HEF7 SERIES
INSTALATION AND MAINTENANCE MANUAL

Adiabatic cooling system for Air-condensed Water Chillers

MHEF7-EN-22-0

In compliance with European Union standards for machinery safety,
it is essential to read this manual in detail before installing units.

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RC-0529/2015

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1. General description

EVAPORATIVE HUMIDIFIER OPERATING PRINCIPLE

FISAIR evaporative humidifier units are designed to increase the water vapour content of the treated air, through the natural evaporation of water in its liquid phase. The air flow being treated passes through a cellular panel, which is watered by an irrigation system. The panel is made up of undulating sheets of organic or inorganic paper containing stiffening agents and water absorbers.

Panels are laid out in criss-crossing channels to provide a large surface area for air-water contact, which maximizes water evaporation and at the same time minimizes resistance to the air flow passing through (pressure drop).

See the graph of evaporative performance and pressure drop for the panel in relation to the air speed

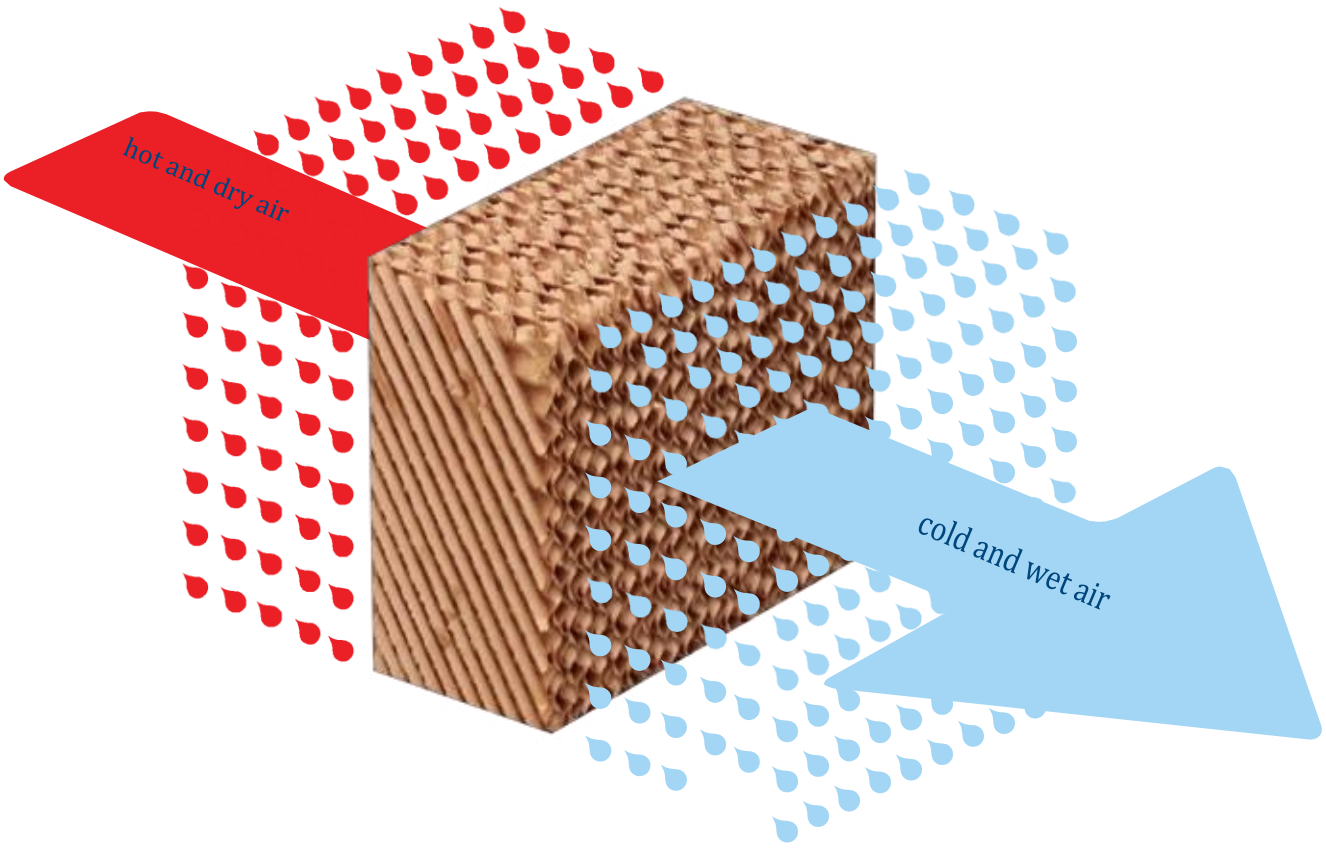
FISAIR evaporative humidifiers work in a similar way to natural phenomena occurring in rivers, lakes and seas. All that is added to the air is pure water vapour.

PROVISIONAL STORAGE

During storage, keep units dry and protected against the elements.

[Note]: Thermo-hygrometric conditions of the storage area:

Temperature: *[-10… 50ºC]*
Relative Humidity: *[5… 95%HR]*
No condensation



1.1. Safety instructions

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. Estas situaciones pueden ser una conexión de alimentación incorrecta, golpes con otros objetos, anulación de seguridades, etc.

Please read these safety notes 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.

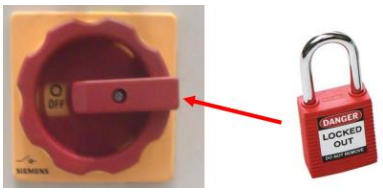
Installing, Disassembling, Maintaining and Repairing the unit

- 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. HEF7 nomenclature

HEF7 MODEL

HEF7 -	VCS906-E6

Factory chiller model

PUMPING GROUP FOR HEF7

Pumping group -	230V-IN-50/60Hz

Line voltage

Basic control panel / (CONTROL PANEL)

CCB2.0-	230V-IN-50/60Hz

Line voltage

3. 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 HEF7 device is classified according to whether it is delivered with a CCB2.0 control panel:

- If only the HEF7 device is supplied → **Partly completed machinery (quasi-machine)**
- If the HEF7 device + CCB2.0 control panel are supplied→ **Machine**
- If the HEF7 device + CCB2.0 control panel are supplied separately → **Partly completed machinery + Partly completed machinery ≠ Machine**

The rating plate shows the following information for the equipment:

- Model: description of the particular HEF7 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:

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

4. High efficiency HEF7 evaporative panel

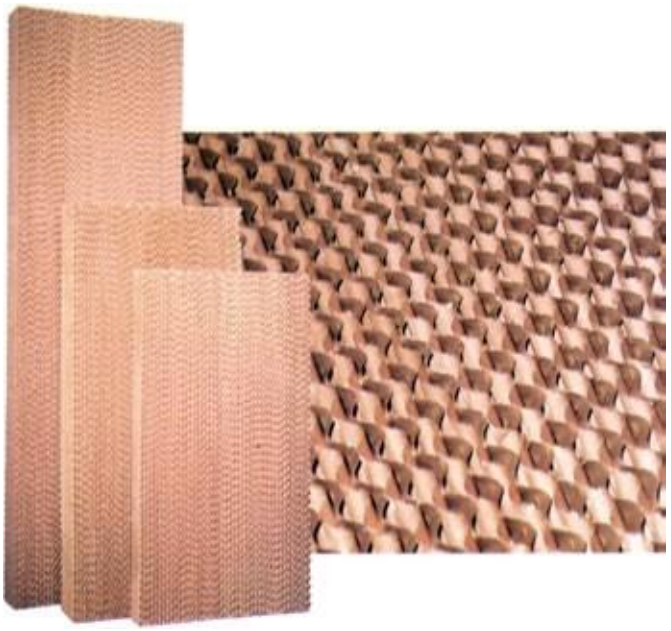
4.1. ORGANIC EVAPORATIVE PANEL

- **Maximum performance:** Organic Media is designed to provide the largest possible air-to-water contact surface area (approximately 460 m2/m3). Such a large area enables optimal evaporative cooling and humidification from the evaporation.

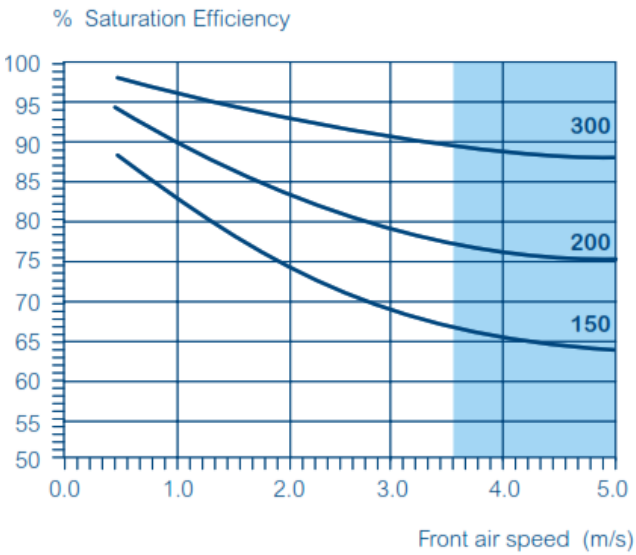
- **Maximum freshness:** it works as a natural filter purifying the entry air. Carefully designed channelling eliminates dust particles and mineral deposits from the air, which are trapped on the evaporative surface.

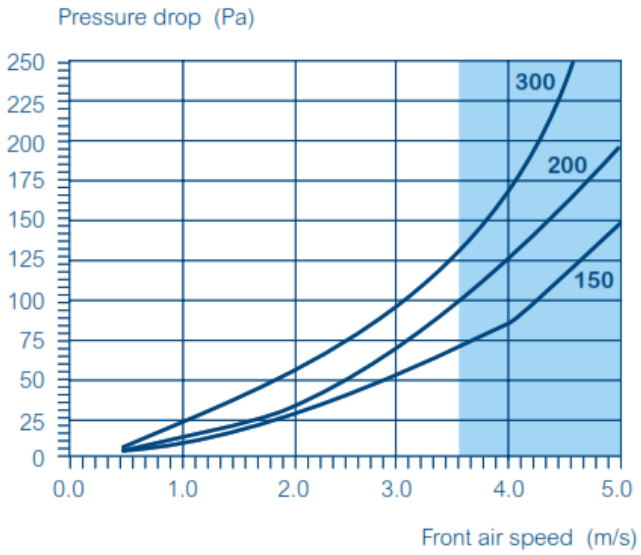
- **Maximum durability:** made from special cellulose paper impregnated with insoluble chemical components in order to ensure a long working life in the system.

- **Maximum resistance:** appropriate bleed-off and regular brushing make it possible to be used in imperfect water and air conditions.



TYPE 0760





[Note]

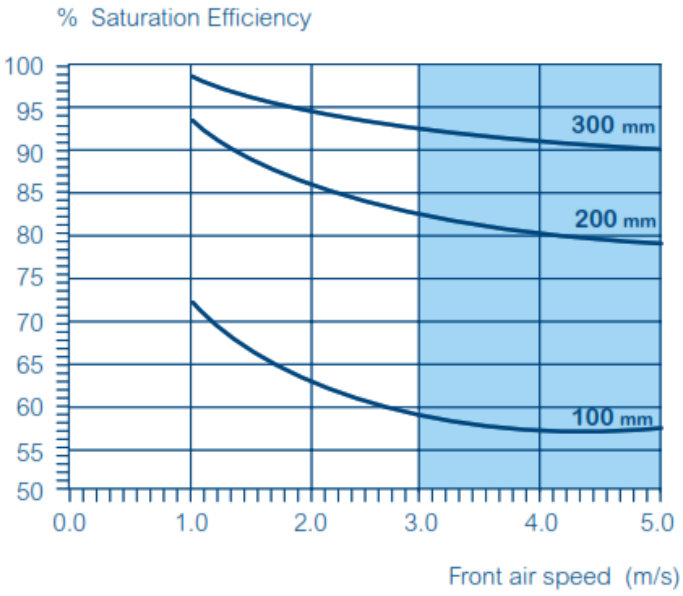
Air speeds in the shaded zone can cause droplet carry-over.

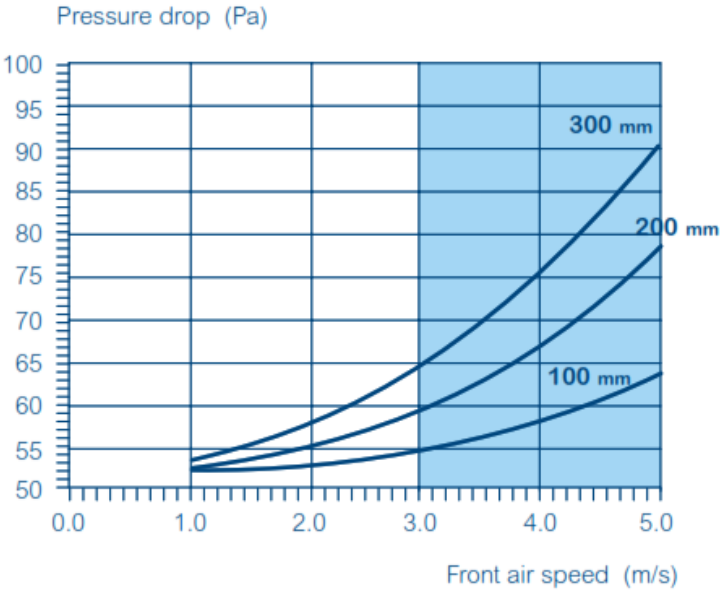
4.2. INORGANIC EVAPORATIVE PANEL

These panels are made of fibreglass with a special coating to enable a greater absorption capacity and ensure constant evaporative humidification and cooling, even at high air speeds. They are made of fireproof inorganic material.
They are ideal for humidifiers placed after air treatment and heater units, and for the pre-cooling of gas turbines.

- **Inorganic and fireproof (in accordance with EURO Class A2, S1, D0)**
- **Low humidification/cooling energy costs**
- **Precise control**
- **No risk of oversaturation**
- **No need for water treatment**
- **Safe and hygienic**

TYPE 0760

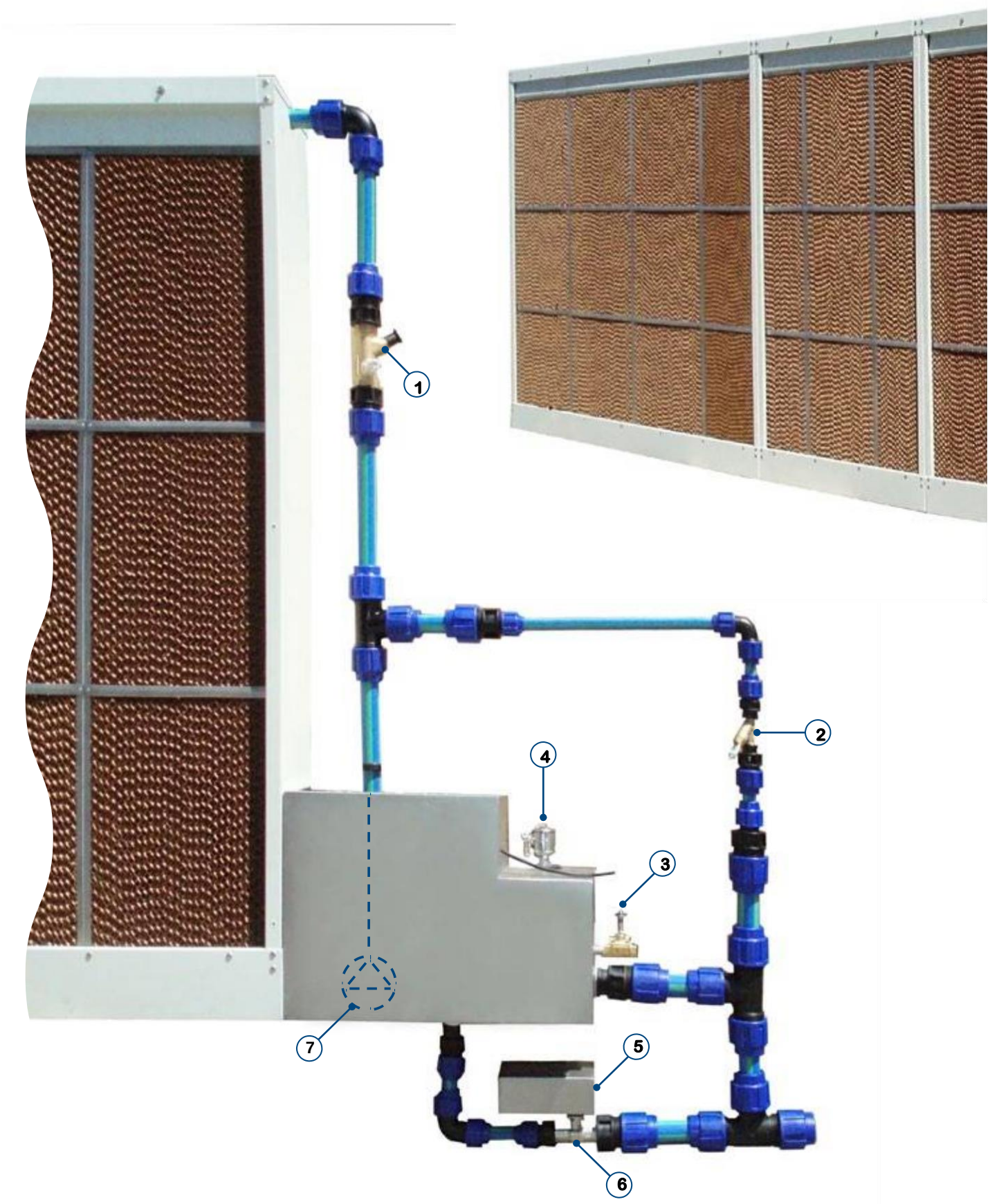


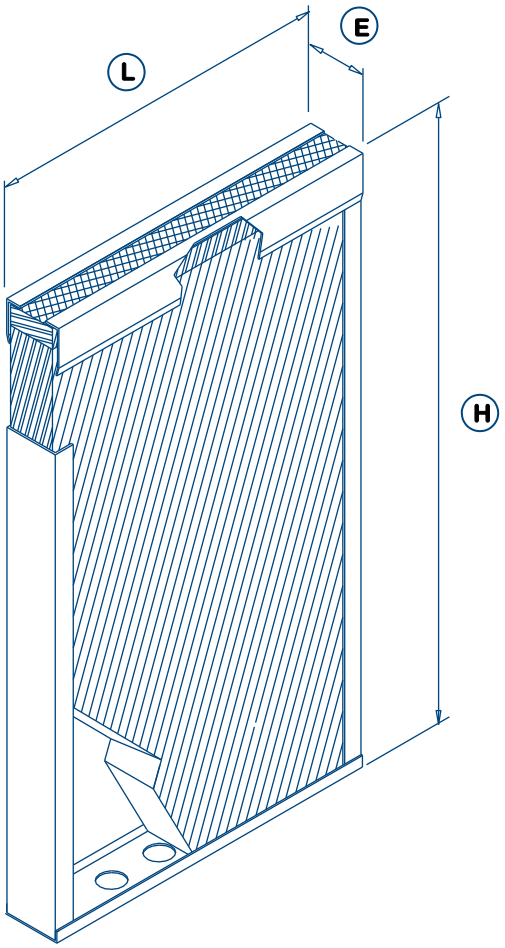


[Note]

Air speeds in the shaded zone can cause droplet carry-over.

5. Unit components





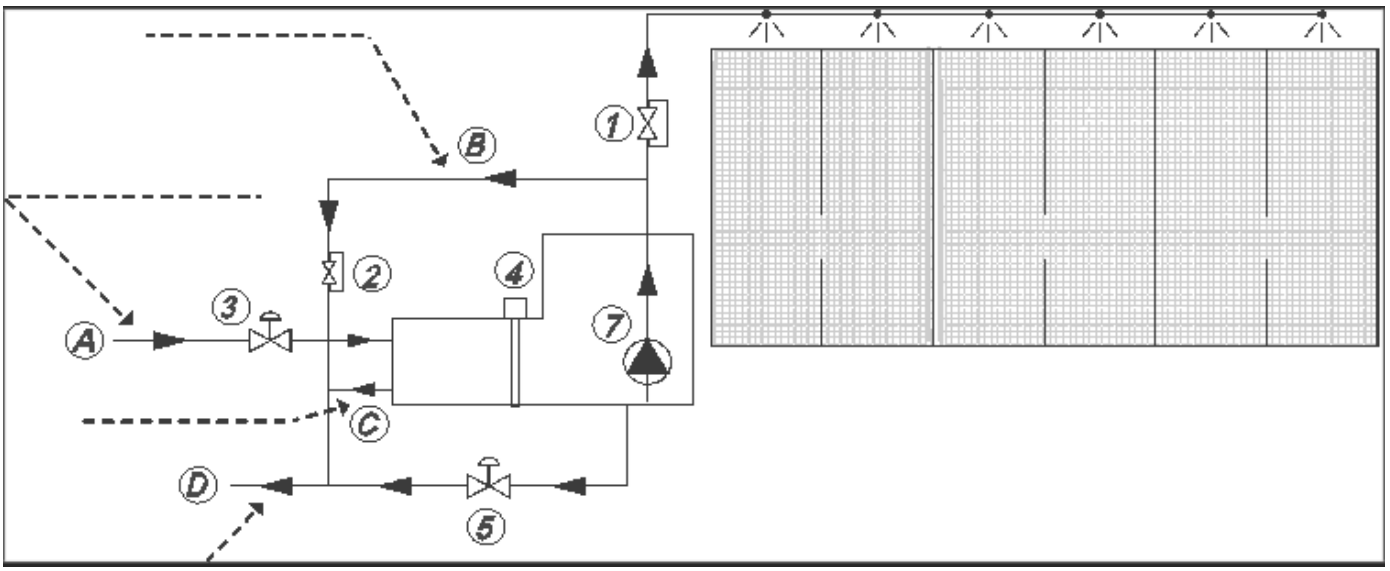
The unit serial number and the dimensions of the cassette are required for evaporate cassette spare parts.

L = Cassette length H = Cassette height E = Cassette thickness

For further information on parts of systems, please contact the manufacturer.

Brand	Code	Descriptions	Units
1	-	REGULATION VALVE	1
2	62000075	REGULATION VALVE	1
3	71090008	SOLENOID VALVE	1
4	64220314	LEVEL SENSOR	1
5	63390021	VALVE ACTUATOR	1
6	63330051	2-WAY VALVE	1
7	65330005	PUMP	1

6. Operating principle



A	Water Supply
B	Constant bleed-off
C	Overflow
D	Drainage
1	Regulation valves with Flow meter (Irrigation)
2	Regulation valves with Flow meter (Bleed-off)
3	Filling Solenoid Valves
4	Max/Min level detector
5	Valves with actuator (Drainage)
7	Water Recirculation Pump

7. Installation requirements

OVERVIEW

To ensure optimum performance and maintenance, humidifiers must be placed on a level surface, with a drain, so possible leaks during installation, start-up, operation and maintenance can be controlled.

Assembly in conjunction with an air-cooling unit must ensure the air passes through the evaporative panels, by closing off the perimeter sides to prevent a potential bypass in the air flow and ensure the adiabatic performance of the design.

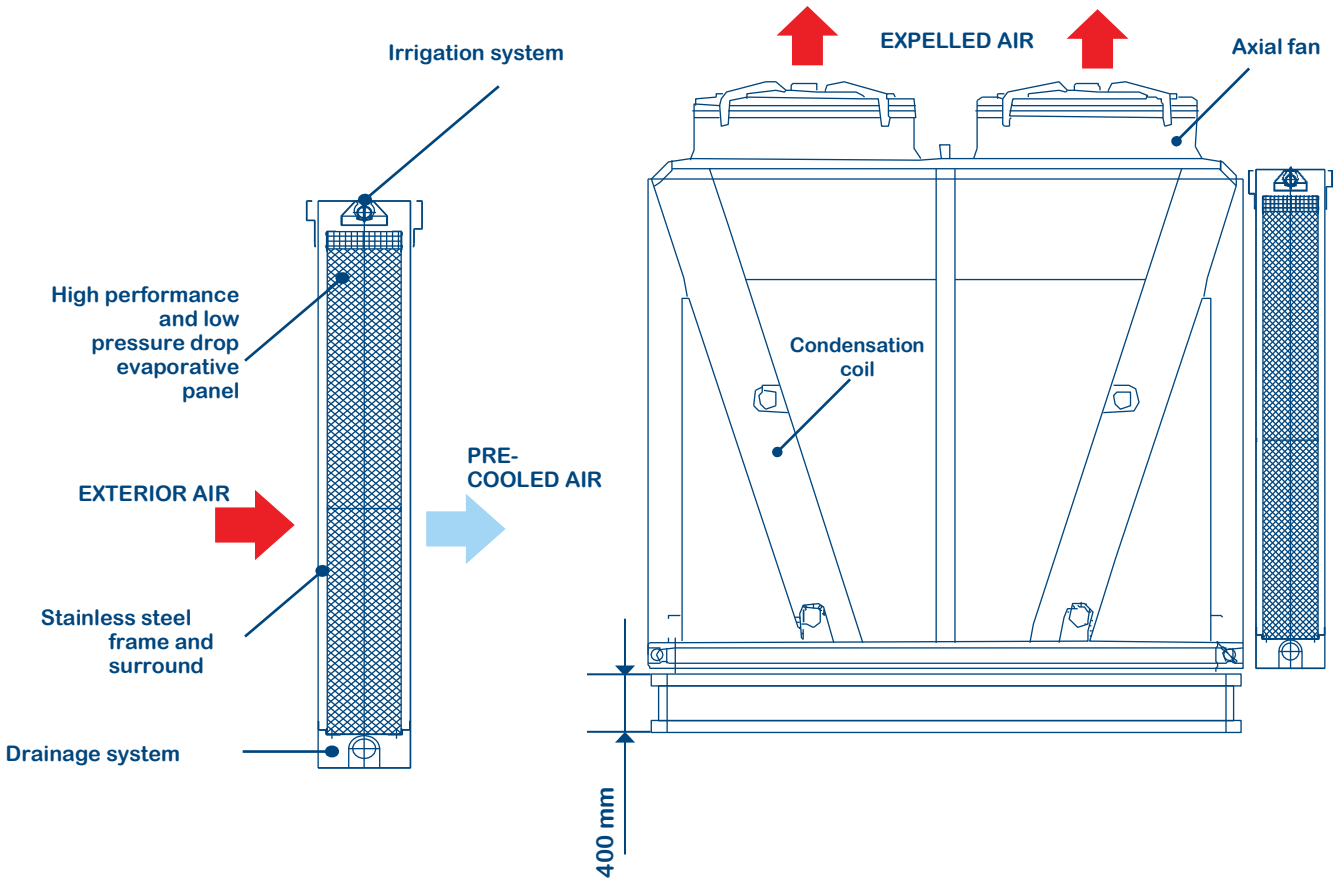
PLACEMENT AND SERVICING SPACE

Humidifiers are normally placed just before the coil and before the sensible exchange in the air cooling system.

A 1m space should be left in front of the unit section for inspection and servicing.

Note: *Thermo-hygrometric conditions of the operating place (*)*
Temperature: *[5… 40ºC]*
Relative humidity: *[5… 97%HR]*

In case the pump does not work (with it consecuence of lack of irrigation) is advisable not to exceed 50ºC in the temperature of the air to be processed,
With the pump running, it cannot exceed 40ºC on the pump side.



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 20-25ºC
V<2	15 min
2≤V<3	12 min
3≤V<4	9 min
4≤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.

8. Connections and regulation

OVERVIEW

FISAIR HEF7 evaporative humidifiers essentially work in accordance with the irrigation of the evaporative panels. Humidification occurs whenever there is an air current passing through and the water pump irrigates the panels.

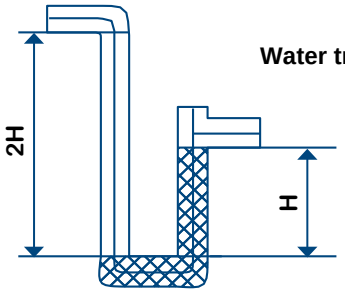
[Note] In order to eliminate superficial dust on the panels, and to prevent its transmission to occupied areas, the water irrigation pump should be left operating for 6 hours with no air flow, to wash the panels. Subsequently, the water used for washing should be drained before normal start-up.

WATER CONNECTIONS

• Connect the water network supply to the ½" filter in Y, and this to the solenoid supply valve.

• Connect the common outlet for the 50mm diameter drain / overflow / constant bleed-off to the drainage network.

• The water outlet connection to the drain must have a water trap or seal, as shown in the figure, large enough to overcome system pressure in order for the tank to drain completely, for hygiene reasons. The system has the normal slope of any drainage line.

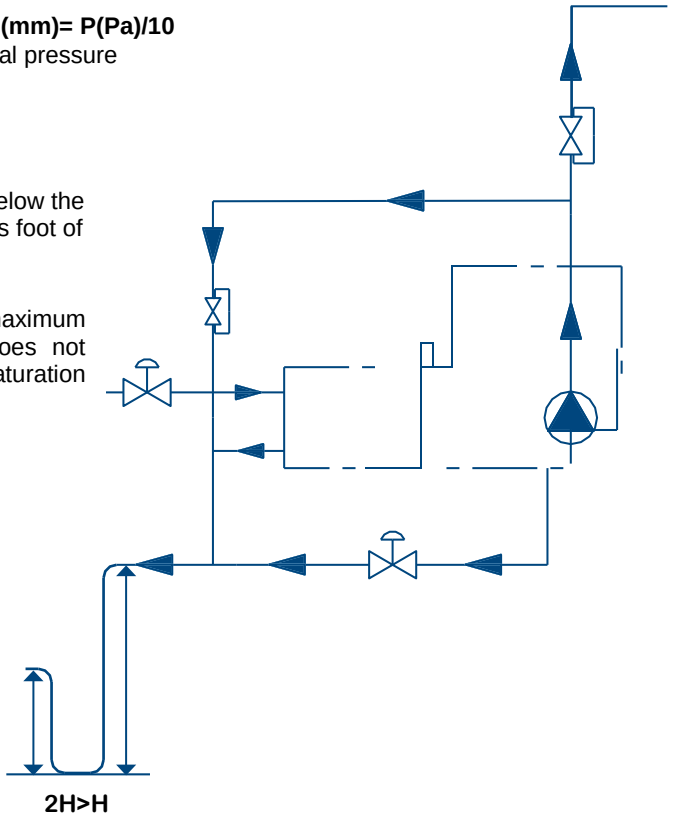


Water trap for positive pressures

Hmin. (mm)= P(Pa)/10
P= Total pressure

Note 1: The water level should never be below the foot of the pump water. The level below this foot of water will damage the pump irreparably.

Note 2: It is very important that the maximum temperature of the basin feed water does not exceed the 25-30ºC range as the saturation efficiency performance could be affected.

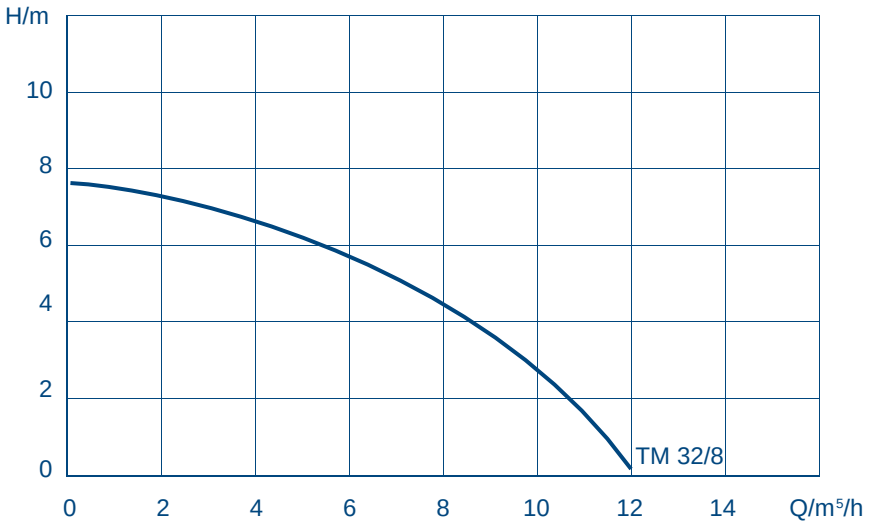


Remark 3: How to avoid standing water in the water supply:

- If the distance from the supply valve to the main water supply line (with continuous water flow) ≥ 2m:
  Install a 3-way valve, before the cut-off valve, with a return line to the main water supply line, to avoid water retention.

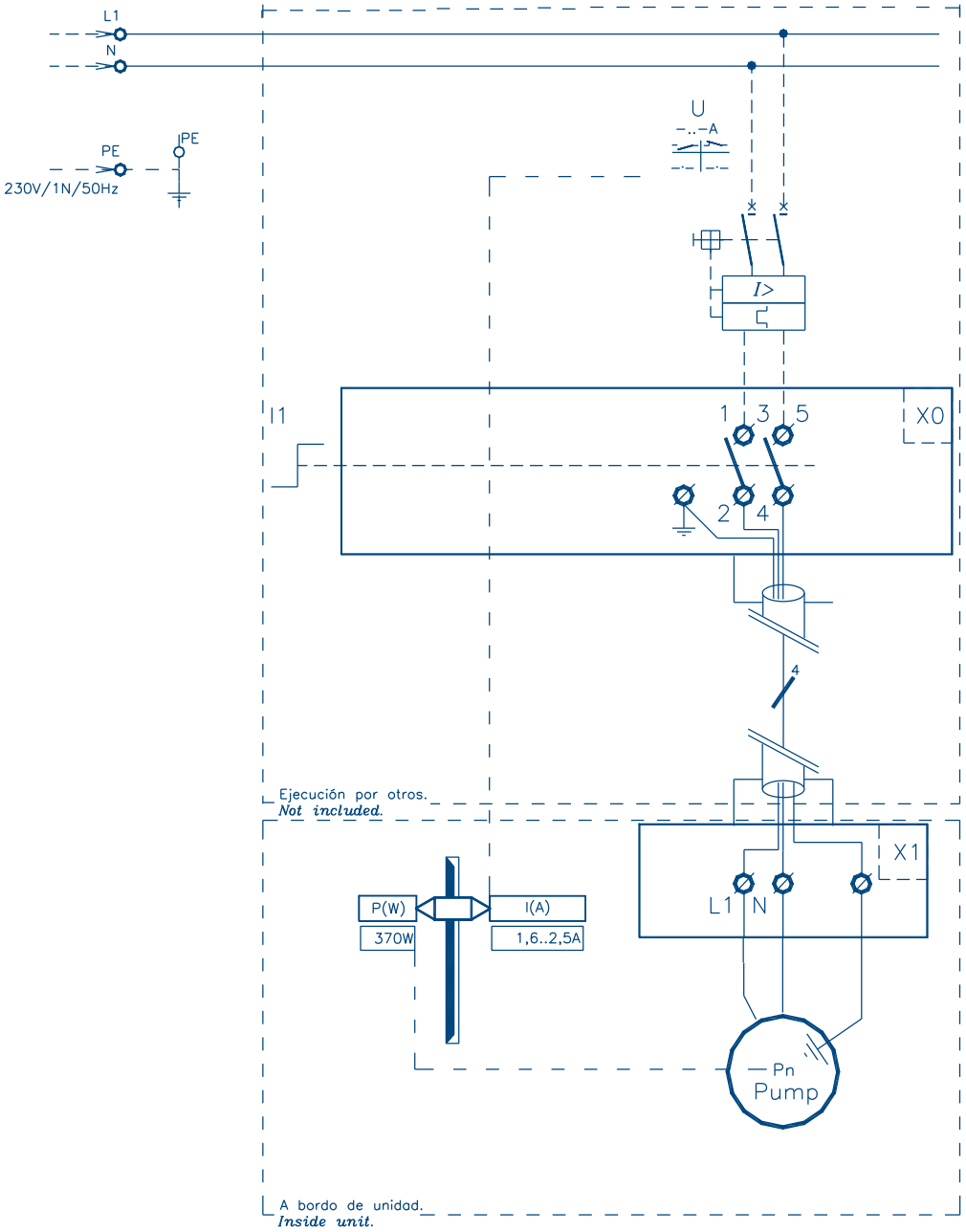
- If the distance from the supply valve to the main water supply line (with continuous water flow) < 2m:
  It is not necessary to install the 3-way valve.

9. Recirculation pump electricity connection



Connect the electricity supply cable to the terminal box of the water irrigation pump using an appropriate connection (IP-55 or higher).

La protección y operativa de alimentación eléctrica a la bomba debe ser determinada por el proyectista del sistema.



PUMP TECHNICAL DATA

Electrical power supply	Service voltage (Vac)	230
	Frequency (Hz)	50
	Motor nominal power (W)	370
	Consumption (A)	2,1
Degree of protection	Degree of protection according to EN 60529	IP 68
Enviromental conditions	Max. fluid temperature (ºC)	35
Functional data	Max working height (m)	7
	Max. working flow (m3/h)	10

10. Level detector connection

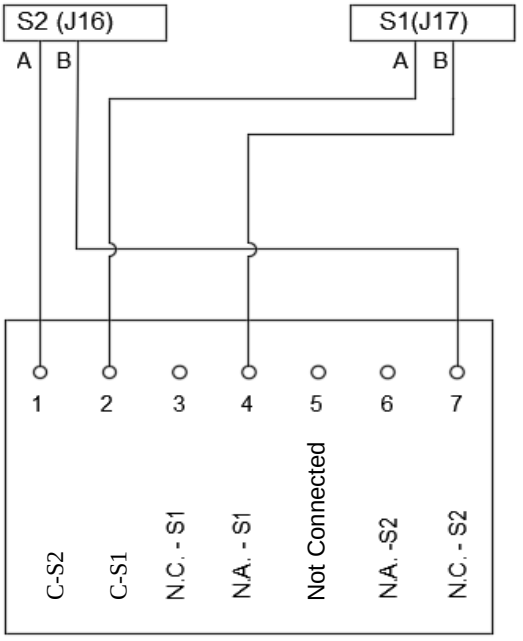
1. Minimum level detector (low level S1):

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 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 manual).

Example connection to CCB2.0



Remark: Max Voltage: 175 Vcc / 110 Vca
Max Current: 1 Acc
Temperature: -20...120ºC
Min. Density: 0, 75 gr/cm^3

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

ALTO= High level S2
BAJO= Low level S1

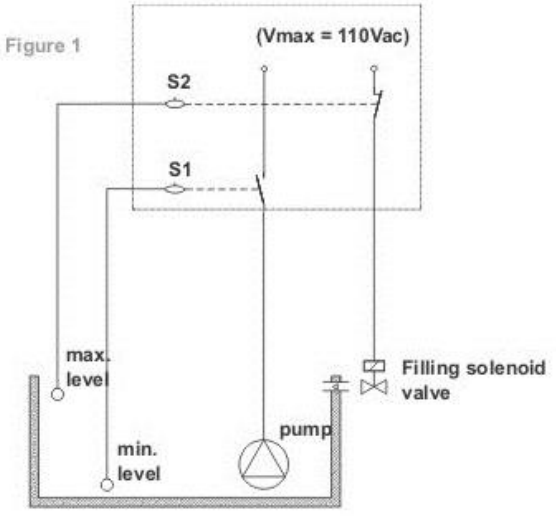
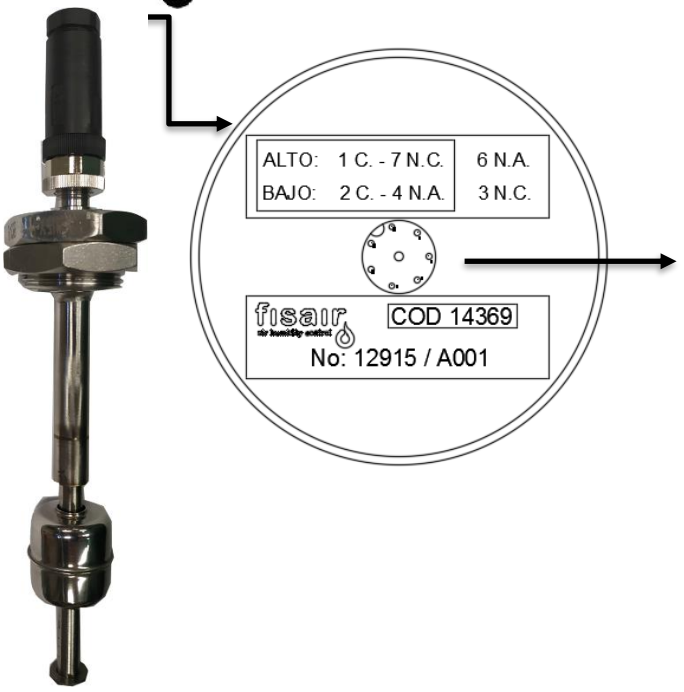
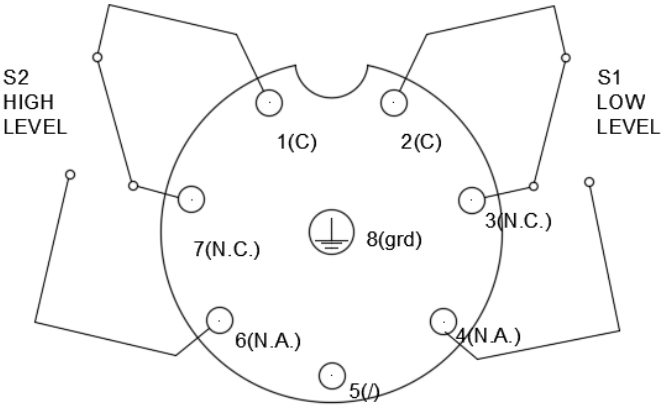


Figure 1: Explanatory diagram to confirm which components are managed by levels S1 and S2.
It's not a *unifilar* diagram.

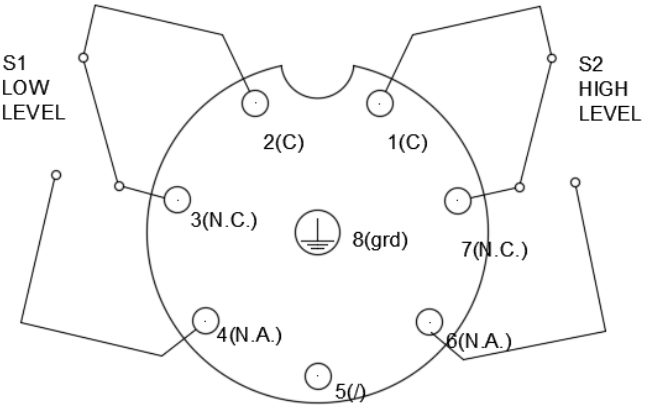


BOTOM VIEW



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

FRONT/TOP VIEW



N.C. = normally closed ALTO= High level S2

N.A. = normally open BAJO= Low level S1

C= Common

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

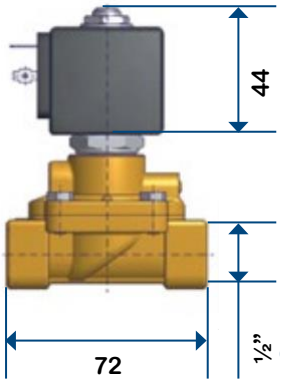
Mesh to fix the float:

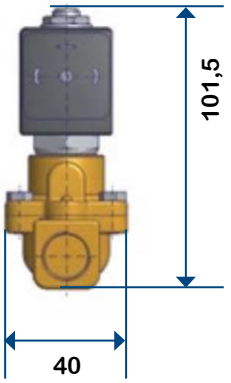
Remark: Remove the fixing mesh when the equipment is placed on its final location just before commissioning.

11. Solenoid valve electricity connection

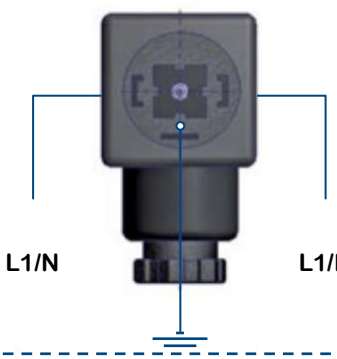
The water supply NC solenoid valve of the tank is composed of the body of the valve, the coil and the connector. The coil and the connector are supplied for a 24Vac or 230Vac connection.

G ½" brass water supply N.C. solenoid valve

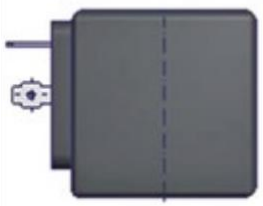




24V connector (L1+N+T)
230V connector (L1+N+T)



230V or 24V coil (50/60 Hz)



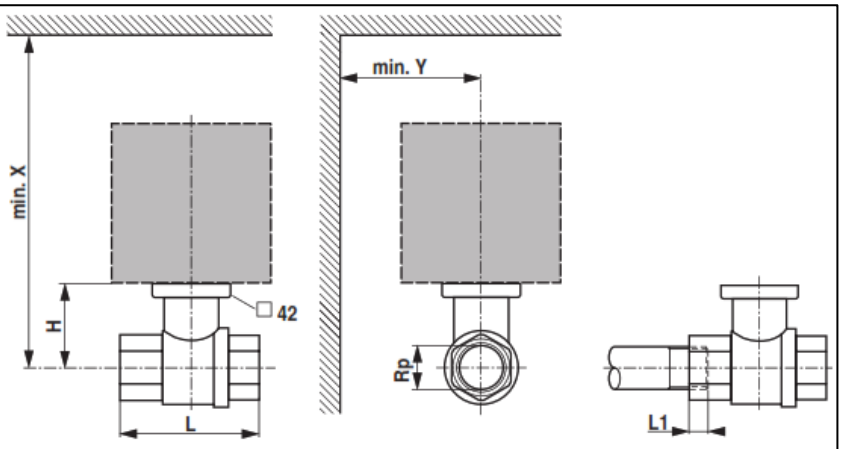
Electrovávula de alimentación de agua		
Alimentación 24V	Tensión de servicio (VAC)/Frecuencia (Hz)	24/50-60
	Potencia Nominal (W)	8
Alimentación 230V	Tensión de servicio (VAC)/Frecuencia (Hz)	230/50-60
	Potencia Nominal (W)	8
Alimentacion de agua	Conexión	1/2" G
Grado de protección de carcasa	Grado de protección según EN 60529	IP55
Condiciones ambientales	Temperatura ambiente máxima (°C)	50
	Temperatura fluido máxima (°C)	90

12. Connection of the motor-zone valve N.C. for automatic emptying / draining

DRAIN/EMPTY VALVE

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

Dimensional drawings



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.

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

ACTUATOR TECHNICAL DATA

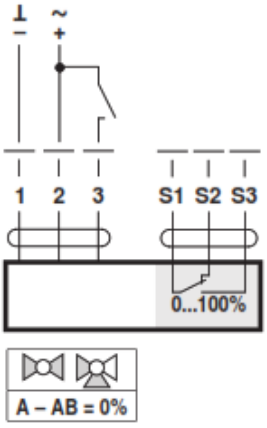
Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Nominal voltage range	AC 19.2...28.8 V / DC 19.2...28.8 V
	Power consumption in operation	1.5 W
	Power consumption in rest position	0.2 W
	Power consumption for wire sizing	2 VA
	Auxiliary switch	1 x SPDT, 0...100%
	Switching capacity auxiliary switch	1 mA...3 A (0.5 A inductive), AC 250 V
	Connection supply / control	Cable 1 m, 3 x 0.75 mm²
	Connection auxiliary switch	Cable 1 m, 3 x 0.75 mm²
	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 voltaje supply

***[Note]**, 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)*

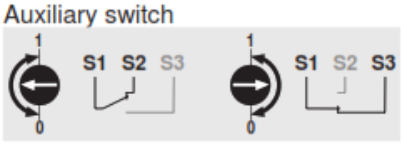
Wiring diagram

24 VDC

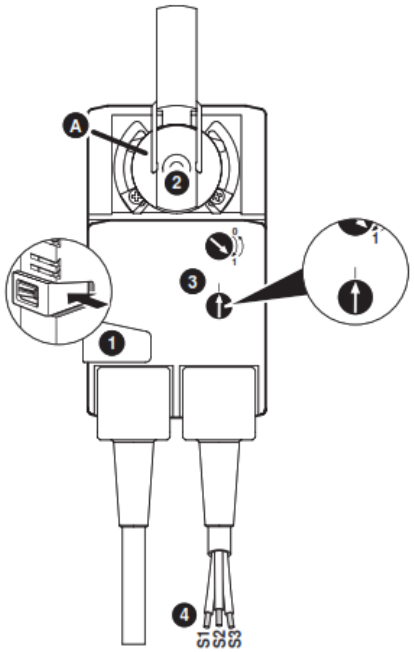


Cable colours:
1 = black
2 = red
3 = white
S1 = violet
S2 = red
S3 = white

Auxiliary switch



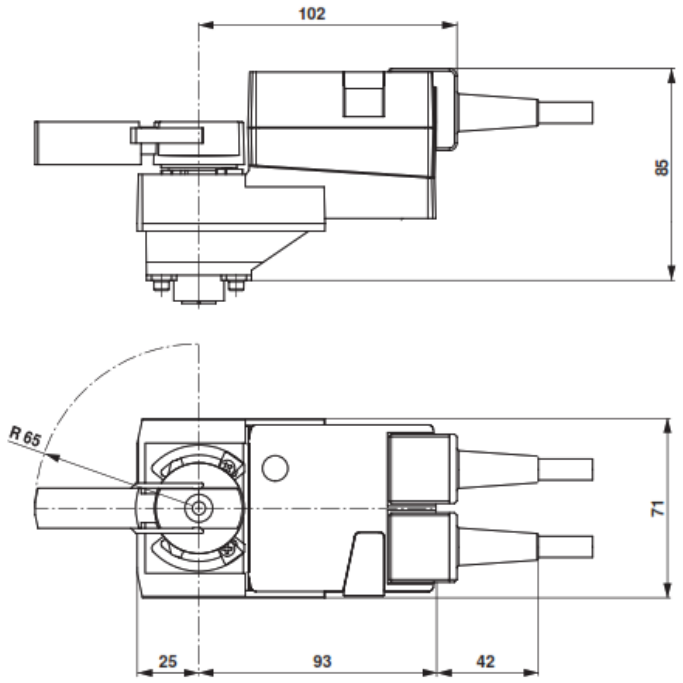
Control for manual operation



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. Setting the valve regulating irrigation flow

Set the valve for the irrigation of the panels to ensure uniform watering of the surface area of the panels. A value of around 1 liter/second for each square meter of irrigation surface is enough to exceed the water required for evaporation. Generally, it is just necessary to ensure there is excess water from panel irrigation falling into the water tank.

The excess irrigation water ensures the surfaces of the panels are constantly being washed.

The following equation for calculating the total irrigation flow of each HEF-7 can be employed to set the regulation valve precisely.

$$I = e * 60 * \sum_{i=0}^{n} a_i$$

I = total unit irrigation

e = thickness of the evaporative cassettes in meters

a = width of the evaporative cassettes in meters

i = evaporative cassettes

n = total number of evaporative cassettes

Example:

I = 0,2 * 60 * (0,6 + 0,6 + 0,6 + 0,45 + 0,6 + 0,6 + 0,6 + 0,42 + 0,32 + 0,32 + 0,45) = 66,72 L/min

To set the valve to the calculated irrigation flow, a 6mm Allen key is used. Flow at any time can be observed in the flow indicator. For the valve to reach its limit, the screw must be turned several times, which enables precise settings. To fix the set flow, use an 8mm Allen key, which ensures a constant irrigation flow.

14. Setting the valve regulating the bleed-off flow

Water evaporation is caused by a higher water vapour pressure in the evaporative panel than in the air moving across it. Because only the water evaporates, dissolved mineral salts remain in solution, and gradually increase in concentration, despite new water being added to compensate for the evaporation.

To prevent the formation of mineral deposits on the surfaces of the evaporative panel (this would lead to a progressive decrease in air pressure and in operating performance) it is essential to discharge some of the recirculated water to the drainage network in tandem with the evaporation.

Analytical parameters of the drinking water network.

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

Bleed-off based on the cycle of concentration COC.

Bleed-off=Evaporation/(COC-1)

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

Observation: Always using the parameters of the drinking water network.
100 µS/cm = 9 COC
550 µS/cm = 6 COC
1000 µS/cm = 2 COC

Calculation example:

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

The flow of the bleed-off valve can be set approximately to begin with as 10% of total irrigation flow. By regularly observing the state of the panels (on the air input side); after 1 to 2 weeks working, if there are no signs of mineral deposits whitening the surface, the bleed-off flow can
be reduced or left the same, or, if on the other hand, lime deposits are noticeable, it can be increased

Set the flow of the bleed-off valve by removing the handwheel from its parked position and placing it on the flow meter. It can then be swivelled to set the required flow. Once the flow has been set, place the handwheel in its parked position once again.

Parked handwheel

Position for setting flow

15. 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 HEF7 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]** 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]:** To avoid leaks, double check that all links/threads are well fixed and adjusted at the commissioning.

☞ **[Remark 3]:** 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 4]:** To avoid airflow by-pass, double check that gap cover plates and fixing plates are well installed and adjusted.

☞ **[Remark 5]:** Make sure that the correct amount of water (according to the technical specification) is established in the balancing valves.

☞ **[Remark 6]:** Be sure to remove the protection screen from the level detector.

16. Maintenance and cleaning

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)

16.1. 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 37-41ºC.

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.

16.2. Cassette cleaning & maintenance

16.2.1. 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.

16.2.2. Scale formation process

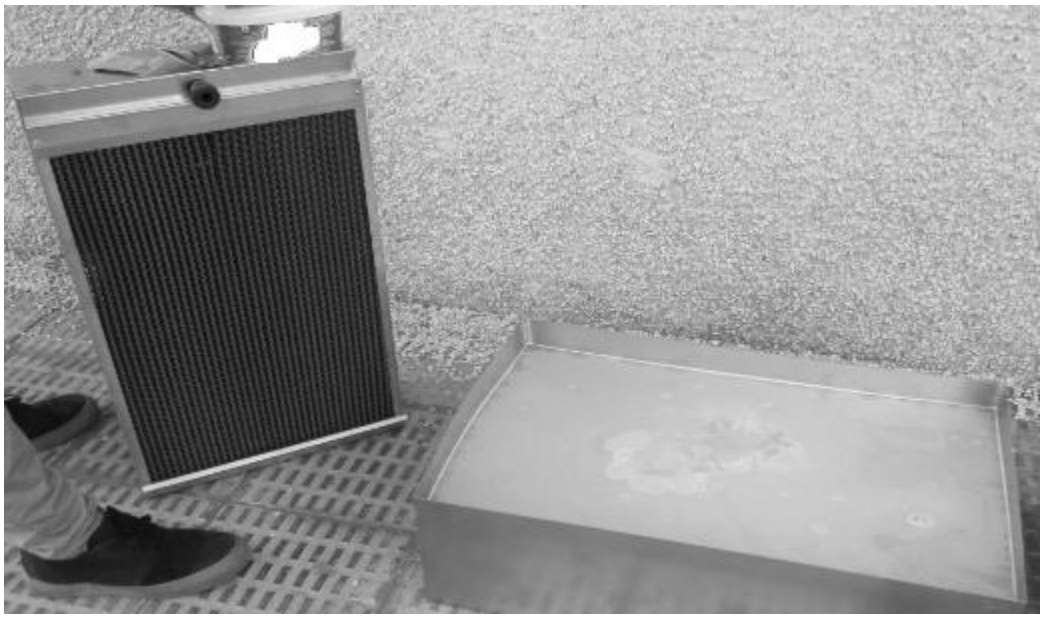
Mains water is not pure as it contains dissolved calcium and magnesium salts (among others) that can be deposited in the form of scale. These salts can clog and harden the inorganic panel and make its water absorption more difficult, thus decreasing performance. If this occurs, the panel should be replaced.

16.2.3. Cassette cleaning protocol

16.2.3 A Cassette disassembly method:

If not, too much scale has been concentrated, it is possible to clean the panel of the Cassettes of unattached inorganic material by removing them from the HEF7 and immersing them in a solution of industrial vinegar and water. It is recommended to test this first with a sample of the inorganic panel, before subjecting the process to the full process. Large scale removal is not possible.
The following items are required for the cleaning protocol:

- A large enough container to insert the Cassette fully.
- Industrial vinegar solution. The solute cannot contain any chlorine.
- Spray hose (not high pressurized) and gloves.

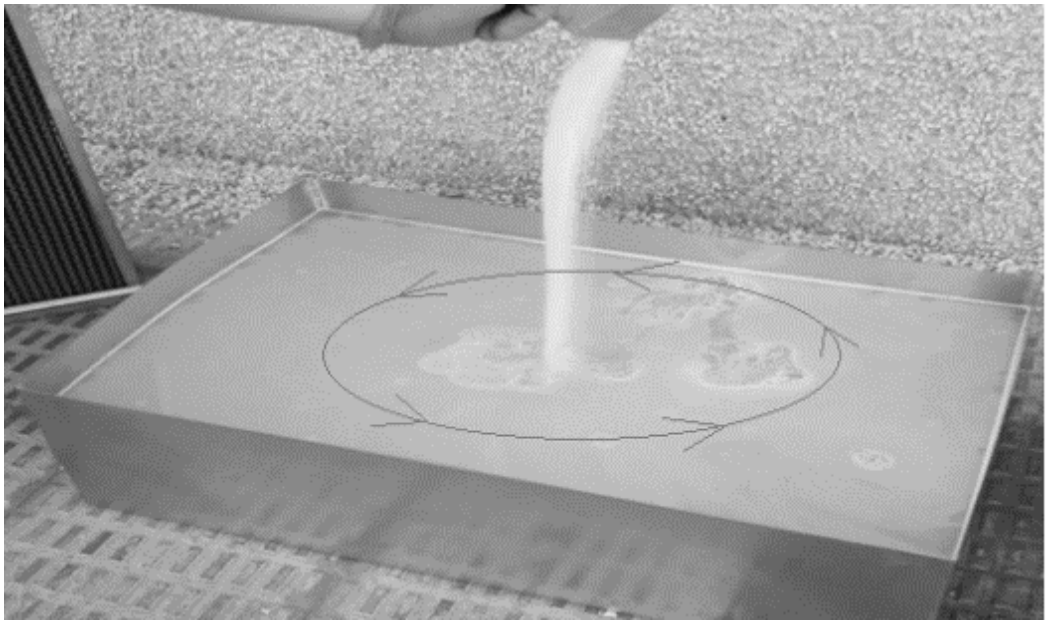


☞ **[Remark 1: Do not remove top cover]:** Do not remove the individual irrigation header distribution.

☞ **[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.

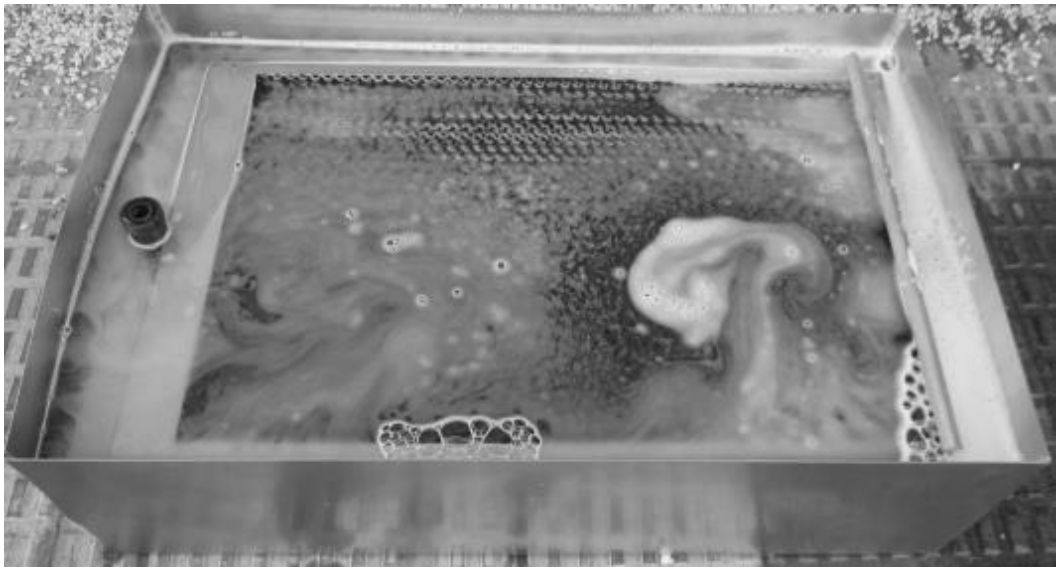
The procedure below should be followed:

1. **Preparing the cleaning solution:** The mixture will be made up of water (solvent) and the industrial vinegar cleaning product, forming an aqueous solution, consisting of approximately 0.016 liters of industrial vinegar per 1 liter of water. Introduce the solute into the water and stir it, mixing it thoroughly.

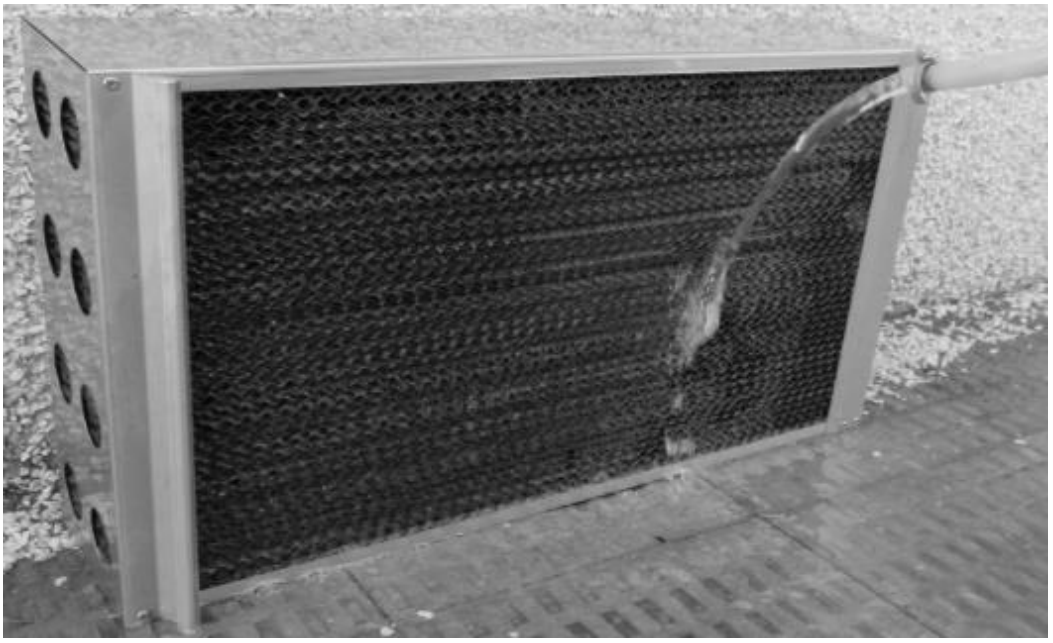


A sufficient amount of solution must be prepared for the corresponding Cassette.

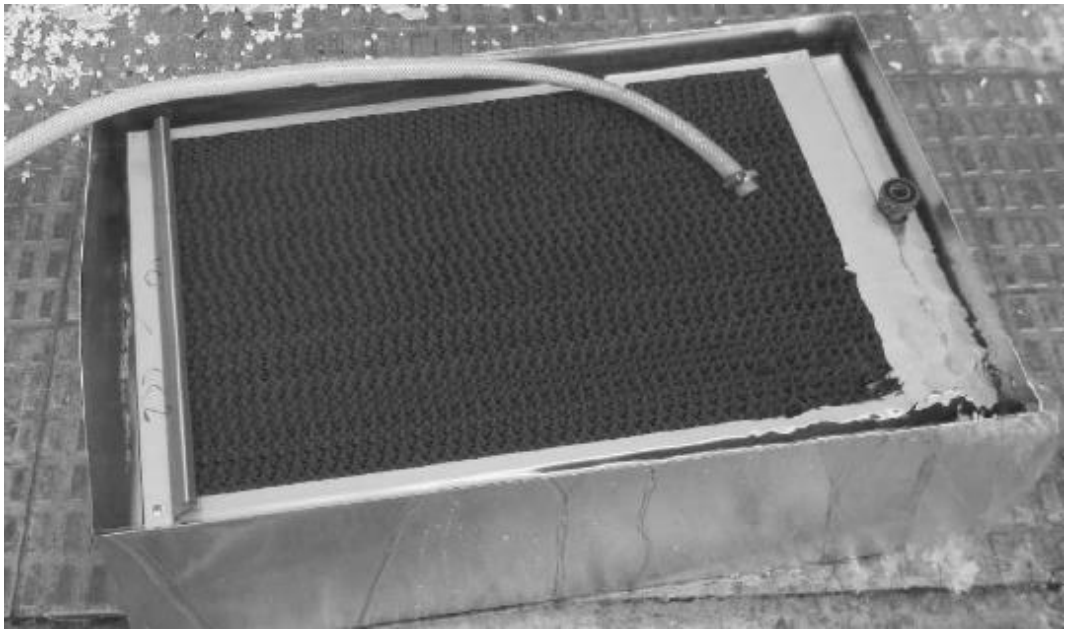
2. Insert the Cassette completely into the container with the solution. Leave it to stand for at least an hour.



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

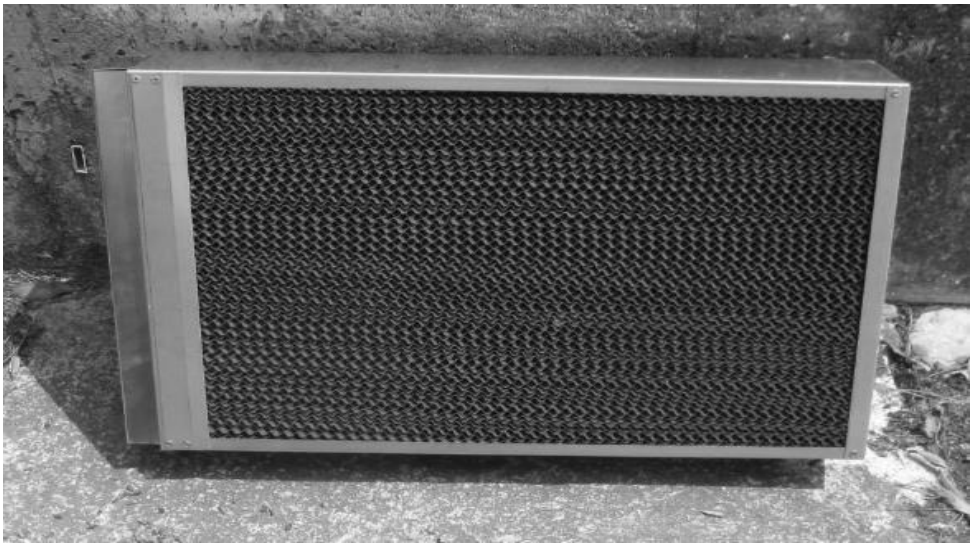


If the foam is not completely removed, reinsert the Cassette into a container with clean running water.



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.

16.2.3.B Dissolution recirculation method:

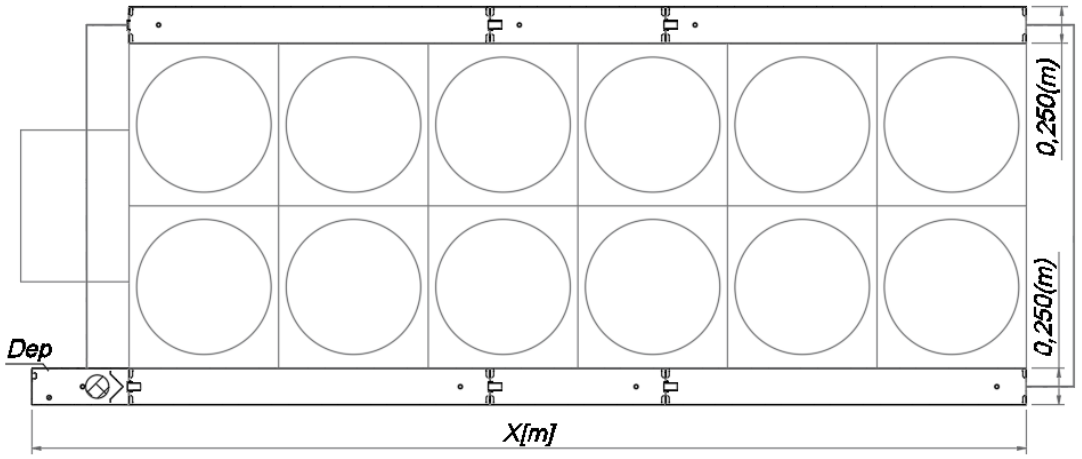
1. Set timmer value T06 of CCB2.0 to 0. (See MCCB2.0)
2. If the tank is full, add industrial vinegar directly to the water in the tank at a ratio of 0.016 liters of industrial vinegar per 1 liter of water. Depending on the volume of the total volume of the basins, add the corresponding amount of industrial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

   Method to obtain the volume of the pond:

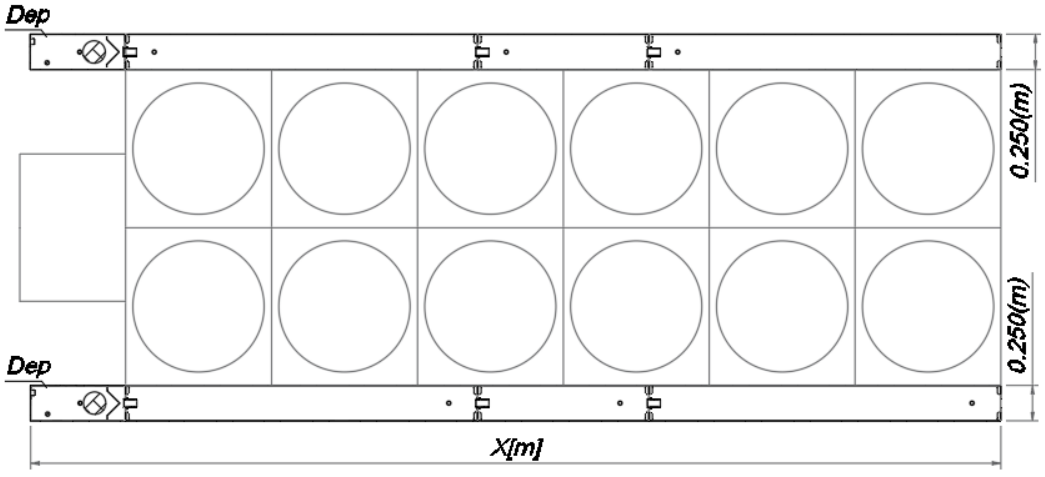
   The dimension X[mm] indicating the length of the equipment should be measured.

   Here are two cases, depending on whether you have one pumping system or two:

   - Total volume for 1 pumping system = X (m)* 0.250 (m) *0.110 (m)* 2 *1000 (l/m^3)



   - Total volume for 2 pumping system = X (m) * 0.250 (m) *0.110 (m) * 1000 (l/m^3)



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 one hour and then stop it by pressing the red off button (red led of the pump On, see MCCB2.0).
4. Perform the cycle again, following steps 1 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 timmer back to the desired value.

16.2.4. Cassettes 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.

16.3. Other components maintenance and cleaning

Humidifier components are very easy to maintain. The following elements require maintenance:

- **The irrigation pump:** The most important thing is to monitor to ensure dirt does not obstruct the suction- impulsion circuit, and electricity consumption is below the power rating on its plate.
- **Control valves:** These must be inspected in accordance with their mechanical regulation.
- **Solenoid valve:** This must be inspected in accordance with its mechanical closure and opening.
- **Metal filter:** This must be cleaned manually.
- **Evaporative panels:** For drinking and industrial water supplies their operating life basically depends on the constant bleed-off system for mineral salts working correctly to prevent the formation of lime deposits on surfaces. If it is not regulated properly, the panels have to be replaced in a short period of time, because the air passing through the panels becomes blocked by the formation of these deposits.
- **Water tank:** Elements holding bodies of still water are renowned for generating microorganisms, and algae. The maintenance director must implement an inspection plan for emptying and cleaning the HEF-7 pump tank based on the quality of the air treated and the water supply.

Regular observations are recommended for correct maintenance during the days following start-up, to find out how the specific installation is behaving, and to establish the emptying and cleaning programme. Similarly, during long periods of inactivity (summer in the case of humidification for comfort, and winter for evaporative refrigeration) it is essential to totally empty and clean the tank.

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

Element	Maintenance and Cleaning
IRRIGATION PUMP	Monthly
CONTROL VALVES	Annually
SOLENOID VALVES	Annually
METAL FILTER	Monthly
EVAPORATIVE PANELS	Trimestralmente
Quarterly WATER TANK	Trimestralmente

Special attention must be paid to cleaning the piping system, and above all the junctions.

In the case of the panels, the use of chemical disinfectants for daily maintenance is not recommended because it could reduce panel efficiency and the useful life. If it is necessary to use chemical products, either because the system has not been operational for a long time, or for any other reason, an effective method is to submerge the panels in a chlorine disinfectant, such as sodium hypochlorite (bleach) or sodium percabonate. When using chlorine disinfectants, it is essential to take into account the formation of toxic chlorine gas if it is combined with an acid solution.

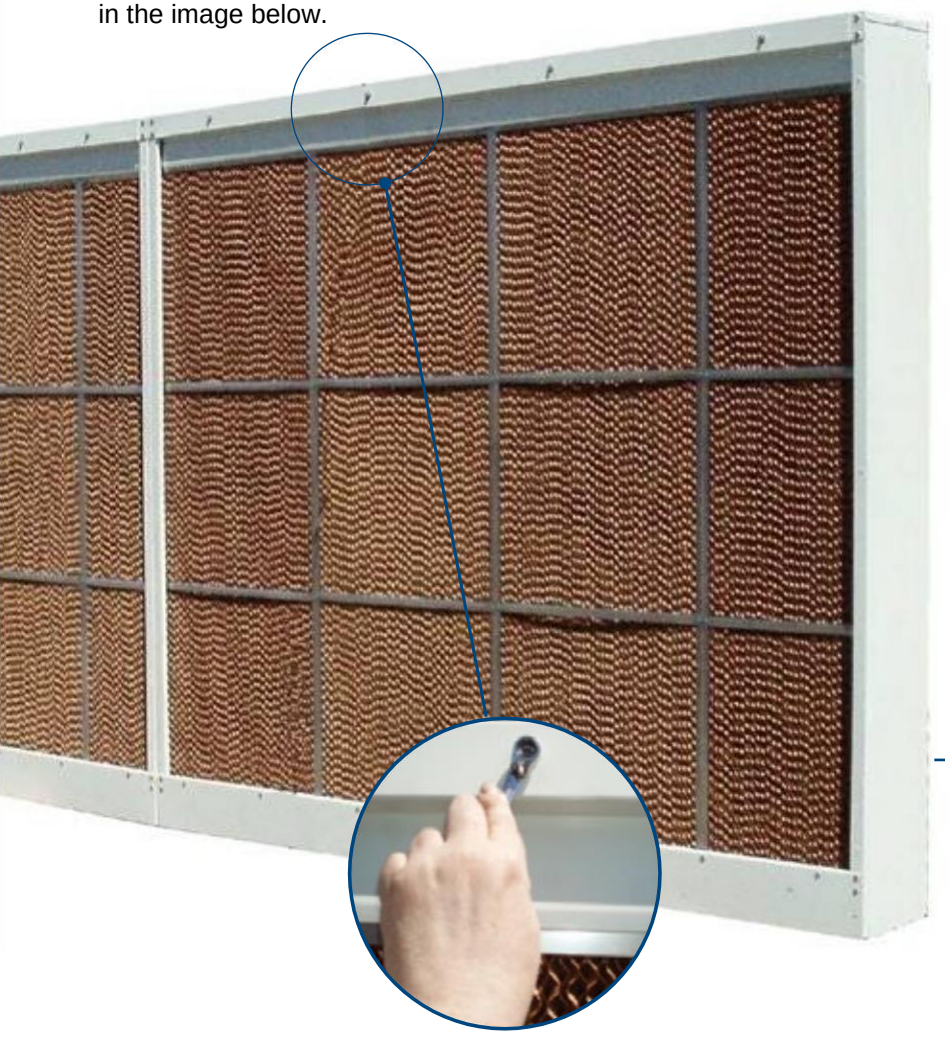
[Note] Do not forget to employ the safety measures of the manufacturer of the disinfectant solution.

As regards the disinfection of the remaining components, the same bleach disinfectant solution can be employed. The number and regularity of the application of disinfection processes must be established by the person responsible for the installation, taking into account the
length of time the unit is operational, its placement, piping system, water quality, etc.

As a result, it is worth insisting once more on the importance of good operational practice, based mainly
on the appropriate regulation of the bleed-off system and correctly regulating the irrigation/drainage.

Another highly recommended practice is to add water treatment to the humidifier supply.

In order to remove the evaporative cassettes from the units, it is necessary to take off the upper front cover of
the structure by removing the front screws as shown in the image below.



Once the cover has been removed, the central cassettes are taken out so the cassettes each end can then be slid to the centre and also removed from the unit in the same way as the others.

In order to assemble the cassettes in the unit, it is first necessary to insert the end cassettes through the centre of the structure and slide them into position. Subsequently the central cassettes can be put into position. Then, the upper front cover of the structure can be put in place and the screws attached tightly to secure the evaporative panels.

17. Machine conformity declaration

DECLARACIÓN CE DE CONFORMIDAD
EC CONFORMITY DECLARATION
EG KONFORMITÄTSERKLÄRUNG
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

La presente declaración de conformidad se expide bajo exclusiva responsabilidad del fabricante.
This declaration of conformity is issued under the sole responsability 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.

Descripción/ Product description/ Produktbeschreibung/ Description du produit: **HEF7E**
Tipo de máquina/ Machine type/ Maschinetyp/ Type de machine: **MÁQUINA/ MACHINE/ MASCHINE/ MACHINE**
Marca/ Brand/ Marke/ Marque: **FISAIR**

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
2006/42/CE
2014/30/UE
2014/35/UE

Es conforme con las siguientes normas:
It complies with the following standards:
Es entspricht den folgenden Normen:
Il est conforme aux normes suivantes:
UNE-EN ISO 12.100:2012
UNE-EN 60204-2:2019
UNE-EN 61000-6-6:2012
UNE-EN 61000-6-3:2012

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.

Con exclusión de responsabilidades sobre las partes o componentes adicionados 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.

Juan Boeta Tejera
-Chairman and CEO- July 2020
Property of FISAIR

Rev01

18. Cuasi machine conformity declaration

DECLARACIÓN CE DE CONFORMIDAD
EC CONFORMITY DECLARATION
EG KONFORMITÄTSERKLÄRUNG
DECLARATION CE DE CONFORMITÉ

Departamento de Dirección de Calidad
Quality Management Department

Qualitätsmanagement-Abteilung
Département de gestion de la qualité

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Descripción/ Product description/ Produktbeschreibung/ Description du produit: **HEF7E**

Tipo de máquina/ Machine type/ Maschinetyp/ Type de machine: **CUASI MÁQUINA/ QUASI MACHINE/ QUASI MASCHINE/ QUASI MACHINE**

Marca/ Brand/ Marke/ Marque: **FISAIR**

Es conforme con la legislación de armonización pertinente a la unión europea:
It complies with the harmonization legislation relevant to the European Union:
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2006/42/CE
2014/30/UE
2014/35/UE

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UNE-EN 61000-6-3:2012

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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.

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 prohibed 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 wich the quasi-machine is mounted must comply. FISAIR is not responsible for security.

Con exclusión de responsabilidades sobre las partes o componentes adicionados 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.

Juan Boeta Tejera
-Chairman and CEO- July 2020

Rev01

19. WARRANTY

FISAIR S.L.U. WARRANTY POLICY

Quality Department
Departamento de Calidad

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28330 San Martín de la Vega (Madrid) SPAIN
Tfº (34) 916921514
Fax (34) 916916456

Two-year Limited Warranty

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.

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.

Warranty disclaimer

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.

The Limited Warranty does not include any consumer part such as joints, pulleys, filters or media.

FISAIR's Limited Warranty shall not be effective or actionable if:

a) All related product invoices have been payed 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).

Any warranty claim must be submitted to FISAIR in writing within the stated warranty period.

Parts Warranty

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.

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.

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.

In case any part from the product / shipment is missing, the customer should notify FISAIR before 3 days from the shipment date of arrival.

FISAIR S.L.U. WARRANTY POLICY

Quality Department
Departamento de Calidad

Service Covered by Warranty

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.

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.

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.

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.

By purchasing FISAIR's products, the purchaser agrees to the terms and conditions of this Limited Warranty.

Extended Warranty

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.

Each case should be valued in terms of type of product, equipment application, use and location of the product operation site.

Any extension of the Limited Warranty under this program must be in writing, signed by FISAIR, and paid for in full by the purchaser.

Quality Manager:

Hugo J. López Álvarez
San Martín de la Vega, February 2016