Film Capacitors – Power Factor Correction

Thyristor module

Series/Type:	**TSM-LC-N690**
Ordering code:	**B44066T3050E690**
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Version:	3

EPCOS AG is a TDK Group Company.

Description:
The TSM-LC-N690 is a fast, electronically controlled, self-monitoring thyristor switch for capacitive loads, capable to connect power capacitors within a few milliseconds as often and long as requested to the grid without any wear off. It can be used in grids with voltages from 380 to 690 V~ (L-L). The triggering can be performed via dynamic power factor controllers, PLC-control or directly out of the technological process.

Characteristics
- Component for the design of dynamic compensation systems in grids of 380 V … 690 V, 50/60 Hz
- Larger operating voltage range up to 690 V~
- **No neutral-line required!**
- Optimized switching behavior by microprocessor controlled adjustment to tuned or de-tuned capacitor branches
- Applicable up to 60 A nominal current
- Monitoring of voltage, phase and temperature; status via LED
- Switching without delay
- No system pertubation by switching operations (transients)
- Maintenance free
- Long service life
- No switching noise
- Ready to use compact module
- Enhanced connection technology (plug)
- Enhanced temperature management

Applications
Dynamic compensation of fast processes
- Presses
- Welding equipment
- Elevators
- Cranes
- Wind turbine applications etc.

Mounting and connection of the module
The mechanical assembly is done directly on a mounting plate. The main circuits are executed as high current plugs (included) and can be directly connected to the main fuse or the capacitors with cables (max. 35 mm^2). Mounting position vertical; minimum 150 mm distance upwards and downwards.

The connection is done according to picture 1. Super fast electronic fuses are mandatory as main fuses ahead the switching module as protection of semiconductor components! Basics of dimensioning have to be obeyed!

Triggering of the module takes place without delay via a 10 – 24 V DC signal (coming from the PF controller or an appropriate control device) which is fed in at the connection X1 (signal). If an increase of the step output is required, cascading of several modules is possible.

Putting into operation

After switching on the grid voltage (engaging of branch fuse) the thyristor is ready for operation.

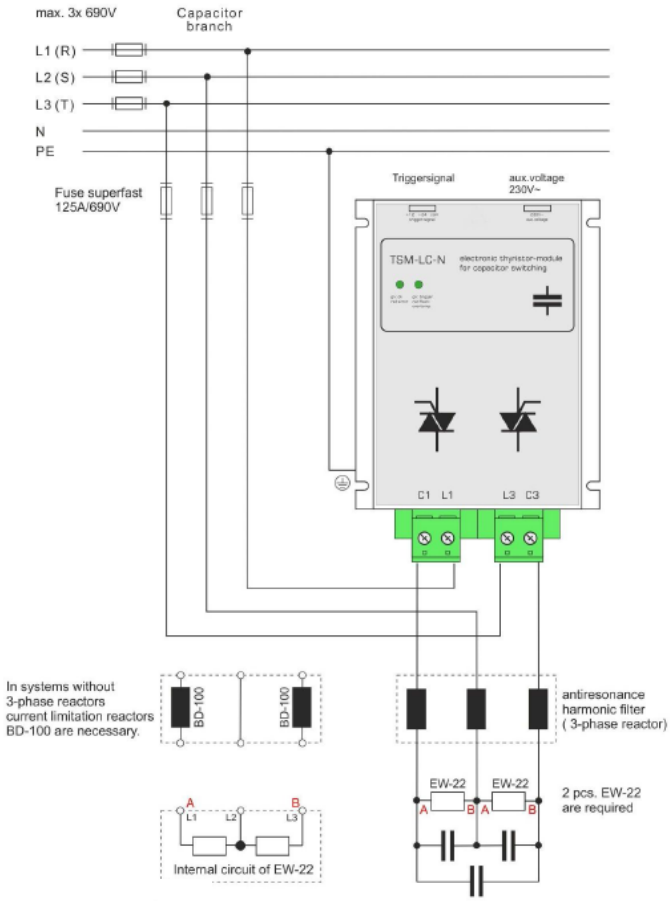
The switch features 2 status-LEDs with following signification:

- LED left
  - Green: operation voltage applied, switch in standby
  - Red constant: capacitor defect or not available; fuse or thyristor defect
  - Red flashing: Grid voltage L1/L3 missing or too low (< 350 V)
- LED right
  - Green: "Module ON" (trigger)
  - Red flashing: Overtemperature

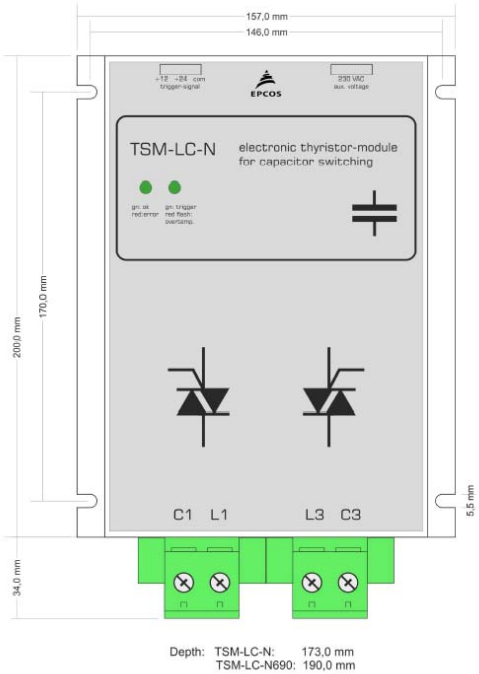
Technical data and specifications

Dimensions	157 x 200 x 190 mm (W x H x D) – without connection clamps		
Weight	4.8 kg		
Operating voltage	380 … 690 V AC		
Nominal voltage (phase voltage)	Step output:	Current/phase	Electronic fuse "super fast" (NH00 AC 690 V)
- 690 V	75 kvar	ca. 60 A	3x 125 A/690 V
- 525 V	55 kvar	ca. 60 A	3x 125 A/690 V
- 480 V	50 kvar	ca. 60 A	3x 125 A/690 V
- 440 V	45 kvar	ca. 60 A	3x 125 A/690 V
- 400 V	40 kvar	ca. 60 A	3x 125 A/690 V
Frequency	50/60 Hz		
Auxiliary supply	230 V~/10 VA (mandatory needed, module does not work without external auxiliary supply)		
Triggering	10 … 24 V DC (ca. 10 mA) via connection clamp, internally galvanically de-coupled		
Switching time	ca. 5 ms		
Re-switching time	Depending on de-tuning factor and discharge resistor used		
Switching capacity	Approx. 60 A		
Display	Via 2 LED (see above)		
Monitoring	Voltage, operation status and temperature		
Operating	For re-switching the heat sink must go below +50 °C after a temperature error (hysteresis)		
Power circuit	Direct connection via high current plug; connection from the bottom		
Power loss	Pv (in W) = 2.4 • I (in A); appr. 150 W thermal at nominal current		
Ambient operating temperature at nominal load	-10 … +55 °C		

Picture 1: Connection plan TSM-LCN690 three phase load (standard)



Dimensional drawing



Mounting depth: 190 mm

Cautions and Warnings

General

- Thyristor modules TSM series may only be used for the purpose they have been designed for.
- Thyristor modules TSM series may only be used in combination with appropriate pre-switched grid separator device.
- Thyristor modules have to be projected in such a way that in case of any failure no uncontrolled high current and voltages may occur.
- The devices in operation have to be protected against moisture and dust.
- As the devices are cooled in passive way (no fan), enough space (min. 150 mm distance up and down) must be guaranteed.
- Do not mount several devices one above the other (heat accumulation)!
- Thyristor switches may only be connected to the grid when a possible harm to humans and devices are eliminated.

Attention

Due to the switching principle of the thyristor module the power capacitors are permanently loaded to the peak value of the grid voltage (DC voltage) even when switched off. Therefore following rules have to be obeyed in any case:

- The discharge resistors of the power capacitors have to be replaced by special voltage resistant types due to the high voltages that occur (2 x peak value of grid voltage); accessory EW22 see connection diagram.
- In dynamic systems with TSM modules no fast discharge reactors may be used (reactor = DC-wise short circuit).
- For standard systems (without reactors) per thyristor switch 2 current limitation reactors are mandatory. Available as accessory (BD100)
- Thyristor modules in general have to be protected by superfast electronic fuses. Principles for dimensioning have to be considered. Fuses in the system have to be marked.
- Due to the special switching, the PFC capacitors are fully loaded even when the particular step has been switched off. Protection against contact has to be guaranteed. Warning signals in the systems are required.
- Even in switched off state no electrical isolation is achieved for electronic switches. Therefore parts of the systems may not be touched after switching off the complete system before the capacitors have been completely discharged.

FAILURE TO FOLLOW CAUTIONS MAY RESULT, WORST CASE, IN PREMATURE FAILURES OR PHYSICAL INJURY.

Note

For detailed information about PFC capacitors and cautions, refer to the latest version of EPCOS PFC Product Profile.

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