DAIKIN

Installation, Operation and Maintenance Manual
D–EIMWC00404-14EN

Water-cooled screw chillers

EWWD 340 ÷ C18 I-SS
EWWD 360 ÷ C12 I-XS
EWLD 320 ÷ C17 I-SS

50Hz – Refrigerant: R-134a

Original Instructions

CE

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▲ IMPORTANT

The present Installation and Maintenance Manual is drawn up for information only and does not constitute an offer binding upon Daikin
Specifications are subject to change without prior notice. Refer to the data communicated at the time of the order as per the “Documents Certified” such as “Dimensional Drawings”, “Wiring diagrams” and “Nameplate”. Daikin explicitly reject any liability for any direct or indirect damage, in the broadest sense, arising from or related to the use and/or interpretation of this Installation and Maintenance Manual.

⚠ WARNING

Before starting the installation of the unit, please read this manual carefully. Starting up the unit is absolutely forbidden if all instructions contained in this manual are not clear.

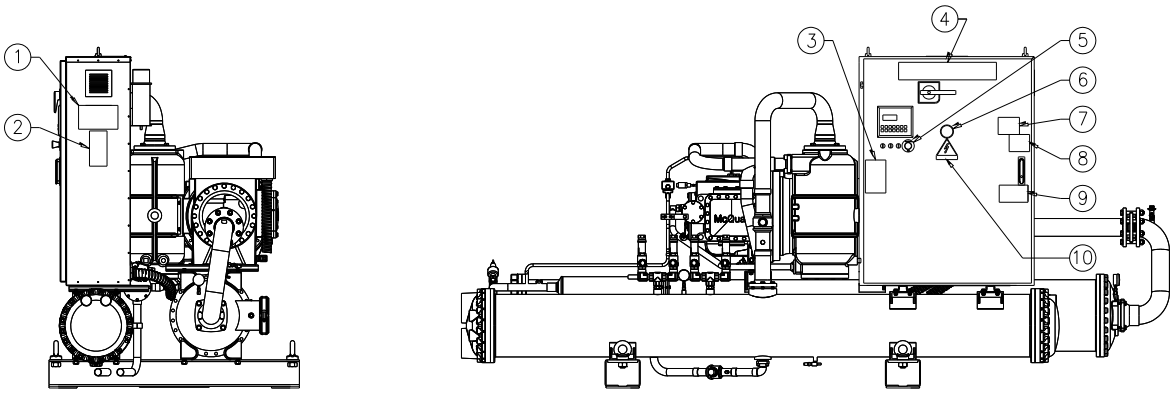
Key to symbols

△ Important note: failure to respect the instruction can damage the unit or compromise functioning

Note regarding safety in general or respect of laws and regulations

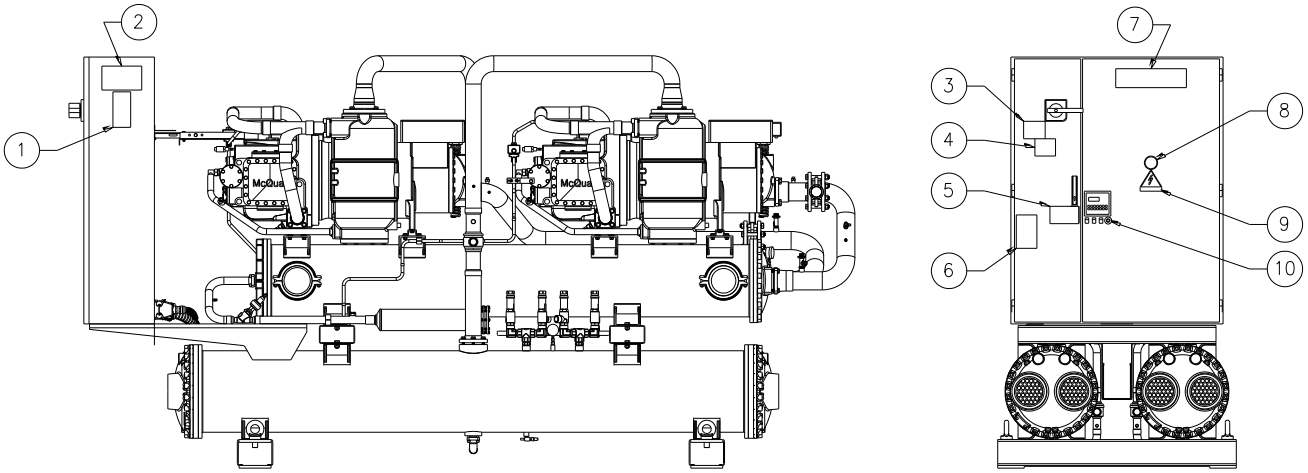
Note concerning electrical safety

Description of the labels applied to the electrical panel



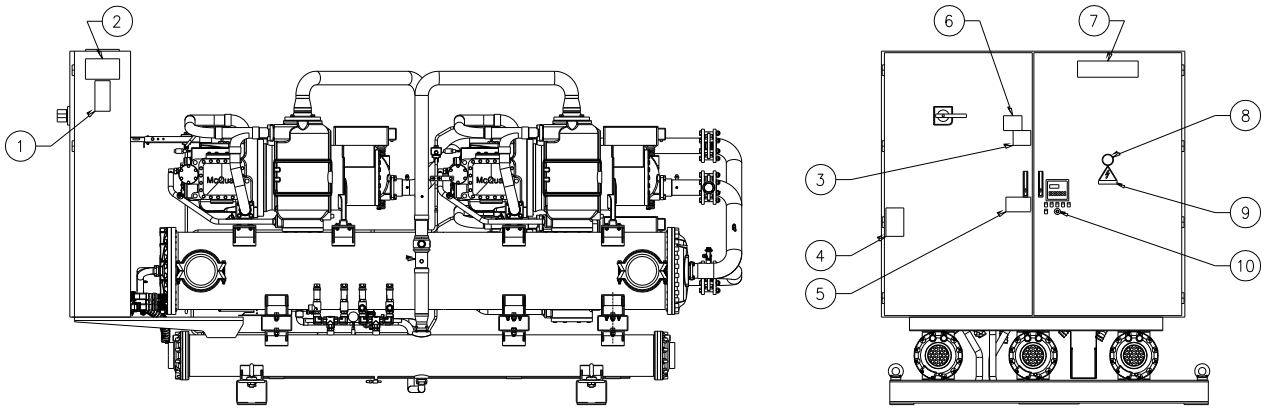
Single compressor Unit

1 – Lifting instructions	**6** – Gas type
2 – Unit nameplate data	**7** – Hazardous Voltage warning
3 – Non flammable gas symbol	**8** – Cable tightening warning
4 – Manufacturer’s logo	**9** – Water circuit filling warning
5 – Emergency stop	**10** – Electrical hazard symbol



Two Compressors Unit

1 – Unit nameplate data	**6** – Non flammable gas symbol
2 – Lifting instructions	**7** – Manufacturer's logo
3 – Hazardous Voltage warning	**8** – Gas type
4 – Cable tightening warning	**9** – Electrical hazard symbol
5 – Water circuit filling warning	**10** – Emergency stop



Three Compressors Unit

1 – Unit nameplate data	**6** – Hazardous Voltage warning
2 – Lifting instructions	**7** – Manufacturer's logo
3 – Cable tightening warning	**8** – Gas type
4 – Non flammable gas symbol	**9** – Electrical hazard symbol
5 – Water circuit filling warning	**10** – Emergency stop

General information

▲ IMPORTANT

The units described in the present manual represent a valuable investment. Maximum care should be taken to ensure correct installation and appropriate working conditions of the units.
A maintenance contract with a authorized service centre is highly recommended.

▲ CAUTION

This manual provides information about the features and procedures for the complete series.

All units are delivered from factory as complete sets which include wiring diagrams and dimensional drawings with size, weight and features of each model.

WIRING DIAGRAMS AND DIMENSIONAL DRAWINGS MUST BE CONSIDERED ESSENTIAL DOCUMENTS OF THIS MANUAL

In case of any discrepancy between this manual and the two aforesaid documents, please refer to the wiring diagram and dimensional drawings.

▲ IMPORTANT

The present Installation and Maintenance Manual is drawn up for information only and does not constitute an offer binding upon Daikin
Specifications are subject to change without prior notice. Refer to the data communicated at the time of the order as per the “Documents Certified” such as “Dimensional Drawings”, “Wiring diagrams” and “Nameplate”. Daikin explicitly reject any liability for any direct or indirect damage, in the broadest sense, arising from or related to the use and/or interpretation of this Installation and Maintenance Manual.

Key to symbols

△ Important note: failure to respect the instruction can damage the unit or compromise functioning

Note regarding safety in general or respect of laws and regulations

Note concerning electrical safety

Safe use and maintenance of the unit, as explained in this manual, is fundamental to prevent accidents during operation and maintenance and repair work.

Therefore, it is highly recommended that this document be read carefully, complied with and stored safely.

Warnings for the operator
The operator must read this manual before using the unit.
The operator must be trained and instructed on how to use the unit.
The operator must strictly follow local safety regulation and laws.
The operator must strictly follow all instruction and limitation given for the unit

Assistance
Should additional maintenance be required, it is advisable to consult authorised staff before carrying out any repair work.

Spare parts
Spare parts to be used for maintenance of the unit must be original. Therefore, always consult the manufacturer.

Receiving the machine
The machine must be inspected for any possible damage immediately upon reaching its final place of installation. All components described in the delivery note must be carefully inspected and checked; any damage must be reported to the carrier. Before connecting the machine to earth, check that the model and power supply voltage shown on the nameplate are correct. Responsibility for any damage after acceptance of the machine cannot be attributed to the manufacturer.

Checks

To prevent the possibility of incomplete delivery (missing parts) or transportation damage, please perform the following checks upon receipt of the machine:

a) Before accepting the machine, please verify every single component in the consignment. Check for any damage.
b) In the event that the machine has been damaged, do not remove the damaged material. A set of photographs are helpful in ascertaining responsibility.
c) Immediately report the extent of the damage to the transportation company and request that they inspect the machine.
d) Immediately report the extent of the damage to the manufacturer representative, so that arrangements can be made for the required repairs. In no case must the damage be repaired before the machine has been inspected by the representative of the transportation company.

Purpose of this manual

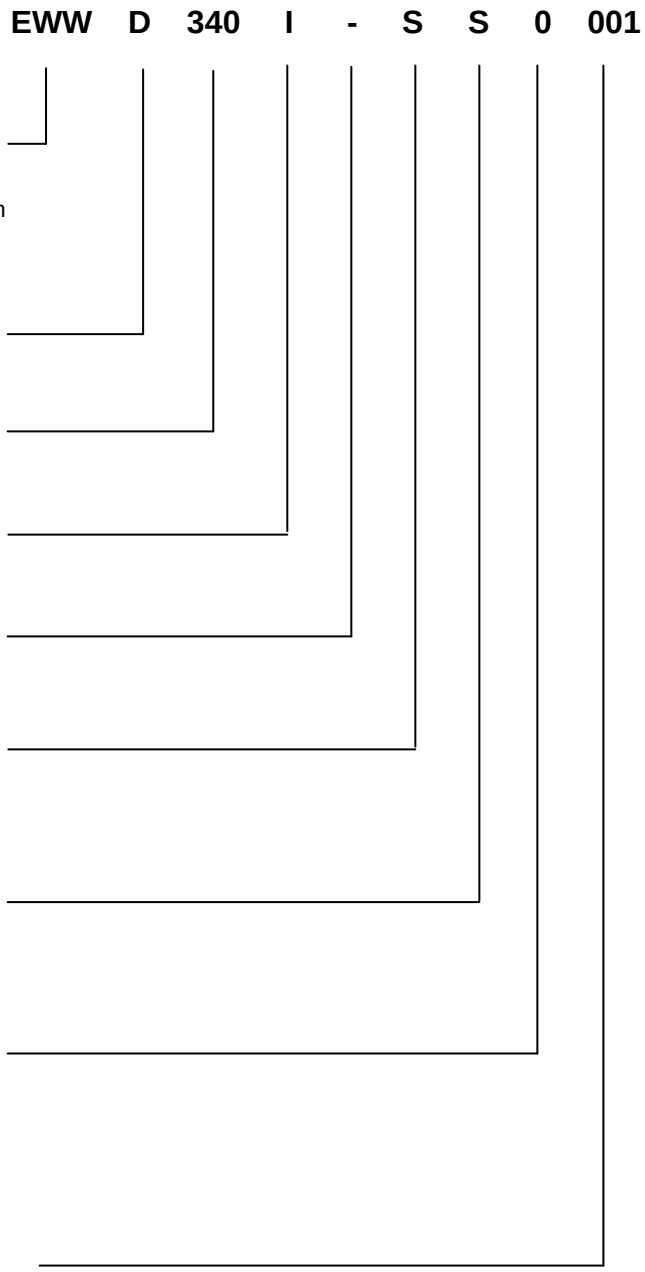
The purpose of this manual is to allow the installer and the qualified operator to carry out all required operations in order to ensure proper installation and maintenance of the machine, without any risk to people, animals and/or objects.
This manual is an important supporting document for qualified personnel but it is not intended to replace such personnel.
All activities must be carried out in compliance with local laws and regulations.

Important information on the refrigerant used

This product contains fluorate gases which have a greenhouse effect and which are covered by the Kyoto protocol. Do not release such gases into the atmosphere.
Type of refrigerant: R134A
GWP value(1) = 1300
The quantity of refrigerant used is indicated on the identity plate with the name of the unit.
Routine inspections may be necessary pursuant to local and/or European laws, to check on possible refrigerant leakage.
For more detailed information, contact your local dealer.

(1) GWP=Global warming potential

NOMENCLATURE



Machine type
EWA = Air-cooled chiller, cooling only
EWY = Air-cooled chiller, heat pump
EWL = Remote condenser water chiller
ERA = Air-cooled condensing unit
EWW = Water cooled packaged water chiller
EWC = Air-cooled chiller, cooling only with centrifugal fan
EWT = Air-cooled chiller, cooling only with heat recovery

Refrigerant
D: R-134a
P: R-407C
Q: R-410A

Capacity class in kW (cooling)
Always 3-digit code
Idem as previous

Model series
Letter A, B,…: major modification

Inverter
- = Non inverter
Z = Inverter

Efficiency Level
S = Standard efficiency
X = High efficiency
P = Premium efficiency (N.A. for this range)

Sound Level
S = Standard noise
L = Low noise (N.A. for this range)
R = Reduced noise (N.A. for this range)
X = Extra low noise (N.A. for this range)
C = Cabinet (N.A. for this range)

Warranty
0 = 1 year of warranty
B = 2 years of warranty
C = 3 years of warranty
… = … years of warranty

Sequential number
000 = Base model
001 = First order this model (1 or more units)
002 = Second order this model (1 or more units)
… = … order this model
B01 = First order for this model + 1 year warranty
B02 = Second order for this model + 1 or more units
… = … order for this model

Technical Specifications

Technical data – EWWD I-SS

TECHNICAL SPECIFICATIONS	EWWD I-SS			340	400	460	550
Capacity	Cooling		kW	333	394	460	538
Capacity control	Type			stepless			
	Minimum capacity		%	25	25	25	25
Unit power input	Cooling		kW	71.5	86.8	101	120
EER				4.66	4.59	4.56	4.47
ESEER				5.06	4.96	4.93	4.86
Casing	Colour			Ivory White (Munsell code 5Y7.5/1)			
	Material			Galvanized and painyedsteel sheet			
Dimensions	Unit	Height	mm	1821	1821	1821	1821
		Width	mm	1430	1430	1430	1430
		Depth	mm	3398	3398	3398	3398
Weight	Unit		kg	2150	2160	2179	2224
	Operating Weight		kg	2380	2396	2410	2457
Water heat exchanger Evaporator	Type			Shell and tube			
	Water volume		l	193	193	183	172
	Nominal water flow rate	Cooling	l/s	15.90	18.81	21.97	25.71
	Nominal Water pressure drop	Cooling	kPa	37	50	54	62
	Insulation material			Closed cell foam elastomer			
Water heat exchanger Condenser	Type			Shell and Tube			
	Number of condensers		No.	1	1	1	1
	Water volume		l	37	43	48	61
	Nominal water flow rate	Cooling	l/s	19.32	22.91	26.79	31.46
	Nominal Water pressure drop	Cooling	kPa	26	28	30	26
	Insulation Material			Closed cell foam elastomer			
Compressor	Type			Screw compressor			
	Oil charge		l	16	16	16	16
	Quantity			1	1	1	1
Sound level	Sound Power	Cooling	dBA	93.7	96.6	96.7	96.7
	Sound Pressure	Cooling	dBA	75.2	76.2	78.2	78.2
Refrigerant circuit	Refrigerant type			R134a			
	Refrigerant charge		kg	54	52	52	52
	N. of circuits			1	1	1	1
Piping connections	Evaporator water inlet/outlet		mm	168.3	168.3	168.3	168.3
	Condenser water inlet/outlet		in	5"	5"	5"	5"
Safety devices	High pressure (pressure switch)						
	Low pressure (pressure switch)						
	Emergency stop						
	High discharge temperature on the compressor						
	Phase monitor						
	Low pressure ratio						
	High oil pressure drop						
	Low oil pressure						
Notes	Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12°/ 7°C; condenser 30°/ 35°C.						

TECHNICAL SPECIFICATIONS EWWD I-SS					650	700	800	850
Capacity	Cooling			kW	640	705	782	844
Capacity control	Type				stepless			
	Minimum capacity			%	12.5	12.5	12.5	12.5
Unit power input	Cooling			kW	141	156	171	186
EER					4.53	4.52	4.57	4.55
ESEER					5.54	5.75	5.56	5.70
Casing	Colour				Ivory White (Munsell code 5Y7.5/1)			
	Material				Galvanized and painyedsteel sheet			
Dimensions	Unit	Height		mm	2113	2113	2113	2113
		Width		mm	1350	1350	1350	1350
		Depth		mm	4361	4361	4361	4361
Weight	Unit			kg	3909	3927	3945	3971
	Operating Weight			kg	4217	4228	4243	4262
Water heat exchanger Evaporator	Type				Shell and tube			
	Water volume			l	271	263	256	248
	Nominal water flow rate	Cooling		l/s	30.58	33.66	37.37	40.34
	Nominal Water pressure drop	Cooling		kPa	55	44	58	53
	Insulation material				Closed cell foam elastomer			
Water heat exchanger Condenser	Type				Shell and Tube			
	Number of condensers			No.	2	2	2	2
	Water volume			l	74	80	86	93
	Nominal water flow rate	Cooling		l/s	37.33	41.11	45.56	49.21
	Nominal Water pressure drop	Cooling		kPa	25	25	28	28
	Insulation Material				Closed cell foam elastomer			
Compressor	Type				Screw compressor			
	Oil charge			l	16 + 16	16 + 16	16 + 16	16 + 16
	Quantity				2	2	2	2
Sound level	Sound Power	Cooling		dBA	96.9	97.3	97.8	98.9
	Sound Pressure	Cooling		dBA	77.8	78.2	78.7	79.8
Refrigerant circuit	Refrigerant type				R134a			
	Refrigerant charge			kg	108	106	104	104
	N. of circuits				2	2	2	2
Piping connections	Evaporator water inlet/outlet			mm	168.3	168.3	168.3	168.3
	Condenser water inlet/outlet			in	5"	5"	5"	5"
Safety devices	High pressure (pressure switch)							
	Low pressure (pressure switch)							
	Emergency stop							
	High discharge temperature on the compressor							
	Phase monitor							
	Low pressure ratio							
	High oil pressure drop							
	Low oil pressure							
Notes	Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12°C/7°C; condenser 30/ 35°C.							

TECHNICAL SPECIFICATIONS EWWD I-SS					900	950	C10	C12
Capacity	Cooling			kW	910	986	1027	1155
Capacity control	Type				stepless			
	Minimum capacity			%	12.5	12.5	12.5	8.3
Unit power input	Cooling			kW	200	218	237	254
EER					4.55	4.51	4.33	4.54
ESEER					5.47	5.61	5.36	5.51
Casing	Colour				Ivory White (Munsell code 5Y7.5/1)			
	Material				Galvanized and painyedsteel sheet			
Dimensions	Unit	Height		mm	2113	2113	2113	2323
		Width		mm	1350	1350	1350	2135
		Depth		mm	4361	4361	4361	4426
Weight	Unit			kg	3996	4080	4092	6079
	Operating Weight			kg	4288	4369	4386	6628
Water heat exchanger Evaporator	Type				Shell and tube			
	Water volume			l	241	233	233	504
	Nominal water flow rate	Cooling		l/s	43.49	47.12	49.06	55.20
	Nominal Water pressure drop	Cooling		kPa	53	66	51	52
	Insulation material				Closed cell foam elastomer			
Water heat exchanger Condenser	Type				Shell and Tube			
	Number of condensers			No.	2	2	2	3
	Water volume			l	100	117	122	135
	Nominal water flow rate	Cooling		l/s	53.04	57.56	60.38	67.35
	Nominal Water pressure drop	Cooling		kPa	26	23	24	24
	Insulation Material				Closed cell foam elastomer			
Compressor	Type				Screw compressor			
	Oil charge			l	16 + 16	16 + 16	16 + 16	16+16+16
	Quantity				2	2	2	3
Sound level	Sound Power	Cooling		dBA	99.8	99.8	99.8	100.4
	Sound Pressure	Cooling		dBA	80.7	80.7	80.7	80.4
Refrigerant circuit	Refrigerant type				R134a			
	Refrigerant charge			kg	104	104	104	156
	N. of circuits				2	2	2	3
Piping connections	Evaporator water inlet/outlet			mm	168.3	168.3	168.3	219.1
	Condenser water inlet/outlet			in	5”	5”	5”	5”
Safety devices	High pressure (pressure switch)							
	Low pressure (pressure switch)							
	Emergency stop							
	High discharge temperature on the compressor							
	Phase monitor							
	Low pressure ratio							
	High oil pressure drop							
	Low oil pressure							
Notes	Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12°/ 7°C; condenser 30°/ 35°C.							

TECHNICAL SPECIFICATIONS EWWD I-SS					C13	C14	C15
Capacity	Cooling			kW	1204	1274	1346
Capacity control	Type				Stepless		
	Minimum capacity			%	8.3	8.3	8.3
Unit power input	Cooling			kW	268	282	298
EER					4.50	4.51	4.51
ESEER					5.56	5.56	5.54
Casing	Colour				Ivory White (Munsell code 5Y7.5/1)		
	Material				Galvanized and painyedsteel sheet		
Dimensions	Unit	Height		mm	2323	2323	2323
		Width		mm	2135	2135	2135
		Depth		mm	4426	4426	4426
Weight	Unit			kg	6097	6136	6174
	Operating Weight			kg	6646	6670	6699
Water heat exchanger Evaporator	Type				Shell and tube		
	Water volume			l	504	489	472
	Nominal water flow rate	Cooling		l/s	57.53	60.87	64.32
	Nominal Water pressure drop	Cooling		kPa	56	47	58
	Insulation material				Closed cell foam elastomer		
Water heat exchanger Condenser	Type				Shell and Tube		
	Number of condensers			No.	3	3	3
	Water volume			l	143	151	159
	Nominal water flow rate	Cooling		l/s	70.32	74.36	78.57
	Nominal Water pressure drop	Cooling		kPa	24	25	24
	Insulation Material				Closed cell foam elastomer		
Compressor	Type				Screw compressor		
	Oil charge			l	16+16+16	16+16+16	16+16+16
	Quantity				3	3	3
Sound level	Sound Power	Cooling		dBA	100.8	101.2	103.0
	Sound Pressure	Cooling		dBA	80.8	81.2	83.0
Refrigerant circuit	Refrigerant type				R134a		
	Refrigerant charge			kg	156	156	156
	N. of circuits				3	3	3
Piping connections	Evaporator water inlet/outlet			mm	219.1	219.1	219.1
	Condenser water inlet/outlet			in	5”	5”	5”
Safety devices	High pressure (pressure switch)						
	Low pressure (pressure switch)						
	Emergency stop						
	High discharge temperature on the compressor						
	Phase monitor						
	Low pressure ratio						
	High oil pressure drop						
	Low oil pressure						
Notes	Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12°/ 7°C; condenser 30°/ 35°C.						

TECHNICAL SPECIFICATIONS	EWWD I-SS			C16	C17	C18
Capacity	Cooling		kW	1401	1455	1510
Capacity control	Type			stepless		
	Minimum capacity		%	8.3	8.3	8.3
Unit power input	Cooling		kW	317	335	353
EER				4.43	4.35	4.28
ESEER				5.55	5.45	5.27
Casing	Colour			Ivory White (Munsell code 5Y7.5/1)		
	Material			Galvanized and painyedsteel sheet		
Dimensions	Unit	Height	mm	2323	2323	2323
		Width	mm	2135	2135	2135
		Depth	mm	4426	4426	4426
Weight	Unit		kg	6192	6210	6228
	Operating Weight		kg	6717	6735	6761
Water heat exchanger Evaporator	Type			Shell and tube		
	Water volume		l	472	472	472
	Nominal water flow rate	Cooling	l/s	66.93	69.54	72.15
	Nominal Water pressure drop	Cooling	kPa	62	66	71
	Insulation material			Closed cell foam elastomer		
Water heat exchanger Condenser	Type			Shell and Tube		
	Number of condensers		No.	3	3	3
	Water volume		l	167	174	183
	Nominal water flow rate	Cooling	l/s	82.05	85.53	89.01
	Nominal Water pressure drop	Cooling	kPa	24	24	23
	Insulation Material			Closed cell foam elastomer		
Compressor	Type			Screw compressor		
	Oil charge		l	16+16+16	16+16+16	16+16+16
	Quantity			3	3	3
Sound level	Sound Power	Cooling	dBA	103.0	103.0	103.0
	Sound Pressure	Cooling	dBA	83.0	83.0	83.0
Refrigerant circuit	Refrigerant type			R134a		
	Refrigerant charge		kg	156	156	156
	N. of circuits			3	3	3
Piping connections	Evaporator water inlet/outlet		mm	219.1	219.1	219.1
	Condenser water inlet/outlet		in	5"	5"	5"
Safety devices	High pressure (pressure switch)					
	Low pressure (pressure switch)					
	Emergency stop					
	High discharge temperature on the compressor					
	Phase monitor					
	Low pressure ratio					
	High oil pressure drop					
	Low oil pressure					
Notes	Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12°/ 7°C; condenser 30°/ 35°C.					

Technical data – EWWD I-XS

TECHNICAL SPECIFICATIONS	EWWD I-XS			360	440	500	600
Capacity	Cooling		kW	362	433	506	573
Capacity control	Type			stepless			
	Minimum capacity		%	25	25	25	25
Unit power input	Cooling		kW	70.7	85.3	100	120
EER				5.12	5.08	5.06	4.76
ESEER				5.34	5.27	5.22	5.11
Casing	Colour			Ivory White (Munsell code 5Y7.5/1)			
	Material			Galvanized and painyedsteel sheet			
Dimensions	Unit	Height	mm	1883	1883	1883	1883
		Width	mm	1430	1430	1430	1430
		Depth	mm	4081	4081	4081	4081
Weight	Unit		kg	2594	2667	2704	2704
	Operating Weight		kg	2998	3078	3116	3116
Water heat exchanger Evaporator	Type			Shell and tube			
	Water volume		l	326	317	308	308
	Nominal water flow rate	Cooling	l/s	17.28	20.69	24.19	27.38
	Nominal Water pressure drop	Cooling	kPa	64	48	54	68
	Insulation material			Closed cell foam elastomer			
Water heat exchanger Condenser	Type			Shell and Tube			
	Number of condensers		No.	1	1	1	1
	Water volume		l	79	94	105	105
	Nominal water flow rate	Cooling	l/s	20.65	24.77	28.97	33.13
	Nominal Water pressure drop	Cooling	kPa	48	47	51	66
	Insulation Material			Closed cell foam elastomer			
Compressor	Type			Screw compressor			
	Oil charge		l	16	16	16	16
	Quantity			1	1	1	1
Sound level	Sound Power	Cooling	dBA	93.7	96.6	96.7	96.7
	Sound Pressure	Cooling	dBA	75.2	76.2	78.2	78.2
Refrigerant circuit	Refrigerant type			R134a			
	Refrigerant charge		kg	54	52	52	52
	N. of circuits			1	1	1	1
Piping connections	Evaporator water inlet/outlet		mm	168.3	168.3	168.3	168.3
	Condenser water inlet/outlet		in	5"	5"	5"	5"
Safety devices	High pressure (pressure switch)						
	Low pressure (pressure switch)						
	Emergency stop						
	High discharge temperature on the compressor						
	Phase monitor						
	Low pressure ratio						
	High oil pressure drop						
	Low oil pressure						
Notes	Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12°/ 7°C; condenser 30°/ 35°C.						

TECHNICAL SPECIFICATIONS	EWWD I-XS				750	800	850	950
Capacity	Cooling			kW	720	795	866	933
Capacity control	Type				Stepless			
	Minimum capacity			%	12.5	12.5	12.5	12.5
Unit power input	Cooling			kW	142	156	171	185
EER					5.08	5.10	5.08	5.05
ESEER					6.13	6.31	6.01	6.14
Casing	Colour				Ivory White (Munsell code 5Y7.5/1)			
	Material				Galvanized and painyedsteel sheet			
Dimensions	Unit	Height		mm	2245	2245	2245	2245
		Width		mm	1350	1350	1350	1350
		Depth		mm	4769	4769	4769	4769
Weight	Unit			kg	4964	4997	5049	5073
	Operating Weight			kg	5582	5615	5671	5695
Water heat exchanger Evaporator	Type				Shell and tube			
	Water volume			l	539	539	528	528
	Nominal water flow rate		Cooling	l/s	20.58 20.58	20.44 24.98	24.75 24.75	23.31 28.48
	Nominal Water pressure drop		Cooling	kPa	48	48	47	50
	Insulation material				Closed cell foam elastomer			
Water heat exchanger Condenser	Type				Shell and Tube			
	Number of condensers			No.	2	2	2	2
	Water volume			l	157	173	188	199
	Nominal water flow rate		Cooling	l/s	20.58 20.58	20.44 24.98	24.75 24.75	23.31 28.48
	Nominal Water pressure drop		Cooling	kPa	48	48	47	50
	Insulation Material				Closed cell foam elastomer			
Compressor	Type				Screw compressor			
	Oil charge			l	16 + 16	16 + 16	16 + 16	16 + 16
	Quantity				2	2	2	2
Sound level	Sound Power		Cooling	dBA	96.9	97.3	97.8	98.9
	Sound Pressure		Cooling	dBA	77.8	78.2	78.7	79.8
Refrigerant circuit	Refrigerant type				R134a			
	Refrigerant charge			kg	108	106	104	104
	N. of circuits				2	2	2	2
Piping connections	Evaporator water inlet/outlet			mm	219.1	219.1	219.1	219.1
	Condenser water inlet/outlet			in	5"	5"	5"	5"
Safety devices	High pressure (pressure switch)							
	Low pressure (pressure switch)							
	Emergency stop							
	High discharge temperature on the compressor							
	Phase monitor							
	Low pressure ratio							
	High oil pressure drop							
	Low oil pressure							
Notes	Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12°C/7°C; condenser 30/ 35°C.							

TECHNICAL SPECIFICATIONS	EWWD I-XS			C10	C11	C12
Capacity	Cooling		kW	976	1038	1134
Capacity control	Type			stepless		
	Minimum capacity		%	12.5	12.5	12.5
Unit power input	Cooling		kW	199	220	240
EER				4.90	4.72	4.73
ESEER				5.90	6.05	5.67
Casing	Colour			Ivory White (Munsell code 5Y7.5/1)		
	Material			Galvanized and painyedsteel sheet		
Dimensions	Unit	Height	mm	2245	2245	2245
		Width	mm	1350	1350	1350
		Depth	mm	4769	4769	4769
Weight	Unit		kg	5097	5132	5132
	Operating Weight		kg	5729	5741	5741
Water heat exchanger Evaporator	Type			Shell and tube		
	Water volume		l	528	504	504
	Nominal water flow rate	Cooling	l/s	46.63	49.59	54.16
	Nominal Water pressure drop	Cooling	kPa	72	46	52
	Insulation material			Closed cell foam elastomer		
Water heat exchanger Condenser	Type			Shell and Tube		
	Number of condensers		No.	2	2	2
	Water volume		l	209	209	209
	Nominal water flow rate	Cooling	l/s	28.07 28.07	27.10 33.12	32.82 32.82
	Nominal Water pressure drop	Cooling	kPa	50	65	65
	Insulation Material			Closed cell foam elastomer		
Compressor	Type			Screw compressor		
	Oil charge		l	16 + 16	16 + 16	16 + 16
	Quantity			2	2	2
Sound level	Sound Power	Cooling	dBA	99.8	99.8	99.8
	Sound Pressure	Cooling	dBA	80.7	80.7	80.7
Refrigerant circuit	Refrigerant type			R134a		
	Refrigerant charge		kg	104	104	104
	N. of circuits			2	2	2
Piping connections	Evaporator water inlet/outlet		mm	219.1	219.1	219.1
	Condenser water inlet/outlet		in	5”	5”	5”
Safety devices	High pressure (pressure switch)					
	Low pressure (pressure switch)					
	Emergency stop					
	High discharge temperature on the compressor					
	Phase monitor					
	Low pressure ratio					
	High oil pressure drop					
	Low oil pressure					
Notes	Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12°/ 7°C; condenser 30°/ 35°C.					

Technical data – EWLD I-SS

TECHNICAL SPECIFICATIONS	EWLD I-SS				320	400	420	500
Capacity	Cooling			kW	328	391	428	504
Capacity control	Type				stepless			
	Minimum capacity			%	25	25	25	25
Unit power input	Cooling			kW	83.8	100	116	137
EER					3.91	3.90	3.70	3.67
Casing	Colour				Ivory White (Munsell code 5Y7.5/1)			
	Material				Galvanized and painyedsteel sheet			
Dimensions	Unit	Height		mm	1899	1899	1899	1899
		Width		mm	1464	1464	1464	1464
		Depth		mm	3114	3114	3114	3114
Weight	Unit			kg	1861	1861	1869	1884
	Operating Weight			kg	2054	2054	2052	2056
Water heat exchanger Evaporator	Type				Shell and tube			
	Water volume			l	193	193	183	172
	Nominal water flow rate		Cooling	l/s	15.65	18.66	20.46	24.09
	Nominal Water pressure drop		Cooling	kPa	34	47	47	54
	Insulation material				Closed cell foam elastomer			
Compressor	Type				Screw compressor			
	Oil charge			l	16	16	16	16
	Quantity				1	1	1	1
Sound level	Sound Power		Cooling	dBA	93.7	96.6	96.7	96.7
	Sound Pressure		Cooling	dBA	75.2	76.2	78.2	78.2
Refrigerant circuit	Refrigerant type				R134a			
	Refrigerant charge[(1)]			kg	-	-	-	-
	N. of circuits				1	1	1	1
Piping connections	Evaporator water inlet/outlet			mm	168.3	168.3	168.3	168.3
Liquid connection	Inlet			mm	42	42	42	42
Gas discharge connection	Outlet			mm	88.9	88.9	88.9	88.9
Liquid Receiver (Optional)	Volume			l	170			
Safety devices	High pressure (pressure switch)							
	Low pressure (pressure switch)							
	Emergency stop							
	High discharge temperature on the compressor							
	Phase monitor							
	Low pressure ratio							
	High oil pressure drop							
	Low oil pressure							
Notes	Cooling capacity and power input are based on: 12°/ 7°C entering/leaving evaporator water temperature; 45°C saturated discharge temperature at the compressor (1) EWLD version units are pre-charged with Nitrogen at 2 bar. Refrigerant charge must be defined by plant designer only							

TECHNICAL SPECIFICATIONS	EWLD I-SS			600	650	750	800
Capacity	Cooling		kW	596	657	730	788
Capacity control	Type			stepless			
	Minimum capacity		%	12.5	12.5	12.5	12.5
Unit power input	Cooling		kW	165	181	198	214
EER				3.61	3.63	3.69	3.67
Casing	Colour			Ivory White (Munsell code 5Y7.5/1)			
	Material			Galvanized and painyedsteel sheet			
Dimensions	Unit	Height	mm	2325	2325	2325	2325
		Width	mm	1464	1464	1464	1464
		Depth	mm	4391	4391	4391	4391
Weight	Unit		kg	3331	3339	3347	3356
	Operating Weight		kg	3602	3602	3603	3604
Water heat exchanger Evaporator	Type			Shell and tube			
	Water volume		l	271	263	256	248
	Nominal water flow rate	Cooling	l/s	28.49	31.40	34.88	37.64
	Nominal Water pressure drop	Cooling	kPa	49	39	52	47
	Insulation material			Closed cell foam elastomer			
Compressor	Type			Screw compressor			
	Oil charge		l	16 + 16	16 + 16	16 + 16	16 + 16
	Quantity			2		2	2
Sound level	Sound Power	Cooling	dBA	96.9	97.3	97.8	98.9
	Sound Pressure	Cooling	dBA	77.8	78.2	78.7	79.8
Refrigerant circuit	Refrigerant type			R134a			
	Refrigerant charge (1)		kg	-	-	-	-
	N. of circuits			2	2	2	2
Piping connections	Evaporator water inlet/outlet		mm	168.3	168.3	168.3	168.3
Liquid connection	Inlet		mm	42	42	42	42
Gas discharge connection	Outlet		mm	88.9	88.9	88.9	88.9
Liquid Receiver (Optional)	Volume		l	170			
Safety devices	High pressure (pressure switch)						
	Low pressure (pressure switch)						
	Emergency stop						
	High discharge temperature on the compressor						
	Phase monitor						
	Low pressure ratio						
	High oil pressure drop						
	Low oil pressure						
Notes	Cooling capacity and power input are based on: 12°/ 7°C entering/leaving evaporator water temperature; 45°C saturated discharge temperature at the compressor (1) EWLD version units are pre-charged with Nitrogen at 2 bar. Refrigerant charge must be defined by plant designer only						

TECHNICAL SPECIFICATIONS	EWLD I-SS			850	900	950	C10
Capacity	Cooling		kW	850	919	966	1033
Capacity control	Type			stepless			
	Minimum capacity		%	12.5	12.5	12.5	8.3
Unit power input	Cooling		kW	231	252	271	279
EER				3.67	3.65	3.56	3.59
Casing	Colour			Ivory White (Munsell code 5Y7.5/1)			
	Material			Galvanized and painyedsteel sheet			
Dimensions	Unit	Height	mm	2325	2325	2325	2415
		Width	mm	1464	1464	1464	2135
		Depth	mm	4391	4391	4391	4426
Weight	Unit		kg	3364	3412	3412	5146
	Operating Weight		kg	3605	3645	3645	5667
Water heat exchanger Evaporator	Type			Shell and tube			
	Water volume		l	241	233	233	521
	Nominal water flow rate	Cooling	l/s	40.61	46.14	46.14	47.91
	Nominal Water pressure drop	Cooling	kPa	47	45	45	52
	Insulation material			Closed cell foam elastomer			
Compressor	Type			Screw compressor			
	Oil charge		l	16 + 16	16 + 16	16 + 16	16+16+16
	Quantity			2	2	2	3
Sound level	Sound Power	Cooling	dBA	99.8	99.8	99.8	100.1
	Sound Pressure	Cooling	dBA	80.7	80.7	80.7	80.1
Refrigerant circuit	Refrigerant type			R134a			
	Refrigerant charge (1)		kg	-	-	-	-
	N. of circuits			2	2	2	3
Piping connections	Evaporator water inlet/outlet		mm	168.3	168.3	168.3	219.1
Liquid connections	Inlet		mm	42	42	42	42
Gas discharge connections	Outlet		mm	88.9	88.9	88.9	88.9
Liquid Receiver (Optional)	Volume		l	170			
Safety devices	High pressure (pressure switch)						
	Low pressure (pressure switch)						
	Emergency stop						
	High discharge temperature on the compressor						
	Phase monitor						
	Low pressure ratio						
	High oil pressure drop						
	Low oil pressure						
Notes	Cooling capacity and power input are based on: 12°/ 7°C entering/leaving evaporator water temperature; 45°C saturated discharge temperature at the compressor (1) EWLD version units are pre-charged with Nitrogen at 2 bar. Refrigerant charge must be defined by plant designer only						

TECHNICAL SPECIFICATIONS	EWLD I-SS			C11	C12	C13	C14
Capacity	Cooling		kW	1078	1125	1188	1267
Capacity control	Type			stepless			
	Minimum capacity		%	8.3	8.3	8.3	8.3
Unit power input	Cooling		kW	296	312	329	347
EER				3.64	3.60	3.61	3.65
Casing	Colour			Ivory White (Munsell code 5Y7.5/1)			
	Material			Galvanized and painyedsteel sheet			
Dimensions	Unit	Height	mm	2415	2415	2415	2415
		Width	mm	2135	2135	2135	2135
		Depth	mm	4426	4426	4426	4426
Weight	Unit		kg	5167	5167	5188	5208
	Operating Weight		kg	5671	5671	5677	5680
Water heat exchanger Evaporator	Type			Shell and tube			
	Water volume		l	504	504	489	472
	Nominal water flow rate	Cooling	l/s	51.51	53.73	56.78	60.53
	Nominal Water pressure drop	Cooling	kPa	46	49	41	51
	Insulation material			Closed cell foam elastomer			
Compressor	Type			Screw compressor			
	Oil charge		l	16+16+16	16+16+16	16+16+16	16+16+16
	Quantity			3	3	3	3
Sound level	Sound Power	Cooling	dBA	100.4	100.8	101.2	103.0
	Sound Pressure	Cooling	dBA	80.4	80.8	81.2	83.0
Refrigerant circuit	Refrigerant type			R134a			
	Refrigerant charge (1)		kg	-	-	-	-
	N. of circuits			3	3	3	3
Piping connections	Evaporator water inlet/outlet		mm	219.1	219.1	219.1	219.1
Liquid connections	Inlet		mm	42	42	42	42
Gas discharge connections	Outlet		mm	88.9	88.9	88.9	88.9
Liquid Receiver (Optional)	Volume		l	170			
Safety devices	High pressure (pressure switch)						
	Low pressure (pressure switch)						
	Emergency stop						
	High discharge temperature on the compressor						
	Phase monitor						
	Low pressure ratio						
	High oil pressure drop						
	Low oil pressure						
Notes	Cooling capacity and power input are based on: 12°/ 7°C entering/leaving evaporator water temperature; 45°C saturated discharge temperature at the compressor (1) EWLD version units are pre-charged with Nitrogen at 2 bar. Refrigerant charge must be defined by plant designer only						

TECHNICAL SPECIFICATIONS	EWLD I-SS			C15	C16	C17
Capacity	Cooling		kW	1319	1370	1422
Capacity control	Type			stepless		
	Minimum capacity		%	8.3	8.3	8.3
Unit power input	Cooling		kW	366	386	405
EER				3.60	3.55	3.51
Casing	Colour			Ivory White (Munsell code 5Y7.5/1)		
	Material			Galvanized and painyedsteel sheet		
Dimensions	Unit	Height	mm	2415	2415	2415
		Width	mm	2135	2135	2135
		Depth	mm	4426	4426	4426
Weight	Unit		kg	5208	5208	5208
	Operating Weight		kg	5680	5680	5680
Water heat exchanger Evaporator	Type			Shell and tube		
	Water volume		l	472	472	472
	Nominal water flow rate	Cooling	l/s	63.00	65.48	67.96
	Nominal Water pressure drop	Cooling	kPa	55	59	63
	Insulation material			Closed cell foam elastomer		
Compressor	Type			Screw compressor		
	Oil charge		l	16+16+16	16+16+16	16+16+16
	Quantity			3	3	3
Sound level	Sound Power	Cooling	dBA	103.0	103.0	103.0
	Sound Pressure	Cooling	dBA	83.0	83.0	83.0
Refrigerant circuit	Refrigerant type			R134a		
	Refrigerant charge (1)		kg	-	-	-
	N. of circuits			3	3	3
Piping connections	Evaporator water inlet/outlet		mm	219.1	219.1	219.1
Liquid connections	Inlet		mm	42	42	42
Gas discharge conn.	Outlet		mm	88.9	88.9	88.9
Liquid Receiver (Optional)	Volume		l	170		
Safety devices	High pressure (pressure switch)					
	Low pressure (pressure switch)					
	Emergency stop					
	High discharge temperature on the compressor					
	Phase monitor					
	Low pressure ratio					
	High oil pressure drop					
	Low oil pressure					
Notes	Cooling capacity and power input are based on: 12°/ 7°C entering/leaving evaporator water temperature; 45°C saturated discharge temperature at the compressor (1) EWLD version units are pre-charged with Nitrogen at 2 bar. Refrigerant charge must be defined by plant designer only					

Sound pressure levels

EWWD I-SS - EWWD I-XS - EWLD I-SS

EWWD I-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)
340	53.6	56.2	71.1	74.5	69.7	65.6	63.9	59.5	**75.2**	**93.7**
400	54.6	57.2	72.1	75.5	70.7	66.6	64.9	60.5	**76.2**	**96.6**
460	56.6	59.2	74.1	77.5	72.7	68.6	66.9	62.5	**78.2**	**96.7**
550	56.6	59.2	74.1	77.5	72.7	68.6	66.9	62.5	**78.2**	**96.7**
650	56.2	58.8	73.7	77.1	72.3	68.2	66.5	62.1	**77.8**	**96.9**
700	56.6	59.2	74.1	77.5	72.7	68.6	66.9	62.5	**78.2**	**97.3**
800	57.1	59.7	74.6	78.0	73.2	69.1	67.4	63.0	**78.7**	**97.8**
850	58.2	60.8	75.7	79.1	74.3	70.2	68.5	64.1	**79.8**	**98.9**
900	59.1	61.7	76.6	80.0	75.2	71.1	69.4	65.0	**80.7**	**99.8**
950	59.1	61.7	76.6	80.0	75.2	71.1	69.4	65.0	**80.7**	**99.8**
C10	59.1	61.7	76.6	80.0	75.2	71.1	69.4	65.0	**80.7**	**99.8**
C12	58.8	61.4	76.3	79.7	74.9	70.8	69.1	64.7	**80.4**	**100.4**
C13	59.2	61.8	76.7	80.1	75.3	71.2	69.5	65.1	**80.8**	**100.8**
C14	59.6	62.2	77.1	80.5	75.7	71.6	69.9	65.5	**81.2**	**101.2**
C15	61.4	64.0	78.9	82.3	77.5	73.4	71.7	67.3	**83.0**	**103.0**
C16	61.4	64.0	78.9	82.3	77.5	73.4	71.7	67.3	**83.0**	**103.0**
C17	61.4	64.0	78.9	82.3	77.5	73.4	71.7	67.3	**83.0**	**103.0**
C18	61.4	64.0	78.9	82.3	77.5	73.4	71.7	67.3	**83.0**	**103.0**

Note: The values are according to ISO 3744 and are referred to: evaporator 12/7°C, condenser 30/35° C, full load operation

EWWD I-XS	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)
360	53.6	56.2	71.1	74.5	69.7	65.6	63.9	59.5	**75.2**	**93.7**
440	54.6	57.2	72.1	75.5	70.7	66.6	64.9	60.5	**76.2**	**96.6**
500	56.6	59.2	74.1	77.5	72.7	68.6	66.9	62.5	**78.2**	**96.7**
600	56.6	59.2	74.1	77.5	72.7	68.6	66.9	62.5	**78.2**	**96.7**
750	56.2	58.8	73.7	77.1	72.3	68.2	66.5	62.1	**77.8**	**96.9**
800	56.6	59.2	74.1	77.5	72.7	68.6	66.9	62.5	**78.2**	**97.3**
850	57.1	59.7	74.6	78.0	73.2	69.1	67.4	63.0	**78.7**	**97.8**
950	58.2	60.8	75.7	79.1	74.3	70.2	68.5	64.1	**79.8**	**98.9**
C10	59.1	61.7	76.6	80.0	75.2	71.1	69.4	65.0	**80.7**	**99.8**
C11	59.1	61.7	76.6	80.0	75.2	71.1	69.4	65.0	**80.7**	**99.8**
C12	59.1	61.7	76.6	80.0	75.2	71.1	69.4	65.0	**80.7**	**99.8**

Note: The values are according to ISO 3744 and are referred to: evaporator 12/7°C, condenser 30/35° C, full load operation

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

Note: The values are according to ISO 3744 and are referred to: evaporator 12/7°C, 40°C saturated discharge temperature at the compressor (condenserless)

EWWD I-SS - EWWD I-XS - EWLD I-SS
with sound proof cabinet

EWWD I-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)
340	43.6	46.2	61.1	64.5	59.7	55.6	53.9	49.5	**65.2**	**83.7**
400	44.6	47.2	62.1	65.5	60.7	56.6	54.9	50.5	**66.2**	**86.6**
460	46.6	49.2	64.1	67.5	62.7	58.6	56.9	52.5	**68.2**	**86.7**
550	46.6	49.2	64.1	67.5	62.7	58.6	56.9	52.5	**68.2**	**86.7**
650	46.2	48.8	63.7	67.1	62.3	58.2	56.5	52.1	**67.8**	**86.9**
700	46.6	49.2	64.1	67.5	62.7	58.6	56.9	52.5	**68.2**	**87.3**
800	47.1	49.7	64.6	68.0	63.2	59.1	57.4	53.0	**68.7**	**87.8**
850	48.2	50.8	65.7	69.1	64.3	60.2	58.5	54.1	**69.8**	**88.9**
900	49.1	51.7	66.6	70.0	65.2	61.1	59.4	55.0	**70.7**	**89.8**
950	49.1	51.7	66.6	70.0	65.2	61.1	59.4	55.0	**70.7**	**89.8**
C10	49.1	51.7	66.6	70.0	65.2	61.1	59.4	55.0	**70.7**	**89.8**
C12	48.8	51.4	66.3	69.7	64.9	60.8	59.1	54.7	**70.4**	**90.4**
C13	49.2	51.8	66.7	70.1	65.3	61.2	59.5	55.1	**70.8**	**90.8**
C14	49.6	52.2	67.1	70.5	65.7	61.6	59.9	55.5	**71.2**	**91.2**
C15	51.4	54.0	68.9	72.3	67.5	63.4	61.7	57.3	**73.0**	**93.0**
C16	51.4	54.0	68.9	72.3	67.5	63.4	61.7	57.3	**73.0**	**93.0**
C17	51.4	54.0	68.9	72.3	67.5	63.4	61.7	57.3	**73.0**	**93.0**
C18	51.4	54	68.9	72.3	67.5	63.4	61.7	57.3	**73.0**	**93.0**

Note: The values are according to ISO 3744 and are referred to: evaporator 12/7°C, condenser 30/35° C, full load operation;

EWWD I-XS	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)
360	43.6	46.2	61.1	64.5	59.7	55.6	53.9	49.5	**65.2**	**83.7**
440	44.6	47.2	62.1	65.5	60.7	56.6	54.9	50.5	**66.2**	**86.6**
500	46.6	49.2	64.1	67.5	62.7	58.6	56.9	52.5	**68.2**	**86.7**
600	46.6	49.2	64.1	67.5	62.7	58.6	56.9	52.5	**68.2**	**86.7**
750	46.2	48.8	63.7	67.1	62.3	58.2	56.5	52.1	**67.8**	**86.9**
800	46.6	49.2	64.1	67.5	62.7	58.6	56.9	52.5	**68.2**	**87.3**
850	47.1	49.7	64.6	68.0	63.2	59.1	57.4	53.0	**68.7**	**87.8**
950	48.2	50.8	65.7	69.1	64.3	60.2	58.5	54.1	**69.8**	**88.9**
C10	49.1	51.7	66.6	70.0	65.2	61.1	59.4	55.0	**70.7**	**89.8**
C11	49.1	51.7	66.6	70.0	65.2	61.1	59.4	55.0	**70.7**	**89.8**
C12	49.1	51.7	66.6	70.0	65.2	61.1	59.4	55.0	**70.7**	**89.8**

Note: The values are according to ISO 3744 and are referred to: evaporator 12/7°C, condenser 30/35° C, full load operation;

EWLD 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)
320	43.6	46.2	61.1	64.5	59.7	55.6	53.9	49.5	**65.2**	**83.7**
400	44.6	47.2	62.1	65.5	60.7	56.6	54.9	50.5	**66.2**	**86.6**
420	46.6	49.2	64.1	67.5	62.7	58.6	56.9	52.5	**68.2**	**86.7**
500	46.6	49.2	64.1	67.5	62.7	58.6	56.9	52.5	**68.2**	**86.7**
600	46.2	48.8	63.7	67.1	62.3	58.2	56.5	52.1	**67.8**	**86.9**
650	46.6	49.2	64.1	67.5	62.7	58.6	56.9	52.5	**68.2**	**87.3**
750	47.1	49.7	64.6	68.0	63.2	59.1	57.4	53.0	**68.7**	**87.8**
800	48.2	50.8	65.7	69.1	64.3	60.2	58.5	54.1	**69.8**	**88.9**
850	49.1	51.7	66.6	70.0	65.2	61.1	59.4	55.0	**70.7**	**89.8**
900	49.1	51.7	66.6	70.0	65.2	61.1	59.4	55.0	**70.7**	**89.8**
950	49.1	51.7	66.6	70.0	65.2	61.1	59.4	55.0	**70.7**	**89.8**
C10	48.5	51.1	66.0	69.4	64.6	60.5	58.8	54.4	**70.1**	**90.1**
C11	48.8	51.4	66.3	69.7	64.9	60.8	59.1	54.7	**70.4**	**90.4**
C12	49.2	51.8	66.7	70.1	65.3	61.2	59.5	55.1	**70.8**	**90.8**
C13	49.6	52.2	67.1	70.5	65.7	61.6	59.9	55.5	**71.2**	**91.2**
C14	51.4	54.0	68.9	72.3	67.5	63.4	61.7	57.3	**73.0**	**93.0**
C15	51.4	54.0	68.9	72.3	67.5	63.4	61.7	57.3	**73.0**	**93.0**
C16	51.4	54.0	68.9	72.3	67.5	63.4	61.7	57.3	**73.0**	**93.0**
C17	51.4	54	68.9	72.3	67.5	63.4	61.7	57.3	**73.0**	**93.0**

Note: The values are according to ISO 3744 and are referred to: evaporator 12/7°C, 40°C saturated discharge temperature at the compressor (condenserless).

Sound pressure correction factors for different distances

EWWD I-SS

EWWD I-SS	Distance (m)					
	1	5	10	15	20	25
340	0	-7.9	-12.7	-15.8	-18.1	-19.8
400	0	-7.9	-12.7	-15.8	-18.1	-19.8
460	0	-7.9	-12.7	-15.8	-18.1	-19.8
550	0	-7.9	-12.7	-15.8	-18.1	-19.8
650	0	-7.9	-12.7	-15.8	-18.1	-19.8
700	0	-7.5	-12.2	-15.3	-17.5	-19.3
800	0	-7.9	-12.7	-15.8	-18.1	-19.8
850	0	-7.5	-12.2	-15.3	-17.5	-19.3
900	0	-7.5	-12.2	-15.3	-17.5	-19.3
950	0	-7.9	-12.7	-15.8	-18.1	-19.8
C10	0	-7.5	-12.2	-15.3	-17.5	-19.3
C12	0	-7.5	-12.2	-15.3	-17.5	-19.3
C13	0	-7.5	-12.2	-15.3	-17.5	-19.3
C14	0	-7.5	-12.2	-15.3	-17.5	-19.3
C15	0	-7.5	-12.2	-15.3	-17.5	-19.3
C16	0	-7.5	-12.2	-15.3	-17.5	-19.3
C17	0	-7.5	-12.2	-15.3	-17.5	-19.3
C18	0	-7.5	-12.2	-15.3	-17.5	-19.3

Note: The values are dB(A) (pressure level), in open field conditions on reflecting surface (directivity factor Q=2)

EWWD I-XS

EWWD I–XS	Distance (m)					
	1	5	10	15	20	25
360	0	-7.9	-12.7	-15.8	-18.1	-19.8
440	0	-7.9	-12.7	-15.8	-18.1	-19.8
500	0	-7.9	-12.7	-15.8	-18.1	-19.8
600	0	-7.9	-12.7	-15.8	-18.1	-19.8
750	0	-7.9	-12.7	-15.8	-18.1	-19.8
800	0	-7.5	-12.2	-15.3	-17.5	-19.3
850	0	-7.9	-12.7	-15.8	-18.1	-19.8
950	0	-7.5	-12.2	-15.3	-17.5	-19.3
C10	0	-7.5	-12.2	-15.3	-17.5	-19.3
C11	0	-7.9	-12.7	-15.8	-18.1	-19.8
C12	0	-7.5	-12.2	-15.3	-17.5	-19.3

Note: The values are dB(A) (pressure level), in open field conditions on reflecting surface (directivity factor Q=2)

Operating limits

Storage

The units can be stored under the following environmental conditions:

Minimum ambient temperature	:	-20°C
Maximum ambient temperature	:	53°C
Maximum relative humidity	:	95% non-condensing

⚠ ATTENTION

Storage at a lower temperature than the minimum indicated can cause damage to certain parts including the electronic control unit and its LCD display.

⚠ ATTENTION

Storage at a higher temperature than that indicated will cause the safety valves on the suction valves of the compressors to open.

⚠ ATTENTION

Storage in a condensed atmosphere can damage the electronic components.

Storage at ambient temperature near or below 0°C, with water loops filled with water require to protect against water freezing. See anti-freeze protection in Mechanical installation paragraph.

Operation

The unit must operate within the limits indicated in the following diagram.

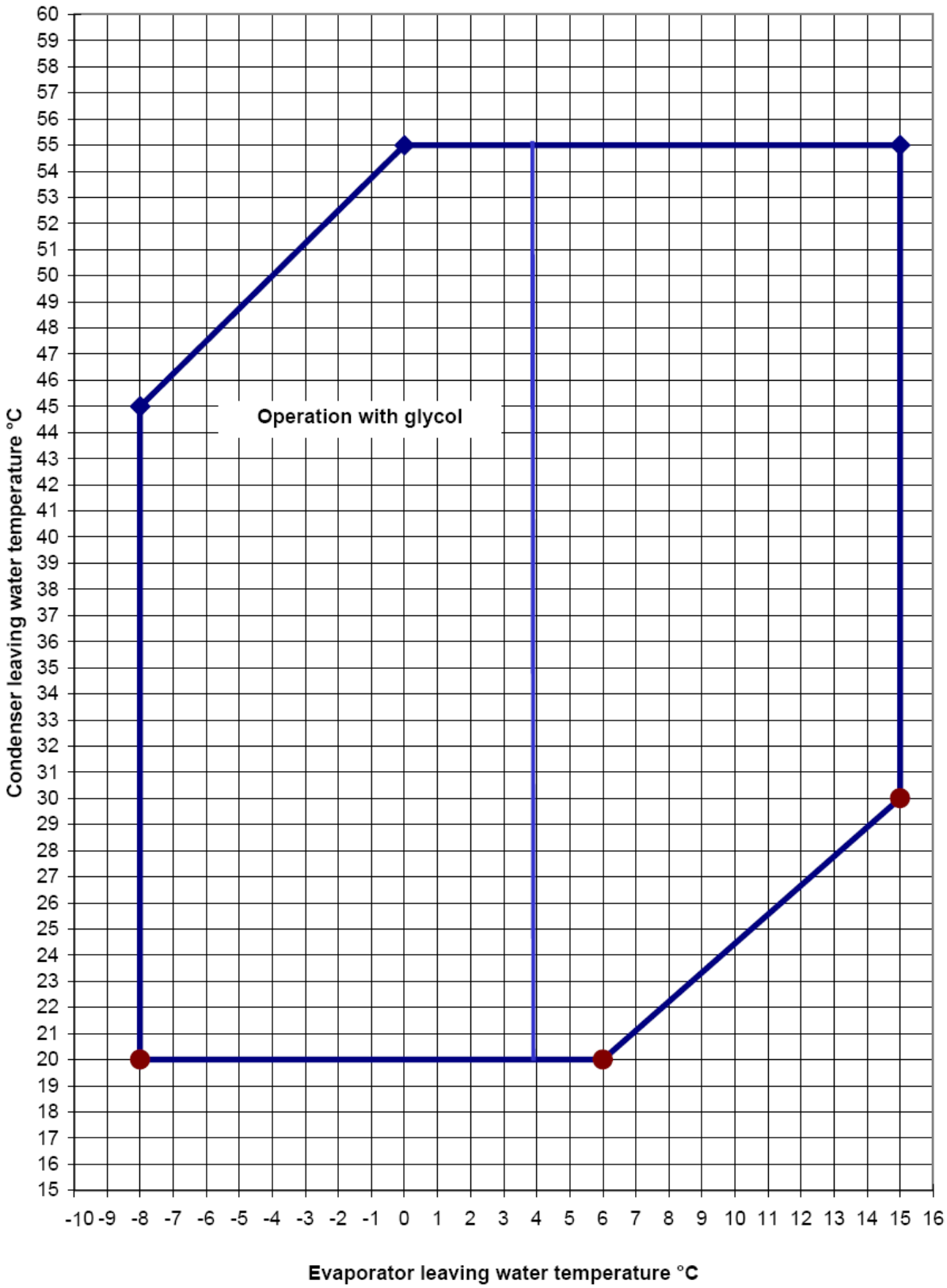
⚠ ATTENTION

Operating outside the limits indicated may trigger the protection devices and interrupt functioning of the unit and, in extreme cases, may damage the unit.

For any doubts, consult the manufacturer.

The operating limits refer to a fully load operating unit. For partial load operation limits please contact the factory

Envelope
EWWD I-SS – EWWD I-XS



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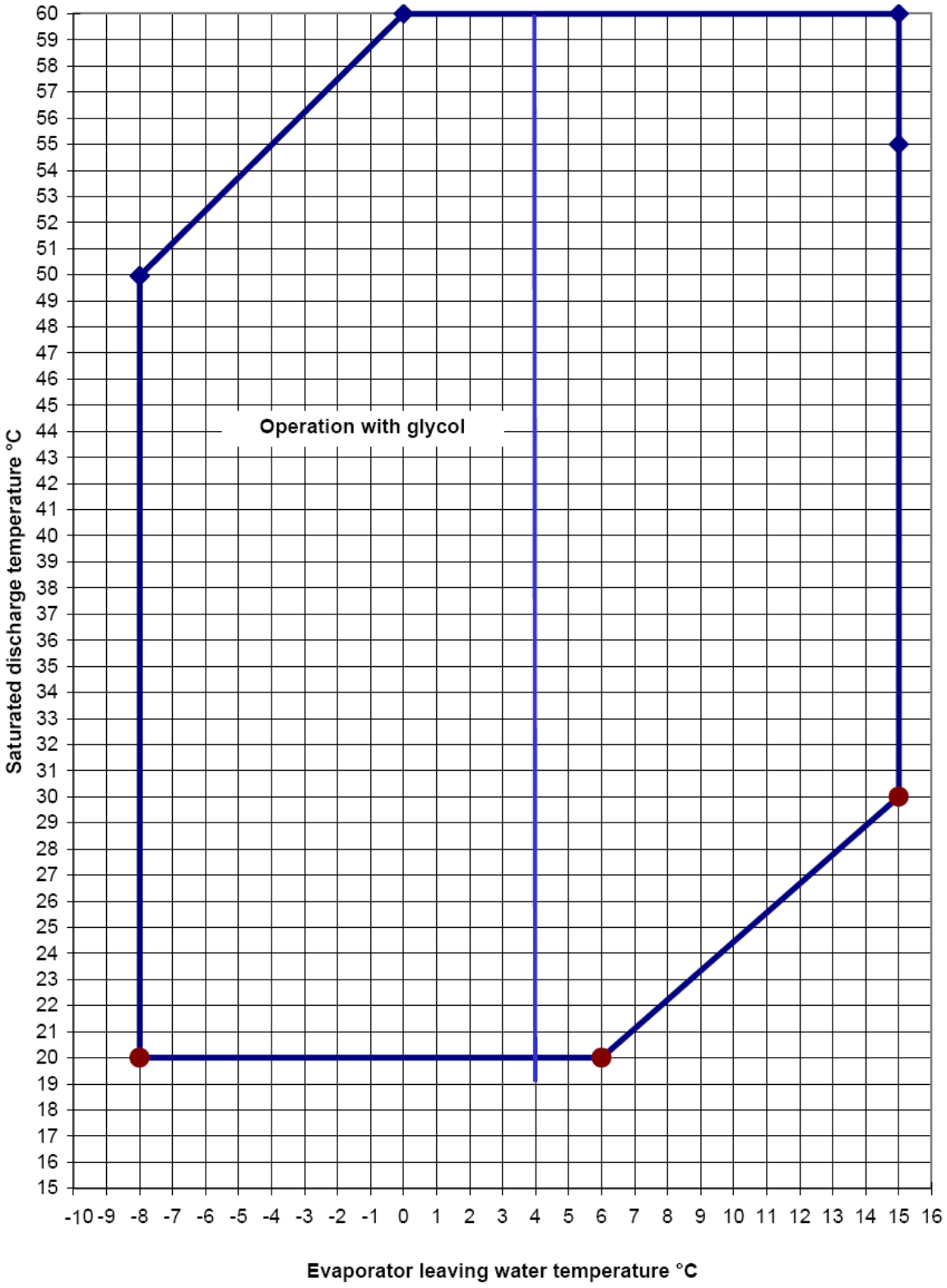
ELWD I-SS



Mechanical Installation

Shipping

The stability of the machine during shipping must be ensured. If the machine is shipped with a wooden cross-plank on its base, the cross-plank must be removed only after the final destination has been reached.

Responsibility

The manufacturer declines all responsibility, present and future, for any damage to persons, animals or property caused by negligence of operators failing to follow the installation and maintenance instructions in this manual.
All safety equipment must be regularly and periodically checked in accordance with this manual and with local laws and regulations regarding safety and environment protection.

Safety

The machine must be firmly secured to the ground.
It is essential to observe the following instructions:

- The machine can only be lifted using the lifting points on the base of the machine itself. These are the only points that can support the entire weight of the unit.
- Do not allow unauthorised and/or unqualified personnel to access the machine.
- It is forbidden to access the electrical components without having opened the machine's general disconnecting switch and switched off the power supply.
- It is forbidden to access the electrical components without using an insulating platform. Do not access the electrical components if water and/or moisture are present.
- All operations on the refrigerant circuit and on components under pressure must be carried out by qualified personnel only.
- Replacement of a compressor or addition of lubricating oil must be carried out by qualified personnel only.
- Sharp edges can cause wounds. Avoid direct contact.
- Avoid introducing solid bodies into the water pipes while the machine is connected to the system.
- A mechanical filter must be installed on the water pipe connected to the heat exchanger inlet.
- The machine is supplied with safety valves, that are installed on both the high and the low pressure sides of the refrigerant circuit.

In case of sudden stop of the unit, follow the instructions on the **Control Panel Operating Manual** which is part of the on-board documentation delivered to the end user with this manual.
It is recommended to perform installation and maintenance with other people. In case of accidental injury or unease, it is necessary to:

- keep calm
- press the alarm button if present in the installation site
- move the injured person in a warm place far from the unit and in rest position
- contact immediately emergency rescue personnel of the building or if the Health Emergency Service
- wait without leaving the injured person alone until the rescue operators come
- give all necessary information to the the rescue operators

⚠ WARNING

Before carrying out any operation on the machine, please read this instruction and operating manual carefully.
Installation and maintenance must be carried out only by qualified personnel that is familiar with the provisions of law and local regulations and has been trained properly or has experience with this type of equipment.

C

⚠ WARNING

Avoid installing the machine in a place that could be dangerous during maintenance operations, such as (but not only) platforms without parapets or railings or areas not complying with the clearance requirements.

Handling and lifting

Avoid bumping and/or jolting during unloading from the lorry and moving the machine. Do not push or pull the machine from any part other than the base frame. Secure the machine inside the lorry to prevent it from moving and causing damage to the panels and to the base frame. Do not allow any part of the machine to fall during transportation and/or unloading, as this could cause serious damage.
All units of the series are supplied with four lifting points. Only these points may be used for lifting the unit, as shown in figure 2.

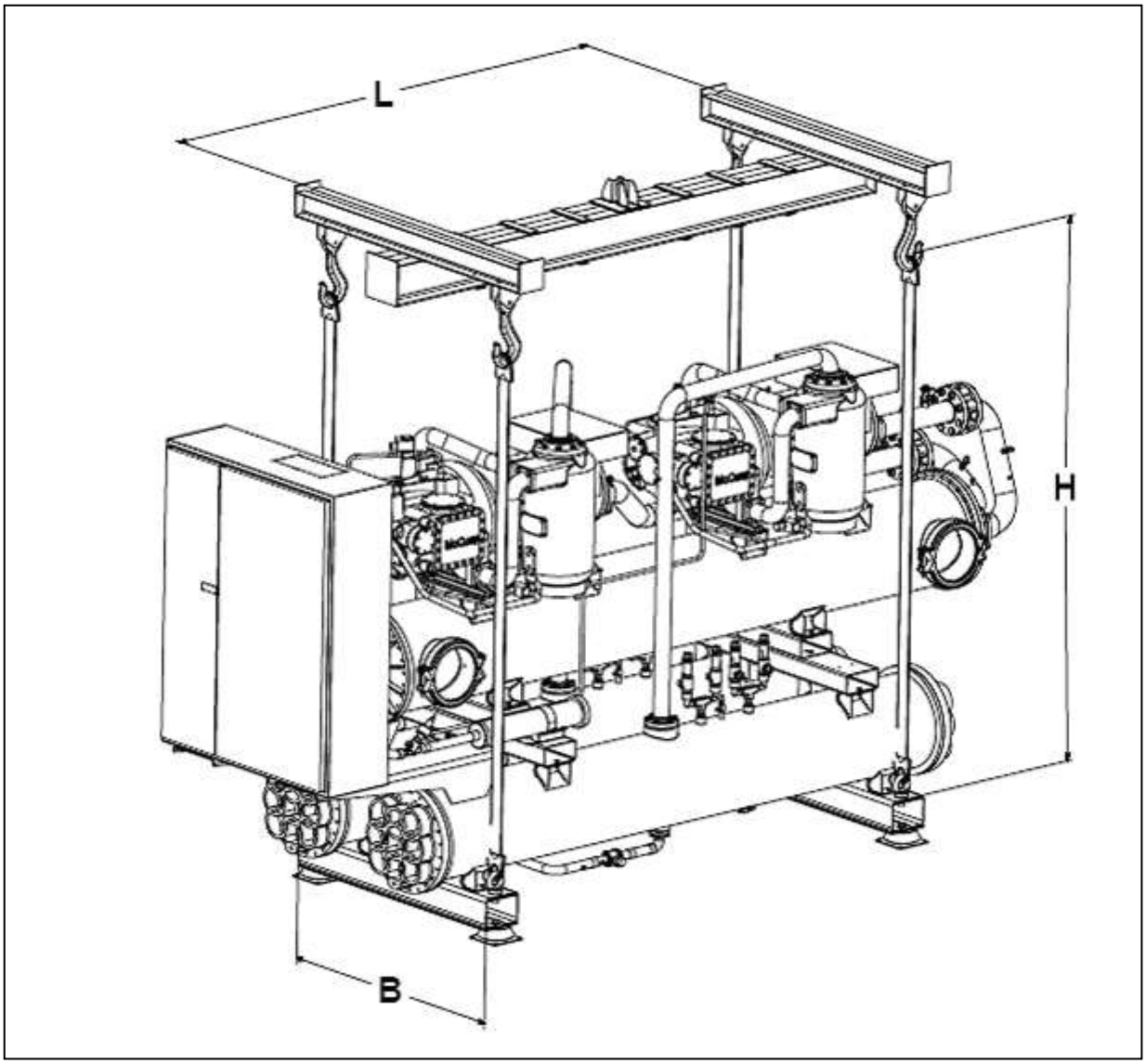


Fig. 1 - Lifting the unit

⚠ WARNING

Both the lifting ropes and the spacing bar and/or scales must be strong enough to support the machine safely. Please check the unit's weight on the machine's nameplate.
The weights shown in the "Technical data" tables in the "General Information" chapter refer to standard units.
Some specific machines might have accessories that increase their overall weight (heat recovery, etc.)

⚠ WARNING

The machine must be lifted with the utmost attention and care. Avoid jolting when lifting and lift the machine very slowly, keeping it perfectly level.

Positioning and assembly

All units are designed for installation indoors. The machine must be installed on a robust and perfectly level foundation; should the machine be installed on balconies or roofs, it might be necessary to use weight distribution beams.
For installation on the ground, prepare a strong cement base that is at least 250 mm wider and longer than the machine. Also, this base must be strong enough to support the weight of the machine as stated in the technical specifications.
If the machine is installed in places that are easily accessible to people and animals, it is advisable to install protection gratings for the compressor section.
To ensure the best possible performance on the installation site, the following precautions and instructions must be followed:

- Make sure to provide a strong and solid foundation to reduce noise and vibration as much as possible.The water in the system must be particularly clean and all traces of oil or rust must be removed. A mechanical water filter must be installed on the machine's inlet piping.

Minimum space requirements

Every side of the machine must be accessible for all post-installation maintenance activities. Figure 2 shows the minimum space necessary.

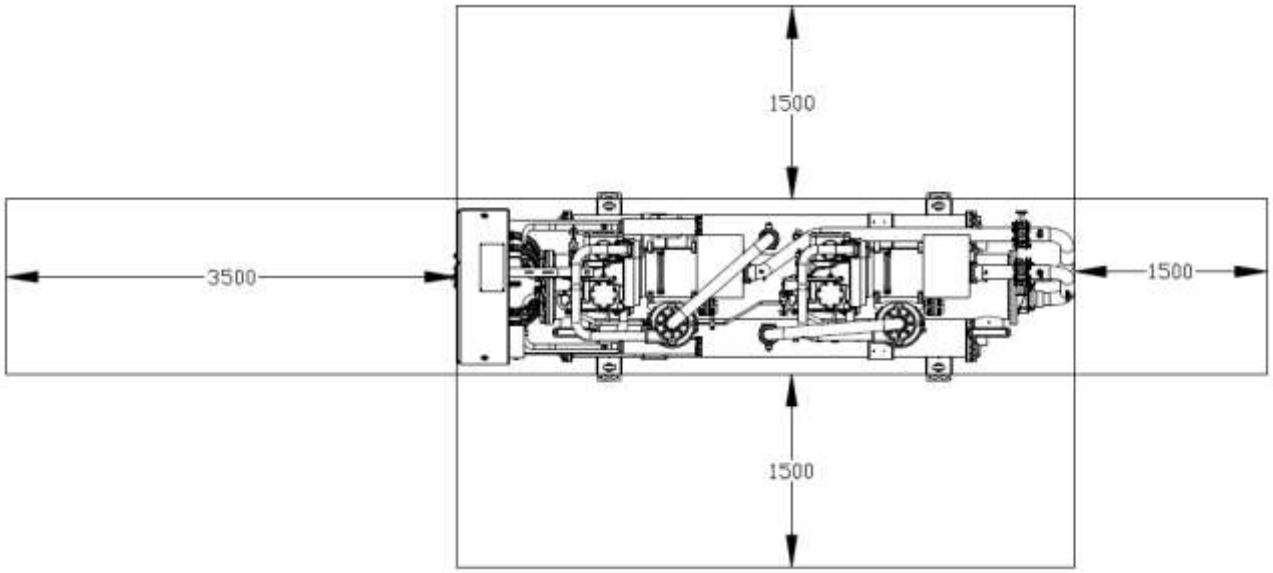


Fig. 2 – Lifting the unit

Ventilation

The temperature of the room where the unit is placed should be always maintained between 0°C and 40°C.

Sound protection

When sound levels require special control, great care must be exercised to isolate the machine from its base by appropriately applying anti-vibration elements (supplied as an option). Flexible joints must be installed on the water connections, as well.

Water piping

Piping must be designed with the lowest number of elbows and the lowest number of vertical changes of direction. In this way, installation costs are reduced considerably and system performance is improved.
The water system must have:

1. Anti-vibration mountings in order to reduce transmission of vibrations to the underlying structure.
2. Isolating valves to isolate the machine from the water system during service.
3. Manual or automatic air venting device at the system's highest point; drain device at the system's lowest point. Neither the evaporator nor the heat recovery device must be positioned at the system's highest point.
4. A suitable device that can maintain the water system under pressure (expansion tank, etc.)
5. Water temperature and pressure indicators on the machine to assist the operator during service and maintenance.
6. A filter or device which can remove debris from the water before it enters the pump (in order to prevent cavitation, please consult the pump manufacturer for the recommended type of filter). The use of a filter prolongs the life of the pump and helps keep the water system in a better condition.
7. Another filter must be installed on the machine inlet water pipe, near the evaporator and heat recovery (if installed). The filter prevents solid particles from entering the heat exchanger, as they could damage it or reduce its heat exchanging capacity.
8. If the machine is intended to replace of another, the entire water system must be emptied and cleaned before the new unit is installed. Regular tests and proper chemical treatment of water are recommended before starting up the new machine.
9. In the event that glycol is added to the water system as anti-freeze protection, pay attention to the fact that suction pressure will be lower, the machine's performance will be lower and water pressure drops will be greater. All machine-protection systems, such as anti-freeze, and low-pressure protection will need to be readjusted.
10. No system is installed on the unit to prevent water freezing in case the ambient temperature goes down below 0°C (thermal insulation is not enough to assure freezing prevent). Machine and water pipes must be protected against freezing

    Before insulating water piping, check that there are no leaks.

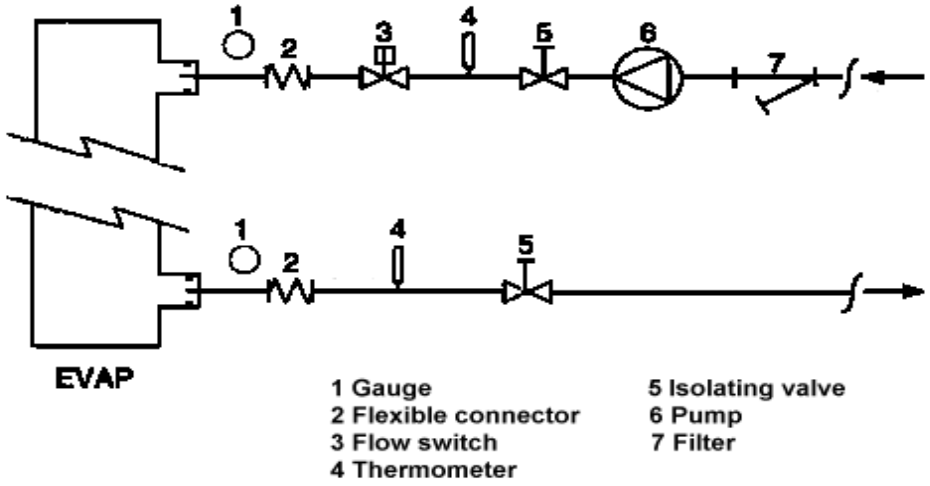


Fig. 3 - Minimum clearance requirements for machine maintenance

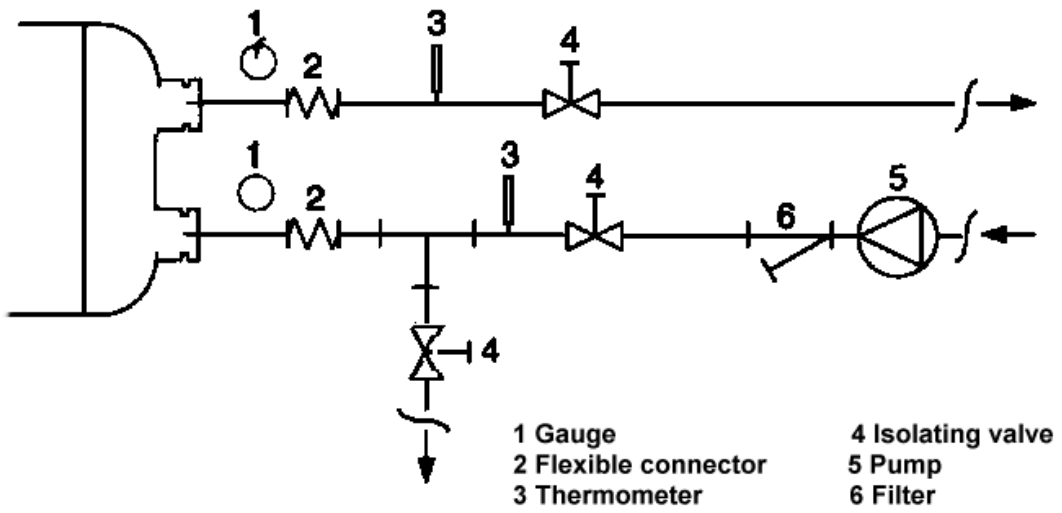


Fig. 4 - Water piping connection for condenser and heat recovery

▲ ATTENTION

Install a mechanical filter on the inlet to each heat exchanger. Failure to install a mechanical filter allows solid particles and/or welding slag to enter the exchanger. Installation of a filter with a mesh size not exceeding 0.5 – 1 mm in diameter is advised.
The manufacturer cannot be held responsible for any damage to exchangers ensuing from the lack of a mechanical filter.

Water treatment

Before putting the machine into operation, clean the water circuit. Dirt, scaling, corrosion residue and other foreign material can accumulate inside the heat exchanger and reduce its heat exchanging capacity. Pressure drops can increase as well, thus reducing water flow. Proper water treatment therefore reduces the risk of corrosion, erosion, scaling, etc. The most appropriate water treatment must be determined locally, according to the type of system and local characteristics of the process water.
The manufacturer is not responsible for damage to or malfunctioning of equipment caused by failure to treat water or by improperly treated water.

Table 1 - Acceptable water quality limits

PH (25°C)	6.8÷8.0	Total hardness (mg $CaCO_3$ / l)	< 200
Electricity conductivity μS/cm (25°C)	<800	Iron (mg Fe / l)	< 1.0
Chloride ion (mg Cl^- / l)	<200	Sulphide ion (mg S^{2-} / l)	None
Sulphate ion (mg SO^{2-}_4 / l)	<200	Ammonium ion (mg NH_4^+ / l)	< 1.0
Alkalinity (mg $CaCO_3$ / l)	<100	Silica (mg SiO_2 / l)	< 50

Evaporator and exchangers anti-freeze protection

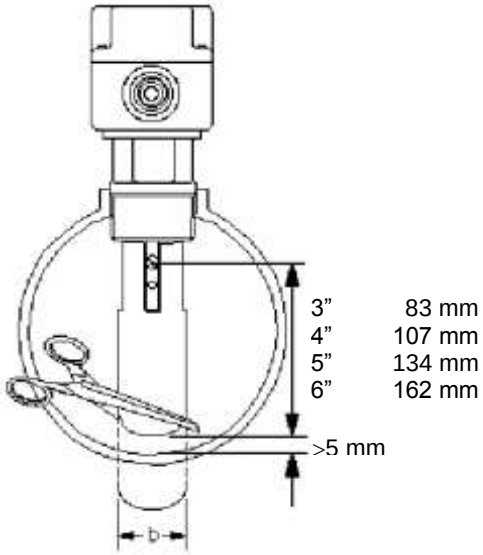
Two or more of below protection methods should be considered when designing the system as a whole:

1. Continuous water flow circulation inside piping and exchangers.
2. Addition of an appropriate amount of glycol inside the water circuit.
3. Additional heat insulation and heating of exposed piping.
4. Emptying and cleaning of the heat exchanger during the winter season.

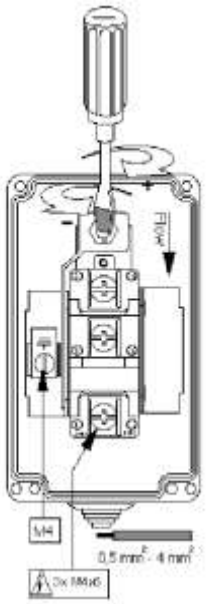
It is the responsibility of the installer and/or local maintenance personnel to ensure that two or more of the described anti-freeze methods are used. Make sure that appropriate anti-freeze protection is maintained at all times. Failure to follow the instructions above could result in damage to some of the machine's components. Damage caused by freezing is not covered by the warranty.

Installing the flow switch

To ensure sufficient water flow through the evaporator, it is essential that a flow switch be installed on the water circuit. The flow switch can be installed either on the inlet or outlet water piping. The purpose of the flow switch is to stop the machine in the event of interrupted water flow, thus protecting the evaporator from freezing.
A flow switch specifically gauged for this purpose, with identification code 131035072, is available as an option.
This paddle-type flow switch is suitable for heavy-duty outdoor applications (IP67) for pipe diameters in the range of 1" to 6".
The flow switch is provided with a clean contact which must be electrically connected to the terminals of the terminal board (check the machine's wiring diagram for further information).
For further information regarding device installation and settings, please read the instruction leaflet in the device box.



For 3” - 6” piping
Use paddle b = 29 mm



Adjusting the flow switch’s trigger sensitivity

Fig. 5 - Adjusting the safety flow switch

Refrigerating circuit safety valves

Each system comes with safety valves that are installed on each circuit, both on the evaporator and on the condenser. The purpose of the valves is to release the refrigerant inside the refrigerant circuit in the event of certain malfunctions.

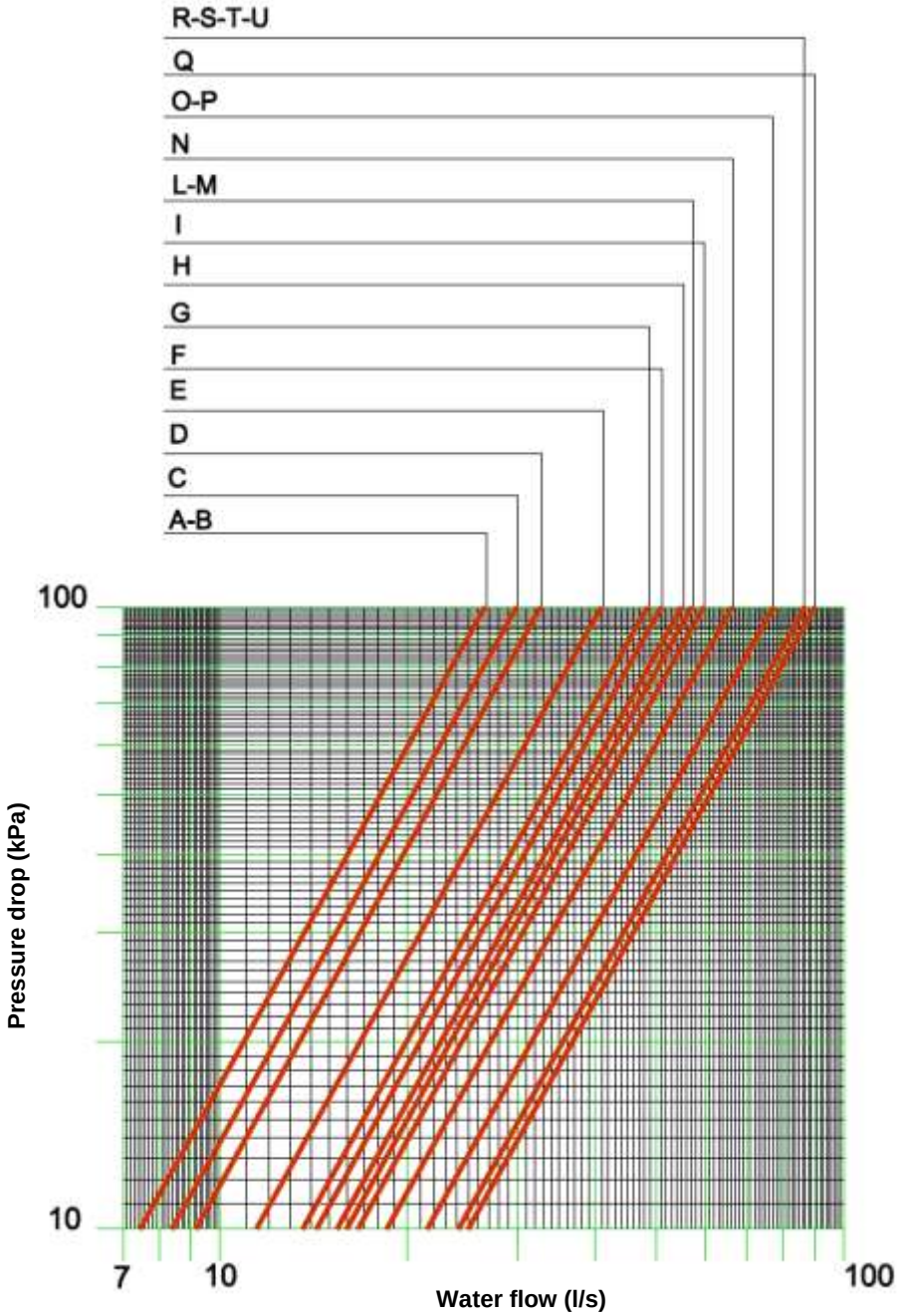
⚠ WARNING

The unit is designed for indoor installation.
Damage may be caused by inhaling the refrigerant gas. Avoid the release of the refrigerant into the atmosphere.
The safety valves must be connected to the outdoor environment. The installer is responsible for connecting the safety valves to the drainage pipes and for their correct dimensioning.
Check for adequate air circulation around the machine.

Pressure drops

Evaporator

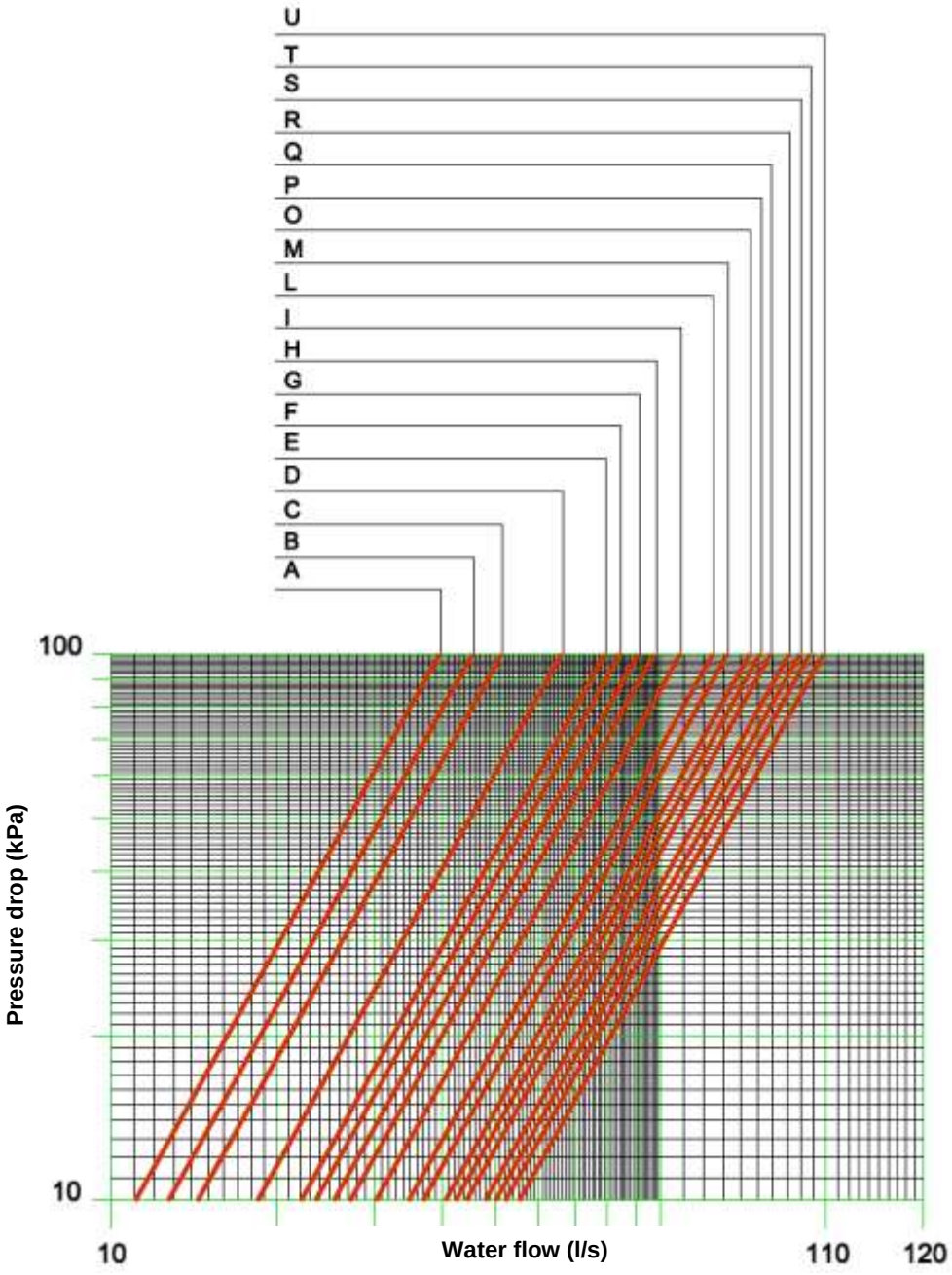
EWWD340~C18 I-SS
EWLD320~C17 I-SS



A	EWWD340 I-SS	EWLD320 I-SS	M	EWWDC10 I-SS	EWLD950 I-SS
B	EWWD400 I-SS	EWLD400 I-SS	N	--	EWLDC10 I-SS
C	EWWD460 I-SS	EWLD420 I-SS	O	EWWDC12 I-SS	EWLDC11 I-SS
D	EWWD550 I-SS	EWLD500 I-SS	P	EWWDC13 I-SS	EWLDC12 I-SS
E	EWWD650 I-SS	EWLD600 I-SS	Q	EWWDC14 I-SS	EWLDC13 I-SS
F	EWWD700 I-SS	EWLD650 I-SS	R	EWWDC15 I-SS	EWLDC14 I-SS
G	EWWD800 I-SS	EWLD750 I-SS	S	EWWDC16 I-SS	EWLDC15 I-SS
H	EWWD850 I-SS	EWLD800 I-SS	T	EWWDC17 I-SS	EWLDC16 I-SS
I	EWWD900 I-SS	EWLD850 I-SS	U	EWWDC18 I-SS	EWLDC17 I-SS
L	EWWD950 I-SS	EWLD900 I-SS			

Condenser (1 pass 4-8°C)

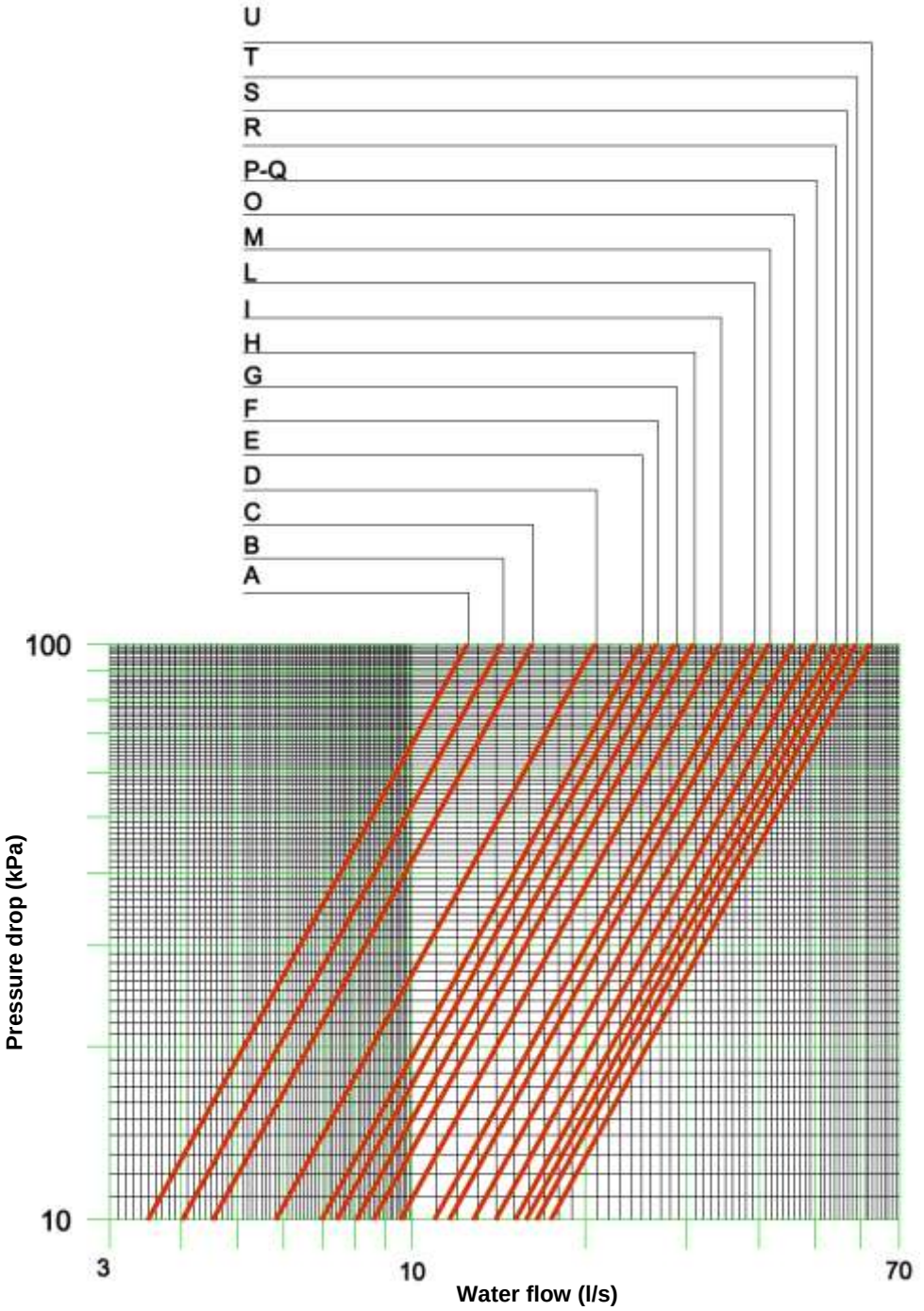
EWWD340~C18 I-SS



A	EWWD340 I-SS	L	EWWD950 I-SS
B	EWWD400 I-SS	M	EWWDC10 I-SS
C	EWWD460 I-SS	O	EWWDC12 I-SS
D	EWWD550 I-SS	P	EWWDC13 I-SS
E	EWWD650 I-SS	Q	EWWDC14 I-SS
F	EWWD700 I-SS	R	EWWDC15 I-SS
G	EWWD800 I-SS	S	EWWDC16 I-SS
H	EWWD850 I-SS	T	EWWDC17 I-SS
I	EWWD900 I-SS	U	EWWDC18 I-SS

Condenser (2 passes 9-15°C)

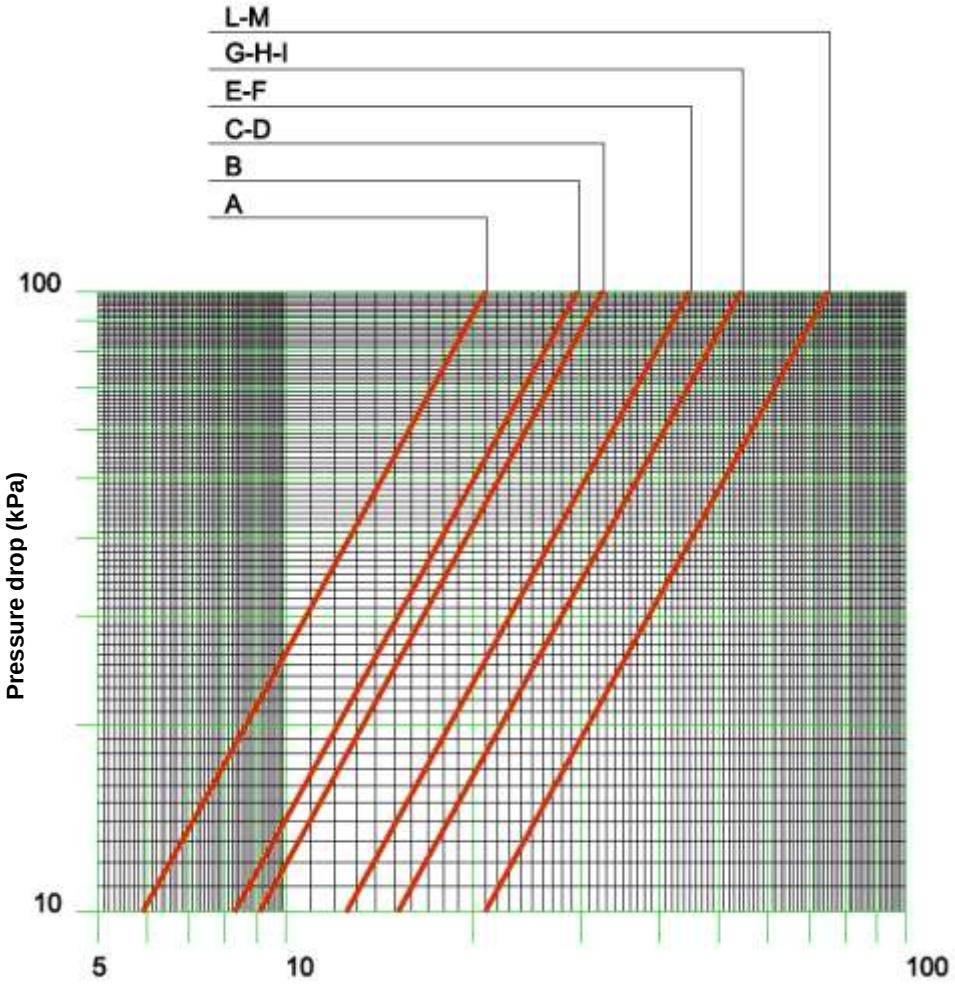
EWWD340~C18 I-SS



A	EWWD340 I-SS	L	EWWD950 I-SS
B	EWWD400 I-SS	M	EWWDC10 I-SS
C	EWWD460 I-SS	O	EWWDC12 I-SS
D	EWWD550 I-SS	P	EWWDC13 I-SS
E	EWWD650 I-SS	Q	EWWDC14 I-SS
F	EWWD700 I-SS	R	EWWDC15 I-SS
G	EWWD800 I-SS	S	EWWDC16 I-SS
H	EWWD850 I-SS	T	EWWDC17 I-SS
I	EWWD900 I-SS	U	EWWDC18 I-SS

Evaporator

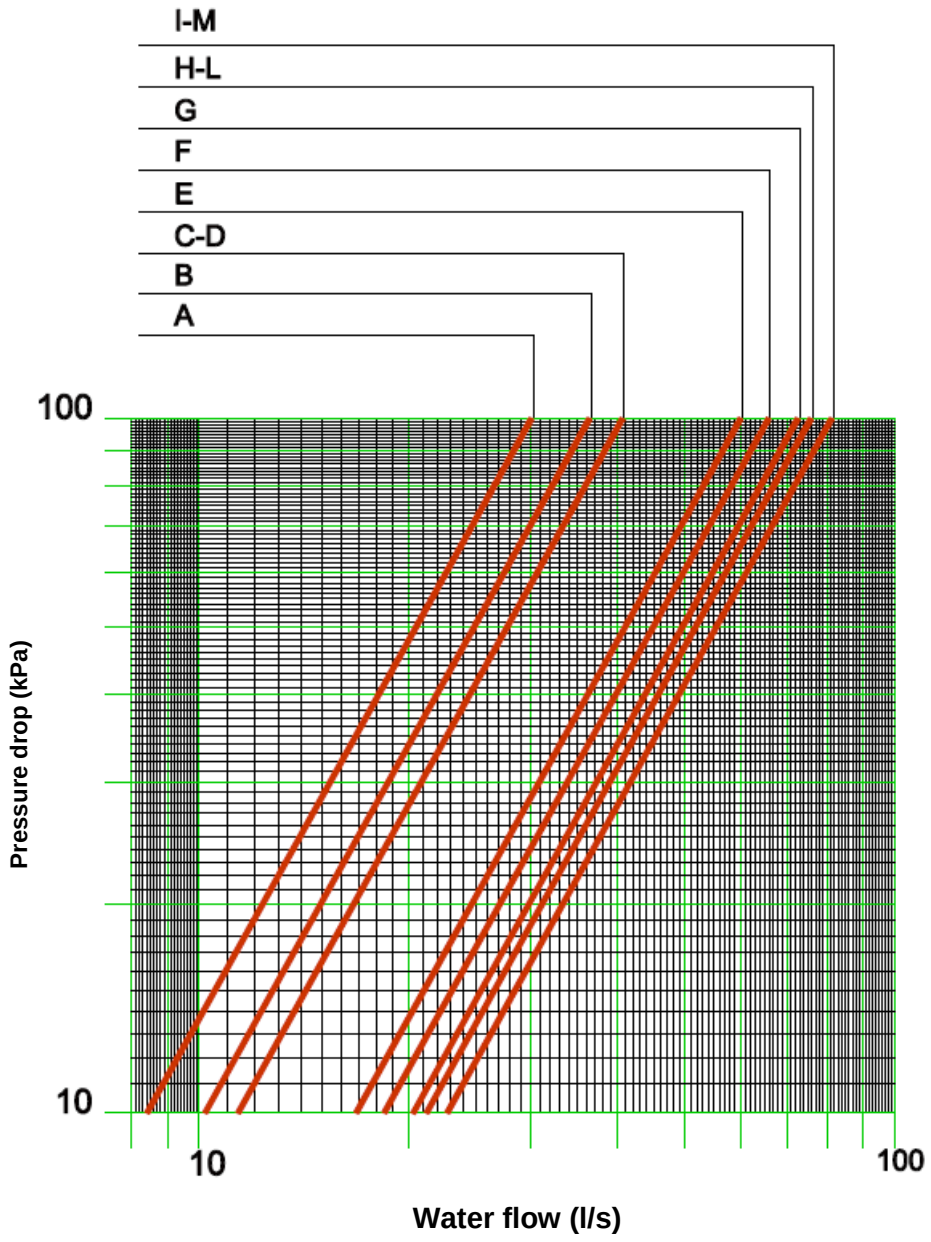
EWWD360~C12 I-XS



A	EWWD360 I-XS
B	EWWD440 I-XS
C	EWWD500 I-XS
D	EWWD600 I-XS
E	EWWD750 I-XS
F	EWWD800 I-XS
G	EWWD850 I-XS
H	EWWD950 I-XS
I	EWWDC10 I-XS
L	EWWDC11 I-XS
M	EWWDC12 I-XS

Condenser (2 passes 4-8°C)

EWWD360~C12 I-XS



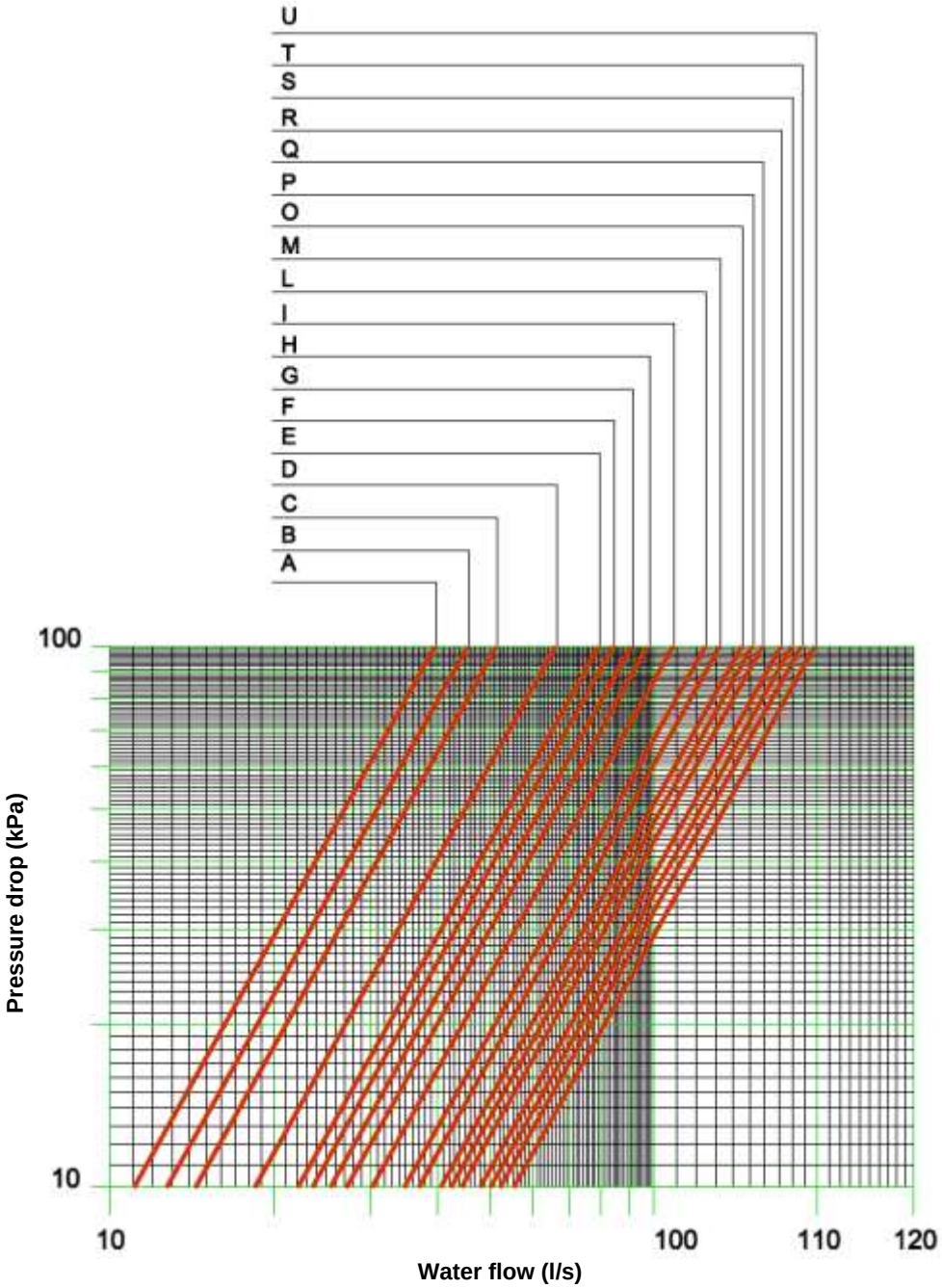
A	EWWD360 I-XS
B	EWWD440 I-XS
C	EWWD500 I-XS
D	EWWD600 I-XS
E	EWWD750 I-XS
F	EWWD800 I-XS
G	EWWD850 I-XS
H	EWWD950 I-XS
I	EWWDC10 I-XS
L	EWWDC11 I-XS
M	EWWDC12 I-XS

Total heat recovery (option on request)

Pressure drops

Condenser (1 pass 4-8°C)

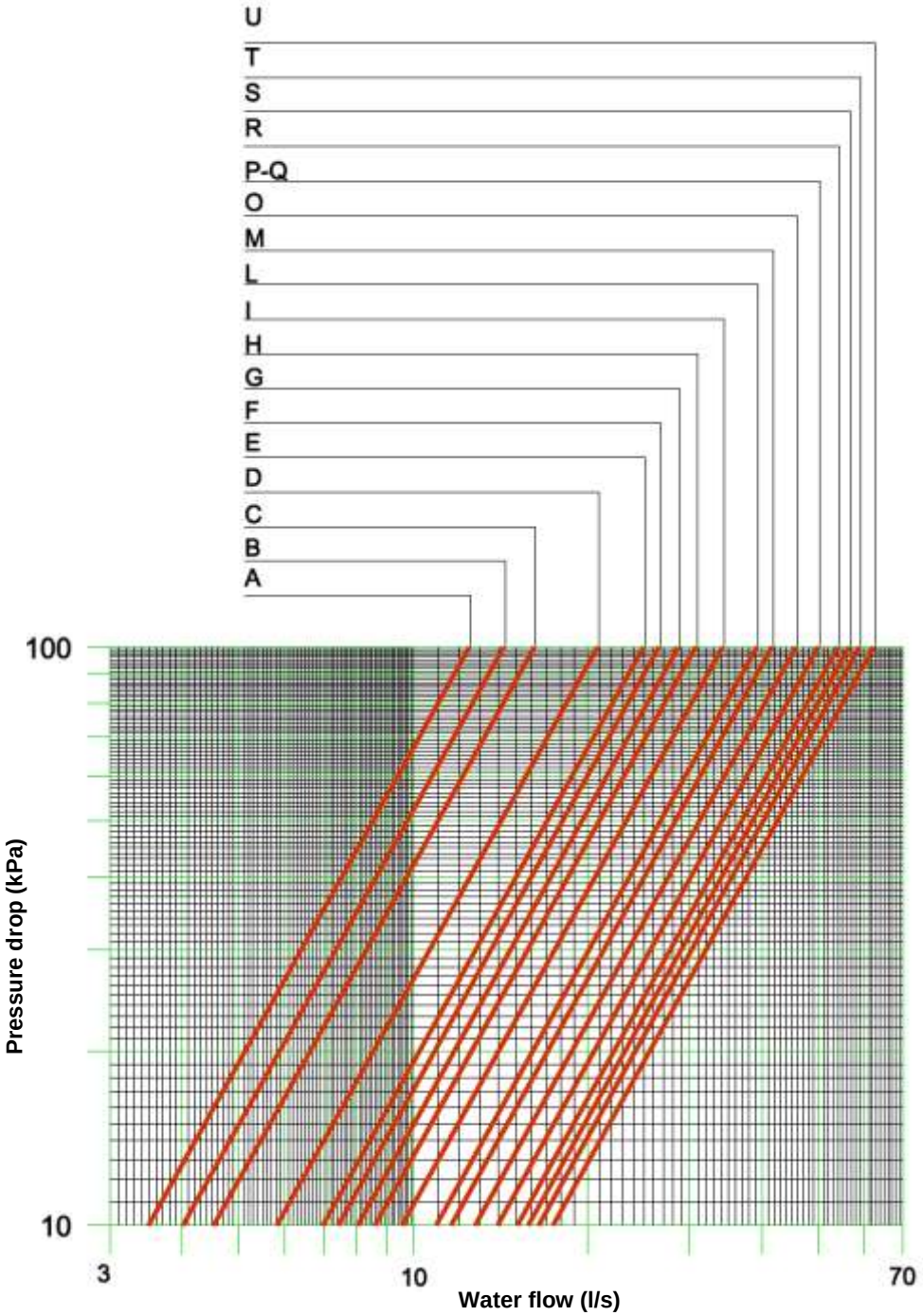
EWWD340~C18 I-SS



A	EWWD340 I-SS	L	EWWD950 I-SS
B	EWWD400 I-SS	M	EWWDC10 I-SS
C	EWWD460 I-SS	O	EWWDC12 I-SS
D	EWWD550 I-SS	P	EWWDC13 I-SS
E	EWWD650 I-SS	Q	EWWDC14 I-SS
F	EWWD700 I-SS	R	EWWDC15 I-SS
G	EWWD800 I-SS	S	EWWDC16 I-SS
H	EWWD850 I-SS	T	EWWDC17 I-SS
I	EWWD900 I-SS	U	EWWDC18 I-SS

Condenser (2 passes 9-15°C)

EWWD340~C18 I-SS

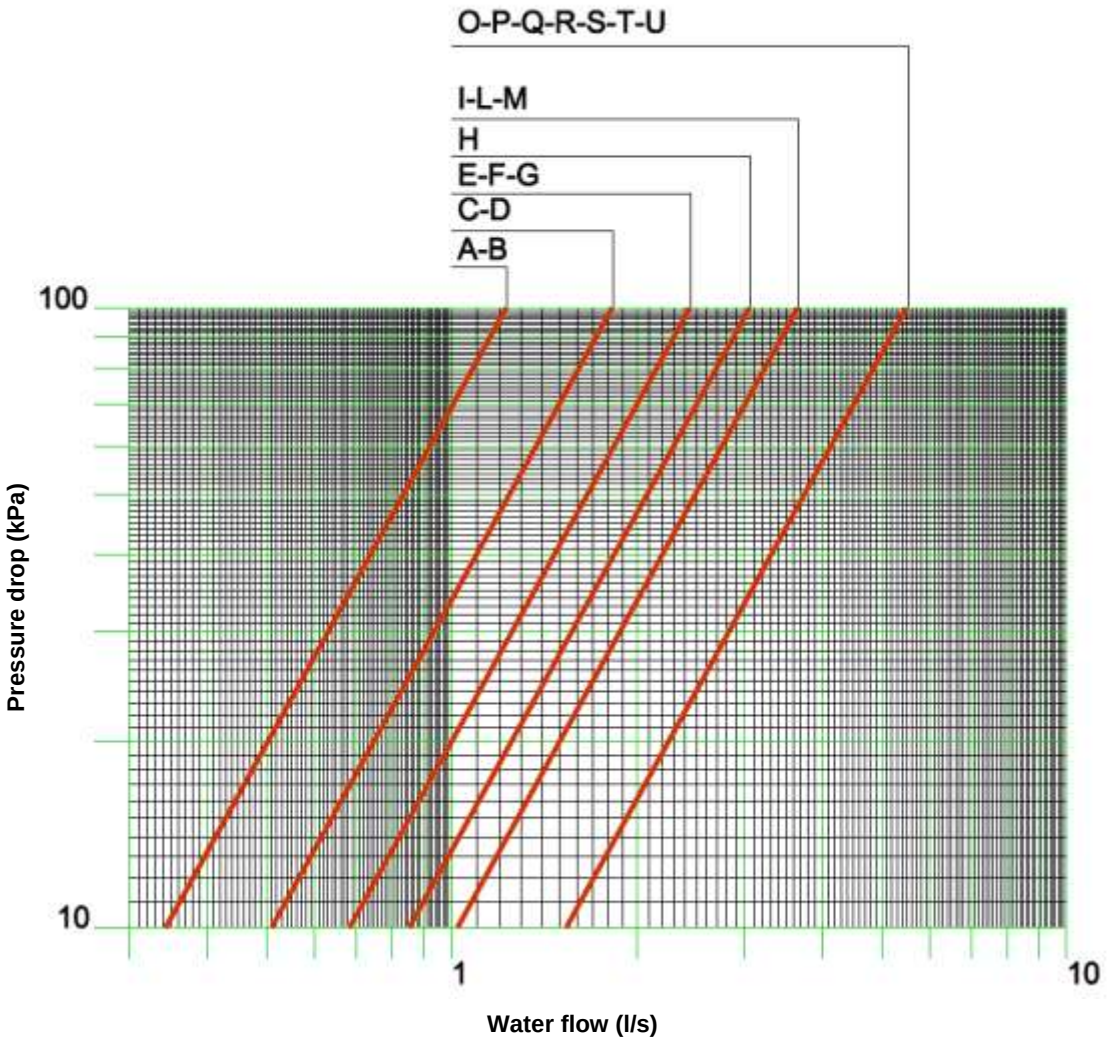


A	EWWD340 I-SS	L	EWWD950 I-SS
B	EWWD400 I-SS	M	EWWDC10 I-SS
C	EWWD460 I-SS	O	EWWDC12 I-SS
D	EWWD550 I-SS	P	EWWDC13 I-SS
E	EWWD650 I-SS	Q	EWWDC14 I-SS
F	EWWD700 I-SS	R	EWWDC15 I-SS
G	EWWD800 I-SS	S	EWWDC16 I-SS
H	EWWD850 I-SS	T	EWWDC17 I-SS
I	EWWD900 I-SS	U	EWWDC18 I-SS

Partial Heat recovery (option on request)

Pressure drops

EWWD340~C18 I-SS



A	EWWD340 I-SS	L	EWWD950 I-SS
B	EWWD400 I-SS	M	EWWDC10 I-SS
C	EWWD460 I-SS	O	EWWDC12 I-SS
D	EWWD550 I-SS	P	EWWDC13 I-SS
E	EWWD650 I-SS	Q	EWWDC14 I-SS
F	EWWD700 I-SS	R	EWWDC15 I-SS
G	EWWD800 I-SS	S	EWWDC16 I-SS
H	EWWD850 I-SS	T	EWWDC17 I-SS
I	EWWD900 I-SS	U	EWWDC18 I-SS

Electrical Installation

General specifications

⚠ CAUTION

All electrical connections to the machine must be carried out in compliance with applicable laws and regulations.
All installation, operating and maintenance activities must be carried out by qualified personnel.
Please refer to the specific wiring diagram for the machine that you have purchased and which was sent with the unit.
Should the wiring diagram not appear on the machine or should it have been lost, please contact your dealer who will provide for a copy to be forwarded.

⚠ CAUTION

Use copper conductors only. Use of conductors in any material other than copper could cause overheating or corrosion at the connection points and damage the unit.
To avoid interference, all control wires must be installed separately from the power cables. Use separate electrical conduits for this purpose.

⚠ CAUTION

Before servicing the machine in any way, open the main disconnecting switch on the machine's main power supply.
When the machine is off but the disconnector switch is in the closed position, unused circuits are live, as well.

⚠ CAUTION

Concurrence of single-phase and three-phase charges and unbalance between phases can cause leakages towards ground of up to 150 mA during the normal operation of the units of the series.

If the unit includes devices that cause superior harmonics (such as VFD and phase cut), the leakage towards ground could increase to very high values (about 2 Ampere).

The protections for the power supply system must be designed in accordance with the above mentioned values.

The area where unit is installed has to be restricted accessible by authorized personnel only.

Electrical data

EWWD I-SS	Maximum Current for wires sizing	Maximum Starting Current (a)	Power factor at nominal conditions	Main Switch	Short Circuit Current	Maximum Compressor Current Circuit 1	Maximum Compressor Current Circuit 2	Maximum Compressor Current Circuit 3	Compressor Inrush Current Circuit 1	Compressor Inrush Current Circuit 2	Compressor Inrush Current Circuit 3	Compressor Fuse Circuit 1	Compressor Fuse Circuit 2	Compressor Fuse Circuit 3	Control Transformer	Control Circuit Breaker
340	224	330	0.88	400 A	25 kA	204	-	-	330	-	-	250A gG	-	-	500 VA	4A
400	256	464	0.86	400 A	25 kA	233	-	-	464	-	-	315A gG	-	-	500 VA	4A
460	298	464	0.88	400 A	25 kA	271	-	-	464	-	-	315A gG	-	-	500 VA	4A
550	328	464	0.90	400 A	25 kA	299	-	-	464	-	-	355A gG	-	-	500 VA	4A
650	448	493	0.87	630 A	25 kA	204	204	-	330	330	-	250A gG	250A gG	-	500 VA	4A
700	480	627	0.86	630 A	25 kA	204	233	-	330	464	-	250A gG	315A gG	-	500 VA	4A
800	512	650	0.86	630 A	25 kA	233	233	-	464	464	-	315A gG	315A gG	-	500 VA	4A
850	554	681	0.87	630 A	25 kA	233	271	-	464	464	-	315A gG	315A gG	-	500 VA	4A
900	597	681	0.88	800 A	25 kA	271	271	-	464	464	-	315A gG	315A gG	-	500 VA	4A
950	627	703	0.89	800 A	25 kA	271	299	-	464	464	-	315A gG	355A gG	-	500 VA	4A
C10	657	703	0.89	800 A	25 kA	299	299	-	464	464	-	355A gG	355A gG	-	500 VA	4A
C12	768	836	0.86	1000 A	25 kA	233	233	233	464	464	464	315A gG	315A gG	315A gG	1000 VA	8A
C13	810	867	0.86	1000 A	25 kA	233	233	271	464	464	464	315A gG	315A gG	315A gG	1000 VA	8A
C14	853	898	0.87	1000 A	25 kA	233	271	271	464	464	464	315A gG	315A gG	315A gG	1000 VA	8A
C15	895	898	0.88	1250 A	25 kA	271	271	271	464	464	464	315A gG	315A gG	315A gG	1000 VA	8A
C16	925	920	0.88	1250 A	25 kA	271	271	299	464	464	464	315A gG	315A gG	355A gG	1000 VA	8A
C17	955	942	0.89	1250 A	25 kA	271	299	299	464	464	464	315A gG	355A gG	355A gG	1000 VA	8A
C18	985	942	0.89	1250 A	25 kA	299	299	299	464	464	464	355A gG	355A gG	355A gG	1000 VA	8A

EWWD I-XS	Maximum Current for wires sizing	Maximum Starting Current (a)	Power factor at nominal conditions	Main Switch	Short Circuit Current	Maximum Compressor Current Circuit 1	Maximum Compressor Current Circuit 2	Maximum Compressor Current Circuit 3	Compressor Inrush Current Circuit 1	Compressor Inrush Current Circuit 2	Compressor Inrush Current Circuit 3	Compressor Fuse Circuit 1	Compressor Fuse Circuit 2	Compressor Fuse Circuit 3	Control Transformer	Control Circuit Breaker
360	224	330	0.88	400 A	25 kA	204	-	-	330	-	-	250A gG	-	-	500 VA	4A
440	256	464	0.86	400 A	25 kA	233	-	-	464	-	-	315A gG	-	-	500 VA	4A
500	298	464	0.88	400 A	25 kA	271	-	-	464	-	-	315A gG	-	-	500 VA	4A
600	328	464	0.90	400 A	25 kA	299	-	-	464	-	-	355A gG	-	-	500 VA	4A
750	448	493	0.87	630 A	25 kA	204	204	-	330	330	-	250A gG	250A gG	-	500 VA	4A
800	480	627	0.86	630 A	25 kA	204	204	-	330	464	-	250A gG	315A gG	-	500 VA	4A
850	512	650	0.86	630 A	25 kA	233	233	-	464	464	-	315A gG	315A gG	-	500 VA	4A
950	554	681	0.87	630 A	25 kA	233	271	-	464	464	-	315A gG	315A gG	-	500 VA	4A
C10	597	681	0.88	800 A	25 kA	271	271	-	464	464	-	315A gG	315A gG	-	500 VA	4A
C11	627	703	0.89	800 A	25 kA	271	299	-	464	464	-	315A gG	355A gG	-	500 VA	4A
C12	657	703	0.89	800 A	25 kA	299	299	-	464	464	464	355A gG	355A gG	-	500 VA	4A

EWLD I-SS	Maximum Current for wires sizing	Maximum Starting Current (a)	Power factor at nominal conditions	Main Switch	Short Circuit Current	Maximum Compressor Current Circuit 1	Maximum Compressor Current Circuit 2	Maximum Compressor Current Circuit 3	Compressor Inrush Current Circuit 1	Compressor Inrush Current Circuit 2	Compressor Inrush Current Circuit 3	Compressor Fuse Circuit 1	Compressor Fuse Circuit 2	Compressor Fuse Circuit 3	Control Transformer	Control Circuit Breaker
320	224	330	0.88	400 A	25 kA	204	-	-	330	-	-	250A gG	-	-	500 VA	4A
400	256	464	0.86	400 A	25 kA	233	-	-	464	-	-	315A gG	-	-	500 VA	4A
420	298	464	0.88	400 A	25 kA	271	-	-	464	-	-	315A gG	-	-	500 VA	4A
500	328	464	0.90	400 A	25 kA	299	-	-	464	-	-	355A gG	-	-	500 VA	4A
600	448	493	0.87	630 A	25 kA	204	204	-	330	330	-	250A gG	250A gG	-	500 VA	4A
650	480	627	0.86	630 A	25 kA	204	233	-	330	464	-	250A gG	315A gG	-	500 VA	4A
750	512	650	0.86	630 A	25 kA	233	233	-	464	464	-	315A gG	315A gG	-	500 VA	4A
800	554	681	0.87	630 A	25 kA	233	271	-	464	464	-	315A gG	315A gG	-	500 VA	4A
850	597	681	0.88	800 A	25 kA	271	271	-	464	464	-	315A gG	315A gG	-	500 VA	4A
900	627	703	0.89	800 A	25 kA	271	299	-	464	464	-	315A gG	355A gG	-	500 VA	4A
950	657	703	0.89	800 A	25 kA	299	299	-	464	464	-	355A gG	355A gG	-	500 VA	4A
C10	737	836	0.86	1000 A	25 kA	204	233	233	303	464	464	250A gG	315A gG	315A gG	1000 VA	8A
C11	768	836	0.86	1000 A	25 kA	233	233	233	464	464	464	315A gG	315A gG	315A gG	1000 VA	8A
C12	810	867	0.86	1000 A	25 kA	233	233	271	464	464	464	315A gG	315A gG	315A gG	1000 VA	8A
C13	853	898	0.87	1000 A	25 kA	233	271	271	464	464	464	315A gG	315A gG	315A gG	1000 VA	8A
C14	895	898	0.88	1250 A	25 kA	271	271	271	464	464	464	315A gG	315A gG	315A gG	1000 VA	8A
C15	925	920	0.88	1250 A	25 kA	271	271	299	464	464	464	315A gG	315A gG	355A gG	1000 VA	8A
C16	955	942	0.89	1250 A	25 kA	299	299	299	464	464	464	315A gG	355A gG	355A gG	1000 VA	8A
C17	985	942	0.89	1250 A	25 kA	299	299	299	464	464	464	355A gG	355A gG	355A gG	1000 VA	8A

Electrical components

All power and interface electrical connections are specified in the wiring diagram that is shipped with the machine.
The installer must supply the following components:

- Power supply wires (dedicated conduit)
- Interconnection and interface wires (dedicated conduit)
- Thermal-magnetic circuit breaker of suitable size (please see electrical data).

Electrical wiring

Power circuit:

Connect the electrical power supply cables to the terminals of the general circuit breaker on the machine's terminal board. The access panel must have a hole of appropriate diameter for the cable used and its cable gland. A flexible conduit can also be used, containing the three power phases plus earth.
In any case, absolute protection against any water penetrating through the connection point must be ensured.

Control circuit:

Every machine of the series is supplied with an auxiliary 400/115V control circuit transformer. No additional cable for the control system power supply is thus required.
Only if the optional separate accumulation tank is requested, the electrical anti-freeze resistance must have a separate power supply.

Oil Heaters

Each circuit has an electrical resistance installed in the compressor, whose purpose is to keep the oil warm thus preventing the presence of liquid refrigerant mixed with the oil in the compressor. Obviously, the operation of the electrical resistance is guaranteed only if there is a constant power supply. If it is not possible to keep the machine powered when inactive during winter, apply at least two of the procedures described in the "Mechanical Installation" section under the "Anti-freeze protection of evaporator and exchangers".

If the plant uses pumps outside the machine (not supplied with the unit), the power line of each pump must be provided with a magnetothermic switch and a control switch.

Water pump control

Connect the control contactor coil power supply to terminals 27 and 28 (pump #1) and 401 and 402 (pump 2) located on terminal board M3, and install the contactor on a power supply having the same voltage as the pump contactor coil. The terminals are connected to a clean microprocessor contact.
The microprocessor contact has the following commutation capacity:

Maximum voltage:	250 Vac
Maximum current:	2 A Resistive - 2 A Inductive
Reference standard:	EN 60730-1

The wiring described above allows the microprocessor to manage the water pump automatically. It is good practice to install a clean status contact pump's thermal-magnetic circuit breaker and to connect it in series with the flow switch.

Alarm relays – Electrical wiring

The machine has a clean-contact digital output that changes state whenever an alarm occurs in one of the refrigerant circuits. Connect this signal to an external visual, sound alarm or to the BMS in order to monitor its operation. See the machine's wiring diagram for wiring.

Unit On/Off remote control – Electrical wiring

The machine has a digital input that allows remote control. A startup timer, a circuit breaker or a BMS can be connected to this input. Once the contact has been closed, the microprocessor launches the startup sequence by first turning on the water pump and then the compressors. When the contact is opened the microprocessor launches the machine shutdown sequence. The contact must be clean.

Double Setpoint – Electrical wiring

The Double Setpoint function allows to change over the unit setpoint between two predefined values in the unit controller. An example of an application is ice production during the night and standard operation during the day. Connect a circuit breaker or timer between terminals 5 and 21 of terminal board M3. The contact must be clean.

External water Setpoint reset – Electrical wiring (Optional)

The machine's local setpoint can be modified by means of an external analogue 4-20 mA signal. Once this function has been enabled, the microprocessor allows to modify the setpoint from the set local value up to a differential of 3°C. 4 mA corresponds to a 0°C differential, 20 mA corresponds to the setpoint plus the maximum differential.
The signal cable must be directly connected to terminals 35 and 36 of the M3 terminal board.
The signal cable must be of the shielded type and must not be laid in the vicinity of the power cables, so as not to induce interference with the electronic controller.

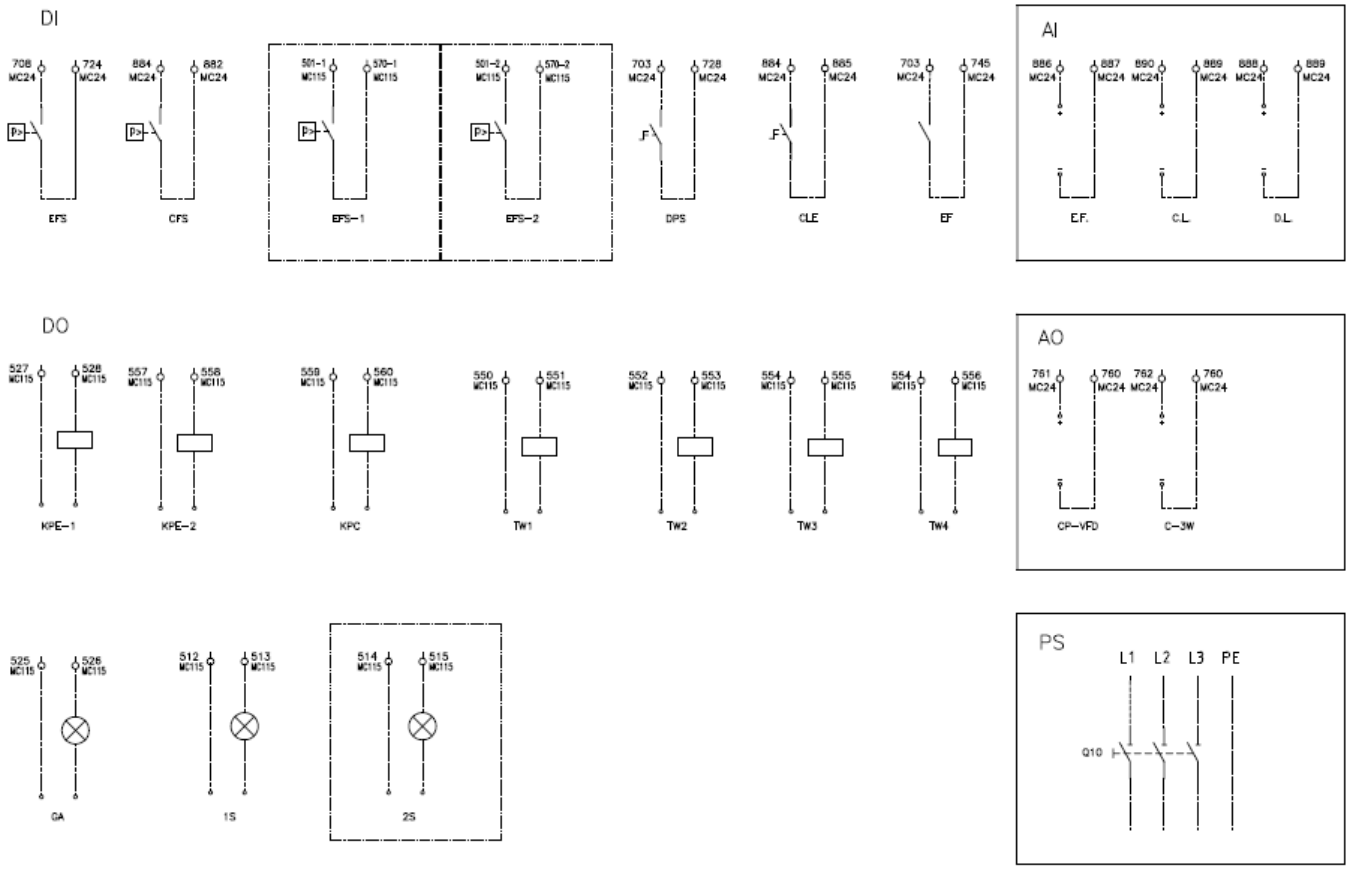
Unit limitation – Electrical wiring (Optional)

The machine's microprocessor allows to limit the capacity by means of two separate criteria:

- >Load limitation: The load can be varied by means of a 4-20 mA external signal from a BMS.
  The signal cable must be directly connected to terminals 36 and 37 of the M3 terminal board.
  The signal cable must be of the shielded type and must not be laid in the vicinity of the power cables, so as not to induce interference with the electronic controller.
- Current limitation: The machine's load can be varied by means of a 4-20 mA external signal from an external device. In this case, current control limits must be set on the microprocessor so that the microprocessor transmits the value of the measured current and limits it.
  The signal cable must be directly connected to terminals 36 and 37 of the M3 terminal board.
  The signal cable must be of the shielded type and must not be laid in the vicinity of the power cables, so as not to induce interference with the electronic controller.
  A digital input allows to enable the current limitation at the desired time. Connect the enabling switch or the timer (clean contact) to terminals 5 and 9.

Attention: the two options cannot be enabled simultaneously. Setting one function excludes the other.

Fig. 6 - User connection to the interface terminal board



LEGEND

1S	Compressor Status 1
2S	Compressor Status 2
AI	Analog Inputs
AO	Analog Output
C-3W	Condenser 3-Way Valve
C.L.	Current Limit
CFS	Condensator Flow Switch
CLE	Current Limit Enable
CP-VFD	Condenser Pump VFD
D.L.	Demand Limit
DI	Digital Inputs
DO	Digital Outputs
DPS	Double Set Point
EF	Esternal Fault
EFS	Evaporator Flow Switch
EFS-1	Evaporator Flow Switch 1
EFS-2	Evaporator Flow Switch 2
GA	General Alarm
KPC	Condensator Water Pump
KPE-1	Evaporator Water Pump 1
KPE-2	Evaporator Water Pump 2
PS	Power Supply
Q10	Main Switch
S.O.	Setpoint Override
TW1	Tower 1 Fan Step
TW2	Tower 2 Fan Step
TW3	Tower 3 Fan Step
TW4	Tower 4 Fan Step

Guidelines for remote condenser application

Design of remote condenser application, and, in particular, sizing of piping and piping path, is a responsibility of plant designer. This paragraph is only focused to give suggestion to plant designer, this suggestions have to be weighted with references to application peculiarities.

For remote condenser application, such as air-cooled or evaporative condensers, the chillers are shipped with holding R134a charge. It is important that the unit be kept tightly closed until the remote condenser is installed and piped to the unit.
Chillers are supplied with filter drier, moisture indicator and expansion valve factory mounted as standard.

It is the contractor's responsibility to install the interconnection piping, leak test it and the entire system, evacuate the system and supply the refrigerant charge.

All piping must be conform to the applicable local and state codes.
Use refrigerant grade copper tubing only and isolate the refrigeration lines from building structures to prevent transfer of vibration.
It is important that the discharge lines be looped at the condenser and trapped at the compressor to prevent refrigerant and oil from draining into the compressors; looping the discharge line also provide greater flexibility.

Do not use a saw to remove end caps. This might allow copper chips to contaminate the system. Use a tube cutter or heat to remove caps. When sweating copper joints it is important to flow dry nitrogen through the system prior to charging with refrigerant. This prevents scale formation and the possible formation of an explosive mixture of HFC-134a and air. This will also prevent the formation of toxic phosgene gas, which occurs when HFC-134a is exposed to open flame.
Soft solders are not to be used. For copper-to-copper joints use a phos-copper solder with 6% to 8% silver content. A high silver content brazing rod must be used for copper-to-brass or copper-to-steel joints. Only use oxy-acetylene brazing.

After the equipment is correctly installed, leak tested and evacuated , it can be charged with R134a refrigerant and started under the supervision of Daikin authorized technician.

Charge will be added until the liquid line sight glass is clear, with no bubbles flowing into the expansion valve. Total refrigerant charge will depend on the used remote condenser and volume of refrigerant piping

Refrigerant piping design

The system can be configured in any of the main arrangements as shown in Figures 7, 8 and 9. The configuration and its associated elevation, along with the total distance between the chiller and the air-cooled condenser are important factors in determining the liquid line and discharge line sizes. This will also affect the field refrigerant charges. Consequently, there are physical limits that must not be violated if the system is to operate as designed.

1. The total distance between the chiller and the air-cooled condenser should not exceed 60 equivalent meters
2. Liquid line risers must not exceed 5 meters in height from the condenser liquid line connection.
3. Discharge line risers cannot exceed an elevation difference greater than 30 actual meters.

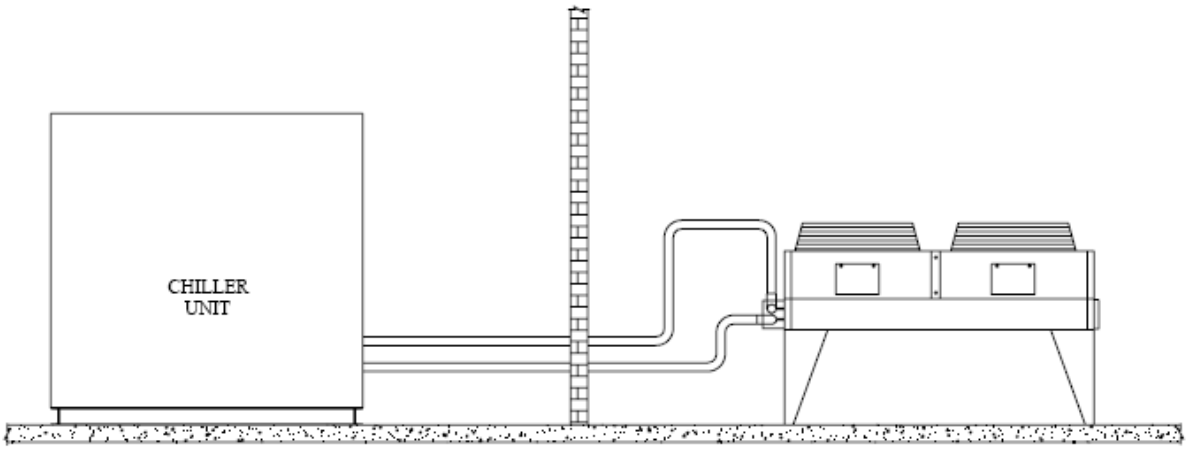


Fig. 7 - Condenser Located with No Elevation Difference

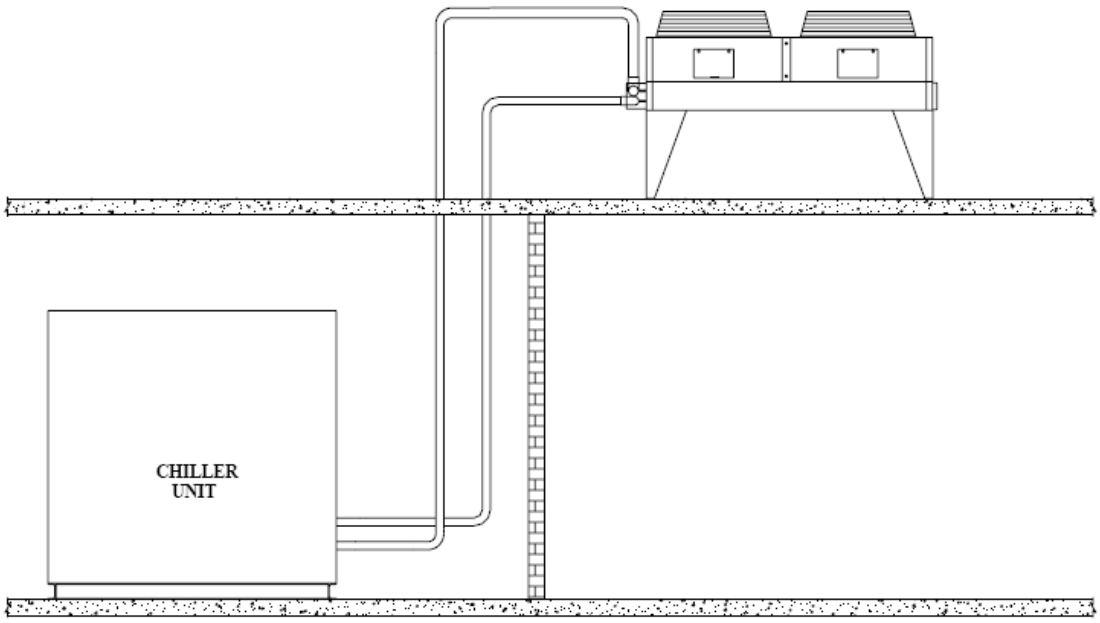


Fig. 8 - Condenser Located above Chiller Unit

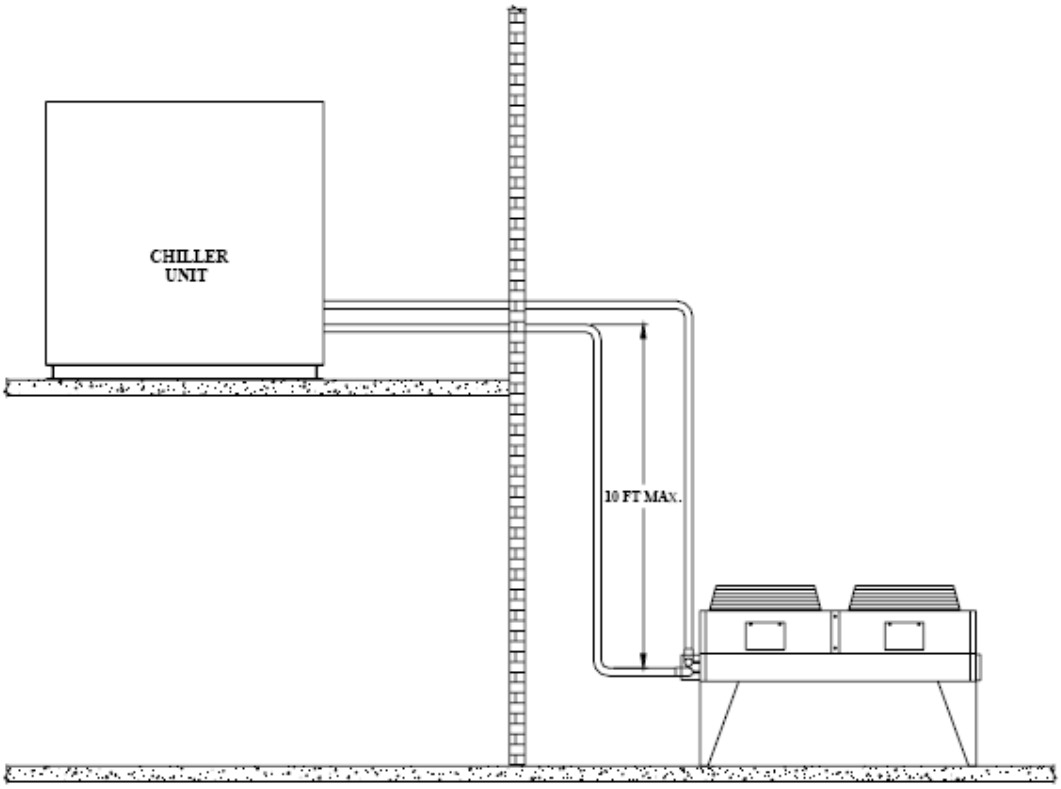


Fig. 9 - Condenser Located below Chiller Unit

Determining Equivalent Line Length

To determine the appropriate size for field installed liquid and discharge lines, it is first necessary to establish the equivalent length of pipe for each line. The equivalent length is the actual friction loss from the linear run of pipe plus the added friction loss of elbows, valves, etc. Table 2 shows the equivalent length of pipe for various nonferrous valves and fittings. Follow these steps when calculating line size:

1. Start with an initial approximation of equivalent length by assuming that the equivalent length of pipe is 1.5 times the actual pipe length.
2. Refer to Tables 2 and 3 for a first approximation of line size.
3. Check the line size by calculating the actual equivalent length.

Note: When calculating the equivalent length, do not include piping of the chiller unit. Only field piping must be considered.

Table 2 - Equivalent Lengths (in meters)

Line Size OD (inches)	Angle Valve	Short Radius EL	Long Radius EL
1/4	5.8	0.8	0.6
3/8	7.3	1.2	0.9
1/2	7.3	1.4	1.0
5/8	7.6	1.7	1.2
3/4	7.6	2.0	1.4
7/8	8.5	2.4	1.6
1-1/8	8.8	0.8	0.6
1-3/8	10.1	1.0	0.7
1-5/8	10.4	1.2	0.8
2-1/8	11.9	1.6	1.0
2-5/8	13.4	2.0	1.3
3-1/8	14.3	2.4	1.6

Liquid Line Sizing

In designing liquid lines it is important that the liquid reaches the expansion valve without flash gas, since this gas will reduce the valve capacity. Because flashing gas can be caused by pressure drop in the line, the pressure losses due to friction and changes in static head should be kept at minimum.

A check valve must be installed in the liquid line where the ambient temperature can drop below the equipment room temperature to prevent liquid migration to the condenser and to maintain liquid refrigerant in the line for unit startup (if thermostatic expansion valve is used, the check valve also help to keep liquid pressure high enough to keep the valve closed with compressor off).
A relief valve should be installed between the check valve and the expansion avlve.

The liquid line diameter should be as small as possible while maintaining acceptable pressure drop. This is necessary to minimize refrigerant charge. The total length between the chiller unit and the air-cooled condenser must not exceed 60 equivalent meters.

Liquid line risers in the system will require an additional 11.5 kPa pressure drop per meter of vertical rise. When it is necessary to have a liquid line riser, make the vertical run immediately after the condenser before any additional restrictions. The liquid line risers must not exceed 3 meters in height from the condenser liquid line connection (see Figure 22). The liquid line does not have to be pitched.

Liquid lines are not typically insulated. However, if the lines are exposed to solar heat gain or temperatures exceeding 43°C, sub-cooling may be effected. In these situations, insulate the liquid lines.

Reference for liquid line sizing is shown in Table 3. It has to be used for reference only, for circuit working with condensing temperature equal to 55°C and 5°C subcooling at the condenser outlet. Line dimensioning is responsibility of plant designer, use ASHRAE Refrigeration Handbook or other suitable design guide.

Table 3 - Liquid line sizes

Circuit Capacity	Total Equivalent Length (meters)								
kW	5	10	15	20	25	30	40	50	60
300	1-1/8	1-1/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-5/8	1-5/8
350	1-1/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-5/8	1-5/8	1-5/8
400	1-1/8	1-3/8	1-3/8	1-3/8	1-3/8	1-5/8	1-5/8	1-5/8	1-5/8
450	1-1/8	1-3/8	1-3/8	1-3/8	1-5/8	1-5/8	1-5/8	2-1/8	2-1/8

Discharge (Hot Gas) Line Sizing

Discharge line size is based on the velocity needed for proper chiller operation handling oil properly and protecting compressor from damage that can result from condensing liquid refrigerant during shutdown.

Total friction loss for discharge line from 20 to 40 kPa is considered good design. Carefully consideration must be given for sizing each section of piping so that gas velocities are sufficient at all operating conditions to carry oil.

If the velocity in a vertical discharge riser is to low, considerable oil can collect in the riser and horizontal header, causing compressor to lose oil and it can result in compressor damage due to lack of oil. When the compressor load (and the gas velocity in the discharge line) increase the oil collected during reduced load can be carried out in a slug back to the compressor causing damage.
Any discharge lines coming into and horizontal header should rise above the centerline of the header.
The discharge lines should pitch downward, in the direction of the hot gas flow, at the rate of 6 mm per meter of horizontal run. This is necessary to move by gravity any oil lying in the header. Oil pockets should be avoided because oil would collect at such points an the compressor can become starved.

If the chiller unit is below condenser, loop the discharge line to at least 2.5 cm above the top of the condenser. A pressure tap valve should be installed at the condenser to facilitate measuring pressure for service.

A relief valve should be installed on the discharge line.

Reference for discharge line sizing is shown in Table 9. It has to be used for reference only, for circuit working with evaporator leaving temperature equal to 7°C and condensing temperature equal to 55°C. Line dimensioning is responsibility of plant designer, use ASHRAE Refrigeration Handbook or other suitable design guide.

Table 4 - Discharge line sizes

Circuit Capacity kW	**Total Equivalent Length (meters)**								
	5	**10**	**15**	**20**	**25**	**30**	**40**	**50**	**60**
300	2-1/8	2-1/8	2-1/8	2-5/8	2-5/8	2-5/8	3-1/8	3-1/8	3-1/8
350	2-1/8	2-1/8	2-5/8	2-5/8	3-1/8	3-1/8	3-1/8	3-1/8	3-1/8
400	2-1/8	2-5/8	2-5/8	3-1/8	3-1/8	3-1/8	3-1/8	2 x 2-5/8	2 x 2-5/8
450	2-5/8	2-5/8	2-5/8	3-1/8	3-1/8	3-1/8	2 x 2-5/8	2 x 2-5/8	2 x 3-1/8

Oil Charge

In remote condenser application the oil charge into the compressor has to take into account that a percentage of oil around 1% is usually mixed into the refrigerant, so some oil has to be added to the standard charge if the refrigerant charge exceed the standard charge of the unit. What is important, during the unit operation, is that the oil level in the oil separator is not lower than the ¼ of the upper sideglass.
The compressor of the EWLD and Liquid Receiver version units are shipped with their proper charge of oil. The refrigerant circuits mustn't remain open to the air for more than 15 minutes. If this happens you need to replace the oilcharge and the oil filter as described in the "Procedure to replace oil filter" of this manual.

Operation

Operator's responsibilities

It is important that the operator is appropriately trained and becomes familiar with the system before operating the machine. In addition to reading this manual, the operator must study the microprocessor operating manual and the wiring diagram in order to understand start-up sequence, operation, shutdown sequence and operation of all the safety devices. During the machine's initial start-up phase, a technician authorized by the manufacturer is available to answer any questions and to give instructions as to the correct operating procedures.
The operator is advised to keep a record of operating data for every installed machine. Another record should also be kept of all the periodical maintenance and servicing activities.
If the operator notes abnormal or unusual operating conditions, he is advised to consult the technical service authorized by the manufacturer.

Description of the machine

This machine, of the water condensation type, is made up of the following main components:

- **Compressor**: The single-screw compressor of the Fr 3200 or Fr4100 series is of the semi-hermetic type and utilises gas from the evaporator to cool the motor and allow optimal operation under any expected load conditions. The oil-injection lubrication system does not require an oil pump as oil flow is ensured by the pressure difference between delivery and suction. In addition to ensuring lubrication of ball bearings, oil injection dynamically seals the screw, thus enabling the compression process.
- **Evaporator**: The direct-expansion shell and tube type evaporator is of ample size in order to ensure optimum efficiency under all load conditions.
- **Condenser**: The shell and tube type condenser has external high efficiency micro fins.
  The liquid subcooled by the lower part of the tubes not only improves overall efficiency of the machine but also compensates variations in heat load by adapting the refrigerant load to all foreseen operating conditions.
- **Expansion valve**: The machine has a an electronic expansion valve, which is controlled by an electronic device called a Driver that optimises its operation.

Description of the refrigeration cycle

The low-temperature refrigerant gas from the evaporator is drawn by the compressor through the electric motor, which is cooled by the refrigerant. It is subsequently compressed and during this process the refrigerant mixes with the oil from the oil separator.

The high-pressure oil-refrigerant mixture is introduced into the centrifuge-type high-efficiency oil separator, where the oil is separated from the refrigerant. The oil accumulated on the bottom of the separator is forced by the pressure difference back into the compressor while the oil-free refrigerant is sent to the condenser.

The refrigerant fluid is evenly distributed inside the condenser throughout the volume of the exchanger, and the gas in contact with the tubes is cooled and successively starts to condense.

The condensed fluid at saturation temperature passes through the subcooling section where it looses even more heat, increasing the efficiency of the cycle. The heat taken from the fluid during cooling, condensation and subcooling is exchanged with that of the water passing inside the condenser tubes.

The subcooled fluid flows through the high-efficiency filter dryer and then reaches the expansion element (expansion valve) through which a fall in pressure starts off the expansion process resulting in the vaporisation of part of the refrigerant liquid.

The result at this point is a low-pressure and low-temperature liquid-gas mixture entering the evaporator, where it takes the heat required for vaporisation.

When the refrigerant liquid-vapour is uniformly distributed in the direct expansion evaporator tubes, heat is exchanged with the cooling water, thus reducing the temperature until complete evaporation, followed by superheating.

Once it has reached the superheated-vapour state, the refrigerant leaves the evaporator and is once again taken into the compressor to repeat the cycle.

Description of the refrigeration cycle with partial heat recovery

The low-temperature refrigerant gas from the evaporator is drawn by the compressor through the electric motor, which is cooled by the refrigerant. It is subsequently compressed and during this process the refrigerant mixes with the oil from the oil separator.

The high-pressure oil-refrigerant mixture is introduced into the centrifuge-type high-efficiency oil separator, where the oil is separated from the refrigerant. The oil accumulated on the bottom of the separator is forced by the pressure difference back into the compressor while the oil-free refrigerant is sent to the condenser.

The upper portion of the condenser has cooling tubes through which about 10% of the heat rejection (mainly discharge gas superheat) of the unit is recovered.

These condensers, with partial heat recovery tubes, have crowns with special couplings by which they can be connected to the hot water pipes. When partial recovery is activated, condenser performance is improved since the condenser temperature is lowered further in as much as the surface dedicated to heat discharge is greater.

After passing through the cooling tubes, the gas starts to condense in the central part of the condenser.

The condensed fluid at saturation temperature passes through the subcooling section where it looses even more heat, increasing the efficiency of the cycle. The subcooled fluid flows through the high-efficiency filter dryer and then reaches the expansion element (expansion valve) through which a fall in pressure starts off the expansion process resulting in the vaporisation of part of the refrigerant liquid.

The result at this point is a low-pressure and low-temperature liquid-gas mixture entering the evaporator, where it takes the heat required for vaporisation.

When the refrigerant liquid-vapour is uniformly distributed in the direct expansion evaporator tubes, heat is exchanged with the cooling water, thus reducing the temperature until complete evaporation, followed by superheating.

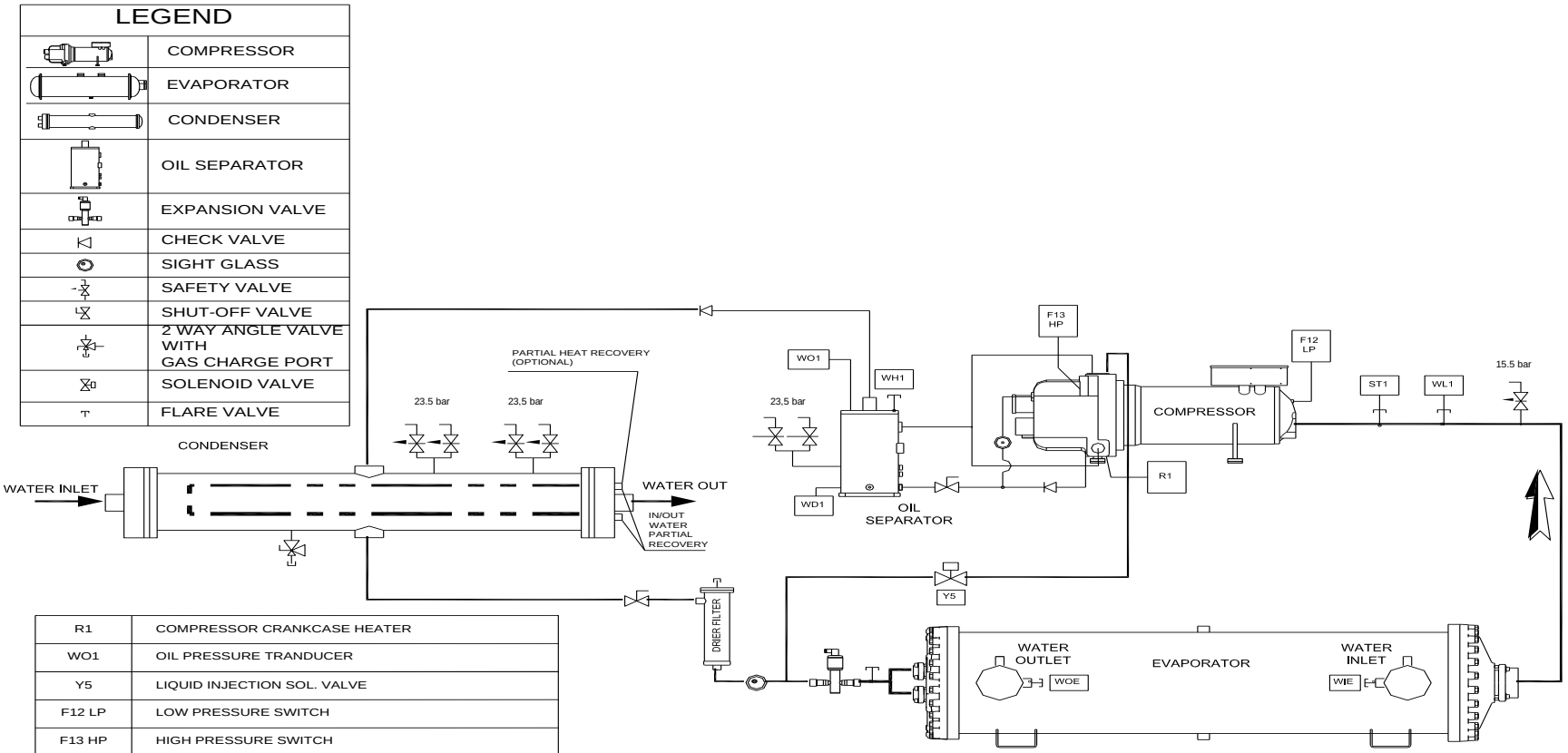
Once it has reached the superheated-vapour state, the refrigerant leaves the evaporator and is once again taken into the compressor to repeat the cycle.

Controlling the partial recovery circuit and installation recommendations

The partial heat recovery system is not managed and/or controlled by the machine. The installer should follow the suggestions below for best system performance and reliability:

1) Install a mechanical filter on the heat exchanger inlet pipe.
2) Install shut-off valves to isolate the heat exchanger from the water system during periods of inactivity or system maintenance.
3) Install a drain valve that allows the heat exchanger to be emptied in the even that air temperature is expected to fall below 0°C during periods of inactivity of the machine.
4) Install flexible anti-vibration joints on the heat recovery water inlet and outlet piping, so that transmission of vibrations, and therefore of noise, to the water system is kept as low as possible.
5) Do not load exchanger joints with the weight of the heat recovery piping. The water joints of the exchangers are not designed to support the weight of the piping.
6) Should heat recovery water temperature be lower than ambient temperature, it is advised to switch off the heat recovery water pump 3 minutes after having switched off the last compressor.

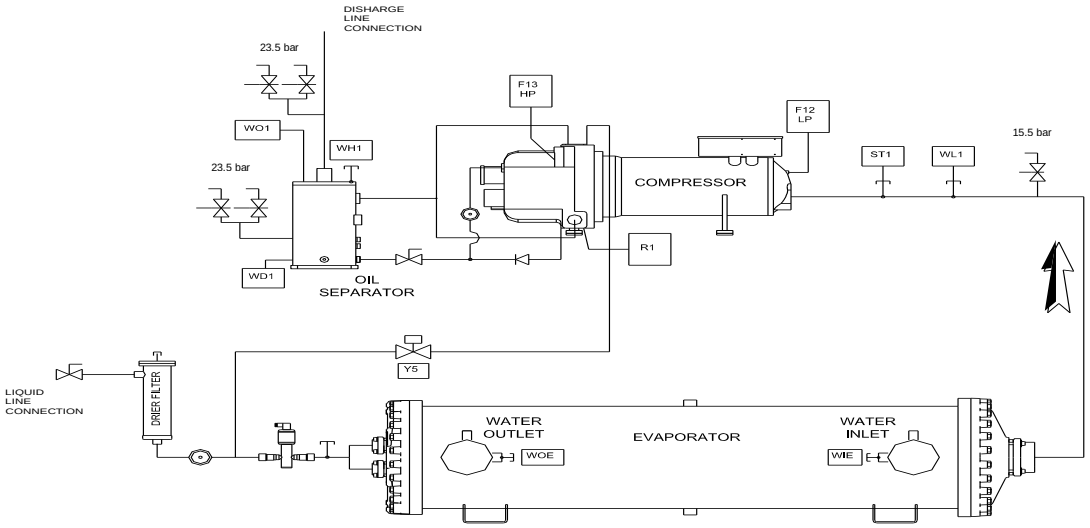
Fig. 10 - Refrigeration cycle of the EWWD I-SS Single Circuit



R1	COMPRESSOR CRANKCASE HEATER
WO1	OIL PRESSURE TRANDUCER
Y5	LIQUID INJECTION SOL. VALVE
F12 LP	LOW PRESSURE SWITCH
F13 HP	HIGH PRESSURE SWITCH
WH1	HIGH PRESSURE TRANSDUCER (0 ÷ 30 bar)
WL1	LOW PRESSURE TRANSDUCER (-0.5 ÷ 7 bar)
WD1	OIL TEMPERATURE
WOE	LEAVING WATER TEMPERATURE
WIE	ENTERING WATER TEMPERATURE
ST1	SUCTION TEMPERATURE

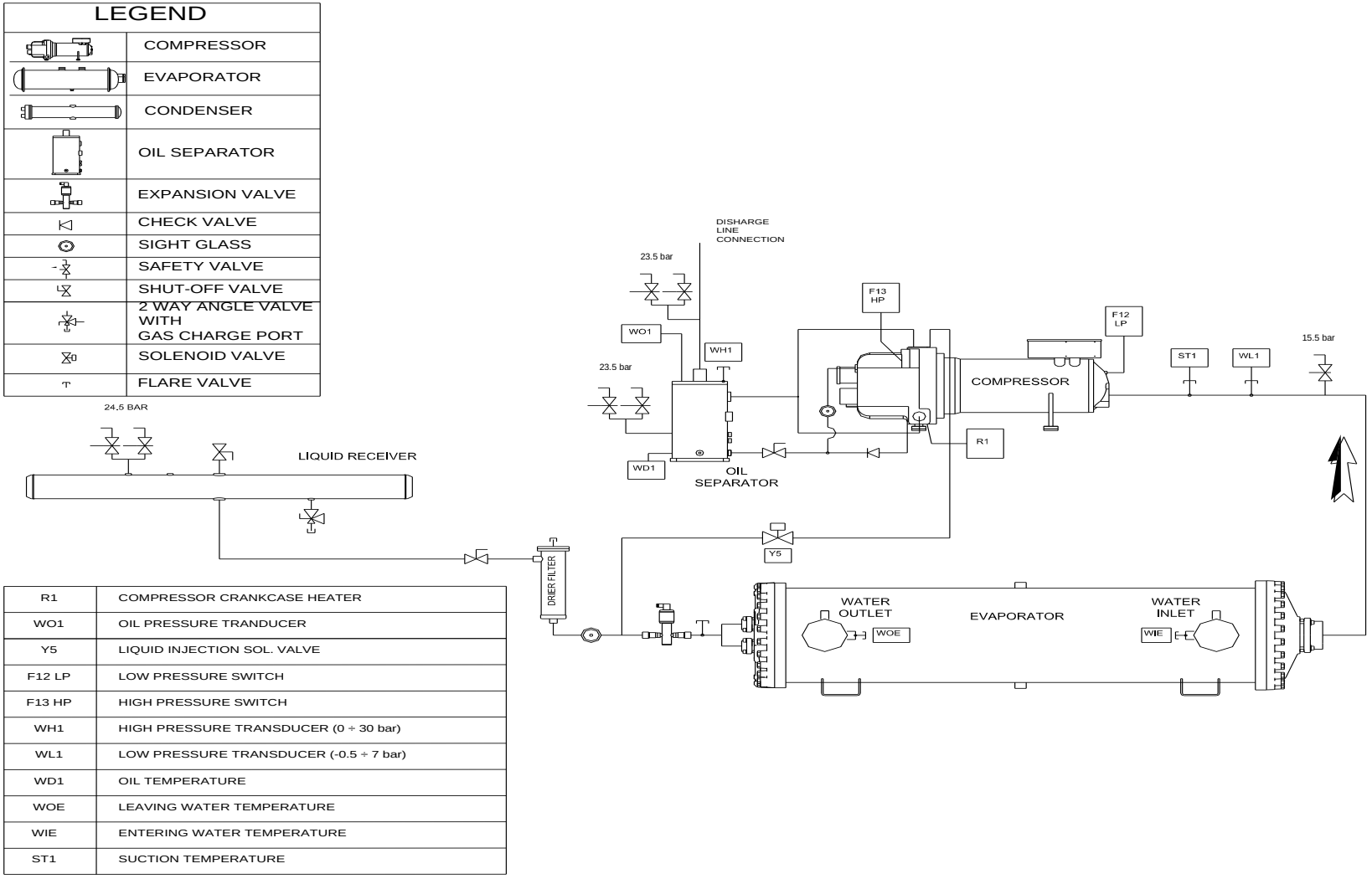
Fig. 11 - Refrigeration cycle of the EWLD I-SS Single Circuit

LEGEND	
	COMPRESSOR
	EVAPORATOR
	CONDENSER
	OIL SEPARATOR
	EXPANSION VALVE
	CHECK VALVE
	SIGHT GLASS
	SAFETY VALVE
	SHUT-OFF VALVE
	2 WAY ANGLE VALVE WITH GAS CHARGE PORT
	SOLENOID VALVE
	FLARE VALVE



R1	COMPRESSOR CRANKCASE HEATER
WO1	OIL PRESSURE TRANDUCER
Y5	LIQUID INJECTION SOL. VALVE
F12 LP	LOW PRESSURE SWITCH
F13 HP	HIGH PRESSURE SWITCH
WH1	HIGH PRESSURE TRANSDUCER (0 ÷ 30 bar)
WL1	LOW PRESSURE TRANSDUCER (-0.5 ÷ 7 bar)
WD1	OIL TEMPERATURE
WOE	LEAVING WATER TEMPERATURE
WIE	ENTERING WATER TEMPERATURE
ST1	SUCTION TEMPERATURE

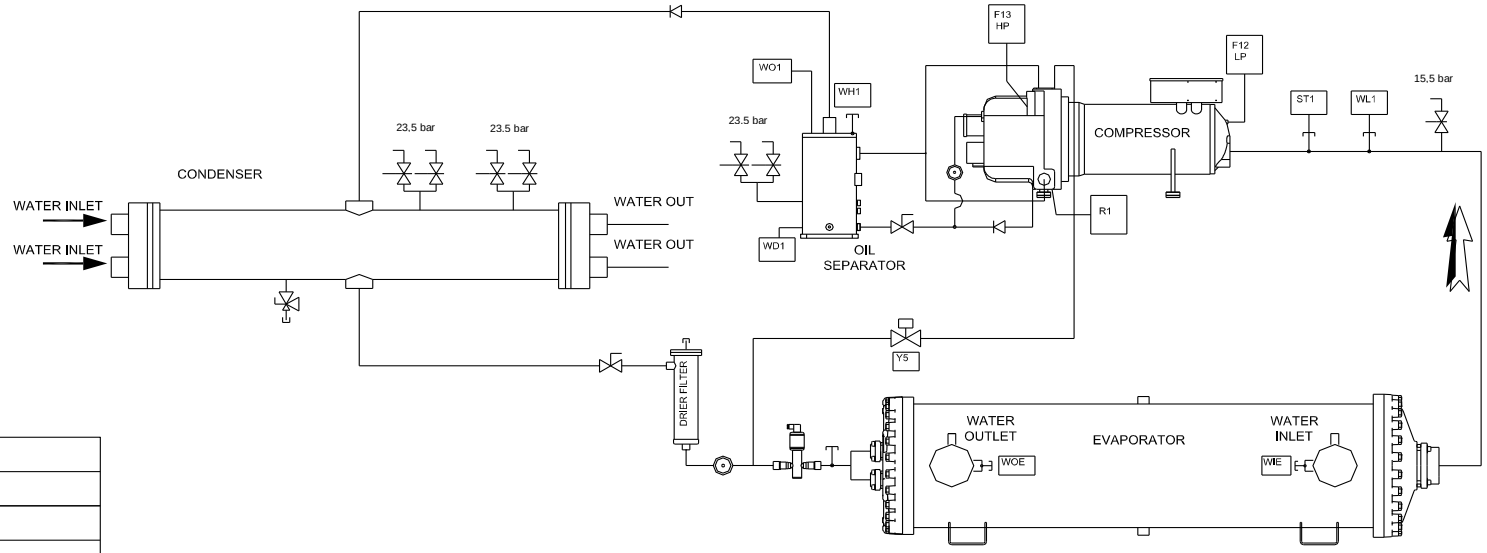
Fig. 12 - Refrigeration cycle of the EWLD I-SS Single Circuit



R1	COMPRESSOR CRANKCASE HEATER
WO1	OIL PRESSURE TRANDUCER
Y5	LIQUID INJECTION SOL. VALVE
F12 LP	LOW PRESSURE SWITCH
F13 HP	HIGH PRESSURE SWITCH
WH1	HIGH PRESSURE TRANSDUCER (0 ÷ 30 bar)
WL1	LOW PRESSURE TRANSDUCER (-0.5 ÷ 7 bar)
WD1	OIL TEMPERATURE
WOE	LEAVING WATER TEMPERATURE
WIE	ENTERING WATER TEMPERATURE
ST1	SUCTION TEMPERATURE

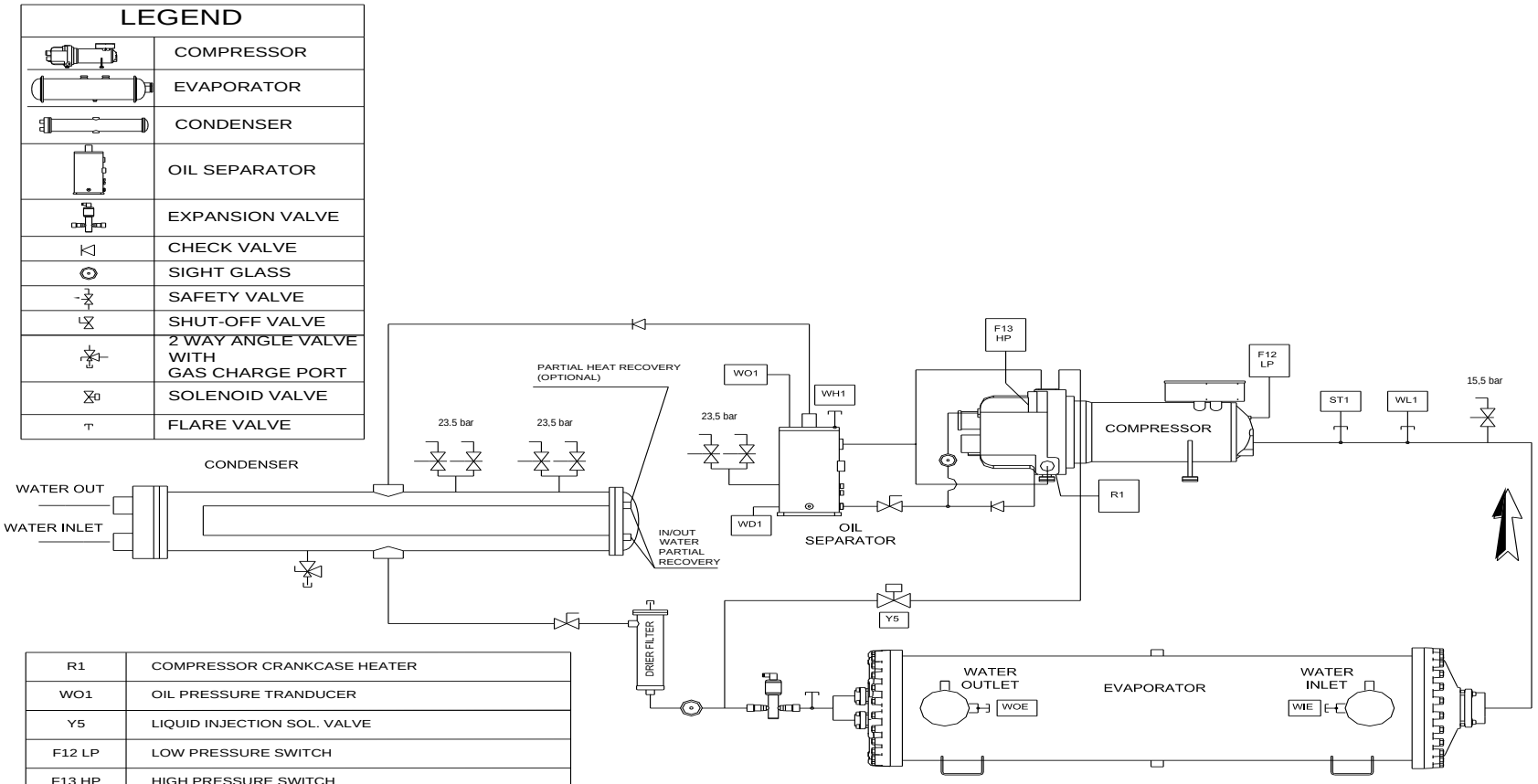
Fig. 13 - Refrigeration cycle of the EWWD Single Circuit – Total heat recovery

LEGEND	
	COMPRESSOR
	EVAPORATOR
	CONDENSER
	OIL SEPARATOR
	EXPANSION VALVE
	CHECK VALVE
	SIGHT GLASS
	SAFETY VALVE
	SHUT-OFF VALVE
	2 WAY ANGLE VALVE WITH GAS CHARGE PORT
	SOLENOID VALVE
	FLARE VALVE



R1	COMPRESSOR CRANKCASE HEATER
WO1	OIL PRESSURE TRANDUCER
Y5	LIQUID INJECTION SOL. VALVE
F12 LP	LOW PRESSURE SWITCH
F13 HP	HIGH PRESSURE SWITCH
WH1	HIGH PRESSURE TRANSDUCER (0 ÷ 30 bar)
WL1	LOW PRESSURE TRANSDUCER (-0.5 ÷ 7 bar)
WD1	OIL TEMPERATURE
WOE	LEAVING WATER TEMPERATURE
WIE	ENTERING WATER TEMPERATURE
ST1	SUCTION TEMPERATURE

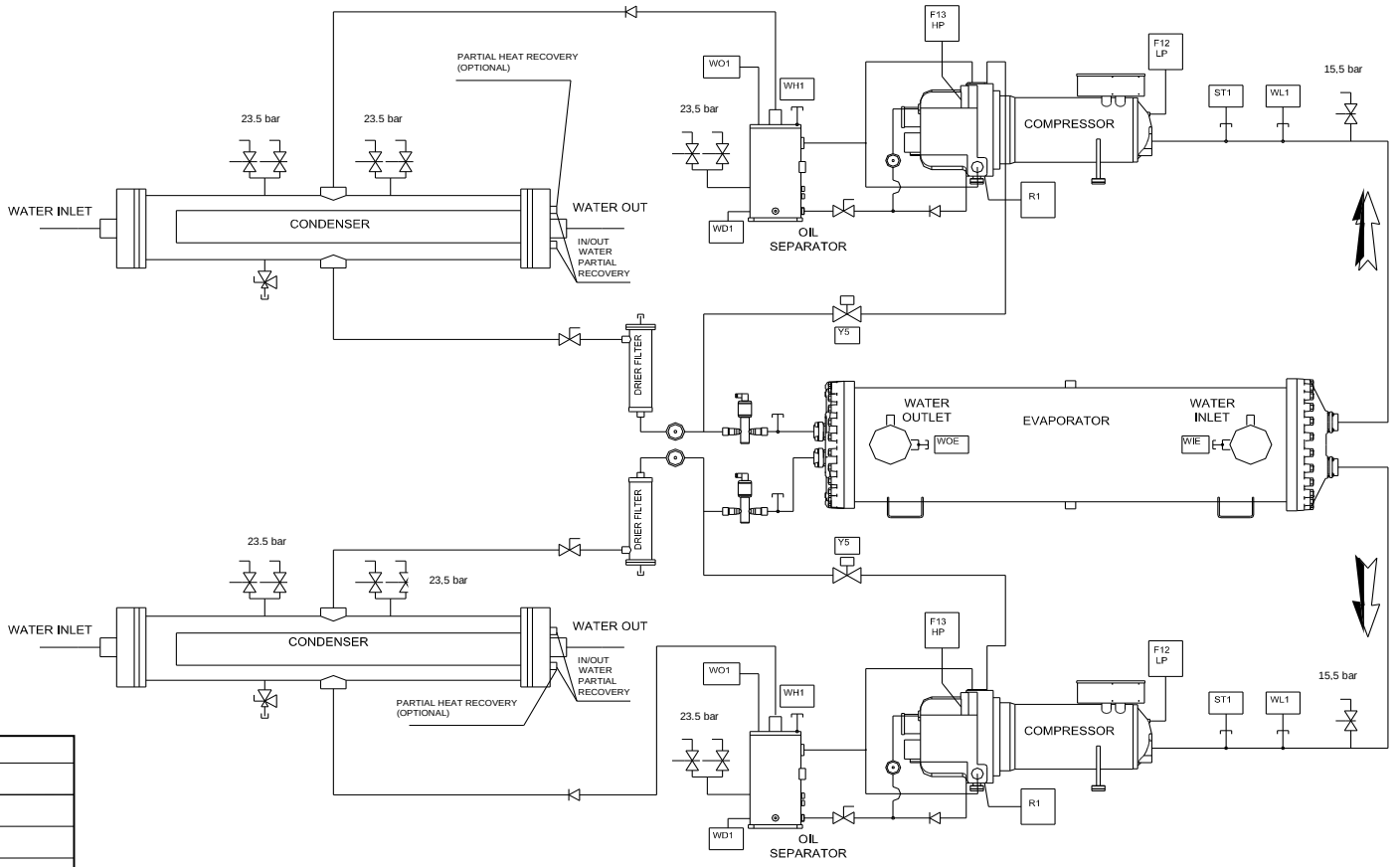
Fig. 14 - Refrigeration cycle of the EWWD I-XS Single Circuit



R1	COMPRESSOR CRANKCASE HEATER
WO1	OIL PRESSURE TRANDUCER
Y5	LIQUID INJECTION SOL. VALVE
F12 LP	LOW PRESSURE SWITCH
F13 HP	HIGH PRESSURE SWITCH
WH1	HIGH PRESSURE TRANSDUCER (0 ÷ 30 bar)
WL1	LOW PRESSURE TRANSDUCER (-0.5 ÷ 7 bar)
WD1	OIL TEMPERATURE
WOE	LEAVING WATER TEMPERATURE
WIE	ENTERING WATER TEMPERATURE
ST1	SUCTION TEMPERATURE

Fig.15 - Refrigeration cycle of the EWWD I-SS Double Circuits

LEGEND	
	COMPRESSOR
	EVAPORATOR
	CONDENSER
	OIL SEPARATOR
	EXPANSION VALVE
	CHECK VALVE
	SIGHT GLASS
	SAFETY VALVE
	SHUT-OFF VALVE
	2 WAY ANGLE VALVE WITH GAS CHARGE PORT
	SOLENOID VALVE
	FLARE VALVE



R1	COMPRESSOR CRANKCASE HEATER
WO1	OIL PRESSURE TRANDUCER
Y5	LIQUID INJECTION SOL. VALVE
F12 LP	LOW PRESSURE SWITCH
F13 HP	HIGH PRESSURE SWITCH
WH1	HIGH PRESSURE TRANSDUCER (0 ÷ 30 bar)
WL1	LOW PRESSURE TRANSDUCER (-0.5 ÷ 7 bar)
WD1	OIL TEMPERATURE
WOE	LEAVING WATER TEMPERATURE
WIE	ENTERING WATER TEMPERATURE
ST1	SUCTION TEMPERATURE

Fig. 16 - Refrigeration cycle of the EWLD I-SS Double Circuits

LEGEND	
	COMPRESSOR
	EVAPORATOR
	CONDENSER
	OIL SEPARATOR
	EXPANSION VALVE
	CHECK VALVE
	SIGHT GLASS
	SAFETY VALVE
	SHUT-OFF VALVE
	2 WAY ANGLE VALVE WITH GAS CHARGE PORT
	SOLENOID VALVE
	FLARE VALVE

R1	COMPRESSOR CRANKCASE HEATER
WO1	OIL PRESSURE TRANDUCER
Y5	LIQUID INJECTION SOL. VALVE
F12 LP	LOW PRESSURE SWITCH
F13 HP	HIGH PRESSURE SWITCH
WH1	HIGH PRESSURE TRANSDUCER (0 ÷ 30 bar)
WL1	LOW PRESSURE TRANSDUCER (-0.5 ÷ 7 bar)
WD1	OIL TEMPERATURE
WOE	LEAVING WATER TEMPERATURE
WIE	ENTERING WATER TEMPERATURE
ST1	SUCTION TEMPERATURE

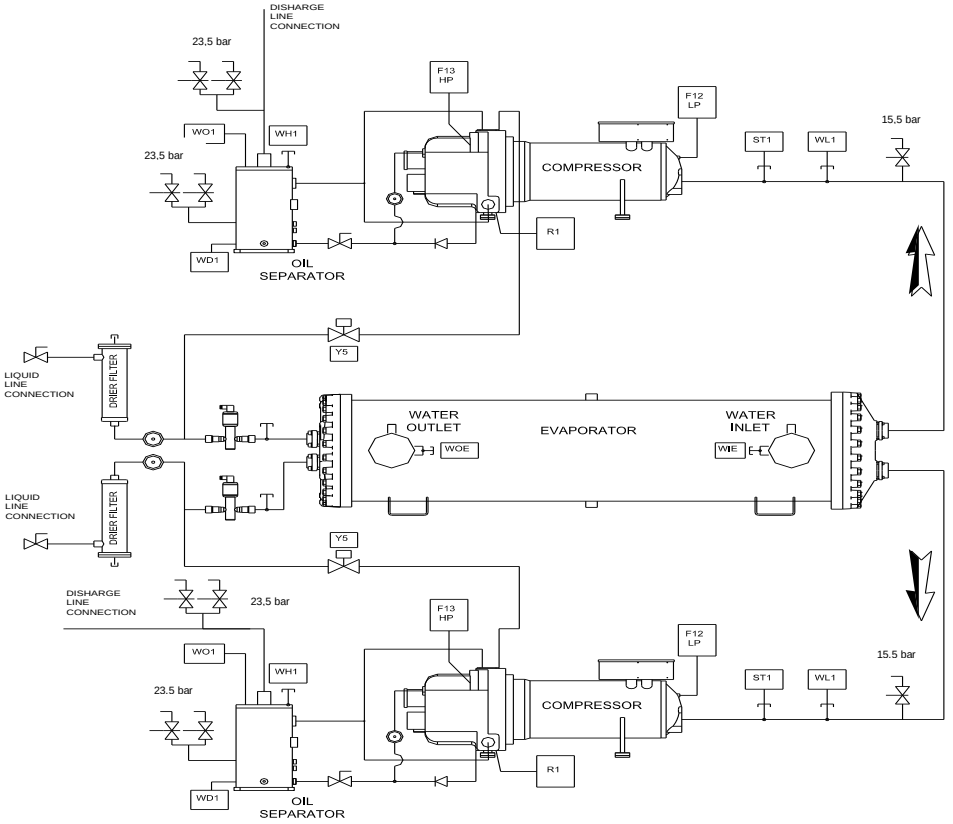
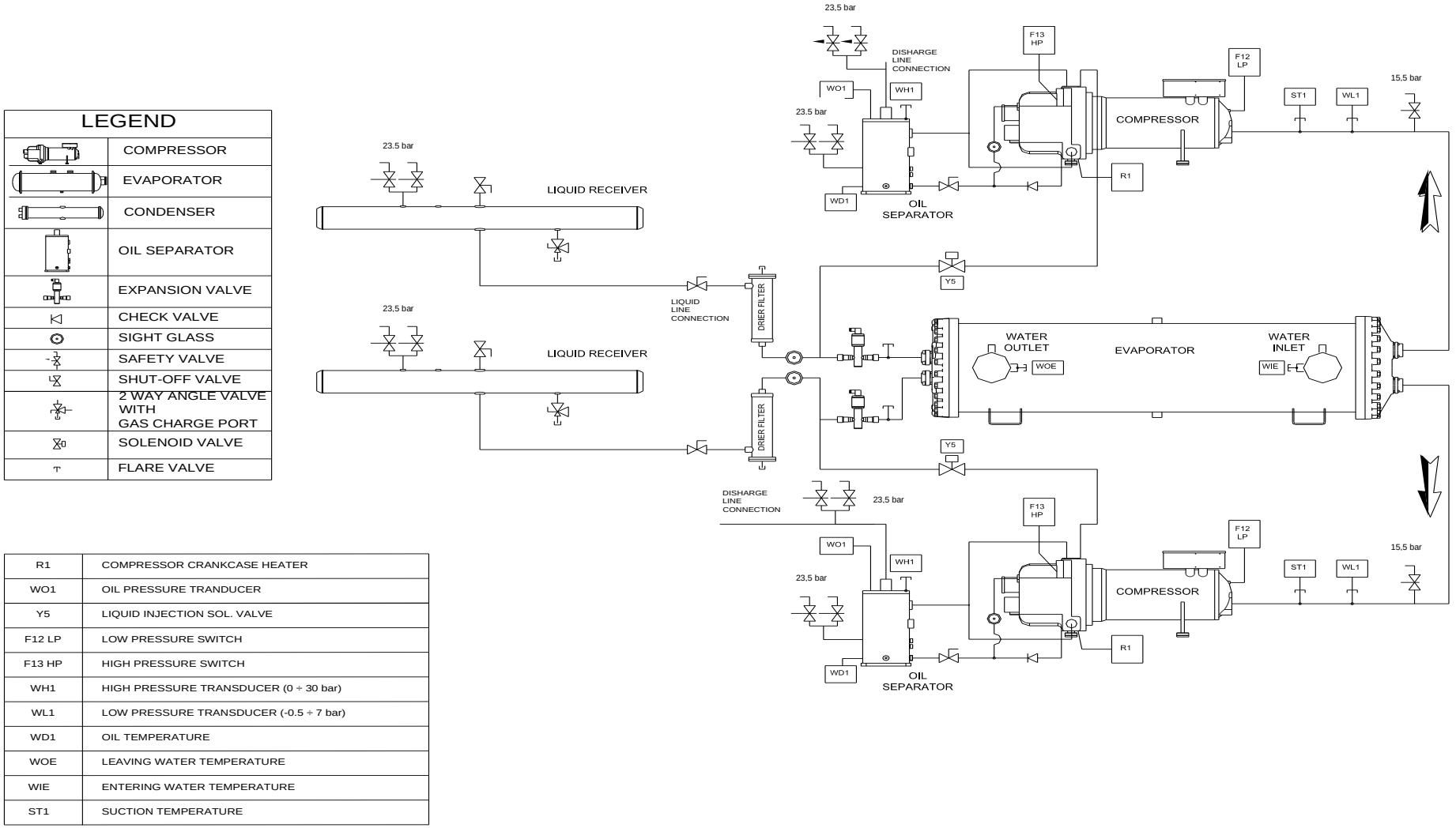
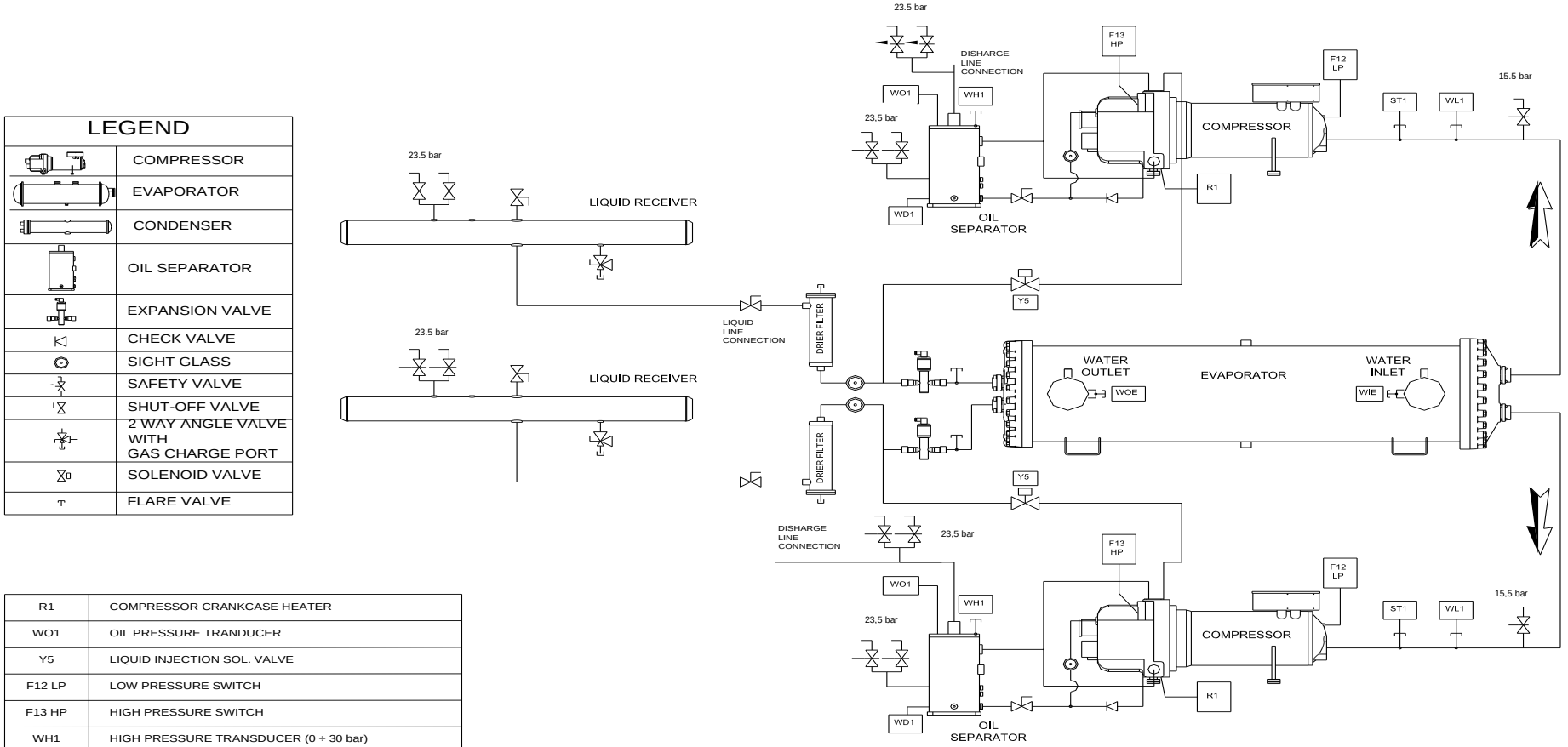


Fig. 17 - Refrigeration cycle of the EWLD I-SS Double Circuits



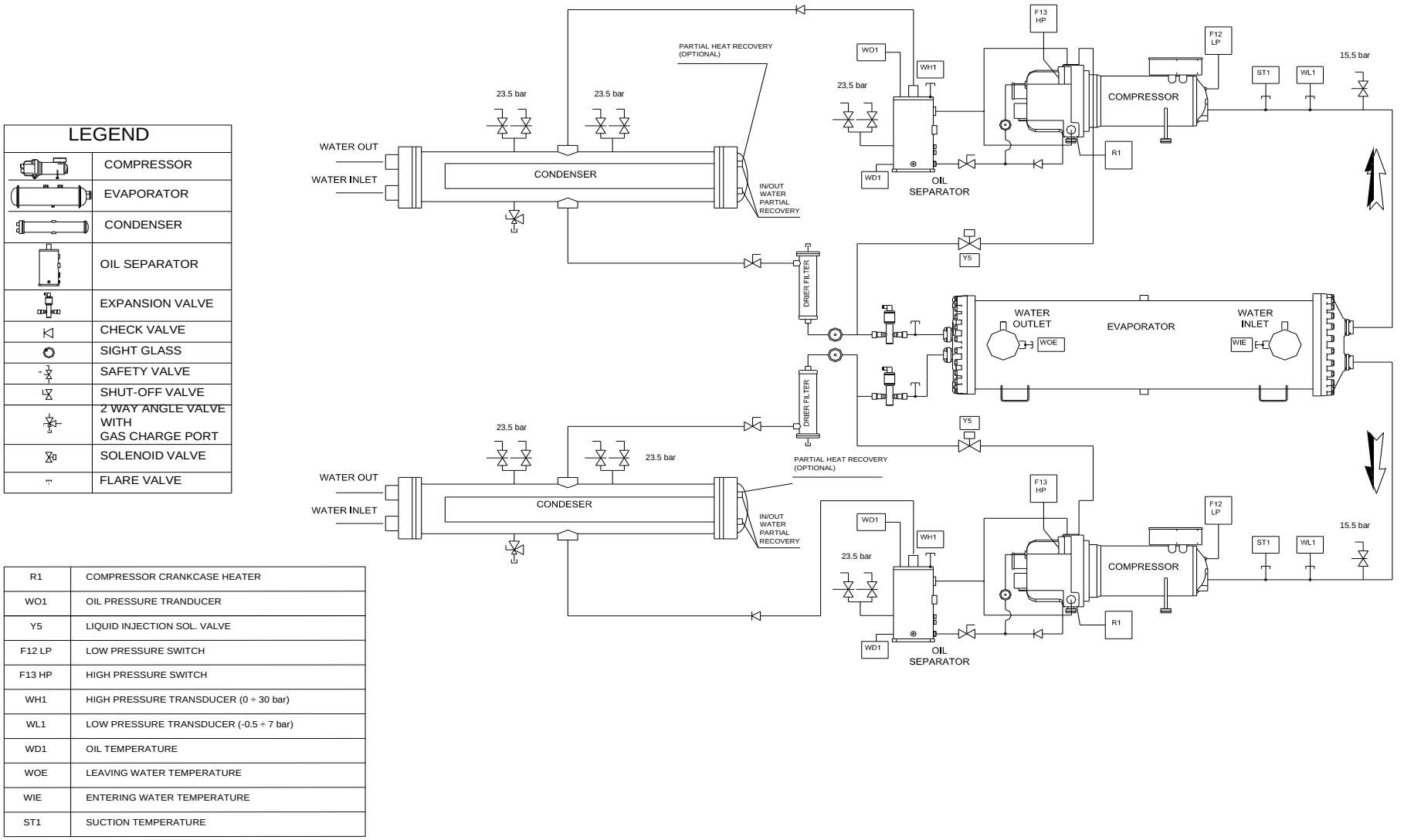
R1	COMPRESSOR CRANKCASE HEATER
WO1	OIL PRESSURE TRANDUCER
Y5	LIQUID INJECTION SOL. VALVE
F12 LP	LOW PRESSURE SWITCH
F13 HP	HIGH PRESSURE SWITCH
WH1	HIGH PRESSURE TRANSDUCER (0 ÷ 30 bar)
WL1	LOW PRESSURE TRANSDUCER (-0.5 ÷ 7 bar)
WD1	OIL TEMPERATURE
WOE	LEAVING WATER TEMPERATURE
WIE	ENTERING WATER TEMPERATURE
ST1	SUCTION TEMPERATURE

Fig. 18 - Refrigeration cycle of the EWWD Double Circuits – Total heat recovery



R1	COMPRESSOR CRANKCASE HEATER
WO1	OIL PRESSURE TRANDUCER
Y5	LIQUID INJECTION SOL. VALVE
F12 LP	LOW PRESSURE SWITCH
F13 HP	HIGH PRESSURE SWITCH
WH1	HIGH PRESSURE TRANSDUCER (0 ÷ 30 bar)
WL1	LOW PRESSURE TRANSDUCER (-0.5 ÷ 7 bar)
WD1	OIL TEMPERATURE
WOE	LEAVING WATER TEMPERATURE
WIE	ENTERING WATER TEMPERATURE
ST1	SUCTION TEMPERATURE

Fig. 19 - Refrigeration cycle of the EWWD I-XS Double Circuits



R1	COMPRESSOR CRANKCASE HEATER
WO1	OIL PRESSURE TRANDUCER
Y5	LIQUID INJECTION SOL. VALVE
F12 LP	LOW PRESSURE SWITCH
F13 HP	HIGH PRESSURE SWITCH
WH1	HIGH PRESSURE TRANSDUCER (0 ÷ 30 bar)
WL1	LOW PRESSURE TRANSDUCER (-0.5 ÷ 7 bar)
WD1	OIL TEMPERATURE
WOE	LEAVING WATER TEMPERATURE
WIE	ENTERING WATER TEMPERATURE
ST1	SUCTION TEMPERATURE

Fig.20 - Refrigeration cycle of the EWWD I-SS Trial Circuits

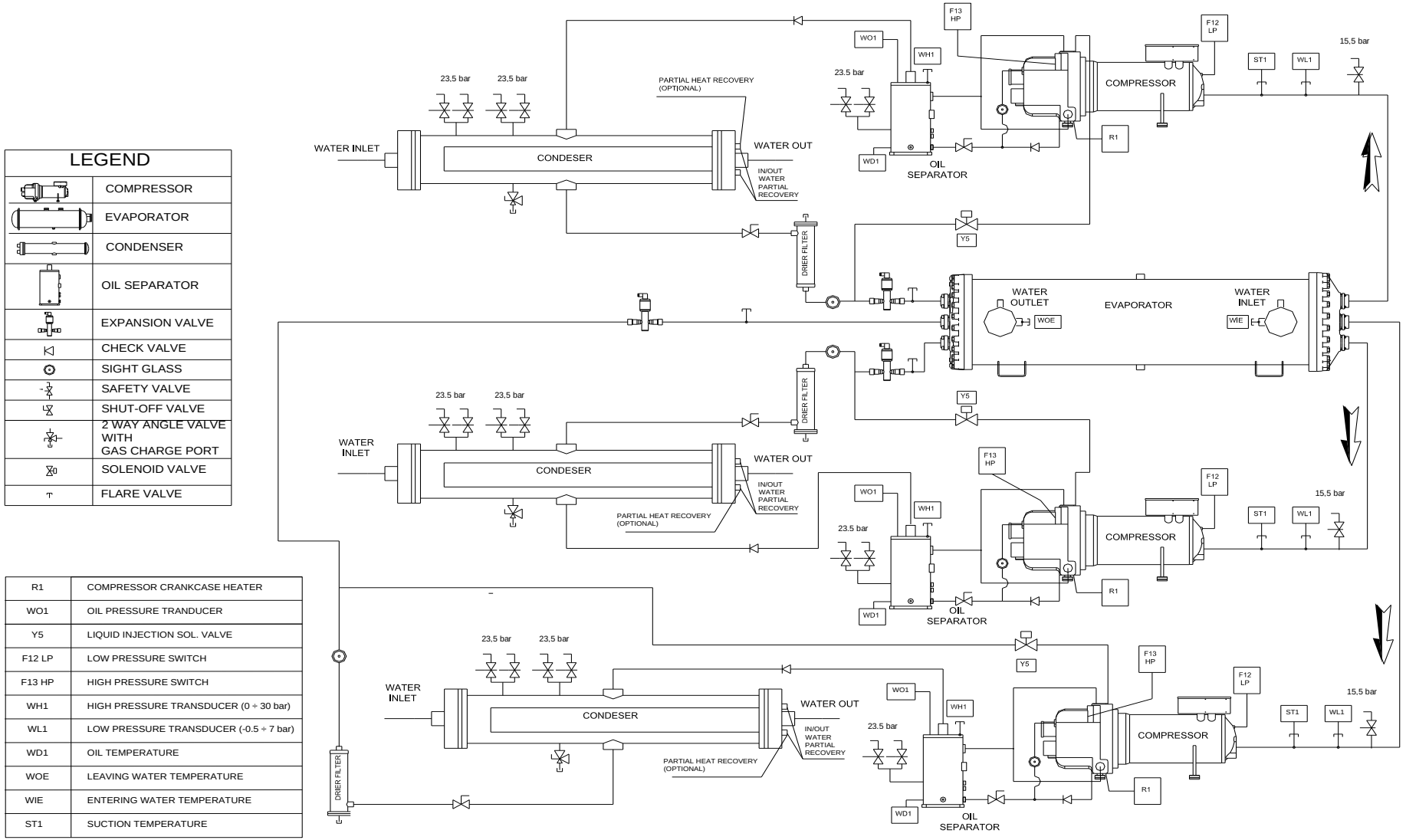


Fig. 21 - Refrigeration cycle of the EWLD I-SS Trial Circuits

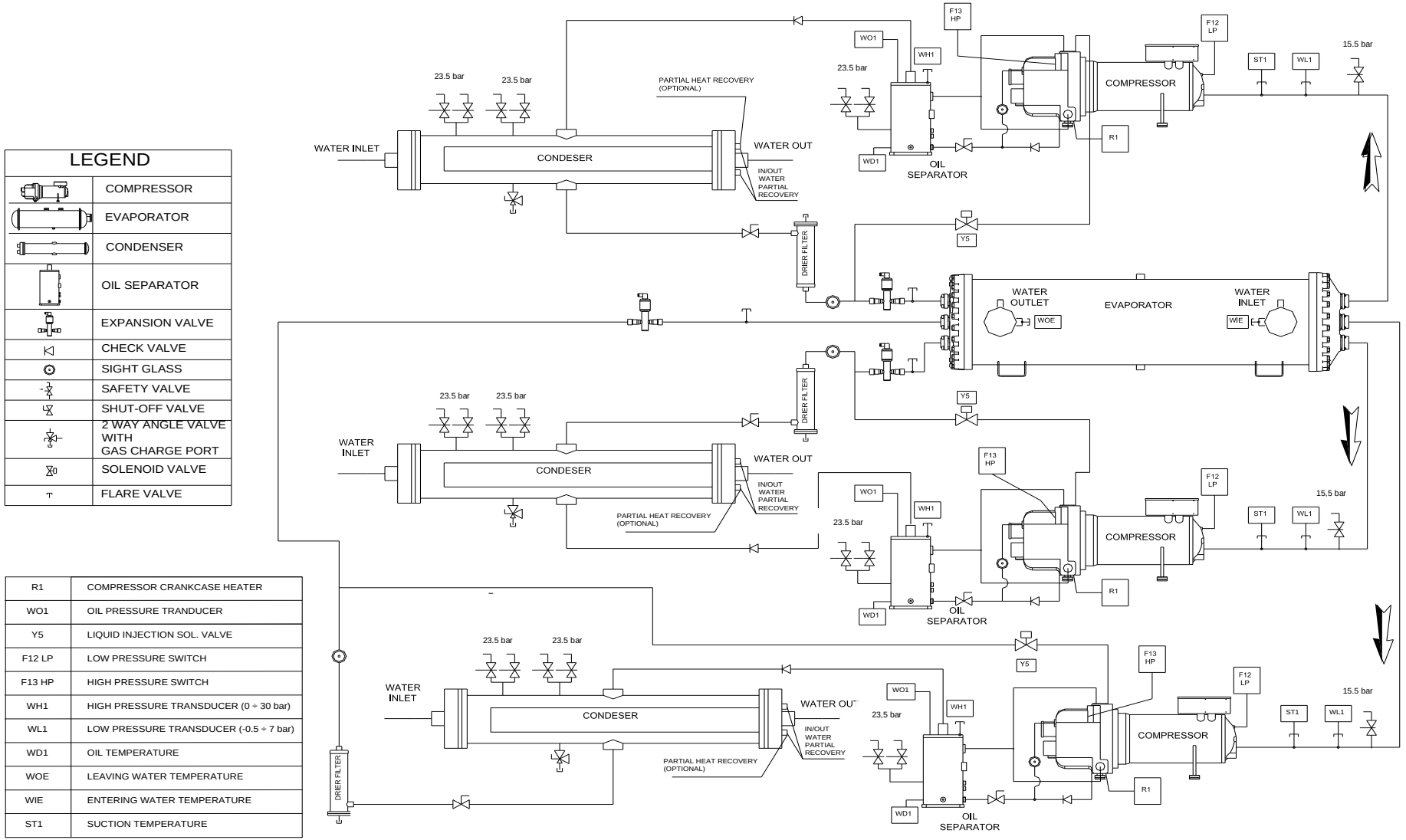
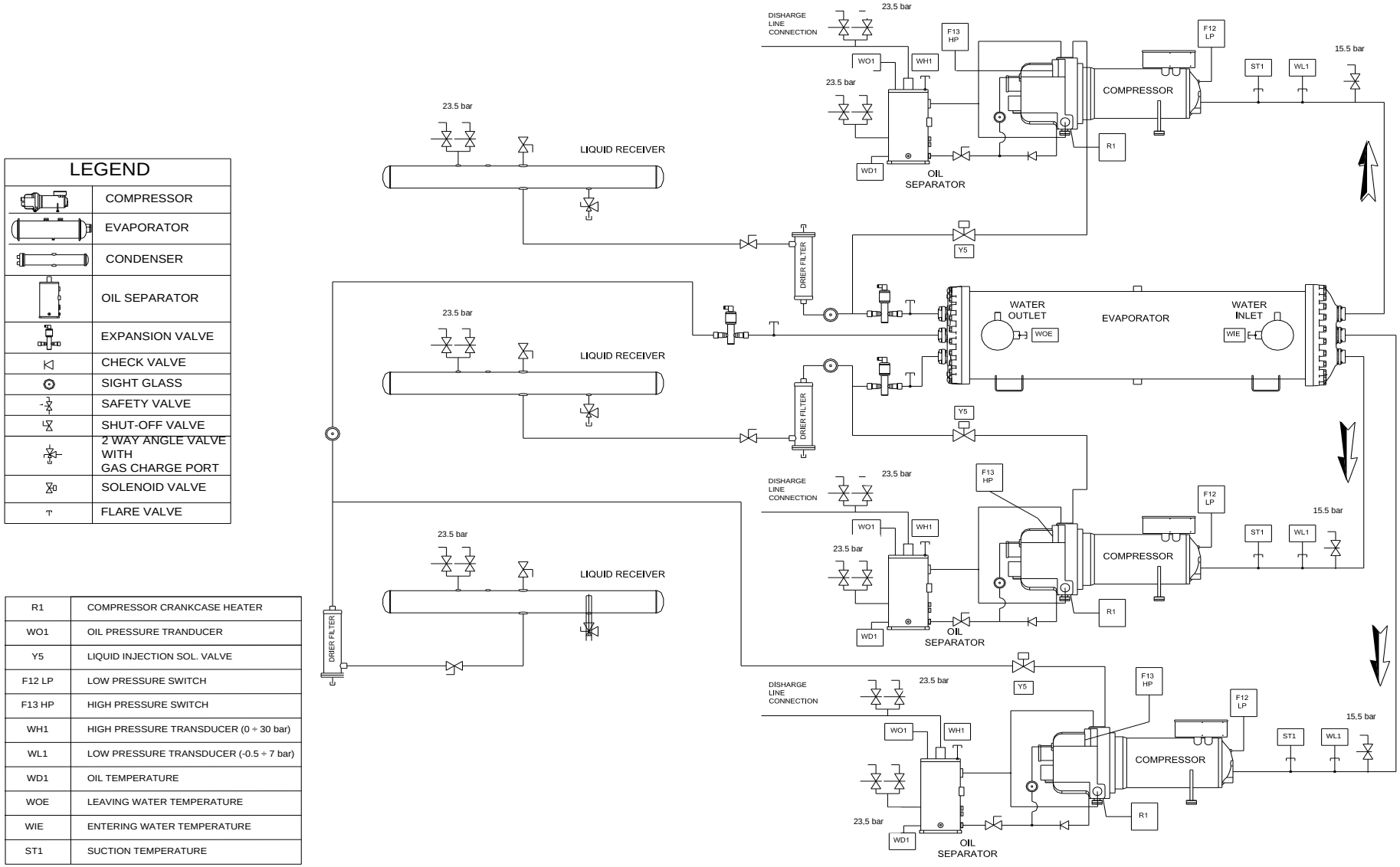
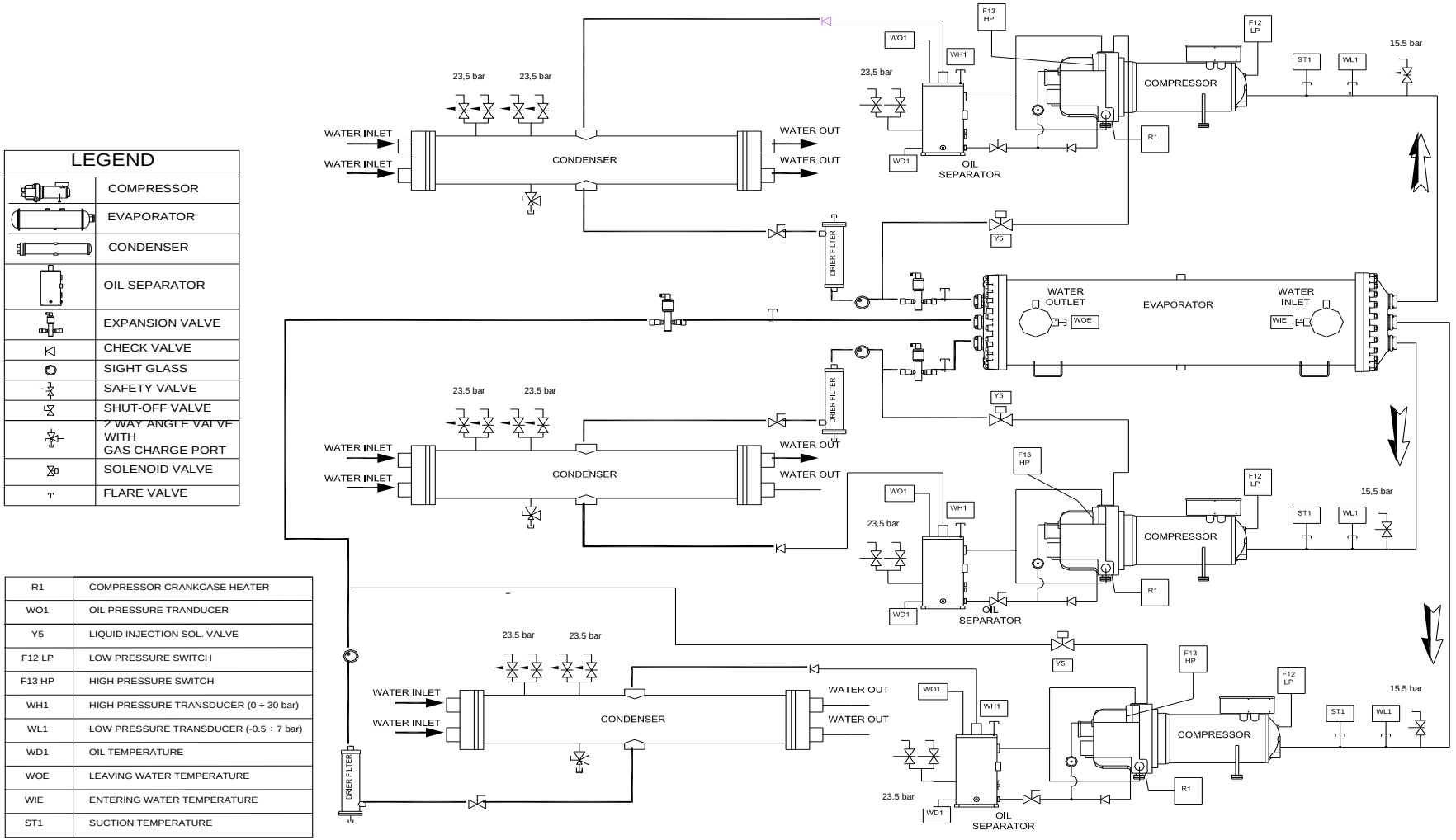


Fig. 22 - Refrigeration cycle of the EWLD I-SS Trial Circuits



R1	COMPRESSOR CRANKCASE HEATER
WO1	OIL PRESSURE TRANDUCER
Y5	LIQUID INJECTION SOL. VALVE
F12 LP	LOW PRESSURE SWITCH
F13 HP	HIGH PRESSURE SWITCH
WH1	HIGH PRESSURE TRANSDUCER (0 ÷ 30 bar)
WL1	LOW PRESSURE TRANSDUCER (-0.5 ÷ 7 bar)
WD1	OIL TEMPERATURE
WOE	LEAVING WATER TEMPERATURE
WIE	ENTERING WATER TEMPERATURE
ST1	SUCTION TEMPERATURE

Fig. 23 - Refrigeration cycle of the EWWD Trial Circuits– Total heat recovery



Compressor

The single-screw compressor is of the semi-hermetic type with an asyncronous three-phase, two-pole motor which is directly splined on the main shaft. The suction gas from the evaporator cools the electric motor before entering the suction ports. There are temperature sensors inside the electric motor which are completely covered by the coil winding and constantly monitor motor temperature. Should the coil winding temperature become very high (120°C), a special external device connected to the sensors and to the electronic controller will deactivate the corresponding compressor.
There are only two moving rotating parts and there are no other parts in the compressor with an eccentric and/or alternating movement.
The basic components are therefore only the main rotor and the satellites that carry out the compression process, meshing perfectly together.
Compression sealing is done thanks to a suitably shaped special composite material that is interposed between the main screw and the satellite. The main shaft on which the main rotor is splined is supported by 2 ball bearings. The system made up in this way is both statically and dynamically balanced before assembly.

Fig. 24 - Picture of Fr4100 compressor

Compression process

With the single-screw compressor the suction, compression and discharge process takes place in a continuous manner thanks to the upper satellite. In this process the suction gas penetrates into the profile between the rotor, the teeth of the upper satellite and the compressor body. The volume is gradually reduced by compression of the refrigerant. The compressed gas under high pressure is thus discharged into the built-in oil separator. In the oil separator, the gas/oil mixture and the oil are collected in a cavity in the lower part of the compressor, where they are injected into the compression mechanisms in order to guarantee compression's sealing and lubrication of the ball bearings.

1. E 2. Suction

Main rotor flutes ‘a’, ‘b’ and ‘c’ are in communication at one end with the suction chamber and are sealed at the other end by the upper satellite teeth. As the main rotor turns, the effective length of the flutes increases, thus increasing the volume open to the suction chamber. Figure 1 clearly illustrates this process. As flute ‘a’ assumes the position of flutes ‘b’ and ‘c’ its volume increases, inducing suction vapour to enter the flute.

Upon further rotation of the main rotor, the flutes which have been open to the suction is chamber engage with the satellite teeth. This coincides with each flute being progressively sealed by the main rotor.

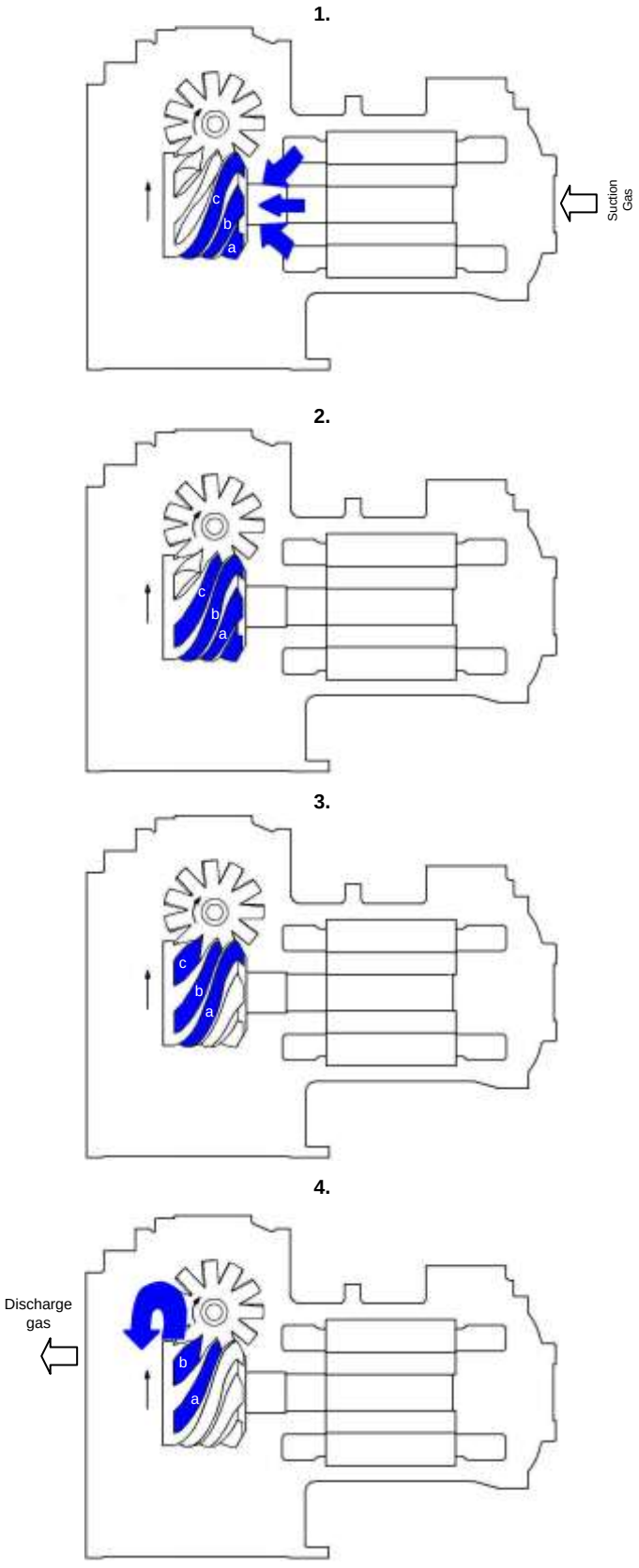
Once the flute volume is closed off from the suction chamber, the suction stage of the compression cycle is complete.

3. Compression

As the main rotor turns, the volume of gas trapped within the flute is reduced as the length of the flute shortens and compression occurs.

4. Discharge

As the satellite tooth approaches the end of a flute, the pressure of the trapped vapour reaches a maximum value occurring when the leading edge of the flute begins to overlap the triangular shaped discharge port. Compression immediately ceases as the gas is delivered into the discharge manifold. The satellite tooth continues to scavenge the flute until the flute volume is reduced to zero. This compression process is repeated for each flute/satellite tooth in turn.



Oil separator not shown

Fig. 25 - Compression process

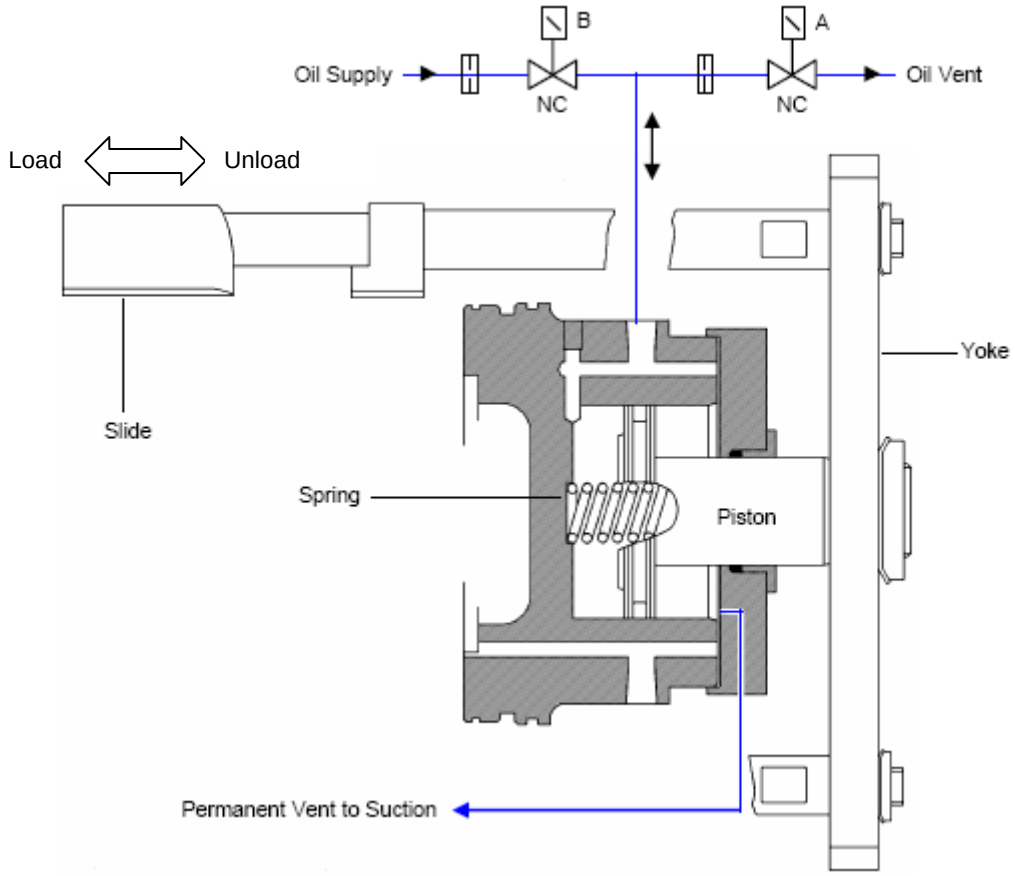


Fig. 26 - Refrigeration capacity control mechanism of compressor Fr4

Pre-startup checks

General

Once the machine has been installed, use the following procedure to check that it has been done correctly:

⚠ CAUTION

Switch off the power supply of the machine before performing any checks.
Failure to open the power switches at this stage can result in serious injury to the operator or even death.

Inspect all the electrical connections to the power circuits and to the compressors, including the contactors, fuse holders and electrical terminals and check that they are clean and well secured. Even though these checks are carried out at the factory on every machine that is shipped, vibrations during transportation may loosen some electrical connections.

⚠ CAUTION

Check that the electrical terminals of cables are well tightened. A loose cable can overheat and give rise to problems with the compressors.

Open discharge, liquid, liquid injection and suction (if installed) valves.

⚠ WARNING

Do not start up the compressors if the delivery, liquid, liquid injection or suction valves are closed. Failure to open these valves can cause serious damage the compressor.
It is absolutely forbidden to close the valves on the delivery and suction piping when the unit is running.
These valves can be closed only when the compressor is off during maintenance of the unit. This operation must be carried out by qualified technical personnel holding the qualifications requested by local and/or European laws and with the adoption of the foreseen Personal and Collective Protection Devices.

Check the power supply voltage at the general door-block disconnector switch terminals. The power supply voltage must be the same as that on the nameplate. Maximum allowed tolerance ± 10%.
Voltage unbalance between the three phases must not exceed ± 3%.

The unit comes with a factory-supplied phase monitor that prevents compressors from starting if the phase sequence is incorrect. Properly connect the electrical terminals to the disconnector switch so as to ensure alarm-free operation. If the phase monitor triggers an alarm once the machine has been powered, just invert two phases at the general disconnecting switch supply (unit power supply). Never invert the electrical wiring on the monitor.

▲ ATTENTION

Starting up with the wrong sequence of phases irreparably compromises operation of the compressor. Ensure that phases L1, L2 and L3 correspond in sequence to R, S, and T.

Fill the water circuit and remove air from the system's highest point and open the air valve above the evaporator shell. Remember to close it again after filling. The design pressure on the water side of the evaporator is 10.0 bar. Never exceed this pressure at any time during the life of the machine.

▲ IMPORTANT

Before putting the machine into operation, clean the water circuit. Dirt, scaling, corrosion residue and other foreign material can accumulate inside the heat exchanger and reduce its heat exchanging capacity. Pressure drops can increase as well, thus reducing water flow. Proper water treatment therefore reduces the risk of corrosion, erosion, scaling, etc. The most appropriate water treatment must be determined locally, according to the type of system and local characteristics of the process water.
The manufacturer is not responsible for damage to or malfunctioning of equipment caused by failure to treat water or by improperly treated water.

Units with external water pump

Start the water pump and check the water system for any leaks; repair these if necessary. While the water pump is in operation, adjust the water flow until the design pressure drop for the evaporator is reached. Adjust the flow switch trigger point (not factory-supplied), to ensure operation of the machine within a ± 20% flow range.

▲ ATTENTION

From this moment onwards, the machine will be under electrical power. Use extreme caution during subsequent operation.
A lack of attention during subsequent operation may cause serious personal injury.

Electrical power supply

The machine's power supply voltage must be the same as that specified on the nameplate ± 10% while the voltage unbalance between phases must not be in excess of ± 3%. Measure the voltage between phases and if the value does not fall within the established limits, correct it before starting the machine.

⚠ CAUTION

Provide suitable power supply voltage. Unsuitable power supply voltage could cause malfunction of the control components and undesired triggering of the thermal protection devices, along with a considerable reduction in the life of the contactors and electric motors.

Unbalance in power supply voltage

In a three-phase system, excessive unbalance between the phases causes overheating of the motor. The maximum allowed voltage unbalance is 3%, calculated as follows:

Unbalance %: $\frac{V\max - Vaverage}{Vaverage} x100 = _____ \%$

Example: the three phases measure 383, 386 and 392 Volts respectively, the average is:

$\frac{383+386+392}{3} = 387$ Volts

thus the unbalance percentage is:

$\frac{392-387}{387} x100 = 1{,}29\%$ below the maximum allowed (3%)

Oil Heaters power supply

Each compressor comes with an electrical resistance located in the compressor's lower area. Its purpose is to warm the lubricating oil and thus avoid the mixing of refrigerant fluid within.
It is therefore necessary to ensure that the resistances are powered at least 24 hours before the planned start-up time. To ensure that they are activated, it is sufficient to keep the machine on by closing the general disconnecting switch Q10. The microprocessor, however, has a series of sensors that prevent the compressor from being started up when the oil temperature is not at least 5°C above the saturation temperature corresponding to the current pressure.
Keep the Q0, Q1, Q2 and Q12 switches in the Off (or 0) position until the machine is to be started up.

Emergency Stop

The machine has an emergency stop system which cuts off power to the compressors, allowing the machine to stop safely in case of danger. The emergency stop is triggered off by pressing the red mushroom button on the door of the machine's electrical panel.
After the machine has stopped, an alarm signal is generated in the unit control card, which reports the triggering of the emergency stop and prevents the re-starting of the compressors. To restart the compressors:

- Reset the emergency button
- Cancel the alarm in the control card.

▲ ATTENTION

The emergency button cuts off electrical power to the compressors, but not to the machine electrical panel. Take all necessary precautions therefore, if action must be taken on the machine subsequent to an emergency stop.

Startup procedure

Turning on the machine

1. With the general disconnecting switch Q10 closed, check that switches Q0, Q1, Q2 and Q12 are in the Off (or 0) position.
2. Close the thermal-magnetic switch Q12 and wait for the microprocessor and the control to start. Check that the oil temperature is warm enough. The oil temperature must be at least 5°C above the saturation temperature of the refrigerant in the compressor.
   If the oil is not warm enough, it will not be possible to start the compressors and the phrase “Oil Heating” will appear on the microprocessor display.
3. Start the water pump.
4. Turn the Q0 switch to On and wait for “Unit-On/Compressor Stand-By” to appear on the display.
5. Check that the evaporator pressure drop is the same as the design pressure drop and correct if necessary. The pressure drop must be measured at the factory-supplied charge connections placed on the evaporator piping. Do not measure the pressure drops at points where any valves and/or filters are interposed.
6. When starting up for the first time, turn the Q0 switch to Off to check that the water pump stays on for three minutes before it stops.
7. Turn the Q0 switch to On again.
8. Check that the local temperature setpoint is set to the required value by pressing the Set key.
9. Turn the Q1 switch to On (or 1) to start compressor #1.
10. Once the compressor has started, wait for at least 1 minute for the system to stabilise. During this time the controller will perform a series of operations to empty the evaporator (pre-purge) to ensure a safe start up.
11. At the end of the pre-purge, the microprocessor will start loading the compressor, now running, in order to reduce the outlet water temperature. Check the proper functioning of the capacity control by measuring the compressor’s electrical current consumption.
12. Check refrigerant evaporation and condensation pressure.
13. Once the system has stabilized, check that the liquid sight glass located on the expansion valve inlet pipe is completely fully (without bubbles) and that the humidity indicator shows “Dry”. Any bubbles inside the liquid sight glass might indicate a low refrigerant level or an excessive pressure drop through the filter dryer or an expansion valve that is blocked at the full open position.
14. In addition to checking the liquid sight glass, check circuit operating parameters by verifying:
    a) Superheating of refrigerant at compressor suction
    b) Superheating of refrigerant at compressor discharge
    c) Subcooling of liquid coming out of the condenser banks
    d) Evaporation pressure
    e) Condensation pressure

    Except for liquid temperature and suction temperature for machines with a thermostatic valve, which require the use of an external thermometer, all other measurements can be carried out by reading the relevant values directly on the on-board microprocessor display.

15. Turn the Q2 switch to On (or 1) to start compressor #2.
16. Repeat steps 10 through 15 for the second circuit.

Table 5 – Typical operating conditions with compressors at 100%

Economised cycle?	Suction superheating	Delivery superheating	Liquid subcooling
NO	4 ± 6 °C	20 ± 25 °C	5 ± 6 °C
YES	4 ± 6 °C	18 ± 23 °C	10 ± 15 °C

▲IMPORTANT

The symptoms of a low refrigerant charge are: low evaporation pressure, high suction and exhaust superheating (beyond the above limits) and a low subcooling level. In this case, add R134A refrigerant to the relevant circuit. The system has been provided with a charge connection between the expansion valve and the evaporator. Charge refrigerant until working conditions return to normal.
Remember to reposition the valve cover when finished.

17. To turn off the machine temporarily (daily or weekend shutdown) turn the Q0 switch to Off (or 0) or open the remote contact between terminals 58 and 59 on terminal board M3 (Installation of remote switch to be carried out by the customer). The microprocessor will activate the shutdown procedure, which requires several seconds. Three minutes after the compressors have been shut down, the microprocessor will shut down the pump. Do not switch off the main power supply so as not to de-activate the electrical resistances of the compressors and the evaporator.

▲IMPORTANT

If the machine is not supplied with a built-in pump, do not shut down the external pump before 3 minutes have elapsed after the last compressor has shut down. Early shutdown of the pump triggers a water-flow failure alarm.

Seasonal shutdown

1. Turn switches Q1 and Q2 to the Off (or 0) position to shut down the compressors, using the normal pump-down procedure.
2. After the compressors have been shut down, turn switch Q0 to the Off (or 0) position and wait for the built-in water pump to shut down. If the pump is managed externally, wait for 3 minutes after the compressors have shut down before turning off the pump.
3. Open the Q12 thermal-magnetic switch (Off position) inside the control section of the electrical board and then open the general disconnecting switch Q10 to cut off the machine's power supply entirely.
4. Close the compressor intake valves (if any) and delivery valves and also the valves located on the liquid and liquid injection line.
5. Place a warning sign on every switch that has been opened, advising to open all the valves before starting the compressors.
6. If no water and glycol mixture has been introduced into the system, discharge all the water from the evaporator and from the connected piping if the machine is to remain inactive during the winter season. One must remember that once the machine's power supply has been cut off, the anti-freeze electrical resistance cannot function. Do not leave the evaporator and piping exposed to the atmosphere during the entire period of inactivity.

Starting up after seasonal shutdown

1. With the general disconnecting switch open, make sure that all the electrical connections, cables, terminals and screws are well tightened to ensure good electrical contact.
2. Verify that the power supply voltage applied to the machine is within ±10% of the nominal nameplate voltage and that the voltage unbalance between the phases is no within ±3% range.
3. Verify that all control devices are in good condition and functioning and that there is a suitable thermal load for start-up.
4. Verify that all the connection valves are well tightened and that there are no refrigerant leaks. Always reposition the valve covers.
5. Verify that switches Q0, Q1, Q2 and Q12 are in the open position (Off). Turn the general disconnecting switch Q10 to the On position. Doing this will allow to turn on the electrical resistances of the compressors. Wait at least 12 hours for them to warm up the oil.
6. Open all suction, delivery, liquid and liquid injection valves. Always reposition valve covers.
7. Open the water valves to fill the system and vent the air from the evaporator through the vent valve installed on its shell. Verify that there are no water leaks from the piping.

System maintenance

⚠ WARNING

All routine and non-routine maintenance activities on the machine must be carried out solely by qualified personnel who are familiar with the machine characteristics, operation and maintenance procedures, and who are aware of the safety requirements and risks involved.

⚠ WARNING

It 's absolutely forbidden to remove all the protections of the moving parts of the unit

▲ ATTENTION

The causes of repeated shutdowns deriving from triggering of safety devices must be investigated and corrected.
Re-starting the unit after simply resetting the alarm can seriously damage the equipment.

▲ ATTENTION

A correct refrigerant and oil charge is essential for optimal operation of the machine and for environmental protection.
Any oil and refrigerant recovery must conform to legislation in force.

General

▲ IMPORTANT

Besides the checks suggested in the routine maintenance program, it is recommended to schedule periodical inspections, to be carried out by qualified personnel, as follows:
4 inspections per year (every three months) for units running about 365 days per year;
2 inspections per year (1 at seasonal start-up and the second one in the middle of the season) for units running about 180 days per year with seasonal operation.
1 inspection per year 1 (at seasonal start-up) for units running about 90 days per year with seasonal operation.

▲ IMPORTANT

The manufacturer of the unit requires users to have a complete check on the unit and on the state of the pressurised refrigeration circuits carried out after ten years of use, in compliance with Italian law (Lgs. Decree 93/2000), for all groups belonging to categories I and IV, containing fluids of group 2.
The manufacturer also recommends that all users analyse compressor vibrations annually and make routine inspections to check on possible refrigerant leaks. These checks ascertain that the refrigeration circuit is intact and safe and must be carried out according to local and/or European laws by personnel holding the qualifications required by such laws.

Compressor maintenance

The analysis of vibrations is a good method for verifying the mechanical conditions of the compressor.
Verification of vibration readings immediately after start-up and periodically on an annual basis is recommended. The compressor load must be similar to the previous measurement's load to ensure measurement reliability.

Lubrication

The units do not require a routine procedure for lubrication of components.
Compressor oil is of the synthetic type and is highly hygroscopic. It is therefore advised to limit its exposure to the atmosphere during storage and filling. It is recommended that the oil be exposed to the atmosphere for no more than 10 minutes.
The compressor oil filter is located under the oil separator (delivery side). Its replacement is advised when its pressure drop exceeds 2.0 bar. The pressure drop across the oil filter is the difference between the compressor discharge pressure and the oil pressure. Both these pressures can be monitored through the microprocessor for both compressors.

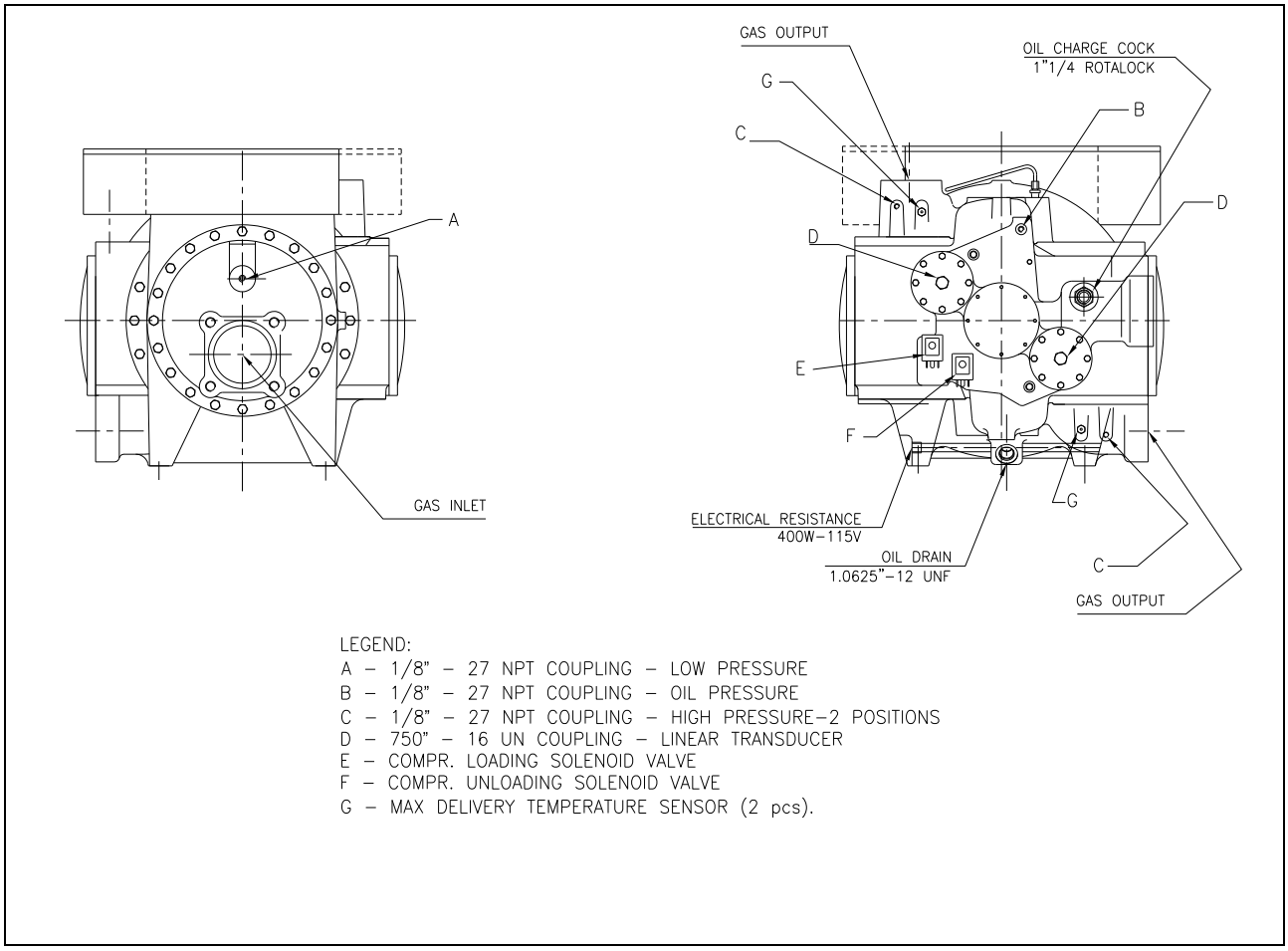


Fig. 27 - Installation of control devices for Fr4 compressor

Routine maintenance

Table 6 – Routine maintenance programme (Note 2)	**Weekly**	**Monthly** (Note 1)	**Yearly** (Note 2)
General			
Reading of operating data (Note 3)	**X**		
Visual inspection of machine for any damage and/or loosening		**X**	
Verification of thermal insulation integrity			**X**
Clean and paint where necessary			**X**
Analysis of water (Note 5)			**X**
Electrical:			
Verification of control sequence			**X**
Verify contactor wear – Replace if necessary			**X**
Verify that all electrical terminals are tight – Tighten if necessary			**X**
Clean inside the electrical control board			**X**
Visual inspection of components for any signs of overheating		**X**	
Verify operation of compressor and electrical resistance		**X**	
Measure compressor motor insulation using the Megger			**X**
Refrigeration circuit:			
Check for any refrigerant leakage		**X**	
Verify refrigerant flow using the liquid sight glass – Sight glass full	**X**		
Verify filter dryer pressure drop		**X**	
Verify oil filter pressure drop (Note 4)		**X**	
Analyse compressor vibrations			**X**
Analyse compressor oil acidity (Note 6)			**X**
Check safety valves (Note 7)		**X**	
Condenser section:			
Clean the exchangers (Note 8)			**X**

Notes:

1) Monthly activities include all the weekly ones
2) The annual (or early season) activities include all weekly and monthly activities
3) Machine operating values should be read on a daily basis thus keeping high observation standards
4) Replace the oil filter when the pressure drop across it reaches 2.0 bar
5) Check for any dissolved metals
6) TAN (Total Acid Number) : ≤0.10 : No action
   Between 0.10 and 0.19 : Replace anti-acid filters and re-check after 1000 running hours. Continue to replace filters until the TAN is lower than 0.10.
   >0.19 : Change oil, replace oil filter and filter dryer. Verify at regular intervals.

7) Safety valves
   Check that the lid and seal have not been tampered with.
   Check that the discharge socket of the safety valves is not obstructed by any objects, rust or ice.
   Check the manufacturing date shown on the safety valve. Replace the valve every 5 years and make sure it is compliant with the current regulations in terms of the installation of the unit.

8) Clean the pipes of the exchanger mechanically and chemically if the following occur: drop in the condenser water capacity, drop in the differential temperature between inlet and outlet water, high temperature condensation.

Replacement of filter dryer

It is strongly advised that the filter dryer cartridges be replaced in the event of a considerable pressure drop across the filter or if bubbles are observed through the liquid sight glass while the subcooling value is within the accepted limits.
Replacement of the cartridges is advised when the pressure drop across the filter reaches 50 kPa with the compressor under full load.
The cartridges must also be replaced when the humidity indicator in the liquid sight glass changes colour and shows excessive humidity, or when the periodic oil test reveals the presence of acidity (TAN is too high).

Procedure to replace the filter dryer cartridge

▲ ATTENTION

Ensure proper water flow through the evaporator during the entire servicing period. Interrupting the water flow during this procedure would cause the evaporator to freeze, with consequent breakage of internal piping.

1. Shut down the relevant compressor by turning the Q1 or Q2 switch to Off.
2. Wait until the compressor has stopped and close the valve located on the liquid line.
3. Once the compressor has stopped, place a label on the compressor start-up switch, to prevent undesired start-ups.
4. Close the compressor suction valve (if any).
5. Using a recovery unit, remove surplus refrigerant from the liquid filter until atmospheric pressure is reached. The refrigerant must be stored in a suitable and clean container.

⚠ WARNING

To protect the environment, do not release removed refrigerant into the atmosphere. Always use a recovery and storage device.

6. Balance internal pressure with external pressure by pressing the vacuum pump valve installed on the filter cover.
7. Remove the filter dryer cover.
8. Remove the filter elements.
9. Install the new filter elements in the filter.

▲ ATTENTION

Do not start the machine before the cartridge has been correctly inserted in the filter dryer. The unit manufacturer will accept no responsibility for any damage to persons or property caused during unit functioning if the filter dryer cartridges have not been correctly inserted.

10. Replace the cover gasket. Do not allow any mineral oil onto the filter gasket so as not to contaminate the circuit. Use only compatible oil for this purpose (POE).
11. Close the filter cover.
12. Connect the vacuum pump to the filter and pull vacuum to 230 Pa.
13. Close the vacuum pump valve.
14. Recharge the filter with the refrigerant recovered during emptying.
15. Open the liquid line valve.
16. Open the suction valve (if any).
17. Start the compressor by turning switch Q1 or Q2.

Replacement of the oil filter

▲ ATTENTION

The lubrication system has been designed to keep most of the oil charge inside the compressor. During operation, however, a small amount of oil circulates freely in the system, conveyed by the refrigerant. The amount of replacement oil going into the compressor should therefore be equal to the quantity removed rather than the amount stated on the nameplate; this will avoid excess of oil during the following start-up.
The quantity of oil removed from the compressor must be measured after having allowed the refrigerant present in the oil to evaporate for a suitable amount of time. To reduce the refrigerant content in the oil to a minimum, it is advised that the electrical resistances be kept on and that the oil be removed only when it has reached a temperature of 35÷45°C.

▲ ATTENTION

The replacement of the oil filter requires careful attention with regard to oil recovering; the oil must not be exposed to air for more than about 30 minutes.
In case of doubts, verify oil acidity or, if it is not possible to carry out the measurement, replace the charge of lubricant with fresh oil stored in sealed tanks or in a way that meet supplier specifications.

▲ ATTENTION

The lubrication system has been designed to keep most of the oil charge inside the compressor. During operation, however, a small amount of oil circulates freely in the system, conveyed by the refrigerant. The amount of replacement oil going into the compressor should therefore be equal to the quantity removed rather than the amount stated on the nameplate; this will avoid excess of oil during the following start-up.
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▲ ATTENTION

The replacement of the oil filter requires careful attention with regard to oil recovering; the oil must not be exposed to air for more than about 30 minutes.
In case of doubts, verify oil acidity or, if it is not possible to carry out the measurement, replace the charge of lubricant with fresh oil stored in sealed tanks or in a way that meet supplier specifications.

Fr4200 compressor

The compressor oil filter is located at the coupling of the oil inlet piping and the compressor body (suction side). It is strongly advised that it be replaced when its pressure drop exceeds 2.0 bar. The pressure drop across the oil filter is the difference between the compressor delivery pressure minus oil pressure. Both pressures can be controlled through the microprocessor for both compressors.

Required materials:

Oil filter Code 95816-401 – Quantity 1
Gaskets kit Code 128810988 – Quantity 1

Compatible oils:
DAPHNE HERMET OIL FVC68D

The standard oil charge for a compressor is18 litres.

Oil filter replacement procedure

Procedure to replace oil filter

1) Shut down both compressors by turning the Q1 and Q2 switches to the Off position.
2) Turn the Q0 switch to Off, wait for the circulation pump to turn off and open the general disconnecting switch Q10 to cut off the machine's electrical power supply.
3) Place a label on the handle of the general disconnecting switch in order to prevent accidental start-up.
4) Close the suction, discharge and liquid injection valves.
5) Connect the recovery unit to the compressor and recover the refrigerant in a suitable and clean container.
6) Evacuate the refrigerant until the internal pressure has turned negative (compared to atmospheric pressure). The amount of refrigerant dissolved in the oil is reduced to a minimum in this way.
7) Drain the oil in the compressor by opening the drain valve located under the oil separator.
8) Remove the oil filter cover and remove the internal filter element.
9) Replace the cover and internal sleeve gaskets. Do not lubricate the gaskets with mineral oil in order not to contaminate the system.
10) Insert the new filter element.
11) Reposition the filter cover and tighten the screws. The screws must be tightened alternately and progressively setting the torque wrench at 60 Nm.
12) Charge the oil from the upper valve located on the oil separator. Considering the high hygroscopy of ester oil, it should be charged as quickly as possible. Do not expose ester oil to the atmosphere for more than 10 minutes.
13) Close the oil charging valve.
14) Connect the vacuum pump and evacuate the compressor up to a vacuum of 230 Pa.
15) On reaching the above vacuum level, close the vacuum pump valve.
16) Open the system's delivery, suction and liquid injection valves.
17) Disconnect the vacuum pump from the compressor.
18) Remove the warning label from to the general disconnecting switch.
19) Close the general disconnecting switch Q10 to supply power to the machine.
20) Start the machine by following the start-up procedure described above.

Refrigerant charge

▲ ATTENTION

The units have been designed to operate with R134a refrigerant. DO NOT USE refrigerants other than R134a.

⚠ WARNING

The addition or removal of refrigerant gas must be carried out in compliance with the laws and regulations in force.

▲ ATTENTION

When refrigerant gas is added to or removed from the system, ensure proper water flow through the evaporator for the entire charge/discharge time. Interrupting the water flow during this procedure would cause the evaporator to freeze with consequent breakage of its internal piping.
Damage caused by freezing makes the warranty void.

⚠ WARNING

Removal of the refrigerant and replenishing operations must be performed by technicians who are qualified to use the appropriate materials for this unit. Unsuitable maintenance can result in uncontrolled losses in pressure and fluid. Do not disperse the refrigerant and lubricating oil in the environment. Always be equipped with a suitable recovery system.

The units ship with a full refrigerant charge, but in some cases it might be necessary to replenish the machine in the field.

▲ ATTENTION

Always verify the causes of a loss of refrigerant. Repair the system if necessary then recharge it.

The machine can be replenished under any stable load condition (preferably between 70 and 100%) and under any ambient temperature condition (preferably above 20°C). The machine should be kept running for at least 5 minutes to allow the condensation pressure to stabilise.
The subcooling value is about 3-4°C.
Once the subcooling section has been completely filled, additional refrigerant will not increase system efficiency. However, a small additional quantity of refrigerant (1÷2 kg) makes the system slightly less sensitive.

N.B.: Subcooling varies and requires a few minutes to re-stabilise. However, subcooling should not come below 2°C under any condition. Also, the subcooling value can change slightly as the water temperature and the suction superheating vary. As the suction superheating value decreases, there is a corresponding decrease in subcooling.

One of the two following scenarios can arise in a machine without refrigerant:

1. If the refrigerant level is slightly low, flow of bubbles can be seen through the liquid sight glass. Replenish the circuit as described in the replenishment procedure.
2. If the gas level in the machine is moderately low, the corresponding circuit could have some low-pressure stops. Replenish the corresponding circuit as described in the replenishment procedure.

Refrigerant filling procedure

1) If the machine has lost refrigerant, it is necessary to first establish the causes before carrying out any replenishment operation. The leak must be found and repaired. Oil stains are a good indicator, as they can appear in the vicinity of a leak. However, this is not necessarily always a good search criterion. Searching with soap and water can be a good method for medium to large leaks, while an electronic leak detector is required to find small leaks.
2) Add refrigerant to the system through the service valve on the suction pipe or through the Schrader valve located on the evaporator inlet pipe.
3) The refrigerant can be added under any load condition between 25 and 100% of the system capacity. Suction superheating must be beteen 4 and 6°C.
4) Add enough refrigerant to fill the liquid sight glass entirely, so that no flow of bubbles can be seen anymore. Add an extra 2 ÷ 3 kg of refrigerant as a reserve, to fill the subcooler if the compressor is operating at 50 – 100% load.
5) Check the subcooling value by reading the liquid pressure and the liquid temperature near the expansion valve. The subcooling value must be between 3 and 5°C. The subcooling value will be lower at 75 ÷ 100% load and higher at 50% load.
6) Overcharging the system will cause a rise in the compressor's discharge pressure.

Standard Checks

Temperature and pressure sensors

The unit comes factory-equipped with all the sensors listed below. Periodically check that their measurements are correct by means of reference instruments (manometers, thermometers); correct the wrong readings as necessary using the microprocessor keypad. Well-calibrated sensors ensure better efficiency for the machine and a longer lifetime.
Note: Refer to the microprocessor use and maintenance manual for a complete description of applications, settings and adjustments.

All sensors are preassembled and connected to the microprocessor. The descriptions of each sensor are listed below:

Outlet water temperature sensor – This sensor is located on the evaporator outlet water connection and is used by the microprocessor to control the machine load depending on the system's thermal load. It also helps control the evaporator's antifreeze protection.

Inlet water temperature sensor – This sensor is located on the evaporator inlet water connection and is used for monitoring the return water temperature.

Compressor discharge pressure transducer – This is installed on every compressor and allows to monitor the discharge pressure and to control the fans. Should the condensation pressure increase, the microprocessor will control the compressor load in order to allow it to function even if the compressor flow gas must be reduced. It also contributes to the oil control logic.

Oil pressure transducer – This is installed on every compressor and allows to monitor the oil pressure. The microprocessor uses this sensor to inform the operator on the conditions of the oil filter and on how the lubrication system is functioning. By working together with the high- and low-pressure transducers, it protects the compressor from problems deriving from poor lubrication.

Low-pressure transducer – This is installed on every compressor and allows to monitor the compressor suction pressure along with low pressure alarms. It contributes to complementing the oil control logic.

Suction sensor – This is installed optionally (if the electronic expansion valve has been requested) on every compressor, and allows to monitor the suction temperature. The microprocessor uses the signal from this sensor to control the electronic expansion valve.

Compressor discharge temperature sensor – This is installed on every compressor and allows to monitor compressor discharge pressure and oil temperature. The microprocessor uses the signal from this sensor to control the liquid injection and to shut down the compressor in case that the discharge temperature reaches 110°C. It also protects the compressor from pumping liquid refrigerant at start-up.

Test sheet

It is recommended that the following operation data are recorded periodically in order to verify correct operation of the machine over time. These data will also be extremely useful to the technicians who will be performing routine and/or non-routine maintenance on the machine.

Water side measurements

Chilled water setpoint	°C	_____
Evaporator outlet water temperature	°C	_____
Evaporator inlet water temperature	°C	_____
Evaporator pressure drop	kPa	_____
Evaporator water flow rate	m^3/h	_____

Chilled water setpoint	°C	_____
Condenser outlet water temperature	°C	_____
Condenser inlet water temperature	°C	_____
Condenser pressure drop	kPa	_____
Condenser water flow rate	m^3/h	_____

Refrigerant side measurements

Circuit #1:

	Compressor load	_____	%
	N. of expansion valve cycles (electronic only)	_____	
Refrigerant/Oil pressure	Evaporation pressure	_____	
	Condensation pressure	_____	bar
	Oil pressure	_____	bar
Refrigerant temperature	Evaporation saturated temperature	_____	bar
	Suction gas temperature	_____	°C
	Suction superheating	_____	°C
	Condensation saturated temperature	_____	°C
	Discharge superheating	_____	°C
	Liquid temperature	_____	°C
	Subcooling	_____	°C
		_____	°C

Circuit #2

	Compressor load	_____	%
	N. of expansion valve cycles (electronic only)	_____	
	Evaporation pressure	_____	
Refrigerant/Oil pressure	Condensation pressure	_____	bar
	Oil pressure	_____	bar
	Evaporation saturated temperature	_____	bar
Refrigerant temperature	Suction gas temperature	_____	°C
	Suction superheating	_____	°C
	Condensation saturated temperature	_____	°C
	Discharge superheating	_____	°C
	Liquid temperature	_____	°C
	Subcooling	_____	°C
		_____	°C
External air temperature		_____	***°C***

Circuit #2

	Compressor load	_____	%
	N. of expansion valve cycles (electronic only)	_____	
	Evaporation pressure	_____	
Refrigerant/Oil pressure	Condensation pressure	_____	bar
	Oil pressure	_____	bar
	Evaporation saturated temperature	_____	bar
Refrigerant temperature	Suction gas temperature	_____	°C
	Suction superheating	_____	°C
	Condensation saturated temperature	_____	°C
	Discharge superheating	_____	°C
	Liquid temperature	_____	°C
	Subcooling	_____	°C
		_____	°C
External air temperature		_____	***°C***

Electrical measurements

Analysis of the unit's voltage unbalance:

Phases:	***RS***	***ST***	***RT***
	_____ ***V***	_____ ***V***	_____ ***V***

Unbalance %: $\frac{V\max - Vaverage}{Vaverage} x100 =$ _____ %

Compressors current – Phases:	***R***	***S***	***T***
Compressor #1	_____ A	_____ A	_____ A
Compressor #2	_____ A	_____ A	_____ A
Compressor #3	_____ A	_____ A	_____ A

Service and limited warranty

All machines are factory-tested and guaranteed for 12 months as of the first start-up or 18 months as of delivery.
These machines have been developed and constructed according to high quality standards ensuring years of failure-free operation. It is important, however, to ensure proper and periodical maintenance in accordance with all the procedures listed in this manual.
We strongly advise stipulating a maintenance contract with a service authorized by the manufacturer in order to ensure efficient and problem-free service, thanks to the expertise and experience of our personnel.
It must also be taken into consideration that the unit requires maintenance also during the warranty period.
It must be borne in mind that operating the machine in an inappropriate manner, beyond its operating limits or not performing proper maintenance according to this manual can void the warranty.
Observe the following points in particular, in order to conform to warranty limits:

1. The machine cannot function beyond the specified limits
2. The electrical power supply must be within the voltage limits and without voltage harmonics or sudden changes.
3. The three-phase power supply must not have un unbalance between phases exceeding 3%. The machine must stay turned off until the electrical problem has been solved.
4. No safety device, either mechanical, electrical or electronic must be disabled or overridden.
5. The water used for filling the water circuit must be clean and suitably treated. A mechanical filter must be installed at the point closest to the evaporator inlet.
6. Unless there is a specific agreement at the time of ordering, the evaporator water flow rate must never be above 120% and below 80% of the nominal flow rate.

Obligatory routine checks and starting up apparatuses under pressure

The units are included in category IV of the classification according to European Directive PED 97/23/EC.
For chillers belonging to this category, some local regulations require a periodic inspection by an authorized agency. Please check with your local requirements.

Important information regarding the refrigerant used

This product contains fluorinated greenhouse gases covered by the Kyoto Protocol. Do not vent gases into the atmosphere.

Refrigerant type: R134a
GWP(1) value: 1300

(1)GWP = global warming potential

The refrigerant quantity is indicated on the unit name plate.
Periodical inspections for refrigerant leaks may be required depending on European or local legislation. Please contact your local dealer for more information.

Disposal

The unit is made of metal and plastic parts. All these parts must be disposed of in accordance with the local regulations in terms of disposal. Lead batteries must be collected and taken to specific refuse collection centres.

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