

MIL-STD-45662A
1 August 1988
SUPERSEDING
MIL-STD-45662
10 June 1980

MILITARY STANDARD

CALIBRATION SYSTEMS REQUIREMENTS



AMSC N/A

AREA QCIC

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

MIL-STD-45662A

DEPARTMENT OF DEFENSE
Washington, DC 20360

Calibration Systems Requirements

1. This military standard is approved for use by all Department and Agencies of the Department of Defense.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, U.S. Army Missile Command, ATTN: AMSMI-RD-SE-TD-ST, Redstone Arsenal, AL 35898-5270, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FOREWORD

This military standard contains requirements for the establishment and maintenance of a calibration system used to control the accuracy of measuring and test equipment (M&TE) and measurement standards.

CONTENTS

	Page
1.	SCOPE----- 1
1.1	Scope----- 1
1.2	Applicability----- 1
1.3	Significance----- 1
2.	REFERENCED DOCUMENTS (Not applicable)----- 1
3.	DEFINITIONS----- 1
3.1	Calibration----- 1
3.2	Consensus Standard----- 1
3.3	Measuring and test equipment----- 1
3.4	Measurement standard----- 1
3.5	Traceability----- 1
4.	GENERAL REQUIREMENTS----- 2
4.1	General----- 2
4.2	Quality assurance provisions----- 2
5.	DETAILED REQUIREMENTS----- 2
5.1	Calibration system description----- 2
5.2	Adequacy of measurement standards----- 3
5.3	Environmental controls----- 3
5.4	Intervals of calibration----- 3
5.5	Calibration procedures----- 3
5.6	Out-of-tolerance conditions----- 4
5.7	Adequacy of the calibration system----- 4
5.8	Calibration sources----- 4
5.9	Records----- 4
5.10	Calibration status----- 4
5.11	Control of subcontractor calibration----- 5
5.12	Storage and handling----- 5
5.13	Amendments and revisions----- 5
6.	NOTES----- 5
6.1	Subject term (key word) listing----- 5
6.2	Changes from previous issue----- 5

1. SCOPE

1.1 Scope. This MIL-STD provides requirements for the establishment and maintenance of a calibration system to control the accuracy of measuring and test equipment (M&TE) and measurement standards used to assure that supplies and services delivered to the Government comply with prescribed technical requirements.

1.2 Applicability. This MIL-STD applies to all contracts under which the contractor uses M&TE or measurement standards.

1.3 Significance. This MIL-STD and any procedure or document executed in implementation thereof shall be in addition to and not weaken or detract from other contract requirements.

2. REFERENCE DOCUMENTS (Not applicable)

3. DEFINITIONS

3.1 Calibration. The comparison of M&TE or measurement standard of unknown accuracy to a measurement standard of known accuracy in order to detect, correlate, report, or eliminate by adjustment any variation in the accuracy of the instrument being compared.

3.2 Consensus standard. An artifact or process that is used as a de facto standard by agreement of the contractor and DOD when no recognized U.S. national standard is available.

3.3 Measuring and test equipment (M&TE). All devices used to measure, gage, test, inspect, or otherwise determine compliance with prescribed technical requirements.

3.4 Measurement standard. Those devices used to calibrate M&TE or other measurement standards and provide traceability.

3.5 Traceability. The ability to relate individual measurement results through an unbroken chain of calibrations to one or more of the following:

3.5.1 U.S. national standards maintained by the U.S. National Bureau of Standards (NBS) and the U.S. Naval Observatory;

3.5.2 Fundamental or natural physical constants with values assigned or accepted by the U.S. NBS;

3.5.3 National standards of other countries which are correlated with U.S. national standards;

3.5.4 Ratio type of calibrations;

3.5.5 Comparison to consensus standards.

4. GENERAL REQUIREMENTS

4.1 General. The contractor shall establish and maintain a system for the calibration of all M&TE and measurement standards used in fulfillment of contractual requirements. The calibration system shall be coordinated with the contractor's inspection or quality control system and shall be designed to provide adequate accuracy in use of M&TE and measurement standards. All M&TE and measurement standards applicable to the contract, whether used in the contractor's plant or at another source, shall be subject to such control as is necessary to assure conformance of supplies and services to contractual requirements. The calibration system shall provide for the prevention of inaccuracy by ready detection of deficiencies and timely positive action for their correction. The contractor shall make objective evidence of accuracy conformance readily available to the Government representative.

4.2 Quality assurance provisions. All operations performed by the contractor in compliance with this MIL-STD shall be subject to Government verification at unscheduled intervals. Verification will include but not be limited to the following:

4.2.1 Review of the contractor's documented calibration system description to determine compliance with the detailed requirements of this MIL-STD;

4.2.2 Surveillance of calibration operations for conformance to the contractor's documented calibration system;

4.2.3 Review of calibration results to verify adequacy of the contractor's calibration process. The contractor's M&TE and measurement standards shall be made available for use by the Government representative, as required. Where conditions warrant, contractor personnel shall be made available for operation of such devices.

Results of inspections or audits conducted within the last 12 months may be used by the government in determining contractor's compliance with this MIL-STD.

5. DETAILED REQUIREMENTS

5.1 Calibration system description. The contractor shall provide and maintain a written description of the calibration system covering M&TE and measurement standards to satisfy each requirement of this MIL-STD. Requests for deviation from the detailed requirements of this MIL-STD, with supporting justification, shall be submitted to the Government representative for approval.

5.2 Adequacy of measurement standards. Measurement standards used by the contractor for calibrating M&TE and other measurement standards shall be traceable and shall have the accuracy, stability, range and resolution required for the intended use. Unless otherwise specified in the contract requirements, the collective uncertainty of the measurement standards shall not exceed 25 percent of the acceptable tolerance for each characteristic being calibrated. The contractor's calibration system description may include provisions for deviating from the uncertainty requirements, provided the adequacy of the calibration is not degraded. All deviations shall be documented.

5.3 Environmental controls. M&TE and measurement standards shall be calibrated and utilized in an environment controlled to the extent necessary to assure continued measurements of required accuracy, giving due consideration to temperature, humidity, vibration, cleanliness, and other controllable factors. When applicable, compensating corrections shall be applied to calibration results obtained in an environment which departs from acceptable conditions.

5.4 Intervals of calibration. M&TE and measurement standards shall be calibrated at periodic intervals established and maintained to assure acceptable accuracy and reliability, where reliability is defined as the probability that the M&TE and measurement standard will remain in-tolerance throughout the established interval. Intervals shall be shortened or may be lengthened, by the contractor, when the results of previous calibrations indicate that such action is appropriate to maintain acceptable reliability. The contractor shall establish a recall system for the mandatory recall of M&TE and measurement standards to assure timely recalibrations, thereby precluding use of an instrument beyond its calibration due date. The recall system may include provisions for the temporary extension of the calibration due date for limited periods of time under certain specific conditions such as the completion of a test in progress.

5.5 Calibration procedures. Procedures shall be available and utilized for the calibration of all M&TE and measurement standards. As a minimum, calibration procedures shall specify the measurement standards and equipment to be used (manufacturer and model or generic description), the required parameter, range, and accuracy of the measurement standard and the acceptable tolerance of each instrument characteristic being calibrated. Calibration procedures shall provide instructions to enable calibration personnel to adequately calibrate each instrument characteristic or measurement parameter of concern. The procedures used may be those available from DOD or other U.S. Government agencies, available in manufacturer's manuals, or published standard practices, and need not be rewritten by the contractor, provided they meet the content requirements of this MIL-STD.

5.6 Out-of-tolerance conditions. If any M&TE or measurement standard is found to be significantly out-of-tolerance during the calibration process, the contractor's calibration system shall provide for the notification to the respective user and designated contractor quality element of the out-of-tolerance condition with associated measurement data so that appropriate action can be taken.

5.7 Adequacy of the calibration system. The contractor shall establish and maintain documented procedures to evaluate the adequacy of the calibration system and to ensure compliance with all requirements of this MIL-STD.

5.8 Calibration sources. M&TE and measurement standards shall be calibrated by the contractor or another calibration facility utilizing measurement standards whose calibration is traceable. All measurement standards used in the calibration system shall be supported by certificates, reports, or data sheets attesting to the description or identification of the item; the calibration source; date of calibration; calibration assigned value; statement of uncertainty and environmental or other conditions under which the calibration results were obtained. In those cases where such data are not required to use the measurement standard, a suitable annotated calibration label on the item shall be sufficient. Certificates or reports from other than the U.S. National Bureau of Standards (NBS) or DOD laboratory shall attest to the fact that the measurement standards used in obtaining the results are traceable. The contractor shall be responsible for assuring that the sources providing calibration services, other than NBS or DOD laboratory, are capable of performing the required service to the satisfaction of this MIL-STD.

5.9 Records. The requirements of this MIL-STD shall be supported by records documenting that established schedules and procedures are followed to maintain the accuracy of all M&TE and measurement standards. The records shall include an individual record of calibration or other means of control for each item of M&TE and measurement standard, providing a description or identification of the item, calibration interval, date calibrated, identification of the calibration source, calibration procedure used, calibration results and calibration actions taken. In addition, the individual record of any item whose accuracy must be reported via a calibration certificate or report, shall state the certificate or report number.

5.10 Calibration status. M&TE and measurement standards shall be labeled to indicate calibration status. The label shall identify, as a minimum, specific date calibrated (day, month, and year, Julian date or equivalent) and the specific calibration due date. Items not calibrated to their full capability or which have other limitations of use, shall be labeled or otherwise identified as to the limitations. When it is impractical to apply a calibration label directly to an item (i.e., gage block) the calibration label may be affixed to the instrument container or some other suitable measures may be used to reflect calibration status. Tamper-resistant seals shall be affixed to operator accessible controls or adjustments on M&TE and measurement standards which, if moved, will affect the calibration. The contractor's calibration system shall provide instructions for use of such seals and disposition on items whose seals are broken.

5.11 Control of subcontractor calibration. The contractor is responsible for assuring that the subcontractor's calibration system conforms to this MIL-STD to the degree necessary to assure compliance with contractual requirements. Results of Government inspections or audits conducted within the last 12 months may be used in determining subcontractor compliance.

5.12 Storage and handling. M&TE and measurement standards shall be handled, stored, and transported in a manner which shall not adversely affect the calibration or condition of the equipment.

5.13 Amendments and revisions. Whenever this MIL-STD is amended or revised subsequent to a contractually effective date, the contractor may follow, or authorize his subcontractor to follow, the amended or revised MIL-STD provided no increase in price or fee is involved. The contractor shall not be required to follow the amended or revised standard except as a change in the contract. If the contractor elects to follow the amended or revised MIL-STD, then the contractor shall notify the contracting officer of this election in writing.

6. NOTES

6.1 Subject term (key word) listing.

Calibration

6.2 Changes from previous issue. Asterisks or vertical lines are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Army - MI
Navy - OS
Air Force - 05

Preparing Activity:

Army - MI

Project No. QCIC-0084

Review Activity:

Army - AR, AV
Navy - AS, EC, SH
DLA - DH

User Activity:

Army - ME
DLA - SS

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL
(See Instructions - Reverse Side)

1. DOCUMENT NUMBER
MIL-STD-45662A

2. DOCUMENT TITLE
CALIBRATION SYSTEMS REQUIREMENTS

3a. NAME OF SUBMITTING ORGANIZATION

b. ADDRESS (Street, City, State, ZIP Code)

4. TYPE OF ORGANIZATION (Mark one)

VENDOR

USER

MANUFACTURER

OTHER (Specify): _____

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER (Last, First, MI) - Optional

b. WORK TELEPHONE NUMBER (Include Area Code) - Optional

c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional

8. DATE OF SUBMISSION (YYMMDD)

INSTRUCTIONS: In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

(Fold along this line)

(Fold along this line)

DEPARTMENT OF THE ARMY

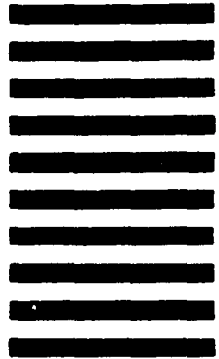


NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE \$300

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 12062 WASHINGTON D. C.
POSTAGE WILL BE PAID BY THE DEPARTMENT OF THE ARMY

Commander
US Army Missile Command
ATTN: AMSMI-RD-SE-TD-ST
Redstone Arsenal, AL 35898-5270



NOTICE OF
CANCELLATION

MIL-STD-45662A
NOTICE 2
February 27, 1995
SUPERSEDING
NOTICE 1
20 January 1995

MILITARY STANDARD
CALIBRATION SYSTEMS REQUIREMENTS

MIL-STD-45662A, dated 1 August 1988, is hereby canceled. Future acquisitions should refer to International Organization for Standards (ISO) 10012-1, "Quality Assurance Requirements for Measuring Equipment", Part 1: "Meteorological Confirmation System for Measuring Equipment"; American National Standards Institute (ANSI) National Conference of Standards Laboratories (NCSL) Z540-1, "General Requirements for Calibration Laboratories and Measuring and Test Equipment"; or comparable standards as alternatives to MIL-STD-45662A.

(DoD activities may obtain copies of ISO 10012-1 and ANSI/NCSL Z540-1 from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094. The private sector and other Government agencies may purchase copies from the American National Standards Institute (ANSI), 11 West 42nd Street, New York, NY 10036.)

Preparing activity:
Army - M1

Agent:
OSD - SO

(Project QCIC-0003)

AMSC N A

AREA QCIC

DISTRIBUTION STATEMENT : Approved for public release;
distribution is unlimited.