



# Electronic Instrumentation

## ANALOG MULTIMETER

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# Analog multimeter

- ▶ It is commonly used for various measurement purposes
- ▶ It is an instrument which measures voltages, currents and resistances of various ranges

Multimeter is of two types– Digital and Analog  
DC and AC measurements



# Analog multimeter is also called as AVO meter

- ▶ Ammeter– currents
- ▶ Voltmeter–Voltage
- ▶ Ohmmeter–Resistance

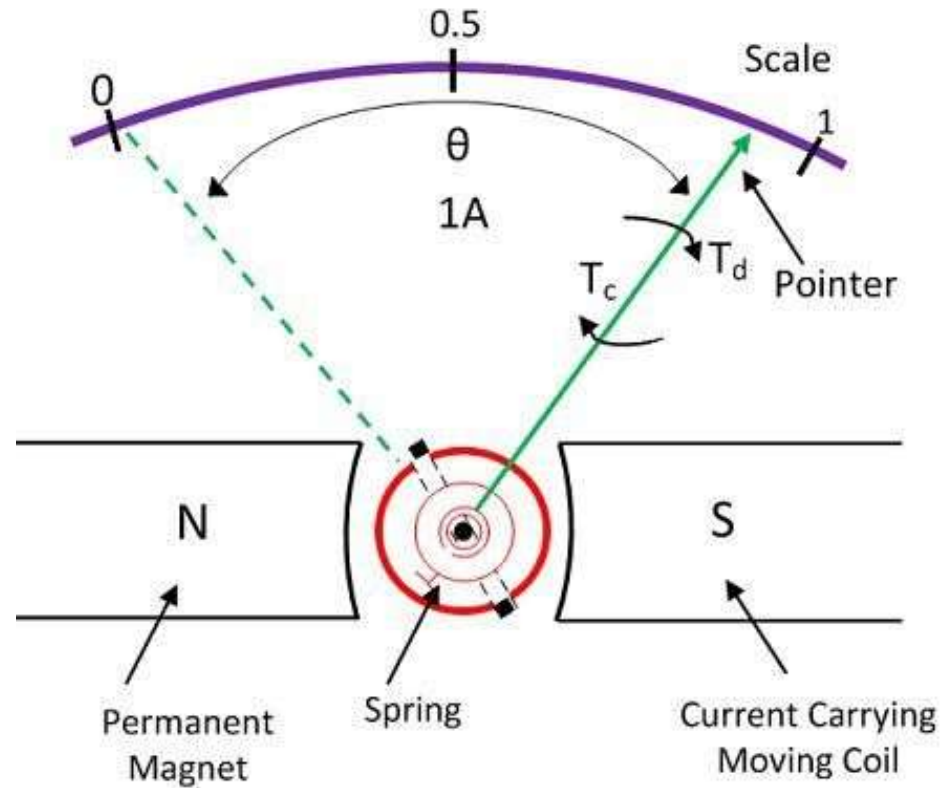


# Principle and construction

- ▶ Permanent magnetic moving coil galvanometer
- ▶ Moving coil- moving in a magnetic field of permanent magnet
- ▶ Moving coil-wound on an aluminium former
- ▶ Coil-pointer is attached
- ▶ Pointer moves over a graduated scale.



# Construction of Analog multimeter



**Deflecting Type Instrument**

Circuit Globe



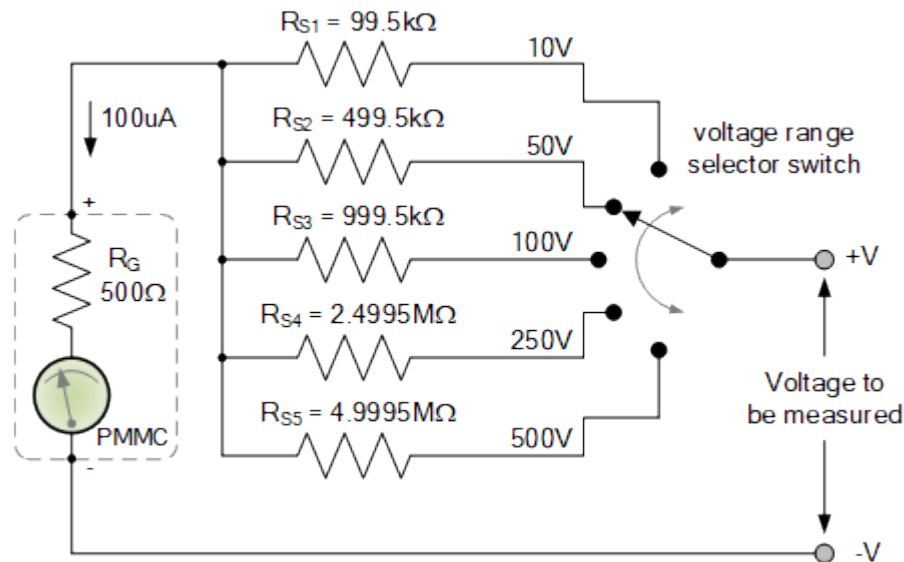
- ▶ Two spiral springs are attached to the coil assembly(at the top and bottom) to provide controlling torque.
- ▶ Galvanometer is converted into a voltmeter, ammeter, ohmmeter with the help of suitable conversion for measuring Voltage, current and resistance
- ▶ All the values are commonly designed on a scale

(left side– minimum, right side– maximum)



# Comparision methods

- ▶ Voltage measurement by multimeter
- ▶ High voltages are measured by connecting resistance in series with galvanometer (higher the resistances, higher the voltages, etc.,).



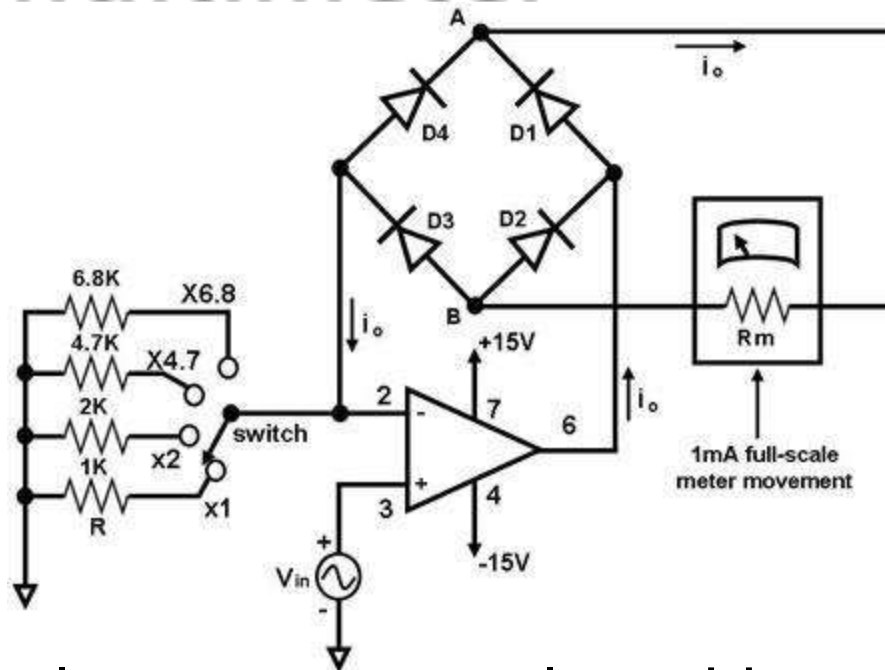
# Multiplier-series resistance

- ▶ Two leads–Red(+Ve), Black(–Ve)
- ▶ One lead is connected in voltage range socket
- ▶ Other lead common socket
- ▶ For AC voltage measurements fullwave rectifier is connected





# AC multimeter



- ▶ AC voltage range is selected by selector switch
- ▶ Analog multimeter is connected in parallel with the portion of the circuit across which voltage is to be measured.

According to the range– selector switch is collected

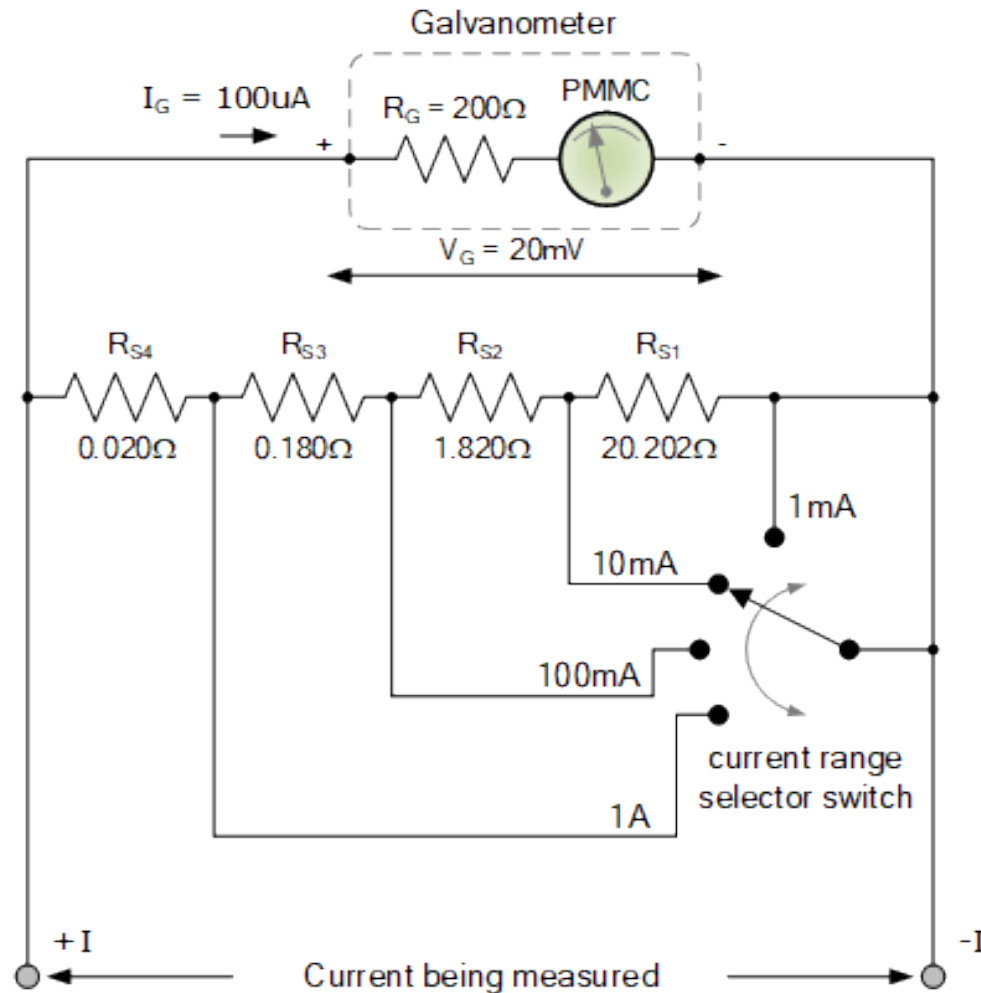


# Current measurement by analog multimeter

- ▶ Ammeter
- ▶ Small resistance is connected in parallel with galvanometer
- ▶ To measure large value of currents, value of shunt resistance is decreased( $V=IR$ )



# For DC current measurement



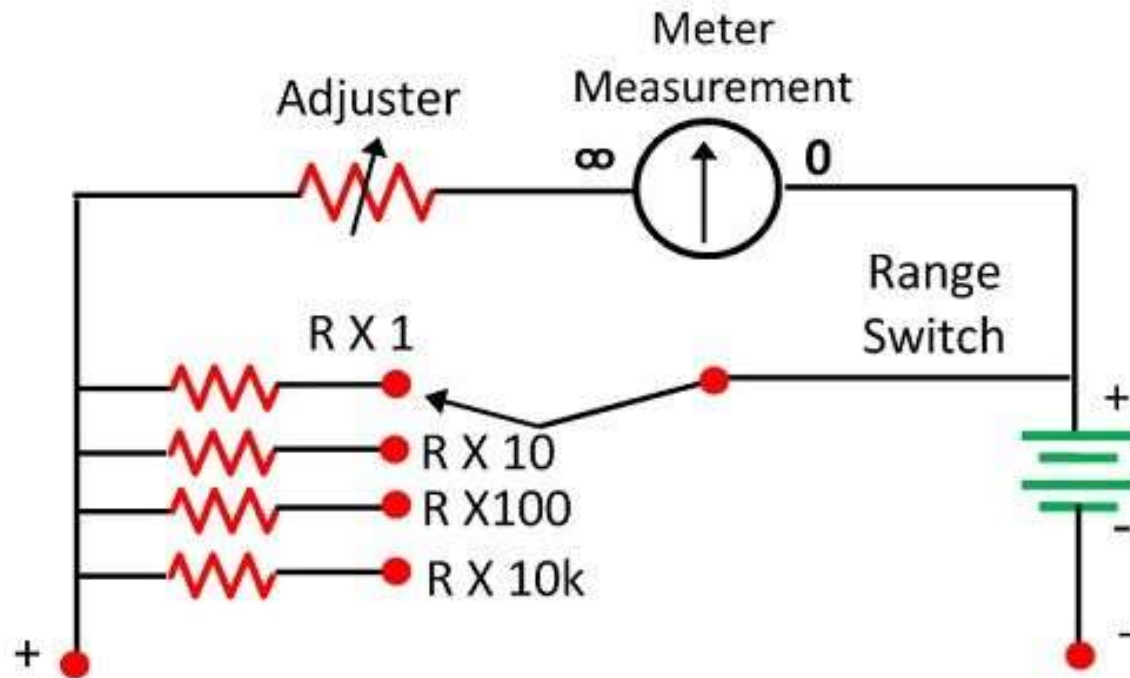
Range is selected by varying the value of shunt resistance



- ▶ Multimeter is connected in series with the branch in which current is to be measured
- ▶ Resistance is measured by a multimeter
- ▶ Galvanometer is converted into Voltmeter internal battery is connected in series
- ▶ Fixed resistance , adjustable resistance are used



# Circuit



**Multi Range Ohmmeter**

Circuit Globe

- ▶ Fixed resistances limit the current within the desired range
- ▶ Variable resistance is used for zero adjustment
- ▶ Scale is calibrated in terms of resistance



# Sensitivity

- ▶ Resistance offered per unit volt of full scale deflection by it
- ▶ High sensitivity– high internal resistance
- ▶ Draw negligible current
- ▶ Correct measurements can be done
- ▶ 8 kilo ohm per volt to 20 kilo ohm per volt



# Advantages

- ▶ As they are highly sensitive, sudden change in signal can be detected effectively
- ▶ All types of measurements can be done by single meter
- ▶ Increase or decrease in signal levels can be observed.





# Disadvantages

- ❖ Bulky, costly, care has to be taken
- ❖ Error can occur due to observer
- ❖ Pointer movement is slow
- ❖ Vulnerable due to the effect of earth magnetic field



# Thank you