

General Specifications

Standards

All instruments are designed in accordance with the following international and national regulations : IS-1248; IEC-51; IEC-1010; BS89; EN60051 respectively various instruments. The overall dimensions comply with DIN43700-43718.

Technical Specifications

Materials

Case : Complies to DIN 43700
 Colour : White
 Front Frame : Complies with DIN 43718
 Colour : Black
 Front Glass : Flat glass

Protection

Case : IP52
 Terminals : IP00
 IP20 (with terminal cover)

Overload Capabilities

Withstand continuous overloads of 1.2 times for Ammeter and Voltmeter the nominal value and short duration overloads of upto 10 times for Ammeter and upto 2 times for Voltmeter the nominal values for 5 seconds.

Climatic Conditions

Reference temperature for these instruments is $27^{\circ}\text{C} \pm 2^{\circ}\text{C}$. The standard instruments can operate at a maximum relative humidity of 90%.

Operating Temperature

-10°C to $+55^{\circ}\text{C}$, RH < 90%

Storage Temperature

-20°C to $+70^{\circ}\text{C}$, RH < 90%

Accuracy Class

All instruments are calibrated according to Accuracy Class specified below as per applicable international standards:

- Moving Iron Meters : 1.5
- Moving Coil Meters : 1.0, 1.5, 2.5
- Electronic Analog Watt / Var Meters : 1.5/1.0
- Power Factor Meters : $\pm 2^{\circ}$ Phase Angle
- Frequency Meters : 1.0

Influence of External Magnetic Fields

Moving Iron Meters are provided with an internal shield cup in order to prevent the influence of stray and low intensity magnetic fields.

Moving Coil and all other instruments have a center core self-shielding construction which protects against stray and external low intensity magnetic fields.

Mounting Position

The nominal operating position of the panel meters is vertical. The required mounting position is shown on the scale of the instrument. Instruments with horizontal and angular mounting positions can be supplied on request.

High Voltage Test

All instruments are designed to withstand 2.5kV RMS, 50Hz, for 1min.

Shock and Vibration Resistance

All meter movements are mounted on spring loaded shock absorbing type of jewel bearings which make the instrument capable of offering good resistance to shocks and vibration. This mechanism is much superior to traditional Taut-Band construction which is highly fragile. The Pivot Jewel mechanism is ideal for aviation, traction and marine applications.

Pointer

The pointers are in accordance with DIN 43802.

Zero Adjustment

A screw for zero adjustment is located on the front glass.

Scales

Instrument scales are in accordance with DIN43802 regulations. Special scales are available on request.

Markings and Symbols on Instruments / Meters

According to IEC51 requirements, all measuring instruments and their accessories bear on the dial, or on the external surface of the case, the markings indicating :

- Manufacturers name or trade mark
- Symbol of the measured parameter
- Accuracy / Accuracy Class
- Type of power supply and the number of measuring elements
- Test Voltage
- Operating method of the instrument
- Rated value
- Symbol for mounting position
- Symbol of the accessory or the transformer ratio for which the instrument has been calibrated.

Moving Iron Meters

These instruments consist of a moving piece of ferro magnetic material, which is under influence of a current carrying fixed coil. Considering the above mentioned operating process, these instruments are ideally suited for measuring TRMS current and voltage in alternating current circuits. Accuracy for these meters is applicable only within the nominal working range and not in the overscale range. When using external current transformer, please ensure that the secondary current value of the CT must be the rated current of the Ammeter i.e., In.

Moving Coil Meters

The operation of these instruments depends on the reaction of the current circulating in a moving coil and the field of a fixed

permanent magnet. They can be used on alternating current with a suitable rectifier inserted in the circuit.

Moving Coil instruments above 50A, the ammeters are to be used with external Shunts having 60mV or 75mV drop. The Shunts are usually calibrated for a lead resistance of usually less than 0.07 Ohm. When lead resistance is greater than 0.1 Ohm, it is advisable to use shunts of 100, 150 or 300mV drop.

Electronic Analog Watt, Var, PF & Hz Meters

These instruments are available for measuring Active and Reactive Power in single phase and three phase balanced or unbalanced load conditions. In addition to these we manufacture Power Factor Meters for single phase and three phase balanced load systems and line Frequency meters for different voltage ratings and different frequency bands.

Electronic Power meters use multiplier circuits which multiply instantaneous voltage and current.

The average of the product is in the form of analog DC current directly proportional to the AC power. This power is measured with DC moving coil meter. Scale is adjusted to indicate power. Sometimes these meters are used along with CTs and PTs. Bi-directional Watt/Var Meters to indicate export / import can be supplied on request.

In Frequency meter a DC current proportional to the input frequency is obtained by using an electronic circuit. This output is calibrated in terms of frequency.

The circuit for Powerfactor meter gives current output proportional to phase angle. This output is bidirectional to discriminate between leading and lagging Powerfactor. Scale is marked in terms of $\text{Cos}\phi$, ϕ being the phase angle between voltage and current vector.

Since these Watt meters and Var meters are self powered, it is essential that the input voltage is within $\pm 15\%$ of the nominal value. At lower voltage, the instrument will function erratically.

To get proper accuracy from Powerfactor meter, please ensure input voltage is within $\pm 15\%$ of the rated value & current is between 20% to 120% of the rated value.

Note

Power meters and Powerfactor meters are normally supplied for 47 to 53 Hz operation. On request meters to suit 60Hz or 400 Hz can be supplied.

Active power, Reactive power & Low Powerfactor Wattmeter are calibrated at $\text{Cos}\phi = 1$, $\text{Sin}\phi = 1$ and $\text{Cos}\phi = 0.2$ Lag respectively.

Burden

Electronic meters impose lower burden on supply than the conventional meters. Typical values are given below.

Watt & Var Meters		1-Phase, 230/250V	< 1.0
Voltage Rating	Total Burden(VA)	3-Phase, 110V	< 0.4
1-Phase, 63.5V	< 0.5	3-Phase, 400/440V	< 1.5
1-Phase, 230/250V	< 2.0	Current Rating	Total Burden (VA)
3-Phase, 110V	< 3x0.5	1.0 A	< 0.5
3-Phase, 400/440V	< 3x2.0	5.0 A	< 0.5
Current Rating	Total Burden (VA)	Frequency Meters	
1.0A	< 1VA/Phase	Voltage Rating	Total Burden (VA)
5.0A	< 1VA/Phase	63.5V	< 0.7
Powerfactor Meters		110V	< 1.2
Voltage Rating	Total Burden (VA)	230/250V	< 2.5
1-Phase, 63.5V	< 0.25	400/440V	< 4.5

Scale

Watt & Var Meters

Upper limits of measuring range is one of the decimal or subdecimal values from the following,

1, 1.2, 1.5, 2, 2.5, 3, 4, 5, 6, 7.5 & 8.

In the interest of standardisation it is recommended that the maximum value of the measuring range is chosen accordingly. Following examples will illustrate the method of working out these values.

i) Single Phase

$$V = 250V, I = 5A, \text{Cos}\phi = 1$$

$$\text{Power} = V.I.\text{Cos}\phi = 250 \times 5 \times 1 = 1250W$$

Maximum upper limit in this case should be 1200 or 1500W.

ii) Three Phase

$$V = 110V, \text{PTR} = 33k V/110V$$

$$I = 5A, \text{CTR} = 500/5A, \text{Cos}\phi = 1$$

$$\text{Power} = \sqrt{3}.V.I.\text{Cos}\phi.\text{PTR}.\text{CTR}$$

$$\text{Power} = \frac{\sqrt{3} \times 110 \times 5 \times 1 \times 33 \times 1000 \times 500}{110 \times 5}$$

$$= 28.578 \times 10 = 28.578 \text{MW}$$

Maximum upper limit in this case should be 25MW or 30MW.

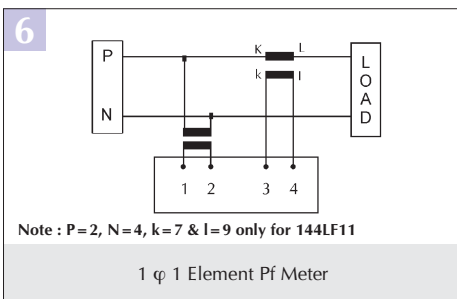
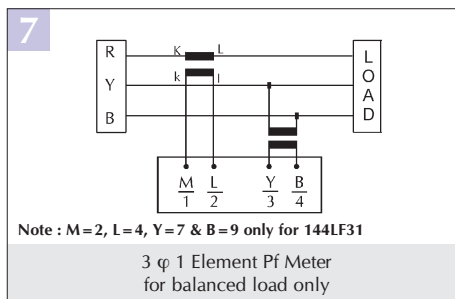
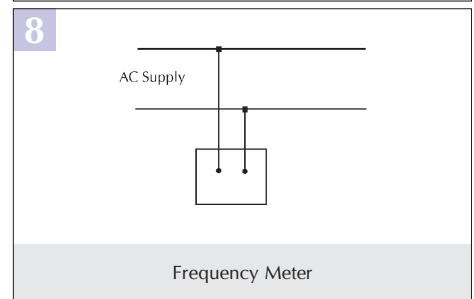
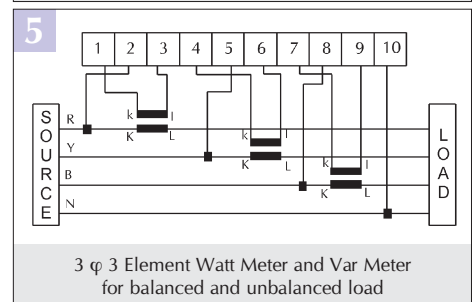
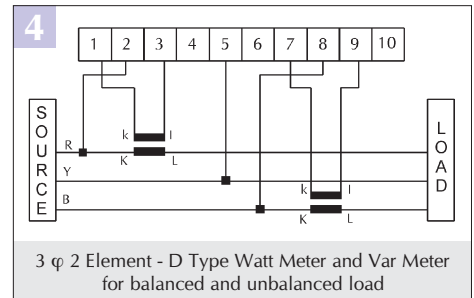
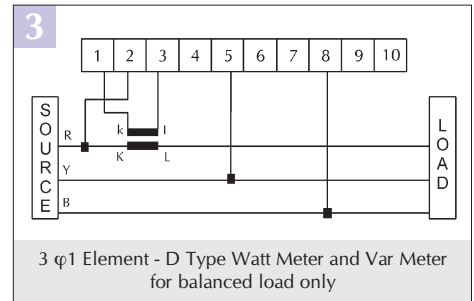
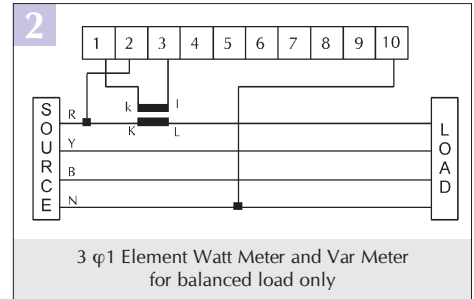
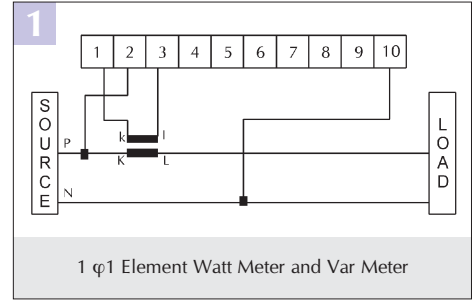
Ordering Information

Please give the following details while ordering :

Model : _____
 Full Scale Range : _____
 CTR : _____
 Voltage (Ph-Ph or Ph-N) : _____
 PTR (if any) : _____
 Connection diagram number : _____

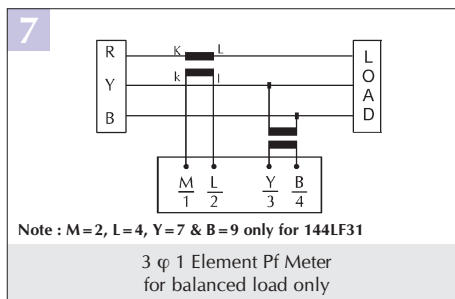
Example :

Model : 96QW32
 Full Scale Range : 0-6 MW
 CTR : 600/5A
 Voltage Ph-Ph : 110V AC
 PTR : 6.6KV/110V
 Connection diagram number : 4



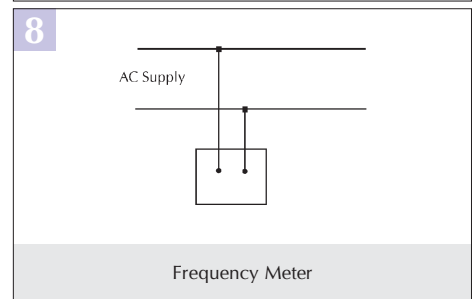
Note : P=2, N=4, k=7 & l=9 only for 144LF11

1 φ 1 Element Pf Meter



Note : M=2, L=4, Y=7 & B=9 only for 144LF31

3 φ 1 Element Pf Meter for balanced load only



Frequency Meter