

## FIGURE OF MERIT

**Aim:** To determine resistance of a galvanometer by half deflection method and to find its figure of merit.

**Apparatus:** Galvanometer, battery, two resistance boxes, one way key (two numbers) and connecting wires.

**Theory:** A galvanometer is a device used to detect small current in a circuit. It has a coil pivoted in a radial magnetic field. When electric current is passed through the coil, it gets deflected. Its deflection is noted by attaching a pointer to the coil. The deflection is proportional to current passed. A galvanometer has a moderate resistance and has a small current carrying capacity. The resistance of a galvanometer can be found by half deflection method. The circuit is shown for this method. Key K is inserted and deflection  $\theta$  is determined with a suitable value of R. If E is the emf of cell and I be the current in circuit, the galvanometer resistance,

$$G = \frac{RS}{R - S}$$

**Figure of merit of galvanometer:** It is defined as current required for producing deflection of 1 division. It is measured in ampere/div. When a high resistance R is taken out from resistance box, a current I flow in the circuit and it produces a deflection  $\theta$

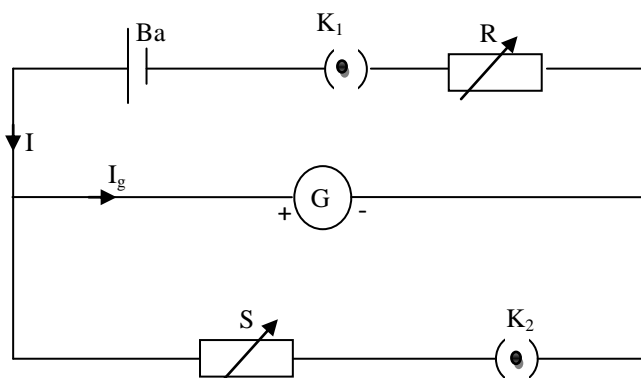
$$I = \frac{E}{R + G} = k\theta$$

Therefore

$$k = \frac{E}{(R + G)\theta}$$

By varying R and noting corresponding value of  $\theta$ , we can find a set of values of figure of merit. The mean of these values gives the figure of merit.

### Circuit Diagram:



Where:

Ba – Battery, G – Galvanometer, R & S – Resistance boxes, K<sub>1</sub> & K<sub>2</sub> – Plug keys

Observation:

S.No	Resistance $\Omega$	Deflection galvanometer $\theta$ (divisions)	$\frac{\theta}{2}$ (divisions)	Shunt S $\Omega$	Galvanometer Resistance G $\Omega$	Figure of merit $k = \frac{E}{(R + G)\theta}$

Mean (K) =            A/division

Procedure:

- Make the connections as shown.
- See that the plugs of resistance box are tight.
- Introduce a resistance of 5000 from the resistance box R and then insert the K1 only
- Adjust the value of R so that the deflection in the galvanometer is maximum (say 30 div)
- Note the deflection. Let it be  $\theta$  i.e.,  $\theta = 30$  div.
- Now, insert the key K2. Without changing the value of R, adjust the value of k, such that deflection in galvanometer reduces exactly to half the value obtained. i.e.,  $\theta/2$ .
- Note the value of R.
- Repeat the above steps for various values of R

Result:

- The resistance of galvanometer is found to be
- Figure of merit of galvanometer is            A/division.

Precautions:

- All the connections should be neat, clean and tight.
- Ensure that the plugs of resistance box are tight.
- Initially a high resistance from the resistance box should be introduced or else a small resistance can damage the galvanometer.

Sources of error:

- The emf of the battery may change during the experiment.
- Calibration of resistance in resistance boxes may not be correct.
- Plugs in resistance boxes may not be tight and may have contact resistance.