ANSI/AWWA **C710-20**

*(Revision of ANSI/AWWA C710-15)*

AWWA Standard

# Cold-Water Meters—Displacement Type, Plastic Main Case



**Effective date: Nov. 1, 2020.**
First edition approved by Board of Directors Jan. 25, 1988.
This edition approved April 20, 2020.
Approved by American National Standards Institute March 24, 2020.

American Water Works Association

Approved American National Standard ANSI

STANDARD Since 1881

## 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 code of any governmental authority. AWWA standards are intended to represent a consensus of the water industry that the product described will provide satisfactory service. When AWWA revises or withdraws this standard, an official notice of action will be placed in the Official Notice 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 ANSI approval. 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; or emailing info@ansi.org.



ISBN-13, print: 978-1-64717-0[illegible]-5

ISBN-13, electronic: 978-1-61300-569-9

DOI: http://dx.doi.org/10.12999/AWWA.C710.20

# Committee Personnel

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

Don Faber, *Chair*

M.J. Aragon, Denver Water, Denver, Colo.
R.A. Barillas, Badger Meter, Milwaukee, Wis.
T.D. Bianchi, Neptune Technology Group Inc., Tallassee, Ala.
J. Conover Jr., City of Sacramento, Sacramento, Calif.
G.H. De Jarlais, Badger Meter, Milwaukee, Wis.
D.J. Devane, Zenner USA, Leeds, Ala.
D. Faber, Faber & Associates, Columbus, Ind.
R.C. Graff, Poway, Calif.
L. Gregory, RG3 Meter Company, Longview, Tex.
A. Hendey Sr., Hendey Meter, Beaumont, Calif.
B. Hildebrand, Carlon Meter Inc., Grand Haven, Mich.
M.C. Johnson, Utah Water Research Laboratory, Utah State University, Logan, Utah
R.N. Koch, Master Meter Inc., Pittsburgh, Pa.
A. Land, Dallas Water Utilities, Dallas, Tex.
J.A. McCraven, Mueller Systems, Cleveland, N.C.
K.C. Molli, Veolia Water North America, Chicago, Ill.
J.E. Pintok, RG3 Meter Company, Lake Mary, Fla.
J.A. Reiss, Elster AMCO Water LLC, Ocala, Fla.
J.R. Scarborough III, Neptune Technology Group Inc., Tallassee, Ala.
R. Sloan, Birmingham Water Works Board, Birmingham, Ala.
T. Smith, Sensus, Morrisville, N.C.
S.M. Swanson, Sensus, Uniontown, Pa.
M.A. Thomas, Mueller Systems, Cleveland, N.C.
W.J. Vetter, Master Meter Inc., Mansfield, Tex.
A.M. Watson, Elster AMCO Water LLC, Ocala, Fla.

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

Thomas A. Kelly Jr., *Chair*
Michael L. Mastic, *Secretary*

*General Interest Members*

J.E. Cray, Wright-Pierce, Andover, Mass.
A. Dabak, Texas Instruments, Dallas, Tex.
D. Faber, Faber & Associates, Columbus, Ind.
R.C. Graff, Poway, Calif.
J.G. Gunn (*alternate*), Johnson Controls Inc., Victor, N.Y.
C.C. Hannah, Johnson Controls Inc., Lubbock, Tex.
D.E. Hood, M.E. Simpson Company Inc., Valparaiso, Ind.
A.M. Horbovetz (*alternate*), M.E. Simpson Company Inc., Valparaiso, Ind.
M.C. Johnson, Utah Water Research Laboratory, Utah State University, Logan, Utah
F.S. Kurtz (*liaison, nonvoting*), Standards Engineer Liaison, AWWA, Denver, Colo.
M.L. Mastic, MARS Company, Ocala, Fla.
R.A. Richter, National Institute of Standards and Technology, Gaithersburg, Md.
S. Thakurdesai (*alternate*), Texas Instruments, Dallas, Tex.

*Producer Members*

F.J. Begale (*alternate*), Badger Meter, Milwaukee, Wis.
T.D. Bianchi, Neptune Technology Group Inc., Tallassee, Ala.
C. Brunson (*alternate*), Neptune Technology Group Inc., Tallassee, Ala.
D. Casper (*alternate*), Mueller Systems, Cleveland, N.C.
M.D. Cole, Meter Technology Werks, Tampa, Fla.
G.H. De Jarlais, Badger Meter, Milwaukee, Wis.
D.J. Devane, Zenner USA, Leeds, Ala.
L. Gregory (*alternate*), RG3 Meter Company, Longview, Tex.
A. Hendey Sr., Hendey Meter, Beaumont, Calif.
R.T. Koch, Master Meter Inc., Pittsburgh, Pa.
M. Laird (*alternate*), Metron-Farnier LLC, Boulder, Colo.
J.A. McCraven, Mueller Systems, Cleveland, N.C.
J. Pintok, RG3 Meter Company, Lake Mary, Fla.
J.A. Reiss (*alternate*), Elster AMCO Water LLC, Ocala, Fla.

M. Shamley, Metron-Farnier LLC, Boulder, Colo.
T. Smith (*alternate*), Sensus, Morrisville, N.C.
S.M. Swanson, Sensus, Uniontown, Pa.
W.J. Vetter (*alternate*), Master Meter Inc., Mansfield, Tex.
A.M. Watson, Elster AMCO Water LLC, Ocala, Fla.

*User Members*

M.J. Aragon, Denver Water, Denver, Colo.
M.C. Bowen, City of Columbus, Division of Water, Columbus, Ohio
J. Conover Jr., City of Sacramento, Sacramento, Calif.
W.F. Dunnill, Consolidated Utility District of Rutherford County, Murfreesboro, Tenn.
W.M. Garfield, Arizona Water Company, Phoenix, Ariz.
G.M. Gehringer, City of Philadelphia, Philadelphia, Pa.
D. Griffin, City of Winnipeg Water and Waste Department, Winnipeg, Man.
P.A. Hayes, Mammoth Community Water District, Mammoth Lakes, Calif.
D.M. Hill, American Water, Voorhees, N.J.
N.D. Kaufman, Truckee Donner Public Utility District, Truckee, Calif.
T.A. Kelly Jr., Washington Suburban Sanitary Commission, Laurel, Md.
A. Land, Dallas Water Utilities, Dallas, Tex.
S.U. Mills-Wright (*liaison, nonvoting*), Standards Council Liaison, Dallas Water Utilities, Dallas, Tex.
R. Molhoek, Desert Water Agency, Palm Springs, Calif.
K.C. Molli, Veolia Water North America, Chicago, Ill.
J.A. Novak, Milwaukee Water Works, Milwaukee, Wis.
R. Sloan, Birmingham Water Works Board, Birmingham, Ala.
D. Strub, Austin Water Utility, Austin, Tex.

# Contents

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

# Foreword

*This foreword is for information only and is not a part of ANSI*/AWWA C710.*

## I. Introduction.

I.A. *Background*. Material goods molded from plastics have been a part of everyday life for many decades, but in the early 1960s, a new group of plastics better suited to meet more demanding applications was discovered. These materials have greatly improved properties, such as strength and stiffness, and are known as *engineering plastics*. With the introduction of this new class of plastics, engineers were able to achieve design objectives that previously had seemed almost beyond reach.

The water meter industry as a whole began underwriting experiments with plastic materials as far back as the 1950s. From 1963 to 1968, two principal research programs were sponsored by the meter suppliers under the auspices of the American Water Works Association (AWWA) at the Armour Research Institute, Chicago, and later at Columbia University, New York City. These programs primarily focused on plastic meter main-case designs and materials.

Plastic material research in the water meter industry has paid great dividends and has resulted in the design of many meter components from engineering plastics. Significant improvements, such as corrosion resistance, dimensional stability, self-lubrication, low mass, and superior surface finishes, have resulted in improved meter accuracies with longer life.

When designing meter components from plastic, today's engineer has a choice of thousands of plastic compound formulations. Although many plastics appear identical, there are often vast differences in their physical properties, and it takes considerable know-how to select the one best suited for a particular application. In addition, plastics used in water meter design often contain various enhancing or reinforcing agents to give components greater rigidity, strength, and dimensional stability.

I.B. *History*. The extensive use of plastic in the design of plastic water meter parts was recognized in the Jan. 24, 1971, revision of ANSI/AWWA C700, Cold-Water Meters—Displacement Type, Bronze Main Case. The use of synthetic polymers as an alternative material for all parts except the main case was one of the major revisions.

At the 1972 AWWA annual convention, the first domestic positive-displacement water meter with a plastic main case (rather than the traditional bronze main case) was

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

introduced. During the next 10 years, three more meter suppliers introduced plastic main-case meters.

The subject of plastic main-case materials not meeting the current standard was discussed at the 1974 meeting of the AWWA Meter Standards Committee. The committee chairman stated that the manufacturers of these meters should initiate a request for change at the next revision.

The revision of ANSI/AWWA C700 in 1977 did not include synthetic polymers as an alternative main-case material because the subcommittee could not reach agreement. The subject was tabled to be considered at the next revision in 1982. Between 1982 and 1985, revising ANSI/AWWA C700 to include synthetic polymers as a main-case alternative became an issue. To resolve this controversy, an ad hoc committee was appointed by the Standards Council. A March 4, 1985, ad hoc committee report recommended that the Standards Council direct the Water Meter Committee to "appoint a new subcommittee … to develop a new standard for displacement-type water meters with plastic main cases, including consideration of appropriate allowable nutation speed for this type of meter." This recommendation was accepted by the Standards Council in June 1985.

Because of the diversity of available materials and the continual development of new and improved materials, this standard will not specify any one material but will use the term *suitable engineering plastic*. For reference purposes only, typical materials used presently for water meter designs are found in ASTM[†] specifications are cited.

The first edition of ANSI/AWWA C710 was approved by the AWWA Board of Directors Jan. 25, 1988. Subsequent editions were approved on Jan. 28, 1990; June 17, 1995; June 16, 2002; Jan. 25, 2009; and Jan. 24, 2015. This edition was approved on April 20, 2020.

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 original consortium included the Water Research Foundation (formerly AwwaRF) and the Conference of State Health and Environmental Managers (COSHEM). AWWA and the Association of State Drinking Water Administrators (ASDWA) joined later.

[†] ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

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. Specific policies of the state, provincial, or local agency.
2. Two standards developed under the direction of NSF:[§] NSF/ANSI/CAN[¶] 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI 61, Drinking Water System Components—Health Effects.
3. 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/CAN 61. Individual states or local agencies have authority to accept or accredit certification organizations within their jurisdictions. Accreditation of certification organizations may vary from jurisdiction to jurisdiction.

Annex A, "Toxicology Review and Evaluation Procedures," to NSF/ANSI/CAN 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.

In an alternative approach to inadvertent drinking water additives, some jurisdictions (including California, Louisiana, Maryland, and Vermont, at the time of this writing) are calling for reduced lead limits for materials in contact with potable water. Various third-party certifiers have been assessing products against these lead content criteria, and a new ANSI-approved national standard, NSF/ANSI 372, Drinking Water System Components—Lead Content, was published in 2010.

On Jan. 4, 2011, legislation was signed revising the definition for "lead free" within the Safe Drinking Water Act (SDWA) as it pertains to "pipe, pipe fittings, plumbing fittings, and fixtures." The changes went into effect on Jan. 4, 2014. In brief, the new

[‡] Persons outside the United States should contact the appropriate authority having jurisdiction.
[§] NSF International, 789 North Dixboro Road, Ann Arbor, MI 48105.
[¶] Standards Council of Canada, 55 Metcalfe Street, Suite 600, Ottawa, ON K1P 6L5 Canada.
** Both publications available from National Academy of Sciences, 500 Fifth Street, NW, Washington, DC 20001.

provisions to the SDWA require that these products meet a weighted average lead content of not more than 0.25 percent.

ANSI/AWWA C710 does not address additives requirements. 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. *Materials*. The materials section of this standard recognizes the advances that have been made in the development of nonmetallic materials for water meter construction. Plastic materials are currently being used successfully for water meter components, and because of the continual development of new and improved materials, this standard does not require any one specific material but cites examples of materials defined by ASTM specifications typically used at this time in the construction of water meters by manufacturers.

II.B. *Fire Flow*. The meters described in this standard are not designed to be used in water service piping intended to extinguish fire. Requirements for meters used for residential fire sprinkler applications that meet the requirements of NFPA* 13D in single- and two-family dwellings and manufactured homes, sizes ¾ in. (20 mm) through 2 in. (50 mm), are found in ANSI/AWWA C714.

II.C. *Chlorine and Chloramine Degradation of Elastomers.* The selection of materials is critical for water service and distribution piping in locations where there is a possibility that elastomers will be in contact with chlorine or chloramines. Documented research has shown that elastomers such as gaskets, seals, valve seats, and encapsulations may be degraded when exposed to chlorine or chloramines. The impact of degradation is a function of the type of elastomeric material, chemical concentration, contact surface area, elastomer cross section, environmental conditions as well as temperature. Careful selection of and specifications for elastomeric materials and the specifics of their application for each water system component should be considered to provide long-term usefulness and minimum degradation (swelling, loss of elasticity, or softening) of the elastomer specified.

*National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

**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.

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 the purchaser's specifications to describe specific requirements.

1. Standard used—that is, ANSI/AWWA C710, Cold-Water Meters—Displacement Type, Plastic Main Case, of latest revision.

2. Whether compliance with NSF/ANSI/CAN 61, Drinking Water System Components—Health Effects; NSF/ANSI 372, Drinking Water System Components—Lead Content; or an alternative lead content criterion is required.

3. Special materials required, if any, to resist corrosion if water is highly aggressive.

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

5. Details of federal, state, and local requirements (Sec. 4.1).

6. 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), 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) (Sec. B.4.2).

9. 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).

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

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

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

11. If a direct-reading remote register or an encoder-type remote register is required (Sec. 4.3.3), specify in detail.

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

13. If the size of individual meters will be permanently marked on the register dial face (Sec. 4.4).

14. If an affidavit of compliance (Sec. 6.2) and certificate of testing for accuracy (Sec. B.2.3) are required.

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. Guidance on selection of materials in terms of chlorine and chloramine degradation of elastomers has been provided in the foreword (Sec. II.C).

2. The requirements for register accuracy at the minimum flow rate has been modified (Sec. 4.2.8.2).

3. Reference to ANSI/AWWA C706 on Direct Reading, Remote Registration Systems for Cold Water Meters has been removed (Sec. 4.3.3.4). (ANSI/AWWA C706 was withdrawn as an AWWA standard in 2015.)

4. Provisions for meter marking have been moved from Sec. 6.1 to Sec. 4.4. (The content of the requirements is unchanged.)

**V. Comments.** If you have any comments or questions about this standard, please call AWWA Engineering and Technical Services at 303.794.7711; FAX at 303.795.7603; write to the department at 6666 West Quincy Avenue, Denver, CO 80235-3098; or email at standards@awwa.org.

ANSI/AWWA C710-20
(Revision of ANSI/AWWA C710-15)

American Water Works Association
*Dedicated to the World's Most Important Resource®*

AWWA Standard

# Cold-Water Meters—Displacement Type, Plastic Main Case

## SECTION 1: GENERAL

### Sec. 1.1 Scope

This standard describes the various types and classes of cold-water displacement meters with plastic main cases, in sizes ½ in. (13 mm) through 1 in. (25 mm), for water utility customer service, 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, plastic 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, plastic main case. This standard can be used as a guide for manufacturing this type of meter. The stipulations of this