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CALIBRATION

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Date:	Latest Revision Date
Project:	Customer, Unique ID, Part Number
Document Status:	Draft, Redline, Released, Obsolete
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Abstract:
This document describes calibration procedures.

[redacted]

REVISION LOG

Issue	Date	Comment	Author
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Issue	Item	Reason for Change

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1.0 PURPOSE

This document defines the procedures necessary for calibration of measuring equipment.

2.0 THEORY

Measurement results are only valid when M&TE of known accuracy is used. This calibration procedure ensures M&TE is properly verified for accuracy against known standards. Measurement devices that are used to indicate process feedback are not subject to calibration, such as short-circuit or open-circuit, hot or cold, off or on, etc; however, when a measurement device is used to determine conformance to a Customer requirement, then the device should be properly verified for accuracy.

3.0 DEFINITIONS

- Accuracy Ratio –
- Adequacy -
- Calibration:
- Gages –
- Inspection Aid –
- M&TE -
- Procurement of M&TE -
- Recall –
- Significantly out-of-tolerance -
- Special Equipment -
- Standards -

4.0 GENERAL CALIBRATION PROCEDURE

4.1 Calibration is performed by trained employees or approved calibration service providers.

4.2 Measuring instruments are to be calibrated at a temperature of and relative humidity. Sufficient temperature stabilization time is allowed before calibration. For cases where calibration must be conducted in the production area, calibration equipment is

4.3 A number is issued when a gage does not provide its own serial number. The numbers run [redacted]

4.4 All M&TE are kept clean and when not in use are [redacted]

4.5 A recall log is maintained on all M&TE and standards. The log provides [redacted]

4.6 The number of items scheduled for monthly recertification is periodically determined and their schedule is adjusted [redacted]

4.7 In addition to the recall log, a Calibration Report is kept on each Company-owned gage/standard. The purpose of this report is [redacted] Calibration instructions are prepared to provide the calibration technician with instructions to perform the recertification. These instructions contain [redacted]

4.8 Calibration intervals may be established based on one or more of the following criteria: [redacted]

4.9 Adjustable M&TE is periodically recalibrated based upon [redacted]

TABLE I, Calibration Intervals

Calibration Cycle	Recalibration Cycles to Qualify for New Calibration Cycle	New Calibration Cycle
Annual	[redacted]	[redacted]
Bi-Annual	[redacted]	[redacted]
3 - 4 Years	[redacted]	[redacted]
5 Years	[redacted]	[redacted]

4.10 Interval Adjustment: M&TE whose calibration error is recorded as being greater than the last recorded calibration error but not significantly out of tolerance [redacted]

4.11 M&TE calibration intervals may be extended or adjusted by [redacted]

4.12 Overdue items should be identified with an appropriate tag and are prevented from use as practicable. A calibration overdue notice in the form of an inter-office memo or other format may be used to facilitate recall of portable gages.

4.13 A calibration sticker is used to identify individual items of M&TE. The sticker displays [redacted]

4.14 Calibration Standards/Special Equipment

The following is the position of the National Conference of Standards Laboratories (NCSL):

[redacted]

Calibration of standards/special equipment is conducted by checking against laboratory standards available at outside laboratories. Approved calibration laboratories are listed in the Approved Supplier's List.

When calibrations are made for standards/special equipment, the calibration lab is required to submit a report that contains, as appropriate:

- [redacted]
- [redacted]
- [redacted].
- [redacted]
- [redacted]
- [redacted]
- [redacted]

4.15 A calibration record and recall log is maintained on all Transfer Standards, indicating [redacted]

4.16 The calibration department places all Customer furnished inspection gages in the calibration system unless otherwise directed by the Customer. Records are kept showing [redacted]

4.17 Traceability: Inspection work instructions and manufacturing travelers specify measurement and test equipment utilized for product conformance inspection.

When specified, the M&TE number is [redacted]

4.18 Non-Calibrated M&TE: Upon request, non-calibrated M&TE may be submitted for calibration. Non-calibrated measurement devices may [redacted] under the following conditions: 1) [redacted] 2) accuracy is verified using current, calibrated M&TE or standards traceable to NIST or by inspection of the product(s) using calibrated M&TE. A non-calibrated measurement device that is verified accurate [redacted]

4.19 Calibration Not Required M&TE

4.19.1 Chemical laboratory glassware is exempt from calibration, such as [redacted]

4.19.2 Chemical analysis equipment that is checked for accuracy prior to use by chemical standards or prepared solutions are exempt from calibration, such as [redacted]

4.19.3 Titration tools and solutions are exempt from calibration, such as [redacted]

4.19.4 Prepared chemical solutions and chemical standards are [redacted]

4.19.5 Software programs that are used for operation of test equipment are [redacted]

4.19.6 Power supplies that are used in process control and test equipment are exempt from calibration; however, [redacted]

4.20 Employee Owned Tools: Personal tooling or gages owned by employees are calibrated prior to use and [redacted]

4.21 Storage and Handling of M&TE: M&TE is handled during movement using the manufacturer's recommendations or handling practices that prevent [redacted]

4.22 M&TE requiring transportation to a calibration laboratory is packaged as required to prevent damage in transit.

4.23 M&TE storage areas are monitored to preclude deterioration of equipment at intervals consistent with internal quality audits. Recalibration of M&TE is required when [redacted]

4.24 Archive / Long-Term Storage: M&TE does not require accuracy verification prior to archive / long-term storage if it was not:

- [redacted]
- [redacted]
- [redacted]

M&TE that has been calibrated and stored must [redacted]

5.0 OUT-OF-TOLERANCE EQUIPMENT AND TOOLING

5.1 Equipment and tooling found to be significantly out of tolerance, damaged, inoperative, erratic or exhibiting some other form of anomalous condition should be immediately tagged by the operator or responsible authority. The degree of error should be recorded on the tag and the item should be removed directly to the calibration department or a notice should be posted on equipment that identifies its condition until the deficiency is evaluated. All pertinent information is entered on the calibration record.

5.2 M&TE found significantly out of tolerance at recalibration for 2 interval cycles is prevented from use by physical removal (except as otherwise provided), labeling or by other effective methods. All out of tolerance data [redacted]

5.3 An instrument whose calibration error is significantly out-of-tolerance over a short portion of a specified range may be returned to service only when [redacted]

5.4 Any product certified with M&TE subsequently found to be out-of-tolerance is reported to the Customer. The impact on the quality of products examined or tested by M&TE found to be out-of-tolerance during calibration will [redacted].

6.0 LOST EQUIPMENT

6.1 Measurement and test equipment that cannot be located shall [redacted]

7.0 MANAGEMENT REVIEW

7.1 Management Review meetings are conducted according to the Management Process Procedure. During Management Review, process resources are discussed and [redacted]

APPENDIX 1

Setting and/or selecting a reference standard to calibrate a measurement device.

Requirement:

The measurement range of a device being checked for accuracy must be less than [redacted]

VOLTMETER:

A voltmeter shall be verified for accuracy within an equivalent range on the reference standard:

A voltmeter reference standard may have scales that range from 2-20V, 20-200V, etc.

The voltmeter being checked for accuracy must be set to bracket within a range of the reference standard - or - the reference standard must be set to a range that brackets the range on the voltmeter being checked for accuracy. For instance, if the voltmeter being checked is set to 2-20V then the standard must be set to the same range – do not use the 20-200V range on the reference standard to check the 2-20V range on the voltmeter.

OTHER MEASUREMENT DEVICES:

Any reference standard whose maximum measurement range is the same as the device being checked for accuracy must be at least [redacted].

For instance, [redacted]

APPENDIX 2

Nonadjustable M&TE is inherently stable and includes [redacted]

The Operator is only required to check inherently stable M&TE for damage prior to each use because [redacted]

For instance, [redacted]

To control the inventory of inherently stable M&TE, determine [redacted]

Operators are required to ONLY use [redacted]

With this method, as long as [redacted]

[redacted]