Designation: F2045 – 00 (Reapproved 2018)ε1

An American National Standard

Standard Specification for Indicators, Sight, Liquid Level, Direct and Indirect Reading, Tubular Glass/Plastic[1]

This standard is issued under the fixed designation F2045; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

ε[1] NOTE—A key was editorially added to Fig. 1 in January 2018.

1. Scope

1.1 This specification covers the requirements for direct and indirect reading sight liquid level indicators for general applications. General applications for indirect reading sight glasses are water and fuel service at working pressures 2.07 MPa (300 lb/in.^{2}) and below, temperatures of 149°C (300°F) and below. General applications for direct reading sight glasses are applications in which the temperature does not exceed 66°C (150°F).

1.2 Direct reading sight glass indicators may consist of glass or plastic tubes with fittings including shutoff valves. Glass tubes may be used for low shock direct reading sight glass indicators in which the fluid is not compatible with plastic.

1.3 Indirect reading indicators may consist of a sealed chamber with a magnetic float or flag indicator.

1.4 Special requirements for naval shipboard applications are included in the supplement to this standard.

1.5 The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to inch-pound units that are provided for information only and are not considered standard.

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D3951 Practice for Commercial Packaging

2.2 *ANSI Standards:*[3]

B16.5 Pipe Flanges and Flanged Fittings (DoD adopted)

3. Terminology

3.1 *Definitions:*

3.1.1 *SI (Le Systeme International d'Unites) Units*—units of measurement recognized by the CIPM (Comite' International des Poids et Mesures).

4. Design Classification

4.1 *Types*—Indicator designs are classified as either direct reading or indirect reading. Both types are depicted in Fig. 1, complete with dimensions that facilitate ordering.

4.2 *Special Considerations*—Special considerations that may affect selection and installation are listed below. This is not to be construed as a complete listing.

(1) Type of indicator,
(2) Manual or automatic shutoff valves,
(3) Indication length of liquid level range,
(4) Method of connection,
(5) Location of indicator relative to vibrating equipment,
(6) Protection of the instrumentation,
(7) Application of each indicator,
(8) Cleaning procedure or reference to the cleaning procedure being used, and

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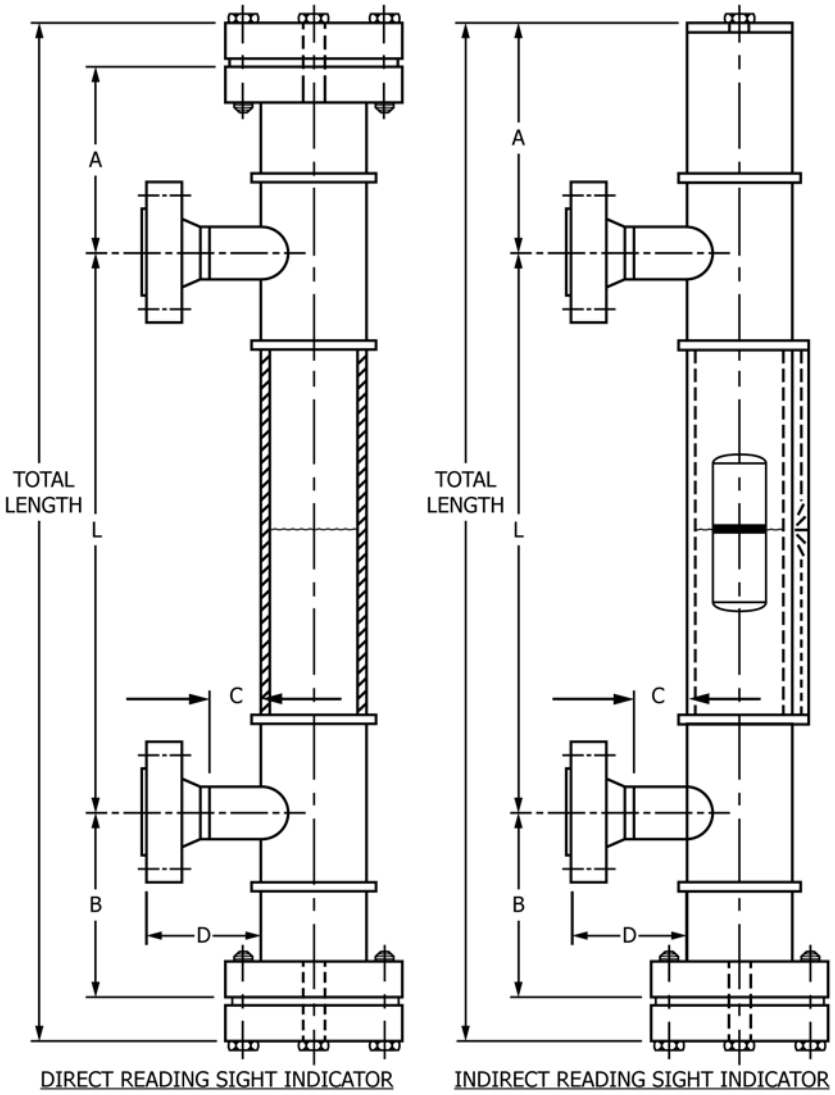
[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.



Dimensions (mm)	
A	Distance between center of top attachment flange face and top of indicator tube
B	Distance between center of bottom attachment flange face and bottom of indicator tube
C	Length of piping between outer tube wall and connection to tank attachment flange
D	Distance between outer tube wall and outer edge of tank attachment flange
L	Distance between center of attachment flange faces

FIG. 1 Indicator Design Types

(9) Selection of indicator for compatibility with materials, temperature, pressure, ambient environment, and with the parameter being measured.

5. Ordering Information

5.1 The buyer shall provide the manufacturer with all of the pertinent application data outlined in the acquisition requirements.

5.2 *Acquisition Requirements*—Acquisition documents shall specify the following:

(1) Title, number, and date of this specification;
(2) Type and quantity of indicators required;
(3) Manufacturer's part number;
(4) When qualification testing is required;
(5) Final disposition of qualification test samples;
(6) Environmental requirements;
(7) Operating media;
(8) Viscosity and specific gravity of fluid for indirect indicators;
(9) Materials;
(10) Indication length;
(11) Size and type of connections;
(12) Shutoff valve requirements;
(13) Cleaning requirements;
(14) When certification is required;
(15) Marking requirements;
(16) Unique packaging requirements; and
(17) Unique preservation requirements.

6. Materials and Manufacture

6.1 *Materials*—The materials for all wetted parts shall be selected for long-term compatibility with the process medium and ambient conditions.

6.2 *Material Inspection*—The manufacturer shall be responsible for ensuring that materials used are manufactured, examined, and tested in accordance with the specifications and standards as applicable.

6.3 *Gaskets and O-Rings*—Gaskets and O-rings shall be fabricated of materials suitable to the operating pressure, temperature, and process medium for each application.

7. Physical Properties

7.1 *Connections*—Sight indicators are usually installed using standard pipe fittings or flanges. Pipe fittings and material should match that of the existing pipe for each installation. Type and size of fittings shall be specified in the acquisition requirements. Welding or brazing shall be performed in accordance with industry standards.

7.2 *Flanged Connections*—Where sight indicators are installed using flanges, flanges shall be in accordance with ANSI B16.5. Standard flange sizes include 1.27 cm (½ in.), 1.9 cm (¾ in.), 2.54 cm (1 in.), 3.8 cm (1-½ in.), and 5.08 cm (2 in.). Standard flange pressure ratings include 1.034 MPa (150 psi), 2.07 MPa (300 psi), and 4.14 MPa (600 psi). Other flange requirements shall be specified in the acquisition requirements.

7.3 *Vent and Drain Connections*—Where required, vent and drain connections are usually plugged, ½- or ¾-in. NPT or with NPT valves. Other vent and drain connections shall be specified in the acquisition requirements.

8. Performance Requirements

8.1 *Performance Considerations*—In many applications, certain performance characteristics are deemed critical to the intended or desired function of a sight liquid level indicator. The following are prime examples:

(1) Accuracy,
(2) Shock and vibration classifications, and
(3) Operating pressure and temperature ranges.

9. Workmanship, Finish, and Appearance

9.1 *Finish and Appearance*—Any special surface finish and appearance requirements shall be specified in the acquisition requirements.

9.2 *Sight Glass Cleaning*—Any special cleaning requirements shall be specified in the acquisition requirements.

10. Inspection

10.1 *Classification of Inspections*—The inspection requirements specified herein are classified as follows:

(1) Qualification testing and
(2) Quality conformance testing.

10.2 *Qualification Testing*—Qualification test requirements shall be specified where applicable. Qualification test methods should be identified for each design and performance characteristic specified. Test report documentation requirements should also be specified.

10.3 *Quality Conformance Testing*—Quality conformance testing is accomplished when qualification testing was satisfied by a previous acquisition or product has demonstrated reliability in similar applications. Quality conformance testing is usually less intensive than qualification, often verifying that samples of a production lot meet a few critical performance requirements.

11. Number of Tests and Retests

11.1 *Test Specimen*—The number of test specimens to be subjected to qualification testing shall depend on the design. If each range is covered by a separate and distinct design, a test specimen for each range will require testing. In instances in which a singular design series may cover multiple ranges and types, only three test specimens need be tested provided the physical similarities are approved by the buyer. In no case, however, shall less than three units, one unit each representing low, medium, and high ranges, be tested, regardless of design similarity.

12. Test Methods

12.1 *Tests*—All tests shall be performed in accordance with ASTM, ASME, or industry standards as specified.

12.2 *Test Data*—All test data shall remain on file at the manufacturer's facility for review by the buyer upon request. It is recommended that test data be retained in the manufacturer's files for at least three years or a period of time acceptable to the buyer and manufacturer.

13. Quality Assurance Provisions

13.1 *Warranty*—Unless otherwise specified, the manufacturer is responsible for the following:

(1) All materials used to produce a unit and
(2) Manufacturer will warrant his product to be free from defect of workmanship to produce the unit.

14. Certification

14.1 When specified in the purchase order or contract, the buyer shall be furnished certification that samples representing each lot have been either tested or inspected as directed in this specification and the requirements have been met. When specified in the purchase order or contract, a report of the test results shall be furnished.

15. Product Marking

15.1 User-specified product marking shall be listed in the acquisition requirements.

16. Packaging and Package Marking

16.1 *Packaging of Product for Delivery*—Product shall be packaged for shipment in accordance with Practice D3951.

16.2 Any special preservation, packaging, or package marking requirements for shipment or storage shall be identified in the acquisition requirements.