

# Ferrolì

i migliori gradi centigradi

## RVW

WATER-COOLED WATER CHILLERS  
282 ÷ 1167 KW



# TECHNICAL MANUAL



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## GENERAL SPECIFICATIONS

### Presentation of unit

This new series of water-cooled water chillers is based on **12 models** with cooling capacity from **282 to 1167 kW** and has been designed to meet the demands of global markets in the medium-big 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**  
**The units are suitable for indoor installation and, as standard, are equipped with bearing structure made of adequately thick coated and galvanized sheet metal where are fastened the condensers, to these the evaporator, the electrical panel and the compressors. This layout allows a uniform weight distribution and an easy maintenance. The basement of the unit is designed and made to allow an easy and quick handling of the unit in order to minimise the cost for installation**

All fastening components are made of stainless and/or galvanized steel. When the units were designed, particular attention was also paid to sound emission in our endeavour to comply with the increasingly more restrictive laws governing acoustic pollution. To reduce the noise emission the units can be equipped with an acoustic box for the compressors: this device allows a noise reduction of 4-5 dB.

The units produce cold water **from 5 to 15°C** (up to 23°C with High power electrical motor) and only for heat pump units hot water **from 30 to 55°C**. They can be equipped with 1 or 2 independent refrigerant circuits, each of which has a semi-hermetic **TWINSCREW** compressor featuring a 25 to 100% control capacity device. They are equipped with an asynchronous threephase motor (400V-3-50Hz) with aluminium squirrel-cage rotor, pre-engineered for part-winding or star-delta starting (so as to reduce the current input during the starting phase to the minimum) and are protected by a chain of thermistors buried in the stator windings (controlled by an electronic module with the function to prevent the reverse rotation of the single compressors) and fuses housed in the electric panel. The standard outfit includes an efficient oil separator complete with electric heater (activated when the compressor stops).

To widen the field of application to an even greater extent, some models are equipped with a liquid injection system controlled by the electronic controller so that use only occurs when effectively necessary. As part of the standard supply, they are positioned on rubber vibration dampers to reduce the vibrations transmitted to the base of the unit.

As standard, the unit is equipped with a shell and tube evaporator optimized for R134a with high efficiency grooved pipes; it is insulated with 10mm flexible closed-cell foam that forms barrier to prevent the formation of condensation and heat exchanges towards the outside. Standard supply also includes a differential water pressure switch built into the water supply circuit to avoid the risk of freezing if the water flow is shut off for some reason and as standard is equipped with VICTAULIC water connections. The evaporator is fed by an electronic expansion valve that allows the exploitation of the evaporator surface thus increasing the efficiency of the system in all working conditions (25 to 100% for single compressor units, 13 to 100% for double compressors units) so achieving the optimal seasonal energy efficiency. The equipment is completed with 1 or 2 shell and tube condensers (one per each refrigerant circuit) optimized for use with R134a, featuring high-efficiency grooved pipes (thermally insulated only for heat pump units); as standard is equipped with VICTAULIC water connections.

As standard, the units are equipped with electric panel for setting and controls with a door-locking main circuit-breaker, controller with microprocessor plus LCD with 4 lines of 20 characters, refrigerant circuit made with copper pipes, complete with low and high pressure switch (automatic and manual reset), safety valves (according to PED), Dehydrator filter with replaceable core, discharge and liquid shutoff valves, low and high pressure transducers, compressor oil, charge of **R134a** environment-friendly refrigerant gas.

All the units are accurately built and tested individually, thus only the electrical and wet connections need be made for installation.

The series is completed by a large and flexible of options and accessories.



### General specifications

- This manual and the wiring diagram supplied with the unit must be kept in a dry place and ready to hand for future consultation when required.
- This manual has been compiled to ensure that the unit is installed in the correct way and to supply comprehensive information about how to correctly use and service the appliance. **Before proceeding with the installation phase, please carefully read all the information in this manual, which describes the procedures required to correctly install and use the unit.**
- Strictly comply with the instructions in this manual and conform to the current safety standards.
- The appliance must be installed in accordance with the laws in force in the country in which the unit is installed.
- Unauthorized tampering with the electrical and mechanical equipment will **VOID THE WARRANTY**.
- Check the electrical specifications on the identification plate before making the electrical connections. Read the instructions in the specific section where the electrical connections are described.
- If the unit must be repaired for any reason, this must only be done by a specialized service center recognized by the manufacturer and using genuine spare parts.
- The manufacturer also declines all liability for any damage to persons or property deriving from failure of the information in this manual to correspond to the actual machine in your possession.
- **Proper uses: this series of chillers is designed to produce cold or hot water for use in hydronic systems for conditioning/heating purposes. The units are not suitable for the production of domestic hot water. Any use differing from this proper use or beyond the operating limits indicated in this manual is forbidden unless previously agreed with the manufacturer.**
- **The prevention of the risk of fire at the installation site is the responsibility of the end user.**

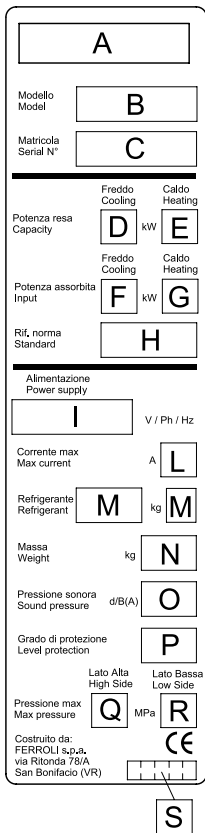
### European Directives

The company hereby declares that the machine in question complies with the matters prescribed by the following Directives:

- |   |                    |
|---|--------------------|
| • Machinery directive                           | <b>2006/42/EC</b>  |
| • Pressurised equipment directive (PED)         | <b>97/23/EC</b>    |
| • Electromagnetic compatibility directive (EMC) | <b>2004/108/EC</b> |
| • Low voltage directive (LVD)                   | <b>2006/95/EC</b>  |

# GENERAL SPECIFICATIONS

## Identification plate of the Unit



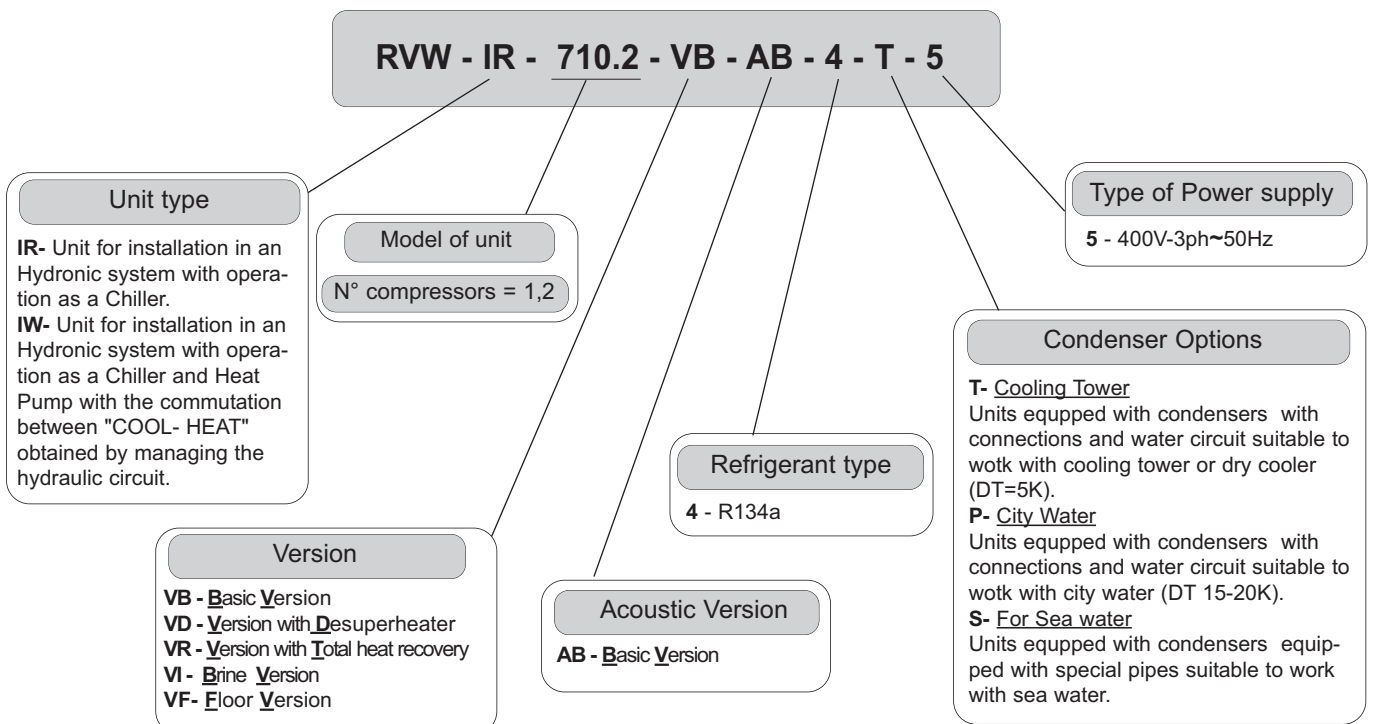
The figure on the left depicts the identification plate of the unit, affixed to the outer left-hand side of the Electric Panel.

A description of the data is given below:

- A** - Trademark
- B** - Model
- C** - Serial number
- D** - Cooling Capacity
- E** - Heating Capacity
- F** - Power input in COOLING mode
- G** - Power input in HEATING mode
- H** - Reference standard
- I** - Electric power supply
- L** - Maximum current absorption
- M** - Type of refrigerant and weight of charge
- N** - Shipping weight of the unit
- O** - Sound pressure level
- P** - IP Level Protection at 1 meters (ISO 3744)
- Q** - Maximum pressure - High Side
- R** - Maximum pressure - Low Side
- S** - PED certification authority

## 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.



## GENERAL SPECIFICATIONS

### Acoustic versions

The available unit versions are described below:

**VD: Version with Desuperheater.** Produces cold water as in the standard version plus hot water at a temperature from 40 to 50°C at the same time. This is achieved thanks to a water-refrigerant gas heat exchanger between the compressors and condenser that recovers part of the thermal power that would otherwise be dispersed in the cooling water and increases the unit cooling capacity from 3 to 5%.

**VR: Version with Total heat Recovery.** Produces cold water as in the standard version plus hot water at a temperature from 35 to 55°C at the same time. This is achieved using a suitable heat exchanger that has a double water circuit: one for condensation and a second for heat recovery.

In this way it is possible to recover the total thermal power that would otherwise be dispersed in the cooling water.

**VI: Version that produces water at a low temperature (BRINE)**

The unit can produce cold water with brine at a temperature of -8 to 4°C.

**VF: Floor Version (only for IW heat pump),** it allows water production for heating/cooling floor.

In heating mode water production (TW IN 30°C, TW OUT 35°C) with COP > 5.3.

In cooling mode water production (TW IN 23°C, TW OUT 18°C) with EER > 5.6.

### Description of the component

#### 1. Electric control and monitoring panel.

It is housed in a cabinet made of adequately thick painted sheet metal suitable for outdoor installation (protection degree IP 54). The panel comprises the following main components:

- Main door-locking circuit-breaker.
- Contactors to control and manage the part-winding or star-delta starting mechanism of each compressor.
- Fuse holders with protection fuses for each compressor.
- Fuse holders with protection fuses for the oil heaters of the compressors.
- Insulating and safety transformer to power the auxiliaries, protected with fuses.
- Basic monitoring board with microprocessor:
- Electronic expansion valve controller

**The main functions of the monitoring system are:**

Temperature regulation of the water produced by the unit, operating hour counting for compressors and pump/s, operating hour, balancing for compressors and pumps, start-up timing, parameter entry digitized via the keyboard, alarm diagnosis.

**Functions associated with the digital inputs:** low and high pressure, high discharge temperature, correct electric power phase presence-sequence, thermal protection for compressors, evaporator and Condenser WATER differential pressure / paddle flow switch, thermal protection for evaporator and condenser, remote controlled ON/OFF commands, switching mode (summer-winter) (only for IW) Heat recovery mode enabling via digital input (only for VR), Heat Recovery WATER differential pressure / paddle flow switch (only for VR), heat recovery pump thermal protection (only for VR).

**Functions associated with the digital outputs:** compressor control, solenoid valves for compressor control capacity, liquid injection solenoid valve control, water pump/s control, general alarm (can be remote controlled), heat recovery water pumps management (only for VR).

**Functions associated with the analog inputs:** evaporator water inlet and outlet temperatures, condenser water outlet temperature (only for IW units) discharge temperature. Suction and discharge pressure, discharge temperature probe, heat recovery water probe (only for VR).

**Functions associated with the analog outputs:** 4-20 mA to manage 3 way valves for condensing pressure control.

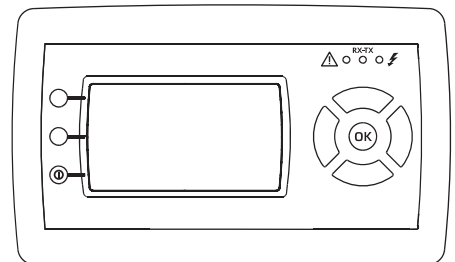
**Moreover the controller allows**

- Alarm history (max 50m alarms managed with FIFO logic)
- Time scheduling (daily and weekly)
- Precise control of the water leaving temperature
- Prevention of the block of the unit: In case of critical conditions the machine does not stop but is able to regulate itself and provide the maximum power that can be generated in those conditions with the compressors working inside the admissible limits.
- Demand Limit by Digital Input and/or by Analog Input (4-20mA)
- Dinamic Setpoint by Analog Input (4-20mA): for instance by an outdoor temperature probe for the climate control
- Second Set Point by Digital Input
- Connection to BMS (supervision systems) through serial port RS 485 and MODBUS protocol

#### 2. User interfacing terminal with display.

The interface consists of:

- FUNCTION/ON-OFF multifunction key for quick access to the 4 main menus and for powering/switching off.
- MENU multifunction key to access all the menus for controlling and configuring the unit.
- **Power-on LED.**
- **RX-TX LED** to indicate that the user interface and monitoring module are communicating.
- **Alarm indicator LED.**
- Check-control with alarm display.
- Time band
- High pressure prevention



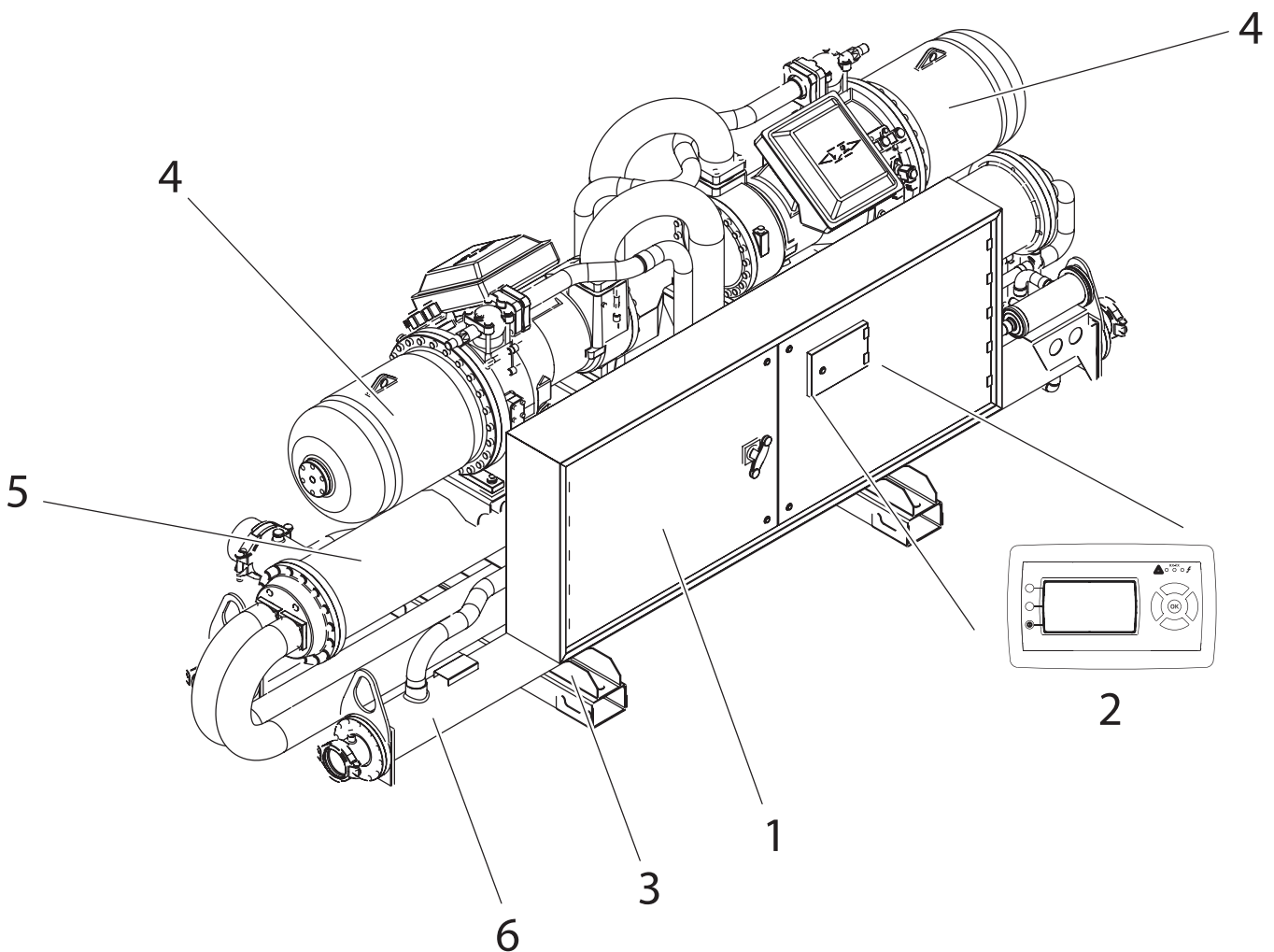
## GENERAL SPECIFICATIONS

**3. Bearing structure** made of galvanized sheet metal coated to ensure good protection against adverse weather conditions.

**4. Compressors.** Suitable for outdoor installation. They are the **TWIN-SCREW type with 25 to 100% control capacity**: in conjunction with accurate assembly, this technical solution allows the refrigerant to compress and the axial thrusts on the bearings (amongst the most critical components of the compressor) to be perfectly balanced, thus guaranteeing long life. They are equipped with an asynchronous three-phase motor (400V-3-50Hz) with aluminium squirrel-cage rotor, pre-engineered for part-winding or star-delta starting (so as to reduce the current input during the starting phase to the minimum) and are protected by a chain of thermostats buried in the stator windings (controlled by an electronic module) and fuses housed in the electric panel. The standard outfit includes an efficient oil separator complete with electric heater (activated when the compressor stops). To widen the field of application to an even greater extent, some models are equipped with a liquid injection system controlled by the electronic controller so that use only occurs when effectively necessary. As part of the standard supply, they are positioned on rubber vibration dampers to reduce the vibrations transmitted to the base of the unit.

**5. - Evaporator** of the shell and tube heat exchanger type, made of carbon steel and optimized for operation with **R134a**. Features high-efficiency grooved pipes and also achieves low losses on the wet side. As standard, the evaporator is insulated with 10mm flexible closed-cell foam that forms barrier to prevent the formation of condensation and heat exchanges towards the outside. Standard supply also includes a differential water pressure switch built into the water supply circuit to avoid the risk of freezing if the water flow is shut off for some reason and electrical antifreeze heater that enables the exchanger to be protected against winter freezing down to a min. air temperature =  $-10^{\circ}\text{C}$ . Also ensures that mechanical stress is absorbed to a good degree. As accessory it can be supplied with Water flow switch FA.

**6. - Condenser/Heat Recovery** shell and tube type; the shell is made by carbon steel and is optimized to work with **R134a**. It is equipped with grooved pipes and allows very low water pressure drop

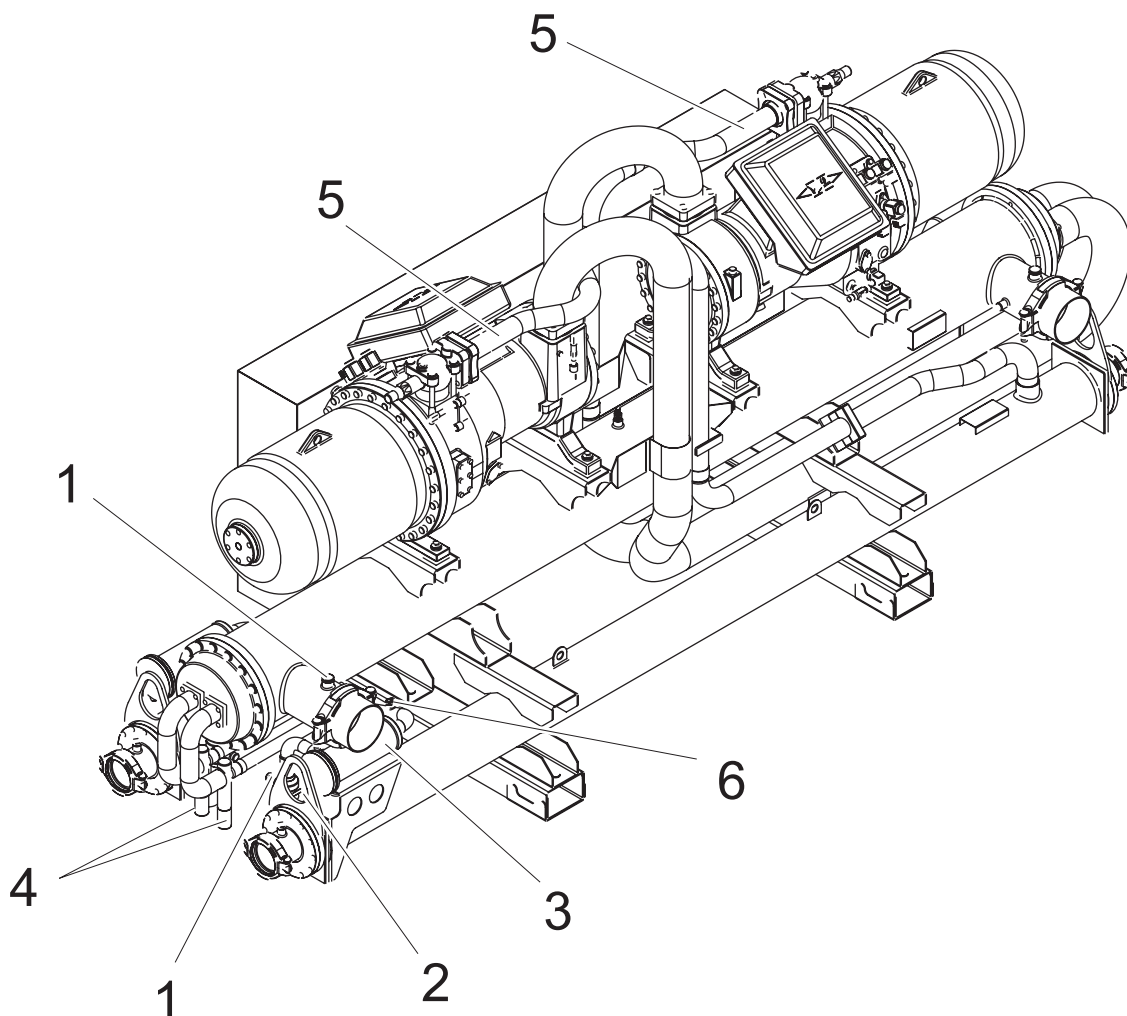




## GENERAL SPECIFICATIONS

### Hydraulic and refrigerant circuit components

- 1. Refrigerant safety valve.** (Conforms to the Directive governing pressurized equipments - PED). Installed on the delivery pipe of the compressors. It acts if critical service faults should occur.
  - 2. Liquid cock - Gas cock.** Allow all the refrigerant in the coils to be pumped and then stored so as to carry out servicing work or to replace all the components of the chilling circuit without having to drain it.
  - 3. Dehydrator filter.** Of the removable cartridge type. Retains impurities and traces of moisture in the circuit.
  - 4. Electronic expansion valve.** It has the task of correctly feeding the evaporator insuring a steady superheat. The valve is managed by a dedicated electronic board. It has also the function to stop the liquid when the compressor is off, so avoiding the refrigerant migration from the coils to the evaporator and to the compressor.
  - 5. Compressor delivery probe.** One per compressor, installed on the delivery pipe to protect the compressor if the end of compression temperature exceeds the established limits.
  - 6. Liquid and moisture sight glass.** Signals when liquid passes through the circuit, indicating that the refrigerant charge is correct. The liquid indicator also changes colour to show the amount of moisture in the refrigerant.
- **Pressure taps:** 1/4 " SAE (7/16" UNF) (schraeder). Allow the operating pressure of both the circuits to be measured in 3 main points of each refrigerant circuit: compressor discharge, thermostatic valve inlet, compressor suction.
  - **High pressure switch.** With fixed setting. It is installed on the delivery pipe and blocks the compressor of the circuit if the operating pressures exceed the tolerated values. If it activates, the circuit will block and can only be restarted by resetting via the user interface terminal.
  - **Oil crankcase heater** to heat the compressor oil. One per compressor. Activated when the compressor switches off. Their task is to keep the temperature of the oil sufficiently high so as to prevent refrigerant from migrating during these pauses.
  - **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.





## ACCESSORIES AND OPTIONAL EQUIPMENT

### Accessories and options

**NOTE:** The accessories can be of the following type:

**(M):** only installed in the factory.

**(F):** supplied for installation by the customer.

**CC (F):** Compressor Soundproofing Box It is made of hot galvanised steel sheet of adequate thickness, with internal acoustic insulation, and externally painted with polyester powders able to resist the atmospheric agents over time.

**MAP (F) Storage and Pumping Module** (Storage on the Delivery or Storage on Return). The purpose of the storage and pumping module is to lower the number of compressor surges, increasing the amount of water in the system and, thus, its thermal inertia. It consists of a base made of galvanized and painted sheet metal and aluminium sheet panelling suitable for outdoor installation.

Designed for connection alongside the chiller, the accessory comprises an insulated carbon steel tank, a single or double centrifugal pump with on-off valves, an electric power panel, expansion tank, safety valve, air vent, pressure gauge and filling and draining valves.

**RAG (M) Antifreeze heating element** for Pumping Module Water tank.

**FLS (M) Evaporator Water paddle flow switch.** factory installed is electrically wired to the electric panel.

**FLS (F) Water paddle flow switch.** The installation is in charge of the customer. It is suitable to be mounted on pipe with diameter from 1" to 8".

**RAG (M) Antifreeze Electrical Heater element for Evaporator.**

**GM (M) Pressure gauge unit.** This consists of low pressure gauges and high pressure gauges (one low and one high pressure gauge for each circuit).

**AVG (F) Rubber vibration dampers.** Consisting of 4 rubber vibration dampers, they reduce the mechanical vibrations generated by the compressor during their normal operation, that are then transmitted to the bearing surface of the machine. The insulation degree provided by the vibration dampers is about 95%.

**RB(M) Compressor suction shut-off valve.** in abbinamento al rubinetto di mandata consente la sostituzione del compressore senza dover scaricare il refrigerante.

**IEM (M): High thickness evaporator insulation** with 19mm flexible closed cell foam.

**CR (F) Remote Control.** Repeats the functions of the control system installed in the unit, thus allowing this latter to be controlled at a distance (up to 100 m) from the unit.

**CSF (M) Voltage monitor and sequence meter.** 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.

**INT (M) RS485 Serial interface,** for communication with the MODBUS protocol To connect to BMS (Building Management System). Via serial port it is possible to manage the ON/OFF of the unit, to modify the set point, to read and store the main parameters of the refrigerant and water circuits (analogue input) and to acquire the main alarms (digital input).

**OP (F) Programmer Clock,** applied to the remote ON/OFF function.

### Electrical options

**MM (M): High power electric motor,** it allows to the unit to produce water up to 23°C (for special applications).

For power supply voltage different from 400V-3ph~50Hz contact our Sales Office.

## TECHNICAL SPECIFICATIONS FOR BASIC VERSION (VB)

### General technical specifications

### Acoustic Version: AB (Basic Version)

The following data refer to an **IR and IW** unit using **R134a** refrigerant

Model	280.1	320.1	360.1	420.1	480.1	540.1	600.1	710.2	820.2	950.2	1100.2	1200.2	UM
Cooling capacity <sup>(1)</sup>	282	317	356	412	478	536	592	704	818	935	1066	1167	kW
Total power input <sup>(1)</sup>	59	67	75	86	100	114	125	150	172	200	228	249	kW
EER <sup>(1)</sup>	4.78	4.73	4.75	4.79	4.78	4.70	4.74	4.69	4.75	4.68	4.67	4.69	W/W
Heat capacity <sup>(2)</sup>	299	338	381	435	512	569	634	754	870	1010	1133	1253	kW
Total power input <sup>(2)</sup>	69	79	90	101	121	133	149	179	204	243	265	298	kW
COP <sup>(2)</sup>	4.30	4.25	4.23	4.33	4.25	4.29	4.24	4.20	4.26	4.16	4.27	4.21	W/W

### Compressor specifications

Type	TWIN-SCREW												-
Quantity	1						2						N°
Capacity control	25-100 %												%
Starting type	PART WINDING			STAR-DELTA				PW	STAR-DELTA				-

### Evaporator data

Type	SHELL AND TUBE HEAT EXCHANGER												-
Quantity	1												N°
Maximum pressure on wet side	1000												kPa
Total water capacity	115	110	106	165	159	153	270	200	353	343	325	315	l
Water flow rate <sup>(1)</sup>	13.5	15.1	17.0	19.7	22.8	25.6	28.3	33.6	39.1	44.7	50.9	55.8	l/s
Water pressure drop <sup>(1)</sup>	46	37	46	44	55	43	54	52	45	57	59	45	kPa
Water flow rate <sup>(2)</sup>	11.0	12.3	13.9	16.0	18.7	20.9	23.1	27.5	31.8	36.7	41.5	45.6	l/s
Water pressure drop <sup>(2)</sup>	30	25	31	29	37	29	36	35	30	38	39	30	kPa

### Condenser data

Model	280.1	320.1	360.1	420.1	480.1	540.1	600.1	710.2	820.2	950.2	1100.2	1200.2	UM
Type	SHELL AND TUBE HEAT EXCHANGER												-
Quantity	1						2						N°
Maximum pressure on wet side	1600												kPa
Total water capacity	27	31	34	37	37	53	59	68	74	74	106	118	l
Water flow rate <sup>(1)</sup>	16.3	18.3	20.6	23.8	27.6	31.1	34.3	40.8	47.3	54.2	61.8	67.7	l/s
Water pressure drop <sup>(1)</sup>	29	25	26	28	38	27	25	26	28	38	27	25	kPa
Water flow rate <sup>(2)</sup>	14.3	16.1	18.2	20.8	24.5	27.2	30.3	36.0	41.6	48.3	54.1	59.8	l/s
Water pressure drop <sup>(2)</sup>	22	19	20	21	30	21	20	20	22	30	21	20	kPa

### Electrical specifications

Electric power supply	400 (±10%) / 3 / 50												V/phHz
FLA - Maximum current input	162	181	211	232	270	309	340	422	464	540	618	680	A
FLI - Maximum power input	99	110	129	144	169	190	209	257	287	339	380	418	kW
MIC - Maximum surge current	520	612	665	436	465	586	650	876	668	735	895	990	A

#### Note:

- (1): **Cooling Mode** The data refer to: Evaporator Water temperature: inlet: 12°C - outlet: 7°C,  
Condenser Water temperature: inlet: 30°C - outlet: 35°C,
- (2): **Heating Mode** The data refer to: Evaporator Water temperature: inlet: 10°C - outlet: 5°C,  
Condenser Water temperature: inlet: 40°C - outlet: 45°C,

### FOULING FACTORS

The performances supplied with the tables are referred to a fouling factory =  $0.44 \times 10^{-4}$  m<sup>2</sup> K/W . For different values of the fouling factory, use the reduction coefficients reported in the following table.

Fouling factory		Evaporator		Condenser / Recuperator	
		F.c. PF	F.c. PA	F.c. PF	F.c. PA
(m <sup>2</sup> K / W)	$0,44 \times 10^{-4}$	1	1	1	1
(m <sup>2</sup> K / W)	$0,86 \times 10^{-4}$	0,98	0,99	0,98	1,025
(m <sup>2</sup> K / W)	$1,72 \times 10^{-4}$	0,93	0,98	0,95	1,06

**F.c. PF:** Correction Factor for Cooling capacity

**F.c. PA:** Correction Factor for Power Input

## TECHNICAL SPECIFICATIONS FOR BASIC VERSION (VB)

### Correction factor for the use of GLYCOL CONDENSER side

Correction factor for the use of **ETHYLENE GLYCOL** with water produced between 30 ÷ 55 ° 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
Refrigerating power CCPF	1,000	0,995	0,985	0,975	0,970
Power input CCPA	1,000	1,010	1,015	1,020	1,030
Water flow rate CCQA	1,000	1,038	1,062	1,091	1,127
Water pressure drop CCDP	1,000	1,026	1,051	1,077	1,103

Correction factor for the use of **PROPYLENE GLYCOL** with water produced between 30 ÷ 55 ° 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
Refrigerating power CCPF	1,000	0,990	0,975	0,965	0,955
Power input CCPA	1,000	1,010	1,020	1,030	1,040
Water flow rate CCQA	1,000	1,018	1,032	1,053	1,082
Water pressure drop CCDP	1,000	1,026	1,051	1,077	1,103

### Correction factor for the use of GLYCOL EVAPORATOR side

Correction factor for the use of **ETHYLENE GLYCOL** with water produced between 5÷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
Refrigerating power CCPF	1,000	0,990	0,980	0,970	0,950
Power input CCPA	1,000	1,000	0,990	0,990	0,980
Water flow rate CCQA	1,000	1,040	1,080	1,120	1,160
Water pressure drop CCDP	1,000	1,080	1,160	1,250	1,350

Correction factor for the use of **PROPYLENE GLYCOL** with water produced between 5÷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
Refrigerating power CCPF	1,000	0,980	0,960	0,940	0,920
Power input CCPA	1,000	0,990	0,980	0,950	0,930
Water flow rate CCQA	1,000	1,010	1,030	1,060	1,090
Water pressure drop CCDP	1,000	1,050	1,110	1,220	1,380

# TECHNICAL SPECIFICATIONS FOR BASIC VERSION (VB)

## Standard performances - Basic Version AB

Mod. 280.1+420.1

MOD.	TWE	TWC / TWR - CONDENSER / RECOVERED WATER TEMPERATURE (°C)																		
		30			35			40			45			50			55			
		kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	
280.1	5	275	53	326	262	58	317	249	63	308	233	69	299	216	77	289	199	84	279	
	6	285	54	336	272	58	327	258	64	318	242	70	308	225	77	298	207	85	288	
	7	296	54	347	<b>282</b>	<b>59</b>	<b>338</b>	267	64	328	251	70	318	234	78	308	216	86	297	
	8	306	55	358	292	59	348	277	65	339	260	71	328	243	78	318	225	86	307	
	9	317	55	369	303	60	359	287	66	349	270	72	339	252	79	327	233	87	316	
	10	327	56	380	313	60	370	297	66	359	280	73	349	261	79	337	242	87	325	
	11	338	56	392	323	61	381	307	66	370	289	73	359	270	80	346	251	88	335	
	12	348	57	402	332	62	391	315	67	379	298	74	368	279	81	355	259	89	344	
	13	358	58	413	342	62	401	324	68	389	307	74	378	287	81	364	268	90	353	
	14	369	58	424	351	63	411	334	69	399	316	75	388	295	82	373	276	90	362	
	15	380	59	436	361	64	422	343	69	409	326	76	398	304	83	383	285	91	372	
	320.1	5	310	60	367	295	65	357	279	72	347	262	79	338	244	87	327	225	96	317
		6	321	61	379	306	66	369	290	72	358	272	80	348	254	88	337	235	97	327
		7	333	61	391	<b>317</b>	<b>67</b>	<b>381</b>	300	73	370	283	80	359	264	89	348	244	98	337
		8	344	62	403	328	67	392	311	74	382	293	81	370	274	89	359	254	99	348
9		356	62	415	340	68	404	322	74	393	304	82	382	284	90	370	264	100	358	
10		368	63	428	351	69	416	334	75	405	315	83	393	295	91	381	273	100	368	
11		380	64	441	363	69	429	345	76	417	325	83	405	305	91	391	283	101	379	
12		391	65	453	373	70	440	355	77	427	335	84	415	313	92	401	292	102	389	
13		402	65	465	384	71	451	365	77	438	345	85	425	322	93	411	301	103	399	
14		414	66	477	394	72	462	375	78	450	355	86	436	332	94	421	311	103	409	
15		426	67	489	405	72	474	386	79	461	365	86	447	341	95	431	321	104	420	
360.1		5	349	67	412	331	73	400	314	80	390	295	90	381	277	98	370	256	109	360
		6	361	68	425	343	74	414	326	81	403	307	90	393	287	99	382	267	110	371
		7	374	69	439	<b>356</b>	<b>75</b>	<b>427</b>	337	82	415	319	90	404	298	100	393	277	111	383
		8	386	70	453	369	76	441	350	83	429	330	91	417	310	101	406	288	113	395
	9	400	70	467	382	76	454	362	83	441	342	92	430	321	102	418	299	114	407	
	10	413	71	480	394	77	468	375	84	455	354	93	443	332	102	430	310	114	418	
	11	427	72	495	407	78	481	387	85	468	366	94	455	343	103	441	321	115	429	
	12	439	72	508	418	79	493	399	86	481	376	95	466	353	104	452	330	116	440	
	13	451	73	521	430	79	505	410	87	493	387	95	477	362	105	462	340	117	451	
	14	464	74	534	441	80	517	422	88	506	398	96	489	372	106	473	350	118	462	
	15	477	74	548	453	81	530	434	89	519	409	97	501	382	108	485	360	119	473	
	420.1	5	402	78	476	383	84	463	363	92	450	340	101	435	314	111	420	289	122	405
		6	417	78	491	397	85	478	376	93	464	353	101	449	327	112	434	301	123	418
		7	432	78	507	<b>412</b>	<b>86</b>	<b>494</b>	390	94	479	366	102	464	341	113	448	314	124	431
		8	447	79	522	427	86	508	404	95	494	380	103	478	355	113	462	326	125	445
9		463	80	539	442	87	525	419	96	510	395	104	494	367	114	476	339	126	458	
10		478	81	555	457	88	540	433	96	524	408	105	508	381	115	490	352	127	472	
11		495	82	573	472	89	557	448	97	540	423	106	524	395	116	505	365	128	487	
12		509	83	588	486	90	571	461	98	553	436	107	537	407	117	518	378	129	500	
13		524	84	604	500	91	586	474	99	567	449	108	552	419	118	531	390	130	513	
14		539	85	620	514	92	602	487	100	582	463	109	566	432	119	545	403	130	527	
15		555	86	637	529	93	617	501	101	597	477	110	581	445	120	559	417	131	542	

Dt condenser [°C]	CCPF	CCPA	DTCN	
5	1,000	1,000	0,000	TWE= Evaporator outlet water temperature (°C)
10	1,025	0,960	-1,500	TWC / TWR= Condenser / recovered water temperature (°C)
15	1,030	0,955	-1,750	TWD = Desuperheater water temperature outlet (°C)
20	1,035	0,950	-2,000	kWf = Cooling capacity (kW).
				kWa = Compressor power input (kW).
				kWt = Heating capacity (kW).

The standard 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<sup>-4</sup> m<sup>2</sup> K/W fouling factor.

## TECHNICAL SPECIFICATIONS FOR BASIC VERSION (VB)

Mod. 480.1÷710.2

MOD.	TWE	TWC / TWR - CONDENSER / RECOVERED WATER TEMPERATURE (°C)																	
		30			35			40			45			50			55		
		kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt
480.1	5	466	89	551	445	98	538	423	109	526	398	121	512	373	134	500	346	149	487
	6	483	90	569	461	99	555	438	110	543	413	122	529	387	135	516	359	150	502
	7	501	91	588	<b>478</b>	<b>100</b>	<b>573</b>	454	111	559	429	123	546	402	136	532	373	151	517
	8	518	91	605	495	101	591	470	112	576	444	124	562	417	137	548	387	152	532
	9	535	92	623	512	102	609	487	113	594	460	125	578	432	138	564	402	153	548
	10	553	93	641	529	102	626	503	113	610	476	125	595	447	138	579	416	153	562
	11	570	94	659	546	103	644	520	114	628	492	127	612	463	139	595	431	154	577
	12	585	95	675	561	104	659	535	115	644	506	128	627	477	140	611	445	155	592
	13	599	96	691	576	105	675	550	116	660	520	129	643	492	141	626	458	156	606
	14	615	97	707	591	106	692	566	117	677	535	130	659	507	142	642	472	157	621
15	630	99	724	607	107	709	582	118	694	550	131	675	522	143	658	487	158	637	
540.1	5	523	103	621	498	111	604	471	121	586	443	133	569	413	146	552	381	160	533
	6	542	104	641	517	113	624	489	122	605	460	134	588	429	147	569	396	162	550
	7	562	105	662	<b>536</b>	<b>114</b>	<b>644</b>	508	124	626	478	136	607	446	148	587	412	163	568
	8	582	107	683	555	115	664	527	125	646	496	137	626	464	150	606	429	165	586
	9	602	108	705	574	116	685	545	126	665	514	138	645	481	151	624	446	166	603
	10	622	110	726	594	118	706	564	128	685	533	139	665	499	153	644	463	167	622
	11	642	111	747	614	119	727	583	129	706	551	140	685	517	154	663	480	169	641
	12	659	113	766	631	121	746	600	131	724	568	141	702	533	155	680	496	170	658
	13	677	114	786	649	122	765	617	132	743	585	142	720	550	156	698	512	172	675
	14	696	116	806	667	124	784	635	134	762	602	143	739	567	157	716	528	173	693
15	715	117	826	685	125	805	654	135	782	620	144	757	585	158	734	545	175	711	
600.1	5	579	113	686	552	123	669	523	134	650	492	149	634	461	165	618	428	183	602
	6	599	114	708	572	124	689	542	136	671	511	150	654	479	166	637	444	185	620
	7	621	115	730	<b>592</b>	<b>125</b>	<b>711</b>	562	137	692	530	151	674	497	168	656	462	186	639
	8	643	117	753	<b>613</b>	<b>126</b>	<b>733</b>	582	138	713	549	153	694	515	169	676	480	188	658
	9	664	118	776	634	127	755	602	139	735	569	154	715	534	170	695	497	189	677
	10	686	119	799	655	128	777	623	140	756	589	155	736	553	171	715	515	190	696
	11	708	120	822	677	129	800	643	141	777	608	156	756	572	173	736	533	192	715
	12	728	121	842	695	130	819	661	142	796	625	157	774	588	174	754	549	193	733
	13	748	122	863	714	131	839	679	143	815	642	158	792	605	176	772	565	195	750
	14	768	123	885	734	133	860	698	144	835	660	159	811	623	177	792	582	196	769
15	789	124	907	754	134	881	717	145	856	679	160	831	641	179	811	600	198	787	
710.2	5	687	135	815	655	148	795	620	161	773	584	179	754	547	198	735	506	221	716
	6	712	137	842	679	149	820	643	163	798	606	180	777	567	200	757	526	222	737
	7	738	139	870	<b>704</b>	<b>150</b>	<b>846</b>	667	165	824	629	181	801	588	202	780	547	223	759
	8	764	140	897	729	152	873	691	166	849	652	183	826	611	203	803	568	225	782
	9	791	141	925	754	153	900	716	167	875	676	184	851	634	205	828	589	227	805
	10	817	143	953	779	154	926	740	169	901	699	185	875	656	206	851	611	228	827
	11	844	144	981	805	155	953	765	170	927	723	187	900	679	207	875	633	229	850
	12	867	145	1005	828	156	976	787	171	950	744	188	923	699	208	896	652	231	871
	13	891	146	1030	851	157	1001	809	172	973	766	190	946	720	209	918	672	232	893
	14	916	147	1056	875	158	1025	832	173	997	788	191	970	742	210	941	693	233	915
15	941	148	1082	900	159	1051	856	174	1022	811	193	994	764	211	964	715	235	938	

Dt condenser [°C]	CCPF	CCPA	DTCN
5	1,000	1,000	0,000
10	1,025	0,960	-1,500
15	1,030	0,955	-1,750
20	1,035	0,950	-2,000

**TWE**= Evaporator outlet water temperature (°C)  
**TWC / TWR**= Condenser / recovered water temperature (°C)  
**TWD** = Desuperheater water temperature outlet (°C)  
**kWf** = Cooling capacity (kW).  
**kWa** = Compressor power input (kW).  
**kWt** = Heating capacity (kW).

The standard 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<sup>-4</sup> m<sup>2</sup> K/W fouling factor.

## TECHNICAL SPECIFICATIONS FOR BASIC VERSION (VB)

Mod. 820.2÷1200.2

MOD.	TWE	TWC / TWR - CONDENSER / RECOVERED WATER TEMPERATURE (°C)																	
		30			35			40			45			50			55		
		kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt	kWf	kWa	kWt
820.2	5	799	154	946	761	170	923	721	185	896	676	204	870	629	223	840	579	245	812
	6	828	156	976	789	171	951	747	187	925	702	205	897	653	225	867	602	247	837
	7	857	158	1008	<b>818</b>	<b>172</b>	<b>981</b>	775	189	954	729	206	925	679	227	895	626	249	862
	8	887	159	1038	847	174	1013	803	190	983	755	208	953	705	229	922	650	251	889
	9	918	161	1071	876	175	1042	832	192	1014	783	210	983	732	231	951	676	253	917
	10	948	162	1103	906	177	1074	860	194	1044	811	211	1011	757	232	977	701	255	943
	11	979	164	1135	936	178	1105	889	195	1074	838	213	1041	784	234	1006	727	257	970
	12	1006	166	1164	961	180	1132	914	197	1101	863	215	1067	808	236	1031	750	258	995
	13	1033	168	1193	988	181	1160	940	199	1129	888	217	1094	832	238	1058	773	260	1020
	14	1061	170	1223	1015	183	1189	966	200	1157	914	219	1122	857	240	1085	798	261	1046
15	1090	172	1254	1043	184	1218	994	202	1186	940	221	1150	883	242	1112	823	263	1073	
950.2	5	915	177	1083	872	198	1060	827	218	1033	779	243	1010	730	270	986	677	297	959
	6	946	179	1117	903	199	1092	857	220	1065	809	244	1041	758	271	1015	704	299	988
	7	979	181	1151	<b>935</b>	<b>200</b>	<b>1125</b>	888	222	1099	839	245	1072	786	272	1044	731	301	1017
	8	1012	182	1185	968	202	1160	921	223	1132	870	247	1104	816	274	1075	759	303	1046
	9	1046	184	1221	1001	203	1194	952	225	1165	900	248	1136	845	275	1107	787	305	1077
	10	1080	185	1256	1033	204	1227	984	225	1199	931	250	1169	874	276	1137	816	307	1107
	11	1114	187	1291	1067	206	1262	1017	227	1232	963	252	1202	905	279	1170	844	308	1137
	12	1144	188	1322	1096	207	1293	1045	229	1262	990	253	1231	932	281	1198	869	310	1164
	13	1174	189	1354	1125	209	1324	1074	230	1293	1019	255	1261	959	283	1228	895	311	1191
	14	1205	191	1386	1156	211	1356	1104	232	1324	1048	256	1291	988	285	1259	922	313	1219
15	1238	192	1420	1187	212	1389	1134	233	1356	1078	258	1323	1017	287	1290	949	315	1248	
1100.2	5	1041	206	1237	991	222	1202	937	242	1167	881	265	1133	820	293	1098	757	321	1062
	6	1078	208	1276	1028	225	1241	973	245	1205	915	268	1170	853	295	1133	788	324	1095
	7	1118	210	1317	<b>1066</b>	<b>228</b>	<b>1282</b>	1010	248	1245	950	271	1208	888	296	1169	820	327	1131
	8	1157	213	1359	1104	230	1322	1047	251	1285	986	273	1246	922	299	1206	853	330	1167
	9	1197	216	1402	1142	233	1363	1084	252	1324	1023	276	1285	956	302	1243	887	332	1202
	10	1236	219	1444	1181	236	1405	1122	255	1364	1059	279	1324	991	305	1281	921	335	1239
	11	1276	222	1487	1220	239	1447	1160	258	1405	1096	281	1363	1028	307	1319	955	338	1276
	12	1311	225	1525	1254	242	1484	1193	261	1441	1129	283	1398	1060	309	1354	986	341	1309
	13	1347	228	1563	1290	245	1522	1228	264	1479	1163	285	1433	1093	311	1389	1017	344	1344
	14	1384	231	1603	1326	248	1561	1263	267	1517	1197	287	1470	1127	313	1425	1050	347	1379
15	1421	234	1644	1363	251	1601	1299	270	1556	1233	289	1508	1163	315	1462	1083	350	1416	
1200.2	5	1141	225	1355	1088	245	1321	1030	268	1285	970	298	1253	909	328	1221	843	365	1190
	6	1182	227	1397	1127	247	1362	1068	271	1326	1007	300	1292	944	331	1258	876	368	1226
	7	1224	229	1442	<b>1167</b>	<b>249</b>	<b>1404</b>	1108	274	1368	1045	302	1332	979	334	1297	911	371	1263
	8	1267	232	1488	1208	252	1448	1147	276	1409	1083	305	1372	1016	337	1336	945	374	1301
	9	1309	234	1532	1250	254	1491	1187	278	1451	1121	307	1412	1052	339	1374	980	377	1338
	10	1352	236	1577	1292	256	1535	1228	280	1493	1160	309	1454	1089	341	1414	1016	379	1376
	11	1397	238	1623	1334	258	1579	1268	282	1536	1199	311	1494	1127	344	1454	1051	382	1414
	12	1435	240	1663	1371	260	1618	1303	284	1573	1232	313	1529	1160	347	1490	1082	385	1448
	13	1474	242	1704	1409	262	1658	1339	286	1611	1267	315	1566	1194	350	1526	1115	388	1483
	14	1515	244	1747	1447	264	1698	1376	288	1650	1302	317	1603	1228	353	1564	1148	391	1519
15	1557	246	1790	1487	266	1740	1414	290	1690	1338	319	1641	1264	356	1603	1182	394	1556	

Dt condenser [°C]	CCPF	CCPA	DTCN
5	1,000	1,000	0,000
10	1,025	0,960	-1,500
15	1,030	0,955	-1,750
20	1,035	0,950	-2,000

**TWE**= Evaporator outlet water temperature (°C)  
**TWC / TWR**= Condenser / recovered water temperature (°C)  
**TWD** = Desuperheater water temperature outlet (°C)  
**kWf** = Cooling capacity (kW).  
**kWa** = Compressor power input (kW).  
**kWt** = Heating capacity (kW).

The standard 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<sup>-4</sup> m<sup>2</sup> K/W fouling factor.



## TECHNICAL SPECIFICATIONS FOR BRINE VERSION (VI)

### Brine version (VI)

Correction factors to be applied to data of the basic version

#### ETHYLENE GLYCOL

percentage of glycol in mass / volume	20 / 18.1						
freezing point [°C]	-8						
Produced water temperature	4	2	0	-2	-4	-6	-8
Refrigerating power c.f.	0,912	0,855	0,798	0,738	0,683	-	-
Power input c.f.	0,967	0,957	0,947	0,927	0,897	-	-
Water flow rate c.f.	0,955	0,895	0,836	0,773	0,715	-	-
Water pressure drop c.f.	1,090	1,095	1,100	1,110	1,120	-	-

percentage of glycol in mass / volume	30 / 27.7						
freezing point [°C]	-14						
Produced water temperature	4	2	0	-2	-4	-6	-8
Refrigerating power c.f.	0,899	0,842	0,785	<b>0,725</b>	0,670	0,613	0,562
Power input c.f.	0,960	0,950	0,940	<b>0,920</b>	0,890	0,870	0,840
Water flow rate c.f.	0,967	0,905	0,844	<b>0,780</b>	0,720	0,659	0,604
Water pressure drop c.f.	1,140	1,145	1,150	<b>1,155</b>	1,160	1,175	1,190

percentage of glycol in mass / volume	40 / 37.5						
freezing point [°C]	-22						
Produced water temperature	4	2	0	-2	-4	-6	-8
Refrigerating power c.f.	0,884	0,827	0,770	0,710	0,655	0,598	0,547
Power input c.f.	0,880	0,870	0,860	0,840	0,810	0,790	0,760
Water flow rate c.f.	1,062	0,929	0,887	0,798	0,740	0,672	0,607
Water pressure drop c.f.	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						
Produced water temperature	4	2	0	-2	-4	-6	-8
Refrigerating power c.f.	0,874	0,807	0,740	0,690	0,641	-	-
Power input c.f.	0,945	0,935	0,925	0,900	0,875	-	-
Water flow rate c.f.	0,915	0,845	0,774	0,723	0,671	-	-
Water pressure drop c.f.	1,110	1,115	1,120	1,130	1,140	-	-

percentage of glycol in mass / volume	30 / 29.4						
freezing point [°C]	-14						
Produced water temperature	4	2	0	-2	-4	-6	-8
Refrigerating power c.f.	0,869	0,799	0,729	<b>0,680</b>	0,630	0,583	0,536
Power input c.f.	0,935	0,923	0,910	<b>0,888</b>	0,865	0,838	0,810
Water flow rate c.f.	0,934	0,859	0,784	<b>0,731</b>	0,678	0,627	0,576
Water pressure drop c.f.	1,160	1,175	1,190	<b>1,200</b>	1,210	1,255	1,300

percentage of glycol in mass / volume	40 / 39.6						
freezing point [°C]	-22						
Produced water temperature	4	2	0	-2	-4	-6	-8
Refrigerating power c.f.	0,848	0,784	0,719	0,670	0,620	0,570	0,520
Power input c.f.	0,865	0,855	0,845	0,820	0,795	0,773	0,750
Water flow rate c.f.	1,062	0,881	0,887	0,752	0,740	0,641	0,607
Water pressure drop c.f.	1,230	1,275	1,320	1,375	1,430	1,500	1,570



## TECHNICAL SPECIFICATIONS FOR DESUPERHEATER VERSION (VD)

### Version with Desuperheater VD

Model	280.1	320.1	360.1	420.1	480.1	540.1	600.1	710.2	820.2	950.2	1100.2	1200.2	UM
Recovered heating capacity	54	62	69	79	92	105	115	138	158	184	210	229	kW
Recovered water flow rate	2,6	2,9	3,3	3,8	4,4	5,0	5,5	6,6	7,6	8,8	10,0	11,0	l/s
Recovered water pressure drop	6	8	7	10	9	7	9	7	10	9	7	9	kPa
Type of recovery exchanger	STAINLESS STEEL BRAZE PLATES												-
Quantity	1						2						N°
Max. operating pressure on wet side	1000												kPa
Total water content of recovery exchangers	5	5	7	7	9	10	14	13	13	18	20	28	l

#### Notes:

The data refer to: Water temperature: evaporator inlet :12°C - evaporator outlet: 7°C.  
 Water temperature: recovery inlet :40°C - recovery outlet: 45°C.  
 Water temperature: condenser inlet :30°C - condenser outlet: 35°C.

### Recovery heat exchanger specifications Version with Desuperheater VD

MOD.	TW <sub>D</sub>	CONDENSER WATER TEMPERATURE (°C TW <sub>C</sub> )					
		30	35	40	45	50	55
		kW <sub>t</sub> = RECOVERED HEATING CAPACITY [Kw]					
280.1	40	47	56	63	69	76	83
	45	45	<b>54</b>	60	66	73	80
	50	44	52	58	64	71	77
320.1	40	54	64	72	79	88	95
	45	52	<b>62</b>	69	76	84	92
	50	50	60	67	73	81	88
360.1	40	60	72	80	88	98	106
	45	58	<b>69</b>	77	85	94	102
	50	56	66	74	81	90	98
420.1	40	69	82	92	101	112	122
	45	66	<b>79</b>	88	97	107	117
	50	64	76	85	93	103	112
480.1	40	80	96	107	118	130	142
	45	77	<b>92</b>	103	113	125	136
	50	74	88	99	109	120	131
540.1	40	92	109	122	134	149	162
	45	88	<b>105</b>	118	129	143	155
	50	85	101	113	124	137	149
600.1	40	100	120	134	147	163	177
	45	97	<b>115</b>	129	141	156	170
	50	93	110	124	136	150	163
710.1	40	121	144	161	177	195	212
	45	116	<b>138</b>	155	170	188	204
	50	111	132	148	163	180	196
820.2	40	138	164	184	202	223	243
	45	133	<b>158</b>	177	194	215	234
	50	127	152	170	187	206	224
950.2	40	161	191	214	235	260	283
	45	155	<b>184</b>	206	226	250	272
	50	148	177	198	217	240	261
1100.2	40	183	218	245	269	297	323
	45	176	<b>210</b>	235	258	286	311
	50	169	202	226	248	274	298
1200.2	40	200	238	267	293	324	352
	45	192	<b>229</b>	256	282	311	339
	50	185	220	246	270	299	325

TW<sub>D</sub> = Desuperheater water temperature outlet (°C)

TW<sub>C</sub> = Condenser water temperature outlet (°C)

The standard 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<sup>-4</sup> m<sup>2</sup> K/W fouling factor.

## TECHNICAL SPECIFICATIONS FOR TOTAL RECOVERY VERSION (VR)

### Version with total recovery on all circuits VR

Model	280.1	320.1	360.1	420.1	480.1	540.1	600.1	710.2	820.2	950.2	1100.2	1200.2	UM
Recovered heating capacity	318	359	404	464	546	607	674	801	925	1072	1208	1332	kW
Recovered water flow rate	15,2	17,2	19,3	22,2	26,1	29,0	32,2	38,3	44,2	51,2	57,7	63,6	l/s
Recovered water pressure drop	25	22	23	24	34	24	22	23	24	34	24	22	kPa
Type of recovery exchanger	SHELL AND TUBE												-
Quantity	1						2						N°
Max. operating pressure on wet side	1600												kPa
Total water content of recovery exchangers	27	31	34	37	37	53	59	68	74	74	106	118	l

**Notes:**

The data refer to: Water temperature: evaporator inlet :**12°C** - evaporator outlet: **7°C**.

The data refer to: Water temperature: recovery inlet :**40°C** - recovery outlet: **45°C**.

**FOR THE STANDARD PERFORMANCES OF THE HEAT RECOVERY VERSION REFER TO THE VALUES REPORTED IN THE TABLES "STANDARD PERFORMANCES" FOR BASIC VERSION (kWt).**

## NOISE LEVELS

### Basic version VB

Mod.	SWL (dB)										SPL (dBA)		
	Octave bands (Hz)								Total		1m	5m	10m
	63	125	250	500	1000	2000	4000	8000	Tot	dB(A)			
280.1	94	93	91	92	92	91	86	79	100	97	79	70	65
320.1	94	93	91	92	92	91	86	79	100	97	79	70	65
360.1	94	93	91	92	92	91	86	79	100	97	79	70	65
420.1	96	95	94	93	94	92	88	82	102	98	80	72	67
480.1	96	95	94	93	94	92	88	82	102	98	80	72	67
540.1	96	95	94	93	94	92	88	82	102	98	80	72	67
600.1	96	95	94	93	94	92	88	82	102	98	80	71	66
710.2	98	97	95	93	94	94	88	82	103	99	80	72	67
820.2	100	98	97	95	96	94	90	84	105	100	81	73	68
950.2	100	98	97	95	96	94	90	84	105	100	81	73	68
1100.2	100	98	97	95	96	94	90	84	105	100	81	73	68
1200.2	100	98	97	95	96	94	90	84	105	100	81	73	68

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: 8°C).

**SWL** = Sound power levels, with reference to  $1 \times 10^{-12}$  W.

The **Total** sound power level in **dB(A)** measured in compliance with **ISO 9614** standards, is certified according to the **Eurovent** certification program.

Eurovent certification (**E**) exclusively refers to the **Total** Sound Power in **db(A)**, 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  $2 \times 10^{-5}$  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 and the units operating in nominal conditions in the cooling mode.

### Basic version VB + Compressor Soundproofing Box accessory (CC)

Mod.	SWL (dB)										SPL (dBA)		
	Octave bands (Hz)								Total		1m	5m	10m
	63	125	250	500	1000	2000	4000	8000	Tot	dB(A)			
280.1	93	90	88	87	86	88	80	76	97	92	74	65	60
320.1	93	90	88	87	86	88	80	76	97	93	75	66	61
360.1	93	90	88	87	86	88	80	76	97	92	74	65	60
420.1	94	91	89	87	86	89	82	78	98	93	75	66	61
480.1	94	91	89	87	86	89	82	78	98	93	75	66	61
540.1	95	92	90	89	87	90	83	80	99	94	76	67	62
600.1	95	92	90	89	87	90	83	80	99	94	76	67	62
710.2	96	94	91	89	89	88	84	80	100	94	75	67	62
820.2	97	93	92	89	88	91	86	80	101	95	76	68	63
950.2	97	93	92	89	88	91	86	80	101	95	76	68	63
1100.2	97	95	94	90	89	92	86	80	102	96	77	69	64
1200.2	97	95	94	90	89	92	86	80	102	96	77	69	64

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: 8°C).

**SWL** = Sound power levels, with reference to  $1 \times 10^{-12}$  W.

The **Total** sound power level in **dB(A)** measured in compliance with **ISO 9614** standards, is certified according to the **Eurovent** certification program.

Eurovent certification (**E**) exclusively refers to the **Total** Sound Power in **db(A)**, 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  $2 \times 10^{-5}$  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 and the units operating in nominal conditions in the cooling mode.

## OPERATING RANGE

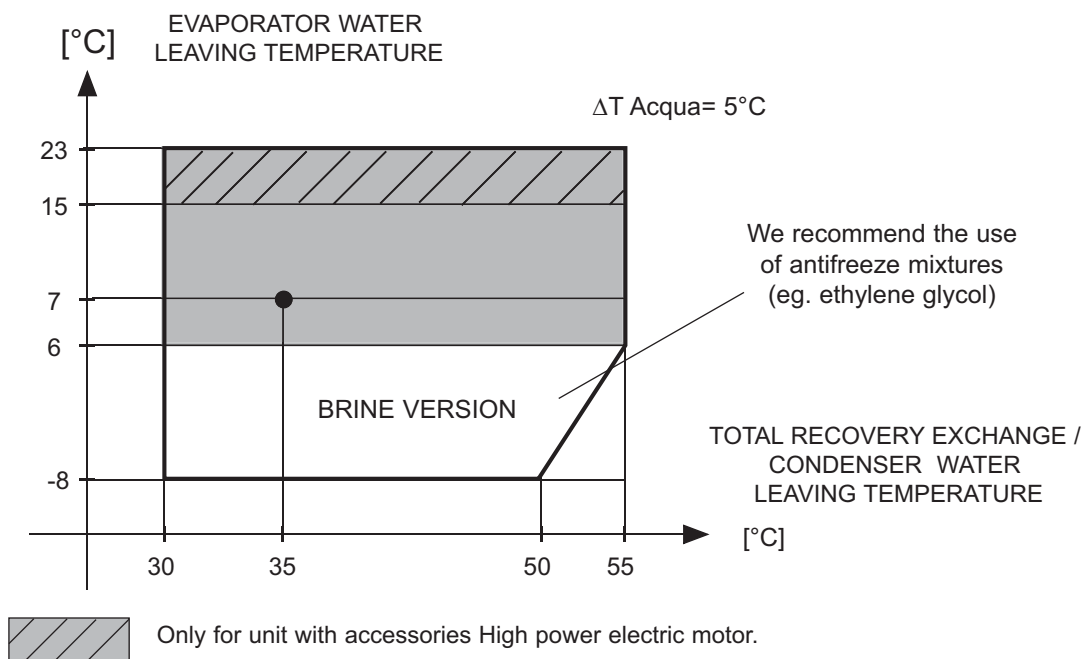
### Limiti operativi

The graph indicates the admissible working envelope of the unit.

The use of the unit in conditions outside the envelope will void the warranty.

Here under are reported the limits of water differential temperature for the heat exchangers of the unit.

Water thermal gradient*		EVAPORATOR	CONDENSER / RECOVERED	
			Cooling Tower	City Water
Minimum	°C	4	4	8
Maximum	°C	8	8	20

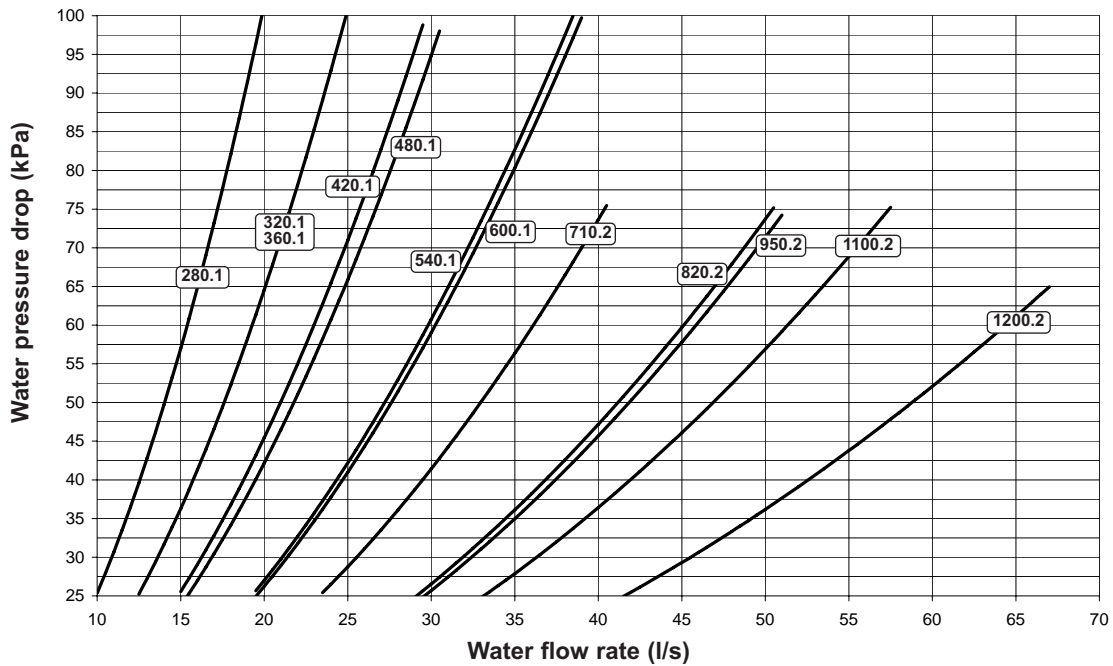


\* : Verify that water flow rate is inside the admissible limits.

# WATER PRESSURE DROP

## Water pressure drop Evaporator

The graph below illustrates for the evaporator 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.

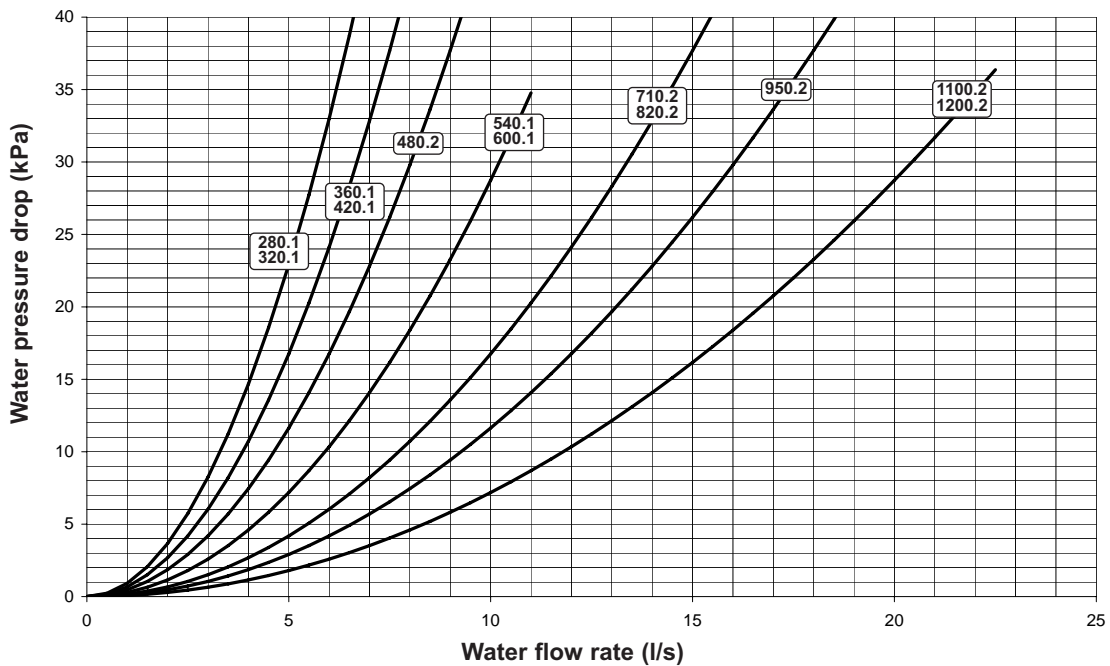


### Operating range

Mod.		280.1	320.1	360.1	420.1	480.1	540.1	600.1	710.2	820.2	950.2	1100.2	1200.2	UM	NOTES
Lower limit value	Q	10	12.5		15	15.5	19.5	19.5	23.5	29	29.5	33	41.5	l/s	Q=Water flow rate Δp=Water pressure drop
	Δp	25												kPa	
Upper limit value	Q	20	25		29.5	30.5	39	39	40.5	50.5	51	57.5	67	l/s	
	Δp	100	100		99	98	100	100	75	75	74	75	65	kPa	

## Water pressure drop Desuperheater

The graph below illustrates for the evaporator 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.



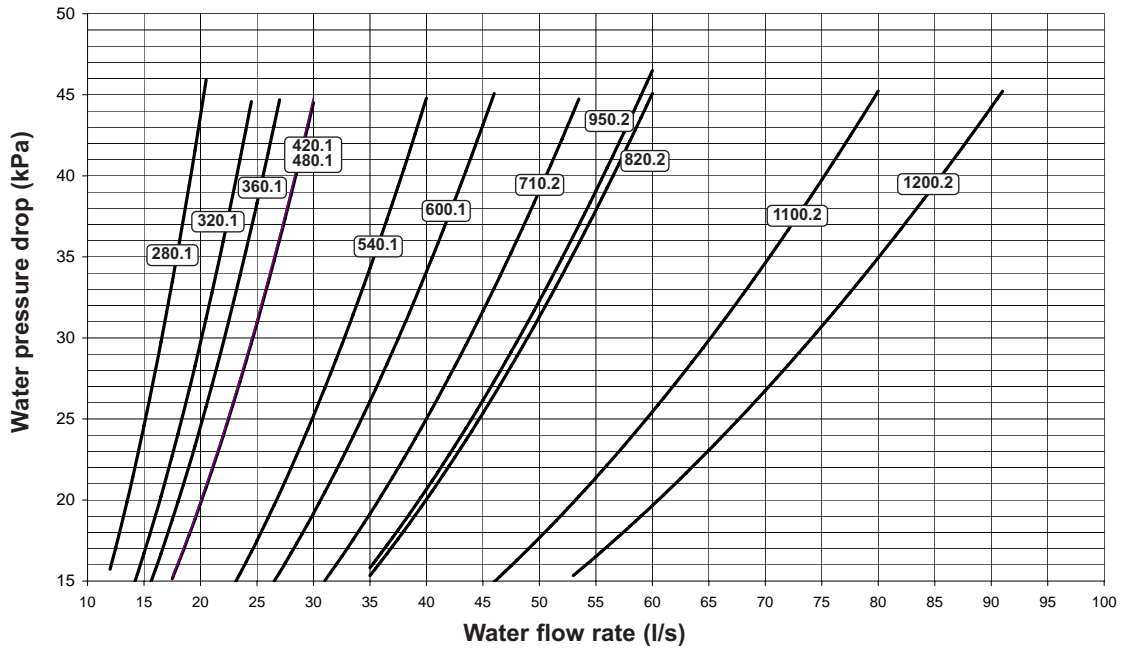
### Operating range

Mod.		280.1	320.1	360.1	420.1	480.1	540.1	600.1	710.2	820.2	950.2	1100.2	1200.2	UM	NOTES
Upper limit value	Q	6.5		7.8		9.2	11		15.5		22.5		l/s	Q = Water flow rate Δp = Water pressure drop	
	Δp	40					35		40		36		kPa		

## WATER PRESSURE DROP

### Water pressure drop Condenser Cooling tower (4T5) / Total recovery version VR

The graph below illustrates for the evaporator 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.

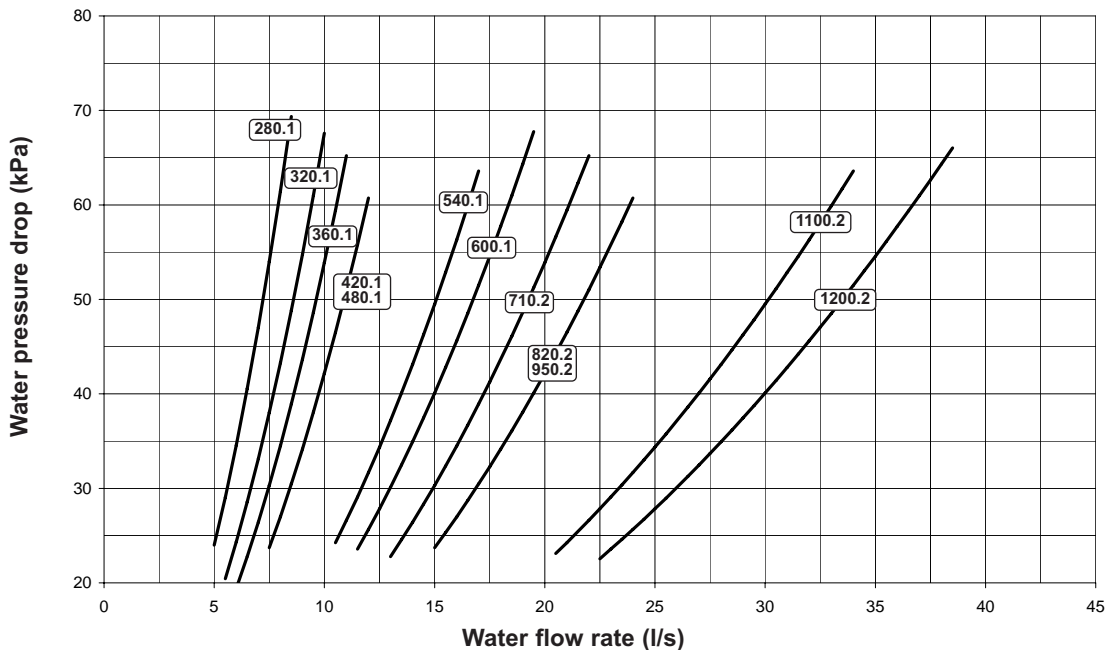


#### Operating range

Mod.		280.1	320.1	360.1	420.1	480.1	540.1	600.1	710.2	820.2	950.2	1100.2	1200.2	UM	NOTES
Lower limit value	Q	12	14	15.5	17.5		23	26.5	31	35	35	46	53	l/s	Q = Water flow rate $\Delta p$ = Water pressure drop
	$\Delta p$	15												kPa	
Upper limit value	Q	20.5	24.5	27	30		40	46	53.5	60	60	80	91	l/s	$\Delta p$ = Water pressure drop
	$\Delta p$	46	45	45	45	45	45	45	45	45	46	45	45	kPa	

### Water pressure drop Condenser City water (4P5)

The graph below illustrates for the evaporator 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.



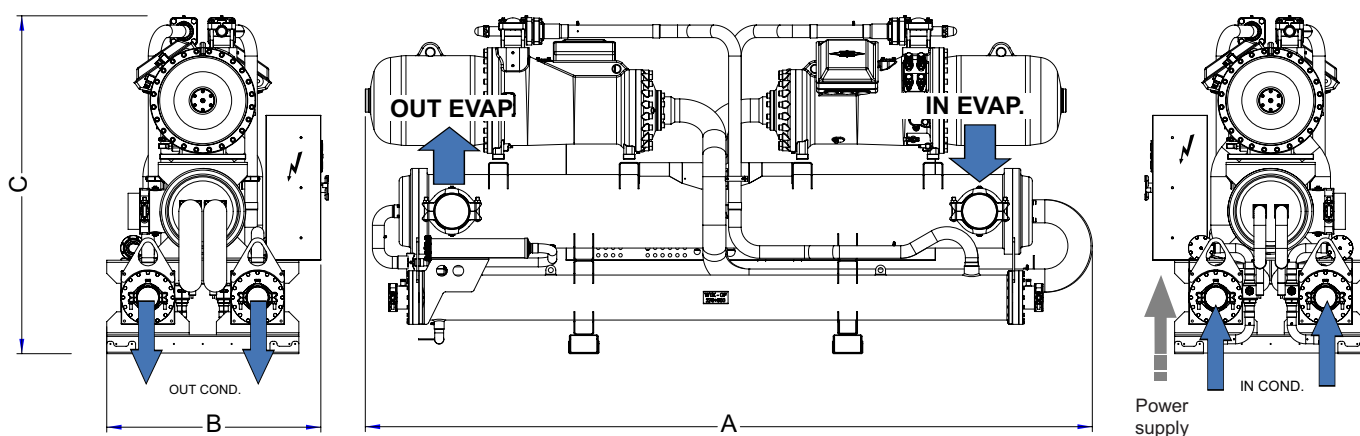
#### Operating range

Mod.		280.1	320.1	360.1	420.1	480.1	540.1	600.1	710.2	820.2	950.2	1100.2	1200.2	UM	NOTES
Lower limit value	Q	5	5.5	6	7.5	10.5	11.5	13	15	23	23	l/s	Q = Water flow rate $\Delta p$ = Water pressure drop		
	$\Delta p$	24	20	19	24	24	24	23	24	20.5	22.5	kPa			
Upper limit value	Q	8.5	10	11	12	17	19.5	22	24	34	38.5	l/s	$\Delta p$ = Water pressure drop		
	$\Delta p$	69	68	65	61	64	68	65	61	64	66	kPa			

## DIMENSIONAL DATA

### Dimension and weight

The image refers to units with 2 compressors in configuration Cooling tower (4T5).

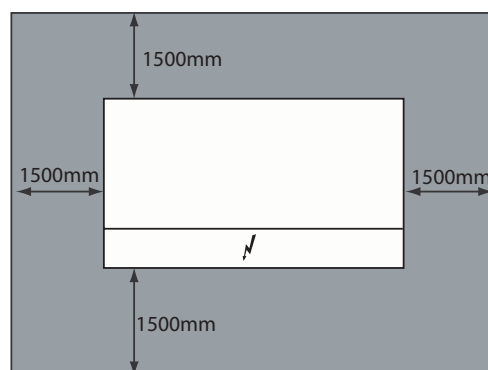


Mod.	280.1	320.1	360.1	420.1	480.1	540.1	600.1	710.2	820.2	950.2	1100.2	1200.2	UM	
Weight shipping	1597	1648	1677	2224	2267	2459	2688	3165	4315	4338	4783	4958	kg	
Weight operation	1739	1789	1817	2426	2463	2665	3017	3433	4742	4755	5214	5391	kg	
A	3900	3900	3900	3900	3900	3900	3900	4320	4400	4400	4400	4400	mm	
B	1100	1100	1100	1100	1100	1100	1100	1190	1190	1190	1230	1230	mm	
C	1845	1845	1845	1880	1880	2045	2045	1845	1880	1880	2045	2045	mm	
EVAPORATOR IN - OUT	DN125 VIC	DN125 VIC	DN125 VIC	DN150 VIC	DN150 VIC	DN150 VIC	DN200 VIC	DN150 VIC	DN200 VIC	DN200 VIC	DN200 VIC	DN200 VIC	-	
CONDENSER IN - OUT	TOWER	3" GAS F	DN100 VIC	DN100 VIC	DN100 VIC	DN100 VIC	DN125 VIC	DN125 VIC	DN100 VIC	DN100 VIC	DN100 VIC	DN125 VIC	DN125 VIC	-
	CITY	2" GAS F	2" 1/2 GAS F	2" 1/2 GAS F	2" 1/2 GAS F	2" 1/2 GAS F	3" GAS F	3" GAS F	2" 1/2 GAS F	2" 1/2 GAS F	2" 1/2 GAS F	3" GAS F	3" GAS F	-

### Minimum space required 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.

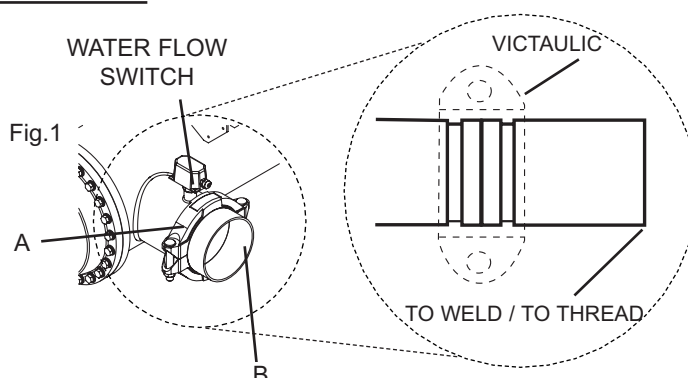
**NOTE: Allow for a clear area of not less than 1.5 meters above unit.**  
The functional areas must be doubled if multiple units are installed.



### Victaulic connections and water flow switch

These comprise two wet connections of the Victaulic type (Fig. 1-A) composed by steel joint (Fig. 1-B) and rubber packing not installed (supplied with the unit). The steel joints are suitable to be welded or threaded.

**Nota:**  
**Supplied as accessory (see "Accessory and optional equipment")**



The manufacturer declines all responsibility for any inaccuracies in this manual due to printing or typing errors. The reserves the right to modify the products contents in this catalogue without previous notice.





# ferroli

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