CATALOG

# VFL Parallel Fan-Powered, Low-Height, VAV Terminals

ENVIRO-TEC®

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NOTES:

- All data herein is subject to change without notice. Some drawings are not shown in this catalog.
- Drawings not for installation purposes.
- Construction drawings and performance data contained herein should not be used for submittal purposes.
- ETL Listing Number 3052384-001.

AHRI CERTIFIED® www.ahridirectory.org VAV Terminals AHRI Standard 880

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# FEATURES AND BENEFITS

## QUIET COMFORT

Model VFL fan terminals are specifically designed for quiet operation in shallow or congested ceiling spaces. They also offer improved space comfort and flexibility for a wide variety of HVAC systems. This is critical in today's buildings, where occupants are placing more emphasis on indoor acoustics.

## OCCUPANT-SENSITIVE DESIGN

Due to heightened interest in Indoor Air Quality, many HVAC system designers are focusing on the effects of particulate contamination within a building's occupied space. Often, HVAC system noise is overlooked as a source of occupied space contamination. The VFL terminal is specifically designed to eliminate obtrusive fan noise from reaching the occupants.

Occupants will benefit from the VFL design that minimizes low frequency (125Hz-250Hz) sound levels that typically dominate the space sound level.

## DESIGN FLEXIBILITY

**Selection and Layout.** The VFL provides flexibility in system design. Reduced noise at the fan terminal allows the system designer to place properly sized units directly above occupied spaces. It is not necessary to use the crowded space above a hall or corridor to locate the equipment. This will reduce lengthy and expensive discharge duct runs. The standard shallow casing height (10 5/8" or 12") minimizes conflict with other systems competing for ceiling space. The FlowStar™ sensor ensures accurate control, even when space constraints do not permit long straight inlet duct runs to the terminal.

**Sizes.** Model VFL terminals are available with primary air valves handling up to 3000 CFM. Three fan sizes provide a range of heating capacities between 100 and 1500 CFM. Units are available with multiple primary air valve and fan combinations to meet current industry needs.

## CONVENIENT INSTALLATION

**Quality.** All VFL terminals are thoroughly inspected during each step of the manufacturing process, including a comprehensive "pre-ship" inspection, to assure the highest quality product available. Each unit is also "run tested" before leaving the factory to ensure trouble free field "start-up."

**Quick Installation.** A standard single point electrical main power connection is provided. Electronic controls and electrical components are located on the same side of the casing for quick access, adjustment, and troubleshooting. Installation time is minimized with the availability of factory calibrated controls.

Terminals can be ordered with left or right hand control configurations to facilitate clearance requirements from obstructions in a congested ceiling cavity.

The terminal is constructed to allow installation with standard metal hanging straps. Optional hanger brackets for use with all-thread support rods or wire hangers are also available.

**Air Balance.** Finite fan speed adjustment is accomplished with an electronic SCR controller. The SCR fan speed controller is offered by ENVIRO-TEC and is compatible with the fan motor. This minimizes electronic interference and harmonic distortion that occurs from non- compatible motor and SCR components. Increased motor life and efficiency result from the compatible design.

VFL terminals utilize three tap motors that accommodate a broad range of flow and static pressure field conditions while dramatically increasing efficiency.

The FlowStar™ sensor ensures accurate airflow measurement, minimizing commissioning and setup time. A calibration label and wiring diagram is located on the terminal for quick reference during start-up.

## VALUE AND SECURITY

**Quality.** All metal components are fabricated from galvanized steel. Unlike most manufacturers' terminals, the steel used in the VFL is capable of withstanding a 125 hour salt spray test without showing any evidence of red rust.

**Energy Efficiency.** In addition to quiet and accurate temperature control, the building owner will benefit from lower operating costs. The highly amplified velocity pressure signal from the FlowStar™ inlet sensor allows precise airflow control at low air velocities.

The FlowStar™ sensor's airfoil shape provides minimal pressure drop across the terminal. This allows the central fan to run at a lower pressure and with less brake horsepower. Energy efficient three tap, three winding, permanent split capacitor fan motors are manufactured to ensure efficient, quiet, reliable, and low maintenance operation.

Three tap motors provide superior energy efficiency over single speed motors by delivering three separate horsepower outputs. For example, a nominal 1/2 HP motor delivers 1/3 HP on medium tap and 1/4 HP on low tap. This allows the motor to operate at a higher efficiency when at a reduced fan capacity.

Fan terminals that utilize a single speed motor must rely solely on an SCR controller to obtain the reduction in fan capacity. At minimum turndown, they suffer from excessive power consumption and high motor winding temperatures, significantly reducing the motor life.

**Agency Certification.** Model VFL terminals, including those with electric heat, are listed with ETL as an assembly, and bear the ETL label.

VFL terminals comply with applicable NEC requirements, are tested in accordance with AHRI Standard 880, and are certified by AHRI.

**Maintenance and Service.** VFL fan terminals require no periodic maintenance other than optional filter replacement. If component replacement becomes necessary, the unit is designed to minimize field labor. Both top and bottom casing panels can be removed to provide easy access to the fan assembly, and the motor electrical leads are easily unplugged.

## CONTROLS

Model VFL terminals are available with the Verasys® Zone Equipment Control Assembly (ZEC). The ZEC Series Direct Digital Control (shown below) combines controller, pressure sensor, and actuator housed in one pre-assembled unit. The Mobile Access Portal (MAP) Gateway Tool (sold separately) allows for convenient configuration via direct connection to the ZEC.

ENVIRO-TEC® manufactures a complete line of controls specifically designed for use with VFL terminals. These controls are designed to accommodate a multitude of control schemes. Pneumatic Controls, and Consignment DDC controls are also available.


From the most basic to the most sophisticated sequence of operation, the controls are designed by experts in VAV terminal operation. Refer to the Electronic Controls Selection Guide, and the Pneumatic Controls Selection Guide for a complete description of the sequences and schematic drawings that are available.

Standard features include the patented FlowStar™ airflow sensor, ETL Listing, NEMA 1 enclosure, 24 volt control transformer, floating modulating actuator, balancing tees and plenum rated tubing.

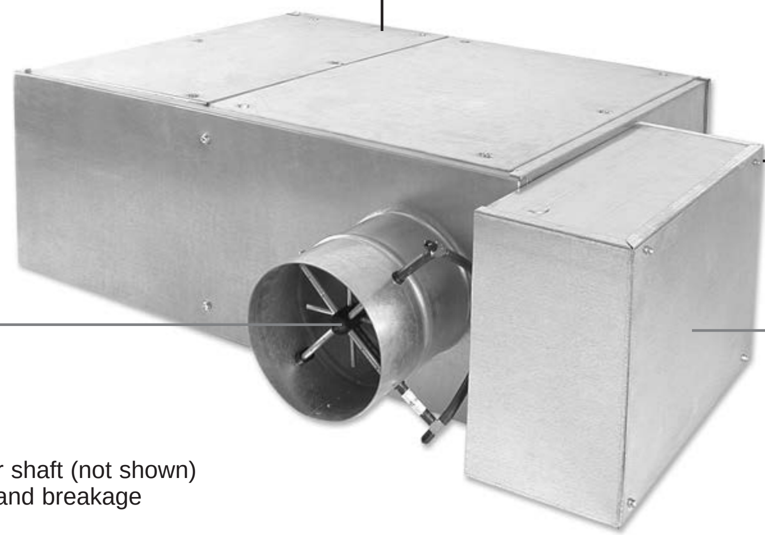
# CONSTRUCTION FEATURES

## MODEL VFL

The VFL terminal incorporates many standard features that are expensive options for other manufacturers.

All unit configurations listed with ETL for safety compliance with UL 1995

20 gauge galvanized steel casing withstands 125 hour salt spray test per ASTM B-117



Patented FlowStar™ airflow sensor (Patent number 5,481,925)

Low leakage damper incorporates closed cell foam gasket

Solid composite damper shaft (not shown) prevents condensation and breakage

Control enclosure standard with all electronic control sequences

Electrical devices installed within a NEMA 1 enclosure, with single point power connection

Fan assembly utilizes a forward curved, dynamically balanced, galvanized wheel with a direct drive motor

Top and bottom fan access panels

1/2" thick fiberglass insulation complying with UL 181, NFPA 90A, and ASTM C1071, mechanically fastened for added security

Optional induction air filter (not shown)

Round Inlets:
22 gauge galvanized steel, roll formed with integral stiffening ribs for added strength and rigidity

Rectangular Inlets:
18 gauge galvanized steel construction

### OPTIONAL CONSTRUCTION FEATURES

- Mounting brackets to accept all-thread hanging rods or wire hangers
- Double wall construction
- Scrim reinforced foil faced insulation meeting ASTM C1136 for mold, mildew, and humidity resistance
- Elastomeric closed cell foam insulation
- Hot water (VFL-WC), steam, or electric heating (VFL-EH) coils
- Factory controls: Verasys® ZEC Series DDC for BACnet, Pneumatic, or Consignment DDC Controls
- Factory piping packages.

## ACCURATE AND ENERGY-SAVING AIRFLOW CONTROL WITH THE PATENTED FLOWSTAR™ SENSOR

Many VAV terminals waste energy due to an inferior airflow sensor design that requires the minimum CFM setpoint to be much higher than the IAQ calculation requirement. This is common with interior spaces that will be effected year round. These interior VAV terminals waste energy in several ways. First, the primary air fan (e.g. AHU) supplies more CFM than the building requires. The higher minimum CFM setpoint overcools the zone with VAV terminals without integral heat. To maintain thermal comfort a building engineer would need to change the minimum setpoint to zero CFM compromising indoor air quality. Interior VAV terminals with integral heat provide adequate comfort in the space but waste significant energy as energy is consumed to mechanically cool the primary air only to have more energy consumed to heat the cooled primary air. Significant energy savings is obtained with proper sizing and by making sure approved VAV terminals are capable of controlling at low CFM setpoints, providing the minimum ventilation requirement.

Currently, most DDC controllers have a minimum differential pressure limitation between 0.015" and 0.05" w.g. The major DDC manufacturers can control down to 0.015" w.g. An airflow sensor that does not amplify, e.g., a Pitot tube, requires about 490 FPM to develop 0.015" w.g. differential pressure. The FlowStar™ develops 0.015" w.g. pressure with only 290 FPM on a size 6 terminal and less than 325 FPM for a size 16. Consequently, VAV terminals utilizing a non-amplifying type sensor could have minimum CFM's that are well over 50% higher than an ENVIRO-TEC terminal. Many airflow sensors provide some degree of amplification simply due to the decrease in free area of the inlet from large area of the sensor. These VAV terminals still require minimum CFM's up to 30% higher than a ENVIRO-TEC terminal, have higher sound levels, and higher pressure drop requiring additional energy consumption at the primary air fan.

A VAV system designed with ENVIRO-TEC terminals consumes significantly less energy than a comparable system with competitor's terminals. The FlowStar™ airflow sensor reduces energy consumption by allowing lower zone minimum CFM setpoints, greatly reducing or eliminating “reheat”, and by imposing less resistance on the primary air fan.

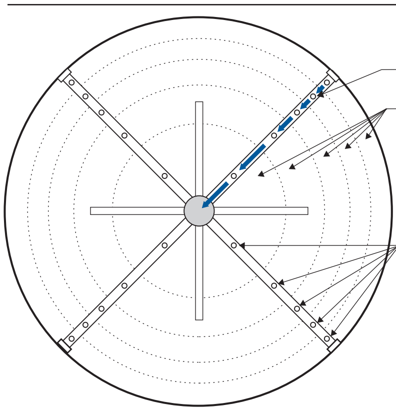
The ENVIRO-TEC air valve features the FlowStar™ airflow sensor which has brought new meaning to airflow control accuracy. The multi-axis design utilizes between 12 and 20 sensing points that sample total pressure at center points within equal concentric cross-sectional areas, effectively traversing the air stream in two planes. Each distinct pressure reading is averaged within the center chamber before exiting the sensor to the controlling device.

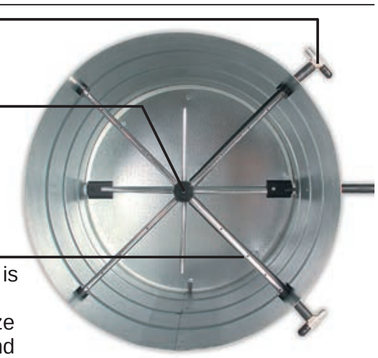
This sensor adds a new dimension to signal amplification. Most differential pressure sensors provide a signal between .5 and 2 times the equivalent velocity pressure signal. The FlowStar™ provides a differential pressure signal that is 2.5 to 3 times the equivalent velocity pressure signal. This amplified signal allows more accurate and stable airflow control at low airflow capacities. Low airflow control is critical for indoor air quality, reheat minimization, and preventing over cooling during light loads.

Unlike other sensors which use a large probe surface area to achieve signal amplification, the FlowStar™ utilizes an unprecedented streamline design which generates amplified signals unrivaled in the industry. The streamlined design also generates less pressure drop and noise.

The VAV schedule should specify the minimum and maximum airflow setpoints, maximum sound power levels, and maximum air pressure loss for each terminal. The specification for the VAV terminal must detail the required performance of the airflow sensor. For maximum building occupant satisfaction, the VAV system designer should specify the airflow sensor as suggested in the Guide Specifications of this catalog.

FlowStar™ Airflow Sensor Patent #5,481,925



# STANDARD AND OPTIONAL FEATURES

## STANDARD FEATURES

**Construction**
- AHRI 880 certified and labeled
- 20 gauge galvanized steel casing
- 1/2" thick fiberglass insulation
- Large top and bottom access openings allowing removal of complete fan assembly for all heating coil options

**Fan Assembly**
- Forward curved, dynamically balanced, direct drive, galvanized blower wheel
- 115, 208/230 or 277 volt single phase, three tap PSC motor
- SCR fan speed controller
- Quick-select motor speed terminal
- Permanently lubricated motor bearings
- Thermally protected motor
- Vibration isolation motor mounts
- Single point wiring

**Primary Air Valve**
- Round inlets: 22 gauge galvanized steel with embossed rigidity rings
- Rectangular inlets: 18 gauge galvanized steel construction
- Low thermal conductance damper shaft
- Position indicator on end of damper shaft
- Mechanical stops for open and closed position
- FlowStar™ center averaging airflow sensor
- Balancing tees
- Plenum rated sensor tubing

**Hot Water Coils**
- Coils are designed, manufactured, and tested by ENVIRO-TEC
- AHRI 410 certified and labeled
- 1, 2, 3, or 4 row coils
- Tested at a minimum of 450 PSIG under water and rated at 450 PSIG working pressure at 200°F
- Left or right hand connections

**Electrical**
- cETL listed for safety compliance
- NEMA 1 wiring enclosure

**Electric Heat**
- cETL listed as an assembly for safety compliance per UL 1995
- Integral electric heat assembly
- Automatic reset primary and back-up secondary thermal limits
- Single point power connection
- Hinged electrical enclosure door
- Fusing per NEC

**Controls**
- Verasys® ZEC Series DDC for BACnet
- Pneumatic Controls

## OPTIONAL FEATURES

**Construction**
- Foil faced scrim backed insulation
- Elastomeric closed cell foam insulation
- Double wall construction with 22 gauge liner
- 1" filter rack with throwaway filter

**Fan Assembly**
- 220/240 volt 50 Hz motors

**Electrical**
- Full unit toggle disconnect
- Inline motor fusing
- Primary and secondary transformer fusing

**Electric Heat**
- Proportional (SSR) heater control
- Door interlocking disconnect switches

**Controls**
- Consignment DDC controls (factory mount and wire controls provided by others)

**Piping Packages**
- Factory assembled – shipped loose for field installation
- 1/2" and 3/4", 2 way, normally closed, two position electric motorized valves
- Isolation ball valves with memory stop
- Fixed and adjustable flow control devices
- Unions and P/T ports
- Floating point modulating control valves
- High pressure close-off actuators (1/2" = 50 PSIG; 3/4" = 25 PSIG)

# APPLICATION AND SELECTION

## PURPOSE OF PARALLEL FLOW FAN TERMINALS

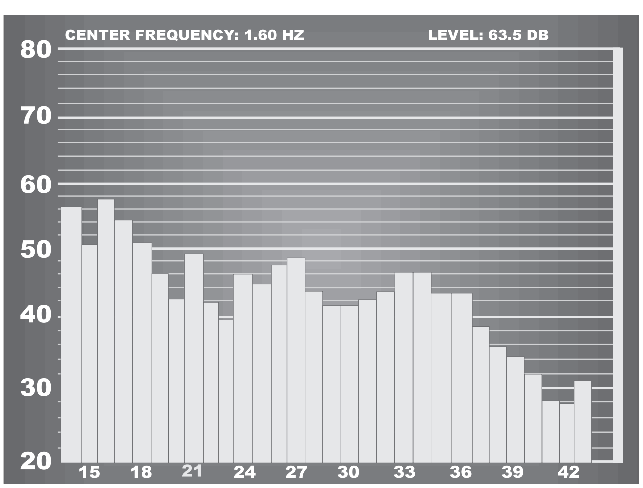
Parallel flow fan powered terminals offer improved space comfort and flexibility in a wide variety of applications. Substantial operating savings can be realized through the recovery of waste heat, and night setback operation.

**Heat Recovery.** The VFL recovers heat from lights and core areas to offset heating loads in perimeter zones. Additional heat is available at the terminal unit using electric, steam, or hot water heating coils. Controls are available to energize remote heating devices such as wall fin, fan coils, radiant panels, and roof load plenum unit heaters.

**Typical Sequences of Operation.** The VFL provides variable volume, constant temperature air in the cooling mode, and constant volume, variable temperature air in the heating mode.

At the design cooling condition, the primary air valve is handling the maximum scheduled airflow capacity while the unit fan is off. As the cooling load decreases, the primary air valve throttles toward the minimum scheduled airflow capacity. A further decrease in the cooling load causes the unit fan to start, inducing warm air from the ceiling plenum which increases the discharge air temperature to the zone. When the heating load increases, the optional hot water coil or electric heater is energized to maintain comfort conditions.

**IAQ.** The VFL enhances the indoor air quality of a building by providing higher air volumes in the heating mode than typically provided by straight VAV single duct terminals. The higher air capacity provides greater air motion in the space and lowers the heating discharge air temperature. This combination improves air circulation, preventing accumulation of $CO^2$ concentrations in stagnant areas. Increased air motion improves occupant comfort. The higher air capacity also improves the performance of diffusers and minimizes diffuser "dumping".




## ACOUSTICAL CONCEPTS

The focus on indoor air quality is also having an effect on proper selection of air terminal equipment with respect to acoustics.

**Sound Paths.** At the zone level, the terminal unit generates acoustical energy that can enter the zone along two primary paths. First, sound from the unit fan can propagate through the downstream duct and diffusers before entering the zone (referred to as Discharge or Airborne Sound). Acoustical energy is also radiated from the terminal casing and travels through the ceiling cavity and ceiling system before entering the zone (referred to as Radiated Sound).

**Sound Power.** To properly quantify the amount of acoustical energy emanating from a terminal unit at a specific operating condition (i.e. CFM and static pressure), manufacturers must measure and publish sound power levels.

The units of measurement, decibels, actually represent units of power (watts). The terminal equipment sound power ratings provide a consistent measure of the generated sound independent of the environment in which the unit is installed. This allows a straight forward comparison of sound performance between equipment manufacturers and unit models.

**Noise Criteria (NC).** The bottom line acoustical criteria for most projects is the NC (Noise Criteria) level. This NC level is derived from resulting sound pressure levels in the zone. These sound pressure levels are the effect of acoustical energy (sound power levels) entering the zone caused by the terminal unit and other sound generating sources (central fan system, office equipment, outdoor environment, etc.).

The units of measurement is once again decibels; however, in this case decibels represent units of pressure (Pascals), since the human ear and microphones react to pressure variations.

There is no direct relationship between sound power levels and sound pressure levels. Therefore, we must predict the resulting sound pressure levels (NC levels) in the zone based in part by the published sound power levels of the terminal equipment. The NC levels are totally dependent on the project specific design, archi-

# APPLICATION AND SELECTION

tecturally and mechanically. For a constant operating condition (fixed sound power levels), the resulting NC level in the zone will vary from one project to another.

**AHRI 885.** A useful tool to aid in predicting space sound pressure levels is an application standard referred to as AHRI Standard 885. This standard provides information (tables, formulas, etc.) required to calculate the attenuation of the ductwork, ceiling cavity, ceiling system, and conditioned space below a terminal unit. These attenuation values are referred to as the “transfer function” since they are used to transfer from the manufacturer’s sound power levels to the estimated sound pressure levels resulting in the space below, and/or served by the terminal unit. The standard does not provide all of the necessary information to accommodate every conceivable design; however, it does provide enough information to approximate the transfer function for most applications. Furthermore, an Appendix is provided that contains typical attenuation values. Some manufacturers utilize different assumptions with respect to a "typical" project design; therefore, cataloged NC levels should not be used to compare acoustical performance. Only certified sound power levels should be used for this purpose.

## GENERAL DESIGN RECOMMENDATIONS FOR A QUIET SYSTEM

**The AHU.** Sound levels in the zone are frequently impacted by central fan discharge noise that either breaks out (radiates) from the ductwork or travels through the distribution ductwork and enters the zone as airborne (discharge) sound. Achieving acceptable sound levels in the zone begins with a properly designed central fan system which delivers relatively quiet air to each zone.

**Supply Duct Pressure.** One primary factor contributing to noisy systems is high static pressure in the primary air duct. This condition causes higher sound levels from the central fan and also higher sound levels from the terminal unit, as the primary air valve closes to reduce the pressure. This condition is compounded when flexible duct is utilized at the terminal inlet, which allows the central fan noise and air valve noise to break out into the ceiling cavity and then enter the zone located below the terminal. Ideally, the system static pressure should be reduced to the point where the terminal unit installed on the duct run associated with the highest pressure drop has the minimum required inlet pressure to deliver the design airflow to the zone. For systems that will have substantially higher pressure variances from one zone to another, special attention should be paid to the proper selection of air terminal equipment.

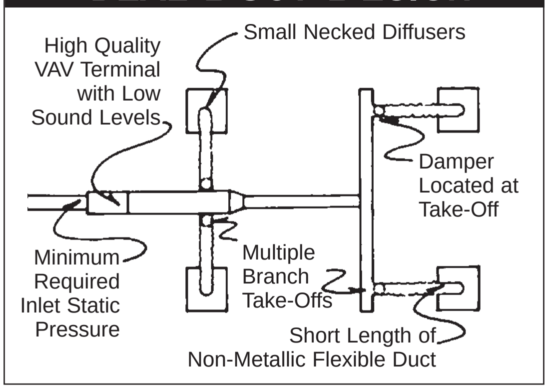
To date, the most common approach has been to select (size) all of the terminals based on the worst case (highest inlet static pressure) condition. Typically, this results in 80% (or higher) of the terminal units being oversized for their application. This in turn results in much higher equipment costs, but more importantly, drastically reduced operating efficiency of each unit. This consequently decreases the ability to provide comfort control in the zone. In addition, the oversized terminals cannot adequately control the minimum ventilation capacity required in the heating mode.

A more prudent approach is to utilize a pressure reducing device upstream of the terminal unit on those few zones closest to the central fan. This device could simply be a manual quadrant type damper if located well upstream of the terminal inlet. In tight quarters, perforated metal can be utilized as a quiet means of reducing system pressure. This approach allows all of the terminal units to experience a similar (lower) inlet pressure. They can be selected in a consistent manner at lower inlet pressure conditions that will allow more optimally sized units.

**Inlet Duct Configuration.** Inlet duct that is the same size as the inlet collar and as straight as possible will achieve the best acoustical performance. For critical applications, flexible duct should not be utilized at the terminal inlet.

**Downstream Duct Design.** On projects where internal lining of the downstream duct is not permitted, special considerations should be made to assure acceptable noise levels will be obtained. In these cases, a greater number of smaller zones will help in reducing sound levels. Where possible, the first diffuser takeoff should be located after an elbow or tee and a greater number of small necked diffusers should be utilized, rather than fewer large necked diffusers.

**IDEAL DUCT DESIGN**



The downstream ductwork should be carefully designed and installed to avoid noise regeneration. Bull head tee arrangements should be located sufficiently downstream of the terminal discharge to provide an established flow pattern downstream of the fan. Place diffusers downstream of the terminal after the airflow has completely developed.

Downstream splitter dampers can cause noise problems if placed too close to the terminal, or when excessive air velocities exist. If tee arrangements are employed, volume dampers should be used in each branch of the tee, and balancing dampers should be provided at each diffuser tap. This arrangement provides maximum flexibility in quiet balancing of the system. Casing radiated sound usually dictates the overall room sound levels directly below the terminal. Because of this, special consideration should be given to the location of these terminals as well as to the size of the zone. Larger zones should have the terminal located over a corridor or open plan office space and not over a small confined private office. Fan powered terminals should never be installed over small occupied spaces where the wall partitions extend from slab-to-slab (i.e. fire walls or privacy walls).

**Fan Terminal Isolation.** Model VFL fan terminals are equipped with sufficient internal vibration dampening means to prevent the need for additional external isolation. Flexible duct connectors at the unit discharge typically do more harm than good. The sagging membrane causes higher air velocities and turbulence, which translates into noise. Furthermore, the discharge noise breaks out of this fitting more than with a hard sheet metal fitting.

## SELECTION GUIDELINES

The VFL product line is designed to provide flexibility in matching primary air valve capacities (cooling loads) with unit fan capacities (heating loads). The VFL model code consists of two pairs of two digit numbers (e.g. 0805). The first two digits describe the primary air valve size (diameter in nominal inches), while the second pair refers to the unit fan capacity (hundreds of CFM) and overall physical size of the unit. Each unit fan size is available with two or more primary air valve sizes. This allows the heating airflow capacity (fan CFM) to be selected over a wide range of design airflow capacities (maximum primary CFM). This accommodates applications where the fan CFM needs to be only 15 to 20% of design capacity, and applications where the fan CFM must be 50 to 70% of design CFM.

The unit fan size should be selected first by cross plotting the specified fan capacity and external static pressure on the appropriate fan performance curves. Terminals utilizing hot water heating coils require the summation of the coil air pressure drop and the design E.S.P. to determine the total E.S.P. It is common to have more than one fan size which can meet the design requirements. Typically, the selection begins with the smallest fan that can meet the capacity. Occasionally, this selection may not meet the acoustical requirements and thus, the next larger fan size would be selected.

Fan selections can be made anywhere in the non-shaded areas. Each fan performance curve depicts the actual performance of the relative motor tap without any additional fan balance adjustment. Actual specified capacities which fall below a particular fan curve (low, medium, or high) are obtained by adjustment of the electronic (SCR) fan speed controller.

The primary air valve is selected next. Typically, the primary air valve sound is insignificant relative to the unit fan sound performance. The selection process involves choosing an air valve size that is as small as possible while yielding acceptable sound levels and pressure drop. For non-acoustically sensitive applications such as shopping malls and airports, the primary air valve can be sized at the maximum rated capacity.

## SYSTEM PRESSURE CONSIDERATIONS

The central fan is required to produce sufficient inlet static pressure to force the air through the primary air valve, unit casing, downstream ductwork and fittings, and diffusers with the unit fan off. The VFL has been designed to reduce central fan power consumption by placing the optional hot water heating coil in the induction air stream, eliminating the coil from these central system pressure considerations.

The industry standard for testing and rating air terminal units (AHRI 880) requires that published pressure drop performance be measured with hard, straight, unlined duct entering and leaving the terminal unit. On many projects, due to the limited available space, terminal units are not installed in this optimum manner. Frequently, flexible duct is used at the terminal inlet and a metal transition is utilized at the discharge. The entrance and exit losses in these instances exceed the actual terminal unit pressure loss. It is important to consider terminal unit pressure loss as well as those losses associated with the entire distribution ductwork (as outlined in applicable ASHRAE Handbooks) when sizing central system fan requirements.

# GENERAL SELECTION DATA

## PRIMARY AIR VALVE

| UNIT SIZE | CFM | Min ΔPs (IN. W.G.) | ROOM NOISE CRITERIA (NC) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 0.5" W.G. ΔPs | | 1.0" W.G. ΔPs | | 3.0" W.G. ΔPs | |
| | | | Disch. | Rad. | Disch. | Rad. | Disch. | Rad. |
| 0405 | 100 | 0.01 | -- | -- | -- | 20 | -- | 28 |
| | 150 | 0.02 | -- | 22 | -- | 27 | 24 | 31 |
| | 200 | 0.02 | -- | 26 | 23 | 29 | 29 | 36 |
| | 250 | 0.03 | 23 | 30 | 26 | 33 | 34 | 39 |
| 0505 | 100 | 0.01 | -- | -- | -- | -- | -- | 23 |
| | 200 | 0.01 | -- | -- | -- | 23 | 20 | 30 |
| | 300 | 0.02 | -- | 25 | -- | 29 | 28 | 36 |
| | 350 | 0.02 | -- | 28 | -- | 33 | 29 | 39 |
| 0605 | 200 | 0.03 | -- | -- | -- | -- | -- | 23 |
| | 250 | 0.04 | -- | -- | -- | 20 | 21 | 28 |
| | 300 | 0.06 | -- | -- | -- | 23 | 22 | 30 |
| | 350 | 0.09 | -- | 22 | -- | 27 | 24 | 31 |
| | 450 | 0.15 | 21 | 26 | 24 | 29 | 29 | 36 |
| | 550 | 0.22 | 26 | 30 | 30 | 33 | 34 | 39 |
| 0805 | 300 | 0.02 | -- | -- | -- | -- | 21 | 23 |
| | 400 | 0.03 | -- | -- | -- | 20 | 24 | 28 |
| | 500 | 0.04 | -- | -- | 21 | 23 | 27 | 30 |
| | 600 | 0.05 | -- | 22 | 23 | 27 | 30 | 31 |
| | 800 | 0.10 | 21 | 26 | 25 | 29 | 33 | 36 |
| | 1000 | 0.15 | 24 | 30 | 29 | 33 | 36 | 39 |
| 1009 | 600 | 0.03 | -- | -- | -- | 22 | 29 | 33 |
| | 800 | 0.05 | -- | -- | -- | 23 | 33 | 36 |
| | 1000 | 0.08 | -- | 20 | 21 | 25 | 36 | 38 |
| | 1200 | 0.12 | -- | 26 | 22 | 29 | 37 | 40 |
| | 1400 | 0.16 | -- | 29 | 22 | 30 | 38 | 43 |
| | 1600 | 0.21 | 20 | 34 | 22 | 33 | 39 | 44 |
| 1209 | 800 | 0.03 | -- | -- | -- | 21 | 21 | 30 |
| | 1100 | 0.06 | -- | -- | 21 | 22 | 33 | 36 |
| | 1400 | 0.09 | -- | 22 | 21 | 25 | 36 | 38 |
| | 1700 | 0.13 | -- | 27 | 21 | 28 | 37 | 39 |
| | 2000 | 0.19 | -- | 29 | 22 | 30 | 38 | 43 |
| | 2300 | 0.27 | 20 | 34 | 22 | 33 | 39 | 44 |
| 1215 | 800 | 0.03 | -- | -- | 20 | -- | 30 | 30 |
| | 1100 | 0.06 | -- | -- | 21 | 23 | 34 | 31 |
| | 1400 | 0.09 | -- | -- | 21 | 25 | 35 | 33 |
| | 1700 | 0.13 | -- | 22 | 22 | 27 | 36 | 36 |
| | 2000 | 0.19 | -- | 29 | 21 | 30 | 38 | 38 |
| | 2300 | 0.27 | 20 | 30 | 21 | 30 | 39 | 41 |
| 1415 | 1200 | 0.05 | -- | -- | 22 | 22 | 27 | 31 |
| | 1500 | 0.09 | -- | -- | 23 | 24 | 33 | 32 |
| | 1800 | 0.13 | -- | 20 | 23 | 25 | 39 | 34 |
| | 2100 | 0.18 | -- | 21 | 25 | 27 | 39 | 36 |
| | 2400 | 0.25 | -- | 23 | 26 | 28 | 39 | 37 |
| | 2700 | 0.32 | 20 | 30 | 27 | 30 | 39 | 38 |
| | 3000 | 0.41 | 21 | 32 | 28 | 30 | 40 | 41 |

## FAN

| UNIT SIZE | FAN CFM | ROOM NOISE CRITERIA (NC) | |
|---|---|---|---|
| | | Discharge | Radiated |
| 0405<br>0505<br>0605<br>0805 | 200 | -- | 22 |
| | 300 | -- | 28 |
| | 400 | -- | 31 |
| | 500 | -- | 34 |
| 1009<br>1209 | 300 | -- | 25 |
| | 400 | -- | 27 |
| | 500 | -- | 30 |
| | 600 | -- | 33 |
| | 700 | -- | 36 |
| | 800 | 21 | 37 |
| | 900 | 25 | 38 |
| 1215<br>1415 | 600 | -- | 31 |
| | 700 | -- | 33 |
| | 800 | -- | 35 |
| | 900 | -- | 37 |
| | 1000 | 20 | 38 |
| | 1100 | 21 | 38 |
| | 1200 | 23 | 39 |
| | 1300 | 25 | 40 |
| | 1400 | 26 | 41 |

**NOTES:**

- Min. ΔPs is the static pressure difference between the terminal inlet and discharge with the damper wide open. Data is applicable to units with or without optional heater.
- Performance data obtained from tests conducted in accordance with AHRI Standard 880.
- Dash (-) indicates NC level less than 20.
- NC values are calculated using attenuation values provided in appendix E of AHRI 885-2008, as shown below.
- NC (sound pressure) levels predicted by subtracting appropriate values below from published sound power levels (following pages).

| DISCHARGE ATTENUATION VALUES | OCTAVE BAND | | | | | |
|---|---|---|---|---|---|---|
| | 2 | 3 | 4 | 5 | 6 | 7 |
| Small Box (< 300 CFM) | 24 | 28 | 39 | 53 | 59 | 40 |
| Medium Box (300-700 CFM) | 27 | 29 | 40 | 51 | 53 | 39 |
| Large Box (> 700 CFM) | 29 | 30 | 41 | 51 | 52 | 39 |

| RADIATED ATTENUATION VALUES | OCTAVE BAND | | | | | |
|---|---|---|---|---|---|---|
| | 2 | 3 | 4 | 5 | 6 | 7 |
| Type 2 - Mineral Fiber Ceiling | 18 | 19 | 20 | 26 | 31 | 36 |

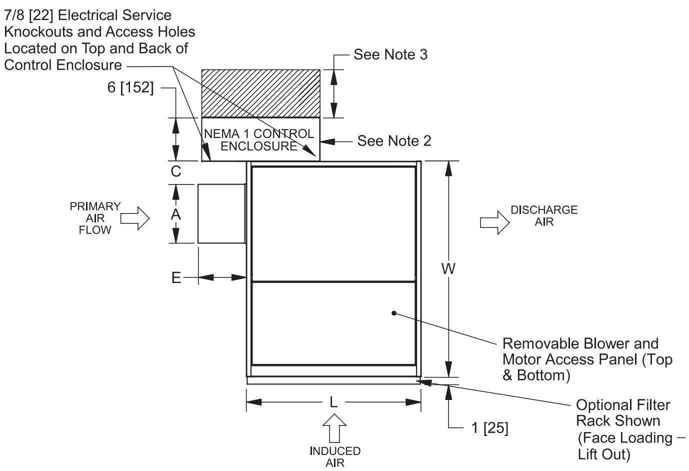
## HORSEPOWER / AMPERAGE DATA

| UNIT SIZE | FAN HORSEPOWER | | | AMPERAGE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 115V | | | 208V | | | 277V | | |
| | LOW | MED | HI | LOW | MED | HI | LOW | MED | HI | LOW | MED | HI |
| **0405, 0505, 0605, 0805** | 1/50 | 1/20 | 1/8 | 0.8 | 1.3 | 1.7 | 0.3 | 0.6 | 0.9 | 0.32 | 0.5 | 0.68 |
| **1009, 1209** | 1/12 | 1/6 | 1/4 | 2.5 | 2.8 | 3.5 | 1.0 | 1.3 | 1.6 | 0.9 | 1.1 | 1.3 |
| **1215, 1415** | 1/4 | 1/3 | 1/2 | 3.1 | 3.7 | 5.8 | 1.4 | 1.7 | 2.7 | 1.1 | 1.5 | 2.2 |

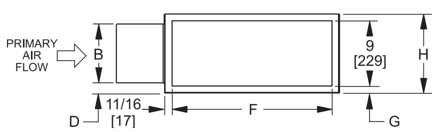
# DIMENSIONAL DATA

## MODEL VFL

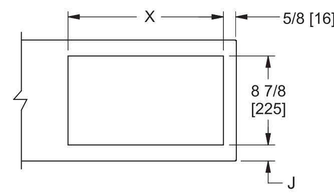
Drawings are not to scale and not for submittal or installation purposes.




**Top View**




**Side View**




**Discharge Air Opening Detail**

| UNIT SIZE | UNIT WEIGHT | | | |
|---|---|---|---|---|
| | VFL | | VFL-EH | |
| | Single Wall | Double Wall | Single Wall | Double Wall |
| 0405, 0505, 0605, 0805 | 58 [26] | 72 [33] | 77 [35] | 91 [41] |
| 1009, 1209 | 86 [39] | 109 [49] | 107 [49] | 130 [59] |
| 1215, 1415 | 118 [54] | 152 [69] | 141 [64] | 175 [79] |

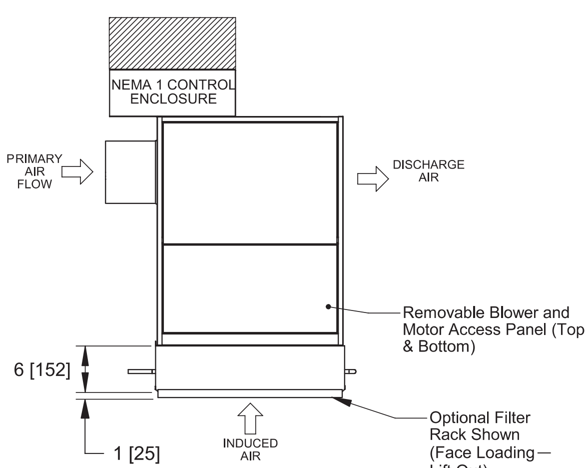
**NOTE:** Unit weights are in pounds [kg]. Refer to submittal drawings for hot water coil weights on Model VFL-WC.

| UNIT SIZE | A | B | C | D | E | F | G | J | X | W | L | H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0405 | 3 7/8ϕ [98] | 3 7/8ϕ [98] | 5 1/8 [130] | 3 3/8 [86] | 10 1/2 [267] | 22 1/8 [562] | 13/16 [21] | 7/8 [22] | 13 5/8 [346] | 29 [737] | 23 1/2 [597] | 10 5/8 [270] |
| 0505 | 4 7/8ϕ [124] | 4 7/8ϕ [124] | 4 5/8 [117] | 2 7/8 [73] | 10 1/2 [267] | 22 1/8 [562] | 13/16 [21] | 7/8 [22] | 13 5/8 [346] | | | |
| 0605 | 5 7/8ϕ [149] | 5 7/8ϕ [149] | 4 1/8 [105] | 2 3/8 [60] | 6 1/2 [165] | 22 1/8 [562] | 13/16 [21] | 7/8 [22] | 13 5/8 [346] | | | |
| 0805 | 7 7/8ϕ [200] | 7 7/8ϕ [200] | 3 1/8 [79] | 1 3/8 [35] | 6 1/2 [165] | 22 1/8 [562] | 13/16 [21] | 7/8 [22] | 13 5/8 [346] | | | |
| 1009 | 10 [254] | 8 [203] | 2 1/2 [64] | 1 5/16 [33] | 6 1/2 [165] | 34 5/8 [879] | 13/16 [21] | 7/8 [22] | 16 [406] | 36 [914] | 36 [914] | |
| 1209 | 14 [356] | 8 [203] | 2 1/2 [64] | 1 5/16 [33] | 6 1/2 [165] | 34 5/8 [879] | 13/16 [21] | 7/8 [22] | 16 [406] | | | |
| 1215 | 14 [356] | 8 [203] | 2 1/2 [64] | 2 [51] | 6 1/2 [165] | 38 5/8 [981] | 1 1/2 [38] | 1 9/16 [40] | 20 [508] | 40 [1016] | 40 [1016] | 12 [305] |
| 1415 | 14 [356] | 10 [254] | 2 1/2 [64] | 1 [25] | 6 1/2 [165] | 38 5/8 [981] | 1 1/2 [38] | 1 9/16 [40] | 20 [508] | | | |

**Notes** (applicable to VFL, VFL-WC, and VFL-EH):

1. Sizes 0405, 0505, 0605, and 0805 have round inlets. Sizes 1009, 1209, 1215, and 1415 have rectangular inlets.
2. Control enclosure is standard with factory mounted electronic controls.
3. Check all national and local codes for required clearances.
4. All dimensions are in inches [mm].
5. Arrangement #1 shown. See next page for other control and heater handing arrangements.

## MODEL VFL-WC (HOT WATER COIL)

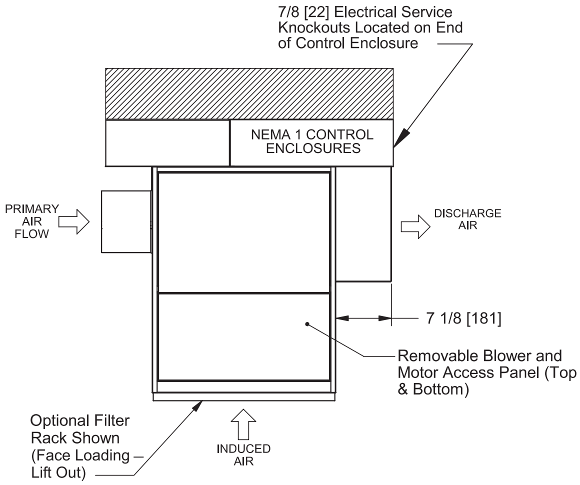



**Top View**

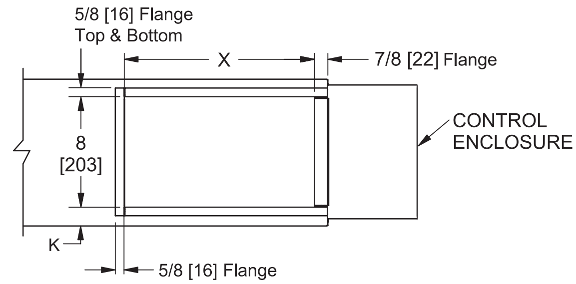
# DIMENSIONAL DATA

## MODEL VFL-EH (ELECTRIC HEAT)

Drawings are not to scale and not for submittal or installation purposes.



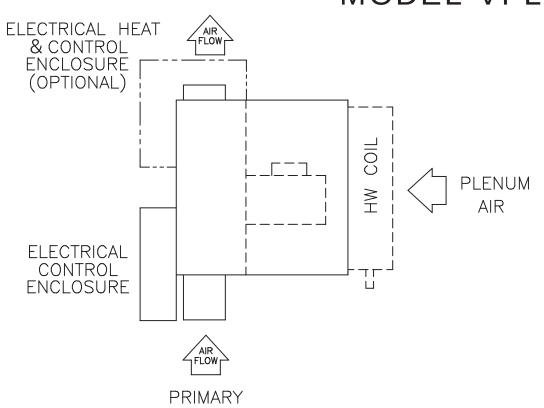

**Top View**



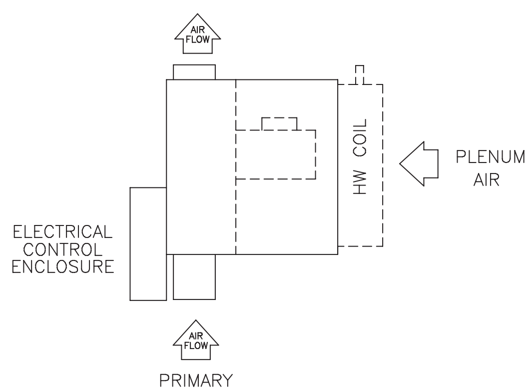

**Discharge Air Opening Detail**

| UNIT SIZE | K |
|---|---|
| 0405, 0505, 0605, 0805, 1009, 1209 | 1 5/16 [33] |
| 1215, 1415 | 2 [51] |

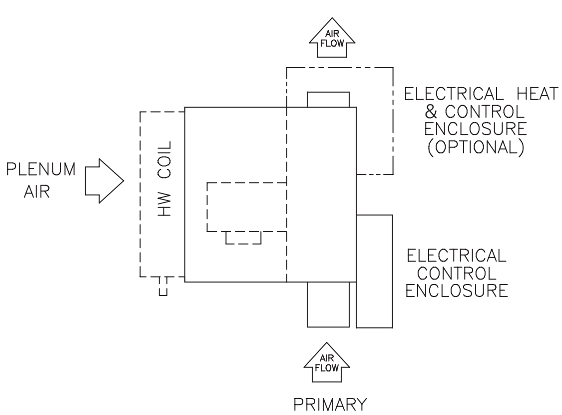
## MODEL VFL ARRANGEMENTS



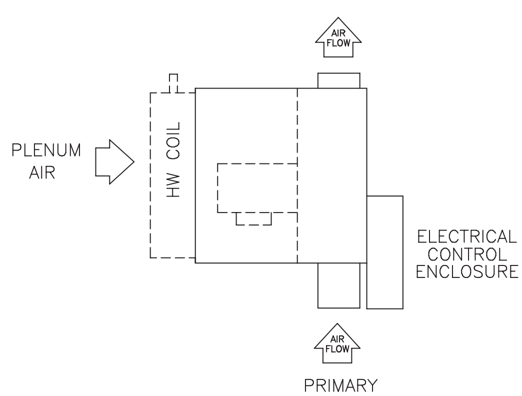

**ARRANGEMENT 1**
Left Hand Control Unit
With Left Hand Hot Water Coil
or Left Hand Electric Heat




**ARRANGEMENT 2**
Left Hand Control Unit
With Right Hand Hot Water Coil




**ARRANGEMENT 3**
Right Hand Control Unit
With Right Hand Hot Water Coil
or Right Hand Electric Heat




**ARRANGEMENT 4**
Right Hand Control Unit
With Left Hand Hot Water Coil

# SOUND POWER DATA

## PRIMARY AIR VALVE, DISCHARGE

| UNIT SIZE | CFM | 0.5" W.G. ΔPs | | | | | | 1.0" W.G. ΔPs | | | | | | 1.5" W.G. ΔPs | | | | | | 3.0" W.G. ΔPs | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | OCTAVE BAND NUMBER | | | | | | OCTAVE BAND NUMBER | | | | | | OCTAVE BAND NUMBER | | | | | | OCTAVE BAND NUMBER | | | | | |
| | | 2 | 3 | 4 | 5 | 6 | 7 | 2 | 3 | 4 | 5 | 6 | 7 | 2 | 3 | 4 | 5 | 6 | 7 | 2 | 3 | 4 | 5 | 6 | 7 |
| **0405** | 100 | 56 | 53 | 43 | 36 | 32 | 29 | 57 | 55 | 48 | 41 | 36 | 32 | 57 | 55 | 49 | 42 | 38 | 35 | 59 | 56 | 51 | 46 | 46 | 43 |
| | 150 | 58 | 56 | 46 | 40 | 35 | 32 | 60 | 60 | 52 | 44 | 40 | 36 | 61 | 61 | 53 | 46 | 42 | 38 | 65 | 64 | 57 | 50 | 49 | 46 |
| | 200 | 61 | 60 | 49 | 43 | 38 | 35 | 64 | 63 | 54 | 47 | 43 | 39 | 65 | 64 | 55 | 48 | 42 | 41 | 70 | 68 | 60 | 52 | 41 | 48 |
| | 250 | 65 | 63 | 52 | 47 | 41 | 38 | 68 | 66 | 57 | 50 | 45 | 41 | 65 | 64 | 55 | 48 | 42 | 41 | 74 | 72 | 63 | 54 | 52 | 50 |
| **0505** | 100 | 51 | 47 | 43 | 36 | 33 | 30 | 52 | 48 | 47 | 42 | 38 | 34 | 54 | 50 | 48 | 43 | 40 | 36 | 57 | 50 | 49 | 47 | 48 | 45 |
| | 200 | 55 | 50 | 45 | 40 | 36 | 33 | 58 | 54 | 50 | 44 | 41 | 37 | 60 | 57 | 52 | 46 | 43 | 39 | 64 | 59 | 56 | 52 | 51 | 48 |
| | 300 | 62 | 57 | 50 | 45 | 40 | 36 | 63 | 59 | 54 | 48 | 44 | 40 | 65 | 61 | 55 | 49 | 43 | 42 | 70 | 65 | 60 | 54 | 52 | 49 |
| | 350 | 64 | 59 | 53 | 48 | 43 | 39 | 66 | 61 | 56 | 51 | 46 | 42 | 68 | 64 | 58 | 52 | 48 | 44 | 72 | 67 | 62 | 56 | 54 | 51 |
| **0605** | 200 | 55 | 48 | 43 | 36 | 33 | 30 | 57 | 52 | 48 | 42 | 38 | 34 | 59 | 54 | 50 | 43 | 40 | 36 | 62 | 57 | 54 | 50 | 48 | 45 |
| | 250 | 57 | 51 | 44 | 38 | 34 | 31 | 59 | 54 | 49 | 43 | 38 | 34 | 61 | 55 | 51 | 45 | 40 | 37 | 65 | 60 | 56 | 51 | 48 | 45 |
| | 300 | 58 | 53 | 46 | 40 | 34 | 31 | 62 | 56 | 51 | 44 | 39 | 35 | 63 | 57 | 53 | 46 | 42 | 38 | 67 | 62 | 57 | 51 | 49 | 46 |
| | 350 | 63 | 55 | 48 | 41 | 38 | 34 | 65 | 59 | 53 | 46 | 41 | 37 | 66 | 60 | 55 | 48 | 43 | 39 | 70 | 64 | 60 | 52 | 49 | 46 |
| | 400 | 65 | 57 | 51 | 44 | 40 | 36 | 67 | 61 | 55 | 48 | 43 | 38 | 70 | 64 | 57 | 52 | 47 | 45 | 72 | 66 | 61 | 53 | 50 | 47 |
| | 450 | 68 | 60 | 53 | 46 | 42 | 38 | 70 | 62 | 57 | 49 | 45 | 40 | 71 | 64 | 59 | 52 | 47 | 45 | 74 | 68 | 63 | 54 | 51 | 48 |
| | 550 | 72 | 63 | 56 | 50 | 45 | 41 | 75 | 67 | 61 | 53 | 49 | 44 | 76 | 68 | 63 | 54 | 51 | 46 | 78 | 71 | 66 | 57 | 54 | 51 |
| **0805** | 300 | 58 | 51 | 47 | 43 | 38 | 34 | 62 | 56 | 53 | 49 | 42 | 39 | 63 | 57 | 54 | 51 | 44 | 41 | 68 | 61 | 59 | 56 | 51 | 49 |
| | 400 | 61 | 53 | 48 | 44 | 39 | 34 | 65 | 58 | 53 | 49 | 44 | 40 | 66 | 60 | 55 | 51 | 46 | 43 | 70 | 64 | 64 | 59 | 53 | 51 |
| | 500 | 64 | 56 | 50 | 45 | 42 | 36 | 68 | 60 | 55 | 50 | 47 | 42 | 69 | 62 | 57 | 53 | 49 | 45 | 73 | 67 | 65 | 59 | 55 | 52 |
| | 600 | 65 | 58 | 52 | 47 | 44 | 38 | 69 | 63 | 56 | 52 | 49 | 43 | 71 | 65 | 59 | 54 | 51 | 46 | 75 | 69 | 67 | 60 | 57 | 54 |
| | 700 | 67 | 60 | 54 | 49 | 46 | 40 | 71 | 64 | 58 | 53 | 51 | 45 | 74 | 67 | 61 | 57 | 54 | 48 | 77 | 71 | 67 | 62 | 59 | 55 |
| | 800 | 70 | 62 | 56 | 51 | 48 | 42 | 73 | 65 | 60 | 54 | 53 | 47 | 74 | 67 | 62 | 57 | 55 | 49 | 79 | 73 | 68 | 63 | 61 | 56 |
| | 1000 | 72 | 64 | 60 | 55 | 51 | 46 | 76 | 68 | 63 | 57 | 55 | 50 | 77 | 70 | 65 | 59 | 57 | 52 | 82 | 75 | 71 | 64 | 63 | 58 |
| **1009** | 600 | 59 | 51 | 48 | 43 | 41 | 38 | 66 | 60 | 53 | 48 | 47 | 47 | 68 | 62 | 54 | 49 | 48 | 47 | 73 | 70 | 64 | 57 | 55 | 57 |
| | 800 | 60 | 53 | 49 | 44 | 42 | 39 | 68 | 61 | 54 | 49 | 48 | 48 | 70 | 62 | 55 | 49 | 48 | 48 | 75 | 73 | 66 | 58 | 56 | 59 |
| | 1000 | 61 | 55 | 50 | 45 | 43 | 40 | 70 | 62 | 55 | 50 | 49 | 48 | 72 | 63 | 55 | 50 | 49 | 48 | 77 | 76 | 68 | 59 | 57 | 61 |
| | 1100 | 61 | 57 | 53 | 46 | 44 | 40 | 70 | 62 | 55 | 50 | 49 | 48 | 72 | 63 | 55 | 50 | 49 | 48 | 79 | 77 | 68 | 60 | 58 | 62 |
| | 1200 | 61 | 58 | 56 | 47 | 44 | 41 | 70 | 62 | 56 | 50 | 49 | 50 | 73 | 66 | 59 | 53 | 52 | 53 | 81 | 77 | 68 | 60 | 58 | 63 |
| | 1400 | 62 | 59 | 62 | 50 | 46 | 43 | 70 | 64 | 58 | 51 | 50 | 51 | 73 | 68 | 61 | 53 | 52 | 54 | 83 | 78 | 68 | 60 | 59 | 64 |
| | 1600 | 65 | 60 | 67 | 54 | 50 | 48 | 70 | 65 | 66 | 53 | 52 | 52 | 73 | 68 | 66 | 55 | 54 | 55 | 84 | 78 | 68 | 61 | 59 | 64 |
| **1209** | 800 | 59 | 51 | 46 | 43 | 40 | 36 | 64 | 59 | 51 | 47 | 47 | 44 | 65 | 60 | 54 | 51 | 49 | 46 | 68 | 63 | 62 | 62 | 55 | 54 |
| | 1100 | 61 | 53 | 48 | 45 | 43 | 39 | 69 | 62 | 53 | 49 | 48 | 47 | 71 | 65 | 56 | 51 | 51 | 50 | 74 | 73 | 67 | 58 | 57 | 59 |
| | 1400 | 61 | 55 | 49 | 45 | 43 | 40 | 70 | 62 | 55 | 49 | 49 | 48 | 71 | 65 | 58 | 52 | 51 | 51 | 76 | 76 | 68 | 58 | 57 | 60 |
| | 1550 | 61 | 56 | 51 | 46 | 43 | 40 | 70 | 62 | 55 | 50 | 49 | 48 | 75 | 68 | 60 | 53 | 53 | 55 | 78 | 77 | 68 | 58 | 58 | 61 |
| | 1700 | 61 | 57 | 54 | 46 | 43 | 41 | 70 | 62 | 56 | 50 | 49 | 49 | 75 | 68 | 60 | 53 | 53 | 55 | 80 | 77 | 68 | 59 | 58 | 62 |
| | 2000 | 62 | 59 | 62 | 50 | 46 | 43 | 70 | 64 | 58 | 51 | 50 | 51 | 76 | 68 | 61 | 53 | 54 | 55 | 83 | 78 | 68 | 60 | 59 | 64 |
| | 2300 | 65 | 60 | 67 | 54 | 50 | 48 | 70 | 65 | 66 | 53 | 52 | 52 | 76 | 69 | 66 | 55 | 54 | 56 | 84 | 78 | 68 | 61 | 59 | 64 |
| **1215** | 800 | 61 | 52 | 48 | 44 | 42 | 39 | 69 | 61 | 52 | 48 | 48 | 47 | 70 | 63 | 56 | 51 | 50 | 49 | 73 | 71 | 67 | 59 | 57 | 58 |
| | 1100 | 61 | 52 | 49 | 45 | 43 | 40 | 70 | 61 | 53 | 49 | 49 | 48 | 71 | 64 | 57 | 51 | 51 | 51 | 75 | 74 | 68 | 58 | 57 | 60 |
| | 1400 | 61 | 54 | 50 | 45 | 43 | 40 | 70 | 61 | 55 | 50 | 49 | 49 | 72 | 65 | 58 | 52 | 51 | 52 | 77 | 75 | 68 | 59 | 57 | 61 |
| | 1550 | 61 | 56 | 53 | 46 | 44 | 40 | 70 | 61 | 55 | 50 | 49 | 50 | 72 | 65 | 58 | 52 | 52 | 54 | 79 | 76 | 68 | 60 | 58 | 62 |
| | 1700 | 61 | 59 | 56 | 47 | 44 | 41 | 70 | 61 | 56 | 50 | 49 | 50 | 73 | 65 | 59 | 53 | 52 | 54 | 81 | 76 | 68 | 60 | 58 | 63 |
| | 2000 | 62 | 59 | 62 | 50 | 46 | 43 | 70 | 63 | 58 | 51 | 50 | 51 | 73 | 67 | 61 | 53 | 52 | 54 | 83 | 77 | 68 | 60 | 59 | 64 |
| | 2300 | 65 | 59 | 67 | 54 | 50 | 48 | 70 | 64 | 66 | 53 | 52 | 52 | 73 | 67 | 66 | 55 | 54 | 55 | 84 | 77 | 68 | 61 | 59 | 64 |
| **1415** | 1200 | 63 | 55 | 49 | 46 | 44 | 41 | 71 | 63 | 53 | 49 | 48 | 47 | 71 | 64 | 57 | 52 | 51 | 50 | 71 | 69 | 66 | 59 | 58 | 59 |
| | 1500 | 63 | 55 | 50 | 46 | 43 | 42 | 71 | 64 | 55 | 50 | 49 | 49 | 72 | 67 | 58 | 52 | 52 | 52 | 74 | 73 | 68 | 59 | 58 | 60 |
| | 1800 | 64 | 56 | 53 | 46 | 44 | 42 | 72 | 64 | 56 | 50 | 50 | 49 | 73 | 68 | 60 | 53 | 52 | 52 | 78 | 79 | 70 | 60 | 59 | 61 |
| | 1925 | 65 | 57 | 53 | 46 | 44 | 43 | 72 | 64 | 57 | 50 | 50 | 49 | 73 | 68 | 61 | 55 | 54 | 56 | 80 | 79 | 70 | 60 | 59 | 61 |
| | 2100 | 66 | 58 | 54 | 47 | 45 | 44 | 73 | 64 | 58 | 51 | 50 | 50 | 75 | 68 | 61 | 55 | 54 | 56 | 83 | 79 | 70 | 61 | 59 | 62 |
| | 2400 | 67 | 62 | 57 | 48 | 46 | 45 | 74 | 65 | 59 | 52 | 50 | 51 | 76 | 69 | 62 | 55 | 54 | 56 | 84 | 79 | 70 | 61 | 59 | 62 |
| | 2700 | 67 | 63 | 60 | 51 | 47 | 45 | 74 | 66 | 61 | 53 | 51 | 51 | 77 | 69 | 63 | 55 | 55 | 57 | 84 | 79 | 70 | 62 | 60 | 63 |
| | 3000 | 68 | 64 | 61 | 55 | 49 | 47 | 75 | 67 | 64 | 55 | 52 | 52 | 78 | 70 | 66 | 57 | 55 | 57 | 85 | 79 | 70 | 62 | 60 | 63 |

**NOTES:**
- Data obtained from tests conducted in accordance with AHRI Standard 880.
- Sound levels are expressed in decibels, dB re: 1 x $10^{-12}$ Watts.
- ΔPs is the difference in static pressure across the primary air valve.
- Duct end corrections included in sound power levels per AHRI Standard 880.
- Certified AHRI data is highlighted blue. Application data (not highlighted blue) is outside the scope of the certification program.

# SOUND POWER DATA

## PRIMARY AIR VALVE, RADIATED

| UNIT SIZE | CFM | 0.5" W.G. ΔPs | | | | | | 1.0" W.G. ΔPs | | | | | | 1.5" W.G. ΔPs | | | | | | 3.0" W.G. ΔPs | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | OCTAVE BAND NUMBER | | | | | | OCTAVE BAND NUMBER | | | | | | OCTAVE BAND NUMBER | | | | | | OCTAVE BAND NUMBER | | | | | |
| | | 2 | 3 | 4 | 5 | 6 | 7 | 2 | 3 | 4 | 5 | 6 | 7 | 2 | 3 | 4 | 5 | 6 | 7 | 2 | 3 | 4 | 5 | 6 | 7 |
| 0405 | 100 | 55 | 45 | 40 | 34 | 31 | 31 | 58 | 47 | 43 | 36 | 32 | 31 | 60 | 49 | 45 | 38 | 34 | 32 | 64 | 56 | 52 | 44 | 39 | 35 |
| | 150 | 60 | 49 | 43 | 37 | 33 | 32 | 63 | 52 | 47 | 41 | 36 | 33 | 64 | 54 | 49 | 42 | 37 | 34 | 67 | 60 | 56 | 47 | 41 | 36 |
| | 200 | 63 | 53 | 49 | 39 | 34 | 32 | 65 | 56 | 52 | 43 | 38 | 33 | 66 | 58 | 54 | 44 | 40 | 34 | 71 | 64 | 59 | 49 | 45 | 37 |
| | 250 | 66 | 56 | 53 | 44 | 37 | 32 | 68 | 59 | 56 | 46 | 39 | 33 | 66 | 58 | 54 | 44 | 40 | 34 | 73 | 66 | 61 | 52 | 48 | 40 |
| 0505 | 100 | 52 | 40 | 38 | 34 | 31 | 30 | 56 | 45 | 41 | 35 | 31 | 31 | 57 | 46 | 43 | 36 | 32 | 32 | 60 | 50 | 48 | 40 | 36 | 33 |
| | 200 | 56 | 44 | 41 | 35 | 33 | 31 | 60 | 50 | 46 | 38 | 35 | 32 | 61 | 52 | 48 | 40 | 36 | 33 | 65 | 58 | 55 | 45 | 39 | 35 |
| | 300 | 62 | 52 | 46 | 38 | 34 | 31 | 65 | 56 | 52 | 42 | 38 | 33 | 66 | 58 | 54 | 44 | 40 | 34 | 71 | 64 | 59 | 49 | 45 | 37 |
| | 350 | 64 | 54 | 50 | 41 | 36 | 32 | 68 | 59 | 55 | 45 | 38 | 33 | 69 | 61 | 57 | 47 | 41 | 34 | 73 | 67 | 62 | 52 | 49 | 38 |
| 0605 | 200 | 52 | 40 | 38 | 34 | 31 | 30 | 56 | 45 | 41 | 35 | 31 | 31 | 57 | 46 | 44 | 38 | 33 | 32 | 60 | 50 | 48 | 40 | 36 | 33 |
| | 250 | 55 | 42 | 40 | 34 | 31 | 31 | 58 | 47 | 43 | 36 | 32 | 31 | 60 | 49 | 45 | 38 | 34 | 32 | 64 | 56 | 52 | 44 | 39 | 35 |
| | 300 | 56 | 44 | 41 | 35 | 33 | 31 | 60 | 50 | 46 | 38 | 35 | 32 | 61 | 52 | 48 | 40 | 36 | 33 | 65 | 58 | 55 | 45 | 39 | 35 |
| | 350 | 60 | 49 | 43 | 37 | 33 | 32 | 63 | 52 | 47 | 41 | 36 | 33 | 64 | 54 | 49 | 42 | 37 | 34 | 67 | 60 | 56 | 47 | 41 | 36 |
| | 400 | 62 | 51 | 46 | 38 | 34 | 32 | 64 | 54 | 50 | 42 | 37 | 33 | 66 | 58 | 54 | 44 | 40 | 36 | 69 | 62 | 58 | 48 | 43 | 36 |
| | 450 | 63 | 53 | 49 | 39 | 34 | 32 | 65 | 56 | 52 | 42 | 38 | 33 | 67 | 59 | 55 | 44 | 40 | 36 | 71 | 64 | 59 | 49 | 45 | 37 |
| | 550 | 66 | 56 | 53 | 44 | 37 | 32 | 68 | 59 | 56 | 46 | 39 | 33 | 69 | 61 | 57 | 47 | 41 | 37 | 73 | 66 | 61 | 52 | 48 | 41 |
| 0805 | 300 | 52 | 40 | 40 | 34 | 31 | 30 | 56 | 45 | 41 | 35 | 31 | 31 | 57 | 46 | 43 | 36 | 32 | 32 | 60 | 50 | 48 | 40 | 36 | 33 |
| | 400 | 55 | 42 | 40 | 34 | 31 | 31 | 58 | 47 | 43 | 36 | 32 | 31 | 60 | 49 | 45 | 38 | 34 | 32 | 64 | 56 | 52 | 44 | 39 | 35 |
| | 500 | 56 | 44 | 40 | 35 | 33 | 31 | 60 | 50 | 46 | 38 | 35 | 33 | 61 | 52 | 48 | 40 | 36 | 34 | 65 | 58 | 55 | 45 | 39 | 35 |
| | 600 | 60 | 49 | 43 | 37 | 33 | 32 | 63 | 52 | 47 | 41 | 36 | 33 | 64 | 53 | 49 | 41 | 37 | 33 | 67 | 60 | 56 | 47 | 41 | 36 |
| | 700 | 62 | 51 | 46 | 38 | 34 | 32 | 64 | 54 | 48 | 39 | 37 | 33 | 64 | 54 | 49 | 41 | 37 | 33 | 69 | 62 | 58 | 48 | 43 | 36 |
| | 800 | 63 | 53 | 49 | 39 | 34 | 32 | 65 | 56 | 52 | 42 | 38 | 33 | 66 | 58 | 54 | 44 | 40 | 34 | 71 | 64 | 59 | 49 | 45 | 37 |
| | 1000 | 66 | 56 | 53 | 44 | 37 | 32 | 68 | 59 | 56 | 46 | 39 | 33 | 69 | 61 | 57 | 48 | 41 | 35 | 73 | 66 | 61 | 52 | 48 | 41 |
| 1009 | 600 | 54 | 46 | 36 | 37 | 35 | 31 | 56 | 53 | 39 | 38 | 37 | 32 | 58 | 55 | 43 | 39 | 37 | 34 | 64 | 62 | 54 | 47 | 44 | 41 |
| | 800 | 56 | 49 | 42 | 37 | 35 | 32 | 59 | 55 | 44 | 39 | 37 | 33 | 61 | 55 | 45 | 40 | 38 | 35 | 67 | 65 | 55 | 47 | 43 | 41 |
| | 1000 | 57 | 52 | 46 | 38 | 35 | 33 | 62 | 55 | 46 | 40 | 37 | 34 | 62 | 55 | 46 | 40 | 38 | 36 | 71 | 67 | 57 | 48 | 43 | 41 |
| | 1100 | 58 | 53 | 46 | 40 | 36 | 34 | 62 | 55 | 46 | 40 | 38 | 34 | 62 | 55 | 46 | 40 | 39 | 39 | 72 | 68 | 58 | 48 | 44 | 42 |
| | 1200 | 59 | 54 | 52 | 41 | 37 | 34 | 65 | 57 | 52 | 43 | 39 | 35 | 67 | 60 | 54 | 44 | 40 | 37 | 74 | 68 | 57 | 49 | 44 | 42 |
| | 1400 | 62 | 55 | 54 | 46 | 39 | 35 | 66 | 59 | 54 | 45 | 40 | 36 | 68 | 62 | 56 | 46 | 41 | 38 | 76 | 69 | 59 | 50 | 45 | 43 |
| | 1600 | 66 | 60 | 59 | 50 | 42 | 36 | 67 | 60 | 58 | 49 | 43 | 37 | 70 | 62 | 58 | 50 | 44 | 38 | 77 | 69 | 60 | 52 | 47 | 43 |
| 1209 | 800 | 54 | 47 | 39 | 36 | 35 | 32 | 59 | 52 | 42 | 38 | 36 | 33 | 60 | 54 | 45 | 40 | 38 | 35 | 64 | 60 | 53 | 47 | 42 | 40 |
| | 1100 | 55 | 48 | 42 | 37 | 35 | 32 | 59 | 54 | 43 | 38 | 36 | 33 | 61 | 57 | 46 | 40 | 38 | 35 | 67 | 65 | 55 | 47 | 43 | 41 |
| | 1400 | 57 | 51 | 48 | 39 | 35 | 33 | 62 | 56 | 49 | 40 | 38 | 34 | 64 | 59 | 51 | 42 | 39 | 36 | 70 | 67 | 56 | 47 | 43 | 41 |
| | 1550 | 58 | 52 | 50 | 40 | 36 | 34 | 63 | 57 | 50 | 41 | 38 | 34 | 67 | 60 | 52 | 43 | 39 | 37 | 72 | 68 | 56 | 48 | 44 | 42 |
| | 1700 | 59 | 54 | 52 | 42 | 37 | 34 | 64 | 58 | 52 | 42 | 39 | 35 | 67 | 60 | 53 | 44 | 40 | 37 | 73 | 68 | 57 | 49 | 44 | 42 |
| | 2000 | 62 | 55 | 54 | 46 | 39 | 35 | 66 | 59 | 54 | 45 | 40 | 36 | 68 | 62 | 56 | 46 | 41 | 38 | 76 | 69 | 59 | 50 | 45 | 43 |
| | 2300 | 66 | 60 | 59 | 50 | 42 | 36 | 67 | 60 | 58 | 49 | 43 | 37 | 70 | 62 | 58 | 50 | 44 | 38 | 77 | 69 | 60 | 52 | 47 | 43 |
| 1215 | 800 | 52 | 47 | 42 | 36 | 36 | 37 | 56 | 51 | 44 | 38 | 37 | 38 | 57 | 53 | 46 | 41 | 39 | 39 | 60 | 58 | 55 | 49 | 45 | 44 |
| | 1100 | 55 | 49 | 43 | 37 | 37 | 38 | 58 | 54 | 46 | 40 | 39 | 39 | 59 | 56 | 47 | 42 | 40 | 40 | 63 | 61 | 56 | 50 | 47 | 46 |
| | 1400 | 56 | 50 | 45 | 38 | 37 | 38 | 61 | 56 | 47 | 41 | 40 | 40 | 62 | 56 | 47 | 42 | 40 | 40 | 66 | 63 | 58 | 51 | 48 | 47 |
| | 1550 | 57 | 51 | 46 | 39 | 38 | 38 | 62 | 56 | 47 | 42 | 40 | 40 | 62 | 56 | 47 | 43 | 40 | 40 | 68 | 64 | 59 | 52 | 48 | 48 |
| | 1700 | 58 | 52 | 48 | 40 | 38 | 38 | 64 | 57 | 50 | 43 | 41 | 40 | 65 | 59 | 52 | 46 | 43 | 42 | 69 | 65 | 60 | 53 | 49 | 48 |
| | 2000 | 59 | 55 | 54 | 43 | 40 | 39 | 66 | 59 | 53 | 45 | 43 | 41 | 68 | 61 | 55 | 47 | 45 | 43 | 72 | 67 | 61 | 54 | 50 | 49 |
| | 2300 | 61 | 56 | 55 | 45 | 43 | 41 | 66 | 60 | 55 | 47 | 45 | 42 | 68 | 62 | 57 | 49 | 46 | 44 | 74 | 70 | 62 | 55 | 51 | 49 |
| 1415 | 1200 | 54 | 48 | 43 | 38 | 37 | 37 | 57 | 53 | 45 | 40 | 39 | 39 | 58 | 55 | 48 | 41 | 40 | 39 | 62 | 61 | 56 | 50 | 46 | 46 |
| | 1500 | 56 | 49 | 44 | 37 | 37 | 38 | 59 | 55 | 46 | 40 | 39 | 39 | 60 | 57 | 49 | 42 | 40 | 39 | 65 | 62 | 57 | 51 | 47 | 46 |
| | 1800 | 57 | 50 | 46 | 38 | 37 | 38 | 62 | 56 | 49 | 41 | 40 | 40 | 63 | 58 | 49 | 42 | 41 | 40 | 67 | 63 | 58 | 52 | 48 | 47 |
| | 1925 | 57 | 51 | 46 | 38 | 37 | 38 | 63 | 56 | 49 | 42 | 40 | 40 | 65 | 58 | 50 | 43 | 41 | 40 | 68 | 64 | 58 | 52 | 48 | 47 |
| | 2100 | 58 | 52 | 47 | 39 | 38 | 38 | 64 | 57 | 50 | 43 | 40 | 40 | 65 | 59 | 52 | 45 | 42 | 42 | 69 | 65 | 59 | 52 | 49 | 48 |
| | 2400 | 58 | 53 | 49 | 40 | 39 | 39 | 65 | 58 | 51 | 44 | 41 | 41 | 66 | 60 | 53 | 46 | 43 | 43 | 70 | 66 | 60 | 53 | 49 | 48 |
| | 2700 | 59 | 55 | 55 | 43 | 40 | 39 | 66 | 59 | 53 | 45 | 43 | 41 | 68 | 61 | 55 | 47 | 45 | 43 | 72 | 67 | 61 | 54 | 50 | 49 |
| | 3000 | 62 | 57 | 57 | 46 | 43 | 41 | 66 | 60 | 55 | 47 | 45 | 42 | 68 | 62 | 57 | 49 | 46 | 44 | 74 | 70 | 62 | 55 | 51 | 49 |

**NOTES:**

- Data obtained from tests conducted in accordance with AHRI Standard 880.
- Sound levels are expressed in decibels, dB re: 1 x $10^{-12}$ Watts.
- ΔPs is the difference in static pressure across the primary air valve.
- Certified AHRI data is highlighted blue. Application data (not highlighted blue) is outside the scope of the certification program.

# SOUND POWER DATA, AHRI RATINGS

## UNIT FAN ONLY

| UNIT SIZE | CFM | DISCHARGE SOUND POWER DATA | | | | | | RADIATED SOUND POWER DATA | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | OCTAVE BAND NUMBER | | | | | | OCTAVE BAND NUMBER | | | | | |
| | | 2 | 3 | 4 | 5 | 6 | 7 | 2 | 3 | 4 | 5 | 6 | 7 |
| 0405, 0505, 0605, 0805 | 200 | 58 | 51 | 47 | 42 | 39 | 33 | 58 | 52 | 48 | 42 | 33 | 32 |
| | 300 | 62 | 54 | 49 | 46 | 41 | 36 | 60 | 57 | 53 | 46 | 39 | 36 |
| | 400 | 63 | 57 | 50 | 50 | 42 | 38 | 63 | 60 | 56 | 49 | 42 | 41 |
| | 450 | 65 | 57 | 51 | 53 | 43 | 38 | 65 | 62 | 57 | 51 | 44 | 43 |
| | 500 | 65 | 58 | 52 | 53 | 45 | 40 | 66 | 63 | 58 | 51 | 45 | 44 |
| 1009 1209 | 300 | 58 | 53 | 47 | 43 | 40 | 37 | 58 | 56 | 50 | 43 | 40 | 39 |
| | 400 | 60 | 54 | 48 | 45 | 41 | 37 | 60 | 58 | 51 | 45 | 40 | 39 |
| | 500 | 60 | 54 | 48 | 45 | 41 | 37 | 61 | 60 | 53 | 48 | 41 | 39 |
| | 600 | 63 | 59 | 51 | 50 | 45 | 40 | 63 | 62 | 55 | 50 | 46 | 42 |
| | 700 | 64 | 61 | 52 | 51 | 46 | 41 | 64 | 65 | 58 | 54 | 49 | 46 |
| | 800 | 65 | 64 | 53 | 52 | 48 | 43 | 67 | 66 | 60 | 56 | 52 | 49 |
| | 850 | 68 | 66 | 55 | 54 | 49 | 46 | 68 | 67 | 61 | 56 | 52 | 50 |
| | 900 | 67 | 67 | 55 | 55 | 50 | 46 | 69 | 67 | 62 | 57 | 53 | 50 |
| 1215 1415 | 600 | 62 | 54 | 49 | 46 | 42 | 38 | 62 | 61 | 53 | 45 | 41 | 40 |
| | 700 | 63 | 55 | 50 | 47 | 42 | 40 | 64 | 63 | 55 | 47 | 44 | 42 |
| | 800 | 65 | 57 | 51 | 49 | 43 | 41 | 65 | 64 | 57 | 49 | 46 | 44 |
| | 900 | 67 | 59 | 53 | 51 | 45 | 43 | 67 | 66 | 59 | 51 | 48 | 46 |
| | 1000 | 69 | 61 | 55 | 53 | 47 | 46 | 68 | 67 | 60 | 53 | 50 | 48 |
| | 1100 | 70 | 62 | 56 | 54 | 48 | 47 | 69 | 67 | 62 | 54 | 51 | 50 |
| | 1200 | 71 | 63 | 57 | 55 | 49 | 48 | 70 | 68 | 63 | 55 | 53 | 52 |
| | 1300 | 73 | 65 | 59 | 57 | 51 | 50 | 71 | 69 | 64 | 57 | 55 | 53 |
| | 1400 | 74 | 67 | 61 | 59 | 53 | 53 | 72 | 70 | 65 | 58 | 56 | 55 |
| | 1450 | 75 | 68 | 62 | 60 | 54 | 53 | 73 | 72 | 66 | 59 | 57 | 56 |

**NOTES:**
- Data obtained from tests conducted in accordance with AHRI Standard 880.
- Sound levels are expressed in decibels, dB re: 1 x $10^{-12}$ Watts.
- Fan external static pressure is 0.25" w.g.
- Duct end corrections included in sound power levels per AHRI Standard 880.
- Certified AHRI data is highlighted blue. Application data (not highlighted blue) is outside the scope of the certification program.

## AHRI RATINGS: FAN PERFORMANCE

| UNIT SIZE | FAN CFM | POWER (WATTS) | SOUND POWER LEVEL, dB re: $10^{-12}$ WATTS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DISCHARGE | | | | | | RADIATED | | | | | |
| | | | OCTAVE BAND NUMBER | | | | | | OCTAVE BAND NUMBER | | | | | |
| | | | 2 | 3 | 4 | 5 | 6 | 7 | 2 | 3 | 4 | 5 | 6 | 7 |
| **0605** | 450 | 202 | 65 | 57 | 51 | 53 | 43 | 38 | 65 | 62 | 57 | 51 | 44 | 43 |
| **0805** | 450 | 202 | 65 | 57 | 51 | 53 | 43 | 38 | 65 | 62 | 57 | 51 | 44 | 43 |
| **1009** | 850 | 268 | 68 | 66 | 55 | 54 | 49 | 46 | 68 | 67 | 61 | 56 | 52 | 50 |
| **1209** | 850 | 268 | 68 | 66 | 55 | 54 | 49 | 46 | 68 | 67 | 61 | 56 | 52 | 50 |
| **1215** | 1450 | 585 | 75 | 68 | 62 | 60 | 54 | 53 | 73 | 72 | 66 | 59 | 57 | 56 |
| **1415** | 1450 | 585 | 75 | 68 | 62 | 60 | 54 | 53 | 73 | 72 | 66 | 59 | 57 | 56 |

**NOTE:** Fan external static pressure is 0.25" w.g.
- Duct end corrections included in sound power levels per AHRI Standard 880.

## AHRI RATINGS: PRIMARY AIR VALVE PERFORMANCE

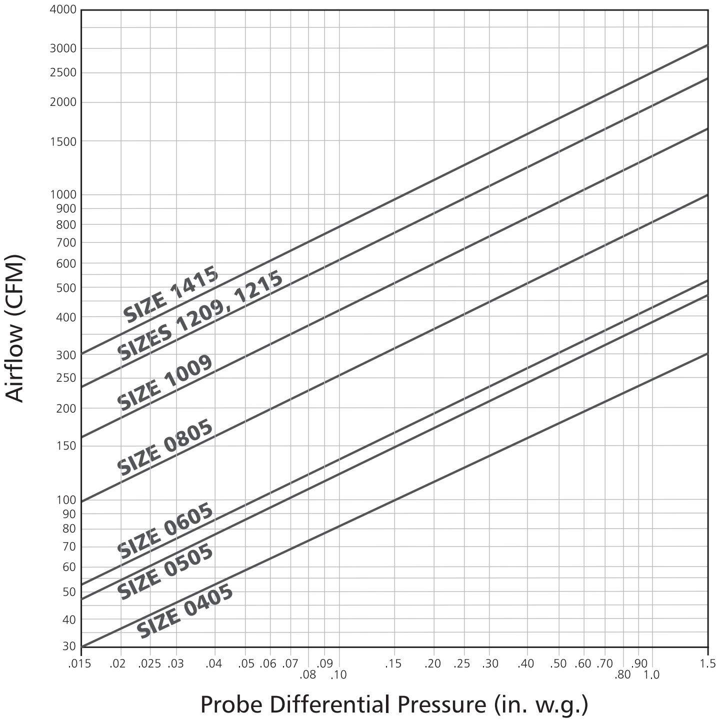
| UNIT SIZE | PRIMARY CFM | MIN. OPER. PRESSURE (In. Water) | SOUND POWER LEVEL, dB re: $10^{-12}$ WATTS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DISCHARGE | | | | | | RADIATED | | | | | |
| | | | OCTAVE BAND NUMBER | | | | | | OCTAVE BAND NUMBER | | | | | |
| | | | 2 | 3 | 4 | 5 | 6 | 7 | 2 | 3 | 4 | 5 | 6 | 7 |
| **0605** | 400 | 0.12 | 70 | 64 | 57 | 52 | 47 | 45 | 66 | 58 | 54 | 44 | 40 | 36 |
| **0805** | 700 | 0.08 | 74 | 67 | 61 | 57 | 54 | 48 | 64 | 54 | 49 | 41 | 37 | 33 |
| **1009** | 1100 | 0.11 | 72 | 63 | 55 | 50 | 49 | 48 | 62 | 55 | 46 | 40 | 39 | 39 |
| **1209** | 1550 | 0.12 | 75 | 68 | 60 | 53 | 53 | 55 | 67 | 60 | 52 | 43 | 39 | 37 |
| **1215** | 1550 | 0.12 | 72 | 65 | 58 | 52 | 52 | 54 | 62 | 56 | 47 | 43 | 40 | 40 |
| **1415** | 1925 | 0.16 | 73 | 68 | 61 | 55 | 54 | 56 | 65 | 58 | 50 | 43 | 41 | 40 |

**NOTE:** Inlet static pressure is 1.5" w.g.
- Duct end corrections included in sound power levels per AHRI Standard 880.

# PRIMARY AIRFLOW CALIBRATION

## FLOWSTAR™ CALIBRATION CHART

(For dead-end differential pressure transducers)




**NOTE:** Maximum and minimum CFM limits are dependent on the type of controls that are utilized. Refer to the table below when the controls are furnished by ENVIRO-TEC. When DDC controls are furnished by others, the CFM limits are dependent on the specific control vendor that is employed. After obtaining the differential pressure range from the control vendor, the maximum and minimum CFM limits can be obtained from the chart above (many controllers are capable of controlling minimum setpoint down to .015" w.g.).

## AIRFLOW RANGES (CFM)

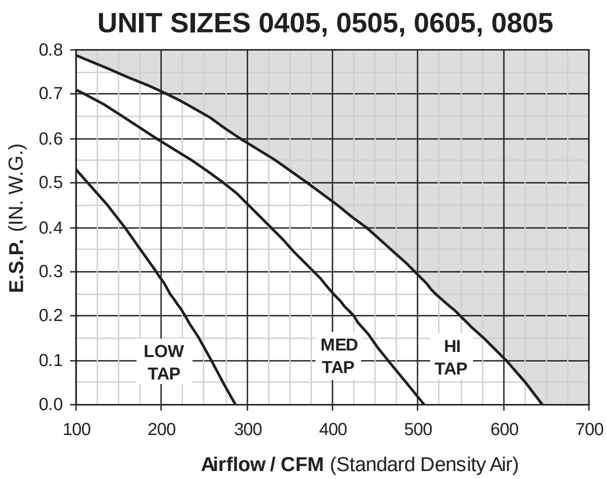
| UNIT SIZE | 400 SERIES (PNEUMATIC) STANDARD CONTROLLER | | 7000 SERIES ANALOG ELECTRONIC | | DDC CONSIGNMENT CONTROLS (See Notes Below) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN. | | | MAX. | |
| | MIN. | MAX. | MIN. | MAX. | Min. transducer differential pressure (in.w.g.) | | | Max. transducer differential pressure (in.w.g.) | |
| | | | | | 0.015 | 0.03 | 0.05 | 1.0 | >=1.5 |
| **0405** | 43 | 250 | 35 | 250 | 30 | 43 | 55 | 250 | 250 |
| **0505** | 68 | 350 | 50 | 350 | 48 | 68 | 88 | 350 | 350 |
| **0605** | 75 | 490 | 60 | 550 | 53 | 75 | 97 | 435 | 530 |
| **0805** | 145 | 960 | 115 | 1000 | 105 | 145 | 190 | 840 | 1000 |
| **1009** | 235 | 1545 | 170 | 1600 | 170 | 235 | 305 | 1370 | 1600 |
| **1209, 1215** | 340 | 2250 | 240 | 2300 | 240 | 340 | 435 | 1955 | 2300 |
| **1415** | 430 | 2835 | 305 | 3045 | 305 | 430 | 555 | 2485 | 3000 |

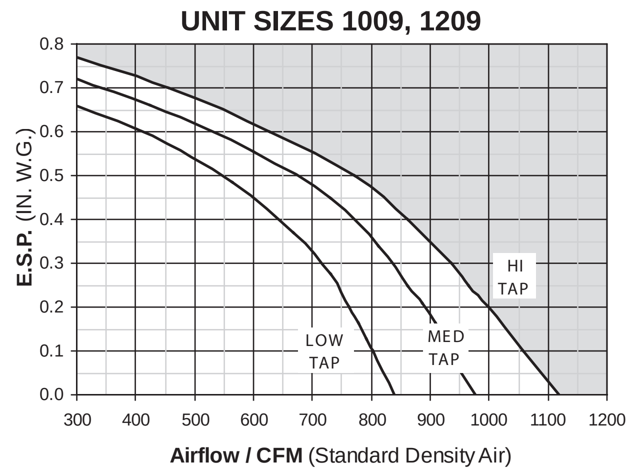
**NOTES:**
1. Minimum and maximum airflow limits are dependent on the specific DDC controller supplied. Contact the control vendor to obtain the minimum and maximum differential pressure limits (inches W.G.) of the transducer utilized with the DDC controller.
2. Maximum CFM is limited to value shown in General Selection Data.

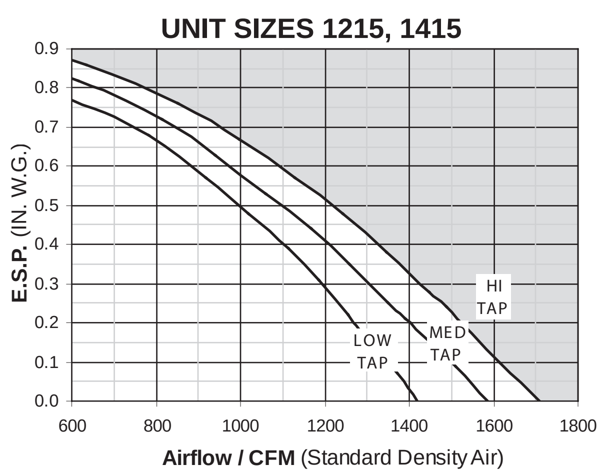
# FAN PERFORMANCE DATA

## GENERAL FAN NOTE

Each fan curve depicts the actual performance for the relative motor tap without any additional fan balance adjustment. Actual specified capacities which fall below a particular fan curve (LOW, MED or HI) can be obtained by adjustment of the electronic fan speed controller. Selections can be made anywhere in the non-shaded area.




**Notes:**

1. Terminals equipped with a hot water coil (Model VFL-WC) require the addition of the coil pressure drop and the specified E.S.P. prior to making a fan selection.
2. Terminals with electric heat (Model VFL-EH) require a minimum of 0.1" w.g. downstream pressure.

# EC FAN MOTOR OPTION

## THE ENERGY EFFICIENT SOLUTION

ENVIRO-TEC® offers an alternative to the PSC motor that significantly increases the operating efficiency of fan terminal units. This motor is frequently referred to as an ECM (electronically commutated motor). It is a brushless DC (BLDC) motor utilizing a permanent magnet rotor. The motor has been in production for years and is commonly used in residential HVAC units. Fan speed control is accomplished through a microprocessor based variable speed controller (inverter) integral to the motor. The motor provides **peak efficiency ratings between 70 & 80%** for most applications.

## ECM FEATURES AND BENEFITS

**Ultra-High Motor & Controller Energy Efficiency**
DC motors are significantly more efficient than AC motors. At full load the EC motor is typically 20% more efficient than a standard induction motor. Due to acoustical considerations, the fan motor on a fan powered terminal typically operates considerably less than full load. At this condition the overall motor / controller (SCR) efficiency can be cut in half. Due to the permanent magnet, DC design, the EC motor maintains a high efficiency at low speeds. Most fan powered unit selections will have an overall efficiency greater than 75%. Furthermore, the motor heat gain is greatly reduced providing additional energy savings by reducing the cold primary air requirement.

**Pressure Independent Fan Volume**
The integral microprocessor based controller includes a feature that provides sensorless (no external feedback) constant airflow operation by automatically adjusting the speed and torque in response to system pressure changes. This breakthrough will no doubt have far reaching benefits and endless applications. For starters, the fan volume supplied to the space will not significantly change as a filter becomes loaded. This provides new opportunities for medical applications where space pressurization and HEPA filters are applied. The air balance process will become simpler and more accurate since the fan volume will not need to be re-adjusted after the diffuser balance is accomplished.

**Factory Calibrated Fan Volume**
Due to the pressure independent feature, the fan capacity can now be calibrated at the factory. Within the published external pressure limits, the fan motor will automatically adjust to account for the varying static pressure requirements associated with different downstream duct configurations. This feature should not preclude the final field air balance verification process during the commissioning stage of a project. An electronic (PWM) speed control device is provided to allow field changes of the fan capacity as the need arises. Fan volume can be field calibrated in two fashions depending on the type of PWM control board provided on the unit. For the Solo PWM board, a potentiometer is provided allowing manual adjustment using an instrument type screwdriver. If a Sync PWM board is provided, the fan volume can be calibrated through the BMS using an analog output (2 to10VDC typical) to the speed controller. A fan volume versus DC volts calibration chart is provided.

**Designer / Owner Flexibility**


The ECM incorporates ball bearings in lieu of sleeve bearings typically utilized with an induction motor. Unlike a sleeve bearing motor, the ECM does not have a minimum RPM requirement for bearing lubrication. This allows it to operate over a much wider speed range. One motor can handle the capacity range previously handled by two motors, allowing simplification of the product line and considerable flexibility to the designer. The owner also benefits since equipment changes are much less likely with tenant requirement changes. A reduced spare parts inventory is another plus.

**Custom Applications —**
**Programmable Fan Operation**
Boundless control opportunities arise due to the controllability of a DC motor combined with an integral microprocessor. Various input signals can direct the motor to behave in an application specific mode. For instance, multiple discrete fan capacities can be achieved. In addition, the fan speed can be varied in response to the space temperature load. The fan can also be programmed for a soft start. The motor starts at a very low speed and slowly ramps up to the required speed. This is especially beneficial for parallel flow fan terminals since the perceived change in space sound levels is lessened.

**Extended Motor Life**
The high motor efficiency provides a significantly reduced operating temperature compared to an induction motor. The lower temperature increases the longevity of all electrical components and therefore the life of the motor. The ball bearings do not require lubrication and do not adversely impact the motor life. Most fan powered applications will provide a motor life between 60,000 and 100,000 hours. A motor life of twenty five years will not be uncommon for a series flow fan terminal and a longer life can be expected for a parallel flow unit.

# GENERAL SELECTION, EC MOTOR

Most variable speed electronic devices, including the EC motor, operate with a rectified and filtered AC power. As a result of the power conditioning, the input current draw is not sinusoidal; rather, the current is drawn in pulses at the peaks of the AC voltage. This pulsating current includes high frequency components called harmonics.

Harmonic currents circulate on the delta side of a Delta-Wye distribution transformer. On the Wye side of the transformer, these harmonic currents are additive on the neutral conductor. A transformer used in this type of application must be sized to carry the output KVA that will include the KVA due to circulating currents.

Careful design must be provided when connecting single-phase products to three-phase systems to avoid potential problems such as overheating of neutral wiring conductors, connectors, and transformers. In addition, design consideration must be provided to address the degradation of power quality by the creation of wave shape distortion.

In summary, proper consideration must be given to the power distribution transformer selection and ground neutral conductor design to accommodate the 3-phase neutral AMPs shown in the adjacent table. Specific guidelines are available from the factory.

| PRIMARY AIR VALVE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit Size | CFM | Fan Size | Min delta P's (IN.W.G.) | ROOM NOISE CRITERIA (NC) | | | | | | Fan HP | Volts | FLA |
| | | | | 0.5" w.g. Δ P | | 1.0" w.g. Δ P | | 3.0" w.g. Δ P | | | | |
| | | | | Dis. | Rad. | Dis. | Rad. | Dis. | Rad. | | | |
| 0405 0505 0605 0805 | 100 | 05 | 0.01 | - | - | - | 20 | - | 28 | 1/3 | 120 | 5 |
| | 200 | | 0.02 | - | 26 | 23 | 29 | 29 | 36 | | | |
| | 300 | | 0.02 | - | 25 | - | 29 | 28 | 36 | | 208 | 3 |
| | 500 | | 0.04 | - | - | 21 | 23 | 27 | 30 | | 240 | 2.8 |
| | 600 | | 0.05 | - | 22 | 23 | 27 | 30 | 31 | | | |
| | 800 | | 0.10 | 21 | 26 | 24 | 29 | 29 | 36 | | 277 | 2.6 |
| | 1000 | | 0.15 | 24 | 30 | 29 | 33 | 34 | 39 | | | |
| 1009 1209 | 600 | 09 | 0.03 | - | - | - | 22 | 29 | 33 | 1/3 | 120 | 5 |
| | 800 | | 0.05 | - | - | - | 23 | 33 | 36 | | | |
| | 1000 | | 0.08 | - | 20 | 21 | 25 | 36 | 38 | | 208 | 3 |
| | 1200 | | 0.12 | - | 26 | 22 | 29 | 37 | 40 | | | |
| | 1400 | | 0.16 | - | 29 | 22 | 30 | 38 | 43 | | 240 | 2.8 |
| | 1700 | | 0.13 | - | 27 | 21 | 28 | 37 | 40 | | 277 | 2.6 |
| 1215 1415 | 800 | 15 | 0.03 | - | - | 20 | - | 30 | 30 | 1/2 | 120 | 7.7 |
| | 1100 | | 0.06 | - | - | 21 | 23 | 34 | 31 | | | |
| | 1400 | | 0.09 | - | - | 21 | 25 | 35 | 33 | | 208 | 5 |
| | 1500 | | 0.09 | - | - | 23 | 24 | 33 | 32 | | | |
| | 1700 | | 0.13 | - | 22 | 22 | 27 | 36 | 36 | | 240 | 4.3 |
| | 1800 | | 0.13 | - | 20 | 23 | 25 | 39 | 34 | | 277 | 4.1 |
| | 2100 | | 0.18 | - | 21 | 25 | 27 | 39 | 36 | | | |

**NOTES:**

1. Min. ∆Ps is the static pressure difference across the primary air valve with the damper wide open. All downstream losses (including optional hot water coil) are handled by the unit fan and need not be considered for primary air performance calculations. Data is certified in accordance with the AHRI 880 certification program.
2. NC values calculated based upon the 2002 Addendum to AHRI Standard 885 Appendix E ***Typical Sound Attenuation Values*** (shown at right).
3. Calculate wire feeder size and maximum overcurrent protective device per NEC and local code requirements. Recommended fuse type shall be UL Class RK5, J, CC or other motor rated fuse.
4. For three-phase conductor sizing, multiply FLA by 1.73.
5. Includes factory provided 2mH choke for power factor correction.

| DISCHARGE ATTENUATION VALUES | OCTAVE BAND | | | | | |
|---|---|---|---|---|---|---|
| | 2 | 3 | 4 | 5 | 6 | 7 |
| **Small Box (< 300 CFM)** | 24 | 28 | 39 | 53 | 59 | 40 |
| **Medium Box (300-700 CFM)** | 27 | 29 | 40 | 51 | 53 | 39 |
| **Large Box (> 700 CFM)** | 29 | 30 | 41 | 51 | 52 | 39 |

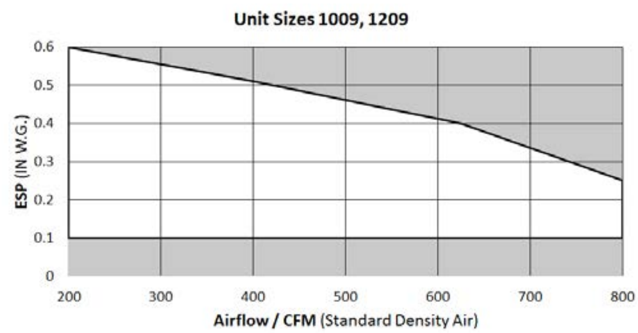
| RADIATED ATTENUATION VALUES | OCTAVE BAND | | | | | |
|---|---|---|---|---|---|---|
| | 2 | 3 | 4 | 5 | 6 | 7 |
| **Type 2 - Mineral Fiber Ceiling** | 18 | 19 | 20 | 26 | 31 | 36 |

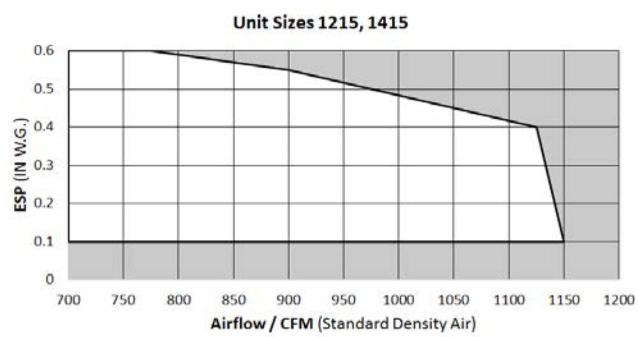
# FAN PERFORMANCE, EC MOTOR

## GENERAL FAN NOTE

The fan curves depicted on this page are for EC motors. Actual specified capacities which fall below the fan curve can be obtained by adjustment of the fan speed controller. Selections should only be made in the non-shaded areas. The minimum external static pressure requirement is shown for each fan assembly. The unit fan should not be energized prior to realizing this minimum external static pressure.

Terminals equipped with a hot water heating coil require the addition of the coil pressure drop to the specified external static pressure before making the fan selection.

# ELECTRIC HEAT

## MODEL VFL-EH

### STANDARD FEATURES

- cETL listed as an assembly for safety compliance per UL 1995
- Primary auto-reset high limit
- Secondary high limit
- Hinged control panel
- Ni-Chrome elements
- Primary/secondary power terminations
- Fusing per NEC
- Wiring diagram and ETL label
- Fan interlock device (relay or P.E. switch)
- Single point power connection
- Available kW increments are as follows:
  0.5 to 12.0 kW - .50 kW;
  12.0 to 18.0 kW - 1.0 kW

### OPTIONAL FEATURES

- Disconnect (toggle or door interlocking)
- P.E. switches
- Magnetic contactors
- Manual reset secondary limit
- Proportional control (SSR)
- 24 volt control transformer
- Airflow switch

### SELECTION PROCEDURE

With standard heater elements, the maximum capacity (kW) is obtained by dividing the heating (fan) SCFM by 70. In other words, the terminal must have at least 70 SCFM per kW. In addition, each size terminal has a maximum allowable kW based upon the specific heater element configuration (i.e. voltage, phase, number of steps, etc.). Contact your ENVIRO-TEC representative for design assistance.

Heaters require a minimum of 0.1" w.g. downstream static pressure to ensure proper operation.

For optimum diffuser performance in overhead heating applications, the supply air temperature should be within 20°F of the desired space temperature. This typically requires a higher air capacity which provides higher air motion in the space increasing thermal comfort. The electric heater should be selected with this in mind, keeping the LAT as low as possible.

**Selection Equations**

$$kW = \frac{SCFM \times \Delta T \times 1.085^*}{3413}$$

$$CFM = \frac{kW \times 3413}{\Delta T \times 1.085^*}$$

$$T = \frac{kW \times 3413}{SCFM \times 1.085^*}$$

** Air density at sea level - reduce by 0.036 for each 1000 feet of altitude above sea level.*

**Calculating Line Amperage**

$$\text{Single Phase Amps} = \frac{kW \times 1000}{Volts}$$

$$\text{Three Phase Amps} = \frac{kW \times 1000}{Volts \times 1.73}$$

| SINGLE POINT POWER | | ELECTRIC HEAT KW LIMITS | | | | | |
|---|---|---|---|---|---|---|---|
| | | Unit Size | | | | | |
| Heater Volts | Motor Volts | 0405, 0505 0605, 0805 | | 1009, 1209 | | 1215, 1415 | |
| | | Min | Max | Min | Max | Min | Max |
| 115 - 120 / 1ϕ | 115 - 120 / 1ϕ | 0.5 | 5.5 | 0.5 | 5.5 | 0.5 | 5.5 |
| 208 / 1ϕ | 208 / 1ϕ | 0.5 | 6 | 0.5 | 9.5 | 0.5 | 9.5 |
| 230 - 240 / 1ϕ | 230 / 1ϕ | 0.5 | 6 | 0.5 | 11 | 0.5 | 11 |
| 277 / 1ϕ | 277 / 1ϕ | 0.5 | 6 | 0.5 | 12 | 0.5 | 13 |
| 208 / 3ϕ, 3 wire | 208 / 1ϕ | 1 | 6 | 1 | 12 | 1 | 17 |
| 240 / 3ϕ, 3 wire | 230 / 1ϕ | 1 | 6 | 1 | 12 | 1 | 18 |
| 208 / 3ϕ, 4 wire | 115 - 120 / 1ϕ | 1 | 6 | 1 | 12 | 1 | 17 |
| 240 / 3ϕ, 4 wire | 115 - 120 / 1ϕ | 1 | 6 | 1 | 12 | 1 | 18 |
| 460 - 480 / 3ϕ, 4 wire | 277 / 1ϕ | 1 | 6 | 1 | 12 | 1 | 18 |

# HOT WATER COIL DATA

## MODEL VFL-WC

### STANDARD FEATURES

- Coils are designed, manufactured and tested by ENVIRO-TEC
- Aluminum fin construction with die-formed spacer collars for uniform spacing
- Mechanically expanded copper tubes, leak tested to 450 PSIG air pressure and rated at 450 PSIG working pressure at 200°F
- 1, 2, 3 and 4 row configurations
- Male sweat type water connections

### OPTIONAL FEATURES

- Multi-circuit coils for reduced water pressure drop
- Opposite hand water connections

### DEFINITION OF TERMS

**EAT** Entering Air Temperature (°F)
**LAT** Leaving Air Temperature (°F)
**EWT** Entering Water Temperature (°F)
**LWT** Leaving Water Temperature (°F)
**CFM** Air Capacity (Cubic Feet per Minute)
**GPM** Water Capacity (Gallons per Minute)
**MBH** 1,000 BTUH
**BTUH** Coil Heating Capacity (British Thermal Units per Hour)
**ΔT** EWT minus EAT

### SELECTION PROCEDURE

Hot Water Coil Performance Tables are based upon a temperature difference of 115°F between entering water and entering air. If this ΔT is suitable, proceed directly to the performance tables for selection. All pertinent performance data is tabulated.

| ENTERING WATER - AIR TEMPERATURE DIFFERENTIAL (ΔT) CORRECTION FACTORS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ΔT** | **10** | **15** | **20** | **25** | **30** | **35** | **40** | **45** | **50** | **55** | **60** | **65** | **70** | **75** | **80** |
| **FACTOR** | 0.15 | 0.19 | 0.23 | 0.27 | 0.31 | 0.35 | 0.39 | 0.43 | 0.47 | 0.51 | 0.55 | 0.59 | 0.63 | 0.67 | 0.71 |
| **ΔT** | **85** | **90** | **95** | **100** | **105** | **110** | **115** | **120** | **125** | **130** | **135** | **140** | **145** | **150** | **155** |
| **FACTOR** | 0.75 | 0.79 | 0.83 | 0.88 | 0.92 | 0.96 | 1.00 | 1.04 | 1.08 | 1.13 | 1.17 | 1.21 | 1.25 | 1.29 | 1.33 |

The table above gives correction factors for various entering ΔT's (difference between entering water and entering air temperatures). Multiply MBH values obtained from selection tables by the appropriate correction factor above to obtain the actual MBH value. Air and water pressure drop can be read directly from the selection table. The leaving air and leaving water temperatures can be calculated from the following fundamental formulas:

$$LAT = EAT + \frac{BTUH}{1.085 \times CFM} \qquad LWT = EWT - \frac{BTUH}{500 \times GPM}$$

# HOT WATER COIL DATA

## MODEL VFL-WC UNIT SIZES 0405, 0505, 0605, 0805
### STANDARD CIRCUITING

| AIRFLOW | | WATER FLOW | | | LAT (°F) | | LWT (°F) | | CAPACITY (MBH) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Rate (CFM) | Air PD (IN.W.G.) | Rate (GPM) | Water PD (FT.W.G.) 1 Row | Water PD (FT.W.G.) 2 Row | 1 Row | 2 Row | 1 Row | 2 Row | 1 Row | 2 Row |
| 100 | 1 Row 0.01<br>2 Row 0.01 | 0.5 | 0.45 | 0.88 | 132.5 | 156.6 | 150.0 | 139.5 | 7.3 | 9.9 |
| | | 1.0 | 1.39 | 2.67 | 139.9 | 164.5 | 163.3 | 157.9 | 8.1 | 10.8 |
| | | 2.0 | 4.90 | 9.28 | 144.3 | 168.3 | 171.2 | 168.5 | 8.6 | 11.2 |
| | | 4.0 | 17.38 | - | 146.8 | - | 175.4 | - | 8.9 | - |
| 200 | 1 Row 0.01<br>2 Row 0.02 | 0.5 | 0.45 | 0.88 | 112.5 | 133.0 | 137.9 | 120.0 | 10.3 | 14.7 |
| | | 1.0 | 1.39 | 2.67 | 120.7 | 145.7 | 155.3 | 144.2 | 12.1 | 17.5 |
| | | 2.0 | 4.90 | 9.28 | 125.9 | 152.8 | 166.5 | 160.5 | 13.2 | 19.0 |
| | | 4.0 | 17.38 | - | 128.9 | - | 172.9 | - | 13.9 | - |
| 300 | 1 Row 0.02<br>2 Row 0.03 | 0.5 | 0.45 | 0.88 | 102.1 | 118.5 | 130.7 | 109.2 | 12.1 | 17.4 |
| | | 1.0 | 1.39 | 2.67 | 110.1 | 132.5 | 150.0 | 135.2 | 14.7 | 21.9 |
| | | 2.0 | 4.90 | 9.28 | 115.5 | 141.2 | 163.2 | 154.6 | 16.4 | 24.8 |
| | | 4.0 | 17.38 | - | 118.7 | - | 171.0 | - | 17.5 | - |
| 400 | 1 Row 0.02<br>2 Row 0.05 | 0.5 | 0.45 | 0.88 | 95.7 | 109.1 | 125.8 | 102.4 | 13.3 | 19.1 |
| | | 1.0 | 1.39 | 2.67 | 103.3 | 123.1 | 146.1 | 128.7 | 16.6 | 25.2 |
| | | 2.0 | 4.90 | 9.28 | 108.6 | 132.6 | 160.6 | 150.0 | 18.9 | 29.3 |
| | | 4.0 | 17.38 | - | 111.9 | - | 169.6 | - | 20.3 | - |
| 500 | 1 Row 0.03<br>2 Row 0.07 | 0.5 | 0.45 | 0.88 | 91.3 | 102.4 | 122.0 | 97.7 | 14.2 | 20.3 |
| | | 1.0 | 1.39 | 2.67 | 98.4 | 116.0 | 143.0 | 123.7 | 18.1 | 27.6 |
| | | 2.0 | 4.90 | 9.28 | 103.6 | 125.8 | 158.5 | 146.3 | 20.9 | 32.9 |
| | | 4.0 | 17.38 | - | 106.9 | - | 168.3 | - | 22.7 | - |

### MULTI-CIRCUITING

| AIRFLOW | | WATER FLOW | | | LAT (°F) | | LWT (°F) | | CAPACITY (MBH) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Rate (CFM) | Air PD (IN.W.G.) | Rate (GPM) | Water PD (FT.W.G.) 1 Row | Water PD (FT.W.G.) 2 Row | 1 Row | 2 Row | 1 Row | 2 Row | 1 Row | 2 Row |
| 100 | 1 Row 0.01<br>2 Row 0.01 | 0.5 | 0.09 | 0.15 | 129.3 | 153.8 | 151.5 | 140.7 | 7.0 | 9.6 |
| | | 1.0 | 0.31 | 0.52 | 137.7 | 162.8 | 163.8 | 158.3 | 7.9 | 10.6 |
| | | 2.0 | 1.05 | 1.68 | 142.9 | 167.4 | 171.3 | 168.6 | 8.4 | 11.1 |
| | | 4.0 | 3.85 | 6.03 | 145.9 | 169.6 | 175.5 | 174.2 | 8.8 | 11.3 |
| 200 | 1 Row 0.01<br>2 Row 0.02 | 0.5 | 0.09 | 0.15 | 109.2 | 129.5 | 140.8 | 123.0 | 9.6 | 14.0 |
| | | 1.0 | 0.31 | 0.52 | 118.1 | 143.0 | 156.4 | 145.4 | 11.5 | 16.9 |
| | | 2.0 | 1.05 | 1.68 | 124.1 | 151.1 | 166.8 | 160.9 | 12.8 | 18.6 |
| | | 4.0 | 3.85 | 6.03 | 127.8 | 155.5 | 173.0 | 169.9 | 13.6 | 19.6 |
| 300 | 1 Row 0.02<br>2 Row 0.03 | 0.5 | 0.09 | 0.15 | 99.1 | 115.2 | 134.7 | 113.6 | 11.1 | 16.3 |
| | | 1.0 | 0.31 | 0.52 | 107.5 | 129.5 | 151.7 | 137.2 | 13.8 | 21.0 |
| | | 2.0 | 1.05 | 1.68 | 113.6 | 139.2 | 163.8 | 155.3 | 15.8 | 24.1 |
| | | 4.0 | 3.85 | 6.03 | 117.5 | 144.8 | 171.2 | 166.7 | 17.1 | 25.9 |
| 400 | 1 Row 0.02<br>2 Row 0.05 | 0.5 | 0.09 | 0.15 | 92.9 | 106.1 | 130.6 | 107.6 | 12.1 | 17.8 |
| | | 1.0 | 0.31 | 0.52 | 100.8 | 120.1 | 148.3 | 131.3 | 15.5 | 23.9 |
| | | 2.0 | 1.05 | 1.68 | 106.7 | 130.3 | 161.4 | 151.0 | 18.1 | 28.3 |
| | | 4.0 | 3.85 | 6.03 | 110.7 | 136.6 | 169.8 | 164.1 | 19.8 | 31.0 |
| 500 | 1 Row 0.03<br>2 Row 0.07 | 0.5 | 0.09 | 0.15 | 88.8 | 99.8 | 127.5 | 103.5 | 12.9 | 18.8 |
| | | 1.0 | 0.31 | 0.52 | 96.1 | 113.1 | 145.6 | 126.9 | 16.8 | 26.0 |
| | | 2.0 | 1.05 | 1.68 | 101.8 | 123.5 | 159.6 | 147.6 | 19.9 | 31.7 |
| | | 4.0 | 3.85 | 6.03 | 105.7 | 130.2 | 168.7 | 161.9 | 22.0 | 35.3 |

**NOTES:**
1. Data is based on 180°F entering water and 65°F entering air temperature at sea level. See selection procedure for other conditions.
2. For optimum diffuser performance in overhead heating applications, the supply air temperature should be within 20°F of the desired space temperature. This typically requires a higher air capacity which provides higher air motion in the space, increasing thermal comfort. The hot water coil should be selected with this in mind, keeping the LAT as low as possible.

# MODEL VFL-WC UNIT SIZES 1009, 1209

## STANDARD CIRCUITING

| AIRFLOW | | WATER FLOW | | | LAT (°F) | | LWT (°F) | | CAPACITY (MBH) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Rate (CFM) | Air PD (IN.W.G.) | Rate (GPM) | Water PD (FT.W.G.) 1 Row | Water PD (FT.W.G.) 2 Row | 1 Row | 2 Row | 1 Row | 2 Row | 1 Row | 2 Row |
| 300 | 1 Row 0.01<br>2 Row 0.02 | 0.5 | 0.55 | 1.09 | 108.1 | 124.5 | 122.9 | 101.5 | 14.0 | 19.3 |
| | | 1.0 | 1.68 | 3.27 | 118.0 | 140.8 | 144.8 | 129.7 | 17.2 | 24.6 |
| | | 2.0 | 5.84 | 11.23 | 124.6 | 150.6 | 160.1 | 151.5 | 19.4 | 27.8 |
| | | 4.0 | 20.57 | - | 128.6 | - | 169.4 | - | 20.7 | - |
| 400 | 1 Row 0.01<br>2 Row 0.02 | 0.5 | 0.55 | 1.09 | 100.8 | 113.9 | 116.9 | 93.9 | 15.5 | 21.2 |
| | | 1.0 | 1.68 | 3.27 | 110.3 | 130.8 | 139.8 | 121.9 | 19.6 | 28.5 |
| | | 2.0 | 5.84 | 11.23 | 117.1 | 142.0 | 156.9 | 145.9 | 22.6 | 33.4 |
| | | 4.0 | 20.57 | - | 121.2 | - | 167.5 | - | 24.3 | - |
| 500 | 1 Row 0.02<br>2 Row 0.03 | 0.5 | 0.55 | 1.09 | 95.7 | 106.5 | 112.4 | 88.9 | 16.6 | 22.5 |
| | | 1.0 | 1.68 | 3.27 | 104.8 | 123.1 | 136.0 | 115.9 | 21.6 | 31.5 |
| | | 2.0 | 5.84 | 11.23 | 111.5 | 135.0 | 154.2 | 141.3 | 25.2 | 37.9 |
| | | 4.0 | 20.57 | - | 115.7 | - | 165.9 | - | 27.4 | - |
| 600 | 1 Row 0.02<br>2 Row 0.05 | 0.5 | 0.55 | 1.09 | 91.9 | 100.9 | 108.9 | 85.4 | 17.5 | 23.4 |
| | | 1.0 | 1.68 | 3.27 | 100.6 | 117.0 | 132.8 | 111.3 | 23.1 | 33.8 |
| | | 2.0 | 5.84 | 11.23 | 107.1 | 129.2 | 151.9 | 137.4 | 27.4 | 41.7 |
| | | 4.0 | 20.57 | - | 111.3 | - | 164.5 | - | 30.1 | - |
| 700 | 1 Row 0.03<br>2 Row 0.06 | 0.5 | 0.55 | 1.09 | 89.0 | 96.7 | 106.2 | 82.7 | 18.2 | 24.0 |
| | | 1.0 | 1.68 | 3.27 | 97.3 | 112.0 | 130.1 | 107.5 | 24.5 | 35.7 |
| | | 2.0 | 5.84 | 11.23 | 103.7 | 124.3 | 150.0 | 134.1 | 29.3 | 45.0 |
| | | 4.0 | 20.57 | - | 107.8 | - | 163.3 | - | 32.5 | - |
| 800 | 1 Row 0.04<br>2 Row 0.07 | 0.5 | 0.55 | 1.09 | 86.6 | 80.6 | 103.8 | 93.3 | 18.7 | 24.5 |
| | | 1.0 | 1.68 | 3.27 | 94.5 | 107.9 | 127.8 | 104.4 | 25.6 | 37.2 |
| | | 2.0 | 5.84 | 11.23 | 100.8 | 120.2 | 148.3 | 131.2 | 31.0 | 47.8 |
| | | 4.0 | 20.57 | - | 104.9 | - | 162.2 | - | 34.6 | - |
| 900 | 1 Row 0.04<br>2 Row 0.09 | 0.5 | 0.55 | 1.09 | 84.7 | 90.6 | 101.9 | 79.0 | 19.2 | 24.9 |
| | | 1.0 | 1.68 | 3.27 | 92.3 | 104.5 | 125.8 | 101.8 | 26.6 | 38.5 |
| | | 2.0 | 5.84 | 11.23 | 98.4 | 116.6 | 146.7 | 128.6 | 32.5 | 50.3 |
| | | 4.0 | 20.57 | - | 102.5 | 100.7 | 161.3 | 157.2 | 36.5 | - |

## MULTI-CIRCUITING

| AIRFLOW | | WATER FLOW | | | LAT (°F) | | LWT (°F) | | CAPACITY (MBH) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Rate (CFM) | Air PD (IN.W.G.) | Rate (GPM) | Water PD (FT.W.G.) 1 Row | Water PD (FT.W.G.) 2 Row | 1 Row | 2 Row | 1 Row | 2 Row | 1 Row | 2 Row |
| 300 | 1 Row 0.01<br>2 Row 0.02 | 0.5 | 0.10 | 0.19 | 105.4 | 121.8 | 126.4 | 105.0 | 13.1 | 18.5 |
| | | 1.0 | 0.36 | 0.62 | 115.7 | 138.4 | 146.3 | 131.3 | 16.5 | 23.9 |
| | | 2.0 | 1.19 | 1.97 | 122.9 | 148.9 | 160.7 | 152.1 | 18.8 | 27.3 |
| | | 4.0 | 4.31 | 6.97 | 127.5 | 154.7 | 169.6 | 165.0 | 20.3 | 29.2 |
| 400 | 1 Row 0.01<br>2 Row 0.02 | 0.5 | 0.11 | 0.19 | 98.3 | 111.6 | 121.2 | 98.1 | 14.4 | 20.2 |
| | | 1.0 | 0.36 | 0.62 | 108.0 | 128.3 | 141.9 | 124.1 | 18.7 | 27.4 |
| | | 2.0 | 1.19 | 1.97 | 115.3 | 140.1 | 157.6 | 146.7 | 21.8 | 32.5 |
| | | 4.0 | 4.32 | 6.98 | 120.0 | 147.0 | 167.8 | 161.8 | 23.8 | 35.5 |
| 500 | 1 Row 0.02<br>2 Row 0.03 | 0.5 | 0.11 | 0.19 | 93.4 | 104.4 | 117.4 | 93.4 | 15.4 | 21.3 |
| | | 1.0 | 0.36 | 0.63 | 102.6 | 120.6 | 138.4 | 118.6 | 20.4 | 30.1 |
| | | 2.0 | 1.19 | 1.98 | 109.7 | 133.0 | 155.2 | 142.4 | 24.2 | 36.8 |
| | | 4.0 | 4.32 | 7.00 | 114.5 | 140.6 | 166.2 | 159.0 | 26.8 | 40.9 |
| 600 | 1 Row 0.02<br>2 Row 0.05 | 0.5 | 0.11 | 0.19 | 89.8 | 99.1 | 114.4 | 90.1 | 16.1 | 22.2 |
| | | 1.0 | 0.36 | 0.63 | 98.5 | 114.6 | 135.6 | 114.4 | 21.7 | 32.2 |
| | | 2.0 | 1.19 | 1.99 | 105.4 | 127.1 | 153.1 | 138.7 | 26.3 | 40.4 |
| | | 4.0 | 4.32 | 7.01 | 110.1 | 135.2 | 164.9 | 156.6 | 29.3 | 45.6 |
| 700 | 1 Row 0.03<br>2 Row 0.06 | 0.5 | 0.11 | 0.19 | 87.0 | 95.1 | 112.0 | 87.6 | 16.7 | 22.8 |
| | | 1.0 | 0.36 | 0.63 | 95.2 | 109.7 | 133.2 | 111.0 | 22.9 | 33.9 |
| | | 2.0 | 1.20 | 1.99 | 102.0 | 122.3 | 151.3 | 135.7 | 28.0 | 43.4 |
| | | 4.0 | 4.33 | 7.02 | 106.6 | 130.6 | 163.8 | 154.5 | 31.6 | 49.8 |
| 800 | 1 Row 0.04<br>2 Row 0.07 | 0.5 | 0.11 | 0.19 | 84.8 | 91.9 | 110.0 | 85.6 | 17.2 | 23.3 |
| | | 1.0 | 0.36 | 0.63 | 92.6 | 105.8 | 131.2 | 108.1 | 23.9 | 35.3 |
| | | 2.0 | 1.20 | 1.99 | 99.1 | 118.1 | 149.7 | 133.0 | 29.6 | 46.0 |
| | | 4.0 | 4.33 | 7.03 | 103.7 | 126.7 | 162.8 | 152.6 | 33.6 | 53.4 |
| 900 | 1 Row 0.04<br>2 Row 0.09 | 0.5 | 0.11 | 0.19 | 83.1 | 89.3 | 108.4 | 84.0 | 17.6 | 23.7 |
| | | 1.0 | 0.36 | 0.63 | 90.4 | 102.5 | 129.5 | 105.8 | 24.8 | 36.5 |
| | | 2.0 | 1.20 | 2.00 | 96.7 | 114.6 | 148.3 | 130.7 | 31.0 | 48.4 |
| | | 4.0 | 4.33 | 7.03 | 101.3 | 123.2 | 161.8 | 150.9 | 35.4 | 56.8 |

**See Notes on following page.**

# HOT WATER COIL DATA

## MODEL VFL-WC UNIT SIZES 1215 AND 1415

### STANDARD CIRCUITING

| AIRFLOW | | WATER FLOW | | | LAT (°F) | | LWT (°F) | | CAPACITY (MBH) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Rate (CFM) | Air PD (IN.W.G.) | Rate (GPM) | Water PD (FT.W.G.) 1 Row | Water PD (FT.W.G.) 2 Row | 1 Row | 2 Row | 1 Row | 2 Row | 1 Row | 2 Row |
| 600 | 1 Row 0.02<br>2 Row 0.04 | 0.5 | 0.58 | 0.20 | 92.8 | 100.0 | 106.6 | 87.8 | 18.1 | 22.7 |
| | | 1.0 | 1.78 | 0.66 | 102.0 | 116.2 | 130.9 | 112.3 | 24.1 | 33.3 |
| | | 2.0 | 6.17 | 2.07 | 109.0 | 129.3 | 150.7 | 137.3 | 28.6 | 41.8 |
| | | 4.0 | 21.66 | 7.30 | 113.5 | 137.7 | 163.8 | 155.8 | 31.5 | 47.2 |
| 800 | 1 Row 0.03<br>2 Row 0.06 | 0.5 | 0.58 | 0.20 | 87.4 | 92.5 | 101.3 | 83.4 | 19.4 | 23.8 |
| | | 1.0 | 1.78 | 0.66 | 95.8 | 107.1 | 125.6 | 105.8 | 26.7 | 36.5 |
| | | 2.0 | 6.17 | 2.07 | 102.4 | 120.1 | 146.8 | 131.2 | 32.4 | 47.8 |
| | | 4.0 | 21.66 | 7.30 | 106.9 | 129.1 | 161.4 | 151.6 | 36.3 | 55.5 |
| 1000 | 1 Row 0.04<br>2 Row 0.09 | 0.5 | 0.58 | 0.20 | 83.7 | 87.7 | 97.6 | 80.5 | 20.3 | 24.6 |
| | | 1.0 | 1.78 | 0.66 | 91.4 | 100.8 | 121.7 | 101.2 | 28.6 | 38.8 |
| | | 2.0 | 6.17 | 2.07 | 97.8 | 113.4 | 143.7 | 126.6 | 35.5 | 52.4 |
| | | 4.0 | 21.66 | 7.30 | 102.1 | 122.5 | 159.4 | 148.1 | 40.2 | 62.3 |
| 1200 | 1 Row 0.06<br>2 Row 0.12 | 0.5 | 0.58 | 0.20 | 81.1 | 84.3 | 94.8 | 78.6 | 21.0 | 25.0 |
| | | 1.0 | 1.78 | 0.66 | 88.2 | 96.1 | 118.5 | 97.8 | 30.2 | 40.5 |
| | | 2.0 | 6.17 | 2.07 | 94.3 | 108.1 | 141.1 | 122.9 | 38.1 | 56.0 |
| | | 4.0 | 21.66 | 7.30 | 98.5 | 117.3 | 157.7 | 145.3 | 43.6 | 67.9 |
| 1400 | 1 Row 0.08<br>2 Row 0.15 | 0.5 | 0.58 | 0.20 | 79.2 | 81.8 | 92.6 | 77.1 | 21.5 | 25.4 |
| | | 1.0 | 1.78 | 0.66 | 85.8 | 92.6 | 115.9 | 95.2 | 31.5 | 41.8 |
| | | 2.0 | 6.17 | 2.07 | 91.5 | 103.9 | 138.9 | 119.8 | 40.3 | 59.1 |
| | | 4.0 | 21.66 | 7.30 | 95.7 | 113.0 | 156.2 | 142.8 | 46.5 | 72.8 |

### MULTI-CIRCUITING

| AIRFLOW | | WATER FLOW | | | LAT (°F) | | LWT (°F) | | CAPACITY (MBH) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Rate (CFM) | Air PD (IN.W.G.) | Rate (GPM) | Water PD (FT.W.G.) 1 Row | Water PD (FT.W.G.) 2 Row | 1 Row | 2 Row | 1 Row | 2 Row | 1 Row | 2 Row |
| 600 | 1 Row 0.02<br>2 Row 0.04 | 0.5 | 0.11 | 0.05 | 90.8 | 97.3 | 111.8 | 94.8 | 16.8 | 21.0 |
| | | 1.0 | 0.38 | 0.19 | 100.0 | 112.7 | 133.6 | 116.9 | 22.7 | 31.0 |
| | | 2.0 | 1.24 | 0.67 | 107.3 | 126.2 | 151.8 | 139.4 | 27.5 | 39.8 |
| | | 4.0 | 4.47 | 2.38 | 112.3 | 135.4 | 164.2 | 156.5 | 30.7 | 45.8 |
| 800 | 1 Row 0.03<br>2 Row 0.06 | 0.5 | 0.11 | 0.05 | 85.6 | 90.4 | 107.3 | 90.8 | 17.9 | 22.0 |
| | | 1.0 | 0.38 | 0.19 | 93.8 | 104.0 | 129.0 | 111.3 | 25.0 | 33.8 |
| | | 2.0 | 1.24 | 0.67 | 100.8 | 117.0 | 148.2 | 134.0 | 31.0 | 45.1 |
| | | 4.0 | 4.47 | 2.38 | 105.7 | 126.7 | 161.9 | 152.6 | 35.3 | 53.5 |
| 1000 | 1 Row 0.04<br>2 Row 0.09 | 0.5 | 0.11 | 0.05 | 82.3 | 85.9 | 104.1 | 88.1 | 18.7 | 22.7 |
| | | 1.0 | 0.38 | 0.19 | 89.7 | 98.0 | 125.5 | 107.4 | 26.7 | 35.7 |
| | | 2.0 | 1.24 | 0.67 | 96.2 | 110.3 | 145.4 | 129.9 | 33.8 | 49.1 |
| | | 4.0 | 4.47 | 2.38 | 101.0 | 120.1 | 160.0 | 149.5 | 39.0 | 59.6 |
| 1200 | 1 Row 0.06<br>2 Row 0.12 | 0.5 | 0.11 | 0.05 | 79.8 | 82.8 | 101.6 | 86.2 | 19.3 | 23.1 |
| | | 1.0 | 0.38 | 0.19 | 86.6 | 93.6 | 122.8 | 104.4 | 28.1 | 37.2 |
| | | 2.0 | 1.24 | 0.67 | 92.8 | 105.2 | 143.1 | 126.7 | 36.1 | 52.3 |
| | | 4.0 | 4.47 | 2.38 | 97.4 | 114.8 | 158.4 | 146.9 | 42.1 | 64.8 |
| 1400 | 1 Row 0.08<br>2 Row 0.15 | 0.5 | 0.11 | 0.05 | 78.0 | 80.5 | 99.7 | 84.8 | 19.8 | 23.5 |
| | | 1.0 | 0.38 | 0.19 | 84.2 | 90.3 | 120.5 | 102.2 | 29.2 | 38.3 |
| | | 2.0 | 1.24 | 0.67 | 90.1 | 101.2 | 141.1 | 124.1 | 38.1 | 54.9 |
| | | 4.0 | 4.47 | 2.38 | 94.6 | 110.6 | 157.0 | 144.6 | 44.8 | 69.1 |

**NOTES:**
1. Data is based on 180°F entering water and 65°F entering air temperature at sea level. See selection procedure for other conditions.
2. For optimum diffuser performance in overhead heating applications, the supply air temperature should be within 20°F of the desired space temperature. This typically requires a higher air capacity which provides higher air motion in the space, increasing thermal comfort. The hot water coil should be selected with this in mind, keeping the LAT as low as possible.

# GUIDE SPECIFICATIONS

## GENERAL

Furnish and install ENVIRO-TEC Model VFL, or equal, Low Height Parallel Flow Variable Volume Fan Powered Terminals of the sizes and capacities scheduled. Units shall be ETL listed. Terminals with electric heat shall be listed as an assembly. Separate listings for the terminal and electric heater are not acceptable. Terminals shall include a single point electrical connection. Terminal units shall be AHRI certified and bear the AHRI 880 seal.

The entire unit shall be designed and built as a single unit. Field-assembled components or built-up terminals employing components from multiple manufacturers are not acceptable.

## CONSTRUCTION

Terminals shall be constructed of not less than 20 gauge galvanized steel, able to withstand a 125 hour salt spray test per ASTM B-117. The terminal casing shall be mechanically assembled (spot-welded casings are not acceptable).

Casing shall be internally lined with 1/2" thick fiberglass insulation, rated for a maximum air velocity of 5000 f.p.m. Maximum thermal conductivity shall be .24 (BTU • in) / (hr • ft2 • °F). Insulation must meet all requirements of ASTM C1071 (including C665), UL 181 for erosion, and carry a 25/50 rating for flame spread/ smoke developed per ASTM E-84, UL 723 and NFPA 90A. Raw insulation edges on the discharge of the unit must be covered with metal liner to eliminate flaking of insulation during field duct connections. Simple "buttering" of raw edges with an approved sealant is not acceptable.

Casing shall have bottom access to gain access to the primary air valve and fan assembly. The opening shall be sufficiently large to allow complete removal of the fan if necessary. The casing shall be constructed in a manner to provide a single rectangular discharge collar. Multiple discharge openings are not acceptable. All appurtenances including control assemblies, control enclosures, hot water heating coils, and electric heating coils shall not extend beyond the top or bottom of the unit casing.

At an air velocity of 2000 f.p.m. through the primary inlet, the static pressure drop across the basic terminal or basic terminal with electric heat shall not exceed 0.20" W.G. for all unit sizes.

## SOUND

The terminal manufacturer shall provide AHRI certified sound power data for radiated and discharge sound. The sound levels shall not exceed the octave band sound power levels indicated on the schedule. If the sound data does not meet scheduled criteria, the contractor shall be responsible for the provision and installation of any additional equipment or material necessary to achieve the scheduled sound performance.

## PRIMARY AIR VALVE

Rectangular shaped primary air valves shall consist of minimum 18 gauge galvanized steel. Cylindrically shaped primary air valves shall consist of minimum 22 gauge galvanized steel and include embossment rings for rigidity. The damper blade shall be connected to a solid shaft by means of an integral molded sleeve which does not require screw or bolt fasteners. The shaft shall be manufactured of a low thermal conducting composite material, and include a molded damper position indicator visible from the exterior of the unit. The damper shall pivot in nylon bearings. The damper actuator shall be mounted on the exterior of the terminal for ease of service. The valve assembly shall include internal mechanical stops for both full open and closed positions. The damper blade seal shall be secured without use of adhesives. The air valve leakage shall not exceed 1% of maximum inlet rated airflow at 3" W.G. inlet pressure for cylindrical valves. Rectangular valve leakage shall not exceed 2% of maximum inlet rated airflow at 3" W.G. inlet pressure.

## PRIMARY AIRFLOW SENSOR

Differential pressure airflow sensor shall traverse the duct along two perpendicular diameters. Single axis sensor shall not be acceptable for duct diameters 6" or larger. A minimum of 12 total pressure sensing points shall be utilized. The total pressure inputs shall be averaged using a pressure chamber located at the center of the sensor. A sensor that delivers the differential pressure signal from one end of the sensor is not acceptable. The sensor shall output an amplified differential pressure signal that is at least 2.3 times the equivalent velocity pressure signal obtained from a conventional pitot tube. The sensor shall develop a differential pressure of 0.015" w.g. at an air velocity of < 325 FPM. Documentation shall be submitted which substantiates this requirement. Balancing taps and airflow calibration charts shall be provided for field airflow measurements.

# GUIDE SPECIFICATIONS

## FAN ASSEMBLY

The unit fan shall utilize a forward curved, dynamically balanced, galvanized wheel with a direct drive motor. The motor shall be permanent split capacitor type with three separate horsepower taps. Single speed motors with electronic speed controllers are not acceptable.

The fan motor shall be unpluggable from the electrical leads at the motor case for simplified removal (open frame motors only). The motor shall utilize permanently lubricated sleeve type bearings, include thermal overload protection and be suitable for use with electronic fan speed controllers.

The terminal shall utilize an electronic (SCR) fan speed controller for aid in balancing the fan capacity. The speed controller shall have a turn down stop to prevent possibility of harming motor bearings.

## HOT WATER COIL

Terminal shall include an integral hot water coil where indicated on the plans. The coil shall be manufactured by the terminal unit manufacturer and shall have a minimum 22 gauge galvanized sheet metal casing. Coil to be constructed of pure aluminum fins with full fin collars to assure accurate fin spacing and maximum tube contact. Fins shall be spaced with a minimum of 10 per inch and mechanically fixed to seamless copper tubes for maximum heat transfer.

Each coil shall be hydrostatically tested at a minimum of 450 PSIG under water, and rated for a maximum 450 PSIG working pressure at 200°F.

## ELECTRIC HEATERS

Terminal shall include an integral electric heater where indicated on the plans. The heater cabinet shall be constructed of not less than 20 gauge galvanized steel. Heater shall have a hinged access panel for entry to the controls.

A power disconnect shall be furnished to render the heater non-operational. Heater shall be furnished with all controls necessary for safe operation and full compliance with UL 1995 and National Electric Code requirements.

Heater shall have a single point electrical connection. It shall include a primary disc-type automatic reset high temperature limit, secondary high limit(s), Ni-Chrome elements, and fusing per UL and NEC. Heater shall have complete wiring diagram with label indicating power requirement and KW output. Heater shall be interlocked with fan terminal so as to preclude operation of the heater when the fan is not running.

## OPTIONS

**Foil Faced Insulation**
Insulation shall be covered with scrim backed foil facing. All insulation edges shall be covered with foil or metal nosing. In addition to the basic requirements, insulation shall meet ASTM C1136 for insulation facings, and ASTM C1338 for mold, mildew and humidity resistance.

**Elastomeric Closed Cell Foam Insulation**
Provide Elastomeric Closed Cell Foam Insulation in lieu of standard. Insulation shall conform to UL 181 for erosion and NFPA 90A for fire, smoke and melting, and comply with a 25/50 Flame Spread and Smoke Developed Index per ASTM E-84 or UL 723. Additionally, insulation shall comply with Antimicrobial Performance Rating of 0, no observed growth, per ASTM G-21. Polyethylene insulation is not acceptable.

**Double Wall Construction**
The terminal casing shall be double wall construction using a 22 gauge galvanized metal liner covering all insulation.

**Filters**
Terminals shall include a filter rack and 1" thick disposable fiberglass filter, allowing removal without horizontal sliding.

## ECM FAN MOTOR

Fan motor shall be ECM, "Electronically Commutated Motor" "Genteq® Eon." Motor shall be brushless DC controlled by an integral controller / inverter that operates the wound stator and senses rotor position to electronically commutate the stator. Motor shall be permanent magnet type with near-zero rotor losses designed for synchronous rotation. The motor shall utilize permanently lubricated ball bearings. Motor shall maintain minimum 70% efficiency over the entire operating range. Motor speed control shall be accomplished through a PWM (pulse width modulation) controller specifically designed for compatibility with the ECM. The speed controller shall have terminals for field verification of fan capacity utilizing a digital volt meter. A calibration graph shall be supplied indicating Fan CFM verses DC Volts.

# GUIDE SPECIFICATIONS

## PIPING PACKAGES

Provide a standard factory assembled non-insulated valve piping package to consist of a 2 way, on/off, motorized electric control valve and two ball isolation valves. Control valves are piped normally closed to the coil. Maximum entering water temperature on the control valve shall be 200°F. The maximum close-off pressure is 40 PSIG (1/2") or 20 PSIG (3/4"). Maximum operating pressure shall be 300 PSIG.

**Option:** Provide 3-wire floating point modulating control valve (fail-in-place) in lieu of standard 2-position control valve with factory assembled valve piping package.

**Option:** Provide high pressure close-off actuators for 2-way, on/off control valves. Maximum close-off pressure is 50 PSIG (1/2") or 25 PSIG (3/4)".

**Option:** Provide either a fixed or adjustable flow control device for each piping package.

**Option:** Provide unions and/or pressure-temperature ports for each piping package.

Piping package shall be completely factory assembled, including interconnecting pipe, and shipped separate from the unit for field installation on the coil, so as to minimize the risk of freight damage.

## CONTROLS

**DDC for BACnet**
Each VAV terminal unit shall be bundled with a digital controller. The controller shall be compatible with a MS/TP (Master-Slave/Token-Passing) BACnet system network. A unique network address and a BACnet site address shall be assigned to each controller, and referenced to the tagging system used on the drawings and in the schedules provided by the Project Engineer. All controllers shall be factory mounted and wired, with the controller's hardware address set, and all of the individual terminal's data pre-loaded into the controller. The terminal's data shall include, but not be limited to Max CFM, Min CFM, Heating CFM, and terminal K factor. Heating system operating data shall also be factory installed for all terminals with heat. Communications with the digital controller shall be accomplished through the MS/TP BACnet network or through a Bluetooth connector. The digital controller shall have hardware input and output connections to facilitate the specified sequence of operation in either the network mode, or on a stand-alone basis. The terminal unit manufacturer shall coordinate, where necessary, with the Temperature Control Contractor.

**Pneumatic Controls**
Units shall be controlled by a pneumatic differential pressure reset volume controller. Controller shall be capable of pressure independent operation down to 0.03 inches W.G. differential pressure and shall be factory set to the specified airflow (CFM). Controller shall not exceed 11.5 scim (Standard Cubic Inches per Minute) air consumption @ 20 PSIG. Unit primary air valve shall modulate in response to the room mounted thermostat and shall maintain airflow in relation to thermostat pressure regardless of system static pressure changes. An airflow (CFM) curve shall be affixed to the terminal unit expressing differential pressure vs. CFM. Pressure taps shall be provided for field use and ease of balancing. Terminal unit manufacturer shall supply and manufacture a 5 to 10 PSIG pneumatic actuator capable of a minimum of 45 in. lbs. of torque. Actual sequence of operation is shown on the contract drawings. Terminal unit manufacturer shall coordinate, where necessary, with the Temperature Control Contractor.

# NOTES

Catalog: ET130.13-EG7 (819) Supersedes ET130.13-EG7 (318)

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