



Member of the FM Global Group

Approval Standard for Liquid and Gas Safety Shutoff Valves

Class Number 7400

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Foreword

The FM Approvals certification mark 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 Approval Standards is to present the criteria for FM 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, 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 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 Approval requirements for liquid and gas safety shutoff valves including those classified as fire safe valves.
- 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 sets performance requirements for liquid and gas safety shutoff valves, fire safe (class 7440) and non-fire safe (Class 7400), used in the supply lines of commercial and industrial burners as well as in ignitable liquid piping systems.
- 1.2.2 Safety shutoff valves are intended to either completely close or open in response to one or more of the following conditions: a remote safety shutdown signal, loss of actuating medium, or under the influence of heat.
- 1.2.3 Safety shutoff valves may be held open or closed electrically, pneumatically, hydraulically, mechanically or a combination of one or more of the aforementioned methods. The valve shall return to its normal position automatically in response to one or more of conditions described in Section 1.2.2. In general, automatic return is by means of a spring.
- 1.2.4 Safety shutoff valves shall reset manually, either locally or remotely.
- 1.2.5 Fire safe valves are intended to provide the same functionality as safety shutoff valves with the additional ability to minimize the total amount of internal and external valve leakage when exposed to fire conditions.
- 1.2.6 Process flow control valves are included in the scope of this standard when equipped with a safety shutoff feature that meets the standard requirements.
- 1.2.7 Valves without automatic operation are not covered in the scope of this Approval.
- 1.2.8 The requirements of this standard shall be used to measure and describe the performance of safety shutoff valves in response to exposure from heat, pressure, etc., under controlled laboratory conditions. The results of these controlled exposures shall not be used to describe or appraise actual exposure conditions since such conditions will vary widely.
- 1.2.9 This standard replaces the following Class Numbers:
 - Class 7411 Safety Shutoff Valves – Electric Opening and Holding
 - Class 7412 Safety Shutoff Valves – Electric and Pressure Opening and Holding
 - Class 7413 Safety Shutoff Valves – Manual Opening, Electric Holding
 - Class 7431 Emergency Automatic Shutoff Valves
 - Class 7432 Emergency Quick-Opening Valves
 - Class 7450 Process Flow Control Valves – Electric Opening

- Class 7451 Process Flow Control Valves – Combination Electric & Pressure Opening
- Class 7452 Process Flow Control Valves – Pressure Opening
- Class 7453 Process Flow Control Valves – Manual

1.3 Basis for Requirements

- 1.3.1 The requirements of this standard are based on experience, research and testing, and 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 safety shutoff valves for the purpose of obtaining Approval. Safety shutoff 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, safety shutoff 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 examination of the manufacturing facilities and audit of quality control procedures is made 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. These examinations may be repeated as part of FM Approvals' product follow-up program.

1.5 Basis for Continued Approval

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 Approval report;
- satisfactory re-examination of production samples for continued conformity to requirements; and
- satisfactory Surveillance Audits conducted as part of FM Approvals' product follow-up program.

Also, as a condition of retaining Approval, manufacturers may not change a product or service without prior authorization by FM Approvals.

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 else forfeit Approval.

The effective date of this Approval Standard is September 1, 2018 for compliance with all requirements.

1.7 System of Units

Units of measurement used in this Standard are United States (U.S.) customary units (with the exception of heat flux). 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*.

For the purposes of this standard, heat flux is measured in terms of International System (SI) units with the United States (U.S.) customary unit conversion provided in Appendix A.

1.8 Applicable Documents

The following standards, test methods, and practices were reviewed and considered in the development of this standard:

ASME CSD-1-2012, *Controls and Safety Devices for Automatically Fired Boilers*
API Standard 607, *Fire Test for Quarter-Turn Valves and Valves Equipped with Nonmetallic Seats*, Sixth Edition, 2010
FM Approvals, Approval Standard 2031, *Heat Responsive Links for Fire Protection*, July 2001
FM Approvals, Approval Standard 3810, *Electrical and Electronic Test, Measuring and Process Control Equipment*, January 2005
FM Global Property Loss Prevention Data Sheet 6-4, *Oil- and Gas-Fired Single-Burner Boilers*, July 2014
FM Global Property Loss Prevention Data Sheet 7-88, *Ignitable Liquid Storage Tanks*, January 2007
IEEE/ASTM SI 10-2010, *American National Standard for Metric Practice*
ISO 17025 – 2005, *General Requirements for the Competence of Testing and Calibration Laboratories*.
NFPA 86, *Standard for Ovens and Furnaces*, 2015 Edition

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.)

Actuator Pressure Range

The holding medium pressure at which the fluid controlled actuator of a safety shutoff valve holds the valve out of normal position.

Actuation Temperature

The temperature at which a heat-actuated safety shutoff valve operates and returns to normal position. (Contrast with Operating Temperature Range.)

Actuator

The component responsible for controlling the operating mechanism of a safety shutoff valve. It is operated by a source of energy, typically electric current, hydraulic fluid pressure, pneumatic pressure, or a loaded mechanical spring. This source of energy is referred to as the holding medium.

Emergency Quick Opening Valve

Deprecated term used to describe heat-actuated normally open safety shutoff valves.

Emergency Shutoff Valve

Deprecated term used to describe heat-actuated normally closed safety shutoff valves.

End Connections

Refers to the method of connecting components to a piping system. Typical end connections are flanged and threaded.

Fire Safe Valve

A safety shutoff valve with the ability to minimize the average combined internal and external valve leakage rates when exposed to fire conditions. See specific fire exposure and performance requirements in Section 4.11.

Fusible Link

A component of a heat-actuated safety shutoff valve consisting of two strips of metal soldered together with a fusible alloy that is designed to melt at a specific temperature, allowing the two pieces to separate.

FM Approvals Certification Marks

Product markings, applied by the manufacturer, that identify a product as FM Approved. Their use is mandatory on all units of FM Approved products. 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, 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 obligates the manufacturer to allow re-examination of the product and surveillance audits 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. See Appendix C for a sample Approval Guide listing.

Heat-actuated Valve

A safety shutoff valve that operates under the influence of heat. Typical heat-actuated safety shutoff valves have an external spring loaded actuator held in place by a fusible link and operate upon failure of the fusible link.