

Inspection, Measuring and Test Equipment (IMTE) Calibration

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Attachment(s):	
Master IMTE Log	

Purpose and Scope

- Purpose** This chapter provides guidelines for:
- identifying Inspection, Measuring and Test Equipment (IMTE)
 - identifying IMTE calibration status
 - handling and storing IMTE
 - maintaining IMTE.
- Scope** This chapter applies across BOC North America to IMTE used for one or more of the following applications:
- equipment used to measure in-process and final product quality/quantity characteristics
 - equipment used to measure key characteristics that can have a significant environmental impact such as, wastewater or air discharges and underground storage tank monitoring devices
 - equipment used for occupational safety and health measurements such as personal atmospheric air monitors, noise measurement devices, combustible, oxygen and toxic monitoring devices
 - equipment used to calibrate or maintain IMTE that is used for any of the above applications.

Responsibilities

- Location Manager or designee** The Location Manager or designee is responsible for:
- controlling the identification, calibration and marking of inspection, measuring and test equipment
 - maintaining a register of measuring and testing equipment
 - maintaining records of calibration for a minimum of 6 years from the calibration expiration date.

About IMTE

Recording IMTE data All equipment must be recorded on a maintenance planning system such as SAP or MAXIMO, which details:

- equipment serial number
- location in the plant
- calibration frequency
- calibration method
- date and record of previous calibration
- date placed in service.

Note: Where possible this information may be used to generate the Master IMTE Log.

Calibration standards *Calibration* must be performed using *Metrology Equipment* or internationally recognized standards, such as those of the National Institute of Standards and Technology (NIST). If no internationally recognized standard exists, a standard based on scientific rationale must be developed, validated and used. Any standard of this nature must be reviewed and approved by relevant approval/design authorities.

Calibration should be carried out against the following:

- test gases or solution of known composition covered by approved certification
- dead weight testers with approved certification
- manufacturer's test data (for example, electrical impulse).

Calibration certificate requirements

A calibration certificate is required and must be maintained on file which:

- was issued by a BOC-approved, nationally accredited test laboratory, or
- certifies that the calibrations performed are traceable to national or international standards, and cross-references the serial number of the calibration standard(s) used, and
- identifies both the "As Found" and "As Left" conditions, highlighting any "As Found" results that are found to be outside acceptance limits and documents the extent of the deviation.

Note: Where calibration is performed internally, the Calibration Record fulfills this requirement.

Instruments in continuous use

Some panel-mounted instruments, due to continuous processing demands, may not be removed for calibration. In this case calibration frequencies should be established to coincide with plant shut downs. When shut down is not possible, the instrumentation loops must be based on design and past performance data.

Calibration checks

All calibration checks and adjustments must be carried out against approved procedures or by approved subcontractors under suitable environmental conditions. In the event of equipment failing to achieve calibration, it must be both removed and replaced, or identified with a BOC official label or tag stating: **DO NOT USE**.

When a calibration *Non-Conformance* is detected:

- raise a corrective action report, and
- re-certify previous inspections/tests.

Note: Previously accepted product must be re-certified prior to dispatch and, where necessary, recalled.

Master IMTE Log

Instruments

All *Primary Instruments / Measuring* Devices used to measure product acceptance criteria, metrology equipment used for primary instrument/equipment calibration, and Safety, Health and Environmental instrumentation must be recorded on the *Master IMTE Log (see attachment)* by:

- Functional description
 - Range (optional)
 - Manufacturer (optional)
- Type (master or work)
- Identifier/Tag number
 - Serial number
 - Model number
- Location
- Calibration frequency
- Date placed in service
- Date removed from service

When validated electronic maintenance scheduling and tracking systems are used, and include all the information that is required above, a paper Master IMTE Log is **not** required.

Sample list of primary instruments/equipment

- Residual and Final Product Analyzers
- Fill or process measurement working gauges and/or transducers
- Scales
- Thermometers
- Analytical flow meters
- Timers

- | | |
|---|--|
| Sample list of metrology equipment | <ul style="list-style-type: none">• Master gauges (used to calibrate working gauges)• Master thermometers• Master flowmeters (used to calibrate working thermometers)• Master timers |
| Sample list of safety, health and environmental equipment | <ul style="list-style-type: none">• Portable and fixed atmospheric analyzers (inert, flammable, toxic, oxygen)• Noise monitoring equipment• Air monitoring• Voltage detectors• Refrigerant leak detectors• Wastewater monitoring devices• Air pollution monitoring devices• Underground storage tank interstitial monitors• Fuel pump meters |

Identification of IMTE Calibration Status

Calibration status label All instruments recorded on the Master IMTE Log should have their calibration status indicated with a label or tag, which includes:

- date on which calibration was performed
- date on which calibration is due
- initials of the person performing such calibration
- identification of device used for calibration.

Note: Labeling of equipment should be done where practical. Equipment requiring daily or weekly calibration does not require labeling.

Laboratory equipment Numerous laboratory items are too small for, or normal use prevents, the use of a status label. For example: mercury-in-glass thermometers, volumetric glassware or thermocouples. In these instances, an alternative method of identifying the calibration status must be developed, by labeling the device storage container, for example.

A list of metrology equipment used at the site must be maintained to identify laboratory equipment and to record calibration status. See *Master IMTE Log (see attachment)*.

General exemptions Some pressure gauges used in “critical” applications, such as Quality Control (QC) panels, are not designed to be calibrated after manufacture. Provision for regular replacement must be made and the device identified with a “replace by (date)” label.

Note: Read only gauges do not require calibration.

Handling and Storage of IMTE

- Guidelines** Adequate handling and storage facilities must be provided to ensure that all instruments are:
- in a current state of calibration
 - clean
 - undamaged
 - adequately maintained.

Calibration of IMTE

Establishing Calibration Frequency

- Calibration frequency** Calibration frequencies are to be established by relevant approval/design authorities, and must be determined by considering the following:
- Manufacturer's recommended frequencies
 - Plant operational conditions
 - Product assurance standards
 - Regulatory requirements.
- Note:** Frequencies may be modified when statistical evidence demonstrates that it is justifiable to do so, to reflect plant operational conditions, and in consideration of experience gained with similar equipment and BOC standards.

- Calibration Checks** For calibration checks, frequency and scheduling specifications must be detailed on a Calibration Schedule or included in a planned maintenance system.

Pre-Calibration

- Pre-calibration requirements** Before commencing work on IMTE, ensure that:
- a safe system of work has been established
 - the plant operating personnel have been informed of the work to be done, and the possible effect on the control system
 - any process control equipment that may be affected has been set up correctly, for example:
 - controllers are set to manual
 - analyzer trip or calibration overrides switched "ON"
 - the following are available:
 - manufacturer's maintenance manual
 - relevant test equipment/reference standards
 - calibration record sheets.

Calibration

Generic IMTE process The generic process for the calibration of all IMTE must be as follows:

Step	Responsibility	Action	
1	Person performing calibration	Calibrate test equipment and record results.	<input type="checkbox"/>
2	Person performing calibration	Has the instrument been found to be outside calibration or does it show evidence of physical damage? <ul style="list-style-type: none"> • If no, calibration has been satisfactorily completed • If yes, log information on the Corrective Action Report, and advise the supervisor or equivalent, so that the potential impact on previously inspected products, equipment or processes can be assessed. 	<input type="checkbox"/>
3	Supervisor/ Manager	If the potential impact on previously inspected products, equipment or processes is considered significant, notify management in order to implement appropriate corrective action, which may include: <ul style="list-style-type: none"> • customer notification • re-testing • recall • replacement 	<input type="checkbox"/>
4	Supervisor/ Manager	Decide if the instrument should be replaced or the time period between calibrations reduced.	<input type="checkbox"/>

Post-Calibration

Post-calibration requirements On completion of calibration, ensure that:

- the appropriate supervisor and plant operating personnel are informed that calibration has been appropriately completed
- any process control equipment, which has been adjusted during calibration, is restored to its normal running position.

Note: Notify plant-operating personnel if restoration is not possible.

Calibration records

Calibration Records are maintained and must include:

- Identification of the device being calibrated
- Date of calibration
- Name and signature of person performing the calibration
- Identification of the standard (calibrated gas, master gauges, etc.) used to verify the suitability of the device
- "As Found" and "As Left" results
- Signature of quality reviewer as required by business process, such as medical or beverage.
- All required calibration information (record on a label and attach to the instrument as required).

Recordkeeping

Retention The Master IMTE Log must be maintained current for the life of the plant.

Forms and Attachments

Forms

The following forms are used in this chapter:

- *Master IMTE Log (see attachment)*