

INSTALLATION – OPERATION & MAINTENANCE INSTRUCTION

HEAT RECOVERY UNITS VHR MODELS



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1. INTRODUCTION

Installation, Operation and Maintenance Instruction concerns heat recovery units manufactured by VENCO. It consists of basic information and recommendation concerning the design, technical specifications, installation, operation and maintenance of the heat recovery unit which shall be obeyed to ensure proper fail-safe operation of the unit. The key to proper and safe operating of the unit, read thoroughly this instruction, use the unit according to guidelines given in it and follow all safety requirements. The instruction should always be in proximity of the unit and within easy reach of the service technician.



READ THE INSTRUCTION BEFORE START-UP THE UNIT and KEEP IT IN PROXIMITY OF THE UNIT and WITHIN EASY REACH OF SERVICE TECHNICIAN.



THE APPLIER WILL BE RESPONSIBLE FOR DEFECTS OCCURED DUE TO OPERATING THE UNIT BY NOT AUTHORIZED PERSONEL or USING THE SPARE PARTS WHICH ARE NOT ORIGINAL.



THE UNIT MUST BE OPERATED APPROPRIATE APPLICATIONS FOR PURPOSES DESIGN and TECHNICAL SPECIFICATIONS



THE UNIT MUST NOT USED IN THE ENVIROMENTS WHERE CORROSION and EXPLOSIVE GASSES EXIST

2. HEAT RECOVERY UNITS and VHR MODELS

VENCO Heat Recovery Units are classified 9 different models; VHR 04 – 07 – 09 – 11 – 16 – 20 – 23 – 29 – 36 – 51 (Figure 2.1). In all models, the housing is made from galvanized sheet metal and the cabinet is fully insulated for sound and heat isolation. The surface of the unit is lacquered with the electrostatic RAL colors. All models contain two access doors for the service to fresh and exhaust air filters.



Figure 2.1. VENCO Heat Recovery Units

Heat Recovery units as standard consist of five different parts as described; Exhaust Fan, Supply Fan, Fresh Air Filter, Exhaust Air Filter, Plate Type Heat Recovery Exchanger.

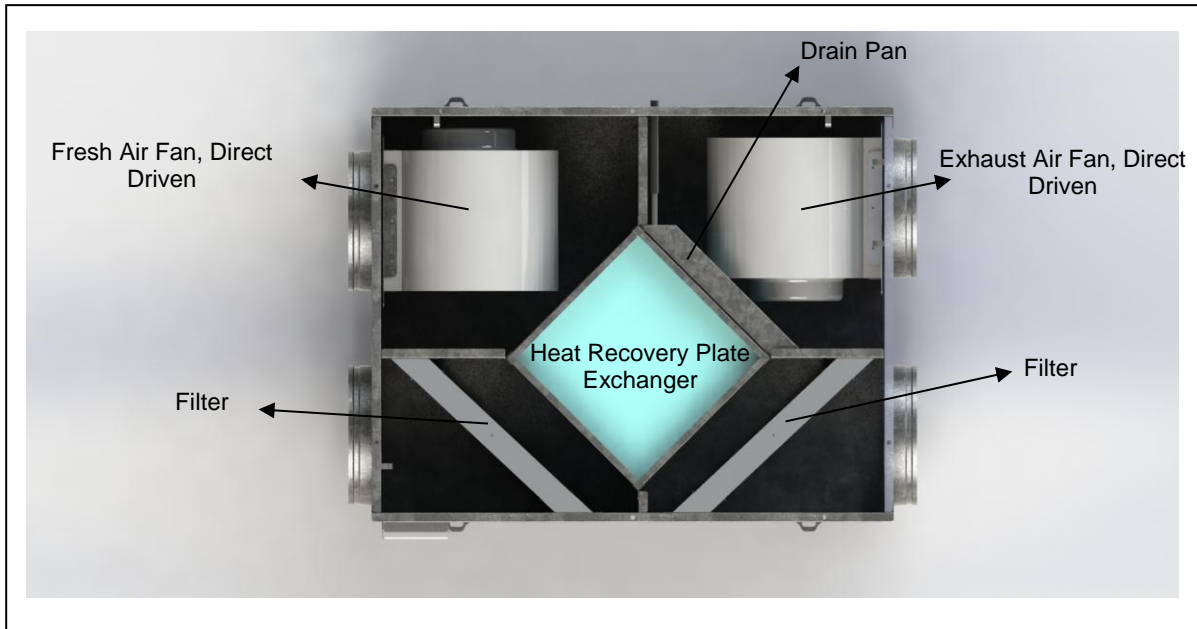


Figure 2.2. Heat Recovery Unit Schema

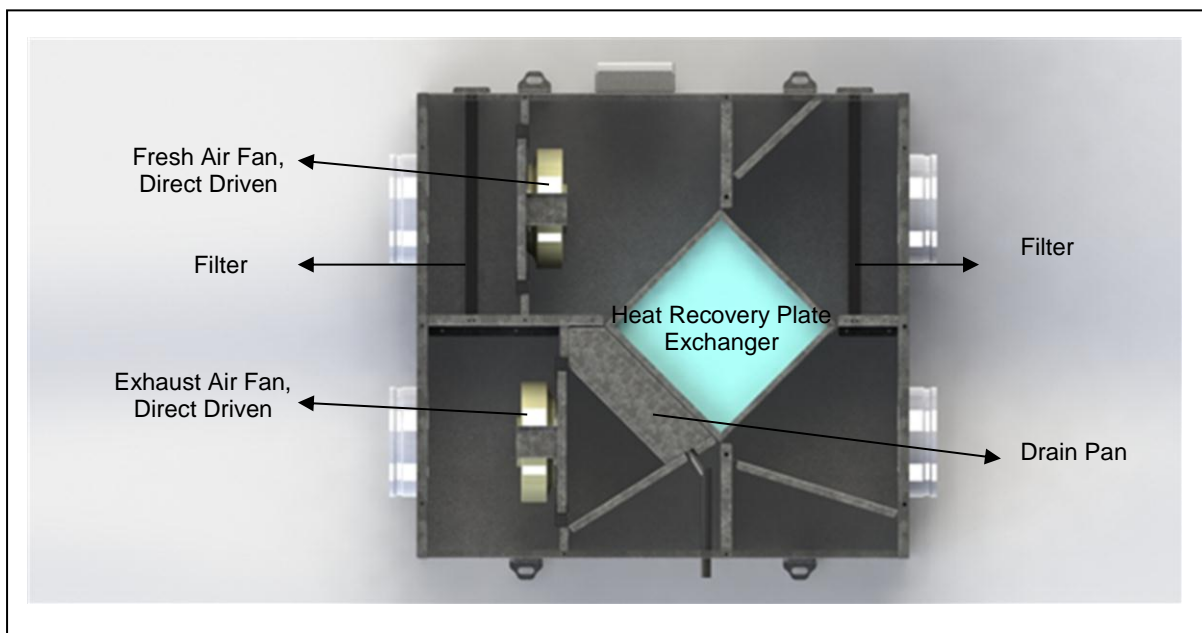


Figure 2.3. Heat Recovery Unit Schema (Plug)

3. TECHNICAL SPECIFICATION for HEAT RECOVERY UNITS

Technical specifications, which are valid for the heat recovery units as standard manufactured by VENCO, are given in the table below.

Table 3.1. Technical Specifications for VHR Models

MODEL		VHR 04	VHR 07	VHR 09	VHR 11	VHR 16	VHR 20	VHR 23	VHR 29	VHR 36	VHR 51	
Air Flow	0 Pa* m³/h	493	770	925	1238	1620	2025	2310	2852	3678	4857	
Air Flow	150 Pa* m³/h	299	595	790	1045	1320	1790	2045	2370	3137	3750	
Efficiency	%	Efficiency up to 70%, depending on working conditions										
ELECTRICAL	Voltage	230Volt / 50Hz										
	Motor Power	Watt	96	180	260	270	450	1000	1000	1.100	1.100	1.472
	SFP**		1,15	1,09	1,18	1,27	1,23	2,00	1,76	1,67	1,26	1,41
Air Filter		Synthetic Filter – For Exhaust and Fresh Air										
OPTIONAL	Electrical Heater	kW	1	2	3	3	4	5	6	7	10	12
			230 V 1~	230 V 1~	230 V 1~	230 V 1~	400V 3~	400 V 3~	400 V 3~	400 V 3~	400 V 3~	400 V 3~
*External static pressure												
**According to EN 13779												

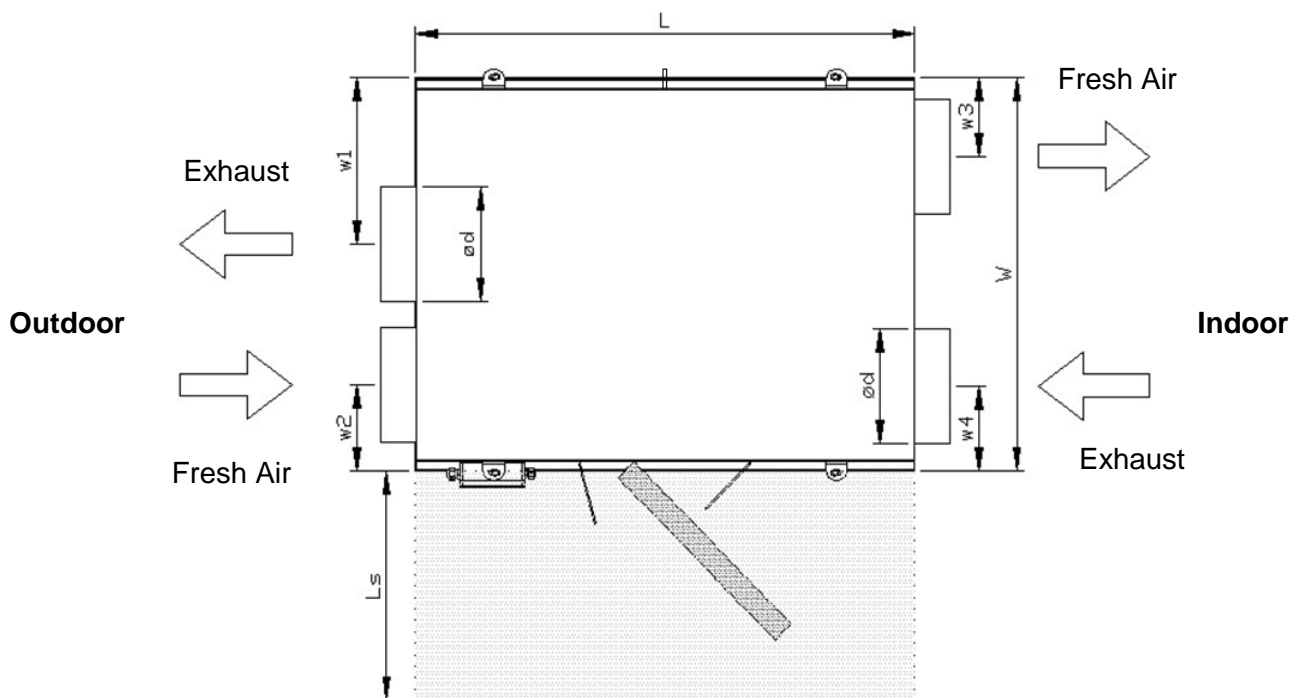
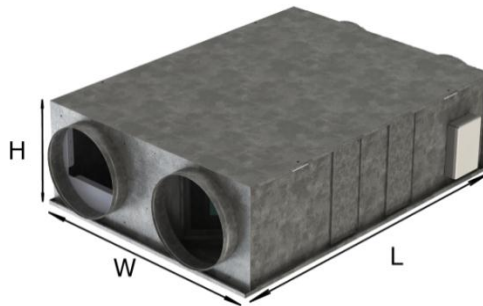
VHR Heat Recovery Units are controlled with Standard Electronic Controller (SEC), supplied as standard with the unit. The supply air fan and return air fan are driven as 5 speeds with SEC. Also the electrical heater (optional) can be controlled by SEC manually or automatically depending on the room set temperature, has a protection system (optional) against the frost formation at the temperatures below -5°C, and Pressure Sensor (optional) for clogged filter.

Functional Electronic Controller (FEC) could be supplied optionally. Moreover to SEC, CO₂ sensor or air quality sensor could be optionally connected. The fan speed automatically changes by regarding to the sensor value.

All controllers have a digital input for Building Management System or VRF (VRV) System and also have a digital output for the unit status information.

Table 3.2. Dimensions for VHR Models

MODEL		VHR 04	VHR 07	VHR 09	VHR 11	VHR 16	VHR 20	VHR 23	VHR 29	VHR 36	VHR 51
Length [mm]	L	800	900	900	940	1115	1125	1125	1.400	1.450	1.650
Width [mm]	W	740	860	860	1020	1030	900	900	980	1.100	1160
Height [mm]	H	295	335	335	450	430	425	425	420	595	690
Duct Connection [mm]	Ød	Ø160	Ø200	Ø200	Ø200	Ø300	Ø300	Ø300	Ø 355	Ø 400	Ø 450
Weight [kg]		28	40	40	63	65	76	76	104	145	160
Dimensions [mm]	W1	180	215	215	250	255	255	255	235	260	285
	W2	195	225	225	270	265	265	265	240	245	270
	W3	180	215	215	250	255	255	255	265	305	345
	W4	195	225	225	270	265	265	265	240	245	270
Service Clearance [mm]	Ls	400	450	450	500	550	550	550	450	450	500



4. WORKING CONDITIONS

The heat recovery units effectively work at the temperatures between -5°C and $+40^{\circ}\text{C}$ at the relative humidity 80%. The unit is not applicable for the corrosive conditions. For different working conditions, please contact with VENCO.

If there is no frost protection on the unit and the outside temperature is less than -5°C , the unit must be stopped and you should contact with VENCO. The condense water can be frozen at the temperature less than -5°C and it can damage the exchanger.

With frost protection system, units can work at the temperature between -30°C and $+40^{\circ}\text{C}$ at the relative humidity 80%. With the frost protection case; if the exchanger thermostat senses below -5°C , fresh air fan jumps to highest speed, and exhaust fan drops to lowest speed. And there is a warning message “Frost Protection” pops up on the controller screen. The unit functions and the controller screen rolls back to normal situation, when the exchanger thermostat senses above -5°C .

5. TRANSPORTATION – STORAGE – INSTALLATION

All heat recovery units by manufactured VENCO are controlled and tested according to the standards before the transportation.

During transportation, lifting and landing, heat recovery units are damaged especially due to wrong methods usage. Appropriate lifting methods should be used in order to minimize any possible damage. Transpallet or forklift can be used for lifting or transporting small units. Lifting and transportation should be done with trained and experienced personnel and security precautions should be taken to prevent the unit to fall over or slide. During lifting and transportation of the unit, nobody should stay under the unit or in the front of the unit (Figure 5.1.).

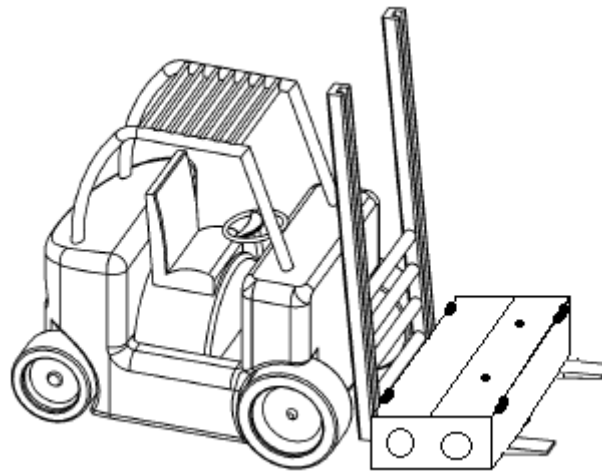


Figure 5.1. Lifting Schema

During Storage: heat recovery units have to be kept in a closed area where the heat should be between -20°C and $+40^{\circ}\text{C}$ and relative humidity should not exceed 80%. Also the unit should be kept away from dust, gas, corrosive streams and effects causing corrosion.

During Installation: EN 60204-1 rules should be implemented during the final assembly. Before the installing of heat recovery units, customers should control whether weight and dimensions of the stations are suitable for the places from where stations will pass through and assembly will be carried out. There should be sufficient amount of place around the unit to be able to give service and for piping connections. Heat recovery units should be assembled onto a hard and flat base.

Damages due to wrong transportation-storage-installation are not covered under warranty.

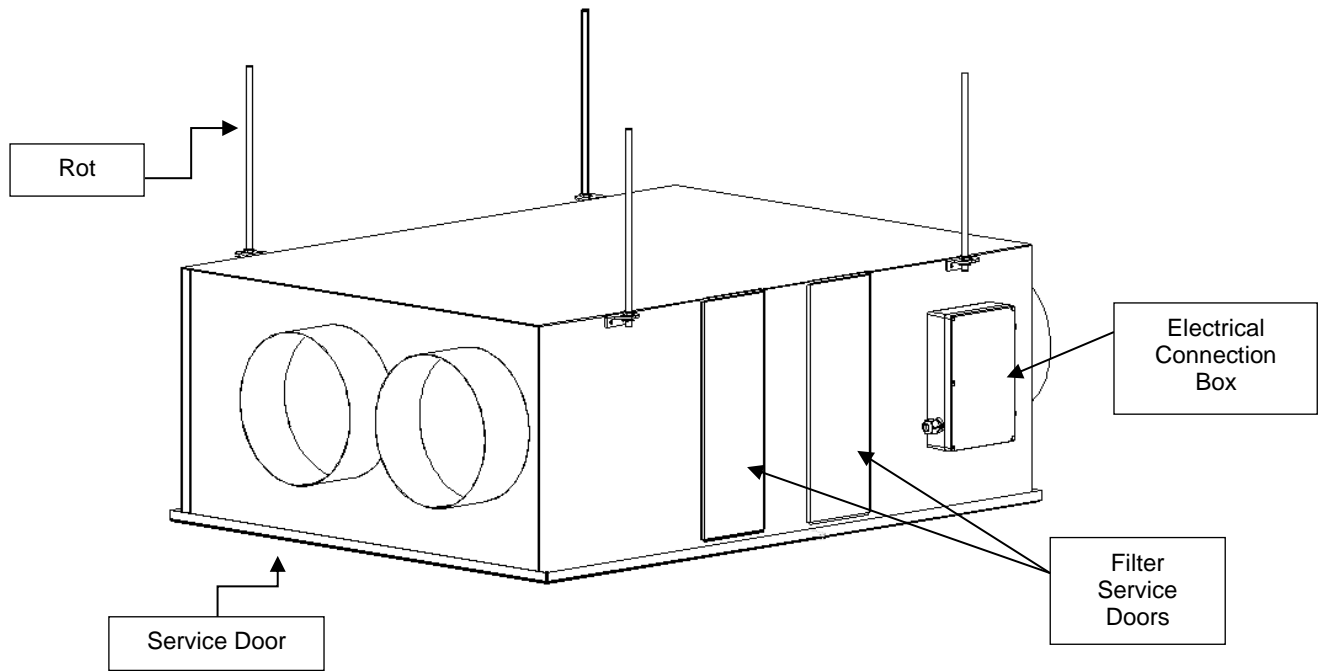


Figure 5.2. Installation Schema

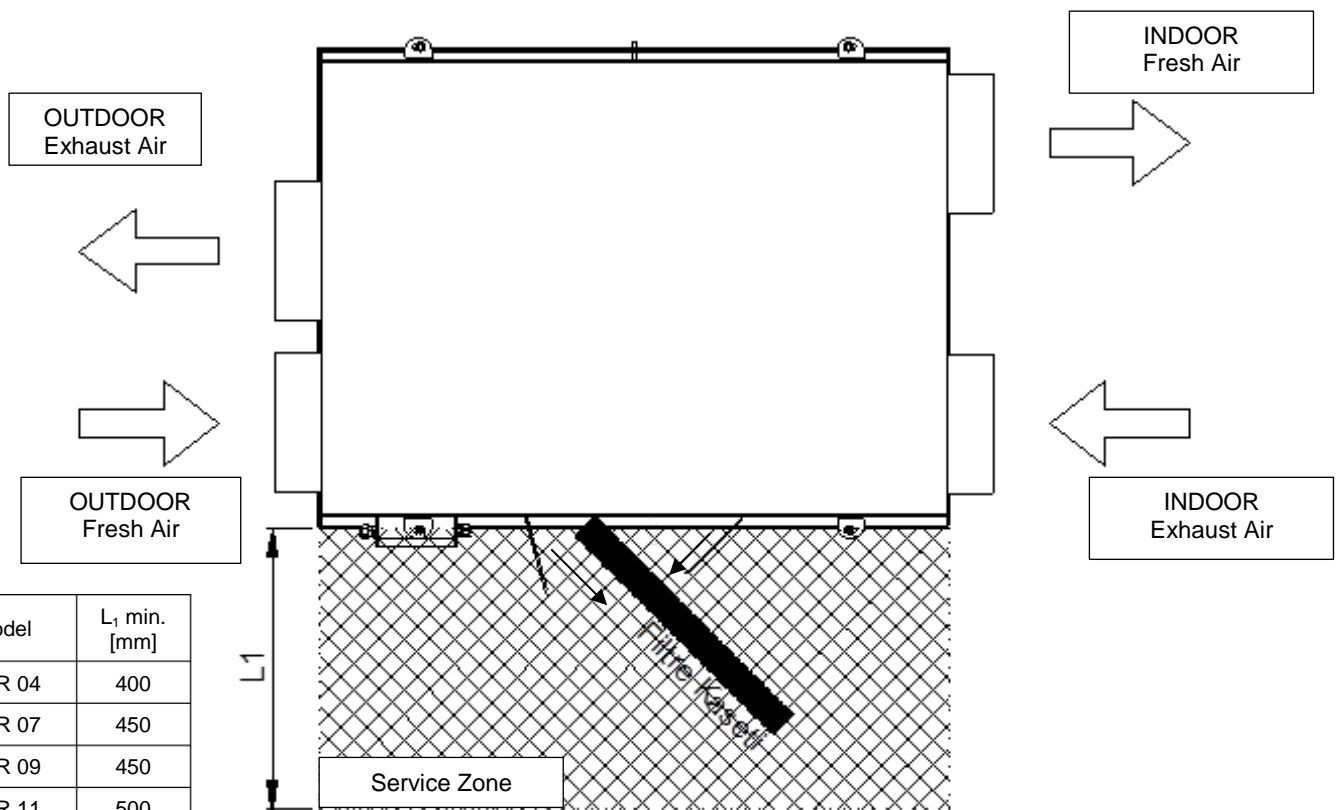


Figure 5.3. Connection Schema (Top View)

Model	L ₁ min. [mm]
VHR 04	400
VHR 07	450
VHR 09	450
VHR 11	500
VHR 16	550
VHR 20	550
VHR 23	550
VHR 29	450
VHR 36	450
VHR 51	500

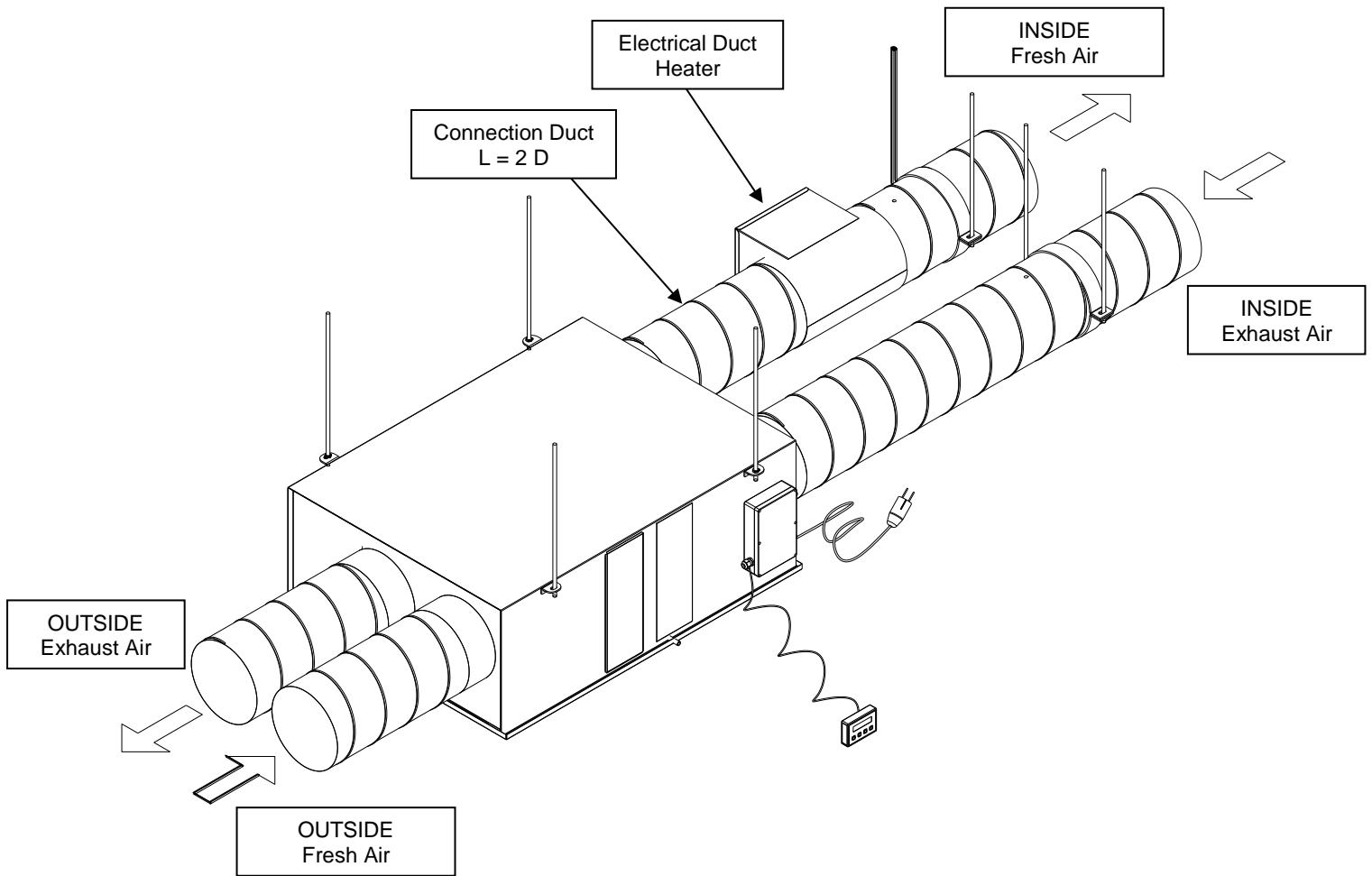


Figure 5.4 Connection Schema

6. CONNECTIONS

6.1. DUCT CONNECTIONS

Return air, fresh air, exhaust air and supply air ducts should be fixed (connected) to the unit with flexible connection. Required leak-proofing should be obtained in order to ensure desirable air flow. Having improper (bad) unit – duct connections and wrong dimension, shape and duct fragments inside of the connection may cause a turbinated air flow.

When air flow direction is changed at fan blowing outlet, excessive losses may occur. If this is compulsory, connections should be done as Figure 6.1.1. The length of duct, before the elbow or electrical heater, should be double of the outlet-diameter.

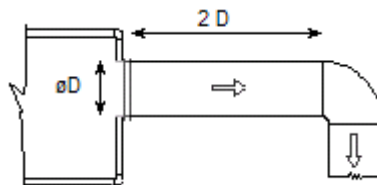


Figure 6.1.1. Duct Connections Schema (Changing the direction of air flow)

6.2. DRAIN CONNECTIONS

The diameter of drain pipe should be equal the diameter of drain pipe on the unit. Drainage pipe and drain pan connections should be made by ripple and flange to be able to dismantle pipe connections easily in order to clean up the residue occurred on drain pan and pipes.

The pipe coming out of the drain pan should be connected to a U or P shaped flusher pipe and should be filled with water in order to not to cause air suction as described below.(Figure 6.2.2.)



Figure 6.2.2. P-Shaped Flusher Application

6.3. ELECTRICAL CONNECTIONS



ALL ELECTRICAL CONNECTIONS SHALL BE DONE ACCORDING TO EN 60204-1 BY TRAINED AND AUTHORIZED PERSONEL



ELECTRICAL CONNECTIONS ARE READY FOR PLUG-IN CONNECTION. DO NOT CUT CABLE AND PREPARE PROPER EQUIPMENT TO CONNECT.

All electricity connections should be designed and prepared according to EN 60204 – 1 Standards. The electrical materials, cables and all relevant control and remote control equipment should be chosen and designed suitable to unit peculiarities and requirements. Electrical wiring diagram is given in Figure 19.1 – Appendix 1.

7. SAFETY REQUIREMENTS

VENCO heat recovery units are produced according to EN 60204-1 Standards and MD 98/37 EC numbered European Union Directives and carry the CE signs on themselves. However, the unit can be dangerous if the unit is not used or the service is given by trained and experienced technicians, and indicated security

precautions are not followed. For this reason the necessity was felt to explain security rules of heat recovery units and explain possible dangers and precautions.

Possible dangers related to heat recovery units are as follow;

- Dangers directed to operator security
- Dangers directed to unit damage
- Dangers directed to unit operation productivity.
- Never expose the unit to moisture, strokes and external effects.
- The unit should not be used in the environment where corrosion and explosive gasses exist.
- The unit should be maintained by trained technicians.
- Do not repair or adjust, when the unit is running.
- Turn the electrical switch off and wait for the motor blades stop, before open the unit.
- Never expose fans, cables and connections to the water.
- If the outside temperature is less than -5°C , the unit must be stopped and you should contact with VENCO. The condense water can be frozen at the temperature less than -5°C , it can be damaged to the exchanger.
- Do not operate the unit, when the access doors open and the duct connections are not completed.

8. SAFETY LABELS

Necessary warning labels are placed onto unit for the users or service personnel. When the unit is put into the operation, following stickers have to be controlled whether they are existing or not.



Figure 8.1. Manuel label



Figure 8.2. Electrical warning label



Figure 8.3. Temperature warning label

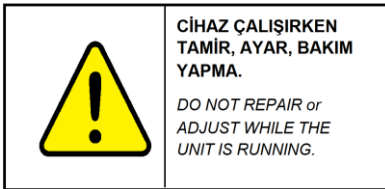


Figure 8.4. Repair warning label



Figure 8.5. Wiring diagram label



Figure 8.6. Ground label



Figure 8.7. Fan label



Figure 8.8. Electrical warning label

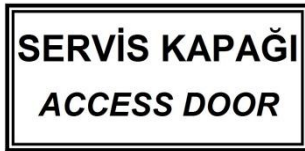


Figure 8.9. Access door label



Figure 8.10. Filter access door label



Figure 8.11. Drain label



Figure 8.12. Fresh air label



Figure 8.13. Exhaust air label



Figure 8.14. Air flow direction label

9. CONTROLS BEFORE START-UP

- Please make sure that all electricity cables are made according to (EN 60204 -1) standards and security and protection units belong to all elements.
- Please make sure that all parts of the unit are clean. There can be duct insulation residuals, bands etc.
- If the outside temperature is less than -5°C , the unit must be stopped and you should contact with VENCO. The condense water can be frozen at the temperature less than -5°C , it can be damaged to the exchanger.

Following points have to be controlled periodically.

- Isolation materials used for heat and sound isolations
- Cable isolation
- Control panel
- Electrical cables and other electromechanical parts
- Metal and painted surfaces
- Connection elements such as screw, turn screw and joint washer

FILTERS; Maintenance of the filters should be done regularly. Dirty filters can decrease air flow and consequently the capacity. Synthetic or metal filters can be cleaned or washed. However it is advised to change synthetic filters every two years. While changing other type filters; bag, hepa filters with the new ones, new ones should have same dimension, type and features.

HEAT RECOVERY EXCHANGER; is controlled before transportation. The plates of heat recovery exchanger should be checked, after transportation.

FANS and MOTORS; Wiring shall be done, according to international standards. The turning way of fan-blades should be checked, according to the air-flow direction label on the fan.

10. TRAINING of TECHNICIANS

Assembly, putting into operation and maintenance works can only be done by authorized and trained technicians. The technician has to be informed by the owner of the unit or it's user about possible dangers he/she may face during following phases:

- Electrical Connections
- Duct Connections
- Putting Into Operation
- Maintenance

For the continuity of the warranty, control and maintenance responsibilities have to be accepted and followed strictly. You can apply to VENCO A.S. to train your authorized technicians.

11. RECOMMENDATIONS FOR SAFETY

This user manual is prepared to provide correct usage and assembling of the heat recovery unit and warn the maintenance personnel for the possible dangers they may face. Apart from instructions and warnings of the producers, legal rules and standards have to be taken into consideration as well.

12. START-UP

Instructions have to be followed before operating the unit first time (or after yearly maintenance). Additionally following controls have to be followed.

- Please make sure that all parts of the unit are clean. There can be duct insulation residuals, bands etc.
- Please make sure that all electrical cables are made according to (EN 60204-1) standards and security and protection units belong to all elements.
- Please take out filters after the first operation and clean them properly. Then insert the filters in it.
- If all access doors are taken out during the assembly, please make sure that service doors are closed.

Control the adjustment of thermal over load relay. Give electricity and provide the fan to operate in the highest speed. Control the following points carefully:

- Unexpected noise
- Motor current and voltage values

13. MAINTENANCE

Protection maintenance program is an important part of an effective security program. Maintenance works have to be carried out by experienced and trained personnel with wearing protection clothing. Please do not try doing any maintenance before switching off the electricity and having fan security. Generally heat

recovery units do not require special maintenance apart from its routine cleaning and maintenance. Maintenance period changes according to work conditions. Advised maintenance program is given below:

Drain Outlet: once in 3 months, please check water flow from drain pipe.

Air Filters: once in 3 months, please check the filters. Please wash it or change it when necessary.

Fans and Motors: Once every-season, please check them by opening access door.

Wiring and Electrical Connections: Once a year, please check the ampere, the voltage.

Construction and Housing: Once a year, please check it for resistance to corrosion.

Heat Recovery Exchanger: Once in two years, check it by taking it out for preventing creation of high pressure. Exchanger can be cleaned by using the warm water & light detergent. After cleaning, all plates surface of exchanger should be dried.

14. CONTROL FUNCTIONS




14.1. Standard Electronic Controller (SEC)



Figure 14.1.1. Standard Electronic Controller (SEC)

VENCO VHR type heat recovery unit control functions are;

- Unit On / Off
- FAN 1 (Supply fan) Speed control as 5 steps
- FAN 2 (Exhaust fan) Speed control as 5 steps
- Duct type electrical heater control – On / Off / Auto

When it is pressed to MODE  button, it flushes over the FAN 1, FAN 2 and Heater. Requested operating value is selected by pressing  or  buttons. Supply and exhaust fan speeds could be adjusted separately.

Duct Type Electrical Heater controlled manually (ON or OFF) or automatically. When AUTO function is selected, the requested room temperature must be set. The heater will operate by regarding to this set temperature.

If there is no electrical heater, nothing appears on the electrical heater part of the screen.

Table 14.1.1. Electronic Controller Buttons

Buttons	Name	Description
	ON / OFF	Unit will be ON or OFF.
	MODE	The change requested area must be selected. FAN1: Supply fan FAN2: Exhaust fan ⏏ : Duct Type Electrical Heater (optional)
	Value Increase	Increases the value of selected area
	Value Decrease	Decreases the value of selected area


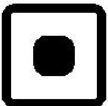


If required optional electric duct heater, it is interlocked against the airflow that passes the heater. That's why; FAN 1 is automatically operated, before starting up of the heater. Wiring diagram for optional electric duct heater is given in Section 17. Appendix.

14.2. Functional Electronic Controller (FEC)



Image 14.2.1. Functional Electronic Controller

Table 14.2.2. Keypad

Button	Tag Name	General Description
	ON / OFF	Unit will be ON or OFF.
	MODE	Selects the feature to be adjusted FAN1: Fresh Air Fan FAN2: Exhaust Fan ☀ ☁ Season ≡ : Duct Type Electrical Heater (optional) ◆ : By-pass (optional)
	Stage Up	- Increases the value of the selected feature. -Shows sensor temperature and set temperature. -Switches to timer setup page (Press 2 times)
	Stage Down	Decrease the value of the selected feature.

When the MODE button is pressed, the cursor starts to blink for adjusting the feature. Repeat pressing MODE button for moving the cursor. (FAN1 / FAN2 / ≡ HEATER / ◆ BY-PASS / SEASON). After adjusting wait for 5 seconds without pressing any button to active the adjustments. The controller starts with the last adjustments.

Function of FEC

- On / Off
- FAN1 (fresh air fan) speed control (OFF / 1 / 2 / 3 / 4 / 5)
- FAN2 (exhaust fan) speed control (OFF / 1 / 2 / 3 / 4 / 5)
- Control of electrical heater- Optional (OFF / ON / AUTO)
- Control of By-Pass Kit - Optional (OFF / ON / AUTO)
- Timer Function

Note: If the unit or the fresh air fan shut down while the electrical heater is working (ON or AUTO), FAN1 keeps working for 30 seconds in full speed to cool the electrical heater.

The electrical heater has the status of OFF / ON / AUTO when the status is “ON” the heater works with both stages, when it is AUTO stage adjustment of the heater is made automatically depending on the set temperature and the sensor temperature.

By-Pass Feature has the status of OFF / ON / AUTO. When the status is ON the By-Pass kit is active, when it is AUTO By-Pass kit is activated or deactivated automatically depending on the selected season mode and the temperatures measured from the sensors.

Push “Stage up” button two times to switch to timer setup page.

FEC can make heat recovery unit on or off depending on the signal from BMS, VRV/VRF System or similar automation systems. And it can send status signal of being On or Off to these applications.

FEC can communicate with a BMS through Modbus Network (RS 485). This allows the BMS to monitor the heat recovery unit and control all parameters of the unit.

To activate the timer function; it is necessary to come to the “Timer” menu first. When the controller is at “Main” menu, it is necessary to press the button. When you press once, you will have “Sensors” menu as it is at the following picture.



Image 14.2.3. Sensors Menu

It is seen the sensor temperatures and the set temperatures those are connected to the unit. When you press second time, you will see “Timer” screen.




Image 14.2.4. Timer Menu

You can move the cursor by pressing to the button, you can select the timer mode as

- 5 + 0 ; to adjust for working days
- 5 + 1 + 1; to adjust for the all week days
- Off ; to adjust the timer is Off.

And also you can set starting and stopping hours for the unit.

At the “Timer” screen press  button for a while to adjust the current date and time.

15. TROUBLESHOOTING

Table15.1. Troubleshooting Table

PROBLEM	INDICATIONS	POSSIBLE REASON	OTHER REASONS and REMEDIES
NO AIR FLOW Motor is not working	No current	No power	Check the power supply
		Thermal protection is open	Fan motor cables at the main controller board are not tight
		Control panel failure	Check the socket behind the the controller
LOW AIR FLOW		Pressure loss in the ducts are higher than calculated	Check the duct design
		Filters clogged or dirty	Clean filter or change it if necessary
	Too much leakage at the pressure side of system	Filter doors are not closed or duct connections are not completed	Check the doors and duct connections.
HIGH AIR FLOW	Too much leakage at the suction side of system	Duct connections are not completed	Check the duct connections
	Overcurrent of fan motors	Supply voltage is low	Engine is over loaded. Measure the current taken by engine.
		Grills are not installed	Install the grills
		Filters are not installed	Put the filters in

16. SPARE PART LIST

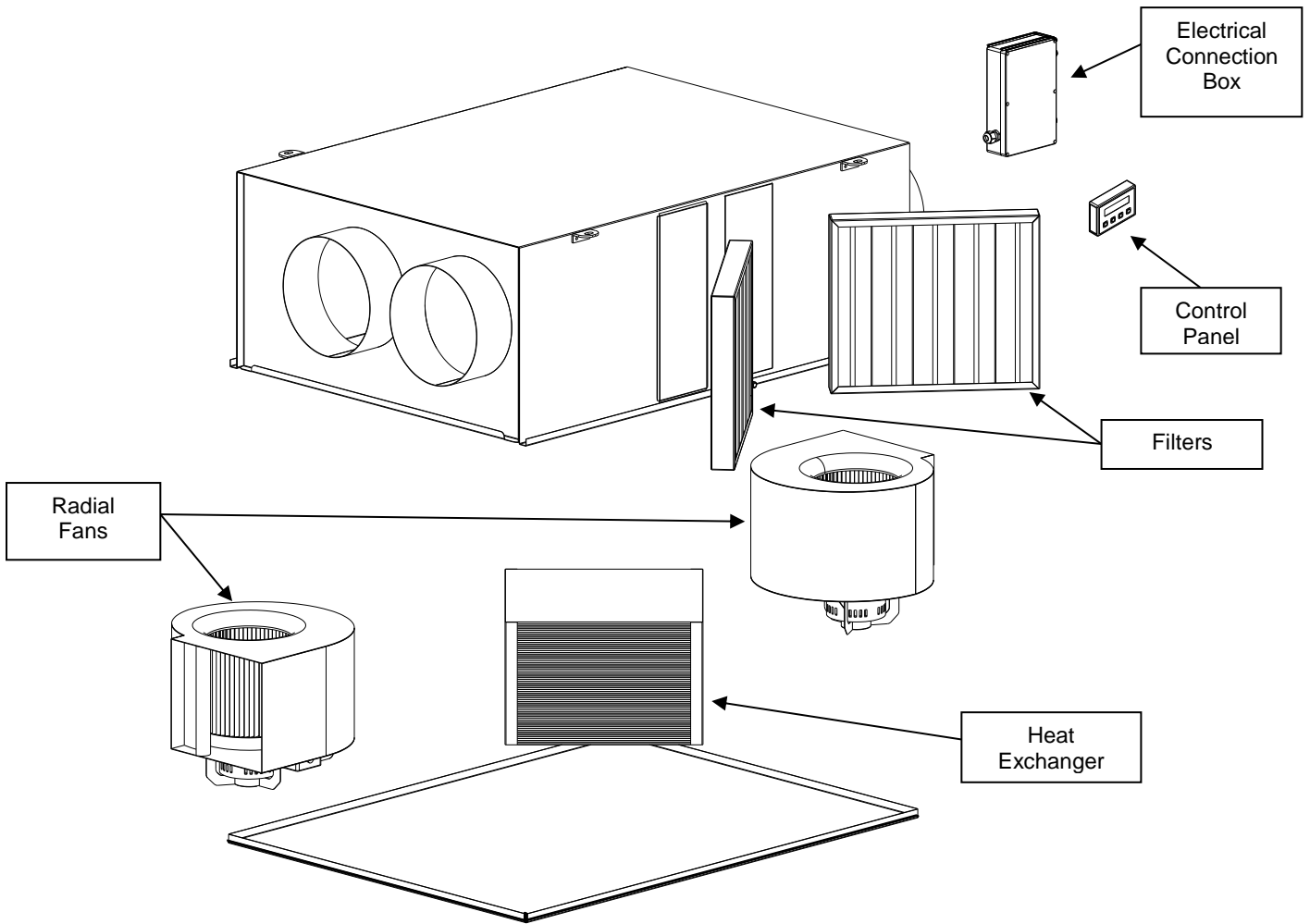
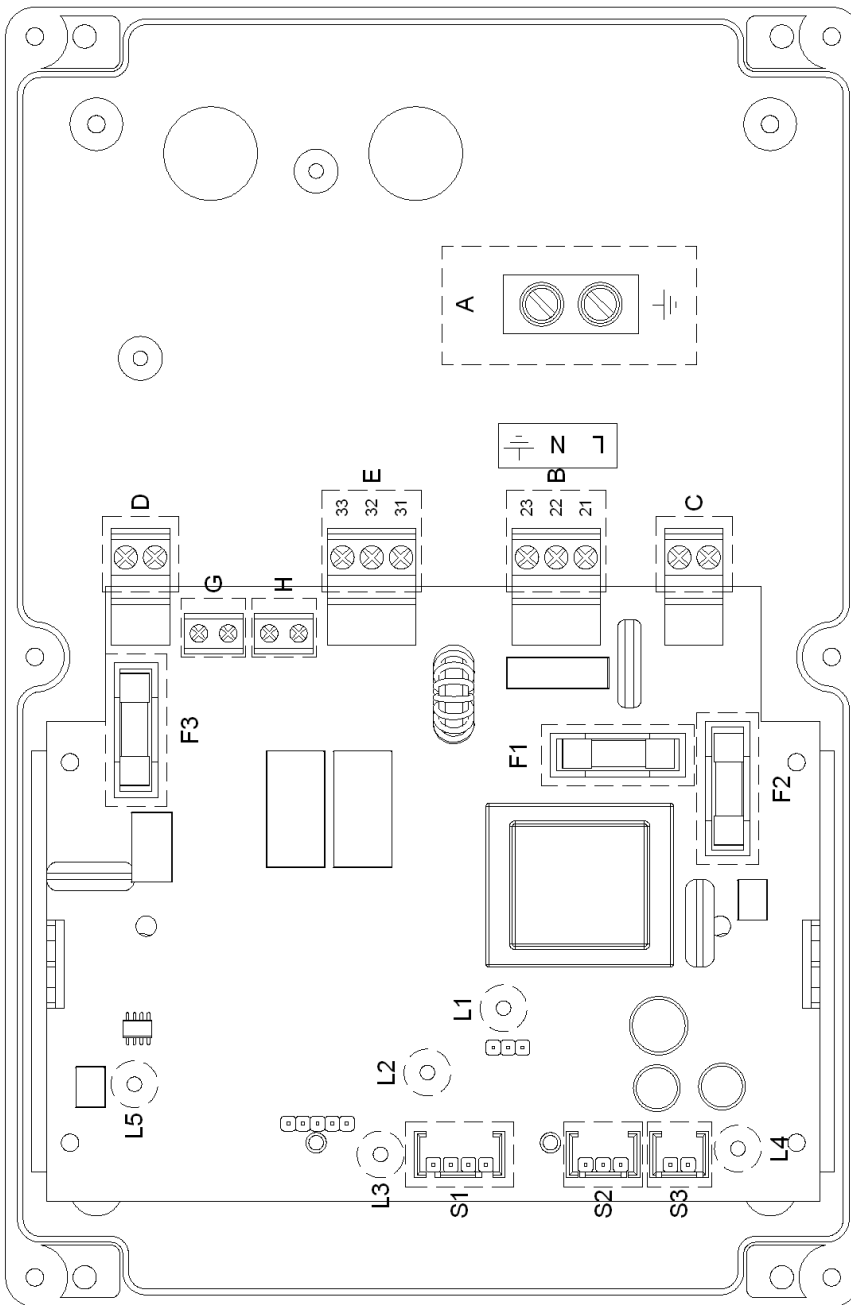
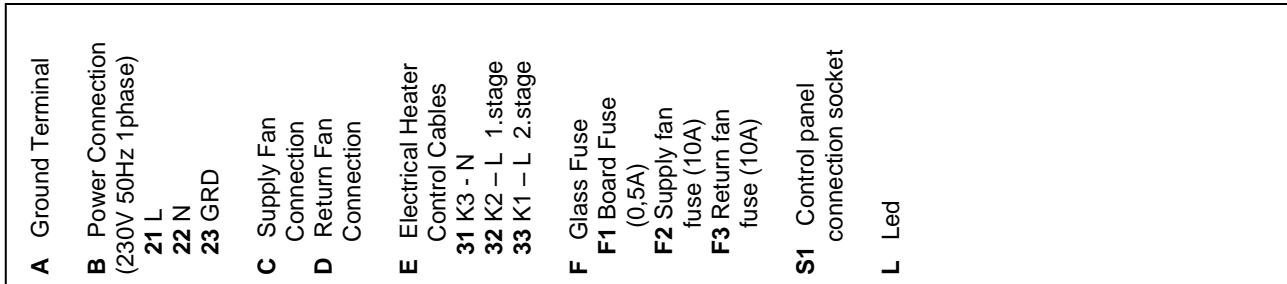


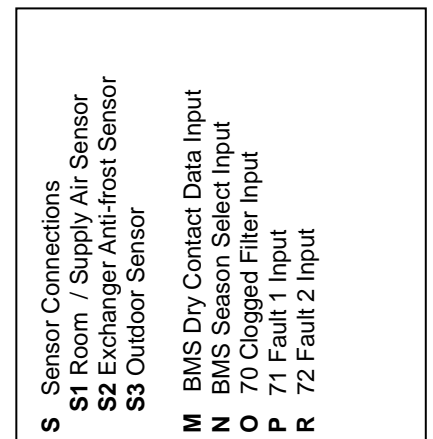
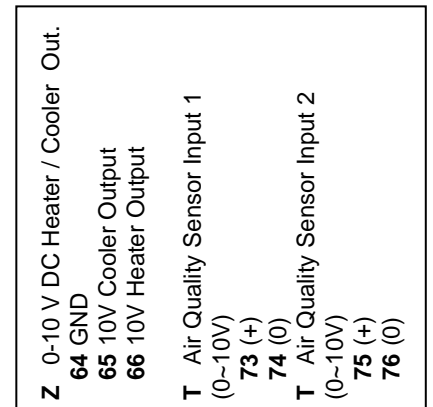
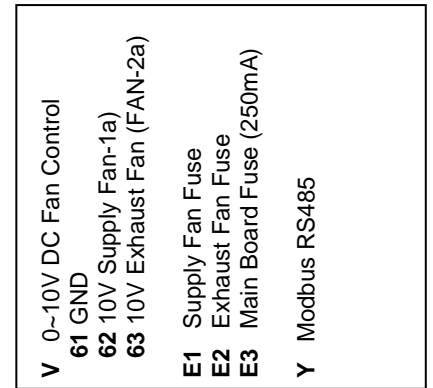
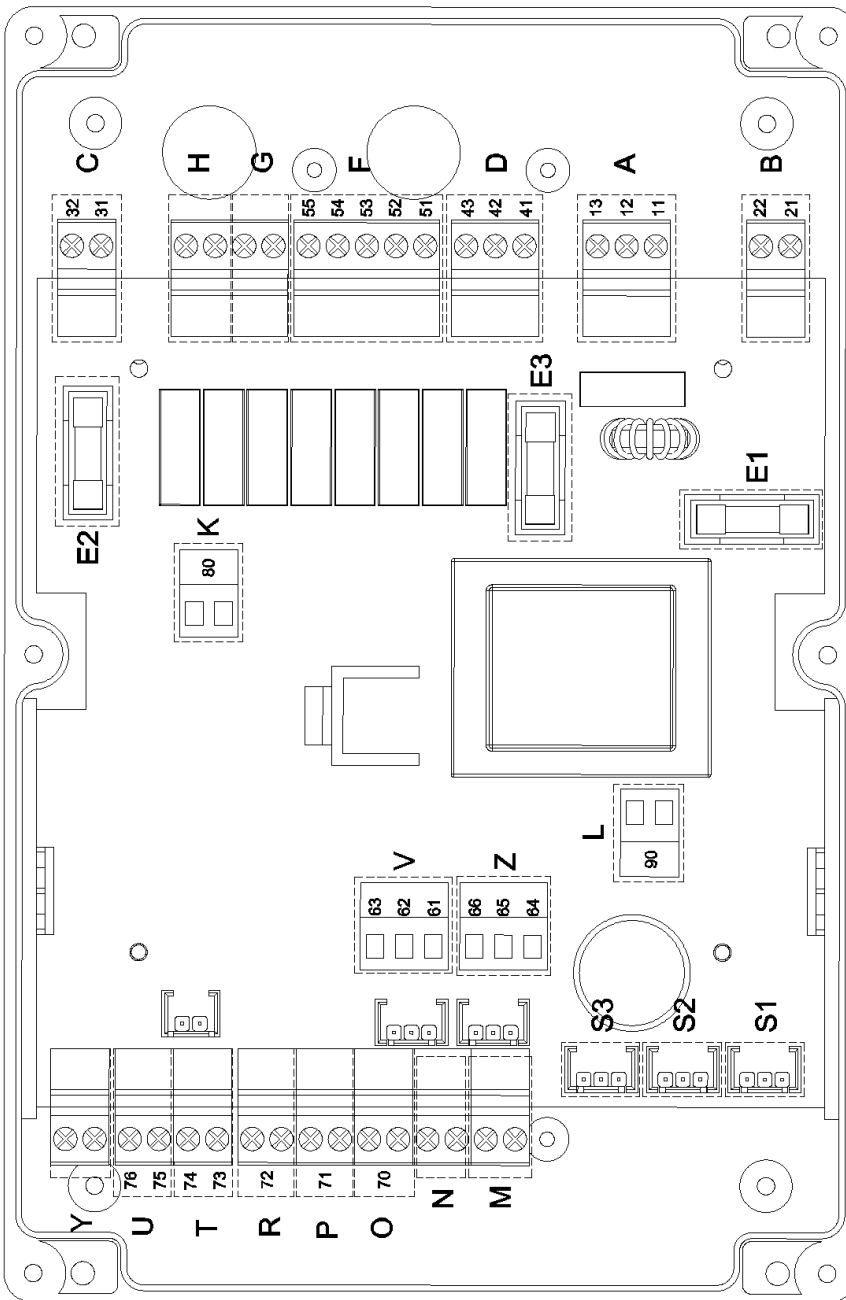
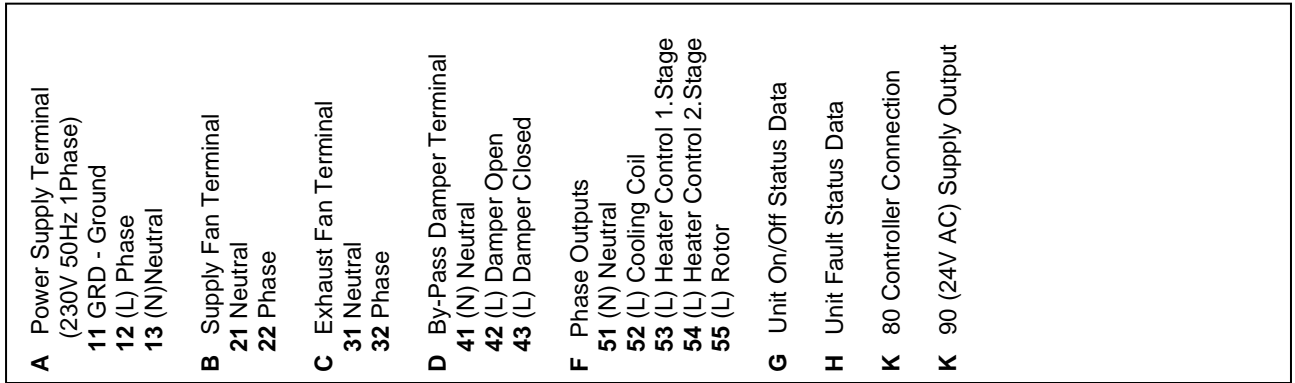
Figure 16.1. Heat Recovery Spare Parts

17. APPENDIX

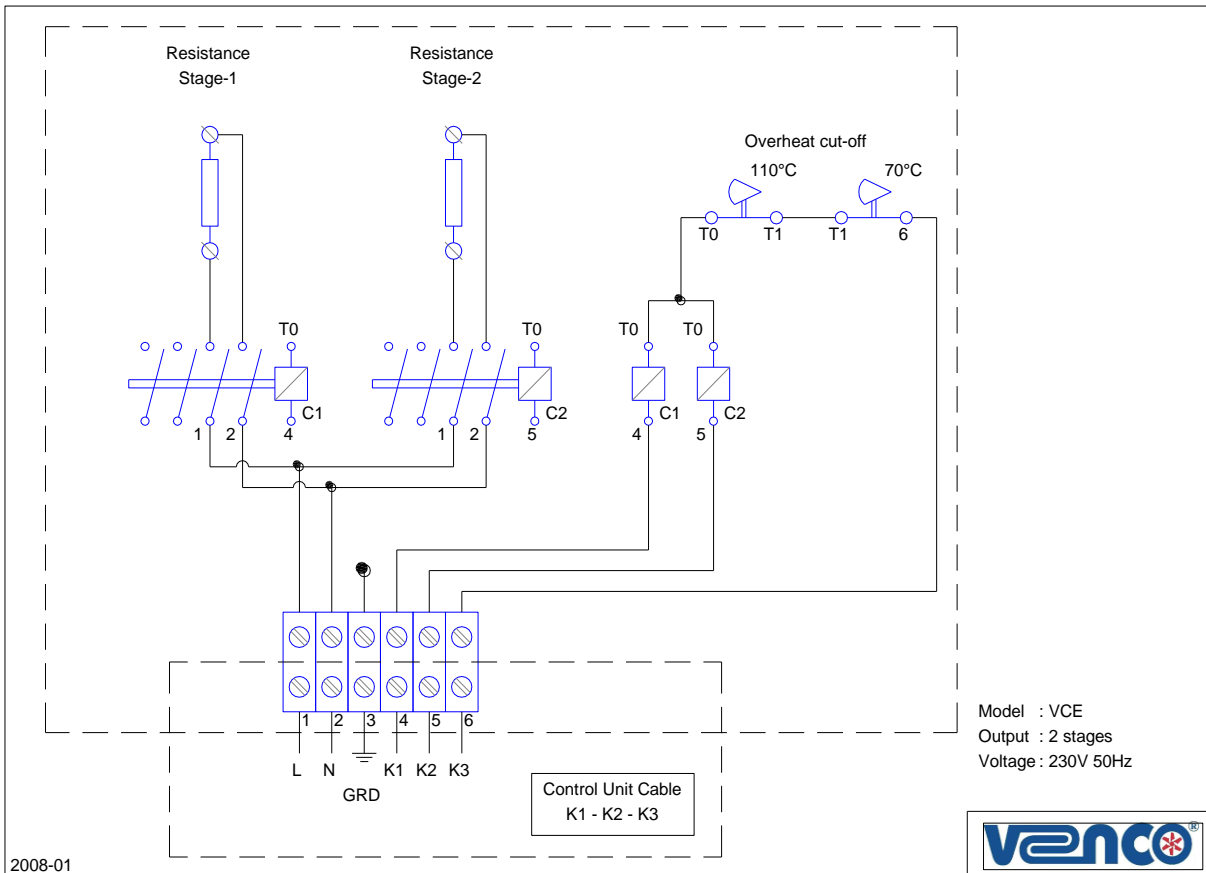
17.1. APPENDIX-1 Standard Controller (SEC) Electrical Wiring Diagram



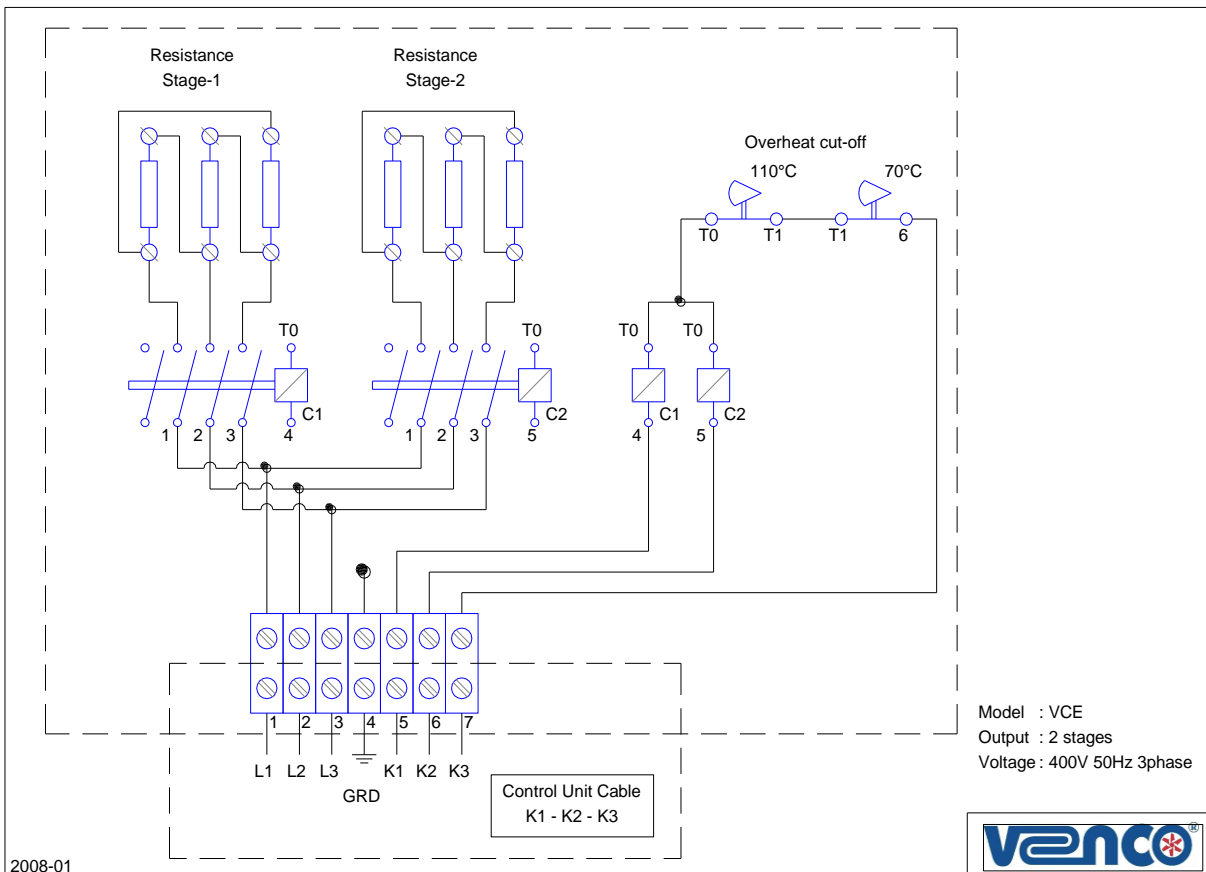
17.2. APPENDIX-2 Functional Controller (FEC) Electrical Wiring Diagram



17.3. APPENDIX-3 230V / 50Hz / 1 Phase Electrical Heater Wiring Diagram



17.4. APPENDIX-4 230V / 50Hz / 1 Phase Electrical Heater Wiring Diagram



17.5. APPENDIX-5 Electrical Cable And Fuse Selection Tables

Table 17.5.1. Heat Recovery Unit Electrical Power Supply and Circuit Breaker Selection Table

MODEL	POWER CONSUMPTION	ELECTRICAL CONNECTION	CIRCUIT BREAKER*
VHR 04	120 Watt	230 volt – 50 Hz	2 Ampere
VHR 07	170 Watt	230 volt – 50 Hz	2 Ampere
VHR 09	270 Watt	230 volt – 50 Hz	2 Ampere
VHR 11	310 Watt	230 volt – 50 Hz	3 Ampere
VHR 16	746 Watt	230 volt – 50 Hz	6 Ampere
VHR 20	1000 Watt	230 volt – 50 Hz	10 Ampere
VHR 23	1000 Watt	230 volt – 50 Hz	10 Ampere
VHR 29	1100 Watt	230 volt – 50 Hz	10 Ampere
VHR 36	1100 Watt	230 volt – 50 Hz	10 Ampere
VHR 51	1500 Watt	230 volt – 50 Hz	10 Ampere

*The circuit breaker must cut L/N at the same time.

Table 17.5.2. Heat Recovery Unit Electrical Power Supply Cable Cross Section Table

MODEL	Cross Section [mm ²]					
	1,5	2,5	4	6	10	16
	Cable Length [m]					
VHR 04	195					
VHR 07	138	230				
VHR 09	87	145				
VHR 11	76	126	202			
VHR 16	74	123	197			
VHR 20	32	53	85	127		
VHR 23	32	53	85	127		
VHR 29		36	57	86	142	
VHR 36		36	57	86	142	
VHR 51		26	42	63	104	167

Table 17.5.3. Duct Type Electrical Heater Power Supply and Circuit Breaker Selection Table

MODEL	POWER CONSUMPTION	ELECTRICAL CONNECTION	CIRCUIT BREAKER*
VHR 04	1 kW	230 Volt – 50 Hz – 1Phase	6 Ampere
VHR 07	2 kW	230 Volt – 50 Hz – 1 Phase	16 Ampere
VHR 09	3 kW	230 Volt – 50 Hz – 1 Phase	20 Ampere
VHR 11	3 kW	230 Volt – 50 Hz – 1 Phase	20 Ampere
VHR 16	4 kW	400 Volt – 50 Hz – 3 Phase	3 x 16 Ampere
VHR 20	5 kW	400 Volt – 50 Hz – 3 Phase	3 x 16 Ampere
VHR 23	6 kW	400 Volt – 50 Hz – 3 Phase	3 x 16 Ampere
VHR 29	7 kW	400 Volt – 50 Hz – 3 Phase	3 x 16 Ampere
VHR 36	10 kW	400 Volt – 50 Hz – 3 Phase	3 x 20 Ampere
VHR 51	12 kW	400 Volt – 50 Hz – 3 Phase	3 x 20 Ampere

*The circuit breaker must cut L/N at the same time.

Table 17.5.4. Duct Type Electrical Heater Power Supply Cable Cross Section Table

MODEL	Cross Section [mm ²]					
	1,5	2,5	4	6	10	16
	Cable Length [m] (3 x ...mm² (Phase, Neutral, Ground))					
VHR 04	33	55	88	133		
VHR 07		27	44	66		
VHR 09		18	29	44	74	
VHR 11		18	29	44	74	
	Cable Length [m] (4 x ...mm² (R,S,T,Ground))					
VHR 16	100	168				
VHR 20	80	134				
VHR 23	67	112	179			
VHR 29	57	96	153			
VHR 36		67	107	161		
VHR 51		56	89	134	224	

