HEAT RECOVERY UNITS

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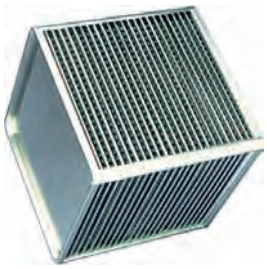
Heat Recovery Ventilation Units (VHR) are designed for saving energy and also improving indoor air quality. VHR units provide the facilities of air-conditioning applications (residential, commercial and industrial areas) by using plate type exchangers, recovering heat from air to air. The heat is effectively transferred from warm to cold air by the exchangers with high conductivity, efficiency and performance.

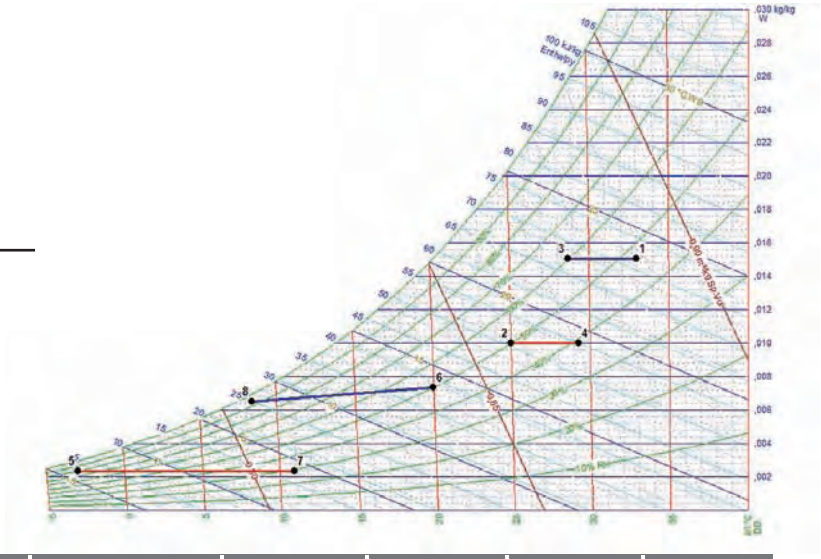
- 7 standard models, with TSEK certification, CE marked and GOST-R certification in compliance with applicable directives,
- High efficient, direct driven AC Fans with low noise level,
- Proper ventilation with 5 speed fans controlled separately,
- The compact design provides easy installation and maintenance,
- Aluminum plate type heat exchangers with high conductivity and performance,
- Indoor air quality with G2 filters,
- Excellent sound and heat isolation due to fully insulated cabinet

Electronic Controller
"Standard with the unit"

WHY HEAT RECOVERY UNITS



VHR 15 model



No	Season	Description	Dry-bulb Temperature	Wet-bulb Temperature	Relative humidity	Enthalpy	Humidity Ratio	Spesific Volume
			(°C)	(°C)	(%)	(kJ/kg)	(gr/kg)	(m^3/kg)
1	Summer	Outside	33	23,8	47,0	71,74	15,0	0,888
2	Summer	Inside	25	17,9	50,0	50,62	10,0	0,858
3	Summer	Frehs Air	28,7	22,8	60,0	67,30	15,0	0,878
4	Summer	Exhaust	29,3	19,3	38,9	55,02	10,0	0,871
5	Winter	Outside	-3	-3,9	80,0	2,91	2,3	0,768
6	Winter	Inside	20	13,8	50,0	38,78	7,3	0,840
7	Winter	Frehs Air	10,9	4,1	28,9	16,93	2,3	0,808
8	Winter	Exhaust	8,4	7,9	93,7	24,79	6,5	0,808

Fresh Air Cooling Capacity

$$ {}_1q_2 = m_a\left[(h_1 - h_2) - (w_1 - w_2)\, h_{w2}\right] $$

$$ {}_1q_2 = \frac{1000}{0,858}\left[(71,74 - 50,62) - (\frac{15 - 10}{1000})\, 104,81\right] $$

$$ {}_1q_2 = 6,67 \text{ kW} $$

Fresh Air Cooling Capacity with VHRV

$$ {}_3q_2 = m_a\left[(h_3 - h_2) - (w_3 - w_2)\, h_{w2}\right] $$

$$ {}_3q_2 = \frac{1000}{0,858}\left[(67,3 - 50,62) - (\frac{15 - 10}{1000})\, 104,81\right] $$

$$ {}_3q_2 = 5,23 \text{ kW} $$

Energy Saving for Summer

$$ Q = {}_1q_{2\,-\,3}q_2 = 6,67 - 5,23 $$

$$ Q = 1,44 \text{ kW} $$

Fresh Air Heating Capacity

$$ {}_5q_{6'} = m_a\left[h_{6'} - h_5\right] $$

$$ {}_5q_{6'} = \frac{1000}{0,840}\left[26,0 - 2,91\right] $$

$$ {}_5q_{6'} = 7,64 \text{ kW} $$

Fresh Air Heating Capacity with VHRV

$$ {}_7q_{6'} = m_a\left[h_{6'} - h_7\right] $$

$$ {}_7q_{6'} = \frac{1000}{0,840}\left[26,0 - 16,93\right] $$

$$ {}_7q_{6'} = 2,99 \text{ kW} $$

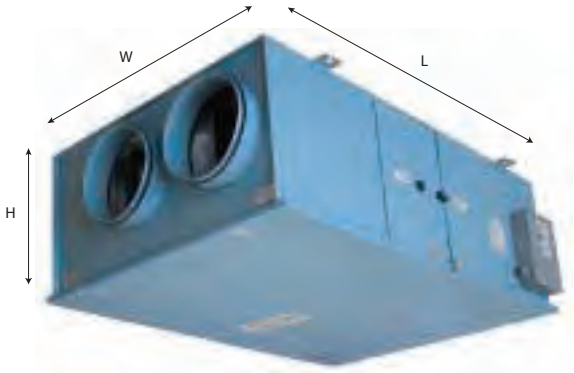
Energy Saving for Winter

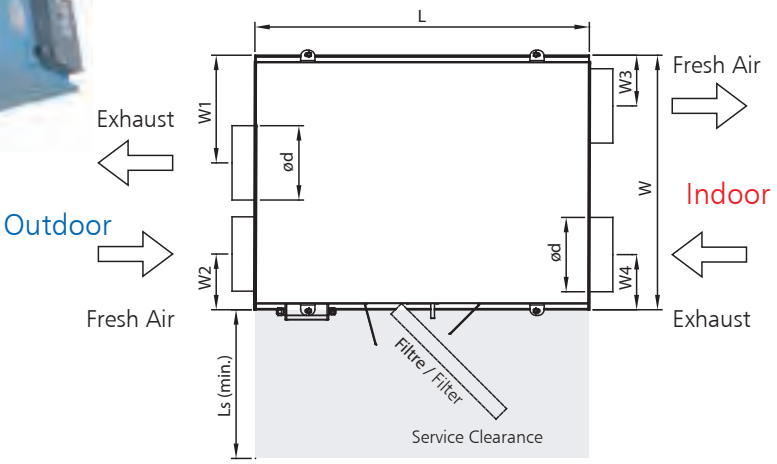
$$ Q = {}_5q_{6'\,-\,7}q_6 = 7,64 - 2,99 $$

$$ Q = 4,65 \text{ kW} $$

SPECIFICATIONS

MODEL		VHR 4	VHR 9	VHR 15	VHR 20	VHR 29	VHR 36	VHR 51
Air Flow 0 Pa*	m³/h	450	905	1500	2000	2950	3600	5100
Heat Recovery Efficiency	%	Efficiency up to 70 %, depending on working conditions						
Electrical Data		230 Volt / 50 Hz / 1~						
	W	160	294	746	746	1.100	1.100	1.472
	A	0,68	4,6	7,8	7,8	11,0	11,0	12,0
Air Filter		Synthetic Filters for Fresh and Exhaust Air						
Optional Heater Electrical or Hot Water with 90/70°C	kW	1 230V/1~	3 230V/1~	4 400V/3~	5 400V/3~	7 400V/3~	10 400V/3~	12 400V/3~
*External static pressure								





MODEL		VHR 4	VHR 9	VHR 15	VHR 20	VHR 29	VHR 36	VHR 51
Lenght [mm]	L	550	850	1120	1120	1400	1450	1650
Width [mm]	W	400	700	850	850	980	1100	1250
Height [mm]	H	600	325	420	420	420	600	690
Duct Connection [mm]	ød	Ø160	Ø200	Ø300	Ø300	Ø355	Ø400	Ø450
Weight [kg]		34	44	80	80	100	130	180
[mm]	W_1		150	185	185	240	240	275
	W_2		296	335	335	320	350	435
	W_3		150	185	185	240	240	275
	W_4		140	185	185	230	240	265
Service clearance [mm]	Ls		300	350	350	450	450	500

AIR FLOW - EXTERNAL STATIC PRESSURE

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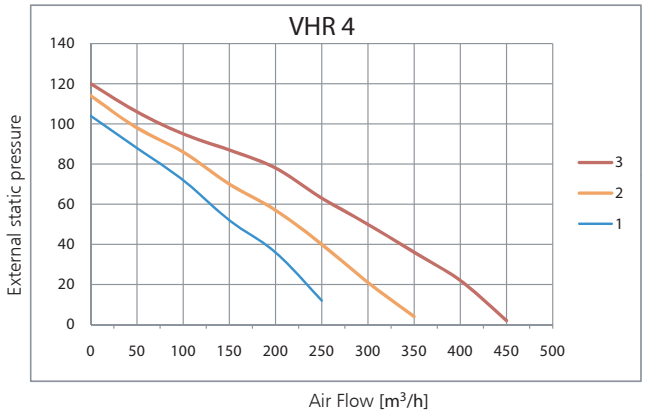
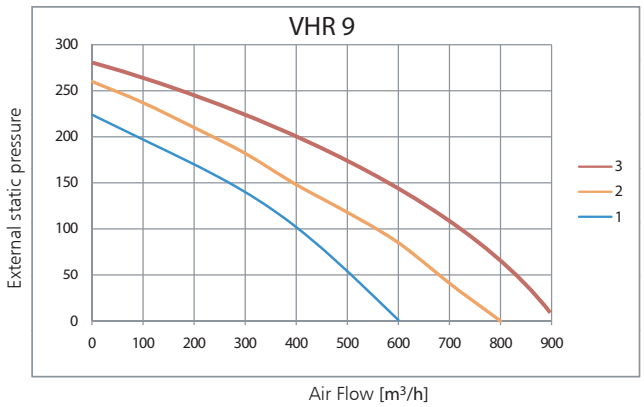
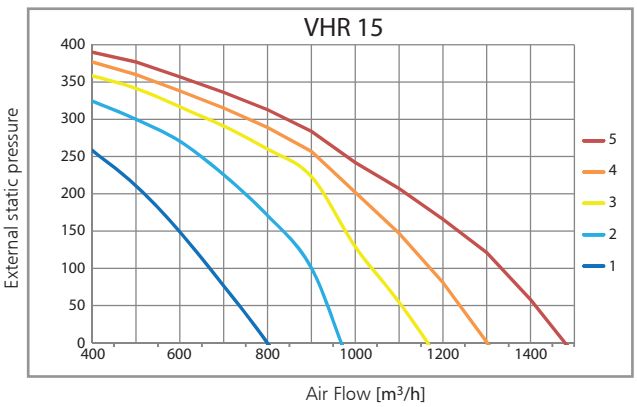
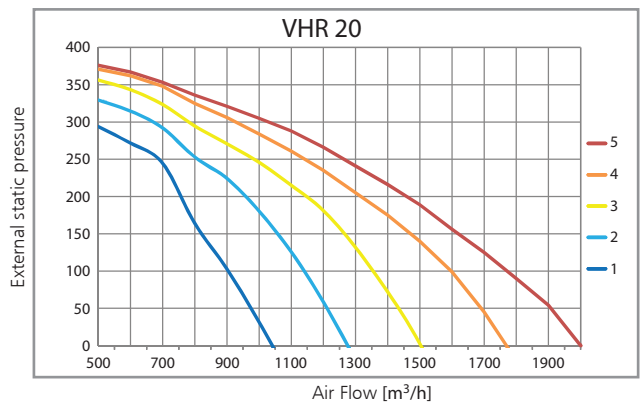
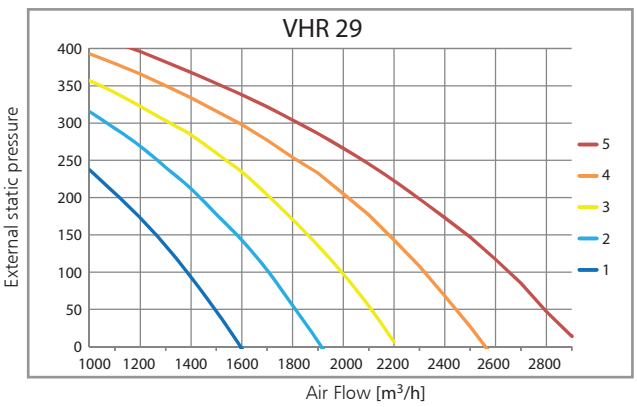
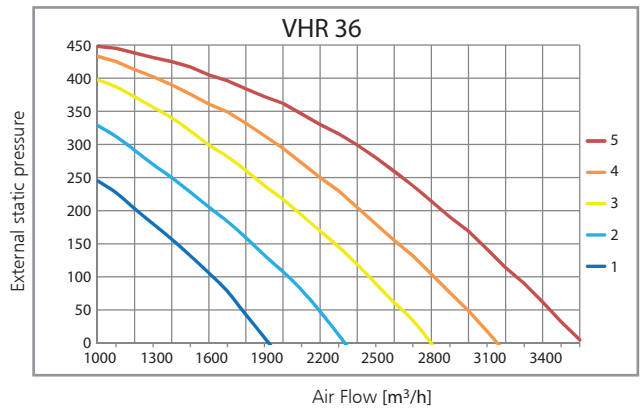


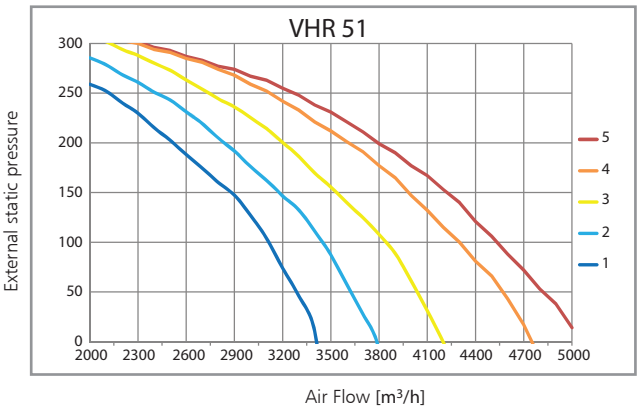




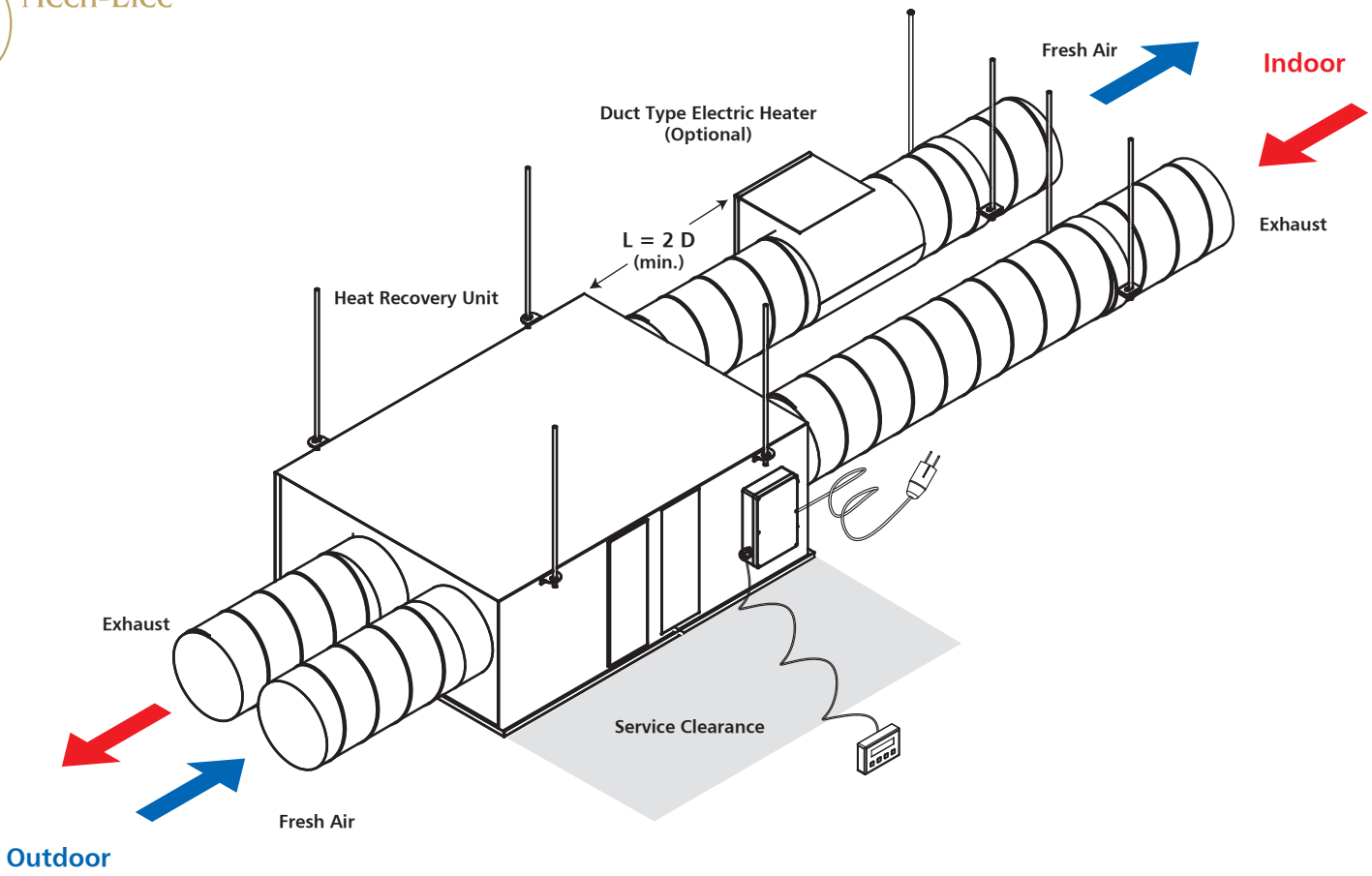




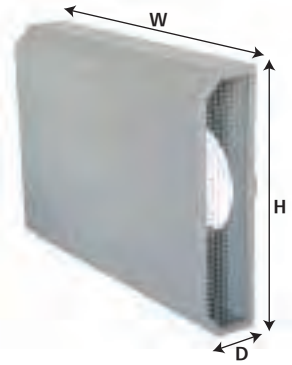




INSTALLATION DETAILS



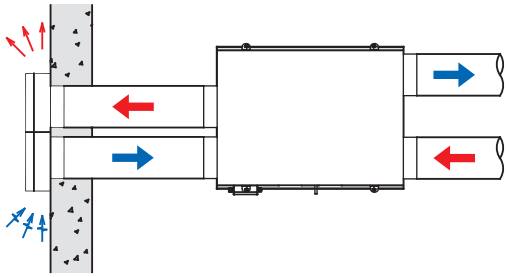
heat recovery units have circular duct inlets and outlets. If the duct system is rectangular, the adaptors from circular to rectangular ducts could be supplied optionally.



OUTDOOR CONNECTION KIT (OCK)

Outdoor connection kit is used to have the fresh air from the outside and exhaust the return air at the same time by not causing the return air at the same time by not causing the short circuit. The connection dimensions are suitable with the heat recovery unit inlets and outlets.

MODEL		VHR 9	VHR 15	VHR 20	VHR 29	VHR 36	VHR 51
Width	W	610	710	780	925	1060	1140
Height	H	350	450	600	800	900	1000
Depth	D	150	150	150	200	200	250



Electronic Controller
"Standard with the unit"

heat recovery units are controlled with standard electronic controllers (SEC). SEC has the following features;

- On / Off control,
- 5 different fan speed for each fan (supply & exhaust),
- Electrical heater control manually or automatic regarding to the set temperature,

FUNCTIONAL ELECTRONIC CONTROLLER (FEC)

Functional electronic controllers (FEC) are used optionally. The unit is equipped with anti-freeze thermostat and protects the heat exchanger against to freezing.

- Frost protection for heat exchangers
- Clogged filtre
- Air quality sensor control
- Carbondioxide sensor control
- Timer function (daily and weekly programing)
- By-pass damper control
- Connectable to BMS or VRV/VRF system

It is possible to increase the air quality by using different sensors such as humidity sensor, air quality sensor and carbon dioxide sensor. The air quality is checked by the sensor and it allows to change the fan speed automatically.

BY-PASS CONNECTION KIT (BCK)

Heat recovery units are used to transfer the heat from the exhaust air to supply air. In the transition seasons, it is much more suitable to supply the fresh air directly to indoor by not entering to the heat exchanger. By-pass connection kit allows controlling the outdoor air automatically and supplying the outdoor air directly to the indoor when it is necessary.

CIRCULAR DUCT SILENCER (SLT)

duct silencers are classified in two groups as SLT models for circular duct systems and LN models for rectangular duct systems. SLT models are produced with the standard diameters of spiral ducts (ø100, 125, 150, ..., 1250). LN models are produced with dimensions as required. Silencers can be connected to the duct system without any accessory. Glasswool insulation is used for the damping material as standard, rockwool insulation is optinal.

DUCT TYPE ELECTRIC HEATER (VCE)

electrical heaters have TSEK certification, CE marked and GOST-R certification. The technical specifications of products meet the essential requirements in the directives EMC 89/336/EEC and are tested according to the standards EN 55014-1, EN 61000-3-2/3-3 for EMC. Electrical heaters are produced in mono phase or three phase upon request in standard spiral duct dimensions. The heaters have two overheating protections. The heater can be controlled manually by SEC or automatically by FEC.

DUCT TYPE WATER HEATER (HWC)

duct type hot water coils produced at standard capacities. High efficient heat transfer can be acquired with high performance heat exchangers. The design, providing fast and easy installation and maintenance.

DUCT TYPE BAG FILTER (VFK)

FLC series, circular duct type bag filter units are produced as suitable for standard spiral duct dimensions. Units have galvanized steel frame and F7 class polyester bag filter according to EN 779. High efficiency bag filters made in synthetic microfiber which has 90°C max. operational temperature and have 85% efficiency.

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SELECTION TABLE FOR ELECTRICAL CABLE CROSS SECTION DEPENDING ON THE CABLE LENGHT

FOR HEAT RECOVERY UNIT

Model	Power [W]	Fuse [A]	[mm²] 3x Cable Cross Section				
			1,5	2,5	4	6	10
VHR 4	160	2	147	244			
VHR 9	294	2	80	133	213		
VHR 15	746	6	32	53	84	126	
VHR 20	746	6	32	53	84	126	
VHR 29	1100	10		36	57	86	142
VHR 36	1100	10		36	57	86	142
VHR 51	1200	10		33	52	78	130

FOR ELECTRICAL HEATER

VHR Model	Model	Power [kW]	Fuse [A]	[mm²] 3x Cable Cross Section					
				1,5	2,5	4	6	10	16
VHR 4	VCE 160-1-G-1-2	1	6	31	51	82	122		
VHR 9	VCE 250-3-G-1-2	3	16		17	28	41	68	109

FOR ELECTRICAL HEATER

VHR Model	Model	Power [kW]	Fuse [A]	[mm²] 4x Cable Cross Section					
				1,5	2,5	4	6	10	16
VHR 15	VCE 250-4-G-3-2	4	3 x 16		75	121			
VHR 20	VCE 250-5-G-3-2	5	3 x 16		61	97	146		
VHR 29	VCE 250-7-G-3-2	7	3 x 16		44	70	104	173	
VHR 36	VCE 250-10-G-3-2	10	3 x 20			49	73	121	
VHR 51	VCE 250-12-G-3-2	12	3 x 25			41	61	101	162

Note : 1- Values are maximum cable lenght in meters.

2– Find the cable cross area by regarding the total power. If the stage contactors are inside the electrical heater, find the cable cross area by regarding the power for each step individually.

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heat recovery units are tested and controlled in function and safety after the production.

The technical specifications of products meets the essential requirements in the directives EMC 89 / 336 / EEC, and are tested according to the standards EN 55014-1 EN 61000-3-2/3-3 for EMC. Technical specifications meet the essential requirements in the standard EN 60335-1 and EN 60204-1

- Leakage Current Test (TS 2000 EN 60335-1)
- High Voltage Test (TS 2000 EN 60335-1)
- Insulation Test (TS 10316 EN 20204-1)
- Earth Bond Test (TS 2000 EN 60335-1)

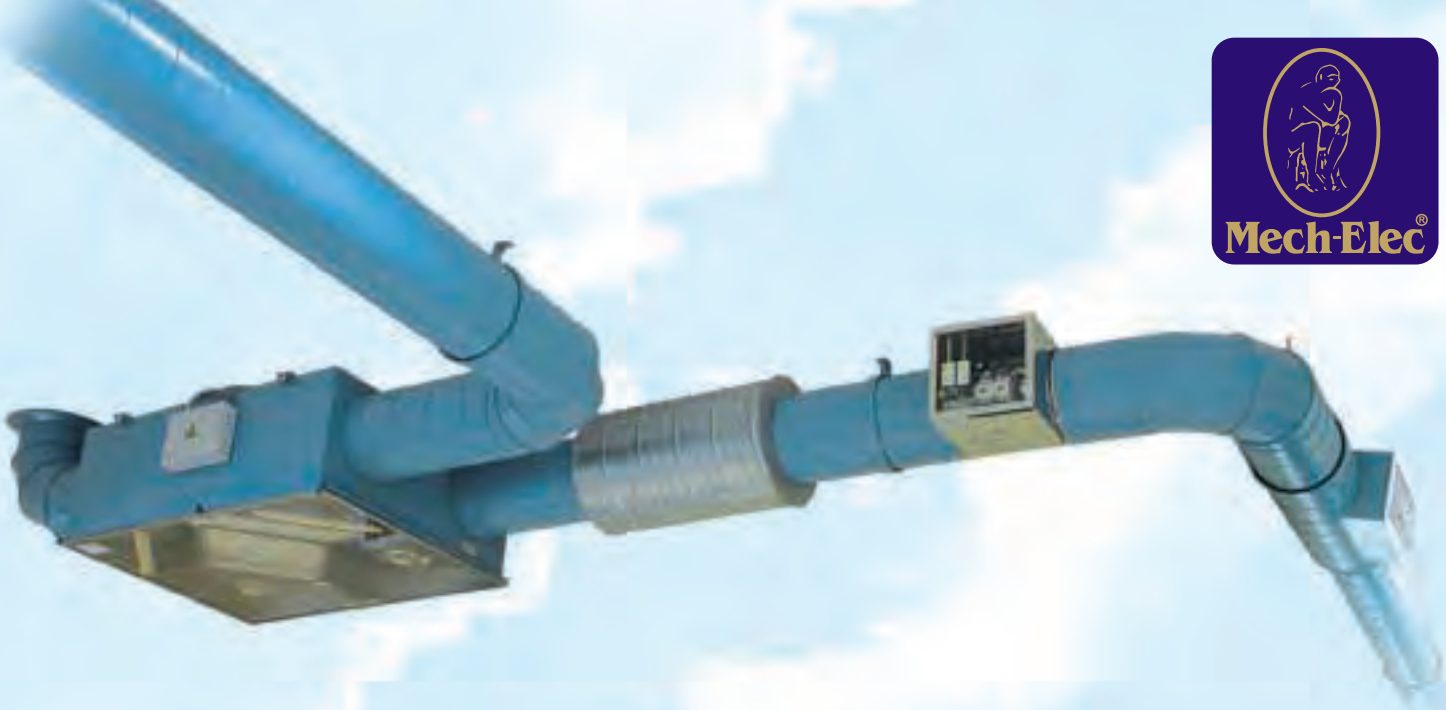
CERTIFICATION

CE-Declaration of Conformity

TSE Certification

GOST-R Certification

GOST-R Certification



Heat Recovery Unit

Heat Recovery Unit With Plug Fan

Heat Pump Heat Recovery Unit

Energy Recovery Unit

Duct Type Electrical Heater

Duct Type Electrical Heater

Kitchen Hood

Duct Type Silencer

Ventilation Ducts