



Member of the FM Global Group

**Examination Standard
for
Water Flow Detector Testers
1 in. Through 8 in.
Nominal Size**

Class Number 1043

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Foreword

This standard is intended to verify that the products and services described will meet stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of this standard is to present the criteria for examination of various types of products and services.

Examination in accordance with this standard shall demonstrate compliance and verify that quality control in manufacturing shall ensure a consistent and reliable product.

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1. INTRODUCTION

1.1 Purpose

- 1.1.1 This standard states testing and certification requirements for water flow detector testers for use in wet pipe sprinkler systems, for both new installations, and for retro-fit applications.
- 1.1.2 Testing and certification criteria may include performance requirements, marking requirements, examination of manufacturing facility(ies), audit assurance procedures, and a surveillance program.

1.2 Scope

- 1.2.1 This standard encompasses the design and performance requirements for 1 inch through 8 inch nominal size water flow detector testers. In cases where metric sized products are to be examined for certification, test criteria comparable to the equivalent or nearest nominal size shall be used.
- 1.2.2 This standard encompasses both traditional mechanical type water flow detector testers (where the water flow detectors are tested by the passage of water past the vane), and electrical style (where the water flow past the water flow detector is electrically simulated).

1.3 Basis for Requirements

- 1.3.1 The requirements of this standard are based on experience, research and testing, and/or the standards of other organizations. The advice of manufacturers, users, trade associations, jurisdictions and loss control specialists may also be considered.
- 1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of water flow detector testers for the purpose of obtaining certification.

1.4 Basis for Certification

Certification is based upon satisfactory evaluation of the product and the manufacturer in the following major areas:

- 1.4.1 Examination and tests on production samples shall be performed to evaluate:
- the suitability of the product;
 - the performance of the product as specified by the manufacturer and required for certification;
 - the durability and reliability of the product.
- 1.4.2 An examination of the manufacturing facilities and audit of quality control procedures may be conducted to evaluate the manufacturer's ability to consistently produce the product, which is examined and tested, and the marking procedures used to identify the product. Subsequent surveillance may be required by the certification agency in accordance with the certification scheme to ensure ongoing compliance.

1.5 Basis for Continued Certification

The basis for continual certification may include the following based upon the certification scheme and requirements of the certification agency:

- production or availability of the product as currently certified;
- the continued use of acceptable quality assurance procedures;

- compliance with the terms stipulated by the certification;
- satisfactory re-examination of production samples for continued conformity to requirements; and
- satisfactory surveillance audits conducted as part of the certification agency's product surveillance program.

1.6 Effective Date

The effective date of this examination standard mandates that all products tested for certification after the effective date shall satisfy the requirements of this standard.

The effective date of this standard is eighteen (18) months after the publication date of the standard for compliance with all requirements.

1.7 System of Units

Units of measurement used in this standard are United States (U.S.) customary units. These are followed by their arithmetic equivalents in International System (SI) units, enclosed in parentheses. The first value stated shall be regarded as the requirement. The converted equivalent value may be approximate. Conversion of U.S. customary units is in accordance with ANSI/IEEE/ASTM SI 10.

Two units (liter and bar), outside of but recognized by SI, are commonly used in international fire protection and are used in this standard.

1.8 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the cited edition applies:

ANSI / AWWA C606 – *Grooved and Shouldered Joints*

ASME B1.20.1, *Pipe Threads, General Purpose (Inch)*

ASME B16.5, *Pipe Flanges and Flanged Fittings: NPS 1/2 through 24 - Metric/Inch Standard*

BS EN 10226-2, *Pipe threads where pressure tight joints are made on the threads - Part 2. Taper, external threads and taper internal threads - Dimensions, tolerances and designation*

IEEE/ASTM SI 10, *American National Standard for Metric Practice*

ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads - Part 1: Dimensions, tolerances and designation*

1.9 Terms and Definitions

For purposes of this standard, the following terms apply:

Accepted

This term refers to installations acceptable to the authority enforcing the applicable installation rules. Acceptance is based upon an overall evaluation of the installation. Acceptance is not a characteristic of a product. A product accepted for one installation may not be acceptable elsewhere.

End Connections

The term “End Connections” refers to the method of connecting components of a pipe system to one another. Typical end connections in a fire protection service are cut groove, rolled groove, cast groove, threaded, flanged, plain end, and welded end.

Flanged End

This term refers to piping components having mating flanged ends per the dimensional values shown in ASME B16.5, *Pipe Flanges and Flanged Fittings: NPS 1/2 through 24 - Metric/Inch Standard*. Flanges meeting other national or international standards may be evaluated on a case-by-case basis.

Grooved End

This term refers to a style of end connection that is characterized by having a groove located near the free end of the piping component allowing joining to other grooved end products via the use of grooved end couplings. Dimensions for these connections may vary slightly due to the method used to impart the groove to the product (i.e. cut groove where the groove is machined, roll groove where the groove is mechanically formed using a grooving machine, or cast groove where the groove is simply cast on the part during casting process) but in all cases tend to follow the dimensions of ANSI / American Water Works Association (AWWA) C606 – *Grooved and Shouldered Joints*.

Mechanical Tee

A mechanical tee is a fitting that provides a connection to a pipe line in the place of a tee. The pipe is pre-drilled per the manufacturer’s instructed hole size, and the “saddle” is placed over the hole so that the mechanical tee gasket encircles the hole. The fitting has a second piece that loops around the pipe and allows for the “saddle” to be drawn tight against the pipe surface. Approval of these fittings is limited to fittings having a minimum of one pipe size reduction as the branch outlet. Equal size outlets are not permitted. Typical end connections for these fittings are threaded and grooved end.

Rated Working Pressure

This is the maximum sustained pressure at or below which the water flow detector tester shall operate trouble free. This also sets the basis for the testing described in Section 4, Performance Requirements. The minimum pressure rating considered for FM Approval is 175 psi (1205 kPa).

Threaded End

Water flow detector testers which have been furnished with its ends threaded with internal or external pipe threads conforming to national or international standards for pipe threads for the nation of intended use (e.g., ASME B1.20.1, EN 10226-2, ISO 7-1).

Water Flow Detector

This term refers to a device that incorporates a switch that is activated when prolonged water flow interacts with a paddle that is inserted into the pipeline. The device is fastened to the pipe by means of a U-Bolt wrapping around the pipe outside diameter and through a saddle housing. The saddle housing also has a gasket that prevents the water supply pressure from escaping, and atmospheric pressure from entering the sprinkler piping.

2. GENERAL INFORMATION

2.1 Product Information

- 2.1.1 Water flow detector testers permit the testing of in-line water flow detectors used in sprinkler piping without the need for the discharge of the water that is used for the test. They are used on wet pipe sprinkler systems in new installations and may also be designed for retro-fit applications.
- 2.1.2 In order to meet the intent of this standard, water flow detector testers shall be examined on a model-by-model, type-by-type, manufacturer-by-manufacture, and plant-by-plant basis. This is predicated on the basis that identical designs, fabricated using identical materials by different manufacturers, or, even by different plants of the same manufacturer, have sometimes been shown to perform differently in testing. Sample valves, selected in conformance to this criterion, shall satisfy all of the requirements of this standard.

2.2 Certification Application Requirements

The manufacturer shall provide the following preliminary information with any request for certification consideration:

- a complete list of all models, types, sizes, and options for the products or services being submitted for certification consideration;
- general assembly drawings, complete set of manufacturing drawing, materials list, anticipated marking format, brochures, sales literature, specification sheets, installation, operation and maintenance procedures, wiring diagrams, and
- the number and location of manufacturing facilities.

All documents shall identify the manufacturer's name, document number or other form of reference, title, date of last revision, and revision level. All foreign language documents shall be provided with English translation.

2.3 Requirements for Samples for Examination

- 2.3.1 Following authorization of certification examination, the manufacturer shall submit samples for examination and testing based on the following:

Sample requirements to be determined by the certification agency.

- 2.3.2 Requirements for samples may vary depending on design features, results of prior or similar testing, and results of any foregoing tests.
- 2.3.3 The manufacturer shall submit samples representative of production.
- 2.3.4 It is the manufacturer's responsibility to provide any necessary test fixtures, such as those which may be required to evaluate the water flow detector testers.

3. GENERAL REQUIREMENTS

3.1 Review of Documentation

- 3.1.1 During the initial investigation and prior to physical testing, the manufacturer's specifications, technical data sheets, and design details shall be reviewed to assess the ease and practicality of installation and use. The product shall be capable of being used within the limits of the certification investigation.
- 3.1.2 The manufacturer's dimensional specifications and/or dimensional drawings shall fully describe the product. All critical dimensions shall be indicated with the allowed upper and lower tolerance limits clearly shown.

3.2 Physical or Structural Features – Mechanical Style

- 3.2.1 Water flow detector testers are available in two basic configurations: new installation and retro-fit installation style. All water flow detector testers discussed in this standard shall be designed for a minimum rated working pressure of 175 psi (1205 kPa). Products with higher rated working pressures will be evaluated on a case-by-case basis.
- 3.2.2 New installation style is characterized by having a manifold body of the same size as the run piping with porting for the installation of the water flow detector and trim loop piping. A flow arrow shall be on the manifold body indicating flow direction for the proper installation of the water flow detector and loop piping.
- 3.2.3 The retro-fit style is characterized by having two mechanical tees that are to be installed in the sprinkler piping directly. The retro-fit installation style shall be installed so that the existing water flow detector is approximately centered between the mechanical tees.
- 3.2.4 Installation is limited to use in wet pipe sprinkler systems and may be installed in horizontal and vertical orientations.
- 3.2.5 The trim loop piping shall be a minimum of 3/4 inch NPS.
- 3.2.6 The circulation pump used to generate the water flow used during the test shall be sized to deliver 20 gpm to 30 gpm (75 L/min to 115 L/min), and must be able to be mounted in horizontal or vertical orientations. The electric motor used to drive the recirculation pump shall have an enclosure rated for occasional water spray. Wiring connections are to be made per the provided wiring diagram. The recirculation pump shall be able to withstand the hydrostatic pressure test described in Section 4.3 or it shall be able to be suitably isolated during this test.
- 3.2.7 The inlet and outlet valves shall be marked to indicate the valve position. In the event that the inlet and outlet valves are not interchangeable, they shall be marked for their proper installation location.
- 3.2.8 Water flow detector testers submitted for testing shall be true production samples and shall be free of sharp edges, burrs, or other imperfections which might injure the installer or interfere with proper assembly of the unit.
- 3.2.9 The manufacturer shall identify all options for internal and external coatings, and materials of construction for major components in order for each option to be represented in the examination.

3.3 Physical or Structural Features – Electrical Style

- 3.3.1 This section has been added as a place holder in the event that some of the currently available water flow detectors build in a capacity for testing either internally or via another means.

- 3.3.2 As applicable, the construction requirements for the base water flow detector would still apply for this construction variation.
- 3.3.3 In the event that this option is submitted for FM Approval evaluation, the tests outlined in this standard would be applied to the test program as appropriate. In addition, other features or characteristics may be subject to additional testing as needed in order to validate their function.

3.4 Materials

All materials used in these water flow detector testers shall be suitable for the intended application. Components exposed to water shall be constructed of corrosion resistant materials. Particular consideration shall be given to the manifold body, inlet and outlet valves, recirculation pump casing, and the loop pipe fittings. These and any other materials used in water flow detector testers shall have physical properties necessary to render them suitable for their intended use. Materials shall be compatible with other sprinkler system components. When unusual materials are used, special tests may be necessary to verify their suitability. All components shall withstand the normal abuse of shipping, handling, and installation.

3.5 Markings

- 3.5.1 Marking on the product or, if not possible due to size, on its packaging or label accompanying the product, shall include the following information:
- name and address of the manufacturer or marking traceable to the manufacturer;
 - date of manufacture or code traceable to date of manufacture or lot identification;
 - model designation; inlet and outlet nominal size; rated working pressure; flow direction etc., as appropriate.

When hazard warnings are needed, the markings should be universally recognizable.

- 3.5.3 Any additional pertinent marking information required by a national or international standard to which the product is manufactured shall be permanently marked on the outside surface of each assembly.
- 3.5.4 Each required marking listed in Section 3.5.1 shall be legible and durable and applied by, or any combination of, casting, forging, roller embossing or electro-etching.
- 3.5.5 The model or type identification shall correspond with the manufacturer's catalog designation and shall uniquely identify certification agency's mark of conformity.
- 3.5.6 The certification agency's mark of conformity shall be displayed visibly and permanently on the product and/or packaging as appropriate and in accordance with the requirements of the certification agency. The manufacturer shall exercise control of this mark as specified by the certification agency and the certification scheme.

3.6 Manufacturer's Installation and Operation Instructions

- 3.6.1 The manufacturer shall
- prepare instructions for the installation, maintenance, and operation of the product;
 - provide facilities for repair of the product and supply replacement parts; and
 - provide services to ensure proper installation, inspection, or maintenance for products where it is not reasonable to expect the average user to be able to provide the installation, inspection, or maintenance.

3.7 Calibration

- 3.7.1 Each piece of equipment used to verify the test parameters shall be calibrated within an interval determined on the basis of stability, purpose, and usage. A copy of the calibration certificate for each piece of test equipment is required. The certificate shall indicate that the calibration was performed against working standards whose calibration is certified and traceable to an acceptable reference standard and certified by an ISO/IEC 17025 accredited calibration laboratory. The test equipment shall be clearly identified by label or sticker showing the last date of the calibration and the next due date. A copy of the service provider's accreditation certificate as an ISO/IEC 17025 accredited calibration laboratory should be available.
- 3.7.2 When the inspection equipment and/or environment is not suitable for labels or stickers, other methods such as etching of control numbers on the measuring device are allowed, provided documentation is maintained on the calibration status of the equipment.

3.8 Tolerances

Tolerances on units of measure shall be described in Appendix A, unless otherwise specified.

4. PERFORMANCE REQUIREMENTS

4.1 Examination

4.1.1 Requirement

The water flow detector testers shall conform to the manufacturer's drawings and specifications and to certification requirements.

4.1.2 Test/Verification

A sample of each model valve submitted for certification shall be examined and compared to drawings and specifications. It shall be verified that the sample conforms to the physical and structural requirements described in Section 3, General Requirements.

4.2 Leakage

4.2.1 Requirements

All water flow detector testers shall be leak tight when hydrostatically tested at twice the rated working pressure of the device for five minutes. During and at the conclusion of this test, there shall be no observed leakage from any piping connection, or component as a result of this test.

4.2.2 Test/Verification

With the ends of the manifold body (or sample run pipe) closed off, the sample shall be filled with water making sure to remove all internal air, and then subjected to an internal hydrostatic pressure of 350 psi (2415 kPa), or twice the rated working pressure, whichever is higher, for five minutes without observed leakage.

4.3 Hydrostatic Integrity

4.3.1 Requirements

All water flow detector testers shall withstand exposure to hydrostatic pressure of four times the rated working pressure of the product for five minutes. During and at the conclusion of the test, no fracture, rupturing or permanent distortion shall occur as a result of this test.

4.3.2 Test/Verification

Each size water flow detector tester shall be subjected to a hydrostatic pressure test at 700 psi (4825 kPa) or four times its rated working pressure, whichever is higher, for five minutes. No failure, as described above, shall be allowed.

4.4 Operational Test

4.4.1 Requirements

Water flow detector testers shall be operated to ensure functionality of all components at 30 psi (205 kPa) and the rated working pressure.

4.4.2 Test/Verification

Each size water flow detector shall be filled with water and operated to ensure that the recirculation pump flows enough water to activate the water flow detector. Verification shall be made at 30 psi (205

kPa) and the rated working pressure 175 psi (1205 kPa) or greater. At the conclusion of the test, the inner components shall be inspected to ensure that they did not dislodge, leak, or distort, and that there is no functional impairment of the device as a result of the test.

4.5 Electrical Test – Voltage Variation

4.5.1 Requirements

Operation of the water flow detector tester will be verified as the input voltage to the recirculation pump motor is varied from 90 percent to 110 percent of rated voltage. The device shall operate properly under these conditions.

4.5.2 Test/Verification

The water flow detector tester shall be filled with water and vented of all internal air. The electrical leads from the recirculation pump motor shall be connected to a power supply and the unit shall be observed for operation as the input power is varied from 90 percent to 110 percent of the electrical nameplate rating. Verification of operation shall be made with water supply pressures of 30 psi (205 kPa) and the rated working pressure. At all points within this range, the unit shall be observed to operate properly.

4.6 Electrical Test - Environmental

4.6.1 Requirements

Water flow detector testers shall be tested for performance for indoor applications only. This testing will expose the water flow detector tester to the following environments for 24 hours at each setting. After the exposure conditioning the assembly will be checked for proper operation.

Table 4.6.1 – *Environmental Conditioning Settings*

<i>Environmental Condition</i>	<i>Parameters</i>
Cold	32°F (0°C)
Hot	120°F (50°C)
Humid	100°F (38°C) at 90 percent humidity

4.6.2 Test/Verification

Samples of water flow detector testers shall be placed in an environmental chamber and exposed to each of the conditions outlined in Table 4.6.1 for a period of 24 hours. After the conclusion of each exposure time, the sample will be checked for proper operation.

4.7 Electrical Test – Dielectric

4.7.1 Requirements

The recirculation pump motor shall withstand, for a time period of one minute, high potential applied between the terminals and the pump enclosure, and between the terminals and the terminal enclosure. During this test, there shall be no signs of arcing or breakdown.

4.7.2 Test/Verification

A voltage of 1500 volts shall be applied between the terminals and the pump enclosure, and between the terminals and the terminal enclosure. The voltage shall be applied in each test for a duration of 1 minute. During the dielectric test there shall be no signs of arcing or breakdown.

4.8 Electrical Test – Bonding Resistance

4.8.1 Requirement

The resistance measured between the grounding screw and/or terminal and various locations shall be less than 1 ohm.

4.8.2 Test/Verification

Using an ohmmeter, the resistance measured between the grounding screw and/or terminal and various locations on the water flow detector tester shall be measured.

5. MANUFACTURER'S REQUIREMENTS

5.1 Demonstrated Quality Control Program

5.1.1 A quality assurance program is required to assure that subsequent products produced by the manufacturer shall present the same quality and reliability as the specific products examined. Design quality, conformance to design, and performance are the areas of primary concern.

- Design quality is determined during the examination and tests, and is documented in the certification report.
- Continued conformance to this standard is verified by the certifier's surveillance program.
- Quality of performance is determined by field performance and by periodic re-examination and testing.

5.1.2 The manufacturer shall demonstrate a quality assurance program which specifies controls for at least the following areas:

- existence of corporate quality assurance guidelines;
- incoming quality assurance, including testing;
- in-process quality assurance, including testing;
- final inspection and tests;
- equipment calibration;
- drawing and change control;
- packaging and shipping; and
- handling and disposition of non-conforming materials.

5.1.3 Documentation/Manual

There should be an authoritative collection of procedures/policies. It should provide an accurate description of the quality management system while serving as a permanent reference for implementation and maintenance of that system. The system should require that sufficient records are maintained to demonstrate achievement of the required quality and verify operation of the quality system.

5.1.4 Records

There should be an authoritative collection of procedures/policies. It should provide an accurate description of the quality management system while serving as a permanent reference for implementation and maintenance of that system. The system should require that sufficient records are maintained to demonstrate achievement of the required quality and verify operation of the quality system.

5.1.5 Drawing and Change Control

The manufacturer shall establish a system of product configuration control that shall allow no unauthorized changes to the product. Changes to critical documents, identified in the certification report, may be required to be reported to, and authorized by the certification agency prior to implementation for production.

Records of all revisions to all certified products shall be maintained.

5.2 Surveillance Audit Program

- 5.2.1 An audit of the manufacturing facility may be part of the certification agency's surveillance requirements to verify implementation of the quality assurance program. Its purpose is to determine that the manufacturer's equipment, procedures, and quality program are maintained to ensure a uniform product consistent with that which was tested and certified.
- 5.2.2 Certified products or services shall be produced or provided at, or provided from, location(s) disclosed as part of the certification examination. Manufacture of products bearing a certification mark is not permitted at any other location prior to disclosure to the certification agency.

5.3 Product Modification

The manufacturer shall notify the certification agency of changes in product construction, components, raw materials, physical characteristics, coatings, component formulation or quality assurance procedures prior to implementation.

5.4 Manufacturing and Production Tests

5.4.1 Test requirement No. 1 – *Leakage*

The manufacturer shall test 100 percent of production water flow detector testers for leakage at the rated working pressure. The test pressure shall be applied for a minimum of 1 minute with no leakage allowed.

5.4.2 Test requirement No. 2 – *Body Hydrostatic*

The manufacturer shall test 100 percent of production water flow detector testers for body integrity to twice the rated working pressure. The pressure shall be held for a minimum of 1 minute with no evidence of leaking, cracking, or distortion.

6. BIBLIOGRAPHY

FM Global Property Loss Prevention Data Sheet 2-0, *Installation Guidelines for Automatic Sprinklers*

FM Global Property Loss Prevention Data Sheet 3-7, *Fire Protection Pumps*

ISO/IEC 17025, *General Requirements for the Competence of Testing and Calibration Laboratories*

NEMA MG-1, *Motors and Generators*

NSF/ANSI 61, *Drinking Water System Components -- Health Effects*

APPENDIX A: Tolerances

Unless otherwise stated, the following tolerances shall apply:

Angle: $\pm 2^\circ$

Frequency (Hz): ± 5 percent of value

Length: ± 2 percent of value

Volume: ± 5 percent of value

Volume Per Unit Area: ± 5 percent of value

Pressure: + 5 percent of value
- 0 percent of value

Temperature: $\pm 4^\circ\text{F}$ (2°C)

Time: + 5/-0 seconds
+0.1/-0 minutes

Unless stated otherwise, all tests shall be carried out at a room (ambient) temperature of $68 \pm 9^\circ\text{F}$ ($20 \pm 5^\circ\text{C}$).

APPENDIX B: Sample Listings

Water Flow Detector Testers

When energized, the water flow detector tester supplies circulating water around a vane type water flow detector, causing vane motion to be transmitted to an alarm-actuating switch after the predetermined time delay has occurred. These devices are suitable for use with FM Approved vane detectors in 2 through 8 in. nominal sizes. No sprinkler system water has to be sent to a drain with this system.

Unless otherwise specified, these testers have a 175 psi (1205 kPa) rated working pressure.

Model A, B

<i>Product Designation</i>	<i>Nominal Pipe Size, in (DN)</i>	<i>Rated Working Pressure, psi (kPa)</i>	<i>Remarks</i>
Model A – Original Installation	1 (DN25)	175 (1205)	a, b, c, d, e
	1-1/4 (DN32)	175 (1205)	a, b, c, d, e
	1-1/2 (DN40)	175 (1205)	a, b, c, d, e
	2 (DN50)	175 (1205)	a, b, c, d, e
	2-1/2 (DN65)	175 (1205)	a, b, c, d, e
	3 (DN80)	175 (1205)	a, b, c, d, e
	4 (DN100)	175 (1205)	a, b, c, d, e
	5 (DN125)	175 (1205)	a, b, c, d, e
	6 (DN150)	175 (1205)	a, b, c, d, e
	8 (DN150)	175 (1205)	a, b, e
Model B – Retrofit Installation	1-1/4 (DN32)	175 (1205)	e
	1-1/2 (DN40)	175 (1205)	e
	2 (DN50)	175 (1205)	e
	2-1/2 (DN65)	175 (1205)	e
	3 (DN80)	175 (1205)	e
	4 (DN100)	175 (1205)	e
	5 (DN125)	175 (1205)	e
	6 (DN150)	175 (1205)	e
8 (DN150)	175 (1205)	e	

Notes:

- a. Certified as supplied in ASTM A795, Schedule 10 piping configuration.
- b. Certified as supplied in ASTM A795, Schedule 40 piping configuration.
- c. Certified as supplied in EN 10255, Heavy piping configuration.
- d. Certified as supplied in EN 10255, Medium piping configuration.
- e. Device requires either 120 V ac and 240V ac power.