

# Power Meters Active, Reactive Meters - WL

WL 96   
WL 144

## Data Sheet

Analogue Power Meters  
240° Scale



## Application

The Watt and Var meters, WL 96 /144 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 single Cut out (Mosaic Mounting). The Bezel, Front window glass and Dial can be easily replaced

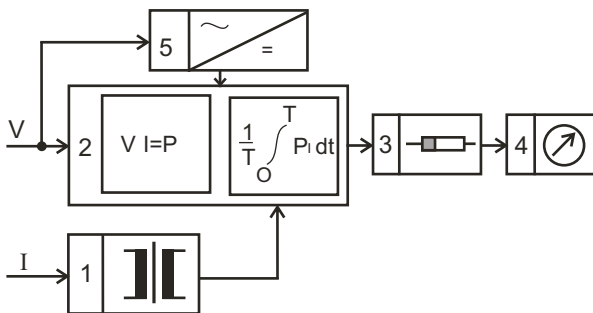
## Features

- Better resolution.
- Linear scale.
- Knife edge pointer.
- Glass filled polycarbonate housing (UL 94-V-0)
- Easily replaceable glass and bezel.
- Easy installation with swivel screws.

## Functional principle

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).

## Specifications

### Scale and Pointer

Pointer	:	Knife -edge pointer
Pointer deflection	:	0 ... 240°
Scale characteristics	:	Linear
Scale division	:	Coarse - fine
Scale length	:	WL 96    WL 144 142 mm   230 mm

## 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 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.
Overload capacity (acc to IS : 1248/ IEC 51/ DIN EN 60051)	:	
Continuously	:	1.2 times rated voltage / current
Short duration	:	2 times rated voltage , 5 Sec max & 10 times rated current, 5 Sec max

### Power consumption(Approx)

Current path	:	$\leq 0.2$ VA
Voltage path types	:	
E1W, D1W,D1B,V1W,V1B	:	$\leq 3.0$ VA
E1B	:	$\leq 3.5$ VA
D2W,D2B	:	$\leq 3.4$ VA
V3W	:	$\leq 3.9$ VA
V3B	:	$\leq 4.3$ 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 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	:	23°C $\pm 2$ °C
Position of use	:	Nominal position $\pm 1^\circ$
Input	:	Full-scale power value Pw or Pb
Feasibility factor	:	"Lambda"= $P_w/P_s$ or $P_b / P_s$
Power factor	:	$\cos \phi = 1 \pm 0.01$ for Watt meters & $\sin \phi = 1 \pm 0.01$ for Var meters
Voltage	:	Rated voltage $\pm 2\%$
Frequency	:	45-65 Hz (50 Hz $\pm 0.1\%$ for E1B)
Current	:	20% to 120% of rated current
Others	:	IS: 1248 (IEC 51/ DIN EN 60051)

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	:	Normal position $\pm 5^\circ$

External magnetic field	0.5 mT
Voltage	Rated voltage $\pm$ 15%
Power factor	Cos $\phi$ = 1 to 0.5 (ind.) for active power Sin $\phi$ = 1 to 0.5 (ind.) for reactive power
Frequency	45-65 Hz (50 Hz $\pm$ 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	$\leq$ 75% annual average, non-condensing
Shock resistance	15g. 11ms
Vibration resistance	10-55-10 Hz / 0.15 mm 1.5 g at about 50 Hz.

#### Standard Measuring Ranges

Type	Active Power	Reactive Power
Single phase system	E1W	E1B
3 phase 3 wire system balanced load	D1W	D1B
3 phase 4 wire system balanced load	V1W	V1B
3 phase 3 wire system unbalanced load	D2W	D2B
3 phase 4 wire system unbalanced load	V3W	V3B

#### Selection of measuring ranges

Apparant power  $P_s$  is calculated from primary ratings of current transformer and voltage transformer.

In single phase network,  $P_s = V \cdot I$

where V = voltage between phase and neutral & I = line current.

In three phase network,  $P_s = \sqrt{3} \cdot V \cdot I$

where V = Voltage between two phases & I = line current.

Full scale value i.e range of the instrument ( $P_w$  = active power,  $P_b$  = reactive power) must be selected in such a way that the same remain between 0.5 times and 1.5 times the value of apparant power  $P_s$ .

Thus feasibility factor "Lambda" should be between 0.3 and 1.5 where "Lambda" =  $P_w/P_s$  or  $P_b/P_s$

Full scale values shall preferably be selected from standard series according to DIN 43701, 1-1.2-1.5-2-2.5-3-4-5-6-7.5-8 and their decadic / decimal multiples.

#### Rated voltage :-

For Single phase(E1W,E1B):- 57.7,63.5,100,110,127,220,289,380.

For Three phase(D1W,D1B,D2W,D2B,V1W,V1B,V3W,V3B):-100, 110,220,240,380,415,440,500.

The voltage will be considered as a phase voltage (between phase an neutral) in case of single phase meters and as a line voltage (between two phases) in case of multiphase (2 wire, 3 wire and 4 wire) meters.

**Rated current :-** 1 A or 5 A

If used on current transformer, please state transformer ratio on the order.

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

#### Applicable Standards

Nominal case and cutout dimensions for indicating measuring 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 IEC 51/DIN EN 60051 DIN 43701
Environmental conditions	: IS 1248 IS: 9000, Part 5, 7, 8, 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-O
Mechanical strength (Free fall test, vibration test)	: IS 1248, IEC 51 IS 9000 VDE 0411, part I, Sec.43/44,IEC 1010
Environmental conditions	: IS : 1248 IS : 9000, Part 5,7,8 VDE / VDI 3540
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.

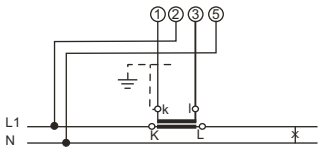
#### Safety Precautions

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

## Connections

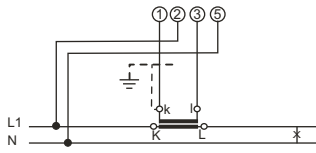
### Active power

E1W-Single phase  
(One element)

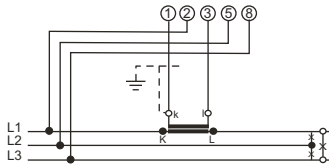


### Reactive power

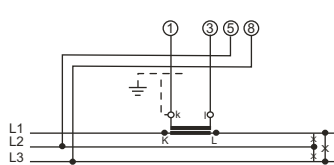
E1B-Single phase  
(One element)



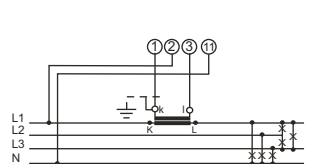
D1W -Three phase, three-wire  
AC Supply with balanced load  
(One element)



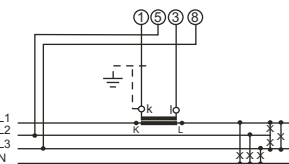
D1B -Three phase, three-wire  
AC Supply with balanced load  
(One element)



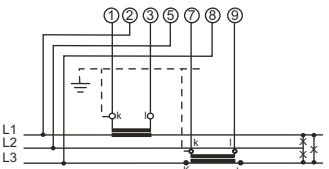
V1W -Three phase, four-wire  
AC Supply with balanced load  
(One element)



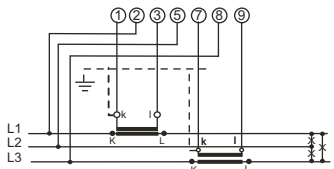
V1B -Three phase, four-wire  
AC Supply with balanced load  
(One element)



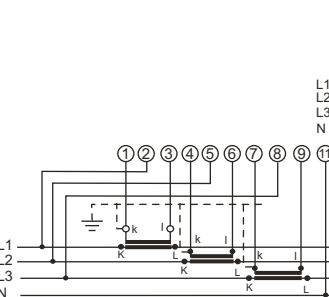
D2W -Three phase, three-wire  
AC Supply with unbalanced load  
(Two element)



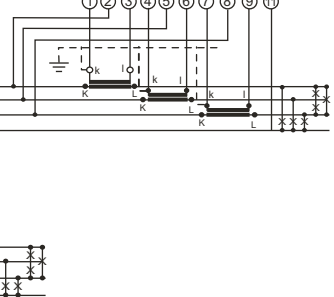
D2B -Three phase, three-wire  
AC Supply with unbalanced load  
(Two element)



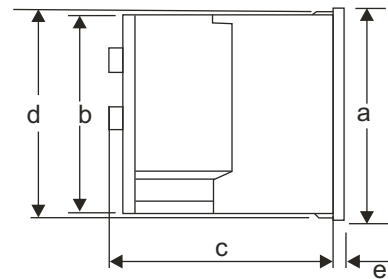
V3W -Three phase, four-wire  
AC Supply with unbalanced load  
(Three element)



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



## Dimensions



Dimensions (in mm)	WL 96	WL 144
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>*1</sup>
Weight (approx.)	0.73 to 0.85 Kg	0.9 to 1.2 Kg

## Ordering Information

Type :-	WL	Watt and Var meter 240° scale
Front dimension :-	96 144	96 mm x 96 mm 144 mm x 144 mm
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 voltage		refer to table inside
Rated current		1 A, 5 A
Front facia		Normal glass <sup>*1</sup> , Normal glass <sup>*3</sup> Antiglare 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		RISHABH <sup>*1</sup> , Others <sup>*3</sup>

<sup>\*1</sup> standard

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

### Ordering example

WL 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 subjects to change without notice (11/11)



**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