

# **Split Passive HRM-V™ Energy Recovery Heat Pipes**

## **ENGINEERING SPECIFICATIONS**

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### **HRM-V™ Series with Permanent Offset or Dynamic Seasonal Offset™ (DSO™) Option and Control Valves**

#### 1. GENERAL

Air Handler(s)  Packaged Air Conditioning Equipment shall be equipped with Energy Recovery Heat Pipes supplied by Heat Pipe Technology, Inc. to transfer heat from the exhaust air to the incoming supply air. Supply and Exhaust heat pipe sections are separated horizontally on the same level or separated horizontally and vertically as specified below:

Level, with Dynamic Seasonal Offset™ (DSO)™: Supply and exhaust are on the same level equipped with integral partial face dampers and actuators on supply and exhaust sections, as specified, for optimized performance and to attain equal amounts of recovery for both heating and cooling. Optimized performance shall be achieved in both heating and cooling seasons by using the dampers to direct flow through sections of the heat pipes to create an offset effect, thus enhancing performance. Actuators and dampers are set up to take 115 VAC signal for one mode of operation and, when power is removed, the dampers switch to their opposite state (open to close and close to open) for the other season.

Fixed offset installation whereby supply side is elevated higher than the exhaust side, as specified, for optimized recovery in heating mode with some or no recovery in the cooling mode.

Fixed offset installation whereby exhaust side is elevated higher than the supply side, as specified, for optimized recovery in cooling mode with some or no recovery in heating mode.

Energy recovery heat pipes shall be tested and certified to AHRI standard 1060. Performance printouts as well as the product itself to carry AHRI 1060 compliance logo. Documents showing testing in accordance with AHRI 1060, but not certified by AHRI, will not be acceptable. Any deviation from the specifications must be approved by the engineer no less than ten days prior to the project bid date. No consideration of alternates will be given after that time. Heat pipes shall be completely manufactured and fully assembled at the manufacturer's facility by factory personnel.

#### 2. CONSTRUCTION

Coil tubes shall be oriented vertical and the fins run horizontal. Each two rows shall be manifolded together into one liquid line at bottom and one vapor line at top and constitute one circuit. Lines shall be sized according to the performance requirements of the circuit. Each heat pipe section

shall be installed level and connected to the other section by two horizontal copper lines, for each circuit, one for liquid and one for vapor.  Extended drain pans (by others) to be provided downstream of supply as well as exhaust sections, or  Moisture eliminators shall be installed immediately downstream of the supply and exhaust sections of the heat pipe to capture condensate that may spit from the heat pipe fins. Condensate shall drain out of the bottom into a drain pan (supplied by others). The moisture eliminator shall be capable of capturing at least 99.75% of condensate when the coil is producing condensate at a rate of 0 to 15 lbs. water/sqft/hour and coil airflow is  $\leq 700$  SFPM. Static pressure loss shall not exceed 0.18 in. wg. at 500 SFPM.

The moisture eliminator blades will be constructed of ABS plastic and meet UL Standard 94 classification V-0, which requires blades to self-extinguish within 10 seconds. It will incorporate an additive that protects against fungal and bacterial deterioration to provide long-term protection against fungal and bacterial attack and help prevent surface growth, permanent staining, embrittlement and premature product failure. The anti-fungal and anti-bacterial additive shall be mixed with the polymer and shall not be a coating, which could wear off over time.

### 3. OPTIONAL MODULATING CONTROL VALVE FEATURE

All or a portion [SPECIFY] of the Heat Pipe circuits shall be equipped with modulating control valves to control the operation of the Heat Pipe circuits. Each circuit shall have one modulating step motor valve in the lower liquid line in an accessible location. Each valve will connect to a control printed circuit board in a NEMA 12 enclosure that contains the number of control boards to control all valves in the system and the appropriate power conversion. The customer supplied electrical power to the control panel power supply transformer shall be:  120 VAC  208 VAC  230 VAC 1 phase 60 Hz. The NEMA box shall be located on the  exterior or  interior surface of the equipment cabinet as indicated  or on a nearby surface.

The Building Automation System (BAS) shall provide the sensors necessary for determination of heat pipe modulation operation and the BAS computer shall be programmed to send the operating control signals to the modulating valves' control boards as required for correct system operation. The control signal shall go through a BAS interface installed near the heat pipe NEMA box. The BAS control signal provided shall be  0 to 10 volt DC or  4-20 mA.

All additional wiring shall be provided and installed by others. With all control valves open, the energy recovery heat pipe assembly will operate at full capacity. Modulating one valve closed restricts the liquid return flow and reduces the heat transferred by the heat pipe until closing the valve shuts off that circuit. Frost control, if needed, is accomplished by closing or shutting off one or more circuits. Economizer operation is also accomplished by shutting off circuits to achieve desired heat transfer.

#### 4. HEAT PIPES

- 1) The Heat Pipe supplier shall have a minimum of 5 years of experience designing, manufacturing, and installing Heat Pipes specifically for split energy recovery applications. Heat pipes must be manufactured and assembled at the heat pipe supplier's own facility by supplier's own staff.
- 2) The tubes shall be copper only, of specific design for Heat Pipe application, permanently expanded onto the fin collar to form a firm, rigid, and complete pressure contact at all operating conditions. Aluminum tubes will not be allowed.
- 3) The fin surface shall be continuous plate type  aluminum or  copper fins of specific design to produce maximum heat transfer efficiency for Heat Pipe applications. Airside pressure loss shall be as given on the schedule, or otherwise specified. Fin density and the number of rows of tubes shall be as specified.
- 4) The Heat Pipe modules shall have an optional protective coating of  E-Coat, similar to Electrofin or  phenolic, similar to Heresite. Heat pipes shall be dipped and completely submerged to insure full coverage of coating - spray coatings are not acceptable.
- 5) Heat transfer fluid shall be classified as Safety Group A1 in ASHRAE Standard 34-2013.
- 6) Heat Pipe capacities, entering and leaving dry and wet bulb temperatures, and face velocity shall be as specified.
- 7) The Heat Pipes shall be installed as specified.
- 8) Frames and mounting structure shall be minimum 16 gauge  galvanized steel or  stainless steel.
- 9) Heat Pipe interconnecting piping and circuitry shall be as specified by Heat Pipe Technology design. Each circuit shall be individually processed, charged, hermetically sealed, and tested.
- 10) The heat pipe system shall be pressure tested on site under the supervision of the manufacturer's crew. Manufacturer's crew shall vacuum and charge the system. Vacuuming and charging by parties other than the manufacturer's own crew shall not be acceptable.
- 11) Scheduled effectiveness or heat recovery shall be met at a minimum and total pressure drop shall not be exceeded. The resulting Recovery Efficiency Ratio, or RER, shall therefore be met at a minimum.
- 12) The Heat Pipes shall be ETL listed to UL standard 207 and CSA C22.2.140.3.
- 13) The Heat Pipe heat exchanger shall have a five (5) year limited warranty. All components such as valves and dampers shall carry a 12 month warranty.