

6.5 VOLTMETERS AND AMMETERS

The current and voltage in a circuit are measured using special devices that disturb the circuit minimally. The devices are either analogue type or a digital type (Fig. 6.32). The analogue-type meters usually show the reading by the deflection of a pointer needle on a calibrated scale and the digital-type meters show the reading on a digital display. A multimeter consists of various functions in the same device where one can choose the mode corresponding to the quantity being measured. To measure current or voltage, one connects the circuit to the two terminals of the meter using wires called probes.



Figure 6.32: (a) Analog Ammeter, (b) Analog Voltmeter and (c) Digital multimeter

To measure current in a branch, the current must pass through the meter. This is done by inserting the ammeter in the circuit so that ammeter is in series with the device as shown in Fig. 6.33(a).

To measure voltage, the probes are connected at the points whose potential difference is desired. A voltmeter measures voltage drop across a device, and hence must be connected in parallel to the device as shown in Fig. 6.33(b).

An ideal ammeter measures current flowing through its terminals without any significant loss of power in the ammeter. Therefore an ideal ammeter has a low resistance compared to the resistances in the circuit. An ideal voltmeter, on the other hand, measures voltage across its terminals without any significant loss of power. Hence, an ideal voltmeter has a large resistance, and therefore draws minimal current. In reality, an ammeter has a small but finite resistance, and a voltmeter has a large but finite resistance. In circuits of low resistance, the resistance of ammeter must be taken into account.

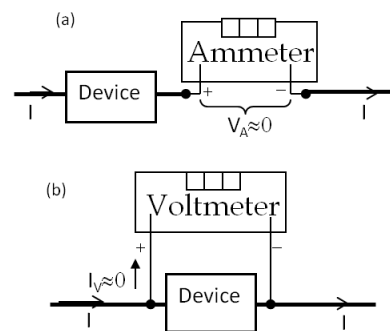


Figure 6.33: (a) Ammeter and (b) Voltmeter connections.

Similarly, in circuits of high resistance, the resistance of the voltmeter must be taken into account.