Film Capacitors – Power Factor Correction

Thyristor module

Series/Type: TSM-LC-S
Ordering code: B44066T1050E402
Date: February 2014
Version: 1
Characteristics

- Thyristor module for dynamic compensation system in grids from 200 to 440 V, 50/60 Hz, up to 50 kvar
- Installation via system bus (interface)
- Real-time monitoring of capacitor current, status, voltage and temperature (capacitor protection)
- Configuration, display of measuring values, alarm and error messages via high-contrast OLED-display
- Transmission of all measured values via interface for further processing in the controller
- Storage of maximum values/temperature
- Easy installation via standard patch cable
- Manual switch on possible
- No wear parts (no fan)
- Switching without delay
- No system perturbation by transients
- Maintenance free, no switching noises
- Compact module, ready to use

Applications

- Presses
- Welding machines
- Elevators
- Cranes
- Wind turbines etc.

Mounting and connection

- Mechanical mounting directly on the mounting plate
- Connection of main current lines via high current plug connections (included in the delivery); can be connected via lines (max. 35 mm²) directly to the main fuse resp. capacitor
- Mounting position vertical; minimum distance 150 mm up and down
- Auxiliary supply (24 V DC) necessary, fed by the patch cable. Per max. 10 switches one feed-in adapter ESP24 is required as accessory (see switching diagram).
- Main fuses have to be super fast electronic fuses as protection of semiconductor devices. Design basics have to be obeyed!
- Triggering of the module via the system bus (patch cable RJ45) from PF-controller BR7000-I-TH/S485.
  Up to 32 devices at bus supported by the controller
## Technical data and specifications

<table>
<thead>
<tr>
<th><strong>Dimensions</strong></th>
<th>157 x 200 x 180 mm (W x H x D) – without connection clamps</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weight</strong></td>
<td>Approx. 5 kg</td>
</tr>
<tr>
<td><strong>Operating voltage</strong></td>
<td>200 ... 440 V AC</td>
</tr>
<tr>
<td><strong>Nominal voltage (phase voltage)</strong></td>
<td>Step output:</td>
</tr>
<tr>
<td>- 230 V</td>
<td>15 kvar</td>
</tr>
<tr>
<td>- 400 V</td>
<td>25 kvar</td>
</tr>
<tr>
<td>- 440 V</td>
<td>28 kvar</td>
</tr>
<tr>
<td>- 230 V</td>
<td>30 kvar</td>
</tr>
<tr>
<td>- 400 V</td>
<td>50 kvar</td>
</tr>
<tr>
<td>- 440 V</td>
<td>55 kvar</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>50/60 Hz</td>
</tr>
<tr>
<td><strong>Auxiliary supply</strong></td>
<td>24 V DC/0.1 A (via system bus) – per 10 switches one feed-in module ESP24 is required. To be ordered as accessory B44066T0002E400</td>
</tr>
<tr>
<td><strong>Triggering</strong></td>
<td>Via system bus (standard patch cable)</td>
</tr>
<tr>
<td><strong>Switching time</strong></td>
<td>Ca. 5 ms</td>
</tr>
<tr>
<td><strong>Re-switching time</strong></td>
<td>Depending on de-tuning factor and discharge resistor used</td>
</tr>
<tr>
<td><strong>Switching capacity</strong></td>
<td>Max. 75 A</td>
</tr>
<tr>
<td><strong>Display</strong></td>
<td>High contrast OLED-display, 2 x 16 digits</td>
</tr>
<tr>
<td><strong>Monitoring</strong></td>
<td>Voltage, capacitor current /-output, temperature, switching stage</td>
</tr>
<tr>
<td><strong>Operating</strong></td>
<td>4 buttons</td>
</tr>
<tr>
<td><strong>Power circuit</strong></td>
<td>Connection via plug connector from the bottom</td>
</tr>
</tbody>
</table>
| **Power loss** | $P_v \ (\text{in W}) = 2.0 \cdot I \ (\text{in A})$;  
At 50 kvar/400 V: ca. 150 W thermal |
| **Ambient operating temperature at nominal load** | -10 ... + 55 °C                                          |
| **Error messages** | Over-/under voltage (auxiliary voltage and grid voltage), over current L1/L3, C-error |
| **Connections:** | 2 x RJ45 (system bus)                                     |
|                | 2 x 2 pole high current plug (35 mm2) for main circuit    |
Connection diagram (three phase load)

- Connection diagram showing the setup for a three-phase load with capacitors.
- Capacitor branch connected to L1, L2, L3, and N with PE.
- Electronic fuse superfast 125A/500V at 50kA or 63A/500V at 25kA.
- Feed in module ESP/24.
- Max. 32 switches.
- 24VDC input.
- Temperature switch for filter reactor adjustment.

Dimensions

- Diagram of the dimensions, including the size and placement of components.

Please read Cautions and warnings and Important notes at the end of this document.
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.
The following applies to all products named in this publication:

1. Some parts of this publication contain statements about the suitability of our products for certain areas of application. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application. As a rule, EPCOS is either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether an EPCOS product with the properties described in the product specification is suitable for use in a particular customer application.

2. We also point out that in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified. In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.

3. The warnings, cautions and product-specific notes must be observed.

4. In order to satisfy certain technical requirements, some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous). Useful information on this will be found in our Material Data Sheets on the Internet (www.epcos.com/material). Should you have any more detailed questions, please contact our sales offices.

5. We constantly strive to improve our products. Consequently, the products described in this publication may change from time to time. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order. We also reserve the right to discontinue production and delivery of products. Consequently, we cannot guarantee that all products named in this publication will always be available. The aforementioned does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.

6. Unless otherwise agreed in individual contracts, all orders are subject to the current version of the “General Terms of Delivery for Products and Services in the Electrical Industry” published by the German Electrical and Electronics Industry Association (ZVEI).

7. The trade names EPCOS, BAOKE, Alu-X, CeraDiode, CSMP, CSSP, CTVS, DeltaCap, DigiSiMic, DSSP, FormFit, MiniBlue, MiniCell, MKD, MKK, MLSC, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMD, SineFormer, SIOV, SIP5D, SIP5K, ThermoFuse, WindCap are trademarks registered or pending in Europe and in other countries. Further information will be found on the Internet at www.epcos.com/trademarks.