



CLARKSON SLURRY KNIFE GATE VALVES

KGD

The Clarkson KGD wafer style slurry knife gate valve offers the latest in elastomer technology with the Mark III sleeve design



FEATURES

- 100% isolation, bubble-tight shut-off results in absolutely zero downstream leakage.
- Double-seated design provides bi-directional flow and shut-off.
- Unobstructed flow eliminates turbulence, minimizes pressure drop across valve.
- No seat cavity where solids can collect and prevent full gate closure.
- Dynamic self-adjusting secondary seal.
- No gate or stem packing is required, eliminating packing leakage and maintenance.
- Long lasting lubrication.
- No metal parts in contact with the flowing slurry.
- Adaptable frame (yoke) design featuring a top-removal stem nut, can be field modified to an air cylinder or bevel gear in the field without welding.
- Open-Closed lockout brackets standard through NPS 16 (DN 400), ready for optional factory supplied or customer supplied lockout pins.

GENERAL APPLICATIONS

- Mining
- Power
- Pulp and paper
- Phosphates
- Steel/Metals
- Chemical
- Cement

TECHNICAL DATA

Size range: NPS 2 to 24 (DN 50 to 600)
Temperatures: Standard sleeve rated to 180°F (80°C), up to 300°F (150°C) with optional elastomer selection

Standard pressure ratings: NPS 2 to 16 (DN 50 to 400) rated to 150 psi (10 bar)
CWP NPS 18 to 24 (DN 450 to 600) rated to 90 psi (6.2 bar) CWP

Optional pressure ratings: Up to 200 psi (14 bar) CWP
Sleeve: Gum rubber (standard)

NOTE:

Zero leakage is defined as no visible leakage of water past the seat at any test pressure up to the fully rated pressure of the valve.

Patent 8,016,265 & 5,890,700

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THE KGD MARK III SLEEVE

The Mark III incorporates advanced features gained from thousands of installed Clarkson KGD slurry valves, giving you a better overall performer with additional features:

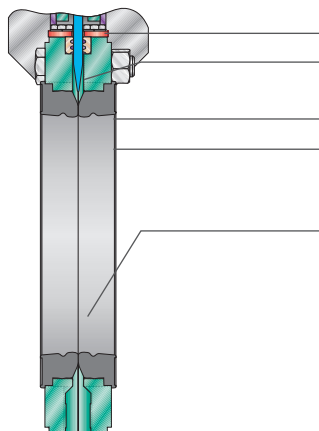
- A more robust support disc is incorporated into the one-piece design which resists over-compression of the sleeve.
- Internal profile of sleeve provides a pressure assist to the sealing function.
- Sleeve profile reduces drag and provides longer service life.
- Easier installation in a variety of pipe styles. The Mark III sleeve can be installed in any existing KGD valve, allowing hassle free upgrade to the latest technology.

HOW THE KGD MARK III SLEEVES WORK

The KGD Mark III sleeves are well suited for slurry service. The face and seal profile allow easier installation and can be used in most pipe style and mating flange configurations without gaskets. Matching sleeves are placed in the valve housing to seal against the gate when the valve is closed and seal against each other when the valve is open. When open, the improved sleeve I.D. profile and the sleeve compression combine to provide a tight seal, containing the internal line pressure and precluding direct pressure against the secondary seal.

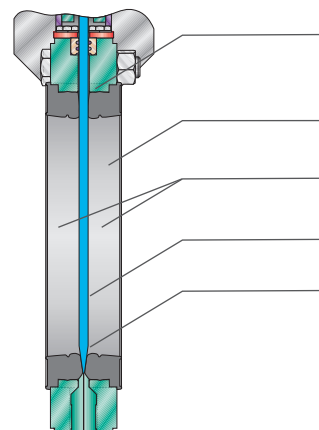
As the gate moves from open to closed, a gap is created between the facing sleeves, allowing any media that could potentially clog or jam the valve to be purged out from between the sleeves, and potentially expelled outside the valve housing to atmosphere.

With the gate fully closed, the sleeves are in full contact with the gate face. Again, the sleeve profile provides an assist to the sealing function. The unique KGD sleeve assembly provides positive sealing action when the valve gate is closed or open; protecting the metal parts from the flowing slurry.



OPEN POSITION:

- Gate positioned above seals
- Tight fit between sleeves and the internal sleeve profile contain the line pressure
- Metal parts not in contact with slurry
- Unobstructed port area eliminates turbulence, minimizes pressure drop across valve
- No seat cavity where solids can collect and prevent full gate closure



CLOSED POSITION:

- Gate travels through sleeves to provide blind flange shut off and expel solids allowing complete closure
- 100% isolation-bubble tight shut-off results in absolutely zero downstream leakage
- Double-seated design provides bi-directional flow and shut-off
- Sleeve profile and tight fit between sleeves and gate contains internal pressure
- Controlled stroke prevents gate from penetrating too far, minimizing stress on sleeve

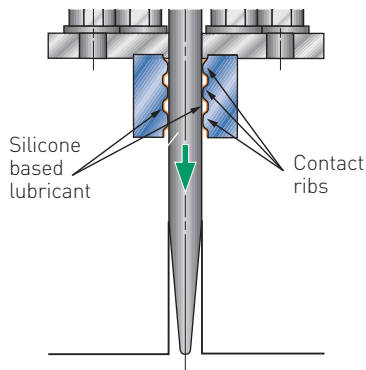
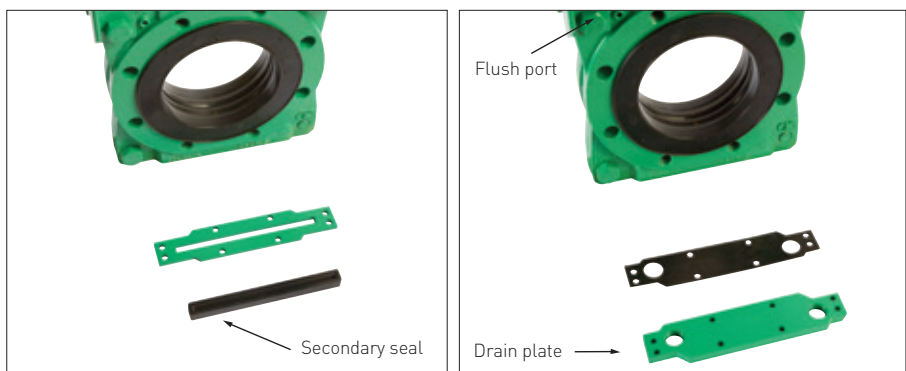
NOTE: It is normal to discharge media during the opening and closing cycle. This helps prevent solids build-up between the sleeves. Discharge can be controlled by optional splash drain plate.

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SECONDARY SEAL

The one-piece, self-adjusting, molded elastomer secondary seal eliminates any leakage between the knife gate and top of the valve body in any orientation. The seal also prevents any outside contaminants from getting inside the valve. It is dynamically self-adjusting, eliminating the need for continual adjustment required with conventional style packing. The secondary seal is also used to lubricate the gate as it cycles through the seal, providing smoother gate movement and longer seal life, as well as reducing the force required to actuate the gate. Silicon-based lubricant is held inside a series of rib cavities built into the seal, each time the gate passes through the seal, a small amount of the long-lasting lubricant is released. The seal is replaceable and can be changed while the valve is in the line.

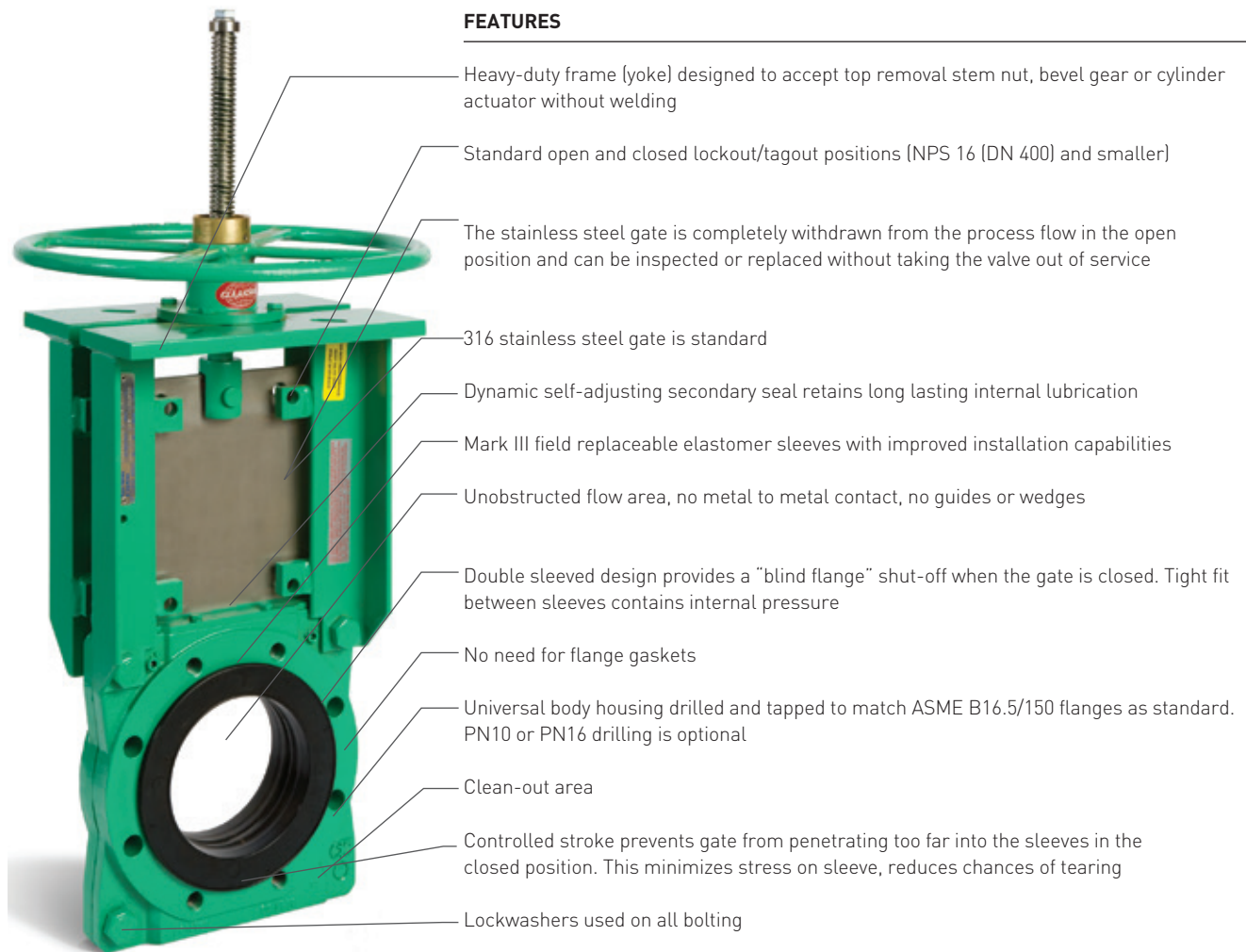


SPLASH CONTAINMENT

The KGD valve incorporates a built-in clean-out area at the base of the valve body. The clean-out area may be enclosed by an optional, removable drain plate that is provided with ports to drain away any accumulated solids that may prevent full gate closure. Flush water can both enter and exit the clean-out area through the ports or enter through a flush port at the top of the valve body. With the drain plate in place, any solids, slurry, or flush water ejected from the valve can be handled in a controlled manner.

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STANDARD SLEEVE MATERIALS

Natural rubber:

This category includes all natural gum elastomers, both filled and unfilled and synthetic polyisoprene. Has high tensile strength, superior resistance to tear and abrasion and good resistance to heat build-up. Maximum continuous operating temperature 180°F (82°C).

EPDM-HTP:

Advantages - excellent resistance to heat, ozone and sunlight, very good flexibility at low temperature, good resistance to alkalis, acids, and oxygenated solvents and superior resistance to water and steam.

Limitations - poor resistance to oil, gasoline, and hydrocarbon based solvents.

Maximum continuous operating temperature 300°F (149°C).

OPTIONAL SLEEVE MATERIALS

The following elastomer compounds are available upon request and review of application and installation by Emerson. Contact your Emerson sales representative for additional information.

NBR (Nitrile) and HNBR (Nitrile-HTP):

Advantages - very good resistance to petroleum based greases/oils, silicone greases/oils and nonoxidizing chemicals. Good resistance hydrocarbon based fuels.

Limitations - Inferior resistance to ozone and oxygenated solvents. Maximum continuous operating temperature 275°F (135°C) for NBR and 325°F (163°C) for HNBR.

Fluoroelastomer:

Advantages - outstanding resistance to high heat, excellent resistance to oil, gasoline and hydrocarbon solvents. Very good impermeability to gases, vapor and oxygen.

Limitations - poor resistance to tear and cut growth, very little resistance to oxygenated solvents. Maximum continuous operating temperature 400°F (204°C) (Contact your Emerson sales representative for temperatures higher than 400°F/204°C).

STANDARD CONFIGURATION

- Ductile iron body housings
- 316 stainless steel gate
- Universal body housing drilled and tapped to match ASME B16.5 Class 150 companion flanges
- High tear strength natural rubber sleeves with integral support discs
- EPDM secondary seal

OPTIONS

- Various gate materials:
 - 316L S/S - 2205
 - 317L S/S - 2507
 - 317L MN - C276
 - Alloy 20 - Others
 - 17-4 PH

- 316 S/S body housing in many sizes
- Sleeves
- Drain plate
- Actuators (see page 5)
- Stem covers
- Control accessories
- Metric flange drilling

NOTE:

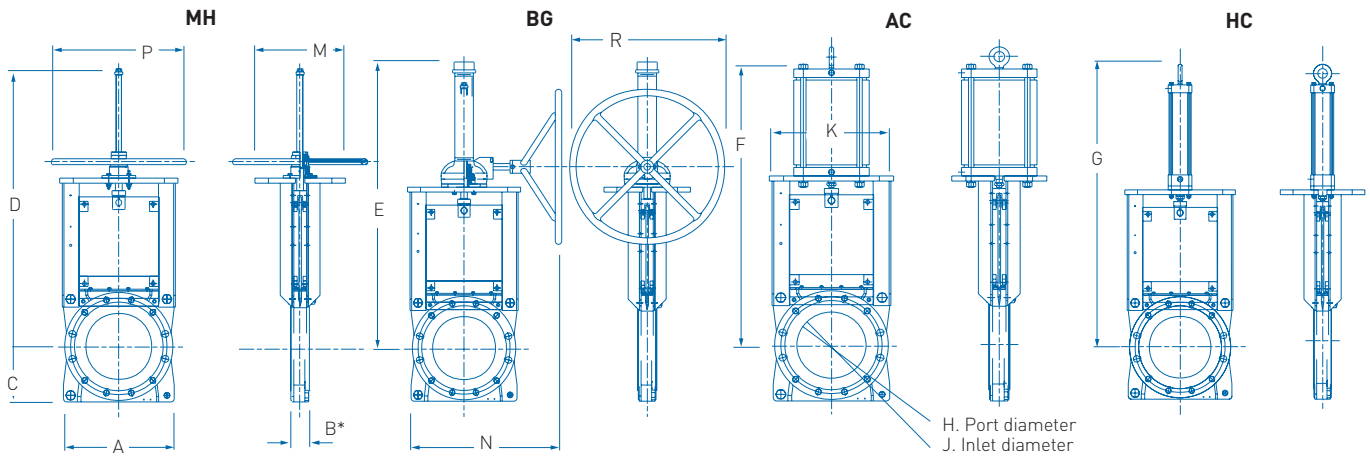
Some optional gate materials can be used to bring the pressure rating of the KGD up to 200 psi (13.8 bar) in select applications.

OEM REPLACEMENT SLEEVES AND PARTS

To maintain the expected performance of your KGD, always use genuine Clarkson OEM sleeves and other replacement parts from Emerson. Genuine KGD sleeves from Emerson are easily recognized by the identifying marks found on the sleeve O.D. These marks include the size, part number, applicable patent number, elastomer batch compound and date of manufacture; all of which allow complete traceability of the part. Clarkson KGD replacement sleeves from Emerson are the only ones authorized for use in the KGD and offer the best fit and continued performance that non-OEM parts simply cannot give. The use of copycat parts may invalidate any remaining warranty.

CLARKSON SLURRY KNIFE GATE VALVES

KGD



DIMENSIONS (inches)

Valve size NPS	A	B1*	B2*	C	D	E	F	G	H	J	K	M	N	P	R
2	6.90	2.25	2.13	4.00	19.17	22.18	21.29	22.04	1.85	2.00	7.50	5.25	15.13	12.00	12.00
3	8.00	2.44	2.25	4.88	22.35	24.09	24.70	25.20	2.81	3.00	8.75	6.39	15.75	12.00	12.00
4	9.60	2.44	2.25	4.69	24.45	25.16	26.27	27.27	3.81	4.00	10.50	6.91	16.63	12.00	12.00
6	11.00	2.68	2.50	5.75	29.45	33.02	31.63	32.51	5.80	6.00	12.63	9.13	17.68	16.00	12.00
8	13.50	3.19	3.00	7.03	34.94	36.39	37.00	37.88	7.73	8.00	14.75	10.31	18.75	20.00	12.00
10	16.40	3.25	3.00	8.23	41.07	44.30	43.91	44.79	9.74	10.00	17.50	13.38	23.87	20.00	24.00
12	19.00	3.50	3.25	9.75	-	47.52	50.13	50.76	11.73	12.00	20.38	13.45	29.06	-	24.00
14	21.00	3.50	3.25	10.77	-	52.79	53.90	54.03	12.96	13.25	22.55	14.75	30.15	-	24.00
16	23.75	4.00	3.75	11.88	-	56.53	59.07	59.20	15.00	15.25	24.47	14.75	31.11	-	24.00
18	25.50	4.06	3.76	12.13	-	66.17	68.05	68.42	17.00	17.25	26.32	17.00	30.26	-	24.00
20	28.00	5.13	4.76	14.50	-	71.79	73.97	74.10	19.03	19.25	28.06	18.88	31.13	-	24.00
24	33.00	5.19	4.76	16.50	-	85.13	87.25	88.00	23.21	23.45	35.00	18.88	34.60	-	24.00

NOTES:

Universal body housing drilled and tapped to match ASME B16.5/150 flanges as standard. PN10 or PN16 drilling is optional.

B1 = minimum dimension required for installation.

B2 = installed face-to-face.

WEIGHTS (lbs)

Valve size NPS	MH	BG	AC	HC
2	43	43	62	52
3	55	55	84	68
4	75	75	93	86
6	89	89	144	96
8	142	142	190	145
10	196	196	325	225
12	373	373	493	316
14	438	438	655	377
16	525	525	736	535
18	569	569	840	634
20	730	730	1163	751
24	1050	1050	1613	1150

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ACTUATION

NOTE: Not all actuators shown are available on all valve sizes.



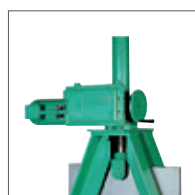
MH Manual handwheel



BG Manual bevel gear



AC Air cylinder



EM Electro-mechanical



RA - Ratchet



HC Hydraulic cylinder

NOTE:

Open-Closed lockout brackets designed to resist the normal MH or BG operating thrust are supplied as standard through NPS 16 (DN 400), ready to accept an optional factory supplied or customer supplied lockout pin. In order to assure complete lockout compliance, any AC, HC or EM actuated valve must be placed in a ZERO ENERGY STATE by isolating all potential energy sources including electricity, operator supply air or hydraulic fluids. Valves supplied with spring to extend (fail close) or retract (fail open) cylinders contain a mechanical spring which is compressed. In this case, the mechanical energy of the compressed spring cannot be placed in a zero energy state.

Take extreme care when inserting and removing the lockout pin. If the valve is actuated or the opposing pneumatic force is removed during the insertion process, the cylinder rod, gate and accompanying hardware will move and injury could occur. Please contact your Emerson sales representative for complete details.

DIMENSIONS (mm)

Valve size DN	A	B1*	B2*	C	D	E	F	G	H	J	K	M	N	P	R
50	175.3	57.2	54.1	101.6	486.9	563.4	540.8	559.8	47.0	50.8	190.5	133.4	384.3	305	305
80	203.2	62.0	57.2	124.0	567.7	611.9	627.4	640.1	71.4	76.2	222.3	162.3	400.1	305	305
100	243.8	62.0	57.2	119.1	621.0	639.1	667.3	692.7	96.8	101.6	266.7	175.5	422.4	305	305
150	279.4	68.1	63.5	146.1	748.0	838.7	803.4	825.8	147.3	152.4	320.8	231.9	449.1	406	305
200	342.9	81.0	76.2	178.6	887.5	924.3	939.8	962.2	196.3	203.2	374.7	261.9	476.3	508	305
250	416.6	82.6	76.2	209.0	1043.2	1125.2	1115.3	1137.7	247.4	254.0	444.5	339.9	606.3	508	610
300	482.6	88.9	82.6	247.7	-	1207.0	1273.3	1289.3	297.9	304.8	517.7	341.6	738.1	-	610
350	533.4	88.9	82.6	273.6	-	1340.9	1369.1	1372.4	329.2	336.6	572.8	374.7	765.8	-	610
400	603.3	101.6	95.3	301.8	-	1435.9	1500.4	1503.7	381.0	387.4	621.5	374.7	790.2	-	610
450	647.7	103.1	95.5	308.1	-	1680.7	1728.5	1737.9	431.8	438.2	668.5	431.8	768.6	-	610
500	711.2	130.3	120.9	368.3	-	1823.5	1878.8	1882.1	483.4	489.0	712.7	479.6	790.7	-	610
600	838.2	131.8	120.9	419.1	-	2162.3	2216.2	2235.2	589.5	595.6	889.0	479.6	878.8	-	610

NOTES:

Metric valves sizes are reference only. Body housing is drilled and tapped to match ASME B16.5/150 flanges as standard. PN10 or PN16 drilling is optional.

B1 = minimum dimension required for installation.

B2 = installed face-to-face.

WEIGHTS (kg)

Valve size DN	MH	BG	AC	HC
50	19.2	19.2	27.7	23.2
80	24.5	24.5	37.5	30.3
100	33.5	33.5	41.5	38.4
150	39.7	39.7	64.3	42.8
200	63.4	63.4	84.8	64.7
250	87.5	87.5	145.0	100.4
300	166.5	166.5	220.0	141.0
350	195.5	195.5	292.3	168.3
400	234.3	234.3	328.5	238.8
450	253.9	253.9	374.9	283.0
500	325.8	325.8	519.1	335.2
600	468.6	468.6	719.9	513.3

SPECIAL COATINGS TO ENHANCE SERVICE LIFE

Emerson is a leader in coating technology with broad experience using special coatings in various industries and applications on a worldwide basis. Each of the coatings below offer advantages in service life and operation, improving performance and adding value.

SSEC: Synergistic surface enhancement coating

Well suited for use in applications where corrosive media or abrasion is a problem, SSEC is ideal for applications with sticky, viscous media, scaling/plating or where galling is a problem. The low coefficient of friction eliminates "stick-slip" problems, reduces drag and increases sleeve life. Often improves micro finish of a gate or body. SSEC is a synergistic coating that combines the advantages of anodizing, plating or thermal spraying with the controlled infusion of polymers, dry lubricants and other materials to provide an entirely new composite with improved properties to the base metal. This coating will work on most metal surfaces and creates a harder-than-steel surface, excellent release (non-stick) properties, protects against wear, corrosion and chemical attack and provides permanent lubricity and a superior resistance to static buildup of material. SSEC has a hardness/wear and abrasion rating of up to Rc 68 Equilibrium Wear Rate (EWR) using Taber abrasion testing methods (CS-10 wheel): 2.0 - 4.0 mg per 1000 cycles. SSEC is also very corrosion resistant and will survive 500 hours in ASTM B-117 salt spray. (Coating thickness will affect corrosion resistance.)

Suitable for use on steel, stainless, copper, brass, bronze, titanium, and aluminum.

SSEC+: Synergistic surface enhancement coating plus

Select SSEC+ for additional corrosion resistance, about 3 times better than the base SSEC coating (based on ASTM B117 Salt Spray Testing). Abrasion resistance, lubricity, corrosion resistance are similar to the base SSEC. SSEC+ is not recommended for strong acids.

TBSEC: Tungsten-based surface enhancement coating

For applications where maximum wear resistance on ferrous and nonferrous metals is needed over a broad temperature range, Emerson offers TBSEC - Tungsten-based surface enhancement coating. TBSEC is a specific combination of ceramics, metals and proprietary polymers that produces a moisture proof and nonporous structural integrity matrix. Adding TBSEC improves the base metal surface properties and is ideal for applications where galling or sticky media and scaling/plating is a problem. Applied by a thermal spray process, this coating will work on most all metal surfaces and has excellent release (non-stick) properties, protects against wear and chemical attack as well as it features excellent abrasion and galling resistance, and provides permanent lubricity and a superior resistance to static buildup of material. TBSEC has excellent abrasion resistance as well as various chemical and acid resistances. Used on steel, stainless, copper, brass, bronze, titanium, and aluminum.

PBSEC: Polymer-based surface enhancement coating

PBSEC is a polymer-based impregnated surface enhancement coating ideal for applications where maximum corrosion resistance on ferrous and nonferrous metals is needed over a broad temperature range. Like SSEC, PBSEC exhibits a very low coefficient of friction, providing improved lubricity and reducing friction as the gate slides through the sleeves thus increasing the sleeve life. It is ideal for applications where galling or sticky media and scaling/plating is a problem. It will work on most all metal surfaces and has excellent release (non-stick) properties. PBSEC features excellent abrasion and galling resistance and a superior resistance to static buildup of material. It has excellent chemical and abrasion resistance as well as high oxidative stability. Can be applied to steel, stainless, copper, brass, bronze, titanium, and aluminum.

PBSEC-80: Polymer-based surface enhancement coating

PBSEC-80 takes all the great qualities of the PBSEC coating and amplifies them. Those qualities include; release (nonstick) properties, protection against wear, chemical attack, corrosion, galling and abrasion resistance. PBSEC-80 also provides permanent lubricity and a superior resistance to static buildup of material. PBSEC-80 is a proprietary blend of engineered polymers that exhibit a very low coefficient of friction.

This is placed on top of an inert ceramic base coating that becomes infused with the PBSEC coating. Used on steel, stainless, brass, copper, titanium, bronze and aluminum.

NOTE:

Emerson does not recommend coatings be used as an attempt to reduce metallurgy of the base material required for the application. Coatings from Emerson are used on all our knife gate and slurry valve products.

CLARKSON SLURRY KNIFE GATE VALVES

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COATING SELECTIONS

	Coefficient of friction	Temperatures ^{a)}	Thickness (Mils)	pH range	Abrasion	Anti-stick (lubricity)	Chemical resistance
SSEC	As low as 0.09	-250°F to 550°F ^{b)} (-157°C to 288°C)	0.2 to 3 (5 to 76)	5 to 8.5	Good	Excellent	Fair
SSEC+	Static as low as 0.10 Dynamic as low as 0.09	-250°F to 500°F (-157°C to 260°C)	0.5 to 2.0 (12.7 to 51)	5 to 8.5	Good	Excellent	Good
TBSEC	As low as 0.06	-200°F to 550°F (-129°C to 288°C)	2 to 10 (51 to 254)	4 to 10	Excellent	Fair	Fair
PBSEC	Static as low as 0.4 Dynamic as low as 0.3	Cryogenic to 275°F ^{c)} (135°C)	3 to 5 (76 to 127)	Below 0 to 14	Fair	Not recommended	Excellent
PBSEC-80	0.19	Cryogenic to 300°F (149°C)	10 to 20 (254 to 508)	0 to 14	Excellent	Fair	Excellent

NOTES:

- a. Stated temperatures are above normal operating temperature of the valve and are not to be considered as the rated temperature of the valve.
- b. SSEC will survive temperatures of 1400°F (760°C), but all lubricant will dissipate above 800°F (427°C).
- c. Short term exposure up to 350°F (177°C).

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SPECIFICATIONS

Clarkson KGD wafer style slurry knife gate valve:

Wafer style, slurry knife gate valve shall be a packingless, elastomer lined, bi-directional valve suitable for a wide range of industrial applications. The full port design shall have no internal obstructions and will provide a "blind flange" shut-off when the gate is closed.

The valve's sealing surface is to be between two elastomer sleeves that are compressed into the valve housings. Each sleeve will be a one-piece molded design with an integral stiffener ring that locates the sleeve in the valve housing and helps the sleeves resist the high shearing forces present when the gate is driven between them.

The sleeves shall include a heavy substrate face ring designed to support sleeves in the installed position and prevent over compression.

Valve shall have a one-piece molded elastomer secondary seal to eliminate any leakage between the knife gate and top of the valve body in any orientation and prevent any outside contaminants from getting inside the valve housing. The secondary seal shall be dynamically self-adjusting eliminating the need for continual adjustment and is to be used to retain a Silicon-based lubricant to lubricate the gate as it cycles through the seal, providing smoother gate movement and longer seal life, as well as reducing the force required to actuate the gate.

The stainless steel gate shall be completely withdrawn from the process flow when in the open position, and can be inspected and replaced, if necessary, without taking the valve out of service.

When the valve is in the closed position, the downstream sleeve can be replaced while the upstream portion of the valve is still holding pressure.

The valve body housing to be full flanged, universal type, standard drilled and tapped to suit ASME B16.5/150 with optional PN10 or PN16 or others, as required. Valve is equipped with a heavy steel fabricated handwheel frame (yoke) which can be converted to bevel gear or cylinder operator in the field without welding, complete with a stainless steel rising stem.

All ferrous exterior surfaces shall be painted to factory standard.

Specify Clarkson KGD slurry knife gate valve from Emerson

Clarkson slurry valves are in more applications around the world than any other manufacturer in a broad range of applications. With a long and successful history, Clarkson slurry valves are well suited for the most challenging applications. Mining, power, steel, pulp and paper, Clarkson slurry valves cross many industries and have proven their worth time and time again. The Clarkson slurry valve literally grew up in the mining industry. The original KGA slurry valve was developed in 1978 and was immediately successful, gaining worldwide recognition as a problem-solving, innovative isolation valve in extremely difficult applications. Building upon that success, the KGD, KLB, KGL, KGF, and C-Valve followed, bringing the most comprehensive line of slurry valve products to the mining industry.

While mining methods around the world vary depending on the material being extracted, many similar processes exist, all of which are well suited for the Clarkson slurry valve.

- Tailings collection
- SAG mill thickener underflow
- Process water
- Cyclone isolation
- Ball mill isolation and diversion
- Tailings discharge
- Isolation feed valve
- Secondary cyclone manifold

Coal fired power plants are another process where you find thousands of Clarkson valves installed. The undisputed leader in wet flue-gas desulfurization, the Clarkson valve is also well suited for many other power plant applications.

- Scrubber isolation
- Slurry diversion
- Bottom ash slurry
- Fly ash
- Bottom ash
- Pyrite separation
- Pump discharge isolation
- Bottom ash isolation
- Sluice line
- Lime slurry isolation
- Reaction slurry
- Pump isolation
- Lime storage diversion
- Absorber tower isolation

Clarkson valves are also found in many other industries installed in aggressive, abrasive application that require the positive action and 100% shut-off found in the Clarkson slurry valve.

- Alumina
- Pulp and paper
- Phosphates
- Steel/Metals
- Chemical
- Cement

CLARKSON SLURRY KNIFE GATE VALVES

KGD

GLOBAL LEADER IN SLURRY VALVE TECHNOLOGY

Field proven, heavy duty, trouble-free slurry valves for abrasive, corrosive and coarse slurries. The Clarkson slurry valves from Emerson feature elastomer sleeves offering the ultimate in protection against heavy slurries. They provide both high performance and long life in the toughest of environments.

KGA slurry valve

The original KGA slurry knife gate valve is the ultimate in protection against heavy slurries. It has the largest installed base of any elastomer sleeved slurry valve in the world.

- Standard operating pressures up to 100 psi (7 bar); higher pressures available
- Sizes NPS 3 to 60 (DN 80 to 1500)



KGF HIGH PRESSURE slurry valve

For high pressure slurry application, the only choice is the KGF slurry knife gate valve. It offers the same features and performance of the KGA or KGD but in a 300, 450, 740 psi (20, 31, 51 bar) design.

- KGF: 300 and 450 psi (20 and 31 bar) CWP
Sizes NPS 3 to 36 (DN 80 to 900)
- KGF-HP: up to 750 psi (51 bar) CWP
Sizes NPS 3 to 36 (DN 80 to 900)



KLB and KGL Linear Line Blinds

The KLB is based on the KGD and the KGL is derived from the KGA. Both provide man-safe isolation in a blanking application.

- Man-safe line blind
- No down stream leakage even with sleeve failure
- KLB: Sizes NPS 2 to 24 (DN 50 to 600)
- KGL: Sizes NPS 3 to 60 (DN 80 to 1500)



