Product Catalog

Water Source Heat Pump
Axiom™ Variable Speed – VSH/VSV

24 to 60 MBtuh – 60 Hz

November 2025

WSHP-PRC041A-EN

Introduction

Imagine a product that delivers superior comfort and performance while reducing operating cost. The Axiom™ Variable Speed model is Trane's most advanced water source comfort solution designed to meet these requirements. Trane achieves higher efficiency, reduced sound, improved indoor air quality and high reliability through variable speed compressor and fan technology.

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Table of Contents

Features and Benefits

System Advantages

Acoustics

Variable speed units have an insulated enclosure for quiet design. Variable speed fan and compressor reduce sound levels at lower load conditions. The advanced Vortica™ fan system uses less energy to produce more airflow with minimal sound. The platform provides double isolation to the compressor and single isolation to the co-axial water coil for additional attenuation during compressor start and stop.

Comfort

Variable speed compressor varies the capacity of the unit to more closely match the load requirements in the zone than a cycling compressor, improving occupant comfort. ECM motor varies supply airflow for improved dehumidification at part load conditions compared to a constant speed fan.

Flexibility

Units support both boiler/cooling tower and ground source heat exchanger applications. There is supply and return airflow configuration flexibility and adjustable supply minimum and maximum airflow settings.

Higher Efficiency

The efficiency increases as the system unloads with EER values up to 40 (ground loop) at part-load operation. The variable speed unit is ANSI/AHRI/ASHRAE/ISO13256-1 certified performance while exceeding ASHRAE 90.1 standards for efficiency.

The variable speed unit contains the best compressor technology available to achieve the highest possible performance. The motor speed is varied through an inverter board. The compressors are outstanding for humidity control and light load cooling and heating conditions.

Indoor Air Quality

Panels must be insulated with either:

- 1/2-inch thick, dual density bonded glass fiber
- 1/2-inch thick, foil-faced glass fiber

Foil-faced insulation edges are encapsulated to prevent glass fibers from entering the air stream. The glass fibre insulations have:

- Flame spread rating of 25 or less
- Smoke developed rating of 50 or less (per ASTM E-84 and UL 723 standards)

The dual density insulation has a minimum rated service air velocity of 3600 feet per minute (FPM) and meets the UL 181 erosion requirements.

The drain pan is composed of a stainless steel material to reduce microbial growth.

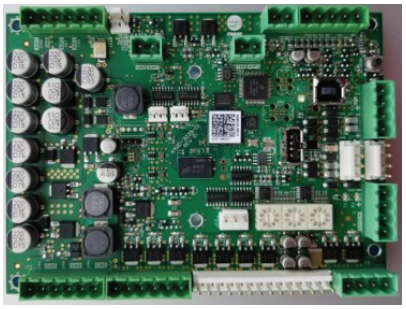
A variety of filter options are available to meet most application requirements. The units are equipped with a disposable 1-inch thick fiberglass filter as standard. Disposable 2-inch thick filters and 2-inch thick MERV 8 or MERV 13 filters are available as an option and 4-inch thick MERV 8 or MERV 13 filters are available as accessories. These filters include an average synthetic dust

weight tolerance of approximately 75%. This dust holding capability includes a colorless, odorless adhesive to retain dirt particles within the filter media after fiber contact.

Integrated Controls

The Trane model VS comes standard with the Symbio™ 400-B controller. The controller is a programmable, micro-processor based, direct digital controller (DDC) integral to the unit. It provides unit control for heating and cooling. The Symbio 400-B is capable of a standalone application or for simple integration into building automation systems which communicate via the BACnet® protocol.

Figure 1. Symbio 400-B



Leak Detection System

The Leak Detection System (LDS) consists of one or more refrigerant detection sensors and is required in ducted HVAC systems that have more than 3.91 lbs of A2L refrigerant charge, per safety standard UL 60335-2-40. For any units with more than 3.91 lbs of charge in a circuit, an LDS will be factory-installed. Having the leak detector installed in the factory by the manufacturer on applicable units reduces the risk of improper installation in the field as well as bypassing the added cost in the field for installation, leading to peace of mind that the right solution has been applied to your unit.

Reliability

Part-load operation reduces cyclic operation. Fewer on/off cycles reduce stress of the components. Every unit is factory run tested in both cooling and heating cycle. The Symbio™ 400-B controller improves quality and reliability with built in safeties and diagnostics. The controller provides anti-short cycle compressor protection, random start delay, heating/cooling status, occupied/unoccupied mode, filter maintenance timer, compressor status (high/low pressure), drive status (operating or failed), and condensate overflow protection.

Supply Fan Motor - ECM

All variable speed units feature a high-efficiency ECM supply fan motor, which enhances efficiency. The motor is attached to the fan housing using rubber isolators to minimize vibration transmission. It is controlled by the unit controller and varies the airflow in tandem with the compressor speed. Minimum and maximum airflow settings are adjustable. Serviceability to the motor is made through one air-side, side access door.

Supply Fan Motor Housing - ECM

The supply fan housing is constructed of a composite Vortica™ housing.

Accessories

Ducted Filter Rack

A ducted filter rack is available for filter access in a ducted return. This option allows access to the filter at the unit. Vertical unit filter racks are available in right or left access configurations. Horizontal unit filter racks are available in bottom access configurations.

Figure 2. Ducted filter rack

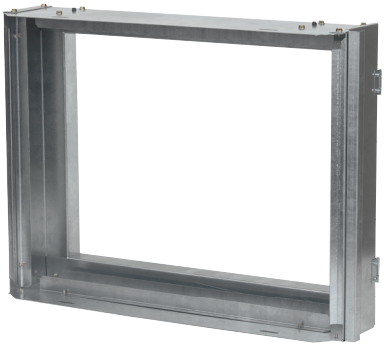


Figure 3. Ducted filter rack – dimensions

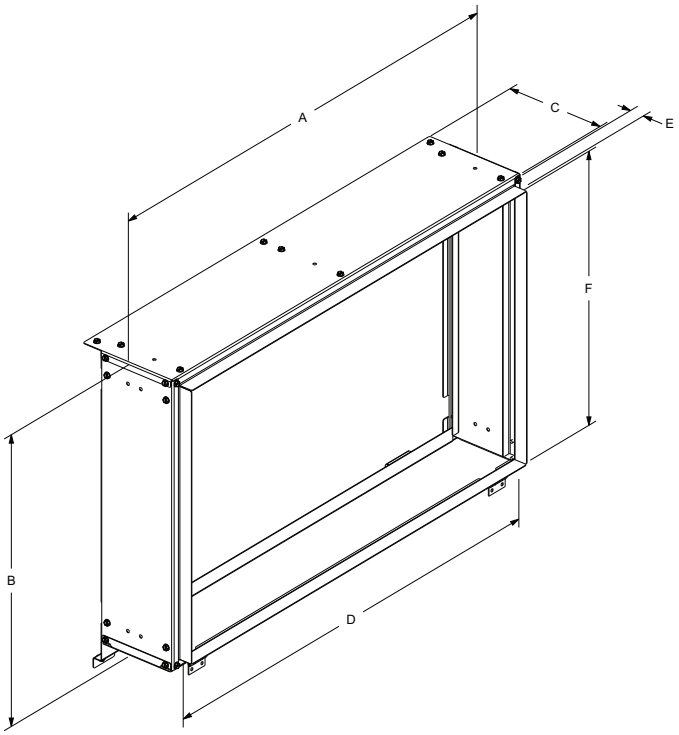


Table 1. Ducted filter rack dimensions

Unit	Filter Size	A	B	C	D	E	F	Part Number
H 042–060	1–2	32–1/4	20	5	31–1/16	1	18–7/8	WSHPFL-T00134
H 042–060	2–4	32–1/4	20	7	31–1/16	1	18–7/8	WSHPFL-T00135

Table 1. Ducted filter rack dimensions (continued)

Unit	Filter Size	A	B	C	D	E	F	Part Number
H 024–033	1–2	21–7/8	20	5	20–3/4	1	18–7/8	WSHPFL-T00130
H 024–033	2–4	21–7/8	20	7	20–3/4	1	18–7/8	WSHPFL-T00131
V 042–060	1–2	30	26–3/4	5	28–3/4	1	25–5/8	WSHPFL-T00065 WSHPFL-T00122
V 042–060	2–4	30	26–3/4	7	28–3/4	1	25–5/8	WSHPFL-T00048 WSHPFL-T00117
V 024–033	1–2	30	26–3/4	5	28–3/4	1	25–5/8	WSHPFL-T00064 WSHPFL-T00121
V 024–033	2–4	30	26–3/4	7	28–3/4	1	25–5/8	WSHPFL-T00047 WSHPFL-T00116

Return Air Ducted Panel

The return-air arrangement may be easily converted from a free return-air system to a ducted return-air system with the addition of a return-air ducted panel. By replacing the filter rail with the return-air panel, a complete seal from the duct to the unit is possible. The 1-inch duct panel facilitates ease of field connection to the mechanical system. This accessory is typically used when the return air filter is placed up stream of the unit or placed within a field provided filter rack assembly.

Figure 4. Ducted panel

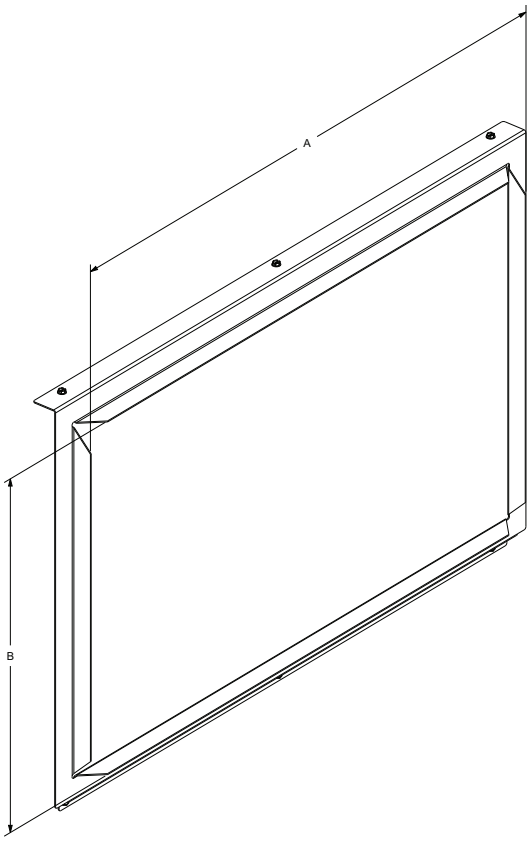


Table 2. Return air ducted panel

Unit	A	B	Part Number
H 042–060	31–3/8 inches	18–15/16 inches	WSHPPND00084
H 024–033	21–3/8 inches	18–5/8 inches	WSHPPND00085
V 042–060	28–3/16 inches	26–3/16 inches	WSHPPND00006
V 024–033	28–3/16 inches	19—1/2inches	WSHPPND00005

System Balancing Hose Kit

Note: *For more information, please refer Hose Kit Accessories Automatic and Manual Balancing Product Catalog (WSHP-PRC025*-EN).*

For automatic system balancing of a water source heat pump, the self-balancing hose kit provides a constant flow rate over the pressure differential range of 2 to 80 psid. As system pressure changes (through further addition of heat pumps, for example) each individual flow control valve will automatically adjust to the new system conditions. In variable water volume applications, a self-balancing hose kit can provide continuous balancing because of its ability to automatically adjust to the varying system conditions.

Note: *At low differential pressure the flow area required to achieve higher flow can exceed the flow area available for the respective series. Therefore, the minimum pressure differential requirement is increased for the higher flow ranges of each series valve.*

Motorized Water Valve (Accessory)

The motorized water valve is installed on the return line of the water loop system between the loop and the pump module loop. This isolation device is less expensive and a very effective alternative to the water regulating valve. A motorized water valve may be applied to each water source heat pump as part of the hose kit accessory.

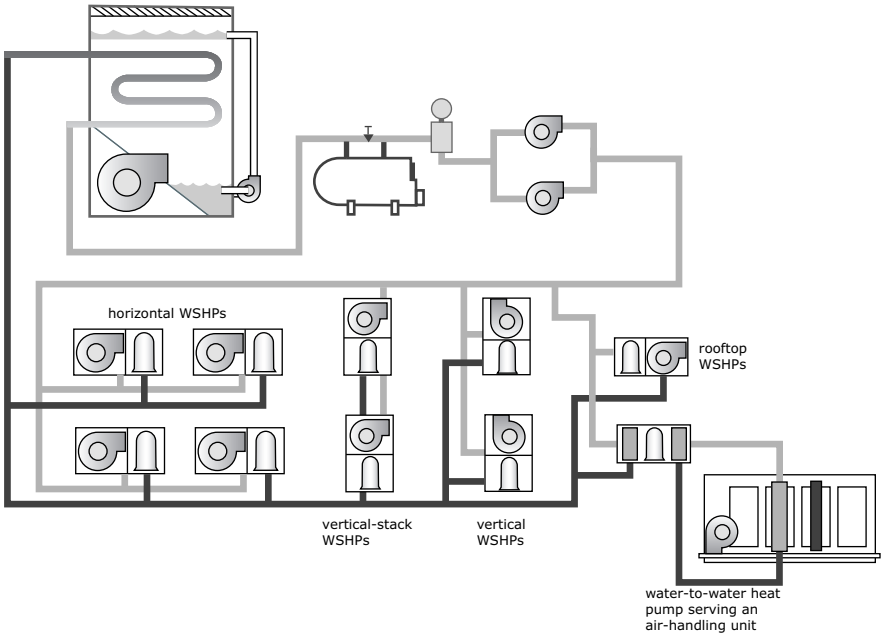
When the compressor begins running, the valve will open, allowing water to flow through the unit. As the compressor shuts down, the valve slowly closes off. The main purpose of the motorized valve is to shut-off the flow of water through the unit when the unit is off, thus reducing water consumption. The motorized valve is fast opening to prevent compressor trip-out, and slow closing to prevent water hammer.

Application Considerations

Water-source heat pump systems are used to provide comfort in a wide range of building types and climates. The system utilizes energy-conserving, heat-recovery capabilities to transfer heat from one area to another to meet individual zone requirements. When used with system design and control strategies, these high-performance systems reduce operating costs for the building owner and improve occupant comfort. For more information on the design and control of these systems, refer *Water-Source and Ground-Source Heat Pump Systems Application Manual* (SYS-APM010*-EN).

Heat pump units are available in many different configurations and the design simplicity can be adapted to suit almost any building plan. The vertical and horizontal water-source heat pump system is versatile for installation in a boiler/cooling tower applications, as well as ground source (geothermal) applications.

Figure 5. Conventional water-source heat pump system



Boiler/Cooling Tower

In this type of system, units are distributed throughout the building to provide cooling and heating to the space. Units are connected to a water distribution loop which circulates water throughout the building to transfer heat from one area to another. This common water loop yields what is essentially a heat-recovery system. Units providing heating extract heat from loop water while units providing cooling reject heat to the loop. In effect the system recovers and redistributes heat where needed.

Also connected to this water loop are a “heat rejecter” such as a cooling tower, a “heat adder” such as a boiler, circulation pumps, and related accessories. Typically, outdoor air is conditioned and delivered by a separate, dedicated ventilation system.

During warm weather when all or most of the units are cooling, the cooling tower is used to dissipate heat from the condensing process. The condensing water is cooled for recirculation back to the water-to-refrigerant heat exchanger by using a combination of heat and mass transfer by evaporation.

A boiler is also used to add heat to the water loop during winter months when most units are heating. The boiler is typically enabled when the water loop temperature falls to a minimum value.

During moderate weather, such as spring or fall, the heat pumps serving the sunny side and interior of the building often operate in cooling mode and reject heat into the water loop. The heat pumps serving the shady side of the building often operate in heating mode and absorb heat from the water loop.

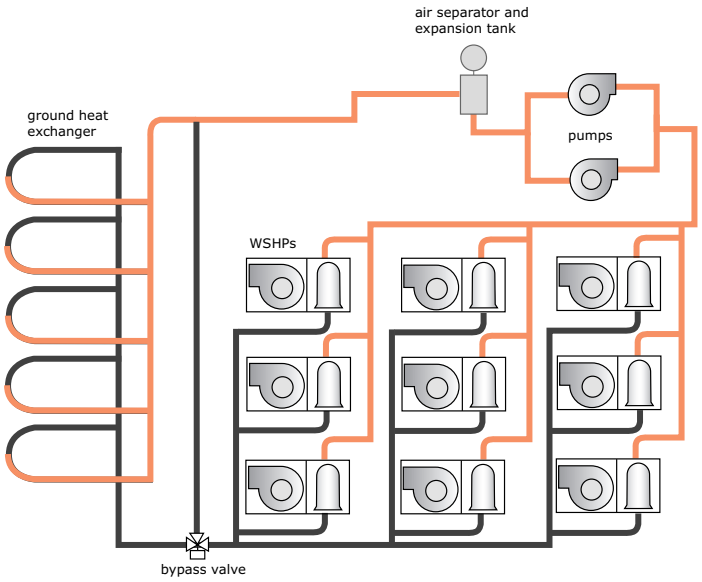
Heat rejected by the units operating in cooling mode is used to offset the heat absorbed by the units in heating mode. In this manner, a WSHP system provides a form of heat recovery and an opportunity to save energy by reducing the need to operate the boiler or cooling tower. For example, if the water temperature stays in the desired range-between 60ºF (16ºC) and 90ºF (32ºC)-neither the boiler nor the cooling tower need to operate.

In applications such as office buildings, heat generated by lights, people, and office equipment often results in the need to provide year-round cooling in the interior zones of the building. In these applications, the benefit of this heat recovery further reduces boiler energy use during the winter months.

Ground Source

The advantages of a geothermal heat pump system can literally cut business heating and cooling cost by 30 to 40 percent. In this application the cooling tower and boiler are replaced with a ground heat exchanger. The ground heat exchanger is a series of pipes buried in the earth. The earth is used as an energy storage tank. Ground-source heat pump systems offer the potential for saving energy because they can reduce (or eliminate) the energy needed to operate a cooling tower and/or boiler. Eliminating the cooling tower has architectural and maintenance advantages, and eliminating the boiler frees up floor space in the building.

Figure 6. Ground source heat pump system



The fluctuating temperatures of fluid from the earth are more stable than air, allowing the equipment to operate at a lower discharge pressure and use fewer kilowatts. The constant earth temperature will heat or cool the fluid running through buried high density polyethylene pipe to provide heating and cooling to a building.

A geothermal loop can be installed either horizontally or vertically. Vertical loops require less overall land area to reject (i.e., sink) the excess heat from the building. Horizontal loops require trenches in the ground spanning a larger overall land area.

Although external piping is the responsibility of the installer and/or piping manufacturer, many electric utilities and rural electric cooperatives are offering monetary incentives to install geothermal systems. Utility companies offer the incentives because of reduced peak loads that flatten out their demand curve over time, and save them money. These savings are ultimately transferred to the consumer.

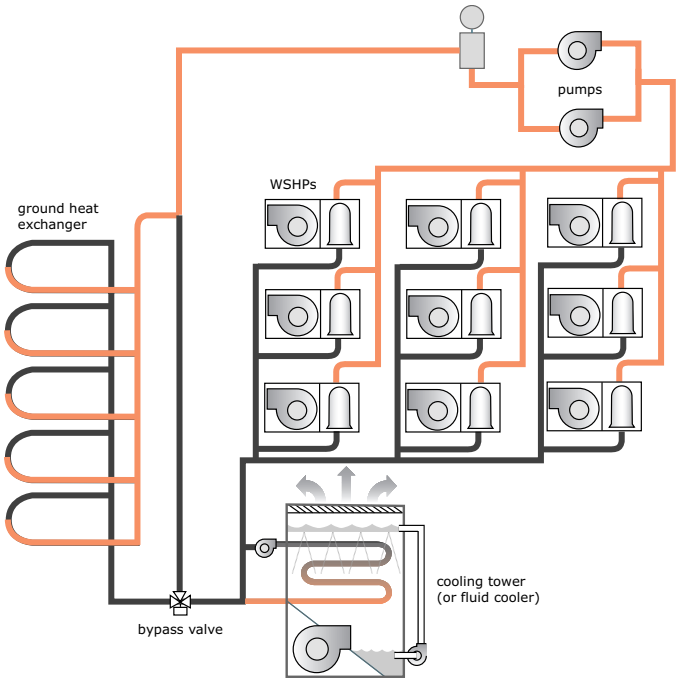
Hybrid Systems

Hybrid systems involve adding a small cooling tower or dry cooler to a ground source system that is installed in a cooling-dominated climate or adding a small boiler to a system in a heating-dominated climate. In either case, the geothermal heat exchanger is sized based on the smaller of the two loads: the total heat absorbed in a cooling-dominated climate or the total heat rejected in a heating-dominated climate. Then, a small cooling tower (or boiler) is added to reject (or add) the remaining heat.

A hybrid system may also be used in existing buildings with existing ground loops as additional rooms or buildings are added to the system. A cooling tower may be the solution to off-load the peak demand of the new building addition as an example. Other additions may include a requirement for fresh-air ventilation. A fresh-air, air handler, along with a water-to-water unit may be introduced to the closed loop system to allow tempered fresh-air into the building. Heat recovery from the loop itself can be shared with the other major components.

Hybrid systems can often make the system more economical, opening up the possibility to reap the potential energy savings.

Figure 7. Hybrid system



Water Loop Distribution

The individual water-source heat pumps are connected to a common water distribution loop. This loop consists of piping, pumps, valves, an air separator and expansion tank and other accessories. It connects to the heat rejecter and heat adder.

Water Circulating Pumps

Because a WSHP can only absorb or reject heat while water flows through the refrigerant-to-water heat exchanger, the water-circulating pumps play a critical role in the operation of the system.

Central Pumping System

Central pumping systems employ a single or dual pump design to fulfill pumping requirements for the entire building system. Pumps are usually installed downstream of the cooling tower and boiler and upstream of the units to ensure positive water pressure throughout the system. The most common configuration is to use two pumps manifolded together with each pump sized to meet the flow requirements of the entire system. Only one of the pumps operates at any given time, with the second available as “standby” pump in case the operating pump was to fail.

- Hose kits are used to connect the water supply and return line to the water inlets and outlets. Trane offers various hose kit combinations to better facilitate system flow balancing. These flexible hoses also aid in the reduction of vibration between the unit and the rigid central piping system.
- A two position isolation valve is often applied to systems which incorporate variable frequency pumping. This valve is capable of stopping/starting water flow to the unit, which in turn reduces the pumping requirements for the entire system.
- The central system supply and return lines should be sized to handle the required flow with a minimum pressure drop.

Note: *Pipe will sweat if low temperature water is below the dew point of the surrounding space. Trane recommends that these lines be insulated to prevent damage from condensation when condenser loop is designed to be below 60°F. Equipment installed in attic/crawl space temperatures below 40°F may require antifreeze in the water loop.*

Distributed Pumping System

A distributed pumping system contains a single pump module connected directly to the unit’s supply and return. This module is typically field installed and piped to the unit. This design requires individual pump modules specifically sized for the flow requirement of the water-source heat pump. When the heat pump compressor turns off, the individual pump also turns off.

- Hose kits are used to connect the water supply and return line to the water inlets and outlets. Trane offers various hose kit combinations to better facilitate system flow balancing. These flexible hoses also aid in the reduction of vibration between the unit and the rigid central piping system.
- A self-contained pump module and hose kit make a complete pumping package for distributed pumping systems. A pump module is designed for circulating commercial loops that require a maximum flow rate of 20 gpm.
- The distributed pumping system supply and return lines should be sized to handle the required flow with a minimum pressure drop.

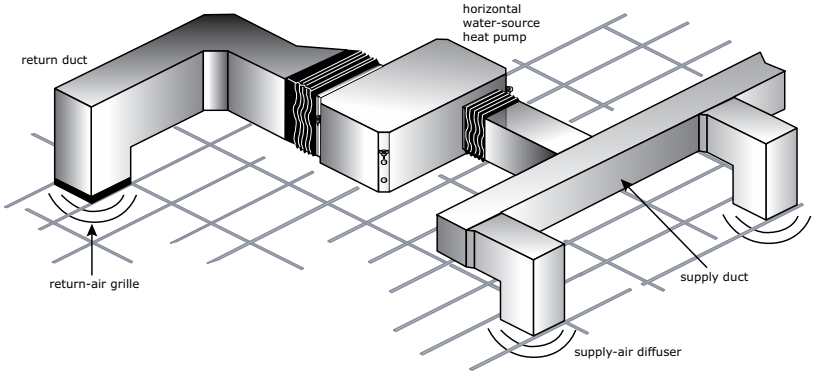
  Note: *Pipe will sweat if low temperature water is below the dew point of the surrounding space. Trane recommends that these lines be insulated to prevent damage from condensation when condenser loop is designed to be below 60°F. Equipment installed in attic/crawl space temperatures below 40°F may require antifreeze in the water loop.*
- The field supplied line voltage disconnect should be installed for branch circuit protection. Check local codes for requirements.
- The units 3/4-inch high voltage and 1/2-inch low voltage connections are located on the left corner of the unit. They are designed to accept conduit.
- Trane recommends that the condensate system be set-up per negative pressure trapping in consideration of the unit's draw-through design. With this properly trapped system, when condensate forms during normal operation, the water level in the trap rises until there is a constant outflow. Refer to the Axiom™ Installation and Operations manual for negative pressure trapping guidelines.
- For acoustically sensitive areas, a 1/2-inch thick field provided vibration pad should be installed below the vertical unit. This field provided piece should be equal to the overall foot-print size of the unit to provide sound damping of the unit while in operation.
- Hose kits are used to connect the water supply and return lines to the water inlet and outlets. Trane includes various hose kit combinations to better facilitate system flow balancing. These flexible hoses, reduce vibration between the unit and the rigid piping system.

Duct Design for Noise Control

Proper acoustics are often a design requirement. Many problems associated with HVAC generated sound can be avoided by properly selecting and locating the components of the system. Acoustical modeling should be used to find the lowest cost design to meet a specific sound requirement.

For heat pumps that are installed outside of the occupied zone (such as horizontal, vertical, and rooftop models), a supply duct system is typically used to transport air from the WSHP to supply-air diffusers for delivery to the zone.

Figure 8. Proper return-air ducting



Other publications contain more complete details related to duct design, but following are a few general recommendations that should be considered when designing the supply duct system:

- Keep the duct layout as simple and symmetrical as possible.
- Use at least three diameters of straight duct for the first section downstream of the discharge from the WSHP.
- When possible, locate ceiling-mounted WSHPs above a hallway or other unoccupied area.
- Limit the use of flexible ductwork.
- Add a balancing damper in the run out duct for each supply air diffuser.

When designing the return-air path for a WSHP, consider the following general recommendations:

- Return-air grilles should not be undersized
- Return-air openings within the ceiling plenum should not be undersized
- Use an open ceiling plenum, rather than a ducted return whenever possible

A duct system with noise control in mind can be designed by:

- Keeping air velocities low
- Using aerodynamic fittings
- Using a duct liner if metal duct is applied
- Avoiding line-of-sight connections between a noise source and an outlet
- Avoiding line-of-site connections between a noise source and an inlet
- Properly locating balancing dampers
- Sealing cracks, seams and joints in the duct run and equipment panels
- Blocking transmission through walls, ceiling and floor
- Mounting and supporting the ductwork with isolation devices that absorb vibration
- Using flexible duct connections
- Using flexible braided hoses on the water connections

For more information on best practices for the design and layout of duct systems, refer to the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) manual, *HVAC Systems Duct Design.*

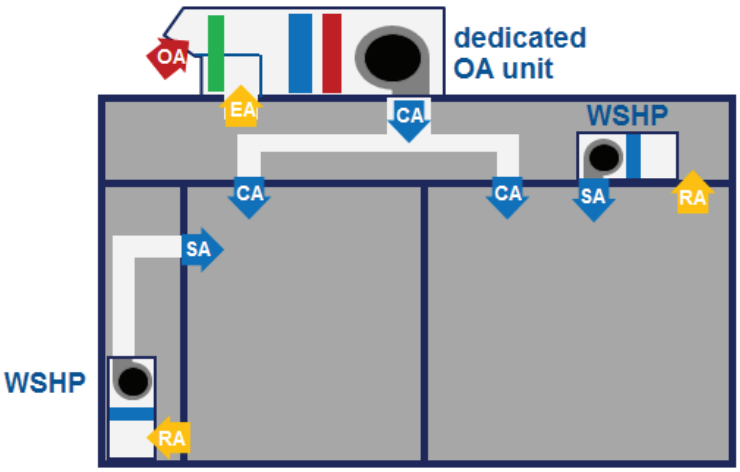
Dehumidification

The variable-speed fan motor (ECM), along with the variable-speed compressor, results in improved dehumidification performance at part-load conditions compared to a unit with a constant-speed fan. When the sensible cooling load in the space decreases, the heat pump responds by simultaneously reducing fan speed and compressor capacity. Reducing the airflow allows the coil to remove more moisture, and lengthens the compressor run-time, both of which improve dehumidification performance.

Note: *This method of control does not provide independent (active) control of both space temperature and humidity. Therefore, in non-arid climates, Trane recommends the use of a dedicated outdoor-air system to dehumidify the outdoor air centrally, rather than relying on the heat pumps to provide sufficient dehumidification. This approach is more efficient than equipping the individual heat pumps with hot gas reheat.*

For more information on the design and control of dedicated outdoor-air systems, see *Dedicated Outdoor Air Systems Trane DX Outdoor Air Unit Application Guide* (SYS-APG001*-EN).

Figure 9. Dehumidification performance



A2L Application Considerations

This product is listed to UL standard 60335-2-40, Household and Similar Electrical Appliances – Safety – Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers, which defines safe design and use strategies for equipment using A2L refrigerants. This standard limits the refrigerant concentration in a space in the event of a refrigerant leak. To meet the requirements, the UL standard defines minimum room area, refrigerant charge limit, minimum circulation airflow and/or ventilation airflow requirements, and limits the use of ignition sources in spaces. The standard may require a unit refrigerant leak detection system.

For equipment with R-454B and charge amounts less than or equal to 3.91 lbs per circuit, this UL standard does not prescribe a room area limit and does not require a refrigerant leak detection system or any circulation airflow or ventilation airflow mitigation strategies. However, ignition sources in ductwork must be evaluated.

Depending on the application, a specific requirement of ANSI/ASHRAE Standard 15, Safety Standard for Refrigeration Systems, could be more stringent than UL 60335-2-40 requirements. See *Refrigeration Systems and Machinery Rooms Application Considerations for Compliance with ASHRAE® Standard 15-2022 Application Engineering Manual* (APP-APM001*-EN) for more information.

Minimum Room Area Limits (Refrigerant charge greater than 3.91 lb per circuit)

Equipment with R-454B charge amounts greater than 3.91 lb per circuit may require additional circulation or ventilation airflow mitigation strategies. In this case, two minimum room area (A_{min}) thresholds:

- The first threshold defines when equipment serving a single room is required to provide circulation airflow, either continuous or activated by a leak detection system. A ducted system requires circulation airflow unless the smallest room it serves is larger than the adjusted A_{min} threshold. This product contains a leak detection system if a circuit charge is greater than 3.91 lbs. As a result, no further leak detection system evaluation is required.
- The second threshold defines when additional ventilation airflow is required. If the room area, A or TA, is below the adjusted A_{min} or TA_{min} threshold, additional ventilation is required to remove refrigerant in the event of a leak. Refer to UL 60335-2-40 Clause GG.8 and ANSI\ASHRAE Standard 15 Section 7 for natural and mechanical ventilation requirements. For minimum room area, see equipment nameplate or unit Installation, Operation, and Maintenance (IOM) manual.

Minimum Room Area (A_{min}) Adjustments

- **Altitude:** The A_{min} threshold changes with altitude. Multiple the altitude adjustment factor in the following table by Amin shown on the unit nameplate or in the Installation, Operation, and Maintenance (IOM) manual.

Table 3. Altitude adjustment factor

Altitude (ft)	Sea Level to 2000	2001 to 4000	4001 to 6000	6001 to 8000	8001 to 10000	10001 to 12000	12001 to 14000	14001 to 15000	Over 15000
A_{min} Adjustment	1	1.05	1.11	1.17	1.24	1.32	1.41	1.51	1.57

- **Height :** A_{min} can be adjusted if the unit is installed in a room at a height higher than the minimum height shown on the unit. Multiply A_{min} by the ratio of the unit minimum release height (in meters) / actual release height (in meters).
- **Institutional Occupancies:** For institutional occupancies, ASHRAE Standard 15 applies an additional adjustment factor, FOCC, to the amount of charge allowed in a space. To calculate the adjusted A_{min} for institutional occupancies, divide the A_{min} on the nameplate by 0.5.

Determining Room Area (A or TA)

The room area (A) is the room area enclosed by the projection to the floor of the walls, partitions, and doors of the space that the equipment serves. For ducted systems, total room area (TA) of all rooms connected by ducts, may be used instead of A.

Rooms connected by drop ceilings only are not considered a single room.

Rooms on the same floor of the building, and connected by an open passageway, can be considered part of the same room if the passageway is a permanent opening, extends to the floor and is intended for people to walk through.

Adjacent rooms on the same floor of the building and connected by permanent openings in the walls and/or doors between rooms (including gaps between the wall and the floor), can be considered part of the same room if the openings meet the following criteria.

- The opening is permanent and cannot be closed.

- Openings extending to the floor, such as door gaps, need to be at least 20 mm above the floor covering surface.
- Natural ventilations opening areas must meet the requirements of ANSI\ASHRAE Standard 15-2022, Section 7.2.3.2.

Rooms that are connected by a mechanical ventilation system can be considered a single room area if the mechanical ventilation system meets the requirements of ANSI\ASHRAE Standard 15-2022, Section 7.6.4.

Leak Detection System (Refrigerant charge greater than 3.91 lb per circuit)

The leak detection system consists of one or more refrigerant detection sensors. When the system detects a leak, the following mitigation actions will be initiated until refrigerant has not been detected for at least 5 minutes:

- Energize the supply fan(s) to deliver a required minimum amount of circulation airflow.
- Disable compressor operation.
- Provide an output signal that can be used to fully open zone dampers and/or VAV boxes and disable electric heat in VAV boxes.
- Provide an output signal that can be used to energize additional mechanical ventilation (if needed).
- Units without airflow proving will disable electric heat sources.

Building fire and smoke systems may override this function.

If the refrigerant sensor has a fault, is at the end of its life, or is disconnected, the unit will initiate the mitigation actions. Mitigation actions may be verified by disconnecting the sensor.

The refrigerant sensors do not need service. Use only manufacturer-approved sensors when replacement is required.

Model Number Description

Digits 1, 2, 3 — Unit Configuration

VSH = Variable Speed Horizontal
VSV = Variable Speed Vertical

Digit 4 — Development Sequence

K = R-454B Refrigerant

Digits 5, 6, 7 — Nominal Capacity

024 = 24 MBtuh
033 = 33 MBtuh
042 = 42 MBtuh
050 = 50 MBtuh
060 = 60 MBtuh

Digit 8 — Voltage (Volts/Hz/Phase)

A = 208-230/60/1
B = 208-230/60/3
4 = 460/60/3

Digit 9 — Heat Exchanger

1 = Copper-Water Coil
2 = Cupro-Nickel Water Coil
7 = Insulated Copper-Water Coil and Suction Lines
8 = Insulated Cupro-Nickel Water Coil and Suction Lines

Digit 10, 11— Design Sequence

Digit 12 — Control Types

H = Symbio™ 400-B
J = Symbio 400-B with Air-Fi Wireless Communications

Digit 13 — Freeze Protection

A = 20°F Freezestat (For Glycol Loop)
B = 35°F Freezestat (For Water Loop)

Note: *20°F Freezestat is typically used in a geothermal application. 35°F Freezestat is typically used in a boiler/tower application.*

Digit 14 — Sales Order Special

0 = None
S = Sales Order Special

Digit 15 — Supply Air Arrangement

B = Back Supply Air
L = Left Supply Air
R = Right Supply Air
T = Top Supply Air

Digit 16 — Return Air Arrangement

L = Left Return Air
R = Right Return Air

Digit 17 — Unit Mounted Disconnect

0 = No Unit Mounted Disconnect
2 = Unit Mounted Disconnect

Digit 18 — Filter Type

1 = 1-inch Throwaway Filter
2 = 2-inch Throwaway Filter
4 = 2-inch MERV 8
5 = 2-inch MERV 13

Digit 19 — Fault Sensors

1 = Condensate Overflow Sensor
6 = Condensate Overflow and Fan Status

Digit 20 — Ducted Filter Rack

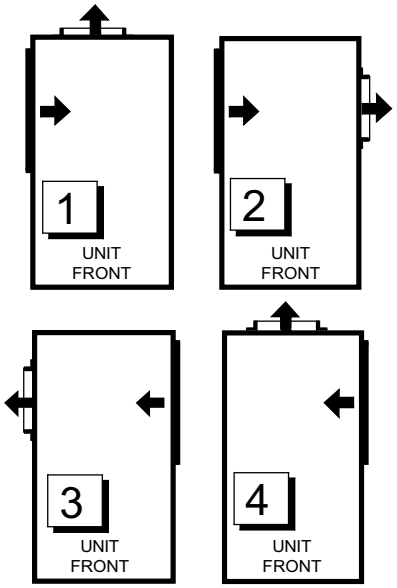
0 = Non-ducted Filter Rack
A = Ducted Filter Rack (Side Access/LH-RH)
C = Ducted Filter Rack (Bottom Access)

Digit 21 — Insulation

1 = Matte-Faced Insulation
2 = Foil-Faced Insulation

General Data

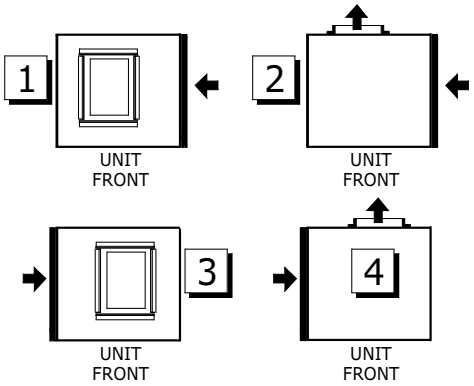
Figure 10. Horizontal Supply/Return Air Configuration



The unit's supply and return air configuration is built to order to meet unique installation requirements. The combinations include:

1. Left return air with back supply air
2. Left return air with right supply air
3. Right return air with left supply air
4. Right return air with back supply air

Figure 11. Vertical Supply/Return Air Configuration



The unit's supply and return air configuration is built to order to meet unique installation requirements. The combinations include:

1. Right return-air with top supply-air combination
2. Right return-air with back supply-air combination
3. Left return-air with top supply -air combination
4. Left return-air with back supply-air combination

Table 4. Cabinet

Model VSH*		VSH*024	VSH*033	VSH*042	VSH*050	VSH*060
Unit size	Length (inch)	59-1/2	59-1/2	70.0	70.0	70.0
	Height (inch)	21.0	21.0	21-1/4	21-1/4	21-1/4
	Width (inch)	24.0	24.0	25-3/8	25-3/8	25-3/8
Compressor type		Scroll	Scroll	Scroll	Scroll	Scroll
Approximate weight	With pallet (lb)	425	425	505	505	505
Approximate weight	Without pallet (lb)	349	349	429	429	429
Nominal Filter size	Inches	20 x 22	20 x 22	20 x 32	20 x 32	20 x 32
Water in/out size (NPTI)	Inches	1	1	1	1	1
Condensate size (NPTI)	Inches	3/4	3/4	3/4	3/4	3/4
Blower wheel size	Direct drive (inch)	11 x 10	11 x 10	11 x 10	11 x 10	11 x 10

Table 5. Air-to-refrigerant coil

Model VSH*	VSH*024	VSH*033	VSH*042	VSH*050	VSH*060
Working pressure	600	600	600	600	600
Tubes high	20	20	20	20	20
Tubes deep	3	3	4	4	4
Number of circuits	4	4	5	5	5
Finned volume (H, W, D: inches)	20 x 19.75 x 3.5	20 x 19.75 x 3.5	20 x 30.25 x 3.5	20 x 30.25 x 3.5	20 x 30.25 x 3.5
Coil surface area (ft^2)	2.750	2.750	4.200	4.200	4.200
Fins per inch	14	14	14	14	14
Tube material	Copper	Copper	Copper	Copper	Copper
Tube OD (inch)	3/8	3/8	3/8	3/8	3/8
Wall thickness (inch)	0.014	0.014	0.014	0.014	0.014
Return bends	Copper	Copper	Copper	Copper	Copper

Table 6. Water volume

Model VSH*	VSH*024	VSH*033	VSH*042	VSH*050	VSH*060
Internal water volume (in^3)	142.4	142.4	331.2	331.2	331.2
Internal water volume (ft^3)	0.082	0.082	0.192	0.192	0.192
Internal water volume (gal)	0.616	0.616	1.434	1.434	1.434

Table 7. Cabinet

Model VSV*		VSV*024	VSV*033	VSV*042	VSV*050	VSV*060
Unit size	Length (inch)	32-1/2	32-1/2	32-1/2	32-1/2	32-1/2
	Height (inch)	42	42	49	49	49
	Width (inch)	23-7/8	23-7/8	25-3/8	25-3/8	25-3/8
Compressor type		Scroll	Scroll	Scroll	Scroll	Scroll
Approximate weight	With pallet (lb)	388	388	441	441	441
Approximate weight	Without pallet (lb)	340	340	393	393	393
Nominal Filter size	Inches	20 x 30	20 x 30	27 x 30	27 x 30	27 x 30
Water in/out size (NPTI)	Inches	1	1	1	1	1
Condensate size (NPTI)	Inches	3/4	3/4	3/4	3/4	3/4
Blower wheel size	Direct drive (inch)	11 x 10	11 x 10	11 x 10	11 x 10	11 x 10

Table 8. Air-to-refrigerant coil

Model VSV*	VSV*024	VSV*033	VSV*042	VSV*50	VSV*060
Working pressure	600	600	600	600	600
Tubes high	20	20	27	27	27
Tubes deep	3	3	3	3	3
Number of circuits	5	5	6	6	6
Finned volume (H, W, D: inches)	20 x 28.25 x 2.6	20 x 28.25 x 2.6	27 x 28.25 x 2.6	27 x 28.25 x 2.6	27 x 28.25 x 2.6
Coil surface area (ft^2)	3.92	3.92	5.30	5.30	5.30
Fins per inch	14	14	14	14	14
Tube material	Copper	Copper	Copper	Copper	Copper
Tube OD (inch)	3/8	3/8	3/8	3/8	3/8
Wall thickness (inch)	0.014	0.014	0.014	0.014	0.014
Return bends	Copper	Copper	Copper	Copper	Copper

Table 9. Water volume

Model VSV*	VSV*024	VSV*033	VSV*042	VSV*050	VSV*060
Internal water volume (in^3)	212	212	414	414	414
Internal water volume (ft^3)	0.123	0.123	0.24	0.24	0.24
Internal water volume (gal)	0.918	0.918	1.792	1.792	1.792

Performance Data

Table 10. ANSI/AHRI/ASHRAE/ISO13256-1 Ratings (VSH)

Model	Load	Rated GPM	Rated CFM	Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
				Cooling 86°F		Heating 68°F		Cooling 59°F		Heating 50°F		Full Cool 77°F Part Cool 68°		Full Heat 32°F Part Heat 41°F	
				Capacity Btuh	EER	Capacity Btuh	COP	Capacity Btuh	EER	Capacity Btuh	COP	Capacity Btuh	EER	Capacity Btuh	COP
VSH*024	Full	6.2	930	24500	18.9	32000	6.7	26900	32.5	25700	5.6	25400	22.4	19200	4.4
VSH*024	Part	6.2	735	12300	23.1	14800	8.8	13900	46.7	12000	6.9	13400	35.4	14100	5.4
VSH*033	Full	8.6	1200	32200	15.6	43600	5.9	35500	25.2	35600	5.1	33300	18.1	27700	4.1
VSH*033	Part	8.6	780	12400	22.3	15100	8.9	14000	44.8	12000	6.7	13500	34.4	14600	5.3
VSH*042	Full	10.9	1650	40300	17.9	50400	6.4	45000	30.2	41200	5.5	42200	21.3	32500	4.4
VSH*042	Part	10.9	1075	18100	22.1	21700	8.4	21500	48.2	17600	6.5	20600	37.3	15400	5.6
VSH*050	Full	13.0	1890	49400	16.0	68200	6.0	55900	25.5	54500	5.2	52100	18.5	41300	4.2
VSH*050	Part	13.0	1325	20800	22.2	25600	8.9	24200	47.6	20500	6.8	23400	36.7	17400	5.5
VSH*060	Full	15.6	2100	58500	14.9	84000	5.5	63800	21.6	67400	4.8	61900	17.0	51400	3.9
VSH*060	Part	15.6	1365	21100	22.5	26200	8.9	24700	48.1	20700	6.7	23900	36.5	17500	5.5

Note: Rated in accordance with ANSI/AHRI/ASHRAE/ISO13256-1. Certified conditions are 80.6°F DB/66.2°F WB EAT in cooling and 68°F DB/59°F WB EAT in heating. Entering liquid temperature in cooling is 86°F for Water Loop, 77°F for Ground Loop (full load), 68°F for Ground Loop (part load), and 59°F for Ground Water. Entering liquid temperature in heating is 68°F for Water Loop, 32°F for Ground Loop (full load), 41°F for Ground Loop (part load), and 50°F for Ground Water.

Table 11. ANSI/AHRI/ASHRAE/ISO13256-1 Ratings (VSV)

Model	Load	Rated GPM	Rated CFM	Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
				Cooling 86°F		Heating 68°F		Cooling 59°F		Heating 50°F		Full Cool 77°F Part Cool 68°		Full Heat 32°F Part Heat 41°F	
				Capacity Btuh	EER	Capacity Btuh	COP	Capacity Btuh	EER	Capacity Btuh	COP	Capacity Btuh	EER	Capacity Btuh	COP
VSV*024	Full	6.3	930	25100	20.4	30500	6.6	28300	38.8	24900	5.6	26300	24.7	18800	4.6
VSV*024	Part	6.3	605	11200	23.1	13500	8.5	13000	53.5	10700	6.7	12400	39.4	11800	5.4
VSV*033	Full	8.3	1200	33300	17.0	39900	6.1	37500	28.8	32900	5.3	35300	20.3	25500	4.3
VSV*033	Part	8.3	780	11500	23.2	13600	9.1	13600	56.1	10800	6.9	12900	40.0	11800	5.5
VSV*042	Full	10.9	1650	42900	18.8	54100	6.3	46600	32.1	43400	5.4	44900	22.7	34400	4.4
VSV*042	Part	10.9	1155	15900	24.6	18800	9.4	18300	56.9	15200	7.0	17800	43.0	17800	5.8
VSV*050	Full	13.0	1890	50300	17.4	63000	5.8	52200	25.9	51500	5.1	50400	19.3	40400	4.3
VSV*050	Part	13.0	1285	20400	22.7	24100	8.5	22700	46.7	19500	6.5	21900	36.8	23400	5.4
VSV*060	Full	15.6	2100	59200	15.7	78800	5.6	62300	22.7	63700	5.0	61200	17.9	49500	4.1
VSV*060	Part	15.6	1365	20500	22.9	25600	9.0	23500	47.6	20500	6.8	22700	37.2	17800	5.6

Note: Rated in accordance with ANSI/AHRI/ASHRAE/ISO13256-1. Certified conditions are 80.6°F DB/66.2°F WB EAT in cooling and 68°F DB/59°F WB EAT in heating. Entering liquid temperature in cooling is 86°F for Water Loop, 77°F for Ground Loop (full load), 68°F for Ground Loop (part load), and 59°F for Ground Water. Entering liquid temperature in heating is 68°F for Water Loop, 32°F for Ground Loop (full load), 41°F for Ground Loop (part load), and 50°F for Ground Water.

Table 12. Cooling capacities - VSH*024

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
45	4.0	28.8	24.7	0.86	0.54	30.6	60.2	2.0
45	5.0	28.9	24.7	0.86	0.49	30.5	57.1	3.0
45	5.6	28.9	24.8	0.86	0.46	30.5	55.8	3.7

Table 12. Cooling capacities - VSH*024 (continued)

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
45	6.2	29.0	24.8	0.86	0.44	30.5	54.7	4.4
45	6.5	29.0	24.8	0.86	0.43	30.4	54.3	4.8
45	6.8	29.0	24.8	0.85	0.42	30.4	53.9	5.2
45	7.4	29.0	24.8	0.85	0.41	30.4	53.2	6.1
55	4.0	28.1	24.4	0.87	0.75	30.7	70.1	2.0
55	5.0	28.2	24.5	0.87	0.69	30.6	67.1	2.9
55	5.6	28.2	24.5	0.87	0.67	30.5	65.8	3.6
55	6.2	28.3	24.5	0.87	0.65	30.5	64.7	4.3
55	6.5	28.3	24.5	0.87	0.64	30.5	64.3	4.6
55	6.8	28.3	24.5	0.87	0.64	30.5	63.9	5.0
55	7.4	28.3	24.5	0.87	0.62	30.5	63.1	5.8
65	4.0	27.1	24.1	0.89	0.94	30.3	79.9	1.9
65	5.0	27.3	24.1	0.88	0.89	30.4	77.0	2.8
65	5.6	27.4	24.2	0.88	0.87	30.3	75.7	3.4
65	6.2	27.4	24.2	0.88	0.85	30.3	74.6	4.1
65	6.5	27.5	24.2	0.88	0.85	30.3	74.2	4.5
65	6.8	27.5	24.2	0.88	0.84	30.3	73.8	4.8
65	7.4	27.5	24.2	0.88	0.83	30.3	73.1	5.6
75	4.0	27.0	24.0	0.89	1.09	30.7	89.9	1.8
75	5.0	27.1	24.0	0.89	1.04	30.7	86.9	2.6
75	5.6	27.2	24.1	0.89	1.01	30.6	85.6	3.2
75	6.2	27.2	24.1	0.88	1.00	30.6	84.6	3.8
75	6.5	27.2	24.1	0.88	0.99	30.6	84.1	4.2
75	6.8	27.2	24.1	0.88	0.98	30.6	83.7	4.5
75	7.4	27.2	24.1	0.88	0.97	30.6	83.0	5.2
85	4.0	26.4	23.7	0.90	1.27	30.8	99.7	1.7
85	5.0	26.5	23.8	0.90	1.22	30.7	96.7	2.5
85	5.6	26.6	23.8	0.90	1.20	30.7	95.5	3.1
85	6.2	26.6	23.8	0.89	1.18	30.7	94.5	3.7
85	6.5	26.6	23.8	0.89	1.17	30.6	94.0	4.0
85	6.8	26.7	23.8	0.89	1.17	30.6	93.6	4.3
85	7.4	26.7	23.9	0.89	1.15	30.6	92.9	5.0
95	4.0	25.0	23.0	0.92	1.46	30.0	109.2	1.6
95	5.0	25.3	23.2	0.92	1.42	30.1	106.4	2.4
95	5.6	25.4	23.3	0.92	1.40	30.2	105.2	3.0
95	6.2	25.5	23.3	0.91	1.38	30.2	104.2	3.5
95	6.5	25.5	23.3	0.91	1.38	30.2	103.8	3.9
95	6.8	25.5	23.3	0.91	1.37	30.2	103.4	4.2
95	7.4	25.6	23.4	0.91	1.36	30.2	102.8	4.8
105	4.0	22.5	22.5	1.00	1.64	28.1	118.2	1.6
105	5.0	22.8	22.8	1.00	1.60	28.3	115.6	2.4
105	5.6	22.9	22.9	1.00	1.59	28.3	114.5	2.9
105	6.2	23.0	23.0	1.00	1.58	28.4	113.6	3.4
105	6.5	23.1	23.1	1.00	1.57	28.4	113.2	3.7
105	6.8	23.1	23.1	1.00	1.57	28.4	112.9	4.1
105	7.4	23.2	23.2	1.00	1.56	28.5	112.2	4.7
115	4.0	20.5	20.5	1.00	1.82	26.7	127.3	1.6
115	5.0	20.9	20.9	1.00	1.79	27.0	125.0	2.3

Table 12. Cooling capacities - VSH*024 (continued)

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
115	5.6	21.1	21.1	1.00	1.78	27.1	124.0	2.8
115	6.2	21.2	21.2	1.00	1.76	27.2	123.1	3.4
115	6.5	21.3	21.3	1.00	1.76	27.3	122.8	3.7
115	6.8	21.3	21.3	1.00	1.76	27.3	122.4	4.0
115	7.4	21.4	21.4	1.00	1.75	27.3	121.9	4.6
120	4.0	19.0	19.0	1.00	1.90	25.4	131.6	1.5
120	5.0	19.5	19.5	1.00	1.88	25.9	129.5	2.3
120	5.6	19.7	19.7	1.00	1.87	26.1	128.6	2.8
120	6.2	19.9	19.9	1.00	1.86	26.2	127.8	3.3
120	6.5	19.9	19.9	1.00	1.85	26.3	127.4	3.6
120	6.8	20.0	20.0	1.00	1.85	26.3	127.1	3.9
120	7.4	20.1	20.1	1.00	1.84	26.4	126.6	4.5

Note: Cooling performance data is tabulated at 80°F DB/67°F WB entering air at ANSI/AHRI/ASHRAE/ISO13256-1 rated CFM. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table. See performance correction tables to correct performance at conditions other than those tabulated. Rated GPM: 6.2; Minimum CFM: 695; Rated CFM: 930; Maximum CFM: 1024.

Table 13. Heating capacities - VSH*024

EWT	GPM	Gross (MBtuh)	Absorb (MBtuh)	Compressor Power (kW)	LWT	Feet Head
25	4.0	15.2	11.4	1.12	18.0	3.8
25	5.0	15.6	11.8	1.12	19.3	5.5
25	5.6	15.7	11.9	1.13	19.8	6.8
25	6.2	15.9	12.0	1.13	20.3	8.1
25	6.5	15.9	12.1	1.13	20.5	8.8
25	6.8	16.0	12.1	1.13	20.7	9.5
25	7.4	16.1	12.2	1.13	21.0	11.0
35	4.0	17.8	13.8	1.16	26.7	3.6
35	5.0	18.2	14.2	1.16	28.2	5.3
35	5.6	18.4	14.4	1.16	28.9	6.5
35	6.2	18.6	14.6	1.17	29.4	7.7
35	6.5	18.6	14.7	1.17	29.6	8.4
35	6.8	18.7	14.7	1.17	29.8	9.1
35	7.4	18.8	14.8	1.17	30.2	10.5
45	4.0	21.6	17.3	1.24	35.5	2.3
45	5.0	22.1	17.9	1.24	37.2	3.4
45	5.6	22.4	18.2	1.24	37.9	4.1
45	6.2	22.6	18.4	1.25	38.6	4.9
45	6.5	22.7	18.4	1.25	38.8	5.3
45	6.8	22.8	18.5	1.25	39.1	5.8
45	7.4	22.9	18.7	1.25	39.5	6.7
55	4.0	24.6	20.3	1.26	44.0	2.2
55	5.0	25.3	20.9	1.27	45.9	3.2
55	5.6	25.6	21.2	1.27	46.8	4.0
55	6.2	25.8	21.5	1.27	47.5	4.7
55	6.5	25.9	21.6	1.27	47.8	5.1
55	6.8	26.0	21.7	1.27	48.1	5.5
55	7.4	26.2	21.9	1.27	48.6	6.4
65	4.0	27.9	23.4	1.31	52.5	2.0
65	5.0	28.7	24.3	1.31	54.6	3.0

Table 13. Heating capacities - VSH*024 (continued)

EWT	GPM	Gross (MBtuh)	Absorb (MBtuh)	Compressor Power (kW)	LWT	Feet Head
65	5.6	29.1	24.6	1.32	55.6	3.7
65	6.2	29.5	25.0	1.32	56.4	4.4
65	6.5	29.6	25.1	1.32	56.7	4.7
65	6.8	29.7	25.2	1.32	57.0	5.1
65	7.4	30.0	25.5	1.32	57.6	5.9
75	4.0	31.2	26.7	1.32	60.7	2.0
75	5.0	32.2	27.7	1.32	63.1	2.9
75	5.6	32.6	28.1	1.32	64.2	3.5
75	6.2	33.0	28.5	1.32	65.1	4.2
75	6.5	33.1	28.6	1.32	65.5	4.6
75	6.8	33.3	28.8	1.32	65.9	5.0
75	7.4	33.5	29.0	1.31	66.6	5.7
85	4.0	34.4	30.0	1.31	68.9	1.9
85	5.0	35.5	31.0	1.31	71.6	2.8
85	5.6	35.9	31.5	1.30	72.9	3.4
85	6.2	36.3	31.9	1.30	73.9	4.1
85	6.5	36.4	32.0	1.30	74.4	4.4
85	6.8	36.6	32.2	1.30	74.8	4.8
85	7.4	36.9	32.5	1.29	75.5	5.6

Note: Heating performance data is tabulated at 70°F DB at rated CFM. See correction factor tables to correct performance at conditions other than those tabulated. Interpolation of data is permissible; extrapolation is not. Rated GPM: 6.2; Minimum CFM: 695; Rated CFM: 930; Maximum CFM: 1024. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table.

Table 14. Fan correction factors - VSH*024

Entering CFM	Cooling Capacity	Sensible Capacity	Cooling Comp Watts	Heating Capacity	Heating Comp Watts
695	0.955	0.837	1.012	0.980	1.135
742	0.966	0.870	1.009	0.987	1.105
836	0.985	0.935	1.004	0.998	1.053
883	0.993	0.965	1.002	0.999	1.025
930	1.000	1.000	1.000	1.000	1.000
977	1.007	1.029	0.998	1.001	0.977
1024	0.973	1.086	1.007	1.002	0.957

Table 15. Cooling capacities - VSV*024

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
45	4.0	30.1	25.5	0.85	0.52	31.8	60.7	2.2
45	4.7	30.1	25.5	0.85	0.47	31.8	58.4	2.9
45	5.6	30.2	25.6	0.85	0.43	31.7	56.2	3.9
45	6.3	30.3	25.6	0.85	0.41	31.6	54.9	4.8
45	6.5	30.3	25.6	0.85	0.40	31.6	54.6	5.1
45	6.8	30.3	25.6	0.85	0.39	31.6	54.2	5.5
45	7.4	30.3	25.6	0.85	0.38	31.6	53.4	6.4
55	4.0	29.2	25.0	0.86	0.73	31.7	70.6	2.1
55	4.7	29.3	25.0	0.86	0.69	31.6	68.3	2.8
55	5.6	29.4	25.1	0.85	0.65	31.6	66.1	3.8
55	6.3	29.4	25.1	0.85	0.62	31.5	64.9	4.7
55	6.5	29.4	25.1	0.85	0.62	31.5	64.6	4.9

Table 15. Cooling capacities - VSV*024 (continued)

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
55	6.8	29.4	25.1	0.85	0.61	31.5	64.2	5.3
55	7.4	29.4	25.1	0.85	0.59	31.5	63.4	6.2
65	4.0	27.9	24.2	0.87	0.91	31.0	80.3	2.0
65	4.7	28.1	24.3	0.87	0.87	31.1	78.0	2.7
65	5.6	28.2	24.4	0.86	0.84	31.1	76.0	3.6
65	6.3	28.3	24.5	0.86	0.82	31.1	74.7	4.5
65	6.5	28.3	24.5	0.86	0.82	31.1	74.4	4.7
65	6.8	28.3	24.5	0.86	0.81	31.1	74.0	5.1
65	7.4	28.4	24.5	0.86	0.80	31.1	73.3	6.0
75	4.0	27.3	24.1	0.88	1.08	31.0	90.2	1.9
75	4.7	27.4	24.1	0.88	1.05	31.0	87.9	2.5
75	5.6	27.5	24.2	0.88	1.01	30.9	85.9	3.5
75	6.3	27.5	24.2	0.88	0.99	30.9	84.6	4.3
75	6.5	27.5	24.2	0.88	0.99	30.9	84.3	4.5
75	6.8	27.5	24.2	0.88	0.98	30.9	83.9	4.9
75	7.4	27.6	24.2	0.88	0.97	30.9	83.2	5.7
85	4.0	26.3	23.6	0.90	1.27	30.7	99.9	1.8
85	4.7	26.4	23.6	0.89	1.24	30.6	97.7	2.4
85	5.6	26.5	23.7	0.89	1.20	30.6	95.6	3.3
85	6.3	26.5	23.7	0.89	1.18	30.6	94.4	4.1
85	6.5	26.6	23.7	0.89	1.18	30.6	94.1	4.3
85	6.8	26.6	23.7	0.89	1.17	30.6	93.7	4.7
85	7.4	26.6	23.7	0.89	1.16	30.5	93.0	5.5
95	4.0	25.1	23.0	0.92	1.46	30.1	109.5	1.8
95	4.7	25.3	23.1	0.91	1.43	30.1	107.4	2.4
95	5.6	25.4	23.2	0.91	1.40	30.2	105.4	3.2
95	6.3	25.4	23.2	0.91	1.38	30.2	104.2	4.0
95	6.5	25.5	23.2	0.91	1.38	30.2	104.0	4.2
95	6.8	25.5	23.2	0.91	1.37	30.2	103.6	4.6
95	7.4	25.5	23.2	0.91	1.36	30.2	102.9	5.3
105	4.0	22.8	22.8	1.00	1.64	28.4	118.5	1.7
105	4.7	22.9	22.9	1.00	1.62	28.5	116.6	2.3
105	5.6	23.1	23.1	1.00	1.59	28.5	114.7	3.2
105	6.3	23.1	23.1	1.00	1.58	28.5	113.7	3.9
105	6.5	23.2	23.2	1.00	1.57	28.5	113.4	4.1
105	6.8	23.2	23.2	1.00	1.57	28.5	113.0	4.4
105	7.4	23.2	23.2	1.00	1.56	28.5	112.4	5.2
115	4.0	21.1	21.1	1.00	1.82	27.3	127.9	1.7
115	4.7	21.4	21.4	1.00	1.80	27.5	126.0	2.3
115	5.6	21.6	21.6	1.00	1.78	27.6	124.3	3.1
115	6.3	21.7	21.7	1.00	1.76	27.7	123.3	3.8
115	6.5	21.7	21.7	1.00	1.76	27.7	123.1	4.0
115	6.8	21.7	21.7	1.00	1.76	27.7	122.7	4.3
115	7.4	21.8	21.8	1.00	1.75	27.8	122.1	5.0
120	4.0	19.9	19.9	1.00	1.91	26.4	132.3	1.7
120	4.7	20.2	20.2	1.00	1.89	26.7	130.6	2.2
120	5.6	20.5	20.5	1.00	1.87	26.8	129.0	3.0
120	6.3	20.6	20.6	1.00	1.86	26.9	128.0	3.7

Table 15. Cooling capacities - VSV*024 (continued)

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
120	6.5	20.7	20.7	1.00	1.85	27.0	127.8	3.9
120	6.8	20.7	20.7	1.00	1.85	27.0	127.5	4.3
120	7.4	20.8	20.8	1.00	1.84	27.1	126.9	5.0

Note: Cooling performance data is tabulated at 80°F DB/67°F WB entering air at ANSI/AHRI/ASHRAE/ISO13256-1 rated CFM. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table. See performance correction tables to correct performance at conditions other than those tabulated. Rated GPM: 6.3; Minimum CFM: 695; Rated CFM: 930; Maximum CFM: 1024.

Table 16. Heating capacities - VSV*024

EWT	GPM	Gross (MBtuh)	Absorb (MBtuh)	Compressor Power (kW)	LWT	Feet Head
25	4.0	15.2	11.3	1.12	18.1	3.9
25	4.7	15.4	11.6	1.13	19.0	5.2
25	5.6	15.7	11.8	1.13	19.9	7.0
25	6.3	15.8	12.0	1.13	20.4	8.6
25	6.5	15.9	12.0	1.14	20.6	9.1
35	6.8	15.9	12.0	1.14	20.7	9.8
35	7.4	16.0	16.0	0.00	0.0	0.0
35	4.0	17.7	13.7	1.17	26.9	3.7
35	4.7	18.0	14.0	1.17	28.0	4.9
35	5.6	18.3	14.3	1.18	29.0	6.7
35	6.3	18.5	14.4	1.18	29.6	8.2
35	6.5	18.5	14.5	1.18	29.7	8.7
45	6.8	18.6	14.5	1.18	30.0	9.4
45	7.4	18.7	14.7	1.19	30.3	10.9
45	4.0	21.3	17.1	1.22	35.8	2.5
45	4.7	21.7	17.5	1.22	37.0	3.3
45	5.6	22.1	17.9	1.23	38.2	4.5
45	6.3	22.3	18.1	1.23	38.8	5.5
45	6.5	22.4	18.2	1.23	39.0	5.8
55	6.8	22.5	18.3	1.23	39.3	6.3
55	7.4	22.6	18.4	1.24	39.7	7.3
55	4.0	24.3	20.0	1.25	44.3	2.4
55	4.7	24.8	20.5	1.26	45.7	3.2
55	5.6	25.2	20.9	1.26	47.0	4.3
55	6.3	25.5	21.2	1.26	47.8	5.3
55	6.5	25.6	21.3	1.26	48.0	5.6
55	6.8	25.7	21.4	1.26	48.3	6.1
65	7.4	25.8	21.5	1.26	48.8	7.0
65	4.0	27.0	22.6	1.30	53.1	2.2
65	4.7	27.6	23.2	1.30	54.6	2.9
65	5.6	28.2	23.7	1.31	56.0	4.0
65	6.3	28.5	24.1	1.31	56.9	4.9
65	6.5	28.6	24.1	1.31	57.1	5.2
75	6.8	28.7	24.3	1.31	57.4	5.6
75	7.4	29.0	24.5	1.31	58.0	6.5
75	4.0	30.3	25.8	1.32	61.3	2.2
75	4.7	30.9	26.4	1.32	63.0	2.8
75	5.6	31.6	27.1	1.32	64.7	3.9
75	6.3	32.0	27.5	1.32	65.7	4.7

Table 16. Heating capacities - VSV*024 (continued)

EWT	GPM	Gross (MBtuh)	Absorb (MBtuh)	Compressor Power (kW)	LWT	Feet Head
75	6.5	32.1	27.6	1.32	66.0	5.0
85	6.8	32.2	27.7	1.32	66.3	5.4
85	7.4	32.5	27.9	1.32	67.0	6.3
85	4.0	33.4	28.9	1.32	69.5	2.1
85	4.7	34.1	29.6	1.32	71.5	2.8
85	5.6	34.8	30.3	1.32	73.4	3.7
85	6.3	35.2	30.8	1.32	74.5	4.6
85	6.5	35.3	30.9	1.32	74.8	4.8
85	6.8	35.5	31.0	1.31	75.2	5.2
85	7.4	35.7	31.3	1.31	75.9	6.1

Note: Heating performance data is tabulated at 70°F DB at rated CFM. See correction factor tables to correct performance at conditions other than those tabulated. Interpolation of data is permissible; extrapolation is not. Rated GPM: 6.3; Minimum CFM: 695; Rated CFM: 930; Maximum CFM: 1024. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table.

Table 17. Fan correction factors - VSV*024

Entering CFM	Cooling Capacity	Sensible Capacity	Cooling Input Watts	Heating Capacity	Heating Input Watts
695	0.954	0.840	1.011	0.979	1.125
742	0.965	0.874	1.009	0.985	1.095
837	0.984	0.936	1.004	0.994	1.044
884	0.992	0.972	1.002	0.998	1.022
930	1.000	1.000	1.000	1.000	1.000
977	1.007	1.032	0.998	1.002	0.980
1023	0.970	1.085	1.007	1.003	0.961

Table 18. Cooling capacities - VSH*033

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
45	5.6	38.3	32.4	0.85	0.98	41.6	59.6	3.6
45	6.9	38.4	32.4	0.84	0.91	41.5	56.8	5.2
45	7.7	38.4	32.4	0.84	0.88	41.4	55.5	6.3
45	8.6	38.5	32.5	0.84	0.85	41.4	54.4	7.7
45	9.0	38.5	32.5	0.84	0.84	41.4	54.0	8.3
45	9.5	38.5	32.5	0.84	0.83	41.3	53.5	9.1
45	10.3	38.5	32.5	0.84	0.81	41.3	52.9	10.5
55	5.6	37.4	32.0	0.86	1.25	41.6	69.5	3.4
55	6.9	37.5	32.1	0.86	1.18	41.5	66.8	5.0
55	7.7	37.5	32.1	0.86	1.15	41.5	65.5	6.1
55	8.6	37.6	32.1	0.85	1.13	41.4	64.4	7.4
55	9.0	37.6	32.1	0.85	1.12	41.4	64.0	8.0
55	9.5	37.6	32.1	0.85	1.11	41.4	63.5	8.8
55	10.3	37.6	32.1	0.85	1.09	41.3	62.9	10.1
65	5.6	36.3	31.6	0.87	1.51	41.4	79.5	3.3
65	6.9	36.4	31.7	0.87	1.45	41.4	76.7	4.8
65	7.7	36.5	31.7	0.87	1.42	41.3	75.5	5.8
65	8.6	36.5	31.7	0.87	1.40	41.3	74.4	7.1
65	9.0	36.6	31.7	0.87	1.39	41.3	74.0	7.7
65	9.5	36.6	31.7	0.87	1.38	41.3	73.5	8.5
65	10.3	36.6	31.8	0.87	1.36	41.3	72.8	9.8

Table 18. Cooling capacities - VSH*033 (continued)

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
75	5.6	35.6	31.1	0.87	1.72	41.4	89.4	3.1
75	6.9	35.7	31.1	0.87	1.65	41.3	86.6	4.5
75	7.7	35.7	31.1	0.87	1.63	41.3	85.4	5.5
75	8.6	35.8	31.2	0.87	1.60	41.2	84.3	6.7
75	9.0	35.8	31.2	0.87	1.59	41.2	83.9	7.2
75	9.5	35.8	31.2	0.87	1.58	41.2	83.4	8.0
75	10.3	35.8	31.2	0.87	1.57	41.2	82.8	9.2
85	5.6	34.9	30.9	0.89	1.98	41.6	99.3	3.0
85	6.9	35.0	31.0	0.89	1.91	41.5	96.6	4.3
85	7.7	35.1	31.0	0.88	1.89	41.5	95.3	5.3
85	8.6	35.1	31.0	0.88	1.86	41.5	94.3	6.4
85	9.0	35.1	31.1	0.88	1.85	41.5	93.8	6.9
85	9.5	35.2	31.1	0.88	1.84	41.4	93.4	7.6
85	10.3	35.2	31.1	0.88	1.83	41.4	92.7	8.8
95	5.6	33.4	30.3	0.91	2.24	41.1	109.0	2.9
95	6.9	33.6	30.3	0.90	2.19	41.1	106.4	4.2
95	7.7	33.7	30.4	0.90	2.16	41.1	105.2	5.1
95	8.6	33.8	30.4	0.90	2.14	41.1	104.1	6.2
95	9.0	33.8	30.4	0.90	2.13	41.1	103.7	6.7
95	9.5	33.8	30.5	0.90	2.12	41.1	103.3	7.4
95	10.3	33.9	30.5	0.90	2.11	41.1	102.6	8.5
105	5.6	31.6	29.1	0.92	2.50	40.1	118.6	2.8
105	6.9	31.9	29.6	0.93	2.45	40.3	116.1	4.1
105	7.7	32.0	29.6	0.92	2.43	40.3	114.9	5.0
105	8.6	32.1	29.3	0.91	2.41	40.4	113.9	6.0
105	9.0	32.2	29.4	0.91	2.40	40.4	113.5	6.5
105	9.5	32.2	29.4	0.91	2.39	40.4	113.1	7.2
105	10.3	32.3	29.4	0.91	2.38	40.4	112.5	8.3
115	5.6	27.8	27.8	1.00	2.75	37.2	127.4	2.8
115	6.9	28.1	28.1	1.00	2.70	37.3	125.2	4.0
115	7.7	28.2	28.2	1.00	2.68	37.4	124.1	4.8
115	8.6	28.3	28.3	1.00	2.67	37.4	123.2	5.9
115	9.0	28.3	28.3	1.00	2.66	37.4	122.8	6.4
115	9.5	28.4	28.4	1.00	2.65	37.4	122.4	7.0
115	10.3	28.4	28.4	1.00	2.64	37.5	121.8	8.1
120	5.6	26.7	26.7	1.00	2.88	36.5	132.2	2.7
120	6.9	27.0	27.0	1.00	2.84	36.7	129.9	3.9
120	7.7	27.2	27.2	1.00	2.82	36.8	128.9	4.8
120	8.6	27.3	27.3	1.00	2.80	36.9	128.0	5.8
120	9.0	27.3	27.3	1.00	2.80	36.9	127.7	6.3
120	9.5	27.4	27.4	1.00	2.79	36.9	127.3	6.9
120	10.3	27.5	27.5	1.00	2.78	36.9	126.7	8.0

Note: Cooling performance data is tabulated at 80°F DB/67°F WB entering air at ANSI/AHRI/ASHRAE/ISO13256-1 rated CFM. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table. See performance correction tables to correct performance at conditions other than those tabulated. Rated GPM: 8.6; Minimum CFM: 891; Rated CFM: 1200; Maximum CFM: 1324.

Table 19. Heating capacities - VSH*033

EWT	GPM	Gross Mbtuh	Absorb Mbtuh	Comp Power (kW)	LWT	Feet Head
25	5.6	21.8	16.0	1.69	18.0	6.3
25	6.9	22.2	16.4	1.70	19.2	9.1
25	7.7	22.5	16.6	1.70	19.7	11.0
25	8.6	22.7	16.8	1.71	20.2	13.3
25	9.0	22.7	16.9	1.71	20.4	14.4
25	9.5	22.8	17.0	1.71	20.7	15.8
25	10.3	23.0	17.1	1.71	21.0	18.2
35	5.6	25.3	19.3	1.76	26.8	6.0
35	6.9	25.9	19.9	1.77	28.1	8.7
35	7.7	26.2	20.1	1.78	28.8	10.5
35	8.6	26.4	20.3	1.78	29.4	12.7
35	9.0	26.5	20.4	1.79	29.6	13.8
35	9.5	26.6	20.5	1.79	29.9	15.1
35	10.3	26.8	20.7	1.79	30.2	17.4
45	5.6	30.1	23.9	1.83	35.7	4.0
45	6.9	30.9	24.6	1.84	37.3	5.7
45	7.7	31.2	24.9	1.84	38.0	6.9
45	8.6	31.5	25.2	1.85	38.6	8.4
45	9.0	31.7	25.4	1.85	38.9	9.1
45	9.5	31.8	25.5	1.85	39.2	10.0
45	10.3	32.0	25.7	1.85	39.6	11.5
55	5.6	34.4	27.9	1.88	44.2	3.8
55	6.9	35.3	28.8	1.89	46.0	5.5
55	7.7	35.7	29.2	1.90	46.8	6.7
55	8.6	36.1	29.6	1.90	47.6	8.1
55	9.0	36.2	29.7	1.91	47.9	8.8
55	9.5	36.4	29.9	1.91	48.2	9.6
55	10.3	36.6	30.1	1.91	48.7	11.1
65	5.6	38.3	31.5	1.97	52.9	3.6
65	6.9	39.4	32.6	1.98	54.9	5.1
65	7.7	39.9	33.1	1.99	55.8	6.2
65	8.6	40.4	33.6	1.99	56.6	7.5
65	9.0	40.6	33.7	1.99	57.0	8.1
65	9.5	40.8	34.0	2.00	57.3	8.9
65	10.3	41.1	34.3	2.00	57.9	10.3
75	5.6	42.9	36.1	2.01	61.2	3.5
75	6.9	44.2	37.3	2.02	63.4	5.0
75	7.7	44.8	37.9	2.02	64.4	6.0
75	8.6	45.3	38.4	2.03	65.4	7.3
75	9.0	45.5	38.6	2.03	65.8	7.9
75	9.5	45.8	38.9	2.03	66.2	8.6
75	10.3	46.1	39.2	2.03	66.8	9.9
85	5.6	47.6	40.6	2.04	69.4	3.3
85	6.9	48.9	42.0	2.04	71.9	4.8
85	7.7	49.6	42.6	2.04	73.1	5.8
85	8.6	50.2	43.2	2.04	74.2	7.0
85	9.0	50.4	43.4	2.04	74.6	7.6
85	9.5	50.7	43.7	2.04	75.1	8.4

Table 19. Heating capacities - VSH*033 (continued)

EWT	GPM	Gross Mbtuh	Absorb Mbtuh	Comp Power (kW)	LWT	Feet Head
85	10.3	51.1	44.1	2.04	75.8	9.6

Note: Heating performance data is tabulated at 70°F DB at rated CFM. See correction factor tables to correct performance at conditions other than those tabulated. Interpolation of data is permissible; extrapolation is not. Rated GPM: 8.6; Minimum CFM: 891; Rated CFM: 1200; Maximum CFM: 1324. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table.

Table 20. Fan correction factors - VSH*033

Entering CFM	Cooling Capacity	Sensible Capacity	Cooling Comp Watts	Heating Capacity	Heating Comp Watts
891	0.949	0.833	1.005	0.984	1.132
952	0.961	0.866	1.004	0.990	1.102
1076	0.982	0.934	1.002	0.998	1.049
1138	0.992	0.967	1.001	0.999	1.023
1200	1.000	1.000	1.000	1.000	1.000
1262	1.008	1.033	0.999	1.001	0.979
1324	1.015	1.066	0.998	1.001	0.960

Table 21. Cooling capacities - VSV*033

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
45	5.0	40.0	32.9	0.82	1.02	43.5	62.3	3.0
45	6.1	40.2	33.0	0.82	0.94	43.4	59.2	4.3
45	7.2	40.2	33.1	0.82	0.89	43.3	57.0	5.7
45	8.3	40.3	33.1	0.82	0.85	43.2	55.4	7.4
45	9.4	40.4	33.1	0.82	0.82	43.2	54.1	9.2
45	10.5	40.4	33.1	0.82	0.79	43.1	53.2	11.2
45	11.6	40.5	33.2	0.82	0.77	43.1	52.4	13.3
55	5.0	38.7	32.2	0.83	1.27	43.0	72.1	2.9
55	6.1	38.9	32.4	0.83	1.20	43.0	69.0	4.1
55	7.2	39.1	32.4	0.83	1.15	43.0	66.9	5.5
55	8.3	39.2	32.5	0.83	1.12	43.0	65.3	7.1
55	9.4	39.3	32.5	0.83	1.09	43.0	64.1	8.8
55	10.5	39.3	32.6	0.83	1.07	42.9	63.1	10.7
55	11.6	39.3	32.6	0.83	1.05	42.9	62.4	12.8
65	5.0	37.0	31.3	0.85	1.50	42.1	81.7	2.8
65	6.1	37.3	31.5	0.84	1.44	42.3	78.8	4.0
65	7.2	37.6	31.7	0.84	1.40	42.4	76.7	5.3
65	8.3	37.7	31.7	0.84	1.37	42.4	75.2	6.8
65	9.4	37.8	31.8	0.84	1.34	42.4	74.0	8.5
65	10.5	37.9	31.8	0.84	1.32	42.4	73.0	10.3
65	11.6	38.0	31.9	0.84	1.31	42.4	72.3	12.3
75	5.0	36.6	31.3	0.86	1.74	42.5	91.7	2.7
75	6.1	36.8	31.5	0.85	1.68	42.6	88.8	3.8
75	7.2	37.0	31.6	0.85	1.64	42.6	86.7	5.1
75	8.3	37.2	31.6	0.85	1.60	42.6	85.1	6.6
75	9.4	37.3	31.7	0.85	1.58	42.6	84.0	8.2
75	10.5	37.3	31.7	0.85	1.56	42.6	83.0	10.0
75	11.6	37.4	31.7	0.85	1.54	42.6	82.3	11.9
85	5.0	35.0	30.7	0.88	1.99	41.7	101.2	2.7
85	6.1	35.2	30.8	0.88	1.93	41.8	98.3	3.8
85	7.2	35.4	30.9	0.87	1.88	41.8	96.2	5.1

Table 21. Cooling capacities - VSV*033 (continued)

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
85	8.3	35.5	31.0	0.87	1.85	41.8	94.8	6.5
85	9.4	35.5	31.0	0.87	1.82	41.7	93.6	8.1
85	10.5	35.6	31.0	0.87	1.80	41.7	92.7	9.9
85	11.6	35.6	31.0	0.87	1.79	41.7	92.0	11.8
95	5.0	33.4	30.0	0.90	2.25	41.0	110.8	2.6
95	6.1	33.7	30.1	0.89	2.19	41.1	108.0	3.7
95	7.2	33.9	30.2	0.89	2.15	41.2	106.0	4.9
95	8.3	34.0	30.3	0.89	2.12	41.2	104.6	6.4
95	9.4	34.1	30.3	0.89	2.10	41.3	103.5	7.9
95	10.5	34.2	30.4	0.89	2.08	41.3	102.6	9.6
95	11.6	34.2	30.4	0.89	2.07	41.3	101.9	11.5
105	5.0	31.4	29.4	0.93	2.51	40.0	120.3	2.5
105	6.1	31.8	29.5	0.93	2.46	40.2	117.6	3.6
105	7.2	32.0	29.7	0.93	2.42	40.3	115.7	4.8
105	8.3	32.2	29.7	0.92	2.39	40.4	114.3	6.2
105	9.4	32.3	29.8	0.92	2.37	40.4	113.2	7.7
105	10.5	32.5	29.8	0.92	2.35	40.5	112.4	9.3
105	11.6	32.6	29.6	0.91	2.34	40.6	111.7	11.1
115	5.0	27.8	27.8	1.00	2.76	37.2	129.1	2.5
115	6.1	28.2	28.2	1.00	2.71	37.4	126.6	3.5
115	7.2	29.8	28.4	0.95	2.69	39.0	125.3	4.7
115	8.3	28.6	28.6	1.00	2.66	37.6	123.6	6.0
115	9.4	28.7	28.7	1.00	2.64	37.7	122.6	7.5
115	10.5	28.8	28.8	1.00	2.62	37.7	121.8	9.1
115	11.6	28.9	28.9	1.00	2.61	37.8	121.2	10.8
120	5.0	26.6	26.6	1.00	2.89	36.4	133.7	2.4
120	6.1	27.0	27.0	1.00	2.84	36.7	131.3	3.5
120	7.2	27.2	27.2	1.00	2.81	36.8	129.7	4.6
120	8.3	27.4	27.4	1.00	2.79	36.9	128.4	5.9
120	9.4	27.5	27.5	1.00	2.77	37.0	127.4	7.4
120	10.5	27.7	27.7	1.00	2.76	37.1	126.7	9.0
120	11.6	27.7	27.7	1.00	2.75	37.1	126.1	10.7

Note: Cooling performance data is tabulated at 80°F DB/67°F WB entering air at ANSI/AHRI/ASHRAE/ISO13256-1 rated CFM. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table. See performance correction tables to correct performance at conditions other than those tabulated. Rated GPM: 8.3; Minimum CFM: 896; Rated CFM: 1200; Maximum CFM: 1321.

Table 22. Heating capacities - VSV*033

EWT	GPM	Gross (MBtuh)	Absorb (MBtuh)	Compressor Power (kW)	LWT	Feet Head
25	5.0	20.5	15.2	1.54	17.7	5.6
25	6.1	20.9	15.6	1.55	18.9	7.9
25	7.2	21.3	15.9	1.56	19.7	10.6
25	8.3	21.5	16.2	1.57	20.4	13.5
25	9.4	21.7	16.4	1.57	20.9	16.8
25	10.5	21.9	16.5	1.57	21.3	20.4
25	11.6	22.0	16.6	1.58	21.6	24.2
35	5.0	23.8	18.3	1.61	26.4	5.4
35	6.1	24.4	18.8	1.63	27.8	7.6
35	7.2	24.8	19.2	1.63	28.8	10.1

Table 22. Heating capacities - VSV*033 (continued)

EWT	GPM	Gross (MBtuh)	Absorb (MBtuh)	Compressor Power (kW)	LWT	Feet Head
35	8.3	25.1	19.5	1.64	29.5	13.0
35	9.4	25.3	19.7	1.64	30.1	16.1
35	10.5	25.5	19.9	1.65	30.6	19.5
35	11.6	25.7	20.0	1.65	31.0	23.2
45	5.0	27.9	22.2	1.67	35.5	3.7
45	6.1	28.6	22.8	1.68	37.0	5.2
45	7.2	29.1	23.3	1.69	38.1	7.0
45	8.3	29.5	23.7	1.70	38.9	8.9
45	9.4	29.7	23.9	1.70	39.6	11.1
45	10.5	30.0	24.2	1.71	40.1	13.4
45	11.6	30.2	24.4	1.71	40.5	16.0
55	5.0	31.7	25.8	1.73	44.0	3.6
55	6.1	32.5	26.6	1.74	45.7	5.0
55	7.2	33.1	27.1	1.75	47.0	6.7
55	8.3	33.5	27.5	1.75	47.9	8.6
55	9.4	33.9	27.9	1.76	48.7	10.6
55	10.5	34.1	28.1	1.76	49.3	12.9
55	11.6	34.4	28.4	1.76	49.8	15.3
65	5.0	34.9	28.8	1.78	52.8	3.3
65	6.1	35.8	29.8	1.79	54.7	4.7
65	7.2	36.5	30.4	1.80	56.1	6.2
65	8.3	37.1	30.9	1.80	57.1	8.0
65	9.4	37.5	31.3	1.81	57.9	9.9
65	10.5	37.8	31.7	1.81	58.6	12.0
65	11.6	38.1	32.0	1.81	59.2	14.3
75	5.0	39.0	32.8	1.82	61.1	3.2
75	6.1	40.1	33.9	1.83	63.2	4.5
75	7.2	40.9	34.6	1.83	64.8	6.0
75	8.3	41.5	35.2	1.83	66.0	7.7
75	9.4	41.9	35.7	1.84	66.9	9.6
75	10.5	42.3	36.1	1.84	67.7	11.6
75	11.6	42.6	36.4	1.84	68.3	13.8
85	5.0	43.1	36.8	1.84	69.3	3.1
85	6.1	44.2	37.9	1.84	71.7	4.4
85	7.2	45.1	38.8	1.85	73.5	5.8
85	8.3	45.7	39.4	1.85	74.8	7.5
85	9.4	46.2	39.9	1.85	75.9	9.2
85	10.5	46.6	40.3	1.85	76.8	11.2
85	11.6	47.0	40.7	1.85	77.5	13.3

Note: Heating performance data is tabulated at 70°F DB at rated CFM. See correction factor tables to correct performance at conditions other than those tabulated. Interpolation of data is permissible; extrapolation is not.Rated GPM: 8.3; Minimum CFM: 896; Rated CFM: 1200; Maximum CFM: 1321. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table.

Table 23. Fan correction factors - VSV*033

Entering CFM	Cooling Capacity	Sensible Capacity	Cooling Input Watts	Heating Capacity	Heating Input Watts
896	0.952	0.844	1.006	0.979	1.116
957	0.963	0.877	1.004	0.985	1.088
1078	0.983	0.942	1.002	0.994	1.041
1139	0.992	0.975	1.001	0.998	1.020

Table 23. Fan correction factors - VSV*033 (continued)

Entering CFM	Cooling Capacity	Sensible Capacity	Cooling Input Watts	Heating Capacity	Heating Input Watts
1200	1.000	1.000	1.000	1.000	1.000
1260	1.007	1.031	0.999	1.002	0.982
1321	1.014	1.071	0.998	1.003	0.965

Table 24. Cooling capacities - VSH*042

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
45	7.0	48.8	43.6	0.89	1.00	52.2	59.6	2.2
45	8.7	49.0	43.7	0.89	0.92	52.1	56.8	3.3
45	9.8	49.1	43.7	0.89	0.88	52.1	55.4	4.1
45	10.9	49.2	43.8	0.89	0.85	52.1	54.4	4.9
45	11.4	49.2	43.8	0.89	0.84	52.0	54.0	5.3
45	12.0	49.2	43.8	0.89	0.83	52.0	53.6	5.8
45	13.1	49.3	43.8	0.89	0.81	52.0	52.8	6.8
55	7.0	47.3	42.5	0.90	1.33	51.8	69.4	2.2
55	8.7	47.5	42.7	0.90	1.25	51.7	66.6	3.2
55	9.8	47.6	42.7	0.90	1.21	51.7	65.3	3.9
55	10.9	47.6	42.8	0.90	1.18	51.7	64.3	4.7
55	11.4	47.7	42.8	0.90	1.17	51.6	63.9	5.1
55	12.0	47.7	42.8	0.90	1.16	51.6	63.5	5.5
55	13.1	47.7	42.8	0.90	1.14	51.6	62.7	6.5
65	7.0	45.5	41.4	0.91	1.64	51.1	79.2	2.1
65	8.7	45.8	41.5	0.91	1.57	51.1	76.4	3.1
65	9.8	45.9	41.6	0.91	1.53	51.1	75.1	3.8
65	10.9	46.0	41.6	0.91	1.51	51.1	74.2	4.5
65	11.4	46.0	41.7	0.91	1.50	51.1	73.7	4.9
65	12.0	46.0	41.7	0.91	1.49	51.1	73.4	5.3
65	13.1	46.1	41.7	0.91	1.47	51.1	72.6	6.3
75	7.0	44.7	41.1	0.92	1.86	51.0	89.1	2.0
75	8.7	44.9	41.2	0.92	1.79	51.0	86.4	2.9
75	9.8	44.9	41.3	0.92	1.75	50.9	85.1	3.6
75	10.9	45.0	41.3	0.92	1.73	50.9	84.1	4.3
75	11.4	45.0	41.3	0.92	1.72	50.9	83.7	4.7
75	12.0	45.0	41.3	0.92	1.71	50.8	83.3	5.1
75	13.1	45.1	41.3	0.92	1.69	50.8	82.6	6.0
85	7.0	43.4	40.6	0.94	2.15	50.7	98.8	1.9
85	8.7	43.5	40.7	0.94	2.08	50.6	96.2	2.8
85	9.8	43.6	40.8	0.94	2.05	50.6	94.9	3.5
85	10.9	43.6	40.5	0.93	2.02	50.5	93.9	4.2
85	11.4	43.6	40.5	0.93	2.01	50.5	93.5	4.5
85	12.0	43.7	40.5	0.93	2.00	50.5	93.1	4.9
85	13.1	40.6	40.6	1.00	2.01	47.5	92.0	5.8
95	7.0	39.1	39.1	1.00	2.45	47.4	107.8	1.9
95	8.7	39.2	39.2	1.00	2.39	47.4	105.3	2.7
95	9.8	39.3	39.3	1.00	2.37	47.3	104.1	3.4
95	10.9	39.3	39.3	1.00	2.35	47.3	103.2	4.0
95	11.4	39.3	39.3	1.00	2.34	47.3	102.9	4.4
95	12.0	39.4	39.4	1.00	2.33	47.3	102.5	4.8

Table 24. Cooling capacities - VSH*042 (continued)

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
95	13.1	39.4	39.4	1.00	2.31	47.3	101.9	5.6
105	7.0	37.6	37.6	1.00	2.75	46.9	117.5	1.8
105	8.7	37.7	37.7	1.00	2.70	47.0	115.1	2.7
105	9.8	37.8	37.8	1.00	2.67	47.0	113.9	3.3
105	10.9	37.9	37.9	1.00	2.65	47.0	113.1	3.9
105	11.4	37.9	37.9	1.00	2.65	47.0	112.7	4.3
105	12.0	37.9	37.9	1.00	2.64	46.9	112.4	4.6
105	13.1	38.0	38.0	1.00	2.62	46.9	111.7	5.4
115	7.0	35.5	35.5	1.00	3.06	46.0	127.0	1.8
115	8.7	35.8	35.8	1.00	3.01	46.1	124.7	2.6
115	9.8	36.0	36.0	1.00	2.98	46.1	123.6	3.2
115	10.9	36.1	36.1	1.00	2.97	46.2	122.8	3.8
115	11.4	36.1	36.1	1.00	2.96	46.2	122.4	4.2
115	12.0	36.1	36.1	1.00	2.95	46.2	122.1	4.5
115	13.1	36.2	36.2	1.00	2.94	46.2	121.5	5.3
120	7.0	34.2	34.2	1.00	3.21	45.2	131.6	1.8
120	8.7	34.6	34.6	1.00	3.16	45.4	129.4	2.6
120	9.8	34.7	34.7	1.00	3.14	45.4	128.4	3.2
120	10.9	34.8	34.8	1.00	3.12	45.5	127.6	3.8
120	11.4	34.9	34.9	1.00	3.12	45.5	127.3	4.1
120	12.0	34.9	34.9	1.00	3.11	45.5	126.9	4.5
120	13.1	35.0	35.0	1.00	3.10	45.6	126.4	5.2

Note: Cooling performance data is tabulated at 80°F DB/67°F WB entering air at ANSI/AHRI/ASHRAE/ISO13256-1 rated CFM. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table. See performance correction tables to correct performance at conditions other than those tabulated. Rated GPM: 10.9; Minimum CFM: 1233; Rated CFM:1650; Maximum CFM:1817.

Table 25. Heating capacities - VSH*042

EWT	GPM	Gross Mbtuh	Absorb Mbtuh	Comp Power kW	LWT	Feet Head
25	7.0	26.0	19.8	1.84	18.4	3.2
25	8.7	26.6	20.3	1.85	19.6	4.6
25	9.8	26.8	20.5	1.85	20.1	5.7
25	10.9	27.0	20.7	1.86	20.6	6.8
25	11.4	27.1	20.8	1.86	20.7	7.3
35	12.0	27.2	20.9	1.86	20.9	7.9
35	13.1	27.4	21.0	1.86	21.2	9.3
35	7.0	30.3	23.8	1.91	27.2	3.0
35	8.7	31.0	24.4	1.92	28.5	4.4
35	9.8	31.3	24.7	1.92	29.2	5.4
35	10.9	31.5	25.0	1.93	29.7	6.5
35	11.4	31.7	25.1	1.93	30.0	7.0
45	12.0	31.8	25.2	1.93	30.2	7.6
45	13.1	32.0	25.4	1.93	30.5	8.9
45	7.0	35.7	29.0	1.97	36.3	2.5
45	8.7	36.6	29.8	1.98	37.8	3.6
45	9.8	37.0	30.2	1.99	38.5	4.4
45	10.9	37.3	30.6	1.99	39.1	5.3
45	11.4	37.5	30.7	1.99	39.3	5.7
55	12.0	37.6	30.8	1.99	39.6	6.2

Table 25. Heating capacities - VSH*042 (continued)

EWT	GPM	Gross Mbtuh	Absorb Mbtuh	Comp Power kW	LWT	Feet Head
55	13.1	37.9	31.1	2.00	40.0	7.2
55	7.0	40.9	34.0	2.03	44.8	2.4
55	8.7	42.0	35.0	2.04	46.6	3.4
55	9.8	42.5	35.5	2.04	47.4	4.3
55	10.9	42.9	35.9	2.04	48.1	5.1
55	11.4	43.1	36.1	2.04	48.4	5.5
65	12.0	43.3	36.3	2.05	48.6	6.0
65	13.1	43.6	36.6	2.05	49.1	7.0
65	7.0	45.1	38.0	2.09	53.8	2.2
65	8.7	46.4	39.3	2.10	55.6	3.3
65	9.8	47.1	39.9	2.11	56.6	4.0
65	10.9	47.6	40.4	2.11	57.3	4.8
65	11.4	47.8	40.6	2.11	57.6	5.2
75	12.0	48.1	40.8	2.11	57.9	5.6
75	13.1	48.5	41.2	2.12	58.4	6.6
75	7.0	51.0	43.7	2.13	62.0	2.2
75	8.7	52.5	45.2	2.14	64.1	3.2
75	9.8	53.3	46.0	2.14	65.2	3.9
75	10.9	53.9	46.6	2.15	66.0	4.6
75	11.4	54.2	46.9	2.15	66.4	5.0
85	12.0	54.4	47.1	2.15	66.7	5.5
85	13.1	54.9	47.6	2.15	67.4	6.4
85	7.0	56.9	49.5	2.16	70.2	2.1
85	8.7	58.7	51.3	2.16	72.6	3.1
85	9.8	59.6	52.2	2.16	73.8	3.8
85	10.9	60.2	52.9	2.16	74.8	4.5
85	11.4	60.5	53.2	2.16	75.2	4.9
85	12.0	60.8	53.4	2.16	75.6	5.3
85	13.1	61.3	54.0	2.16	76.3	6.2

Note: Heating performance data is tabulated at 70°F DB at rated CFM. See correction factor tables to correct performance at conditions other than those tabulated. Interpolation of data is permissible; extrapolation is not. Rated GPM: 10.9; Minimum CFM: 1233; Rated CFM:1650; Maximum CFM:1817. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table.

Table 26. Fan correction factors - VSH*042

Entering CFM	Cooling Capacity	Sensible Capacity	Cooling Comp Watts	Heating Capacity	Heating Comp Watts
1233	0.954	0.835	1.006	0.992	1.128
1316	0.965	0.870	1.005	0.994	1.097
1483	0.984	0.939	1.002	0.998	1.043
1567	0.992	0.973	1.001	0.999	1.021
1650	1.000	1.000	1.000	1.000	1.000
1733	0.944	1.015	1.007	1.001	0.981
1817	0.956	1.028	1.006	1.001	0.964

Table 27. Cooling capacities - VSV*042

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
45	7.1	50.0	44.3	0.89	1.11	53.8	59.9	2.4
45	8.7	50.1	44.3	0.88	1.03	53.6	57.1	3.4
45	9.8	50.2	44.4	0.88	0.99	53.5	55.7	4.2

Table 27. Cooling capacities - VSV*042 (continued)

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
45	10.9	50.2	44.4	0.88	0.96	53.4	54.7	5.0
45	11.4	50.2	44.4	0.88	0.94	53.4	54.2	5.5
45	12.0	50.2	44.4	0.88	0.93	53.4	53.8	6.0
45	13.1	50.2	44.4	0.88	0.91	53.3	53.0	7.0
55	7.1	48.5	43.2	0.89	1.43	53.4	69.8	2.3
55	8.7	48.6	43.3	0.89	1.36	53.2	67.0	3.3
55	9.8	48.6	43.3	0.89	1.32	53.1	65.6	4.0
55	10.9	48.6	43.3	0.89	1.29	53.0	64.6	4.9
55	11.4	48.6	43.3	0.89	1.27	53.0	64.1	5.3
55	12.0	48.6	43.3	0.89	1.26	52.9	63.7	5.8
55	13.1	48.7	43.3	0.89	1.24	52.9	62.9	6.7
65	7.1	46.8	42.0	0.90	1.75	52.8	79.6	2.2
65	8.7	46.9	42.1	0.90	1.68	52.6	76.9	3.1
65	9.8	46.9	42.1	0.90	1.64	52.5	75.5	3.9
65	10.9	47.0	42.2	0.90	1.61	52.5	74.5	4.7
65	11.4	47.0	42.2	0.90	1.60	52.5	74.0	5.1
65	12.0	47.0	42.2	0.90	1.59	52.4	73.6	5.5
65	13.1	47.0	42.2	0.90	1.57	52.4	72.9	6.5
75	7.1	46.8	42.2	0.90	2.02	53.7	89.8	2.1
75	8.7	46.9	42.2	0.90	1.94	53.5	87.1	3.0
75	9.8	46.9	42.2	0.90	1.91	53.4	85.7	3.7
75	10.9	47.0	42.3	0.90	1.88	53.4	84.6	4.5
75	11.4	47.0	42.3	0.90	1.86	53.3	84.2	4.8
75	12.0	47.0	42.3	0.90	1.85	53.3	83.7	5.3
75	13.1	47.0	42.3	0.90	1.83	53.3	83.0	6.2
85	7.1	45.3	41.7	0.92	2.34	53.2	99.5	2.0
85	8.7	45.4	41.7	0.92	2.26	53.1	96.8	2.9
85	9.8	45.4	41.7	0.92	2.22	53.0	95.5	3.6
85	10.9	45.5	41.7	0.92	2.19	52.9	94.4	4.3
85	11.4	45.5	41.7	0.92	2.18	52.9	94.0	4.7
85	12.0	45.5	41.8	0.92	2.17	52.9	93.6	5.1
85	13.1	45.5	41.8	0.92	2.15	52.8	92.8	6.0
95	7.1	40.5	40.5	1.00	2.66	49.6	108.4	2.0
95	8.7	40.6	40.6	1.00	2.59	49.4	105.9	2.8
95	9.8	40.6	40.6	1.00	2.56	49.4	104.7	3.5
95	10.9	40.6	40.6	1.00	2.54	49.3	103.7	4.2
95	11.4	40.6	40.6	1.00	2.53	49.3	103.3	4.5
95	12.0	40.7	40.7	1.00	2.52	49.3	102.9	5.0
95	13.1	40.7	40.7	1.00	2.50	49.2	102.2	5.8
105	7.1	39.1	39.1	1.00	2.98	49.3	118.3	1.9
105	8.7	39.2	39.2	1.00	2.92	49.2	115.8	2.7
105	9.8	39.2	39.2	1.00	2.89	49.1	114.6	3.4
105	10.9	39.3	39.3	1.00	2.87	49.1	113.6	4.1
105	11.4	39.3	39.3	1.00	2.86	49.1	113.2	4.4
105	12.0	39.3	39.3	1.00	2.85	49.0	112.8	4.8
105	13.1	39.3	39.3	1.00	2.84	49.0	112.2	5.6
115	7.1	37.4	37.4	1.00	3.31	48.7	128.0	1.9
115	8.7	37.6	37.6	1.00	3.26	48.7	125.6	2.7

Table 27. Cooling capacities - VSV*042 (continued)

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
115	9.8	37.7	37.7	1.00	3.23	48.7	124.4	3.3
115	10.9	37.7	37.7	1.00	3.21	48.7	123.5	4.0
115	11.4	37.7	37.7	1.00	3.20	48.7	123.1	4.3
115	12.0	37.8	37.8	1.00	3.19	48.7	122.7	4.7
115	13.1	37.8	37.8	1.00	3.18	48.6	122.1	5.5
120	7.1	36.4	36.4	1.00	3.48	48.3	132.8	1.8
120	8.7	36.6	36.6	1.00	3.43	48.3	130.5	2.6
120	9.8	36.7	36.7	1.00	3.40	48.3	129.3	3.2
120	10.9	36.8	36.8	1.00	3.38	48.3	128.4	3.9
120	11.4	36.8	36.8	1.00	3.37	48.3	128.0	4.2
120	12.0	36.9	36.9	1.00	3.36	48.3	127.6	4.6
120	13.1	36.9	36.9	1.00	3.35	48.3	127.0	5.4

Note: Cooling performance data is tabulated at 80°F DB/67°F WB entering air at ANSI/AHRI/ASHRAE/ISO13256-1 rated CFM. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table. See performance correction tables to correct performance at conditions other than those tabulated. Rated GPM: 10.9; Minimum CFM: 1233; Rated CFM: 1650; Maximum CFM: 1817.

Table 28. Heating capacities - VSV*042

EWT	GPM	Gross (MBtuh)	Absorb (MBtuh)	Compressor Power (kW)	LWT	Feet Head
25	7.1	27.5	20.5	2.04	18.1	3.2
25	8.7	28.1	21.1	2.05	19.2	4.6
25	9.8	28.4	21.4	2.05	19.8	5.7
25	10.9	28.6	21.6	2.06	20.3	6.8
25	11.4	28.7	21.7	2.06	20.5	7.4
35	12.0	28.8	21.8	2.06	20.7	8.1
35	13.1	29.0	21.9	2.07	21.0	9.4
35	7.1	32.0	24.8	2.12	26.8	3.1
35	8.7	32.7	25.4	2.14	28.2	4.4
35	9.8	33.1	25.8	2.14	28.9	5.4
35	10.9	33.4	26.1	2.15	29.4	6.5
35	11.4	33.5	26.2	2.15	29.6	7.1
45	12.0	33.7	26.3	2.15	29.9	7.7
45	13.1	33.9	26.5	2.16	30.3	9.0
45	7.1	36.5	29.0	2.20	36.1	2.6
45	8.7	37.4	29.8	2.21	37.6	3.8
45	9.8	37.8	30.3	2.22	38.3	4.6
45	10.9	38.2	30.6	2.23	38.9	5.6
45	11.4	38.4	30.8	2.23	39.2	6.0
55	12.0	38.5	30.9	2.23	39.4	6.6
55	13.1	38.8	31.2	2.24	39.9	7.7
55	7.1	41.9	34.1	2.28	44.7	2.5
55	8.7	42.9	35.1	2.29	46.3	3.6
55	9.8	43.5	35.7	2.30	47.2	4.4
55	10.9	44.0	36.1	2.30	47.9	5.4
55	11.4	44.1	36.3	2.30	48.2	5.8
65	12.0	44.4	36.5	2.31	48.5	6.3
65	13.1	44.7	36.8	2.31	49.0	7.4
65	7.1	47.3	39.1	2.39	53.2	2.4
65	8.7	48.6	40.4	2.40	55.1	3.4

Table 28. Heating capacities - VSV*042 (continued)

EWT	GPM	Gross (MBtuh)	Absorb (MBtuh)	Compressor Power (kW)	LWT	Feet Head
65	9.8	49.2	41.0	2.41	56.1	4.2
65	10.9	49.8	41.6	2.41	56.9	5.1
65	11.4	50.0	41.8	2.41	57.2	5.5
75	12.0	50.3	42.0	2.42	57.5	6.0
75	13.1	50.7	42.4	2.42	58.1	7.0
75	7.1	53.3	45.0	2.45	61.5	2.3
75	8.7	54.8	46.4	2.46	63.6	3.3
75	9.8	55.6	47.2	2.46	64.7	4.1
75	10.9	56.2	47.8	2.47	65.6	4.9
75	11.4	56.5	48.1	2.47	66.0	5.3
85	12.0	56.8	48.4	2.47	66.4	5.8
85	13.1	57.2	48.8	2.47	67.1	6.8
85	7.1	59.4	50.9	2.49	69.7	2.3
85	8.7	61.1	52.6	2.50	72.1	3.2
85	9.8	62.0	53.5	2.50	73.4	4.0
85	10.9	62.7	54.2	2.50	74.4	4.8
85	11.4	63.0	54.5	2.50	74.8	5.2
85	12.0	63.3	54.8	2.50	75.3	5.6
85	13.1	63.8	55.3	2.50	76.0	6.6

Note: Heating performance data is tabulated at 70°F DB at rated CFM. See performance correction tables to correct performance at conditions other than those tabulated. Interpolation of data is permissible; extrapolation is not. Rated GPM: 10.9; Minimum CFM: 1233; Rated CFM: 1650; Maximum CFM: 1817. For ANSI/AHRI/ASHRAE/ ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table.

Table 29. Fan correction factors - VSV*042

Entering CFM	Cooling Capacity	Sensible Capacity	Cooling Input Watts	Heating Capacity	Heating Input Watts
1233	0.952	0.833	1.005	0.991	1.117
1316	0.964	0.867	1.004	0.995	1.090
1483	0.984	0.934	1.002	0.999	1.042
1567	0.992	0.967	1.001	1.000	1.020
1650	1.000	1.000	1.000	1.000	1.000
1733	0.935	1.016	1.006	1.000	0.982
1817	0.948	1.030	1.005	1.001	0.966

Table 30. Cooling capacities - VSH*050

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
45	8.4	61.1	51.8	0.85	1.48	66.2	60.5	2.9
45	10.4	61.4	52.0	0.85	1.37	66.1	57.5	4.3
45	11.7	61.5	52.0	0.85	1.33	66.0	56.0	5.3
45	13.0	61.6	52.1	0.85	1.29	66.0	55.0	6.3
45	13.6	61.6	52.1	0.85	1.28	66.0	54.5	6.9
45	14.3	61.6	52.1	0.85	1.26	66.0	54.1	7.4
45	15.6	61.7	52.2	0.85	1.24	65.9	53.3	8.7
55	8.4	59.3	50.7	0.85	1.85	65.7	70.3	2.8
55	10.4	59.6	50.8	0.85	1.75	65.5	67.3	4.1
55	11.7	59.7	50.9	0.85	1.71	65.5	65.9	5.1
55	13.0	59.8	51.0	0.85	1.67	65.5	64.9	6.1
55	13.6	59.8	51.0	0.85	1.66	65.4	64.4	6.6
55	14.3	59.8	51.0	0.85	1.65	65.4	64.0	7.2

Table 30. Cooling capacities - VSH*050 (continued)

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
55	15.6	59.9	51.0	0.85	1.62	65.4	63.2	8.4
65	8.4	57.2	49.4	0.86	2.22	64.8	80.0	2.7
65	10.4	57.5	49.6	0.86	2.13	64.8	77.1	3.9
65	11.7	57.7	49.7	0.86	2.09	64.8	75.8	4.9
65	13.0	57.8	49.7	0.86	2.06	64.8	74.7	5.9
65	13.6	57.8	49.7	0.86	2.04	64.8	74.3	6.4
65	14.3	57.9	49.8	0.86	2.03	64.8	73.9	6.9
65	15.6	57.9	49.8	0.86	2.01	64.8	73.1	8.1
75	8.4	56.2	49.0	0.87	2.53	64.8	89.9	2.6
75	10.4	56.4	49.1	0.87	2.43	64.7	87.0	3.8
75	11.7	56.5	49.1	0.87	2.39	64.7	85.7	4.7
75	13.0	56.6	48.9	0.86	2.37	64.7	85.1	5.5
75	13.6	56.6	49.2	0.87	2.34	64.6	84.2	6.1
75	14.3	56.7	49.2	0.87	2.33	64.6	83.8	6.6
75	15.6	56.8	49.2	0.87	2.31	64.6	83.0	7.7
85	8.4	54.3	48.3	0.89	2.86	64.1	99.5	2.5
85	10.4	54.5	48.4	0.89	2.77	64.0	96.7	3.6
85	11.7	54.6	48.4	0.89	2.73	63.9	95.4	4.5
85	13.0	54.7	48.4	0.89	2.70	63.9	94.4	5.4
85	13.6	54.7	48.5	0.89	2.69	63.9	93.9	5.9
85	14.3	54.7	48.5	0.89	2.68	63.9	93.5	6.4
85	15.6	54.8	48.5	0.89	2.65	63.8	92.8	7.5
95	8.4	52.1	47.2	0.91	3.24	63.2	109.1	2.4
95	10.4	52.5	47.3	0.90	3.16	63.2	106.4	3.5
95	11.7	52.6	47.4	0.90	3.12	63.2	105.1	4.4
95	13.0	52.7	47.5	0.90	3.09	63.2	104.2	5.2
95	13.6	52.7	47.5	0.90	3.08	63.2	103.7	5.7
95	14.3	52.8	47.5	0.90	3.07	63.2	103.4	6.2
95	15.6	52.8	47.5	0.90	3.05	63.2	102.6	7.2
105	8.4	49.6	46.0	0.93	3.62	62.0	118.6	2.4
105	10.4	50.0	46.2	0.92	3.55	62.2	116.1	3.4
105	11.7	50.2	46.3	0.92	3.51	62.2	114.8	4.3
105	13.0	50.4	46.3	0.92	3.48	62.2	113.9	5.1
105	13.6	50.4	46.3	0.92	3.47	62.3	113.5	5.5
105	14.3	50.5	46.4	0.92	3.46	62.3	113.1	6.0
105	15.6	50.6	46.4	0.92	3.44	62.3	112.4	7.0
115	8.4	44.5	44.5	1.00	3.98	58.1	127.5	2.3
115	10.4	44.9	44.9	1.00	3.91	58.3	125.1	3.4
115	11.7	45.1	45.1	1.00	3.88	58.4	124.0	4.2
115	13.0	45.2	45.2	1.00	3.86	58.4	123.2	5.0
115	13.6	45.3	45.3	1.00	3.85	58.4	122.8	5.4
115	14.3	45.4	45.4	1.00	3.84	58.5	122.5	5.8
115	15.6	45.5	45.5	1.00	3.82	58.5	121.8	6.9
120	8.4	42.8	42.8	1.00	4.17	57.0	132.1	2.3
120	10.4	43.3	43.3	1.00	4.11	57.3	129.9	3.3
120	11.7	43.5	43.5	1.00	4.08	57.4	128.8	4.1
120	13.0	43.6	43.6	1.00	4.06	57.5	127.9	4.9
120	13.6	43.7	43.7	1.00	4.05	57.5	127.6	5.3

Table 30. Cooling capacities - VSH*050 (continued)

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
120	14.3	43.8	43.8	1.00	4.04	57.5	127.3	5.8
120	15.6	43.9	43.9	1.00	4.02	57.6	126.6	6.8

Note: Cooling performance data is tabulated at 80°F DB/67°F WB entering air at ANSI/AHRI/ASHRAE/ISO13256-1 rated CFM. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table. See performance correction tables to correct performance at conditions other than those tabulated. Rated GPM:13.0; Minimum CFM:1412; Rated CFM:1890; Maximum CFM:2081.

Table 31. Heating capacities - VSH*050

EWT	GPM	Gross Mbtuh	Absorb Mbtuh	Comp Power (kW)	LWT	Feet Head
25	8.4	32.6	24.3	2.45	18.0	4.2
25	10.4	33.4	24.9	2.47	19.3	6.1
25	11.7	33.7	25.3	2.48	19.9	7.6
25	13.0	34.0	25.5	2.48	20.3	9.1
25	13.6	34.1	25.6	2.49	20.5	9.8
25	14.3	34.2	25.7	2.49	20.7	10.6
25	15.6	34.4	25.9	2.49	21.0	12.5
35	8.4	38.0	29.2	2.57	26.8	4.1
35	10.4	38.8	30.0	2.59	28.2	5.9
35	11.7	39.3	30.4	2.60	28.9	7.3
35	13.0	39.6	30.8	2.60	29.4	8.7
35	13.6	39.8	30.9	2.61	29.7	9.4
35	14.3	39.9	31.0	2.61	29.9	10.2
35	15.6	40.2	31.3	2.62	30.3	11.9
45	8.4	46.1	37.0	2.68	35.5	3.2
45	10.4	47.3	38.1	2.69	37.1	4.6
45	11.7	47.9	38.7	2.70	37.9	5.7
45	13.0	48.3	39.1	2.71	38.6	6.8
45	13.6	48.5	39.3	2.71	38.8	7.4
45	14.3	48.7	39.5	2.72	39.1	8.0
45	15.6	49.1	39.8	2.72	39.5	9.3
55	8.4	52.7	43.2	2.78	44.0	3.0
55	10.4	54.1	44.6	2.80	45.9	4.4
55	11.7	54.8	45.2	2.81	46.8	5.5
55	13.0	55.4	45.8	2.82	47.5	6.5
55	13.6	55.6	46.0	2.82	47.8	7.1
55	14.3	55.8	46.2	2.82	48.1	7.7
55	15.6	56.2	46.6	2.83	48.6	8.9
65	8.4	59.7	49.7	2.93	52.4	2.9
65	10.4	61.6	51.5	2.95	54.5	4.2
65	11.7	62.5	52.4	2.96	55.6	5.2
65	13.0	63.2	53.0	2.97	56.4	6.2
65	13.6	63.5	53.3	2.97	56.7	6.7
65	14.3	63.8	53.6	2.97	57.0	7.2
65	15.6	64.3	54.1	2.98	57.6	8.4
75	8.4	67.1	56.8	3.02	60.6	2.8
75	10.4	69.2	58.9	3.04	63.0	4.0
75	11.7	70.3	59.9	3.05	64.2	5.0
75	13.0	71.1	60.7	3.06	65.1	5.9
75	13.6	71.5	61.0	3.06	65.5	6.5
75	14.3	71.8	61.3	3.06	65.9	7.0

Table 31. Heating capacities - VSH*050 (continued)

EWT	GPM	Gross Mbtuh	Absorb Mbtuh	Comp Power (kW)	LWT	Feet Head
75	15.6	72.4	61.9	3.07	66.6	8.2
85	8.4	74.6	64.0	3.10	68.8	2.7
85	10.4	77.0	66.4	3.12	71.4	3.9
85	11.7	78.2	67.5	3.13	72.8	4.8
85	13.0	79.1	68.4	3.13	73.8	5.8
85	13.6	79.5	68.8	3.14	74.3	6.3
85	14.3	79.9	69.2	3.14	74.7	6.8
85	15.6	80.6	69.9	3.14	75.5	7.9

Note: Heating performance data is tabulated at 70°F DB at rated CFM. See correction factor tables to correct performance at conditions other than those tabulated. Interpolation of data is permissible; extrapolation is not. Rated GPM:13.0; Minimum CFM:1412; Rated CFM:1890; Maximum CFM:2081. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table.

Table 32. Fan correction factors - VSH*050

Entering CFM	Cooling Capacity	Sensible Capacity	Cooling Comp Watts	Heating Capacity	Heating Comp Watts
1412	0.953	0.836	1.002	0.991	1.136
1508	0.964	0.869	1.002	0.993	1.102
1699	0.984	0.935	1.001	0.998	1.046
1794	0.992	0.967	1.000	0.999	1.022
1890	1.000	1.000	1.000	1.000	1.000
1986	1.007	1.032	1.000	1.001	0.980
2081	1.014	1.065	0.999	1.002	0.962

Table 33. Cooling capacities - VSV*050

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
45	8.5	56.6	50.5	0.89	1.45	61.6	59.2	3.3
45	10.4	56.7	50.5	0.89	1.36	61.4	56.6	4.8
45	11.7	56.7	50.6	0.89	1.32	61.3	55.3	5.9
45	13.0	56.8	50.6	0.89	1.29	61.2	54.2	7.1
45	13.7	56.8	50.6	0.89	1.27	61.1	53.8	7.8
45	14.3	56.8	50.6	0.89	1.26	61.1	53.4	8.4
45	15.6	56.8	50.6	0.89	1.24	61.1	52.7	9.8
55	8.5	54.9	49.3	0.90	1.81	61.1	69.1	3.2
55	10.4	55.0	49.3	0.90	1.73	60.9	66.5	4.6
55	11.7	55.0	49.3	0.90	1.69	60.8	65.2	5.7
55	13.0	55.0	49.4	0.90	1.65	60.7	64.2	6.8
55	13.7	55.1	49.4	0.90	1.64	60.7	63.7	7.5
55	14.3	55.1	49.4	0.90	1.63	60.6	63.3	8.1
55	15.6	55.1	49.4	0.90	1.61	60.6	62.6	9.4
65	8.5	53.1	48.0	0.90	2.17	60.4	78.9	3.1
65	10.4	53.1	48.0	0.90	2.09	60.3	76.4	4.4
65	11.7	53.2	48.0	0.90	2.05	60.2	75.1	5.5
65	13.0	53.2	48.1	0.90	2.02	60.1	74.1	6.6
65	13.7	53.2	48.1	0.90	2.01	60.1	73.6	7.2
65	14.3	53.3	48.1	0.90	2.00	60.1	73.2	7.8
65	15.6	53.3	48.1	0.90	1.97	60.0	72.5	9.1
75	8.5	53.3	48.2	0.91	2.47	61.7	89.2	3.0
75	10.4	53.4	48.3	0.90	2.38	61.5	86.6	4.3
75	11.7	53.4	48.3	0.90	2.35	61.4	85.3	5.3

Table 33. Cooling capacities - VSV*050 (continued)

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
75	13.0	53.5	48.3	0.90	2.31	61.3	84.2	6.3
75	13.7	53.5	48.3	0.90	2.30	61.3	83.8	6.9
75	14.3	53.5	48.3	0.90	2.29	61.3	83.4	7.5
75	15.6	53.5	48.3	0.90	2.27	61.2	82.7	8.7
85	8.5	53.4	48.2	0.90	2.82	63.0	99.4	2.6
85	10.4	53.5	48.2	0.90	2.74	62.9	96.8	3.8
85	11.7	53.6	48.2	0.90	2.70	62.8	95.4	4.6
85	13.0	53.6	48.3	0.90	2.66	62.7	94.4	5.6
85	13.7	53.7	48.3	0.90	2.65	62.7	93.9	6.1
85	14.3	53.7	48.3	0.90	2.64	62.7	93.5	6.6
85	15.6	53.7	48.3	0.90	2.62	62.6	92.8	7.7
95	8.5	51.5	47.3	0.92	3.20	62.4	109.2	2.6
95	10.4	51.6	47.4	0.92	3.12	62.3	106.6	3.7
95	11.7	51.7	47.4	0.92	3.08	62.2	105.3	4.5
95	13.0	51.8	47.4	0.92	3.05	62.2	104.3	5.4
95	13.7	51.8	47.5	0.92	3.04	62.1	103.8	5.9
95	14.3	51.8	47.5	0.92	3.03	62.1	103.4	6.4
95	15.6	51.8	47.5	0.92	3.01	62.1	102.7	7.5
105	8.5	46.1	46.1	1.00	3.56	58.2	118.2	2.5
105	10.4	46.2	46.2	1.00	3.49	58.1	115.7	3.6
105	11.7	46.3	46.3	1.00	3.46	58.1	114.5	4.4
105	13.0	46.3	46.3	1.00	3.43	58.0	113.6	5.3
105	13.7	46.3	46.3	1.00	3.42	58.0	113.1	5.8
105	14.3	46.3	46.3	1.00	3.41	58.0	112.8	6.2
105	15.6	46.4	46.4	1.00	3.39	57.9	112.1	7.3
115	8.5	44.2	44.2	1.00	3.95	57.6	127.9	2.4
115	10.4	44.4	44.4	1.00	3.88	57.6	125.6	3.5
115	11.7	44.4	44.4	1.00	3.85	57.6	124.4	4.3
115	13.0	44.5	44.5	1.00	3.83	57.6	123.5	5.1
115	13.7	44.5	44.5	1.00	3.81	57.5	123.0	5.6
115	14.3	44.6	44.6	1.00	3.80	57.5	122.7	6.1
115	15.6	44.6	44.6	1.00	3.79	57.5	122.0	7.1
120	8.5	43.0	43.0	1.00	4.14	57.1	132.8	2.4
120	10.4	43.3	43.3	1.00	4.08	57.2	130.5	3.4
120	11.7	43.4	43.4	1.00	4.05	57.2	129.3	4.2
120	13.0	43.5	43.5	1.00	4.03	57.2	128.4	5.1
120	13.7	43.5	43.5	1.00	4.01	57.2	127.9	5.6
120	14.3	43.5	43.5	1.00	4.01	57.2	127.6	6.0
120	15.6	43.6	43.6	1.00	3.99	57.2	127.0	7.0

Note: Cooling performance data is tabulated at 80°F DB/67°F WB entering air at ANSI/AHRI/ASHRAE/ISO13256-1 rated CFM. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table. See performance correction tables to correct performance at conditions other than those tabulated. Rated GPM: 13.0; Minimum CFM: 1412; Rated CFM: 1890; Maximum CFM: 2081.

Table 34. Heating capacities - VSV*050

EWT	GPM	Gross (MBtuh)	Absorb (MBtuh)	Compressor Power (kW)	LWT	Feet Head
25	8.5	32.1	23.7	2.46	18.3	4.4
25	10.4	32.8	24.3	2.48	19.4	6.2
25	11.7	33.1	24.7	2.48	20.0	7.6

Table 34. Heating capacities - VSV*050 (continued)

EWT	GPM	Gross (MBtuh)	Absorb (MBtuh)	Compressor Power (kW)	LWT	Feet Head
25	13.0	33.4	24.9	2.49	20.4	9.1
25	13.7	33.6	25.0	2.49	20.6	10.0
25	14.3	33.7	25.1	2.50	20.8	10.8
25	15.6	33.9	25.3	2.50	21.1	12.5
35	8.5	37.5	28.7	2.58	27.0	4.2
35	10.4	38.3	29.5	2.59	28.3	5.9
35	11.7	38.8	29.9	2.60	29.0	7.3
35	13.0	39.1	30.2	2.61	29.5	8.7
35	13.7	39.3	30.4	2.61	29.8	9.6
35	14.3	39.4	30.5	2.62	30.0	10.3
35	15.6	39.7	30.7	2.62	30.4	12.0
45	8.5	42.9	33.8	2.67	36.3	3.5
45	10.4	43.9	34.8	2.68	37.7	4.9
45	11.7	44.5	35.3	2.69	38.5	6.0
45	13.0	44.9	35.7	2.70	39.0	7.2
45	13.7	45.1	35.9	2.71	39.3	7.9
45	14.3	45.3	36.0	2.71	39.5	8.5
45	15.6	45.6	36.3	2.72	40.0	9.9
55	8.5	49.3	39.8	2.77	44.9	3.3
55	10.4	50.5	41.0	2.79	46.5	4.7
55	11.7	51.2	41.6	2.80	47.3	5.8
55	13.0	51.7	42.1	2.81	48.0	7.0
55	13.7	52.0	42.4	2.82	48.4	7.6
55	14.3	52.2	42.5	2.82	48.6	8.2
55	15.6	52.6	42.9	2.83	49.1	9.5
65	8.5	54.4	44.5	2.90	53.7	3.2
65	10.4	55.8	45.9	2.92	55.5	4.5
65	11.7	56.6	46.6	2.93	56.4	5.5
65	13.0	57.2	47.2	2.94	57.2	6.6
65	13.7	57.5	47.5	2.94	57.6	7.3
65	14.3	57.8	47.7	2.95	57.8	7.8
65	15.6	58.2	48.2	2.95	58.4	9.1
75	8.5	61.4	51.2	2.99	62.1	3.1
75	10.4	63.2	52.9	3.01	64.1	4.3
75	11.7	64.1	53.8	3.02	65.2	5.3
75	13.0	64.8	54.5	3.03	66.0	6.4
75	13.7	65.2	54.8	3.04	66.4	7.0
75	14.3	65.4	55.1	3.04	66.8	7.6
75	15.6	66.0	55.6	3.04	67.4	8.8
85	8.5	68.6	58.2	3.07	70.3	3.0
85	10.4	70.6	60.1	3.09	72.6	4.2
85	11.7	71.6	61.1	3.10	73.8	5.2
85	13.0	72.5	61.9	3.11	74.8	6.2
85	13.7	72.9	62.3	3.11	75.3	6.8
85	14.3	73.2	62.6	3.12	75.6	7.3
85	15.6	73.8	63.2	3.12	76.3	8.5

Note: Heating performance data is tabulated at 70°F DB at rated CFM. See performance correction tables to correct performance at conditions other than those tabulated. Interpolation of data is permissible; extrapolation is not. Rated GPM: 13.0; Minimum CFM: 1412; Rated CFM: 1890; Maximum CFM: 2081. For ANSI/AHRI/ASHRAE/ ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table.

Table 35. Fan correction factors - VSV*050

Entering CFM	Cooling Capacity	Sensible Capacity	Cooling Input Watts	Heating Capacity	Heating Input Watts
1412	0.952	0.834	1.002	0.993	1.109
1508	0.963	0.868	1.002	0.996	1.083
1699	0.983	0.934	1.001	0.999	1.038
1794	0.992	0.967	1.000	1.000	1.018
1890	1.000	1.000	1.000	1.000	1.000
1986	1.007	1.033	1.000	1.000	0.983
2081	0.946	1.049	1.002	1.001	0.968

Table 36. Cooling capacities - VSH*060

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
45	10.1	69.9	56.8	0.81	2.09	77.1	60.3	4.0
45	12.5	70.2	56.9	0.81	1.98	76.9	57.4	5.9
45	14.1	70.3	57.0	0.81	1.93	76.9	55.9	7.3
45	15.6	70.4	57.0	0.81	1.90	76.9	54.9	8.8
45	16.4	70.4	57.1	0.81	1.88	76.8	54.4	9.6
45	17.1	70.5	57.1	0.81	1.86	76.8	54.0	10.4
45	18.7	70.5	57.1	0.81	1.84	76.8	53.2	12.1
55	10.1	67.9	55.5	0.82	2.50	76.4	70.2	3.9
55	12.5	68.2	55.7	0.82	2.39	76.3	67.2	5.7
55	14.1	68.3	55.7	0.82	2.35	76.3	65.8	7.1
55	15.6	68.4	55.8	0.82	2.31	76.2	64.8	8.5
55	16.4	68.4	55.8	0.82	2.29	76.2	64.3	9.2
55	17.1	68.4	55.8	0.82	2.28	76.2	63.9	10.0
55	18.7	68.5	55.9	0.82	2.25	76.2	63.1	11.7
65	10.1	65.6	54.1	0.82	2.92	75.6	80.0	3.8
65	12.5	65.9	54.3	0.82	2.82	75.5	77.1	5.5
65	14.1	66.1	54.4	0.82	2.77	75.5	75.7	6.8
65	15.6	66.2	54.4	0.82	2.73	75.5	74.7	8.2
65	16.4	66.2	54.5	0.82	2.72	75.5	74.2	8.9
65	17.1	66.3	54.5	0.82	2.70	75.5	73.8	9.6
65	18.7	66.3	54.5	0.82	2.68	75.5	73.0	11.3
75	10.1	66.4	54.9	0.83	3.26	77.5	90.1	3.6
75	12.5	66.6	55.0	0.83	3.16	77.4	87.2	5.3
75	14.1	66.7	55.0	0.82	3.11	77.3	85.8	6.6
75	15.6	66.9	55.1	0.82	3.07	77.3	84.8	7.9
75	16.4	66.9	55.1	0.82	3.05	77.3	84.3	8.6
75	17.1	66.9	55.1	0.82	3.04	77.3	83.9	9.3
75	18.7	67.0	55.2	0.82	3.01	77.2	83.1	10.9
85	10.1	63.6	54.9	0.86	3.63	76.0	99.5	3.5
85	12.5	63.8	55.1	0.86	3.53	75.9	96.7	5.2
85	14.1	63.9	55.1	0.86	3.48	75.8	95.3	6.4
85	15.6	64.0	55.2	0.86	3.45	75.8	94.3	7.6
85	16.4	64.0	55.2	0.86	3.43	75.8	93.9	8.3
85	17.1	64.1	55.2	0.86	3.42	75.7	93.5	9.0
85	18.7	64.1	55.2	0.86	3.39	75.7	92.8	10.5
95	10.1	61.2	53.8	0.88	4.07	75.1	109.2	3.4
95	12.5	61.5	53.9	0.88	3.98	75.1	106.4	5.0

Table 36. Cooling capacities - VSH*060 (continued)

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
95	14.1	61.7	54.0	0.88	3.93	75.1	105.1	6.2
95	15.6	61.8	54.1	0.88	3.90	75.1	104.2	7.4
95	16.4	61.8	54.1	0.87	3.88	75.1	103.7	8.1
95	17.1	61.8	54.1	0.87	3.87	75.1	103.4	8.7
95	18.7	61.9	54.1	0.87	3.85	75.0	102.6	10.2
105	10.1	58.5	52.5	0.90	4.53	73.9	118.8	3.3
105	12.5	58.9	52.7	0.89	4.43	74.0	116.1	4.9
105	14.1	59.1	52.7	0.89	4.39	74.1	114.9	6.0
105	15.6	59.2	52.8	0.89	4.36	74.1	113.9	7.2
105	16.4	59.3	52.8	0.89	4.35	74.1	113.5	7.8
105	17.1	59.3	52.9	0.89	4.33	74.1	113.2	8.5
105	18.7	59.4	52.9	0.89	4.31	74.1	112.5	9.9
115	10.1	55.1	50.8	0.92	4.98	72.1	128.2	3.2
115	12.5	55.6	51.1	0.92	4.90	72.3	125.7	4.7
115	14.1	55.9	51.2	0.92	4.86	72.5	124.5	5.9
115	15.6	56.1	51.3	0.91	4.83	72.6	123.6	7.0
115	16.4	56.2	51.3	0.91	4.82	72.6	123.2	7.6
115	17.1	56.2	51.4	0.91	4.81	72.6	122.9	8.3
115	18.7	56.4	51.4	0.91	4.79	72.7	122.2	9.7
120	10.1	53.0	49.9	0.94	5.22	70.8	132.9	3.2
120	12.5	53.6	50.2	0.94	5.14	71.1	130.5	4.7
120	14.1	53.9	50.3	0.93	5.10	71.3	129.3	5.8
120	15.6	54.1	50.4	0.93	5.07	71.4	128.4	6.9
120	16.4	54.1	50.4	0.93	5.06	71.4	128.0	7.5
120	17.1	54.2	50.5	0.93	5.05	71.4	127.7	8.2
120	18.7	54.4	50.5	0.93	5.03	71.5	127.0	9.6

Note: Cooling performance data is tabulated at 80°F DB/67°F WB entering air at ANSI/AHRI/ASHRAE/ISO13256-1 rated CFM. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table. See performance correction tables to correct performance at conditions other than those tabulated. Rated GPM: 15.6; Minimum CFM: 1569; Rated CFM: 2100; Maximum CFM: 2312.

Table 37. Heating capacities - VSH*060

EWT	GPM	Gross (MBtuh)	Absorb (MBtuh)	Compressor Power (kW)	LWT	Feet Head
25	10.1	41.0	30.2	3.16	17.9	5.9
25	12.5	41.9	31.1	3.18	19.1	8.6
25	14.1	42.4	31.5	3.20	19.7	10.6
25	15.6	42.7	31.8	3.21	20.2	12.6
25	16.4	42.9	31.9	3.21	20.4	13.7
25	17.1	43.0	32.1	3.22	20.6	14.8
25	18.7	43.3	32.3	3.22	20.9	17.4
35	10.1	47.6	36.2	3.34	26.6	5.7
35	12.5	48.7	37.3	3.37	28.0	8.2
35	14.1	49.3	37.8	3.38	28.8	10.1
35	15.6	49.8	38.2	3.39	29.3	12.1
35	16.4	50.0	38.4	3.40	29.5	13.1
35	17.1	50.1	38.5	3.40	29.8	14.2
35	18.7	50.5	38.8	3.41	30.2	16.6
45	10.1	56.7	44.7	3.51	35.4	4.4
45	12.5	58.2	46.1	3.54	37.0	6.4

Table 37. Heating capacities - VSH*060 (continued)

EWT	GPM	Gross (MBtuh)	Absorb (MBtuh)	Compressor Power (kW)	LWT	Feet Head
45	14.1	58.9	46.8	3.56	37.9	7.9
45	15.6	59.5	47.3	3.57	38.5	9.4
45	16.4	59.7	47.5	3.57	38.7	10.2
45	17.1	60.0	47.8	3.58	39.0	11.0
45	18.7	60.4	48.2	3.59	39.5	12.9
55	10.1	64.7	52.1	3.69	43.9	4.2
55	12.5	66.5	53.8	3.72	45.8	6.1
55	14.1	67.4	54.6	3.74	46.7	7.6
55	15.6	68.0	55.2	3.75	47.4	9.0
55	16.4	68.3	55.5	3.76	47.8	9.8
55	17.1	68.6	55.8	3.77	48.0	10.6
55	18.7	69.1	56.3	3.78	48.6	12.4
65	10.1	73.0	59.8	3.87	52.4	4.0
65	12.5	75.2	61.8	3.91	54.5	5.8
65	14.1	76.3	62.9	3.94	55.5	7.2
65	15.6	77.2	63.7	3.95	56.3	8.6
65	16.4	77.6	64.1	3.96	56.7	9.3
65	17.1	77.9	64.4	3.97	57.0	10.1
65	18.7	78.6	65.0	3.98	57.6	11.8
75	10.1	82.0	68.1	4.05	60.6	3.9
75	12.5	84.5	70.6	4.10	63.0	5.6
75	14.1	85.9	71.8	4.12	64.2	7.0
75	15.6	86.9	72.7	4.14	65.1	8.3
75	16.4	87.3	73.1	4.15	65.5	9.0
75	17.1	87.7	73.5	4.16	65.9	9.7
75	18.7	88.5	74.2	4.17	66.6	11.4
85	10.1	91.1	76.7	4.22	68.8	3.8
85	12.5	94.0	79.4	4.28	71.4	5.5
85	14.1	95.5	80.8	4.30	72.8	6.7
85	15.6	96.6	81.9	4.32	73.8	8.0
85	16.4	97.1	82.4	4.33	74.3	8.7
85	17.1	97.6	82.8	4.34	74.7	9.4
85	18.7	98.5	83.6	4.36	75.5	11.0

Note: Heating performance data is tabulated at 70°F DB at rated CFM. See correction factor tables to correct performance at conditions other than those tabulated. Interpolation of data is permissible; extrapolation is not. Rated GPM: 15.6; Minimum CFM: 1569; Rated CFM: 2100; Maximum CFM: 2312. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table.

Table 38. Fan correction factors - VSH*060

Entering CFM	Cooling Capacity	Sensible Capacity	Cooling Comp Watts	Heating Capacity	Heating Comp Watts
1569	0.951	0.839	0.997	0.989	1.130
1675	0.963	0.871	0.998	0.992	1.097
1888	0.983	0.936	0.999	0.997	1.044
1994	0.992	0.968	1.000	0.999	1.021
2100	1.000	1.000	1.000	1.000	1.000
2206	1.007	1.032	1.000	1.001	0.981
2312	1.014	1.063	1.001	1.002	0.964

Table 39. Cooling capacities - VSV*060

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
45	10.1	67.0	57.1	0.85	2.09	74.2	59.4	4.4
45	12.5	67.2	57.1	0.85	2.00	74.0	56.6	6.4
45	14.0	67.2	57.2	0.85	1.95	73.9	55.3	7.8
45	15.6	67.3	57.2	0.85	1.92	73.8	54.2	9.5
45	16.4	67.3	57.2	0.85	1.90	73.8	53.8	10.3
45	17.2	67.3	57.2	0.85	1.89	73.7	53.4	11.2
45	18.7	67.3	57.2	0.85	1.86	73.7	52.7	13.0
55	10.1	65.4	56.4	0.86	2.50	74.0	69.3	4.2
55	12.5	65.6	56.5	0.86	2.41	73.8	66.6	6.1
55	14.0	65.6	56.5	0.86	2.36	73.7	65.3	7.5
55	15.6	65.7	56.5	0.86	2.33	73.6	64.2	9.1
55	16.4	65.7	56.5	0.86	2.31	73.6	63.8	9.9
55	17.2	65.7	56.6	0.86	2.30	73.6	63.4	10.8
55	18.7	65.7	56.6	0.86	2.27	73.5	62.7	12.5
65	10.1	63.7	55.7	0.88	2.92	73.7	79.3	4.1
65	12.5	63.8	55.8	0.87	2.83	73.5	76.5	5.9
65	14.0	63.9	55.8	0.87	2.79	73.4	75.3	7.2
65	15.6	64.0	55.8	0.87	2.75	73.4	74.2	8.8
65	16.4	64.0	55.9	0.87	2.73	73.3	73.8	9.6
65	17.2	64.0	55.9	0.87	2.72	73.3	73.4	10.4
65	18.7	64.0	55.9	0.87	2.70	73.2	72.7	12.1
75	10.1	64.7	55.7	0.86	3.26	75.8	89.6	3.9
75	12.5	64.9	55.8	0.86	3.15	75.7	86.8	5.7
75	14.0	65.0	55.8	0.86	3.11	75.6	85.5	7.0
75	15.6	65.1	55.9	0.86	3.07	75.5	84.4	8.5
75	16.4	65.1	55.9	0.86	3.05	75.5	84.0	9.2
75	17.2	65.1	55.9	0.86	3.04	75.5	83.6	10.1
75	18.7	65.2	55.9	0.86	3.02	75.5	82.9	11.7
85	10.1	62.7	55.3	0.88	3.65	75.2	99.4	3.8
85	12.5	63.0	55.4	0.88	3.55	75.1	96.6	5.5
85	14.0	63.1	55.4	0.88	3.50	75.1	95.4	6.8
85	15.6	63.2	55.4	0.88	3.47	75.0	94.3	8.2
85	16.4	63.2	55.5	0.88	3.45	75.0	93.9	9.0
85	17.2	63.3	55.5	0.88	3.44	75.0	93.5	9.7
85	18.7	63.3	55.5	0.88	3.41	75.0	92.8	11.3
95	10.1	60.2	54.2	0.90	4.11	74.2	109.3	3.7
95	12.5	60.5	54.4	0.90	4.01	74.2	106.5	5.4
95	14.0	60.7	54.4	0.90	3.97	74.2	105.3	6.6
95	15.6	60.8	54.5	0.90	3.93	74.2	104.2	8.0
95	16.4	60.9	54.5	0.90	3.92	74.2	103.8	8.7
95	17.2	60.9	54.5	0.90	3.90	74.2	103.4	9.5
95	18.7	61.0	54.6	0.89	3.88	74.2	102.7	11.0
105	10.1	54.1	54.1	1.00	4.53	69.6	118.3	3.6
105	12.5	57.7	53.2	0.92	4.48	73.0	116.3	5.2
105	14.0	57.9	53.3	0.92	4.44	73.0	115.1	6.4
105	15.6	58.0	53.4	0.92	4.41	73.1	114.1	7.7
105	16.4	58.1	53.4	0.92	4.39	73.1	113.6	8.5
105	17.2	58.1	53.4	0.92	4.38	73.1	113.2	9.2

Table 39. Cooling capacities - VSV*060 (continued)

EWT	GPM	Gross (MBtuh)	Sen (MBtuh)	SHR	Compressor Power (kW)	Reject (MBtuh)	LWT	Feet Head
105	18.7	58.2	53.5	0.92	4.36	73.1	112.6	10.6
115	10.1	51.4	51.4	1.00	5.01	68.5	128.1	3.5
115	12.5	51.8	51.8	1.00	4.93	68.6	125.6	5.1
115	14.0	52.0	52.0	1.00	4.89	68.7	124.5	6.2
115	15.6	52.1	52.1	1.00	4.86	68.7	123.5	7.5
115	16.4	52.2	52.2	1.00	4.85	68.7	123.1	8.2
115	17.2	52.2	52.2	1.00	4.83	68.7	122.7	9.0
115	18.7	52.3	52.3	1.00	4.82	68.7	122.1	10.4
120	10.1	49.8	49.8	1.00	5.25	67.7	133.0	3.5
120	12.5	50.2	50.2	1.00	5.17	67.8	130.5	5.0
120	14.0	50.4	50.4	1.00	5.14	67.9	129.4	6.2
120	15.6	50.6	50.6	1.00	5.11	68.0	128.4	7.4
120	16.4	50.6	50.6	1.00	5.09	68.0	128.0	8.1
120	17.2	50.7	50.7	1.00	5.08	68.0	127.7	8.8
120	18.7	50.8	50.8	1.00	5.06	68.1	127.0	10.2

Note: Cooling performance data is tabulated at 80°F DB/67°F WB entering air at ANSI/AHRI/ASHRAE/ISO13256-1 rated CFM. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table. See performance correction tables to correct performance at conditions other than those tabulated. Rated GPM: 15.6; Minimum CFM: 1569; Rated CFM: 2100; Maximum CFM: 2312.

Table 40. Heating capacities - VSV*060

EWT	GPM	Gross (MBtuh)	Absorb (MBtuh)	Compressor Power (kW)	LWT	Feet Head
25	10.1	39.3	29.0	3.03	18.1	6.6
25	12.5	40.2	29.8	3.06	19.3	9.6
25	14.0	40.6	30.1	3.07	19.9	11.7
25	15.6	40.9	30.4	3.07	20.3	14.1
25	16.4	41.1	30.6	3.08	20.6	15.3
25	17.2	41.2	30.7	3.08	20.7	16.7
25	18.7	41.4	30.9	3.09	21.1	19.3
35	10.1	45.7	34.8	3.19	26.9	6.3
35	12.5	46.7	35.7	3.22	28.3	9.2
35	14.0	47.2	36.2	3.23	28.9	11.2
35	15.6	47.6	36.6	3.24	29.5	13.5
35	16.4	47.8	36.8	3.24	29.7	14.7
35	17.2	48.0	36.9	3.25	30.0	16.0
35	18.7	48.3	37.2	3.25	30.3	18.5
45	10.1	52.8	41.5	3.33	36.0	4.8
45	12.5	54.1	42.6	3.35	37.5	7.0
45	14.0	54.7	43.2	3.37	38.2	8.5
45	15.6	55.2	43.7	3.38	38.9	10.2
45	16.4	55.4	43.9	3.38	39.1	11.1
45	17.2	55.6	44.1	3.38	39.4	12.1
45	18.7	56.0	44.4	3.39	39.8	14.0
55	10.1	60.4	48.5	3.48	44.6	4.6
55	12.5	61.9	49.9	3.51	46.3	6.7
55	14.0	62.6	50.6	3.52	47.2	8.1
55	15.6	63.2	51.1	3.53	47.9	9.8
55	16.4	63.5	51.4	3.53	48.2	10.7
55	17.2	63.7	51.6	3.54	48.5	11.6

Table 40. Heating capacities - VSV*060 (continued)

EWT	GPM	Gross (MBtuh)	Absorb (MBtuh)	Compressor Power (kW)	LWT	Feet Head
55	18.7	64.1	52.0	3.54	49.0	13.5
65	10.1	68.0	55.5	3.67	53.1	4.4
65	12.5	69.8	57.2	3.70	55.1	6.4
65	14.0	70.7	58.0	3.71	56.0	7.8
65	15.6	71.4	58.7	3.72	56.9	9.4
65	16.4	71.7	59.0	3.73	57.2	10.3
65	17.2	72.0	59.3	3.73	57.6	11.2
65	18.7	72.5	59.7	3.74	58.1	12.9
75	10.1	76.4	63.4	3.82	61.5	4.3
75	12.5	78.5	65.4	3.85	63.7	6.2
75	14.0	79.5	66.3	3.86	64.8	7.5
75	15.6	80.3	67.1	3.87	65.7	9.1
75	16.4	80.7	67.4	3.88	66.1	9.9
75	17.2	81.0	67.7	3.88	66.5	10.8
75	18.7	81.5	68.3	3.89	67.1	12.5
85	10.1	84.9	71.4	3.96	69.8	4.1
85	12.5	87.2	73.6	3.99	72.3	6.0
85	14.0	88.3	74.7	4.00	73.5	7.3
85	15.6	89.3	75.6	4.01	74.6	8.8
85	16.4	89.7	76.0	4.02	75.0	9.6
85	17.2	90.1	76.4	4.02	75.5	10.4
85	18.7	90.8	77.0	4.03	76.1	12.1

Note: Heating performance data is tabulated at 70°F DB at rated CFM. See correction factor tables to correct performance at conditions other than those tabulated. Interpolation of data is permissible; extrapolation is not. Rated GPM: 15.6; Minimum CFM: 1569; Rated CFM: 2100; Maximum CFM: 2312. For ANSI/AHRI/ASHRAE/ISO13256-1 certified ratings, refer to the ANSI/AHRI/ASHRAE/ISO13256-1 performance table.

Table 41. Fan correction factors - VSV*060

Entering CFM	Cooling Capacity	Sensible Capacity	Cooling Comp Watts	Heating Capacity	Heating Comp Watts
1569	0.953	0.841	0.998	0.990	1.116
1675	0.965	0.873	0.999	0.994	1.089
1888	0.984	0.937	0.999	0.998	1.041
1994	0.992	0.969	1.000	0.999	1.019
2100	1.000	1.000	1.000	1.000	1.000
2206	1.007	1.031	1.000	1.001	0.983
2312	1.013	1.063	1.000	1.001	0.967

Table 42. Correction factors for variation in entering air temperature VSH*024

Cooling Entering Air WB°F	Cooling Capacity	Cooling Input Watts	Sensible vs Entering Dry Bulb Multipliers						Heating Entering Air DB°	Heating Capacity	Heating Input Watts
			65.0	70.0	75.0	80.0	85.0	90.0			
50	0.931	1.019	0.895	*	*	*	*	*	55	1.016	0.759
55	0.932	1.018	0.840	0.957	*	*	*	*	58	1.014	0.808
60	0.933	1.018	0.621	0.843	1.022	*	*	*	61	1.011	0.857
65	0.934	1.018	0.395	0.619	0.841	1.087	1.152	*	64	1.008	0.906
67	1.000	1.000	-	0.527	0.751	0.973	1.152	*	67	1.004	0.953
70	1.053	0.983	-	0.388	0.613	0.836	0.904	1.219	70	1.000	1.000
75	1.141	0.946	-	-	0.377	0.603	0.706	1.051	73	0.993	1.043
78	1.196	0.920	-	-	-	0.460	0.586	0.912	76	0.984	1.080

Note: * = Sensible equals total capacity.

Table 43. Correction factors for variation in entering air temperature VSV*024

Cooling Entering Air WB°F	Cooling Capacity	Cooling Input Watts	Sensible vs Entering Dry Bulb Multipliers						Heating Entering Air DB°	Heating Capacity	Heating Input Watts
			65.0	70.0	75.0	80.0	85.0	90.0			
50	0.927	1.017	0.887	*	*	*	*	*	55	1.025	0.779
55	0.928	1.017	0.834	0.949	*	*	*	*	58	1.021	0.825
60	0.929	1.017	0.618	0.840	1.013	1.078	*	*	61	1.016	0.870
65	0.930	1.017	0.394	0.618	0.841	1.080	*	*	64	1.011	0.914
67	1.000	1.000	-	0.527	0.750	0.969	1.147	*	67	1.006	0.958
70	1.055	0.984	-	0.389	0.614	0.838	0.907	1.215	70	1.000	1.000
75	1.150	0.949	-	-	0.381	0.607	0.711	1.056	73	0.991	1.039
78	1.208	0.923	-	-	-	0.465	0.591	0.916	76	0.982	1.076

Note: * = Sensible equals total capacity.

Table 44. Correction factors for variation in entering air temperature VSH*033

Cooling Entering Air WB°F	Cooling Capacity	Cooling Input Watts	Sensible vs Entering Dry Bulb Multipliers						Heating Entering Air DB°	Heating Capacity	Heating Input Watts
			65.0	70.0	75.0	80.0	85.0	90.0			
50	0.902	1.010	0.886	*	*	*	*	*	55	1.018	0.790
55	0.902	1.010	0.842	0.944	*	*	*	*	58	1.015	0.833
60	0.903	1.009	0.624	0.844	1.004	1.064	*	*	61	1.012	0.875
65	0.904	1.009	0.401	0.622	0.843	1.063	1.127	*	64	1.008	0.917
67	1.000	1.000	-	0.532	0.753	0.974	1.127	1.19	67	1.004	0.959
70	1.053	0.992	-	0.395	0.617	0.839	0.893	1.190	70	1.000	1.000
75	1.146	0.975	-	-	0.386	0.609	0.701	1.053	73	0.995	1.040
78	1.203	0.960	-	-	-	0.468	0.583	0.915	76	0.987	1.075

Note: * = Sensible equals total capacity.

Table 45. Correction factors for variation in entering air temperature VSV*033

Cooling Entering Air WB°F	Cooling Capacity	Cooling Input Watts	Sensible vs Entering Dry Bulb Multipliers						Heating Entering Air DB°	Heating Capacity	Heating Input Watts
			65.0	70.0	75.0	80.0	85.0	90.0			
50	0.909	1.009	0.897	*	*	*	*	*	55	1.024	0.794
55	0.910	1.009	0.845	0.956	*	*	*	*	58	1.020	0.836
60	0.910	1.009	0.627	0.846	1.016	1.077	*	*	61	1.016	0.878
65	0.966	1.004	0.404	0.624	0.844	1.063	*	*	64	1.011	0.920
67	1.000	1.000	-	0.534	0.754	0.974	1.142	*	67	1.006	0.960
70	1.053	0.992	-	0.397	0.618	0.839	0.888	1.205	70	1.000	1.000
75	1.143	0.973	-	-	0.387	0.609	0.697	1.052	73	0.992	1.037
78	1.199	0.958	-	-	-	0.468	0.580	0.913	76	0.983	1.073

Note: * = Sensible equals total capacity.

Table 46. Correction factors for variation in entering air temperature VSH*042

Cooling Entering Air WB°F	Cooling Capacity	Cooling Input Watts	Sensible vs Entering Dry Bulb Multipliers						Heating Entering Air DB°	Heating Capacity	Heating Input Watts
			65.0	70.0	75.0	80.0	85.0	90.0			
50	0.915	1.011	0.846	*	*	*	*	*	55	1.023	0.786
55	0.916	1.011	0.833	0.903	0.962	*	*	*	58	1.019	0.829
60	0.916	1.011	0.604	0.835	0.962	1.023	*	*	61	1.014	0.872
65	0.917	1.011	0.371	0.603	0.834	1.023	1.085	*	64	1.010	0.915
67	1.000	1.000	-	0.509	0.741	0.972	1.085	*	67	1.005	0.958
70	1.055	0.991	-	0.367	0.600	0.832	0.946	1.149	70	1.000	1.000

Table 46. Correction factors for variation in entering air temperature VSH*042 (continued)

Cooling Entering Air WB°F	Cooling Capacity	Cooling Input Watts	Sensible vs Entering Dry Bulb Multipliers						Heating Entering Air DB°	Heating Capacity	Heating Input Watts
			65.0	70.0	75.0	80.0	85.0	90.0			
75	1.153	0.971	-	-	0.361	0.595	0.737	1.061	73	0.995	1.042
78	1.214	0.955	-	-	-	0.450	0.609	0.918	76	0.989	1.083

Note: * = Sensible equals total capacity.

Table 47. Correction factors for variation in entering air temperature VSV*042

Cooling Entering Air WB°F	Cooling Capacity	Cooling Input Watts	Sensible vs Entering Dry Bulb Multipliers						Heating Entering Air DB°	Heating Capacity	Heating Input Watts
			65.0	70.0	75.0	80.0	85.0	90.0			
50	0.906	1.009	0.855	*	*	*	*	*	55	1.020	0.796
55	0.907	1.009	0.837	0.912	0.970	*	*	*	58	1.017	0.838
60	0.908	1.009	0.614	0.839	0.970	*	*	*	61	1.013	0.879
65	0.908	1.009	0.387	0.613	0.838	1.031	*	*	64	1.009	0.919
67	1.000	1.000	-	0.521	0.748	0.973	1.092	*	67	1.005	0.960
70	1.056	0.993	-	0.382	0.610	0.836	0.929	1.156	70	1.000	1.000
75	1.155	0.976	-	-	0.376	0.605	0.728	1.059	73	0.994	1.039
78	1.218	0.963	-	-	-	0.463	0.606	0.920	76	0.987	1.075

Note: * = Sensible equals total capacity.

Table 48. Correction factors for variation in entering air temperature VSH*050

Cooling Entering Air WB°F	Cooling Capacity	Cooling Input Watts	Sensible vs Entering Dry Bulb Multipliers						Heating Entering Air DB°	Heating Capacity	Heating Input Watts
			65.0	70.0	75.0	80.0	85.0	90.0			
50	0.918	1.003	0.898	*	*	*	*	*	55	1.020	0.804
55	0.919	1.003	0.841	0.958	*	*	*	*	58	1.017	0.844
60	0.920	1.003	0.621	0.843	1.020	1.082	*	*	61	1.013	0.883
65	0.921	1.003	0.395	0.619	0.841	1.063	*	*	64	1.009	0.922
67	1.000	1.000	-	0.528	0.751	0.973	1.147	*	67	1.005	0.961
70	1.054	0.996	-	0.389	0.614	0.837	0.895	1.213	70	1.000	1.000
75	1.147	0.986	-	-	0.381	0.606	0.702	1.055	73	0.995	1.038
78	1.205	0.978	-	-	-	0.465	0.584	0.916	76	0.990	1.076

Note: * = Sensible equals total capacity.

Table 49. Correction factors for variation in entering air temperature VSV*050

Cooling Entering Air WB°F	Cooling Capacity	Cooling Input Watts	Sensible vs Entering Dry Bulb Multipliers						Heating Entering Air DB°	Heating Capacity	Heating Input Watts
			65.0	70.0	75.0	80.0	85.0	90.0			
50	0.905	1.004	0.874	*	*	*	*	*	55	1.022	0.814
55	0.905	1.004	0.841	0.932	*	*	*	*	58	1.018	0.851
60	0.906	1.004	0.610	0.840	0.991	1.051	*	*	61	1.014	0.889
65	0.907	1.004	0.375	0.606	0.836	1.051	1.113	*	64	1.009	0.926
67	1.000	1.000	-	0.512	0.742	0.972	1.113	*	67	1.005	0.963
70	1.055	0.996	-	0.369	0.600	0.831	0.909	1.177	70	1.000	1.000
75	1.152	0.986	-	-	0.360	0.592	0.705	1.055	73	0.995	1.036
78	1.213	0.978	-	-	-	0.447	0.582	0.911	76	0.988	1.070

Note: * = Sensible equals total capacity.

Table 50. Correction factors for variation in entering air temperature VSH*060

Cooling Entering Air WB°F	Cooling Capacity	Cooling Input Watts	Sensible vs Entering Dry Bulb Multipliers						Heating Entering Air DB°	Heating Capacity	Heating Input Watts
			65.0	70.0	75.0	80.0	85.0	90.0			
50	0.905	0.995	0.915	*	*	*	*	*	55	1.022	0.832
55	0.906	0.995	0.847	0.974	*	*	*	*	58	1.018	0.866
60	0.907	0.995	0.631	0.848	1.035	1.096	*	*	61	1.014	0.899
65	0.966	0.998	0.411	0.628	0.845	1.062	1.159	*	64	1.010	0.933
67	1.000	1.000	-	0.539	0.757	0.974	1.159	*	67	1.005	0.966
70	1.053	1.002	-	0.404	0.623	0.841	0.870	1.223	70	1.000	1.000
75	1.146	1.002	-	-	0.395	0.615	0.686	1.053	73	0.995	1.034
78	1.205	1.001	-	-	-	0.477	0.574	0.917	76	0.990	1.067

Note: * = Sensible equals total capacity.

Table 51. Correction factors for variation in entering air temperature VSV*060

Cooling Entering Air WB°F	Cooling Capacity	Cooling Input Watts	Sensible vs Entering Dry Bulb Multipliers						Heating Entering Air DB°	Heating Capacity	Heating Input Watts
			65.0	70.0	75.0	80.0	85.0	90.0			
50	0.912	0.996	0.907	0.964	*	*	*	*	55	1.019	0.824
55	0.913	0.996	0.851	0.964	*	*	*	*	58	1.016	0.860
60	0.913	0.996	0.635	0.850	1.024	1.083	*	*	61	1.012	0.895
65	0.914	0.996	0.414	0.631	0.847	1.062	*	*	64	1.009	0.930
67	1.000	1.000	-	0.542	0.758	0.974	1.145	*	67	1.005	0.965
70	1.052	1.001	-	0.406	0.624	0.841	0.886	1.207	70	1.000	1.000
75	1.143	1.000	-	-	0.396	0.615	0.698	1.050	73	0.996	1.035
78	1.200	0.998	-	-	-	0.477	0.584	0.915	76	0.989	1.068

Note: * = Sensible equals total capacity.

Table 52. ECM fan performance

Model	External Static Pressure																											
		0		0.05		0.10		0.15		0.20		0.25		0.30		0.35		0.40		0.45		0.50		0.55		0.60	
	CFM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM
VSH024	796	0.070	535	0.080	570	0.090	604	0.099	635	0.109	665	0.120	694	0.131	722	0.142	749	0.153	774	0.165	799	0.178	824	0.191	847	0.204	870
	840	0.083	563	0.092	596	0.102	628	0.112	659	0.123	688	0.134	716	0.145	743	0.157	769	0.169	794	0.182	818	0.195	842	0.208	865	0.222	888
	885	0.095	591	0.105	623	0.115	654	0.126	683	0.138	711	0.149	738	0.161	765	0.174	790	0.187	814	0.200	838	0.214	861	0.228	884	0.243	906
	930	0.109	620	0.119	650	0.131	680	0.142	708	0.154	735	0.167	761	0.180	787	0.193	811	0.207	835	0.221	859	0.235	881	0.250	903	0.265	925
	974	0.124	647	0.135	677	0.147	705	0.159	732	0.172	759	0.185	784	0.199	809	0.213	833	0.227	856	0.242	879	0.257	901	0.273	923	0.289	944
	1019	0.140	676	0.153	704	0.165	731	0.179	758	0.192	783	0.206	808	0.221	832	0.235	855	0.251	878	0.266	900	0.282	921	0.298	943	0.314	963
VSH033	1014	0.138	673	0.151	701	0.163	728	0.176	755	0.190	780	0.204	805	0.218	829	0.233	853	0.248	875	0.263	897	0.279	919	0.295	940	0.311	961
	1076	0.165	712	0.178	738	0.192	764	0.206	790	0.220	814	0.235	838	0.251	861	0.267	884	0.283	906	0.299	927	0.315	948	0.332	969	0.349	989
	1138	0.194	750	0.209	776	0.224	801	0.239	825	0.255	848	0.271	871	0.287	893	0.304	915	0.320	936	0.337	957	0.354	978	0.371	998	0.388	1017
	1200	0.228	789	0.244	814	0.260	837	0.276	860	0.293	883	0.310	905	0.327	926	0.344	947	0.361	968	0.378	988	0.395	1008	0.412	1027	0.429	1046
	1262	0.266	828	0.282	851	0.299	874	0.316	896	0.333	918	0.351	939	0.368	960	0.385	980	0.403	1000	0.419	1019	0.436	1038	0.452	1057	0.468	1076
	1324	0.307	867	0.324	889	0.341	911	0.359	932	0.376	953	0.393	973	0.410	993	0.427	1013	0.444	1032	0.459	1051	0.475	1070	0.490	1088	0.504	1106
VSH042	1414	0.163	584	0.176	608	0.188	632	0.202	655	0.215	679	0.230	702	0.244	725	0.259	748	0.275	771	0.291	794	0.307	816	0.324	839	0.341	861
	1485	0.188	607	0.201	630	0.214	654	0.228	677	0.242	699	0.257	722	0.272	745	0.288	767	0.304	789	0.320	811	0.337	833	0.354	855	0.372	876
	1579	0.224	638	0.238	660	0.252	683	0.266	705	0.281	727	0.296	749	0.312	770	0.328	792	0.345	813	0.362	834	0.380	855	0.398	876	0.416	897
	1650	0.254	661	0.268	683	0.283	704	0.298	726	0.313	747	0.329	769	0.345	790	0.362	811	0.379	831	0.397	852	0.415	872	0.433	893	0.452	913
	1721	0.287	684	0.301	705	0.316	727	0.332	748	0.348	768	0.364	789	0.381	809	0.398	830	0.416	850	0.434	870	0.452	890	0.471	909	0.491	929
	1815	0.333	715	0.348	736	0.364	756	0.380	776	0.397	796	0.414	816	0.431	835	0.449	855	0.467	874	0.486	893	0.505	912	0.525	931	0.545	950
VSH050	1414	0.163	584	0.176	608	0.188	632	0.202	655	0.215	679	0.230	702	0.244	725	0.259	748	0.275	771	0.291	794	0.307	816	0.324	839	0.341	861
	1485	0.188	607	0.201	630	0.214	654	0.228	677	0.242	699	0.257	722	0.272	745	0.288	767	0.304	789	0.320	811	0.337	833	0.354	855	0.372	876
	1579	0.224	638	0.238	660	0.252	683	0.266	705	0.281	727	0.296	749	0.312	770	0.328	792	0.345	813	0.362	834	0.380	855	0.398	876	0.416	897
	1650	0.254	661	0.268	683	0.283	704	0.298	726	0.313	747	0.329	769	0.345	790	0.362	811	0.379	831	0.397	852	0.415	872	0.433	893	0.452	913
	1721	0.287	684	0.301	705	0.316	727	0.332	748	0.348	768	0.364	789	0.381	809	0.398	830	0.416	850	0.434	870	0.452	890	0.471	909	0.491	929
	2077	0.484	803	0.501	821	0.519	839	0.537	857	0.555	874	0.574	892	0.593	909	0.613	926	0.633	943	0.654	960	0.675	977	0.696	993	0.718	1010

Table 52. ECM fan performance (continued)

Model	External Static Pressure																									
		0		0.05		0.10		0.15		0.20		0.25		0.30		0.35		0.40		0.45		0.50		0.55		0.60	
	CFM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM
VSH060	1803	0.327	711	0.342	732	0.358	752	0.374	772	0.390	793	0.407	812	0.425	832	0.442	852	0.461	871	0.479	890	0.498	909	0.518	928	0.538	947
	1908	0.383	746	0.399	766	0.415	785	0.432	805	0.449	824	0.467	843	0.485	861	0.504	880	0.523	899	0.542	917	0.562	935	0.582	953	0.603	971
	2014	0.445	782	0.462	800	0.479	819	0.496	837	0.514	855	0.533	873	0.551	891	0.571	909	0.590	927	0.611	944	0.631	961	0.652	978	0.674	995
	2120	0.512	817	0.529	835	0.547	853	0.565	870	0.584	887	0.603	905	0.623	921	0.643	938	0.663	955	0.684	971	0.706	988	0.727	1004	0.750	1020
	2226	0.584	853	0.602	870	0.621	887	0.640	903	0.659	920	0.679	936	0.700	952	0.720	968	0.741	983	0.763	999	0.785	1014	0.808	1029	0.831	1044
	2332	0.662	889	0.680	905	0.700	921	0.719	937	0.740	952	0.760	967	0.781	982	0.803	997	0.825	1012	0.847	1027	0.870	1041	0.893	1055	0.917	1069

Table 53. ECM fan performance

Model	External Static Pressure																											
		0		0.05		0.10		0.15		0.20		0.25		0.30		0.35		0.40		0.45		0.50		0.55		0.60	
	CFM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM
VSV024	837	0.047	436	0.056	468	0.065	500	0.075	532	0.084	563	0.094	593	0.103	623	0.113	652	0.123	681	0.133	709	0.143	737	0.154	764	0.164	791
	884	0.054	449	0.064	482	0.073	513	0.083	545	0.092	575	0.102	605	0.112	635	0.123	664	0.133	692	0.143	720	0.154	748	0.165	775	0.176	801
	930	0.062	463	0.072	495	0.081	526	0.091	557	0.101	587	0.112	617	0.122	647	0.132	675	0.143	704	0.154	731	0.165	758	0.176	785	0.187	811
	977	0.070	476	0.080	508	0.090	539	0.100	570	0.111	600	0.121	630	0.132	659	0.143	687	0.154	715	0.165	743	0.177	769	0.188	796	0.200	822
	1023	0.079	490	0.089	522	0.099	552	0.110	583	0.121	613	0.132	642	0.143	671	0.154	699	0.166	727	0.177	754	0.189	780	0.201	806	0.213	832
VSV033	1080	0.090	507	0.101	538	0.112	569	0.123	599	0.134	628	0.145	657	0.157	686	0.169	714	0.181	741	0.192	768	0.205	794	0.217	820	0.229	845
	1140	0.103	526	0.114	556	0.126	586	0.137	616	0.149	645	0.161	674	0.173	702	0.185	730	0.197	757	0.210	783	0.222	809	0.235	834	0.248	859
	1200	0.117	544	0.129	574	0.141	604	0.153	634	0.165	662	0.177	691	0.189	718	0.202	746	0.215	772	0.228	798	0.241	824	0.254	849	0.267	873
	1260	0.132	563	0.144	593	0.156	622	0.169	651	0.181	680	0.194	708	0.207	735	0.220	762	0.233	788	0.247	814	0.260	839	0.274	864	0.288	888
	1320	0.148	582	0.160	612	0.173	641	0.186	669	0.199	697	0.212	725	0.226	752	0.239	778	0.253	804	0.267	830	0.281	855	0.295	879	0.309	903
VSV042	1485	0.120	541	0.135	568	0.150	595	0.165	621	0.180	647	0.195	673	0.211	698	0.226	723	0.242	748	0.258	772	0.275	796	0.291	820	0.307	843
	1568	0.146	563	0.162	590	0.177	616	0.193	642	0.208	667	0.224	692	0.240	717	0.257	741	0.273	765	0.290	789	0.306	812	0.323	835	0.340	858
	1650	0.175	586	0.191	612	0.207	637	0.223	662	0.239	687	0.256	712	0.272	736	0.289	759	0.306	783	0.323	806	0.340	829	0.358	851	0.375	873
	1733	0.208	609	0.224	634	0.240	659	0.257	684	0.274	708	0.291	732	0.308	755	0.325	778	0.343	801	0.360	824	0.378	846	0.396	868	0.414	889
	1815	0.243	632	0.259	657	0.276	681	0.294	705	0.311	729	0.328	752	0.346	775	0.364	797	0.382	820	0.400	841	0.418	863	0.436	884	0.455	905
VSV050	1701	0.195	600	0.211	625	0.227	650	0.244	675	0.260	700	0.277	724	0.294	748	0.311	771	0.328	794	0.346	817	0.363	839	0.381	861	0.399	883
	1796	0.234	627	0.251	651	0.268	675.9	0.285	700	0.302	724	0.319	747	0.337	770	0.354	793	0.372	815	0.390	837	0.408	859	0.427	880	0.445	901
	1890	0.277	654	0.294	678	0.312	702	0.329	725	0.347	748	0.365	771	0.383	793	0.401	815	0.420	837	0.438	858	0.457	879	0.476	900	0.495	920
	1985	0.324	682	0.342	705	0.360	728	0.378	751	0.396	773	0.415	795	0.434	817	0.452	838	0.471	859	0.491	880	0.510	900	0.529	920	0.549	940
	2079	0.374	710	0.393	732	0.411	755	0.430	777	0.449	798	0.468	820	0.487	841	0.507	861	0.526	882	0.546	902	0.566	921	0.586	940	0.606	959
VSV060	1816	0.243	632	0.260	657	0.277	681	0.294	705	0.311	729	0.329	752	0.346	775	0.364	798	0.382	820	0.400	842	0.418	863	0.437	884	0.455	905
	1918	0.290	662	0.308	686	0.326	709	0.343	732	0.361	755	0.379	778	0.398	800	0.416	822	0.435	843	0.453	864	0.472	885	0.491	906	0.510	926
	2019	0.342	692	0.360	715	0.378	738	0.397	760	0.415	782	0.434	804	0.453	825	0.472	846	0.491	867	0.510	888	0.530	908	0.549	927	0.569	947
	2121	0.398	722	0.417	745	0.436	767	0.455	789	0.474	810	0.493	831	0.513	852	0.532	872	0.552	892	0.572	912	0.592	931	0.613	950	0.633	968
	2222	0.458	753	0.478	775	0.497	796	0.517	817	0.537	838	0.557	858	0.577	878	0.597	898	0.617	917	0.638	936	0.659	954	0.680	973	0.701	990

MERV Filter

Table 54. Added pressure drop through MERV filters (inches water column)

Model No.	CFM	MERV 8	MERV 13
VSH*024	742	0.08	0.09
	836	0.09	0.10
	930	0.10	0.12
	977	0.11	0.12
	1024	0.11	0.13
VSH*033	952	0.10	0.12
	1076	0.12	0.14
	1200	0.14	0.16
	1262	0.15	0.17
	1324	0.21	0.19
VSH*042	1324	0.09	0.10
	1487	0.10	0.11
	1650	0.11	0.13
	1731	0.12	0.14
	1813	0.13	0.15
VSH*050	1517	0.10	0.12
	1704	0.12	0.14
	1890	0.13	0.16
	1983	0.14	0.17
	2077	0.15	0.18
VSH*060	1890	0.13	0.16
	2016	0.14	0.17
	2120	0.15	0.18
	2225	0.16	0.19
	2329	0.17	0.21

Note: Added pressure drop should be considered when utilizing optional 2–inch MERV 8 and MERV 13 filters.

Table 55. Added pressure drop through MERV filters (inches water column)

Model No.	CFM	MERV 8	MERV 13
VSV*024	837	0.12	0.14
	884	0.13	0.15
	930	0.14	0.16
	977	0.15	0.17
	1023	0.15	0.18
VSV*033	1080	0.16	0.20
	1140	0.18	0.21
	1200	0.19	0.23
	1260	0.20	0.24
	1320	0.21	0.26

Table 55. Added pressure drop through MERV filters (inches water column) (continued)

Model No.	CFM	MERV 8	MERV 13
VSV*042	1485	0.13	0.15
	1568	0.14	0.16
	1650	0.15	0.17
	1733	0.15	0.18
	1815	0.16	0.19
VSV*050	1701	0.15	0.18
	1796	0.16	0.19
	1890	0.17	0.21
	1985	0.18	0.22
	2079	0.19	0.23
VSV*060	1900	0.14	0.16
	2021	0.15	0.17
	2121	0.16	0.19
	2221	0.17	0.20
	2321	0.18	0.21

Note: Added pressure drop should be considered when utilizing optional 2–inch MERV 8 and MERV 13 filters.

Table 56. Antifreeze correction factors

Methanol						
Item	Concentration by Volume					
	0%	10%	20%	30%	40%	50%
Cooling Capacity	1.000	0.998	0.997	0.995	0.993	0.992
Heating Capacity	1.000	0.995	0.990	0.985	0.979	0.974
Pressure Drop	1.000	1.023	1.057	1.091	1.122	1.160
Ethylene Glycol						
Item	Concentration by Volume					
	0%	10%	20%	30%	40%	50%
Cooling Capacity	1.000	0.996	0.991	0.987	0.983	0.979
Heating Capacity	1.000	0.993	0.985	0.977	0.969	0.961
Pressure Drop	1.000	1.024	1.068	1.124	1.188	1.263
Propylene Glycol						
Item	Concentration by Volume					
	0%	10%	20%	30%	40%	50%
Cooling Capacity	1.000	0.993	0.987	0.980	0.974	0.968
Heating Capacity	1.000	0.986	0.973	0.960	0.948	0.935
Pressure Drop	1.000	1.040	1.098	1.174	1.273	1.405
7.5						
Item	Concentration by Volume					
	0%	10%	20%	30%	40%	50%
Cooling Capacity	1.000	0.994	0.987	0.979	0.971	0.963
Heating Capacity	1.000	0.993	0.987	0.982	0.978	0.976
Pressure Drop	1.000	1.154	1.325	1.497	1.669	1.841

Figure 12. Cooling capacity correction factor

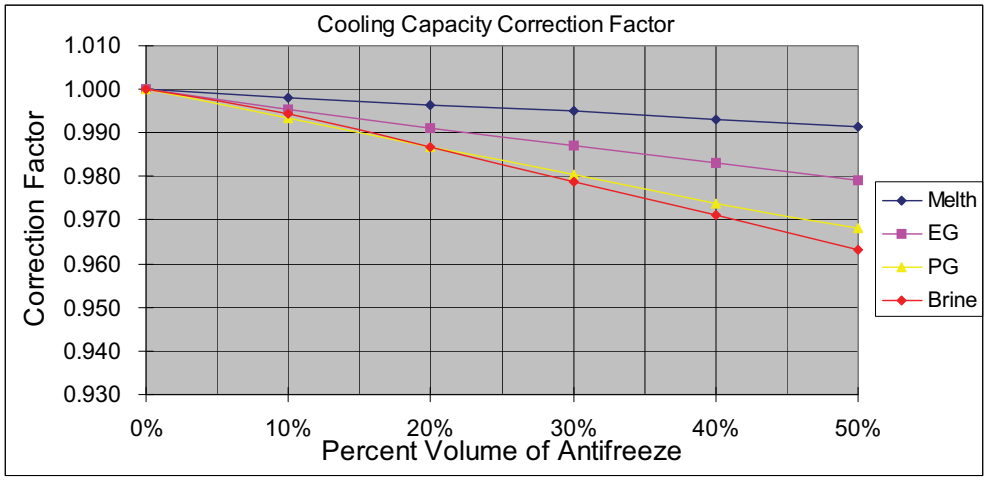


Figure 13. Heating capacity correction factor

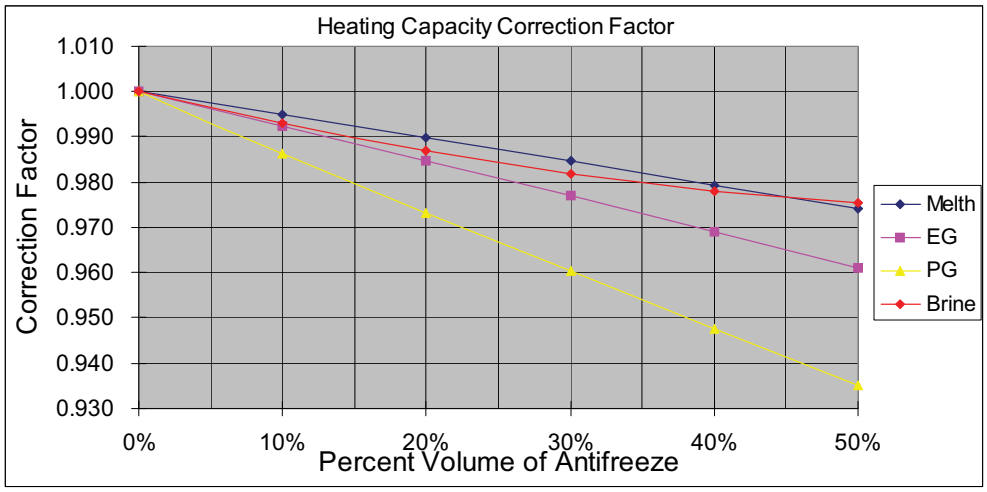
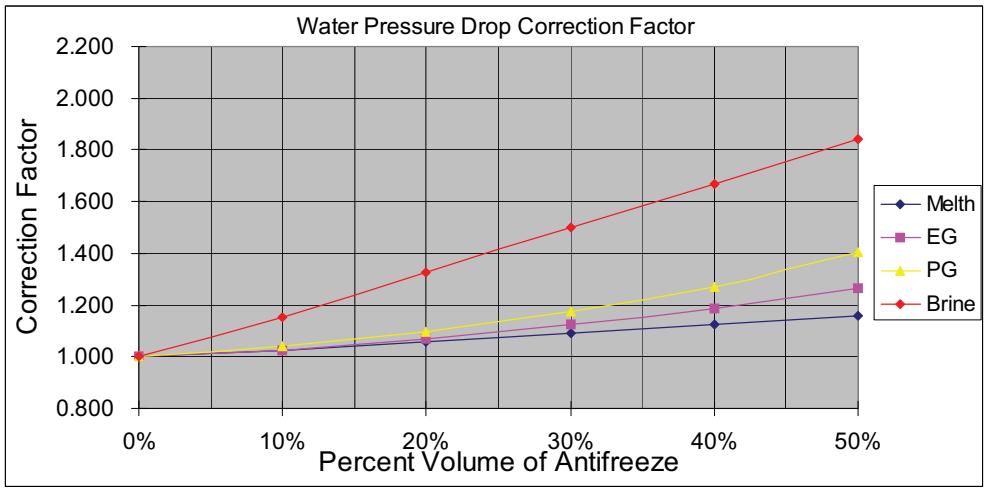


Figure 14. Water pressure drop correction factor



Example 1 (Ethylene Glycol):

The antifreeze solution is 20% by volume of Ethylene Glycol. Determine the corrected cooling capacity and waterside pressure drop for a VSHK024 when the EWT is 85°F and the GPM is 6.2.

From the catalog data, the cooling capacity at these conditions with 100% water is 26.6 Mbtuh, and the waterside pressure drop is 3.7 feet of Head. At 20% Ethylene Glycol, the correction factor for cool capacity is 0.9912 and the pressure drop is 1.068.

The corrected cooling capacity (Mbtuh) = 26.6* 0.9912 = 26.4. The corrected water side pressure drop (Ft. Head) = 3.7* 1.068 = 4.0.

Example 2 (Propylene Glycol):

The antifreeze solution is 30% by volume of Propylene Glycol. Determine the corrected heating capacity and waterside pressure drop for a VSVK050 when the EWT is 45°F and the GPM is 13.0.

From the catalog data, the heating capacity at these conditions with 100% water is 44.9 Mbtuh, and the waterside pressure drop is 7.2 feet of Head. At 30% Propylene Glycol, the correction factor for heat capacity is 0.9603 and the pressure drop is 1.174.

The corrected cooling capacity (Mbtuh) = 44.9* 0.9603 = 43.1. The corrected water side pressure drop (Ft. Head) = 7.2* 1.174 = 8.5.

Controls

Symbio™ 400-B Programmable BACnet® Controller

The Symbio 400-B is a programmable, direct digital control (DDC) system designed to control the water source heat pump unit. The controller provides system-level data used to optimize the overall unit performance. Stand-alone applications as well as full building automation systems via the BACnet® MS/TP protocol are supported through the controller.

Features and Functions

Complete control of the water source heat pump unit variable speed compressor and supply air fan is provided through the Symbio 400-B. The control strategies are optimized for enhanced energy efficiency and comfort.

The features and functions of the Symbio 400-B are described in the following sections.

Anti-short Cycle Timer

The anti-short cycle timer provides a three minute time delay between compressor stop and compressor restart.

Compressor Operation

Upon a call for cooling or heating, the compressor will follow a programmed startup sequence with prescribed acceleration rates to safely enable compressor operation. Once ramp up has occurred the compressor is controlled within minimum and maximum capacity as determined by heating or cooling demands. When the compressor is no longer needed for cooling or heating, it will follow a predefined shutdown sequence to safely turn off.

When switching between heating and cooling modes, the compressor will follow the shutdown sequence prior to de-energizing the compressor. Once the compressor is off the anti-short cycle timer will provide a 3-minute time delay restarting.

Demand Limiting

The Symbio 400-B controller supports communicated requests for demand limiting the compressor and supply fan outputs. When demand limited is enabled, the unit capacity is limited to a maximum of 50% for all unit modes (cooling and heating). Demand limit requests will not override compressor startup and shutdown sequences or unit protection modes (for example, low entering water temp).

Enhanced Dehumidification

The variable-speed fan motor (ECM), along with the variable-speed compressor, results in improved dehumidification performance at part-load conditions compared to a unit with a constant-speed fan. In addition the Symbio 400-B controller includes an enhanced dehumidification control mode that can improve dehumidification performance by further reducing fan speed. A space humidity value is either communicated from the BAS, or input from a humidity sensor wired into the controller. When the measured space relative humidity enable/disable exceeds the setpoint, the enhanced dehumidification mode is enabled and the fan speed is further reduced to remove moisture. increase dehumidification.

Enhanced dehumidification mode does not provide independent (active) control of both space temperature and humidity. This mode can only occur when the controller is in the cooling mode, and a high cooling load (warm temperature in the zone) can override the enhanced dehumidification mode. Therefore, in non-arid climates, Trane® recommends the use of a dedicated outdoor-air system to dehumidify the outdoor air centrally, rather than relying on the heat pumps to provide sufficient dehumidification (see the Application Considerations section of this catalog).

Supply Fan Operation

The Symbio 400-B supports continuous fan and fan cycling modes.

- Fan Cycling Mode: For active cooling, heating, and operation, the supply fan will be commanded on and will ramp up to the appropriate minimum speed once the unit determines there is a request for active compressor output control. When there is no longer an active request and all compressor capacity is de-energized, the supply fan will be de-energized once any supply fan off delays have timed out. In heat mode, the fan will run for 30 seconds beyond compressor shutdown in both occupied and unoccupied mode.
- Continuous Fan Mode: The unit will energize the supply fan and hold the fan speed output at the minimum fan speed setting until there is a request for the fan speed to increase. When the unit is in unoccupied mode, however, the supply fan mode operates in cycling mode.

Filter Maintenance Timer

The controller's filter status is based on the supply fan's cumulative run hours. The controller compares the fan run time against an adjustable fan run hours limit and recommends unit maintenance as required.

Occupancy Determination

The five operations of the Symbio 400-B controller include occupied, occupied standby, occupied bypass, unoccupied and timed override.

- Occupied mode: When the controller is in the OCCUPIED mode, the unit will operate to maintain the space temperature at the active occupied heating or cooling setpoint. This occupied operation is normally used during the daytime hours when the building is at the highest occupancy level.
- Occupied Standby mode: The occupied standby mode allows the unit to operate at heating or cooling setpoints between the occupied and unoccupied setpoints to help maintain the space while decreasing energy consumption. Unit operation in the mode is similar to the occupied mode except for the different heating and cooling setpoints. The occupied standby operation is used during daytime hours when people are not present in the space (such as lunchtime or recess).
- Unoccupied mode: When the controller is in the Unoccupied mode, the unit will attempt to maintain the space temperature at the stored unoccupied heating or cooling setpoint.
- Occupied Bypass mode: This mode is used to transition the unit from the Unoccupied mode to the Occupied mode for a period of time from 0 to 4 hours.
- Timed Override Operation: If the unit receives a request for timed override mode while the unit is operating in Unoccupied mode, the unit will transition to Occupied Bypass mode for the selected Occupied Bypass Time.

Random Start

To prevent all of the units in a building from energizing major loads at the same time, the controller observes a random start from 5 to 30 seconds. This timer halts the controller from starting the unit until the random start time expires.

Reversing Valve Operation

For normal unit operation, the reversing valve output is energized when the unit is in Cooling mode and de-energized in Heating mode. If de-energized, the reversing valve output shall be energized for Cooling when the compressor output is energized and the compressor speed has ramped up to the proper startup speed. Once energized, the reversing valve output will remain energized until the controller energizes the compressor output for heating and the compressor speed has ramped up to the startup speed for heating or the Unit Mode is set to Off. When a power-failure occurs, the reversing valve output defaults to the heating (de-energized) state.

Test Mode

The Symbio 400-B shall support two field test modes to allow the user to setup/troubleshoot the system. One test mode is available through the Tracer® TU service tool and the other is available through a local input on the Symbio 400-B.

Water Isolation Valve

For all units, the Symbio 400-B shall support a two-position water isolation valve without needing any special configuration; by default, the Symbio 400-B will control as though isolation valves are present.

Isolation Valve "ON" Control. The isolation valve output will be energized (controlled open) during compressor heating, compressor cooling, and when forced open during manual output override testing.

When the isolation valve is driven open for compressor operation, the output will be energized 20 seconds prior to the compressor and indoor fan (if not already energized) outputs to ensure adequate water flow to the heat exchanger. To reduce excessive cycling of the isolation valve, once opened, the isolation valve will remain open for a minimum of 10 minutes.

Isolation Valve "OFF" Control. The isolation valve output will be de-energized (controlled closed) when there is no longer a call for compressor operation and the 10 min. minimum on time has expired or the manual output override test has driven it closed.

Trane® Air-Fi® Wireless Systems

Trane Air-Fi wireless systems provides significant advantages to better meet customer by providing a lower initial cost; ease of installation for reduced risk; increased reliability and flexibility for easier problem solving; and fewer maintenance issues for worry-free operation and cost savings over the life of the system. Trane Air-Fi wireless systems helps save time and money, with industry-leading technology and performance.

Air-Fi Wireless Communications Interface (WCI)

The Air-Fi Wireless Communications Interface (WCI) enables wireless communications between system controls, unit controls, and wireless sensors for Trane control products that use the BACnet® protocol. The WCI replaces the need for communications wire in all system applications.

The WCI is available in three configurations:

- The universal model is the most common. It installs the same as a wired zone sensor in indoor applications.
- The outdoor model is housed in an enclosure suitable for outdoor environments. It is usually used on equipment above the roof deck.
- The flush mount model is used on fan coils, blower coils, and unit ventilators.

Air-Fi Wireless Communications Sensor (WCS)

The Air-Fi Wireless Communications Sensor (WCS) is compatible with any Trane controller that uses a WCI. The WCS provides the same functions as many currently available Trane wired sensors. No further software or hardware is necessary for site evaluation, installation, or maintenance. Space temperature is standard on all models. (A service tool cannot be connected to a Trane wireless sensor.)

Three WCS models are available:

- Digital display (WCS-SD) model
- Base (WCS-SB) model has no exposed display or user interface
- 2% relative humidity sensor module (WCS-SH), which can be field installed inside either the WCS-SD or WCS-SB.

In most applications, one WCS-SD or WCS-SB sensor will be used per WCI acting as a router. However, up to 6 WCS-SD or WCS-SB sensors can be associated to a single equipment controller or BCI.

Compatibility with Previous Generation Wireless Zone Products

Our previous line of wireless zone sensors (WZS, WTS, and WDS) are not compatible with the Air-Fi Wireless Communications Interface (WCI).

The new Air-Fi Wireless Communications Sensor (WCS) are compatible with old WCIs that have updated firmware.

Wired Zone Sensors

Wired zone sensors can be used with Air-Fi wireless systems.

Stand-alone Systems

When units are applied as a stand-alone control system, the Symbio 400-B provides accurate temperature control directly through the wall-mounted zone sensor. This system set-up may be utilized in a replacement design where a single unit retrofit is needed or on small jobs where a building controller may not be necessary.

Direct Digital Controls for Building Automation Systems

For owners who require a complete building management “open protocol” system, the Symbio 400-B controller may be linked directly to the Trane Tracer SC or other third party BACnet® MS/TP systems.

Building Control Advantages

When water source heat pumps are applied with the Trane Tracer SC, the potential for greater energy savings can be achieved. The Symbio 400-B controller has the ability to share information with the building automation system via a communications wire. The operation of the system can be optimized with capabilities such as:

- Centralized system scheduling and shutdown based on occupancy
- Override to allow the system to operate when a zone is occupied after scheduled hours (indicated through the use of a timed override button on the zone sensor)
- Enabling morning warm-up and cool-down sequences, including optimal start
- Centralized alarms to indicate problems, required service or needed maintenance
- Trend logging to help anticipate potential system problems
- Integration with other systems serving the building such as dedicated outdoor-air system, lighting, security, and fire safety.

Tracer® TU Service Tool Support

The Symbio 400-B for Variable Speed Water Source Heat Pump Units will be supported by the Trane Tracer TU Service Tool and can be used to change default setpoints as well as view active diagnostics/alarms. The Symbio 400-B will also support a version of Service Test Mode that will be available through the Tracer TU communication link.

Symbio™ 400-B Setpoints and Set-up Parameters

The setpoints shown in Table 57, p. 65 are available for modification through the Tracer® TU Field Service tool if changes from the factory default values are required.

Table 57. Symbio™ 400-B setpoints

Input Name	Selections	Default
Default Setpoint		
Unoccupied Cooling Setpoint	40°F to 115°F	85°F
Unoccupied Heating Setpoint	40°F to 115°F	60°F
Occupied Offset	0.9°F to 18°F	1.5°F
Standby Offset	0.9°F to 18°F	7.5°F
Space Temperature Setpoint Default	40 to 115°F	72.5°F
Setpoint Limits		
Cooling Setpoint High Limit	40 to 115°F	110°F
Cooling Setpoint Low Limit	40 to 115°F	40°F
Heating Setpoint High Limit	40 to 115°F	105°F
Heating Setpoint Low Limit	40 to 115°F	40°F
Humidity Setpoint	40 to 100%	60%

Product-specific set-up parameters shown in Table 58, p. 65 are available for modification through the Tracer TU Field Service tool if changes are required and does not include standard Tracer TU parameters (for example, units of measure).

Table 58. Symbio™400-B set-up parameters

Input Name	Range	Default
Device		
Occupancy Request Source	Local Source BAS	Local Source
Heat Cool Mode Request Source	Local Source BAS	Local Source
Emergency Override Command Source	Local Source BAS	Local Source
Space Temperature Source	Local Source BAS	Local Source
Space Humidity Source	Local Source BAS	Local Source
Entering Water Temperature Source	Local Source BAS	Local Source

Table 58. Symbio™400-B set-up parameters (continued)

Input Name	Range	Default
Supply Fan		
Supply Fan Configuration Command	Continuous[a] Cycling with capacity	Continuous
Enable Local Supply Fan Switch Control	Enable Disable	Enable
Supply Fan Speed Low Limit	33 to 100%[b]	33%
Space Temperature Setpoint Source	BAS Default	Local Source
Supply Fan Speed High Limit	75 to 110%	100%
Filter Runtime Hours Enable	Enable Disable	Enable
Filter Runtime Hours Setpoint	0 to 10000 hours	600 hrs.
Bypass Time		
Occupied Bypass Time[c]	0 to 240 minutes	120 min.
Humidity/Dehumidification		
Space Dehumidification Setpoint Default	40 to 100%	60%

[a] Fan will cycle when unoccupied.
[b] The minimum supply fan speed percentage is dependent upon the maximum supply fan speed PWM percentage. The maximum supply fan speed percentage is based on the user selected maximum and is the highest fan speed the unit will run: 100% cool output.
[c] The occupied bypass timer is used for timed override applications.

Safety Control

The Symbio™ 400-B controller receives separate input signals from the refrigerant high and low pressure switches and water temperature sensors. These devices are provided to improve reliability and protect the unit and compressor from damage.

Compressor Protection Control

An input on the Symbio 400-B is dedicated to monitoring the status of the high pressure, low pressure and temperature and discharge line temperature devices for compressor protection control.

Condensate Overflow

All units have a UL508 condensate overflow installed as standard. When condensate reaches the trip point, a condensate overflow signal generates a diagnostic which disables the fan, unit water valve (if present), and compressor.

Discharge Air

A discharge air sensor is included to identify leaving air temperature.

Entering Water Temperature Sampling

The Symbio 400-B shall sample the entering water temperature to determine proper control action for the unit. The entering water temperature will be measured when there is a new request for compressor operation, the isolation valve is not open, and it has been greater than one hour since the last sampling occurred.

Extended Time @ Compressor Low Speed (Oil Recovery Mode)

If the compressor operates for 90 continuous minutes at the minimum speed the compressor speed shall ramp to 50% for 3 minutes and then will be released back to normal operation.

Freeze Protection

The unit is protected from low temperature water via a leaving water temperature sensor installed in the unit.

Low Entering Water Temperature

During low entering water temperature conditions, the minimum compressor speed will be modified based on the active operating mode and the entering water temperature.

Zone Sensors

Table 59. Zone sensor selection for use with Symbio™ 400-B controller

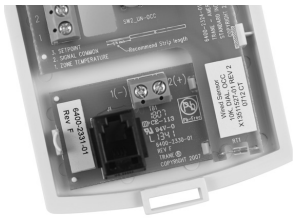
Sensor	Part Number	Description
	X13790886010	Wired temperature sensor with an LCD display • Allows an occupant to control the temperature setpoint, request timed override of system operation, and provides a COMM module to service technicians. Symbio 400-B Compatible.
	X13651467020	Communication Module • Sold in packs of 12 • Provides local RJ22 connection to Trane® service tools for easy, low cost maintenance.
	X13511529010	Zone Sensor • Symbio 400-B compatible • External setpoint adjustment wheel
	X13511527010	Zone Sensor • Symbio 400-B compatible • External setpoint adjustment wheel • ON and CANCEL buttons
	X1379084501	Zone Sensor • Symbio 400-B compatible • External setpoint adjustment wheel • ON and CANCEL buttons • Fan switch AUTO-OFF

Table 59. Zone sensor selection for use with Symbio™ 400-B controller (continued)

Sensor	Part Number	Description
	X1379044401	Temperature and relative humidity sensor • Symbio 400-B compatible
	X13790955050	Trane Air-Fi® WCS-SD (display) • Symbio 400-B compatible • Easy-to-use interface for clear and simple monitoring and control.
	X13790956010	Trane Air-Fi® WCS-SB (base) • Symbio 400-B compatible • Simplicity • Eliminates local temperature control when higher control level is required.

Table 59. Zone sensor selection for use with Symbio™ 400-B controller (continued)

Sensor	Part Number	Description
	X13790993001	Commercial Touch Screen Programmable Zone Sensor • Supports Standby, Occupied, and Unoccupied • 7 day, 5+2 day, and 5+1+1 day • Cannot be used with BAS as sensor ties up BACnet link. For use with factory programmed Symbio 400-B. ***Notes:*** • *Adjusting the rotary switch on Symbio 400-B may be required to correspond address configuration in the sensor. See the installation manual for more information.* • *Additional configuration is needed in the field to use the programmable zone sensors (to put BAS points in service on Symbio 400-B).*
	X13790992001	Residential Touch Screen Programmable Zone Sensor • Supports Awake, Away, Home, and Sleep • 7 day, 5+2 day, and 5+1+1 day • Cannot be used with BAS as sensor ties up BACnet link. For use with factory programmed Symbio 400-B. ***Notes:*** • *Adjusting the rotary switch on Symbio 400-B may be required to correspond address configuration in the sensor. See the installation manual for more information.* • *Additional configuration is needed in the field to use the programmable zone sensors (to put BAS points in service on Symbio 400-B).*

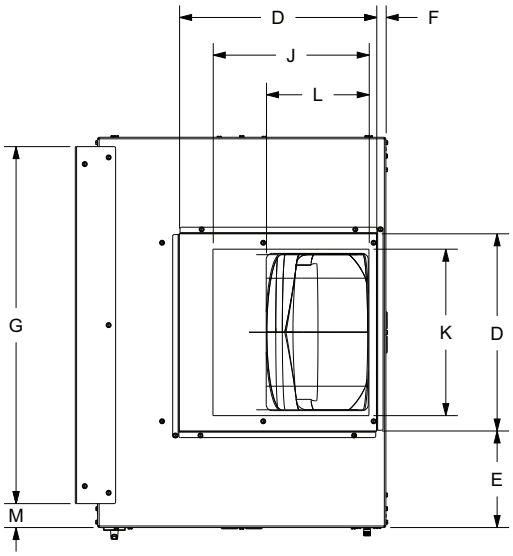
Electrical Data

Table 60. VSH*/VSV* electrical data with ECM

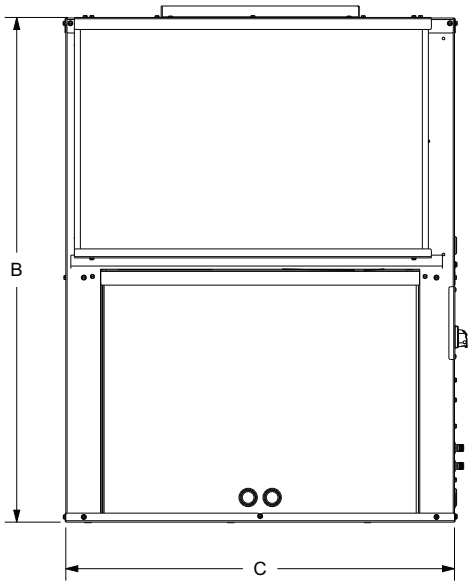
Model No.	Unit Volts	Total Unit FLA	Comp MRC (ea)	No. of Compres-sors	Blower Motor FLA	Blower Motor hp	Fan Motor Num.	Minimum Circuit Ampacity	Maximum Overcurrent Protective Device
VSH*/VSV*024	208-230/60/1	15.4	11.9	1	3.50	3/4	1	19.00	30
	208-230/60/3	9.9	6.4	1	3.50	3/4	1	12.00	15
	460/60/3	6.7	4.4	1	2.30	3/4	1	8.00	15
VSH*/VSV*033	208-230/60/1	20.7	17.2	1	3.50	3/4	1	25.00	40
	208-230/60/3	12.5	9.0	1	3.50	3/4	1	15.00	20
	460/60/3	8.7	6.4	1	2.30	3/4	1	11.00	15
VSH*/VSV*042	208-230/60/1	27.7	21.0	1	6.70	1	1	33.00	50
	208-230/60/3	17.9	11.2	1	6.70	1	1	21.00	30
	460/60/3	11.3	7.8	1	3.50	1	1	14.00	20
VSH*/VSV*050	208-230/60/1	32.4	25.7	1	6.70	1	1	39.00	60
	208-230/60/3	19.9	13.2	1	6.70	1	1	24.00	35
	460/60/3	13.0	9.5	1	3.50	1	1	16.00	20
VSH*/VSV*060	208-230/60/1	39.2	32.5	1	6.70	1	1	48.00	70
	208-230/60/3	23.7	17.0	1	6.70	1	1	28.00	40
	460/60/3	14.1	10.6	1	3.50	1	1	17.00	25

Dimensional Data

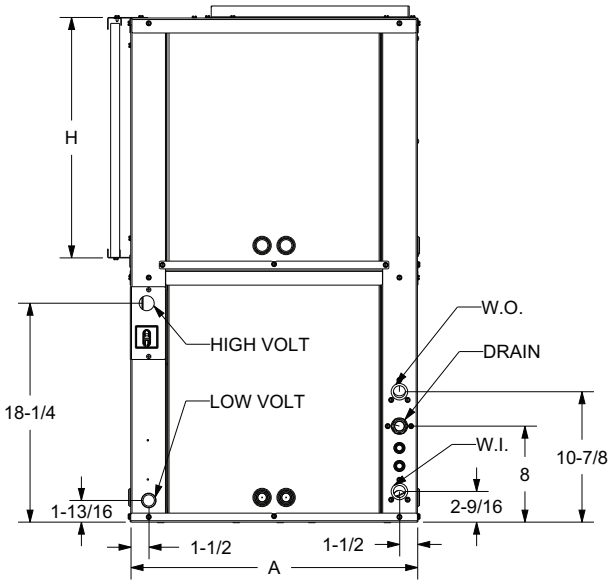
Figure 15. Left return/top supply VSV



TOP



LEFT



FRONT

Dimensional Data

Table 61. Dimensional data—left return/top supply VSV

Units	A	B	C	D	E	F	G	H	J	K	L	M	W.I. NPTI	W.O. NPTI	Drain FPT
024–033	23-7/8	42	32-1/2	16-7/16	8-1/16	13/16	29-3/4	20	13	13-7/8	8-1/2	2	1	1	3/4
042–060	25-3/8	49	32-1/2	16-7/16	8-1/16	13/16	29-3/4	20	13	13-7/8	8-1/2	2	1	1	3/4

Note: Access to the unit for service purposes should be provided at installation. Local and/or NEC codes may require greater service clearance. Check all code requirements prior to the unit installation. Installer is responsible for following all local and NEC code requirements.

Figure 16. Left return/back supply VSV

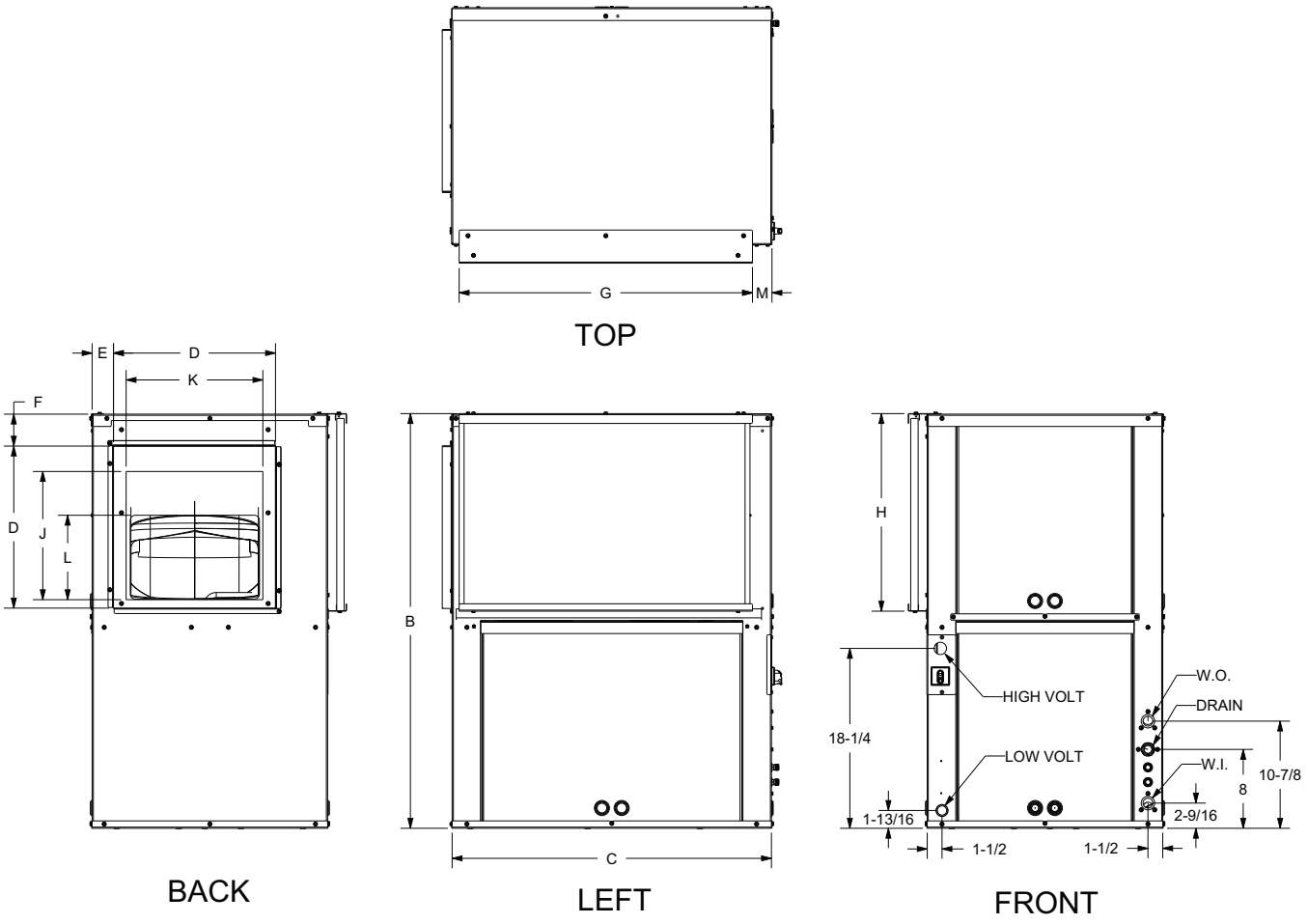


Table 62. Dimensional data—left return/back supply VSV

Units	A	B	C	D	E	F	G	H	J	K	L	M	W.I. NPTI	W.O. NPTI	Drain FPT
024–033	23-7/8	42	32-1/2	16-7/16	2-1/4	3-1/4	29-3/4	20	13	13-7/8	8-1/2	2	1	1	3/4
042–060	25-3/8	49	32-1/2	16-7/16	2-1/4	3-1/4	29-3/4	20	13	13-7/8	8-1/2	2	1	1	3/4

Note: Access to the unit for service purposes should be provided at installation. Local and/or NEC codes may require greater service clearance. Check all code requirements prior to the unit installation. Installer is responsible for following all local and NEC code requirements.

Figure 17. Right return/top supply VSV

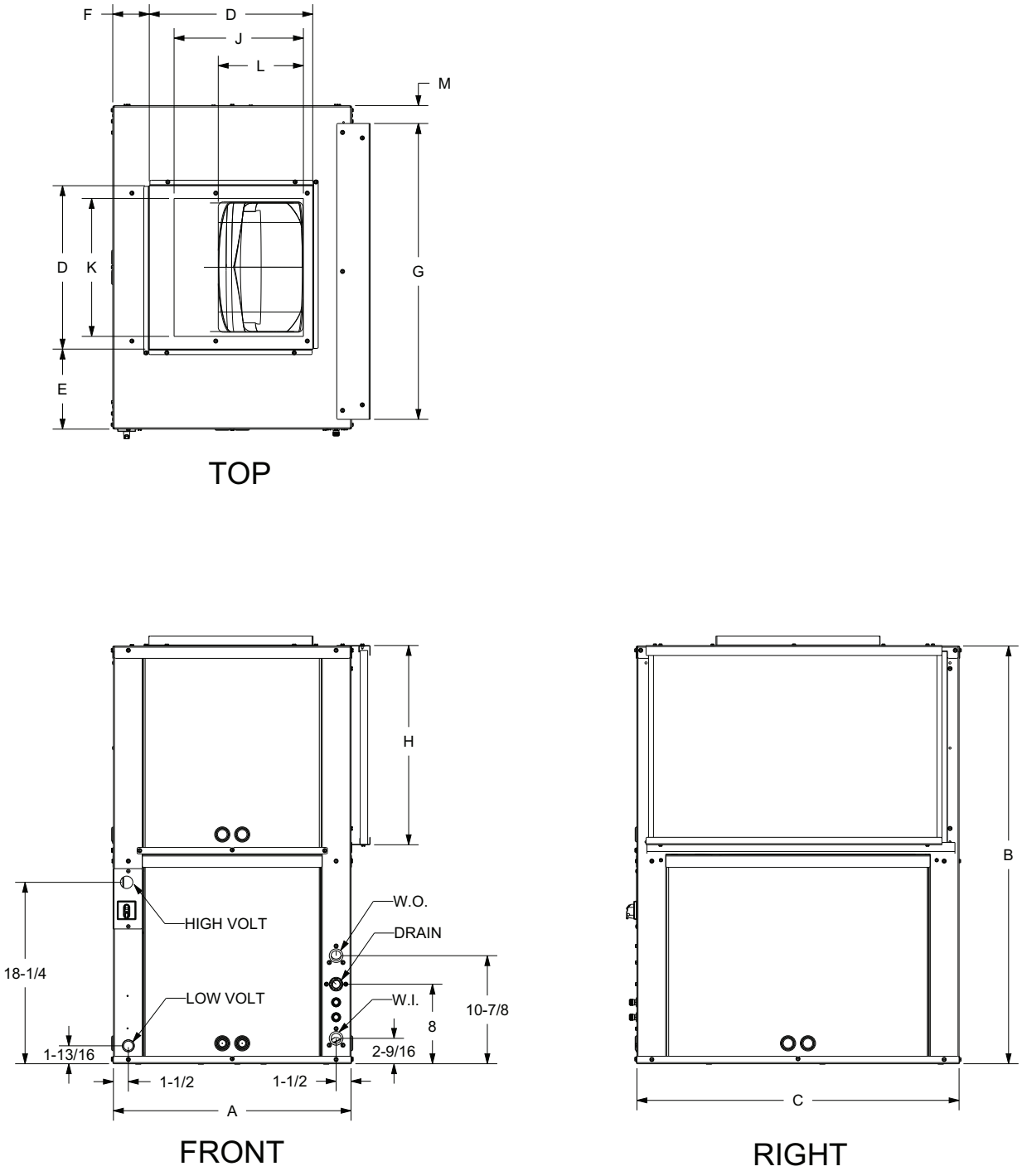


Table 63. Dimensional data—right return/top supply VSV

Units	A	B	C	D	E	F	G	H	J	K	L	M	W.I. NPTI	W.O. NPTI	Drain FPT
024–033	23-7/8	42	32-1/2	16-7/8	8-1/16	13/16	29-3/4	20	13	13-7/8	8-1/2	1-3/4	1	1	3/4
042–060	25-3/8	49	32-1/2	16-7/8	8-1/16	13/16	29-3/4	20	13	13-7/8	8-1/2	1-3/4	1	1	3/4

Note: Access to the unit for service purposes should be provided at installation. Local and/or NEC codes may require greater service clearance. Check all code requirements prior to the unit installation. Installer is responsible for following all local and NEC code requirements.

Figure 18. Right return/back supply VSV

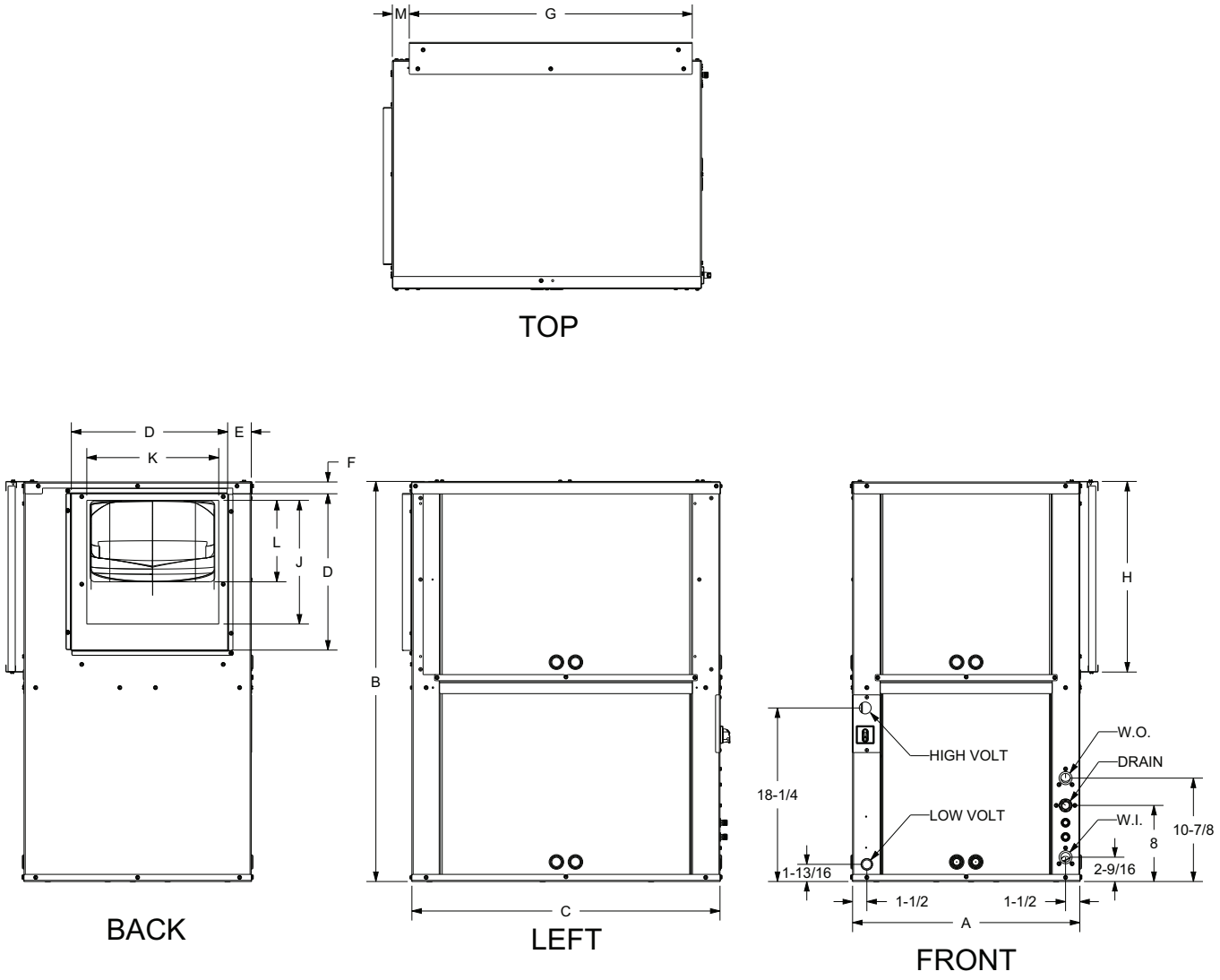


Table 64. Dimensional data—right return/back supply VSV

Units	A	B	C	D	E	F	G	H	J	K	L	M	W.I. NPTI	W.O. NPTI	Drain FPT
024–033	23-7/8	42	32-1/2	16-7/16	2-1/4	3-1/4	29-3/4	20	13	13-7/8	8-1/2	1-3/4	1	1	3/4
042–060	25-3/8	49	32-1/2	16-7/16	2-1/4	3-1/4	29-3/4	20	13	13-7/8	8-1/2	1-3/4	1	1	3/4

Note: Access to the unit for service purposes should be provided at installation. Local and/or NEC codes may require greater service clearance. Check all code requirements prior to the unit installation. Installer is responsible for following all local and NEC code requirements.

Figure 19. Left return/back supply VSH

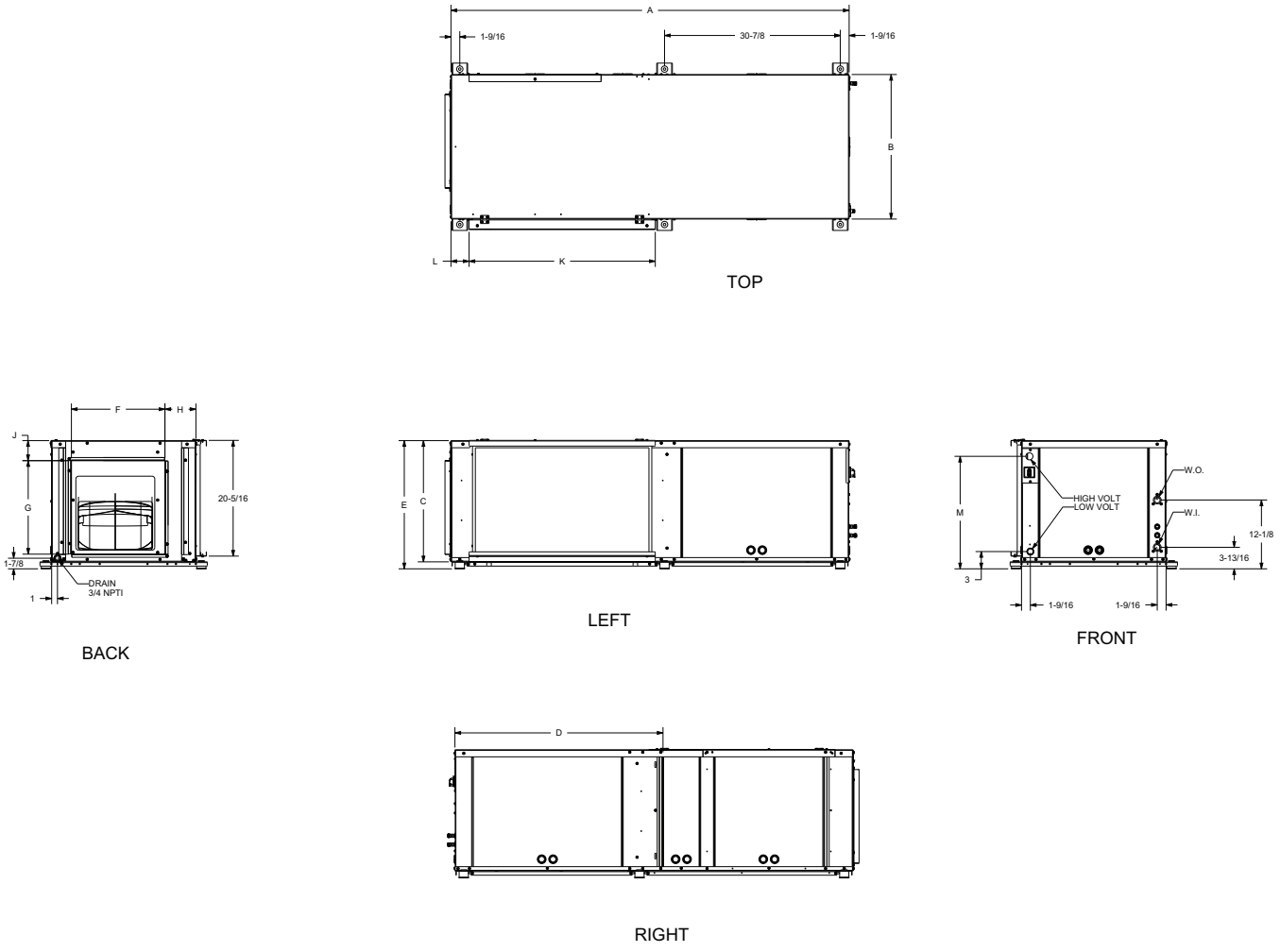


Table 65. Dimensional data— left return/back supply VSH

Units	A	B	C	D	E	F	G	H	J	K	L	M	W.I. NPTI	W.O. NPTI	Drain FPT
024–033	**59-1/2**	**24**	**21**	**35-1/2**	**22-1/4**	**16-7/16**	**16-7/16**	**3-3/4**	**3-3/8**	**21-1/2**	**3-9/16**	**19-1/2**	**1**	**1**	**3/4**
042–060	70	25-3/8	21-1/4	35-1/2	22-1/2	16-7/16	16-7/16	5-3/8	3-1/2	32-11/16	3-3/16	19-3/4	1	1	3/4

Note: Access to the unit for service purposes should be provided at installation. Local and/or NEC codes may require greater service clearance. Check all code requirements prior to the unit installation. Installer is responsible for following all local and NEC code requirements.

Figure 20. Left return/right supply VSH

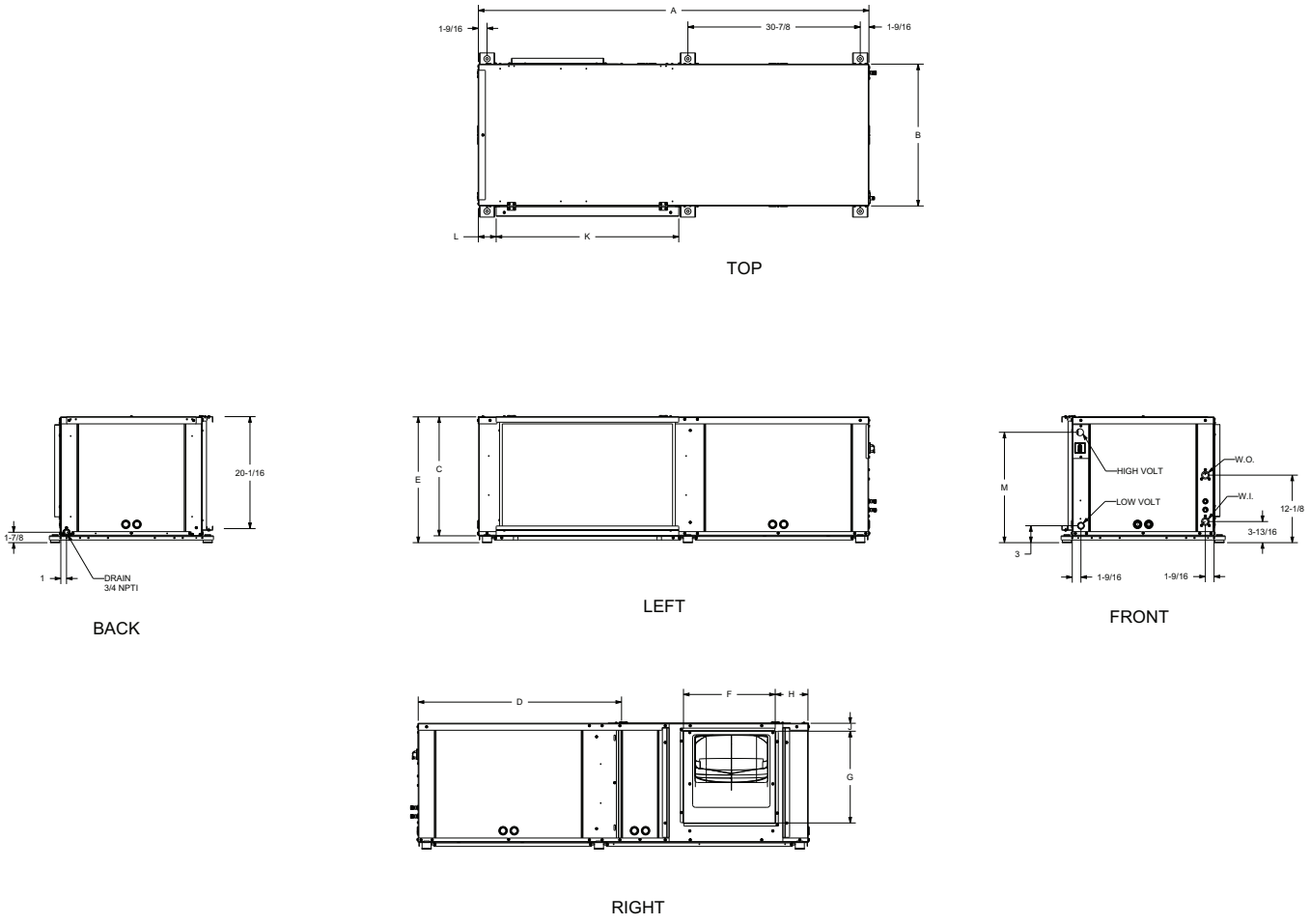


Table 66. Dimensional data— left return/right supply VSH

Units	A	B	C	D	E	F	G	H	J	K	L	M	W.I. NPTI	W.O. NPTI	Drain FPT
024–033	59-1/2	24	21	35-1/2	22-1/4	16-7/16	16-7/16	5-1/2	1-1/4	21-1/2	3-9/16	19-1/2	1	1	3/4
042–060	70	25-3/8	21-1/4	35-1/2	22-1/2	16-7/16	16-7/16	6	1-7/16	32-11/16	3-3/16	19-3/4	1	1	3/4

Note: Access to the unit for service purposes should be provided at installation. Local and/or NEC codes may require greater service clearance. Check all code requirements prior to the unit installation. Installer is responsible for following all local and NEC code requirements.

Figure 21. Right return/back supply VSH

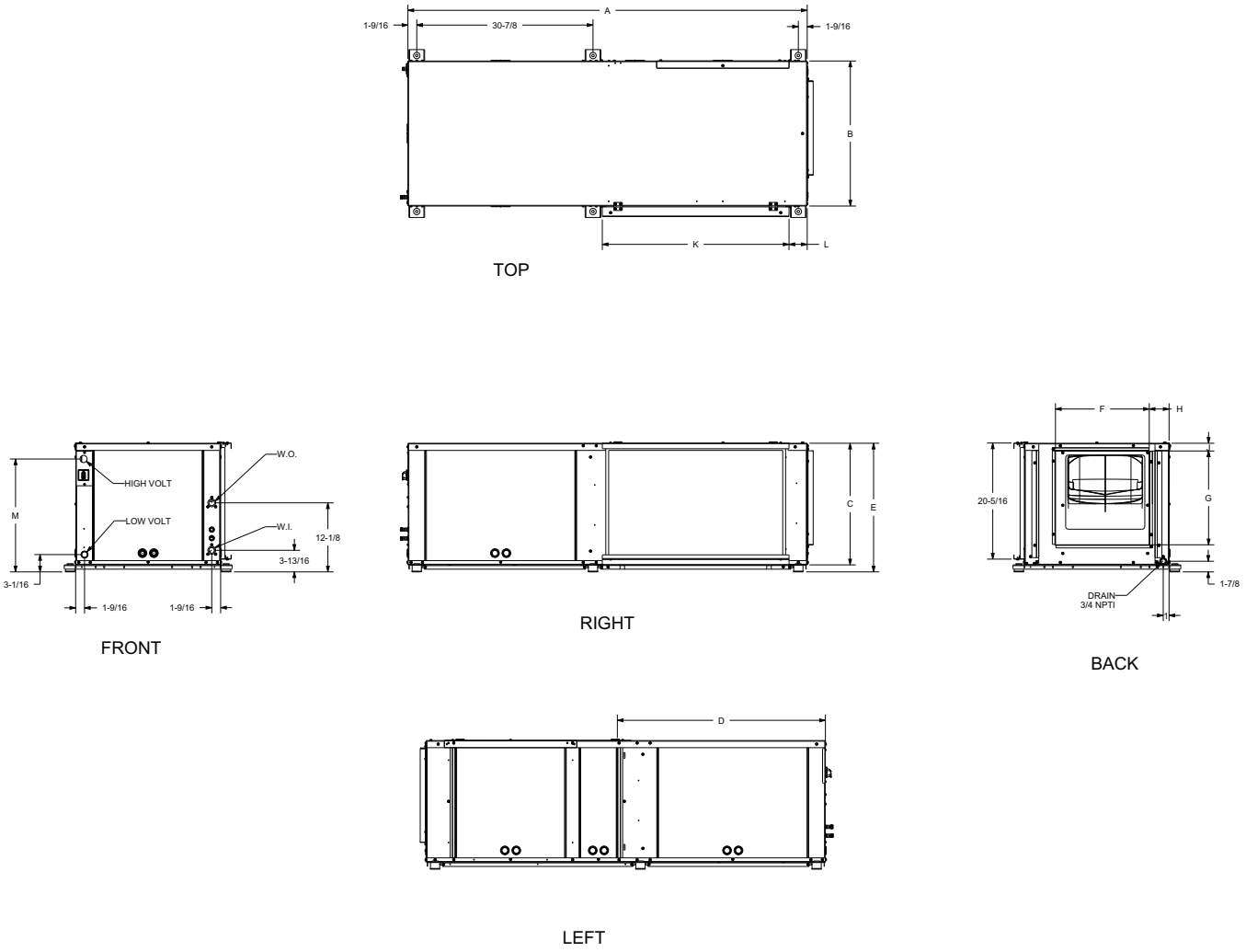


Table 67. Dimensional data — right return/back supply VSH

Units	A	B	C	D	E	F	G	H	J	K	L	M	W.I. NPTI	W.O. NPTI	Drain FPT
024–033	59-1/2	24	21	35-1/2	22-1/4	16-7/16	16-7/16	3-3/4	1-1/4	21-1/2	3-9/16	19-1/2	1	1	3/4
042–060	70	25-3/8	21-1/4	35-1/2	22-1/2	16-7/16	16-7/16	3-1/2	1-7/16	32-11/16	3-3/16	19-3/4	1	1	3/4

Note: Access to the unit for service purposes should be provided at installation. Local and/or NEC codes may require greater service clearance. Check all code requirements prior to the unit installation. Installer is responsible for following all local and NEC code requirements.

Figure 22. Right return/left supply VSH

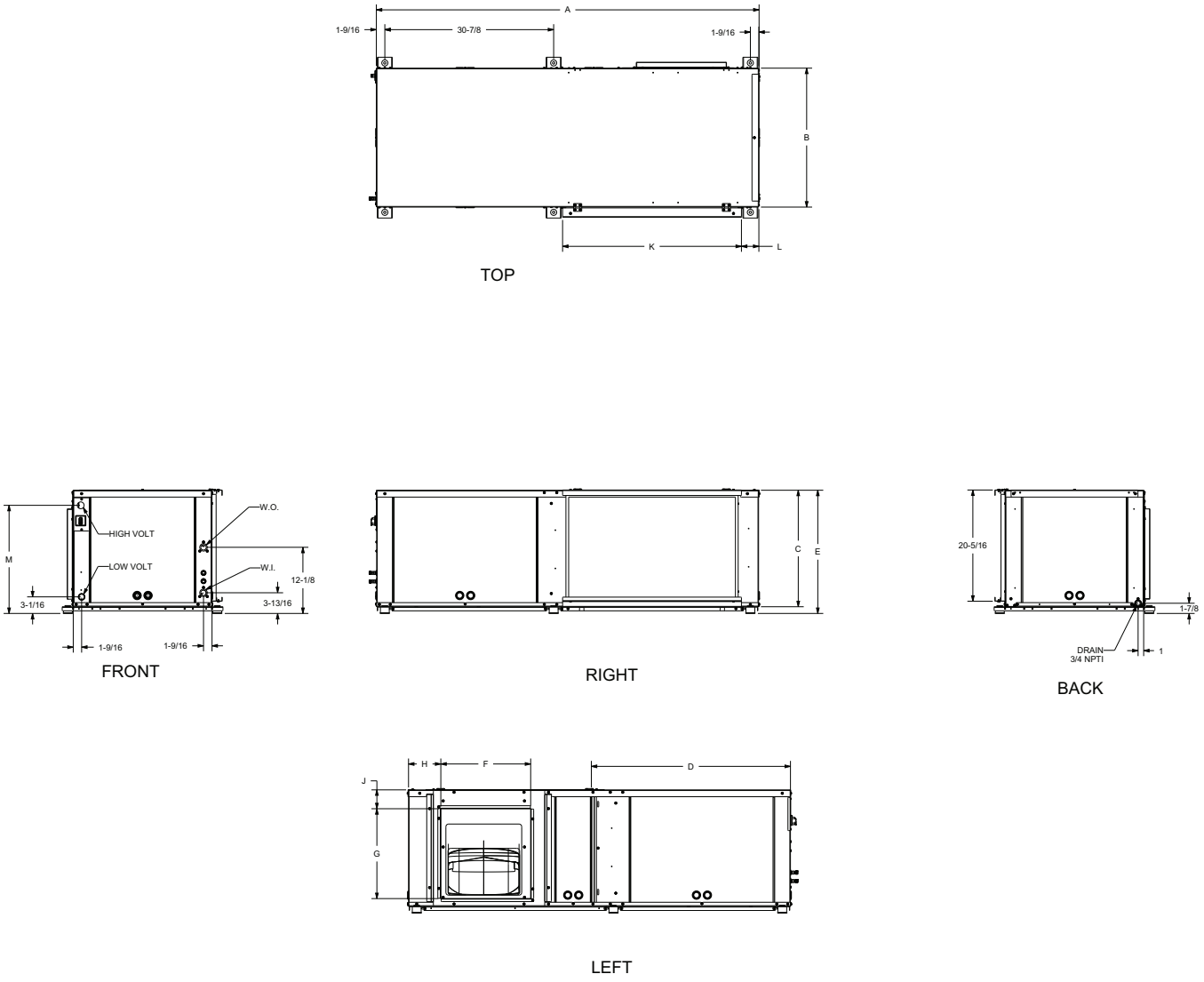


Table 68. Dimensional data — right return/left supply VSH

Units	A	B	C	D	E	F	G	H	J	K	L	M	W.I. NPTI	W.O. NPTI	Drain FPT
024–033	59-1/2	24	21	35-1/2	22-1/4	16-7/16	16-7/16	5-1/2	3-3/8	21-1/2	3-9/16	19-1/2	1	1	3/4
042–060	70	25-3/8	21-1/4	35-1/2	22-1/2	16-7/16	16-7/16	6	3-1/2	32-11/16	3-3/16	19-3/4	1	1	3/4

Note: Access to the unit for service purposes should be provided at installation. Local and/or NEC codes may require greater service clearance. Check all code requirements prior to the unit installation. Installer is responsible for following all local and NEC code requirements.

Mechanical Specifications

General

Trane water source heat pump model Axiom Variable Speed unit shall be furnished and installed.

Equipment shall be factory assembled, piped, internally wired, fully charged with R-454B refrigerant and oil and test operated at the factory. The unit shall have an operating range is 45 to 120°F entering water temperature in cooling and 25 to 85°F entering water temperature in heating.

Equipment shall be rated, certified and labeled in accordance with ANSI/AHRI/ASHRAE/ISO13256-1 and must be tested, labeled and classified in accordance to UL Std 60335-1, UL Std 60335-2-40, CSA C22.2 No. 60335-1, and CSA C22.2 No. 60335-2-40. Service and caution labels shall be placed on the unit in their appropriate locations.

Air-to-Refrigerant Coil

The air-to-refrigerant coil shall consist of copper tubes mechanically bonded into evenly spaced aluminum fins. All coils shall be leak tested to 450 psig and pressure tested to 600 psig at the factory to ensure the pressure integrity. The tubes are completely evacuated of air and correctly charged with proper volume of refrigerant prior to shipment. The refrigerant coil distributor assembly shall be of orifice style with round copper distributor tubes. The tubes are sized consistently with the capacity of the coil. Suction headers are fabricated from rounded copper pipe.

Cabinet/Casing

The unit frame is constructed of heavy-gauge, galvanized steel. The panels are insulated with either 1/2-inch thick, dual density bonded glass fibre or 1/2-inch thick foil faced glass fiber insulation to provide thermal and acoustical insulation. The insulation is UL listed and meets NFPA-90A and UL 181 standard.

Access for inspection and cleaning of the unit drain pan, coils and fan section is provided. The unit is installed for proper access. Procedures for proper access, inspection and cleaning of the unit are included in the installation, operation and maintenance manual.

Compressors

Units have a high efficiency scroll variable speed type compressor. An inverter board for speed control of the compressor will be provided as standard.

The compressor will be dually isolated. External vibration isolation is provided by rubber mounting devices located underneath the mounting base of the compressor. A second isolation of the refrigerant assembly is supported under the compressor mounting base.

Internal thermal overload protection shall be provided. Protection against excessive discharge pressure is provided by means of a high pressure switch. A loss of charge is provided by a low pressure safety.

Controls

The unit shall utilize a factory furnished, programmed and mounted direct digital controller. The Symbio™ 400-B is a 23 I/O point BACnet® MS/TP controller capable of a standalone application or as applied to a full building automation system.

The controller provides anti-short cycle compressor protection, random start delay, heating/cooling status, occupied/unoccupied mode, high and low pressure safety control, filter maintenance timer, compressor status (high/low pressure), drive status (operating or failed), freeze protection and condensate overflow.

Note: *Discharge air, entering and leaving water temperature sensors are standard on VSHV.*

Drain Pan

All unit drain pans are constructed of stainless steel. The bottom of these drain pans will be sloped in two planes to pitch the condensate to the drain connection. These drain pans comply with ASHRAE62 for IAQ. A UL508 float switch is factory installed on all units as standard to protect against the overflow of condensate from the drain pan and the drain must be externally trapped.

Electrical

The unit control box contains the following devices to allow heating and cooling operation to occur from a remote mounted zone sensor:

- 100 VA transformer
- A low-voltage connection point for zone sensor connections located inside the control panel behind the service access panel

Enhanced Dehumidification Control

A humidity sensor shall be available as a field installed option for dehumidification operation. In cooling mode, when the space humidity level exceeds the setpoint, the enhanced dehumidification mode will reduce the fan speed to increase dehumidification.

Fan and Motor Assembly

The fan is a forward-curved style wheel constructed of corrosion resistant galvanized material. The fan is placed in a draw-through configuration and is arranged for top or back supply air. This assembly shall attach the wheel and motor to the fan housing providing single side service access.

The fan motor is an ECM programmable type motor with electronic protection. The motor is programmed at the factory for variable air flow. Minimum and maximum airflow settings are configurable.

The motor has permanently lubricated and sealed bearings. The motor contains a quick disconnect plug for ease of maintenance. Removal of the motor and fan wheel shall be made with the assistance of a factory provided orifice ring assembly.

Filters

Units come standard with a flat filter rack for non-ducted return air applications. A one-inch disposable filter is provided with the unit as standard. 2-inch disposable, 2-inch MERV 8, or 2-inch MERV 13 filters are available as an option. 4-inch MERV 8 and 4-inch MERV 13 filters are available as accessories.

Filter Access – Ducted Return

An optional ducted filter rack is provided as a field installed accessory for applications requiring filter access at the unit in a ducted return. The vertical unit filter rack has side access while the horizontal unit filter rack has bottom access.

Freeze Protection

Freeze protection (35°F or 20°F) shall be provided by use of a thermistor on the leaving water temperature side of the unit.

Refrigerant Circuit

Within the refrigerant circuit, access ports shall be factory supplied on the high and low pressure sides for easy refrigerant pressure or temperature testing. A filter drier shall be provided and factory-installed within the refrigeration circuit. Internal thermal overload protection is also provided. Protection against excessive discharge pressure is provided by means of a high pressure switch. A loss of charge is provided by a low pressure safety.

The refrigerant tubing shall be of 99% pure copper. This system is clean and free from contaminants and conditions such as drilling fragments, dirt, and oil. All refrigerant and water lines are insulated with an elastomeric insulation that has a 3/8-inch thick wall wherever air is introduced to the assembly.

Refrigerant Metering

The equipment is provided with a bi-directional thermal expansion valve (TXV). The device allows the operation of the equipment in the range of 25 to 120°F entering fluid temperature and 55 to 90°F entering air temperatures for either water loop or ground loop (geothermal) applications.

Reversing Valve

Units shall come standard with a reversing valve for heating and cooling operation. The reversing valve is a pilot operating sliding piston type with replaceable encapsulated magnetic coil. This valve shall be energized in cooling.

Sound Attenuation

Sound attenuation shall be a standard feature in the product design. The sound reduction package shall include, vibration isolation to the compressor and water-to-refrigerant coil, unit base stiffeners, insulated heavy gauge metal enclosure, and a second stage of vibration isolation to the compressor and water-to-refrigerant coil base pan.

Water-to-Refrigerant Heat Exchanger

The water-to-refrigerant heat exchanger is a high quality co-axial coil for maximum heat transfer. The copper coil is deeply fluted to enhance heat transfer and minimize fouling and scaling. The coil has a working pressure of 400 psig on the water side and 600 psig on the refrigerant side. Cupro-nickel may be provided as an option.

Zone Sensors

Zone sensors are available to interface with the Symbio 400-B controller and control the unit to the desired stage of cooling or heating. These sensors are field installed in the zone.

Leak Detection Sensors

Unit shall be furnished with a leak detection system from the factory when a circuit refrigerant charge exceeds 3.91 lbs. The leak detection system shall consist of one or more refrigerant detection sensors. When the system detects a leak, the unit controller shall initiate mitigation actions.

Notes

The AHRI Certified mark indicates Trane U.S. Inc. participation in the AHRI Certification program. For verification of individual certified products, go to ahridirectory.org.

Trane - by Trane Technologies (NYSE: TT), a global innovator - creates comfortable, energy efficient indoor environments for commercial and residential applications. For more information, please visit trane.com or tranetechnologies.com.

Trane has a policy of continuous product and product data improvements and reserves the right to change design and specifications without notice. We are committed to using environmentally conscious print practices.

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