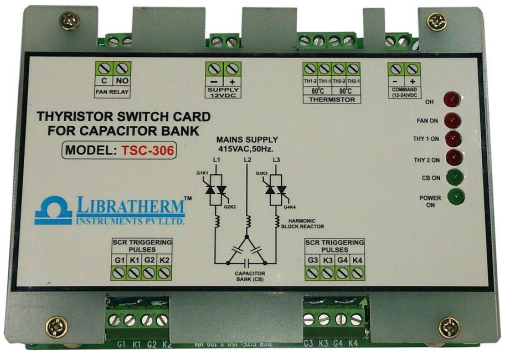
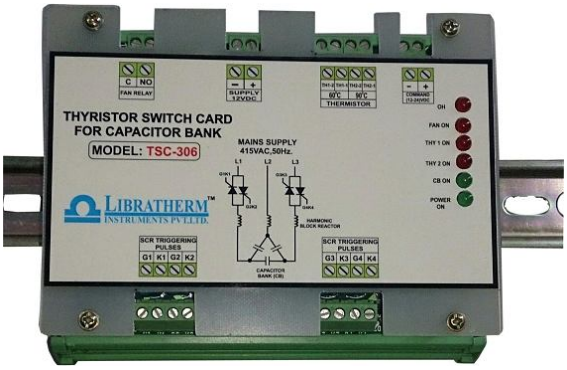
# Zero Cross Over Turn On – Thyristor Switch Card for Capacitor Bank




TSC-306-S/TSC-303-S




TSC-306-D/TSC-303-D

## Description:

**L**ibratherm offers Thyristor Switch Card model **TSC-306** which is specially designed for APFC (Automatic Power Factor Correction) applications to switch ON and OFF, 3 phase capacitor banks, based on the command from the APFC relay module. These cards are developed to trigger solid state switch or silicon controlled rectifiers (SCRs) or thyristors. The gate/cathode triggering pulses are generated using zero cross over firing techniques. The two sets of gate / cathode pulses are galvanically isolated using the on card ferrite core pulse transformers. Libratherm also offer economical version of thyristor triggering card model **TSC-303**, where gate / cathode triggering pulses are generated using zero cross over optically isolated integrated chips.

Each card can simultaneously trigger 2 sets of back to back SCRs or 2 thyristor modules to switch 3 phase capacitor banks. TSC-306/TSC-303 accepts control signal in the form of relay contact or DC pulse from APFC relay unit. When command is ON, capacitors banks are connected to the power lines and when command is OFF capacitor banks are disconnected.

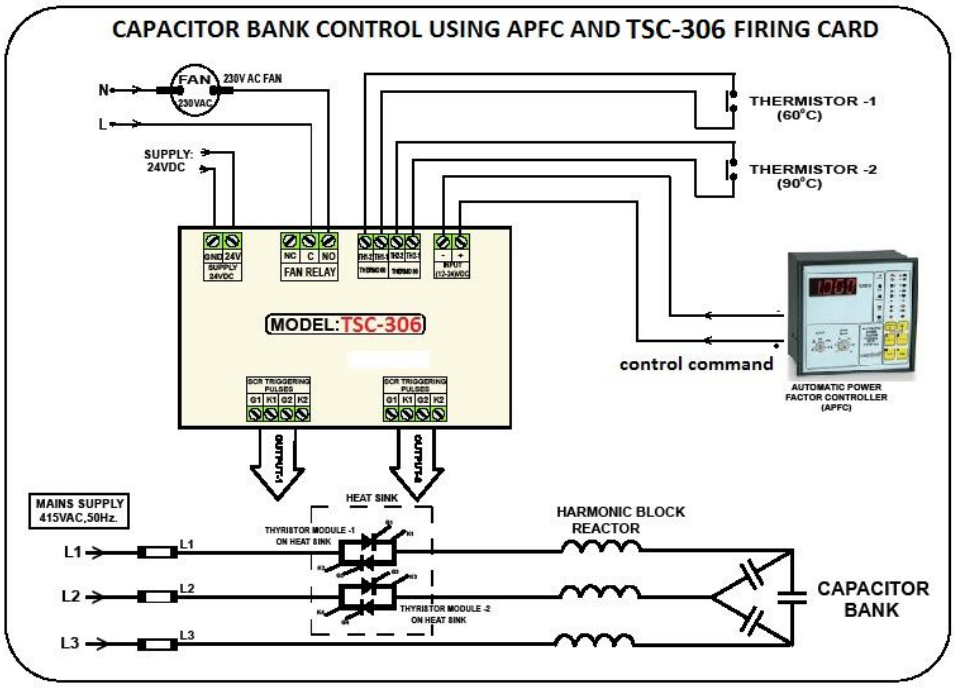
Each TSC-306/TSC-303 card has the provision to accept 2 external thermostat contacts, which can be used to operate the cooling fan mounted on the heat sinks and to trip the circuit in case of over - heating. On card LED indicates the on/off status of incoming DC power supply, ON/OFF status of capacitor banks and status of heat sink temperature.

Normally, each of the power factor controllers gives 6 to 12 outputs to select that many capacitor banks of different KVAR depending on the total KVAR demand to maintain the unity power factor. Hence, for each output from APFC it will be required to use 6 to 12 nos. of TSC-306/TSC-303 cards.

The APFC panel builders can use TSC-306 or TSC-303 cards as an independent firing card and can wire the SCR modules separately mounted on the heat sink in the panel. The physical isolation of electronic cards and SCR modules makes the overall system safer, reliable and it becomes easy to maintain and service. Libratherm has supplied more than 5000 cards, which are installed on the field giving satisfactory performance for power factor correction application.

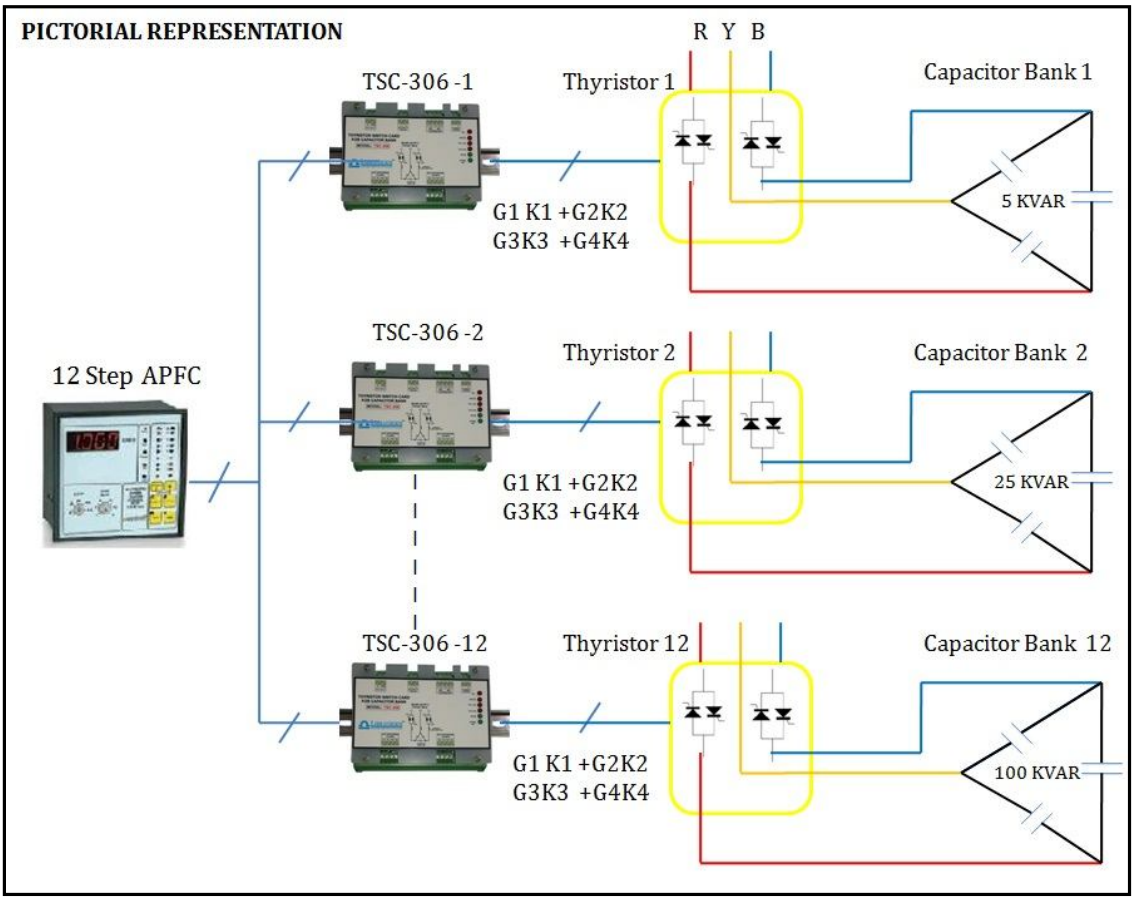
## Technical Specifications:

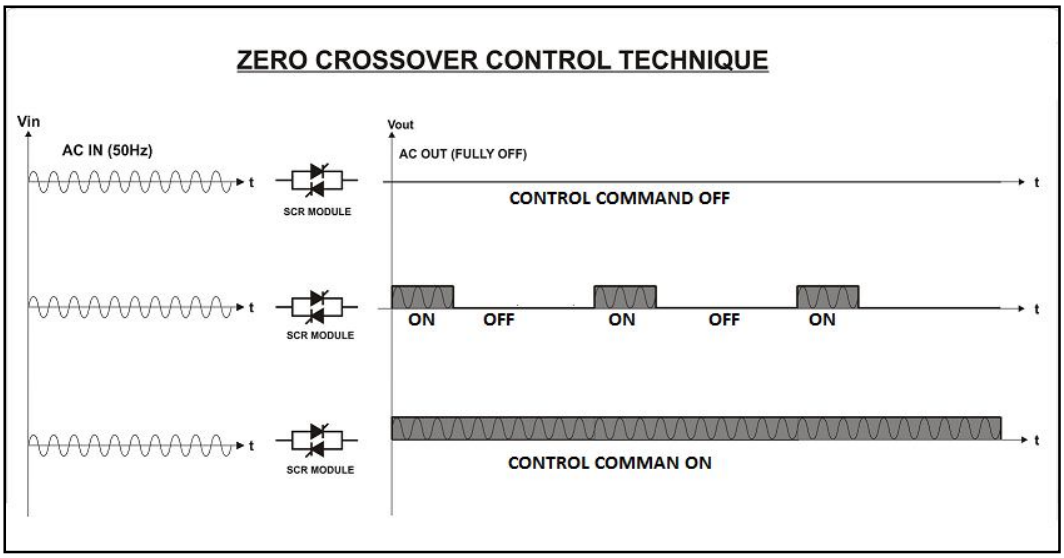
| Item | Zero cross over SCR Firing Card for 3 phase capacitor bank selection. |
|---|---|
| **Model** | TSC-306-S (Stud mounting) and TSC-306-D (DIN rail mounting)<br>TSC-303-S (Stud mounting) and TSC-303-D (DIN rail mounting) |
| **Control Command** | 12 to 24DC pulse or potential free contact from APFC |
| **Triggering Pulses** | Gate/ Cathode pulses - isolated from the Input – suitable to fire 25A to 500A back to back connected SCRs modules<br>G1K1+G2K2 and G3K3+G4K4 |
| **Triggering Technique** | Guaranteed Zero cross over firing to prevent generation of transients during switching action. |
| **Gate Current** | Max. 350 mA. |
| **Switching time** | Min. 100mS (5 AC cycles @ 50Hz line frequency) |
| **Load Configuration** | Single capacitor bank in 3 phase delta configuration.<br>(Detail wiring diagram as shown below) |
| **Over Temperature Protection** | Facility to accept 2 nos. of thermostat input for fan control and trip function. |
| **LED Indications** | For Power ON, THY1 ON, THY2 ON, FAN ON, CB ON, Over Temperature. |
| **Aux. Supply Voltage** | 12VDC @ 600mA max. (TSC-306)<br>24VDC @ 100mA max. (TSC-303) |
| **Three Phase Voltage** | 110 to 500VAC (Special cards are available for 690VAC supply) |
| **Mounting (DIN rail)<br>On studs** | Can be easily mounted on the 35 mm DIN rail or on the base plate.<br>**TSC-303:** (120 x 99)mm x 4nos. of M4 holes<br>**TSC-306:** (140 x 99)mm x 4nos. of M4 holes |
| **Card Size** | 150 (l) x 109 (w) x 60 (h) mm. (with DIN rail frame) – (TSC-306)<br>125(l) x 125 (w) X 65(h) mm – ( TSC-303) |



## Application:

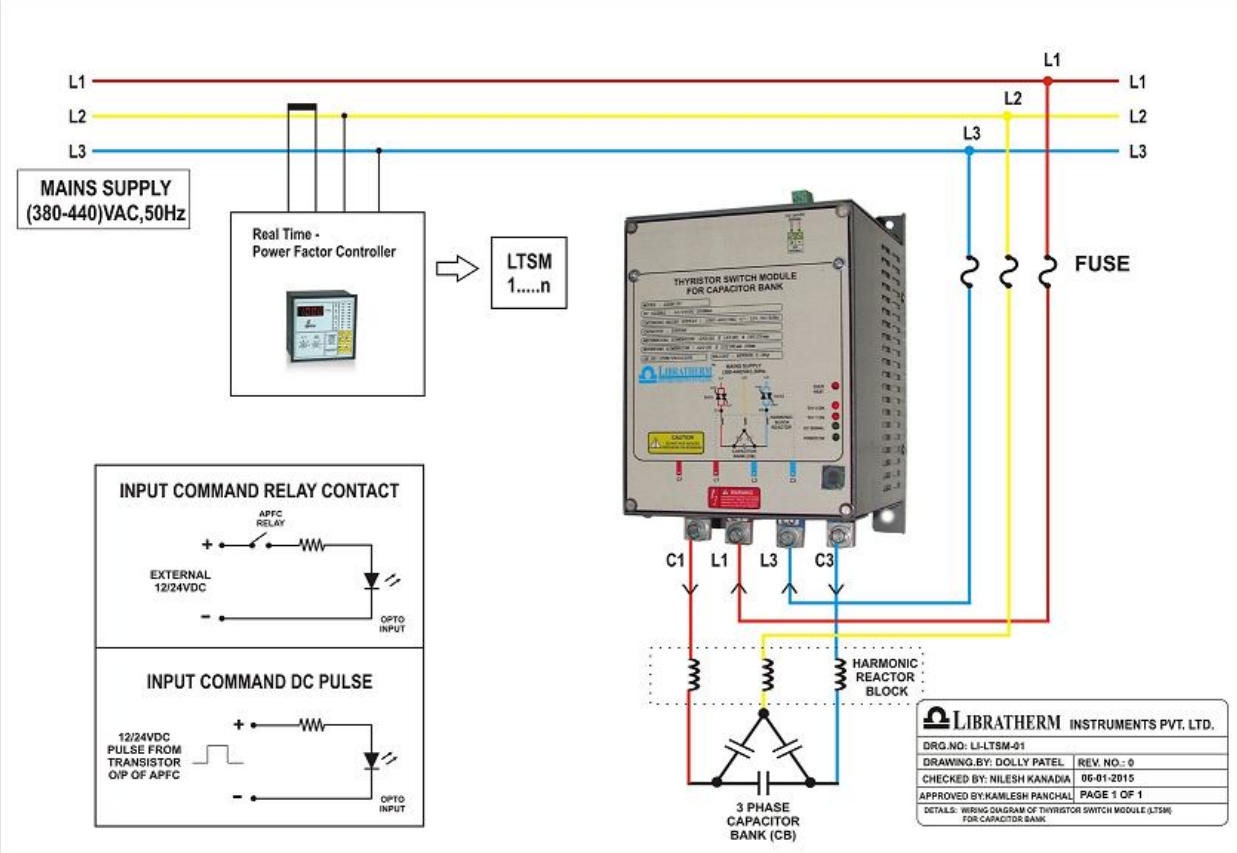
Following diagram shows – one of the applications of using ZERO CROSS OVER firing card model: TSC-306 for Automatic power factor control – for selecting the capacitor bank using back to back connected SCRs. One such card will be required for each of the capacitor bank, which can be selected through APFC controller by giving relay contacts or DC pulse to this card. TSC-306 cards can be used by APFC panel builders and OEMs. Using this card, one can make their own thyristor switch module for desired KVAR by appropriately choosing SCRs, Heat sinks and RC snubber circuits.



## Ready to use Thyristor Switch Module (LTSM) for APFC

In case, user does not want to use cards and SCRs separately, then integrated modules LTSM can be used.




**Description:** Libratherm offers Thyristor Switch Module specially designed for Automatic Power Factor Control (APFC) applications. In APFC the capacitor banks are sequentially selected, based on the command from the power factor controller. In conventional method, the capacitor banks are selected by switching the contactors. An LTSM module allows the selection of capacitor banks using thyristors. Thyristors being solid state switch has many advantages compared to electromechanical contactors.

Libratherm make LTSM modules are available to switch 3 phase capacitor banks rated for 5, 10, 15, 25, 50 and 100 KVAR. Zero cross over switching technique is used to turn on and turn off the thyristors (i.e. back to back connected SCRs) in series with the three phase capacitor banks.

**Advantages of Thyristor switch module over conventional electro-mechanical contactors:**

a) Since there is no mechanical contacts involved, no arcing and sparking takes place and no audible switching noise is produced.
b) Due to zero cross over switching techniques, voltage transients can be controlled within the safe limits.

c) Using LTSM it is possible to switch the capacitors at 100mS rate; thereby power factor close to unity can be maintained. Contactors cannot be switched that fast.
d) There are no limitations in number of switching operations.

These switching modules LTSM are easy to install and come with built in indications for normal function and faults, along with built in protection circuits for fail safe operations.

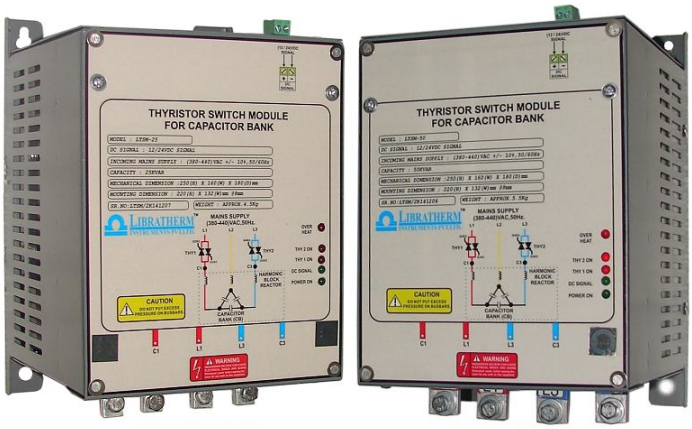
Generally, each of the real time power factor controllers (RPFC – relay module) gives 4 to 12 outputs, to select that many capacitor banks to maintain desired power factor and hence it will be required to use that many numbers of LTSM modules. User has to specify the required KVAR ratings of LTSM while placing the order with us.

## LIBRATHERM MAKE STANDARD THYRISTOR SWITCH MODULE

| Sr.No. | Model No. | KVAR of 3 phase Capacitor bank | Size (h x w x d) mm. |
|---|---|---|---|
| 1. | **LTSM-5** | **5 KVAR** | 250 x 160 x 130 |
| 2. | **LTSM-10** | **10 KVAR** | 250 x 160 x 130 |
| 3. | **LTSM-15** | **15 KVAR** | 250 x 160 x 130 |
| 4. | **LTSM-25** | **25 KVAR** | 250 x 160 x 180 |
| 5. | **LTSM-50** | **50 KVAR** | 250 x 160 x 180 |
| 6. | **LTSM-100** | **100 KVAR** | 450 x 355 x 300 |

Note: Sizes are subject to change

## ACTUAL PICTURE




LTSM-25 LTSM-50