



# Data Sheet

K Series  
460.D.101.07

## Analog Power Factor Meters, Electronically, 90° or 240° Dial

CQ 96 K  
CQ 144 K  
LSC 96 K

with Slide-In-Dial



**WEIGEL**

## Application

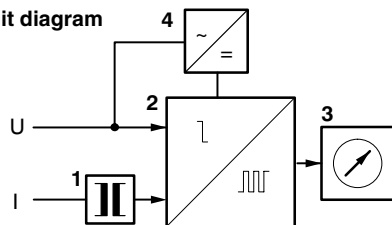
The moving - coil meter models **CQ 96/144 K** with 90° dial or **LSC 96 K** with 240° dial of the K series are suitable to measure the power factor as a ratio of active and reactive power in single phase AC or in balanced 3 phase systems:

The instruments are suitable to be mounted in switchboards, control panels, machine tool consoles and mosaic panels. The bezel, the glass window and the dial can be easily exchanged on - site.

## Functional Principle

The meters consist of a moving - coil movement with core - magnet (CQ) or pivot suspended spring loaded jewel bearings (LSC) system and a measuring converter. Both devices are included in a common plastic case.

### block circuit diagram



A current transformer 1 of the phase angle converter adapts the input current to the electronic circuit. Both the input voltage and the current are passed to a bistable flip - flop stage 2.

The pulse duty cycle of the flip - flop is proportional to the phase angle  $\psi$ . A low - pass filter forms the mean value which is fed to the moving - coil movement 3. The standard dial is scaled with the cosine of the phase angle  $\psi$ .

Power supply is obtained from voltage input in block 4.

## Mechanical Data

|                    |  |                 |
|--------------------|--|-----------------|
| case details       | moulded square case suitable to be mounted in control / switchgear panels, machine tool consoles or mosaic panels, stackable |                 |
| material of case   | polycarbonate thermoplastics, flame retardant with UL rating of 94 V - 0   |                 |
| material of window | glass  |                 |
| colour of bezel    | black (similar to RAL 9005)  |                 |
| position of use    | vertical $\pm 5^\circ$   |                 |
| panel fixing       | screw clamps   |                 |
| mounting           | stackable next to each other   |                 |
| panel thickness    | $\leq 40$ mm   |                 |
| terminals          | hexagon studs with M4 screws   |                 |
| <b>dimensions</b>  | <b>CQ/LSC 96 K</b>   | <b>CQ 144 K</b> |
| bezel              | □ 96 mm  | □ 144 mm        |
| case               | □ 90 mm  | □ 136 mm        |
| depth              | 104 mm   | 104 mm          |
| panel cutout       | □ $92^{+0.8}$ mm   | □ $138^{+1}$ mm |
| weight approx.     | 0,55 kg  | 0,75 kg         |

◆ also refer to "Options"

## Electrical Data

|   |  |
|---|--|
| measuring unit                                | power factor (phase angle $\psi$ )   |
| frequency range                               | 49 ... 50 ... 51 Hz (single phase system)<br>45 ... 50 ... 65 Hz (3 phase system)  |
| overload capacity (acc. to DIN EN 60 051 - 1) |  |
| continuously                                  | 1.2 times rated voltage / current  |
| 5 s max.                                      | 2 times rated voltage,<br>10 times rated current   |
| power consumption                             |  |
| current path                                  | $\leq 0.1$ VA  |
| voltage path                                  | $\leq 3.0$ VA  |
| measurement category                          | CAT III  |
| operating voltage                             | refer to Measuring Ranges  |
| pollution level                               | 2  |
| enclosure code                                | IP 52 case front side<br>IP 00 for terminals without protection against accidental contact<br>IP 20 for terminals protected against accidental contact |

## Measuring Ranges

### type

|          |                                     |
|----------|-------------------------------------|
| <b>E</b> | single phase system                 |
| <b>D</b> | 3 phase 3 wire system balanced load |

### measuring ranges

|            |                           |
|------------|---------------------------|
| cos $\psi$ | cap 0.5 ... 1 ... 0.5 ind |
| cos $\psi$ | cap 0.8 ... 1 ... 0.3 ind |
| cos $\psi$ | cap 0.8 ... 1 ... 0.8 ind |

| single phase system<br>rated<br>voltages | operating voltage |       | 3 phase system<br>rated<br>voltages | operating voltage |       |
|--|-------------------|-------|-------------------------------------|-------------------|-------|
|  | CQ 96 K           | 144 K |                                     | CQ 96 K           | 144 K |
| 57.7 V ( $100 \text{ V} : \sqrt{3}$ )    | 150 V             | 150 V |                                     |                   |       |
| 63.5 V ( $110 \text{ V} : \sqrt{3}$ )    | 150 V             | 150 V |                                     |                   |       |
| 100 V <sup>1)</sup>                      | 150 V             | 150 V | 100 V <sup>1)</sup>                 | 150 V             | 150 V |
| 110 V <sup>1)</sup>                      | 150 V             | 150 V | 110 V <sup>1)</sup>                 | 150 V             | 150 V |
| 115 V                                    | 150 V             | 150 V | 115 V                               | 150 V             | 150 V |
| 120 V                                    | 150 V             | 150 V | 120 V                               | 150 V             | 150 V |
| 127 V ( $220 \text{ V} : \sqrt{3}$ )     | 150 V             | 150 V | 127 V                               | 150 V             | 150 V |
| 208 V                                    | 300 V             | 600 V | 208 V                               | 300 V             | 600 V |
| 230 V                                    | 300 V             | 600 V | 230 V                               | 300 V             | 600 V |
| 289 V ( $500 \text{ V} : \sqrt{3}$ )     | 600 V             | 600 V | 289 V                               | 600 V             | 600 V |
| 400 V                                    | 600 V             | 600 V | 400 V                               | 600 V             | 600 V |
|  |                   |       | 415 V                               | 600 V             | 600 V |
|  |                   |       | 440 V                               | 600 V             | 600 V |
|  |                   |       | 500 V                               | 600 V             | 600 V |

<sup>1)</sup> also for use on voltage transformer

### rated currents

|     |
|-----|
| 1 A |
| 5 A |



## Analog Power Factor Meters, Electronically, 90° or 240° Dial

### Scaling

|                       |  |
|-----------------------|--|
| dial                  | flat dial  |
| pointer               | bar / knife-edge pointer   |
| pointer deflection    | 0 ... 90° (CQ)<br>0 ... 240° (LSC)                                   |
| scale characteristics | non-linear   |
| scale division        | coarse – fine  |
| scale length          | CQ 96 K      CQ 144 K      LSC 96 K<br>97 mm      146 mm      142 mm |

### Accuracy at Reference Conditions

accuracy class      1.5 according to DIN EN 60 051 - 1

#### reference conditions

|                     |                            |
|---------------------|----------------------------|
| ambient temperature | 23°C                       |
| position of use     | nominal position ±1° ♦     |
| voltage             | rated voltage              |
| frequency           | 50 Hz ±0.1%                |
| wave form           | sine wave                  |
| distortion factor   | ≤ 0.1%                     |
| current             | 95 ... 100 % rated current |
| warm-up             | ≥ 5 min                    |
| others              | DIN EN 60 051 - 1          |

#### influences

|                      |                       |
|----------------------|-----------------------|
| ambient temperature  | 23°C ± 2K             |
| position of use      | nominal position ± 5° |
| stray magnetic field | 0.5 mT                |

### Environmental

|                             |   |
|-----------------------------|---|
| climatic suitability        | climatic class 3 acc. to VDE/VDI 3540 sheet 2 |
| operating temperature range | -10 ... +55°C                                 |
| storage temperature range   | -25 ... +65°C                                 |
| relative humidity           | ≤ 75% annual average, non-condensing          |
| shock resistance            | 15 g, 11 ms                                   |
| vibration resistance        | 2.5 g, 5 ... 55 Hz                            |

### Rules and Standards

|                      |  |
|----------------------|--|
| DIN 43 718           | Measurement and control; front-frames and frontpanels of measurement and control equipment; principal dimensions   |
| DIN 43 802           | Line scales and pointers for indicating electrical measuring instruments; general requirements   |
| DIN 16 257           | Nominal positions and position symbols used for measuring instruments  |
| DIN EN 60 051        | Direct acting indicating analogue electrical measuring instruments and their accessories   |
| -1                   | Part 1: Definitions and general requirements common to all parts   |
| -5                   | Part 5: Special requirements for phase meters, power factor meters, and synchrosopes   |
| -9                   | Part 9: Recommended test methods   |
| DIN EN 60 529        | Enclosure codes by housings (IP-code)  |
| DIN EN 61 010 - 1    | Safety requirements for electrical measuring, control and laboratory equipment<br>Part 1: General requirements   |
| DIN EN 61 326 - 1    | Electrical equipment for measurement, control and laboratory use – EMC requirements<br>Part 1: General requirements<br>(IEC 61 000 - 4 - 3 evaluation criterion B) |
| DIN IEC 61 554       | Panel mounted equipment –<br>Electrical measuring instruments –<br>Dimensions for panel mounting   |
| VDE/VDI 3540 sheet 2 | reliability of measuring and control equipment (classification of climates)  |

### Options

#### case

|                       |  |
|-----------------------|--|
| window                | non-glaring glass  |
| colour of bezel       | gray (similar to RAL 7037)   |
| index marking pointer | red, front adjustable  |
| position of use       | on request 15...165°   |
| marine application    | non-certified or with approbation by "Germanischer Lloyd" (CQ 96/144 K only) |

#### terminal protection against accidental contact

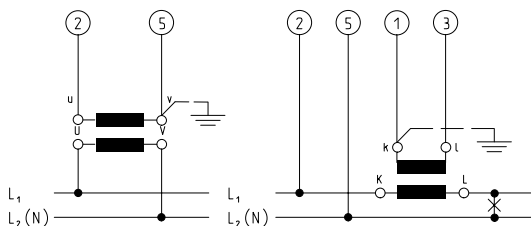
protective sleeves

#### dial

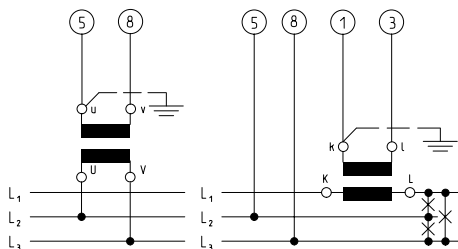
|                      |   |
|----------------------|---|
| additional lettering | on request e.g. "generator"                   |
| additional figuring  | on request                                    |
| coloured marks       | red, green or blue for important scale values |
| coloured sector      | red, green or blue within scale division      |
| logo on the dial     | none or on request                            |

## Connections

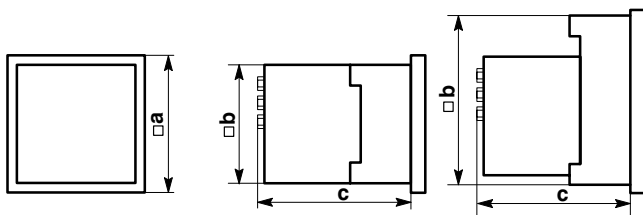
### CQ 96/144 K E, LSC 96 K E



### CQ 96/144 K D, LSC 96 K D



## Dimensions



CQ/LSC 96 K

CQ 144 K

### dimensions (in mm)

|   | CQ/LSC 96 K | CQ 144 K |
|---|-------------|----------|
| a | 96          | 144      |
| b | 90          | 136      |
| c | 104         | 104      |

## Ordering Information

|   |  |
|---|--|
| <b>type</b><br>CQ<br>LSC (96 K only)        | power factor meter, electrical<br>with moving-coil movement. 90° dial<br>with moving-coil movement. 240° dial  |
| <b>front dimensions</b><br>96 K<br>144 K    | 96 mm x 96 mm<br>144 mm x 144 mm   |
| <b>type</b><br>E<br>D                       | single phase system<br>3 phase system balanced load  |
| <b>measuring ranges</b>                     | cap 0.5 ... 1 ... 0.5 ind<br>cap 0.8 ... 1 ... 0.3 ind<br>cap 0.8 ... 1 ... 0.8 ind  |
| <b>rated voltages</b>                       | refer to preceding table   |
| <b>rated currents</b>                       | 1 A<br>5 A   |
| <b>window</b>                               | glass <sup>1)</sup><br>non-glaring glass   |
| <b>colour of bezel</b>                      | black (similar to RAL 9005) <sup>1)</sup><br>gray (similar to RAL 7037)  |
| <b>index marking pointer</b>                | none <sup>1)</sup><br>red, front adjustable <sup>3)</sup>  |
| <b>position of use</b>                      | vertical <sup>1)</sup><br>on request 15 ... 165° <sup>2)</sup>   |
| <b>marine application</b>                   | none <sup>1)</sup><br>non-certified<br>with approbation by<br>"Germanischer Lloyd" <sup>3)</sup>   |
| <b>safety terminal<br/>touch protection</b> | none <sup>1)</sup><br>protective sleeves   |
| <b>dial</b>                                 | scale division & measuring range alike <sup>1)</sup><br>additional lettering on request <sup>2)</sup><br>additional figuring on request <sup>2)</sup><br>coloured marks red, green or blue <sup>2)</sup><br>coloured sector red, green or blue <sup>2)</sup> |
| <b>logo</b>                                 | WEIGEL <sup>1)</sup><br>none<br>OEM logo <sup>2)</sup>   |

<sup>1)</sup> Standard

<sup>2)</sup> Please clearly add the desired specifications.

<sup>3)</sup> CQ 96/144 K only

### ordering example

CQ 96 K D for 3 phase system balanced load,  
measuring range (cos  $\psi$ ) cap 0.5 ... 1 ... 0.5 ind, rated voltage AC 230 V,  
rated current 1 A, window non-glaring glass, no logo

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– specifications subject to change without notice; date of issue 2/11 –

