
Thermocouple Replacement and Heating Zone Calibration

1.0 Maintenance Objective & Frequency

The objective of this procedure is to replace a failed or drifting thermocouple and recalibrate the associated heating zone to maintain process temperature accuracy within $\pm 2^{\circ}\text{C}$ of setpoint. This PM is triggered by temperature deviation alarms, visual damage to the thermocouple, or as part of the annual preventive maintenance schedule.

Frequency: Annually, or as needed based on alarm history or visual inspection.

2.0 Lockout/Tagout (LOTO) & Safety

- Electrical Isolation: Disconnect main power to the oven/furnace at the disconnect switch. Apply personal lock and tag.
- Thermal Hazard: Allow the heating zone to cool below 50°C before opening any access panels. Use a non-contact infrared thermometer to verify.
- PPE: Wear Class 0 electrical gloves, safety glasses with side shields, and heat-resistant gloves when handling the thermocouple or heating elements.
- Confined Space: If the thermocouple is inside a sealed chamber, follow confined space entry procedures.

3.0 Required Tools, Parts & Lubricants

- Replacement thermocouple (Type J, K, or T as per OEM spec – verify part number)
- Digital multimeter with thermocouple measurement function (or separate thermocouple simulator)
- Calibrated reference thermometer (NIST-traceable, 0.1°C resolution)
- Small flathead screwdriver (for terminal block connections)
- 5mm hex key (for access panel screws)
- Non-contact infrared thermometer
- High-temperature anti-seize compound (for thermocouple threads)
- Heat-resistant gloves
- Lockout/tagout kit

4.0 Step-by-Step Maintenance Procedure

1. Perform LOTO: Isolate electrical power to the oven/furnace at the main disconnect. Lock and tag the disconnect. Verify zero voltage with a multimeter.
2. Allow the heating zone to cool below 50°C . Use an infrared thermometer to confirm the temperature at the thermocouple mounting location.
3. Remove the access panel covering the thermocouple junction box using a 5mm hex key. Set the panel aside.
4. Disconnect the old thermocouple wires from the terminal block. Note the polarity (positive/negative) or take a photo for reference.

5. Unscrew the old thermocouple from its mounting port. Use a wrench if necessary. Clean the threads of the port with a wire brush.
6. Apply a thin layer of high-temperature anti-seize compound to the threads of the new thermocouple. Screw it into the port and tighten to 15 Nm (11 ft-lb). Do not overtighten.
7. Connect the new thermocouple wires to the terminal block matching the polarity. Ensure the wires are fully seated and the screws are tight.
8. Reinstall the access panel and secure it with the hex key.
9. Remove LOTO and restore power to the oven/furnace.
10. Set the controller to a known reference temperature (e.g., 200°C for a typical oven). Allow the zone to stabilize for 15 minutes.
11. Insert the calibrated reference thermometer into the same zone, as close as possible to the thermocouple tip. Record the reference temperature and the controller reading.
12. If the difference exceeds $\pm 2^{\circ}\text{C}$, adjust the controller offset or bias parameter per the OEM manual. Repeat the stabilization and measurement until the error is within tolerance.

5.0 Verification & Return to Service

1. Perform a three-point calibration check at low, mid, and high operating temperatures (e.g., 100°C, 200°C, 300°C). Record all readings on the PM work order.
2. Run a full production cycle on a test part or scrap material to verify the heating profile meets process specifications.
3. Inspect all electrical connections for signs of overheating or looseness. Tighten if necessary.
4. Sign off on the PM work order in ServiceGrid, including the calibration data and any offset adjustments made.
5. Dispose of the old thermocouple in accordance with local electronic waste regulations.

Regulatory Disclaimer: This document is a generic maintenance template provided for educational and informational purposes only. It does not constitute professional engineering or reliability advice. The end-user assumes all liability for validating all step sequences, torque specs, and LOTO protocols against specific machinery OEM manuals before deployment to a live production floor.