SOP Template: Step-by-Step Calibration Procedures for Each Equipment Type

This SOP provides detailed **step-by-step calibration procedures** for each equipment type, ensuring accurate and consistent performance. It includes preparation guidelines, calibration standards, adjustment techniques, verification methods, and documentation requirements. Following these procedures helps maintain equipment reliability, improve measurement precision, and comply with quality control standards across all operational processes.

1. Purpose

To establish standardized procedures for calibrating various equipment types, ensuring accuracy, consistency, and documentation in compliance with quality management systems.

2. Scope

This SOP applies to all laboratory and production equipment that require routine calibration within the facility.

3. Responsibilities

- **Personnel:** Perform calibration as outlined in this SOP.
- **Supervisors:** Verify completion, review records, and ensure proper documentation.
- **Quality Assurance:** Audit calibration records and schedules for compliance.

4. Definitions

- **Calibration:** The process of adjusting and verifying equipment to ensure accuracy within designated tolerances using recognized standards.
- **Calibration Standard:** A certified reference instrument or material used during calibration.
- **Verification:** Assessment of calibration effectiveness by comparing additional measurements to expected results.

5. Equipment Types & Calibration Procedures

Equipment Type	Calibration Frequency	Step-by-Step Procedure
Analytical Balance	Monthly / After Relocation	1. Ensure balance is clean and level; allow to warm up for 30 minutes. 2. Gather certified calibration weights (traceable to NIST or equivalent). 3. Check zero reading with the balance empty. 4. Place calibration weights on pan in ascending and descending order; record readings. 5. If deviation exceeds tolerance, adjust balance according to manufacturer instructions. 6. Repeat steps 3-4 to verify adjustment. 7. Complete calibration log and update sticker.
pH Meter	Before Use / Daily	1. Rinse electrode with distilled water. 2. Immerse electrode in pH 7.00 buffer; calibrate to read '7.00'. 3. Repeat with pH 4.00 and pH 10.00 buffers as required. 4. Rinse and store electrode in appropriate storage solution. 5. Document calibration on instrument log sheet.

Thermometer (Digital or Analog)	Quarterly	1. Place thermometer and certified reference thermometer in a controlled-temperature bath. 2. Wait until readings stabilize, then compare values at specified points (e.g., 0Â°C, 25Â°C, 50Â°C, 100Â°C). 3. If discrepancies exceed allowed tolerance, adjust (if adjustable) or service/replace device. 4. Document results in calibration log.

6. General Calibration Steps

1. **Preparation:** Assemble required tools, standards, and documentation. Ensure equipment is powered on, clean, and stabilized before calibration.
2. **Calibration:** Follow equipment-specific procedure using appropriate standards. Record observed values and deviations.
3. **Adjustment:** Perform adjustments if readings are out of tolerance. Re-test to confirm correction.
4. **Verification:** Use verification standards or independent measurements to confirm calibration effectiveness.
5. **Documentation:** Complete calibration logbook, including date, standards used, results, adjustments, and operator signature.
6. **Labelling:** Update equipment calibration sticker (include calibration and next due dates).

7. Documentation Requirements

- Date and time of calibration
- Equipment ID and serial number
- Calibration standard details (ID, certificate number, expiry)
- Observed readings and tolerance
- Adjustments performed (if any)
- Operator name and signature
- Supervisor/QA verification (if required)

8. References

- Equipment Manufacturer's Manuals
- ISO/IEC 17025: Testing and Calibration Laboratories
- Internal Quality Management System Requirements

> **Note:** If equipment fails calibration and cannot be adjusted, remove from service and notify supervisor for maintenance or replacement.