

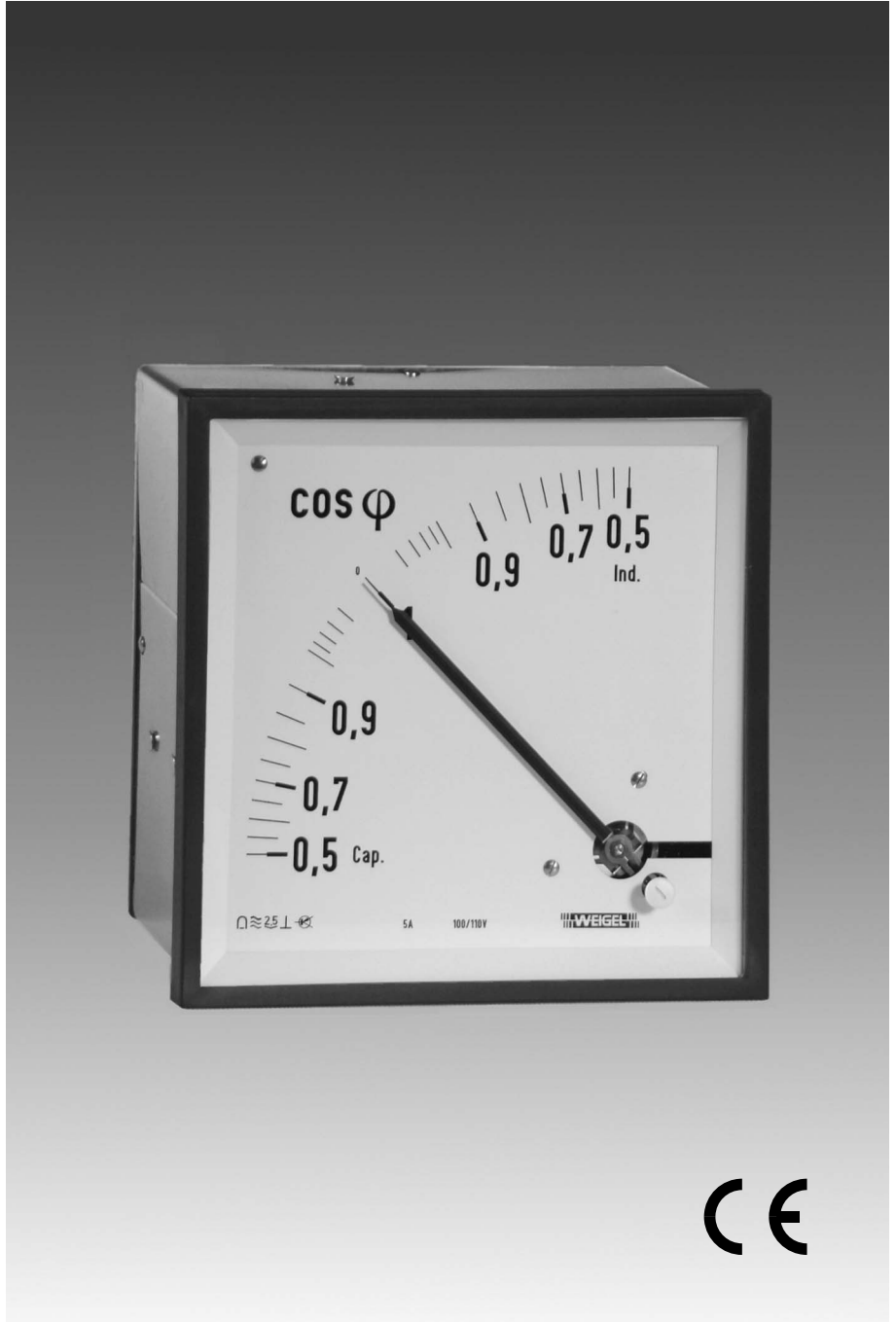


Data Sheet

M Series
060.D.101.06

Analog Meters Power Factor Meters, Electronically 90° Dial

LFUQ 144



WEIGEL

Application

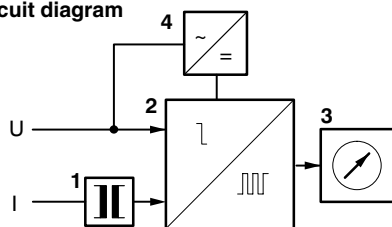
The power factor meter **LFUQ 144** (M series) is suitable for to measure the power factor as ratio of real power to apparent power in single phase AC or 3 phase 3 wire balanced load systems.

The meter is housed in a pressed steel case suitable for mounting in switchboards, generator control panels and/or mosaic grid panels.

Functional Principle

The indicators have self-contained solid state electronic converter circuits. The moving-coil movement of the indicating instrument comprises a core-type magnetic system with twin spring loaded shock absorbing jewel bearings.

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 ψ . A low-pass filter forms the mean value which is fed to the moving-coil movement 3. The standard dial is scaled in values of the $\cos \psi$ of the phase angle ψ .

Power supply is obtained from voltage input in block 4.

Mechanical Data

case details	square case suitable to be mounted in switchboards or mosaic grid panels, stackable
material of case	pressed steel
material of window	glass ▶
colour of bezel	black (similar to RAL 9005) ▶
position of use	vertical $\pm 5^\circ$ ▶
panel fixing	screw clamps
panel thickness	1 ... 15 mm
mounting	stackable next to each other
terminals	
voltage circuit	hexagon studs, M3 screws and wire clamps C6
current circuit	hexagon studs, M5 screws and wire clamps C10
dimensions	LFUQ 144
bezel	□ 144 mm
case	□ 137 mm
depth	60 mm
panel cutout	□ 138 ⁺¹ mm
weight approx.	0.8 kg

▶ also refer to "Options"

Electrical Data

measuring unit	power factor (phase angle ψ)
frequency range	49 Hz ... <u>50 Hz</u> ... 51 Hz or 59 Hz ... <u>60 Hz</u> ... 61 Hz
overload capacity (acc. continuously 5 s max.)	to DIN EN 60 051 - 1) 1.2 times rated voltage / current 2 times rated voltage 10 times rated current
power consumption	
voltage circuit	approx. 2.5 mA
current circuit	approx. 0.3 VA at 5 A rated current
measurement category	CAT III
operating voltage	300 V (rated mains voltage phase to zero)
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

E	single phase system
D	3 phase 3 wire system, balanced load

measuring ranges ($\cos \psi$)

cap 0.5 ... 1 ... 0.5 ind
cap 0.7 ... 1 ... 0.3 ind

rated frequency

50 Hz
60 Hz (single phase system only)

rated voltage

single phase system	3 phase 3 wire system
100 V ¹⁾	100 V ¹⁾
110 V ¹⁾	110 V ¹⁾
115 V	115 V
230 V	230 V
	400 V
	415 V
	440 V

rated current

1 A ¹⁾
5 A ¹⁾

¹⁾ also for use on transformer

Scaling

pointer	bar / knife-edge pointer
pointer deflection	0 ... 90°
scale characteristics	non-linear
scale division	coarse-fine
scale length	146 mm



Analog Meters Power Factor Meters, Electronically 90° Dial

Accuracy at Reference Conditions

accuracy class 2.5 according to DIN EN 60 051 - 1

reference conditions

ambient temperature 23 °C
position of use nominal position $\pm 1^\circ$ ♦
voltage rated voltage
frequency rated frequency $\pm 0.1\%$
wave form sine wave
distortion factor $\leq 0.1\%$
current 40 ... 100% rated current
warm up ≥ 5 min
others DIN EN 60 051 - 1

influences

ambient temperature 23 °C $\pm 2K$
position of use nominal position $\pm 5^\circ$
frequency rated frequency $\pm 1\%$
current 20 ... 120% rated current
stray magnetic field 0.5 mT

Environmental

climatic suitability climatic class 2 ♦ acc. to VDE/VDI 3540 sheet 2
operating temperature range $-25 \dots +40^\circ C$ ♦
storage temperature range $-25 \dots +65^\circ C$
relative humidity $\leq 75\%$ 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 synchronoscopes
-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)

♦ also refer to "Options"

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)
(non - condensing)

Options

case

window non-glaring glass
colour of bezel gray (similar to RAL 7037)
position of use horizontal or to be specified 15...165°

performance

increased mechanical loads shock 30 g, 11 ms
vibration 5 g, 5 ... 55 Hz
climatic suitability limited use in the tropics
climatic class 3 acc. to VDE/VDI 3540 sheet 2
with operating temperature range $-10 \dots +55^\circ C$
marine application non-certified
enclosure code IP 54 splash-water protected front

accessories

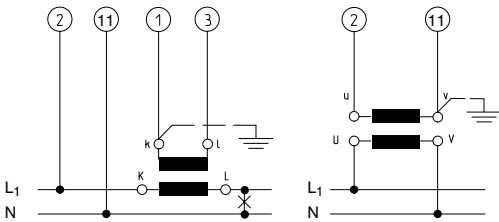
terminal protection against accidental contact
full-sized rear cover or protective sleeves
terminals connector blades 6.3 x 0.8

dial

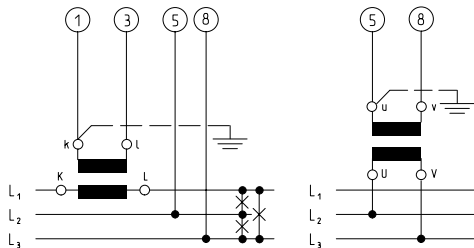
additional lettering to be specified e.g. "generator"
additional figuring to be specified
coloured marks red, green or blue for important scale values
coloured sector red, green or blue within scale division
logo on the dial none or to be specified

Connections

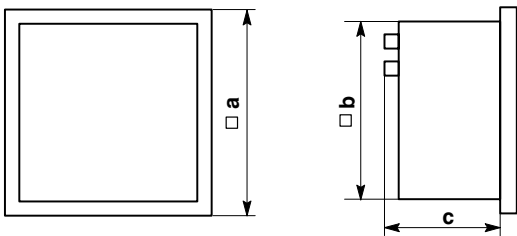
LFUQ 144 E, single phase system



LFUQ 144 D, 3 phase 3 wire system, balanced load



Dimensions



dimensions (in mm) LFUQ 144

a	144
b	137
c	60

Ordering Information

type LFUQ	power factor meter, electronically, with moving-coil movement
front dimensions 144	144 mm x 144 mm
system type E D	single phase system 3 phase 3 wire system
measuring ranges ($\cos \psi$)	cap 0.5 ... 1 ... 0.5 ind cap 0.7 ... 1 ... 0.3 ind
rated frequency	50 Hz ¹⁾ 60 Hz ³⁾
rated voltage	refer to preceding table
rated current	1 A 5 A
window	glass ¹⁾ non-glaring glass
colour of bezel	black (similar to RAL 9005) ¹⁾ gray (similar to RAL 7037)
position of use	vertical ¹⁾ to special order 15 ... 165° ²⁾
mechanical loads	shock 15 g, vibration 2.5 g ¹⁾ shock 30 g, vibration 5 g
climatic suitability	class 2, -25 ... +40°C ¹⁾ class 3, -10 ... +55°C
marine application	none ¹⁾ non-certified
enclosure code	IP 52 ¹⁾ IP 54 splash-water protected front
terminal safety protection	none ¹⁾ full-sized rear cover protective sleeves SW6 / SW10
terminals	screws and wire clamps ¹⁾ connector blades 6.3 x 0.8
dial	scale division & measuring range alike ¹⁾ blank dial additional lettering to be specified ²⁾ additional figuring to be specified ²⁾ coloured marks red, green or blue ²⁾ coloured sector red, green or blue ²⁾
logo	WEIGEL ¹⁾ none OEM logo ²⁾

¹⁾ Standard

²⁾ Please clearly add the desired specifications.

³⁾ LFUQ 144 E only

ordering example

LFUQ 144 D for use on 3 phase 3 wire balanced load system,
measuring range cap 0.5 ... 1 ... 0.5 ind, rated frequency 50 Hz,
rated voltage 400 V_~, rated current 1 A,
window non-glaring glass, WEIGEL logo

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– specifications subject to change without notice; date of issue 04/11 –

