DAIKIN

Applied Systems

Technical Data

Water cooled chiller, high efficiency

EEDEN13-422

EWWD-H-XS

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EWWD-H-XS

1 Features

- Cooling range: 369-1,215 kW
- Condenser leaving water temperatures (CLWT) up to 65ºC (optional)
- Heat pump version available
- Flooded type heat exchangers
- MicroTech III controller

2 Specifications

2-1 Technical Specifications					EWWD 370H-XS	EWWD 450H-XS	EWWD 530H-XS	EWWD 610H-XS	EWWD 750H-XS	EWWD 830H-XS	EWWD 930H-XS	EWWD 980H-XS	EWWD C10H-XS	EWWD C11H-XS	EWWD C12H-XS
Cooling capacity	Nom.			kW	368 (1)	444 (1)	520 (1)	606 (1)	746 (1)	825 (1)	930 (1)	977 (1)	1,049 (1)	1,130 (1)	1,212 (1)
Heating capacity	Nom.			kW	432 (2)	520 (2)	608 (2)	709 (2)	873 (2)	965 (2)	1,083 (2)	1,142 (2)	1,225 (2)	1,321 (2)	1,416 (2)
Capacity control	Method				Stepless										
	Minimum capacity			%	25.0				12.5						
Power input	Cooling	Nom.		kW	63.9 (1)	76.6 (1)	88.3 (1)	103 (1)	127 (1)	140 (1)	153 (1)	166 (1)	177 (1)	190 (1)	204 (1)
	Heating	Nom.		kW	63.9 (2)	76.6 (2)	88.3 (2)	103 (2)	127 (2)	140 (2)	153 (2)	166 (2)	177 (2)	190 (2)	204 (2)
EER					5.75 (1)	5.79 (1)	5.88 (1)	5.90 (1)	5.85 (1)	5.88 (1)	6.06 (1)	5.90 (1)	5.94 (1)		5.95 (1)
ESEER					6.11	6.18	6.27	6.25	6.76	6.87	6.97	7.03	7.07	7.10	
COP					6.75 (2)	6.79 (2)	6.88 (2)	6.90 (2)	6.85 (2)	6.88 (2)	7.06 (2)	6.90 (2)	6.94 (2)		6.95 (2)
IPLV					6.94	6.99	7.09	7.10	7.73	7.81	7.89	7.96	8.00	8.02	
Casing	Colour				Ivory white										
	Material				Galvanized and painted steel sheet										
Dimensions	Unit	Height		mm	2,121			2,048					2,161		
		Width		mm	1,353			1,384	1,689		1,711				
		Depth		mm	3,341		3,419	3,417	3,609				3,509		
Weight	Unit			kg	3,089	3,370	3,603	3,781	5,289	5,375	5,654	5,707	6,066	6,105	6,156
	Operation weight			kg	3,250	3,588	3,870	4,163	5,694	5,835	6,174	6,262	6,709	6,773	6,859
Water heat exchanger - evaporator	Type				Single pass shell and tube										
	Water volume			l	78	107	134	160	172	201	261	272	295	310	327
	Water flow rate	Nom.		l/s	17.6	21.2	24.9	29.0	35.7	39.5	44.5	46.7	50.1	54.1	58.0
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	37	31		36	42	35	32		30		29
	Insulation material				Closed cell										
Water heat exchanger - condenser	Type				Single pass shell and tube										
	Water flow rate	Nom.		l/s	20.8	25.1	29.3	34.2	42.1	46.5	52.2	55.0	59.1	63.7	68.3
	Nominal water pressure drop	Cooling		kPa	29	24	26	21	27	26	30	28	27	28	27
	Insulation material				Closed cell										
Sound power level	Cooling	Nom.		dBA	97	98	99		100	101		102		103	
Sound pressure level	Cooling	Nom.		dBA	78	79	80		81	82		83		84	
Compressor	Type				Semi-hermetic single screw compressor										
	Quantity				1				2						
	Oil	Charged volume		l	30				60						
Operation range	Evaporator	Cooling	Min.	ºCDB	-8 (4)										
			Max.	ºCDB	15										
	Condenser	Cooling	Min.	ºCDB	18										
			Max.	ºCDB	65										
Refrigerant	Type				R-134a										
	Charge			kg	210	190	180	210	220	250	300			330	
	Circuits	Quantity			1				2						
Piping connections	Evaporator water inlet/outlet			mm	168.3		219.1								
	Condenser water inlet/outlet			inch	6		8								
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										

2 Specifications

2-2 Electrical Specifications				EWWD 370H-XS	EWWD 450H-XS	EWWD 530H-XS	EWWD 610H-XS	EWWD 750H-XS	EWWD 830H-XS	EWWD 930H-XS	EWWD 980H-XS	EWWD C10H-XS	EWWD C11H-XS	EWWD C12H-XS
Compressor	Phase			3~										
	Voltage		V	400										
	Voltage range	Min.	%	-10										
		Max.	%	10										
	Maximum running current		A	146 / 197 (11)	174 / 236 (11)	199 / 276 (11)	236 / 315 (11)	146 / 197 (11)	146 / 197 (11)	174 / 236 (11)	174 / 236 (11)	199 / 276 (11)	199 / 276 (11)	236 / 315 (11)
	Starting method			Wye-delta										
Compressor 2	Maximum running current		A	-				146 / 197 (11)	174 / 236 (11)	174 / 236 (11)	199 / 276 (11)	199 / 276 (11)	236 / 315 (11)	236 / 315 (11)
Power supply	Phase			3~										
	Frequency		Hz	50										
	Voltage		V	400										
	Voltage range	Min.	%	-10										
		Max.	%	10										
Unit	Maximum starting current		A	330	330 / 464 (11)	330 / 464 (11)	464	447 / 488 (11)	469 / 622 (11)	469 / 653 (11)	489 / 685 (11)	489 / 685 (11)	623 / 716 (11)	653 / 716 (11)
	Nominal running current (RLA)	Cooling	A	106 / 111 (11)	123 / 136 (11)	140 / 153 (11)	166 / 175 (11)	213 / 223 (11)	230 / 248 (11)	247 / 273 (11)	263 / 290 (11)	280 / 306 (11)	306 / 328 (11)	331 / 349 (11)
	Maximum running current		A	146 / 197 (11)	174 / 236 (11)	199 / 276 (11)	236 / 315 (11)	293 / 395 (11)	320 / 433 (11)	347 / 472 (11)	373 / 512 (11)	398 / 552 (11)	435 / 591 (11)	472 / 630 (11)
	Max unit current for wires sizing		A	161 / 217 (11)	191 / 260 (11)	219 / 304 (11)	260 / 347 (11)	322 / 434 (11)	352 / 477 (11)	382 / 519 (11)	410 / 563 (11)	438 / 607 (11)	479 / 650 (11)	519 / 693 (11)

Notes

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

(2) Heating capacity, unit power input and COP are based on the following conditions: evaporator 15/10ºC; condensor 40/45ºC, unit at full load operation

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

(4) The unit can not reach the minimum capacity when working in part load conditions

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

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

(7) Nominal current cooling mode is referred to the following conditions: evaporator 12ºC/7ºC; condenser 30/35ºC

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

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

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

(11) Unit + high temperature kit (max. leaving water temperature = 65ºC)

3 Features and advantages

3 - 1 Features and Advantages

The water cooled chillers, featuring single R-134a refrigerant circuit with one or two single screw compressors, shell & tube 'flooded type' exchangers and MicroTech III controller, are manufactured to provide high efficiency and superior control for a broad spectrum of comfort and industrial applications.
Chiller design experience, combined with outstanding features, makes this chiller range unmatched in the industry.

Application flexibility
The new range boasts a wide operating range thanks to the use of the electronic expansion valve. This makes possible condenser leaving water temperatures (CLWT) of 50°C. The addition of an optional high temperature kit allows CLWT's up to 65°C.
A heat pump version is also available for supplying hot water, and is well suited to geothermal applications.

Superior control logic
The new range features the Microtech III controller that provides an easy to use control environmental. The control logic is designed to provide maximum efficiency, to continue operation in unusual operating conditions and to provide a history of unit operation. One of the greatest benefits is the easy interface with external systems such as building management systems and sequencing panels.

Extensive option list
The base model includes several standard factory mounted options such as: electronic expansion valve, double set point, main switch interlock, etc. Moreover, the new range features an extensive option list, including the heat pump version, the high temperature kit, the sound proof system, etc. The long list of additional options makes it ideal for a broad range of comfort and cooling applications.

Code requirements – Safety and observant of laws/directives
All water cooled units are designed and manufactured in accordance with applicable selections of the following:

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

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

Versions
Available in high efficiency version:

X: High Efficiency

11 sizes, covering a cooling capacity range from 370 up to 1,215 kW, EER up to 6.17 and ESEER up to 7.43.
The EER (Energy Efficiency Ratio) is the ratio of the Cooling Capacity to the Power Input of the unit. The Power Input includes: the power input for operation of the compressor, the power input of all control and safety devices.
The ESEER (European Seasonal Energy Efficiency Ratio) is a weighed formula enabling to take into account the variation of EER with the load rate and the variation of water inlet condenser temperature.

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

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

Sound Configuration
Available in standard sound level configuration:

S: Standard sound

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4 General Characteristics

4 - 1 General characteristics

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

Screw compressors
The 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 external high efficiency oil separator maximizes the oil separation. Standard start is Wye-delta (Y-Δ).

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) that means low TEWI (Total Equivalent Warming Impact).

Evaporator
Each unit is equipped with flooded shell & tube evaporator with water flowing inside the tubes and refrigerant boiling outside. The tubes are enhanced for maximum heat transfer and rolled into steel tube sheet and sealed. The tubes are individually replaceable. The evaporators are designed according to the 97/23/EC directive (PED). The water side is designed for 10 bar of maximum operating pressure; vents and drain are provided. Water connections are designed with Victaulic system, anyway flanges are available under request.

Condensers
Each unit is equipped with shell & tube condenser with water flowing inside the tubes and refrigerant condensing outside. The bottom of the condenser is provided with subcooler section for better refrigerant capacity. The tubes are enhanced for maximum heat transfer and rolled into steel tube sheet and sealed. The tubes are individually replaceable. The condensers are designed according to the 97/23/EC directive (PED). The water side is designed for 10 bar of maximum operating pressure; vents and drain are provided. Water connections are designed with Victaulic system, anyway flanges are available under request.

Electronic expansion valve
The unit is equipped with the most advanced electronic expansion valves to achieve precise control of refrigerant mass flow. As today's system requires improved energy efficiency, tighter temperature control, wider range of operating conditions and incorporate features like remote monitoring and diagnostics, the application of electronic expansion valves becomes mandatory.

Electronic expansion valve proposes features that make it unique: short opening and closing time, high resolution, positive shut-off function to eliminate use of additional solenoid valve, highly linear flow capacity, continuous modulation of mass flow without stress in the refrigerant circuit and corrosion resistance stainless steel body.

Electronic expansion valve strength point is the capacity to work with lower ΔP between high and low pressure side, than a thermostatic expansion valve. The electronic expansion valve allows the system to work with low condenser pressure (winter time) without any refrigerant flow problems and with a perfect chilled water leaving temperature control.

Refrigerant circuit
Each unit has single refrigerant circuit including:
- One or two single screw compressor with external oil separator
- Evaporator
- Condenser
- Oil pressure transducer
- High pressure switches
- High pressure transducer
- Low pressure transducer
- Moisture liquid indicator
- Electronic expansion valve

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4 General Characteristics

4 - 1 General characteristics

Electrical control panel

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

Power Section

The power section includes compressors fuses and control circuit transformer.

MicroTech III controller

MicroTech III controller is installed as standard; it can be used to modify unit set-points and check control parameters. A built-in display shows chiller operating status plus temperatures and pressures of water, refrigerant, programmable values, set-points. A sophisticated software with predictive logic, selects the most energy efficient combination of compressors and electronic expansion valve 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 Pressure / temperature conversions.

Control section - main features

- Management of the compressor stepless capacity.
- Chiller enabled to work in partial failure condition.
- Full routine operation at condition of:
  - high ambient temperature value
  - high thermal load
  - high evaporator entering water temperature (start-up)
- Display of evaporator entering/leaving water temperatures.
- Display of condensing-evaporating temperatures and pressures, suction and discharge superheat for each circuit.
- Leaving water evaporator temperature regulation. Temperature tolerance = 0,1°C.
- Compressor and evaporator pumps hour counters.
- Display of Status Safety Devices.
- Number of starts and compressor working hours.
- Optimized management of compressor load.
- Re-start in case of power failure (automatic / manual).
- Soft Load (optimized management of the compressor load during the start-up).
- Start at high evaporator water temperature.
- Return Reset (Set Point Reset based on return water temperature).
- Set point Reset.
- 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).

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4 General Characteristics

4 - 1 General characteristics

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

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

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

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

Supervising systems (on request)

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

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

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

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

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4 General Characteristics

4 - 1 General characteristics

Standard accessories (supplied on basic unit)

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.

Evaporator Victaulic Kit - Hydraulic joint with gasket for an easy and quick water connection.

Evaporator Water side design pressure 10 bar

20 mm evaporator insulation

Condenser Victaulic Kit - Hydraulic joint with gasket for an easy and quick water connection.

Condenser Water side design pressure 10 bar

Condenser 2 passes (DT 4-8°C)

Electronic expansion device

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

Hour Run meter - Digital compressors hour run meter

General fault contactor - Contactor for alarm warning.

Set-point reset, demand limit and alarm from external device – The leaving water temperature set-point can be overwritten with the following options: 4-20mA from external source (by user); outside ambient temperature; evaporator water temperature Δt. Moreover the device allows the user to limit the load of the unit by 4-20mA signal or by network system and the microprocessor is able to receive an alarm signal from an external device (pump etc… - user can decide if this alarm signal will stop or not the unit).

Main switch interlock door

Emergency stop

Evaporator 2 passes

Options (on request)

Soft start - Electronic starting device to reduce the mechanical stress during compressor start-up

Heat pump version

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

Compressor thermal overload relays - Safety devices against compressor motor overloading in addition to the normal protection envisaged by the electrical windings.

Under/Over Voltage – This device controls the voltage value of power supply and stops 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 shown 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.

Evaporator marine water box

Condenser double flanges kit

20mm Condenser Insulation

Condenser marine water boxes

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

Condenser 1/3 passes

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4 General Characteristics

4 - 1 General characteristics

Evaporator / condenser flow switch for the water piping

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

High/Low Pressure Side Manometers

Container kit

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

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

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

Dual Pressure Relief Valve

Automatic circuit breakers

Ground fault relay

Evaporator 1/3 passes

Evaporator double flange kit

High temperature kit - Optional kit to allow the unit to operate up to 65°C leaving condenser water temperature. The unit operation diagram must be checked to evaluate when this option is required.

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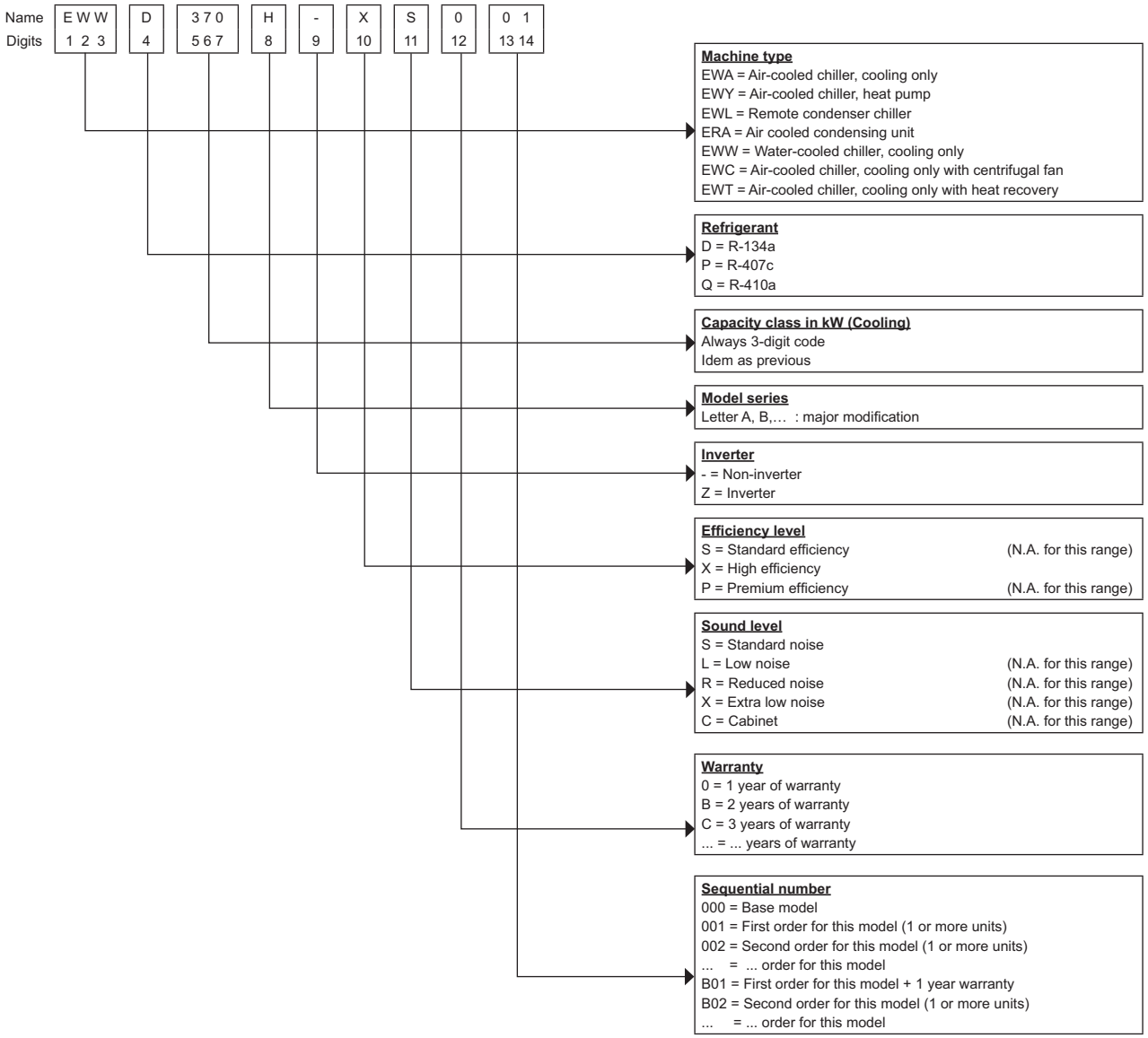
5 Nomenclature

5 - 1 Nomenclature



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6 Capacity tables

6 - 1 Cooling/Heating Capacity Tables

EWWD370-830H-XS

Twe: Evaporator leaving water temperature (Δt 5°C); Twc: Condenser leaving water temperature (Δt 5°C)
qwe: Fluid flow rate at evaporator; dpwe: Fluid pressure drop at evaporator
HC: Heat capacity at condenser; qwc: Fluid flow rate at condenser; dpwc: Fluid pressure drop at condenser

	Condenser inlet air temperature	Twout																						
		5							7							9								
		CC	PI	qwe	dpwe	HC	qwc	dpwc	CC	PI	qwe	dpwe	HC	qwc	dpwc	CC	PI	qwe	dpwe	HC	qwc	dpwc		
Size	Ta	kW	kW	l/s	kPa	kW	l/s	kPa	kW	kW	l/s	kPa	kW	l/s	kPa	kW	kW	l/s	kPa	kW	l/s	kPa		
370	30	357	55.9	17.1	35	413	19.9	26	384	56.8	18.4	39	441	21.2	30	412	57.7	19.8	45	470	22.6	33		
	35	342	63.1	16.3	32	405	19.5	26	368	63.9	17.6	37	432	20.8	29	395	64.8	18.9	42	460	22.2	32		
	40	326	70.9	15.6	29	397	19.2	25	351	71.7	16.8	34	423	20.4	28	377	72.5	18.1	38	450	21.7	31		
	45	309	79.6	14.8	27	389	18.8	24	333	80.3	15.9	31	414	20	27	359	81	17.2	35	440	21.3	30		
	50															339	90.5	16.3	32	430	20.8	29		
	55																							
450	30	432	66.6	20.6	29	498	24	22	464	67.4	22.2	33	531	25.6	25	498	68.2	23.8	38	566	27.2	28		
	35	413	75.7	19.7	27	488	23.5	22	444	76.6	21.2	31	520	25.1	24	477	77.5	22.8	35	554	26.7	27		
	40	393	85.5	18.8	25	478	23.1	21	423	86.3	20.2	28	509	24.6	23	455	87.2	21.8	32	542	26.2	26		
	45	373	96	17.8	22	469	22.7	20	402	96.7	19.2	26	498	24.1	23	432	97.5	20.7	29	530	25.6	25		
	50															409	109	19.6	27	518	25.1	24		
	55																							
530	30	506	77.3	24.2	29	583	28.1	24	543	78	26	33	621	29.9	27	583	78.6	27.9	38	662	31.8	30		
	35	483	87.3	23.1	27	570	27.5	23	520	88.3	24.9	31	608	29.3	26	558	89.3	26.7	35	647	31.2	29		
	40	460	98	22	25	558	26.9	22	495	99	23.7	28	594	28.7	25	533	100	25.5	32	633	30.6	28		
	45	436	110	20.8	22	546	26.4	22	471	111	22.5	26	581	28.1	24	507	112	24.2	29	618	29.9	27		
	50															480	125	23	27	604	29.3	26		
	55																							
610	30	590	89.9	28.2	34	680	32.7	19	634	90.7	30.3	39	725	34.9	21	681	91.2	32.6	44	772	37.1	24		
	35	563	102	26.9	31	665	32.1	18	606	103	29	36	709	34.2	21	652	104	31.2	41	755	36.4	23		
	40	536	114	25.6	29	650	31.4	18	578	115	27.6	33	693	33.5	20	622	117	29.8	38	738	35.6	22		
	45	509	128	24.3	26	637	30.8	17	549	129	26.3	30	678	32.8	19	591	130	28.3	34	721	34.9	21		
	50															560	145	26.8	31	705	34.2	21		
	55																							
750	30	724	112	34.6	40	835	40.2	25	778	113	37.3	46	892	42.9	28	836	115	40.1	52	951	45.8	31		
	35	693	126	33.1	37	818	39.4	24	746	127	35.7	42	873	42.1	27	801	129	38.4	48	930	44.8	30		
	40	660	142	31.5	34	801	38.7	23	711	143	34	39	854	41.2	26	765	144	36.7	45	909	43.9	29		
	45	626	159	29.9	31	785	38	23	675	160	32.3	35	836	40.4	25	727	162	34.8	41	889	43	28		
	50															688	180	33	37	869	42.1	27		
	55																							
830	30	801	122	38.3	33	924	44.4	24	862	124	41.2	37	986	47.4	26	926	125	44.3	43	1051	50.6	30		
	35	766	139	36.6	30	905	43.6	23	825	140	39.5	35	965	46.5	26	887	142	42.5	39	1028	49.6	29		
	40	730	156	34.9	28	886	42.8	22	786	158	37.6	32	944	45.6	25	846	159	40.5	36	1005	48.5	28		
	45	692	175	33.1	25	868	42	21	747	177	35.7	29	923	44.7	24	804	178	38.5	33	982	47.5	27		
	50															761	199	36.4	30	960	46.5	26		
	55																							

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

1 Fluid: Water
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Líquido: agua
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Fluido: Acqua
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2 For working conditions where dpw values are in italic, please contact factory.
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SRC_1-2_Rev.01_1_(1-4)

6 Capacity tables

6 - 1 Cooling/Heating Capacity Tables

EWWD370-830H-XS

Twe: Evaporator leaving water temperature (Δt 5°C); Twc: Condenser leaving water temperature (Δt 5°C)
qwe: Fluid flow rate at evaporator; dpwe: Fluid pressure drop at evaporator
HC: Heat capacity at condenser; qwc: Fluid flow rate at condenser; dpwc: Fluid pressure drop at condenser

	Condenser inlet air temperature	Twout																						
		11							13							15								
		CC	PI	qwe	dpwe	HC	qwc	dpwc	CC	PI	qwe	dpwe	HC	qwc	dpwc	CC	PI	qwe	dpwe	HC	qwc	dpwc		
Size	Ta	kW	kW	l/s	kPa	kW	l/s	kPa	kW	kW	l/s	kPa	kW	l/s	kPa	kW	kW	l/s	kPa	kW	l/s	kPa		
370	30	441	58.5	21.2	51	500	24.1	37	472	59	22.7	58	531	25.6	41	504	59.3	24.2	65	563	27.1	46		
	35	423	65.5	20.3	47	489	23.6	36	453	66.1	21.8	53	519	25	40	484	66.4	23.3	60	551	26.5	44		
	40	405	73.2	19.4	44	478	23.1	35	433	73.8	20.8	49	507	24.5	38	463	74.2	22.3	56	537	25.9	43		
	45	385	81.7	18.5	40	467	22.6	33	413	82.3	19.8	45	495	23.9	37	442	82.6	21.2	51	524	25.4	41		
	50	365	91.1	17.5	36	456	22.1	32	391	91.7	18.8	41	483	23.4	35	419	92	20.1	46	511	24.8	39		
	55																							
450	30	534	69	25.6	43	603	29	31	571	69.8	27.4	49	641	30.8	35	611	70.3	29.4	55	681	32.8	39		
	35	511	78.4	24.5	40	590	28.4	30	548	79.3	26.3	45	627	30.2	34	586	80	28.2	51	666	32.1	38		
	40	488	88.1	23.4	37	576	27.8	29	524	89	25.1	42	613	29.6	33	561	89.8	26.9	47	650	31.4	36		
	45	465	98.4	22.3	33	563	27.2	28	499	99.3	23.9	38	598	28.9	31	534	100	25.7	43	634	30.7	35		
	50	440	110	21.1	30	550	26.6	27	473	110	22.7	35	583	28.3	30	507	111	24.4	39	619	30	33		
	55																							
530	30	625	79.1	30	43	704	33.9	34	668	79.3	32.1	49	748	36	38	714	79.3	34.3	55	793	38.2	42		
	35	599	90.2	28.7	40	689	33.2	33	641	90.9	30.8	45	732	35.3	36	685	91.5	32.9	51	777	37.4	40		
	40	572	101	27.4	37	673	32.5	31	613	103	29.4	42	715	34.5	35	655	104	31.5	47	759	36.6	39		
	45	544	113	26.1	33	657	31.8	30	584	114	28	38	698	33.8	34	625	116	30	43	741	35.8	37		
	50	516	126	24.7	30	642	31.1	29	554	127	26.6	35	681	33	32	593	129	28.5	39	722	35	36		
	55																							
610	30	730	91.5	35	50	821	39.5	27	781	91.5	37.5	57	873	42	30	820	90	39.4	62	910	43.8	32		
	35	699	105	33.5	47	804	38.7	26	749	105	36	53	855	41.2	29	802	106	38.5	60	907	43.7	32		
	40	668	118	32	43	786	37.9	25	716	119	34.4	49	835	40.3	28	767	120	36.9	55	887	42.8	31		
	45	636	131	30.5	39	767	37.1	24	683	133	32.8	45	815	39.4	27	731	134	35.1	51	866	41.9	30		
	50	603	146	28.9	36	749	36.3	23	648	148	31.1	41	795	38.5	26	695	149	33.4	46	844	40.9	28		
	55																							
750	30	896	116	43	59	1012	48.7	35	959	117	46.1	67	1076	51.8	39	1024	118	49.3	76	1142	55	44		
	35	860	130	41.2	55	990	47.7	34	920	131	44.2	62	1052	50.7	38	984	132	47.3	70	1116	53.8	42		
	40	821	146	39.4	51	967	46.7	33	880	147	42.3	58	1027	49.6	36	941	147	45.3	65	1089	52.6	40		
	45	782	163	37.5	46	944	45.7	31	838	164	40.3	53	1002	48.5	35	897	164	43.1	60	1062	51.4	39		
	50	741	181	35.5	42	922	44.7	30	795	182	38.2	48	977	47.4	34	852	183	40.9	54	1035	50.1	37		
	55																							
830	30	993	127	47.6	48	1119	53.9	33	1063	128	51	55	1191	57.3	37	1136	128	54.6	62	1265	60.9	41		
	35	951	143	45.6	45	1095	52.8	32	1019	145	48.9	51	1164	56.1	36	1090	145	52.4	58	1236	59.6	40		
	40	909	161	43.6	41	1069	51.6	31	974	162	46.8	47	1136	54.9	34	1043	163	50.1	53	1206	58.2	38		
	45	864	180	41.4	38	1044	50.5	30	928	181	44.5	43	1109	53.6	33	994	182	47.8	49	1176	56.9	37		
	50	819	200	39.2	34	1019	49.4	28	880	201	42.2	39	1081	52.4	32	944	202	45.3	44	1146	55.5	35		
	55																							

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SRC_1-2_Rev.01_1_(2-4)

6 Capacity tables

6 - 1 Cooling/Heating Capacity Tables

EWWD930-C12H-XS

Twe: Evaporator leaving water temperature (Δt 5°C); Twc: Condenser leaving water temperature (Δt 5°C)
qwe: Fluid flow rate at evaporator; dpwe: Fluid pressure drop at evaporator
HC: Heat capacity at condenser; qwc: Fluid flow rate at condenser; dpwc: Fluid pressure drop at condenser

	Condenser inlet air temperature	Twout																					
		5							7							9							
		CC	PI	qwe	dpwe	HC	qwc	dpwc	CC	PI	qwe	dpwe	HC	qwc	dpwc	CC	PI	qwe	dpwe	HC	qwc	dpwc
Size	Ta	kW	kW	l/s	kPa	kW	l/s	kPa	kW	kW	l/s	kPa	kW	l/s	kPa	kW	kW	l/s	kPa	kW	l/s	kPa
930	30	904	133	43.2	30	1037	49.9	28	972	135	46.5	34	1107	53.3	31	1044	137	50	39	1180	56.8	35
	35	864	152	41.3	28	1016	48.9	27	930	153	44.5	32	1083	52.2	30	999	155	47.8	36	1154	55.6	34
	40	823	171	39.3	25	994	48	26	886	173	42.4	29	1059	51.1	29	953	174	45.6	33	1128	54.4	33
	45	780	192	37.3	23	972	47	25	841	193	40.2	26	1035	50	28	906	195	43.4	30	1101	53.2	31
	50															857	218	41	27	1075	52.1	30
	55																					
980	30	950	144	45.4	31	1094	52.6	26	1021	146	48.8	35	1167	56.2	29	1096	147	52.5	40	1243	59.8	33
	35	907	164	43.3	28	1071	51.6	25	977	166	46.7	32	1142	55	28	1049	167	50.3	37	1217	58.6	32
	40	864	184	41.3	26	1048	50.6	24	931	186	44.5	30	1117	53.9	27	1001	188	47.9	34	1189	57.4	31
	45	819	207	39.1	24	1026	49.6	24	884	208	42.3	27	1092	52.8	26	952	210	45.6	31	1162	56.2	29
	50															901	234	43.1	28	1135	55	28
	55																					
C10	30	1020	155	48.7	28	1175	56.5	25	1097	156	52.4	32	1252	60.3	28	1177	157	56.4	37	1334	64.2	31
	35	974	175	46.5	26	1149	55.4	24	1049	177	50.1	30	1225	59.1	27	1127	178	54	34	1305	62.9	30
	40	927	196	44.3	24	1124	54.3	23	1000	198	47.8	27	1198	57.8	26	1075	200	51.5	31	1276	61.6	29
	45	880	220	42	22	1100	53.2	22	949	222	45.4	25	1171	56.6	25	1022	224	48.9	28	1246	60.3	28
	50															968	249	46.3	26	1217	59	27
	55																					
C11	30	1100	167	52.5	28	1266	60.9	26	1182	168	56.5	32	1350	65	29	1269	169	60.8	36	1438	69.2	32
	35	1050	188	50.2	26	1239	59.7	25	1130	190	54.1	30	1321	63.7	28	1215	192	58.2	34	1407	67.8	31
	40	1000	212	47.7	24	1211	58.5	24	1078	214	51.5	27	1291	62.3	27	1159	216	55.5	31	1375	66.4	30
	45	948	237	45.3	21	1185	57.3	23	1023	239	48.9	25	1262	61	26	1102	241	52.7	28	1343	65	29
	50															1043	269	49.9	26	1312	63.6	28
	55																					
C12	30	1179	178	56.3	28	1358	65.3	25	1268	180	60.6	31	1448	69.7	28	1361	181	65.2	36	1542	74.2	32
	35	1126	202	53.8	25	1328	64	24	1212	204	58	29	1416	68.3	27	1303	206	62.4	33	1509	72.7	31
	40	1072	226	51.2	23	1299	62.7	23	1155	229	55.2	27	1384	66.8	26	1243	231	59.5	30	1474	71.2	29
	45	1017	254	48.5	21	1271	61.5	23	1097	256	52.4	24	1353	65.4	25	1182	258	56.6	28	1440	69.7	28
	50															1119	288	53.5	25	1407	68.2	27
	55																					

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SRC_1-2_Rev.01_1_(3-4)

6 Capacity tables

6 - 1 Cooling/Heating Capacity Tables

EWWD930-C12H-XS

Twe: Evaporator leaving water temperature (Δt 5°C); Twc: Condenser leaving water temperature (Δt 5°C)
qwe: Fluid flow rate at evaporator; dpwe: Fluid pressure drop at evaporator
HC: Heat capacity at condenser; qwc: Fluid flow rate at condenser; dpwc: Fluid pressure drop at condenser

	Condenser inlet air temperature	Twout																						
		11							13							15								
		CC	PI	qwe	dpwe	HC	qwc	dpwc	CC	PI	qwe	dpwe	HC	qwc	dpwc	CC	PI	qwe	dpwe	HC	qwc	dpwc		
Size	Ta	kW	kW	l/s	kPa	kW	l/s	kPa	kW	kW	l/s	kPa	kW	l/s	kPa	kW	kW	l/s	kPa	kW	l/s	kPa		
930	30	1119	138	53.7	44	1257	60.5	39	1198	139	57.5	50	1338	64.4	44	1282	141	61.6	57	1423	68.4	49		
	35	1072	157	51.4	41	1229	59.2	38	1149	158	55.1	46	1307	63	42	1230	160	59.1	53	1390	67	47		
	40	1023	176	49.1	38	1200	57.9	36	1098	178	52.7	43	1276	61.6	41	1176	180	56.5	48	1355	65.4	45		
	45	974	197	46.7	34	1170	56.6	35	1045	199	50.1	39	1244	60.2	39	1120	200	53.8	44	1321	63.9	43		
	50	922	219	44.2	31	1142	55.3	34	991	221	47.5	36	1212	58.7	37	1064	222	51.1	40	1286	62.3	41		
	55																							
980	30	1175	148	56.4	46	1324	63.7	37	1258	149	60.4	52	1407	67.7	41	1345	149	64.7	58	1495	71.9	46		
	35	1126	169	54	42	1295	62.4	36	1206	170	57.9	48	1377	66.4	40	1291	172	62	54	1462	70.5	44		
	40	1075	190	51.5	39	1265	61.1	34	1153	192	55.3	44	1345	64.9	38	1235	194	59.3	50	1428	69	42		
	45	1023	212	49	35	1235	59.8	33	1098	214	52.7	40	1313	63.5	37	1177	216	56.5	46	1393	67.4	41		
	50	970	236	46.5	32	1206	58.4	32	1042	238	50	37	1280	62	35	1117	240	53.7	42	1358	65.8	39		
	55																							
C10	30	1262	157	60.5	41	1419	68.3	35	1351	157	64.8	47	1508	72.6	38	1444	157	69.4	53	1601	77	43		
	35	1209	180	58	38	1389	66.9	33	1295	181	62.2	44	1476	71.2	37	1386	182	66.6	49	1567	75.5	41		
	40	1155	202	55.4	35	1358	65.5	32	1238	204	59.4	40	1443	69.7	36	1326	206	63.7	45	1532	74	40		
	45	1099	226	52.7	32	1325	64.1	31	1180	229	56.6	37	1408	68.1	34	1264	231	60.7	42	1495	72.3	38		
	50	1042	252	49.9	29	1293	62.7	30	1119	254	53.7	33	1373	66.6	33									
	55																							
C11	30	1361	169	65.2	41	1530	73.6	36	1456	170	69.9	47	1626	78.2	40	1556	169	74.8	53	1726	83	44		
	35	1304	194	62.5	38	1497	72.2	35	1397	195	67	43	1592	76.7	39	1494	196	71.7	49	1690	81.4	43		
	40	1245	218	59.7	35	1463	70.6	33	1335	220	64	40	1555	75.1	37	1429	222	68.6	45	1651	79.7	41		
	45	1185	244	56.8	32	1429	69.1	32	1272	246	61	37	1518	73.4	36	1362	249	65.4	42	1611	77.9	40		
	50	1123	271	53.8	29	1394	67.6	31	1206	274	57.8	33	1480	71.7	34									
	55																							
C12	30	1459	181	69.9	41	1641	78.9	35	1562	181	75	46	1743	83.9	40	1670	181	80.2	52	1850	89	44		
	35	1398	207	67	38	1606	77.4	34	1498	209	71.9	43	1707	82.2	38	1602	210	77	48	1812	87.3	42		
	40	1335	234	64	35	1569	75.7	33	1432	236	68.7	39	1668	80.5	37	1533	238	73.6	45	1770	85.5	41		
	45	1271	261	60.9	32	1532	74.1	32	1364	264	65.4	36	1627	78.7	35	1461	266	70.1	41	1727	83.5	39		
	50	1204	290	57.7	29	1495	72.4	30	1294	293	62	33	1587	76.9	34									
	55																							

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SRC_1-2_Rev.01_1_(4-4)

7 Pressure drops

7 - 1 Evaporator Pressure Drops

Pressure drops

	370	450	530	610	750	830	930	980	C10	C11	C12
Cooling Capacity (kW)	369	445	521	608	748	827	932	978	1050	1133	1215
Water Flow (l/s) - Evaporator	17.63	21.26	24.89	29.05	35.74	39.51	44.53	46.73	50.17	54.13	58.05
Evaporator Pressure Drops (kPa)	48	40	38	42	48	40	38	35	35	37	40
Water Flow (l/s) - Condenser	20.63	24.86	29.05	33.87	41.71	46.11	51.74	54.52	58.48	63.12	67.65
Condenser Pressure Drops (kPa)	35	30	32	28	34	30	37	35	33	33	35

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

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7 Pressure drops

7 - 1 Evaporator Pressure Drops

Evaporator and condenser pressure drops

Evaporator and/or condenser pressure drops for different versions or different working condition can be calculated with the following formula:

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

where:

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

How to use the formula: Example (evaporator)

The unit EWWD370H-XS has been selected for working at the following conditions:
- evaporator water in/out : 11/6°C
- condenser air inlet: 30/35°C
The cooling capacity at these working conditions is: 356 kW
The water flow at these working conditions is: 17.02 l/s

The unit EWWD370H-XS at nominal working conditions has the following data:
- evaporator water in/out : 12/7°C
- condenser air inlet: 30/35°C
The cooling capacity at these working conditions is: 369 kW
The evaporator water flow at these working conditions is: 17.63 l/s
The evaporator pressure drop at these working conditions is: 48 kPa

The evaporator pressure drop at the selected working condition will be:

$$PD_2\ (kPa) = 48\ (kPa) \times \left(\frac{17.02\ (l/s)}{17.63\ (l/s)} \right)^{1.8}$$

$$PD_2\ (kPa) = 45\ (kPa)$$

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

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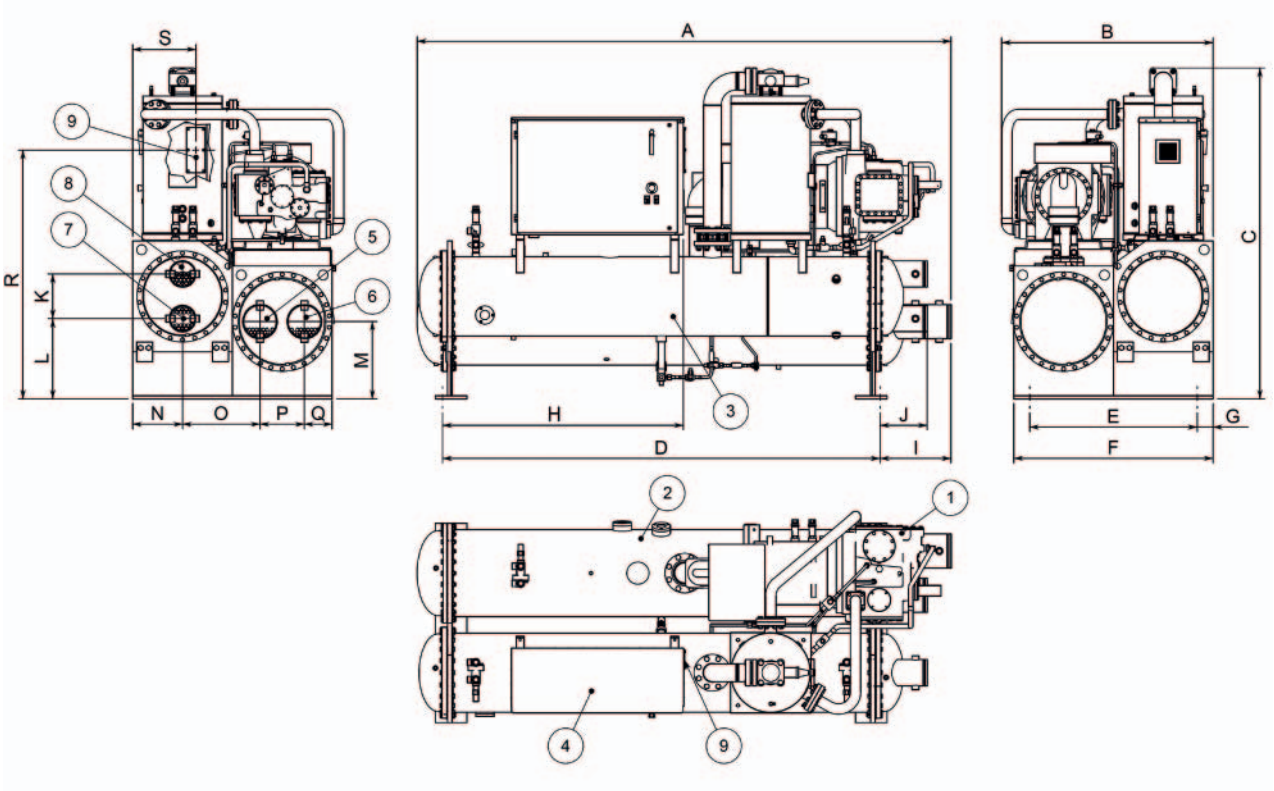
8 Dimensional drawings

8 - 1 Dimensional Drawings

EWWD370-530H-XS - 1 circuit



Models	Dimensions (mm)									
EWWD~H-XS	A	B	C	D	E	F	G	H	I	J
370	3341	1353	2121	2800	1072	1276	102	1541	303	303
450	3341	1353	2121	2800	1072	1276	102	1541	303	303
530	3419	1353	2121	2800	1072	1276	102	1541	456	303

EWWD~H-XS	K	L	M	N	O	P	Q	R	S
370	286	515	496	319	495	286	176	1595	384
450	286	515	496	319	495	286	176	1595	384
530	286	515	496	319	496	284	177	1595	384

LEGEND

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

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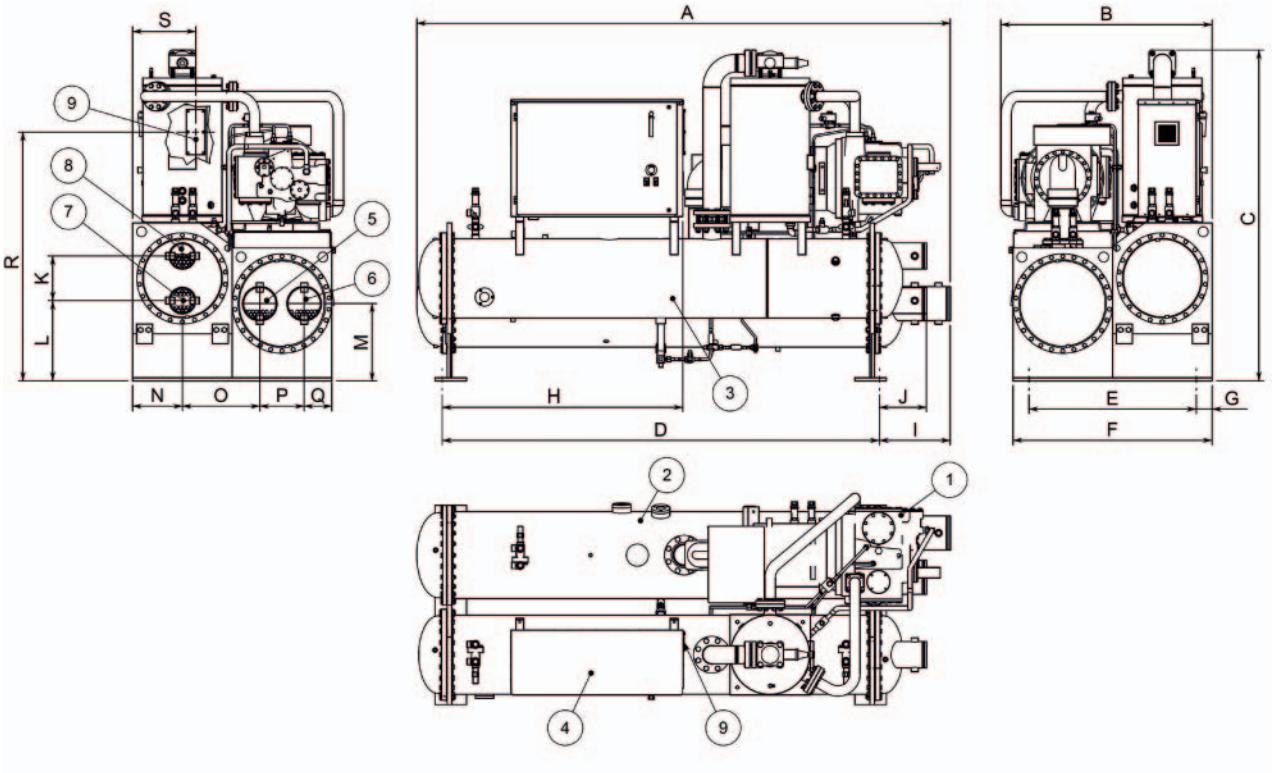
8 Dimensional drawings

8 - 1 Dimensional Drawings

EWWD610H-XS - 1 circuit



Models	Dimensions (mm)									
EWWD~H-XS	A	B	C	D	E	F	G	H	I	I²
610	3417	1384	2048	2805	1072	1276	102	1510	452	452

EWWD~H-XS	J	J'	K	L	M	N	O	P	Q	R
610	300	300	300	376	300	806	319	638	1521	384

LEGEND

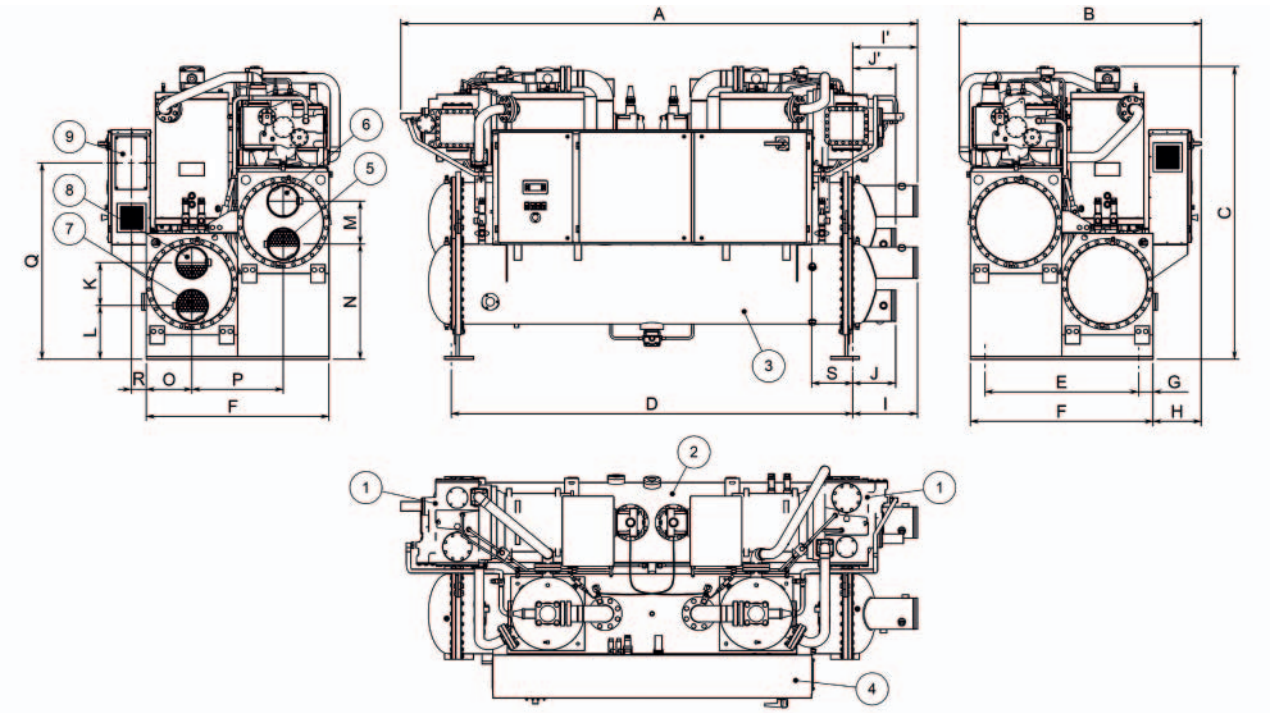
1 Compressor
2. Evaporator
3. Condenser
4. Electrical panel
5. Evaporator water inlet
6. Evaporator water outlet
7. Condenser water inlet
8. Condenser water outlet
9. Power connections slot

DMN_1-2-3_Rev.00_2

8 Dimensional drawings

8 - 1 Dimensional Drawings

EWWD750-C12H-XS - 2 circuits



Models	Dimensions (mm)										
EWWD~H-XS	A	B	C	D	E	F	G	H	I	I'	J
750	3609	1689	2048	2805	1072	1276	102	336	452	452	300
830	3609	1689	2048	2805	1072	1276	102	336	452	452	300
930	3609	1711	2048	2805	1157	1361	102	336	452	300	300
980	3609	1711	2048	2805	1157	1361	102	336	452	300	300
C10	3509	1711	2161	2805	1221	1425	102	272	300	300	300
C11	3509	1711	2161	2805	1221	1425	102	272	300	300	300
C12	3509	1711	2161	2805	1221	1425	102	272	300	300	300

EWWD~H-XS	J'	K	L	M	N	O	P	Q	R	S
750	300	300	376	300	806	319	638	1373	106	288
830	300	300	376	300	806	319	638	1373	106	288
930	300	300	376	360	725	319	660	1337	106	288
980	300	300	376	360	725	319	660	1337	106	288
C10	300	360	409	360	839	383	660	1487	42	288
C11	300	360	409	360	839	383	660	1487	42	288
C12	300	360	409	360	839	383	660	1487	42	288

LEGEND

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

DMN_1-2-3_Rev.00_3

9 Sound data

9 - 1 Sound Level Data

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10^{-5} Pa)									Power
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)
370	63,5	70,5	80,0	74,5	74,0	68,5	60,5	50,5	**78,0**	**96,7**
450	64,5	71,5	81,0	75,5	75,0	69,5	61,5	51,5	**79,0**	**97,7**
530	65,5	72,5	82,0	76,5	76,0	70,5	62,5	52,5	**80,0**	**98,7**
610	65,5	72,5	82,0	76,5	76,0	70,5	62,5	52,5	**80,0**	**99,1**
750	66,5	73,5	83,0	77,5	77,0	71,5	63,5	53,5	**81,0**	**100,2**
830	67,0	74,0	83,5	78,0	77,5	72,0	64,0	54,0	**81,5**	**100,7**
930	67,5	74,5	84,0	78,5	78,0	72,5	64,5	54,5	**82,0**	**101,2**
980	68,0	75,0	84,5	79,0	78,5	73,0	65,0	55,0	**82,5**	**101,7**
C10	68,5	75,5	85,0	79,5	79,0	73,5	65,5	55,5	**83,0**	**102,2**
C11	69,0	76,0	85,5	80,0	79,5	74,0	66,0	56,0	**83,5**	**102,7**
C12	69,0	76,0	85,5	80,0	79,5	74,0	66,0	56,0	**83,5**	**102,7**

NOTES

(1) The values are according to ISO 3744 and are referred to: evaporator 12/7° C, condenser 30/35° C, full load operation.
(2) The above sound pressure levels will decrease by 6dB(A) when the sound proof system (option) is installed.

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10 Installation

10 - 1 Installation Method

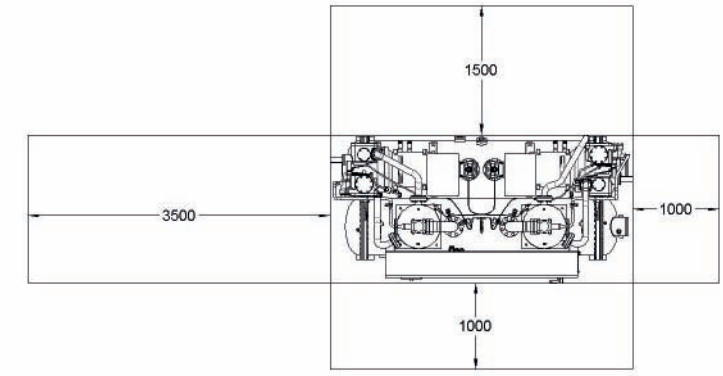
Installation notes

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

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

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

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



Minimum clearance requirements for machine maintenance

INN_1_Rev.00

10 Installation

10 - 2 Water Charge, Flow and Quality

Items (1) (5)			Cooling Water			Cooled Water		Heated water (2)				Tendency if out of criteria
			Circulating System		Once Flow			Low temperature		High temperature		
			Circulating water	Supply water (4)	Flowing water	Circulating water [Below 20°C]	Supply water (4)	Circulating water [20°C ~ 60°C]	Supply water (4)	Circulating water [60°C ~ 80°C]	Supply water (4)	
Items to be controlled:	pH	at 25°C	6.5 ~ 8.2	6.0 ~ 8.0	6.0 ~ 8.0	6.8 - 8.0	6.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	Corrosion + Scale
	Electrical conductivity	[mS/m] at 25°C	Below 80	Below 30	Below 40	Below 80	Below 80	Below 30	Below 30	Below 30	Below 30	Corrosion + Scale
		(µS/cm) at 25°C	(Below 800)	(Below 300)	(Below 400)	(Below 800)	(Below 800)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	Corrosion + Scale
	Chloride ion	[mgCl^{2}-/l]	Below 200	Below 50	Below 50	Below 200	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	Sulfate ion	[mgSO^{2}-4/l]	Below 200	Below 50	Below 50	Below 200	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	M-alkalinity (pH4.8)	[mg$CaCO_3$/l]	Below 100	Below 50	Below 50	Below 100	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Total hardness	[mg$CaCO_3$/l]	Below 200	Below 70	Below 70	Below 200	Below 70	Below 70	Below 70	Below 70	Below 70	Scale
	Calcium harness	[mg$CaCO_3$/l]	Below 150	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Silca ion	[mgSiO2/l]	Below 50	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Scale
	Oxygen	(mg O2 /l)	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Corrosion
	Particole size	(mm)	Below 0.5	Below 0.5	Below 0.5	Below 0.5	Below 0.6	Below 0.5	Below 0.6	Below 0.5	Below 0.6	Erosion
	Total dissolved solids	(mg / l)	Below 1000	Below 1000	Below 1000	Below 1000	Below 1001	Below 1000	Below 1001	Below 1000	Below 1001	Erosion
	Ethykene, Propylene Glycol	(weight conc.)	Below 60%	Below 60%	---	Below 60%	Below 60%	Below 60%	Below 60%	Below 60%	Below 60%	--
Items to be referred to	Nitrate ion	(mg NO3- /l)	Below 100	Below 100	Below 100	Below 100	Below 101	Below 100	Below 101	Below 100	Below 101	Corrosion
	TOC Total organic carbon	(mg /l)	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Scale
	Iron	[mgFe/l]	Below 1.0	Below 0.3	Below 1.0	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Corrosion + Scale
	Copper	[mgCu/l]	Below 0.3	Below 0.1	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 0.1	Below 1.0	Below 0.1	Corrosion
	Sulfite ion	[mgS^{2}-/l]	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Corrosion
	Ammonium ion	[mgNH_4/l]	Below 1.0	Below 0.1	Below 1.0	Below 1.0	Below 0.1	Below 0.3	Below 0.1	Below 0.1	Below 0.1	Corrosion
	Remaining chloride	[mgCL/l]	Below 0.3	Below 0.3	Below 0.3	Below 0.3	Below 0.3	Below 0.25	Below 0.3	Below 0.1	Below 0.3	Corrosion
	Free carbide	[mgCO_2/l]	Below 4.0	Below 4.0	Below 4.0	Below 4.0	Below 4.0	Below 0.4	Below 4.0	Below 0.4	Below 4.0	Corrosion
	Stability index		6.0 ~ 7.0	---	---	---	---	---	---	---	---	Corrosion + Scale

NOTES

(1) Names, definitions and units are according to JIS K 0101. Units and figures between brackets are old units published as reference only.
(2) In case of using heated water (more than 40°C), corrosion is generally noticeable. Especially when the iron material is in direct contact with water without any protection shields, it is desireable to give the valid measure for corrosion. E.g. chemical measure.
(3) In the cooling water using hermetic cooling tower, close circuit water is according to heated water standard, and scattered water is according to cooling water standard.
(4) Supply water is considered drink water, industrial water and ground water except for genuine water, neutral water and soft water.
(5) The above mentioned items are representable items in corrosion and scale cases.
(6) The limits above have to be considered as a general prescription and can not totally assure the absence of corrosion and erosion. Some particular combinations of elements or the presence of components not listed in the table or factors not considered may trigger corrosion phenomena.

waflowqua_1-2_Rev.00_1

10 Installation

10 - 2 Water Charge, Flow and Quality

Water content in cooling circuits

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

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

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

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

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

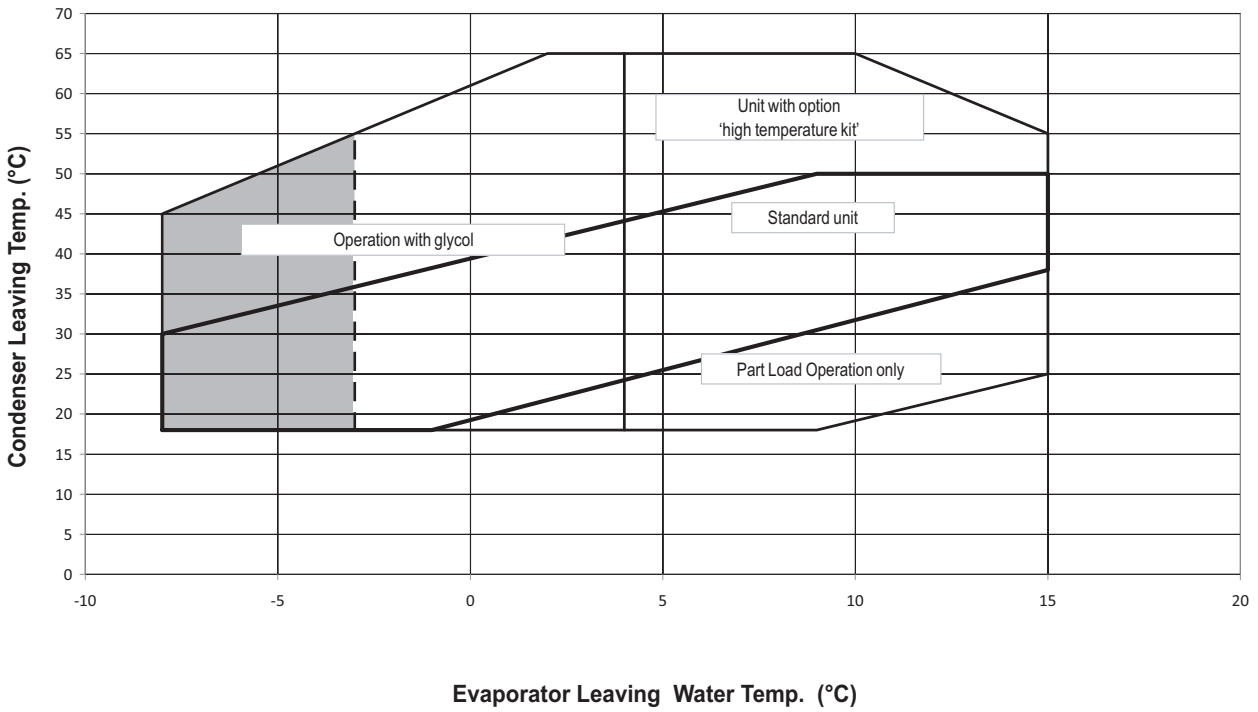
This formula is valid for:
- standard microprocessor parameters

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

waflowqua_1-2_Rev.00_2

11 Operation range

11 - 1 Operation Range



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11 Operation range

11 - 2 Correction Factors

Table 1 - Evaporator/Condenser minimum and maximum water Δt

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

Table 2 - Evaporator fouling factors

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

Table 3 - Condenser fouling factors

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

Table 4.1 - Minimum glycol percentage for low water temperature

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

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

Table 4.2 - Minimum glycol percentage for low air temperature

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

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

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

Table 5 - Correction factors for low evaporator leaving water temperature

Evaporator Leaving Water Temperature (°C)	2	0	-2	-4	-6	-8
Ethylene glycol (%)	0.842	0.785	0.725	0.670	0.613	0.562
Propylene glycol (%)	0.950	0.940	0.920	0.890	0.870	0.840

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

Table 6 - Correction factors for water and glycol mixture

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

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11 Operation range

11 - 2 Correction Factors

How to use the Correction factors proposed in the previous tables

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

- depending from the type and percentage (%) of glycol filled in the circuit (see table 4.2 and 6)
- multiply the Cooling Capacity, the Compressor Power Input by the Correction factor of Table 6
- starting from this new value of Cooling Capacity, calculate the Flow Rate (l/s) and the 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:	**EWWD610H-XS**
Mixture:	Water
Working condition:	ELWT 12/7°C – CLWT 30/35°C
- Cooling capacity:	608 kW
- Power input:	101 kW
- Flow rate (Δt 5°C):	29.05 l/s
- Evaporator pressure drop:	42 kPa
Mixture:	Water + Ethylene Glycol 30% (for a winter air temperature up to -15°C)
Working condition:	ELWT 12/7°C – CLWT 30/35°C
- Cooling capacity:	608 x 0.972 = 591 kW
- Power input:	101 x 0.986 = 99.6 kW
- Flow rate (Δt 5°C):	28.23 (referred to 591 kW) x 1.074 = 30.33 l/s
- Evaporator pressure drop:	45 (referred to 30.33 l/s) x 1.181 = 53 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:	**EWWD610H-XS**
Mixture:	Water
Working condition:	ELWT 12/7°C – CLWT 30/35°C
- Cooling capacity:	608 kW
- Power input:	101 kW
- Flow rate (Δt 5°C):	29.05 l/s
- Evaporator pressure drop:	42 kPa
Mixture:	Water + Glycol 30% (for a low evaporator leaving temperature of -1/-6°C)
Working condition:	ELWT -1/-6°C – CLWT 30/35°C
- Cooling capacity:	608 x 0.613 x 0.972 = 362 kW
- Power input:	101 x 0.870 x 0.986 = 86.6 kW
- Flow rate (Δt 5°C):	17.29 l/s (referred to 362 kW) x 1.074 = 18.58 l/s
- Evaporator pressure drop:	19 kPa (referred to 18.58 l/s) x 1.181 = 22 kPa

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12 Specification text

12 - 1 Specification Text

Technical Specification for Water Cooled Screw Chiller

GENERAL

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

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

The unit will be tested at full load in the factory at the nominal working conditions and water temperatures. Before shipment a full test will be held to avoid any losses.
Chiller will be delivered to the job site completely assembled and charged with right refrigerant and oil quantity.
Comply with the manufacturer instructions for rigging and handling equipment.

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

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

REFRIGERANT

Only R-134a will be accepted.

PERFORMANCE

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

UNIT DESCRIPTION

Chiller shall include as standard: single refrigerant circuit, semi-hermetic single screw compressors, electronic expansion device (EEXV), flooded shell & tube heat exchangers, R-134a refrigerant, lubrication system, motor starting components, control system and all components necessary for safe and stable unit operation.

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

NOISE LEVEL AND VIBRATIONS

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

DIMENSIONS

Unit dimensions shall not exceed following indications:

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

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CHILLER COMPONENTS

Compressors

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

Cooling capacity control system

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

Evaporator

- ✓ The units shall be equipped with flooded shell & tube type evaporator with water flowing inside the tube and refrigerant boiling outside. The tubes shall be enhanced for maximum heat transfer and rolled into steel tube sheet and sealed. The tubes shall be individually replaceable.
- ✓ The water side shall be designed for 10 bar of maximum operating pressure; vents and drain shall be provided.
- ✓ The water connections shall be VICTAULIC type connections as standard to ensure quick mechanical disconnection between the unit and the hydronic network.

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Condensors

- ✓ The units shall be equipped with shell & tube condenser with water flowing inside the tube and refrigerant condensing outside. The bottom of the condenser shall be provided with subcooler section for better refrigerant capacity. The tubes shall be enhanced for maximum heat transfer and rolled into steel tube sheet and sealed. The tubes shall be individually replaceable
- ✓ The condensers are designed in according to 97/23/EC directive (PED).
- ✓ The water side shall be designed for 10 bar of maximum operating pressure; vents and drain shall be provided.
- ✓ The water connections shall be VICTAULIC type connections as standard to ensure quick mechanical disconnection between the unit and the hydronic network.

Refrigerant circuit

The refrigerant circuit shall include as standard: one or two single screw compressor with external oil separator, evaporator, condenser, oil pressure transducer, high pressure switches, high pressure transducer, low pressure transducer, moisture liquid indicator, electronic expansion valve.

Control panel

- ✓ Field power connection, control interlock terminals, and unit control system should be centrally located in an electric panel (IP 54). Power and starting controls should be separate from safety and operating controls in different compartments of the same panel.
- ✓ Starting shall be Wye-Delta type as standard.
- ✓ Operating and safety controls should include energy saving control; emergency stop switch; overload protection for compressor motor; high and low pressure cut-out switch (for each refrigerant circuit); anti-freeze thermostat; cut-out switch for each compressor.
- ✓ All of the information regarding the unit will be reported on a display and with the internal built-in calendar and clock that will switch the unit ON/OFF during day time all year long.
- ✓ The following features and functions shall be included:
  - resetting chilled water temperature by controlling the return water temperature or by a remote 4-20 mA DC signal or by controlling the external ambient temperature;
  - soft load function to prevent the system from operating at full load during the chilled fluid pulldown period;
  - password protection of critical parameters of control;
  - start-to-start and stop-to-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 by manual or automatically by circuit run hours;
  - double set point for brine unit version;
  - scheduling via internal time clock to allow programming of a yearly start-stop schedule accommodating weekends and holidays.

Optional High Level Communications Interface

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

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

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

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

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