



Member of the FM Global Group

Approval Standard for Water Motor Gongs

Class Number 1055

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Foreword

The FM Approvals certification mark is intended to verify that the products and services described will meet FM Approvals' stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of Approval Standards is to present the criteria for Approval of various types of products and services, as guidance for FM Approvals personnel, manufacturers, users and authorities having jurisdiction.

Products submitted for certification by FM Approvals shall demonstrate that they meet the intent of the Approval Standard, and that quality control in manufacturing shall ensure a consistently uniform and reliable product. Approval Standards strive to be performance-oriented. They are intended to facilitate technological development.

For examining equipment, materials and services, Approval Standards:

- a) Must be useful to the ends of property conservation by preventing, limiting or not causing damage under the conditions stated by the Approval listing; and
- b) Must be readily identifiable.

Continuance of Approval and listing depends on compliance with the Approval Agreement, satisfactory performance in the field, successful re-examinations of equipment, materials, and services as appropriate, and surveillance audits of the manufacturing facility.

FM Approvals LLC reserves the right in its sole judgment to change or revise its standards, criteria, methods, or procedures.

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1 INTRODUCTION

1.1 Purpose

- 1.1.1 This standard states FM Approvals criteria for water motor gongs for use in sprinkler system piping. They are used to give an audible alarm signal when a fire protection system operates.
- 1.1.2 Approval criteria may include, but are not limited to, performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a surveillance audit program.

1.2 Scope

- 1.2.1 This standard encompasses the design and performance requirements for water motor gongs.
- 1.2.2 Approval Standards are intended to verify that the product described will meet stated conditions of performance, safety, reliability and quality useful to the ends of property conservation.

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/or 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 motor gongs for the purpose of obtaining Approval. Water motor gongs having characteristics not anticipated by this Standard may be FM Approved if performance equal, or superior, to that required by this Standard is demonstrated, or if the intent of the Standard is met. Alternatively, water motor gongs which meet all of the requirements identified in this Standard may not be FM Approved if other conditions which adversely affect performance exist or if the intent of this standard is not met.

1.4 Basis for Approval

Approval 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 by FM Approvals; and as far as practical,
 - The durability and reliability of the product.
- 1.4.2 An examination of the manufacturing facilities and audit of quality control procedures is made to evaluate the manufacturer's ability to consistently produce the product that was examined and tested as part of the Approval project. The audit shall review the facility and in-place quality control procedures used in the manufacturing of the product. Typically, areas of review are incoming inspection, work in progress, production testing, final quality control, marking, calibration of equipment, shipping procedures, and document and drawing control. These examinations are repeated periodically as part of the FM Approvals product follow-up program. (Refer to Section 5.2, Surveillance Audit Program)

1.5 Basis for Continued Approval

1.5.1 Continued Approval is based upon:

- Production or availability of the product as currently FM Approved;
- The continued use of acceptable quality assurance procedures;
- Satisfactory field experience;
- Compliance with the terms stipulated in the Master Agreement;
- Satisfactory re-examination of production samples for continued conformity to requirements; and
- Satisfactory Surveillance Audits conducted as part of FM Approvals' surveillance audit Program.

1.5.2 Also, as a condition of retaining Approval, manufacturers may not change an FM Approved product or service without prior written authorization by FM Approvals. (Refer to Section 5.1.3 for further details regarding changes.)

1.6 Effective Date

The effective date of an Approval standard mandates that all products tested for Approval after the effective date shall satisfy the requirements of that standard. Products FM Approved under a previous edition shall comply with the new version by the effective date or forfeit Approval.

The effective date of this standard is **February 28, 2017** 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. Appendix A lists the selected units and conversions to SI units for measures appearing in this standard. Conversion of U.S. customary units is in accordance with the American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE)/American Society for Testing Materials (ASTM) SI 10-2010, "*American National Standard for Metric Practice*."

1.8 Applicable Documents

The following standards, test methods, and practices are referenced in this standard:

American National Standards Institute (ANSI) / American Society of Mechanical Engineers (ASME)
B1.20.1-2013, *Pipe Threads, General Purpose (Inch)*
ANSI/ Acoustical Society of America (ASA) S1.4A-1985, Specification for Sound Level Meters
ANSI/IEEE/ASTM SI 10, 2010, *American National Standard for Metric Practice*
FM Global Property Loss Prevention Data Sheet 2-0 – January 2014, *Installation Guidelines for Automatic Sprinklers*
FM Global Property Loss Prevention Data Sheets
IEEE/ASTM SI 10-2010, *American National Standard for Metric Practice*
International Organization for Standardization (ISO) / International Electrotechnical Commission (IEC)
17025-2005, *General Requirements for the Competence of Testing and Calibration Laboratories*

1.9 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. When the authority is FM Global, such locations are termed “FM Global Accepted.” Acceptance is based upon an overall evaluation of the installation. Factors other than the use of FM Approved equipment impact upon the decision to accept, or not to accept. Acceptance is not a characteristic of a product. It is installation specific. A product accepted for one installation may not be acceptable elsewhere. (Contrast with FM Approved.)

End Connections

The means by which components of a sprinkler system are connected to the sprinkler fitting or piping. The typical end connection used for water motor gongs is a threaded connection.

FM Approved

This term refers to products FM Approved by FM Approvals. Such products are listed in the Approval Guide, an on-line resource of FM Approvals. All products so listed have been successfully examined by FM Approvals, and their manufacturers have signed and returned a Master Agreement to FM Approvals. This form obligate the manufacturer to allow re-examination of the product and surveillance audits at FM Approval’s discretion. It further requires the manufacturer not to deviate from the as-FM Approved configuration of the product without review by and agreement of FM Approvals.

FM Approvals Certification Mark

Product markings, applied by the manufacturer, that identify the product as FM Approved. Their use is mandatory on all units of FM Approved water motor gongs. These registered marks cannot be used except as authorized by FM Approvals via the granting of Approval to a specific product.

Rated Working Pressure

This is the maximum sustained pressure at or below which the water motor gong 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).

2. GENERAL INFORMATION

2.1 Product Information

- 2.1.1 Water motor gongs produce an audible alarm signal sufficient to alert nearby personnel that a fire protection sprinkler system is experiencing a water flow condition, and needs to be investigated.
- 2.1.2 In order to meet the intent of this standard, water motor gongs must be examined on a model-by-model, type-by-type, manufacturer-by-manufacturer, and plant-by-plant basis. This is predicated on the basis that identical designs, fabricated in identical materials by different manufacturers or, even by different plants of the same manufacturer, have been seen to perform differently in testing. Sample water motor gongs, selected in conformance to this criterion, shall satisfy all of the requirements of this standard.

2.2 Approval Application Requirements

- 2.2.1 To apply for an Approval examination, the manufacturer, or an authorized representative, shall submit a request to:

Manager of Fire Protection
FM Approvals Hydraulics Laboratory
743A Reynolds Road
West Glocester, RI 02814
U.S.A.

- 2.2.2 The manufacturer shall provide the following preliminary information with any request for Approval consideration:

- A complete list of all models, types, sizes, and options for the products or services being submitted for Approval consideration,
- General assembly drawings, one complete set of manufacturing drawings, materials list(s), anticipated marking format, brochures, sales literature, specification sheets, installation, operation and maintenance procedures, and
- Number and location of manufacturing facilities.

- 2.2.3 All the above referenced documents shall be controlled by the manufacturer's Quality Assurance procedures, and shall identify:

- The manufacturer's name
- Document number or other form of reference
- Title
- Date of last revision or revision level

2.3 Requirements for Samples for Examination

- 2.3.1 Sample Requirements are to be determined by FM Approvals following review of the preliminary information used in the preparation of the examination proposal. Sample requirements may vary depending on size range of the product under consideration, design features, or results of prior testing. Following the authorization of the examination proposal, the manufacturer shall submit samples for examination and testing using the shipping guidance information included with the proposal letter.

- 2.3.2 The manufacturer shall submit samples representative of production. Any decision to use data generated using prototypes is at the discretion of FM Approvals.

- 2.3.3 It is the manufacturer's responsibility to provide any necessary test fixtures, such as those which may be required to evaluate the water motor gongs.

- 2.3.4 If there are failures encountered during the examination testing, FM Approvals will provide the manufacturer with information regarding what testing will need to be repeated and any additional sample requirements.

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 Approval 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.
- 3.1.3 All documents pertaining to the product materials, dimensions, processing, and marking shall be controlled by the manufacturer's Quality Assurance procedures, and 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.

3.2 Physical or Structural Features

- 3.2.1 Water motor gongs 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.
- 3.2.2 The design shall permit disassembly for inspection, lubrication, adjustment, or repair without removal from the supporting wall or structure. Suitable means shall be provided so that nozzle and strainer can be readily cleaned.
- 3.2.3 An outer shield or cover shall be provided to protect the gong from effects of rain and snow, or to prevent nesting of birds, vermin, etc.
- 3.2.4 Nominal size of inlet threads shall be 3/4 inch NPT or equal. Other threaded connections, conforming to recognized international standards, are acceptable on a case by case basis.
- 3.2.5 Nominal size of outlet shall be between 1 and 1-1/2 inch NPT to facilitate the removal of waste water.
- 3.2.6 Shafts and other moving parts shall be designed to prevent binding, and to be protected against mechanical injury.
- 3.2.7 Bearings shall be either self-lubricating, or have means for lubrication as part of normal maintenance. The lubricant must be suitable for use over a range of temperatures from between -40°F (-40°C) and 120°F (49°C).
- 3.2.8 Double water motor gongs are permitted, where one unit sounds inside a building, and one unit sounds outside the building. Both gongs are driven by one drive section, and are connected by a shaft turning inside a pipe spacer or nipple.
- 3.2.9 Operating ports such as nozzles shall have a diameter of not less than 1/8 inch (3.2 mm), and shall be protected by a suitable strainer of corrosion-resistant material. The total area of all openings in the strainer screen shall be at least ten times the port area. The strainer, which shall be supplied by the gong manufacturer, may be located at the water flow detecting device.

3.3 Materials

All materials used in these water motor gongs shall be suitable for the intended application. Parts exposed to water shall be constructed of corrosion resistant materials. 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.

3.4 Markings

3.4.1 Each water motor gong discussed in this Standard, shall be permanently marked with the following information:

- Manufacturer's name or trademark
- The words "Sprinkler Alarm" on the shield or cover
- Model designation
- FM Approvals Certification Mark

3.4.2 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.

3.4.3 Each required marking listed in Section 3.4.1 shall be legible and durable and applied in any of, or any combination of casting, die stamping, forging, roller embossing or electro-etching.

3.4.4 The model or type identification shall correspond with the manufacturer's catalog designation and shall uniquely identify the product as FM Approved. The manufacturer shall not place this model or type identification on any other product unless covered by a separate agreement.

3.4.5 All markings shall be legible and durable throughout the useful life of the product.

3.5 Manufacturer's Installation and Operation Instructions

3.5.1 The manufacturer shall provide complete installation instructions with each assembly, where necessary, including any special dimension requirements. The installation instructions shall outline in detail the field procedures for installing, testing, and repairing the units. Instructions shall be provided in each shipping container, as appropriate. The manual shall be reviewed for completeness and ease of comprehension.

3.5.2 The installation instructions identified in Section 3.5.1 shall be made available in multiple languages in support of the regions where the product is intended to be sold.

3.6 Calibration

All equipment used to verify the test parameters shall be calibrated within an interval determined on the basis of stability, purpose, and usage of the equipment. A copy of the calibration certificate for each piece of test equipment is required for FM Approvals records, indicating that the calibration was performed against working standards whose calibration is certified as traceable to the National Institute of Standards and Technology (NIST) or to other acceptable reference standards and certified by a ISO 17025 calibration laboratory. The test equipment must be clearly identified by label or sticker showing the last date of the calibration and the next due date. A copy of the service accreditation certificate as an ISO 17025, "General Requirements for the Competence of Testing and Calibration Laboratories", calibration laboratory is required for FM Approvals records.

The calibration of recently purchased new equipment is also required. Documentation indicating either the date of purchase or date of shipment, equipment description, model and serial number is required for identification. The new test equipment shall be clearly identified by label or sticker showing the date of initial calibration and the next due date. 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 thus equipment.

3.7 Tolerances

Tolerances on units of measure shall be as described in Appendix B, unless otherwise specified in this standard.

4. PERFORMANCE REQUIREMENTS

4.1 Examination

4.1.1 Requirement

The water motor gongs shall conform to the manufacturer's drawings and specifications and to FM Approval requirements.

4.1.2 Test/Verification

A sample water motor gong 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 Audibility

4.2.1 Requirement

The water motor gong shall produce an audible signal sufficient to alert nearby personnel that a fire protection sprinkler system is experiencing a water flow condition.

4.2.2 Test/Verification

The water motor gong shall generate sound waves having a minimum sound-pressure level of 90 decibels (referred to a 0.0002 microbar base) using the "C" weighting, when testing in a room having a background noise level within the approximate range of 50 to 55 decibels. The operating pressure at the inlet to the water motor gong shall be 30 psi (205 kPa). Sound pressure level measurements will be made at a point of 10 feet (3 m) in front of the gong with the shield or protective cover in place.

4.3 Durability

4.3.1 Requirement

A water motor gong shall be designed to operate reliably without excessive maintenance. It will be subjected to a 60 hour continuous endurance run with an average full flow operating water pressure of 50 psi (345 kPa) at the inlet to the device. No lubrication or adjustment will be made during the endurance test.

4.3.2 Test/Verification

Operate one sample of each style water motor gong for 60 hours continuously, with an inlet water supply set at 50 psi (345 kPa). The gong shall be capable of generating sound waves having a minimum sound-pressure level of 80 decibels (referred to a 0.0002 microbar base) using the "C" weighting, when testing in a room having a background noise level within the approximate range of 50 to 55 decibels at the conclusion of the test period, and there shall be no evidence of excessive wear of any component at the conclusion of the test.

4.4 Sensitivity

4.4.1 Requirement

The water motor gong shall sound an audible alarm when subjected to a minimum operating water supply pressure of 5 psi (35 kPa).

4.4.2 Test/Verification

Starting from zero water pressure, increase the water supply to the inlet of the water motor gong, until a pressure of 5 psi +/- 0.2 psi (35 kPa +/- 1.4 kPa) is measured. The sound pressure level at this minimum water supply should be clearly audible. The gong shall be capable of generating sound waves having a minimum sound-pressure level of 70 decibels (referred to a 0.0002 microbar base) using the "C" weighting, when testing in a room having a background noise level within the approximate range of 50 to 55 decibels.

4.5 Hydrostatic Strength

4.5.1 Requirement

The water motor gong housing shall withstand hydrostatic strength testing without sustaining cracking or permanent deformation.

4.5.2 Test/Verification

The water motor gong housing shall be able to withstand a hydrostatic pressure of 175 psi (1205 kPa) or the rated working pressure, whichever is greater, for 5 minutes.

4.6 Protective Cover

4.6.1 Requirement

A water motor gong cover or shield shall be able to withstand 6 impacts from a 10.5 lb (4.8 kg) weight, swinging along a 10.5 foot (3.2 m) long pendulum from a height of 5 feet (1.5 m).

4.6.2 Test/ Verification

The water motor gong cover shall withstand six impacts from a 10.5 foot (3.2 m) long pendulum supporting a 10.5 lb. (4.8 kg) circular weight hung directly above the cover such that the weight will strike the cover at a 90° angle. The weight shall be raised to a distance of 5 feet (1.5 m) above the point of impact along the trajectory of the pendulum. The point of impact between the circular weight and gong cover will be halfway between the center of the cover and its periphery in a horizontal plane. After the 6 impacts, the water motor gong shall still provide an audible signal in accordance with Section 4.2.

4.7 Additional Tests

Additional tests may be required, depending on design features, results of any tests, material application, or to verify the integrity and reliability of the water motor gongs, at the discretion of FM Approvals.

Unexplainable failures shall not be permitted. A re-test shall only be acceptable at the discretion of FM Approvals and with adequate technical justification of the conditions and reasons for failure.

5. OPERATIONS REQUIREMENTS

A quality control program is required to assure that subsequent water motor gongs produced by the manufacturer at an authorized location, shall present the same quality and reliability as the specific water motor gongs examined. Design quality, conformance to design, and performance are the areas of primary concern. Design quality is determined during the Approval examination and tests, and is covered in the Approval Report. Conformance to design is verified by control of quality and is covered in the Surveillance Audit Program. Quality of performance is determined by field performance and by periodic re-examination and testing.

5.1 Demonstrated Quality Control Program

5.1.1 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
- Handling and disposition of non-conformance materials.
- In order to assure adequate traceability of materials and products, the manufacturer shall maintain records of all quality control tests performed, for a minimum period of two years from the date of manufacture.

5.1.2 Documentation/Manual

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

5.1.3 Drawing and Change Control

The manufacturer shall establish a system of product configuration control that does not allow unauthorized changes to the product. Revisions to critical documents, identified in the Approval Report, must be reported to, and authorized by, FM Approvals prior to implementation for production. The manufacturer shall assign an appropriate person or group to be responsible for, and require that, proposed changes to FM Approved or Listed products be reported to FM Approvals before implementation. The manufacturer shall notify FM Approvals of changes in the product or of persons responsible for keeping FM Approvals advised by means of FM Approvals Form 619, *FM Approved Product/Specification-Tested Revision Report or Address/Main Contact Change Report*. Records of all revisions to all FM Approved products shall be maintained.

5.1.3.1 The table below has been included as a guide to manufacturers of what is considered to be a significant change to FM Approvals. As mentioned above, modifications that fit this category shall be documented by means of a letter stating the change, and requesting a quotation for an Approval examination.

<i>Modification</i>	<i>Description/Example</i>
Addition or Relocation of the Manufacturing Location	The product was originally FM Approved in location A, and now is desired to be made in locations A and B, or only in location B.
Change in Manufacturing Process	Change from Threaded Assembly to Rolled Groove End Connections
Changes to Critical Dimensions	Modifications that would depart from the national or international standards that are used in the manufacturing of the product as originally FM Approved.
	Modifications that would have an effect on the use of the product with standardized fittings/couplings.
	Modifications that would have an effect on the ability of the product to maintain the same performance as the originally Approved product. An example of this would be a significant reduction of wall thickness or change in material of the Protection Cover.

5.1.3.2 The table below has been included as a guide to manufacturers of modifications that are commonly submitted by the manufacturer to notify FM Approvals of changes in the product or of persons responsible for keeping FM Approvals advised by means of FM Approvals Form 619, *FM Approved Product/Specification-Tested Revision Report or Address/Main Contact Change Report*.

<i>Modification</i>	<i>Description/Example</i>
Change in Company Contact Information	Name, Title, Phone Number, Fax Number, Email Address, Company Office Address, Company Name
Updating of Drawings	FM Approved Product Revision Request Form is used to notify FM Approvals in the event of: minor dimensional changes to non-critical features, minor changes in notes, location of title block, re-creation of the same drawing on CAD, etc.
Changes in Markings	Please describe what changes are to be made and include a drawing of the proposed marking.
Changes in Materials of a component	Where new material is either superior, or comparable to material used in original Approval
Updating of Documentation	Creation of New or Revisions to Sales literature, Installation Instructions, Grooving Dimensions, Quality Manual, etc.

5.1.3.3 For the instances where the modification is difficult to categorize, manufacturers are encouraged to contact FM Approvals to discuss the nature of the change, and inquire about how to send the information to FM Approvals. The examples shown in Sections 5.1.3.1 and 5.1.3.2 are based on common examples of modifications as they relate to the manufacture of the product.

5.2 Surveillance Audit Program

- 5.2.1 An audit of the manufacturing facility is part of the Approval investigation to verify implementation of the quality control program. The surveillance audit shall ensure that the appropriate controls are in place to verify that the product bearing the FM Approval Mark conforms to the specified requirements. Although the structure defined in ISO 9001 “Quality Management Systems - Requirements” may be applied, the focus of surveillance audits is principally the FM Approved or Listed product. Initial inspections of facilities already producing similar FM Approved products may be waived at the discretion of FM Approvals.
- 5.2.2 Surveillance audits shall be conducted by FM Approvals, or its representatives, at least annually at each location that manufactures the product, and/or applies the FM Approval Mark as listed in the final Approval Report to confirm continued compliance. The frequency of, and time needed to complete, the surveillance audit is dependent on the product class, product complexity, jurisdictional requirements, FM Approvals accreditation requirements, and findings.
- 5.2.3 The manufacturer shall manufacture the product or service only at the location(s) audited by FM Approvals and as specified in the Approval Report. Manufacture of products bearing the FM Approval Mark is not permitted at any other locations without prior written authorization by FM Approvals.
- 5.2.4 In the event that all or part of the quality inspection is subcontracted, the manufacturer shall provide FM Approvals with documentation outlining the nature of the inspection, frequency, test details, and pass / fail criteria that was provided to the subcontracted company, and documentation that they have received and implemented these procedures.

5.3 Installation Inspections

Field inspections may be conducted to review an installation. The inspections are conducted to assess ease of application, and conformance to written specifications. When more than one application technique is used, one or all may be inspected at the discretion of FM Approvals.

5.4 Manufacturer's Responsibilities

The manufacturer shall notify FM Approvals of changes in product construction, design, components, raw materials, physical characteristics, coatings, component formulation or quality assurance procedures prior to implementation of such changes.

5.5 Manufacturing and Production Tests

5.5.1 Test Requirement No. 1 – *Durability Test*

The manufacturer shall test 100 percent of production water motor gongs hydrostatically for body and joint integrity during operation. The flow shall be held for a minimum of 10 seconds with no evidence of body leakage, cracking or distortion. There will be an audible sound produced, and the mechanism will run freely.

APPENDIX A: UNITS OF MEASUREMENT

FORCE:	lb - “pounds”; (N - “Newtons”) $N = lb \times 4.4482$
LENGTH:	in. - “inches”; (mm - “millimeters”) $mm = in. \times 25.4$ ft - “feet”; (m - “meters”) $m = ft \times 0.3048$
MASS:	lb - “pounds”; (kg - “kilograms”) $kg = lb \times 0.454$
PRESSURE:	psi - “pounds per square inch”; (kPa - “kilopascals”, Bar) $kPa = psi \times 6.895$ $bar = psi \times 0.0689$
TEMPERATURE:	°F - “degrees Fahrenheit”; (°C - “degrees Celsius”) $^{\circ}C = (^{\circ}F - 32) \times 0.556$

APPENDIX B: TOLERANCE

Unless otherwise stated, the following tolerances shall apply:

Mass	± 2 percent of value
Length	± 2 percent of value
Pressure	± 2 psi (14 kPa)
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 C: SAMPLE LISTING**Water Motor Gongs**

Water motor gongs give a locally audible alarm signal when the automatic sprinkler system operates. They may be used with water flow alarm, dry pipe, or automatic water control valves. Unless otherwise specified in the listing, all water motor gongs have a rated working pressure of 175 psi (1205 kPa).

CAT Co., Inc, 4321 E West Ave, Hope RI 02816

Product Designation	Inlet Connection	Outlet Connection	Remarks
Model TAC	3/4 inch NPT	1-1/2 inch NPT	