



CLARKSON KNIFE GATE AND SLIDE GATE VALVE TESTING CRITERIA

Design and test parameters for knife gate and slide gate valves

MSS-SP81 FOR KNIFE GATE VALVES*

Emerson applies the parameters as dictated by MSS-SP81 in the design and manufacture of many of its standard knife gate and slide gate valve products. The most important applicable parameters are the design and test pressures for the body and seat along with the face-to-face dimension. However, many of our knife gate and slide gate products fall outside MSS-SP81 in scope, so in these cases, we apply MSS-SP81 where it makes sense for the product and potential application. The chart on page 2 displays the matrix of products and how they apply to MSS-SP81.

OTHER APPLICABLE STANDARDS

As the performance of many of our knife gate, slide gate and slurry valve products exceeds those established by MSS-SP81, other standards may apply including ASME/FCI 70-2 Control valve leakage.

SPECIAL APPLICATIONS

For specific applications and special valve products, other parameters will be considered (temperature and pressure relationship is specifically taken into account in design of product).

* Manufacturer's Standardization Society Standard Practice # 81



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MSS-SP81 DEFINED

MSS-SP81 applies only to bonnetless metal-seated knife gates, NPS 2 - 24 (DN 50 - 600) in size, 150 psi (1000 kPa) CWP and NPS 30 and 36 (DN 750 and 900) 100 psi (700 kPa) CWP designs. Larger sizes are not covered under this standard. Additionally, resilient seated knife gates, slurry knife gates and slide gate valves are not taken into account within MSS-SP81. These products are subject to the individual manufacturer's internal testing and design specifications.

DESIGN AND TESTING

Body: MSS-SP81 requires the valve body (pressure vessel to be designed for and hydrostatically pressure tested at 1.5 times the rated working pressure.

Size	Valve rated pressure	Body test pressure
NPS 2 - 24 (DN 50 - 600)	150 psi (1000 kPa)	225 psi (1500 kPa)
NPS 30 and 36 (DN 750 and 900)	100 psi (700 kPa)	150 psi (1000 kPa)
Above NPS 36 (DN 900)	Per application	Rated times 1.5

Shut-off: MSS-SP81 has an allowable leakage rate (for metal-to-metal seated valves) of 40 cc per inch (25 mm) of diameter, per minute, at 40 psi (275 kPa). On a NPS 12 valve this would be equal 40 times 12, or 480 cc per minute at 40 psi.

Face-to-Face: MSS-SP81 has specified face-to-face dimensions and tolerances of each valve size to assure ease of installation for the consumer, regardless of the valve manufacturer. See chart below for dimensions.

NOTES

- Special, custom design valves are designed to suit a particular application. Where practical, the design and testing parameters as specified in MSS-SP81 are applied.
Example: For a 50 psi (350 kPa) CWP knife gate valve, the following test pressure may apply:
 - Body test pressure: 75 psi (500 kPa)
 As each custom design valve is unique, you should consult your sales representative to confirm design and test pressure in each case.
- Emerson does apply, as a standard, the design and testing parameters for the body and gate as specified in MSS-SP81, to large diameter valves (above NPS 36 - 48 (DN 900 - 1200)). Contact your sales representative for larger sizes.

CLARKSON - MSS-SP81 MATRIX

Figure number	MSS-SP81 parameters		
	Body test	Shut-off test	Face-to-Face
F17	Yes	Superior ⁽¹⁾	Yes
F20	Yes	Yes	Yes
PCS17	Yes	Superior ⁽¹⁾	Yes
F215	Yes	N/A ⁽²⁾	Yes
F220	Yes	Yes	Yes
M145	Yes	Superior ⁽³⁾	Yes
M345	Yes	Superior ⁽³⁾	Yes
KGA	No	No ⁽⁴⁾	No
KGD	No	No ⁽⁴⁾	Yes ⁽⁵⁾

NOTES

- MSS-SP81 does not apply to resilient seated knife gate valves. The Emerson standard for the PCS17 and F17 is zero leakage of water from 1 to the full rated pressure of the valve.
- MSS-SP81 does not apply to slide gate valves. However, Emerson applies this standard for valve sizes NPS 2 - 12 (DN 50 - 600) with standard seating.
- The M145 features a polymer liner and offers shut-off exceeding the requirements of MSS-SP81. The allowable leak rate for the M145 is 20 cc per inch (25 mm) of diameter at 40 psi (275 kPa) in BOTH directions.
- Both the KGA and KGD are elastomer sleeved slurry valves and MSS does not apply. Both products provide bi-directional, zero leakage across the sleeves.
- For ease of replacement and installation, the installed face to face of the KGD is design to suit an MSS face-to-face take-out.
- Face-to-face compliance refers to standard products in sizes noted in MSS-SP81.
- Above applies to standard products. F17 and F20 valves can be designed to suit specific application pressure and temperature and may have differing face to face dimension.

FACE-TO-FACE PER MSS-SP81

Valve size		MSS Face-to-face	
NPS	DN	inches	mm
2	50	1 ⁷ / ₈	47.6
3	80	2	50.8
4	100	2	50.8
6	150	2 ¹ / ₄	57.2
8	200	2 ³ / ₄	69.9
10	250	2 ³ / ₄	69.9
12	300	3	76.2
14	350	3	76.2
16	400	3 ¹ / ₂	88.9
18	450	3 ¹ / ₂	88.9
20	500	4 ¹ / ₂	114.3
24	600	4 ¹ / ₂	114.3
30	750	4 ⁵ / ₈	117.5
36	900	4 ⁵ / ₈	117.5

NOTE

Valve flanges are drilled and tapped to ASME B16.5 150.

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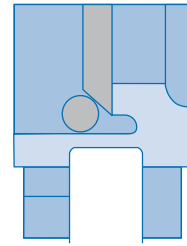
TEST PROCEDURES FOR CLARKSON VALVE PRODUCTS

Body: Valve body is blanked, gate is off the seat. Ambient temperature water is introduced and pressure is applied until maximum test pressure is achieved. Body is visually examined for leak points. Any evidence of leakage indicates failure. A packing leak at the maximum test pressure (1.5 times the rated pressure) is not cause for rejection.

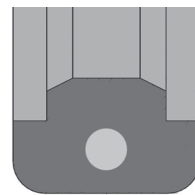
Seat: Refer to the illustrations below. Valve body is blanked on one side (on uni-directional valves, this would be opposite the seat side of the valve) gate is fully closed. Ambient temperature water is introduced and pressure applied until maximum test pressure is achieved. Seat is visually examined for leakage. Any evidence of excessive leakage beyond the allowable indicates failure. The leakage on valves tested to ASME Class V or Class VI is captured and measured to determine actual leak rate. Refer to Standard Shut-off chart below for allowable leakage. (Uni-directional knife gate and slide gate valves have a seat on one side of the gate and the normal test is with pressure pushing the gate against the seat. Bi-directional valves may be tested in one or both directions. Refer to standard shut-off chart below.)

NOTES

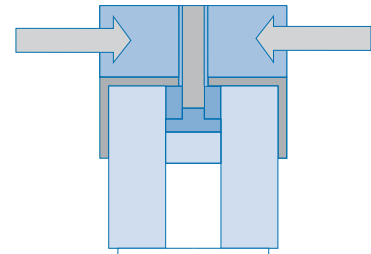
1. Certified tests are available upon request at time of order.
2. Because of testing facilities, valves above NPS 72 (DN 1800) will not be hydrostatically tested unless it is a part of the specification and purchase order.
3. Valves larger than NPS 24 (DN 600) with special flange drilling may require additional equipment to test. Consult your sales representative.
4. Clarkson Figure F215 with hardened gate or seat and Figure F215 larger than NPS 12 (DN 300) will not be leak tested unless it is part of the specification and purchase order.
5. Square or rectangular valves do not have seat leakage tests unless specified on the order.



Metal-to-Metal seated valves, like the F220, are uni-directional and are tested with pressure pushing the gate against the seat.



Perimeter resilient seated valves, like the PCS17 are bi-directional. With a perimeter seat, pressure against the gate is not required to create a seal, so testing is done in one direction only.



Polymer lined valves, like the M145, have bi-directional, pressure assisted seals. Because of this, they are tested in both directions with pressure pushing the gate against the seat.

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STANDARD SHUT-OFF

Valve style	Test psi (kPa)	Leakage	Test direction
Uni-directional metal-to-metal seat, Figures F20, F220 ⁽³⁾	40 (275)	40 cc ⁽¹⁾	Normal
Uni-directional O-ring seat Figures F20, F220	40 (275)	Zero ⁽²⁾	Normal
Resilient perimeter seat PCS17, F17 ⁽⁵⁾	150 (1000)	Zero ⁽²⁾	Exception
Uni-directional metal-to-metal slide gate Clarkson Figure 215 NPS 2 - 12 (DN 50 - 300)	40 (275)	40 cc	Normal
Polymer lined knife gate Clarkson M145 ⁽⁴⁾⁽⁷⁾	40 (275)	20 cc	Both
Polymer lined slide gate Clarkson M345 ⁽⁴⁾	40 (275)	40 cc	Both

This chart describes normally accepted leak rates for various Clarkson valve products. Depending on the actual application, superior performance may be available. Advise your sales representative of desired performance.

NOTES

1. Total acceptable leak rate equals valve size times number of cc's per minute. Metal seated, round ported knife gates meet MSS-SP81 which has an allowable leak rate of 40 cc/inch (25 mm)/min at 40 psi (275 kPa).
2. Zero leakage is defined as no visible leakage of water past the seat at test pressure.
3. Includes all Clarkson metal seated, round ported knife gate valves with standard seat. Valves with modified seats including hard surfaced seats may not meet the standard leak rate, Consult your sales representative for complete details.
4. Includes all Clarkson normally metal seated knife gate valves with optional resilient O-ring seat.
5. Although perimeter seated valves are designed for two-way shut-off, seat leakage testing is required in one direction only.
6. Applies to all round or rectangular ported multi-piece polymer lined Clarkson knife gate valves. Valves are fully rated for bi-directional flow and shut-off.
7. The M145 is available on special order with an ASME Class V leak rate. This equals valve size times .05 CC per minute at test pressure

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