

Scholar V Heat Pumps: 2 to 5 Ton Cooling Capacity Models VAIVA36 (14-42 BTUH) VIAVA60 (24-60 BTUH) with Variable Compressors



Scholar V with Free Blow Plenum

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GENERAL DESCRIPTION

The Scholar V fifth generation heat pumps with FlexCap™ Variable Speed Compressor Technology are unique because they automatically vary output to precisely match the classroom load and can't undercool or overcool the space. These self-contained HVAC systems are designed to provide heating, cooling, and outside fresh air for school classrooms. The units are installed in the classroom against an exterior wall. The vertical configuration minimizes the floor space occupied by the HVAC unit. This unique design makes it ideal for both new schools and for renovation of existing classrooms.

A full range of ventilation options – from two energy recovery ventilators, the Greenwheel® ERV or the GreenCube® ERV, to a mechanical damper - are offered to meet any climate or budget. A wide selection of architectural louvers provides the designer with unlimited styles and configurations to complement the exterior of the school. (For a complete description of the architectural louvers, please refer to the Marvair brochure entitled, "Architectural Extruded Aluminum Louvers".) The unit is managed using a built-in programmable touchpad controller and wall mounted humidistat.

Scholar V heat pumps are available in cooling capacities from 2 to 5 tons with a variable speed compressor as standard and electric resistance heat. All sizes are available for operation on 208/230 V. 1Ø or 3Ø and 460 V. electrical supply. All models comply with UL standard 1995, 4th edition and CAN/CSA C22.2, No. 236-11 and listed by ETL.

Features and Benefits

FlexCap™ Variable Speed Compressor Technology

- Significantly Lowered Sound Levels
- Lowered Energy Usage at Startup
- Greater Efficiency
- Increased Longevity of Internal Components
- No Surge or "Light Flicker" Upon Compressor Start

R-410A Refrigerant

- Efficient Heat Release
- Non-Ozone Depleting Refrigerant
- Synthetic Lubricant
- Reduced Compressor Wear

Improved Humidity Control

- More Consistent Temperature and Humidity Control
- No Temperature Drop During Dehumidification

GreenWheel® and GreenCube® Energy Recovery Ventilators (ERV)

- Removes Both Moisture and Heat from the Incoming Air Stream
- Optimized for Hot Gas Reheat



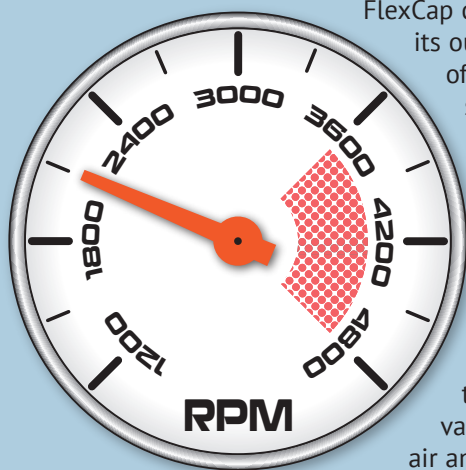
SCHOLAR V ADVANTAGES

Since their introduction in 1991, Scholar heat pumps and air conditioners have been the undisputed leaders in interior, self-contained classroom HVAC systems. Students in tens of thousands of classrooms across the USA have benefited from the environment provided by Scholar heat pumps and air conditioners.

The Scholar V builds on this history with unique design innovations and features.

► Marvair FlexCap™ Variable Speed Compressor Technology

Using innovative flexible capacity compressor technology, FlexCap can precisely match its output to the load of the conditioned space resulting in much improved conditioned air quality. Longer operation at very high efficiency, reduced load conditions results in smaller temperature variations, cleaner air and more optimized humidity.



FlexCap is capable of boosting running speed by up to 25% during heating. This reduces the dependence on supplemental and highly inefficient electrical strip heat. Heat pump Defrost cycles can also be shortened as FlexCap can remove more frost quicker by running at a high speed during the defrost cycle. Coupled with smart demand defrost equipment, FlexCap can extend the time between defrost cycles at certain conditions further reducing the need for expensive strip heating.

Fewer Start/Stop Cycles Improves Reliability & Efficiency

Field Trial Data	Single Stage Unit	Variable Speed Unit		Benefit
		Low Speed	High Speed	
Number of Annual Compressor Start/Stops	9790	3925	920	50.5% Fewer Starts
Annual Compressor Run Hours	2793	2208	506	81.4% Low Speed Run Hours

Now with a simple speed drive that has been optimized for FlexCap variable compressor technology, system designers can eliminate the need for components with known high failure rates such as:

- Contactors
- Start Relays
- Start and Run Capacitors

Lower noise levels are enjoyed as the compressor and fans run at lower speeds greatly reducing noise associated with compressor operation, start-up and shut-down and air flow through registers. A very quiet and gentle ramp up and ramp down is standard. "Light flicker" is eliminated as the start-up current is only a fraction of traditional air conditioning systems. The ramp up and ramp down sequence improves the life of the compressor and other components due to greatly reduced electrical and mechanical stress. A 4:1 speed ratio offers designers the potential for superior heating boost as well as the opportunity to "tune" the system for optimum performance.

► Compressor "Overspeed" Feature

The minimum operating speed for the variable compressor is 1200RPM. This yields a compressor capacity of about 1/3 the rated capacity for load matching of a classroom at the normal 3600RPM.

Under certain conditions, it is possible to "overspeed" the compressor to 4800RPM, yielding a higher capacity than the design rating of 3600RPM.

This feature is useful when space heating in low ambient temperatures where compressor capacity may be insufficient and supplemental heat must be used.

► Humidity Control

The control of humidity is essential for a positive learning environment. Scholar V heat pumps actively control humidity with both standard controls and several optional accessories for schools where control of humidity is an everyday concern. The electronically commutated motor optimizes moisture removal by automatically controlling the air flow across the indoor coil. Unconditioned outdoor air for ventilation is not brought directly into the classroom. Ventilation air first passes through the indoor coil to temper the air and remove moisture. It then is mixed with classroom air before being introduced into the classroom.

► GreenWheel® and GreenCube® Energy Recovery Ventilators (ERV)

The optional GreenWheel® ERV and GreenCube® ERV's are total energy recovery ventilators, removing both moisture and heat from the incoming air stream. With an outdoor wet bulb of 74°F and an indoor dry bulb of 72°F and 450 cfm of outside air, the ERV's will remove 8 pints per hour of moisture from the incoming fresh air stream.

For optimum control of the humidity, the GreenWheel and GreenCube® ERV's should be used in conjunction with Hot Gas Reheat. This complete, factory assembled optional coil and controls economically maintains the temperature and humidity in the classroom.

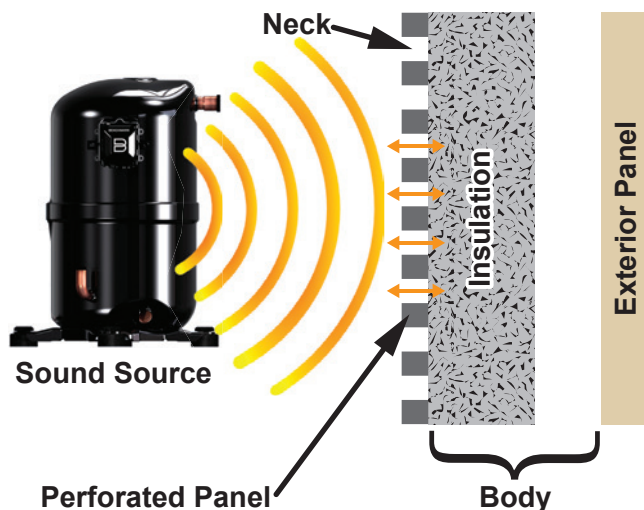
LOW NOISE AND HIGH EFFICIENCY FEATURES



The Scholar V was designed from the onset for unsurpassed quiet operation and high efficiency. With the proper installation, sound levels of 45 dBA or less with a freeblow plenum can be obtained. With ducting, sound levels can be greatly reduced. In addition, many of the same components that enable the Scholar V to have such quiet operation, contribute to its high efficiency.

► Cabinet Construction

All exterior cabinet panels are double wall construction with a perforated interior panel and the finished exterior panel. Between the two sheet metal panels is a 1-1/4" thick, acoustical and thermal insulation. The perforation pattern and the insulation are designed to optimize the reduction of sound. The absorption mechanism of these panels is a combination of the perforated panels and insulation acting together as an array of Helmholtz Resonators. The columns of air in each perforation correspond to the "neck" of the Resonator and the layer of air at the back side of the panel including insulation correspond to the "body" of the Resonator. As sound passes through a perforation, it causes the air of the "neck" to vibrate. When the vibrations meet the resistance of the panel material surrounding the perforation or the resistance of the insulation attached to the back of the perforated panel, the resistance causes the sound to convert to heat energy, the heat is absorbed by the insulation & sound levels are reduced.



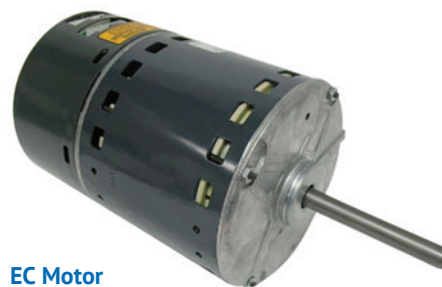
► Variable Compressor and R-410A Refrigerant

The heart of every air conditioner or heat pump is the compressor and the Scholar V utilizes an innovative variable compressor specifically designed to use R-410A refrigerant. This compressor is quieter and more energy efficient than compressors that operate on R-22. Since R-410A can absorb and release heat more efficiently than R-22, compressors with R-410A run cooler than R-22 systems, reducing the risk of burnout due to overheating.

► Electronically Commutated (EC) Indoor Air Mover Motor

The Scholar V heat pump uses an Electronically Commutated (EC) motor for the indoor air mover and provides a number of advantages over conventional induction motors.

- **Constant Torque** Factory set, but can be adjusted in the field to compensate for high static filters, grilles or duct work. At a given torque setting, the EC motor has a lower drop in air flow with increasing static compared to a conventional PSC motor.
- **Quiet** The three phase brushless DC motor construction results in a very low torque ripple and the rotor construction effectively eliminates noise transmission through the shaft. Unlike a conventional induction motor that repeatedly cycles on & off, the EC motor is always powered, but cycled through an external low control voltage programmed to slowly ramp up to speed, eliminating the abrupt sound at start-up.
- **Ultra-High Efficiency** On constant fan speed, the motor consumes 60-80 watts compared to 400 watts for an induction motor.
- **Reliable** The motor's electronics are mounted on a potted single board design less susceptible to damage from moisture.



EC Motor

► Fully Variable Compressor

The variable compressor offers better comfort and improved overall energy efficiency. Please refer to specification tables for performance and efficiency information.

- **Better Comfort** The compressor is able to maintain more precise temperature and relative humidity levels. During mild days, the first stage can satisfy the load, minimizing temperature fluctuations providing steady, even comfort.
- **Improved Energy Efficiency** The Scholar V heat pump can provide significant energy savings compared to older, less efficient systems.
- **Hot Gas Reheat** Hot gas reheat controls humidity.

The outside air requirements of classrooms require a special emphasis on control of humidity. The Scholar V with hot gas reheat and fully variable compressor provides a comprehensive, yet affordable solution. It is a complete factory assembled unit designed to provide dehumidification of fresh air and room air. See page 5 for a complete description of Hot Gas Reheat for dehumidification.

EASE OF INSTALLATION

Scholar V heat pumps and air conditioners are installed in the classroom against an exterior wall. The outdoor air box slides into an opening in the exterior wall. The outdoor air box provides for the ingress and egress of the condenser air as well as the intake and exhaust for the ventilation air. The bottom of the outdoor air box is 33" from the base of the unit, enabling it to clear the sills of windows. For existing schools this greatly facilitates installation since expensive structural changes to exterior walls are not required. By having the fresh air intake three feet above grade, stagnant, moisture laden air is not introduced into the classroom.

Scholar V heat pumps and air conditioners can be installed as a free blow or ducted system. Free blow and ducted plenums are built in various heights to match the color and appearance of Scholar V units.

Scholar V units are available with a full range of accessories for customizing the installation including, base stands, decorative trim panels, and outdoor louvers.

The outdoor air box is designed to be quickly removed and reinstalled in the field. With the box removed, Scholar V heat pumps and air conditioners will slide comfortably through a three foot wide door.

SERVICE AND MAINTENANCE

All service and maintenance is performed from the front or side of the unit – no need to slide the unit away from the wall. The heavy duty hinged front panels open 180° to facilitate access to parts, air filters and controls. Both the indoor and outdoor coils are easily accessible for cleaning.

RUGGED CABINET CONSTRUCTION

The exterior cabinet is constructed of 16 gage galvanized steel with a mark and scratch resistant polyester finish. Grey is the standard cabinet color, but other colors are available.

The hinged doors permit easy access to the filters and components for service and maintenance. Tamper resistant locks which require a special tool may be ordered as an option.

The drain pans under each indoor coil are sloped to ensure the water drains completely.

Outdoor drain pan constructed of .156" rigid PVC will not corrode.

FIELD INSTALLED ACCESSORIES



► Trim Piece

The trim piece provides a color coordinated panel between the cabinet and the wall. Built in the same color as the cabinet and in various widths. Trim pieces provide a finished appearance and cover any space between the back of the cabinet and the wall.

► Base Stand

A 2" or 4" high base (standard, with other heights available) matches the Scholar V™ cabinet and raises it off the floor for custodial purposes. The base stand is available in several colors to match the color of the unit.

► Dry Erase Board

Magnetic dry erase board provides an excellent surface for displaying student art or important announcements.



LOUVER AND COLLAR OPTIONS

See the brochure, *Architectural Extruded Aluminum Louvers*, for complete description of the various styles and configurations of louvers.

► Louver/Collar Assembly

Aluminum louver and collar, pre-assembled at the factory to cover outside wall opening. The louver with 2" collar assembly is to be used when the louver is flush with the outside wall and is the preferred method of filling and sealing the outside wall. Standard colors are dark bronze or clear anodized. Exterior louver includes 1/2" x 1/2" bird screen. Note: Louvers are available in a variety of styles to meet architectural needs and various colors for aesthetic considerations. Contact your Marvair® representative for custom louvers.

► Louver Collar

Aluminum louver collar to enclose the louver and provide finished appearance over wall opening. Fits flush with outer wall surface. Available in dark bronze or clear anodized. Normally used when wall depth is less than 14" and louver is not flush with the outside wall.

► Louver

Aluminum louver for covering the outside wall opening. Available in dark bronze or clear anodized. Used with collar when louver is not flush with the outside wall. Exterior louver includes 1/2" x 1/2" bird screen.

► 4" Hurricane Louver

Miami-Dade approved, hurricane-resistant aluminum louvers with stationary drainable blades. These louvers are designed to protect the outside opening in building exterior walls from water penetration during high winds and rain.



AIR DISTRIBUTION OPTIONS

► Freeblow Air Distribution

Provided with the freeblow plenum. The front grille has individually adjustable vertical louvers that provide a full range of airflow direction. Two side supply grilles with vertical louvers enhance the air flow in the classroom. All grilles have a clear brushed aluminum finish to be used with Scholar V™ unit's with no heat or electric resistance heat. The plenum is 12-1/2" high.

► Supply Grilles

The frame and blades are 6063 extruded aluminum alloy with a 2000-R1 satin anodized finish. To eliminate corrosion and vibration, the frame is separated from the blade with injection molded bushings. All blades are air foil in design, individually adjustable and spaced 3/4" on center. A specially engineered channel on the outside of the frame holds an extruded flexible vinyl bulb gasket that produces a positive air seal at the mounting surface.

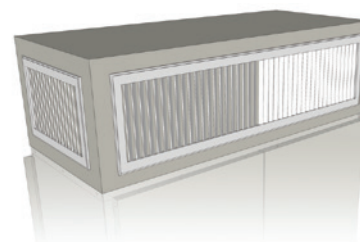
► Ducted Air Distribution



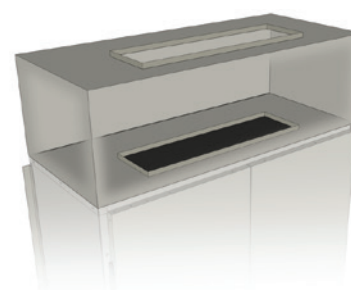
Provided with the ducted plenum. The plenum is 12-1/2" high. Duct can be easily installed to the flanged rectangular opening on the top. The tables on page 12 and 17 show the cfm for the various units.

► Plenum Extenders

In order to provide a finished appearance, plenum extenders may be ordered. The plenum extender rests on top of the either the free blow or ducted plenum and may be ordered in various heights in 1" increments.



Freeblow Plenum



Plenum Extender

DEHUMIDIFICATION OPTIONS

► Reheat Dehumidification

Scholar V heat pumps with hot gas reheat are complete factory assembled units designed to provide dehumidification of fresh air and room air. Hot gas reheat can be used with any supplemental heat and the GreenWheel® ERV, the GreenCube® ERV or motorized damper ventilation options. Hot gas reheat is controlled by an external humidity controller or EMS control. For optimum performance, hot gas reheat should be used in conjunction with the GreenWheel® ERV or the GreenCube® ERV. When used with the motorized damper, hot gas reheat alone may not maintain satisfactory control of the humidity in the classroom over all outdoor conditions.

As an option to the standard HGR control, a modulating valve, a PC board and temperature sensor can be used. The modulating valve maintains a constant discharge temperature during reheat operation. This temperature can be adjusted after installation.

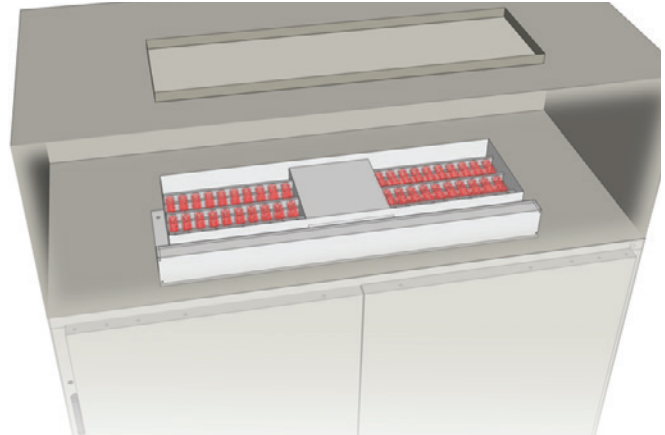
Operation - There is a dedicated dehumidification mode with hot gas reheat. If the unit is running continuously in cooling, but the humidity remains above the set-point for a pre-set time, the compressor runs at full speed until the humidity setting is satisfied. If the room temperature drops below the cooling set point during full speed dehumidification operation, hot gas reheat is energized.

HEAT OPTIONS

An electric heat option is available for the Scholar V air conditioners and heat pumps to supplement, where required, the heat pump cycle.

► Electric Resistance Heat

Installs above the indoor air blowers. Each Scholar V unit is available with 5, 7.5, 10 or 15 kW of electric heat. Electric heat can be used with the freeblow plenum or with ducted air distribution options.



CABINET CONSTRUCTION OPTIONS

► Coastal Installations

For installation in coastal areas where salt corrosion may be a problem, the Scholar V heat pumps and air conditioners may be ordered with a stainless steel drain pan for the indoor coil and a corrosion resistant coating on the outdoor coils.

► Tamper Resistant Door Latches

Requires special access tool to open the front doors.

VENTILATION OPTIONS

► Configuration “N”: Manual Fresh Air Damper with Pressure Relief Ventilation (Standard)

Manually adjustable to a fixed position up to 40% outside air, with a maximum of 450 cfm. Includes fresh air filter and exhaust air filters, fresh air intake blower, fan speed controller and pressure relief.

► Configuration “B”: Motorized Fresh Air Damper with Pressure Relief Ventilation (Optional)

A 24 volt actuated motor allows fresh air to enter, as a function of an external input; e.g., time clock, CO2 sensor, energy management system, or manual switch. Includes fresh air and exhaust air filters, a ventilation intake blower and a fan speed controller for the blower. Pressure relief is standard.

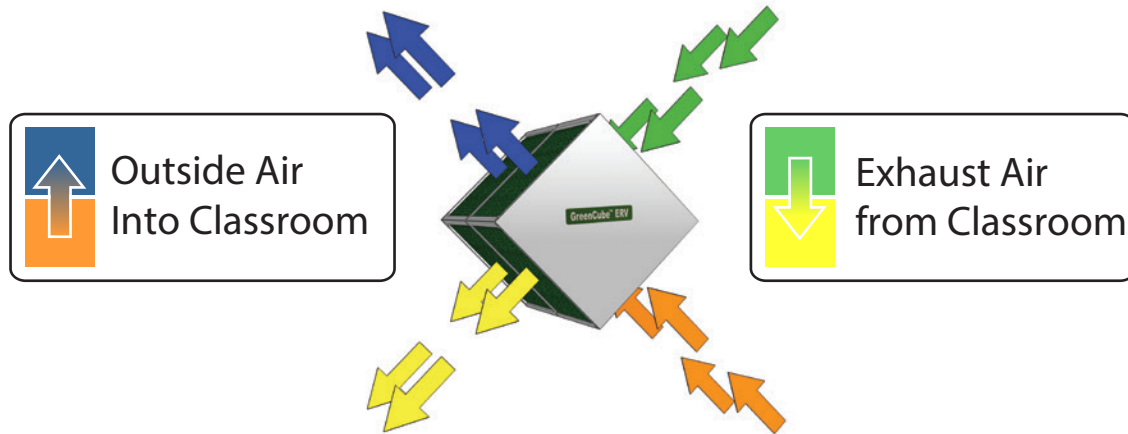
► Configuration “J”: Power Vent with Motorized Damper (Optional)

Ventilation Configuration “J”. A 24 volt actuated motor allows fresh air to enter, as a function of an external input; e.g., time clock, CO2 sensor, energy management system, or manual switch. Includes fresh air filter and exhaust air filters, a ventilation intake blower, a fan speed controller for the intake blower, a ventilation exhaust blower and pressure relief. An optional fan speed controller for the exhaust air blower may be ordered. Vents up to 40% of classroom air, with a maximum of 450 cfm, to assure fresh air circulation.



► **Configuration “Q”: GreenCube® ERV Ventilation (Optional)**

The Marvair GreenCube ERV is an enthalpy plate heat exchanger that transfers both sensible and latent energies between outgoing and incoming air streams in a cross flow arrangement. Except for two air movers, it has no moving parts. The media is impregnated with a RC134 polymeric desiccant that exchanges water by direct vapor transfer using molecular transport without the need of condensation. The GreenCube® ERV will operate at temperatures as low as 10°F without a defrost mechanism. In addition, the desiccant is a bactericide. Two MERV 6 type filters are used on both sides of the enthalpy core. The fresh air and exhaust motors have independent speed controllers to permit each of the motors to be regulated independently.

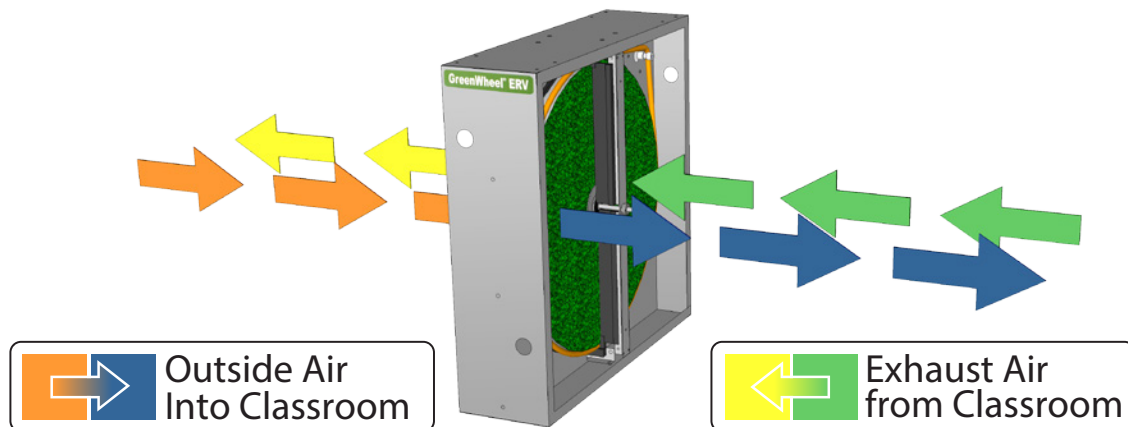


► **Configuration “H”: GreenWheel® ERV Ventilation (Optional)**

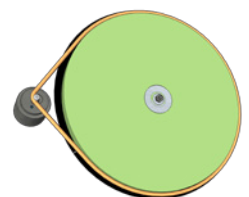
The Marvair® GreenWheel® ERV is a total energy (both sensible and latent) wheel that reduces both construction and operating cost while ventilating the classroom. The use of the GreenWheel ERV reduces the energy load of the outside air. Exhausting stale, inside air keeps indoor pollutants and harmful gases to a minimum.

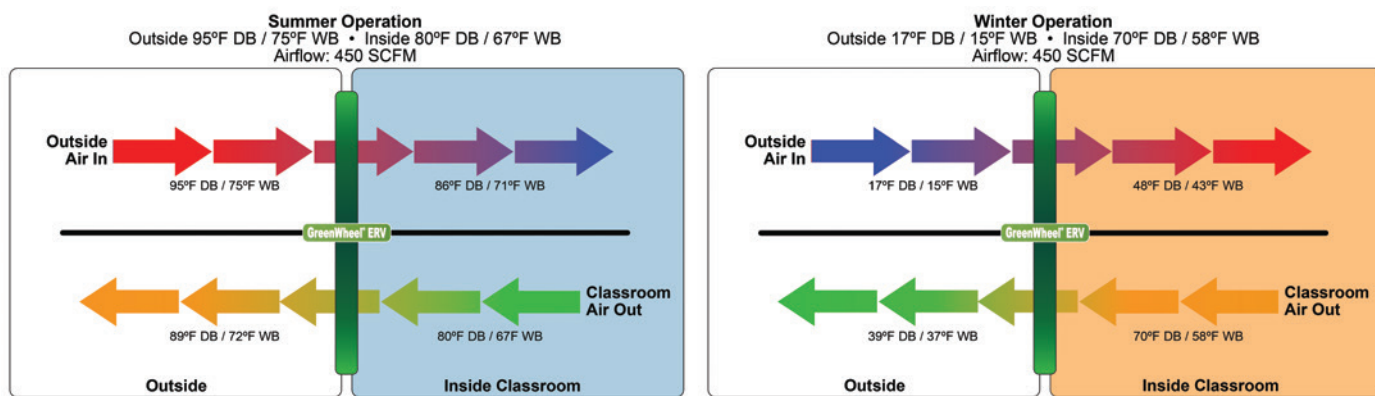
How It Works - During the summer, cool dry air from the classroom is exhausted through the GreenWheel® ERV to the outside. As the air passes through the rotating wheel, the desiccant becomes cooler and drier. Simultaneously, hot humid air is being pulled across the rotating wheel. The cool, dry desiccant absorbs moisture and heat from the incoming air. The cooler, drier air is mixed with the return air from the classroom and distributed throughout the room.

In the winter, warm moist air is exhausted through the GreenWheel ERV to the outside. As the air passes through the rotating wheel, the desiccant becomes warmer and absorbs moisture. Simultaneously, cold dry air is being pulled across the rotating wheel. The cold, dry air absorbs heat and moisture from the desiccant. The warmed air is mixed with the return air from the classroom and distributed throughout the room.



Quality Components - The GreenWheel® ERV cassette consists of the wheel, two blowers and the drive motor and belt. The two blowers simultaneously pull fresh air from outside and exhaust air from the classroom through the rotating wheel. The air streams are separated by an insulated partition so that the incoming fresh air is not mixed with the exhaust air. Two variable speed blowers ensure that up to 450 CFM of outside air can be brought into the room and the indoor air is properly exhausted. Variable speed blowers permit that the desired quantity of outside air is delivered into the room. Optional independent exhaust air blower control allows positive pressurization of the classroom, i.e., more outside air can be introduced through the GreenWheel ERV than is exhausted.





GreenWheel® Energy Recovery Ventilator Performance

SCFM* of Outside Air	Energy Conserved, BTUH					
	95° DB/73° WB Outside • 80° DB/67° WB Inside			95° DB/80° WB Outside • 80° DB/67° WB Inside		
	Sensible	Latent	Total	Sensible	Latent	Total
225	2,900	1,100	4,000	2,900	6,400	9,300
250	3,100	1,200	4,300	3,100	6,900	10,000
325	3,700	1,400	5,100	3,700	8,100	11,800
400	4,200	1,500	5,700	4,200	9,100	13,300
450	4,500	1,600	6,100	4,500	9,700	14,200

SCFM* of Outside Air	Energy Conserved, BTUH								
	90° DB/74° WB Outside • 75° DB/64° WB Inside			80° DB/70° WB Outside • 75° DB/64° WB Inside			60° DB/54° WB Outside • 70° DB/58° WB Inside		
	Sensible	Latent	Total	Sensible	Latent	Total	Sensible	Latent	Total
225	2800	3600	6400	900	2800	2700	1900	200	2100
250	3000	3800	6800	1000	3000	4000	2000	200	2200
325	3600	4500	8100	1200	3500	4700	2400	200	2600
400	4100	4900	9000	1400	3800	5200	2700	300	3000
450	4300	5200	9500	1400	4000	5400	2900	300	3200

SCFM* of Outside Air	Energy Conserved, BTUH								
	40° DB/36° WB Outside • 70° DB/58° WB Inside			20° DB/18° WB Outside • 70° DB/58° WB Inside			0° DB/7° WB Outside • 70° DB/58° WB Inside		
	Sensible	Latent	Total	Sensible	Latent	Total	Sensible	Latent	Total
225	5600	3300	8900	9300	4900	14200	13000	5700	18700
250	6000	3600	9600	10000	5300	15300	14000	6100	20100
325	7200	4200	11400	12000	6200	18200	16700	7100	23800
400	8100	4600	12700	13500	6800	20300	18900	7900	26800
450	8600	4800	13400	14400	7100	21500	20100	8200	28300

*SCFM = Standard Cubic Feet per Minute

For performance of the GreenWheel® ERV at conditions other than those shown, please contact your Marvair® representative or the factory.

➤ Fresh Air Backdraft Damper (standard on all Ventilation Configurations)

A factory installed flapper type damper that prevents air from entering the Scholar V unit when the intake (fresh air) blower is not operating. The damper opens whenever the ventilation fan is on and automatically shuts when the ventilation fan turns off.

Ventilation Summary Comparison

Ventilation Package	Description	Pressure Relief	Vent Filters	Vent Fresh Air Mover	Vent Exhaust Air Mover	Standard Controls	Options
N	Manual, fixed position damper. Up to 450 cfm of outside air not to exceed 40% of rated air flow.	Yes	One on incoming air	Yes	No	One fan speed controller for fresh air mover.	None
B	Two position (open & close) motorized damper with a fresh air intake blower. Up to 450 cfm of outside air not to exceed 40% of rated air flow.	Yes	One on incoming air	Yes	No	One fan speed controller that controls the intake air blower.	None
J	PowerVent with two position motorized damper with a fresh air intake blower. 0-450 cfm of outside air not to exceed 40% of rated air flow.	Yes	One on incoming air	Yes	Yes	One fan speed controller that controls both blowers.	Second fan speed controller for the exhaust air.
Q	GreenCube ERV	Yes	Two. One on fresh air and 2nd on exhaust air	Yes	Yes	Independent speed controllers	None
H	GreenWheel® ERV. 0-450 cfm of outside air	Yes	Two. One on fresh air and 2nd on exhaust air	Yes	Yes	One fan speed controller that controls both blowers.	Second fan speed controller for the exhaust air.

Notes:

1. The optional fan speed controller for the exhaust air allows independent control of the two ventilation motors to permit positive pressurization of the classroom.

2. Aluminum side return air grilles for the ventilation air from the classroom may be ordered on all Scholar III units as factory installed option in lieu of the standard air slots.

OPTIONAL VENTILATION CONTROLS AND GRILLES

► Control Ventilation

A field or factory installed carbon dioxide sensor controls the ventilation damper and only opens the damper when CO₂ levels exceed a specified level. Demand control ventilation saves energy and utility costs by ventilating the classroom based upon occupancy. Note: Not available on the manual fresh air damper ("B") configuration.

► Ventilation Exhaust Air Controller

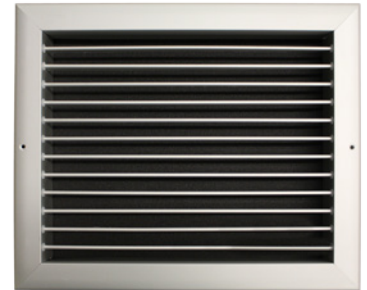
As standard, the motorized fresh air damper with PowerVent (option J) and GreenWheel® ERV (option H) ventilation options are equipped with a single controller which controls both the exhaust air and the fresh air blowers. The optional exhaust air blower controller allows positive pressurization of the classroom; i.e., more outside air can be introduced through the GreenWheel® ERV than is exhausted.

► Side Return Air Grilles

Aluminum grille replaces stamped slots on left and right side of the unit.

► GreenWheel® and GreenCube® ERV Exhaust Air Grille

Aluminum grille replaces slots in cabinet.



Aluminum Grille

THERMOSTAT/CONTROLLER

The Scholar V temperature and humidity control settings are input using a touch screen display mounted on the unit. This unit may also be mounted remotely and connected by using standard Category 5 Ethernet cable.

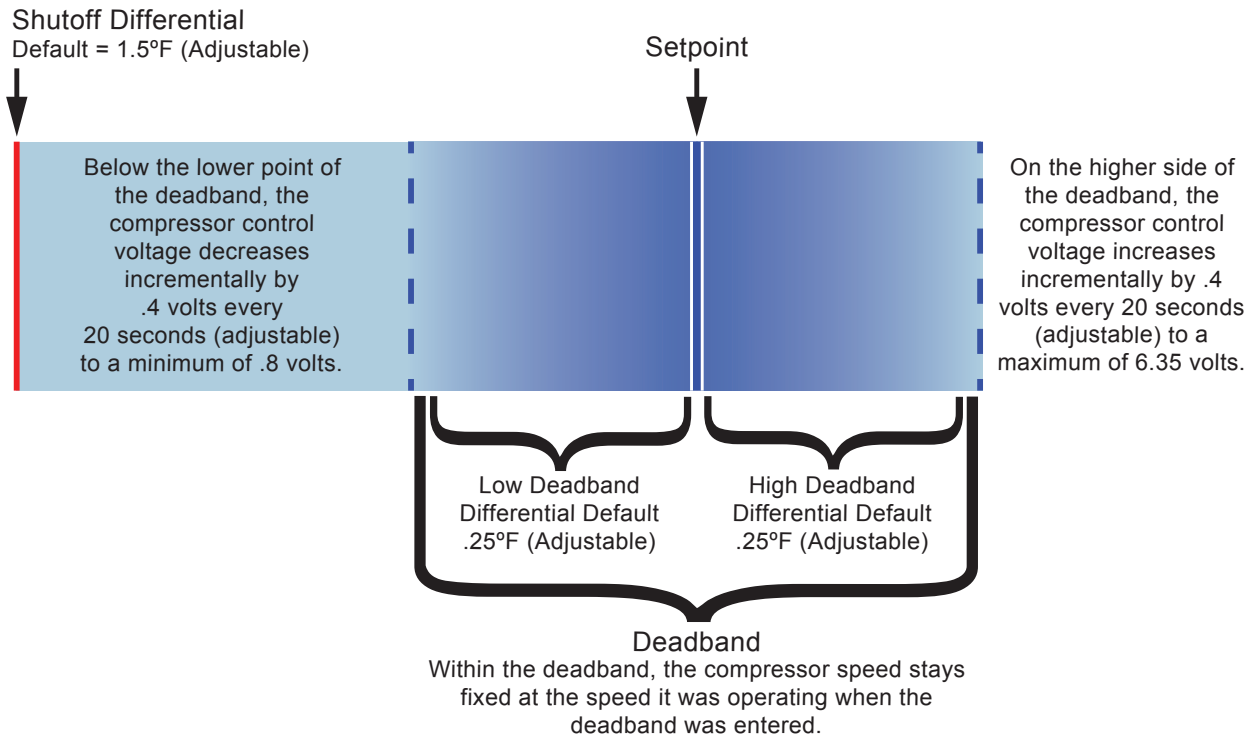
The remote temperature and relative humidity sensor/transmitter is installed on a wall in the classroom and provides ambient conditions information to the Scholar V internal processor. It connects to the Scholar V unit using standard 4-conductor wiring.



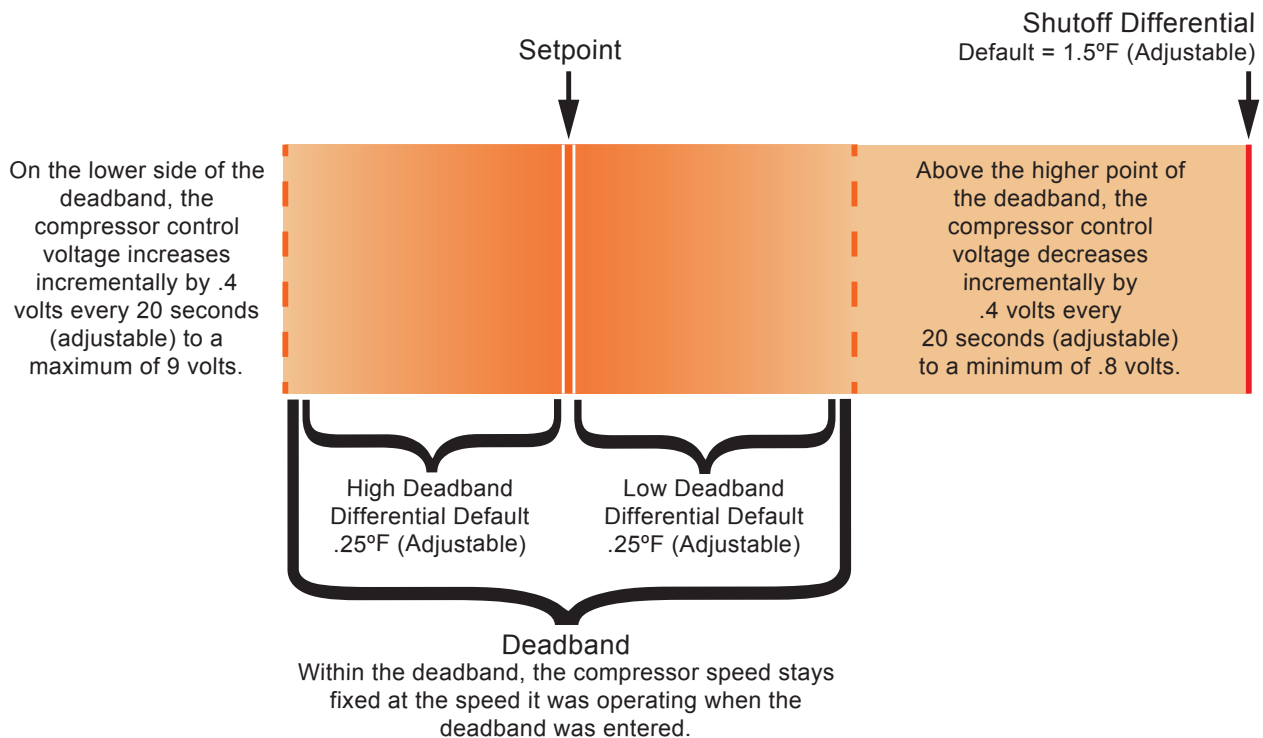
Touch Screen Controller and Remote Temperature/Relative Humidity Sensor



SCHOLAR V COOLING CONTROL METHOD



SCHOLAR V HEATING CONTROL METHOD



STANDARD CONTROLS

► High Pressure and Loss of Charge (HP) or Low Pressure (A/C) Switches

Includes a lockout relay.

► PLC Controller

The PLC is a factory installed microprocessor. LED indicator lights show operational status and provide assistance with diagnosis if troubleshooting is ever required. The controller can perform extensive self diagnosis to assess the operational status and indicate a fault when detected.

The controller in the Scholar V heat pumps improves reliability due to a reduction of components and simplification of control panel wiring.

► Built-In Humidity Control

Scholar V heat pumps and air conditioners with optional hot gas reheat are complete factory assembled units designed to provide dehumidification of fresh air and room air. Hot gas reheat can be used with any supplemental heat and the GreenWheel® ERV, the GreenCube® ERV or motorized damper ventilation options.

► Defrost Control

Based upon time and temperature. The defrost time interval and temperature can be adjustable from 30 to 90 minutes in one minute increments. The control system initiates a defrost cycle only if the outdoor coil temperature is 28°F or below. (heat pump only)

► Anti-short Cycle Timer

Prevents the compressor's motor windings and starting controls from destructive overheating.

► Electric Heat Control

Controls operation of electric heat and allows either simultaneous or non-simultaneous operation of electric heat and the compressor. (heat pump only)

► Ventilation Control

The motorized fresh air damper with PowerVent and GreenWheel® ERV ventilation options are equipped with a Fresh Air Fan Speed Control. The fresh air fan controls both the ventilation intake and exhaust blowers together, automatically balancing the intake exhaust cfm up to 450 cfm.

► Indoor Blower Fan Speed Controller

Indoor blower fan speed is variable depending on compressor speed and capacity.

OPTIONAL CONTROLS

► Condensate Float Switch

Factory installed in the outdoor drain pan and will turn the unit off if the pan is not draining properly.

OTHER OPTIONS

► Condensate Pans and Freeze Protection

To prevent freezing of water in the condensate lines and in the drain pans, this kit should be installed in locales subject to freezing temperatures. The kit includes a heater for the outdoor condensate pan.

► Anti-Microbial Light

A germicidal UV light destroys toxic bacteria, viruses and mold on the indoor air coil.

► Cold Plasma Air Purification Device

Installed inside the Scholar V unit, this device neutralizes odors, kills mold, bacteria and viruses. It also helps to control allergens*, asthma*, smoke and airborne particles.

► MERV 13 Return Air Filters

Factory installed two inch (51 cm) MERV 13 filters. Ultra high filtration material that removes most airborne mold, spores and dust. Replaces standard MERV 7 return air filters.

► Protective Coil Coating Packages

The Scholar V is available with corrosion protection coatings for the condenser and evaporator coils.

*These statements are based on customer testimonials and have not been evaluated by the FDA.

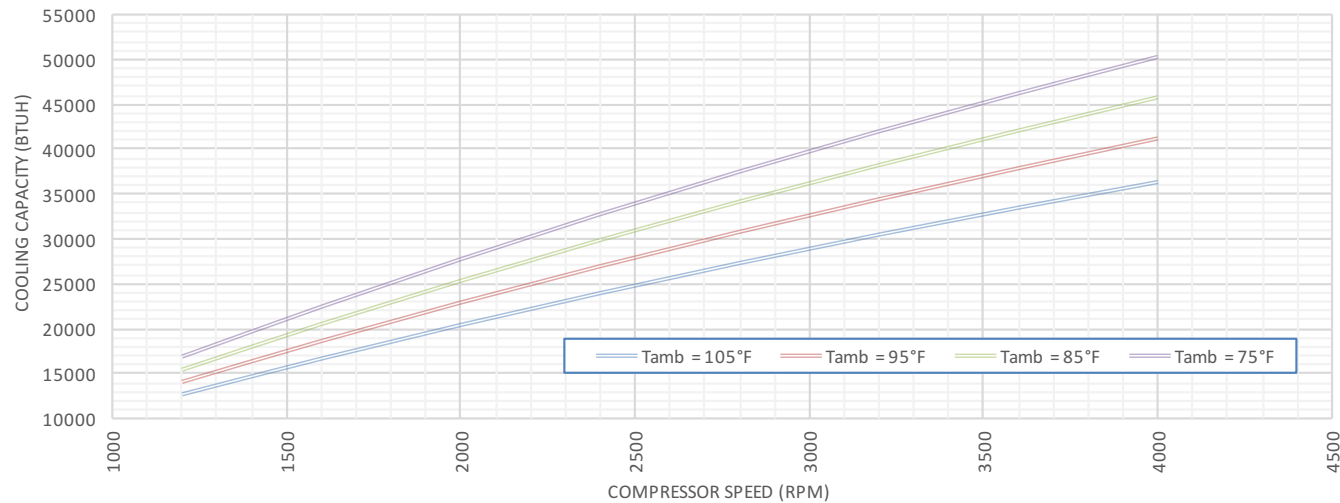


Cold Plasma Air Purifier

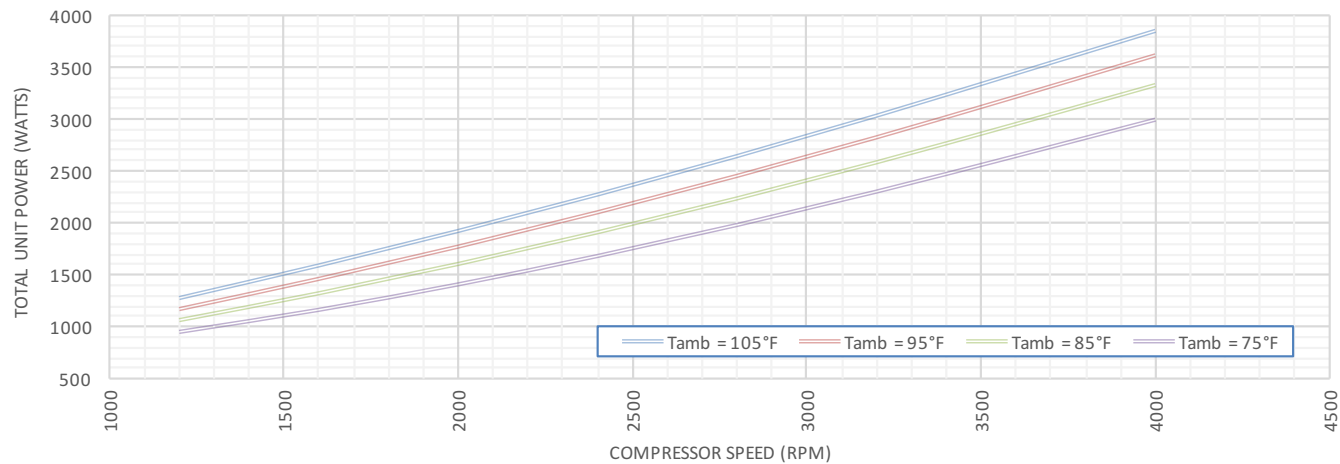
MODEL IDENTIFICATION

VAI	V	A	•	•	•	•	•	•	V	•
Vertical Air Indoor Source	Variable Compressor	Nominal Cooling 36 = 14,000 - 42,000 BTUH 60 = 24,000 - 60,000 BTUH	Refrigerant R-410A	System Type HP = Heat Pump	Power Supply A = 208/230V, 1,60Hz C = 208/230V, 3,60Hz D = 460V, 3,60Hz	Heat – kW 000 = No Heat 050 = 5 kW 075 = 7.5 kW 100 = 10 kW 150 = 15 kW	Configuration N = Manual Damper (std) B = Motorized Damper J = PowerVent w/Motorized Damper Q = GreenCube® ERV H = GreenWheel® ERV	Configuration V = Scholar V	Special Options G = Hot Gas Reheat/Dehumidification	Cabinet Color 100 = Beige 200 = Gray

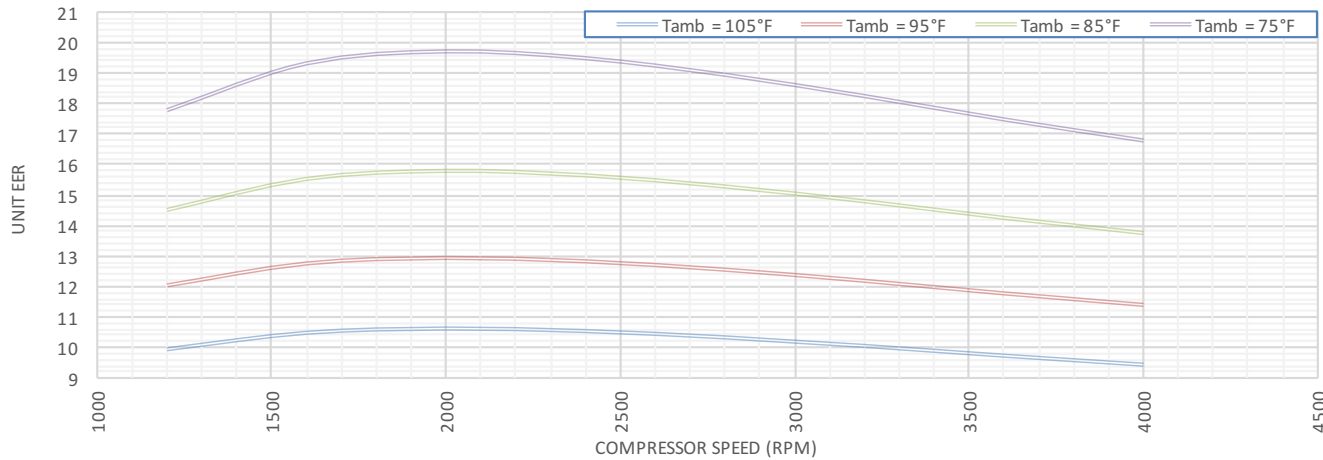
VAIVA36 Heat Pumps: Preliminary Efficiency and Capacity Ratings:
Capacity (BTUH) vs. Compressor Speed (Cooling, Sensible Heat Ratio of .7, ARI of 80°/67°)*



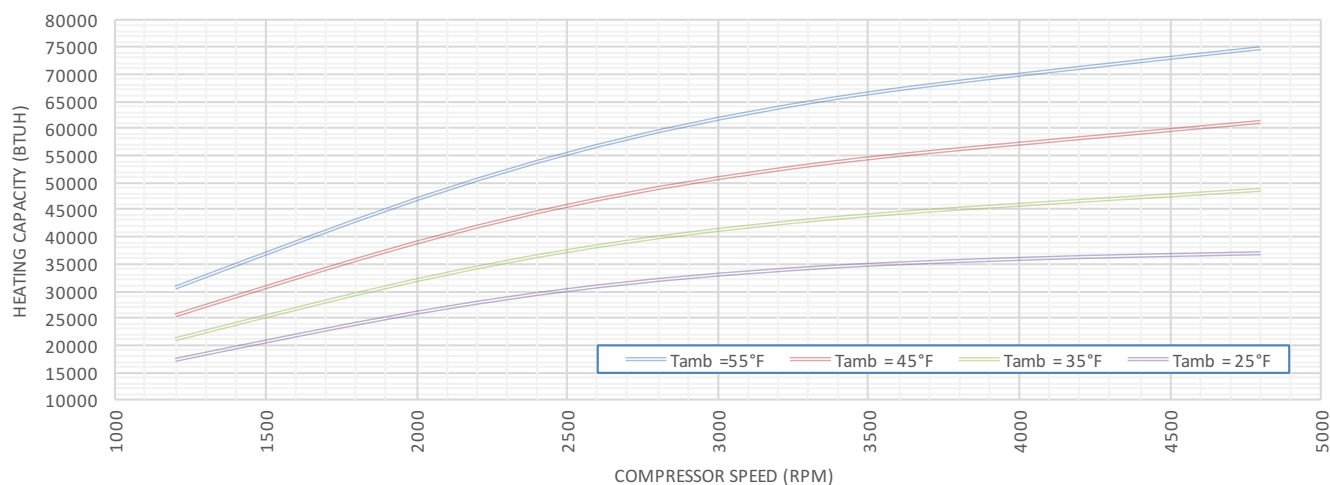
VAIVA36 Heat Pumps: Preliminary Efficiency and Capacity Ratings:
Total Unit Power vs. Compressor Speed (Cooling, ARI of 80°/67°)*



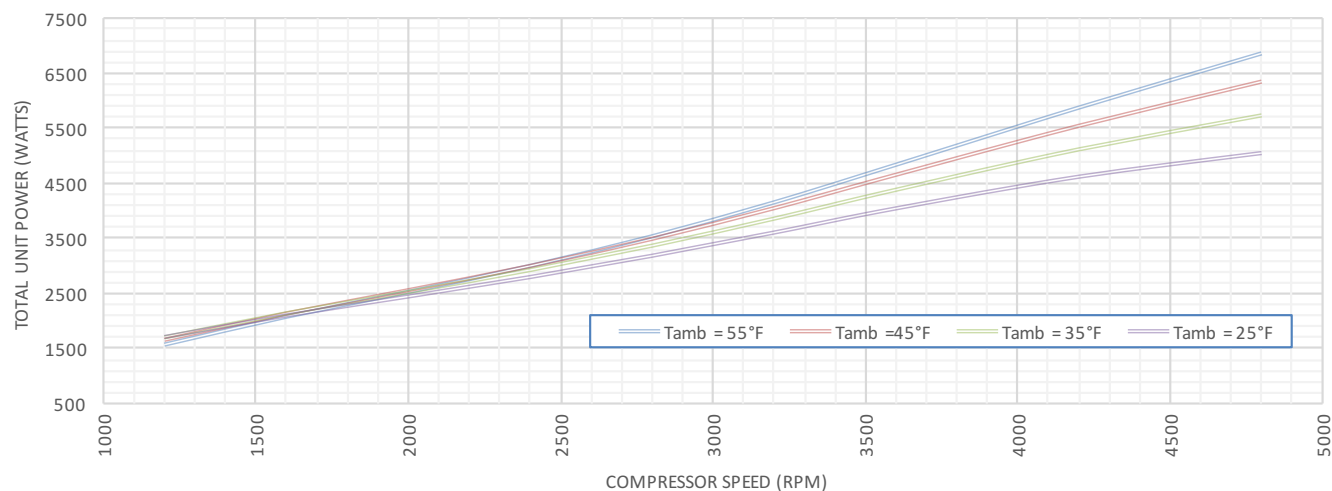
VAIVA36 Heat Pumps: Preliminary Efficiency and Capacity Ratings:
Energy Efficiency Ratio (EER) vs. Compressor Speed (Cooling, ARI of 80°/67°)*



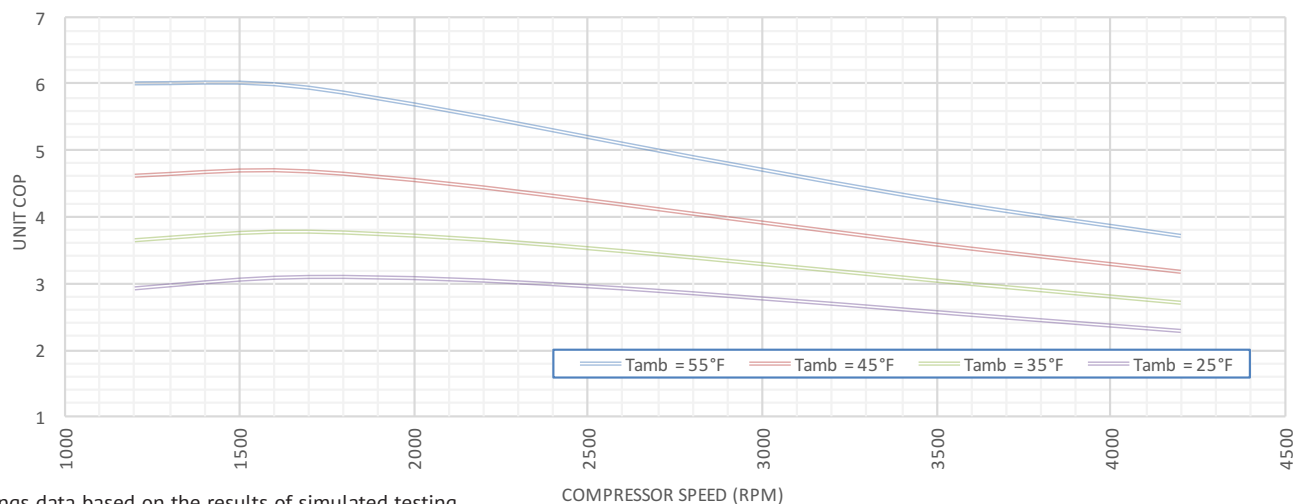
VAIVA36 Heat Pumps: Preliminary Efficiency and Capacity Ratings: Capacity (BTUH) vs. Compressor Speed (Heating @ 70° Room Temperature)*



VAIVA36 Heat Pumps: Preliminary Efficiency and Capacity Ratings: Total Unit Power vs. Compressor Speed (Heating @ 70° Room Temperature)*

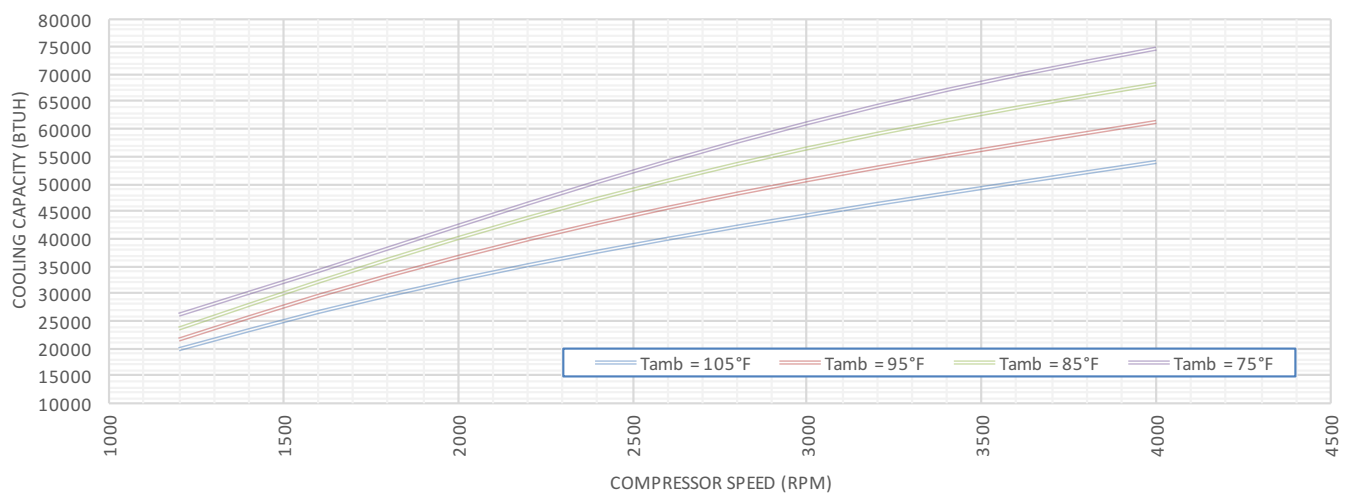


VAIVA36 Heat Pumps: Preliminary Efficiency and Capacity Ratings: Coefficient of Performance (COP) vs. Compressor Speed (Heating @ 70° Room Temperature)*

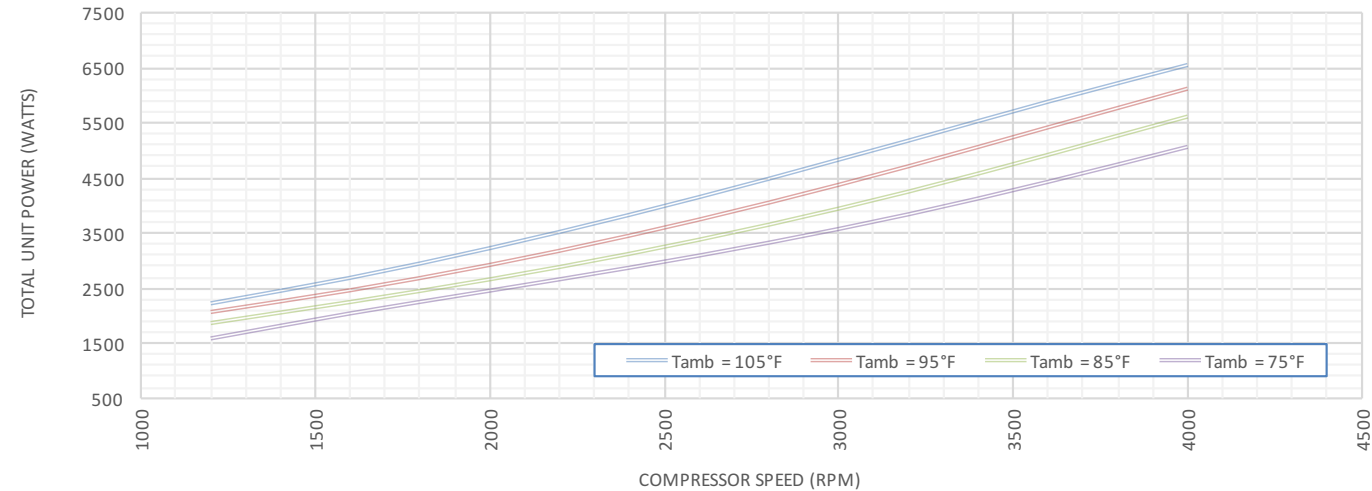


*Ratings data based on the results of simulated testing.

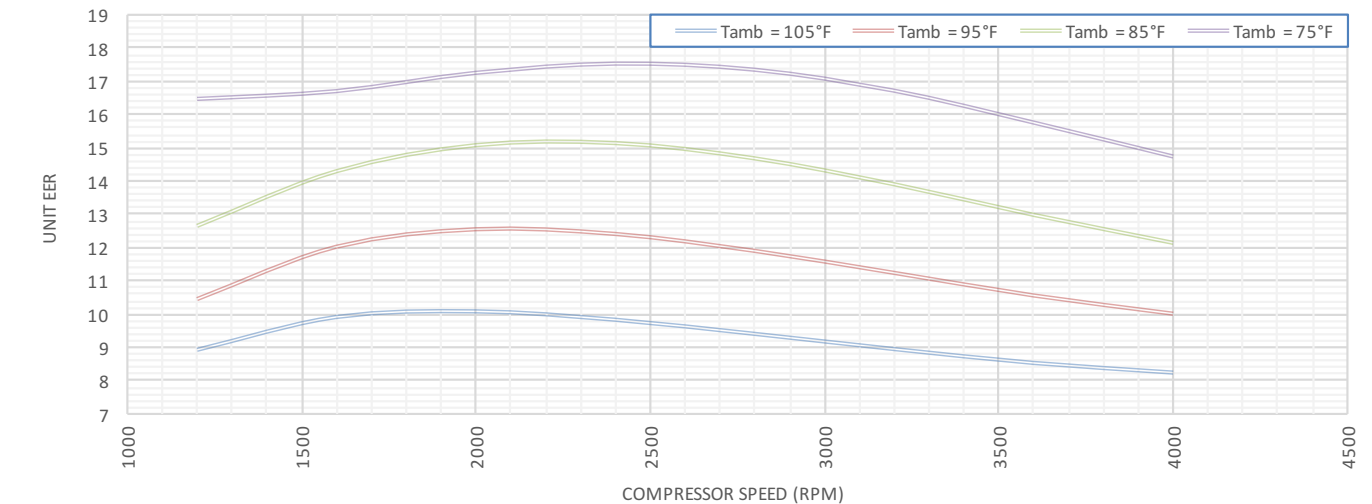
VAIVA60 Heat Pumps: Preliminary Efficiency and Capacity Ratings:
Capacity (BTUH) vs. Compressor Speed (Cooling, Sensible Heat Ratio of .7, ARI of 80°/67°)*



VAIVA60 Heat Pumps: Preliminary Efficiency and Capacity Ratings:
Total Unit Power vs. Compressor Speed (Cooling, ARI of 80°/67°)*



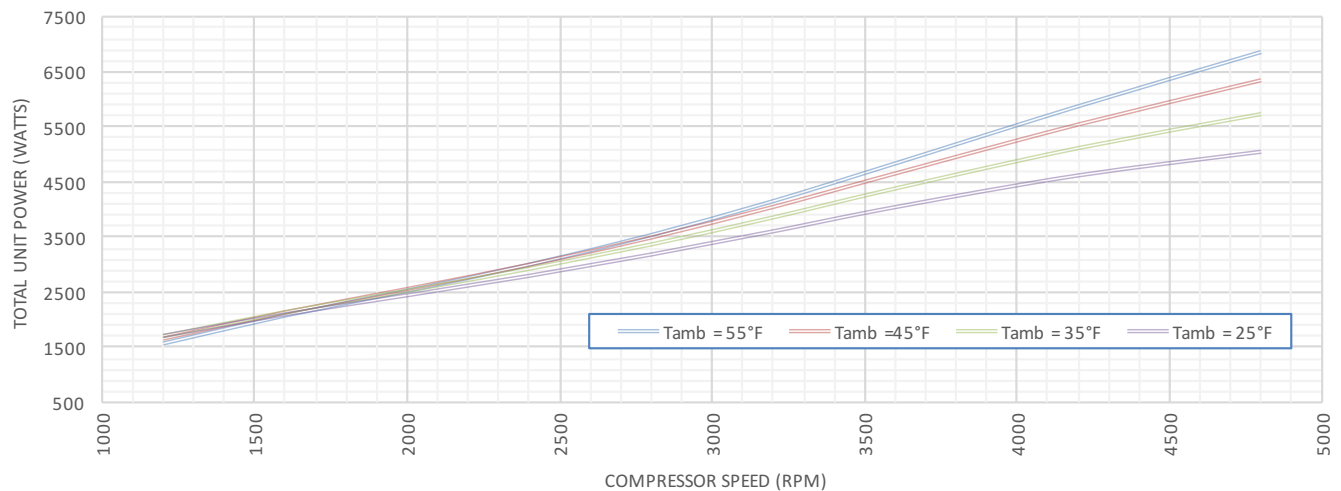
VAIVA60 Heat Pumps: Preliminary Efficiency and Capacity Ratings:
Energy Efficiency Ratio (EER) vs. Compressor Speed (Cooling, ARI of 80°/67°)*



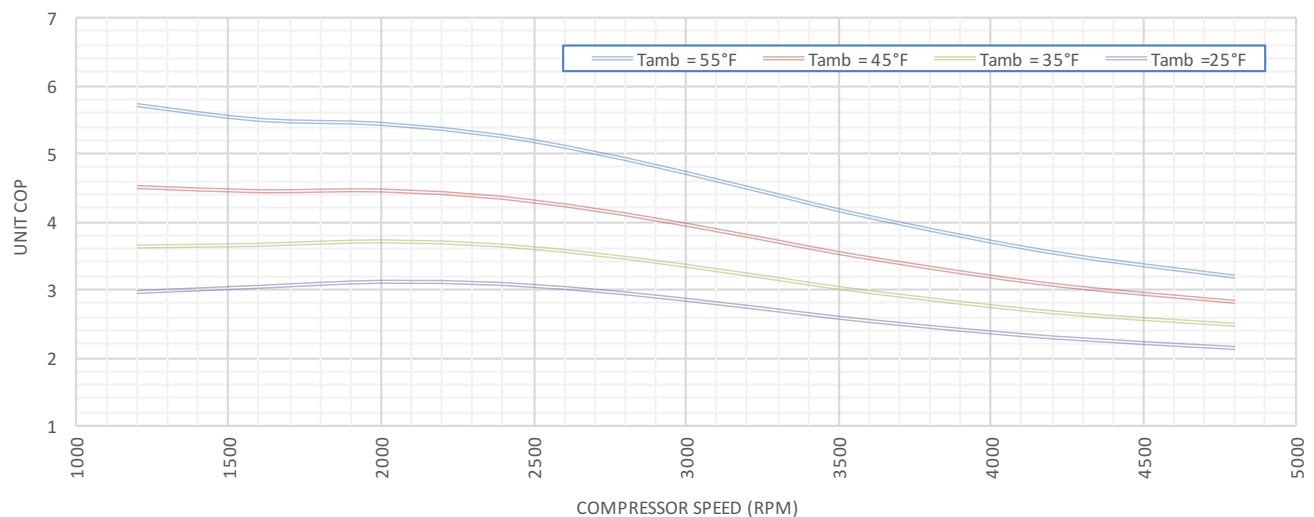
VAIVA60 Heat Pumps: Preliminary Efficiency and Capacity Ratings: Capacity (BTUH) vs. Compressor Speed (Heating @ 70° Room Temperature)*



VAIVA60 Heat Pumps: Preliminary Efficiency and Capacity Ratings: Total Unit Power vs. Compressor Speed (Heating @ 70° Room Temperature)*

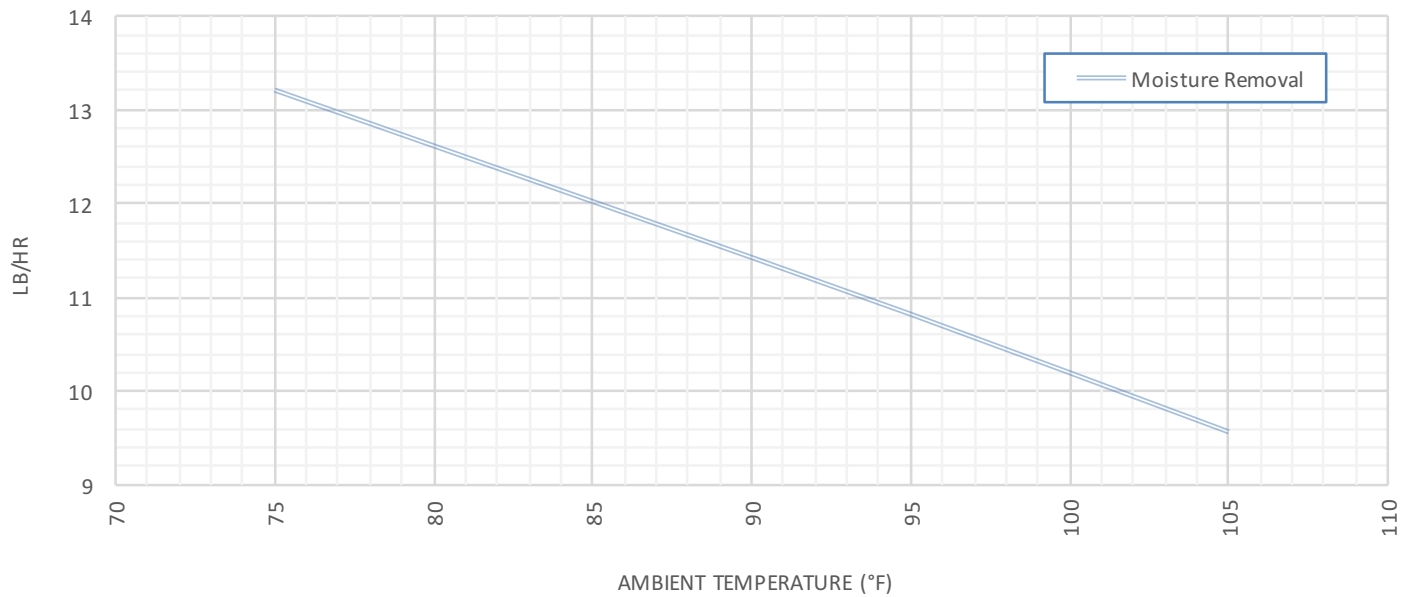


VAIVA60 Heat Pumps: Preliminary Efficiency and Capacity Ratings: Coefficient of Performance (COP) vs. Compressor Speed (Heating @ 70° Room Temperature)*

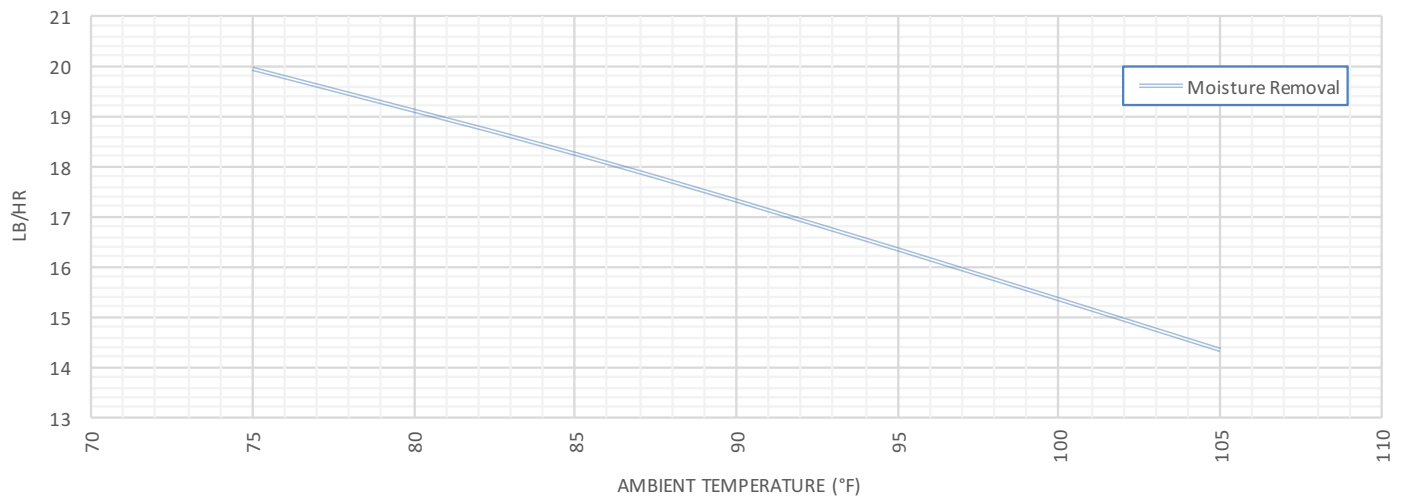


*Ratings data based on the results of simulated testing.

VAIVA36 Heat Pumps: Preliminary Efficiency and Capacity Ratings: Dehumidification Performance*



VAIVA60 Heat Pumps: Preliminary Efficiency and Capacity Ratings: Dehumidification Performance*



*Ratings data based on the results of simulated testing.

Certified Efficiency and Capacity Ratings at ANSI/ARI Standard 390 VAIVA Heat Pumps



Model Number	VAIVA36			VAIVA60		
	HPA	HPC	HPD	HPA	HPC	HPD
Cooling BTUH Full Rating Point ¹	32,600	32,600	32,600	50,000	50,000	50,000
EER - Full Rating Point ¹	10	10	10	9.50	9.50	9.50
Heating BTUH, High Temp Heating ²	30,000	30,000	30,000	49,000	49,000	49,000
High Temp COP ²	3	3	3	3	3	3

¹Cooling is rated at 95°F (35°C) outdoor and 80°F DB/67°F WB (26.5°C DB/19.5°C WB) return air.

²High Temperature Heating & COP are rated at 47°F DB/43°WB (8.3°C DB/6.1°C WB) outdoor and 70°F (21.1°C) return air.

Electrical Characteristics - Compressor, Fan, Ventilation & Blower Motors - VAIVA Heat Pumps

Model Number	COMPRESSOR			OTHER MOTORS		OUTDOOR FAN			INDOOR BLOWER (ECM)			ENERGY RECOVERY VENTILATORS				
	VOLTS / HZ / PH	RLA ¹	LRA ²	VOLTS / HZ / PH	QTY	RPM ³	FLA ⁴	HP ⁵	RPM ³	FLA ⁴	HP ⁵	GREENWHEEL®			GREENCUBE™	
												AMPS			AMPS	
												OAM ⁶	EXM ⁷	WD ⁸	OAM ⁶	EXM ⁷
VAIVA36HPA	208/230-60-1	15.2	83.0	208/230-60-1	1	1030	1.4	1/3	1500	2.8	1/2	1.0	0.4	0.2	3.2	0.4
VAIVA60HPA	208/230-60-1	27.1	152.9	208/230-60-1	2	1500	2.8	1/2	1500	4.3	3/4	1.0	0.4	0.2	3.2	0.4
VAIVA36HPC	208/230-60-3	11.6	73.0	208/230-60-1	1	1030	1.4	1/3	1500	2.8	1/2	1.0	0.4	0.2	3.2	0.4
VAIVA60HPC	208/230-60-3	16.5	110.0	208/230-60-1	2	1500	2.8	1/2	1500	4.3	3/4	1.0	0.4	0.2	3.2	0.4
VAIVA36HPD	460-60-3	5.7	38.0	208/230-60-1	1	1030	1.4	1/3	1500	2.8	1/2	1.0	0.4	0.2	3.2	0.4
VAIVA60HPD	460-60-3	7.2	52.0	208/230-60-1	2	1500	2.8	1/2	1500	4.3	3/4	1.0	0.4	0.2	3.2	0.4

¹RLA = Rated Load Amps ²LRA = Locked Rotor Amps ³RPM = Revolutions per Minute ⁴FLA = Full Load Amps
⁵HP = Horsepower ⁶OAM - Outside Air Motor ⁷EXM-Exhaust Air Motor ⁸WD-Wheel Drive Motor
 The 460 volt units have a step down transformer for the 230 volt motors. Always verify electrical characteristics before beginning construction.

Summary Electrical Ratings (Wire and Circuit Breaker Sizing) - VAIVA Heat Pumps with Ventilation Configurations - Manual Damper, up to 15% Outside Air ("N") Motorized Damper, up to 450 CFM of Outside Air with Pressure Relief ("B")

ELECTRIC HEAT		000 = None		050 = 5 kw		075 = 7.5 kw		100 = 10 kw		150 = 15 kw	
BASIC MODEL	VOLTAGE Ph-Hz	SPPE ³		SPPE ³		SPPE ³		SPPE ³		SPPE ³	
		MCA ¹	MFS ²	MCA ¹	MFS ²	MCA ¹	MFS ²	MCA ¹	MFS ²	MCA ¹	MFS ²
VAIVA36HPA	208/230-1-60	24.2	35	50.2	60	60.6	70	76.3	80		
VAIVA60HPA	208/230-1-60	44.8	60	70.8	80	81.2	90	96.9	100		
VAIVA36HPC	208/230-3-60	19.7	30	34.7	35	42.2	45	49.8	50	64.8	70
VAIVA60HPC	208/230-3-60	31.5	45	46.5	50	54.0	60	61.6	70	76.6	80
VAIVA36HPD	460-3-60	9.7	15	17.2	20	21.0	25	24.7	25	32.2	35
VAIVA60HPD	460-3-60	14.5	20	22.0	25	25.8	30	29.5	30	37.0	40

¹MCA = Minimum Circuit Ampacity (Wiring Size Amps) ²MFS = Maximum Fuse or HACR Breaker Size ³SPPE = Single Point Power Entry
 MCA & MFS are calculated at 230 volts on the 208-230v. (HPA & HPC) models. The 460 volts HPD models are calculated at 460 volts. This chart should only be used as a guideline for estimating conductor size and overcurrent protection. For the requirements of specific units, always refer to the data label on the unit.

Summary Electrical Ratings (Wire and Circuit Breaker Sizing) - VAIVA Heat Pumps with Ventilation Configuration - PowerVent with Motorized Damper & up to 450 CFM of Outside Air with Pressure Relief ("J")

ELECTRIC HEAT		000 = None		050 = 5 kw		075 = 7.5 kw		100 = 10 kw		150 = 15 kw	
BASIC MODEL	VOLTAGE Ph-Hz	SPPE ³		SPPE ³		SPPE ³		SPPE ³		SPPE ³	
		MCA ¹	MFS ²	MCA ¹	MFS ²	MCA ¹	MFS ²	MCA ¹	MFS ²	MCA ¹	MFS ²
VAIVA36HPA	208/230-1-60	24.6	40	50.6	60	61.0	70	76.7	80		
VAIVA60HPA	208/230-1-60	45.2	60	71.2	80	81.6	90	97.3	100		
VAIVA36HPC	208/230-3-60	20.1	30	35.1	40	42.6	45	50.2	60	65.2	70
VAIVA60HPC	208/230-3-60	31.9	45	46.9	50	54.4	60	62.0	70	77.0	80
VAIVA36HPD	460-3-60	9.9	15	17.4	20	21.2	25	24.9	25	32.4	35
VAIVA60HPD	460-3-60	14.7	20	22.2	25	26.0	30	29.7	30	37.2	40

¹MCA = Minimum Circuit Ampacity (Wiring Size Amps) ²MFS = Maximum Fuse or HACR Breaker Size ³SPPE = Single Point Power Entry
 MCA & MFS are calculated at 230 volts on the 208-230v. (HPA & HPC) models. The 460 volts HPD models are calculated at 460 volts. This chart should only be used as a guideline for estimating conductor size and overcurrent protection. For the requirements of specific units, always refer to the data label on the unit.

Summary Electrical Ratings (Wire and Circuit Breaker Sizing) - VAIVA Heat Pumps with Ventilation Configuration - GreenCube® Energy Recovery Ventilator ("Q")

ELECTRIC HEAT		000 = None		050 = 5 kw		075 = 7.5 kw		100 = 10 kw		150 = 15 kw	
BASIC MODEL	VOLTAGE Ph-Hz	SPPE ³		SPPE ³		SPPE ³		SPPE ³		SPPE ³	
		MCA ¹	MFS ²	MCA ¹	MFS ²	MCA ¹	MFS ²	MCA ¹	MFS ²	MCA ¹	MFS ²
VAIVA36HPA	208/230-1-60	26.8	40	52.8	60	63.2	70	78.9	80		
VAIVA60HPA	208/230-1-60	47.4	60	73.4	80	83.8	90	99.5	100		
VAIVA36HPC	208/230-3-60	22.3	30	37.3	40	44.8	45	52.4	60	67.4	70
VAIVA60HPC	208/230-3-60	34.1	50	49.1	50	56.6	60	64.2	70	79.2	80
VAIVA36HPD	460-3-60	11.0	15	18.5	20	22.3	25	26.0	30	33.5	35
VAIVA60HPD	460-3-60	15.8	20	23.3	25	27.1	30	30.8	40	38.3	40

¹MCA = Minimum Circuit Ampacity (Wiring Size Amps) ²MFS = Maximum Fuse or HACR Breaker Size ³SPPE = Single Point Power Entry
 MCA & MFS are calculated at 230 volts on the 208-230v. (HPA & HPC) models. The 460 volts HPD models are calculated at 460 volts. This chart should only be used as a guideline for estimating conductor size and overcurrent protection. For the requirements of specific units, always refer to the data label on the unit.

Summary Electrical Ratings (Wire and Circuit Breaker Sizing) – VAIVA Heat Pumps with Ventilation Configuration - GreenWheel® Energy Recovery Ventilator (“H”)

ELECTRIC HEAT		000 = None		050 = 5 kw		075 = 7.5 kw		100 = 10 kw		150 = 15 kw	
BASIC MODEL	VOLTAGE Ph-Hz	SPPE ³		SPPE ³		SPPE ³		SPPE ³		SPPE ³	
		MCA ¹	MFS ²	MCA ¹	MFS ²	MCA ¹	MFS ²	MCA ¹	MFS ²	MCA ¹	MFS ²
VAIVA36HPA	208/230-1-60	24.8	40	50.8	60	61.2	70	76.9	80		
VAIVA60HPA	208/230-1-60	45.4	60	71.4	80	81.8	90	97.5	100		
VAIVA36HPC	208/230-3-60	20.3	30	35.3	40	42.8	45	50.4	60	65.4	70
VAIVA60HPC	208/230-3-60	32.1	45	47.1	50	54.6	60	62.2	70	77.2	80
VAIVA36HPD	460-3-60	10.0	15	17.5	20	21.3	25	25.0	25	32.5	35
VAIVA60HPD	460-3-60	14.8	20	22.3	25	26.1	30	29.8	30	37.3	40

¹MCA = Minimum Circuit Ampacity (Wiring Size Amps) ²MFS = Maximum Fuse or HACR Breaker Size ³SPPE = Single Point Power Entry
MCA & MFS are calculated at 230 volts on the 208-230v. (HPA & HPC) models. The 460 volts HPD models are calculated at 460 volts. This chart should only be used as a guideline for estimating conductor size and overcurrent protection. For the requirements of specific units, always refer to the data label on the unit.

Unit Load Amps (Heating) - VAIVA Heat Pumps

Electric Heat		Heat Pump¹ (Amps)				Load of Resistive Heating Elements Only (Amps)				Total Maximum Heating Amps² (Electric Heat is on a Separate Circuit)															
Basic Model	Voltage Ph-Hz	Config. B & N	Power Vent J	Green Wheel H	Green Cube Q					Config. (B) & (N)				Power Vent (J)				GreenWheel® ERV (H)				GreenCube™ ERV (Q)			
						Heating Element (kW)				Heating Element (kW)				Heating Element (kW)				Heating Element (kW)				Heating Element (kW)			
						5	7.5	10	15	5	7.5	10	15	5	7.5	10	15	5	7.5	10	15	5	7.5	10	15
VAIVA36HPA	208-230/1/60	21.8	22.2	22.4	24.4	20.8	31.3	41.7		42.6	53.1	63.5		43.0	53.5	63.9		43.2	53.7	64.1		45.2	55.7	66.1	
VAIVA60HPA	208-230/1/60	36.5	36.9	37.1	39.1	20.8	31.3	41.7		57.3	67.8	78.2		57.7	68.2	78.6		57.9	68.4	78.8		59.9	70.4	80.8	
VAIVA36HPC	208-230/3/60	16.3	16.7	16.9	18.9	12.0	18.0	24.1	36.1	28.3	34.3	40.4	52.4	28.7	34.7	40.8	52.8	28.9	34.9	41.0	53.0	30.9	36.9	43.0	55.0
VAIVA60HPC	208-230/3/60	28.5	28.9	29.1	31.1	12.0	18.0	24.1	36.1	40.5	46.5	52.6	64.6	40.9	46.9	53.0	65.0	41.1	47.1	53.2	65.2	43.1	49.1	55.2	67.2
VAIVA36HPD	460/3/60	7.1	7.3	7.4	8.4	6.0	9.0	12.0	18.0	13.1	16.1	19.1	25.1	13.3	16.3	19.3	25.3	13.4	16.4	19.4	25.4	14.4	17.4	20.4	26.4
VAIVA60HPD	460/3/60	14.5	14.7	14.8	15.8	6.0	9.0	12.0	18.0	20.5	23.5	26.5	32.5	20.7	23.7	26.7	32.7	20.8	23.8	26.8	32.8	21.8	24.8	27.8	33.8

¹Heat Pump = Total Heat Pump Unit Amps (Electric Heat is not Operating).

²Total Maximum Heating Amps = Total Amps with the Compressor, Motors and Electric Heat Operating at the same time.

Heating kW is rated at 240 volts on the 208-230v. (HPA & HPC) models. Derate heater output by 25% for operation at 208 volts. Heating kW is rated at 480 volts on the HPD models. Three phase models contain single phase motor loads. Values shown are maximum phase loads. Loads are not equally balanced on each phase.

Electrical Characteristics - Ventilation Motors

Ventilation Configuration	Ventilation Designator	Exhaust Air Motor (EXM)				Outdoor Air Motor (OAM)				Wheel Drive Motor			
		Volts	Hz/Ph	FLA ¹	HP	Volts	Hz/Ph	FLA	HP	Volts	Hz/Ph	FLA	HP
Manual Damper (Standard)	N	n/a	n/a	n/a	n/a	230	60/1	1.0	0.17	n/a	n/a	n/a	n/a
Motorized Damper	B	n/a	n/a	n/a	n/a	230	60/1	1.0	0.17	n/a	n/a	n/a	n/a
PowerVent with Motorized Damper	J	230	60/1	0.4	0.12	230	60/1	1.0	0.17	n/a	n/a	n/a	n/a
GreenCube™ ERV	Q	230	60/1	0.4	0.12	230	60/1	3.2	1/2	n/a	n/a	n/a	n/a
GreenWheel® ERV	H	230	60/1	0.4	0.12	230	60/1	1.0	0.17	230	60/1	0.2	0.01

¹FLA = Full Load Amps Hz/Ph = Hertz (Frequency)/Number of Phases

Electric Heat Table - Heat Pumps

OUTPUT	HEATER KW			
	5	7.5	10	15
240 VOLT (BTUH)	16,380	24,500	32,670	49,150
208 VOLT (BTUH)	12,290	18,420	24,570	36,860
480 VOLT (BTUH)	17,070	25,600	34,130	51,200

Electric heaters are field installed.

Shipping Weight (pounds)

BASIC MODEL	36	60
VOLTAGE - 230	1020	1060
VOLTAGE - 460	1045	1085

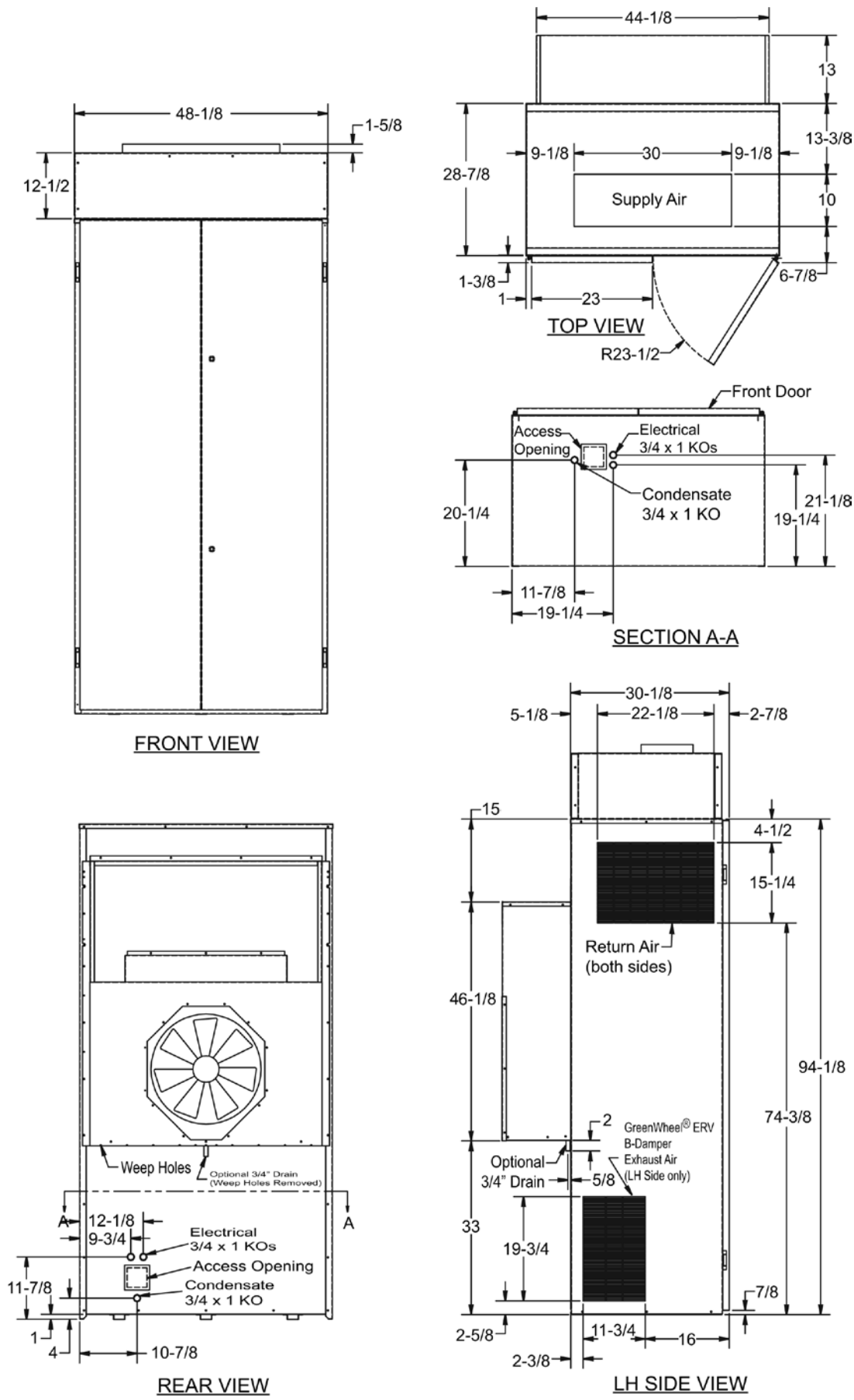
Air Filters

	Qty per unit	Size	Type	MERV ¹ Rating
Return Air Filter	2	46" x 24" x 2"	Pleated, disposable	7 ²
Fresh Air Ventilation Filter	1	12" x 20" x 1"	Fiberglass, disposable	N/A
Exhaust Air Ventilation Filter	1	12" x 20" x 1"	Fiberglass, disposable	N/A

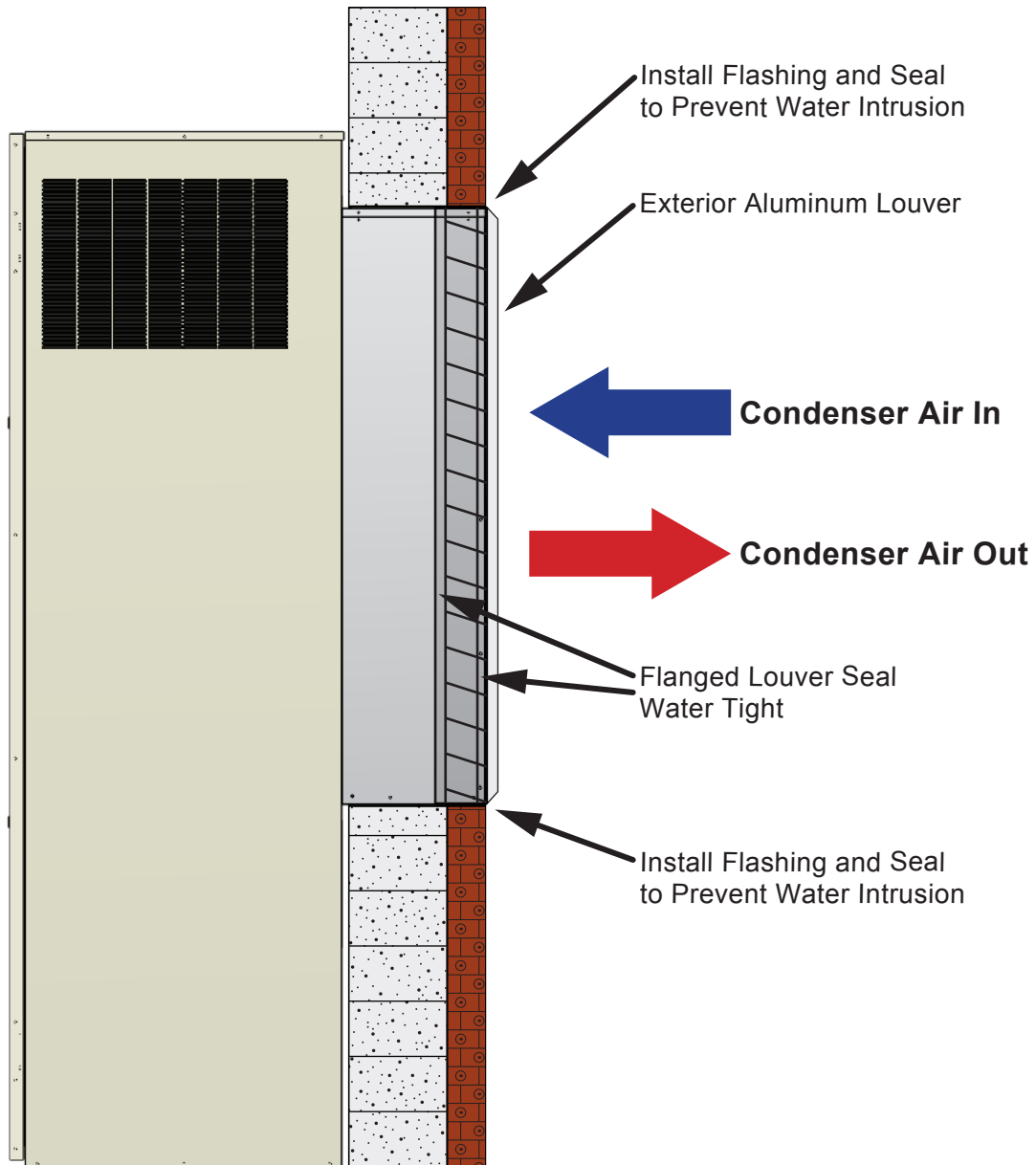
¹MERV = Minimum Efficiency Reporting Value

²Standard return air filter has MERV rating of 7. Optional filters are available with MERV ratings of 8 and 13.

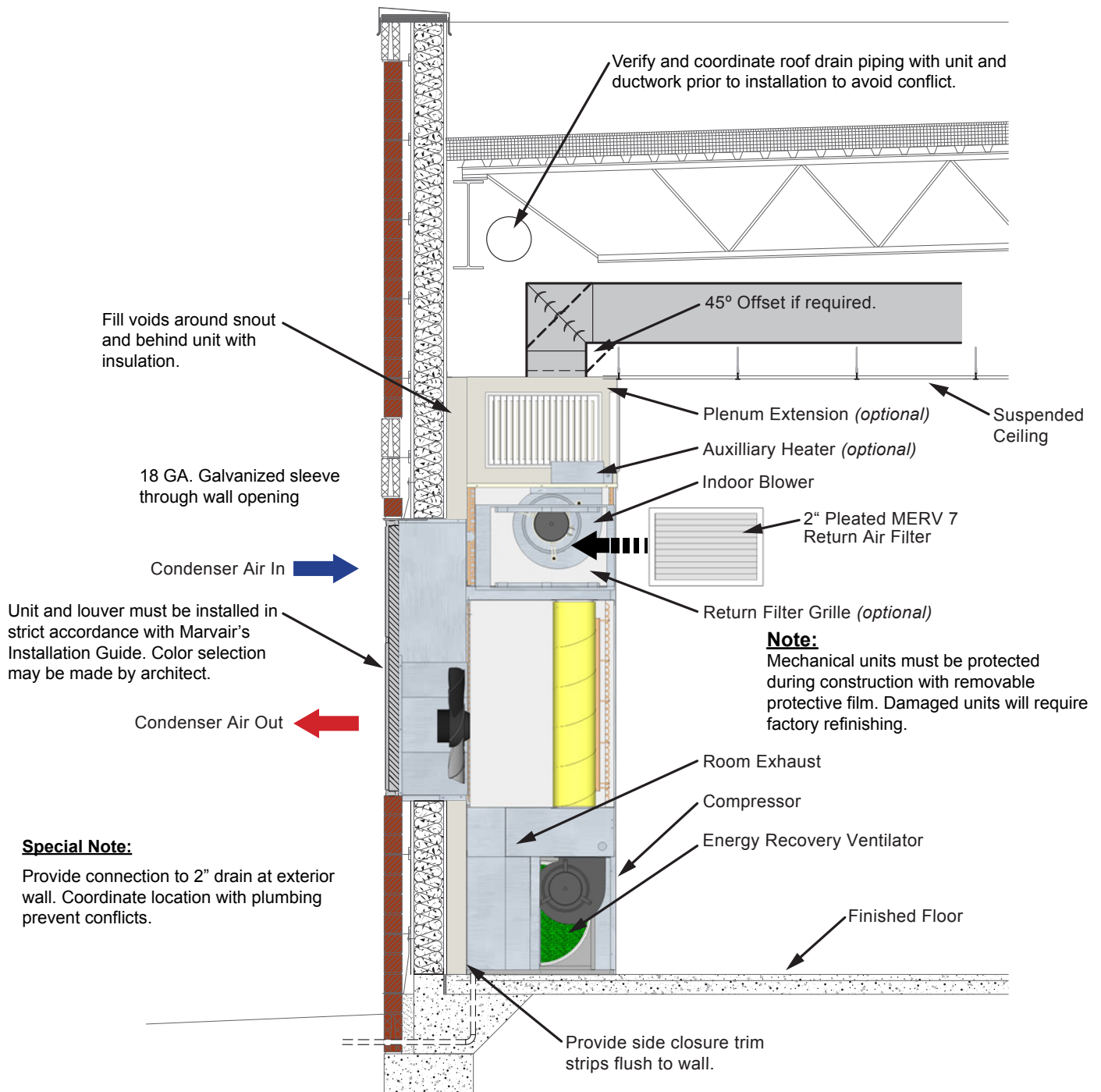
Dimensional Data for VAIVA36-60 (in inches)



WALL MOUNTED LOUVER DETAIL



TYPICAL INSTALLATION DETAIL



Note:

1. Coordinate installation of unit with general contractor for a complete and airtight installation. Caulk unit casing to wall.
2. Installation of the louver must be performed by the mechanical contractor and caulked by the general contractor
3. Provide blank off panel on rear of louver to seal off unused portion of louver.



Please consult the Marvair® website at www.marvair.com for the latest product literature. Detailed dimensional data is available upon request. A complete warranty statement can be found in each product's Installation/Operation Manual, on our website or by contacting Marvair at 229-273-3636. As part of the Marvair continuous improvement program, specifications are subject to change without notice.



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