Electrical Transducer

- An electrical transducer is a sensing device by which the physical, mechanical or optical quantity to be measured is transformed directly by a suitable mechanism into an electrical voltage/current proportional to the input measured.
- An electrical transducer must have the following parameters:

1. ***Linearity*** The relationship between a physical parameter and the resulting electrical signal must be linear.
2. ***Sensitivity*** This is defined as the electrical output per unit change in the physical parameter (for example V/°C for a temperature sensor). High sensitivity is generally desirable for a transducer.
3. **Dynamic Range** The operating range of the transducer should be wide, to permit its use under a wide range of measurement conditions.
4. ***Repeatability*** The input/output relationship for a transducer should be predictable over a long period of time. This ensures reliability of operation.
5. ***Physical Size*** The transducer must have minimal weight and volume, so that its presence in the measurement system does not disturb the existing conditions.

Advantages of Electrical Transducers

The main advantages of electrical transducers (conversion of physical quantity into electrical quantities) are as follows:

1. Electrical amplification and attenuation can be easily done.
2. Mass-inertia effects are minimised.
3. Effects of friction are minimised.
4. The output can be indicated and recorded remotely at a distance from the sensing medium.
5. The output can be modified to meet the requirements of the indicating or controlling units. The signal magnitude can be related in terms of the voltage current. (The analog signal information can be converted in to pulse or frequency information. Since output can be modified, modulated or amplified at will, the output signal can be easily used for recording on any suitable multichannel recording device.)
6. The signal can be conditioned or mixed to obtain any combination with outputs of similar transducers or control signals.
7. The electrical or electronic system can be controlled with a very small power level.
8. The electrical output can be easily used, transmitted and processed for the purpose of measurement.

Pressure Inductive Transducer

- A simple, arrangement, wherein a change in the inductance of a sensing element is produced by a pressure change, is given in Fig. 1.
- Here the pressure acting on a movable magnetic core causes an increase in the coil inductance corresponding to the acting pressure. The change in inductance can again be made on the basis of an electrical signal, using an ac bridge.
- An advantage of the inductive type over the resistive type is that no moving contacts are present, thereby providing continuous resolution of the change, with no extra friction load imposed on the measuring system.
- In a slightly modified form, this principle is used to obtain a change in mutual inductance between magnetically coupled coils, rather than in the self inductance of a single coil. When a change in an induced voltage is involved, the transducer is sometimes called a variable reluctance sensor or magnetic pickup. A very important example of the mutual type is the LVDT.

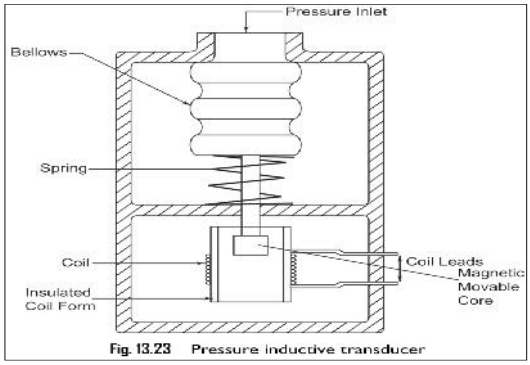

Fig. 13.23 Pressure inductive transducer

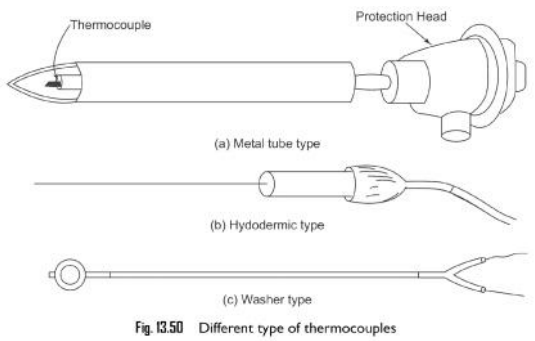

Fig. 13.50 Different type of thermocouples