

## OVERVIEW

Integral electric coils are available on Titus single duct and fan powered terminals. Titus electric heating coils are specifically designed to for use with Titus terminal units. Titus electric heater coils are not available as stand-alone duct heaters.

On fan powered terminals, the electric coil controls are interlocked with the unit fan to allow the electric coil to energize only when the fan is running.

The heater design minimizes stratification and hot spots that can cause nuisance tripping of the thermal cutouts.

Each complete terminal, with electric coil installed, is ETL listed and has been tested in accordance with UL standards. The NEMA 1 electrical enclosure includes a single point.

## SINGLE DUCT ELECTRIC COIL

### STANDARD FEATURES:

- Primary automatic reset thermal cutout (one per coil)
- Secondary manual reset thermal cutout
- Airflow switch (differential pressure)
- Derated nickel chrome heating elements
- Magnetic or safety contactors (as required)
- Line terminal block
- Control terminal block
- ETL listed
- 80/20 nickel chrome element wire

### SINGLE DUCT OPTIONAL FEATURES:

- Class II, 24 VAC control transformer
- Door interlock disconnect switch
- Main supply fuses
- Dust tight construction
- Optional Lynergy Comfort Controlled SSR Electric Heat available



## FAN POWERED DUCT ELECTRIC COIL

### STANDARD FEATURES:

- Automatic reset thermal cutouts, one per element
- 80/20 nickel chrome heating elements
- Magnetic contractors, where required, on pneumatic units
- Airflow safety switch
- Line terminal block (277/1Ø, 208/240/3Ø, or 480/3Ø 4 wire)
- Flanged connection
- Control transformer for DDC or analog electronic controls
- Pneumatic electric switch for pneumatic parallel fan terminals
- Fan relay for DDC fan terminals
- Magnetic contactor per step on terminals with DDC or analog electronic controls

### FAN POWERED OPTIONAL FEATURES:

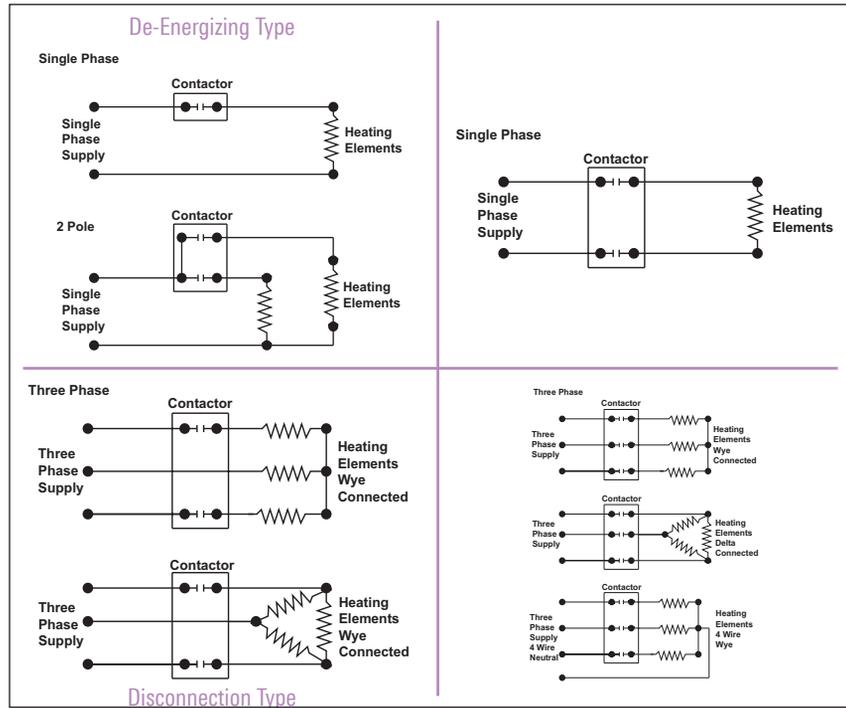
- Interlocking disconnect
- Main power supply fuses
- Manual reset thermal cutout
- Dust tight construction
- Optional Lynergy Comfort Controlled SSR Electric Heat available



CONTACTOR CIRCUITRY

There are two types of contactor circuitry used in electric coils: de-energizing contactors break only one ungrounded line on single phase circuits and two ungrounded lines of three phase circuits. (Note: Breaking the L1 on 277 volt electric coil can be considered as disconnecting.)

Disconnecting contactors break all ungrounded lines or conductors. The electric coils are wired for de-energizing contactor circuitry as standard.

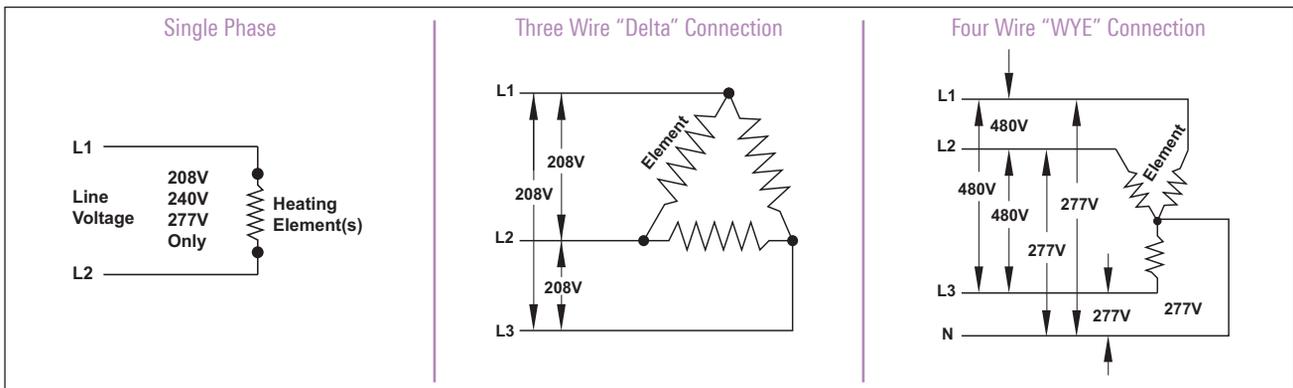


ELEMENT WIRING CONFIGURATIONS

There are three basic wiring configurations used with electric coils. The coil can be wired for single phase, three phase delta, or three phase wye. When using single phase coils versus three phase coils, the amp draw will be almost double and will require heavier gauge conductors.

Therefore, it would normally be more economical to use three phase electric coils. If the electric coil and fan motor combination exceeds 48 amps, you are required to subdivide the heating elements. Each subdivided circuit will be required to have some type of over current protection such as fuses.

Note: A 480 volt three wire wye connection, 277 volts is not available for the fan motor. You must have four wire wye.



**Calculating Line Amperage**

$\text{Single Phase Amps} = \frac{\text{kW} \times 1000}{\text{Volts}}$	$\text{Three Phase Amps} = \frac{\text{kW} \times 1000}{\text{Volts} \times 1.73}$
<p>Converting kW to BTU per hour    BTUH = kW x 3413</p>	

## OPTIONAL LYNERGY CONTROLLED SSR ELECTRIC HEAT

### OVERVIEW

The zone reheat in an HVAC system needs to address concerns about comfort, indoor air quality, energy and acoustics. Several ASHRAE Standards are used to cover all of these areas of design.

The ASHRAE Fundamentals Handbook states that discharging air at a temperature more than 15°F above the room (90°F in a 75°F room) will likely result in significant unwanted air temperature stratification.

ASHRAE Standard 62 (Indoor Air Quality) has been modified to require increased outside air when heating from the ceiling (Table 6.2, Addenda N. Using the ASHRAE 129 test procedure for Air Change Effectiveness, mixing effectiveness values as low as 20% (or lower) have been observed, when the supply to room differential exceeds 15°F. In most cases, it only requires 85°F air to handle a typical winter design perimeter load at 1 cfm/Sq.Ft. air supply rate (the airflow rate recommended for both good ventilation mixing and comfort).

Standard staged electric heat energizes each stage of heat as the zone temperature calls for more heat. In a three-stage heater, the increase happens in 33% heater output increments. If an additional 33% heater output provides too much heating, then the heater will de-energize that stage. The result is over- and under-heating of the zone.

A proportional SCR or SSR heater eliminates the over- and under-heating of the zone by providing only as much heater output needed to satisfy the zone.

During the time a standard staged electric heater is over-heating the zone, it is using more energy than needed to satisfy the zone. For example, if the zone requires 50% of the heater capacity, a three-stage heater would have to output 66% of its capacity until the thermostat responds to the temperature in the over-heated zone and de-energizes the second stage of heat.

The Lynergy Comfort Control SSR electric heater is an electronic, time proportional electric heater, which utilizes silent, rapid responding solid-state relays. The solid-state relays are controlled by the Lynergy Comfort Controller.

The Lynergy Comfort Controller is available in 208V and 240V single phase and 277V, 208V, and 480V three phase line voltages. The Lynergy Comfort Controller accepts one of seven input signal types to provide superior control and flexibility: PWM, 2 stage heat, 0-10V/0-20mA, 2-10V/4-20mA, incremental thermostat, binary, and 3-point floating.

If the optional discharge temperature sensor is used, the heater is set to modulate heat to a set discharge temperature. The sensor can be mounted up to 20 feet from the unit discharge. User defined maximum temperature and controller defined temperature desired are maintained independent of heater kW or incoming air temperature.

The maximum discharge temperature produced by the heater is set by rotary dial on the Lynergy control board. When the unit receives a signal to start heating, the board will take an initial temperature reading and modulate heat from that point to the maximum temperature.

For example, if a thermostat requires only a 10% increase in heating of air that was initially 60°F, and has a maximum temperature setting of 90°F, the Lynergy controller will modulate the heater's output temperature to 63°F (the additional 3 degrees coming from  $(90^\circ - 60^\circ) \times 10\%$ ). This option allows an increase of heater energy into occupancy by increasing discharge airflow while keeping an optimal discharge temperature.

### OPTIONAL STANDARD SCR CONTROLLED ELECTRIC HEAT

As an alternative to the standard staged electric heater, Titus offers SCR controlled electric heat, also known as time proportioned electric heat. SCR controlled electric heat provide superior comfort and energy savings. Two and three stage electric heaters cycle the stages on and off to meet the comfort requirements of the space. When the zone requires 50 percent heat output, a three stage heater will cycle the second stage of heat on and off. When the second stage is on, the heat output is 66.6 percent, 16.6 percent more than required to satisfy the zone.

An SCR controller is a time proportioned controller that modulates the heater to supply the exact amount of heat required to satisfy the zone requirements. SCR electric heat works by modulating the time the electric heater is powered on, not the kW of the heater.

An SCR heater sends a pulsed ON/OFF signal to energize and de-energize the electric coil to provide an average heat output that matches the heat requirement of the zone. The SCR is silent and can be pulsed continuously.

The Titus SCR controlled heater has a patented proportional electronic airflow sensor. This sensor allows the heater to operate at extremely low airflow. The unique electronic flow sensor allows the heater to respond exactly to the quantity of air flowing through the unit and safely de-energize in case of a total loss of airflow. The electronic airflow sensor allows you to size the box for the exact space requirements instead of oversizing for minimum required heater cfm, which can reduce the initial terminal unit cost.