DAIKIN

Installation, Operation and Maintenance Manual
D – 806 C – 07/02 F – EN

Water-cooled screw chillers

EWWD170-600DJYNN
EWWD190-650DJYNN/A
50Hz – Refrigerant: R-134a

Introduction

Purpose of the manual

The manual allows the installer and the operator to perform correctly all the required operations for unit installation and maintenance without causing any damage to the chiller or injuries to qualified personnel.
Therefore the manual is essential for the qualified personnel that have to arrange the equipment to provide the correct installation in accordance with local codes and regulation.

Inspection

When the equipment is received, all items in the bill of lading should be carefully checked to make sure the shipment is complete. The unit should be carefully checked and shipping damages should be reported to the carrier. The unit identification plate should be checked before unloading the unit to ensure that it conforms to the power supply available. Physical damage to the unit after acceptance is not Daikin's responsibility.

Responsibilities

DAIKIN declines all present and future responsibilities regarding injuries to people and damage to things or to the unit caused by operator's negligence, failure to respect installation/maintenance data in this manual, or failure to respect the current regulations regarding the safety of both the equipment and the qualified personnel.

Servicing and maintenance

Servicing and maintenance of this unit must be carried out by experienced personnel with specific training in refrigeration. Regular checking of safety devices should be carried out, but also routine maintenance should be carried out in accordance with the recommendation list in the main section.
The simple design of the refrigeration circuit minimises potential problems during normal unit operation.

Features

General description

The chillers of the series are equipped with 1 or 2 Frame 3200 single-screw compressors. They are manufactured to satisfy the requirements of the consultants and the end user. The units are designed to minimise energy costs while maximising the refrigeration capacity. Once again, Daikin has developed a line of chillers unsurpassed in performance and quality that will meet the most stringent requirements of comfort cooling, ice storage and process applications.
Daikin's chiller design experience, combined with outstanding features, makes the chillers of the series unmatched in the industry.

Safety measures

The unit must be suitably clamped to the ground.
It is necessary to follow these cautions and warnings:

- The unit must be lifted only by using the proper tools able to support the weight of the unit.
- No admittance to unauthorised or unqualified personnel should be allowed.
- No operation on electrical components is allowed without having switched off electric power supply.
- No operation on electrical components is allowed without using insulated platforms; no water or moisture should be present.
- All operations on the refrigerant circuit and pressurised components are to be performed by qualified personnel only.
- Compressor replacement or oil addition must be performed by qualified personnel only.
- Avoid contamination with foreign bodies in the water piping when connecting the unit to the water system.
- Fit a mechanical filter to the piping connected to the heat exchangers inlet.

WARNING

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

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

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

In case of any discrepancy between this manual and the equipment's document please refer to the wiring diagram and dimensional drawings.

Installation

Check the instructions for use before operating the unit.

Warning

Installation and maintenance are to be performed only by qualified personnel who are familiar with local codes and regulations, and who are experienced with this type of equipment. Unit installation must be avoided in areas that could be considered dangerous for maintenance operations.

Receiving and handling

Inspect the unit immediately after receipt for possible damage. The chillers are shipped ex-factory and all claims for handling and shipping damage are the responsibility of the consignee. Leave the shipping skid in place until the unit is in final position. This will aid in handling the equipment. Use extreme care when rigging the equipment to prevent damage to the control panel, or refrigerant piping. See Dimensional Data for the centre of gravity of the unit.

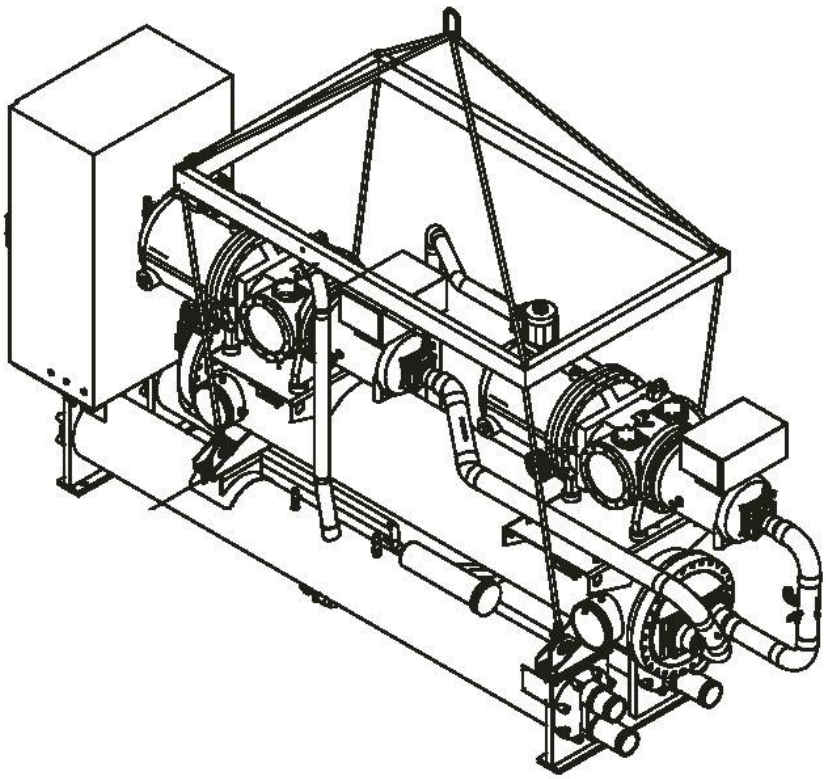


Figure 1. Lifting the unit

Perform all moving and handling with skids or dollies under the unit when possible, and do not remove them until the unit is in its final location.

When moving the unit, apply pressure on the base of the skids only, never on the piping or other components. A long bar will help move the unit. Do not drop the unit at the end of the move.
Do not attach slings to piping or equipment. Do not attempt to lift the unit by the lifting points mounted on the compressors. They are for lifting only the compressor should one need be removed from the unit. Move unit in the upright and level position at all times. Drop the unit gently when lowering from the truck or rollers.

Location

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

Compressor condensation

Condensation occurs on the compressor surface when the temperature of the compressor surface is lower than the ambient dew point temperature. Drain pans with drain connections are provided underneath each compressor to collect the condensate. The compressor motor housing extends past the drain pans. Install a floor drain close to the unit to collect condensate from motor housing and condensate pans.

Water treatment

If unit is operating with a cooling tower, clean and flush cooling tower. Make sure tower blowdown or bleed-off is operating. Atmospheric air contains many contaminants which increase the need for water treatment. The use of untreated water may result in corrosion, erosion, sliming, scaling, or algae formation. A water treatment service is recommended. Daikin is not responsible for damage or faulty operation from untreated or improperly treated water.

Head pressure control, tower system

The minimum condenser water inlet temperature must not be lower than 15°C at full tower water flow. If lower water temperature is used, the flow must be reduced proportionally. Use a three-way bypass valve around the tower to regulate the condenser water flow. Figure 1 shows a three-way pressure-actuated water regulating valve used for cooling applications. This regulating valve will assure an adequate condensation pressure if the condenser water inlet temperature drops below 15 °C.

Condensation pressure control, well water system

When using city or well water for condensing the refrigerant, install a normally closed direct acting water regulating valve in the outlet piping of the condenser. This regulating valve will assure an adequate condensation pressure if the condenser water inlet temperature drops below 15 °C. The condenser service valve provides a pressure tap for the regulating valve. The valve can modulate in response to existing pressure. On shutdown, the valve closes, preventing water from siphoning out of the condenser. Siphoning causes condenser waterside drying and accelerates fouling. If a valve is not used, Figure 2 illustrates the recommendation of a loop at the outlet. Size the loop height (H) to offset the negative pressure caused by the siphoning effect. A vacuum breaker may be required.

Figure 2. Bypass valve

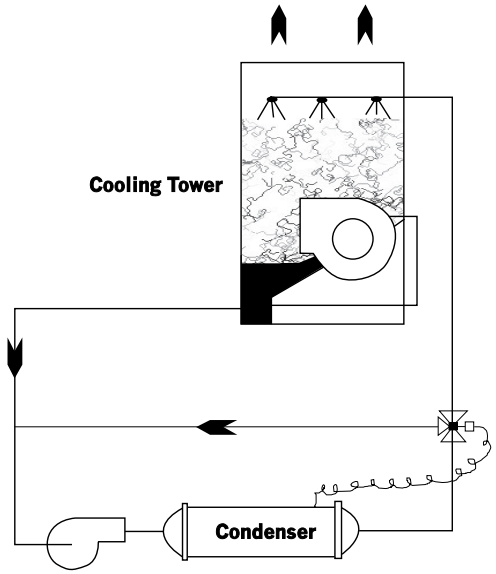
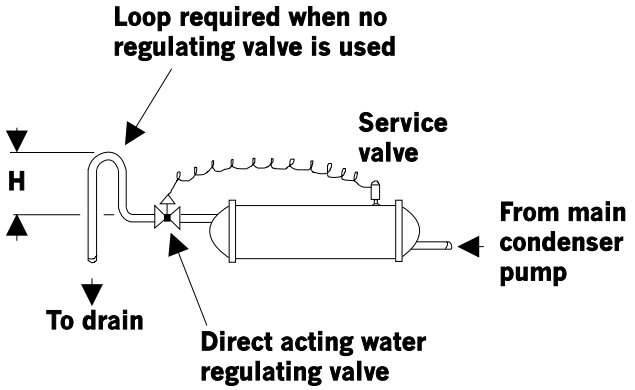


Figure 3. Well water system



Cooling tower	Cooling tower
Condenser	Condenser
Loop required when no regulating valve is used	Loop required when no regulating valve is used
Service valve	Service valve
To drain	To drain
Direct acting water regulating valve	Direct acting water regulating valve
From main condenser pump	From main condenser pump

Temperature and water flow limits

The units of the series are designed to operate in conditions from -8°C to +15°C water outlet temperature on the evaporator side and +15°C to +55°C water inlet temperature on the condenser side. Glycol in the evaporator is required on all applications below +4°C evaporator water outlet temperature. The maximum allowable water temperature to the cooler in a non-operating cycle is 40°C. The non-operating condenser maximum water outlet temperature is 46°C. Flow rates below the minimum values shown in the evaporator and condenser pressure drop curves, may cause freeze-up problems, scaling and poor control. Flow rates above the maximum values shown in the evaporator and condenser pressure drop curves will result in unacceptable pressure drops, excessive nozzle and tube erosion and possibly cause tube failure.

Evaporator freeze protection

When freeze protection is a concern, do the following:

- If the unit will not be operated during the winter, drain and flush the evaporator and chilled water piping with glycol. Drain and vent connections are provided on the evaporator.
- When using a cooling tower, add a glycol solution to the chilled water system. Freeze point should be approximately 6°C below minimum design ambient temperature.
- Insulate the field water piping, especially the chilled water side.

Note: Freeze damage is not considered a warranty failure and is not the responsibility of Daikin.

Water piping

Due to the variety of piping practices, it is advisable to follow the recommendations of local authorities. They can provide the installer with the proper building and safety codes required for a safe and proper installation.
Basically, the piping should be designed with a minimum number of bends and changes in elevation for low cost and high performance of the system. It should contain:

1. Vibration eliminators to reduce vibration and noise transmission to the building.
2. Shutoff valves to isolate the unit from the piping system during unit servicing.
3. Manual or automatic air vent valves at the high points of the system. Drains at the low parts in the system. The evaporator should not be the highest point in the piping system.
4. Some means of maintaining adequate system water pressure (e.g., expansion tank or regulating valve).
5. Water temperature and pressure indicators in the unit to aid in unit servicing.

6. A strainer or some means of removing foreign matter from the water before it enters the pump. The strainer should be placed far enough upstream to prevent cavitation at the pump inlet (consult pump manufacturer for recommendations). The use of a strainer will prolong pump life and help maintain high system performance levels.
7. A strainer should also be placed in the supply water line just before the evaporator inlet. This will aid in preventing foreign material from entering and decreasing the performance of the evaporator.
8. The shell-and-tube evaporator has a thermostat and an electric heater to prevent freeze-up down to -28°C. Any water piping to the unit must also be protected to prevent from freezing.
9. If the unit is used as a replacement chiller on a previously existing piping system, the system should be thoroughly flushed prior to unit installation and then regular chilled water analysis and chemical water treatment is recommended immediately at equipment start-up.
10. In the event that glycol is added to the water system for anti-freeze protection, note that the refrigerant suction pressure will be lower, cooling performance will be lower and water pressure drop will be higher. System safety devices such as freeze protection and low pressure protection must be readjusted.

Prior to insulating the piping and filling the system, a preliminary leak check should be made.

Chilled water thermostat

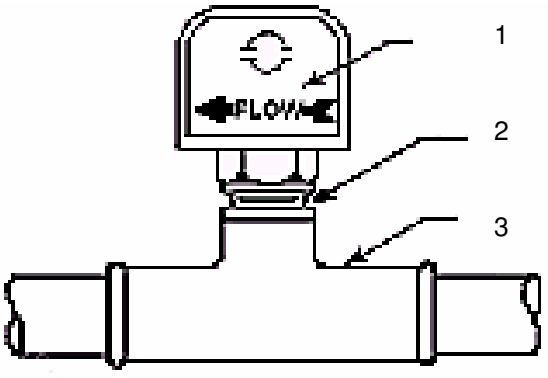
The water-cooled chillers of the series are equipped with a controller for outlet water temperature. Be careful to avoid damaging lead wires and sensor cables when working around the unit. Check the cables before running the unit. Avoid rubbing the cables on the frame or other components. Verify that the lead wires are firmly anchored. If the sensor is removed from the well for servicing, do not wipe off the heat conducting compound applied to the well.

Refrigerant charge

All units are designed for use with R-134a and are shipped with a full operating charge. The operating charge for each unit is shown in the Physical Data Table.

Flow switch

A water flow switch must be mounted in either the inlet or outlet water line to insure adequate water flow through the evaporator before starting the unit. This will safeguard against slugging the compressors on start-up. It also serves to shut down the unit in the event that water flow is interrupted, thus preventing the evaporator from freeze-up. There is a "paddle" type flow switch available which is adaptable to any nominal pipe size from 1" (25 mm) to 8" (203 mm).
Certain minimum flow rates are required to close the switch as listed in Table 1.



1 Flow direction marked on switch
2 NPT flow switch connection
3 Tee

Figure 4. Flow switch

Table 1

NOMINAL PIPE SIZE INCHES (MM)	MINIMUM REQUIRED FLOW TO ACTIVATE SWITCH – LITERS PER SECOND
5 (127)	3.7
6 (152)	5.0
8 (203)	8.8

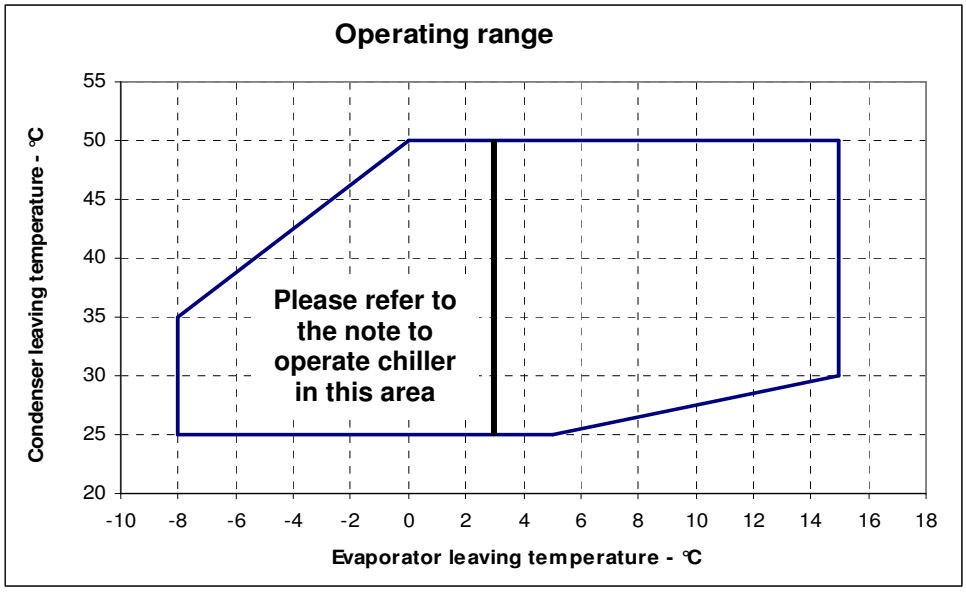
Glycol solutions

Use industrial grade glycols only. Do not use automotive grade antifreeze. Automotive antifreeze contains inhibitors that will cause plating on the copper tubes of the chiller evaporator. The type and handling of glycol must be consistent with local codes.

Evaporator and condenser water flow and pressure drop

Flow rates must be between the minimum and maximum values shown on the relevant evaporator and condenser curves. Flow rates below the minimum values shown will result in laminar flow that will reduce efficiency, cause erratic operation of the electronic expansion valve and could cause low temperature cut-out. On the other hand, flow rates exceeding the maximum values shown can cause erosion on the evaporator water connections and tubes. Measure the chilled water pressure drop across the evaporator at field installed pressure taps. It is important not to include the effect of valves or strainers in these readings. Do not vary the water flow through the evaporator while the compressor(s) are operating. The control set points are based on constant flow.

Operating limits



Operating range	Operating range
Condenser leaving temperature (°C)	Condenser outlet temperature (°C)
Evaporator leaving temperature (°C)	Evaporator outlet temperature (°C)
Please refer to the note to operate chiller in this area	Please refer to the note to operate chiller in this range

Note: The use of glycol is necessary for evaporator outlet water temperature below +3°C.

Physical data EWWD-DJYNN R-134a

Unit size		170	210	260	300	320
Cooling capacity (1)	kW	165,5	201,2	252,8	280,4	333,9
Power input (1)	kW	42,1	50,7	64,9	75,4	84,3
Screw compressor	N.	1	1	1	1	2
Refrigerant circuits	N.	1	1	1	1	2
Refrigerant charge R-134a	kg	50	50	55	55	110
Min % of capacity reduction	%	25	25	25	25	12,5
Evaporator						
Evaporators / water volume	N. / l	1 / 60	1 / 56	1 / 123	1 / 123	1 / 118
Max operating pressure	bar	10,5	10,5	10,5	10,5	10,5
Condenser						
Condensers / water volume	N./l	1 / 13	1 / 15	1 / 15	1 / 15	2 / 26
Max operating pressure	bar	10,5	10,5	10,5	10,5	10,5
Weight and dimensions						
Standard unit shipping weight	kg	1393	1410	1503	1503	2687
Standard unit operating weight	kg	1470	1480	1650	1650	2840
Unit length	mm	3435	3435	3435	3435	4305
Unit width	mm	920	920	920	920	860
Unit height	mm	1860	1860	1860	1860	1880

Note: **(1)** Nominal cooling capacity and power input are based on: 12/7 °C evaporator water inlet /outlet temperature; 30/35°C condenser water inlet /outlet temperature.

Physical data EWWD-DJYNN R-134a

Unit size		380	420	460	500	600
Cooling capacity (1)	kW	372,2	402,5	448,3	493,7	555,7
Power input (1)	kW	93,1	101,4	115,1	129,0	150,2
Screw compressor	N.	2	2	2	2	2
Refrigerant circuits	N.	2	2	2	2	2
Refrigerant charge R-134a	kg	110	110	110	110	110
Min % of capacity reduction	%	12,5	12,5	12,5	12,5	12,5
Evaporator						
Evaporators / water volume	N./l	1 / 113	1 / 113	1 / 173	1 / 168	1 / 168
Max operating pressure	bar	10,5	10,5	10,5	10,5	10,5
Condenser						
Condensers / water volume	N./l	2 / 28	2 / 30	2 / 30	2 / 30	2 / 30
Max operating pressure	bar	10,5	10,5	10,5	10,5	10,5
Weight and dimensions						
Standard unit shipping weight	kg	2697	2702	2757	2762	2762
Standard unit operating weight	kg	2850	2860	2970	2970	2970
Unit length	mm	4305	4305	4305	4305	4305
Unit width	mm	860	860	860	860	860
Unit height	mm	1880	1880	1880	1880	1880

Note: **(1)** Nominal cooling capacity and power input are based on: 12/7 °C evaporator water inlet /outlet temperature; 30/35°C condenser water inlet /outlet temperature.

Physical data EWWD-DJYNN/A R-134a

Unit size		190	230	280	320	380
Cooling capacity (1)	kW	186,4	223,3	276,5	306,7	366,3
Power input (1)	kW	39,7	48,1	59,3	71,4	79,3
Screw compressor	N.	1	1	1	1	2
Refrigerant circuits	N.	1	1	1	1	2
Refrigerant charge R-134a	kg	55	55	55	55	110
Min % of capacity reduction	%	25	25	25	25	12,5
Evaporator						
Evaporators / water volume	N./l	1 / 125	1 / 120	1 / 110	1 / 110	1 / 170
Max operating pressure	bar	10,5	10,5	10,5	10,5	10,5
Condenser						
Condensers / water volume	N./l	1 / 22	1 / 25	1 / 25	1 / 25	2 / 44
Max operating pressure	bar	10,5	10,5	10,5	10,5	10,5
Weight and dimensions						
Standard unit shipping weight	kg	1650	1665	1680	1680	2800
Standard unit operating weight	kg	1800	1810	1820	1820	3020
Unit length	mm	3435	3435	3435	3435	4305
Unit width	mm	920	920	920	920	860
Unit height	mm	1860	1860	1860	1860	1880

Note: **(1)** Nominal cooling capacity and power input are based on: 12/7 °C evaporator water inlet /outlet temperature; 30/35°C condenser water inlet /outlet temperature.

Physical data EWWD-DJYNN/A R-134a

Unit size		400	460	500	550	650
Cooling capacity (1)	kW	408,2	443,6	496,0	540,5	603,9
Power input (1)	kW	87,2	95,0	104,8	114,4	137,7
Screw compressor	N.	2	2	2	2	2
Refrigerant circuits	N.	2	2	2	2	2
Refrigerant charge R-134a	kg	105	100	100	100	100
Min % of capacity reduction	%	12,5	12,5	12,5	12,5	12,5
Evaporator						
Evaporators / water volume	N./l	1 / 285	1 / 285	1 / 280	1 / 280	1 / 280
Max operating pressure	bar	10,5	10,5	10,5	10,5	10,5
Condenser						
Condensers / water volume	N./l	2 / 47	2 / 50	2 / 59	2 / 68	2 / 68
Max operating pressure	bar	10,5	10,5	10,5	10,5	10,5
Weight and dimensions						
Standard unit shipping weight	kg	2945	2955	2975	2990	2990
Standard unit operating weight	kg	3280	3290	3315	3340	3340
Unit length	mm	4305	4305	4305	4305	4305
Unit width	mm	860	860	860	860	860
Unit height	mm	1880	1880	1880	1880	1880

Note: **(1)** Nominal cooling capacity and power input are based on: 12/7 °C evaporator water inlet /outlet temperature; 30/35°C condenser water inlet /outlet temperature.

Electrical data EWWD-DJYNN R-134a

Unit size		170	210	260	300	320
Nominal voltage (1)		400 V - 3f – 50 Hz				
Nominal unit current (2)	A	81	92	111	131	163
Max unit current (3)	A	112	133	164	174	225
Max unit inrush current (4)	A	288	288	288	288	349
Max unit current for wires sizing (5)	A	124	147	165	190	248

Unit size		380	420	460	500	600
Nominal voltage (1)		400 V - 3f – 50 Hz				
Nominal unit current (2)	A	174	184	202	221	260
Max unit current (3)	A	246	266	299	329	345
Max unit inrush current (4)	A	353	357	366	371	439
Max unit current for wires sizing (5)	A	271	294	312	330	380

Note:
(1) Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.
(2) Absorbed current referred to nominal condition: 12/7 °C evaporator water inlet /outlet temperature; 30/35°C condenser water inlet /outlet temperature.
(3) Absorbed current referred to the following conditions: 14/9 °C evaporator water inlet /outlet temperature; 45/50°C condenser water inlet /outlet temperature.
(4) Inrush compressor's current for unit with one compressor OR 75% of nominal absorbed current of compressor n°1 + inrush current of last compressor (n°2).
(5) Compressor FLA (Full Load Ampere).

Electrical data EWWD-DJYNN/A R-134a

Unit size		190	230	280	320	380
Nominal voltage (1)		400 V - 3f – 50 Hz				
Nominal unit current (2)	A	79	89	103	124	157
Max unit current (3)	A	108	128	154	162	215
Max unit inrush current (4)	A	288	288	288	288	347
Max unit current for wires sizing (5)	A	124	147	165	190	248

Unit size		400	460	500	550	650
Nominal voltage (1)		400 V - 3f – 50 Hz				
Nominal unit current (2)	A	167	175	188	201	238
Max unit current (3)	A	234	253	276	299	313
Max unit inrush current (4)	A	351	354	359	363	430
Max unit current for wires sizing (5)	A	271	294	312	330	380

Note:
(1) Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.
(2) Absorbed current referred to nominal condition: 12/7 °C evaporator water inlet /outlet temperature; 30/35°C condenser water inlet /outlet temperature.
(3) Absorbed current referred to the following conditions: 14/9 °C evaporator water inlet /outlet temperature; 45/50°C condenser water inlet /outlet temperature.
(4) Inrush compressor's current for unit with one compressor OR 75% of nominal absorbed current of compressor n°1 + inrush current of last compressor (n°2).
(5) Compressor FLA (Full Load Ampere).

Sound pressure level EWWD-DJYNN EWWD-DJYNN/A

Unit size		Sound pressure level at 1 m from the unit in free field (ref. factor 2 x 10^{-5})								
DJYNN	**DJYNN/A**	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1000 Hz**	**2000 Hz**	**4000 Hz**	**8000 Hz**	**dBA**
170	**190**	58	58	63,5	68,5	63	64	53	49,5	**69,7**
210	**230**	58	58	63,5	68,5	63	64	53	49,5	**69,7**
260	**280**	58	58	63,5	68,5	63	64	53	49,5	**69,7**
300	**320**	58	58	63,5	68,5	63	64	53	49,5	**69,7**
320	**380**	60	60	65,5	70,5	65	66	55	51,5	**71,7**
380	**400**	60	60	65,5	70,5	65	66	55	51,5	**71,7**
420	**460**	60	60	65,5	70,5	65	66	55	51,5	**71,7**
460	**500**	60	60	65,5	70,5	65	66	55	51,5	**71,7**
500	**550**	60	60	65,5	70,5	65	66	55	51,5	**71,7**
600	**650**	60	60	65,5	70,5	65	66	55	51,5	**71,7**

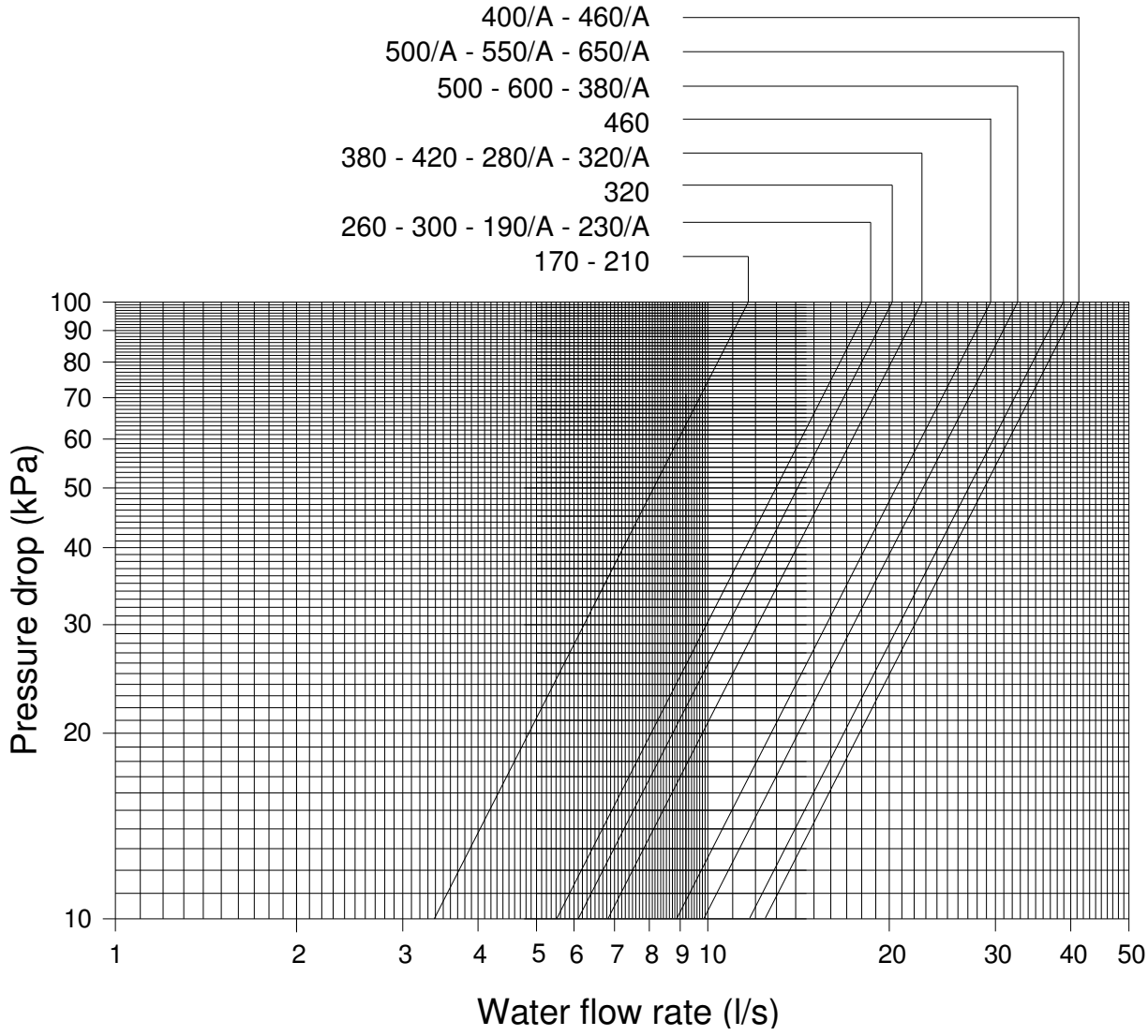
Note: Average sound pressure level rated in accordance with ISO 3744, free field semispheric conditions.

Sound pressure level EWWD-DJYNN EWWD-DJYNN/A with sound proof cabinet

Unit size		Sound pressure level at 1 m from the unit in free field (ref. factor 2 x 10^{-5})								
DJYNN	**DJYNN/A**	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1000 Hz**	**2000 Hz**	**4000 Hz**	**8000 Hz**	**dBA**
170	**190**	55,9	55,2	59,6	63,9	57,7	58,5	47,7	44,2	**64,7**
210	**230**	55,9	55,2	59,6	63,9	57,7	58,5	47,7	44,2	**64,7**
260	**280**	55,9	55,2	59,6	63,9	57,7	58,5	47,7	44,2	**64,7**
300	**320**	55,9	55,2	59,6	63,9	57,7	58,5	47,7	44,2	**64,7**
320	**380**	57,9	57,2	61,6	65,9	59,7	60,5	49,7	46,2	**66,7**
380	**400**	57,9	57,2	61,6	65,9	59,7	60,5	49,7	46,2	**66,7**
420	**460**	57,9	57,2	61,6	65,9	59,7	60,5	49,7	46,2	**66,7**
460	**500**	57,9	57,2	61,6	65,9	59,7	60,5	49,7	46,2	**66,7**
500	**550**	57,9	57,2	61,6	65,9	59,7	60,5	49,7	46,2	**66,7**
600	**650**	57,9	57,2	61,6	65,9	59,7	60,5	49,7	46,2	**66,7**

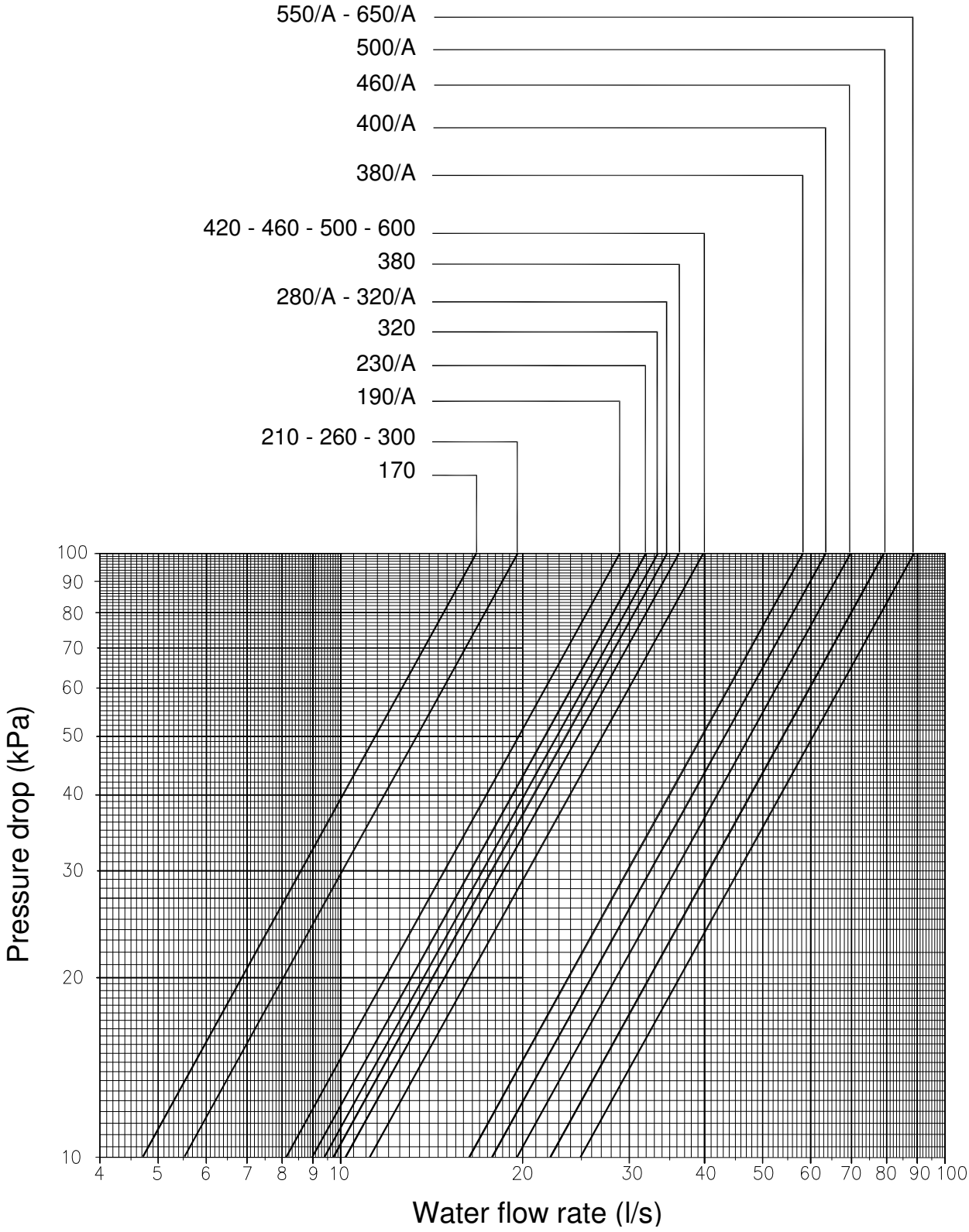
Note: Average sound pressure level rated in accordance with ISO 3744, free field semispheric conditions.

Evaporator pressure drop
EWWD-DJYNN
EWWD-DJYNN/A



Pressure drop (kPa)	Pressure drop (kPa)
Water flow rate (l/s)	Water flow rate (l/s)

Condenser pressure drop
EWWD-DJYNN
EWWD-DJYNN/A



Pressure drop (kPa)	Pressure drop (kPa)
Water flow rate (l/s)	Water flow rate (l/s)

Partial heat recovery ratings EWWD-DJYNN EWWD-DJYNN/A

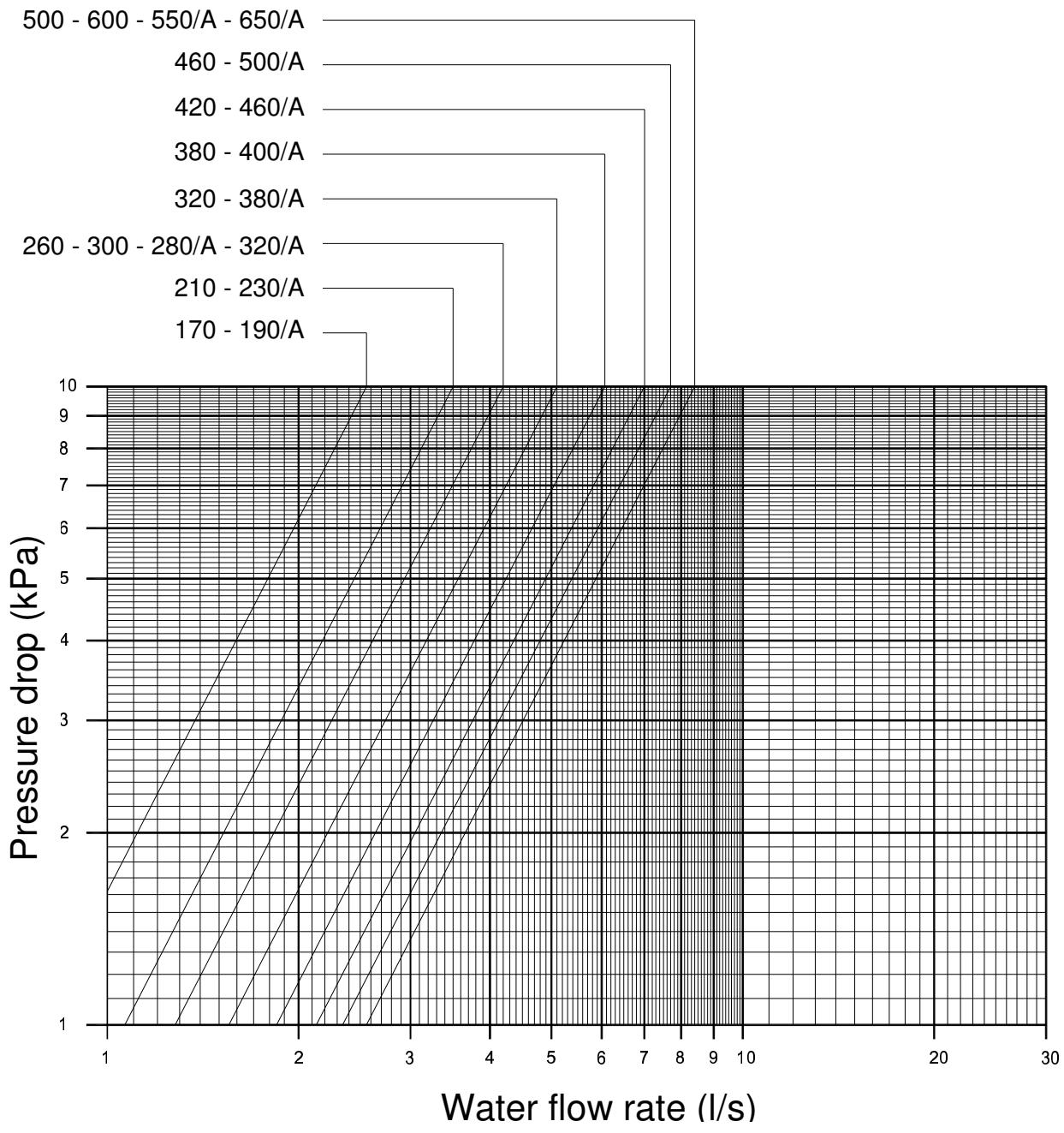
Unit		Desuper-heater water outlet temperature (°C)	Condenser water inlet temperature (°C)				
			30	35	40	45	50
EWWD DJYNN	EWWD DJYNN/A		Heating capacity (kW)	Heating capacity (kW)	Heating capacity (kW)	Heating capacity (kW)	Heating capacity (kW)
170	190	45	21	22	23	24	25
		50	10	18	22	23	24
		55	6	11	17	20	21
210	230	45	22	29	30	31	32
		50	17	23	28	29	30
		55	10	16	24	26	27
260	280	45	35	36	37	38	39
		50	28	34	35	36	37
		55	19	30	31	32	33
300	320	45	48	43	44	45	46
		50	39	45	42	43	44
		55	28	44	38	38	39
320	380	45	42	44	46	48	50
		50	20	36	44	46	48
		55	12	22	34	40	42
380	400	45	43	51	53	55	57
		50	27	41	50	52	54
		55	16	27	41	46	48
420	460	45	44	58	60	62	64
		50	34	46	56	58	60
		55	20	32	48	52	54
460	500	45	57	65	67	69	71
		50	45	57	63	65	67
		55	29	46	55	58	60
500	550	45	70	72	74	76	78
		50	56	68	70	72	74
		55	38	60	62	64	66
600	650	45	96	86	88	90	92
		50	78	90	84	86	88
		55	56	88	76	76	78

Note: **(1)** Evaporator water outlet temperature 7°C - ΔT 5°C; ΔT condenser water temperature 5°C.

Heating capacity correction factors for other evaporator water outlet temperatures

Evaporator water outlet temperature	9	8	7	6	5	4
Heating capacity correction factor	1,062	1,029	1,000	0,973	0,941	0,914

Partial heat recovery pressure drop
EWWD-DJYNN
EWWD-DJYNN/A



Pressure drop (kPa)	Pressure drop (kPa)
Water flow rate (l/s)	Water flow rate (l/s)

Total heat recovery ratings – EWWD-DJYNN 170÷320

Unit size	Evaporator water outlet temperature (°C)	Heat recovery water outlet temperature (°C)											
		35			40			45			50		
		Cooling Cap'ty [kW]	Power Input [kW]	Total Heat [kW]	Cooling Cap'ty [kW]	Power Input [kW]	Total Heat [kW]	Cooling Cap'ty [kW]	Power Input [kW]	Total Heat [kW]	Cooling Cap'ty [kW]	Power Input [kW]	Total Heat [kW]
170	4	151,6	37,5	189,1	145,2	42,3	187,5	138,6	47,5	186,1	131,7	53,1	184,8
	5	156,4	37,7	194,1	149,9	42,5	192,4	143,2	47,6	190,8	136,1	53,3	189,4
	6	161,4	37,8	199,2	154,7	42,6	197,3	147,8	47,8	195,6	140,7	53,5	194,2
	7	166,4	38,0	204,4	159,6	42,8	202,4	152,6	48,0	200,6	145,3	53,7	199,0
	8	171,5	38,1	209,6	164,6	43,0	207,6	157,4	48,2	205,6	150,0	53,9	203,9
	9	176,7	38,3	215,0	169,7	43,2	212,9	162,4	48,5	210,9	154,8	54,1	208,9
210	4	184,5	45,0	229,5	176,8	50,8	227,6	168,7	57,0	225,7	160,2	63,7	223,9
	5	190,4	45,2	235,6	182,5	51,0	233,5	174,3	57,2	231,5	165,6	64,0	229,6
	6	196,4	45,4	241,8	188,4	51,2	239,6	180,0	57,5	237,5	171,2	64,2	235,4
	7	202,5	45,6	248,1	194,3	51,4	245,7	185,8	57,7	243,5	176,8	64,5	241,3
	8	208,7	45,8	254,5	200,4	51,7	252,1	191,7	58,0	249,7	182,5	64,7	247,2
	9	215,0	46,0	261,0	206,5	51,9	258,4	197,7	58,2	255,9	188,3	65,0	253,3
260	4	234,2	55,9	290,1	224,2	63,0	287,2	213,7	70,6	284,3	202,7	78,8	281,5
	5	241,8	56,2	298,0	231,6	63,3	294,9	220,9	70,9	291,8	209,6	79,1	288,7
	6	249,6	56,5	306,1	239,1	63,6	302,7	228,2	71,3	299,5	216,7	79,5	296,2
	7	257,5	56,8	314,3	246,8	63,9	310,7	235,7	71,6	307,3	223,9	79,9	303,8
	8	265,5	57,0	322,5	254,6	64,3	318,9	243,3	72,0	315,3	231,3	80,3	311,6
	9	273,7	57,3	331,0	262,6	64,6	327,2	251,0	72,4	323,4	238,8	80,7	319,5
300	4	269,9	65,4	335,3	257,4	71,1	328,5	245,2	77,7	322,9	232,4	85,1	317,5
	5	279,0	66,3	345,3	266,3	72,0	338,3	253,3	78,5	331,8	240,3	85,9	326,2
	6	288,4	67,3	355,7	275,4	72,9	348,3	261,8	79,4	341,2	248,5	86,7	335,2
	7	297,9	68,3	366,2	284,6	73,9	358,5	270,8	80,3	351,1	256,6	87,5	344,1
	8	307,5	69,3	376,8	294,0	74,9	368,9	280,0	81,2	361,2	265,3	88,4	353,7
	9	317,3	70,3	387,6	303,7	75,9	379,6	289,2	82,2	371,4	274,2	89,3	363,5
320	4	305,9	75,1	381,0	292,9	84,7	377,6	279,5	95,0	374,5	265,5	106,2	371,7
	5	315,7	75,4	391,1	302,5	85,0	387,5	288,8	95,4	384,2	274,5	106,6	381,1
	6	325,7	75,7	401,4	312,2	85,4	397,6	298,2	95,8	394,0	283,7	107,1	390,8
	7	335,9	76,0	411,9	322,2	85,7	407,9	307,9	96,2	404,1	293,1	107,5	400,6
	8	346,3	76,3	422,6	332,3	86,1	418,4	317,7	96,6	414,3	302,6	107,9	410,5
	9	356,8	76,6	433,4	342,5	86,5	429,0	327,7	97,0	424,7	312,4	108,4	420,8

Note: Values are based on ΔT=5°C condenser water inlet/outlet temperature; ΔT=5°C evaporator water inlet/outlet temperature and evaporator fouling factor of 0.0176 m^2 °C/kW, condenser fouling factor of 0.0440 m^2 °C/kW.

Total heat recovery ratings – EWWD-DJYNN 380÷600

Unit size	Evaporator water outlet temperature (°C)	Heat recovery water outlet temperature (°C)											
		35			40			45			50		
		Cooling Cap'ty [kW]	Power Input [kW]	Total Heat [kW]	Cooling Cap'ty [kW]	Power Input [kW]	Total Heat [kW]	Cooling Cap'ty [kW]	Power Input [kW]	Total Heat [kW]	Cooling Cap'ty [kW]	Power Input [kW]	Total Heat [kW]
380	4	341,2	82,7	423,9	326,7	93,2	419,9	311,7	104,6	416,3	295,9	117,0	412,9
	5	352,2	83,1	435,3	337,5	93,6	431,1	322,1	105,1	427,2	306,0	117,4	423,4
	6	363,4	83,4	446,8	348,4	94,1	442,5	332,7	105,5	438,2	316,3	117,9	434,2
	7	374,8	83,8	458,6	359,5	94,5	454,0	343,5	106,0	449,5	326,8	118,4	445,2
	8	386,5	84,1	470,6	370,8	94,9	465,7	354,5	106,4	460,9	337,5	118,9	456,4
	9	398,3	84,4	482,7	382,3	95,3	477,6	365,7	106,9	472,6	348,4	119,4	467,8
420	4	369,2	90,1	459,3	353,8	101,6	455,4	337,6	114,0	451,6	320,6	127,5	448,1
	5	381,0	90,5	471,5	365,2	102,0	467,2	348,8	114,5	463,3	331,4	127,9	459,3
	6	393,0	90,8	483,8	376,9	102,4	479,3	360,2	115,0	475,2	342,5	128,4	470,9
	7	405,2	91,2	496,4	388,8	102,9	491,7	371,7	115,4	487,1	353,7	129,0	482,7
	8	417,6	91,6	509,2	400,9	103,3	504,2	383,5	115,9	499,4	365,2	129,5	494,7
	9	430,2	92,0	522,2	413,2	103,8	517,0	395,5	116,4	511,9	376,9	130,0	506,9
460	4	413,3	100,7	514,0	395,9	113,5	509,4	377,8	127,3	505,1	358,6	142,3	500,9
	5	426,5	101,2	527,7	408,8	114,0	522,8	390,3	127,9	518,2	370,8	142,9	513,7
	6	439,9	101,7	541,6	421,9	114,6	536,5	403,0	128,5	531,5	383,1	143,5	526,6
	7	453,6	102,1	555,7	435,2	115,1	550,3	416,0	129,0	545,0	395,7	144,1	539,8
	8	467,5	102,6	570,1	448,8	115,6	564,4	429,2	129,6	558,8	408,5	144,7	553,2
	9	481,7	103,0	584,7	462,6	116,2	578,8	442,6	130,2	572,8	421,6	145,4	567,0
500	4	457,3	111,4	568,7	438,0	125,5	563,5	417,9	140,7	558,6	396,7	157,2	553,9
	5	471,9	112,0	583,9	452,3	126,1	578,4	431,7	141,4	573,1	410,1	157,8	567,9
	6	486,8	112,5	599,3	466,8	126,7	593,5	445,8	142,0	587,8	423,8	158,5	582,3
	7	502,0	113,1	615,1	481,5	127,4	608,9	460,2	142,7	602,9	437,7	159,2	596,9
	8	517,4	113,6	631,0	496,5	128,0	624,5	474,8	143,4	618,2	451,8	160,0	611,8
	9	533,0	114,2	647,2	511,8	128,6	640,4	489,6	144,1	633,7	466,2	160,7	626,9
600	4	529,5	129,8	659,3	505,4	141,4	646,8	480,5	154,5	635,0	454,2	169,3	623,5
	5	547,0	131,5	678,5	522,6	143,0	665,6	497,0	156,1	653,1	470,4	170,8	641,2
	6	564,9	133,3	698,2	540,1	144,8	684,9	514,0	157,8	671,8	486,8	172,4	659,2
	7	583,2	135,2	718,4	557,9	146,6	704,5	531,3	159,5	690,8	503,5	174,0	677,5
	8	601,8	137,2	739,0	576,0	148,4	724,4	548,9	161,3	710,2	520,6	175,7	696,3
	9	621,2	139,2	760,4	594,4	150,4	744,8	566,8	163,1	729,9	538,0	177,5	715,5

Note: Values are based on ΔT=5°C condenser water inlet/outlet temperature; ΔT=5°C evaporator water inlet/outlet temperature and evaporator fouling factor of 0.0176 m^2 °C/kW, condenser fouling factor of 0.0440 m^2 °C/kW.

Total heat recovery ratings – EWWD-DJYNN/A 190÷380

Unit size	Evaporator water outlet temperature (°C)	Heat recovery water outlet temperature (°C)											
		35			40			45			50		
		Cooling Cap'ty [kW]	Power Input [kW]	Total Heat [kW]	Cooling Cap'ty [kW]	Power Input [kW]	Total Heat [kW]	Cooling Cap'ty [kW]	Power Input [kW]	Total Heat [kW]	Cooling Cap'ty [kW]	Power Input [kW]	Total Heat [kW]
190	4	167,1	37,1	204,2	159,6	41,9	201,5	151,9	47,0	198,9	143,9	52,6	196,5
	5	172,9	37,2	210,1	165,2	42,0	207,2	157,3	47,2	204,5	149,2	52,8	202,0
	6	178,8	37,3	216,1	171,0	42,2	213,2	162,9	47,4	210,3	154,6	53,0	207,6
	7	184,8	37,4	222,2	176,8	42,3	219,1	168,6	47,5	216,1	160,1	53,1	213,2
	8	191,0	37,5	228,5	182,8	42,5	225,3	174,4	47,7	222,1	165,7	53,3	219,0
	9	197,3	37,6	234,9	189,0	42,6	231,6	180,4	47,9	228,3	171,5	53,5	225,0
230	4	200,8	44,6	245,4	192,0	50,4	242,4	182,8	56,6	239,4	173,2	63,2	236,4
	5	207,7	44,8	252,5	198,7	50,6	249,3	189,3	56,8	246,1	179,5	63,4	242,9
	6	214,7	44,9	259,6	205,5	50,7	256,2	195,9	57,0	252,9	185,9	63,7	249,6
	7	221,8	45,1	266,9	212,4	50,9	263,3	202,6	57,2	259,8	192,4	63,9	256,3
	8	229,1	45,2	274,3	219,5	51,1	270,6	209,5	57,4	266,9	199,1	64,1	263,2
	9	236,6	45,3	281,9	226,7	51,3	278,0	216,5	57,6	274,1	205,8	64,4	270,2
280	4	248,9	54,7	303,6	237,9	61,7	299,6	226,6	69,3	295,9	214,7	77,4	292,1
	5	257,4	54,9	312,3	246,2	62,0	308,2	234,6	69,5	304,1	222,4	77,7	300,1
	6	266,1	55,1	321,2	254,7	62,2	316,9	242,8	69,8	312,6	230,3	78,0	308,3
	7	275,0	55,3	330,3	263,3	62,5	325,8	251,2	70,1	321,3	238,4	78,3	316,7
	8	284,1	55,5	339,6	272,1	62,7	334,8	259,7	70,4	330,1	246,7	78,6	325,3
	9	293,4	55,7	349,1	281,1	63,0	344,1	268,4	70,7	339,1	255,1	78,9	334,0
320	4	287,4	64,6	352,0	274,8	70,1	344,9	261,8	76,3	338,1	248,1	83,4	331,5
	5	296,9	65,5	362,4	284,1	71,0	355,1	270,8	77,1	347,9	256,9	84,1	341,0
	6	306,6	66,5	373,1	293,6	71,8	365,4	280,0	78,0	358,0	265,8	84,9	350,7
	7	316,6	67,5	384,1	303,3	72,8	376,1	289,4	78,8	368,2	275,0	85,7	360,7
	8	326,7	68,5	395,2	313,1	73,7	386,8	299,0	79,7	378,7	284,2	86,6	370,8
	9	337,1	69,5	406,6	323,1	74,7	397,8	308,8	80,7	389,5	293,7	87,5	381,2
380	4	328,4	74,1	402,5	314,0	83,7	397,7	299,0	93,9	392,9	283,5	105,1	388,6
	5	339,6	74,3	413,9	324,8	83,9	408,7	309,5	94,3	403,8	293,7	105,4	399,1
	6	351,1	74,5	425,6	336,0	84,2	420,2	320,3	94,6	414,9	304,2	105,7	409,9
	7	362,8	74,7	437,5	347,3	84,5	431,8	331,3	94,9	426,2	314,9	106,1	421,0
	8	374,7	74,9	449,6	358,9	84,8	443,7	342,6	95,2	437,8	325,8	106,5	432,3
	9	386,9	75,1	462,0	370,8	85,0	455,8	354,1	95,6	449,7	336,9	106,8	443,7

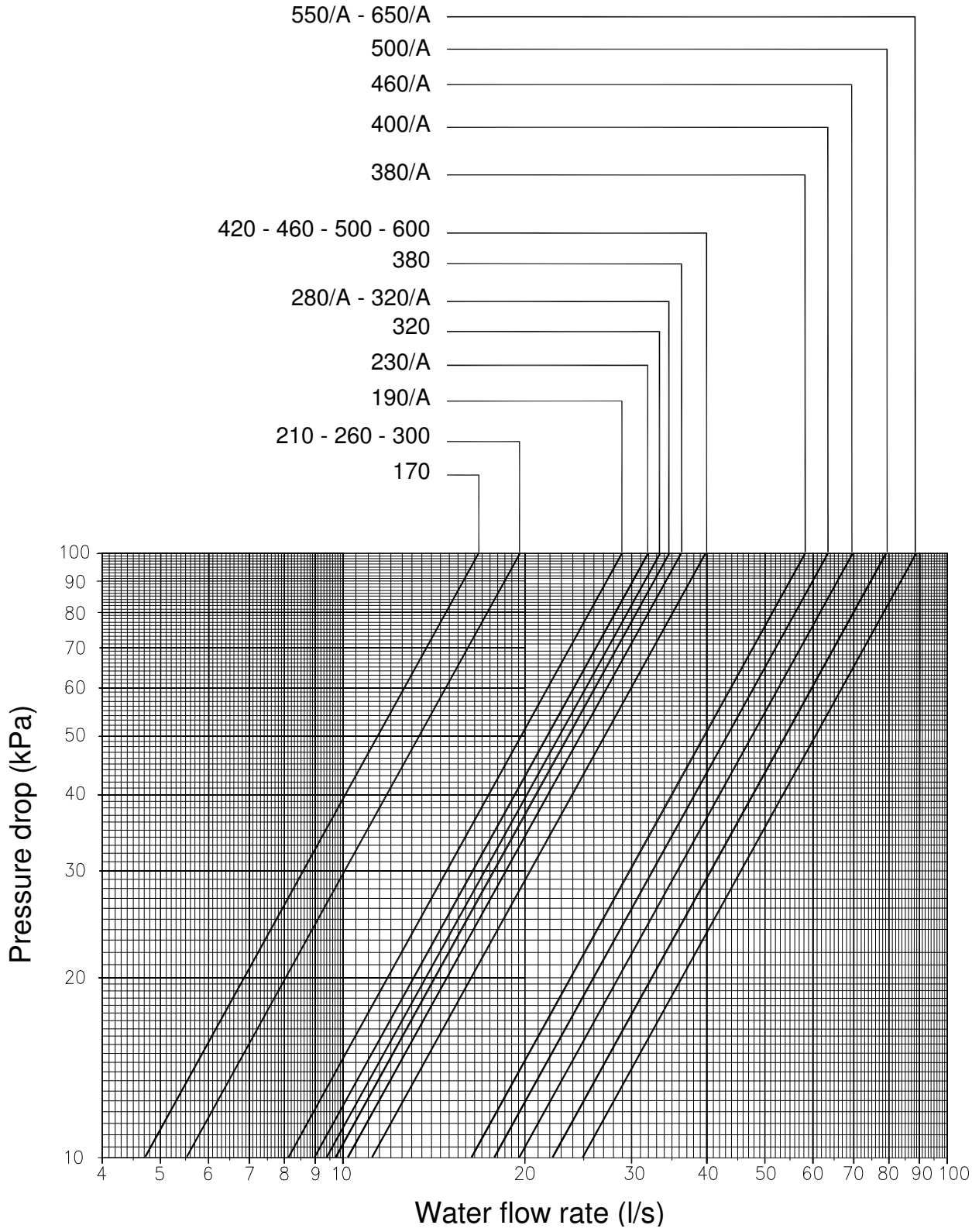
Note: Values are based on ΔT=5°C condenser water inlet/outlet temperature; ΔT=5°C evaporator water inlet/outlet temperature and evaporator fouling factor of 0.0176 m^2 °C/kW, condenser fouling factor of 0.0440 m^2 °C/kW.

Total heat recovery ratings – EWWD-DJYNN/A 400÷650

Unit size	Evaporator water outlet temperature (°C)	Heat recovery water outlet temperature (°C)											
		35			40			45			50		
		Cooling Cap'ty [kW]	Power Input [kW]	Total Heat [kW]	Cooling Cap'ty [kW]	Power Input [kW]	Total Heat [kW]	Cooling Cap'ty [kW]	Power Input [kW]	Total Heat [kW]	Cooling Cap'ty [kW]	Power Input [kW]	Total Heat [kW]
400	4	366,0	81,5	447,5	349,9	92,0	441,9	333,2	103,4	436,6	315,8	115,6	431,4
	5	378,6	81,8	460,4	362,1	92,3	454,4	345,0	103,7	448,7	327,2	115,9	443,1
	6	391,4	82,0	473,4	374,5	92,7	467,2	357,1	104,1	461,2	338,9	116,3	455,2
	7	404,4	82,2	486,6	387,2	93,0	480,2	369,4	104,4	473,8	350,8	116,7	467,5
	8	417,8	82,5	500,3	400,2	93,3	493,5	381,9	104,8	486,7	363,0	117,1	480,1
	9	431,4	82,7	514,1	413,4	93,6	507,0	394,8	105,2	500,0	375,5	117,6	493,1
460	4	398,0	88,8	486,8	380,7	100,3	481,0	362,7	112,6	475,3	343,8	125,9	469,7
	5	411,5	89,1	500,6	393,8	100,6	494,4	375,5	113,0	488,5	356,2	126,3	482,5
	6	425,3	89,4	514,7	407,2	101,0	508,2	388,5	113,4	501,9	368,8	126,8	495,6
	7	439,4	89,6	529,0	420,9	101,3	522,2	401,7	113,8	515,5	381,7	127,2	508,9
	8	453,7	89,8	543,5	434,8	101,6	536,4	415,2	114,2	529,4	394,8	127,6	522,4
	9	468,3	90,1	558,4	449,0	101,9	550,9	429,1	114,6	543,7	408,2	128,1	536,3
500	4	444,8	98,1	542,9	425,5	110,8	536,3	405,5	124,4	529,9	384,6	139,1	523,7
	5	459,9	98,4	558,3	440,2	111,2	551,4	419,8	124,8	544,6	398,4	139,6	538,0
	6	475,3	98,7	574,0	455,2	111,5	566,7	434,3	125,3	559,6	412,5	140,0	552,5
	7	491,0	99,0	590,0	470,4	111,9	582,3	449,1	125,7	574,8	426,8	140,5	567,3
	8	507,0	99,2	606,2	486,0	112,2	598,2	464,3	126,1	590,4	441,5	141,0	582,5
	9	523,4	99,5	622,9	501,9	112,6	614,5	479,7	126,6	606,3	456,5	141,5	598,0
550	4	484,8	107,3	592,1	464,1	121,1	585,2	442,7	136,1	578,8	420,2	152,2	572,4
	5	501,0	107,6	608,6	479,9	121,5	601,4	458,0	136,5	594,5	435,1	152,6	587,7
	6	517,6	107,9	625,5	496,1	121,9	618,0	473,7	137,0	610,7	450,3	153,1	603,4
	7	534,5	108,2	642,7	512,5	122,3	634,8	489,7	137,4	627,1	465,8	153,6	619,4
	8	551,7	108,5	660,2	529,3	122,7	652,0	506,0	137,9	643,9	481,6	154,1	635,7
	9	569,3	108,8	678,1	546,4	123,1	669,5	522,7	138,3	661,0	497,7	154,6	652,3
650	4	561,0	126,1	687,1	537,3	137,0	674,3	512,4	149,4	661,8	486,4	163,4	649,8
	5	580,0	127,8	707,8	555,2	138,5	693,7	529,9	150,8	680,7	503,4	164,8	668,2
	6	600,3	129,6	729,9	573,6	140,1	713,7	547,7	152,3	700,0	520,7	166,2	686,9
	7	621,0	131,5	752,5	593,6	141,9	735,5	565,9	153,9	719,8	538,4	167,6	706,0
	8	641,8	133,5	775,3	614,2	143,8	758,0	585,1	155,6	740,7	556,4	169,1	725,5
	9	663,0	135,5	798,5	634,9	145,7	780,6	605,5	157,4	762,9	574,7	170,7	745,4

Note: Values are based on ΔT=5°C condenser water inlet/outlet temperature; ΔT=5°C evaporator water inlet/outlet temperature and evaporator fouling factor of 0.0176 m^2 °C/kW, condenser fouling factor of 0.0440 m^2 °C/kW.

Total heat recovery pressure drop
EWWD-DJYNN
EWWD-DJYNN/A



Pressure drop (kPa)	Pressure drop (kPa)
Water flow rate (l/s)	Water flow rate (l/s)

Screw compressors

Stargate™ single-screw compressor has a well balanced compression mechanism which prevents both radial and axial loads on the screw rotor. As a result of the basic single-screw compressor design, the operation is virtually load-free, what means that main bearing design life is 3-4 times higher than it is for twin-screws, while eliminating the need for expensive and complicated thrust balancing systems. The two exactly opposed gate rotors create two exactly opposed compression cycles. Compression is made at the lower and upper parts of the screw rotor at the same time, thus cancelling the radial loads. Also, both ends of the screw rotor are subject to suction pressure only, which cancels the axial loads and eliminates the huge thrust loads inherent to twin-screw compressors.
Oil injection is used for these compressors in order to get high COP at high condensation pressure. The units of the series are equipped with a single screw Frame 3200 compressor provided with a high efficiency, built-in oil separator to maximise oil removal.
Compressors have an infinitely variable capacity control down to 25% of its total capacity. This control is made by means of capacity slides controlled by microprocessors.
Standard start is star-delta type; Soft start type is available (as an option) in order to minimise inrush current.

Standard controls

High pressure control

The high pressure switch will shut-down the compressor when the discharge pressure exceeds the setting point value.

Warning: During testing, stand by the emergency stop switch on the control panel, to shut the unit down should the safety control malfunction. Be sure that the installed gauge is accurately adjusted.

Phase/voltage monitor

The phase/voltage monitor is a device which provides protection against three-phase electrical motor fault conditions such as power failure, phase failure, and phase reversal. Whenever any of these conditions occur, an open contact signal is sent to the microprocessor which then de-energizes all inputs. Once power is restored, contacts close and the microprocessor enables compressors for operation. When three-phase power has been applied, the output relay should close and the "run light" should turn on. If the output relay does not close, perform the following tests:

1. Check the voltages between L1-L2, L1-L3 and L2-L3 (L1, L2, L3 are the three phases). These voltages should be even and within + 10% of the rated three-phase line-to-line voltage.
2. If these voltages are extremely low or widely unbalanced check the power system to determine the cause of the problem.
3. If the voltages are good, using a phase tester, verify that phases are in A, B, C sequence for L1, L2 and L3. Correct rotation is required for compressor operation. If it is necessary to correct the phase sequence, turn off the power supply and interchange any two of the supply power leads wired to the main disconnect switch. This may be necessary as the phase voltage monitor is sensitive to phase reversal. Turn on the power. The output relay should now close after the appropriate delay.

System maintenance

General

To ensure proper operation at peak capacity and to avoid damage to system components, a periodic inspections program should be set up and followed. The information given below is intended as a guide to be used during inspection and must be combined with sound refrigeration and electrical practice to ensure trouble-free performance. The sight-glass indicator in the liquid line of every circuit must be checked to verify the glass is full and clear. If the indicator shows that a wet condition exists or if bubbles show in the sight-glass, even with a full refrigerant charge, the filter-dryer element must be changed.

Compressor maintenance

The Frame 3200 screw compressor does not require frequent maintenance. However, vibration test is an excellent way to check mechanical operation. Compressor vibration indicates that maintenance is required as it adversely affects the performance and efficiency of the unit. It is recommended that the compressor be checked with a vibration analyser at or shortly after start-up and again on an annual basis. When performing the test, the load should be maintained as close to the rated load as possible. The vibration analyzer test provides a fingerprint of the compressor and when performed routinely can give a warning of impending problems. The compressor is supplied with a cartridge oil filter. It is a good practice to replace this filter anytime the compressor is opened for service.

Electrical control

Warning: Electric shock hazard. Turn off all power before continuing with following service.

Caution: It is necessary to de-energize the complete panel, including crankcase heater, before doing any servicing inside.
Prior to attempting any service on the control panel, it is advisable to study the wiring diagram and understand the operation system of the water chiller. Electrical components do not require any special maintenance other than a monthly tightening of cable connections.

Warning: The warranty becomes void if the wiring is not in accordance with the specification. A blown fuse or tripped protector indicates that a short, ground or overload condition exists.
Before replacing the fuse or restarting the compressor, the cause of the problem must be found and corrected. It is important to have a qualified electrician service this panel. Unqualified tampering with the controls may cause serious damage to the equipment and makes the warranty void.

Refrigerant sight-glass

The refrigerant sight-glasses should be observed periodically (a weekly observation should be adequate). A clear liquid sight-glass indicates that the system is charged with the correct amount of refrigerant to ensure proper feed through the expansion valve. Bubbling refrigerant in the sight-glass, during stable running conditions, indicates that the system may be short of refrigerant charge. Refrigerant gas flashing in the sight-glass might also indicate an excessive pressure drop in the liquid line, possibly due to a clogged filter-dryer or a restriction elsewhere in the liquid line. If sub-cooling is low add refrigerant to make the sight-glass clear. If sub cooling is normal and flashing is visible in the sight glass check the pressure drop across the filter-drier. The moisture condition of the refrigerant is indicated by the changing color of the element inside the sight-glass. If the sight-glass does not indicate a dry condition after about 3 hours of operation, the unit should be pumped down and the filter-dryers changed.
The following table is a guide to determine the dry or wet condition of the system:

COLOUR	MEANING
Green (Sky Blue)	Dry
Yellow (Pink)	Wet

Filter-dryers

A replacement of the filter-drier is recommended during scheduled service maintenance of the unit, any time excessive pressure drop is read across the filter-drier and/or when bubbles occur in the sight glass with normal sub cooling. The maximum recommended pressure drop across the filter-drier at 75% to 100% system load is 70 kPa. The maximum recommended pressure drop across the filter-drier at 25% to 50% system load is 35 kPa. The filter-dryer should also be changed if the colour of the moisture indicator in the sight-glass shows excessive humidity content. During the first few months of operation the filter-drier replacement may be necessary if the pressure drop across the filter-drier exceeds the values listed in the paragraph above. Any residual particles from the unit heat transfer tubing, compressor and miscellaneous components are swept by the refrigerant into the liquid line and are caught by the filter-drier.

To change the filter drier, pump the unit down by moving the ON/OFF compressors switches to the “off” position.

Move the ON/OFF unit switch Q0 to the “off” position. Turn off the unit power supply and install jumpers across the terminals.

This overrides the low pressure control. Close the manual liquid line shutoff valve.

Turn the power of the unit back on and restart the unit by operating the ON/OFF switch unit Q0. The unit will start pumping down past the low pressure setting.

When the evaporator pressure reaches 0.3 bar, move the switch Q0 to the “off” position. Remove the jumper.

Close the suction line valve. Remove and replace the filter-drier. Evacuate the lines through the liquid line manual shutoff valve to remove the non condensable that may have entered during filter replacement.

Open the suction line valve. A leak check is recommended before putting the unit back in operation.

Electronic expansion valve

The water cooled chillers of the series are equipped with the most advanced electronic expansion valve to achieve precise control of refrigerant mass flow. As today’s systems require improved energy efficiency, tighter temperature control, and wider range of operating conditions, and incorporate features like remote monitoring and diagnostics, the application of electronic expansion valves becomes mandatory. The electronic expansion valve has features that make it unique: short opening and closing time, high accuracy, positive shut-off function that eliminates the need for an additional solenoid valve, highly linear flow capacity, continuous modulation of mass flow without stress in the refrigerant circuit and corrosion-resistant stainless steel body.

Evaporator

The evaporator is a direct expansion type with refrigerant inside the copper tubes and water on the outside. The evaporators are manufactured with carbon steel shells, high efficiency copper tubes and polypropylene baffles. The copper tubes are roll expanded into carbon steel tube plates.

Condensers

Condensers are shell and cleanable, through-tube type (1 pass). The unit has independent condensers, one per circuit. Each condenser has integrally finned high efficiency copper tubes which are roll expanded into heavy carbon steel tube sheets. Water heads are removable and include vent and drain plugs. Condensers come complete with liquid shut-off valve and spring loaded relief valve.

Note: The units are furnished with 1-pass condensers as standard (water entering a side and leaving the opposite side of the heat exchanger). On request, the chillers will be equipped with 2-pass condensers (entering and leaving water on the same side of the heat exchanger); two different options are available:

- 2-pass condensers, standard water ΔT (ΔT between 4 and 8 °C)
- 2-pass condensers, high water ΔT (ΔT between 8 and 15 °C) In this case total heat recovery is not available.

Lubricating oils

In addition to lubricating the bearing and other moving parts, the oil has the equally important task of sealing the clearances between the rotors and other potential leakage paths, thus improving pumping efficiency; the oil also helps dissipate the heat of compression. The amount of oil injected is therefore well in excess of that required for lubrication alone.

Lubricating oil approved by Daikin is mentioned on the compressor label.

The oil differential pressure switch monitors the differential between oil injection pressure and compressor suction pressure.

After the compressor has started and been in operation for a short time, allowing sufficient time for the system differential pressure to stabilise, the oil differential pressure switch becomes operational in the safety trip system. Oil is now being supplied to the compressor under the action of the system differential pressure, monitored by the switch. If the differential pressure drops below the cut-out setting, the oil differential pressure switch trips and stops the compressor.

Because the oil pressure is generated by discharge pressure, a minimum discharge pressure must be maintained; this minimum pressure increases as the suction pressure increases in order to maintain the pressure difference required.

Crankcase and oil separator heaters

The function of the heaters is to prevent oil dilution with refrigerant during compressor shutdown, which would cause foaming and consequent reduction in lubricating oil flow to the moving parts. Electric heaters are energized every time the compressor shuts down.

Warning: Verify that the heaters have operated for at least 12 hours prior to start-up.

Preventive maintenance schedule

Operation Ref. No.	TYPE OF OPERATION	FREQUENCY			
		Weekly	Monthly	Six-Monthly	Yearly
1	Reading and recording of suction pressure	x			
2	Reading and recording of discharge pressure	x			
3	Reading and recording of supply voltage	x			
4	Reading and recording of current intensity	x			
5	Check the circuit for refrigerant charge and possible moisture by observing the liquid sight glass	x			
6	Check the suction temperature and the superheating		x		
7	Check setting and operation of safety devices		x		
8	Check setting and proper operation of control devices			x	
9	Inspect the condenser for possible scaling or sludging				x

Refrigerant

Refrigerant charging

These water-cooled screw chillers have been factory-charged with a full operating charge of refrigerant; however, there might be times when the unit must be recharged at the jobsite. Follow these recommendations when charging in the field. The water-cooled screw chillers of the series are more sensitive to under-charging than to overcharging, therefore it is preferable slightly overcharge rather than undercharge the circuit. The optimum charge is the charge that allows the unit to run with no flashing in the liquid line at any operating conditions. When the liquid line temperature does not drop with the addition of 2.2-4.5 Kg of charge, then the sub cooler is nearly full and proper charge has been reached. If the liquid line temperature does not drop and the discharge pressure goes up by 20.7-34.5 kPa when 2.2-4.5 kg of refrigerant is added, the correct maximum charge has been reached. Unit charging can be done at any steady load condition, at any outdoor ambient temperature. Unit must be allowed to run for 5 minutes or longer so that the condenser fan staging is stabilized at normal operating discharge pressure.
In case moisture is detected in the moisture indicator, the system must be evacuated to eliminate the cause of trouble. After the problem has been solved, the system must be dried by making an almost perfect vacuum. For this purpose, a displacement vacuum pump should be used.
Any moisture and air left in the system will be absorbed by the dry nitrogen used to break the vacuum, and they will be almost completely removed by the three evacuations.
If burnt oil or sludge are found in the refrigerant circuit (caused by the compressor motor burn-out), it will be necessary to carefully clean the system, before attempting the vacuum operation, by using the filter dryer clean-out method, which basically involves the use of special filter dryers including a suitable desiccant in both the liquid and suction lines.
Excessive refrigerant losses can also cause leak of oil from the system. Check the separator oil level during operation and ensure that oil is visible in the top sight glass.

1. If the unit is slightly undercharged, it will show bubbles in the sight-glass. Recharge the unit.
2. If the unit is moderately undercharged, it will, most likely, trip on freeze protection. Recharge the unit as described in the charging procedure below.

Procedure to charge a moderately undercharged unit

1. If a unit is low on refrigerant, you must first determine the cause before attempting to recharge the unit. Locate and repair any refrigerant leak. Evidence of oil is a good indicator of leakage; however, oil might not be visible in all cases. Liquid leak detector fluids work well to show bubbles in medium size leaks but electronic leak detector may be needed to locate small leaks.
2. Add refrigerant to the system through the valve on the evaporator inlet pipe, between the expansion valve and the evaporator head.
3. The charge can be added at any load condition.

Charging the refrigerant

1. Connect the refrigerant bottle with a filling pipe to the filling valve on the evaporator head. Before firmly tightening the refrigerant bottle valve, open it and force the air out of the filling pipe. Tighten the charging valve connection.
2. When the refrigerant stops flowing into the system, start the compressor and complete the refrigerant charge.
3. When the exact quantity of refrigerant has been predetermined, check the liquid sight glass.

If you do not know how much refrigerant has to be added, shut off the bottle valve every 5 minutes and continue to charge the refrigerant until the sight glass is clear and free of bubbles.

Note: Do not discharge the refrigerant into the atmosphere. To recover it, use empty, clean and dry bottles. The liquid refrigerant recovery can be made through the valve provided on the condenser coil sub-cooler outlet. To facilitate the recovery of refrigerant, put the bottle inside a container full of ice; avoid excessive filling of the bottle (70÷80% max).

Start-up and shut-down

Pre-start-up

1. Open all electrical disconnects and check that electrical connections are tight.
2. Verify water piping flow directions are correct and properly connected at the evaporator and condenser.
3. Using a phase tester, check that electrical phase sequence for each compressor circuit is A-B-C for respectively phases L1, L2, & L3.
4. Verify unit power supply is within 10% of nameplate rating.
5. Verify power supply wiring is the correct size and has a minimum temperature insulation rating of 75°C.
6. Verify all mechanical and electrical inspections have been completed according to local code.
7. Make certain all auxiliary control equipment is operative and an adequate cooling load is available.
8. Check all compressor valve connections for tightness.
9. Open compressor suction valve until back seated.
10. Open discharge shutoff valve until back seated.
11. Vent air from the evaporator and condenser water system piping.
12. Open all water flow valves and start chilled water pump.
13. Check all piping for leaks.
14. Flush the evaporator and condenser system piping.

Initial start-up

Initial Start-up must be performed by Daikin service personnel.

1. Set up control as described in Initial Conditions.
2. Turn front panel switch to Auto position. (chilled water flow pump relay will energize.)
3. If the field-installed flow indicator does not indicate chilled water flow after 30 seconds, then the alarm output will be energized.

Note: The unit starts the compressor with the least starts and run hours while in auto lead lag setting

4. When the Active Set point is 3°C lower than the actual water outlet temperature, the chiller starts.
5. When the chiller starts, the following occurs:
   - Crank case heaters de-energize
   - Compressor starts
   - Motor cooling solenoid is energized
6. Suction injection will turn off when the following conditions have been met:
   - Discharge superheat drops below 3 °C
   - Liquid presence sensor shows liquid

Procedure to return materials under warranty

Material may not be returned except with permission from DAIKIN Service department. A "Return Goods" tag will be included with the returned material. This tag will include all information required to expedite handling at our factory. Return of the parts does not constitute an order for replacement. Therefore, a purchase order must be entered through our nearest Sales Representative. The order should include part name, part number, model number and serial number of the unit involved. Following our personal inspection of the returned part, if it is determined that the failure is due to faulty material or workmanship, credit will be issued on the customer's purchase order. All parts shall be returned to the factory, transportation charges prepaid.

Service & replacement parts

Always quote the model number, acknowledgement number and the machine's serial number stamped on the nameplate attached to the machine itself, whenever ordering maintenance service or replacement parts.
If replacement parts are being ordered, state the date the machine was installed and the date the breakdown occurred. For an exact definition of the replacement part requested, please mention the respective code number or, should this not be possible, attach a description of the part being requested.

Water-cooled screw chillers

EWWD170-600DJYNN
EWWD190-650DJYNN/A

Daikin units comply with the European regulations that guarantee the safety of the product.

Daikin Europe N.V. is participating in the EUROVENT Certification Programme. Products are as listed in the EUROVENT Directory of Certified Products.

DAIKIN EUROPE N.V.

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