

## Instrumentation Interview Question & Answer

### 1. What types of sensors are used for measuring different parameters?

- Temperature sensors – RTD, Thermocouple, Thermister
- Pressure Sensor – Borden Tube, Bellows, Strain gauge
- Flow sensor – Pitot tube
- Level, Conductivity, Density, Ph



### 2. What is transmitter?

A transmitter is an electronic device that is generally mounted in the field in close proximity to a sensor. The sensor (also known as a transducer) measures a physical variable such as temperature or pressure and outputs a very low level electronic signal. The basic function of the transmitter is to provide the correct electrical power to turn on (or excite) the sensor then to read the low level sensor signal, amplify it to a higher level electrical signal and send that signal a long distance to a control or read-out device.



Since low-level electrical signals do not transmit long distances with great accuracy, installing a transmitter generally gives a tremendous improvement in the accuracy of the information delivered to a larger control system. Typically the output from the transmitter is 4-20 mA or 0-10 V

### **3. Why 4-20 mA preferred over 0-10 V signal ?**

The 0-10 V signal has tendency to drop because of line resistance. If the distance between sensor and input card is more the signal will not properly represent the field value. The 4-20 mA will travel a long distance without dropping signal value.

### **4. Why 4-20 mA preferred over 0-20 mA signal ?**

With 0- 20 mA you can not distinguish between minimum field value and connection break. With 4-20 mA, internal circuit can distinguish between connection break of minimum value. Normally when the value is minimum the transmitter will give you 4 mA while in case of connection breakage it will give 0 mA.

### **5. Difference between 2 wire, 3 wire and 4 wire transmitter.**

In 2 wire transmitter the power and signal are transmitted through same cable.

In 3 wire transmitter the data signal and power are with respect to common ground. In 4 wire transmitter two wires for power supply and two for signals.

Only current transmitters can be used as 2 wire transmitters.

### **6. What is a "Smart" Transmitter ?.**

A "Smart" transmitter is a transmitter that uses a microprocessor as the heart of the electronics. In addition, a "Smart" transmitter will output some type of remote digital communications allowing you to read and set-up the device from a remote position.

### **7. What is Field bus ?.**

Fieldbus is a general term for a digital only, high speed communications protocol. The key attribute to Fieldbus communications is higher speed communications with the possibility of addressing multiple transmitters all on the same field wiring. The Foundation Fieldbus is a specific digital protocol that is often shortened to just be called Fieldbus. Other digital only communications such as Profibus are also Fieldbus protocols

## 8. What is Actuator ?.

In a closed-loop control system, the part of the final control element that translates the control signal into action by the control device.



## 9. Explain Working of RTDs

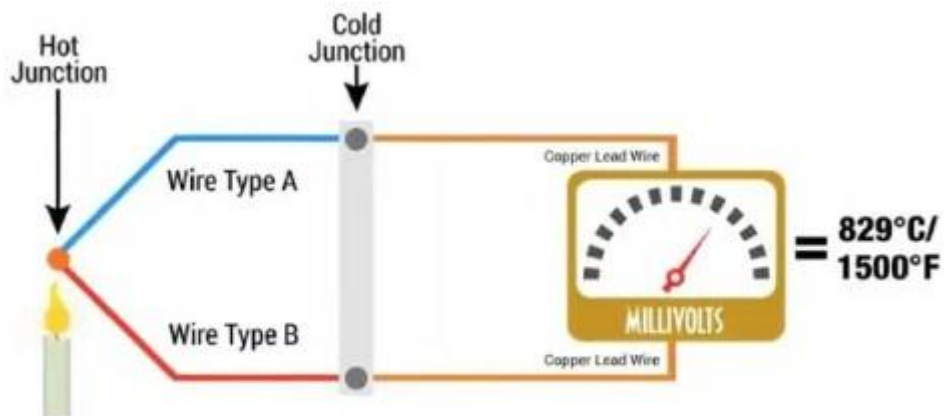
Resistance Temperature Device works on the principles that the resistance of the material changes as its temperature changes. Temperature is determined by measuring resistance and then using the RTD Resistance vs Temp characteristic to detect temperature. Typical elements used for RTD are Nickel, Copper and Platinum. Platinum is widely used in RTDs because of accuracy. PT 100 means at 0 deg temp 100 ohms resistance. A typical RTD consists of a fine platinum wire wrapped around a mandrel and covered with a protective coating (glass or ceramic).

## 10. Temperature measurement range supported by RTDs?

The RTD work on temperature range between -250 to 850 deg C.

## 11. Explain Working of Thermocouple

Thermocouple consists of two strips or wires made up of different metals and joined at one end. The temperature at that juncture induces an electromotive force (emf) between the other ends. As the temperature goes up the emf also increases. Through standard charts and tables the corresponding temperature can be found out.



The relationship between the thermocouple output and the temperature is quite non linear. Different metallurgies produce different outputs. The different metallurgies and different linearities result in different thermocouple designations such as "J", "K", "N", "L", etc.

## 12. What is Cold Junction compensation?

The industry accepted standard for the temperature at open end is 0 deg C. Therefore most tables and charts make the assumption that the temp at open end is 0 deg C. In industry the open ends are always at actual room temperature and not 0 deg C. The emf adjustment because of difference between the actual temp and 0 deg C is referred as Cold Junction Correction (CJ Correction)

## 13. Temperature measurement range supported by thermocouple ?

The thermocouple work on broad temperature range ie -270 to 2300.

## 14. Can I split my one T/C signal to two separate instruments?

No. The T/C signal is a very low-level millivolt signal, and should only be connected to one device. Splitting to two devices may result in bad readings or loss of signal. The solution is to use a "dual" T/C probe, or convert one T/C output to a 4-20 mA signal by using a transmitter or signal conditioner; then the new signal can be sent to more than one instrument

## 15. What are the flow measuring instruments used in Flow measurement ?

- Differential pressure meters
- Positive displacement
- Velocity meters

## 16. Explain working of differential pressure measurement ?

Suitable restriction placed in flow stream causes a differential pressure across it. As flow depends upon differential pressure (Head) & area, so any of them or both can be varied for varying flow.

**17. What are the components of differential flow sensor ?**

For creating differential pressure : Orifice plate, Venturi Tube, Flow Nozzle , pitot tube  
For measuring pressure : U-Tube Manometers, Ring-Balance Manometer, D.P. Cell

**18. What type of pressure sensors used in pressure measurement?**

- Manometers
- Bourdon tubes
- Bellow elements
- Diaphragm elements
- DP transmitters

**19. Explain working of differential pressure transmitters.**

Process pressure is transmitted through isolating diaphragms and oil fill fluid to a sensing diaphragm. The sensing diaphragm is a stretched spring element that deflects in response to differential pressure across it. The displacement of the sensing diaphragm, a maximum deflection of 0.004 inch (0.10 mm), is proportional to the applied pressure. Capacitor plates on both sides of the sensing diaphragm detect the position of the diaphragm. The transmitter electronics convert the differential capacitance between the sensing diaphragm and the capacitor plates into a two-wire, 4-20 mA dc signal and a digital output signal.

## Pressure Transmitters



## 20. What is Control Valves ?

The control valve, commonly named the final control element of control contains a pneumatic device that converts the control signal from the controller in action, regulating the flow.

*CONTROL VALVES MAINLY HAVE TWO PARTS:*

*1) ACTUATOR PART*

*2) BODY PART FOR EASY UNDERSTANDING.*

