



Measurement and Instrumentation

Course Code: EEE 2211

# Instrument Transformers

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# Syllabus

**Introduction :** Methods of measurement. Statistical method applied to field of measurement and error analysis and calibration.

**Resistance, Inductance and Capacitance measurements:** Different methods of measuring high, medium and low resistances. Methods of measuring self and mutual inductance and capacitance measurement. A.C. and DC bridge methods, Measurement of insulation and earth resistances. Localization of cable fault.

**Magnetic measurement:** Flux meter, Flux and Flux density measurement. Determination of iron losses and their separation.

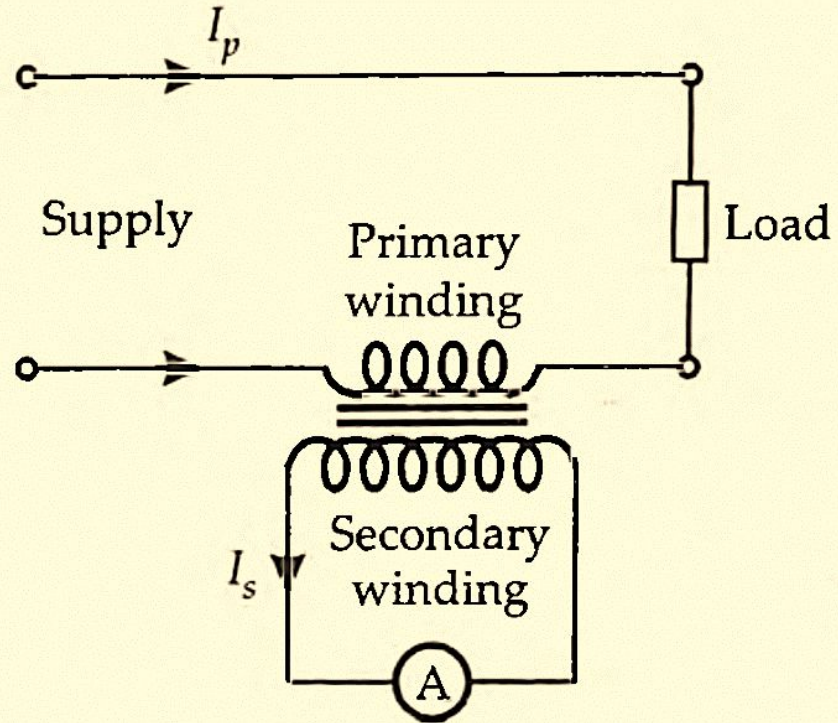
**Measuring instruments :** Classification of measuring instruments. Ammeter, Voltmeter, wattmeter, AVO meter, Energy meter, Ampere-hour meter and Maximum demand meter for measuring AC and DC quantities. Speed, frequency and phase difference measurements. Illumination measurement.

**Electronic measuring instruments:** Digital instruments, VTVM, Q-meter and CRO.

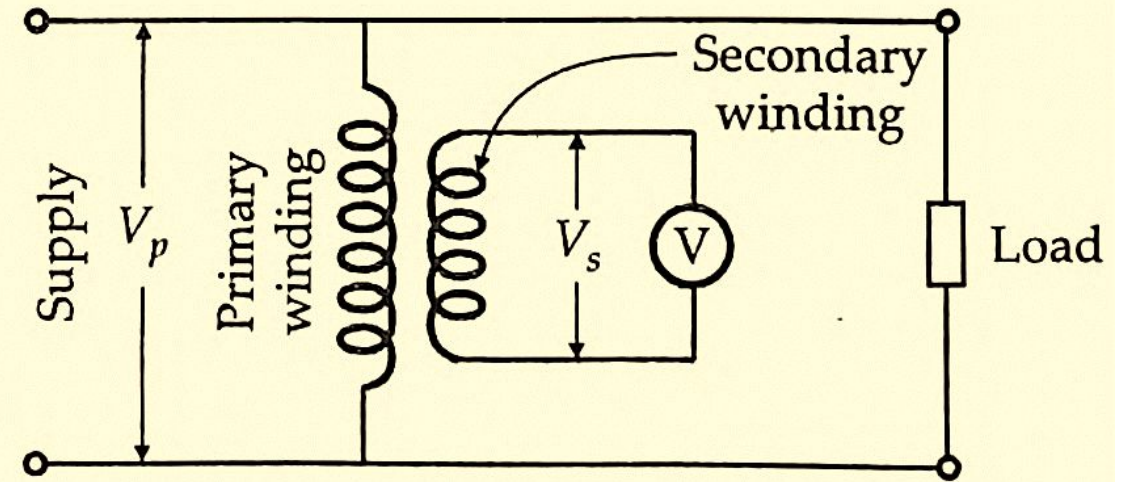
**Instrumentation :** Extension of instrument range. Use of C.T. and P.T and calculation of their burden, Instrumentation of substation.

**Measurement of non-electrical quantities:** Transducer. Measurement of temperature, pressure, displacement, velocity, acceleration. Strain gauge and their applications.

## Use of Instrument Transformers



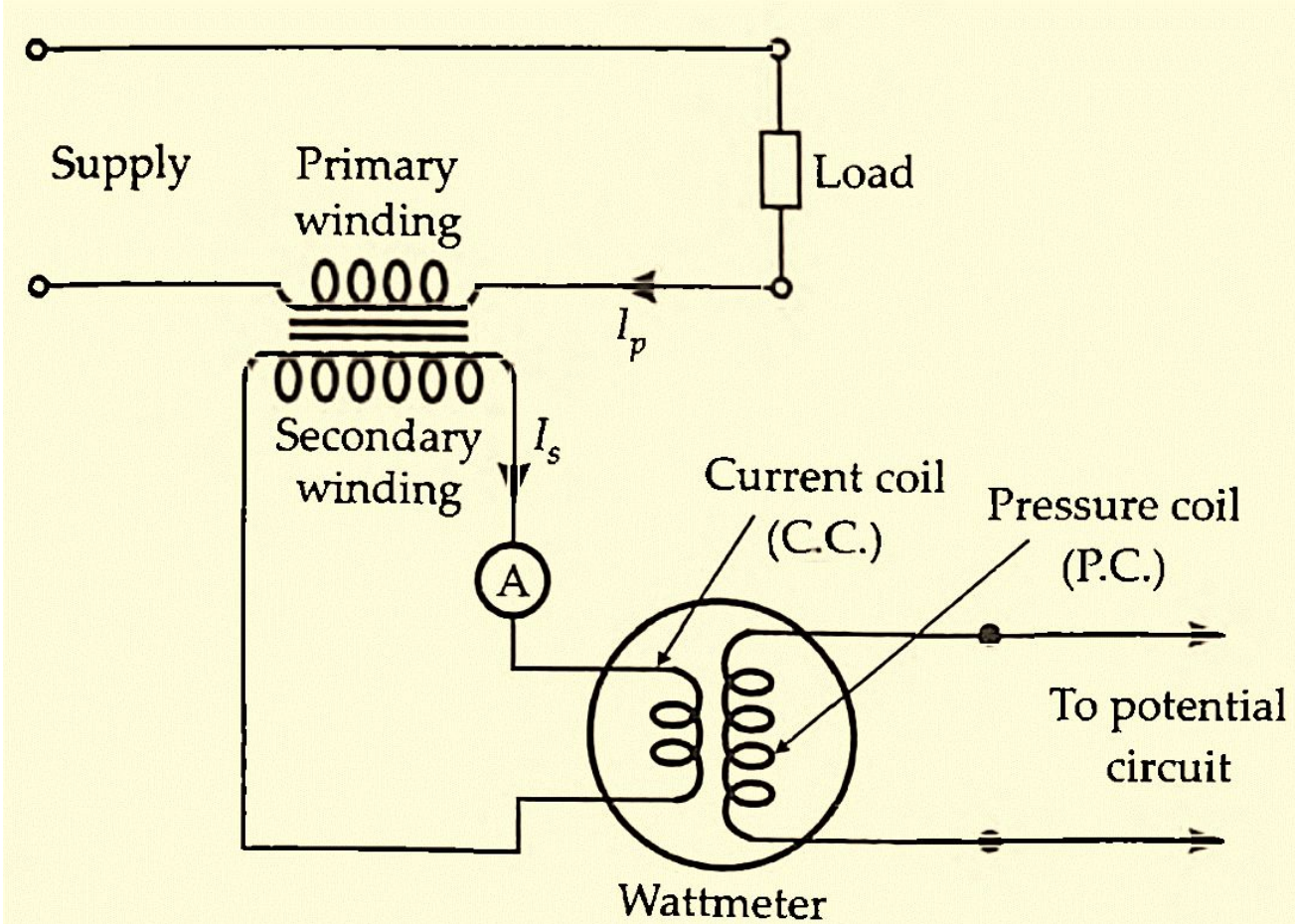
**Fig. 10.1** Current transformer.



**Fig. 10.2** Potential transformer.



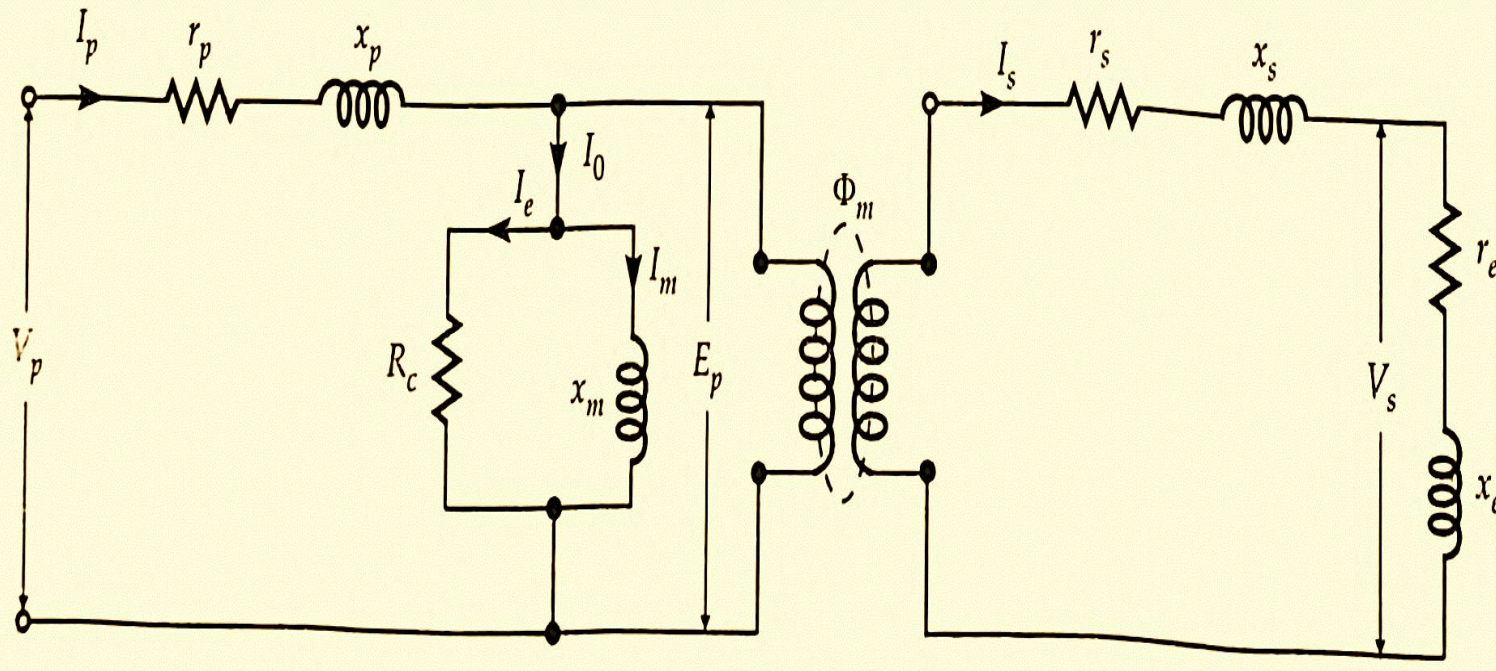
# Current Transformers



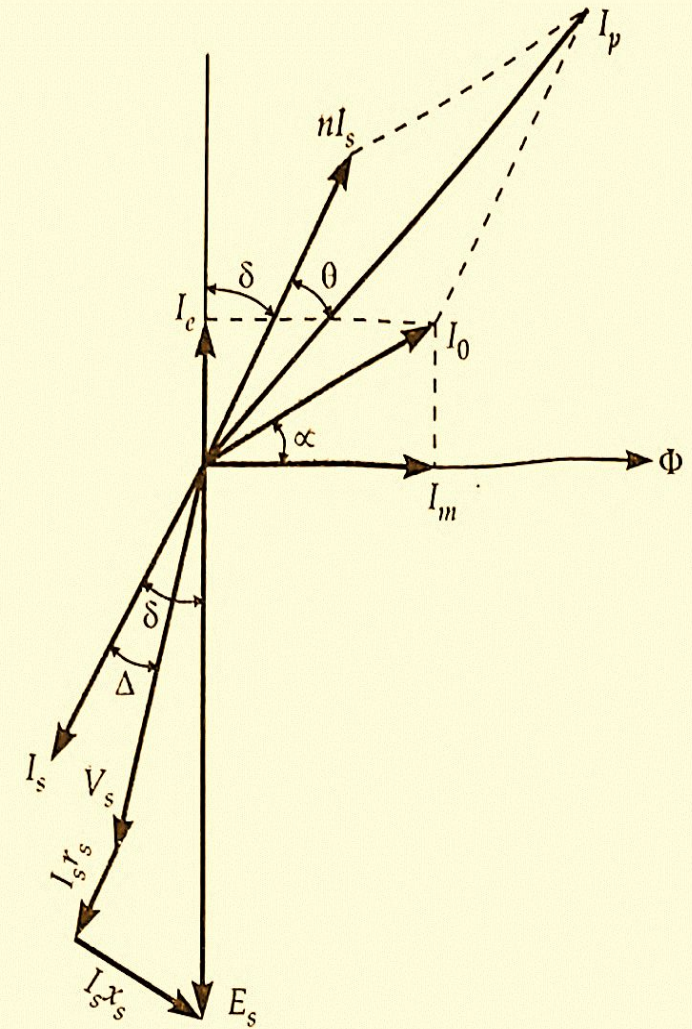
**Fig. 10.3** Use of C.T. for current and power measurement.



## Relationships in a CT



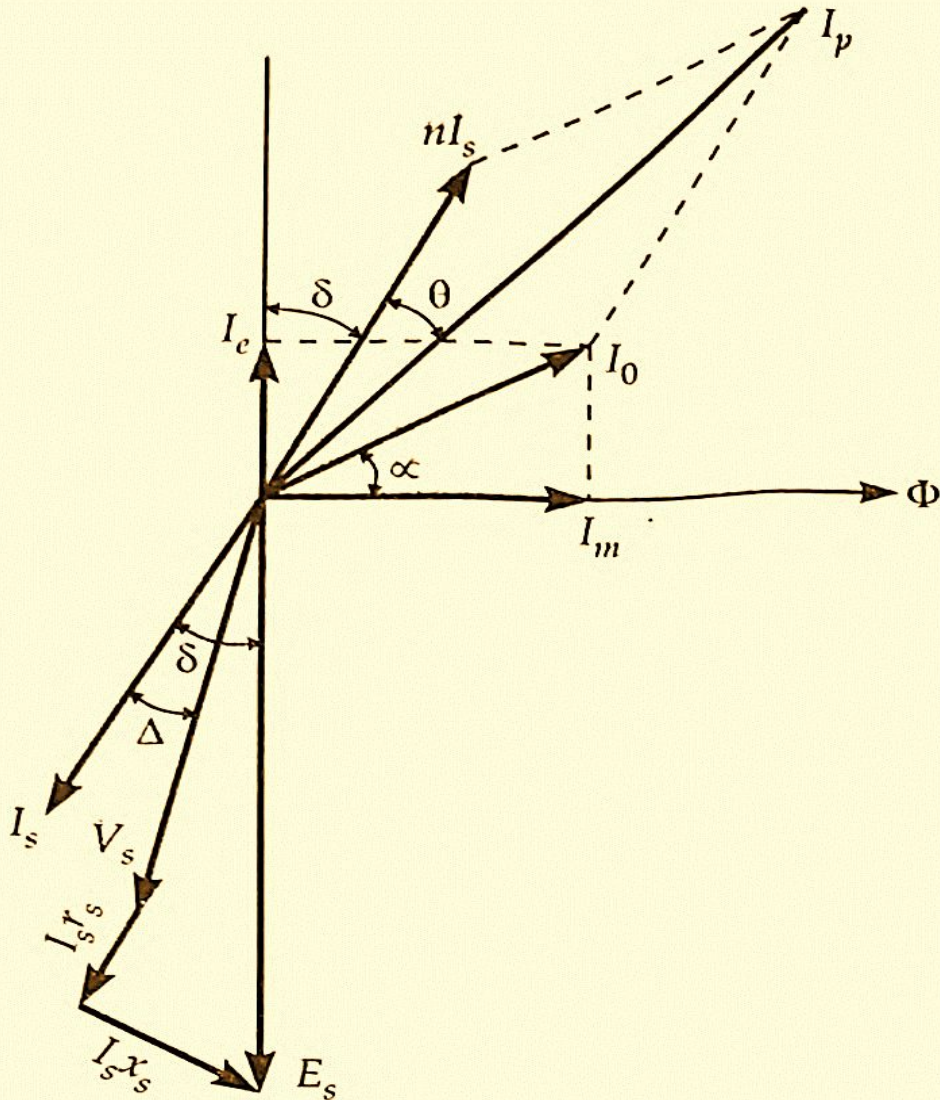
**Fig. 10.4** Equivalent circuit of a C.T.



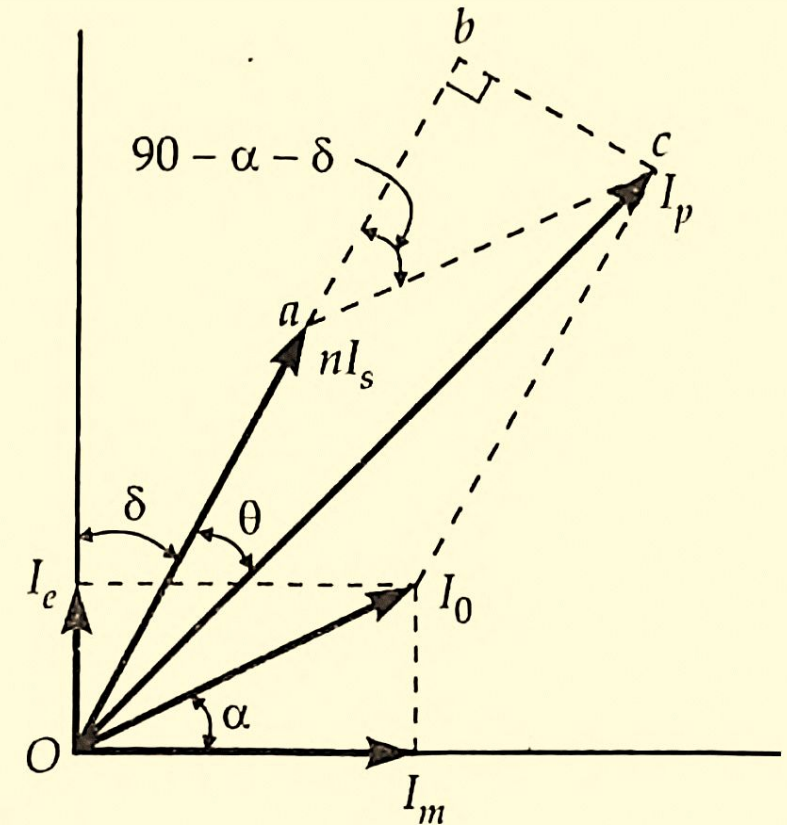
**Fig. 10.5** Phasor diagram of a C.T.



## Relationships in a CT

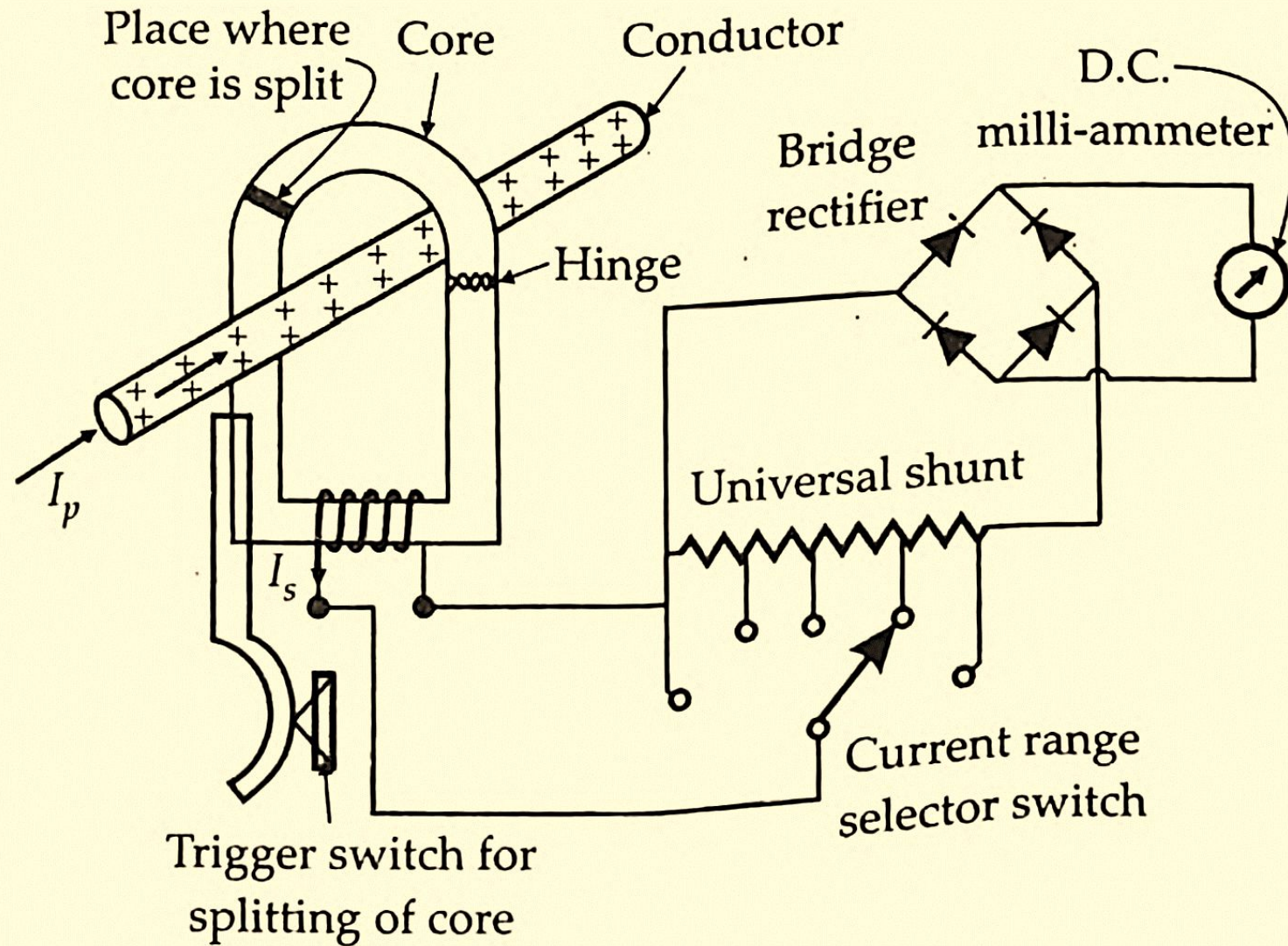


**Fig. 10.5** Phasor diagram of a C.T.



**Fig. 10.6** A section of phasor diagram of a C.T.

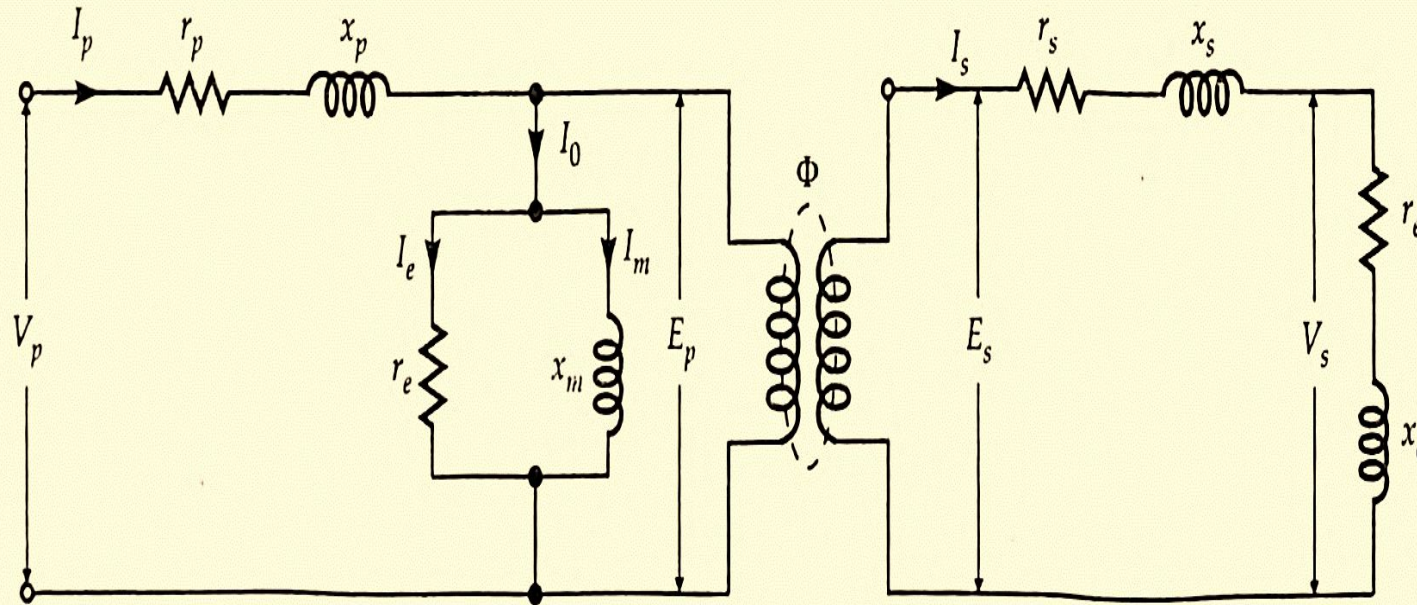
## Clamp on Ammeter



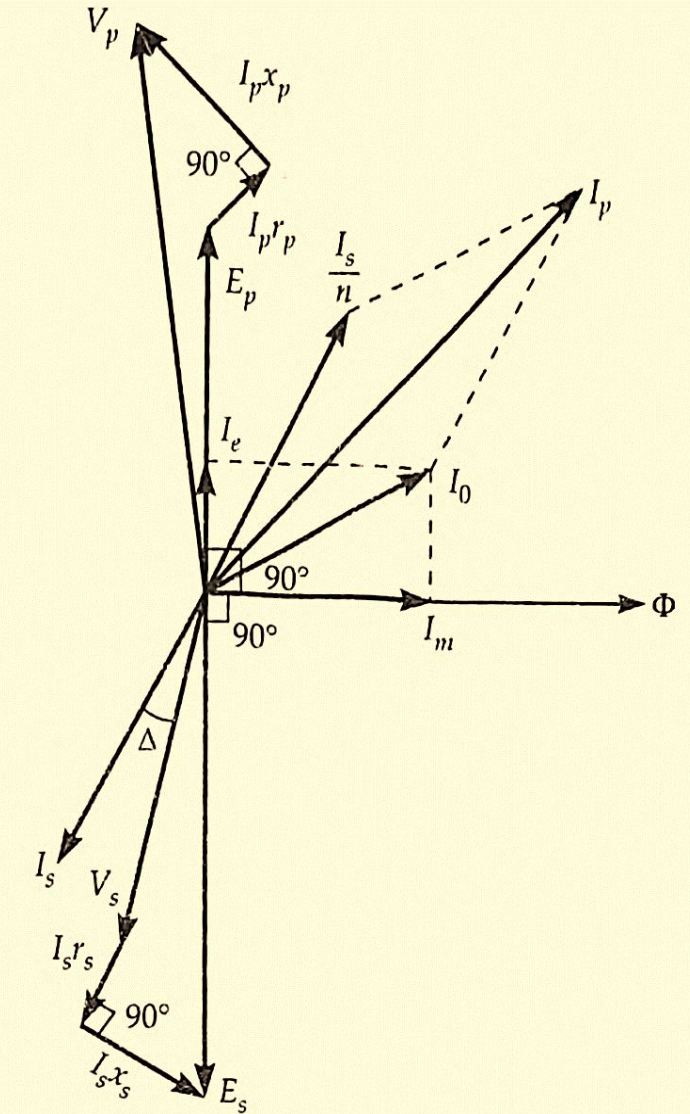
**Fig. 10.16** Clamp-on Ammeter.



## Relationships in a PT



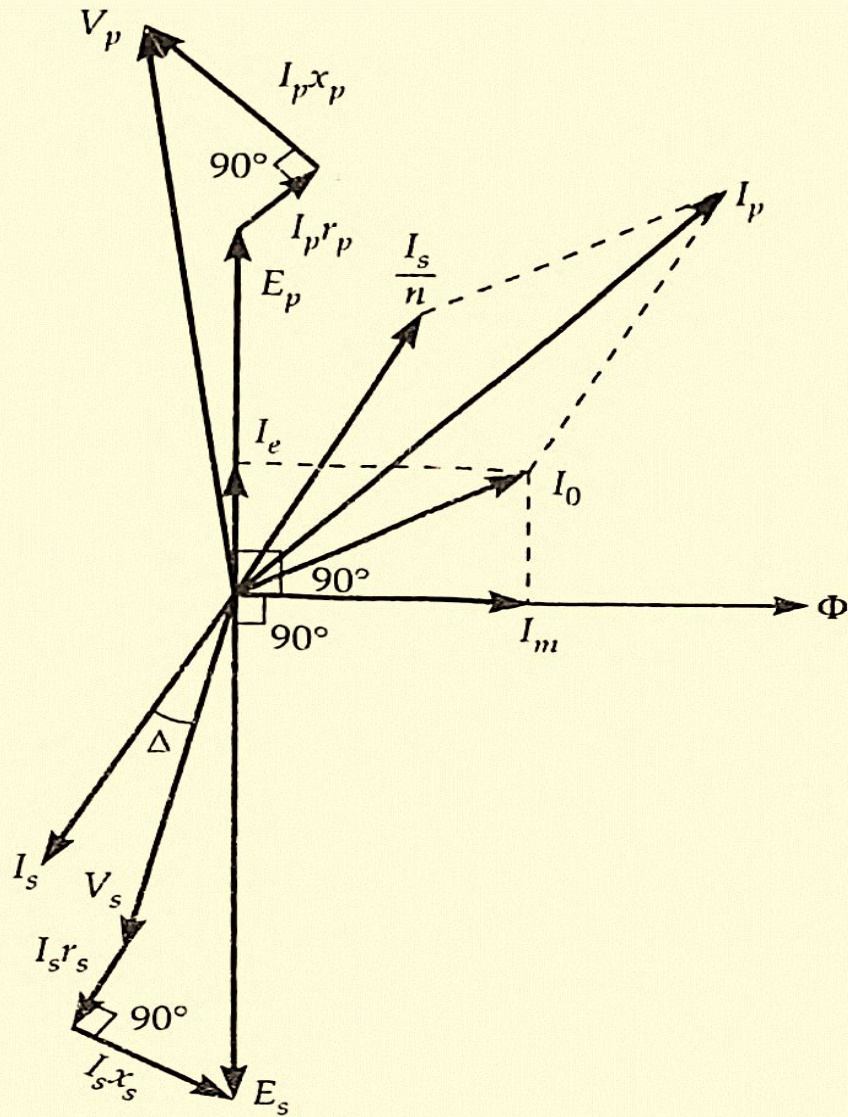
**Fig. 10.20** Equivalent circuit of a potential transformer.



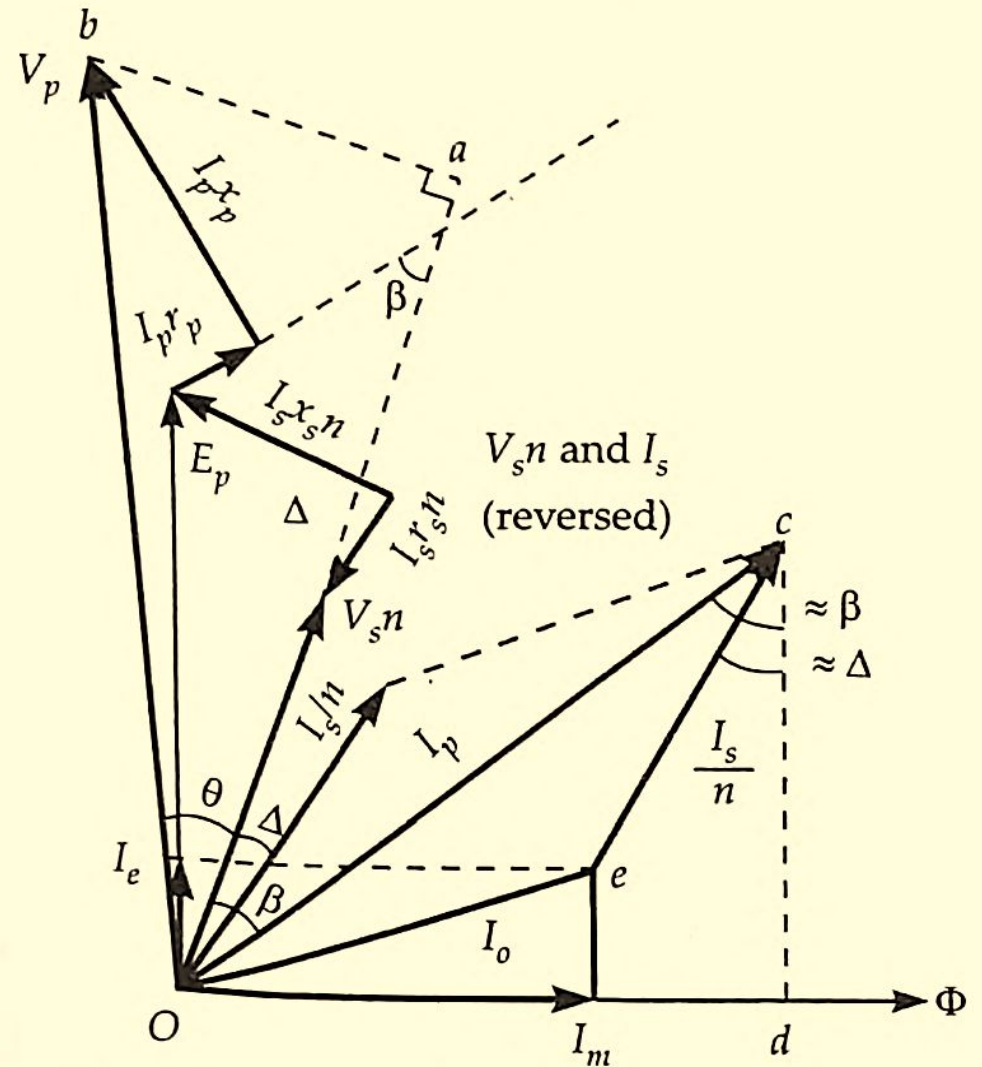
**Fig. 10.21** Phasor diagram of a potential transformer.



## Relationships in a PT



**Fig. 10.21** Phasor diagram of a potential transformer.



**Fig. 10.22** Enlarged and concise phasor diagram of a potential transformer.