

INCH – POUND

MIL-DTL-55023D

6 January 2011

SUPERSEDING

MIL-M-55023C

30 September 1975

MILITARY SPECIFICATION

MANOMETERS, U-TUBE AND CURVED TUBE

Inactive for new design after 24 March 1999.

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers manometers for determining positive pressure, vacuum, and pressure differentials in linear inches.

1.2 Classification. Manometers are of the following types, sizes and styles, as specified (see 6.2).

Type I	U-tube
Size 1	Range 15-0-15 inches
Size 2	Range 5-0-5 inches
Type II	Curved-tube
Style A	Smooth bend, with logarithmic graduated scale
Size 3	Range 0-3 inches
Size 4	Range 0-7 inches
Style B	Abrupt bend, with two straight portions, each having arithmetic graduated scale
Size 5	Range as specified

Beneficial comments, recommendations, additions, deletions, clarifications, etc. and any data that may improve this document should be sent to: STDZNMGT@dla.mil or Defense Logistics Agency Aviation VEB, 8000 Jefferson Davis Highway, Richmond, VA 23297-5616. Since contact information can change, you may want to verify the currency of this address information using the ASSIST database at <https://assist.daps.dla.mil/>.

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2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of the documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL STANDARD

FED-STD-H28 - Screw-Thread Standards for Federal Services

DEPARTMENT OF DEFENSE SPECIFICATION

MIL-T-704 - Treatment and Painting of Material

DEPARTMENT OF DEFENSE STANDARD

MIL-STD-130 - Identification Marking of U.S. Military Property

(Copies of these documents are available online at <https://assist.daps.dla.mil/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR QUALITY

ANSI Z1.4 - Sampling Procedures and Tables by Inspection of Attributes

(Copies of ANSI/ASQ Z1.4 are available online at www.asq.org or ASQ, 600 North Plankinton Avenue, Milwaukee, Wisconsin 53203)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this

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document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Description. The manometers shall be designed to be used with any of the commercial indicator fluids for determining positive pressure, vacuum, and pressure differentials. All parts subject to wear, breakage, or distortion shall be accessible for adjustment, replacement, and repair.

3.1.1 Type I. Type I shall be of the vertical type, with straight indicating tubes. Size 1 shall be adaptable for mounting on a wall or table stand. Size 2 shall be for wall-mounting only.

3.1.2 Type II. Type II shall be of the inclined vertical type, with a curved tube. The lower portion of the tube has a slight inclination from horizontal to provide low-range accuracy. The upper portion of the tube has a slight inclination from vertical to provide high capacity.

3.1.2.1 Style A. Style A shall consist of an indicating tube curved in a smooth bend throughout its entire length, and calibrated logarithmically with uneven graduations. Style A shall be for wall-mounting only.

3.1.2.2 Style B. Style B shall be similar to style A, except that the curve shall be an abrupt bend, thus forming two straight-tube portions at an angle to each other. Each straight portion shall be independently arithmetically calibrated with even graduations. Style B shall be adaptable for wall-mounting. When specified (see 6.2), table-stand mounting shall be provided.

3.2 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.3 Standard commercial product. Standard commercial (see 6.3.1) manometers may be furnished if they meet the minimum requirements of this specification. Additional or better features which are not specifically prohibited by this specification, but which are a part of the manufacturer's commercial product shall be included in the manometers being furnished.

3.4 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.5 Interchangeability. All manometers of the same classification furnished with similar options under a specific contract shall be identical to the extent necessary to insure interchangeability of component parts, assemblies, accessories, and spare parts. All threaded parts shall comply with FED-STD-H28.

3.6 Performance. The manometer shall indicate positive pressure, vacuum, and pressure differentials in linear inches of indicator fluid. The manometer shall measure differential pressure

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within the minimum range indicated in Table I. The manometer shall withstand, without damage or leakage, an internal pressure not less than 100 pounds per square inch gauge (psig).

Table I. Minimum differential pressure range

Size	Linear inches of indicating fluid (psig)
1	0 to 30
2	0 to 10
3	0 to 3
4	0 to 7
5	As specified

3.7 Construction. The manometer shall be complete and usable for operation. Type I shall consist of a frame, clean-out head or tube, graduated scale, and U-tube. The mounting stand shall be furnished with size 1 manometers. Type II manometers shall include a housing, reservoir, curved tube, and applicable components of type I manometers.

3.7.1 Frame. The frame shall be metal or plastic. Metal frames shall be corrosion resistant or have a corrosion-resistant finish. All frames shall have provisions for wall-mounting. The frame for the size 1 manometers shall permit mounting in the table stand. When a table stand is required for the style B manometer, the frame shall include provisions for mounting the stand.

3.7.2 Clean-out head or tube connector. The clean-out head or tube connector shall be corrosion-resistant steel, and shall be removable without the use of special tools to permit cleaning and replacing the tube. The head shall have a female pressure connection. The pressure connection shall be connected to the inlet for tube ends. The clean-out head shall be secured to the frame by clamp or screw providing an air-tight connection between the head inlet and the tube end. Tube connectors, if furnished, shall provide an air-tight connection between indicating tube and connecting tubing.

3.7.3 Tube. The U-tube shall be borosilicate glass or plastic. Unless otherwise specified (see 6.2), the curved tube shall be cellulose acetate butyrate. The tube shall be free of scratches, bubbles, and fog to permit an unobstructed view of the indicating fluid level and shall withstand a minimum internal pressure of 100 psig. The tube shall be removable without the use of special tools to permit cleaning and replacements. A brush shall be provided for cleaning the tube.

3.7.4 Scale. The scale shall be graduated in linear inches and millimeters and constructed of corrosion-resistant material. The scale shall be adjustable to align the zero mark with the fluid level. The scale marking and background shall non-glare, contrasting colors. The minimum range of the graduated scale for the type, size, and style manometer shall be as indicated in Table II.

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Table II. Minimum graduated scale range.

Type	Style	Size	Range (Inches)	Increments (Inches)	Graduation
I	-	1	15-0-15	0.1 (1)	Arithmetic
I	-	2	5-0-5	0.1 (1)	Arithmetic
II	A	3	0-3	(2)	Logarithmic
II	A	4	0-7	(2)	Logarithmic
II	B	5	(3)	(3)	Arithmetic

- Notes:
- (1) Even graduations. Numerical markings at 1 inch intervals. The distance from the zero index to each 1-inch graduation on the scale shall have a maximum tolerance of 0.025 inches. Each 0.1 inch graduation within each index shall be accurate within 0.010 inches. The accuracy of the graduations shall be determined at a temperature of $80 \pm 5^{\circ}\text{F}$.
 - (2) Logarithmic graduations of 0.01 inch increments from 0 inches to 0.10 inches and 0.1 inch increments above 1 inch. Increments between 0.1 inches and 1 inch shall be determined by the manufacturer.
 - (3) Range and graduations in even increments as specified in 6.2.

3.7.5 Table mounting stand. The table mounting stand shall be constructed of corrosion-resistant metal or metal treated to resist corrosion. Without means for fastening attachment to the table, the stand shall rigidly hold the manometer in a stable, vertical position.

3.7.6 Housing for type II manometers. Unless otherwise specified (see 6.2), the housing shall be plastic.

3.7.7 Reservoir for type II manometers. Unless otherwise specified (see 6.2), the reservoir for holding the indicator fluid shall be brass plated to resist corrosion. Reservoir connections shall be provided O-ring seals to prevent fluid leakage. Adequate means shall be provided to permit tight external connections when plastic tubing is used. Fittings shall be furnished for 1/8 inch nominal pipe size connections.

3.8 Indicator fluid. The type and quantity of indicator fluid to be furnished with each manometer shall be as specified (see 6.2).

3.9 Painting. All surfaces to be painted shall be free of grease, oil, scale, rust, dirt, other extraneous material, and shall be dry. Painting shall be in accordance with MIL-T-704 except as specified herein. Unless otherwise specified (see 6.2), the equipment shall be treated and painted in accordance with the manufacturer's standard commercial practice.

3.10 Identification marking. Equipment, assemblies, and component parts shall be marked for identification in accordance with MIL-STD-130.

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3.11 Instruction handbook. An instruction handbook shall be supplied with each manometer. When specified (see 6.2), the supplier shall furnish the additional quantity of handbooks specified in the contract. The handbook shall contain operating instructions, drawing, illustrations, parts list, and safety precautions to ensure proper operation and maintenance of the manometer. The handbook shall also include a list of indicating fluids for use with the manometer, with the specific gravity and the freezing or congealing point of each fluid and factors for converting scale readings in inches to pressure in psig.

3.11.1 Conversion factor table. A conversion factor table, independent of the instructions handbook, shall be furnished with each manometer. The table shall comprise the conversion factors of 3.11 and shall be imprinted or otherwise indelibly inscribed on a plate or card, suitable for attaching to a surface in the proximity of the manometer.

3.12 Workmanship. Workmanship shall be of the highest grade in accordance with good commercial practice for this type of equipment.

4. VERIFICATION

4.1 Classifications of inspection. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.2)
- b. Conformance inspection (see 4.3)

4.2 First article inspection. First article inspection shall be performed on one of each type, size, and style manometer when a first article sample is required (see 3.2). This inspection shall include the examination of 4.4 and tests of 4.5. The first article may be a standard production item from the supplier's current inventory provided the manometer meets the requirements of this specification and is representative of the design, construction, and manufacturing technique applicable to the remaining manometers to be furnished under the contract.

4.3 Conformance inspection. The conformance inspection shall include the examination of 4.4 and the tests of 4.5.

4.3.1 Inspection lot. A lot shall consist of all manometers of the same type, size, and style offered for delivery to the Government at one time under a specific contract.

4.3.2 Sampling for examination. A random sample of manometers shall be selected from each lot in accordance with inspection level II of ANSI Z1.4.

4.3.3 Sampling for tests. A random sample of manometer shall be selected from each lot in accordance with ANSI Z1.4 at inspection level S-2.

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4.4 Examination. Each sample selected in accordance with 4.3.2 shall be examined for compliance with the requirements specified in section 3 of this specification. This element of inspection shall encompass all visual examinations and dimensional measurements.

4.5 Tests. Each sample shall be tested as specified in 4.5.1 and 4.5.2.

4.5.1 Scale accuracy. The manometer shall be tested in a room having a temperature of $80 \pm 5^{\circ}\text{F}$. The graduated scale of type I manometers shall be checked against a standard measuring device having an accuracy of 0.001 inch at any reading. The distances from the zero index to each 1 inch scale graduation and the 0.1 inch graduation within each 1 inch increment shall be checked to determine compliance with 3.7.4. The type II manometers shall be given a comparable test.

4.5.2 Pressure test. The manometer shall be filled with water and one pressure connection shall be plugged. The other pressure connection shall be attached to a source of air pressure by means of 0.312 inch inside diameter air hose 10 feet in length. The pressure shall be measured using a system with an accuracy of 0.25%. A pressure of 100 psig shall be applied for 10 minutes. During this period, no pressure drop shall be indicated on the gauge. After the test, the manometer shall be examined to determine compliance with 3.6.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The manometers covered by this specification are intended for use in determining positive pressure, vacuum, pressure differentials or, when used with a pitot tube, rate of flow. The manometers may be used as liquid level gauges and for calibration of pressure gauges.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Types, sizes and styles of manometer required (see 1.2)
- c. When table-stand mounting is required for style B (see 3.1.2.2)

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- d. When a first article inspection is required for inspection and approval (see 3.2 and 4.2)
- e. When the curved tube is constructed of different material (see 3.7.3)
- f. Scale ranges, graduations, and increments for style B, size 5 manometers (see 3.7.4)
- g. When the housing for type II manometers is different (see 3.7.6)
- h. When the reservoir for type II manometers is different (see 3.7.7)
- i. The type and quantity of indicator fluid required (see 3.8)
- j. When different treatment and painting is required (see 3.9)
- k. When additional instruction handbooks are required and the number to be furnished (see 3.11)
- l. Packaging requirements (see 5.1).

6.3 Definitions.

6.3.1 Standard commercial product. A standard commercial product is a product which has been or will be sold on the commercial market through advertisements or manufacturer's catalogs or brochures, and represents the latest production model(s).

6.4 Subject term (key word) listing.

Borosilicate glass
Cellulose acetate butyrate

6.5 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians:

Army – AT

Navy – MS

Air Force – 99

Review Activities

Air Force – 71

Army – GL

Preparing Activity:

DLA – GS1

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