

## Single and Three Phase Wattmeter and Energy Meters

### Single Phase Induction Type Meters

The construction and principle of operation of Single Phase Energy Meters is explained below

### Construction of Induction Type Energy Meters

There are four main parts of the operating mechanism

1. Driving system
2. Moving system
3. Braking system
4. Registering system

#### Driving system

The driving system of the meter consists of two electro-magnets.

The core of these electromagnets is made up of silicon steel laminations. The coil of one of the electromagnets is excited by the load current. This coil is called the current coil.

The coil of second electromagnet is connected across the supply and, therefore, carries a current proportional to the supply voltage. This coil is called the pressure coil.

Consequently the two electromagnets are known as series and shunt magnets respectively.

Copper shading bands are provided on the central limb. The position of these bands is adjustable.

The function of these bands is to bring the flux produced by the shunt magnet exactly in quadrature with the applied voltage

#### Moving System

This consists of an aluminum disc mounted on a light alloy shaft.

This disc is positioned in the air gap between series and shunt magnets. The upper bearing of the rotor (moving system) is a steel pin located in a hole in the bearing cap fixed to the top of the shaft.

The rotor runs on a hardened steel pivot, screwed to the foot of the shaft. The pivot is supported by a jewel bearing.

A pinion engages the shaft with the counting or registering mechanism.

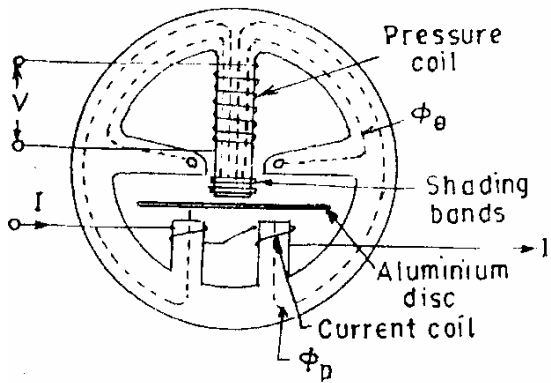
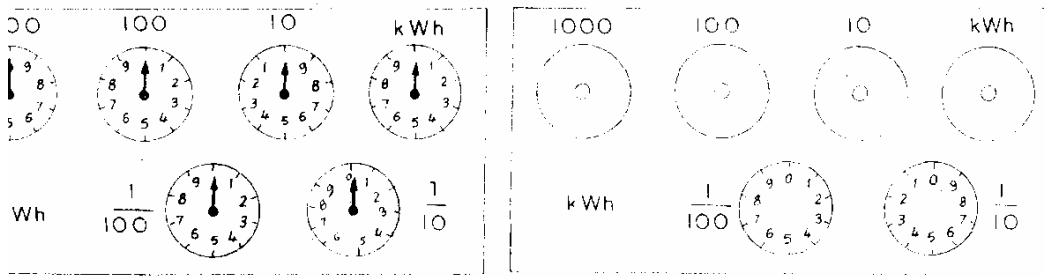


Fig2.25 single phase energy meter

### Braking System

A permanent magnet positioned near the edge of the aluminium disc forms the braking system. The aluminium disc moves in the field of this magnet and thus provides a braking torque.

The position of the permanent magnet is adjustable, and therefore braking torque can be adjusted by shifting the permanent magnet to different radial positions as explained earlier.



(a) Pointer type

(b) cyclometer

register Fig2.26 Braking System

### Registering (counting) Mechanism

The function of a registering or counting mechanism is to record continuously a number which is proportional to the revolutions made by the moving system. By a suitable system, a train of reduction gears the pinion on the rotor shaft drives a series of five or six pointers. These rotate on round dials which are marked with ten equal divisions.

The pointer type of register is shown in Fig. Cyclo-meter register as shown in Fig can also be used.

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## Errors in Single Phase Energy Meters

The errors caused by the driving system are

- 1) Incorrect magnitude of fluxes.
- 2) Incorrect phase angles.
- 3) Lack of Symmetry in magnetic

circuit.

- 4) The errors caused by the braking

system are

- 5) changes in strength of brake magnet
- 6) changes in disc resistance
- 7) abnormal friction
- 8) self-braking effect

## Three Phase General Supply with Controlled Load

- L1 – 30A Load Control (Hot Water)
- L2 – Maximum 2A Load Control (Storage Heating)
- 2.5mm<sup>2</sup> with 7 strands for conductors to control customer contactor Load carrying conductors not less than 4mm<sup>2</sup> or greater than 35mm<sup>2</sup>
- All metering neutrals to be black colour 4mm<sup>2</sup> or 6 mm<sup>2</sup> with minimum 7 stranded conductors.
- Not less than 18 strand for 25 & 35mm<sup>2</sup> conductors Refer to SIR's for metering obligations
- Comply with Electrical Safety (Installations) Regulations 2009 and AS/NZS 3000 Customer needs to provide 2A circuit breaker as a Main Switch and their load control contactor
- Within customer's switchboard
- Meter panel fuse not required for an overhead supply.
- Off Peak controlled load only includes single phase hot water & single or multi- phase storage heating
- Wiring diagram applicable for Solar Metering diagram is applicable for 2 or 3 phase load. For 2 phase loads – Red and Blue phase is preferred.

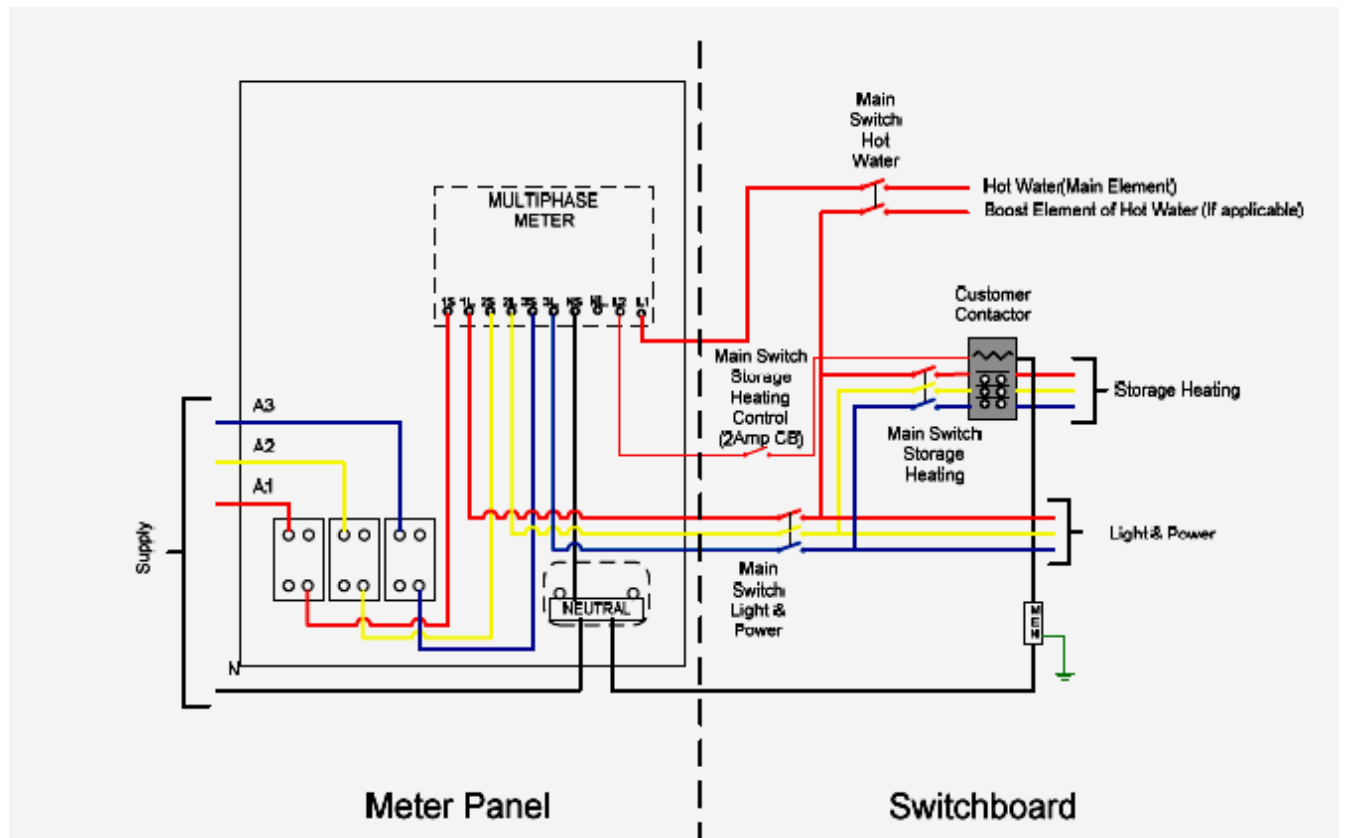


Fig2.27 Three Phase General Supply with Controlled Load

