Small Duct High Velocity Heating, Cooling and Home Comfort Systems

VESH

Variable Electric Strip Heater

Installation Manual

VESH-400 (5 kW)
VESH-650 (10, 15 kW)
VESH-750 (10, 18 kW)
VESH-1100 (10, 18, 23 kW)
VESH-2500 (10, 15, 20, 25 kW)

Features:

- Add-on to HE-Z/HE-B/LV-Z/LV-B/LV/CU Series
- Suitable for use with Zoning Units
- Easily slides into heating section of BU Series
- Variable/Modulating
- 5 kW to 25 kW
- Warm weather adaptable
- Pre-wired elements electronically controlled
- High-Limit thermal protection
- Approved for zero clearance to combustible materials

Includes:

VESH Cut-Out Template (CU Units)

DS-600 Duct Sensor

Hardware (Neoprene, Screws, 1' length of t-stat wire, plugs)

Fitted Coil Door (HE-Z/HE-Z/Zoning/HE-B & LV Units)

Installation Manual

Variable Electrical Strip Heater (VESH)

The Variable Electrical Strip Heater (VESH) is an Advance Power Savings electric resistance heater which modulates the output based on the selection setting of the supply air duct sensor and the system leaving air temperature.

The VESH slides into the air handler on the leaving air side (supply side) of the blower. This heater can be used for primary heating or supplemental (auxiliary) heating for heat pumps. The VESH has "0" clearance to combustibles, and requires minimum clearances on the access side for maintenance and servicing (see Air Handler clearances below and add 4"). Allow 18" minimum of straight plenum duct from the supply of the air handler before any branch outlets, tees or elbows.

Air Handler Clearances

Air Handler	Inches
50/51/52	18" (457mm)
70/71	22" (559mm)
100/101	29"(737mm)

Add an additional 4" (102mm) for Electric Strip Coils

There is a minimum airflow/outlet requirement for electric strip heaters. Refer to chart:

VESH - Minimum # of Outlets Required (Airflow)

Model	5 kW	10 kW	15 kW	18/20 kW	23/25 kW
CU-31	6 HE 12 2"	N/A	N/A	N/A	N/A
CU-51	N/A	10 HE 20 2"	10 HE 20 2"	N/A	N/A
HE-Z/B 50/51	N/A	6 HE 12 2"	10 HE 20 2"	N/A	N/A
HE-Z/B 70/71	N/A	10 HE 20 2"	10 HE 20 2"	12 HE 24 2"	N/A
HE-Z/B 100/101	N/A	14 HE 28 2"	14 HE 28 2"	16 HE 32 2"	20 HE 40 2"
HE-P 240/241	N/A	28 HE 56 2"	28 HE 56 2"	28 HE 56 2"	28 HE 56 2"

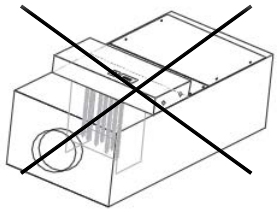
Installation

Remove the shipping covers and inspect the heater carefully. Check the VESH for any shipping damage, check the heating elements for any loose connections and check all porcelain insulators for any breaks. Report any damage to the manufacturer. DO NOT INSTALL DAMAGED HEATER.

The VESH is labeled with a directional airflow sticker; when placing the VESH, the sticker shall be in the direction of the air flow.

Install the VESH in the supply air side of the air handler. Follow directions on the cut-out template pages included with the coil, or install the provided VESH door on air handler for easy slide-in installation of the VESH. ***The heating elements (Fig. 01) must always be installed horizontally.*** Seal the void between the air handler and the VESH with foam tape or a suitable sealant. Mount the VESH onto the air handler cabinet with 4 self tapping screws from inside the VESH wiring access door (holes are not pre-drilled and are made on site). Seal any additional openings with foil tape or a suitable sealing compound.

Fig. VESH-01 - Do not install elements Vertically



Wiring the Electrical Strip Heater

Disconnect all power sources before opening the control box and working within. The air handler and the VESH must have independent power supplies. Wires shall be sized according to local electrical codes and ordinances. All wires must be brought in through knock-outs. See table below for feeder quantity of feeder ampacity.

Table VESH-01

Kw	Volts/ Phase	# of feeders	Circuit Breakers
5	240/1	1 X 20.8	1 X 30A
10	240/1	1 X 41.6	1 X 60A
15	240/1	1 X 20.8, 1 X 41.6	1 X 30A, 1 X 60A
18	240/1	1 X 31.2, 1 X 41.6	1 X 40A, 1 X 60A
20	240/1	2 X 41.6	2 X 60A
23	240/1	2 X 47.0	2 X 60A
25	240/1	2 X 41.6, 1 X 20.8	2 X 60A, 1 X 40A

PLEASE NOTE: THE VESH MUST BE WIRED TO A DEDICATED BREAKER, SEPARATE FROM THE AIR HANDLER.

The VESH elements are rated for 240V 60 Hz. Higher voltages are not recommended. When lower voltages are supplied, de-rate the capacity of the ESH accordingly. 230V = 92%, 220V = 84%, 208V = 75%. Use only wires suitable for 167° F (75°C).

The VESH 5 and 10 kW units have one single 240V breaker; the 15 kW to 23 kW units come complete with two supply circuit breakers. These two circuits can be joined together using a Jumper Bar (Square D® – QOU14100JBAF, not supplied) designed to use one pair of larger gauge wire instead of two smaller gauge wires. Install as per manufacturers guide lines, and according to code. A disconnect switch close to the heater will be required.

Control circuit wiring between the heater terminals #1 and #2 on the VESH - use Class 2 - 18 gauge wire to the zone valve terminals in the fan control box.

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Wiring and Configuration

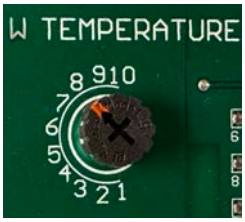
Wire the DS-600 in to the WT terminals of the VESH circuit board.

The VESH is supplied with a duct sensor (DS-600) to be installed in the main supply plenum, preferably 18" away from the air handler, and wired back to the VESH with 2-18 gauge wire.

If the sensor is being installed on a zoned system it should be installed on the largest zone (primary zone). The sensor will read the leaving air temperature of the system regardless of what zone you install the air sensor in, as the dampers practically bleed some air to each zone when operating and will modulate the VESH based on leaving air temperature.

When the VESH is incorporated with a heat pump, the VESH will not operate until the thermostat sends a 2nd stage heat call (or 3rd stage, depending on the system setup). Please note, if heat pump goes into defrost cycle the heat pump may have to provide an output signal to turn on the heater as well – this is normal operation of a heat pump.

On the circuit board of the VESH there is a turn dial, set this dial to the desired air temperature for the system to operate at.



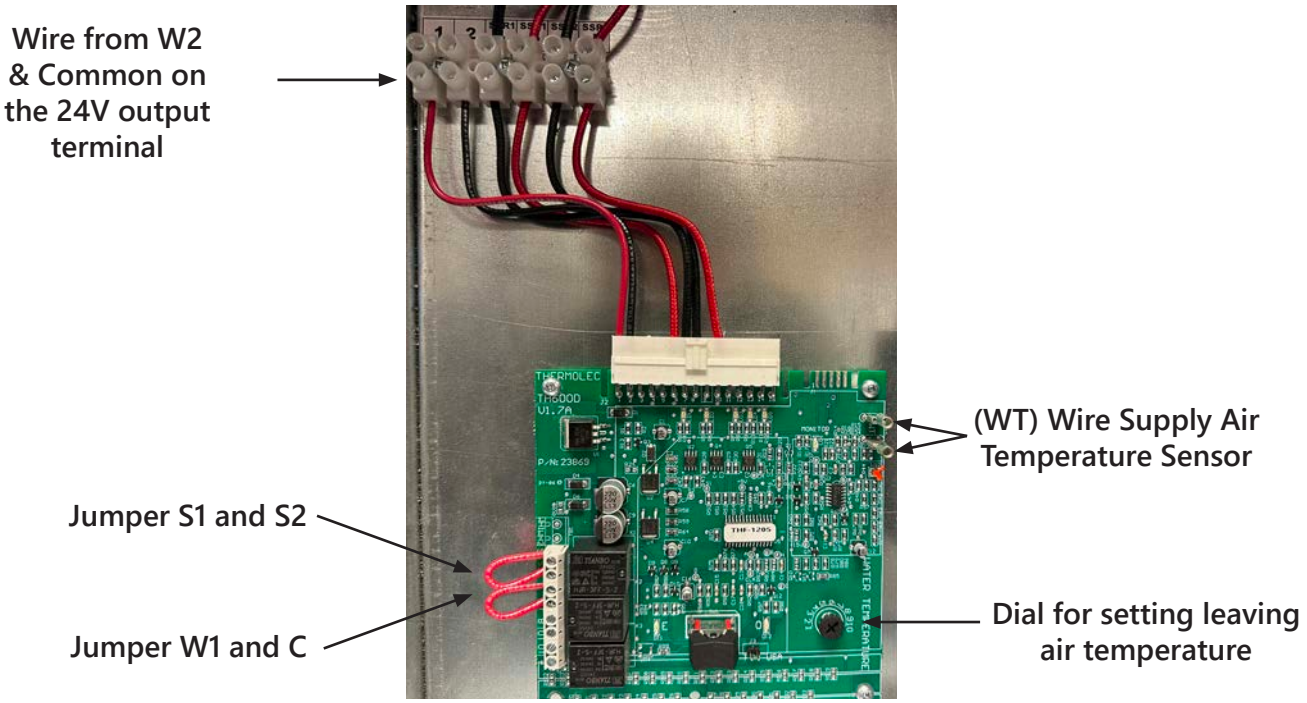
To set the dial, turn the dial to 1, activate a heat call and adjust the TURN dial to the desired leaving air temperature.

Temperature is recommended to be set lower than 140°F.

Maximum Temperature

TH600 TEMPERATURE SET POINTS							
Dial #	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#7**
°C	35°	41°	44°	49°	53°	58°	63°
°F	96°	105°	111°	120°	128°	136°	146°

It is not recommended to turn dial higher than 60°C (140°F) or #6 on the dial.



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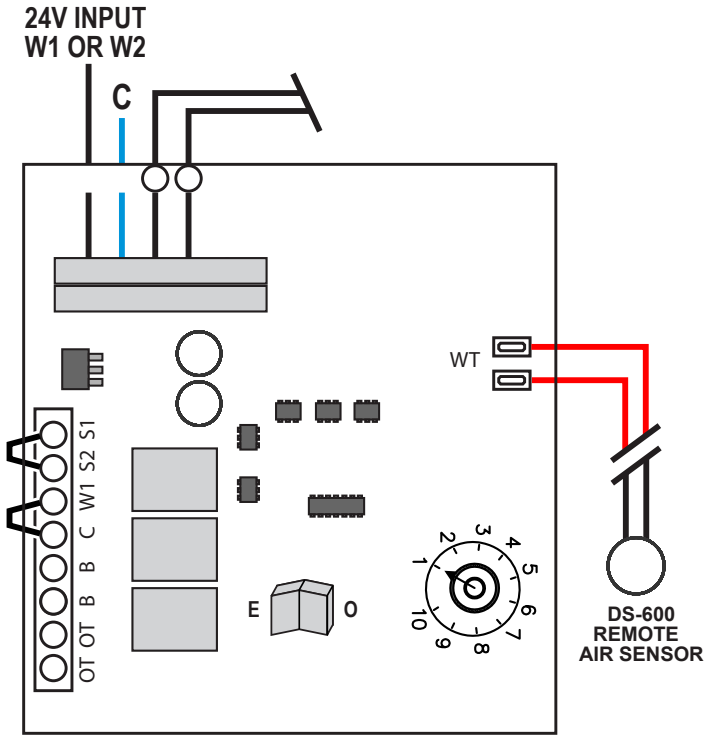
Wiring and Configuration



- Leave rocker switch in the middle.
- Add jumpers to (W1 to C) and (S1 to S2).
- Install DS-600 sensor in supply main plenum, minimum 18" feet from VESH. If on a zoned system add to primary zone.
- Set desired leaving air temperature for the VESH on turn dial.

Maximum Temperature

TH600 TEMPERATURE SET POINTS							
Dial #	#1	#2	#3	#4	#5	#6	#7
°C	35°	41°	44°	49°	53°	58°	63°
°F	96°	105°	111°	120°	128°	136°	146°

It is not recommended to turn dial higher than 60°C (140°F) or #6 on the dial.

Example Set-Up - VESH-750-15kW:

If you have the dial turned to 5 (in the VESH) the maximum air temperature will be 128°F, the VESH will modulate the leaving air temperature to 128°F. If the heat pump is running the system higher than 128°F the VESH will not increase the air temperature any higher.

- Entering air temperature (EAT) to the air handler from the heat pump before the VESH is 111°F.
- Temperature dial in the VESH is set to #5 the DS-600 (supply air sensor) will variable the output to 128°F.
- As an example of a zoned system with total 750 CFM of air and a zone is supplying 500 CFM: 500 CFM x 1.08 x 17 delta T (to raise 111°F to 128°F) = 4860 BTU (1.42 kW). The VESH will operate at 1.42 kW.

Note: A standard single stage "ESH" will run the full kW's upon a heat call and will not modulate but will cut off 5 kW at a time if the temperature reads too high. These temperature sensors do not reset until they cool down to 80/90°F, so in most heat pump applications they will not reset until the system cycles off.

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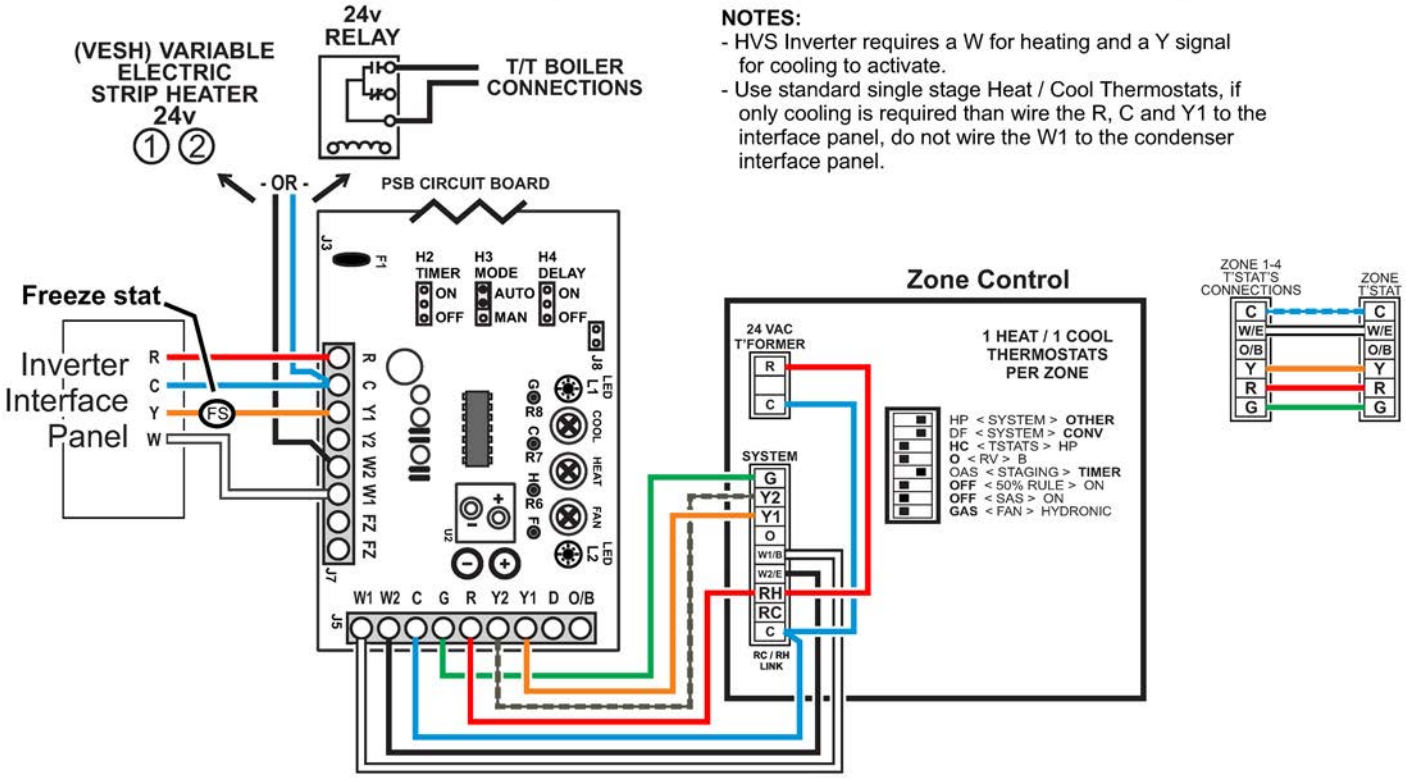
HVS INVERTER CONDENSING UNIT (HEAT / COOL) c/w supplemental 2nd stage heat



NOTES:

- HVS Inverter requires a W for heating and a Y signal for cooling to activate.
- Use standard single stage Heat / Cool Thermostats, if only cooling is required than wire the R, C and Y1 to the interface panel, do not wire the W1 to the condenser interface panel.

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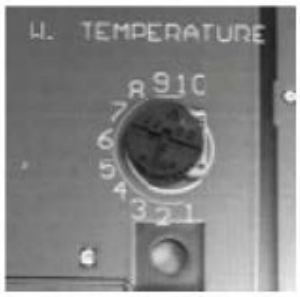
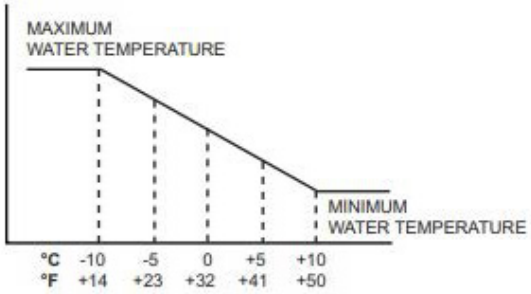
Electronic Aquastat





The outdoor sensor will :

a) Maintain the selected **maximum** water temperature when the outdoor temperature is at -10°C (+14° F) or colder.

b) **Automatically and proportionally** compensate by varying the water temperature between the maximum and minimum when the outdoor temperature is between –10°C (+14°F) and +10°C (+50°F).

c) Maintain the **minimum** water temperature when the outdoor temperature is between +10°C (+50°F) and +20°C (+68°F).

d) Prevent boiler operation above +20°C (+68°F).

This is what is see with your boiler and using a Electronic Aquastat

Water Temperature controlled by Electronic Aquastat										
Set-point		10	9	8	7	6	5	4	3	2	1
Maximum temperature	°C	88	81	75	67	58	50	45	42	39	36
	°F	190	178	167	153	137	122	113	107	102	97

- What is the maximum when I use the turn dial?
- shown on the wiring diagram seems very different and there is only 6 spots is it 5-10?

- Please fill in turn dial numbers Turn dial # 1 to 10?
- is the °F numbers correct? (I can calculate the °C)

I would like to off the turn down temperatures to minimum temperatures using a second DS-600 for outside temperature control through the OT / OT terminals.

Maximum Temperature

	TH600 TEMPERATURE SET POINTS						
	°C						
	°F						
Turn dial	#						

MiniumTemperature

	TH600 TEMPERATURE SET POINTS						
	°C						
	°F						
Turn dial	#						

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Maintenance

VESH heaters have been designed to operate long term without issue. Those responsible for equipment and maintenance should be aware of the following suggestions:

Periodic visual inspection: This precautionary step will help to keep your unit operating properly. Inspect the unit periodically and be on the lookout for any first signs of problems: Accumulation of dust on the heating elements, signs of overheating on the heater frame, traces of water or rust on the control box.

Electrical inspection: Two weeks after start up, all electric connections to contactors should be re-checked and tightened. Before each heating season, the following steps are recommended:

- Check all fuses
- Check resistance to ground for each circuit
- Check resistance phase to phase for each circuit
- Check the tightness of connections at all contactors and heating elements
- Check all contactors
- Check electrical connections to heating elements, magnetic contactors, and main power plugs.

It is recommended that this inspection be performed monthly for the first four months of operation. Following that, two inspections per heating season is sufficient.

Off Season Maintenance

Should a heater be shut off for a long period, we recommend that you carefully check the resistance to ground for each circuit. It is important not to power a heater when too low a resistance to ground has been measured. It is also recommended to pay attention to any other heater operating in normal conditions. All control components should be maintained and checked according to respective manufacturer's instructions. Any defective components should be replaced only with identical origin parts.

Specifications	VESH - 400	VESH - 650	VESH - 750	VESH - 1100	VESH - 2500
Part Number	5 kW - 10025404005	10 kW - 10025654010	10 kW - 10025754010	10 kW - 10025114010	10 kW - 10025254010
		15 kW - 10025654015	18 kW - 10025754018	18 kW - 10025114018	15 kW - 10025254015
				23 kW - 10025114023	20 kW - 10025254020
					25 kW - 10025254025
Matching Air Handler	CU-31 BU	HE-Z/HE-B/HE/ HV-50/51 BU, CU-51 BU, LV-Z/LV-B-750/751 BU, LV-50 BU	HE-Z/HE-B/HE/ HV-70/71 BU LV-Z/LV-B-1050/1051 BU LV-70 BU	HE-Z/HE-B/HE/ HV-100/101 BU LV-120/140 BU	HE-P-240 BU, LV-Z-1750 BU
Volts	240	240	240	240	240
Phase	1	1	1	1	1
Shipping Weight	20 lbs (9.1 kg)	21 lbs (9.5 kg)	27 lbs (12.2 kg)	28 lbs (12.7 kg)	30 lbs (13.6 kg)
Coil Dimensions[1] (L x W x H)	13 3/4" x 5 5/8" x 12 1/8" (349 mm x 143 mm x 308 mm)	13 3/4" x 5 5/8" x 17" (349 mm x 143 mm x 432 mm)	18 3/4" x 5 5/8" x 17" (476 mm x 143 mm x 432 mm)	24 3/4" x 5 5/8" x 17" (629 mm x 143 mm x 432 mm)	25 3/4" x 6" x 21 7/8" (654 mm x 152 mm x 556 mm)

[1] Module dimensions above do not include the electrical access panel, add 4" to L for total length (5" for VESH-2500)

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Energy Saving Products Ltd, established in 1983, manufactures the Hi-Velocity Systems™ product line for residential, commercial and multi-family markets. Our facilities house Administration, Sales, Design, Manufacturing, as well as Research & Development complete with an in-house test lab. Energy Saving Products prides itself on Customer Service and provides design services and contractor support.

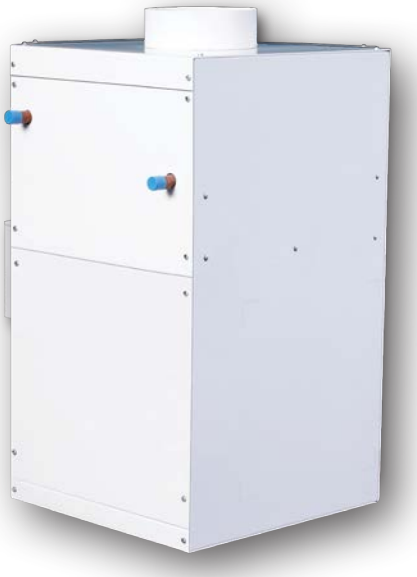
For all of your Heating, Cooling and Indoor Air Quality needs, the Hi-Velocity System is the right choice for you!

Hi-Velocity Systems™

Small Duct Heating, Cooling and IAQ Systems

Build Smart, Breathe *Easy*

Hi-Velocity HE-Z Air Handlers, Green Technology



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