Technical Manual

DFMO 22-41

R410A

23.AW.DFMO22-41.R410A.TM.EN.20.07

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Total comfort is required all year round, even in the most difficult application situations

In applications like offices, shops, hotels and public buildings it is necessary to maintain comfort all year round, regardless of the external conditions and the different uses of the served ambient. Each area requires its own temperature, humidity and air purification level, in the fastest and simplest way for users.

The maintenance cost of this comfort depends on the chosen air-conditioning system, both when purchasing and above all during use and maintenance over its working lifetime. The rationale of the chosen system and its energy efficiency are therefore fundamental factors of choice.

Finally, an air-conditioning system must be perfectly integrated into a building, in harmony with the structure and the furniture. In some cases, this is a very complex challenge, where, for instance, external units cannot be installed and air vents cannot be fitted, as in certain buildings or historical structures due to regulatory or aesthetic reasons.

Highly efficient and reliable reversible electric heat pump technology

Electric heat pumps represent an efficient and advantageous choice for ambient air-conditioning. These devices enable energy to be exchanged between the external ambient, known as the source, and the served setting, using the particular refrigeration circuit which they are equipped with. This transfer only requires the use of electrical energy and is highly efficient, therefore at low consumption. Furthermore, reversible electric heat pumps simplify the system, since only one plant can operate heating and cooling requirements over the entire annual cycle.

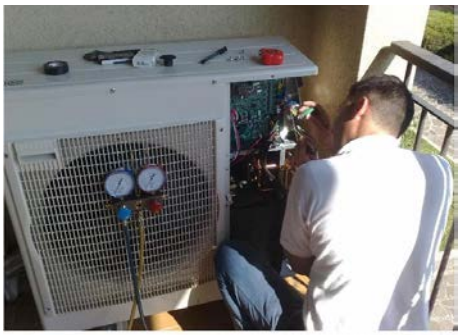
Thanks to their energy efficiency, electric heat pumps guarantee the desired level of comfort with reduced management costs and a low impact on the environment. For this reason there are numerous initiatives to aid their production with economic and fiscal incentives.

Heat pump systems which use water as heat source are even more efficient than traditional systems

In the face of apparently limited costs, direct expansion systems, for instance, split, multisplit and VRF/VRV systems have numerous limitations in their applications. The piping which contains the refrigerant passes through served settings and is therefore subject to restrictions and usage limitations. It must be limited in length and insulated. Furthermore, external units may be totally incompatible with the architectural and constructions characteristics of the building.

Hydronic systems are without doubt more complete and versatile. Often the system costs for medium and small sized systems are higher in that they are more highly articulated and subject to labour costs for installation, set up and calibration. The complexity increases even more in large-scale centralised systems with four-pipe distribution.

On the other hand, when each area is equipped with its own heat pump which uses water as a heat source, there are only two supply pipes, which save space and installation costs and pump usage costs. Furthermore, there are no length limitations, since they contain water and not refrigerant. The water temperature is generally neutral in comparison with the served ambient and therefore the pipes do not need to be insulated. By using water as a heat source, the energy efficiency of the heat pump further increases, even as much as by 30%.



The compact and silent solution

DFMO brings reversible heat pump technology and the system reliability in a unit simple to false ceiling positioning and versatile like a fan coil.

A high efficient rotating compressor with ecological refrigerant R410A, electronic expansion valve, plate exchanger source side and multi-speed fan: are only some of the solutions available in this completely automatic air-conditioner.

It's the ideal solution when there are the necessity to install the false ceiling unit or for its maximum integration within furnishings. Furthermore, it contains only a minimum quantity of ecological refrigerant (less than 3 kg), and is therefore not subject to restrictions on use. The two water supply ducts do not have length limitations, even, in many cases, they do not need to be insulated and result easy to install and maintain.

It purifies and conditions the air in all settings

Use water as heat source

It contains the best reversible heat pump technology in its interior

Advantages

System simplification

Thanks to its one-piece construction, the system components and installations are already within the unit itself. The heat or cooling energy which is generated by the unit is directly transferred into the served ambient. The supply water may come from an energy transfer WLHP loop circuit, from a natural source such as a groundwater, or even from water works in certain cases where architectural constraints make any other system solution impossible.

Silence and reduction of management costs

Thanks to the numerous construction solutions which have been adopted and to its special automatic control, vibrations and sound emissions are undoubtedly reduced. The reversible heat pump technology at high energy efficiency maintains the required comfort only where and when it is needed, reducing the consumption and therefore the management costs over the entire annual cycle. In all the applications which allow it, the devices which limit water consumption reduce these expenses even furthe

High energy efficiency all year round

DFMO increases the overall system cost thanks to technological solutions from the inside, all choices for efficient operation and long-lasting is guaranteed by strict quality controls in the construction phase and rigorous testing functional on the finished product.

High efficiency rotary compressor

With silent and reliable operation, it uses the ecological refrigerant R410A and it is contained within a special compartment which has been further sound-proofed.

Electronic expansion valve

The electronic expansion valve (EEV) rapidly and precisely adapts to the effective load required. Furthermore, in the heat pump operation it ensures stability also with high water temperatures.

Source side plate exchanger

Universally recognised for its highly efficient heat exchange, it is complete with a regulation probe and safety device and is offered with a matching mechanical steel knit strainer which can ensure excellent performance over time.

Multi-speed fan

The EXTRAQUIET, QUIET and POWERFUL speeds allow to achieve always the best operating conditions in the different applications. In the AUTO mode, the unit automatically sets the most appropriate speed to quickly reach the comfort conditions, thanks to the automatic compensation depending on the distance between the effective temperature in the served room and the set-point.

The silent comfort

The compressor is housed in a dedicated compartment, made of thick stainless steel and covered with sound-proofing material. It is equipped with a double anti-vibration support system, a vibration sound absorber in the refrigerant circuit, and also with a metal closure hood and finishing in the cased configuration.

At the end of the steady state phase, the AUTO fan mode activation maintains furthermore the minimum speed necessary to maintain the comfort, further increasing the acoustic comfort in the room.

Reliability and safety

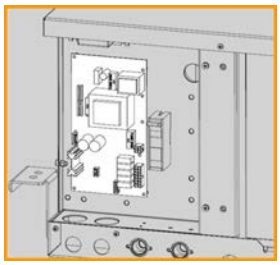
Among the numerous adopted solutions, are:

- The combination of outlet water anti-freeze sensor, treated air anti-freeze sensor, entering water temperature sensor and water flow-rate monitoring device protects the unit from the ice formation and any malfunctioning which may derive from it.
- The thermostatic valve with MOP (Maximum Operating Pressure) function automatically controls the evaporating pressure to an optimal value for the efficient compressor operating, even upon changes of the heat exchange conditions with the water source.
- The electronic control of the thermostatic valve also uses dynamic algorithms, managing the regularity of the refrigerant flow in the circuit and ensuring a compressor stable operating and, therefore, an increase of its efficiency and operating life.

Easy to use in the small and large plants

DFMO is extremely versatile and reliable even in solutions controlled by the User.

Standard automatic functions

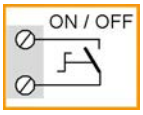


The standard DFMO version is equipped with a standard automatic control, complete with a micro processor card and control and safety sensors built-in. Given that it is without a user display, this version represents an efficient solution in all applications open to the public where the operating parameters could otherwise be inappropriately changed.

The standard automatic control:

- it detects the space conditions and compares them with the user set point;
- it can decide the operating mode automatically (heating or cooling);
- it decides the activation of resources and can automatically select the fan speed depending on the distance from the scheduled set point;
- it can manage without further accessories a mini local network of 15 units, one of which is a master and the others slaves which replicate its operating.

Voltage-free contact user interface

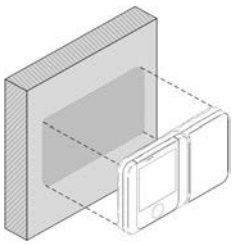


The standard version has a series of voltage-free contacts, or rather contacts without tension, for managing the following functions remotely: Switching on and switching off, Changing function mode (heating or cooling), setting the Set point (standard or economic), Cumulative alarm.

User interface with wall display

The control can be cased or uncased. It has a modern aspect and is very simple to use even for non-specialised users. Furthermore, it has different access levels, password protected, available for managing the different unit functions.

Among the main functions, it detects the temperature using the temperature sensor in its interior, schedules the operating time bands, displays and manages the operating alarms and parameters, enables the manual management of the fan speed and operating mode (heating or cooling).



on the wall

User interface by serial connection

The various communication protocols allow the unit to exchange information with the main supervision systems by means of serial connections.

Easy to connect to the water network

System components for connecting DFMO to water circuit are available as accessories and are already sized to ensure the proper operating and efficiency of the unit.

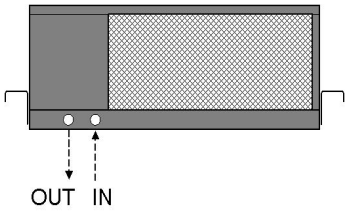
The assembly of hydraulic valves and cock outside the unit allows their place in a easily accessible position of the ceiling for routine maintenance.

Further components which are needed for connecting the hydraulic supply network are available as accessories for installation, encharged to the Client:

- steel mesh strainer
- ON/OFF motorised 2-way valve for variable flow-rate system
- motorised 2-way modulating valve for system with disposable water
- hand shut-off valves
- hand by-pass valve for system cleaning
- water balancing valve
- flexible pipe for water supply and condensate drain

The unit is complete with plate heat exchanger and control and safety devices.

standard unit



The versatility in different application systems

The integration of the unit with the optional hydraulic components makes it easier to start and run the system operation in the different installations: constant or variable flow-rate loop.

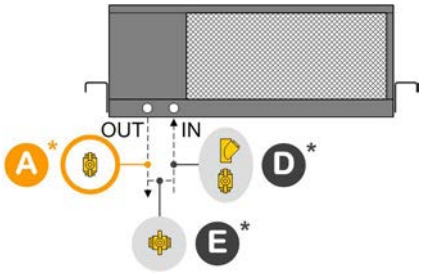
The pipe work arrangements enable the unit to be intercepted from the system, the system cleaning (fluxing), the water mechanical filtration during the ordinary operating to protect the exchanger from fouling.

The 2-way modulating valve, available as accessory, allows to:

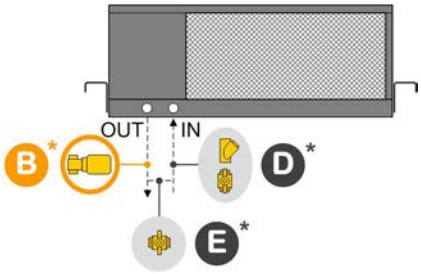
- further extend the application range to systems fed with groundwater or aqueduct. It is so possible to reduce the water consumption;
- extend the standard unit operating range in cooling mode with source at low water temperature;
- maximize the efficiency in heating mode also with source at high water temperature.

In the presence of the 2-way modulating valve, the water feeding must be at variable flow-rate. This allows an interesting energy saving on the installation and then a further reduction of the management costs.

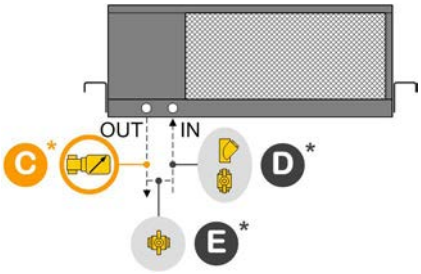
APPLICATION: CONSTANT FLOW-RATE LOOP



APPLICATION: VARIABLE FLOW-RATE LOOP



APPLICATION: WASTE WATER SYSTEM



A - Hand shut-off valve
B - ON/OFF motorised 2-way valve
C - Modulating 2-way motorised valve
D - Steel mesh strainer and hand shut-off valve
E - Hand by-pass valve

*** to instal outside the unit**

Standard unit technical specifications

Compressor

Hermetic rotary compressor with gas compression in the crankcase, direct suction, no oil heater. It is mounted on antivibration rubber pads. Includes oil feed.

Structure

Structure made entirely in Zinc–Magnesium plate that guarantees excellent mechanical characteristics and high corrosion strength over time. The compressor area is made from thick metal plate and is completely insulated with soundproofing material to minimise noise output. The ventilating section is completely lined with anti-condensate and soundproofing material. **M0 insulation.**

Internal exchanger

Direct expansion finned exchanger, made of copper pipes in staggered rows and mechanically expanded to the fin collars. The fins are made of aluminium with a corrugated surface and adequately distanced to ensure the maximum heat exchange efficiency.

External exchanger source side (water)

Direct expansion heat exchanger with braze welded stainless steel INOX AISI 316 plates and complete with external thermal/anti-condensation insulation.

The exchanger is complete with:

- differential pressure switch, water side
- entering water temperature sensor
- leaving water temperature sensor, with antifreeze function
- Vent valve

Fan

dual intake centrifugal fan, directly coupled, motor with external rotor, located in the centre of the fan in an aerodynamically optimum position and suspended on antivibration dampers. Forward blades for maximum efficiency and low noise, statically- and dynamically-balanced according to the ISO 1940 standards, section 6.3. The scroll, the rotor and the frame are made from galvanized steel plate (sendzimir).

The fan is mounted on a fixing plate that can be installed rotated by 180° so that the air supply intake is located on the upper part.

Refrigeration circuit

Refrigeration circuit with:

- liquid receiver
- non-return valve
- 4-way reverse cycle valve
- high pressure safety pressure switch
- electronic thermostatic valve
- inlet pressure transducer for electronic thermostatic valve
- Inlet temperature probe for electronic thermostatic valve

Filtration

Flat filter, made up of a galvanized plate frame with galvanized and electric-welded protective mesh and 100% regenerable polyester filtering media with PVC resin. G2 efficiency according to CEN-EN 779 standard (Eurovent class EU4/5 - average efficiency 79% ASHRAE 52-76 Atm). Self-extinguishing (resistance to fire class 1 - DIN 53438).

Drain pan

Condensate collecting tray plate "Aluzink" welded, fitted with a discharge coupling and covered externally with anti-condensate insulation.

Trap on the drop conduit to be performed by the installer

Electrical panel

The electrical panel, consisting of a microprocessor control, is located inside the unit and can be accessed via a panel which can be easily removed.

The capacity section includes:

- power input terminals
- main fuse

The control section includes:

- microprocessor control
- self-test system
- switch on and off daily and weekly programmer and set point
- cumulative alarms device, potential-free contacts for remote ON-OFF, summer/winter mode change, ECO setpoint setting, water flow presence
- antifreeze protection on the air side
- antifreeze protection water side
- no water flow-rate protection
- return air temperature probe with thermoregulation function
- manual or automatic fan speed selection

Accessories

- 2-way modulating valve for disposable water system (Accessory separately supplied)

General technical data

Size			5	9	17
Cooling A 2 W 30					
Cooling capacity (EN14511:2011)	1	kW	2.26	3.16	4.16
Total power input (EN14511:2011)	1	kW	0.54	0.74	0.92
EER (EN 14511:2011)	1	kW	4.22	4.28	4.51
Cooling capacity	2	kW	2.24	3.14	4.13
Sensible capacity	2	kW	1.91	2.75	3.50
Compressor power input	2	kW	0.46	0.64	0.81
Total power input	2	kW	0.53	0.72	0.91
Heating A W 20					
Heating capacity (EN14511:2011)	3	kW	2.76	3.85	4.92
Total power input (EN14511:2011)	3	kW	0.55	0.77	1.06
COP (EN 14511:2011)	3	kW	4.99	4.97	4.66
Heating capacity	4	kW	2.78	3.87	4.95
Compressor power input	4	kW	0.48	0.68	0.95
Total power input	4	kW	0.55	0.76	1.05
Heating A W 15					
Heating capacity (EN14511:2011)	5	kW	2.46	3.33	4.42
Total power input (EN14511:2011)	5	kW	0.55	0.73	1.02
COP (EN 14511:2011)	5	kW	4.42	4.47	4.30
Heating capacity	6	kW	2.48	3.35	4.45
Compressor power input	6	kW	0.48	0.64	0.92
Total power input	6	kW	0.55	0.72	1.02
Compressor					
Type of compressors	7		ROT	ROT	ROT
No. of compressors		No	1	1	1
Air Handling Section Fans (Supply)					
Type of fans	8		CFG	CFG	CFG
Airflow		l/s	148	170	222
Airflow		m3/h	533	612	800
Water side exchanger					
Type of exchanger	9		PHE	PHE	PHE
Water flow-rate	10	l/s	0.129	0.181	0.236
Pressure drop	11	kPa	18	26	26
Connections					
Water fittings	12		1/2"	1/2"	1/2"
Condensate drain	13		15	15	15
Power supply					
Standard power supply		V	230/1/50	230/1/50	230/1/50

The Product is compliant with the Erp (Energy Related Products) European Directive. It includes the Commission delegated Regulation (EU) No 2016/2281, also known as Ecodesign Lot21.
Performances referred to the standard speed fan (Quiet)
A 27/19 W 30 = Unit inlet air temperature 27°C D.B. / 19°C W.B. Unit inlet water temper
A 20 W 20 = Unit inlet air temperature 20°C Unit inlet water temperature 20°C
A 20 W 15 = Inlet air temperature 20°C Inlet water temperature 15°C
DB = dry bulb WB = wet bulb

1. Ambient air 27°C D.B./19°C W.B. Exchanger water temperature 30°C / 35°C. Values read in compliance with EN14511:2011 and including the required system fan motor and water pump capacity for overcoming pressure drops inside the unit.
2. Ambient air 27°C D.B./19°C W.B. Exchanger water temperature 30°C / 35°C. The value does not take into account the power of the fan's motor and the part related to the pumps and required to overcome the pressure drops for the circulation of the solution inside the exchangers
3. Ambient air 20°C D.B. Exchanger inlet water temperature 20°C. The water temperature at the exchanger output is read in relation to the flow of water being chilled. Values read in compliance with EN14511:2011 and including the required system fan motor and water pump capacity for overcoming pressure drops inside the unit.
4. Ambient air 20°C D.B. Exchanger inlet water temperature 20°C. The value does not take into account the power of the fan's motor and the part related to the pumps and required to overcome the pressure drops for the circulation of the solution inside the exchangers
5. Ambient air 20°C D.B. Exchanger inlet water temperature 15°C. The water temperature at the exchanger output is read in relation to the flow of water being chilled. Values read in compliance with EN14511:2011 and including the required system fan motor and water pump capacity for overcoming pressure drops inside the unit.
6. Ambient air 20°C D.B. Exchanger inlet water temperature 15°C. The value does not take into account the power of the fan's motor and the part related to the pumps and required to overcome the pressure drops for the circulation of the solution inside the exchangers
7. ROT = rotary compressor
8. CFG = centrifugal fan
9. PHE = plate exchanger
10. Water flow calculated in relation to the performances in cooling
11. Total pressure drop of the standard unit (without optional hydraulic pipe works). To obtain the total drops with any additional hydraulic components see accessory section.
12. inlet / outlet
13. External diameter pipe

Electrical data

Size			5	9	17
F.L.A. - Full load current at max admissible conditions					
F.L.A. - Compressor 1		A	2.82	3.90	5.86
F.L.A. - Single supply fan		A	0.41	0.41	1.5
F.L.A. - Total		A	3.23	4.31	7.36
F.L.I. - Full load power input at max admissible conditions					
F.L.I. - Compressor 1		kW	0.65	0.85	1.25
F.L.I. - Single External Fan		kW	0.09	0.09	0.15
F.L.I. - Total		kW	0.74	0.94	1.40
M.I.C. Maximum inrush current					
M.I.C. - Value		A	18.4	20.4	26.9

Data refer to standard units.
Power supply: 230/1/50 Hz. Voltage variation: max. +/-10%

Performances in cooling

SIZES	Ta(°C) DB/WB	EXCHANGER ENTERING/LEAVING WATER TEMPERATURE (°C)																							
		20/25				25/30				30/35				35/40				40/45				45/50			
		kWf	kWs	kWe	EER	kWf	kWs	kWe	EER	kWf	kWs	kWe	EER	kWf	kWs	kWe	EER	kWf	kWs	kWe	EER	kWf	kWs	kWe	EER
5	22 / 16	2,11	1,68	0,38	**5,55**	2,09	1,67	0,42	**4,98**	2,04	1,66	0,47	**4,34**	1,94	1,65	0,54	**3,59**	1,81	1,64	0,62	**2,92**	1,63	1,63	0,71	**2,30**
	24 / 17	2,19	1,81	0,38	**5,76**	2,17	1,8	0,42	**5,17**	2,1	1,79	0,47	**4,47**	2	1,78	0,53	**3,77**	1,86	1,77	0,62	**3,00**	1,68	1,68	0,71	**2,37**
	26 / 18	2,27	1,94	0,37	**6,14**	2,24	1,93	0,41	**5,46**	2,17	1,92	0,47	**4,62**	2,07	1,9	0,53	**3,91**	1,92	1,89	0,62	**3,10**	1,73	1,73	0,71	**2,44**
	27 / 19	2,35	1,94	0,37	**6,35**	2,32	1,92	0,41	**5,66**	2,24	1,91	0,46	**4,87**	2,13	1,89	0,53	**4,02**	1,98	1,87	0,62	**3,19**	1,79	1,79	0,71	**2,52**
	28 / 20	2,44	1,93	0,37	**6,59**	2,4	1,91	0,4	**6,00**	2,32	1,89	0,46	**5,04**	2,2	1,87	0,53	**4,15**	2,04	1,85	0,61	**3,34**	1,85	1,83	0,71	**2,61**
	30 / 22	2,63	1,87	0,36	**7,31**	2,57	1,84	0,4	**6,43**	2,47	1,82	0,45	**5,49**	2,34	1,79	0,52	**4,50**	2,17	1,77	0,61	**3,56**	1,97	1,75	0,71	**2,77**
9	22 / 16	2,86	2,37	0,56	**5,11**	2,86	2,37	0,6	**4,77**	2,81	2,37	0,66	**4,26**	2,71	2,37	0,74	**3,66**	2,56	2,37	0,85	**3,01**	2,35	2,35	0,99	**2,37**
	24 / 17	2,97	2,56	0,55	**5,40**	2,97	2,56	0,59	**5,03**	2,92	2,56	0,65	**4,49**	2,81	2,56	0,74	**3,80**	2,65	2,56	0,86	**3,08**	2,44	2,44	1	**2,44**
	26 / 18	3,08	2,76	0,54	**5,70**	3,08	2,75	0,58	**5,31**	3,03	2,75	0,65	**4,66**	2,92	2,75	0,74	**3,95**	2,75	2,74	0,86	**3,20**	2,53	2,53	1	**2,53**
	27 / 19	3,2	2,76	0,52	**6,15**	3,2	2,75	0,57	**5,61**	3,14	2,75	0,64	**4,91**	3,02	2,74	0,74	**4,08**	2,85	2,74	0,86	**3,31**	2,62	2,62	1	**2,62**
	28 / 20	3,33	2,75	0,5	**6,66**	3,32	2,75	0,56	**5,93**	3,25	2,74	0,64	**5,08**	3,13	2,74	0,74	**4,23**	2,95	2,73	0,86	**3,43**	2,71	2,71	1,01	**2,68**
	30 / 22	3,6	2,73	0,47	**7,66**	3,58	2,72	0,54	**6,63**	3,49	2,71	0,63	**5,54**	3,35	2,7	0,74	**4,53**	3,16	2,7	0,87	**3,63**	2,91	2,69	1,02	**2,85**
17	22 / 16	4,12	3,24	0,63	**6,54**	3,95	3,15	0,72	**5,49**	3,78	3,06	0,8	**4,73**	3,6	2,97	0,89	**4,04**	3,42	2,89	0,98	**3,49**	3,23	2,8	1,06	**3,05**
	24 / 17	4,24	3,43	0,63	**6,73**	4,07	3,34	0,72	**5,65**	3,89	3,26	0,8	**4,86**	3,72	3,17	0,89	**4,18**	3,54	3,08	0,98	**3,61**	3,36	2,99	1,07	**3,14**
	26 / 18	4,36	3,64	0,64	**6,81**	4,19	3,56	0,72	**5,82**	4,01	3,47	0,81	**4,95**	3,83	3,38	0,89	**4,30**	3,66	3,29	0,98	**3,73**	3,48	3,21	1,06	**3,28**
	27 / 19	4,49	3,67	0,64	**7,02**	4,31	3,59	0,72	**5,99**	4,13	3,5	0,81	**5,10**	3,95	3,41	0,89	**4,44**	3,77	3,33	0,98	**3,85**	3,6	3,24	1,06	**3,40**
	28 / 20	4,63	3,74	0,65	**7,12**	4,44	3,66	0,73	**6,08**	4,26	3,57	0,81	**5,26**	4,07	3,49	0,89	**4,57**	3,89	3,41	0,97	**4,01**	3,71	3,32	1,06	**3,50**
	30 / 22	4,91	4,05	0,67	**7,33**	4,72	3,97	0,74	**6,38**	4,53	3,89	0,81	**5,59**	4,33	3,81	0,89	**4,87**	4,13	3,73	0,97	**4,26**	3,93	3,65	1,05	**3,74**

Performances referred to the standard speed fan (Quiet)

EER referred only to compressors

Ta = entering air temperature to the air handling coil (°C)
DB = dry bulb WB = wet bulb

kWf = Cooling capacity in kW.
kWe = Compressor power input in kW
kWs = sensible cooling capacity (kW)

Not all cooling yields take into account the heat dissipated by the fan motors

Performance in Heating

SIZES	Ta (°C) DB	EXCHANGER ENTERING/LEAVING WATER TEMPERATURE (°C)																	
		12/7			15/10			17/12			20/15			25/20			35/30		
		kWt	kWe	COP	kWt	kWe	COP	kWt	kWe	COP	kWt	kWe	COP	kWt	kWe	COP	kWt	kWe	COP
5	10	2,19	0,39	**5,62**	2,45	0,39	**6,28**	2,61	0,39	**6,69**	2,84	0,39	**7,28**	3,2	0,4	**8,00**	3,27	0,43	**7,70**
	15	2,21	0,42	**5,26**	2,44	0,43	**5,67**	2,58	0,43	**6,00**	2,79	0,44	**6,34**	3,1	0,44	**7,05**	3,18	0,47	**6,82**
	18	2,21	0,44	**5,02**	2,43	0,45	**5,40**	2,56	0,46	**5,57**	2,75	0,46	**5,98**	3,04	0,47	**6,47**	3,12	0,50	**6,29**
	20	2,2	0,46	**4,78**	2,41	0,47	**5,13**	2,54	0,48	**5,29**	2,73	0,48	**5,69**	2,99	0,49	**6,10**	3,07	0,52	**5,94**
	22	2,19	0,48	**4,56**	2,39	0,49	**4,88**	2,52	0,49	**5,14**	2,7	0,5	**5,40**	2,95	0,51	**5,78**	3,03	0,54	**5,65**
	25	2,15	0,5	**4,30**	2,36	0,52	**4,54**	2,49	0,52	**4,79**	2,65	0,53	**5,00**	2,87	0,54	**5,31**	2,95	0,57	**5,21**
	30	2,08	0,55	**3,78**	2,3	0,57	**4,04**	2,42	0,58	**4,17**	2,57	0,59	**4,36**	2,74	0,6	**4,57**	2,81	0,63	**4,50**
9	10	2,94	0,57	**5,16**	3,27	0,55	**5,95**	3,49	0,54	**6,46**	3,84	0,53	**7,25**	4,45	0,54	**8,24**	4,50	0,58	**7,72**
	15	2,95	0,59	**5,00**	3,27	0,59	**5,54**	3,48	0,59	**5,90**	3,82	0,6	**6,37**	4,39	0,63	**6,97**	4,44	0,67	**6,59**
	18	2,94	0,61	**4,82**	3,25	0,61	**5,33**	3,47	0,62	**5,60**	3,79	0,64	**5,92**	4,33	0,68	**6,37**	4,38	0,72	**6,05**
	20	2,93	0,62	**4,73**	3,24	0,63	**5,14**	3,45	0,65	**5,31**	3,76	0,67	**5,61**	4,29	0,72	**5,96**	4,34	0,76	**5,68**
	22	2,92	0,64	**4,56**	3,22	0,66	**4,88**	3,43	0,67	**5,12**	3,73	0,7	**5,33**	4,24	0,75	**5,65**	4,29	0,79	**5,40**
	25	2,9	0,67	**4,33**	3,19	0,7	**4,56**	3,38	0,72	**4,69**	3,67	0,75	**4,89**	4,16	0,81	**5,14**	4,21	0,86	**4,92**
	30	2,84	0,74	**3,84**	3,11	0,77	**4,04**	3,29	0,8	**4,11**	3,56	0,83	**4,29**	3,99	0,89	**4,48**	4,04	0,94	**4,31**
17	10	4,25	0,72	**5,90**	4,57	0,76	**6,01**	4,79	0,76	**6,30**	5,12	0,79	**6,48**	5,66	0,84	**6,74**	5,70	0,90	**6,34**
	15	4,14	0,79	**5,24**	4,45	0,84	**5,30**	4,66	0,84	**5,55**	4,98	0,86	**5,79**	5,5	0,9	**6,11**	5,54	0,96	**5,77**
	18	4,07	0,84	**4,85**	4,39	0,89	**4,93**	4,59	0,89	**5,16**	4,9	0,91	**5,38**	5,41	0,95	**5,69**	5,45	1,01	**5,39**
	20	4,03	0,87	**4,63**	4,34	0,92	**4,72**	4,55	0,92	**4,95**	4,85	0,94	**5,16**	5,36	0,98	**5,47**	5,40	1,04	**5,19**
	22	3,99	0,9	**4,43**	4,3	0,95	**4,53**	4,5	0,95	**4,74**	4,8	0,98	**4,90**	5,3	1,01	**5,25**	5,34	1,07	**4,99**
	25	3,93	0,95	**4,14**	4,23	1	**4,23**	4,43	1	**4,43**	4,73	1,03	**4,59**	5,23	1,07	**4,89**	5,27	1,13	**4,66**
	30	3,84	1,02	**3,76**	4,13	1,08	**3,82**	4,33	1,08	**4,01**	4,62	1,12	**4,13**	5,13	1,17	**4,38**	5,17	1,23	**4,20**

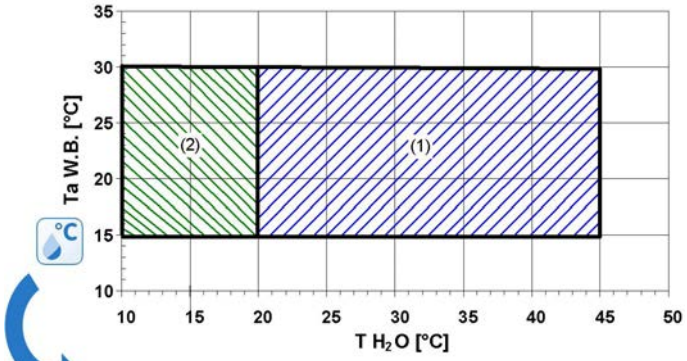
Performances referred to the standard speed fan (Quiet)

COP referred only to compressors

Ta = entering air temperature to the air handling coil (°C)
DB = dry bulb
kWt = Provided heating capacity (kW).
kWe = Compressor power input in kW

Not all thermal yields take into account the heat dissipated by the fan motors

Operating range (Cooling)



The limits are meant as an indication and they have been calculated by considering:

- general and non specific sizes
- standard airflow (Fan speed: Medium speed (M))
- non-critical positioning and correct use of the unit
- operation at full load
- difference between inlet / outlet water temperature = 5°C

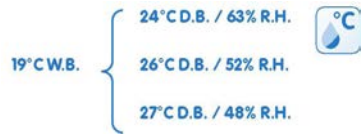
Ta = handling air coil entering air temperature (°C)

WARNING! WET BULB TEMPERATURE
(W.B. = WET BULB)

TH2O = Water temperature at plate exchanger input (°C)

1. Standard operating range
2. Operating range for unit equipped with 'V2MODX - 2-way modulating valve for installation with disposable water' option, i.e. , groundwater or anyway a source at low water temperature. By this option the water feeding system must be at variable flow-rate.

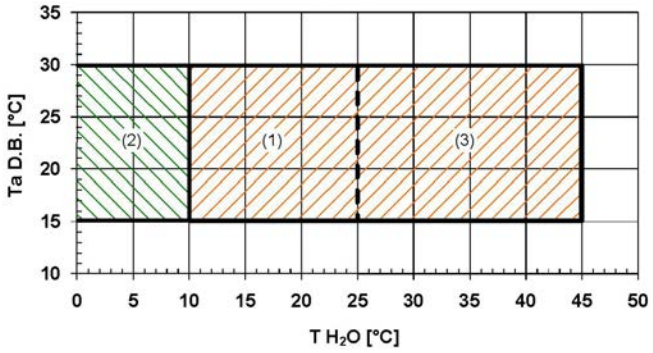
WET BULB TEMPERATURE - EXAMPLE



WARNING: THE GRAPH REFERS TO A WATER TEMPERATURE DIFFERENTIAL OF 5°C. WITH A REDUCED WATER FLOW RATE, THE TEMPERATURE DIFFERENTIAL IS MORE THAN 5°C, SO IT IS NECESSARY TO REDUCE THE SPECIFIED OPERATING RANGE FOR STEPS EXCEEDING THE NOMINAL 5°C

EXAMPLE: WITH A TEMPERATURE DIFFERENTIAL OF 8°C, THE UPPER TH2O LIMIT IS NO LONGER 45°C BUT 42°C.

Operating range (Heating)



The limits are meant as an indication and they have been calculated by considering:

- general and non specific sizes
- standard airflow (Fan speed: Medium speed (M))
- non-critical positioning and correct use of the unit
- operation at full load
- difference between inlet / outlet water temperature = 5°C

Ta = handling air coil entering air temperature (°C)

WARNING! DRY BULB TEMPERATURE (D.B.=DRY BULB)

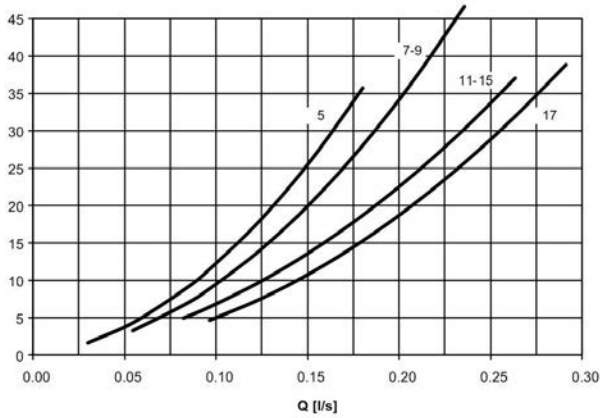
TH2O = Water temperature at plate exchanger input (°C)

1. Standard operating range
2. Operating field for water glycol system (to prevent frost)
3. Standard unit operating range. In this range the COP efficiency can be increased equipping the unit with the 'V2MODX - 2-way modulating valve for installation with disposable water' option, that controls the heat exchange with the source. In this way the unit performances are similar to the unit ones with feeding water temperature (T H2O) equal to 25°C. With this option the water feeding system must be at variable flow-rate.

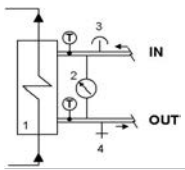
WARNING: THE GRAPH REFERS TO A WATER TEMPERATURE DIFFERENTIAL OF 5°C. WITH A REDUCED WATER FLOW RATE, THE TEMPERATURE DIFFERENTIAL IS MORE THAN 5°C, SO IT IS NECESSARY TO REDUCE THE SPECIFIED OPERATING RANGE FOR STEPS EXCEEDING THE NOMINAL 5°C

EXAMPLE: WITH A TEMPERATURE DIFFERENTIAL OF 8°C, THE LOWER TH2O LIMIT IS NO LONGER 10°C BUT 13°C

Standard unit water circuit pressure drops



Q = water flow-rate (l/s)
DP = water side pressure drops (kPa)



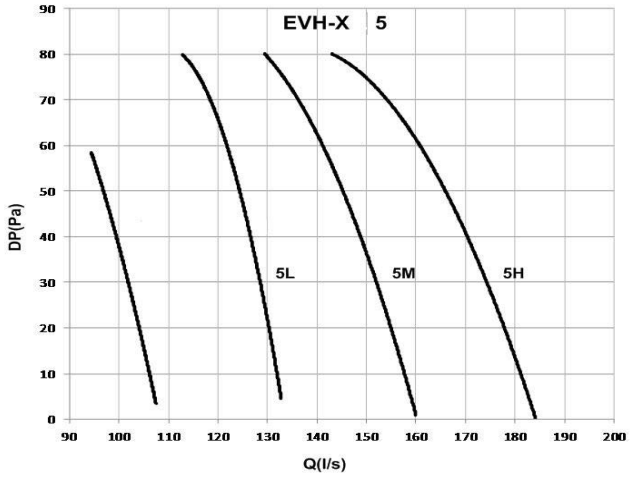
The standard unit (supply limit A) includes the following components:
1 - plate exchanger and water temperature control probes on the inlet and the outlet (to preventive from forming and to disable the compressor when the water temperature drops below a limit value)
2 - water side differential pressure switch (to control the water flow- rate presence)
3 - relief valve (to allow the air to bleed out from the system)
4 - drain valve (to allow to drain the exchanger for maintenance operations).
It does not include other shut-off or control parts.

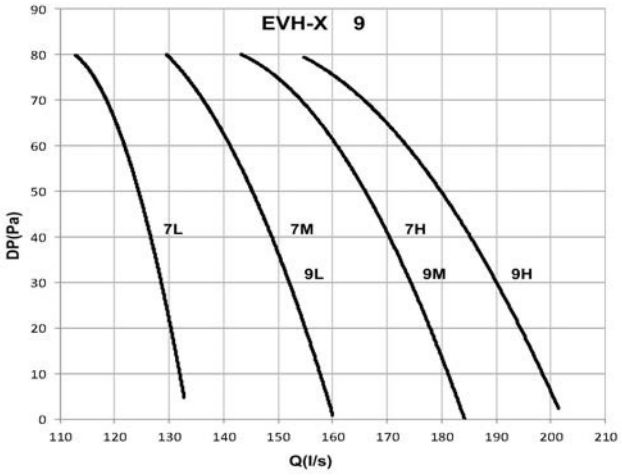
Electric fans performance

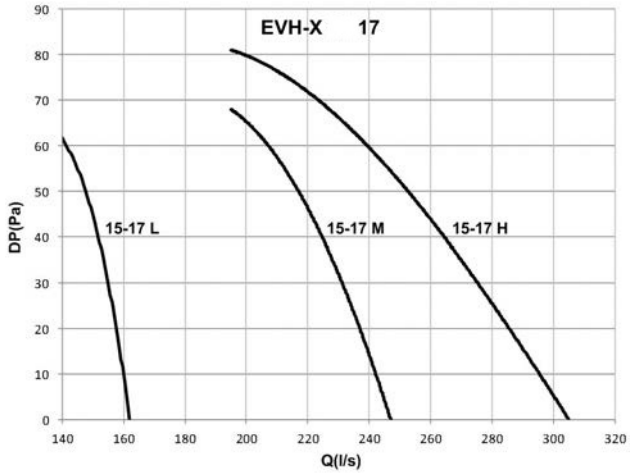
SIZES			5	9	17
Minimum speed - EXTRAQUIET (L)					
Airflow		l/s	126	148	152
Airflow		m3/h	454	533	547
Nominal head		Pa	40	40	40
Electrical power absorbed by the fan	1	kW	0.061	0.071	0.072
Standard speed - QUIET (M)					
Airflow		l/s	148	170	222
Airflow		m3/h	533	612	800
Nominal head		Pa	40	40	40
Electrical power absorbed by the fan	1	kW	0.071	0.082	0.095
Maximum speed - POWERFUL (H)					
Airflow		l/s	170	185	265
Airflow		m3/h	612	667	955
Nominal head		Pa	40	40	40
Electrical power absorbed by the fan	1	kW	0.082	0.092	0.128

1. Power absorbed by the fans in relation to the specified air flow rate and head

Airflow / head curves







The letters next to the identification number of the unit size indicate:
L = minimum speed (Extra-quiet)
M = average speed (Quiet)
H = maximum speed (Powerful)

The three speeds can be set via the user interface or the serial protocol as indicated in the user and maintenance manual.

Q = airflow (l/s)
DP = available pressure (Pa)

Performance corrective coefficients in relation to the speed of the treatment fans

	Minimum speed - EXTRAQUIET					Standard speed - QUIET					Maximum speed - POWERFUL				
	Kf	Ks	Kt	Kef	Ket	Kf	Ks	Kt	Kef	Ket	Kf	Ks	Kt	Kef	Ket
5	0,97	0,97	1	1,01	1,06	1	1	1	1	1	1,01	1,08	1,01	0,99	0,97
9	0,95	0,94	0,98	1,02	1,03	1	1	1	1	1	1,04	1,11	1,04	1	0,95
17	0,94	0,85	0,95	1	1,12	1	1	1	1	1	1,05	1,16	1,03	1	0,92

The performances at the handling fan speeds are obtained by multiplying the standard flow unit (Quiet) by the correction factors in the table.

Extra-quiet = Fan maximum speed
Quiet (standard) = Fan medium speed
Powerful = Fan maximum speed
Kf = output multiplying coefficient in cooling mode
Ks= sensible output multiplication coefficient
Kt = heating performance multiplication coefficient
Kef = multiplying coefficient of the power absorbed by the compressors in cooling mode
Ket = multiplying coefficient of the power absorbed by the compressors in heating mode

Sound levels

Extra-quiet = Fan maximum speed

SIZES	Sound Power Level [dB]								Sound Pressure Level	Sound Power Level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
5	62	56	49	42	38	30	21	15	32	46
9	66	57	50	41	37	29	21	15	33	46
17	75	59	50	39	36	26	20	14	34	47

Quiet (standard) = Fan medium speed

SIZES	Sound Power Level [dB]								Sound Pressure Level	Sound Power Level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
5	62	57	51	42	40	31	24	20	33	47
9	66	58	51	42	39	30	23	18	34	47
17	75	59	52	41	38	30	21	14	35	48

Powerful = Fan maximum speed

SIZES	Sound Power Level [dB]								Sound Pressure Level	Sound Power Level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
5	62	59	53	43	42	34	28	22	35	48
9	65	61	53	44	42	34	28	22	36	49
17	73	66	54	45	42	35	29	24	38	51

Sound levels refer to the unit at full load installed on the ceiling, ducted, with minimum, standard and maximum air flow rate of the fan. Available static pressure 40 Pa.

In accordance with the UNI-EN ISO 3744 regulation, the average sound pressure level refers to a distance of 1 m from the outer surface of a ducted unit installed on the ceiling.

Measurements are made in accordance to the UNI EN ISO 9614-2, with units installed over two sound reflective surfaces.

If the unit is installed in conditions other than the nominal ones(for instance, near walls or obstacles in generally) the sound levels may undergo substantial variations.

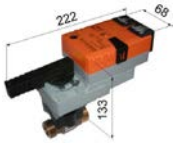
Electronic control with display for wall installation

The electronic control with display is simple to use even for non-specialised users.
It allows different unit functions to be controlled, including:

- reading the temperature directly on the thermostat using the probe in its interior
- switching the unit on and off
- unit parameter protection with password
- programming the daily and weekly time schedule for switching on and off and for setting the standard or economic set point.
- changing the manual operating mode (hot or cold) and/or set point
- alarm and unit status display;
- management of the operating parameters.
- language management for the navigation menu
- back-lit icon menu
- manual or automatic fan speed management in relation to how far away the setpoint is.

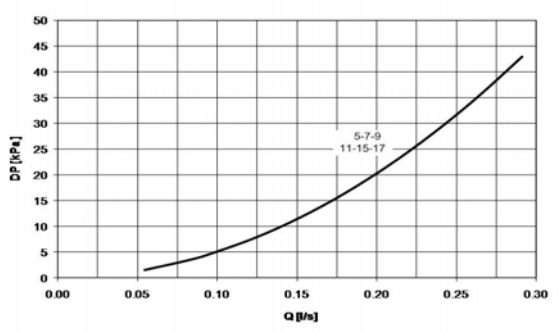
2-way modulating valve for installation with disposable water

Option indicated in the applications with disposable water at a temperature relatively low (groundwater) or with a variable flow-rate loop where the unit must operate in heating with high water temperatures or in cooling with low water temperatures. The 2-way motorised valve, modulating type, is placed in the exchanger output water side and is fed by the unit. Its operating is combined with that of the refrigerant circuit: the modulation by 0-10V signal according to the refrigerant pressure in the exchanger source side, reduces the water consumption and maintains the unit in the provided operating range both in cooling and in heating mode.



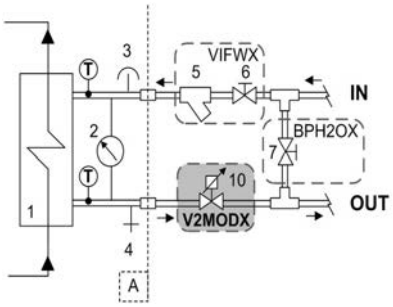
The supplied valve ensures proper opening and closure for water differential pressures that do not exceed 800 kPa, i.e. 8 bar.

PRESSURE DROPS OF V2MODX OPTION



Q = water flow-rate[l/s]
DP = water side pressure drops (kPa)

WATER CONNECTION DIAGRAM



1. Internal exchanger with temperature probes
2. Differential pressure switch
3. Vent valve
4. Drainage bibcock
5. Steel mesh strainer (not included)
6. Hand shut-off valve (not included)
7. Shut-off valve for by-pass (water side) (not included)

10. Two-way modulating valve for systems with disposable water (V2MODX accessory)

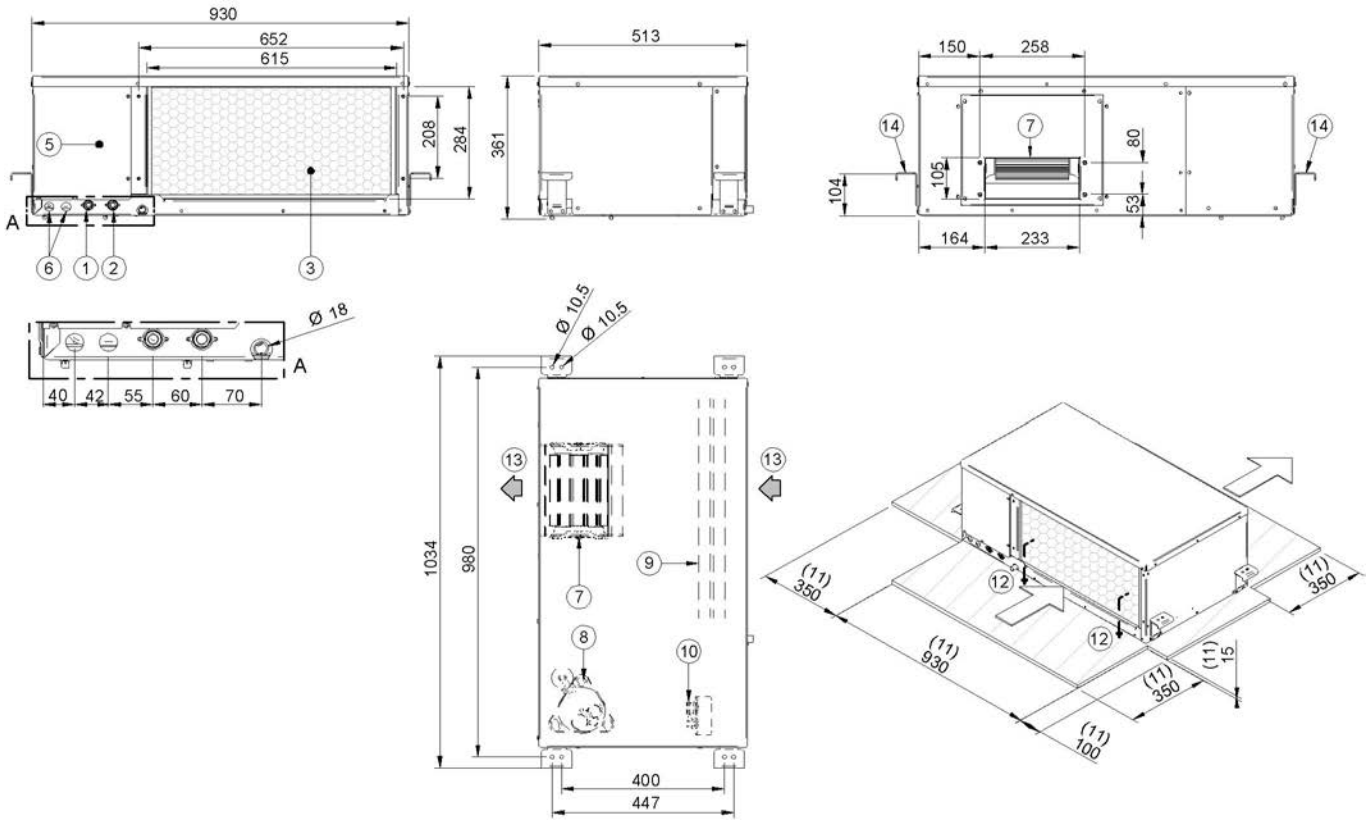
A. tandard unit supply limit

Option to be installed outside the unit on the water outlet pipe of the exchanger. Provide for spaces to assemble/disassemble the valve.

With this option the unit is provided full of rapid electric connections for the valve feeding and automatic control.

Dimensional drawings

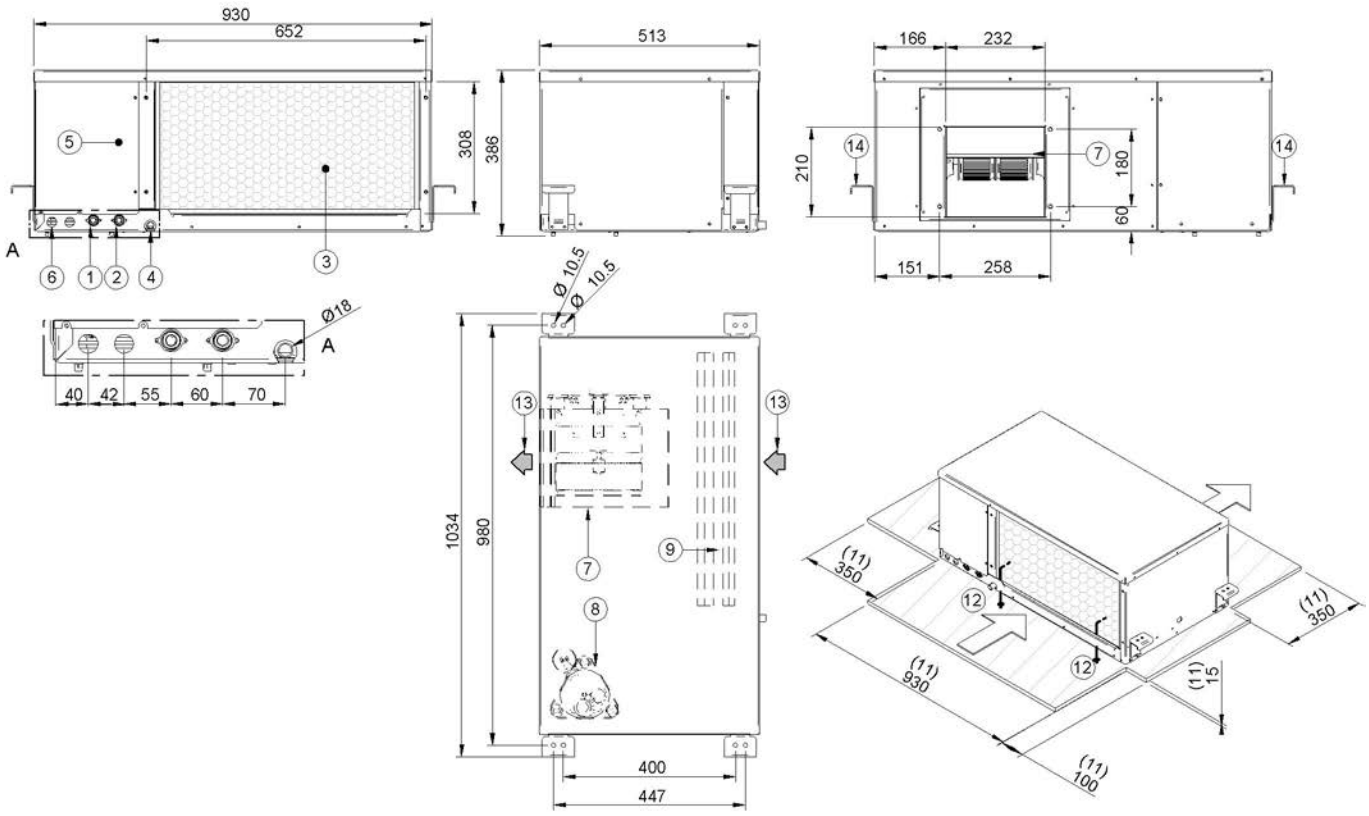
Size 5-9



1. Standard unit water inlet (female)
2. Standard unit water outlet (female)
3. Air filter
4. Condensate drain Ø 15 mm
5. Electrical panel
6. Power input
7. Fan
8. Compressor
9. Direct expansion exchanger
10. Plate exchanger
11. Functional spaces
12. Filter extraction (provide for the space to access the filter)
13. Airflow
14. Fixing brackets

SIZES	5	9
A (Lenght)	1034	1034
B (Height)	361	361
C (Depth)	513	513
Weight	71	74
Standard unit water fittings	1/2"	1/2"

Size 17



1. Standard unit water inlet (female)
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6. Power input
7. Fan
8. Compressor
9. Direct expansion exchanger
10. Plate exchanger
11. Functional spaces
12. Filter extraction (provide for the space to access the filter)
13. Airflow
14. Fixing brackets

SIZES	17
A (Lenght)	1034
B (Height)	386
C (Depth)	513
Weight	82
Standard unit water fittings	1/2"

TECHNICAL MANUAL
DFMO 22-41

WARNING :
The design and specifications are subject to change without prior notice for product improvement. Consult with the sales agency or manufacturer for details.

23.AW.DFMO22-41.R410A.TM.EN.20.07