DAIKIN

Applied Systems

Technical Data

Condenserless chiller

EEDEN13-419

EWLD-G-SS

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EWLD-G-SS

1 Features

- Wide capacity range: 10 sizes to cover a range from 161 to 526 kW
- EER range from 3.48 to 3.70
- Stepless single-screw compressor
- Optimised for use with R-134a
- 1-2 truly independent refrigerant circuits
- 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
- MicroTech III controller with superior control logic and easy interface
- Partial heat recovery available

2 Specifications

2-1 Technical Specifications					EWLD160G-SS	EWLD190G-SS	EWLD240G-SS	EWLD280G-SS	EWLD320G-SS	EWLD360G-SS	EWLD380G-SS	EWLD420G-SS	EWLD480G-SS	EWLD550G-SS
Cooling capacity	Nom.			kW	160 (1)	188 (1)	243 (1)	269 (1)	315 (1)	350 (1)	379 (1)	426 (1)	474 (1)	524 (1)
Capacity control	Method				Stepless									
	Minimum capacity			%	25				12.5					
Power input	Cooling	Nom.		kW	46.1 (1)	55.3 (1)	66.8 (1)	75.7 (1)	92.1 (1)	101.3 (1)	110.5 (1)	121.7 (1)	133.4 (1)	150 (1)
EER					3.47 (1)	3.40 (1)	3.64 (1)	3.55 (1)	3.42 (1)	3.46 (1)	3.43 (1)	3.50 (1)	3.55 (1)	3.48 (1)
Casing	Colour				Ivory white									
	Material				Galvanized and painted steel sheet									
Dimensions	Unit	Height		mm	1,860					1,942				
		Width		mm	1,000				1,100					
		Depth		mm	3,700				4,400					
Weight	Unit			kg	1,280		1,398		2,442	2,446		2,501	2,506	
	Operation weight			kg	1,337		1,516		2,560			2,670		
Water heat exchanger - evaporator	Type				Single pass shell and tube									
	Water volume			l	60	56	123		118	113		173	168	
	Water flow rate	Nom.		l/s	7.7	9.0	11.7	12.9	15.1	16.8	18.2	20.5	22.7	25.1
	Nominal water pressure drop	Cooling	Heat exchanger	kPa	44	60	41	49	57	55.9	64.4	49.9	50.6	60.6
	Insulation material				Closed cell									
Sound power level	Cooling	Nom.		dBA	87.7				90.2					
Sound pressure level	Cooling	Nom.		dBA	69.7				71.7					
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									
	Circuits	Quantity			1				2					
Piping connections	Liquid line connection			mm	42									
	Discharge line connection			mm	67									
	Evaporator water inlet/outlet (OD)				88.9		114.3					139.7mm		
Safety devices	Item	01			High discharge pressure (pressure switch)									
		02			High discharge pressure (pressure transducer)									
		03			Low suction pressure (pressure transducer)									
		04			Compressor motor protection									
		05			High discharge temperature									
		06			Refrigerant in oil sump									
		07			Low oil pressure									
		08			Low pressure ratio									
		09			High oil filter pressure drop									
		10			Phase monitor									
		11			Flowswitch									
		12			Emergency stop									
		13			Water freeze protection controller									

2-2 Electrical Specifications				EWLD160G-SS	EWLD190G-SS	EWLD240G-SS	EWLD280G-SS	EWLD320G-SS	EWLD360G-SS	EWLD380G-SS	EWLD420G-SS	EWLD480G-SS	EWLD550G-SS
Compressor	Phase			3~									
	Voltage		V	400									
	Voltage range	Min.	%	-10									
		Max.	%	10									
	Maximum running current		A	112	134	161	182	112		134		161	182
	Starting method			Wye-delta									
Compressor 2	Maximum running current		A	-				112	134		161	182	

2 Specifications

2-2 Electrical Specifications				EWLD160G-SS	EWLD190G-SS	EWLD240G-SS	EWLD280G-SS	EWLD320G-SS	EWLD360G-SS	EWLD380G-SS	EWLD420G-SS	EWLD480G-SS	EWLD550G-SS
Power supply	Phase			3~									
	Frequency		Hz	50									
	Voltage		V	400									
	Voltage range	Min.	%	-10									
		Max.	%	10									
Unit	Maximum starting current		A	288				378	395		417	434	
	Nominal running current (RLA)	Cooling	A	79	90	107	120	157	169	181	197	214	239
	Maximum running current		A	112	134	161	182	224	246	268	295	343	364
	Max unit current for wires sizing		A	123	147	177	200	246	271	295	325	377	400

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: ISO 3744

(3) Units are shipped with holding nitrogen charge at 2 bar

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

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

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

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

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

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

3 Features and advantages

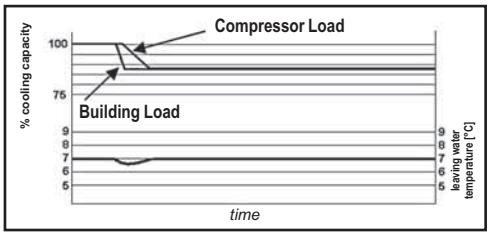
3 - 1 Features and Advantages

Features and advantages

The water cooled screw chillers EWLD~G- are equipped with single screw compressors.
They 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~G- chiller unmatched in the industry.

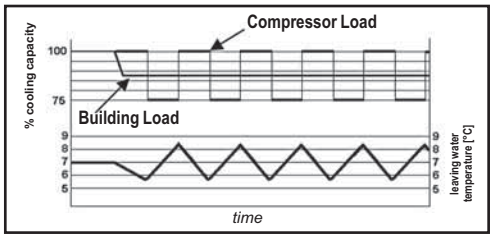
Seasonal quietness
The compressor design with a single screw and twin rotors allows a constant gas flow. This compression process completely eliminates gas pulsations. The oil injection also results in significant mechanical noise reduction.
The twin gas compressor discharge chambers are designed to 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~G- chiller for all applications.
The reduced number of vibrations produced from the EWLD~G- 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). This modulation allows the compressor capacity to exactly match the building cooling load without any leaving evaporator water temperature fluctuation. This chilled water temperature fluctuation is avoided only with a stepless control.



ELWT fluctuation with 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 step-less regulation.

Unmatched serviceability
Field serviceability has not been sacrificed. Inspection covers allows visual inspection of the main screw and gaterotors.

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3 Features and advantages

3 - 1 Features and Advantages

Outstanding reliability features

Unsurpassed Efficiency

• Zero clearance fit between the two gaterotors and main screw rotor virtually eliminates leakage between the high and low-pressure sides during compression. Special gaterotor material made from an advanced composite, temperature stable material makes a zero clearance design possible.

• The chiller is equipped with the most advanced means of refrigerant flow control available. An electronic expansion valve coupled with the MicroTech II C Plus controller's control logic provides excellent operating efficiencies both at full and part load operation.

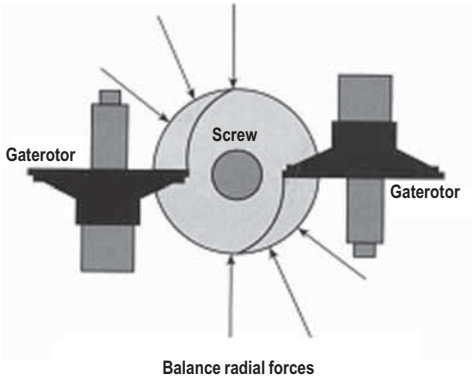
• Infinite unloading matches compressor capacity to load.

• Full factory testing of the unit with water hookups helps provides a trouble-free start-up. Extensive quality control checks during testing means that each equipment protection and operating control is properly adjusted and operates correctly before it leaves the factory. Factory-installed options minimize field expenses and startup labor.

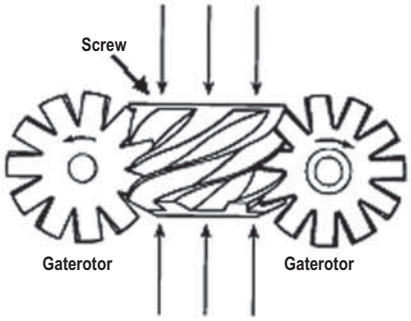
• The rugged design of the single-screw compressor allows it to be tolerant of liquid slugging.

• Very low loading enhances the bearing and compressor reliability. Due to symmetrical compression taking place on both sides of the main screw rotor, balanced forces result in the elimination of the large radial force loads inherent in twin-screw compressors.

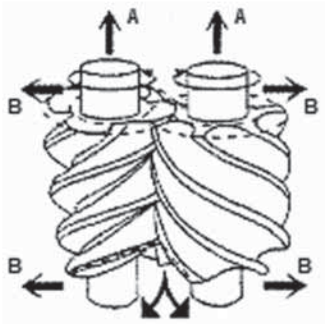
• Integral to the basic design of the single-screw compressor, the main screw rotor shaft and the gaterotor shafts cross at right angles in the compressor. The result is ample space to locate heavy duty bearings and increase compressor reliability since no limitations are placed on bearing design as found in twin-screw compressors.



Balance radial forces



Balanced axial forces



High Axial and Radial thrusts in TwinScrew Compressor

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

EWLD~G- is available in one Efficiency Version:

S: Standard Efficiency

10 sizes to cover a range from 161 up to 526 kW with an EER up to 3.70

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~G- is available in Standard sound level configuration:

S: Standard Noise

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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. The 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
- (Common) 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.
- 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.

4 General Characteristics

4 - 1 General characteristics

Safety device / logic for each refrigerant circuit

- High pressure (pressure switch).
- High pressure (transducer).
- 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
Electronic Expansion Device
Suction line shut off valve - Suction shut-off valve installed on the suction of the compressor to facilitate maintenance operation.
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 the unit or not).

Options (on request)

Partial heat recovery - Produced with plate to plate heat exchangers installed on discharge side of compressor hot gas. These allow hot water to be produced up to a maximum temperature of +50°C.
Brine version - Allows the unit to operate down to -8°C leaving liquid temperature (antifreeze required).
20mm Evaporator Insulation
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 control the voltage value of power supply and stop the chiller if the value exceeds the allowed operating limits.
Energy Meter - This device allows to measure the energy absorbed by the chiller during its life. It is installed inside the control box mounted on a DIN rail and show on a digital display: Line-to-Line Voltage, Phase and Average Current, Active and Reactive Power, Active Energy, Frequency.
Capacitors Cosfi 0.9 - Installed on the electrical control panel to ensure it conforms to the plant rules (advise: maximum 0,9).
Current Limit - To limit maximum absorbed current of the unit whenever is required.
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.
Forklift kit
Witness test - Every unit is always tested at the test bench prior to the shipment. On request, a second test can be carried out, at customer’s presence, in accordance with the procedures indicated on the test form. (Not available for units with glycol mixtures).
Acoustic test

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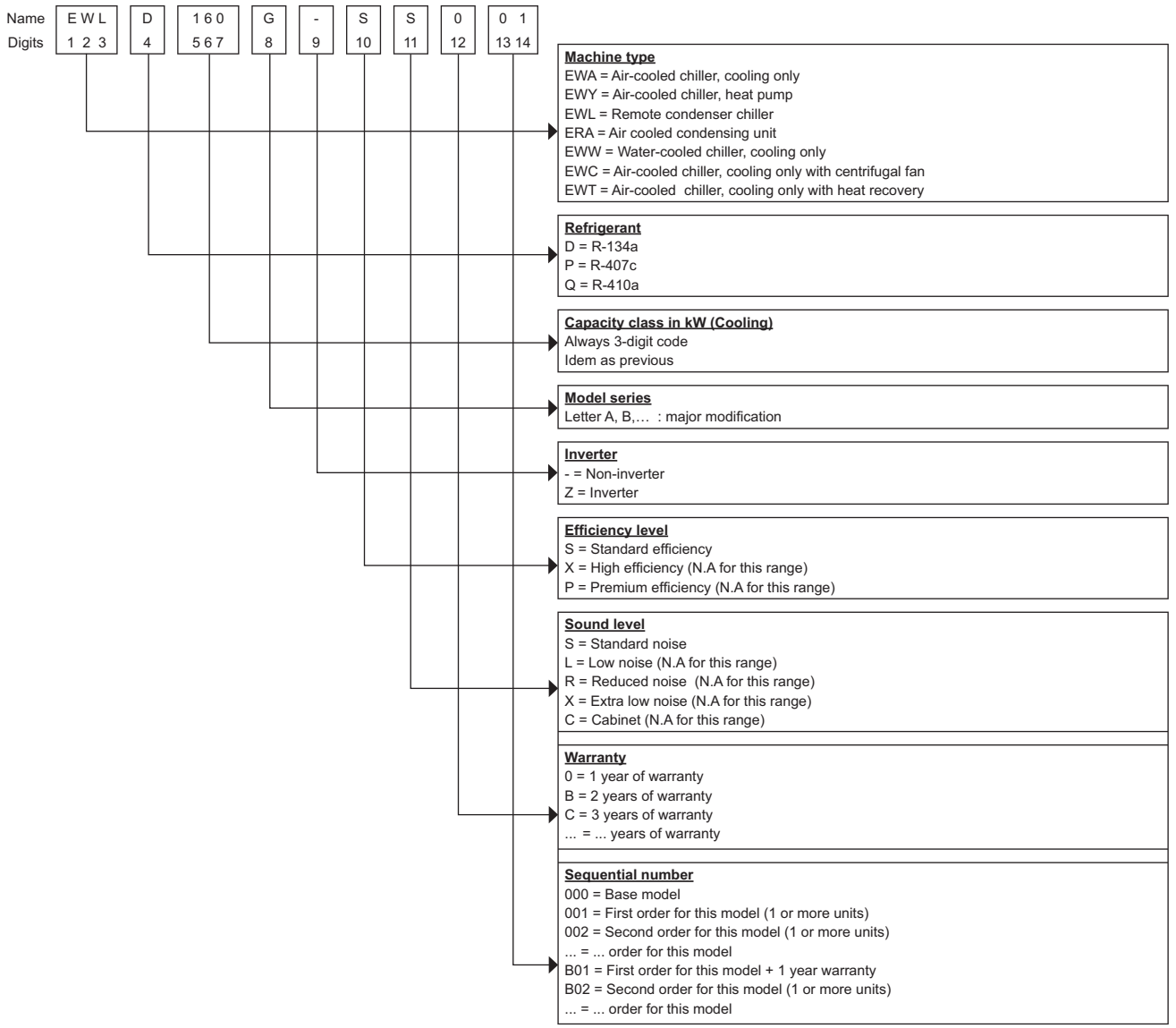
5 Nomenclature

5 - 1 Nomenclature



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6 Capacity tables

6 - 1 Cooling Capacity Tables

EWLD-G-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

Size	Tc	Twe																							
		5				7				9				11				13				15			
		CC	PI	qwe	dpwe	CC	PI	qwe	dpwe	CC	PI	qwe	dpwe	CC	PI	qwe	dpwe	CC	PI	qwe	dpwe	CC	PI	qwe	dpwe
		kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa	kW	kW	l/s	kPa
160	30	171	32.0	8.20	48	183	32.2	8.80	54	195	32.3	9.40	61	208	32.4	10.00	68	222	32.5	10.70	76	236	32.6	11.40	86
	35	164	36.3	7.90	44	176	36.5	8.40	50	188	36.7	9.00	56	200	36.9	9.60	64	213	37.1	10.30	71	227	37.3	10.90	80
	40	157	40.9	7.50	41	168	41.2	8.10	46	180	41.4	8.60	52	192	41.7	9.20	59	205	42.0	9.90	66	218	42.2	10.50	74
	45	150	45.9	7.20	37	160	46.2	7.70	42	172	46.5	8.20	48	184	46.8	8.80	54	196	47.1	9.40	61	209	47.4	10.10	69
	50	142	51.2	6.80	34	153	51.6	7.30	39	163	51.9	7.80	44	175	52.2	8.40	50	187	52.6	9.00	56	200	53.0	9.60	63
	55	134	57.1	6.40	31	145	57.4	6.90	35	155	57.7	7.40	40	166	58.1	8.00	45	178	58.5	8.50	51	190	58.9	9.10	58
190	30	207	38.5	9.90	65	221	38.8	10.60	73	235	39.0	11.30	82	251	39.3	12.10	92	266	39.5	12.80	103	283	39.7	13.70	115
	35	199	43.6	9.50	60	212	43.9	10.20	68	226	44.2	10.90	77	241	44.5	11.60	86	257	44.9	12.40	96	273	45.2	13.20	108
	40	190	49.0	9.10	56	203	49.4	9.80	63	217	49.8	10.40	71	232	50.2	11.10	80	247	50.6	11.90	90	262	51.0	12.70	100
	45	181	55.0	8.70	51	194	55.3	9.30	58	208	55.8	10.00	66	222	56.2	10.70	74	236	56.7	11.40	83	252	57.1	12.10	93
	50	172	61.4	8.30	47	185	61.8	8.90	53	198	62.2	9.50	60	212	62.7	10.20	68	226	63.2	10.90	76	240	63.7	11.60	86
	55	163	68.4	7.80	42	175	68.8	8.40	48	187	69.2	9.00	54	201	69.6	9.60	62	214	70.1	10.30	70	229	70.6	11.00	78
240	30	267	46.2	12.80	45	285	46.5	13.70	51	304	46.6	14.60	58	325	46.8	15.60	65	346	46.9	16.70	73	347	44.9	16.70	73
	35	256	52.4	12.20	42	274	52.8	13.10	47	293	53.1	14.00	54	312	53.3	15.00	60	333	53.6	16.00	68	355	53.8	17.10	76
	40	245	59.2	11.70	39	262	59.5	12.60	44	281	59.9	13.50	50	300	60.3	14.40	56	320	60.7	15.40	63	341	61.0	16.40	71
	45	233	66.4	11.20	35	251	66.8	12.00	40	268	67.2	12.90	46	287	67.7	13.80	52	306	68.1	14.70	58	327	68.6	15.70	66
	50	222	74.2	10.60	32	238	74.6	11.40	37	255	75.1	12.20	42	273	75.6	13.10	47	292	76.1	14.00	53	312	76.6	15.00	60
	55	210	82.6	10.00	29	225	83.0	10.80	33	242	83.5	11.60	38	259	84.0	12.40	43	277	84.6	13.30	49	296	85.2	14.20	55
280	30	298	52.3	14.30	55	319	52.6	15.30	62	340	52.9	16.30	70	363	53.1	17.50	79	387	53.3	18.60	88	411	53.5	19.80	99
	35	286	59.3	13.70	51	306	59.7	14.70	58	328	60.0	15.70	65	349	60.4	16.80	73	372	60.8	17.90	82	396	61.1	19.10	92
	40	274	66.8	13.10	47	294	67.2	14.10	53	314	67.7	15.10	60	335	68.2	16.10	68	358	68.7	17.20	77	381	69.1	18.40	86
	45	262	74.9	12.50	43	281	75.4	13.40	49	300	75.9	14.40	56	321	76.5	15.40	63	342	77.0	16.50	71	365	77.6	17.60	80
	50	249	83.7	11.90	39	267	84.2	12.80	45	286	84.7	13.70	51	306	85.3	14.70	58	327	86.0	15.70	65	349	86.6	16.80	73
	55	235	93.2	11.20	36	253	93.7	12.10	41	271	94.2	13.00	46	290	94.8	13.90	52	310	95.5	14.90	59	331	96.2	16.00	67
320	30	344	64.1	16.50	62	367	64.5	17.60	70	392	64.8	18.80	79	417	65.1	20.10	88	444	65.4	21.40	99	472	65.7	22.80	111
	35	330	72.6	15.80	57	353	73.1	16.90	65	377	73.6	18.10	73	402	74.1	19.30	82	428	74.6	20.60	92	455	75.0	21.90	103
	40	316	81.8	15.10	53	338	82.4	16.20	60	361	83.0	17.30	68	385	83.6	18.50	76	411	84.2	19.80	86	437	84.8	21.10	96
	45	301	91.7	14.40	49	323	92.4	15.50	55	345	93.0	16.60	62	369	93.8	17.70	71	393	94.4	18.90	79	419	95.2	20.20	89
	50	286	102	13.70	44	307	103	14.70	50	329	104	15.80	57	351	105	16.90	65	375	105	18.10	73	400	106	19.30	82
	55	271	114	13.00	40	291	115	13.90	46	312	115	14.90	52	334	116	16.00	59	357	117	17.20	67	381	118	18.40	75
360	30	383	70.4	18.40	60	410	70.8	19.60	68	437	71.2	21.00	77	466	71.5	22.40	86	496	71.8	23.90	97	527	72.1	25.40	108
	35	368	79.7	17.60	56	394	80.2	18.90	63	420	80.8	20.20	71	448	81.3	21.50	80	477	81.8	23.00	90	508	82.3	24.50	101
	40	352	89.8	16.90	52	377	90.4	18.10	59	403	91.1	19.30	66	430	91.8	20.70	75	458	92.4	22.10	84	488	93.1	23.50	94
	45	336	101	16.10	47	360	101	17.30	54	385	102	18.50	61	412	103	19.80	69	439	104	21.10	77	468	104	22.50	87
	50	319	112	15.30	43	342	113	16.40	49	367	114	17.60	56	392	115	18.80	63	419	116	20.10	71	447	117	21.50	80
	55	302	125	14.40	39	324	126	15.50	44	348	127	16.70	51	372	128	17.90	57	398	128	19.10	65	425	129	20.50	73
380	30	415	77.0	19.90	70	443	77.5	21.30	79	473	78.0	22.70	89	503	78.5	24.20	100	535	78.9	25.80	112	568	79.3	27.40	125
	35	398	87.1	19.10	65	426	87.7	20.40	73	455	88.4	21.80	83	485	89.0	23.30	93	516	89.7	24.80	104	548	90.3	26.40	117
	40	382	98.1	18.30	60	408	98.8	19.60	68	436	99.6	20.90	77	465	100	22.40	86	496	101	23.90	97	527	102	25.40	109
	45	364	110	17.40	55	390	111	18.70	63	417	112	20.00	71	445	112	21.40	80	475	113	22.90	90	505	114	24.40	101
	50	346	123	16.50	50	371	124	17.80	57	397	124	19.10	65	425	125	20.40	73	453	126	21.80	82	483	127	23.30	93
	55	327	137	15.60	45	351	138	16.80	52	376	138	18.10	59	403	139	19.30	66	430	140	20.70	75	459	141	22.10	85
420	30	466	84.6	22.30	54	498	85.1	23.90	61	531	85.5	25.50	69	566	85.9	27.20	77	602	86.2	29.00	86	639	86.5	30.80	96
	35	448	95.9	21.40	50	479	96.5	22.90	57	511	97.1	24.50	64	545	97.7	26.20	72	580	98.3	27.90	81	617	98.8	29.70	90
	40	429	108	20.50	46	459	109	22.00	53	490	110	23.50	59	523	110	25.10	67	557	111	26.80	75	593	112	28.60	84
	45	409	121	19.60	43	438	122	21.00	48	469	123	22.50	55	501	124	24.00	62	534	125	25.70	69	569	126	27.40	78
	50	389	136	18.60	39	417	136	20.00	44	447	137	21.40	50	478	138	22.90	57	510	139	24.50	64	543	140	26.20	72
	55	367	151	17.60	35	395	152	18.90	40	423	153	20.30	45	453	154	21.70	51	484	155	23.30	58	517	156	24.90	66
480	30	519	92.8	24.80	55	554	93.3	26.60	62	591	93.8	28.40	69	630	94.2	30.30	78	670	94.5	32.20	87	711	94.8	34.30	97
	35	498	105	23.80	51	532	106	25.50	57	569	107	27.30	65	606	107	29.10	73	645	108	31.00	82	686	108	33.10	91
	40	477	118	22.80	47	511	119	24.50	53	545	120	26.20	60	582	121	28.00	68	620	122	29.80	76	660	123	31.80	85
	45	455	133	21.80	43	488	134	23.40	49	522	135	25.00	55	557	136	26.80	62	594	137	28.60	70	633	138	30.50	79
	50	433	149	20.70	39	464	149	22.20	45	497	150	23.80	51	531	151	25.50	57	567	153	27.30	65	605	154	29.10	73
	55	409	166	19.60	36	439	166	21.00	40	471	167	22.60	46	504	168	24.20	52	539	169	25.90	59	575	171	27.70	66
550	30	590	106	28.20	66	629	106	30.20	75	671	107	32.20	84	714	107	34.30	94	758	108	36.50	105	805	108	38.80	117
	35	566	119	27.10	61	605	120	29.00	69	645	121	31.00	78	687	122	33.10	88	731	123	35.20	98	777	124	37.40	110
	40	543	135	26.00	57	580	135	27.80	64	620	137	29.70	73	661	138	31.80	82	703	139	33.90	92	748	140	36.00	102
	45	518	151	24.80	52	555	152	26.60	59	593	153	28.50	67	633	154	30.40	75	674	155	32.50	85	718	156	34.60	95
	50	493	169	23.60	48	528	170	25.30	54	565	171	27.10	61	604	172	29.00	69	644	173	31.00	78	686	175	33.10	88
	55	465	188	22.30	43	500	189	23.90	49	536	190	25.70	56	573	191	27.50	63	612	192	29.40	71	653	194	31.40	80

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

7 Pressure drops

7 - 1 Evaporator Pressure Drops

Evaporating Pressure Drops

EWLD~G-SS

Size	160	190	240	280	320	360	380	420	480	550
Cooling Capacity (kW)	161	189	244	270	316	352	381	428	476	526
Water Flow (l/s)	7.69	9.03	11.7	12.9	15.1	16.8	18.2	20.4	22.7	25.1
Evaporator Pressure Drops (kPa)	44	60	41	49	57	56	64	50	51	61

Water flow and pressure drop referred to nominal condition: evaporator water in/out: 12/7°C – 45 °C saturated discharge temperature at the compressor.

EPD_1-2_Rev.00_1

Evaporating Pressure Drops

To determinate the pressure drop for different versions or at different working condition, 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

The unit EWLD160G-SS has been selected for working at the following conditions:
- evaporator water in/out: 11/6°C
- saturated discharge temperature: 50°C
The cooling capacity at these working conditions is: 148 kW
The water flow at these working conditions is: 7.07 l/s

The unit EWLD160G-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: 161 kW
The water flow at these working conditions is: 7.69 l/s
The pressure drop at these working conditions is: 44 kPa

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

$$PD_2\ (kPa) = 44\ (kPa) \times \left(\frac{7.07\ (l/s)}{7.69\ (l/s)} \right)^{1.8}$$

PD_2 (kPa) = **38** (kPa)

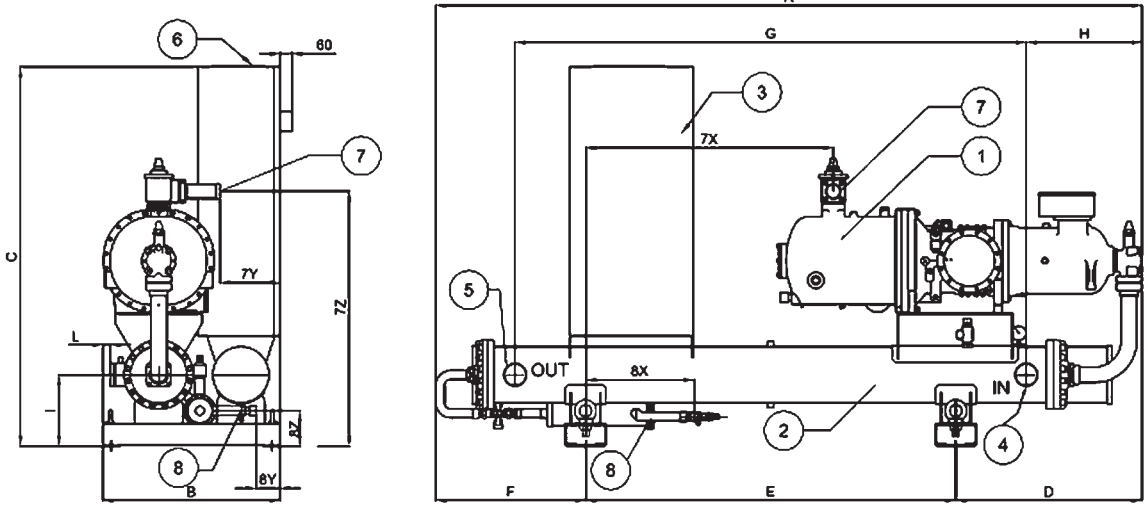
NOTE - Important
If the calculated evaporator water pressure drop is below 10 kPa or above 100 kPa please contact the factory for dedicated evaporator.

EPD_1-2_Rev.00_2

8 Dimensional drawings

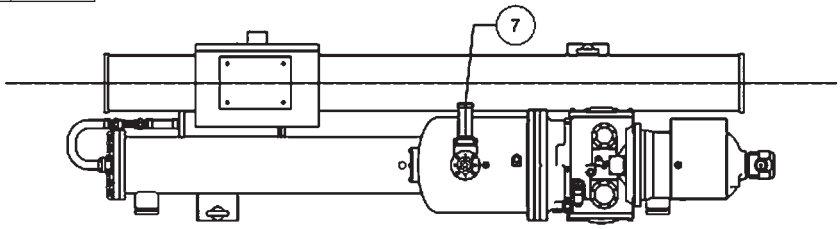
8 - 1 Dimensional Drawings

EWLD160-280G-SS



7x	7Y	7Z	8X	8Y	8Z
1205	292	1243	824	130	125

mm



Models	Dimensions (mm)									
EWLD~G-SS	A	B	C	D	E	F	G	H	I	L
EWLD160G-SS	3435	860	1860	957	1800	943	2526	564	350	77
EWLD190G-SS	3435	860	1860	957	1800	943	2526	564	350	77
EWLD240G-SS	3435	860	1860	906	1800	755	2486	564	350	33
EWLD280G-SS	3435	860	1860	906	1800	755	2486	564	350	33

LEGEND

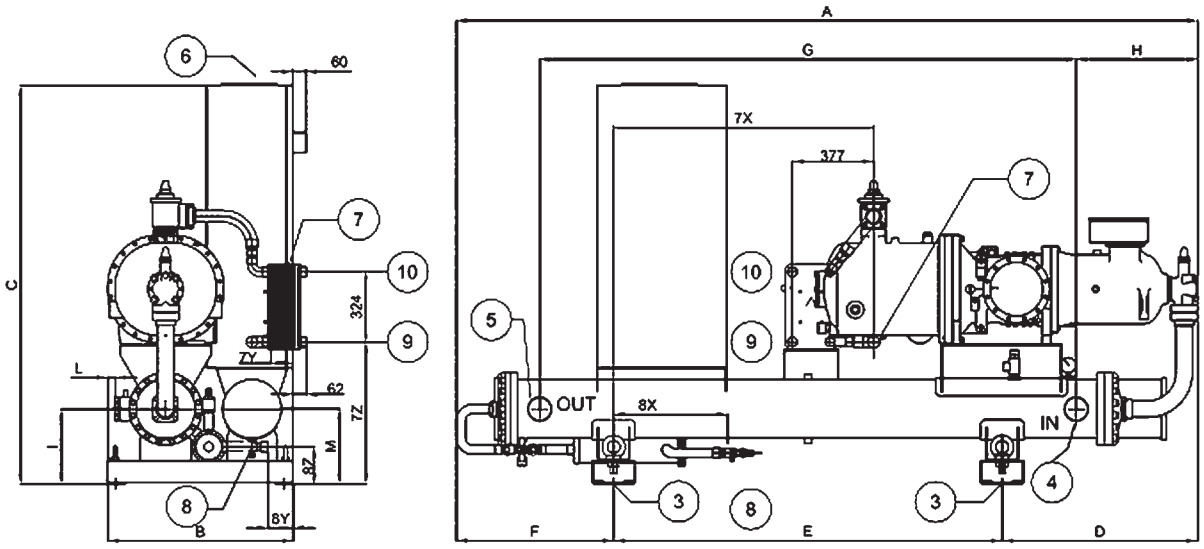
1 - Compressor
2 - Water heat exchanger evaporator
3 - Electrical panel
4 - Evaporator water inlet
5 - Evaporator water outlet
6 - Power connections slot
7 - Discharge line connection
8 - Pipe liquid connection

DMN_1-2-3-4_Rev.00_1

8 Dimensional drawings

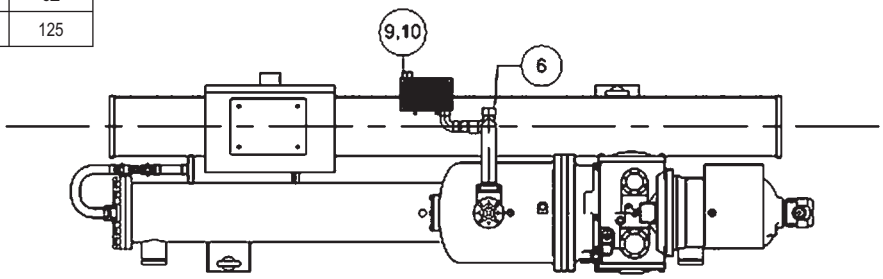
8 - 1 Dimensional Drawings

EWLD160-280G-SS
Partial Heat Recovery



7x	7Y	7Z	8X	8Y	8Z
1205	103	660	824	130	125

mm



Models	Dimensions (mm)									
EWLD~G-SS	A	B	C	D	E	F	G	H	I	L
EWLD160G-SS	3435	860	1860	957	1800	943	2526	564	350	77
EWLD190G-SS	3435	860	1860	957	1800	943	2526	564	350	77
EWLD240G-SS	3435	860	1860	906	1800	755	2486	564	350	33
EWLD280G-SS	3435	860	1860	906	1800	755	2486	564	350	33

LEGEND

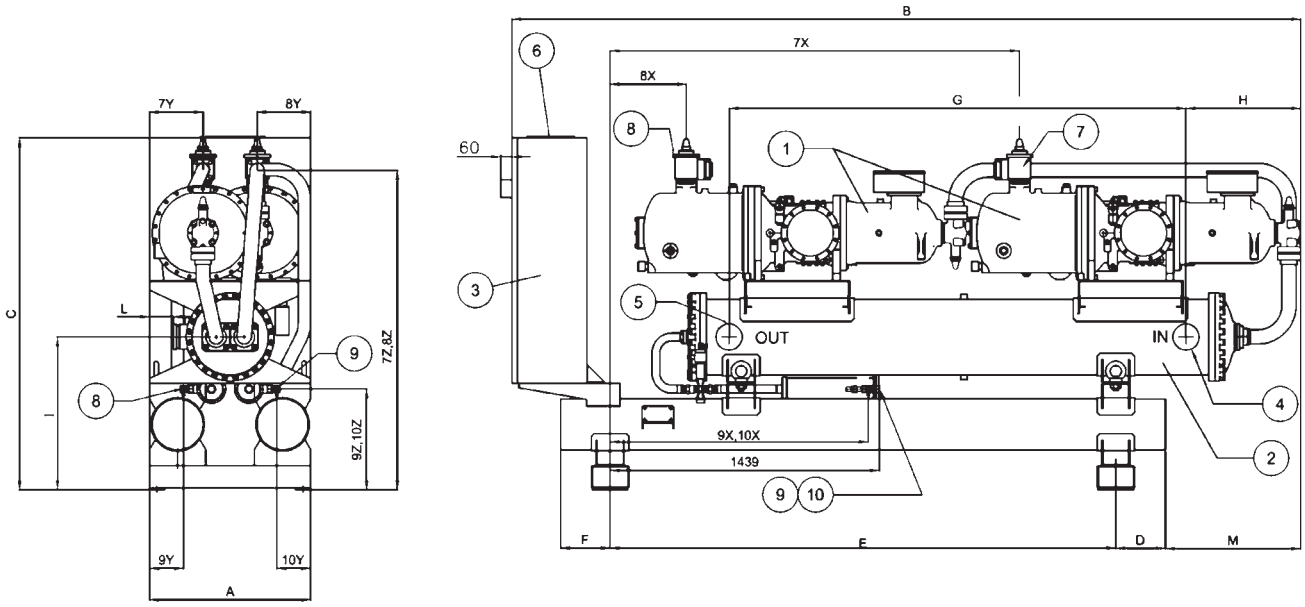
1 - Compressor
2 - Water heat exchanger evaporator
3 - Electrical panel
4 - Evaporator water inlet
5 - Evaporator water outlet
6 - Power connections slot
7 - Discharge line connection
8 - Pipe liquid connection
9 - Desupheater water inlet
10 - Desupheater water outlet

DMN_1-2-3-4_Rev.00_3

8 Dimensional drawings

8 - 1 Dimensional Drawings

EWLD320-550G-SS



7x	7Y	7Z	8X	8Y	8Z	9X	9Y	9Z	10X	10Y	10Z
2186	285	1706	406	285	1706	1440	181	539	1440	181	539

mm

Models	Dimensions (mm)										
EWLD~G-SS	A	B	C	D	E	F	G	H	I	L	M
EWLD320G-SS	4245	860	1880	264	2700	264	2486	564	815	127	723
EWLD360G-SS	4245	860	1880	264	2700	264	2486	564	815	127	723
EWLD380G-SS	4245	860	1880	264	2700	264	2486	564	815	127	723
EWLD420G-SS	4245	860	1880	264	2700	264	2450	582	815	122	723
EWLD480G-SS	4245	860	1880	264	2700	264	2450	582	815	122	723
EWLD550G-SS	4245	860	1880	264	2700	264	2450	582	815	122	723

LEGEND

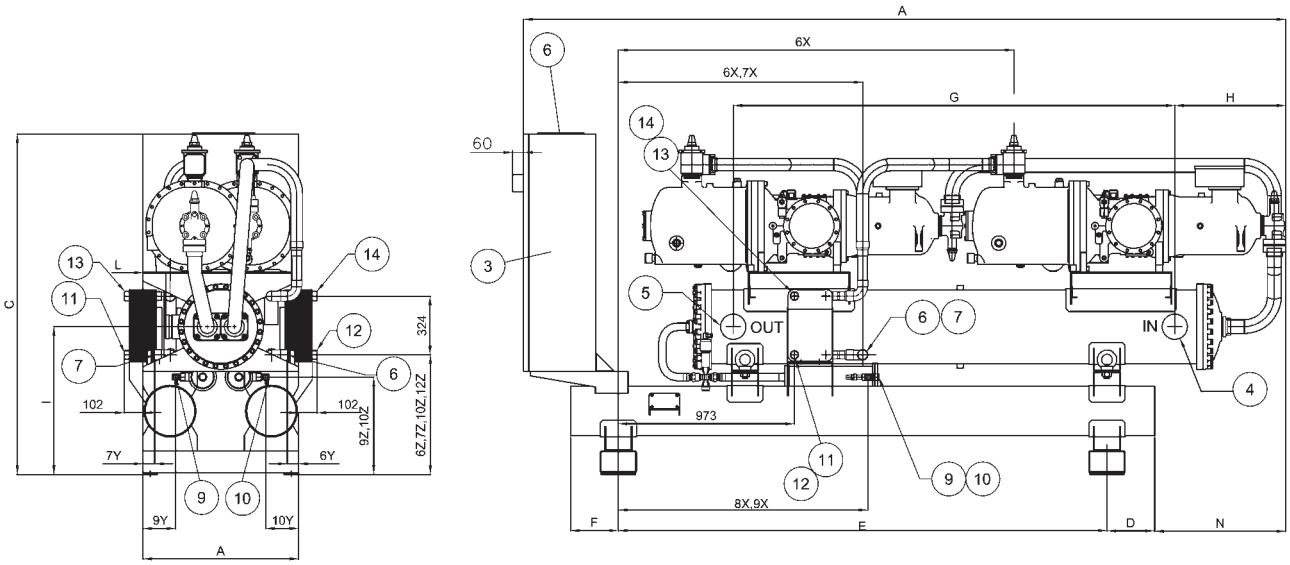
1 - Compressor
2 - Water heat exchanger evaporator
3 - Electrical panel
4 - Evaporator water inlet
5 - Evaporator water outlet
6 - Power connections slot
7 - Discharge line connection
8 - Pipe liquid connection

DMN_1-2-3-4_Rev.00_2

8 Dimensional drawings

8 - 1 Dimensional Drawings

EWLD320-550G-SS
Partial Heat Recovery



6x	6Y	6Z	7x	7Y	7Z	8X	8Y	8Z	9X	9Y	9Z
1350	63	661	1350	63	661	1379	181	539	1379	181	539

mm

Models	Dimensions (mm)										
EWLD~G-SS	A	B	C	D	E	F	G	H	I	L	M
EWLD320G-SS	4245	860	1880	264	2700	264	2486	564	815	127	723
EWLD360G-SS	4245	860	1880	264	2700	264	2486	564	815	127	723
EWLD380G-SS	4245	860	1880	264	2700	264	2486	564	815	127	723
EWLD420G-SS	4245	860	1880	264	2700	264	2450	582	815	122	723
EWLD480G-SS	4245	860	1880	264	2700	264	2450	582	815	122	723
EWLD550G-SS	4245	860	1880	264	2700	264	2450	582	815	122	723

LEGEND

1 - Compressor
2 - Water heat exchanger evaporator
3 - Electrical panel
4 - Evaporator water inlet
5 - Evaporator water outlet
6 - Power connections slot
7 - Discharge line connection circ. 1
8 - Discharge line connection circ. 2
9 - Pipe liquid connection 1
10 - Pipe liquid connection 2
11 - Desupheater water inlet circ. 1
12 - Desupheater water inlet circ. 2
13 - Desupheater water outlet circ. 1
14 - Desupheater water outlet circ. 2

DMN_1-2-3-4_Rev.00_4

9 Sound data

9 - 1 Sound Level Data

Noise Level

EWLD~G-SS

EWLD~G-SS	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)
160	58.0	58.0	63.5	68.5	63.0	64.0	53.0	49.5	**69.7**	**87.7**
190	58.0	58.0	63.5	68.5	63.0	64.0	53.0	49.5	**69.7**	**87.7**
240	58.0	58.0	63.5	68.5	63.0	64.0	53.0	49.5	**69.7**	**87.7**
280	58.0	58.0	63.5	68.5	63.0	64.0	53.0	49.5	**69.7**	**87.7**
320	60.0	60.0	65.5	70.5	65.0	66.0	55.0	51.5	**71.7**	**90.2**
360	60.0	60.0	65.5	70.5	65.0	66.0	55.0	51.5	**71.7**	**90.2**
380	60.0	60.0	65.5	70.5	65.0	66.0	55.0	51.5	**71.7**	**90.2**
420	60.0	60.0	65.5	70.5	65.0	66.0	55.0	51.5	**71.7**	**90.2**
480	60.0	60.0	65.5	70.5	65.0	66.0	55.0	51.5	**71.7**	**90.2**
550	60.0	60.0	65.5	70.5	65.0	66.0	55.0	51.5	**71.7**	**90.2**

NOTES

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

EWLD~G-SS + OPLN

EWLD~G-SS	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)
160	55.9	55.2	59.6	63.9	57.7	58.5	47.7	44.2	**64.7**	**82.7**
190	55.9	55.2	59.6	63.9	57.7	58.5	47.7	44.2	**64.7**	**82.7**
240	55.9	55.2	59.6	63.9	57.7	58.5	47.7	44.2	**64.7**	**82.7**
280	55.9	55.2	59.6	63.9	57.7	58.5	47.7	44.2	**64.7**	**82.7**
320	57.9	57.2	61.6	65.9	59.7	60.5	49.7	46.2	**66.7**	**85.2**
360	57.9	57.2	61.6	65.9	59.7	60.5	49.7	46.2	**66.7**	**85.2**
380	57.9	57.2	61.6	65.9	59.7	60.5	49.7	46.2	**66.7**	**85.2**
420	57.9	57.2	61.6	65.9	59.7	60.5	49.7	46.2	**66.7**	**85.2**
480	57.9	57.2	61.6	65.9	59.7	60.5	49.7	46.2	**66.7**	**85.2**
550	57.9	57.2	61.6	65.9	59.7	60.5	49.7	46.2	**66.7**	**85.2**

NOTES

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

NSL_1-2_Rev.00_1

9 Sound data

9 - 1 Sound Level Data

Sound pressure reduction values for different distances

EWLD~G-SS	Distance					
	1m	5m	10m	15m	20m	25m
160	0.0	-8.7	-13.7	-16.9	-19.2	-21.1
190	0.0	-8.7	-13.7	-16.9	-19.2	-21.1
240	0.0	-8.7	-13.7	-16.9	-19.2	-21.1
280	0.0	-8.7	-13.7	-16.9	-19.2	-21.1
320	0.0	-8.7	-13.7	-16.9	-19.2	-21.1
360	0.0	-8.4	-13.4	-16.5	-18.8	-20.6
380	0.0	-8.3	-13.3	-16.4	-18.7	-20.5
420	0.0	-8.3	-13.3	-16.4	-18.7	-20.5
480	0.0	-8.3	-13.3	-16.4	-18.7	-20.5
550	0.0	-8.3	-13.3	-16.4	-18.7	-20.5

NOTES

The values are dB(A) (pressure level).

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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.

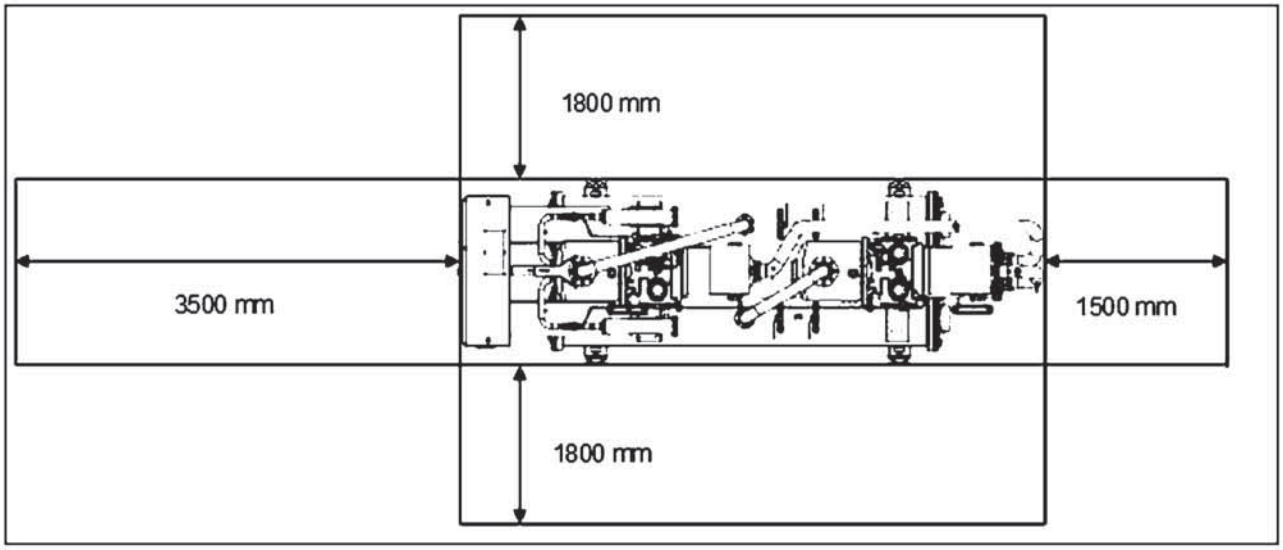
Location

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



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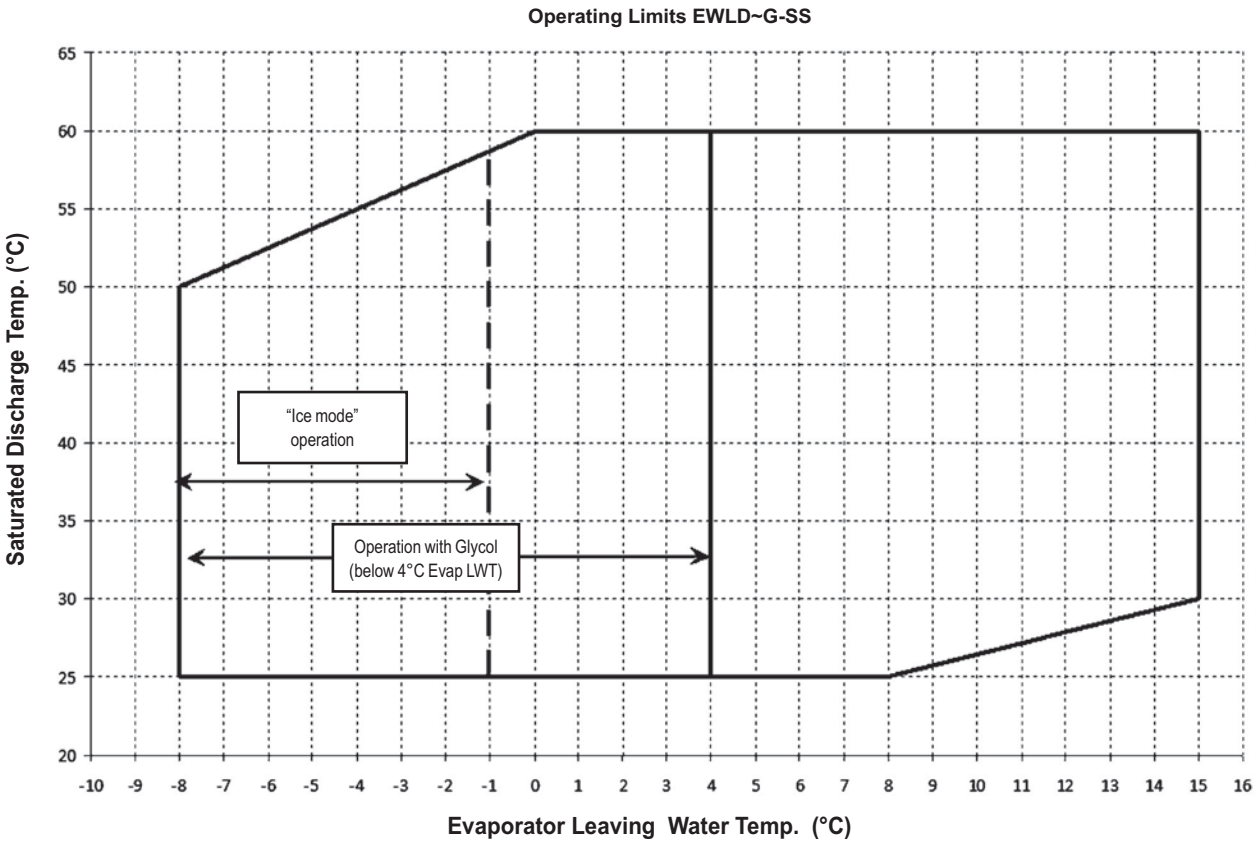
11 Operation range

11 - 1 Operation Range



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11 Operation range

11 - 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

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%

(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 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

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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11 Operation range

11 - 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:	**EWLD160G-SS**
Mixture:	Water
Working condition:	ELWT 12/7°C – Saturated DischargeTemperature 45°C
- Cooling capacity:	161kW
- Power input:	45.4kW
- Flow rate (Δt 5°C):	7.69 l/s
- Evaporator pressure drop:	44kPa
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:	161 x 0.972 = 156 kW
- Power input:	45.4 x 0.986 = 44.8 kW
- Flow rate (Δt 5°C):	7.45 (referred to 156 kW) x 1.074 = 8.00 l/s
- Evaporator pressure drop:	47 (referred to 8 l/s) x 1.181 = 56kPa

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:	**EWLD160G-SS**
Mixture:	Water
Standard working condition	ELWT 12/7°C – Saturated DischargeTemperature 40°C
- Cooling capacity:	168 kW
- Power input:	40.3 kW
- Flow rate (Δt 5°C):	8.02 l/s
- Evaporator pressure drop:	47kPa
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:	168 x 0.613 x 0.972 = 100 kW
- Power input:	40.3 x 0.870 x 0.986 = 34.6 kW
- Flow rate (Δt 5°C):	4.78 l/s (referred to 100 kW) x 1.074 = 5.13 l/s
- Evaporator pressure drop:	21 kPa (referred to 5.13 l/s) x 1.181 = 25 kPa

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11 Operation range

11 - 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	6.0 ~ 8.0	6.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	Corrosion + Scale
	Electrical conductivity	[mS/m] at 25°C	Below 80	Below 30	Below 40	Below 40	Below 30	Below 30	Below 30	Below 30	Below 30	Corrosion + Scale
		(µS/cm) at 25°C	(Below 800)	(Below 300)	(Below 400)	(Below 400)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	Corrosion + Scale
	Chloride ion	[mgCl^{-}/l]	Below 200	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	Sulfate ion	[mgSO^{2-}_{4}/l]	Below 200	Below 50	Below 50	Below 50	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 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Total hardness	[mg$CaCO_3$/l]	Below 200	Below 70	Below 70	Below 70	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
Items to be referred to	Iron	[mgFe/l]	Below 1.0	Below 0.3	Below 1.0	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Below 1.0	Below 0.3	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	[mg$NH+_{4}$/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 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.

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11 Operation range

11 - 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)

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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12 Hydraulic performance

12 - 1 Partial Heat Recovery Pressure Drop

Partial Heat Recovery Ratings
EWLD~G-SS

EWLD~G-SS	Leaving desuper-heater water temp.°C	Saturated discharge temperature (°C)				
		40	45	50	55	60
		Hc (kW)	Hc (kW)	Hc (kW)	Hc (kW)	Hc (kW)
160	45	21.0	22.0	23.0	24.0	25.0
	50	10.0	18.0	22.0	23.0	24.0
	55	6.00	11.0	17.0	20.0	21.0
190	45	22.0	29.0	30.0	31.0	32.0
	50	17.0	23.0	28.0	29.0	30.0
	55	10.0	16.0	24.0	26.0	27.0
240	45	35.0	36.0	37.0	38.0	39.0
	50	28.0	34.0	35.0	36.0	37.0
	55	19.0	30.0	31.0	32.0	33.0
280	45	42.0	43.0	44.0	45.0	46.0
	50	39.0	45.0	42.0	43.0	44.0
	55	28.0	44.0	38.0	38.0	39.0
320	45	42.0	44.0	46.0	48.0	50.0
	50	20.0	36.0	44.0	46.0	48.0
	55	12.0	22.0	34.0	40.0	42.0
360	45	43.0	51.0	53.0	55.0	57.0
	50	27.0	41.0	50.0	52.0	54.0
	55	16.0	27.0	41.0	46.0	48.0
380	45	44.0	58.0	60.0	62.0	64.0
	50	34.0	46.0	56.0	58.0	60.0
	55	20.0	32.0	48.0	52.0	54.0
420	45	57.0	65.0	67.0	69.0	71.0
	50	45.0	57.0	63.0	65.0	67.0
	55	29.0	46.0	55.0	58.0	60.0
480	45	70.0	72.0	74.0	76.0	78.0
	50	56.0	68.0	70.0	72.0	74.0
	55	38.0	60.0	62.0	64.0	66.0
550	45	96.0	86.0	88.0	90.0	92.0
	50	78.0	90.0	84.0	86.0	88.0
	55	56.0	88.0	76.0	76.0	78.0

NOTES

Leaving Evaporator Water Temperature 7°C, ΔT 5°C;
Hc (heating heat recovery capacity)

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12 Hydraulic performance

12 - 1 Partial Heat Recovery Pressure Drop

Partial Total Heat Recovery pressure drops

	EWLD~G-SS									
Size EWLD~G-SS	**160**	**190**	**240**	**280**	**320**	**360**	**380**	**420**	**480**	**550**
Heating Capacity (kW)	22	29	36	43	44	51	58	65	72	86
Water Flow (l/s)	1.05	1.39	1.7	2.1	2.1	2.4	2.8	3.1	3.4	4.1
Heat Recovery Pressure Drops (kPa)	2	2	2	3	2	1	1	1	2	3

NOTES

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

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12 Hydraulic performance

12 - 2 Total Heat Recovery Pressure Drop

Partial Heat Recovery Pressure Drops

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

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

where:

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

How to use the formula: Example

The unit EWLD160G-SS has been selected for working at the following conditions:
- evaporator water in/out: 12/7°C
- saturated discharge temperature: 40°C
- Partial heat recovery leaving water temperature 45/50°C

The heating capacity at these working conditions is: 10 kW
The water flow at these working conditions is: 0.48 l/s

The unit EWLD160G-SS at nominal working conditions has the following data:
- evaporator water in/out: 12/7°C
- saturated discharge temperature: 45°C
- Partial heat recovery leaving water temperature 40/45°C

The heating capacity at these working conditions is: 22 kW
The water flow at these working conditions is: 1.05 l/s
The pressure drop at these working conditions is: 2 kPa

The pressure drop at the selected working condition will be:

$$PD_2\ (kPa) = 2\ (kPa) \times \left(\frac{0.48\ (l/s)}{1.0\ (l/s)} \right)^{1.80}$$

$$PD_2\ (kPa) = 1\ (kPa)$$

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13 Specification text

13 - 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 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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13 Specification text

13 - 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 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, 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.
- ✓ 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 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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13 Specification text

13 - 1 Specification Text

Refrigerant circuit
Each circuit shall include as standard: electronic expansion device piloted by unit's microprocessor control, 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-star 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.

SPC_1-2-3_Rev.00_3

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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