

Approval Standard for Alarm Check Valves

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Foreword

FM Approvals are 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 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 Approval 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, on successful re-examinations of equipment, materials, and services as appropriate, and on periodic follow-up audits of the manufacturing facility.

FM Approvals LLC reserves the right in its sole judgement 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 alarm check valves that hydraulically activate a mechanical and/or electrical alarm when one or more sprinklers activate.
- 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 follow-up program.

1.2 Scope

- 1.2.1 This standard encompasses the design and performance requirements for differential and pilot valve type alarm check valves. These valves are installed in wet sprinkler systems in either the vertical or horizontal orientation.
- 1.2.2 This standard was developed for alarm check valves in sizes: 1-1/2, 2, 2-1/2, 3, 4, 5, 6, and 8 in. nominal pipe size. Sizes refer to the nominal diameter of the pipeline to which the valve will be connected. In cases where metric sized alarm check valves are to be examined for Approval, test criteria comparable to the equivalent or nearest nominal inch size shall be used.
- 1.2.3 Alarm check valves covered in this Approval standard are supplied with either flanged, grooved, or flange x grooved inlet and outlet end connections.
- 1.2.4 Alarm check valves discussed in this Approval standard may also be supplied with a retard chamber in order to minimize false alarms due to surges and fluctuations in water supply pressure.
- 1.2.5 Alarm check valves discussed in this Approval standard are FM Approved for a 175 psi (1205 kPa) minimum rated working pressure.
- 1.2.6 Approval standards are intended to verify that the product described will meet stated conditions of performance, safety and quality useful to the ends of property conservation. Alarm check valves of unusual design may be subjected to special tests to determine their suitability.

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 was also considered.
- 1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of alarm check valves for the purpose of obtaining Approval. Alarm check valves 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, alarm check valves 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 initial facilities and procedures audit shall be conducted to evaluate the manufacturer's ability to consistently produce the product which was examined and tested as part of the Approval project. The audit will 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 drawing control. These examinations are repeated periodically as part of the FM Approvals' product follow-up program, (Refer to Section 5.2, Facilities and Procedures Audits).

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 Facilities and Procedures Audits (F&PAs) conducted as part of FM Approvals product follow-up program.

1.5.2 Also, as a condition of retaining Approval, manufacturers may not change a product or service without prior authorization by FM Approvals. (Refer to Section 5.1.3 Drawing and Change Control.)

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 **September 1, 2006** 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 10-97, "Standard for Use of the International System of Units (SI): The Modern Metric System."

2 FM APPROVALS

1.8 Applicable Documents

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

ANSI/American Society of Mechanical Engineers (ASME) B1.20.1-2001, *Pipe Threads, General Purpose (Inch)* and Redesignation of AMSE/ANSI B2.1 - 1968 (R2001)
ANSI/ASME B16.5 - 1988, *Pipe Flanges and Flanged Fittings*
ANSI/IEEE/ASTM SI 10-1997, *Standard for Use of the International System of Units (SI): The Modern Metric System*
ASTM D471 - 1998e1, *Standard Test Method for Rubber Property - Effect of Liquids*
ASTM D 572 - 1999, *Standard Test Method for Rubber - Deterioration by Heat and Oxygen*
American Water Works Association (AWWA) C606-1997, *Joints, Grooved and Shouldered Type*
FM Global Property Loss Prevention Data Sheets
International Standards Organization (ISO) 17025 – 1999, *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.)

Alarm Device

This term refers to the device that activates as a result of the opening of the alarm check valve. Alarm devices include electrical pressure switches that send signals to the control panel, and mechanical devices such as water motor gongs.

Alarm Line

This term refers to the valve trim piping from the alarm check valve to the alarm device. The alarm line piping is fed from water from the alarm port and may pass through the retard chamber.

Alarm Port

This term refers to the passageway through the alarm check valve body from the seat ring to the alarm line.

Bypass Line

This term refers to the trim piping that channels water from the water supply to the downstream side of the alarm check valve.

Constant Pressure Service

This term refers to installations where the alarm check valve is fed from a static water supply such as a water tank.

Corrosion Resistant

Having resistance to corrosion equal to or exceeding that of a bronze alloy having a minimum copper content of 80 percent, or constructed of 300 or 400 Series Stainless Steel.

Drain Orifice

This term refers to the designed restriction in the valve trim piping used to regulate the draining of water from the alarm line. The drain orifice may be located prior to, or at the bottom of the retard chamber.

Drain Valve

This term refers to the auxiliary valve located adjacent to the alarm check valve used to drain all water from the sprinkler system for valve maintenance, or system repair.

End Connections

This term refers to the method of connecting components of a pipe system to the ends of the valve. Typical end connections for alarm check valves discussed in this Approval Standard are flanged and grooved ends.

Flanged End Valves

Valves having mating flanged ends per the dimensional values shown in ANSI/ASME B16.5. Flanges to other national or international standards shall be evaluated on a case-by-case basis.

FM Approved Mark

The FM Approved Mark is detailed in Appendix B. Its use is mandatory on all units of FM Approved valves. These registered marks cannot be used except as authorized by FM Approvals via the granting of Approval to a specific product.

FM Approved

This term refers to products FM Approved by FM Approvals. Such products are listed in the Approval Guide, a publication of FM Approvals, issued annually, or one of the supplements. 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 obligates the manufacturer to allow re-examination of the product and audit of facilities and procedures at FM Approvals' 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. Approval is product specific.

Grooved End Valves

A grooved end valve is characterized by having grooved ends on the inlet and outlet ends of the valve body such that the valve may be installed in the sprinkler system piping using FM Approved grooved end couplings. For the purpose of this standard, grooves shall comply to the dimensional values shown in AWWA C606. Grooves to dimensions of other standards will be reviewed on a case-by-case basis.

Hand Hole Cover

A removable cover, which when removed, allows replacement of internal parts without having to remove the valve from the pipe line.

Horizontal Orientation

This term refers to installations where the alarm check valve is installed so that the clapper is in a near vertical position when closed. When installed in the horizontal orientation, the clapper shall be observed to fall towards the closed position when the waterflow stops.

Rated Working Pressure

The maximum sustained pressure at or below which the valve shall operate trouble free. This also sets the basis for the testing described in Section 4, Performance Requirements.

Retard Chamber

A retard chamber is a pressure vessel that is fed from water flowing through the alarm port of the alarm check valve. The vessel is sized to minimize false alarms due to surges and fluctuations in water supply pressures found in variable pressure service.

Retard Orifice

This term refers to a designed restriction in the waterway feeding the retard chamber with water. The retard orifice shall be sized to allow the retard chamber to provide a 5 to 60 second delay before signaling the alarm. The retard orifice may or may not be part of the retard chamber itself.

Variable Pressure Service

This term refers to installations where the alarm check valve is supplied water from a water supply with varying water supply pressure. An example of variable pressure service installations are when the alarm check valve is fed off the municipal water main.

Vertical Orientation

This term refers to installations where the alarm check valve is installed so that the clapper is in a near horizontal position when closed. When installed in the vertical orientation, the clapper shall be observed to fall towards the closed position when the waterflow stops.

2. GENERAL INFORMATION

2.1 Product Information

- 2.1.1 Alarm check valves typically consist of an assembly of the following components: body, spring, disc/clapper, seat ring, seal facing, lifting lug, hand hole cover, clapper spring, and hinge pin.
- 2.1.2 Alarm check valves are supplied with trim piping that create the alarm, bypass, and drain lines that provide for proper operation of the valve. The trim piping typically consists of pipe fittings and nipples, retard chamber, retard orifice, drain orifice, drain valve, inlet and outlet pressure gauges, and pressure switch (for electrical alarm signaling).
- 2.1.3 Alarm check valves discussed in this Approval standard are for use in wet sprinkler systems.
- 2.1.4 In order to meet the intent of this standard, alarm check valves 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 valves, 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 its authorized representative, shall submit a request to:

Hydraulics Group Manager
FM Approvals, Member of the FM Global Group
Hydraulics Laboratory
743A Reynolds Road
West Glocester, RI 02814
U.S.A.

- 2.2.2 The manufacturer shall provide, at a minimum, 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,
 - The number and location of manufacturing facilities.
- 2.2.3 All 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, and revision level. All foreign language documents shall be provided with English translation.

2.3 Requirements for Samples for Examination

Following set-up and authorization of an Approval examination, the manufacturer shall submit samples for examination and testing. Sample requirements are to be determined by FM Approvals following review of the preliminary information. Sample requirements may vary depending on design features, results of prior testing, and results of the foregoing tests. It is the manufacturer's responsibility to submit samples representative of production. Any decision to use data generated utilizing prototypes is at the discretion of FM Approvals. The manufacturer shall provide any special test fixtures, which may be required to evaluate the alarm check valves.

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 design drawings shall fully describe the product. All critical dimensions shall be indicated with 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 drawings shall be provided with an English translation.

3.2 Physical or Structural Features

- 3.2.1 Valves shall be designed for a minimum rated working pressure of 175 psi (1205 kPa).
- 3.2.2 End connections shall be flanged, grooved, or flanged x grooved and shall conform to a nationally or internationally recognized standard. Other types of end connections shall be evaluated on a case-by-case basis.
- 3.2.3 Alarm check valves shall be supplied with a hand hole large enough to permit the removal of all internal working parts without removal of the valve body from the sprinkler system.