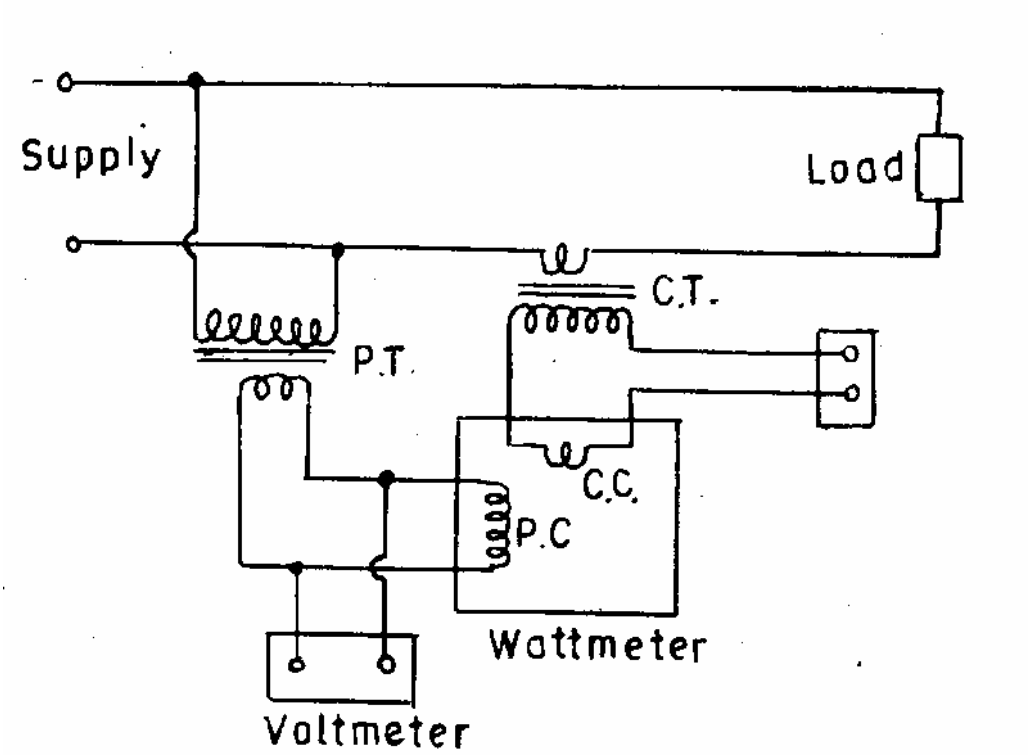
Instrument Transformers

- Power measurements are made in high voltage circuits connecting the wattmeter to the circuit through current and potential transformers as shown.
- The primary winding of the C.T. is connected in series with the load and the secondary winding is connected in series with an ammeter and the current coil of a wattmeter.
- The primary winding of the potential transformer is connected across the supply lines and a voltmeter and the potential coil circuit of the wattmeter are connected in parallel with the secondary winding of the transformer. One secondary terminal of each transformer and the casings are earthed.
- The errors in good modem instrument transformers are small and may be ignored for many purposes.
- However, they must be considered in precision work. Also in some power measurements these errors, if not taken into account, may lead to very inaccurate results.
- Voltmeters and ammeters are affected by only ratio errors while wattmeter's are influenced in addition by phase angle errors. Corrections can be made for these errors if test information is available about the instrument transformers and their burdens.



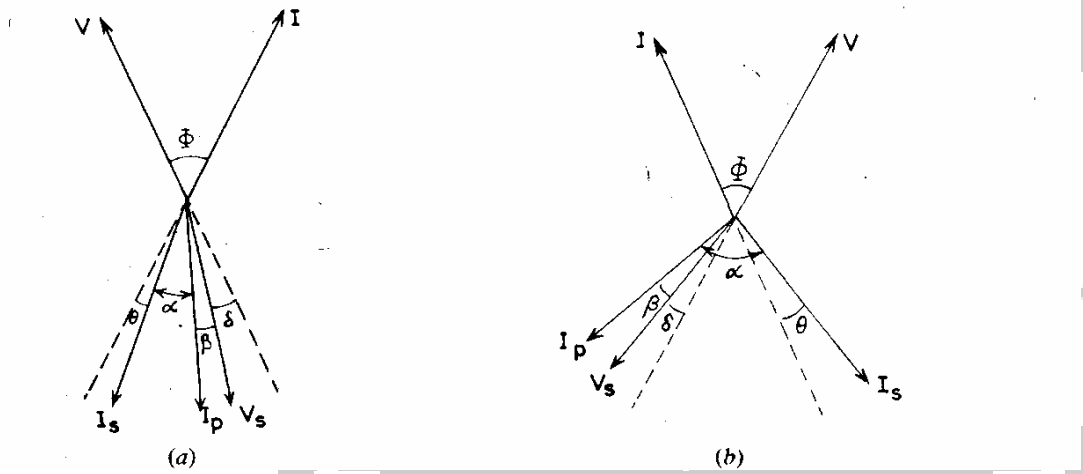


Fig 2.33Phasor diagrams for the current and voltages of load, and in the wattmeter coils.

Measurements of flux and flux density (Method of reversal)

D.C. voltage is applied to the electromagnet through a variable resistance R1 and a reversing switch. The voltage applied to the toroid can be reversed by changing the switch from position 2 to position „1". Let the switch be in position „2" initially. A constant current flows through the toroid and a constant flux

is established in the core of the magnet.

A search coil of few turns is provided on the toroid. The B.G. is connected to the search coil through a current limiting resistance. When it is required to measure the flux, the switch is changed from position „2" to position „1". Hence the flux reduced to zero and it starts increasing in the reverse direction. The flux goes from + ϕ to - ϕ, in time „t" second. An emf is induced in

The search coil, science the flux changes with time. This emf circulates a current through R2 and B.G. The meter deflects. The switch is normally closed. It is opened when it is required to take the reading.

Plotting the BH curve

The curve drawn with the current on the X-axis and the flux on the Y-axis, is called magnetization characteristics. The shape of B-H curve is similar to shape of magnetization characteristics. The residual magnetism present in the specimen can be removed as follows.

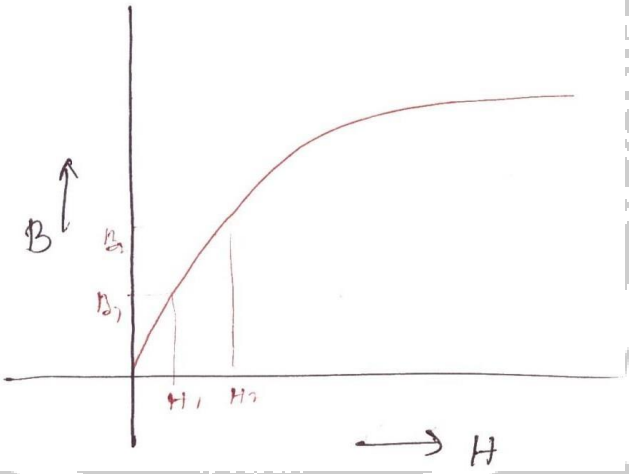


Fig 2.34 BH curve

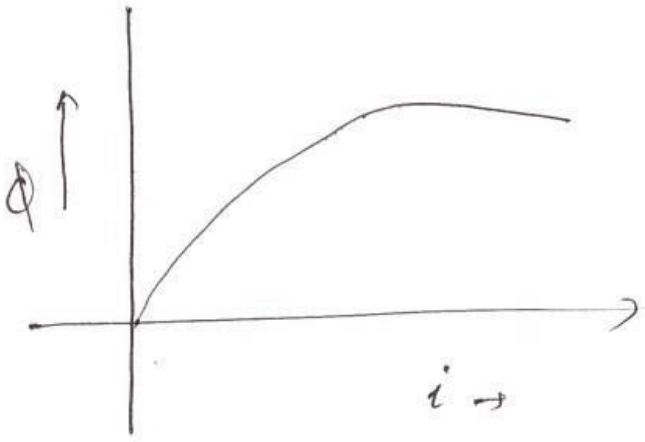


Fig 2.35 Magnetization characteristics

Close the switch „S2" to protect the galvanometer, from high current. Change the switch S1 from position „1" to „2" and vice versa for several times.

To start with the resistance „R1" is kept at maximum resistance position. For a particular value of current, the deflection of B.G. is noted. This process is repeated for various value of current. For

each deflection flux can be calculated.(B □□) _

A

Magnetic field intensity value for various current can be calculated.().The B-H curve can be plotted by using the value of „B" and „H".