

TSM-LC 200

Thyristor-Module for dynamic Power Factor Correction (PFC) 200 kvar / 400V

Version 1.0

Characteristics:

- Fast electronically controlled self observing thyristor switch
- For capacitive loads up to 200 kvar
- Suitable for designing dynamic PFC-systems in 380 and 400 V grids
- Micro-processor controlled alignment to tuned or detuned capacitor branches (up to 14 %) for optimized switching behaviour
- No system perturbation due to switching operations (transients)
- Switching without delay
- Maintenance-free
- Long useful service life
- No noise emission during switching operation
- Compact module ready for connection



Application:

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

- pressing
 - welding machines
 - elevators
 - cranes
 - wind turbines etc.
- with fast changing and high fluctuating loads.

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 (185mm²) 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-LC-module 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 (DC-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.

When switching on the net voltage the first time, the internal processor will optimize the switching behavior to the connected steps (without reactors / de-tuned). This results in optimized switching times during operation later. These parameters are internally stored.

For each phase the thyristor module has 2 status-LEDs with the following meaning:

LED 1 (TSM ok):	green:	operating voltage activated, TSM-LC in standby
	red is flashing:	auxiliary voltage (230V) too low
	permanent red:	phase missing or under-voltage or capacitor without capacitance or not existent
LED 2 (TSM ON):	green:	"Module ON"
	Red:	"Overtemperature"

Technical Data

Rated voltage: 380 ... 400 V - 50/60Hz
Auxiliary supply: 230 V~
Switching capability: max. 200 kvar at 400V

Max. voltage:

- conventional PFC-systems (without reactors): 440 V
- in detuned PFC-systems (7%): 440 V (no upwards tolerance permitted)
- in detuned PFC-systems (14%): 400 V

Activation: 10...24 VDC (approx. 20mA) via terminal clamp, internally electrically isolated

Switching time: approx. 5 ms

Reset time: Depending on degree of detuning and dimension of discharge resistor

Display: 2 status-LEDs per phase: operation/fault and triggering signal

Monitoring: permanent self-monitoring of voltage, operating state and temperature

Power circuit: direct connection 4 pole via busbar (cable lug max. 185 mm², D=12mm); connection from the top

Power dissipation: Pd(in W) = 2.0 x I (in A); at 400V /200 kvar approx. 580W thermal

Fuses: 3 x electronic fuse „superfast“, NH2 AC 690V, characteristic gRL
(mandatory for protection of components)
125 kvar: 315 A (e.g. SIBA Art.Nr.: 20 212 20.315)
150 kvar: 350 A (e.g. SIBA Art.Nr.: 20 212 20.350)
200 kvar: 450 A (e.g. SIBA Art.Nr.: 20 212 20.450)

Dimensions: 250 x 480 x 160 mm (w x h x d)

Mounting position: upright, minimum 150mm space on top and below

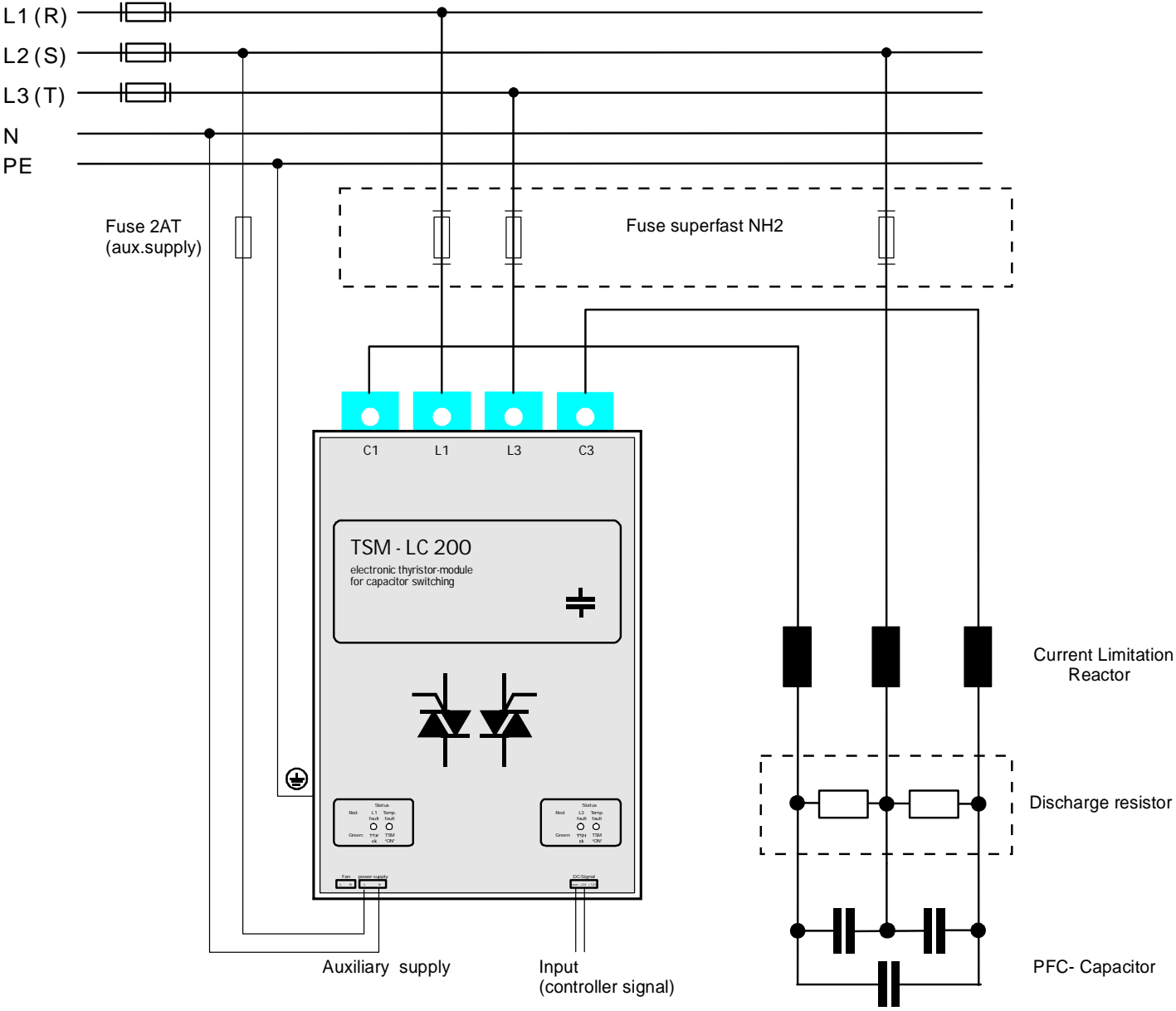
Weight: 11.5 kg

Installation: mechanical assembly directly on a mounting plate

Ambient temperature at nominal load: -10 °C ... 55 °C

Picture 1

Connection diagram: three-phase load (standard):





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, sufficient cooling has to be assured.

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:

- For tuned systems power capacitors of 440 V nominal voltage have to be used; for detuned systems PFC capacitors of 525 V nominal voltage have to be used.
- Due to the high voltage (2 x peak value of nominal voltage) that occurs, the discharge resistors of the power capacitors have to be replaced by special types.
- In dynamic systems with TSM modules no fast discharge reactors may be used (reactor = DC-wise short circuit).
- For tuned systems 2 current limiting reactors are mandatory per thyristor module.
- 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.

MAINTENANCE, REPAIR

The TSM-LC-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-LC-thyristor-module!