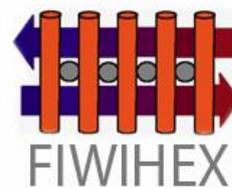


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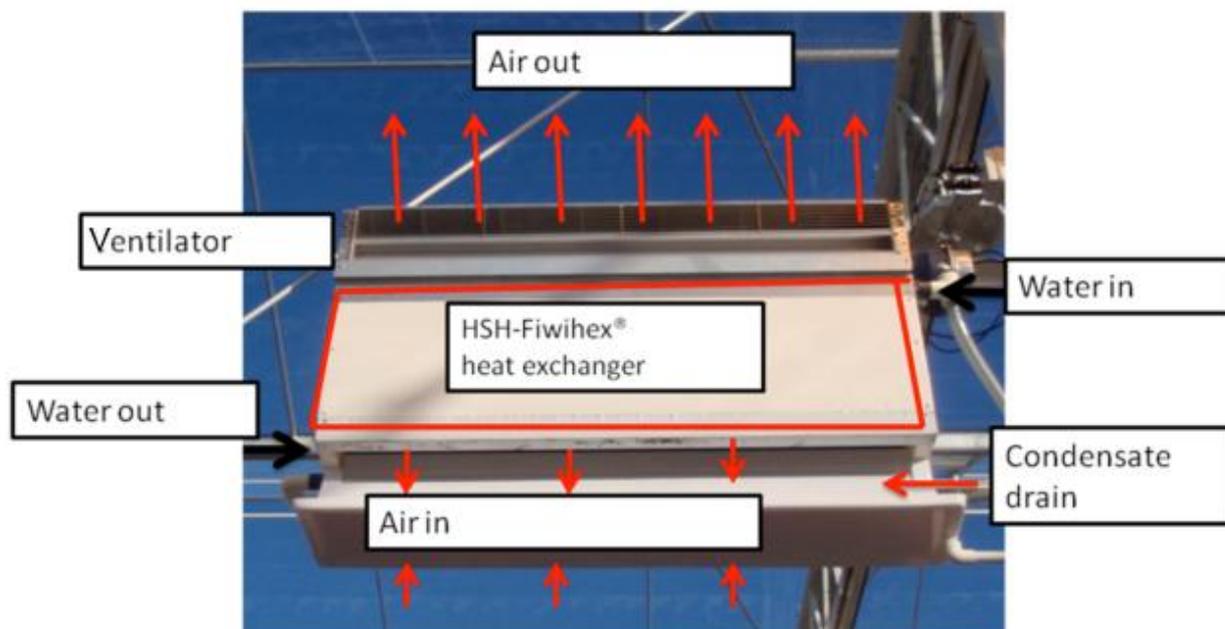
## Specification HSH-Fiwihex® Alpha 96 Very Low Temperature heating and cooling.

### 1. General information

#### 1.1 General description HSH-Fiwihex® Alpha 96

The HSH-Fiwihex® Alpha 96 is a Very Low Temperature heating and cooling system. For heating there may be water between 25°C and 45°C and for cooling 5 to 20°C. The heat/cold is transferred from water to the air. The heat transfer is determined by the airmovement of the fans and the average temperature difference between water and air. During the cooling with a water temperature of 5-18°C condensation may occur. In that case, the rate of cooling increase drastically.

#### Principle of HSH-Fiwihex® Alpha 96



Heat capacity with water of 35°C 11 kW  
Cooling capacity water 10°C 11 kW (indicative data)

The HSH-Fiwihex® Alpha 96 can be placed in a variety of ways:

- Suspended, at the top of any open space.
- Standing on a floor level for implementation.

## 1.2 Heat exchanger

The HSH-Fiwihex® Alpha 96 is a co-current heat exchanger with a strong increase heat exchange surface. It is possible to use very low temperature difference between water and air. The HSH-Fiwihex® Alpha 96 (without ventilator), has modest dimensions, Length\*breadth\*height = 1060\*250\*700 mm. in the case of a water temperature of 35°C and an air temperature of 20°C is the air warmed up to 28°C. The transfer rate at this condition is 11 kW.

## 1.3 Ventilator

The maximum air movement of the fans is 3200m<sup>3</sup>/h. A cross flow LTG ventilator is applied. Dimensions are 1260 \*250\*220mm.

**Electrical connection:** The fan is powered with 230V AC. The fan speed is controlled by means of a bus controller, 0-10V signal (see annex).

Regulating of heat and cold supply is controlled by the air quantity/fan speed.

## 1.4 Principle of operating

The HSH-Fiwihex® technique is a heat exchanger with highly efficient heat transfer between water and air.

Large amounts of heat and cold , with a slight temperature difference are transferred.

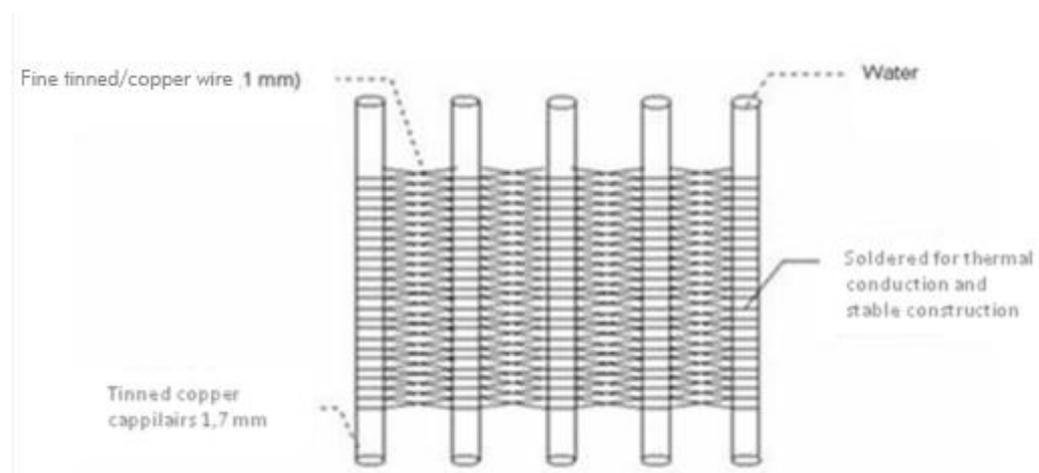
The efficient heat transfer is established by the general contact surface between water and air. The functional part of the HSH-Fiwihex® Alpha 96 is a total of copper wires of 0,1mm and a copper capillary tube, both with a layer of tin, with a diameter of 1,7mm.

The water flows through the capillary tubes and air along the tinned copper wires.

The large surface contact area between air and the tinned copper, reduce to a large extent the resistance to heat transmission. Temperature differences between water and air are much smaller than usual.

The woven fabric, consists of the tinned/copper wires and the capillary tubes.

After weaving, the fabric is electroplated with a special anti oxidation layer of tin/nickel.



The HSH-Fiwihex® Alpha 96 is a total of 96 cells with its own water in- and outlet. A cell has 35 capillary tubes. Water enters the cell through 5 series-switched groups.

### **1.5 Facilities for reception of condensate**

Placement of the HSH-Fiwihex® Alpha 96: there may be a condensate drainage under the heat exchanger.

### **1.6 Dust filter**

There is no dust filter.

### **1.7 Maintenance requirements HSH-FIWIHEX® ALPHA 96**

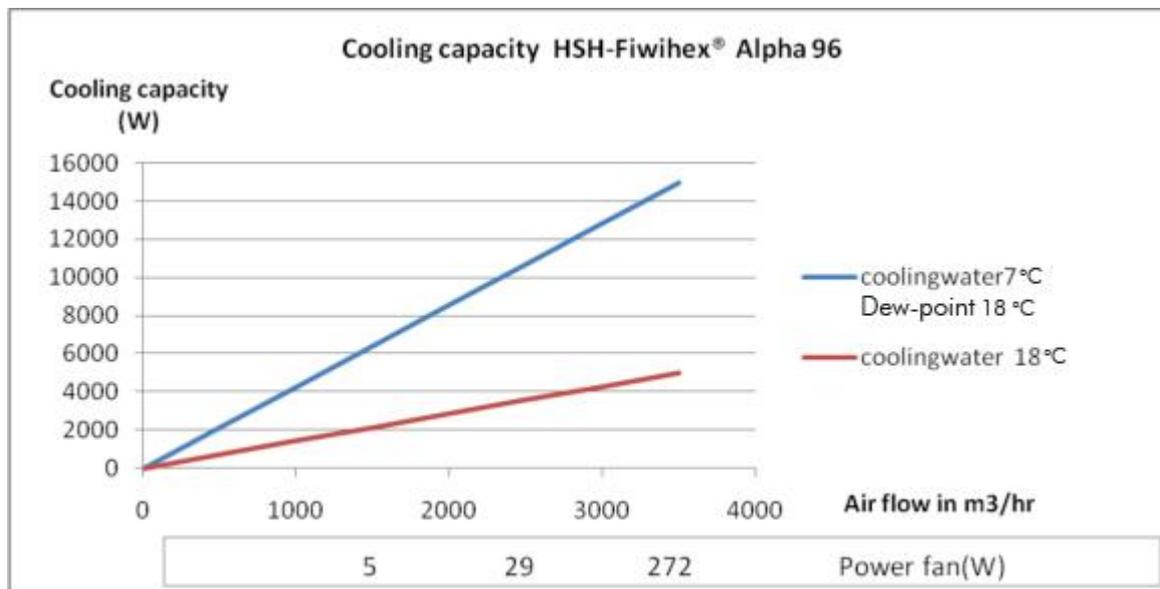
Normally, it is not necessary to clean.

In typical pollution is annually with an air pressure system, with a maximum pressure of 2,5 bar.

In the case of severe pollution, is 2-4 times per year to clean.

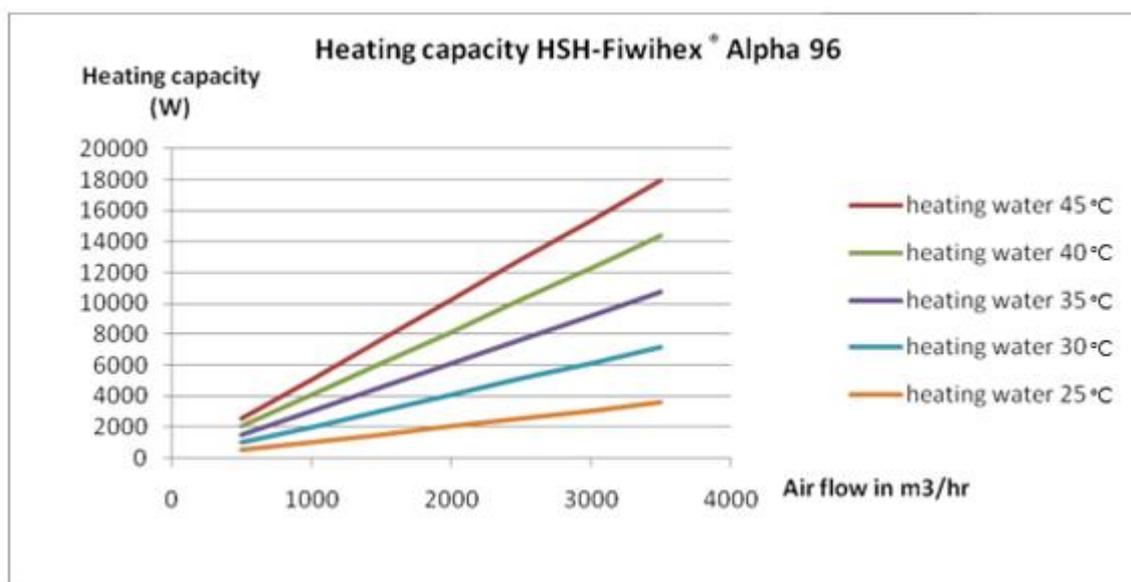
## 2. Specifications HSH-FIWIHEX® ALPHA 96

2.1. Cooling capacity HSH-FIWIHEX® ALPHA 96 and power consumption of the ventilator. (see chart below)



Under normal climate conditions in the NETHERLANDS, no condensation will occur. When using water of 18°.

2.2 Heating capacity HSH-FIWIHEX® ALPHA 96 and power consumption of water in order to minimize the fan (see chart below)



Note: The HSH-FiwiHex® Alpha 96 is manufactured from high quality ABS, as a result, the maximum water temperature 45°C.

### The water inlet system

- <10.000 Pa, of less than 0,1 bar. The pressure drop of water over an HSH-FiwiHex® Alpha 96 at a flow of 1,5m<sup>3</sup>/hour is approximately 0,1 bar.

### **2.3 The useful jack, Waterside connection**

The useful connection consists of an internal screw-tread, ISO R7. Rp 3/4" ISO R7. Rp De maximum water pressure in the system must not differ by more than 1,5 to 2 bar normally necessary pressure is 1,2 bar.

However, a separate heat exchanger must be applied, between water from the aquifair and water in the HSH-Fiwihex® circulation circuit.

### **2.4 Sound level depending on the fan speed**

With an airspeed of approximately 3200m<sup>3</sup>/h per fan noise levels up to 50dB. At lower fan speeds, the sound level will be significantly reduced.

### **2.5 Guarantee**

Under normal conditions of use in the built environments there will be 10 years on the HSH-Fiwihex® Alpha 96.

Warranty includes the functionality (heat transfer capacity) and leak protection.

The copper cells for assembling, are specifically electroplated with a tin/nickel layer of 10 micron.

This means that HSH BV gives to 10 year warranty to corrosion, under the following conditions:

The warranty is void if:

- Mechanical damage during Assembly and use.
- Mechanical damage from exposure to higher pressure than according to the assembly instructions.
- If there is no separate heat exchanger placed between water source and the HSH-Fiwihex® Alpha 96.
- Exposure to corrosive substances acids and complex formers on air- and waterside, pH value is less than 4.0 and greater than 10.0.
- Water temperature, higher than 45°C shall be used.
- Damage by freezing.
- Blocking of the capillairs by solid particals.

#### **Warranty fans:**

For the LTG fan by EBM Pabst and LTG issued guarantees.

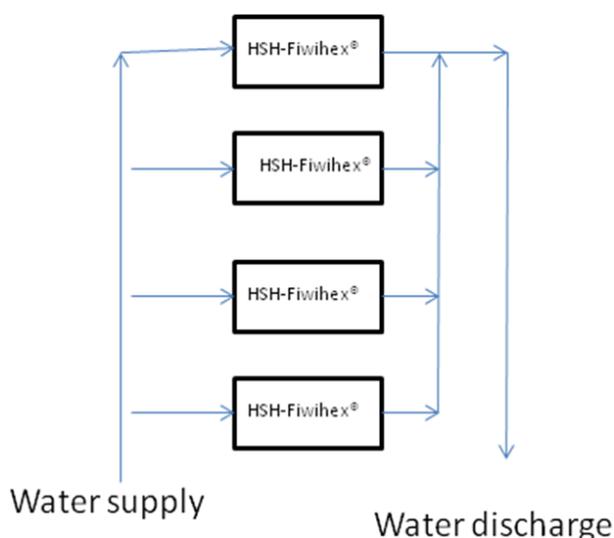
Warranty of LTG/EBM Pabst, will be included by the HSH BV delivered systems.

## 2.6 Installation requirements.

### INSTALLATION Requirements for water and drainage:

- The flow of water, by HSH-Fiwihex® Alpha 96 under normal circumstances is usually between 0,3—1,8m<sup>3</sup>/hour.
- Maximum operating pressure is 1,5 to 2 bar (absolute).
- Iron parts may not apply in the water pipes. Only stainless steel or plastics are allowed. Iron is not allowed to prevent of formation Fe<sub>2</sub>(OH)<sub>3</sub> or iron hydroxide.
- There should always be placed in, a separation heat exchanger, between heat /cold well , tap or aquifair and the HSH-Fiwihex® Alpha 96 circulation system (See chapter separate heat exchanger).
- A filter in the water circulation circuit, for and after the splitter separate heat exchanger (filtration of parts < 0,2mm) for the prevention of pollution, of sand etc. in the 1mm capillairs.
- HSH-Fiwihex® heat exchangers are parallel in the circulation circuit placed, according to the “Tichelmanns principle” (See painting). The flow resistance in the feed pipe should be equal with the flow resistance in the discharge pipe.
- The pressure drop of water over an HSH-Fiwihex® Alpha 96at a flow of 1,5m<sup>3</sup>/hour is approximately 0,1 bar.
- If a condensate drainage is available is should be connected.
- The useful waterside connections are an internal screw-tread, ISO R7. Rp ¾” .
- Care of co--current flow connection for water/air: Air discharge and water supply next to each other.
- It is recommended to any HSH-Fiwihex® Alpha 96 by means of two valves to be able to disconnect every individual HSH-Fiwihex® system.
- Storage and transport: Transport and storage in original packaging/only on euro pallets. Do not place anything above and beyond the pallets with the HSH-Fiwihex® Alpha 96 heat exchangers, or multiple pallets on superimposing.

### Tichelman Principle Connection see painting



### **SEPARATE HEAT EXCHANGER For Greenhouses**

There is a separate heat exchanger applied between water from the aquifair and the water circulation over the HSH-Fiwihex® installation.

This separate heat exchanger is applied to obstruction of the aquifair and as prevention for the HSH-Fiwihex® circulation circuit.

The fluid movement of as HSH-Fiwihex® installation is not fully close for air. (for Greenhouses) Due to higher costs of other materials, are PVC pipes applied for the part of the installation that is built into the Greenhouse.

Use of PVS causes some oxygen diffusion in to the circulation water.

Water from the aquifair is free of oxygen. By aeration of the water you will experience a chemical change that dissolved iron that is almost always present in the spring water will precipitate as iron hydroxide.

To prevent blockage of the aquifair wit iron hydroxide, a separate heat exchanger is placed between the aquifair and the HSH-Fiwihex® circulation circuit.

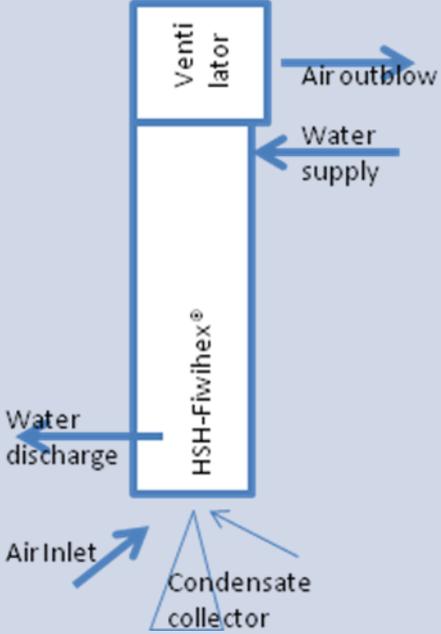
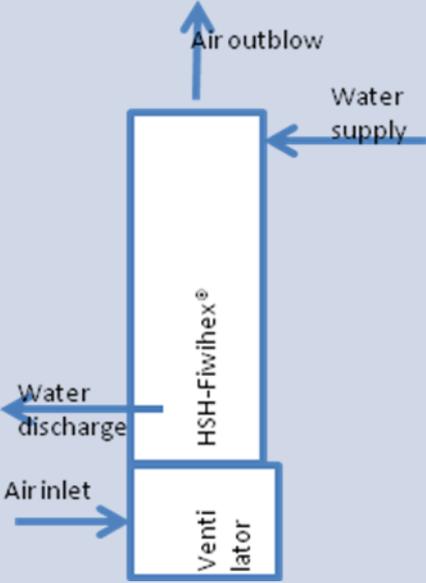
Iron hydroxide makes obstruction of the aquifair around the source. Also, in common situations deposition of lime/calcium .

### **SEPARATE HEAT EXCHANGER for the built environment**

There is a separate heat exchanger applied between water from the aquifair and the water circulation over the HSH-Fiwihex® installation.

This separate heat exchanger is applied to obstruction of the aquifair and as prevention for the HSH-Fiwihex® circulation circuit.

## Annex 1: Sample placement HSH-Fiwihex® Alpha 96 heat exchange units in buildings:

Procedure to be used for drawing up	HSH-Fiwihex® Alpha 96 at least 4 m level above the ground	HSH-Fiwihex® Alpha 96 at the floor
		
Out blow direction fan	Horizontally on ca. 4 m above the ground	To top
Length of roll fan	Up to 30 metres	Approximately 5 metres
Aspirated air	Bottom	Bottom
Work terms heating	Water temp 25—45°C Capacity 5- 18kW	Water temp 25—45°C Capacity 5- 18 kW
Work terms cooling	Water temp 5-20°C Capacity 15-5kW	Water temp 16-20°C Capacity 15-5 kW
Condense drainage need	yes	no