Electric Coils

Product Information

General Information

Electric heat coils are an available accessory for use with Price blower coil units. The electric heating coils have been specifically designed to suit Price blower coil. Electric heating coils are factory-mounted at the discharge outlet of the terminal unit.

Controls for the electric heat are interlocked and sequenced with the recirculating fan in the unit. The electric heat can be energized only after the recirculating fan is operating and then only if the warm plenum air supplied by the recirculating fan has not been sufficient to satisfy space heat requirements.

Benefits of Electric Coils vs Hot Water Coils

Electric coils offer an alternative to hot water reheat coils as an optional accessory for blower coil. The benefits are:

- No need for water lines which can lead to potential leaks, damaging property and reduced installation costs.
- Advantage can be taken of the electrical power supply hookup for the blower coil when making the electrical connection for the electric coil. (Note: the electrical power supply conductor size increases when electrical reheat coil load is added, refer to NEC codes for conductor sizing.)
- No pressure drop across the coils, therefore reduced fan HP requirements.

Features/Benefits of Price Electric Heat Coils:

- Heavy gauge zinc-coated steel electrical cabinet and frame.
- Large electrical cabinet door hinged for easy access and designed for secure closure.
- Electric coil controls and blower coil unit controls are on the same side of the unit reducing design restrictions and providing ease of servicing.
- Electric coil configuration and air flow is matched to eliminate hot spots to provide efficient heat transfer and to maintain element life.
- Automatic reset thermal cutout specifically matched to each unit to protect from overheating in case the minimum air flow requirements are not met.
- Secondary thermal cutout is in the power circuit and is used as a backup in case of failure of the automatic reset thermal cutout.
- Recirculating fan is interlocked with the heating elements to ensure that the fan is operational prior to the heating elements being energized.
- High grade nickel chrome heating elements are an available option to provide superior element life and corrosion resistance.
- A single point connection is provided for both heater and fan motor (except 600v/3ø). Dual point connection is available as an option on special request.
- Electric coil units are ETL listed to meet electrical safety standards and comply with dual designation CSA 236/UL 1995.

Available Options

- An interlocking main disconnect switch is used to de-energize the electric unit once the electrical enclosure door has been opened.
- Positive pressure air flow switch which senses pressure differential between a factory preset pressure and the combined velocity pressure plus static pressure. If the recirculating fan fails to operate, then the positive pressure air flow switch will not allow the electric coil to operate.
- Mercury contactors recommended for use in applications sensitive to noise. Mercury contactors provide quiet operating characteristics. Recommended for applications which have frequent demand and cycle repeatedly.
- Disconnecting contactors for applications where it is necessary to disconnect all three phase power up.
- Up to two additional stages of electric available to allow for staged heating capacity.
- SCR (Silicon Controlled Rectifier) option provides infinite heater control using a proportional signal. Element life is extended and noise from contactors is eliminated. This option may be specified compatible with pneumatic, electronic, or DDC controls. See description below. (UL and CSA certified)
- Primary or Secondary Fusing for added safety or to meet local electrical codes.

Conventional Staged Heater

- **Pneumatic**
- **Electronic**
- **Digital (DDC)**

Maximum 3 Stages

SCR Heater

- **Pneumatic**
  proportional (with the addition of a pneumatic-electric transducer).
- **Digital (DDC)**
  proportional, pulsed AC, or pulsed DC.

All Metric dimensions ( ) are soft conversion.
Imperial dimensions are converted to metric and rounded to the nearest millimetre.

Price Silent Guard™ – Silent Operating Electric Heater Control Module

The Price Silent Guard Heater Control Module provides efficient operation of duct heaters with a wide range of features to cover all control, safety and troubleshooting concerns. The on-board PCB relays provide quiet and reliable operation to give the end user peace of mind.

Benefits

- Quiet on-board relays
- Auto resetting 24VAC fuse
- On-board air flow switch
- Status LED to aid troubleshooting

General Information

The Price Silent Guard (PSG) is an all-in-one solution to duct heater control. The complex internal wiring normally associated with duct heater assemblies is eliminated and replaced with the sleek and compact all-inclusive PSG circuit board. Installing the board is very straight forward: thanks to the snap-in design and fully labeled on-board connectors, wiring is made quick and efficient.

Features

The Price Silent Guard incorporates many features on to the board to make it the safest and most reliable product possible:

- Accepts either switched HOT or switched COMMON input signals.
- Software averaging of input signal prevents relay chatter and extends device life.
- Fan interlock option prevents coil from overheating.
- FR-4 rated circuit board complies with safety standards.
- PCB mounted air flow switch with Intelliflow technology.
- Easy to use with One-Phase, Three-Phase Y or Three-Phase Delta power systems.
- Each stage handles up to 277VAC.
- Indicator lights show operation of each stage of heat and fan output.
- Programmed time delays prevent short cycling of fan or heater stages.
- PCB Relays are much quieter than standard magnetic contactors.
- Price Silent Guard is also a great alternative to expensive mercury contactors.

PSG (Price Silent Guard)

Installation and Maintenance

The design of the PSG greatly reduces installation time and increases convenience: the unit simply snaps in to the duct heater. Wiring connections for every possible configuration are labeled on the board in a straight forward and simple to understand manner. This reduces wiring clutter and space required for the assembly.

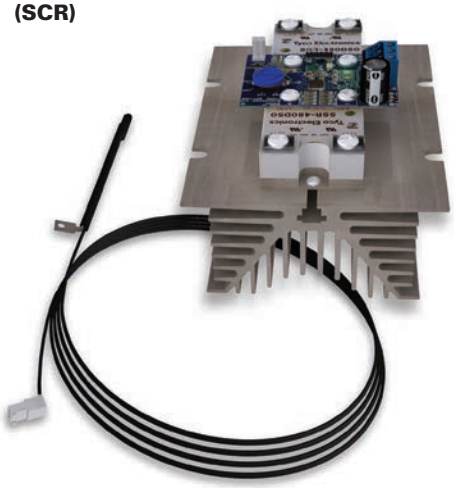
Troubleshooting the unit is even easier. An on-board status LED sequentially blinks out a troubleshooting code which indicates the current status of the board. (For example: three blinks means 3 stages of heating are active, six blinks means auto reset has tripped, etc.) The indicator lights also show the user which individual circuits are currently energized.

Safety

The PSG has undergone rigorous testing and earned ETL approval giving the user comfort in the safe operation of the device. Numerous innovative concepts were incorporated into the design of the circuit board ensuring not only the safety of the building and its occupants, but also the safety and longevity of the fan and heater components.

Electronic Heating Controls

Silicon Controlled Rectifier (SCR)



SCR

The Price SCR Controller is a Silicon Controlled Rectifier that provides proportional modulation to the output over its full operating range. The SCR acts like an electronic switch that turns on and off large amounts of power to the load (heater). The Price SCR uses a Zero Crossing feature that allows a soft start of the electronic load, which eliminates power surges.

Features

- Power requirements – 24 VAC, polarity sensitive.
- Large, finned aluminum Heat Sink to provide proper heat dissipation.
- Load Power ranging from 120 VAC to 480 VAC, and a current rating up to 25 or 45 amps (depending on model).
  Multiple Control Input signals from stand alone controller or BAS controller: 2-10 vdc signal, 4-20 mA signal, 24 VAC Pulsed signal
- LED indication for: Firmware Version, Type of Input Signal, and Output Indication.
  Factory or Field installable optional Discharge Air Temperature (DAT) Probe for maintaining outlet air

Benefits of SCR

- Proportional modulation of the heater maintains set-point more accurately than on/off control, providing maximum comfort in the space.
- Energy efficient by avoiding overshooting and undershooting and reduces operation costs.
- Quiet operation of solid state relays compared to mechanical relay or contactor pulling in and dropping out.
- SCR can be tied into existing BAS controller, or can be used in a stand alone application.

Selection Parameters

Supply Voltage/Phase Selection

Common Supply Voltages:

Electric coils for Blower Coils units can be ordered for a variety Voltage supplies.

When possible, a single point connection is provided for the heater and fan motor. **Table 1**, below, indicates compatible heater/fan motor voltages.

	Heater Volts/Phase	Fan Motor Volts/Phase
Single Point Connection	115V/1PH	115V/1PH
	208V/1PH	208V/1PH
	240V/1PH	240V/1PH
	277V/1PH	277V/1PH
	480V/1PH* 3wire	277V/1PH
	208V/3PH	208V/1PH
	480V/3PH* 4wire	277V/1PH
Two Point Connection	600V/3PH	Various

NEC Code Requirements

In order to comply with NEC Code requirements for fan terminals with electric heat the following factory supplied options are available

a) All heaters are furnished with a fan interlock contact as standard. An optional air flow switch (pressure type) is also available.

b) Optional door interlock disconnect to disconnect power to the heater and fan terminal immediately upon opening of the control panel door.

c) Supplemental heater fusing circuit is required if total of heater and motor amps exceeds 48 amps.

d) Standard contactors are of the de-energizing type. Optional disconnecting contactors provide a full-line break to assure all wires are de-energized when the contactor is open.

All Metric dimensions ( ) are soft conversion.
Imperial dimensions are converted to metric and rounded to the nearest millimetre.

Selection Guidelines

Electric Coil Selection

In selecting electric coils, consider the following:

1. Once the design air flow has been determined refer to the appropriate fan performance curves and select the model size of unit required to deliver the specified air flow.
2. With the model size and air flow known, electric coil capacity can be calculated. Refer to the electric coil selection procedure for details.
3. With the heating capacity (kW) of the unit known, Select the Power supply voltage based on maximum recommended kW, referring to the coil selection chart.
4. Verify that minimum air flow requirements of 70 cfm/kW [33L/s per kw] are met, and that the discharge air temperature does not exceed 120 °F. Refer to example.
5. Select options.

Coil Selection Chart –

Max – kW for Conventional

Size	1 Phase Voltage				3 Phase Voltage			
	115	208	240	277	208	230	460	600
	kW	kW	kW	kW	kW	kW	kW	kW
8	5.5	9.9	11.5	13.2	13.9	14.2	14.2	14.2
12	5.5	9.9	11.5	13.2	13.9	14.2	14.2	20
16	5.5	9.9	11.5	13.2	13.9	14.2	14.2	25.7
20	5.5	9.9	11.5	13.2	17.2	19.2	25	26
30	5.5	9.9	11.5	13.2	17.2	19.2	25	37.2
40	5.5	9.9	11.5	13.2	17.2	19.2	25	37.2

Notes

1. ETL certified assemblies.
2. Minimum kW:
   Single Phase = 0.5 kW per stage.
   Three Phase = 1.5 kW per stage.
3. The recommend limit of 48 Amps may by exceeded. This requires supplemental fusing to meet NEC code requirements. Contact your local Price representative for further details.
4. Maximum kW limitations is the lesser of
   a) coil selection chart
   or
   b) minimum air flow requirements of 70 cfm/kW [33 L/s per kW].

Price Silent Guard

In selecting electric coils, consider the following:

1. Once the design air flow has been determined refer to the appropriate fan performance curves and select the model size of unit required to deliver the specified air flow.
2. With the model size and air flow known, electric coil capacity can be calculated. Refer to the electric coil selection procedure for details.
3. With the heating capacity (kW) of the unit known, Select the Power supply voltage based on maximum recommended kW, referring to the coil selection chart.
4. Verify that minimum air flow requirements of 70 cfm/kW [33L/s per kw] are met, and that the discharge air temperature does not exceed 120 °F. Refer to example.
5. Select options.

Coil Selection Chart – Maximum kW

Max – kW for Price Silent Guard Controller

Size	1 Phase Voltage				3 Phase Voltage			
	115	208	240	277	208	230	460	600
	kW	kW	kW	kW	kW	kW	kW	kW
8	5.4	9.3	10.8	12.4	13.9	14.2	14.2	14.2
12	5.4	9.3	10.8	12.4	13.9	14.2	14.2	20
16	5.4	9.3	10.8	12.4	13.9	14.2	14.2	25.7
20	5.4	9.3	10.8	12.4	16.2	17.9	25	26
30	5.4	9.3	10.8	12.4	16.2	17.9	25	37.2
40	5.4	9.3	10.8	12.4	16.2	17.9	25	37.2

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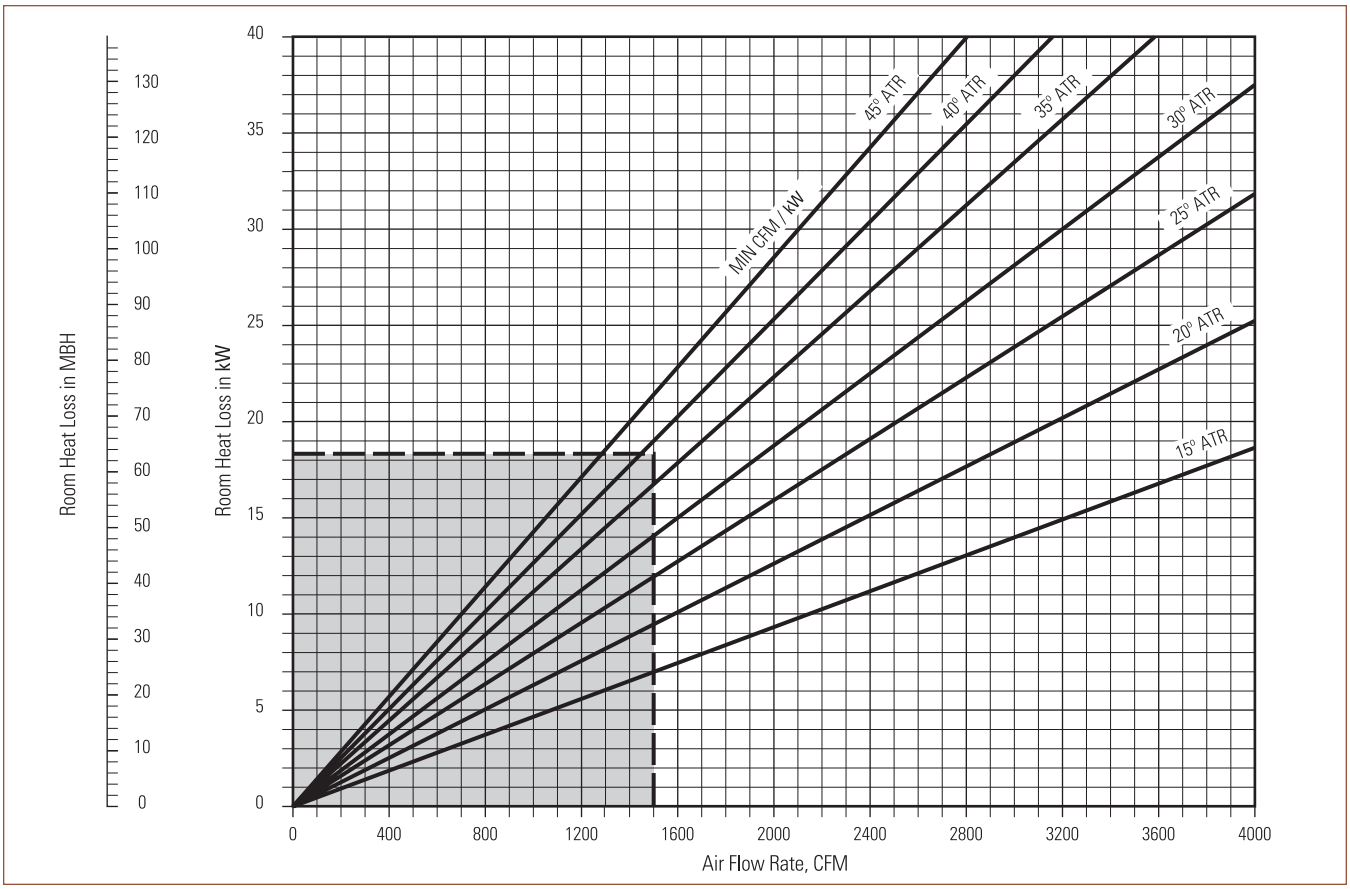
Electric Coil Selection Chart



How To Use the Chart

Electric Coil Selection Procedure

The selection of an electric coil for a blower coil requires the determination of the two components of the heat loss. One component is the heat required to satisfy the space load. The second component is the heat required to raise the temperature of the primary air to that of the space. This can be determined as follows, using the Electric Coil Selection Chart and the equation as given below.

1. Locate the room heat loss on the MBH scale on the far left side of the chart. Convert to kW by moving horizontally to the right to the kW scale (1 kW = 3.413 MBH).
2. Calculate the kW required to heat the recirculated plenum air to room temperature using the following equation:

$$kW = \frac{cfm \times 1.08 \times \Delta T}{3413}$$

3. Add the kW value obtained in step 2 to the kW scale at the left side. Move horizontally to the right to the point where the kW value and the air flow volume intersect.
4. With the point of intersection from 3, the air temperature rise (ATR), can be obtained by interpolating between the air temperature n/se lines on the graph.
5. To verify the selection, sum the air temperature rise and the temperature of the recirculated plenum air. The sum total should be less than 120 °F.

Example

Select an electric coil for a Size 16 Model BCH, with a fan capacity of 1500 cfm. Space heat loss is estimated at 56 MBH and space design temperature is 72 °F. The temperature of primary air is 68 °F.

1. Space heat loss (56 MBH) = 16.4 kW
2. Heat required to raise the temperature of the recirculated plenum air.

$$kW = \frac{1500 \times 1.08 \times 4}{3413} = 1.9\ kW$$

3. Total heat required = 16.4 + 1.9 = 18.3 kW.
4. Air temperature rise (ATR) = 38.5 °F.
5. Leaving air temperature - 68° + 38.5° = 106.5 °F. Since the leaving air temperature is less than the recommended maximum limit of 120 °F, the selection is satisfactory.
6. Select a suitable power supply from Table 3.
7. Verify minimum air flow requirements are met.

$$\frac{1500\ cfm}{18.3\ kW} = 82\ cfm/kw$$

- 82 cfm per kW is greater than 70 cfm per kW from Table 1 — a satisfactory selection.

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Horizontal and Vertical

Electric Coils

Electric coils shall be factory-mounted and of the capacity scheduled on the drawings. Blower Coil and heater assembly shall be UL 1995 and ETL certified. The heater frame and cabinet shall be constructed of heavy gauge galvanized steel. Heating elements shall be open-coil type constructed of high grade 80/20 NiCr resistance wire. Elements shall be low density and designed to minimize hot spots and nuisance cycling of the thermal resets. Coil elements shall be insulated from the frame using floating ceramic bushings.

Electric coils shall be supplied with contactors, relays, and transformers as required. Two thermal cutouts of automatic reset and manual reset type shall be provided as primary and secondary overload protection, respectively. Fused secondary thermal cutout devices are not acceptable. A differential pressure switch shall be provided to ensure air flow is present before heater is energized. A door-interlock disconnect switch shall be provided to cut power to the electric coil prior to accessing components in the control enclosure.

Modulating Control (SCR) option:

Where desired, heater shall be capable of providing proportional control of reheat capacity using an analog input signal (0-10 VDC, 4-20 mA, or PWM) from a room thermostat or from the unit controller. The SCR shall pulse the coil on and off in proportion to the heating demand indicated by the room thermostat. The SCR controller shall provide solid state switching with zero crossover for silent operation. Magnetic or mercury contactors are not acceptable for control of reheat capacity.

SCR with Discharge Air Temperature (DAT) control option:

Heater shall be supplied with SCR controller featuring discharge air temperature sensor. The controller shall feature adjustable discharge air temperature set-point controlled by a dial on the SCR controller. The SCR shall pulse the coil in proportion to the heating demand indicated by the room thermostat, while ensuring the discharge air temperature does not exceed the set-point indicated on the dial. Upon sensing DAT above set-point, the controller shall reduce the heater output in order to maintain desired discharge air temperature set-point. Discharge air temperature set-point shall be variable from 70-130 °F [21-54 °C].

- Staged Reheat Control, Quiet option (Price SilentGuard™)
- Electric heaters shall be supplied with Price 'SilentGuard™' control circuit board or equivalent, to be complete with:
- Quiet PCB relays with indicator LEDs for up to 3 stages of electric heat.
- Integrated differential air pressure switch (with control algorithm to prevent nuisance tripping).
- Blinking status LED to aid in troubleshooting of heater. Status LED shall indicate heater condition and fault; eg: no air flow, tripped manual /automatic reset, etc.
- Automatic reset 24VAC control circuit fusing.

The electric heater circuit board shall be capable of automatically adjusting to accept either a 24VAC switched HOT or switched COMMON signal from the controller in order to energize the PCB relays. The electric heater and circuit board shall be ETL listed.