



HEF2E series

Low energy consumption adiabatic systems
for cooling and humidification





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General description

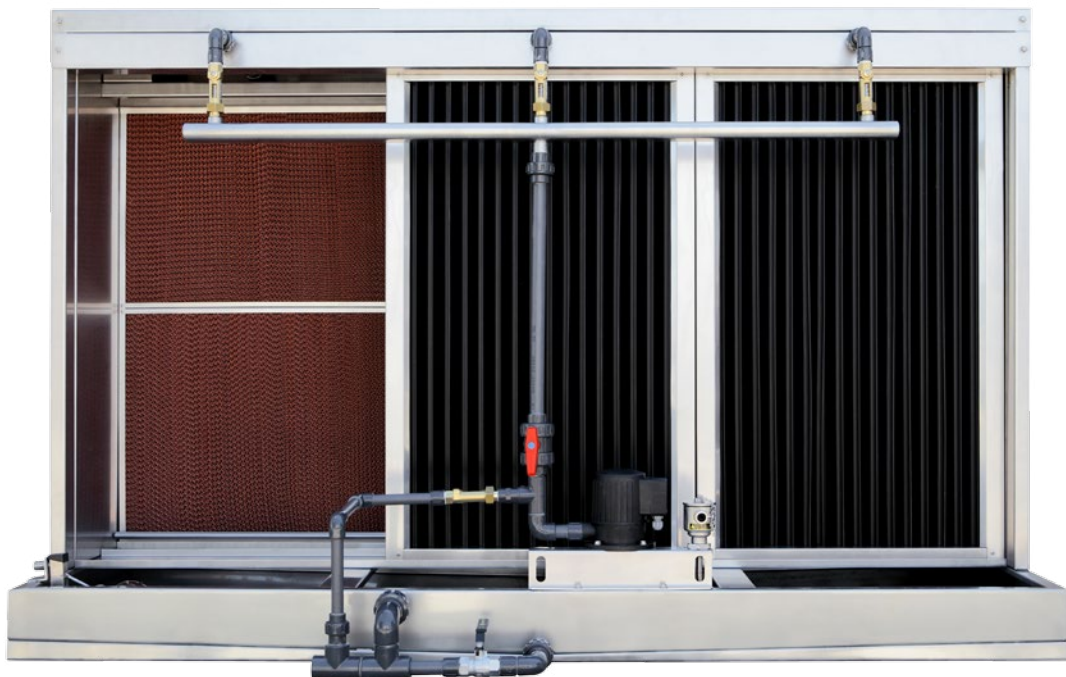
OPERATING PRINCIPLES

FISAIR adiabatic humidifiers/coolers are designed so water evaporates naturally using an air current, as occurs in the natural environment. Air passes across a sheet of water, partially evaporates it, and adds the water vapour to its composition. It is at the same time cooled because the energy required for the evaporation is provided by the air.

This operating principle is completely healthy because microorganisms, minerals, etc. are not added to the air during the vapour phase of water. Only in the event of a simultaneous droplet carry-over in its liquid phase, could solutes and other compounds, or microorganisms enter the air current. This is the differentiating factor between air-water contact panel evaporative humidifiers and atomizing humidifiers (using water droplets).



HEF2E with recirculation





The evaporation process in the psychrometric chart

The attached chart shows standard psychrometric processes in the design of this type of humidifier: the starting point is winter air at -3°C and 80% R.H. to obtain air at 22°C and 50% R.H.

There are two possible routes:

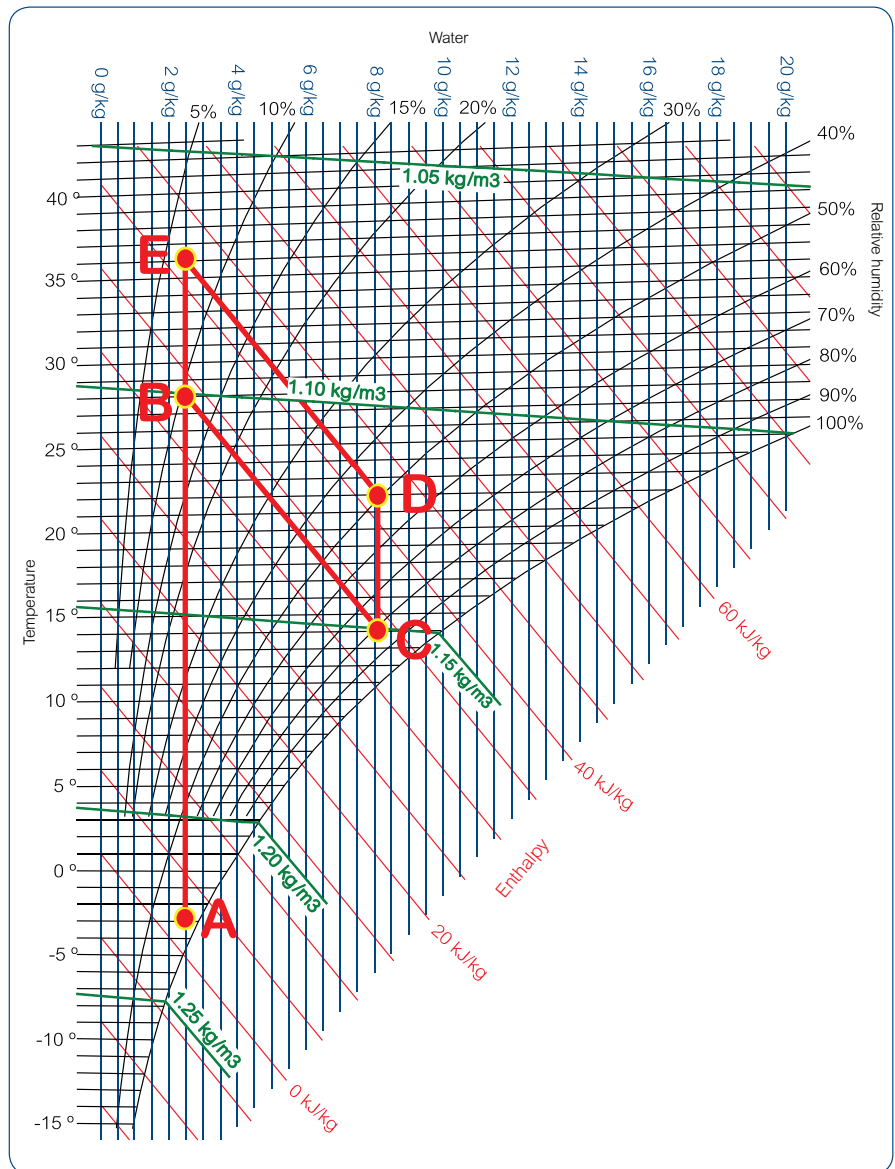
- 1) Preheating-Humidification-Postheating (A-B-C-D).
- 2) Heating-Humidification (A-E-D).

In both cases the humidification achieved (Δx) is the same; from 2.5 g/kg to 8 g/kg but the performance is different. The B-C line covers almost all the admissible evaporative humidification, while the E-D line only does this partially. That is why we define what is known as "Saturation efficiency".

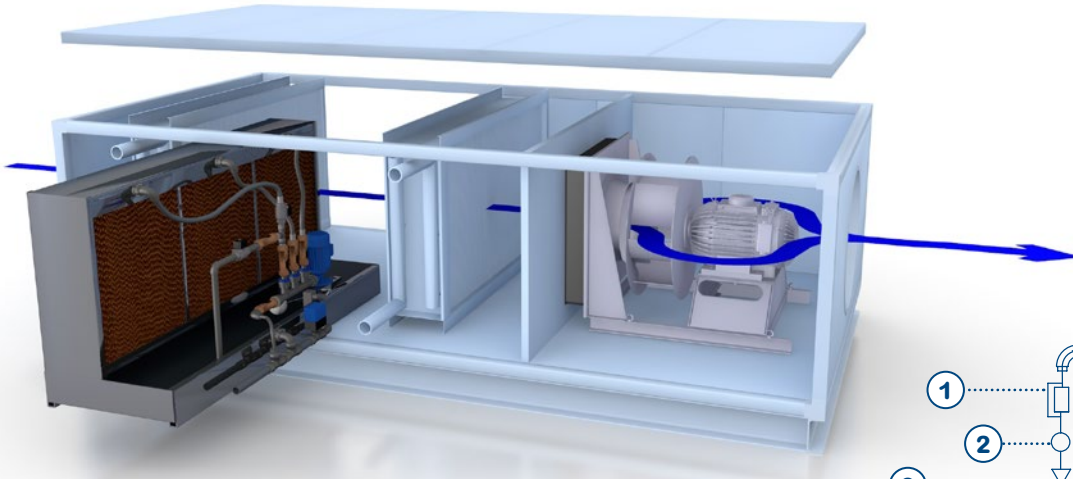
SATURATION EFFICIENCY

The relationship between the humidification required and the maximum admissible; defined as the relationship between the difference in dry bulb temperatures of the process and humidification air, and the difference in dry and wet bulb temperatures of the process air:

- Line B-C: $28 - 14 / 28 - 12.5 = 90\%$
- Line E-D: $36 - 22 / 36 - 15.5 = 68.3\%$



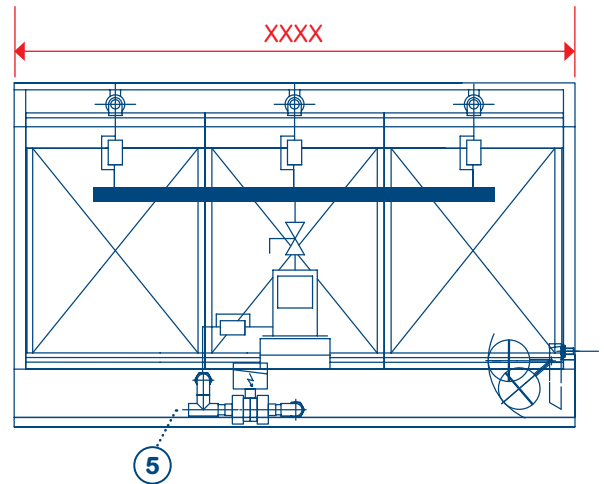
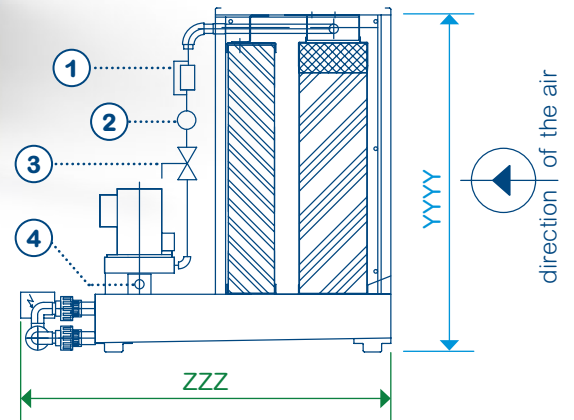
Classification of Fisair adiabatic humidifiers/coolers (Recirculated water)



1 HEF2E (recirculated water, standard on/off)

FISAIR adiabatic humidifier/cooler for Air Handling Units (A.H.U.), by means of the evaporative panels with the highest saturation efficiency on the market, which distribute irrigation around independent cassettes equipped with:

- Water tank, structure, screws, distribution, collector and AISI-304 Stainless Steel cassette frames.
- Water tank drained completely by gravity, without a need for mechanical parts.
- Water tank accessible on every side to aid maintenance and cleaning work.
- Unit designed to comply with standard VDI 6022.
- Optimum and efficient irrigation for a uniform/balanced distribution of water through the cassettes.
- Water recirculation pump for irrigating cassettes.
- Droplet separator composed of extruded PP profiles designed especially for HVAC applications.
- Special regulation valves with flow meters to regulate the irrigation of each cassette independently.
- Constant bleed-off system to keep the salt content of the recirculated water stable managed by a special regulation valve and flow meter.



1. 1/2" brass regulation valves with flow meter
2. Stainless steel collector
3. DN20 PVC-U ball valve
4. 3/8" or 1/2" BSP water supply
5. Ø32 PVC-U drain+overflow+bleed-off



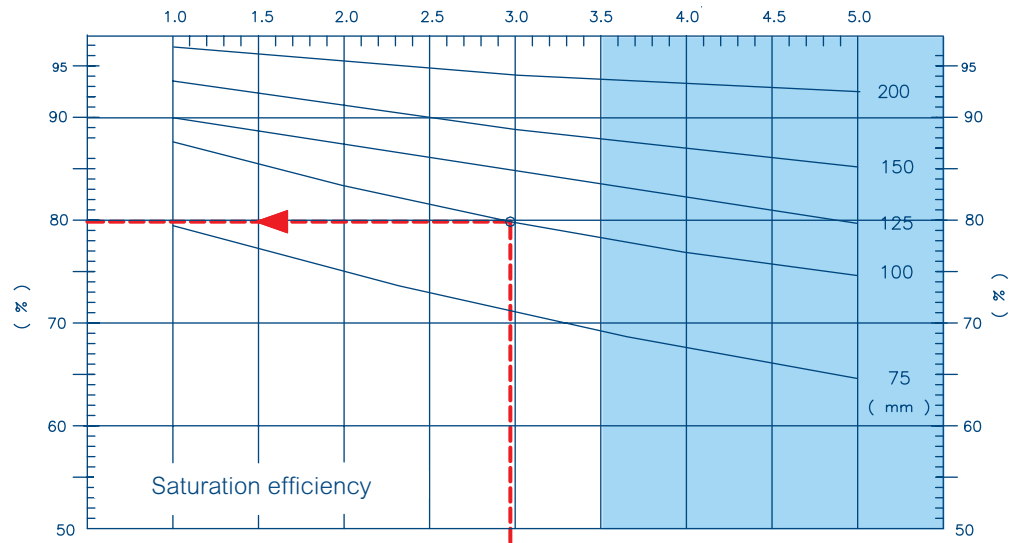
High efficiency HEF2E evaporative panel

- **Non-combustible**, A1 classification, fibreglass with inorganic absorption agents.
- With no chemical product odours.
- **Maximum water absorption**, optimum saturation efficiency.
- **Uniform surface**, minimum pressure drop.
- **Healthy**, can be used in any kind of industrial or comfort installation.



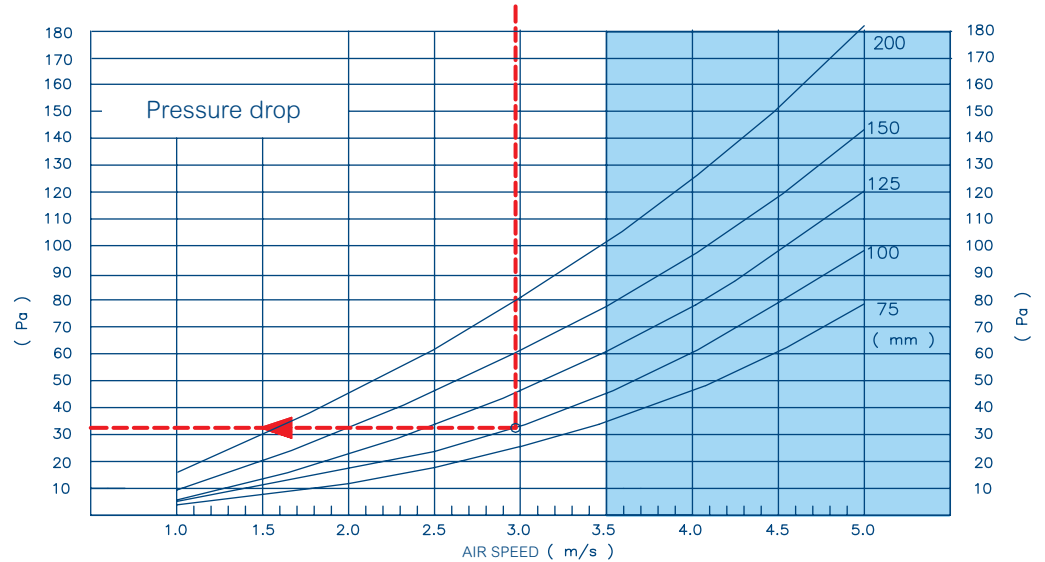
Evaporative cassette

Performance curves

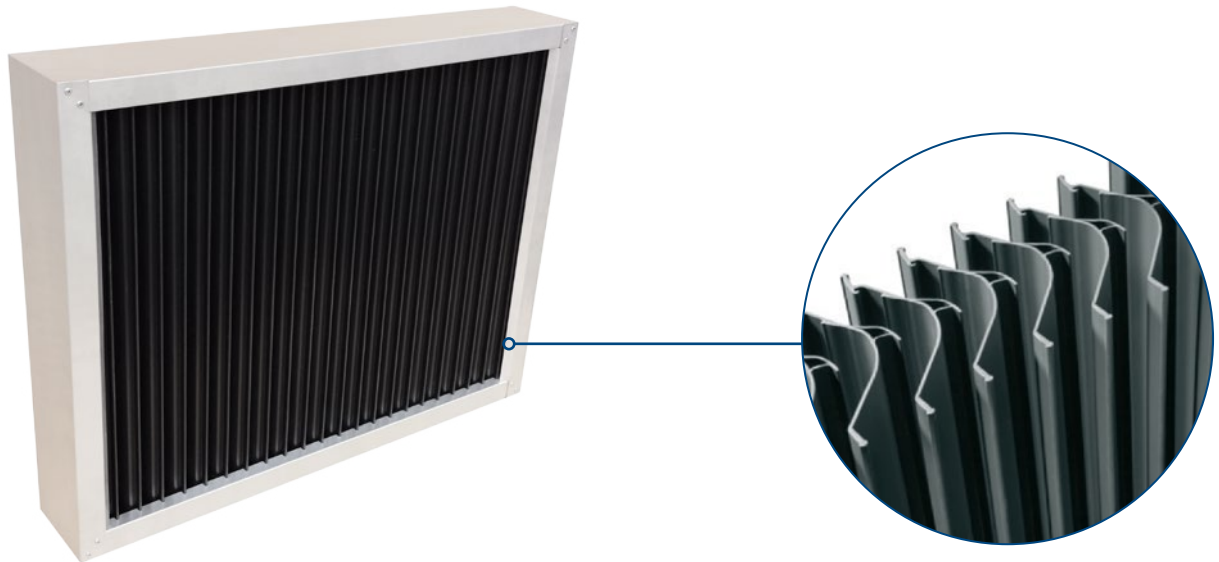


--- Example

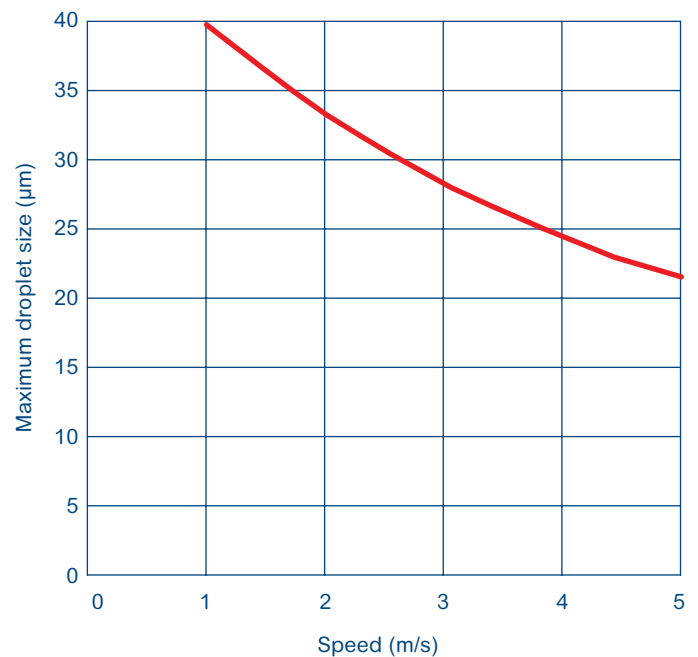
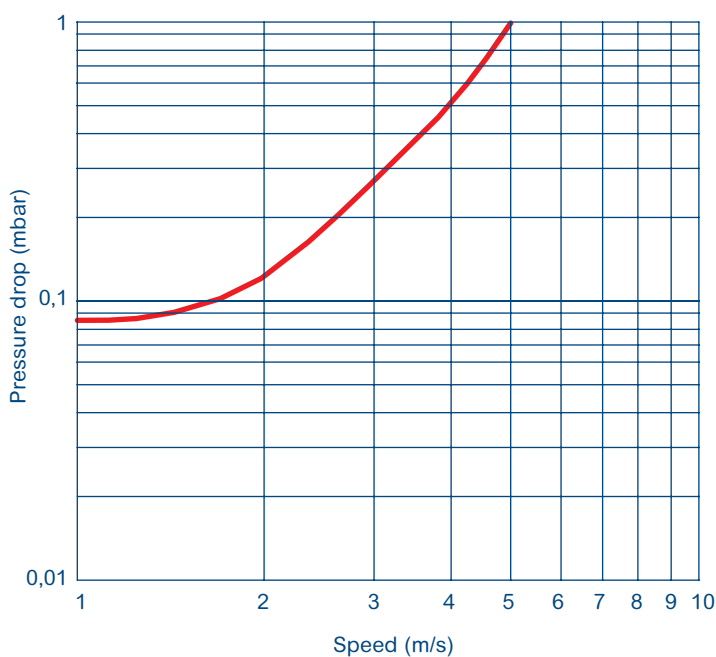
■ Droplet carry-over



Droplet separator



- **PP profiles with a high efficiency** in the separation and low pressure drop.
- **Hygiene certified** in compliance with VDI 6022.
- In addition to separating droplets, it also aligns the air flow.
- It should be pointed out that although the nominal air speed does not exceed the droplet carry-over limit, the non-uniform distribution (turbulent flow) of air before the humidifier/cooler can give rise to sporadic droplet carry-overs, so it useful to analyse this possibility in installations in which this phenomenon could occur upstream of the humidifier when the speed is between values of 3.2 and 3.5 m/s.



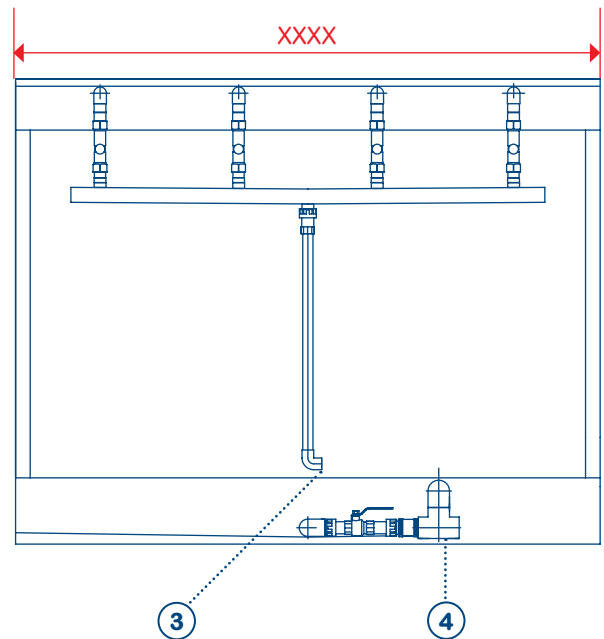
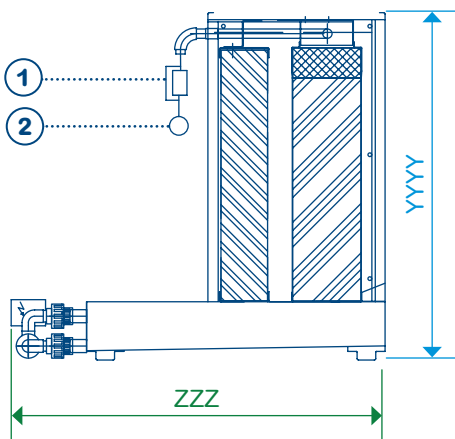


Classification of Fisair adiabatic humidifiers/coolers (Direct water)

② HEF2E-DW (direct water, standard on/off)

FISAIR adiabatic humidifier/cooler for Air Handling Units (A.H.U.), by means of the evaporative panels with the highest saturation efficiency on the market, which distribute irrigation around independent cassettes equipped with:

- Water tank, structure, screws, distribution, collector and AISI-304 Stainless Steel cassette frames.
- Water tank drained completely by gravity, without a need for mechanical parts.
- Water tank accessible on every side to aid maintenance and cleaning work.
- Unit designed to comply with standard VDI 6022.
- Optimum and efficient irrigation for a uniform/balanced distribution of water through the cassettes.
- Droplet separator composed of extruded PP profiles designed especially for HVAC applications.
- Special regulation valves with flow meters to regulate the irrigation of each cassette independently.



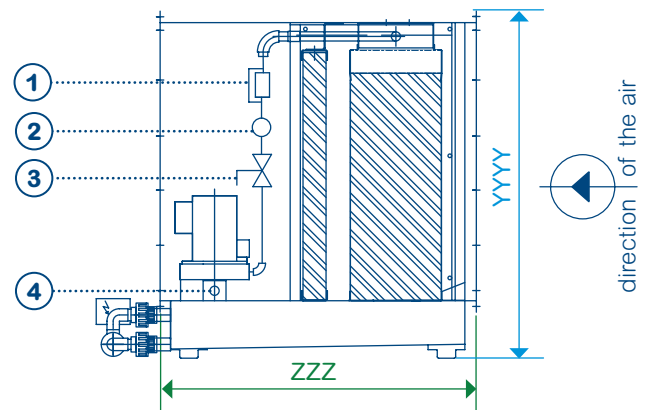
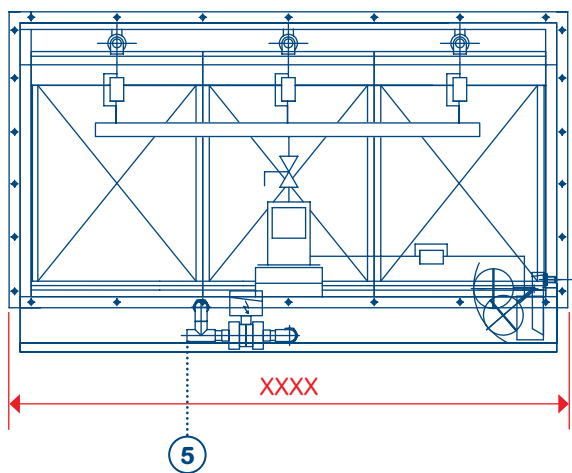
1. 1/2" brass regulation valves with flow meter
2. Stainless steel collector
3. BSP 1/2" water supply
4. D32 PVC-U draining+overflow

Classification of Fisair adiabatic humidifiers/coolers (Recirculated water)

3 HEF2E (application for ducts, standard on/off)

FISAIR adiabatic humidifier/cooler for ducts, by evaporative panel, which distributes irrigation around independent cassettes equipped with:

- Water tank, structure, screws, distribution, collector and AISI-304 Stainless Steel cassette frames.
- Water tank drained completely by gravity, without a need for mechanical parts.
- Water tank accessible on every side to aid maintenance and cleaning work.
- Unit designed to comply with standard VDI 6022.
- Optimum and efficient irrigation for a uniform/balanced distribution of water through the cassettes.
- Water recirculation pump for irrigating cassettes.
- Droplet separator composed of extruded PP profiles designed especially for HVAC applications.
- Special regulation valves with flow meters to regulate the irrigation of each cassette independently.
- Constant bleed-off system to keep the salt content of the recirculated water stable managed by a special regulation valve and flow meter.



1. 1/2" brass regulation valves with flow meter
2. Stainless steel collector
3. DN20 PVC-U ball valve
4. 3/8" or 1/2" BSP water supply
5. Draining + D32 PVC-U overflow + bleed-off

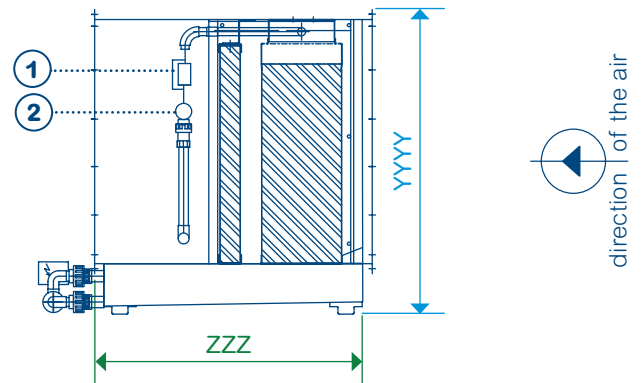
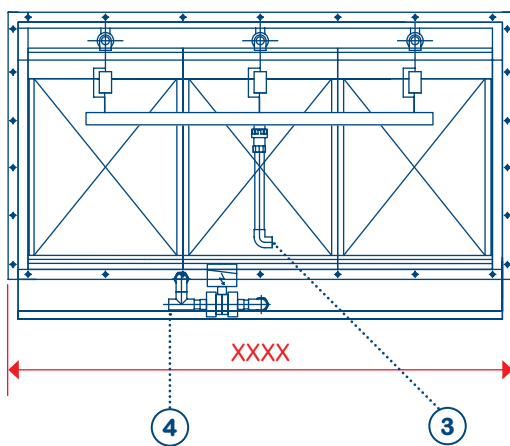


Classification of Fisair adiabatic humidifiers/coolers (Direct water)

4 HEF2E-DW (direct water, application for ducts, standard on/off)

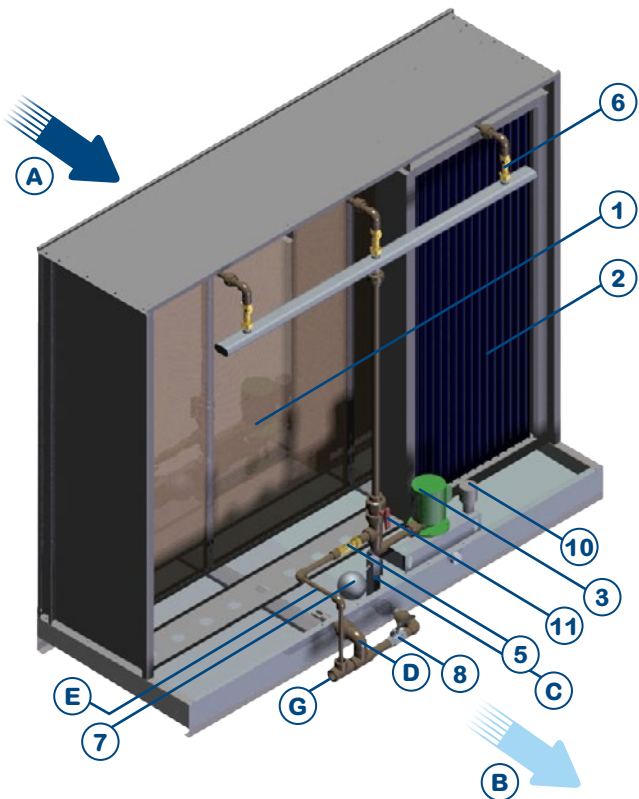
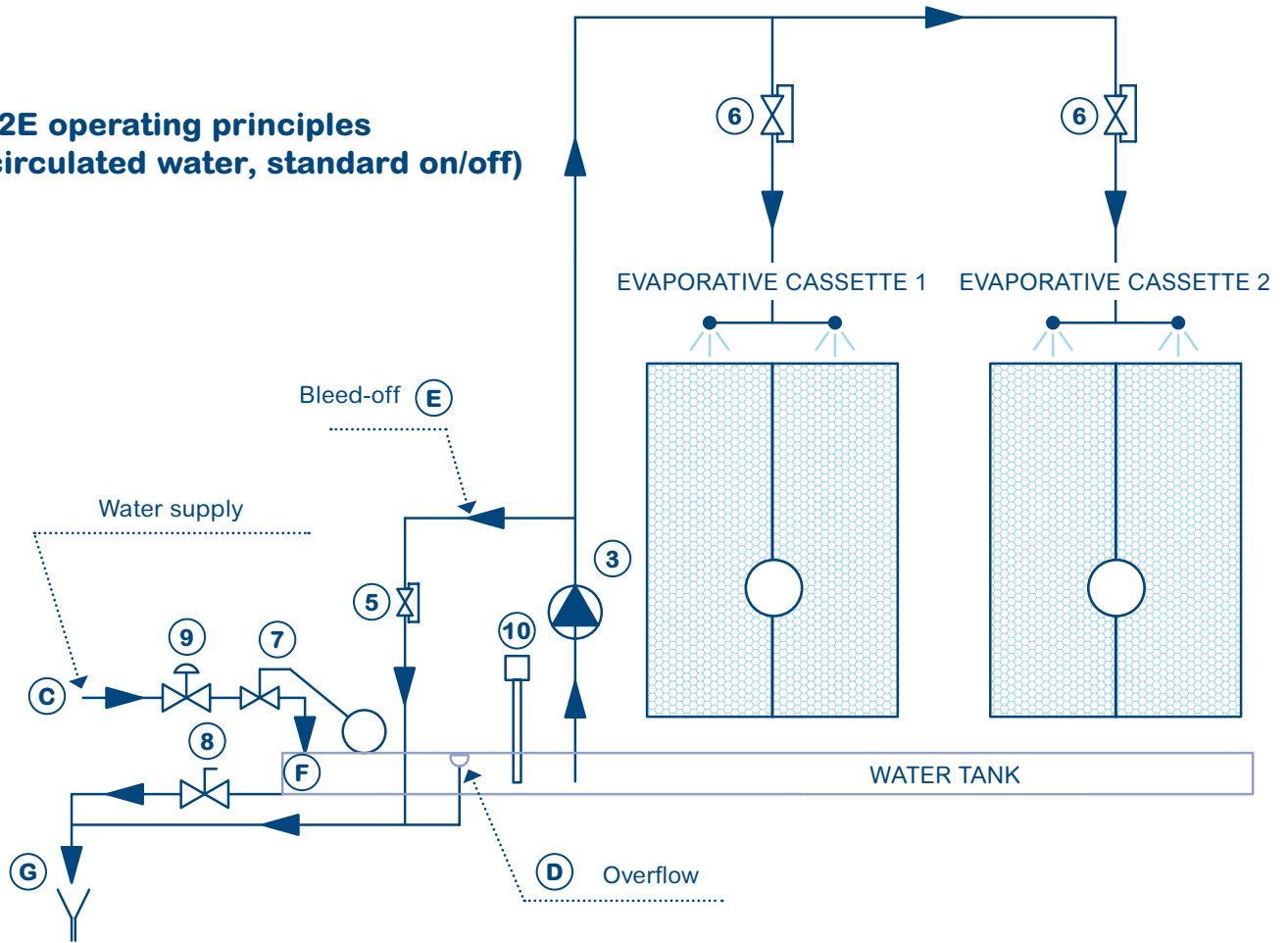
FISAIR adiabatic humidifier/cooler for ducts, by evaporative panel, which distributes irrigation around independent cassettes equipped with:

- Water tank, structure, screws, distribution, collector and AISI-304 Stainless Steel cassette frames.
- Water tank drained completely by gravity, without a need for mechanical parts.
- Water tank accessible on every side to aid maintenance and cleaning work.
- Unit designed to comply with standard VDI 6022.
- Optimum and efficient irrigation for a uniform/balanced distribution of water through the cassettes.
- Droplet separator composed of extruded PP profiles designed especially for HVAC applications.
- Special regulation valves with flow meters to regulate the irrigation of each cassette independently.



1. ½" brass regulation valves with flow meter
2. Stainless steel collector
3. BSP ½" water supply
4. Draining + D32 PVC-U overflow + bleed-off

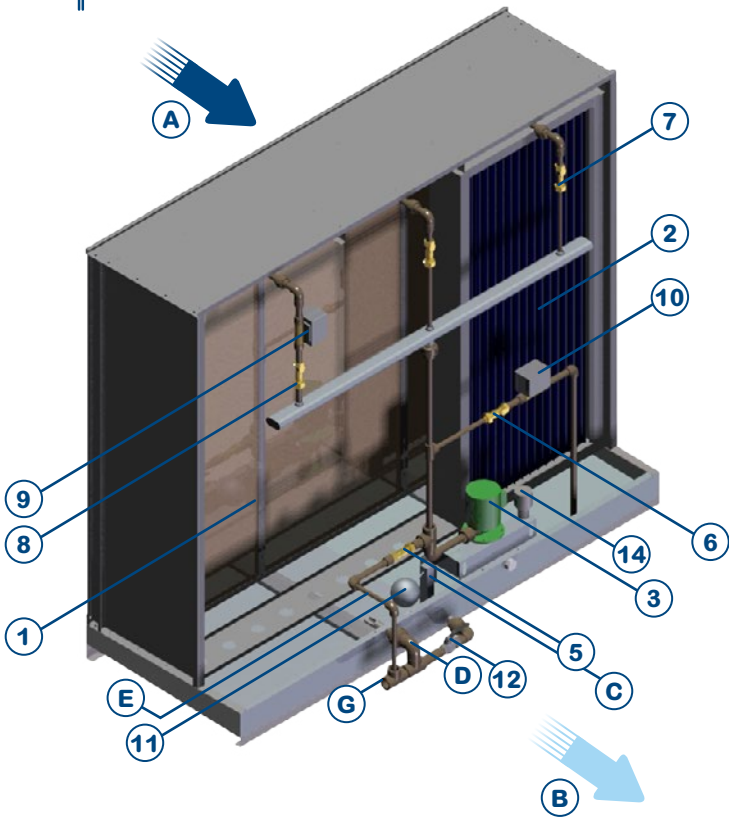
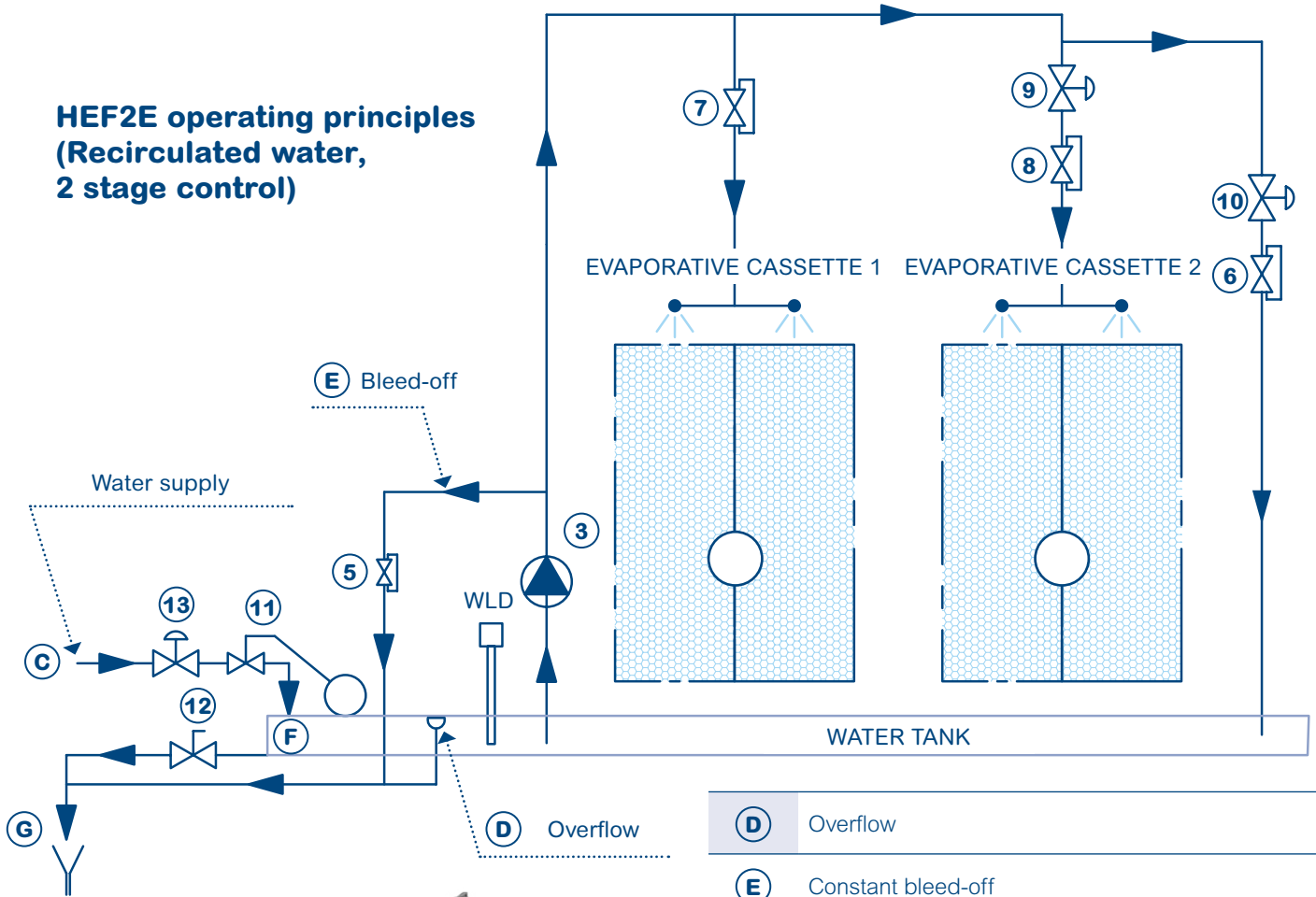
HEF2E operating principles
(Recirculated water, standard on/off)



- (A)** Process air
- (B)** Humidified air
- (C)** Water supply
- (D)** Overflow
- (E)** Constant bleed-off
- (F)** Draining
- (G)** Water outlet to drain (draining + overflow + constant bleed-off)
- (1)** Evaporative cassette
- (2)** Droplet separator (optional)
- (3)** Water recirculation pump
- (5)** Bleed-off regulation valve + flow meter
- (6)** Irrigation regulation valves + flow meter
- (7)** Float valve (regulation of supply water)
- (8)** Draining valve
- (9)** Filling solenoid valve (optional, supplied loose)
- (10)** Max/min water level detector
- (11)** Cut-off valve (depending on model)



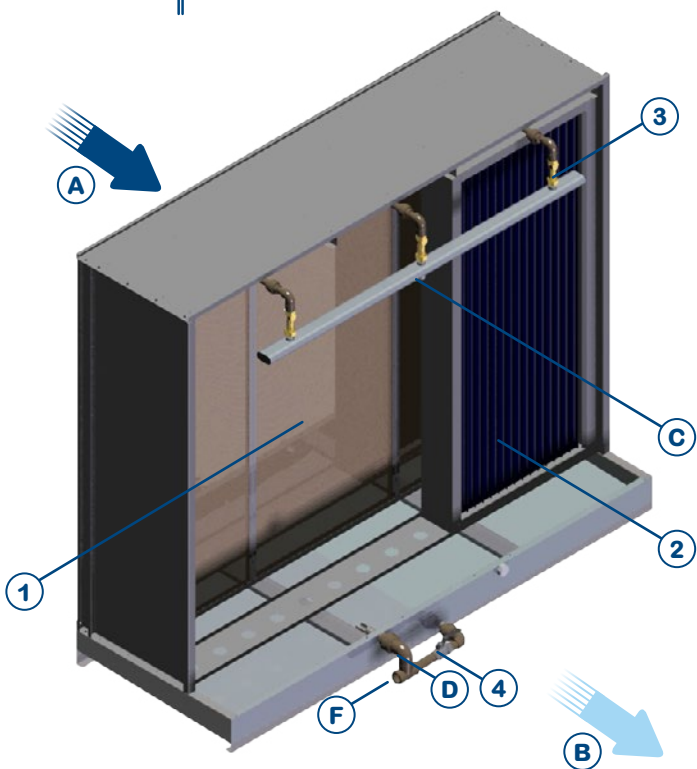
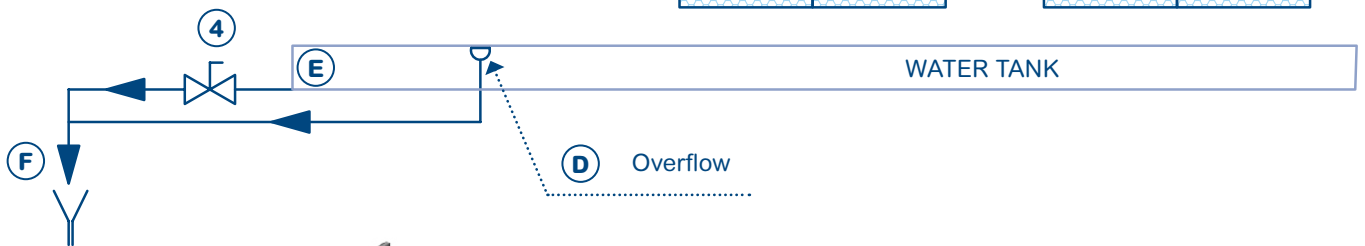
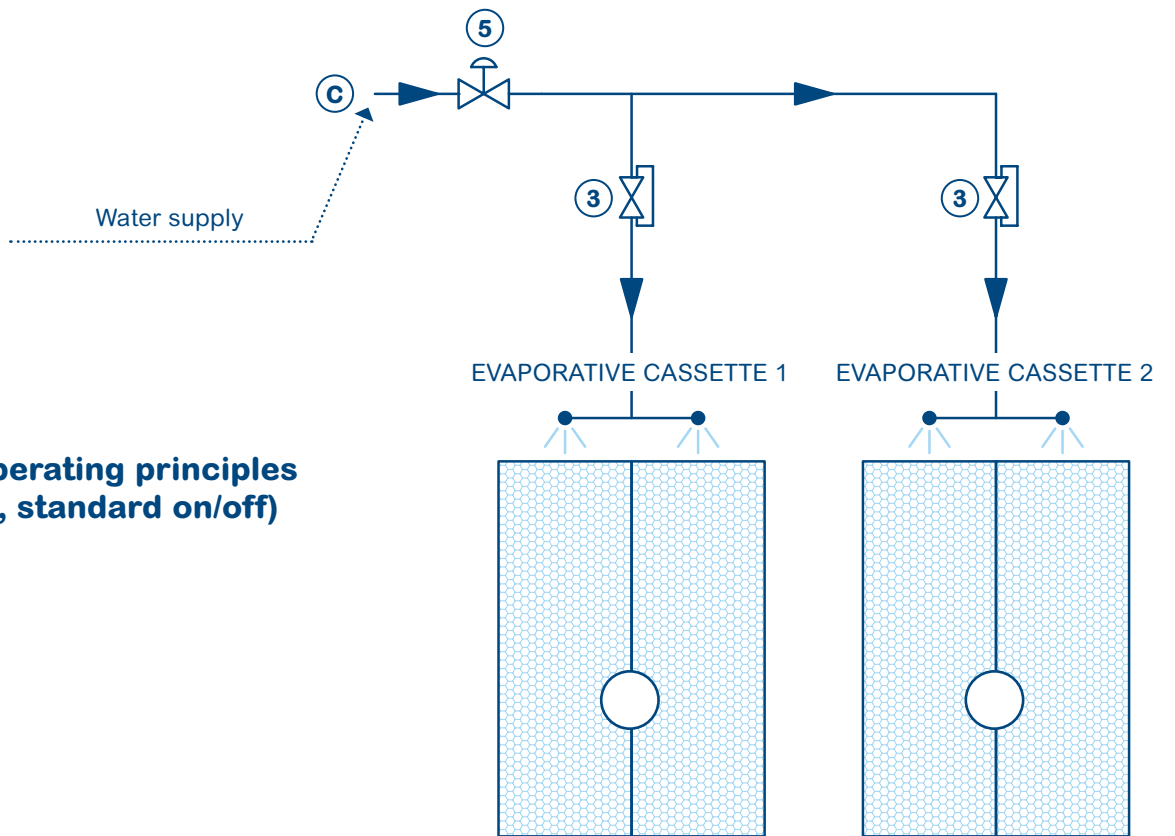
**HEF2E operating principles
(Recirculated water,
2 stage control)**



- D** Overflow
- E** Constant bleed-off
- F** Draining
- G** Water outlet to drain (draining + overflow + constant bleed-off)
- 1** Evaporative cassette
- 2** Droplet separator (optional)
- 3** Water recirculation pump
- 5** Bleed-off regulation valve + flow meter
- 6** By-pass regulation valve + flow meter
- 7** Irrigation regulation valve + flow meter (stage 1)
- 8** Irrigation regulation valve + flow meter (stage 2)
- 9** N.C. solenoid valve (stage 2)
- 10** N.O. by-pass solenoid valve (stage 2)
- 11** Float valve (supply water regulation)
- 12** Water tank draining valve
- 13** N.C. filling solenoid valve (optional, supplied loose)
- 14** Min/max water level detector

- A** Process air
- B** Humidified air
- C** Water supply

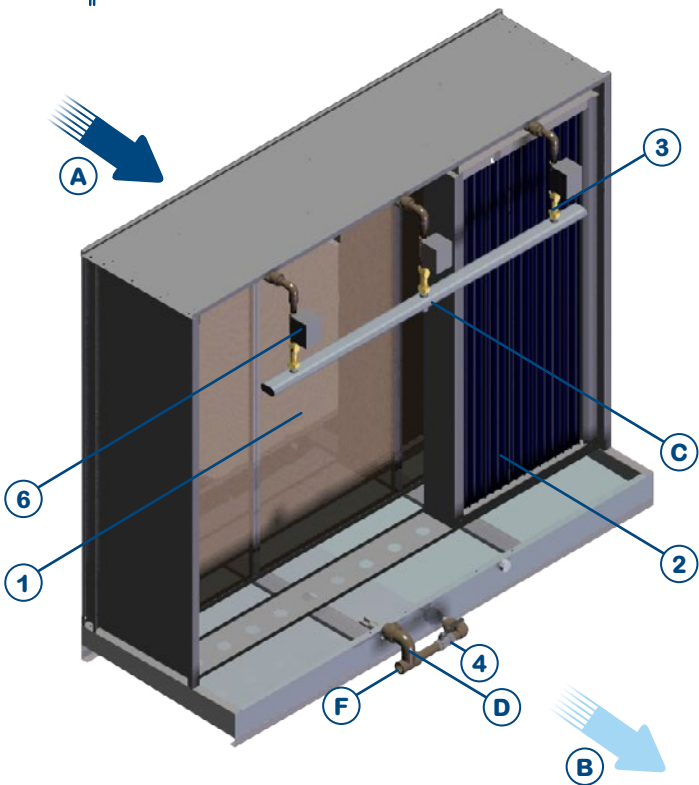
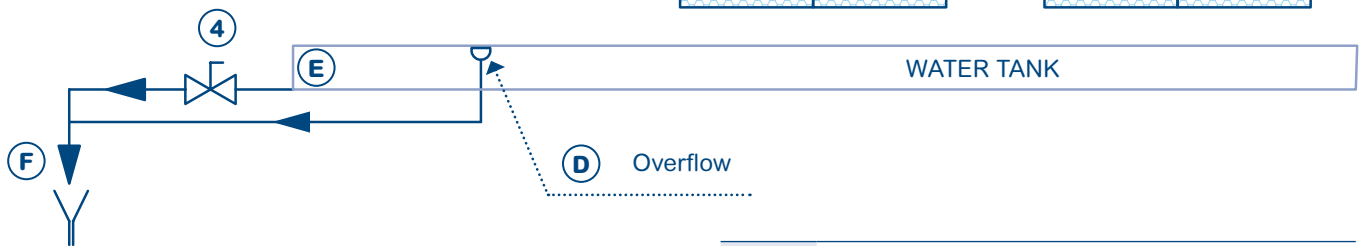
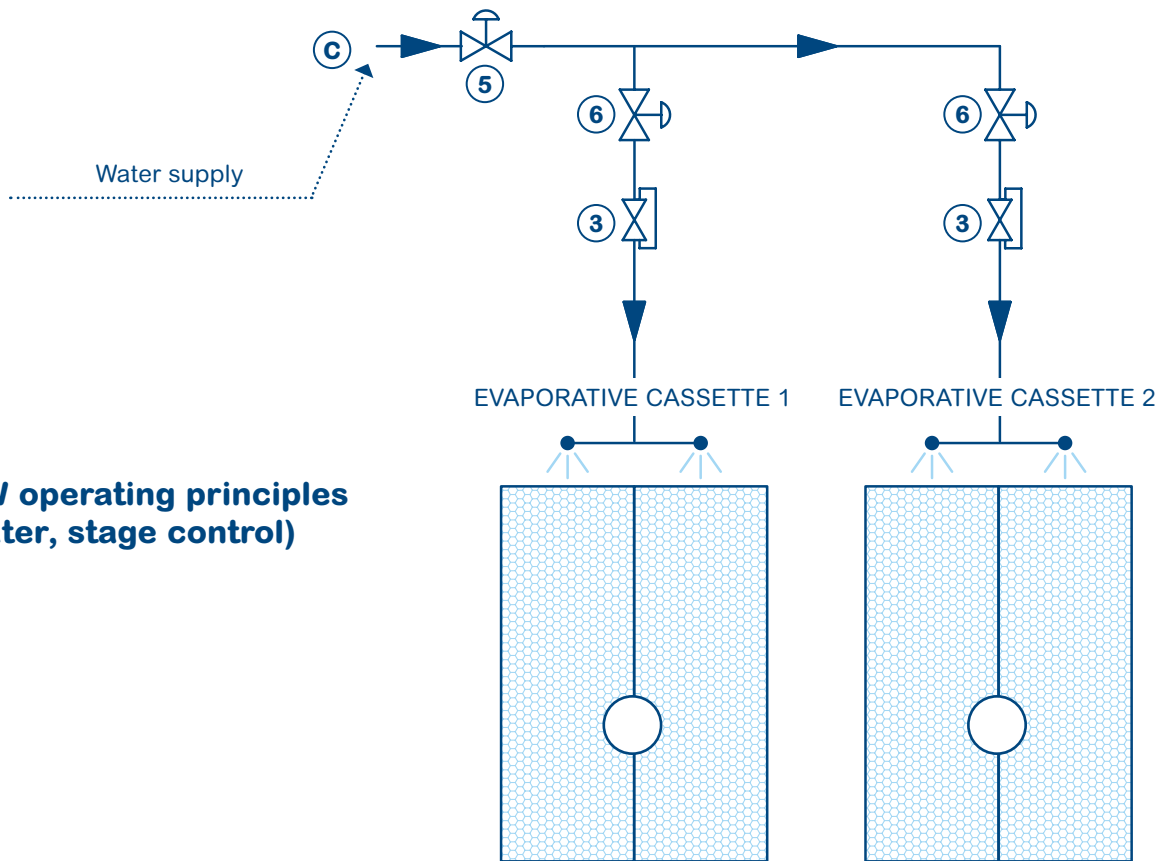
**HEF2E-DW operating principles
(Direct water, standard on/off)**



(A)	Process air
(B)	Humidified air
(C)	Water supply
(D)	Overflow
(E)	Draining
(F)	Water outlet to drain (draining + overflow)
(1)	Evaporative cassette
(2)	Droplet separator (optional)
(3)	Irrigation regulation valves + flow meter
(4)	Draining valve
(5)	Filling solenoid valve (optional, supplied loose)

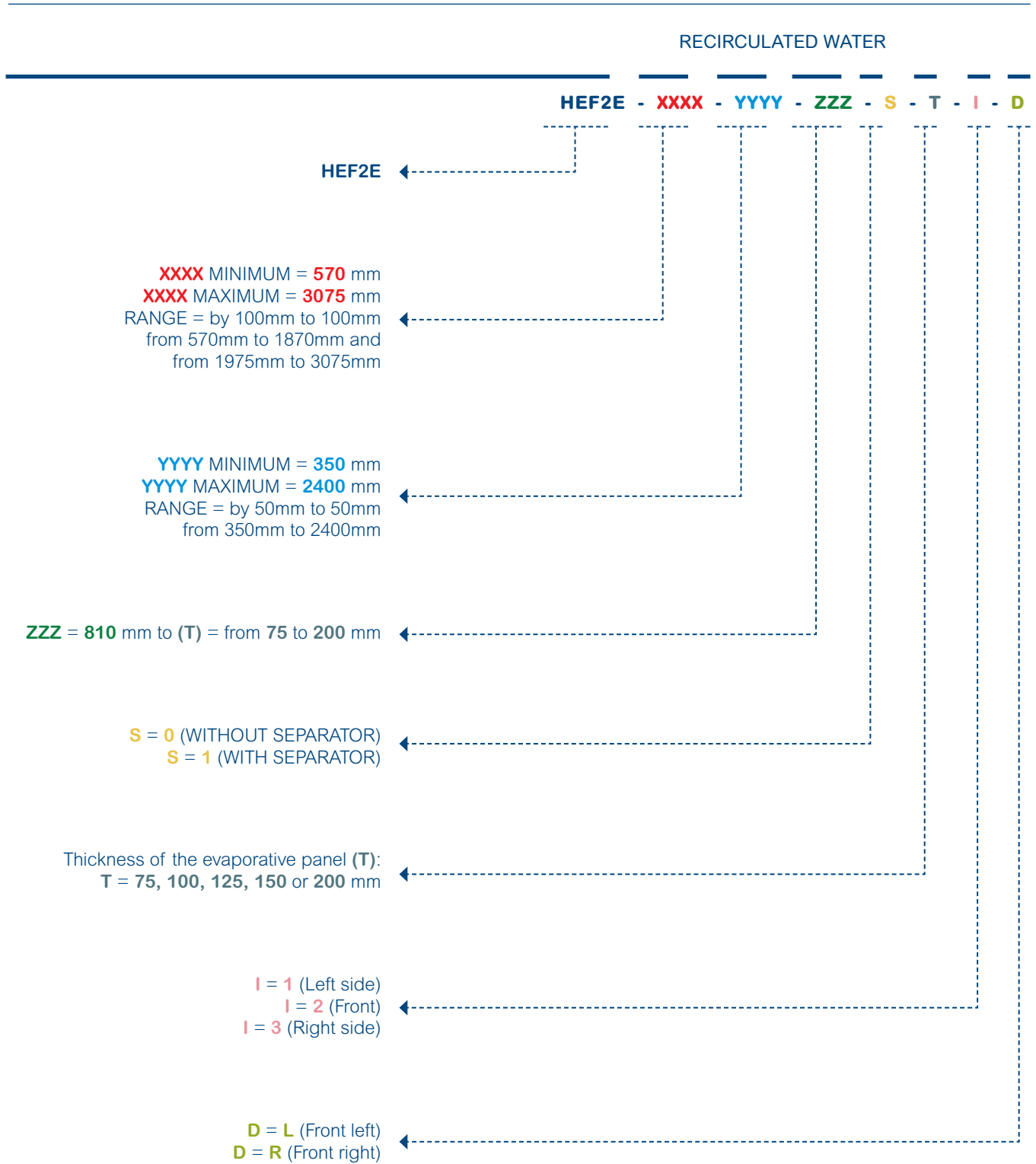


**HEF2E-DW operating principles
(Direct water, stage control)**



(A)	Process air
(B)	Humidified air
(C)	Water supply
(D)	Overflow
(E)	Draining
(F)	Water outlet to drain (draining + overflow)
(1)	Evaporative cassette
(2)	Droplet separator (optional)
(3)	Irrigation regulation valves + flow meter
(4)	Draining valve
(5)	Filling solenoid valve (optional, supplied loose)
(6)	Irrigation N.C. solenoid valve for each stage

Typical specifications for Fisair adiabatic humidifiers/coolers





DIRECT WATER

HEF2E-DW - XXXX - YYYY - ZZZ - S - T - D - I

HEF2E-DW ←

XXXX MINIMUM = 570 mm
XXXX MAXIMUM = 3075 mm
RANGE = by 100mm to 100mm
from 570mm to 1870mm and
from 1975mm to 3075mm ←

YYYY MINIMUM = 350 mm
YYYY MAXIMUM = 2400 mm
RANGE = by 50mm in 50mm
from 350mm to 2400mm ←

ZZZ = 810 mm for (T) = from 75 to 200 mm ←

S = 0 (WITHOUT SEPARATOR) ←
S = 1 (WITH SEPARATOR)

Thickness of the evaporative panel (T):
T = 75, 100, 125, 150 or 200 mm ←

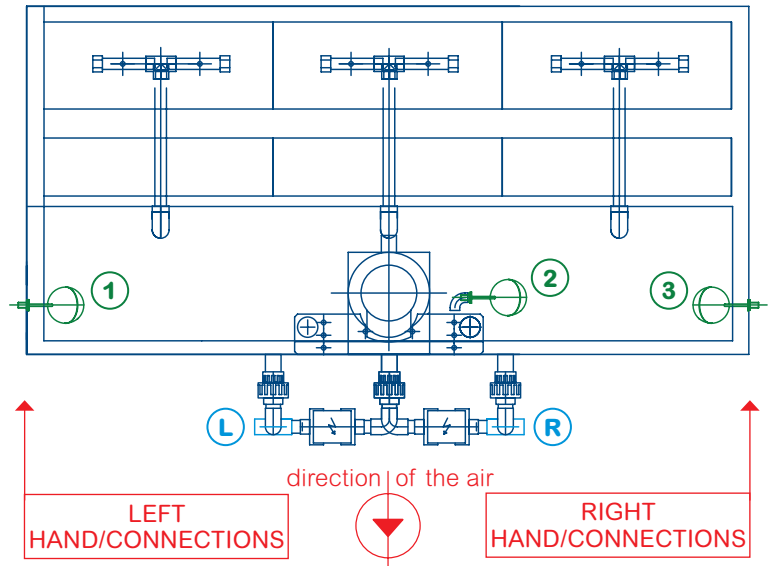
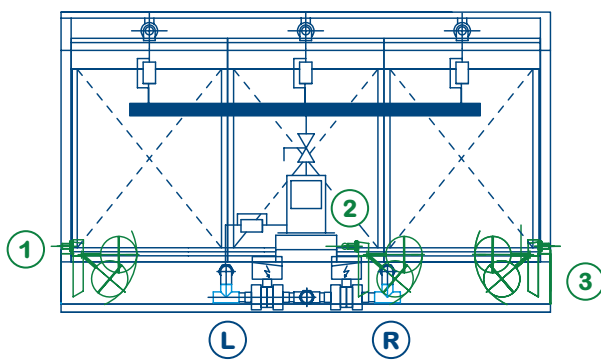
I = 1 (Left side) ←
I = 3 (Right side)

D = L (Front left) ←
D = R (Front right)

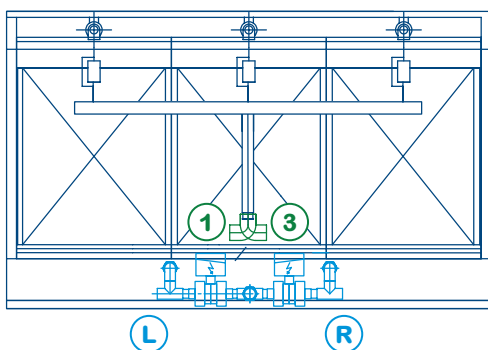
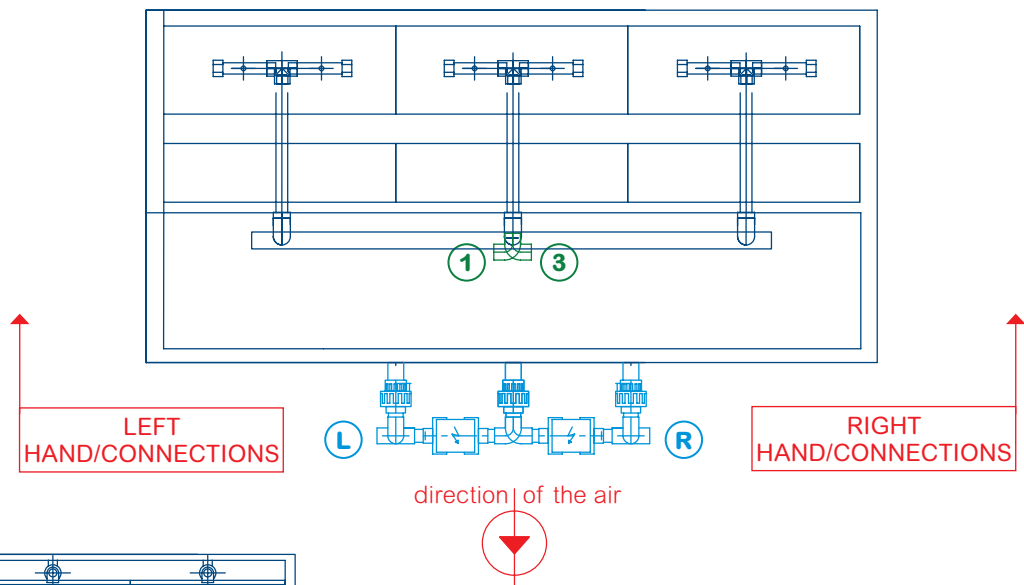
Connecting Fisair adiabatic humidifiers/coolers

HEF2E (recirculated water)

- A) Water supply connection options: (1) or (2) or (3)
- B) Draining connection options: (L) or (R)



HEF2E-DW (direct water)



- A) Water supply connection options: (1) or (3)
- B) Draining connection options: (L) or (R)



STANDARD accessories and components (HEF2E, recirculated water)






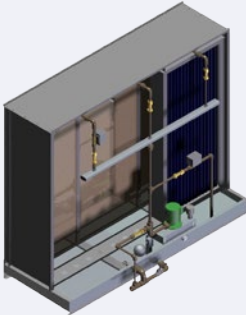
		RECIRCULATED WATER (standard)
Accessory		Description
Water recirculation pumps		55W (230V/In/50Hz) 60W (230-400V/III/50Hz) 120W (230-400V/III/50Hz) 240W (230-400V/III/50Hz)
Irrigation and bleed-off regulation valves		Individual irrigation valves and bleed-off valve: 1/2" ball regulation with brass flow meter (L/min range set for each scenario) Collector supply cut-off valve: DN20 PVC-U ball
Water distribution fixtures		Irrigation: AISI-304 stainless steel + PVC-U Bleed-off: PVC-U
Float valve (Water supply)		3/8" or 1/2" AISI-304 stainless steel
Distribution collector		AISI-304 stainless steel
Low/high level detector		AISI-316 stainless steel to protect the pump and so the water tank does not spill over. Max. 110 Vca
Draining valve		3/4" brass ball valve


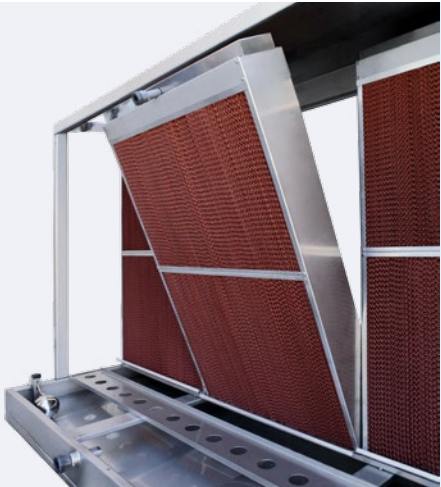




**STANDARD accessories and components
(HEF2E-DW, direct water)**

		DIRECT WATER (standard)
Accessory		Description
Irrigation regulation valves		Individual irrigation valves: Ball regulation with 1/2" brass flow meter (L/min range set for each scenario)
Water distribution fixtures		Irrigation: AISI-304 stainless steel + PVC-U Bleed-off: PVC-U
Individual distribution collector		AISI-304 stainless steel
Draining valve		3/4" brass ball valve



OPTIONAL accessories and components (HEF2E, recirculated water)

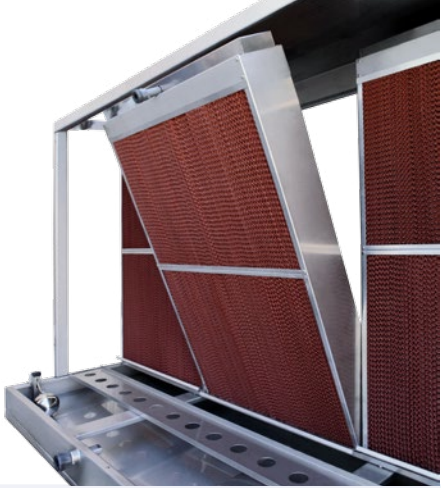





RECIRCULATED WATER (optional)	
Accessory	Description
<p>Water supply solenoid valve</p> 	<p>N.C. 1/2" brass solenoid valve (24V or 230V coil) (Unassembled)</p>
<p>Zone motor-valve (on/off) for draining</p> 	<p>N.C. 3/4" brass zone motor-valve (24V or 230V coil) (Assembled)</p>
<p>Control panels</p> 	<p>According to HEF2E control panel specifications</p>
<p>Conductivity meter + Conductivity sensor</p> 	<p>Conductivity meter directly in water tank</p>
<p>U.V. lamp disinfection system</p> 	<p>According to U.V. lamp disinfection system specifications</p>
<p>Two stage control system</p> 	<p>Depending on number of cassettes for each stage</p>

RECIRCULATED WATER (optional)		
Accessory	Description	
Water tank		AISI-316-L stainless steel
Cassette removal		From the front
Flexible hose (water supply)		Stainless steel 1/2" flexible hose (L=530mm) + reducer from 3/8" to 1/2" for the water supply
ATEX certification		Depending on the installation
Draining to exterior (PVC-U rigid pipe)		D32 PVC-U draining pipe for connecting to the exterior of the A.H.U. (L=+180mm)
Exterior supply (Rigid stainless steel pipe)		Rigid 1/2" stainless steel pipe for connecting the water supply to the exterior of the A.H.U. (L=+180mm)



OPTIONAL accessories and components (HEF2E-DW, direct water)

DIRECT WATER (optional)	
Accessory	Description
<p>Zone motor-valve for draining</p> 	<p>N.C. 3/4" brass motor-valve (24V or 230V coil) (Assembled)</p>
<p>U.V. lamp disinfection system</p> 	<p>According to U.V. lamp disinfection system specifications</p>
<p>Stage control system</p>  <p>HEF2E-DW</p>	<p>Each stage has a cassette, upstream of each regulation valve with flow meter, an N.C. 1/2" brass solenoid valve is installed (24V or 230V coil)</p>
<p>Water tank</p> 	<p>AISI-316-L stainless steel</p>

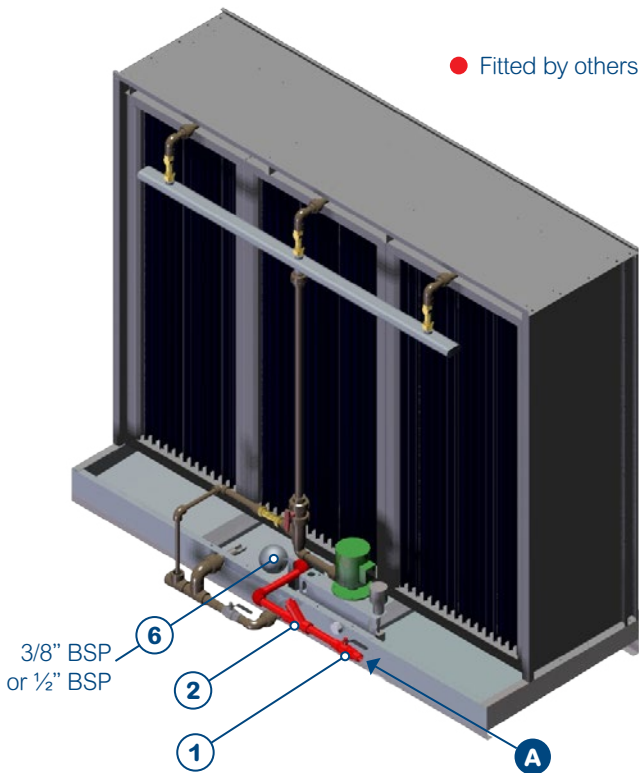
DIRECT WATER (optional)	
Accessory	Description
<p>Cassette removal</p> 	<p>From the front</p>
<p>Flexible hose (Water supply)</p> 	<p>1/2" stainless steel flexible hose (L=530mm) + reducer from 3/8" to 1/2" for the water supply</p>
<p>ATEX certification</p> 	<p>Depending on the installation</p>
<p>Draining to exterior (PVC-U rigid pipe)</p> 	<p>D32 PVC-U draining pipe for connecting to the exterior of the A.H.U. (L=+180mm)</p>
<p>Exterior supply (Rigid stainless steel pipe)</p> 	<p>Rigid 1/2" stainless steel pipe for connecting the water supply to the exterior of the A.H.U. (L=+180mm)</p>
<p>Exterior flow meter</p> 	<p>Exterior flow meter to measure the supply water (Unassembled)</p>



Connection of the water supply for filling the water tank

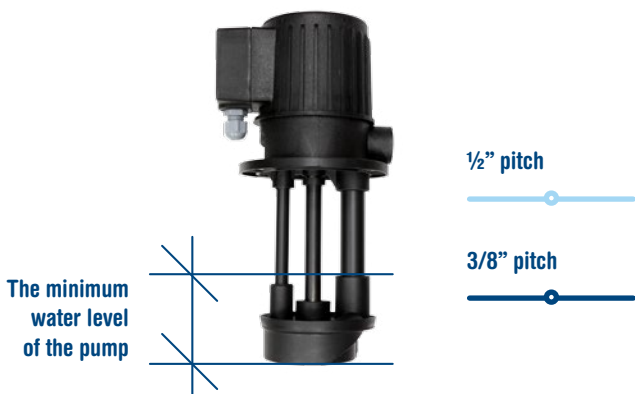
WATER CONNECTIONS

- Connect the water supply (A) to the 3/8" male BSP or 1/2" male BSP float valve (6) using suitable piping with a cut-off valve (1). We recommend the installation of a 0.5 mm light filter (2). The float valve can be regulated to set it to a range of water supply pressures, as shown in figure 1 on this page.



[Note]

The water level must never fall below the minimum water level of the pump. Water levels below this minimum irreparably harm the pump.



WATER TANK WATER SUPPLY

- Adjust the water level of the water tank to between 1 and 2 cm below the level of the overflow by regulating the float valve.

Regulating the float valve

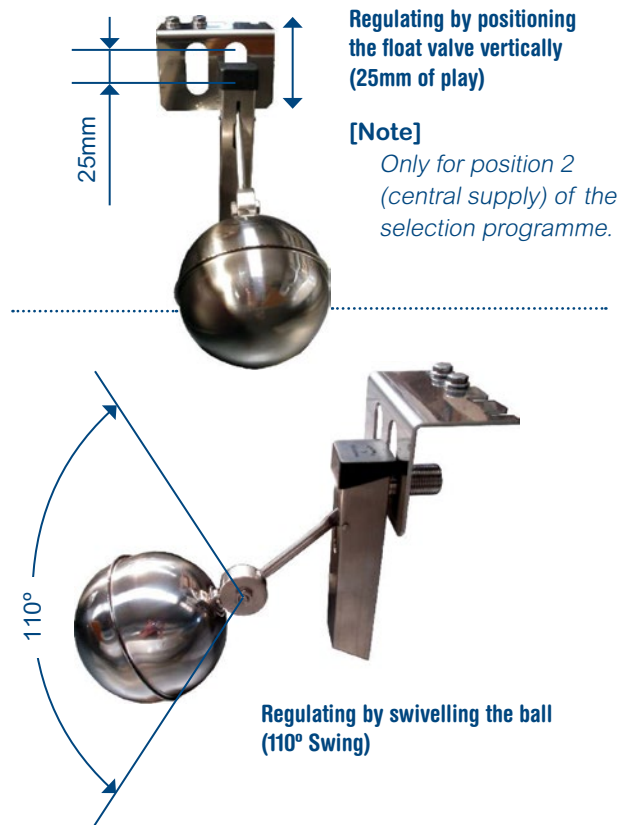
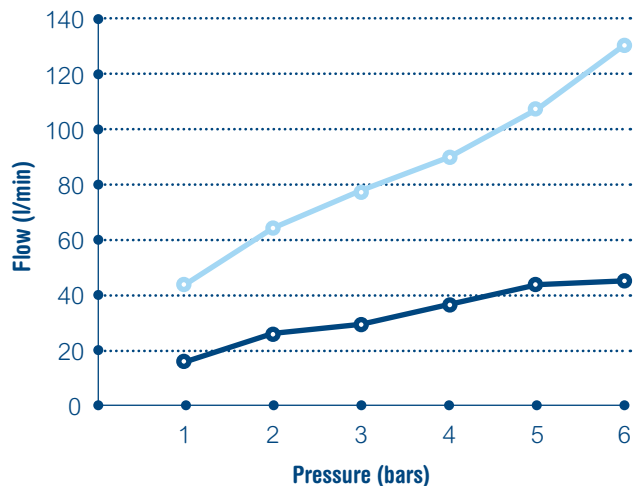


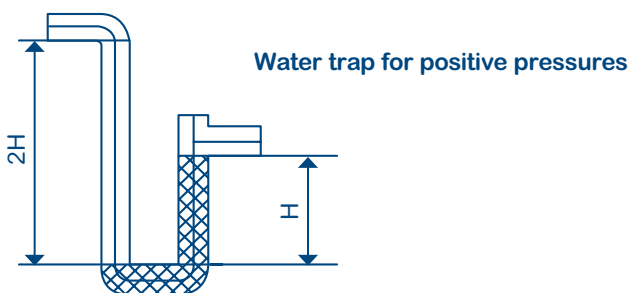
Figure 1
Float valve



Connection for draining to the water trap

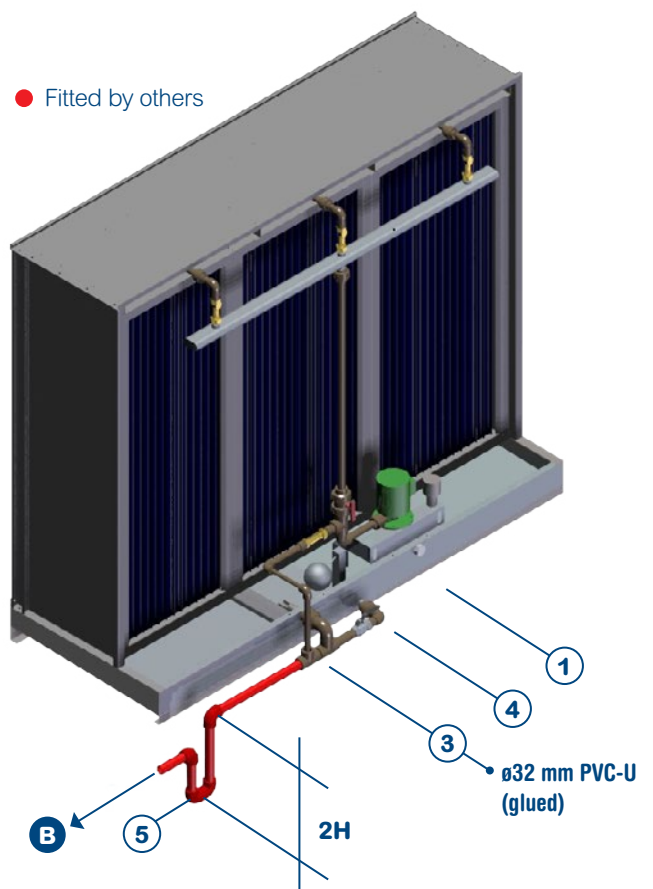
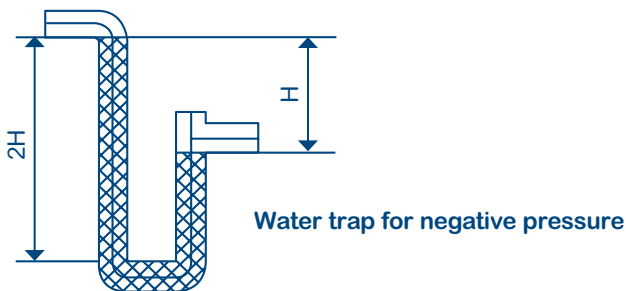
DRAINING CONNECTIONS

- Connect the ø32 mm common outlet (female/glued PVC-U) for the draining / overflow / constant bleed-off (3), with no cut-off valve, to the network.
A cut-off valve (4) (manual or automatic depending on specifications) is included to control drainage. *
- The connection of the water outlet to the drainage must include a water trap (5) high enough (2H) to exceed the pressure in the system, so the water tank can be completely emptied, for hygiene reasons. The system will also have the normal slope of typical drainage lines.

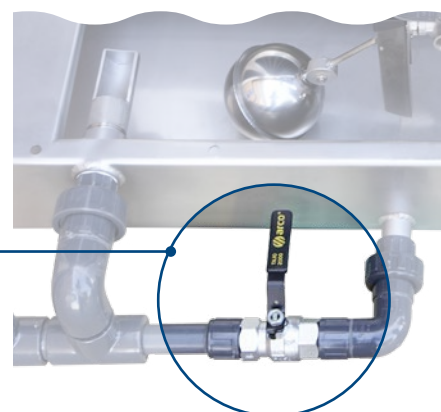
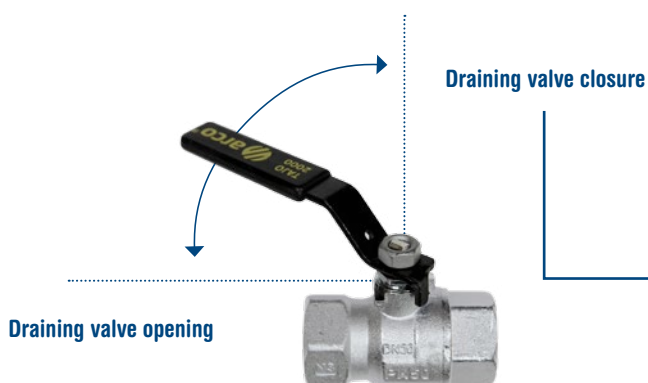


$$H_{min.} (mm) = P(Pa) / 10$$

P = Total fan pressure



* HEF2Es are supplied with a manual ball valve for draining as standard

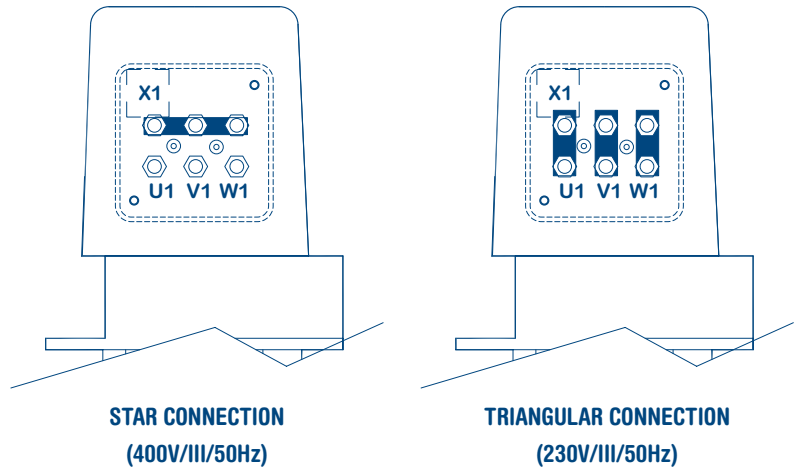




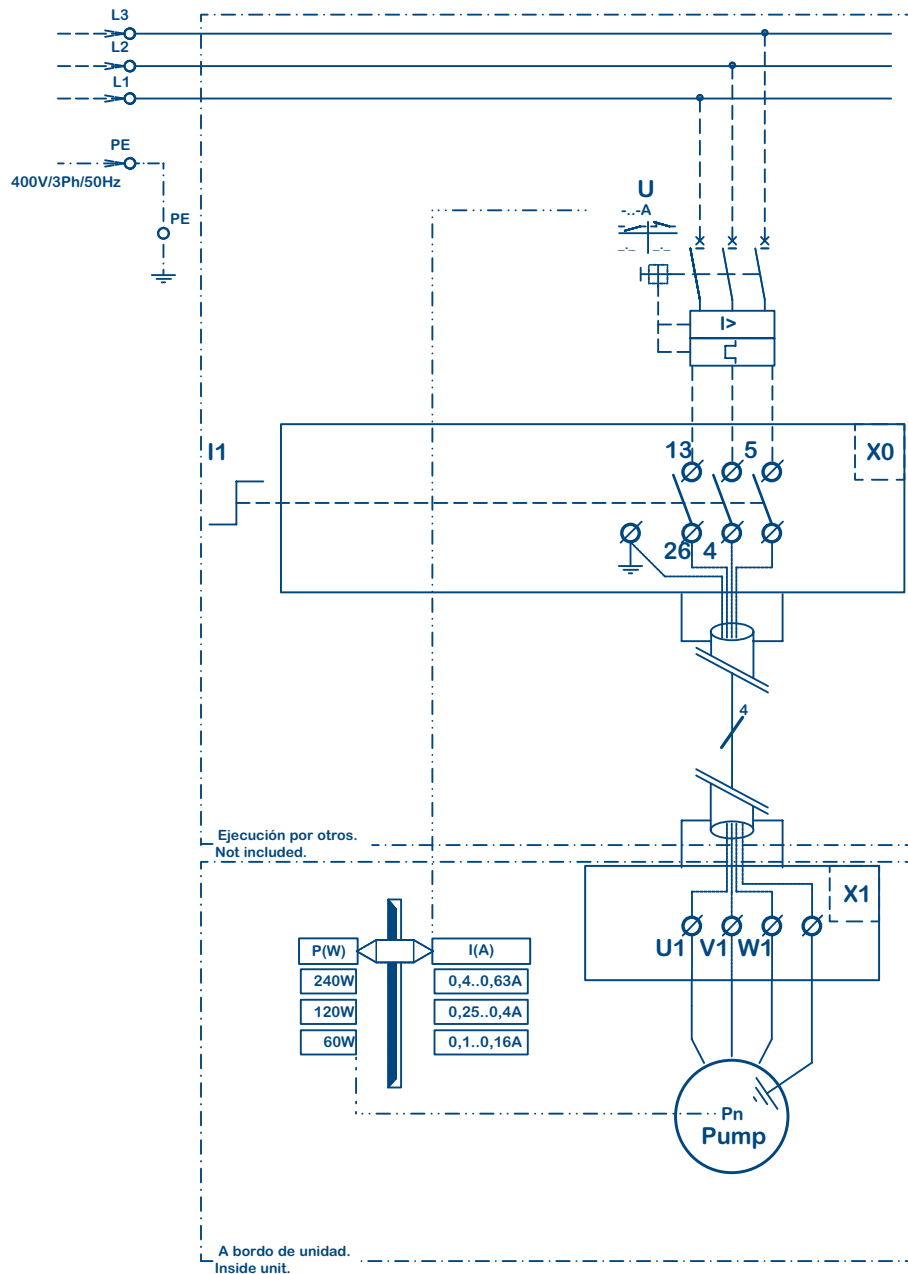
Electricity connection of the Fisair recirculation pump

Connect the electricity supply line to the terminal box of the water irrigation pump using a suitable connection (IP-55 or higher).

The protection and operation of the electricity supply to the pump must be determined by the project designer of the system.



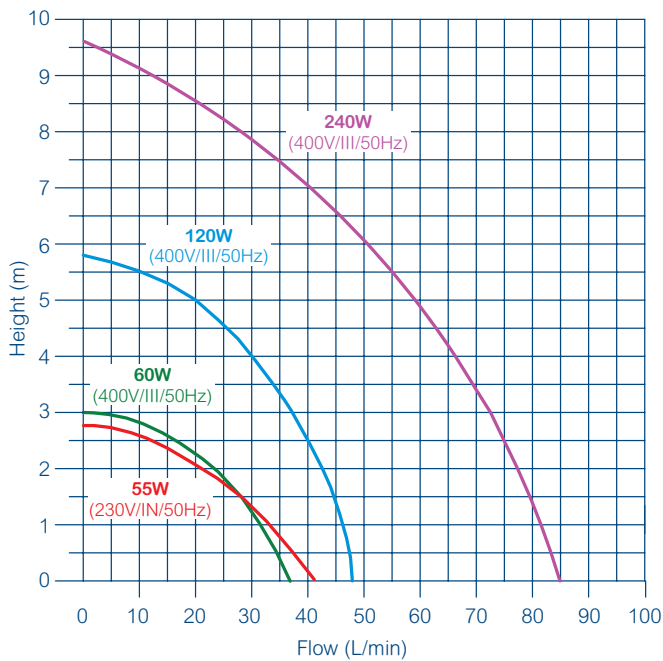
WIRING DIAGRAM
THREE PHASE PUMP



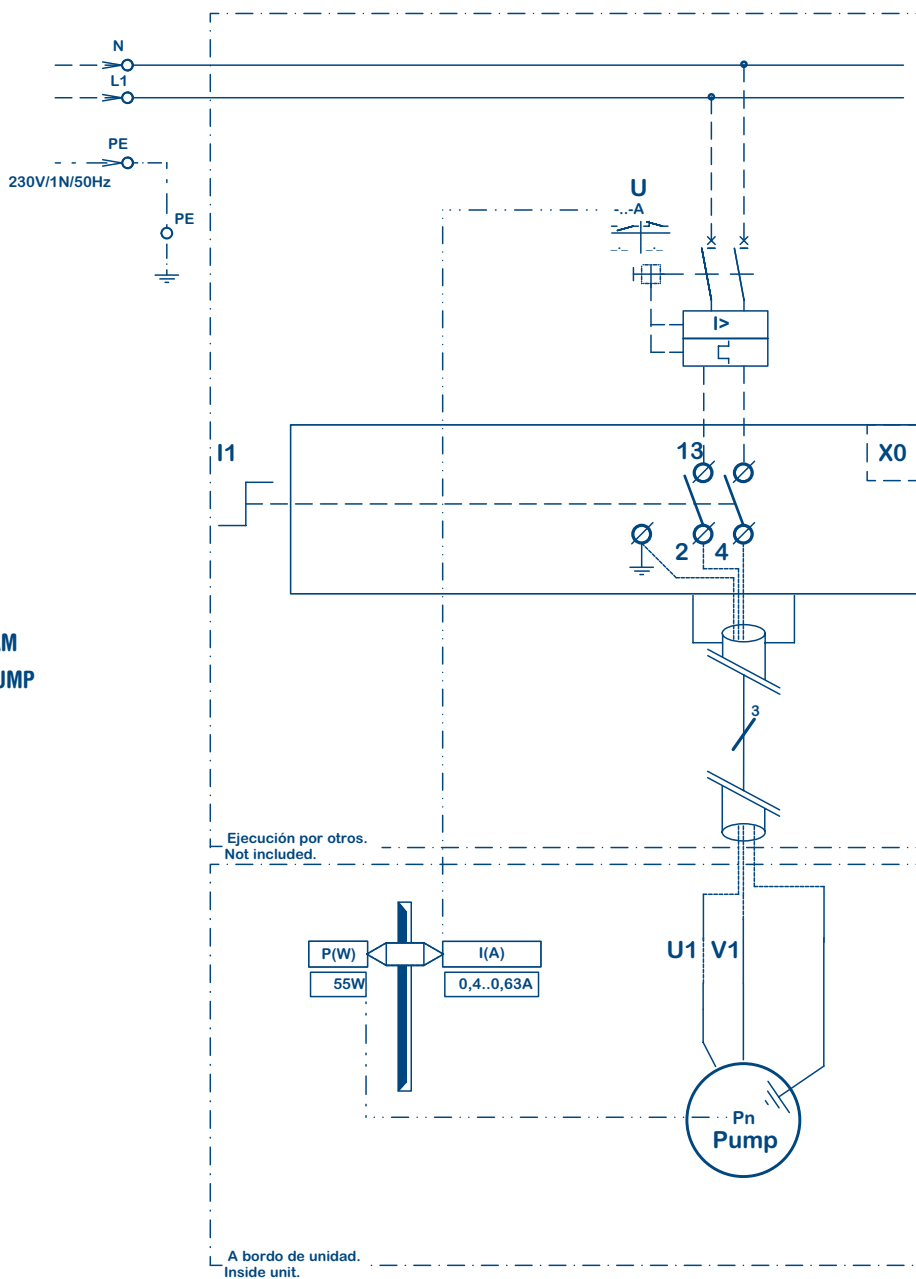
Power Rating

- In (240W)= 0,52A (400V/III/50Hz)
- In (120W)= 0,34A (400V/III/50Hz)
- In (60W)= 0,12A (400V/III/50Hz)
- In (55W)= 0,51A (230V/IN/50Hz)

Name	Description	Position												
I1	Isolator for electrical insulation	D3												
<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>SEL</th> <th>1-2</th> <th>3-4</th> <th>5-6</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>0</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			SEL	1-2	3-4	5-6	1				0			
SEL	1-2	3-4	5-6											
1														
0														
X0	Exterior box	D7												
X1	Pump connection box (IP55)	G7												



WIRING DIAGRAM
SINGLE PHASE PUMP



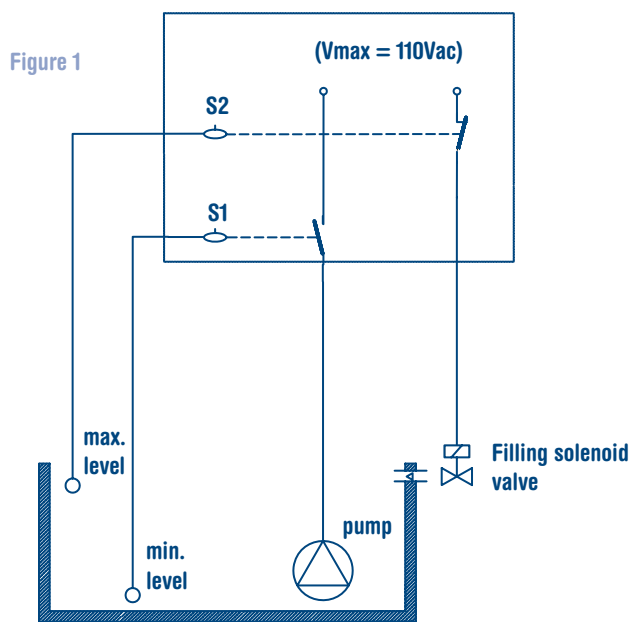
P(W)	I(A)
55W	0,4..0,63A



Level detector electricity connection

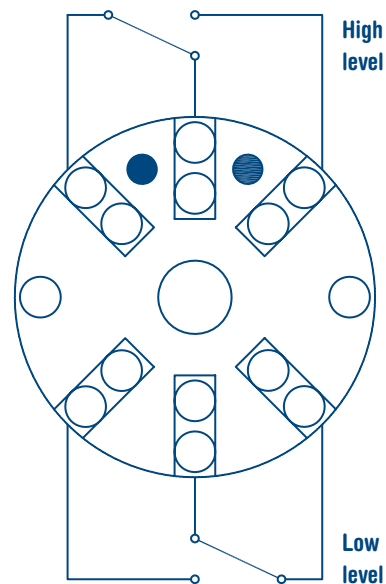
1. Minimum level detector (low level):

The minimum level must be connected to protect the workings of the recirculation pump as shown in the diagram in figure 1.

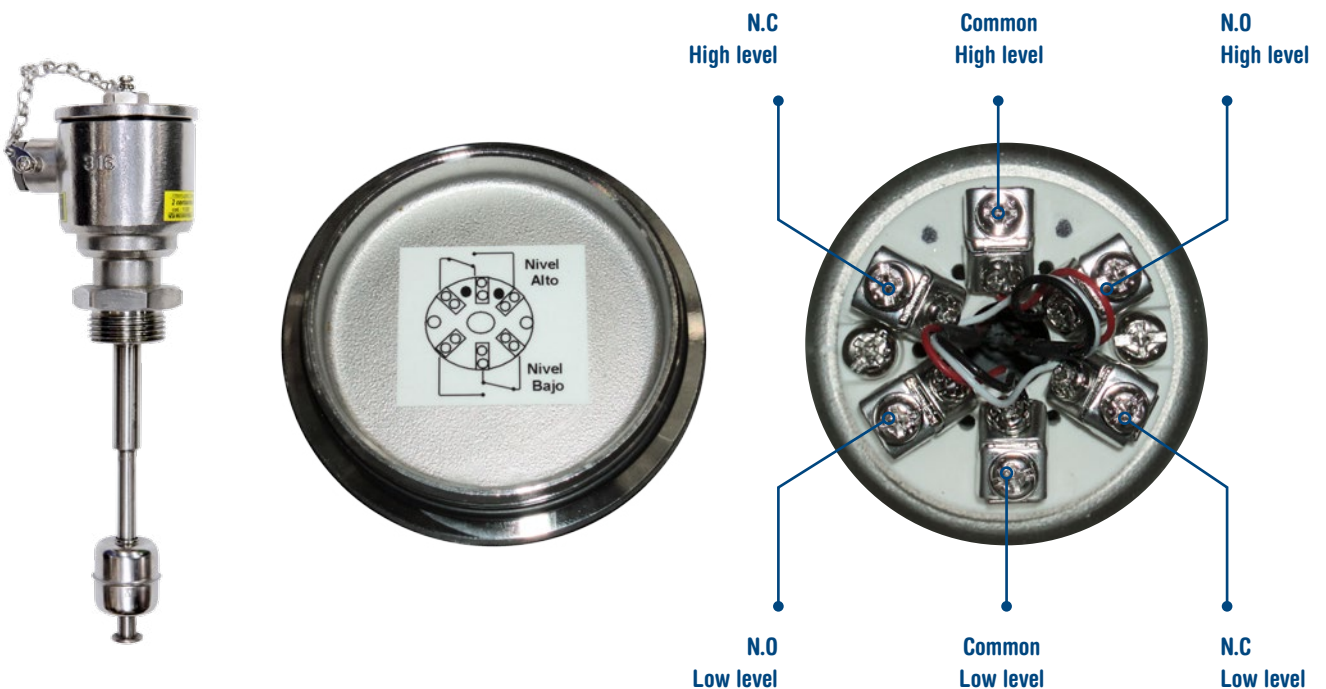


2. Maximum level detector (high level):

The maximum level must be connected to cut-off the water supply when the HEF2E is supplied with the "Filling solenoid valve" optional accessory. The connection must be made as shown in the diagram in figure 1.



[Important note] Maximum connection 110 Vca



Setting valves regulating evaporative cassette irrigation flow

Adjust the irrigation valves of the evaporative cassettes so their surfaces are uniformly wet. The empirical value of approximately 1 litre/second for each square metre of irrigation surface is enough to exceed the water needed for evaporation. Generally, it is just necessary to ensure the irrigation of the panels has excess water falling into the water tank.

[Note] The flow in L/min for each cassette can be found on the HEF2E selection sheet.

Adjusting the constant bleed-off regulation valve

The importance of constant bleed-off based on conductivity

Water evaporates because the water vapour pressure is higher in the evaporative panel than in the air passing through it. Since only the water evaporates, dissolved mineral salts remain in solution, which gradually increases their concentration, despite new water being added to compensate for the evaporation.

In order to prevent the formation of mineral deposits on the surfaces of the evaporative panel (giving rise to a progressive increase in air pressure drop and reducing operational performance) it is essential to drain off some of the recirculated water to the network during the evaporation.

Bleed-off based on the COC (cycle of concentration).

Bleed-off = Evaporation (COC-1)

Cycle of concentration COC based on conductivity (100-1000 µS/cm)

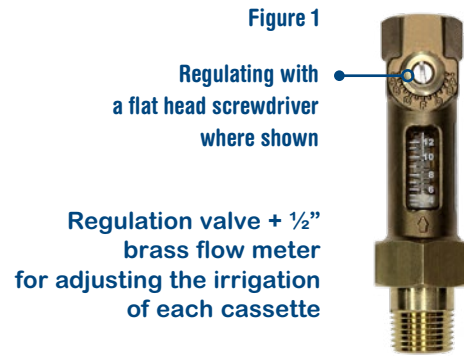
Comment: Always in line with the recommended parameters of the drinking water supply.

- 100 µS/cm = 9 COC
- 550 µS/cm = 6 COC
- 1000 µS/cm = 2 COC

Calculation example:

- Based on drinking water network parameters
- Water evaporation= 3.23 l/min
- Water conductivity= 550 µS/cm
- COC= 6
- Bleed-off = $3.23/(6-1) = 0.65$ l/min

[Note] The flow of the constant bleed-off cannot fall below 0.3 L/min.
The flow in L/min of the bleed-off can be found on the HEF2E selection sheet.



Excess irrigation water is important to ensure constant and superficial washing of the panels.

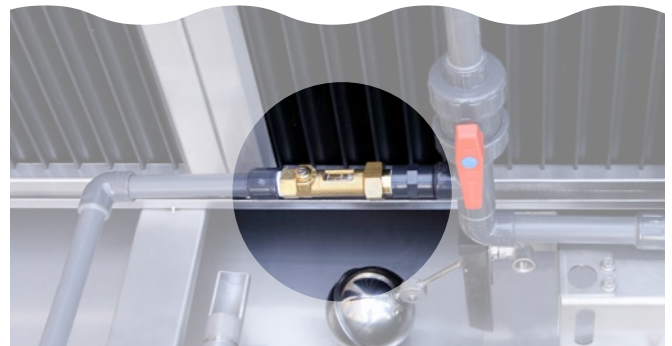
Example of irrigation x cassette:

Cassette width (500mm) and panel thickness (150mm)
 $0.5\text{m} \times 0.15\text{m} \times 60 = 4.5\text{L/min}$

Initial approximate settings can be made as 10% of the total flow of the irrigation. By regularly observing the state of the panels (on the air input side), after 1 or 2 weeks in use, if there are no white mineral deposits on the surfaces, the bleed-off flow can be reduced, or on the other hand, if there are lime deposits, it can be increased.

Analytical parameters of the drinking water network (Recommended)

- Hardness of the water (CaCO₃): 50-170 ppm
- Chlorine (Cl): <55 ppm
- PH: 6-8
- Silica (SiO): <30 ppm
- Iron (Fe): <0.2 ppm
- Oils and grease: <2 ppm
- Total dissolved solids: <550ppm
- Total alkalinity (CaCo₃): 50-170 ppm
- Suspended solids: <5 ppm



Regulation valve with flow meter to adjust the bleed-off. It is regulated using a screwdriver as shown in figure 1.



STANDARD Disassembly

DISASSEMBLY OF CASSETTES AND DROPLET SEPARATORS. Laterally (STANDARD)

The unit can be disassembled in a few simple steps for maintenance and/or cleaning work of the HEF2E.

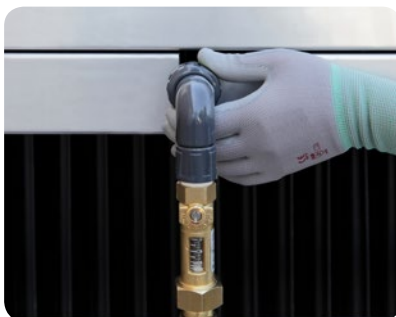
Disassembly steps:

1st

Disassemble the collector + regulation valve set for the irrigation flow of the evaporative cassettes.



a



Unscrew each irrigation union

b



Unscrew the unions



c Collector + regulation valve set of the irrigation flow

2nd

Disassemble the D25 PVC-U up-pipe to the collector.

a



Unscrew the DN20 PVC-U ball valve fitting

b



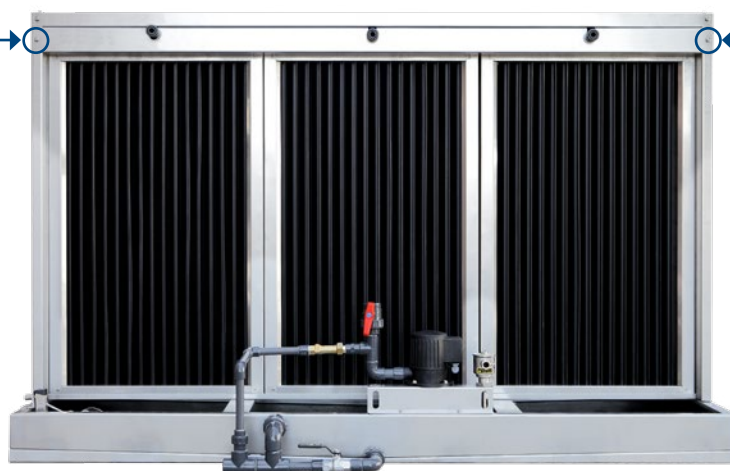
D25 PVC-U pipe

3rd

Disassemble front cover

a

Unscrew the two screws holding the piece in place



b Front cover





4th

Disassemble the side cover



a

Unscrew (upper screw) without removing the screw from its bolt



b

Unscrew (lateral screw)

c

Unscrew (lower screw)



5th

Removal of the droplet separators.



6th

Disassemble the "C" piece
(there is one piece for each evaporative cassette)



side view



a

Unscrew



front view

b

Release the pipe
from the nylon clip



c



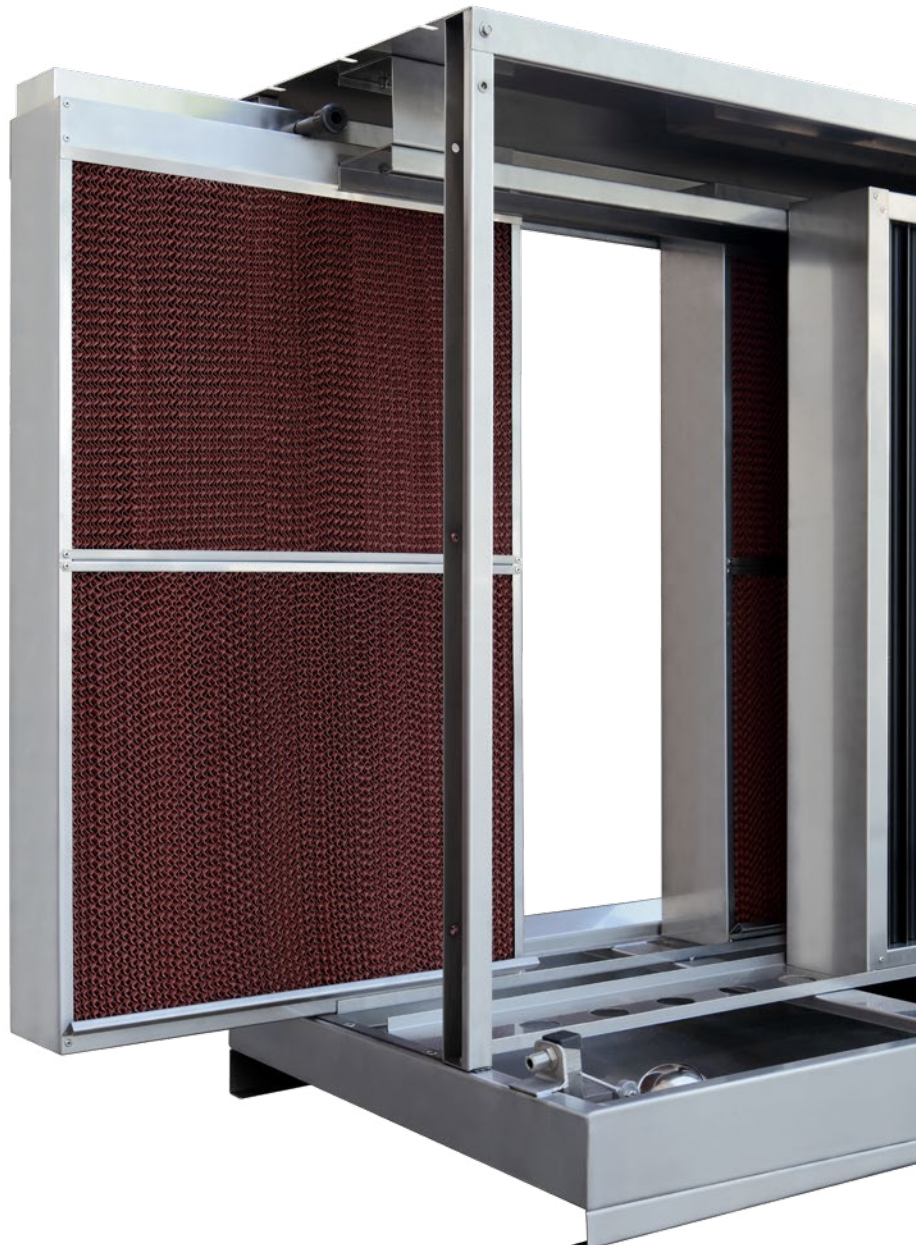


a

Remove the cassettes

7th

Removal of evaporative cassettes



OPTIONAL Disassembly

UNIT DISASSEMBLY. FRONT (OPTIONAL)

The unit can be disassembled in easy steps for maintenance and/or cleaning work of the HEF2E.

Disassembly steps

- 1st STANDARD disassembly step 1 page 30
- 2nd STANDARD disassembly step 2 page 31
- 3rd STANDARD disassembly step 3 page 31

4th

Bleed-off disassembly



a

Unscrew the brass fitting of the regulation valve + flow meter of the bleed-off



b

Unscrew the 1/2" PVC-U union

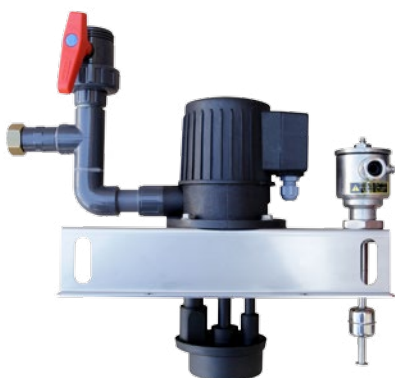


c

Bleed-off

5th

Disassemble the support + pump + level detector set (optionally the float valve can be mounted on this support)



a

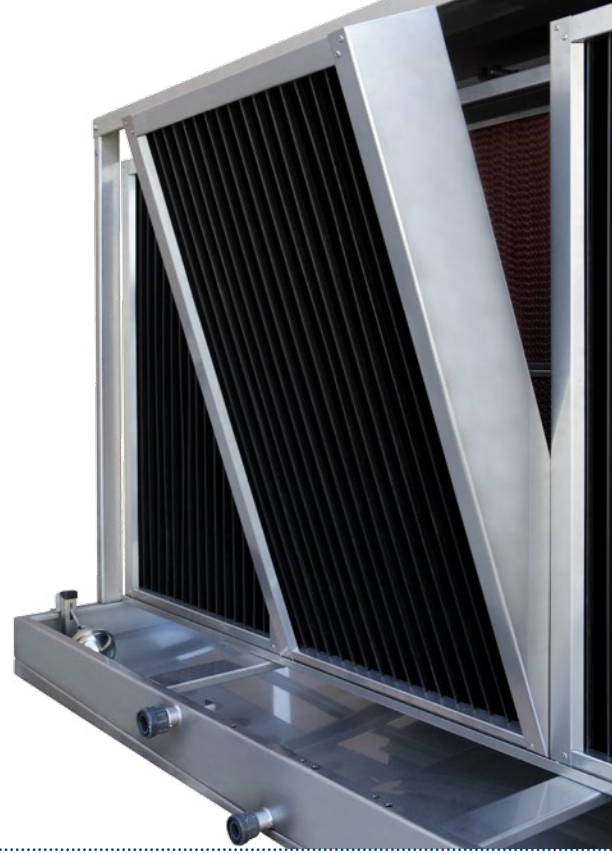
Unscrew the support

b

If the float valve is mounted on the support, disconnect the water supply

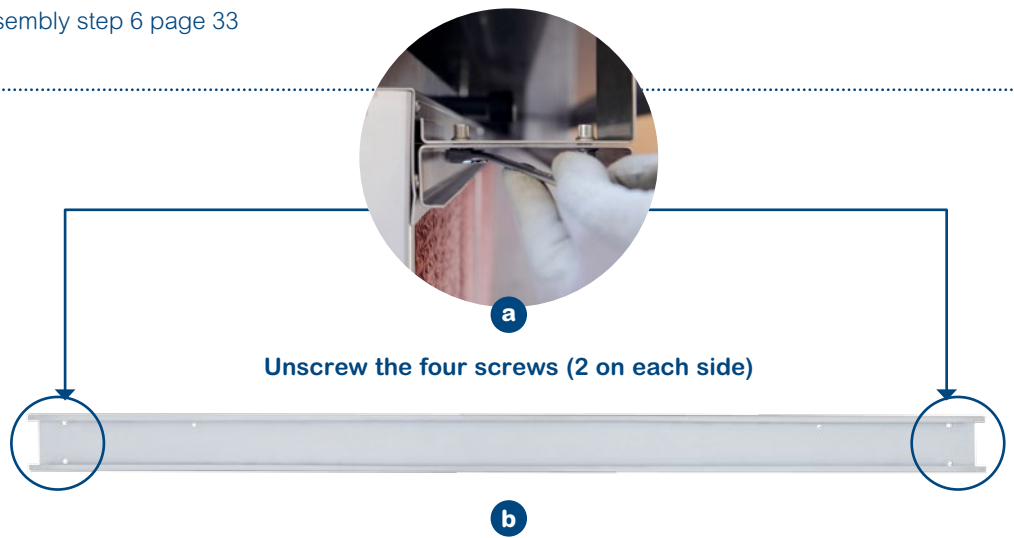


6th Removal of droplet separators

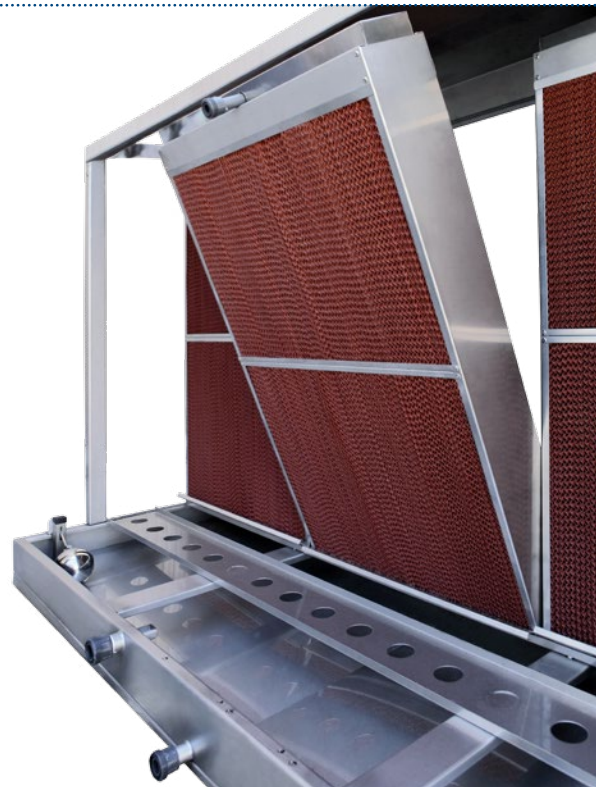


7th STANDARD disassembly step 6 page 33

8th Disassembly of the "b" piece



9th Removal of the evaporative cassettes



Direct water HEF2E

Direct water HEF2E units use water at domestic network supply pressure (1-8 bars). Direct water HEF2Es are exactly the same as recirculated water HEF2E units apart from the following:

Direct water HEF2E systems do not include:

- Recirculation pump
- Float valve
- Bleed-off system
- Level detectors

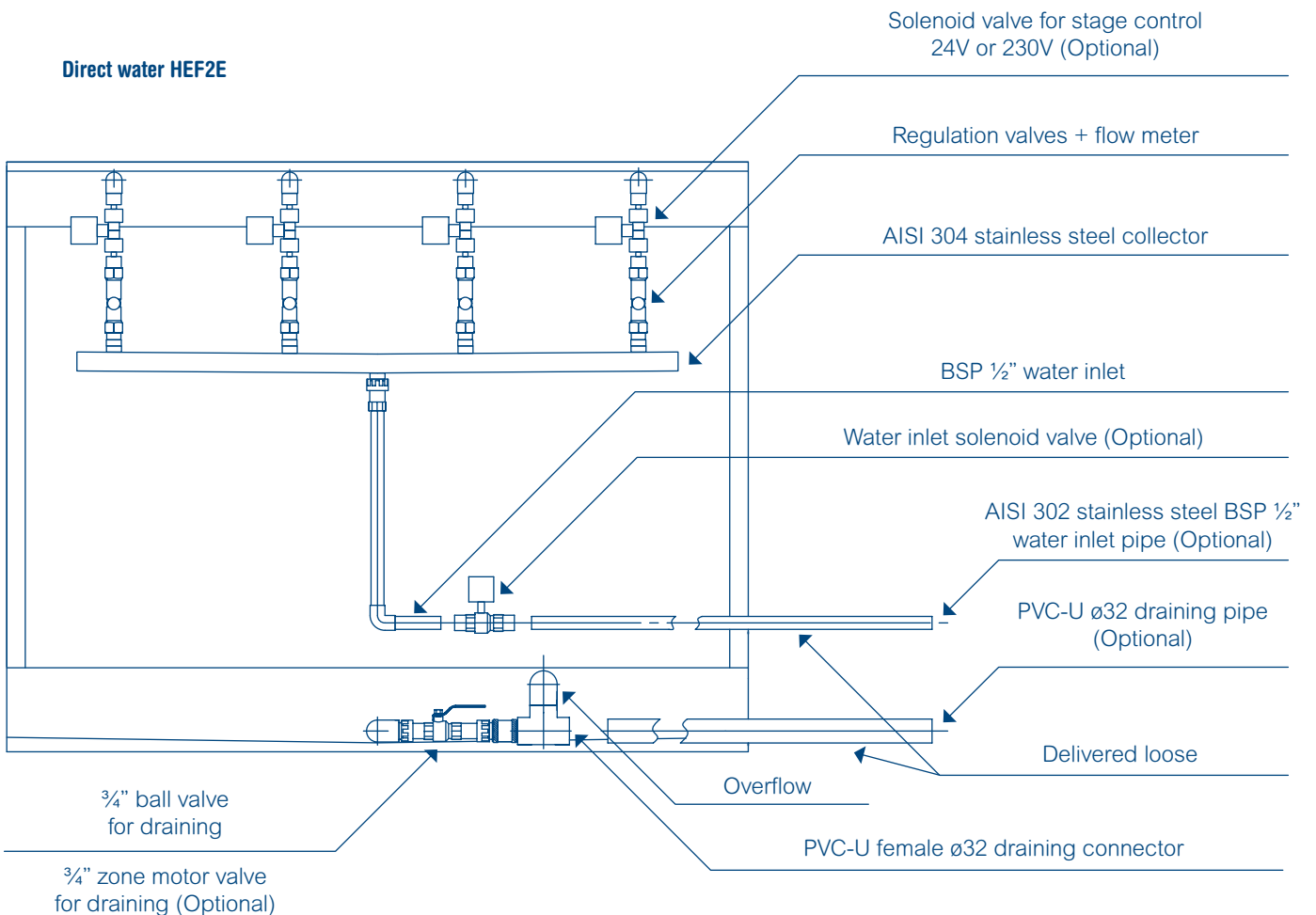
Direct water HEF2E systems include the following components as standard in addition to components common to recirculated water HEF2E systems:

- AISI304 stainless steel collector with BSP 1/2" screwed inlet for the supply

- One regulation valve + flow meter per cassette for irrigation settings
- Overflow
- 3/4" brass manual ball valve for draining
- PVC draining connector
- Female/glued 32

Direct water HEF2E systems include the following components as optional:

- 1/2" brass solenoid valve for the supply
- 1/2" brass solenoid valve for each irrigation
- 3/4" brass zone motor valve for draining
- 1/2" flexible or rigid AISI304 stainless steel filling pipe (length depending on need)
- Male/glued 32 PVC draining pipe (length depending on need)
- High level detector





Direct water HEF2E

230V or 24V coil



1/2" brass N.C. water supply solenoid valve + AISI304 stainless steel 1/2" M/F union (optional components): solenoid valve coil with 230V or 24V connection. (Supplied unassembled)

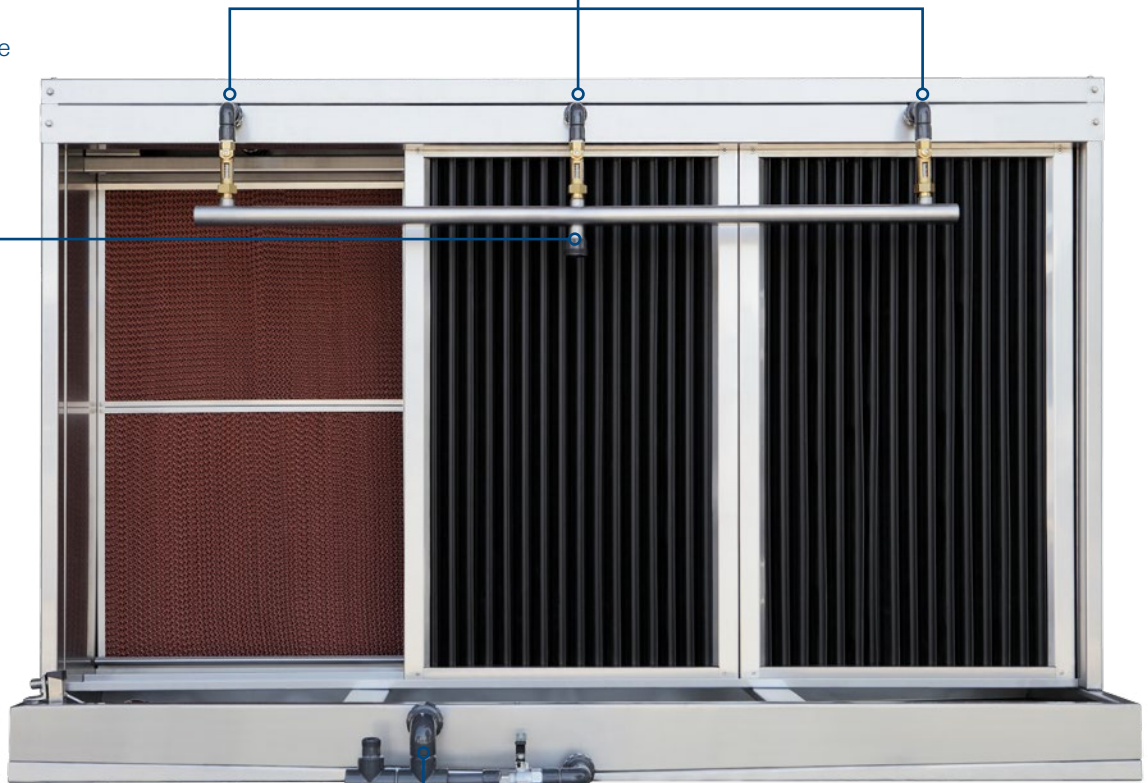


Regulation valves + brass 1/2" flow meter for adjusting the irrigation of each cassette. Regulation according to the formula given in point 3.2.

Example of cassette irrigation: cassette width (500mm) and panel thickness (150 mm)
 $0.5 \times 0.15 \times 60 = 4.5 \text{L/min.}$

1/2" N.C. Solenoid valve

BSP 1/2" screwed inlet AISI304 stainless steel collector for the water supply



Overflow

Female/glued ø32 PVC draining connection



3/4" manual brass ball valve for draining

3/4" brass zone motor valve for draining (optional).

Cleaning and disinfection

Evaporative humidification; a natural way of avoiding bacteria transport.

The operating principles of FISAIR evaporative humidifiers are based on the natural effects of water evaporation when an air flow passes over a humid surface (the same phenomenon takes place when water evaporates in rivers, reservoirs, lakes, etc.).

The water supply is normally drinking or industrial water. This contains dissolved salts such as calcium and magnesium (it can also contain microorganisms).

Water evaporation occurring in evaporative panels adds water vapour molecules to the air to the exclusion of all else. In order for treated air to contain microorganisms that could be found in the recirculation water, droplet carry-over would have to occur (the droplets acting as vehicles). That is why it is important to ensure the maximum front air speed without droplet carry-over is not exceeded. If this does occur, install a droplet separator (annex 5.5).

What is more, the optimum temperature for the growth of many bacteria families present in water, especially Legionella Pneumophila, is 37°C-41°C. Evaporative humidifiers however, usually work with water temperatures below 24°C.

Cleaning and disinfection.

Despite the inexistence of documentary records showing Legionnaires' disease caused by the use of evaporative humidifiers, suitable maintenance procedures should be adopted (see chapter 4.1) to avoid possible health problems, increase the evaporative performance efficiency and lengthen the life of units.

Evaporative humidifiers must be cleaned on a regular basis to prevent contamination. All the surfaces of components (panels, piping and especially the water tank) must be disinfected using an appropriate solution.

Special attention must be paid to cleaning the system of pipes, above all at junctions, to ensure the cleaning process reaches every corner of the system.

We do not recommend the use of chemical disinfectants for everyday maintenance of the panels, because these could reduce the efficiency of panels and their useful life. If the use of chemical products is required, because the system has been out of use for a long time, or for any other reason, an effective method is to submerge the panels in a chlorine disinfectant such as sodium hypochlorite (bleach), or sodium percarbonate. Whenever chlorine disinfectants are used, it is essential to remember toxic chlorine gas is formed if it is combined with an acid solution.

Note: always follow the safety instructions provided by the manufacturer of the disinfectant solution.

The inorganic panels the HEF-2E cassettes are made from contain a bacterial and fungus inhibitor as part of their composition, such as Silver ions and zinc pyrithione. These agents are bacteriostatic, not disinfectants.

As for the disinfection of the remaining components, the same bleach disinfection solution can be used. The number and time-spans of disinfection processes must be established by the person responsible for the installation, with regard to the use of the unit, its location, piping system, water quality, etc.

In sum, it is worth mentioning once again the importance of good operating practices, essentially based on appropriately regulating the bleed-off system and correctly regulating irrigation / draining.

An extra highly recommended practice would be to add a treatment system to the humidifier water supply.



Specifications of control panels for Fisair adiabatic humidifiers/coolers

1. Basic control panel for A.H.U. applications, including:

- IP54 rated U.V. resistant plastic control panel.
- Control panel with supply: 400V/III+N/50Hz.
- Recirculation pump motor and operational protection.
- Signalling card with 3 LEDs "Power, On and Fault".
- Operating switch with the possibility of MAN (local) or AUT (remote) working. Three position switch MAN-O-AUT:
- For remote working (AUT) a dry contact is included for the connection of: a humidistat, remote ON/OFF connection, etc.
- Supply/connection for managing the filling solenoid valve.
- Connection for a high level detector (maximum water level in the water tank) to control the filling solenoid valve.
- Connection for a low level detector (minimum water level in the water tank) to protect the water recirculation pump.
- Supply/connection for managing the zone motor valve for draining the water tank automatically.
- Functions:
 - Pump protection time (adjustable) to avoid stuttering recirculation pump operation when the water tank is being filled with water.
 - Draining cycle time (adjustable) so the water tank is emptied/drained when this time has elapsed.
 - Draining time (adjustable). Draining time of the water tank.
 - (OPTIONAL) three state signals (power free) for remote connection (power, On and fault).
 - (OPTIONAL) conductivity meter + sensor for regulating the bleed-off in On/Off, based on the draining to reduce concentrations.

2. Stage control panel with PLR microprocessor for 2 stages:

- EPOXY enamelled metal control panel with IP65.
- Control panel with supply: 400V/III+N/50Hz.
- Recirculation pump motor and operational protection.
- Signalling card with 3 LEDs "Power, On and Fault".
- Operating switch with the possibility of MAN (local) or AUT (remote) working. Three position switch MAN-O-AUT.
- For remote working (AUT) a dry contact is included for the connection of: a humidistat, remote ON/OFF connection, etc.
- Supply/connection for managing the filling solenoid valve.
- Connection for a high level detector (maximum water level in the water tank) to control the filling solenoid valve.
- Connection for a low level detector (minimum water level in the water tank) to protect the water recirculation pump.
- Supply/connection for managing the zone motor valve for draining the water tank automatically.
- Control of the different irrigation stages (on demand):
 - Units with 2 stages (2 cassettes): the irrigation of the 1st stage (1st cassette) is controlled using the ON/OFF function of the recirculation pump.
The irrigation of the 2nd stage (2nd cassette) is controlled by opening/closing an N.C. solenoid valve.
- The stages can include more than one cassette. The configuration of stages varies and is defined by the client.
- A by-pass N.O. solenoid valve is included in the irrigation in order to balance the water flow, and to ensure it is constant.
- All the solenoid valves must mount a regulation + flow meter valve to correctly regulate the irrigation and by-pass flows.
- Ultraviolet lamp control (on demand).
- PLR microprocessor with operations and functions described in the technical/commercial document entitled: "Control Panel with PLR Microprocessor".

U.V. lamp disinfection system (*)

ULTRAVIOLET LAMP

Concerns related to pathogenic organisms in the water causing illnesses and contaminating industrial processes, have led FISAIR S.L. to provide the optional integration of ultraviolet technology in its evaporative units. This type of system eliminates bacteria, viruses and other pathogens, prevents their reproduction, and results in completely safe drinking water.

U.V. radiation is one band of the electromagnetic spectrum. It has more energy than visible light. The irradiation of germs present in the water with U.V. light harms their DNA molecules (figure 1) in a number of ways, which prevents cell division and kills them. The most harmful radiation for germs has a wavelength of 254 nanometres. The DNA exposed to this energy can only absorb up to a maximum, after which there is an irreparable inactivation of the growth of the pathogens.

The only control panel that includes it as standard, is the panel in which the U.V. lamp is integrated (figure 2).

Figure 1
DNA molecule damage caused by U.V. light

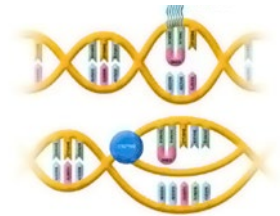
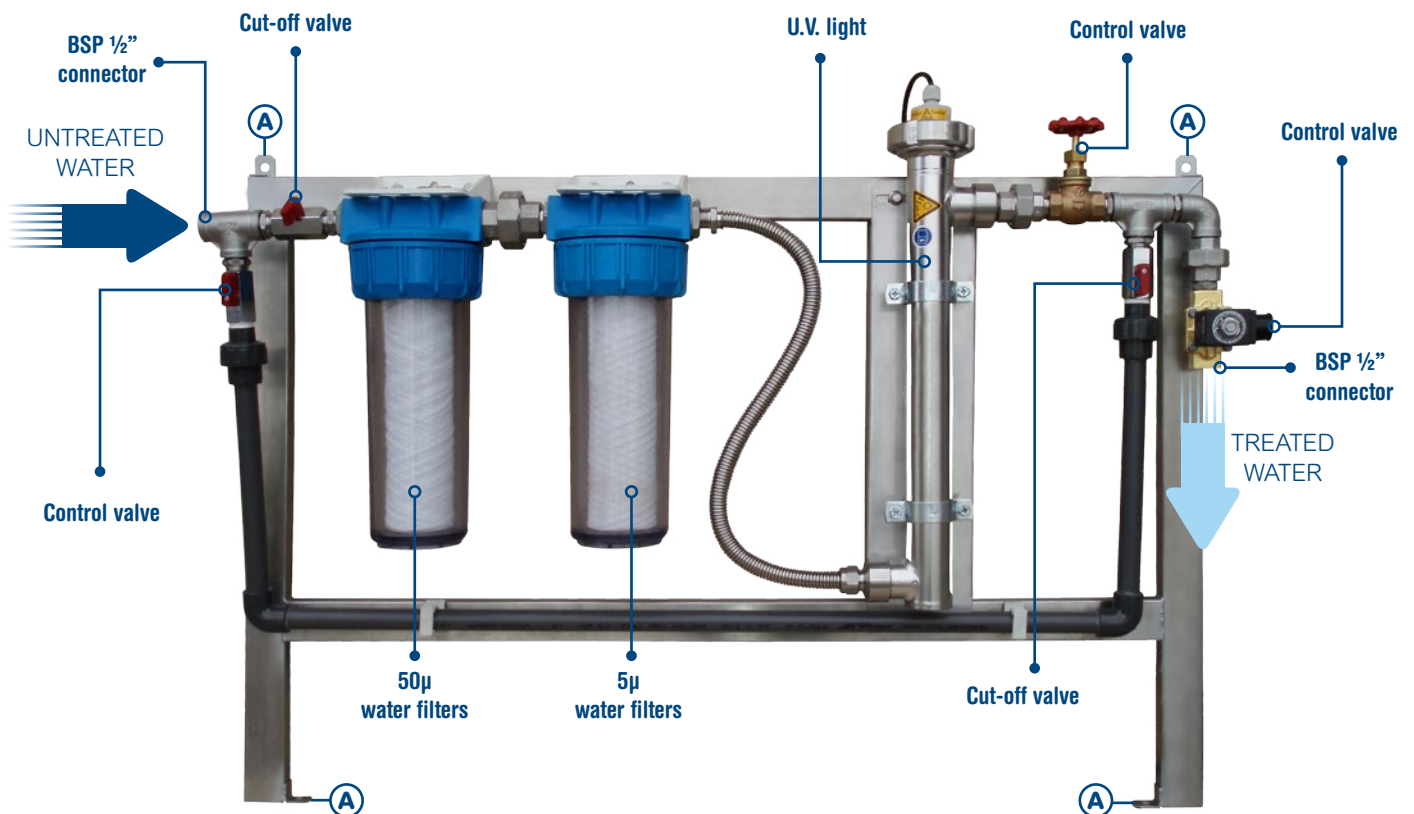


Figure 2
Control panel



ULTRAVIOLET LIGHT DISINFECTION SYSTEM + WATER FILTERS



Warning!!! To avoid unnecessary blockages in the filters of the system, the water should be made to circulate through the by-pass when the appropriate settings are being made to the irrigation of the cassettes and the cellular panel is being washed during installation.

(A) M8 attachment points

(*) Valid for all evaporative humidifiers and all those systems requiring treated water.

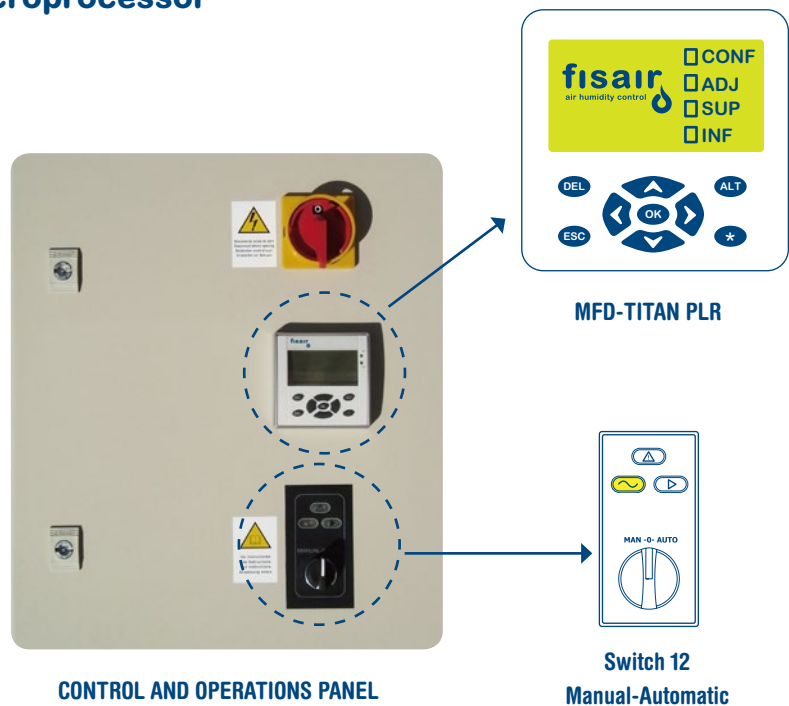


Stage control panel with PLR Microprocessor for 2 stages

MFD-TITAN PLR MICROPROCESSOR

The integration of 1 humidifier/cooler with MFD-TITAN PLR in operational management and monitoring enables quicker, more precise, more reliable and simpler humidifier operations.

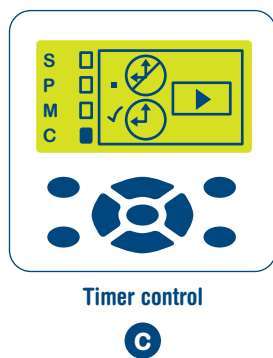
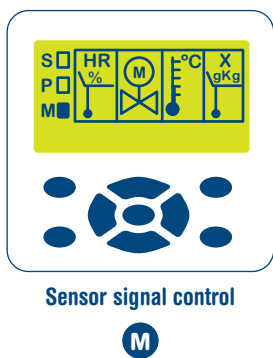
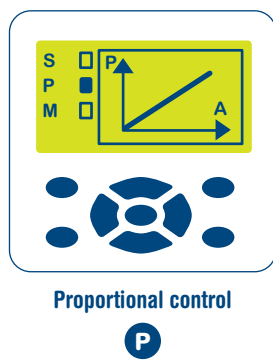
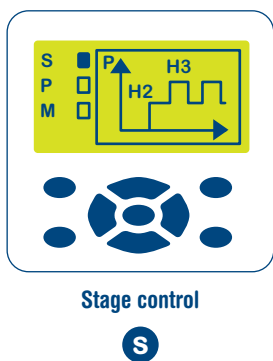
MFD-TITAN PLR programmable logic relay employed in this type of unit is a programmable device for the configuration, setting, monitoring and control, in real time of the range of components in the unit, and those connected to it.



FUNCTIONS OF THE MFD-TITAN PLR

1. OPERATIONS

- On-off switch for motor pumps
- On-off switch for solenoid valves (filling, drainage, 2nd stage and by-pass), and the ultraviolet lamp –if applicable–.
- Possible working configurations:



1.1 Stage control “S”: The two humidifier stages can be controlled and turned on and off using an external on/off digital signal. These are controlled remotely using an H1 connection for the first stage and an H2 connection for the second stage.

1.2 Proportional control “P”: The two humidifier stages can be controlled using an external regulated analogical signal 0...10Vcc (A1) from a humidity or temperature regulator/ controller. When the signal is between 0...5.9Vcc only the first stage works, and when it is 6...10Vcc both work.

1.3 Sensor signal control “M” -Optional-: The two humidifier stages can be controlled using an unregulated external analogical signal 0...10Vcc from a humidity sensor (A2 connection) or a temperature sensor (A3 connection). By adjusting the setpoint for the desired humidity or temperature in the PLR, the operation of the 2 stages of the humidifier/cooler is controlled.

1.4 Timer control “C”: The unit works in accordance with adjustable timers. Once the timers have been set, the type of work undertaken must be selected in Stages “S”, Proportional “P” or by Sensor Signal “M”.

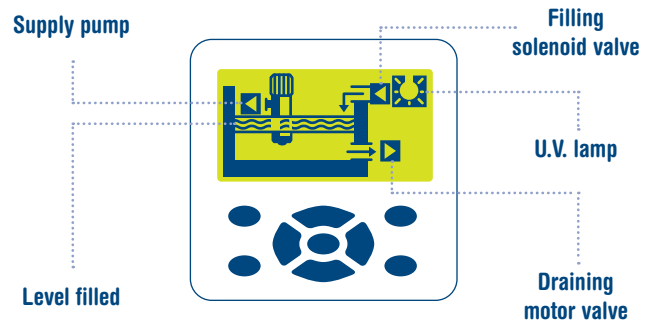
(*) Example of a control panel for a 2 stage unit.

FUNCTIONS OF THE MFD-TITAN PLR

2. MEASUREMENT AND MONITORING

- Measuring the minimum water level.
On-screen diagram of operational components.
- Monitoring the value supplied by the analogical regulated inlet 0...10Vcc.
- Setting the draining-rinsing times and their frequency.
- Setting the timer referenced to annual and weekly working.
- Monitoring the working times of the pump and cycles executed by the different solenoid valves.
- Measuring and monitoring the setpoint for relative humidity and temperature –optional.
- Monitoring the opening of the filling, draining, 2nd stage and by-pass solenoid valves in the component operations diagram.
- Minimum air flow -optional.

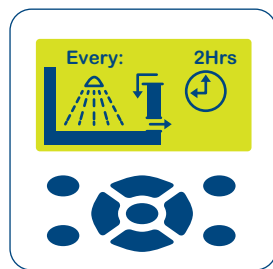
COMPONENT OPERATIONS DIAGRAM



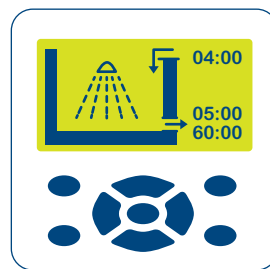
3. SAFETY AND ALARMS

- Alarm and unit stoppage because a circuit breaker is triggered.
- Pump stoppage due to insufficient water level.
- U.V. default contact -optional.

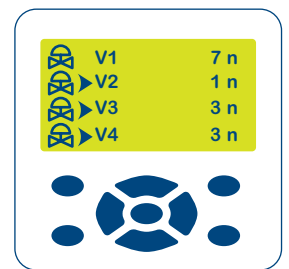
TIME SETTINGS FOR DRAINING-RINSING AND THEIR FREQUENCIES



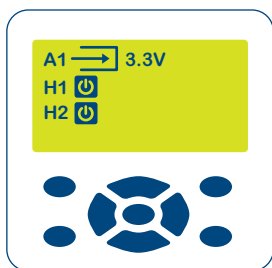
Draining-Rinsing Frequencies



Draining-Rinsing Times



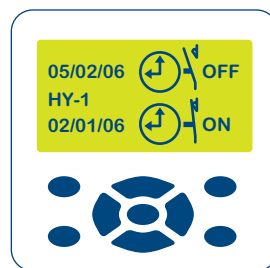
Solenoid Valve Cycles



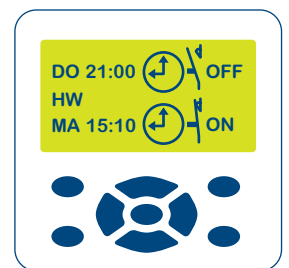
A1 Analogical Entries 0...10Vcc and Stage Control



Motor Pump Operation Times



Weekly Timer



Annual Timer



HEF2E series

Technical Catalogue



fisair
air humidity control 

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