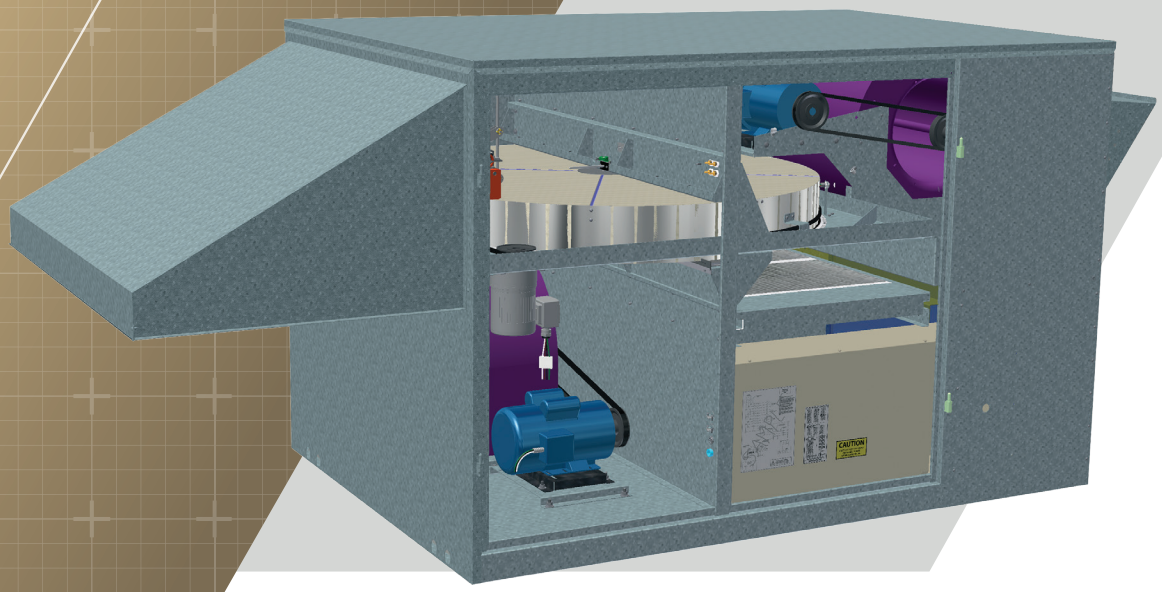
FläktGroup SEMCO

SPECIALIZED HEALTHY AIR SOLUTIONS

SEMCO FV-TS PRE-CONDITIONER SERIES

TECHNICAL GUIDE



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FLÄKTGROUP® SEMCO® FV-TS OUTDOOR AIR PRE-CONDITIONER

The FläktGroup® SEMCO® FV-TS (Fresh Air Ventilator) Series of outdoor air pre-conditioners has been specifically designed to reduce the energy required to heat or cool outdoor air by up to 80 percent. The FläktGroup SEMCO FV-TS pre-conditioner allows the HVAC system to effectively and economically accommodate the three-to-four-fold increase in outdoor air quantities, which is recommended by the ASHRAE Standard 62, Ventilation for Acceptable Indoor Air Quality. This unique capability allows both new and existing buildings to benefit from a healthy indoor environment.

A FläktGroup SEMCO FV-TS pre-conditioner will significantly reduce the operating cost of the HVAC system of a facility designed in accordance with the ASHRAE IAQ standard. It will also improve humidity control when combined with unitary heating and cooling equipment.

Because the FläktGroup SEMCO FV-TS unit preconditions the incoming air to the packaged equipment, the required refrigeration capacity may be reduced by as much as 50 percent. Thus, the cost of the FläktGroup SEMCO FV-TS pre-conditioner and its installation is typically offset by the reduced size of the conventional HVAC system.

In existing facilities, retrofitting the HVAC system with a FläktGroup SEMCO FV-TS pre-conditioner allows the outdoor air quantity to be increased significantly without raising energy costs, losing humidity control or changing the size of the current HVAC unit.

HOW IT WORKS

The FläktGroup SEMCO FV-TS system is a packaged system, which includes supply and exhaust air fans, outdoor and return air filters and FläktGroup SEMCO's Fusion total energy recovery wheel. The Fusion wheel recovers both sensible (temperature) and latent (moisture) energy; it cools and dehumidifies the outdoor air during the cooling season, while heating and humidifying the outdoor air in the heating season.

The Fusion utilizes a honeycomb-like media having an aluminum substrate, which is carefully coated with a fast-acting, adsorbent desiccant surface. As the transfer media slowly rotates between the outdoor and exhaust airstreams, the higher temperature air gives up its sensible energy to the aluminum. This energy is then given up to the cooler airstream during the second half of the revolution (See **FIGURE 1**).

Just as the temperature is captured and released, so is the moisture. The Fusion's molecular sieve desiccant coating has an enormous internal surface area and a strong attraction to water vapor. Since the opposing airstreams have different temperature and moisture contents, their vapor pressures differ. This difference causes the transfer of latent energy.

The Fusion wheel is coated with a proprietary zeolite composite which helps the Fusion recover moisture from the exhaust airstream, limiting the amount of airborne pollutants contained within the airstream. This important feature has been well documented through independent laboratory and field-testing. Please contact FläktGroup SEMCO for a copy of the Independent Performance Verification of FläktGroup SEMCO Total Energy Recovery Wheels.

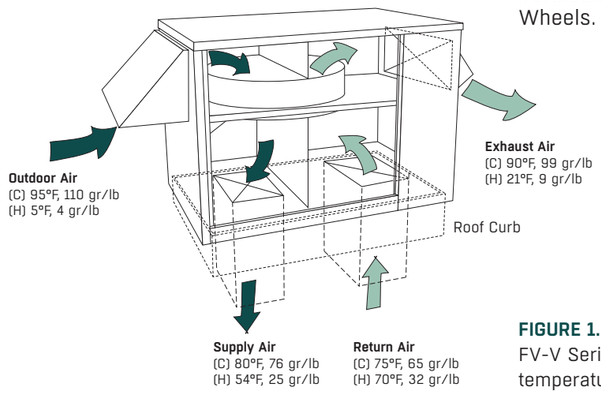


FIGURE 1. An inside view of the FläktGroup® SEMCO® FV-V Series pre-conditioner with typical operating temperatures during the cooling (C) and heating (H) season, respectively.

INDOOR AIR QUALITY

PRE-CONDITIONING

ASHRAE Standard 62 defines the minimum outdoor air ventilation rate required to achieve acceptable indoor air quality. This standard, which is incorporated in the three major U.S. building codes (BOCA, Southern and Uniform), recommends that outdoor air quantities be increased from 5 CFM per person to 15 to 20 CFM per person to avoid adverse health effects. The increased ventilation air rates concern many owners, architects and engineers with regard to their impact on humidity control, operating costs and construction costs.

By recovering up to 80 percent of the total energy normally exhausted from facilities, the FläktGroup SEMCO FV-TS system provides an effective solution to the ASHRAE Standard 62 dilemma. When an FV-TS system is combined with a traditional HVAC system, it allows for a four-fold increase in the outdoor air quantity (5 to 20 CFM per person) without an increase in operating costs.

If a facility is designed to include unitary packaged HVAC equipment or heat pumps, the addition of an FV-TS unit is especially beneficial. In addition to reducing the cost of operation, the FV-TS system greatly improves humidity control; something that is important for providing acceptable indoor air quality.

HUMIDITY CONTROL

Unitary air conditioners and heat pump units are controlled by temperature. When space conditions are satisfied, the cooling coil or heating source is cycled off. Since the ASHRAE Standard 62 recommends a continuous supply of outdoor air, warm/humid (cooling mode) or cool/dry (heating mode), outdoor air is typically dumped directly into the occupied space during those times.

As the outdoor air load changes, humidity levels can fluctuate significantly with unitary HVAC equipment and heat pumps. To achieve an acceptable indoor environment, space humidity conditions should be maintained between 30 and 60 percent relative humidity. The probability of microbial problems (i.e. mold) is greatly enhanced at 70 percent relative humidity and above.

APPLYING THE FV-TS UNIT

The FläktGroup SEMCO FV-TS series units are offered in four basic configurations depending on the locations of the supply air and return air discharge openings:

- H - horizontal supply air discharge and horizontal return air in the back of the unit
- HS - horizontal supply air discharge in the back of the unit with vertical return air in the floor of the unit
- V - vertical supply air discharge and vertical return air in the floor of the unit
- VS - vertical supply air discharge in the floor of the unit with horizontal return air in the back of the unit

Please consult **FIGURES 14-17** on **PAGE 12-13** and dimensional drawings on **PAGES 29-36** for additional information.

THE FLÄKTGROUP® SEMCO® FV-TS - H SERIES APPLICATION

The H series has been designed to compliment conventional rooftop air-conditioners (See **FIGURE 2**). In a typical application, it provides preconditioning of outside air to a rooftop unitary air-conditioner. At the same time, it draws return air from the rooftop unit. Here, the SEMCO FV-TS unit effectively shields the rooftop unit from the operating conditions normally experienced throughout the year. Consequently, the rooftop air-conditioner works within a narrow, more optimal zone of operating conditions. The end result is that the refrigeration capacity of the rooftop unit is generally increased by at least 30 percent. For example, a combination of a FläktGroup SEMCO FV-1000TS H model with a nominal 5-ton rooftop air-conditioner effectively increases the refrigeration capacity of the rooftop unit to 7 to 8 tons or more.

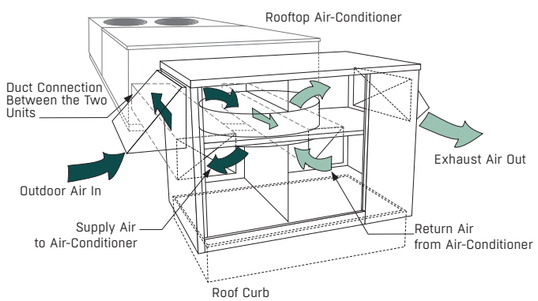


FIGURE 2. FläktGroup SEMCO FV-TS - H Series pre-conditioner typical installation.

The key benefits of the H series are:

- The FläktGroup SEMCO FV-TS - H series allows for easy integration with rooftop or other types of air conditioners. By reducing the outside load by 75% or more, it effectively increases the capacity of the air-conditioner by 30 or more percent. Conversely, it reduces the amount of required refrigeration capacity to meet a mandated amount of ventilation air. Depending on the climate the reduction in refrigeration capacity may be up to 50 percent.
- Because the FläktGroup SEMCO FV-T - H series preheats the incoming outside air in wintertime, heating requirements on the conventional equipment can be dramatically reduced as well.
- By tying in to the air-conditioning system, no additional distribution ductwork is need. In most applications, the distribution ductwork in the conditioned space can be downsized since the overall refrigeration capacity has been reduced and the required total airflow is smaller.
- The FläktGroup SEMCO FV-TS - H series allows for easy retrofit of existing air-conditioning systems, allowing a significant increase in the amount of outside air without increasing the operating costs.

FLÄKTGROUP SEMCO FV-TS-V SERIES APPLICATION

The FläktGroup SEMCO FV-TS - V series is typically installed on a roof curb with supply and return air connections on the bottom of the unit (See **FIGURE 3**). In such an installation, the unit commonly delivers supply air to conditioned space below. Supply air can also be provided to an HVAC system installed indoors. In another variation, supply air is distributed via ducts to two or more conditioned zones within a building.

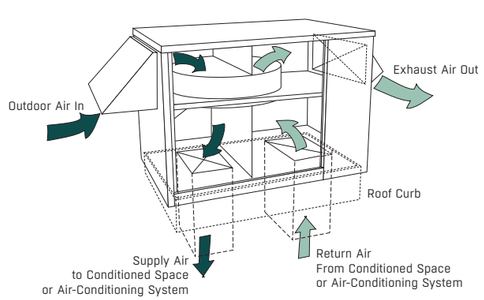


FIGURE 3. The SEMCO FV-TS - V Series Pre-Conditioner basic installation.

The major benefits of this installation are:

- The FläktGroup SEMCO FV-TS unit can serve several air-conditioning systems, which now can be configured to run in 100 percent recirculation mode. The FläktGroup SEMCO FV-TS unit meets all the outdoor air requirements.
- The FläktGroup SEMCO FV-TS system can run independently of all other air-conditioning systems. During occupied modes it can run continuously, while during the unoccupied periods it can provide pressurization to reduce infiltration of unwanted humidity to the building.
- Control requirements are very simple and there is no-tie-in with any other air-conditioning system required.

STANDARD FEATURES

NOVEL SYSTEM DESIGN

Efficient and economical design meeting the needs of the conventional HVAC market.

- Compact, low profile design to conform to typical architectural requirements.
- Easy access to all internal components through a large hinged access door(s) and removable roof panel.
- Outdoor air inlet and exhaust air outlet located at opposite ends of unit for maximum separation.

1) THE FUSION TOTAL ENERGY WHEEL

- Certified total energy (both sensible and latent) recovery performance.
- Proprietary zeolite composite coating that provides a contaminant carry-over superior to competitor's non-molecular sieve based wheels.
- Easily removable wheel cassette module.
- Surpasses NFPA-90A requirements having a smoke and flame spread rating of 0 and 0, vs. 50 and 25 allowed by the standard.
- Self-adjusting air seals.
- Acid resistant face coating.

2) CABINET CONSTRUCTION

- Galvanized steel cabinet construction with enamel finish.
- Entire cabinet insulated with closed cell elastomeric foam with Microban® antimicrobial technology to minimize energy loss and provide resistance to mold, fungi and bacteria.
- Hinged doors for easy access. Hinges are lift-off — no tools required.
- Floor of the unit built as a pan to ensure watertight design.

3) SUPPLY AND EXHAUST AIR FANS

- Sized for quiet and efficient operation.
- Mounted and balanced.
- Multiple motor/sheave selections for efficient adjustment of airflow.

4) FILTER SECTIONS

- Filtration provided for both the outdoor air and return air.
- Standard aluminum mesh filters

5) HOODS AND DAMPERS

- Intake hood with a cleanable filter to limit rain and snow introduction on outdoor units
- Indoor filter assembly (See page 34) with pleated filters on indoor units
- Exhaust air back draft damper on outdoor units only
- Outdoor air manually adjustable damper

6. ELECTRICAL PACKAGE WITH SINGLE POINT CONNECTION

- All motors wired to starters.
- Accepts contact inputs for supply fan start/stop, wheel start/stop and unit start/stop.
- Multiple options on input voltage to units:

  FläktGroup SEMCO FV-1000TS: 208, 240V 1Ø
  208, 480V 3Ø

  FläktGroup SEMCO FV-2000TS: 208, 240V 1Ø
  208, 480, 575V 3Ø

  FläktGroup SEMCO FV-3000TS: 208, 240V 1Ø
  208, 480, 575*V 3Ø

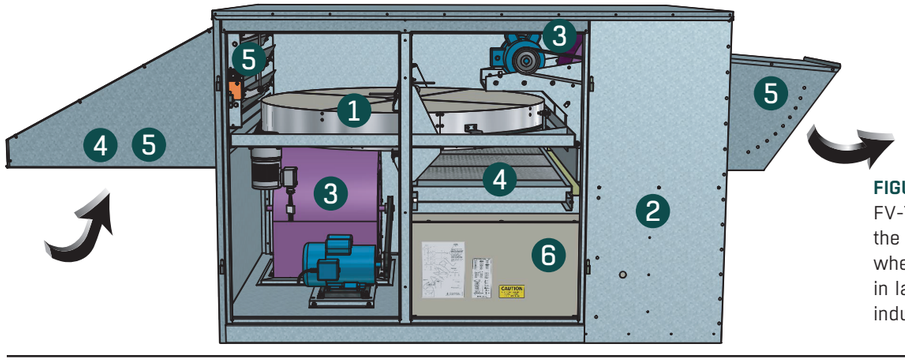


FIGURE 4. FläktGroup SEMCO FV-TS Pre-Conditioner uses the same high performing wheel technology proven in large institutional and industrial applications.

FläktGroup SEMCO FV-4000TS: 208, 240V, 1Ø
208, 480, 575*V 3Ø

FläktGroup SEMCO FV-5000TS: 208, 240V, 1Ø
208, 480, 575*V 3Ø

FläktGroup SEMCO FV-7500TS: 208, 480, 575*V 3Ø

FläktGroup SEMCO FV-9000TS: 208, 480, 575*V 3Ø

*Available with limited configurations and options.

OPTIONAL FEATURES

GALVANIZED UNPAINTED FINISH

Fan VFDs for 3Ø Applications: FläktGroup SEMCO FV-2000TS — FläktGroup SEMCO FV-9000TS only

- VFDs are factory installed and wired, located in an enclosure mounted on the exterior of the unit. The VFDs are preset at the factory to run at constant speeds when enabled, or can be field set for control by others.

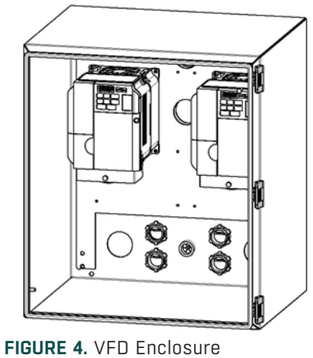


FIGURE 4. VFD Enclosure

DISCONNECT

Safety, non-fused, shipped loose for field installation

OUTDOOR ELECTRIC PREHEAT COIL

An electric preheat coil can be provided to avoid frosting conditions for installations in cold climates, which have high indoor humidity design conditions.

MOTORIZED OUTDOOR AIR DAMPER

2-position non-spring return actuator

MOTORIZED EXHAUST AIR DAMPER

2-position spring return actuator

DUAL WALL CONSTRUCTION

Interior of FV-TS pre-conditioner is lined with 22 gauge galvanized sheet metal.

ROOF CURB

Units will be provided with a non-insulated roof curb sized to fit just inside of the unit's self flashing base. Curb will be fourteen inches tall and will have a wood nailer on the perimeter for attaching unit.

WHEEL CONTROL OPTIONS

STOP/JOG ECONOMIZER

- Allows the wheel to be stopped automatically during mild outdoor temperatures with periodic brief rotation to maintain the self-cleaning feature of the heat exchanger *(Not applicable with variable speed wheel control package. See selection software.).*

ON/OFF FROST CONTROL

- Thermostatic frost control allows the FläktGroup SEMCO FV-TS unit to be turned off at a predetermined outdoor temperature (when electric preheat is not desired). Protects the wheel from accumulating frost *(Not applicable with variable speed wheel control package. See selection software.).*

ROTATION DETECTOR

- The energy recovery wheel is equipped with a rotation detector. If there is a lack of wheel rotation for more than 10 minutes when the wheel is called to run, an alarm is generated *(Included with stop/jog economizer or variable speed wheel control package. See selection software).*

REMOTE INDICATING PANEL

- The remote indicating panel provides a convenient and attractive option for monitoring the FläktGroup SEMCO FV-TS pre-conditioner. Remote mounted Indicating panel provides status indicators for: (1) Unit Power; (2) Wheel Rotation; (3) Dirty Outside Air Filter; and (4) Dirty Return Air Filter
- Field wiring is only required from the remote panel to a low voltage terminal strip factory mounted on the FläktGroup SEMCO FV-TS unit. Remote indicating panel includes a junction box and plaster ring for recessed or surface mounting.
- **NOTE:** Stop/jog Control Package Option must also be selected. Not applicable with variable speed wheel control package.

VARIABLE SPEED WHEEL CONTROL PACKAGE

NOTE: Control Package available on the FläktGroup SEMCO FV-2000TS - FläktGroup SEMCO FV-9000TS units, 3 phase only.

STANDARD FEATURES:

- I/O Zone 583 controller & BACview5 keypad/ display, unit on/off switch & unit alarm lamp
- BAS integration available via BACnet MS/TP, Modbus, N2
- Factory mounted & programmed wheel VFD (See **FIGURE 5**)

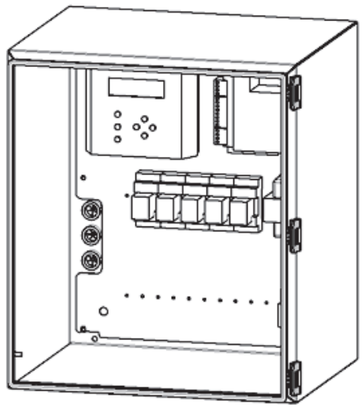


FIGURE 5: Variable speed controls.

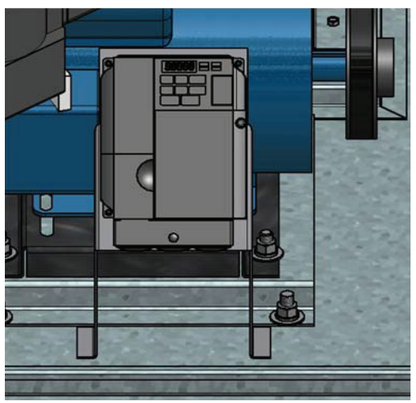


FIGURE 6: Wheel VFD, placed in supply air compartment of FV-TS.

- Temperature based wheel speed control with frost control wheel speed modulation
- Temperature sensors: outdoor air, supply air, return air, exhaust air
- Filter pressure switches for outdoor and return air filters with alarms
- Wheel rotation detector with alarm
- Outdoor air damper actuator, 2-position
- Controller provides modulating control signal to electric wheel preheat when needed (optional)

NON-VARIABLE SPEED WHEEL CONTROLS

BASIC PACKAGE

The basic FläktGroup SEMCO FVTS unit ships without controls. The standard wiring package provides connections for the starting/stopping of the complete unit, supply fan and the energy wheel. The connections are shipped with factory jumpers installed. Remote control of any of these options can be achieved by removing the correct factory jumper and installing a contact in its place. The contact should be capable of handling 24VAC power at 3.5 amps, except for the FläktGroup SEMCO FV-1000TS which handles 24VAC at 2 amps. (See appropriate 1Ø or 3Ø circuit diagram on **PAGES 37-42**). It is strongly recommended that a remote unit start/stop relay (supplied by others) be used to turn the unit on and off. This allows the outdoor air damper to fully close when the unit is off.

OPTIONAL ELECTRIC PREHEAT FROST CONTROL

For applications where the outdoor conditions do not exceed -10°F and where the indoor design conditions do not exceed 70°F and 25 percent RH, the energy wheel can operate at full capacity and will not frost. For colder design conditions or buildings with higher humidity levels, frosting of the wheel can be prevented by providing a modest amount of preheat to the outdoor air. The amount of preheat required is small and is not intended to raise the outdoor air temperature above the freezing point. It is only necessary to keep the exhaust air temperature above the dew point. This prevents condensation on the wheel so that all the moisture transfer occurs in the vapor phase.

The preheat control option includes a finned tube electric coil mounted on the outdoor air intake of the unit, an SCR controller and a temperature sensor mounted in the outdoor air plenum. The temperature for the controller is set to the minimum temperature of the outdoor air required to prevent condensation at the design indoor temperature and humidity. This is done by plotting a line on the psychometric chart from the indoor design condition down to the coldest temperature that does not cause the operating line to intersect the saturation curve on the chart. As stated above, for inside conditions of 70°F and 25 percent RH, this temperature is about -10°F (See **FIGURE 13** on **PAGE 12**).

OPTIONAL VARIABLE SPEED WHEEL CONTROL PACKAGE

- **Digital reading of temperatures**
- **Proportional heating control**
- **Automatic summer/winter changeover**

OPTIONAL STOP/JOG ECONOMIZER AND WHEEL FROST PROTECTION (GENERAL PURPOSE ROTATION DETECTOR)

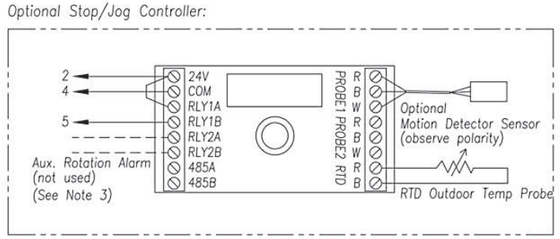
The stop/jog economizer option is used during moderate outdoor air temperatures to stop the recovery wheel. The jog function is included to allow the wheel to rotate periodically to self-clean.

The stop/jog economizer consists of a temperature sensor and a circuit board with dip switch selection of temperature and stop/jog times. When the outdoor temperature is in the range between the two set-points, the timer relay operates the wheel for approximately 30 seconds in every 30 minutes.

The general purpose rotation detector (GPRD) board also has the ability to put the wheel in stop/jog mode when the outdoor air temperature drops below a preset value. This is a lower cost option than the electric preheat. It also has the disadvantage in supplying untreated outdoor air into the ventilation system whenever the stop/jog activates.

GPRD controller as installed on the electric panel.

Optional Stop/Jog Controller:



OPTIONAL ROTATION DETECTOR SENSOR FOR A GPRD CONTROLLER

The GPRD stop/jog economizer board is supplied with a motion detector to monitor the rotation of the energy recovery wheel (see **FIGURE 7**). The sensor is a Hall effect device that senses the passage of a small magnet on the perimeter of the rotor. When the sensor fails to register any wheel rotation - it requires a signal every 10 minutes - it energizes the alarm relay of the GPRD board. This can be used for remote indication of the alarm. The sensor will not create a false alarm when the GPRD controller is in stop/jog mode.

The alarm resets itself once the wheel begins to turn or the system is shut off and restarted.

THERMOSTAT FROST PROTECTION

A lower cost solution to frost protection is to use a thermostat to turn the entire ventilation unit off during periods when the air is below the calculated frosting temperature. This should only be used in non-critical ventilation applications as no outdoor air will be supplied when the unit is switched off by the thermostat.

FIGURE 7 GPRD Controller settings.

Default Stop/Jog Device Parameters

Press and "double click" dial to enter parameter menu.
Rotate dial to view parameters. Press & click dial to select parameter for editing. Value will flash when parameter is selected.
Adjust setting by rotating dial, then press & click dial to lock in new setting. After 10secs with no activity, parameter menu will exit.
Alarms can be cleared by pressing and holding the dial for 3 seconds.

Parameter	Default Setting
MODE	3
MOTION ALARM	10
REVERSE ALARM	OFF
S-J ENABLE	On
S-J LOW TEMP	55
S-J HI TEMP	75
S-J On TIME	30
S-J OFF TIME	30
S-J FROST ENABLE	OFF
S-J FROST TEMP	0
TEMP UNITS	F
RELAY 1	4
RELAY 2	1
DISPLAY	2

BENEFITS PROVIDED

ECONOMICAL COMPLIANCE WITH ASHRAE STANDARD 62

To achieve acceptable indoor air quality, ASHRAE Standard 62 recommends a three-to-four-fold increase in the amount of outdoor air provided to most facilities. In addition, ASHRAE recommends that this increased outdoor air quantity be introduced continuously while spaces are occupied. By recovering up to 80 percent of the total energy normally exhausted from facilities, the FläktGroup SEMCO FV-TS preconditioning allows conventional HVAC systems to effectively handle this increase in outdoor air load without increasing the size of the heating/cooling capacity while decreasing energy consumption.

REDUCED EQUIPMENT FIRST COST

Without the addition of effective energy recovery, the capacity of HVAC systems must be increased significantly to handle the greater outdoor air loads associated with higher ventilation rates. Increasing equipment size often requires the addition of reheat and sophisticated control sequences to control humidity as well as temperature. The FV-TS pre-conditioner often reduces project first cost by allowing smaller HVAC units and duct systems to be used, without the need for reheat or complex controls.

IMPROVED COOLING SEASON HUMIDITY CONTROL

A thermostat governs operation of conventional HVAC systems, i.e., in response to the conditioned space temperature only. When the cooling coil is cycled off, the outside air fan is typically shut-off as well. Thus, no ventilation is provided to the conditioned space until the thermostat calls for cooling. If the outside air fan is allowed to run while the cooling coil is off, then warm, humid air is directed to the space. In both of these cases, indoor space humidity levels will increase above guideline levels, i.e., 60 percent relative humidity.

Since the FV-TS pre-conditioner dehumidifies and cools the incoming outdoor air, the supply air conditions are close to the return air conditions. This effectively produces a buffer against high outdoor latent loads resulting in acceptable indoor humidity levels.

IMPROVES THE COMFORT OF OCCUPIED SPACES

As the outdoor air is supplied to the space, the heating/cooling source is cycled on and off to maintain temperature. When it is cycled off, very cold or very warm/humid air can be “dumped” on the occupants, causing wide temperature fluctuations, which makes for a very uncomfortable environment. FV-TS preconditioning solves this problem by providing moderated supply air conditions, even as the heating/cooling source is cycled on and off.

HELPS REDUCE HUMIDIFICATION REQUIREMENTS DURING THE HEATING SEASON

Supplying 15 to 20 CFM/person of cold, dry outdoor air to a facility during the heating season can result in unacceptably low indoor relative humidity. The HVAC system effectively maintains space temperature by heating the air, yet few facilities are humidified. It is now well documented that many wintertime illnesses come as a result of the body’s inability to fight off infection due to “dry airways.” The FV-TS unit captures the moisture generated within the space to provide free humidification during the heating season, therefore maintaining a healthier indoor environment.

IMPROVES THE IAQ OF EXISTING FACILITIES

The compact yet versatile design of the FläktGroup SEMCO FV-TS unit allows for easy installation in existing facilities and eliminates additional ductwork and disruption of the occupied space below. It can either be used as a stand-alone unit serving multiple HVAC units or as a dedicated pre-conditioner ducted directly to a single unitary HVAC system
(See **FIGURES 2** and **3 on** PAGES 2 and 3).

SELECTION PROCEDURE

1) CHOOSE A UNIT SIZE

Use the unit capacity/wheel face area (See **FIGURE 8**) to determine the appropriate unit size based on the larger amount of fresh air that needs to be supplied to or return air exhausted from the facility. In the case where two units will provide the desired airflow, the smaller unit will provide the more economical selection and is generally the appropriate choice.

EXAMPLE. Two thousand (2000) CFM of supply air and 1800 CFM of exhaust air is required. Select model FläktGroup SEMCO FV-2000TS based on the 2000 CFM flow volume.

FLÄKTGROUP® SEMCO® MODEL	AIRFLOW RANGE (SCFM)	WHEEL FACE AREA (FT^2/SIDE)
FV-1000TS	415-1245	1.42
FV-2000TS	800-2000	2.60
FV-3000TS	1800-3000	4.13
FV-4000TS	2600-4000	5.00
FV-5000TS	2600-6200	6.27
FV-7500TS	4500-9000	9.10
FV-9000TS	6000-10000	9.10

FIGURE 8. Airflow range and energy wheel area.

2) SELECT FAN MOTOR

Using the fan tables on **PAGES 16-28** for the unit selection, locate the intersection of the desired supply external static pressure and supply airflow quantity for the supply fan. This intersection gives the brake horsepower and fan speed. The fan table shading gives the appropriate standard motor.

After obtaining the supply fan motor information, repeat the same steps using the exhaust fan tables for the chosen unit.

EXAMPLE. For a FläktGroup® SEMCO® FV-2000TS, the supply air at 2000 CFM and 0.5 in. WG. external static is met with a 2 hp motor and fan operating at 1803 rpm. Exhaust air at 1800 CFM and 0.75 in. WG. external static is met with a 2 hp motor and fan operating at 2004 rpm.

3) DETERMINE SUPPLY AIR RECOVERY EFFICIENCY

Enter **FIGURE 9** for the chosen unit to determine the recovery wheel face area per airstream. Divide the smaller volume of the supply and return airstreams by the wheel area obtained from **FIGURE 8** to determine face velocity. Enter **FIGURE 9** for the face velocity of the smaller airstream to determine the unit base effectiveness. If the airstreams are equal the base effectiveness is the same as the wheel effectiveness.

WHEEL FACE VELOCITY (FPM)	BASE RECOVERY EFFECTIVENESS (%)
300	80.3
400	77.8
500	75.3
600	72.8
700	70.3
800	67.8
900	65.3
1000	62.8
1100	60.3

FIGURE 9. Unit Effectiveness vs. Wheel Face Velocity.

If the airflows are not equal, then divide the supply air volume by the return air volume to determine the airflow ratio. Using the base effectiveness determined from **FIGURE 9** and the calculated airflow ratio, enter **FIGURE 10** on **PAGE 11**) to obtain the corrected supply air efficiency for unequal airflow applications.

EXAMPLE. From **FIGURE 8**, the FV-2000TS wheel area per side is 2.60 sq. ft. Dividing 1800 CFM (the smaller of the two airstreams) by 2.60, provides a face velocity of 692 ft/min. From **FIGURE 10** the base effectiveness is 70%. Using the base effectiveness and an airflow ratio of 1.11 (2000 CFM/1800 CFM) from **FIGURE 11** determines the supply side efficiency to be 68%.

RATIO OF SUPPLY AIR FLOW RATE TO RETURN AIR FLOW RATE	BASE EFFECTIVENESS						
	68	70	72	74	76	78	80
0.7	82.6	84.0	85.5	87.0	88.5	90.0	91.4
0.8	78.0	79.8	81.5	83.2	84.9	86.7	88.4
0.9	73.2	75.1	77.0	78.9	80.8	82.7	84.7
1.0	68.0	70.0	72.0	74.0	76.0	78.0	80.0
1.1	66.1	67.9	69.6	71.4	73.1	74.8	76.6
1.25	62.4	63.8	65.2	66.6	68.0	69.4	70.8
1.4	58.5	55.9	60.7	61.8	62.9	63.9	65.1

FIGURE 10. Unequal Airflow Efficiency Correction.

4) CALCULATE THE SUPPLY AIR CONDITIONS

Once the design conditions are known and the supply side efficiency is determined, then the temperature and humidity content of the air supplied to the space after the wheel can easily be calculated by using the equation in **FIGURE 11** Using dry bulb temperatures in **FIGURE 11** provides the supply air temperature. The supply air humidity level is also determined by the equation in **FIGURE 11** by using grains of moisture or humidity content (lb. moisture/lb. dry air.) The enthalpy of the supply air can be calculated in the same manner. Do not use the equation in **FIGURE 11** to calculate the wet bulb temperature.

$$X_{SA} = \{X_{OA} - (Efficiency_{SA}) (X_{OA} - X_{RA})\}$$

FIGURE 11. Calculating supply temperatures and moisture content.

Where

X = dry bulb temperature in °F
-or- humidity content in gr/lb
-or- enthalpy in Btu/lbs.

Indices

SA = supply air
OA = outside air
RA = return air

EXAMPLE. Summer outdoor air design conditions are 90°F, 110 gr/lb with a return condition of 75°F, 65 gr/lb. Winter outdoor air design conditions are 5°F, 4 gr/lb with a return air condition of 70°F, 32 gr/lb. Using the equation in **FIGURE 11**, the summer supply temperature and humidity is calculated as follows:

- TSA = 90°F - .68 (90 - 75)°F = 79.8°F
- wSA = 110 gr/lb - .68 (110 - 65)gr/lb = 79 gr/lb

The winter supply air temperature and humidity level is calculated in the same fashion to give a condition of 49.2°F, 23 gr/lb.

5) DETERMINE IF FROST PROTECTION IS REQUIRED

Plotted on a psychrometric chart, the performance of an enthalpy recovery wheel will form a straight line between the outdoor air and return air conditions (See **FIGURE 12**). If this line does not pass through the saturated line on the psychrometric chart or if the leaving exhaust air condition of the wheel is not below freezing, the wheel will not frost. In general, if the space is not humidified above 30% relative humidity on extreme winter days and the outdoor design is above 0°F, then frost protection is probably not required.

Should frost protection be required, three different methods of frost protection are available on the

FLÄKTGROUP® SEMCO® FV-TS MODULES

- Preheat is used as the primary method of frost protection for the energy wheel in FläktGroup SEMCO FV-TS units. This employs an electric heater on the outdoor air intake to raise the incoming air temperature such that the operating line of the wheel no longer hits saturation. This is the preferred method since it requires usually only about 10°F of preheat to avoid frosting and the wheel continues to operate at full capacity even at the extreme conditions.

- The stop/jog economizer can be programmed to stop the wheel rotation below a preset outdoor air temperature. This has the disadvantage of introducing untreated, cold outdoor air to the HVAC unit or occupied space.

- A frost protection thermostat which turns the FläktGroup SEMCO FV-TS unit off below a preset outdoor air temperature is the third available option. This is generally considered the least attractive solution since it results in the unit supplying no outdoor air during low temperature periods.

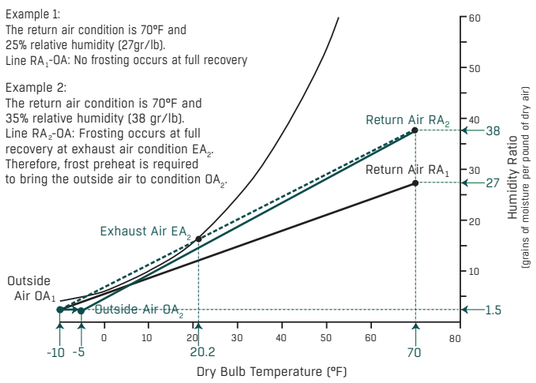


FIGURE 13. Using the psychrometric chart to determine the need for preheat frost control.

EXAMPLE. Since the outdoor air winter design temperature for this example is 5°F and the space humidity is 30%, preheating is not required.

6) DETERMINE DIMENSIONAL DATA

The FläktGroup SEMCO FV-TS pre-conditioner can be installed in one of four possible configurations depending on the arrangement of the supply and return air openings (See **FIGURES 14-17**).

The FV-V configuration is selected when the FläktGroup SEMCO FV-TS unit is mounted on a curb and ducted vertically. It provides preconditioned air either directly to the occupied space or to a HVAC unit located inside the facility. The FläktGroup SEMCO FV-H configuration is selected when the FläktGroup SEMCO FV-TS unit is mounted adjacent to a rooftop unit, or for other applications requiring a side connection for the supply and return air ducts.

The dimensional data for the various FläktGroup SEMCO FV-TS units is provided on **PAGES 29-36**. When noting dimensional information, only the supply and return outlet locations change between the configurations. All other dimensions remain the same.

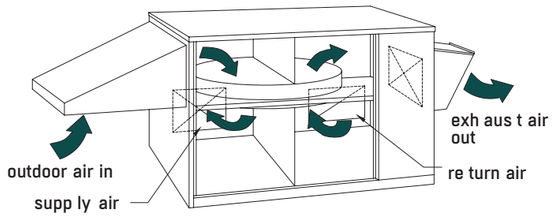


FIGURE 14. H configuration with horizontal supply air and horizontal return air duct arrangement.

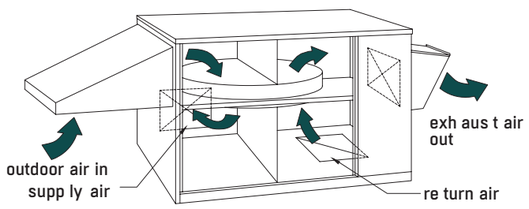


FIGURE 15. HS configuration with horizontal supply air and vertical return air duct arrangement.

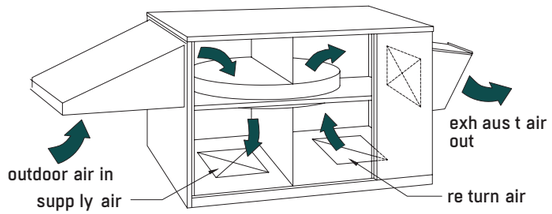


FIGURE 16. V configuration with vertical supply air and vertical return air duct arrangement.

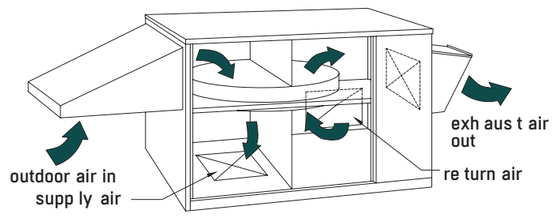


FIGURE 17. VS configuration with vertical supply air and horizontal return air duct arrangement.

EXAMPLE. Since the FläktGroup SEMCO FV-2000TS unit for this example will be roof mounted to serve several indoor HVAC units, the FläktGroup SEMCO FV-2000TS-V pre-conditioner is selected.

7) DETERMINE ELECTRICAL DATA

The electrical data is determined on by **FIGURES 18-20**. Since the electrical requirements are a function of the power source, the desired power source (voltage and phase) must be known before determining this information. If an electrical pre-heater is required, the electrical data should be increased appropriately by the information given in **FIGURE 31** on **PAGE 47**.

EXAMPLE. If 240V/1Ø power is available then the required minimum circuit ampacity and maximum overcurrent protection are determined as follows. For the SEMCO FV-2000TS with the motors selected in step 2 and no electric preheat, the minimum circuit ampacity is calculated using the equation in **FIGURE 18**.

1.25 * FLA largest fan motor	=	15.0 (1.25*12)
+ FLA other fan motor	=	12.0
+ FLA wheel drive	=	2.2
MCA	=	28.25

The maximum circuit overcurrent protection is calculated using the equation in **FIGURE 20**.

2.25 * FLA largest fan motor	=	27.0 (2.25*12)
+ FLA other fan motor	=	12.0
+ FLA wheel drive	=	2.2
MOP	=	41.2

Select motors using the fan tables on **PAGES 16-28** For the unit and motors selected, **FIGURE 30** on **PAGE 46** will have the corresponding full load amps (FLA) for each motor/device per UL Standard 1995 Sections 36.14-36.16.

To determine minimum circuit ampacity (MCA):

1.25 *	FLA largest fan motor (**FIGURE 30**)
+	FLA other fan motor (**FIGURE 30**)
+	FLA wheel drive (**FIGURE 30**)
=	MCA

FIGURE 18. Formula to determine minimum circuit ampacity (MCA) without pre-heater and with transformer less than 1 amp. See **FIGURE 30** on **PAGE 46**.

To determine minimum circuit ampacity (MCA):

	FLA exhaust fan motor (**FIGURE 30**)
+	FLA supply fan motor (**FIGURE 30**)
+	FLA wheel drive (**FIGURE 30**)
+	FLA transformer if ≥ 1 amp
+	FLA optional pre-heater (**FIGURE 31**)
*	1.25
=	MCA

FIGURE 19. Formula to determine minimum circuit ampacity (MCA) with pre-heater or with transformer equal to 1 amp or greater. See **FIGURE 30** on **PAGE 46** and **FIGURE 31** on **PAGE 47**.

To determine maximum overcurrent protection (MOP):

For all FläktGroup SEMCO FV-TS units:

2.25 * FLA largest fan motor (**FIGURE 30**)
\+ FLA other fan motor (**FIGURE 30**)
\+ FLA wheel drive (**FIGURE 30**)
\+ FLA transformer if ≥ 1 amp
\+ FLA optional pre-heater (**FIGURE 31**)
= MOP

Using the total above, select the next smaller sized time delay fuse (LOW-PEAK™, FUSETRON or equivalent) or HACR-type circuit breaker, minimum of 15 amps (some exceptions may apply). If the fuses/breakers do not hold, consult the National Electric Code for suitability of larger fuses/breakers.

FIGURE 20. Formula to determine maximum overcurrent protection (MOP.) See **FIGURE 30** on PAGE 49 and **FIGURE 31** on PAGE 50.

DIMENSIONS

Service clearance is a minimum of 4 ft. around the unit with the exception of the access side. The access service side is equal to the width of the unit.

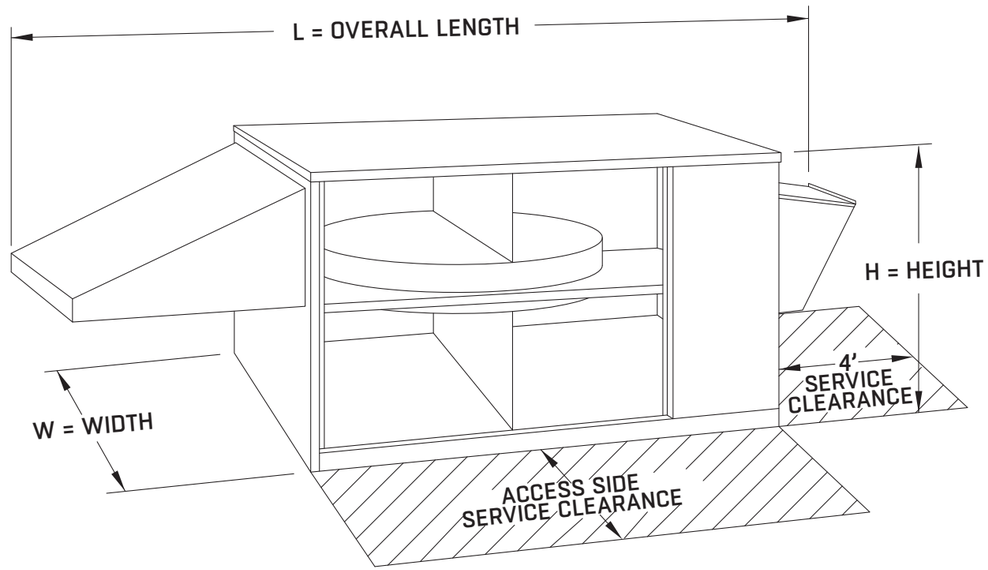


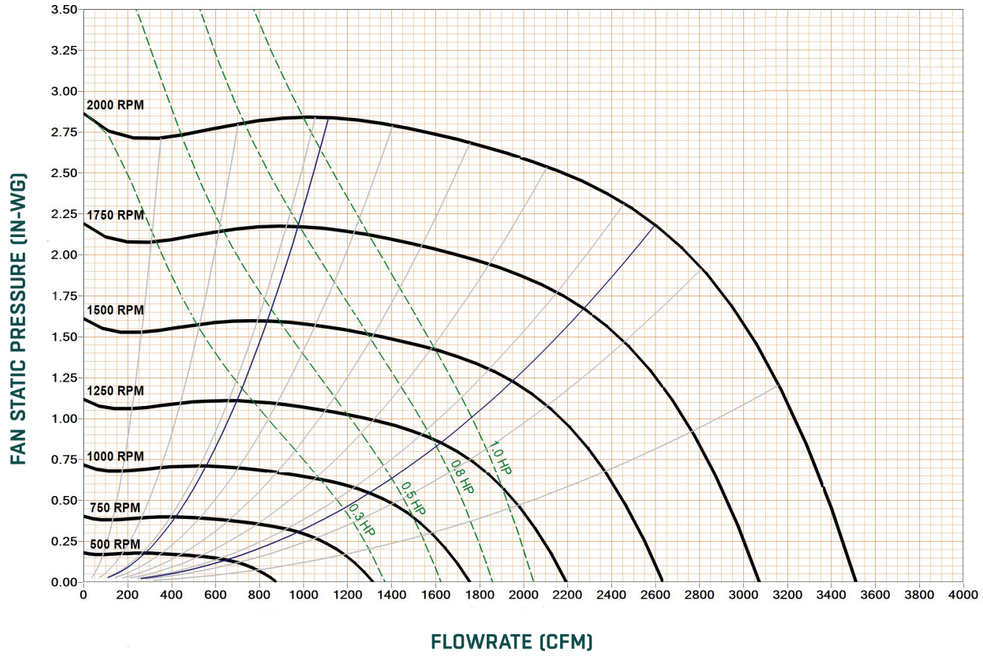
FIGURE 21. Overall unit dimensions.

FLÄKTGROUP SEMCO UNIT	L	H	W
(DIMENSIONS IN INCHES)			
FV-1000TS	77.5	31.1	29.1
FV-2000TS	88.5	32.6	37.0
FV-3000TS	102.7	47.8	45.0
FV-4000TS	133.8	51.9	54.0
FV-5000TS	133.8	51.9	54.0
FV-7500TS	150.3	59.0	64.6
FV-9000TS	150.3	59.0	64.6

FV-1000TS: FAN TABLES AND FAN CURVES

FLÄKTGROUP SEMCO FV-1000TS SUPPLY FAN ALL MOTORS 3/4HP, 1,625 RPM	EXTERNAL STATIC PRESSURE (IN.WG.)*								
	-0.3	-0.1	0.1	0.3	0.5	0.75	1.0	1.25	1.5
AIRFLOW (SCFM)	1245	1180	1115	1045	970	865	750	605	415

FLÄKTGROUP SEMCO FV-1000TS EXHAUST FAN ALL MOTORS 3/4HP, 1,625 RPM	EXTERNAL STATIC PRESSURE (IN.WG.)*								
	-0.3	-0.1	0.1	0.3	0.5	0.75	1.0	1.25	1.5
AIRFLOW (SCFM)	1255	1150	1040	925	805	645	480	300	-



NOTE: For power draw of motors, see **FIGURE 30** on PAGE 46. When sizing fan motors, it is not required to add purge air or seal leakage as these corrections are reflected in the fan charts.

*Positive statics reference external static pressures that work against the FläktGroup SEMCO FV-TS unit fan. Negative statics would work with the SEMCO FV-TS unit fan. For example, a FläktGroup SEMCO FV-TS pre-conditioner that is blowing into a mixing section of another air handling unit (AHU) with a -0.3" static pressure in the AHU mixing section would have a FläktGroup SEMCO FV-TS supply fan static of -0.3" and an exhaust fan static of +0.3". All statics internal to the FläktGroup SEMCO FV-TS unit are already included in the selection.

FV-2000TS: FAN TABLES AND FAN CURVES

FLÄKTGROUP SEMCO FV-2000TS SUPPLY FAN DATA

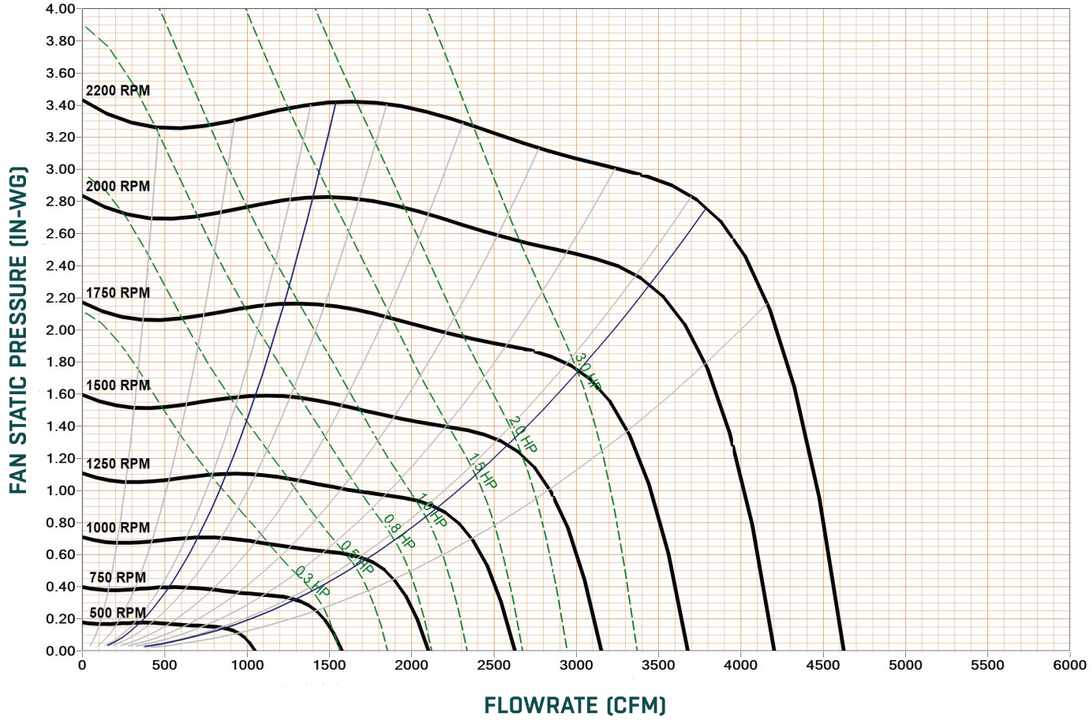
AIRFLOW (SCFM)	EXTERNAL STATIC PRESSURE (IN.WG.)*								
	-0.3	-0.1	0.1	0.3	0.5	0.75	1.0	1.25	1.5
	MOTOR BRAKE HORSEPOWER/RPM								
800	.10/438	.10/627	.10/815	.17/986	.24/1138	.31/1282	.38/1404	.44/1517	.52/1617
1000	.10/611	.13/783	.21/950	.28/1105	.35/1239	.44/1369	.52/1495	.61/1601	.68/1707
1200	.17/779	.25/934	.33/1086	.42/1227	.50/1336	.60/1472	.70/1586	.80/1699	.89/1798
1400	.31/938	.39/1084	.50/1222	.59/1335	.69/1447	.80/1571	.93/1691	1.04/1799	1.14/1876
1600	.47/1096	.58/1227	.70/1340	.81/1454	.92/1558	1.07/1684	1.19/1799	1.32/1884	1.45/1969
1800	.69/1239	.82/1353	.94/1466	1.07/1573	1.20/1679	1.36/1801	1.52/1893	1.67/1985	1.78/2078
2000	.96/1371	1.09/1482	1.24/1592	1.38/1703	1.54/1803	1.72/1902	1.89/2001	-	-

SUPPLIED MOTOR:

0.33 hp, 1725 rpm	0.75 hp, 1725 rpm	1.50 hp, 1725 rpm	2.00 hp, 1725 rpm

FLÄKTGROUP SEMCO FV-2000TS EXHAUST FAN DATA

AIRFLOW (SCFM)	EXTERNAL STATIC PRESSURE (IN.WG.)*								
	-0.3	-0.1	0.1	0.3	0.5	0.75	1.0	1.25	1.5
	MOTOR BRAKE HORSEPOWER/RPM								
800	.10/462	.10/718	.16/954	.23/1127	.31/1289	.41/1480	.51/1603	.58/1724	.66/1821
1000	.10/664	.18/914	.27/1084	.35/1252	.46/1415	.57/1568	.68/1694	.77/1803	.87/1896
1200	.21/882	.31/1058	.41/1226	.53/1397	.65/1536	.78/1669	.88/1789	1.00/1887	1.11/1985
1400	.37/1050	.48/1215	.61/1390	.76/1536	.88/1648	1.00/1779	1.14/1882	1.28/1986	1.39/2089
1600	.56/1219	.71/1394	.88/1542	1.02/1662	1.15/1775	1.30/1883	1.47/1991	1.59/2100	1.74/2208
1800	.83/1411	1.01/1558	1.18/1687	1.33/1798	1.48/1890	1.67/2004	1.82/2118	-	-
2000	1.17/1584	1.37/1726	1.55/1831	1.72/1927	1.89/2023	-	-	-	-



NOTE: For power draw of motors, see **FIGURE 30** on **PAGE 46**. When sizing fan motors, it is not required to add purge air or seal leakage as these corrections are reflected in the fan charts.

*Positive statics reference external static pressures that work against the FläktGroup SEMCO FV-TS unit fan. Negative statics would work with the SEMCO FV-TS unit fan. For example, a FläktGroup SEMCO FV-TS pre-conditioner that is blowing into a mixing section of another air handling unit (AHU) with a -0.3" static pressure in the AHU mixing section would have a FläktGroup SEMCO FV-TS supply fan static of -0.3" and an exhaust fan static of +0.3". All statics internal to the FläktGroup SEMCO FV-TS unit are already included in the selection.

FV-3000TS: FAN TABLES AND FAN CURVES

FLÄKTGROUP SEMCO FV-3000TS SUPPLY FAN DATA

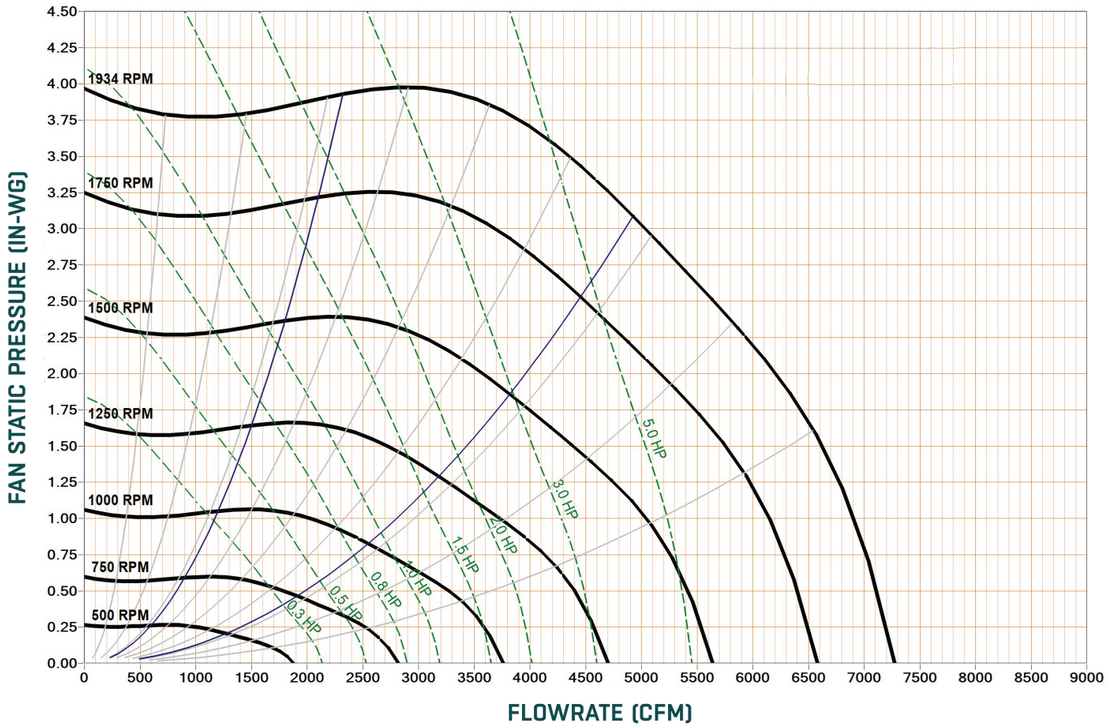
AIRFLOW (SCFM)	EXTERNAL STATIC PRESSURE (IN.WG.)*								
	-0.3	-0.1	0.1	0.3	0.5	0.75	1.0	1.25	1.5
	MOTOR BRAKE HORSEPOWER/RPM								
1800	.15/799	.23/912	.43/1021	.62/1124	.77/1203	.91/1302	1.10/1394	1.21/1473	1.24/1552
2000	.30/891	.50/1000	.70/1110	.88/1189	.99/1268	1.13/1366	1.28/1449	1.38/1531	1.50/1613
2200	.59/986	.78/1097	.98/1180	1.10/1258	1.20/1337	1.35/1427	1.49/1512	1.65/1598	1.80/1678
2400	.88/1090	1.07/1175	1.21/1254	1.31/1333	1.43/1408	1.59/1497	1.79/1587	1.95/1670	2.08/1736
2600	1.17/1175	1.32/1254	1.43/1334	1.56/1411	1.69/1486	1.93/1579	2.12/1666	2.26/1730	2.36/1794
2800	1.43/1259	1.55/1340	1.69/1419	1.87/1497	2.07/1576	2.30/1666	2.45/1728	2.57/1791	2.69/1853
3000	1.67/1351	1.84/1433	2.06/1516	2.28/1598	2.48/1669	2.65/1731	2.80/1793	-	-

SUPPLIED MOTOR:

0.75 hp, 1725 rpm	1.50 hp, 1725 rpm	2.00 hp, 1725 rpm	3.00 hp, 1725 rpm (3 phase only)

FLÄKTGROUP SEMCO FV-3000TS EXHAUST FAN DATA

AIRFLOW (SCFM)	EXTERNAL STATIC PRESSURE (IN.WG.)*								
	-0.3	-0.1	0.1	0.3	0.5	0.75	1.0	1.25	1.5
	MOTOR BRAKE HORSEPOWER/RPM								
1800	.15/689	.31/887	.50/1018	.68/1140	.85/1232	1.06/1347	1.29/1441	1.46/1527	1.64/1612
2000	.24/854	.49/983	.67/1112	.87/1206	1.04/1298	1.29/1407	1.51/1500	1.71/1593	1.94/1661
2200	.50/959	.68/1085	.89/1185	1.07/1277	1.27/1369	1.53/1471	1.77/1572	2.02/1653	2.20/1709
2400	.69/1066	.90/1170	1.11/1261	1.30/1352	1.54/1440	1.80/1547	2.08/1643	2.33/1703	2.47/1764
2600	.92/1161	1.14/1251	1.35/1341	1.59/1431	1.82/1520	2.10/1631	2.42/1696	2.59/1762	2.76/1827
2800	1.19/1246	1.41/1334	1.65/1425	1.89/1517	2.13/1609	2.48/1688	2.71/1759	2.89/1831	-
3000	1.47/1333	1.71/1423	1.97/1515	2.21/1607	2.49/1677	2.80/1755	-	-	-



NOTE: For power draw of motors, see **FIGURE 30** on **PAGE 46**. When sizing fan motors, it is not required to add purge air or seal leakage as these corrections are reflected in the fan charts.

*Positive statics reference external static pressures that work against the FläktGroup SEMCO FV-TS unit fan. Negative statics would work with the SEMCO FV-TS unit fan. For example, a FläktGroup SEMCO FV-TS pre-conditioner that is blowing into a mixing section of another air handling unit (AHU) with a -0.3" static pressure in the AHU mixing section would have a FläktGroup SEMCO FV-TS supply fan static of -0.3" and an exhaust fan static of +0.3". All statics internal to the FläktGroup SEMCO FV-TS unit are already included in the selection.

FV-4000TS: FAN TABLES AND FAN CURVES

FLÄKTGROUP SEMCO FV-4000TS SUPPLY FAN DATA

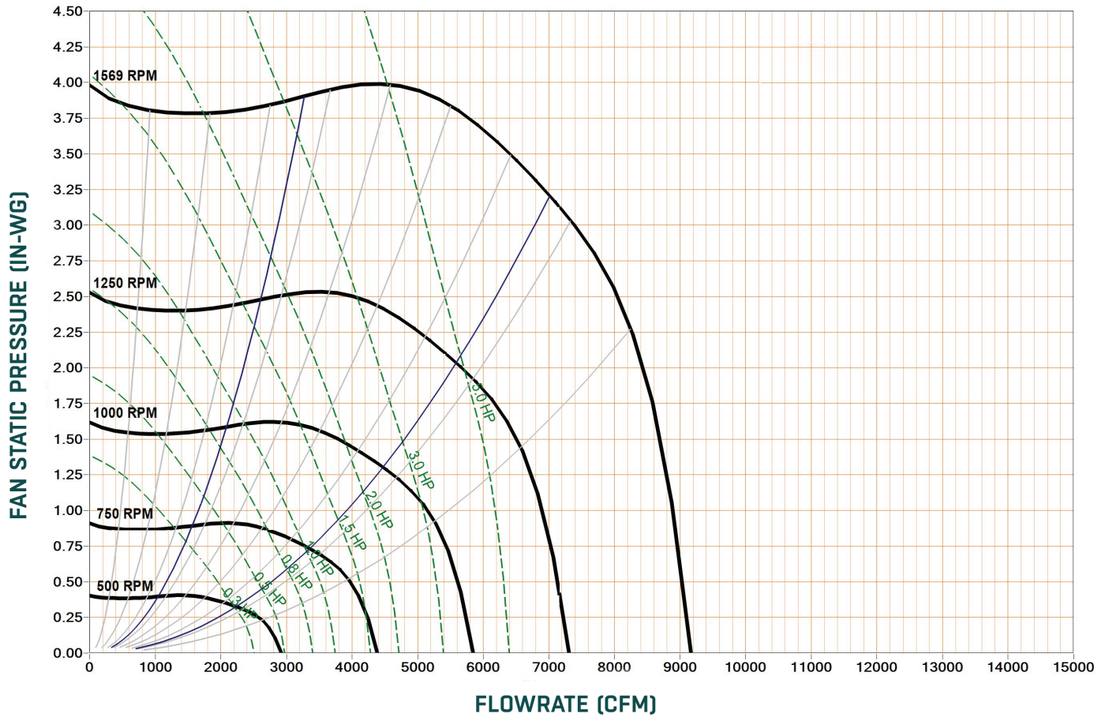
AIRFLOW (SCFM)	EXTERNAL STATIC PRESSURE (IN.WG.)*								
	-0.3	-0.1	0.1	0.3	0.5	0.75	1.0	1.25	1.5
	MOTOR BRAKE HORSEPOWER/RPM								
2600	.40/590	.52/666	.63/742	.74/817	.87/887	1.01/964	1.14/1040	1.31/1116	1.48/1200
2800	.54/648	.66/717	.77/786	.89/854	1.02/917	1.16/993	1.31/1069	1.49/1145	1.68/1229
3000	.69/700	.81/762	.93/824	1.06/886	1.18/948	1.33/1025	1.50/1102	1.69/1180	1.91/1260
3200	.85/746	.97/801	1.09/857	1.23/919	1.35/981	1.52/1060	1.72/1138	1.92/1214	2.16/1290
3400	1.03/784	1.15/834	1.27/889	1.41/954	1.54/1019	1.74/1100	1.95/1177	2.17/1248	2.42/1319
3600	1.21/816	1.33/860	1.46/927	1.60/994	1.75/1061	1.99/1146	2.22/1214	2.45/1281	2.70/1348
3800	1.40/843	1.52/898	1.66/969	1.83/1040	2.01/1112	2.27/1186	2.50/1249	2.75/1313	3.00/1376
4000	1.59/867	1.71/943	1.89/1020	2.08/1096	2.31/1164	2.58/1224	2.81/1284	3.06/1343	3.31/1403

SUPPLIED MOTOR:

0.75 hp, 1725 rpm	1.50 hp, 1725 rpm	2.00 hp, 1725 rpm	3.00 hp, 1725 rpm (3 phase only)	5.00 hp, 1725 rpm (3 phase only)

FLÄKTGROUP SEMCO FV-4000TS EXHAUST FAN DATA

AIRFLOW (SCFM)	EXTERNAL STATIC PRESSURE (IN.WG.)*								
	-0.3	-0.1	0.1	0.3	0.5	0.75	1.0	1.25	1.5
	MOTOR BRAKE HORSEPOWER/RPM								
2600	.46/632	.60/728	.74/822	.90/903	1.01/974	1.17/1062	1.35/1149	1.51/1202	1.64/1254
2800	.60/688	.75/778	.90/867	1.05/940	1.17/1012	1.36/1101	1.56/1174	1.69/1225	1.84/1277
3000	.76/741	.91/827	1.08/906	1.22/981	1.36/1055	1.57/1148	1.76/1201	1.90/1252	2.05/1304
3200	.93/791	1.09/872	1.26/950	1.41/1028	1.58/1106	1.82/1179	1.98/1231	2.14/1284	2.30/1336
3400	1.11/838	1.29/919	1.46/1002	1.63/1084	1.84/1159	2.08/1213	2.23/1267	2.40/1321	2.57/1374
3600	1.32/887	1.50/976	1.69/1065	1.91/1152	2.14/1197	2.33/1253	2.51/1309	2.69/1365	2.87/1422
3800	1.54/949	1.75/1046	1.97/1144	2.24/1195	2.45/1242	2.63/1302	2.82/1362	3.02/1421	3.21/1481
4000	1.79/1029	2.04/1138	2.33/1196	2.60/1248	2.76/1299	2.97/1364	3.18/1428	3.40/1493	3.62/1557



NOTE: For power draw of motors, see **FIGURE 30** on **PAGE 46**. When sizing fan motors, it is not required to add purge air or seal leakage as these corrections are reflected in the fan charts.

*Positive statics reference external static pressures that work against the FläktGroup SEMCO FV-TS unit fan. Negative statics would work with the SEMCO FV-TS unit fan. For example, a FläktGroup SEMCO FV-TS pre-conditioner that is blowing into a mixing section of another air handling unit (AHU) with a -0.3" static pressure in the AHU mixing section would have a FläktGroup SEMCO FV-TS supply fan static of -0.3" and an exhaust fan static of +0.3". All statics internal to the FläktGroup SEMCO FV-TS unit are already included in the selection.

FV-5000TS: FAN TABLES AND FAN CURVES

FLÄKTGROUP SEMCO FV-5000TS SUPPLY FAN DATA

AIRFLOW (SCFM)	EXTERNAL STATIC PRESSURE (IN.WG.)*								
	-0.3	-0.1	0.1	0.3	0.5	0.75	1.0	1.25	1.5
	MOTOR BRAKE HORSEPOWER/RPM								
2600	.23/433	.37/537	.52/637	.66/708	.80781	.99/857	1.15/921	1.32/986	1.50/1044
3000	.42/525	.59/629	.75/701	.90/773	1.07/838	1.26/904	1.44/969	1.62/1031	1.83/1084
3400	.66/629	.86/700	1.02/772	1.21/837	1.39/890	1.59/957	1.78/1022	2.01/1076	2.22/1131
3800	.99/706	1.16/776	1.37/841	1.57/895	1.75/949	1.97/1017	2.21/1073	2.45/1130	2.71/1186
4200	1.34/786	1.56/849	1.79/905	1.98/961	2.18/1017	2.44/1075	2.71/1133	2.99/1191	3.29/1227
4600	1.79/862	2.03/920	2.25/979	2.47/1033	2.71/1082	3.01/1142	3.32/1202	3.64/1237	3.87/1268
5000	2.31/943	2.56/1005	2.81/1057	3.08/1107	3.34/1156	3.68/1216	4.04/1257	4.30/1297	4.49/1338
5400	2.92/1036	3.20/1087	3.51/1139	3.80/1190	4.11/1237	4.49/1291	-	-	-
5800	3.68/1126	4.01/1179	4.33/1233	-	-	-	-	-	-
6200	4.59/1229	-	-	-	-	-	-	-	-

SUPPLIED MOTOR:

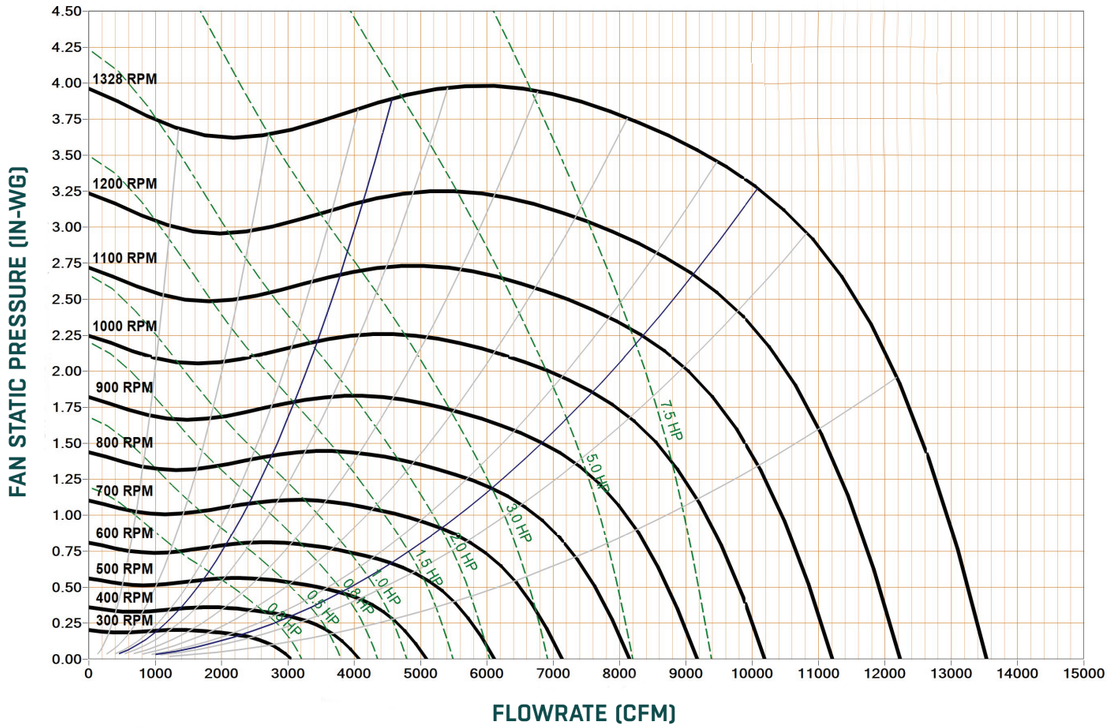
0.75 hp, 1725 rpm	1.50 hp, 1725 rpm	2.00 hp, 1725 rpm	3.00 hp, 1725 rpm (3 phase only)	5.00 hp, 1725 rpm (3 phase only)

FLÄKTGROUP SEMCO FV-5000TS EXHAUST FAN DATA

AIRFLOW (SCFM)	EXTERNAL STATIC PRESSURE (IN.WG.)*								
	-0.3	-0.1	0.1	0.3	0.5	0.75	1.0	1.25	1.5
	MOTOR BRAKE HORSEPOWER/RPM								
2600	.28/474	.45/607	.63/698	.79/784	.98/861	1.19/948	1.41/1029	1.63/1089	1.84/1149
3000	.49/588	.71/689	.88/775	1.09/854	1.29/925	1.53/1014	1.78/1077	2.01/1139	2.26/1202
3400	.80/686	.99/771	1.22/851	1.45/923	1.66/995	1.95/1067	2.20/1132	2.48/1198	2.78/1258
3800	1.13/773	1.38/852	1.63/925	1.87/998	2.11/1058	2.41/1127	2.72/1197	3.05/1263	3.39/1327
4200	1.56/857	1.83/930	2.09/1003	2.36/1066	2.64/1126	2.98/1200	3.35/1270	3.74/1339	4.15/1408
4600	2.06/939	2.35/1013	2.64/1078	2.96/1143	3.27/1209	3.69/1282	4.13/1355	4.59/1428	-
5000	2.64/1025	2.95/1097	3.32/1169	3.68/1237	4.06/1297	4.56/1373	-	-	-
5400	3.31/1125	3.72/1208	4.16/1270	4.61/1332	-	-	-	-	-
5800	4.19/1246	4.71/1307	-	-	-	-	-	-	-
6200	-	-	-	-	-	-	-	-	-

SUPPLIED MOTOR:

0.75 hp, 1725 rpm	1.50 hp, 1725 rpm	2.00 hp, 1725 rpm	3.00 hp, 1725 rpm (3 phase only)



NOTE: For power draw of motors, see **FIGURE 30** on **PAGE 46**. When sizing fan motors, it is not required to add purge air or seal leakage as these corrections are reflected in the fan charts.

*Positive statics reference external static pressures that work against the FläktGroup SEMCO FV-TS unit fan. Negative statics would work with the SEMCO FV-TS unit fan. For example, a FläktGroup SEMCO FV-TS pre-conditioner that is blowing into a mixing section of another air handling unit (AHU) with a -0.3" static pressure in the AHU mixing section would have a FläktGroup SEMCO FV-TS supply fan static of -0.3" and an exhaust fan static of +0.3". All statics internal to the FläktGroup SEMCO FV-TS unit are already included in the selection.

FV-7500TS: FAN TABLES AND FAN CURVES

FLÄKTGROUP SEMCO FV-7500TS SUPPLY FAN DATA

AIRFLOW (SCFM)	EXTERNAL STATIC PRESSURE (IN.WG.)*								
	-0.3	-0.1	0.1	0.3	0.5	0.75	1.0	1.25	1.5
	MOTOR BRAKE HORSEPOWER/RPM								
4500	.99/585	1.16/647	1.34/708	1.53/770	1.74/818	1.97/877	2.20/935	2.42/991	2.65/1042
5000	1.35/647	1.55/707	1.75/766	1.99/815	2.18/861	2.43/918	2.68/975	2.92/1025	3.19/1076
5500	1.79/710	2.01/767	2.26/815	2.47/860	2.69/905	2.97/962	3.24/1013	3.51/1064	3.82/1114
6000	2.30/773	2.56/819	2.79/864	3.04/909	3.28/954	3.58/1006	3.87/1056	4.20/1106	4.53/1156
6500	2.91/826	3.16/871	3.43/916	3.70/961	3.96/1003	4.28/1053	4.63/1103	4.99/1154	5.35/1210
7000	3.57/883	3.86/928	4.16/974	4.46/1014	4.74/1055	5.11/1105	5.50/1156	5.88/1215	6.29/1277
7500	4.35/945	4.68/989	5.01/1030	5.31/1071	5.64/1112	6.06/1164	6.48/1229	6.91/1296	7.46/1330
8000	5.27/1009	5.63/1051	5.96/1093	6.33/1135	6.70/1180	7.14/1253	7.61/1316	8.23/1351	8.76/1386
8500	6.33/1078	6.70/1122	7.10/1165	7.51/1227	7.88/1292	8.41/1339	9.11/1379	-	-
9000	7.54/1157	7.98/1222	8.40/1296	8.80/1333	-	-	-	-	-

SUPPLIED MOTOR:

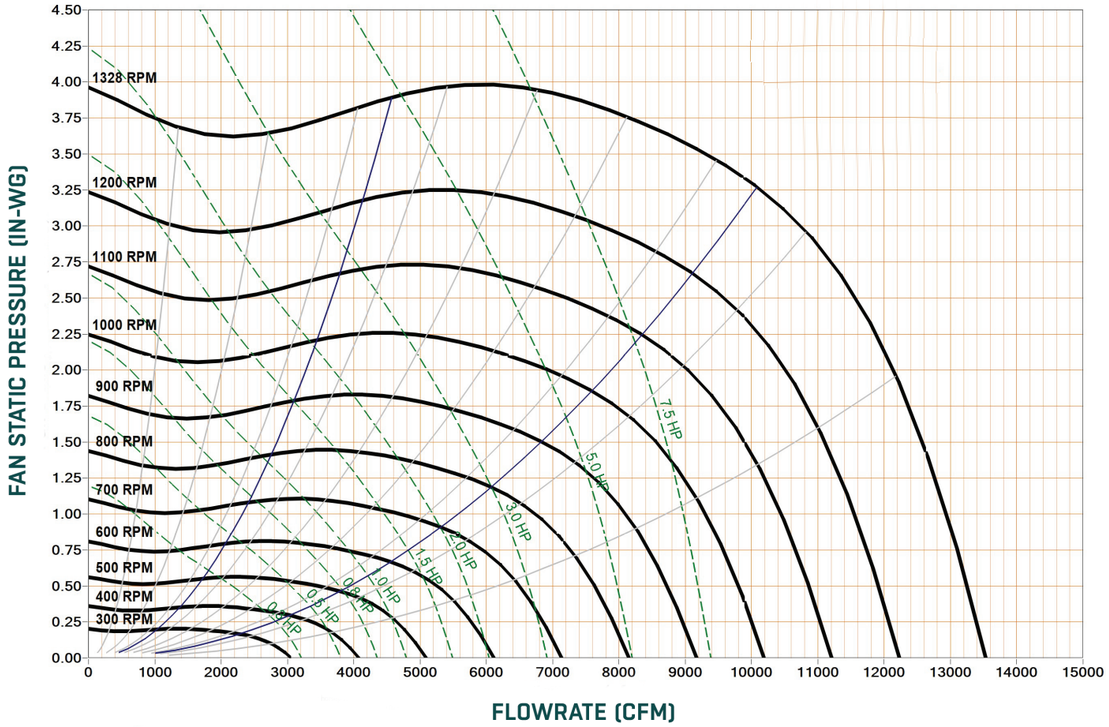
2.00 hp, 1725 rpm	3.00 hp, 1725 rpm (3 phase only)	5.00 hp, 1725 rpm (3 phase only)	7.50 hp, 1725 rpm (3 phase only)	10.00 hp, 1725 rpm (3 phase only)

FLÄKTGROUP SEMCO FV-7500TS EXHAUST FAN DATA

AIRFLOW (SCFM)	EXTERNAL STATIC PRESSURE (IN.WG.)*								
	-0.3	-0.1	0.1	0.3	0.5	0.75	1.0	1.25	1.5
	MOTOR BRAKE HORSEPOWER/RPM								
4500	1.09/624	1.34/719	1.64/792	1.83/843	2.03/895	2.27/957	2.49/1015	2.73/1073	3.00/1131
5000	1.48/698	1.80/782	2.07/835	2.29/888	2.51/941	2.78/1005	3.05/1068	3.37/1132	3.71/1207
5500	1.97/774	2.32/828	2.57/883	2.83/938	3.08/994	3.39/1064	3.77/1135	4.16/1214	4.65/1293
6000	2.60/823	2.87/879	3.16/936	3.45/998	3.75/1061	4.19/1139	4.65/1222	5.19/1306	5.79/1389
6500	3.18/878	3.52/936	3.85/1006	4.21/1075	4.63/1145	5.17/1233	5.77/1321	6.44/1410	7.17/1454
7000	3.90/939	4.28/1017	4.71/1095	5.21/1172	5.72/1247	6.39/1340	7.14/1427	7.96/1471	8.56/1516
7500	4.74/1034	5.25/1122	5.85/1203	6.46/1283	7.07/1363	7.90/1442	8.80/1493	-	-
8000	5.84/1155	6.57/1240	7.28/1326	7.97/1411	8.72/1461	-	-	-	-
8500	7.38/1285	8.18/1377	8.98/1447	-	-	-	-	-	-
9000	9.17/1430	-	-	-	-	-	-	-	-

SUPPLIED MOTOR:

2.00 hp, 1725 rpm	3.00 hp, 1725 rpm (3 phase only)	5.00 hp, 1725 rpm (3 phase only)	7.50 hp, 1725 rpm (3 phase only)	10.00 hp, 1725 rpm (3 phase only)



NOTE: For power draw of motors, see **FIGURE 30** on **PAGE 46**. When sizing fan motors, it is not required to add purge air or seal leakage as these corrections are reflected in the fan charts.

*Positive statics reference external static pressures that work against the FläktGroup SEMCO FV-TS unit fan. Negative statics would work with the SEMCO FV-TS unit fan. For example, a FläktGroup SEMCO FV-TS pre-conditioner that is blowing into a mixing section of another air handling unit (AHU) with a -0.3" static pressure in the AHU mixing section would have a FläktGroup SEMCO FV-TS supply fan static of -0.3" and an exhaust fan static of +0.3". All statics internal to the FläktGroup SEMCO FV-TS unit are already included in the selection.

FV-9000TS: FAN TABLES AND FAN CURVES

FLÄKTGROUP SEMCO FV-9000TS SUPPLY FAN DATA

AIRFLOW (SCFM)	EXTERNAL STATIC PRESSURE (IN.WG.)*								
	-0.3	-0.1	0.1	0.3	0.5	0.75	1.0	1.25	1.5
	MOTOR BRAKE HORSEPOWER/RPM								
6000	2.30/772	2.56/818	2.79/864	3.03/909	3.29/955	3.59/1007	3.88/1057	4.21/1107	4.54/1156
6500	2.91/825	3.15/870	3.43/917	3.70/962	3.97/1004	4.28/1054	4.64/1104	4.99/1154	5.35/1209
7000	3.56/882	3.86/927	4.17/974	4.46/1015	4.74/1055	5.12/1106	5.50/1157	5.89/1214	6.28/1277
7500	4.35/944	4.68/990	5.01/1031	5.32/1072	5.65/1113	6.07/1165	6.48/1228	6.90/1295	7.45/1329
8000	5.26/1010	5.62/1052	5.97/1094	6.34/1136	6.70/1179	7.15/1252	7.60/1315	8.22/1350	8.76/1385
8500	6.32/1079	6.71/1121	7.11/1164	7.51/1225	7.89/1290	8.40/1338	9.10/1378	9.64/1418	9.97/1458
9000	7.55/1157	7.99/1221	8.41/1295	8.79/1332	9.33/1364	10.13/1403	10.63/1442	11.05/1481	11.50/1520
9500	8.98/1308	9.40/1335	9.90/1361	10.63/1388	11.26/1414	11.73/1447	12.20/1480	-	-
10000	10.52/1357	11.36/1377	12.12/1398	12.49/1418	-	-	-	-	-

SUPPLIED MOTOR:

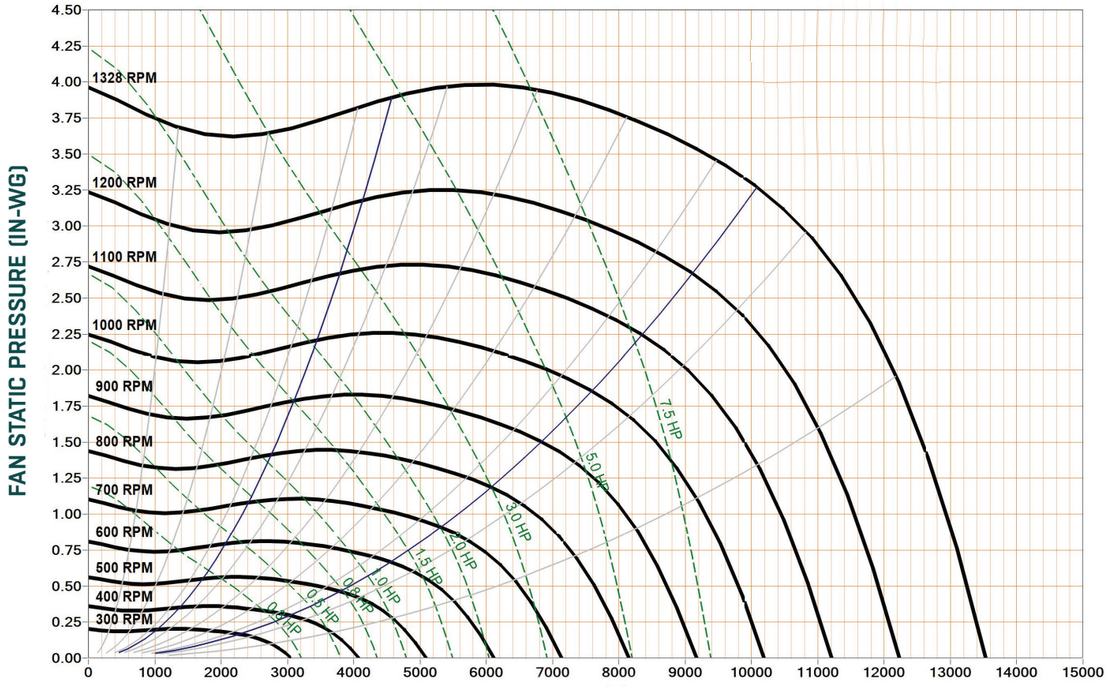
3.00 hp, 1725 rpm (3 phase only)	5.00 hp, 1725 rpm (3 phase only)	7.50 hp, 1725 rpm (3 phase only)	10.00 hp, 1725 rpm (3 phase only)	15.00 hp, 1725 rpm (460V, 3 phase only)

FLÄKTGROUP SEMCO FV-9000TS EXHAUST FAN DATA

AIRFLOW (SCFM)	EXTERNAL STATIC PRESSURE (IN.WG.)*								
	-0.3	-0.1	0.1	0.3	0.5	0.75	1.0	1.25	1.5
	MOTOR BRAKE HORSEPOWER/RPM								
6000	2.59/824	2.86/880	3.16/937	3.46/999	3.75/1062	4.20/1140	4.66/1224	5.19/1305	5.80/1388
6500	3.19/877	3.53/937	3.86/1007	4.22/1077	4.63/1146	5.18/1234	5.78/1320	6.43/1408	7.16/1454
7000	3.91/941	4.29/1019	4.71/1096	5.22/1173	5.73/1248	6.41/1339	7.13/1426	7.95/1471	8.56/1516
7500	4.74/1036	5.26/1123	5.86/1205	6.48/1283	7.08/1361	7.89/1441	8.79/1494	9.43/1545	9.91/1596
8000	5.85/1157	6.58/1239	7.29/1324	7.99/1410	8.71/1461	9.71/1519	10.39/1577	10.98/1634	11.56/1691
8500	7.39/1283	8.19/1375	8.99/1446	9.82/1495	10.74/1546	11.44/1608	12.14/1670	-	-
9000	9.16/1429	10.08/1480	11.05/1531	11.93/1584	12.57/1635	13.38/1698	-	-	-
9500	9.88/1512	10.77/1562	11.65/1614	-	-	-	-	-	-
10000	10.52/1585	11.36/1633	-	-	-	-	-	-	-

SUPPLIED MOTOR:

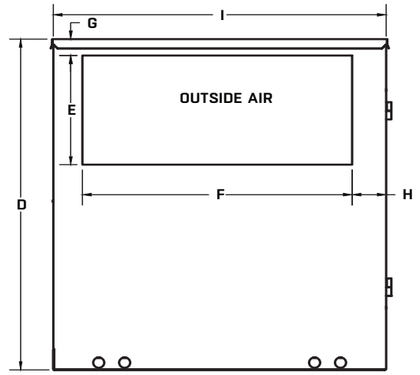
3.00 hp, 1725 rpm (3 phase only)	5.00 hp, 1725 rpm (3 phase only)	7.50 hp, 1725 rpm (3 phase only)	10.00 hp, 1725 rpm (3 phase only)	15.00 hp, 1725 rpm (460V, 3 phase only)



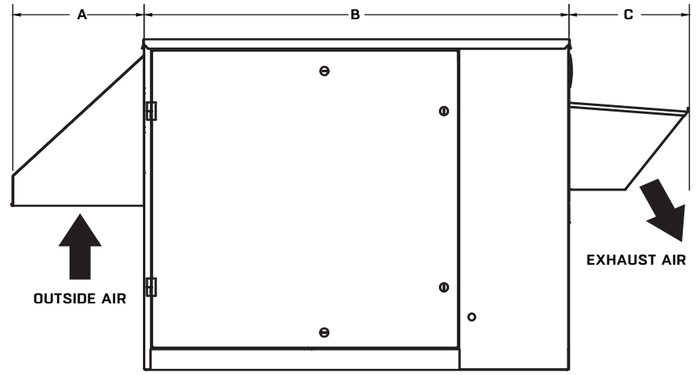
NOTE: For power draw of motors, see **FIGURE 30** on **PAGE 46**. When sizing fan motors, it is not required to add purge air or seal leakage as these corrections are reflected in the fan charts.

*Positive statics reference external static pressures that work against the FläktGroup SEMCO FV-TS unit fan. Negative statics would work with the SEMCO FV-TS unit fan. For example, a FläktGroup SEMCO FV-TS pre-conditioner that is blowing into a mixing section of another air handling unit (AHU) with a -0.3" static pressure in the AHU mixing section would have a FläktGroup SEMCO FV-TS supply fan static of -0.3" and an exhaust fan static of +0.3". All statics internal to the FläktGroup SEMCO FV-TS unit are already included in the selection.

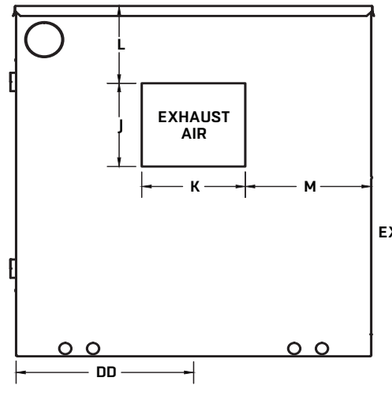
UNIT ARRANGEMENT H SERIES



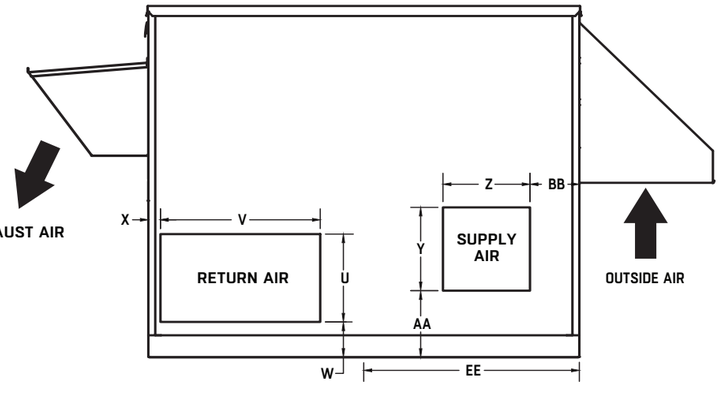
LEFT VIEW



FRONT VIEW



RIGHT VIEW



BACK VIEW

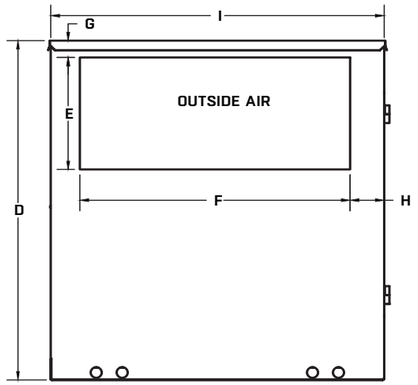
PLAN VIEW

FLÄKTGROUP® SEMCO® MODEL	NET WT. (LBS.)	DIMENSIONS (INCHES)								
		A	B	C	D	E	F	G	H	I
FV-1000TS H	500	16.5	44.3	16.7	31.1	7.6	22.6	2.6	4.1	29.1
FV-2000TS H	550	20.4	51.4	16.7	32.6	9.1	28.5	2.5	4.5	37.0
FV-3000TS H	1000	20.4	64.8	17.5	47.8	15.8	36.4	2.3	5.0	45.0
FV-4000TS H	1150	32.7	78.8	22.3	51.9	15.8	44.3	2.5	4.8	54.0
FV-5000TS H	1150	32.7	78.8	22.3	51.9	15.8	44.3	2.5	4.8	54.0
FV-7500TS H	1800	32.7	95.3	22.3	59.0	20.8	54.1	2.7	5.2	64.6
FV-9000TS H	1800	32.7	95.3	22.3	59.0	20.8	54.1	2.7	5.2	64.6

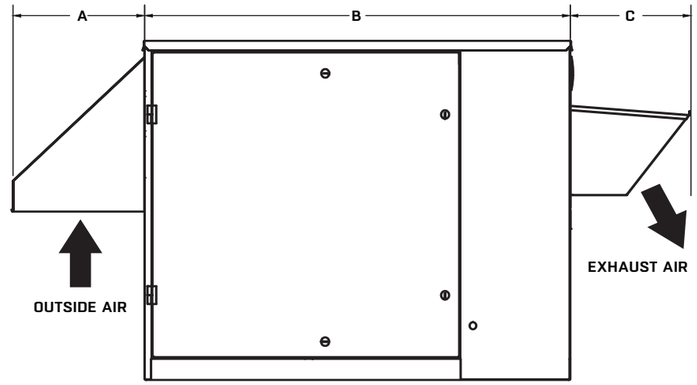
FLÄKTGROUP SEMCO MODEL	NET WT. (LBS.)	DIMENSIONS (INCHES)													
		J	K	L	M	U	V	W	X	Y	Z	AA	BB	DD	EE
FV-1000TS H	500	10.2	9.2	4.2	9.9	7.0	16.0	3.8	8.0	10.2	9.3	5.8	5.0	13.6	21.3
FV-2000TS H	550	10.2	11.7	4.3	7.3	7.8	23.0	3.2	2.7	10.1	11.7	4.9	4.3	17.4	24.7
FV-3000TS H	1000	11.4	13.1	10.6	16.0	12.0	24.0	4.8	1.8	11.4	13.1	9.1	7.4	21.2	31.1
FV-4000TS H	1150	13.4	14.6	11.8	19.6	20.0	19.0	4.3	2.4	13.4	14.6	10.2	7.1	25.4	37.8
FV-5000TS H	1150	15.9	18.6	9.5	17.6	20.0	19.0	4.3	2.4	15.9	18.6	11.4	5.2	25.4	37.8
FV-7500TS H	1800	15.9	18.6	11.6	23.0	16.5	47.2	4.3	7.4	15.9	18.6	11.6	8.0	30.4	45.7
FV-9000TS H	1800	15.9	18.6	11.6	23.0	16.5	47.2	4.3	7.4	15.9	18.6	11.6	8.0	30.4	45.7

NOTE: Dimensions DD & EE represent approximate unit center of gravity.

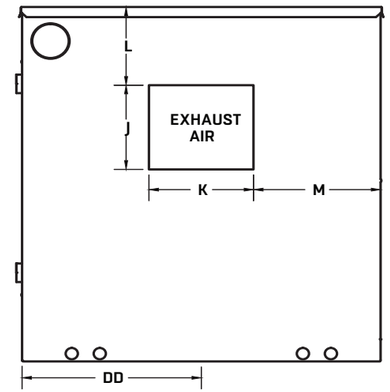
UNIT ARRANGEMENT HS SERIES



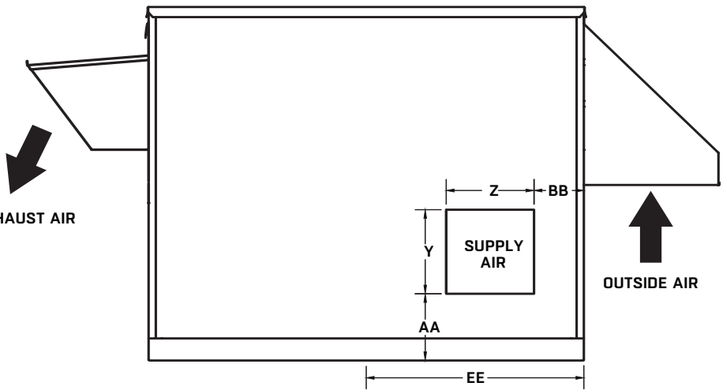
LEFT VIEW



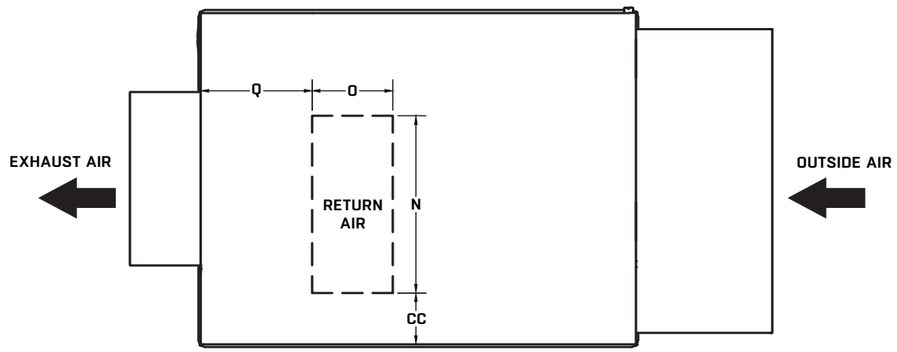
FRONT VIEW



RIGHT VIEW



BACK VIEW



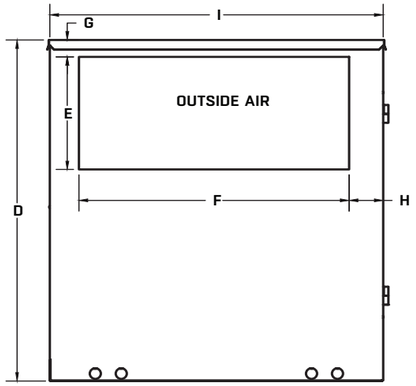
PLAN VIEW

FLÄKTGROUP SEMCO MODEL	NET WT. (LBS.)	DIMENSIONS (INCHES)								
		A	B	C	D	E	F	G	H	I
FV-1000TS HS	500	16.5	44.3	16.7	31.1	7.6	22.6	2.6	4.1	29.1
FV-2000TS HS	550	20.4	51.4	16.7	32.6	9.1	28.5	2.5	4.5	37.0
FV-3000TS HS	1000	20.4	64.8	17.5	47.8	15.8	36.4	2.3	5.0	45.0
FV-4000TS HS	1150	32.7	78.8	22.3	51.9	15.8	44.3	2.5	4.8	54.0
FV-5000TS HS	1150	32.7	78.8	22.3	51.9	15.8	44.3	2.5	4.8	54.0
FV-7500TS HS	1800	32.7	95.3	22.3	59.0	20.8	54.1	2.7	5.2	64.6
FV-9000TS HS	1800	32.7	95.3	22.3	59.0	20.8	54.1	2.7	5.2	64.6

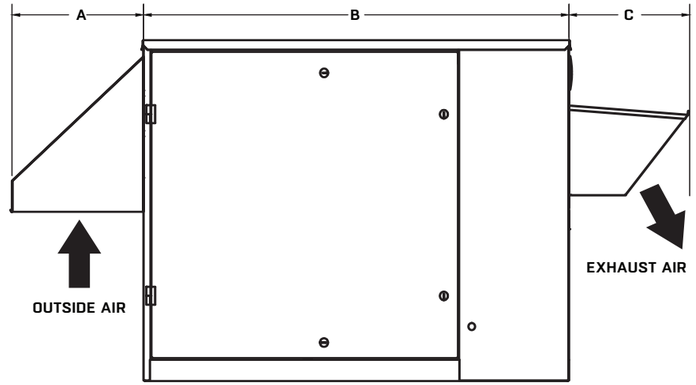
FLÄKTGROUP SEMCO MODEL	NET WT. (LBS.)	DIMENSIONS (INCHES)												
		J	K	L	M	N	O	Q	Y	Z	AA	BB	CC	DD	EE
FV-1000TS HS	500	10.2	9.2	4.2	9.9	11.1	10.0	12.6	10.2	9.3	5.8	5.0	9.0	13.6	21.3
FV-2000TS HS	550	10.2	11.7	4.3	7.3	19.7	9.1	17.9	10.1	11.7	4.9	4.3	7.9	17.4	24.7
FV-3000TS HS	1000	11.4	13.1	10.6	16.0	24.0	12.0	16.6	11.4	13.1	9.1	7.4	7.0	21.2	31.1
FV-4000TS HS	1150	13.4	14.6	11.8	19.6	20.0	19.0	20.7	13.4	14.6	10.2	7.1	11.9	25.4	37.8
FV-5000TS HS	1150	15.9	18.6	9.5	17.6	20.0	19.0	20.7	15.9	18.6	11.4	5.2	11.9	25.4	37.8
FV-7500TS HS	1800	15.9	18.6	11.6	23.0	47.2	16.5	25.2	15.9	18.6	11.6	8.0	4.0	30.4	45.7
FV-9000TS HS	1800	15.9	18.6	11.6	23.0	47.2	16.5	25.2	15.9	18.6	11.6	8.0	4.0	30.4	45.7

NOTE: Dimensions DD & EE represent approximate unit center of gravity.

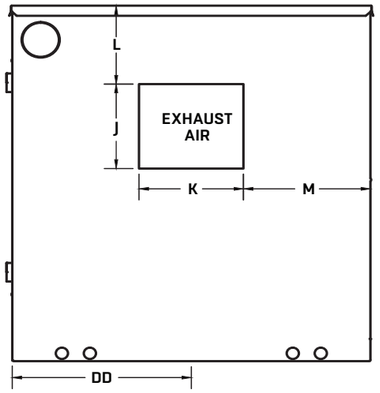
UNIT ARRANGEMENT V SERIES



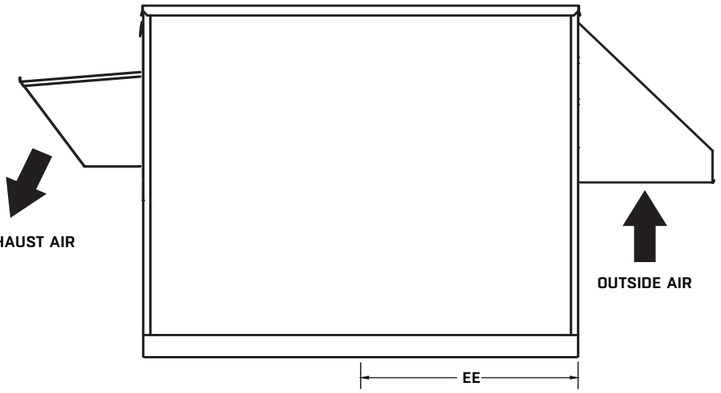
LEFT VIEW



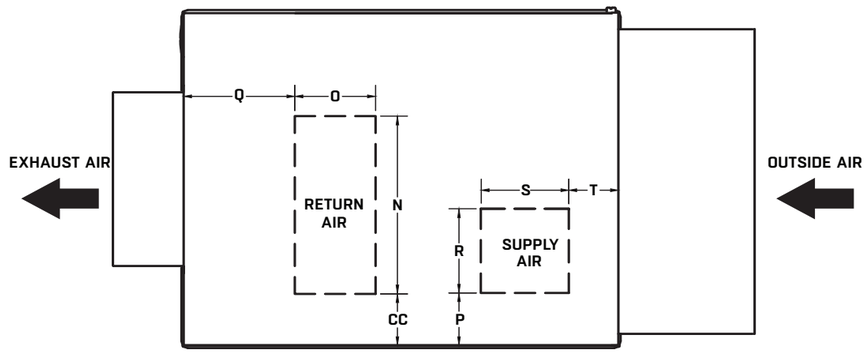
FRONT VIEW



RIGHT VIEW



BACK VIEW



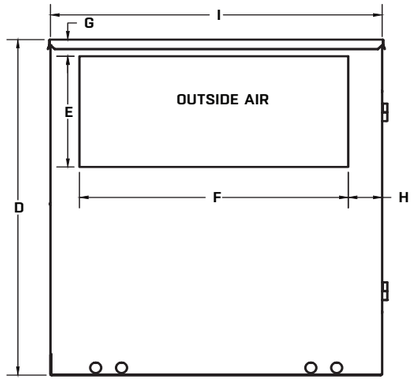
PLAN VIEW

FLÄKTGROUP SEMCO MODEL	NET WT. (LBS.)	DIMENSIONS (INCHES)								
		A	B	C	D	E	F	G	H	I
FV-1000TS V	500	16.5	44.3	16.7	31.1	7.6	22.6	2.6	4.1	29.1
FV-2000TS V	550	20.4	51.4	16.7	32.6	9.1	28.5	2.5	4.5	37.0
FV-3000TS V	1000	20.4	64.8	17.5	47.8	15.8	36.4	2.3	5.0	45.0
FV-4000TS V	1150	32.7	78.8	22.3	51.9	15.8	44.3	2.5	4.8	54.0
FV-5000TS V	1150	32.7	78.8	22.3	51.9	15.8	44.3	2.5	4.8	54.0
FV-7500TS V	1800	32.7	95.3	22.3	59.0	20.8	54.1	2.7	5.2	64.6
FV-9000TS V	1800	32.7	95.3	22.3	59.0	20.8	54.1	2.7	5.2	64.6

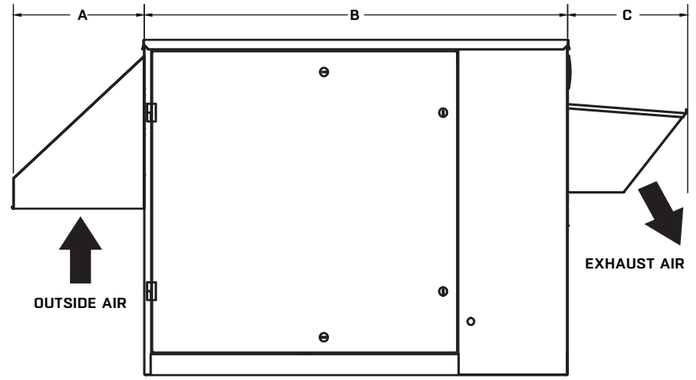
FLÄKTGROUP SEMCO MODEL	NET WT. (LBS.)	DIMENSIONS (INCHES)												
		J	K	L	M	N	O	P	Q	R	S	T	CC	DD	EE
FV-1000TS V	500	10.2	9.2	4.2	9.9	11.1	10.0	7.0	12.6	10.2	9.3	5.0	9.0	13.6	21.3
FV-2000TS V	550	10.2	11.7	4.3	7.3	19.7	9.1	5.9	17.9	10.3	11.8	4.1	7.9	17.4	24.7
FV-3000TS V	1000	11.4	13.1	10.6	16.0	24.0	12.0	7.1	16.6	11.4	13.1	7.4	7.0	21.2	31.1
FV-4000TS V	1150	13.4	14.6	11.8	19.6	20.0	19.0	7.3	20.7	13.5	14.7	7.1	11.9	25.4	37.8
FV-5000TS V	1150	15.9	18.6	9.5	17.6	20.0	19.0	8.9	20.7	15.9	18.6	5.2	11.9	25.4	37.8
FV-7500TS V	1800	15.9	18.6	11.6	23.0	47.2	16.5	9.0	25.2	15.9	18.6	7.9	4.0	30.4	45.7
FV-9000TS V	1800	15.9	18.6	11.6	23.0	47.2	16.5	9.0	25.2	15.9	18.6	7.9	4.0	30.4	45.7

NOTE: Dimensions DD & EE represent approximate unit center of gravity.

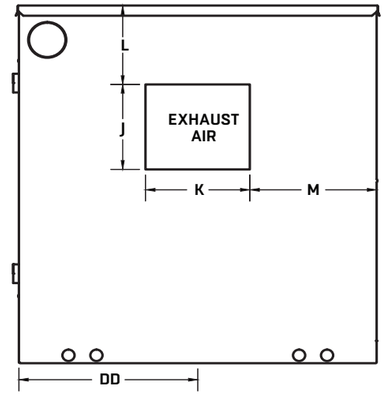
UNIT ARRANGEMENT VS SERIES



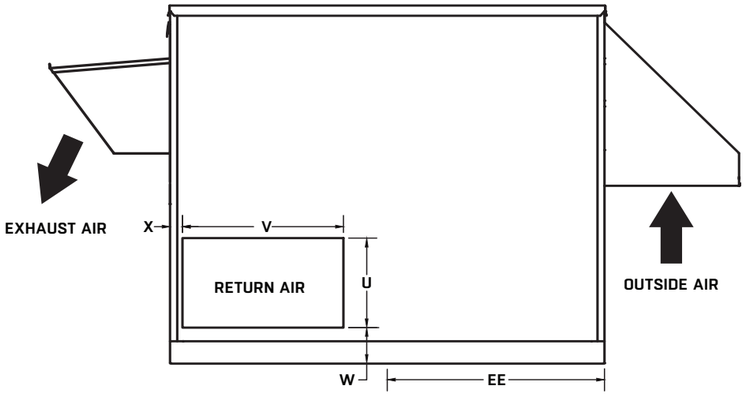
LEFT VIEW



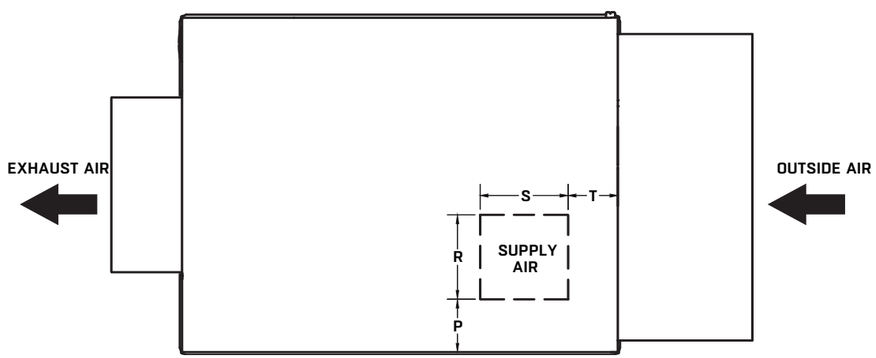
FRONT VIEW



RIGHT VIEW



BACK VIEW



PLAN VIEW

FLÄKTGROUP SEMCO MODEL	NET WT. (LBS.)	DIMENSIONS (INCHES)								
		A	B	C	D	E	F	G	H	I
FV-1000TS VS	500	16.5	44.3	16.7	31.1	7.6	22.6	2.6	4.1	29.1
FV-2000TS VS	550	20.4	51.4	16.7	32.6	9.1	28.5	2.5	4.5	37.0
FV-3000TS VS	1000	20.4	64.8	17.5	47.8	15.8	36.4	2.3	5.0	45.0
FV-4000TS VS	1150	32.7	78.8	22.3	51.9	15.8	44.3	2.5	4.8	54.0
FV-5000TS VS	1150	32.7	78.8	22.3	51.9	15.8	44.3	2.5	4.8	54.0
FV-7500TS VS	1800	32.7	95.3	22.3	59.0	20.8	54.1	2.7	5.2	64.6
FV-9000TS VS	1800	32.7	95.3	22.3	59.0	20.8	54.1	2.7	5.2	64.6

FLÄKTGROUP SEMCO MODEL	NET WT. (LBS.)	DIMENSIONS (INCHES)													
		J	K	L	M	P	R	S	T	U	V	W	X	DD	EE
FV-1000TS VS	500	10.2	9.2	4.2	9.9	7.0	10.2	9.3	5.0	7.0	16.0	3.8	8.0	13.6	21.3
FV-2000TS VS	550	10.2	11.7	4.3	7.3	5.9	10.3	11.8	4.1	7.8	23.0	3.2	2.7	17.4	24.7
FV-3000TS VS	1000	11.4	13.1	10.6	16.0	7.1	11.4	13.1	7.4	12.0	24.0	4.8	1.8	21.2	31.1
FV-4000TS VS	1150	13.4	14.6	11.8	19.6	7.3	13.5	14.7	7.1	20.0	19.0	4.3	2.4	25.4	37.8
FV-5000TS VS	1150	15.9	18.6	9.5	17.6	8.9	15.9	18.6	5.2	20.0	19.0	4.3	2.4	25.4	37.8
FV-7500TS VS	1800	15.9	18.6	11.6	23.0	9.0	15.9	18.6	7.9	16.5	47.2	4.3	7.4	30.4	45.7
FV-9000TS VS	1800	15.9	18.6	11.6	23.0	9.0	15.9	18.6	7.9	16.5	47.2	4.3	7.4	30.4	45.7

NOTE: Dimensions DD & EE represent approximate unit center of gravity.

INDOOR FILTER ASSEMBLY

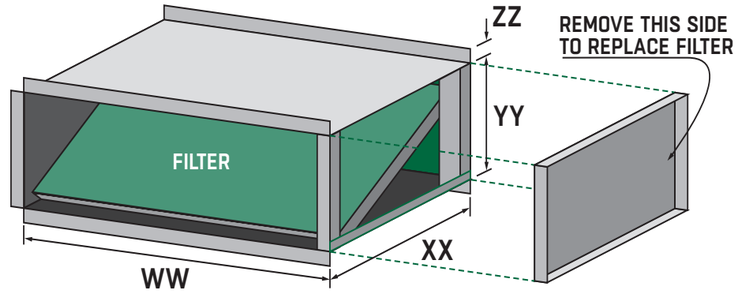


FIGURE 22. Schematic of the indoor filter assembly.

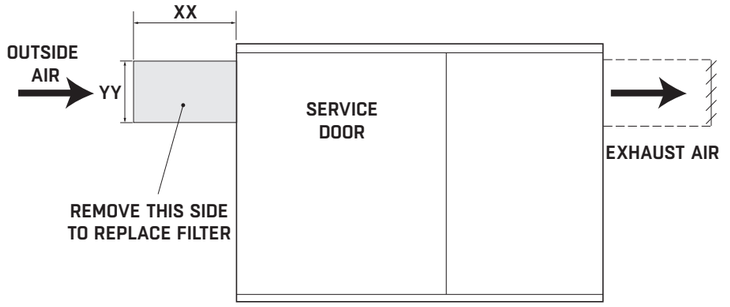


FIGURE 23. Front view of the FläktGroup SEMCO FV-TS Pre-conditioner with attached indoor filter assembly.

FLÄKTGROUP SEMCO MODEL	DIMENSIONS (INCHES)			
	WW	XX	YY	ZZ
FV-1000TS	25.5	21.4	9.0	0.8
FV-2000TS	32.2	24.0	12.1	0.8
FV-3000TS	40.2	20.3	16.2	0.8
FV-4000TS	50.0	20.8	18.1	0.8
FV-5000TS	50.0	20.8	18.1	0.8
FV-7500TS	59.8	18.8	23.0	0.8
FV-9000TS	59.8	18.8	23.0	0.8

FIGURE 24. Indoor filter assembly dimensions.

CURB MOUNTING

The FläktGroup SEMCO FV-TS series is generally installed on a curb (unless mounted indoors). The curb ships separately for pre-installation to simplify rigging. The dimensions of the curbs required for the FläktGroup SEMCO FV-TS units are listed below.

All FläktGroup SEMCO FV-TS configurations have the same curb dimensions. The curb for a FläktGroup SEMCO FV-TS unit can be provided by FläktGroup SEMCO or purchased from a curb manufacturer provided it is designed to support the weight of the FläktGroup SEMCO FV-TS unit specified in this manual and conforms to the dimensions listed in **FIGURE 25** below.

FIGURE 24. Curb dimensions.

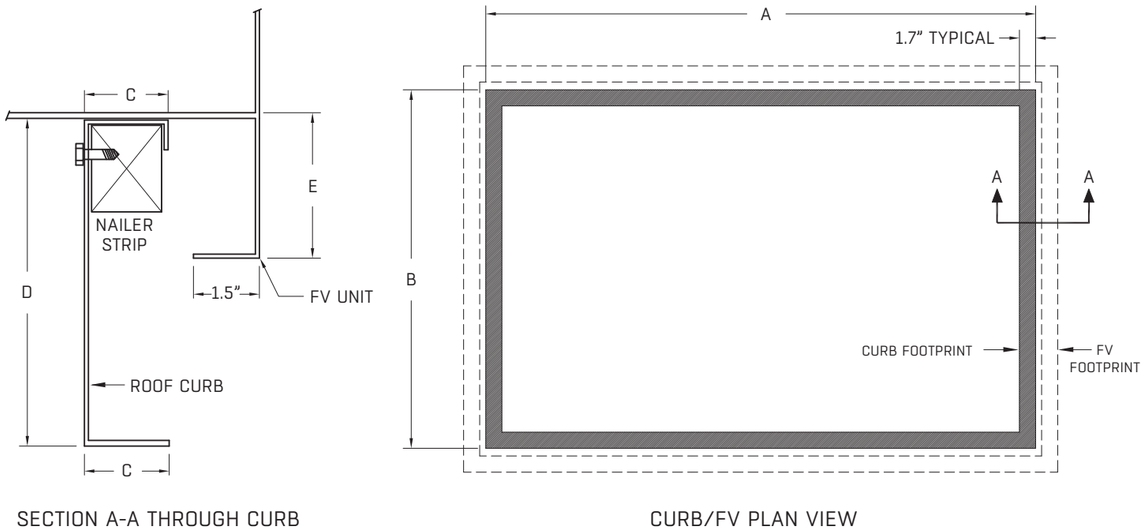


FIGURE 25. Curb dimensions.

FLÄKTGROUP SEMCO MODEL	A	B	C	D	E
FV-1000TS	40.1	25.0	1.7	14.0	3.0
FV-2000TS	47.4	33.0	1.7	14.0	2.0
FV-3000TS	60.6	41.0	1.7	14.0	3.0
FV-4000TS	74.6	49.9	1.7	14.0	3.0
FV-5000TS	74.6	49.9	1.7	14.0	3.0
FV-7500TS	91.0	60.4	1.7	14.0	3.0
FV-9000TS	91.0	60.4	1.7	14.0	3.0

All dimensions in inches.

ADDITIONAL CURB OPTIONS:

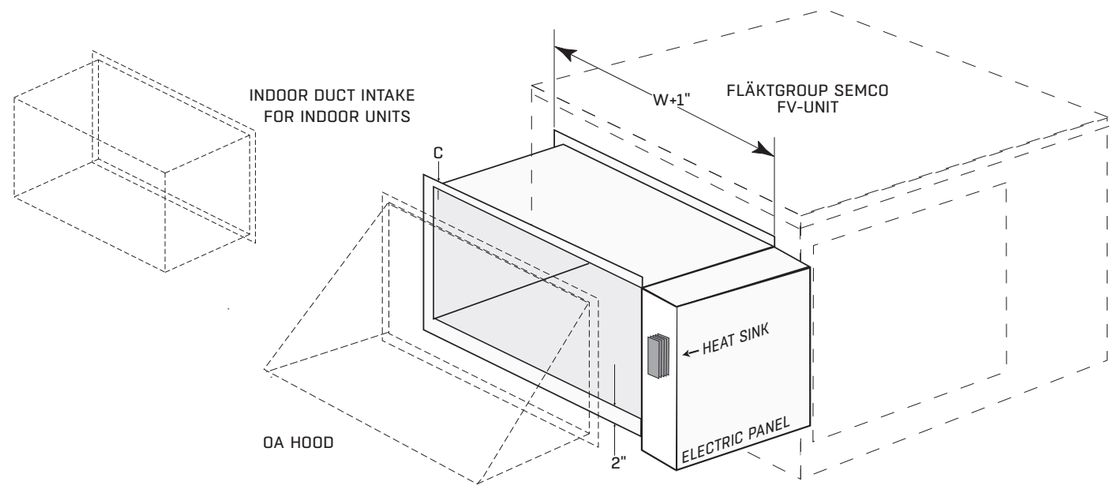
- Height Variations
- Insulated Curbs
- Isolated Curbs / Seismic
- Ducted

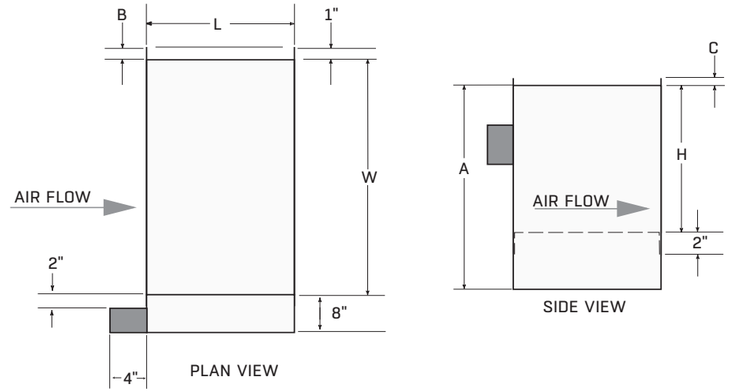
Not in selection program. Contact your sales representative for further details.

ELECTRIC PREHEAT LAYOUT

FLÄKTGROUP SEMCO MODEL	W	H	L	A	B	C
FV-1000TS	24.4	9.0	14.0	20.0	1.0	1.0
FV-2000TS	31.1	11.0	14.0	20.0	1.0	2.0
FV-3000TS	39.1	16.0	20.0	40.0	1.0	2.0
FV-4000TS	49.1	17.0	20.0	40.0	1.0	2.0
FV-5000TS	49.1	17.0	20.0	40.0	1.0	2.0
FV-7500TS	56.0	24.0	20.0	40.0	3.0	2.0
FV-9000TS	56.0	24.0	20.0	40.0	3.0	2.0

All dimensions in inches.





ELECTRICAL PREHEAT DATA

An electric preheat coil is an available option for all FläktGroup SEMCO FV-TS units to limit the risk of frost formation for projects that involve high indoor humidity and/or extreme winter design conditions.

Applications involving space conditions that will exceed 30 percent relative humidity when the outdoor air temperature is below 0°F, should be evaluated to see if preheating is necessary. In such cases it is best to contact your local FläktGroup SEMCO representative for assistance.

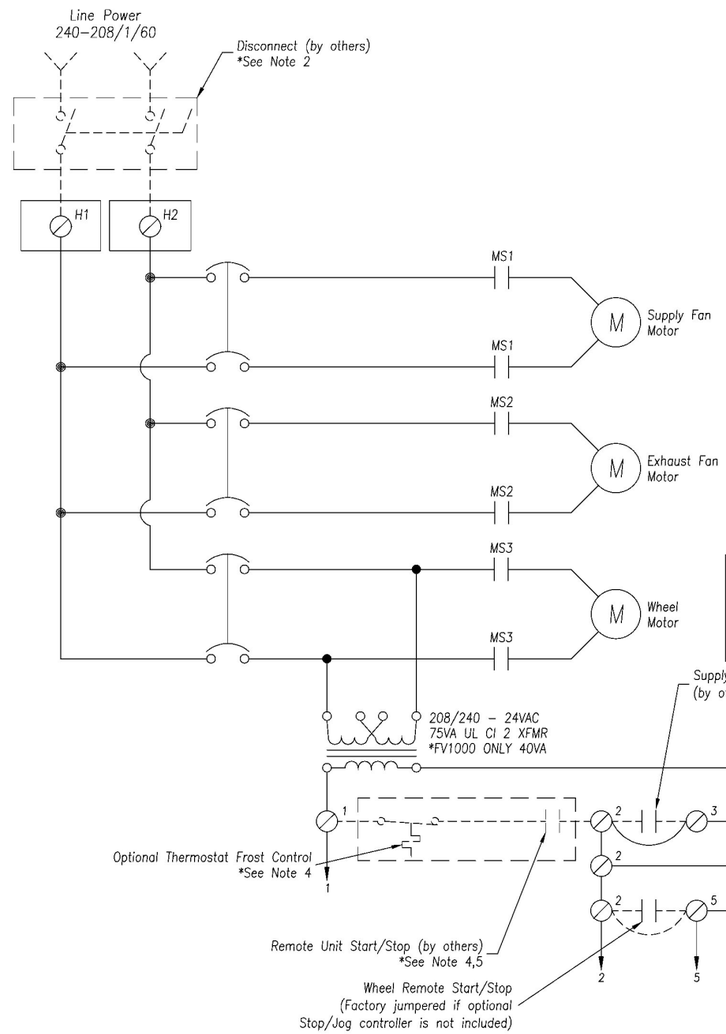
Most applications that do not involve space humidification will function as desired without preheating. Even in extremely cold climates, 10 to 15 degrees of preheat, which is only operated on extreme days, will usually prove adequate in avoiding frost formation.

FIGURE 26 should be used to select the appropriate size electric pre-heater for a given application. Often it is best to make this selection in conjunction with your local FläktGroup SEMCO representative to assure proper sizing.

FLÄKTGROUP SEMCO MODEL	OPTIONAL ELECTRIC PRE-HEATER (kW)	TEMPERATURE RISE @ FULL kW (°F)	FULL LOAD POWER DRAW (KW / AMPS)				
			208V/1Ø	230V/1Ø	208V/3Ø	460V/3Ø	575V/3Ø
FV-1000TS	3.0	9-19	3.40 / 16.3	3.5 / 14.6	3.0 / 8.3	3.5 / 4.2	—
FV-2000TS	7.5	12-30	7.65 / 36.8	7.5 / 31.3	7.65 / 21.2	7.5 / 9.0	7.5 / 7.5
FV-3000TS	13.5	14-24	13.6 / 65.4	13.5 / 56.3	13.5 / 37.5	13.5 / 16.2	13.5 / 13.6
FV-4000TS	15.0	12-17	15.0 / 72.1	15.0 / 62.5	15.0 / 41.6	15.0 / 18.0	15.0 / 15.1
FV-5000TS	15.0	9-16	15.0 / 72.1	15.0 / 62.5	15.0 / 41.6	15.0 / 18.0	15.0 / 15.1
FV-7500TS	23.0	9-16	-	-	22.5 / 62.5	23.0 / 27.7	23.0 / 23.1
FV-9000TS	23.0	7-12	-	-	-	23.0 / 27.7	23.0 / 23.1

FIGURE 26. Electric preheat full load power draw data.

1Ø CIRCUIT DIAGRAM, SEMCO FV-1000TS THROUGH SEMCO FV-5000TS



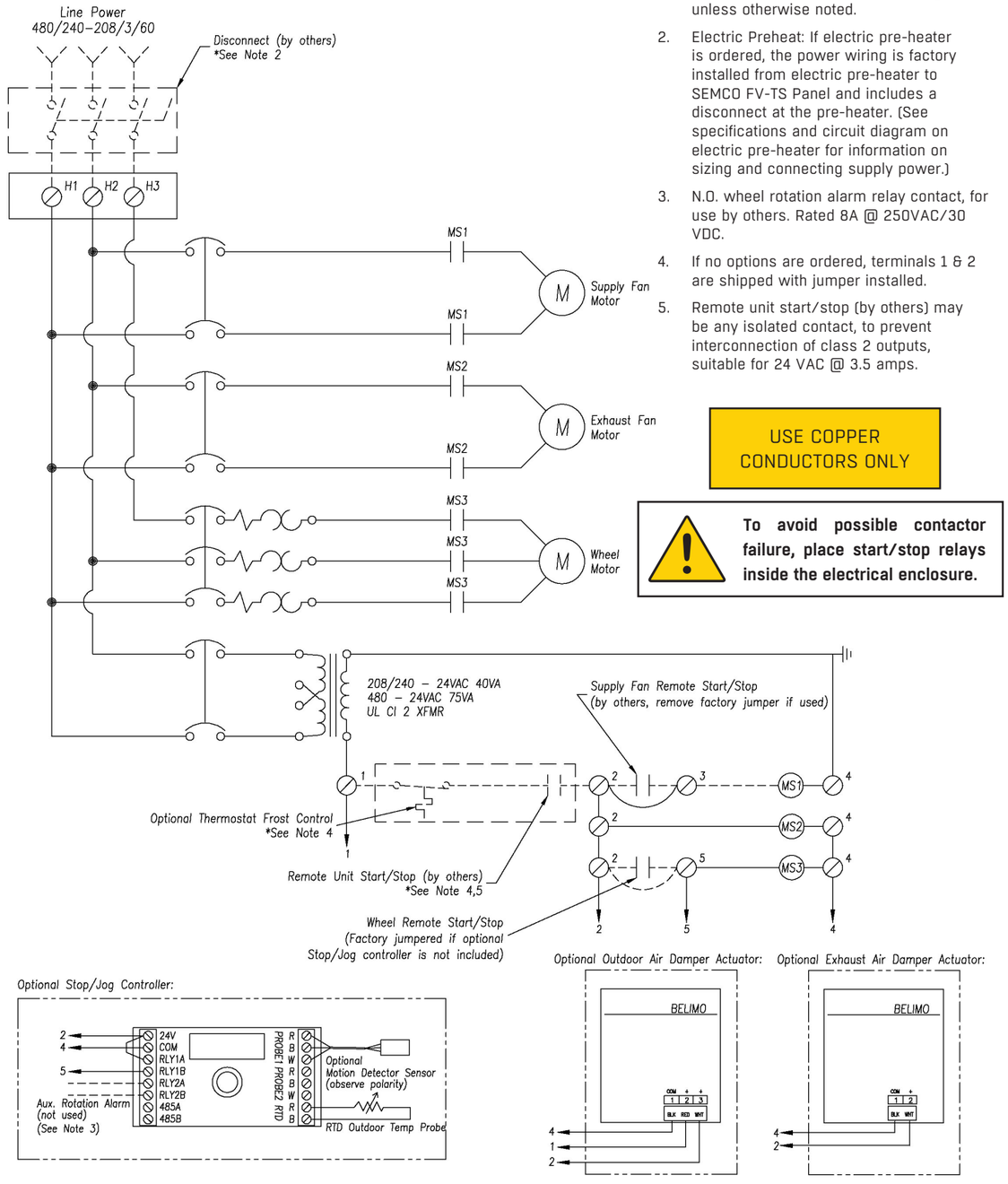
NOTES:

1. All dashed lines indicate field wiring unless otherwise noted.
2. Electric Preheat: If electric pre-heater is ordered, the power wiring is factory installed from electric pre-heater to SEMCO FV-TS Panel and includes a disconnect at the pre-heater and a breaker in the SEMCO FV-TS Panel. (See specifications and circuit diagram on electric pre-heater for information on sizing and connecting supply power.)
3. N.O. wheel rotation alarm relay contact for use by others. Rated 8A @ 250VAC/30VDC.
4. If no options are ordered, terminals 1 & 2 are shipped with jumper installed.
5. Remote unit start/stop (by others) may be any isolated contact, to prevent interconnection of class 2 outputs, suitable for 24 VAC @ 3.5 amps.
6. Time Delay Relay included on SEMCO FV-3000TS and SEMCO FV-5000TS if optional outdoor air damper actuator is included. Otherwise, terminal 3 wired to MS1.

USE COPPER CONDUCTORS ONLY

To avoid possible contactor failure, place start/stop relays inside the electrical enclosure.

3Ø CIRCUIT DIAGRAM, SEMCO FV-1000TS



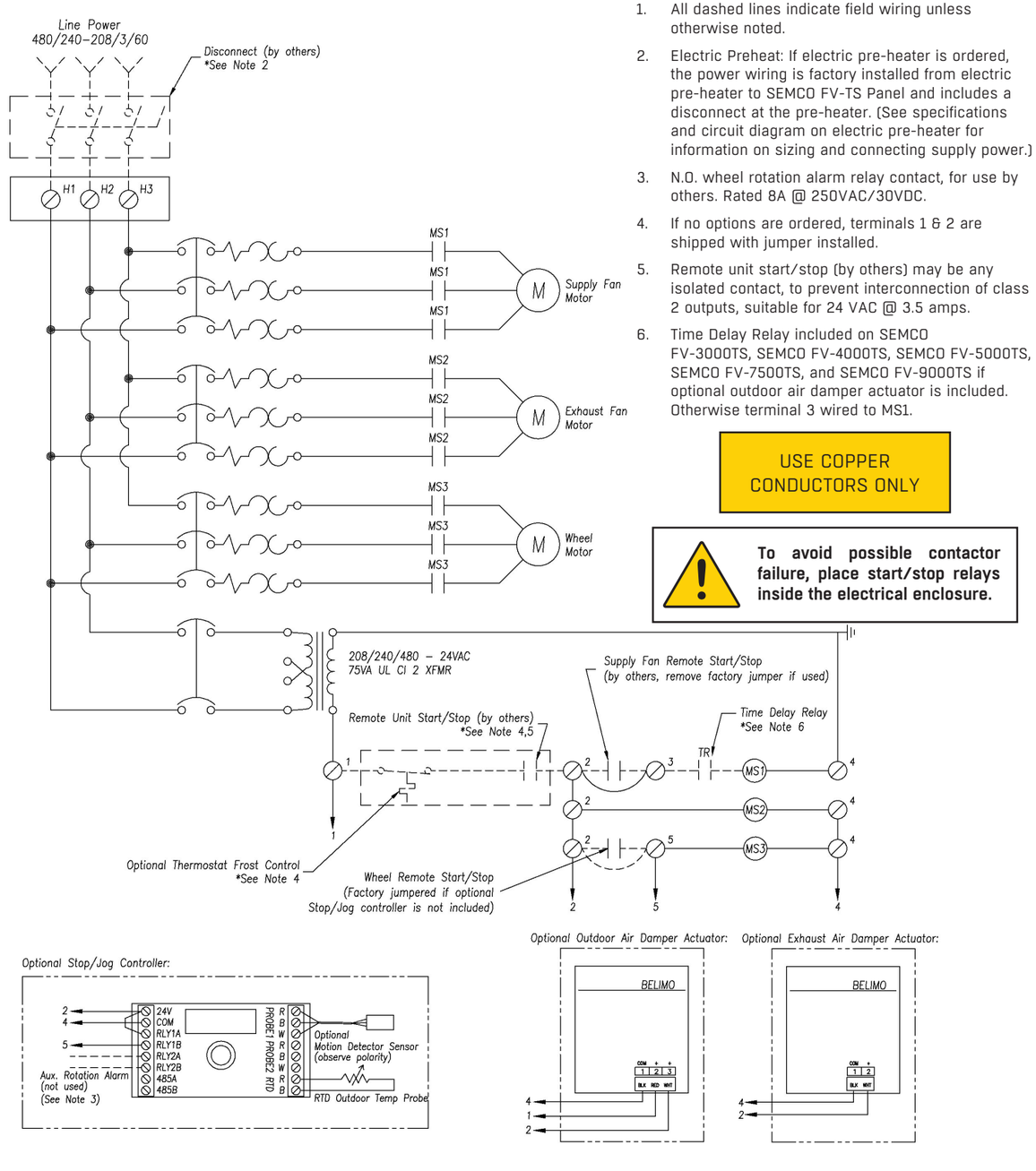
NOTES:

1. All dashed lines indicate field wiring unless otherwise noted.
2. Electric Preheat: If electric pre-heater is ordered, the power wiring is factory installed from electric pre-heater to SEMCO FV-TS Panel and includes a disconnect at the pre-heater. (See specifications and circuit diagram on electric pre-heater for information on sizing and connecting supply power.)
3. N.O. wheel rotation alarm relay contact, for use by others. Rated 8A @ 250VAC/30 VDC.
4. If no options are ordered, terminals 1 & 2 are shipped with jumper installed.
5. Remote unit start/stop (by others) may be any isolated contact, to prevent interconnection of class 2 outputs, suitable for 24 VAC @ 3.5 amps.

USE COPPER CONDUCTORS ONLY

To avoid possible contactor failure, place start/stop relays inside the electrical enclosure.

3Ø CIRCUIT DIAGRAM, SEMCO FV-2000TS THROUGH SEMCO FV-9000TS



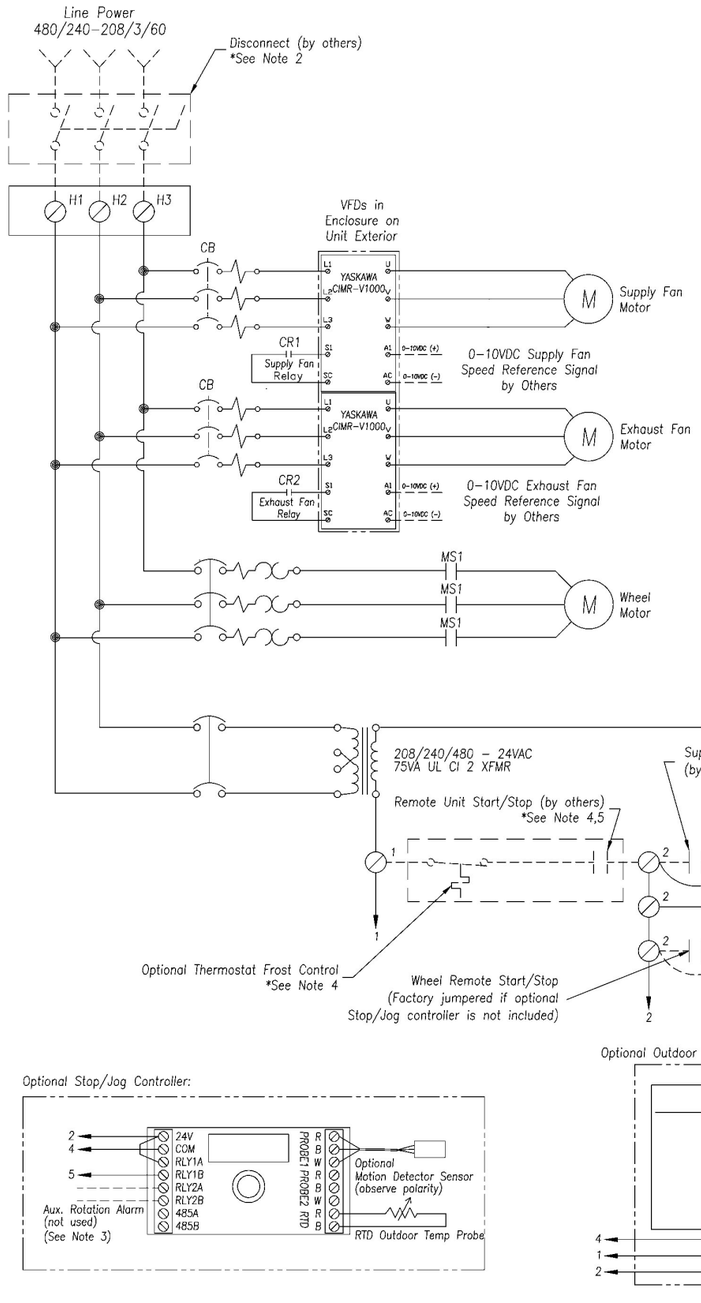
NOTES:

1. All dashed lines indicate field wiring unless otherwise noted.
2. Electric Preheat: If electric pre-heater is ordered, the power wiring is factory installed from electric pre-heater to SEMCO FV-TS Panel and includes a disconnect at the pre-heater. (See specifications and circuit diagram on electric pre-heater for information on sizing and connecting supply power.)
3. N.O. wheel rotation alarm relay contact, for use by others. Rated 8A @ 250VAC/30VDC.
4. If no options are ordered, terminals 1 & 2 are shipped with jumper installed.
5. Remote unit start/stop (by others) may be any isolated contact, to prevent interconnection of class 2 outputs, suitable for 24 VAC @ 3.5 amps.
6. Time Delay Relay included on SEMCO FV-3000TS, SEMCO FV-4000TS, SEMCO FV-5000TS, SEMCO FV-7500TS, and SEMCO FV-9000TS if optional outdoor air damper actuator is included. Otherwise terminal 3 wired to MS1.

USE COPPER CONDUCTORS ONLY

To avoid possible contactor failure, place start/stop relays inside the electrical enclosure.

3Ø CIRCUIT DIAGRAM, SEMCO FV-2000TS THROUGH SEMCO FV-9000TS WITH VARIABLE SPEED FANS



NOTES:

1. All dashed lines indicate field wiring unless otherwise noted.
2. Electric Preheat: If electric pre-heater is ordered, the power wiring is factory installed from electric pre-heater to SEMCO FV-TS panel and includes a disconnect at the pre-heater. (See specifications and circuit diagram on electric pre-heater for information on sizing and connecting supply power.)
3. N.O. wheel rotation alarm relay contact, for use by others. Rated 8A @ 250VAC/30VDC.
4. If no options are ordered, terminals 1 & 2 are shipped with jumper installed.
5. Remote unit start/stop (by others) may be any isolated contact, to prevent interconnection of class 2 outputs, suitable for 24 VAC @ 3.5 amps.
6. Time Delay Relay included on SEMCO FV-3000TS, SEMCO FV-4000TS, SEMCO FV-5000TS, SEMCO FV-7500TS, and SEMCO FV-9000TS if optional outdoor air damper actuator is included. Otherwise terminal 3 wired to CR1.

USE COPPER CONDUCTORS ONLY

To avoid possible contactor failure, place start/stop relays inside the electrical enclosure.

ELECTRICAL DATA

Select motors using the fan tables on **PAGES 16-29** For the unit and motors selected, **FIGURE 30** on **PAGE 49** will have the corresponding full load amps (FLA) for each motor/device per UL Standard 1995 Sections 36.14-36.16.

To determine minimum circuit ampacity (MCA):

1.25 * FLA largest fan motor (**FIGURE 30**)
\+ FLA other fan motor (**FIGURE 30**)
\+ FLA wheel drive (**FIGURE 30**)
= MCA

FIGURE 27. Formula to determine minimum circuit ampacity (MCA) without pre-heater and with transformer less than 1 amp. See **FIGURE 31** on **PAGE 47**.

To determine minimum circuit ampacity (MCA):

FLA exhaust fan motor (**FIGURE 30**)
\+ FLA supply fan motor (**FIGURE 30**)
\+ FLA wheel drive (**FIGURE 30**)
\+ FLA transformer if ≥ 1 amp
\+ FLA optional pre-heater (**FIGURE 31**)
* 1.25
= MCA

FIGURE 28. Formula to determine minimum circuit ampacity (MCA) with pre-heater or with transformer equal to 1 amp or greater. See **FIGURE 30** on **PAGE 46** and **FIGURE 31** on **PAGE 47**.

To determine maximum overcurrent protection (MOP):

For all FläktGroup SEMCO FV-TS units:

2.25 * FLA largest fan motor (**FIGURE 30**)
\+ FLA other fan motor (**FIGURE 30**)
\+ FLA wheel drive (**FIGURE 30**)
\+ FLA transformer if ≥ 1 amp
\+ FLA optional pre-heater (**FIGURE 31**)
= MOP

Using the total above, select the next smaller sized time delay fuse (LOW-PEAK™, FUSETRON or equivalent) or HACR-type circuit breaker, minimum of 15 amps (some exceptions may apply). If the fuses/breakers do not hold, consult the National Electric Code for suitability of larger fuses/breakers.

FIGURE 29. Formula to determine maximum overcurrent protection (MOP.) See **FIGURE 30** on **PAGE 46** and **FIGURE 31** on **PAGE 47**.

FIGURE 30. Electric Unit Data, Full Load Power Draw

FLÄKTGROUP SEMCO FV-1000TS					
HP	**208/1/60**	**240/1/60**	**208/3/60**	**480/3/60**	**575/3/60**
1/2	5.4	4.9	5.4	2.5	—
3/4	7.6	6.9	7.6	3.5	—
WHEEL (1/6)	2.4	2.2	0.6	0.3	—
TRANSFORMER	0.2	0.2	0.2	0.2	—
FLÄKTGROUP SEMCO FV-2000TS-9000: FAN MOTOR NO VFD					
HP	**208/1/60**	**240/1/60**	**208/3/60**	**480/3/60**	**575/3/60**
1/3	4.0	3.6	1.4	0.7	0.7
3/4	7.6	6.9	3.5	1.6	1.3
1 1/2	11.0	10.0	6.6	3.0	2.4
2	13.2	12.0	7.5	3.4	2.7
3	—	—	10.6	4.8	3.9
5	—	—	16.7	7.6	6.1
7 1/2	—	—	24.2	11.0	9.0
10	—	—	30.8	14.0	11.0
15	—	—	46.2	21.0	17.0
FLÄKTGROUP SEMCO FV-2000TS-9000: FAN MOTOR WITH VFD					
HP	**208/1/60**	**240/1/60**	**208/3/60**	**480/3/60**	**575/3/60**
1/3	—	—	3.9	2.1	—
3/4	—	—	3.9	2.1	—
1 1/2	—	—	7.3	4.3	—
2	—	—	10.8	4.3	—
3	—	—	10.8	5.9	—
5	—	—	24	9.4	—
7 1/2	—	—	34.7	14.0	—
10	—	—	34.7	20.0	—
15	—	—	50.9	24.0	—
FLÄKTGROUP SEMCO FV-2000TS-9000: WHEEL MOTOR NO VFD (CONSTANT SPEED OR STOP/JOG)					
HP	**208/1/60**	**240/1/60**	**208/3/60**	**480/3/60**	**575/3/60**
WHEEL (1/6)	2.4	2.2	0.6	0.3	—
TRANSFORMER	0.4	0.3	0.4	0.2	—
FLÄKTGROUP SEMCO FV-2000TS-9000: WHEEL MOTOR WITH VFD (VARIABLE SPEED WHEEL CONTROL PACKAGE)					
HP	**208/1/60**	**240/1/60**	**208/3/60**	**480/3/60**	**575/3/60**
WHEEL (1/6)	—	—	1.2	0*	0*
TRANSFORMER	—	—	0.7	1.0	0.9
*wheel motor power included with transformer					

All FV-TS units have SCCR 10k

ELECTRICAL PREHEAT DATA

An electric preheat coil is an available option for all FläktGroup SEMCO FV-TS units to limit the risk of frost formation for projects that involve high indoor humidity and/or extreme winter design conditions.

Applications involving space conditions that will exceed 30 percent relative humidity when the outdoor air temperature is below 0°F, should be evaluated to see if preheating is necessary. In such cases it is best to contact your local FläktGroup SEMCO representative for assistance.

Most applications that do not involve space humidification will function as desired without preheating. Even in extremely cold climates, 10 to 15 degrees of preheat, which is only operated on extreme days, will usually prove adequate in avoiding frost formation.

FIGURE 31 should be used to select the appropriate size electric pre-heater for a given application. Often it is best to make this selection in conjunction with your local FläktGroup SEMCO representative to assure proper sizing.

FLÄKTGROUP SEMCO MODEL	OPTIONAL ELECTRIC PRE-HEATER (kW)	TEMPERATURE RISE @ FULL kW (°F)	FULL LOAD POWER DRAW (kW / AMPS)				
			208V/1Ø	230V/1Ø	208V/3Ø	460V/3Ø	575V/3Ø
FV-1000TS	3.0	9-19	3.40 / 16.3	3.5 / 14.6	3.0 / 8.3	3.5 / 4.2	—
FV-2000TS	7.5	12-30	7.65 / 36.8	7.5 / 31.3	7.65 / 21.2	7.5 / 9.0	7.5 / 7.5
FV-3000TS	13.5	14-24	13.6 / 65.4	13.5 / 56.3	13.5 / 37.5	13.5 / 16.2	13.5 / 13.6
FV-4000TS	15.0	12-17	15.0 / 72.1	15.0 / 62.5	15.0 / 41.6	15.0 / 18.0	15.0 / 15.1
FV-5000TS	15.0	9-16	15.0 / 72.1	15.0 / 62.5	15.0 / 41.6	15.0 / 18.0	15.0 / 15.1
FV-7500TS	23.0	9-16	—	—	22.5 / 62.5	23.0 / 27.7	23.0 / 23.1
FV-9000TS	23.0	7-12	—	—	—	23.0 / 27.7	23.0 / 23.1

FIGURE 31. Electric preheat full load power draw data.

SAMPLE SPECIFICATIONS

CASING

Standard panels shall be 20 gauge galvanized steel. The housing shall be supported by a formed structural base that forms a pan to ensure weather tight construction. Lifting holes shall be provided at the unit base. Units shall have a weatherproof sheet metal roof. Insulation shall be ½" thick closed-cell neoprene for wash down capability and include antimicrobial protection. Insulation shall meet or exceed requirements of UL 181, ASTM G21/C 1338 and ASTM G 22 for resistance to mold, fungi and bacteria. The outdoor air intake opening shall be protected by a galvanized steel sheet metal weather hood and include an automatic rotary blade damper and an electric actuator. The exhaust air discharge shall be covered with a gravity back draft damper and weather hood. The exterior of the unit shall be coated with an epoxy primer and a polyurethane enamel painting system for added protection. Painting system shall be rated to meet a 1,000-hour salt spray test.

ACCESS

Access to components shall be provided through a large, tightly sealed lift-off hinged door. Access doors shall be constructed of the same materials as the unit casing and use FläktGroup SEMCO's standard hardware. The wheel cassette shall be easily removable from the unit. The roof of the unit shall also be removable for access.

UNIT CONFIGURATION

The supply air inlet and exhaust air outlet must be oriented at opposite ends of the Energy Recovery System to maximize the distance between the two airstreams in order to minimize the risk of short circuiting exhaust air into the supply air intake.

FANS

Fans shall be double width double inlet design with forward curve type wheels. The blades shall be designed for maximum efficiency and quiet operation. Impellers shall be statically and dynamically balanced.

Fans shall be driven by direct drive motors located at the fan inlet (FläktGroup SEMCO FV-1000TS) or by motors using belts and sheaves (FV-2000TS and larger). Motors shall be standard NEMA frame with open drip-proof enclosures. V-belt drives shall be designed for a minimum 1.2 service factor.

OPTIONAL VARIABLE FREQUENCY DRIVES ON FANS

Variable speed fan control is accomplished by the use of a 208/240 or 480 VAC 3 phase inverter. The inverter includes a keypad operator with a status display and is mounted in an enclosure on the exterior of the unit. The drive system will be wired at the factory and loaded with a default program to make it operational.

TOTAL ENERGY WHEEL

The rotor media shall be made of aluminum, which is coated to prohibit corrosion. All surfaces shall be coated with a non-migrating adsorbent specifically developed for the selective transfer of water vapor. Verification in writing shall be presented from the desiccant manufacturer confirming that the internal pore diameter distribution inherent in the desiccant being provided limits adsorption to materials not larger than the critical diameter of a water molecule (2.8 angstroms). In addition, the face of the media shall be coated with an acid resistant coating to provide maximum protection against face oxidation. Equal sensible and latent recovery efficiencies shall be clearly documented through a certification program conducted in accordance with ASHRAE 84-78P and ARI 1060 standards. The media shall be cleanable with low temperature steam, hot water or light detergent, without degrading the latent recovery. Dry particles up to 600 microns shall freely pass through the media. Wheel media shall be independently tested and shown to conform to the requirements of NFPA-90A, documenting a flame spread of less than 25 and a smoke generation rating of less than 50.

The faces of the total energy recovery wheel shall be sealed with a two-part polymer acid resistant coating to limit surface oxidation. The media face coating shall also include a proprietary Teflon-based anti-stick additive shown, by independent testing, to effectively limit the collection of dust or smoke particulate and to aid in the surface cleaning process should cleaning be required.

The entire recovery wheel media face shall be treated with Avron46®, and shall exhibit effective antimicrobial action, supported by independent test data. Any antimicrobial agent used must, by law, carry an EPA registration for use in duct systems. All desiccant surfaces within the transfer media shall also exhibit bacteria-static properties as supported by independent testing.

ROTOR CASSETTE

The rotor cassette shall be a sheet metal framework, which limits the deflection of the rotor due to air pressure. The cassette shall be made of galvanized steel to prevent corrosion. The rotor cassette shall be easily removable from the Energy Recovery Unit to facilitate rigging (if necessary) and ease of service. The wheel cassette design shall use pillow block bearings for long life. A non-adjustable purge sector shall be included in the cassette.

OPTIONAL VARIABLE SPEED WHEEL CONTROL PACKAGE

Variable speed wheel control is provided and uses a pre-programmed A/C inverter and digital controller. A proportional supply air temperature sensor, differential summer/winter change over sensors and frost prevention sensor are included. A digital readout of temperatures are provided by a display on the digital controller. Includes DDC control system consisting of an Automated Logic I/O Zone 583 Controller and a BACview-5 two row backlit LCD display to allow set points to be adjusted and status points to be viewed. Controller supports remote communications using BACnet over MS/TP, Modbus, or N2 protocols. Pressure switches are provided across the outdoor and return air filters, wired to inputs on the controller. Rotation detector with indicating light is provided to indicate wheel rotation failure or filter loading alarm.

OPTIONAL AIRFLOW MONITOR

Unit shall include an integral airflow monitoring station with the ability to read both ventilation and exhaust airflow expressed in CFM. Monitor gauge to be flush mounted on unit exterior and watertight.

OPTIONAL ROTATION DETECTOR

Unit shall be equipped with a rotation sensor and controller, should the energy recovery wheel not rotate during a signaled run period. The controller shall not initiate an alarm during a stop/jog function.

OPTIONAL STOP/JOG ECONOMIZER

Unit shall be equipped with an outdoor air temperature sensor and controller such that the energy recovery wheel can be stopped during moderate temperature periods. The controller shall perform a stop/jog function for the wheel long enough to promote the self-cleaning features of the wheel but not long enough to induce energy recovery.

OPTIONAL WHEEL STOP/JOG FROST PROTECTION

Unit shall be equipped with an outdoor air temperature sensor and controller such that the energy recovery wheel can be operated in stop/jog mode during very low outdoor air temperature periods to prevent freezing of the wheel while still delivering outdoor air through the unit.

FILTERS

The filters shall be 1 inch thick permanent aluminum washable type mounted in the outside air hood and return air plenum. The filters shall be listed by Underwriters' Laboratories as Class 2. As an option, 2" pleated MERV filters can be added to the outside air hood, and/or replace the 1" filters in the return air plenum.

OUTDOOR AIR DAMPER

The outdoor air damper shall be constructed of galvanized steel; the frame being formed into hat channels for added strength; the blades being single skin and parallel in action. Standard assembly shall include a manual adjustable blade lock with no control, though a two-position actuator for control is available.

OPTIONAL MOTORIZED EXHAUST DAMPER

Units shall be equipped with an exhaust damper, low-leak and galvanized steel in construction; the frame being formed for added strength; the blades being airfoil and parallel in action. Standard assembly shall include a two-position actuator for control.

ROOF CURB

Units will be provided with a non-insulated roof curb sized to fit just inside of the unit's self flashing base. Curb will be fourteen inches tall and will have a wood nailer on the perimeter for attaching unit.

OPTIONAL REMOTE INDICATING PANEL

Panel shall provide remote indication of status of unit power on, wheel rotation alarm, outside air dirty filter and return air dirty filter. Low voltage LED's will be illuminated for power on, wheel stop, and filter pressure switch status. LEDs are factory mounted in a brushed aluminum face plate with identification label and are factory wired to a terminal strip. Panel includes a junction box and plaster ring for either recessed or surface mounting. FläktGroup SEMCO FV-TS unit will include factory mounted pressure switches and electrical components wired to a terminal strip located in an exterior weatherproof junction box. Field wiring between the FläktGroup SEMCO FV-TS unit and the remote panel using Belden 5 conductor 8465 (20 gauge) or equivalent.

OPTIONAL ELECTRIC PREHEAT COIL

Coil shall be of the resistance coil type with elements enclosed in a steel sheath with fins and painted with a baked-on aluminum paint for long life in a 100% fresh air stream. Coil shall include thermal cutout protection with automatic primary protection and a secondary manual reset linear thermal cutout. Coil shall have magnetic safety and backup contactors, main disconnect, fusing, control circuit transformer, air flow interlock switch and SCR controller. Coil shall be UL listed and constructed in accordance with NEC requirements. A temperature controller located in the outdoor air section of the unit shall supply the signal to the SCR controller.

OPTIONAL FREEZE PROTECTION THERMOSTAT

Unit shall be equipped with an outdoor air temperature thermostat such that the energy recovery ventilator can be stopped during very low temperature periods.

This thermostat shall stop the both the fans and the energy recovery wheel until the outdoor air temperature rises above the set-point, then the unit will restart automatically.

OPTIONAL DUAL WALL CONSTRUCTION

Unit shall be equipped with an interior liner of 22 gauge galvanized sheet metal.

ELECTRICAL

Units shall require a single 60-cycle power connection. See schedule for voltage and phase requirements. The electrical panel shall consist of individual motor contactors, short circuit and overload protection and control power transformer. The electrical panel shall be mounted in the unit with access from the exterior of the unit. Unit shall be ETL listed and labeled.

WARRANTY

Please see the terms and conditions for your order or contact service.semco@flaktgroup.com.

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