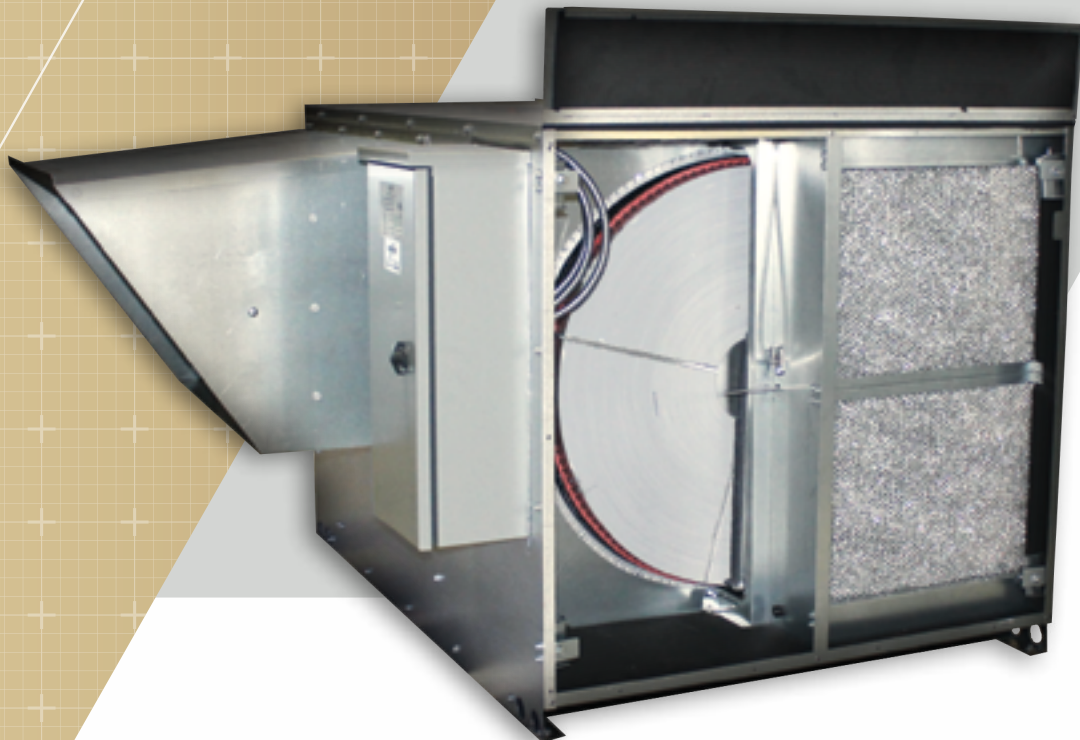


FLÄKTGROUP® SEMCO®
SYNERGY PLUS®
RECOVERY MODULE
TECHNICAL GUIDE



SP-700
SP-2200

TABLE OF CONTENTS

Overview.....	1
How It Works	1
Pre-conditioning and Good Indoor Air Quality	2
Humidity Control and Indoor Air Quality.....	2
Applying the SynergyPLUS®	3
Standard Features	3
Optional Features.....	4
Benefits	6
Selection Procedure.....	8
Fan Tables	11
Fan Curves	13
Unit Arrangement.....	14
Electric Preheat Layout	15
1Ø Circuit Diagram, SP-700 & SP-2200	16
3Ø Circuit Diagram, SP-700	17
3Ø Circuit Diagram, SP 2200	18
3Ø Circuit Diagram, SP-2200 with Variable Speed Fans.....	19
1Ø Electric Preheat Frost Protection Circuit Diagram.....	20
3Ø Electric Preheat Frost Protection Circuit Diagram	20
Electrical Data	21
Electric Preheat Data	22
Order Summary Sheet	23
Sample Specifications	24

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OVERVIEW

The FläktGroup SEMCO® Synergy Plus® (SP) Energy Recovery Module is an outdoor air pre-conditioner specifically designed to reduce the energy required to cool or heat the outdoor air by as much as 80 percent. When mounted to the Trane® Precedent® the FläktGroup SEMCO SP module allows the Trane® Precedent® roof top air-conditioner 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 healthy indoor environments.

HOW IT WORKS

The FläktGroup SEMCO SP module is a packaged system which includes supply and exhaust air fans, outdoor and return air filter and FläktGroup SEMCO’s TEC total energy recovery wheel. The TEC 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 TEC wheel utilizes a fluted aluminum substrate which is uniformly coated with a fast-acting, adsorbent desiccant. 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**).

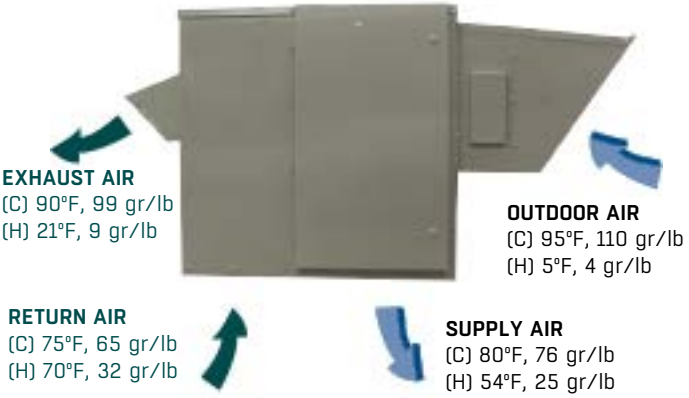


FIGURE 1. An inside view of the SP module with typical operating conditions during the cooling (C) and heating (H) season respectively.

The FläktGroup SEMCO SP Energy Recovery Module is designed to improve humidity control when mounted to the Trane® Precedent® rooftop unit. Because the SEMCO unit pre-conditions the incoming air to the packaged equipment, the required refrigeration capacity can be reduced by as much as 50 percent. Thus, the costs of the FläktGroup SEMCO SP pre-conditioner and its installation are typically offset by the reduced size of the Trane® Precedent® system. Generally, any first cost premium is paid back within the first year of operation.

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

PRE-CONDITIONING AND GOOD INDOOR AIR QUALITY

ASHRAE Standard 62 defines the minimum outdoor air ventilation rate required to achieve acceptable indoor air quality. This standard, which is incorporated in all the U.S. model 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 SP module provides an effective solution to the ventilation mandate. When a FläktGroup SEMCO SP system is mounted to a Trane® Precedent® rooftop unit, it allows for a three-to-four-fold increase in the outdoor air quantity (5 to 20 cfm/person) without an increase in operating costs.

HUMIDITY CONTROL AND INDOOR AIR QUALITY

Unitary air conditioner and heat pump units are controlled by temperature. When space conditions are satisfied, the cooling coil or heating source is cycled off. Since ASHRAE Standard 62 recommends the continuous supply of outdoor air, then warm/humid (cooling mode) or cool/dry (heating mode) outdoor air is 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 growth, is greatly enhanced at 70 percent relative humidity and above.

Mounting a FläktGroup SEMCO SP module to a Trane® Precedent® rooftop air-conditioner unit to precondition outdoor air will effectively eliminate up to 80 percent of the outdoor humidity load from the space and thereby significantly improve indoor humidity conditions.

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

APPLYING THE FLÄKTGROUP® SEMCO® SynergyPLUS®

The FläktGroup® SEMCO® SP series has supply and return connections located on the side of the unit and is designed to mate up and mount to selected Trane® Precedent® series rooftop air-conditioner units. The FläktGroup SEMCO SP is designed for outdoor installation, has a high level of total recovery where effectiveness and includes a single-point electrical connection. The FläktGroup SEMCO SP can be used with and mounted to both downflow and horizontal Trane® Precedent® units.

In a typical application, the FläktGroup SEMCO SP module pulls exhaust air directly from the return air section of the Trane® Precedent® unit. Preconditioned outdoor air is then provided directly to the cooling coil, mixing with the recirculated airstream. The FläktGroup SEMCO SP module and the Trane® Precedent® unit's supply fans run continuously while occupants are in the conditioned space, even when the heating or cooling coils are off. This provides a continuous supply of outdoor air, therefore meeting the ASHRAE Standard 62 guidelines.

A key advantage to this approach is that no additional duct work is required beyond that which is already provided for the Trane® Precedent®. This simplifies the installation process and minimizes project first cost. This approach also simplifies retrofit applications it is desirable to increase the amount of outdoor air supplied to a space without replacing the existing HVAC system.

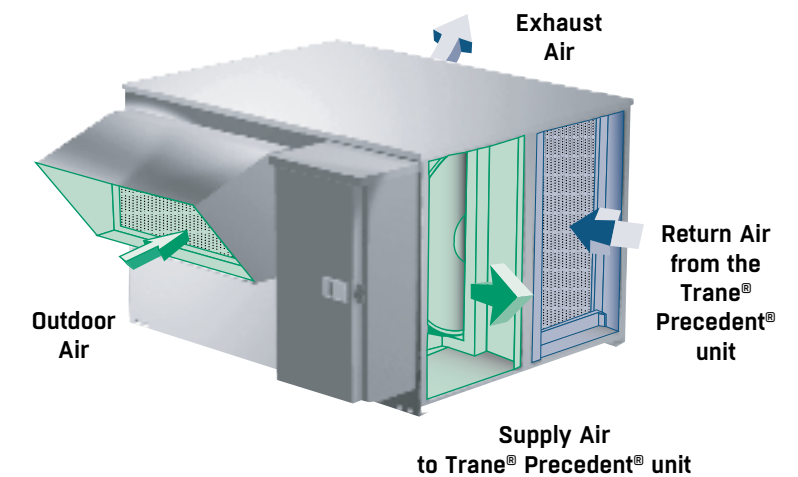


FIGURE 2. FläktGroup® SEMCO® SP series typical installation.

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 and removable side access and roof panels
- Outdoor air inlet and exhaust air outlet located at opposite ends of unit for maximum separation

1) THE TEC TOTAL ENERGY WHEEL

- Certified total energy (both sensible and latent) recovery performance
- 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

2) CABINET CONSTRUCTION

- Galvanized steel cabinet construction with enamel finish
- Entire cabinet insulated to minimize energy loss
- Hinged doors for easy access
- 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

4) FILTER SECTIONS

- Filtration provided for both the outdoor air and return air

5) HOODS AND DAMPERS

- Airflow balancing dampers
- Unit provided with an intake hood with cleanable filter to limit rain and snow introduction
- Exhaust air back draft damper
- Return air hood

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:
 - SP-700:208, 240V 1Ø, 208, 240, 480V 3Ø
 - SP-2200:208, 240V 1Ø, 208, 240, 480V 3Ø

OPTIONAL FEATURES

ELECTRIC PREHEAT

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

THERMOSTAT FROST PROTECTION

Thermostatic frost control allows the FläktGroup SEMCO SP module to be turned off at a predetermined temperature when electric preheat is not desired.

CONTROL OPTIONS

STOP/JOG ECONOMIZER board allows the wheel to be stopped automatically during mild outdoor temperatures with periodic brief rotation to maintain the self-cleaning features of the heat exchanger.

WHEEL FROST PROTECTION allows the wheel only to be stopped by the stop/jog economizer board at a predetermined outdoor temperature in applications where a preheat coil or thermostat shut-off of the SP module is not desired.

ROTATION DETECTOR SENSOR can provide an alarm signal through the stop/jog economizer board indicating failure of the wheel rotation.

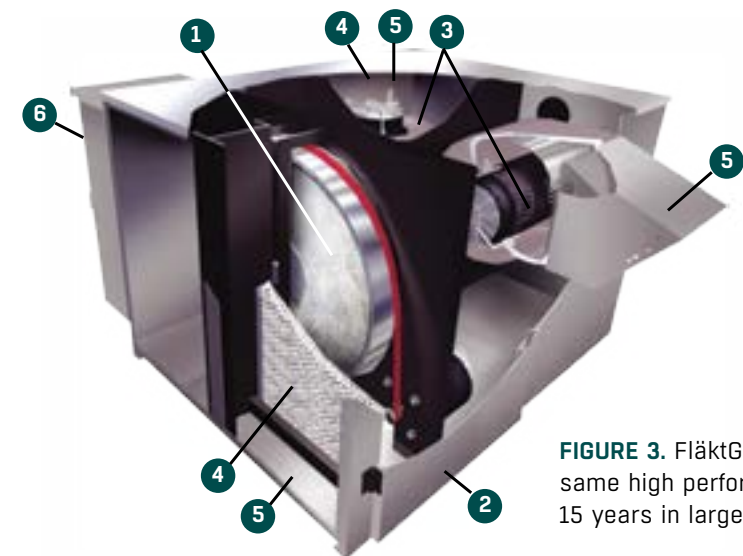


FIGURE 3. FläktGroup® SEMCO® SP Recovery Module uses the same high performing wheel technology proven over the past 15 years in large institutional and industrial applications.

NON-VARIABLE SPEED WHEEL CONTROLS

BASIC PACKAGE

The basic FläktGroup SEMCO SP 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 SP-700 & FläktGroup SEMCO SP-2200 which handles 24VAC at 2 amps. (See appropriate 1Ø or 3Ø circuit diagram on **PAGES 16-20**). 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 9** on **PAGE 9**).

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.

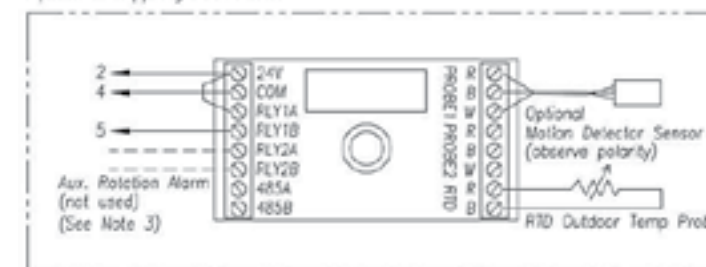
The stop/jog economizer consists of a temperature sensor and a circuit board with dip switch selection of temperature and stop/jog times. When the outdoor temperature is in the range between the two set-points, the timer relay operates the wheel for approximately 30 seconds in every 30 minutes.

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 4**). 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.

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
NOE On ALARM	10
RESET SE 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 Unit ES	F
RELAY 1	4
RELAY 2	1
DISPLAY	2

FIGURE 4 GPRD Controller settings.

BENEFITS

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, the ASHRAE Standard 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 occupied spaces, the FläktGroup SEMCO SynergyPLUS (SP) module enables the Trane® Precedent® unit to effectively handle this increase in outdoor air load without the need for a larger sized package and without increasing energy consumption.

REDUCED EQUIPMENT FIRST COST

Without the addition of effective energy recovery, the capacity of HVAC systems must be increased greatly to handle the greater outdoor air loads. Increasing equipment size often requires the addition of reheat and sophisticated control sequences to control both humidity and temperature. When the FläktGroup SEMCO SP module is mounted to the Trane® Precedent® unit, often reduces initial project costs by allowing a smaller Trane® Precedent® unit and duct system to be used, without the need for reheat or complex controls.

IMPROVED COOLING SEASON HUMIDITY CONTROL

Operation of conventional HVAC systems is governed by a thermostat, i.e., in response only to the conditioned space temperature. 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 FläktGroup SEMCO SP unit 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.

REDUCED 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. Most facilities require humidification, which is costly to operate and maintain. The FläktGroup SEMCO SP unit captures the moisture generated within the space to provide free humidification during the heating season, therefore maintaining a healthier indoor environment.

In moderate climates with short heating seasons, this may be sufficient to completely eliminate the need for any humidification equipment.

IMPROVED COMFORT OF OCCUPIED SPACES

As 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. The mounting of a FläktGroup SEMCO SP module to the Trane® Precedent® unit solves this problem by providing moderated supply air conditions, even as the Trane® Precedent® unit is cycled on and off.

SELECTION PROCEDURE

The selection of the FläktGroup SEMCO SP Energy Recovery Module is governed by two parameters: the amount of outside air needed to be pre-conditioned and the Trane® Precedent® unit to which the FläktGroup SEMCO SP module is mounted. Only a specific size FläktGroup SEMCO SP module will mount to a Trane® Precedent® unit. Nominally, the FläktGroup SEMCO SP module will provide between 30% and up to 100% of outside air. There is a limited product combination which will allow 100% outside air applications.

1) DETERMINE SUPPLY SIDE RECOVERY EFFICIENCY

Enter the values in **FIGURE 5** to determine the recovery wheel face area per airstream. Divide the smaller volume of the two airstreams by the wheel area obtained from **FIGURE 5** to determine face velocity. Enter **FIGURE 6** for the face velocity of the smaller airstream to determine the unit base effectiveness at equal airflows.

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 6** and the calculated airflow ratio, enter **FIGURE 7** to obtain the corrected supply air efficiency for unequal airflow applications.

EXAMPLE: Given a supply airflow of 965 and exhaust airflow of 1015. From **FIGURE 5**, the FläktGroup SEMCO SP-700 wheel area per side is 1.23 sq. ft. Dividing 965 cfm (supply) by 1.23, gives a (supply side) face velocity of 785 ft/min. From **FIGURE 6** the base effectiveness is interpolated at 68 percent. Using the base effectiveness and an airflow ratio of 0.95 (965cfm/1015cfm) from **FIGURE 7** determines the supply side efficiency to be 70.6 percent.

FLÄKTGROUP® SEMCO® MODEL	AIRFLOW RANGE (SCFM)	WHEEL FACE AREA (FT²/SIDE)
SP-700	450-1110	1.23
SP-2200	800-2400	2.46

FIGURE 5. Airflow range and energy wheel area.

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

FIGURE 6. Unit effectiveness vs. wheel face velocity.

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 7. Unequal airflow efficiency correction

2) CALCULATE THE SUPPLY AIR CONDITIONS

Once the design conditions are known and the supply side efficiency is determined, the temperature and humidity content of the air supplied to the space can easily be calculated by using **FIGURE 8**. Using dry bulb temperatures in **FIGURE 8** provides the supply air temperature. The supply air humidity level is also determined in **FIGURE 8** 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 **FIGURE 8** to calculate the wet bulb temperature.

EXAMPLE CONTINUED. Summer outdoor air design conditions are 90°F, 110 gr/lb with a return condition of 75°F, 50% relative humidity (65 gr/lb.)

Using **FIGURE 8**, the summer supply temperature and humidity is calculated as follows:

$$T_{SA} = (90^{\circ}\text{F} - .706 (90 - 75)^{\circ}\text{F}) = 79.4^{\circ}\text{F}$$

$$w_{SA} = (110 \text{ gr/lb} - .706 (110 - 65)\text{gr/lb}) = 78 \text{ gr/lb}$$

Winter outdoor air design conditions are 5°F, 4 gr/lb with a return air condition of 70°F, 32 gr/lb. The winter supply air temperature and humidity level is calculated in the same fashion to give a condition of 51°F and 24 gr/lb.

FIGURE 8. Calculating supply, outdoor and return air temperatures and moisture content.

$$X_{SA} = \{X_{OA} - (\text{Efficiency}_{SA}) (X_{OA} - X_{RA})\}$$

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

3) 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. 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 percent 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 SP modules.

- PREHEAT** is used as the primary method of frost protection for the energy wheel in FläktGroup SEMCO SP 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 Trane® Precedent® unit.

- A FROST PROTECTION THERMOSTAT** which turns the FläktGroup SEMCO SP 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.

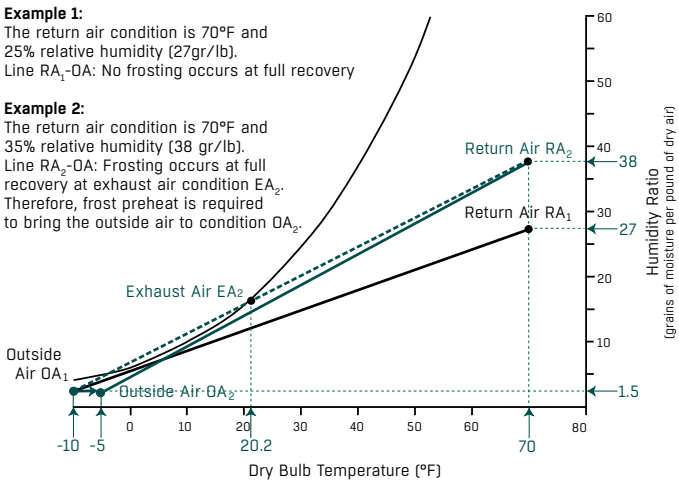


FIGURE 9. Using the psychrometric chart to determine the need for preheat frost control.

EXAMPLE CONTINUED. Since the outdoor air winter design temperature for this example is 5°F and the space humidity is 30 percent, frost protection is not required.

4) DETERMINE DIMENSIONAL AND ELECTRICAL DATA

The dimensional data for the FläktGroup SEMCO SP unit is provided on **PAGE 14**. The FläktGroup SEMCO SP module is mounted adjacent to the Trane® Precedent® unit.

The electrical data is determined by using the equations on **PAGE 21**, in **FIGURES 10** and **11**. 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 preheater is required, the electrical data should be increased appropriately by the information given in **FIGURE 14, PAGE 22**.

EXAMPLE CONTINUED. Assuming that 240V/1Ø power is available, the minimum circuit ampacity (MCA) for the motors selected in **STEP 2** is calculated using the equation in **FIGURE 10** on **PAGE 21**.

1.25 * FLA largest fan motor = 8.6 (1.25 * 6.9)

+ FLA other fan motor = 6.9

+ FLA wheel drive/accessories = 1.1

= MCA

= 16.6

The maximum circuit overcurrent protection is calculated using **FIGURE 12** on **PAGE 21**.

2.25 * FLA largest fan motor = 15.53 (2.25 * 6.9)

+ FLA other fan motor = 6.9

+ FLA wheel drive/accessories = 1.1

= MOP

= 23.53

5) SUMMARIZE SELECTION INFORMATION

A selection summary sheet is provided on **PAGE 23** which helps organize the performance data when ordering an SP unit and simplifies the design schedule preparation process.

FLÄKTGROUP® SEMCO® SP-700: SUPPLY FAN DATA

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
AIRFLOW (SCFM)	1110	1035	965	885	805	695	580	450

NOTE: For power draw of motors, see **FIGURE 13** on **PAGE 22**.

SP-2200 SUPPLY FAN DATA

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)
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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	.15/516	.15/651	.15/785	.15/919	.24/1025	.46/1152	.65/1259	.75/1345	.85/1432
1000	.15/579	.15/734	.15/889	.24/1008	.43/1113	.66/1234	.79/1321	.90/1409	1.02/1493
1200	.15/670	.15/872	.26/1007	.46/1114	.64/1219	.82/1308	.95/1398	1.09/1486	1.27/1565
1400	.15/881	.31/1024	.50/1132	.70/1233	.86/1307	1.01/1399	1.17/1490	1.38/1572	1.62/1654
1600	.38/1058	.58/1168	.78/1259	.95/1337	1.09/1415	1.27/1507	1.51/1590	1.76/1674	1.98/1757
1800	.68/1218	.89/1302	1.07/1385	1.22/1468	1.40/1536	1.67/1619	1.92/1702	2.16/1780	2.40/1826
2000	1.03/1366	1.21/1456	1.39/1526	1.65/1591	1.85/1656	2.11/1737	2.36/1805	2.59/1860	2.71/1916
2200	1.41/1529	1.69/1590	1.92/1653	2.11/1715	2.32/1777	2.58/1842	2.78/1908	-	-
2400	2.01/1657	2.20/1716	2.40/1774	2.60/1833	2.79/1891	-	-	-	-

NOTE: For power draw of motors, see **FIGURE 13** on **PAGE 22**.

All statics internal to the FläktGroup SEMCO SP module are included in the fan data charts. The FläktGroup SEMCO SP external static is the same as the static in the return air plenum in the Trane® Precedent® unit.

* A FläktGroup SEMCO SP unit mounted to a Trane® Precedent® unit typically has a supply fan static of -0.1” and an exhaust fan static of +0.3”.

When sizing fan motors, it is not required to add purge air or seal leakage as these corrections are reflected.

FLÄKTGROUP SEMCO SP 700 & 2200: EXHAUST FAN DATA

SP-700 EXHAUST FAN DATA

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
AIRFLOW (SCFM)	1235	1235	1135	1015	890	730	560	385

NOTE: For power draw of motors, see **FIGURE 13** on **PAGE 22**

SP-2200 EXHAUST FAN DATA

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)
-----------------	-------------------	-------------------	-------------------	----------------------------------

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	.15/497	.15/667	.15/836	.15/979	.15/1089	.15/1225	.55/1315	.82/1405	1.02/1480
1000	.15/575	.15/751	.15/925	.15/1036	.15/1145	.45/1263	.79/1355	1.04/1448	1.22/1513
1200	.15/659	.15/845	.15/989	.15/1098	.33/1207	.75/1307	1.04/1403	1.28/1488	1.42/1559
1400	.15/758	.15/946	.15/1056	.29/1165	.69/1261	1.03/1361	1.30/1461	1.51/1541	1.69/1621
1600	.15/887	.15/1019	.24/1129	.67/1235	1.00/1320	1.30/1426	1.57/1521	1.79/1611	2.01/1691
1800	.15/987	.19/1098	.64/1208	1.03/1302	1.30/1393	1.60/1501	1.87/1600	2.15/1690	2.34/1741
2000	.15/1071	.61/1184	1.06/1287	1.36/1386	1.62/1482	1.93/1588	2.26/1687	2.50/1741	2.64/1796
2200	.60/1164	1.07/1276	1.41/1386	1.70/1489	1.98/1577	2.35/1684	2.65/1741	2.83/1798	-
2400	1.07/1269	1.46/1395	1.79/1502	2.11/1590	2.42/1678	2.78/1738	-	-	-

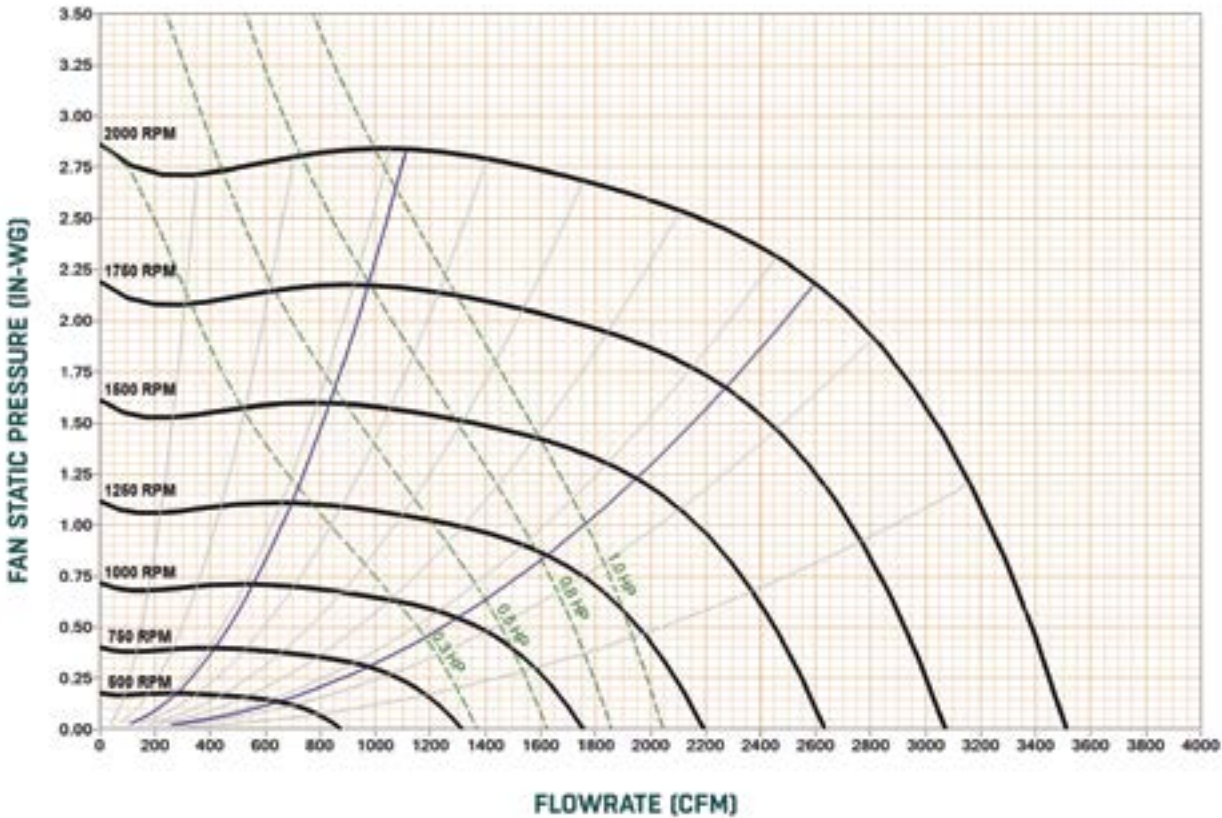
NOTE: For power draw of motors, see **FIGURE 13** on **PAGE 22**.

All statics internal to the FläktGroup SEMCO SP module are included in the fan data charts. The FläktGroup SEMCO SP external static is the same as the static in the return air plenum in the Trane® Precedent® unit.

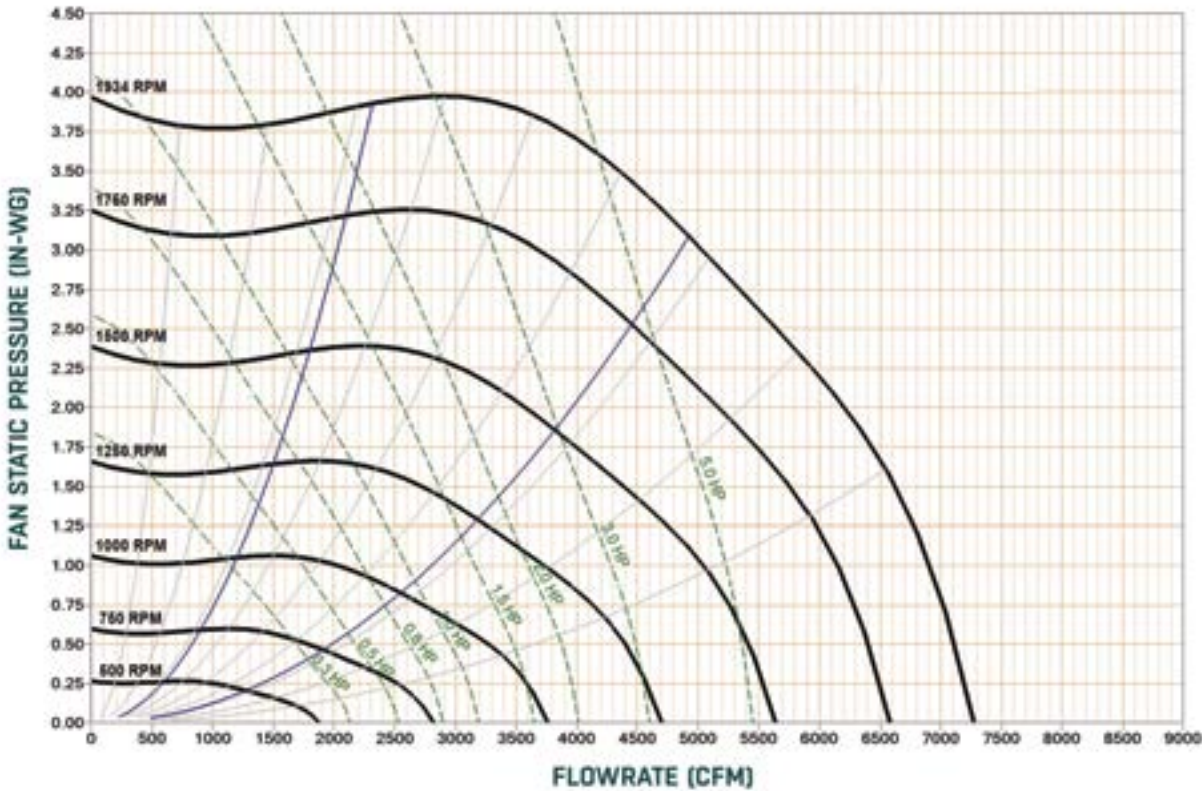
* A FläktGroup SEMCO SP unit mounted to a Trane® Precedent® unit typically has a supply fan static of -0.1" and an exhaust fan static of +0.3".

When sizing fan motors, it is not required to add purge air or seal leakage as these corrections are reflected.

FLÄKTGROUP SEMCO SP-700: FAN CURVE

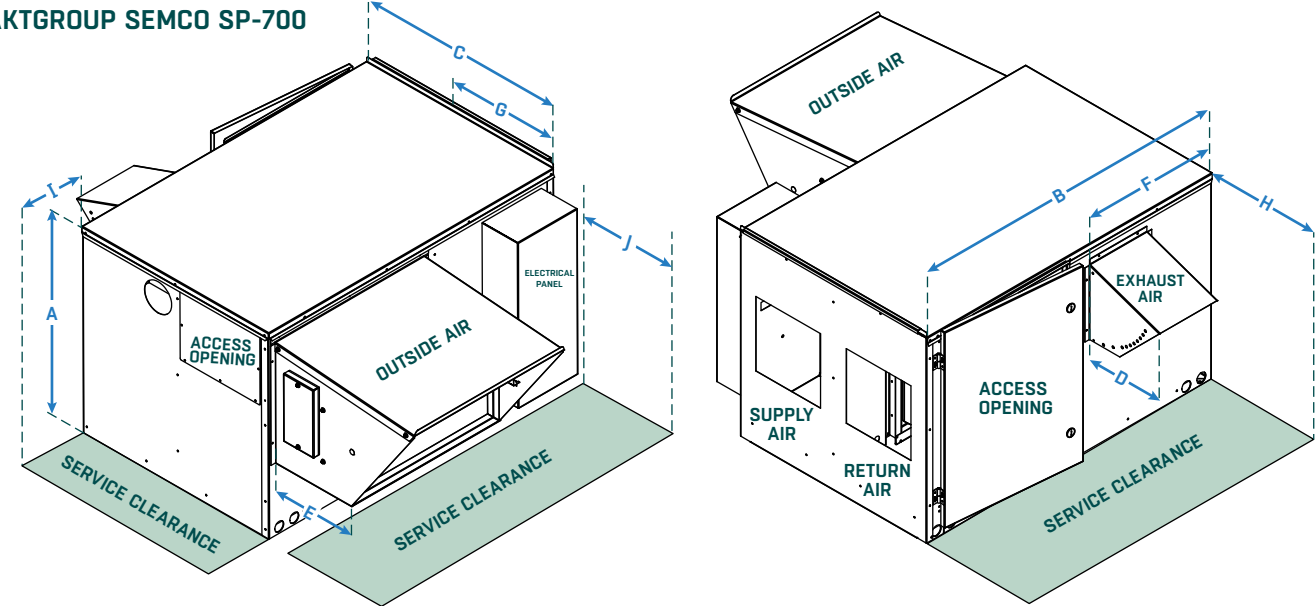


FLÄKTGROUP SEMCO SP-2200: FAN CURVE

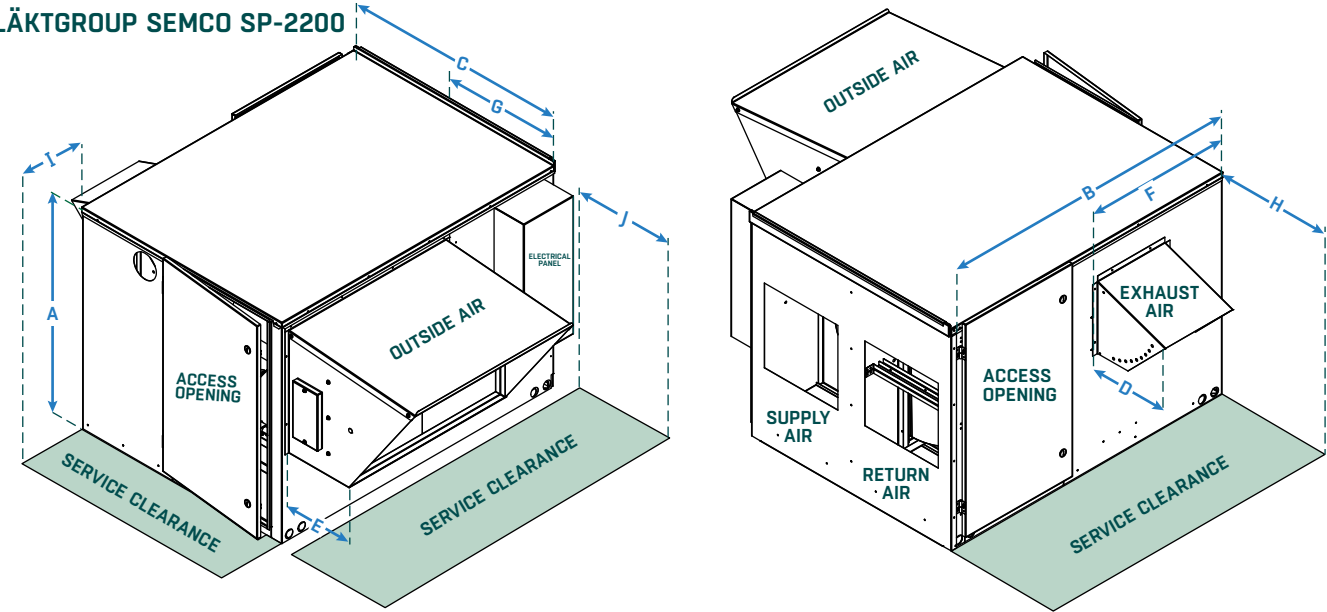


UNIT ARRANGEMENTS

FLÄKTGROUP SEMCO SP-700



FLÄKTGROUP SEMCO SP-2200

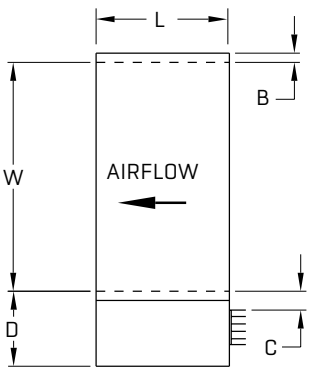
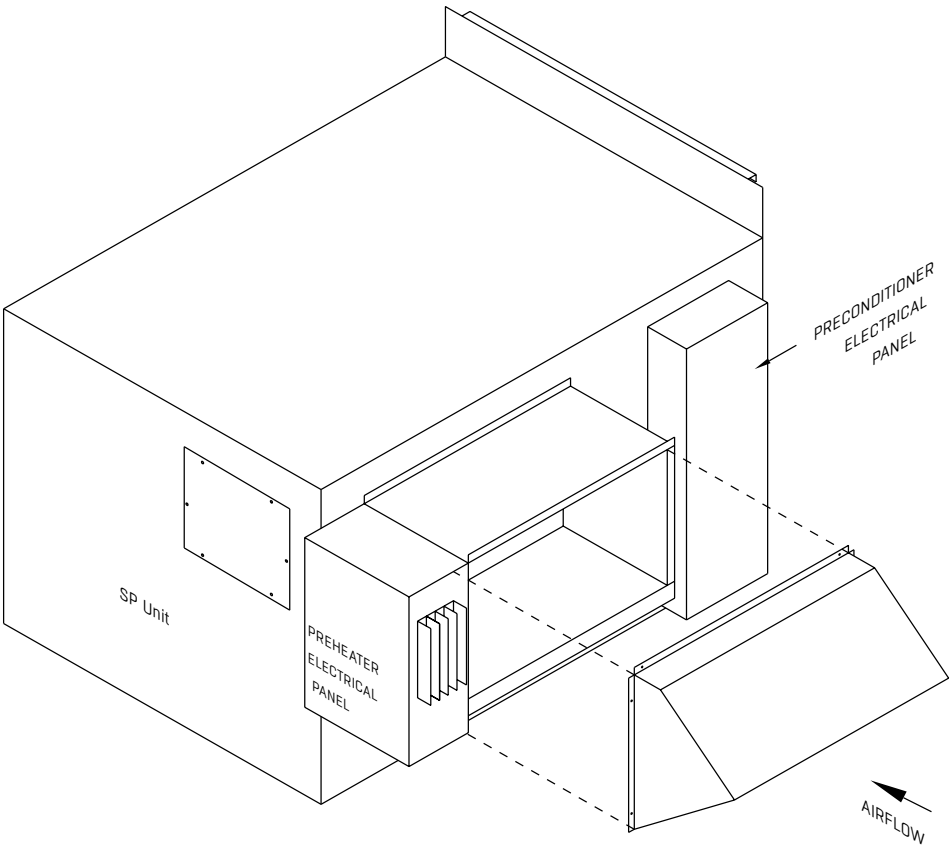


FLÄKTGROUP SEMCO MODEL #	NET WT. (LBS.)*	DIMENSIONS (INCHES)									
		A	B	C	D	E	F*	G*	H	I	J
SP-700	350*	30.12	47.83	31.34	11.75	23.36	25.6*	14.9*	31.375	24.0	36.0
SP-2200	475*	38.74	54.72	40.31	13.55	25.51	27.0*	21.4*	40.375	24.0	36.0

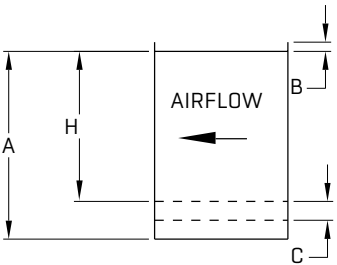
*Note: Dimensions F & G represent approximate unit center of gravity.

*The package weighs approximately 100 lbs. more than the net weight.

ELECTRIC PREHEAT LAYOUT



PLAN VIEW



SIDE VIEW

FLÄKTGROUP SEMCO UNIT SIZE	W	H	L	A	B	C	D
SP-700	24.37	16	14	20	1	2	8
SP-2200	30.5	20.37	14	20	1	2	8

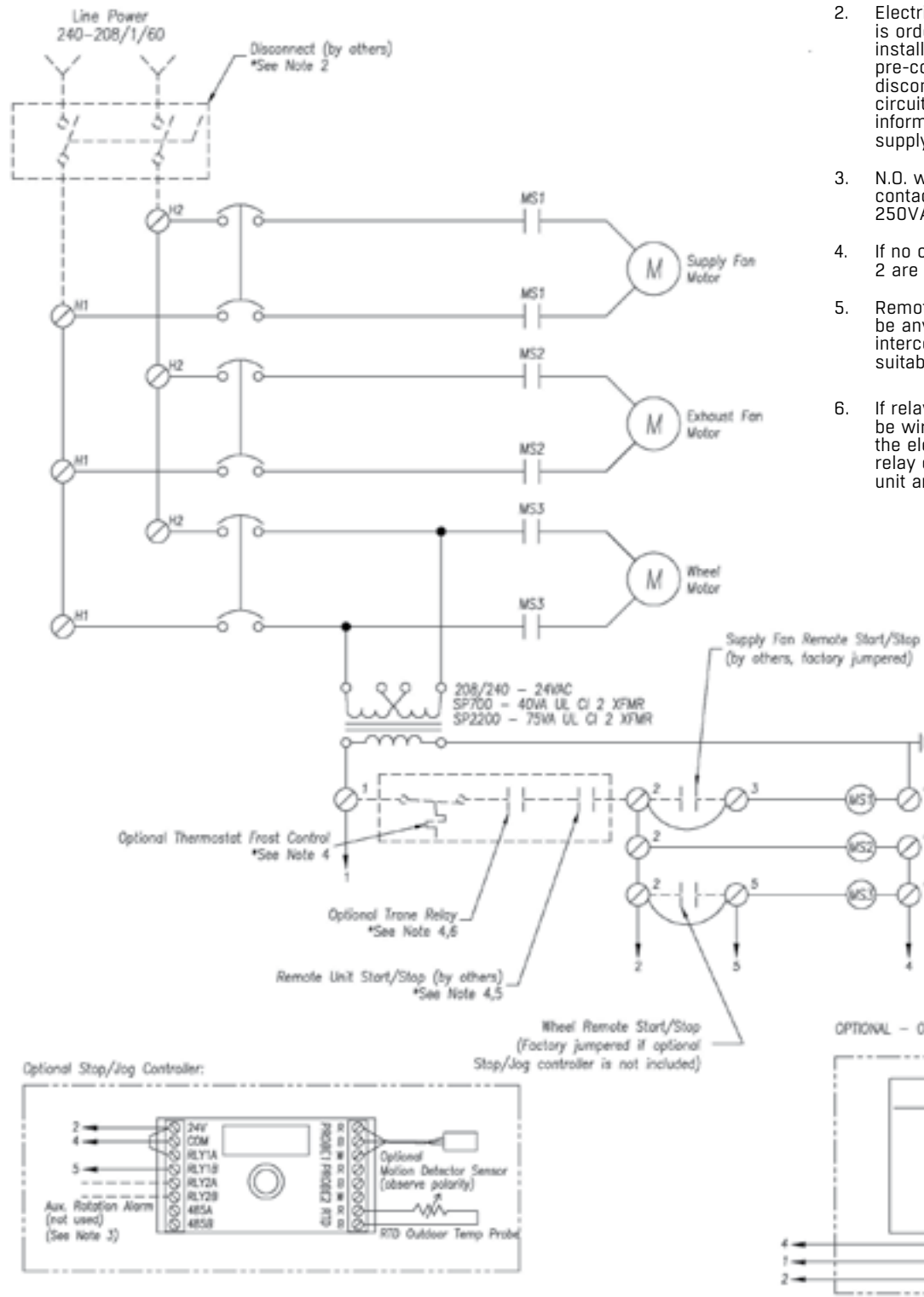
All dimensions in inches.

1Ø CIRCUIT DIAGRAM, SP-700 & SP-2200

Schematics for units with Economizer are provided with submittal and unit

NOTES:

- 1. All dashed lines indicate field wiring unless otherwise noted.
- 2. Electric Preheat: If electric preheater is ordered, the power wiring is factory installed from electric preheater to pre-conditioner panel and includes a disconnect. (See specifications and circuit diagram on electric preheater 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. If relay is ordered terminals 1 and 2 will be wired to the N.O. relay mounted on the electric panel. Power wiring for the relay coil is from the Trane® Precedent® unit and is installed by others.



TERMINAL TORQUE REQUIREMENTS	
AWG SIZE	IN-LB
18-10	20
8	25
6-4	35

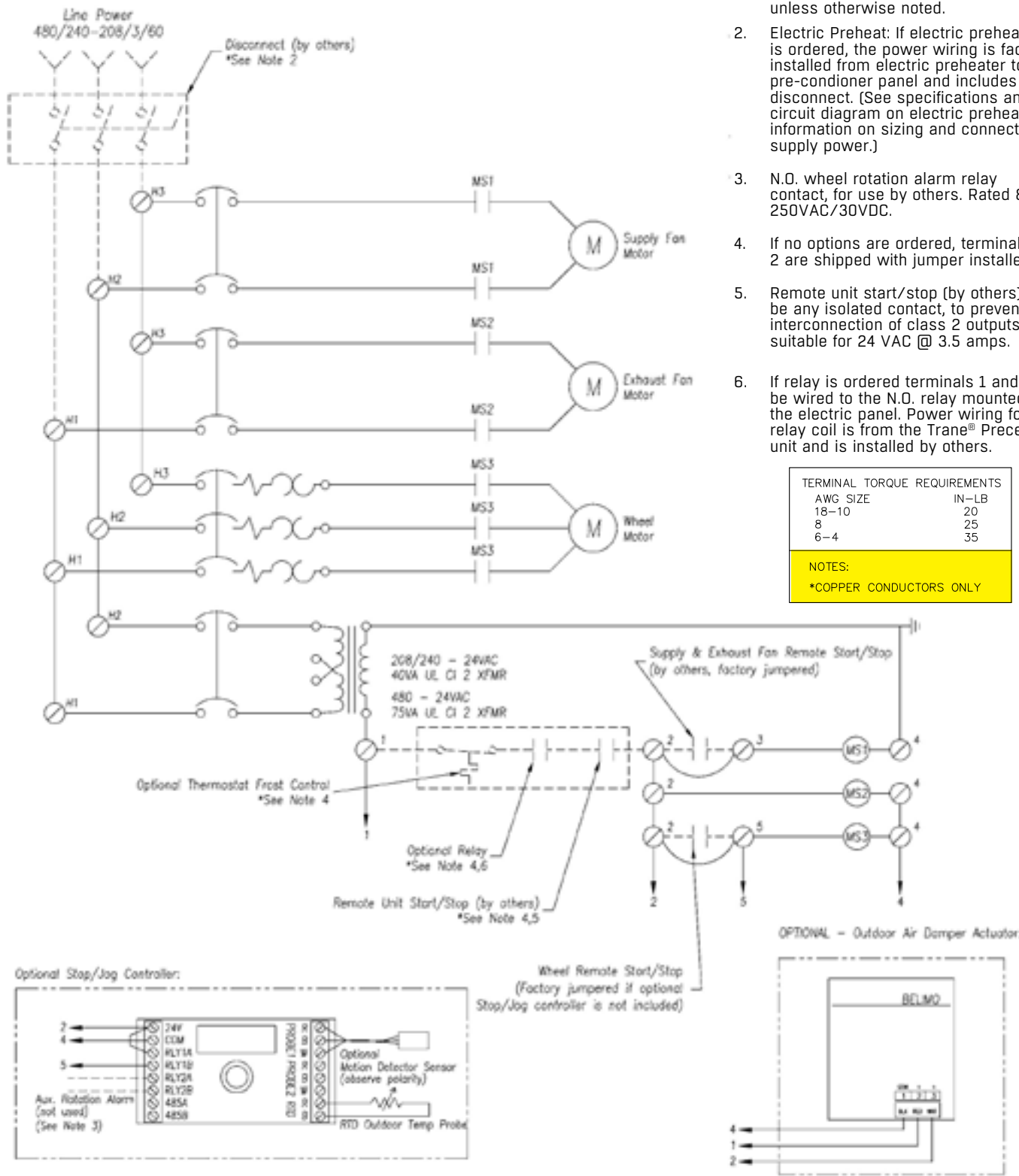
NOTES:
*COPPER CONDUCTORS ONLY

3Ø CIRCUIT DIAGRAM, SEMCO SP-700

Schematics for units with an Economizer are provided with submittal and unit

NOTES:

- 1. All dashed lines indicate field wiring unless otherwise noted.
- 2. Electric Preheat: If electric preheater is ordered, the power wiring is factory installed from electric preheater to pre-conditioner panel and includes a disconnect. (See specifications and circuit diagram on electric preheater 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. If relay is ordered terminals 1 and 2 will be wired to the N.O. relay mounted on the electric panel. Power wiring for the relay coil is from the Trane® Precedent® unit and is installed by others.

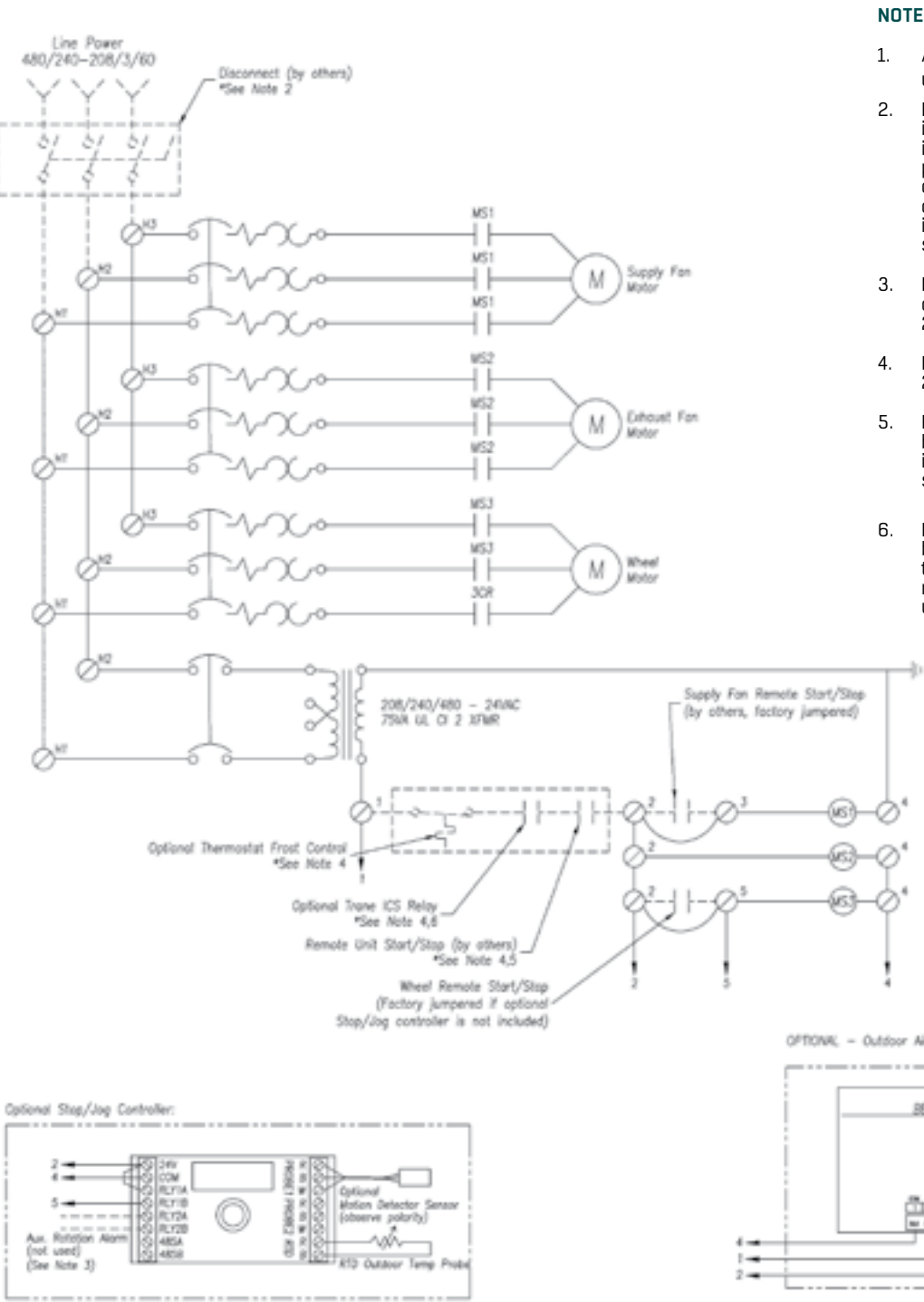


TERMINAL TORQUE REQUIREMENTS	
AWG SIZE	IN-LB
18-10	20
8	25
6-4	35

NOTES:
*COPPER CONDUCTORS ONLY

3Ø CIRCUIT DIAGRAM, SP-2200

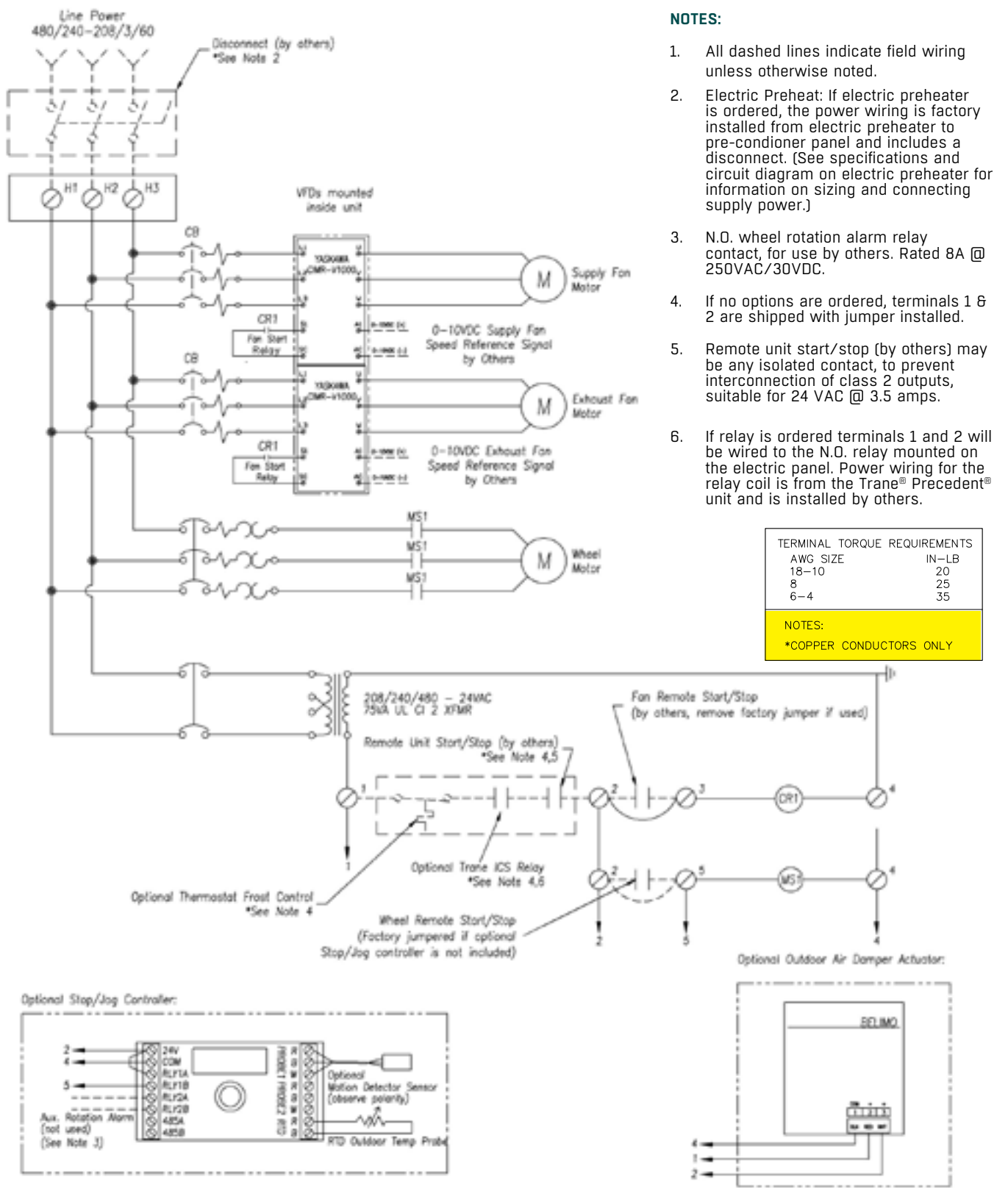
Schematics for units with Economizer are provided with submittal and unit



- NOTES:
- All dashed lines indicate field wiring unless otherwise noted.
 - Electric Preheat: If electric preheater is ordered, the power wiring is factory installed from electric preheater to pre-conditioner panel and includes a disconnect. (See specifications and circuit diagram on electric preheater for information on sizing and connecting supply power.)
 - N.O. wheel rotation alarm relay contact, for use by others. Rated 8A @ 250VAC/30VDC.
 - If no options are ordered, terminals 1 & 2 are shipped with jumper installed.
 - 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.
 - If relay is ordered terminals 1 and 2 will be wired to the N.O. relay mounted on the electric panel. Power wiring for the relay coil is from the Trane® Precedent® unit and is installed by others.

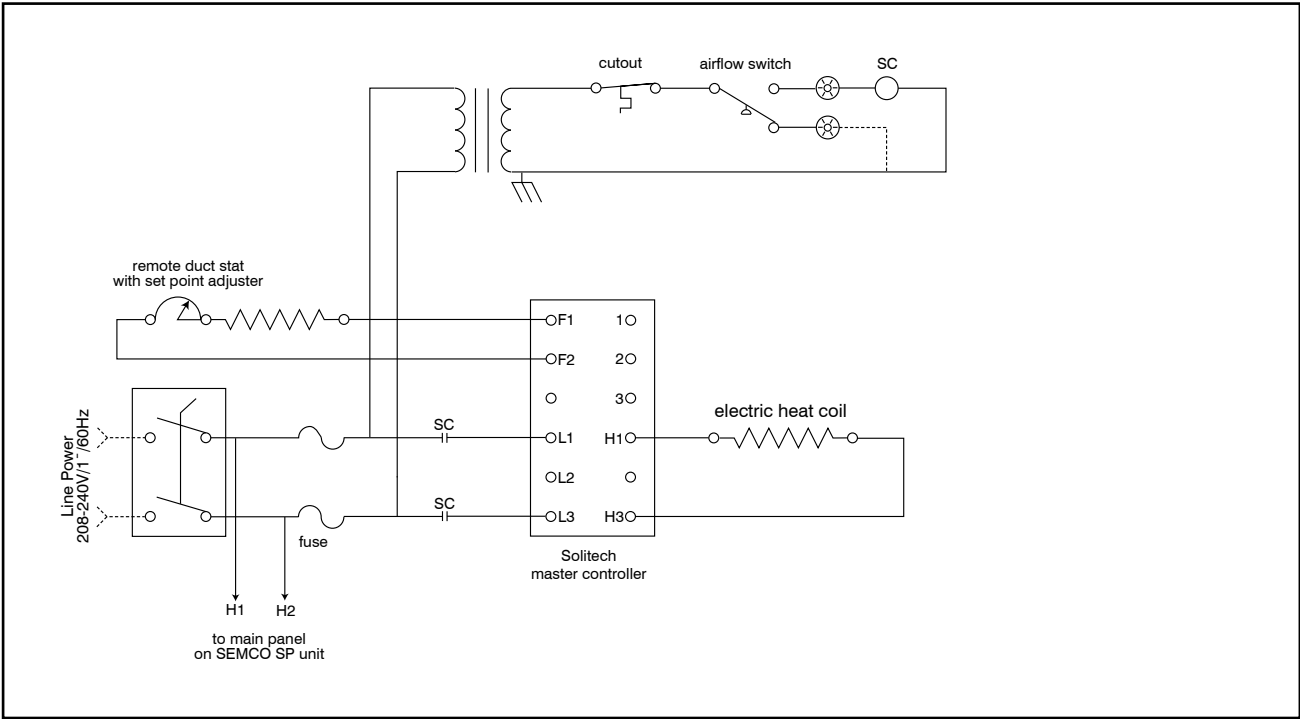
3Ø CIRCUIT DIAGRAM, SP-2200 WITH VARIABLE SPED FANS

Schematics for units with Economizer are provided with submittal and unit



- NOTES:
- All dashed lines indicate field wiring unless otherwise noted.
 - Electric Preheat: If electric preheater is ordered, the power wiring is factory installed from electric preheater to pre-conditioner panel and includes a disconnect. (See specifications and circuit diagram on electric preheater for information on sizing and connecting supply power.)
 - N.O. wheel rotation alarm relay contact, for use by others. Rated 8A @ 250VAC/30VDC.
 - If no options are ordered, terminals 1 & 2 are shipped with jumper installed.
 - 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.
 - If relay is ordered terminals 1 and 2 will be wired to the N.O. relay mounted on the electric panel. Power wiring for the relay coil is from the Trane® Precedent® unit and is installed by others.

1Ø ELECTRIC PREHEAT FROST PROTECTION CIRCUIT DIAGRAM



ELECTRICAL DATA

Select motors using the fan tables on **PAGES 11-12** For the unit and motors selected, **FIGURE 13** will have the corresponding full load amps (FLA) for each motor.

To determine minimum circuit ampacity (MCA):

$$\begin{aligned}
&1.25 * \text{FLA largest fan motor (FIGURE 13)} \\
&+ \text{FLA other fan motor (FIGURE 13)} \\
&+ \text{FLA wheel drive/ accessories (FIGURE 13)} \\
&\text{-----} \\
&= \text{MCA}
\end{aligned}$$

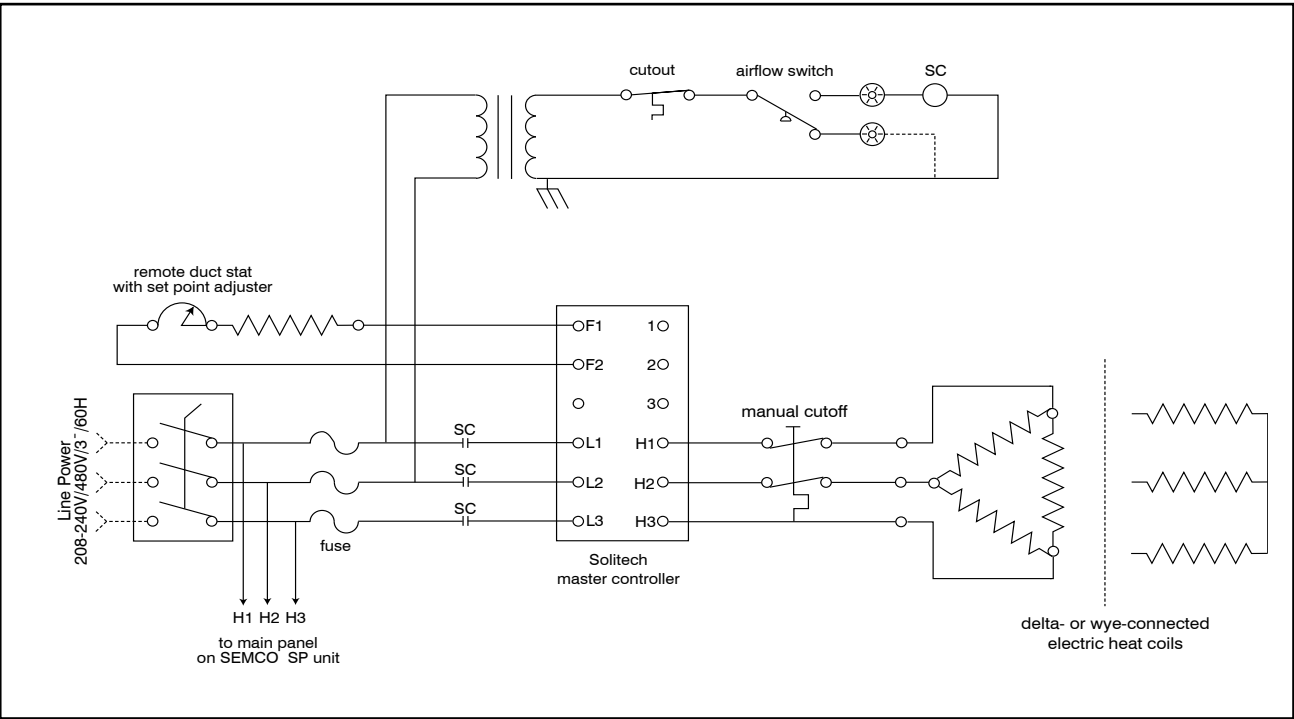
FIGURE 10. Formula to determine minimum circuit ampacity (MCA) without pre-heater.

To determine minimum circuit ampacity (MCA):

$$\begin{aligned}
&\text{FLA exhaust fan motor (FIGURE 13)} \\
&+ \text{FLA supply fan motor (FIGURE 13)} \\
&+ \text{FLA wheel drive/ accessories (FIGURE 13)} \\
&+ \text{FLA optional preheater (FIGURE 14)} \\
&* 1.25 \\
&\text{-----} \\
&= \text{MCA}
\end{aligned}$$

FIGURE 11. Formula to determine minimum circuit ampacity (MCA) with preheater.

3Ø ELECTRIC PREHEAT FROST PROTECTION CIRCUIT DIAGRAM



To determine maximum overcurrent protection (MOP):

For the SP-700 without preheater: MOP=15

For the SEMCO SP-2200 with preheater:

$$\begin{aligned}
&2.25 * \text{FLA largest fan motor (FIGURE 13)} \\
&+ \text{FLA other fan motor (FIGURE 13)} \\
&+ \text{FLA wheel drive/ accessories (FIGURE 13)} \\
&+ \text{FLA optional preheater (FIGURE 14)} \\
&\text{-----} \\
&= \text{MOP}
\end{aligned}$$

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. If the fuses/breakers do not hold, consult the National Electric Code for suitability of larger fuses/breakers.

FIGURE 12. Formula to determine maximum overcurrent protection (MOP).

FIGURE 13. Electric unit data, full load power draw

FLÄKTGROUP SEMCO UNIT	MOTOR SIZE (HP)	FULL LOAD POWER DRAW (AMPS)				
		208V/1Ø	240V/1Ø	208V/3Ø	240V/3Ø	480V/3Ø
SP-700	3/4	7.6	6.9	7.6	6.9	3.5
	WHEEL DRIVE / ACCESSORIES	1.1	1.1	0	0	0
SP-2200	1/3	4.0	3.6	1.7	1.6	0.8
	3/4	7.6	6.9	3.5	3.2	1.6
	1-1/2	11.0	10.0	6.6	6.0	3.0
	2	13.2	12.0	7.5	6.8	3.4
	3	-	-	10.6	9.6	4.8
	WHEEL DRIVE / ACCESSORIES	1.25	1.25	1.1	1.1	0

ELECTRIC PREHEAT DATA

An electric preheat coil is an available option for all FläktGroup SEMCO SP 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 Trane® or 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 to avoid frost formation.

FIGURE 13 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 Trane® or FläktGroup SEMCO representative to assure proper sizing.

FIGURE 14.. Electric Preheat Data

FLÄKTGROUP SEMCO MODEL	NOMINAL PREHEATER SIZE (kW)	TEMPERATURE RISE @ FULL kW (°F)	ACTUAL PREHEATER SIZE (kW) / FULL LOAD POWER DRAW (AMPS)				
			208V/1Ø	240V/1Ø	208V/3Ø	240V/3Ø	480V/3Ø
SP-700	3.0	9-19	3.40 / 16.3	3.50 / 14.6	3.00 / 8.3	3.00 / 7.2	3.50 / 4.2
SP-2200	7.5	10-29	7.65 / 36.8	7.5 / 31.3	7.65 / 21.2	7.5 / 18.0	7.5 / 9.0

All SP units have SCCR 10k.

ORDER SUMMARY SHEET

FLÄKTGROUP SEMCO SynergyPLUS® ENERGY RECOVERY MODULE

ORDER SUMMARY SHEET (FLÄKTGROUP SEMCO SP-700 & FLÄKTGROUP SEMCO SP-2200)

FOR TRANE® PRECEDENT® UNITS

JOB NAME:

UNIT TAG:

FLÄKTGROUP SEMCO SP MODEL:

TRANE® PRECEDENT® MODEL NUMBER

UNIT VOLTAGE:

SUPPLY STATIC (in.wg.)

OUTSIDE AIR FLOW RATE (cfm)

RETURN STATIC (in.wg.)

EXHAUST AIR FLOW RATE (cfm)

ELECTRIC PREHEAT (kW):

DISCONNECT (NON-FUSED):

ECONOMIZER STOP/JOG WITH ROTATION SENSOR & LOW TEMP FROST PROTECTION (SMX-70)

THERMOSTAT FROST PROTECTION:

SEGREGATED EXHAUST ADAPTER:

PEDESTAL SUPPORT:

☐ SP-700

☐ SP-2200

☐ 208V/1PH

☐ 240V/1PH

☐ 208V/3PH

☐ 240V/3PH

☐ 480V/3PH

☐ NO

☐ 3

☐ NO

☐ 7.5

☐ NO

☐ YES

☐ NO

☐ YES

☐ NO

☐ YES

☐ NO

☐ YES

☐ NO

☐ YES

PLEASE NOTE: THIS INFORMATION MUST BE PROVIDED IN FULL BY THE SALES ENGINEER. CONTACT YOUR FLÄKTGROUP SEMCO SALES REPRESENTATIVE FOR ACCESS TO THE SELECTION SOFTWARE FOR COMPLETING YOUR SP ORDER.

573 443 1481 | sales.semco@flaktwoods.com | www.semcohvac.com

*TRANE® PRECEDENT® SMOKE DETECTOR OPTION IS ONLY AVAILABLE IN SUPPLY AIR DISCHARGE OF TRANE® PRECEDENT® UNIT WHEN USING THE SEMCO SP ENERGY RECOVERY MODULE

SAMPLE SPECIFICATIONS

CASING

Standard panels shall be 20 gauge galvanized steel, lined with 1/2 inch thick neoprene insulation where required. 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. The outdoor air intake opening shall be protected by a galvanized steel sheet metal weather hood and include an automatic shutoff damper with electric operator. The exhaust air discharge shall be covered with a gravity backdraft 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 and easily removable access panel. Access panels 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 sides 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 have 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 or by motors using belts and sheaves. Motors shall be standard NEMA frame with open drip-proof enclosures. V-belt drives shall be designed for a minimum 1.2 service factor.

TOTAL ENERGY WHEEL

The rotor media shall be made of aluminum which is coated to prohibit corrosion. The rotor media shall be coated with a non-migrating adsorbent to controller

transfer water vapor and to prohibit corrosion. Equal sensible and latent recovery efficiencies shall be clearly documented through a certification program conducted in accordance with ASHRAE 84-91 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 have a flame spread of less than 25 and a smoke generation rating of less than 50 when tested in accordance with ASTM-E-84.

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.

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 such that should the energy recovery wheel not rotate during a signaled run period, the controller shall send a 24 volt AC signal suitable for operating a relay to be used as an alarm contact. 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 in the return air plenum. The filters shall be listed by Underwriters' Laboratories as Class 2.

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 setpoint, then the unit will restart automatically.

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 NEMA 3R electrical panel shall be mounted on the unit exterior for ease of access. Unit shall be ETL listed and labeled.

WARRANTY

Please see the terms and conditions for your order or contact service.semco2@flaktgroup.com.



WWW.SEMCOHVAC.COM

SYNERGYPLUS[®] / 20231411

FläktGroup SEMCO[®] delivers smart, energy-efficient, air-quality solutions to support every building application. We offer our customers innovative technologies, high-quality products and outstanding performance supported by more than fifty years of accumulated industry experience. The broadest offering on the market and a strong market presence in 65 countries worldwide guarantees that we are always by your side, ready to deliver: Excellence in Solutions.

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