



## Film Capacitors – Power Factor Correction

### Thyristor Module

**Series/Type:** TSM-HV200  
**Ordering code:** B44066T0200E690  
**Date:** 2010-04-12  
**Version:** 4

### Characteristics

- Fast electronically controlled self-observing thyristor switch
- Usage in dynamic (fast) power factor correction systems
- For capacitive loads up to 200 kvar up to 690 V line voltage

### Features

- No neutral conductor required
- Micro-processor controlled thyristor switching module (TSM) for standard and detuned capacitor branches for optimized switching behavior
- Permanent self-monitoring of voltage, phase sequence, temperature; display of status via LED
- No system perturbation due to switching operations (transients)
- Switching without delay
- Very low maintenance efforts
- Long useful service life
- No noise emission during switching operation
- Compact module ready for connection



### Technical data

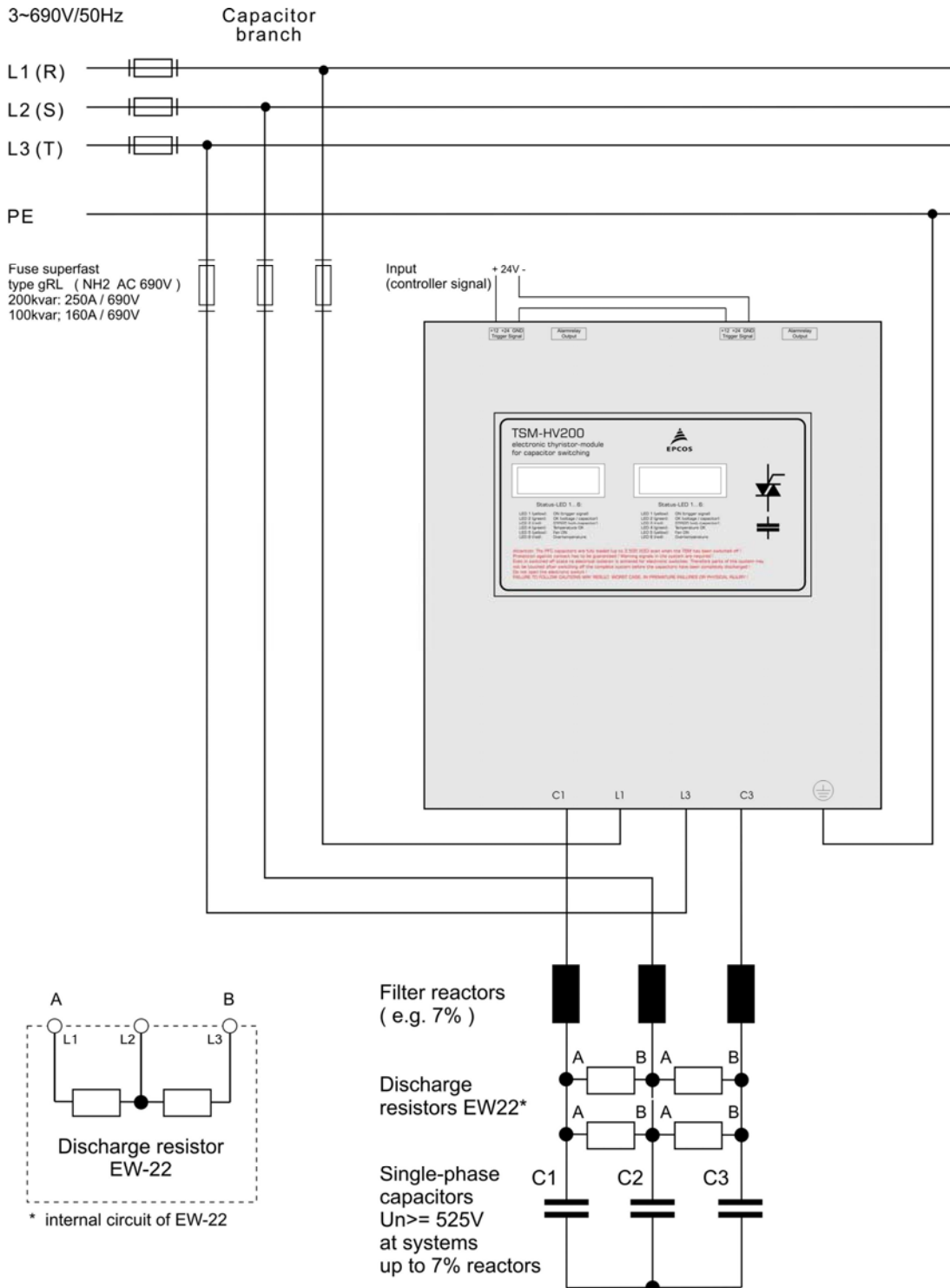
Dimensions	410 x 400 x 250 mm (w x h x d)
Weight	17 kg
Voltage	690 V
Maximum voltage	
- in conventional PFC-systems (without reactors)	690 V
- in detuned PFC-systems (7% detuning)	690 V
- in detuned PFC-systems (14% detuning)	690 V
Frequency	50 Hz/60 Hz
Max. power	200 kvar
Auxiliary supply	Not required
Activation	10 ... 24 V DC (20 mA), via terminal clamp; internally insulated
Monitoring	Net voltage, temperature and operation status Note: Before re-switching after temperature fault, heat sink temperature must be below 50 °C (hysteresis)!
Display	6 LEDs/phase: operation/error each phase, triggering signal, over temperature

Power circuit	Direct connection 4-pole via bus bar cable lug max. 70 mm <sup>2</sup> , D = 8 mm connection inside the device
Power dissipation	$P_D$ (W) = 2.0 • I (in A); at 690 V / 200 kvar typical 350 W thermal Note: Take care of proper air convection (forced cooling) inside the panel (switchboard)!
Fuses* (required for protection of TSM-HV and capacitor):	3 • electronic fuse „superflink“ (NH2 AC 690 V) 100 kvar: 160 A (e.g. SIBA 20 212 34-160 ) 200 kvar: 250 A (e.g. SIBA 20 212 34-250 )
Switching time	approx. 5 ms
Operating ambient temperature with nominal load	–10 ... +50 °C
Assembling	Directly on mounting plate
Mounting position	Vertical, minimum 200 mm distance upwards and downwards

\*not included in the delivery

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 currents 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 (up to 3.500 V DC!) even when switched off! Therefore, following rules have to be obeyed in any case:

- Single-phase capacitors of 525 V nominal voltage in star connection have to be used.
- In dynamic PFC-systems with TSM-modules no fast discharge reactors may be used (reactor = DC-wise short circuit.)
- For standard PFC-systems (without reactors) current limitation reactors are mandatory!
- 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 system are mandatory!
- 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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