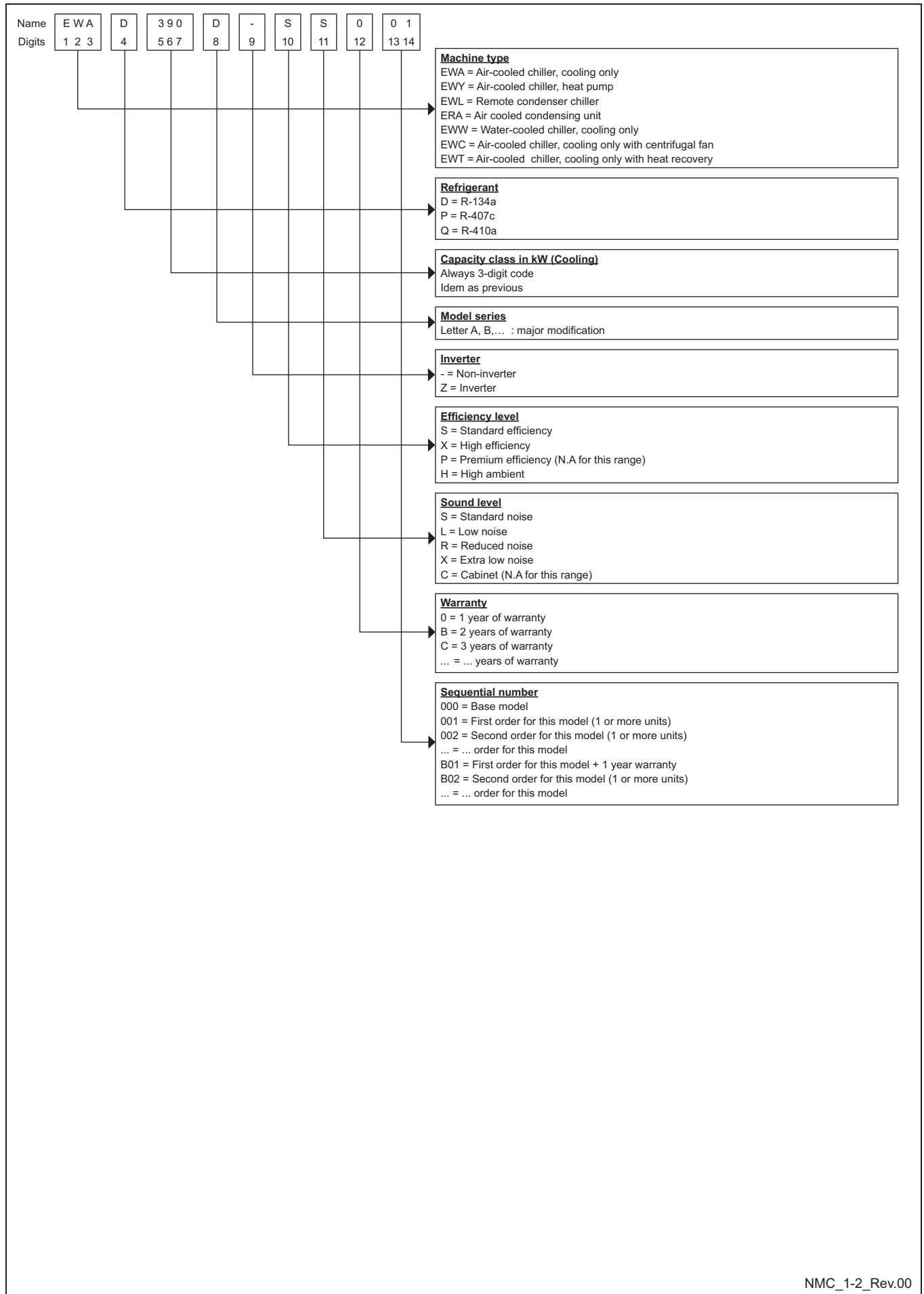
**Container kit**

**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 (please contact the factory) (This test is not available for units with glycol mixtures).

**Acoustic test** – On request, a test can be carried out, at customer's presence (please contact the factory) (This test is not available for units with glycol mixtures).

# 4 Nomenclature

## 4 - 1 Nomenclature



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4



## 5 Specifications

5-1 Technical Specifications				EWAD200D-HS	EWAD210D-HS	EWAD230D-HS	EWAD260D-HS	EWAD270D-HS	EWAD290D-HS	
Cooling capacity	Nom.		kW	195 (1)	208 (1)	234 (1)	256 (1)	274 (1)	289 (1)	
Capacity control	Method			Stepless						
	Minimum capacity			12.5						
Power input	Cooling	Nom.	kW	77.2 (1)	75.5 (1)	83.0 (1)	91.0 (1)	97.7 (1)	104 (1)	
EER				2.52 (1)	2.76 (1)	2.81 (1)		2.80 (1)	2.78 (1)	
ESEER				3.11	3.26	3.34	3.21	3.30	3.28	
IPLV				3.56	3.74	3.77	3.66	3.74	3.73	
Casing	Colour			Ivory white						
	Material			Galvanized and painted steel sheet						
Dimensions	Unit	Height	mm	2,223						
		Width	mm	2,234						
		Depth	mm	2,239			3,339			
Weight	Unit		kg	2,475	2,470	2,865		2,870		
	Operation weight		kg	2,500			2,960			
Water heat exchanger	Type			Plate to plate			Single pass shell & tube			
	Water volume		l	25	30	95		90		
	Nominal water flow	Cooling	l/s	9.30	9.90	11.10	12.20	13.10	13.80	
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	32	24	46	52	54	59
	Insulation material			Closed cell						
Air heat exchanger	Type			High efficiency fin and tube type with integral subcooler						
Fan	Quantity			4			6			
	Type			Direct propeller						
	Diameter		mm	710						
	Air flow rate	Nom.	l/s	21,848	21,153	32,772		32,250	31,729	
Fan motor	Drive			DOL						
	Speed	Cooling	Nom.	rpm	890					
	Input	Cooling	W	1,750						
Sound power level	Cooling	Nom.	dBA	95.7			96.3			
Sound pressure level	Cooling	Nom.	dBA	77.0						
Compressor	Type			Semi-hermetic single screw compressor						
	Quantity			2						
	Oil	Charged volume		l	26					
Operation range	Water side	Cooling	Min.	°CDB	-15					
			Max.	°CDB	15					
	Air side	Cooling	Min.	°CDB	-18					
			Max.	°CDB	48					
Refrigerant	Type			R-134a						
	Circuits	Quantity		2						
Refrigerant circuit	Charge		kg	36	42	44		55	56	
Piping connections	Evaporator water inlet/outlet			88.9			114.3			
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	Water freeze protection controller							

## 5 Specifications

5-1 Technical Specifications					EWAD310D-HS	EWAD340D-HS	EWAD380D-HS	EWAD420D-HS	EWAD450D-HS	EWAD480D-HS	
Cooling capacity	Nom.		kW	306 (1)	336 (1)	381 (1)	415 (1)	448 (1)	478 (1)		
Capacity control	Method		Stepless								
	Minimum capacity		%	12.5							
Power input	Cooling	Nom.	kW	112 (1)	120 (1)	127 (1)	141 (1)	150 (1)	162 (1)		
EER				2.73 (1)	2.80 (1)	3.00 (1)	2.94 (1)	2.98 (1)	2.95 (1)		
ESEER				3.27	3.25	3.57	3.61	3.68			
IPLV				3.72	3.64	3.99	4.00	4.05	3.99		
Casing	Colour		Ivory white								
	Material		Galvanized and painted steel sheet								
Dimensions	Unit	Height	mm	2,223							
		Width	mm	2,234							
		Depth	mm	3,339	4,040				4,940		
Weight	Unit		kg	2,870	3,185		3,277	3,942	4,356		
	Operation weight		kg	2,960	3,300		3,447	4,112	4,526		
Water heat exchanger	Type			Single pass shell & tube							
	Water volume		l	90	115		170				
	Nominal water flow	Cooling	l/s	14.60	16.00	18.20	19.80	21.40	22.80		
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	64	58	70	46	53	58	
Insulation material			Closed cell								
Air heat exchanger	Type			High efficiency fin and tube type with integral subcooler							
Fan	Quantity			6	8			10			
	Type			Direct propeller							
	Diameter		mm	710			800				
	Air flow rate	Nom.	l/s	31,729	43,696		42,306		54,620		
Fan motor	Drive			DOL							
	Speed	Cooling	Nom.	rpm	890						
	Input	Cooling		W	1,750						
Sound power level	Cooling	Nom.	dBA	96.3	96.7	98.7	96.7	97.7			
Sound pressure level	Cooling	Nom.	dBA	77.0		79.0	77.0	77.5			
Compressor	Type			Semi-hermetic single screw compressor							
	Quantity			2							
	Oil	Charged volume		l	26		32				
Operation range	Water side	Cooling	Min.	°CDB	-15						
			Max.	°CDB	15						
	Air side	Cooling	Min.	°CDB	-18						
			Max.	°CDB	48						
Refrigerant	Type			R-134a							
	Circuits	Quantity			2						
Refrigerant circuit	Charge		kg	56	58	66	70	90	95		
Piping connections	Evaporator water inlet/outlet			114.3			139.7				
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	Water freeze protection controller								

## 5 Specifications

5-1 Technical Specifications					EWAD510D-HS	EWAD550D-HS	EWAD590D-HS
Cooling capacity	Nom.		kW		514 (1)	547 (1)	587 (1)
Capacity control	Method				Stepless		
	Minimum capacity			%	12.5		
Power input	Cooling	Nom.	kW		175 (1)	182 (1)	191 (1)
EER					2.94 (1)	3.00 (1)	3.07 (1)
ESEER					3.66	3.71	3.79
IPLV					4.10	4.18	4.50
Casing	Colour				Ivory white		
	Material				Galvanized and painted steel sheet		
Dimensions	Unit	Height	mm		2,223		
		Width	mm		2,234		
		Depth	mm		4,940		
Weight	Unit		kg		4,361		4,366
	Operation weight		kg		4,526		
Water heat exchanger	Type				Single pass shell & tube		
	Water volume			l	165		160
	Nominal water flow	Cooling	l/s		24.50	26.10	28.00
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	51	56	53
	Insulation material				Closed cell		
Air heat exchanger	Type				High efficiency fin and tube type with integral subcooler		
Fan	Quantity				10		
	Type				Direct propeller		
	Diameter		mm		800		
	Air flow rate	Nom.	l/s		54,620		
Fan motor	Drive				DOL		
	Speed	Cooling	Nom.	rpm	890		
	Input	Cooling	W		1,750		
Sound power level	Cooling	Nom.	dBA	97.7	99.2	99.7	
Sound pressure level	Cooling	Nom.	dBA	77.5	79.0	79.5	
Compressor	Type				Semi-hermetic single screw compressor		
	Quantity				2		
	Oil	Charged volume		l	32		
Operation range	Water side	Cooling	Min.	°CDB	-15		
			Max.	°CDB	15		
	Air side	Cooling	Min.	°CDB	-18		
			Max.	°CDB	48		
Refrigerant	Type				R-134a		
	Circuits	Quantity			2		
Refrigerant circuit	Charge		kg		100		
Piping connections	Evaporator water inlet/outlet				139.7		
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	Water freeze protection controller				

## 5 Specifications

5-2 Electrical Specifications				EWAD200D-HS	EWAD210D-HS	EWAD230D-HS	EWAD260D-HS	EWAD270D-HS	EWAD290D-HS	
Compressor	Phase			3~						
	Voltage		V	400						
	Voltage range	Min.	%	-10						
		Max.	%	10						
	Maximum running current		A	78		94		105		
Starting method			Wye-delta							
Compressor 2	Maximum running current		A	78		94		105		
Power supply	Phase			3~						
	Frequency		Hz	50						
	Voltage		V	400						
	Voltage range	Min.	%	-10						
		Max.	%	10						
Unit	Maximum starting current		A	222		239		282		291
	Nominal running current (RLA)	Cooling	A	134	131	145	157	169	180	
			A	172		196	213	223	234	
	Max unit current for wires sizing		A	189		216	234	246	257	
Fans	Nominal running current (RLA)		A	16		24				

5-2 Electrical Specifications				EWAD310D-HS	EWAD340D-HS	EWAD380D-HS	EWAD420D-HS	EWAD450D-HS	EWAD480D-HS
Compressor	Phase			3~					
	Voltage		V	400					
	Voltage range	Min.	%	-10					
		Max.	%	10					
	Maximum running current		A	105	119	125	140	153	
Starting method			Wye-delta						
Compressor 2	Maximum running current		A	119		125	147	153	174
Power supply	Phase			3~					
	Frequency		Hz	50					
	Voltage		V	400					
	Voltage range	Min.	%	-10					
		Max.	%	10					
Unit	Maximum starting current		A	303	307	311	422	468	489
	Nominal running current (RLA)	Cooling	A	191	204	214	239	258	275
			A	248	271	283	320	337	366
	Max unit current for wires sizing		A	273	298	311	352	371	403
Fans	Nominal running current (RLA)		A	24	32				40

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## 5 Specifications

5-2 Electrical Specifications				EWAD510D-HS	EWAD550D-HS	EWAD590D-HS
Compressor	Phase			3~		
	Voltage			400		
	Voltage range	Min.	%	-10		
		Max.	%	10		
	Maximum running current			174		185
	Starting method			Wye-delta		
Compressor 2	Maximum running current			174	185	
Power supply	Phase			3~		
	Frequency			50		
	Voltage			400		
	Voltage range	Min.	%	-10		
		Max.	%	10		
	Unit	Maximum starting current			489	498
Nominal running current (RLA)		Cooling	A	295	306	320
			A	387	398	409
Max unit current for wires sizing			426	438	450	
Fans	Nominal running current (RLA)			40		

### Notes

- (1)Cooling: entering evaporator water temp. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C; full load operation.
- (2)Sound pressure levels are measured at entering evaporator water temp. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C; 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. 12°C; leaving evaporator water temp. 7°C; ambient air temp. 35°C. 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

# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

### EWAD-D-HS

ELWT (°C)		200						210						230						260									
		Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)									
		25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46
4	Cc (kW)	196	187	177	167	163	158	153	209	200	190	179	174	170	165	233	223	213	201	197	192	187	256	245	234	221	216	211	205
	Pi (kW)	63	68	74	81	84	86	89	61	67	73	79	82	84	87	68	74	80	87	90	93	96	75	81	88	96	99	102	106
	Qwe (l/s)	9.3	8.9	8.4	8	7.7	7.5	7.3	10	9.5	9	8.5	8.3	8.1	7.8	11.1	10.6	10.1	9.6	9.4	9.1	8.9	12.2	11.7	11.1	10.5	10.3	10	9.8
	Pdwe (kPa)	31.8	29.2	26.6	23.9	22.7	21.6	20.5	23.8	21.9	20	17.9	17.1	16.3	15.5	45.8	42.4	38.9	35.3	33.8	32.3	30.8	52	48.1	44.2	40	38.3	36.6	34.8
5	Cc (kW)	202	193	183	173	168	164	159	215	206	196	185	180	176	171	240	230	220	208	203	198	193	264	253	241	229	223	218	212
	Pi (kW)	64	69	75	82	85	87	90	62	68	74	80	83	85	88	69	75	81	88	91	94	97	75	82	89	97	100	103	107
	Qwe (l/s)	9.6	9.2	8.7	8.2	8	7.8	7.6	10.2	9.8	9.3	8.8	8.6	8.4	8.1	11.4	11	10.5	9.9	9.7	9.5	9.2	12.6	12.1	11.5	10.9	10.6	10.4	10.1
	Pdwe (kPa)	33.6	30.9	28.1	25.3	24.2	23	21.8	25	23.2	21.2	19.1	18.2	17.4	16.5	48.4	44.9	41.2	37.5	35.9	34.4	32.8	54.8	50.8	46.8	42.5	40.7	38.9	37.1
6	Cc (kW)	208	199	189	178	174	169	165	221	212	202	191	186	182	177	247	237	227	215	210	205	200	271	260	249	236	231	225	219
	Pi (kW)	65	70	76	83	86	88	91	63	69	75	81	84	86	89	70	76	82	89	92	95	98	76	83	90	98	101	104	108
	Qwe (l/s)	9.9	9.5	9	8.5	8.3	8.1	7.8	10.6	10.1	9.7	9.1	8.9	8.7	8.4	11.8	11.3	10.8	10.3	10	9.8	9.5	12.9	12.4	11.9	11.3	11	10.7	10.5
	Pdwe (kPa)	35.5	32.6	29.8	26.8	25.7	24.5	23.3	26.4	24.4	22.5	20.3	19.4	18.5	17.6	51.1	47.4	43.6	39.8	38.1	36.5	34.9	57.8	53.6	49.4	45	43.2	41.3	39.4
7	Cc (kW)	214	205	195	184	179	175	170	228	218	208	197	193	188	183	255	244	234	222	217	212	207	279	268	256	243	238	233	227
	Pi (kW)	65	71	77	84	87	89	92	64	69	75	82	85	87	90	71	77	83	90	93	96	99	77	84	91	99	102	106	109
	Qwe (l/s)	10.2	9.8	9.3	8.8	8.6	8.3	8.1	10.9	10.4	9.9	9.4	9.2	9	8.7	12.1	11.7	11.1	10.6	10.4	10.1	9.9	13.3	12.8	12.2	11.6	11.4	11.1	10.8
	Pdwe (kPa)	37.4	34.5	31.5	28.4	27.2	25.9	24.7	28	25.7	23.7	21.5	20.6	19.7	18.7	53.9	50.1	46.1	42.1	40.4	38.8	37.1	60.8	56.5	52.1	47.6	45.7	43.8	41.9
8	Cc (kW)	220	211	201	190	185	180	176	236	225	214	204	199	194	189	262	252	241	229	224	219	214	287	276	264	251	245	240	234
	Pi (kW)	66	72	78	85	88	91	94	65	70	76	83	86	89	91	71	77	84	91	94	97	100	78	85	92	100	103	107	110
	Qwe (l/s)	10.5	10.1	9.6	9.1	8.8	8.6	8.4	11.2	10.7	10.2	9.7	9.5	9.3	9	12.5	12	11.5	10.9	10.7	10.4	10.2	13.7	13.2	12.6	12	11.7	11.5	11.2
	Pdwe (kPa)	39.3	36.4	33.3	30.1	28.8	27.5	26.2	29.6	27.2	24.9	22.8	21.8	20.9	19.9	56.7	52.8	48.7	44.5	42.8	41.1	39.3	64	59.5	54.9	50.2	48.3	46.4	44.4
9	Cc (kW)	226	217	207	195	191	186	181	243	232	221	210	205	200	195	269	259	248	236	231	226	220	295	283	271	258	253	247	241
	Pi (kW)	67	73	79	86	89	92	95	66	71	77	84	87	90	92	72	78	85	92	95	98	101	79	86	93	101	104	108	111
	Qwe (l/s)	10.8	10.4	9.9	9.3	9.1	8.9	8.7	11.6	11.1	10.5	10	9.8	9.6	9.3	12.9	12.4	11.8	11.3	11	10.8	10.5	14.1	13.5	13	12.3	12.1	11.8	11.5
	Pdwe (kPa)	41.4	38.3	35.1	31.8	30.4	29.1	27.7	31.3	28.8	26.3	24	23.1	22.1	21.1	59.7	55.6	51.4	47	45.3	43.5	41.6	67.3	62.7	57.9	53	51	49	46.9
10	Cc (kW)	233	223	213	201	197	192	187	250	239	227	215	211	206	201	277	266	255	243	238	233	227	303	291	279	266	260	255	249
	Pi (kW)	68	74	80	87	90	93	96	67	72	78	85	88	91	94	73	79	86	93	96	99	102	80	87	94	102	105	109	112
	Qwe (l/s)	11.1	10.6	10.2	9.6	9.4	9.2	8.9	12	11.4	10.9	10.3	10.1	9.9	9.6	13.2	12.7	12.2	11.6	11.4	11.1	10.9	14.5	13.9	13.3	12.7	12.4	12.2	11.9
	Pdwe (kPa)	43.5	40.3	37	33.5	32.1	30.7	29.3	33	30.4	27.8	25.2	24.3	23.3	22.4	62.8	58.5	54.2	49.7	47.8	45.9	44	70.7	65.9	60.9	55.8	53.7	51.7	49.6
11	Cc (kW)	239	229	219	207	203	198	193	257	246	235	222	217	212	207	284	274	262	250	245	240	234	311	299	287	273	268	262	256
	Pi (kW)	69	75	81	88	91	94	97	68	73	79	86	89	92	95	74	80	87	94	97	100	103	81	88	95	103	106	110	113
	Qwe (l/s)	11.4	10.9	10.4	9.9	9.7	9.4	9.2	12.3	11.8	11.2	10.6	10.4	10.1	9.9	13.6	13.1	12.5	12	11.7	11.5	11.2	14.9	14.3	13.7	13.1	12.8	12.5	12.2
	Pdwe (kPa)	45.7	42.3	38.9	35.4	33.9	32.5	31	34.8	32.2	29.4	26.6	25.5	24.6	23.6	66	61.5	57	52.3	50.4	48.5	46.5	74.2	69.2	64.1	58.8	56.6	54.4	52.3
12	Cc (kW)	245	235	225	213	209	204	198	264	254	242	229	224	218	213	292	281	270	257	252	247	241	320	307	295	281	275	270	264
	Pi (kW)	70	76	82	89	92	95	98	69	74	81	87	90	93	96	75	81	88	95	98	101	104	82	89	96	104	108	111	115
	Qwe (l/s)	11.7	11.3	10.7	10.2	10	9.7	9.5	12.6	12.1	11.6	10.9	10.7	10.4	10.2	14	13.4	12.9	12.3	12.1	11.8	11.5	15.3	14.7	14.1	13.4	13.2	12.9	12.6
	Pdwe (kPa)	48	44.4	40.9	37.3	35.8	34.3	32.7	36.5	33.9	31.1	28.2	27	25.8	24.8	69.3	64.7	59.9	55.1	53.1	51.2	49.1	77.9	72.7	67.3	61.8	59.6	57.3	55.1
13	Cc (kW)	252	242	231	219	214	210	204	272	261	249	236	230	225	219	300	289	277	264	259	254	248	328	316	303	289	283	277	271
	Pi (kW)	71	77	83	90	93	96	99	70	75	82	88	91	94	97	76	82	89	96	99	102	105	83	90	97	105	109	112	116
	Qwe (l/s)	12.1	11.6	11	10.5	10.3	10	9.8	13	12.5	11.9	11.3	11	10.8	10.5	14.3	13.8	13.2	12.7	12.4	12.1	11.9	15.7	15.1	14.5	13.8	13.5	13.3	13
	Pdwe (kPa)	50.3	46.6	42.9	39.2	37.6	36.1	34.5	38.4	35.6	32.8	29.8	28.5	27.3	26.1	72.7	67.9	63	58	55.9	53.9	51.8	81.7	76.2	70.7	65	62.7	60.3	58
14	Cc (kW)	259	248	237	225	220	215	210	279	268	256	243	237	232	226	308	296	284	272	266	261	255	336	324	311	297	291	285	279
	Pi (kW)	72	78	84	91	94	97	100	71	77	83	89	92	95	98	77	83	90	97	100	103	106	84	91	98	106	110	113	117
	Qwe (l/s)	12.4	11.9	11.3	10.8	10.5	10.3	10.1	13.3	12.8	12.3	11.6	11.4	11.1	10.8	14.7	14.2	13.6	13	12.8	12.5	12.2	16.1	15.5	14.9	14.2	13.9	13.6	13.3
	Pdwe (kPa)	52.8	49	45.1	41.1	39.6	38	36.4	40.3	37.4	34.5	31.4	30.1	28.9	27.6	76.2	71.2	66.1	60.9	58.8	56.7	54.5	85.6	79.9	74.2	68.2	65.8	63.4	61
15	Cc (kW)	266	255	243	231	226	221	215	286	275	263	250	245	239	233	316	304	292	279	274	268	263	345	332	319	305	299	293	286
	Pi (kW)	73	79	86	93	95	98	101	72	78	84	91	93	96	99	78	84	91	98	101	104	107	85	92	100	108	111	115	118
	Qwe (l/s)	12.7	12.2	11.6	11.1	10.8	10.6	10.3	13.7	13.2	12.6	12	11.7	11.4	11.2	15.1	14.6	14	13.4	13.1	12.8	12.6	16.5	15.9	15.3	14.6	14.3	14	13.7
	Pdwe (kPa)	55.4	51.4	47.3	43.2	41.5	39.9	37.8	42.2	39.3	36.2	33.1	31.8																

# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

EWAD-D-HS

		270						290						310						340									
		Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)									
ELWLT (°C)		25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46
4	Cc (kW)	274	262	249	236	230	224	218	289	277	264	250	244	238	231	307	294	280	265	259	252	245	335	323	309	293	286	279	272
	Pi (kW)	80	87	94	103	106	110	113	85	92	100	109	113	117	121	91	99	108	118	122	126	130	98	107	117	127	131	135	140
	Qwe (l/s)	13	12.5	11.9	11.2	11	10.7	10.4	13.8	13.2	12.6	11.9	11.6	11.3	11	14.6	14	13.3	12.6	12.3	12	11.7	16	15.4	14.7	13.9	13.6	13.3	13
	Pdwe (kPa)	53.6	49.6	45.4	41	39.2	37.4	35.6	59.2	54.8	50.2	45.4	43.5	41.5	39.6	64.5	59.7	54.6	49.4	47.3	45.2	43	58.1	54.2	50	45.5	43.6	41.8	39.9
5	Cc (kW)	282	270	257	244	238	232	226	298	286	272	258	252	246	239	316	303	289	274	267	260	253	344	332	318	302	295	288	281
	Pi (kW)	81	88	95	104	107	111	114	86	93	102	110	114	118	122	92	101	110	119	123	128	132	99	108	118	128	132	137	141
	Qwe (l/s)	13.4	12.9	12.3	11.6	11.3	11.1	10.8	14.2	13.6	13	12.3	12	11.7	11.4	15.1	14.4	13.8	13	12.7	12.4	12.1	16.4	15.8	15.1	14.4	14.1	13.7	13.4
	Pdwe (kPa)	56.6	52.4	48.1	43.6	41.7	39.8	37.9	62.5	57.9	53.1	48.2	46.2	44.1	42.1	68	63	57.8	52.4	50.2	48	45.7	61	57	52.8	48.2	46.2	44.3	42.4
6	Cc (kW)	290	278	266	252	246	240	234	307	294	281	266	260	254	247	325	312	298	282	276	269	262	353	341	327	311	305	298	290
	Pi (kW)	82	89	97	105	108	112	116	87	95	103	112	115	119	123	94	102	111	121	125	129	133	100	109	119	129	134	138	143
	Qwe (l/s)	13.9	13.3	12.7	12	11.7	11.4	11.1	14.6	14	13.4	12.7	12.4	12.1	11.8	15.5	14.9	14.2	13.5	13.1	12.8	12.5	16.9	16.2	15.6	14.8	14.5	14.2	13.8
	Pdwe (kPa)	59.8	55.4	50.9	46.2	44.3	42.3	40.4	65.9	61.1	56.2	51.1	49	46.9	44.7	71.7	66.4	61.1	55.5	53.2	50.9	48.5	63.9	59.8	55.5	50.9	48.9	46.9	44.9
7	Cc (kW)	299	287	274	260	254	248	241	316	303	289	275	268	262	255	335	321	306	291	284	277	270	363	350	336	321	314	307	300
	Pi (kW)	83	90	98	106	110	113	117	88	96	104	113	117	121	125	95	103	112	122	126	130	135	101	110	120	131	135	139	144
	Qwe (l/s)	14.3	13.7	13.1	12.4	12.1	11.8	11.5	15.1	14.4	13.8	13.1	12.8	12.5	12.2	16	15.3	14.6	13.9	13.6	13.2	12.9	17.3	16.7	16	15.3	15	14.6	14.3
	Pdwe (kPa)	63	58.4	53.7	48.9	46.9	44.9	42.9	69.4	64.4	59.3	54.1	51.9	49.7	47.5	75.4	70	64.4	58.6	56.3	53.9	51.5	67	62.7	58.3	53.7	51.7	49.6	47.5
8	Cc (kW)	308	295	282	268	262	256	249	324	312	298	283	277	270	264	344	330	315	300	293	286	279	372	359	345	329	323	316	309
	Pi (kW)	84	91	99	107	111	114	118	89	97	105	114	118	122	126	96	104	113	123	127	132	136	103	112	121	132	136	141	146
	Qwe (l/s)	14.7	14.1	13.5	12.8	12.5	12.2	11.9	15.5	14.9	14.2	13.5	13.2	12.9	12.6	16.4	15.8	15.1	14.3	14	13.7	13.3	17.7	17.1	16.4	15.7	15.4	15.1	14.7
	Pdwe (kPa)	66.3	61.6	56.7	51.7	49.7	47.6	45.5	73	67.9	62.6	57.1	54.9	52.6	50.3	79.4	73.7	67.9	61.9	59.4	57	54.5	70.2	65.7	61.2	56.4	54.5	52.4	50.3
9	Cc (kW)	316	304	290	276	270	264	257	334	320	306	292	285	279	272	353	339	324	308	302	295	288	381	368	354	338	332	325	318
	Pi (kW)	85	92	100	108	112	116	119	90	98	106	115	119	123	127	97	106	115	125	129	133	138	104	113	122	133	138	142	147
	Qwe (l/s)	15.1	14.5	13.9	13.2	12.9	12.6	12.3	15.9	15.3	14.6	13.9	13.6	13.3	13	16.9	16.2	15.5	14.7	14.4	14.1	13.7	18.2	17.6	16.9	16.2	15.8	15.5	15.2
	Pdwe (kPa)	69.8	64.9	59.8	54.6	52.5	50.4	48.2	76.8	71.4	65.9	60.3	58	55.6	53.2	83.4	77.5	71.5	65.3	62.7	60.2	57.6	73.4	68.9	64.1	59.2	57.2	55.1	53
10	Cc (kW)	325	312	299	284	278	272	265	343	329	315	300	294	287	281	363	349	334	317	311	304	296	391	377	363	347	341	334	327
	Pi (kW)	86	93	101	110	113	117	121	91	99	108	117	121	125	129	98	107	116	126	130	135	139	105	114	124	134	139	143	148
	Qwe (l/s)	15.5	14.9	14.3	13.6	13.3	13	12.7	16.4	15.7	15.1	14.3	14	13.7	13.4	17.3	16.7	15.9	15.2	14.8	14.5	14.2	18.7	18	17.3	16.6	16.3	16	15.6
	Pdwe (kPa)	73.4	68.3	63	57.6	55.4	53.2	51	80.7	75.1	69.4	63.5	61.1	58.7	56.3	87.6	81.5	75.2	68.7	66.1	63.5	60.8	76.8	72.1	67.2	62.1	60	57.9	55.8
11	Cc (kW)	334	321	307	292	286	280	273	352	338	324	309	302	296	289	373	358	343	326	319	312	305	400	386	372	356	349	343	336
	Pi (kW)	87	94	102	111	114	118	122	93	100	109	118	122	126	130	100	108	117	127	132	136	141	106	115	125	136	140	145	150
	Qwe (l/s)	16	15.3	14.7	14	13.7	13.4	13.1	16.8	16.2	15.5	14.8	14.4	14.1	13.8	17.8	17.1	16.4	15.6	15.3	14.9	14.6	19.1	18.5	17.8	17	16.7	16.4	16
	Pdwe (kPa)	77.1	71.8	66.3	60.7	58.5	56.1	53.8	84.7	78.9	73	66.9	64.4	61.9	59.4	91.9	85.6	79	72.3	69.6	66.9	64.1	80.2	75.4	70.3	65	62.9	60.7	58.5
12	Cc (kW)	343	330	316	301	295	288	282	361	348	333	317	311	304	297	383	368	352	335	328	321	314	410	396	381	365	358	352	345
	Pi (kW)	88	96	104	112	116	119	123	94	102	110	119	123	127	131	101	110	119	129	133	138	142	107	116	126	137	141	146	151
	Qwe (l/s)	16.4	15.8	15.1	14.4	14.1	13.8	13.5	17.3	16.6	15.9	15.2	14.9	14.5	14.2	18.3	17.6	16.8	16	15.7	15.4	15	19.6	18.9	18.2	17.5	17.1	16.8	16.5
	Pdwe (kPa)	80.9	75.4	69.7	63.9	61.6	59.2	56.8	88.9	82.9	76.7	70.4	67.8	65.2	62.6	96.4	89.8	83	76.1	73.2	70.4	67.5	83.8	78.8	73.5	68.1	65.9	63.6	61.4
13	Cc (kW)	352	339	324	309	303	297	290	371	357	342	326	320	313	306	393	378	362	345	338	330	323	420	405	390	374	368	361	354
	Pi (kW)	89	97	105	113	117	121	125	95	103	111	121	125	129	133	102	111	120	130	135	139	144	108	117	127	138	143	148	152
	Qwe (l/s)	16.8	16.2	15.5	14.8	14.5	14.2	13.9	17.7	17.1	16.4	15.6	15.3	15	14.6	18.8	18.1	17.3	16.5	16.1	15.8	15.4	20.1	19.4	18.7	17.9	17.6	17.3	16.9
	Pdwe (kPa)	84.9	79.1	73.3	67.2	64.8	62.3	59.8	93.2	87	80.6	74	71.3	68.6	65.9	101	94.2	87.1	79.9	77	74	71	87.5	82.3	76.9	71.2	69	66.6	64.3
14	Cc (kW)	361	348	333	318	311	305	298	381	366	351	335	328	322	314	403	387	371	354	347	339	332	429	415	400	384	377	370	363
	Pi (kW)	91	98	106	115	118	122	126	96	104	113	122	126	130	134	104	112	122	132	136	141	145	109	119	129	140	144	149	154
	Qwe (l/s)	17.3	16.6	15.9	15.2	14.9	14.6	14.3	18.2	17.5	16.8	16	15.7	15.4	15	19.3	18.5	17.8	16.9	16.6	16.2	15.9	20.5	19.9	19.1	18.4	18	17.7	17.3
	Pdwe (kPa)	89	83	76.9	70.7	68.1	65.6	63	97.7	91.2	84.5	77.7	74.9	72.1	69.3	105.8	98.7	91.4	83.9	80.8	77.8	74.7	91.2	85.9	80.3	74.5	72.1	69.7	67.3
15	Cc (kW)	371	357	342	326	320	313	307	390	376	361	344	337	330	323	413	397	381	363	356	349	341	439	425	409	393	386	379	372
	Pi (kW)	92	99	107	116	120	123	127	97	105	114	123	127	132	136	105	114	123	133	138	142	147	111	120	130	141	146	150	155

# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

EWAD-D-HS

		380						420						450						480									
		Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)									
ELWT (°C)		25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46
4	Cc (kW)	370	363	354	343	339	334	328	410	397	382	361	351	341	329	450	432	412	389	378	367	340	479	461	441	417	407	389	367
	Pi (kW)	102	113	124	136	141	146	152	114	125	136	150	156	162	168	122	133	146	160	166	173	173	132	144	157	173	180	183	186
	Qwe (l/s)	17.6	17.3	16.9	16.4	16.1	15.9	15.6	19.5	18.9	18.2	17.2	16.7	16.2	15.7	21.4	20.6	19.6	18.5	18	17.5	16.2	22.8	21.9	21	19.9	19.4	18.5	17.5
	Pdwe (kPa)	66	63.7	61	57.8	56.3	54.8	53.2	44.6	42.2	39.3	35.5	33.8	32	30	52.7	49	45	40.6	38.6	36.6	32	58	54.2	50	45.3	43.2	39.8	36
5	Cc (kW)	379	372	363	352	348	343	337	421	409	393	372	362	351	339	462	444	424	401	390	378	366	492	473	453	430	419	407	388
	Pi (kW)	103	114	125	137	142	148	153	115	126	138	151	157	164	170	124	135	147	162	168	175	182	134	145	159	174	181	188	192
	Qwe (l/s)	18	17.7	17.3	16.8	16.6	16.3	16.1	20.1	19.5	18.7	17.7	17.3	16.7	16.1	22	21.2	20.2	19.1	18.6	18	17.4	23.4	22.6	21.6	20.5	20	19.4	18.5
	Pdwe (kPa)	69	66.7	63.9	60.6	59.1	57.6	55.9	46.9	44.4	41.4	37.5	35.7	33.8	31.7	55.4	51.6	47.5	42.9	40.8	38.7	36.4	60.9	56.9	52.6	47.8	45.7	43.4	39.8
6	Cc (kW)	388	381	372	362	357	352	346	433	420	404	383	373	361	349	474	456	436	412	402	390	377	504	486	466	442	431	419	407
	Pi (kW)	104	115	126	138	144	149	154	117	128	140	153	159	165	172	125	136	149	163	170	176	183	135	147	160	176	183	190	198
	Qwe (l/s)	18.5	18.2	17.7	17.2	17	16.8	16.5	20.6	20	19.3	18.3	17.8	17.2	16.6	22.6	21.8	20.8	19.7	19.1	18.6	18	24	23.2	22.2	21.1	20.6	20	19.4
	Pdwe (kPa)	72	69.7	66.8	63.5	62	60.4	58.7	49.3	46.7	43.5	39.5	37.7	35.6	33.5	58.1	54.2	50	45.2	43.1	40.8	38.5	63.8	59.7	55.3	50.3	48.1	45.8	43.3
7	Cc (kW)	397	390	381	371	366	361	355	444	431	415	394	383	372	359	486	469	448	424	413	402	389	517	499	478	454	443	431	419
	Pi (kW)	105	116	127	140	145	150	156	118	129	141	155	161	167	174	127	138	150	165	171	178	185	137	149	162	177	184	192	199
	Qwe (l/s)	18.9	18.6	18.2	17.7	17.5	17.2	17	21.2	20.6	19.8	18.8	18.3	17.7	17.1	23.2	22.4	21.4	20.2	19.7	19.2	18.5	24.7	23.8	22.8	21.7	21.1	20.6	20
	Pdwe (kPa)	75.2	72.8	69.9	66.5	64.9	63.3	61.6	51.7	49.1	45.8	41.6	39.7	37.6	35.3	60.9	56.9	52.5	47.6	45.4	43.1	40.7	66.8	62.6	58	52.9	50.6	48.2	45.7
8	Cc (kW)	406	399	390	380	375	370	365	456	443	426	404	394	382	370	499	480	460	436	425	413	400	530	511	490	466	455	444	431
	Pi (kW)	106	117	128	141	146	151	157	119	131	143	157	163	169	176	129	139	152	166	173	180	187	138	150	164	179	186	193	201
	Qwe (l/s)	19.4	19.1	18.6	18.1	17.9	17.7	17.4	21.7	21.1	20.3	19.3	18.8	18.3	17.6	23.8	22.9	22	20.8	20.3	19.7	19.1	25.3	24.4	23.4	22.3	21.7	21.2	20.6
	Pdwe (kPa)	78.4	76	73	69.5	68	66.3	64.5	54.1	51.5	48	43.7	41.7	39.5	37.2	63.7	59.6	55.1	50	47.8	45.4	42.9	69.9	65.5	60.8	55.5	53.2	50.7	48.1
9	Cc (kW)	415	408	400	389	384	379	374	467	454	437	415	404	393	380	511	493	472	448	436	425	412	543	524	503	478	467	456	443
	Pi (kW)	107	118	129	142	147	153	158	121	132	144	158	165	171	178	130	141	154	168	175	181	188	140	152	165	181	188	195	203
	Qwe (l/s)	19.8	19.5	19.1	18.6	18.4	18.1	17.9	22.3	21.7	20.9	19.8	19.3	18.8	18.1	24.4	23.5	22.5	21.4	20.8	20.3	19.7	25.9	25	24	22.8	22.3	21.8	21.1
	Pdwe (kPa)	81.7	79.2	76.2	72.7	71.1	69.4	67.6	56.7	53.9	50.4	45.8	43.8	41.5	39.1	66.7	62.4	57.8	52.5	50.2	47.8	45.2	73.1	68.5	63.7	58.2	55.8	53.3	50.6
10	Cc (kW)	425	418	409	399	394	389	383	478	465	448	426	415	403	390	524	505	484	459	448	436	423	556	537	515	491	480	468	455
	Pi (kW)	108	119	131	143	149	154	160	122	133	146	160	167	173	180	132	143	155	170	176	183	190	142	153	167	182	189	197	204
	Qwe (l/s)	20.3	20	19.5	19	18.8	18.6	18.3	22.9	22.2	21.4	20.3	19.8	19.3	18.6	25	24.1	23.1	21.9	21.4	20.8	20.2	26.6	25.7	24.6	23.4	22.9	22.3	21.7
	Pdwe (kPa)	85.2	82.6	79.5	75.9	74.3	72.5	70.7	59.2	56.3	52.7	48	45.9	43.5	41	69.7	65.2	60.4	55.1	52.6	50.1	47.5	76.4	71.7	66.6	60.9	58.5	55.9	53.1
11	Cc (kW)	434	427	419	408	403	398	393	490	477	459	437	426	414	400	536	517	496	471	460	448	435	570	550	528	503	492	480	467
	Pi (kW)	109	120	132	145	150	155	161	124	135	148	162	168	175	182	133	144	157	172	178	185	192	143	155	169	184	191	198	206
	Qwe (l/s)	20.8	20.4	20	19.5	19.3	19	18.8	23.4	22.8	22	20.9	20.3	19.8	19.1	25.6	24.7	23.7	22.5	22	21.4	20.8	27.2	26.3	25.2	24	23.5	22.9	22.3
	Pdwe (kPa)	88.7	86.1	82.9	79.2	77.5	75.8	73.9	61.8	58.9	55.1	50.3	48	45.6	43	72.8	68.2	63.2	57.6	55.2	52.6	49.9	79.8	74.9	69.6	63.7	61.2	58.5	55.7
12	Cc (kW)	444	437	428	417	413	408	402	501	488	470	447	436	424	410	549	530	508	483	471	459	446	583	563	541	515	504	492	478
	Pi (kW)	110	121	133	146	151	157	162	125	137	149	164	170	177	184	135	146	159	173	180	187	194	145	157	170	186	193	200	208
	Qwe (l/s)	21.2	20.9	20.5	20	19.7	19.5	19.2	24	23.3	22.5	21.4	20.9	20.3	19.6	26.3	25.3	24.3	23.1	22.5	22	21.3	27.9	26.9	25.9	24.6	24.1	23.5	22.9
	Pdwe (kPa)	92.3	89.6	86.4	82.6	80.9	79.1	77.2	64.5	61.5	57.5	52.5	50.2	47.7	45	76	71.2	66	60.2	57.8	55.1	52.3	83.3	78.2	72.7	66.6	64	61.2	58.3
13	Cc (kW)	454	446	438	427	422	417	412	513	499	481	458	447	434	421	562	542	520	494	483	471	458	597	576	554	528	516	504	490
	Pi (kW)	111	122	134	147	152	158	164	127	138	151	166	172	179	186	137	148	160	175	182	188	196	147	159	172	188	195	202	210
	Qwe (l/s)	21.7	21.4	20.9	20.4	20.2	20	19.7	24.5	23.9	23	21.9	21.4	20.8	20.1	26.9	25.9	24.9	23.6	23.1	22.5	21.9	28.6	27.6	26.5	25.2	24.7	24.1	23.5
	Pdwe (kPa)	96	93.3	90	86.1	84.4	82.5	80.5	67.2	64.1	60	54.8	52.5	49.9	47.1	79.3	74.3	68.9	62.9	60.3	57.6	54.8	86.9	81.6	75.9	69.6	66.8	64	61
14	Cc (kW)	463	456	447	437	432	427	421	524	511	492	469	457	445	431	575	555	532	506	494	482	469	611	590	567	540	528	516	502
	Pi (kW)	112	123	135	148	154	159	165	128	140	153	168	174	181	188	138	150	162	177	183	190	197	149	160	174	190	196	204	211
	Qwe (l/s)	22.2	21.8	21.4	20.9	20.7	20.4	20.2	25.1	24.4	23.6	22.4	21.9	21.3	20.6	27.5	26.5	25.5	24.2	23.7	23.1	22.4	29.2	28.2	27.1	25.8	25.3	24.7	24
	Pdwe (kPa)	99.8	97	93.7	89.7	87.9	86	84	70.1	66.8	62.5	57.2	54.7	52	49.2	82.7	77.5	71.9	65.7	63	60.2	57.3	90.5	85.1	79.1	72.6	69.8	66.8	63.7
15	Cc (kW)	473	466	457	446	442	436	431	536	522	503	479	468	455	441	588	568	544	518	506	494	480	624	603	580	553	541	528	514
	Pi (kW)	114	125	137	150	155	161	167	130	141	155	170	176	183	190	140	151	164	179	185	192	199	150	162	176	191	198	206	213
	Qwe (l/s)	22.7	22.3	21.9	21.4																								



# 6 Capacity tables

## 6 - 1 Cooling Capacity Tables

EWAD-D-HS

		510						550						590								
		Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)						Condenser Inlet Air Temperature (°C)								
ELWT (°C)		25	30	35	40	42	44	46	25	30	35	40	42	44	46	25	30	35	40	42	44	46
4	Cc (kW)	517	496	472	445	433	420	389	542	525	505	478	458	436	404	574	560	544	522	497	464	431
	Pi (kW)	143	155	169	186	193	201	200	146	161	177	195	199	202	200	151	168	186	207	210	209	207
	Qwe (l/s)	24.6	23.6	22.5	21.2	20.6	20	18.5	25.8	25	24.1	22.8	21.8	20.8	19.3	27.3	26.7	25.9	24.9	23.7	22.1	20.5
	Pdwe (kPa)	51.2	47.5	43.6	39.2	37.2	35.2	30.7	54.6	51.6	48.2	43.6	40.4	36.9	32.3	50.3	48.2	45.7	42.5	38.9	34.4	30
5	Cc (kW)	531	510	486	459	446	433	418	556	539	519	495	480	458	434	589	575	558	536	525	499	462
	Pi (kW)	144	157	171	188	195	203	211	148	163	179	198	205	208	211	152	170	188	209	219	222	219
	Qwe (l/s)	25.3	24.3	23.2	21.9	21.3	20.6	19.9	26.5	25.7	24.7	23.6	22.9	21.8	20.7	28.1	27.4	26.6	25.6	25	23.8	22
	Pdwe (kPa)	53.8	50.1	45.9	41.4	39.4	37.2	35	57.3	54.1	50.6	46.5	44	40.4	36.7	52.7	50.5	47.9	44.6	43	39.2	34.1
6	Cc (kW)	545	524	500	472	460	446	431	571	553	533	508	497	479	456	604	589	573	550	539	527	496
	Pi (kW)	146	159	173	189	197	204	213	149	164	180	199	208	215	218	154	171	189	211	220	231	233
	Qwe (l/s)	26	25	23.8	22.5	21.9	21.3	20.6	27.2	26.4	25.4	24.2	23.7	22.9	21.7	28.8	28.1	27.3	26.2	25.7	25.1	23.7
	Pdwe (kPa)	56.5	52.6	48.4	43.6	41.6	39.4	37.1	60.1	56.8	53.1	48.8	46.8	43.9	40.1	55.3	52.9	50.2	46.8	45.1	43.2	38.8
7	Cc (kW)	560	538	514	486	473	459	445	585	567	547	522	510	498	479	619	604	587	565	553	541	526
	Pi (kW)	148	161	175	191	199	206	215	151	166	182	201	210	219	226	156	173	191	212	222	233	245
	Qwe (l/s)	26.7	25.7	24.5	23.2	22.6	21.9	21.2	27.9	27.1	26.1	24.9	24.3	23.7	22.8	29.5	28.8	28	26.9	26.4	25.8	25.1
	Pdwe (kPa)	59.3	55.2	50.9	46	43.8	41.5	39.2	63	59.5	55.7	51.2	49.2	47	43.8	57.8	55.4	52.6	49	47.3	45.3	43.2
8	Cc (kW)	575	552	528	499	487	473	458	600	582	561	536	524	511	496	635	619	602	579	567	555	540
	Pi (kW)	150	162	177	193	201	208	216	153	168	184	203	212	221	231	157	175	193	214	224	235	246
	Qwe (l/s)	27.4	26.4	25.2	23.8	23.2	22.6	21.9	28.7	27.8	26.8	25.6	25	24.4	23.7	30.3	29.6	28.7	27.6	27.1	26.5	25.8
	Pdwe (kPa)	62.2	58	53.4	48.3	46.1	43.8	41.3	65.9	62.3	58.4	53.7	51.6	49.3	46.8	60.5	57.9	55	51.2	49.5	47.5	45.3
9	Cc (kW)	590	567	542	513	500	486	471	615	597	575	549	537	524	510	650	635	616	593	581	568	554
	Pi (kW)	152	164	179	195	203	210	218	155	170	186	205	214	223	233	159	177	195	216	226	236	248
	Qwe (l/s)	28.2	27.1	25.9	24.5	23.9	23.2	22.5	29.4	28.5	27.5	26.2	25.7	25	24.3	31.1	30.3	29.4	28.3	27.8	27.1	26.5
	Pdwe (kPa)	65.2	60.8	56	50.8	48.5	46.1	43.5	69	65.2	61.1	56.2	54.1	51.7	49.1	63.3	60.6	57.4	53.5	51.7	49.7	47.4
10	Cc (kW)	605	582	556	527	514	499	484	631	611	589	563	551	538	523	666	650	631	607	595	582	568
	Pi (kW)	154	166	181	197	205	212	221	157	172	188	207	216	225	235	161	179	197	218	228	238	250
	Qwe (l/s)	28.9	27.8	26.6	25.2	24.5	23.9	23.1	30.1	29.2	28.2	26.9	26.3	25.7	25	31.8	31.1	30.1	29	28.4	27.8	27.1
	Pdwe (kPa)	68.3	63.7	58.7	53.2	50.9	48.4	45.8	72.1	68.2	63.9	58.8	56.6	54.1	51.5	66.1	63.3	60	55.9	54	51.9	49.6
11	Cc (kW)	620	596	570	540	527	513	498	646	626	604	577	565	551	536	682	665	646	621	609	596	581
	Pi (kW)	156	168	183	199	207	215	223	158	174	190	209	217	227	236	163	181	199	220	230	240	251
	Qwe (l/s)	29.6	28.5	27.3	25.8	25.2	24.5	23.8	30.9	29.9	28.9	27.6	27	26.3	25.6	32.6	31.8	30.9	29.7	29.1	28.5	27.8
	Pdwe (kPa)	71.5	66.7	61.5	55.8	53.4	50.8	48.1	75.4	71.3	66.8	61.5	59.1	56.6	53.9	69	66	62.6	58.3	56.3	54.2	51.8
12	Cc (kW)	635	611	585	554	541	526	511	662	641	618	591	578	564	550	698	681	661	635	623	610	595
	Pi (kW)	158	171	185	202	209	217	225	160	176	192	211	220	229	238	164	183	201	222	232	242	253
	Qwe (l/s)	30.4	29.2	28	26.5	25.8	25.2	24.4	31.6	30.7	29.6	28.3	27.6	27	26.3	33.4	32.6	31.6	30.4	29.8	29.2	28.4
	Pdwe (kPa)	74.7	69.8	64.4	58.4	55.9	53.2	50.5	78.7	74.5	69.7	64.2	61.8	59.2	56.4	72.1	68.9	65.3	60.8	58.8	56.5	54
13	Cc (kW)	651	626	599	568	554	540	524	677	657	633	605	592	578	563	714	697	676	650	638	624	595
	Pi (kW)	160	173	187	204	211	219	227	162	178	194	213	222	231	240	166	185	203	224	234	244	247
	Qwe (l/s)	31.1	30	28.7	27.2	26.5	25.8	25.1	32.4	31.4	30.3	28.9	28.3	27.7	26.9	34.2	33.3	32.3	31.1	30.5	29.8	28.4
	Pdwe (kPa)	78.1	72.9	67.3	61.1	58.5	55.7	52.9	82.2	77.7	72.8	67.1	64.5	61.8	58.9	75.2	71.8	68.1	63.4	61.2	58.9	54
14	Cc (kW)	667	642	614	582	568	553	537	693	672	648	619	606	592	569	731	713	691	665	652	638	597
	Pi (kW)	162	175	189	206	213	221	229	164	180	196	215	224	233	238	168	187	206	227	236	246	242
	Qwe (l/s)	31.9	30.7	29.4	27.9	27.2	26.5	25.7	33.2	32.2	31	29.6	29	28.3	27.3	35	34.1	33.1	31.8	31.2	30.5	28.6
	Pdwe (kPa)	81.6	76.2	70.3	63.9	61.2	58.3	55.3	85.7	81.1	75.9	70	67.3	64.5	60.2	78.3	74.9	70.9	66	63.8	61.3	54.4
15	Cc (kW)	682	657	629	596	582	567	551	709	687	663	633	620	606	577	747	729	707	679	666	652	595
	Pi (kW)	164	177	192	208	216	223	232	166	182	199	218	226	235	237	170	189	208	229	238	248	235
	Qwe (l/s)	32.7	31.5	30.1	28.5	27.9	27.1	26.4	33.9	32.9	31.7	30.3	29.7	29	27.6	35.8	34.9	33.8	32.5	31.9	31.2	28.5
	Pdwe (kPa)	85.2	79.6	73.5	66.8	63.9	61	57.9	89.4	84.5	79.1	72.9	70.2	67.3	61.8	81.6	78	73.8	68.7	66.4	63.8	54.2

## 6 Capacity tables

### 6 - 2 Partial Heat Recovery Capacity tables

#### Partial Heat Recovery Ratings EWAD-D-HS

EWC / LWC	*Model EWAD-D-HS*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
50/60	200	159	80.0	84	35%	3.03
	210	171	78.4	87	35%	3.30
	230	196	83.3	98	35%	3.52
	260	213	92.2	107	35%	3.48
	270	227	105	116	35%	3.28
	290	240	112	123	35%	3.23
	310	259	124	134	35%	3.18
	340	281	128	123	30%	3.15
	380	329	141	122	28%	3.20
	420	332	161	173	35%	3.13
	450	373	172	191	35%	3.27
	480	403	189	207	35%	3.24
	510	432	206	223	35%	3.18
	550	461	219	238	35%	3.19
	590	508	225	191	26%	3.10

#### NOTES

Cc (cooling capacity)

Pi (unit power input)

Hc (heating heat recovery capacity)

%Hc (percentage heat recovered)

EER Hc (coefficient 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<sup>2</sup> °C/kW evaporator fouling factor

# 6 Capacity tables

## 6 - 3 Total Heat Recovery Capacity Tables

**Total Heat Recovery Ratings**  
EWAD-D-HS

EWC / LWC	*Model EWAD-D-HS*	Cc (kW)	Pi (kW)	Hc (kW)	% Hc	EER Hc
40/45	200	167	76.7	207	85%	4.88
	210	179	75.1	216	85%	5.27
	230	205	80.0	243	85%	5.60
	260	224	88.4	265	85%	5.54
	270	238	102	289	85%	5.19
	290	251	109	306	85%	5.12
	310	272	120	333	85%	5.04
	340	294	124	314	75%	4.89
	380	345	137	314	65%	4.81
	420	348	154	427	85%	5.02
	450	391	165	473	85%	5.23
	480	423	183	515	85%	5.13
	510	453	200	555	85%	5.05
	550	484	213	592	85%	5.06
	590	533	219	488	65%	4.67
40/50	200	159	77.5	201	85%	4.65
	210	171	75.9	210	85%	5.02
	230	196	80.8	235	85%	5.33
	260	213	89.3	257	85%	5.27
	270	227	103	281	85%	4.94
	290	240	110	297	85%	4.88
	310	259	121	323	85%	4.81
	340	281	125	305	75%	4.66
	380	329	138	304	65%	4.58
	420	332	156	415	85%	4.79
	450	373	167	459	85%	4.99
	480	403	185	500	85%	4.89
	510	432	202	539	85%	4.81
	550	461	215	575	85%	4.82
	590	508	221	474	65%	4.44
45/55	200	159	78.4	143	60%	3.85
	210	171	76.8	149	60%	4.16
	230	196	81.7	167	60%	4.43
	260	213	90.4	182	60%	4.38
	270	227	104	199	60%	4.11
	290	240	111	210	60%	4.05
	310	259	122	229	60%	3.99
	340	281	127	204	50%	3.82
	380	329	140	202	43%	3.80
	420	332	158	294	60%	3.97
	450	373	169	325	60%	4.13
	480	403	187	354	60%	4.06
	510	432	204	382	60%	3.99
	550	461	217	407	60%	4.00
	590	508	223	314	43%	3.68

**NOTES**

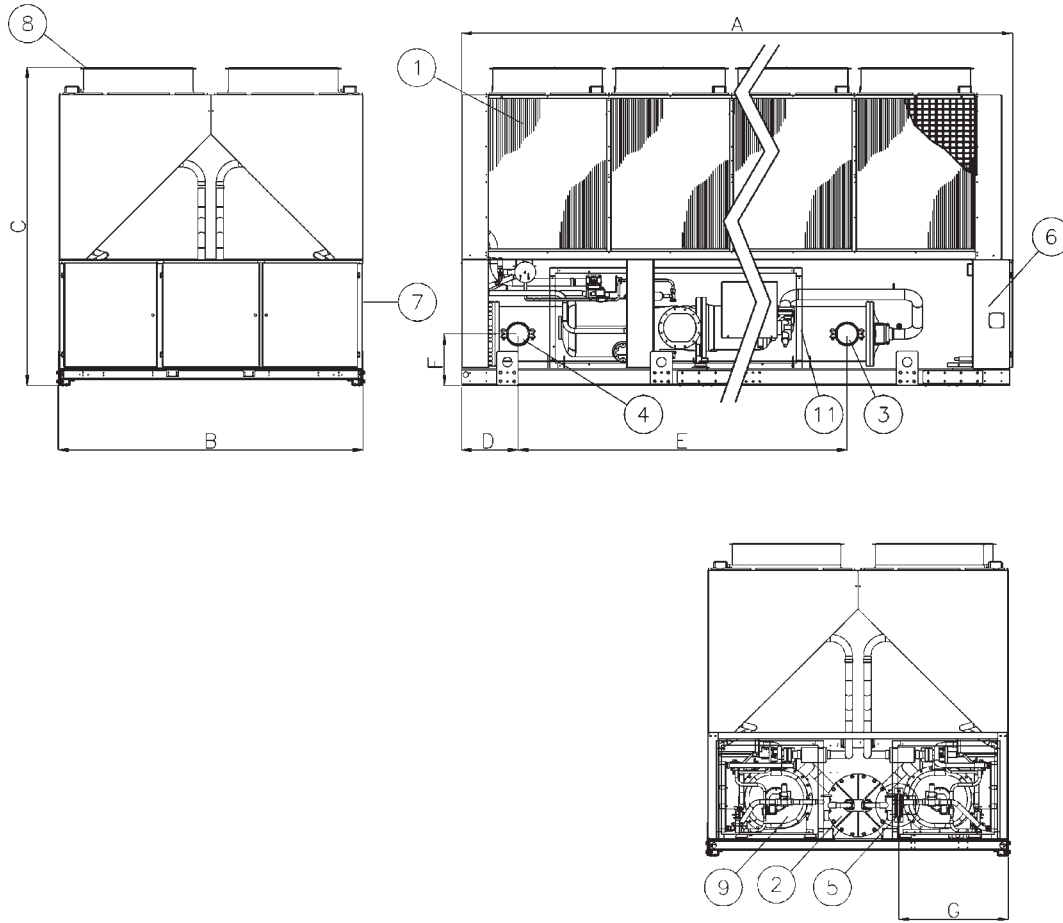
- Cc (cooling capacity)
- Pi (unit power input)
- Hc (heating heat recovery capacity)
- %Hc (percentage heat recovered)
- EER Hc (coefficient of performance during heat recovery = (cooling+ heating capacity) / power input)
- EWC (Entering water heat recovery condenser)
- LWC (Leaving water heat recovery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

Data refers to:  
 LWL (Leaving water evaporator) = 7°C  
 Same evaporator flow as for nominal cooling operation  
 Condenser Inlet Air Temperature = 35°C  
 0.0176 m<sup>2</sup> °C/kW evaporator fouling factor

# 7 Dimensional drawings

## 7 - 1 Dimensional Drawings

Dimensions EWAD~D-



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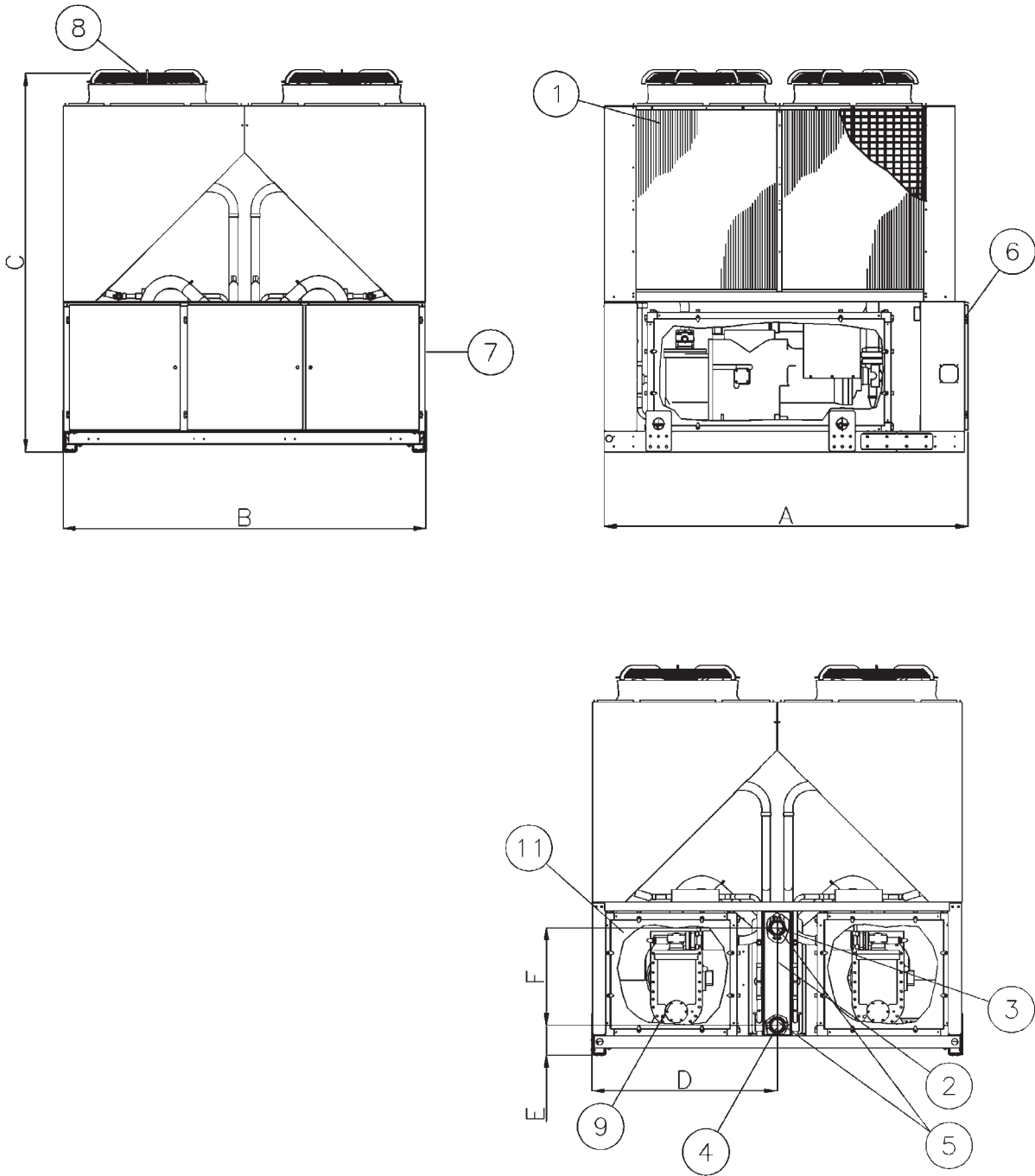
Models	Dimensions (mm)						
	A	B	C	D	E	F	G
EWAD							
EWAD390D-SS	3139	2234	2223	392	1875	339	873
EWAD440~580D-SS	4040	2234	2223	392	2450	339	855
EWAD230~300D-SL	3139	2234	2355	374	1911	339	873
EWAD320D-SL	4040	2234	2355	374	2486	339	873
EWAD400~530D-SL	4040	2234	2223	392	2450	339	855
EWAD220~280D-SR	3139	2234	2355	374	1911	339	873
EWAD310D-SR	4040	2234	2355	374	2486	339	873
EWAD400~530D-SR	4040	2234	2223	392	2450	339	855
EWAD210D-SX	3139	2234	2420	374	1911	339	873
EWAD230~310D-SX	4040	2234	2420	374	2486	339	873
EWAD370~490D-SX	4040	2234	2420	392	2450	339	873
EWAD250D-XS	3138	2234	2355	374	1911	339	873
EWAD280~400D-XS	4040	2234	2355	374	2486	339	873
EWAD470D-XS	4040	2234	2223	414	2412	379	873
EWAD520~620D-XS	4940	2234	2223	414	2412	379	815
EWAD240D-XR	3138	2234	2355	374	1911	339	873
EWAD270~390D-XR	4040	2234	2355	374	2486	339	873
EWAD460D-XR	4040	2234	2223	414	2412	379	873
EWAD510~600D-XR	4940	2234	2223	414	2412	379	815
EWAD230~310D-HS	3339	2234	2223	374	1911	339	873
EWAD340~380D-HS	4040	2234	2223	374	2486	339	873
EWAD420~590D-HS	4040	2234	2223	392	2450	339	873

**LEGEND**

- 1 – Condenser Coil
- 2 – Water heat exchanger (evaporator)
- 3 – Evaporator water inlet
- 4 – Evaporator water outlet
- 5 – Victaulic connection
- 6 – Operating and control panel
- 7 – Slot for power and control connection
- 8 – Fan
- 9 – Compressor

# 7 Dimensional drawings

## 7 - 1 Dimensional Drawings



7  
7

Models	Dimensions (mm)					
	A	B	C	D	E	F
EWAD180~200D-SL	2239	2234	2355	1117	181	590
EWAD180~190D-SR	2239	2234	2355	1117	181	590
EWAD200~210D-HS	2223	2234	2223	1117	181	590

- LEGEND**
- 1 – Condenser Coil
  - 2 – Water heat exchanger (evaporator)
  - 3 – Evaporator water inlet
  - 4 – Evaporator water outlet
  - 5 – Victaulic connection
  - 6 – Operating and control panel
  - 7 – Slot for power and control connection
  - 8 – Fan
  - 9 – Compressor

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## 8 Sound data

### 8 - 1 Sound Level Data

EWAD-D-HS

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. $2 \times 10^{-5}$ Pa)								Power	
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)
200	79.0	74.3	72.4	78.8	67.8	65.2	56.5	50.8	77.0	95.7
210	79.0	74.3	72.4	78.8	67.8	65.2	56.5	50.8	77.0	95.7
230	79.0	74.3	72.4	78.8	67.8	65.2	56.5	50.8	77.0	96.3
260	79.0	74.3	72.4	78.8	67.8	65.2	56.5	50.8	77.0	96.3
270	79.0	74.3	72.4	78.8	67.8	65.2	56.5	50.8	77.0	96.3
290	79.0	74.3	72.4	78.8	67.8	65.2	56.5	50.8	77.0	96.3
310	79.0	74.3	72.4	78.8	67.8	65.2	56.5	50.8	77.0	96.3
340	79.0	74.3	72.4	78.8	67.8	65.2	56.5	50.8	77.0	96.7
380	81.0	76.4	74.4	80.7	70.2	67.4	58.8	52.9	79.0	98.7
420	63.0	72.0	70.5	77.0	68.5	71.0	58.5	50.4	77.0	96.7
450	63.0	72.0	71.5	77.0	70.0	71.5	58.5	51.5	77.5	97.7
480	63.0	72.0	71.5	77.0	70.0	71.5	58.5	51.5	77.5	97.7
510	63.0	72.0	71.5	77.0	70.0	71.5	58.5	51.5	77.5	97.7
550	64.5	73.5	73.5	78.5	71.5	73.0	60.0	53.0	79.0	99.2
590	65.0	74.0	74.0	79.0	72.1	73.6	60.5	53.5	79.5	99.7

#### NOTES

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

## 8 Sound data

### 8 - 1 Sound Level Data

EWAD-D-HS

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
200	0.0	-8.4	-13.4	-16.5	-18.8	-20.6	-26.4
210	0.0	-8.4	-13.4	-16.5	-18.8	-20.6	-26.4
230	0.0	-8.0	-12.9	-16.0	-18.2	-20.1	-25.8
260	0.0	-8.0	-12.9	-16.0	-18.2	-20.1	-25.8
270	0.0	-8.0	-12.9	-16.0	-18.2	-20.1	-25.8
290	0.0	-8.0	-12.9	-16.0	-18.2	-20.1	-25.8
310	0.0	-8.0	-12.9	-16.0	-18.2	-20.1	-25.8
340	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
380	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
420	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
450	0.0	-7.8	-12.6	-15.7	-17.9	-19.7	-25.4
480	0.0	-7.5	-12.3	-15.3	-17.6	-19.3	-25.0
510	0.0	-7.5	-12.3	-15.3	-17.6	-19.3	-25.0
550	0.0	-7.5	-12.3	-15.3	-17.6	-19.3	-25.0
590	0.0	-7.5	-12.3	-15.3	-17.6	-19.3	-25.0

#### NOTES

Values are dB(A) (pressure level)

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## 9 Installation

### 9 - 1 Installation Method

#### Installation notes

##### Warning

Installation and maintenance of the unit must be performed only by qualified personnel who have knowledge with local codes and regulations, and experience with this type of equipment. The unit must be installed to allow all the maintenance operations.

##### Handling

Care should be taken to avoid rough handling or shock due to dropping of 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 result in reductions in unit efficiency and capacity.

Moreover the unique microprocessor has the ability to analyse the operating environment of the air cooled chiller and to optimize its performance to stay 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.3). 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 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.4); 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 for general installation. A specific evaluation should be done by contractor depending on the case.

Minimum recommended installation clearances

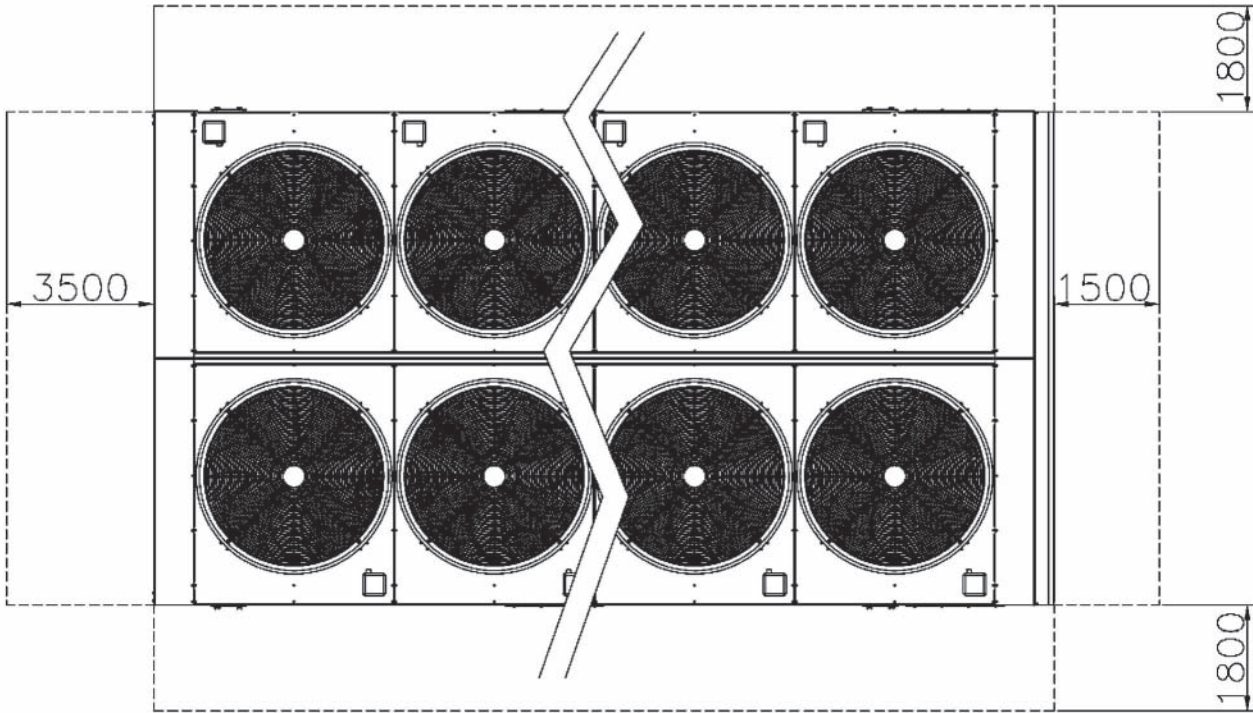


Fig. 1

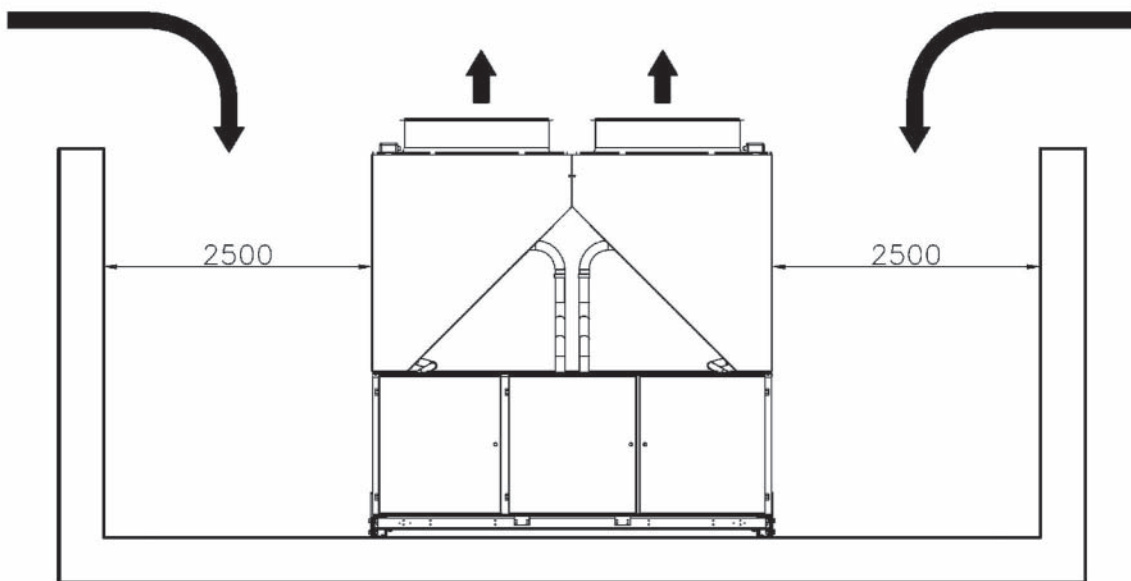


Fig. 2

## 9 Installation

### 9 - 1 Installation Method

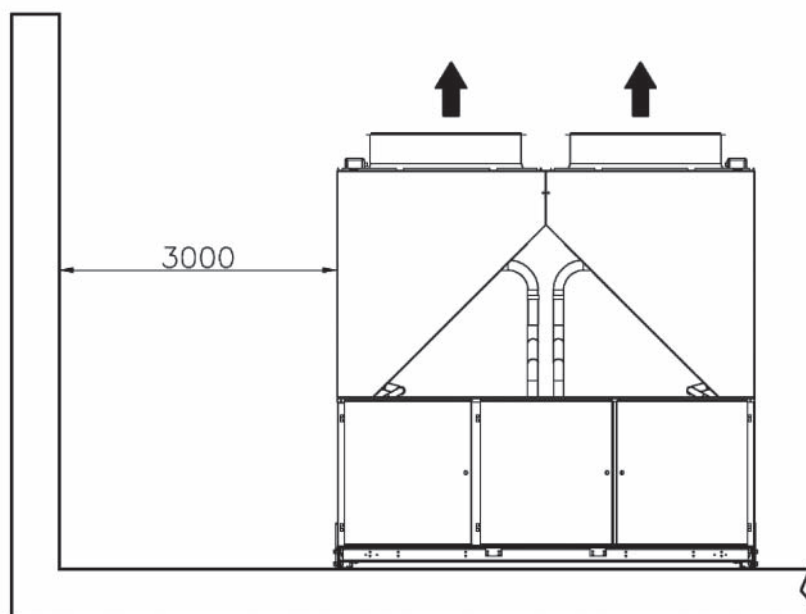


Fig. 3

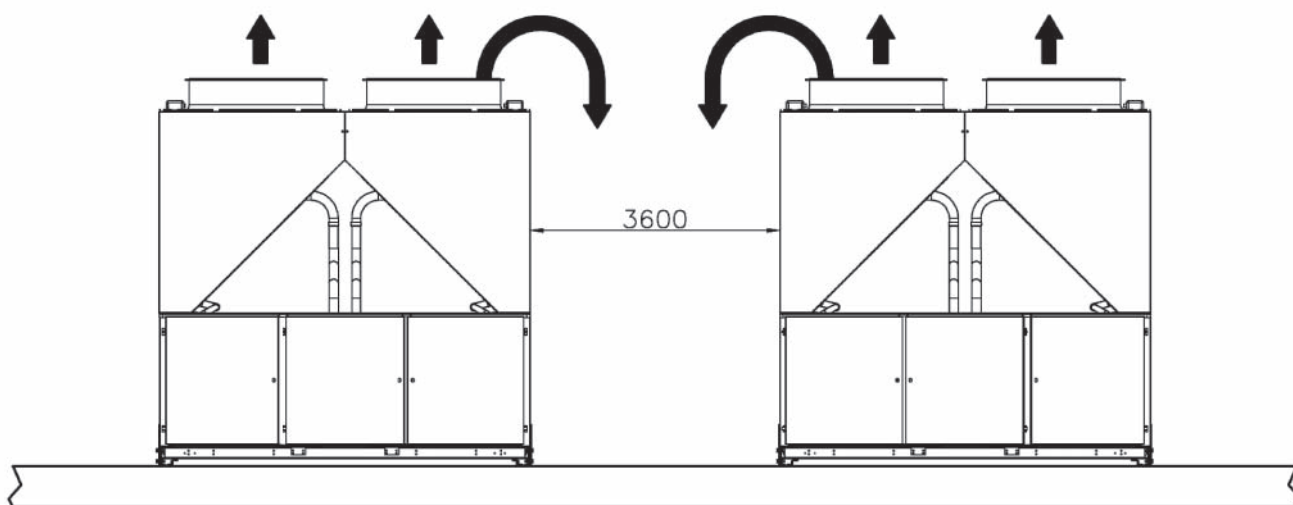


Fig. 4

#### 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

# 10 Operation range

## 10 - 1 Operation Range

**Table 1 - Evaporator minimum and maximum water Δt**

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

**Table 2 - Evaporator fouling factors**

Fouling factors m <sup>2</sup> °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 - Air heat exchanger - 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 operating altitude is 2000 m above sea level.
- Contact factory in case the unit has to be installed at altitudes between 1000 and 2000 m above sea level.

**Table 4.1 - Minimum glycol percentage for low water temperature**

EWLT (°C)	2	0	-2	-4	-6	-8	-10	-12	-15
Ethylene glycol (%)	10	20	20	20	30	30	30	40	40
Propylene glycol (%)	10	20	20	30	30	30	40	40	40

- ELWT (Evaporator Leaving Water Temperature (°C)).
- 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 ambient temperature**

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

- Minimum glycol percentage to prevent freezing of water circuit at indicated air ambient temperature.
- 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 (EWLT < 4°C)**

EWLT (°C)	-4	-6	-8	-10	-12	-15
Cooling Capacity	0.670	0.613	0.562	0.510	0.455	0.375
Compressor Power Input	0.890	0.870	0.840	0.798	0.755	0.680

- ELWT (Evaporator Leaving Water Temperature (°C)).
- 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

- Contact factory for water temperature out of operating limits.

## 10 Operation range

### 10 - 1 Operation Range

#### 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: **EWAD390D-SS**

Mixture: Water  
 Working condition: ELWT 12/7°C – Condenser inlet air temperature 35°C  
 - Cooling capacity: 389 kW  
 - Power input: 152 kW  
 - Flow rate ( $\Delta t$  5°C): 18.60 l/s  
 - Evaporator pressure drop: 46 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:  $389 \times 0.972 = 378$  kW  
 - Power input:  $152 \times 0.986 = 150$  kW  
 - Flow rate ( $\Delta t$  5°C):  $18$  (referred to 378 kW)  $\times 1.074 = 19.33$  l/s  
 - Evaporator pressure drop:  $49$  (refererd to 19.33 l/s)  $\times 1.181 = 58$  kPa

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##### 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: **EWAD390D-SS**

Mixture: Water  
 Standard working condition ELWT 12/7°C – Condenser inlet air temperature 30°C  
 - Cooling capacity: 412 kW  
 - Power input: 139 kW  
 - Flow rate ( $\Delta t$  5°C): 19.7 l/s  
 - Evaporator pressure drop: 51 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:  $412 \times 0.613 \times 0.972 = 245$  kW  
 - Power input:  $139 \times 0.870 \times 0.986 = 119$  kW  
 - Flow rate ( $\Delta t$  5°C):  $11.71$  l/s (referred to 245 kW)  $\times 1.074 = 12.58$  l/s  
 - Evaporator pressure drop:  $23$  kPa (referred to 12.58 l/s)  $\times 1.181 = 27$  kPa

# 10 Operation range

## 10 - 1 Operation Range

Table 7.1 - 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

ESP table refers to fan diameter Ø800, available on units as follows:

EWAD390~580D-SS  
EWAD470~620D-XS  
EWAD420~590D-HS

Table 7.2 - Available fan static pressure correction factors

"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

ESP table refers to fan diameter Ø800, available on units as follows:

EWAD320~530D-SL/SR  
EWAD460~600D-XR

### How to use the Correction factors proposed in the previous tables

#### Example

Unit Size: **EWAD390D-SS**

- External static pressure: **0 Pa**
- Working condition: ELWT 12/7°C – Condenser inlet air temperature 35°C
- Cooling capacity: 389 kW
- Power input: 152 kW
- Maximum CIAT: 48°C (see graphic operating limit)

- External static pressure: **40 Pa**
- Working condition: ELWT 12/7°C – Condenser inlet air temperature 35°C
- Cooling capacity:  $389 \times 0.993 = 386 \text{ kW}$
- Power input:  $152 \times 1.018 = 155 \text{ kW}$
- Maximum CIAT:  $48 - 1.0 = 47^\circ\text{C}$

# 10 Operation range

## 10 - 1 Operation Range

### Water charge, flow and quality

Items <sup>(1) (5)</sup>		Cooling Water			Cooled Water		Heated water <sup>(2)</sup>				Tendency if out of criteria		
		Circulating System		Once Flow			Low temperature		High temperature				
		Circulating water	Supply water <sup>(4)</sup>		Flowing water	Circulating water [Below 20°C]	Supply water <sup>(4)</sup>	Circulating water [20°C ~ 60°C]	Supply water <sup>(4)</sup>	Circulating water [60°C ~ 80°C]		Supply water <sup>(4)</sup>	
Items to be controlled:	pH	at 25°C	6.5 ~ 8.2	6.0 ~ 8.0	6.0 ~ 8.0	6.0 ~ 8.0	6.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	Corrosion + Scale	
	Electrical conductivity	[mS/m] at 25°C	Below 80	Below 30	Below 40	Below 40	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Corrosion + Scale
		[µS/cm] at 25°C	(Below 800)	(Below 300)	(Below 400)	(Below 400)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	Corrosion + Scale
	Chloride ion	[mgCl <sup>-</sup> /l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	Sulfate ion	[mgSO <sub>4</sub> <sup>2-</sup> /l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	M-alkalinity (pH4.8)	[mgCaCO <sub>3</sub> /l]	Below 100	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Total hardness	[mgCaCO <sub>3</sub> /l]	Below 200	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Below 70	Scale
	Calcium hardness	[mgCaCO <sub>3</sub> /l]	Below 150	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
Silica ion	[mgSiO <sub>2</sub> /l]	Below 50	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Scale	
Items to be referred to	Iron	[mgFe/l]	Below 1.0	Below 0.3	Below 1.0	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Below 1.0	Below 0.3	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 1.0	Below 0.1	Corrosion
	Sulfite ion	[mgS <sup>2-</sup> /l]	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Corrosion
	Ammonium ion	[mgNH <sub>4</sub> <sup>+</sup> /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	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	Below 0.3	Corrosion
	Free carbide	[mgCO <sub>2</sub> /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	Below 4.0	Corrosion
	Stability index		6.0 ~ 7.0	---	---	---	---	---	---	---	---	---	Corrosion + Scale

#### NOTES

- Names, definitions and units are according to JIS K 0101. Units and figures between brackets are old units published as reference only.
- 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 desirable to give the valid measure for corrosion. E.g. chemical measure.
- 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.
- Supply water is considered drink water, industrial water and ground water except for genuine water, neutral water and soft water.
- The above mentioned items are representable items in corrosion and scale cases.

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## 10 Operation range

### 10 - 1 Operation Range

#### 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

$$M \text{ (liters)} = ( 0.1595 \times \Delta T(^{\circ}\text{C}) + 3.0825 ) \times P(\text{kW})$$

where:

- M minimum water content per unit expressed in litres
- P Cooling Capacity of the unit expressed in kW
- $\Delta T$  evaporator entering / leaving water temperature difference expressed in  $^{\circ}\text{C}$

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.

## 10 Operation range

### 10 - 1 Operation Range

#### 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

$$M \text{ (liters)} = ( 0.1595 \times \Delta T(^{\circ}\text{C}) + 3.0825 ) \times P(\text{kW})$$

where:

M minimum water content per unit expressed in litres

P Cooling Capacity of the unit expressed in kW

$\Delta T$  evaporator entering / leaving water temperature difference expressed in  $^{\circ}\text{C}$

This formula is valid for:

- standard microprocessor parameters

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

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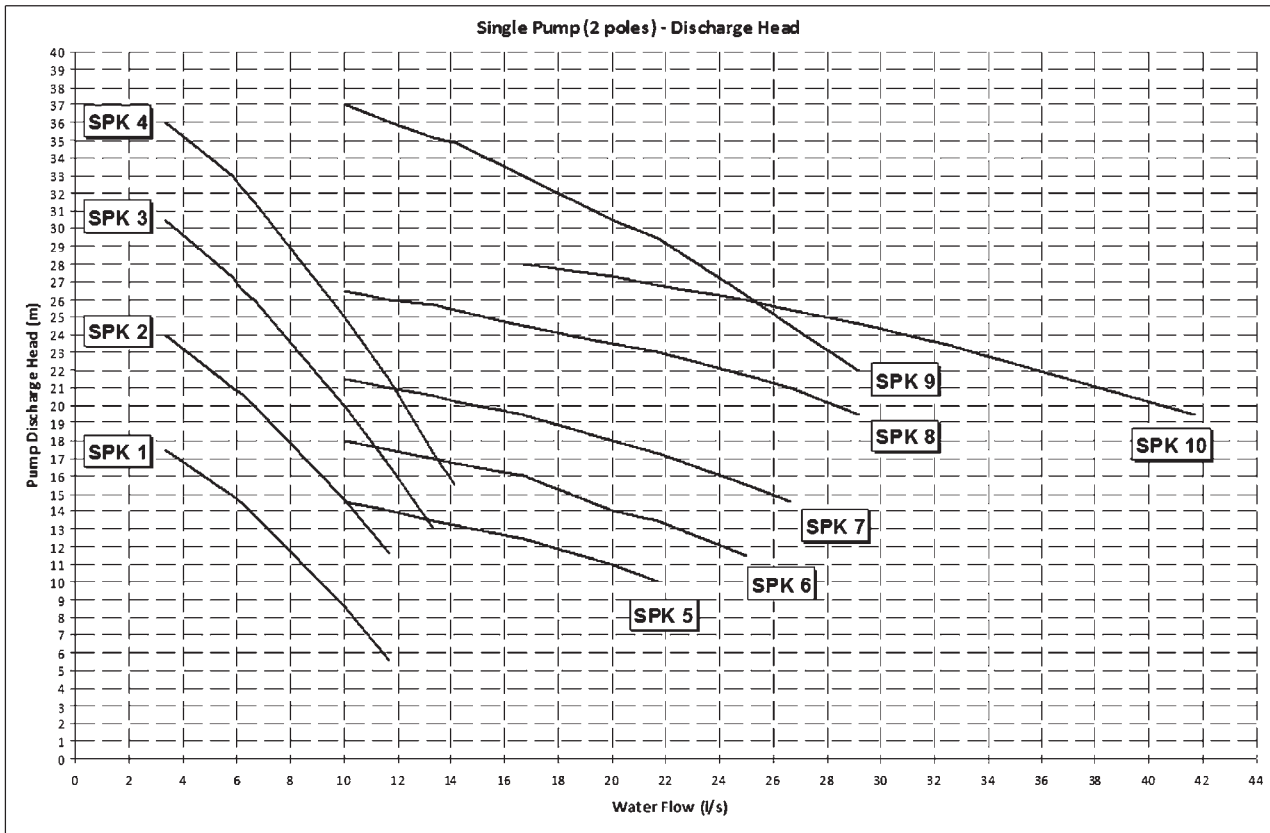
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# 11 Hydraulic performance

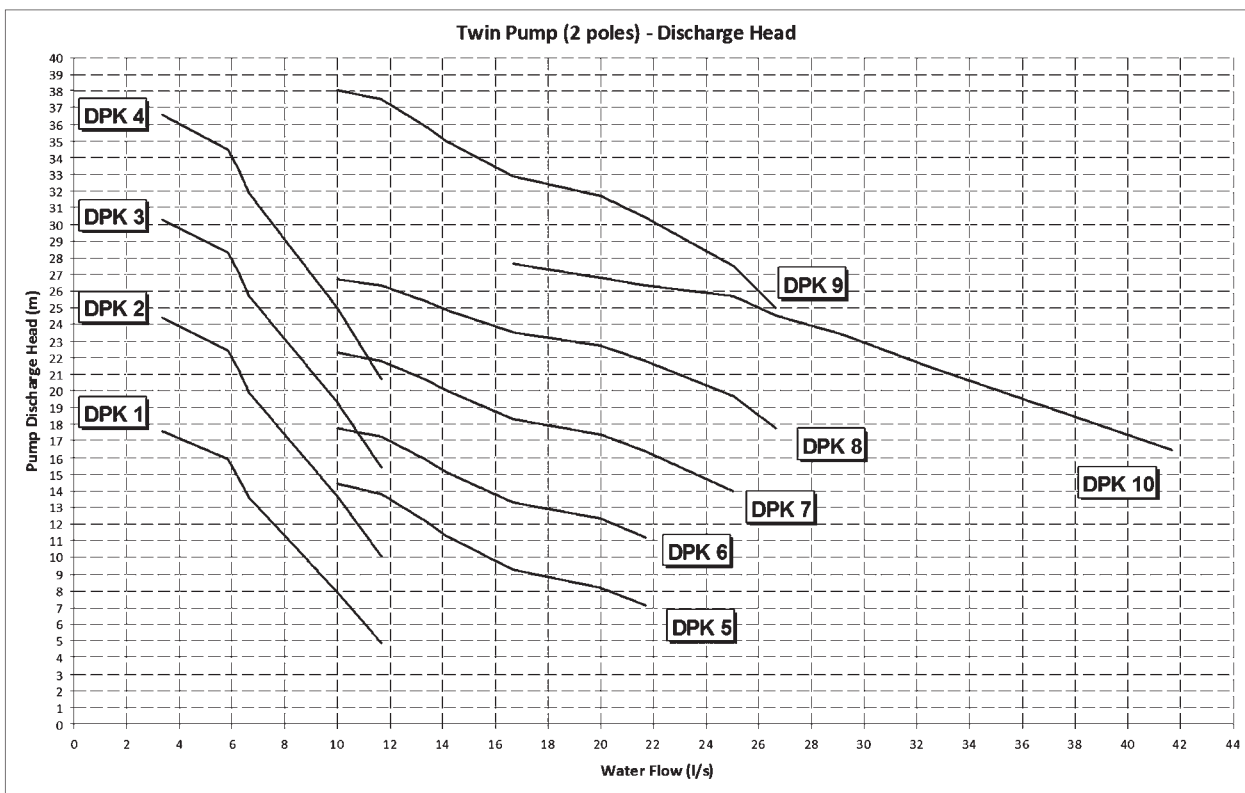
## 11 - 1 Pump Characteristics

Water Pump Kit - Available External Static Pressure



OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_6 (1/2)

Water Pump Kit - Available External Static Pressure



OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_6 (2/2)

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

Water Pump Kit - Combination Matrix

Version	Size	Single Pump										
		SPK 1	SPK 2	SPK 3	SPK 4	SPK 5	SPK 6	SPK 7	SPK 8	SPK 9	SPK 10	
EWAD-D-SS	390						X	X	X	X	X	
	440						X	X	X	X	X	
	470						X	X	X	X	X	
	510						X	X	X	X	X	
	530							X	X	X	X	
	560							X	X	X	X	
	580							X	X	X	X	
	580							X	X	X	X	
EWAD-D-SL	180	X	X	X	X							
	200	X	X	X	X							
	230		X	X	X							
	250		X	X	X							
	260			X	X							
	280				X							
	300			X	X							
	320					X				X		
	370					X				X		
	400					X				X		
	440					X				X		
	480					X				X		
	510					X				X		
	530					X				X		
EWAD-D-SR	180	X	X	X	X							
	190	X	X	X	X							
	220		X	X	X		X	X	X	X		
	240		X	X	X		X	X	X	X		
	250			X	X		X	X	X	X		
	270			X	X		X	X	X	X		
	280			X	X		X	X	X	X		
	310				X		X	X	X	X		
	370					X	X	X	X	X	X	
	400					X	X	X	X	X	X	
	440					X	X	X	X	X	X	
	480					X	X	X	X	X	X	
	510					X	X	X	X	X	X	
	530					X	X	X	X	X	X	
EWAD-D-SX	210		X	X								
	230		X	X	X	X	X	X	X			
	250		X	X	X	X	X	X	X			
	270			X	X	X	X	X	X			
	290				X	X	X	X	X			
	300				X	X	X	X	X			
	310				X	X	X	X	X			
	370				X	X	X	X	X		X	
	410				X	X	X	X	X		X	
	450				X	X	X	X	X		X	
	490				X	X	X	X	X		X	
	250			X	X	X	X	X	X			
	280			X	X	X	X	X	X			
	300				X	X	X	X	X			
EWAD-D-SX	330				X	X	X	X	X			
	350				X	X	X	X	X		X	
	380				X	X	X	X	X		X	
	400				X	X	X	X	X		X	
	470					X	X	X	X		X	
	520					X	X	X	X		X	
	580						X	X	X		X	
	620							X	X		X	
	EWAD-D-XR	240		X	X	X	X	X	X	X		
		270			X	X	X	X	X	X		
300					X	X	X	X	X			
320					X	X	X	X	X			
350					X	X	X	X	X			
370					X	X	X	X	X			
390					X	X	X	X	X		X	
460						X	X	X	X		X	
510						X	X	X	X		X	
560							X	X	X		X	
EWAD-D-HS	200		X	X	X							
	210		X	X	X							
	230		X	X	X	X	X	X	X			
	260			X	X	X	X	X	X			
	270			X	X	X	X	X	X			
	290				X	X	X	X	X			
	310				X	X	X	X	X			
	340				X	X	X	X	X			
	360				X	X	X	X	X		X	
	420				X	X	X	X	X		X	
	450					X	X	X	X		X	
	480					X	X	X	X		X	
	510					X	X	X	X		X	
	550						X	X	X		X	
590							X	X		X		

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11

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

Water Pump Kit - Combination Matrix

Version	Size	Double Pump									
		DPK 1	DPK 2	DPK 3	DPK 4	DPK 5	DPK 6	DPK 7	DPK 8	DPK 9	DPK 10
EWAD-D-SS	390						X	X	X	X	X
	440						X	X	X	X	X
	470							X	X	X	X
	510							X	X	X	X
	530								X	X	X
	560								X	X	X
	580									X	X
EWAD-D-SL	180	X	X	X	X						
	200	X	X	X	X						
	230		X	X	X						
	250		X	X	X						
	260										
	280						X	X	X	X	
	300					X	X	X	X	X	
	320					X	X	X	X	X	
	370						X	X	X	X	X
	400						X	X	X	X	X
	440						X	X	X	X	X
	480							X	X	X	X
	510							X	X	X	X
530								X	X	X	
EWAD-D-SR	180	X	X	X	X						
	190	X	X	X	X						
	220		X	X	X		X	X	X	X	
	240		X	X	X		X	X	X	X	
	250						X	X	X	X	
	270						X	X	X	X	
	280						X	X	X	X	
	310						X	X	X	X	
	370						X	X	X	X	X
	400						X	X	X	X	X
	440						X	X	X	X	X
	480						X	X	X	X	X
	510						X	X	X	X	X
530							X	X	X	X	
EWAD-D-SX	210		X	X	X						
	230		X	X	X	X	X	X	X		
	250		X	X	X	X	X	X	X		
	270		X	X	X	X	X	X	X		
	290			X	X	X	X	X	X		
	300				X	X	X	X	X		
	310				X	X	X	X	X		
	370				X	X	X	X	X		X
	410				X	X	X	X	X		X
	450				X	X	X	X	X		X
	490				X	X	X	X	X		X
	250					X	X	X	X		
	280					X	X	X	X		
300					X	X	X	X			
330					X	X	X	X			
350						X	X	X		X	
380						X	X	X		X	
400						X	X	X		X	
470						X	X	X		X	
520						X	X	X		X	
580										X	
620										X	
EWAD-D-XR	240		X	X	X		X	X	X	X	
	270					X	X	X	X	X	
	300					X	X	X	X	X	
	320					X	X	X	X	X	
	350						X	X	X	X	
	370						X	X	X	X	
	390						X	X	X	X	X
	460						X	X	X	X	X
	510						X	X	X	X	X
	560										X
EWAD-D-HS	200	X	X	X	X						
	210	X	X	X	X						
	230		X	X	X						
	260						X	X	X	X	
	270						X	X	X	X	
	290					X	X	X	X	X	
	310						X	X	X	X	
	340						X	X	X	X	
	380						X	X	X	X	X
	420						X	X	X	X	X
	450						X	X	X	X	X
	480						X	X	X	X	X
	510						X	X	X	X	X
550										X	
590										X	

# 11 Hydraulic performance

## 11 - 1 Pump Characteristics

### 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	1.5	3.5	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 2	2.2	5.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 3	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 4	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 5	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 6	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 7	5.5	10.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 8	7.5	13.7	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 9	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	SPK 10	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
Double Pump	DPK 1	1.5	3.5	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 2	2.2	5.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 3	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 4	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 5	3.0	6.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 6	4.0	8.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 7	5.5	10.1	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 8	7.5	13.7	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 9	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130
	DPK 10	11.0	20.0	400V-3ph-50hz	PN10	IP55	F	-10 ~ 130

#### NOTES

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

# 11 Hydraulic performance

## 11 - 2 Total and Partial Heat Recovery Pressure Drop

### Total and Partial Heat Recovery Pressure Drops

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

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

where:

- PD<sub>2</sub> Pressure drop to be determinate (kPa)
- PD<sub>1</sub> Pressure drop at nominal condition (kPa)
- Q<sub>2</sub> water flow at new working condition (l/s)
- Q<sub>1</sub> water flow at nominal condition (l/s)

### How to use the formula: Example

The unit EWAD390D-SS has been selected for working at the following conditions:  
 - Total heat recovery leaving water temperature 40/50°C  
 The heating capacity at these working conditions is: 415 kW  
 The water flow at these working conditions is: 9.91 l/s

The unit EWAD390D-SS at nominal working conditions has the following data:  
 - Total heat recovery leaving water temperature 40/45°C  
 - condenser air inlet: 35°C  
 The heating capacity at these working conditions is: 427 kW  
 The water flow at these working conditions is: 20.41 l/s  
 The pressure drop at these working conditions is: 37 kPa

The pressure drop at the selected working condition will be:

$$PD_2 \text{ (kPa)} = 37 \text{ (kPa)} \times \left( \frac{9.91 \text{ (l/s)}}{20.41 \text{ (l/s)}} \right)^{1.80}$$

$$PD_2 \text{ (kPa)} = 10 \text{ (kPa)}$$

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_5

### Partial Total Heat Recovery pressure drops

EWAD-D-HS	200	210	230	260	270	290	310	340	380	420	450	480	510	550	590
Heating Capacity (kW)	207	216	243	265	289	306	333	314	314	427	473	515	555	592	488
Water Flow (l/s)	9.89	10.34	11.59	12.68	13.82	14.63	15.91	15.00	14.98	20.41	22.59	24.61	26.52	28.28	23.33
Heat Recovery Pressure Drops (kPa)	23	25	28	28	31	31	35	26	23	37	13	15	17	19	11

### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – saturated discharge temperature 45°C – water heat recovery in/out 40/45°C

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_3 (3/3)

# 11 Hydraulic performance

## 11 - 2 Total and Partial Heat Recovery Pressure Drop

### Partial Heat Recovery pressure drops

EWAD-D-HS	200	210	230	260	270	290	310	340	380	420	450	480	510	550	590
Heating Capacity (kW)	84	87	98	107	116	123	134	123	122	173	191	207	223	238	191
Water Flow (l/s)	4.00	4.17	4.67	5.11	5.55	5.88	6.40	5.86	5.84	8.25	9.12	9.90	10.67	11.38	9.11
Heat Recovery Pressure Drops (kPa)	4	5	5	6	6	6	7	5	4	7	2	3	3	3	2

#### NOTES

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – condenser air inlet 35°C – water heat recovery in/out 50/60°C

OPT\_1-2-3-4-5a-6-7-8\_Rev.01\_4 (3/3)

## 12 Specification text

### 12 - 1 Specification Text

#### Technical Specification for Water Cooled Screw Chiller

##### GENERAL

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

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

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 air cooled screw chiller(s) : ..... unit(s)
- ✓ Cooling capacity for single air cooled screw chiller : ..... kW
- ✓ Power input for single air cooled screw 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 independent refrigerant circuits, semi-hermetic type rotary single screw compressor, electronic expansion device (EEXV), refrigerant 'plate to plate' or 'shell&tube' heat exchanger (depending on the size), air-cooled condenser section, R-134a refrigerant, lubrication system, motor starting components, discharge line shut-off valve, suction 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.

##### NOISE LEVEL AND VIBRATIONS

Sound pressure level at 1 meter distance in free field, semispheric conditions, shall not exceed .....dB(A). The sound pressure levels must be rated in accordance to ISO 3744 (other types of rating can not be used).

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

## 12 Specification text

### 12 - 1 Specification Text

#### DIMENSIONS

Unit dimensions shall not exceed following indications:

- Unit length ..... mm
- Unit width ..... mm
- Unit height ..... mm

#### CHILLER COMPONENTS

##### Compressors

- ✓ The compressor is semi-hermetic, single-screw type with gate-rotors made of carbon impregnated engineered composite material or the latest high-strength fibre reinforced star material (depending on the size). The gaterotor supports will be constructed of cast iron.
- ✓ The oil injection shall be used in order to get high EER (Energy Efficiency Ratio) also at high condensing pressure and low sound pressure levels in each load condition.
- ✓ 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 slide valve position.
- ✓ The unit capacity control shall be infinitely modulating, from 100% down to 25% for each circuit. The chiller shall be capable of stable operation to a minimum of 12.5% 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.
- ✓ The unit control logic shall manage the compressor slides to exactly match the plant load request in order to keep constant the set point for delivered chilled water temperature.
- ✓ 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:
  - High condenser pressure
  - Low evaporating refrigerant temperature

##### Evaporator

- ✓ The units shall be equipped (depending on the size) with a 'plate to plate' or 'shell&tube' evaporator:
  - The 'plate to plate' evaporator is made of stainless steel brazed plates and is covered with a 20mm closed cell insulation material. The exchanger is equipped with a heater for protection against freezing down to -28°C and evaporator water outlet connections of 3". Each evaporator has 1 circuit (one compressor) and the water filter is standard.
  - The 'shell&tube' evaporator is made with copper tubes rolled into steel tubesheets. The evaporators are single-pass on both the refrigerant and water sides for pure counter-flow heat exchange and low refrigerant pressure drops. The external shell is covered with a 10mm closed cell insulation material and the evaporator water outlet connections are provided with victaulic kit (as standard). Each evaporator has 2 circuits, one for each compressor and the water filter is standard.
- ✓ The evaporator is manufactured in accordance to PED approval.



## 12 Specification text

### 12 - 1 Specification Text

#### 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 breaker installed inside the electrical panel as a standard.

#### Refrigerant circuit

- ✓ The unit shall have two independent refrigerant circuits.
- ✓ Each circuit shall include as standard: electronic expansion device piloted by unit's microprocessor control, compressor discharge shut-off valve, suction 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:
  - in-line single pump low and high lifting
  - in-line twin pumps low and high lifting

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

#### Optional High Level Communications Interface

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