OVERVIEW
The Valveworks USA FM4 Series consists of a lineup of gate valves with reliable, proven designs that are engineered and manufactured to meet the requirements of API 6A, and where a 7 1/16" bore is required. This series of gate valves offer the user several options depending on the specific application including achieving a positive seal at wellbore/flowline pressures ranging from zero to 5,000 PSI.

FM4 Series gate valves are full bore, through conduit valves. This allows for downhole tools to be passed through the wellhead and/or Christmas tree and reduces turbulent flow. FM4 Series valves are similar to each other in design with only slight variations across the lineup, offering a high percentage of parts interchangeability, giving you an efficiency-driven advantage in the management and maintenance of your gate valve fleet, and providing optimal life cycle management integrity.

This brochure provides an in-depth look at the details of this series of gate valves and explains the features, benefits, characteristics, dimensional & technical data, and other valuable information needed to determine which valve provides an optimal solution for your specific application.

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a) Equipped with a non-sealing seat on the upstream side. See engineering note titled “Model FM4 & Model FM4 RC” for details.
b) 7-1/16" X 5-1/8", 7-1/16" X 5-3/4", 7-1/16" X 6-1/8", 7-1/16" X 6-3/8", 7-1/16" X 6-5/8", and 7-1/16" x 7-1/8" available upon request.
c) Product Specification Level
d) See engineering note titled “Expanding Gate Assembly Operation Explained” for details.
e) Also referred to as “HANDWHEEL OPERATED”
g) Also referred to as “FULL OPENING”
h) Injectable packing can be energized into the valve bonnet stuffing box under pressure.
i) Repacking is achieved via stem backseat method.
j) Valve bonnet / ball screw housing (where applicable) equipped with grease port(s) and fitting(s) for bearing lubrication.
Expanding Gate Assembly Operation Explained – The expanding gate assembly consists of two main components; the gate (major) and the segment (minor). These components are assembled together using precision machined pins and high quality, precision formed and treated Nickel-Chromium alloy springs. When the valve is manually operated, the gate and segment act one against the other by means of a dual expanding wedge when the valve is either fully opened or fully closed. This expansion effect of the gate assembly against the valve seats, through parallel faces of the gate assembly, provides a strong and positive seal against pulsations and vibrations created by flow conditions.

Model FM4 and Model FM4 RC – These models are unidirectional gate valves equipped with an expanding gate assembly and a sealing seat in the downstream seat pocket. The upstream seat pocket is equipped with a non-sealing seat assembly. This allows pressure to bypass the upstream seat, equalize throughout the valve body, and only seal against the downstream seat assembly as the original Model M was intended. These models are marked with a flow direction arrow for accurate installation.

NOTE: When bidirectional operation is required, a slab gate valve is necessary: FM4 expanding gate valves (Model FM4 and Model FM4 RC) are not designed for bidirectional operation.

Pressure Testing – FM4 Series gate valves are not intended to be tested through the body lubrication fittings. These fittings are designed for lubrication purposes only. Shell tests and gate/seat tests shall be conducted from the end/outlet connection by qualified personnel.

Ball Screw Operated (BSOP) – FM4 Series gate valves are offered with an optional ball screw operator, which reduces the number of handwheel turns by approximately 60%, and greatly reduces the operating torque when opening and/or closing the valve. The number of turns required for a regular handwheel operated valve is between 39-1/4 to 39-1/2 from full open to full closed. The ball screw operated (BSOP) version of the same valve requires only 15-1/2 turns. This can be beneficial when time is of the essence.

<table>
<thead>
<tr>
<th>TEMPERATURE CLASSIFICATION</th>
<th>OPERATING RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>-75°F (-60°C) TO 180°F (82°C)</td>
</tr>
<tr>
<td>L</td>
<td>-50°F (-46°C) TO 180°F (82°C)</td>
</tr>
<tr>
<td>N</td>
<td>-50°F (-46°C) TO 140°F (60°C)</td>
</tr>
<tr>
<td>P</td>
<td>-20°F (-29°C) TO 180°F (82°C)</td>
</tr>
<tr>
<td>S</td>
<td>0°F (-18°C) TO 140°F (60°C)</td>
</tr>
<tr>
<td>T</td>
<td>0°F (-18°C) TO 180°F (82°C)</td>
</tr>
<tr>
<td>V</td>
<td>35°F (2°C) TO 250°F (121°C)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MATERIAL CLASS</th>
<th>BODY, BONNET END &amp; OUTLET CONNECTIONS</th>
<th>PRESSURE-CONTROLLING PARTS &amp; STEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA GENERAL SERVICE</td>
<td>CARBON OR LOW-ALLOY STEEL</td>
<td>CARBON OR LOW-ALLOY STEEL</td>
</tr>
<tr>
<td>BB GENERAL SERVICE</td>
<td>CARBON OR LOW-ALLOY STEEL</td>
<td>STAINLESS STEEL</td>
</tr>
<tr>
<td>CC GENERAL SERVICE</td>
<td>STAINLESS STEEL</td>
<td>STAINLESS STEEL</td>
</tr>
<tr>
<td>DD SOUR SERVICE</td>
<td>CARBON OR LOW-ALLOY STEEL</td>
<td>CARBON OR LOW-ALLOY STEEL</td>
</tr>
<tr>
<td>EE SOUR SERVICE</td>
<td>CARBON OR LOW-ALLOY STEEL</td>
<td>STAINLESS STEEL</td>
</tr>
<tr>
<td>FF SOUR SERVICE</td>
<td>STAINLESS STEEL</td>
<td>STAINLESS STEEL</td>
</tr>
<tr>
<td>HH SOUR SERVICE</td>
<td>CRA</td>
<td>CRA</td>
</tr>
</tbody>
</table>

a) as defined by ISO 15156 (all parts) (NACE MR0175; See Clause 2).
b) in accordance with ISO 15156 (NACE MR0175; See Clause 2).
c) CRA required on retained-fluid wetted surfaces only.
d) CRA as defined in Clause 3; ISO 15156 (all parts) (NACE MR0175; See Clause 2) definition of CRA does not apply.

ValveWorks USA Description Key

- Gate Valve
- API Specification
- ValveWorks USA Model
- Gate Type
- Bore Size (Nominal)
- Rated Working Pressure
- End Connection
- Material Class
- Temperature Rating/Classification
- PSL
- PR
- Operation Type

Abbreviation Key

- FM4 = MODEL FM4
- FM4 SG = MODEL FM4 SLAB GATE
- FM4 RC = MODEL FM4 ROUND CAVITY
- FM4 SG SG = MODEL FM4 ROUND CAVITY SLAB GATE
- FM4 BSOP = MODEL FM4 BALL-SCREW OPERATED
- FM4 RC BSOP = MODEL FM4 ROUND CAVITY BALL-SCREW OPERATED

- HWO = Handwheel Operated (Manual)
- BSOP = Ball-Screw Operated
- EXP = Expanding Gate
- SG = Slab Gate
- FE = Flanged End
- RTJ = Ring Type Joint
- PSL = Product Specification Level
- PR = Performance Requirement
- XYL = Xylan®
- HF = Hardfaced
## Dimension Table Key

- **A**: Flange to Flange
- **B**: Valve Bore Size
- **C**: Bore Centerline to Bottom
- **D**: Bore Centerline to Top
- **E**: Handwheel Diameter
- **NT**: Number of Turns
- **RJ**: Ring Joint
- **BSS**: Bonnet Stud Size
- **N**: Number of Studs
- **WT**: Approximate Weight
- **HT**: Handwheel Operating Torque

### Flanged Gate Valves (HWO)

<table>
<thead>
<tr>
<th>Size</th>
<th>WP (PSI)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>NT</th>
<th>RJ</th>
<th>BSS</th>
<th>N</th>
<th>WT (LBS)</th>
<th>HT (FT-LBS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 1/16</td>
<td>2K</td>
<td>25 1/8</td>
<td>7 1/16</td>
<td>16 5/8</td>
<td>33 1/2</td>
<td>24</td>
<td>39 1/4</td>
<td>R-45</td>
<td>1 1/4</td>
<td></td>
<td>1047</td>
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</tr>
<tr>
<td>7 1/16</td>
<td>3K</td>
<td>28 1/8</td>
<td>7 1/16</td>
<td>16 5/8</td>
<td>33 1/2</td>
<td>24</td>
<td>39 1/4</td>
<td>R-45</td>
<td>1 1/4</td>
<td></td>
<td>1550</td>
<td></td>
</tr>
<tr>
<td>7 1/16</td>
<td>5K</td>
<td>32</td>
<td>7 1/16</td>
<td>16 5/8</td>
<td>33 1/2</td>
<td>30</td>
<td>39 1/4</td>
<td>R-46</td>
<td>1 1/4</td>
<td></td>
<td>1650</td>
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</tbody>
</table>

### Flanged Gate Valves (BSOP)

<table>
<thead>
<tr>
<th>Size</th>
<th>WP (PSI)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>NT</th>
<th>RJ</th>
<th>BSS</th>
<th>N</th>
<th>WT (LBS)</th>
<th>HT (FT-LBS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 1/16</td>
<td>3K</td>
<td>28 1/8</td>
<td>7 1/16</td>
<td>30 1/8</td>
<td>56</td>
<td>28</td>
<td>15 1/2</td>
<td>R-45</td>
<td>1 1/4</td>
<td></td>
<td>1915</td>
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<tr>
<td>7 1/16</td>
<td>5K</td>
<td>32</td>
<td>7 1/16</td>
<td>30 1/8</td>
<td>56</td>
<td>28</td>
<td>15 1/2</td>
<td>R-46</td>
<td>1 1/4</td>
<td></td>
<td>2015</td>
<td></td>
</tr>
</tbody>
</table>

*All dimensions are in inches*
a) Equipped with a non-sealing seat on the upstream side. See engineering note titled “Model FM4 & Model FM4 RC” for details.

b) See engineering note titled “Expanding Gate Assembly Operation Explained” for details.

c) Valve bonnet / ball screw housing (where applicable) equipped with grease port(s) and fitting(s) for bearing lubrication.

*THE ACTUAL PRODUCT MAY VARY SLIGHTLY FROM SHOWN SCHEMATIC DUE TO ENGINEERING APPROVED VARIATION*
h) Injectable packing can be energized into the valve bonnet stuffing box under pressure.

i) Valve bonnet / ball screw housing (where applicable) equipped with grease port(s) and fitting(s) for bearing lubrication

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*THE ACTUAL PRODUCT MAY VARY SLIGHTLY FROM SHOWN SCHEMATIC DUE TO ENGINEERING APPROVED VARIATION*
**MODEL FM4 BSOP - BIDIRECTIONAL, SLAB GATE, CAST BODY**

- HANDWHEEL
- COVER PLATE
- BEARINGS
- BALL SCREW
- BEARINGS
- BONNET PACKING
- BEARINGS
- UPPER BONNET
- BONNET SEAL RING
- OPERATING STEM
- GREASE FITTING
- LOWER BEARING SPACER
- STEM ADAPTER
- UPPER BEARING SPACER
- BONNET SEAL RING
- STEM PROTECTOR
- CAST BODY
- GATE
- SEAT
- GREASE FITTING
- GREASE FITTING

**j** Valve bonnet / ball screw housing (where applicable) equipped with grease port(s) and fitting(s) for bearing lubrication

*THE ACTUAL PRODUCT MAY VARY SLIGHTLY FROM SHOWN SCHEMATIC DUE TO ENGINEERING APPROVED VARIATION*
Model FM4 RC BSOP - Bidirectional, Slab Gate, Forged Body

- Handwheel
- Cover Plate
- Bearing
- Ball Screw
- Upper Bearing Spacer
- Operating Stem
- Lower Bearing Spacer
- Bonnet Packing
- Upper Bonnet
- Bonnet Seal Ring
- Grease Fitting
- Gate
- Forged Body
- Stem Protector
- Balance Stem

j) Valve bonnet / ball screw housing (where applicable) equipped with grease port(s) and fitting(s) for bearing lubrication

*The actual product may vary slightly from shown schematic due to engineering approved variation