DAIKIN

Applied Systems

Technical Data

Condenserless chiller

EEDEN13-423

EWLD-J-SS

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EWLD-J-SS

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1 Features

- Compact design to allow easy indoor installation or retrofit operations
- Daikin semi-hermetic single screw stepless compressor
- High efficiency at full and partial load
- Chilled water temperatures down to -10ºC on standard unit
- Optimised for use with R-134a
- MicroTech III controller with superior control logic and easy interface

2 Specifications

2-1 Technical Specifications					EWLD110J-SS	EWLD130J-SS	EWLD145J-SS	EWLD165J-SS	EWLD195J-SS	EWLD235J-SS	EWLD265J-SS	EWLD290J-SS
Cooling capacity	Nom.			kW	109 (1)	127 (1)	143 (1)	164 (1)	191 (1)	236 (1)	264 (1)	285 (1)
Capacity control	Method				Stepless							
	Minimum capacity			%	25							12.5
Power input	Cooling	Nom.		kW	31.1 (1)	38.2 (1)	43.8 (1)	50.4 (1)	56.0 (1)	65.9 (1)	75.3 (1)	87.5 (1)
EER					3.52 (1)	3.33 (1)	3.25 (1)		3.41 (1)	3.59 (1)	3.51 (1)	3.26 (1)
Casing	Colour				Ivory white							
	Material				Galvanized and painted steel sheet							
Dimensions	Unit	Height		mm	1,020							2,000
		Width		mm	913							
		Depth		mm	2,684							
Weight	Unit			kg	1,124	1,141	1,237	1,263	1,305	1,489		2,474
	Operation weight			kg	1,138	1,159	1,253	1,281	1,327	1,518		2,505
Water heat exchanger - evaporator	Type				Brazed plate, one per circuit							
	Water volume			l	14	18	14	17	20	26		29
	Water flow rate	Nom.		l/s	5.24	6.10	6.84	7.84	9.16	11.32	12.65	13.68
	Nominal water pressure drop	Cooling	Total	kPa	14	12	36	34	32	25	31	36
	Insulation material				Closed cell							
Sound power level	Cooling	Nom.		dBA	88.6 (2)					87.2 (2)		92.4 (2)
Sound pressure level	Cooling	Nom.		dBA	71.4 (2)					70.0 (2)		74.4 (2)
Compressor	Type				Semi-hermetic single screw compressor							
	Quantity				1							2
	Oil	Charged volume		l	13					16		26
Operation range	Evaporator	Cooling	Min.	°CDB	-10							
			Max.	°CDB	15							
	Condenser	Cooling	Min.	°CDB	25							
			Max.	°CDB	60							
Refrigerant	Type				R-134a							
	Circuits	Quantity			1							2
Piping connections	Liquid line connection			inch	1"3/8							
	Discharge line connection			inch	2"1/8							
	Evaporator water inlet/outlet (OD)				3"							
Safety devices	Item	01			High discharge pressure (pressure switch)							
		02			High discharge pressure (pressure transducer)							
		03			Low suction pressure (pressure transducer)							
		04			Compressor motor protection							
		05			High discharge temperature							
		06			Low oil pressure							
		07			Low pressure ratio							
		08			High oil filter pressure drop							
		09			Phase monitor							
		10			Emergency stop button							
		11			Water freeze protection controller							

2-2 Technical Specifications				EWLD310J-SS	EWLD330J-SS	EWLD360J-SS	EWLD390J-SS	EWLD430J-SS	EWLD470J-SS	EWLD500J-SS	EWLD530J-SS
Cooling capacity	Nom.		kW	306 (1)	327 (1)	355 (1)	382 (1)	427 (1)	473 (1)	501 (1)	528 (1)
Capacity control	Method			Stepless							
	Minimum capacity		%	12.5							
Power input	Cooling	Nom.	kW	94.0 (1)	100 (1)	106 (1)	112 (1)	122 (1)	131 (1)	141 (1)	150 (1)
EER				3.26 (1)		3.34 (1)	3.42 (1)	3.51 (1)	3.60 (1)	3.56 (1)	3.52 (1)
Casing	Colour			Ivory white							
	Material			Galvanized and painted steel sheet							
Dimensions	Unit	Height	mm	2,000							
		Width	mm	913							
		Depth	mm	2,684							
Weight	Unit		kg	2,500	2,526	2,568	2,611	2,795	2,979		
	Operation weight		kg	2,533	2,562	2,608	2,655	2,845	3,036		

2 Specifications

2-2 Technical Specifications					EWLD310J-SS	EWLD330J-SS	EWLD360J-SS	EWLD390J-SS	EWLD430J-SS	EWLD470J-SS	EWLD500J-SS	EWLD530J-SS
Water heat exchanger - evaporator	Type				Brazed plate, one per circuit							
	Water volume			l	31	33	37	41	46	52		
	Water flow rate	Nom.		l/s	14.68	15.69	17.00	18.32	20.47	22.63	23.97	25.30
	Nominal water pressure drop	Cooling	Total	kPa	36	34		32		25		31
	Insulation material				Closed cell							
Sound power level	Cooling	Nom.		dBA	92.4 (2)				91.8 (2)	91.0 (2)		
Sound pressure level	Cooling	Nom.		dBA	74.4 (2)				73.8 (2)	73.0 (2)		
Compressor	Type				Semi-hermetic single screw compressor							
	Quantity				2							
	Oil	Charged volume		l	26				74	76		
Operation range	Evaporator	Cooling	Min.	°CDB	-10							
			Max.	°CDB	15							
	Condenser	Cooling	Min.	°CDB	25							
			Max.	°CDB	60							
Refrigerant	Type				R-134a							
	Circuits	Quantity			2							
Piping connections	Liquid line connection			inch	1"3/8							
	Discharge line connection			inch	2"1/8							
	Evaporator water inlet/outlet (OD)				3"							
Safety devices	Item	01			High discharge pressure (pressure switch)							
		02			High discharge pressure (pressure transducer)							
		03			Low suction pressure (pressure transducer)							
		04			Compressor motor protection							
		05			High discharge temperature							
		06			Low oil pressure							
		07			Low pressure ratio							
		08			High oil filter pressure drop							
		09			Phase monitor							
		10			Emergency stop button							
		11			Water freeze protection controller							

2-3 Electrical Specifications				EWLD110J-SS	EWLD130J-SS	EWLD145J-SS	EWLD165J-SS	EWLD195J-SS	EWLD235J-SS	EWLD265J-SS	EWLD290J-SS
Compressor	Phase			3~							
	Voltage		V	400							
	Voltage range	Min.	%	-10							
		Max.	%	10							
	Maximum running current		A	80	96	107	121	145	161	182	107
	Starting method			Wye-delta							
Power supply	Phase			3~							
	Frequency		Hz	50							
	Voltage		V	400							
	Voltage range	Min.	%	-10							
		Max.	%	10							
Unit	Maximum starting current		A	151		195			288		281
	Nominal running current (RLA)	Cooling	A	45 (6)	54 (6)	74 (6)	83 (6)	91 (6)	108 (6)	123 (6)	147 (6)
	Maximum running current		A	80	96	107	121	145	161	182	214
	Max unit current for wires sizing		A	88	106	118	133	160	177	200	235

2-4 Electrical Specifications				EWLD310J-SS	EWLD330J-SS	EWLD360J-SS	EWLD390J-SS	EWLD430J-SS	EWLD470J-SS	EWLD500J-SS	EWLD530J-SS
Compressor	Phase			3~							
	Voltage		V	400							
	Voltage range	Min.	%	-10							
		Max.	%	10							
	Maximum running current		A	107	121		145		161		182
	Starting method			Wye-delta							

2 Specifications

2-4 Electrical Specifications				EWLD310J-SS	EWLD330J-SS	EWLD360J-SS	EWLD390J-SS	EWLD430J-SS	EWLD470J-SS	EWLD500J-SS	EWLD530J-SS
Power supply	Phase			3~							
	Frequency		Hz	50							
	Voltage		V	400							
	Voltage range	Min.	%	-10							
		Max.	%	10							
Unit	Maximum starting current		A	292		311		404	417	434	
	Nominal running current (RLA)	Cooling	A	156 (6)	166 (6)	174 (6)	182 (6)	199 (6)	216 (6)	231 (6)	246 (6)
	Maximum running current		A	228	242	266	290	306	322	343	364
	Max unit current for wires sizing		A	251	266	293	319	337	354	377	400.4

Notes

(1) Cooling: entering evaporator water temp. 12ºC; leaving evaporator water temp. 7ºC; saturated discharge temp. 45ºC, unit at full load operation

(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) 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) Nominal current in cooling mode: entering evaporator water temp. 12ºC; leaving evaporator water temp. 7ºC; saturated discharge temperature 45ºC

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

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

(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 EWLD-J- water cooled chillers, featuring 1 or 2 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.

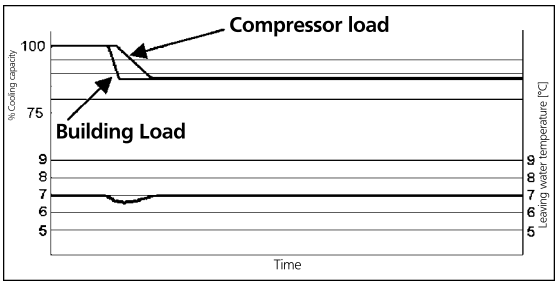
Daikin's chiller design experience, combined with outstanding features makes the EWLD-J- chiller unmatched in the industry.

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-J- chiller for all applications.
The reduced number of vibrations produced from the EWLD-J- chiller offers a surprisingly quiet operation eliminating the noise transmission through the structure and the chilled water piping system.

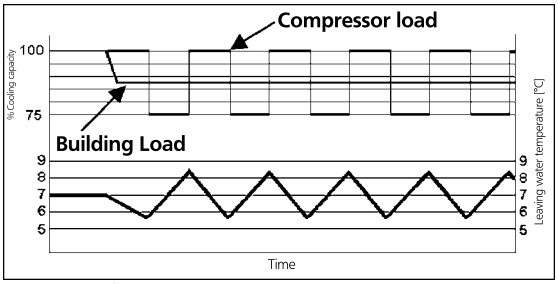
Infinitely capacity control

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.



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.



EWLT 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.

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

FTA_1-2_Rev.00_1

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-J- is available in standard efficiency version:

S: Standard Efficiency
16 sizes, covering a cooling capacity range from 110 up to 530 kW, EER up to 3.63

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-J- is available in standard sound level configuration:

S: Standard Noise

FTA_1-2_Rev.00_2

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

Ecological R-134a refrigerant

The compressors have been designed to operate with R-134a, ecological refrigerant with zero ODP (Ozone Depletion Potential) and very low GWP (Global Warming Potential) that means low TEWI (Total Equivalent Warming Impact).

Evaporator

The units are equipped with direct expansion plate to plate type evaporator, one per circuit. This heat exchanger is made of stainless steel brazed plates and is covered with a 10mm closed cell insulation material. The evaporator 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 makes 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.

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

Refrigerant circuit

Each unit has independent refrigerant circuits and each one includes:

- Single screw compressor with integrated oil separator
- Brazed plate evaporator
- Oil pressure transducer
- High pressure switches
- High pressure transducer
- Low pressure transducer
- Moisture liquid indicator
- Replaceable core filter-drier
- Electronic expansion valve

GNC_1-2-3-4_Rev.00_1

4 General Characteristics

4 - 1 General characteristics

Electrical control panel

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

Power section

The power section includes compressors fuses and control circuit transformer.

MicroTech III controller

MicroTech III controller is installed as standard; it can be used to modify unit set-points and check control parameters. A built-in display shows chiller operating status plus temperatures and pressures of water, refrigerant, programmable values, set-points.
A sophisticated software with predictive logic, selects the most energy efficient combination of compressors and electronic expansion valve to keep stable operating conditions to maximise chiller energy efficiency and reliability. MicroTech III is able to protect critical components based on external signs from its system (such as motor temperatures, refrigerant gas and oil pressures, correct phase sequence, pressure switches and evaporator). The input coming from the high pressure switch cuts all digital output from the controller in less than 50ms, this is an additional security for the equipment.
Fast program cycle (200ms) for a precise monitoring of the system. Floating point calculations supported for increased accuracy in 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 temperature.
- Display of condensing-evaporating temperature and pressure, suction and discharge superheating temperature 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).
- Setpoint Reset (optional).
- Application and system upgrade with commercial SD cards.
- Ethernet port for remote or local servicing using standard web browsers.
- Two different sets of default parameters could be stored for easy restore.

Safety device / logic for each refrigerant circuit

- High pressure (pressure switch).
- High pressure (transducer).
- Low pressure (transducer).
- 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.

GNC_1-2-3-4_Rev.00_2

4 General Characteristics

4 - 1 General characteristics

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.
- General faults alarm relays.
- General faults alarm led.
- 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.

Standard accessories (supplied on basic unit)

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

GNC_1-2-3-4_Rev.00_3

4 General Characteristics

4 - 1 General characteristics

High Pressure Side Manometers

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.

Evaporator flow switch for the water piping.

Hour run meter - Digital compressors hour run meter.

General fault contactor - Contactor for alarm warning.

Main switch interlock

Emergency stop

Options (on request)

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

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

Evaporator Water side design pressure 16 bar

Water pressure differential switch on evaporator

Sound Proof System - Compressor sound enclosure.

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.

Fork lift kit

Low pressure side manometers

Dual Pressure Relief Valve on evaporator

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.

Current limit display

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

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

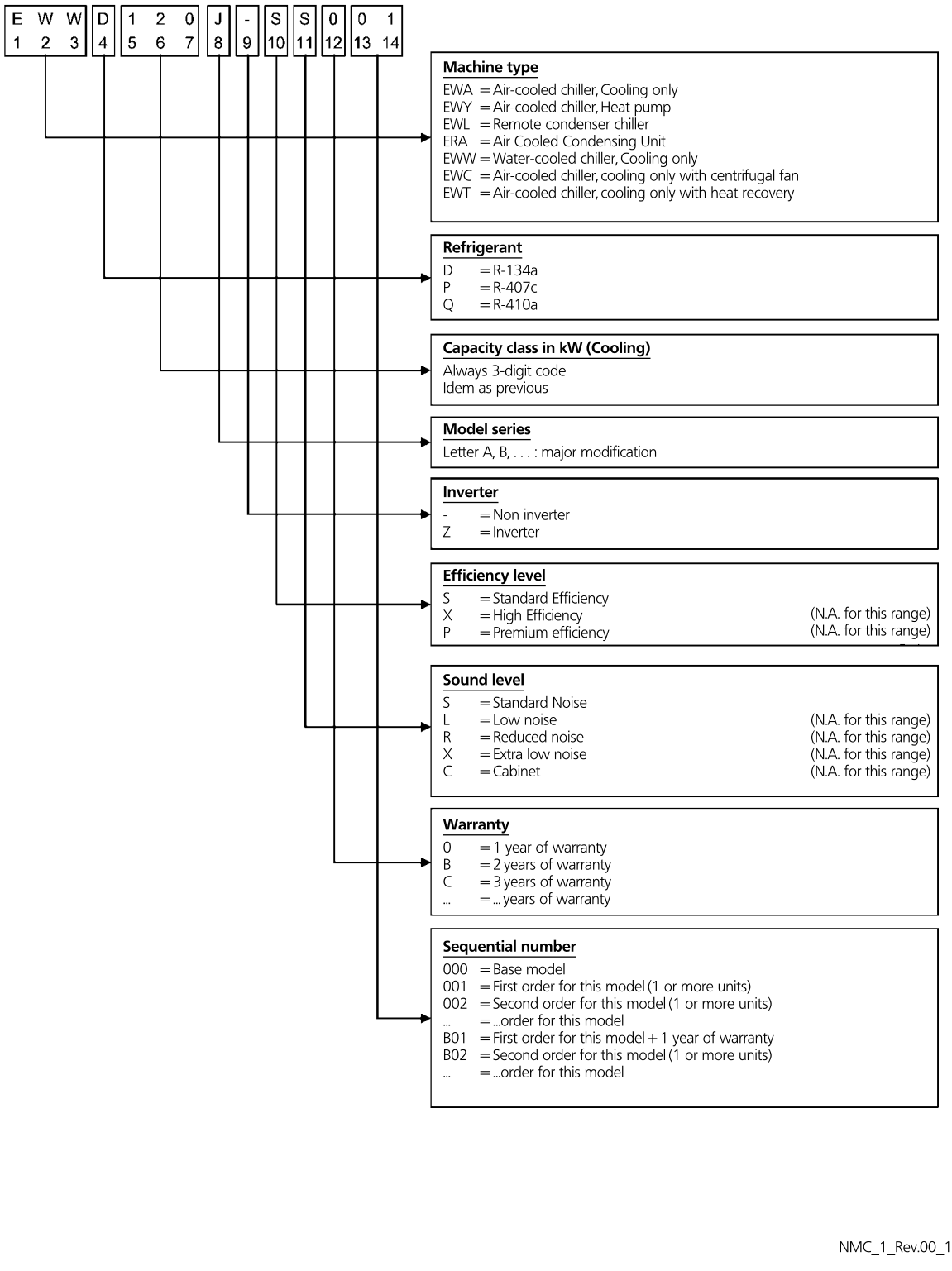
Set-point reset, demand limit and alarm from external device - The leaving water temperature set-point can be overwritten with the following options: 4-20mA from external source (by user), outside ambient temperature; evaporator water temperature $\triangle t$. Moreover the device allow the user to limit 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).

Automatic circuit breakers

GNC_1-2-3-4_Rev.00_4

5 Nomenclature

5 - 1 Nomenclature



6 Capacity tables

6 - 1 Cooling Capacity Tables

EWLD110-330J-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
110	30	116	23.3	5.60	15	124	23.8	5.90	17	133	24.3	6.30	19	141	24.8	6.80	22	150	25.4	7.20	24
	35	112	25.6	5.30	14	120	26.1	5.70	16	128	26.6	6.10	18	136	27.1	6.50	20	145	27.7	6.90	23
	40	107	28.1	5.10	13	115	28.6	5.50	15	123	29.1	5.90	17	131	29.7	6.30	19	139	30.2	6.70	21
	45	102	30.9	4.90	12	109	31.4	5.20	14	117	31.9	5.60	15	125	32.5	6.00	18	134	33.0	6.40	20
	50	96.3	34	4.60	11	104	34.5	5.00	12	111	35.0	5.30	14	119	35.5	5.70	16	128	36.1	6.10	18
	55	90.6	37.4	4.30	10	97.7	37.8	4.70	11	105	38.4	5.00	13	113	38.9	5.40	15	121	39.4	5.80	16
130	30	135	28.6	6.50	14	145	29.2	6.90	16	155	29.8	7.40	18	165	30.6	7.90	20	176	31.2	8.40	23
	35	130	31.4	6.20	13	140	32.0	6.70	15	149	32.7	7.20	17	159	33.3	7.60	19	170	34.1	8.10	22
	40	124	34.5	5.90	12	134	35.2	6.40	14	143	35.8	6.90	16	153	36.5	7.30	18	163	37.2	7.80	20
	45	118	38.0	5.70	11	127	38.6	6.10	13	137	39.2	6.50	15	146	39.9	7.00	16	157	40.6	7.50	19
	50	112	41.7	5.30	10	121	42.4	5.80	12	130	43.0	6.20	13	139	43.6	6.70	15	149	44.3	7.20	17
	55	105	45.9	5.00	9	114	46.4	5.40	10	122	47.1	5.90	12	132	47.7	6.30	14	141	48.4	6.80	15
145	30	150	32.6	7.20	43	159	33.2	7.60	48	168	33.9	8.10	54	178	34.6	8.60	59	188	35.4	9.00	66
	35	145	35.9	6.90	41	154	36.5	7.40	45	163	37.2	7.80	50	172	37.8	8.30	56	182	38.5	8.80	62
	40	139	39.5	6.70	38	148	40.1	7.10	42	157	40.8	7.50	47	166	41.5	8.00	53	176	42.2	8.50	58
	45	133	43.5	6.40	35	142	44.1	6.80	39	151	44.7	7.20	44	160	45.4	7.70	49	170	46.1	8.20	54
	50	126	47.8	6.00	32	135	48.4	6.50	36	144	49.1	6.90	41	153	49.7	7.40	45	163	50.4	7.80	51
	55	119	52.5	5.70	29	128	53.1	6.10	33	137	53.8	6.60	37	146	54.5	7.00	42	155	55.1	7.50	46
165	30	172	37.4	8.20	41	183	38.2	8.80	45	194	39.0	9.30	51	206	39.8	9.90	56	218	40.8	10.50	62
	35	166	41.2	8.00	38	177	42.0	8.50	43	188	42.7	9.00	48	199	43.5	9.60	53	211	44.4	10.20	59
	40	160	45.4	7.60	35	170	46.1	8.10	40	181	46.9	8.70	44	192	47.7	9.20	50	204	48.5	9.80	55
	45	152	49.9	7.30	32	163	50.7	7.80	37	174	51.4	8.30	41	185	52.2	8.90	46	196	53.0	9.40	51
	50	144	54.8	6.90	29	155	55.6	7.40	34	166	56.4	7.90	38	176	57.2	8.50	43	188	58.0	9.00	48
	55	137	60.3	6.50	27	146	61.0	7.00	30	157	61.8	7.50	34	168	62.6	8.10	39	179	63.4	8.60	44
195	30	202	41.7	9.70	36	214	42.5	10.30	40	227	43.4	10.90	44	241	44.2	11.50	49	254	45.3	12.20	55
	35	194	46.0	9.30	33	207	46.8	9.90	37	219	47.6	10.50	42	233	48.5	11.20	46	246	49.5	11.80	52
	40	187	50.5	8.90	31	199	51.4	9.50	35	212	52.2	10.10	39	224	53.1	10.80	44	238	53.9	11.40	48
	45	178	55.5	8.50	29	191	56.3	9.10	32	203	57.2	9.70	36	216	58.0	10.40	41	229	58.9	11.00	45
	50	169	61.1	8.10	26	181	61.9	8.70	29	194	62.8	9.30	33	206	63.7	9.90	37	219	64.6	10.50	42
	55	158	67.7	7.60	23	170	68.5	8.10	26	181	69.3	8.70	30	194	70.2	9.30	34	207	71.1	9.90	38
235	30	250	46.1	12.00	29	266	46.3	12.80	33	282	46.5	13.50	36	297	46.6	14.30	40	313	46.7	15.00	44
	35	241	52.2	11.50	27	257	52.5	12.30	31	273	52.8	13.10	34	288	52.9	13.80	38	304	53.2	14.60	42
	40	230	58.9	11.00	25	246	59.2	11.80	28	263	59.5	12.60	32	278	59.8	13.30	35	294	60.1	14.10	39
	45	220	66.0	10.50	23	236	66.4	11.30	26	252	66.8	12.10	30	268	67.2	12.90	33	283	67.5	13.60	37
	50	209	73.8	10.00	21	224	74.2	10.70	24	240	74.7	11.50	27	256	75.1	12.30	31	272	75.5	13.10	34
	55	197	82.3	9.40	19	212	82.7	10.10	22	227	83.1	10.90	25	243	83.6	11.70	28	260	84.0	12.50	31
265	30	278	52.7	13.30	35	294	52.9	14.10	39	310	53.1	14.90	43	327	53.3	15.70	47	344	53.5	16.50	51
	35	269	59.6	12.80	33	284	59.9	13.60	36	300	60.2	14.40	40	317	60.5	15.20	44	334	60.8	16.00	49
	40	258	67.2	12.30	30	274	67.6	13.10	34	290	67.9	13.90	38	306	68.3	14.70	42	323	68.6	15.50	46
	45	247	75.4	11.80	28	263	75.8	12.60	32	279	76.2	13.40	35	295	76.6	14.20	39	312	77.0	15.00	43
	50	234	84.3	11.20	26	251	84.7	12.00	29	268	85.2	12.80	33	284	85.6	13.60	36	300	86.1	14.40	40
	55	222	93.9	10.60	23	238	94.3	11.40	26	255	94.8	12.20	30	271	95.3	13.00	33	287	95.8	13.80	37
290	30	300	64.9	14.30	43	318	66.2	15.20	48	337	67.5	16.20	54	356	68.9	17.10	59	376	70.5	18.10	66
	35	290	71.5	13.90	41	308	72.7	14.70	45	326	74.0	15.60	50	345	75.4	16.60	56	365	76.9	17.50	62
	40	279	78.8	13.30	38	296	80.0	14.20	42	314	81.3	15.10	47	333	82.7	16.00	53	353	84.0	16.90	58
	45	266	86.7	12.70	35	284	87.9	13.60	39	302	89.2	14.50	44	321	90.6	15.40	49	340	91.9	16.30	54
	50	253	95.3	12.10	32	271	96.6	13.00	36	289	97.9	13.80	41	307	99.2	14.70	45	326	101	15.60	51
	55	239	105	11.40	29	256	106	12.30	33	275	107	13.20	37	293	109	14.00	42	311	110	14.90	46
310	30	322	69.8	15.40	41	342	71.2	16.40	46	363	72.7	17.40	51	384	74.2	18.40	56	406	75.9	19.50	62
	35	311	76.9	14.90	38	331	78.3	15.80	43	351	79.7	16.80	48	372	81.2	17.90	53	394	82.8	18.90	59
	40	299	84.7	14.30	36	318	86.1	15.20	40	338	87.5	16.20	45	359	89.0	17.20	50	380	90.5	18.30	55
	45	286	93.2	13.70	33	305	94.6	14.60	37	325	96.0	15.60	42	345	97.5	16.60	46	366	99.0	17.60	52
	50	271	103	13.00	30	291	104	13.90	34	310	105	14.90	38	330	107	15.80	43	351	108	16.80	48
	55	256	113	12.20	27	275	114	13.10	31	295	115	14.10	35	314	117	15.10	39	334	118	16.10	44
330	30	345	74.6	16.50	41	366	76.1	17.60	45	389	77.7	18.60	51	412	79.4	19.80	56	436	81.2	21.00	62
	35	333	82.2	15.90	38	354	83.7	16.90	43	376	85.2	18.00	48	399	86.8	19.10	53	422	88.6	20.30	59
	40	319	90.5	15.30	35	340	92.0	16.30	40	362	93.5	17.40	44	385	95.1	18.50	50	408	96.8	19.60	55
	45	305	99.6	14.60	32	326	101	15.60	37	347	103	16.60	41	369	104	17.70	46	392	106	18.80	51
	50	289	109	13.80	29	310	111	14.90	34	332	112	15.90	38	353	114	16.90	43	376	116	18.00	48
	55	273	120	13.10	27	293	122	14.00	30	315	123	15.10	34	336	125	16.10	39	358	127	17.20	44

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6 Capacity tables

6 - 1 Cooling Capacity Tables

EWLD360-500J-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
360	30	374	78.8	17.90	37	398	80.4	19.00	41	422	82.1	20.20	46	447	83.8	21.40	51	472	85.7	22.70	57
	35	361	86.9	17.20	35	384	88.5	18.40	39	408	90.1	19.50	43	432	91.8	20.70	48	457	93.6	22.00	54
	40	346	95.6	16.60	32	369	97.2	17.70	36	393	98.8	18.80	41	417	100	20.00	45	442	102	21.20	50
	45	331	105	15.80	30	354	107	16.90	34	377	108	18.10	38	401	110	19.20	42	425	112	20.40	47
	50	314	116	15.00	27	336	117	16.10	31	360	119	17.20	35	383	121	18.40	39	407	122	19.50	43
	55	295	128	14.10	24	316	129	15.10	27	339	131	16.20	31	362	132	17.40	35	386	134	18.50	39
390	30	403	82.9	19.30	36	428	84.5	20.50	40	454	86.2	21.70	44	480	88.0	23.00	49	507	90.1	24.40	55
	35	388	91.5	18.50	33	413	93.1	19.70	37	438	94.8	21.00	42	464	96.6	22.30	46	491	98.4	23.60	52
	40	372	101	17.80	31	397	102	19.00	35	422	104	20.20	39	448	106	21.50	44	475	107	22.80	48
	45	356	110	17.00	29	381	112	18.20	32	406	114	19.40	36	431	116	20.70	41	457	117	21.90	45
	50	338	122	16.10	26	361	123	17.30	29	386	125	18.50	33	411	127	19.70	37	436	129	20.90	42
	55	315	135	15.10	23	338	136	16.20	26	362	138	17.30	30	387	140	18.60	34	412	142	19.80	38
430	30	452	87.4	21.60	31	481	88.4	23.00	35	509	89.5	24.40	39	538	90.4	25.80	43	568	91.6	27.30	48
	35	435	97.8	20.80	29	464	98.9	22.20	33	492	100.0	23.60	37	521	101	25.00	41	550	102	26.40	45
	40	417	109	19.90	27	446	110	21.30	31	475	111	22.70	34	503	112	24.10	38	532	114	25.50	42
	45	398	121	19.00	25	427	122	20.40	28	455	124	21.80	32	484	125	23.20	36	512	126	24.60	40
	50	378	135	18.10	23	405	136	19.40	26	434	137	20.80	29	462	138	22.20	33	491	140	23.60	37
	55	355	150	17.00	20	382	151	18.30	23	409	152	19.60	26	438	153	21.00	30	467	155	22.40	33
470	30	501	92.0	23.90	29	533	92.4	25.50	33	564	92.7	27.00	36	595	92.9	28.50	40	627	93.1	30.10	44
	35	481	104	23.00	27	514	105	24.60	31	545	105	26.10	34	576	106	27.60	38	608	106	29.20	42
	40	461	117	22.00	25	493	118	23.60	28	526	119	25.20	32	557	119	26.70	35	588	120	28.20	39
	45	440	132	21.00	23	471	133	22.50	26	504	133	24.10	30	536	134	25.70	33	567	135	27.20	37
	50	418	147	20.00	21	448	148	21.40	24	480	149	23.00	27	513	150	24.60	31	545	151	26.10	34
	55	395	164	18.90	19	424	165	20.30	22	455	166	21.80	25	487	167	23.30	28	520	168	24.90	31
500	30	528	98.6	25.20	32	561	99.1	26.80	36	592	99.4	28.40	39	624	99.7	29.90	43	658	100.0	31.60	48
	35	509	112	24.30	30	541	112	25.90	33	573	113	27.50	37	605	113	29.00	41	638	114	30.60	45
	40	488	126	23.30	28	521	127	24.90	31	553	127	26.50	35	585	128	28.00	39	617	129	29.60	42
	45	467	141	22.30	25	499	142	23.90	29	531	143	25.40	32	564	144	27.00	36	595	144	28.60	40
	50	444	158	21.20	23	475	159	22.70	26	508	160	24.30	30	540	161	25.90	33	572	161	27.50	37
	55	419	176	20.00	21	450	177	21.50	24	482	178	23.10	27	515	179	24.70	31	547	180	26.20	34

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.

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7 Pressure drops

7 - 1 Evaporator Pressure Drops

Evaporator Pressure Drops

EWLD~J-SS

	110	130	145	165	195	235	265	290	310	330
Cooling capacity (kW)	110	128	143	164	192	237	265	286	307	328
Water flow (l/s) - Evaporator	5.24	6.10	6.84	7.84	9.16	11.32	12.65	13.68	14.68	15.69
Evaporator Pressure Drops (kPa)	14	12	36	34	32	25	31	36	36	34

NOTES

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

	360	390	430	470	500	530
Cooling capacity (kW)	356	383	429	474	502	530
Water flow (l/s) - Evaporator	17.00	18.32	20.47	22.63	23.97	25.30
Evaporator Pressure Drops (kPa)	34	32	32	25	25	31

NOTES

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

Evaporator Pressure Drops

To determinate the evaporator pressure drop for different versions or at different working condition, please refer to te 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 fomula: Example (Evaporator)

The unit EWLD110J-SS at nominal working conditions has the following data:
- evaporator water in/out: 11/6°C
- condenser water in/out: 35°C

The cooling capacity at these working conditions is: 137 kW
The evaporator water flow at these working conditions is: 6.55 l/s

The unit EWLD110J-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: 110 kW
The evaporator water flow at these working conditions is: 5.24 l/s
The evaporator pressure drop at these working conditions is: 14 kPa

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

$$PD_2\,(kPa) = \mathbf{14}\,(kPa) \times \left(\frac{\mathbf{6.55}\,(l/s)}{\mathbf{5.24}\,(l/s)} \right)^{1.8}$$

$$PD_2\,(kPa) = \mathbf{21}\,(kPa)$$

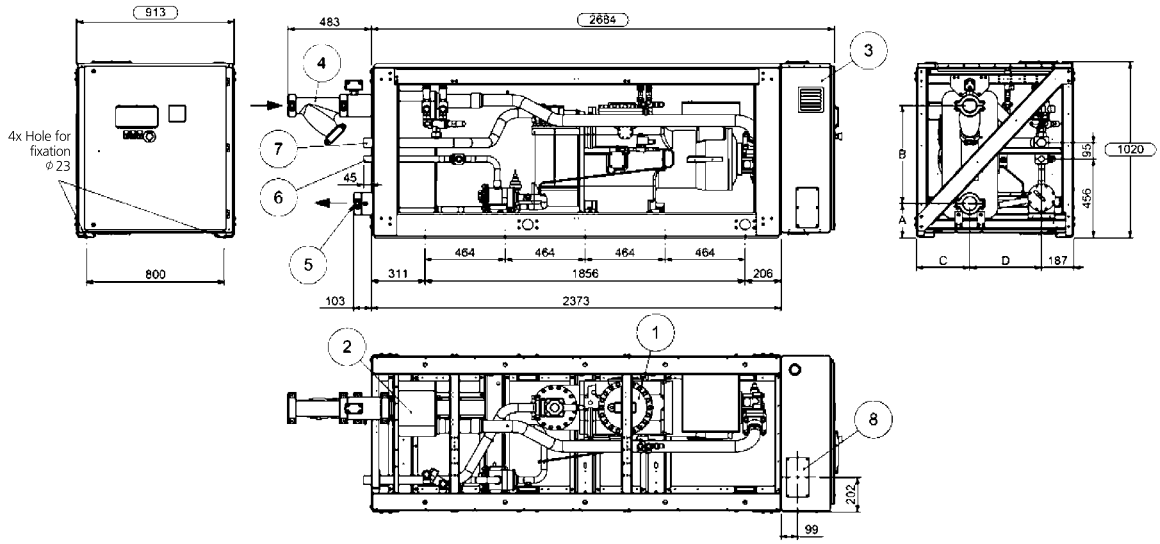
Note: If the calculated evaporator water pressure drop is below 10 kPa or above 100 kPa please contact the factory for dedicated evaporator.

EPD_1_Rev.00_1

8 Dimensional drawings

8 - 1 Dimensional Drawings

EWLD~J-SS / 1 circuit



Models	Dimensions (mm)			
EWLD~J -SS	A	B	C	D
110	198	519	326	398
130	198	519	326	398
145	198	568	311	413
165	198	568	311	413
195	198	568	311	413
235	198	568	311	413
265	198	568	311	413

Legend

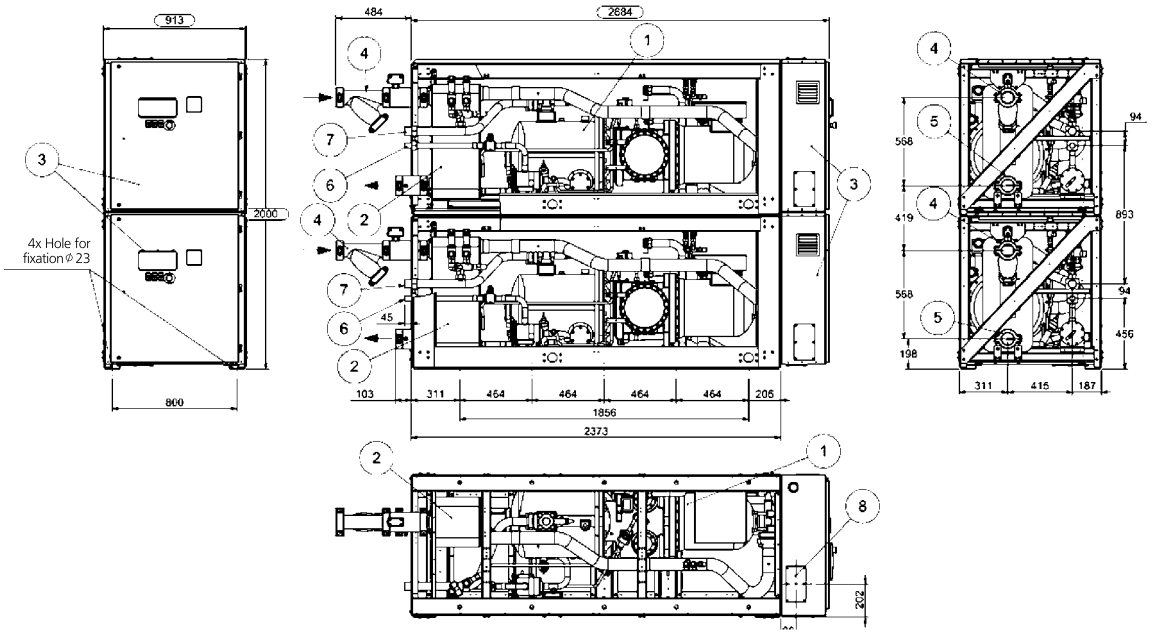
1 Compressor
2 Evaporator
3 Electrical panel
4 Evaporator water inlet
5 Evaporator water outlet
6 Liquid line inlet connection
7 Gas discharge line connection
8 Power connections slot

DMN_1-2_Rev.00_1

8 Dimensional drawings

8 - 1 Dimensional Drawings

EWLD~J-SS / 2 Circuits



Note: Dimension refers to 2 circuit units (size from 290-530).

Legend

1 Compressor
2 Evaporator
3 Electrical panel
4 Evaporator water inlet
5 Evaporator water outlet
6 Liquid line inlet connection
7 Gas discharge line connection
8 Power connections slot

DMN_1-2_Rev.00_2

9 Sound data

9 - 1 Sound Level Data

EWLD~J-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)
110	64.6	69.1	74.1	78.5	73.6	71.2	58.6	55.7	**79.0**	**88.9**
130	64.6	69.1	74.1	78.5	73.6	71.2	58.6	55.7	**79.0**	**88.9**
145	64.6	69.1	74.1	78.5	73.6	71.2	58.6	55.7	**79.0**	**88.9**
165	64.6	69.1	74.1	78.5	73.6	71.2	58.6	55.7	**79.0**	**88.9**
195	64.6	69.1	74.1	78.5	73.6	71.2	58.6	55.7	**79.0**	**88.9**
235	67.3	67.3	72.8	77.8	72.3	73.3	62.3	58.8	**79.0**	**88.9**
265	67.3	67.3	72.8	77.8	72.3	73.3	62.3	58.8	**79.0**	**88.9**
290	67.6	72.1	77.1	81.5	76.6	74.2	61.6	58.7	**82.0**	**94.4**
310	67.6	72.1	77.1	81.5	76.6	74.2	61.6	58.7	**82.0**	**94.4**
330	67.6	72.1	77.1	81.5	76.6	74.2	61.6	58.7	**82.0**	**94.4**
360	67.6	72.1	77.1	81.5	76.6	74.2	61.6	58.7	**82.0**	**94.4**
390	67.6	72.1	77.1	81.5	76.6	74.2	61.6	58.7	**82.0**	**94.4**
430	69.2	71.3	76.5	81.2	76.0	75.4	63.8	60.5	**82.0**	**94.4**
470	70.3	70.3	75.8	80.8	75.3	76.3	65.3	61.8	**82.0**	**94.4**
500	70.3	70.3	75.8	80.8	75.3	76.3	65.3	61.8	**82.0**	**94.4**
530	70.3	70.3	75.8	80.8	75.3	76.3	65.3	61.8	**82.0**	**94.4**

NOTE

1. The values are according to ISO 3744 and are referred to: evaporator 12/7°C, saturated discharge temperature 45°C, full load operation.
2. The above sound pressure levels will decrease by 4dB(A) when a compressor sound enclosure (option) is installed.

NSL_1a-2a_Rev.01_1a

Sound pressure level correction for different distances

EWLD-J-SS

Unit size	Distance					
	1m	5m	10m	15m	20m	25m
110	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
130	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
145	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
165	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
195	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
235	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
265	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
290	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
310	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
330	0.0	-7.9	-12.7	-15.8	-18.1	-19.8
360	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
390	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
430	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
470	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
500	0.0	-7.5	-12.2	-15.3	-17.5	-19.3
530	0.0	-7.5	-12.2	-15.3	-17.5	-19.3

NOTE

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

NSL_1a-2a_Rev.01_2a

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.

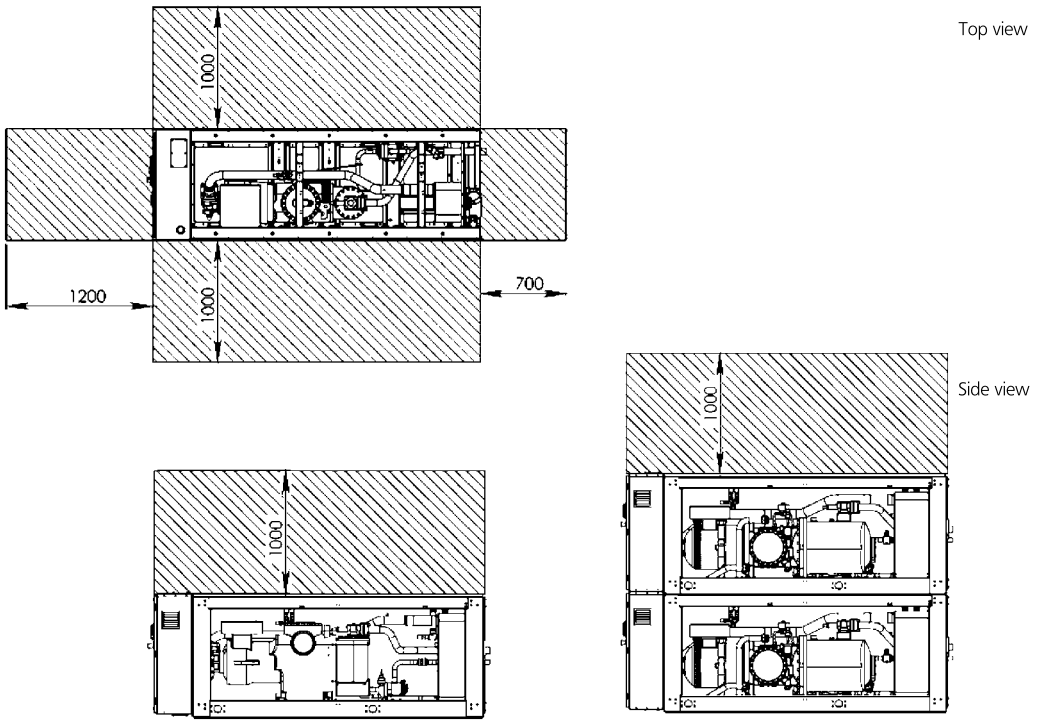
Location

A levelled 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 are 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 are recommended to avoid straining the piping and transmitting vibration and noise.

Minimum space requirements

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



Minimum clearance requirements for machine maintenance

INN_1_Rev.00_1

10 Installation

10 - 2 Water Charge, Flow and Quality

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 [80°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
	Electricall 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^-/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 hardness	[mg$CaCO_3$/l]	Below 150	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Silica ion	[mgSiO_2/l]	Below 50	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Scale
	Oxygen	[mgO2 /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
	Totall 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 Glycoll (weight conc.)		Below 60%	Below 60%	Below ---	Below 60%	Below 60%	Below 60%	Below 60%	Below 60%	Below 60%	--
Items to be referred to:	Nitrate ion	(mg NO3-/l)	Below 100	Below 100	Below 100	Below 100	Below 101	Below 100	Below 101	Below 100	Below 101	Corrosion
	TOC Total organic carbon	(mg/l)	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Scale
	Iron	[mgFe/l]	Below 1.0	Below 0.3	Below 1.0	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Below 1.0	Below 0.3	Corrosion+Scale
	Copper	[mgCu/l]	Below 0.3	Below 0.1	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 0.1	Below 1.0	Below 0.1	Corrosion
	Sulfite ion	[mgS^{2-}/l]	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Corrosion
	Ammonium ion	[mgNH^+_4/l]	Below 1.0	Below 0.1	Below 1.0	Below 1.0	Below 0.1	Below 0.3	Below 0.1	Below 0.1	Below 0.1	Corrosion
	Remaining chloride	[mgCL/l]	Below 0.3	Below 0.3	Below 0.3	Below 0.3	Below 0.3	Below 0.25	Below 0.3	Below 0.1	Below 0.3	Corrosion
	Free carbide	[mgCO_2/l]	Below 4.0	Below 4.0	Below 4.0	Below 4.0	Below 4.0	Below 0.4	Below 4.0	Below 0.4	Below 4.0	Corrosion
	Stability index		6.0 ~ 7.0	---	---	---	---	---	---	---	---	Corrosion + Scale

NOTES

1 Names, definitions and units are according to JIS K 0101. Units and figures between brackets are old units published as reference only.

2 In case of using heated water (more than 40°C), corrosion is generally noticeable.
Especially when the iron material is in direct contact with water without any protection shields, it is desireable to give the valid measures for corrosion. e.g. chemical measure.

3 In the cooling water using hermetic cooling tower, closed circuit water is according to heated water standard, and scattered water is according to cooling water standard.

4 Supply water is considered drink water, industrial water and ground water except for genuine water, neutral water and soft water.

5 The above mentioned items are representable items in corrosion and scale cases.

6 The limits above have to be considered as a general prescription and can not totally assure the absence of corrosion and erosion.
Some particular combinations of elements or the presence of components not listed in the table or factors not considered may trigger corrosion phenomena.

WAFLOWQUA_1-2_Rev.00_1

10 Installation

10 - 2 Water Charge, Flow and Quality

Water content in cooling circuits

The cooled water distribution circuits should have a minimum water content to avoid excessive compressors starts and stops.

In fact, each time the compressor starts up, an excessive quantity of oil goes from the compressor's pump 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
$M\,(Liters) = (0.94 \times \triangle T(°C) + 5.87) \times P(kW)$

For 2 compressors unit
$M\,(Liters) = (0.1595 \times \triangle T(°C) + 3.0825) \times P(kW)$

where:

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

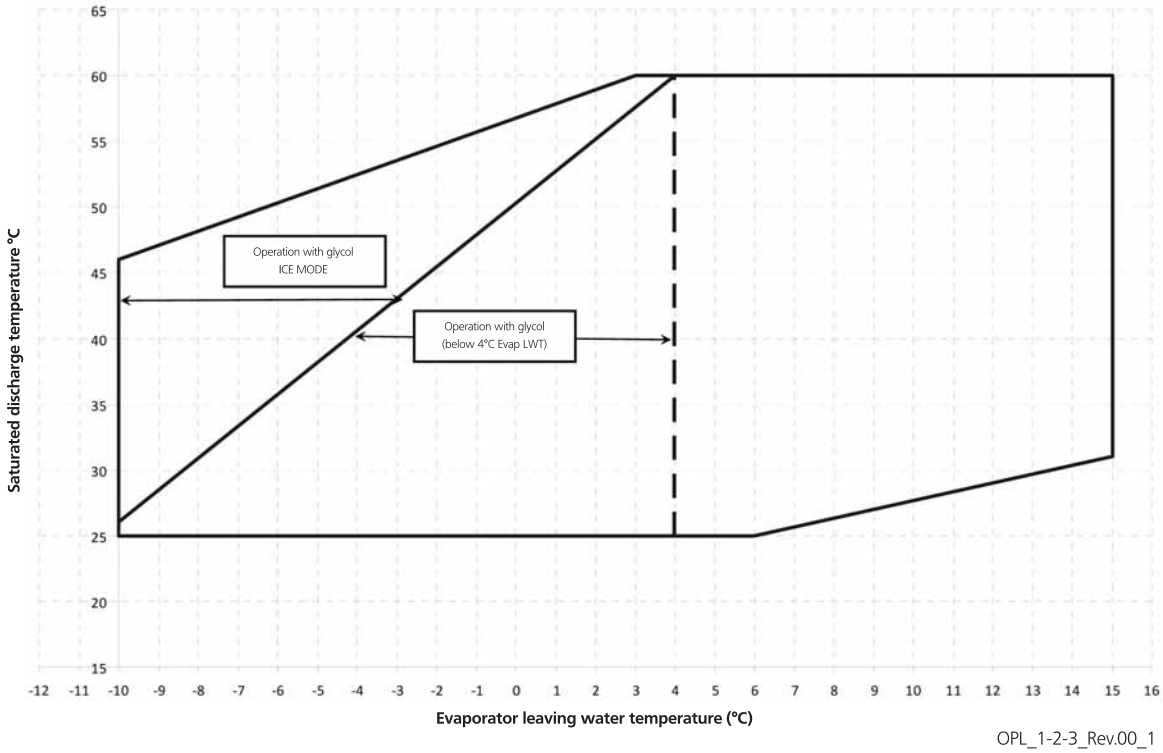
This formula is valid for:
- standard microprocessor parameters

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

WAFLOWQUA_1-2_Rev.00_2

11 Operation range

11 - 1 Operation Range



11 Operation range

11 - 1 Operation Range

Table 1 - Evaporator minimum and maximum water △t

Max evaporator water △T	°C	8
Min evaporator water △T	°C	4

Table 2 - Evaporator fouling factors

Fouling factors $m^2°C / kW$	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 (△t)	1.013	1.04	1.074	1.121	1.178
	Evaporator Pressure Drop	1.070	1.129	1.181	1.263	1.308

Ethylene 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 (△t)	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:	**EWLD110J-SS**
Mixture:	Water
Working condition:	ELWT 12/7°C - Saturated discharge temperature 45°C
- Cooling capacity:	110 kW
- Power input:	30.9 kW
- Flow Rate (△t 5°C):	5.24
- Evaporator Pressure Drop:	14kPa
Mixture:	Water+Ethylene glycol 30% (for a winter air temperature up to -15°C)
Working condition:	ELWT 12/7°C - Saturated discharge temperature 45°C
- Cooling capacity:	110 x 0.972 = 107 kW
- Power input:	30.9 x 0.986 = 30.5 kW
- Flow Rate (△t 5°C):	5.11 l/s (referred to 107 kW) x 1.074 = 5.49 l/s
- Evaporator Pressure Drop:	15 (referred to 5.49 l/s) x 1.181 = 18kPa

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 5)
- 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:	**EWLD110J-SS**
Mixture:	Water
Working condition:	ELWT 12/7°C - Saturated discharge temperature 40°C
- Cooling capacity:	115 kW
- Power input:	28 kW
- Flow Rate (△t 5°C):	5.49
- Evaporator Pressure Drop:	15kPa
Mixture:	Water+Ethylene glycol 30% (for a low evaporator leaving temperature of 0/-5°C)
Working condition:	ELWT 0/-5°C - Saturated discharge temperature 40°C
- Cooling capacity:	110 x 0.641 x 0.972 = 68.5 kW
- Power input:	28 x 0.880 x 0.986 = 24.3 kW
- Flow Rate (△t 5°C):	3.27 l/s (referred to 68.5 kW) x 1.074 = 3.51 l/s
- Evaporator Pressure Drop:	7 kPa (referred to 3.51 l/s) x 1.181 = 9kPa

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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 refrigerant and oil.
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 saturated discharge 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 HFC 134a will be accepted.

Freeze protection

- ✓ 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
- ✓ Plate to plate evaporator entering water temperature in cooling mode: ..... °C
- ✓ Plate to plate evaporator leaving water temperature in cooling mode: ..... °C
- ✓ Plate to plate 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: Chiller shall include as standard: 1 or 2 independent refrigerant circuits, semi-hermetic rotary single screw compressors, electronic expansion device (EEXV), direct expansion plate to plate evaporator, 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 vibration

Sound pressure level at 1 meter distance in free field, semispheric conditions, shall not exceed . . . . . dBA. 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.

Dimension

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 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.
- ✓ 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 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 fluctuation that shall be controlled y 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 operation condition unit control logic shall modulate electrical frequency level in a range lower and upper the nominal electrical network value 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:
  - ○ High condenser pressure
  - ○ Low evaporation refrigerant temperature
  - ○ High compressor motor amps

Evaporator

- ✓ The units shall be equipped with a Direct Expansion plate to plate evaporator with copper tubes rolled into steel tubesheets.
- ✓ The external shell shall be linked with an electrical heater to prevent freezing down to -28°C ambient temperature, controlled by a thermostat and shall be insulated with flexible, closed cell polyurethane insulation material (10 mm thick).
- ✓ The evaporator will have 1 circuit.
- ✓ The water connections shall be threaded type connections as standard to ensure quick mechanical disconnection between the unit and the hydronic network.
- ✓ Evaporator is manufactured in accordance to PED approval.

SPC_1-2-3_Rev.00_2

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.

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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