

Switching Devices – Thyristor Modules for Dynamic PFC, TSM-Series

Power Quality Solutions



Switching Devices – Thyristor Modules for Dynamic PFC, TSM-Series

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General

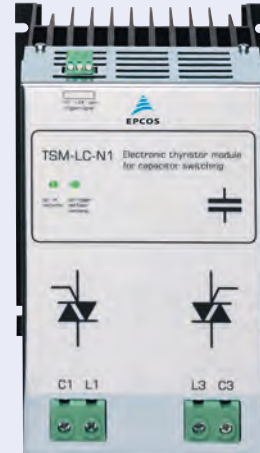
Conventional systems for power factor correction are used to optimize the power factor and reduce the level of harmonics in the grid. The usage of new technologies in modern industry has negative impacts on electric power quality of the main supply networks, e.g. frequent high load fluctuations and harmonic oscillation.

Excessive currents, increased losses and flickering will not only influence the supply capacity but will also have a significant impact on the operation of sensitive electronic devices.

The solution for this are dynamic power factor correction systems.

With the thyristor module series TSM-LC and TSM-HV, we provide the main component – “the electronic switch” – for dynamic power factor correction.

The TSM module series offers fast electronically controlled, self-observing thyristor switches for capacitive loads up to 200 kvar, that are capable to switch PFC capacitors within a few milliseconds nearly without a limitation to the number of switchings during the capacitor lifetime.



Applications

- Main supply networks with high load fluctuations for dynamic PFC systems
- Presses
- Welding machines
- Elevators
- Cranes
- Wind turbines

Features

- Easy installation: it can be used similar to a contactor
- All the intelligence needed is offered within the thyristor module itself
- Reaction time: 5 milliseconds only
- Permanent self-controlling of:
 - voltage parameter
 - phase sequence
 - capacitor output
- Display of
 - operation
 - faults
 - activation
- TSM-LC-I: Single-phase, for direct 2-phase switching of capacitive loads (L-N) or (L-L)
- TSM-LC-S: Triggering of the module via system bus (patch cable) from PF-controller BR7000-I-TH/S485
 - Up to 32 devices at supported by controller
 - Display and monitoring of V, I, Q, temperature, switching state
 - Error display and evaluation via bus directly at PF-controller
 - Direct monitoring of temperature switch of filter reactor
- Voltage range:
 - TSM-LC-I: 230 ... 525 V
 - TSM-LC*: 380 ... 440 V
 - TSM-LC-S: 200 ... 440 V
 - TSM-LC-N690: 380 ... 690 V
 - TSM-HV: 690 V
- Output range:
 - TSM-LC-I: 10 ... 22 kvar, depending on the voltage
 - TSM-LC: 10, 25, 50, 100, 200 kvar, depending on the voltage
 - TSM-HV: 200 kvar

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Selection table TSM-series

	TSM-LC-I ³⁾	TSM-LC10	TSM-LC-N1	TSM-LC-N690	TSM-LC-S
Ordering code	B44066T1022E520	B44066T0010E402	B44066T3850E402	B44066T3050E690	B440661050E402
Rated voltage	230 ... 525 V	380 ... 400 V	380 ... 440 V AC	380 ... 690 V AC	200 ... 440 V AC
Max. grid voltage: – in conventional PFC systems (without reactors)	525 V	440 V	440 V	690 V	440 V
– in detuned PFC system (7% detuning)	525 V	440 V	440 V	690 V	440 V
– in detuned PFC system (14% detuning)	525 V	400 V	max. 440 V	max. 690 V	max. 440 V
Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Maximum power / at nominal voltage	10 to 22 kvar depend- ing on the voltage	12.5 kvar	25 to 50 kvar depend- ing on the voltage	40 to 75 kvar depend- ing on the voltage	15 to 55 kvar depending on the voltage
Power circuit	Connection via plug connector; conduc- tor cross section steep or flexible max 2 x 35 mm ²)	Direct connection 4 pole via terminal clamps (D = 6 mm ² resp. 4 mm ²)	Direct connection via terminal clamps from the bottom	Direct connection via high current plug; connection from the bottom	Direct connection via high current plug; connection from the bottom
Neutral required	no	no	no	no	no
Aux. supply voltage required	24 V DC	no	no	230 V~/10 VA	24VDC via power supply module ESP24
Connection	from front	from bottom	Connection of main current lines via high current plug connections (included in the delivery); can be connected via lines (max. 35 mm ²) directly to the main fuse resp. capacitor		
Losses (PD in W)	Pv (in W) = 1.0 x I (in A); at nominal power: approx. 45 W (thermal)	Pv (in W) = 2.0 x I (in A); at 400 V/ 12.5 kvar approx. 35 W (thermal)	Pv (in W) = 2.0 x I (in A); at nominal voltage approx. 150 W thermal	Pv (in W) = 2.4 x I (in A); appr. 150 W thermal at nominal current	Pv (in W) = 2.0 x I (in A); at nominal voltage approx. 150 W thermal
Recommended fuses “superfast”	1x electronic fuse (NH00 AC 690 V) 63 A	3x electronic fuse (NH00 AC 690 V) 35 A	3x electronic fuse (NH00 AC 690 V) 50 kvar: 125 A 25 kvar: 63 A	3x electronic fuse (NH00 AC 690 V) 125 A	3x electronic fuse (NH00 AC 690 V) 125 A
Dimensions in mm (w x h x d)	70 x 200 x 150	163 x 152 x 75	157 x 200 x 180	157 x 200 x 190	157 x 200 x 180
Weight	1.5 kg	1.75 kg	approx. 4.8 kg	approx. 4.8 kg	approx. 5 kg
Display per phase	3 LED	2 LED	2 LED	2 LED	OLED-Display 2 x 16 characters
Ambient temperature	-10 °C ... +55 °C	-10 °C ... +55 °C	-10 °C ... +55 °C	-10 °C ... +55 °C	-10 °C ... +55 °C
Discharge resistors EW-22 needed	not needed	1	1	2	1
Current limitation reactor BD-*** needed²⁾	1	2	2 x BD100	2 x BD100	2 x BD100

¹⁾ Only for operation with single-phase capacitors. ²⁾ For PFC systems without detuning reactors mandatory.

³⁾ Single-phase, for direct 2-phase switching of capacitive loads (L-N) or (L-L).

Accessories for TSM modules

	BD-050 ¹⁾	BD-050/480 ¹⁾	BD-100	BD-100/480 ¹⁾	BD-200 ²⁾
Ordering code	B44066T0050E400	B44066T0050E480	B44066T0100E400	B44066T0100E480	B44066T0200E400
Nominal voltage	400/440 V	480 V	400/440 V	480 V	400/440 V
Nominal current	50 A	50 A	85 A	85 A	170 A
Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Dimensions (w x d x h)	56 x 71 x 70 mm	65 x 58 x 82 mm	75 x 75 x 88 mm	75 x 75 x 88 mm	104 x 114 x 125 mm
Weight	approx. 1.5 kg	approx. 1.5 kg	approx. 2 kg	approx. 2 kg	approx. 6 kg

¹⁾ Production only after ordering. ²⁾ Only suitable for TSM-LC100.

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	TSM-LC100	TSM-LC200	TSM-HV200
	B44066T0100E402	B44066T0200E402	B44066T0200E690
	380 ... 400 V	380 ... 400 V	690 V
	440 V	440 V	690 V
	440 V	440 V	690 V
	400 V	400 V	690 V
	50/60 Hz	50/60 Hz	50/60 Hz
	100 kvar	200 kvar	200 kvar
	Direct connection 4 pole via busbar (cable lug 70 mm ² , D = 10 mm)	Direct connection 4 pole via busbar (cable lug 185 mm ² , D = 12 mm)	Direct connection 4 pole via busbar (cable lug)
	no	no	no
	230 V AC (needed for fan) via terminal clamp	230 V AC	no
	from bottom	from top	from bottom
	Pv (in W) = 2.0 x I (in A); typical 300 W (thermal)	Pv (in W) = 2.0 x I (in A); at 400 V/200 kvar approx. 580 W (thermal)	Pv (in W) = 2.0 x I (in A); at 690 V/ 200 kvar typical 350 W (thermal)
	3 x NH1 (AC 690 V) 250 A	3 x NH2 (AC 690 V) 125 kvar: 315 A 150 kvar: 350 A 200 kvar: 450 A	3 x NH2 (AC 690 V) 100 kvar: 160 A 200 kvar: 250 A
	157 x 240 x 195	250 x 480 x 160	410 x 400 x 250
	5.5 kg	11.5 kg	17 kg
	2 LED	2 LED	6 LED
	-10 °C ... +55 °C	-10 °C ... +55 °C	-10 °C ... +50 °C
	1-2 in parallel	2-4 in parallel	4 – refer to connection diagram in the data sheet
	Standard applica- tions require a special current limitation reactor.	Standard applica- tions require a special current limitation reactor.	only for systems with detuning- reactors

BD-200/480 ²⁾
B44066T0200E480
480 V
170 A
50/60 Hz
104 x 114 x 125 mm
approx. 6 kg

Accessories for TSM modules

Type / Description

Discharge resistors EW-22 at least 1 piece per step to be used for all types of TSM if fast re-switching time is required.¹⁾ For higher rated steps please contact our local sales office.

EW-22:

Dimensions

(w x d x h): 90 x 50 x 100 mm

Weight (approx.): 0.3 kg

Design panel: for mounting on heat sink/fitting

Connection: screw terminal, ready for three-phase connection to the capacitor

Ordering code

B44066T0022E400

¹⁾ Consisting of two single resistors of 22 kΩ each



EW-22



BD-100

BD-Series:

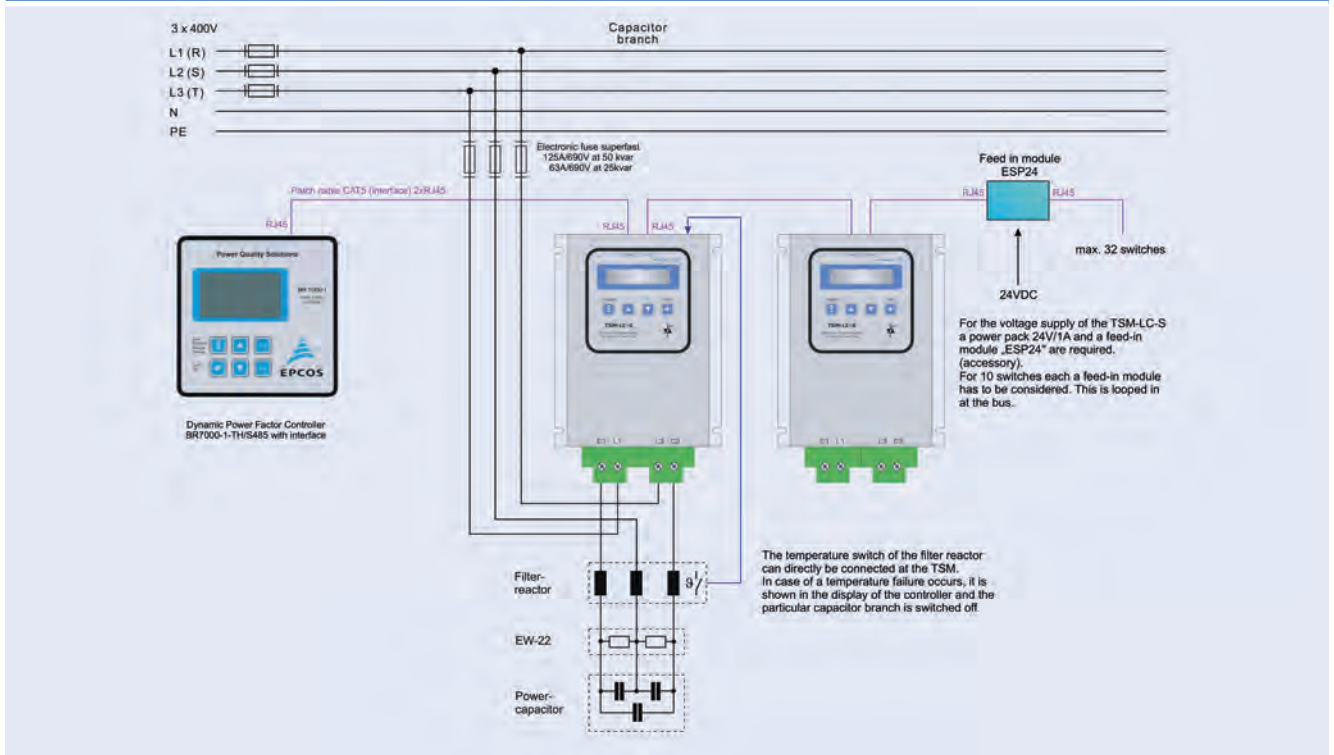
Single phase current limitation reactor for thyristor modules TSM-series in conventional dynamic PFC-systems without reactor

- Used for limitation of the pace of current increase di/dt in the thyristors to the maximum permissible value
- Protection of thyristor modules series TSM-LC

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Dynamic PFC network with TSM-LC-S



Dynamic PFC network: complete system; easy connection with standard patch-cable

