Temperature measurement

The importance of accurate temperature measurement in 3D printing and various industrial applications is highlighted, emphasizing the challenges involved.
NTC thermistors (Negative Temperature Coefficient) decrease resistance with increasing temperature, as a method for measuring temperature.
NTC thermistors come in different nominal resistor values at 25°C (e.g., 1K, 10K, or 100K ohms). Their resistance can be used to calculate temperature using characteristic curves.
The non-linear response of NTC thermistors makes them less precise compared to PT100 sensors, which have a linear relationship between resistance and temperature. PT100 sensors have a nominal resistance of 100 ohms at 0°C and are classified as RTDs (Resistance Temperature Detectors), offering better accuracy up to temperatures of about 850°C.
To measure resistance accurately with PT100 sensors, a low constant current (~1 mA) is required. This prevents excessive power loss across the sensor.
A voltage divider can help eliminate offset voltage issues at zero degrees Celsius. Alternatively, a Wheatstone bridge can also be employed for similar results.
Both methods require amplification through an operational amplifier circuit before connecting to a microcontroller's analog input.
A pre-made transmitter offers an easier solution for measuring temperatures with minimal error (0.2% full scale). It connects the PT100 in two or three wire configurations to reduce measurement errors caused by wire resistance.