

## LML 96 | 144

Analogue Watt and Var Meter 240° Scale



© Ziegler Instruments Order No. LML\_240\_Deg Data sheet-E1.R0-2020806-43-2013-EN

## Application

The Watt and Var meters, LML 96 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 instruments are suitable to indicate forward (export / out going) and reverse (import/in coming) power flow as well as inductive and capacitive reactive power. They can be used both on sinusoidal and non-sinusoidal current

These meters offer several advantages in Switchboard & 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

## Application Standard

Nominal case and cutout dimensions for indicating measuring instruments.	IS 2419
Scale and pointer for electrical measuring instruments.	DIN IEC 61554
Connections and Terminal markings for panel meters	IS 1248
Terminal bolts / leads	DIN 43802
Clamp straps for connections.	IS 1248
Safety requirements and protective measures for Electrical indicating instruments and their accessories.	DIN 43807
	DIN 46200/46282
	DIN 46282
	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
Environmental conditions	IEC 51/DIN EN 60051
	DIN 43701
	IS 1248
	IS: 9000
	VDE / VDI 3540
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-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	Linear
Scale division	Coarse - fine
Scale length	LML 96      LML 144
	142 mm      230 mm

## 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	Active or Reactive Power
Response time	4s max.
<b>Overload capacity (acc to IS : 1248/ IEC 51/ DIN EN 60051)</b>	
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	< 0.2 VA
Voltage path types	
E1W, D1W,D1B,V1W,V1B	< 3.0 VA
E1B	< 3.5 VA
D2W,D2B	< 3.4 VA
V3W	< 3.9 VA
V3B	< 4.3 VA
Enclosures code (IEC 529)	IP 52 case IP 00 for terminals without backcover
Insulation class	Group A according to VDE 0110
Rated insulation voltage	660 V
Proof voltage testing	2 kV
Installation category (IEC 1010)	300 V CAT 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)
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## Reference conditions

Ambient temperature	23°C ± 2°C
Position of use	Nominal position ± 1°
Input	Full-scale power value Pw or Pb
Feasibility factor	"Lambda"=Pw/Ps or Pb / Ps
Power factor	& Sin = 1 + 0.01 for Var meters Cos = 1 + 0.01 for Watt meters 45-65 Hz (50 Hz + 0.1% for E1B) Rated voltage + 2%
Voltage	
Frequency	IS: 1248 (IEC 51/ DIN EN 60051)
Current	20% to 120% of rated current
Others	

Electrical and mechanical zero point in the meter are not necessarily identical. Zero adjustment should be done when only voltage is applied and current circuit not energised.

## 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%
Power factor	
Cos = 1 to 0.5 (ind.) for active power	
Sin = 1 to 0.5 (ind.) for reactive power	
Frequency 45-65 Hz (50 Hz + 1% for E1B)	

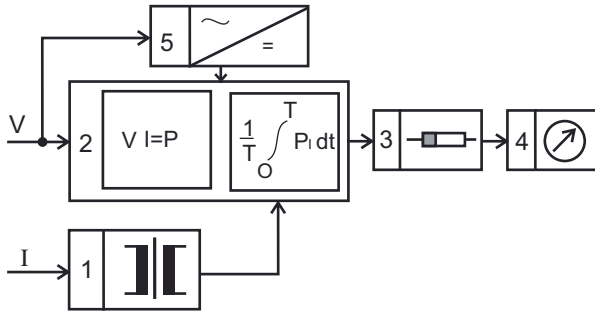
## Environmental Conditions

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 <sub>n</sub> for pulse duration 11 ms
Vibration resistance	10-55-10Hz for ampli. 0.15mm (1.5 g at 50Hz)

### Function principal

For active and reactive power measurement, a moving-coil indicator is used to indicate watts and vars for which an analogue DC signal is obtained from a power converter attached to the case of the indicator.

### Schematic Diagram.

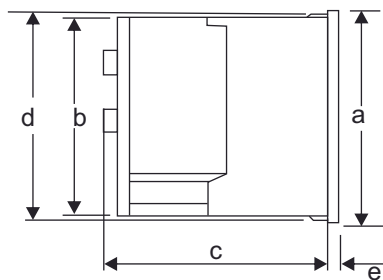


The power converter uses one, two or three multiplier systems 2 depending on the measurement of balanced or unbalanced load AC systems. Current transformers 1 provide the input current to the multiplier circuit.

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. Subsequently product proportional output is delivered to 3. There the voltage is converted into Current, whose magnitude also depends on Feasibility Factor ( $\Xi$ ).

Finally this current is fed to the moving coil movement, 4. For the instrument DC power supply is obtained from input voltage, 5.

### Dimensions



Dimensions	(in mm)	LML96	LML144
Bezel	a	96	144
Case	b	90	136
Depth	c	106	106
	d	91.5	137.5
	e	5.5	5.5
Cutout Size		92 <sup>+0.8</sup>	138 <sup>+0.1</sup>
Weight (approx.)		0.73 to 0.85 kg.	0.9 to 1.2 kg.

### Safety Precautions

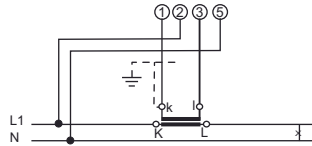
- 1) Instruments with damaged bezel or glasses must be disconnected from the mains.
- 2) Adequate safety clearance must be maintained to control panel fasteners and to sheet metal housing. If non - insulated connector wires are used.
- 3) The back cover must be snapped into place after connector wires 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.

- 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.
- Scales should be replaced under Voltage - free conditions.
- Bezels and window glasses should be replaced under Voltage free conditions

### Connections

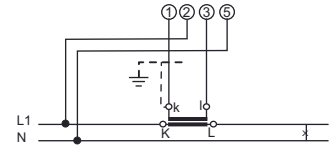
#### Active power

E1W-Single phase  
(One element)

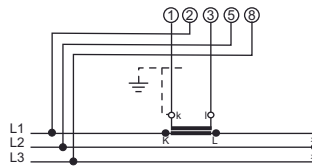


#### Reactive power

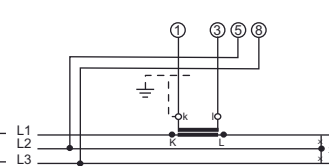
E1B-Single phase  
(One element)



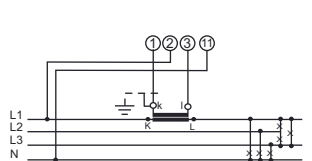
D1W -Three phase, three-wire  
AC Supply with balanced load  
(One element)



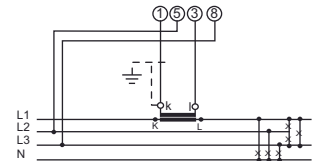
D1B -Three phase, three-wire  
AC Supply with balanced load  
(One element)



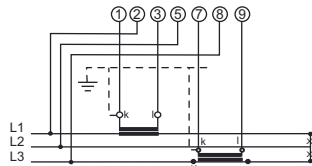
V1W -Three phase, four-wire  
AC Supply with balanced load  
(One element)



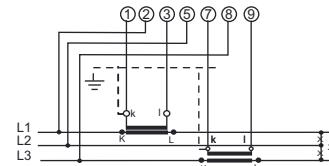
V1B -Three phase, four-wire  
AC Supply with balanced load  
(One element)



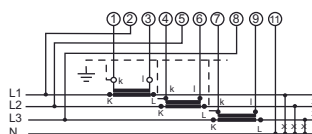
D2W -Three phase, three-wire  
AC Supply with unbalanced load  
(Two element)



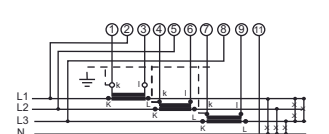
D2B -Three phase, three-wire  
AC Supply with unbalanced load  
(Two element)



V3W -Three phase, four-wire  
AC Supply with unbalanced load  
(Three element)



V3B -Three phase, four-wire  
Supply with unbalanced load  
(Three element)



## Ordering Information

Type	LML	Watt and Var meter 240° Scale
Front Dimension		96mm x 96mm
Type	E1W, E1B D1W, D1B V1W,V1B D2W,D2B V3W,V3B	Single phase systems 3 phase 3 wire system balance load 3 phase 4 wire system balance load 3 phase 3 wire system unbalance load 3 phase 4 wire system unbalance load
Measuring ranges		Specify while ordering
Rated voltages		Refer to table inside
Rated currents		1 A, 5 A
Front facia		Normal glass <sup>1</sup> Antiglare glass <sup>3</sup> Polycarbonate glass <sup>3</sup>
Colour of Bezel		Black <sup>1</sup> Red, Blue, Yellow, White <sup>3</sup>
Position of use		Vertical <sup>1</sup> on request 0...180° <sup>3</sup>
Dial		Standard scale same as measuring range <sup>1</sup> Blank dial with division <sup>3</sup> Additional lettering on request <sup>3</sup> Additional numbering on request <sup>3</sup> Coloured marking red or green <sup>3</sup> Coloured sector red or green <sup>3</sup>
Logo		ZIEGLER <sup>1</sup>

<sup>1</sup>Standard

<sup>3</sup>Please clearly add the desired specifications while ordering

## Ordering example

LML 96 V3W for active power 3 phase 4 wire system unbalanced load, measuring range 0...480 kW, voltage AC 440 V, for use on current transformer 600/5A

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

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