**Project: Handheld temperature measurement device.**  
 - Temperature Sensors: 4 types - J, K, R, S.  
 - Sensor Connection: All sensors connected to the same ADC channel.  
 - Sensor Selection: Menu for selecting the type of sensor.  
 - ADC Input Range: Sensor output is 0 to 20 mV for a temperature range of 1 to 800°C.  
 - OpAmp: Likely required to amplify the sensor output for ADC input.  
 - Sensor Type: Pt100 sensor.  
 - Approaches:  
 1. Thermocouple + OpAmp + ADC + ESP32.  
 2. Thermocouple + Sensor-specific digital amplifier IC + ESP32 (using IC with amplifier + ADC + calibration in one).

# **Links**

Thermocouple Types: https://www.thermocoupleinfo.com/thermocouple-types.htm

Using Thermocouple with ESP32: https://randomnerdtutorials.com/esp32-k-type-thermocouple-max6675/

MAX31865: https://www.mouser.in/new/analog-devices/maxim-max31865-converters/?utm\_id=116744523&gad\_source=1&gclid=Cj0KCQjw-uK0BhC0ARIsANQtgGNSFjYbuRekfj\_Rl6FzhoxBeiV7BJmf\_fi8Sg\_kDTbTjmkM82ORTB0aApp0EALw\_wcB

Omega - RTD vs Thermocouple: https://www.omega.com/en-us/resources/rtd-vs-thermocouple

MAX31855: https://www.analog.com/en/products/max31855.html

**Important**

1) R1 = 4x RTD resistance at 0\*C (so 400 ohm for a 100 ohm RTD), Use high quality 1% or better resistors.

2)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| CALIBRATION CHART | | | | | |
| Temp (°C) | J (mV) | K (mV) | R (mV) | S (mV) | Pt 100 Resi (Ω) |
| -200 | -7.89 | -5.891 | - | - | 18.49 |
| -100 | -4.632 | -3.553 | - | - | 60.25 |
| -50 | -2.431 | -1.89 | -0.226 | -0.236 | 80.31 |
| -25 | -1.24 | -0.97 | -0.123 | -0.127 | 90.19 |
| 0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| 10 | 0.507 | 0.397 | 0.054 | 0.055 | 103.90 |
| 20 | 1.01 | 0.8 | 0.11 | 0.11 | 107.79 |
| 25 | 1.27 | 1.0 | 0.14 | 0.14 | 109.73 |
| 30 | 1.53 | 1.2 | 0.17 | 0.17 | 111.67 |
| 35 | 1.797 | 1.407 | 0.201 | 0.203 | 113.61 |
| 40 | 2.058 | 1.611 | 0.232 | 0.235 | 115.54 |
| 50 | 2.58 | 2.02 | 0.33 | 0.3 | 119.4 |
| 75 | 3.92 | 3.058 | 0.466 | 0.467 | 128.98 |
| 100 | 5.26 | 4.1 | 0.65 | 0.65 | 138.5 |
| 150 | 8.01 | 6.14 | 1.04 | 1.03 | 157.32 |
| 200 | 10.78 | 8.14 | 1.47 | 1.44 | 175.84 |
| 300 | 16.32 | 12.21 | 2.4 | 2.32 | 212.02 |
| 400 | 21.85 | 16.4 | 3.41 | 3.26 | 247.06 |
| 500 | 27.39 | 20.64 | 4.47 | 4.232 | 280.98 |
| 600 | 33.1 | 24.9 | 5.58 | 5.24 | 313.59 |
| 800 | 45.5 | 33.28 | 7.95 | 7.35 | - |
| 900 | 51.98 | 37.33 | 9.2 | 8.45 | - |
| 1000 | 57.94 | 41.27 | 10.5 | 9.59 | - |
| 1100 | 45.11 | 11.85 | 10.75 | - | - |
| 1200 | 48.83 | 13.22 | 11.95 | - | - |
| 1400 | - | 16.03 | 14.37 | - | - |
| 1500 | - | 17.45 | 15.58 | - | - |
| 1600 | - | 18.84 | 16.77 | - | - |

# **Questions:**

1. I have changed the RTD to Digital converter from MAX31865Xap to MAX31865xTP because of the wrong pin configuration.