

EWYQ-F

Air to water heat pump
multiscroll

Product manual

XS (High Efficiency - Standard Noise) - Cooling Capacity from 164 to 624 kW

XL (High Efficiency - Low Noise) - Cooling Capacity from 164 to 624 Kw

XR (High Efficiency - Extra Low Noise) - Cooling Capacity from 158 to 606 Kw

Performance according to EN14511

Refrigerant: R-410a

Code	CSS - Rev.9.2
Date	August 2014
EWYQ-F	R3.4.5

Table of con-

EWYQ-F

Features and benefits	2	Pump curves (technical data)	
General characteristics	3	Filter pressure drops	44
Options		Single pump	
Standard options	5	Twin pump	
Mechanical options	5	Pump kit combination matrix	46
Electrical options	5	Pump kit technical information	46
Installation and other options	6		
Nomenclature	7	Dimensional drawings	48
Technical specifications performance data		Installation notes	
EWYQ F XS	8	Technical specification	
EWYQ F XL	10		
EWYQ F XR			
Heating mode			
Electrical specifications			
EWYQ F XS			
EWYQ F XL			
EWYQ F XR			
Sound levels			
Operating limits			
Operating envelope			
Water charge, flow, quality	23		
Performance in cooling mode			
EWYQ F XS	25		
EWYQ F XL			
EWYQ F XR			
Performance in heating mode			
EWYQ F XS	34		
EWYQ F XL			
EWYQ F XR	40		

Low operating cost and extended operating life This chiller range is the result of careful design, aimed to optimize the energy efficiency of the chillers, with the objective of bringing down operating costs and improving installation profitability, effectiveness and economical management.

The chillers feature a high efficiency scroll compressors, large condenser coil surface area for maximum heat transfer and low discharge pressure, advanced technology condenser fans and a 'plate to plate' evaporator with low refrigerant pressure drops.

Low operating sound levels Very low sound levels both at full load and part load conditions are achieved by the latest compressor design and by a unique new fan that moves large volume of air at exceptionally low sound levels and by the virtually vibration-free operation.

Outstanding reliability The chillers have two truly independent refrigerant circuits, in order to assure maximum safety for any maintenance, whether planned or not. They are equipped with hermetic orbiting scroll compressor complete with motor over-temperature and over-current devices and protection against excessive gas discharge temperature, a proactive control logic and are full factory-run-tested to optimized trouble-free operation.

Superior control logic The new MicroTech III controller provides an easy to use control environmental. The control logic is designed to provide maximum efficiency, to continue operation in unusual operating conditions and to provide a history of unit operation. One of the greatest benefits is the easy interface with LonWorks, Bacnet, Ethernet TCP/IP or Modbus communications.

Code requirements – Safety and observant of laws/directives Units are designed and manufactured in accordance with applicable selections of the following:

Construction of pressure vessel	97/23/EC (PED)
Machinery Directive	2006/42/EC
Low Voltage	2006/95/EC
Electromagnetic Compatibility	2004/108/EC
Electrical & Safety codes	EN 60204-1 / EN 60335-2-40
Manufacturing Quality Stds	UNI – EN ISO 9001:2004

Certifications Units are CE marked, complying with European directives in force, concerning manufacturing and safety. On request units can be produced complying with laws in force in non European countries (ASME, GOST, etc.), and with other applications, such as naval (RINA, etc.).

Versions This range is available in HIGH EFFICIENCY version (XE):

12 sizes to cover a range from 158 up to 624 kW with an EER up to 3.04 and ESEER up to 4.74 in cooling mode and from 173 up to 674 kW in heating with COP up to 3.30.

All chiller sizes are Class A energy efficiency version in heating mode (COP >= 3,20).

The EER (Energy Efficiency Ratio) is the ratio of the Cooling Capacity to the Power Input of the unit. The Power Input includes: the power input for operation of the compressor, the power input of all control and safety devices, the power input for fans.

The ESEER (European Seasonal Energy Efficiency Ratio) is a weighed formula enabling to take into account the variation of EER with the load rate and the variation of air inlet condenser temperature.

$ESEER = A \times EER_{100\%} + B \times EER_{75\%} + C \times EER_{50\%} + D \times EER_{25\%}$

	A	B	C	D
K	0.03 (3%)	0.33 (33%)	0.41 (41%)	0.23 (23%)
T	35°C	30°C	25°C	20°C

K = Coefficient; T = Air inlet condenser temperature.

The COP (Coefficient of Performance) is the ratio of the heating capacity to the power input of the unit.

The Seasonal Coefficient Of Performances (SCOP) is the seasonal efficiency of a unit in active heating mode without supplementary electric heaters; calculated at the following conditions: T_{bivalent} +2 °C, T_{design} -10 °C, Average ambient conditions, Ref.

Sound configurations Standard, low and reduced sound configurations available as follows:

STANDARD SOUND

Condenser fan rotating at 900 rpm, rubber antivibration under compressor

LOW SOUND

Condenser fan rotating at 900 rpm, rubber antivibration under compressor, compressor sound enclosure.

REDUCED SOUND

Condenser fan rotating at 705 rpm, rubber antivibration under compressor, compressor sound enclosure.

Cabinet and structure The cabinet is made of galvanized steel sheet and painted to provide a high resistance to corrosion. Colour Ivory White (Munsell code 5Y7.5/1) ($\pm$ RAL7044). The base frame has an eye-hook to lift the unit with ropes for an easy installation. The weight is uniformly distributed along the profiles of the base and this facilitates the arrangement of the unit.

Compressor The compressor is hermetic orbiting scroll compressor complete with motor over-temperature and over-current devices. An oil heater, which starts automatically, keeps the oil from being diluted by the refrigerant when the compressor stops. The compressors are connected in Tandem or Trio on a single refrigerating circuit and are fitted on rubber antivibration mounts and complete with oil charge.

Refrigerant Units have been optimized to operate with R-410A, refrigerant with zero ODP (Ozone Depletion Potential). R-410A has been the logical choice for our multiple scroll chiller because today it is one of the most promising refrigerants in terms of efficiency, stability and environmental impact. R-410A offers a small swept volume, a good heat exchange capacity and leads to reduced component sizes of items such as heat exchangers and tubing.

Evaporator (Plate Heat Exchanger) The unit is equipped with a direct expansion plate to plate type evaporator. This heat exchanger is made of stainless steel brazed plates and is covered with a 20mm closed cell insulation material. The exchanger is equipped with an electric heater for protection against freezing down to -28°C and evaporator water connections are provided with a vitaulic kit (as standard). The evaporator is manufactured in accordance to PED approval. Flow switch on evaporator standard factory mounted. Water filter is standard (depending on the unit model it can be shipped loose or unit mounted).

Condenser The condenser is manufactured with internally enhanced seamless copper tubes arranged in a staggered row pattern and mechanically expanded into lanced and rippled aluminum condenser fins with full fin collars. An integral sub-cooler circuit provides sub-cooling to effectively eliminate liquid flashing and increase cooling capacity without increasing the power input.

Condenser fans ($\varnothing$ 800) The condenser fans are propeller type with high efficiency design blades to maximize performances. The material of the blades is glass reinforced resin and each fan is protected by a guard. Fan motors are internally protected from overtemperature and are IP54.

Electronic expansion valve The unit is equipped with the most advanced electronic expansion valves to achieve precise control of refrigerant mass flow. As today's system requires improved energy efficiency, tighter temperature control, wider range of operating conditions and incorporate features like remote monitoring and diagnostics, the application of electronic expansion valves becomes mandatory.

Electronic expansion valves possess unique features: short opening and closing time, high resolution, positive shut-off function to eliminate use of additional solenoid valve, continuous modulation of mass flow without stress in the refrigerant circuit and corrosion resistance stainless steel body.

Electronic expansion valves are typically working with lower ΔP between high and low pressure side, than a thermostatic expansion valve. The electronic expansion valve allows the system to work with low condenser pressure (winter time) without any refrigerant flow problems and with a perfect chilled water leaving temperature control.

Refrigerant circuit Each unit has 2 independent refrigerant circuits and each one includes:

- Compressors
- Refrigerant
- Evaporator
- Air Cooled Condenser
- Electronic expansion valve
- 4 way valve
- Sight glass with moisture indicator
- Filter drier
- Charging valves
- High pressure switch
- High pressure transducers
- Low pressure transducers
- Suction temperature sensor

Electrical control panel Power and control are located in the main panel that is manufactured to ensure protection against all weather conditions. The electrical panel is IP54 and (when opening the doors) internally protected against possible accidental contact with live parts. The main panel is fitted with a main switch interlocked door that shuts off power supply when opening.

Power Section

The power section includes compressors and fans protection devices, compressors and fans starters and control circuit power supply.

MicroTech III controller

MicroTech III controller is installed as standard; it can be used to modify unit set-points and check control parameters. A built-in display shows chiller operating status plus temperatures and pressures of water, refrigerant and air, programmable values, set-points. A sophisticated software with predictive logic, selects the most energy efficient combination of compressors, EEXV and condenser fans to keep stable operating conditions to maximise chiller energy efficiency and reliability.

MicroTech III is able to protect critical components based on external signals from its system (such as motor temperatures, refrigerant gas, correct phase sequence (option), pressure switches and evaporator). The input coming from the high pressure switch cuts all digital output from the controller in less than 50ms, this is an additional security for the equipment.

Fast program cycle (200ms) for a precise monitoring of the system. Floating point calculations supported for increased accuracy in Pressure / Temperature conversions.

Control section - main features

Control Section has the following feature.

- Management of the refrigerant circuit capacity and fans modulation.
- Chiller enabled to work in partial failure condition.
- Full routine operation at condition of:
 - high ambient temperature value
 - high thermal load
 - high evaporator entering water temperature (start-up)
- Display of evaporator entering/leaving water temperature.
- Display of Outdoor Ambient Temperature.
- Display of condensing-evaporating temperature and pressure, suction and superheat for each circuit.
- Leaving water evaporator temperature regulation.
- Compressor and evaporator pumps hours counter.
- Display of Status Safety Devices.
- Number of starts and compressor working hours.
- Optimized management of circuit load.
- Fan management according to condensing pressure.
- Re-start in case of power failure (automatic / manual).
- Start at high evaporator water temperature.
- Return Reset (Set Point Reset based on return water temperature).
- OAT (Outside Ambient temperature) Reset.
- Set point Reset (optional).
- Application and system upgrade with commercial SD cards.
- Ethernet port for remote or local servicing using standard web browsers.

Safety device / logic for each refrigerant circuit

The following devices / logics are available.

- High pressure (pressure switch).
- High pressure (transducer).
- Low pressure (transducer).
- High motor winding temperature.
- Low pressure ratio.

System security

The following securities are available.

Low Ambient temperature lock-out.

Regulation type

Proportional + integral + derivative regulation on the evaporator leaving water output probe.

MicroTech III

MicroTech III built-in terminal has the following features.

- 164x44 dots liquid crystal display with white back lighting. Supports Unicode fonts for multi-lingual.
- Key-pad consisting of 3 keys.
- Push'n'Roll control for an increased usability.
- Memory to protect the data.
- General faults alarm relays.
- Password access to modify the setting.
- Application security to prevent application tampering or hardware usability with third party applications.
- Service report displaying all running hours and general conditions.
- Alarm history memory to allow an easy fault analysis.

Supervising systems (on request)

MicroTech III remote communication

MicroTech III is able to communicate to BMS (Building Management System) based on the most common protocols as:

- ModbusRTU
- LonWorks, now also based on the international 8040 Standard Chiller Profile and LonMark Technology.
- BacNet BTP certified over IP and MS/TP (class 4) (Native).
- Ethernet TCP/IP.

Standard Options (supplied on basic unit)

Direct on line starter (DOL)

Alucoat fins coil - Fins are protected by a special acrylic paint with a high resistance to corrosion.

Double setpoint - Dual leaving water temperature setpoints.

Evaporator victaulic kit - Hydraulic joint with gasket for an easy and quick water connection.

20mm evaporator insulation - The external shell is covered with a 20mm closed cell insulation material.

Evaporator electric heater - Electric heater (controlled by a thermostat) to protect the evaporator from freezing down to 28°C ambient temperature, providing the power supply is on.

Evaporator flow switch - Supplied separately to be wired and installed on the evaporator water piping (by the customer).

Electronic expansion valve

Ambient outside temperature sensor and setpoint reset

Hour run meter

General fault contactor

Main switch interlock door

Water filter - The water filter removes impurities from water by means of a fine physical barrier.

Options (on request)

MECHANICAL

Partial heat recovery - Plate to plate heat exchangers for hot water production.

Brine version - Allows the unit to operate down to 15°C leaving liquid temperature (antifreeze required). Recommended below +4°C

Condenser coil guards

Evaporator area guards

Cu-Cu condenser coil - To give better protection against corrosion by aggressive environments.

CuCuSn condenser coil - To give better protection against corrosion in aggressive environments and by salty air.

Discharge line shutoff valve - Installed on the discharge port of the compressor to facilitate maintenance operation.

Suction line shut-off valve - Installed on the suction port of the compressor to facilitate maintenance operation.

High pressure side manometers

Low pressure side manometers

One centrifugal pumps (low or high lift) - Hydronic kit consists of: single direct driven centrifugal pump, water filling system with pressure gauge, safety valve, drain valve. The motor pump is protected by a circuit breaker installed in control panel. The kit is assembled and wired to the control panel. The pipe and pump are protected from freezing with an additional electrical heater.

Two centrifugal pumps (low or high lift) - Not available for the 4 and 5 fans chiller footprint.

Hydronic kit consists of: twin direct driven centrifugal pumps, water filling system with pressure gauge, safety valve, drain valve. The motor pump is protected by a circuit breaker installed in control panel. The kit is assembled and wired to the control panel. The pipe and pumps are protected from freezing with an additional electrical heater.

Double pressure relief valve with diverter

Blygold Coil Treatment - It is a Polyurethane coating impregnated with metallic pigment which provides a long lasting corrosion protection to condenser fins coils; it is UV resistant, flexible, heat conductive, chemical resistant to aggressive environments.

ELECTRICAL / CONTROL

Compressor thermal overload relays - Safety electronic devices that, added to the standard protection devices, protect compressor motors against overload and current unbalance.

Phase monitor - Device that monitors input voltage and stops the chiller in case of phase loss or wrong phase sequence.

Under / Over voltage control - Electronic device that monitors and displays input voltage, and stops the chiller in case of phase loss, wrong phase sequence, or voltage exceeding minimum and maximum allowed values.

Energy meter - Device installed inside the control box that displays all chiller electrical power parameters at line input such as line voltage and phase current, input active and reactive power, active and reactive energy. An integrated RS485 module allows a Modbus communication to an external BMS.

Capacitors for power factor correction - Devices that increase the power factor of the unit. The capacitors are "dry" selfregenerating type with over pressure disconnecting safety device insulated with a no toxic dielectric mix without PCB or PCT.

Speedtrol (fan speed control device - ON/OFF - up to 10°C in Cooling) - Continuous fan speed regulation on the first fan (VFD driven) of each circuit. It allows unit operation down to -10°C.

Setpoint reset, Demand limit and Alarm from external device - Setpoint Reset: The leaving water temperature setpoint can be overwritten with an external 4-20mA, through the ambient temperature, or through the evaporator water temperature ΔT . Demand Limit: Chiller capacity can be limited through an external 4-20mA signal or via network. Alarm from external device: The unit controller is able to receive an external alarm signal. The user can decide whether this alarm signal will stop the unit or not.

Compressors circuit breakers Safety devices that include in a single device all safety functions otherwise provided by standard fuses and optional thermal relays, such as protection against overcurrent, overload, current unbalance.

Fans circuit breakers - Safety devices that, added to the standard protection devices, protect fan motors against overload and overcurrent.

Fans speed regulation (INVERTER) - Continuous fan speed regulation of all fans (VFD driven) for improved sound level of the unit during low ambient temperature operation. At very low temperatures, all fans except the first are switched off thus allowing unit operation down to -10°C. (STD option on XN version)

Ground fault relay - To shut down the entire unit if a ground fault condition is detected.

Nordic kit - This option is offering enhanced drain pans and water discharge line, electric heaters on the pans protected by insulating material and additional covers for plugs at the back side of the electrical panel. Recommended for cold regions installations.

INSTALLATION

Rubber anti vibration mounts - Supplied separately, these are positioned under the base of the unit during installation. Ideal to reduce the vibrations when the unit is floor mounted.

Spring anti vibration mounts - Supplied separately, these are positioned under the base of the unit during installation. Ideal for dampening vibrations for installation on roofs and metallic structures.

External tank without cabinet (500 L)

External tank without cabinet (1000 L)

External tank with cabinet (500 L)

External tank with cabinet (1000 L)

OTHER

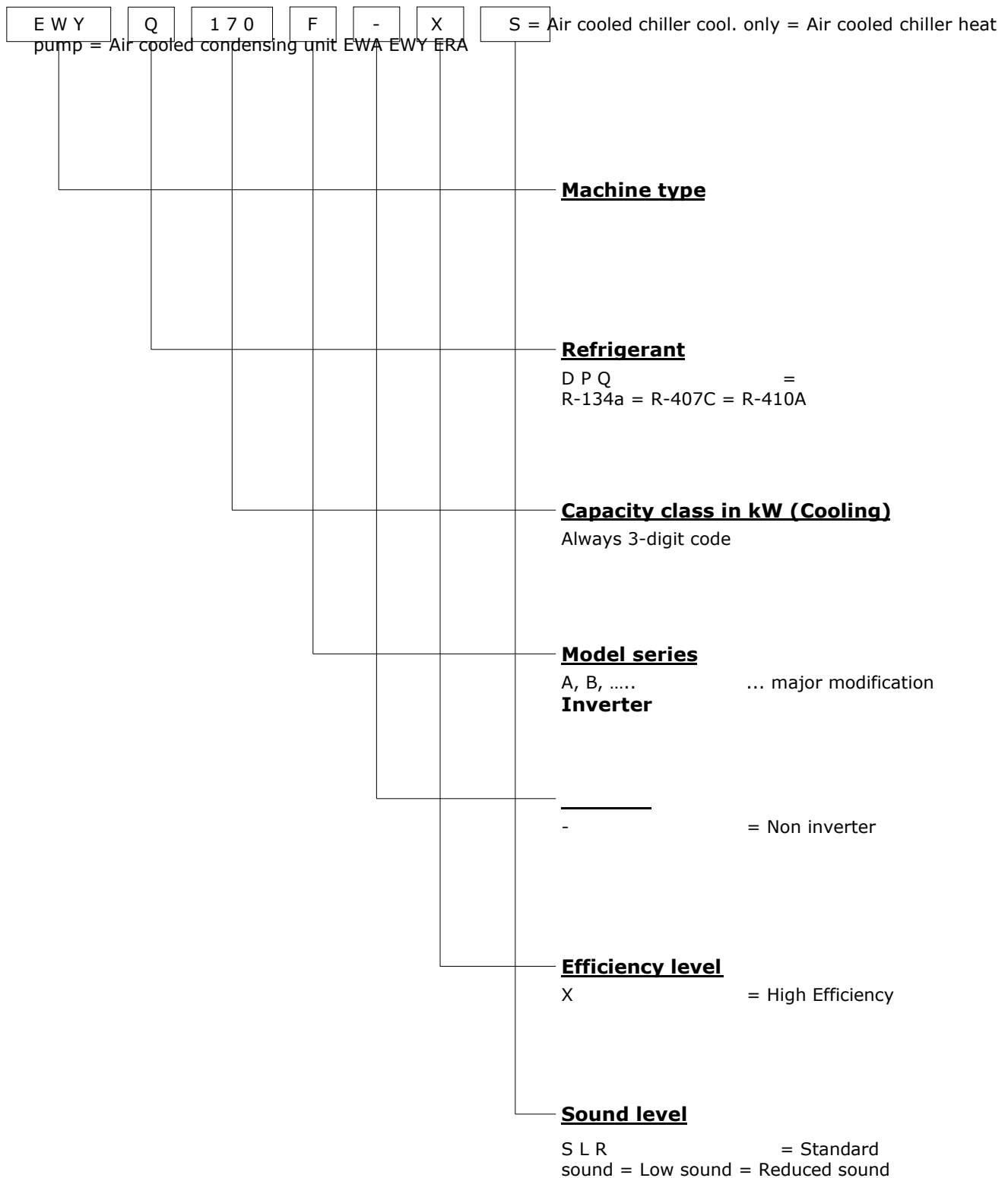
Container Kit

Transport kit

Witness test

Condenser coil protection panel - Wooden panels protecting the coils against possible damage are installed for shipment.

Acoustic test



EWYQFXS

MODEL		160	190	210	230	310	340	380	400
Capacity - Cooling (1)	kW	164	184	205	231	304	335	376	401
Capacity control - Type		Step	Step	Step	Step	Step	Step	Step	Step
Capacity control - Minimum capacity	%	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Unit power input - Cooling (1) kW		57.6	63.3	70.3	79.3	102	114	129	138
EER (1)		2.84	2.91	2.92	2.92	2.99	2.93	2.91	2.90
ESEER		3.73	3.89	3.81	3.71	4.07	4.19	3.99	3.96
IPLV		4.45	4.47	4.55	4.38	4.56	4.61	4.38	4.50
CASING									
Colour (2)		IW	IW	IW	IW	IW	IW	IW	IW
Material (2)		GPSS	GPSS	GPSS	GPSS	GPSS	GPSS	GPSS	GPSS
DIMENSIONS									
Height mm		2270	2270	2270	2270	2220	2220	2220	2220
Width	mm	1200	1200	1200	1200	2258	2258	2258	2258
Length mm		4370	4370	5270	5270	4125	4125	4125	5025
WEIGHT									
Unit Weight kg		1430	1850	2300	2350	2900	2910	2920	3730
Operating Weight	kg	1470	1890	2340	2390	2980	2990	3000	3840
WATER HEAT EXCHANGER									
Type (3)		PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE
Water Volume	l	18	18	18	18	44	44	44	60
Nominal water flow rate l/s		7.8	8.8	9.8	11.1	14.6	16.0	18.0	19.2
Nominal Water pressure drop	kPa	22	28	36	40	21	27	30	29
Insulation material (4)		CC	CC	CC	CC	CC	CC	CC	CC
AIR HEAT EXCHANGER									
Type (5)		HFP	HFP	HFP	HFP	HFP	HFP	HFP	HFP
FAN									
Type (6)		DPT	DPT	DPT	DPT	DPT	DPT	DPT	DPT
Drive (7)		DOL	DOL	DOL	DOL	DOL	DOL	DOL	DOL
Diameter	mm	800	800	800	800	800	800	800	800
Nominal air flow	l/s	22577	21593	26992	26992	43187	43187	43187	55213
Quantity	No.	4	4	5	5	8	8	8	10
Speed	rpm	900	900	900	900	900	900	900	900
Motor input	kW	7.0	7.0	8.8	8.8	14.0	14.0	14.0	17.5
COMPRESSOR									
Type		Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
Oil charge	l	14	16	19	23	26	25	25	25
Quantity	No.	4	4	4	4	4	4	4	4
SOUND LEVEL									
Sound Power - Cooling	dB(A)	92	94	95	95	97	97	98	99
Sound Pressure - Cooling (8)	dB(A)	72	74	75	76	77	77	78	78

Fluid: Water

(1) Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12.0/7.0°C; ambient 35.0°C, unit at full load operation;

(2) IW: Ivory White; GPSS: Galvanized and Painted Steel Sheet; (3) PHE: Plate Heat Exchanger --- S&T: Single Pass Shell & Tube

(4) CC: Closed Cell; (5) HFP: High efficiency fin and tube type with integral subcooler

(6) DPT: Direct Propeller Type; (7) DOL: Direct On Line - VFD: Inverter - BRS: Brushless

(8) The values are according to ISO 3744 and are referred to: evaporator 12/7°C, ambient 35°C, full load operation.

** If value is "Italic-Red Color" please contact factory

EWYQFXS

MODEL		430	510	570	630				
Capacity - Cooling (1)	kW	427	502	565	624				
Capacity control - Type		Step	Step	Step	Step				
Capacity control - Minimum capacity	%	25.0	17.0	17.0	17.0				
Unit power input - Cooling (1) kW		145	172	195	214				
EER (1)		2.94	2.92	2.90	2.91				
ESEER		4.14	4.20	3.98	4.06				
IPLV		4.70	4.71	4.56	4.74				
CASING									
Colour (2)		IW	IW	IW	IW				
Material (2)		GPSS	GPSS	GPSS	GPSS				
DIMENSIONS									
Height mm		2220	2220	2220	2220				
Width	mm	2258	2258	2258	2258				
Length mm		5025	5925	5925	6825				
WEIGHT									
Unit Weight kg		3750	4250	4280	4670				
Operating Weight	kg	3850	4370	4400	4780				
WATER HEAT EXCHANGER									
Type (3)		PHE	PHE	PHE	PHE				
Water Volume	l	60	70	70	70				
Nominal water flow rate	l/s	20.4	24.0	27.1	29.9				
Nominal Water pressure drop	kPa	34	37	42	56				
Insulation material (4)		CC	CC	CC	CC				
AIR HEAT EXCHANGER									
Type (5)		HFP	HFP	HFP	HFP				
FAN									
Type (6)		DPT	DPT	DPT	DPT				
Drive (7)		DOL	DOL	DOL	DOL				
Diameter	mm	800	800	800	800				
Nominal air flow	l/s	53983	64780	64780	75577				
Quantity	No.	10	12	12	14				
Speed	rpm	900	900	900	900				
Motor input	kW	17.5	21.0	21.0	24.5				
COMPRESSOR									
Type		Scroll	Scroll	Scroll	Scroll				

Fluid: Water

(1) Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12.0/7.0°C; ambient 35.0°C, unit at full load operation;

(2) IW: Ivory White; GPSS: Galvanized and Painted Steel Sheet; (3) PHE: Plate Heat Exchanger --- S&T: Single Pass Shell & Tube

(4) CC: Closed Cell; (5) HFP: High efficiency fin and tube type with integral subcooler (6)

DPT: Direct Propeller Type; (7) DOL: Direct On Line - VFD: Inverter - BRS: Brushless

(8) The values are according to ISO 3744 and are referred to: evaporator 12/7°C, ambient 35°C, full load operation.

** If value is "Italic-Red Color" please contact factory

EWYQFXL

MODEL		160	190	210	230	310	340	380	400
Capacity - Cooling (1)	kW	164	184	205	231	304	335	376	401
Capacity control - Type		Step	Step	Step	Step	Step	Step	Step	Step
Capacity control - Minimum capacity	%	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Unit power input - Cooling (1) kW		57.6	63.3	70.3	79.3	102	114	129	138
EER (1)		2.84	2.91	2.92	2.92	2.99	2.93	2.91	2.90
ESEER		3.73	3.89	3.81	3.71	4.07	4.19	3.99	3.96
IPLV		4.45	4.47	4.55	4.38	4.56	4.61	4.38	4.50
CASING									
Colour (2)		IW	IW	IW	IW	IW	IW	IW	IW
Material (2)		GPSS	GPSS	GPSS	GPSS	GPSS	GPSS	GPSS	GPSS
DIMENSIONS									
Height mm		2270	2270	2270	2270	2220	2220	2220	2220
Width	mm	1200	1200	1200	1200	2258	2258	2258	2258
Length mm		4370	4370	5270	5270	4125	4125	4125	5025
WEIGHT									
Unit Weight kg		1520	1940	2400	2440	3060	3070	3080	3890
Operating Weight	kg	1570	1980	2440	2480	3130	3150	3160	3990
WATER HEAT EXCHANGER									
Type (3)		PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE
Water Volume	l	18	18	18	18	44	44	44	60
Nominal water flow rate l/s		7.8	8.8	9.8	11.1	14.6	16.0	18.0	19.2
Nominal Water pressure drop	kPa	22	28	36	40	21	27	30	29
Insulation material (4)		CC	CC	CC	CC	CC	CC	CC	CC
AIR HEAT EXCHANGER									
Type (5)		HFP	HFP	HFP	HFP	HFP	HFP	HFP	HFP
FAN									
Type (6)		DPT	DPT	DPT	DPT	DPT	DPT	DPT	DPT
Drive (7)		DOL	DOL	DOL	DOL	DOL	DOL	DOL	DOL
Diameter	mm	800	800	800	800	800	800	800	800
Nominal air flow	l/s	22577	21593	26992	26992	43187	43187	43187	55213
Quantity	No.	4	4	5	5	8	8	8	10
Speed	rpm	900	900	900	900	900	900	900	900
Motor input	kW	7.0	7.0	8.8	8.8	14.0	14.0	14.0	17.5
COMPRESSOR									
Type		Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
Oil charge	l	14	16	19	23	26	25	25	25
Quantity	No.	4	4	4	4	4	4	4	4
SOUND LEVEL									
Sound Power - Cooling	dB(A)	89	92	93	93	95	95	95	96
Sound Pressure - Cooling (8)	dB(A)	70	73	73	74	75	75	75	75

Fluid: Water

(1) Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12.0/7.0°C; ambient 35.0°C, unit at full load operation;

(2) IW: Ivory White; GPSS: Galvanized and Painted Steel Sheet; (3) PHE: Plate Heat Exchanger --- S&T: Single Pass Shell & Tube

(4) CC: Closed Cell; (5) HFP: High efficiency fin and tube type with integral subcooler

(6) DPT: Direct Propeller Type; (7) DOL: Direct On Line - VFD: Inverter - BRS: Brushless

(8) The values are according to ISO 3744 and are referred to: evaporator 12/7°C, ambient 35°C, full load operation.

** If value is "Italic-Red Color" please contact factory

EWYQFXL

MODEL		430	510	570	630				
Capacity - Cooling (1)	kW	427	502	565	624				
Capacity control - Type		Step	Step	Step	Step				
Capacity control - Minimum capacity	%	25.0	17.0	17.0	17.0				
Unit power input - Cooling (1) kW		145	172	195	214				
EER (1)		2.94	2.92	2.90	2.91				
ESEER		4.14	4.20	3.98	4.06				
IPLV		4.70	4.71	4.56	4.74				
CASING									
Colour (2)		IW	IW	IW	IW				
Material (2)		GPSS	GPSS	GPSS	GPSS				
DIMENSIONS									
Height mm		2220	2220	2220	2220				
Width	mm	2258	2258	2258	2258				
Length mm		5025	5925	5925	6825				
WEIGHT									
Unit Weight kg		3900	4400	4440	4820				
Operating Weight	kg	4010	4520	4550	4940				
WATER HEAT EXCHANGER									
Type (3)		PHE	PHE	PHE	PHE				
Water Volume	l	60	70	70	70				
Nominal water flow rate l/s		20.4	24.0	27.1	29.9				
Nominal Water pressure drop	kPa	34	37	42	56				
Insulation material (4)		CC	CC	CC	CC				
AIR HEAT EXCHANGER									
Type (5)		HFP	HFP	HFP	HFP				
FAN									
Type (6)		DPT	DPT	DPT	DPT				
Drive (7)		DOL	DOL	DOL	DOL				
Diameter	mm	800	800	800	800				
Nominal air flow	l/s	53983	64780	64780	75577				
Quantity	No.	10	12	12	14				
Speed	rpm	900	900	900	900				
Motor input	kW	17.5	21.0	21.0	24.5				
COMPRESSOR									
Type		Scroll	Scroll	Scroll	Scroll				

Fluid: Water

(1) Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12.0/7.0°C; ambient 35.0°C, unit at full load operation;

(2) IW: Ivory White; GPSS: Galvanized and Painted Steel Sheet; (3) PHE: Plate Heat Exchanger --- S&T: Single Pass Shell & Tube

(4) CC: Closed Cell; (5) HFP: High efficiency fin and tube type with integral subcooler (6)

DPT: Direct Propeller Type; (7) DOL: Direct On Line - VFD: Inverter - BRS: Brushless

(8) The values are according to ISO 3744 and are referred to: evaporator 12/7°C, ambient 35°C, full load operation.

** If value is "Italic-Red Color" please contact factory

EWYQFXR

MODEL		160	180	200	220	300	330	360	390
Capacity - Cooling (1)	kW	158	178	199	223	296	326	363	389
Capacity control - Type		Step	Step	Step	Step	Step	Step	Step	Step
Capacity control - Minimum capacity	%	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Unit power input - Cooling (1) kW		56.2	62.3	68.4	77.9	97.4	111	127	134
EER (1)		2.81	2.86	2.92	2.87	3.04	2.93	2.86	2.90
ESEER		4.33	4.39	4.38	4.19	4.63	4.68	4.37	4.44
IPLV		5.11	5.18	5.22	4.96	5.25	5.35	4.97	5.08
CASING									
Colour (2)		IW	IW	IW	IW	IW	IW	IW	IW
Material (2)		GPSS	GPSS	GPSS	GPSS	GPSS	GPSS	GPSS	GPSS
DIMENSIONS									
Height mm		2270	2270	2270	2270	2220	2220	2220	2220
Width	mm	1200	1200	1200	1200	2258	2258	2258	2258
Length mm		4370	4370	5270	5270	4125	4125	4125	5025
WEIGHT									
Unit Weight kg		1520	1940	2400	2440	3060	3070	3080	3890
Operating Weight	kg	1570	1980	2440	2480	3130	3150	3160	3990
WATER HEAT EXCHANGER									
Type (3)		PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE
Water Volume	l	18	18	18	18	44	44	44	60
Nominal water flow rate l/s		7.5	8.5	9.6	10.7	14.2	15.6	17.4	18.6
Nominal Water pressure drop	kPa	20	26	34	38	20	25	28	27
Insulation material (4)		CC	CC	CC	CC	CC	CC	CC	CC
AIR HEAT EXCHANGER									
Type (5)		HFP	HFP	HFP	HFP	HFP	HFP	HFP	HFP
FAN									
Type (6)		DPT	DPT	DPT	DPT	DPT	DPT	DPT	DPT
Drive (7)		DOL	DOL	DOL	DOL	DOL	DOL	DOL	DOL
Diameter	mm	800	800	800	800	800	800	800	800
Nominal air flow	l/s	17380	16564	20706	20706	33129	33129	33129	42431
Quantity	No.	4	4	5	5	8	8	8	10
Speed	rpm	700	700	700	700	700	700	700	700
Motor input	kW	3.0	3.0	3.8	3.8	6.0	6.0	6.0	7.5
COMPRESSOR									
Type		Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
Oil charge	l	14	16	19	23	26	25	25	25
Quantity	No.	4	4	4	4	4	4	4	4
SOUND LEVEL									
Sound Power - Cooling	dB(A)	83	84	86	86	88	88	89	90
Sound Pressure - Cooling (8)	dB(A)	64	65	66	67	69	69	69	70

Fluid: Water

(1) Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12.0/7.0°C; ambient 35.0°C, unit at full load operation;

(2) IW: Ivory White; GPSS: Galvanized and Painted Steel Sheet; (3) PHE: Plate Heat Exchanger --- S&T: Single Pass Shell & Tube

(4) CC: Closed Cell; (5) HFP: High efficiency fin and tube type with integral subcooler

(6) DPT: Direct Propeller Type; (7) DOL: Direct On Line - VFD: Inverter - BRS: Brushless

(8) The values are according to ISO 3744 and are referred to: evaporator 12/7°C, ambient 35°C, full load operation.

** If value is "Italic-Red Color" please contact factory

MODEL		420	490	550	610				
Capacity - Cooling (1)	kW	415	487	546	606				
Capacity control - Type		Step	Step	Step	Step				
Capacity control - Minimum capacity	%	25.0	17.0	17.0	17.0				
Unit power input - Cooling (1) kW		141	167	191	210				
EER (1)		2.93	2.91	2.85	2.89				
ESEER		4.60	4.83	4.50	4.62				
IPLV		5.25	5.54	5.13	5.36				
CASING									
Colour (2)		IW	IW	IW	IW				
Material (2)		GPSS	GPSS	GPSS	GPSS				
DIMENSIONS									
Height mm		2220	2220	2220	2220				
Width	mm	2258	2258	2258	2258				
Length mm		5025	5925	5925	6825				
WEIGHT									
Unit Weight kg		3900	4400	4440	4820				
Operating Weight	kg	4010	4520	4550	4940				
WATER HEAT EXCHANGER									
Type (3)		PHE	PHE	PHE	PHE				
Water Volume	l	60	70	70	70				
Nominal water flow rate	l/s	19.8	23.3	26.1	29.0				
Nominal Water pressure drop	kPa	32	35	39	53				
Insulation material (4)		CC	CC	CC	CC				
AIR HEAT EXCHANGER									
Type (5)		HFP	HFP	HFP	HFP				
FAN									
Type (6)		DPT	DPT	DPT	DPT				
Drive (7)		DOL	DOL	DOL	DOL				
Diameter	mm	800	800	800	800				
Nominal air flow	l/s	41411	49693	49693	57975				
Quantity	No.	10	12	12	14				
Speed	rpm	700	700	700	700				
Motor input	kW	7.5	9.0	9.0	10.5				
COMPRESSOR									
Type		Scroll	Scroll	Scroll	Scroll				

Fluid: Water

(1) Cooling capacity, unit power input in cooling and EER are based on the following conditions: evaporator 12.0/7.0°C; ambient 35.0°C, unit at full load operation;

(2) IW: Ivory White; GPSS: Galvanized and Painted Steel Sheet; (3) PHE: Plate Heat Exchanger --- S&T: Single Pass Shell & Tube

(4) CC: Closed Cell; (5) HFP: High efficiency fin and tube type with integral subcooler

(6) DPT: Direct Propeller Type; (7) DOL: Direct On Line - VFD: Inverter - BRS: Brushless

(8) The values are according to ISO 3744 and are referred to: evaporator 12/7°C, ambient 35°C, full load operation.

** If value is "Italic-Red Color" please contact factory

EWYQFXS

MODEL		160	190	210	230	310	340	380	400	
Capacity - Heating *	kW	173	197	227	254	329	362	404	429	
Unit power input - Heating *	kW	54.0	61.6	70.5	79.2	101	113	126	133	
COP *	---	3.20	3.20	3.22	3.21	3.24	3.21	3.21	3.23	
SCOP **	---	2.78	2.85	2.81	2.80	2.87	2.89	2.89	2.84	
HEAT EXCHANGER - EVAPORATOR										
Nominal water flow rate	l/s	8.3	9.5	10.9	12.2	15.9	17.5	19.5	20.7	
Nominal Water pressure drop	kPa	25	32	43	50	25	31	37	33	

EWYQFXS

MODEL		430	510	570	630
Capacity - Heating *	kW	463	535	607	674
Unit power input - Heating *	kW	140	167	190	210
COP *	---	3.30	3.21	3.20	3.21
SCOP **	---	2.90	2.83	2.82	2.84
HEAT EXCHANGER - EVAPORATOR					
Nominal water flow rate	l/s	22.3	25.8	29.3	32.5
Nominal Water pressure drop	kPa	40	43	50	66

EWYQ-F-XL

MODEL		160	190	210	230	310	340	380	400
Capacity - Heating *	kW	173	197	227	254	329	362	404	429
Unit power input - Heating *	kW	54.0	61.6	70.5	79.2	101	113	126	133
COP *	---	3.20	3.20	3.22	3.21	3.24	3.21	3.21	3.23
SCOP **	---	2.78	2.85	2.81	2.80	2.87	2.89	2.89	2.84
HEAT EXCHANGER - EVAPORATOR									
Nominal water flow rate	l/s	8.3	9.5	10.9	12.2	15.9	17.5	19.5	20.7
Nominal Water pressure drop	kPa	25	32	43	50	25	31	37	33

EWYQFXL

MODEL		430	510	570	630				
Capacity - Heating *	kW	463	535	607	674				
Unit power input - Heating *	kW	140	167	190	210				
COP *	---	3.30	3.21	3.20	3.21				
SCOP **	---	2.90	2.83	2.82	2.84				
HEAT EXCHANGER - EVAPORATOR									
Nominal water flow rate	l/s	22.3	25.8	29.3	32.5				

EWYQFXR

MODEL	160	180	200	220	300	330	360	390	
Capacity - Heating *	kW	173	197	227	254	329	362	404	429
Unit power input - Heating *	kW	54.0	61.6	70.5	79.2	101	113	126	133
COP *	---	3.20	3.20	3.22	3.21	3.24	3.21	3.21	3.23
SCOP **	---	2.78	2.85	2.81	2.80	2.87	2.89	2.89	2.84
HEAT EXCHANGER - EVAPORATOR									
Nominal water flow rate	l/s	8.3	9.5	10.9	12.2	15.9	17.5	19.5	20.7
Nominal Water pressure drop	kPa	25	32	43	50	25	31	37	33

EWYQFXR

MODEL		420	490	550	610
Capacity - Heating *	kW	463	535	607	674
Unit power input - Heating *	kW	140	167	190	210
COP *	---	3.30	3.21	3.20	3.21
SCOP **	---	2.90	2.83	2.82	2.84
HEAT EXCHANGER - EVAPORATOR					
Nominal water flow rate	l/s	22.3	25.8	29.3	32.5
Nominal Water pressure drop	kPa	40	43	50	66

Fluid: Water

* Heating capacity, unit power input and COP are based on the following conditions: air exchanger 7.0 - 90%°C; water exchanger 40.0/45.0, unit at full load operation;

** SCOP is based on the following conditions: Tbivalent +2 °C, Tdesign -10 °C, Average ambient conditions, Ref. EN14825

EWYQFXS

160	190	210	230	310	340	380	400	
POWER SUPPLY								
Nr	3	3	3	3	3	3	3	3
Hz	50	50	50	50	50	50	50	50
V	400	400	400	400	400	400	400	400
%	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-10%
%	+10%	+10%	+10%	+10%	+10%	+10%	+10%	+10%
A	282	536	353	560	600	516	637	659
A	115	140	128	162	193	205	235	251
A	138	165	164	196	246	264	295	316
A	152	182	181	216	271	290	324	348
A	16	16	20	20	32	32	32	40
Nr	3	3	3	3	3	3	3	3
V	400	400	400	400	400	400	400	400
%	10%	10%	10%	10%	10%	10%	10%	10%
%	+10%	+10%	+10%	+10%	+10%	+10%	+10%	+10%

EWYQFXS

MODEL		430	510	570	630				
POWER SUPPLY									
Phases	Nr	3	3	3	3				
Frequency	Hz	50	50	50	50				
Voltage	V	400	400	400	400				
Voltage tolerance Minimum	%	10%	10%	10%	10%				
Voltage tolerance Maximum	%	+10%	+10%	+10%	+10%				
UNIT									
Maximum starting current	A	666	648	787	827				
Nominal running current cooling	A	257	307	353	384				
Maximum running current	A	330	396	442	491				
Maximum current for wires sizing	A	363	436	486	540				
FANS									
Nominal running current cooling	A	40	48	48	56				
COMPRESSORS									
Phases	Nr	3	3	3	3				

Fluid: Water

Allowed voltage tolerance $\pm 10\%$. Voltage unbalance between phases must be within $\pm 3\%$. Maximum starting current: starting current of biggest compressor + current of the other compressors at maximum load + fans current at maximum load. In case of inverter driven units, no inrush current at start up is experienced.

Nominal current in cooling mode is referred to the following conditions: evaporator $12/7^{\circ}\text{C}$; ambient 35°C ; compressors + fans current.

Maximum running current is based on max compressor absorbed current in its envelope and max fans absorbed current

Maximum unit current for wires sizing is based on minimum allowed voltage

Maximum current for wires sizing: (compressors full load ampere + fans current) $\times 1,1$.

EWYQFXL

MODEL	160	190	210	230	310	340	380	400	
POWER SUPPLY									
Phases	Nr	3	3	3	3	3	3	3	3
Frequency	Hz	50	50	50	50	50	50	50	50
Voltage	V	400	400	400	400	400	400	400	400
Voltage tolerance Minimum	%	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-10%
Voltage tolerance Maximum	%	+10%	+10%	+10%	+10%	+10%	+10%	+10%	+10%
UNIT									
Maximum starting current	A	282	536	353	560	600	516	637	659
Nominal running current cooling	A	115	140	128	162	193	205	235	251
Maximum running current	A	138	165	164	196	246	264	295	316
Maximum current for wires sizing	A	152	182	181	216	271	290	324	348
FANS									
Nominal running current cooling	A	16	16	20	20	32	32	32	40
COMPRESSORS									
Phases	Nr	3	3	3	3	3	3	3	3
Voltage	V	400	400	400	400	400	400	400	400
Voltage tolerance Minimum	%	10%	10%	10%	10%	10%	10%	10%	10%
Voltage tolerance Maximum	%	+10%	+10%	+10%	+10%	+10%	+10%	+10%	+10%

EWYQFXL

MODEL	430	510	570	630					
POWER SUPPLY									
Phases	Nr	3	3	3	3				
Frequency	Hz	50	50	50	50				
Voltage	V	400	400	400	400				
Voltage tolerance Minimum	%	10%	10%	10%	10%				
Voltage tolerance Maximum	%	+10%	+10%	+10%	+10%				
UNIT									
Maximum starting current	A	666	648	787	827				
Nominal running current cooling	A	257	307	353	384				
Maximum running current	A	330	396	442	491				
Maximum current for wires sizing	A	363	436	486	540				
FANS									
Nominal running current cooling	A	40	48	48	56				
COMPRESSORS									
Phases	Nr	3	3	3	3				

Fluid: Water

Allowed voltage tolerance $\pm 10\%$. Voltage unbalance between phases must be within $\pm$

Maximum starting current: starting current of biggest compressor + current of the other compressors at maximum load + fans current at maximum load.

In case of inverter driven units, no inrush current at start up is experienced.

Nominal current in cooling mode is referred to the following conditions: evaporator $12/7^{\circ}\text{C}$; ambient 35°C ; compressors + fans current.

Maximum running current is based on max compressor absorbed current in its envelope and max fans absorbed current

Maximum unit current for wires sizing is based on minimum allowed voltage

Maximum current for wires sizing: (compressors full load ampere + fans current) $\times 1,1$.

EWYQFXR

160	180	200	220	300	330	360	390	
POWER SUPPLY								
Nr	3	3	3	3	3	3	3	3
Hz	50	50	50	50	50	50	50	50
V	400	400	400	400	400	400	400	400
%	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-10%
%	+10%	+10%	+10%	+10%	+10%	+10%	+10%	+10%
A	276	530	346	553	589	505	626	645
A	114	138	126	160	187	201	232	245
A	133	160	157	189	235	253	283	302
A	146	176	173	208	258	278	312	333
A	10	10	13	13	21	21	21	26
Nr	3	3	3	3	3	3	3	3
V	400	400	400	400	400	400	400	400
%	10%	10%	10%	10%	10%	10%	10%	10%
%	+10%	+10%	+10%	+10%	+10%	+10%	+10%	+10%

EWYQFXR

MODEL		420	490	550	610				
POWER SUPPLY									
Phases	Nr	3	3	3	3				
Frequency	Hz	50	50	50	50				
Voltage	V	400	400	400	400				
Voltage tolerance Minimum	%	10%	10%	10%	10%				
Voltage tolerance Maximum	%	+10%	+10%	+10%	+10%				
UNIT									
Maximum starting current	A	652	631	770	807				
Nominal running current cooling	A	252	301	350	379				
Maximum running current	A	316	379	425	471				
Maximum current for wires sizing	A	348	417	468	519				
FANS									
Nominal running current cooling	A	26	31	31	36				
COMPRESSORS									
Phases	Nr	3	3	3	3				

Fluid: Water

Allowed voltage tolerance $\pm 10\%$. Voltage unbalance between phases must be within $\pm 3\%$. Maximum starting current: starting current of biggest compressor + current of the other compressors at maximum load + fans current at maximum load. In case of inverter driven units, no inrush current at start up is experienced. Nominal current in cooling mode is referred to the following conditions: evaporator 12/7°C; ambient 35°C; compressors + fans current.

Maximum running current is based on max compressor absorbed current in its envelope and max fans absorbed current

Maximum unit current for wires sizing is based on minimum allowed voltage

Maximum current for wires sizing: (compressors full load ampere + fans current) x 1,1.

EWYQFXL

MODEL	Sound pressure level at 1 m from the unit (rif. 2 x 105 Pa)									Power
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)
160	75.0	68.4	68.1	65.1	66.1	63.3	55.7	44.1	70.0	89.2
190	77.8	71.2	70.9	67.9	68.9	66.1	58.5	46.9	72.8	92.0
210	78.1	71.5	71.2	68.2	69.2	66.4	58.8	47.2	73.2	92.8
230	78.8	72.2	71.9	68.9	69.9	67.1	59.5	47.9	73.8	93.4
310	80.1	73.5	73.2	70.2	71.2	68.4	60.8	49.2	75.1	94.8
340	80.1	73.5	73.2	70.2	71.2	68.4	60.8	49.2	75.1	94.8
380	80.1	73.5	73.2	70.2	71.2	68.4	60.8	49.2	75.2	94.9
400	80.4	73.8	73.5	70.5	71.5	68.7	61.1	49.5	75.4	95.5
430	80.4	73.8	73.5	70.5	71.5	68.7	61.1	49.5	75.5	95.6
510	81.7	75.1	74.8	71.8	72.8	70.0	62.4	50.8	76.7	97.2
570	81.7	75.1	74.8	71.8	72.8	70.0	62.4	50.8	76.7	97.2

EWYQ-F-XS

MODEL	Sound pressure level at 1 m from the unit (rif. 2 x 105 Pa)									Power
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)
160	77.4	70.8	70.5	67.5	68.5	65.7	58.1	46.5	72.4	91.6
190	79.4	72.8	72.5	69.5	70.5	67.7	60.1	48.5	74.4	93.6
210	80.0	73.4	73.1	70.1	71.1	68.3	60.7	49.1	75.0	94.6
230	80.5	73.9	73.6	70.6	71.6	68.8	61.2	49.6	75.5	95.1
310	82.1	75.5	75.2	72.2	73.2	70.4	62.8	51.2	77.1	96.8
340	82.1	75.5	75.2	72.2	73.2	70.4	62.8	51.2	77.1	96.8
380	82.9	76.3	76.0	73.0	74.0	71.2	63.6	52.0	77.9	97.6
400	83.4	76.8	76.5	73.5	74.5	71.7	64.1	52.5	78.4	98.5
430	83.7	77.1	76.8	73.8	74.8	72.0	64.4	52.8	78.7	98.8
510	83.7	77.1	76.8	73.8	74.8	72.0	64.4	52.8	78.7	99.2
570	84.3	77.7	77.4	74.4	75.4	72.6	65.0	53.4	79.4	99.9

EWYQFXR

MODEL	Sound pressure level at 1 m from the unit (rif. 2 x 105 Pa)									Power
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)
160	69.0	62.4	62.1	59.1	60.1	57.3	49.7	38.1	64.0	83.2
180	70.2	63.6	63.3	60.3	61.3	58.5	50.9	39.3	65.2	84.4
200	70.9	64.3	64.0	61.0	62.0	59.2	51.6	40.0	66.0	85.6
220	71.7	65.1	64.8	61.8	62.8	60.0	52.4	40.8	66.7	86.3
300	73.6	67.0	66.7	63.7	64.7	61.9	54.3	42.7	68.6	88.3
330	73.6	67.0	66.7	63.7	64.7	61.9	54.3	42.7	68.6	88.3
360	74.4	67.8	67.5	64.5	65.5	62.7	55.1	43.5	69.4	89.1
390	74.8	68.2	67.9	64.9	65.9	63.1	55.5	43.9	69.8	89.9
420	74.9	68.3	68.0	65.0	66.0	63.2	55.6	44.0	69.9	90.1
490	76.1	69.5	69.2	66.2	67.2	64.4	56.8	45.2	71.1	91.6
550	76.1	69.5	69.2	66.2	67.2	64.4	56.8	45.2	71.1	91.6

EWYQFXL

DISTANCE							
MODEL	1 m	5 m	10 m	15 m	20 m	25 m	50 m
160	70.0	61.9	57.1	54.0	51.7	49.9	44.1
190	72.8	64.7	59.9	56.8	54.5	52.7	46.9
210	73.2	65.4	60.6	57.5	55.3	53.5	47.7
230	73.8	66.0	61.2	58.1	55.9	54.1	48.3
310	75.1	67.3	62.6	59.5	57.2	55.4	49.7
340	75.1	67.3	62.6	59.5	57.2	55.4	49.7
380	75.2	67.4	62.7	59.6	57.3	55.5	49.8
400	75.4	67.9	63.2	60.1	57.9	56.1	50.4
430	75.5	68.0	63.3	60.2	58.0	56.2	50.5
510	76.7	69.4	64.8	61.8	59.5	57.7	52.1
570	76.7	69.4	64.8	61.8	59.5	57.7	52.1
630	77.1	70.0	65.4	62.4	60.2	58.5	52.8

EWYQFXS

DISTANCE							
MODEL	1 m	5 m	10 m	15 m	20 m	25 m	50 m
160	72.4	64.3	59.5	56.4	54.1	52.3	46.5
190	74.4	66.3	61.5	58.4	56.1	54.3	48.5
210	75.0	67.2	62.4	59.3	57.1	55.3	49.5
230	75.5	67.7	62.9	59.8	57.6	55.8	50.0
310	77.1	69.3	64.6	61.5	59.2	57.4	51.7
340	77.1	69.3	64.6	61.5	59.2	57.4	51.7
380	77.9	70.1	65.4	62.3	60.0	58.2	52.5
400	78.4	70.9	66.2	63.1	60.9	59.1	53.4
430	78.7	71.2	66.5	63.4	61.2	59.4	53.7
510	78.7	71.4	66.8	63.8	61.5	59.7	54.1
570	79.4	72.1	67.5	64.5	62.2	60.4	54.8
630	79.6	72.5	67.9	64.9	62.7	61.0	55.3

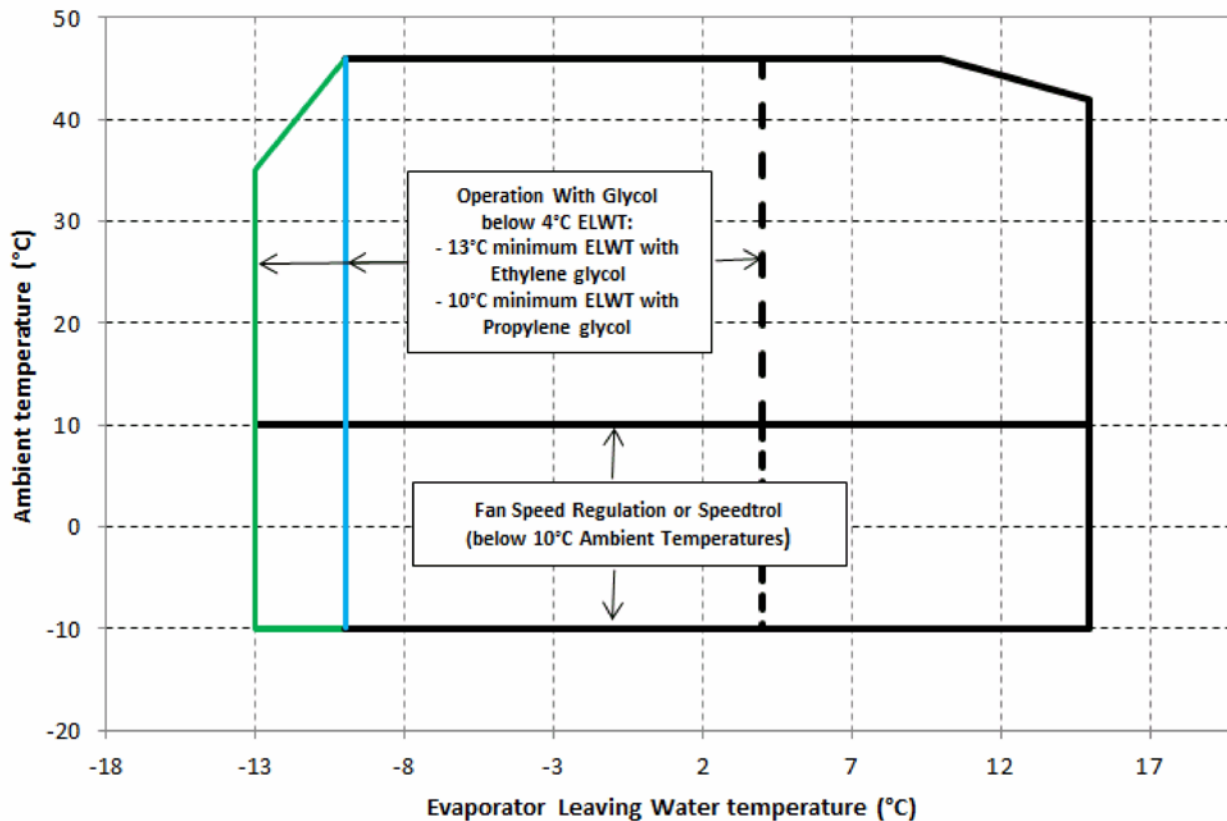
EWYQFXR

DISTANCE							
MODEL	1 m	5 m	10 m	15 m	20 m	25 m	50 m
160	64.0	55.9	51.1	48.0	45.7	43.9	38.1
180	65.2	57.1	52.3	49.2	46.9	45.1	39.3
200	66.0	58.2	53.4	50.3	48.1	46.3	40.5
220	66.7	58.9	54.1	51.0	48.8	47.0	41.2
300	68.6	60.8	56.1	53.0	50.7	48.9	43.2
330	68.6	60.8	56.1	53.0	50.7	48.9	43.2
360	69.4	61.6	56.9	53.8	51.5	49.7	44.0
390	69.8	62.3	57.6	54.5	52.3	50.5	44.8
420	69.9	62.4	57.7	54.6	52.4	50.6	44.9
490	71.1	63.8	59.2	56.2	53.9	52.1	46.5
550	71.1	63.8	59.2	56.2	53.9	52.1	46.5
610	71.4	64.3	59.7	56.7	54.5	52.8	47.1

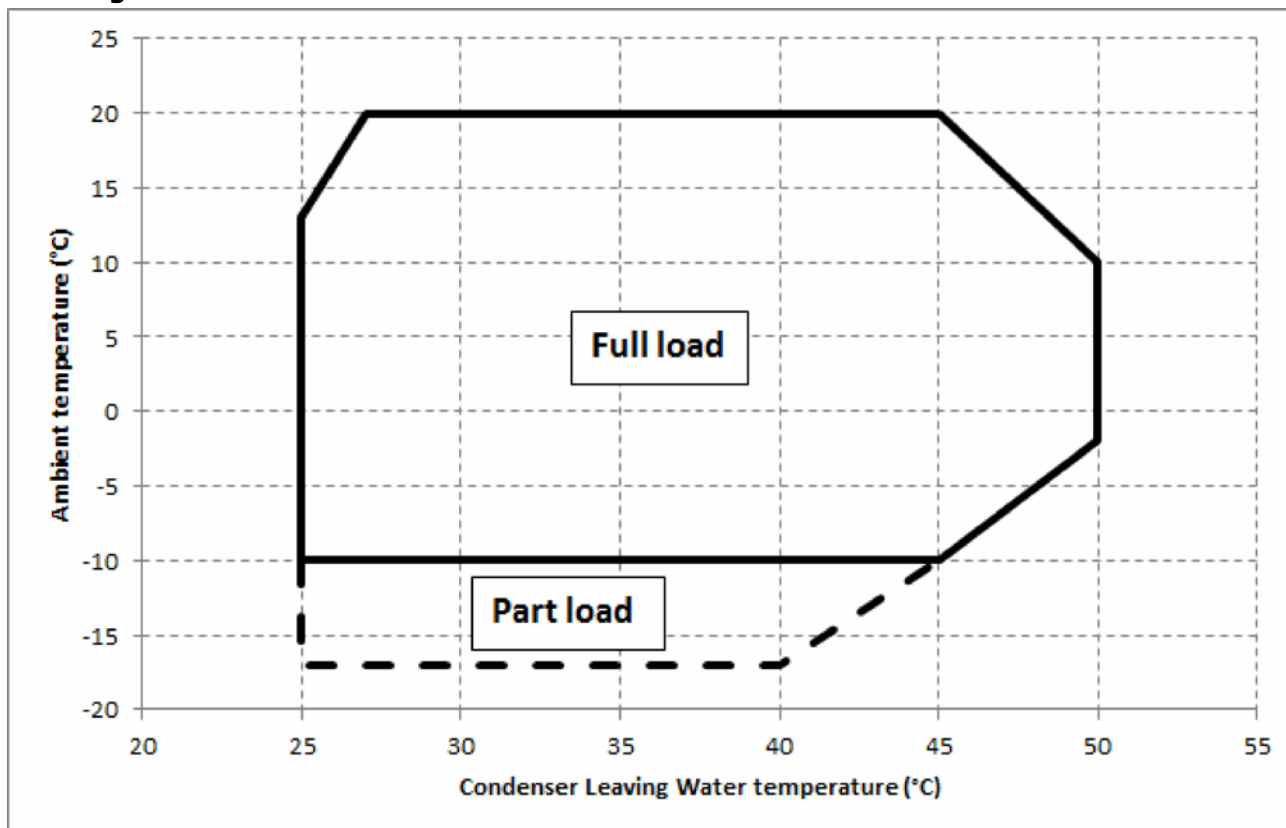
Fluid: Water Note: The values are according to ISO 3744 and are referred to: evaporator 12/7° C, air ambient 35°C, full load operation

Operating Limits

Cooling Mode



Heating Mode



The above graphic represents a guidelines about the operating limits of the range. Please refer to Chiller Selection Software (CSS) for real operating limits working conditions for each size.

Table 1 - Water heat exchanger - Minimum and maximum water Δt

A - Δt	°C	8
B - Δt	°C	4

Legend:

A = Max evaporator water Δt

B = Min evaporator water Δt

Note: Table referred to Cooling and Heating Mode

Table 2 - Minimum glycol percentage for low air ambient temperature

AAT (2)	-3	-8	-15	-20
A (1)	10%	20%	30%	40%
AAT (2)	-3	-7	-12	-20
B (1)	10%	20%	30%	40%

Legend:

AAT = Air Ambient Temperature (°C) (2)

A = Ethylene glycol (%) (1)

B = Propylene glycol (%) (1)

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

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

Water charge, flow and quality

Water charge, flow and quality

Items (1) (6)		Cooling Water			Once Flow		Cooled Water		Heated water (2)			Tendency if out of criteria
		Circulating System		Flowing water	Supply water (4)	Circulating water [Below 20°C]	Supply water (4)	Low temperature		High temperature		
		Circulating water	Supply water (4)					Circulating water [20°C ~ 60°C]	Supply water (4)	Circulating water [60°C ~ 80°C]	Supply water (4)	
Items to be controlled:	pH	6.5 ~ 8.2	6.0 ~ 8.0	6.0 ~ 8.0	6.0 ~ 8.0	6.8 ~ 8.0	6.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	Corrosion + Scale
	Electrical conductivity	[mS/m] at 25°C	Below 80	Below 30	Below 40	Below 80	Below 80	Below 30	Below 30	Below 30	Below 30	Corrosion + Scale
		[μS/cm] at 25°C	(Below 800)	(Below 300)	(Below 400)	(Below 800)	(Below 800)	(Below 300)	(Below 300)	(Below 300)	(Below 300)	Corrosion + Scale
	Chloride ion	[mgCl ² /l]	Below 200	Below 50	Below 50	Below 200	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	Sulfate ion	[mgSO ² -4/l]	Below 200	Below 50	Below 50	Below 200	Below 50	Below 50	Below 50	Below 30	Below 30	Corrosion
	M-alkalinity (pH4.8)	[mgCaCO ₃ /l]	Below 100	Below 50	Below 50	Below 100	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Total hardness	[mgCaCO ₃ /l]	Below 200	Below 70	Below 70	Below 200	Below 70	Below 70	Below 70	Below 70	Below 70	Scale
	Calcium harness	[mgCaCO ₃ /l]	Below 150	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Below 50	Scale
	Silica ion	[mgSiO ₂ /l]	Below 50	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Below 30	Scale
	Oxygen	(mg O ₂ /l)	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Corrosion
	Particulate size	(mm)	Below 0.5	Below 0.5	Below 0.5	Below 0.5	Below 0.6	Below 0.6	Below 0.5	Below 0.5	Below 0.6	Erosion
	Total dissolved solids	(mg / l)	Below 1000	Below 1000	Below 1000	Below 1000	Below 1001	Below 1001	Below 1000	Below 1000	Below 1001	Erosion
	Items to be referred to:	Ethylene, Propylene Glycol (weight conc.)	Below 60%	Below 60%	---	Below 60%	Below 60%	Below 60%	Below 60%	Below 60%	Below 60%	Below 60%
Nitrate ion			(mg NO ₃ - /l)	Below 100	Below 100	Below 100	Below 100	Below 101	Below 101	Below 100	Below 101	Below 101
TOC Total organic carbon		(mg /l)	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Below 1.0	Scale
Iron		[mgFe/l]	Below 1.0	Below 0.3	Below 1.0	Below 1.0	Below 0.3	Below 0.3	Below 1.0	Below 0.3	Below 0.3	Corrosion + Scale
Copper		[mgCu/l]	Below 0.3	Below 0.1	Below 1.0	Below 1.0	Below 1.0	Below 0.1	Below 1.0	Below 0.1	Below 0.1	Corrosion
Sulfite ion		[mgS ² -/l]	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Not detectable	Corrosion
Ammonium ion		[mgNH ⁺ 4/l]	Below 1.0	Below 0.1	Below 1.0	Below 1.0	Below 0.1	Below 0.1	Below 0.3	Below 0.1	Below 0.1	Corrosion
Remaining chloride		[mgCl/l]	Below 0.3	Below 0.3	Below 0.3	Below 0.3	Below 0.3	Below 0.3	Below 0.25	Below 0.3	Below 0.3	Corrosion
Free carbide		[mgCO ₂ /l]	Below 4.0	Below 4.0	Below 4.0	Below 4.0	Below 4.0	Below 4.0	Below 0.4	Below 4.0	Below 4.0	Corrosion
Stability index			6.0 ~ 7.0	---	---	---	---	---	---	---	---	Corrosion + Scale

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

2 In case of using heated water (more than 40°C), corrosion is generally noticeable.

Especially when the iron materials is in direct contact with water without any protection shields, it is desirable to give the valid measure for corrosion. E.g. chemical measure

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

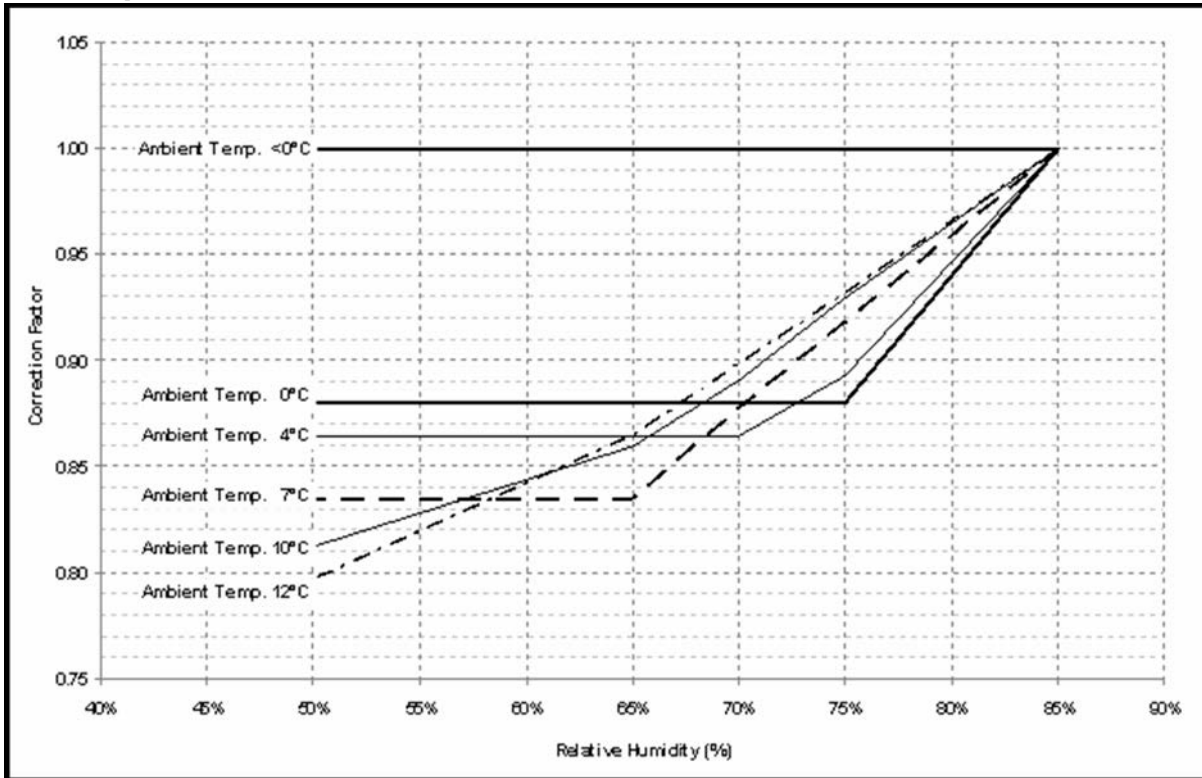
4 Supply water is considered drink water, industrial water and ground water except for genuine water, neutral water and soft water.

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

6 The limits above have to be considered as a general prescription and can not totally assure the absence of corrosion and erosion.

Some particular combinations of elements or the presence of components not listed in the table or factors not considered may trigger corrosion phenomena.

Heating Capacity correction factors for different evaporator inlet air temperature and relative humidity conditions



			160											
Twout	Tain		25	30	35	40	43	46	25	30	35	40	43	46
5	Pf	kW	173	164	155	145	138	131	194	184	174	163	156	150
	Pa	kW	48.4	52.3	56.6	61.4	64.5	68	52.9	57.2	62.2	67.9	71.8	76
	qw	l/s	8.3	7.8	7.4	6.9	6.6	6.3	9.3	8.8	8.3	7.8	7.5	7.1
	dpw	kPa	24	22	20	17	16	14	31	28	25	22	20	18
7	Pf	kW	183	174	164	153	146	139	206	195	184	173	166	159
	Pa	kW	49.3	53.3	57.6	62.4	65.6	69	53.9	58.3	63.3	69.1	72.9	77.2
	qw	l/s	8.8	8.3	7.8	7.3	7.0	6.7	9.8	9.3	8.8	8.3	7.9	7.6
	dpw	kPa	27	25	22	19	18	16	35	31	28	25	23	21
9	Pf	kW	193	183	173	161	154	86.5	217	207	195	183	176	168
	Pa	kW	50.3	54.3	58.7	63.5	66.7	34	54.9	59.4	64.5	70.3	74.2	78.4
	qw	l/s	9.2	8.8	8.3	7.7	7.4	4.1	10.4	9.9	9.4	8.8	8.4	8.1
	dpw	kPa	31	28	24	21	20	6	39	35	31	28	25	23
11	Pf	kW	203	193	182	170	163		230	218	206	194	186	
	Pa	kW	51.3	55.4	59.8	64.7	67.9		56	60.6	65.7	71.6	75.5	
	qw	l/s	9.8	9.3	8.7	8.2	7.8		11.0	10.5	9.9	9.3	8.9	
	dpw	kPa	34	31	27	24	22		43	39	35	31	28	
13	Pf	kW	214	203	192	179	172		242	230	217	204	196	
	Pa	kW	52.3	56.5	61	65.9	69.1		57.1	61.8	67	72.9	76.8	
	qw	l/s	10.3	9.7	9.2	8.6	8.2		11.6	11.0	10.4	9.8	9.4	
	dpw	kPa	38	34	30	26	24		48	44	39	34	32	
15	Pf	kW	225	213	201	189			255	242	229	215		
	Pa	kW	53.4	57.7	62.2	67.1			58.3	63	68.3	74.3		
	qw	l/s	10.8	10.3	9.7	9.1			12.3	11.6	11.0	10.4		
	dpw	kPa	42	38	33	29			54	48	43	38		
Twout	Tain		25	30	35	40	43	46	25	30	35	40	43	46
5	Pf	kW	216	205	193	182	175	168	245	232	218	204	195	186
	Pa	kW	59.1	63.7	69.2	75.7	80.1	85	66.3	71.8	78	85.2	89.9	95.1
	qw	l/s	10.3	9.8	9.3	8.7	8.4	8.0	11.7	11.1	10.4	9.8	9.3	8.9
	dpw	kPa	39	36	32	28	26	24	45	40	36	31	29	26
7	Pf	kW	228	217	205	193	186	178	259	245	231	216	207	197
	Pa	kW	60.1	64.8	70.3	76.9	81.4	86.3	67.5	73	79.3	86.5	91.3	96.5
	qw	l/s	10.9	10.4	9.8	9.2	8.9	8.5	12.4	11.8	11.1	10.3	9.9	9.4
	dpw	kPa	44	40	36	32	29	27	51	45	40	35	32	29
9	Pf	kW	242	230	217	205	197	189	274	259	244	229	219	208
	Pa	kW	61.2	65.9	71.6	78.1	82.6	87.6	68.8	74.3	80.6	87.9	92.7	97.9
	qw	l/s	11.6	11.0	10.4	9.8	9.4	9.1	13.1	12.4	11.7	11.0	10.5	10.0
	dpw	kPa	50	45	40	36	33	31	57	51	45	39	36	33

11	Pf	kW	255	243	230	217	209	289	274	258	241	231		
	Pa	kW	62.3	67.2	72.8	79.5	84	70.1	75.7	82	89.3	94.2		
	qw	l/s	12.3	11.7	11.0	10.4	10.0	13.9	13.1	12.4	11.6	11.1		
	dpw	kPa	56	50	45	40	37	63	57	50	44	40		
13	Pf	kW	269	256	243	229	221	304	288	272	255	244		
	Pa	kW	63.6	68.5	74.2	80.9	85.5	71.6	77.1	83.5	90.8	95.7		
	qw	l/s	13.0	12.3	11.7	11.0	10.6	14.6	13.9	13.1	12.2	11.7		
	dpw	kPa	62	56	51	45	42	70	63	56	49	45		
15	Pf	kW	284	270	256	242		320	303	286	268			
	Pa	kW	64.9	69.8	75.6	82.4		73	78.6	85.1	92.4			
	qw	l/s	13.7	13.0	12.3	11.6		15.4	14.6	13.8	12.9			
	dpw	kPa	69	63	56	50		78	70	62	55			
Twout	Tain		25	30	35	40	43	46	25	30	35	40	43	46
5	Pf	kW	320	304	287	269	258	246	352	334	316	297	285	273
	Pa	kW	85.6	92.5	100	109	115	121	95.7	104	113	123	130	137
	qw	l/s	15.3	14.5	13.7	12.8	12.3	11.7	16.8	16.0	15.1	14.2	13.6	13.0
	dpw	kPa	23	21	18	16	15	14	29	27	24	21	19	18
7	Pf	kW	339	322	304	285	273	261	373	354	335	315	303	290
	Pa	kW	86.9	93.8	102	111	116	123	97.3	105	114	125	132	139
	qw	l/s	16.2	15.4	14.6	13.6	13.1	12.5	17.8	16.9	16.0	15.1	14.5	13.9
	dpw	kPa	26	23	21	18	17	15	33	30	27	24	22	20
9	Pf	kW	359	341	322	302	290	276	394	375	355	334	320	307
	Pa	kW	88.3	95.2	103	112	118	124	99.1	107	116	127	134	141
	qw	l/s	17.2	16.3	15.4	14.5	13.9	13.2	18.9	18.0	17.0	16.0	15.3	14.7
	dpw	kPa	29	26	23	21	19	17	37	34	30	27	24	22
11	Pf	kW	379	361	341	320	306		416	396	375	353	339	
	Pa	kW	89.8	96.7	105	114	120		101	109	118	129	136	
	qw	l/s	18.2	17.3	16.3	15.3	14.7		20.0	19.0	18.0	16.9	16.2	
	dpw	kPa	32	29	26	23	21		41	37	34	30	27	
13	Pf	kW	401	381	360	337	323		439	418	396	372	358	
	Pa	kW	91.3	98.3	106	115	121		103	111	120	131	138	
	qw	l/s	19.2	18.3	17.3	16.2	15.5		21.1	20.1	19.0	17.9	17.2	
	dpw	kPa	36	33	29	26	24		46	42	37	33	31	
15	Pf	kW	422	401	379	356			462	440	417	392		
	Pa	kW	92.9	99.9	108	117			105	113	123	133		
	qw	l/s	20.3	19.3	18.2	17.1			22.2	21.2	20.0	18.8		
	dpw	kPa	40	36	32	29			51	46	42	37		
Twout	Tain		25	30	35	40	43	46	25	30	35	40	43	46

PERFORMANCE IN COOLING

5	Pf	kW	398	378	356	332	317	301	423	401	379	355	340	324
	Pa	kW	109	117	127	139	146	154	117	126	136	148	155	164
	qw	l/s	19.0	18.0	17.0	15.9	15.1	14.4	20.2	19.2	18.1	17.0	16.2	15.5
	dpw	kPa	34	31	27	24	22	20	32	29	26	23	21	19
7	Pf	kW	421	399	376	351	335	319	447	425	401	376	360	344
	Pa	kW	111	119	129	141	148	156	119	128	138	150	158	166
	qw	l/s	20.1	19.1	18.0	16.8	16.0	15.2	21.4	20.3	19.2	18.0	17.2	16.4
	dpw	kPa	38	34	30	27	24	22	36	33	29	26	23	21
9	Pf	kW	444	421	397	371	354	337	472	448	424	397	381	363
	Pa	kW	113	122	131	143	150	158	121	130	141	152	160	168
	qw	l/s	21.3	20.2	19.0	17.8	17.0	16.1	22.6	21.5	20.3	19.0	18.2	17.4
	dpw	kPa	43	38	34	30	27	24	40	36	32	29	26	24
11	Pf	kW	468	444	418	391	373		498	473	447	419	402	
	Pa	kW	115	124	134	145	152		124	133	143	155	163	
	qw	l/s	22.4	21.3	20.1	18.7	17.9		23.9	22.7	21.4	20.1	19.2	
	dpw	kPa	47	43	38	33	30		45	41	36	32	29	
13	Pf	kW	492	467	440	411	393		524	498	471	442	423	
	Pa	kW	117	126	136	147	155		126	135	146	157	165	
	qw	l/s	23.6	22.4	21.1	19.7	18.9		25.2	23.9	22.6	21.2	20.3	
	dpw	kPa	53	47	42	37	33		50	45	40	35	33	
15	Pf	kW	517	491	462	432			551	524	495	465		
	Pa	kW	120	128	138	149			129	138	149	160		
	qw	l/s	24.9	23.6	22.2	20.8			26.5	25.2	23.8	22.3		
	dpw	kPa	58	52	46	40			55	50	45	39		
Twout	Tain		25	30	35	40	43	46	25	30	35	40	43	46
5	Pf	kW	447	426	403	379	365	349	526	500	473	445	428	410
	Pa	kW	122	132	143	155	163	171	144	156	169	185	195	207
	qw	l/s	21.4	20.4	19.3	18.1	17.4	16.7	25.1	23.9	22.6	21.3	20.4	19.6
	dpw	kPa	37	34	30	27	25	23	41	37	33	29	27	25
7	Pf	kW	473	450	427	402	386	370	556	530	502	472	453	434
	Pa	kW	125	134	145	158	166	174	147	158	172	188	198	209
	qw	l/s	22.6	21.6	20.4	19.2	18.5	17.7	26.6	25.4	24.0	22.6	21.7	20.8
	dpw	kPa	42	38	34	30	28	25	46	42	37	33	30	28
9	Pf	kW	499	476	451	425	408	391	588	560	530	499	480	460
	Pa	kW	128	137	148	160	168	177	149	161	175	191	201	212
	qw	l/s	23.9	22.8	21.6	20.3	19.6	18.7	28.2	26.8	25.4	23.9	23.0	22.0
	dpw	kPa	47	42	38	34	31	29	51	47	42	37	34	31
11	Pf	kW	527	502	476	448	431		620	590	560	527	507	
	Pa	kW	130	140	151	163	171		152	164	178	194	204	
	qw	l/s	25.3	24.1	22.8	21.5	20.7		29.7	28.3	26.9	25.3	24.3	
	dpw	kPa	52	47	42	38	35		57	52	47	41	38	

			160						190					
13	Pf	kW	555	529	502	473	455		653	622	590	556	535	
	Pa	kW	133	143	154	166	174		155	167	181	197	208	
	qw	l/s	26.7	25.4	24.1	22.7	21.8		31.4	29.9	28.3	26.7	25.7	
	dpw	kPa	58	52	47	42	39		64	58	52	46	43	
15	Pf	kW	583	556	528	498			687	654	621	585		
	Pa	kW	137	146	157	169			158	170	184	200		
	qw	l/s	28.1	26.8	25.4	23.9			33.0	31.5	29.8	28.1		
	dpw	kPa	64	58	52	46			70	64	58	51		
Twout	Tain		25	30	35	40	43	46	25	30	35	40	43	46
5	Pf	kW	598	568	535	500	477	454	654	624	592	558	536	514
	Pa	kW	164	177	192	209	220	232	180	194	211	229	241	253
	qw	l/s	28.6	27.1	25.6	23.9	22.8	21.7	31.3	29.8	28.3	26.7	25.6	24.6
	dpw	kPa	47	42	38	33	30	27	62	56	50	45	41	38
7	Pf	kW	631	599	565	528	505	480	689	658	624	589	566	543
	Pa	kW	167	180	195	212	223	235	184	198	214	233	245	257
	qw	l/s	30.2	28.7	27.1	25.3	24.1	23.0	33.1	31.5	29.9	28.2	27.1	26.0
	dpw	kPa	53	47	42	37	34	30	69	63	56	50	46	43
9	Pf	kW	665	632	596	557	533	507	727	693	658	621	597	573
	Pa	kW	170	183	198	215	226	238	188	202	218	237	249	261
	qw	l/s	31.9	30.3	28.6	26.7	25.5	24.3	34.9	33.3	31.6	29.8	28.6	27.5
	dpw	kPa	58	53	47	41	37	34	77	70	63	56	52	47
	11	Pf	kW	700	665	627	587	561		765	730	693	654	629
Pa		kW	173	186	201	218	229		192	206	223	241	253	
qw		l/s	33.6	31.9	30.1	28.1	26.9		36.8	35.1	33.3	31.4	30.2	
dpw		kPa	65	59	52	46	42		85	77	70	62	57	
13	Pf	kW	736	698	659	617	590		804	767	729	688	662	
	Pa	kW	177	190	205	221	233		196	211	227	245	258	
	qw	l/s	35.4	33.6	31.7	29.6	28.3		38.7	36.9	35.0	33.1	31.8	
	dpw	kPa	72	65	58	50	46		94	86	77	69	64	
15	Pf	kW	772	733	692	647			844	806	765	723		
	Pa	kW	180	193	208	225			201	215	232	250		
	qw	l/s	37.2	35.3	33.3	31.1			40.7	38.8	36.9	34.8		
	dpw	kPa	79	72	64	56			104	95	85	76		
Twout	Tain		25	30	35	40	43	46	25	30	35	40	43	46
5	Pf	kW	173	164	155	145	138	131	194	184	174	163	156	150
	Pa	kW	48.4	52.3	56.6	61.4	64.5	68	52.9	57.2	62.2	67.9	71.8	76
	qw	l/s	8.3	7.8	7.4	6.9	6.6	6.3	9.3	8.8	8.3	7.8	7.5	7.1
	dpw	kPa	24	22	20	17	16	14	31	28	25	22	20	18

7	Pf	kW	183	174	164	153	146	139	206	195	184	173	166	159
	Pa	kW	49.3	53.3	57.6	62.4	65.6	69	53.9	58.3	63.3	69.1	72.9	77.2
	qw	l/s	8.8	8.3	7.8	7.3	7.0	6.7	9.8	9.3	8.8	8.3	7.9	7.6
	dpw	kPa	27	25	22	19	18	16	35	31	28	25	23	21
9	Pf	kW	193	183	173	161	154	86.5	217	207	195	183	176	168
	Pa	kW	50.3	54.3	58.7	63.5	66.7	34	54.9	59.4	64.5	70.3	74.2	78.4
	qw	l/s	9.2	8.8	8.3	7.7	7.4	4.1	10.4	9.9	9.4	8.8	8.4	8.1
	dpw	kPa	31	28	24	21	20	6	39	35	31	28	25	23
11	Pf	kW	203	193	182	170	163		230	218	206	194	186	
	Pa	kW	51.3	55.4	59.8	64.7	67.9		56	60.6	65.7	71.6	75.5	
	qw	l/s	9.8	9.3	8.7	8.2	7.8		11.0	10.5	9.9	9.3	8.9	
	dpw	kPa	34	31	27	24	22		43	39	35	31	28	
13	Pf	kW	214	203	192	179	172		242	230	217	204	196	
	Pa	kW	52.3	56.5	61	65.9	69.1		57.1	61.8	67	72.9	76.8	
	qw	l/s	10.3	9.7	9.2	8.6	8.2		11.6	11.0	10.4	9.8	9.4	
	dpw	kPa	38	34	30	26	24		48	44	39	34	32	
15	Pf	kW	225	213	201	189			255	242	229	215		
	Pa	kW	53.4	57.7	62.2	67.1			58.3	63	68.3	74.3		
	qw	l/s	10.8	10.3	9.7	9.1			12.3	11.6	11.0	10.4		
	dpw	kPa	42	38	33	29			54	48	43	38		
Twout	Tain		25	30	35	40	43	46	25	30	35	40	43	46
5	Pf	kW	216	205	193	182	175	168	245	232	218	204	195	186
	Pa	kW	59.1	63.7	69.2	75.7	80.1	85	66.3	71.8	78	85.2	89.9	95.1
	qw	l/s	10.3	9.8	9.3	8.7	8.4	8.0	11.7	11.1	10.4	9.8	9.3	8.9
	dpw	kPa	39	36	32	28	26	24	45	40	36	31	29	26
7	Pf	kW	228	217	205	193	186	178	259	245	231	216	207	197
	Pa	kW	60.1	64.8	70.3	76.9	81.4	86.3	67.5	73	79.3	86.5	91.3	96.5
	qw	l/s	10.9	10.4	9.8	9.2	8.9	8.5	12.4	11.8	11.1	10.3	9.9	9.4
	dpw	kPa	44	40	36	32	29	27	51	45	40	35	32	29
9	Pf	kW	242	230	217	205	197	189	274	259	244	229	219	208
	Pa	kW	61.2	65.9	71.6	78.1	82.6	87.6	68.8	74.3	80.6	87.9	92.7	97.9
	qw	l/s	11.6	11.0	10.4	9.8	9.4	9.1	13.1	12.4	11.7	11.0	10.5	10.0
	dpw	kPa	50	45	40	36	33	31	57	51	45	39	36	33
11	Pf	kW	255	243	230	217	209		289	274	258	241	231	
	Pa	kW	62.3	67.2	72.8	79.5	84		70.1	75.7	82	89.3	94.2	
	qw	l/s	12.3	11.7	11.0	10.4	10.0		13.9	13.1	12.4	11.6	11.1	
	dpw	kPa	56	50	45	40	37		63	57	50	44	40	
13	Pf	kW	269	256	243	229	221		304	288	272	255	244	
	Pa	kW	63.6	68.5	74.2	80.9	85.5		71.6	77.1	83.5	90.8	95.7	
	qw	l/s	13.0	12.3	11.7	11.0	10.6		14.6	13.9	13.1	12.2	11.7	
	dpw	kPa	62	56	51	45	42		70	63	56	49	45	

15	Pf	kW	284	270	256	242		320	303	286	268			
	Pa	kW	64.9	69.8	75.6	82.4		73	78.6	85.1	92.4			
	qw	l/s	13.7	13.0	12.3	11.6		15.4	14.6	13.8	12.9			
	dpw	kPa	69	63	56	50		78	70	62	55			
Twout	Tain		25	30	35	40	43	46	25	30	35	40	43	46
5	Pf	kW	320	304	287	269	258	246	352	334	316	297	285	273
	Pa	kW	85.6	92.5	100	109	115	121	95.7	104	113	123	130	137
	qw	l/s	15.3	14.5	13.7	12.8	12.3	11.7	16.8	16.0	15.1	14.2	13.6	13.0
	dpw	kPa	23	21	18	16	15	14	29	27	24	21	19	18
7	Pf	kW	339	322	304	285	273	261	373	354	335	315	303	290
	Pa	kW	86.9	93.8	102	111	116	123	97.3	105	114	125	132	139
	qw	l/s	16.2	15.4	14.6	13.6	13.1	12.5	17.8	16.9	16.0	15.1	14.5	13.9
	dpw	kPa	26	23	21	18	17	15	33	30	27	24	22	20
9	Pf	kW	359	341	322	302	290	276	394	375	355	334	320	307
	Pa	kW	88.3	95.2	103	112	118	124	99.1	107	116	127	134	141
	qw	l/s	17.2	16.3	15.4	14.5	13.9	13.2	18.9	18.0	17.0	16.0	15.3	14.7
	dpw	kPa	29	26	23	21	19	17	37	34	30	27	24	22
11	Pf	kW	379	361	341	320	306		416	396	375	353	339	
	Pa	kW	89.8	96.7	105	114	120		101	109	118	129	136	
	qw	l/s	18.2	17.3	16.3	15.3	14.7		20.0	19.0	18.0	16.9	16.2	
	dpw	kPa	32	29	26	23	21		41	37	34	30	27	
13	Pf	kW	401	381	360	337	323		439	418	396	372	358	
	Pa	kW	91.3	98.3	106	115	121		103	111	120	131	138	
	qw	l/s	19.2	18.3	17.3	16.2	15.5		21.1	20.1	19.0	17.9	17.2	
	dpw	kPa	36	33	29	26	24		46	42	37	33	31	
15	Pf	kW	422	401	379	356			462	440	417	392		
	Pa	kW	92.9	99.9	108	117			105	113	123	133		
	qw	l/s	20.3	19.3	18.2	17.1			22.2	21.2	20.0	18.8		
	dpw	kPa	40	36	32	29			51	46	42	37		
Twout	Tain		25	30	35	40	43	46	25	30	35	40	43	46
5	Pf	kW	398	378	356	332	317	301	423	401	379	355	340	324
	Pa	kW	109	117	127	139	146	154	117	126	136	148	155	164
	qw	l/s	19.0	18.0	17.0	15.9	15.1	14.4	20.2	19.2	18.1	17.0	16.2	15.5
	dpw	kPa	34	31	27	24	22	20	32	29	26	23	21	19
7	Pf	kW	421	399	376	351	335	319	447	425	401	376	360	344
	Pa	kW	111	119	129	141	148	156	119	128	138	150	158	166
	qw	l/s	20.1	19.1	18.0	16.8	16.0	15.2	21.4	20.3	19.2	18.0	17.2	16.4
	dpw	kPa	38	34	30	27	24	22	36	33	29	26	23	21

9	Pf	kW	444	421	397	371	354	337	472	448	424	397	381	363
	Pa	kW	113	122	131	143	150	158	121	130	141	152	160	168
	qw	l/s	21.3	20.2	19.0	17.8	17.0	16.1	22.6	21.5	20.3	19.0	18.2	17.4
	dpw	kPa	43	38	34	30	27	24	40	36	32	29	26	24
11	Pf	kW	468	444	418	391	373		498	473	447	419	402	
	Pa	kW	115	124	134	145	152		124	133	143	155	163	
	qw	l/s	22.4	21.3	20.1	18.7	17.9		23.9	22.7	21.4	20.1	19.2	
	dpw	kPa	47	43	38	33	30		45	41	36	32	29	
13	Pf	kW	492	467	440	411	393		524	498	471	442	423	
	Pa	kW	117	126	136	147	155		126	135	146	157	165	
	qw	l/s	23.6	22.4	21.1	19.7	18.9		25.2	23.9	22.6	21.2	20.3	
	dpw	kPa	53	47	42	37	33		50	45	40	35	33	
15	Pf	kW	517	491	462	432			551	524	495	465		
	Pa	kW	120	128	138	149			129	138	149	160		
	qw	l/s	24.9	23.6	22.2	20.8			26.5	25.2	23.8	22.3		
	dpw	kPa	58	52	46	40			55	50	45	39		
Twout	Tain		25	30	35	40	43	46	25	30	35	40	43	46
5	Pf	kW	447	426	403	379	365	349	526	500	473	445	428	410
	Pa	kW	122	132	143	155	163	171	144	156	169	185	195	207
	qw	l/s	21.4	20.4	19.3	18.1	17.4	16.7	25.1	23.9	22.6	21.3	20.4	19.6
	dpw	kPa	37	34	30	27	25	23	41	37	33	29	27	25
7	Pf	kW	473	450	427	402	386	370	556	530	502	472	453	434
	Pa	kW	125	134	145	158	166	174	147	158	172	188	198	209
	qw	l/s	22.6	21.6	20.4	19.2	18.5	17.7	26.6	25.4	24.0	22.6	21.7	20.8
	dpw	kPa	42	38	34	30	28	25	46	42	37	33	30	28
9	Pf	kW	499	476	451	425	408	391	588	560	530	499	480	460
	Pa	kW	128	137	148	160	168	177	149	161	175	191	201	212
	qw	l/s	23.9	22.8	21.6	20.3	19.6	18.7	28.2	26.8	25.4	23.9	23.0	22.0
	dpw	kPa	47	42	38	34	31	29	51	47	42	37	34	31
11	Pf	kW	527	502	476	448	431		620	590	560	527	507	
	Pa	kW	130	140	151	163	171		152	164	178	194	204	
	qw	l/s	25.3	24.1	22.8	21.5	20.7		29.7	28.3	26.9	25.3	24.3	
	dpw	kPa	52	47	42	38	35		57	52	47	41	38	
13	Pf	kW	555	529	502	473	455		653	622	590	556	535	
	Pa	kW	133	143	154	166	174		155	167	181	197	208	
	qw	l/s	26.7	25.4	24.1	22.7	21.8		31.4	29.9	28.3	26.7	25.7	
	dpw	kPa	58	52	47	42	39		64	58	52	46	43	

15	Pf	kW	583	556	528	498		687	654	621	585			
	Pa	kW	137	146	157	169		158	170	184	200			
	qw	l/s	28.1	26.8	25.4	23.9		33.0	31.5	29.8	28.1			
	dpw	kPa	64	58	52	46		70	64	58	51			
Twout	Tain	25	30	35	40	43	46	25	30	35	40	43	46	
5	Pf	kW	598	568	535	500	477	454	654	624	592	558	536	514
	Pa	kW	164	177	192	209	220	232	180	194	211	229	241	253
	qw	l/s	28.6	27.1	25.6	23.9	22.8	21.7	31.3	29.8	28.3	26.7	25.6	24.6
	dpw	kPa	47	42	38	33	30	27	62	56	50	45	41	38
7	Pf	kW	631	599	565	528	505	480	689	658	624	589	566	543
	Pa	kW	167	180	195	212	223	235	184	198	214	233	245	257
	qw	l/s	30.2	28.7	27.1	25.3	24.1	23.0	33.1	31.5	29.9	28.2	27.1	26.0
	dpw	kPa	53	47	42	37	34	30	69	63	56	50	46	43
9	Pf	kW	665	632	596	557	533	507	727	693	658	621	597	573
	Pa	kW	170	183	198	215	226	238	188	202	218	237	249	261
	qw	l/s	31.9	30.3	28.6	26.7	25.5	24.3	34.9	33.3	31.6	29.8	28.6	27.5
	dpw	kPa	58	53	47	41	37	34	77	70	63	56	52	47
11	Pf	kW	700	665	627	587	561		765	730	693	654	629	
	Pa	kW	173	186	201	218	229		192	206	223	241	253	
	qw	l/s	33.6	31.9	30.1	28.1	26.9		36.8	35.1	33.3	31.4	30.2	
	dpw	kPa	65	59	52	46	42		85	77	70	62	57	
13	Pf	kW	736	698	659	617	590		804	767	729	688	662	
	Pa	kW	177	190	205	221	233		196	211	227	245	258	
	qw	l/s	35.4	33.6	31.7	29.6	28.3		38.7	36.9	35.0	33.1	31.8	
	dpw	kPa	72	65	58	50	46		94	86	77	69	64	
15	Pf	kW	772	733	692	647			844	806	765	723		
	Pa	kW	180	193	208	225			201	215	232	250		
	qw	l/s	37.2	35.3	33.3	31.1			40.7	38.8	36.9	34.8		
	dpw	kPa	79	72	64	56			104	95	85	76		
Twout	Tain	25	30	35	40	43	46	25	30	35	40	43	46	
5	Pf	kW	168	159	149	139	133	74.8	189	179	169	158	151	144
	Pa	kW	46.5	50.5	55	60.1	63.4	30	51.2	55.7	61	67.1	71.2	75.8
	qw	l/s	8.0	7.6	7.1	6.6	6.3	3.6	9.0	8.6	8.1	7.5	7.2	6.9
	dpw	kPa	23	21	18	16	14	5	29	26	23	20	19	17
7	Pf	kW	177	168	158	147	140	79.6	200	189	178	167	160	89.7
	Pa	kW	47.6	51.7	56.2	61.3	64.6	30.4	52.3	57	62.3	68.4	72.6	34.1
	qw	l/s	8.5	8.0	7.5	7.0	6.7	3.8	9.6	9.1	8.5	8.0	7.6	4.3
	dpw	kPa	26	23	20	18	16	5	33	29	26	23	21	7

9	Pf	kW	187	177	166	155	88.3	84.6	211	200	189	176	169	95.5
	Pa	kW	48.7	52.9	57.4	62.5	29.3	30.8	53.5	58.2	63.6	69.8	74	34.6
	qw	l/s	9.0	8.5	8.0	7.4	4.2	4.0	10.1	9.6	9.0	8.5	8.1	4.6
	dpw	kPa	29	26	23	20	6	6	37	33	29	26	23	7
11	Pf	kW	197	186	175	163	93.6		223	211	199	186	178	
	Pa	kW	49.9	54.1	58.7	63.8	29.7		54.7	59.6	65	71.3	75.5	
	qw	l/s	9.4	8.9	8.4	7.8	4.5		10.7	10.1	9.5	8.9	8.6	
	dpw	kPa	32	28	25	22	7		41	37	33	29	26	
13	Pf	kW	207	196	184	172	99.2		234	222	210	196	112	
	Pa	kW	51.1	55.4	60	65.1	30.1		56	61	66.5	72.8	33.7	
	qw	l/s	9.9	9.4	8.8	8.2	4.8		11.3	10.7	10.1	9.4	5.4	
	dpw	kPa	35	32	28	24	8		45	41	36	32	10	
15	Pf	kW	217	205	193	109			246	234	220	207		
	Pa	kW	52.3	56.7	61.4	29.1			57.4	62.4	68.1	74.5		
	qw	l/s	10.4	9.9	9.3	5.2			11.8	11.2	10.6	9.9		
	dpw	kPa	39	35	31	10			50	45	40	35		
Twout	Tain		25	30	35	40	43	46	25	30	35	40	43	46
5	Pf	kW	210	199	188	177	170	162	238	225	211	197	188	178
	Pa	kW	56.2	61.2	67.1	74	78.7	84	64.1	69.8	76.4	84	89.1	94.5
	qw	l/s	10.1	9.5	9.0	8.4	8.1	7.8	11.4	10.8	10.1	9.4	9.0	8.5
	dpw	kPa	38	34	30	27	24	22	43	38	34	29	26	24
7	Pf	kW	223	211	199	187	180	172	252	238	223	208	198	113
	Pa	kW	57.4	62.4	68.4	75.4	80.2	85.5	65.4	71.2	77.9	85.5	90.6	42.9
	qw	l/s	10.7	10.1	9.6	9.0	8.6	8.3	12.1	11.4	10.7	10.0	9.5	5.4
	dpw	kPa	42	38	34	30	28	25	48	43	38	33	30	10
9	Pf	kW	235	223	211	198	191	183	266	251	236	220	210	120
	Pa	kW	58.6	63.7	69.7	76.8	81.7	87	66.8	72.7	79.4	87.1	92.2	43.4
	qw	l/s	11.3	10.7	10.1	9.5	9.1	8.8	12.7	12.0	11.3	10.5	10.0	5.7
	dpw	kPa	47	43	38	34	31	28	53	48	42	36	33	11
11	Pf	kW	248	236	223	210	202		280	265	249	232	221	
	Pa	kW	59.9	65.1	71.2	78.4	83.3		68.4	74.3	81	88.8	93.9	
	qw	l/s	11.9	11.3	10.7	10.1	9.7		13.4	12.7	11.9	11.1	10.6	
	dpw	kPa	53	48	42	38	35		59	53	47	41	37	
13	Pf	kW	262	249	235	221	213		294	278	262	244	233	
	Pa	kW	61.3	66.6	72.7	80	85		70	75.9	82.7	90.5	95.7	
	qw	l/s	12.6	12.0	11.3	10.6	10.2		14.2	13.4	12.6	11.7	11.2	
	dpw	kPa	59	53	47	42	39		66	59	52	45	41	

			160						190					
15	Pf	kW	275	262	248	233			309	293	275	256		
	Pa	kW	62.8	68.1	74.4	81.7			71.6	77.6	84.5	92.3		
	qw	l/s	13.3	12.6	11.9	11.2			14.9	14.1	13.2	12.3		
	dpw	kPa	65	59	53	47			73	65	57	50		
Twout	Tain		25	30	35	40	43	46	25	30	35	40	43	46
5	Pf	kW	313	297	280	261	250	238	343	326	307	288	276	264
	Pa	kW	80.5	87.7	95.8	105	111	118	91.4	99.7	109	120	127	135
	qw	l/s	14.9	14.2	13.4	12.5	11.9	11.3	16.4	15.6	14.7	13.8	13.2	12.6
	dpw	kPa	22	20	18	15	14	13	28	25	22	20	18	17
7	Pf	kW	332	314	296	277	265	252	363	345	326	305	293	280
	Pa	kW	81.9	89.2	97.4	107	113	119	93.3	102	111	122	130	137
	qw	l/s	15.9	15.0	14.2	13.2	12.7	12.0	17.4	16.5	15.6	14.6	14.0	13.4
	dpw	kPa	25	22	20	17	16	14	31	28	25	22	20	19
9	Pf	kW	351	333	313	293	280	267	384	364	344	323	309	296
	Pa	kW	83.5	90.7	99	108	114	121	95.2	104	113	124	132	140
	qw	l/s	16.8	15.9	15.0	14.0	13.4	12.8	18.4	17.5	16.5	15.5	14.8	14.2
	dpw	kPa	28	25	22	19	18	16	35	32	28	25	23	21
11	Pf	kW	370	351	331	309	296		405	385	363	341	327	
	Pa	kW	85.1	92.4	101	110	116		97.4	106	116	127	134	
	qw	l/s	17.7	16.8	15.9	14.8	14.2		19.4	18.4	17.4	16.3	15.7	
	dpw	kPa	31	28	25	22	20		39	35	31	28	25	
13	Pf	kW	390	370	349	326	312		427	405	383	359	344	
	Pa	kW	86.8	94.2	103	112	118		99.6	108	118	129	137	
	qw	l/s	18.7	17.8	16.7	15.6	15.0		20.5	19.4	18.4	17.2	16.5	
	dpw	kPa	34	31	27	24	22		44	39	35	31	28	
15	Pf	kW	411	390	367	343			449	426	403	378		
	Pa	kW	88.6	96	104	114			102	111	121	132		
	qw	l/s	19.7	18.7	17.6	16.5			21.6	20.5	19.3	18.1		
	dpw	kPa	38	34	30	27			48	44	39	34		
Twout	Tain		25	30	35	40	43	46	25	30	35	40	43	46
5	Pf	kW	387	366	344	320	304	288	412	391	368	343	328	312
	Pa	kW	105	114	125	137	145	153	111	121	131	144	152	160
	qw	l/s	18.5	17.5	16.4	15.3	14.5	13.8	19.7	18.7	17.6	16.4	15.7	14.9
	dpw	kPa	32	29	25	22	20	18	31	28	24	21	19	18
7	Pf	kW	409	387	363	338	321	183	435	413	389	363	347	270
	Pa	kW	108	117	127	139	147	69.6	114	123	134	146	154	120
	qw	l/s	19.6	18.5	17.4	16.1	15.4	8.7	20.8	19.7	18.6	17.4	16.6	12.9
	dpw	kPa	36	32	28	25	22	7	34	31	27	24	22	13

9	Pf	kW	431	407	383	356	339	194	459	435	410	383	366	207
	Pa	kW	110	119	129	141	149	70.3	116	126	137	149	157	75.1
	qw	l/s	20.6	19.5	18.3	17.0	16.2	9.3	22.0	20.8	19.6	18.3	17.5	9.9
	dpw	kPa	40	36	32	27	25	8	38	34	30	27	24	8
11	Pf	kW	453	429	402	374	357		484	458	432	404	386	
	Pa	kW	112	121	132	144	152		119	128	139	152	160	
	qw	l/s	21.7	20.6	19.3	17.9	17.1		23.2	22.0	20.7	19.3	18.5	
	dpw	kPa	44	40	35	30	27		42	38	34	30	27	
13	Pf	kW	476	450	423	393	375		509	482	454	425	406	
	Pa	kW	115	124	134	146	154		122	131	142	155	163	
	qw	l/s	22.9	21.6	20.3	18.9	18.0		24.4	23.1	21.8	20.4	19.5	
	dpw	kPa	49	44	39	33	30		47	42	37	33	30	
15	Pf	kW	500	473	444	413			534	506	477	446		
	Pa	kW	117	127	137	149			125	134	145	158		
	qw	l/s	24.0	22.7	21.3	19.8			25.7	24.3	22.9	21.4		
	dpw	kPa	54	48	43	37			52	47	41	36		
Twout		Tain	25	30	35	40	43	46	25	30	35	40	43	46
5	Pf	kW	437	415	392	368	353	337	513	488	461	432	414	396
	Pa	kW	117	127	138	151	159	168	138	150	164	181	192	204
	qw	l/s	20.9	19.8	18.7	17.6	16.9	16.1	24.5	23.3	22.0	20.6	19.8	18.9
	dpw	kPa	35	32	29	25	23	21	39	35	31	28	25	23
7	Pf	kW	461	439	415	389	373	357	543	516	487	457	439	419
	Pa	kW	120	130	141	154	162	171	140	153	167	184	195	207
	qw	l/s	22.1	21.0	19.8	18.6	17.8	17.1	26.0	24.7	23.3	21.9	21.0	20.1
	dpw	kPa	40	36	32	28	26	24	44	39	35	31	28	26
9	Pf	kW	487	463	437	411	394	221	573	545	515	483	463	443
	Pa	kW	123	133	144	157	165	79.5	143	156	171	187	198	210
	qw	l/s	23.3	22.2	21.0	19.7	18.9	10.6	27.5	26.1	24.7	23.1	22.2	21.2
	dpw	kPa	44	40	36	31	29	9	49	44	39	35	32	29
11	Pf	kW	513	488	461	433	416		603	574	543	510	489	
	Pa	kW	126	136	147	160	169		147	159	174	191	202	
	qw	l/s	24.6	23.4	22.1	20.8	19.9		29.0	27.5	26.0	24.4	23.4	
	dpw	kPa	49	44	40	35	32		54	49	44	39	36	
13	Pf	kW	539	513	485	456	438		635	604	571	537	515	
	Pa	kW	129	139	151	164	172		150	163	178	195	206	
	qw	l/s	25.9	24.6	23.3	21.9	21.0		30.5	29.0	27.4	25.8	24.7	
	dpw	kPa	55	49	44	39	36		60	54	49	43	39	

15	Pf	kW	567	539	510	480		667	634	600	564			
	Pa	kW	132	143	154	167		153	167	182	199			
	qw	l/s	27.2	25.9	24.5	23.0		32.1	30.5	28.8	27.1			
	dpw	kPa	60	55	49	43		66	60	54	47			
Twout	Tain	25	30	35	40	43	46	25	30	35	40	43	46	
5	Pf	kW	582	551	517	481	458	380	638	608	575	540	518	495
	Pa	kW	159	172	188	206	218	184	173	188	205	224	237	250
	qw	l/s	27.8	26.3	24.7	23.0	21.9	18.1	30.6	29.1	27.5	25.8	24.8	23.7
	dpw	kPa	45	40	35	30	28	19	59	53	48	42	39	35
7	Pf	kW	613	581	546	508	484	402	673	640	606	570	547	391
	Pa	kW	162	176	191	209	221	187	177	193	210	229	241	158
	qw	l/s	29.4	27.8	26.1	24.3	23.1	19.2	32.2	30.7	29.0	27.3	26.2	18.7
	dpw	kPa	50	45	39	34	31	21	65	59	53	47	43	22
9	Pf	kW	646	611	575	535	510	367	708	674	638	600	576	414
	Pa	kW	165	179	195	213	225	146	182	197	214	233	246	160
	qw	l/s	31.0	29.3	27.5	25.6	24.4	17.5	34.0	32.3	30.6	28.8	27.6	19.8
	dpw	kPa	55	49	44	38	34	18	73	66	59	52	48	25
11	Pf	kW	679	643	604	563	536		744	709	671	631	606	
	Pa	kW	169	183	199	217	229		186	202	219	238	251	
	qw	l/s	32.6	30.8	29.0	27.0	25.7		35.8	34.0	32.2	30.3	29.1	
	dpw	kPa	61	55	48	42	38		80	73	65	58	53	
13	Pf	kW	712	674	634	590	496		781	744	705	663	637	
	Pa	kW	173	187	202	221	185		191	206	224	243	256	
	qw	l/s	34.2	32.4	30.4	28.3	23.8		37.6	35.8	33.9	31.9	30.6	
	dpw	kPa	67	60	53	46	33		89	81	72	64	59	
15	Pf	kW	747	707	664	619			819	780	739	696		
	Pa	kW	177	191	206	224			196	212	229	248		
	qw	l/s	35.9	34.0	31.9	29.7			39.5	37.6	35.6	33.5		
	dpw	kPa	74	66	59	51			98	89	80	70		
Twout	Tain	10	5	0	2	7	10	10	5	0	2	7	10	
35	Pt	kW	113	130	148	156	176	190	138	153	170	178	200	215
	Pat	kW	42.7	43.3	44.2	44.5	45.5	46.1	49	49.6	50.3	50.6	51.5	52.1
	qw	l/s	5.4	6.2	7.1	7.5	8.5	9.1	6.6	7.3	8.2	8.5	9.6	10.3
	dpw	kPa	11	14	19	21	26	31	16	19	24	26	33	39
38	Pt	kW	113	129	147	155	175	189	137	152	169	177	199	214
	Pat	kW	45.2	45.7	46.5	46.8	47.8	48.4	51.7	52.3	53	53.3	54.2	54.9
	qw	l/s	5.4	6.2	7.1	7.4	8.4	9.1	6.6	7.3	8.1	8.5	9.6	10.3
	dpw	kPa	11	14	18	20	26	30	16	19	24	26	33	38

			160						190					
40	Pt	kW	113	129	147	154	175	188	137	152	169	177	198	213
	Pat	kW	47	47.5	48.2	48.5	49.4	50	53.8	54.3	54.9	55.2	56.2	56.8
	qw	l/s	5.4	6.2	7.1	7.4	8.4	9.0	6.6	7.3	8.1	8.5	9.5	10.3
	dpw	kPa	11	14	18	20	26	30	16	19	24	26	33	38
45	Pt	kW	113	129	146	153	173	185	138	152	168	176	197	211
	Pat	kW	52.3	52.4	52.9	53.1	54	54.5	59.5	59.8	60.4	60.7	61.6	62.2
	qw	l/s	5.5	6.2	7.0	7.4	8.3	8.9	6.6	7.3	8.1	8.5	9.5	10.2
	dpw	kPa	11	14	18	20	25	29	16	19	24	26	32	37
48	Pt	kW		129	145	152	171	184		152	168	175	196	210
	Pat	kW		55.9	56.1	56.3	57	57.5		63.7	64.2	64.4	65.2	65.9
	qw	l/s		6.2	7.0	7.3	8.3	8.9		7.3	8.1	8.5	9.5	10.1
	dpw	kPa		14	18	20	25	29		19	24	26	32	37
50	Pt	kW			145	152	171	183			168	175	195	209
	Pat	kW			58.4	58.6	59.2	59.7			66.9	67.1	67.9	68.5
	qw	l/s			7.0	7.3	8.2	8.8			8.1	8.5	9.4	10.1
	dpw	kPa			18	20	25	28			24	26	32	37
Twout		Tain	10	5	0	2	7	10	10	5	0	2	7	10
35	Pt	kW	149	170	193	204	232	250	169	192	217	228	259	279
	Pat	kW	55.9	56.6	57.5	57.9	59	59.8	62.4	63.3	64.4	64.9	66.2	67.1
	qw	l/s	7.2	8.2	9.3	9.8	11.1	12.0	8.1	9.2	10.4	11.0	12.4	13.4
	dpw	kPa	19	24	31	35	45	52	22	29	37	41	52	60
38	Pt	kW	149	169	192	202	230	248	169	191	217	227	257	277
	Pat	kW	58.9	59.7	60.5	60.9	62	62.8	65.9	66.8	67.9	68.4	69.7	70.6
	qw	l/s	7.2	8.1	9.3	9.7	11.0	11.9	8.1	9.2	10.4	10.9	12.4	13.3
	dpw	kPa	19	24	31	34	44	51	22	29	36	40	51	60
40	Pt	kW	149	169	192	202	229	247	170	192	216	227	256	276
	Pat	kW	61.1	61.9	62.7	63.1	64.3	65	68.3	69.3	70.4	70.9	72.2	73.2
	qw	l/s	7.2	8.1	9.2	9.7	11.0	11.9	8.2	9.2	10.4	10.9	12.3	13.3
	dpw	kPa	19	24	31	34	44	51	22	29	36	40	51	59
45	Pt	kW	150	170	191	201	227	244	171	192	216	226	254	273
	Pat	kW	67.4	68.1	69	69.4	70.5	71.2	75.2	76.3	77.4	77.9	79.2	80.1
	qw	l/s	7.2	8.2	9.2	9.7	10.9	11.8	8.2	9.3	10.4	10.9	12.2	13.1
	dpw	kPa	19	24	31	34	43	50	23	29	36	40	50	58
48	Pt	kW		170	192	201	226	243		193	216	226	253	271
	Pat	kW		72.4	73.2	73.6	74.7	75.5		80.9	82	82.5	83.9	84.8
	qw	l/s		8.2	9.2	9.7	10.9	11.7		9.3	10.4	10.9	12.2	13.1
	dpw	kPa		24	31	34	43	49		29	36	40	50	57

50	Pt	kW	192 201 226 242						216 225 252 270					
	Pat	kW	76.3 76.7 77.8 78.6						85.4 85.9 87.2 88.2					
	qw	l/s	9.3 9.7 10.9 11.7						10.4 10.9 12.2 13.0					
	dpw	kPa	31 34 43 49						36 40 50 57					
Twout	Tain		10	5	0	2	7	10	10	5	0	2	7	10
35	Pt	kW	230	255	285	299	337	363	254	281	313	327	368	397
	Pat	kW	82.3	82.9	83.7	84.1	85.2	86	91.3	91.8	92.6	93	94.2	95.2
	qw	l/s	11.0	12.3	13.7	14.4	16.2	17.5	12.2	13.5	15.0	15.7	17.7	19.1
	dpw	kPa	12	15	19	20	26	30	15	19	23	25	32	37
38	Pt	kW	229	254	284	297	335	360	254	281	312	326	366	394
	Pat	kW	86.9	87.5	88.2	88.6	89.7	90.5	96.7	97.1	97.8	98.1	99.2	100
	qw	l/s	11.0	12.2	13.7	14.3	16.1	17.3	12.2	13.5	15.0	15.7	17.6	19.0
	dpw	kPa	12	15	18	20	26	30	15	19	23	25	32	37
40	Pt	kW	228	254	283	296	333	358	254	281	311	325	365	393
	Pat	kW	90.1	90.7	91.4	91.7	92.8	93.6	101	101	101	102	103	104
	qw	l/s	11.0	12.2	13.6	14.3	16.0	17.3	12.3	13.5	15.0	15.7	17.6	18.9
	dpw	kPa	12	15	18	20	25	29	15	19	23	25	32	37
45	Pt	kW	228	252	281	293	329	353	256	281	311	324	362	389
	Pat	kW	98.9	99.4	100	100	101	102	111	111	112	112	113	114
	qw	l/s	11.0	12.2	13.5	14.1	15.9	17.0	12.4	13.6	15.0	15.6	17.5	18.7
	dpw	kPa	12	15	18	20	25	29	16	19	23	25	31	36
48	Pt	kW	251 279 292 326 350						282 310 323 360 386					
	Pat	kW	105 106 106 107 108						118 118 118 119 120					
	qw	l/s	12.1 13.5 14.1 15.8 16.9						13.6 15.0 15.6 17.4 18.7					
	dpw	kPa	15 18 19 24 28						19 23 25 31 36					
50	Pt	kW	278 290 325 348						311 323 360 385					
	Pat	kW	110 110 111 112						123 123 124 125					
	qw	l/s	13.5 14.0 15.7 16.8						15.0 15.6 17.4 18.6					
	dpw	kPa	18 19 24 28						23 25 31 35					
Twout	Tain		10	5	0	2	7	10	10	5	0	2	7	10
35	Pt	kW	287	317	352	367	412	442	284	323	366	385	436	470
	Pat	kW	101	102	103	104	106	107	106	107	109	110	112	114
	qw	l/s	13.8	15.2	16.9	17.7	19.8	21.2	13.6	15.5	17.6	18.5	21.0	22.6
	dpw	kPa	19	23	28	30	38	44	15	19	24	27	34	40
38	Pt	kW	286	316	351	366	409	439	284	323	365	384	434	468
	Pat	kW	106	107	109	109	111	113	111	113	115	116	118	119
	qw	l/s	13.8	15.2	16.9	17.6	19.7	21.1	13.7	15.5	17.6	18.5	20.9	22.5
	dpw	kPa	19	23	28	30	38	44	15	19	24	27	34	40

40	Pt	kW	286	316	350	365	408	438	285	323	365	383	433	466
	Pat	kW	110	112	113	113	115	117	116	117	119	120	122	123
	qw	l/s	13.8	15.2	16.8	17.6	19.6	21.1	13.7	15.6	17.6	18.4	20.8	22.4
	dpw	kPa	19	23	28	30	38	43	15	19	24	27	34	39
45	Pt	kW	286	315	348	363	404	433	287	323	364	381	429	461
	Pat	kW	122	123	124	124	126	127	127	128	130	131	133	134
	qw	l/s	13.8	15.2	16.8	17.5	19.5	20.9	13.8	15.6	17.6	18.4	20.7	22.2
	dpw	kPa	19	23	27	30	37	42	15	19	24	26	33	39
48	Pt	kW		315	347	362	402	430		324	364	381	427	458
	Pat	kW		130	131	132	133	134		136	138	138	140	142
	qw	l/s		15.2	16.8	17.5	19.4	20.8		15.7	17.6	18.4	20.6	22.1
	dpw	kPa		23	27	30	37	42		19	24	26	33	38
50	Pt	kW			347	361	401	428			363	380	426	456
	Pat	kW			137	137	139	140			143	144	146	147
	qw	l/s			16.8	17.4	19.4	20.7			17.6	18.4	20.6	22.0
	dpw	kPa			27	30	36	42			24	26	33	38
Twout		Tain	10	5	0	2	7	10	10	5	0	2	7	10
35	Pt	kW	306	348	395	416	472	509	350	399	453	476	541	584
	Pat	kW	110	112	114	115	118	120	135	135	137	137	139	141
	qw	l/s	14.7	16.7	19.0	20.0	22.7	24.4	16.9	19.2	21.8	22.9	26.0	28.0
	dpw	kPa	17	22	29	32	41	48	18	24	31	34	43	51
38	Pt	kW	307	348	394	414	469	506	353	400	453	476	539	581
	Pat	kW	116	118	121	122	124	126	143	143	144	145	147	148
	qw	l/s	14.8	16.7	19.0	19.9	22.6	24.3	17.0	19.2	21.8	22.9	25.9	27.9
	dpw	kPa	17	22	29	32	41	47	19	24	31	34	43	50
40	Pt	kW	307	348	393	413	467	503	355	401	453	475	538	579
	Pat	kW	120	123	125	126	129	131	149	149	150	150	152	154
	qw	l/s	14.8	16.7	18.9	19.9	22.5	24.2	17.1	19.3	21.8	22.9	25.9	27.9
	dpw	kPa	17	22	29	31	40	47	19	24	31	34	43	50
45	Pt	kW	308	347	391	410	463	497	360	404	454	475	535	575
	Pat	kW	132	134	137	138	140	142	164	164	165	165	167	168
	qw	l/s	14.9	16.8	18.9	19.8	22.3	24.0	17.4	19.5	21.9	22.9	25.8	27.7
	dpw	kPa	18	22	28	31	40	46	19	24	31	34	43	49
48	Pt	kW		347	390	409	460	494		407	455	476	533	572
	Pat	kW		142	144	145	148	150		174	175	175	177	178
	qw	l/s		16.8	18.8	19.7	22.2	23.8		19.7	22.0	23.0	25.7	27.6
	dpw	kPa		22	28	31	39	45		25	31	34	42	49
50	Pt	kW			390	408	458	491			456	476	532	570
	Pat	kW			150	151	153	155			182	182	184	185
	qw	l/s			18.8	19.7	22.1	23.7			22.0	23.0	25.7	27.5
	dpw	kPa			28	31	39	45			31	34	42	49

			570											
Twout	Tain		10	5	0	2	7	10	10	5	0	2	7	10
35	Pt	kW	399	455	516	542	614	661	442	504	571	601	681	734
	Pat	kW	150	152	155	156	159	161	163	166	170	172	177	180
	qw	l/s	19.2	21.9	24.8	26.0	29.5	31.7	21.2	24.2	27.4	28.8	32.6	35.2
	dpw	kPa	22	28	36	40	51	59	29	37	48	53	67	78
38	Pt	kW	401	456	516	542	612	659	444	505	571	600	679	731
	Pat	kW	159	161	163	164	167	169	172	176	180	181	186	189
	qw	l/s	19.3	21.9	24.8	26.1	29.4	31.6	21.4	24.3	27.5	28.8	32.6	35.1
	dpw	kPa	22	28	36	40	51	59	29	37	48	52	67	78
40	Pt	kW	403	457	516	541	611	656	445	505	571	600	678	729
	Pat	kW	165	167	169	170	173	175	178	182	186	188	192	196
	qw	l/s	19.4	22.0	24.8	26.1	29.4	31.6	21.5	24.3	27.5	28.8	32.6	35.0
	dpw	kPa	22	29	36	40	51	59	29	37	48	52	67	77
45	Pt	kW	407	459	516	541	607	651	450	508	572	599	674	724
	Pat	kW	183	184	186	187	190	192	195	200	204	206	210	214
	qw	l/s	19.6	22.2	24.9	26.1	29.3	31.4	21.7	24.5	27.5	28.9	32.5	34.8
	dpw	kPa	23	29	36	40	50	58	30	38	48	52	66	76
48	Pt	kW		461	517	541	605	648		509	572	599	672	721
	Pat	kW		196	197	198	201	202		211	215	217	222	225
	qw	l/s		22.3	24.9	26.1	29.2	31.2		24.6	27.6	28.9	32.4	34.7
	dpw	kPa		29	37	40	50	57		38	48	52	66	76
50	Pt	kW			517	540	604	646			572	598	671	719
	Pat	kW			206	206	209	210			223	225	230	234
	qw	l/s			25.0	26.1	29.2	31.2			27.6	28.9	32.3	34.6
	dpw	kPa			37	40	50	57			48	52	66	75
Twout	Tain		10	5	0	2	7	10	10	5	0	2	7	10
35	Pt	kW	113	130	148	156	176	190	138	153	170	178	200	215
	Pat	kW	42.7	43.3	44.2	44.5	45.5	46.1	49	49.6	50.3	50.6	51.5	52.1
	qw	l/s	5.4	6.2	7.1	7.5	8.5	9.1	6.6	7.3	8.2	8.5	9.6	10.3
	dpw	kPa	11	14	19	21	26	31	16	19	24	26	33	39
38	Pt	kW	113	129	147	155	175	189	137	152	169	177	199	214
	Pat	kW	45.2	45.7	46.5	46.8	47.8	48.4	51.7	52.3	53	53.3	54.2	54.9
	qw	l/s	5.4	6.2	7.1	7.4	8.4	9.1	6.6	7.3	8.1	8.5	9.6	10.3
	dpw	kPa	11	14	18	20	26	30	16	19	24	26	33	38
40	Pt	kW	113	129	147	154	175	188	137	152	169	177	198	213
	Pat	kW	47	47.5	48.2	48.5	49.4	50	53.8	54.3	54.9	55.2	56.2	56.8
	qw	l/s	5.4	6.2	7.1	7.4	8.4	9.0	6.6	7.3	8.1	8.5	9.5	10.3
	dpw	kPa	11	14	18	20	26	30	16	19	24	26	33	38
45	Pt	kW	113	129	146	153	173	185	138	152	168	176	197	211
	Pat	kW	52.3	52.4	52.9	53.1	54	54.5	59.5	59.8	60.4	60.7	61.6	62.2
	qw	l/s	5.5	6.2	7.0	7.4	8.3	8.9	6.6	7.3	8.1	8.5	9.5	10.2
	dpw	kPa	11	14	18	20	25	29	16	19	24	26	32	37

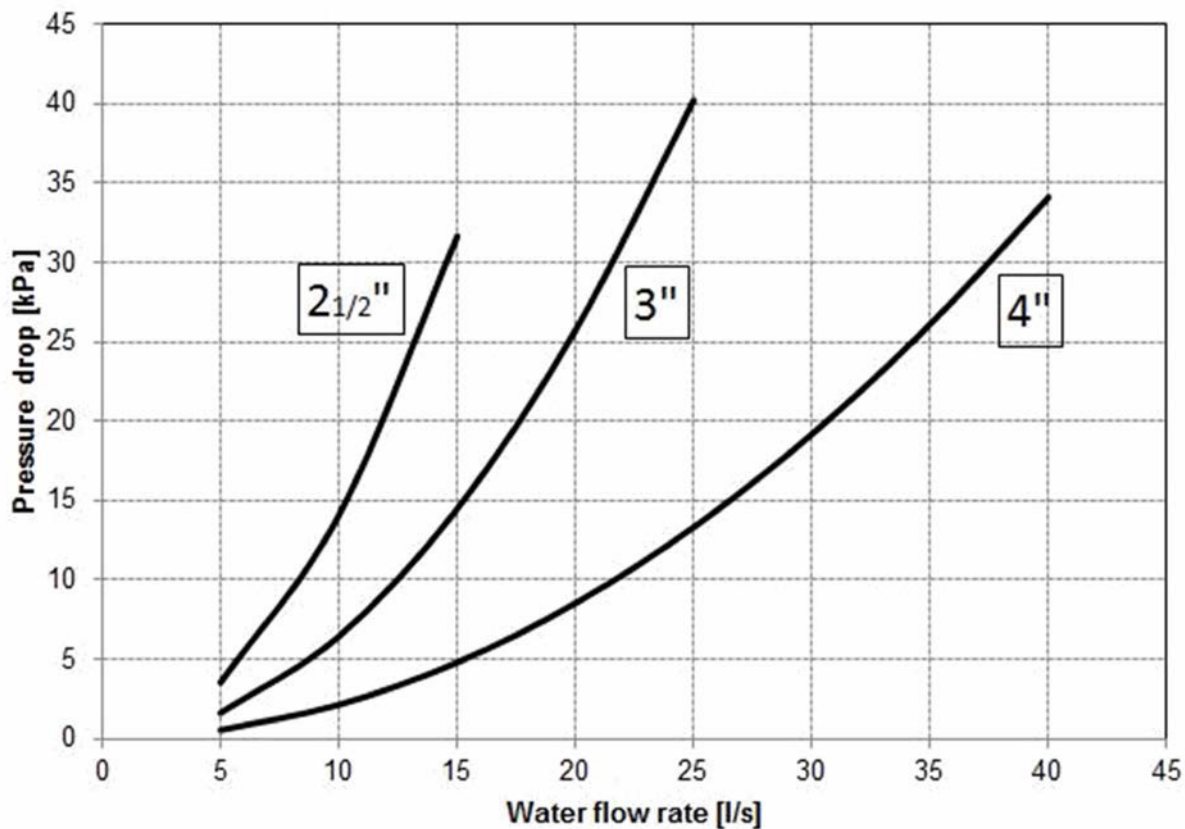
48	Pt	kW	129145152171184					152	168	175	196	210		
	Pat	kW	55.956.156.35757.5					63.7	64.2	64.4	65.2	65.9		
	qw	l/s	6.27.07.38.38.9					7.3	8.1	8.5	9.5	10.1		
	dpw	kPa	1418202529					19	24	26	32	37		
50	Pt	kW	145152171183					168	175	195	209			
	Pat	kW	58.458.659.259.7					66.9	67.1	67.9	68.5			
	qw	l/s	7.07.38.28.8					8.1	8.5	9.4	10.1			
	dpw	kPa	18202528					24	26	32	37			
Twout	Tain		10	5	0	2	7	10	10	5	0	2	7	10
35	Pt	kW	149	170	193	204	232	250	169	192	217	228	259	279
	Pat	kW	55.9	56.6	57.5	57.9	59	59.8	62.4	63.3	64.4	64.9	66.2	67.1
	qw	l/s	7.2	8.2	9.3	9.8	11.1	12.0	8.1	9.2	10.4	11.0	12.4	13.4
	dpw	kPa	19	24	31	35	45	52	22	29	37	41	52	60
38	Pt	kW	149	169	192	202	230	248	169	191	217	227	257	277
	Pat	kW	58.9	59.7	60.5	60.9	62	62.8	65.9	66.8	67.9	68.4	69.7	70.6
	qw	l/s	7.2	8.1	9.3	9.7	11.0	11.9	8.1	9.2	10.4	10.9	12.4	13.3
	dpw	kPa	19	24	31	34	44	51	22	29	36	40	51	60
40	Pt	kW	149	169	192	202	229	247	170	192	216	227	256	276
	Pat	kW	61.1	61.9	62.7	63.1	64.3	65	68.3	69.3	70.4	70.9	72.2	73.2
	qw	l/s	7.2	8.1	9.2	9.7	11.0	11.9	8.2	9.2	10.4	10.9	12.3	13.3
	dpw	kPa	19	24	31	34	44	51	22	29	36	40	51	59
45	Pt	kW	150	170	191	201	227	244	171	192	216	226	254	273
	Pat	kW	67.4	68.1	69	69.4	70.5	71.2	75.2	76.3	77.4	77.9	79.2	80.1
	qw	l/s	7.2	8.2	9.2	9.7	10.9	11.8	8.2	9.3	10.4	10.9	12.2	13.1
	dpw	kPa	19	24	31	34	43	50	23	29	36	40	50	58
48	Pt	kW	170	192	201	226	243	193	216	226	253	271		
	Pat	kW	72.4	73.2	73.6	74.7	75.5	80.9	82	82.5	83.9	84.8		
	qw	l/s	8.2	9.2	9.7	10.9	11.7	9.3	10.4	10.9	12.2	13.1		
	dpw	kPa	24	31	34	43	49	29	36	40	50	57		
50	Pt	kW	192	201	226	242	216	225	252	270				
	Pat	kW	76.3	76.7	77.8	78.6	85.4	85.9	87.2	88.2				
	qw	l/s	9.3	9.7	10.9	11.7	10.4	10.9	12.2	13.0				
	dpw	kPa	31	34	43	49	36	40	50	57				
Twout	Tain		10	5	0	2	7	10	10	5	0	2	7	10
35	Pt	kW	230	255	285	299	337	363	254	281	313	327	368	397
	Pat	kW	82.3	82.9	83.7	84.1	85.2	86	91.3	91.8	92.6	93	94.2	95.2
	qw	l/s	11.0	12.3	13.7	14.4	16.2	17.5	12.2	13.5	15.0	15.7	17.7	19.1
	dpw	kPa	12	15	19	20	26	30	15	19	23	25	32	37

38	Pt	kW	229	254	284	297	335	360	254	281	312	326	366	394
	Pat	kW	86.9	87.5	88.2	88.6	89.7	90.5	96.7	97.1	97.8	98.1	99.2	100
	qw	l/s	11.0	12.2	13.7	14.3	16.1	17.3	12.2	13.5	15.0	15.7	17.6	19.0
	dpw	kPa	12	15	18	20	26	30	15	19	23	25	32	37
40	Pt	kW	228	254	283	296	333	358	254	281	311	325	365	393
	Pat	kW	90.1	90.7	91.4	91.7	92.8	93.6	101	101	101	102	103	104
	qw	l/s	11.0	12.2	13.6	14.3	16.0	17.3	12.3	13.5	15.0	15.7	17.6	18.9
	dpw	kPa	12	15	18	20	25	29	15	19	23	25	32	37
45	Pt	kW	228	252	281	293	329	353	256	281	311	324	362	389
	Pat	kW	98.9	99.4	100	100	101	102	111	111	112	112	113	114
	qw	l/s	11.0	12.2	13.5	14.1	15.9	17.0	12.4	13.6	15.0	15.6	17.5	18.7
	dpw	kPa	12	15	18	20	25	29	16	19	23	25	31	36
48	Pt	kW		251	279	292	326	350		282	310	323	360	386
	Pat	kW		105	106	106	107	108		118	118	118	119	120
	qw	l/s		12.1	13.5	14.1	15.8	16.9		13.6	15.0	15.6	17.4	18.7
	dpw	kPa		15	18	19	24	28		19	23	25	31	36
50	Pt	kW			278	290	325	348			311	323	360	385
	Pat	kW			110	110	111	112			123	123	124	125
	qw	l/s			13.5	14.0	15.7	16.8			15.0	15.6	17.4	18.6
	dpw	kPa			18	19	24	28			23	25	31	35
Twout	Tain		10	5	0	2	7	10	10	5	0	2	7	10
35	Pt	kW	287	317	352	367	412	442	284	323	366	385	436	470
	Pat	kW	101	102	103	104	106	107	106	107	109	110	112	114
	qw	l/s	13.8	15.2	16.9	17.7	19.8	21.2	13.6	15.5	17.6	18.5	21.0	22.6
	dpw	kPa	19	23	28	30	38	44	15	19	24	27	34	40
38	Pt	kW	286	316	351	366	409	439	284	323	365	384	434	468
	Pat	kW	106	107	109	109	111	113	111	113	115	116	118	119
	qw	l/s	13.8	15.2	16.9	17.6	19.7	21.1	13.7	15.5	17.6	18.5	20.9	22.5
	dpw	kPa	19	23	28	30	38	44	15	19	24	27	34	40
40	Pt	kW	286	316	350	365	408	438	285	323	365	383	433	466
	Pat	kW	110	112	113	113	115	117	116	117	119	120	122	123
	qw	l/s	13.8	15.2	16.8	17.6	19.6	21.1	13.7	15.6	17.6	18.4	20.8	22.4
	dpw	kPa	19	23	28	30	38	43	15	19	24	27	34	39
45	Pt	kW	286	315	348	363	404	433	287	323	364	381	429	461
	Pat	kW	122	123	124	124	126	127	127	128	130	131	133	134
	qw	l/s	13.8	15.2	16.8	17.5	19.5	20.9	13.8	15.6	17.6	18.4	20.7	22.2
	dpw	kPa	19	23	27	30	37	42	15	19	24	26	33	39
48	Pt	kW		315	347	362	402	430		324	364	381	427	458
	Pat	kW		130	131	132	133	134		136	138	138	140	142
	qw	l/s		15.2	16.8	17.5	19.4	20.8		15.7	17.6	18.4	20.6	22.1
	dpw	kPa		23	27	30	37	42		19	24	26	33	38

Water filter and piping diameter - Combination matrix

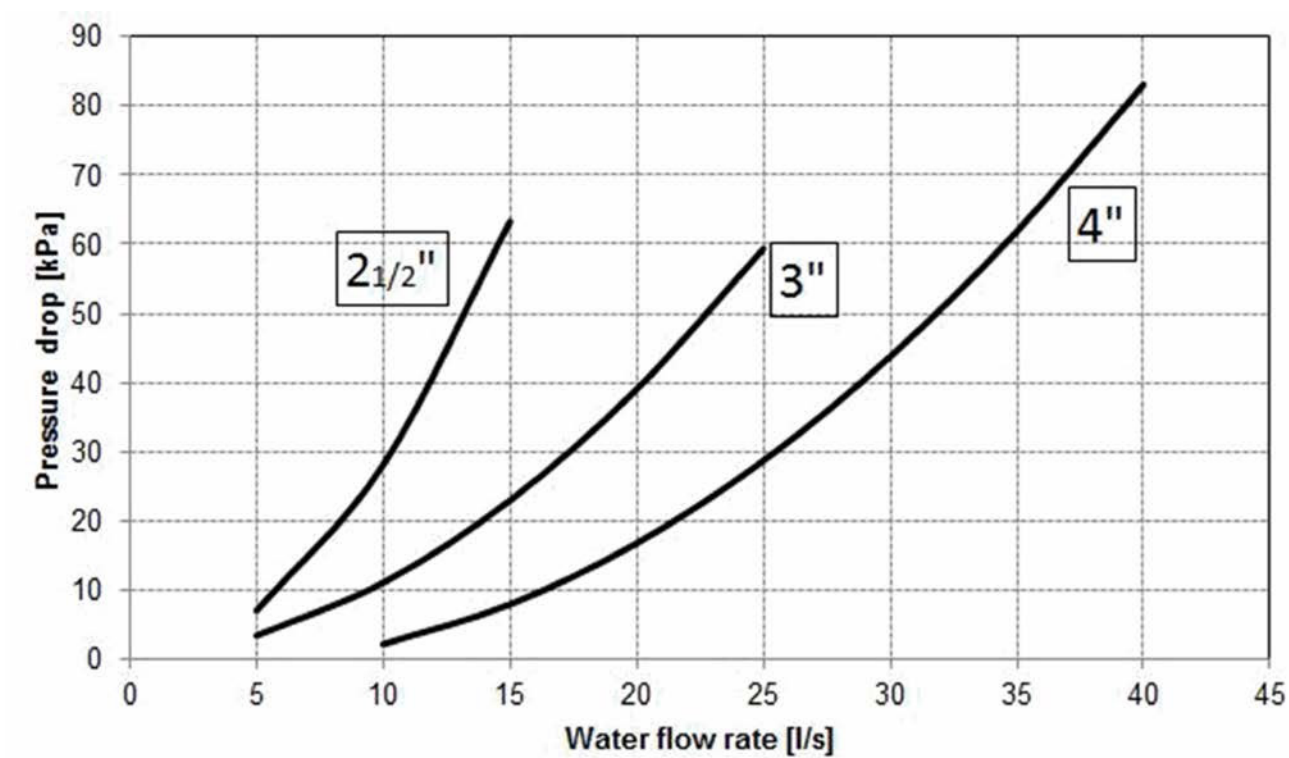
Water filter size and piping diameter				Water filter size and piping diameter				Water filter size and piping diameter			
	2½"	3"	4"		2½"	3"	4"		2½"	3"	4"
EWYQ160F-XS	X			EWYQ160F-XL	X			EWYQ160F-XR	X		
EWYQ190F-XS	X			EWYQ190F-XL	X			EWYQ180F-XR	X		
EWYQ210F-XS	X			EWYQ210F-XL	X			EWYQ200F-XR	X		
EWYQ230F-XS	X			EWYQ230F-XL	X			EWYQ220F-XR	X		
EWYQ310F-XS		X		EWYQ310F-XL		X		EWYQ300F-XR		X	
EWYQ340F-XS		X		EWYQ340F-XL		X		EWYQ330F-XR		X	
EWYQ380F-XS			X	EWYQ380F-XL			X	EWYQ360F-XR			X
EWYQ400F-XS			X	EWYQ400F-XL			X	EWYQ390F-XR			X
EWYQ430F-XS			X	EWYQ430F-XL			X	EWYQ420F-XR			X
EWYQ510F-XS			X	EWYQ510F-XL			X	EWYQ490F-XR			X
EWYQ570F-XS			X	EWYQ570F-XL			X	EWYQ550F-XR			X
EWYQ630F-XS			X	EWYQ630F-XL			X	EWYQ610F-XR			X

Filter pressure drops



Note: to calculate the pressure drops values introduced by the water filter, refer to the above curves.

Single/Twin pump kit pressure drop (including filter)

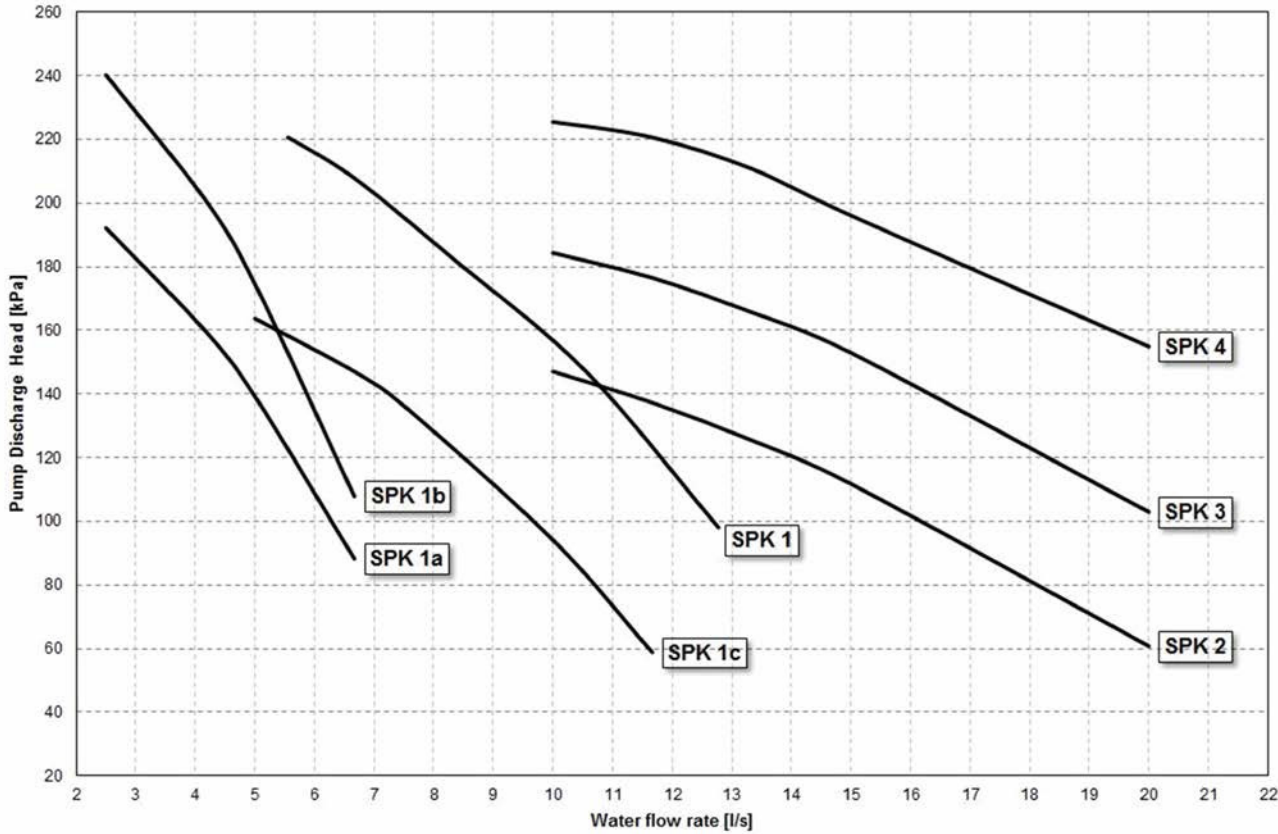


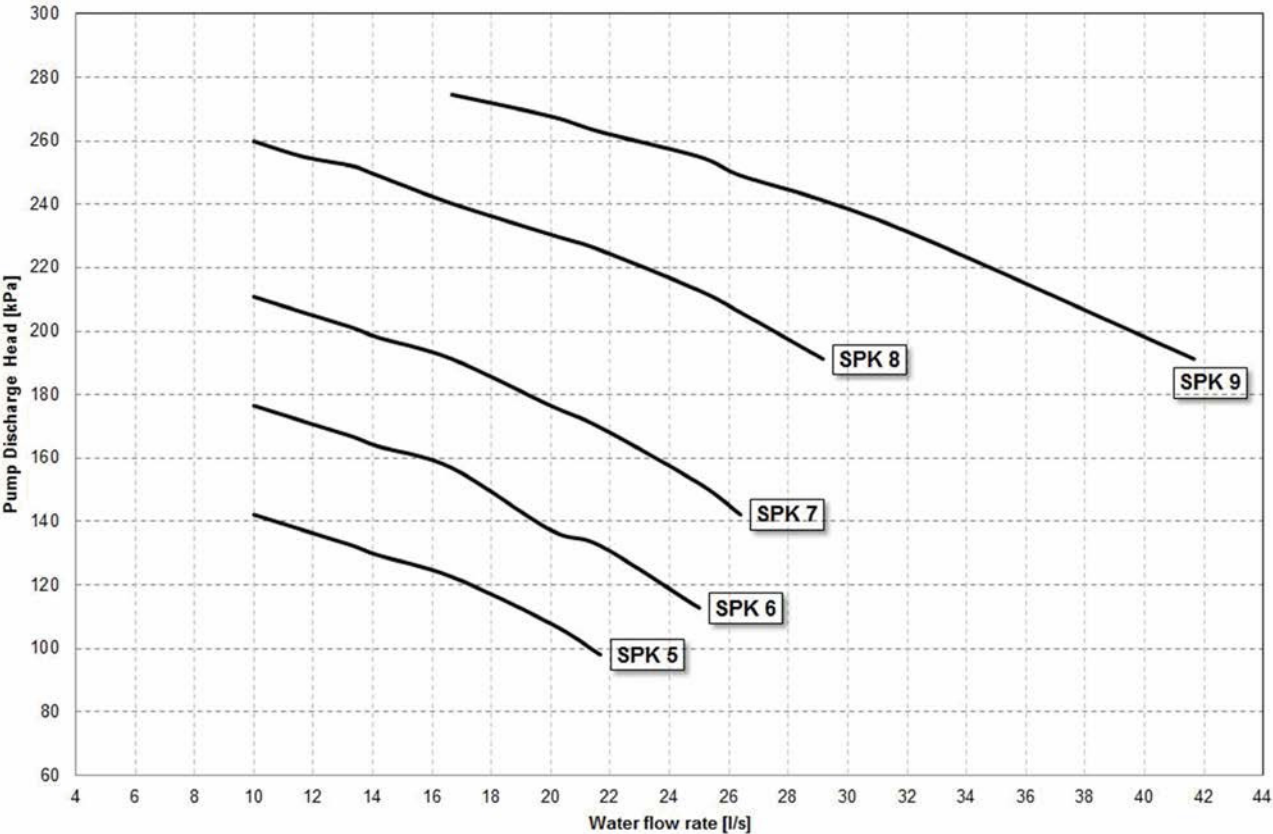
Note: to calculate the pressure drops values introduced by the water filter and pump's suction and discharge lines, refer to the above curves.

Water Pump Kit

Single Pump (2 poles)

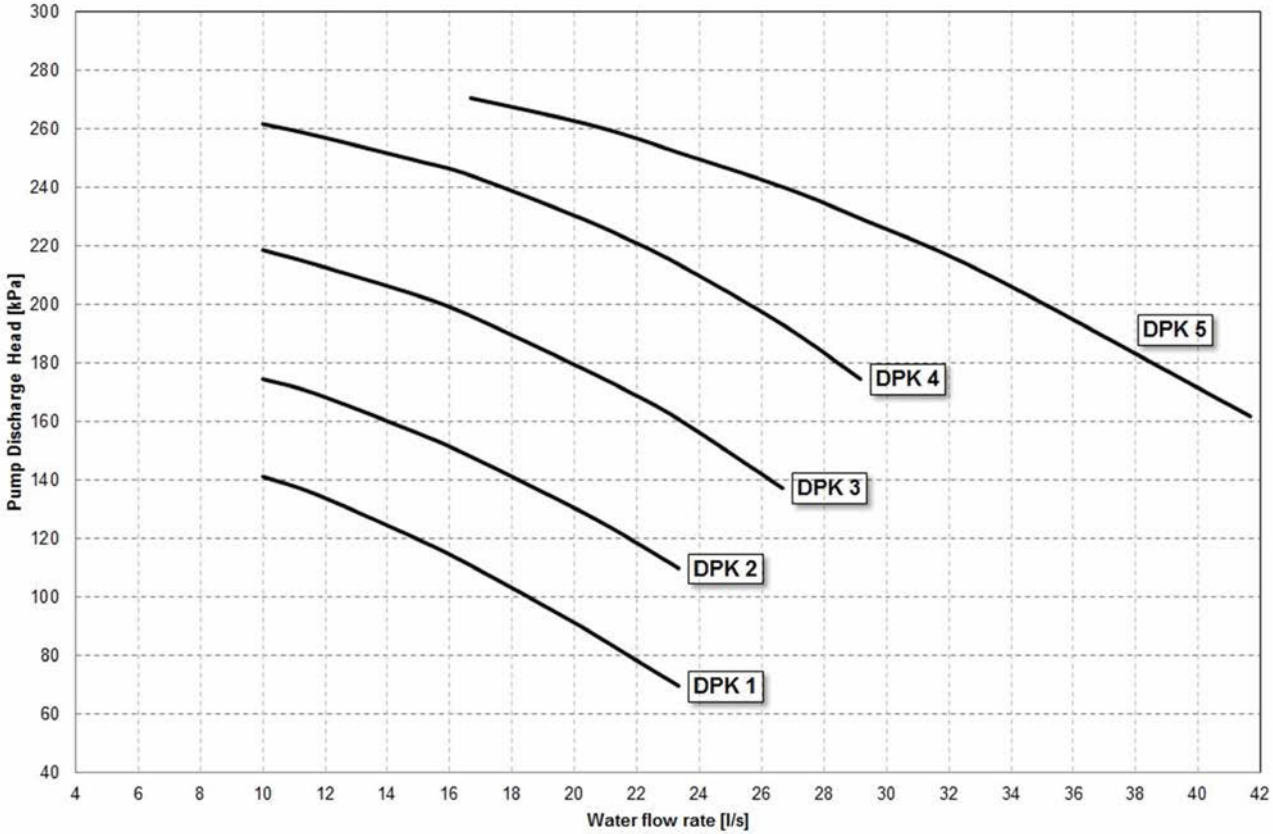
Discharge Head





- the above curves are referred to the discharge head of the pump only, not including pressure drops in the unit - when using mixture of water and glycol please contact the factory as above specification can change

Twin Pump (2 poles)
Discharge Head



- the above curves are referred to the discharge head of the pump only, not including pressure drops in the unit
- when using mixture of water and glycol please contact the factory as above specification can change

Water Pump Kit - Combination Matrix

	Single Pumps											Twin Pumps					
	SPK1a	SPK1b	SPK1c	SPK1	SPK2	SPK3	SPK4	SPK5	SPK6	SPK7	SPK8	SPK9	DPK1	DPK2	DPK3	DPK4	DPK5
EWYQ160F-XS	X	X	X	X	X	X	X										
EWYQ190F-XS	X	X	X	X	X	X	X										
EWYQ210F-XS	X	X	X	X	X	X	X										
EWYQ230F-XS	X	X	X	X	X	X	X										
EWYQ310F-XS								X	X	X	X		X	X	X	X	
EWYQ340F-XS								X	X	X	X		X	X	X	X	
EWYQ380F-XS								X	X	X	X		X	X	X	X	
EWYQ400F-XS								X	X	X	X		X	X	X	X	
EWYQ430F-XS								X	X	X	X	X	X	X	X	X	X
EWYQ510F-XS								X	X	X	X	X	X	X	X	X	X
EWYQ570F-XS								X	X	X	X	X	X	X	X	X	X
EWYQ630F-XS								X	X	X	X	X	X	X	X	X	X
EWYQ160F-XL	X	X	X	X	X	X	X										
EWYQ190F-XL	X	X	X	X	X	X	X										
EWYQ210F-XL	X	X	X	X	X	X	X										
EWYQ230F-XL	X	X	X	X	X	X	X										
EWYQ310F-XL								X	X	X	X		X	X	X	X	
EWYQ340F-XL								X	X	X	X		X	X	X	X	
EWYQ380F-XL								X	X	X	X		X	X	X	X	
EWYQ400F-XL								X	X	X	X		X	X	X	X	
EWYQ430F-XL								X	X	X	X	X	X	X	X	X	X
EWYQ510F-XL								X	X	X	X	X	X	X	X	X	X
EWYQ570F-XL								X	X	X	X	X	X	X	X	X	X
EWYQ630F-XL								X	X	X	X	X	X	X	X	X	X
EWYQ160F-XR	X	X	X	X	X	X	X										
EWYQ180F-XR	X	X	X	X	X	X	X										
EWYQ200F-XR	X	X	X	X	X	X	X										
EWYQ220F-XR	X	X	X	X	X	X	X										
EWYQ300F-XR								X	X	X	X		X	X	X	X	
EWYQ330F-XR								X	X	X	X		X	X	X	X	
EWYQ360F-XR								X	X	X	X		X	X	X	X	
EWYQ390F-XR								X	X	X	X		X	X	X	X	
EWYQ420F-XR								X	X	X	X	X	X	X	X	X	X
EWYQ490F-XR								X	X	X	X	X	X	X	X	X	X
EWYQ550F-XR								X	X	X	X	X	X	X	X	X	X
EWYQ610F-XR								X	X	X	X	X	X	X	X	X	X

Water Pump Kit - Technical Information

		Pump Motor Power [kW]	Pump Motor Current [A]	Power supply	PN	Motor Protection	Insulation (class)	Water Working Temperatures [°C]
Single Pumps	SPK1a	1,1	2,61	400V-3ph-50Hz	PN12	IP55	F	-20 ÷ 85
	SPK1b	1,5	3,45	400V-3ph-50Hz	PN12	IP55	F	-20 ÷ 85
	SPK1c	1,5	3,45	400V-3ph-50Hz	PN12	IP55	F	-20 ÷ 85
	SPK1	2,2	5,03	400V-3ph-50Hz	PN12	IP55	F	-20 ÷ 85
	SPK2	2,2	5,03	400V-3ph-50Hz	PN12	IP55	F	-20 ÷ 85
	SPK3	3	6,01	400V-3ph-50Hz	PN12	IP55	F	-20 ÷ 85
	SPK4	4	8,09	400V-3ph-50Hz	PN12	IP55	F	-20 ÷ 85
	SPK5	3	6,01	400V-3ph-50Hz	PN10	IP55	F	-10 ÷ 130
	SPK6	4	8,09	400V-3ph-50Hz	PN10	IP55	F	-10 ÷ 130
	SPK7	5,5	10,1	400V-3ph-50Hz	PN10	IP55	F	-10 ÷ 130
	SPK8	7,5	13,7	400V-3ph-50Hz	PN10	IP55	F	-10 ÷ 130
	SPK9	11	20	400V-3ph-50Hz	PN10	IP55	F	-10 ÷ 130
Twin Pumps	DPK1	3	6,01	400V-3ph-50Hz	PN10	IP55	F	-10 ÷ 130
	DPK2	4	8,09	400V-3ph-50Hz	PN10	IP55	F	-10 ÷ 130
	DPK3	5,5	10,1	400V-3ph-50Hz	PN10	IP55	F	-10 ÷ 130
	DPK4	7,5	13,7	400V-3ph-50Hz	PN10	IP55	F	-10 ÷ 130
	DPK5	11	20	400V-3ph-50Hz	PN10	IP55	F	-10 ÷ 130

How to calculate the overall chiller water side pressure drops (pump by others)

In order to calculate the overall pressure drops introduced by the chiller in an installation the following points have to be considered: -
 The pressure drop value showed in CSS (Chiller Selection Software) are referred to chiller's evaporator only
 - This multiscroll series is equipped as standard with water filter (factory supplied)

$$\text{Overall chiller pressure drops} = \text{evaporator [kPa]} + \text{Filter pressure drop [kPa]}$$

- Select the chiller with CSS tool, you get easily the design water flow rate and the corresponding 'evaporator pressure drops' value (in CSS tool kPa figures are referred to evaporator only).
- Refer to table "Water filter and piping diameter - Combination Matrix" to know what filter size and piping diameter correspond to the selected chiller.
- Considering the design flow rate and water filter size and piping diameter, from graph "Filter pressure drops" get the corresponding kPa value.
- By adding the values at point a and c, 'Overall chiller pressure drops' figure is got.

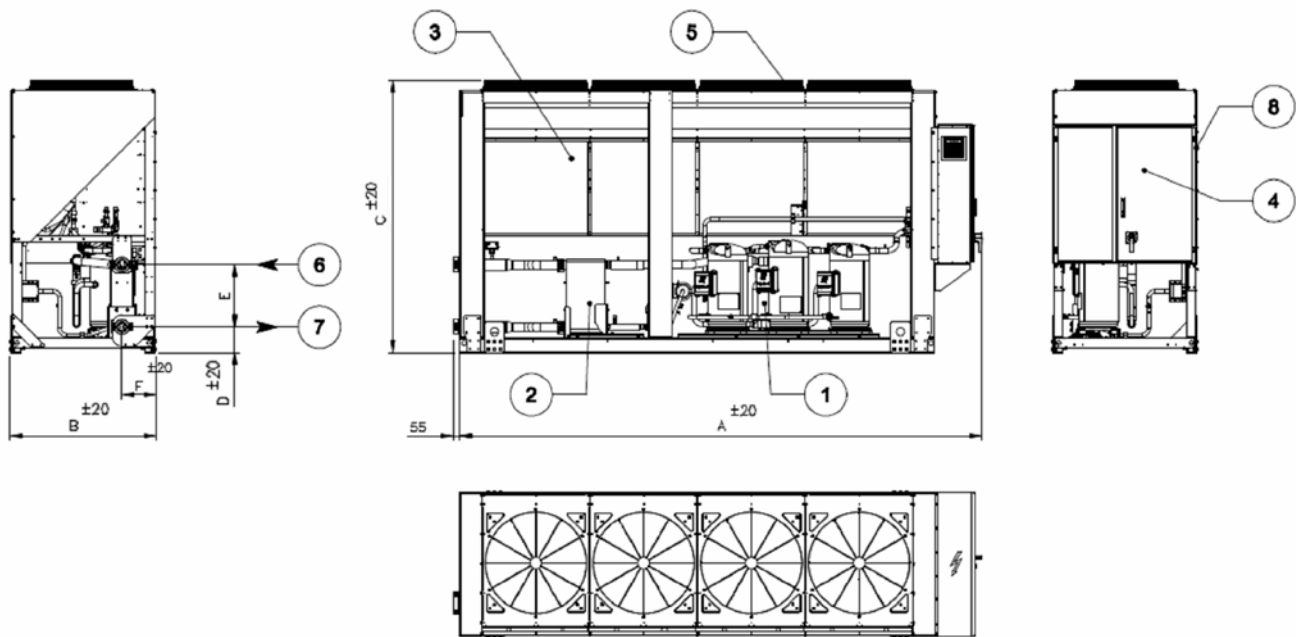
How to calculate the chiller external available pressure head with Single/Twin pumps kit option (factory supplied)

In order to calculate the chiller external available pressure head with Single/Twin pumps kit option (factory supplied) the following points have to be considered:
 -The pressure drop values showed in CSS (Chiller Selection Software) are referred to chiller's evaporator only.
 -This multiscroll series is equipped as standard with water filter (factory supplied).

$$\text{Chiller external available pressure head} = \text{pump discharge head [kPa]} - \text{evaporator pressure drop [kPa]} - \text{Single/Twin pumps kit pressure drop (including filter) [kPa]}$$

- Select the single or twin pump model in "Water Pump Kit" graph and get the corresponding 'Pump Discharge Head'.
- Verify with "Water Pump Kit - Combination Matrix" that the selected pump model is available for that chiller size.
- Select the chiller with CSS tool at design conditions, you get easily the design water flow rate and the corresponding "evaporator pressure drop" (in CSS tool kPa figures are referred to evaporator only)
- Refer to table "Water filter and piping diameter - Combination Matrix" to know what filter size and piping diameter correspond to the selected chiller.
- Considering the design flow rate and water filter size and piping diameter, from graph "Single/Twin pumps kit pressure drop (including filter)" get the pressure drops value introduced by pumps kit.
- By considering the values at point a, c and e you can easily calculate the chiller external available pressure head as pump discharge head - evaporator pressure drop - Single/Twin pumps kit pressure drop (including filter).

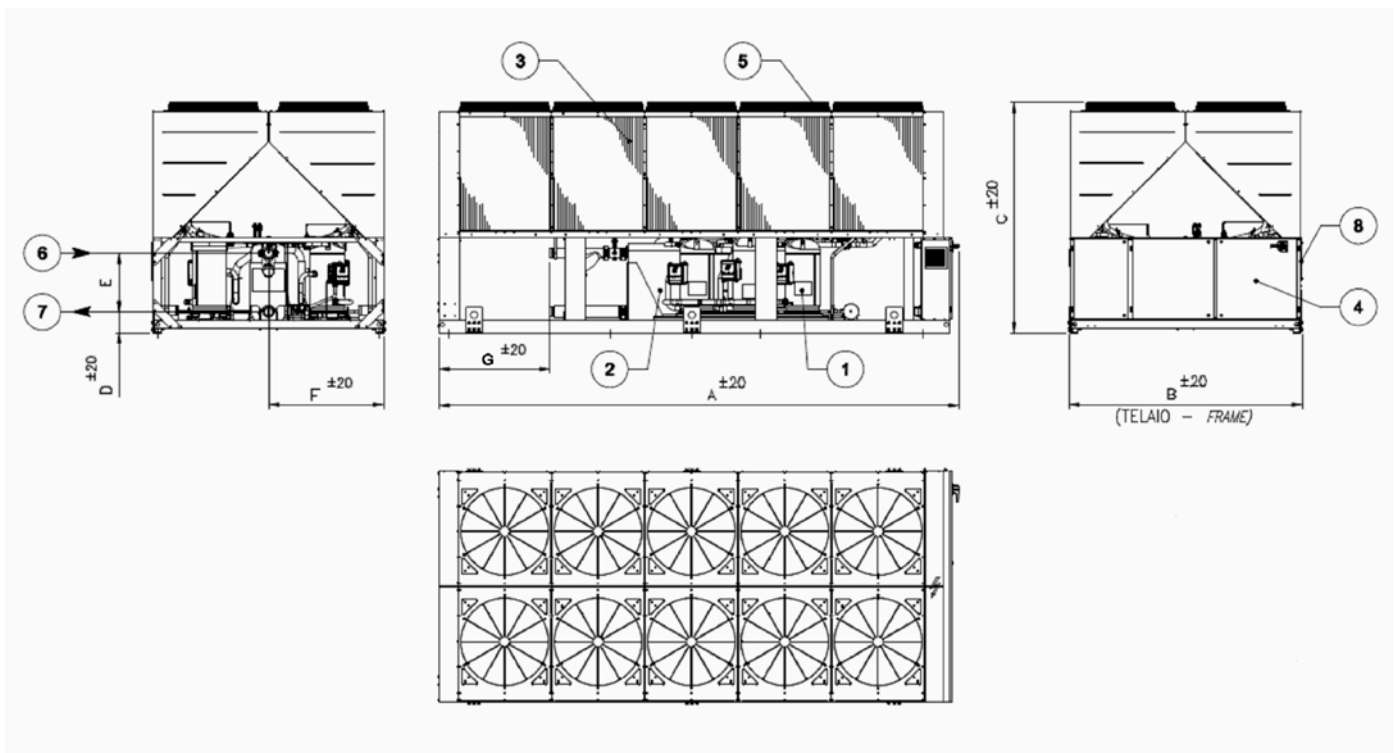
Note: when using mixture of water and glycol please contact the factory as above specification could change



LEGEND

- 1: Compressor
- 2: Evaporator
- 3: Condenser coil
- 4: Electrical panel
- 5: Fan
- 6: Evaporator water inlet
- 7: Evaporator water outlet
- 8: Slot for power and control panel connection

	A	B	C	D	E	F	G	H	I	L	M
EWYQ160FXS	4370	1200	2270	208	369	600					
EWYQ190FXS	4370	1200	2270	208	369	600					
EWYQ210FXS	5270	1200	2270	208	369	600					
EWYQ230FXS	5270	1200	2270	208	369	600					
EWYQ160FXL	4370	1200	2270	208	369	600					
EWYQ190FXL	4370	1200	2270	208	369	600					
EWYQ210FXL	5270	1200	2270	208	369	600					
EWYQ230FXL	5270	1200	2270	208	369	600					



LEGEND

- 1: Compressor
- 2: Evaporator
- 3: Condenser coil
- 4: Electrical panel
- 5: Fan
- 6: Evaporator water inlet
- 7: Evaporator water outlet
- 8: Slot for power and control panel connection

	A	B	C	D	E	F	G	H	I	L	M
EWYQ310FXS	4125	2258	2220	233	568	1129					
EWYQ340FXS	4125	2258	2220	233	568	1129					
EWYQ380FXS	4125	2258	2220	233	568	1129					
EWYQ400FXS	5025	2258	2220	233	568	1129	760				
EWYQ430FXS	5025	2258	2220	233	568	1129	760				
EWYQ510FXS	5925	2258	2220	233	568	1129	770				
EWYQ570FXS	5925	2258	2220	233	568	1129	770				
EWYQ630FXS	6825	2258	2220	233	568	1129	1670				
EWYQ310FXL	4125	2258	2220	233	568	1129					
EWYQ340FXL	4125	2258	2220	233	568	1129					
EWYQ380FXL	4125	2258	2220	233	568	1129					
EWYQ400FXL	5025	2258	2220	233	568	1129	760				
EWYQ430FXL	5025	2258	2220	233	568	1129	760				
EWYQ510FXL	5925	2258	2220	233	568	1129	770				
EWYQ570FXL	5925	2258	2220	233	568	1129	770				

Warning Installation and maintenance of the unit must to be performed only by qualified personnel who have knowledge with local codes and regulations, and experience with this type of equipment. Must be avoided the unit installation in places that could be considered dangerous for all the maintenance operations.

Handling Care should be taken to avoid rough handling or shock due to dropping the unit. Do not push or pull the unit from anything other than the base frame. Never allow the unit to fall during unloading or moving as this may result in serious damage. To lift the unit, rings are provided in the base frame of the unit. Spreader bar and cables should be arranged to prevent damage to the condenser coil or unit cabinet.

Location The units are produced for outside installation on roofs, floors or below ground level on condition that the area is free from obstacles for the passage of the condenser air. The unit should be positioned on solid foundations and perfectly level; in the case of installation on roofs or floors, it may be advisable to arrange the use of suitable weight distribution beams. When the units are installed on the ground, a concrete base at least 250 mm wider and longer than the unit's footprint should be laid. Furthermore, this base should withstand the unit weight mentioned in the technical data table.

Acoustic protection When noise level must meet special requirements, it is necessary to pay the maximum attention to ensure the perfect insulation of the unit from the support base by applying appropriate vibration-dampening devices on the unit, on the water pipes and on the electrical connections.

Storage The environment conditions have to be in the following limits:

Minimum ambient temperature:	20°C
Maximum ambient temperature:	+42°C
Maximum R.H.:	95% not condensing

Space requirements The units are air-cooled, then it is important to respect the minimum distances which guarantee the best ventilation of the condenser coils. Limitations of space reducing the air flow could cause significant reductions in cooling capacity and an increase in electricity consumption.

To determinate unit placement, careful consideration must be given to assure a sufficient air flow across the condenser heat transfer surface. Two conditions must be avoided to achieve the best performance: warm air recirculation and coil starvation.

Both these conditions cause an increase of condensing pressures that results in reductions in unit efficiency and capacity.

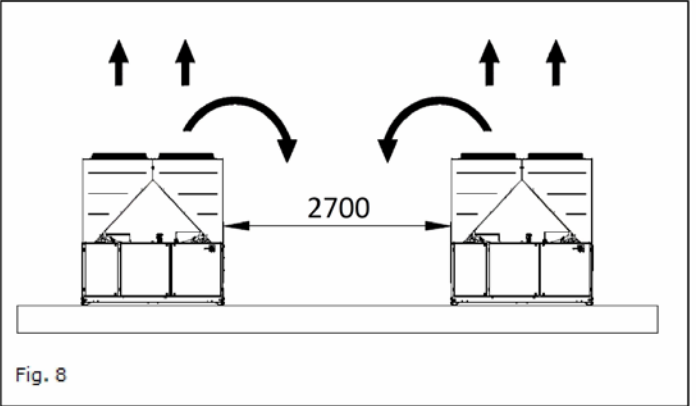
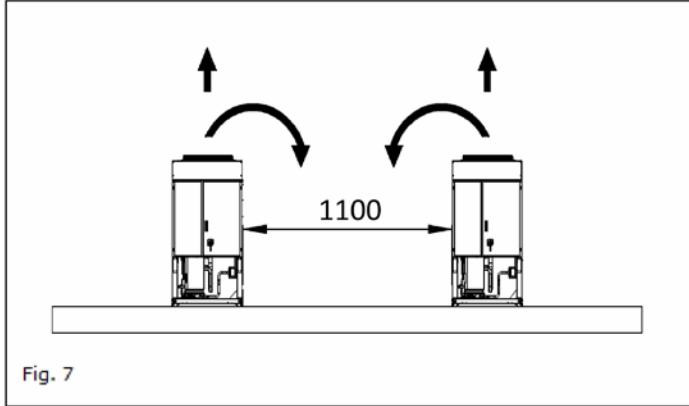
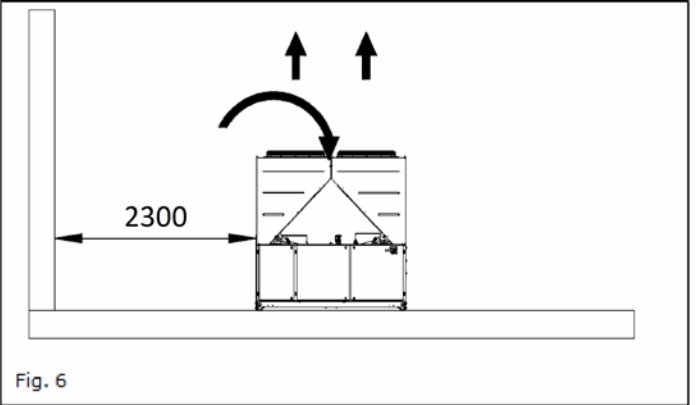
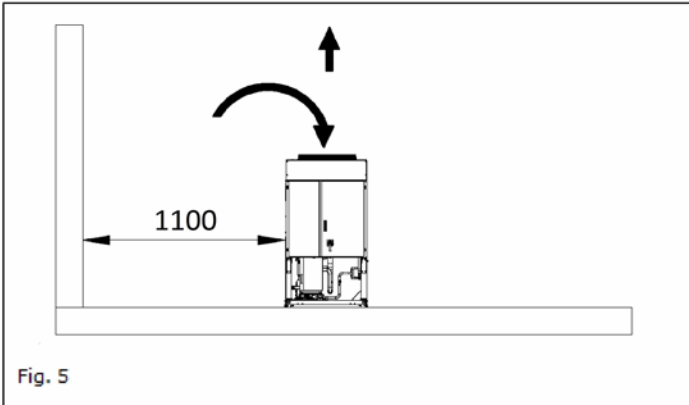
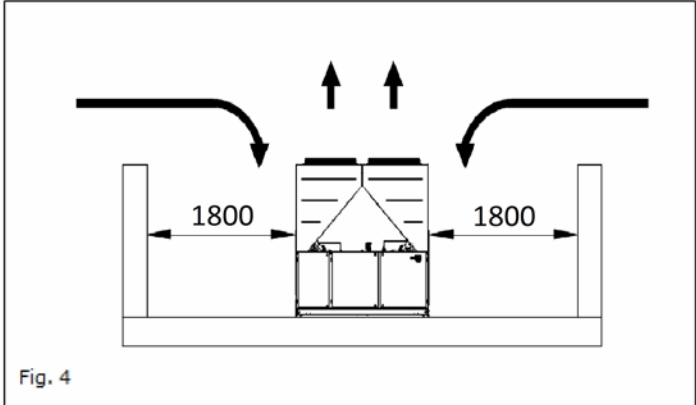
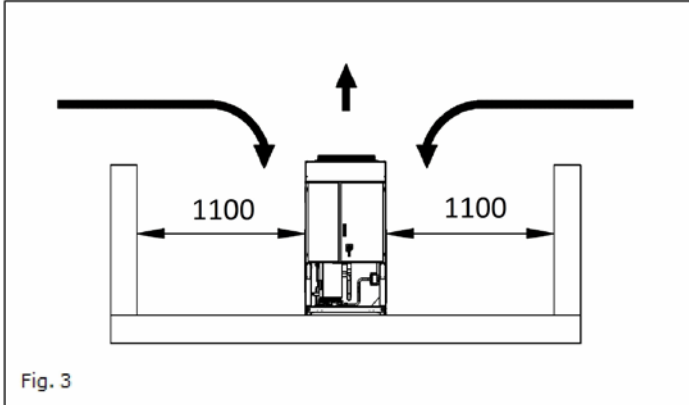
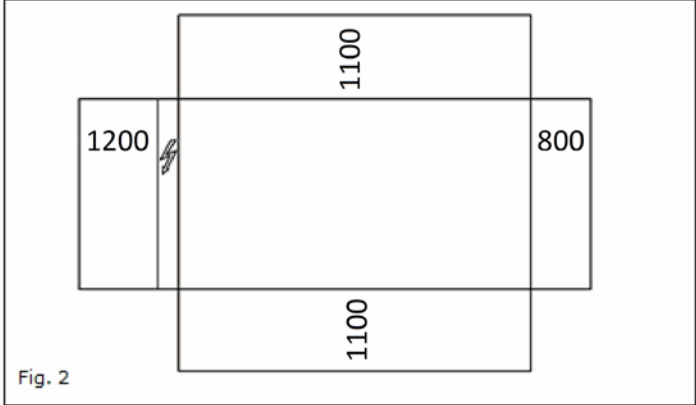
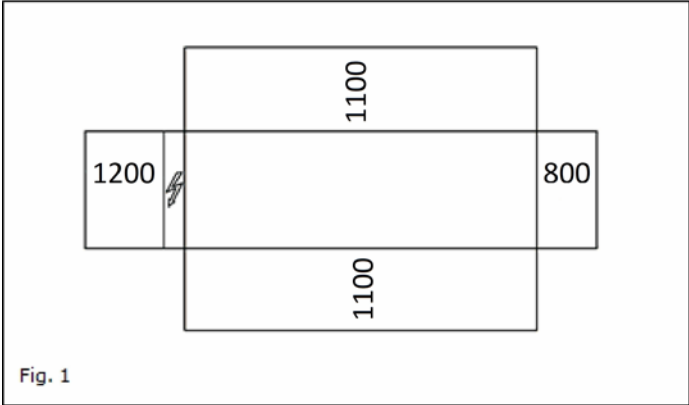
Moreover the unique microprocessor has the ability to calculate the operating environment of the air cooled chiller and the capacity to optimize its performance staying on-line during abnormal conditions.

Each side of the unit must be accessible after installation for periodic service. 'Fig.1 and Fig.2' shows you minimum recommended clearance requirements. Vertical condenser air discharge must be unobstructed because the unit would have its capacity and efficiency significantly reduced.

If the units are positioned in places surrounded by walls or obstacles of the same height as the units, the units should follow the minimum recommended clearance requirements shown in 'Fig.3 and Fig.4'. In the event the obstacles are higher than the units, the minimum recommended clearance requirements are shown in 'Fig.5 and Fig.6'. Units installed closer than the minimum recommended distance to a wall or other vertical riser may experience a combination of coil starvation and warm air recirculation, thus causing reduction in unit capacity and efficiency reductions. The microprocessor control is proactive in response "of design condition". In the case of single or compounded influences restricting airflow to the unit, the microprocessor will act to keep the compressor(s) running (at reduced capacity) rather than allowing a shut-off on high discharge pressure.

When two or more units are positioned side by side it is recommended that the condenser coils are at a minimum distance from one another as shown in 'Fig.7 and Fig.8'; strong wind could be the cause of air warm recirculation. For other installation solutions, consult our technicians.

The above recommended information are representative of general installation. A specific evaluation should be done by contractor depending on the case.



General The Air to Water Heat Pump will be designed and manufactured in accordance with the following European directives:

- Construction of pressure vessel 97/23/EC (PED)
- Machinery Directive 2006/42/EC
- Low Voltage 2006/95/EC
- Electromagnetic Compatibility 2004/108/EC

To avoid any losses, the unit will be tested at full load in the factory (at the nominal working conditions and water temperatures). The Air to Water Heat Pump will be delivered to the job site completely assembled and charged with refrigerant and oil. The installation of the Air to Water Heat Pump must comply with the manufacturer's instructions for rigging and handling equipment.

The unit will be able to start up and operate (as standard) at full load with:

- outside air temperature from °C to °C
- evaporator leaving fluid temperature between °C and °C

Refrigerant Only HFC 410A can be used.

Performance • Number of air to water heat pumps: unit(s)

- Cooling capacity for single air to water heat pump: kW
- Power input for single air to water heat pump in cooling mode : kW
- Heat exchanger entering water temperature in cooling mode : °C
- Heat exchanger leaving water temperature in cooling mode : °C
- Heat exchanger water flow : l/s
- Nominal outside working ambient temperature in cooling mode : °C
- Heating capacity for single air to water heat pump: kW
- Power input for single air to water heat pump in heating mode : kW
- Heat exchanger entering water temperature in heating mode : °C •
- Heat exchanger leaving water temperature in heating mode : °C
- Heat exchanger water flow : l/s
- Nominal outside working ambient temperature in heating mode : °C

Operating voltage range should be 400V ±10%, 3ph, 50Hz, voltage unbalance maximum 3%, without neutral conductor and shall only have one power connection point.

Unit description Chiller shall include as standard not less than: two independent refrigerant circuits, hermetic type rotary scroll compressors, electronic expansion device (EEXV), refrigerant direct expansion plate to plate heat exchanger, air-cooled condenser section, R-410A refrigerant, motor starting components, control system and all components necessary for a safe and stable unit operation.

The chiller will be factory assembled on a robust base frame made of galvanized steel, protected by an epoxy paint.

Sound level and vibrations Sound pressure level at 1 meter distance in free field, semispheric conditions, shall not exceeddB(A). The sound pressure levels must be rated in accordance to ISO 3744 (other types of rating can not be used). Vibration on the base frame should not exceed 2 mm/s.

Dimensions Unit dimensions shall not exceed following indications:

- Unit length mm
- Unit width mm
- Unit height mm

Evaporator (PHE) The units shall be equipped with a direct expansion plate to plate type evaporator.

- The evaporator will be made of of stainless steel brazed plates and shall be linked with an electrical heater to prevent freezing down to -28°C ambient temperature, controlled by a thermostat and shall be insulated with flexible, closed cell polyurethane insulation material (20-mm thick).
- The evaporator will have 2 refrigerant circuits.
- The water connections shall be VICTAULIC type connections as standard to ensure quick mechanical disconnection between the unit and the hydronic network.
- The evaporator will be manufactured in accordance to PED approval.
- Flow switch will be standard factory mounted.
- Water filter will be standard (depending on the unit model it can be shipped loose or unit mounted).

- **Condenser coil** The unit shall be equipped with condenser coils constructed with internally finned seamless copper tubes and arranged in a staggered row pattern and mechanically expanded into lanced and rippled aluminum fins with full fin collars for higher efficiencies. The space between the fins is given by a collar that will increase the surface area in connection with the tubes, protecting them from ambient corrosion.
- The condenser coils will have an integral subcooler circuit that provides sufficient subcooling to effectively eliminate the possibility of liquid flashing and increase the unit's efficiency with 5% to 7% without increasing in energy consumption.
- The condenser coils shall be leak-tested and submitted to a pressure test with dry air.

Condenser fans The condenser fans used in conjunction with the condenser coils, shall be propeller type with glass reinforced resin blades for higher efficiencies and lower sound. Each fan shall be protected by a fan guard.

- The air discharge shall be vertical and each fan must be coupled to the electrical motor, supplied as standard to IP54 and capable to work to ambient temperatures of - 20°C to + 65°C.
- The condenser fans shall have as a standard an internally protection from overtemperature.

Refrigerant circuit The unit shall have two refrigerant circuits. • The circuit shall include as standard: electronic expansion device piloted by unit's microprocessor control, liquid line shut-off valve, 4-way valve to reverse refrigerant cycle into the unit, sight glass with moisture indicator, replaceable filter drier, charging valves, high pressure switch, high and low pressure transducers and insulated suction line.

Condensation control The units will be provided with an automatic control for condensing pressure which ensures the working at low external temperatures down to - °C, to maintain condensing pressure.

The unit automatically unloads when abnormal high condensing pressure is detected. This to prevent the shutdown of the refrigerant circuit (shutdown of the unit) due to a high-pressure fault.

Low sound unit configurations (on request) The unit compressor shall be connected with unit's metal base frame by rubber antivibration supports to prevent the transmission of vibrations to all metal unit structure, in order to control the unit sound. • The chiller shall be provided with an acoustical compressor enclosure. This enclosure shall be realized with a light, corrosion resisting aluminum structure and metal panels. The compressor sound-proof enclosure shall be internally fitted with flexible, multi-layer, high density materials.

Hydronic kit options (on request) The hydronic module shall be integrated in the chiller chassis without increasing its dimensions and includes the following elements: centrifugal pump with motor protected by a circuit breaker installed in control panel, water filling system with pressure gauge, safety valve, drain valve.

- The hydronic module shall be assembled and wired to the control panel.
- The water piping shall be protected against corrosion and freezing and insulated to prevent condensation.
- A choice of two pump types shall be available:
- in-line single pump

Electrical control panel Power and control shall be located in the main panel that will be manufactured to ensure protection against all weather conditions.

- The electrical panel shall be IP54 and (when opening the doors) internally protected against possible accidental contact with live parts.
- The main panel shall be fitted with a main switch interlocked door that shuts off power supply when opening.
- The power section will include compressors and fans protection devices, compressors and fans starters and control circuit power supply.

• **Controller** The controller will be installed as standard and it will be used to modify unit set-points and check control parameters.

- A built-in display will shows chiller operating status plus temperatures and pressures of water, refrigerant and air, programmable values, set-points.
- A sophisticated software with predictive logic, will select the most energy efficient combination of compressors, EEXV and condenser fans to keep stable operating conditions to maximize chiller energy efficiency and reliability.
- The controller will be able to protect critical components based on external signals from its system (such as motor temperatures, refrigerant gas and oil pressures, correct phase sequence, pressure switches and evaporator). The input coming from the high pressure switch cuts all digital output from the controller in less than 50ms, this will be an additional security for the equipment.
- Fast program cycle (200ms) for a precise monitoring of the system.

- Floating point calculations supported for increased accuracy in P/T conversions.
 - **Controller main features** Controller shall be guarantee following minimum functions:
 - Management of the compressor stepless capacity and fans modulation.
-
- Chiller enabled to work in partial failure condition.
 - Full routine operation at condition of:
 - high ambient temperature value
 - high thermal load
 - high evaporator entering water temperature (start-up)
 - Display of evaporator entering/leaving water temperature.
 - Display of Outdoor Ambient Temperature.
 - Display of condensing-evaporating temperature and pressure, suction and discharge superheat for each circuit.
 - Leaving water evaporator temperature regulation (temperature tolerance = 0,1°C).
 - Compressor and evaporator pumps hours counter.
 - Display of Status Safety Devices.
 - Number of starts and compressor working hours.
 - Optimized management of compressor load.
 - Fan management according to condensing pressure.
 - Re-start in case of power failure (automatic / manual).
 - Soft Load (optimized management of the compressor load during the start-up).
 - Start at high evaporator water temperature.
 - Return Reset (Set Point Reset based on return water temperature).
 - OAT (Outside Ambient temperature) Reset.
 - Set point Reset (optional).
 - Application and system upgrade with commercial SD cards.
 - Ethernet port for remote or local servicing using standard web browsers. • Two different sets of default parameters could be stored for easy restore.

High Level Communications Interface (on request) The chiller shall be able to communicate to BMS (Building Management System) based on the most common protocols as:

- ModbusRTU
- LonWorks, now also based on the international 8040 Standard Chiller Profile and LonMark Technology
- BacNet BTP certified over IP and MS/TP (class 4) (Native)

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