

Power Factor Meters - LFL

LFL 96
LFL 144

Data Sheet

Analogue Power Factor
Meter 240° Scale



Application

The moving coil indicators LFL 96/144 and a phase angle adjuster are used to monitor changing power factor conditions on irreversible balanced load systems.

The power factor is indirectly determined by measuring the phase angle ϕ between current and voltage (both sinusoidal). However the indicators are calibrated in values of $\cos \phi$ of the angle ϕ

These meters offer several advantages in Switchboard and Generating Set panels. Number of meters can be mounted in a Panel Cut out (Mosaic Mounting). The Bezel, Front window glass and Dial can be easily replaced

Features

- Better resolution.
- Knife edge pointer.
- Glass filled polycarbonate (UL 94-V-0)
- Easily replaceable glass and bezel.

Application Standard

Nominal case and cutout dimensions for indicating measuring instruments.	IS 2419 DIN IEC 61554
Scale and pointer for electrical measuring instruments.	IS 1248 DIN 43802
Connections and Terminal markings for panel meters	IS 1248 DIN 43807
Terminal bolts / leads	DIN 46200/46282
Clamp straps for connections.	DIN 46282
Safety requirements and protective measures for Electrical indicating instruments and their accessories.	IS 9249 DIN 40050 VDE 0110 VDE 0410 IEC 529,IEC 1010
Performance specifications for direct acting indicating analogue electrical measuring instruments & their accessories	IS 1248 IEC 51/DIN EN 60051
Environmental conditions	DIN 43701 IS 1248 IS: 9000 VDE / VDI 3540 DIN 43701
Technical conditions of delivery for electrical instruments.	
Front frames for indicating measuring instruments principle dimensions.	DIN 43718
UL Combustibility class.	UL 94 V-0
Mechanical strength (Free fall test, vibration test)	IS 1248 IS 9000 VDE 0411 IEC 1010
Environmental conditions	IS : 1248 IS : 9000 VDE / VDI 3540

Comply with following European directives :

2004 / 108 / EC (EMC directive), 2006 / 95/ EC (low voltage directive) & amendment 93/ 68/ EEC, For CE Marking.

Scale and Pointer

Pointer	Knife -edge pointer
Pointer deflection	0 ... 240°
Scale characteristics	Non-Linear
Scale division	Coarse - fine
Scale length	LFL 96 LFL 144 142 mm 230 mm
Scale Interchangeability	Scales are interchangeable.

Mechanical Data

Case details	Moulded square case suitable for mounting in Control / Switchgear panels, Machinery consoles.
--------------	---

Case material	Polycarbonate, flame retardant and drip proof as per UL 94 V-0.
Front facia	Glass
Colour of bezel	Black
Position of use	Vertical
Panel fixing	Mounting Clamp.
Mounting	Stackable in a single cutout
Panel thickness	≤ 25 mm
Terminals	Hexagon studs, M4 screws and wire clamps E3 (DIN 46282)

Electrical Data

Measured quantity	Power factor
-------------------	--------------

Overload capacity (acc to IS : 1248/ IEC 51)

Continuously	1.2 times rated voltage / current
Short duration	2 times for 5 sec : 1 overload 2 times for 0.5 sec : 9 overloads

Power consumption(Approx)

Current path	< 1.0 VA
Voltage path types	< 3.5 VA
Enclosures code (IEC 529)	IP 52 case IP 00 for terminals
Insulation class	Group A according to VDE 0110
Rated insulation voltage	660 V
Proof voltage testing	2 kV
Installation category (IEC 1010)	300 VCAT III
Insulation resistance	> 50 Mohm at 500V DC

Accuracy at Reference Conditions

Accuracy class	1.5 according to IS:1248 (IEC 51/ DIN EN 60051)
----------------	---

Reference conditions

Ambient temperature	23°C ± 2°C
Position of use	Nominal position ± 1°
Waveform	Sinewave
Current	95...100% rated current
Warmup	>=5 minutes at min 80% of rated current and 100% of rated voltage.
Voltage	IS : 1248 (IEC 51 / DIN EN 60051)
Frequency	Rated voltage + 2%
Others	50 Hz ± /- 0.1%
Distortion factor	IS: 1248 (IEC 51/ DIN EN 60051) < 1%

Nominal range of use

Ambient temperature	0 ... 50 °C
Position of use	Nominal position + 5°
External magnetic field	At 0.4 kA/m
Voltage	Rated voltage ± 15%
Current	20 to 120% of rated current
Frequency	49-51 Hz for single phase 45-65 Hz for 3 phase

Environmental Conditions

Climatic suitability	Climate category II as per IS : 1248 (climatic class 3 according to VDE/VDI 3540)
Operating temperature	-10 ... + 55 °C
Storage temperature	-25 + 65 °C
Relative humidity	≤ 75% annual average, non-condensing
Shock resistance	15g _n for pulse duration 11 ms
Vibration resistance	10-55-10Hz for ampli. 0.15mm (1.5 g at 50Hz)

Options

Case

Front facia	Antiglare glass
Colour of bezel	Red, Yellow, Blue, White
Red index pointer	Front adjustable on site
Position of use	on request 0180°

Dial

Blank dial	With initial and end values marked.
Special markings	Numbering /Lettering.
Division dials	Basic divisions without numbering.
Colour markings/bands	Red or green.

Standard Measuring Ranges

Type

E	Single phase system
D	3 phase system balanced load

Measuring ranges

COS ϕ	cap 0.5....1....0.5 ind
COS ϕ	cap 0.8....1....0.3 ind
COS ϕ	cap 0.8....1....0.8 ind

Rated voltages

Following single phase and three phase voltages are available as standard. The voltage will be considered as a phase voltage (between phase & neutral) in case of single phase meters and as a line voltage (between two phases) in case of multi phase 3 wire and 4 wire meters.

Please clearly specify the application (3 ph. 3 wire or 4 wire)

Single Phase	Three Phase
57.5	100
63.5	110
100	220
110	380
127	415
220	440
230	500
240	
289	

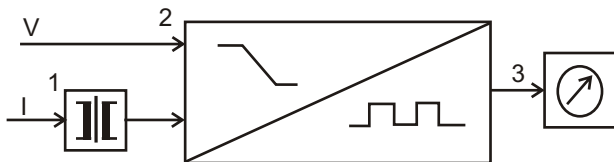
Rated currents

1A
5A

Functional Principle

The measuring system comprises a moving coil indicator & phase angle converter attached to the case of indicating instrument. Moving coil movements has pivots of very high hardness. Movement is suspended between spring loaded sapphire jewels. Movement is properly shielded & critically damped by eddy currents induced in coil former.

Schematic Diagram

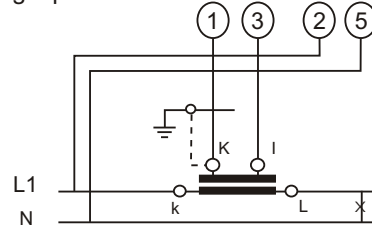


A current transformer 1 of the phase angle converter provides input current to the electronic circuit. Both the input voltage and the current are passed to a bistable flip-flop stage 2.

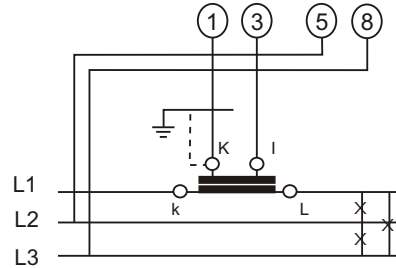
The pulse duty cycle of flip-flop is proportional to the phase angle ϕ . A low pass filter allows the mean value which is proportional to the phase angle and is fed to the moving coil movement 3.

Connections

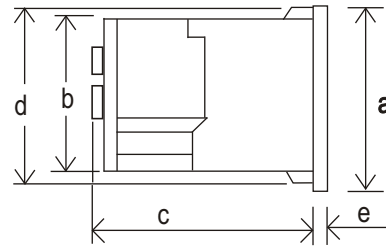
LFL 96 Single phase



LFL 96 Three phase balanced load



Dimensions



Dimensions	(in mm)	LFL96	LFL144
Bezel	a	96	144
Case	b	90	136
Depth	c	106	106
	d	91.5 ^{+0.8}	137.5
	e	5.5	5.5
Cutout Size		92	138 ^{+0.1}
Weight (approx.)		0.68 kg.	0.8 kg.

Safety Precautions

- 1) Instruments with damaged bezel or glasses must be disconnected from the mains.
- 2) Adequate safety clearance must be maintained to control panel fasteners and to sheet metal housing. If non - insulated connector wires are used.
- 3) The back cover must be snapped into place after connector wires have been clamped for protection against accidental contact.
- 4) Bezel, Scale and Glass may only be replaced under voltage free conditions.
- 5) Instruments to be used in grounded panel.

Ordering Information

Type LFL	Power Factor meter 240 degree scale
Front Dimension 96 144	96mm x 96mm 144mm x 144mm
Type E D	Single phase systems 3 phase system balance load
Measuring ranges (COS ϕ)	cap 0.5...1...0.5 ind cap 0.8...1...0.3 ind cap 0.8...1...0.8 ind
Terminal protection	full sized polycarbonate backcover
Rated voltages	Refer to table inside
Rated currents	1 A, 5 A
Front facia	Normal glass ^{**} Antiglare glass ^{**3} Polycarbonate glass ^{**3}
Colour of Bezel	Black ^{**1} Red, Blue, Yellow, White ^{**3}
Position of use	Vertical ^{**1} on request 0... 180 ^{**3}
Dial	Standard scale same as measuring range ^{**1} Additional lettering on request ^{**3} Additional numbering on request ^{**3} Coloured marking red or green ^{**3} Coloured sector red or green ^{**3}
Logo	RISHABH ^{**1}

^{**}Standard

^{**3}Please clearly add the desired specifications while ordering

Ordering example

LFL 96 for 3 phase system balanced load, measuring range (cos ϕ)
cap 0.5...1...0.5 ind, rated voltage AC 230 V, rated current 1A.

Specifications are subject to change without notice (04/10)



www.rishabh.co.in

RISHABH
INSTRUMENTS

Measure, Control & Record with a Difference

RISHABH INSTRUMENTS PVT.LTD.

F-31, MIDC, Satpur, Nashik-422 007, India.

Tel.: +91 253 2202160, 2202202 Fax : +91 253 2351064

E-mail : India :- marketing@rishabh.co.in

International :- exp.marketing@rishabh.co.in

www.rishabh.co.in