



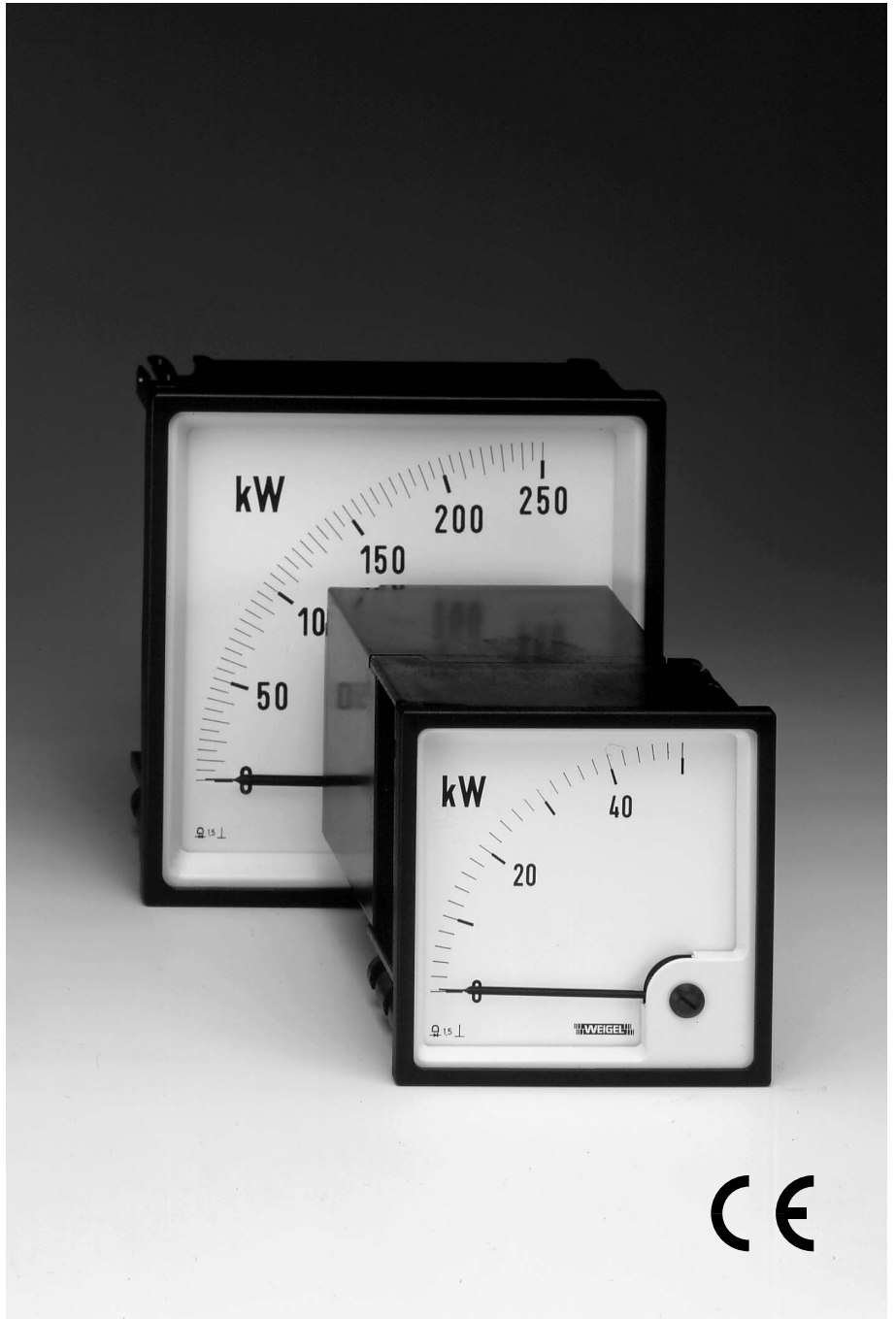
# Data Sheet

K Series  
470.D.101.08

## Analog Watt and VAr Meters, Electronically, 90° or 240° Dial

LQ 96 K  
LQ 144 K  
LSL 96 K

with Slide-In-Dial



**WEIGEL**

## Application

The electronic Watt and VA moving-coil meter models **LQ 96/144 K** with 90° dial or **LSL 96 K** with 240° dial of the K series are offered for the following AC systems:

- single phase,
- 3 phase balanced load, 3 or 4 wire,
- 3 phase unbalanced load, 3 or 4 wire.

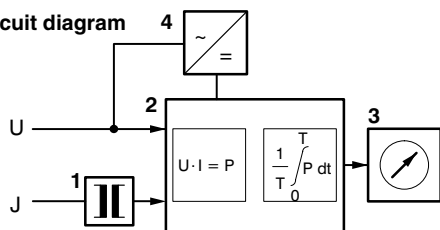
These wattmeters are suitable to indicate forward (export) and reverse (import) power flow as well as inductive and capacitive reactive power. They can be used both on sinusoidal and non-sinusoidal current.

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 (LQ) or pivot suspended spring loaded jewel bearings (LSL) system and a power converter. Both devices are included in a common plastic case.

**block circuit diagram**



The power converter uses one, two or three multiplier systems **2** depending on the measurement of balanced or unbalanced load AC systems. Current transformers **1** adapt the input current to the multiplier electronics.

The multipliers form the product of the instantaneous values of current and voltage (TDM principle). Subsequently, the product resultant is integrated, thereby suppressing the AC ripple. A DC voltage output signal is fed to the moving-coil movement **3**.

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 ±5°		
panel fixing	screw clamps		
mounting	stackable next to each other		
panel thickness	≤ 40 mm		
terminals	hexagon studs with M4 screws		
<b>dimensions</b>	<b>LQ 96 K</b>	<b>LQ 144 K</b>	<b>LSL 96 K</b>
bezel	□ 96 mm	□ 144 mm	□ 96 mm
case	□ 90 mm	□ 136 mm	□ 90 mm
depth	129 mm	129 mm	129 mm
	VW/B 3 versions		all versions
depth	104 mm	104 mm	–
	EW/B1, DW/B1, VW/B1, DW/B2 versions		
panel cutout	□92 <sup>+0.8</sup> mm	□138 <sup>+1</sup> mm	□92 <sup>+0.8</sup> mm
weight approx.	1.1 kg	1.1 kg	1.1 kg

## Electrical Data

measuring unit	active or reactive power
response time	4 s
overload capacity (acc. to DIN EN 60 051 - 1)	
continuously	1.2 times rated voltage / current
5 s max.	2 times rated voltage, 10 times rated current
power consumption	
current path	≤ 0.2 VA / each
voltage path types	
EW 1, DW 1, DB 1, VW 1, VB 1	≤ 3.0 VA / each
EB 1	≤ 3.5 VA / each
DW 2, DB 2	≤ 3.4 VA / each
VW 3	≤ 3.9 VA / each
VB 3	≤ 4.3 VA / each
measurement category	CAT III
operating voltage	refer to Measuring Ranges
pollution level	2
enclosure code	IP 52 case front side IP 00 for terminals without protection against accidental contact IP 20 for terminals protected against accidental contact

## Measuring Ranges

type	active power	reactive power
single phase system	<b>EW 1</b>	<b>EB 1</b>
3 phase 3 wire system balanced load	<b>DW 1</b>	<b>DB 1</b>
3 phase 4 wire system balanced load	<b>VW 1</b>	<b>VB 1</b>
3 phase 3 wire system unbalanced load	<b>DW 2</b>	<b>DB 2</b>
3 phase 4 wire system unbalanced load	<b>VW 3</b>	<b>VB 3</b>

### selection of measuring range

The apparent power  $P_S$  is calculated from the primary ratings of current transformers and voltage transformers:

$$\text{single phase} \quad P_S = U \cdot I$$

$$\text{3 phase} \quad P_S = \sqrt{3} \cdot U \cdot I$$

Select full-scale values between 0.5 and 1.2 times the calculated apparent power preferably from DIN series

1 – 1.2 – 1.5 – 2 – 2.5 – 3 – 4 – 5 – 6 – 7.5 – 8 and their decimal multiples.

single phase system	3 phase 3 wire system		3 phase 4 wire system		
rated voltage	operating voltage		rated voltage	operating voltage	
	LQ 96 K	144 K	LQ 96 K	144 K	96 K
	LSL	96 K	LSL	96 K	
57.7 V (100 V : $\sqrt{3}$ )	150 V	150 V	57.7/100 V	150 V	150 V
63.5 V (110 V : $\sqrt{3}$ )	150 V	150 V	63.5/110 V	150 V	150 V
100 V	150 V	150 V			
115 V	150 V	150 V			
120 V	150 V	150 V			
127 V (220 V : $\sqrt{3}$ )	150 V	150 V	127/220 V	150 V	150 V
230 V (400 V : $\sqrt{3}$ )	300 V	600 V			
289 V (500 V : $\sqrt{3}$ )	300 V	600 V			
400 V	600 V	600 V	230/400 V	600 V	600 V
440 V	600 V	600 V	254/440 V	600 V	600 V
500 V	600 V	600 V	289/500 V	600 V	600 V

**rated current** 1 A or 5 A  
If used on current transformer, please state transformer ratio on the order.

also refer to "Options"



## Analog Watt and VAr Meters, Electronically, 90° or 240° Dial

### Scaling

dial	flat dial		
pointer	bar / knife-edge pointer		
pointer deflection	0 ... 90° (LQ) 0 ... 240° (LSL)		
scale characteristics	linear		
scale division	coarse-fine		
scale length	LQ 96 K 97 mm	LQ 144 K 146 mm	LSL 96 K 142 mm

### Accuracy at Reference Conditions

accuracy class	1.5 according to DIN EN 60 051 - 1
<b>reference conditions</b>	
ambient temperature	23°C
position of use	nominal position ±1°
input	full-scale power value P <sub>N</sub>
calibration factor	$\lambda = P_N / P_S$
power factor	$\cos \psi = \lambda / 0.6$ resp. $\sin \psi = \lambda / 0.6$ for $0.3 \leq \lambda < 0.6$ $\cos \psi = 1$ resp. $\sin \psi = 1$ for $0.6 \leq \lambda \leq 1.5$
voltage	rated voltage
frequency	50 Hz ±2%
warm-up	≥ 15 min
others	DIN EN 60 051 - 1
<b>influences</b>	
ambient temperature	23°C ±2K
position of use	nominal position ±5°
stray magnetic field	0.5 mT
power factor	-1 ind (export) ... 1 (import) ... -1 cap (export) (4 quadrants)

### 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
-3	Part 3: Special requirements for wattmeters and varimeters
-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 Part 1: General requirements
DIN EN 61 326-1	Electrical equipment for measurement, control and laboratory use – EMC requirements Part 1: General requirements (IEC 61 000-4-3 evaluation criterion B)
DIN IEC 61 554	Panel mounted equipment – Electrical measuring instruments – Dimensions for panel mounting
VDE/VDI 3540 sheet 2	reliability of measuring and control equipment (classification of climates)

### Options

<b>case</b>	
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" (LQ 96/144 K only)

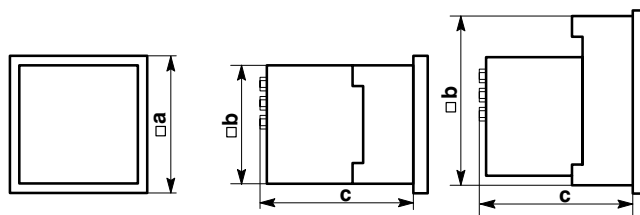
#### terminal protection against accidental contact

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

### Dimensions



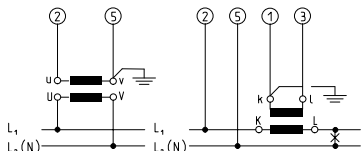
LQ/LSL 96 K

LQ 144 K

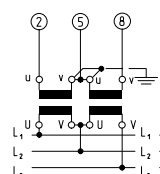
dimensions (in mm)	LQ 96 K	LQ 144 K	LSL 96 K
a	96	144	96
b	90	136	90
c	104	104	129
(EW/B1, DW/B 1, VW/B 1, DW/B 2 versions)			
c	129	129	129
(VW/B 3 versions)			

## Connections

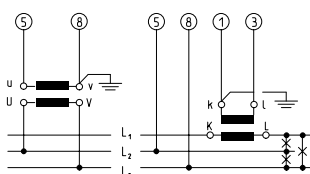
### LQ/LSL 96/144 K EW1/EB1



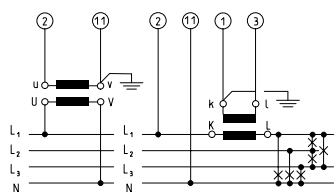
### LQ/LSL 96/144 K DW1



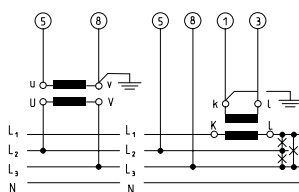
### LQ/LSL 96/144 K DB1



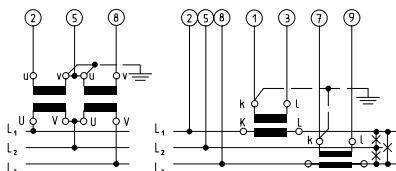
### LQ/LSL 96/144 K VW1



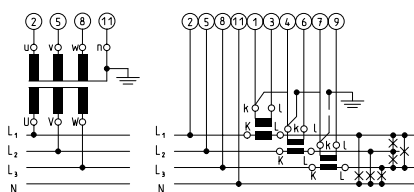
### LQ/LSL 96/144 K VB1



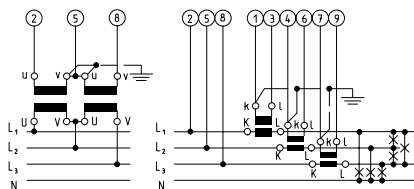
### LQ/LSL 96/144 K DW2/DB2



### LQ/LSL 96/144 K VW3



### LQ/LSL 96/144 K VB3



## Ordering Information

<b>type</b> LQ LSL (96 K only)	Watt and VAr meters, electrical with moving-coil movement. 90° dial with moving-coil movement. 240° dial
<b>front dimensions</b> 96 K 144 K	96 mm x 96 mm 144 mm x 144 mm
<b>type</b> EW1, EB1 DW1, DB1 VW1, VB1 DW2, DB2 VW3, VB3	single phase system 3 phase 3 wire system balanced load 3 phase 4 wire system balanced load 3 phase 3 wire system unbalanced load 3 phase 4 wire system unbalanced load
<b>measuring ranges</b>	refer to preceding table
<b>rated voltages</b>	refer to preceding table
<b>rated currents</b>	1 A 5 A
<b>window</b>	glass <sup>1)</sup> non-glaring glass
<b>colour of bezel</b>	black (similar to RAL 9005) <sup>1)</sup> gray (similar to RAL 7037)
<b>index marking pointer</b>	none <sup>1)</sup> red, front adjustable
<b>position of use</b>	vertical <sup>1)</sup> on request 15 ... 165° <sup>2)</sup>
<b>marine application</b>	none <sup>1)</sup> non-certified with approbation by "Germanischer Lloyd" <sup>3)</sup>
<b>terminal protection</b>	none <sup>1)</sup> protective sleeves
<b>dial</b>	scale division & measuring range alike <sup>1)</sup> additional lettering on request <sup>2)</sup> additional figuring on request <sup>2)</sup> coloured marks red, green or blue <sup>2)</sup> coloured sector red, green or blue <sup>2)</sup>
<b>logo</b>	WEIGEL <sup>1)</sup> none OEM logo <sup>2)</sup>

<sup>1)</sup> Standard

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

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

### ordering example

LQ 96 K VW3 for active power, 3 phase 4 wire system, unbalanced load, measuring range 0 ... 400 kW, rated voltage AC 230/400 V, for use on current transformer 600/5 A, window non-glaring glass, no logo

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

