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Different types of thermometers, characteristics and application

THERMOMETERS

There are many different types of thermometers but they all have one thing in common – they all have a property that changes with temperature.

Look at the display of thermometers.

- **How do they work?**
- **What differences are there between the clinical thermometer and the ‘lab’ thermometer?**
- **How does the doctor use a clinical thermometer?**

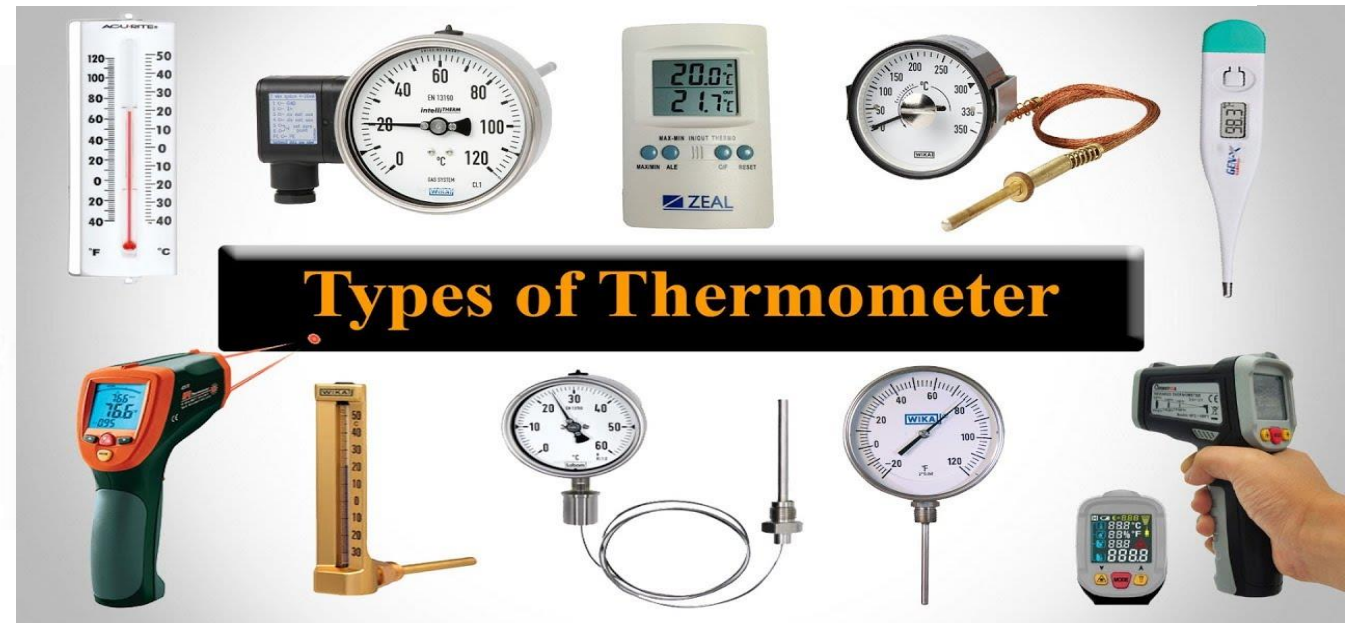
Types of thermometers

There are various types of thermometers available. Choose the one most appropriate for the person's age and ability to cooperate.



There are various types of thermometers. These are just a few examples

- Probe
- Laser
- Oven
- Fridge
- Many more.



WHAT ARE DIGITAL THERMOMETERS?

Digital thermometers are temperature-sensing instruments that are easily portable, have permanent probes, and a convenient digital display.

The way a digital thermometer works depends upon its type. They are generally a resistance temperature detector (RTD), thermocouple digital, or thermistor digital thermometer



TYPES OF DIGITAL THERMOMETER

- **Resistance temperature detectors (RTDs):-**These are wire windings or other thin film serpentines that exhibit changes in resistance with changes in temperature. They measure temperature using the positive temperature coefficient of electrical resistance of metals. The hotter they become, the higher the value of their electrical resistance
- **Thermocouples:-** are accurate, highly sensitive to small temperature changes, and quickly respond to changes to the environment. They consist of a pair of dissimilar metal wires joined at one end. The metal pair generates a net thermoelectric voltage between their opening and according to the size of the temperature difference between the ends. A temperature reading is made by calibrating the device with known temperatures, then placing one of the metal junctions on ice (or something else of a known temperature) and the other on the object whose temperature needs to be identified.

Thermistor :-Elements are the most sensitive temperature sensors available. A thermistor is a semiconductor device with an electrical resistance that is proportional to temperature. There are two types of products.

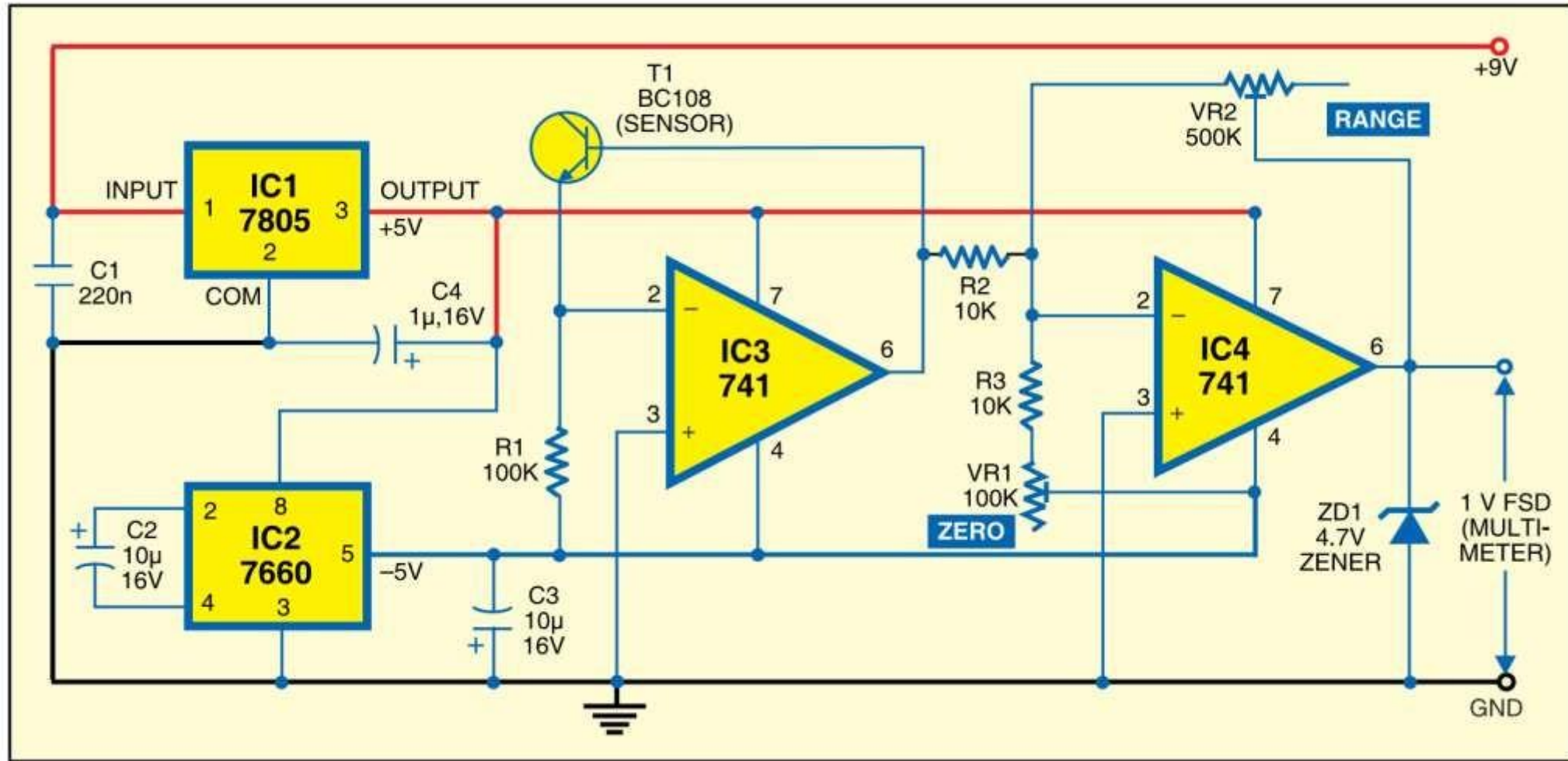
Negative temperature coefficient (NTC) devices are used in temperature sensing and are the most common type of thermistor. NTCs have temperatures that vary inversely with their resistance, so that when the temperature increases, the resistance decreases, and vice versa. NTCs are constructed from oxides of materials such as nickel, copper, and iron

Display Options:-

GlobalSpec provides information about digital thermometers with different display options. These options include:

- Fahrenheit display, display range, and scale divisions
- Celsius or Centigrade display, display range, and scale divisions
- Both Fahrenheit and Celsius displays
- Max/min readings

Circuit diagram:-



Principal of operation:-

This digital thermometer can measure temperatures up to 150°C with an accuracy of $\pm 1^\circ\text{C}$. The temperature is read on a 1V full scale-deflection (FSD) moving-coil voltmeter or digital voltmeter.

Operational amplifier IC 741 (IC3) provides a constant flow of current through the base-emitter junction of npn transistor BC108 (T1). The voltage across the base-emitter junction of the transistor is proportional to its temperature. The transistor used this way makes a low-cost sensor.

You can

use silicon diode instead of transistor. The small variation in voltage across the base-emitter junction is amplified by second operational amplifier (IC4),

- Before the temperature is displayed on the meter. Preset VR1 is used to set the zero-reading on the meter and preset VR2 is used to set the range of temperature measurement. Operational amplifiers IC3 and IC4 operate off regulated $\pm 5V$ power supply, which is derived from 3-terminal positive voltage regulator IC 7805 (IC1) and negative low-dropout regulator IC 7660 (IC2).
- The entire circuit works off a 9V battery. Assemble the circuit on a general-purpose PCB and enclose in a small plastic box. Calibrate the thermometer using presets VR1 and VR2. After calibration, keep the box in the vicinity of the object whose temperature is to be measured

Specialty Features:-

- In terms of specialty features, products may include or offer Datalogger or data collection capabilities.
- Recording of minimum and maximum values
- Internal timers and counters
- Ability to perform math or statistical functions Self-test or diagnostic capabilities
- Battery-powered

➤ Application

- **Medicine:** Digital thermometers are often used in clinical settings on patients.
- **HVAC thermometers** are rated for HVAC applications such as duct or flume monitoring.
- Common applications for digital thermometers include:
- **Sanitary applications.** Sanitary thermometers are rated for sanitary use such as food or pharmaceutical applications.
- **Home use:** includes digital thermometers used for home health care, cooking, and monitoring temperature on home appliances such as the refrigerator or swimming pool.
- **Laboratory** use includes monitoring experiments and chemical reactions as well as maintaining an optimal laboratory environment.
- **Food Service** uses thermometers in identifying completeness of cooking, and sanitation of ingredients.
- **Meteorological** thermometers are used to give air, atmosphere and water temperature readings.

Conclusion:-

- Thermometer is a device which helps to measure the temperature gradient or temperature of human beings by following some principles.
- Digital thermometers are the developed version of mercury thermometer.
- They offer fast and accurate result, are eco friendly and any one can use them.