

HEF2 SERIES

INSTALLATION AND MAINTENANCE MANUAL OF EVAPORATIVE HUMIDIFIERS FOR AIR HANDLING UNITS (A.H.U.) OR DUCTS

MHEF2-EN-22-0

In compliance with European Union Standards for machinery safety,
It's essential to read this manual in detail before installing units.

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1. GENERAL DESCRIPTION

EVAPORATIVE HUMIDIFIER OPERATING PRINCIPLES

FISAIR evaporative humidifiers are units designed to increase the water vapour content of the treated air, by making use of the natural evaporation of water from its liquid phase. The air supply being treated is passed through a cellular panel dampened using an irrigation system. This panel is composed of undulating sheets of inorganic paper with stiffening and water absorbent additives.

The layout, as channels criss-crossing the panel provides a huge surface for water-air contact, which maximises water evaporation, and reduces to a minimum resistance to the movement of the air (pressure drop).

FISAIR evaporative humidifiers work in a similar way to natural processes in rivers, lakes and seas. The vapour added to the air is exclusively pure water vapour.

PROVISIONAL STORAGE

During storage, units must be kept dry and protected from the elements.



Warning: Avoid direct sunlight and sites in which temperatures can exceed 50°C.



Remark: Thermo-hygrometric conditions during storage:



Temperature: [-10... 50°C]

Relative Humidity: [5...95%HR]

without condensation

1.1. Safety Instructions

FISAIR disclaims any liability if not all the installation and operating instructions it has provided are complied with; if the products have been modified or altered without the written consent of FISAIR; or if the products have been subjected to improper use, mishandling, alteration, improper maintenance or show signs of negligent use or being involved in an accident. These situations could include an incorrect power connection, impacts with other objects, removal or disarming of security fittings/measures, etc.

Please read these safety Remarks carefully and examine the equipment to become familiar with it before installing, commissioning or servicing.

The following symbols or messages may appear in this document or on the equipment. They warn of potential hazards or provide information that may help you clarify or simplify a procedure.



Attention, Live Current

The presence of this symbol on a hazard or warning label indicates that there is a risk of electrocution, which can lead to personal injury or life-threatening conditions if the instructions are not followed.



Atención

The presence of this symbol on a hazard or warning label indicates that there is a risk of electrocution, which can lead to personal injury or life-threatening conditions if the instructions are not followed.



Installation of a residual current device in the power supply line.

The installer has to install a specific residual current device in the machine's electrical power circuit.

General points

- If you notice that something is not working properly, switch off the unit immediately and take steps to ensure that it does not switch on again. All faults must be corrected immediately.
- Use duly qualified personnel to carry out repair work. This will ensure that the unit operates safely.
- Use only original FISAIR replacement parts.
- Refer to local regulations that restrict or regulate the use of this humidifier.

How the unit works

- Do not jeopardise the safety of the unit.
- Periodically check the device's protection and alert devices.
- The unit's safety fittings must not be removed or disabled.

Installing, Disassembling, Maintaining and Repairing the unit

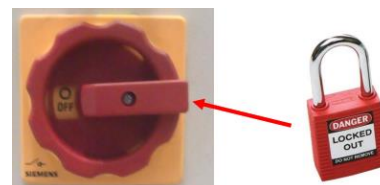
- The machine must not be manipulated when it is operating.
- Switch off the unit's power supply when conducting maintenance work or making repairs to the unit.
- Never add components to the unit without prior written approval from FISAIR.

About the electrical components


- Any work that affects the electrical components must be carried out by qualified electricians.
- Use only original, correctly calibrated fuses.
- Carry out periodic checks of the electrical unit.
- All defects, such as loose connections or burnt cables, must be repaired immediately.



The HEF2E control panel load break switch, whether it is external or a FISAIR CCB2.0 or CCE2.0 panel, must be set to position "0" (lock) before performing any maintenance on the unit.

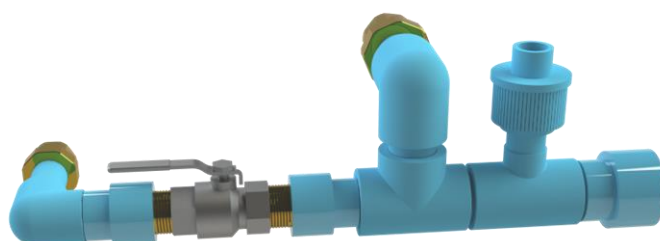
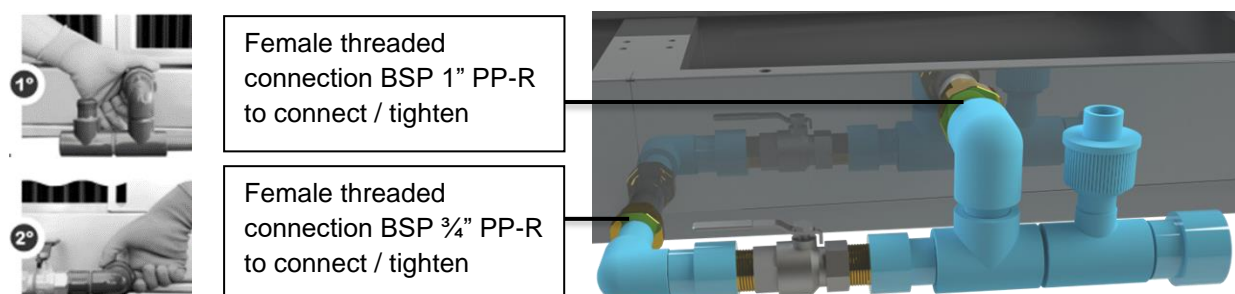


2. ASSEMBLY OF ACCESORIES DELIVERED AS PARTS. (Recirculated Water)

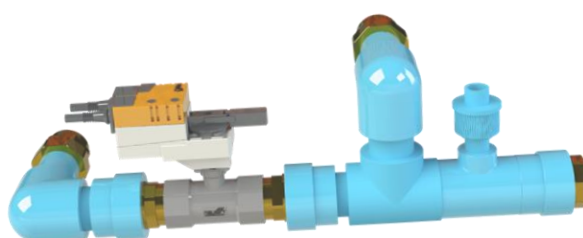
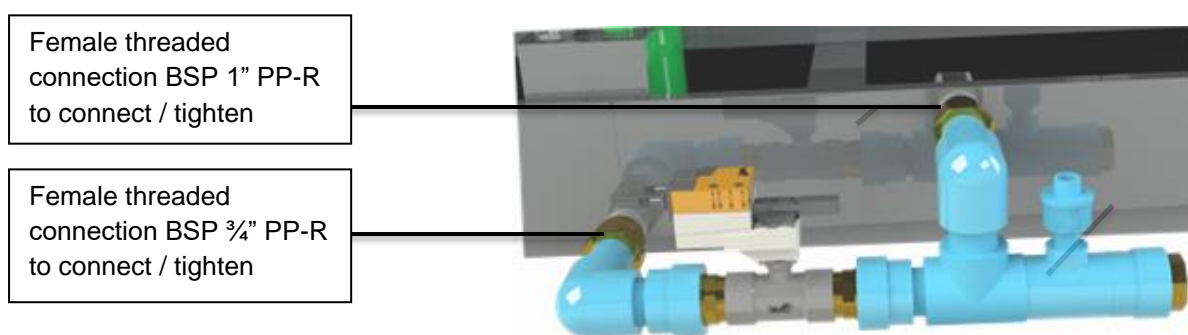
 **Remark:** These accessories can only be attached once the equipment is located inside the air handling unit.

ASSEMBLY SET (overflow + draining + draining valve)

Standard: A **ball valve** is used for draining.



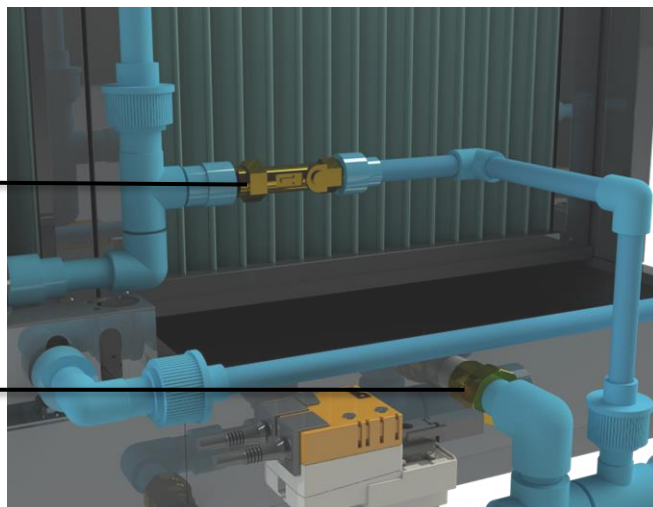
Optional: A **motorized zone** valve is used for draining.



ASSEMBLY SET OF THE CONSTANT BLEED-OFF (*)(**)

Connect the ½ "brass fitting to the regulation valve + purge flow meter and screw the male end of the fitting to the PP-R BPS-H connection.

Removable threaded connection PP-R ½", 3 pieces, to connect / tighten



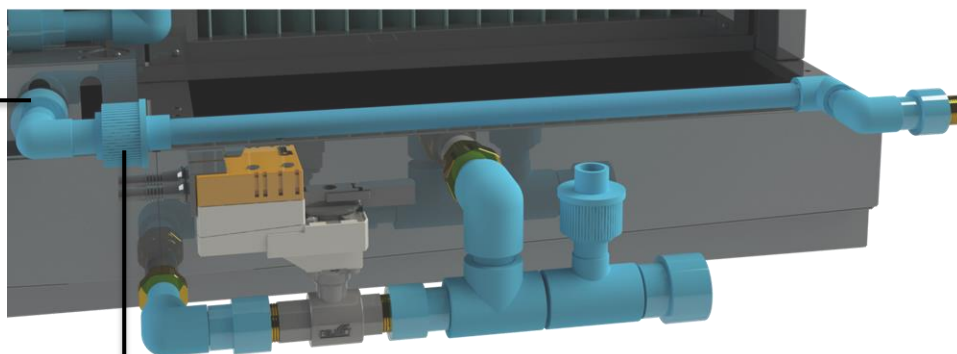
(*) Not necessary with conductivity control

(**) When the optional "piping system on stainless steel" is available, the PP-R purge panoply is replaced by a ½" stainless steel hose. See right image.

ASSEMBLY OF THE WATER SUPPLY PROLONGATION

Thread the ½ "BSP-H female elbow to the male float valve

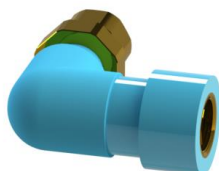
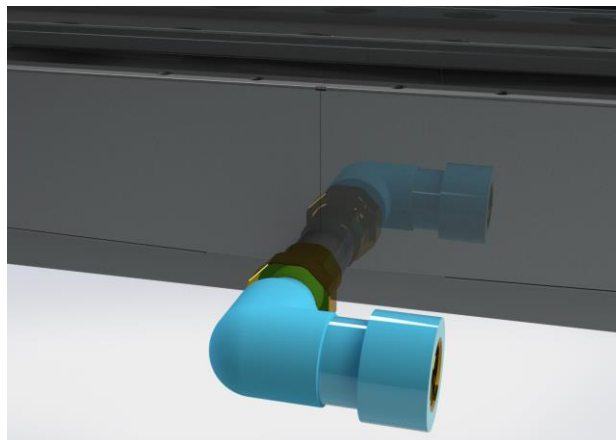
Couple the 3 pieces , ½ " PP-R removable threaded connection to join the elbow with the prolongation



3. ASSEMBLY OF ACCESORIES DELIVERED AS PARTS. (Direct Water)

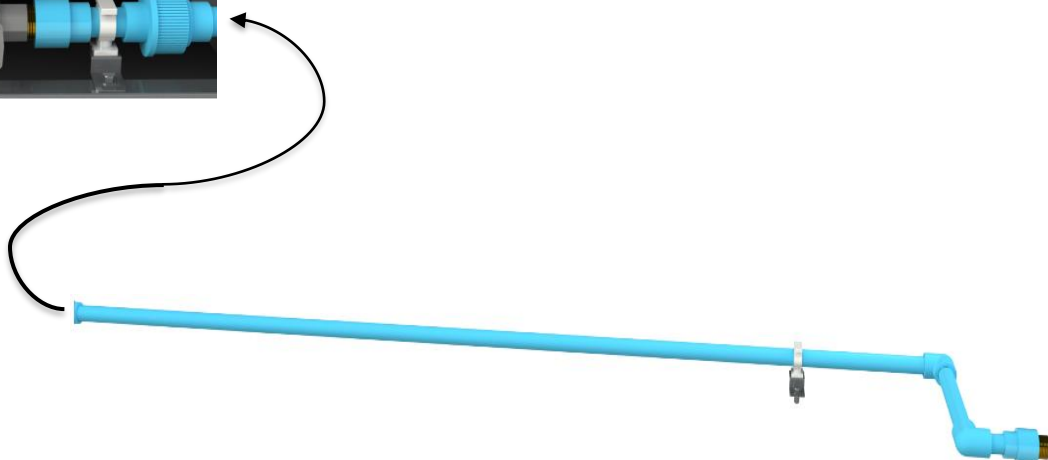
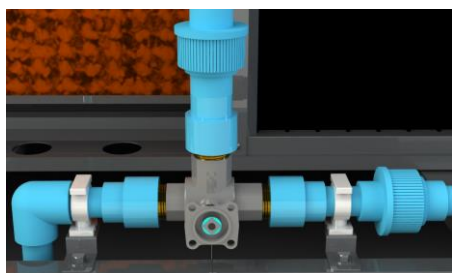
ASSEMBLY Drain set:

1" BSP-H, PP-R link into the drain outlet towards the selected hand of the water drain.



ASSEMBLY Water supply 3-way valve set + rigid external connection (if applicable).

Couple 3 pieces ½" BSP link in PP-R



4. RATING PLATE AND MACHINE TYPE

The rating plate provides essential information about the technical features of the machine.

The EC Machinery Safety Regulation requires all machinery operated within the European Economic Community to have a rating plate indicating its main features, the machine serial number and the manufacturer's name inscribed in a durable manner.

According to article 2, section g of the Machinery Directive 2006/42/CE - RD 1644/2008, 'partly completed machinery' means

"an assembly which is almost machinery, but which cannot in itself perform a specific application. A drive system is partly completed machinery. Partly completed machinery is intended only to be incorporated into or assembled with other machinery or other partly completed machinery or equipment, thereby forming machinery to which this Directive applies"

Therefore, the HEF2 device is classified according to whether it is delivered with a CCB2.0 or CCE2.0 control panel:

- If only the HEF2 device is supplied → **Partly completed machinery (quasi-machine)**
- If the HEF2 device + CCB2.0 or CCE2.0 control panel are supplied → **Machine**
- If the HEF2 device + CCB2.0 or CCE2.0 control panel are supplied separately → **Partly completed machinery + Partly completed machinery ≠ Maquina**




The rating plate shows the following information for the equipment:

- Model: description of the particular HEF2 device
- Serial No.: equipment serial number
- FISAIR devices it can be joined with
- Machine type: Machine or Partly completed machinery
- Designed in accordance with directive
- Made in Spain (EU): Place and date of manufacture
- QR code for technical assistance service and warranty activation

Machine type rating plate:

fisair air humidity control		FISAIR S.L.U. C/ Uranio, 20 - P.I. AIMAYR 28330 San Martín de la Vega MADRID (SPAIN) www.fisair.com	After Sales Service Servicio Postventa Mail: sat@fisair.com Tel: +34916921514
Modelo Model Typ	HEF2E-2975-2200-810-1-150-1-L		
Nº Serie Serial Number Seriennummer	2020----01		
Equipos de FISAIR a los que puede incorporarse FISAIR equipment you can join FISAIR-Ausrüstung, an der Sie teilnehmen können	-		
Tipo de máquina Machine type Maschinentyp	Máquina Machine Maschine		
Diseñada de acuerdo a directiva Designed according to directive Entwickelt nach richtlinien	2006/42/CE		
Fabricado en España (UE) Made in Spain (EU) Hergestellt in Spanien (EU)	--/2020		
 			

Partly completed machinery (quasi-machine) type rating plate:

fisair air humidity control		FISAIR S.L.U. C/ Uranio, 20 - P.I. AIMAYR 28330 San Martín de la Vega MADRID (SPAIN) www.fisair.com	After Sales Service Servicio Postventa Mail: sat@fisair.com Tel: +34916921514
Modelo Model Typ	HEF2E-2975-2200-810-1-150-1-L		
Nº Serie Serial Number Seriennummer	2020----01		
Equipos de FISAIR a los que puede incorporarse FISAIR equipment you can join FISAIR-Ausrüstung, an der Sie teilnehmen können	-		
Tipo de máquina Machine type Maschinentyp	Cuasi Máquina Quasi Machine Quasi Maschine		
Diseñada de acuerdo a directiva Designed according to directive Entwickelt nach richtlinien	2006/42/CE		
Fabricado en España (UE) Made in Spain (EU) Hergestellt in Spanien (EU)	--/2020		
 			

5. PRODUCT CODE

Type*: Recirculated water (HEF2E) Direct water (HEF2E-DW)	External dimensions Width (mm)	External dimensions Height (mm)	External dimensions : Length (mm)	Droplet separator (PP) : YES(1) NO(0)	Evap. Media pad thick: (mm)	Water inlet side: Left(1) Center(2) Right(3)	Water draining side: Left(L) Right(R)
HEF2E	- 1070	- 1000	- 810	- 1	- 75	- 1	- L
HEF2E				0	100	2	R
HEF2E-DW					125	3	
					150		
					200		
					200		

* **HEF2E:** High Efficiency Fisair Inorganic Panel (without Glue)

HEF2-GP760: Glued inorganic Fisair panel

HEF2-HK790: Glued organic Fisair panel

6. MECHANICAL DESIGN, OPERATING PRINCIPLES AND COMPONENTS. (Recirculated water, standard on/off)

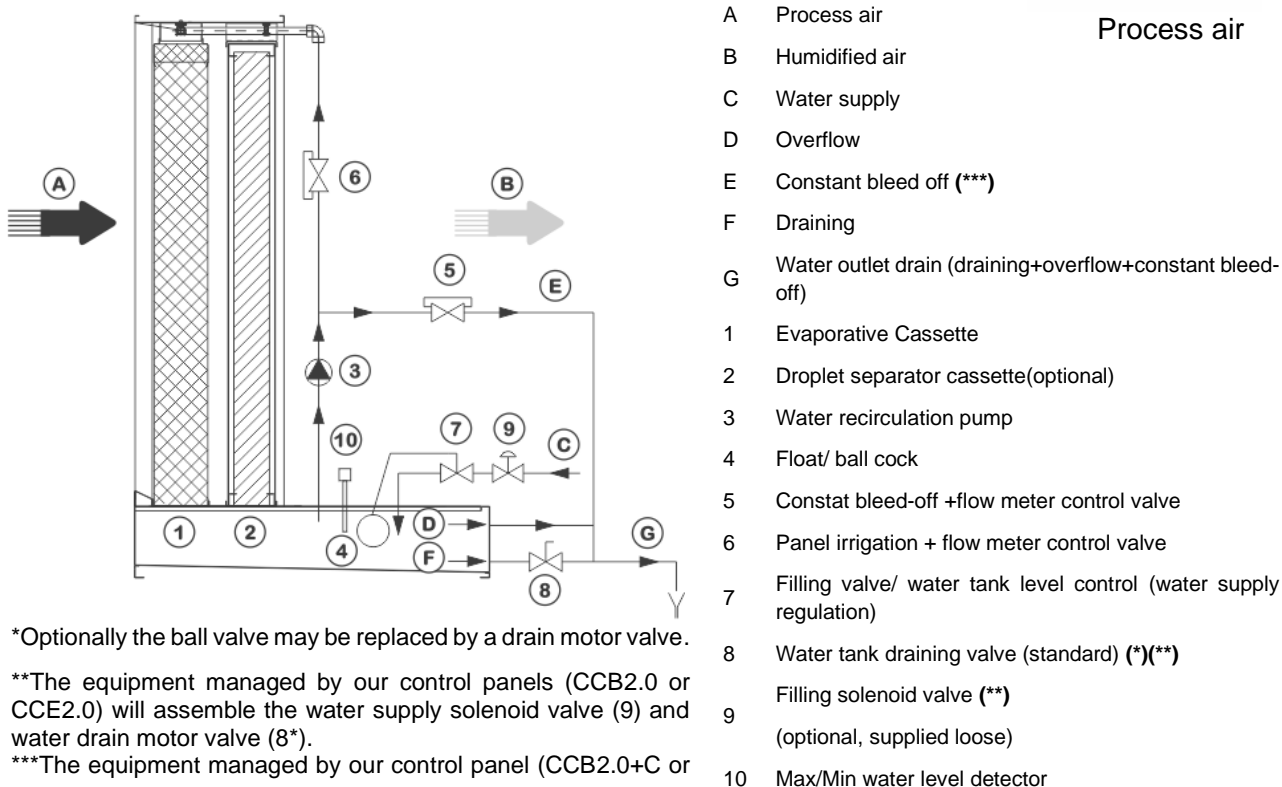
MECHANICAL DESIGN

The humidifier comprises the following elements:

- A stainless steel self-supporting chassis-water tank structure that houses the unit.
- A set of evaporative cassettes of variable sizes and thicknesses, depending on the model and stainless steel surround.
- A stainless steel float valve automatic control mechanism for the water supply, to maintain the appropriate level in the water tank, so the unit works correctly. This valve can be regulated in order to set it to the available water pressure in the network.
- A stainless steel water tank to hold the water, which is designed so it can be completely emptied by gravity.
- A pump for supplying water from the water tank to evaporative panels (technical data on chapter 9.2.c).
- A stainless steel mechanism integrated into the water tank acting as an overflow for the system in the event of water level control faults.
- A distribution collector + regulation valves with flow meter set to supply the appropriate irrigation individually to the evaporative panels.
- A diversion from the water flow to the distribution collector regulates a constant flow of water, which is eliminated from the system in order to maintain a uniform amount of mineral salts in the irrigation water, which we will refer to as the “Constant bleed-off system”.
(See page 36).

DROPLET SEPARATOR

Operating conditions giving rise to droplet carry-over, can be handled by adding a second PP profile panel to the humidifiers to capture the droplets being detached from the evaporative panel.



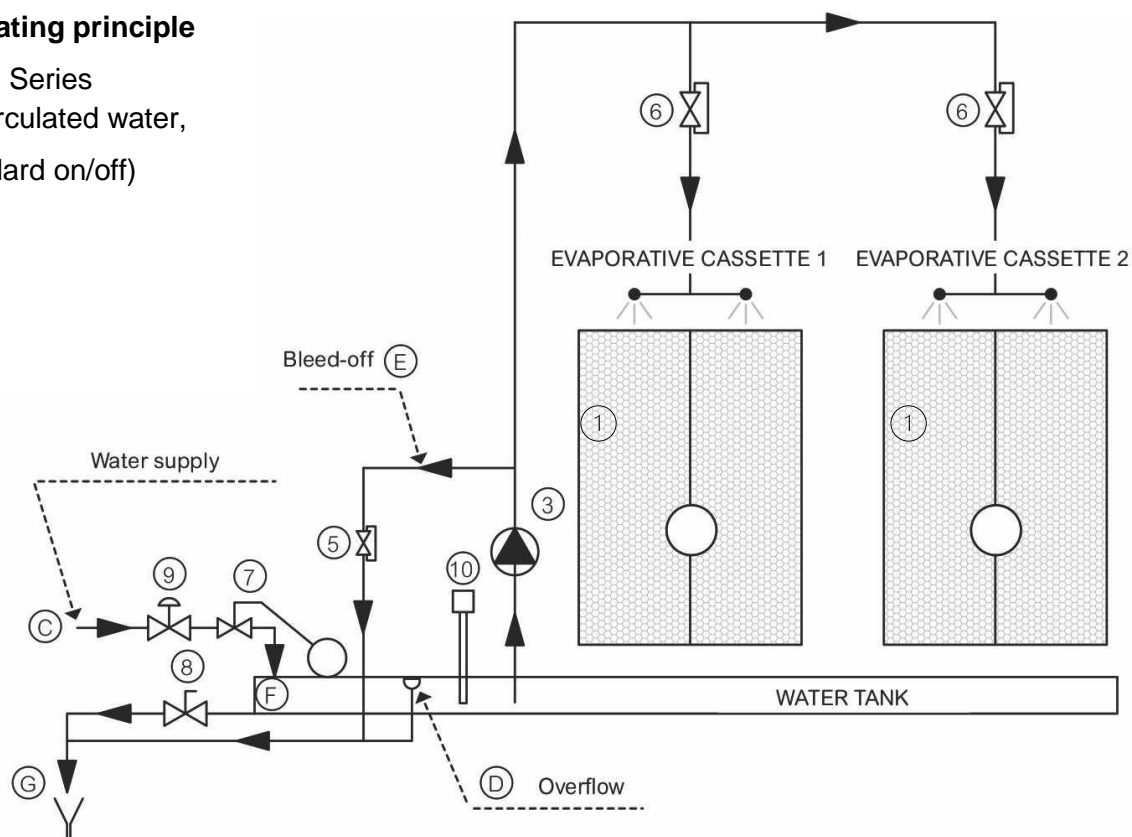
*Optionally the ball valve may be replaced by a drain motor valve.

**The equipment managed by our control panels (CCB2.0 or CCE2.0) will assemble the water supply solenoid valve (9) and water drain motor valve (8*).

***The equipment managed by our control panel (CCB2.0+C or CCE2.0+C) including the conductivity control will not have the continuous bleed-off system, as the concentration will be reduced by opening the drainage motor valve managed by the conductivity control.

Operating principle

HEF2 Series
(Recirculated water,
Standard on/off)



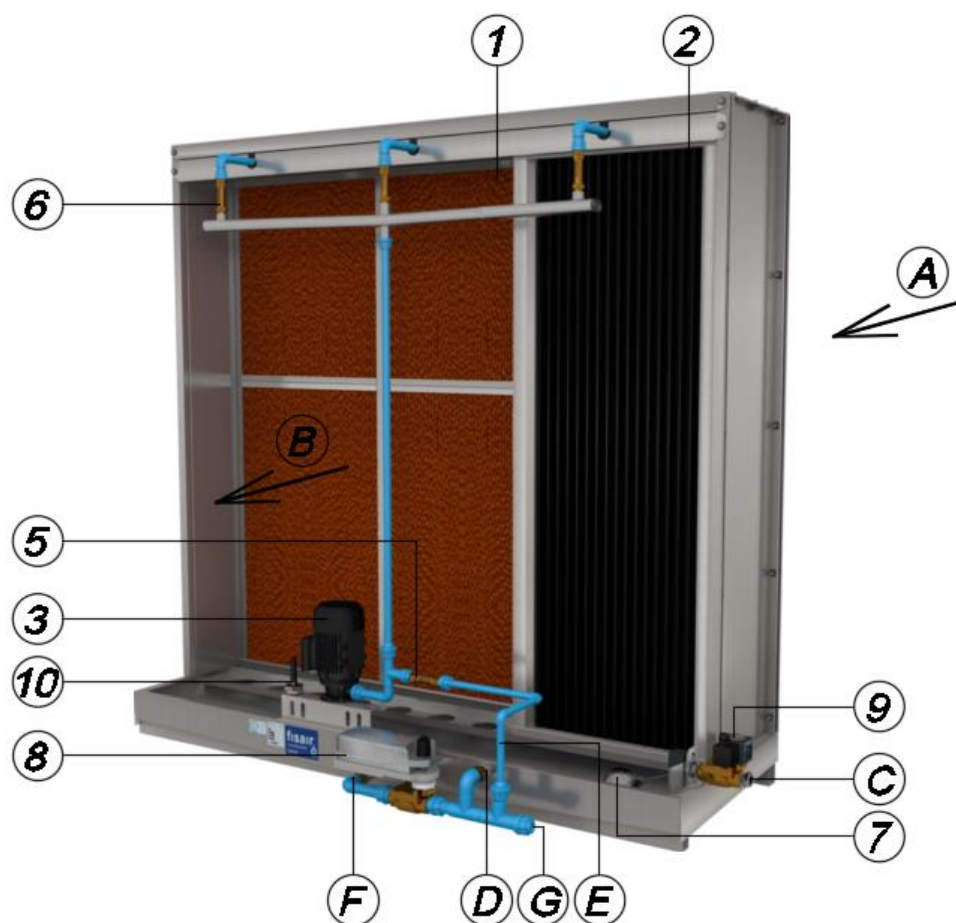
1	Evaporative Cassette
2	Droplet separator cassette(optional)
3	Water recirculation pump
5	Constat bleed-off +flow meter control valve
6	Panel irrigation + flow meter control valve
7	Filling valve/ water tank level control (water supply regulation)
8	Water tank draining valve (standard) (*)(**)
9	Filling solenoid valve (**) (optional, supplied loose)
10	Max/Min water level detector

A	Process air
B	Humidified air
C	Water supply
D	Overflow
E	Constant bleed off (***)
F	Draining
G	Water outlet drain (draining+overflow+constant bleed-off)

(*) Optionally the ball valve may be replaced by a drain motor valve

(**) The equipment managed by our control panels (CCB2.0 or CCE2.0) will assemble the water supply solenoid valve (9) and water drain motor valve (8).

(***) The equipment managed by our control panel (CCB2.0+C or CCE2.0+C) including the conductivity control will not have the continuous bleed-off system, as the concentration will be reduced by opening the drainage motor valve managed by the conductivity control.



1	Evaporative Cassette
2	Droplet separator cassette(optional)
3	Water recirculation pump
5	Constat bleed-off +flow meter control valve
6	Panel irrigation + flow meter control valve
7	Filling valve/ water tank level control (water supply regulation)
8	Water tank draining valve (standard) (*)(**)
9	Filling solenoid valve (**) (optional, supplied loose)
10	Max/Min water level detector

A	Process air
B	Humidified air
C	Water supply
D	Overflow
E	Constant bleed off (***)
F	Draining
G	Water outlet drain (draining+overflow+constant bleed-off)

(*) Optionally the ball valve may be replaced by a drain motor valve

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(***) The equipment managed by our control panel (CCB2.0+C or CCE2.0+C) including the conductivity control will not have the continuous bleed-off system, as the concentration will be reduced by opening the drainage motor valve managed by the conductivity control.

7. MECHANICAL DESIGN, OPERATING PRINCIPLES AND COMPONENTS. (Direct water, standard on/off)

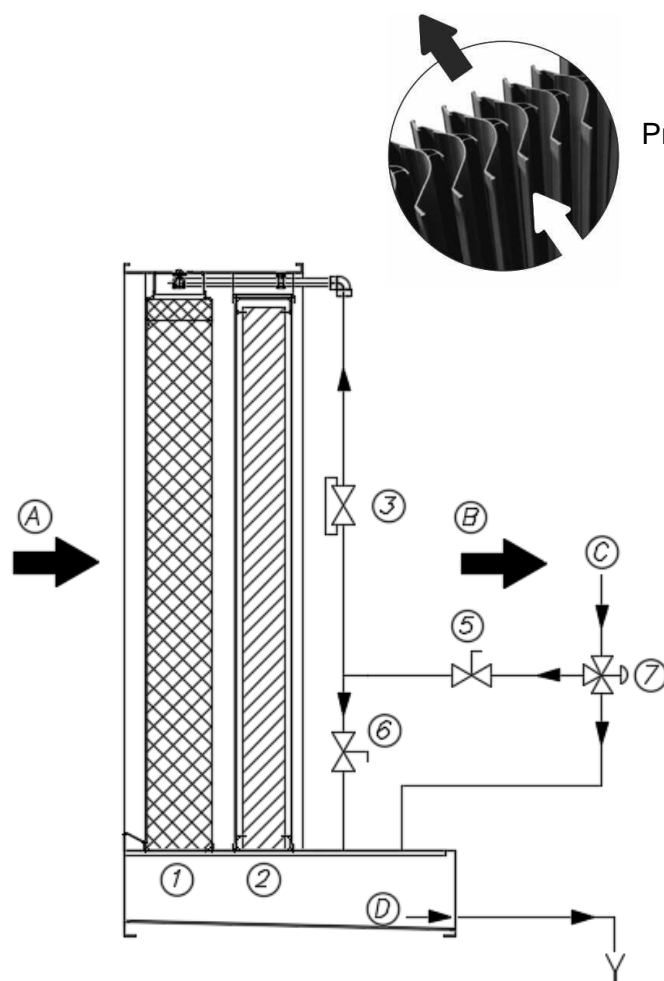
MECHANICAL DESIGN

The humidifier is composed of the following elements:

- A stainless steel self-supporting chassis-water tank structure that houses the unit.
- A set of evaporative panels of variable sizes and thicknesses, depending on the model and stainless steel surround.
- A stainless steel water tank to hold the water, which is designed so it can be completely emptied by gravity.
- A distribution collector + regulation valves with flow meter set to supply the appropriate irrigation individually to the evaporative panels.

DROPLET SEPARATOR

Operating conditions giving rise to droplet carry-over can be handled by adding a second PP profile panel to the humidifiers to capture the droplets being detached from the evaporative panel.



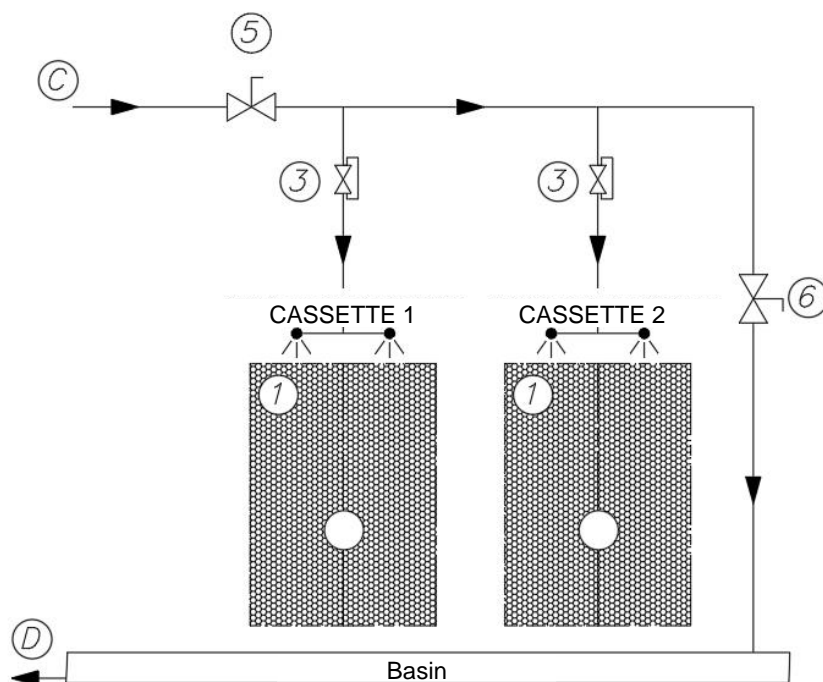
A	Process aire
B	Humidified air
C	Water supply
D	Emptying
1	Evaporative Cassette
2	Droplet separator cassette(optional)
3	Control valve + water flow meter
5	1/2" Ball valve. Water supply
6	Ball valve 1/2" empty(water collection + distribution)
7	3 Way motor valve for automatic water feeding and automatic emptying of the water manifold + water distribution (removes 5&6)(*)

(*) The equipment controlled by our stage control panels (CCE2.0-DW) will assemble the 3-way motor-valve (7)

**OPERATING
PRINCIPLE:**

HEF2 SERIES- DW

(Direct water, standard
all/nothing)

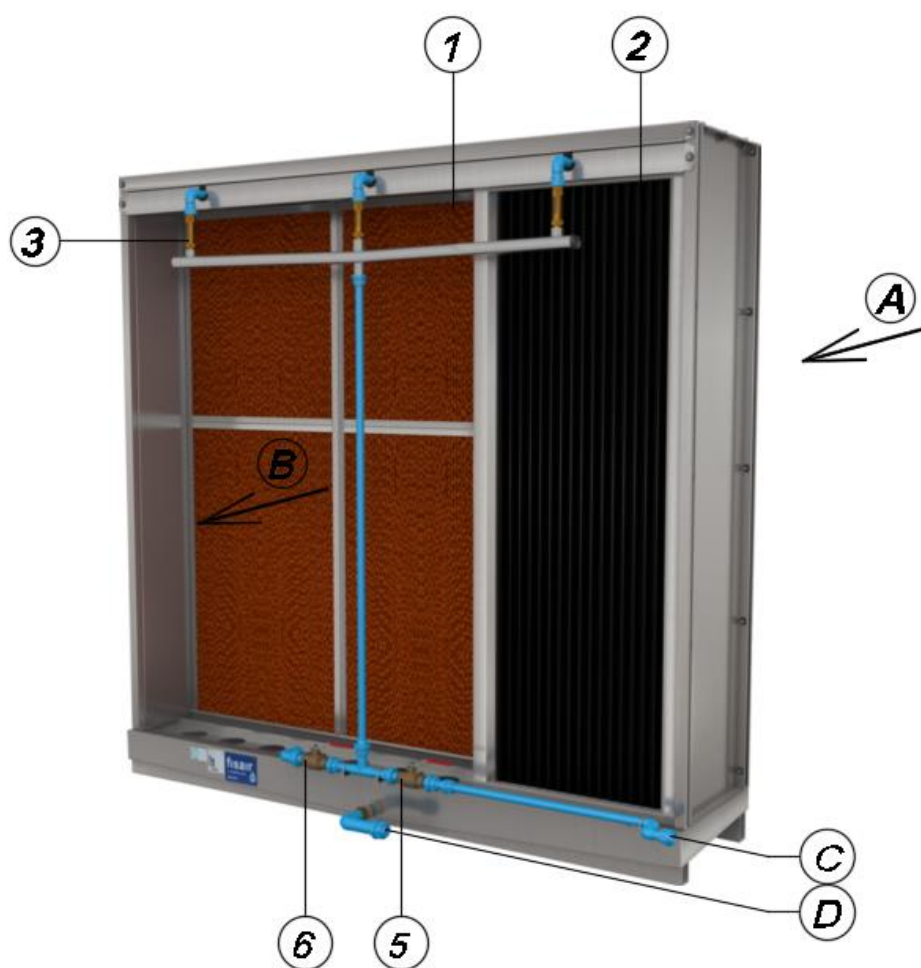


1	Evaporative Cassette
2	Droplet separator cassette(optional)
3	Control valve + water flow meter
5	½" Ball valve. Water supply
6	Ball valve 1/2" empty(water collection + distribution)

A	Process aire
B	Humidified air
C	Water supply
D	Emptying



[Remark]: In equipment where at least one of the valves [3] has a flow rate $Q < 0.3 \text{ l / min}$, another general regulation valve will be installed after valve [5] (if HEF2E heigh $\geq 750 \text{ mm}$) or replacing valve [5] (if HEF2E heigh $< 750 \text{ mm}$). For more information see section 12.2.E.2.



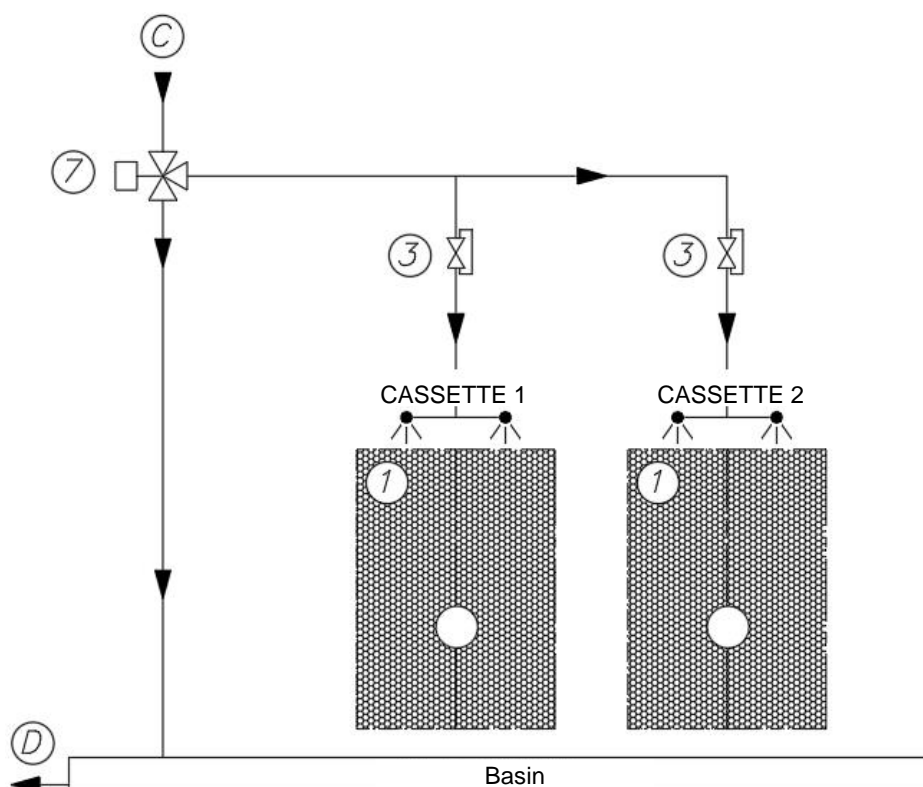
1	Evaporative Cassette
2	Droplet separator cassette(optional)
3	Control valve + water flow meter
5	Ball valve 1/2" . Water supply
6	Ball valve 1/2" empty(water collection + distribution)

A	Process air
B	Humidified air
C	Water supply
D	Emptying

OPERATING PRINCIPLE:

HEF2 SERIES- DW

(Direct water, standard all/nothing, 3-way motor-valve)

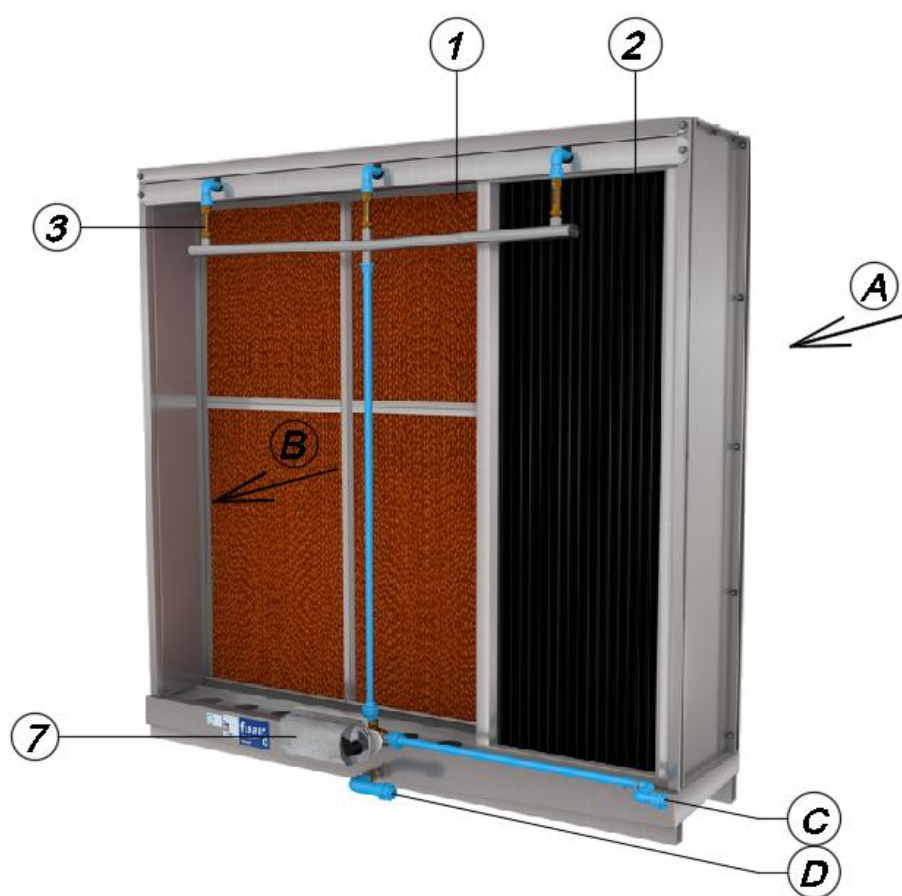


1	Evaporative Cassette
2	Droplet separator cassette(optional)
3	Control valve + water flow meter
7	3 Way motor valve for automatic water feeding and automatic emptying of the water manifold + water distribution

A	Process air
B	Humidified air
C	Water supply
D	Emptying



[Remark]: In equipment where at least one of the valves [3] has a flow rate $Q < 0.3 \text{ l / min}$, another general regulation valve will be installed before or after valve [7]. For more information see section 12.2.E.2.



1	Evaporative Cassette
2	Droplet separator cassette(optional)
3	Control valve + water flow meter
7	3 Way motor valve for automatic water feeding and automatic emptying of the water manifold + water distribution


A	Process air
B	Humidified air
C	Water supply
D	Emptying

8. MECHANICAL DESIGN, OPERATING PRINCIPLES AND COMPONENTS. (Recirculated water with stage control)

MECHANICAL DESIGN

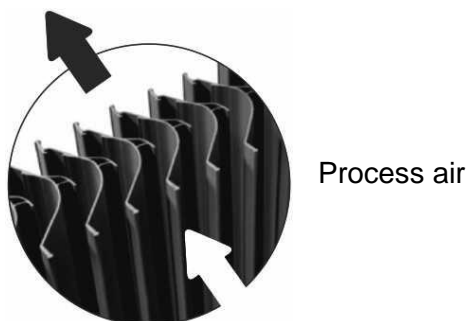
The humidifier is composed of the following elements:

- A stainless steel self-supporting chassis-water tank structure that houses the unit.
- A set of evaporative panels of variable sizes and thicknesses, depending on the model and stainless steel surround.
- A stainless steel float valve automatic control mechanism for the network water supply, to maintain the appropriate level in the water tank, so the unit works correctly. This valve can be regulated in order to set it to the available water pressure in the network.
- A stainless steel water tank to hold the water, which is designed so it can be completely emptied by gravity.
- A pump for supplying water from the water tank to the evaporative panels (technical data on chapter 9.2.C).
- A stainless steel mechanism integrated into the water tank acting as an overflow for the system in the event of water level control faults.
- The stages are controlled by opening the N.C. solenoid valve of each stage.
- A distribution collector + regulation valves with flow meter set to supply the appropriate irrigation individually to the evaporative panels.
- A diversion from the water flow to the distribution collector regulates a constant flow of water, which is eliminated from the system in order to maintain a uniform amount of mineral salts in the irrigation water, which we will refer to as the "Constant bleed-off system". (See page 36).

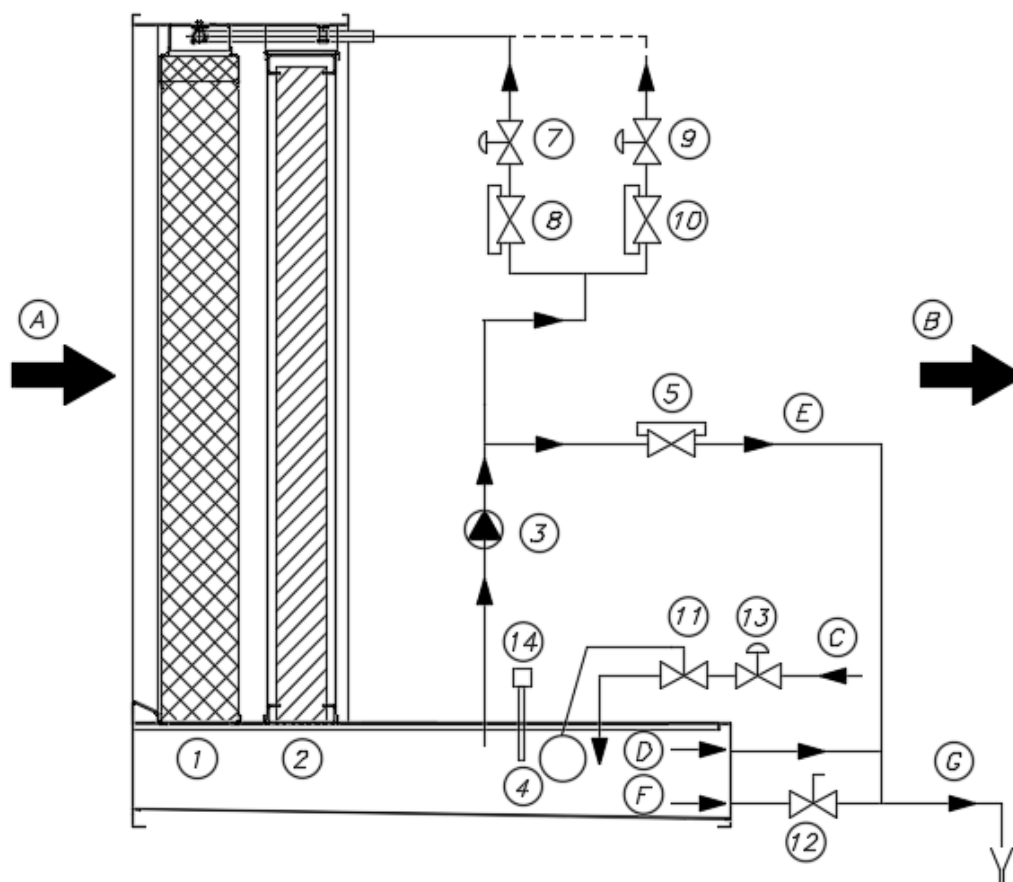
 **Remark:** Each stage can include the irrigation of more than one cassette. The configuration of stages is variable and defined by the client.

DROPLET SEPARATOR

Operating conditions giving rise to droplet carry-over, can be handled by adding a second PP profile panel to the humidifiers to capture the droplets being detached from the evaporative panel.



OPERATING PRINCIPLE FOR 2-STAGE CONTROL (*)



1	Evaporative Cassette
2	Droplet separator cassette(optional)
3	Water recirculation pump
4	Float/buoy
5	Constat bleed-off +flow meter control valve
7	Stage 1 solenoid valve. N.C.
8	Stage 1 Irrigation regulation valve + flow meter
9	Stage 2 solenoid valve. N.C.
10	Stage 2 Irrigation regulation valve + flow meter
11	Supply float valve for tank level control.
12	Water tank draining vale (****) (**)
13	Filling solenoid valve. N.C. (optional,supplied loose) (****)
14	Min/Max water level detector

A	Process air
B	Humidificacion air
C	Water supply
D	Overflow
E	Constant bleed off (***)
F	Draining
G	Water outlet to drain(draining + overflow + constant bleed off)

(*) With a maximum of 5 solenoid valves for the HEF2 Series with 5 Cassettes

(**) Optionally the ball valve can be replaced for a zone motor-valve

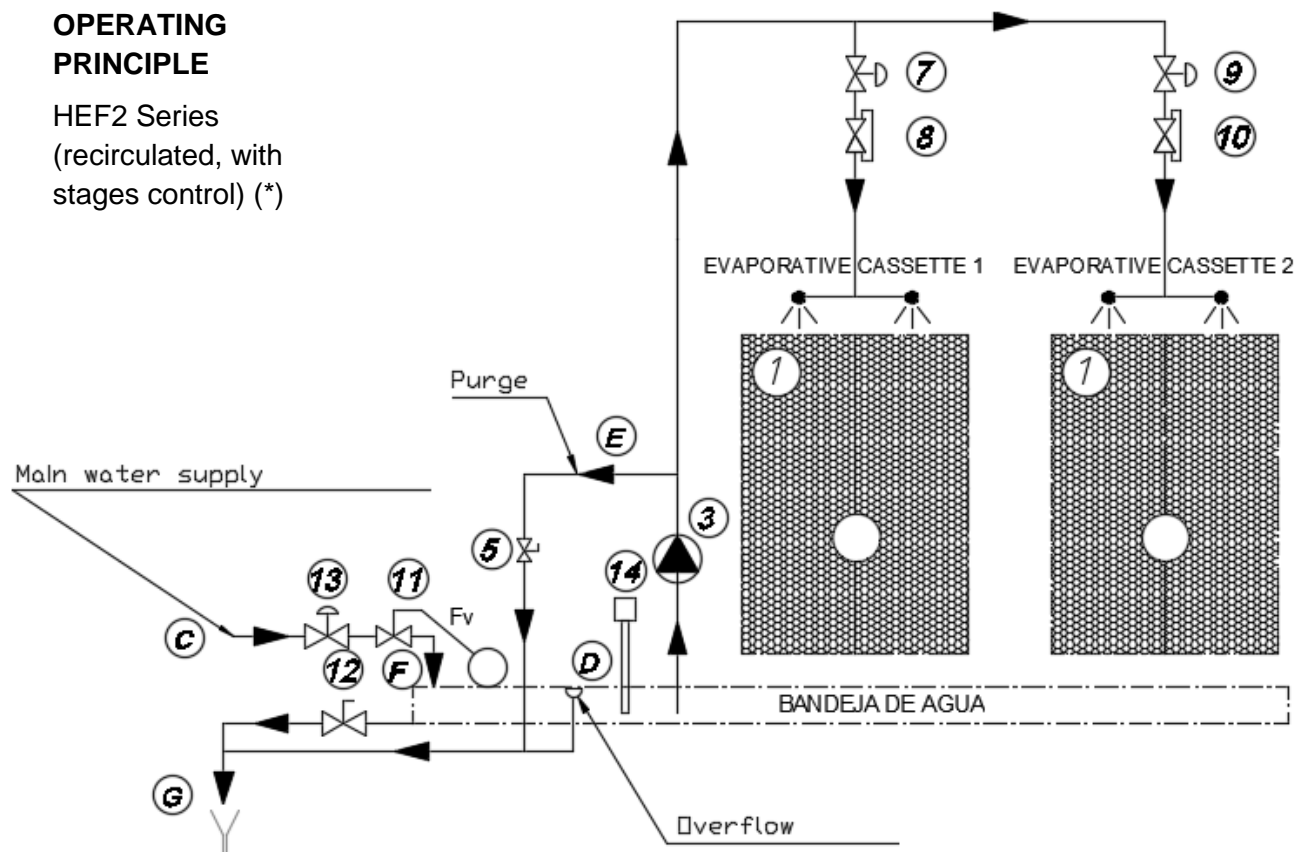
(***) The equipment managed by our control panel (CCB2.0+C of CCE2.0+C) including the conductivity control will not have the continuous bleed-off system, as the

concentration will be reduced by opening the drainage motor valve managed by the conductivity control

(****) The equipment managed by our control panels (CCB2.0 or CCE2.0) will assemble the water supply solenoid valve (13) and water drain motor valve

OPERATING PRINCIPLE

HEF2 Series
(recirculated, with stages control) (*)



1	Evaporative Cassette
2	Droplet separator cassette(optional)
3	Water recirculation pump
4	Float/buoy
5	Constat bleed-off +flow meter control valve
7	Stage 1 solenoid valve. N.C.
8	Stage 1 Irrigation regulation valve + flow meter
9	Stage 2 solenoid valve. N.C.
10	Stage 2 Irrigation regulation valve + flow meter
11	Float valve. Supply water regulation
12	Water tank draining vale (****) (**)
13	Filling solenoid valve. N.C. (optional,supplied loose) (****)
14	Min/Max water level detector

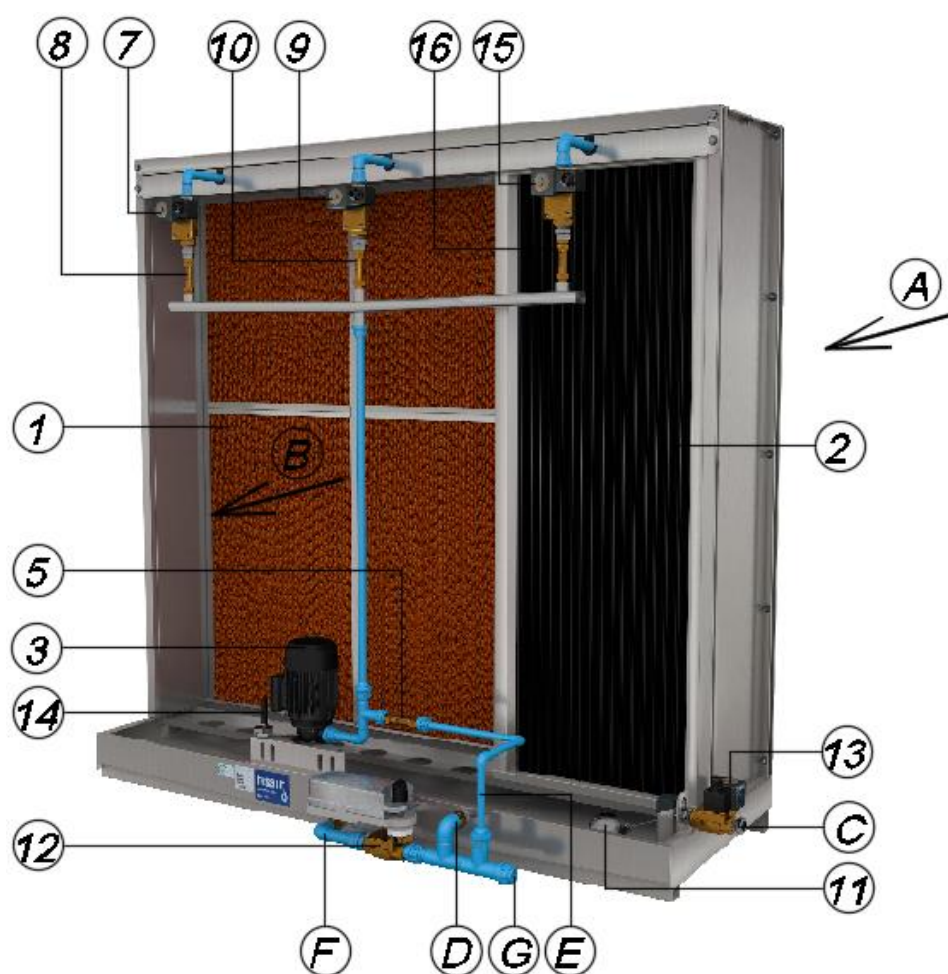
A	Process air
B	Humidificacion air
C	Water supply
D	Overflow
E	Constant bleed off (***)
F	Draining
G	Water outlet to drain(draining + overflow + constant bleed off)

(*) With a maximum of 5 solenoid valves for the HEF2 Series with 5 Cassettes

(**) Optionally the ball valve may be replaced by an area motor-valve

(***) The equipment managed by our control panel (CCB2.0+C or CCE2.0+C) including the conductivity control will not have the continuous purge system, as the concentration will be reduced by opening the drainage motor valve managed by the conductivity control.

(****) The equipment managed by our control panels (CCB2.0 or CCE2.0) will assemble the water supply solenoid valve (13) and the water drain motor valve.



1	Evaporative Cassette
2	Droplet separator cassette(optional)
3	Water recirculation pump
4	Float/buoy
5	Constat bleed-off +flow meter control valve
7	Stage 1 solenoid valve. N.C.
8	Stage 1 Irrigation regulation valve + flow meter
9	Stage 2 solenoid valve. N.C.
10	Stage 2 Irrigation regulation valve + flow meter
11	Float valve. Supply water regulation
12	Water tank draining vale (****) (**)
13	Filling solenoid valve. N.C. (optional,supplied loose) (****)
14	Min/Max water level detector
15	Stage 3 solenoid valve. N.C.
16	Stage 3 Irrigation regulation valve + flow meter

A	Aire de proceso
B	Aire humidificado
C	Alimentación de agua
D	Rebosadero
E	Purga continua(***)
F	Vaciado
G	Salida de agua hacia desagüe (vaciado+rebosadero+purga)

(**) Optionally the ball valve may be replaced by an area motor-valve

(***) The equipment managed by our control panel (CCB2.0+C or CCE2.0+C) including the conductivity control will not have the continuous purge system, as the concentration will be reduced by opening the drainage motor valve managed by the conductivity control.

(****) The equipment managed by our control panels (CCB2.0 or CCE2.0) will assemble the water supply solenoid valve (13) and the water drain motor valve.

9. MECHANICAL DESIGN, OPERATING PRINCIPLES AND COMPONENTS. (Direct water, stage control)

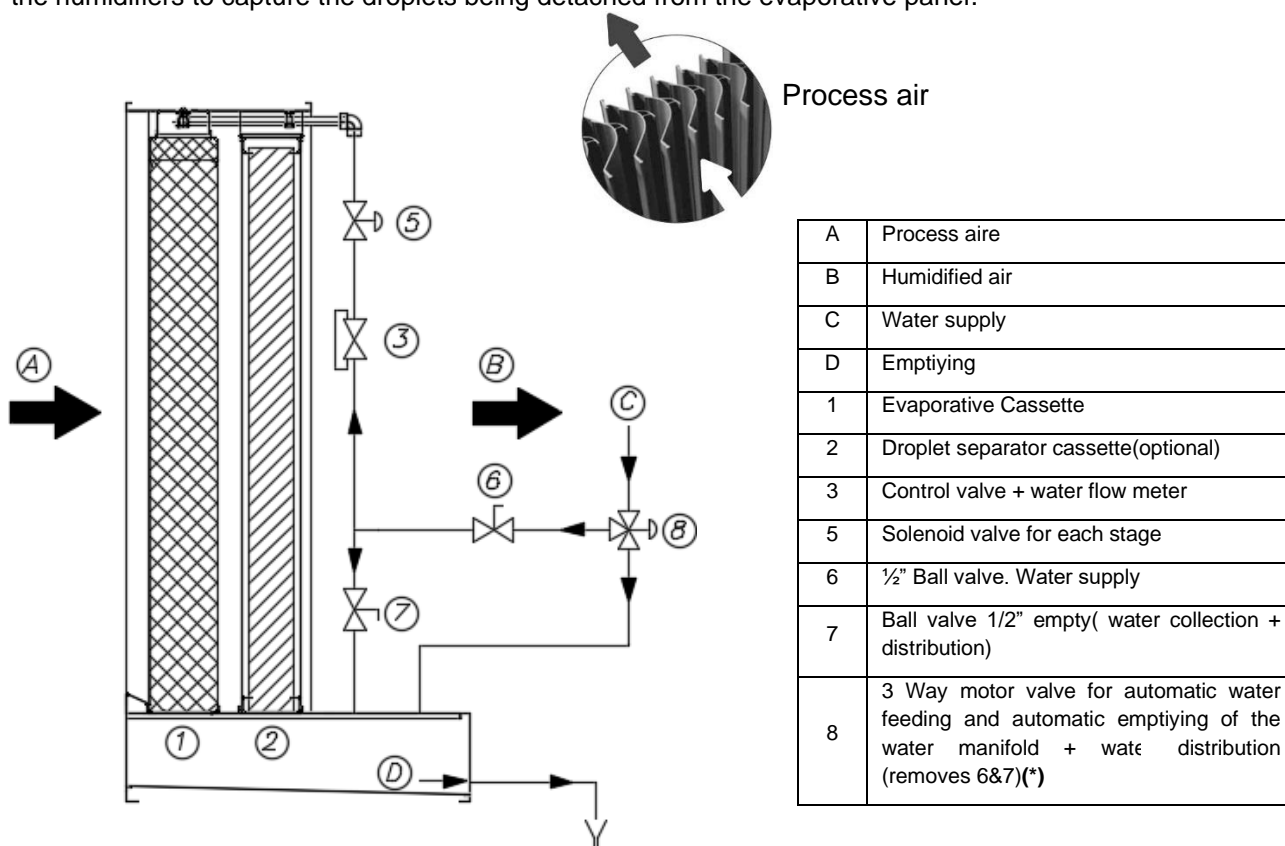
MECHANICAL DESIGN

The humidifier is composed of the following elements:

- A stainless steel self-supporting chassis-water tank structure that houses the unit.
- A set of evaporative panels of variable sizes and thicknesses, depending on the model and stainless steel surround.
- A stainless steel water tank to hold the water, which is designed so it can be completely emptied by gravity.
- A distribution collector + regulation valves with flow meter set to supply the appropriate irrigation individually to the evaporative panels.
- An N.C. irrigation control solenoid valve for each stage/ evaporative cassette.

DROPLET SEPARATOR

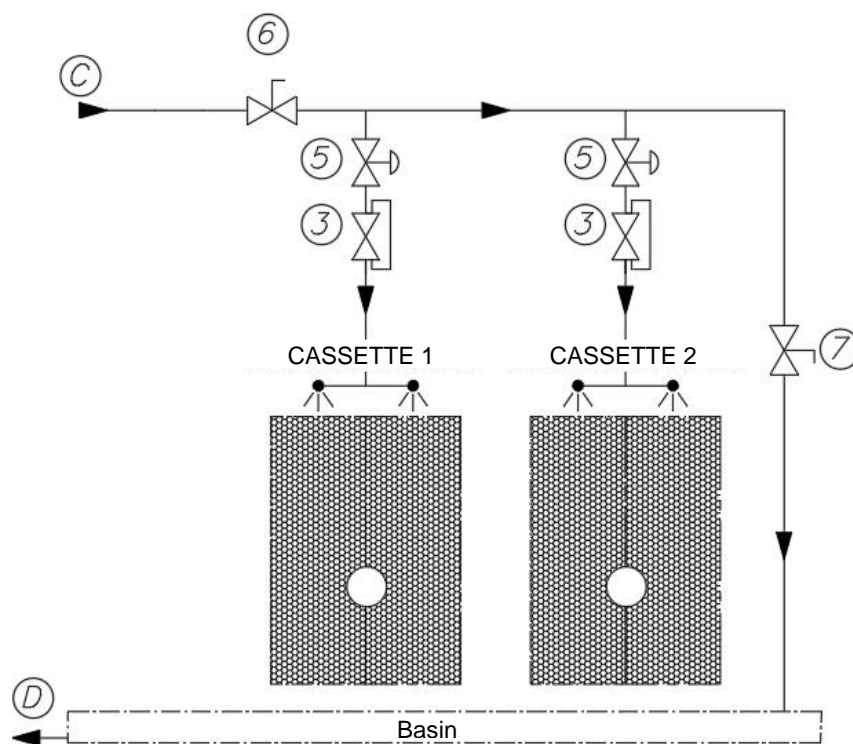
Operating conditions giving rise to droplet carry-over, can be handled by adding a second PP profile panel to the humidifiers to capture the droplets being detached from the evaporative panel.



(*) The equipment controlled by our stage control panels (CCE2.0-DW) will assemble the 3-way motor-valve (8)

OPERATING PRINCIPLE

HEF2 Series (Direct water, standard stages control)

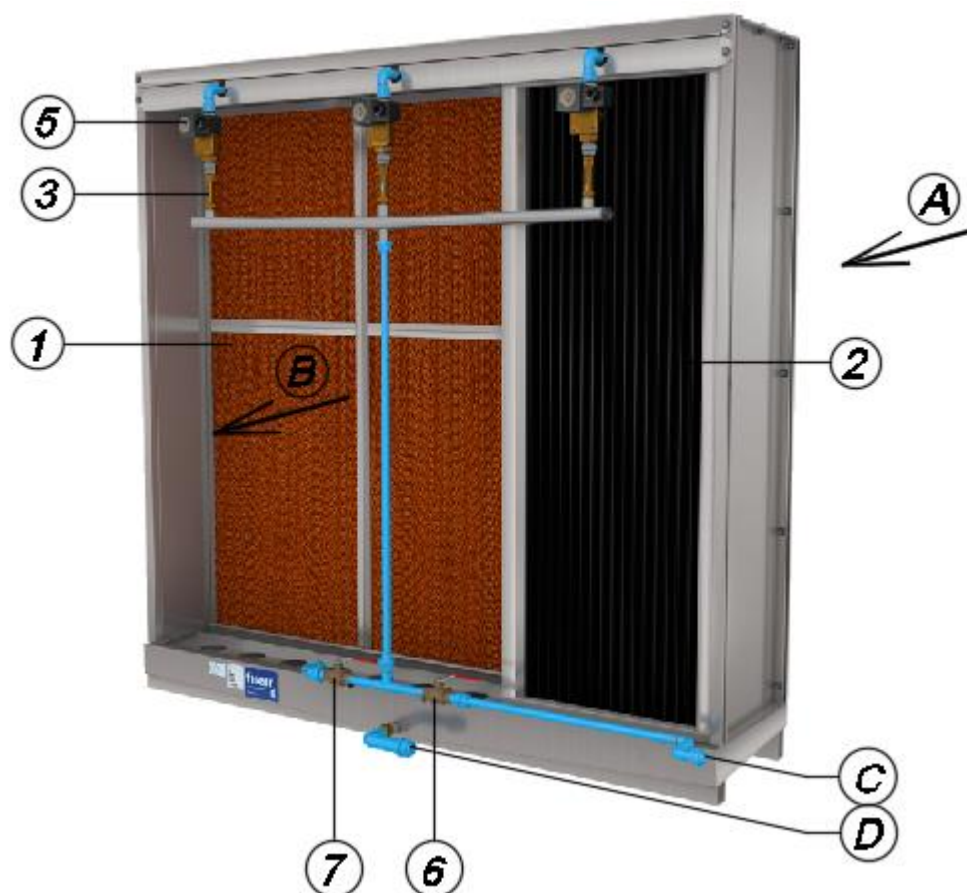


1	Evaporative Cassette
2	Droplet separator cassette(optional)
3	Control valve + water flow meter
5	Stage solenoid valve. N.C.
6	½" Ball valve. Water supply
7	Ball valve 1/2" empty(water collection + distribution)

A	Process aire
B	Humidified air
C	Water supply
D	Emptying



[Remark]: In equipment where at least one of the valves [3] has a flow rate $Q < 0.3 \text{ l/min}$, another general regulation valve will be installed after valve [6] (if HEF2E height $\geq 750 \text{ mm}$) or replacing valve [6] (if HEF2E height $< 750 \text{ mm}$). For more information see section 12.2.E.2.



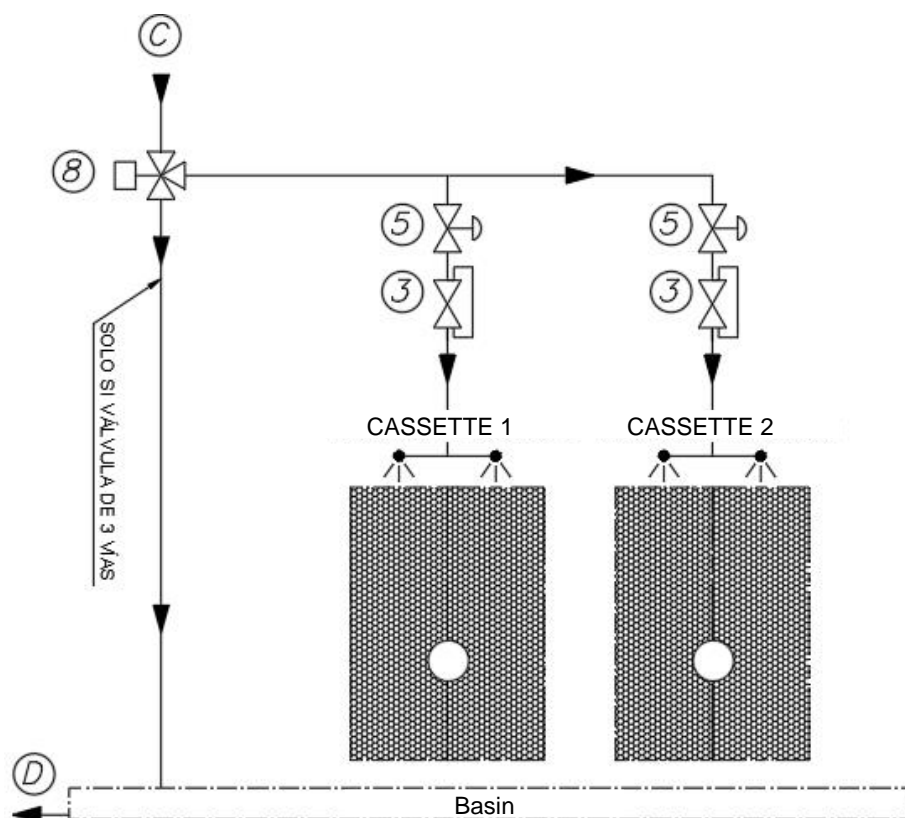
1	Evaporative Cassette
2	Droplet separator cassette(optional)
3	Control valve + water flow meter
5	Stage solenoid valve. N.C.
6	1/2" Ball valve. Water supply
7	Ball valve 1/2" empty(water collection + distribution)

A	Process aire
B	Humidified air
C	Water supply
D	Emptying

OPERATIVE PRINCIPLE

HEF2 Series (direct water.

Stages, non-standard, 3 way moto-valve)



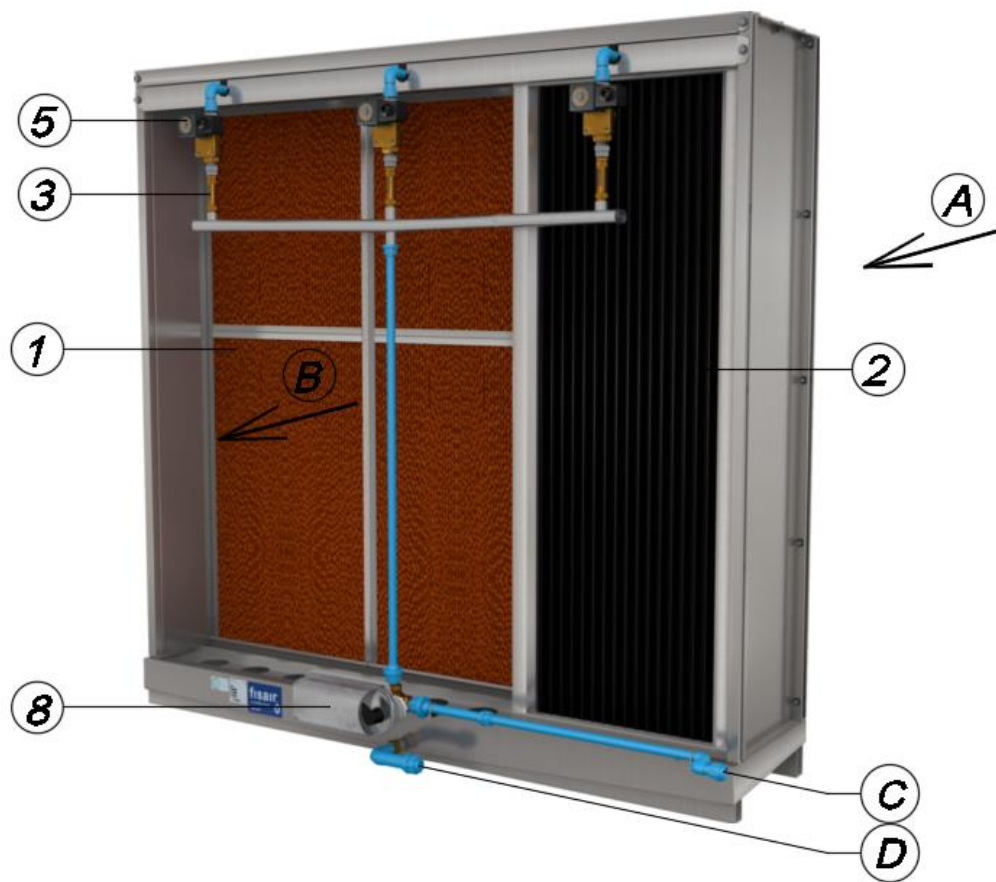
1	Evaporative Cassette
2	Droplet separator cassette(optional)
3	Control valve + water flow meter
5	Stage solenoid valve. N.C.
8	3 Way motor valve for automatic water feeding and automatic emptying of the water manifold + water distribution(*)

A	Process aire
B	Humidified air
C	Water supply
D	Emptying

(*) The equipment controlled by our stage control panels (CCE2.0-DW) will assemble the 3-way motor-valve (8)



[Remark]: In equipment where at least one of the valves [3] has a flow rate $Q < 0.3 \text{ l/min}$, another general regulation valve will be installed before or after valve [8]. For more information see section 12.2.E.2.



1	Evaporative Cassette
2	Droplet separator cassette(optional)
3	Control valve + water flow meter
5	Stage solenoid valve. N.C.
8	3 Way motor valve for automatic water feeding and automatic emptying of the water manifold + water distribution(*)

A	Process aire
B	Humidified air
C	Water supply
D	Emptying

(*) The equipment controlled by our stage control panels (CCE2.0-DW) will assemble the 3-way motor-valve (8)

10. INSTALLATION REQUIREMENTS.

GENERALITIES

In order to optimize maintenance/installation, humidifiers must be placed on a level waterproof surface, with a drain or run-off, so possible leaks can be dealt with during installation, set up, operation and maintenance.

Assembly inside an air handling unit must ensure the air being treated passes through the evaporative panels, by closing off the perimeters adequately to prevent possible by-passes of the air flow.

All humidifier components are employed downstream, or in other words, in the outlet of the humidified air, as standard.

LOCATION AND SERVICING SPACE

The normal location of the humidifier in the air handling system is after the pre-heating coil and before the cold/heating coil, if there is one. However, the position must be chosen by the project designer.

The area where the water basin is located must be equipped with a peep-hole (minimum diameter of 150 mm) and lighting must be provided to allow periodic visual inspections.

 **Remark:** *Thermo-hygrometric operative conditions (*)*

Temperature: [5... 40°C]

Relative Humidity: [5... 97%HR]

(*) Airflow situated at the pump zone or water supply zone.

We recommend allowing for a 500mm space before and after the unit for inspection and servicing.

Although the humidifying matrix is not combustible, it is advisable to not exceed process air temperatures of 50°C, in the event that the pump does not work and there is no resulting irrigation.

When the pump works, 40°C should not be exceeded on the side of the pump.

EVAPORATIVE PANEL DRYING TIME

To ensure complete drying of the cooling pad, after a work period, the air fan of the UTA must be working during the times set out in the following table:

Air Velocity (V) m/s	Aprox. extra working time of the air fan with a temperature between 20-25°C
$V < 2$	15 min
$2 \leq V < 3$	12 min
$3 \leq V < 4$	9 min
$4 \leq V < 5$	6 min

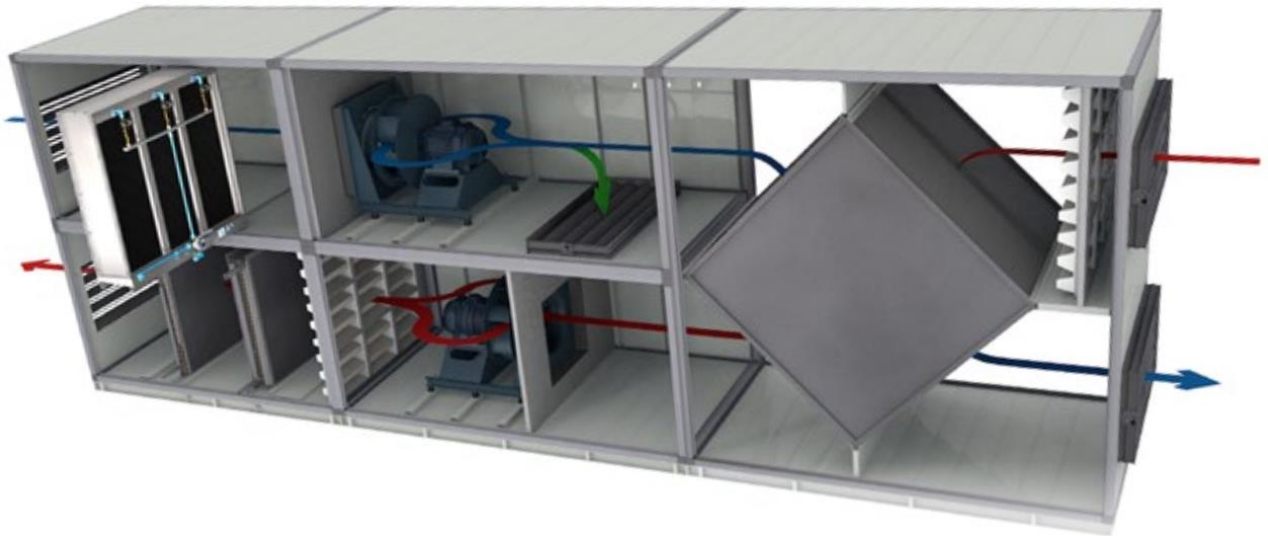
Before drying the evaporation panel, the ventilation must be stopped for 10 minutes and watering continued with the cassettes. This is done by keeping the water recirculation or direct water irrigation to remove all possible minerals stuck to the panel. Afterwards, the recirculation is turned-off and the ventilation system re-started for the estimated time on the above table.

USE IN AIR HANDLING UNITS (A.H.U.)

FISAIR air humidifiers are normally incorporated into air-handling units after the pre-heating and cooling coil or post-heating coil as shown in figure 2. Since all the components are in service down stream, access from this side is normally enough.

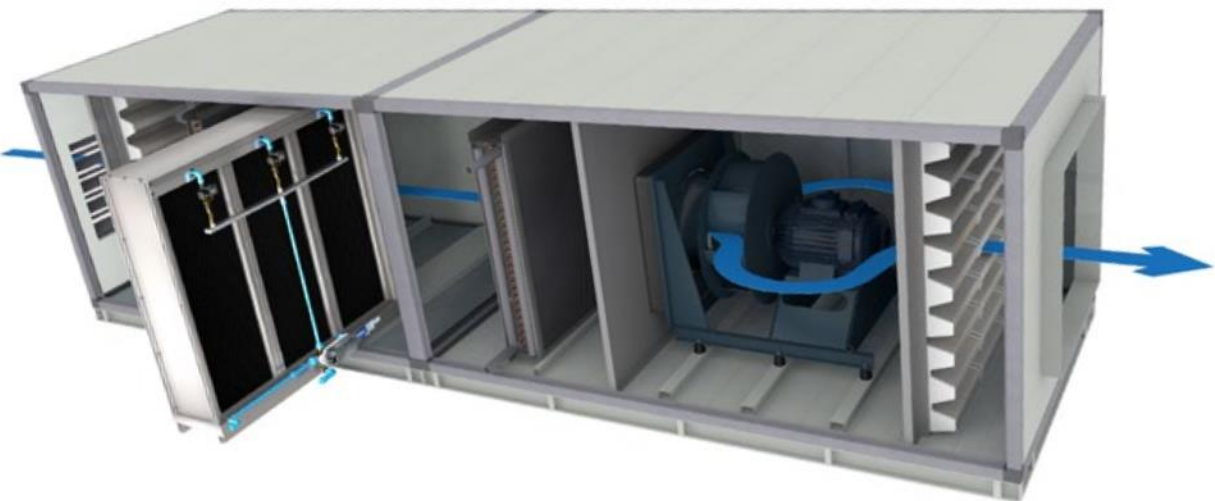
INSTALLATION IN RETURN:

Increased performance of the heat exchange with the return air flow by means of adiabatic cooling.



INSTALLATION IN SUPPLY:

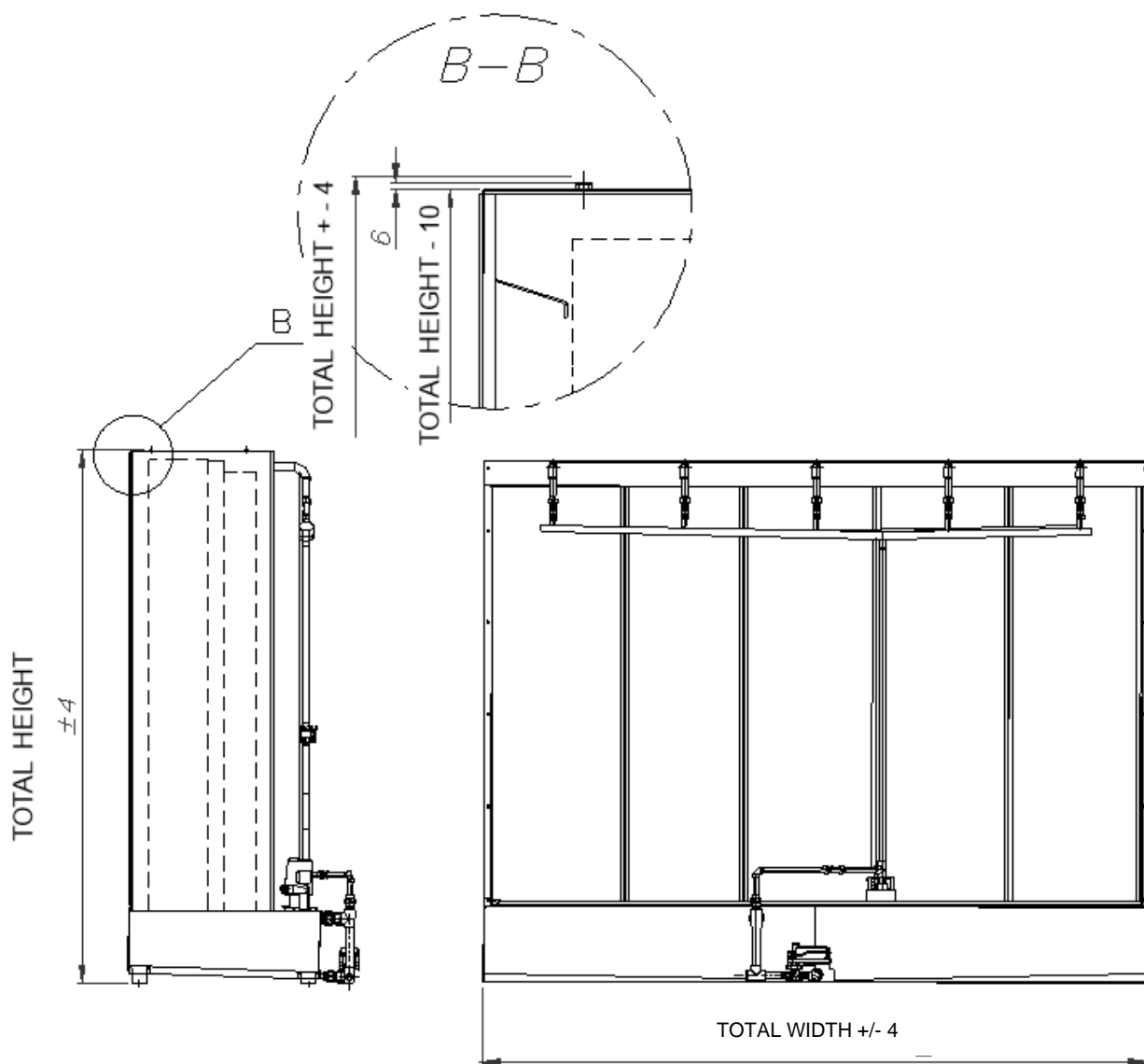
Adiabatic humidification at cold times of year with greater energy efficiency in all the humidification systems.



11. CONNECTIONS, SETTINGS AND REGULATION FOR HEF2 SERIES (RECIRCULATED WATER)

11.1. External dimensions tolerances, Fill/drain connection and leg measurements

11.1.1 External dimensions tolerances and cassettes GAP



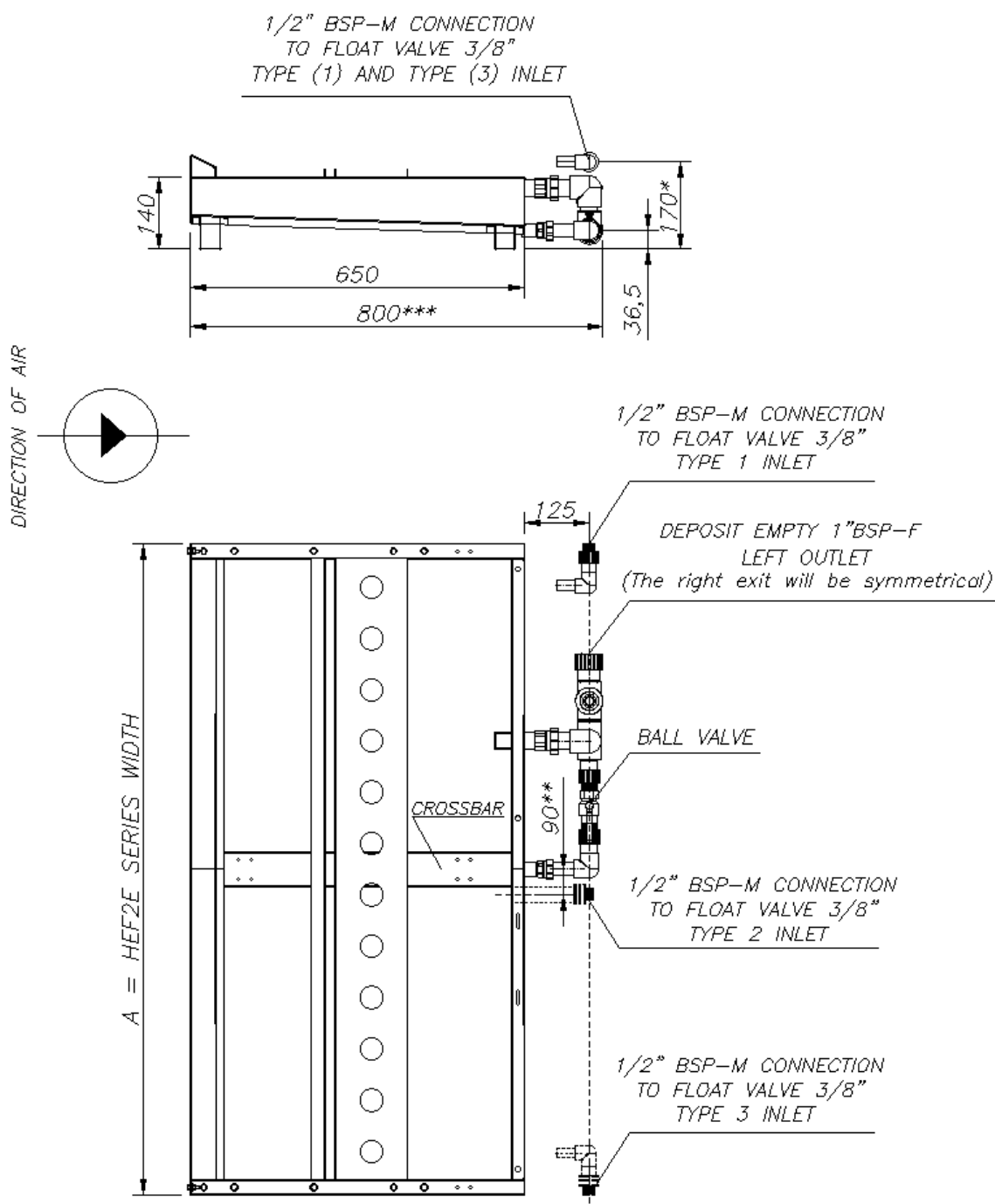
GAP between cassettes (*)

1. For 1, 2 and 3 cassettes the total GAP between them is 10mm.
2. For 4 and 5 cassettes the total GAP between them is 15mm.

(*) The by-pass obtained because of this GAP will be eliminated by joints attached at the cassettes sides.

11.1.2 With float valve for filling 3/8"

CONNECTION MEASUREMENTS FOR WATER SUPPLY/FILLING AND EMPTYING/DRAINAGE WITH BALL VALVE (STANDARD).



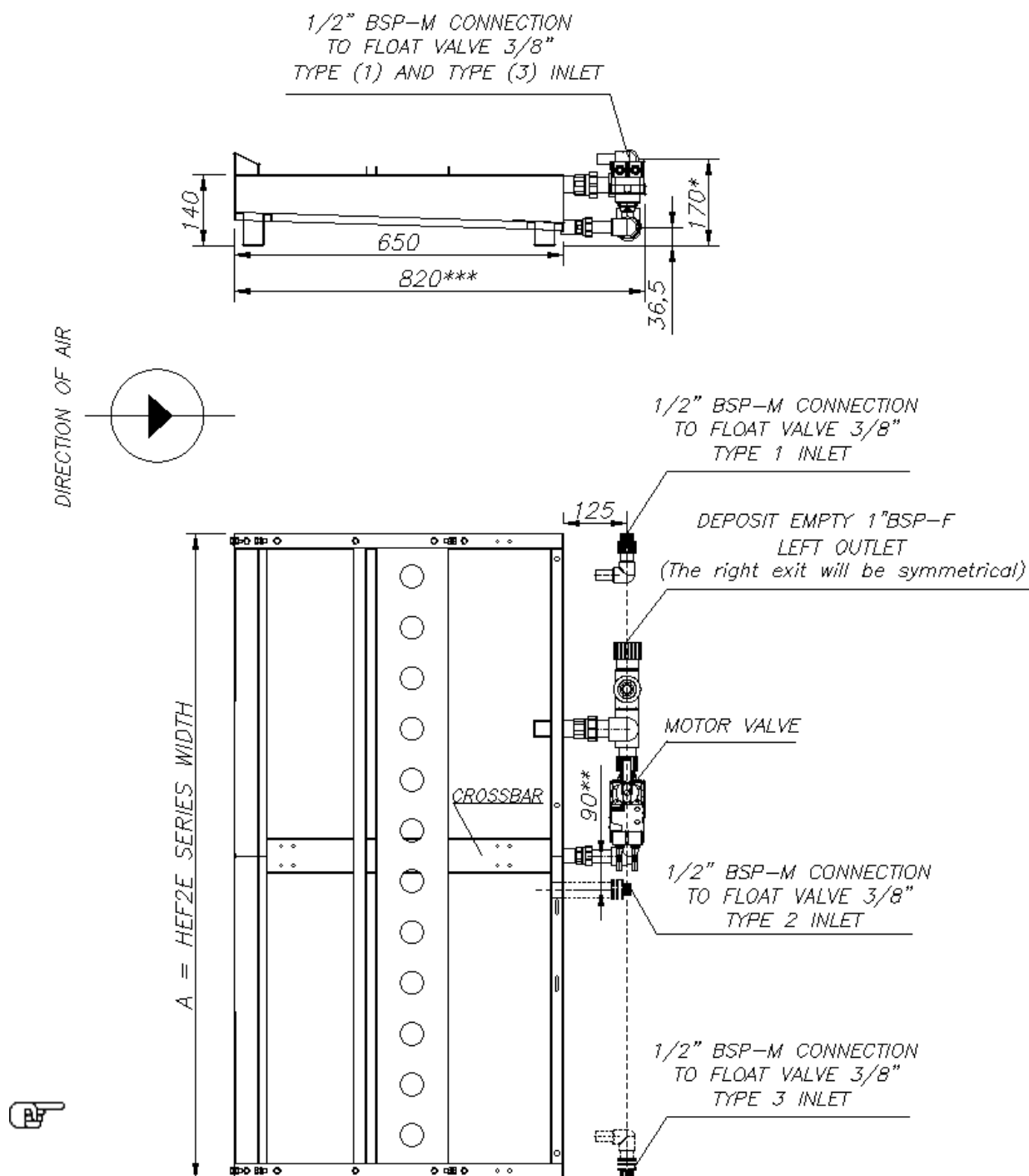
* This dimension varies from 170 mm to 190 mm.

** 50 mm when there is no central crossbar at the water basin.

*** 880 mm for A Water basin width of 570 mm and 670 mm

Remark: When **A** (Width HEF2 series) ≥ 1570 mm the 3/8 " float valve will be installed at the crossbar closest to the center of the basin. Even so the connection is made on the side if there are type 1 or 3 connections.
When **A** (Width HEF2 series) < 1570 mm the 3/8 " float valve will be installed on the pump bracket

CONNECTION MEASUREMENTS FOR WATER SUPPLY/FILLING AND EMPTYING/DRAINAGE WITH MOTOR ZONE VALVE (OPTIONAL).



* This dimension varies from 170 mm to 190 mm.

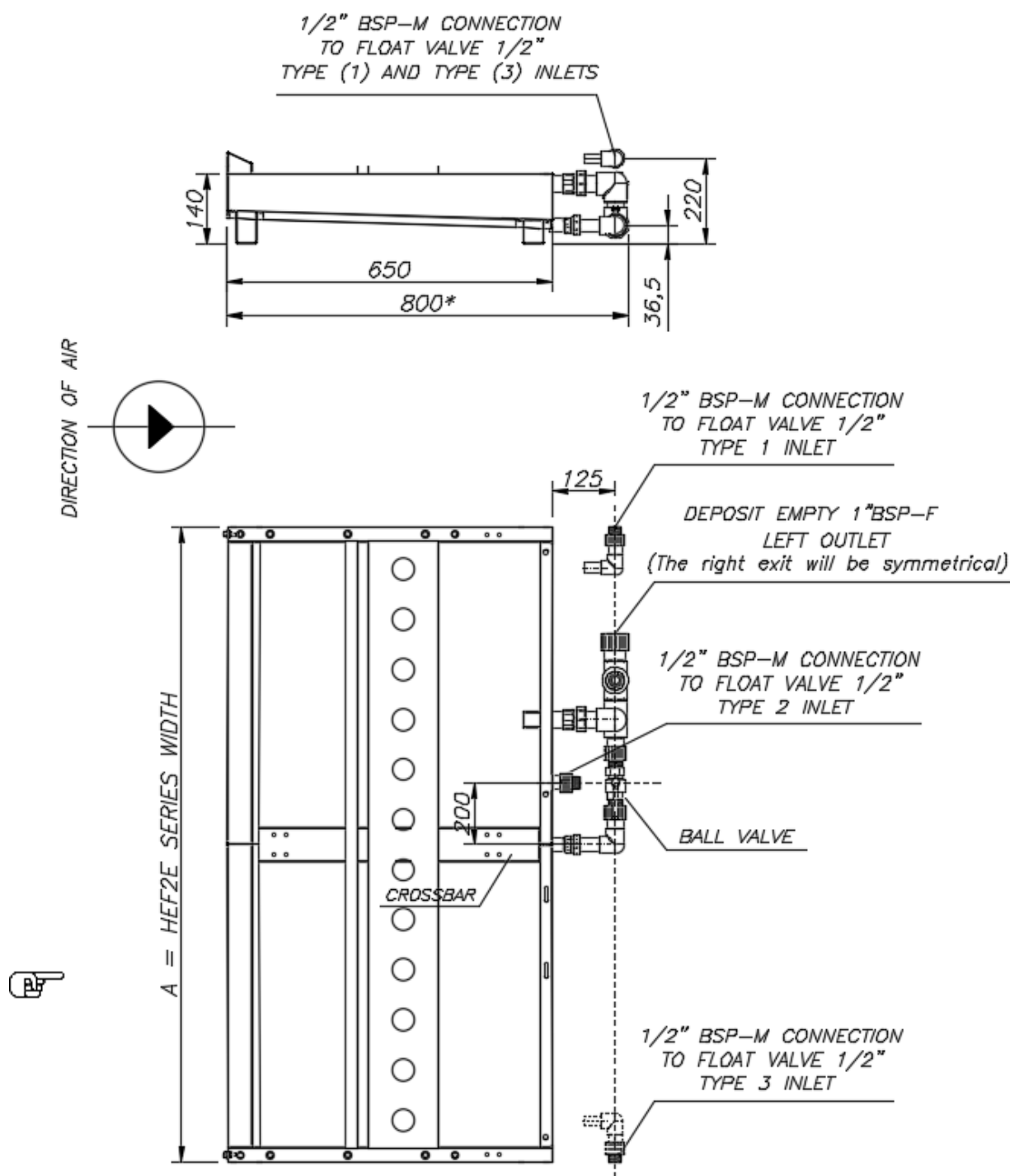
** 50 mm when there is no central crossbar at the water basin.

*** 880 mm for A Water basin width of 570 mm and 670 mm

Remark: When **A** (Width HEF2 series) ≥ 1570 mm the 3/8 " float valve will be installed at the crossbar closest to the center of the basin. Even so the connection is made on the side if there are type 1 or 3 connections.
When **A** (Width HEF2 series) < 1570 mm the 3/8 " float valve will be installed on the pump bracket

11.1.3 With float valve for filling 1/2

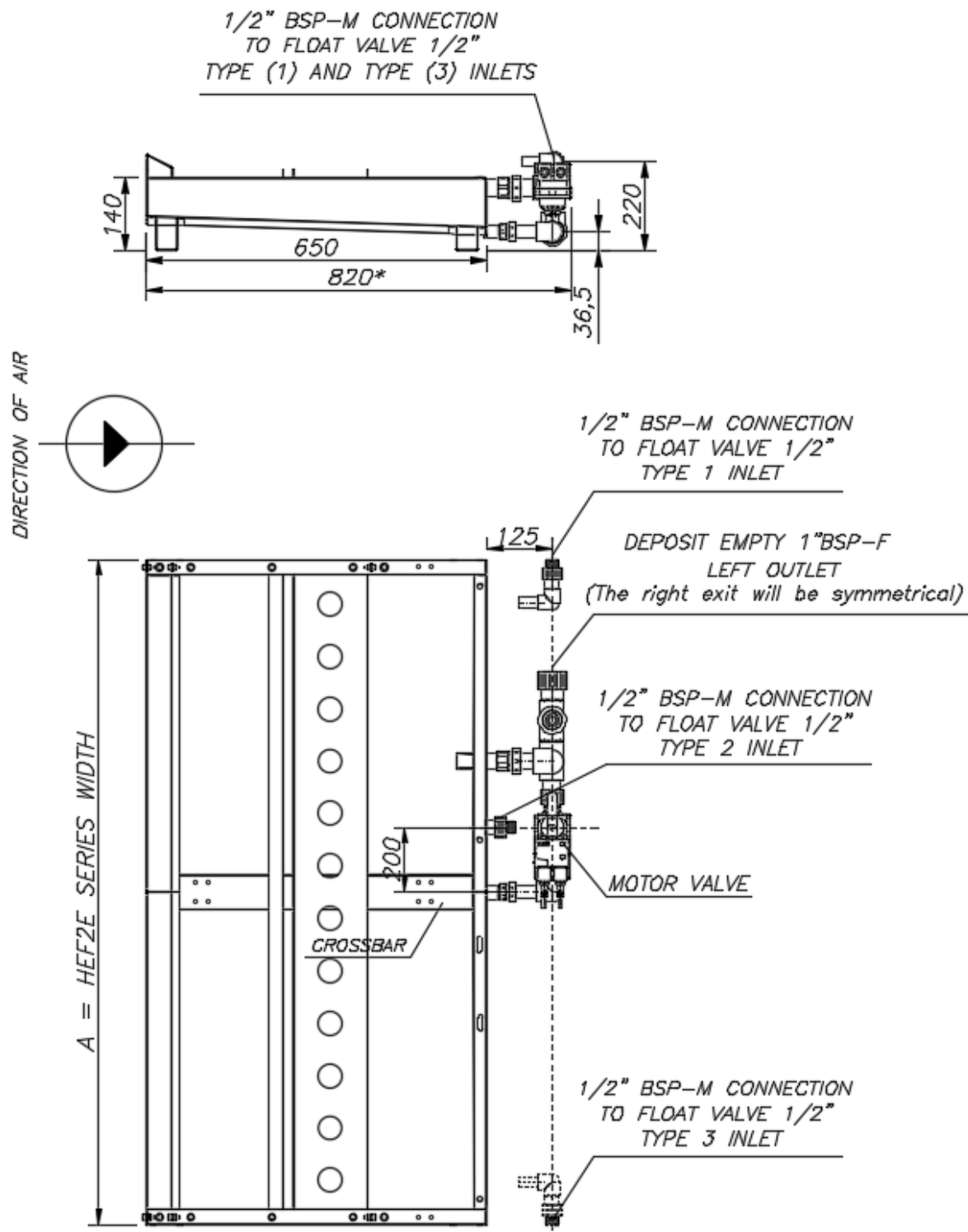
CONNECTION MEASUREMENTS FOR WATER SUPPLY/FILLING AND EMPTYING/DRAINAGE WITH BALL VALVE (STANDARD).




*880 mm for A Water basin width of 570 mm and 670 mm

Remark: the 1/2" float valve will be installed at the crossbar closest to the center of the basin. Even so the connection is made on the side if there are type 1 or 3 connections.

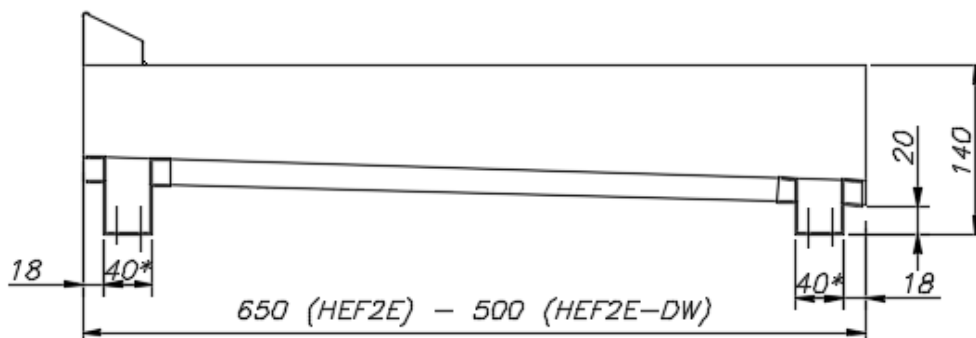
CONNECTION MEASUREMENTS FOR WATER SUPPLY/FILLING AND EMPTYING/DRAINAGE WITH AREA MOTOR VALVE (OPTIONAL).



*880 mm for A Water basin width of 570 mm and 670 mm

 **Remark:** the 1/2" float valve will be installed at the crossbar closest to the center of the basin. Even so the connection is made on the side if there are type 1 or 3 connections.

11.1.4 Water basin leg measurements

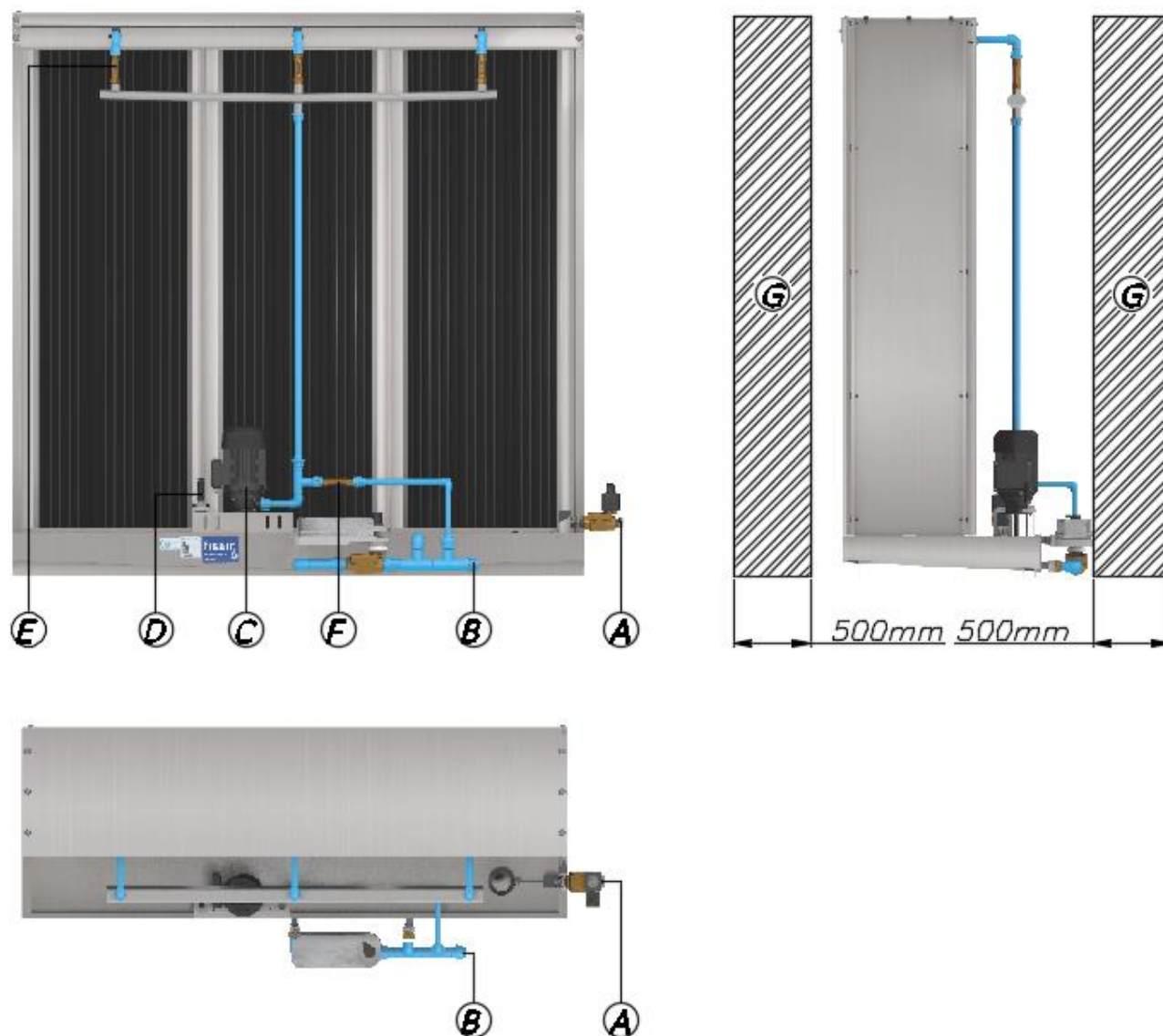


OMEGA TYPE LEG



(*) 50 mm for models with HEF2E WIDTH ≥ 2975 mm

11.2. Scheme of the connections (Standard)



A	Connection to the water supply (connection to external water at between 1 and 6 bar)	E	Setting of the irrigation valves in each evaporative cassette
B	Connection to drain to the water trap	F	Constant bleed-off valve setting
C	Electricity connection to the recirculation pump	G	500 mm gaps recommended for maintenance
D	Electricity connection to the level detector		

11.2 A. Connection to the water supply for filling the water tank.

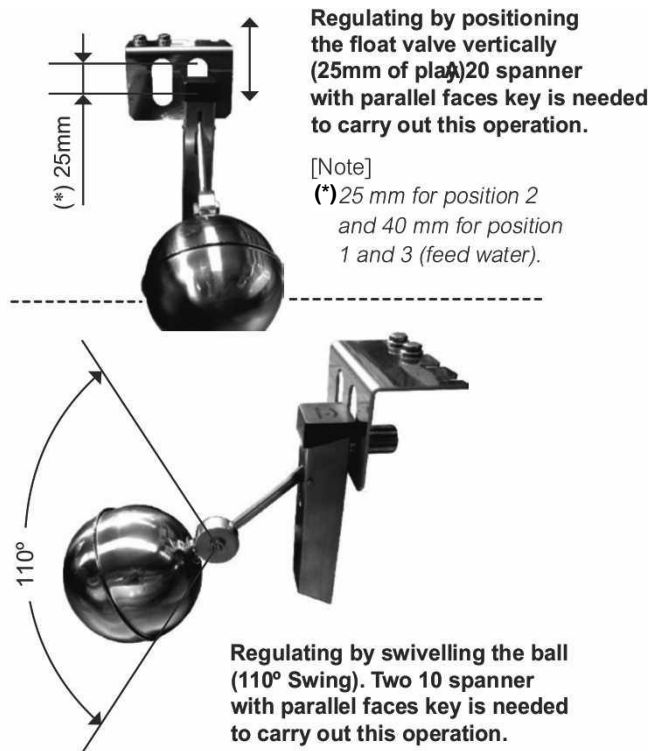
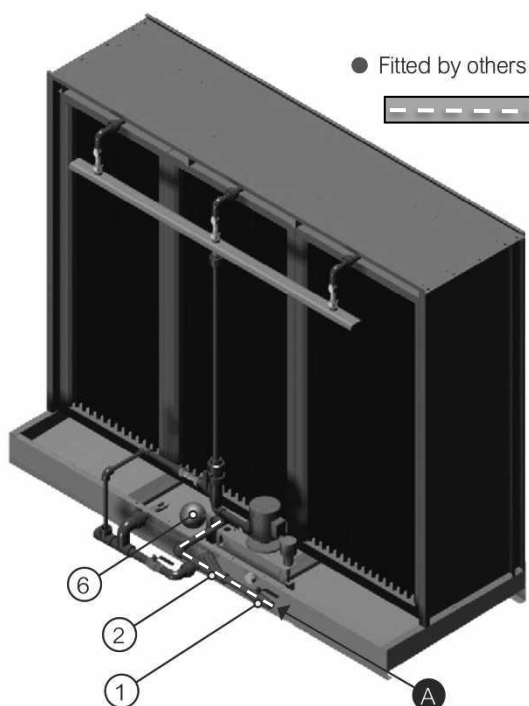
WATER CONNECTIONS

Connect the water supply (A) to the ½" 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.

WATER BASIN SUPPLY

Adjust the water level of the basin to between 3 cm below the level of the overflow by regulating the float valve.

Regulating the float valve (Only 3/8" float valve)



Remark 1: The water level must never fall below the minimum water level of the pump. Water levels below this irreparably harm the pump.

Remark 2: It is very important that the maximum temperature of the basin water supply does not exceed the 25°C range as the saturation efficiency performance could be affected.





Remark 3: How to avoid standing water in the water supply:

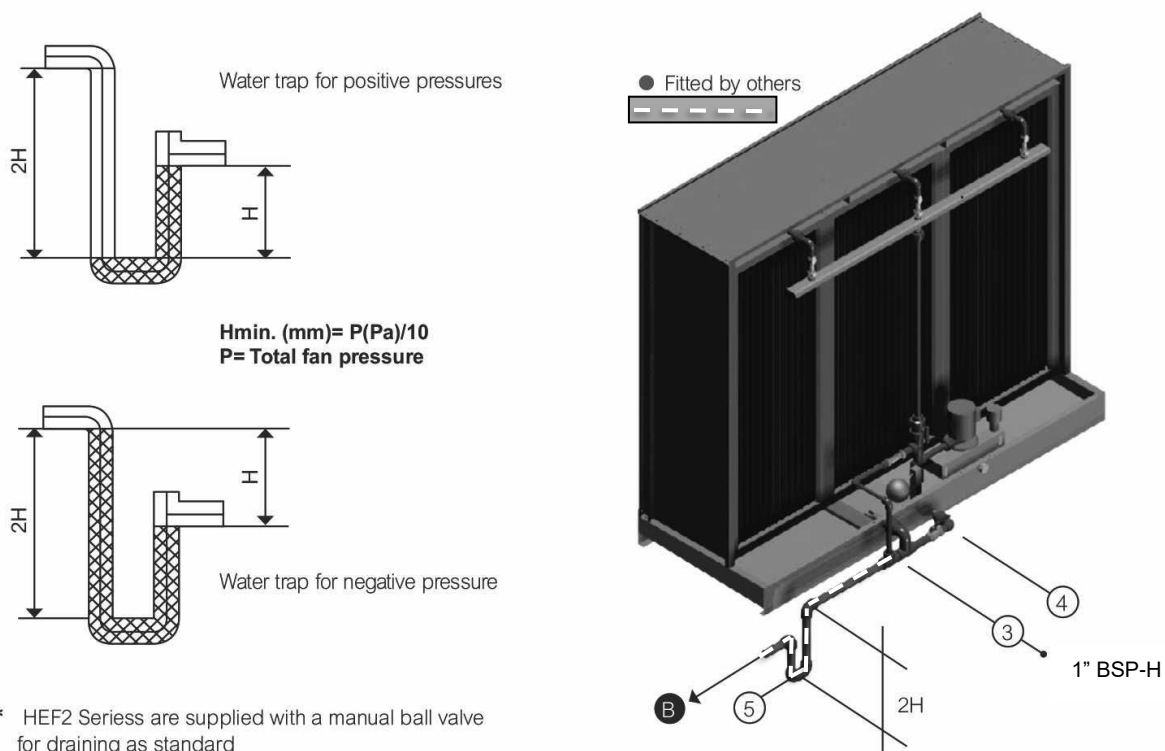
- If the distance from the supply valve to the main water supply line (with continuous water flow) $\geq 2\text{m}$:
Install a 3-way valve, before the cut-off valve, with a return line to the main water supply line, to avoid water retention.
- If the distance from the supply valve to the main water supply line (with continuous water flow) $< 2\text{m}$:
It is not necessary to install the 3-way valve.

11.2 B. Connecting the drain to the water trap.

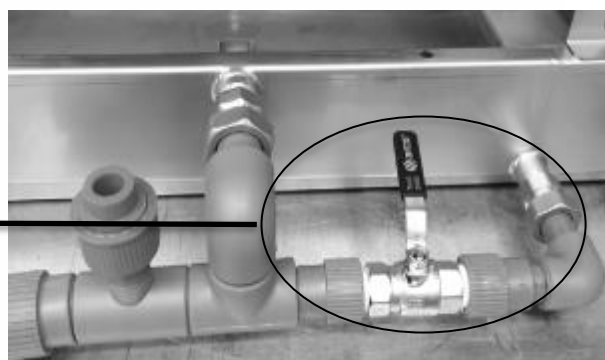
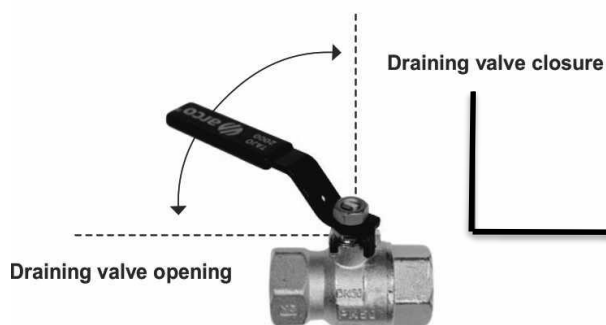
DRAINING CONNECTIONS

Connect the ø32 mm common outlet (1 "BSP-H) 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 for drainage control.

- 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.
- Recovering water from the humidification process into the drinking water mains is absolutely prohibited.
- The siphon must be able to drain freely and must not be connected directly to the sewer pipe.



* HEF2 Series are supplied with a manual ball valve for draining as standard

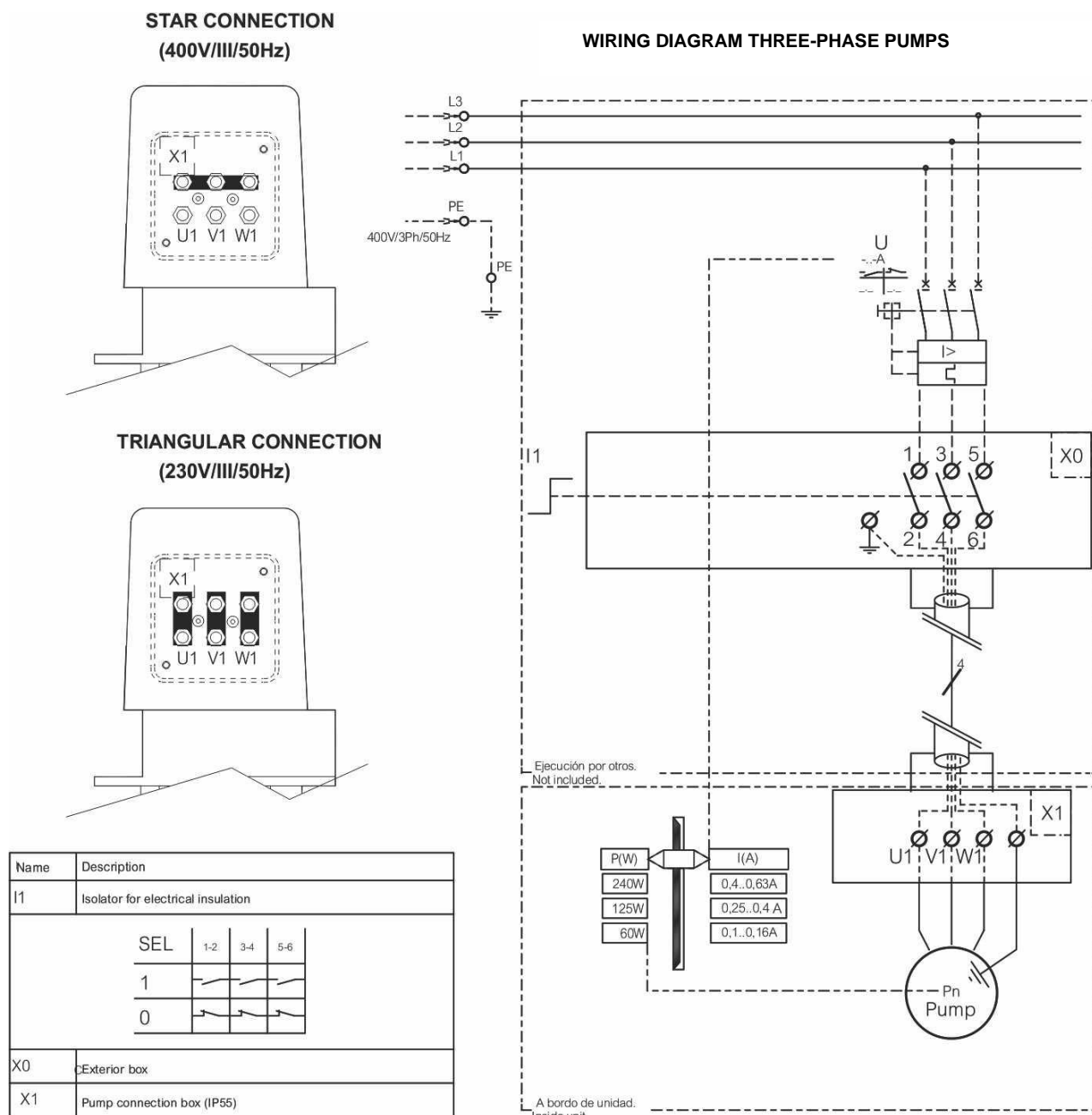


The humidifier must be disconnected automatically when the system fails.

To meet working conditions according to sanitary standard VDI6022, FISAIR recommends including our BASIC CONTROL PANEL (CCB2.0) or STAGES CONTROL PANEL (CCE2.0).

11.2 C. 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 (IP55 or higher). The protection and operation of the electricity supply to the pump must be determined by the project designer of the system.









Remark: Check the rotation of the pump in the direction of the arrow that appears on the pump casing.


Remark: Type of service S2 (1-2 working minutes to achieve thermal equilibrium and 0,8 stop minutes). Maximum 30 work cycles per hour.

		Type 5a		Type 5a1		Type 5b		Type 5c		Type 5d	
Supply	Operating Voltage Vac	230	120	230	120	230-400	250-400	230-400	250-440	230-400	250-440
	Frequency (Hz)	50	60	50	60	50	60	50	60	50	60
	Nominal Power (W)	50	40	90	142	60		125		240	
	Consumption (A)	0.4	0.6 6	0.8	2.9	0.22-0.13	0.19-0.11	0.62-0.36	0.58-0.34	0.89-0.52	0.8-0.47
Degree of protection	As per EN 60529	IPX8		IPX8		IP55		IP55		IP55	
Work Conditions	Maximum temperature (°C)	40		40		40		40		40	
Work point	Head (m)	2		2		2		2		2	
	Flow (l/m)	18		66.6		25		50		78	

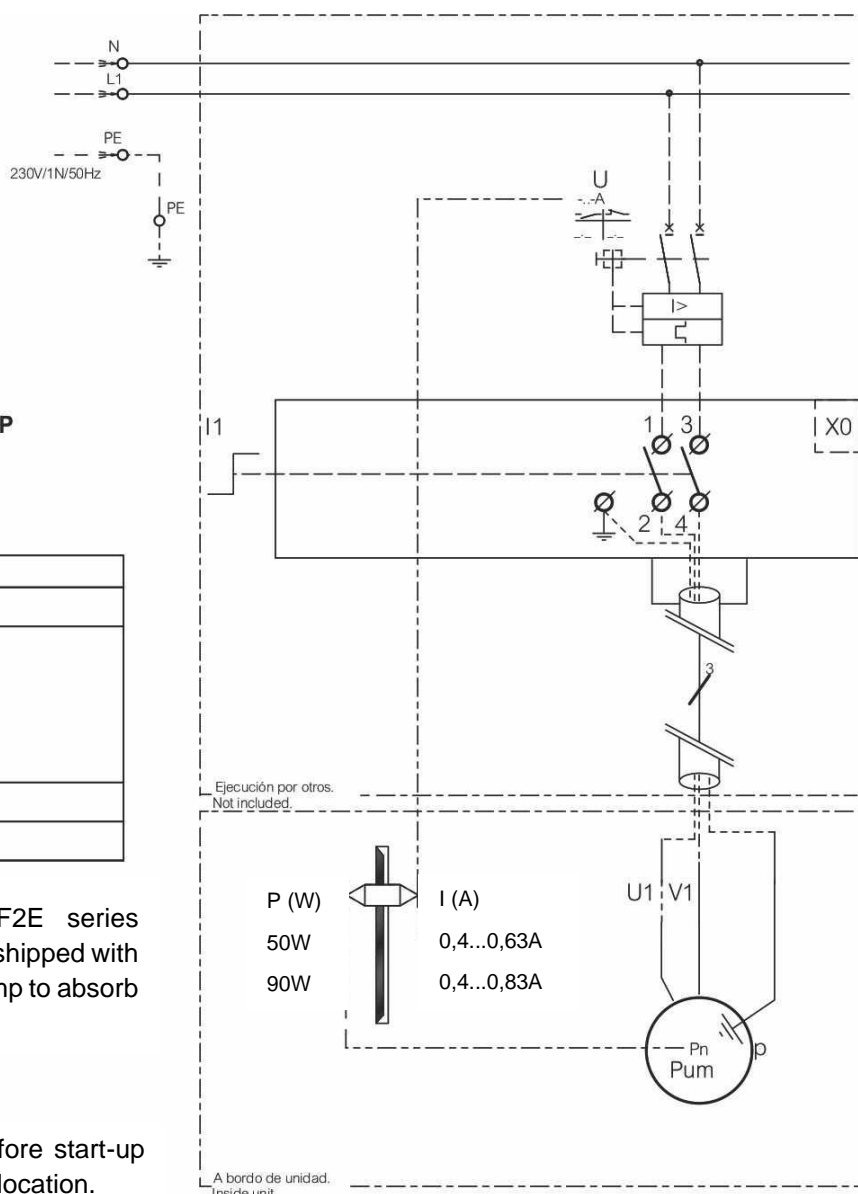
 **Remark 1:** 2 cables (yellow) are available to make a possible connection of the motor thermal protection using CLIXON. Potential free connection and N.C.

WIRING DIAGRAM SINGLE PHASE PUMP

Name	Description							
I1	Isolator for electrical insulation							
<table><tr><td>SEL</td><td>1-2</td><td>3-4</td></tr><tr><td>1</td><td></td></tr><tr><td>0</td><td></td></tr></table>		SEL	1-2	3-4	1		0	
SEL	1-2	3-4						
1								
0								
X0	Exterior box							
X1	Pump connection box (IP55)							

 **Remark 2:** 2 The HEF2E series recirculated water humidifiers are shipped with a silent block placed under the pump to absorb vibrations during transport. (*)

(*) It is mandatory to remove before start-up when the equipment is in its final location.



Components	Pump materials			
	Type 5a (40W-50W-90W-142W)	Type 5b (60W)	Type 5c (125W)	Type 5d (240W)
Main hydraulic body	ABS	Polypropylene		
Hydraulic body tubes	ABS	Stainless steel AISI-304		
Shaft	Ceramic material	Stainless steel AISI-420		
Fasteners	-	Stainless steel AISI-316		
Impeller	TPC	Acetal resin (POM)		
Motor housing	ABS	Polypropylene	Aluminium	Aluminium

11.2 D. Level detector electricity connection

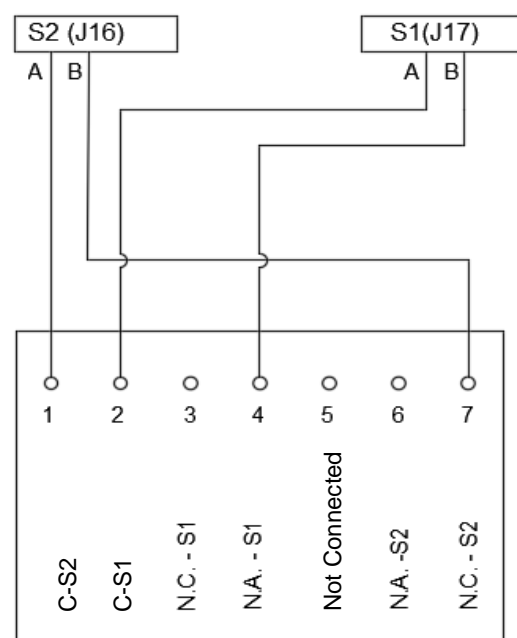
1. Minimum level detector (low level S1):

Level detector must be connected to protect the water pump working. Water level in basin is detected by this level detector (J17 sensor indicates minimum water level NO, take a look on CCB2.0 or CCE2.0 manual).

2. Maximum level detector (high level S2):

The maximum level is used as a security system in a float valve regulation water feed possible failure event. It must not be used to regulate the fresh water inlet. In case the equipment has a filling solenoid valve, connect it to this level so that it is cut for safety (J16 sensor indicates maximum water level NC, take a look on CCB2.0 or CCE2.0 manual).

Example connection to CCB2.0 or CCE2.0



N.C. = normally closed

ALTO= High level S2

N.A. = normally open

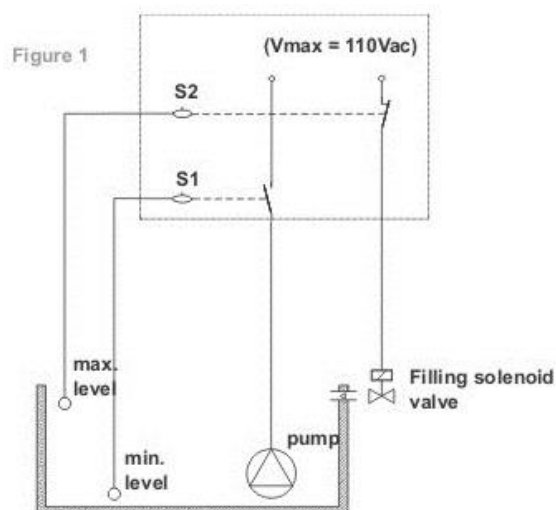
BAJO= Low level S1

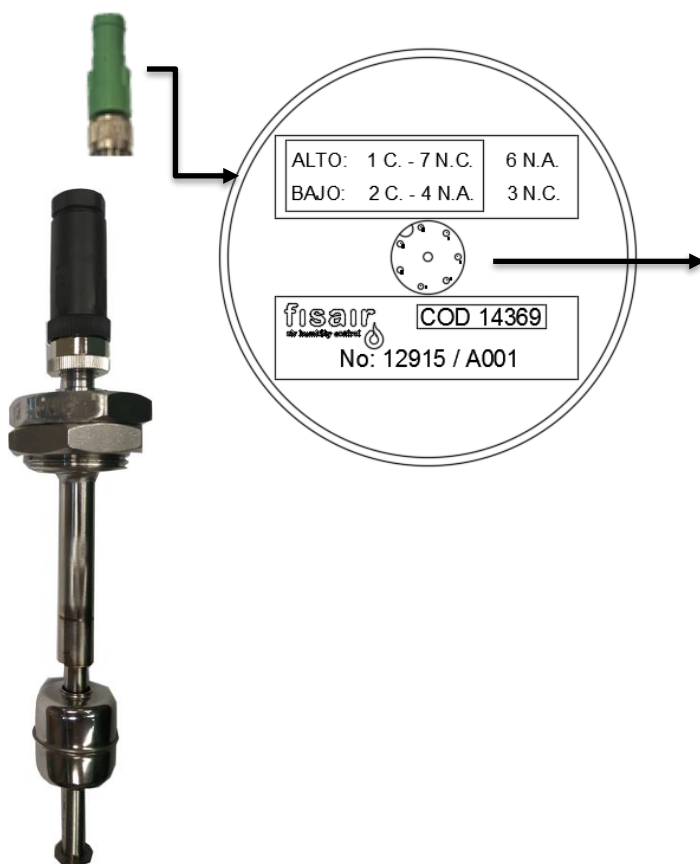
C= Common



Remark: Max Voltage: 175 Vcc / 110 Vca
 Max Current: 1 Acc
 Temperature: -20...120°C
 Min. Density: 0, 75 gr/cm³

Figure 1: Explanatory diagram to confirm which components are managed by levels S1 and S2.
 It's not a *unifilar* diagram.





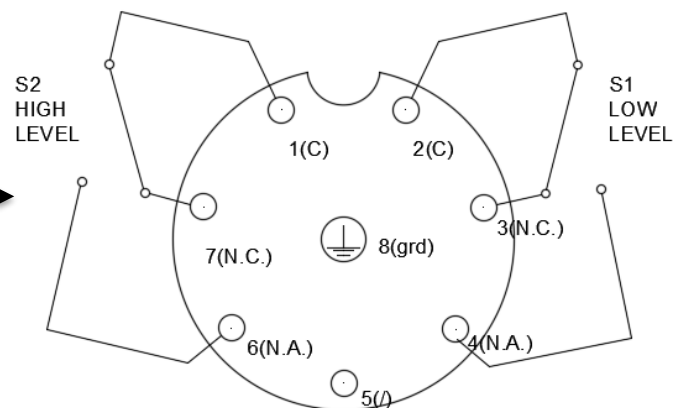
N.C. = normally closed
N.A. = normally open
C= Common

ALTO= High level S2
BAJO= Low level S1

Mesh to fix the float:

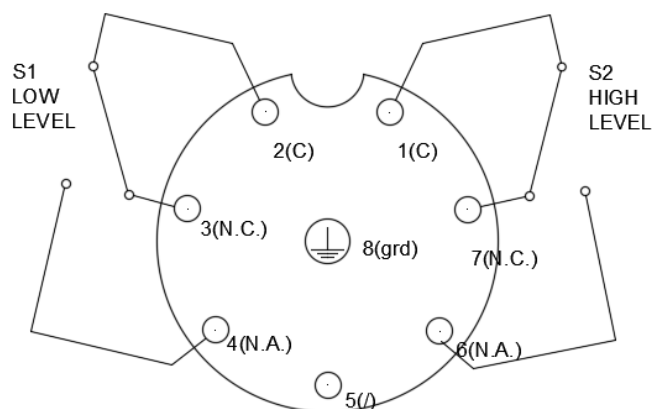


BOTOM VIEW



Pin assignment M12 socket, 8-pos., A-coded, view female side

FRONT/TOP VIEW



[Remark] Pin 5 (/) must be left without connection.

Circuit diagram

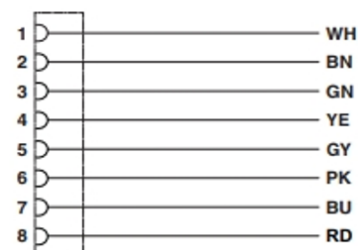



Figure 2: Circuit diagram showing the interdependence between pins and wire colours of the M12 connector with 3m cable.

 **Remark:** Remove the fixing mesh when the equipment is placed on its final location just before commissioning.

11.2 E. 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. It is necessary to ensure the irrigation of the panels has excess water falling into the water tank. Excess irrigation water is important to ensure constant and superficial washing of the panels.

Figure 1:

The adjustment is done with a flat screwdriver. Regulation valve + flowmeter 1/2 in brass to adjust the irrigation of each cassette



➤ Inorganic panel Systems: Calculation of water flow for Cassette:

- X = Cassette width [m]
- S = Cassette thickness [m]
- Q_R = Water flow rate per cassette

$$Q_R = X * S * 60$$

Example: Calculation of water flow for Cassette – Inorganic panel system

- X = 500mm
- S = 150mm

$$Q_R = X * S * 60 = 0,5 * 0,15 * 60 = 4,5 \text{ l/ min}$$

➤ Organic panel Systems: Calculation of water flow for Cassette:

- X = Cassette width [m]
- S = Cassette thickness [m]
- Q_R = Water flow rate per cassette

$$Q_R = X * S * 1,2 * 60$$

Example: Calculation of water flow for Cassette – Organic panel system

- X = 500mm
- S = 150mm

$$Q_R = X * S * 60 = 0,5 * 0,15 * 1,2 * 60 = 5,4 \text{ l/ min}$$

 **Remark:** In the selection sheet of the HEF2 Series you will find the flow rate in L / min of each cassette.

11.2 F. 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 $\mu\text{S/cm}$).


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

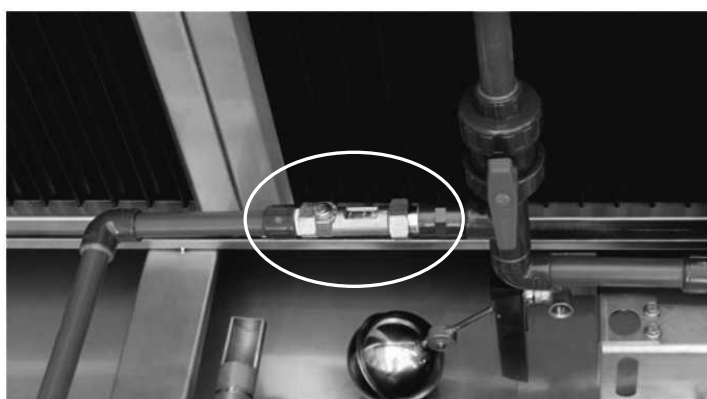
- 100 $\mu\text{S/cm}$ = 9 COC
- 550 $\mu\text{S/cm}$ = 6 COC
- 1000 $\mu\text{S/cm}$ = 2 COC

Calculation example:

- Based on drinking water network parameters
- Water evaporation= 3.23 l/min
- Water conductivity= 550 $\mu\text{S/cm}$
- COC= 6
- Bleed-off = $3.23/(6-1) = 0.65$ 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.

 **Remark:** The flow of the constant bleed-off cannot fall below 0,31 L/min. The flow in L/min of the bleed-off can be found on the HEF2 Series selection sheet.

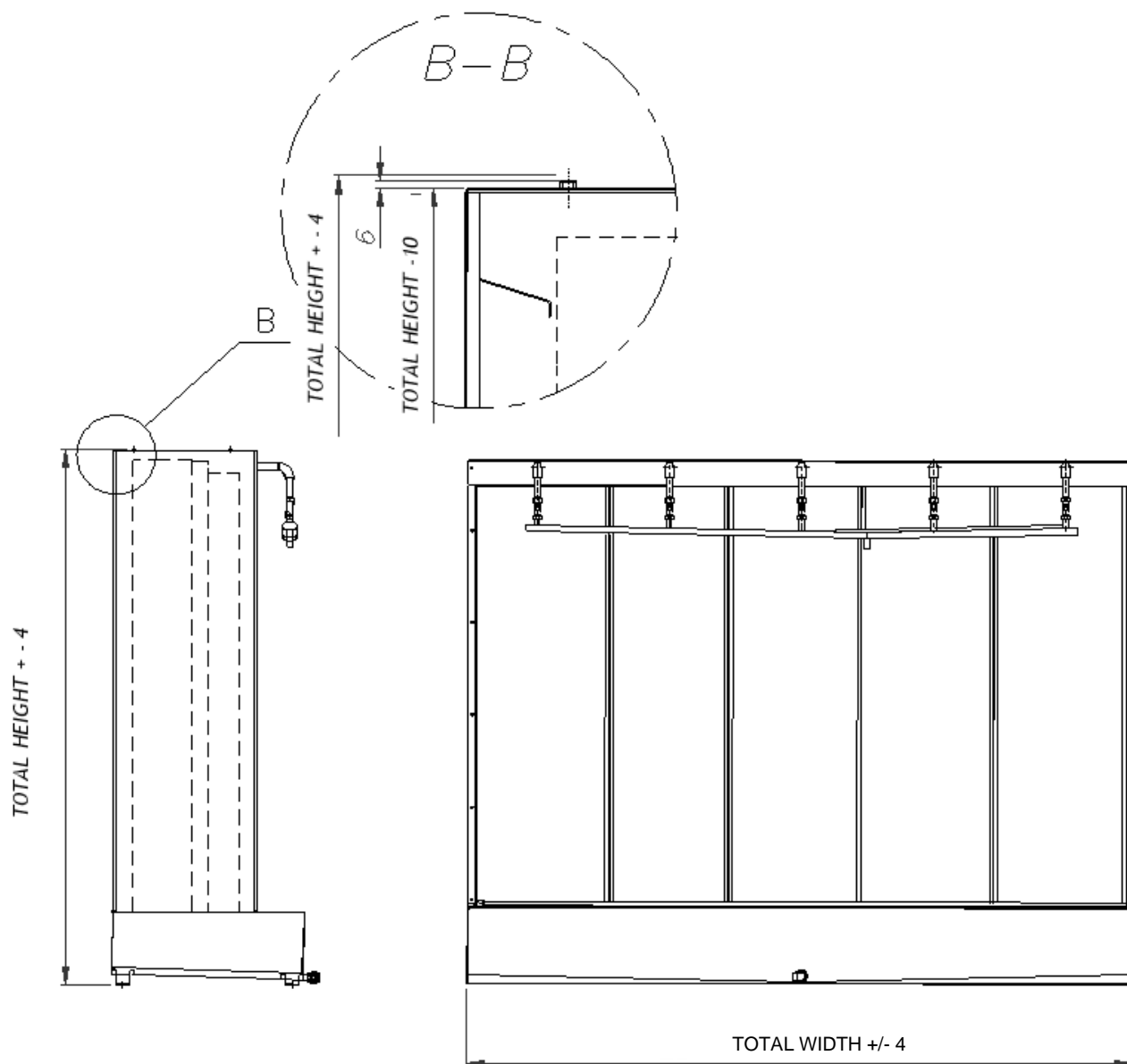


**Regulation valve with flow meter to adjust the bleed-off.
It is regulated using a screwdriver as shown in figure 1.**

12.CONNECTIONS AND SETTINGS/REGULATIONS FOR HEF2-DW (DIRECT WATER SERIES).

12.1. General external and connection dimensions. (Standard)

12.1.1 External measurements tolerances & GAP between cassettes.



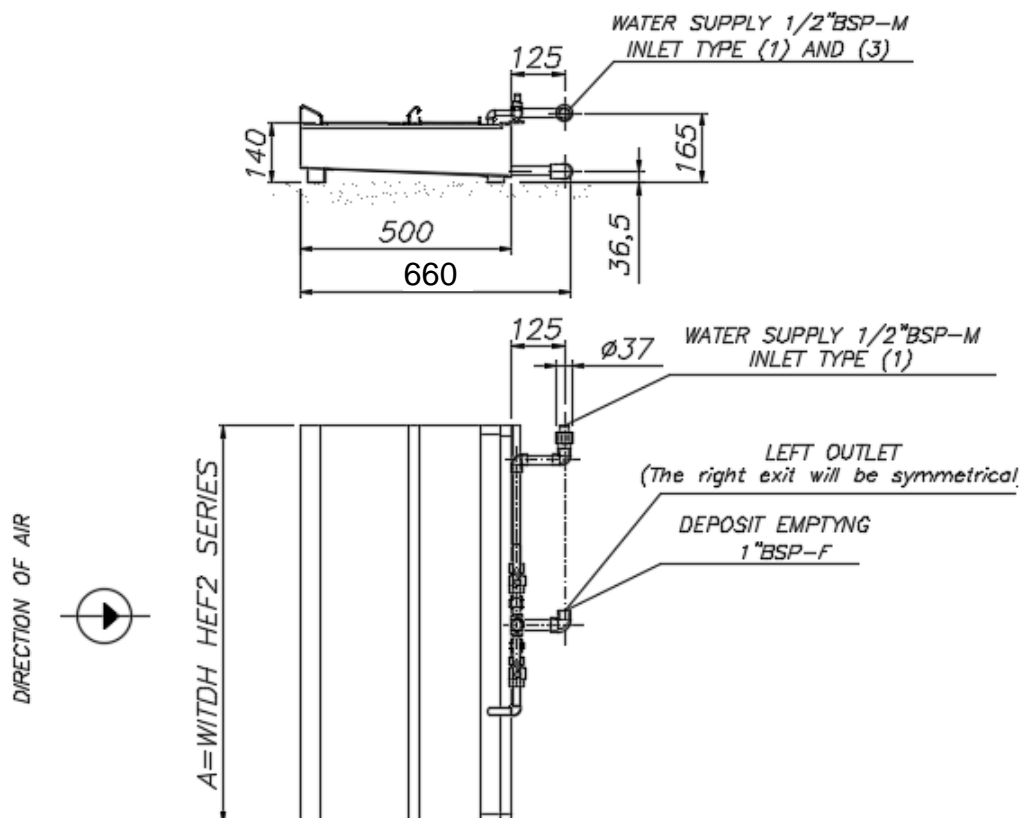
GAP between cassettes(*)

1. For 1, 2 and 3 cassettes the total GAP between them is 10mm.
2. For 4 and 5 cassettes the total GAP between them is 15mm.

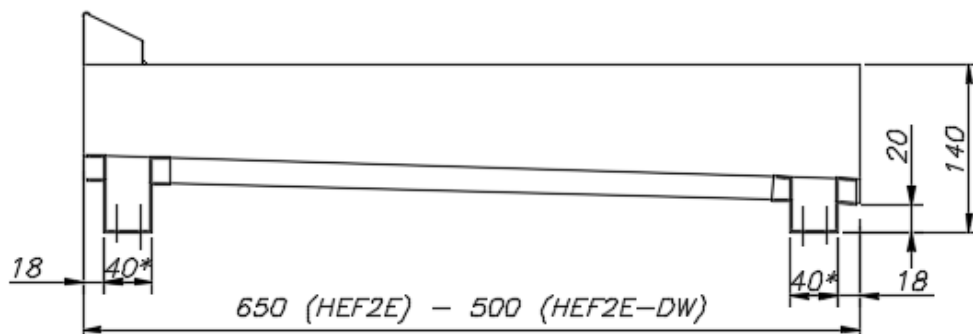
(*) The by-pass obtained because of this GAP will be eliminated by joints attached at the cassettes sides.

12.1.2 Dimensional drawing for water supply & drain connections.

WATER SUPPLY AND BASIN DRAINING (STANDARD)



12.1.3 Water basin leg measurements.

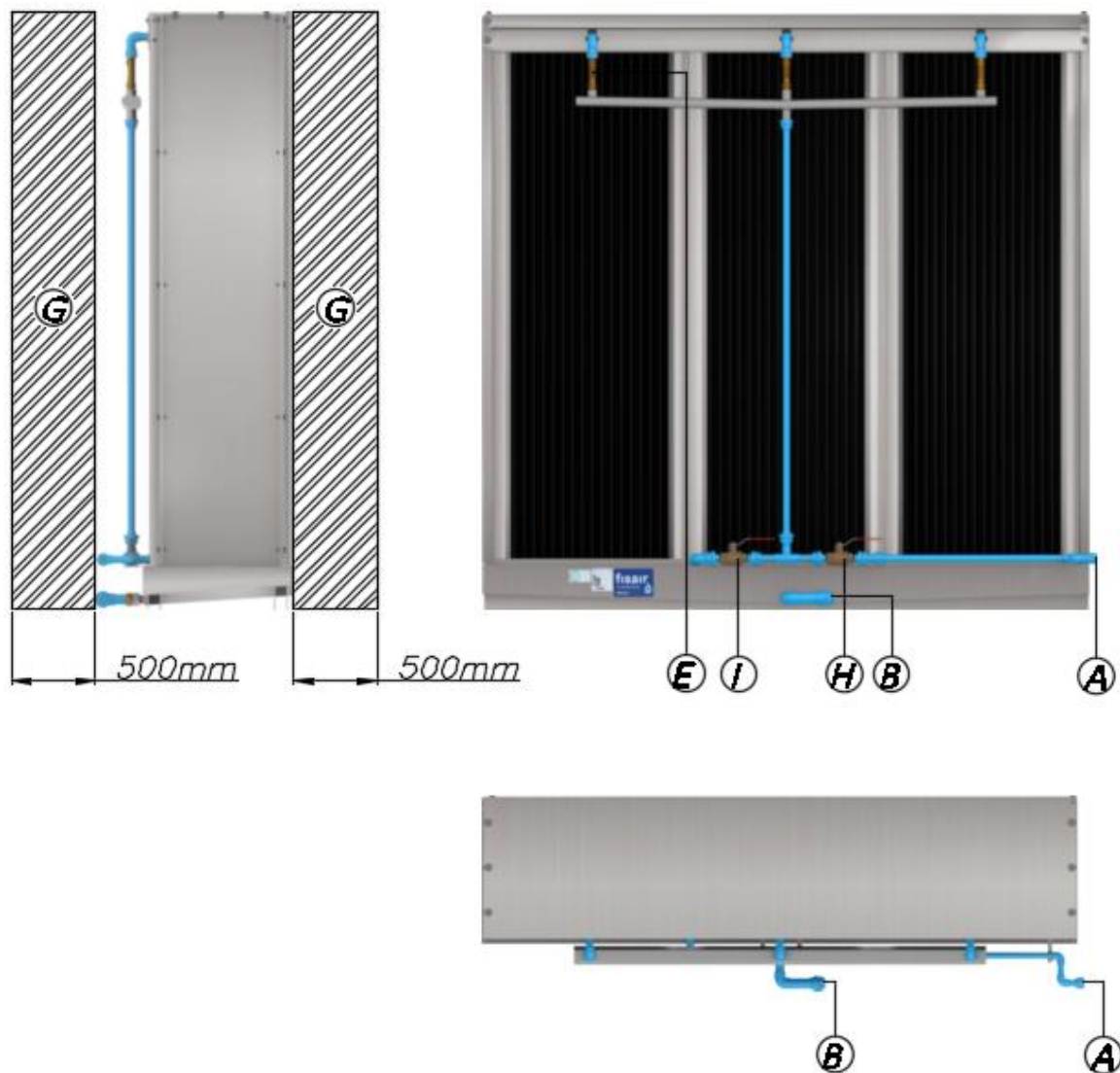


OMEGA TYPE LEG



(*) 50 mm for models with HEF2E WIDTH ≥ 2975 mm

12.2. Schematic connections

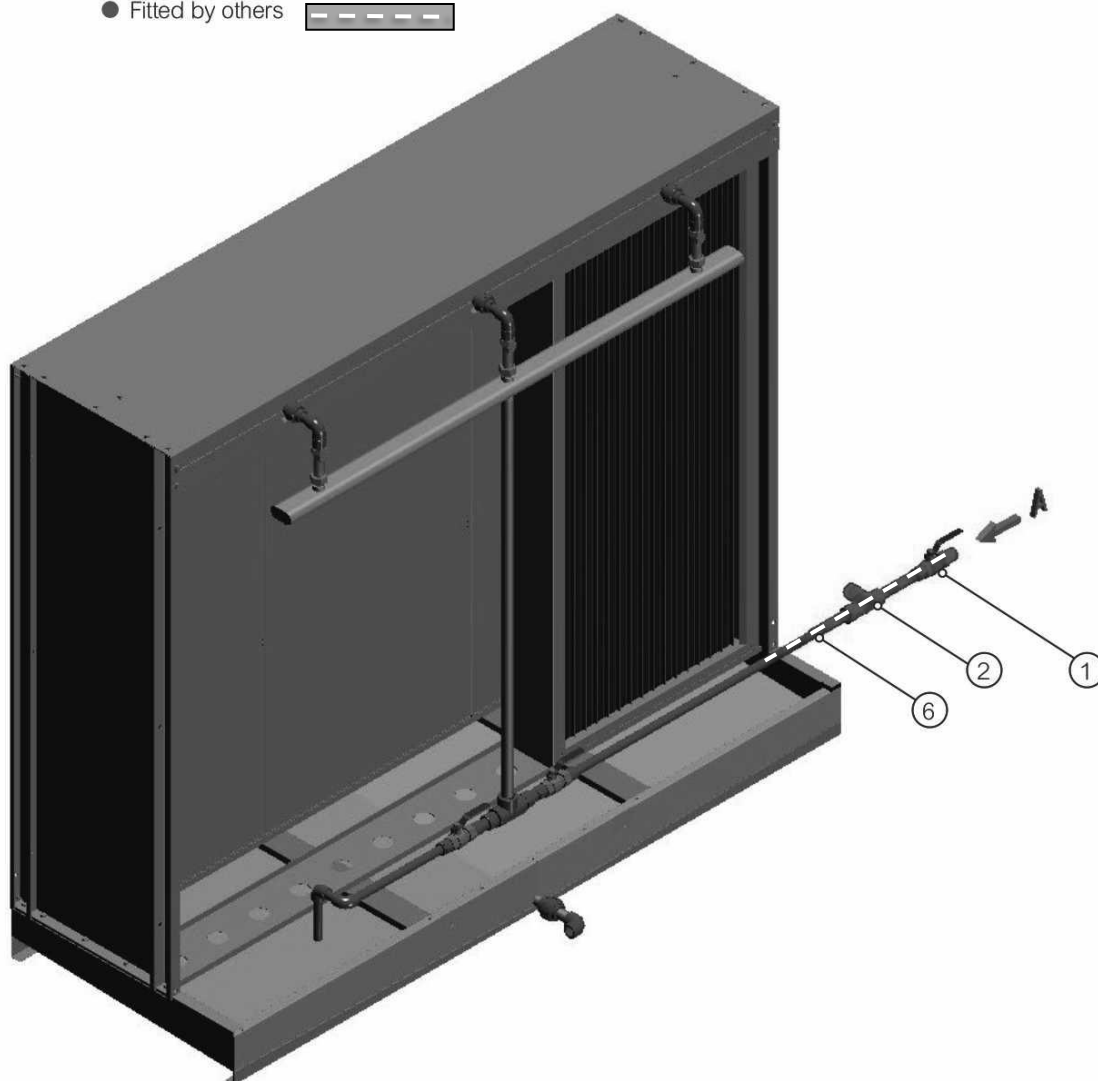


A	Connection to the water supply (connection to external water at between 1 and 6 bar)	G	500 mm gaps recommended for maintenance
B	Connection the drain to the water trap	H	1/2" ball valve to cut off water feed
E	Setting of the irrigation valves in each evaporative cassette	I	1/2" ball valve for draining manifold and irrigation system

12.2 A. Connection to the water supply.

- Connect the water supply (A) to the ½" male BSP-M (6) using suitable piping with a cut-off valve (1). We recommend the installation of a 0,5mm filter light (2).
- In the HEF2 Series-DW, when the temperature of the feed water is below the dew point of the downstream air flow after the wetting panel, FISAIR recommends to isolate the stainless steel manifold and pipes to prevent possible condensations. To work according to hygienic certificate VDI6022 (ISO846) the isolations should also meet that standards.

● Fitted by others 

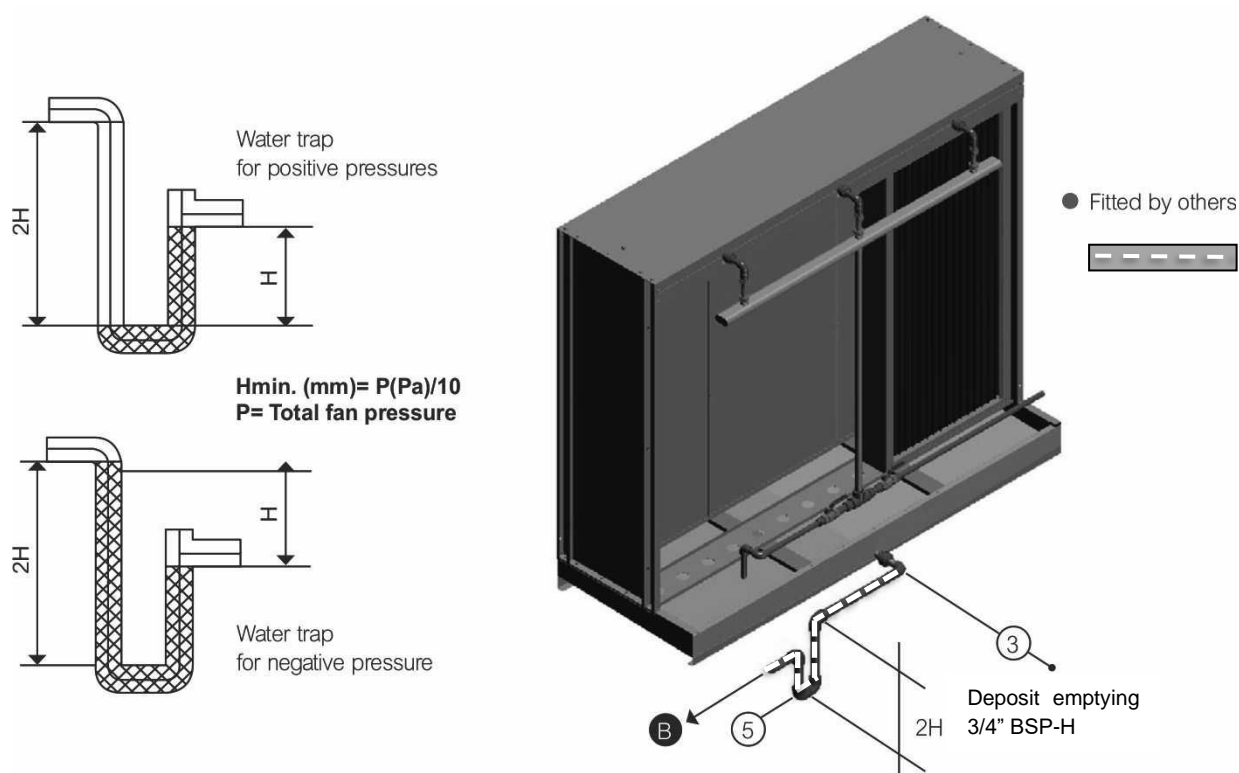


Remark: How to avoid standing water in the water supply:

- If the distance from the supply valve to the main water supply line (with continuous water flow) \geq 2m:
 - Install a non-return valve before the cut-off valve.
 - Install a 3-way valve, before the non-return valve, with a return line to the main water supply line, to avoid water retention.
- If the distance from the supply valve to the main water supply line (with continuous water flow) $< 2m$:
 - Only the non-return valve is installed before the cut-off valve.

12.2 B. Connecting the drain to the water trap.

- Connect the 3/4 "common outlet (BSP-Female) for the draining / overflow / constant bleed-off (3), with no cut-off valve, to the network.
- 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.
- Recovering water from the humidification process into the drinking water mains is absolutely prohibited.



- The siphon must be able to drain freely and must not be connected directly to the sewer pipe.

12.2 E. Setting of the irrigation valves in each evaporative cassette

- 12.2 E.1. Individual water flow for each Cassette (Q_{Rn}) ≥ 0.3 l/min

Adjust the irrigation valves of the evaporative cassettes so their surfaces are uniformly wet. It is necessary to ensure the irrigation of the panels has excess water falling into the water tank.

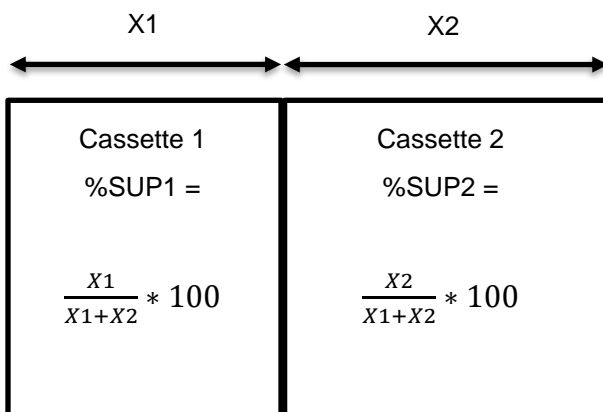
Excess irrigation water is important to ensure constant and superficial washing of the panels.

Figure 1
The adjustment is done with a flat screwdriver

Regulation valve + flowmeter 1/2" in brass to adjust the irrigation of each cassette



Calculation of water flow for Cassette:



- Q_{TOT} = Total flow rate to evaporate (l/min)
- Q_{Rn} = Water flow rate per cassette (l/min)
- Q_{RT} = Total water flow (l/min)
- $X1$ = Width cassette 1 (mm)
- $X2$ = Width cassette 2 (mm)

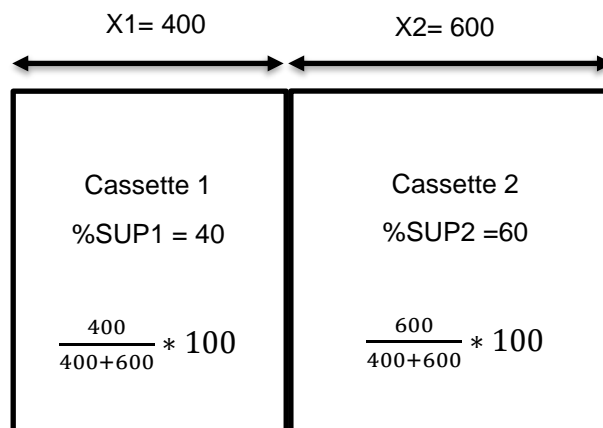
The following relationship exists between the water flow rate (Q_{RT}) and the evaporation rate from each cassette (Q_{TOT}):

$$Q_{RT} = Q_{TOT} * 3; \quad Q_{RT} = \sum Q_{Rn}$$

$$Q_{R1} = Q_{TOT} * \frac{X1}{X1 + X2} * 3$$

$$Q_{R2} = Q_{TOT} * \frac{X2}{X1 + X2} * 3$$

Example calculation of water flow for cassette:



- $Q_{TOT} = 2$ l/min
- $X1 = 400$ mm
- $X2 = 600$ mm

$$Q_{R1} = Q_{TOT} * \frac{X1}{X1 + X2} * 3 = 2 * \frac{400}{1000} * 3 = \mathbf{2,4 \text{ l/min}}$$

$$Q_{R2} = Q_{TOT} * \frac{X2}{X1 + X2} * 3 = 2 * \frac{600}{1000} * 3 = \mathbf{3,6 \text{ l/min}}$$

$$Q_{RT} = Q_{TOT} * 3 = 2 * 3 = \mathbf{6 \text{ l/min}} = Q_{R1} + Q_{R2}$$

$$2,4 \text{ l/min} > 0,3 \text{ l/min}$$

12.2E.2. Individual water flow for each Cassette (QRn) < 0.3 l/min

In this particular case, the equipment has a general regulation valve (prior to the individual distribution of each irrigation) that helps to control the pressure of the individual irrigation valves of the stages:

1. Calculation of the general regulation flow (Q_{REG}):

It has to be regulated 20% more than the flow defined in the equipment.

$$Q_{REG} = Q_{RT} * 1,2$$

- Q_{REG} = General regulation flow (l/min)
- Q_{RT} = Total water flow (l/min)

Example calculation for the general regulation flow:

- $Q_{RT} = 0,6$ l/min

$$Q_{REG} = Q_{RT} * 1,2 = 0,6 * 1,2 = \mathbf{0,72 \text{ l/min}}$$

The adjustment is done with a flat screwdriver

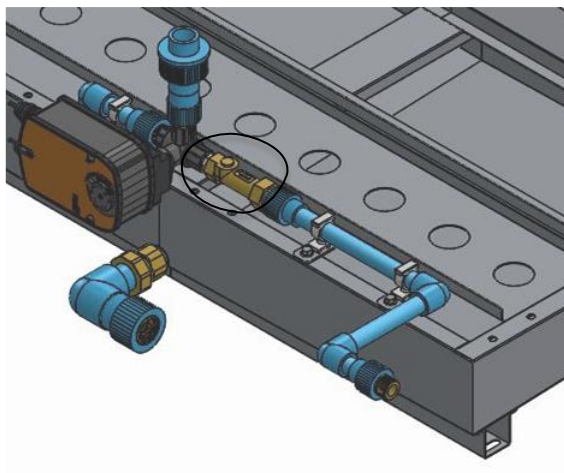
Regulation valve + flowmeter 1/2" in brass to adjust the irrigation of each cassette



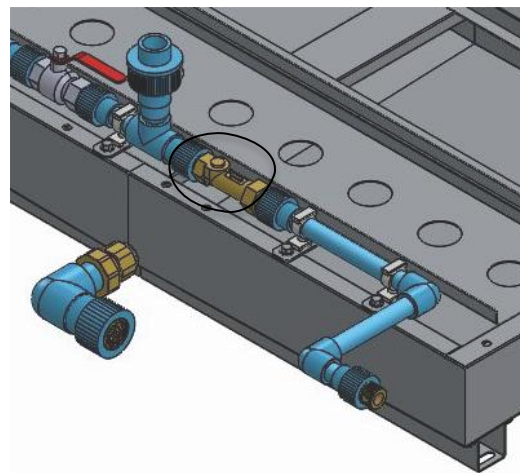
Location of the general regulation valve:

- HEF2E height < 750 mm

With 3 way motor-valve valve

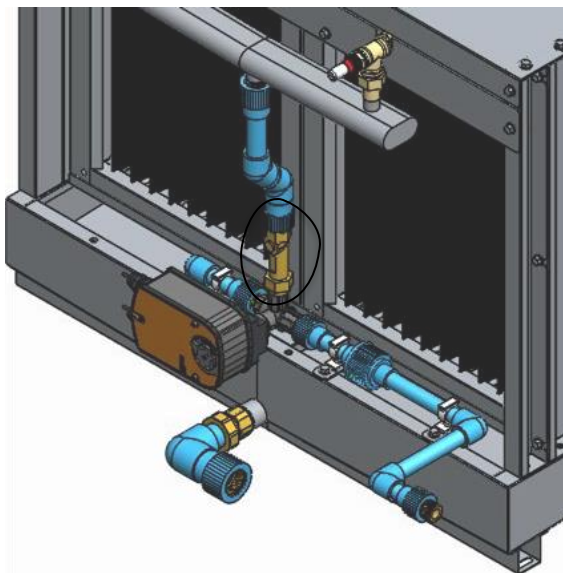


Without 3 way motor-valve

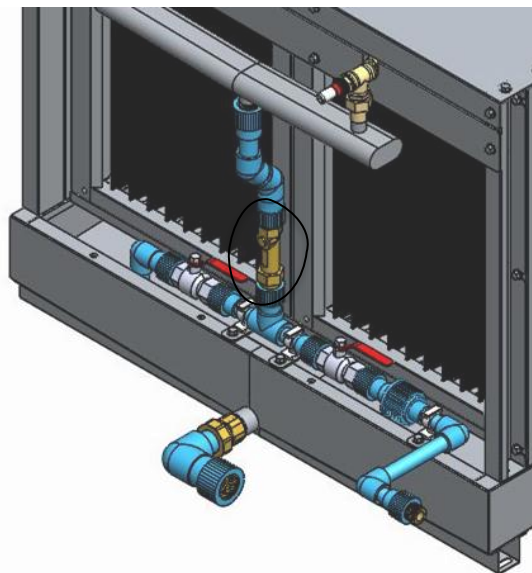


- HEF2E height ≥ 750 mm

With 3 way motor-valve valve



Without 3 way motor-valve



2. Calculation of the particular irrigation flow for each cassette:

Adjust the evaporation cassette water valves so their surface appears uniformly wet. It is necessary to ensure the irrigation of the panels has excess water falling into the water tank.

An excess of water is important to ensure the continuous washing of the panel surfaces.



Calculation of water flow for Cassette:

X1	X2
<p>Cassette 1</p> <p>%SUP1 =</p> $\frac{X1}{X1+X2} * 100$	<p>Cassette 2</p> <p>%SUP2 =</p> $\frac{X2}{X1+X2} * 100$

- Q_{TOT} = Total flow rate to evaporate (l/min)
- Q_{Rn} = Water flow rate per cassette (l/min)
- Q_{RT} = Total water flow rate (l/min)
- $X1$ = Width cassette 1 (mm)
- $X2$ = Width cassette 2 (mm)

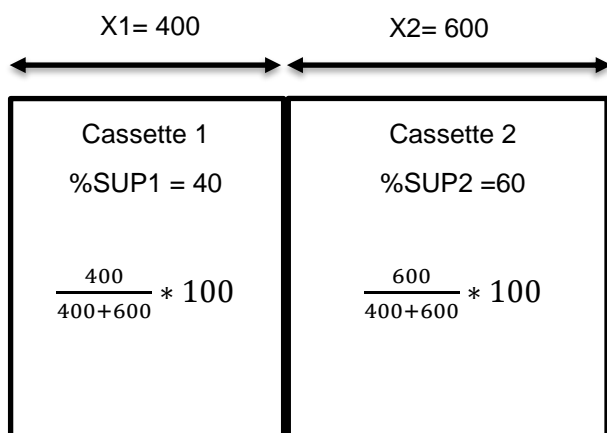
The following relationship exists between the water flow rate (Q_{RT}) and the evaporation rate from each cassette (Q_{TOT}):

$$Q_{RT} = Q_{TOT} * 3 ; Q_{RT} = \sum Q_{Rn}$$

$$Q_{R1} = Q_{TOT} * \frac{X1}{X1 + X2} * 3$$

$$Q_{R2} = Q_{TOT} * \frac{X2}{X1 + X2} * 3$$

Example calculation of water flow for cassette:



- $Q_{TOT} = 0.15 \text{ l/min}$
- $X1 = 400 \text{ mm}$
- $X2 = 600 \text{ mm}$

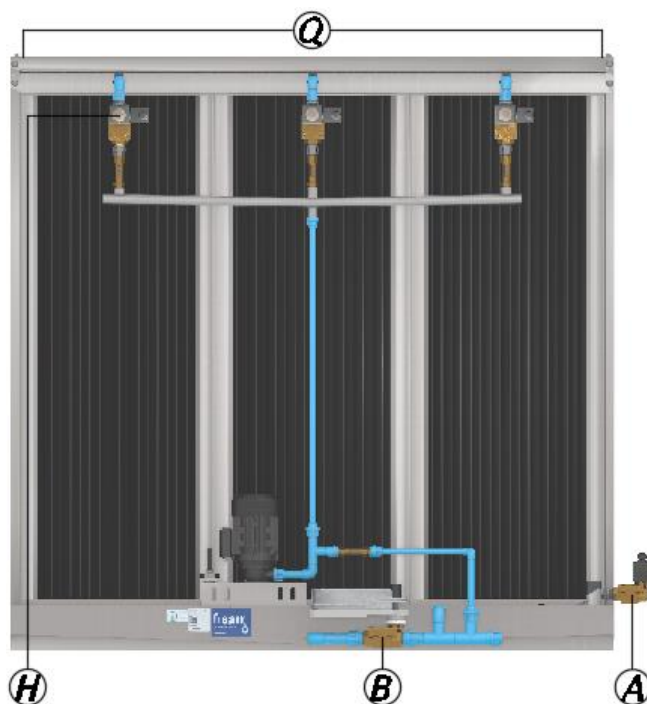
$$Q_{R1} = Q_{TOT} * \frac{X1}{X1 + X2} * 3 = 0,15 * \frac{400}{1000} * 3 = \mathbf{0,18 \text{ l/min}}$$

$$Q_{R2} = Q_{TOT} * \frac{X2}{X1 + X2} * 3 = 0,15 * \frac{600}{1000} * 3 = \mathbf{0,27 \text{ l/min}}$$

$$Q_{RT} = Q_{TOT} * 3 = 0,15 * 3 = \mathbf{0,45 \text{ l/min}} = Q_{R1} + Q_{R2}$$

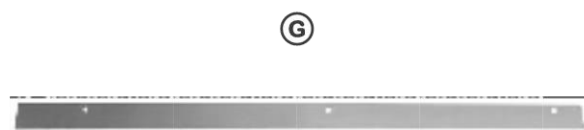
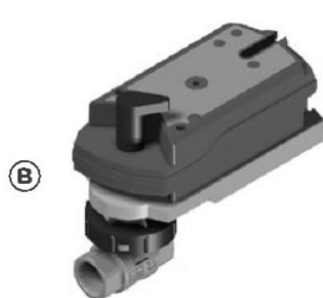
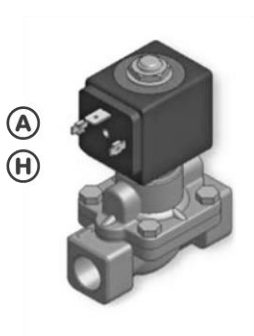
13.CONNECTIONS AND SETTINGS/REGULATIONS MADE FOR OPTIONAL ACCESORIES.

13.1. Optional accessories schematic connections for recirculated water HEF2 series.

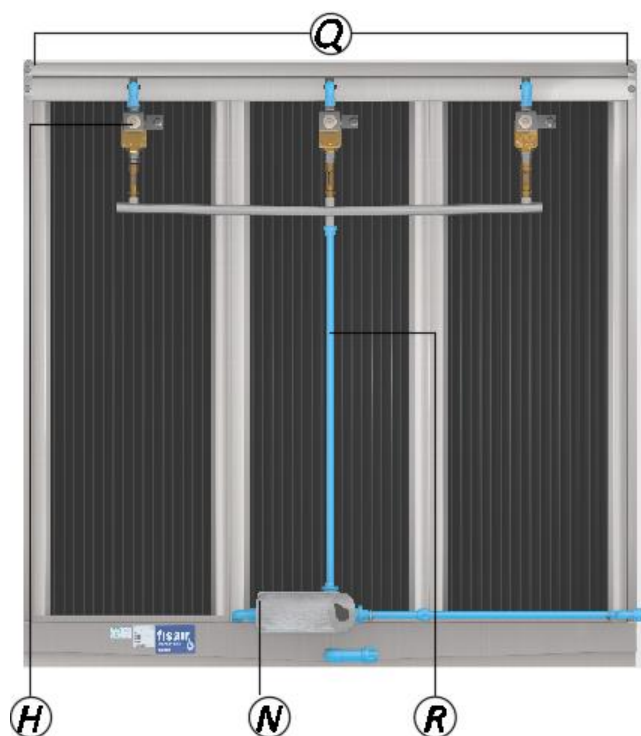


- A Connection of the water tank filling solenoid valve. This solenoid valve is supplied loose for installation by others
- B Connection of the zone motor-valve for automatic draining. This motor valve is supplied assembled.
- C Flexible connector for the water supply
- D Rigid external connection in PP-R (1/2 "BSPT-M) for water supply
- E Rigid external connection in PP-R (1"BSPT-M) for draining
- F U.V. light disinfection system
- G Perimeter closure cover plates
- H Solenoid valve(s) connection for stage control
- I Basic control panel with conductivity control (*)(**)
- J HEF2E series for duct
- K Piping system in stainless steel
- L Cuadro de control básico CCB2.0 Basic Control panel (*)
- M CCE2.0 Stages control panel (*)
- P Stages control panel with conductivity control (*)(**)
- Q Anchor eyebolts

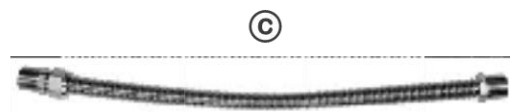
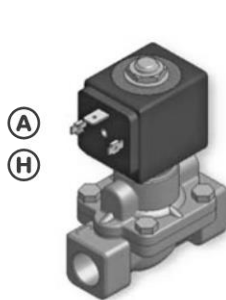
(*) Go to the corresponding control panel manual
(**) To locate the conductivity sensor in the tank, go to point 13.14



13.2. Optional accessories schematic connections for direct water HEF2-DW series.



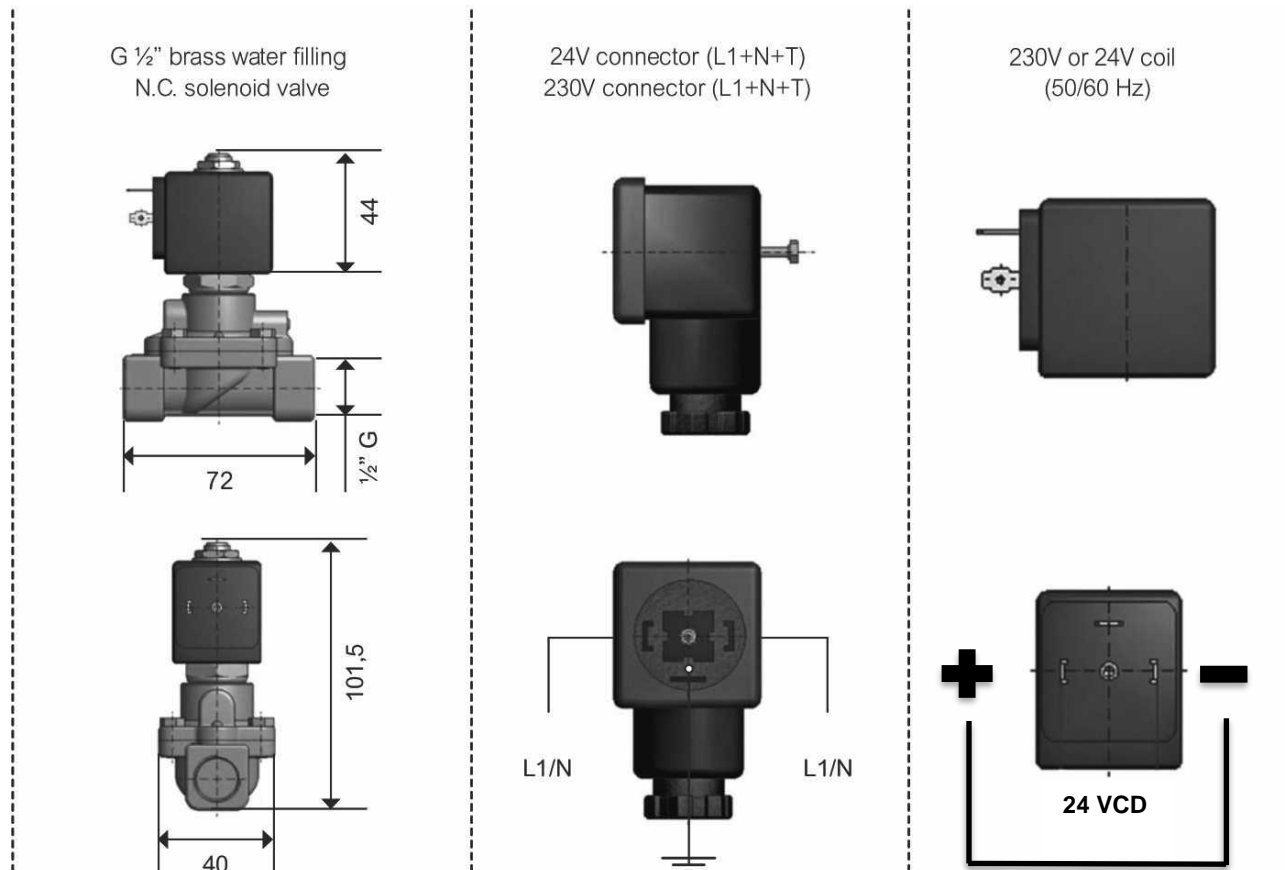
- C Flexible connector for the water supply
- D Rigid external connection in PP-R (1/2" BSPT-M) for water supply
- E Rigid external connection in PP-R (1" BSPT-M) for draining
- F U.V. light disinfection system
- G Perimeter closure cover plates
- H Solenoid valve(s) connection for stage control
- J HEF2E series for duct
- K Piping system in stainless steel
- N Connection of the 3-way motor-zone valve to manage the water feed and emptying of the manifold/irrigation system
- Q Anchor eyebolts
- R HEF2E-DW without collector



13.3 A. Connection of the 24V or 230V water basin filling N.C. solenoid valve (supplied loose for installation by others) (*)

In the case of HEF2 series of recirculated water, the maximum level must manage this solenoid valve. It is used as a security system in the event of a possible failure of the float valve. It must not be used for regulating the water feed. *The float valve is the responsible for the regulation.*

PARKER TYPE SOLENOID VALVES



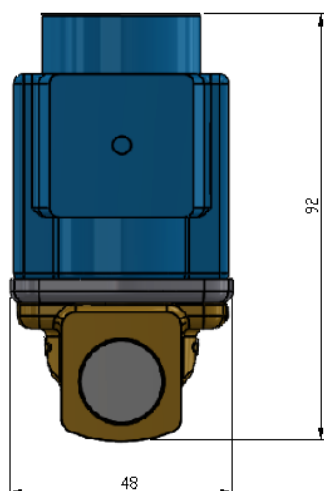
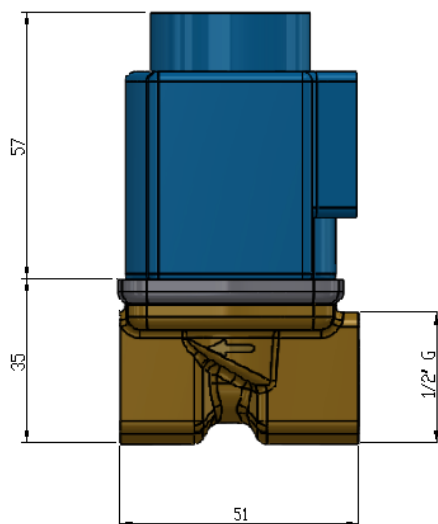
Water supply solenoid valve		
24Vac Supply	Operating voltage (Vac)/Frequency (Hz)	24/50-60
	Nominal Power (W)	8/9
230Vac Supply	Operating voltage (VAC)/Frequency (Hz)	230/50-60
	Nominal Power (W)	8
Water supply	Nominal width	1/2" G
Degree of protection	As per EN 60529	IP55
Work conditions	Maximum temperature level (°C)	50
	Maximum flow temperature level (°C)	90

(*) In the HEF2 series of recirculated water this solenoid valve must always be installed upstream of the float valve.

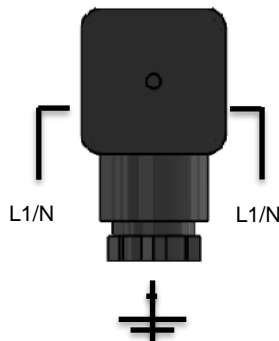
In the HEF2 series-DW (Direct Water), this solenoid valve manages the water feed of the irrigation system (it will be supplied assembled on the unit). Eliminates the standard 1/2" ball valve and makes it impossible for the 3-way motor-zone valve to be assembled.

DANFOSS TYPE SOLENOID VALVES

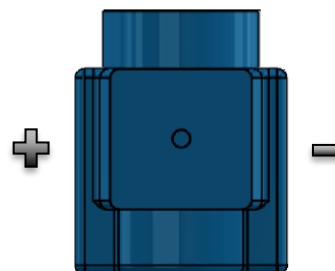
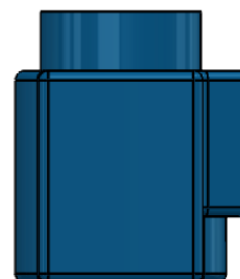
G 1/2" brass water filling N.C. solenoid valve



24Vac/Vdc conector (L1+N+T)
230Vac conector (L1+N+T)



24Vac/Vdc coil
230Vac coil



Electric supply : Service voltaje/Frecuency/Power	Tipo 24Vdc	24Vdc/-/16W
	Tipo 24Vac	24Vac/50Hz/11W
	Tipo 230 Vac	230Vac/50Hz/11W
Water supply	Conexión	1/2" G
Work condtions	Room temperature rengue	-40°C..50°C
	Fluid temperature range	-30°C..100 °C
Grado de proteccion	IP65	

(*) In the HEF2 series of recirculated water this solenoid valve must always be installed upstream of the float valve.

In the HEF2 series-DW (Direct Water), this solenoid valve manages the water feed of the irrigation system (it will be supplied assembled on the unit). Eliminates the standard 1/2" ball valve and makes it impossible for the 3-way motor-zone valve to be assembled.

13.4 B. Connection of the N.C. motor-zone valve for automatic draining of the HEF2 series. (Recirculated water)

DRAIN/EMPTY VALVE RW



	DN []	DN ["]	Rp ["]	kvs [m³/h]	PN []
R2020-S2	20	3/4	3/4	32	40

Dimensional drawings								
<p>L1: Maximum screwing depth. X/Y: Minimum distance with respect to the valve centre. The actuator dimensions can be found on the respective actuator data sheet.</p>								
Type	DN []	Rp ["]	L [mm]	L1 [mm]	H [mm]	X [mm]	Y [mm]	Weight
R2020-S2	20	3/4	78	14	46	235	90	0.43 kg

RECIRCULATED WATER ACTUATOR

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Nominal voltage range	AC 19.2...28.8 V / DC 19.2...28.8 V
	Power consumption in operation	1.5 W
	Power consumption in rest position	0.2 W
	Power consumption for wire sizing	2 VA
	Auxiliary switch	1 x SPDT, 0...100%
	Switching capacity auxiliary switch	1 mA...3 A (0.5 A inductive), AC 250 V
	Connection supply / control	Cable 1 m, 3 x 0.75 mm ²
	Connection auxiliary switch	Cable 1 m, 3 x 0.75 mm ²
	Parallel operation	Yes (note the performance data)
Functional data	Torque motor	5 Nm
	Manual override	with push-button, can be locked
	Running time motor	90 s / 90°
	Sound power level, motor	35 dB(A)
	Position indication	Mechanically, pluggable
Safety	Protection class IEC/EN	III Safety Extra-Low Voltage (SELV)
	Protection class UL	UL Class 2 Supply
	Protection class auxiliary switch IEC/EN	II reinforced insulation
	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2
	Enclosure	UL Enclosure Type 2
	EMC	CE according to 2014/30/EU
	Low voltage directive	CE according to 2014/35/EU
	Certification IEC/EN	IEC/EN 60730-1 and IEC/EN 60730-2-14
	Certification UL	cULus according to UL60730-1A, UL60730-2-14 and CAN/CSA E60730-1:02
	Certification UL note	The UL marking on the actuator depends on the production site, the device is UL-compliant in any case
	Mode of operation	Type 1
	Rated impulse voltage supply / control	0.8 kV
	Rated impulse voltage auxiliary switch	2.5 kV
	Control pollution degree	3
	Ambient temperature	-30...50°C
	Storage temperature	-40...80°C
	Ambient humidity	Max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	0.51 kg

24 VDC voltage supply



Electrical data	Nominal voltage	AC 100 ... 240 V, 50/60 Hz
	Power supply range	AC 85 ... 265 V
	Power consumption In operation	1.5 W at nominal torque
	At rest	0.4 W
	For wire sizing	4 VA
	Auxiliary switch	1 x SPDT, 1 mA ... 3 (0.5) A, AC 250 V II □ (0 ... 100% adjustable)
	Connection Motor	Cable 1 m, 3 x 0.75 mm ²
	Auxiliary switch	Cable 1 m, 3 x 0.75 mm ²
	Parallel connection	Possible, note performance data
Functional data	Torque (nominal torque)	Min. 5 Nm at nominal voltage
	Manual override	Gearing latch disengaged with pushbutton (temporary-permanent)
	Running time	90 s / 90° <4
	Noise level	Max. 35 dB (A) (without the valve)
	Position indication	Mechanical, add-on
Safety	Protection class	II Totally insulated □
	Degree of protection	IP54 in any mounting position
	EMC	CE according to 89/336/EEC
	Mode of operation	Type 1 (to EN 60730-1)
	Rated impulse voltage	4 kV (to EN 60730-1)
	Control pollution degree	3 (to EN 60730-1)
	Ambient temperature range	0 ... +50°C
	Media temperature	+5 ... +110°C in (control) ball valve -10°C with stem heating upon request
	Non-operating temperature	-40 ... +80°C
	Ambient humidity range	95% r.H., non-condensing (to EN 60730-1)
Dimensions / Weight	Maintenance	Maintenance-free
	Dimensions	See «Dimensions» on page 2
	Weight	Approx. 600 g

230 VAC voltage supply

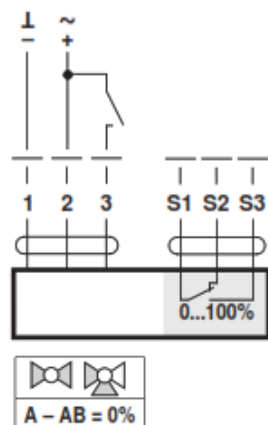


[Nota], When the motor-valve is connected to CCB2.0 or CCE2.0 control panels, the S1 (purple) and S3 (white) cables must be connected to the “Feedback” connection J15 (See CCB2.0 or CCE2.manuals)

The power connections are according to the manual of the CCB2.0 or CCE2.0.

Wiring diagram

24 VDC



Cable colours:

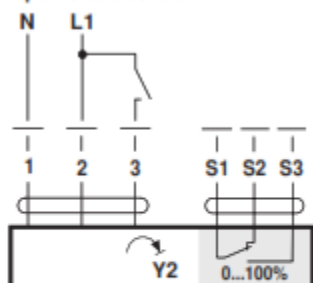
1 = black
2 = red
3 = white
S1 = violet
S2 = red
S3 = white

Auxiliary switch



230 VAC

Open-close control



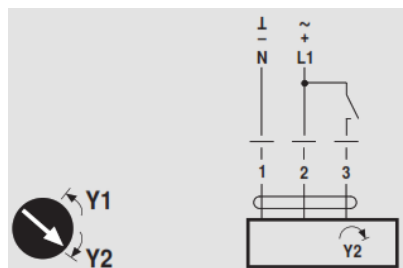
Rotary actuator	Rotary valve
Y2	A - AB = 0%



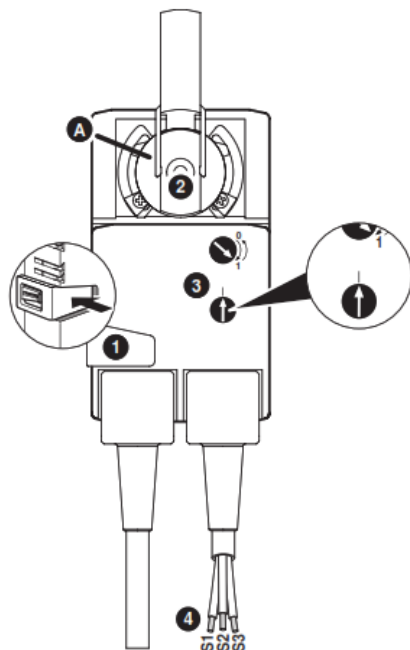
Auxiliary switch



Sentido de giro:



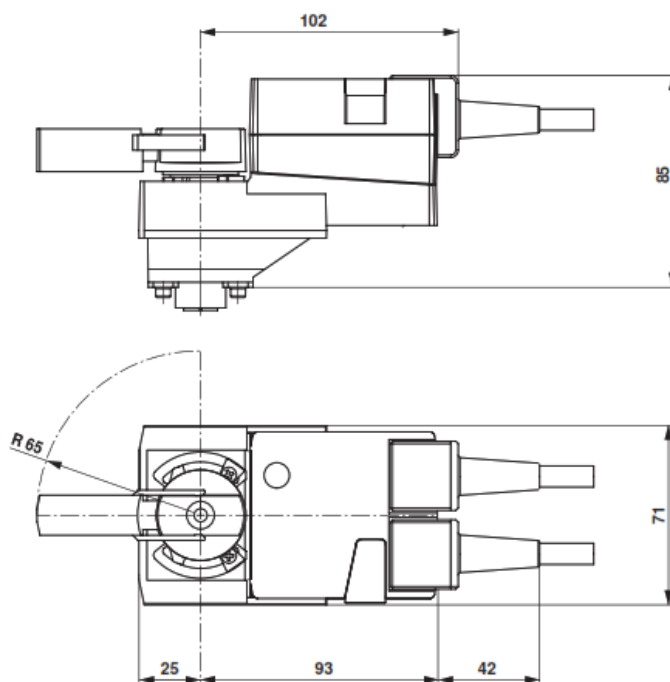
Control for manual operation



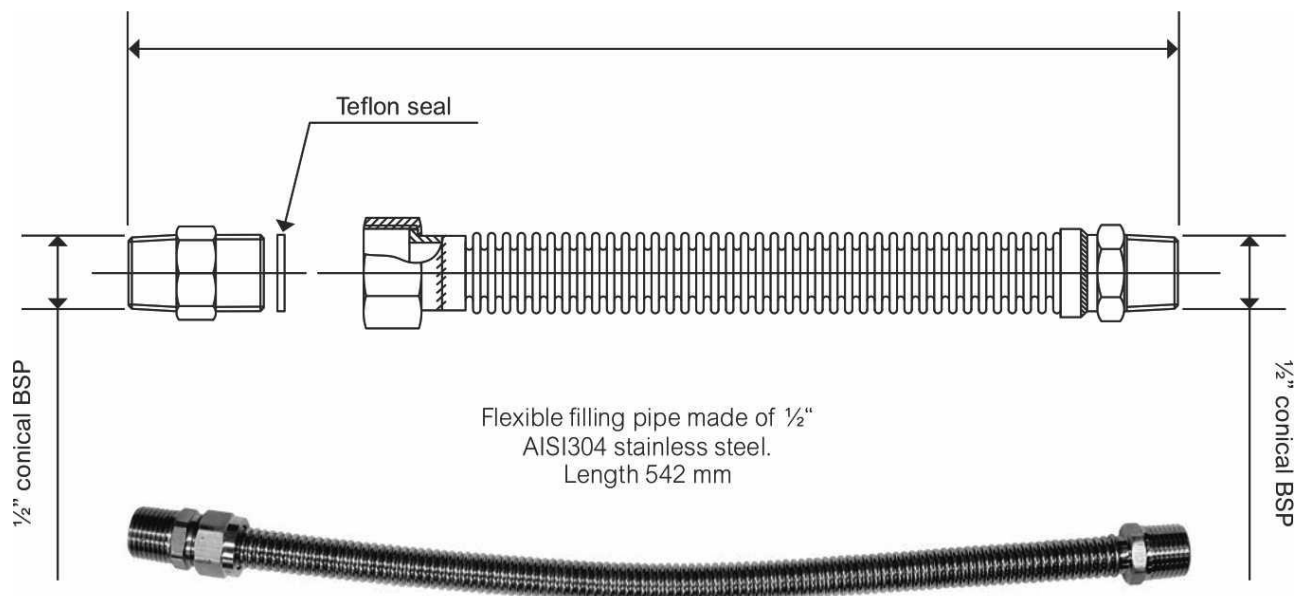
Note: Perform settings on the actuator only in deenergised state.

- 1 Gear disengagement**
Holding button pressed down: Gear is disengaged.
Manual override is possible.
- 2 Form fit adapter**
Turn until edge line **A** displays the desired switching position of the actuator and release button **1**.
- 3 Auxiliary switch**
Turn rotary knob until the arrow points to the vertical line.
- 4 Cable**
Connect continuity tester to S1 + S2 or to S1 + S3.
If the auxiliary switch should switch in the opposite direction, rotate the auxiliary switch by 180°.

Dimensions



13.5 C. Flexible connector for the water supply.

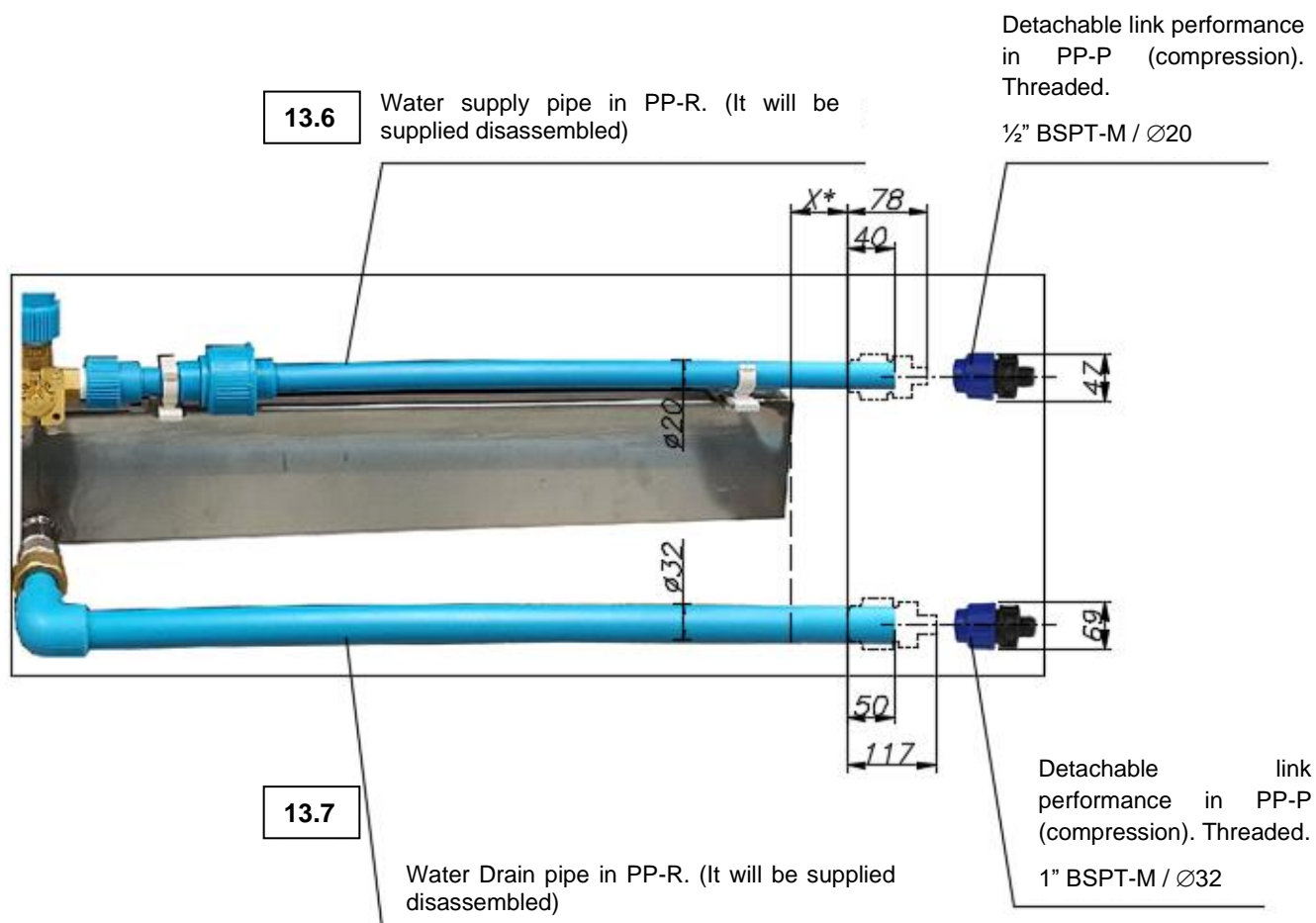


[Remark]: It will be delivered unassembled; it must be connected to the inlet of the float valve in the case of recirculated water. In the case of direct water it will be connected to the input 1/2" BSPT-M. An 1/2" – 3/8" reduction is supplied when the float valve is 3/8".

13.6 D. External rigid connector in PP-R (BSPT-M ½ ") for the water supply.

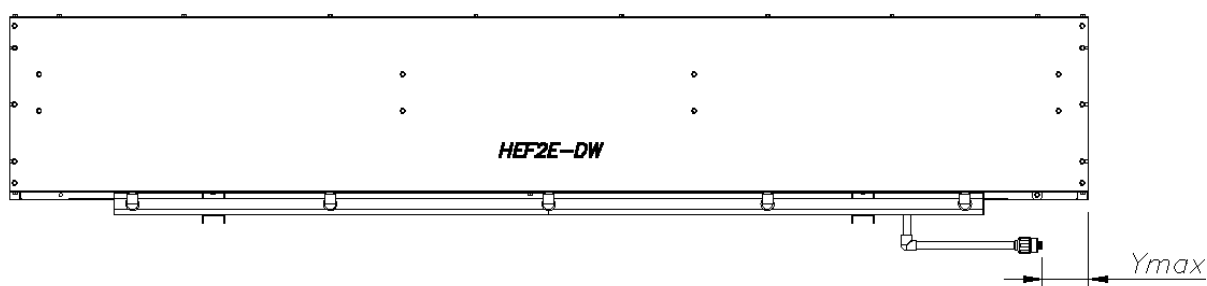
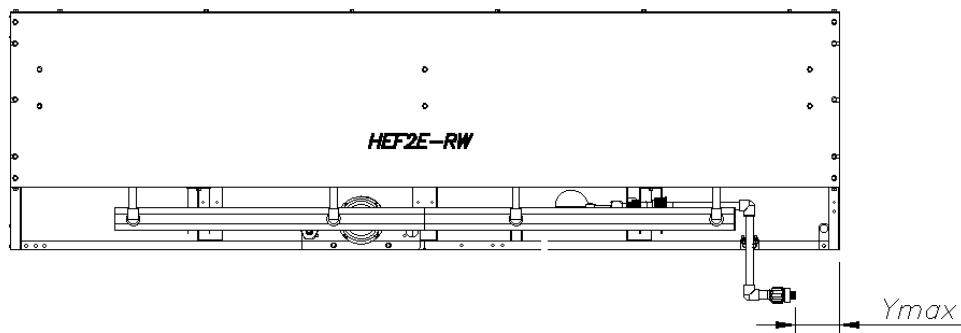
13.7 E. External rigid connector in PP-R (BSPT-M) for draining.

External rigid connector out of the equipment (positive "X"):



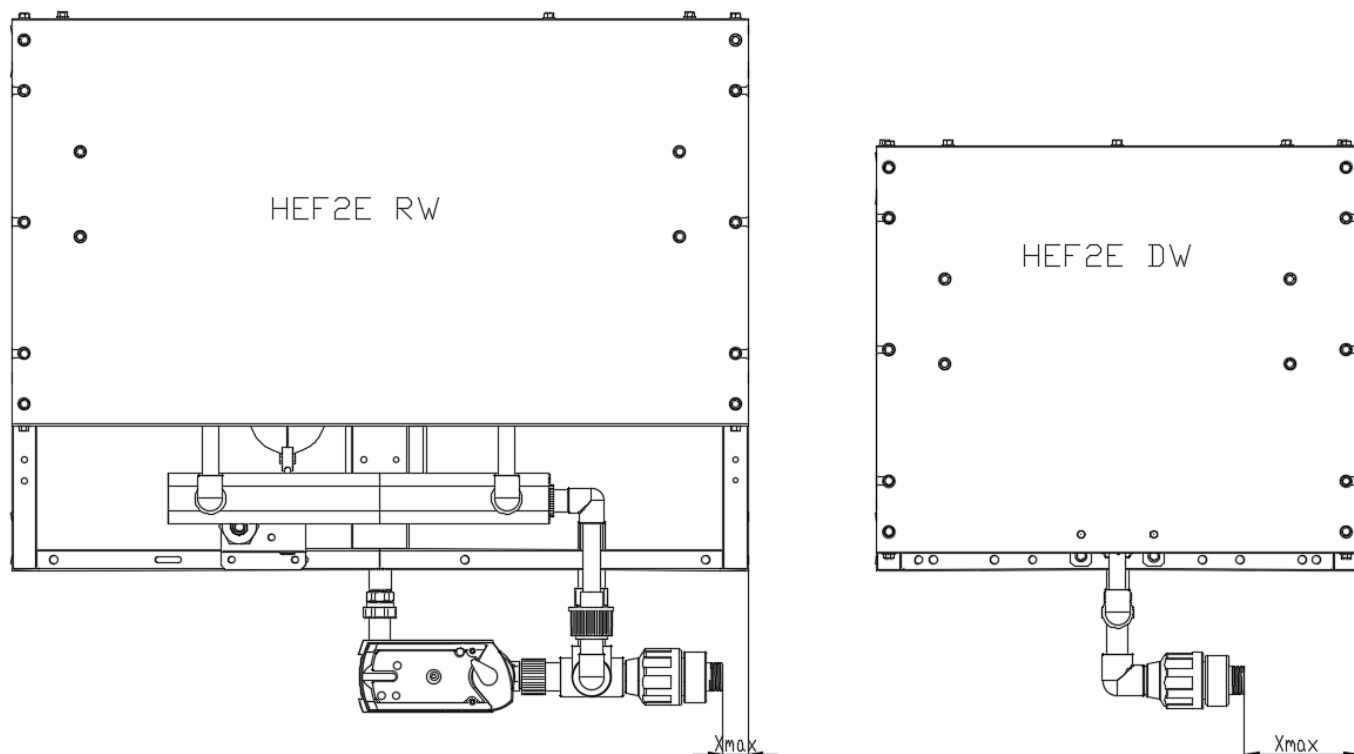
(*) Dimension X to be defined by the client: Positive towards the outside of the basin and negative towards the inside (x for the draining and y for the supply).

External rigid connector into the equipment – Water supply (negative Ymax):



HEF2E RW Length [mm]	Ymax Maximum value [mm]	HEF2E DW Length [mm]	Ymax Maximum value [mm]
570	N/D	570	N/D
670	N/D	670	N/D
770	N/D	770	-65
870	N/D	870	-115
970	-30	970	-165
1070	-80	1070	-215
1170	-130	1170	-265
1270	-180	1270	-315
1370	-230	1370	-365
1470	-280	1470	-415
1570	-330	1570	-465
1670	-380	1670	-515
1770	-430	1770	-565
1870	-480	1870	-615
1975	-530	1975	-665
2075	-580	2075	-715
2175	-630	2175	-765
2275	-680	2275	-815
2375	-730	2375	-865
2475	-780	2475	-915
2575	-830	2575	-965
2675	-880	2675	-1015
2775	-930	2775	-1065
2875	-980	2875	-1115
2975	-1030	2975	-1165

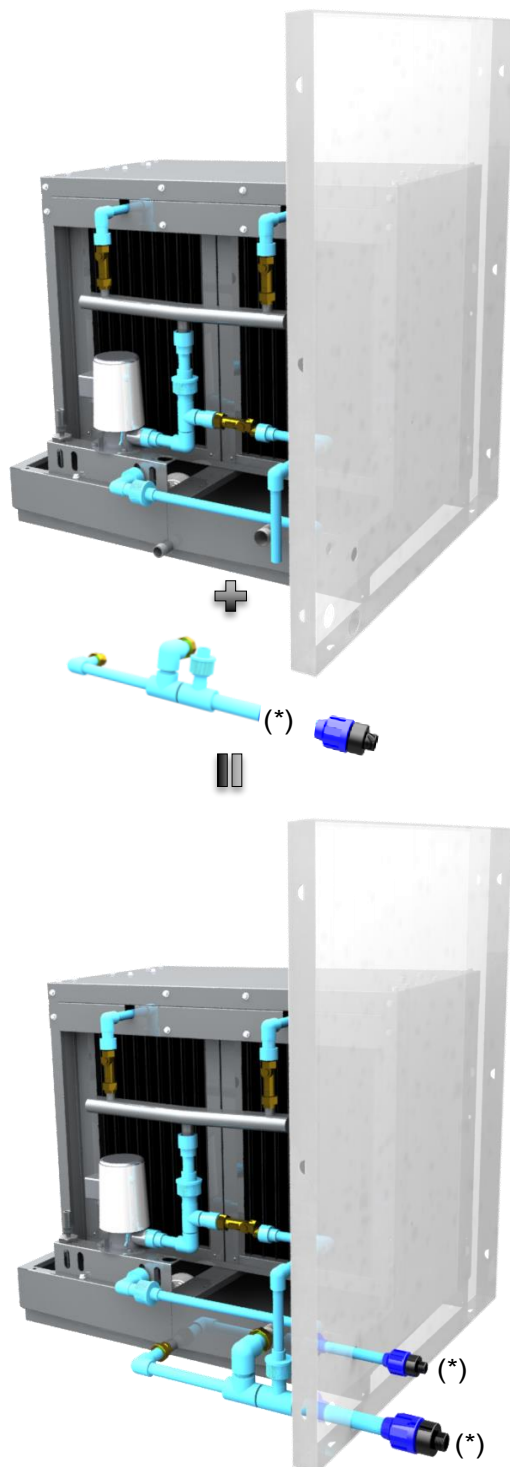
External rigid connector into the equipment - Water draining (negative “Xmax”):



HEF2E RW Length [mm]	Xmax Maximum value [mm]	HEF2E DW Length [mm]	Xmax Maximum value [mm]
570	N/D	570	-125
670	N/D	670	-175
770	N/D	770	-225
870	-30	870	-275
970	-80	970	-325
1070	-130	1070	-375
1170	-180	1170	-425
1270	-40	1270	-475
1370	-90	1370	-525
1470	-140	1470	-575
1570	-190	1570	-625
1670	-240	1670	-675
1770	-290	1770	-725
1870	-340	1870	-775
1975	-390	1975	-825
2075	-440	2075	-875
2175	-490	2175	-925
2275	-540	2275	-975
2375	-590	2375	-1025
2475	-640	2475	-1075
2575	-690	2575	-1125
2675	-740	2675	-1175
2775	-790	2775	-1225
2875	-840	2875	-1275
2975	-890	2975	-1325

Installation of draining external rigid connection:

The draining piping set is delivered disassembled. The overflow and drain links must be screwed together (*):



(*) The piping set must first be inserted through D32 hole in the wall of the AHU or Duct. Once inserted, it must be threaded through the threaded fitting at the overflow and drain connection points. In the case of supply extension, the same procedure is used, with a D20 hole.

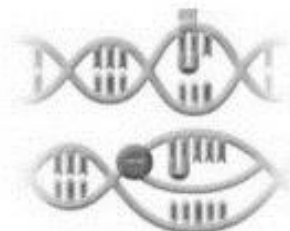
13.8 F. U.V. lamp disinfection system.

ULTRAVIOLET LAMP.

Concerns related to pathogenic organisms in the water causing illnesses and contaminating industrial processes, have led FISAIR S.L.U 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.

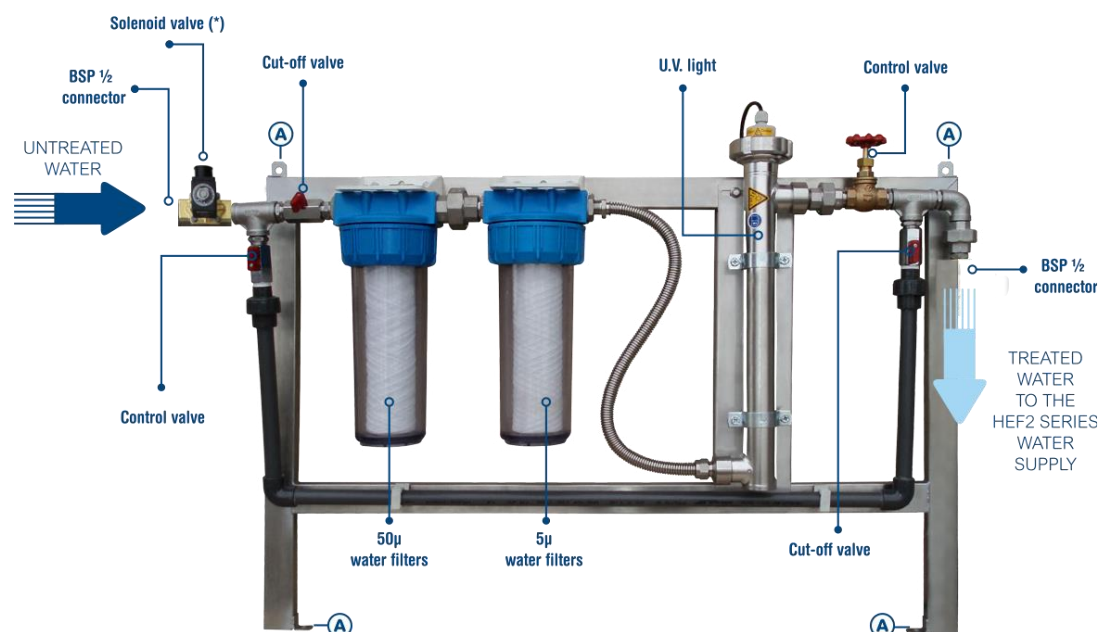
U.V. radiation is one band of the electromagnetic spectrum. It has more energy than visible light. The irradiation of germs presents in the water with U.V. light harms their DNA molecules (figure 1) in a number of ways, which prevents cell division and kills them. The most harmful radiation for germs 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.

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



13.8 F1. External fill/water supply UV lamp disinfection system. (For direct water)

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

Figure 2:
Control panel



The only control panel included as standard is the one that comes with the UV lamp itself. (Figure 2).

The 50µ and 5µ filters are delivered loose for assembly in final installation. Specific key is delivered.

(*) This solenoid valve is not delivered assembled with the optional UV lamp. The solenoid valve is the filling option defined in point 13.1.A. and is delivered loose.

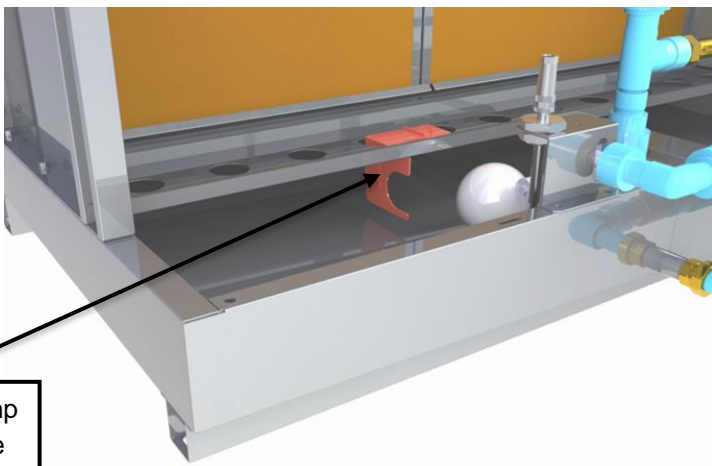
13.8 F2. UV lamp disinfection by immersion at the water basin. (For recirculated water)



Note: Be careful when mounting the UV-C lamp due to the fragility of the quartz crystal of the emitter.

UV-C LAMP INSTALLATION PROCESS

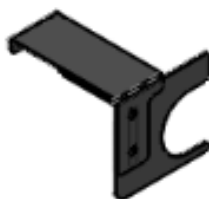
For quartz glass protection, the UV-C lamp is delivered disassembled. It must be mounted and placed on the pre-installed UV-C lamp holder inside the basin.



UV-C lamp supporting plate

Delivered components:

- UV-C lamp + quartz glass enclosure + ballast + wiring, in its box for protection.
- UV-C lamp supporting plate, **pre-installed in the basin**. See point "location of the UV-C lamp(s) according to A=WIDTH HEF2 series.

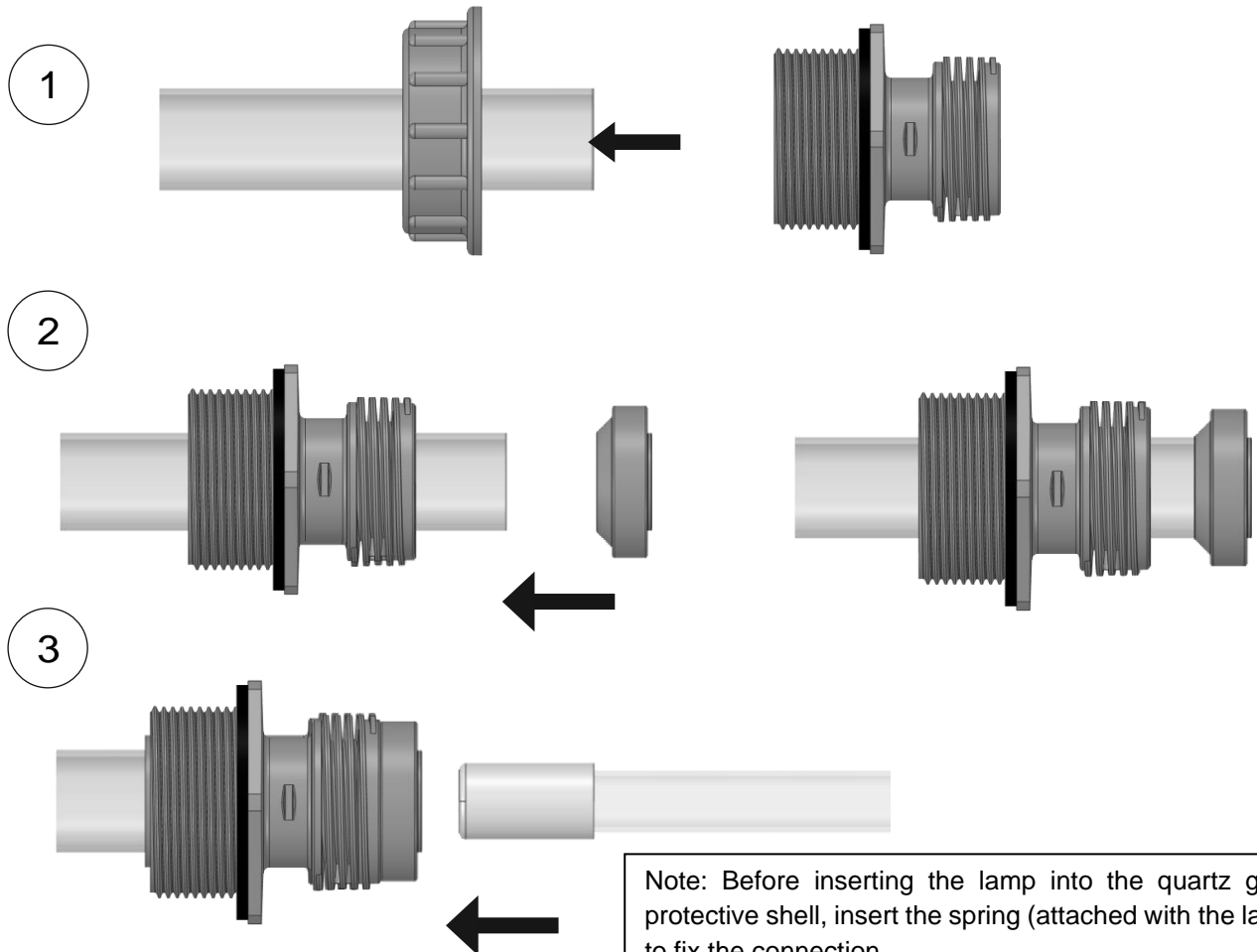
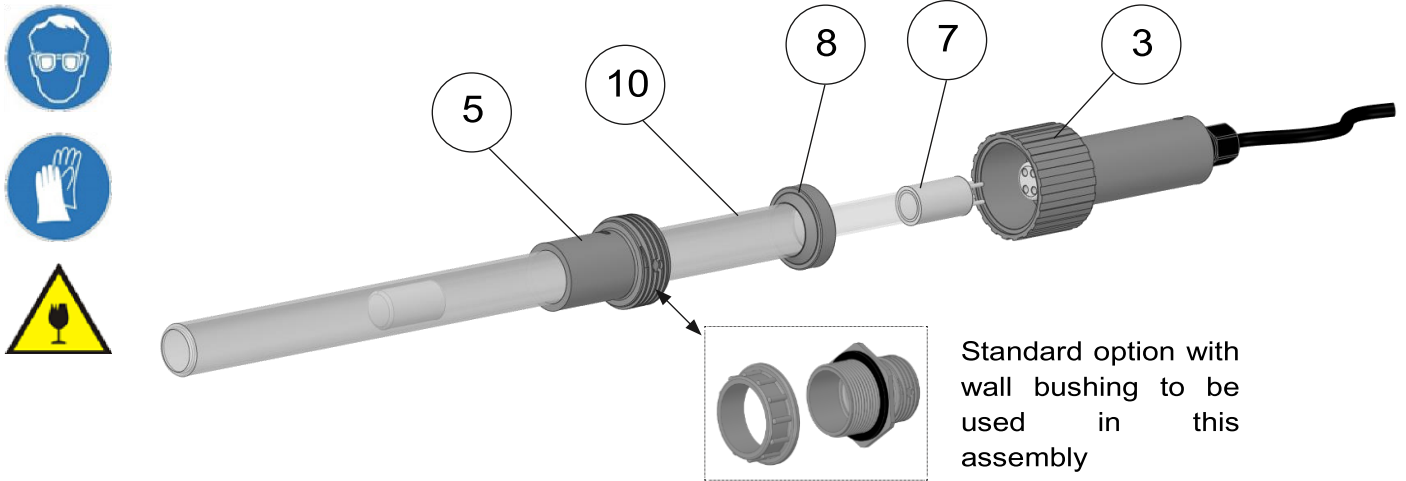


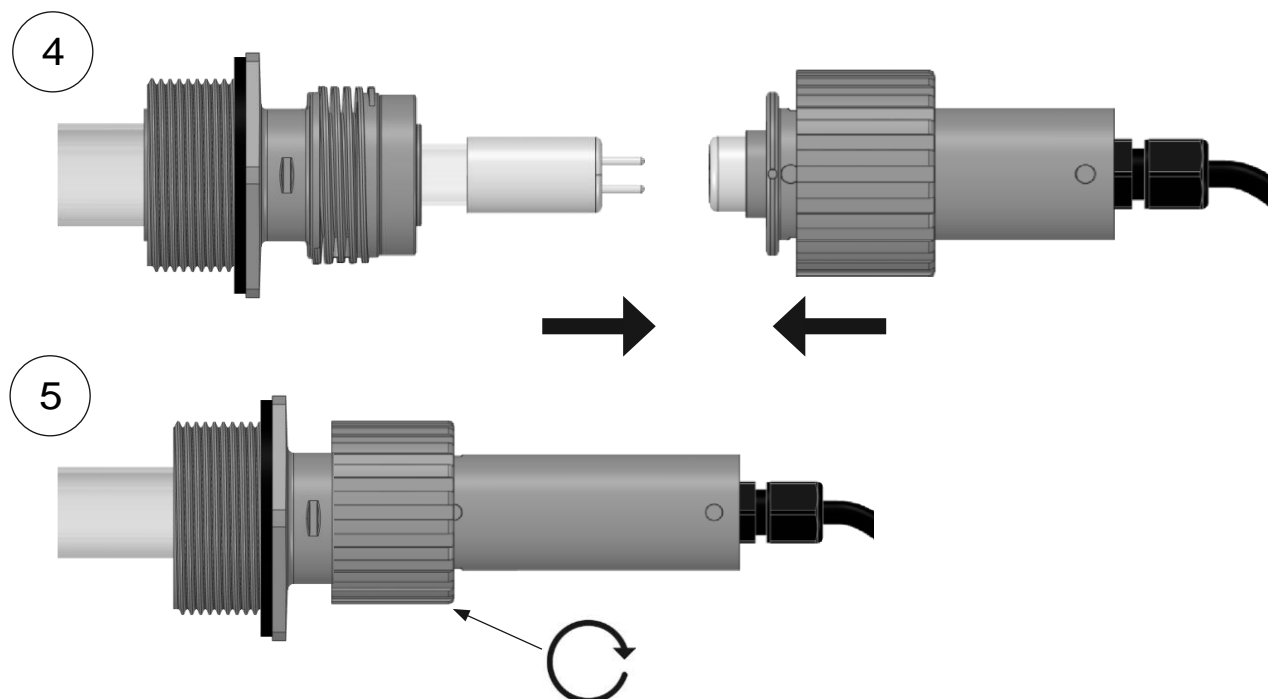
- Ballast support. Pre-installed at the ballast and inside the UV-C box.



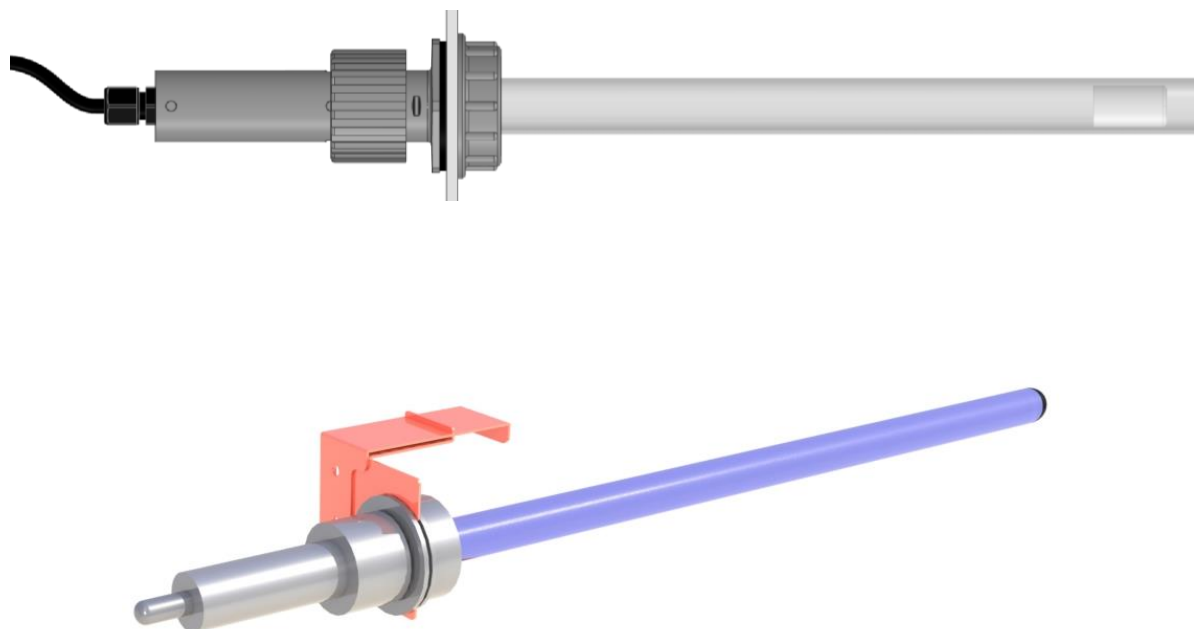
UV-C lamps installation procedure:


1. Mount the lamp following the sequence shown below.

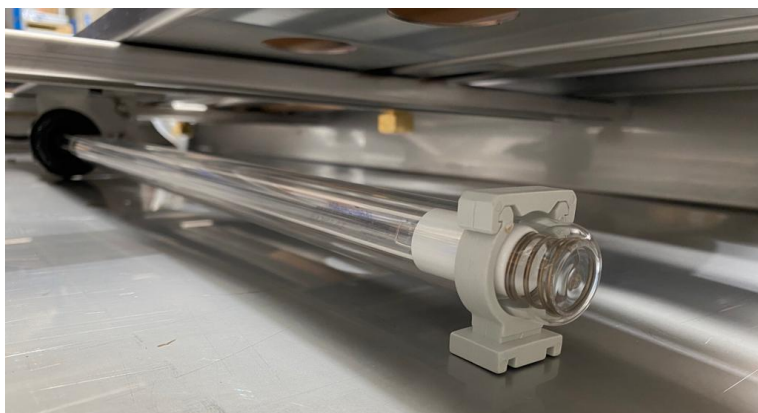




2. Insert the lamp into the basin, placing it on the UV-C lamp supporting plate.



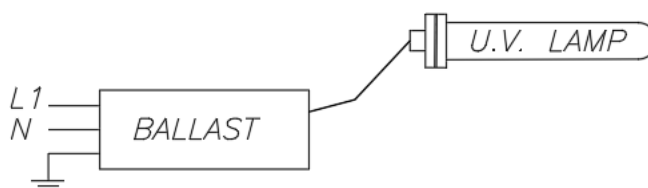
-  **Note:** If the U.V. lamp glass touches the ballast, it will be necessary to install the clamp supplied in the box together with the ballast.



3. Place the ballast in the basin by means of its two hooks. The recommended position of the ballast(s) varies according to A=WIDTH HEF2 series. See point "Ballast location for equipment installed in U.T.A. or Duct".

There is 1 m of cable between the UV-C lamp and the ballast and 10 m of cable between the ballast and the power supply.

4. Connect the power supply of the UV-C lamp to 230V/IN/50Hz.



L1= Line= Brown ; N= Neutral= Blue ; GND= Yellow= Ground

5. In case of using the CCB2.0 basic control panel or CCE2.0 stages control panel, connect the power supply of the lamp to terminals J10. See the manuals MCCB2.0 (basic control board) or MCCE2.0 (step control board) for more information.

BALLAST LOCATION FOR EQUIPMENT INSTALLED IN A.H.U. OR DUCT:

FIGURE 1: Immersion lamp at duct HEF2E systems

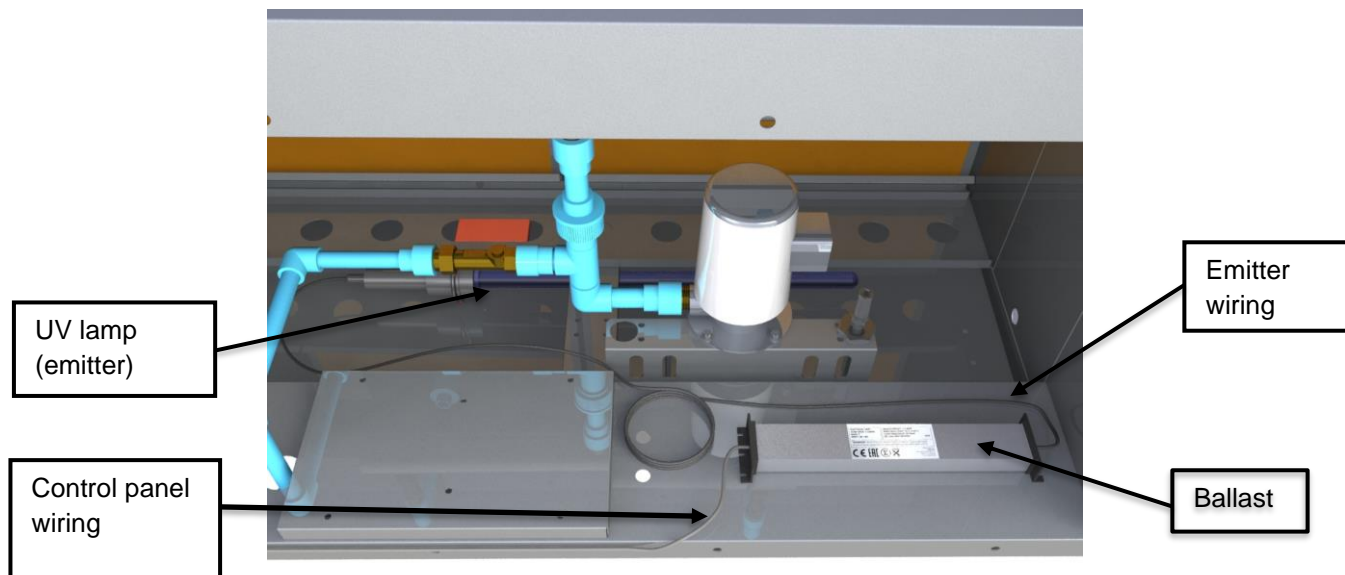
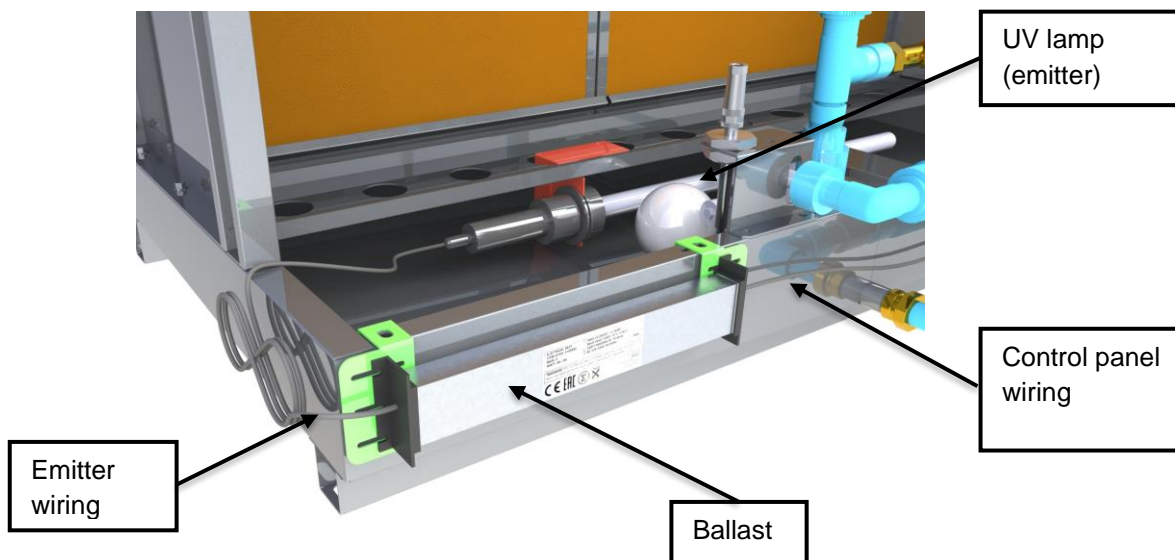




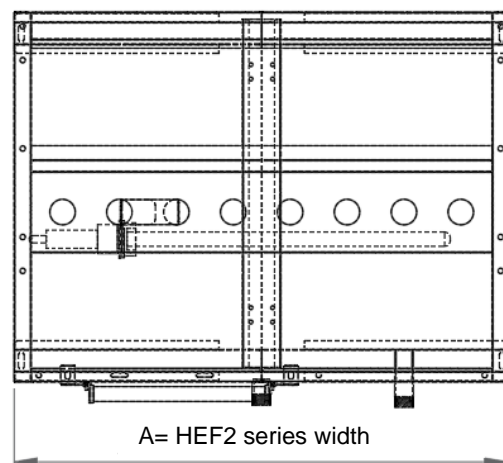
FIGURE 2: Immersion lamp at AHU HEF2E systems



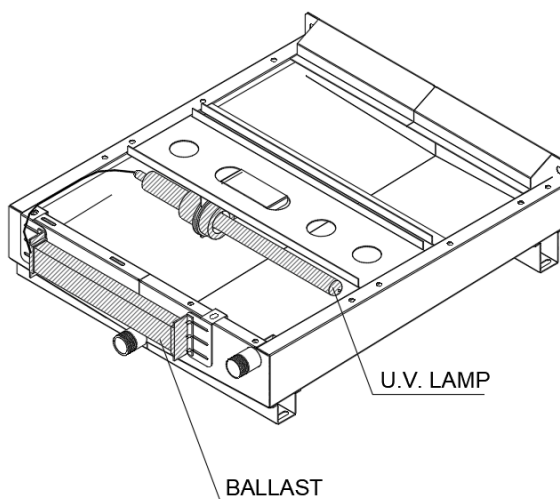
-  **[Remark]:** The ballast can't be introduced into the water of the basin (It has IP65 protection degree).
-  **[Remark]:** The excess cable should always be positioned out of the raft water.

LOCATION OF UV-C LAMP(S) ACCORDING TO A= HEF2 SERIES WIDTH.

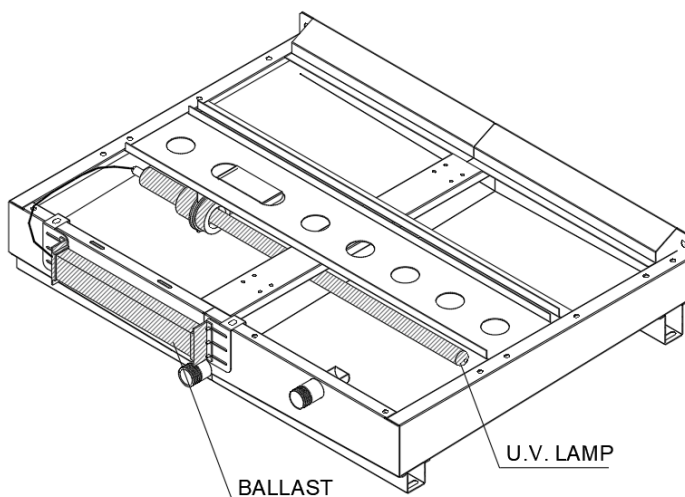
WIDTH "A" [mm]	U.V. LAMP LENGHT [mm]	Nº OF U.V. LAMPS	TOTAL POWER[W]
A ≤ 770	480	1	40
770 < A ≤ 1975	730	1	80
1975 < A	730	2	2x80



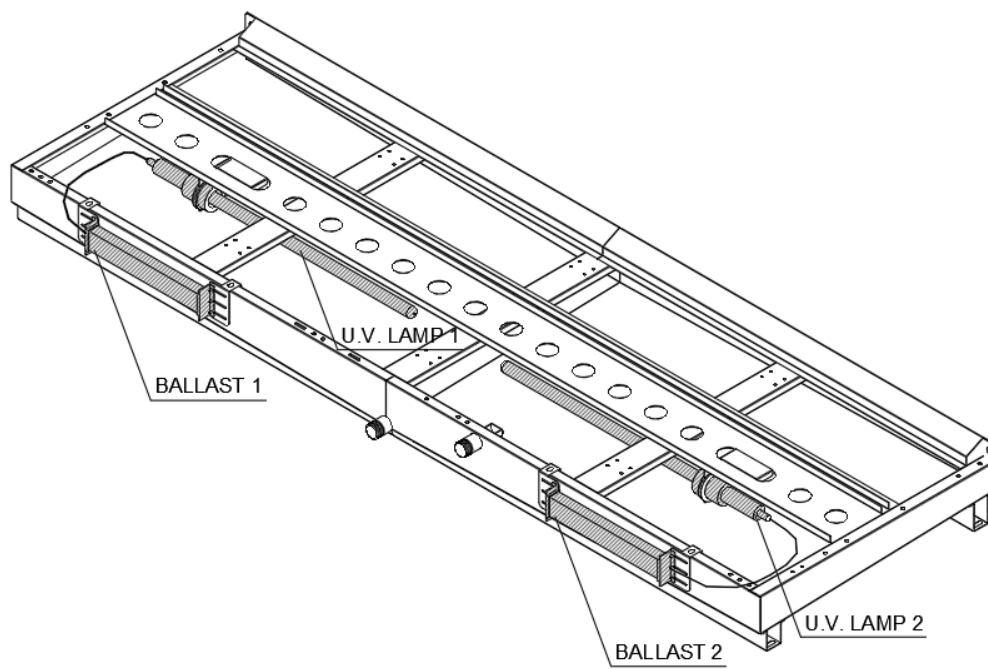
A= HEF2 series width ≤ 770 mm \rightarrow 410 mm emisor U.V. lamp (x1 units)



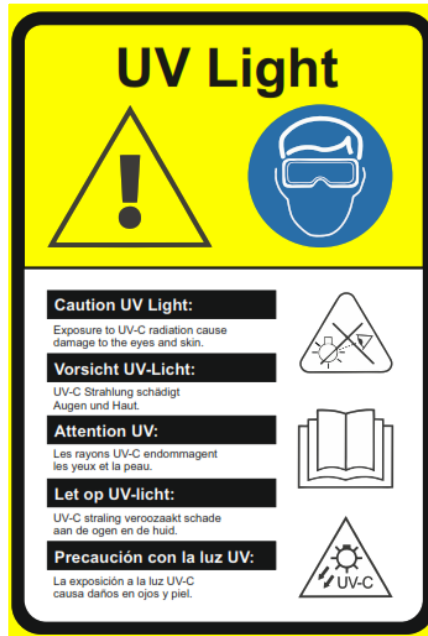
770 mm < A= HEF2 series width ≤ 1975 mm \rightarrow 730 mm emisor U.V. lamp (x1 units)



1975 < A= HEF2 series width → 730 mm emisor U.V. lamp (x2 units)



The optional U.V. lamp is delivered with a loose sticker to locate on the access door of the U.T.A. and another sticker installed on the CCB2.0 or CCE2.0 control panel. (If you do not have a CCB2.0 or CCE2.0 control panel, the safety sticker will be installed to the HEF2E basin):

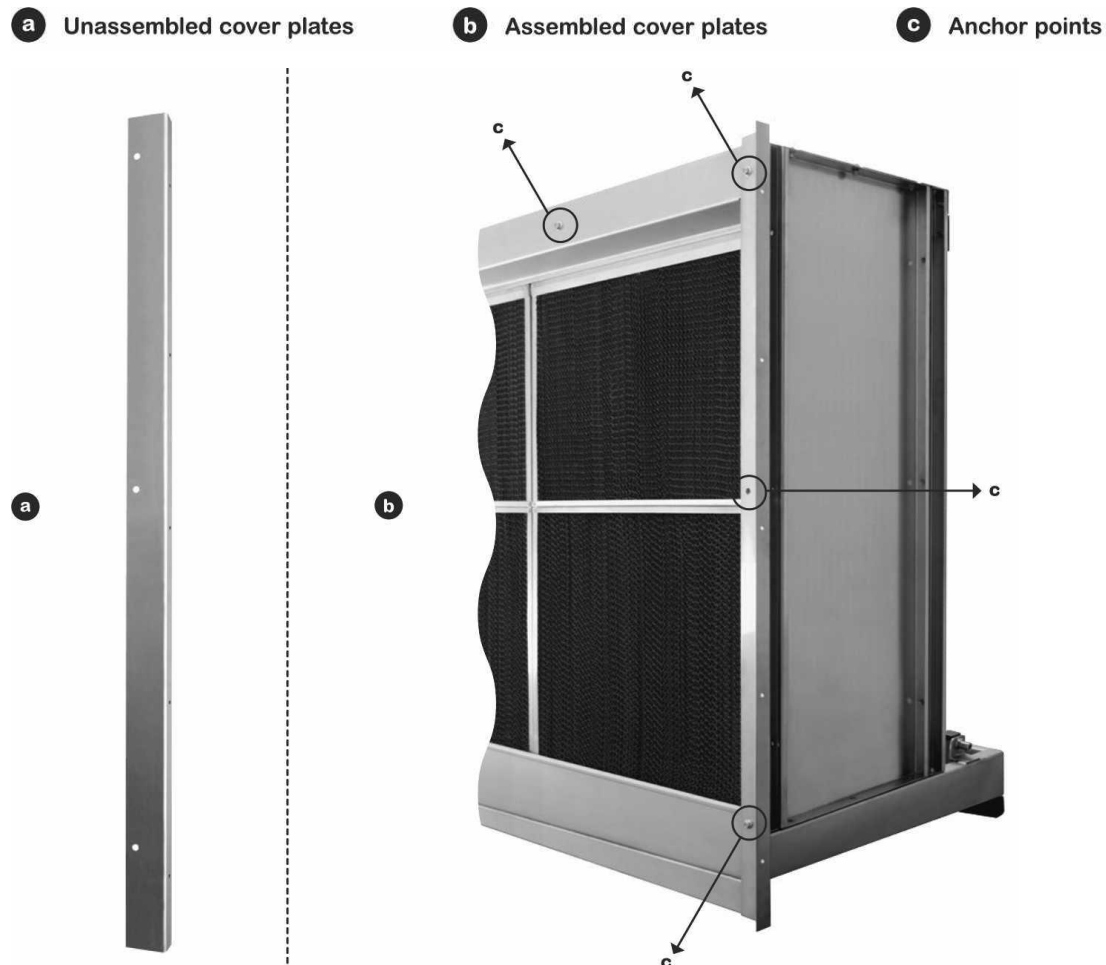


It is mandatory to install a safety switch on the access door to the HEF2E with UV lamp. This safety switch must be electrically interlocked in series with the main power supply of the UV lamp. and it will cut off the power of the U.V.lamp. when the access door to that gives acces to the the HEF2E is opened.

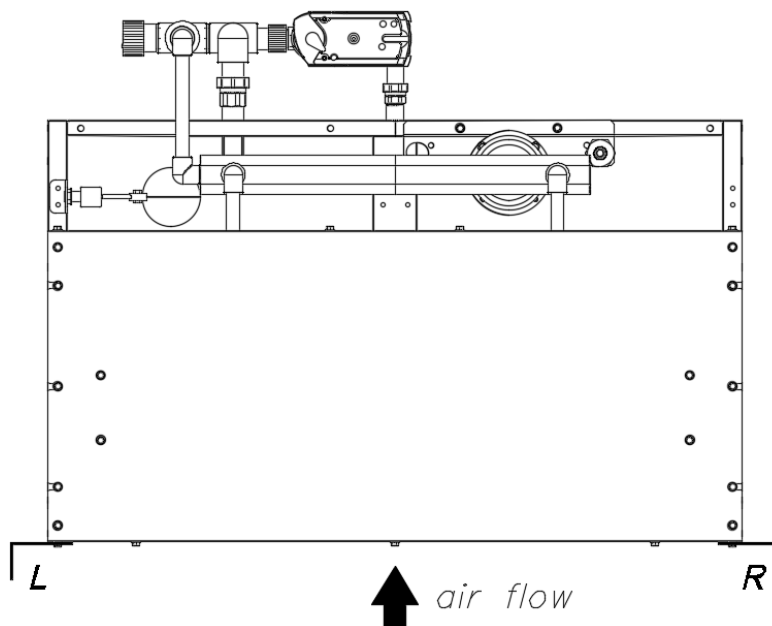
Example of a safety switch for AHU doors:



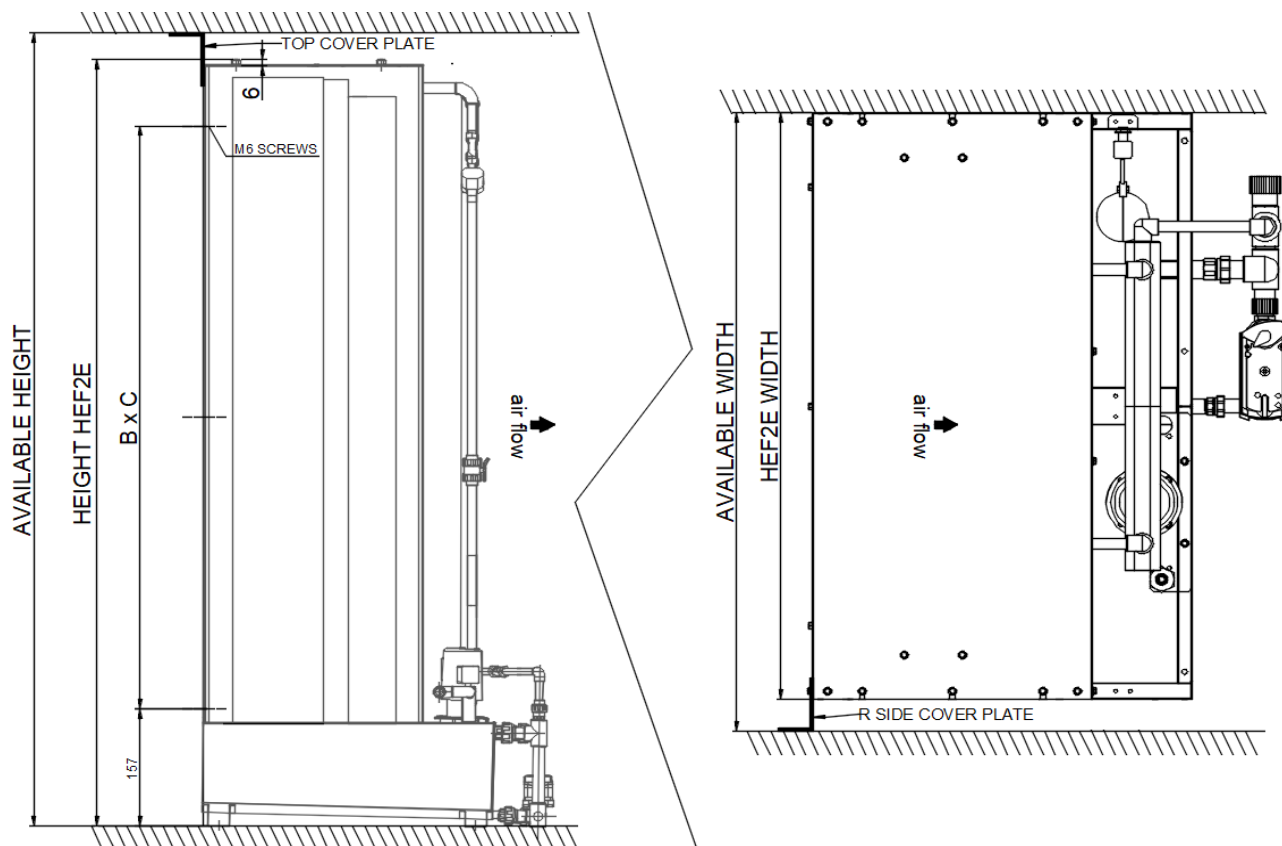
13.9 G. Perimeter closures cover plates & dimensional drawings.



The side joint cover plates can be defined as left side (**L**) or right side (**R**):



Dimensional drawing for union between Side Cover Plates and HEF2.



HEIGHT HEF2E (mm)	B (mm)	C (mm)	HEIGHT HEF2E (mm)	B (mm)	C (mm)
350	1	138,0	1400	3	396,0
400	1	188,0	1450	3	412,7
450	1	238,0	1500	3	429,3
500	2	144,0	1550	3	446,0
550	2	169,0	1600	3	462,7
600	2	194,0	1650	3	479,3
650	2	219,0	1700	3	496,0
700	2	244,0	1750	4	384,5
750	2	269,0	1800	4	397,0
800	2	294,0	1850	4	409,5
850	2	319,0	1900	4	422,0
900	2	344,0	1950	4	434,5
950	2	369,0	2000	4	447,0
1000	2	394,0	2050	4	459,5
1050	2	419,0	2100	4	472,0
1100	2	444,0	2150	4	484,5
1150	2	469,0	2200	5	397,6
1200	2	494,0	2250	5	407,6
1250	2	519,0	2300	5	417,6
1300	3	362,7	2350	5	427,6
1350	3	379,3	2400	5	437,6

Dimensions of side cover plates and AHU joint holes. (valid for right side or left side option side cover plates)

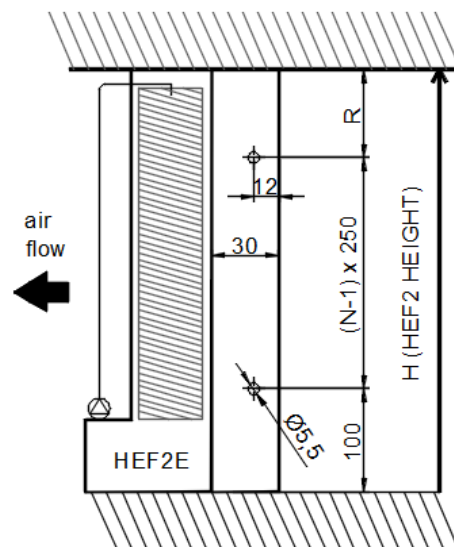
There are "N" holes depending on the height of the equipment. The reminder "R" goes from the last hole to the upper joint cover.

$$N = \frac{H - 100}{250} + 1 \rightarrow R = H - 100 - (N - 1) * 250$$

H = HEF2 height (mm).

N = Number of holes pre-installed in the side cover plate (mm).

R = Remainder (mm)



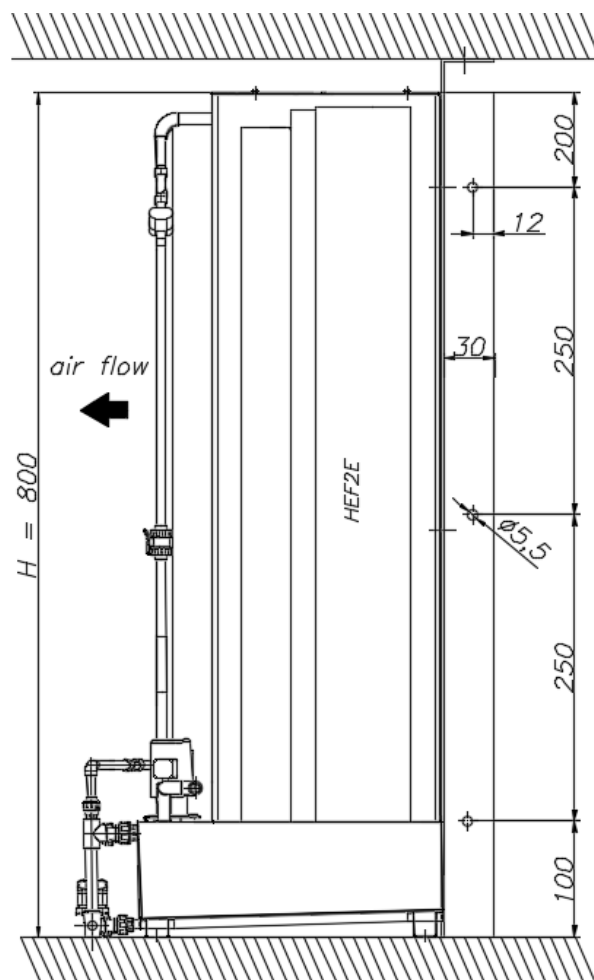
[Remark] = Always round to the lowest whole number:

[Nota] = If the remainder R is <50 mm, the last hole is not made

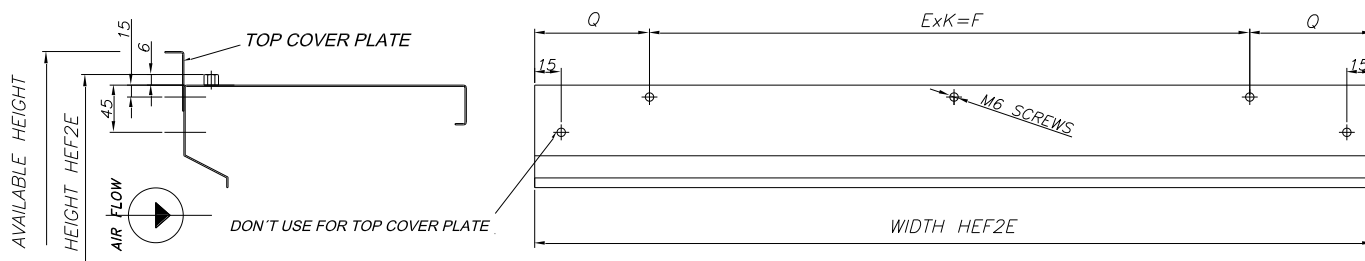
Example for a 800 mm height HEF2:

$$N = \frac{800 - 100}{250} + 1 = 3,8 \rightarrow 3$$

$$R = H - 100 - (N - 1) * 250 = 800 - 100 - (3 - 1) * 250 = 200 \text{ mm}$$

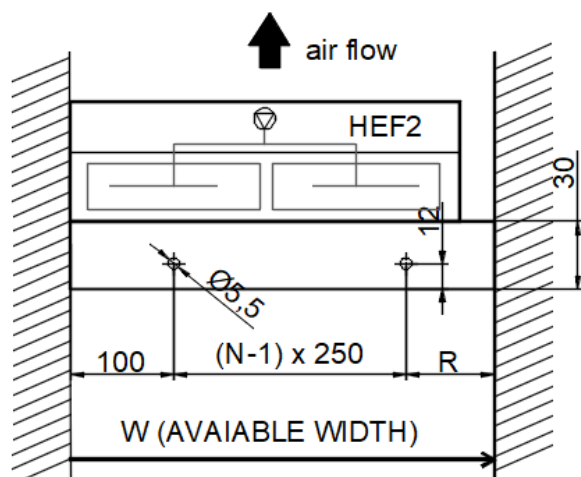


Dimensional drawing for union between Top Cover Plates and HEF2.



WIDTH (mm)	E	K	F	Q	WIDTH (mm)	E	K	F	Q
570	2	200	400	85	1975	4	400	1600	188
670	2	200	400	135	2075	4	400	1600	238
770	2	200	400	185	2175	5	400	2000	88
870	2	200	400	235	2275	5	400	2000	138
970	2	400	800	85	2375	5	400	2000	188
1070	2	400	800	135	2475	5	400	2000	238
1170	2	400	800	185	2575	6	400	2400	88
1270	2	400	800	235	2675	6	400	2400	138
1370	3	400	1200	85	2775	6	400	2400	188
1470	3	400	1200	135	2875	6	400	2400	238
1570	3	400	1200	185	2975	7	400	2800	88
1670	3	400	1200	235					
1770	4	400	1600	85					
1870	4	400	1600	135					

**Dimensions of the holes for the joint between top cover plates and AHU. ("left side" option.
For the "right side" option, apply the symmetrical case)**



There are "N" holes depending on the "W" available width. The reminder "R" goes from the last hole to the right side of the available gap.

$$N = \frac{W - 100}{250} + 1; \rightarrow R = W - 100 - (N - 1) * 250$$

W= Available gap width (mm).

N = Number of holes pre-installed in the top cover plates (mm).

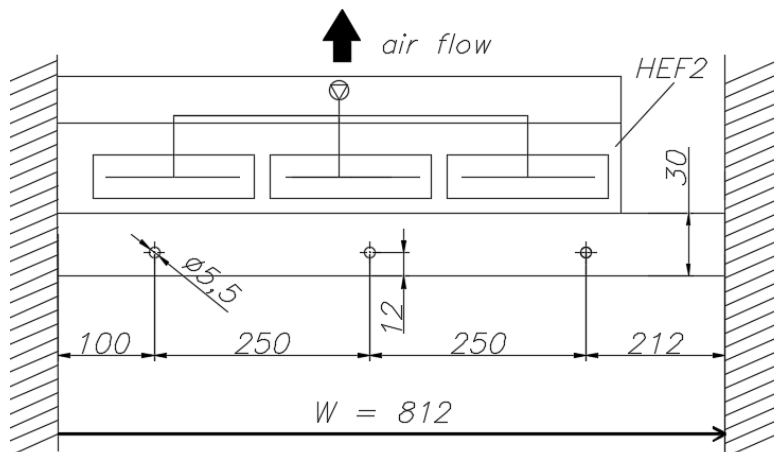
R = Remainder (mm)

[Remark] = Always round to the lowest whole number:

[Nota] = If the remainder R is <50 mm, the last hole is not made

Example for a W=812 mm available gap width:

$$N = \frac{812-100}{250} + 1 = 3,848 \rightarrow 3 \rightarrow R = W - 100 - (N - 1) * 250 = 812 - 100 - (3 - 1) * 250 = 212 \text{ mm}$$



13.10 H. Solenoid valve(s) connection for stage control.

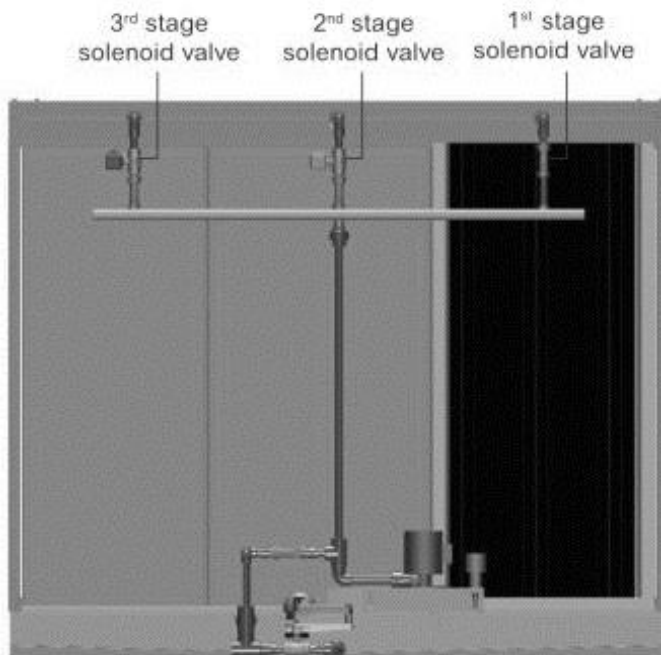


Figure 1: HEF2 series (recirculated water) with 3 stages

CASE 1: (figure 1)

HEF2 series (recirculated water)

As standard, each stage manages the irrigation of 1 cassette with a solenoid valve (*) situated after the regulation water flow balancing valves.

•

The number of stages that we can manage depends on the cassettes numbers and the width of each cassette. (Till the maximum 14 stages per HEF2E)

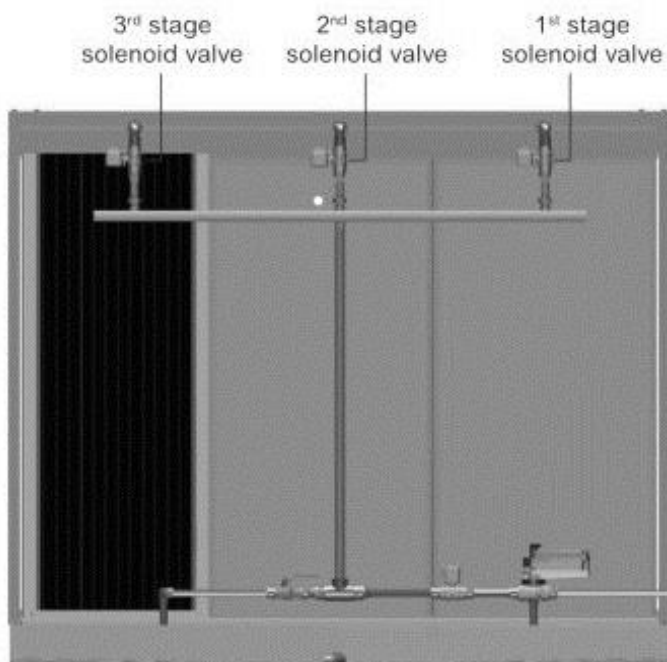


Figure 2: HEF2 series-DW (direct water) with 3 stages.

CASE 2: (figure 2)

HEF2 series (direct water)

As standard, each stage manages the irrigation of 1 cassette with a solenoid valve (*) situated after the regulation water flow balancing valves.

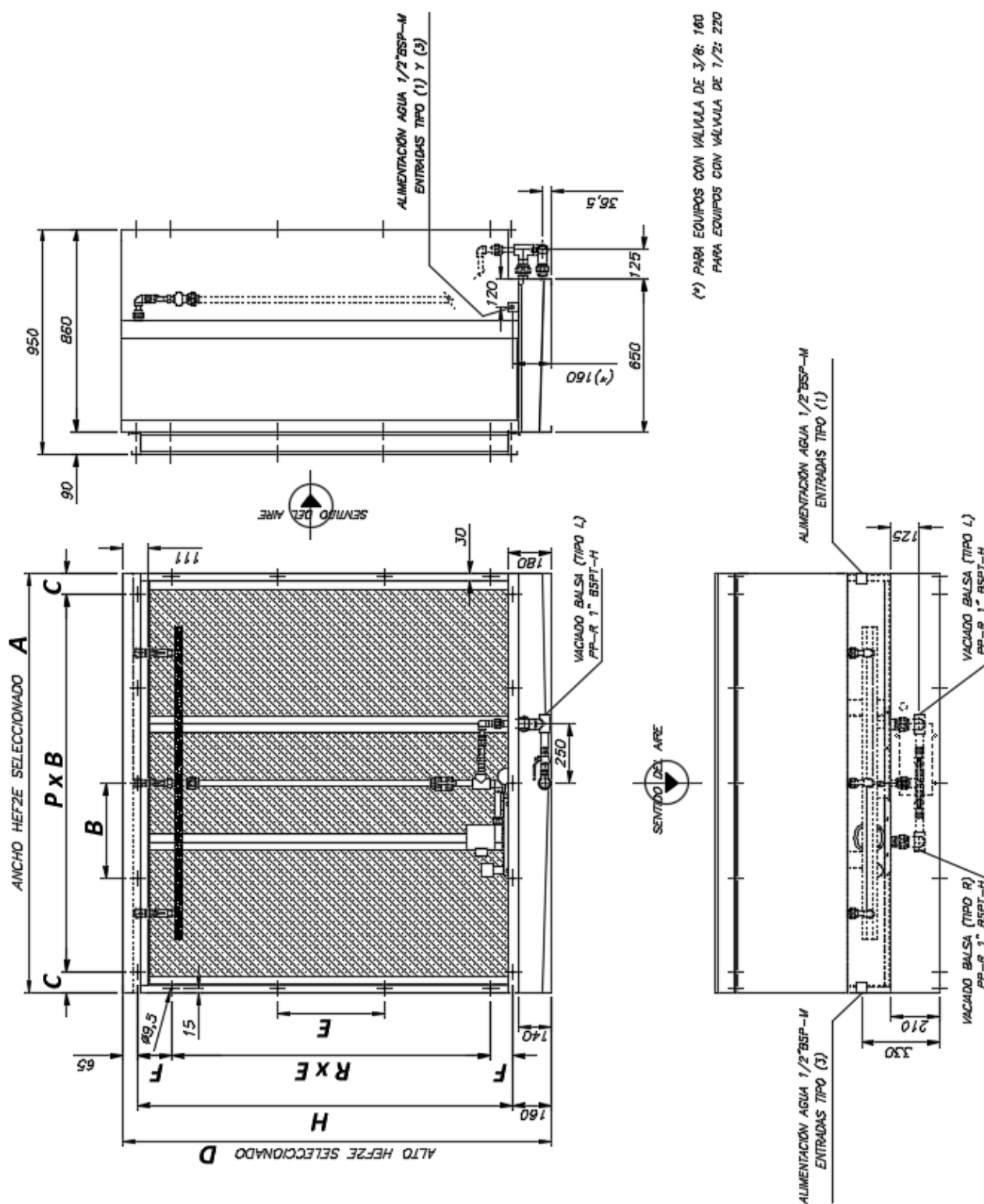
The number of stages that we can manage depends on the cassettes numbers and the width of each cassette. (Till the maximum 14 stages per HEF2E)

(*) To connect the valves, refer to pont 13.3.A.

13.11 J. HEF2 Series for duct

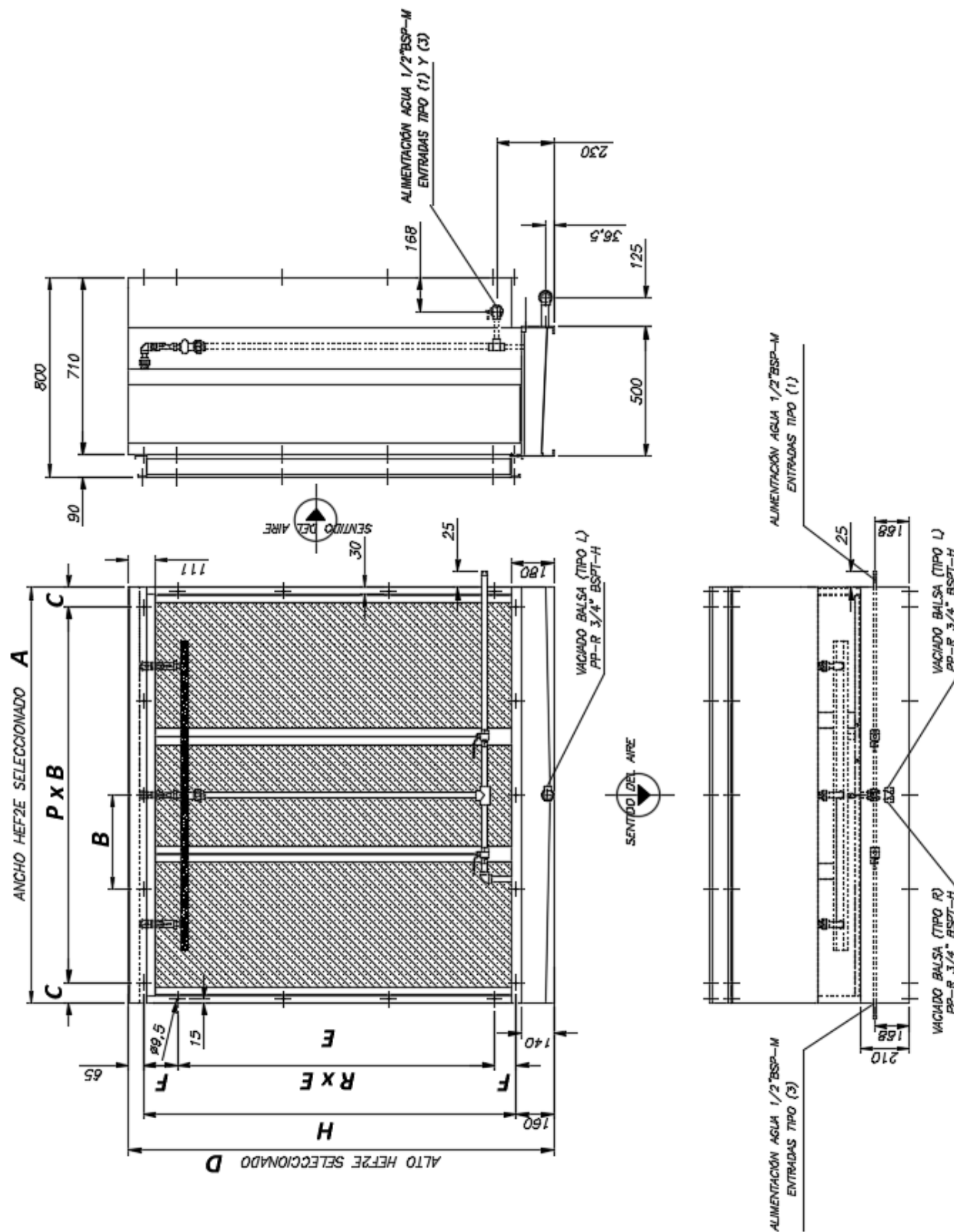
HEF2 SERIES FOR DUCTS (RECIRCULATED WATER)

Main Dimensions + Water supply and basin draining connections



HEF2-DW SERIES FOR DUCTS (DIRECT WATER)

Main Dimensions + Water supply and basin draining connection

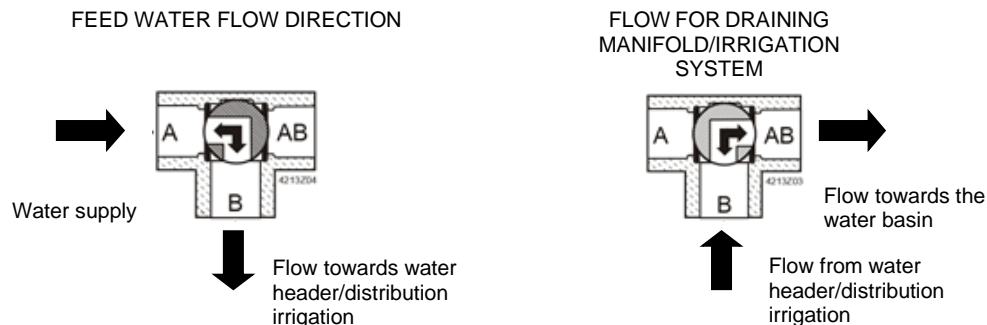



HEIGHT				
"D"	"E"	STEPS "R"	"F"	"H"
400	100	1	32,5	165
450	100	1	57,5	215
500	100	1	82,5	265
550	200	1	57,5	315
600	200	1	82,5	365
650	300	1	57,5	415
700	300	1	82,5	465
750	300	1	107,5	515
800	300	1	132,5	565
850	300	1	157,5	615
900	300	2	32,5	665
950	300	2	57,5	715
1000	300	2	82,5	765
1050	300	2	107,5	815
1100	300	2	132,5	865
1150	300	2	157,5	915
1200	300	3	32,5	965
1250	300	3	57,5	1015
1300	300	3	82,5	1065
1350	300	3	107,5	1115
1400	300	3	132,5	1165
1450	300	3	157,5	1215
1500	300	4	32,5	1265
1550	300	4	57,5	1315
1600	300	4	82,5	1365
1650	300	4	107,5	1415
1700	300	4	132,5	1465
1750	300	4	157,5	1515
1800	300	5	32,5	1565
1850	300	5	57,5	1615
1900	300	5	82,5	1665
1950	300	5	107,5	1715
2000	300	5	132,5	1765
2050	300	5	157,5	1815
2100	300	6	32,5	1865
2150	300	6	57,5	1915
2200	300	6	82,5	1965
2250	300	6	107,5	2015
2300	300	6	132,5	2065
2350	300	6	157,5	2115
2400	300	7	32,5	2165

WIDTH			
" A "	" B "	STEPS P	" C "
570	300	1	135
670	300	1	185
770	200	3	85
870	200	3	135
970	200	3	185
1070	300	3	85
1170	300	3	135
1270	300	3	185
1370	200	5	185
1470	200	5	235
1570	200	5	285
1670	300	5	85
1770	300	5	135
1870	300	5	185
1975	200	9	87,5
2075	200	9	137,5
2175	200	9	187,5
2275	300	7	87,5
2375	300	7	137,5
2475	300	7	187,5
2575	200	11	187,5
2675	200	11	237,5
2775	200	11	287,5
2875	300	9	87,5
2975	300	9	137,5
3075	300	9	187,5

13.12 N Connecting the 3-way motor valve to manage the water feed and emptying of the manifold/water system

ASSEMBLIES
WATER FLOW
DIRECTION

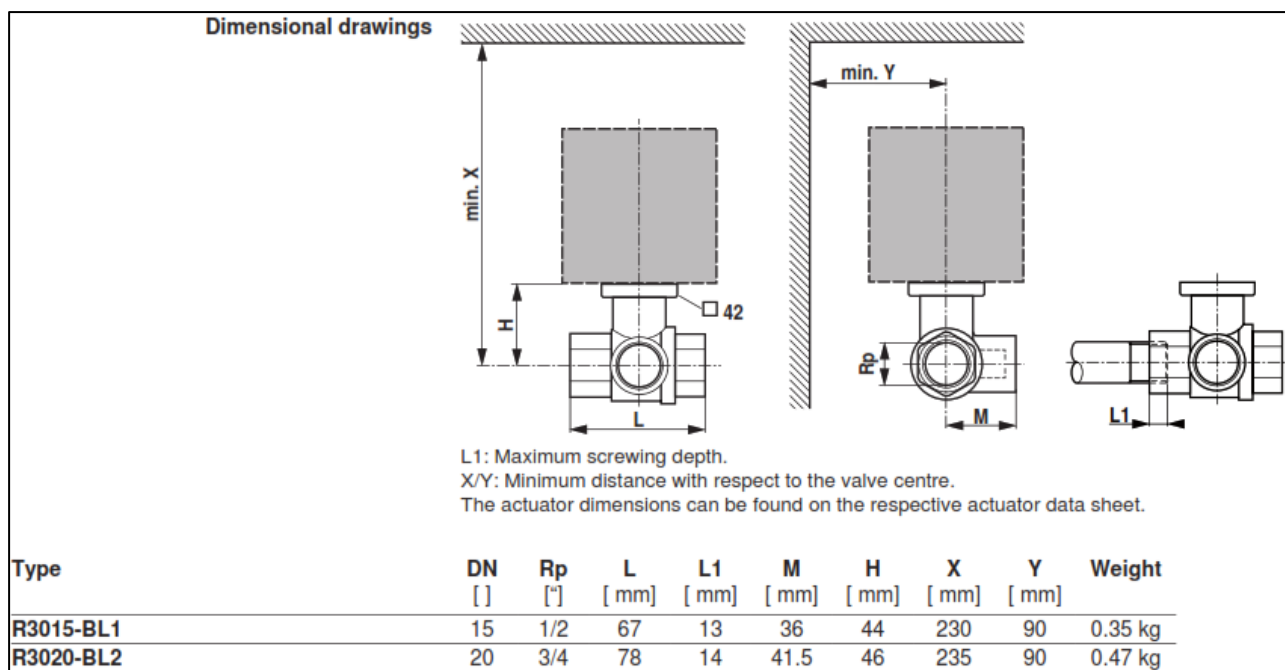


 **[Remark]** = ΔP_{max} 3,5bar. The illustrated 3-way valve works against atmospheric pressure, therefore, when this valve is used, only a water inlet pressure of a maximum of 3.5 bar is allowed.

To manage the water supply and the collector /irrigation system drainage of the HEF2 Series-DW (direct water) the two-point zone motor-valve is mounted. See final part of this section.

Connection of the 3-way motor zone valve to manage the water supply and empty the collector / irrigation system in HEF2-DW (direct water series).

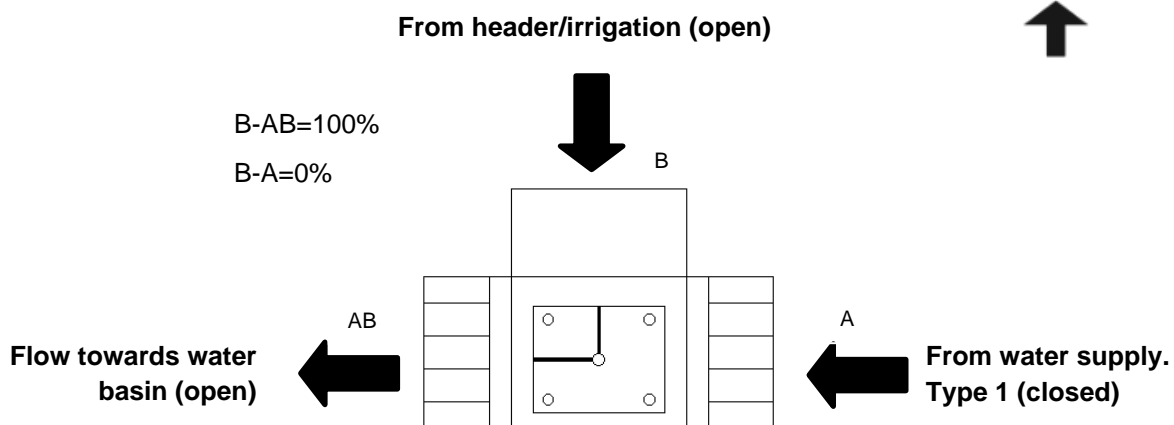
R3015-BL1 and R3020-BL2 3-way valves general dimensions (Brass body):



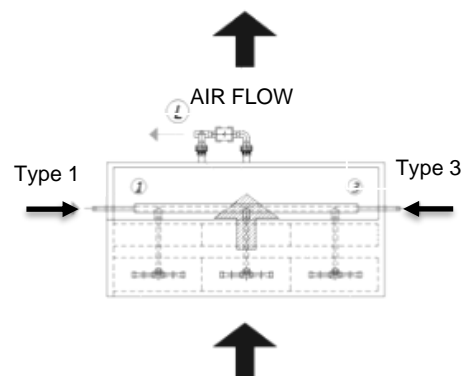
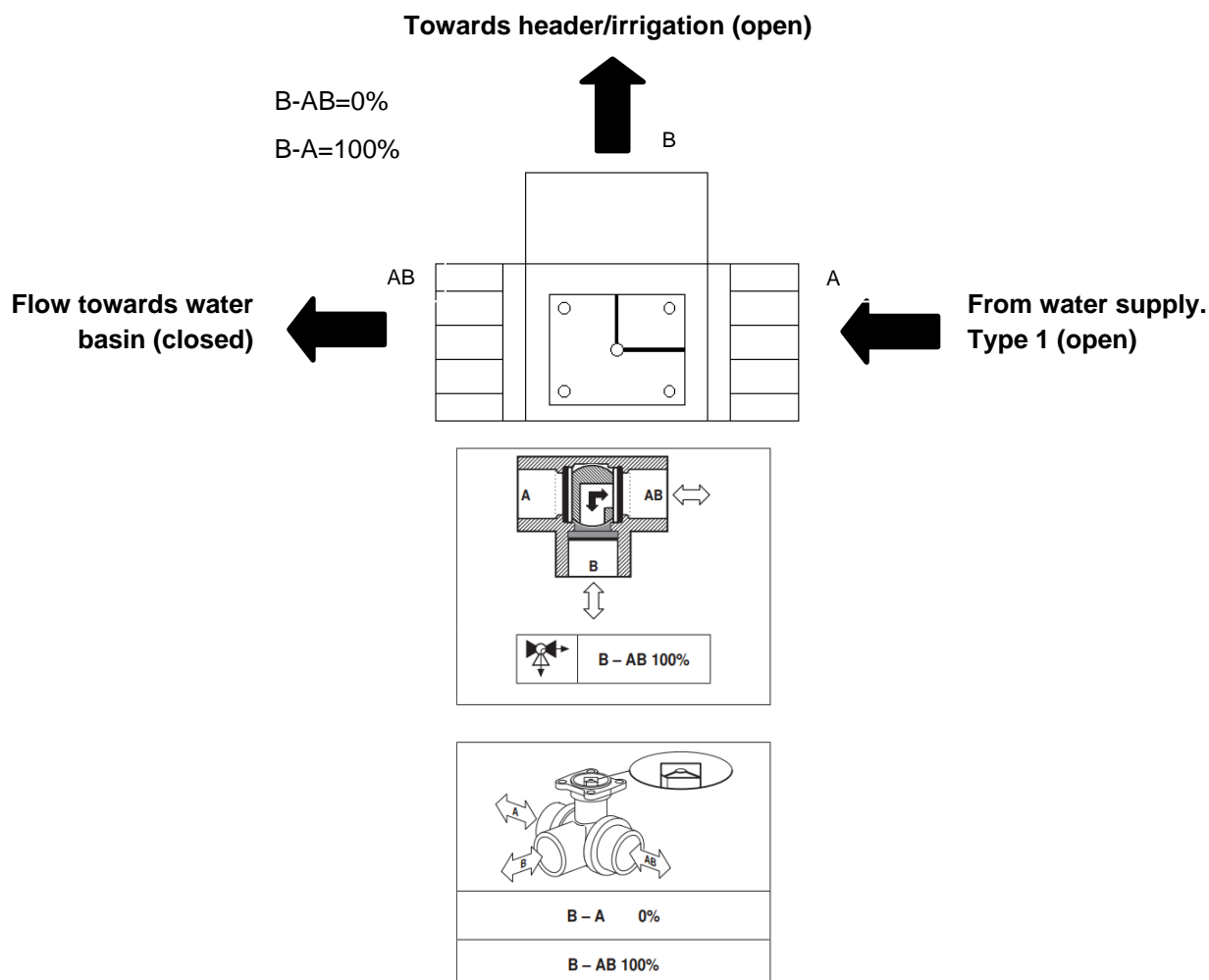
3-WAY VALVE CONNECTION:

Series HEF2 - DW; Type 1 water inlet side:

1. Before turning on, no power (factory settings):

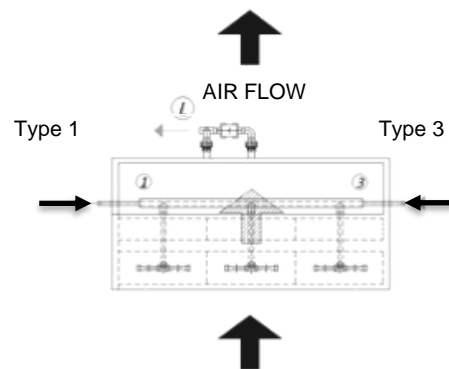
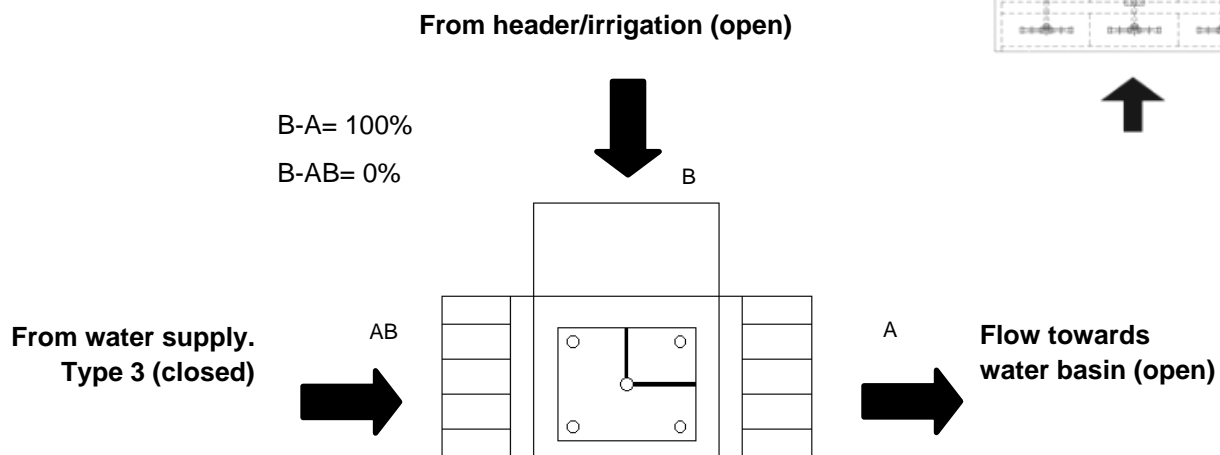


2. After turning on, rotate 90° clockwise:

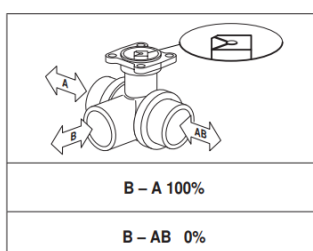
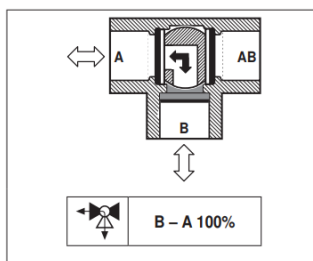
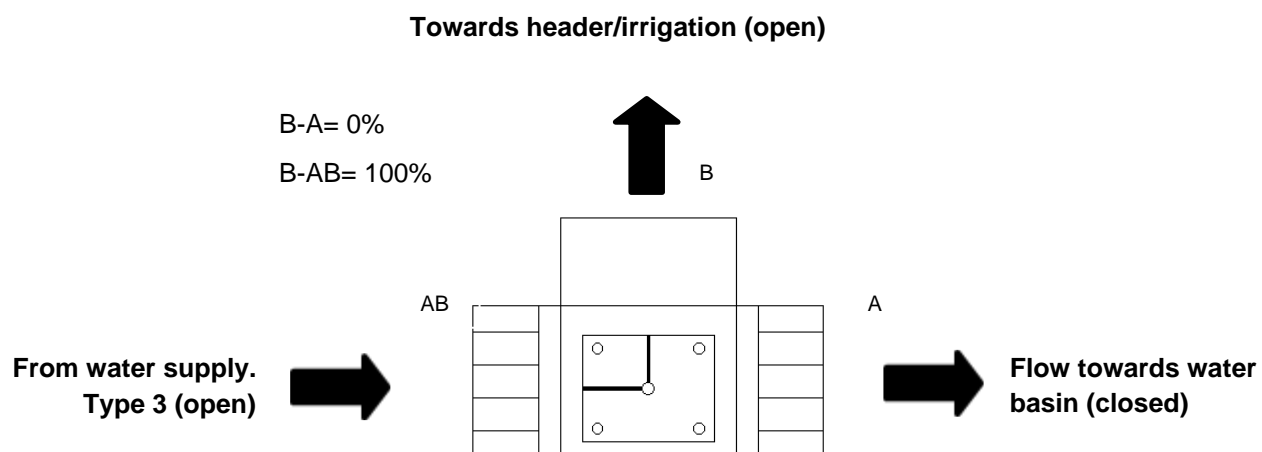


Series HEF2 - DW; Type 3 water inlet side:

1. Before turning on, no power (factory settings):



2. After turning on, rotate counter-clockwise:



DIRECT WATER ACTUATOR

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Nominal voltage range	AC 19.2...28.8 V / DC 21.6...28.8 V
	Power consumption in operation	5 W
	Power consumption in rest position	2.5 W
	Power consumption for wire sizing	7 VA
	Auxiliary switch	2 x SPDT, 1 x 10° / 1 x 85°
	Switching capacity auxiliary switch	1 mA...3 A (0.5 A inductive), AC 250 V
	Connection supply / control	Cable 1 m, 2 x 0.75 mm ²
	Connection auxiliary switch	Cable 1 m, 6 x 0.75 mm ²
	Parallel operation	Yes (note the performance data)
Functional data	Torque motor	4 Nm
	Torque fail-safe	4 Nm
	Direction of motion fail-safe	Deenergised NC, valve closed (A – AB = 0%)
	Manual override	hand lever
	Running time motor	75 s / 90°
	Running time fail-safe	<20 s / 90°
	Running time fail-safe note	@ -20...50°C / <60 s @ -30°C
	Sound power level, motor	50 dB(A)
	Position indication	Mechanical
	Service life	Min. 60'000 fail-safe positions
Safety	Protection class IEC/EN	III Safety Extra-Low Voltage (SELV)
	Protection class auxiliary switch IEC/EN	II reinforced insulation
	Degree of protection IEC/EN	IP54
	EMC	CE according to 2014/30/EU
	Low voltage directive	CE according to 2014/35/EU
	Certification IEC/EN	IEC/EN 60730-1 and IEC/EN 60730-2-14
	Mode of operation	Type 1
	Rated impulse voltage supply / control	0.8 kV
	Rated impulse voltage auxiliary switch	2.5 kV
	Control pollution degree	3
	Ambient temperature	-30...50°C
	Storage temperature	-40...80°C
	Ambient humidity	Max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	1.6 kg



24 VDC voltaje supply

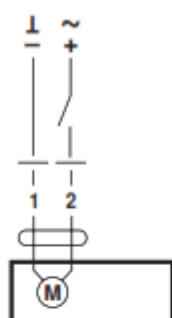
Electrical data	Nominal voltage	AC 230 V, 50/60 Hz
	Power supply range	AC 198 ... 264 V
	Power consumption	Spring return 5 W at nominal torque
		Holding position 3 W
		For wire sizing 7 VA
	Auxiliary switch	2 x SPDT, 3 (0.5) A, AC 250 V II □ Switching points: 10° < fixed, 85° < fixed
	Connection	Motor Cable 1 m, 2 x 0.75 mm ²
		Auxiliary switch Cable 1 m, 6 x 0.75 mm ²
	Parallel connection	Yes (Note performance data for supply!)
Functional data	Torque (nominal torque) Motor	Min. 4 Nm at nominal voltage
		Spring return Min. 4 Nm
	Direction of rotation	LRF230-S Deenergised NC, ball valve closed (A – AB = 0%)
		LRF230-S-O Deenergised NO, ball valve open (A – AB = 100%)
	Manual override	With hand crank, can be fixed in any position
	Angle of rotation	95° < fixed
	Running time	Motor 40 ... 75 s (0 ... 4 Nm)
		Spring return ~20 s at -20 ... 50°C / max. 60 s at -30°C
	Noise level	Motor Max. 50 dB (A)
		Spring return ~62 dB (A)
	Service life	Min. 60'000 emergency settings
	Position indication	Mechanical
	Safety Protection class	II Totally insulated □
	Degree of protection	IP54
	EMC	CE according to 89/336/EEC
	Low voltage directive	CE according to 2006/95/EC
	Mode of operation	Type 1 (to EN 60730-1)
	Rated impulse voltage	4 kV (to EN 60730-1)
	Control pollution degree	3 (to EN 60730-1)
	Ambient temperature range	-30 ... +50°C
	Media temperature	+5 ... +100°C (in ball valve)
	Non-operating temperature	-40 ... +80°C
	Ambient humidity range	95% r.H., non-condensating (to EN 60730-1)
	Maintenance	Maintenance-free
Dimensions / Weight	Dimensions	See «Dimensions» on page 2
	Weight	Approx. 1.4 kg (without ball valve)



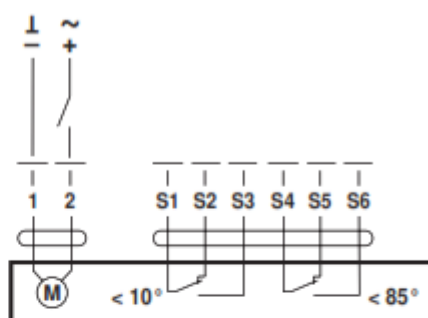
230 VAC voltaje supply

Wiring diagram

AC 24 V

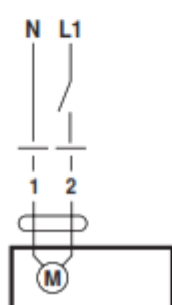


LRF24 (-O)

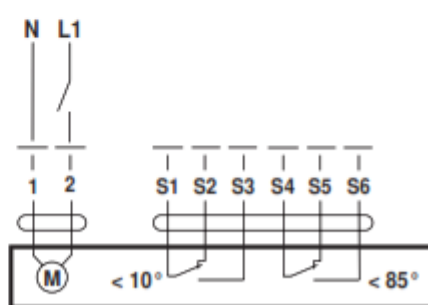


LRF24-S (-O)

AC 230 V

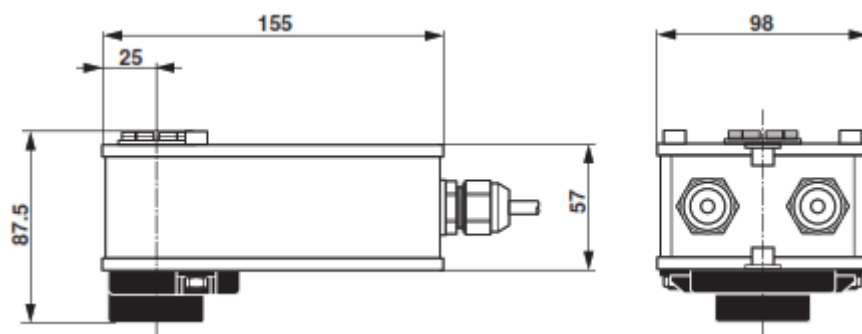


LRF230 (-O)



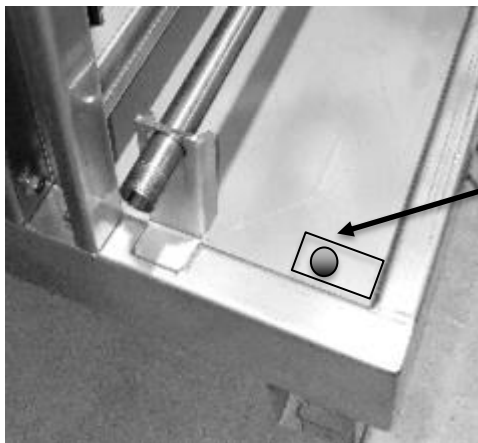
LRF230-S (-O)

Dimensiones



13.14 I and P Control panel (P stages) with conductivity control

Location of conductivity probe on the deposit:



Conductivity probe in position with 2 m cable*. When you have the float valve installed inside the basin.

(*) Conductivity probes are delivered with our CCB2.0 and CCE2.0 panels. Optionally, they can be served with a 5 m cable.

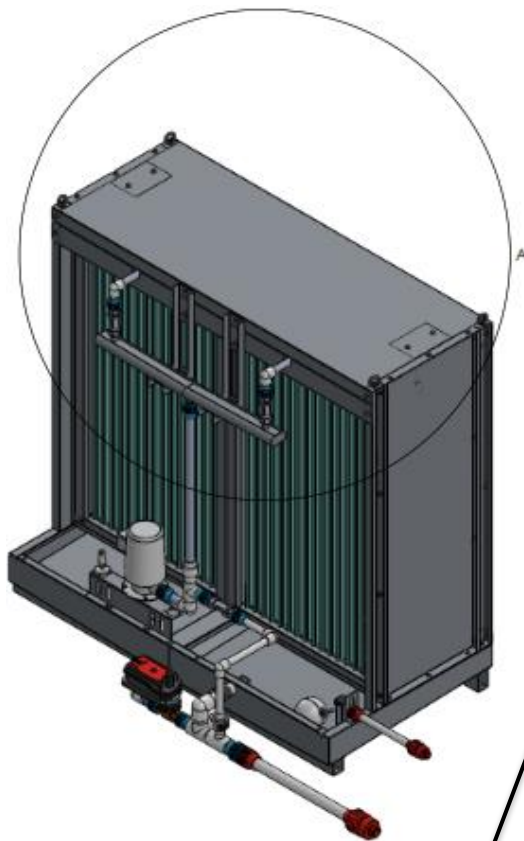
For more information, consult the following manuals:

- CCB2.0 Manuals (without stages)
- CCE2.0 Manuals (with stages)

13.15 Q Anchor eyebolts

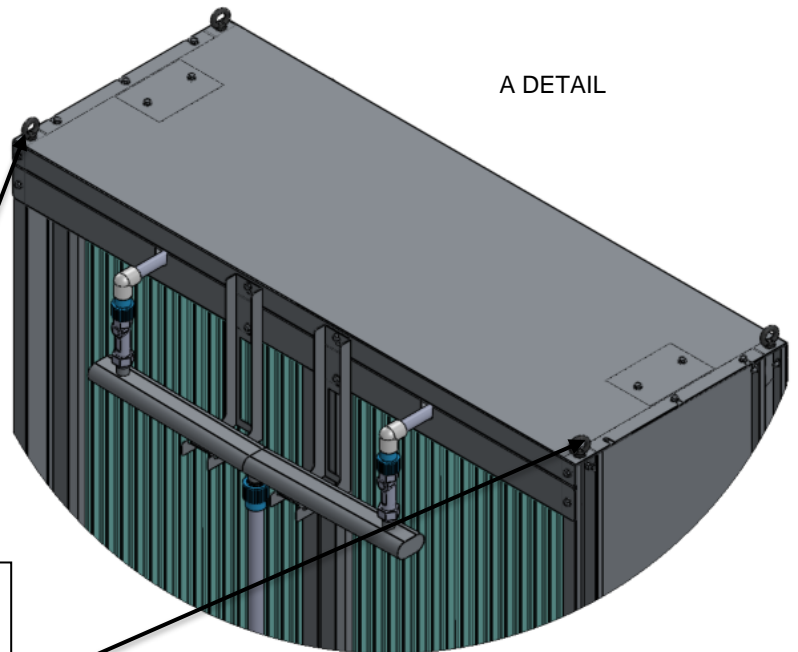
1. Anchor eyebolts for a basin width from 570 mm to 2775 mm, both included.

The equipment has 4 male eyebolts for optional lifting during transport. The eyebolts are threaded and are removable.



Male eyebolt (x4)

A DETAIL



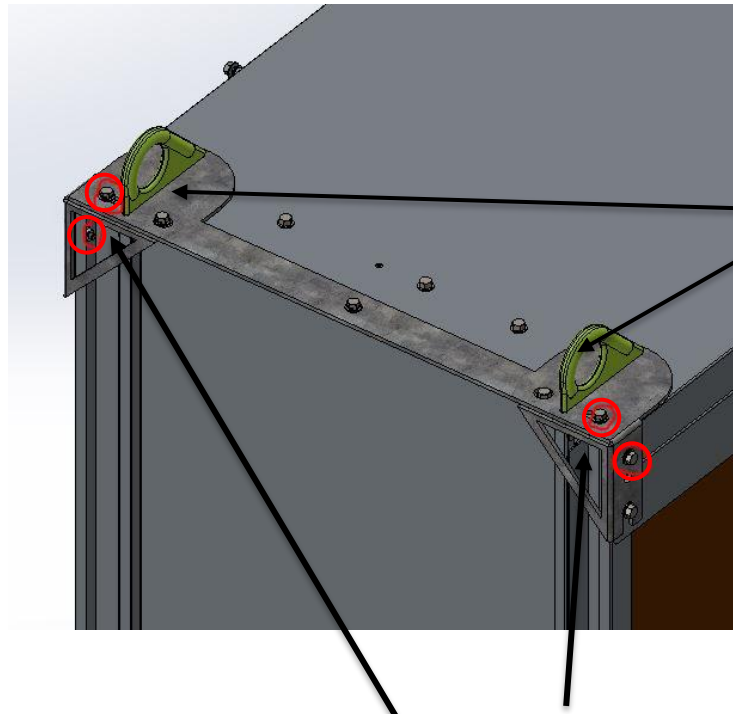
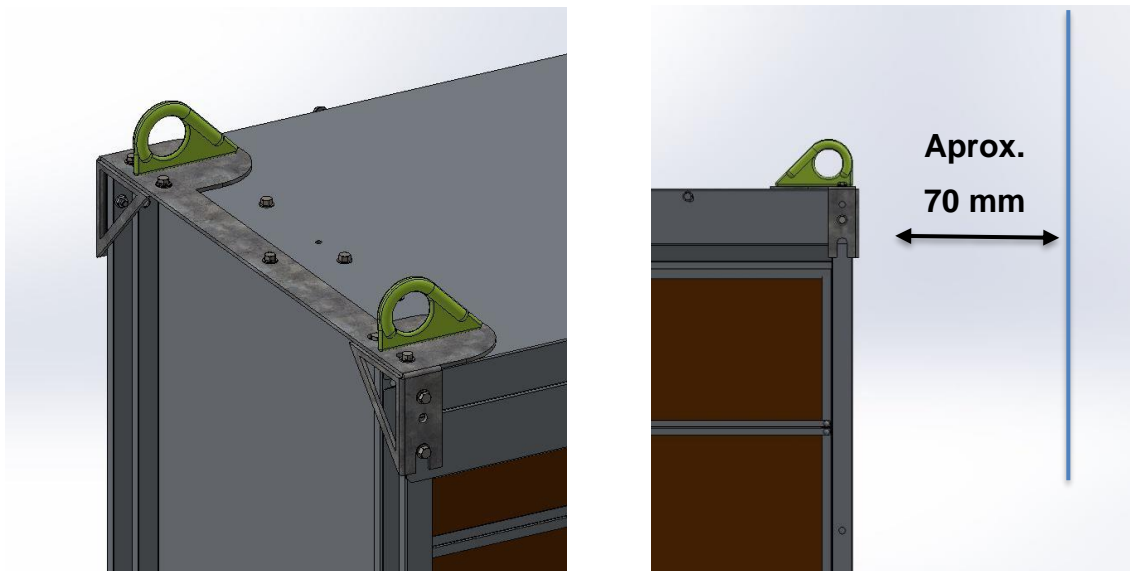
Important: The use of the four side eyebolts is mandatory for any lifting of this equipment.



Note: Lifting eyebolts valid for transport and final location lifting only, not valid for operational use.

2. Anchor eyebolts for a basin width from 2875 mm to 2975 mm, both included.

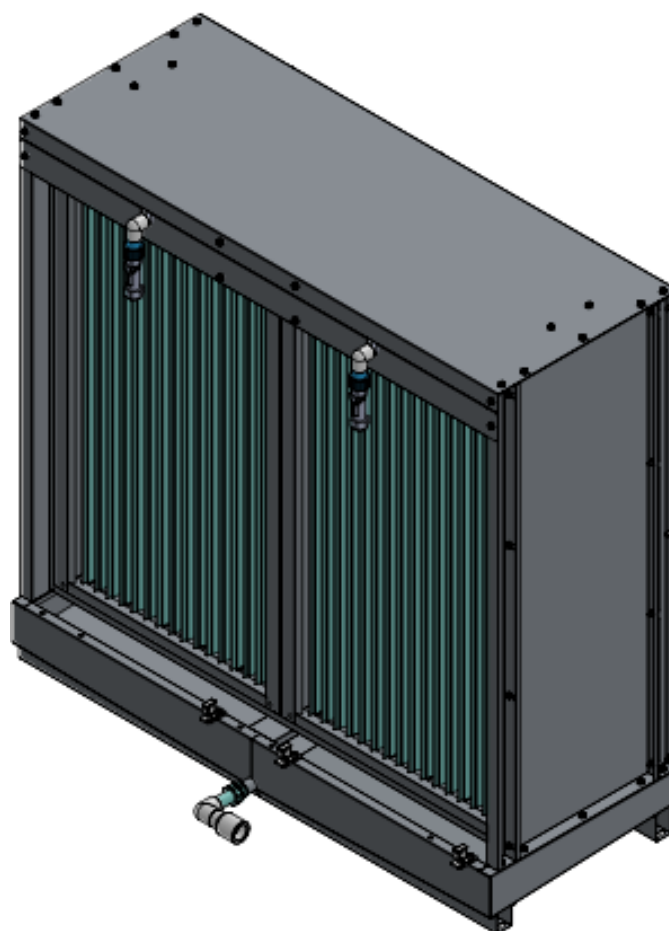
It is advisable to lift the equipment using an H-shape structure that allows the force to be applied vertically on each of the 4 canals as shown below:



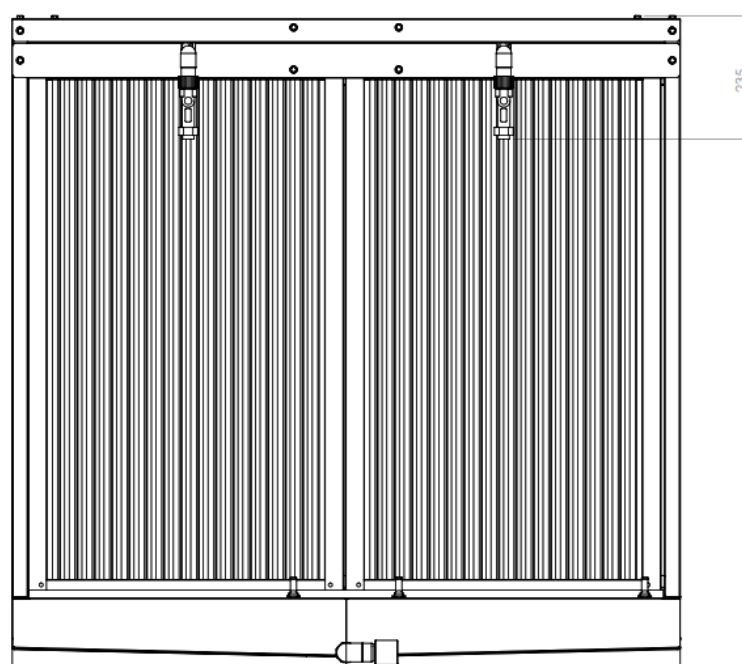
Important: The use of the four side eyebolts is mandatory for any lifting of this equipment.

Remark: Leave a clearance of 70mm, as shown in the image above, to allow for the removal of the eyebolt bolts shown. It can then be put in place.

13.16 R HEF2E-DW without collector



The inlet water regulation valve is at the height indicated below:



14. WATER QUALITY, AIR QUALITY AND MAINTENANCE CONDITIONS

Water quality, air quality and maintenance conditions for the FISAIR high efficiency inorganic panel reaches 10,000 hours in operation.

Water quality conditions: (for 10000 operating hours)

1. Conductivity: $60\mu\text{S/cm (*)} \leq \text{conductivity} \leq 350\mu\text{S/cm (*)}$
2. Total hardness: (as CaCO_3) $20\text{mg/l} \leq \text{total hardness} \leq 100\text{mg/l}$
3. Ionic silica: (SiO_2) $< 30 \text{ mg/l}$
4. Iron: (Fe) $< 0.2 \text{ mg/l}$
5. Oils and fats: $< 2 \text{ mg/l}$
6. Total dissolved solids: $< 450 \text{ mg/l}$
7. pH value: $6 < (\text{pH}) < 8$
8. Water quality standards described in table of the next pages.

(*) maximum recommended conditions $1000 \mu\text{S} / \text{cm}$. The higher the conductivity, the shorter the hours of operation.

Equipment requirements depending on the conductivity and pH of the site water:

1. **If conductivity $< 60 \mu\text{S/cm}$ and $\text{PH} \geq 7$:** Standard components can be used: brass solenoid valves, brass motor valves and PP-R pipes.
2. **If conductivity $< 60 \mu\text{S/cm}$ and $\text{PH} < 7$:** Special options for stainless steel piping and solenoid valves are to be included.
3. **If $60 \mu\text{S/cm} \leq \text{Conductivity} \leq 350 \mu\text{S/cm}$ and $6 < \text{PH} < 8$:** Standard components can be used: brass solenoid valves, brass motor valves and PP-R piping.
4. **If $350 \mu\text{S/cm} < \text{Conductivity} \leq 1000 \mu\text{S/cm}$ and $6 < \text{PH} < 8$:** Water treatment is recommended:
 - a) If no water treatment is used Standard components can be used: brass solenoid valves, brass motor valves and PP-R piping.
 - b) If water treatment is used Make sure there are no conflicts with 1 and 2. If there are no conflicts, standard components can be used: brass solenoid valves, brass motor valves and PP-R piping.
5. **If Conductivity $> 1000 \mu\text{S/cm}$ and $6 < \text{PH} < 8$:** Water treatment is mandatory if you want to extend the lifetime of the evaporative pad. Make sure there are no conflicts with points 1 and 2. If there are no conflicts, standard components can be used: brass solenoid valves, brass motor valves and PP-R pipes.



[Note]: When the water supply of the HEF2s uses some type of water treatment, pre-notification must be made in the order, because whether it is a decalcified or reverse osmosis water, different improvements in the design of the HEF2 will be required. Failure to do so could result in different types of damage to different parts of the equipment.

VDI2022 recommends the next parameters of water quality in these situations:

- **Standard climate:**

Total hardness < 20°dH = 356 ppm CaCo3

Water conductivity at 20°C < 1000 µS/cm

- **Data center:**

Total hardness < 20°dH = 356 ppm CaCo3

Water conductivity at 20°C < 3000 µS/cm

- **Clean rooms:**

Total hardness = not specified

Water conductivity at 20°C < 120 µS/cm

A table of required chloride (Cl-) values for each type of water is attached. Damage caused by chlorine corrosion is not covered by the FISAIR warranty policy:

Chlorides		
Drinking water	Softened water	Deionized water
< 100 mg/l	< 70 mg/l	< 30 mg/l

Air quality conditions: Clean air. F7 pre-filtration is recommended.

Maintenance conditions: The cleaning protocol is not to extend the final life, but to maintain the expectation of 10,000 operating hours. It is essential to perform it once a year.



[Note]: Humidifier cassettes are consumable parts and are not covered by warranty.

N°	NAME	STANDARD VALUE
1	Common bacteria	Colonisation number per 100 or less than 1 mL
2	Escherichia Coli	Not detected
3	Cadmium and compounds	≤ 0.003 mg/l (volume of Cadmium)
4	Mercury and compounds	≤ 0.0005 mg/l (volume of Mercury)
5	Selenium and compounds	≤ 0.01 mg/l (volume of Selenium)
6	Lead and compounds	≤ 0.01 mg/l (volume of Lead)
7	Arsenic and compounds	≤ 0.01 mg/l (volume of Arsenic)
8	Chromium [VI] compounds	≤ 0.05 mg/l (volume of Chromium [VI])
9	Cyanide and Cyanogen Chloride	≤ 0.01 mg/l (volume of Cyanogen)
10	Nitrate and nitrite	≤ 10 mg/l
11	Fluoride and compounds	≤ 0.8 mg/l (volume of Fluoride)
12	Boron and compounds	≤ 1.0 mg/l (volume of Boron)
13	Carbon tetrachloride	≤ 0.002 mg/l
14	1,4-Dioxane	≤ 0.05 mg/l
15	Cis-1,2-Dichloroethylene and trans-1,2-Dichloroethylene	≤ 0.04 mg/l
16	Dichloroethylene	≤ 0.02 mg/l
17	Tetrachlorethylene	≤ 0.01 mg/l
18	Trichlorethylene	≤ 0.01 mg/l (the standard value was tightened in 2011 from 0.03 mg/l)
19	Benzene	≤ 0.01 mg/l
20	Chlorate	≤ 0.6 mg/l
21	Chloroacetic acid	≤ 0.02 mg/l
22	Chloroform	≤ 0.06 mg/l
23	Dichloroacetic acid	≤ 0.04 mg/l
24	Dibromochloromethane	≤ 0.1 mg/l
25	Bromate	≤ 0.01 mg/l
26	Total trihalomethane (chloroform, dibromochloromethane, bromodichloromethane and bromoform)	≤ 0.1 mg/l
27	Trichloroacetic acid	≤ 0.2 mg/l
28	Bromodichloromethane	≤ 0.03 mg/l
29	Bromoform	≤ 0.09 mg/l
30	Formaldehyde	≤ 0.08 mg/l
31	Zinc and compounds	≤ 1.0 mg/l (volume of Zinc)
32	Aluminium and compounds	≤ 0.2 mg/l (volume of Aluminium)
33	Copper and compounds	≤ 1.0 mg/l (volume of Copper)
34	Sodium and compounds	≤ 200 mg/l (volume of Sodium)
35	Manganese and compounds	≤ 0.05 mg/l (volume of Manganese)
36	Chloride	200 mg/l or less

N°	NAME	STANDARD VALUE
37	Calcium, Magnesium (hardness)	300 mg/l or less
38	Active surface anionic agent	0.2 mg/l or less
39	(4S,4aS,8aR)-4,8a-dimethyloctahydronaphthalen-4a(2H)-ol (or Geosmin)	0.00001 mg/l or less
40	1,2,7,7-Tetramethylbicyclo[2,2,1]-Heptane-2-ol (or 2-Methylisobolneol)	0.00001 mg/l or less
41	Nonionic surfactant	0.02 mg/l or less
42	Phenols	≤ 0.005 mg/l (converted to volume of Phenols)
43	Organic substances (Total organic carbon)	3 mg/l or less
44	Taste	Not abnormal
45	Odour	Not abnormal
46	Colour	≤ 5 degrees
47	Turbidity	≤ 2 degrees

15. MINIMUM COMPLIANCE REQUIREMENTS VDI6022

15.1. Recirculated water equipment:

1. Use of FISAIR high efficiency inorganic panel containing no glue.
2. Use of inlet solenoid valve.
3. Use of motor valve for automatic draining.
4. Use of F7 filtrate upstream of HEF2E humidifier.
5. Use of droplet separator when the recommended panel carryover speed (3.2 m/s) is exceeded.
6. Use of the FISAIR control panel (CCB) and FISAIR stage control panel (CCBE) is recommended for automatic drainage and to cover all hygienic needs of the VDI6022.
7. As standard, our equipment has a continuous bleed-off system installed; thus, a constant flow of water drains, with respect to section 9.8.
8. To lose less water and adjust the minerals concentration more adequately, we recommend using the control panel CCB+C. By using the CCB+C conductivity control panel, the minimum amount of water necessary is drained to reach the required conductivity Set Point.
9. When the equipment is shut down, the deposit water should not be left standing for more than 12 h. To comply with VDI6022, it is compulsory for the water to remain standing for no more than 48 h when the HEF2E is shut down. Therefore, the automatic drain motor valve is mandatory.
10. The access door to the HEF2E in the AHU must have a darkened sight glass installed and a light inside that cannot be switched on while the equipment is in operation.
11. The installation of a non-return valve in the water supply is mandatory.
12. Preventive maintenance must be done following the standards of the VDI6022-2011.

15.2. Direct water equipment:

1. Use of FISAIR high efficiency inorganic panel containing no glue.
2. Compliance with 2.I or 2.II:
 - I. Filling solenoid valve and water drain motor valve for water remaining in distribution pipes and header.
 - II. Motor valve to manage water supply and drain water remaining in distribution pipes and header via a 3-way valve.
3. Use of F7 filtration upstream of HEF2E humidifier.
4. Use of droplet separator when the recommended panel carryover speed (3.2 m/s) is exceeded.
5. The access door to the HEF2E in the AHU must have a darkened sight glass installed and a light inside that cannot be switched on while the equipment is in operation.
6. Preventive maintenance must be done following the standards of the VDI6022-2011.

16. HEF2E CONTROL INSTALLED IN THE AHU



CCB2.0: Basic Control Panel 2.0

CCE2.0: Stage Control Panel 2.0



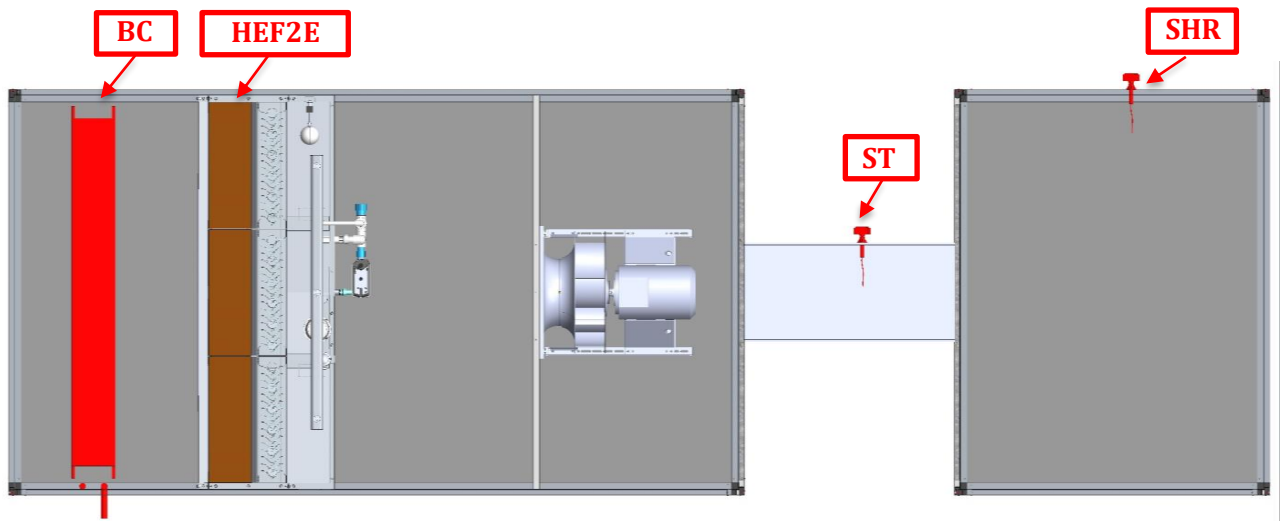
HEF2E SERIES



HEF2E CONTROL:

- ❖ Recirculation pump
- ❖ Filling solenoid valve
- ❖ Motorised drain valve
- ❖ Min/Max level detector
- ❖ Water conductivity control
- ❖ Stage solenoid valve
- ❖ Modbus TCP/IP
- ❖ Modbus RTU
- ❖ BACnet

16.1. Basic on/off control



BC: Pre-heating coil

ST: Temperature sensor

SHR: Relative Humidity Sensor

- ❖ The Relative Humidity probe (SHR) must be placed in the room or in the return. It is responsible for turning the pump on or off (ON/OFF) according to the set-point \pm hysteresis value. The pump will wet all the cassettes.

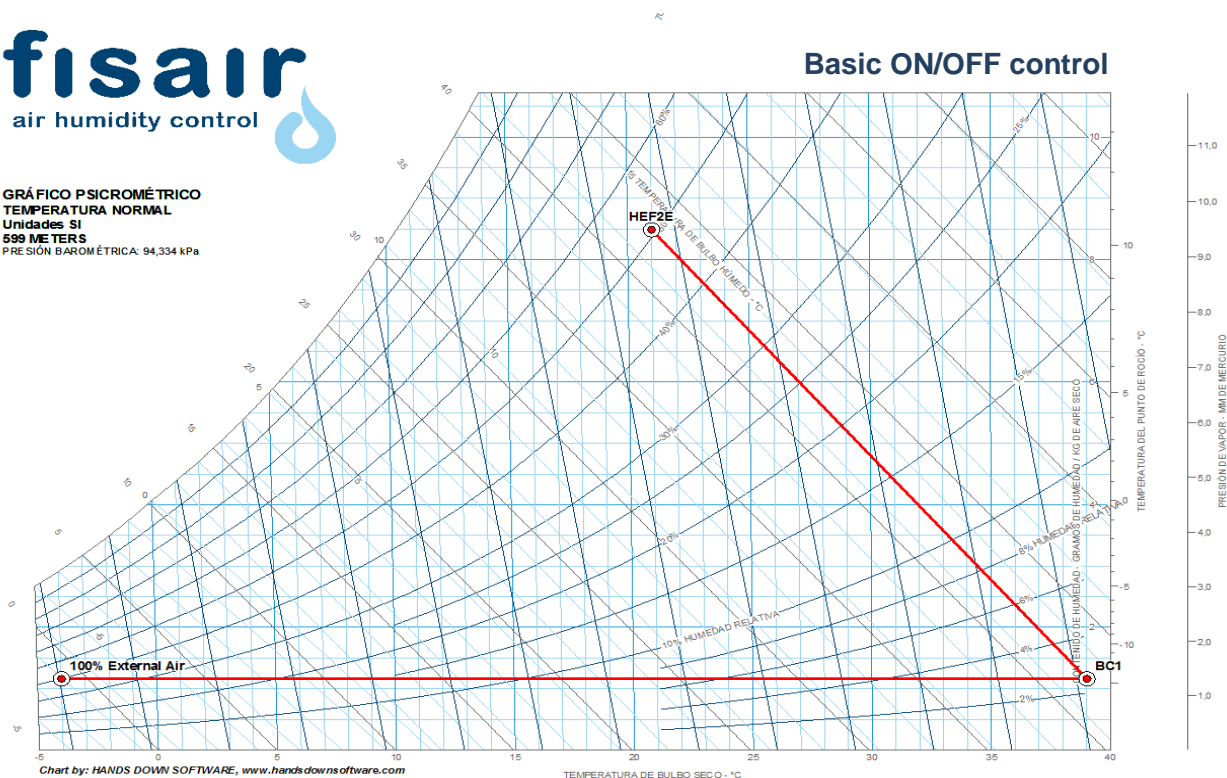
For example, Set-point $50 \pm 5\%$ RH (Pump starts at 45% RH - Pump stops at 55% RH)

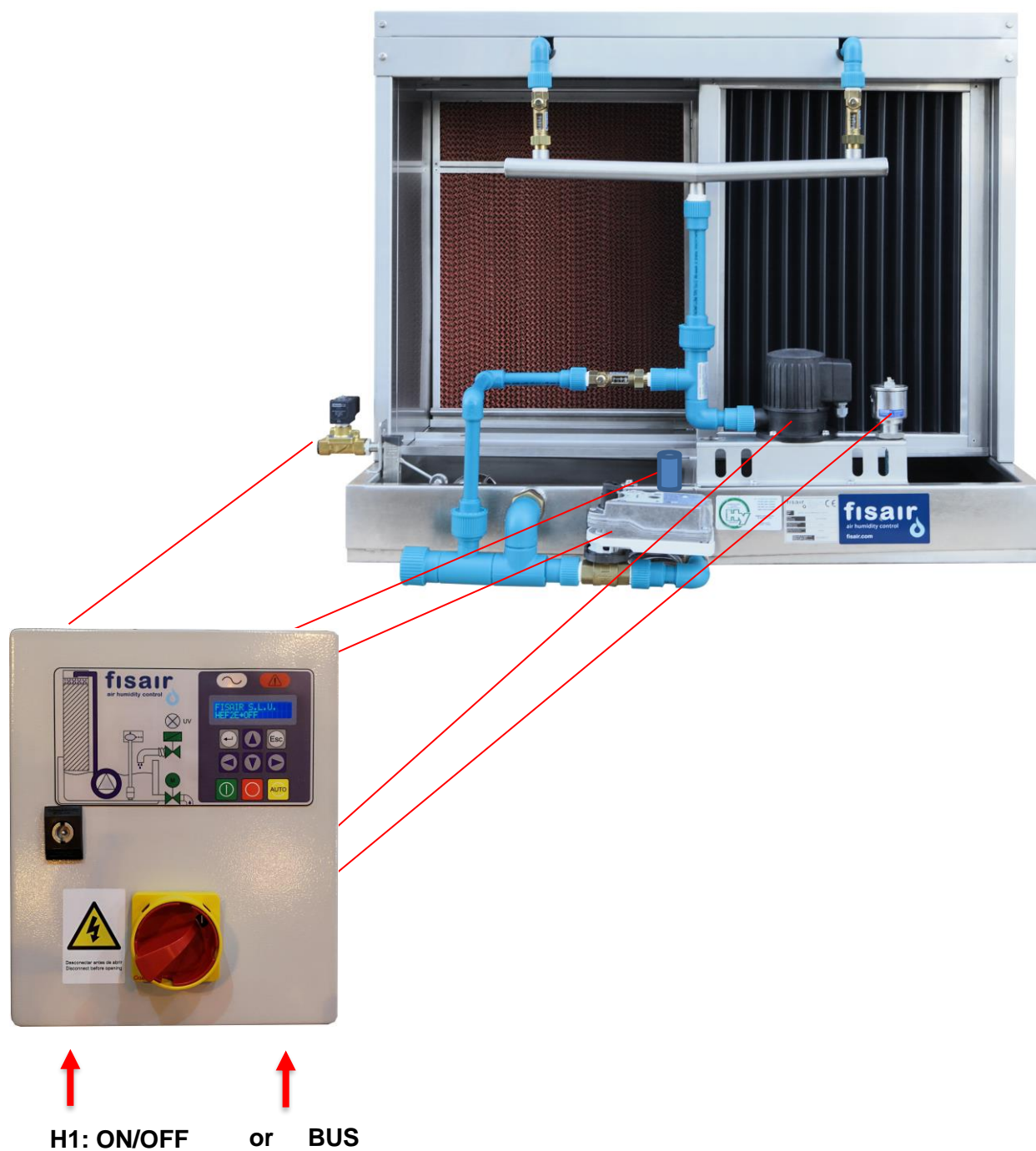
- ❖ The Temperature probe (ST) is located in the drive and controls the Pre-heating coil (BC) via the PID loop. This BC must have 10-20% extra capacity as a safety factor.
- ❖ Once the pump starts, the relative humidity rises to its maximum quite quickly and cuts off when the maximum level (55% RH) is reached. The humidity then begins to fall slowly until it reaches the minimum level (45% RH), when the pump starts again.

- ❖ This type of control will have an accuracy of about $\pm 10\%$ RH.
- ❖ It must be remembered that the RH may vary due to regulation by the electronic control system.

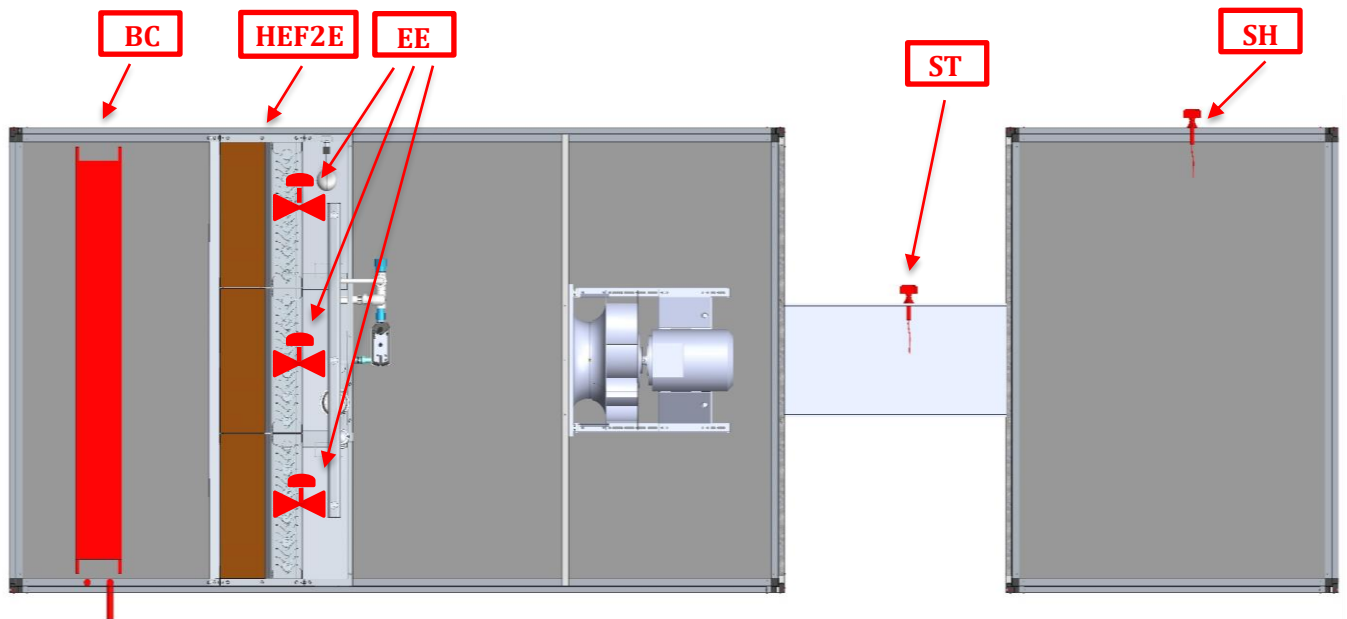


GRÁFICO PSICROMÉTRICO
TEMPERATURA NORMAL
Unidades SI
599 METERS
PRESIÓN BAROMÉTRICA: 94,334 kPa





16.2. Stages control



BC: Pre-heating coil

ST: Temperature sensor

SHR: Relative Humidity Sensor

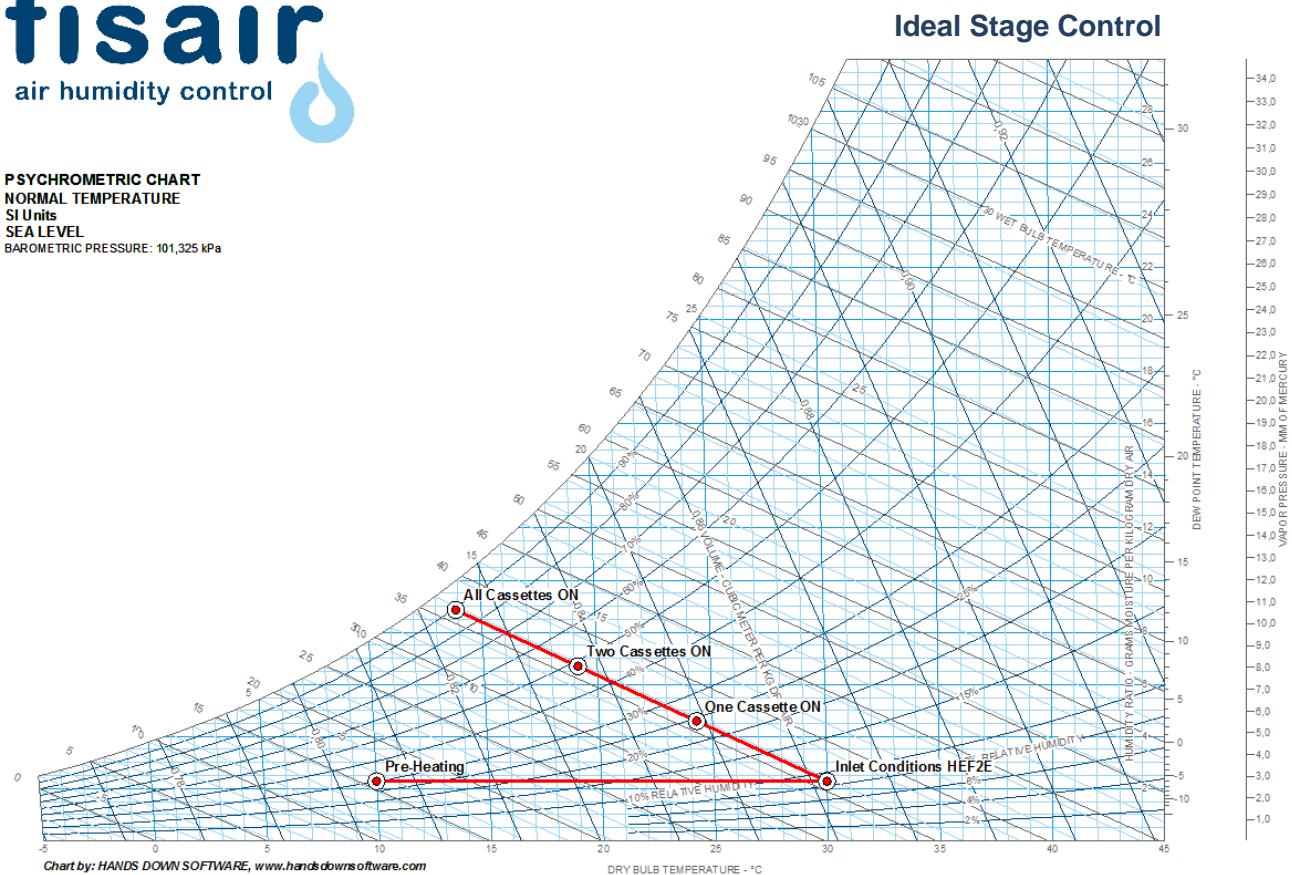
EE: Stage solenoid valve

- ❖ The Relative Humidity probe (SHR) must be placed in the room or in the return. The PI or PID regulation loop turns the solenoid valves of each stage (EE) on or off.
- ❖ The pump will start whenever moisture is required.
- ❖ The Temperature probe (ST) is located in the drive and controls the Pre-heating coil (BC) via the PID loop. This BC must have 10-20% extra capacity as a safety factor.
- ❖ This type of control will have an accuracy of about $\pm 5\%$ RH. The use of evaporative cassettes is 50% less than in on/off systems.
- ❖ Care must be taken with the accuracy of the probes used.
- ❖ It must be remembered that the RH may vary due to regulation by the electronic control system.

Number of stages Available	Analogue signal range V_{DC}	Analogue signal range mA	Number of active solenoid valves
5 stages	0-0.2 V_{DC}	<4.2 mA	All OFF
	0.3-2.0 V_{DC}	4.3 – 7.2 mA	S1
	2.1-4.0 V_{DC}	7.3 – 10.4 mA	S1+S2
	4.1-6.0 V_{DC}	10.5 – 13.6 mA	S1+S2+S3
	6.2-8.0 V_{DC}	13.7 – 16.8 mA	S1+S2+S3+S4
	8.1-10.0 V_{DC}	16.9 – 20 mA	S1+S2+S3+S4+S5
4 stages	0-0.2 V_{DC}	<4.2 mA	All OFF
	0.3-2.5 V_{DC}	4.3-8.2 mA	S1
	2.6-5.0 V_{DC}	8.3-12.3 mA	S1+S2
	5.1-7.5 V_{DC}	12.4-16.3mA	S1+S2+S3
	7.6-10.0 V_{DC}	16.4-20 mA	S1+S2+S3+S4
3 stages	0-0.2 V_{DC}	<4.2 mA	All OFF
	0.3-3.3 V_{DC}	4.3-9.6 mA	S1
	3.4-6.6 V_{DC}	9.7 - 15 mA	S1+S2
	6.7-10.0 V_{DC}	15.1-20 mA	S1+S2+S3
2 stages	0-0.2 V_{DC}	<4.2 mA	All OFF
	0.3-5.0 V_{DC}	4.3-12.1 mA	S1
	5.1-10.0 V_{DC}	12.1 - 20 mA	S1+S2

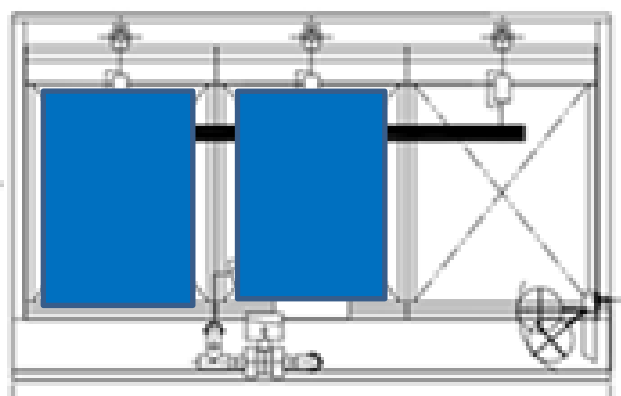
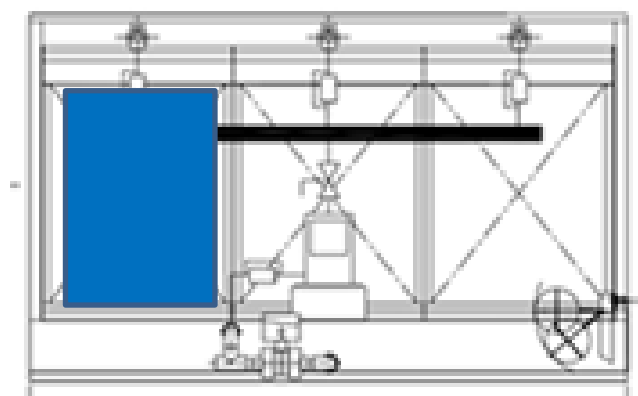


PSYCHROMETRIC CHART
NORMAL TEMPERATURE
SI Units
SEA LEVEL
BAROMETRIC PRESSURE: 101,325 kPa



1 Cassette ON:

2 Cassettes ON:



3 Cassettes ON:

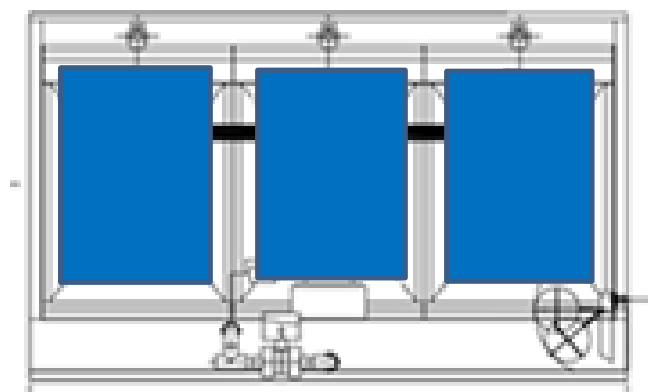
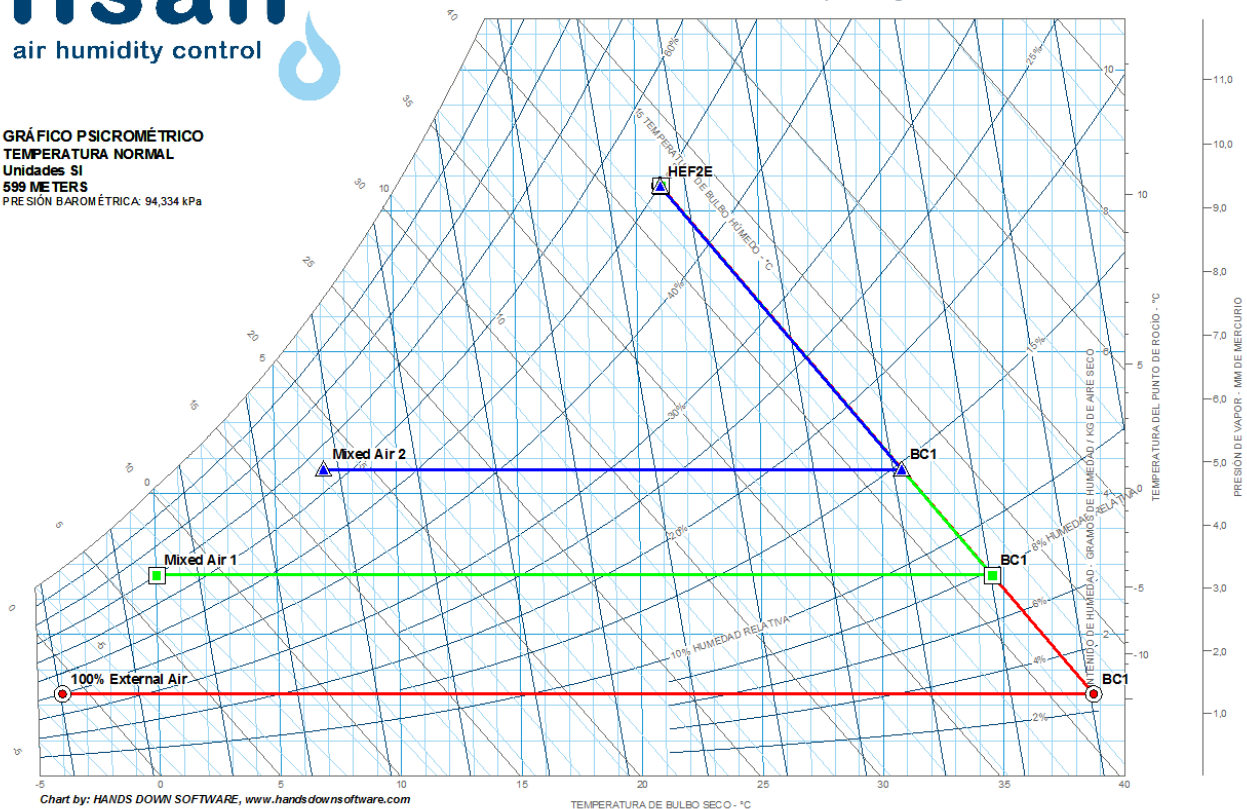
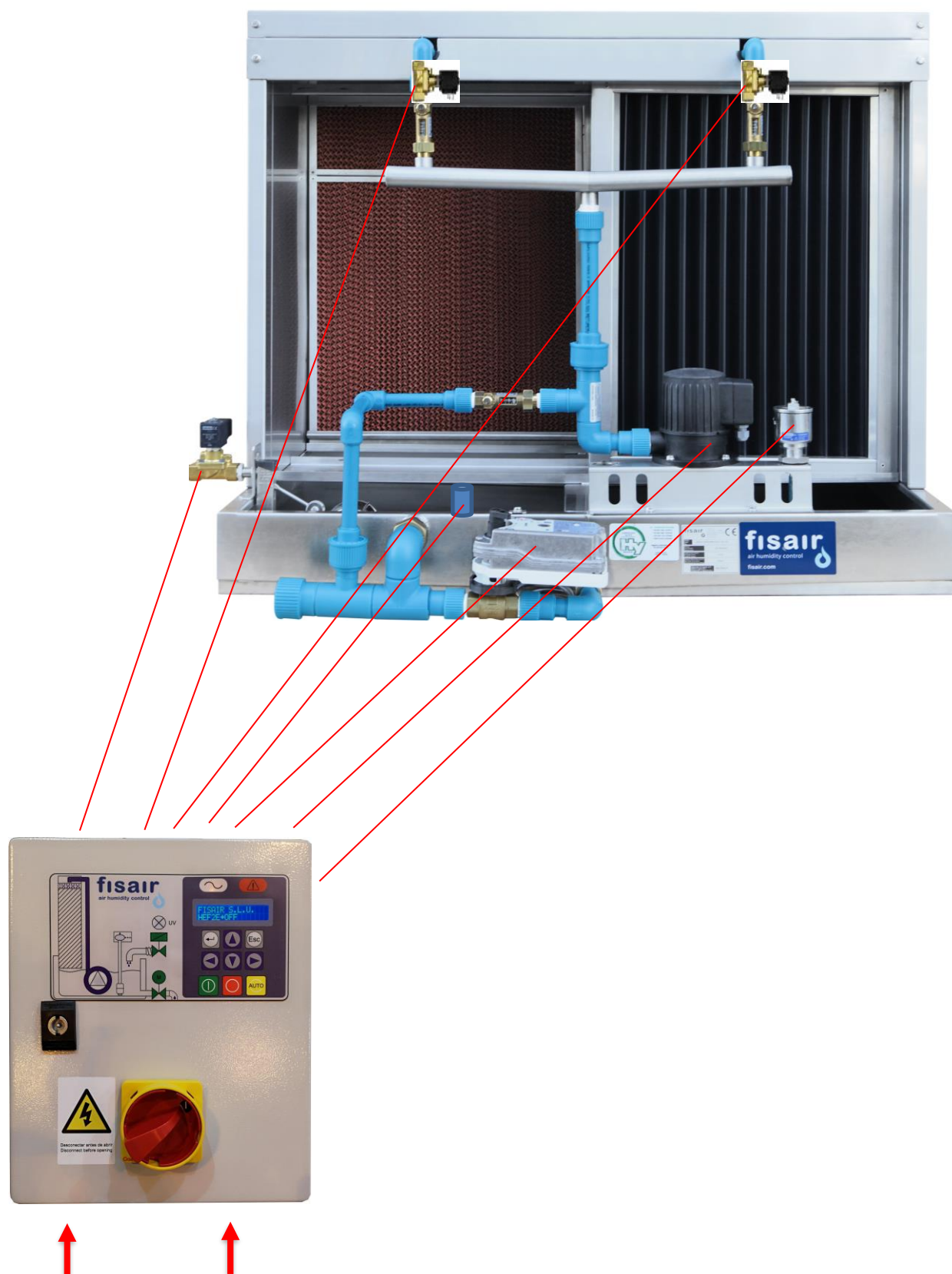




GRÁFICO PSICROMÉTRICO
TEMPERATURA NORMAL
Unidades SI
599 METERS
PRESIÓN BAROMÉTRICA: 94,334 kPa

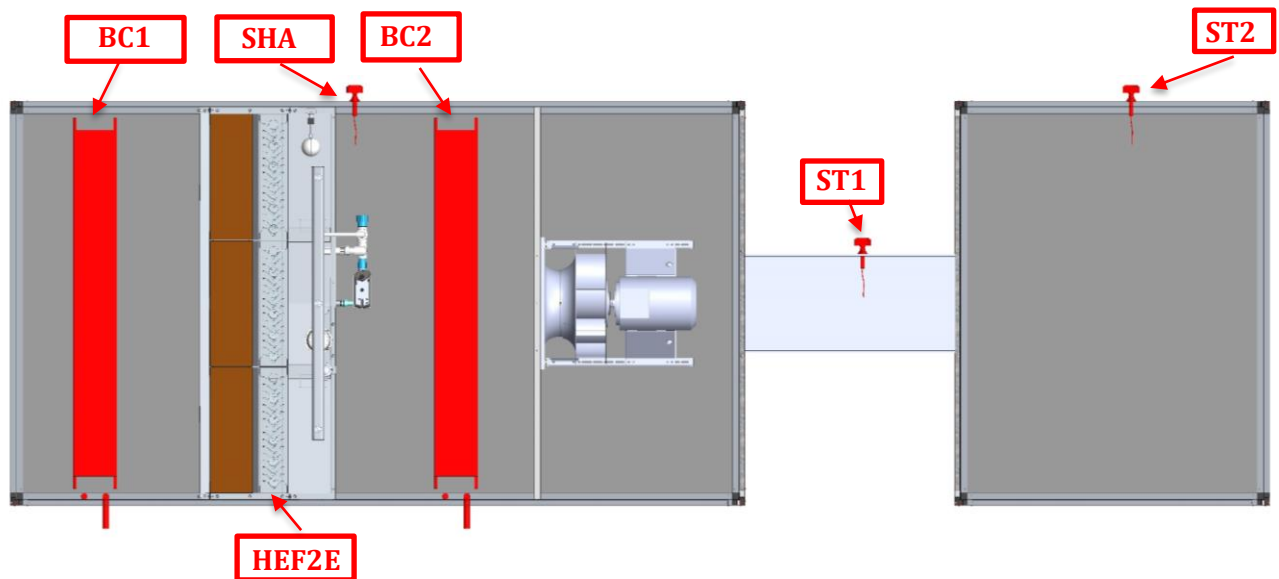
Control by stages or control ON/OFF





H1: ON/OFF or BUS
+ 0...10Vcc
(regulated)

16.3. Dew point control



BC1/BC2: Coil Pre-Heating / Post-Heating

ST1/ ST2: Temperature sensor 1 / Temperature sensor 2

SHA: Absolute Humidity Sensor

- ❖ The dew point probe measures the Absolute Humidity (SHA) and must be placed after the evaporative cooler. It controls the pre-heating coil (BC1) via the PID loop. This BC1 must have 10-20% extra capacity as a safety factor.
- ❖ The Temperature probe (ST1) is located in the drive and controls the Post-heating coil (BC2) via the PID loop. This BC2 must have 10-20% extra capacity as a safety factor.
- ❖ The pump starts whenever moisture is required and will wet all the cassettes.
- ❖ A constant internal heat load is assumed for a constant ambient temperature. If this is not the case, a room temperature sensor (ST2) must be added. This will control the Post-heating coil (BC2) via the PID loop.
- ❖ This type of control will have an accuracy of about $\pm 3\%$ RH.
- ❖ Care must be taken with the accuracy of the probes used. It must be remembered that the RH may vary due to regulation by the electronic control system.



GRÁFICO PSICROMÉTRICO
TEMPERATURA NORMAL
Unidades SI
599 METERS
PRESIÓN BAROMÉTRICA: 94,334 kPa

Dew point control

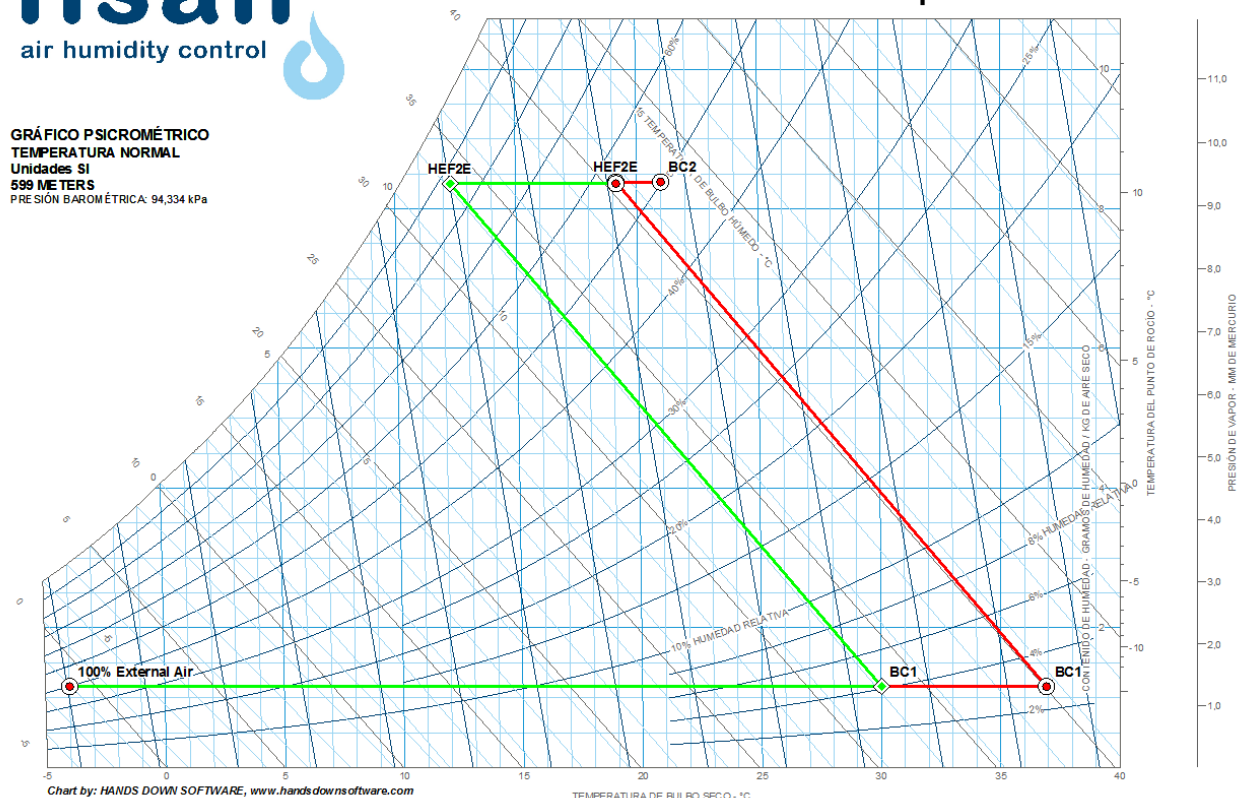
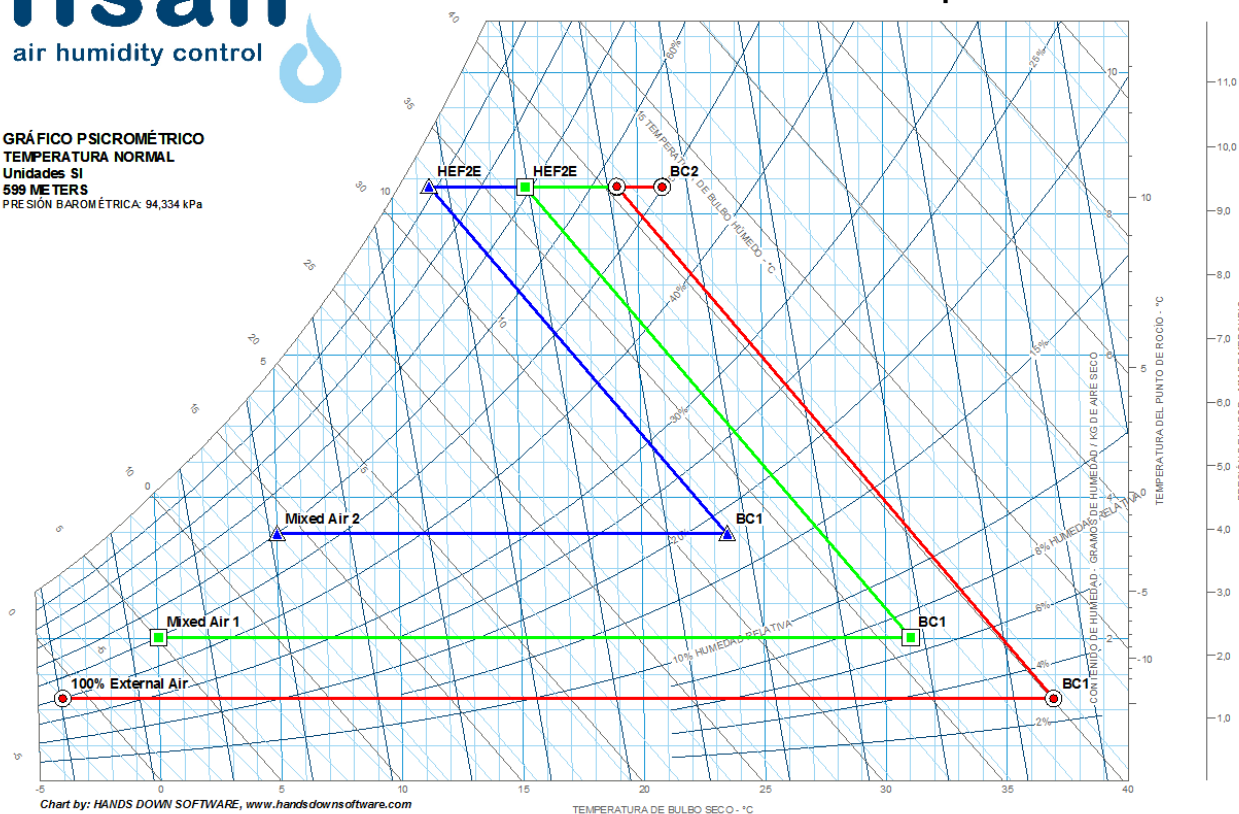


GRÁFICO PSICROMÉTRICO
TEMPERATURA NORMAL
Unidades SI
599 METERS
PRESIÓN BAROMÉTRICA: 94,334 kPa

Dew point control





17. START-UP RECOMMENDATIONS


IMPORTANT Request start-up of your units by contacting:


sat@fisair.com o service@fisair.com


<https://fisair.com/es/servicio/puestas-en-marcha/> (application in Spanish)


<https://fisair.com/service/start-ups/> (application in English)


The operation of the FISAIR HEF2 Series evaporative humidifier is mainly determined by the irrigation of the evaporative panels. The humidifier will work as such whenever there is a current of air passing through it and the water pump irrigates the panels.


 **[Remark 1. Recirculated water systems]:** Before starting the air fans, to remove inorganic dust from the panel surfaces, for the purpose of preventing air flow contamination and avoid extra foam formation, it is recommended to repeat the following cycle for 6 periods: 10 min of pump operation (recirculating the water) and then, 10 min of emptying.


 **[Remark 2: Direct water equipment]:** Before starting the air fans, to remove inorganic dust from the panel surfaces, for the purpose of preventing air flow contamination and avoid extra foam formation, direct water irrigation of Cassettes is recommended during 60 min without air flow, to wash the panels.


 **[Remark 3]:** To avoid leaks, double check that all links/threads are well fixed and adjusted at the commissioning. Teflon gaskets, Teflon tape or special glue for threads should be used in the cases where they are needed.


 **[Remark 4]:** Double check water basins mandatory levelling. This is a very important point because a fine levelling is a must for a correct operation of the level detector and the inlet float valve water level.


 **[Remark 5]:** To avoid airflow by-pass, double check that gap cover plates and fixing plates are well installed and adjusted.

 **[Remark 6]:** Make sure that the correct amount of water (according to the technical specification) is established in the balancing valves.

 **[Nota 7: Recirculated water systems]:** Be sure to remove the protection screen from the level detector and the transport locking Silentblock placed under the pump.

 **[Nota 8: Recirculated water systems]:** If $V \geq 4$ m/s, before the start-up, a rain gutter will be installed to prevent the water in the basin from overcoming it.

 **[Remark 9. Direct water systems]:** Depending on the psychrometric conditions of the air and the water temperature, it may be necessary to isolate the stainless-steel manifold and the water inlet area of the PP-R pipe.

 **[Remark 10. Direct water systems + stainless steel pipe]:** Depending on the psychrometric conditions of the air and the water temperature, it may be necessary to isolate the stainless steel manifold and the water inlet area of the pipe.

To ensure proper operation in accordance with the health standard VDI6022, maintenance should be performed regularly as directed, and it is also necessary to keep a maintenance record.

If there is a fan section before the HEF2E, we recommend an air alignment section.

HEF2 SERIES WITH EXTERIOR AIR OR INSTALLED IN AN AHU OUTDOORS

All units using the HEF2 Series with exterior air must stop the pump and drain the water tank in the event of preheater faults. Units for adiabatic cooling of the return air must drain the water tank water during the winter.

OPERATIONAL PERFORMANCE CONTROL

Humidifiers work with excess panel irrigation. If evaporative performance is to be regulated, this is not done by controlling the quantity of irrigation water but rather:

- Preferably, on the operative front surface, regulating the number of cassettes in operation, the HEF2 Series Fisair can be equipped with the necessary components for an external stage control or they can also include the Fisair step control.
- Alternatively, by controlling irrigation operation times, so the humidity/temperature regulator acts on the pump working time.

18. MAINTENANCE.

IMPORTANT Request maintenance of your units by contacting:

sat@fisair.com o service@fisair.com

<https://fisair.com/es/servicio/mantenimientos/> (application in Spanish)

<https://fisair.com/service/maintenance/> (application in English)

GENERALITIES

Humidifier components are very easy to maintain, because the only active parts are the irrigation pump and the float valve. The following elements require some kind of maintenance:

- **Once a month, the irrigation pump:** The most important thing is to monitor to ensure dirt does not obstruct the suction impulsion circuit and electricity consumption is lower than the power rating shown on its plate.
- **Once a year, the float valve:** This must be inspected on a regular basis to ensure its mechanical closure and opening works correctly.
- **Once a year, the control valves:** These must be inspected to ensure their mechanical regulatory function works correctly.
- **Once a year, the solenoid valves (if applicable):** These must be inspected to ensure their mechanical closure and opening works correctly.
- **Once every three months, the evaporative panels:** Their operating life basically depends on the correct use of the constant bleed-off system for mineral salts which prevents the formation of superficial lime deposits, from the supply of drinking or industrial water. If they are not maintained properly, the panels have to be replaced more often, because the flow of air through them can be blocked by these deposits.
- **Once a year, the irrigation:** Take the steps described on the page entitled "Cleaning the individual irrigation system".

In the interests of correct maintenance, it is advisable to make regular observations on the days after installing the system, to understand the specific behaviour of the installation, so the draining and cleaning programmes can be set. Similarly, during long periods of inactivity (summer for humidification for comfort, and winter for evaporative refrigeration) it is essential to completely drain and clean the water tank.

19. CLEANING AND DISINFECTION

19.1. Evaporative humidification: a natural method that does not carry bacteria

The operational features of evaporative humidifiers are based on the natural effect of the water evaporation when an air flow goes through/by a wet surface (is the same natural principle that occurs when water evaporates from waterfalls, rivers, lakes, seas...).

Evaporation means that the water leaves the humidifier as pure vapour (gas). Minerals and eventual pollutants stay in the water and can be eventually drained / eliminated. With no droplets or aerosols carry over, the bacteria can't be transferred to the humidified air. It is important to use a droplet separator when it's needed.

The evaporative humidifiers work with water temperatures below 24°C, very far from the optimal growth temperatures of the bacteria present in the water, essentially *Legionella pneumophila*, with an optimum growth temperature of 37-41°C.

The water basin, manifold, irrigation system and the other components of the HEF2 series are specially designed for there to be complete emptying by gravity, without the aid of mechanical elements. Based on the quality of treated air and water supply, a cleaning and emptying inspection plan should be established.

19.2. Cleaning

19.2 A. General

An inspection, emptying and cleaning plan must be established for the HEF2 Series depending on the treated air and feed water quality.

Evaporation humidifiers should be cleaned regularly to prevent contamination. All the component surfaces (panel, pipes and especially the water deposit) must be disinfected with an appropriate solution.

A cleaning process must be carried out once a year to maximize the useful life of the Cassettes.

Special attention must be paid to the cleanliness of the piping system, especially where it diverts; and the cleaning process must reach all parts of the system.

19.2 B. Scale formation process

Main's water is not pure as it contains dissolved calcium and magnesium salts (among others) that can be deposited in the form of scale. These salts can clog and harden the inorganic panel and make its water absorption more difficult, thus decreasing performance. If this occurs, the panel should be replaced.

19.2 C. Cassette cleaning protocol

19.2.1. Individual cleaning process of the cassettes

If the Cassette panel is not badly scaled, it can be cleaned with a weak acid solution or Oxygen based household use bleach agent after disassembling from the HEF2E (section 18 or 19). We recommend that a sample of the inorganic panel should be tested first, before subjecting it to the entire process. A large build-up of scale cannot be removed.

The following items are required for the cleaning protocol:

- A large enough container to insert the Cassette fully.
- Dissolution of a household cleaning product based on oxygen (ex: "Oxiclean"), dissolved in water in the proportions recommended by the manufacturer. It can also be used as a solution of citric acid or acetic acid dissolved in aqueous solvent. The solute cannot contain any chlorine.
- Spray hose (not high pressurized) and gloves.

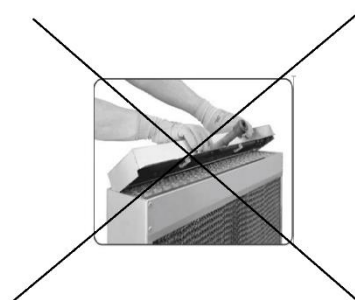




[Remark 1: Do not remove top cover]: Do not remove the individual irrigation header distribution.

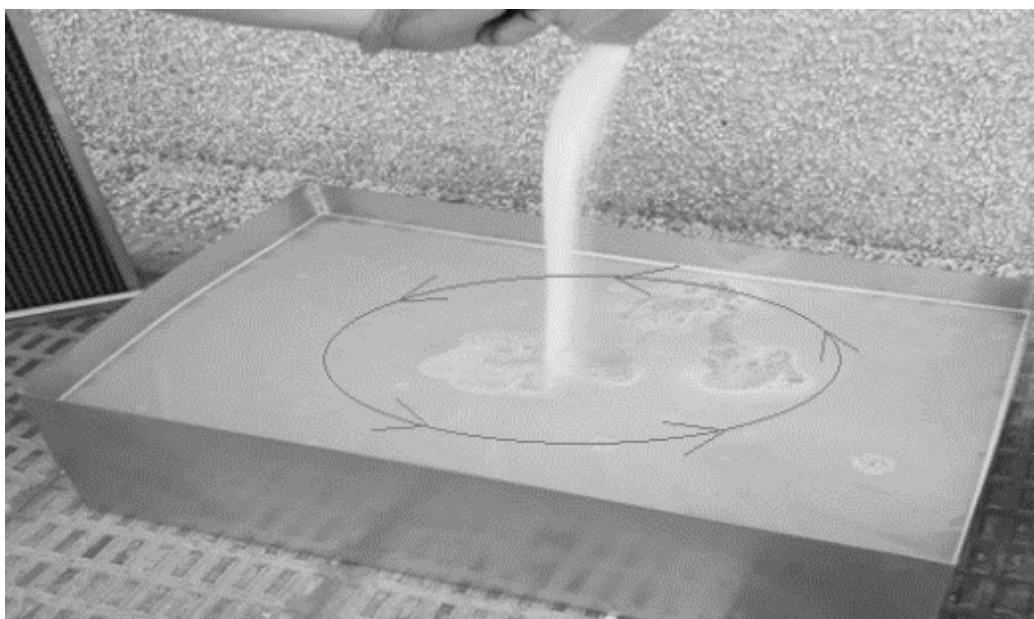


[Remark 2: Only use for high efficiency inorganic panel FISAIR]: If you have an inorganic panel or an organic panel with glued slats, this cleaning process cannot be carried out. For these cases use a weak acid solution such as citric acid or acetic acid dissolved in aqueous solvent.



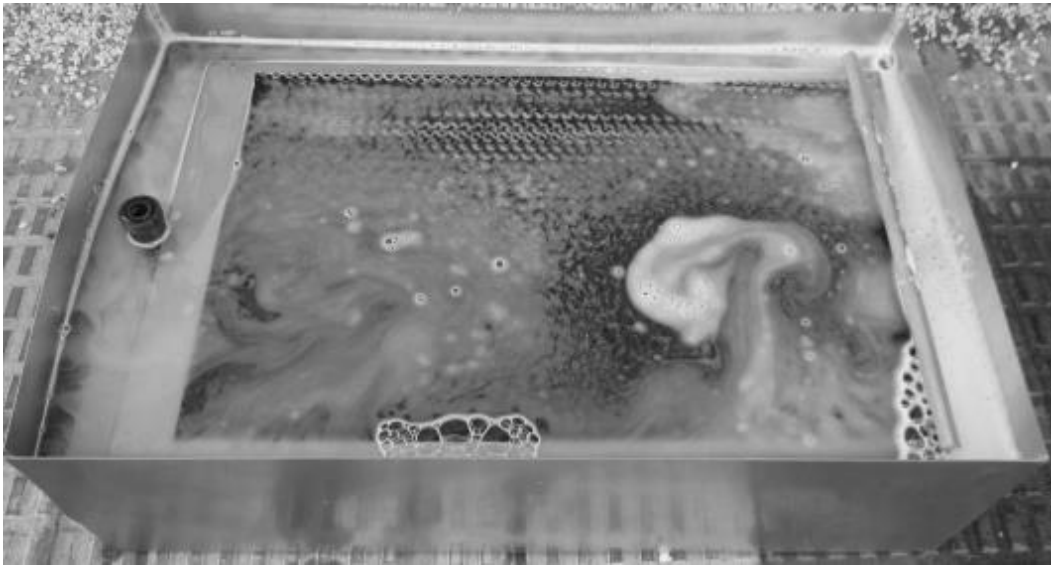
The procedure below should be followed:

1. **Preparing the cleaning solution:** The aqueous solution mixture consists of water (solvent) and household cleaning product based on oxygen (solute) in the proportions indicated by the manufacturer. Add the solute to the water and stir it completely.

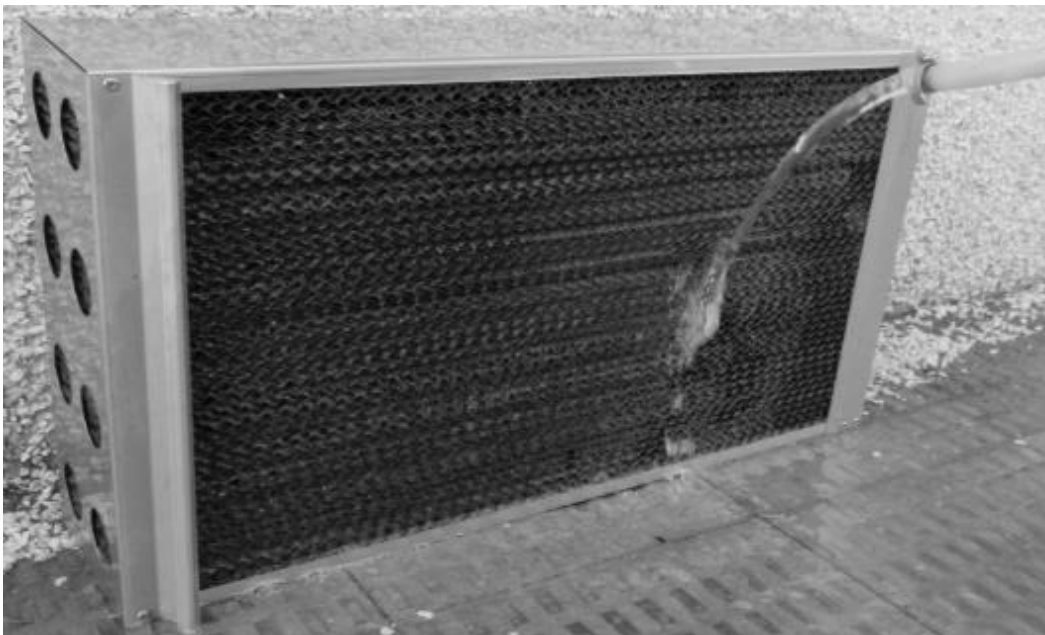


A sufficient amount of solution must be prepared for the corresponding Cassette.

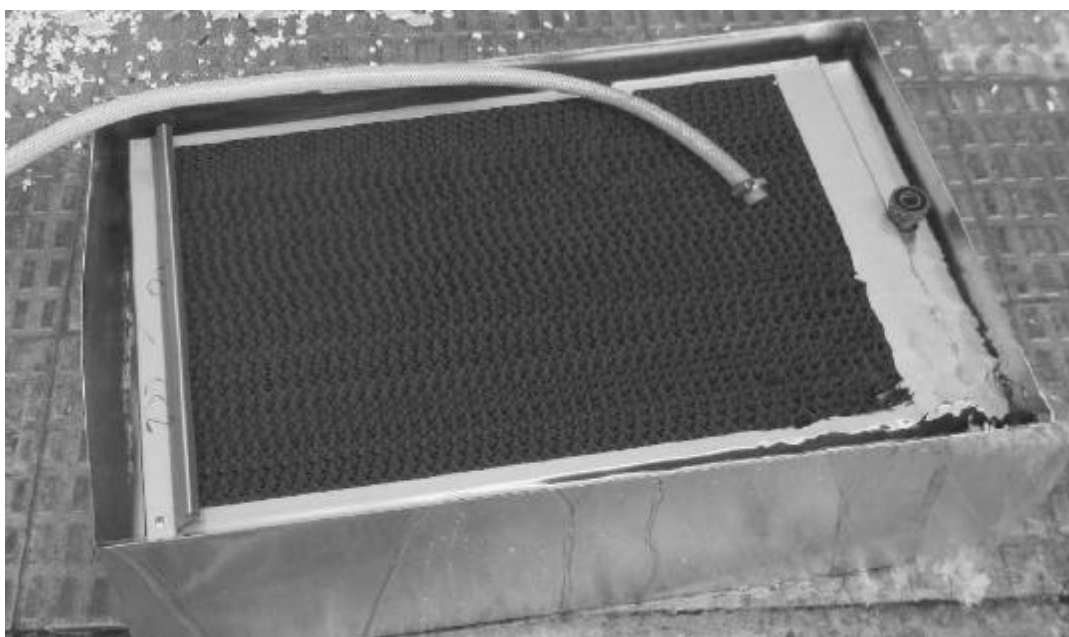
2. Insert the Cassette completely into the container with the solution. Leave it to stand for at least an hour.



3. Remove the panel from the container and wash it with the sprayed water hose.

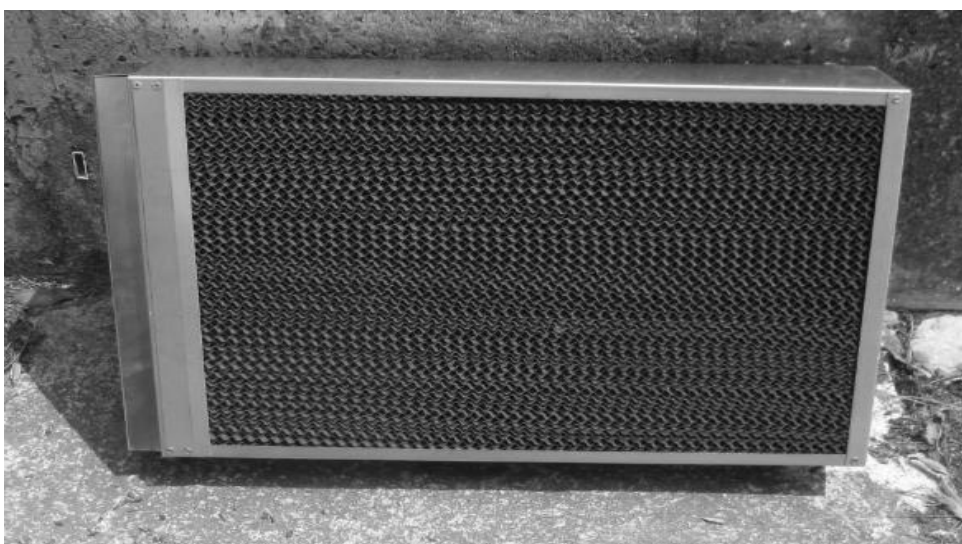


If the foam is not completely removed, reinsert the Cassette into a container with clean running water.



Once the foam has completely disappeared, remove the Cassette from the container and wash it again with the sprayed water hose.

4. Allow the Cassette to dry completely in the open air for as long as necessary. If not completely dry it may cause a strange smell.



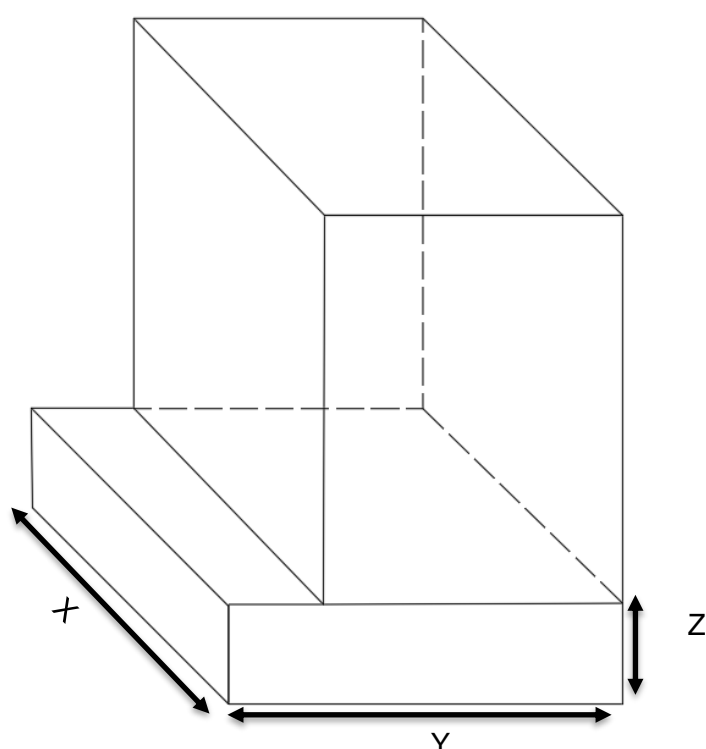
5. It is not normally necessary to repeat the process.

19.2.2. Water recirculation cleaning method

1. Set timer value T06 of CCB2.0 to 0. (See MCCB2.0)
2. If the tank is full, add industrial vinegar directly to the water in the tank at a ratio of 0.016 liters of industrial vinegar per 1 liter of water. Depending on the volume of the total volume of the basins, add the corresponding amount of industrial vinegar proportionally:

Method to obtain the volume of the basin:

The dimension X [mm] indicating the width of the equipment should be measured.



Depth (Y) varies if HEF2E is direct water (DW) or recirculated water (RW)

Y if HEF2E direct water = 500 mm
Y if HEF2E recirculated water = 650 mm

Z is the height of the basin = 110 mm

Volume of the basin = X (m) * Y (m) * Z (m)

Volume of the pond = X (m) * 0,5 o 0,65 (m) * 0,11(m)

Volume of the pond= m³



Note: If the tank is empty, wait until the tank is full (green led of the pump On, see MCCB2.0) to add the corresponding proportion of industrial vinegar in the tank.

3. Once the pump has started (green led On), keep the equipment running for about two hours. Then turn it off, wait for it to drain completely, which should take at least one hour and then stop it by pressing the red off button (see MCCB2.0).
4. Perform the cycle again, following steps 2 to 4, two times
5. Run the cycle again, following steps 1 to 4, this time without adding the industrial vinegar, to finish cleaning the cassettes.
6. Let the panel dry and observe if the lime scale on the panel has been removed. If not, repeat steps 1 to 6 as many times as necessary.

 **Note:** Once the panel cleaning process is finished, set the T06 timer back to the desired value.

19.2.3. Comparison of cassette cleaning methods

The two most used cleaning methods are industrial vinegar and Oxiclean. The effectiveness of each depends on the purpose for which they are used, so in certain contexts it will be appropriate to use one or the other, depending on the needs.

The categories used to measure effectiveness were: high, medium or low.

	CLEANLINESS and HYGIENE	DESCALCIFICATION
Industrial vinegar	Medium	High
Oxiclean	High	Medium/low

19.3 Desinfection

The use of chemical disinfectants for daily maintenance of the panels is not recommended as it may reduce their efficiency and useful life. If chemical products need to be used, because of a long time without operation or any other reason, an effective method is to immerse the panels in a chlorine-based disinfectant, such as sodium hypochlorite (bleach) or sodium peroxycarbonate. If chlorine-based disinfectants are used, they should not be mixed with an acid solution due to the potential formation of toxic chlorine gas.

 **Remark:** The manufacturer's safety steps for the disinfectant solution should be followed.

The inorganic high efficiency panel the HEF2 Series cassettes includes agents, such as silver ions, that inhibit the growth of bacteria and fungi. This works against bacteria and mold, but not as a sterilizing agent.

The same bleach disinfectant solution may be appropriate to disinfect the other components. The number and periods of application of the disinfection processes must be established by the person responsible for the

facility, taking into account the time of use of the equipment, its location, piping system and water quality, for example.

Therefore, good operating practices, based mainly on an adequate control of the bleed-off system and watering/emptying, should be followed.

An additional and highly recommended practice would be to treat to the humidifier supply water.

20. HYGIENE CERTIFICATE

Sanitary conformity test.

HEF2E humidifiers have the “hygiene conformity test” certificate. This complies with the following standards:

For air conditioning:

- VDI 6022, sheet 1 (01/2018)
- SWKI VA104-01 (01/2019)
- VDI 3803, sheet 1 (05/2020)

For hospitals:

- DIN 1946 part 4, (09/2018)

All the materials included in the HEF2E obtained a negative result for the proliferation of pathogenic microorganisms. Non-metallic components comply with the standard, UNE-EN 16421:2015 “Evaluation of the action of microorganisms”.

To ensure proper operation in accordance with the health standard VDI6022, maintenance should be performed regularly as directed, and it is also necessary to keep a maintenance record.

Hygiene-Institut des Ruhrgebiets

Institut für Umwelthygiene und Toxikologie

Director: Prof. Dr.rer.nat. Lothar Dunemann

Legal Entity: Verein zur Bekämpfung der Volkskrankheiten im Ruhrkohlengebiet e.V.



Hygiene-Institut - P.O. Box 10 12 55 - DE 45812 Gelsenkirchen - Germany

Address:
Rotthaus Str. 21, DE 45879 Gelsenkirchen

Switchboard +49 (0)209 9242-0
Telefax +49 (0)209 9242-222
Internet www.hyg.de

Our reference: W-3301 29-20-AB
Contact person: Dipl.-Ing. (FH) S. Horn

Gelsenkirchen, 02.07.2020

Test - certificate

hygiene-conformity check to the design requirements of
selected regulations

Test institute: Hygiene Institut des Ruhrgebiets
Institut für Umwelthygiene und Toxikologie
Rotthauser Straße 21
45879 Gelsenkirchen

Test object: humidification device Type HEF2E
with and without circulation

Manufacturer: FISAIR SLU "Air Humidity Control"
Ciudad de frías, 33
28025 Madrid – SPAIN



Basis of the examination: ✓ VDI 6022, sheet 1 (01/2018)
✓ DIN 1946, part 4 (09/2018)
✓ VDI 3803, sheet 1 (05/2020)
✓ SWKI VA104-01 (01/2019)

Validity period: 5 years 07/2020 – 07/2025

Test report: W-330129-20-AB

In conclusion it can be stated that the examined "humidification device Type HEF2E with and without circulation", as specified in the test report W-330129-20-AB, is in compliance with the above mentioned regulations.

(Dipl.-Ing. (FH) S. Horn)
Head of the Department hygienic building technology

(A. Blankenberg)
clerk of the Department hygienic building technology
issued 02.07.2020, Gelsenkirchen

Within the framework of the conformity check the hygiene-relevant requirements of the above mentioned regulations was examined. Requirements of other regulations that refer to the above mentioned regulations were not part of the examination. Additionally, the conformity check does not include a toxicological or sensory testing of the introduced materials.

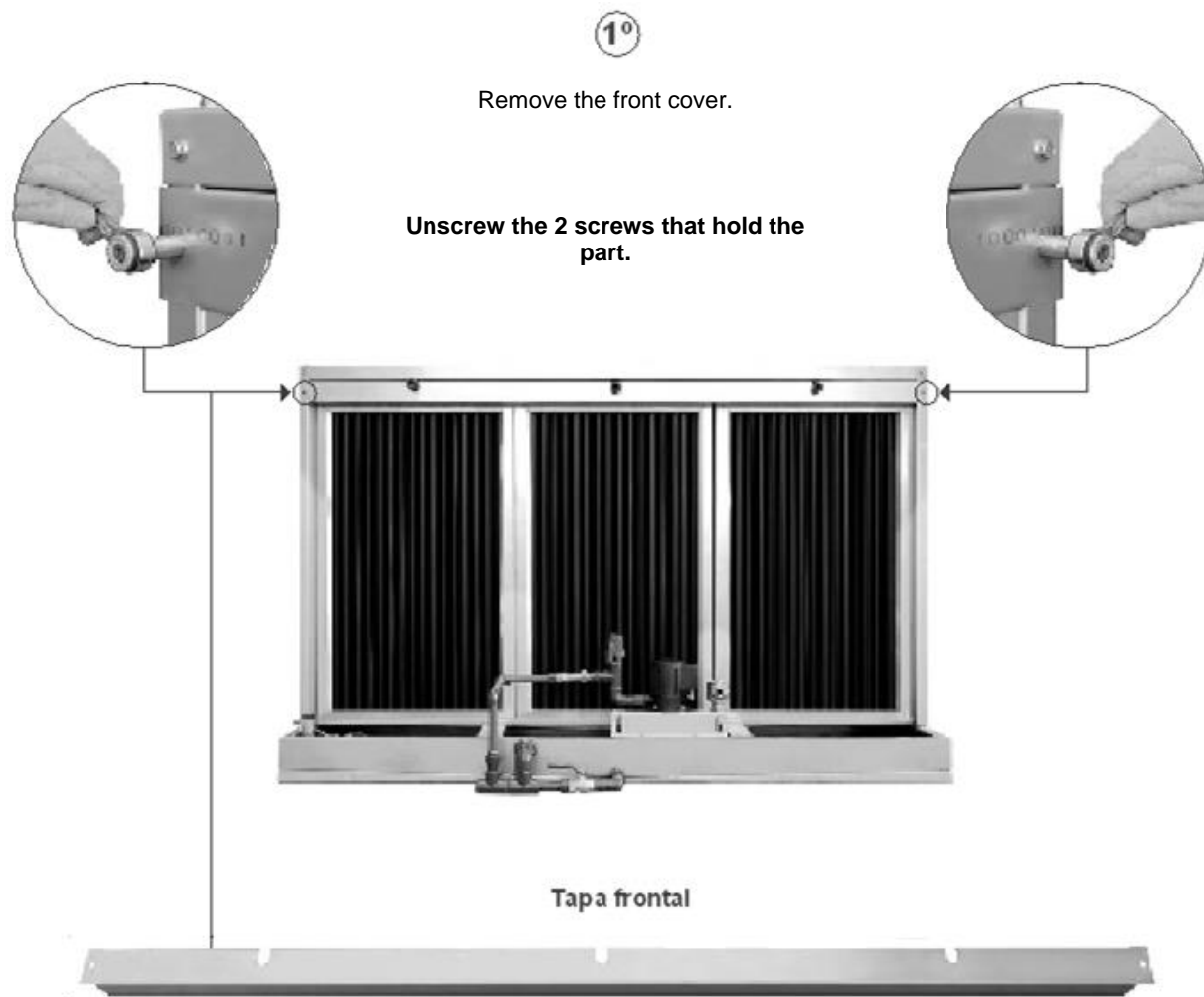
Legal Entity: Verein zur Bekämpfung der Volkskrankheiten im Ruhrkohlengebiet e.V., Register: VR 519 Local Court Gelsenkirchen (Germany); VAT ID: DE125018356
Directorate: Prof. Dr. Jürgen Kretschmann (Head), Dr. Emanuel Grün, Dr. Dirk Waider, Joachim Lichte, Prof. Dr. Lothar Dunemann (Executive Member).

21. LATERAL DISASSEMBLY.

Disassembly of cassettes and droplet separators. Laterally

The unit can be disassembled in a few simple steps for maintenance and/or cleaning work of the HEF2 Series.

Disassembly steps:



2°

Dismantle the header + water flow control valve assembly of the evaporation cassettes.



a



Unscrew the links for each watering supply.

b



Unscrew the links



c

Header + water flow control valve assembly

3°

Remove the PP-R D25 piping to the header.



PP-R D25 pipe

4°

Disassemble the side cover



a

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



b

Unscrew (lateral screw)

c

Unscrew (lower screw)



5°

Removal of the droplet separators.





a

Remove the cassettes

7°

Removal of evaporative cassettes



22. FRONT DISASSEMBLY

Unit disassembly. Front

The unit can be disassembled in easy steps for maintenance and/or cleaning work of the HEF2 Series.

Disassembly steps:

1st LATERAL disassembly step 1

2nd LATERAL disassembly step 2

3rd LATERAL disassembly step 3

4°

Bleed-off disassembly



a

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



b

Unscrew
D25 PP-R union



c

Bleed-off

5°

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



a

Unscrew the support

b

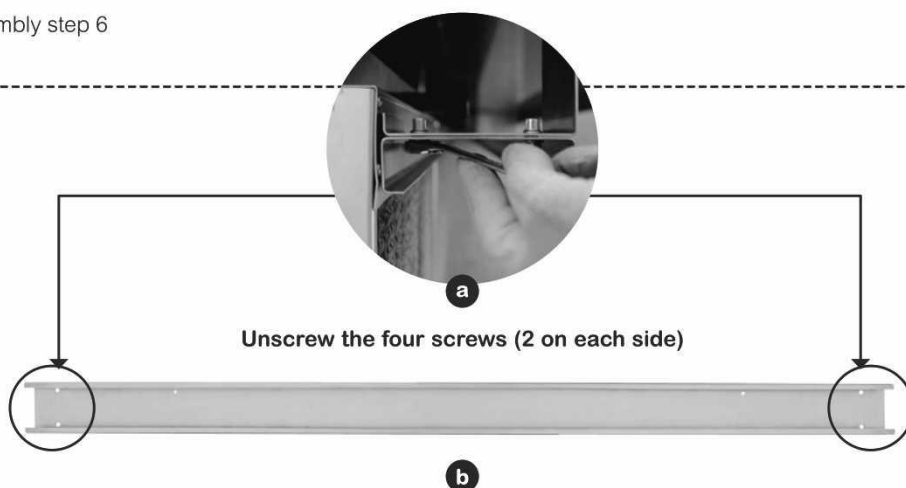
If the float valve is mounted on the support,
disconnect the water supply

6° Removal of droplet separators

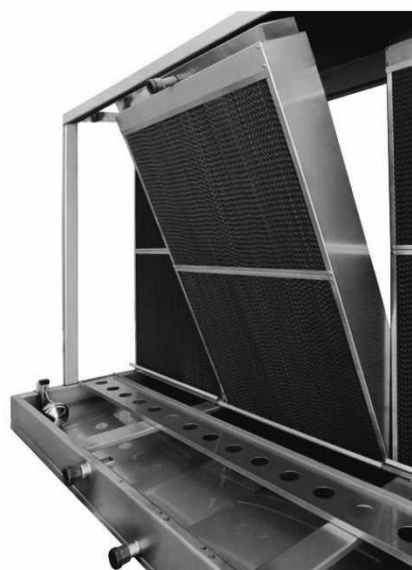


7° LATERAL disassembly step 6

8° Disassembly of the b piece



9° Removal of the evaporative cassettes



23. CLEANING THE INDIVIDUAL IRRIGATION SYSTEM.

1°

Remove the individual top piece mounted on each evaporative cassette

a
Evaporative
cassette



b

Press with both hands
on one of the flaps,
as shown in the image.



c

Remove the individual irrigation top piece



d

Individual top piece

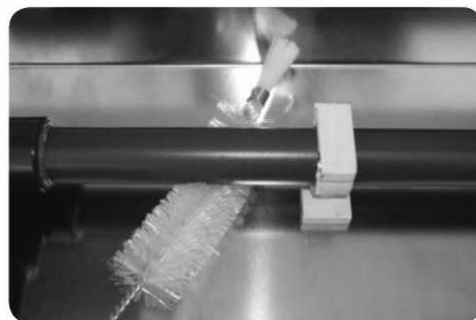
2°

Clean the perforated pipe of the individual irrigation top piece



a

Use the special brush supplied with each HEF2 Series



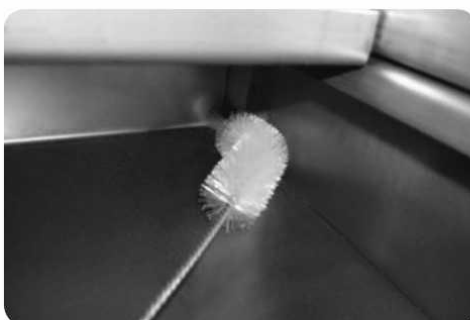
b

Brush the perforated pipe as shown in the image

[Note]

We recommend 10 strokes swivelling 180° each time.

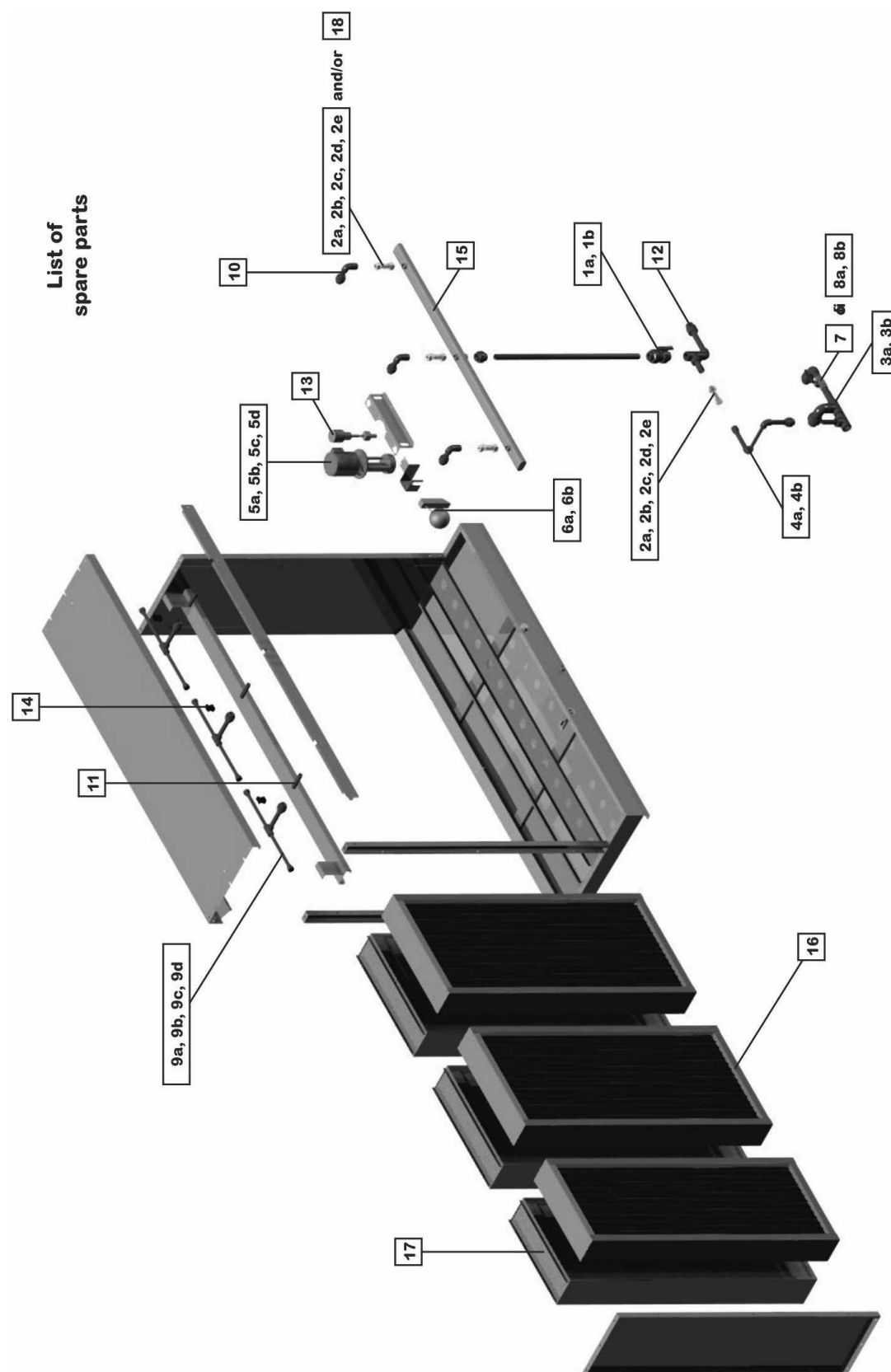
CLEANING THE INDIVIDUAL IRRIGATION SYSTEM OF THE WATER TANK






a


The out-of-reach zones of the water tank simply by hand.
Use the special brush supplied with each unit


24. LIST OF SPARE PARTS.



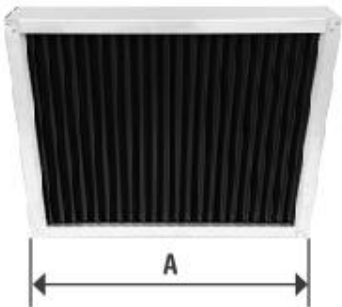
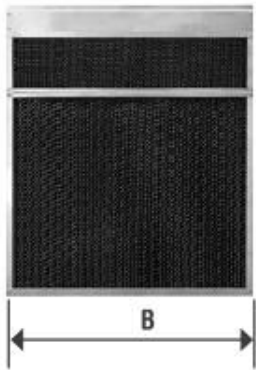



SPARE PARTS LIST	ITEM	COMPONENT	FISAIR CODE
2-REGULATION VALVE SHOWING CASSETTE AND BLEED-OFF FLOW 	2a	Regulation Valve Showing Flow DN 15 0,3-1,5 l/m	62000050
	2b	Regulation Valve Showing Flow DN 15 0,6-2.4 l/m	62000055
	2c	Regulation Valve Showing Flow DN 15 1-3,5 l/m	62000060
	2d	Regulation Valve Showing Flow DN 15 2-8 l/m	62000065
	2e	Regulation Valve Showing Flow DN 15 3-12 l/m	62000070
3-DRAINING SET, OVERFLOW TO DRAIN 	3a	Left	62500221
	3b	Right	62500220
4-BLEED-OFF SET 	4a	Left	62500230
	4b	Right	62500229
5-WATER RECIRCULATION PUMP 	5a	Water Pump 50W. 230V/I/50Hz	65310065
	5b	Water Pump 60W. 230-400V/III/50Hz	65310005
	5c	Water Pump 125W. 230-400V/III/50Hz	65310021
	5d	Water Pump 240W. 230-400V/III/50Hz	65310020

SPARE PARTS LIST	ITEM	COMPONENT	FISAIR CODE
6- WATER SUPPLY FLOAT VALVE 	6a	AISI 304 Stainless steel float valve 3/8"	62350010
	6b	AISI 304 Stainless steel float valve 1/2"	62350015
7-DRAINING CUT-OFF VALVE 	7	3/4F-F Chrome Brass Ball Valve Lever	62000015
8- MOTOR VALVE 2-WAY (RW) 	8a	DRAINAGE MOTOR VALVE 24 VAC/DC, 2-WAY 1 1/2"	71090385
	8b	DRAINAGE MOTOR VALVE 230 VAC, 2-WAY 1 1/2"	71090386

LIST OF SPARE PARTS	ITEM	COMPONENT	FISAIR CODE
<p>8. 3-WAY MORISED VALVE</p> 	14a	3-WAY MOTORISED VALVE 24 VAC/DC 3/4" TYPE 1	71090346
	14b	3-WAY MOTORISED VALVE 230 VAC 3/4" TYPE 1	71090342
	14c	3-WAY MOTORISED VALVE 24 VAC/DC 3/4" TYPE 3	71090348
	14d	3-WAY MOTORISED VALVE 230 VAC 3/4" TYPE 3	71090344

SPARE PARTS LIST	ITEM	COMPONENT	FISAIR CODE
9-CASSETTE IRRIGATION SET 	9a	For 300 mm Cassette	62500223
	9b	For 400 mm Cassette	62500224
	9c	For 500 mm Cassette	62500225
	9d	For 600 mm Cassette	62500226
	9e	For 200 mm thickness Cassette	62500227
	9f	For 300 mm thickness Cassette	62500228
10-CASSETTE IRRIGATION SUPPLY 	10	Cassette Irrigation Supply Set	-
12-COLLECTOR PUMP-BLEED OFF 	12	Collector Pump-Bleed Off-Up Pipe Set	62500222
12-LEVEL DETECTOR 	13	Max/Min level detector	64220324

SPARE PARTS LIST	ITEM	COMPONENT	FISAIR CODE
14-IRRIGATION INDIVIDUAL DISTRIBUTION NYLON CLIP 	14	D20 mm Nylon Clip	60700015
15-STAINLESS STEEL COLLECTOR 	15	Provide HEF2 Series Serial N°	
16-DROPLET SEPARATORS 	16	1. Measure A in the droplet separator being replaced 2. Provide GEF2 Series Serial N°	-
17-EVAPORATIVE CASSETTES 	17	1. Measure B in the evaporative Cassette being replaced 2. Give the HEF2E Series Serial N°	
17-SOLENOID VALVE 	18a	24Vac Parker supply solenoid valve	71090005
	18b	230Vac Parker supply solenoid valve	71090006
	18c	24Vdc Parker supply solenoid valve	71090008
	18d	24Vdc Danfoss supply solenoid valve	71090010
	18e	24Vac Danfoss supply solenoid valve	71090312
	18f	230Vdc Danfoss supply solenoid valve	71090315

25. MACHINE CONFORMITY DECLARATION

 	DECLARACIÓN CE DE CONFORMIDAD EC CONFORMITY DECLARATION EG KONFORMITÄTSEKTLÄRUNG DECLARATION CE DE CONFORMITÉ	
Departamento de Dirección de Calidad Quality Management Department	Qualitätsmanagement-Abteilung Département de gestion de la qualité	
	FISAIR S.L.U. C/ Ciudad de Frias,33-(P.L. Camino de Getafe) 28021 Madrid SPAIN Tel.: (+34) 916921514 info@fisair.com	
<p>La presente declaración de conformidad se expide bajo exclusiva responsabilidad del fabricante. This declaration of conformity is issued under the sole responsibility of the manufacturer. Diese konformitätserklärung wird in der alleinigen verantwortung des herstellers ausgestellt. Cette déclaration de conformité est délivrée sous la seule responsabilité du fabricant.</p>		
<p>Descripción/ Product description/ Produktbeschreibung/ Description du produit: HEF2E Tipo de máquina/ Machine type/ Maschinentyp/ Type de machine: MÁQUINA/ MACHINE/ MASCHINE/ MACHINE Marca/ Brand/ Marke/ Marque: FISAIR</p>		
<p>Es conforme con la legislación de armonización pertinente a la unión europea: It complies with the harmonization legislation relevant to the European Union: Es entspricht den für die Europäische Union relevanten Harmonisierungsgesetzen</p>		
<p>Es conforme con las siguientes normas: It complies with the following standards: Es entspricht den folgenden Normen: Il est conforme aux normes suivantes:</p>		2006/42/CE 2014/30/UE 2014/35/UE UNE-EN ISO 12.100:2012 UNE-EN 60204-2:2019 UNE-EN 61000-6-6:2012 UNE-EN 61000-6-3:2012
<p>FISAIR se exime de cualquier responsabilidad a menos que se cumplan con todas las instrucciones de instalación y funcionamiento proporcionadas por FISAIR, o si los productos han sido modificados o alterados sin el consentimiento por escrito de FISAIR, o si tales productos han sido sometidos a un mal uso, mala manipulación, alteración, mantenimiento inadecuado o muestran consecuencias de accidente o utilización negligente. FISAIR disclaims any liability unless all installation and operating instructions provided by FISAIR are followed, or if products have been modified or altered without FISAIR's written consent, or if such products have been subjected to misuse. use, mishandling, alteration, improper maintenance or show consequences of accident or negligent use.</p>		
<p>Con exclusión de responsabilidades sobre las partes o componentes adicionales o montados por el cliente. With no liability for the parts or components added or assembled by the customer. Unter Ausschuß der Verantwortung über die vom Kunden bereitgestellten und/oder angebauten Teile. Avec exclusion des responsabilités concernant les parties ou les composants ajoutés ou assemblés par le.</p>		
<p>Juan Boeta Tejera -Chairman and CEO- July 2020 Property of FISAIR</p>		
		Rev01

26. PARTLY COMPLETED MACHINERY (QUASI-MACHINE) CONFORMITY DECLARATION

		DECLARACIÓN CE DE CONFORMIDAD EC CONFORMITY DECLARATION EG KONFORMITÄTSEKTLÄRUNG DECLARATION CE DE CONFORMITÉ	
Departamento de Dirección de Calidad Quality Management Department		Qualitätsmanagement-Abteilung Département de gestion de la qualité	
		FISAIR S.L.U. C/ Ciudad de Frias,33-(P.L. Camino de Getafe) 28021 Madrid SPAIN Tel.: (+34) 916921514 info@fisair.com	
<p>La presente declaración de conformidad se expide bajo exclusiva responsabilidad del fabricante. This declaration of conformity is issued under the sole responsibility of the manufacturer. Diese konformitätserklärung wird in der alleinigen verantwortung des herstellers ausgestellt. Cette déclaration de conformité est délivrée sous la seule responsabilité du fabricant.</p>			
Descripción/ Product description/ Produktbeschreibung/ Description du produit: HEF2E			
Tipo de máquina/ Machine type/ Maschinentyp/ Type de machine: CUASI MÁQUINA/ QUASI MACHINE/ QUASI MASCHINE/ QUASI MACHINE			
Marca/ Brand/ Marke/ Marque: FISAIR			
<p>Es conforme con la legislación de armonización pertinente a la unión europea: 2006/42/CE It complies with the harmonization legislation relevant to the European Union: 2014/30/UE Es entspricht den für die Europäische Union relevanten Harmonisierungsgesetzen 2014/35/UE</p>			
<p>Es conforme con las siguientes normas: UNE-EN ISO 12.100:2012 It complies with the following standards: UNE-EN 60204-2:2019 Es entspricht den folgenden Normen: UNE-EN 61000-6-6:2012 Il est conforme aux normes suivantes: UNE-EN 61000-6-3:2012</p>			
<p>FISAIR se exime de cualquier responsabilidad a menos que se cumplan con todas las instrucciones de instalación y funcionamiento proporcionadas por FISAIR, o si los productos han sido modificados o alterados sin el consentimiento por escrito de FISAIR, o si tales productos han sido sometidos a un mal uso, mala manipulación, alteración, mantenimiento inadecuado o muestran consecuencias de accidente o utilización negligente. FISAIR disclaims any liability unless all installation and operating instructions provided by FISAIR are followed, or if products have been modified or altered without FISAIR's written consent, or if such products have been subjected to misuse, use, mishandling, alteration, improper maintenance or show consequences of accident or negligent use.</p>			
<p>Lea el Manual de Instalación, Funcionamiento y Mantenimiento antes de utilizar este equipo. La puesta en servicio de cuasi máquina estará prohibida hasta que la cuasi máquina sea montada en una máquina y esta cumpla las disposiciones de la Directiva 2006/42/CE y se disponga de la declaración de conformidad de acuerdo con lo dispuesto en el Anexo II A. En el manual se determinan medidas de seguridad que deberá cumplir la máquina en la que se monte la cuasi máquina. FISAIR no se responsabiliza de la seguridad. Read the Installation, Use and Maintenance Manual before using this equipment. The commissioning of the quasi-machine shall be prohibited until the quasi-machine is mounted on a machine and the machine complies with the provisions of Directive 2006/42/CE and the declaration of conformity is available in accordance with the provisions of Annex II A. The manual determines the safety measures that the machine on which the quasi-machine is mounted must comply. FISAIR is not responsible for security.</p>			
<p>Con exclusión de responsabilidades sobre las partes o componentes adicionales o montados por el cliente. With no liability for the parts or components added or assembled by the customer. Unter Ausschluss der Verantwortung über die vom Kunden bereitgestellten und/oder angebauten Teile. Avec exclusion des responsabilités concernant les parties ou les composants ajoutés ou assemblés par le.</p>			
<p>Juan Boeta Tejera -Chairman and CEO- July 2020 Property of FISAIR</p> <p style="text-align: right;">Rev01</p>			

27. WARRANTY

	<p align="center">FISAIR S.L.U. WARRANTY POLICY</p>	
<p align="center">Quality Department Departamento de Calidad</p>		
<div data-bbox="496 551 759 674">  </div> <div data-bbox="778 551 1262 678"> <p>FISAIR S.L.U. C/ Uranio, 20 (Pol. Ind. Aimayr) 28330 San Martín de la Vega (Madrid) SPAIN ☎ Tfº (34) 916921514 ☎ Fax (34) 916916456</p> </div> <p>Two-year Limited Warranty</p> <p>FISAIR warrants to the original purchaser that its products will be free from defects in materials and parts for a period of two (2) years after installation or twenty-seven (27) months from the date FISAIR ships such product, whichever date is the earlier.</p> <p>If any FISAIR product is found to be defective in material or assembly during the applicable warranty period, FISAIR's entire liability, and the purchaser's sole and exclusive remedy, shall be the repair or replacement of the defective product or part.</p> <p>Warranty disclaimer</p> <p>FISAIR shall not be liable for any costs or expenses, whether direct or indirect, associated with the installation, removal or reinstallation of any defective product.</p> <p>The Limited Warranty does not include any consumer part such as joints, pulleys, filters or media.</p> <p>FISAIR's Limited Warranty shall not be effective or actionable if:</p> <ul style="list-style-type: none"> a) All related product invoices have been paid in time and terms. b) Unless there is compliance with all installation and operating instructions furnished by FISAIR, or if the products have been modified or altered without the written consent of FISAIR, or if such products have been subject to accident, misuse, mishandling, tampering, negligence or improper maintenance. Such situations could be an incorrect power supply connection, crashed with inappropriate objects, security protection devices unblocked and so. c) Components and/or manufactures are affected or damaged by the effects of corrosion (gradual wear of the metal bodies by the action of external actors not controlled by FISAIR). <p>Any warranty claim must be submitted to FISAIR in writing within the stated warranty period.</p> <p>Parts Warranty</p> <p>Defective parts may be required to be returned to FISAIR. In case any part is claimed as a faulty one, FISAIR will ask the customer to send the part back to the factory in order to analyze if the part is failing due to any of above referred actions (see warranty disclaimer) or due to effective part failing.</p> <p>If the part must be replaced immediately, FISAIR will ship the part to the customer immediately and invoice the part with a 30 days delay payment for the faulty part to be returned. If the part is returned in this period, the part fail analysis would be made to emit a technical report for the warranty coverage based in this Warranty Statement document.</p> <p>In case that the part is failing due to a lack of quality, FISAIR will credit this invoice in order to stop the payment. In case FISAIR does not receive the part in this period, or if the failure is due to the reasons covered in the Warranty disclaimer paragraph, the invoice will be effective.</p> <p>In case any part from the product / shipment is missing, the customer should notify FISAIR before 3 days from the shipment date of arrival.</p>		
<p align="center">1/2</p>		

	FISAIR S.L.U. WARRANTY POLICY	
Quality Department Departamento de Calidad		
Service Covered by Warranty		
<p>In case that there is any FISAIR product that should be serviced in order to recover its proper used designed, FISAIR will select the person (s) in charge of this operation. These qualified technicians should have the enough knowledge to service FISAIR units.</p>		
<p>No company should practice a warranty service without the writing FISAIR notice giving the authorization to do it and if any cost should be cover by FISAIR should be advised in advance to the service job. In case that FISAIR should send FISAIR staff to solve the solution, trip expenses are not covered by the warranty.</p>		
<p>FISAIR's Limited Warranty is made in lieu of, and FISAIR disclaims all other warranties, whether express or implied, including but not limited to any implied warranty of merchantability, any implied warranty of fitness for a particular purpose, any implied warranty arising out of a course of dealing or of performance, custom or usage of trade.</p>		
<p>FISAIR shall not, under any circumstances be liable for any direct, indirect, incidental, special or consequential damages (including, but not limited to, loss of profits, revenue or business) or damage or injury to persons or property in any way related to the manufacture or the use of its products. The exclusion applies regardless of whether such damages are sought based on breach of warranty, breach of contract, negligence, strict liability in tort, or any other legal theory, even if FISAIR has notice of the possibility of such damages.</p>		
<p>By purchasing FISAIR's products, the purchaser agrees to the terms and conditions of this Limited Warranty.</p>		
Extended Warranty		
<p>The original user may extend the term of the FISAIR Limited Warranty for a limited number of months past the initial applicable warranty period and term provided in the first paragraph of this Limited Warranty. All the terms and conditions of the Limited Warranty during the initial applicable warranty period and term shall apply during any extended term.</p>		
<p>Each case should be valued in terms of type of product, equipment application, use and location of the product operation site.</p>		
<p>Any extension of the Limited Warranty under this program must be in writing, signed by FISAIR, and paid for in full by the purchaser.</p>		
Quality Manager:		
<div style="text-align: center;">  Hugo J. López Álvarez San Martín de la Vega, February 2016 </div>		
2/2		