

HEF3 CAD SERIES

INSTALLATION AND MAINTENANCE MANUAL OF EVAPORATIVE HUMIDIFIERS FOR DUCTS

MHEF3-CAD-EN-22-2

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



HEF3-CAD Series

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.



Attention

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 must 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.

2. RATING PLATE

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"

- Model: description of the particular HEF3 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/ Urañlo, 20 - P.J. AIMAYR 28330 San Martín de la Vega MADRID (SPAIN) www.fisair.com	After Sales Service Servicio Postventa Mail: sat@fisair.com Tel: +349169 21514
Modelo Model Typ	HEF3-500-I-CAD		
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		
CE EAC			

3. PRODUCT CODE

MODEL	MATERIAL	CODE
HEF3-500-I-CAD	Stainless steel AISI-304	71037007
HEF3-1000-I-CAD	Stainless steel AISI-304	71037001
HEF3-1500-I-CAD	Stainless steel AISI-304	71037002
HEF3-2000-I-CAD	Stainless steel AISI-304	71037003
HEF3-2500-I-CAD	Stainless steel AISI-304	71037004
HEF3-3000-I-CAD	Stainless steel AISI-304	71037005
HEF3-3500-I-CAD	Stainless steel AISI-304	71037006

4. 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.

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

Temperature: [5...50°C]

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

EVAPORATIVE PANEL DRYING TIME

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

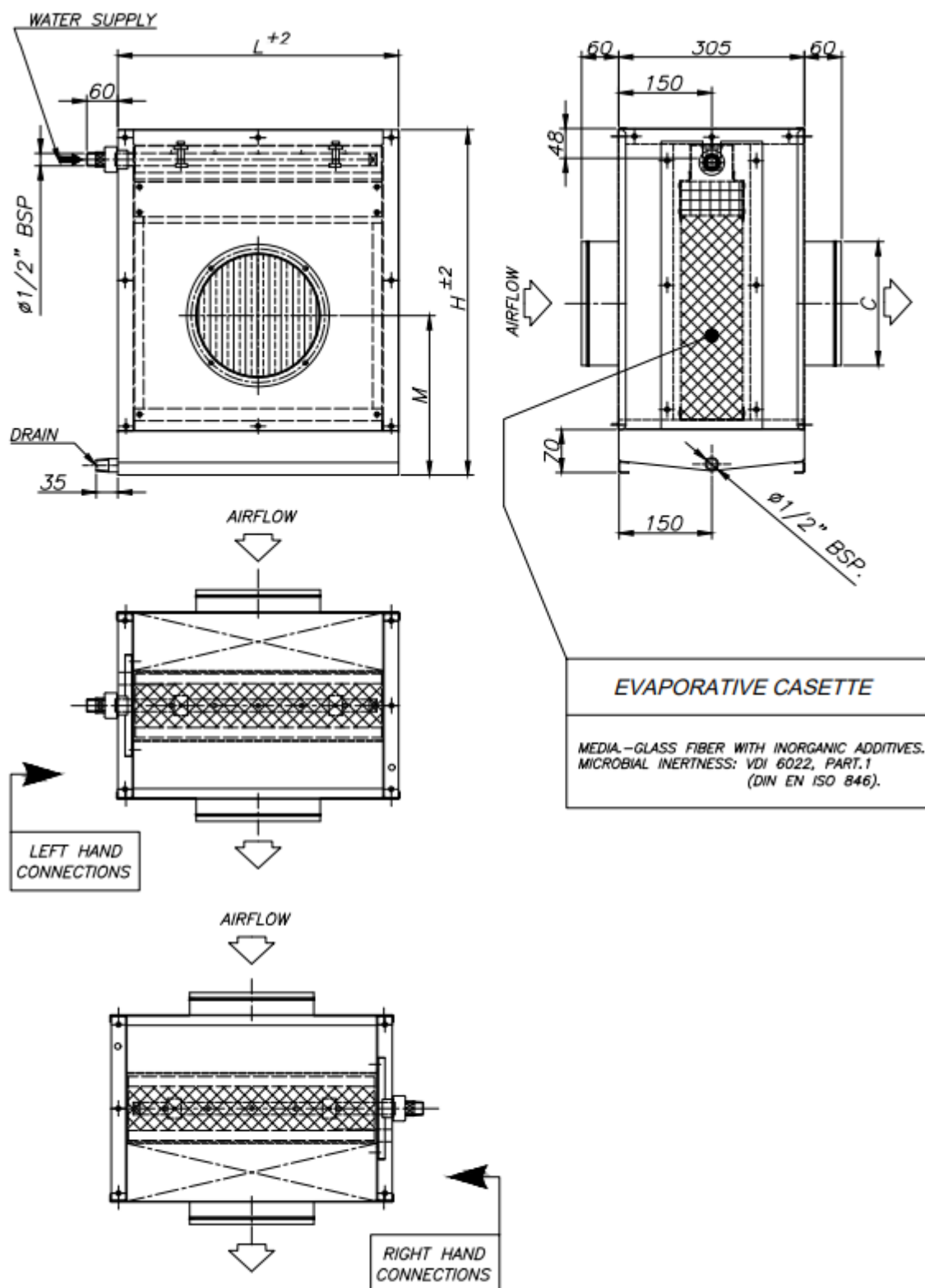
Air Velocity (V) m/s	Aprox. extra working time of the air fan with a temperature between 20-25°C
$V < 2$	15 min
$2 \leq V < 3$	12 min
$3 \leq V < 4$	9 min
$4 \leq V < 5$	6 min

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.

5. DIMENSIONS, CONNECTIONS, FITTINGS AND ADJUSTMENTS HEF3 DIRECT WATER

5.1. External dimensions tolerances and connections (standard)



MODEL	MATERIAL	CODE	L WIDTH EQUIPMENT (mm)	H HEIGHT EQUIP (mm)	M (mm)	C (mm)	WEIGH T kg.
HEF3-500-I-CAD	Stainless steel AISI-304	71037007	460	410	220	250	20
HEF3-1000-I-CAD	Stainless steel AISI-304	71037001	460	540	285	315	25
HEF3-1500-I-CAD	Stainless steel AISI-304	71037002	480	650	340	355	29
HEF3-2000-I-CAD	Stainless steel AISI-304	71037003	600	650	340	400	31
HEF3-2500-I-CAD	Stainless steel AISI-304	71037004	600	750	390	450	34
HEF3-3000-I-CAD	Stainless steel AISI-304	71037005	700	750	390	500	36
HEF3-3500-I-CAD	Stainless steel AISI-304	71037006	750	800	415	560	54

MODEL	MATERIAL	CODE	X CASSETTE WIDTH (mm)	D CASSETE HEIGHT (mm)	S CASSETE THICKNESS (mm)
HEF3-500-I-CAD	Stainless steel AISI-304	71037007	400	252	103
HEF3-1000-I-CAD	Stainless steel AISI-304	71037001	400	382	103
HEF3-1500-I-CAD	Stainless steel AISI-304	71037002	420	492	103
HEF3-2000-I-CAD	Stainless steel AISI-304	71037003	540	492	103
HEF3-2500-I-CAD	Stainless steel AISI-304	71037004	540	592	103
HEF3-3000-I-CAD	Stainless steel AISI-304	71037005	640	592	103
HEF3-3500-I-CAD	Stainless steel AISI-304	71037006	686	642	103

5.2. Scheme of the connections (Standard)

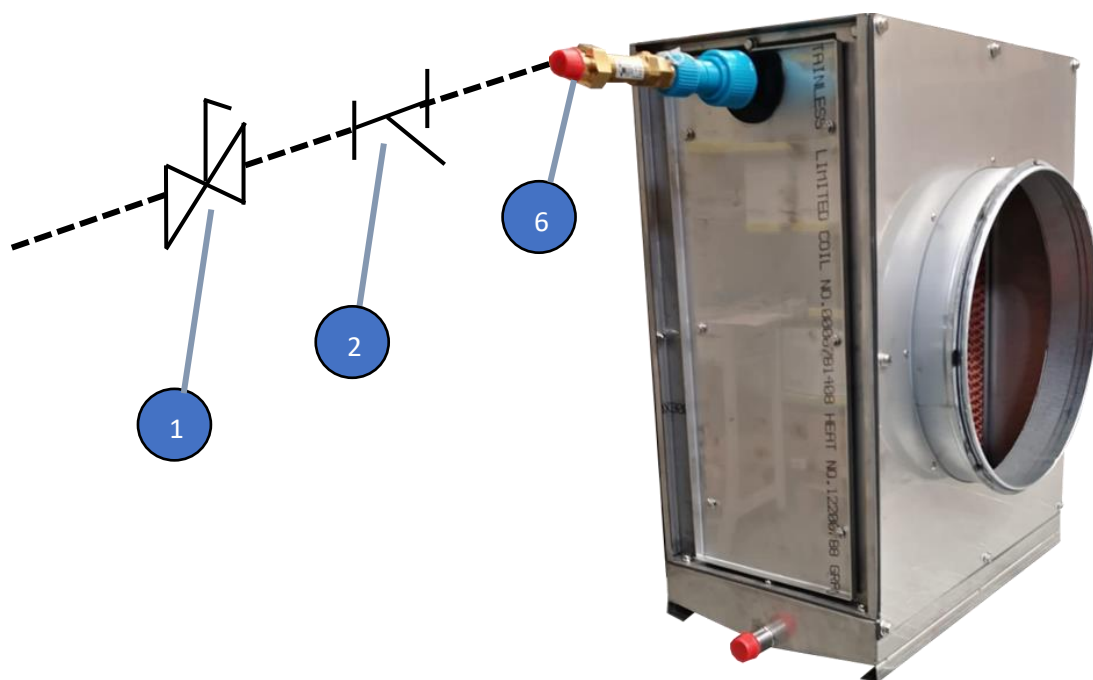


A	Connection to the water supply (connection to external water at between 1 and 6 bar)
B	Connection to drain to the water trap

5.2.1. Connection/ Regulation of the water supply

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).

In the HEF3 Series, when the feed water temperature is below the dew point of the air flow after the humidifying panel, it is recommended to insulate the collector and pipe to prevent possible condensation.



Supplied by others

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

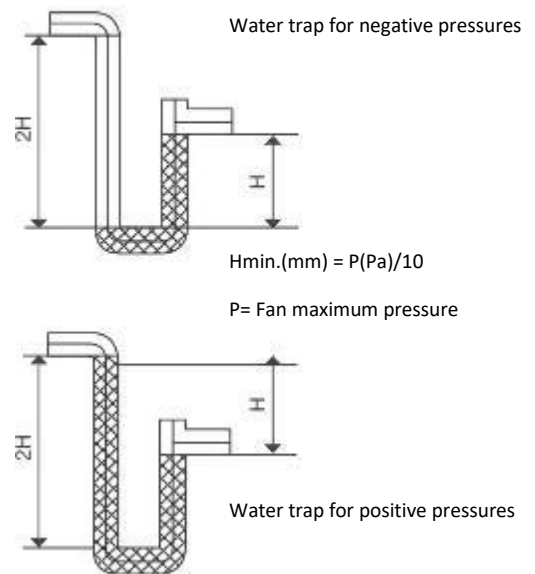
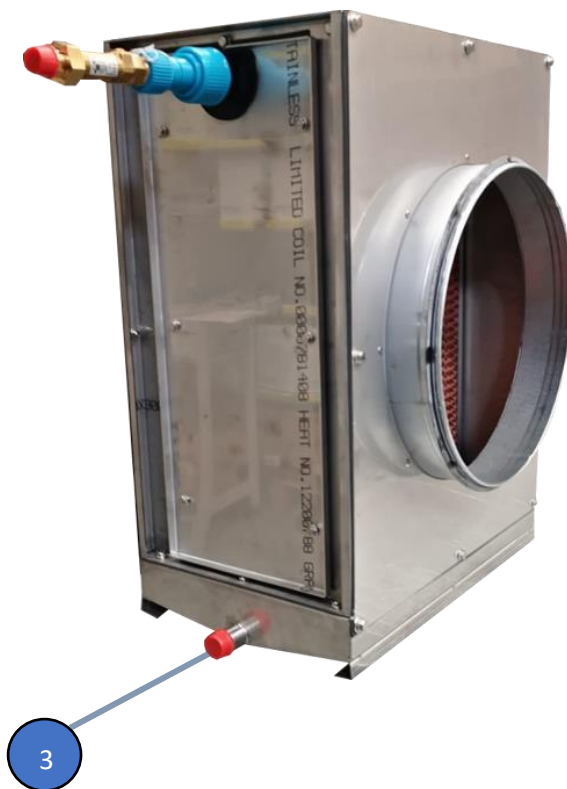
- If the distance from the supply valve to the main water supply line (with continuous water flow) $\geq 2\text{m}$:
 - Install a non-return valve before the cut-off valve.
 - Install a 3-way valve, before the non-return valve, with a return line to the main water supply line, to avoid water retention.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

5.2.2. Connecting the drain to the water trap

DRAINING CONNECTIONS

Connect the 1 1/2" outlet (BSP Female) of the drain (3) to the drainage network (B) without a shut-off valve.

- The connection of the water outlet to the drainage must include a water trap 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.



Supplied by others

5.2.3. Setting in the irrigation valve in the evaporative cassette

- **Water flow for the cassette (Q_{RT}) ≥ 0.3 l/min**

Adjust the irrigation valve of the evaporative cassette so HIS 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.

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



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

The width and height of the cassettes, depending on the HEF3 model, can be found in the table in point 5.1.

➤ Inorganic panel Systems: Calculation of water flow for the cassette:

- Q_{RT} = Total water flow (l/min)
- Q_{TOT} = Total flow rate to evaporate (l/min)

$$Q_{RT} = Q_{TOT} * 3$$

Example: Calculation of water flow for Cassette in a HEF3-500-I-CAD: Inorganic panel system

- $Q_{TOT} = 0,5$ l/min

$$Q_{RT} = Q_{TOT} * 3$$

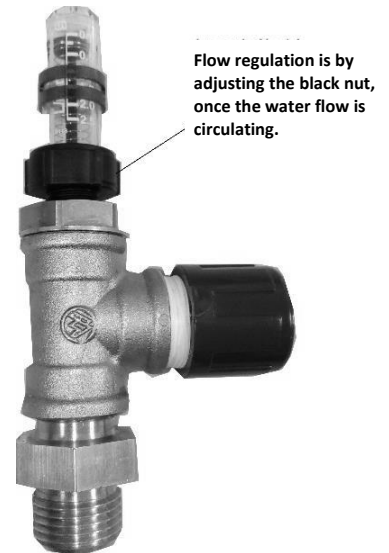
$$Q_{RT} = Q_{TOT} * 3; Q_{RT} = 0,5 * 3 = 1,5 \text{ l/min}$$

$$1,5 \text{ l/min} > 0,3 \text{ l/min}$$

- **Water flow for the cassette (Q_{RT}) < 0.3 l/min**

Adjust the evaporation cassette water valve so his surface appears uniformly wet. It is necessary to ensure the irrigation of the panel has excess water falling into the water tank.

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



- Q_{RT} = Total water flow (l/min)
- Q_{TOT} = Total flow rate to evaporate (l/min)

Example: Calculation of water flow for Cassette in a HEF3-500-I-CAD: Inorganic panel system

- $Q_{TOT} = 0,07$ l/min

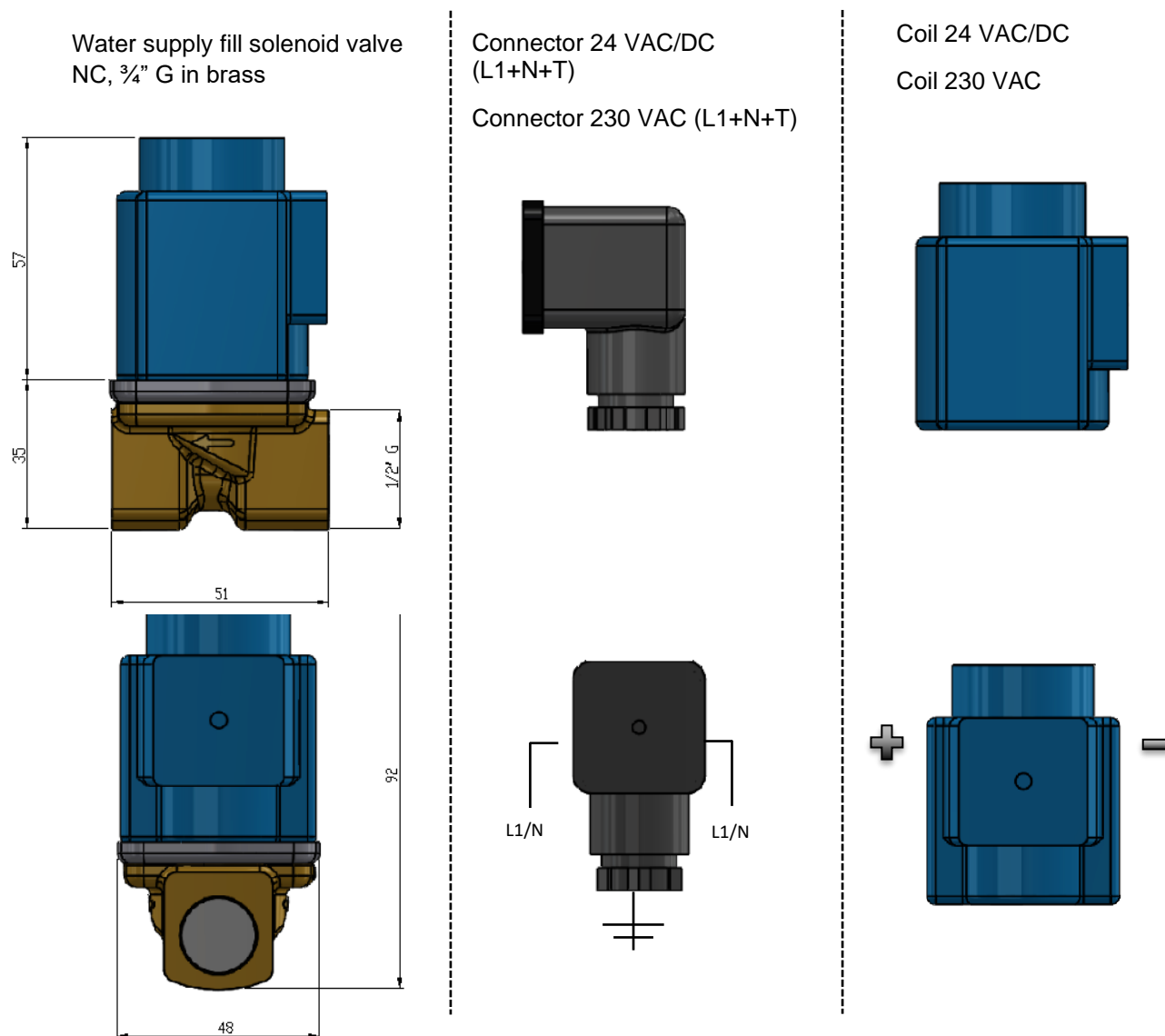
$$Q_{RT} = Q_{TOT} * 3$$

$$Q_{RT} = Q_{TOT} * 3 = 0,07 * 3 = \mathbf{0,21\ l/min}$$

$$0,21\ l/min < 0,3\ l/min$$

6. OPTIONAL HEF3 SERIES ELEMENTS

6.1. Connecting the NC solenoid valve IP55 water supply 24 VDC, 24VAC or 230VAC



Supply: voltage/Frequency/Power	24 VDC type	24VDC/-/16W
	24 VAC type	24VAC/50Hz/11W
	Type 230 VAC	230VAC/50Hz/11W
Water supply	Connection	3/4" G
Environmental conditions	Ambient temperature	-40°C..50°C
	Fluid temperature	-30°C ..100 °C
Degree of protection	IP65	

7. WATER QUALITY, AIR QUALITY AND MAINTENANCE CONDITIONS

Optimal water quality, air quality and maintenance conditions.

Water quality conditions:


1. Conductivity: Conductivity: 60-350 $\mu\text{S}/\text{cm}$, inclusive. *)
2. Total hardness: (as CaCO_3) Total hardness 20-100 mg/l, inclusive.
3. Ionic silica: (SiO_2) < 30 mg/l
4. Iron: (Fe) < 0.2 mg/l
5. Oils and fats: < 2 mg/l
6. Total dissolved solids: < 450 mg/l
7. pH: 6-8
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 $\mu\text{S}/\text{cm}$ and $\text{PH} \geq 7$:** Cassette with special distributor shall be used (This requirement shall be remarked in the order). Standard components can be used: brass solenoid valves, brass motor valves and PP-R pipes.
2. **If conductivity < 60 $\mu\text{S}/\text{cm}$ and $\text{PH} < 7$:** Cassette with special manifold to be used (Please note this requirement in the order) and special optionals of stainless-steel piping and solenoid valves must be included.
3. **If 60 $\mu\text{S}/\text{cm} \leq \text{Conductivity} \leq 350 \mu\text{S}/\text{cm}$ and $6 < \text{PH} < 8$:** Cassette with standard manifold to be used. Standard components can be used: brass solenoid valves, brass motor valves and PP-R piping.
4. **If 350 $\mu\text{S}/\text{cm} < \text{Conductivity} \leq 1000 \mu\text{S}/\text{cm}$ 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 $\mu\text{S}/\text{cm}$ and $6 < \text{PH} < 8$:** Water treatment is mandatory if you want to prolong the life of the evaporative cooling 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.

 **[Remark]:** When the water to be supplied to the HEF3 requires treatment, this must be notified in advance on the order, as different improvements in the HEF3 design are needed, depending on whether it is softened or reverse osmosis water. Failure to provide this information could lead to different parts of the equipment being damaged.

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.

Nº	DESIGNACIÓN	VALOR ESTÁNDAR
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

Nº	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

8. START UP RECOMENDATIONS

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 HEF3 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, direct water irrigation of Cassettes is recommended during 60 min without air flow, to wash the panels.



[Remark 2]: 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 3]: Verification of the proper levelling of the basins. This is very important because accurate levelling is essential for the proper functioning of the water level detector.



[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: 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, maintenance should be performed regularly as directed, and it is also necessary to keep a maintenance record.

9. 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 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.

10. CLEANING AND DESINFECTION

10.1. 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 HEF3 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.

10.2. Cleaning

10.2.1. General

An inspection, emptying and cleaning plan must be established for the HEF3 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.

10.2.2. 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.

10.2.3. Cassette cleaning protocol


10.2.3.A. 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 HEF3 (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.

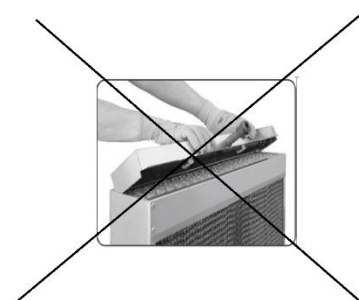
The following items are required for the cleaning protocol:

- 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.



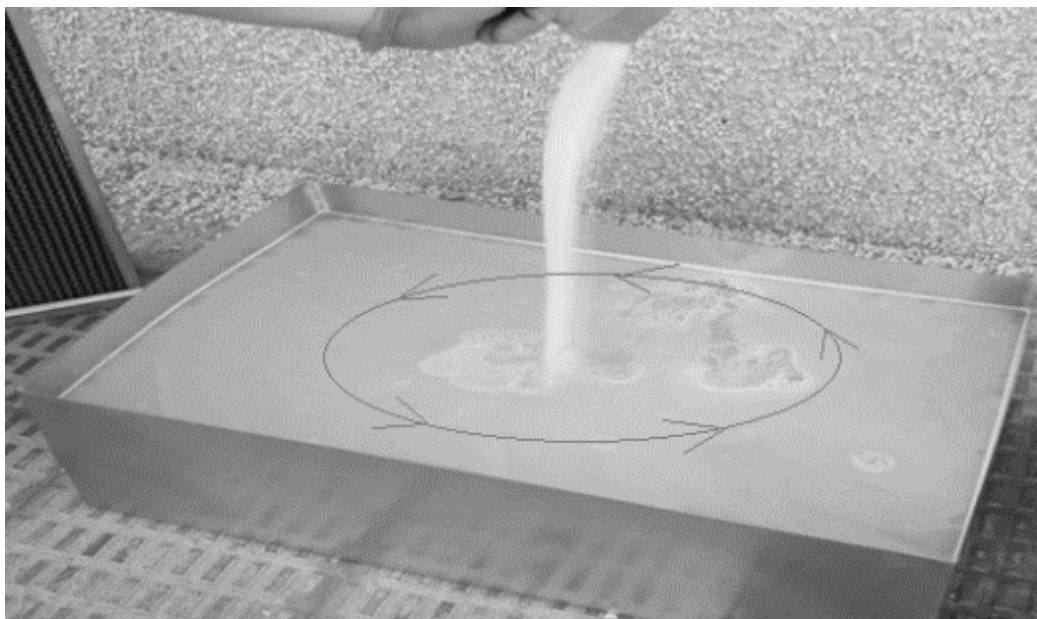
 **[Remark 1: Do not remove top cover]:** Do not remove the individual irrigation header distribution.

 **[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.

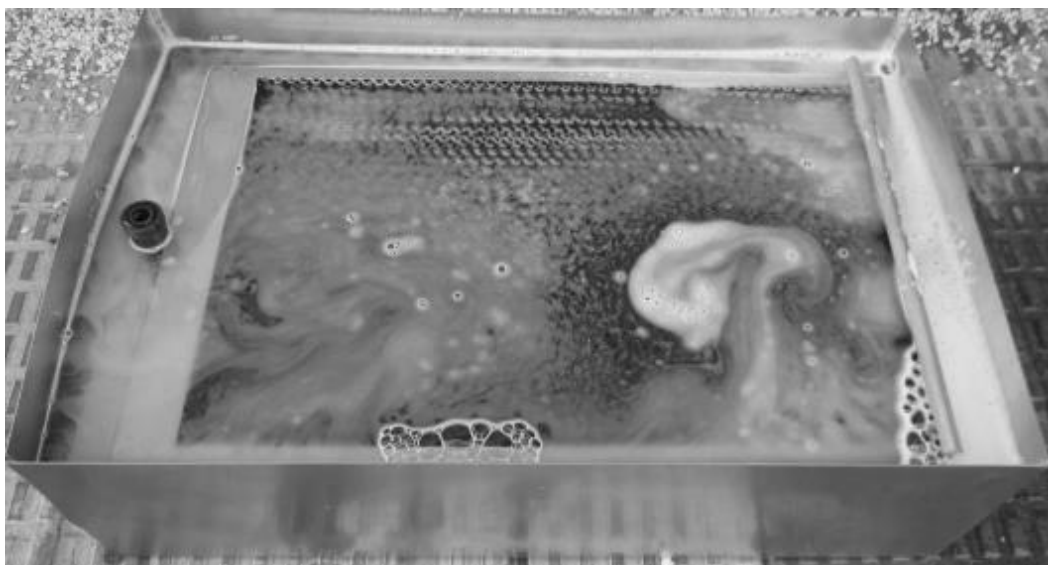


The procedure below should be followed:

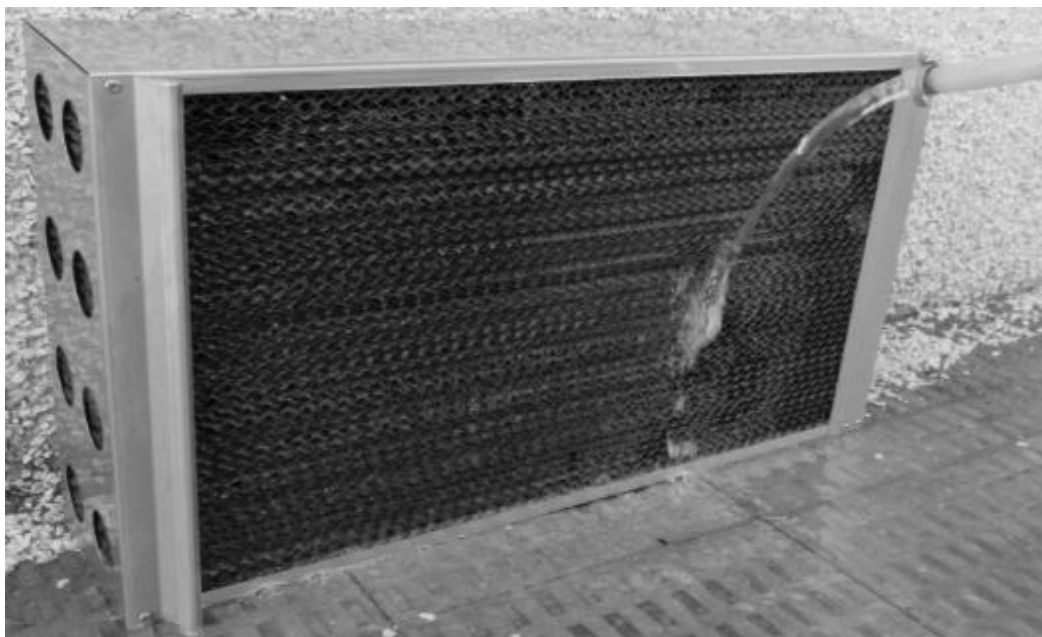
1. **Preparing the cleaning solution:** The aqueous solution mixture consists of water (solvent) and household cleaning product based on oxygen (solute) in the proportions indicated by the manufacturer. Add the solute to the water and stir it completely.



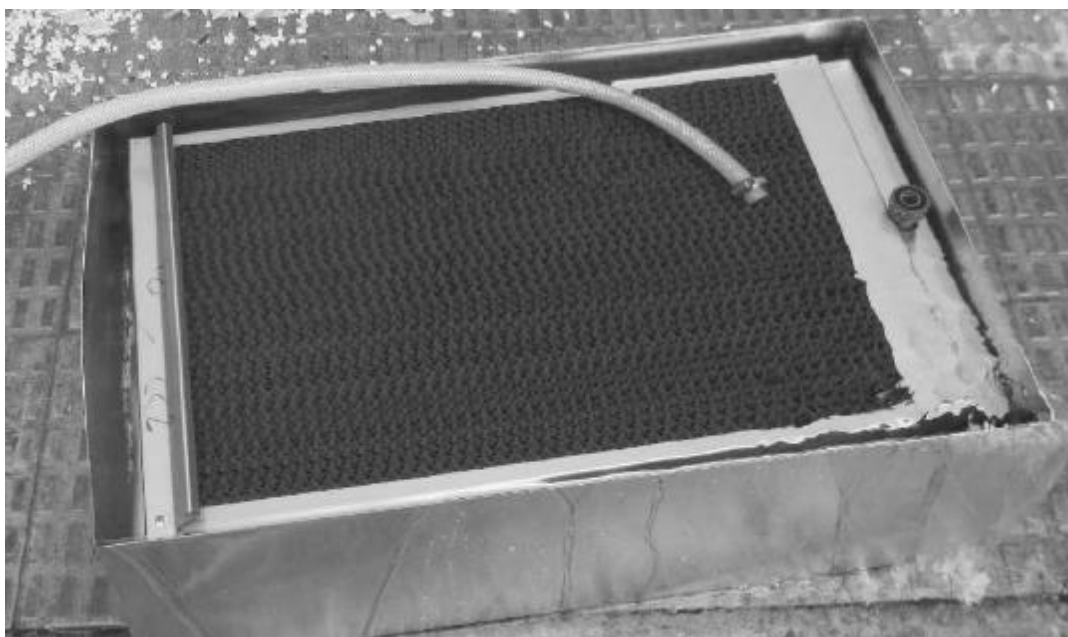
2. Insert the cassette completely into the container with the solution. Leave it to stand for at least an hour.



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

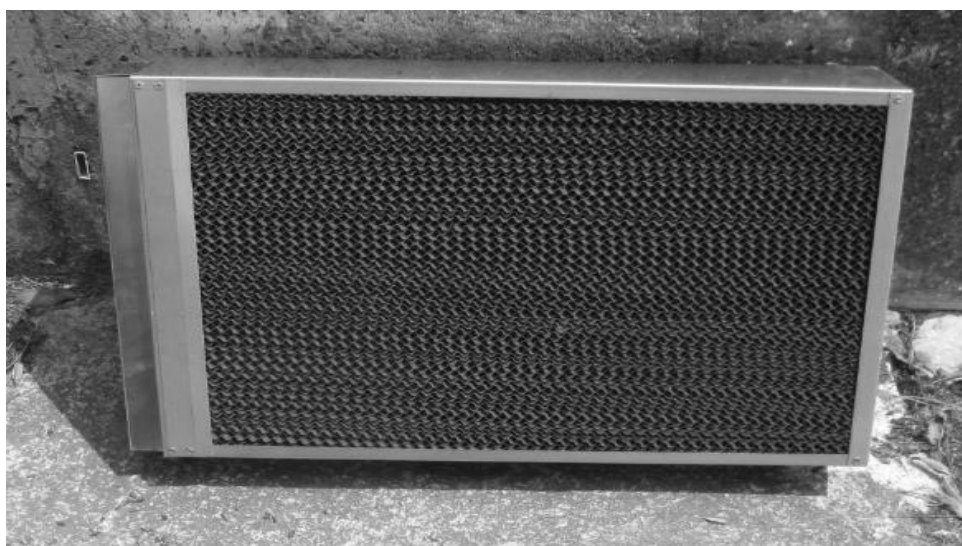


If the foam is not completely removed, reinsert the cassette into a container with clean running water.



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.

10.2.3.B. Cleaning with vinegar

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

10.2.3.C. 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
Industrial vinegar	Medium
Oxiclean	High

10.3. 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 HEF3 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, considering 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.

11. DISASSEMBLY STRUCTURE

11.1. Changing the evaporative cassettes

To service the evaporative cassettes it is first necessary to shut off the water flow from the valve so that the drain and supply lines can be removed.

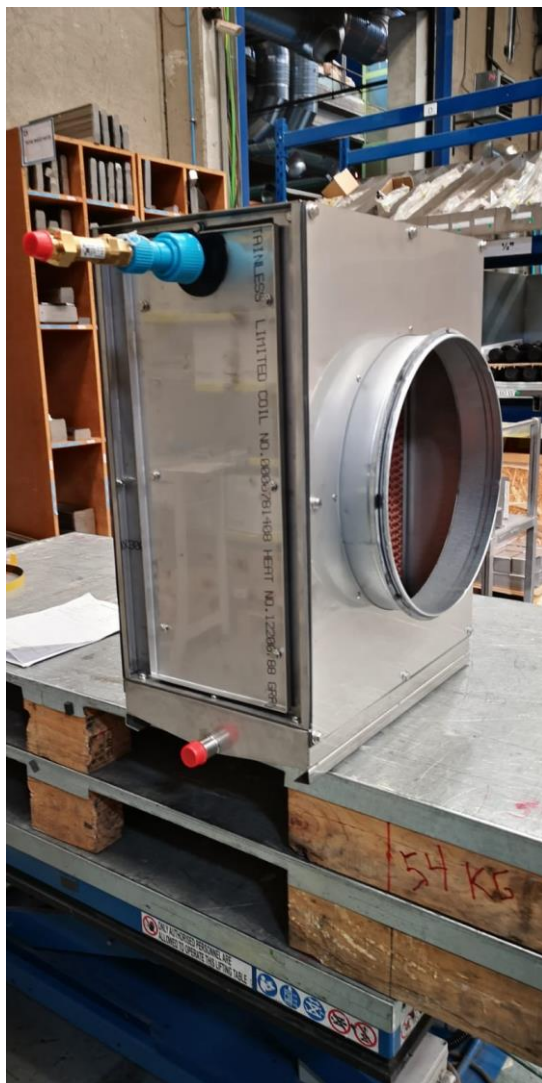


Illustration 1. Side view of HEF3

Unscrew the feed pipe attached to the three-piece link on the side of the equipment.



Illustration 2. Side view of HEF3

Dismantle the side cover by removing the M6 hexagonal screws that join this element to the complete structure of the unit. The result is also shown below:

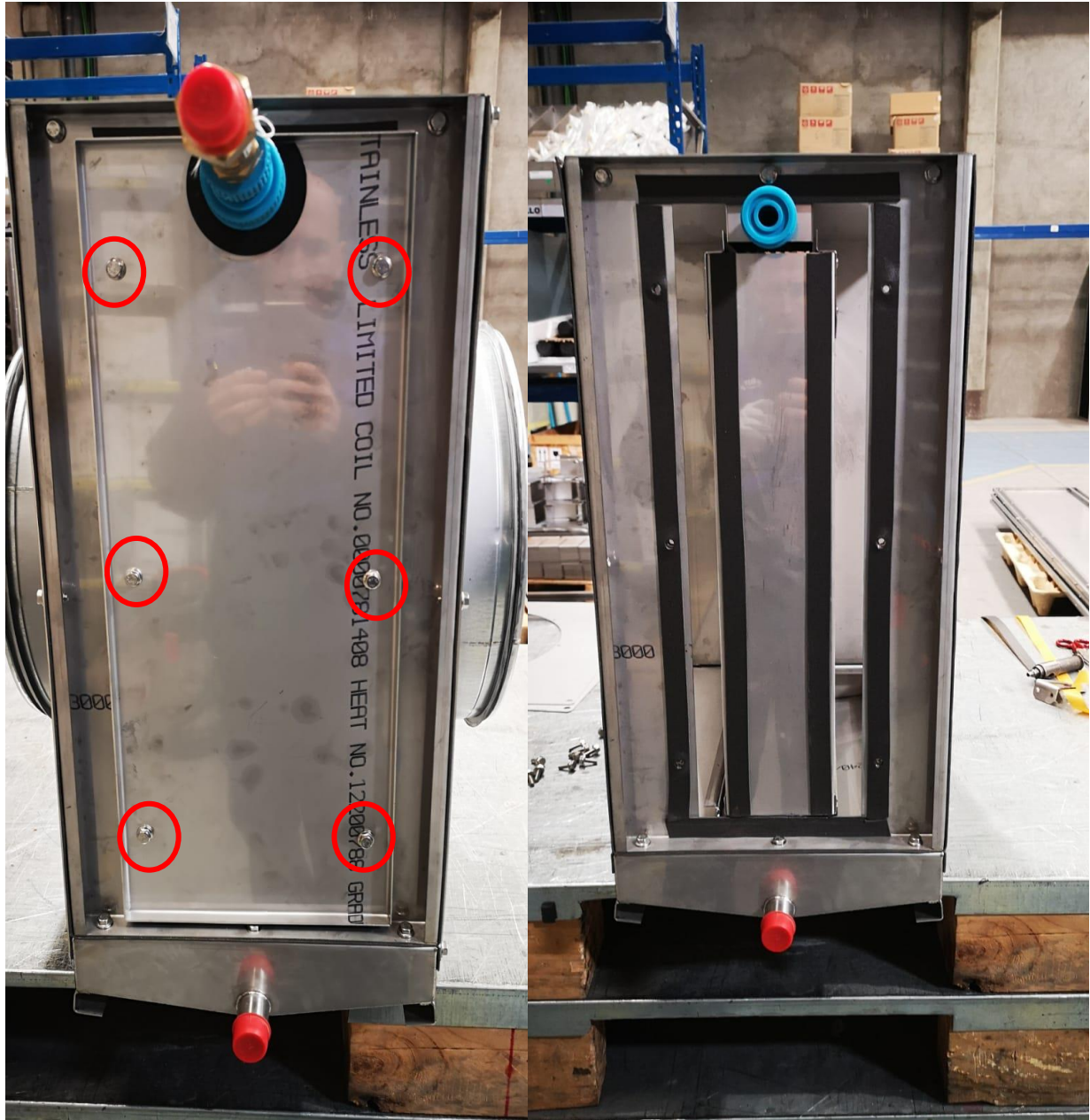


Illustration 3. Disassembly of the side cover

The inside of the unit, after removing the side cover, reveals the evaporative cassette for replacement. It is not necessary to disassemble the three-piece linkage above it to carry out the replacement, as shown in the following picture.



Illustration 4. Disassembled cassette

12. 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	
<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: HEF3</p> <p>Tipo de máquina/ Machine type/ Maschinentyp/ Type de machine: MÁQUINA/ MACHINE/ MASCHINE/ MACHINE</p> <p>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>		
		2006/42/CE 2014/30/UE 2014/35/UE
<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>		
		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 adicionados 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

13. WARRANTY

	<p>FISAIR S.L.U. WARRANTY POLICY</p>	
<p>Quality Department Departamento de Calidad</p>		
<div data-bbox="480 510 758 640">  </div> <div data-bbox="778 510 1292 645"> <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 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). <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>1/2</p>		



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