

ferroli

EGW

CONDENSERLESS UNITS
FOR INDOOR INSTALLATION



TECHNICAL MANUAL

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GENERAL SPECIFICATIONS

Presentation of the unit

This new series of industrial condenserless units has been designed to meet the demands of global markets in the small medium power industrial and commercial plants.

Units are compact and highly configurable, built to fit different types of plants so to meet the needs of highly qualified engineers. Units are only cooling (IR) suitable for indoor installation; and, if equipped with painted structure and panels (option), they are suitable for outdoor installation too. This series is composed of 11 models and two sizes with nominal cooling capacity from 61 to 210 Kw. The units produce cold water from 5 to 20°C.

The units can be supplied for brine production (BR) that allow brine production from -10 to 5°C.

To increase the seasonal efficiency index (ESEER) and so further containing power input and operation cost the units can be supplied with electronic expansion valve. Great attention has been dedicated to achieve low sound levels in order to meet the increasingly restrictive laws in terms of noise: upon request, you can choose for a Standard Unit (AB) or Low noise unit (AS) or Extra low noise unit (AX), The low noise unit (AS) provides sound attenuation thanks to panels with sound absorbing insulation. The extra low noise unit (AX) provides a further sound attenuation thanks to panels with sound absorbing and acoustic jackets for compressors. The basic unit (AB) is an essential structure made by sheet metal with anti-corrosion treatment (not painted) and without any closing panels so suitable ONLY for indoor installation.

All the units are equipped with 2 scroll compressors arranged in pairs (tandem) on 1 circuit operating with environmental friendly R410A gas, brazed plate heat exchangers on plant side (evaporator) completely insulated and protected on water side with a differential pressure control), electrical panel complete with electronic controller and display, phase presence and sequence control device (as standard).

As option the unit can be selected with painted structure (epoxy powders RAL 7035).

For low noise (AS) and extra low noise (AX) units, the painting is extended to all closing panels, so ensuring for the electrical panel a protection degree IP54 and the maximum protection against adverse weather conditions: with this features the unit is suitable for outdoor installation (to agree with our commercial office).

The units are supplied charge with NITROGEN (in order to avoid entrance of air into the refrigerant circuit).

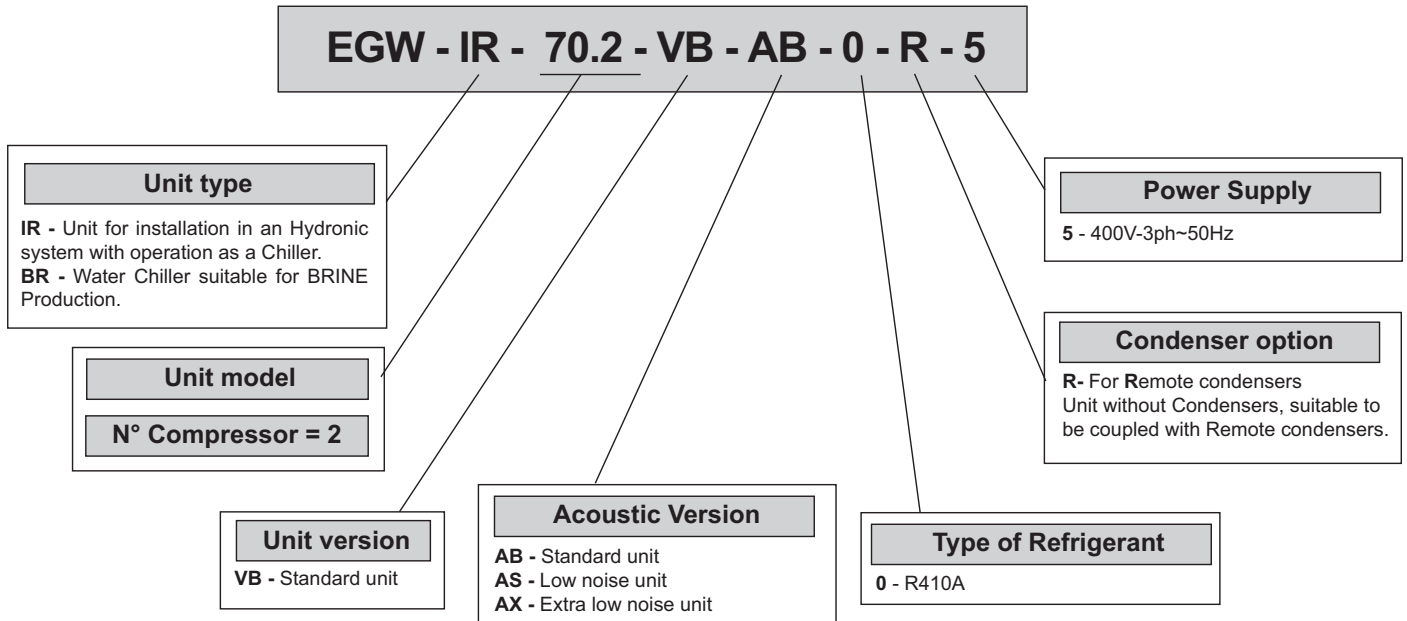
A variety of other accessories are available to extend the capabilities of the units.

All units are accurately build in compliance with the existing standards and are individually tested in factory.

GENERAL SPECIFICATIONS

Identification code of the unit

The codes that identify the units are listed below and include the sequences of letters that determine the meanings for the various versions and set-ups.



The available special versions are described below:

AB Standard unit. The compressors are installed on rubber vibration dampers.

The unit has composed by basement and framework made by sheet metal with anticorrosion treatment without any closing panels.

AS Low noise unit. Allows a noise reduction of 4-5 dB.

The compressors are installed on rubber vibration dampers and the unit is closed with panels made by sheet metal with anticorrosion treatment and coated with sound absorbing insulation.

The AS unit reaches IP54 (protection degree) so it can be installed outdoor.

AX Extra low noise unit. Allows a noise reduction of 7-8 dB.

The compressors are installed on rubber vibration dampers and insulated with acoustic jackets; the unit is closed with panels made by sheet metal with anticorrosion treatment and coated with sound absorbing insulation.

The AX unit reaches IP54 (protection degree) so it can be installed outdoor.

Description of the components

Componenti principali:

1. Electric control and monitoring panel. This is housed in a metal casing in which the various electrical components are positioned on one metal plate.

1a. The power section includes:

- Main door-locking circuit-breaker.
- Fuse-holder that can be isolated with protection fuse triad for each compressor.
- Fuse-holder that can be isolated with protection fuse for compressor oil heaters and antifreeze (if installed).
- Control contactor for each compressor.
- Contactor and magnetothermic switch to protect the pump (if installed).
- Phase presence and sequence monitoring device on power supply

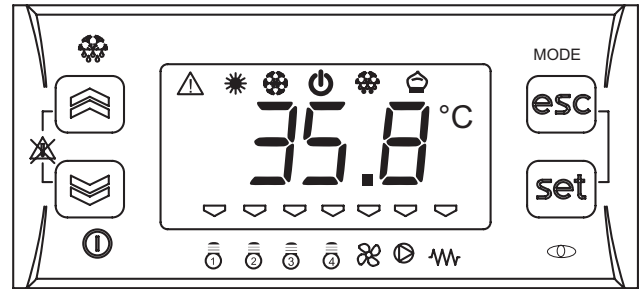
1b. The auxiliary section includes:

- Fuses on the auxiliary transformer.
- Electromagnetic noise filter
- Insulating and safety transformer to power the auxiliary circuit.

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1c. The microprocessor monitoring section includes:

- User interfacing terminal with display.
- On-off key.
- Operating mode selector key.
- Compressor on-off display **LED**.
- Operational mode **LED**
- Antifreeze heaters activated indicator **LED**.
- Source Pump/s on-off display **LED**
- Plant Pumps on-off display **LED**
- Check-control with fault code display
- ON / Stand-by remote - Summer/Winter (E/I) remote selection (IW, IP, BW, BP units only).



Control system main functions:

temperature control of the water produced by the unit, compressor and pump operating hour counter, timing and cycling of start-ups, input parameters by keyboard, alarms management, operating mode change (IW, IP, BW, BP units only), dynamic set-point (climatic control), scheduling and integrative heaters control.

If installed the hydronic kit these functions are enabled: antifreeze with pump, start-up cycle after prolonged inactivity (antisticking), if the hydronic kit installed has 2 pumps there is a cycling between each pump to ensure an equivalent lifetime,

Digital input functions: low pressure, high pressure, high temperature on compressor supply, phase presence and sequence monitoring device on power supply, differential water pressure control, compressors thermal protection, pumps thermal protection, ON / Stand-by remote and remote operating mode change, demand limit and Economy function,

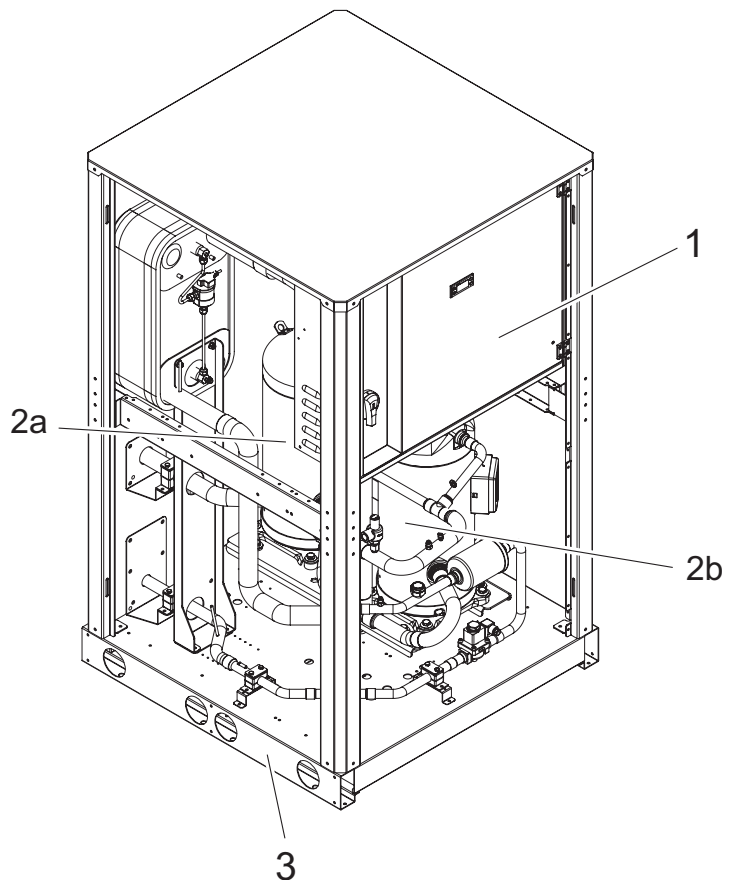
Digital output functions: compressor start-up, pump start-up, plate heat exchanger electrical heater, remote general alarm, 4-way valve (only IP, BP unit), integrative heaters.

Analogic input functions: in and out water temperature for plant and source sides, external air temperature probe (if present).

Analogic output functions: continuous control (0-10V) for 2 or 3 way valves (supplied as accessory too) or for inverter pumps for condensing control.

2. Compressors. They are the **SCROLL** type with orbiting coil equipped with built-in thermal protection. The AX unit includes: an acoustic jacket for the compressors. All units are equipped with two compressors connected in pairs (1 single refrigerant circuit) which can operate at the same time (**100% cooling capacity**) or individually (**50% of the cooling capacity**), thus adapting to the different thermal loads of the system.

3. Frame structure made of sheet metal with anticorrosion treatment and– as option- coated with epoxy powders (RAL 7035 to ensure maximum protection against adverse weather conditions).



The image refer to IR unit Mod. 90.2

GENERAL SPECIFICATIONS

4. Plant Exchanger made of brazed stainless steel plates (**AISI 316**). It is installed in a shell of heat-insulating material to prevent the formation of condensation and heat exchanges towards the outside. Standard supply also includes a differential pressure switch on the water circuit to avoid the risk of freezing if the water flow is shut off for some reason. It can be equipped with antifreeze heater.

Covering panels (for AS and AX units, or as accessory for AB unit), made of galvanized sheet metal, if painting option (VER) is selected the panels are provided coated with epoxidic powder paint (RAL 7035) to ensure maximum protection against adverse weather conditions.

5. Dehydrator filter. Mechanical type. Retains impurities and traces of moisture in the circuit. **Hermetic** type for models **70÷90**; **cartridge** type for models **105÷240**.

6. Water differential pressure switch. It is installed on the connections between the water inlet and outlet of the exchanger. It stops the unit if it activates.

7. Thermostatic expansion valve. With external equalizer, this feeds the evaporator correctly, keeping the selected superheat degree at a steady level.

Electronic Expansion valve (optional), feeds the evaporator correctly, keeping the selected superheat degree at a steady level; it guarantees an effective and quick response to the load modifications so increasing the efficiency at partial load.

8. Refrigerant Safety valve. Installed on the discharge pipe of the compressors, this operates if extreme faults should occur in the system.

9a. - 9b. Gas and Liquid shut-off valves. Allow that all the refrigerant can be pumped in the coil (remote condenser when it is connected to the condenserless unit) and then stored in order to carry out servicing work or to replace all the components of the refrigerant circuit without having to drain it.

10. liquid Solenoid Valve. It shuts off when both the compressors of the circuit switch off, preventing liquid refrigerant from flowing towards the evaporator during periods at a standstill.

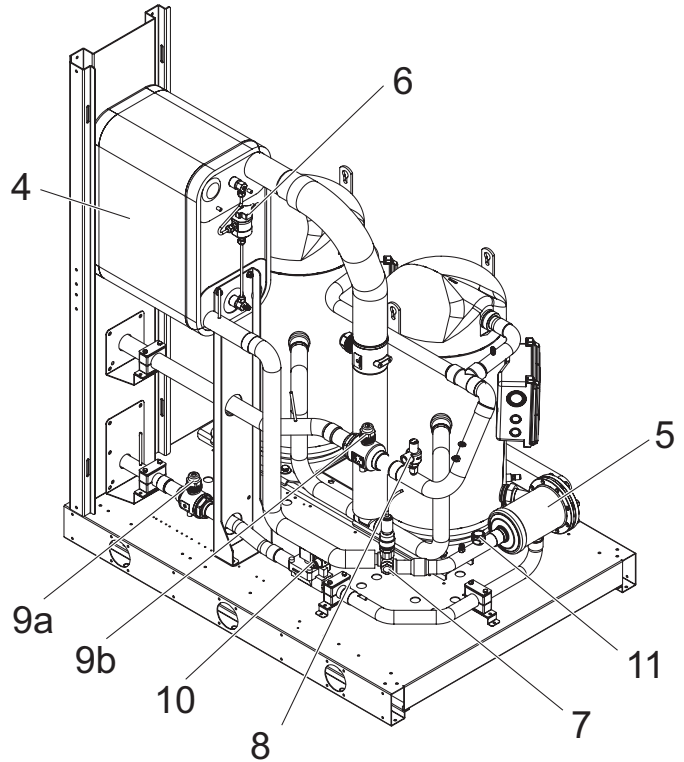
11. Liquid and moisture indicator. Signals if refrigerant is in liquid state so indicating that the refrigerant charge is correct. The indicator light also indicates the amount of moisture in the refrigerant by changing colour.

Low pressure switch. With fixed setting. It is installed on the suction pipe and blocks the compressors if the operating pressures drop below the tolerated values. Automatically resets as the pressure increases. If it activates frequently, the unit will block and can only be restarted by resetting via the user interface terminal.

High pressure switch (n°2). With fixed setting. Are installed on the discharge pipe and blocks the compressors if the operating pressure exceeds the tolerated values. If it activates, the unit will block and can only be restarted by resetting via the user interface terminal.

Pressure taps: 5/16 " SAE. Allow the operating pressure of the system to be measured: compressor discharge, expansion valve inlet, compressor suction.

Pressure taps: 1/4 " SAE (7/16" UNF) type with schraeder pin. Allow the charge/discharge of the refrigerant gas from the system.



The image refer to IR unit Mod. 90.2

ACCESSORIES AND OPTIONAL EQUIPMENT

RC (F) Remote Condensers. It is possible to supply several types of air cooled remote condensers following different project specification as for instance different noise levels (standard, low noise, eXtra low noise), coils with coated or copper fins, ecc. The remote condensers can be equipped with specific accessories as for instance sheet metal support for horizontal installation, electrical wiring box, electrical panel (CE marked), fans speed control by cut of phase for head pressure control.

Specific accessories for condenserless units

PAN - Covering panels (M) (accessory only for AB unit), made of galvanized sheet metal, if painting option (VER) is selected the panels are provided coated with epoxidic powder paint (RAL 7035) to ensure maximum protection against adverse weather conditions.

AVG - Rubber vibration dampers (F). Consisting of 4 rubber vibration dampers to fit under the unit. Reduce the transmission of the mechanical vibrations generated by the compressors and pumps during normal operation to the basement of the unit. The insulating degree of the vibration dampers is about 85-90%.

GM - Pressure gauge unit (M). Consisting of 2 pressure gauges that display the pressure values of the refrigerant on the suction and discharge of the compressors.

AV – Victaulic Connections (F) Consisting of 2 Victaulic-brackets and 2 pipe Victaulic-Welding.

CV – Victaulic Elbows (F) Consisting of 2 brackets and 2 elbows Victaulic-Victaulic.

VA – Water valves (F) Consisting of 2 brackets and 2 water valves Victaulic to shut-off the unit from the plant or from the source.

F – Victaulic Water Filter Y (F). Consisting of 1 bracket and 1 Victaulic water filter of “Y” shape. Can be turned on and off and inspected. It prevents that machining residues (dust, swarf, etc.) in the water pipes can enter into the plate-type heat exchanger.

FLS - Flow switch (F). Paddle flow switch on the water circuit to avoid the risk of freezing if the water flow is shut off for any reason. For a quick connection to the unit the accessory is completed with grooved pipe (on which install the flow switch) and victaulic bracket.

CR - Remote control (F). This can be used to select all the monitoring and display functions of the control unit on the machine at a maximum distance of 100 meters away. It must be installed by using a cable with three strands or three wires in **PVC** of the **N07-VK** type with a 1mm² section. The transmission line must be installed in a raceway separate from any electric powering wires (**230/400 V**). The control unit has the following buttons:



MODE key : used to select the operating mode

ON/OFF key : used to turn the unit ON/OFF and to reset the alarms

Mode + ON/OFF keys : used to access and quit the various menu levels

UP key : scrolls forwards through the menu items or increases the value of a parameter

Tasto DOWN: scrolls backwards through the menu items or decreases the value of a parameter.

KOP - Programmer clock (F). Allows the unit to be turned on and off depending on the programmed time setting (up to 14 switching actions can be programmed as required throughout the 7 days of the week).

TAT- High Temperature Thermostat (M). Two thermostats in series on compressors discharge pipes preserve operation not allowing temperature to rise up than a specified fixed value.

INT - Serial interface (M/F). Allows serial communication on RS485 via MODBUS protocol

CSF - Voltage monitor and sequence meter (M/F). The device enables control of the correct sequence of power phases and the lack of any phases. It also ensures that the unit works within $\pm 10\%$ the rated voltage (MIN=360 V - RATED=400V - MAX=440V). It blocks the unit if the voltage is outside the limits provided for the condensation pressure inside the correct operating limits.

KBT – Low temperature Kit (M). Consisting of antifreeze electrical heaters for plate heat exchangers and oil crankcase heaters for compressors. It is particularly suggested for outdoor installation or indoor installation in rooms that during winter can reach very low ambient temperature

RB- Compressors suction shut-off valve (M). Made by a ball valve installed on compressors suction: allows a quick replacement of the compressor in case of failure.

VER Framework and panels (if present) made by sheet metal with anticorrosion treatment painted RAL7035 with epoxy powders to ensure the maximum resistance to adverse weather conditions.

EEV (M) Electronic Expansion valve (standard for IP and BP units), feeds the evaporator correctly, keeping the selected superheat degree at a steady level; it guarantees an effective and quick response to the load modifications so increasing the efficiency at partial load.

SS - Soft Starter (M). Soft starter on compressors reduce the inrush current and reduce the vibrations transmitted to the pipes and basic frame during the start-up phase.

RIF - Capacitors for power factor corrections (M). Capacitors for power factor corrections increase power factor $\cos \phi$ (>0.91)

MTC - Magnetothermic switch (M). Magnetothermic switch on all loads in place of fuses.

NOTES: (M): only installed in the factory. **(F):** supplied for installation by the customer.

Other power source voltage rating (contact our technical department).

GENERAL TECHNICAL SPECIFICATION

General technical specifications

MODELS	70.2	80.2	90.2	105.2	120.2	135.2	150.2	170.2	190.2	215.2	240.2	UM
Power supply	400-3-50											V-ph-Hz
Refrigerant type	R410A											-
Compressor specifications												
Type / capacity control	SCROLL (ON-OFF)											-
Starting	Direct											-
Quantity	2											N°
Plant Exchanger												
Type	Aluminum fins and copper tubes											-
PS max. operating pressure	1000											kPa
Quantity	1											N°
Victaulic hydraulic connection	DN65	DN65	DN65	DN65	DN65	DN65	DN65	DN65	DN65	DN65	DN65	DN
Total water capacity	3.9	4.2	4.8	5.5	5.9	6.9	7.5	8.7	9.7	11.2	12.8	l

Electrical specifications

MODELS	70.2	80.2	90.2	105.2	120.2	135.2	150.2	170.2	190.2	215.2	240.2	UM
Total maximum load current [FLA]	45	51	62	68	74	82	90	105	120	142	164	A
Total maximum power input [FLI]	26	29	34	40	45	50	55	63	72	83	93	kW
Total maximum starting current [MIC]	141	166	204	256	262	309	317	355	370	454	476	A

NOMINAL performances - Standard plants

IR unit

MODELS	70.2	80.2	90.2	105.2	120.2	135.2	150.2	170.2	190.2	215.2	240.2	UM	
Cooling mode (plant temperature: water in 12°C out 7°C; condensing temperature = 50 °C - subcooling = 5K) PS= 43 bar													
Cooling capacity	61	68	81	92	103	116	130	149	168	190	210	kW	
Total power input	19.4	21.4	25.8	29.3	32.9	37.2	41.5	47.2	53.0	59.9	66.8	kW	
EER	3.15	3.18	3.14	3.13	3.13	3.12	3.13	3.15	3.17	3.17	3.15	W/W	
Plant side	Water flow rate	2.9	3.2	3.9	4.4	4.9	5.5	6.2	7.1	8.0	9.1	10.0	l/s
	Water pressure drop	36	28	31	31	34	32	35	35	37	37	38	kPa

The values are referred to units without options and accessories.

IR-IW UNIT PERFORMANCE

Mod. 70.2 ÷ 105.2

MOD.	TWE	Tc CONDENSING TEMPERATURE (°C)																		
		35			40			45			50			55			60			
		kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	
70.2	5	67.5	14.1	80.9	64.2	15.6	79.0	60.9	17.3	77.4	56.9	19.4	75.4	52.7	21.5	73.1	47.7	23.8	70.4	
	6	69.8	14.1	83.2	66.5	15.6	81.3	63.1	17.4	79.6	59.0	19.4	77.4	54.6	21.6	75.0	49.4	23.9	72.1	
	7	72.2	14.2	85.6	70.1	15.3	84.6	65.2	17.4	81.8	61.0	19.4	79.5	56.4	21.6	76.9	51.2	23.9	73.8	
	8	74.5	14.2	88.0	71.1	15.7	86.0	67.4	17.4	84.0	63.1	19.5	81.6	58.3	21.6	78.9	-	-	-	
	9	76.8	14.3	90.4	73.4	15.7	88.3	69.6	17.5	86.2	65.1	19.5	83.6	60.2	21.6	80.8	-	-	-	
	10	79.1	14.3	92.7	75.6	15.8	90.6	71.8	17.5	88.4	67.1	19.5	85.7	62.1	21.7	82.7	-	-	-	
	11	81.5	14.3	95.1	77.9	15.8	93.0	73.9	17.6	90.6	69.2	19.6	87.8	64.0	21.7	84.6	-	-	-	
	12	83.8	14.4	97.5	80.2	15.9	95.3	76.1	17.6	92.8	71.2	19.6	89.8	65.9	21.7	86.5	-	-	-	
	13	86.1	14.4	99.8	82.5	15.9	97.6	78.3	17.6	95.0	73.2	19.6	91.9	67.8	21.8	88.4	-	-	-	
	14	88.5	14.5	102.2	84.8	15.9	99.9	80.5	17.7	97.3	75.3	19.7	94.0	69.6	21.8	90.3	-	-	-	
	15	90.8	14.5	104.6	87.1	16.0	102.3	82.6	17.7	99.5	77.3	19.7	96.0	71.5	21.8	92.3	-	-	-	
	16	93.1	14.6	107.0	89.4	16.0	104.6	84.8	17.7	101.7	79.3	19.7	98.1	73.4	21.8	94.2	-	-	-	
	17	95.5	14.6	109.3	91.7	16.1	106.9	87.0	17.8	103.9	81.4	19.8	100.2	75.3	21.9	96.1	-	-	-	
	18	97.8	14.6	111.7	94.0	16.1	109.3	89.2	17.8	106.1	83.4	19.8	102.2	77.2	21.9	98.0	-	-	-	
	80.2	5	74.8	15.4	89.5	71.3	17.1	87.5	67.7	19.1	85.8	63.4	21.4	83.7	58.7	23.8	81.3	53.4	26.4	78.4
		6	77.3	15.4	92.0	73.7	17.1	90.0	70.1	19.1	88.2	65.7	21.4	86.0	60.9	23.8	83.6	55.4	26.4	80.5
		7	79.8	15.5	94.5	78.8	17.1	95.0	72.5	19.1	90.7	68.0	21.4	88.4	63.1	23.9	85.8	57.5	26.5	82.7
		8	82.3	15.5	97.1	78.7	17.2	95.1	74.9	19.2	93.1	70.3	21.5	90.7	65.3	23.9	88.0	-	-	-
9		84.8	15.6	99.6	81.2	17.3	97.6	77.3	19.2	95.6	72.6	21.5	93.1	67.5	23.9	90.3	-	-	-	
10		87.3	15.6	102.1	83.7	17.3	100.1	79.7	19.3	98.0	74.9	21.6	95.4	69.7	24.0	92.5	-	-	-	
11		89.8	15.7	104.7	86.1	17.4	102.6	82.1	19.3	100.4	77.2	21.6	97.7	71.9	24.0	94.7	-	-	-	
12		92.3	15.7	107.2	88.6	17.4	105.2	84.5	19.4	102.9	79.5	21.6	100.1	74.1	24.0	97.0	-	-	-	
13		94.8	15.8	109.8	91.1	17.4	107.7	86.9	19.4	105.3	81.8	21.7	102.4	76.3	24.1	99.2	-	-	-	
14		97.3	15.8	112.3	93.6	17.5	110.2	89.3	19.4	107.8	84.1	21.7	104.8	78.5	24.1	101.5	-	-	-	
15		99.7	15.9	114.8	96.1	17.5	112.7	91.7	19.5	110.2	86.4	21.8	107.1	80.7	24.1	103.7	-	-	-	
16		102.2	15.9	117.4	98.6	17.6	115.3	94.1	19.5	112.7	88.8	21.8	109.5	83.0	24.2	105.9	-	-	-	
17		104.7	16.0	119.9	101.0	17.6	117.8	96.5	19.6	115.1	91.1	21.8	111.8	85.2	24.2	108.2	-	-	-	
18		107.2	16.0	122.4	103.5	17.7	120.3	98.9	19.6	117.5	93.4	21.9	114.1	87.4	24.3	110.4	-	-	-	
90.2		5	88.6	18.4	106.1	84.5	20.5	104.0	80.5	22.9	102.2	75.6	25.7	100.0	70.3	28.7	97.6	64.2	31.9	94.5
		6	91.4	18.5	108.9	87.3	20.5	106.8	83.2	23.0	105.0	78.3	25.8	102.8	73.0	28.8	100.3	66.8	31.9	97.2
		7	94.1	18.5	111.7	92.7	20.8	112.5	86.0	23.0	107.9	81.0	25.8	105.6	75.7	28.8	103.0	69.5	32.0	99.9
		8	96.9	18.6	114.6	93.0	20.7	112.6	88.8	23.1	110.7	83.8	25.9	108.4	78.4	28.9	105.8	-	-	-
	9	99.7	18.6	117.4	95.8	20.7	115.4	91.6	23.1	113.5	86.5	25.9	111.2	81.0	28.9	108.5	-	-	-	
	10	102.5	18.7	120.2	98.6	20.8	118.3	94.3	23.2	116.4	89.2	26.0	113.9	83.7	28.9	111.2	-	-	-	
	11	105.3	18.8	123.1	101.4	20.8	121.2	97.1	23.2	119.2	92.0	26.0	116.7	86.4	29.0	114.0	-	-	-	
	12	108.0	18.8	125.9	104.2	20.9	124.0	99.9	23.3	122.0	94.7	26.1	119.5	89.1	29.0	116.7	-	-	-	
	13	110.8	18.9	128.7	107.0	20.9	126.9	102.7	23.3	124.8	97.4	26.1	122.3	91.8	29.1	119.4	-	-	-	
	14	113.6	18.9	131.6	109.8	21.0	129.8	105.4	23.4	127.7	100.2	26.2	125.1	94.5	29.1	122.2	-	-	-	
	15	116.4	19.0	134.4	112.6	21.0	132.6	108.2	23.4	130.5	102.9	26.2	127.8	97.2	29.2	124.9	-	-	-	
	16	119.2	19.0	137.2	115.5	21.1	135.5	111.0	23.5	133.3	105.6	26.3	130.6	99.8	29.2	127.6	-	-	-	
	17	121.9	19.1	140.1	118.3	21.1	138.4	113.8	23.6	136.2	108.4	26.4	133.4	102.5	29.3	130.4	-	-	-	
	18	124.7	19.2	142.9	121.1	21.2	141.2	116.5	23.6	139.0	111.1	26.4	136.2	105.2	29.3	133.1	-	-	-	
	105.2	5	100.7	21.2	120.8	95.9	23.4	118.2	91.2	26.1	116.0	85.5	29.1	113.1	79.3	32.3	110.0	72.2	35.8	106.2
		6	104.0	21.3	124.2	99.3	23.5	121.6	94.5	26.1	119.3	88.7	29.2	116.5	82.5	32.4	113.3	75.3	35.8	109.3
		7	107.3	21.4	127.6	105.8	23.7	128.3	97.8	26.2	122.7	92.0	29.3	119.8	85.7	32.5	116.5	78.4	35.9	112.5
		8	110.7	21.4	131.0	106.0	23.7	128.5	101.1	26.3	126.1	95.2	29.3	123.1	88.8	32.5	119.7	-	-	-
9		114.0	21.5	134.5	109.4	23.7	131.9	104.4	26.4	129.5	98.4	29.4	126.4	92.0	32.6	123.0	-	-	-	
10		117.3	21.6	137.9	112.7	23.8	135.4	107.7	26.4	132.8	101.7	29.5	129.7	95.1	32.7	126.2	-	-	-	
11		120.7	21.7	141.3	116.1	23.9	138.8	111.0	26.5	136.2	104.9	29.6	133.0	98.3	32.8	129.4	-	-	-	
12		124.0	21.7	144.7	119.5	24.0	142.2	114.3	26.6	139.6	108.2	29.6	136.3	101.5	32.8	132.7	-	-	-	
13		127.3	21.8	148.1	122.8	24.0	145.7	117.6	26.7	143.0	111.4	29.7	139.6	104.6	32.9	135.9	-	-	-	
14		130.7	21.9	151.5	126.2	24.1	149.1	120.9	26.7	146.3	114.6	29.8	142.9	107.8	33.0	139.1	-	-	-	
15		134.0	22.0	154.9	129.6	24.2	152.5	124.2	26.8	149.7	117.9	29.8	146.2	111.0	33.1	142.4	-	-	-	
16		137.4	22.0	158.3	132.9	24.3	156.0	127.5	26.9	153.1	121.1	29.9	149.5	114.1	33.1	145.6	-	-	-	
17		140.7	22.1	161.7	136.3	24.3	159.4	130.9	26.9	156.5	124.3	30.0	152.8	117.3	33.2	148.8	-	-	-	
18		144.0	22.2	165.1	139.6	24.4	162.8	134.2	27.0	159.8	127.6	30.1	156.1	120.5	33.3	152.1	-	-	-	

TWE= Plant exchanger (evaporator) outlet water temperature (°C)

Tc= Condensing temperature (°C) - Subcooling = 5K

kWf = Cooling capacity (kW).

kWa = Compressor power input (kW).

kWt = Heating capacity (kW).

The performances refer to a 5°C temperature difference between the water entering and leaving the heat exchanger. Has also been considered A 0.44 x 10⁻⁴ m² K/W fouling factor.

IR-IW UNIT PERFORMANCE

Mod. 120.2 ÷ 170.2

MOD.	TWE	Tc CONDENSING TEMPERATURE (°C)																		
		35			40			45			50			55			60			
		kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	
120.2	5	112.8	24.1	135.8	107.4	26.6	132.7	102.0	29.4	130.0	95.6	32.7	126.6	88.6	36.2	122.9	80.5	39.9	118.4	
	6	116.7	24.2	139.7	111.3	26.6	136.6	105.9	29.5	133.9	99.3	32.8	130.4	92.2	36.3	126.6	83.9	40.0	121.9	
	7	120.6	24.3	143.7	118.9	26.8	144.4	109.7	29.6	137.8	103.0	32.9	134.2	95.7	36.4	130.3	87.4	40.1	125.5	
	8	124.5	24.4	147.7	119.1	26.8	144.6	113.5	29.7	141.7	106.7	33.0	138.0	99.3	36.5	134.0	-	-	-	
	9	128.4	24.5	151.6	123.1	26.9	148.6	117.3	29.8	145.6	110.4	33.1	141.8	102.9	36.6	137.7	-	-	-	
	10	132.3	24.6	155.6	127.0	27.0	152.6	121.1	29.8	149.5	114.1	33.2	145.6	106.5	36.7	141.4	-	-	-	
	11	136.2	24.6	159.6	130.9	27.1	156.6	124.9	29.9	153.4	117.8	33.3	149.4	110.1	36.7	145.0	-	-	-	
	12	140.1	24.7	163.6	134.8	27.2	160.6	128.8	30.0	157.3	121.5	33.3	153.2	113.7	36.8	148.7	-	-	-	
	13	144.0	24.8	167.5	138.7	27.2	164.6	132.6	30.1	161.2	125.3	33.4	157.0	117.3	36.9	152.4	-	-	-	
	14	147.9	24.9	171.5	142.6	27.3	168.5	136.4	30.2	165.1	129.0	33.5	160.8	120.9	37.0	156.1	-	-	-	
	15	151.8	25.0	175.5	146.5	27.4	172.5	140.2	30.3	169.0	132.7	33.6	164.6	124.5	37.1	159.8	-	-	-	
	16	155.7	25.0	179.5	150.4	27.5	176.5	144.0	30.4	172.9	136.4	33.7	168.4	128.1	37.2	163.5	-	-	-	
	17	159.6	25.1	183.4	154.3	27.6	180.5	147.8	30.5	176.8	140.1	33.8	172.2	131.7	37.3	167.2	-	-	-	
	18	163.5	25.2	187.4	158.2	27.7	184.5	151.7	30.5	180.7	143.8	33.9	176.0	135.3	37.4	170.8	-	-	-	
	135.2	5	127.1	27.4	153.1	121.1	30.1	149.7	115.1	33.3	146.8	108.0	37.0	143.1	100.2	40.9	139.1	91.3	45.1	134.1
		6	131.5	27.5	157.5	125.5	30.2	154.1	119.4	33.4	151.1	112.0	37.1	147.2	104.1	41.0	143.0	94.9	45.2	137.8
		7	135.8	27.5	162.0	133.8	30.4	162.7	123.6	33.5	155.3	116.0	37.2	151.4	107.9	41.1	146.9	98.5	45.3	141.5
		8	140.2	27.6	166.4	134.2	30.4	163.0	127.8	33.6	159.6	120.1	37.3	155.5	111.7	41.2	150.9	-	-	-
9		144.6	27.7	170.9	138.5	30.4	167.4	132.0	33.6	163.9	124.1	37.4	159.6	115.6	41.3	154.8	-	-	-	
10		148.9	27.8	175.4	142.8	30.5	171.9	136.2	33.7	168.2	128.1	37.4	163.7	119.4	41.4	158.7	-	-	-	
11		153.3	27.9	179.8	147.2	30.6	176.3	140.4	33.8	172.5	132.2	37.5	167.8	123.3	41.4	162.6	-	-	-	
12		157.7	28.0	184.3	151.5	30.7	180.7	144.6	33.9	176.8	136.2	37.6	171.9	127.1	41.5	166.6	-	-	-	
13		162.0	28.1	188.7	155.9	30.8	185.1	148.8	34.0	181.1	140.2	37.7	176.0	131.0	41.6	170.5	-	-	-	
14		166.4	28.2	193.2	160.2	30.9	189.6	153.0	34.1	185.3	144.2	37.8	180.2	134.8	41.7	174.4	-	-	-	
15		170.8	28.3	197.6	164.6	31.0	194.0	157.2	34.2	189.6	148.3	37.9	184.3	138.6	41.8	178.4	-	-	-	
16		175.2	28.3	202.1	168.9	31.1	198.4	161.4	34.3	193.9	152.3	38.0	188.4	142.5	41.9	182.3	-	-	-	
17		179.5	28.4	206.5	173.3	31.2	202.9	165.6	34.4	198.2	156.3	38.1	192.5	146.3	42.0	186.2	-	-	-	
18		183.9	28.5	211.0	177.6	31.2	207.3	169.8	34.4	202.5	160.4	38.2	196.6	150.2	42.1	190.1	-	-	-	
150.2		5	142.6	30.7	171.7	135.9	33.7	167.9	129.3	37.2	164.6	121.3	41.3	160.6	112.7	45.6	156.0	102.7	50.3	150.5
		6	147.4	30.8	176.7	140.7	33.8	172.8	133.9	37.3	169.3	125.7	41.4	165.0	116.8	45.7	160.2	106.6	50.3	154.4
		7	152.2	31.0	181.6	149.8	33.9	182.0	138.5	37.4	174.0	130.0	41.5	169.5	120.9	45.8	164.4	110.4	50.4	158.3
		8	157.1	31.1	186.6	150.3	34.1	182.6	143.1	37.6	178.7	134.4	41.6	174.0	125.1	45.9	168.7	-	-	-
	9	161.9	31.2	191.5	155.1	34.2	187.5	147.7	37.7	183.4	138.8	41.7	178.4	129.2	46.0	172.9	-	-	-	
	10	166.7	31.3	196.5	159.8	34.3	192.4	152.3	37.8	188.1	143.2	41.8	182.9	133.3	46.1	177.1	-	-	-	
	11	171.6	31.4	201.4	164.6	34.4	197.3	156.9	37.9	192.8	147.5	41.9	187.4	137.4	46.2	181.3	-	-	-	
	12	176.4	31.5	206.3	169.4	34.5	202.2	161.5	38.0	197.5	151.9	42.0	191.8	141.6	46.3	185.5	-	-	-	
	13	181.2	31.6	211.3	174.2	34.6	207.1	166.1	38.1	202.2	156.3	42.1	196.3	145.7	46.4	189.7	-	-	-	
	14	186.1	31.8	216.2	179.0	34.7	212.0	170.7	38.2	206.9	160.7	42.2	200.8	149.8	46.5	194.0	-	-	-	
	15	190.9	31.9	221.2	183.8	34.8	216.8	175.3	38.3	211.6	165.0	42.3	205.2	154.0	46.5	198.2	-	-	-	
	16	195.7	32.0	226.1	188.6	34.9	221.7	179.8	38.4	216.3	169.4	42.4	209.7	158.1	46.6	202.4	-	-	-	
	17	200.6	32.1	231.1	193.3	35.0	226.6	184.4	38.5	221.0	173.8	42.5	214.2	162.2	46.7	206.6	-	-	-	
	18	205.4	32.2	236.0	198.1	35.1	231.5	189.0	38.6	225.7	178.1	42.6	218.6	166.3	46.8	210.8	-	-	-	
	170.2	5	163.1	35.0	196.3	155.5	38.4	192.0	148.0	42.4	188.2	138.9	47.0	183.6	129.1	51.9	178.4	117.8	57.1	172.1
		6	168.6	35.1	202.0	161.0	38.5	197.6	153.3	42.5	193.6	144.0	47.1	188.7	133.9	52.0	183.3	122.3	57.3	176.7
		7	174.2	35.2	207.7	171.7	38.5	208.3	158.6	42.6	199.1	149.0	47.2	193.9	138.7	52.1	188.2	126.7	57.4	181.2
		8	179.8	35.3	213.3	172.1	38.7	208.9	163.9	42.7	204.5	154.1	47.4	199.1	143.5	52.2	193.1	-	-	-
9		185.3	35.5	219.0	177.6	38.9	214.5	169.2	42.8	209.9	159.1	47.5	204.2	148.2	52.4	198.0	-	-	-	
10		190.9	35.6	224.7	183.1	39.0	220.1	174.5	43.0	215.3	164.2	47.6	209.4	153.0	52.5	202.9	-	-	-	
11		196.5	35.7	230.4	188.6	39.1	225.8	179.8	43.1	220.7	169.2	47.7	214.6	157.8	52.6	207.8	-	-	-	
12		202.1	35.8	236.1	194.1	39.2	231.4	185.1	43.2	226.2	174.3	47.8	219.7	162.6	52.7	212.6	-	-	-	
13		207.6	36.0	241.8	199.7	39.3	237.0	190.4	43.3	231.6	179.4	48.0	224.9	167.4	52.8	217.5	-	-	-	
14		213.2	36.1	247.5	205.2	39.5	242.7	195.7	43.4	237.0	184.4	48.1	230.1	172.1	52.9	222.4	-	-	-	
15		218.8	36.2	253.2	210.7	39.6	248.3	201.0	43.6	242.4	189.5	48.2	235.2	176.9	53.0	227.3	-	-	-	
16		224.3	36.3	258.8	216.2	39.7	253.9	206.4	43.7	247.9	194.5	48.3	240.4	181.7	53.2	232.2	-	-	-	
17		229.9	36.4	264.5	221.7	39.8	259.6	211.7	43.8	253.3	199.6	48.4	245.6	186.5	53.3	237.1	-	-	-	
18		235.5	36.6	270.2	227.3	40.0	265.2	217.0	43.9	258.7	204.6	48.5	250.7	191.2	53.4	242.0	-	-	-	

TWE= Plant exchanger (evaporator) outlet water temperature (°C)

Tc= Condensing temperature (°C) - Subcooling = 5K

kWf = Cooling capacity (kW).

kWa = Compressor power input (kW).

kWt = Heating capacity (kW).

The performances refer to a 5°C temperature difference between the water entering and leaving the heat exchanger. Has also been considered A 0.44 x 10⁻⁴ m² K/W fouling factor.

IR-IW UNIT PERFORMANCE

Mod. 190.2 ÷ 240.2

MOD.	TWE	Tc CONDENSING TEMPERATURE (°C)																		
		35			40			45			50			55			60			
		kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	
190.2	5	183.6	39.2	220.8	175.1	43.0	216.0	166.6	47.5	211.8	156.5	52.7	206.6	145.5	58.2	200.8	132.8	64.1	193.7	
	6	190.0	39.3	227.3	181.4	43.1	222.4	172.7	47.6	217.9	162.2	52.9	212.5	150.9	58.4	206.4	137.9	64.3	198.9	
	7	196.3	39.4	233.8	193.8	43.2	234.8	178.8	47.8	224.1	168.0	53.0	218.4	156.4	58.5	211.9	142.9	64.4	204.1	
	8	202.7	39.6	240.3	194.0	43.4	235.3	184.8	47.9	230.3	173.8	53.1	224.3	161.8	58.6	217.5	-	-	-	
	9	209.1	39.7	246.8	200.3	43.5	241.7	190.9	48.0	236.5	179.5	53.3	230.1	167.3	58.8	223.1	-	-	-	
	10	215.4	39.8	253.3	206.6	43.7	248.1	196.9	48.2	242.7	185.3	53.4	236.0	172.7	58.9	228.7	-	-	-	
	11	221.8	40.0	259.8	212.9	43.8	254.6	203.0	48.3	248.9	191.1	53.5	241.9	178.1	59.1	234.2	-	-	-	
	12	228.2	40.1	266.3	219.3	43.9	261.0	209.1	48.4	255.1	196.8	53.7	247.8	183.6	59.2	239.8	-	-	-	
	13	234.6	40.2	272.8	225.6	44.1	267.4	215.1	48.6	261.3	202.6	53.8	253.7	189.0	59.3	245.4	-	-	-	
	14	240.9	40.4	279.3	231.9	44.2	273.8	221.2	48.7	267.5	208.4	54.0	259.6	194.5	59.5	251.0	-	-	-	
	15	247.3	40.5	285.8	238.2	44.3	280.3	227.2	48.8	273.6	214.1	54.1	265.5	199.9	59.6	256.5	-	-	-	
	16	253.7	40.6	292.3	244.5	44.5	286.7	233.3	49.0	279.8	219.9	54.2	271.4	205.4	59.8	262.1	-	-	-	
	17	260.1	40.8	298.8	250.8	44.6	293.1	239.4	49.1	286.0	225.6	54.4	277.3	210.8	59.9	267.7	-	-	-	
	18	266.4	40.9	305.3	257.1	44.7	299.6	245.4	49.3	292.2	231.4	54.5	283.2	216.2	60.0	273.3	-	-	-	
	215.2	5	207.7	44.1	249.6	198.1	48.5	244.2	188.5	53.6	239.5	177.0	59.6	233.7	164.5	65.9	227.2	150.2	72.7	219.2
		6	214.9	44.3	256.9	205.2	48.7	251.4	195.3	53.8	246.4	183.5	59.8	240.3	170.7	66.1	233.4	155.9	72.8	225.1
		7	222.0	44.4	264.2	219.0	49.4	265.9	202.1	54.0	253.4	190.0	59.9	246.9	176.8	66.2	239.7	161.6	73.0	230.9
		8	229.2	44.6	271.5	219.4	49.0	265.9	209.0	54.1	260.4	196.5	60.1	253.5	182.9	66.4	246.0	-	-	-
9		236.3	44.8	278.8	226.4	49.1	273.1	215.8	54.3	267.3	202.9	60.2	260.2	189.0	66.5	252.2	-	-	-	
10		243.5	44.9	286.1	233.5	49.3	280.3	222.6	54.4	274.3	209.4	60.4	266.8	195.2	66.7	258.5	-	-	-	
11		250.6	45.1	293.4	240.6	49.4	287.6	229.4	54.6	281.2	215.9	60.5	273.4	201.3	66.8	264.8	-	-	-	
12		257.8	45.2	300.7	247.7	49.6	294.8	236.2	54.7	288.2	222.4	60.7	280.0	207.4	67.0	271.0	-	-	-	
13		264.9	45.4	308.0	254.8	49.7	302.0	243.0	54.9	295.1	228.8	60.9	286.7	213.5	67.1	277.3	-	-	-	
14		272.1	45.5	315.4	261.9	49.9	309.3	249.8	55.0	302.1	235.3	61.0	293.3	219.7	67.3	283.6	-	-	-	
15		279.2	45.7	322.7	268.9	50.1	316.5	256.6	55.2	309.0	241.8	61.2	299.9	225.8	67.4	289.8	-	-	-	
16		286.4	45.8	330.0	276.0	50.2	323.7	263.4	55.3	316.0	248.3	61.3	306.5	231.9	67.6	296.1	-	-	-	
17		293.6	46.0	337.3	283.1	50.4	331.0	270.2	55.5	323.0	254.8	61.5	313.2	238.0	67.8	302.4	-	-	-	
18		300.7	46.2	344.6	290.2	50.5	338.2	277.0	55.7	329.9	261.2	61.6	319.8	244.1	67.9	308.7	-	-	-	
240.2		5	229.3	49.0	275.9	218.8	53.9	270.0	208.3	59.7	265.0	195.6	66.5	258.8	182.0	73.6	251.9	166.2	81.2	243.3
		6	237.2	49.2	284.0	226.6	54.1	278.0	215.8	59.9	272.7	202.8	66.7	266.1	188.7	73.8	258.8	172.5	81.4	249.8
		7	245.1	49.4	292.0	240.8	55.6	293.6	223.3	60.1	280.4	210.0	66.8	273.5	195.5	73.9	265.7	178.8	81.6	256.3
		8	253.1	49.5	300.1	242.3	54.5	294.0	230.9	60.3	288.1	217.1	67.0	280.8	202.3	74.1	272.7	-	-	-
	9	261.0	49.7	308.2	250.1	54.6	302.0	238.4	60.4	295.8	224.3	67.2	288.1	209.0	74.3	279.6	-	-	-	
	10	268.9	49.9	316.3	258.0	54.8	310.0	245.9	60.6	303.5	231.4	67.4	295.5	215.8	74.5	286.5	-	-	-	
	11	276.8	50.0	324.4	265.8	55.0	318.0	253.4	60.8	311.2	238.6	67.6	302.8	222.5	74.7	293.5	-	-	-	
	12	284.7	50.2	332.4	273.6	55.2	326.0	261.0	61.0	318.9	245.8	67.7	310.1	229.3	74.8	300.4	-	-	-	
	13	292.7	50.4	340.5	281.5	55.3	334.0	268.5	61.1	326.6	252.9	67.9	317.4	236.1	75.0	307.3	-	-	-	
	14	300.6	50.6	348.6	289.3	55.5	342.0	276.0	61.3	334.3	260.1	68.1	324.8	242.8	75.2	314.3	-	-	-	
	15	308.5	50.7	356.7	297.1	55.7	350.0	283.6	61.5	342.0	267.3	68.3	332.1	249.6	75.4	321.2	-	-	-	
	16	316.4	50.9	364.8	305.0	55.8	358.0	291.1	61.7	349.7	274.4	68.4	339.4	256.4	75.6	328.1	-	-	-	
	17	324.3	51.1	372.8	312.8	56.0	366.0	298.6	61.8	357.4	281.6	68.6	346.8	263.1	75.7	335.1	-	-	-	
	18	332.2	51.2	380.9	320.6	56.2	374.0	306.1	62.0	365.1	288.7	68.8	354.1	269.9	75.9	342.0	-	-	-	

TWE= Plant exchanger (evaporator) outlet water temperature (°C)

Tc= Condensing temperature (°C) - Subcooling = 5K

kWf = Cooling capacity (kW).

kWa = Compressor power input (kW).

kWt = Heating capacity (kW).

The performances refer to a 5°C temperature difference between the water entering and leaving the heat exchanger. Has also been considered A 0.44 x 10⁻⁴ m² K/W fouling factor.

CORRECTION FACTOR

Correction factor for the use of glycol in cooling mode

ETHYLENE GLYCOL with water produced between $5 \div 20$ ° C.

Percentage Of glycol in mass / volume [%]	0 / 0	10 / 8.9	20 / 18.1	30 / 27.7	40 / 37.5
Freezing point [°C]	0	-3.2	-8	-14	-22
CCPF - Cooling capacity correction factor	1	0.99	0.98	0.97	0.95
CCPA - Power input correction factor	1	1	0.99	0.99	0.98
CCQA - Water flow rate correction factor	1	1.04	1.08	1.12	1.16
CCDP - Water pressure drop correction factor	1	1.08	1.16	1.25	1.35

PROPYLENE GLYCOL with water produced between $5 \div 20$ ° C.

Percentage Of glycol in mass / volume [%]	0 / 0	10 / 9.6	20 / 19.4	30 / 29.4	40 / 39.6
Freezing point [°C]	0	-3.3	-7	-13	-21
CCPF - Cooling capacity correction factor	1	0.98	0.96	0.94	0.92
CCPA - Power input correction factor	1	0.99	0.98	0.95	0.93
CCQA - Water flow rate correction factor	1	1.01	1.03	1.06	1.09
CCDP - Water pressure drop correction factor	1	1.05	1.11	1.22	1.38

Basing on design condensing temperature and leaving water temperature of the plant exchanger (evaporator) (DESIGN CONDITIONS) from the table "performances" extract Cooling Capacity (kWf) and Compressors Power Input (kW_a).

Based on type and percentage of glycol extract CCPF, CCPA, CCQA, CCDP.

Then calculate.

$$Pf_{brine} = kWf \times CCPF$$

$$Pass_{CP_{brine}} = kW_a \times CCPA$$

Then calculate brine flow rate of the plant exchanger (evaporator):

$$Q_{brine} [l/s] = CCQA \times (Pf_{brine} [kW]) \times 0.86 / \Delta T_{brine} / 3.6$$

where ΔT_{brine} is the difference inlet-outlet plant exchanger (evaporator) water temperature:

$$\Delta T_{brine} = T_{win_{brine}} - T_{wout_{brine}}$$

With this brine flow rate enter in abscissa on the water pressure drop of the plant exchanger (evaporator) then you have Δp_{app} .

Finally you can calculate the actual pressure drop of the brine on plant exchanger (evaporator) side:

$$\Delta p_{brine} = CCDP \times \Delta p_{app}$$

Fouling factors

The performances supplied with the tables are referred to a fouling factory = 0.44×10^{-4} m² K/W . For different values of the fouling factory, use the reduction coefficients reported in the following table.

Fouling factory		Evaporator	
		F.c. PF	F.c. PA
(m ² K / W)	0.44×10^{-4}	1	1
(m ² K / W)	0.86×10^{-4}	0.98	0.99
(m ² K / W)	1.72×10^{-4}	0.93	0.98

F.c. PF: Correction Factor for Cooling capacity

F.c. PA: Correction Factor for compressor power Input

BRINE UNIT BR

Brine Unit (BR)

Correction factors to apply to the basic version data

ETHYLENE GLYCOL

Percentage Of glycol in mass / volume [%]	20 / 18.1						
Freezing point [°C]	-8						
Leaving water temperature	4	2	0	-2	-4	-6	-8
CCPF - Cooling capacity correction factor	0.912	0.855	0.798	0.738	0.683	-	-
CCPA - Compressor power input correction factor	0.967	0.957	0.947	0.927	0.897	-	-
CCQA - Water flow rate correction factor	1.071	1.072	1.073	1.075	1.076	-	-
CCDP - Water pressure drop correction factor	1.090	1.095	1.100	1.110	1.120	-	-

Percentage Of glycol in mass / volume [%]	30 / 27.7						
Freezing point [°C]	-14						
Leaving water temperature	4	2	0	-2	-4	-6	-8
CCPF - Cooling capacity correction factor	0.899	0.842	0.785	0.725	0.670	0.613	0.562
CCPA - Compressor power input correction factor	0.960	0.950	0.940	0.920	0.890	0.870	0.840
CCQA - Water flow rate correction factor	1.106	1.107	1.108	1.109	1.110	1.111	1.112
CCDP - Water pressure drop correction factor	1.140	1.145	1.150	1.155	1.160	1.175	1.190

Percentage Of glycol in mass / volume [%]	40 / 37.5						
Freezing point [°C]	-22						
Leaving water temperature	4	2	0	-2	-4	-6	-8
CCPF - Cooling capacity correction factor	0.884	0.827	0.770	0.710	0.655	0.598	0.547
CCPA - Compressor power input correction factor	0.880	0.870	0.860	0.840	0.810	0.790	0.760
CCQA - Water flow rate correction factor	1.150	1.151	1.153	1.154	1.155	1.157	1.158
CCDP - Water pressure drop correction factor	1.190	1.195	1.200	1.210	1.220	1.235	1.250

PROPYLENE GLYCOL

Percentage Of glycol in mass / volume [%]	20 / 19.4						
Freezing point [°C]	-8						
Leaving water temperature	4	2	0	-2	-4	-6	-8
CCPF - Cooling capacity correction factor	0.874	0.807	0.740	0.690	0.641	-	-
CCPA - Compressor power input correction factor	0.945	0.935	0.925	0.900	0.875	-	-
CCQA - Water flow rate correction factor	1.037	1.038	1.039	1.039	1.040	-	-
CCDP - Water pressure drop correction factor	1.110	1.115	1.120	1.130	1.140	-	-

Percentage Of glycol in mass / volume [%]	30 / 29.4						
Freezing point [°C]	-14						
Leaving water temperature	4	2	0	-2	-4	-6	-8
CCPF - Cooling capacity correction factor	0.869	0.799	0.729	0.680	0.630	0.583	0.536
CCPA - Compressor power input correction factor	0.935	0.923	0.910	0.888	0.865	0.838	0.810
CCQA - Water flow rate correction factor	1.072	1.071	1.070	1.069	1.069	1.068	1.067
CCDP - Water pressure drop correction factor	1.160	1.175	1.190	1.200	1.210	1.255	1.300

Percentage Of glycol in mass / volume [%]	40 / 39.6						
Freezing point [°C]	-22						
Leaving water temperature	4	2	0	-2	-4	-6	-8
CCPF - Cooling capacity correction factor	0.848	0.784	0.719	0.670	0.620	0.570	0.520
CCPA - Compressor power input correction factor	0.865	0.855	0.845	0.820	0.795	0.773	0.750
CCQA - Water flow rate correction factor	1.116	1.114	1.112	1.110	1.108	1.107	1.105
CCDP - Water pressure drop correction factor	1.230	1.275	1.320	1.375	1.430	1.500	1.570

Basing on design condensing temperature and with leaving water temperature of the plant exchanger (evaporator) = 7°C from the table "performances" extract Cooling Capacity (kWf) and Compressors Power Input (kW_a).

Based on type and percentage of glycol extract CCPF, CCPA, CCQA, CCDP.

Then calculate.

$$Pf_{brine} = kWf \times CCPF$$

$$Pass_{CP_{brine}} = kW_a \times CCPA$$

Then calculate brine flow rate:

$$Q_{brine} [l/s] = CCQA \times (Pf_{brine} [kW] \times 0.86 / \Delta T_{brine}) / 3.6$$

where ΔT_{brine} is the difference between inlet-outlet plant exchanger (evaporator) water temperature:

$$\Delta T_{brine} = T_{win_{brine}} - T_{wout_{brine}}$$

With this brine flow rate enter in abscissa on the water pressure drop of the plant exchanger (evaporator) then you have Dp_{app} .

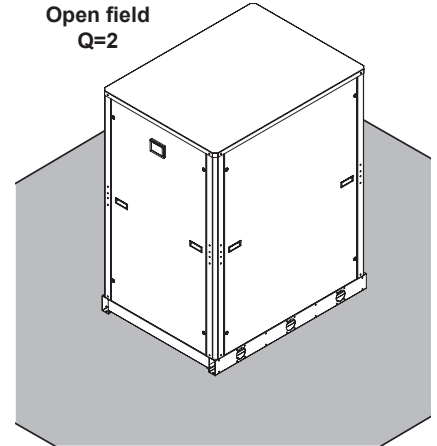
Finally you can calculate the actual pressure drop of the brine on plant exchanger (evaporator) side:

$$Dp_{brine} = CCDP \times Dp_{app}$$

NOISE LEVEL

The noise levels refer to units operating in the nominal conditions (water temperature: inlet: 12°C - outlet: 7°C, Condenser water temperature: inlet: 30°C - outlet: 35°C).
The acoustic pressure levels are measured 1/ 5 / 10 meters away from the outer surface of the unit operating in the free field and resting on a reflecting surface (directional factor of 2).

Open field
Q=2



SWL = Sound power levels, with reference to 1×10^{-12} W.

The Total sound power level in dB(A) measured in compliance with ISO 9614 standards, which is therefore the only binding acoustic specification (the values of the Octave bands in the table are indicative).

SPL = Sound pressure levels, with reference to 2×10^{-5} Pa.

The sound pressure levels are values calculated by applying the **ISO-3744 relation (Eurovent 8/1)** and refer to a distance of 1 meter away from the external surface of units operating in the open field with directivity factor 2 (Q=2) and the units operating in nominal conditions in the cooling mode.

AB Standard unit

MOD.	SWL (dB)									SPL [dB(A)]			
	Octave bands (Hz)								Total		1 m	5 m	10 m
	63	125	250	500	1000	2000	4000	8000	dB	dB(A)			
70.2	76	74	71	72	72	65	61	55	80.6	75	59	49	44
80.2	76	74	75	74	70	68	64	53	81.5	76	60	50	45
90.2	77	75	76	75	71	69	65	54	82.5	77	61	51	46
105.2	77	75	76	75	71	69	65	54	82.5	77	61	51	46
120.2	77	75	76	75	71	69	65	54	82.5	77	61	51	46
135.2	78	76	77	76	72	70	66	55	83.5	78	62	52	47
150.2	78	76	77	76	72	70	66	55	83.5	78	62	52	47
170.2	79	77	78	77	73	71	67	56	84.5	79	63	53	48
190.2	79	77	78	77	73	71	67	56	84.5	79	63	53	48
215.2	80	78	79	78	74	72	68	57	85.5	80	64	54	49
240.2	80	78	79	78	74	72	68	57	85.5	80	64	54	49

AS Low noise unit

MOD.	SWL (dB)									SPL [dB(A)]			
	Octave bands (Hz)								Total		1 m	5 m	10 m
	63	125	250	500	1000	2000	4000	8000	dB	dB(A)			
70.2	72	70	67	68	68	61	57	51	76.6	71	55	45	40
80.2	72	70	71	70	66	64	60	49	77.5	72	56	46	41
90.2	73	71	72	71	67	65	61	50	78.5	73	57	47	42
105.2	73	71	72	71	67	65	61	50	78.5	73	57	47	42
120.2	73	71	72	71	67	65	61	50	78.5	73	57	47	42
135.2	74	72	73	72	68	66	62	51	79.5	74	58	48	43
150.2	74	72	73	72	68	66	62	51	79.5	74	58	48	43
170.2	75	73	74	73	69	67	63	52	80.5	75	59	49	44
190.2	75	73	74	73	69	67	63	52	80.5	75	59	49	44
215.2	76	74	75	74	70	68	64	53	81.5	76	60	50	45
240.2	76	74	75	74	70	68	64	53	81.5	76	60	50	45

AX Extra low noise unit

MOD.	SWL (dB)									SPL [dB(A)]			
	Octave bands (Hz)								Total		1 m	5 m	10 m
	63	125	250	500	1000	2000	4000	8000	dB	dB(A)			
70.2	68	66	63	64	64	57	53	47	72.6	67	51	41	36
80.2	68	66	67	66	62	60	56	45	73.5	68	52	42	37
90.2	69	67	68	67	63	61	57	46	74.5	69	53	43	38
105.2	69	67	68	67	63	61	57	46	74.5	69	53	43	38
120.2	69	67	68	67	63	61	57	46	74.5	69	53	43	38
135.2	70	68	69	68	64	62	58	47	75.5	70	54	44	39
150.2	70	68	69	68	64	62	58	47	75.5	70	54	44	39
170.2	71	69	70	69	65	63	59	48	76.5	71	55	45	40
190.2	71	69	70	69	65	63	59	48	76.5	71	55	45	40
215.2	72	70	71	70	66	64	60	49	77.5	72	56	46	41
240.2	72	70	71	70	66	64	60	49	77.5	72	56	46	41

OPERATING RANGE

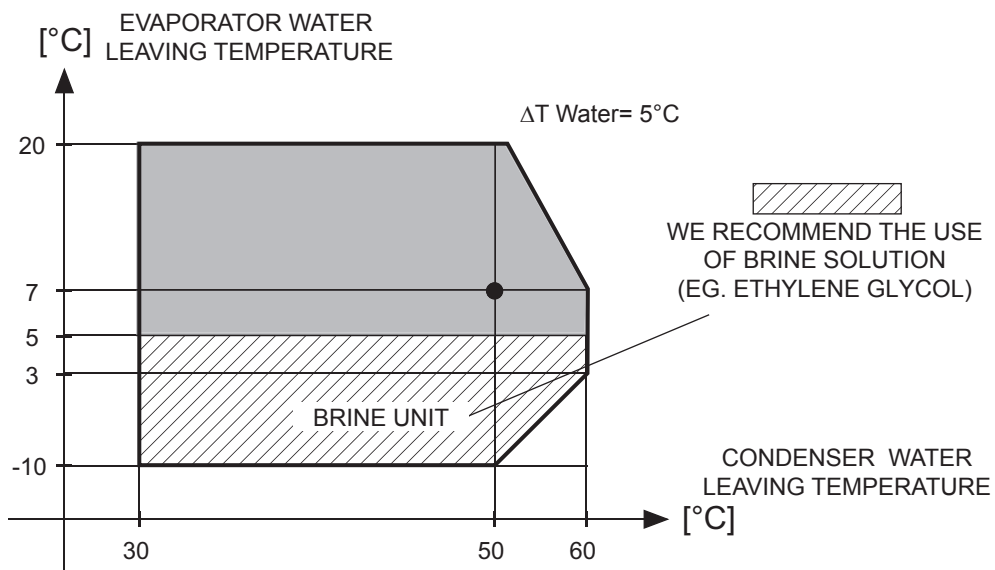
Operating range

The graph indicates the admissible working envelope of the unit.
 The use of the unit in conditions outside the envelope will avoid the warranty.
 Here under are reported the limits of water differential temperature for the heat exchangers of the unit.

Operating range standard unit AB

Water thermal gradient		Limit value
		Plant exchanger
Minimum	°C	3
Maximum	°C	10
Verify that water flow rate is inside the admissible limits.		

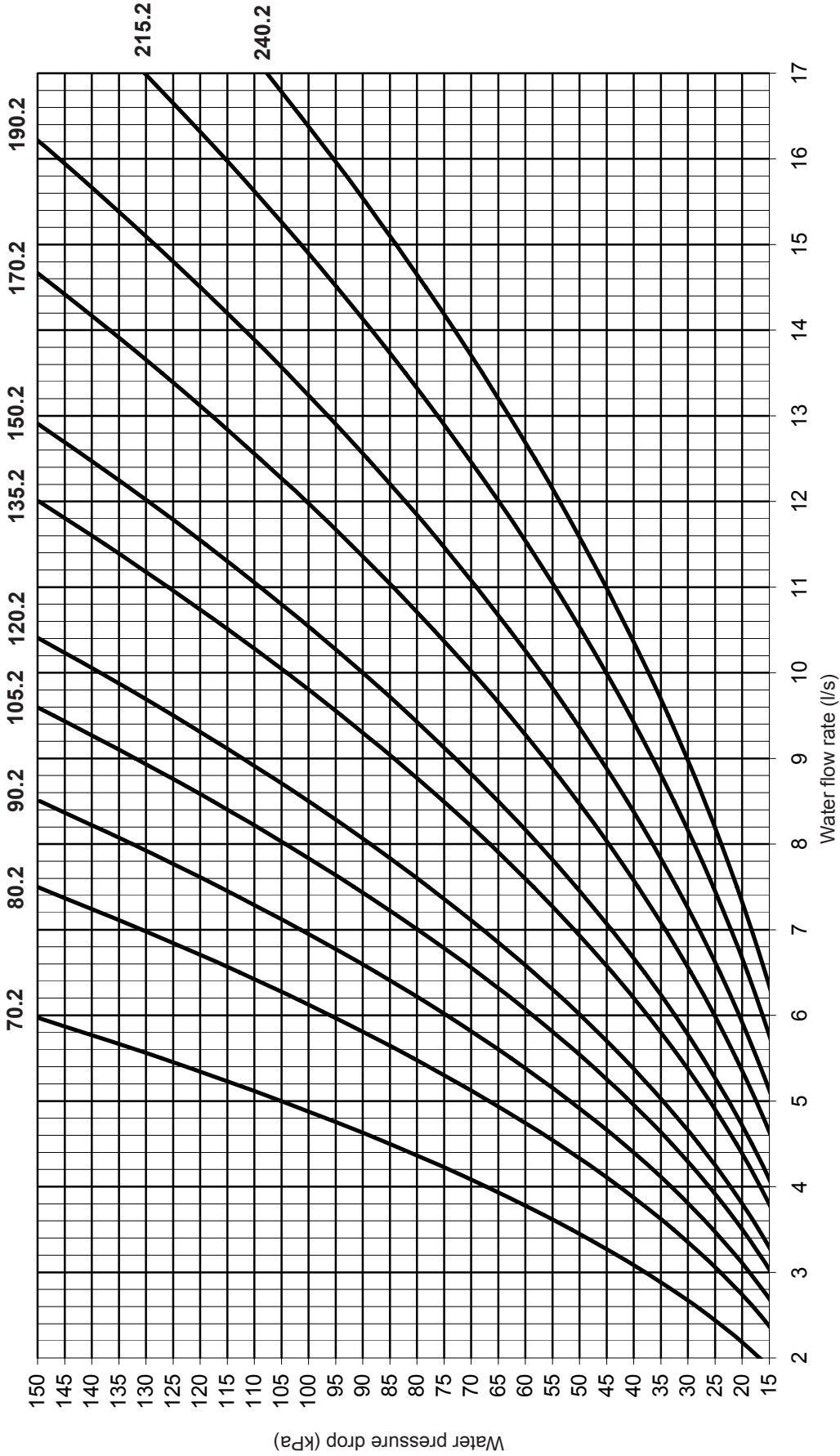
NOTE: the admissible limits for water flow rate on heat exchangers are indicated under the related pressure drop graph (see section "water pressure drop").



WATER PRESSURE DROP

Plant exchanger

The graph below illustrates for the plant exchanger the water pressure drop values in kPa depending on the flow rate in liters/second. The operating range is delimited by the minimum and maximum values given in the next table.



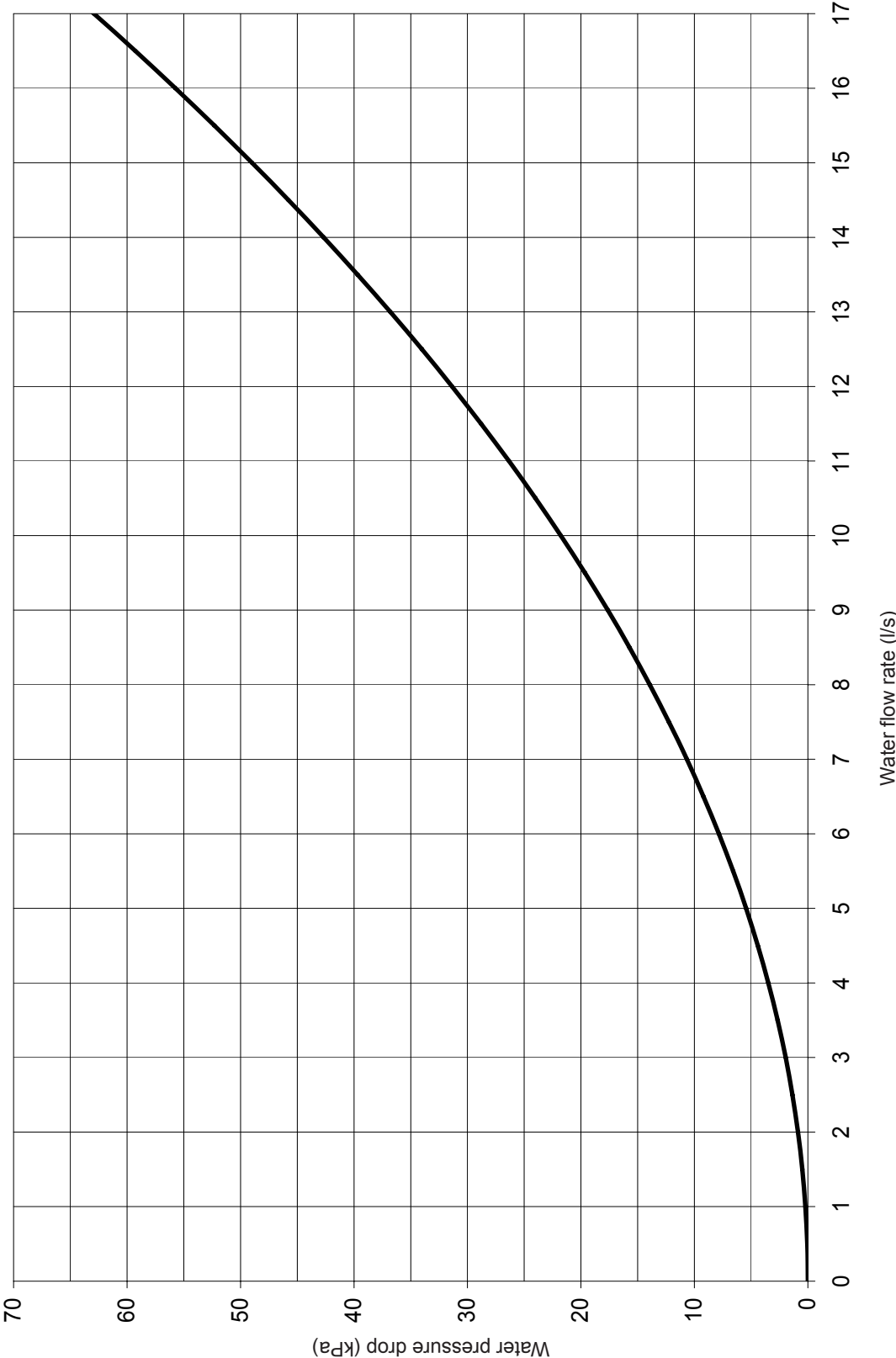
Operating range

MODELS		70.2	80.2	90.2	105.2	120.2	135.2	150.2	170.2	190.2	215.2	240.2	UM	NOTES
Lower limit value	Q	2.00	2.37	2.69	3.03	3.29	3.80	4.08	4.64	5.13	5.77	6.34	Q	Q=Water flow rate
Upper limit value	Q	5.97	7.50	8.51	9.60	10.41	12.01	12.91	14.67	16.22	17.00	17.00	Q	

WATER PRESSURE DROP

Water filter

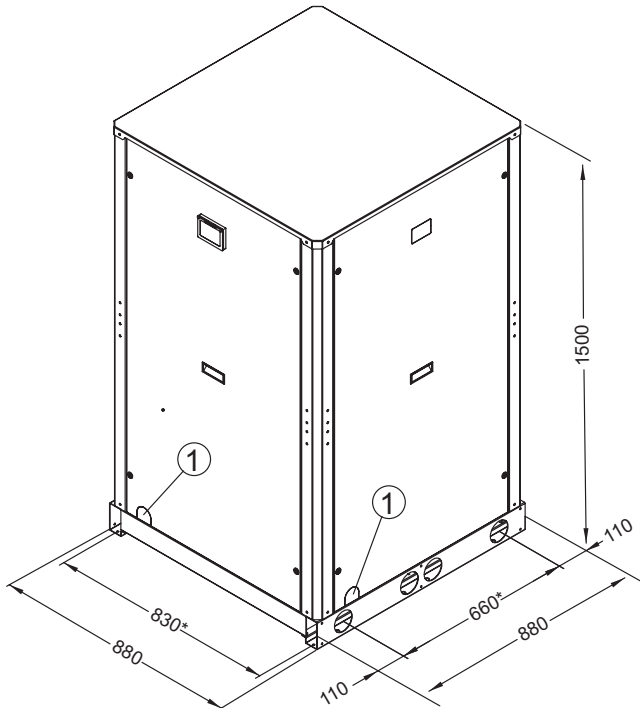
The following graph shows the water filter pressure drop values in kPa as a function of flow rate in litres/second.



DIMENSIONAL DATA

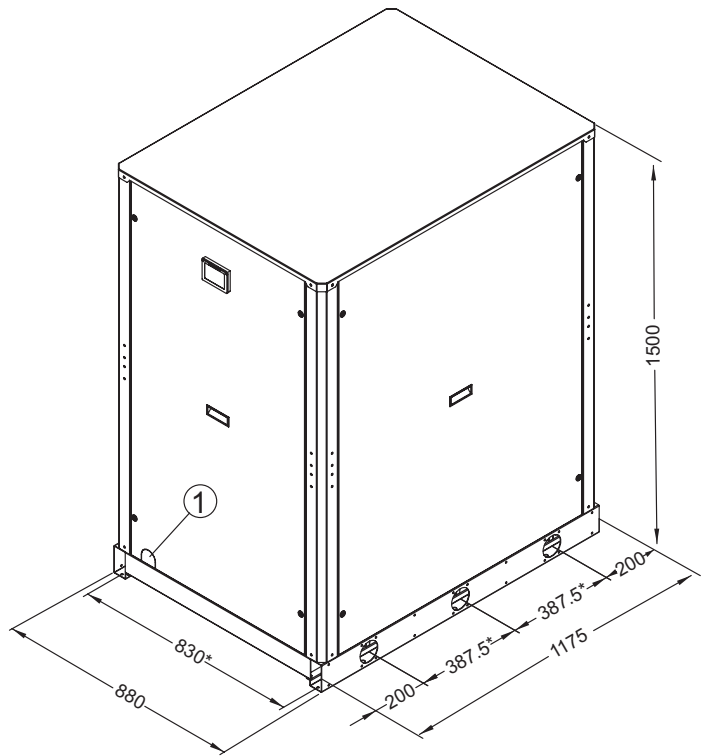
Standard unit overall dimension

FRAME 1
(Mod. 70.2 ÷ 90.2)



* : Center distance of vibration damper holes and lifting holes
 ø 14 mm Vibration damper fixing holes
 ø 75 mm lifting holes
 1- Power supply

FRAME 2
(Mod. 105.2 ÷ 240.2)



* : Center distance of vibration damper holes and lifting holes
 ø 14 mm Vibration damper fixing holes
 ø 75 mm lifting holes
 1- Power supply

Shipping weight

Mod.	70.2	80.2	90.2	105.2	120.2	135.2	150.2	170.2	190.2	215.2	240.2	UM
AB Standard unit ⁽¹⁾	290	300	306	403	482	508	532	568	592	621	642	kg
AB Standard unit ⁽²⁾	340	350	356	465	545	571	594	630	654	683	705	kg
AS Low noise unit ⁽²⁾	340	350	356	465	545	571	594	630	654	683	705	kg
AX Extra low noise unit ⁽²⁾	364	374	380	495	575	601	624	660	684	713	735	kg

- 1) Unit without cover panels
 2) Unit with cover panels

Operation weight

Mod.	70.2	80.2	90.2	105.2	120.2	135.2	150.2	170.2	190.2	215.2	240.2	UM
AB Standard unit ⁽¹⁾	294	304	311	409	488	515	540	577	602	632	655	kg
AB Standard unit ⁽²⁾	344	354	361	471	551	577	602	639	664	694	717	kg
AS Low noise unit ⁽²⁾	344	354	361	471	551	577	602	639	664	694	717	kg
AX Extra low noise unit ⁽²⁾	368	378	385	501	581	607	632	669	694	724	747	kg

- 1) Unit without cover panels
 2) Unit with cover panels

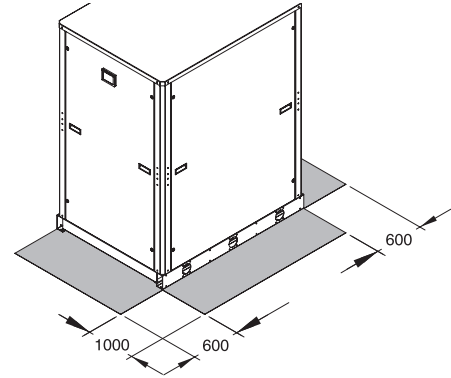
DIMENSIONAL DATA

Minimum space for operation

Refer to the figure alongside for the dimensions of the unit.
To correctly install the unit, comply with the measurements for the free area that must be left around the machine, as shown in the figure. The distances must be doubled if the unit is to be installed in a pit.

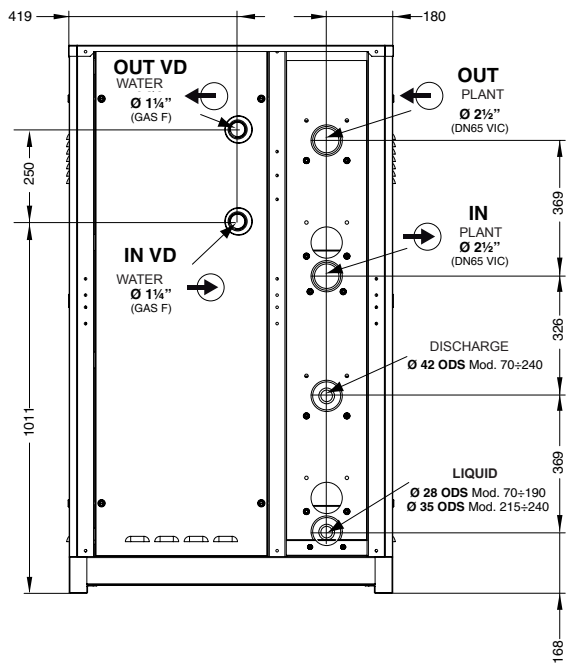
NOTE: Allow for a clear area of not less than 0.5 meters above unit.

The areas installation must be doubled if multiple units are installed.

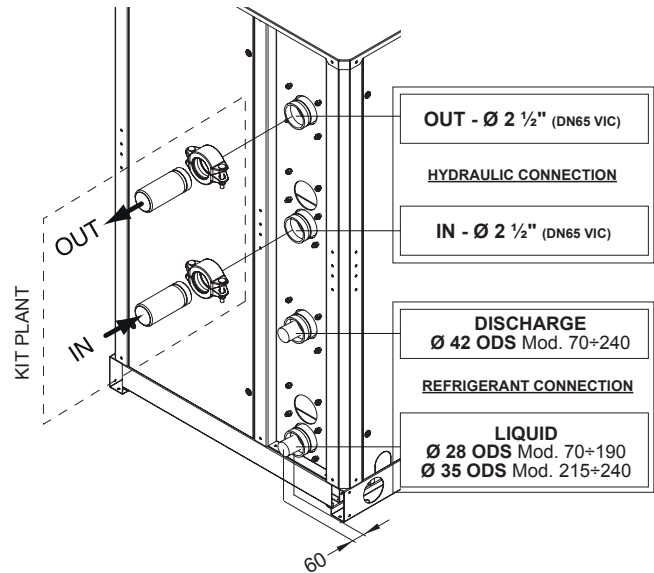


Refrigerant and hydraulic connections

STANDARD UNIT VB + DESUPERHEATER VD

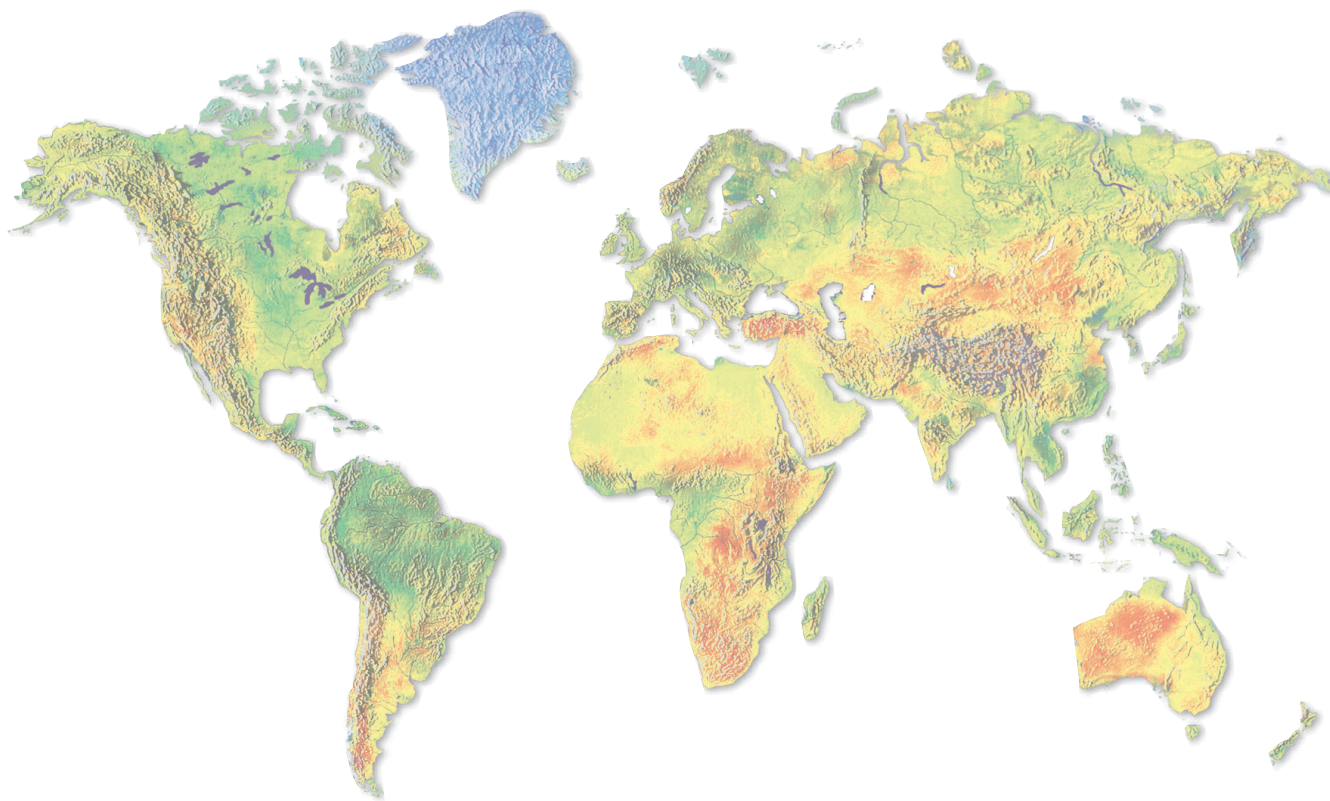


UNIT WITH ACCESSORY VICTAULIC CONNECTION



NB.: The measures are in mm.

The manufacturer declines all responsibility for any inaccuracies in this manual due to printing or typing errors.
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