ANSI/AWWA C700-09
(Revision of ANSI/AWWA C700-02)

American Water Works Association

The Authoritative Resource on Safe Water®

AWWA Standard

Cold-Water Meters—Displacement Type, Bronze Main Case

Effective date: Nov. 1, 2009.
First edition approved by AWWA Board of Directors June 9, 1921.
This edition approved Jan. 25, 2009.
Approved by American National Standards Institute Sept. 11, 2009.

6666 West Quincy Avenue
Denver, CO 80235-3098
T 800.926.7337
www.awwa.org

Advocacy
Communications
Conferences
Education and Training
Science and Technology
Sections

AWWA Standard

This document is an American Water Works Association (AWWA) standard. It is not a specification. AWWA standards describe minimum requirements and do not contain all of the engineering and administrative information normally contained in specifications. The AWWA standards usually contain options that must be evaluated by the user of the standard. Until each optional feature is specified by the user, the product or service is not fully defined. AWWA publication of a standard does not constitute endorsement of any product or product type, nor does AWWA test, certify, or approve any product. The use of AWWA standards is entirely voluntary. This standard does not supersede or take precedence over or displace any applicable law, regulation, or codes of any governmental authority. AWWA standards are intended to represent a consensus of the water supply industry that the product described will provide satisfactory service. When AWWA revises or withdraws this standard, an official notice of action will be placed on the first page of the classified advertising section of *Journal AWWA*. The action becomes effective on the first day of the month following the month of *Journal AWWA* publication of the official notice.

American National Standard

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. An American National Standard is intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of an American National Standard does not in any respect preclude anyone, whether that person has approved the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standard. American National Standards are subject to periodic review, and users are cautioned to obtain the latest editions. Producers of goods made in conformity with an American National Standard are encouraged to state on their own responsibility in advertising and promotional materials or on tags or labels that the goods are produced in conformity with particular American National Standards.

CAUTION NOTICE: The American National Standards Institute (ANSI) approval date on the front cover of this standard indicates completion of the ANSI approval process. This American National Standard may be revised or withdrawn at any time. ANSI procedures require that action be taken to reaffirm, revise, or withdraw this standard no later than five years from the date of publication. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036; (212) 642-4900.

Committee Personnel

The AWWA Subcommittee on Displacement-Type Meters, Bronze Main Case, which developed this standard, had the following personnel at the time:

Michael J. Kebles, *Chair*

J.W. Benson, Memphis Light, Gas and Water, Memphis, Tenn. (AWWA)
T. Butler, Actaris Metering Systems, Greenwood, S.C. (AWWA)
M. Cole, Infinity Metering Company Inc., Ocala, Fla. (AWWA)
G.H. De Jarlais, Badger Meter Inc., Milwaukee, Wis. (AWWA)
D. Faber, Badger Meter Inc., Tulsa, Okla. (AWWA)
J.R. Grabinski, Dallas Water Utilities, Dallas, Texas (AWWA)
R.C. Graff, Poway, Calif. (AWWA)
M.J. Kebles, Las Vegas Valley Water District, Las Vegas, Nev. (AWWA)
D.J. Kullmann, Neptune Technology Group Inc., Marietta, Ga. (AWWA)
L.E. Simmonds, Lafayette, Calif. (AWWA)
S. Swanson, Sensus Metering Systems, Uniontown, Pa. (AWWA)
T. Swinson, Neptune Technology Group, Tallassee, Ala. (AWWA)

The AWWA Standards Committee on Water Meters, which reviewed and approved this standard, had the following personnel at the time of approval:

Michael J. Kebles, *Chair*

General Interest Members

F.S. Kurtz,* Standards Engineer Liaison, AWWA, Denver, Colo. (AWWA)
E.N. Olson,* Standards Council Liaison, Brown and Caldwell, Gold Hill, Ore. (AWWA)
F.S. Salser Jr., Floyd S. Salser Jr. & Associates, Ocala, Fla. (AWWA)
R. San Giacomo, R&D Engineering P.C., Orchard Park, N.Y. (AWWA)

* Liaison, nonvoting

Producer Members

G.H. De Jarlais,* Badger Meter Inc., Milwaukee, Wis.	(AWWA)
D. Faber, Badger Meter Inc., Tulsa, Okla.	(AWWA)
L.W. Fleury Jr., Mueller Group, Smithfield, R.I.	(AWWA)
R.N. Koch, Master Meter Inc., Pittsburgh, Pa.	(AWWA)
D.J. Kullmann, Neptune Technology Group Inc., Marietta, Ga.	(AWWA)
M. Laird, Metron–Farnier, Boulder, Colo.	(AWWA)
J. Panek,* McCrometer Inc., Rowley, Iowa	(AWWA)
D.C. Pinney, Sensus Technologies Inc., Uniontown, Pa.	(AWWA)
J. Potter,* Master Meter Inc., Mansfield, Texas	(AWWA)
M. Shamley,* Metron–Farnier, Boulder, Colo.	(AWWA)
T. Swinson,* Neptune Technology Group Inc., Tallassee, Ala.	(AWWA)
M.A. Thomas,* Hersey Meters, Cleveland, N.C.	(AWWA)
G.M. Voss, McCrometer Inc., Hemet, Calif.	(AWWA)

User Members

M.L. Aigen, Boston Water and Sewer Commission, Roxbury, Mass.	(NEWWA)
J. Alongi, Kansas City Water Services Department, Kansas City, Mo.	(AWWA)
W.M. Garfield, Arizona Water Company, Phoenix, Ariz.	(AWWA)
J.R. Grabinski, Dallas Water Utilities, Dallas, Texas	(AWWA)
R.C. Graff, Poway, Calif.	(AWWA)
D. Griffin, City of Winnipeg, Winnipeg, Man.	(AWWA)
M.J. Kebles, Las Vegas Valley Water District, Las Vegas, Nev.	(AWWA)
T.A. Kelly, Washington Suburban Sanitary Commission, Laurel, Md.	(AWWA)
J.A. Novak, Milwaukee Water Works, Milwaukee, Wis.	(AWWA)
G.E. Raymond, Water Distribution–Meter Services, Los Angeles, Calif.	(AWWA)
S. Solotoff, Miami–Dade Water and Sewer, Miami, Fla.	(AWWA)
J.H. Standi Jr., Golden State Water Company, Fontana, Calif.	(AWWA)

* Alternate

Contents

All AWWA standards follow the general format indicated subsequently. Some variations from this format may be found in a particular standard.

This page intentionally blank.

Foreword

This foreword is for information only and is not part of ANSI/AWWA C700.

I. Introduction.

I.A. *Background.* For the past century, no tool available to water utilities has played a greater part in the conservation of water than the water meter. It has reduced waste and distributed the cost of operating a water system in the most equitable manner possible.

Although patents were issued earlier, it is thought that the first meter produced in the United States was made in 1857. It was a positive-displacement type with reciprocating pistons. This design consisted of two cylinders and pistons with inlet and outlet ports arranged so that while water in one cylinder was discharging, the other was filling. Water flowing through the meter was subject to pulsation and high friction loss. Other types of displacement meters manufactured before the turn of the 20th century were the rotary piston, oscillating piston, and nutating disc. Only the oscillating and nutating types remain in production today, as they have proved satisfactory for metering domestic water services.

I.B. *History.* Standardization of water meters was a matter of concern for many years before the first standard was adopted. An AWWA committee appointed in 1913 proposed the adoption of standards on overall meter lengths and connections in 1915 and 1916.

The standards were not adopted officially but were recorded in the proceedings for 1915* and for 1916.†

The New England Water Works Association (NEWWA), in separate action, appointed a committee in 1916 that produced drafts of standards in 1917. Action on adoption or publication was delayed on the recommendation of manufacturers.

In 1916, the meter manufacturers, who for several years had worked informally on the matter of meter standards, formally organized a meter standards committee on which most of the meter manufacturers were represented. The records indicate that those who were not represented were kept informed of the committee's activities and given the opportunity to comment on drafts of proposed standards.

* AWWA Proceedings 35th Year, *Journal of the American Water Works Association*, 3:283 (1915).
† AWWA Proceedings 36th Year, *Journal of the American Water Works Association*, 2:690 (1916).

On Mar. 9–10, 1920, the AWWA and NEWWA committees met for the first time as a joint committee to review drafts of a proposed standard that had been prepared by the manufacturers' committee. Subcommittees appointed at that meeting prepared a final draft that was approved by the joint committee and submitted to both associations for approval. AWWA adopted the standard on June 9, 1921, and NEWWA adopted it on Sept. 14, 1921. The standard, the first for any type of meter, was titled "Standard Specifications for Cold-Water Meters, Disc Type."

The first revision of the standard was approved as tentative by AWWA on Oct. 31, 1941. The effective date of the standard was delayed until Jan. 1, 1943. On Mar. 15, 1943, it was approved by NEWWA. The document was advanced from tentative to standard by AWWA on May 10, 1946.

Emergency alternative provisions were imposed by the War Production Board from Dec. 1, 1942, to Jan. 8, 1945. Emergency provisions were imposed again on Jan. 1, 1952.

The next edition of the standard was approved by AWWA as tentative on Jan. 23, 1961, and was later advanced to standard without revision on Feb. 11, 1964, and subsequently revised on Jan. 24, 1971, May 8, 1977, Jan. 28, 1990, June 17, 1995, and June 16, 2002. This edition was approved on Jan. 25, 2009.

I.C. *Acceptance.* In May 1985, the US Environmental Protection Agency (USEPA) entered into a cooperative agreement with a consortium led by NSF International (NSF) to develop voluntary third-party consensus standards and a certification program for direct and indirect drinking water additives. Other members of the consortium included the American Water Works Association Research Foundation (AwwaRF) and the Conference of State Health and Environmental Managers (COSHEM). The American Water Works Association (AWWA) and the Association of State Drinking Water Administrators (ASDWA) joined later.

In the United States, authority to regulate products for use in, or in contact with, drinking water rests with individual states.* Local agencies may choose to impose requirements more stringent than those required by the state. To evaluate the health effects of products and drinking water additives from such products, state and local agencies may use various references, including

1. An advisory program formerly administered by USEPA, Office of Drinking Water, discontinued on Apr. 7, 1990.
2. Specific policies of the state, provincial, or local agency.

* Persons outside the United States should contact the appropriate authority having jurisdiction.

3. Two standards developed under the direction of NSF, NSF*/ANSI† 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI 61, Drinking Water System Components—Health Effects.

4. Other references, including AWWA standards, *Food Chemicals Codex*, *Water Chemicals Codex*,‡ and other standards considered appropriate by the state or local agency.

Various certification organizations may be involved in certifying products in accordance with NSF/ANSI 61. Individual states or local agencies have authority to accept or accredit certification organizations within their jurisdiction. Accreditation of certification organizations may vary from jurisdiction to jurisdiction.

Annex A, "Toxicology Review and Evaluation Procedures," to NSF/ANSI 61 does not stipulate a maximum allowable level (MAL) of a contaminant for substances not regulated by a USEPA final maximum contaminant level (MCL). The MALs of an unspecified list of "unregulated contaminants" are based on toxicity testing guidelines (noncarcinogens) and risk characterization methodology (carcinogens). Use of Annex A procedures may not always be identical, depending on the certifier.

ANSI/AWWA C700 does not address additives requirements. Thus, users of this standard should consult the appropriate state or local agency having jurisdiction in order to

1. Determine additives requirements, including applicable standards.

2. Determine the status of certifications by parties offering to certify products for contact with, or treatment of, drinking water.

3. Determine current information on product certification.

II. Special Issues.

II.A. *Fire Flow.* The meters described in this standard are not designed to be used in water service piping intended to extinguish fire. Requirements for residential fire service products and combined residential domestic/fire service products are currently being developed as part of a different ANSI/AWWA Water Meter standard.

III. Use of This Standard. It is the responsibility of the user of an AWWA standard to determine that the products described in that standard are suitable for use in the particular application being considered.

* NSF International, 789 North Dixboro Road, Ann Arbor, MI 48105.

† American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

‡ Both publications available from National Academy of Sciences, 500 Fifth Street, N.W., Washington, DC 20001.

III.A. *Purchaser Options and Alternatives.* This standard provides for several options and alternatives that purchasers must designate if they wish to exercise the options or if they have a preference among the alternatives. Also, several items must be specified by purchasers to describe completely the type, size, and quantity of meters required. All such items, options, and alternatives are summarized in the following itemized list. Purchasers should review each one and then make the appropriate provisions in their specifications to describe specific requirements.

1. Standard used—that is, ANSI/AWWA C700, Cold-Water Meters—Displacement Type, Bronze Main Case, of latest revision.

2. Statement by the purchaser whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is to be required, in addition to the requirements of the Safe Drinking Water Act.

3. If meters are to be furnished with nutating discs or oscillating pistons (Sec. 1.1), and if there is a preference.

4. Details of other federal, state or provincial, and local requirements (Sec. 4.1).

5. If meters are to be furnished with cast-iron, stainless-steel, copper alloy, or suitable engineering plastic top or bottom covers (Sec. 4.1.9), and if there is a preference.

6. If corrosion protection is required for cast-iron, frost-protection covers (Sec. 4.1.9.1 and 4.2.5), and if there is a preference.

7. Size of meter (Sec. 4.2.1 and Tables 1 and 2) and quantity required.

8. Modifications of test specifications (Sec. 4.2.8), if operating water temperature will exceed 80°F (27°C).

9. If meters in sizes ½ in. (13 mm) through 1 in. (25 mm) are to be of split-case or frost-protection-type design (Sec. 4.3.1.1).

10. If ½-in. (13-mm), ½-in. × ¾-in. (13-mm × 20-mm), ⅝-in. (15-mm), ⅝-in. × ¾-in. (15-mm × 20-mm), ¾-in. (20-mm), and 1-in. (25-mm) meters are to be furnished with coupling nuts and tailpieces (Sec. 4.3.2.1), and whether tailpieces are to be of a copper alloy or a suitable engineering plastic (Sec. 4.1.11).

11. If 1½-in. (40-mm) and 2-in. (50-mm) meters are to be furnished with flanged ends or threaded (spud) ends (Sec. 4.3.2.2).

12. If flanged meters are to be furnished with companion flanges, gaskets, bolts, and nuts (Sec. 4.3.2.2), and whether companion flanges are to be of a copper alloy, cast iron, or suitable engineering plastic (Sec. 4.1.12).

13. Details of register (Sec. 4.3.3) to be furnished, where there is a preference, with regard to the following:

a. If the registers shall be read in US gallons, cubic feet, or cubic meters.

b. If the registers shall be permanently sealed against the disassembly of the gear train, or have replaceable change gears.

14. If a direct-reading remote register or an encoder-type remote register is required (Sec. 4.3.3.5), specify in detail.

15. If warranty requirements will be specified (Sec. 5.1.1).

16. If an affidavit of compliance (Sec. 6.3) and certificate of testing for accuracy (Sec. B.3.3) are required.

17. If the size of individual meters will be permanently marked on the register dial face (Sec. 6.1).

18. Special materials required, if any, to resist corrosion if water is highly aggressive (Sec. B.5.3).

III.B. *Modification to Standard.* Any modifications to the provisions, definitions, or terminology in this standard must be provided by the purchaser.

IV. Major Revisions. Major revisions made to the standard in this edition include the following:

1. Fire-flow meter use has been clarified (Sec. II.A).
2. New text has been added to number-wheel numerals (Sec. 4.3.3.2).
3. Mechanism details section has been removed (Sec. 4.3.3.3).
4. A footnote to safe maximum operating capacity has been added (Table 1, p. 9).
5. Text has been added to register dial type (Sec. B.2).
6. The time that the test pressure is to be applied has been added to pressure tests (Sec. B.3.2).

V. Comments. If you have any comments or questions about this standard, please call the AWWA Volunteer and Technical Support Group at 303.794.7711, FAX at 303.795.7603, write to the group at 6666 West Quincy Avenue, Denver, CO 80235-3098, or e-mail the group at standards@awwa.org.

This page intentionally blank.

ANSI/AWWA C700-09
(Revision of ANSI/AWWA C700-02)

American Water Works Association

AWWA Standard

Cold-Water Meters—Displacement Type, Bronze Main Case

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes the various types and classes of cold-water displacement meters with bronze main cases, in sizes ½ in. (13 mm) through 2 in. (50 mm), and the materials and workmanship employed in their fabrication. The displacement meters described, known as nutating-disc or oscillating-piston meters, are positive in action because the pistons and discs displace or carry over a fixed quantity of water for each nutation or oscillation when operated under positive pressure.

Sec. 1.2 Purpose

The purpose of this standard is to provide the minimum requirements for cold-water meters—displacement type, bronze main case, including materials and design.

Sec. 1.3 Application

This standard can be referenced in specifications for purchasing and receiving cold-water meters—displacement type, bronze main case. This standard can be used as a guide for manufacturing this type of meter. The stipulations of this standard apply when this document has been referenced and only to cold-water meters—displacement type, bronze main case.