EVHR / EVHR EC Ceiling Type Heat Recovery Unit





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EVHR Ceiling Type Heat Recovery Unit

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General Terms and Conditions of Sale





The technical specifications and the performance data declared with this logo have been developed by the tests performed in Eneko Energy Laboratory which is established with the development Project support of Tübitak by regarding

Casing & Insulation

High corrosion resistive 200 gr/m Galvanize coated steel is used for the casing. The unit is insulated from inside with 10 mm polyether foam against sound and thermal conduction.

Control System - Plug&Play -

ENECON PLUS control unit is developed for controlling of heat recovery units' equipments, meeting the demands coming from the customers and is user-friendly designed. ENECON PLUS is capable of commanding the equipments in standard unit and optional accessories. ENECON PLUS Control unit can be performed the basic functions without any control panel, with Standard Panel can be also used more functional. Besides, the control unit can control the all functions via ModBus and switch on/off via BMS as optional. Alternatives different from ENECON PLUS controller are listed in "Control System" part.

Supply and Exhaust Air Fans

Backward curved plug fans are used in EVHR units. Fan blades have high aerodynamic efficient backward curved design. Plug fans are used for high efficiency and low sound levels. With AC Fans, maintenance costs are reduced as the fans are directly connected to the motors; the belt and pulley problems are eliminated.

EVHR 820/1020/1520/2020/2520/3020/3520/5020 Ceiling Type Heat Recovery Unit

Aluminum Cross-flow Heat Exchanger

EVHR heat recovery ventilation units have aluminum crossflow, plate heat recovery exchangers. Plate heat recovery exchangers have plates that are produced improved surface areas to provide high efficient and leakage free design. With the optimization of exchanger heat transfer is increased and pressure drop is decreased. Heat recovery exchanger has Eurovent certification.

Supply and Exhaust Air Filters

To increase indoor air quality and to protect the equipments used in unit, G class filters (according to EN 779 standard) are used for both exhaust and supply air streams. F class filters can be also used optionally. F class filters reduce the available static pressure of the unit for the nominal air flow rate.

EVHR 420 EC/820 EC/1020 EC/1520 EC/2020 EC/2520 EC/3020 EC/3520 EC/5020 EC/6020 EC Ceiling Type Heat Recovery Unit

Aluminum Cross-flow Heat Exchanger EVHR heat recovery ventilation units have aluminum crossflow, plate heat recovery exchangers. Plate heat recovery exchangers have plates that are produced improved surface areas to provide high efficient and leakage free design. With the optimization of exchanger heat transfer is increased and pressure drop is decreased. Heat recovery exchanger has Eurovent certification.

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Casing & Insulation -

thermal conduction

High corrosion resistive 200 gr/m Galvanize coated

steel is used for the casing. The unit is insulated from

inside with 10 mm polyether foam against sound and

Supply and Exhaust Air Fans

The fans in units are equipped with innovative Electronically Commutated EC motor technology. EC motors have higher efficiency and simple speed control. Fan blades have high aerodynamic efficient backward curved design. EC motors reduce the energy consumption and increase the energy efficiency of the unit. With EC Fans, maintenance costs are reduced as the fans are directly connected to the motors; the belt and pulley problems are eliminated.

-

Supply and Exhaust Air Filters

To increase indoor air quality and to protect the equipments used in unit, G class filters (according to EN 779 standard) are used for both exhaust and supply air streams. F class filters can be also used optionally . F class filters reduce the available static pressure of the unit for the nominal air flow rate.



EVHR 420 EC



PERFORMANCE CURVE External Pressure (Pa) Air Flow (m^3 / h) - EVHR EC - EVHR





EVHR 820 / EVHR 820 EC





EVHR 1520 / EVHR 1520 EC

















EVHR 2020 / EVHR 2020 EC













EVHR 3520 / EVHR 3520 EC





EVHR 6020 EC







Technical Specifications



			EVHR 820	EVHR 1020	EVHR 1520	EVHR 2020	EVHR 2520	EVHR 3020	EVHR 3520	EVHR 5020	
	Air Flow *	m³/h	780	930	1440	1800	2440	2780	3500	4650	
u	Supply Voltage	V/Hz/f		230/ 50 /1~							
ficati	Max. Power Consumption **	W	244	350	688	688	1060	1060	940	1460	
ecifi	Max. Operation Current	A	1.08	1.54	3.02	3.02	4.68	4.68	4.92	6.58	
l Sp	Max. Sound Pressure ***	dB	42	43	46	42	52	52	44	50	
inicc	Unit Weight	kg	46	46	60	82	104	127	132	164	
Tech	Filter Class			G Class Synthetic Filter According to EN 779							
ΉR	Electric Heater****	kW	2	3	3	5	7	8	10	13	
Ъ	E.Heater Supply Voltage	V/Hz/f 230 / 50 / 1~ 400 / 50 /							50 / 3~		
	Heater Coil (90/70 °C)	kW	2.9	4.3	6.4	8.3	11.4	14.2	17	22.8	

*External static pressure is 0 Pa.

**If unit selected with bypass module, max power consumption will be increase 100w.

Measured at 1,5m distance to the unit @ 250 Hz. *Electrical heater and heater coil are optional. Electrical heaters shall be used before the fresh air inlet of the unit to preheat air where outdoor air is below -3°C and condensation can occur. Also in humid climates return air ducts must also be insulated against condensation.

			EVHR 420	EVHR 820	EVHR 1020	EVHR 1520	EVHR 2020	EVHR 2520	EVHR 3020	EVHR 3520	EVHR 5020	EVHR 6020
			<u> </u>	EL	<u> </u>	EL						
	Air Flow *	m³/h	420	840	1075	1600	2350	3075	3300	3550	4700	6250
ion	Supply Voltage	V/Hz/f		230/ 50 /1~					400/50/3			
ficat	Max. Power Consumption	W	144	248	380	810	1020	1040	1040	2400	2240	6140
peci	Max. Operation Current	А	0,98	1,78	2,98	5,18	6,38	4,58	4,58	3,78	3,58	9,58
	Max. Sound Pressure **	dB	42	43	46	42	52	52	44	50	50	50
hnic	Unit Weight	kg	41	45	45	53	84	104	130	115	153	165
Tec	Filter Class		G Class Synthetic Filter According to EN 779									
S EC	Electric Heater***	kW	2	3	3	5	7	8	10	10	10	10
H	E.Heater Supply Voltage	V/Hz/f		2	30 / 50 / 1	~			400	/ 50 / 3~		
	Heater Coil (90/70 °C)	kW	1.5	2.9	4.3	6.4	8.3	11.4	14.2	17	22.8	25.1

*External static pressure is 0 Pa.

 $\star\star If$ unit selected with bypass module,max power consumption will be increase 100w.

***Measured at 1,5m distance to the unit @ 250 Hz.

****Electrical heater and heater coil are optional. Electrical heaters shall be used before the fresh air inlet of the unit to preheat air where outdoor air is below -3°C and condensation can occur. Also in humid climates return air ducts must also be insulated against condensation.



Unit Dimensions

EVHR Unit Dimensions

	EVHR 420 EC	EVHR 820 EVHR 820 EC	EVHR1020 EVHR1020 EC	EVHR1520 EVHR1520 EC	EVHR2020 EVHR2020 EC	EVHR2520 EVHR2520 EC	EVHR3020 EVHR3020 EC	EVHR3520 EVHR3520 EC	EVHR5020 EVHR5020 EC	EVHR6020 EC
A	820	930	930	1072	1193	1335	1570	1570	1800	1800
В	500	680	680	826	980	1120	1160	1160	1170	1170
C	275	342	342	379	433	433	535	535	650	650
E	260	340	340	420	490	560	580	580	580	580
ØD	160	200	250	250	300	355	355	355	450	450
* In the	e use of option	al bypass, devi	ice C dimension v	vill increase by 1	00 mm.			* All	measurement v	values are mm.





Automati	Control Cards						
Chandrad	0-1:	Cum I al	Altern	ative 1	Altern	ative 2	
Standara	Uptional	Standard	Type 1	Type 2	Type 1	Type 2	
OA Temperature Sensor		S	S	S	\odot	Ś	
RA Temperature Sensor		Ø	\odot	S	Ś	Ś	
SA Fan Control		S	S	S	S	Ś	
RA Fan Control		S	Ø	S	Ø	S	
Filter Contamination Info (Time)		\odot	S	S	\odot	S	
Modbus RTU		\odot	Ø	S	Ø	S	
Weekly Timer		\bigotimes	Ø	S	\odot	S	
,	ByPass Damper	\odot	S	S	\otimes	\odot	
	On/Off Damper Control	\odot	Ø	\odot	\otimes	\odot	
	Proportional Damper Control	\otimes	Ø	\odot	\otimes	\odot	
	Airflow Control	\otimes					
	Humidity Control						
	CO2 Control						
	SA Temperature Sensor	\otimes	\otimes	\odot	\otimes	\odot	
	On/Off Heating Coil	S	S	S	Ø	S	
	Proportional Heating Coil	S	S	S	Ø	S	
	On/Off Cooling Coil	S	\odot	S	Ø	S	
	Proportional Cooling Coil	S	\odot	S	\odot	\odot	
	Electrical Pre-Heater	Ø	\odot	S	Ø	S	
	Electrical After-Heater	\odot	Ø	S	S	S	
	BacNET MSTP	\otimes	Ø	S	\odot	S	
	Web Browser (TCP/IP)	\otimes	Ø	S	\odot	Ś	
	Filter Contamination Info (DPS)	$\langle \cdot \rangle$	()	(V)	()	(V)	

 \bigcirc Only one of them the defined functions is selectable for this control card.

 \bigtriangleup The optional features in the table vary according to the product.

	(Control Panel	Control Cards					
Panel Type		Panel Descriptions	Standard	Alterno	itive 1	Altern	Alternative 2	
i unor rypo			Jiuliuulu	Type 1	Type 2	Type 1	Type 2	
1-1.5-	Standard	Wall-mounted type Max:30 m communication ability	Ś	\otimes	\otimes	\otimes	\otimes	
	Wall-mounted type hand panel, IP 30 protection class, Max:100 m communication ability		\otimes	S	\otimes	\otimes	\otimes	
	Wall-mounted type hand panel, IP 30 protection class, Max:100 m communication ability		\otimes	\otimes	\bigotimes	\otimes	\otimes	
8	Magnet type, IP 31 protection class, Max:700 m communication ability		8	\otimes	8	Ś	Ś	
	Max:700 m communication ability Hand Panel 1: Wall-mounted type, IP 65 protection class for only front side of panel, Max:50 m communication ability Hand Panel 2: Magnet type, IP 65 protection class for whole panel, Max:50 m communication ability		8	8	8	Ś	Ś	



Control System

- Stepless Control



- Stepless flow control
- Internal fuse
- On/Off function
- Flush mounted or surface mounted
- Compact design

Standard EVHR units are delivered to the site with fan speed regulators. With fan speed regulators, both exhaust and supply air fans are regulated and unit also can be switched on/off. Mains electricity is connected to the fan speed regulator where EVHR units shall be connected to the fan speed regulator there after.

- Selection of Electrical Cable Cross-Section

Unit Model EVHR	Unit Voltage (V)	Unit Power Input (kW)	Current (A)	Fuse (A)	Cable Cross-Section(mm²) for 50M and PF=0.8
820	230	0.24	1.08	2	1.5
1020	230	0.35	1.54	2	1.5
1520	230	0.69	3.02	3.15	2.5
2020	230	0.69	3.02	3.15	2.5
2520	230	1.06	4.68	5	2.5
3020	230	1.06	4.68	5	2.5
3520	230	1.02	4.92	6.3	2.5
5020	230	1.46	6.58	10	4

The data in the table shows the maximum power/current values. Please check unit label for updated values.

Unit Model EVHR EC	Unit Voltage (V)	Unit Power Input (kW)	Current (A)	Fuse (A)	Cable Cross-Section(mm ²) for 50M and PF=0.8
400	000	0.14	0.00	0	1.6
420	230	0.14	0.98	Ζ	1.5
820	230	0.25	1.78	2	1.5
1020	230	0.38	2.98	3.15	1.5
1520	230	0.81	5.18	6.3	2.5
2020	230	1.02	6.38	10	2.5
2520	230	1.04	4.58	5	2.5
3020	230	1.04	4.58	5	2.5
3520	400	2.40	3.78	3x4	2.5
5020	400	2.24	3.58	3x4	2.5
6020	400	6.14	9.18	3x16	2.5

The data in the table shows the maximum power/current values. Please check unit label for updated values.



Cable Cross-Section Formulas

1	
$I_{current} = \frac{P}{U.CosQ}$	
I cable > I current	
2 %e = $\frac{100.P.L}{k.S.U^2}$, S = $\frac{100.P.L}{k.\%e.U^2}$ %e = %3 3 $I_{cable} > I_{fuse} \ge I_{current}$	
Cable Cross-Section S = Max (S1, S2, S3, 1.5mm²)	
P : Power I : Current U : Voltage S : Conductor cross section k : Conductor coefficient L : Conductor length %e The voltage drop	

- Example of Cable Cross-Section Calculation

P : 2,6 kW	L:50m
U: 230V	% e : %3
PF: Cos®8	$k:\text{56m}/\Omega$

 $I_{current} = \frac{2600 \text{ W}}{230.0,8} = 14.2 \text{ A}$

The cable will be used, is selected from the cable cross-section table so that the equivalent ampere value in the table should be higher than calculated "I current" value.

 $S1 = 1.5 \text{ mm}^2$

2

1

%e = %3

$$S = \frac{100.2600.50}{56.3.230^2} = 1.46 \text{ mm}^2$$

 $S2 \ge 1.46 \text{ mm}^2 \ge 1.5 \text{ mm}^2$

```
S2 = 1.5 \text{ mm}^2
```

3

 $|_{cable} > |_{fuse} \ge |_{current}$ $I_{cable} > 16A \ge 14.2A$

"I fuse" which will be higher than "I current", is selected.

The cable will be used, is selected from the cable cross-section table so that the equivalent ampere value in the table should be higher than selected "I fuse" value.

 $I_{cable} = 24A$ $S3 = 1.5 \text{ mm}^2$ Cable cross-section $S = Max (S1, S2, S3, 1.5 mm^2)$ S = Max (1.5, 1.5, 1.5, 1.5)

 $S = 1.5 \text{ mm}^2$



- Duct Type Electric Heater



Electric heaters are optionally supplied in cold climates for supply air and in extreme climates for both supply and outdoor air sides against freezing. Electric heaters are manufactured according to circular or rectangular duct systems. Standard types are produced of stainless steel heating elements and galvanized metal casing. Stainless steel casing is also avaliable.

Electric heaters are equipped with two excessive temperature protection. When inside of the electric heater's temperature is 70°C, "automatic excessive temperature protection" enables and electric heater disables automatically. When 70°C automatic temperature protection doesn't enable or the inside of the electric heater's temperature is 110°C, the second

protection enables and electric heater disables until the manual reset will be done. The electrical heaters, designed as maximum 3 steps, step automatically according to temperature that is set on room control panel with control panel. Eneko electric heaters are connected in Delta connection in standard models.

Heating Capacity Calculation

 $Q = 0,33x V x (T_2 - T_1)$

- Q : Heating Capacity (W)
- $V\,$: Air Flow through electric heater (m³/h)
- T_1 : Air temperature before the heater (°C) T_2 : Air temperature after the heater (°C)

- Duct Type Coils



Duct type heating/cooling coils are assembled in cabin as suitable to mount inside duct and have standard capacity. Coils consist of copper tubes and aluminum fins. Inlets and outlets of cabin are suitable for circular duct connections as in heat recovery ventilation units. Additionally, cooling coils have drain pan and extra insulation to prevent condensation of cabin. Both heating and cooling coils can be controlled seperately as on/off via unit automation system.



Ventilation on Demand

Air Quality Sensor (CO_2 / Humidity) is mounted to the return air duct and is connected to control system of unit. The set point for the desired indoor air quality is set during the installation. According to the demand indoors, EVHR units are modulated automatically by the sensor. Annual energy consumption of the unit is reduced as a result of the modulation, ending in reduction in energy costs.

Fresh air demand in a space is calculated according to human occupancy and/or physical properties of the conditioned space. The calculation is based on the maximum indoor occupancy. In practice maximum occupany is observed for only a small period of time annually where lower air flow rates will be sufficient for most of the year. By reducing the air flow rate according to the fresh air demand; it is possible to reduce units electrical consumption and reduce also energy consumption used to condition the space. It should be noted that by increasing fresh air rate, indoors heating/cooling demand will also be increased.

With the help of control panel, it is possible to regulate fresh air rate according to the demand indoors. Eneko Indoor air quality sensor (CO_2 /Humidity) sensor is mounted to the return duct or the conditioned space and the demanded condition is set. A 0-10 V signal will be created and EVHR unit's air flow will be regulated according to the signal.



- Sound Attenuator For Circular Ducts



Sound attenuators are designed for standard duct dimensions. Various lenghts are available accoring to attenuation demand. Sound attenuation capacities are given in the table.For better performance sound attenuators can be used in series. For the best result the sound attenuators shall be installed just after the unit.



Sound Attenuation Capacity [dB]

				- 1				
SLT	63	125	250	500	1k	2k	4k	8k
200-300	1	2	3	6	10	14	12	14
200-600	2	3	6	7	13	17	18	20
200-900	3	4	7	10	16	18	21	22
250-300	1	2	6	6	13	16	14	15
250-600	2	3	7	7	18	21	20	22
250-900	3	4	9	8	21	24	21	23
300-300	1	2	4	4	10	12	12	15
300-600	1	3	6	7	13	15	17	19
300-900	2	4	7	8	15	17	18	21
355-600	1	3	8	8	9	6	5	7
355-900	4	4	13	13	11	7	6	8



Sound Attenuator Dimensions [mm]

	-	-	
SLT	length (L)	Ø di	Ø do
200-300	300	200	260
200-600	600	200	260
200-900	900	200	260
250-300 250-600 250-900	300 600 900	250 250 250 250	310 310 310
300-300	300	300	360
300-600	600	300	360
300-900	900	300	360
355-600	600	355	415
355-900	900	355	415



General Terms and Conditions of Sale



GENERAL

The sale of all Products of ENEKO shall exclusively be made on the basis of these General Terms and Conditions of Sales. Any other conditions and General Conditions of Purchase of the Buyer are not accepted.



OFFERS

Our offers are non-binding and without obligation. Contracts for delivery and all other agreements (including subsidiary agreements) as well as declarations of our representatives shall only become legally binding for us after written confirmation. We do not render planning service. Proposals made and information provided by our representatives shall be non-binding. Illustrations, drawings, dimensions and weights or other performance data shall only be binding if this is expressly agreed in writing.



TERMS OF ORDER

Purchase orders shall be sent to ENEKO in written form and shall be non-binding unless they are accepted by written confirmation (order confirmation) from ENEKO. Each order shall include properly identified Products ordered and relevant shipping dates.



PRICE OF THE GOODS

Prices are net Ex Works according to current Incoterms unless stated otherwise and do not include any kind of taxes. Prices are valid at the date of delivery will be applied. We reserve the right to adjust prices for confirmed orders as well to reflect any increase in our costs for any reason beyond our control like force majeure, shortage of primary material or labor strikes, official orders, transportation or similar problems. In this case, a new price agreement shall be required for higher rates. If such an agreement is not made, we shall be entitled to withdraw from the contract by written notice within 15 days.



TERMS OF PAYMENT

Payments shall be carried out according to the contractual terms as defined and set forth in the order confirmation. If the payment conditions have not been agreed upon conclusion of the contract, the payment terms and payment dates specified in our invoices shall be binding. Deadlines for discounts and periods allowed for payment shall begin to run upon receipt of the invoice. Payments by draft, bills of Exchange or anyway extended payments shall mean neither credit novation, nor prejudice to the Retention of Title agreement, nor to territorial competence. If buyer fails to make payment by due date, we are entitled to charge the buyer with a relevant interest on the unpaid amount.



TERMS OF DELIVERY

Delivery time information is only approximate. We shall only be in default if the performance is due and a written demand for payment was issued. Delivery day is the day of dispatch Ex Works. We shall also not be liable with regard to bindingly agreed periods and dates in the event of delays an delivery and of performance due to force majeure and events which considerably complicate or make delivery impossible not only temporarily-strike lockout, breakdown, delay in supply with important raw and auxiliary materials even if the delay occurs at our supplier, in particular. These delays entitle us to postpone delivery for the period of the impediment plus a reasonable start-up period or to withdraw from the contract as a whole or in part. If delivery time is extended or we are released from our delivery commitment, the buyer may not derive a claim for damages from it. However, we may only rely on the circumstances mentioned if we notify the buyer immediately. We shall be entitled to make part deliveries. Any part delivery shall be considered as independent transaction. In case of default, our liability is limited to contract-typical foreseeable damage.

General Terms and Conditions of Sale





SHIPMENT

Shipment is made for the buyer's account. Mode of shipment and shipping route, transport and packaging and other securities respectively shall be at our choice. We shall be entitled, however, not obliged to insure deliveries in the name and for account of the buyer. Risk passes to the buyer when shipment is handed over to the person performing the transport or left our Works for shipment. If shipment is delayed upon buyer's request, risk passes to the buyer with the ready for shipment note. If ordered goods are rejected after the ready for shipment note, we shall be entitled to request payment and store the goods at buyer's expense. Discharge of the goods is made at buyer's expense.



RETENTION OF TITLE

In any event ENEKO shall retain full ownership of all materials supplied whilst the payment conditions of the entire amount have not been complied with, said materials may be removed from the customer at our request. Should the customer be declared bankrupt or insolvent and has not made paid the entire amount of payments. ENEKO shall be entitled to recover the goods. ENEKO may interrupt the supply without incurring any liability whatsoever if he had notice of or became aware of a decrease in the creditworthiness of the purchaser or if any of the existing negotiable instruments or debts were not properly complied with, shall result as being unpaid and protested.



WARRANTY

ENEKO Products are under warranty (defect in material or workmanship)for 2 years from the date of sale reflected on the invoice. Under this warranty, ENEKO is under the obligation to replace the part requested under warranty.

The followings are excluded from ENEKO warranty:

- Normal wear and tear
- Defective assembly or handling
- Third party compensation

Parts the subject of a claim shall be sent to our warehouse as carriage paid with relevant report completely filled in, wherein the parts shall be subjected to analysis.



HABILITY

ENEKO, for any losses/damages, shall only be responsible within the limits of the law.Owing to basic obligations undertaken by simple nealigence, if the contract is violated, ENEKO's liability shall be limited to compensate for losses which are emerged specific and predictable. ENEKO shall not carry any responsibility in case of a single negligence in breach of non-essential contractual obligations.



PROPERTY RIGHTS

The purchaser in no event and under no circumstances whatsoever shall publish or use the trademark, trade name or logo of ENEKO without a prior written permission.



GOVERNING LAW AND JURISDICTION

This agreement shall be governed with all aspects of the Turkish Law. The courts of Izmir/Turkey shall have an exclusive jurisdiction to adjudicate any dispute arising under or in connection with this gareement.









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