

# FHE

## Dehumidifiers for radiant cooling systems with heat recovery



The dehumidifiers with heat recovery of high efficiency series FHE were designed to provide dehumidification and fresh air in a residential area with very high energy efficiency, combined with radiant cooling systems.

The units have been designed to grant the dehumidification either under conditions of thermally neutral air or in terms of air-cooled, managing small air flow thus avoiding annoying tiny air currents typical of traditional air conditioning systems.

The units consist of a direct expansion cooling system combined with a cross flow heat exchanger highly efficient, designed for heat recovery and air exchange environment in compliance with applicable regional and national laws.

### Versions

All units are supplied with double condenser (the first is an air condenser, the second is a water one) and of a logic which allows the dehumidification with neutrum air or with cooled air.

FHE		26
Useful dehumidification capacity (from the net hygroscopic content of the external air) <sup>(1)</sup>	l/24h	30,1
Total cooling Power (latent + sensible) <sup>(1)</sup>	W	1380
Recovered winter heating power <sup>(2)</sup>	W	950
Efficiency winter recovery <sup>(2)</sup>	%	90
Efficiency summer recovery <sup>(1)</sup>	%	70
Power supply	V/Ph/Hz	230/1/50
Compressor absorbed power <sup>(1)</sup>	W	340
Supply fan absorbed power: minimum+nominal+maximum	W	10 ÷ 30 ÷ 86
Return fan absorbed power	W	11 ÷ 22 ÷ 43
Supply fan nominal useful prevalence	Pa	50 ÷ 140
Return fan nominal useful prevalence	Pa	50 ÷ 140
Min-max coil water flow	l/h	150 - 250 ÷ 400
Min-max water pressure drop	kPa	15
Outdoor air flow	m <sup>3</sup> /h	80 ÷ 130
Supply air flow	m <sup>3</sup> /h	130 ÷ 260
Refrigerant		R134a
Global warming potential (GWP)		1430
Refrigerant charge	Kg	0,59
Equivalent CO <sub>2</sub> charge	t	0,84
Sound power <sup>(3)</sup>	dB(A)	47
Sound Pressure <sup>(4)</sup>	dB(A)	39

Performances are referred to the following conditions:

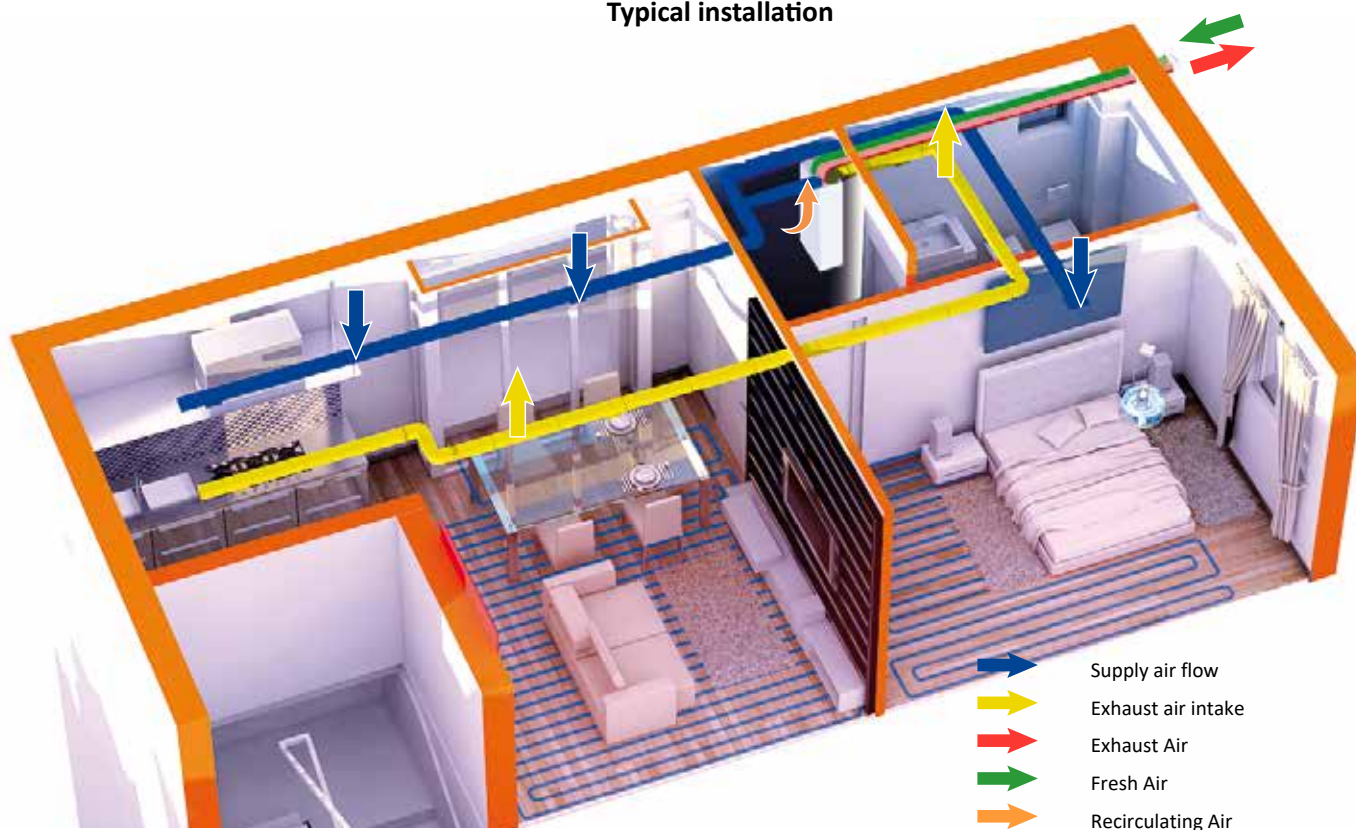
(1) Room Temp. 26°C; 65% RU; Ambient Temp. 35°C; 50% RU; Fresh Air System volume 130 m<sup>3</sup>/h; Water IN 15°C, Water Flow 250 l/h.

(2) Ambient Temp. -5°C; 80% RU; Room Temp. 20°C; Fresh Air system at maximum.

(3) Sound Power level according to ISO 9614.

(4) Sound Pressure level measured at 1 mt from the unit in free field conditions according with ISO 9614, at the normal working conditions.

### Typical installation



### Frame

All units are made from hot-galvanised thick sheet metal, painted with polyurethane powder enamel and stoved at 180°C to ensure the best resistance against the corrosions. The frame is self-supporting with removable panels. The drip tray is made in painted galvanized steel and it is present in all units. The standard colour is RAL 9010.

### Refrigerant circuit

The refrigerant circuit is made by using international primary brands components and according to ISO 97/23 concerning welding procedures. The refrigerant gas used in is R134a.

### Compressor

The compressor is alternative type equipped and thermal overload protection by a klixon embedded in the motor winding. It's mounted on rubber vibration dampers to reduce the noise.

### Heat exchangers

The heat exchangers are made of copper pipes and aluminium fins. The diameter of the copper pipes is 3/8" and the thickness of the aluminium fins is 0,1 mm.

### Fans

The supply fan is centrifugal type, double inlet with forwards blades, with EC Fan motor directly connected. The exhaust fan is plug fan type with backwards blades, with EC fan motor directly connected.

### Air filter

It's supplied standard with the unit. It's made of filtering material in synthetic fibre without electrostatic charge. It can be removed for differential disposal, class G4, according to EN 779:2002.

### Heat recovery

Hexagonal cross-flow regenerator with PVC plates, high efficiency (90%).

### Adjustment trimmers

Used during calibration of fans air flow depending on the ducts pressure drop .

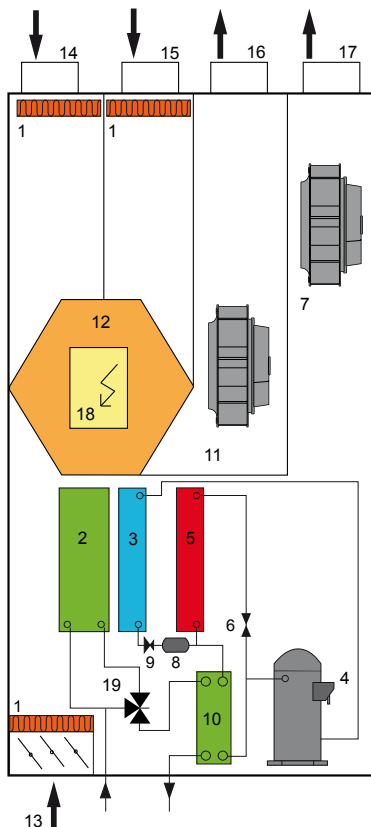
### Microprocessor

All FHE units are supplied with an advanced software for the complete control of the hydronic and air distribution side.

The software can manage:

- The management of the operation according to a probe of temperature and humidity.
- Activation of the dehumidification based on the pre set humidity conditions.
- Activation of winter or summer sensible load integration, according to the summer or winter set point
- Management of supply air temperature through discharge limit probe sensor (standard).
- Modulating valve for the proper management of the water battery power.
- Ventilation Management directly from built-in timer in the micro-processor (optional).
- Management damper
- Machine alarm display
- Supervisor and BMS connection through serial card RS485 (Standard fitted) a/o XWEB Module (Optional).
- Clogged filters management (optional).
- Antifreeze management.
- Summer/Winter commutation.

## Main components



1	Air filter
2	Pre-Cooling coil
3	Evaporator
4	Compressor
5	Air Condenser
6	Solenoid Valve
7	Supply fan with EC
8	Dryer Filter
9	Body rolling
10	Water condenser
11	Exhaust fan with EC motor
12	High efficiency cross-flow heat recovery
13	Return motorized damper
14	WC exhaust air
15	Fresh air
16	Exhaust Air
17	Supply air flow
18	Electrical Panel
19	Modulating 3-way valve

## Refrigerant circuit functioning principles

The functioning of the dehumidifier model FHE is as follows: the fan takes the air humid from the ambient through the fan (7) and it's made go through the filter (1), the cross-flow heat (12) and the pre-cooling water coil (2) where it's cooled and brought to a condition closed to saturation.

Now it passes through the evaporating coil (3) where it's fatherly cooled and dehumidified.

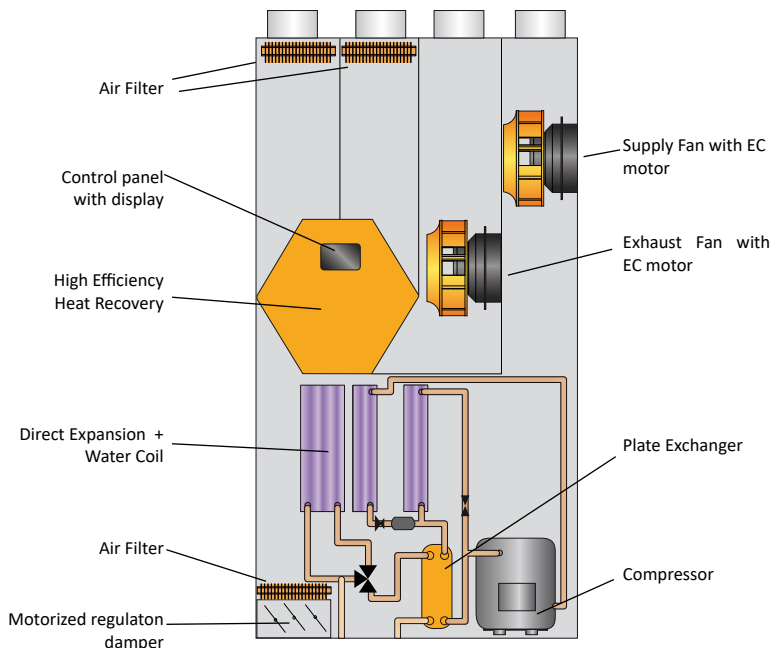
At this time the functionality mode may be:

### Dehumidification with neutral air :

The cooling system works partially in the water through the heat exchanger (10) and partially in the air with the heat exchanger (5) which will then make a post-heating at constant humidity blowing air in the room in thermally neutral conditions.

### Dehumidification with cooling:

The cooling circuit, in this case, works performing 100% of the condensation in the water through the heat exchanger (10). The heat exchanger (5) is intercepted by the valve (6) and the air supplied in the room is the same as leaving the evaporator coil (3), cold and dried.

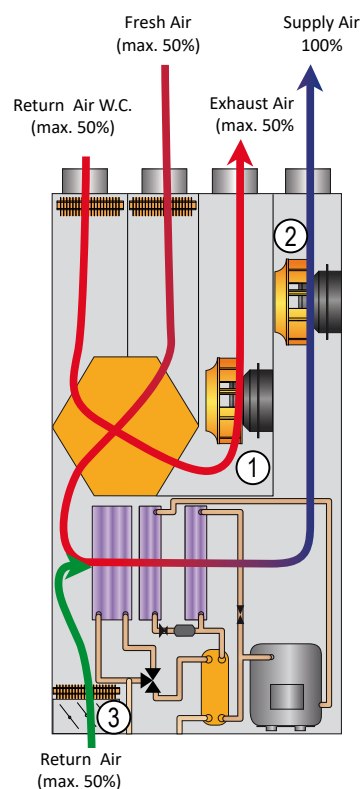


## Aeraulic circuit functioning principle

FHE units can operate with a flow rate of outdoor air from 80 to 130 m<sup>3</sup>/h, to ensure sufficient supply air changes in the room having a variable volume by 430 m<sup>3</sup> (0,3 vol/h) in compliance with regional and national regulations. The air flow rate of discharge can vary from 80 to 130 m<sup>3</sup>/h in the winter mode, and is fixed to 260 m<sup>3</sup>/h in summer mode.

The cross-flow heat exchanger of high efficiency is designed to ensure a recovery rating of 90% in terms of air temperature -5°C and air temperature 20°C. The stale air is expelled from the environment by the fan (1), while the outside air is sucked through the fan (2).

The proper balance of air flows is ensured by the damper (3) that handles both the balance of flows of air and the air flow recirculation summer.

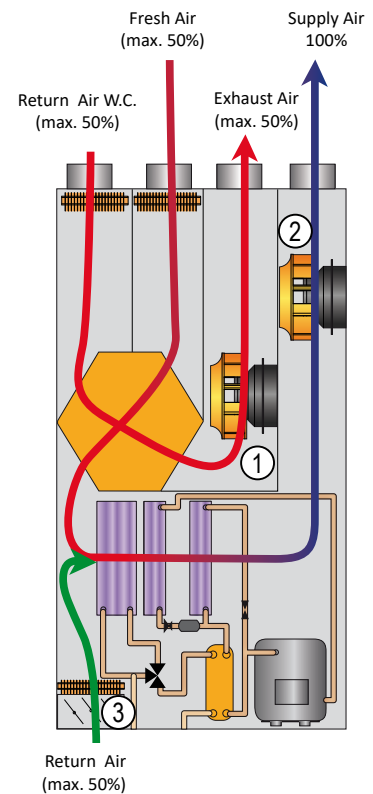


## Summer operation (Compressor on)

Whit this selected mode, the unit renews the ambient air with the outside through the heat exchanger for high efficiency, air flow is increased so as to allow operation of refrigerant circuit; for this purpose the recycling damper will be open, the supply fan is operated at the maximum capacity and the unit works with external air and partial recirculation.

### The possible functions in this configuration are

- **Renewal + Air Dryers neutral:** The condensing unit partially in air and partially in the water through the condenser plate, obtaining dry air and thermally neutral.
- **Renewal + Dehumidification with cooling:** The unit operates with 100% of the condensation water, obtaining dry and cooled air.

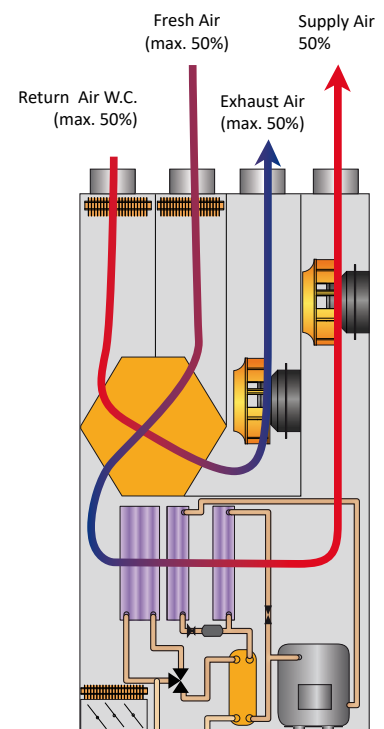


## Winter operation and middle season (Compressor off)

Whit this selected mode, the unit renews the ambient air with the outside through the heat exchanger of high efficiency. The air flow is reduced to the value required by the standard (0,3 ÷ 0,5 Vol/h), the recirculation damper is closed and the unit operates with 100% fresh air.

### The possible functions in this configuration are:

- **Renewal with heated air:** The compressor is switched off, the battery can be supplied with hot water from radiant system. (even due to the high efficiency of the heat exchanger, is able to obtain a supply air temperature 17°C, without using hot water and ambient air temperature of -5°C), and behaves like a normal air handling with recovery.

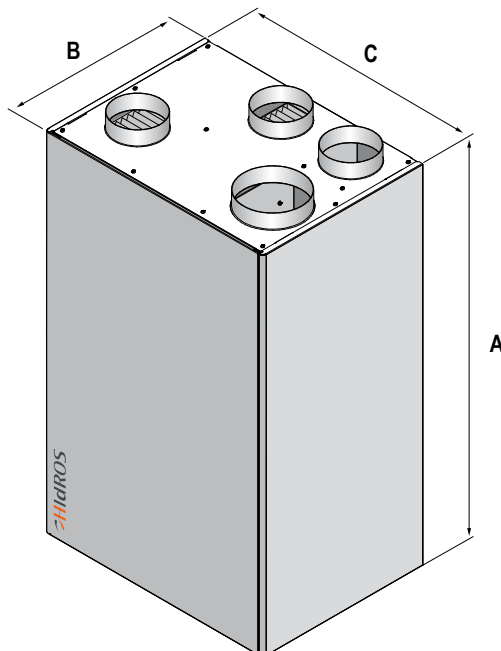
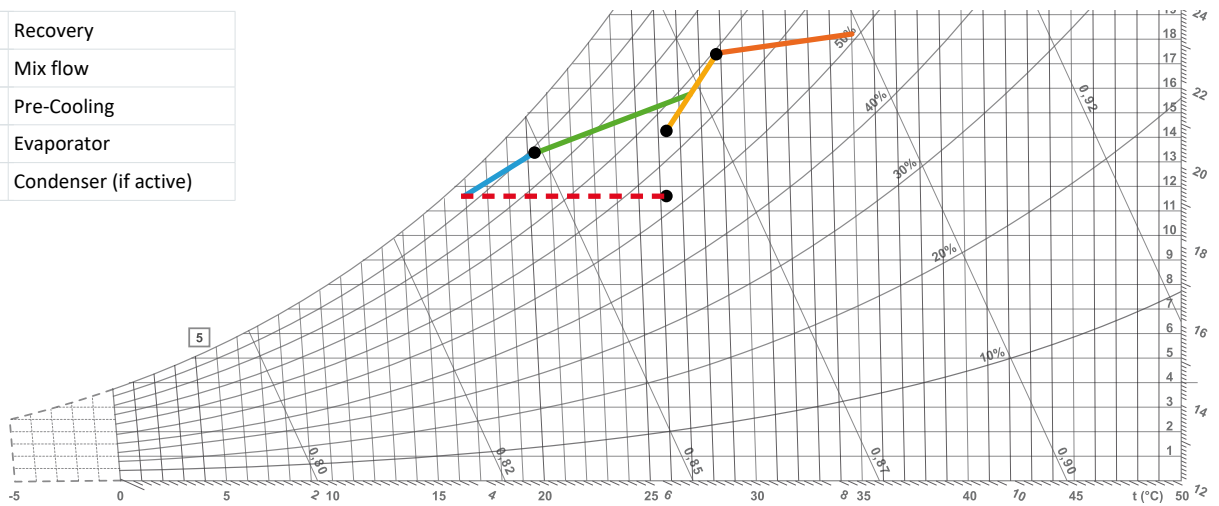


FHE		26
Microprocessor control		●
User flow switch		●
Modulating 3-way valve		●
Supply & Return EC fans		●
G4 air filter		●
Adjustable Trimmers		●
High Efficiency Heat Recovery		●
Humidity and Temperature electronic probe sensor	RGDD	●
Remote control Panel	PCRL	○
Serial interface card RS485	INSE	○

● Standard, ○ Optional, – Not available.

### Summer air treatment

<span style="color: orange;">—</span>	Recovery
<span style="color: yellow;">—</span>	Mix flow
<span style="color: green;">—</span>	Pre-Cooling
<span style="color: blue;">—</span>	Evaporator
<span style="color: red;">- - -</span>	Condenser (if active)



Mod.	A (mm)	B (mm)	C (mm)	Kg
26	1125	440	600	90