



## CLARKSON SLURRY KNIFE GATE VALVES

KGF AND KGF-HP

The Clarkson KGF and KGF-HP slurry knife gate valves provide proven slurry valve technology in higher pressures



### FEATURES

- High pressure designs:
  - KGF: 20 bar (300 psi) CWP optional gate provides 31 bar (450 psi) CWP
  - KGF-HP: class 300 (51 bar [740 psi] CWP) for the most challenging applications.
- 100% isolation bubble-tight shut-off results in absolute zero downstream leakage.
- Double-seated design provides bi-directional flow and shutoff.
- Field replaceable elastomer sleeves.
- Dynamic, self-adjusting secondary seal.
- Unobstructed flow helps eliminate turbulence and minimizes pressure drop across valve.
- No seat cavity where solids can collect and prevent full gate closure.
- No metal parts in contact with the flowing slurry.
- No gate or stem packing is required, eliminating packing leakage and maintenance.
- Adaptable frame (yoke) design, featuring a top-removal stem nut, can be field modified to an air cylinder or bevel gear in the field.

### GENERAL APPLICATIONS

- Mining
- Power
- Pulp and paper
- Alumina
- Chemical
- Cement

### TECHNICAL DATA

Size range: DN 80 - 900 (NPS 3 - 36)  
 Temperature rating: Standard sleeve rated to 82°C (180°F), up to 150°C (300°F) with proper elastomer selection  
 Pressure range: KGF: 20 bar (300 psi) CWP  
 KGF-HP: 51 bar (740 psi) CWP  
 Sleeve: Natural rubber (standard)

### NOTES

1. Patent 5,890,700 and others pending.
2. 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.

# CLARKSON SLURRY KNIFE GATE VALVES

## KGF AND KGF-HP

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### HOW THE KGF SLEEVES WORK

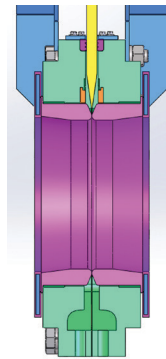
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When the gate is open, matching elastomer sleeves seal against each other under a high compression load, creating the valve pressure vessel and provide an unobstructed port, protecting metal parts from the flowing slurry. As the gate strokes to close, the gate tip creates a gap 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. When closed, the sleeves seal against the gate face, isolating upstream from downstream providing positive sealing action. The sleeve has an integrally molded encapsulated internal stiffener ring designed to maintain the roundness of the sleeves, resisting the heavy shearing forces during actuation while retaining the internal line pressure.

### OPEN POSITION

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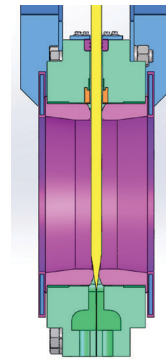
- Gate positioned above seals, out of flow.
- Matching elastomer sleeves seal against each other under a high compression load.
- Sleeves act as pressure vessel.
- No metal parts in contact with slurry.
- Unobstructed port area eliminates turbulence, minimizes pressure drop across valve.
- No seat cavity where solids can collect and prevent full gate closure.



### CLOSED POSITION

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- Gate travels through sleeves to provide blind flange shut-off, allowing opportunity for media to expel to atmosphere.
- 100% Isolation-bubble tight shut-off results in absolutely zero downstream leakage.
- When properly installed and maintained, the KGF is designed to provide man-safe isolation.
- Double-seated design provides bidirectional flow and shut-off.
- Controlled stroke prevents gate from penetrating too far, minimizing stress on sleeve.



# CLARKSON SLURRY KNIFE GATE VALVES

## KGF AND KGF-HP

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### STANDARD SLEEVE MATERIALS

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#### 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 of 82°C (180°F).

#### 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 of 150°C (300°F).

### OPTIONAL SLEEVE MATERIALS

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Emerson offers optional elastomers for use in the KGF including those listed below. These are available upon request and after review of application and the installation by Emerson. Please contact your 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.

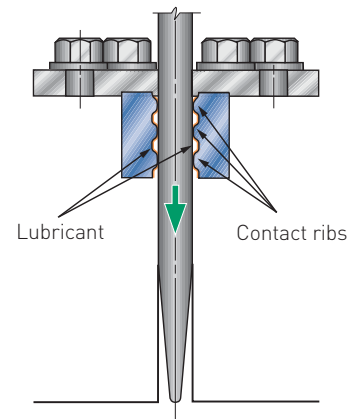
Good resistance to hydrocarbon based fuels.

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

### SECONDARY SEAL

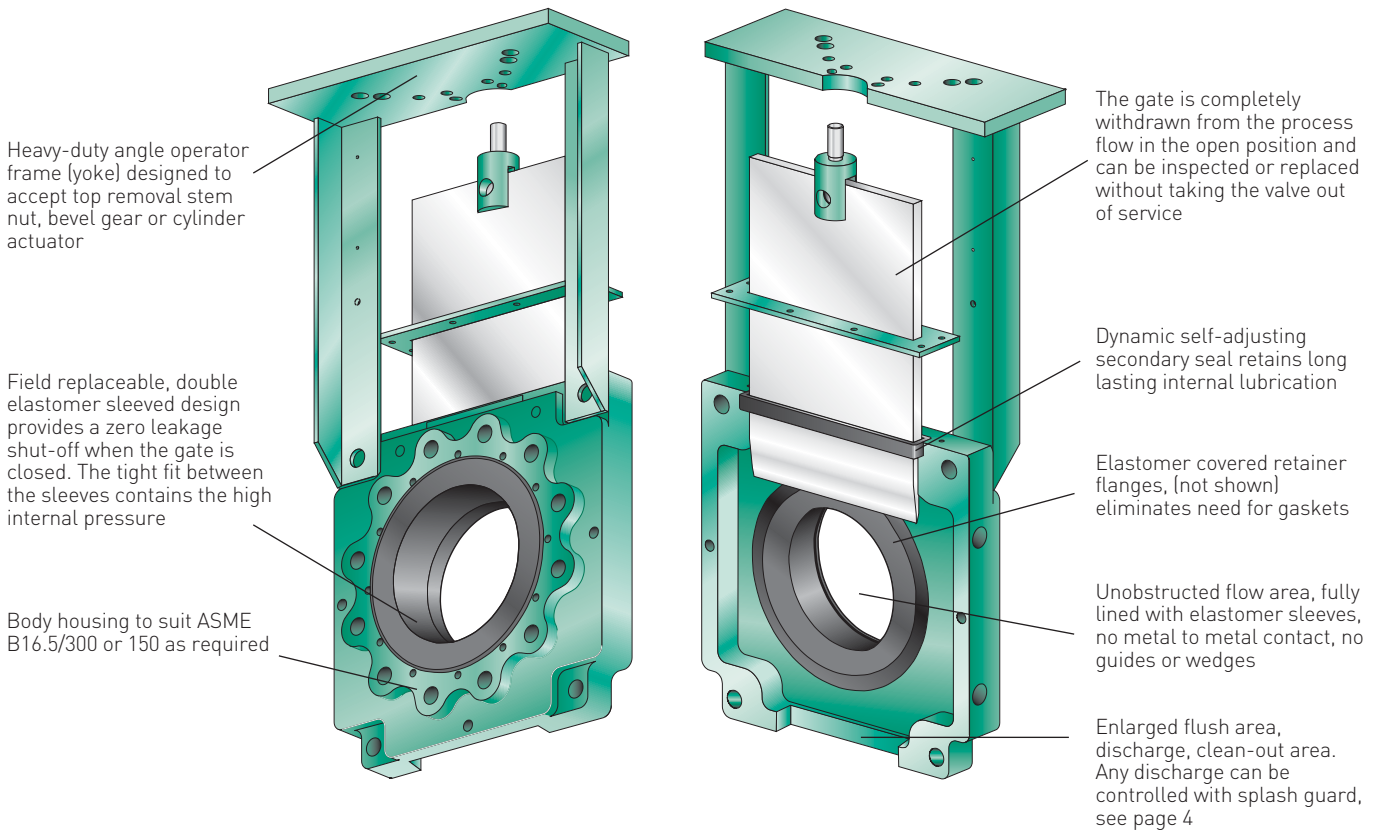
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The one-piece, self-adjusting, molded elastomer secondary seal eliminates any leakage between the knife gate and top of the valve body in any orientation. The seal also prevents any outside contaminants from getting inside the valve. It is dynamically 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.



# CLARKSON SLURRY KNIFE GATE VALVES

## KGF AND KGF-HP



### STANDARD CONFIGURATIONS

	KGF	KGF - HP
Body	Cast WCB housings	Cast WCB housings
Gate	DN 80 - 400 (NPS 3 - 16) 316 S/S DN 450 - 600 (NPS 18 - 24) 2205 S/S  DN 750 - 900 (NPS 30 - 36) 316 S/S (31 bar [450 psi] CWP has 2205 gate through DN 600, 750 and 900 (NPS 24, 30 and 36) use 316S/S)	DN 80 - 350 (NPS 3 - 14) 2205 S/S DN 400 - 900 (NPS 16 - 36) 17.4 PH 17.4 HT S/S
Sleeves	Gum rubber sleeves with integral support	Gum rubber sleeves with integral support
Secondary seal	EPDM	EPDM
Body flange drilling	Drilled and tapped to match ASME 16.5 Class 300	Drilled and tapped to match ASME 16.5 Class 300
Retainer	Gum rubber coated carbon steel	Gum rubber coated carbon steel
Containment	Optional B9 or B12	Standard with B12

### OPTIONS

- Various gate materials
  - Jessop 700
  - 316L S/S
  - 317L S/S
  - 317L MN
  - Ferralium 255
  - 410 S
  - 17-4 PH
  - Alloy 20
  - Alloy C276
  - Others available on request
- Body housing drilled and tapped to match ASME B16.5 Class 150
- Body housing drilled and tapped to match PN10 or PN16
- Sleeves (see page 2)
- Stem covers
- Actuators (see page 4)
- Control accessories

### NOTES

1. Not all options are available on both the KGF and KGF-HP; contact your sales representative.
2. KGF-HP is not available with ASME B16.5/150 or PN10 or PN16 drilling.
3. Optional gate materials may change rated pressure.
4. Valves with 31 bar (450 psi) rated gate are standard with B9 drain plate.
5. KGF-HP Valves are standard with B12 drain bucket.

# CLARKSON SLURRY KNIFE GATE VALVES

## KGF AND KGF-HP

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### KGF AND KGF-HP VALVE SPECIFICATIONS

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#### Clarkson KGF slurry knife gate valve

High pressure slurry knife gate valve, 20 [31] bar [300 [450] psi] CWP design, flat-face flanged, packingless, bi-directional design with two matching heavy-duty, full port elastomer sleeves with no internal obstructions that will provide a zero leakage shutoff when the gate is closed. The sleeves seal against each other under a high compression load when the valve is open, creating the valve pressure vessel. As the gate strokes through the elastomer sleeves, media in the line which could potentially clog or jam the valve is purged out from between the sleeves, to atmosphere, through the bottom of the valve housing. Each sleeve is molded with an integral, internal stiffener that retains the internal line pressure, locates the sleeve in the valve housing and helps the sleeves resist the high shearing forces when the gate is driven between them. Valve shall have a one-piece, molded, replaceable elastomer secondary seal to eliminate leakage between the 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 retains 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 valve is provided with a heavy duty 20 [31] bar [300 [450] psi] CWP rated gate with a double beveled tip that can be completely withdrawn from the valve housing for inspection. [Valves rated to 31 bar [450 psi] CWP will be equipped with a drain plate as standard to control purged media when valve cycles.] The valve body housing to be drilled and tapped to suit ASME B16.5/150 or 300 as required, with optional drilling to PN10 or PN16.

Valve is equipped with a heavy steel fabricated operator stand (yoke). All ferrous exterior surfaces shall be painted to factory standard.

Specify Clarkson KGF slurry knife gate valve from Emerson.

For optional 31 bar [450 psi] CWP rated valve, use [bracketed] sections.

#### Clarkson KGF-HP slurry knife gate valve

High pressure slurry knife gate valve, Class 300 design, flat-face flanged, packingless, bi-directional design with two matching heavy-duty, full port elastomer sleeves with no internal obstructions that will provide a zero leakage shutoff when the gate is closed. The sleeves seal against each other under a high compression load when the valve is open, creating the valve pressure vessel. As the gate strokes through the elastomer sleeves, media in the line which could potentially clog or jam the valve is purged out from between the sleeves, to atmosphere, through the bottom of the valve housing. Each sleeve is molded with an integral, internal stiffener that retains the internal line pressure, locates the sleeve in the valve housing and helps the sleeves resist the high shearing forces when the gate is driven between them. Valve shall have a one-piece, molded, replaceable elastomer secondary seal to eliminate leakage between the 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 retains 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 valve is provided with a heavy duty 51 bar [740 psi] CWP rated gate with a double beveled tip that can be completely withdrawn from the valve housing for inspection. Valves will be equipped with a large capacity drain bucket to control the purged media and allow the opportunity to flush it away.

The valve body housing to be drilled and tapped to suit ASME B16.5/300. Valve is equipped with a heavy steel fabricated operator stand (yoke). All ferrous exterior surfaces shall be painted to factory standard. Specify Clarkson KGF-HP slurry knife gate valve from Emerson.

# CLARKSON SLURRY KNIFE GATE VALVES

## KGF AND KGF-HP

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### ACTUATION OPTIONS

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**MH** Manual handwheel



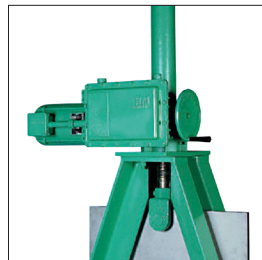
**BG** Manual bevel gear



**AC** Air cylinder



**HC** Hydraulic cylinder



**EM** Electro-mechanical



**RA**-Ratchet

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

### SPLASH CONTROL

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To control purged media, the KGF is available with a choice of two splash control assemblies. These splash control assemblies are not designed to contain the media, instead they provide a temporary capture and control point, allowing the media to be drained and or flushed away.

**Drain plate:**

Optional 20 bar (300 psi) rated KGF, standard on 31 bar (450 psi) rated version

**Drain bucket:**

Standard on KGF-HP, optional on 20 and 31 bar (300 and 450 psi) rated version

# CLARKSON SLURRY KNIFE GATE VALVES

## KGF AND KGF-HP

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### **SPECIAL COATINGS TO ENHANCE SERVICE LIFE**

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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 (non-stick) 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

## KGF AND KGF-HP

### COATING SELECTIONS

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

### NOTE

[a] Stated temperatures are beyond normal operating temperature of the valve and are not to be considered as the rated temperature of the valve.

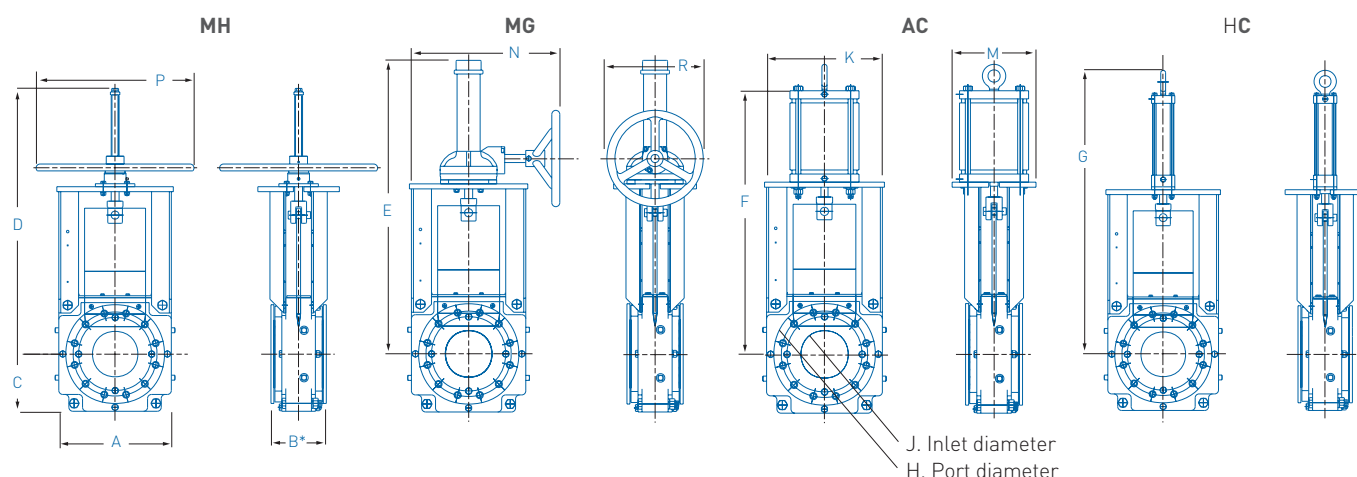
[b] SSEC Will survive temperatures of 760°C [1400°F], but all lubricant will dissipate above 427°C [+800°F].

[c] Short term exposure up to 177°C [350°F].



# CLARKSON SLURRY KNIFE GATE VALVES

KGF AND KGF-HP



## DIMENSIONS - IMPERIAL

Valve size NPS	A	B	C	D	E	F	G	H	J	K	M	N	P	R
3	10.50	6.92	5.25	20.48	22.83	16.07	23.44	2.42	2.81	10.56	6.94	16.62	16.00	12.00
4	11.75	6.93	6.00	27.27	28.27	26.13	30.25	3.36	3.88	12.63	9.15	17.69	16.00	12.00
6	14.25	7.28	7.25	33.61	36.57	30.43	36.56	5.75	5.83	14.75	10.32	18.75	20.00	12.00
8	16.75	7.28	8.50	39.55	40.68	39.16	43.29	7.34	7.86	17.50	13.40	23.87	20.00	24.00
10	20.09	8.91	10.00	-	47.52	47.15	50.76	9.10	9.80	17.02	17.00	25.60	-	24.00
12	22.49	10.17	11.00	-	53.56	51.19	55.81	10.75	11.50	17.00	17.00	25.60	-	24.00
14	29.50	10.22	13.88	-	60.81	59.81	-	12.50	13.30	17.00	17.00	25.60	-	24.00
16	32.50	10.98	15.50	-	66.57	64.69	-	14.25	14.75	19.00	18.88	26.60	-	24.00
18	34.75	12.65	16.50	-	70.75	68.25	75.75	15.00	17.00	17.00	17.00	25.60	-	24.00
20	37.25	14.44	17.75	-	80.19	78.50	83.13	16.56	18.50	23.00	21.03	30.73	-	24.00
24	44.50	14.56	21.50	-	89.35	89.35	91.97	21.19	22.70	22.00	18.96	28.10	-	24.00
30	53.50	16.26	26.00	-	-	-	112.63	26.75	29.00	21.00	20.06	-	-	-
36	60.00	18.58	30.00	-	-	-	131.00	31.88	35.00	25.00	18.88	-	-	-

## NOTES

1. Universal flanges drilled and tapped to ASME B16.5 Class 300 or Class 150, as required.
2. Face-to-face includes the retainer flanges, all sizes.
3. Contact your local sales representative for dimensions of additional sizes.

## DIMENSIONS - METRIC

Valve size DN	A	B	C	D	E	F	G	H	J	K	M	N	P	R
80	266.70	175.80	133.40	520.20	579.90	408.20	595.40	61.50	71.40	268.20	176.30	422.10	406.40	304.80
100	298.50	176.00	152.40	692.70	718.10	663.70	768.40	85.30	98.60	320.80	232.40	449.30	406.40	304.80
150	362.00	184.90	184.20	853.70	928.90	772.90	928.60	146.10	148.10	374.70	262.10	476.30	508.00	304.80
200	425.50	184.90	215.90	1004.60	1033.30	994.70	1099.60	186.40	199.60	444.50	340.40	606.30	508.00	609.60
250	510.30	226.30	254.00	-	1207.00	1197.60	1289.30	231.10	248.90	432.30	431.80	650.20	-	609.60
300	571.20	258.30	279.40	-	1360.40	1300.20	1417.60	273.10	292.10	431.80	431.80	650.20	-	609.60
350	749.30	259.60	352.60	-	1544.60	1519.20	-	317.50	337.80	431.80	431.80	650.20	-	609.60
400	825.50	278.90	393.70	-	1690.90	1643.10	-	362.00	374.70	482.60	479.60	675.60	-	609.60
450	882.70	321.30	419.10	-	1797.10	1733.60	1924.10	381.00	431.80	431.80	431.80	650.20	-	609.60
500	946.20	366.80	450.90	-	2036.80	1993.90	2111.50	420.60	469.90	584.20	534.20	780.50	-	609.60
600	1130.30	369.80	546.10	-	2269.50	2269.50	2336.00	538.20	576.60	558.80	481.60	713.70	-	609.60
750	1358.90	413.00	660.40	-	-	-	2860.80	679.50	736.60	533.40	509.50	-	-	-
900	1524.00	471.90	762.00	-	-	-	3327.40	809.80	889.00	635.00	479.60	-	-	-

## NOTES

1. Universal flanges drilled and tapped to PN10 and PN16 or others, as required.
2. Face-to-face includes the retainer flanges, all sizes.
3. Contact your local sales representative for dimensions of additional sizes.

# CLARKSON SLURRY KNIFE GATE VALVES

## KGF AND KGF-HP

### WELL SUITED FOR AGGRESSIVE APPLICATIONS

Clarkson slurry valves are installed 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 desulfurisation, 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 applications that require the positive action and 100% shutoff found in the Clarkson slurry valve.

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



# CLARKSON SLURRY KNIFE GATE VALVES

KGF AND KGF-HP

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## GLOBAL LEADER IN SLURRY VALVE TECHNOLOGY

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

### KGD Wafer Slurry Knife Gate Valve

- MSS face-to-face dimension
- 100% full port
- Double-seated, bi-directional shutoff design
- Exclusive, dynamic self-adjusting sleeve design
- Standard operating pressures up to 10 bar (150 psi); higher pressures available
- Sizes DN 50 to 600 (NPS 2 to 24)

### 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 downstream leakage even with sleeve failure
- KLB: Sizes DN 50 to 600 (NPS 2 to 24)
- KGL: Sizes DN 80 to 1500 (NPS 3 to 60)



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