



# Film Capacitors – Power Factor Correction

## Power Factor Controller

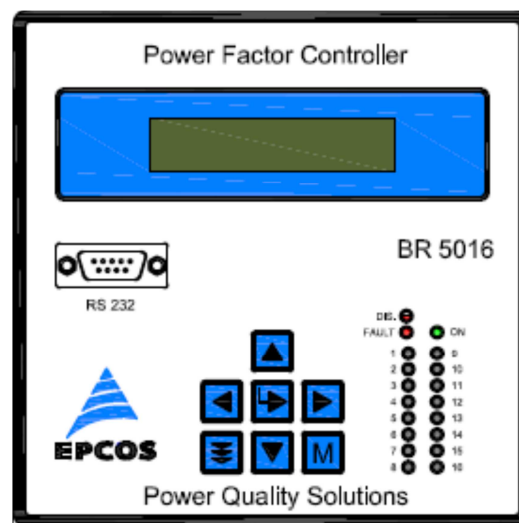
**Series/Type:** BR5000  
**Ordering code:** BR5000-R8.....R16  
**Date:** 2018-08-09  
**Version:** 3

© EPCOS AG 2018. Reproduction, publication and dissemination of this publication, enclosures hereto and the information contained therein without EPCOS' prior express consent is prohibited.

EPCOS AG is a TDK Group Company.

### Characteristics

- Three phase three wire measuring and controlling
- Switching relays customizable for three phase compensation
- Advance automatic synchronization features. It is Capable of giving correct results even for phase Interchange connections at CT terminals and also Wrong polarity of CTs with the help of Capacitor CT.
- Usage as power factor controller and/or as measuring device
- Intelligent control
- Menu driven handling (English language)
- 7 dedicated keys provide for modify/change the Setting and Confirm the setting by pressing the memory key.
- Programming key provide for selection the mode of operation.
- Measurement Accuracy – Class 2
- Display of harmonics (upto 15<sup>th</sup>)
- Two months of data logging. Data in the form of hourly  
Records & faults events records- recording all electrical values.



**Measurement and display**

- 3-phase measurement of all relevant grid parameters (voltage, current, reactive power, active power, apparent power, frequency,  $V_{thd}$  and  $I_{thd}$  of each phase fundamental/RMS value.)
- Storage of values on hourly basis with date and time stamping.
- Display of date, time.
- Display of switching counter of individual banks with reset option.
- Display of harmonics upto 15<sup>th</sup> order

**Operation**

- LCD display 16 characters with 2 lines
- User interface English language

**Modes of operation**

- Auto mode of operation (normal control)
- Manual mode of operation
- Programming mode

**Controlling**

- Simple controlling 3-phase, 3wire measurements supply. Eight switching outputs for 8steps models, sixteen switching outputs for 16step model. For 3-phase-measurement the controlling is done according to the average value of Power factor. The PF has two limit, PF upper limit and PF lower limit. The control starts when the load side PF goes below the set limit of Lower side limit.

**Error messages**

- Over voltage/under voltage/no voltage
- Over /Under load
- Under compensated( only Indication)
- Over temperature
- C-defect
- Faults with time stamp
- NV –RAM Battery down
- Over/ under frequency
- Load unbalance

Two characters represent one of the following status of faults/ error:

|    |                               |
|----|-------------------------------|
| OK | Controller status is okay     |
| VA | Measurement voltage is absent |
| OD | Outputs are disabled          |
| UC | Under capacitor current       |
| OC | Over capacitor current        |
| NV | NV RAM Check sum error        |
| BF | Battery Fail                  |
| ET | Over external temperature     |
|    |                               |

|    |                               |
|----|-------------------------------|
| LU | Load unbalance                |
| OB | Out of Banks(Undercompensate) |
| OH | Over capacitor current THD    |
| UT | Over Internal temperature     |
| OT | Over internal temperature     |
| UF | Under frequency               |
| OF | Over frequency                |
| UV | Under voltage                 |
| OV | Over voltage                  |

### Inputs

- Auxiliary voltage: 415VAC (L-L) (+20%, to -30%)
- Measuring voltage: 3 phase 3 wire , 415VAC (L-L) ( +20%, -30%)
- 3 current: X:1A / X:5A selectable through the connection terminal for Load & Capacitor CT
- PT 100 : one PT100 connection for monitor the temperature at the outside
- Auxiliary Input : one Auxiliary input 120- 230Vac programmable for switch over 2<sup>nd</sup> target cos-phi, Reset the system faults

### Outputs

- 8 / 16 relay outputs (contact NO) as switching outputs for 8 and 16 step models respectively.
- 1 independent isolated interfaces RS232
- 2 Independent isolated Auxiliary outputs potential free 5A, 230V

### Interfaces

- 1 - independent, isolated RS232 interface ( D type nine pin connector)usage
- 1 – RS485 interface with MODBUS protocol, selectable through DIP Switch
- As interface for PC for usage with BR5000 data downloading dedicated software

### Technical data

|                                      |                                                                                  |
|--------------------------------------|----------------------------------------------------------------------------------|
| Type                                 | BR 5000                                                                          |
| Operating voltage                    | 415 V AC(L-L) +20% to -30% , 50Hz                                                |
| Measuring voltage(3-phase,3wire)     | 415 V AC(L-L) +20% to -30% , 50Hz                                                |
| Measuring current (3-phase)          | 3 · X: 5A / X:1A selectable through connection terminals for load & capacitor CT |
| Power consumption                    | < 10 VA ( with max 16 relay ON)                                                  |
| Sensibility                          | 200 mA / 100 mA                                                                  |
| Switching outputs                    |                                                                                  |
| Relay outputs for capacitor branches | 8 / 16 relays, freely programmable for switching of 3-phase capacitors           |
| Switching power of relays            | 250 V AC, 1250VA/ 150W                                                           |
| Number of active outputs             | programmable                                                                     |
| Operation and display                | illuminated LCD display 16 × 2 line                                              |
| Menu languages                       | English                                                                          |
| Controlling                          | reach controlling of each phase ( L-L)                                           |
| Modes of operation                   | 3- phase: 8 / 16 three-phase capacitors                                          |
| Control principle                    | self-optimized intelligent switching mode<br>4-quadrant operation                |
| Automatic initialization             | possible                                                                         |
| target cos $\varphi$                 | 0.3 ind ... 0.3 cap adjustable                                                   |
| Correction time                      | selectable from 1 sec to 600 sec                                                 |
| Discharge time                       | selectable from 1 sec to 600 sec                                                 |
| Manual operation                     | yes                                                                              |
| Fixed steps                          | programmable                                                                     |

|                                  |                                                                                                                                                                                                                                     |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Display/Display functions</b> |                                                                                                                                                                                                                                     |
| Display of grid parameters       | 3- phase values<br>cos $\phi$ , U, I, f, Q, P, S, THD-V, THD-I                                                                                                                                                                      |
| Precision                        | current/voltage: 2%<br>active, reactive, apparent power: 3%                                                                                                                                                                         |
| <b>Storage function</b>          |                                                                                                                                                                                                                                     |
| Storage of faults events values  | voltage, current, temperature, recorded in controller with date and time stamping                                                                                                                                                   |
| Storage of switching operations  | each output, separately re-settable                                                                                                                                                                                                 |
| Faults record events             | Yes with time stamp                                                                                                                                                                                                                 |
| <b>Temperature monitoring</b>    |                                                                                                                                                                                                                                     |
| Temperature measuring range      | 0 ... 70 °C                                                                                                                                                                                                                         |
| Interface                        | 1 independent isolated interfaces<br>RS232 (with EPCOS dedicated protocol)<br>GSM connectivity available with dedicated Modem                                                                                                       |
| Casing                           | panel-mounted instrument<br>144(L)mm x 144(H)mm x 125(D) mm<br><br>Door cutout (138mm x 138mm)                                                                                                                                      |
| Weight                           | 2.5 kg                                                                                                                                                                                                                              |
| Operating ambient temperature    | 0 ... +65 °C                                                                                                                                                                                                                        |
| Protection class                 | Front IP: 41(with RS232 cover) IP 20(without RS232 cover) rear: IP20                                                                                                                                                                |
| EMI/ EMC                         | IEC61000-4-2: $\pm 8$ kV for Air discharge; $\pm 4$ KV for contact discharge<br>IEC61000-4-3<br>IEC61000-4-4: $\pm 2$ kV<br>IEC61000-4-5: $\pm 4$ KV(Measurement supply); $\pm 0.5$ KV(Aux. supply)<br>IEC61000-4-6<br>IEC61000-4-8 |

**Ordering Codes :**

| Types      | Voltage<br>50 Hz | Measurement<br>( R, Y, B) | Relay<br>Output | Interface | Ordering code     |
|------------|------------------|---------------------------|-----------------|-----------|-------------------|
| BR5000-R8  | 415V             | 3 Phase, 3Wire            | 8               | RS232     | B44066R5908A415N1 |
| BR5000-R16 | 415V             | 3 Phase, 3Wire            | 16              | RS232     | B44066R5916A415N1 |

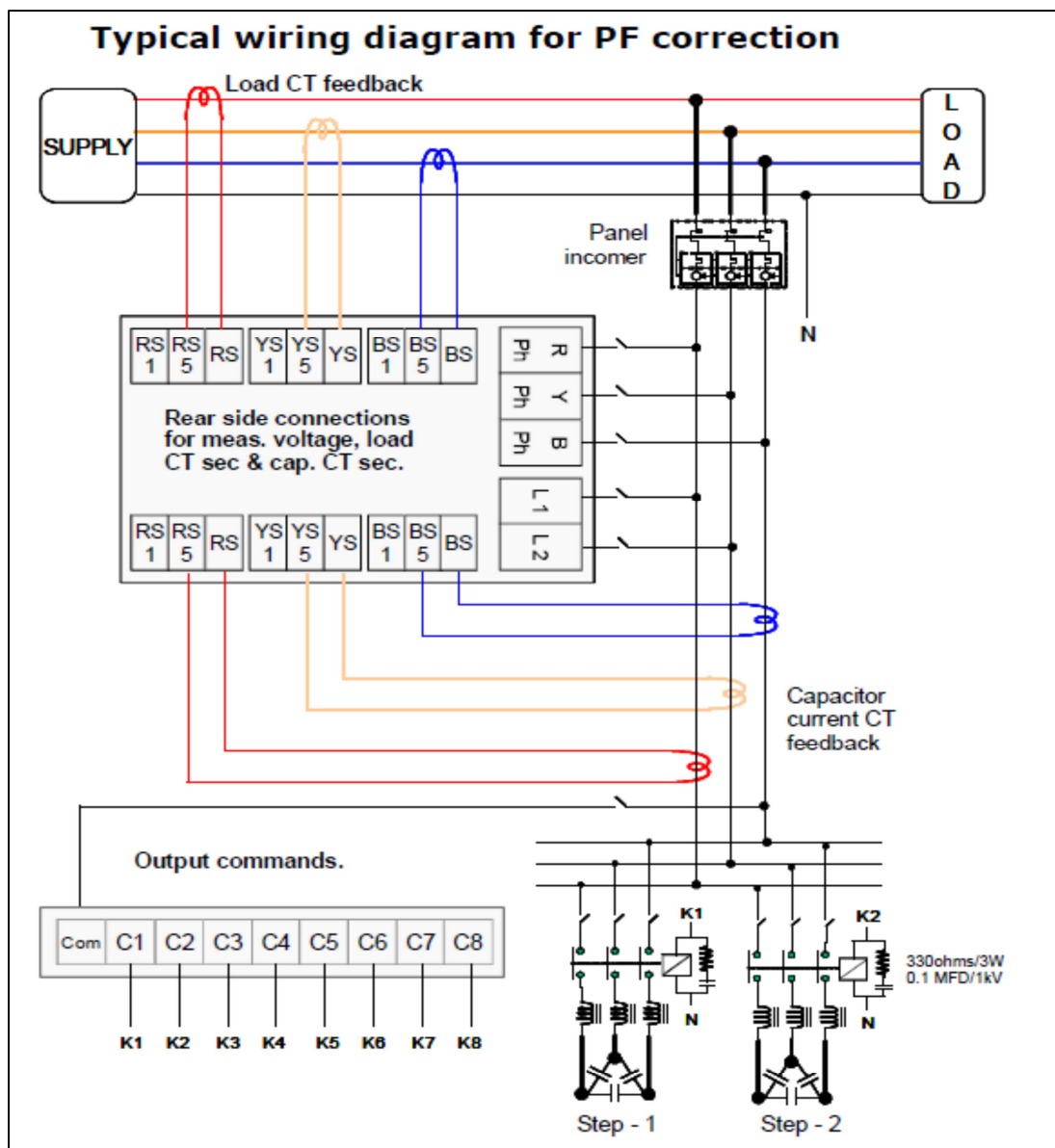
**⚠ Cautions :-**

**1. Controller hunting:** - when putting the capacitor bank into operation, it is required to avoid needless switching cycles (means permanent switching on and off of steps without significant change of consumer load). This so called “controller hunting” would increase the number of switching operations of the connected contactors and capacitors and decrease the expected life cycle (wear out) and, in worst case, capacitor bursting and fire, etc. This can be avoided by a proper programming of the BR5000 with the actual system parameters ( current transformer primary, step kvar and correction time)

**2. Minimum discharge time set in the controller must be in line with the discharge device of the capacitors** e.g. standard discharge resistors used by EPCOS are designed for 60 seconds discharge time. A discharge time set in BR5000 shorter than the capacitor discharge time leads to extremely high inrush current and can damage the capacitor as well as distribution equipment and may in worst case lead to capacitor bursting and fire.

Beside high inrush currents, it has to be considered that according IEC831 standard the annual number of switching operations is limited to 5000 switching. In case of very fast switching and higher number of switching operations you are kindly request EPCOS approval for your application. For fast switching LV PFC we recommend dynamic PFC systems.

Connection plan





## Important notes

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](http://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. **Our manufacturing sites serving the automotive business apply the IATF 16949 standard**. The IATF certifications confirm our compliance with requirements regarding the quality management system in the automotive industry. Referring to customer requirements and customer specific requirements (“CSR”) TDK always has and will continue to have the policy of respecting individual agreements. Even if IATF 16949 may appear to support the acceptance of unilateral requirements, we hereby like to emphasize that **only requirements mutually agreed upon can and will be implemented in our Quality Management System**. For clarification purposes we like to point out that obligations from IATF 16949 shall only become legally binding if individually agreed upon.

## Important notes

8. The trade names EPCOS, CeraCharge, CeraDiode, CeraLink, CeraPad, CeraPlas, CSMP, CTVS, DeltaCap, DigiSiMic, ExoCore, FilterCap, FormFit, LeaXield, MiniBlue, MiniCell, MKD, MKK, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, PowerHap, PQSine, PQvar, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, 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](http://www.epcos.com/trademarks).

Release 2018-06