

## TSM-LC-N100

### Thyristor-Module for dynamic Power Factor Correction (PFC) up to 144 A (100kvar@400V); 3~230...440V

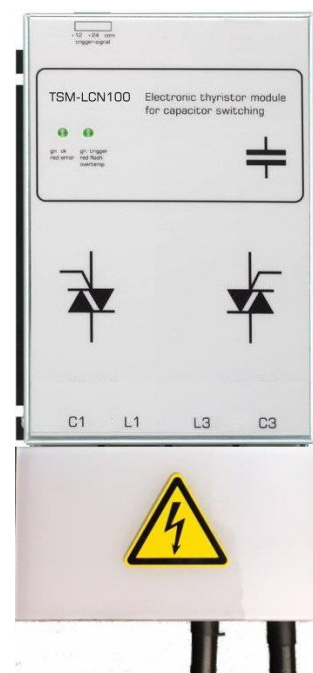
Version 1.1

#### **Description**

The TSM-LC-N100 for Dynamic PFC is a fast electronically controlled, self-observing thyristor switch for capacitive loads up to 144 A (100kvar@400V) which is capable to switch PFC capacitors within a few milliseconds as often and as long as required without abrasion. Triggering can be done by means of dynamic power factor controllers, programmable logic controllers (PLC) or directly out of the technologic process.

#### **Features**

- Component for the design of Dynamic PFC-systems
- Nominal voltage: 3~ 230V... 440V
- Automatically adapted by microprocessor to de-tuned and conventional capacitor branches (up to 14%); therefore optimization of the switching behavior.
- Available for max. 144 A
- Monitoring of voltage, phase sequence, temperature; display of status via LED
- Switching without time lag
- No system perturbation caused by switching operations (no transients)
- Maintenance free
- High switching speed
- No noise during switching
- Compact design
- Forced cooling by fan, temperature controlled
- Ready for connection



#### **Application:**

Dynamic („real time“) PFC for fast processes, e.g.

- pressing
- welding machines
- elevators
- cranes
- wind turbines etc.

#### **Installation and connection**

The mechanical mounting is done directly on a mounting plate. The main terminals are designed as bus bars and can be directly connected via conductors with cable lugs to the branch fuse resp. to the capacitor.

Connection is done according picture 1. It is mandatory to use superfast electronic fuses as branch fuses of the TSM-modules to protect the semiconductor device! Basics of dimensioning must be obeyed!

Triggering of the module is taking place without any time delay by a 10 – 24 VDC signal (coming from the PFC-controller or an adequate control system) fed in at the connection X1 (signal). If an increase of the stage output is needed, a cascading of several modules is possible.

## **Putting into operation**

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

The thyristor module has 2 status-LEDs with the following meaning:

LED - left side

Green:	operating voltage activated, thyristor module standby
Red permanent:	capacitor without capacitance or not existent; thyristor or fuse defect
Red flashing:	net voltage L1/L3 missing or too low

LED - right side:

Green:	„Module ON“ (Trigger)
Red flashing:	Over-temperature

## **Technical Data**

Net voltage: 3~ 230 ... 440 V – 50/60Hz; no aux. voltage needed

Max. power: 144 A (100 kvar @ 400V)

Activation: 10...24 VDC (10mA), via terminal clamp; internally insulated

**Switching-on time: app. 5 ms**

Re-switching time: Depending on degree of de-tuning and dimension of discharge resistor

Display: via 2 LEDs (see above)

Monitoring: permanent monitoring of net voltage, temperature and operation status

Note: Before re-switching after temperature fault, heat sink temperature must be below 50 °C (hysteresis)!

Power circuit: direct connection 4-pole via bus bar (cable lug 70qmm D=10mm)  
Connection from bottom

Automatically controlled cooling, overtemperature switch-OFF

Max. RMS-current\*: 200A

\* no continuous current – thermal load has to be considered!

Max. voltage: 440 V

Power dissipation:  $P_v ( W ) = 2,1 \times I ( \text{ in A } )$ ; at 400V / 100kvar typical 300 W therm.

Thermal warming: about 20K over ambient temperature at nominal load

Fuses: 3 x electronic fuse „superfast“ ( NH1 AC 690V )  
100 kvar: 250 A (e.g. SIBA Art.No.: 20 211 20-250 )

Dimensions: 157 x 240 x 195 (w x h x d)

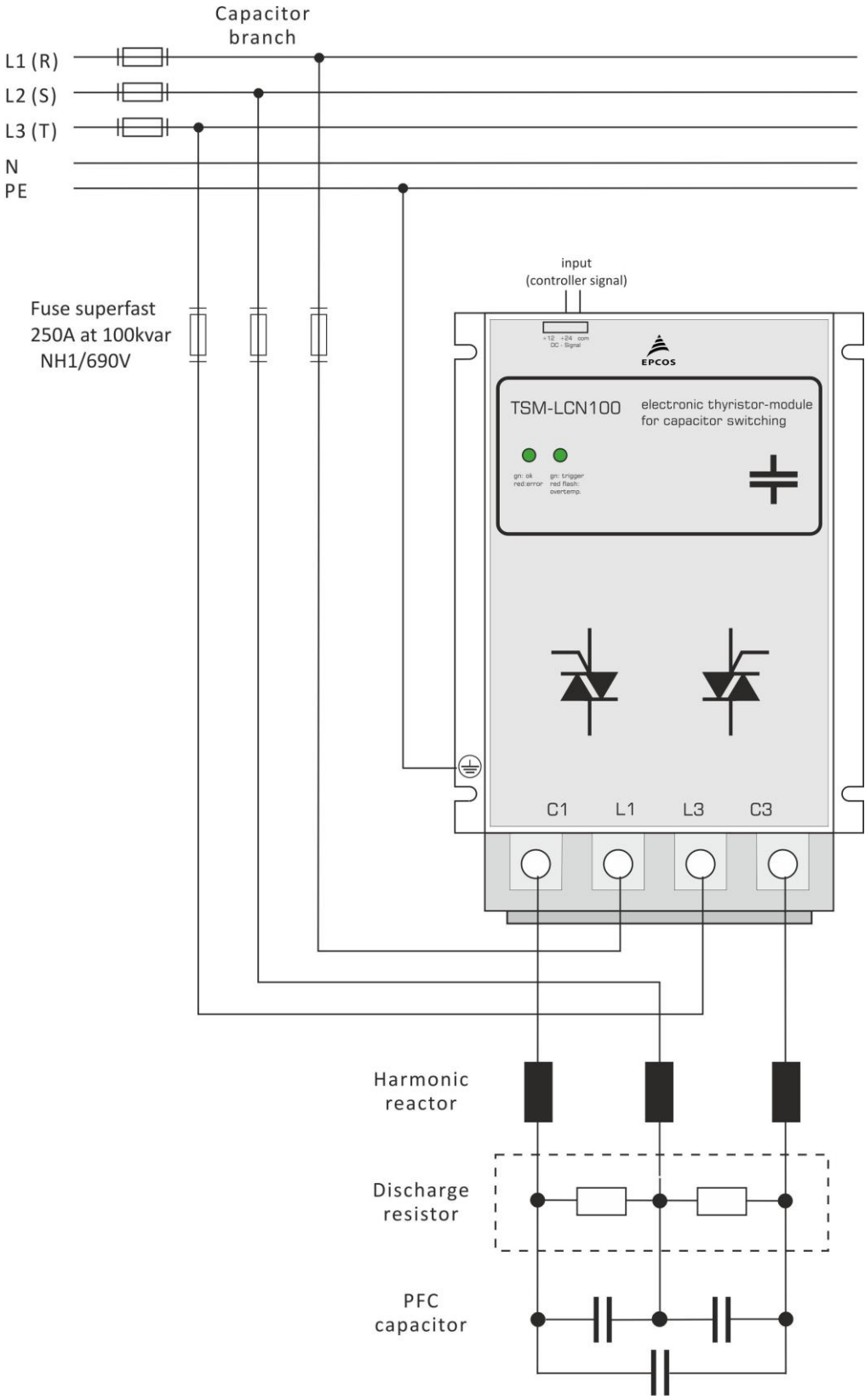
Weight : 5.5 kg

Assembling : direct mounting on mounting plate

Mounting position : vertical, minimum 100mm distance upwards and downwards

Operating ambient temperature with nominal load: -10°C ... 55°C

Pic. 1:  
 Connecting diagram  
 Three-phase load  
 (Standard)



## Attention: Please follow SAFETY INSTRUCTIONS !

### **GENERAL:**

- The TSM-thyristor-modules must only be used in combination appropriate safety devices (e.g. superfast fuses).
- The TSM-thyristor-modules have to be projected in such a way that no uncontrolled high currents and voltages can occur in case of faults.
- The devices have to be protected against humidity and dust – a sufficient ventilation has to be assured.
- The TSM-thyristor-modules must only be switched to the net if any harm or danger to human beings or the PFC-system is eliminated.

Due to the switching principle of the thyristor modules the PFC-capacitors are permanently loaded at the peak value of the grid voltage (DC current) even when they are disconnected! Therefore, the following instructions have to be obeyed:

- For discharging the capacitors special high-voltage resistors are recommended (e.g. EW22) Check whether the standard resistors can be used. (Re-switching-time; electric strength)
- In dynamic PFC-systems with TSM-LC-thyristor-modules fast discharge reactors must not be used (reactor = direct current short circuit.)
- In non-detuned PFC-systems (without harmonic reactors) 2 current limitation reactors per thyristor-module are recommended. Available as accessory.
- The TSM-thyristor-modules have to be protected by superfast electronic fuses in any case. Dimensioning principles have to be observed. Fuses in the PFC-system must be marked!
- Due to the special switching the PFC-capacitors are fully loaded even if the step is switched off. An appropriate protection against touch must be assured!
- Even when electronic switches are turned off, no electrical isolation is given. Therefore even after switching off the complete PFC-system (main circuit breaker), parts of the PFC-system must only be touched after the discharge-time of the PFC-capacitor elapsed.
- In the PFC-system warning signs indicating the presence of residual voltage even at disconnected stage have to be visible.

### **MAINTENANCE, REPAIR**

- The TSM-thyristor-switch has to be deactivated for maintenance purpose and main circuit breaker must be released. It must be assured that it cannot be switched on during maintenance. It must be checked that there is no voltage at all. Maintenance must only be executed by specially skilled personnel.
- In case any repairs are needed, this must only be done from the manufacturers of the TSM-thyristor-module!

### **Notice:**

***Connector cables have to get an isolation up to the bus bars and should protect with the included rubber grommets (see picture below)***

