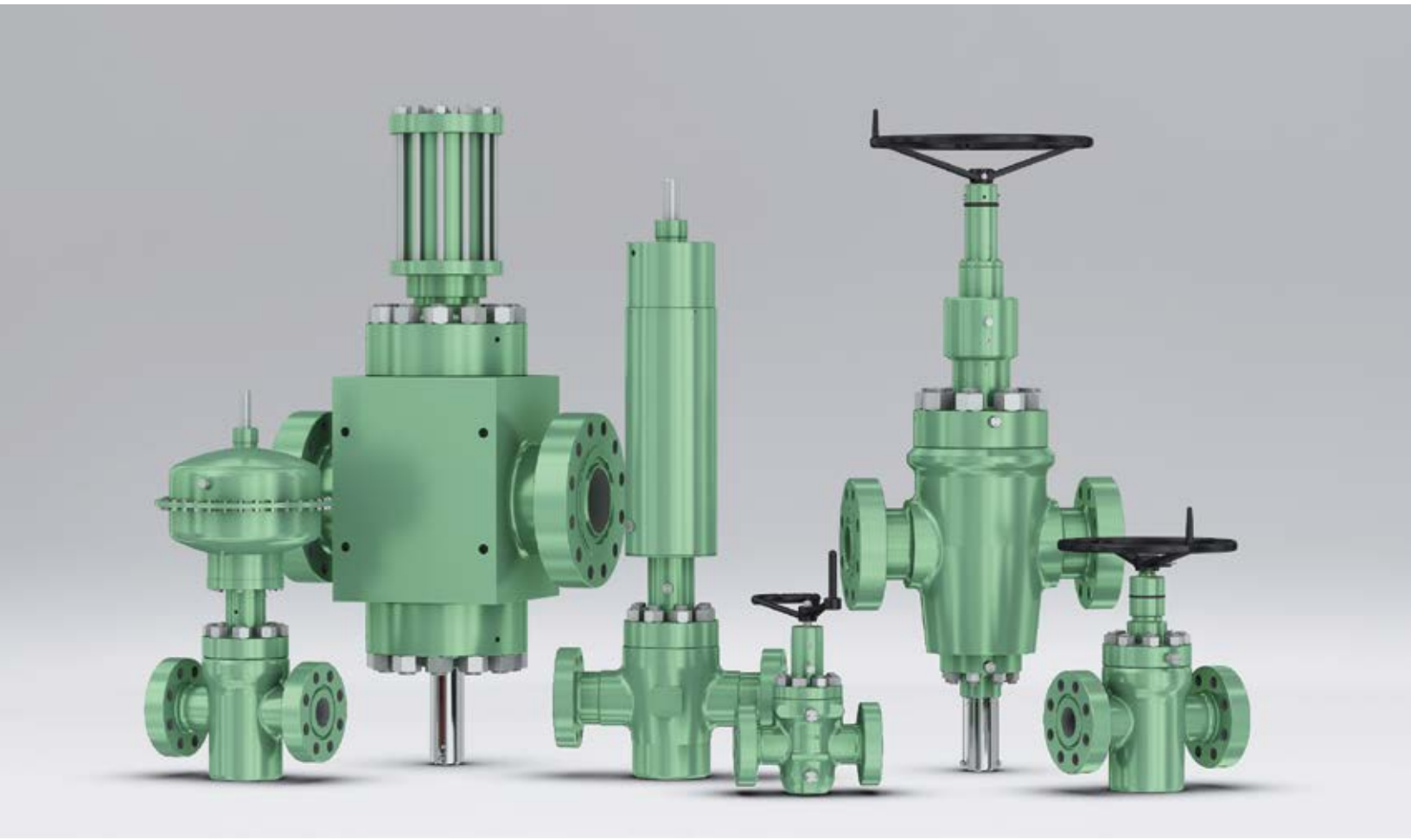
CAMERON
A Schlumberger Company



API Spec 6A Gate Valves

Innovative pressure control solutions
for onshore and offshore applications

There is a need for upstream drilling and production valves to be more than adequate to withstand the industry's demanding applications, such as drilling, production, large-bore completions, frac service, HPHT, ultraHPHT, wellhead, frac and production trees, and steam service. As an original equipment manufacturer, Cameron is committed to designing, manufacturing, testing, installing, and servicing premium gate valves with the highest degree of precision and quality. Our valves are built to perform.

Industry-leading sealing technology is incorporated into every design and we undertake constant improvement initiatives to develop new design concepts, such as the FLS-S* API 6A split slab-style gate valve with a split-gate design that has two slab gates in the same valve cavity to allow performing a flowline seal test simultaneously in both flow directions. Our efforts to provide reliable valves carry over into customer service, a dedication to quality assurance, intensive service personnel training programs, and our global network of service facilities. Stringent procedures are followed to maintain valve integrity throughout service life.

Cameron actuated and manual valves for North Sea platform.

The Cameron gate valve product line provides

- Technology validated from 2,000-psi to 30,000-psi working pressure (WP) and temperature coverage from –75 to 650 degF [–60 to 345 degC]
- Sealing designs that increase gate valve dependability
- Components constructed of carefully selected alloys suitable for severe service applications
- Wide product selection for various onshore and offshore applications
- Expanding and slab gate designs, each with its own recognized strengths
- Cast and forged bodies
- Wide range of nominal bore sizes
- Designs that are compatible with a wide selection of actuators

Maximum attention is paid to all Cameron valve development and manufacturing phases, enabling us to invent innovative solutions to pressure control challenges that deliver reliable performance.

Your Choice of Gate Designs

Slab-style gates

Most of our gate valve designs use a solid, single-piece slab gate. The use of a slab-style gate simplifies the design, resulting in a valve that is rugged, yet easy to assemble and maintain. Included in this category are the Cameron FLS* extreme service API 6A slab-style gate valve and HT model, FLS-R* large-bore HP API 6A slab-style gate valve, and M STS-2* API 6A manual slab-style gate valve.

Expanding-style gates

An alternative to the slab-style gate design is the expanding gate, which is used in our M Pow-R-Seal* API 6A expanding gate valve and M-HT* API 6A HT expanding gate valve. The defining feature of this design is its high mechanical seating force generated by applying torque to the handwheel in the full open and full closed positions, making it a favorite of many operators for some applications.

Power-actuated valves

The FL* API 6A slab-style gate valve and FLS gate valve, in addition to the M Saf-T-Seal* API 6A power-actuated fullbore through-conduit gate valve (the actuated version of M STS-2 gate valve), are readily adaptable to a wide range of our Saf-T-Gard* actuators. These designs include

- pneumatic
- hydraulic
- electric actuator.

Wireline-cutting versions are available for the FLS gate valve.

Slab-style gate.

Expanding-style gate.

Finishing chamfers on edges of gates.

Size and Pressure Availability

Nominal Bore Size, in	Working Pressure, psi						
	2,000 [13.8 MPa]	3,000 [20.7 MPa]	5,000 [34.5 MPa]	10,000 [69.0 MPa]	15,000 [103.5 MPa]	20,000 [138.0 MPa]	30,000† [206.8 MPa]
1 13/16	–	–	–	FLS valve	FLS valve	FLS valve	FLS‡ and FLS-R valves
2 1/16	FLS valve§	FLS§ and FLS-S valves	FLS§ and FLS-S valves	FLS and FLS-S valves	FLS and FLS-S valves	FLS valve	–
	M-series	M-series	M-series	–	–	–	–
2 9/16	FLS valve§	FLS§ and FLS-S valves	FLS§ and FLS-S valves	FLS and FLS-S valves	FLS and FLS-S valves	FLS valve	FLS‡ and FLS-R valves
	M-series	M-series	M-series	–	–	–	–
3 1/16	–	FLS-S valve	FLS-S valve	FLS and FLS-S valves	FLS and FLS-S valves	FLS‡ and FLS-R valves	–
3 1/8	FLS valve§	FLS§ and FLS-S valves	FLS§ and FLS-S valves	FLS-S valve	FLS-S valve	–	–
	M-series	M-series	M-series	–	–	–	–
4 1/16	–	FLS-S valve	FLS-S valve	FLS and FLS-S valves	FLS, FLS-R, and FLS-S valves	FLS‡ and FLS-R valves	FLS‡ and FLS-R valves
4 1/8	FLS valve§	FLS valve§	FLS valve§	–	–	–	–
	M-series	M-series	M-series	–	–	–	–
5 1/8	FLS valve	FLS and FLS-S valves	FLS and FLS-S valves	FLS, FLS-R, and FLS-S valves	FLS‡ and FLS-R valves	FLS‡ and FLS-R valves	–
	–	–	–	–	FLS-RS* large-bore HP API 6A split slab-style gate valve	–	–
6 1/8	FLS valve	FLS valve	FLS valve	–	–	–	–
6 3/8	FLS valve	FLS and FLS-S valves	FLS and FLS-S valves	FLS and FLS-R valves	FLS‡ and FLS-R valves	–	–
	–	–	–	FLS-S and FLS-RS valves	FLS-S valve	–	–
7 1/16	–	FLS-S valve	FLS and FLS-S valves	FLS and FLS-R valves‡	FLS‡ and FLS-R valves	–	–
	–	–	–	FLS-S and FLS-RS valves	FLS-S valve	–	–
9	–	FLS-S valve	FLS and FLS-R valves	FLS‡ and FLS-R valves	FLS‡ and FLS-R valves	–	–
	–	–	FLS-S valve	FLS-S and FLS-RS valves	FLS-S valve	–	–
11	–	–	FLS‡ and FLS-R valves	–	–	–	–

Notes: FLS gate valves may be manual or actuated unless otherwise noted.

† This is a working pressure not currently covered in API Spec 6A.

‡ FLS gate valves for this size and pressure combination are power actuated.

§ FLS gate valves also available as HT models.

For FLS and FLS-R gate valves, this chart represents typical valves for API Material Classes AA, BB, CC, DD, EE, FF, and HH (except FL); Temperature Ratings K, L, P, S, T, U, and V; and Product Specification Levels 1, 2, 3, 3G, and 4. For other designs, please contact your Cameron representative.

For M-series gate valves, this chart represents typical valves for API Material Classes AA, BB, CC, DD, EE, and FF; Temperature Ratings K, L, P, S, T, U, and V; and Product Specification Levels 1 and 2. For other designs, please contact your Cameron representative.

A Family of High-Quality Gate Valves for Demanding Applications

Quality assurance

Cameron gate valves are designed with experience, manufactured with painstaking attention to detail, and tested to API- and Cameron-approved quality plans. No shortcuts. No cheap substitutes. If it says Cameron on the nameplate, you can feel confident that it is made to Cameron's exacting standards.

Large-bore completions

The Cameron gate valve lineup includes bore sizes up to 11-in nominal to enable operators to increase production rates from large reservoirs.

- FLS API 6A gate valves fitted with Saf-T-Gard actuators are designed for surface safety valve (SSV) and large-bore, high-pressure applications. These are available with wireline-cutting capability and a full complement of accessories such as position indicators, fusible lock-open devices, and manual overrides.
- FLS-R gate valve is a manual API 6A gate valve designed specifically for large-bore and high-pressure applications. The lower balancing stem and the unique ball-screw stem drive mechanism serve to reduce break-open and running torques and to cycle the valve quickly.

Pressure and temperature extremes (HPHT and ultra-HPHT)

Deep wells are known for high, sometimes extreme, pressures and temperatures. The FLS and FLS-R gate valves continuously undergo R&D efforts designed to push their performance boundaries as needed to service HPHT and ultra-HPHT applications.

If requirements are for pressures up to 30,000 psi or temperatures up to 450 degF (232 degC), Cameron gate valves can cover those needs.

Frac service

As a leading provider of critical and high-pressure control equipment, Cameron is committed to providing effective, reliable, and cost-effective products to handle the challenges that are unique to this fast-growing element of our industry.

The line of FLS API 6A valves incorporates features such as forged body construction, a floating gate, and bidirectional sealing. The manual FLS-R gate valve is a manually operated valve designed for use in large-bore high-pressure applications. This valve incorporates a lower balancing stem and unique ball-screw mechanism for ease of operation in the field.

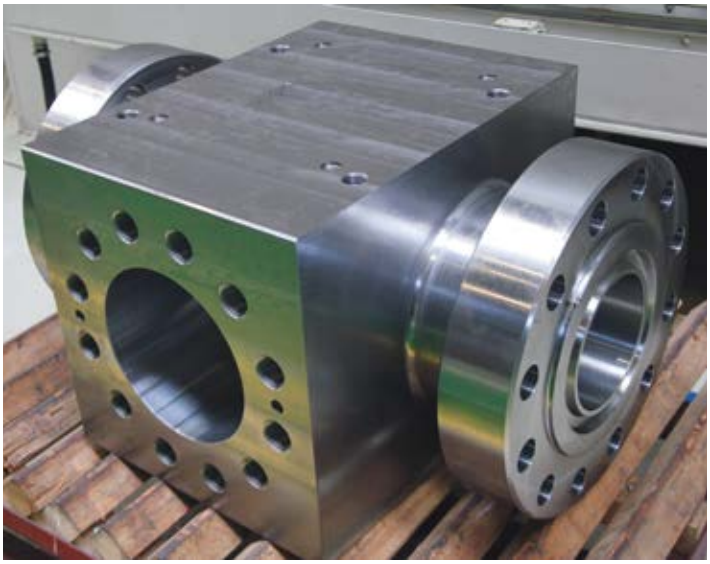
The FLS-DA2* API 6A double-acting actuated gate valve is a hydraulically operated valve designed for high-pressure frac applications. The FLS-DA2 gate valve is fitted with a lower balancing stem to work in concert with a double-acting hydraulic actuator to provide reliable control through the entire stroke of the valve. Featuring a position indicator for ease of use, both the FLS-R and FLS-DA2 gate valves incorporate an improved stem seal design specially suited to harsh frac environments.

Large-bore HPHT wellhead and 20,000-psi WP, 300 degF [149 degC] gate valves with actuators used in HPHT applications.

A 7-in, 15,000-psi WP large-bore gate valve used in hydraulic fracturing applications.

Gate Valve Application Table	FLS Valve	HT Model FLS Valve	FLS-R Valve	FLS-S Valve	FLS-RS Valve	M Pow-R-Seal Valve	M-HT Valve	M STS-2 Valve	M Saf-T-Seal Valve
Characteristics									
Slab gate	●	●	●	●	●			●	●
Expanding gate						●	●		
Split gate				●	●				
Forged body	●	●	●	●	●				
Cast body						●	●	●	●
Manual	●	●	●	●	●	●	●	●	
Power actuated	●			●					●
Applications									
Tree	●	●	●	●	●	●	●	●	●
Wellhead	●	●	●			●	●	●	●
Manifold	●		●					●	
Frac service	●		●						
Drilling	●		●						
Subsea	●		●						
Service									
Temperature ranges									
–20–250 degF [–29–121 degC]	●		●	●	●	●		●	●
–50–250 degF [–46–121 degC]	●		●	●	●	●		●	●
–75–250 degF [–60–121 degC]	●		●	●	●				
350 degF [180 degC] max.	●		●	●	●				
Steam service (650 degF [345 degC]) max.	●	●	●	●	●		●		
Material Class (API Spec 6A)									
AA (general service)	●	●	●	●	●	●	●	●	●
BB (general service)	●	●	●	●	●	●	●	●	●
CC (general service)	●	●	●	●	●	●	●	●	●
DD (sour service)	●	●	●	●	●	●	●	●	●
EE (sour service)	●	●	●	●	●	●	●	●	●
FF (sour service)	●	●	●	●	●	●	●	●	●
HH (sour service)	●	●	●	●	●				

Gate valve bodies and bonnets in process.



Finished machined gate valve body.

FLS Extreme Service API 6A Slab-Style Gate Valve

The FLS slab-style gate valve is widely recognized as a high-quality valve for severe applications. The FLS valve is a forged fullbore through-conduit gate valve available in standard double flange, threaded-end, and special block body configurations. The FLS valve is our standard valve for critical requirements including extreme sour and subsea applications. It can be fitted with a wide range of Cameron actuators.

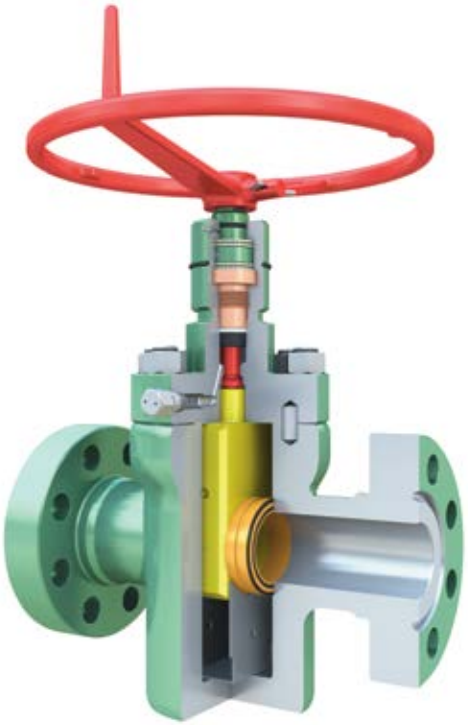
Features and benefits

- Bidirectional design for flow direction versatility and increased service life
- Positive metal-to-metal sealing (gate-to-seat and seat-to-body)
- Simple, reliable gate and seat designs promoting ease of field service and minimal spare parts inventory
- Two spring-loaded, pressure-energized, nonelastomeric lip seals between each seat and body for assisting in low-pressure sealing and protecting against intrusion of particle contaminants into the body cavity and seal areas
- Stem seal design covering a wide range of pressures, temperatures, and fluids encountered in wellhead and manifold service
- Metal-to-metal bonnet seal
- Optional backseating of stem for allowing stem seal replacement with the valve under pressure
- Grease injection fitting location downstream of the stem back seat for increased safety and fitting in the bonnet to help elimination of body penetration
- Bearing cap grease fitting enabling positive bearing lubrication
- Easy closing and sealing without excessive torque

FLS-DA2 API 6A double-acting actuated gate valve

For positive control of high-pressure frac valves and for many subsea and drilling applications, Cameron offers the FLS-DA2 API 6A double-acting actuated gate valve. This design combines the field-proven FLS gate valve with a double-acting hydraulic actuator.

The FLS-DA2 gate valve is fitted with a balancing lower stem to work in concert with a double-acting hydraulic actuator to provide positive, reliable control through the entire stroke of the valve. Should a failure of hydraulic power occur, this valve remains in position.



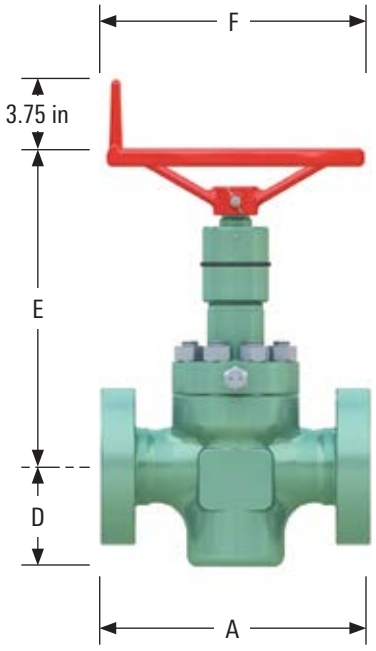
FL and FLS Valves Trim Chart

API 6A Classification	Body and Bonnet Material	Stem Material	Gate Material, Coating	Seat Material, Coating
AA—general service	Alloy steel	Alloy steel	Alloy, nitrided	Alloy steel, nitrided
BB—general service	Alloy steel	Stainless steel†	Stainless steel, hard-faced	Stainless steel, hard-faced
CC—general service	Stainless steel	Stainless steel†	Stainless steel, hard-faced	Stainless steel, hard-faced
DD—sour service‡	Alloy steel	Alloy steel	Alloy, hard-faced	Stainless steel, hard-faced
EE—sour service‡	Alloy steel	Stainless steel†	Stainless steel, hard-faced	Stainless steel, hard-faced
FF—sour service‡	Stainless steel	Stainless steel†	Stainless steel, hard-faced	Stainless steel, hard-faced
HH—sour service‡	Alloy steel clad with alloy 625 or solid CRA	CRA	CRA, hard-faced	Solid cobalt alloy or CRA, hard-faced

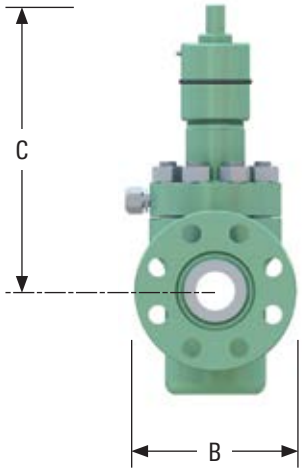
† Corrosion-resistant alloy (CRA) for applications below –20 degF [–29 degC]

‡ As defined by NACE MR0175/ISO 15156

Note: Specifications are subject to change without notice. Special trims are available on request.



FLS gate valve—side view.



FLS gate valve—end view.

FLS Valve Operating and Dimensional Data (Inches and Pounds)

Nominal Size, in	Working Pressure, psi	Dimensions, in						Weight, lbm	Number of Turns
		A	B	C	D	E	F		
1 13/16	10,000	18.25	9.00	15.00	5.75	17.25	14.00	241	12⅓
	15,000	18.00	9.50	15.00	5.88	17.38	14.00	296	12⅓
	20,000	21.00	11.38	16.25	7.88	18.00	18.50	565	14¾
2 1/16	2,000	11.62	6.09	13.00	5.28	14.25	10.00	95	12⅓
	3,000	14.62	7.00	15.00	5.50	17.25	14.00	169	12⅓
	5,000	14.62	7.00	15.00	5.50	17.25	14.00	169	12⅓
	10,000	20.50	9.00	15.00	5.62	16.75	18.50	256	12⅓
	15,000	19.00	9.62	15.12	5.88	16.88	18.50	306	12⅓
	20,000	23.00	11.75	17.00	7.50	18.75	18.50	773	15⅞
2 9/16	2,000	13.12	7.00	13.88	6.00	15.00	10.00	138	15⅛
	3,000	16.62	7.88	15.88	6.00	18.12	14.00	232	15⅛
	5,000	16.62	7.88	15.88	6.00	18.12	14.00	232	15⅛
	10,000	22.25	9.38	15.88	6.75	17.62	18.50	365	15⅛
	15,000	21.00	11.25	17.25	7.75	19.00	18.50	555	15¾
	20,000	26.50	14.62	20.25	10.00	23.88	24.00	1,188	19½
3 1/8	2,000	14.12	7.88	14.75	7.12	17.00	14.00	205	18⅛
	3,000	17.12	8.38	16.75	7.25	19.00	14.00	271	18⅛
	5,000	18.62	9.12	16.75	7.25	18.50	18.50	316	18⅛
3 1/16	10,000	24.38	10.12	18.00	8.12	21.62	24.00	515	18⅛
	15,000	23.56	13.75	18.50	9.75	22.00	24.00	895	22⅞
4 1/8	2,000	17.12	9.62	18.38	9.00	20.12	14.00	341	23¼
	3,000	20.12	10.38	18.38	8.75	20.12	18.50	410	23¼
	5,000	21.62	10.75	18.38	9.88	20.12	18.50	537	23¼
4 1/16	10,000	26.38	12.75	19.62	10.25	23.25	24.00	879	23¼
	15,000	29.00	14.50	32.88	11.62	34.38	24.00	1,506	29¼
5 1/8	2,000	22.12	11.00	21.25	12.62	23	18.50	933	27½
	3,000	24.12	13.00	21.25	12.75	24.75	24.00	987	27½
	5,000	28.62	11.50	21.25	12.62	24.75	24.00	1,131	27½
	10,000	29.00	14.50	23.25	13.25	26.75	24.00	1,239	29
6 1/8	2,000	22.12	12.38	22.75	12.88	26.25	18.00	895	33¾
	3,000	24.12	12.62	22.75	12.88	26.38	24.00	999	33¾
	5,000	29.00	14.12	22.75	12.88	26.38	24.00	1,186	33¾
6 3/8	2,000	22.12	12.38	22.75	12.88	26.25	18.00	895	33¾
	3,000	24.12	12.62	22.75	12.88	26.38	24.00	999	33¾
	5,000	29.00	14.12	22.75	12.88	26.38	24.00	1,184	33¼
	10,000	35.00	18.00	39.25	14.62	41.25	34.00	2,660	43⅛
7 1/16	5,000	32.00	17.38	37.12	14.75	39.12	28.00	2,673	46½
9	5,000	41.00	23.12	40.62	20.00	42.62	40.00	4,557	59¼

Additional sizes and pressures are available on request.
All valves rated 2,000, 3,000, and 5,000 psi are also available as HT model.

FLS Valve Operating and Dimensional Data (Millimeters and Kilograms)

Nominal Size, in	Working Pressure, psi	Dimensions, mm						Weight, kg	Number of Turns
		A	B	C	D	E	F		
1 13/16	10,000	463.6	228.6	381.0	146.1	438.2	355.6	109	12⅓
	15,000	457.2	241.3	381.0	149.4	441.5	355.6	134	12⅓
	20,000	533.4	289.1	412.8	200.2	457.2	469.9	256	14¾
2 1/16	2,000	295.1	154.7	330.2	134.1	362.0	254.0	43	12⅓
	3,000	371.3	177.8	381.0	139.7	438.2	355.6	77	12⅓
	5,000	371.3	177.8	381.0	139.7	438.2	355.6	77	12⅓
	10,000	520.7	228.6	381.0	142.7	425.5	469.9	116	12⅓
	15,000	482.6	244.3	384.0	149.4	428.8	469.9	139	12⅓
	20,000	584.2	298.5	431.8	190.5	476.3	469.9	351	15⅞
2 9/16	2,000	333.2	177.8	352.6	152.4	381.0	254.0	63	15⅛
	3,000	422.1	200.2	403.4	152.4	460.2	355.6	105	15⅛
	5,000	422.1	200.2	403.4	152.4	460.2	355.6	105	15⅛
	10,000	565.2	238.3	403.4	171.5	447.5	469.9	165	15⅛
	15,000	533.4	285.8	438.2	196.9	482.6	469.9	252	15¾
	20,000	673.1	371.3	514.4	254.0	606.6	609.6	539	19½
3 1/8	2,000	358.6	200.2	374.7	180.8	431.8	355.6	93	18⅛
	3,000	434.8	212.9	425.5	184.2	482.6	355.6	123	18⅛
	5,000	472.9	231.6	425.5	184.2	469.9	469.9	143	18⅛
3 1/16	10,000	619.3	257.0	457.2	206.2	549.1	609.6	234	18⅛
	15,000	598.4	349.3	469.9	247.7	558.8	609.6	406	22⅞
4 1/8	2,000	434.8	244.3	466.9	228.6	511.0	355.6	155	23¼
	3,000	511.0	263.7	466.9	222.3	511.0	469.9	186	23¼
	5,000	549.1	273.1	466.9	251.0	511.0	469.9	243	23¼
4 1/16	10,000	670.1	323.9	498.3	260.4	590.6	609.6	399	23¼
	15,000	736.6	368.3	835.2	295.1	873.3	609.6	683	29¼
5 1/8	2,000	561.8	279.4	539.8	320.5	542.2	469.9	423	27½
	3,000	612.6	330.2	539.8	323.9	628.7	609.6	447	27½
	5,000	726.9	292.1	539.8	320.5	628.7	609.6	513	27½
	10,000	736.6	368.3	590.6	336.6	679.5	609.6	562	29
6 1/8	2,000	561.8	314.5	577.9	327.2	666.8	457.2	406	33¾
	3,000	612.6	320.5	577.9	327.2	670.1	609.6	453	33¾
	5,000	736.6	358.6	577.9	327.2	670.1	609.6	538	33¾
6 3/8	2,000	561.8	314.5	577.9	327.2	666.8	457.2	406	33¾
	3,000	612.6	320.5	577.9	327.2	670.1	609.6	453	33¾
	5,000	736.6	358.6	577.9	327.2	670.1	609.6	537	33¼
	10,000	889.0	457.2	997.0	371.3	1,047.8	863.6	1,206	43⅛
7 1/16	5,000	812.8	441.5	942.8	374.7	993.6	711.2	1,212	46½
9	5,000	1,041.4	587.2	1,031.7	508	1,082.5	1,016	2,066	59¼

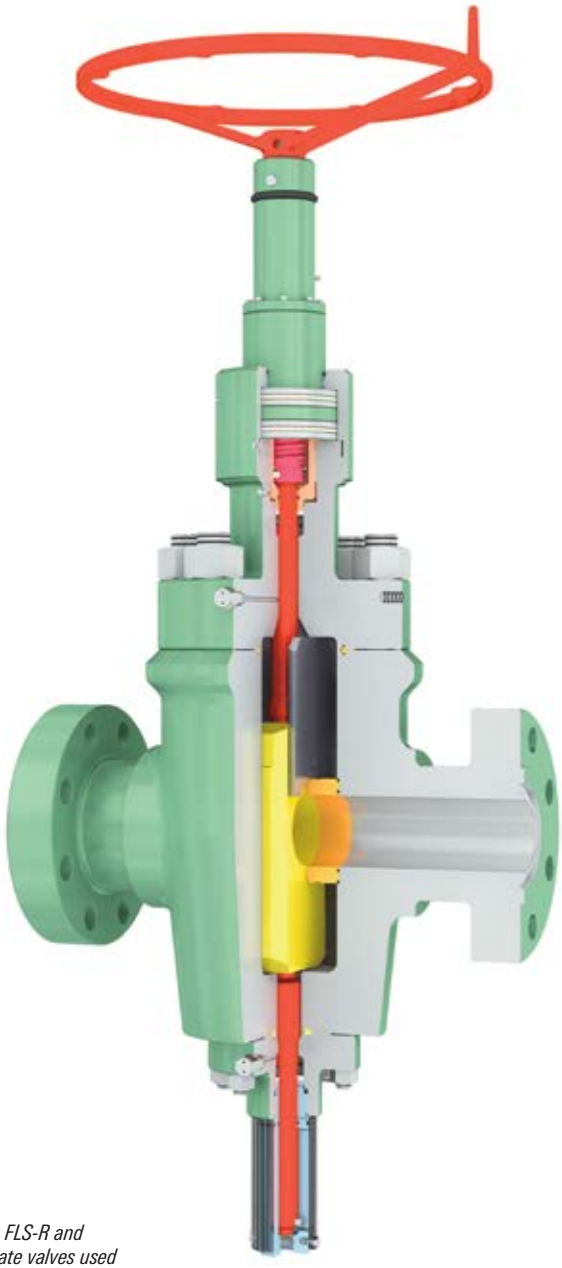
Additional sizes and pressures are available on request.
All valves rated 2,000, 3,000, and 5,000 psi are also available as HT model.

FLS-R Large-Bore HP API 6A Slab-Style Gate Valve

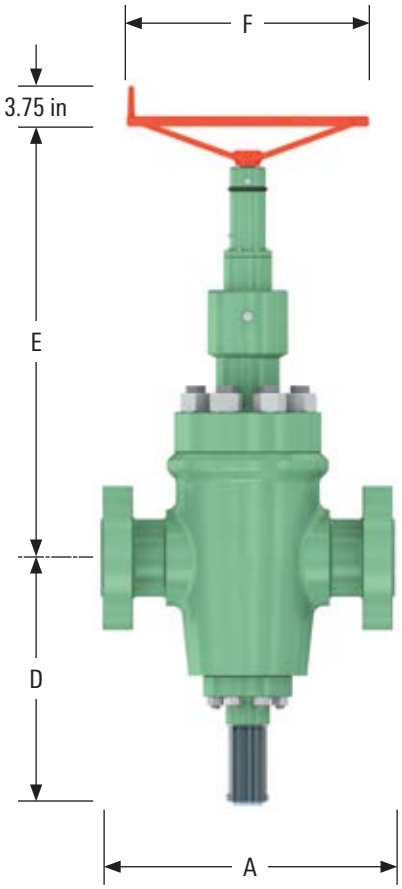
The FLS-R slab-style gate valve was designed for use as a manual valve in high-pressure large-bore applications. This valve incorporates a lower balancing stem and unique ball-screw mechanism for ease of operation in the field. The FLS-R gate valve is value-engineered for reliability, low torque, and ease of operation and service. The FLS-R gate valve has many of the same features as the FLS gate valve, including the gate and seat design.

Features and benefits

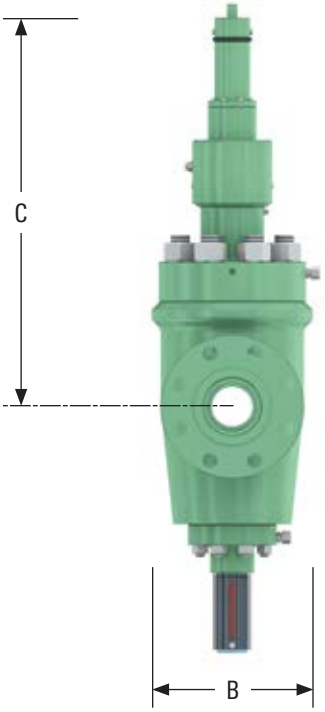
- Bidirectional design for flow direction versatility and increased service life
- Positive metal-to-metal sealing (gate-to-seat and seat-to-body)
- Simple, reliable gate and seat designs promoting ease of field service and minimal spare parts inventory
- Two spring-loaded, pressure-energized, nonelastomeric lip seals between each seat and body for assisting in low-pressure sealing and protecting against intrusion of particle contaminants into the body cavity and seal areas
- Lower stem balancing pressure thrust on upper stem for reducing operating torque, preventing body cavity pressure buildup during operation, and providing position indication
- Spring-loaded, pressure-energized, nonelastomeric stem seal covering a wide range of pressures, temperatures, and fluids
- Pressure-energized metal-to-metal bonnet seal
- Optional backseating of either stem for allowing stem seal replacement with valve under pressure
- Grease injection fittings located on the downstream side of the stem and the balancing stem back seat for safety
- Metal-to-metal bonnet seal



Large-bore FLS-R and FLS-DA2 gate valves used in Cameron frac manifolds and manufactured in-house at our state-of-the-art manufacturing facilities.



FLS-R gate valve—side view.



FLS-R gate valve—end view.

FLS-R Gate Valve Operating and Dimensional Data (Inches and Pounds)

Nominal Size, in	Working Pressure, psi	Dimensions, in						Weight, lbm	Number of Turns
		A (Flanged)	B	C	D	E	F		
1 13/16	30,000	26	13.5	33.5	22.5	37.12	24	1,477	13½
2 9/16	30,000	31	15.38	35.88	25	37.88	28	2,073	15
3 1/16	20,000	30.5	16	32	19.25	35.75	24	2,178	15¾
4 1/16	15,000 20,000	29 35.5	15.88 18.75	39.75 38.25	24.88 23.5	41.12 40.25	24 34	1,592 3,447	19 21
5 1/8	10,000 15,000	29 35	15.94 17.75	40.44 40.5	27.12 24.62	41.75 42.5	24 28	1,575 3,198	23¼ 24
6 3/8	10,000 15,000	35 41	18 23.88	45.75 59.5	32.62 33.75	47.75 61.5	34 40	2,699 7,024	28¾ 15¼
7 1/16	10,000 15,000	35 41	18.88 24	47.62 60.38	29.5 35	49.62 62.38	34 40	3,619 7,017	31 16⅝
9	5,000	41	23	53.12	33.5	55.12	28	4,526	38¼

Additional sizes and working pressures are available. Contact your Cameron representative.

FLS-R Valve Operating and Dimensional Data (Millimeters and Kilograms)

Nominal Size, in	Working Pressure, psi	Dimensions, mm						Weight, kg	Number of Turns
		A (Flanged)	B	C	D	E	F		
1 13/16	30,000	660.4	342.9	850.9	571.5	942.8	609.6	670	13½
2 9/16	30,000	787.4	390.7	911.4	635	962.2	711.2	940	15
3 1/16	20,000	774.7	406.4	812.8	489	908.1	609.6	988	15¾
4 1/16	15,000 20,000	736.6 901.7	403.4 476.3	1,009.7 971.6	632 596.9	1,044.4 1,022.4	609.6 863.6	722 1,563	19 21
5 1/8	10,000 15,000	736.6 889.0	404.9 450.9	1,027.2 1,028.7	688.8 625.3	1,060.5 1,079.5	609.6 711.2	714 1,450	23¼ 24
6 3/8	10,000 15,000	889.0 1,041.4	457.2 606.6	1,162.1 1,511.3	828.5 857.3	1,212.9 1,562.1	863.6 1,016	1,224 3,185	28¾ 15¼
7 1/16	10,000 15,000	889.0 1,041.4	479.6 609.6	1,209.5 1,533.7	749.3 889	1,260.3 1,584.5	863.6 1,016	1,641 3,182	31 16⅝
9	5,000	1,041.4	584.2	1,349.2	850.9	1,400	711.2	2,053	38¼

Additional sizes and working pressures are available. Contact your Cameron representative.

FLS-R Valve Trim Chart

API 6A Classification	Body and Bonnet Material	Stem Material	Gate Material, Coating	Seat Material, Coating
AA—general service	Alloy steel	CRA or stainless steel	Alloy steel, nitrided	Alloy steel, nitrided
BB—general service	Alloy steel	CRA or stainless steel	Stainless steel, hard-faced	Stainless steel, hard-faced
CC—general service	Stainless steel	CRA or stainless steel	Stainless steel, hard-faced	Stainless steel, hard-faced
DD—sour service†	Alloy steel	CRA or stainless steel	Alloy steel, hard-faced	Stainless steel, hard-faced
EE—sour service†	Alloy steel	CRA or stainless steel	Stainless steel, hard-faced	Stainless steel, hard-faced
FF—sour service†	Stainless steel	CRA or stainless steel	Stainless steel, hard-faced	Stainless steel, hard-faced
HH—sour service†	Alloy steel clad with alloy 625 or solid CRA	CRA	CRA, hard-faced	Solid cobalt alloy or CRA, hard-faced

† As defined by NACE MR0175/ISO 15156

Note: Specifications are subject to change without notice. Special trims are available on request.

Torque Comparison of 7 1/16-in, 10,000-psi WP Valves

Torque	Conventional (Nonrising Stem) Design†		FLS-R Valve Design‡
	Direct to Stem: 39 Turns	6:1 Torque Multiplier: 234 Turns	31 Turns
Opening torque (10,000-psi differential)	1,500 lbf.ft [2,035 N.m] (first 3.25 turns)	313 lbf.ft [425 N.m] (first 19.5 turns)	150 lbf.ft [203 N.m] (avg) (first 3 turns)
Opening torque (after unseating)	55 lbf.ft [75 N.m] (35.75 turns)	55 lbf.ft [75 N.m] (214.5 turns)	15 lbf.ft [20 N.m] (avg) (28 turns)

† Typical values

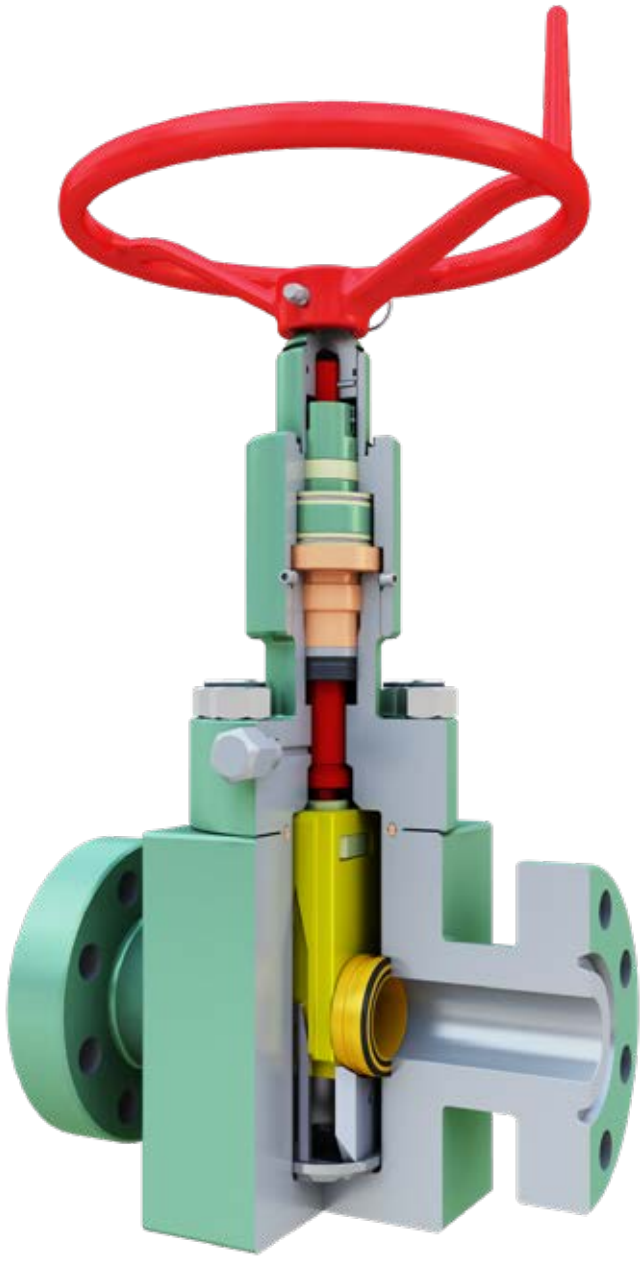
‡ Actual test data

FLS-S API 6A Split Slab-Style Gate Valve

The FLS-S split slab-style gate valve model was designed for API Spec 6A application with all features of the FLS valve model, such as forged construction, metal-to-metal sealing, slab-style gate, stem seal, and seat design. The most beneficial feature of the FLS-S gate valve split gate design is its ability to perform a single dual-seat seal test. The gate design is available for all FLS-S and FLS-RS valve pressure ratings (3,000 to 15,000 psi) and bore sizes (2 1/16 to 9 in).

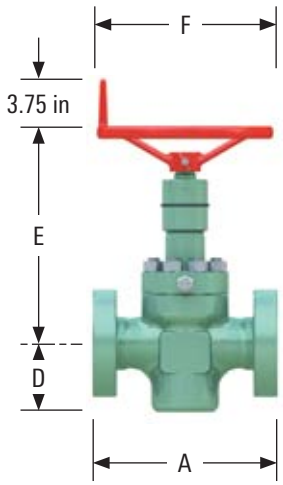
Features and benefits

- Bidirectional design for flow direction versatility and increased service life
- Positive metal-to-metal sealing (gate-to-seat and seat-to-body)
- Simple, reliable gate and seat design promoting ease of field service and minimal spare parts inventory
- Split gate design allows for single dual-seat test for both flow directions
- Two spring-loaded, pressure energized, nonelastomeric lip seals between each seat and body for assisting in low-pressure sealing and protecting against intrusion of particle contaminants into the body cavity and seal areas
- Stem seal design covering full range of pressures, temperatures, and fluids encountered in wellhead and manifold service
- Metal-to-metal bonnet seal
- Optional backseating of stem for allowing stem seal replacement with the valve under pressure
- Grease injection fitting location downstream of the stem back seat for increased safety and fitting in the bonnet to help elimination of body penetration
- Bearing cap grease fitting enabling positive bearing lubrication
- Easy closing and sealing without excessive torque
- True shear pin protection from torque



FLS-RS large-bore HP API 6A split slab-style gate valve

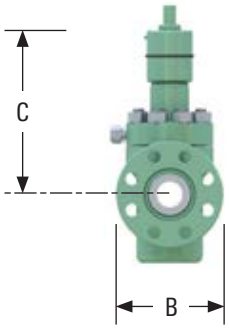
The FLS-RS large-bore HP API 6A split slab-style gate valve model was designed with all features of the FLS-R gate valve combined with the dual-seat, single-test functionality of the FLS-S gate valve model. The FLS-RS gate valve is designed for use in high-pressure large-bore applications. The valve incorporates a lower balancing stem and ball-screw mechanism to lower operator torque.



FLS-S gate valve—side view.

FLS-S Gate Valve Operating and Dimensional Data (Inches and Pounds)

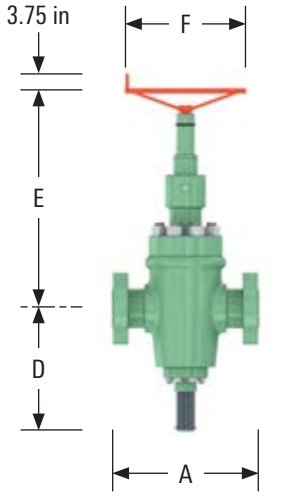
Nominal Size, in	Working Pressure, psi	Dimensions, in						Weight, lbm	Number of Turns
		A	B	C	D	E	F		
2 1/16	5,000 10,000	14.62 20.5	7.19 9	19.38 19.38	5.38 5.59	21.65 21.12	14 18.5	260 297	12 1/3 12 1/4
3 1/16	10,000	24.38	11	21.44	8.15	22.75	24	760	18
4 1/8	3,000	20.12	11.5	23.28	9.63	25.03	18.5	575	23 1/4
4 1/16	10,000	26.38	13.5	24.5	11.44	25.94	24	1,350	23 1/4
5 1/8	5,000 10,000	28.62 29	14.5 17.25	26.31 30.75	12.94 13.5	27.75 34.43	24 24	1,235 2,670	27 1/2 29
6 3/8	3,000	24.12	15.25	30.32	13.67	34	24	1,950	34



FLS-S gate valve—end view.

FLS-S Gate Valve Operating and Dimensional Data (Millimeters and Kilograms)

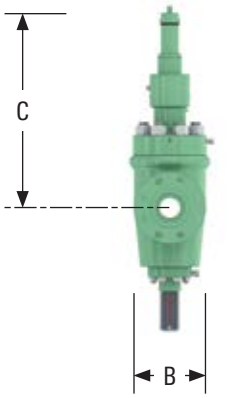
Nominal Size, in	Working Pressure, psi	Dimensions, mm						Weight, kg	Number of Turns
		A	B	C	D	E	F		
2 1/16	5,000 10,000	371.3 520.7	182.6 228.6	492.3 492.3	136.7 142	549.9 536.4	355.6 469.9	118 135	12 1/3 12 1/4
3 1/16	10,000	619.3	279.4	544.6	207	577.9	609.6	345	18
4 1/8	3,000	511	292.1	591.3	244.6	635.8	469.9	261	23 1/4
4 1/16	10,000	670.1	342.9	622.3	290.6	658.9	609.6	614	23 1/4
5 1/8	5,000 10,000	726.9 736.6	368.3 438.2	668.3 781.1	328.7 342.9	704.9 874.5	609.6 609.6	561 1,213	27 1/2 29
6 3/8	3,000	612.6	387.4	770.1	347.2	863.6	609.6	886	34



FLS-RS gate valve—side view.

FLS-RS Gate Valve Operating and Dimensional Data (Inches and Pounds)

Nominal Size, in	Working Pressure, psi	Dimensions, in						Weight, lbm	Number of Turns
		A	B	C	D	E	F		
4 1/16	15,000	29.00	15.82	38.33	25.91	43.37	24.00	1,100	19
6 3/8	10,000	35.00	20.00	44.38	32.24	47.74	34.00	2,700	28 3/4



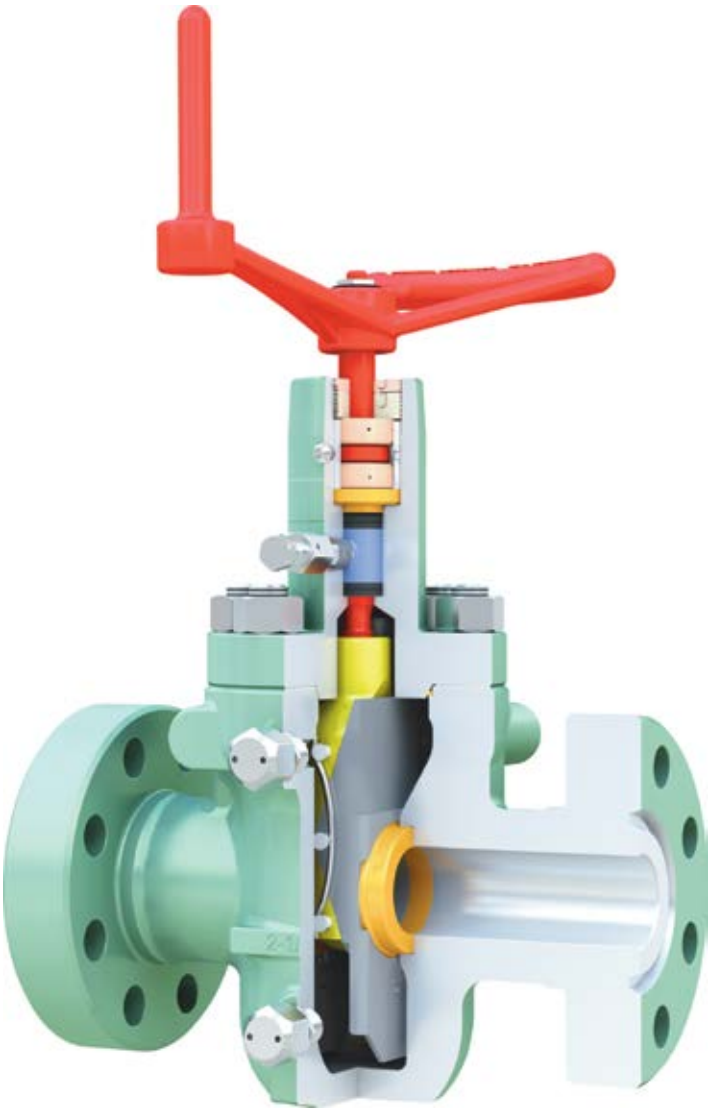
FLS-RS gate valve—end view.

FLS-RS Gate Valve Operating and Dimensional Data (Millimeters and Kilograms)

Nominal Size, in	Working Pressure, psi	Dimensions, mm						Weight, kg	Number of Turns
		A	B	C	D	E	F		
4 1/16	15,000	736.6	401.8	973.6	658.1	1,101.6	609.6	499	19
6 3/8	10,000	889.0	508.0	1,127.3	818.9	1,212.6	863.6	1,225	28 3/4

M Pow-R-Seal API 6A Expanding Gate Valve

The M Pow-R-Seal gate valve features an expanding wedge-type gate, nonrising stem, and metal-to-metal seal technology throughout. It provides reliable, dependable service in applications from 2,000 to 5,000 psi and is available in sizes from 2 1/16 and 4 1/16 in, with either flanged, threaded, or clamp-hub end connections. The M Pow-R-Seal gate valve has a cast valve body and is trimmed for several types of oilfield services, including sour gas.



Features and benefits

- Bidirectional design with a preferred direction of installation indicated, providing reduced operating torque
- Metal-to-metal seal (gate-to-seat and seat-to-body)
- Expanding gate design to create a positive mechanical seal across the seats with or without line pressure
- Fullbore through-conduit gate-to-seat seal for increasing valve life by virtually eliminating turbulence and pressure drop
- Seat skirts to reduce loss of body lubricants
- Thrust bearings in isolation from well fluid
- Stem packing reenergizable with valve under pressure
- Seats, gates, stems, and other working parts field-replaceable
- Cast body
- Metal-to-metal bonnet seal

M-HT API 6A HT expanding gate valve

The M-HT API 6A high-temperature expanding gate valve with expanding WKM* Pow-R-Seal* double-expanding gate valve design, nonrising stem, and metal-to-metal sealing technology is ideal for an operating temperature range of –50 to 650 degF [–46 to 345 degC].

The M-HT gate valve features a special high-temperature stem packing rated for 650 degF steam service.

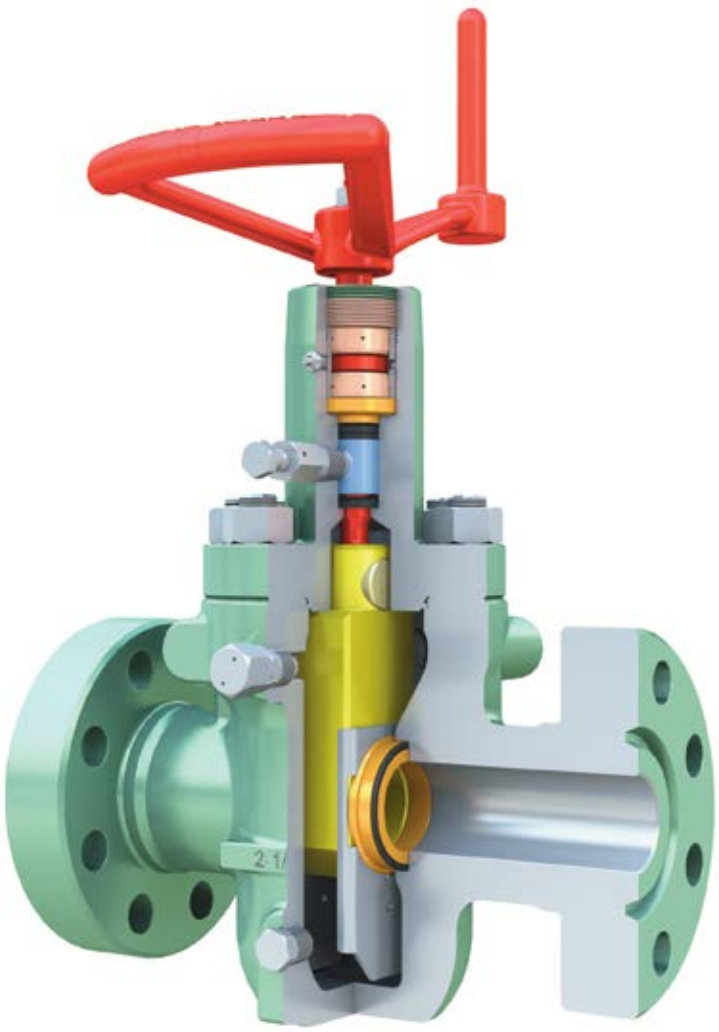
Completed M Pow-R-Seal gate valves prepared for shipment.

M STS-2 API 6A Manual Slab-Style Gate Valve

The M STS-2 manual slab-style gate valve is a fullbore, through-conduit API Spec 6A gate valve.

As with all of the M-series gate valves, the M STS-2 gate valve features a cast body and forged bonnet. The slab-style gate valve design allows the M STS-2 gate valve to perform well in most oilfield applications.

The M STS-2 gate valve is available in 2 1/16- through 4 1/16-in nominal sizes, in 2,000- to 5,000-psi WP, and with either flanged, threaded, or clamp-hub end connections.

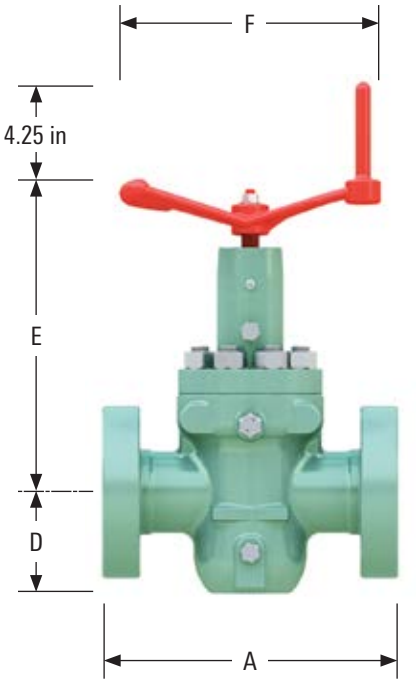


Features and benefits

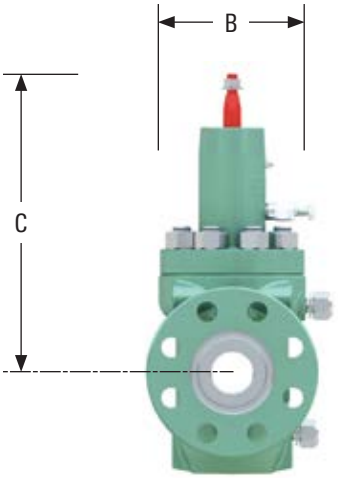
- Metal-to-metal sealing (gate-to-seat and seat-to-body), with PTFE soft-seal backup ring between gate and seat surface
- Bidirectional design with simple, reliable slab gate and disk seats
- Fullbore through-conduit design for elimination of turbulence and pressure drop
- Seat skirts to reduce loss of body filler grease
- Upper and lower roller thrust bearings isolated from well fluid
- Stem packing reenergizable with plastic packing at full line pressure
- Metal-to-metal bonnet seal

M Saf-T-Seal API 6A power-actuated fullbore through-conduit gate valve

The M Saf-T-Seal gate valve is the power-actuated fullbore through-conduit version of the M STS-2 gate valve. It features a cast body and slab-style gate and is available in all the same size, pressure, and trim combinations as the M STS-2 gate valve. It also is readily adapted to multiple actuator designs.



M-series gate valve—side view.



M-series gate valve—end view.

M Pow-R-Seal, M STS-2, and M-HT Gate Valves Operating and Dimensional Data (Inches and Pounds)

Nominal Size, in	Working Pressure, psi	Dimensions, in							Weight (Flanged), lbm	Number of Turns
		A (Threaded)	A (Flanged)	B	C	D	E	F		
2 1/16	2,000	9.62	11.62	6.12	14.75	4.94	19.38	11.00	91	13
	3,000	9.62	14.62	7.25	14.75	5.06	19.62	13.00	180	13
	5,000	9.62	14.62	7.25	14.75	5.06	19.62	13.00	180	13
2 9/16	2,000	10.25	13.12	7.12	15.47	5.75	20.31	13.00	125	15½
	3,000	10.25	16.62	7.88	15.47	5.94	20.56	16.00	205	15½
	5,000	10.25	16.62	7.88	15.47	5.94	20.56	16.00	205	15½
3 1/8	2,000	11.38	14.12	8.50	17.69	7.06	22.56	13.00	181	20
	3,000	11.38	17.12	9.25	17.69	7.31	22.79	16.00	265	20
	5,000	11.38	18.62	9.25	17.69	7.31	22.79	16.00	296	20
4 1/8	2,000	13.00	17.12	10.75	21.31	8.94	26.27	16.00	345	24½
	3,000	13.00	20.12	12.25	21.31	9.06	26.65	20.00	515	24½
	5,000	13.00	21.62	12.25	21.31	9.06	26.65	20.00	530	24½

M Pow-R-Seal, M STS-2, and M-HT Gate Valves Operating and Dimensional Data (Millimeters and Kilograms)

Nominal Size, in	Working Pressure, psi	Dimensions, mm							Weight (Flanged), kg	Number of Turns
		A (Threaded)	A (Flanged)	B	C	D	E	F		
2 1/16	2,000	244.3	295.1	155.4	374.7	125.5	492.3	279.4	41	13
	3,000	244.3	371.3	184.2	374.7	128.5	498.3	330.2	82	13
	5,000	244.3	371.3	184.2	374.7	128.5	498.3	330.2	82	13
2 9/16	2,000	260.4	333.2	180.8	392.9	146.1	515.9	330.2	57	15½
	3,000	260.4	422.1	200.2	392.9	150.9	522.2	406.4	93	15½
	5,000	260.4	422.1	200.2	392.9	150.9	522.2	406.4	93	15½
3 1/8	2,000	289.1	358.6	215.9	449.3	179.3	573.0	330.2	82	20
	3,000	289.1	434.8	235.0	449.3	185.7	578.9	406.4	120	20
	5,000	289.1	472.9	235.0	449.3	185.7	578.9	406.4	134	20
4 1/8	2,000	330.2	434.8	273.1	541.3	227.1	667.3	406.4	156	24½
	3,000	330.2	511.0	311.2	541.3	230.1	676.9	508.0	234	24½
	5,000	330.2	549.1	311.2	541.3	230.1	676.9	508.0	240	24½

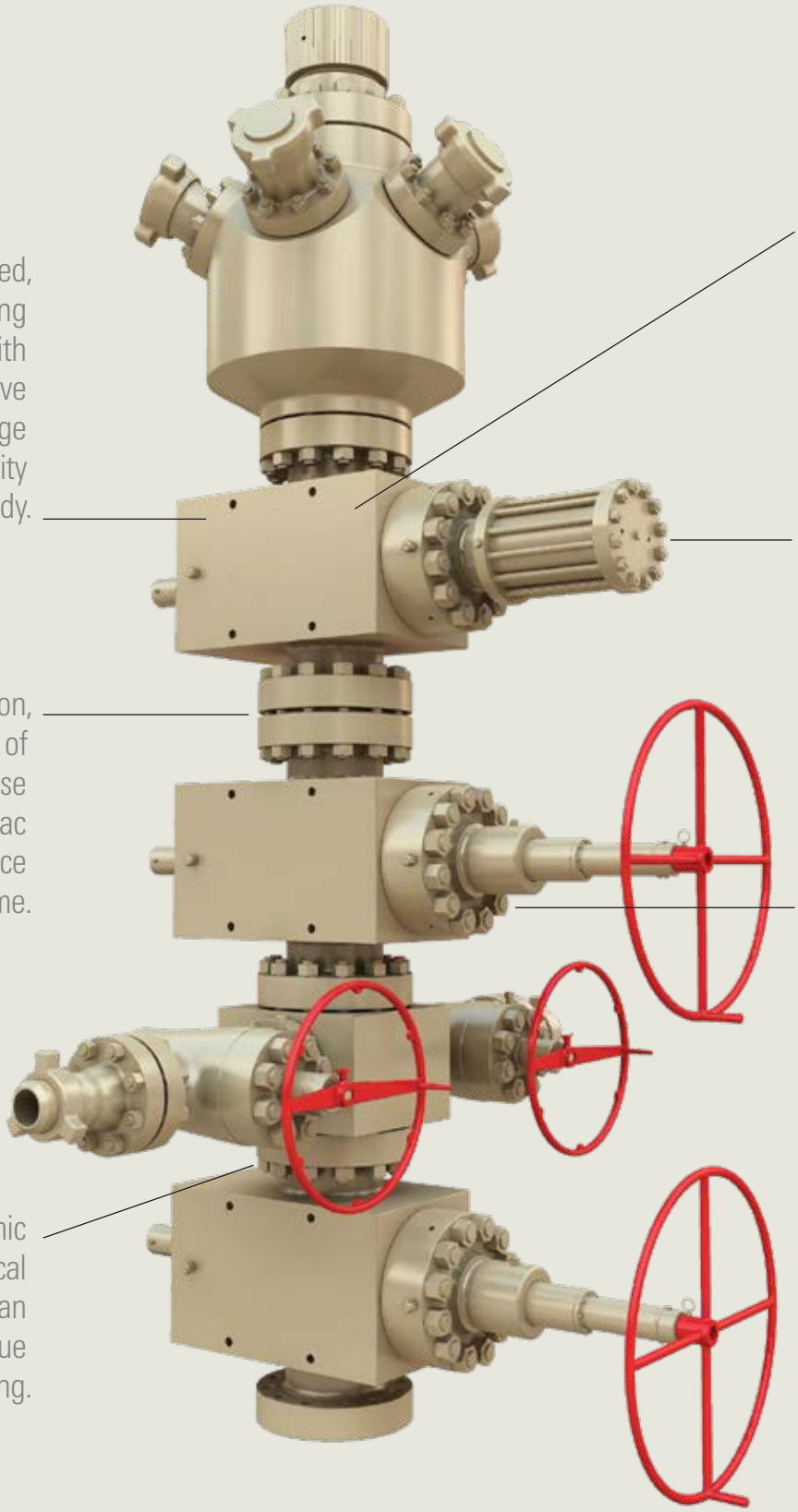
M Pow-R-Seal and M STS-2 Valves Trim Chart

API 6A Classification	Body and Bonnet Material	Stem Material	Gate Material, Coating	Seat Material, Coating
AA—general service	Alloy steel	Alloy steel	Alloy steel, nitrided	Alloy steel, nitrided
BB—general service	Alloy steel	Stainless steel	Stainless steel, nitrided	Stainless steel, nitrided
CC—general service	Stainless steel	Stainless steel	Stainless steel, nitrided	Stainless steel, nitrided
DD—sour service†	Alloy steel	Alloy steel	Alloy steel, nitrided	Alloy steel, nitrided
EE—sour service†	Alloy steel	Stainless steel	Stainless steel, nitrided	Stainless steel, nitrided
FF—sour service†	Stainless steel	Stainless steel	Stainless steel, hard-faced	Stainless steel, hard-faced

† As defined by NACE MR0175/ISO 15156

Note: Specifications are subject to change without notice. Special trims are available on request.

Frac Facts: Why You Need Cameron API Spec 6A Gate Valves



Sand, acid, and many other erosive and corrosive elements of a frac job reduce the life of a valve's gate and seat if left untreated.

Left unchecked, frequently fluctuating pressure coupled with corrosive and erosive service can damage the structural integrity of a valve's body.

Lacking proper attention, the high-pressure variations and chemical makeup of fluids used during a frac job can reduce the lifespan of elastomers and other soft goods in a frac valve.

Without intervention, the extreme nature of frac service can cause pitting and other frac valve seal surface damage over time.

Sand and other particulate debris left unmonitored can affect the performance of grease fittings over time.

If ignored, the dynamic environment typical of a frac job can significantly fatigue damage bolting.

Designed, Developed, Qualified, and Manufactured In-House

Over the last few decades the gate valve performance envelope demanded by the oil and gas industry has seen a significant expansion—not only in terms of temperature extremes, increased pressure, and ever more severe service environments, but also in terms of the quality and the attention to detail necessary to be instilled into every phase of product design, development, and production.

Against this backdrop, continuing our heritage of industry leadership requires a focus on ever-improving technology and on the application of decades of earned experience to the solution of the challenges of today and of the future.

New and modified gate valve designs, once advanced from concept to prototype by a process of meticulous design reviews, are subjected to qualification testing designed to find and correct any material or design weakness. Once approved for production in a documented final design review, Cameron gate valves are subjected to quality control measures in excess of those mandated by API.

Hardness inspection being conducted on seat ring.

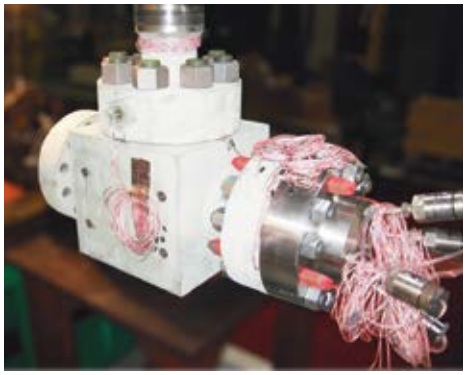
Besides painstaking design and zealous qualification testing, another essential element in the production of reliable gate valves is proper material selection and careful procurement practices. We have compiled a substantial body of knowledge to guide us in material selection, forming practices, heat treat and welding processes, and inspection techniques to assure the safest and most reliable products. The quality and integrity of the materials of construction for our critical gate valve components are controlled by material specifications written by design engineers and metallurgists to meet industry and customer requirements.

Having assured the selection and sourcing of proper raw materials, we place equal importance and insistence on in-house manufacturing of critical components (body, bonnet, gate, seats, and stem) and assembly and test of critical service gate valves. This policy assures that the manufacturing processes applied to these critical components are conducted in *our* facilities, by *our* trained employees, and in strict compliance with the rigorous quality controls that are designed into the product by *our* design and quality engineers. To that end, we have put in place manufacturing cells (Romania, Singapore, Veracruz, etc.) specifically dedicated to the production of our gate valves, assuring proper and sustained focus on manufacturing, assembly, and inspection practices.

These design, procurement, and manufacturing practices are what you would expect only of a world-class provider of high-quality, reliable gate valves.

Valve body in process in gate valve cell.

Valve bodies in fixture for machining.



Gate valve assembly prepared for strain gauge testing.

Notes

API Spec 6A Gate Valves

slb.com/valves

CAMERON
A Schlumberger Company