Fire-Rated Ball Valves

Meet EXES 3-14-1-2A, API 607 Edition 3 and 4, Factory Mutual FM 7440 and British Standards
In recent years, many factors have contributed to an increased demand for fire-safe valves. Engineers and plant managers have faced the rising cost of insurance for liability and property damage. There has been an across-the-board tightening of environmental and safety regulations. Also, the cost of replacing damaged property and the expense of after-fire clean-ups have skyrocketed.

Worcester Controls has the quality solution for tough valve applications where operational integrity must be maintained before, during and after a fire. The solution is Worcester’s Fire-Rated Valves that assure tight shutoff and prevent external leakage in the tremendous heat of an industrial fire.

Heavy-duty body bolts and pipe ends add a great margin of safety to Worcester Fire-Safe Valves. Normal service performance is maintained with bubble-tight bidirectional sealing and three rugged seating materials - TFE, Reinforced TFE and Polyfill®. All fire-rated products can be ordered to meet NACE MR-01-75.

Fire-Rated Valves for All Standards
Worcester Controls Fire-Rated Valves meet the requirements of all major fire-safe standards including EXES 3-14-1-2A, API 607 Edition 4, Factory Mutual FM-7440 and British Standards BS5146 APP.B, BS 5351 Anti-Static and BS 6755-PT2. (See page 3).

Tight Shutoff
The ball in Worcester’s fire-rated valves moves downstream to create a metal-to-metal seal when the resilient seat has been totally sublimated in a fire (see illustrations on page 3).

Anti-Static
All Worcester fire valves feature a thrust bearing or stem seal of carbon-filled TFE. This material has excellent bearing characteristics, seals well, and positively grounds the stem to the valve body under all operating conditions. Valve sizes three inches and larger with 316 stainless steel stems feature positive ball grounding through the stem (IAW BS 5351).

No External Leakage
Process fluids are contained within the valves in a fire situation. The standard thrust bearing is carbon-filled TFE. If heat from the fire sublimates the thrust bearing, the blowout-proof stem forms a metal-to-metal seal with the valve body. TFE or graphite-coated stainless steel body seals (shown below) provide maximum fire safety. If a fire does occur, the 316 stainless steel “S” gasket provides a spring action to maintain the body seal throughout drastic temperature fluctuations. Larger valves utilize graphite body seals.

Standard Service vs High Cycle
All Worcester Fire Safe Valves provide excellent performance as manually operated or automated valves. For high-cycle operation, specify Series FZ94 three-piece or flanged valves. For cryogenic applications, specify the Series 94 cryogenic valve through the Custom Products Department.
Valve Model Identification
Three basic valve model identification letter groups are presented in this brochure, AF, FZ and FM. The letters are applied to a number of valve lines according to the standard the valve meets. AF valves meet API607. FZ valves meet EXES 3-14-1-2A (as well as API 607). FM valves meet FM 7440. Refer to the table below.

The Standards
EXES 3-14-1-2A (Fire-Safe)
This fire test is a recognized standard in the industry. It includes a test for sealing at low pressures to reduce the risk of gravity fed liquids fuelling a fire. It also includes a rapid quench of the valve after the burn, to simulate the abrupt cooling that occurs in an actual fire fighting situation.

API 607, Edition 4
This is a fire test for soft seated valves, developed by the Refinery Division of the American Petroleum Institute (API). This standard measures the ability of a ball valve to retard fire propagation. Valves meeting API 607 are designed to inhibit fires that are fueled by volatile fluids.

BS-5351
This British anti-static standard is the only national standard for grounding of valves. This standard requires a grounded stem on ball valves. AF44 and FZ44 valves meet this standard through the use of carbon-filled thrust bearing. On sizes 3” - 10”, anti-static devices grounding the ball to the body via the stem are also mandatory and accomplished with a spring loaded plunger on the stem tang. Available on the Series AF51/52, AF 818/828, EAF 818/828 and 3” - 6” FZ 51 with 316 stainless steel stem.

Optional, All-Metal, Fire-Rated Valves
Special versions of Worcester’s Series PT 44 and 94 valves incorporate abrasion resistant “Metal G” seats of graphite impregnated sintered stainless steel. Request Worcester brochures PB HP and PB 94.

<table>
<thead>
<tr>
<th>Worcester Fire-Rated Valves</th>
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<tr>
<td>Fire-Safe Standard</td>
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<td>EXES 3-14-1-2A</td>
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<tr>
<td>American Petroleum Institute API 607, Edition 4</td>
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<tr>
<td>British and Standard BS 6755-PT2 (same as API 607, Edition 3)</td>
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<tr>
<td>Factory Mutual FM-7440</td>
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</tbody>
</table>

Automation
Worcester offers a complete line of pneumatic and electric automation packages for the FZ, FM* and AF Series valves. Both electric and pneumatic packages are offered for on/off or proportional control. Available options include:

For Pneumatic
- Failsafe operation
- End and top mounted limit switches
- Proximity switches
- Single- and double-acting and electropneumatic positioner

For Electric
- TYPE 1,4,7 and 9 enclosures
- Remote positions indication
- Single-loop, set-point control
- Computer interfaces
- Many more options for today’s computer control applications

For more information, request Bulletins PB-302 and PB-730.

*For pneumatic operation only.
Specifications
Series AF44, Series FZ44, Three-Piece Valves, Series AF59 Full-Port, Three-Piece Valves

Sizes
AF44 ¼” and ½” only FZ44 - ¼”, ½”, 1”, 1½”, 2” AF59 - 2”

Pipe Ends
Screw Ends, Socket Weld, Butt Weld

Body and End Material
Carbon Steel or 316 Stainless Steel

Stem
One-piece, bottom-entry, 316 Stainless Steel, Monel®, Hastelloy C®

Stem Seal
Flexible Graphite

Follower
316 Stainless Steel

Thrust Bearing
Carbon-filled TFE (Conductive)

Seats
TFE, Reinforced TFE, Polyfill, Metal “G”

Body Seals
316 Stainless Steel “S” gasket (TFE or Graphite coated). Graphite on 2” AF59

Ball
316 Stainless Steel, Monel, Hastelloy C®

Body Bolts*
Stainless Steel ASTM A193 Grade B8 through bolts maintain strength even during the high temperatures of a fire.

Body Nuts
Stainless Steel ASTM A194 Grade 8

Operation
Valves are supplied with a handle. A locking or spring-return handle and complete complement of pneumatic and electric automation packages are also available.

Variations (V-Numbers)
V14 - Handleless Valves (2” AF59)
V32 - Oval Handle
V38 - Assemble without lubrication
V48 - Extended Lever Handle
V59 - Extended Oval Handle
V60 - OSHA Lockout
V67 - Weld-as-is

For other variations, see bottom of page 5.

Series FZ94, Three-Piece Valves

Sizes
¼”, ½”, 1”, 1½”, 2”

Pipe Ends
Screw Ends, Socket Weld, Butt Weld

Body and End Material
Carbon Steel, Stainless Steel

Stem
316 Stainless Steel, one-piece extended length construction with increased stem support for high cycling.

Stem Seal
Grafoil®

Seats
TFE, Reinforced TFE, Polyfill®, Metal “G”

Body Seals
316 Stainless Steel “S” gasket (TFE or Graphite coated).

Ball
316 Stainless Steel

Body Bolts*
Stainless Steel ASTM A193 Grade B8 through bolts maintain strength even during the high temperatures of a fire.

Body Nuts
Stainless Steel ASTM A194 Grade 8

Port
One sensing port drilled and tapped to ¼” NPT standard. Optional second port for purging.

Operation
Optional lever handle, pneumatic or electric automation (on/off or proportional control).

Variations (V-Numbers)
V38 - Assemble without lubrication
V57 - Corrosion Resistant Hardware
V67 - Weld-as-is

For other variations, see bottom of page 5.

*Alloy 20® bolts and nuts available for Chloride environments.
Series AF51 and AF52, Series FZ51 & FZ52, One-Piece Flanged Valves

Sizes
AF51/52 - ½", ⅜", 1", 1 ¼", 2", 3", 4", 6", 8", 10"
FZ51/52 - ¼", ⅜", 1", 1 ¼", 2", 3", 4", 6"

Flanges
Series AF51 - ANSI 150#, Series AF52 - ANSI 300#
Series FZ51 - ANSI 150#, Series FZ52 - ANSI 300#

Body Material
Carbon Steel ASTM A216 Grade WCB
Stainless Steel ASTM A351 Grade CF8M

Stem
One-piece, bottom-entry, 316 Stainless Steel, Monel, Hastelloy C

Thrust Bearing
Carbon-filled TFE (conductive)

Stem Seal
Flexible Graphite

Follower
316 Stainless Steel

Seats
TFE, Reinforced TFE, Polyfill, Metal “G”

Body Seal
316 Stainless Steel “S” gasket (TFE or Graphite coated) (⅜" - 2")
Graphite (3" - 8")

Ball
316 Stainless Steel, Monel, Hastelloy C

End Plug
Retention Bolt Style (except ⅜" - 2" threaded style) Carbon Steel or
316 Stainless Steel.

Operation
Valves are supplied with a lever or T-handle. Gear operators as
well as pneumatic and electric automation packages are also
available.

Variations (V-Numbers)
V14 - Handleless Valves (3" - 10")
V17 - Grounding Thrust Bearing
V32 - Oval Handle (⅜" - 2")
V34 - Threaded End Plug (3" - 10")
V39 - API - 6D Approved
V48 - Extended Lever Handle (⅜" - 2")
V59 - Extended Oval Handle (⅜" - 2")

For other variations, see below.

Series AF94 and FZ94, One-Piece Flanged Valves

Sizes
AF94 - 4", 6"
FZ94 - ⅜", ⅝", 1", 1 ⅛", 2", 3", 4", 6"

Flanges
AF94; FZ94-150 (ANSI 150# raised face)
AF94; FZ94-300 (ANSI 300# raised face)

Body Material
Carbon Steel ASTM A216 Grade WCB
Stainless Steel ASTM A351 Grade CF8M

Stem
316 Stainless Steel, one-piece extended length construction with
increased stem support for high cycling.

Stem Seal
Grafoil

Seats
TFE, Reinforced TFE, Polyfill, Metal “G”

Body Seal
316 Stainless Steel “S” gasket (TFE or Graphite-coated), Graphite (3" - 6")

Ball
316 Stainless Steel

End Plug
Retention Bolt Style (except ⅜" - 2" threaded style) Carbon Steel or
316 Stainless Steel.

Port
One sensing port drilled and tapped to ⅜" NPT standard. Optional
second port for purging.

Operation
Optional lever or T-handle, pneumatic or electric
automation (on/off or proportional control).

Variations (V-Numbers)
V38 - Assemble without Lubrication (⅜" - 2")
V57 - Corrosion Resistant Hardware

For other variations, see below.

Other Available Variations (V-Numbers)
V3 - Upstream Relief Hole, V5 - Hydrostatic Testing, V6 - Source Inspection, V20 - Oxygen Service, V33 - Oxygen Service without Source Inspection,

All products designed to ANSI B16.34. *Requires metal G seats.
### Series AF82 and AF83, AF/FZ818 and AF/FZ828, EAF818 and EAF828, Full Port Flanged Valves

**Sizes**
AF82/83 - ¼", ⅜", ⅜", ½" 1", 2½", 3", 4", 6", 8"
AF/FZ818/828 - 2", and EAF818/828 - 2", 3", 4", 6", 8"

**Flanges**
AF 82, AF/FZ 818, EAF818 (ANSI 150# raised face)
AF 83, AF/FZ 828, EAF828 (ANSI 300# raised face)

**Body Material**
Carbon Steel ASTM A216 Grade WCB
Stainless Steel ASTM A351 Grade CF8M

**End Connector**
Carbon Steel ASTM A216 Grade WCB
Stainless Steel ASTM A351 Grade CF8M

**Stem**
One-piece, bottom-entry, 316 Stainless Steel

**Stem Seals**
Flexible Graphite

**Thrust Bearing**
AF82/83 - Carbon-filled TFE (Conductive)
AF/FZ 818/828, EAF818/828 - Graphite

**Body Seal**
¾" - 1½" Stainless Steel (TFE or Graphite coated)
2" - 10" Graphite

**Ball**
16 Stainless Steel

**Operation**
Supplied with lever or T-handles (¾" - 6" only). Handles optional on EAF 818/828 Valves. Gear Operators as well as electric and pneumatic automation packages are also available.

**Dimensions**
For dimensions, refer to dimensional sheets EVD - 1, 2 and 4. For Fire-Safe Series 94 valves, refer to Brochure PB-94.

### Specifications (AF/FZ Valves)

#### Pressure Temperature Ratings

![Graph showing pressure and temperature ratings]

**Note:** Standard Worcester valves are assembled with silicon based break-in. For other options consult your distributor or Flowserve.

#### Flow Coefficient (Cv)

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<th>Valve Size</th>
<th>Max. Cv</th>
<th>Equivalent Length of Pipe in Feet</th>
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<td>⅜&quot;</td>
<td>8</td>
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<td>½&quot;</td>
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<td>Flanged Ball Valves</td>
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</table>

**For other variations, see bottom of page 5.**
Series FM and AFM 51/52 Flanged Valves

Factory Mutual Approved Valves for Flammable Liquid Service

Worcester Controls Series FM 51/52 valves are a line of rugged flanged ball valves designed specifically to meet requirements of the FM 7440 Standards, flammable liquid service. The valve performance features are the same as AF 51/52 and FZ 51/52 Worcester Fire-Safe valves.

The approved AFM valves have specific seat and body seal materials, actuator sizes and solenoid valve types (see specifications below). When a Series 39 pneumatic actuator is used for on-off or throttling service, a fusible plug with splash guard is installed in the air line to the actuator. At a predetermined temperature, the plug melts, exhausting air to close the valve well before the actuator is threatened by fire exposure.

AFM 51/52 valves are available in sizes ½" - 4", with Series 39 pneumatic actuators with solenoid valves (on-off operation) and PM-15 positioners (throttling operation). FM 51/52 valves are manual valves also available in sizes ½" - 4". For an outline of FM testing programs, refer to Worcester Controls' Technical Paper TP-2D-1.

*AFM designates “Actuated Factory Mutual” and is a separate product from the AF Series, which is appropriate to API and British Standards.

Specifications (FM/AFM Valves)

Valve Series and Size
Series FM51, Class 150 Flanged ½" - 4"
Series FM52, Class 300 Flanged ½" - 4"

Materials
All Stainless Steel
Carbon Steel with Stainless Steel ball and stem

Valve End Connections
ANSI Class 150 flanged
ANSI Class 300 flanged

Seats
Polyfill

Body Seal
TFE 316 Stainless Steel “S” Gasket (TFE or Graphite coated)
(½" - 2") Graphite (3", 4")

Stem Seals
Grafoil

Pressure Rating
125 psig maximum, flammable liquid

Temperature Rating
500°F maximum. Refer to published pressure/temperature curves

Operation
Manual lever handle or fail closed air actuated

Actuator Series Minimum Sizes
1039S (½" - ¾")
1539S (1")
2039S (1¼")
2539S (2")
3339S (3")
3539S (4")

Actuator Pressure Rating
60 to 120 psi

Solenoid/NEMA Rating
TYPE 7 Class 1, Groups C&D

Solenoid Voltage
24, 120, 240 VAC; 6, 12, 24 VDC

Limit Switch Rating
ELK39, End Mounted Indication Device TYPE 4, 7, 9

Positioner
PM15D, double acting pneumatic
PM15S, single acting pneumatic

Positioner Input
3 to 15 psi, 3 to 9 psi, 9 to 15 psi

Positioner Mode
Direct or reverse acting
### How to Order

#### Three-Piece Valves

<table>
<thead>
<tr>
<th>Size</th>
<th>Options</th>
<th>Styles</th>
<th>Series</th>
<th>Body Pipe Ends</th>
<th>Ball and Stem</th>
<th>Seats</th>
<th>Body Seals</th>
<th>Pipe Ends</th>
<th>Variations</th>
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<tbody>
<tr>
<td>1/4&quot;</td>
<td>V - Vacuum</td>
<td>AF</td>
<td>44</td>
<td>4 - Carbon steel</td>
<td>6 - Stainless steel</td>
<td>T - TFE</td>
<td>G - Graphite coated stainless steel “S” gasket</td>
<td>SE - Screw ends</td>
<td>L20 - Alloy 20(^\circ) body bolts and nuts</td>
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<td>3/8&quot;</td>
<td>X - Oxygen</td>
<td>FZ</td>
<td>44</td>
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Note: FZ valves with “G” seats use G seals only.

#### Full-Port Flanged Valves

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<tr>
<th>Size</th>
<th>Options</th>
<th>Styles</th>
<th>Series</th>
<th>Body Pipe Ends</th>
<th>Ball and Stem</th>
<th>Seats</th>
<th>Body Seals</th>
<th>Pipe Ends</th>
<th>Variations</th>
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<td>R - RTFE</td>
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150 - ANSI Class 150 flanges
300 - ANSI Class 300 2" - 10" flanges

See pages 5 and 6 for available variations.
# How to Order

## One-Piece Flanged Valves

<table>
<thead>
<tr>
<th>Size</th>
<th>Options</th>
<th>Styles</th>
<th>Series</th>
<th>Body Pipe Ends</th>
<th>Ball and Stem</th>
<th>Seats</th>
<th>Body Seals</th>
<th>End Connections</th>
<th>Variations</th>
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<tbody>
<tr>
<td>1/2&quot;</td>
<td>V - Vacuum</td>
<td>AF</td>
<td>51/52</td>
<td>4 - Carbon steel</td>
<td>6 - Stainless steel</td>
<td>T - TFE</td>
<td>M - TFE coated</td>
<td>150 - ANSI Class 150 flanges</td>
<td>S-7 - Complete S.S. externals</td>
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<td>X - Oxygen (Specify Service)</td>
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<td></td>
<td>R - RTFE</td>
<td>G - Graphite coated stainless steel</td>
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*A FM 51/52 Valves available through Custom Products, Consult Factory.*
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