



Data Sheet

Power Factor Meter 90⁰ CQ



Measure



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Application

The moving coil indicators CQ 72/96/144 and a phase angle adjuster are used to monitor changing power factor conditions on ir-reversible 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 & Generating Set panels. Number of meters can be mounted in a single Cut out (Mosaic Mounting). The Bezel, Front window glass and Dial can be easily replaced.

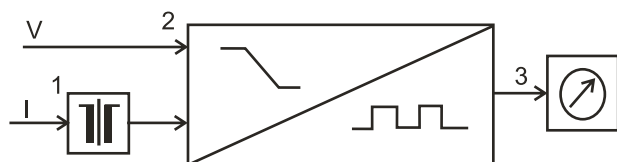
Features

- Knife edge pointer.
- Glass filled polycarbonate housing
- Easily replaceable glass and bezel.
- Easy installation with swivel screws.

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.

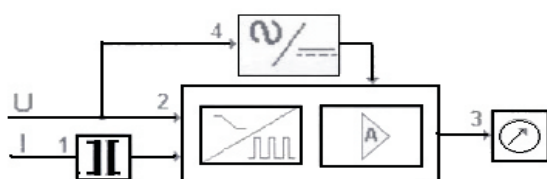
Schematic Diagram. E1C, D1C (1 Phase & 3 Ph. 3W Bal.)



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. A low pass filter allows the mean value which is proportional to the phase angle and is fed to the moving coil movement 3.

V3C, D1C (1 Phase & 3 Ph. 3W Unbal.)



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The pulse duty cycle of flip-flop is proportional to the phase angle. A low pass filter allows the mean value which is proportional to the phase angle and is fed to the moving coil movement 3, though an amplifier. Subsequent calibration is done in terms of $\cos \phi$.

Power supply is obtained from voltage in in block 4

Specifications

Scale and Pointer

Pointer	:	Knife - edge pointer
Pointer deflection	:	0 ... 90°
Scale characteristics	:	Non - Linear
Scale division	:	Coarse - fine
Scale length	:	CQ72 CQ96 CQ144 61 mm 97 mm 146mm
Interchangeability	:	Scale are Interchangeable.

Mechanical Data

Case details	:	Moulded square case suitable for mounting in Control / Switchgear panels. Machinery consoles.
Case material	:	Glass filled 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	:	Swivel Screws
Mounting	:	Stackable in single cut out
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/ DIN EN 60051)	:	1.2 times rated voltage / current
Continuously	:	2 times rated voltage , 5 Sec max overload
Short duration	:	10 times rated current ,5 Sec max overload

Power Consumption(Approx)

Current path	:	< 1.0 VA
Voltage	:	< 3.0 VA Bal / 3.5 VA for Unbal
Enclosures code (IEC 529)	:	IP 52 case
	:	IP 00 for terminals without backcover
	:	IP 00 for terminals with backcover



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Insulation class	: Group A according to VDE 0110
Rated insulation voltage	: 660V
Proof voltage testing	: 2kV
Installation category (IEC 1010)	: 300V CAT III
Insulation resistance	: > 50 Mohm at 500 V d.c.

Accuracy at Reference Conditions

Accuracy class	: 1.5 according to IS:1248 (IEC 51/ DIN EN 60051)
Reference conditions	
Ambient temperature	: 20°C ± 2°C
Position of use	: Nominal position ± 1°
Waveform	: Sinewave
Distortion Factor	: ≤ 1%
Current	: 95...100% rated current for bal. 40...100% rated current for unbal.
Warmup	: ≥ 5 minutes at min 80% of rated current & 100% of rated voltage.
Voltage	: Rated voltage ±2%
Frequency	: 50 Hz +/- 0.1%
Others	: IS : 1248 (IEC 51/DIN EN 60051)

Nominal range of use	
Ambient temperature	: 0 ... 50° C
Position of use	: Nominal position ± 5°
External magnetic field	: 0.5 mT
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. 11 ms
Vibration resistance	: 10-55-10Hz / 0.15mm 1.5 g at about 50 Hz.

Standard Measuring Ranges

Measuring Ranges (For 1ph. and 3ph balance and unbal. load)

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 Voltage:

Following single phase and three phase voltages are available as standard. The voltages 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)

E1C, D1C	V3C, D2C ¹
57.5	100
63.5	110
100	220
110	380
120	415
127	440
220	500
230	
240	
289	
380	
415	
440	
500	

Rated Current: 1A, 5A

¹Possible in 96 and above size

Applicable Standards

Nominal case and cutout dimensions for indicating electrical instruments.	: IS 2419 DIN 43700
Scale and pointer for electrical measuring instruments	: IS 1248, IEC 51 DIN 43802
Connections and Terminal markings for panel meters	: IS 1248, IEC 51 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 / 8-70 VDE 0110 /11-72 VDE 0410 /10-76 IEC 529, IEC 1010
Performance specifications for direct acting indicating analogue electrical measuring instruments & their accessories:	: IS 1248, IEC 51/DIN EN 60051 DIN 43701
Front frames for indicating measuring instruments principle dimensions.	: DIN 43718
Technical conditions of delivery for electrical instruments.	: DIN 43701
UL Combustibility class.	: UL 94 V-O
Mechanical strength (Free fall test, vibration test)	: IS 1248, IEC 51 IS 9000 VDE 0411, part I, Sec.43/44. IEC 1010



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Electro Magnetic Compatibility(EMC) Compliance as per following standards:-

EN 50081-2, EN 50082-2, EN 55011/CISPR 11,
EN 60555-2, IEC 555-2,
EN 61000-4-4 / IEC 1000-4-4,
EN 61000-4-2 / IEC 1000-4-2,
EN 61000-4-5 / IEC 1000-4-5, ENV 50140.

Comply with following European directives: 89/336/EEC (EMC directive), 73/23/EEC (low voltage directive) & amendment 93/68/EEC, for CE marking.

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 0°...180°
Dial	
Blank dial	: With initial & end values marked.
Special markings	: Numbering/ Lettering.
Division dials	: Basic divisions without numbering.
Colour markings/bands	: Red or green.

Accessories

Safety terminal protection

Full sized polycarbonate back cover to provide protection against accidental contact (hand & fingers) acc to IS 9249 VDE 0410

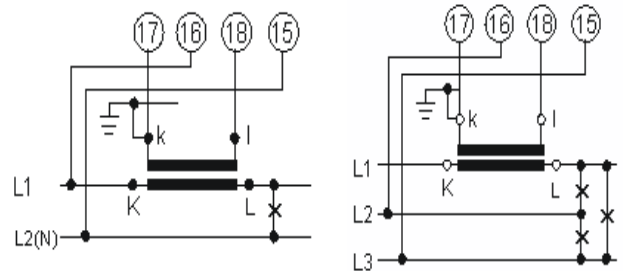
Safety Precautions

- Instruments with damaged bezels or window glasses must be disconnected from mains.
- Adequate safety clearance must be maintained to control panel fasteners and to sheet metal housing, if non - insulated connector wires are used.
- * The back cover must be snapped into place after the connector wires have been clamped for protection against accidental contact.
- Scales should be replaced under Voltage- free conditions.
- Bezels and window glasses should be replaced under Voltage - free conditions
- Specifications are subject to change without notice(02/09)

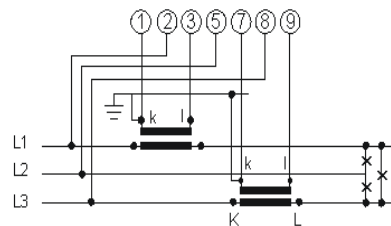
Connections

CQ 96/144 Single phase

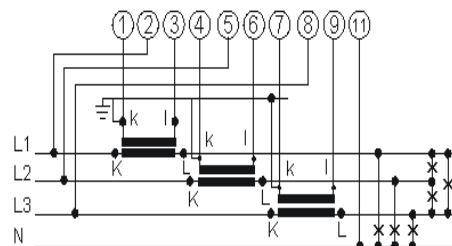
CQ 72/96/144 three ph. bal. Load



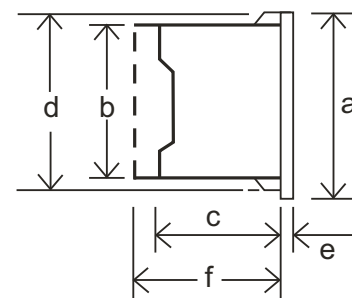
CQ 96/144 3ph. 3W Unbal. Load



CQ 96/144 3ph. 4W Unbal. Load



Dimension



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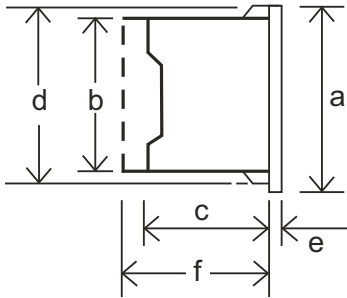


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Dimension



Dimensions (mm)	CQ 72	CQ 96	CQ 144
Bezel (a)	72	96	144
Case (b)	66	90	136
Depth (c) Balanced	72	53	53
Unbalanced	-	122	136
(d)	68	92	138
(e)	5.5	5.5	6.5
Cutout size	68	92	138
Depth with cover (f)	—	64	64
Weight (approx.)	0.55 kg.	0.6 kg.	0.8 kg.



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Ordering Information

Type : CQ	Power Factor meter
Front dimension : 72, 96 144	72 mm x 72 mm 96 mm x 96 mm 144 mm x 144 mm
Type E D V	Single phase systems 3 phase system balanced/ unbal. load 3 phase 4 wire system balanced 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 back cover
Rated voltages	Refer to table inside
Rated Currents	1A, 5A
Front facia	Normal glass ^{*1} , PC glass ^{*3} Antiglare glass ^{*3}
Colour of bezel	Black ^{*1} Red, Blue, Yellow, White ^{*3}
Position of use	Vertical ^{*1} on request 0....180 ^{0*3}
Dial	Standard scale same as measuring range ^{*3} Blank dial with division ^{*3} 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} , Others ^{*3}

^{*1} standard

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

Ordering example

CQ 96, 3 phase 3 wire 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 (04/18)



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Specifications may change without prior notice



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