DAIKIN

Applied Systems

Technical Data

Condenserless chiller

EEDEN13-425

EWLD-I-SS

TABLE OF CONTENTS

EWLD-I-SS

1 Features

- Cooling range: 328–1,422kW
- EER range: 3.51 to 3.91
- Stepless single-screw compressor
- Optimised for use with R-134a
- Standard electronic expansion valve
- DX shell and tube evaporator – one pass refrigerant side for easy oil circulation and return
- All models are PED pressure vessel approved

2 Specifications

2-1 Technical Specifications					EWLD320I-SS	EWLD400I-SS	EWLD420I-SS	EWLD500I-SS	EWLD600I-SS	EWLD650I-SS	EWLD750I-SS	EWLD800I-SS	EWLD850I-SS	EWLD900I-SS
Cooling capacity	Nom.			kW	327 (1)	389 (1)	426 (1)	502 (1)	594 (1)	655 (1)	727 (1)	785 (1)	847 (1)	916 (1)
Capacity control	Method				Stepless									
	Minimum capacity			%	25				12.5					
Power input	Cooling	Nom.		kW	84.8 (1)	102 (1)	118 (1)	139 (1)	167 (1)	183 (1)	201 (1)	217 (1)	234 (1)	255 (1)
EER					3.86 (1)	3.84 (1)	3.62 (1)	3.61 (1)	3.55 (1)	3.58 (1)	3.62 (1)			3.59 (1)
Casing	Colour				Ivory white									
	Material				Galvanized and painted steel sheet									
Dimensions	Unit	Height		mm	1,899				2,323					
		Width		mm	1,468				1,350					
		Depth		mm	3,114				4,116					
Weight	Unit			kg	1,861		1,869	1,884	3,331	3,339	3,347	3,356	3,364	3,412
	Operation weight			kg	2,054		2,052	2,056	3,602		3,603	3,604	3,605	3,645
Water heat exchanger - evaporator	Type				Single pass shell and tube									
	Water volume			l	193		183	172	271	263	256	248	241	233
	Water flow rate	Nom.		l/s	15.67	18.68	20.45	24.08	28.48	31.39	34.88	37.65	40.61	43.91
	Nominal water pressure drop	Cooling	Total	kPa	34	47		54	49	39	52	47		45
	Insulation material				Closed cell									
Sound power level	Cooling	Nom.		dBA	93.7	96.6	96.7		96.9	97.3	97.8	98.9	99.8	
Sound pressure level	Cooling	Nom.		dBA	75.2	76.2	78.2		77.8	78.2	78.7	79.8	80.7	
Compressor	Type				Semi-hermetic single screw compressor									
	Quantity				1				2					
	Oil	Charged volume		l	16				32					
Operation range	Evaporator	Cooling	Min.	ºCDB	-8									
			Max.	ºCDB	15									
	Condenser	Cooling	Min.	ºCDB	25									
			Max.	ºCDB	60									
Refrigerant	Type				R-134a									
	Charge			kg	5									
	Circuits	Quantity			1				2					
Piping connections	Liquid line connection			mm	42									
	Discharge line connection			mm	88.9									
	Evaporator water inlet/outlet (OD)				168.3mm									
Safety devices	Item	01			High discharge pressure (pressure switch)									
		02			High discharge pressure (pressure transducer)									
		03			Low suction pressure (pressure transducer)									
		04			Compressor motor protection									
		05			High discharge temperature									
		06			Low oil pressure									
		07			Low pressure ratio									
		08			High oil filter pressure drop									
		09			Phase monitor									
		10			Emergency stop button									
		11			Water freeze protection controller									

2-2 Technical Specifications				EWLD950I-SS	EWLDC10I-SS	EWLDC11I-SS	EWLDC12I-SS	EWLDC13I-SS	EWLDC14I-SS	EWLDC15I-SS	EWLDC16I-SS	EWLDC17I-SS
Cooling capacity	Nom.		kW	963 (1)	1,029 (1)	1,074 (1)	1,121 (1)	1,185 (1)	1,263 (1)	1,314 (1)	1,365 (1)	1,416 (1)
Capacity control	Method			Stepless								
	Minimum capacity		%	12.5	8.3							
Power input	Cooling	Nom.	kW	274 (1)	283 (1)	300 (1)	316 (1)	332 (1)	351 (1)	371 (1)	391 (1)	411 (1)
EER				3.51 (1)	3.64 (1)	3.59 (1)	3.55 (1)	3.56 (1)	3.59 (1)	3.54 (1)	3.49 (1)	3.45 (1)
Casing	Colour			Ivory white								
	Material			Galvanized and painted steel sheet								
Dimensions	Unit	Height	mm	2,323	2,415							
		Width	mm	1,350	2,128					2,135		
		Depth	mm	4,116	4,427					4,426		

2 Specifications

2-2 Technical Specifications					EWLD950 I-SS	EWLDC10 I-SS	EWLDC11 I-SS	EWLDC12 I-SS	EWLDC13 I-SS	EWLDC14 I-SS	EWLDC15 I-SS	EWLDC16 I-SS	EWLDC17 I-SS
Weight	Unit			kg	3,412	5,146	5,167		5,188	5,208			
	Operation weight			kg	3,645	5,667	5,671		5,677	5,680			
Water heat exchanger - evaporator	Type				Single pass shell and tube								
	Water volume			l	233	504		489	472	504		489	472
	Water flow rate	Nom.		l/s	46.15	49.35	51.50	53.75	56.76	60.53	63.02	65.46	67.94
	Nominal water pressure drop	Cooling	Total	kPa	45	52	46	49	41	51	55	59	63
	Insulation material				Closed cell								
Sound power level	Cooling	Nom.		dBA	99.8	100.4	100.8	101.2	103	100.4	100.8	101.2	103
Sound pressure level	Cooling	Nom.		dBA	80.7	80.4	80.8	81.2	83	80.4	80.8	81.2	83
Compressor	Type				Semi-hermetic single screw compressor								
	Quantity				2	3							
	Oil	Charged volume		l	32	48							
Operation range	Evaporator	Cooling	Min.	°CDB	-8								
			Max.	°CDB	15								
	Condenser	Cooling	Min.	°CDB	25								
			Max.	°CDB	60								
Refrigerant	Type				R-134a								
	Charge			kg	5								
	Circuits	Quantity			2	3							
Piping connections	Liquid line connection			mm	42								
	Discharge line connection			mm	88.9								
	Evaporator water inlet/outlet (OD)				168.3mm	219.1mm							
Safety devices	Item	01			High discharge pressure (pressure switch)								
		02			High discharge pressure (pressure transducer)								
		03			Low suction pressure (pressure transducer)								
		04			Compressor motor protection								
		05			High discharge temperature								
		06			Low oil pressure								
		07			Low pressure ratio								
		08			High oil filter pressure drop								
		09			Phase monitor								
		10			Emergency stop button								
		11			Water freeze protection controller								

2-3 Electrical Specifications				EWLD320I-SS	EWLD400I-SS	EWLD420I-SS	EWLD500I-SS	EWLD600I-SS	EWLD650I-SS	EWLD750I-SS	EWLD800I-SS	EWLD850I-SS	EWLD900I-SS
Compressor	Phase			3~									
	Voltage		V	400									
	Voltage range	Min.	%	-10									
		Max.	%	10									
	Maximum running current		A	195	242	282	321	195		242		282	
	Starting method			Wye-delta									
Compressor 2	Maximum running current		A	-				195	242		282		321
Power supply	Phase			3~									
	Frequency		Hz	50									
	Voltage		V	400									
	Voltage range	Min.	%	-10									
		Max.	%	10									
Unit	Maximum starting current		A	330	464			486	620	658	690		721
	Nominal running current (RLA)	Cooling	A	135 (5)	164 (5)	188 (5)	216 (5)	268 (5)	296 (5)	325 (5)	350 (5)	375 (5)	407 (5)
	Maximum running current		A	195	242	282	321	390	437	484	524	564	603
	Max unit current for wires sizing		A	215	266	310	353	429	481	532	576	620	663

2 Specifications

2-4 Electrical Specifications				EWLD950 I-SS	EWLDC10 I-SS	EWLDC11 I-SS	EWLDC12 I-SS	EWLDC13 I-SS	EWLDC14 I-SS	EWLDC15 I-SS	EWLDC16 I-SS	EWLDC17 I-SS
Compressor	Phase			3~								
	Voltage		V	400								
	Voltage range	Min.	%	-10								
		Max.	%	10								
	Maximum running current		A	321	195	242		282				321
	Starting method			Wye-delta								
Compressor 2	Maximum running current		A	321	242		282				321	
Power supply	Phase			3~								
	Frequency		Hz	50								
	Voltage		V	400								
	Voltage range	Min.	%	-10								
		Max.	%	10								
Unit	Maximum starting current		A	721	814	851	883	915		946	978	
	Nominal running current (RLA)	Cooling	A	437 (5)	457 (5)	487 (5)	511 (5)	536 (5)	562 (5)	592 (5)	622 (5)	652 (5)
	Maximum running current		A	642	679	726	766	806	846	885.0	924	963
	Max unit current for wires sizing		A	706	747	799	843	887	931	974.0	1,016	1,059

Notes

(1) Cooling: entering evaporator water temp. 12ºC; leaving evaporator water temp. 7ºC; saturated discharge temp. at the compressor 45ºC.

(2) Sound level data are measured at entering evaporator water temp. 12ºC; leaving evaporator water temp. 7ºC; saturated discharge temp. 45ºC; 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 + current of the other compressor at 75 % of maximum load

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

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

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

3 Features and advantages

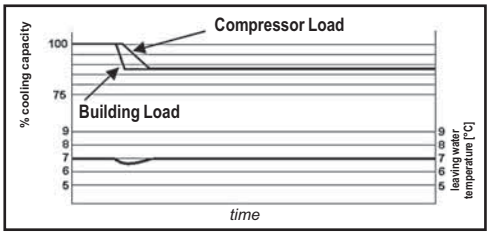
3 - 1 Features and Advantages

Features and advantages

The EWLD~I- chillers, featuring 1, 2 or 3 single screw compressors, are manufactured to satisfy the requirements of the consultants and the end user. Units are designed to minimise energy costs while maximising the refrigeration capacities.
Daikin's chiller design experience combined with outstanding features makes the EWLD~I- chiller unmatched in the industry.

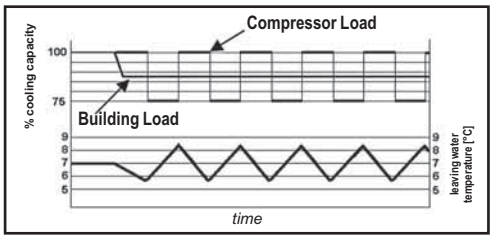
Seasonal quietness
The compressor design with a single screw and twin rotors allows a constant gas flow. This compression process completely eliminates gas pulsations. The oil injection also results in significant mechanical noise reduction.
The twin gas compressor discharge chambers are designed to act as attenuators, based on the harmonic wave principle with destructive interference, thus always resulting equal to zero. The extremely low noise compressor performance affords the use of EWLD~I- chiller for all applications.
The reduced number of vibrations produced from the EWLD~I- chiller offers a surprisingly quiet operation eliminating the noise transmission through the structure and the chilled water piping system.

Infinitely capacity control
Cooling capacity control is infinitely variable by means of a screw compressor controlled by microprocessor system. Each unit has infinitely variable capacity control from 100% down to 25% (one compressor unit), down to 12.5% (two compressors units) and down to 8.3% (three compressors units). This modulation allows the compressor capacity to exactly match the building cooling load without any leaving evaporator water temperature fluctuation. This chilled water temperature fluctuation is avoided only with a stepless control.



EWLT fluctuation with stepless capacity control

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



ELWT fluctuation with steps capacity control (4 steps)

Units with stepless regulation offer benefits that the units with step regulation are unable to match. The ability to follow the system energy demand at any time and the possibility to provide steady outlet water temperature without deviations from the set-point, are the two points that allow you to understand how the optimum operating conditions of a system can be met only through the use of a unit with stepless regulation.

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

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3 Features and advantages

3 - 1 Features and Advantages

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
EWLD~I- is available in standard efficiency level:

S: Standard Efficiency
19 sizes, covering a cooling capacity range from 328 up to 1422 kW, EER up to 3.91

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.

Sound Configuration
EWLD~I- is available in standard sound level configuration:

S: Standard Sound

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4 General Characteristics

4 - 1 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) (±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 single-screw compressor has a well balanced compression mechanism which cancels the screw rotor load in both the radial and axial directions. Inherent to the basic single-screw compressor design is the virtually load-free operation that gives main bearing design life of 3-4 times greater than twin-screws, and eliminates expensive and complicated thrust balancing schemes. The two exactly opposed gate rotors create two exactly opposed compression cycles. Compression is made at the lower and upper parts of the screw rotor at the same time, thus cancelling the radial loads. Also, both ends of the screw rotor are subjected to suction pressure only, which cancels the axial loads and eliminates the huge thrust loads inherent in twin-screw compressors.

Oil injection is used for these compressors in order to get EER at high condensing pressure. EWLD~I- units are provided with a high efficiency oil separator to maximise oil extraction.

Compressors have an infinitely variable capacity control down to 25% of its total capacity. This control is made by means of capacity slides controlled by microprocessors.

Standard start is star-delta type; soft start type is available as option.

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

The 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. Each evaporator has 1 circuit for each compressor and is manufactured in accordance to PED approval. The evaporator water outlet connections are provided with Victaulic Kit (as standard).

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.

EEXV 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 independent refrigerant circuits and each one includes:

- Single screw compressor with external cyclonic oil separator
- Evaporator
- Oil pressure transducer
- High pressure switches
- High pressure transducer
- Low pressure transducer
- Moisture liquid indicator

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4 General Characteristics

4 - 1 General characteristics

- High efficiency oil separator
- Replaceable core filter-drier
- Electronic expansion valve

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 EEXV to keep stable operating conditions to maximise chiller energy efficiency and reliability.
MicroTech III is able to protect critical components based on external signs from its system (such as motor temperatures, refrigerant gas and oil pressures, correct phase sequence, pressure switches and evaporator). The input coming from the high pressure switch cuts all digital output from the controller in less than 50ms, this is an additional security for the equipment.
Fast program cycle (200ms) for a precise monitoring of the system. Floating point calculations supported for increased accuracy in P/T conversions.

Control section - main features
- Management of the compressor 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 (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).

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4 General Characteristics

4 - 1 General characteristics

- Low pressure (transducer).
- 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 certifief 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)

Evaporator Victaulic Kit - Hydraulic joint with gasket for an easy and quick water connection.
Evaporator Water side design pressure 10 bar
Y-D starter - Star Delta starter is the standard type
Double set-point - Dual leaving water temperature set-points.
Phase monitor - The phase monitor controls that phases sequence is correct and controls phase loss.
High Pressure Side Manometers
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 allow 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).
Electronic Expansion Valve

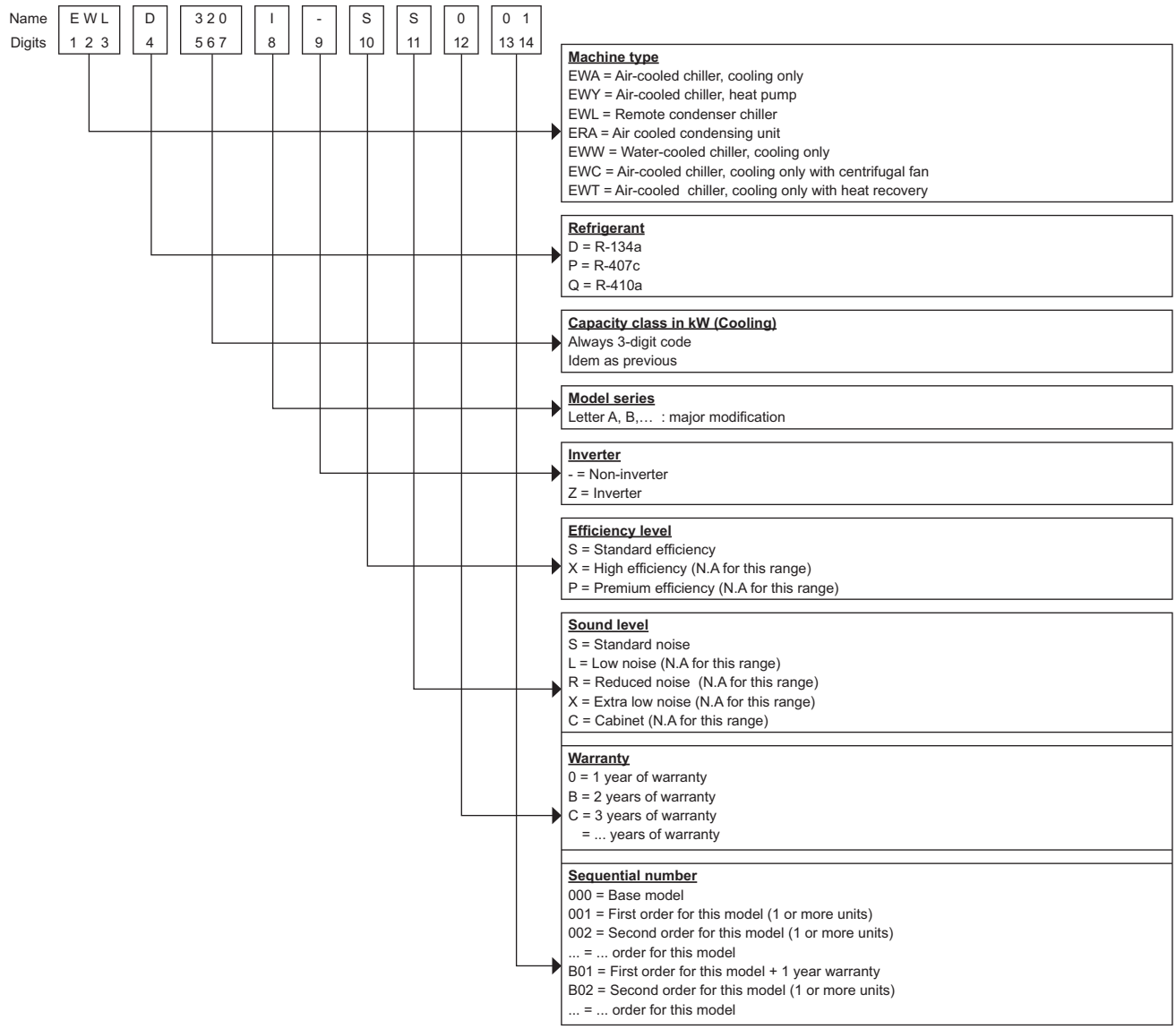
Options (on request)

Brine version - Allows the unit to operate down to -8°C leaving liquid temperature (antifreeze required).
Liquid Receiver - the receiver capacity is 170 Lt
20mm Evaporator Insulation
Suction line shut-off valve - Suction shut-off valve installed on the suction of the compressor to facilitate maintenance operation.
Discharge line shut-off valves - Discharge shut-off valve installed on the discharge of the compressor to facilitate maintenance operations.
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.
Dual Pressure Relief Valve on evaporator
Soft start - Electronic starting device to reduce the mechanical stress during compressor start-up
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 show on a digital display: Line-to-Line Voltage, Phase and Average Current, Active and Reactive Power, Active Energy, Frequency.
Evaporator flow switch for the water piping
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.
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).
Container kit
Acoustic test

GNC_1-2-3-4_Rev.00_4

5 Nomenclature

5 - 1 Nomenclature



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6 Capacity tables

6 - 1 Cooling Capacity Tables

EWLD320-900I-SS

Tc: Condensing temperature; Twe: Evaporator leaving water temperature (Δt 5°C);
CC: Cooling capacity; PI: Power input; qwe: Fluid flow rate at evaporator; dpwe: Fluid pressure drop at evaporator

	Tc	Twe																			
		5				7				9				11				13			
		CC	PI	qwe	dpwe	CC	PI	qwe	dpwe	CC	PI	qwe	dpwe	CC	PI	qwe	dpwe	CC	PI	qwe	dpwe
Size		kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa
320	30	338	59.0	16.1	38	362	60.1	17.3	43	387	61.3	18.6	49	414	62.6	19.9	55	442	63.8	21.2	62
	35	323	65.0	15.5	35	347	66.2	16.6	40	372	67.5	17.8	45	398	68.8	19.1	51	424	70.2	20.4	58
	40	308	71.7	14.7	32	331	72.9	15.9	37	355	74.1	17.0	42	381	75.5	18.3	47	407	76.9	19.5	53
	45	293	79.4	14	29	315	80.3	15.1	34	339	81.5	16.2	38	363	82.8	17.4	43	388	84.2	18.7	49
	50	277	88.3	13.2	27	299	88.9	14.3	30	321	89.8	15.4	35	345	90.9	16.5	40	369	92.2	17.7	45
	55	261	98.6	12.5	24	281	98.9	13.5	27	303	99.5	14.5	31	326	100	15.6	36	350	101	16.8	41
400	30	400	71.1	19.1	51	428	72.8	20.5	58	457	74.6	21.9	66	488	76.4	23.4	74	520	78.3	25.0	83
	35	383	78.2	18.3	48	410	79.8	19.7	54	439	81.6	21.1	61	469	83.4	22.5	69	500	85.4	24.0	78
	40	366	85.9	17.5	44	392	87.5	18.8	50	420	89.2	20.2	57	449	91.0	21.6	64	479	93.0	23.1	72
	45	348	94.6	16.6	40	374	96.1	17.9	46	401	97.6	19.2	52	429	99.4	20.6	59	458	101	22.0	66
	50	329	104	15.7	36	354	106	17.0	41	380	107	18.2	47	408	109	19.6	54	436	110	21.0	61
	55	310	116	14.8	32	334	117	16.0	37	359	118	17.2	43	386	119	18.5	48	413	121	19.9	55
420	30	467	83.6	22.4	55	500	85.5	24.0	63	534	87.6	25.6	71	569	89.7	27.4	80	607	91.9	29.2	89
	35	448	91.7	21.4	51	480	93.7	23.0	58	513	95.8	24.6	66	548	97.9	26.3	74	584	100	28.1	83
	40	427	101	20.4	47	458	103	22.0	54	491	105	23.6	61	525	107	25.2	69	560	109	26.9	77
	45	407	111	19.4	43	437	113	20.9	49	468	115	22.5	56	501	117	24.1	63	535	119	25.7	71
	50	385	123	18.4	39	414	124	19.8	45	445	126	21.3	51	477	128	22.9	58	510	130	24.5	65
	55	362	136	17.3	35	391	137	18.7	40	420	138	20.1	46	451	140	21.6	52	483	142	23.2	59
500	30	544	101	26.1	63	582	103	27.9	72	622	105	29.9	81	663	107	31.9	91	706	110	34.0	102
	35	522	110	25.0	59	559	113	26.8	67	597	115	28.7	75	638	118	30.7	85	679	120	32.7	95
	40	498	121	23.8	54	534	123	25.6	61	572	126	27.5	70	611	129	29.4	79	652	131	31.4	88
	45	474	131	22.7	49	509	134	24.4	56	546	137	26.2	64	584	140	28.0	72	623	143	30.0	82
	50	448	142	21.4	45	482	146	23.1	51	518	149	24.9	58	555	152	26.7	66	594	155	28.6	75
	55	422	154	20.2	40	455	157	21.8	46	489	161	23.5	52	525	164	25.2	60	563	168	27.1	68
600	30	647	117	31.0	56	689	119	33.0	63	732	122	35.2	71	778	124	37.4	79	824	126	39.7	88
	35	622	129	29.7	52	663	131	31.8	59	705	134	33.8	66	750	136	36.0	74	795	139	38.3	82
	40	595	143	28.5	48	636	145	30.5	55	677	147	32.5	61	721	150	34.6	69	765	152	36.8	77
	45	568	158	27.1	44	607	160	29.1	50	648	162	31.1	57	690	164	33.2	64	734	167	35.3	71
	50	539	176	25.8	40	578	177	27.7	46	618	179	29.6	52	659	181	31.6	58	702	183	33.7	66
	55	509	197	24.3	36	546	198	26.2	42	585	199	28.1	47	626	200	30.0	53	667	202	32.1	60
650	30	714	129	34.1	45	760	131	36.4	51	808	134	38.7	57	857	136	41.2	63	908	139	43.7	70
	35	686	142	32.8	42	731	144	35.0	47	778	147	37.3	53	827	150	39.7	59	877	153	42.1	66
	40	657	157	31.4	39	701	159	33.6	44	748	162	35.8	49	795	164	38.2	55	844	167	40.6	62
	45	626	173	29.9	36	670	175	32.1	40	715	178	34.3	45	762	180	36.6	51	810	183	38.9	57
	50	594	192	28.4	32	637	194	30.5	37	681	196	32.7	42	727	198	34.9	47	774	201	37.2	53
	55	561	214	26.8	29	603	215	28.8	33	646	217	30.9	38	691	218	33.1	43	736	221	35.4	48
750	30	794	142	38.0	59	854	146	40.9	67	918	149	44.1	76	985	153	47.3	87	1055	158	50.8	99
	35	758	156	36.3	54	817	159	39.1	62	878	163	42.1	71	943	167	45.3	80	1011	172	48.7	91
	40	723	171	34.6	50	778	175	37.3	57	838	178	40.2	65	900	182	43.3	74	967	186	46.5	84
	45	687	189	32.9	45	739	192	35.4	52	796	195	38.2	59	856	199	41.1	68	920	203	44.3	77
	50	648	209	31.0	41	700	211	33.5	47	753	214	36.1	53	811	217	38.9	61	873	221	41.9	70
	55	608	231	29.1	36	659	233	31.5	42	710	235	34.1	48	764	238	36.7	55	823	241	39.6	63
800	30	855	154	40.9	55	911	157	43.6	61	969	161	46.5	69	1029	164	49.4	77	1092	168	52.5	86
	35	821	169	39.3	51	876	172	42.0	57	933	176	44.8	64	992	180	47.6	72	1053	183	50.6	80
	40	786	186	37.6	47	840	189	40.2	53	896	193	43.0	60	953	196	45.8	67	1013	200	48.7	75
	45	749	205	35.8	43	802	208	38.4	49	857	211	41.1	55	913	215	43.8	62	971	218	46.7	69
	50	711	227	34.0	39	763	229	36.5	45	816	232	39.1	50	871	235	41.8	57	928	239	44.6	64
	55	671	251	32.1	35	721	253	34.5	40	773	255	37.0	46	827	258	39.7	52	882	261	42.4	58
850	30	921	165	44.0	45	981	169	47.0	50	1043	172	50.0	56	1107	176	53.2	63	1174	180	56.4	70
	35	885	182	42.3	42	944	185	45.2	47	1005	189	48.2	53	1068	193	51.2	59	1133	197	54.4	66
	40	848	201	40.5	39	905	204	43.3	44	965	207	46.2	49	1026	211	49.2	55	1090	215	52.4	61
	45	809	221	38.7	35	865	224	41.4	40	923	227	44.2	45	983	231	47.2	51	1046	235	50.2	57
	50	768	245	36.7	32	823	247	39.4	37	880	250	42.1	41	938	253	45.0	47	999	257	48.0	52
	55	725	271	34.6	29	779	273	37.3	33	835	276	40.0	38	891	278	42.7	42	950	282	45.6	48
900	30	995	183	47.6	55	1058	186	50.7	61	1124	190	53.9	68	1192	194	57.2	76	1261	198	60.7	85
	35	957	201	45.8	51	1019	205	48.8	57	1083	209	52.0	64	1150	213	55.2	71	1218	217	58.6	79
	40	917	220	43.8	47	978	224	46.8	53	1041	229	49.9	60	1106	233	53.1	67	1173	237	56.4	74
	45	875	242	41.8	43	935	246	44.8	49	997	250	47.8	55	1061	254	50.9	62	1126	259	54.1	69
	50	831	265	39.7	40	890	269	42.6	45	951	273	45.6	51	1013	277	48.6	57	1077	282	51.8	64
	55	785	290	37.5	36	843	294	40.3	41	902	298	43.2	46	963	303	46.2	52	1026	307	49.3	58

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6 Capacity tables

6 - 1 Cooling Capacity Tables

EWLD950-C17I-SS

Tc: Condensing temperature; Twe: Evaporator leaving water temperature (Δt 5°C);
CC: Cooling capacity; PI: Power input; qwe: Fluid flow rate at evaporator; dpwe: Fluid pressure drop at evaporator

		Twe																			
	Tc	5				7				9				11				13			
		CC	PI	qwe	dpwe	CC	PI	qwe	dpwe	CC	PI	qwe	dpwe	CC	PI	qwe	dpwe	CC	PI	qwe	dpwe
Size		kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa
950	30	1038	197	49.6	40	1104	201	52.8	45	1173	204	56.2	50	1244	208	59.7	56	1317	212	63.3	62
	35	998	217	47.7	37	1063	221	50.9	42	1130	225	54.1	47	1200	229	57.6	52	1272	233	61.1	58
	40	956	238	45.7	35	1020	242	48.8	39	1086	247	52.0	44	1154	251	55.3	49	1225	256	58.8	54
	45	913	259	43.6	32	975	264	46.7	36	1040	269	49.8	40	1106	274	53.0	45	1175	279	56.4	50
	50	868	282	41.5	29	929	287	44.4	33	992	293	47.5	37	1056	298	50.7	42	1124	304	53.9	46
	55	820	305	39.2	26	880	311	42.1	30	941	317	45.1	34	1004	323	48.1	38	1070	329	51.3	43
C10	30	1000	257	47.9	60	1062	261	50.9	67	1127	266	54.1	74	1194	271	57.4	83	1262	276	60.7	91
	35	962	283	46.0	56	1023	288	49.0	62	1087	293	52.1	70	1152	298	55.4	77	1220	303	58.7	86
	40	923	313	44.1	52	983	317	47.1	58	1045	322	50.1	65	1109	327	53.3	72	1175	332	56.5	80
	45	881	346	42.1	47	940	350	45.0	53	1001	354	48.0	60	1064	359	51.1	67	1128	364	54.3	75
	50	838	384	40.1	43	896	387	42.9	49	955	391	45.8	55	1016	395	48.8	62	1080	400	51.9	69
	55	792	427	37.8	39	849	429	40.6	44	907	432	43.5	50	967	435	46.4	56	1029	440	49.4	63
C11	30	1161	214	55.5	52	1232	218	59.0	58	1305	223	62.6	65	1381	227	66.3	72	1459	232	70.2	80
	35	1116	236	53.4	49	1187	240	56.9	55	1260	244	60.4	61	1334	249	64.0	68	1411	254	67.8	75
	40	1069	260	51.1	45	1141	264	54.6	51	1212	268	58.1	57	1285	272	61.7	63	1360	277	65.4	70
	45	1020	286	48.8	41	1090	290	52.2	47	1162	294	55.7	53	1233	299	59.2	59	1307	303	62.8	65
	50	969	317	46.3	38	1037	320	49.6	43	1108	324	53.1	48	1180	328	56.6	54	1252	332	60.1	60
	55	915	351	43.7	34	982	354	47.0	39	1051	357	50.3	44	1122	360	53.8	49	1193	364	57.3	55
C12	30	1209	226	57.8	56	1282	230	61.4	63	1358	235	65.1	70	1436	239	69.0	77	1516	244	72.9	85
	35	1163	249	55.7	52	1236	253	59.2	59	1311	258	62.9	65	1387	262	66.6	72	1466	267	70.5	80
	40	1116	274	53.4	49	1188	278	56.9	55	1261	283	60.5	61	1337	287	64.2	68	1414	292	68.0	75
	45	1066	303	51.0	45	1137	306	54.4	50	1210	311	58.0	56	1284	315	61.6	63	1359	320	65.3	70
	50	1013	335	48.4	41	1083	338	51.9	46	1155	342	55.4	52	1228	346	58.9	58	1302	350	62.6	65
	55	957	372	45.7	37	1026	374	49.1	42	1097	377	52.6	47	1169	381	56.1	53	1242	384	59.7	59
C13	30	1280	238	61.2	47	1361	242	65.2	53	1445	247	69.3	59	1532	252	73.5	65	1621	257	77.9	73
	35	1231	262	58.9	44	1311	266	62.8	49	1393	271	66.8	55	1478	276	70.9	61	1566	282	75.2	68
	40	1180	289	56.4	41	1258	293	60.2	46	1339	298	64.2	51	1422	303	68.2	57	1508	308	72.4	64
	45	1126	319	53.8	37	1203	323	57.6	42	1282	327	61.4	47	1363	332	65.4	53	1447	337	69.5	59
	50	1069	353	51.1	34	1145	356	54.8	39	1222	360	58.5	43	1302	364	62.4	49	1384	369	66.4	55
	55	1009	391	48.2	31	1083	394	51.8	35	1159	397	55.5	39	1237	401	59.3	44	1317	405	63.2	50
C14	30	1353	252	64.7	58	1440	257	69.0	65	1531	262	73.5	73	1625	268	78.1	82	1722	274	82.8	91
	35	1300	277	62.2	54	1385	282	66.4	61	1474	288	70.7	68	1566	293	75.2	76	1662	299	79.9	85
	40	1245	305	59.5	50	1329	310	63.6	56	1416	315	67.9	63	1506	321	72.3	71	1599	327	76.9	79
	45	1187	336	56.7	46	1269	341	60.8	52	1354	346	64.9	59	1442	351	69.2	66	1533	357	73.7	74
	50	1126	372	53.8	42	1207	376	57.8	47	1290	380	61.8	54	1376	385	66.0	60	1464	390	70.4	68
	55	1063	412	50.8	38	1141	415	54.6	43	1223	419	58.6	49	1306	423	62.7	55	1393	428	66.9	62
C15	30	1407	268	67.3	62	1497	273	71.8	70	1591	279	76.3	78	1688	285	81.1	87	1788	291	86.0	97
	35	1352	294	64.7	58	1441	300	69.0	65	1532	306	73.5	73	1627	312	78.2	82	1725	318	83.0	91
	40	1295	323	62.0	54	1382	329	66.2	61	1472	335	70.6	68	1564	341	75.1	76	1661	348	79.9	85
	45	1236	354	59.1	49	1321	360	63.2	56	1408	366	67.5	63	1499	372	72.0	70	1593	379	76.6	79
	50	1174	389	56.1	45	1256	394	60.2	51	1342	400	64.3	58	1430	407	68.7	65	1522	413	73.1	73
	55	1108	427	53.0	41	1189	432	56.9	46	1273	438	61.0	52	1359	444	65.2	59	1448	450	69.6	66
C16	30	1461	284	69.9	67	1554	289	74.5	75	1650	295	79.2	84	1750	301	84.1	93	1853	307	89.2	104
	35	1404	312	67.2	62	1495	318	71.7	70	1590	324	76.3	78	1688	330	81.1	87	1789	337	86.1	97
	40	1346	341	64.4	58	1435	348	68.8	65	1527	354	73.3	73	1623	361	78.0	81	1722	368	82.8	91
	45	1285	373	61.4	53	1372	380	65.7	60	1462	387	70.1	67	1556	394	74.7	75	1652	401	79.5	84
	50	1221	407	58.4	48	1306	414	62.5	55	1394	421	66.8	62	1485	429	71.3	69	1579	436	75.9	78
	55	1153	444	55.1	44	1236	451	59.2	50	1322	458	63.4	56	1411	466	67.7	63	1503	474	72.2	71
C17	30	1515	300	72.6	72	1611	305	77.3	80	1711	311	82.1	89	1813	318	87.2	99	1919	324	92.4	110
	35	1457	329	69.8	67	1551	336	74.4	75	1649	342	79.1	84	1749	349	84.1	93	1853	356	89.2	104
	40	1397	360	66.9	62	1489	367	71.4	69	1584	374	76.0	78	1683	381	80.9	87	1784	389	85.9	97
	45	1334	392	63.8	57	1424	400	68.2	64	1517	407	72.8	72	1613	415	77.5	80	1713	423	82.4	90
	50	1268	425	60.7	52	1356	434	64.9	59	1447	442	69.4	66	1540	451	74.0	74	1638	460	78.7	83
	55	1199	460	57.3	47	1285	470	61.5	53	1373	479	65.8	60	1464	488	70.3	68	1559	498	74.9	76

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

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

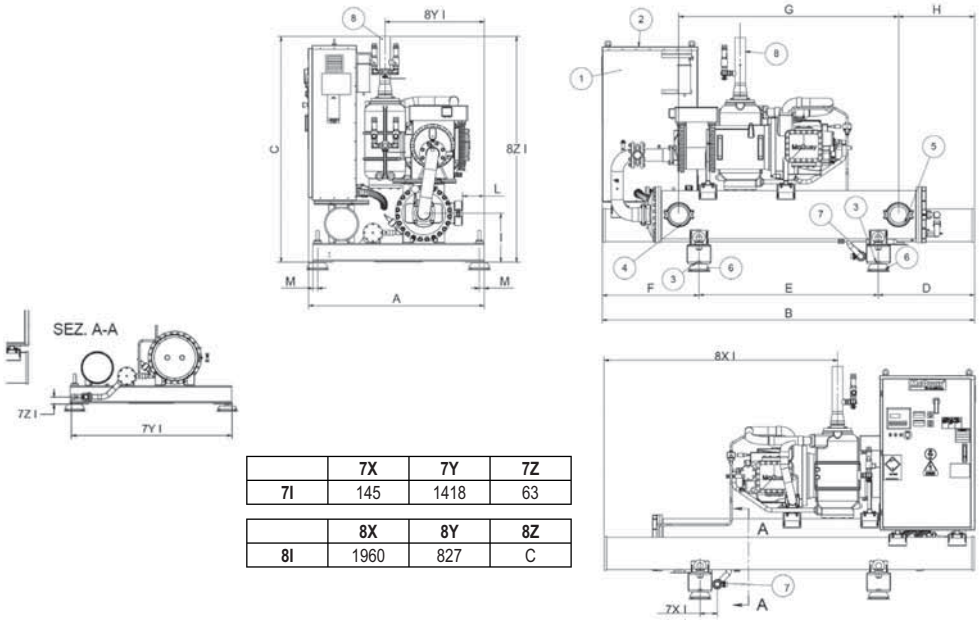
2 For working conditions where dpw values are in italic, please contact factory.
Für Arbeitsbedingungen mit kursiv gedruckten dpw-Werten, wenden Sie sich bitte an den Hersteller.
Για τις συνθήκες εργασίας όπου οι τιμές dpw είναι σε πλάγια γραφή, παρακαλούμε επικοινωνήστε με το εργοστάσιο.
Para las condiciones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

SRC_1-2_Rev.01_2_(2_2)

7 Dimensional drawings

7 - 1 Dimensional Drawings

EWLD320-500I-SS



	7X	7Y	7Z
7I	145	1418	63

	8X	8Y	8Z
8I	1960	827	C

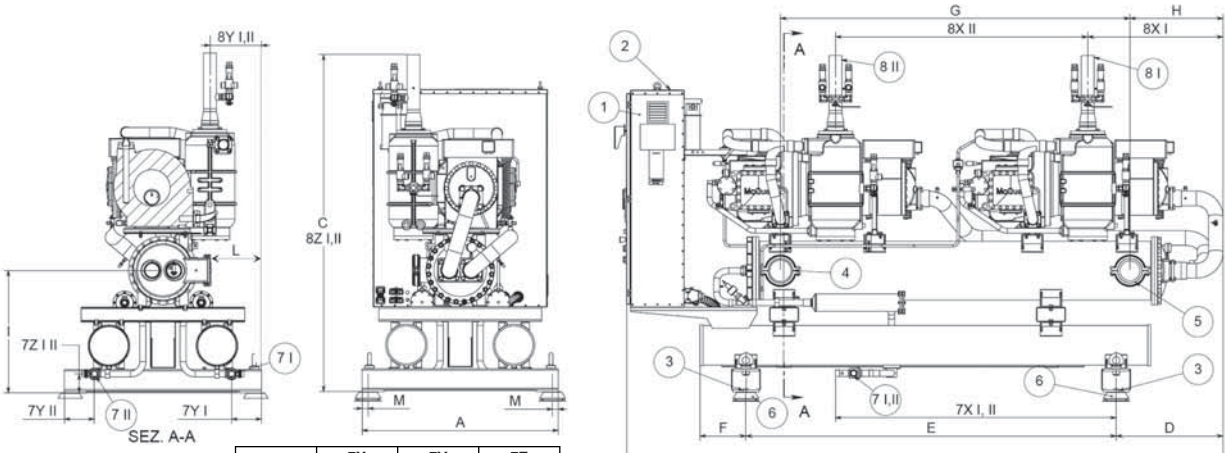
	Dimensions										
EWLD~I-	A	B	C	D	E	F	G	H	I	L	M
320-500I-SS	1468	3114	1899	805	1500	809	1837	637	412	182	40

LEGEND

1 - Electrical Panel
2 - Power connections slot 150x200
3 - Four (4) holes Ø21 for isolator mounting
4 - Evaporator water inlet (Victaulic connection) [168.3mm]
5 - Evaporator water outlet (Victaulic connection) [168.3mm]
6 - Isolators (optional)
7 - Liquid line inlet connection [Ø42]
8 - Discharge line connection [Ø88.9]

DMN_1-2-3_Rev.00_1

EWLD600-950I-SS



	7X	7Y	7Z
7 I	1938	205	130
7 II	1938	205	130
	8X	8Y	8Z
8 I	934	353	C
8 II	1740	353	C

	Dimensions										
EWLD~I-	A	B	C	D	E	F	G	H	I	L	M
600-950I-SS	1350	4116	2323	7379	2555	1068	2412	643	838	346	40

LEGEND

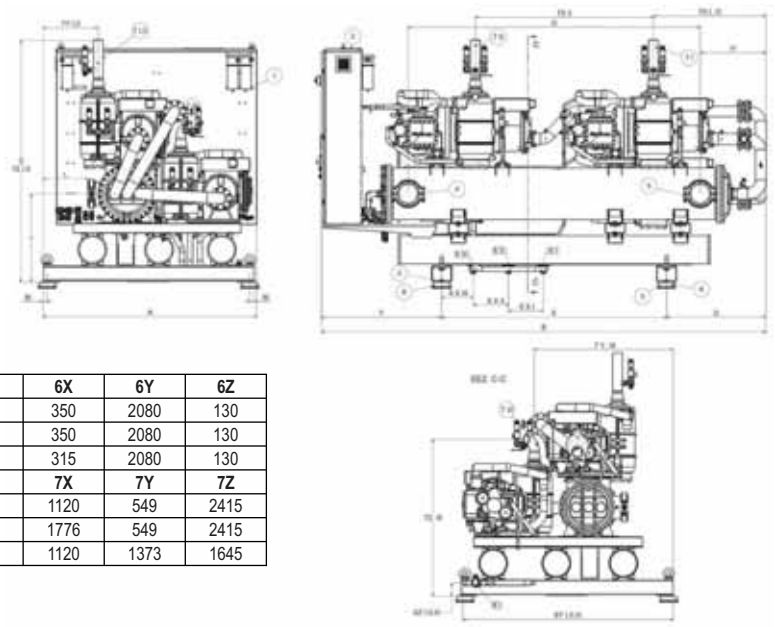
1 - Electrical Panel
2 - Power connections slot 150x200
3 - Four (4) holes Ø21 for isolator mounting
4 - Evaporator water inlet (Victaulic connection) [168.3mm]
5 - Evaporator water outlet (Victaulic connection) [168.3mm]
6 - Isolators (optional)
7 - Liquid line inlet connection [Ø42]
8 - Discharge line connection [Ø88.9]

DMN_1-2-3_Rev.00_2

7 Dimensional drawings

7 - 1 Dimensional Drawings

EWLDC10-C17I-SS



	6X	6Y	6Z
6 I	350	2080	130
6 II	350	2080	130
6 III	315	2080	130
	7X	7Y	7Z
7 I	1120	549	2415
7 II	1776	549	2415
7 III	1120	1373	1645

	Dimensions										
EWLD~I-	A	B	C	D	E	F	G	H	I	L	M
C10-C17I-SS	2128	4427	2415	1041	2200	1198	2910	656	880	446	40

LEGEND

1 - Electrical Panel
2 - Power connections slot 150x350
3 - Four (4) holes Ø21 for isolator mounting
4 - Evaporator water inlet (Victaulic connection) [219.1mm]
5 - Evaporator water outlet (Victaulic connection) [219.1mm]
6 - Liquid line inlet connection [Ø42]
7 - Discharge line connection [Ø88.9]
8 - Isolators (optional)

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8 Sound data

8 - 1 Sound Level Data

Sound level

EWLD~I-SS

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)
320	53.6	56.2	71.1	74.5	69.7	65.6	63.9	59.5	**75.2**	**93.7**
400	54.6	57.2	72.1	75.5	70.7	66.6	64.9	60.5	**76.2**	**96.6**
420	56.6	59.2	74.1	77.5	72.7	68.6	66.9	62.5	**78.2**	**96.7**
500	56.6	59.2	74.1	77.5	72.7	68.6	66.9	62.5	**78.2**	**96.7**
600	56.2	58.8	73.7	77.1	72.3	68.2	66.5	62.1	**77.8**	**96.9**
650	56.6	59.2	74.1	77.5	72.7	68.6	66.9	62.5	**78.2**	**97.3**
750	57.1	59.7	74.6	78.0	73.2	69.1	67.4	63.0	**78.7**	**97.8**
800	58.2	60.8	75.7	79.1	74.3	70.2	68.5	64.1	**79.8**	**98.9**
850	59.1	61.7	76.6	80.0	75.2	71.1	69.4	65.0	**80.7**	**99.8**
900	59.1	61.7	76.6	80.0	75.2	71.1	69.4	65.0	**80.7**	**99.8**
950	59.1	61.7	76.6	80.0	75.2	71.1	69.4	65.0	**80.7**	**99.8**
C10	58.5	61.1	76.0	79.4	74.6	70.5	68.8	64.4	**80.1**	**100.1**
C11	58.8	61.4	76.3	79.7	74.9	70.8	69.1	64.7	**80.4**	**100.4**
C12	59.2	61.8	76.7	80.1	75.3	71.2	69.5	65.1	**80.8**	**100.8**
C13	59.6	62.2	77.1	80.5	75.7	71.6	69.9	65.5	**81.2**	**101.2**
C14	61.4	64.0	78.9	82.3	77.5	73.4	71.7	67.3	**83.0**	**103.0**
C15	61.4	64.0	78.9	82.3	77.5	73.4	71.7	67.3	**83.0**	**103.0**
C16	61.4	64.0	78.9	82.3	77.5	73.4	71.7	67.3	**83.0**	**103.0**
C17	61.4	64.0	78.9	82.3	77.5	73.4	71.7	67.3	**83.0**	**103.0**

NOTE

The values are according to ISO 3744 and are referred to: evaporator 12/7° C, saturated discharge temperature 45° C, full load operation

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8 Sound data

8 - 1 Sound Level Data

Sound pressure levels correction for different distances

EWLD~I-SS

Unit size	Distance					
	1m	5m	10m	15m	20m	25m
320	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
400	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
420	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
500	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
600	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
650	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
750	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
800	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
850	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
900	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
950	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C10	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C11	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C12	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C13	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C14	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C15	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C16	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
C17	0.0	-7.5	-12.2	-15.3	-17.5	-19.3

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9 Installation

9 - 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.

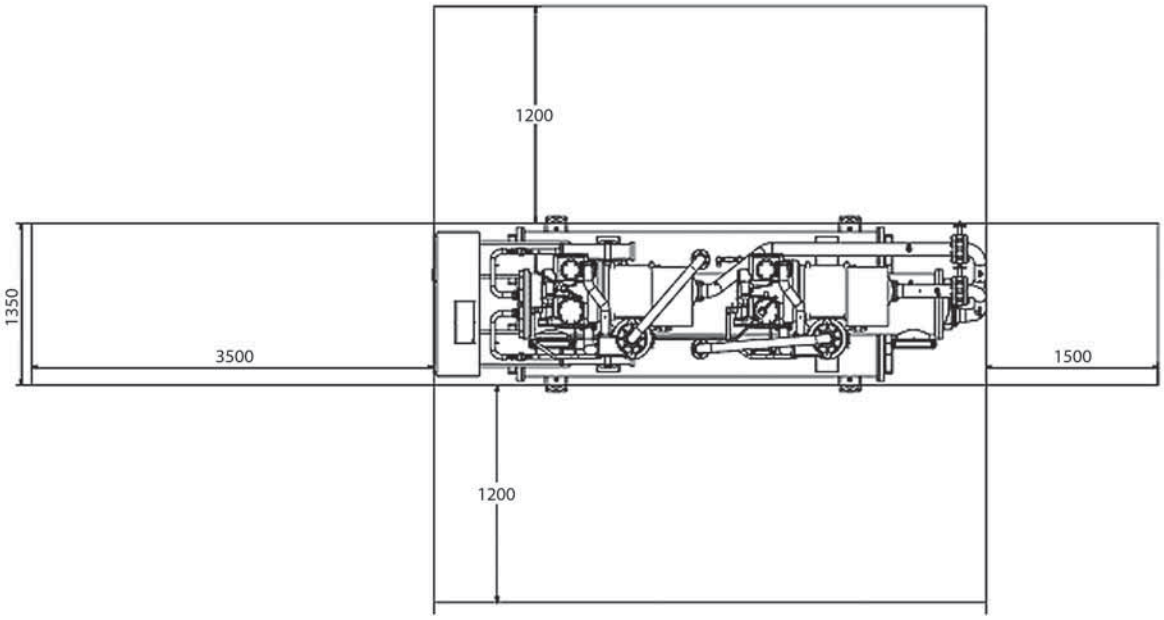
Location

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

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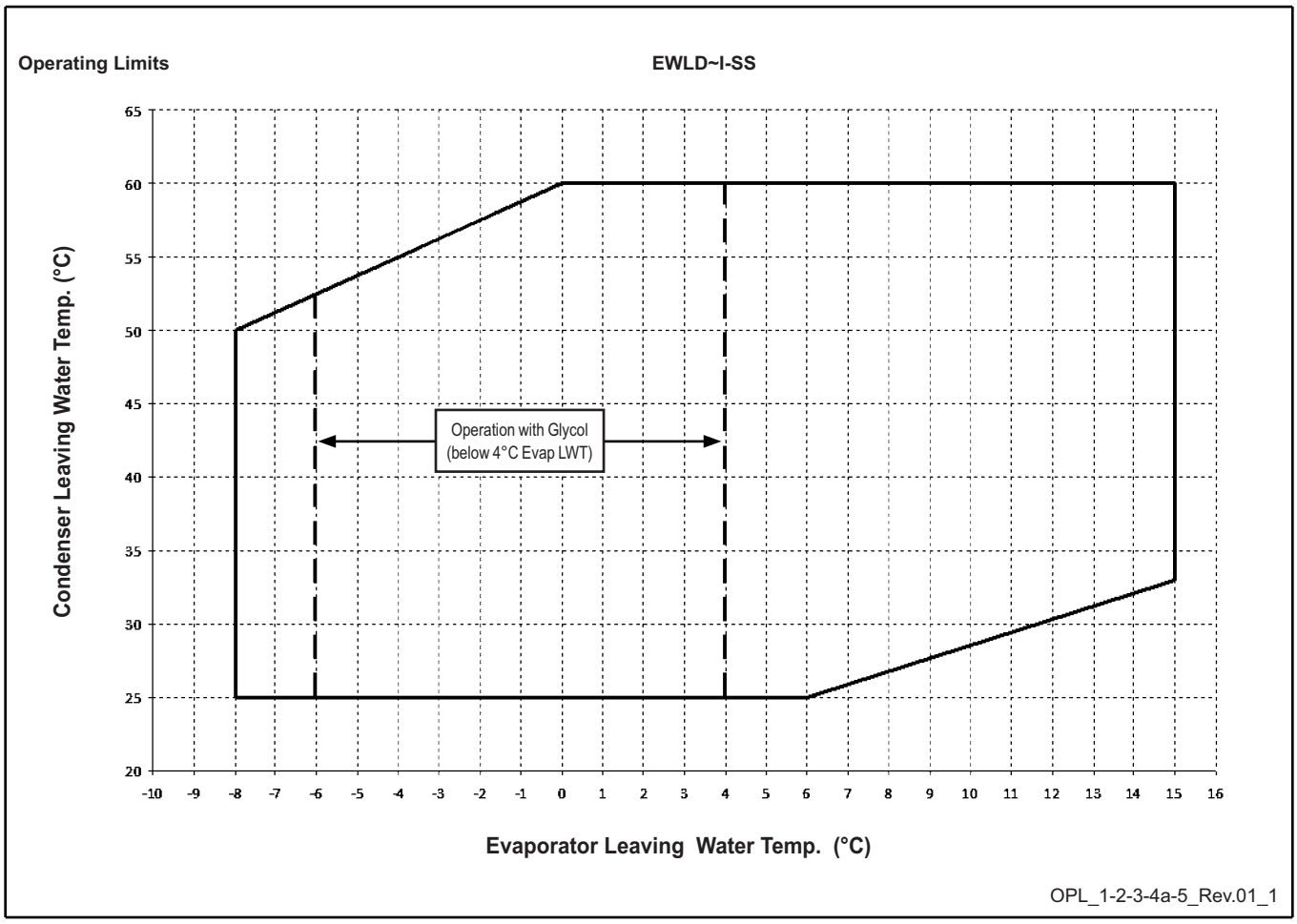
10 Operation range

10 - 1 Operation Range



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 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 3.1 - Minimum glycol percentage for low water temperature

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

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

Table 3.2 - Minimum glycol percentage for low air temperature

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

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

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

Table 4 - Correction factors for low evaporator leaving water temperature

Evaporator Leaving Water Temperature (°C)	2	0	-2	-4	-6	-8
Cooling Capacity	0.842	0.785	0.725	0.670	0.613	0.562
Compressor Power Input	0.950	0.940	0.920	0.890	0.870	0.840

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

Table 5 - 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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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 3.2 and 5)
- multiply the Cooling Capacity, the Compressor Power Input by the Correction factor of Table 5
- 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 5

Example

Unit Size:	**EWLD320I-SS**
Mixture:	Water
Working condition:	ELWT 12/7°C – Saturated DischargeTemperature 45°C
- Cooling capacity:	328kW
- Power input:	83.8kW
- Flow rate (Δt 5°C):	15.67 l/s
- Evaporator pressure drop:	36kPa
Mixture:	Water + Ethylene Glycol 30% (for a winter air temperature up to -15°C)
Working condition:	ELWT 12/7°C – Saturated DischargeTemperature 45°C
- Cooling capacity:	328 x 0.972 = 319 kW
- Power input:	83.8 x 0.986 = 82.6 kW
- Flow rate (Δt 5°C):	15.24 (referred to 328 kW) x 1.074 = 16.36 l/s
- Evaporator pressure drop:	39 (referred to 16.36l/s) x 1.181 = 46kPa

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 3.1 and 3.2 and table 4)
- depending from the evaporator leaving water temperature (see table 4)
- multiply the Cooling Capacity, the Compressor Power Input by the Correction factor of Table 4 and Table 5
- 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 5

Example

Unit Size:	**EWLD320I-SS**
Mixture:	Water
Standard working condition	ELWT 12/7°C – Saturated DischargeTemperature 40°C
- Cooling capacity:	345kW
- Power input:	75.9 kW
- Flow rate (Δt 5°C):	16.48 l/s
- Evaporator pressure drop:	39kPa
Mixture:	Water + Glycol 30% (for a low evaporator leaving temperature of -1/-6°C)
Working condition:	ELWT -1/-6°C – Saturated DischargeTemperature 40°C
- Cooling capacity:	345 x 0.613 x 0.972 = 206 kW
- Power input:	75.9 x 0.870 x 0.986 = 65.11 kW
- Flow rate (Δt 5°C):	9.84 l/s (referred to 206 kW) x 1.074 = 10.57 l/s
- Evaporator pressure drop:	18 kPa (referred to 10.57 l/s) x 1.181 = 21 kPa

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10 Operation range

10 - 1 Operation Range

Water charge, flow and quality

Items (1) (5)			Cooling Water			Cooled Water		Heated water (2)				Tendency if out of criteria
			Circulating System		Once Flow			Low temperature		High temperature		
			Circulating water	Supply water (4)	Flowing water	Circulating water [Below 20°C]	Supply water (4)	Circulating water [20°C ~ 60°C]	Supply water (4)	Circulating water [60°C ~ 80°C]	Supply water (4)	
Items to be controlled:	pH	at 25°C	6.5 ~ 8.2	6.0 ~ 8.0	6.0 ~ 8.0	6.8 - 8.0	6.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	Corrosion + Scale
	Electrical conductivity	[mS/m] at 25°C	Below 80	Below 30	Below 40	Below 80	Below 80	Below 30	Below 30	Below 30	Below 30	Corrosion + Scale
		(µS/cm) at 25°C	(Below 800)	(Below 300)	(Below 400)	(Below 800)	(Below 800)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	Corrosion + Scale
	Chloride ion	[mgCl_{2-}/l]	Below 200	Below 50	Below 50	Below 200	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	Sulfate ion	[mgSO_{2-4}/l]	Below 200	Below 50	Below 50	Below 200	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	M-alkalinity (pH4.8)	[mg$CaCO_3$/l]	Below 100	Below 50	Below 50	Below 100	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Total hardness	[mg$CaCO_3$/l]	Below 200	Below 70	Below 70	Below 200	Below 70	Below 70	Below 70	Below 70	Below 70	Scale
	Calcium harness	[mg$CaCO_3$/l]	Below 150	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Silca ion	[mgSiO_2/l]	Below 50	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Scale
	Oxygen	(mg O2 /l)	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Corrosion
	Particole size	(mm)	Below 0.5	Below 0.5	Below 0.5	Below 0.5	Below 0.6	Below 0.5	Below 0.6	Below 0.5	Below 0.6	Erosion
	Total dissolved solids	(mg / l)	Below 1000	Below 1000	Below 1000	Below 1000	Below 1001	Below 1000	Below 1001	Below 1000	Below 1001	Erosion
	Ethykene, Propylene Glycol (weight conc.)		Below 60%	Below 60%	---	Below 60%	Below 60%	Below 60%	Below 60%	Below 60%	Below 60%	--
Items to be referred to:	Nitrate ion	(mg NO3- /l)	Below 100	Below 100	Below 100	Below 100	Below 101	Below 100	Below 101	Below 100	Below 101	Corrosion
	TOC Total organic carbon	(mg /l)	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Scale
	Iron	[mgFe/l]	Below 1.0	Below 0.3	Below 1.0	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Corrosion + Scale
	Copper	[mgCu/l]	Below 0.3	Below 0.1	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 0.1	Below 1.0	Below 0.1	Corrosion
	Sulfite ion	[mgS2-/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	[mgCO2/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 materials is in direct contact with water without any protection shields, it is desireable to give the valid measure for corrosion. E.g. chemical measure
3 In the cooling water using hermetic cooling tower, close circuit water is according to heated water standard, and scattered water is according to cooling water standard.
4 Supply water is considered drink water, industrial water and ground water except for genuine water, neutral water and soft water.
5 The above mentioned items are representable items in corrosion and scale cases.
6 The limits above have to be considered as a general prescription and con not 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.

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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 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)

For 3 compressors unit
M (liters) = (0.0443 x ΔT(°C) + 1.6202) x P(kW)

where:

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

This formula is valid for:
- standard microprocessor parameters

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

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11 Hydraulic performance

11 - 1 Water Pressure Drop Curve Evaporator/Condenser

Pressure Drops

EWLD~I-SS

Size	320	400	420	500	600	650	750	800	850	900	950	C10	C11	C12	C13	C14	C15	C16	C17
Cooling Capacity (kW)	328	391	428	504	596	657	730	788	850	919	966	1033	1078	1125	1188	1267	1319	1370	1422
Water Flow (l/s) - Evaporator	15.67	18.68	20.45	24.08	28.48	31.39	34.88	37.65	40.61	43.91	46.15	49.35	51.50	53.75	56.76	60.53	63.02	65.46	67.94
Evaporator Pressure Drops (kPa)	34	47	47	54	49	39	52	47	47	45	45	52	46	49	41	51	55	59	63

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

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Evaporator and Condenser Pressure Drops

To determinate the evaporator or condenser pressure drop for different versions or at different working conditions, please refer to 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 EWLD320I-SS has been selected for working at the following conditions:
- Evaporator water in/out: 11/6°C
- Saturated discharge Temperature: 40°C

The cooling capacity at these working conditions is: 333 kW
The evaporator water flow at these working conditions is: 15.91 l/s

The unit EWLD320I-SS at nominal working conditions has the following data:
- evaporator water in/out: 12/7°C
- Saturated discharge Temperature: 45°C

The cooling capacity at these working conditions is: 328 kW
The evaporator water flow at these working conditions is: 15.67 l/s
The evaporator pressure drop at these working conditions is: 34 kPa

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

$$PD_2\ (kPa) = 34\ (kPa) \times \left(\frac{15{,}91\ (l/s)}{15.67\ (l/s)} \right)^{1.8}$$

$$PD_2\ (kPa) = 35\ (kPa)$$

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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12 Specification text

12 - 1 Specification Text

Technical Specification for Water Cooled Screw Chiller

GENERAL

The water 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

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 condenser entering fluid 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
- ✓ Shell & tube evaporator entering water temperature in cooling mode: ..... °C
- ✓ Shell & tube evaporator leaving water temperature in cooling mode: ..... °C
- ✓ Shell & tube evaporator water flow: ..... l/s
- ✓ Saturated Discharge Temperature: ..... °C
- ✓ The unit should work with electricity in range 400V ±10%, 3ph, 50Hz without neutral and shall only have one power connection point.

UNIT DESCRIPTION

Chiller shall include as standard: 1, 2 or 3 independent refrigerant circuits, semi-hermetic rotary single screw compressors, electronic expansion device (EEXV), refrigerant direct expansion shell & tube heat exchangers, R134a 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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12 Specification text

12 - 1 Specification Text

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 through service replacable, 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, cyclonic type 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 two 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 and 8.3% for units with 3 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 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 supplied with shell and tubes counter-flow heat exchanger with single refrigerant pass. It will be refrigerant direct expansion type with refrigerant inside the tubes and water outside (shell side). It will include carbon steel tube sheets, with straight copper tubes internally wound for higher efficiencies, expanded on the tube plates.
- ✓ The evaporator will have 2 circuits, one for each compressor and shall be single refrigerant pass.
- ✓ The water connections shall be VICTAULIC type connections as standard to ensure quick mechanical disconnection between the unit and the hydronic network.
- ✓ Evaporator is manufactured in accordance to PED approval.

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12 Specification text

12 - 1 Specification Text

Refrigerant circuit

Each circuit shall include as standard: electronic expansion device piloted by unit's microprocessor control, compressor discharge shut-off valve, suction line shut-off valve, replaceable core filter-drier, sight glass with moisture indicator and insulated suction line.

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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