KEYSTONE KNIFE GATE VALVE

FIGURE OS1700

Installation and maintenance instructions for Class 150 knife gate valves

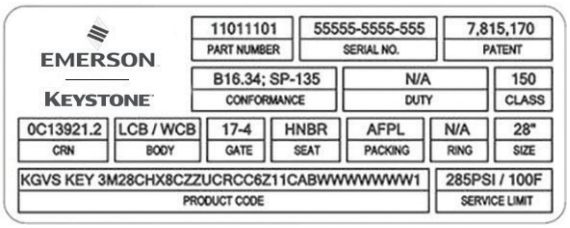
GENERAL INFORMATION

The Keystone OS1700 knife gate valve is a bi-directional zero leakage ASME Class 150 rated knife gate valve. Designed for the rigors of high pressure slurry and oil sands applications.
Please take note of specific installation tags provided with each OS1700 series valve.
Compliance to ASME B16.34 Class 150, Valves—Flanged and MSS SP 135 (Short Face-to-Face).
Bi-directional valve, no special concerns in relation to direction of flow are required when installing the valve.

Mating line flanges must be properly aligned. Slip-on or weld flanges can be used. Never try to make up for misaligned pipe flanges by the line bolting.
Flange fasteners should be tightened in a uniform manner using a cross-pattern to prevent distortion of the valve.
Pipe supports and/or expansion joints should be used to minimize pipe loads on valves.
OS1700 valves are suitable for use in either vertical or horizontal lines. If installation is other than vertical, additional support will be required for cylinder actuated valves.



COMPLIANCE LABEL



LABEL CONTENTS

Item	Description	Example
Product code	Manufacturer's Model/Code	KGVS Keystone 3M28CHX8CZZUCRCC6Z11CAB00000001
Part number	Manufacturer's Part Number	11011101
Serial number	Manufacturer's Serial Number	55555-5555-555
Size	NPS Valve size	28
Class	Pressure rating per conforming standard	150
Duty	N/A	N/A
Ring material	N/A	N/A
Service limit	Limits in pressure and temperature operation	285psi/100F
Conformance	Standard used for design and manufacture	ASME B16.34, MSS SP-135
CRN	Canadian registration number	0C13921.2
Body material	Compliance standard for body material	WCB/LCB
Gate material	Compliance standard for gate material	17-4
Seat material	Seat material	HNBR
Packing material	Packing material	AFPL#3

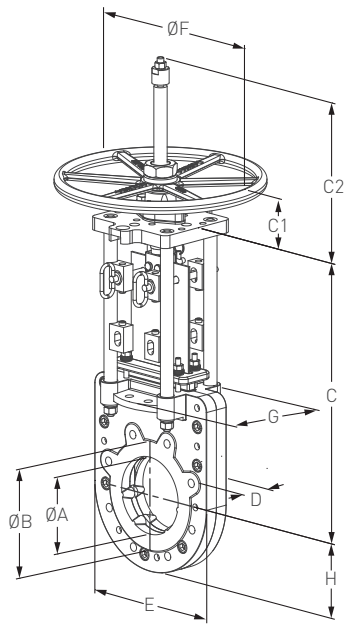
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KEYSTONE KNIFE GATE VALVE

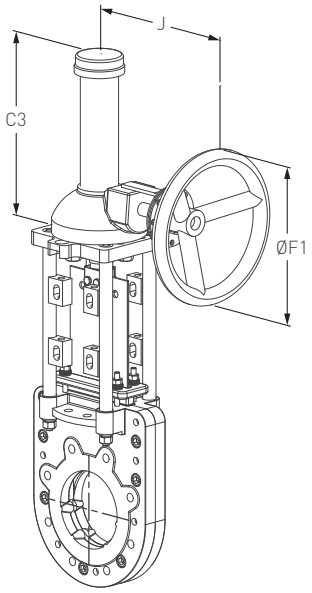
FIGURE OS1700

INITIAL INSPECTION

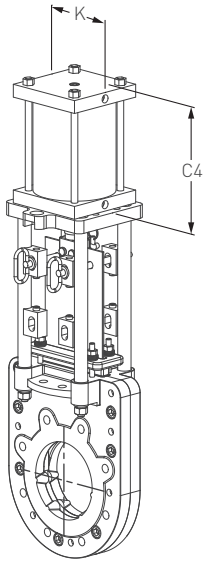
1. Examine entire valve and report any damage or discrepancies immediately.
2. Accessories, if any, including solenoids, limit switches, positioners, etc., are tested for functionality prior to shipment. Examine carefully for damage which may occur during shipment.
3. Operators: Standard manual hand wheels may be shipped loose for field installation. It is necessary to use a pipe wrench or large crescent wrench to properly tighten the hand wheel retaining nut. Be sure to fully tighten.
4. Packing assembly: The packing gland bolts should be checked and adjusted to obtain a first time packing seal. Packing gland nuts may become slightly loose when valve is shipped. Field adjustment is expected and desired. (Tighten just enough to stop any leakage. Overtightening may increase valve operating torque and shorten packing life).



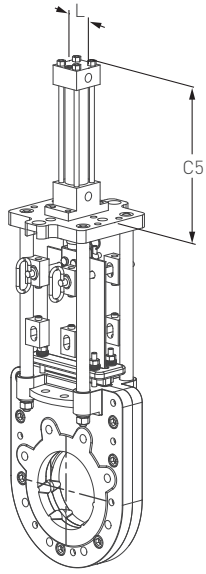
Note: DN 150 (NPS 6)
Manual hand wheel valve



Note: DN 150 (NPS 6)
Bevel gear operated valve



Note: DN 150 (NPS 6)
Pneumatic actuated valve



Note: DN 150 (NPS 6)
Hydraulic actuated valve

DIMENSIONS (inches)

Valve size NPS	ØA	ØB	C	C1	C2	C3	C4	C5	D	E	ØF	ØF1	G	H	J	K	L
2	2.00	3.62	13.70	2.64	7.62	9.00	5.63	7.88	2.06	6.81	12.00	12.00	9.50	3.41	12.47	4.50	2.50
3	3.00	5.00	15.69	2.64	8.64	11.00	6.63	8.88	2.06	8.06	12.00	12.00	9.50	4.03	12.47	4.50	2.50
4	4.00	6.19	17.59	2.64	9.64	11.06	7.63	9.88	2.00	9.56	12.00	12.00	9.50	4.78	12.47	4.50	2.50
6	6.00	8.50	21.46	3.39	12.51	14.00	9.75	11.88	2.25	11.88	14.00	12.00	9.50	5.94	12.47	6.50	2.50
8	8.00	10.62	27.19	-	-	15.09	12.69	14.38	2.75	18.28	-	18.00	9.50	6.68	12.47	8.50	3.00
10	10.00	12.75	32.48	-	-	18.00	15.75	16.38	2.88	17.32	-	18.00	12.00	8.50	12.47	10.63	3.50
12	12.00	15.00	35.85	-	-	21.00	17.81	19.44	3.00	23.28	-	18.00	12.00	9.59	13.97	12.75	4.50
14	13.25	16.25	39.54	-	-	21.00	20.00	20.63	3.13	22.88	-	24.00	12.81	10.94	16.59	14.75	4.50
16	15.25	18.50	43.81	-	-	23.00	22.27	23.14	6.32	25.55	-	24.00	12.77	12.19	16.59	17.00	5.00
18	17.25	21.00	50.77	-	-	26.53	24.52	25.14	3.62	28.21	-	18.00	16.00	13.13	17.26	19.00	5.00
20	19.25	23.00	55.69	-	-	29.03	27.14	27.95	4.50	31.04	-	24.00	16.00	14.25	19.23	21.00	6.50
24	23.25	27.25	63.70	-	-	32.03	33.08	31.96	4.50	36.84	-	24.00	18.42	16.75	19.25	25.00	6.50
26	25.25	29.50	69.07	-	-	35.60	-	35.39	6.75	39.51	-	24.00	25.00	17.88	25.86	-	7.50
28	27.25	31.50	72.90	-	-	37.60	-	37.39	7.12	42.26	-	24.00	22.00	19.00	25.92	-	7.50
30	29.25	33.75	76.89	-	-	40.60	-	40.89	7.38	45.25	-	24.00	22.63	20.00	25.90	-	8.50
32	31.25	36.00	80.90	-	-	43.15	-	42.58	8.12	47.92	-	24.00	23.96	21.63	25.90	-	8.50
36	35.25	40.25	90.11	-	-	47.54	-	48.31	8.88	55.53	-	24.00	27.76	23.75	25.90	-	9.50
42	41.25	47.00	108.22	-	-	CS	-	57.31	9.75	61.66	-	24.00	34.63	27.13	CS	-	12.63
48	47.25	53.50	119.15	-	-	CS	-	CS	11.50	71.39	-	CS	35.69	30.38	CS	-	CS

KEYSTONE KNIFE GATE VALVE

FIGURE OS1700

DIMENSIONS (mm)

Valve size DN	ØA	ØB	C	C1	C2	C3	C4	C5	D	E	ØF	ØF1	G	H	J	K	L
50	51	92	348	67	194	229	143	200	52	173	300	300	241	87	317	114	64
80	76	127	399	67	219	279	168	225	52	205	300	300	241	102	317	114	64
100	102	157	447	67	245	281	194	251	51	243	300	300	241	121	317	114	64
150	152	216	545	86	318	356	248	302	57	302	350	300	241	151	317	165	64
200	203	270	691	-	-	383	322	365	70	464	-	450	241	170	317	216	76
250	254	324	825	-	-	457	400	416	73	440	-	450	305	216	317	270	89
300	305	381	911	-	-	533	452	494	76	591	-	450	305	243	355	324	114
350	337	413	1004	-	-	533	508	524	80	581	-	600	325	278	421	375	114
400	387	470	1113	-	-	584	566	588	161	649	-	600	324	310	421	432	127
450	438	533	1290	-	-	674	623	639	92	717	-	450	406	333	438	483	127
500	489	584	1415	-	-	737	689	710	114	788	-	600	406	362	488	533	165
600	591	692	1618	-	-	814	840	812	114	936	-	600	468	425	489	635	165
650	641	749	1754	-	-	904	-	899	171	1004	-	600	635	454	657	-	191
700	692	800	1852	-	-	955	-	950	181	1073	-	600	559	483	658	-	191
750	743	857	1953	-	-	1031	-	1039	187	1149	-	600	575	508	658	-	216
800	794	914	2055	-	-	1096	-	1082	206	1217	-	600	609	549	658	-	216
900	895	1022	2289	-	-	1207	-	1227	226	1410	-	600	705	603	658	-	241
1050	1048	1194	2749	-	-	CS	-	1456	248	1566	-	600	880	689	CS	-	321
1200	1200	1359	3026	-	-	CS	-	CS	292	1813	-	CS	907	772	CS	-	CS

WEIGHTS (lbs)

Valve size NPS	H/W mass	BG mass	Hyd mass	Pneu mass	Bevel gear model
2	62	107	58	63	BG3
3	71	116	67	72	BG3
4	82	128	78	83	BG3
6	137	176	125	147	BG3
8	-	237	194	241	BG3
10	-	359	319	466	BG3
12	-	427	409	596	BG3
14	-	647	606	903	BG3
16	-	822	811	1234	BG4
18	-	1118	1043	1562	BG42
20	-	1418	1399	2023	BG42
24	-	1930	1954	CS	BG44
26	-	2963	2849	-	BG64
28	-	3709	3591	-	BG64
30	-	4246	4298	-	BG64
32	-	5162	5205	-	BG624
36	-	6842	7020	-	BG624
42	-	CS	CS	-	BG624
48	-	CS	CS	-	CS

WEIGHTS (kgs)

Valve size DN	H/W mass	BG mass	Hyd mass	Pneu mass	Bevel gear model
50	28	49	26	29	BG3
80	32	53	30	33	BG3
100	37	58	35	38	BG3
150	62	80	57	67	BG3
200	-	108	88	109	BG3
250	-	163	145	211	BG3
300	-	194	186	270	BG3
350	-	293	275	410	BG3
400	-	373	368	560	BG4
450	-	507	473	709	BG42
500	-	643	635	918	BG42
600	-	875	886	CS	BG44
650	-	1344	1292	-	BG64
700	-	1682	1629	-	BG64
750	-	1926	1950	-	BG64
800	-	2341	2361	-	BG624
900	-	3103	3184	-	BG624
1050	-	CS	CS	-	BG624
1200	-	CS	CS	-	CS

BOLTING AND INSTALLATION INSTRUCTIONS

OS1700 standard flange configuration is "flanged" where port flange mounting holes are drilled and tapped. Flange mounting holes in chest area are limited to a depth of 1 x flange bolt diameter, and other flange bolt holes have a minimum depth of 1.5 x flange bolt diameter. It is recommended that studs be used on all flange mounting holes in chest area.

WARNING

Care must be taken when installing studs or bolts in tapped flange holes in chest area to prevent damage to internal wall profile.

NOTE

Optional through bolting configurations are also available.

OS1700 Series valves are designed to suit flanges compliant to ASME B16.5 and B16.47, and gaskets designed to ASME VIII-1 Appendix 2, and ASME B16.20 and B16.21. Torque on Flange bolt should not exceed values shown in Table 1.

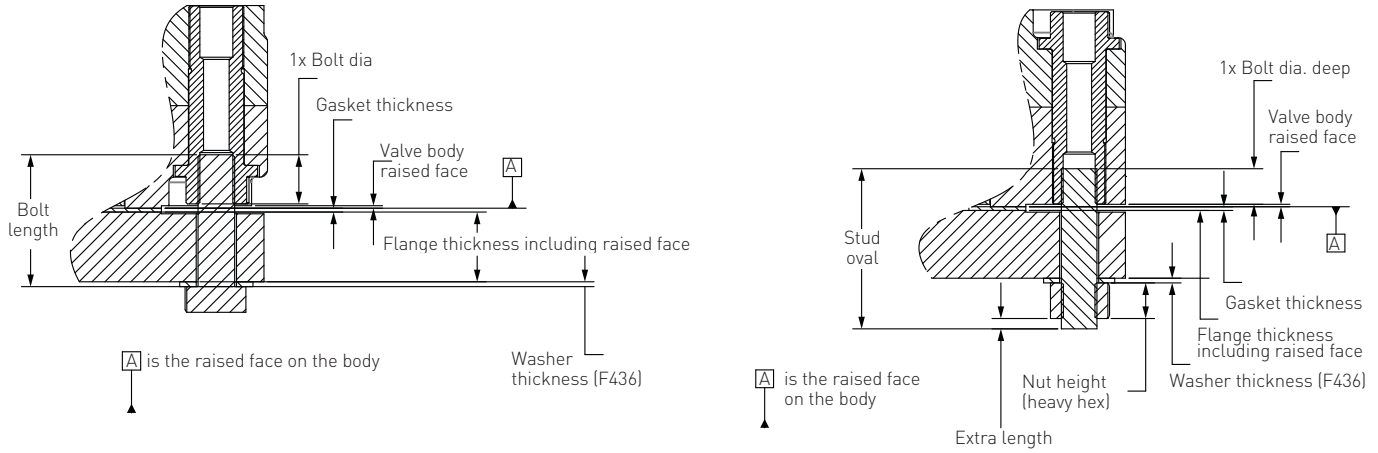
TABLE 1 - MAXIMUM TORQUE ON FLANGE BOLT/STUD

Valve size NPS (DN)	Number of Bolts per Flange	Bolt size	Torque (ft·lb)	Recommended bolt length (in)	Recommended stud length (in)
2 (50)	4	5/8 -11	115	1.50	2.250
3 (80)	4	5/8 -11	115	1.75	2.500
4 (100)	8	5/8 -11	115	1.75	2.500
6 (150)	8	3/4 -10	200	2.00	3.250
8 (200)	8	3/4 -10	200	2.00	3.250
10 (250)	12	7/8 -9	318	2.25	3.500
12 (300)	12	7/8 -9	318	2.25	3.500
14 (350)	12	1-8	473	2.50	3.750
16 (400)	16	1-8	473	2.63	4.000
18 (450)	16	1 1/8 -8	685	2.75	4.500
20 (500)	20	1 1/8 -8	685	3.00	4.500
24 (600)	20	1 1/4 -8	951	3.25	5.250
26 (650)	24	1 1/4 -8	951	4.00	6.000
28 (700)	28	1 1/4 -8	951	4.25	6.000
30 (750)	28	1 1/4 -8	951	4.25	6.250
32 (800)	28	1 1/2 -8	1675	4.75	7.000
36 (900)	32	1 1/2 -8	1675	5.25	7.625

NOTES

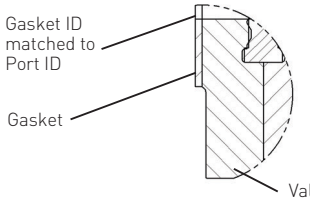
Maximum torque should not be exceeded to insure threaded flange holes in valve body are not damaged. The recommended bolt length assumes; final gasket thickness = .125", min F436 flatwasher thickness 1x bolt diameter thread depth, and common heavy hex bolt lengths. Use the below equation to calculate flange bolt length per your application. It is strongly recommended stud to be used to achieve maximum thread engagement length.

BASIS OF BOLT LENGTH AND STUD LENGTH CALCULATION



Bolt length = Washer thickness + Flange thickness + Flange raised face + Gasket thickness + 1 x Bolt dia
Stud length = Nut Height + Washer thickness + Flange thickness + Flange raised face + Gasket thickness + 1 x Bolt dia + Extra Length

GASKET DETAIL - FIGURE 5



WARNING

To minimize stress concentration on raised face, ensure flange gasket ID is matched with port ID as shown in Figure 5.

ACTUATION

OS1700 has four options for actuation: Hydraulic cylinder (HC), Bevel gearbox (BG) with manual hand wheel, Manual handwheel (MH), and Pneumatic cylinder (AC).

Hydraulic cylinder option:
Designed to operate with hydraulic fluid pressure of less than 2000 psi.

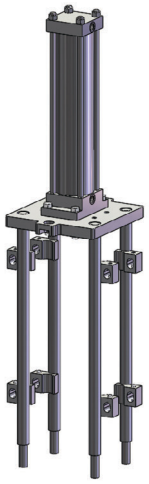
Pneumatic cylinder option:
Designed to operate with air pressure of 75 psi

Manual handwheel option:
Designed to operate with a rim-pull of less than 80 lb.

Bevel gear option:
Designed to operate with a rim-pull of less than 80 lb.

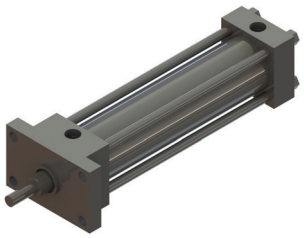
HYDRAULIC CYLINDER SIZE AND REQUIRED FLOW RATE

Valve size	HC	Rod	Fluid flow rate (in³ /sec)	
NPS (DN)	size	size	1 in/s (close)	1 in/s (open)
2 (50)	1½	⅝	1.8	1.5
3 (80)	1½	⅝	1.8	1.5
4 (100)	1½	⅝	1.8	1.5
6 (150)	1½	⅝	1.8	1.5
8 (200)	2	1	3.1	2.7
10 (250)	2½	1	4.9	4.1
12 (300)	3¼	1⅜	8.3	7.1
14 (350)	3¼	1⅜	8.3	7.1
16 (400)	4	1¾	12.6	10.7
18 (450)	4	1¾	12.6	10.7
20 (500)	5	2	19.6	16.5
24 (600)	5	2	19.6	16.5
26 (650)	6	2½	28.3	23.4
28 (700)	6	2½	28.3	23.4
30 (750)	7	3	38.5	31.4
32 (800)	7	3	38.5	31.4
36 (900)	8	3½	50.3	40.6



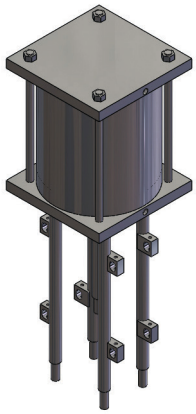
HYDRAULIC CYLINDER ACTUATION

Figure 6
Yoke with hydraulic cylinder



PNEUMATIC CYLINDER SIZE AND REQUIRED FLOW RATE

Valve size	AC	Rod	Fluid flow rate (in³ /sec)	
NPS (DN)	size	size	1 in/s (close)	1 in/s (open)
2 (50)	4	1	12.6	10.7
3 (80)	4	1	12.6	10.7
4 (100)	4	1	12.6	10.7
6 (150)	6	1	28.3	24.1
8 (200)	8	1	50.3	42.8
10 (250)	10	1⅜	78.5	66.7
12 (300)	12	1⅜	113.1	96.1
14 (350)	14	1⅜	153.9	130.8
16 (400)	16	2	201.1	170.9
18 (450)	18	2	254.5	216.3
20 (500)	20	2	314.2	267.1
24 (600)	24	3	452.4	384.5

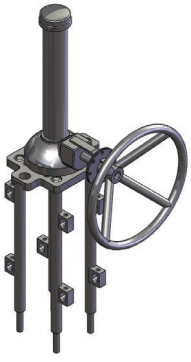


PNEUMATIC CYLINDER ACTUATION

Figure 7
Yoke with pneumatic cylinder

BEVEL GEARBOX SELECTION WITH HANDWHEEL

		150 psi Differential			285 psi Differential	
Valve size	BG	BG	HW	BG	BG	HW
NPS (DN)	size	ratio	(in)	size	ratio	(in)
2 (50)	3	3	12	3	3	12
3 (80)	3	3	12	3	3	12
4 (100)	3	3	12	3	3	12
6 (150)	3	3	12	3	3	12
8 (200)	3	3	18	34	12	18
10 (250)	3	3	18	34	12	18
12 (300)	3	3	18	34	12	18
14 (350)	3	3	24	34	12	24
16 (400)	4	4	24	42	8	24
18 (450)	42	8	18	42	8	24
20 (500)	42	8	24	42	8	36
24 (600)	44	16	24	44	16	24



BEVEL GEARBOX ACTUATION

Figure 8
Yoke with bevel gear actuator and manual handwheel

MANUAL HANDWHEEL SELECTION

Valve size	MH	Stem
NPS (DN)	Handwheel size	Assembly size
2 (50)	3 (50)	4 (50)
3 (80)	12	¾
4 (100)	12	¾
6 (150)	16	1



MANUAL HANDWHEEL ACTUATION

Figure 9
Yoke with manual handwheel

OPERATIONAL CONSIDERATIONS

1. All valves should be operated within their design pressure and temperature ranges. Under no circumstances should the valves be operated at conditions outside these parameters.
2. The operator should have an understanding of the effects of opening/closing the valve with regards to its role in the overall piping system. Take caution to ensure that the valve is in good operating condition prior to operating it under pressure.
3. Care should be taken when processes contain hazardous and/or otherwise unstable media to ensure the operator is aware of the specific health and safety risks associated with that medium.
4. Stand clear of any moving parts such as the stem and/or gate assembly, beware of pinch points, use of gloves is suggested when operating manual valves to minimize the risk of injury.
5. All manual handwheel operated valves are designed for hand input. Do not apply excessive input torque via pipe wrenches, 'cheater bars', or other devices. If a manual handwheel actuated valve is difficult to operate due to torque requirements, it is recommended that the valve be supplied with or converted to a bevel gear, air/hydraulic cylinder or electric motor actuator.
6. Electric motor actuated valves should be left in their factory set condition unless the system operating parameters dictate a change. If changes are necessary, they should be performed in small increments using the lightest/lowest setting possible to achieve the desired performance and then the valve/actuator function inspected. Excess torque and/or thrust in the motor settings may damage or lockup the valve.
7. The OS1700 valve is position seated and should never be torque seated. Do not use the motor torque settings to seat the valve.
8. Care should be taken to ensure that electrical motors are wired correctly. Incorrect phasing of 3-phase wiring may cause valve/motor damage.

LOCKOUT DESIGN

Options

1. Cable lockout standard for manual hand wheel.
2. Bevel gear lockout is standard for use on BG actuators.
3. Lockout pin on both open and closed positions standard on hydraulic cylinder and pneumatic cylinder actuators
4. Lockout pin style for open and closed positions are optional for MH valves.
5. Energy lockouts for hydraulic cylinder actuators.

Safety

1. Pin-style lockouts will assume potential energy of actuator has been removed through other means and will be designed to prevent gate movement caused by line pressure. They are not designed to overcome or resist an energized hydraulic cylinder actuator.
2. Pin-style lockouts positions will be designed to resist unauthorized manual unassisted operation of the valve and prevent gate movement caused by line pressure.
3. Pin style lockouts not available on BG actuated valves.

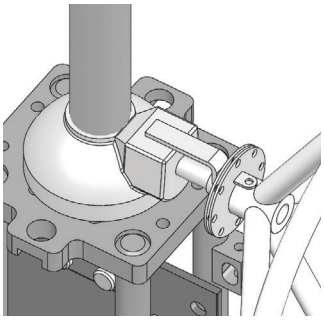


Figure 10
Lockout design for bevel gearbox

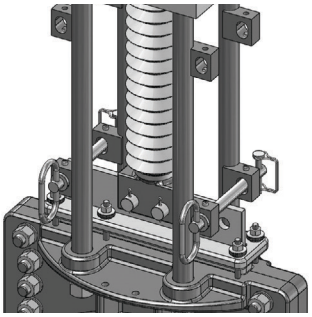


Figure 11
Lockout design for OS1700-18

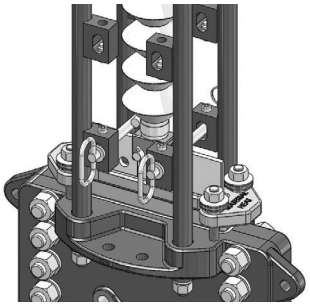


Figure 12
Lockout design for OS1700-8

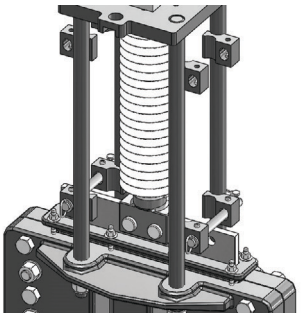


Figure 13
Lockout design for OS1700-28

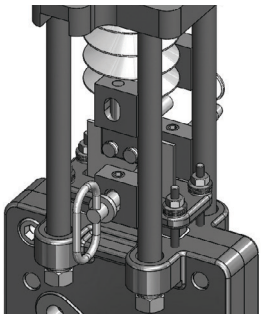


Figure 14
Lockout design for OS1700-3

NOTE
Lockout design may vary between sizes. All lockouts (except BG) include a pin to secure lockout in position and lanyard to tie lockout pin to valve body.

NOTE
Lockout pin may differ from illustration

GENERAL MAINTENANCE

Emerson recommends that all Keystone OS1700 series valves be inspected every 60 days.
The following points should be examined and corrected as required:

1. Cylinder rods, rod boots: Look for excessive corrosion, media or material build-up, tears in rod boot, etc. Check rod boot connections and for cylinder rod seal blow-by.
2. Packing gland: Check for leaks or worn packing. If leakage is occurring around the packing gland, tighten the packing gland bolts evenly at all points, being careful not to overstress the bolting. (On some valves this will require two wrenches, one to tighten the nut and the other to hold the packing bolt from turning.) If the valve requires repacking, see additional instructions for repacking below.
3. Resilient seats: Examine seat for cracks, cuts, corrosion, erosion or swelling. Evidence of any above defects may justify replacement if seat has recorded evidence of leaking when closed, or condition is considered to be at risk of pending failure. To replace a seat, disassembly of valve is required.
4. If possible stroke the valve through the full open and closed position to make sure it is functioning properly.

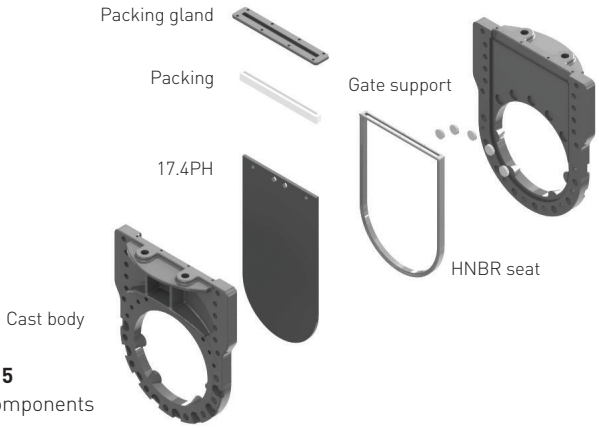


Figure 15
Major components

REPACKING INSTRUCTIONS

1. Each packing piece is cut a bit longer to add some compression within each layer and to accommodate for fraying strands of packing at each end. The size, length, and quantity of each piece can be found in the relevant Table. Each layer shall alternate, as shown in Figure 16.
2. Method of installing packing is shown in Figure 17. Place one end of packing along face of gate and within the range, as shown in Figure 18. The other end should touch initial packing piece once installation of packing commences.
3. Start at the hump of each packing piece and pack the packing with a packing tool, as shown in Figure 18. Packing with a packing tool is required to fill in any gaps that can or cannot be seen. Each layer will require this step.

NOTE
Do not let packing material to twist during installation.

4. Each layer of packing should be stacked in a specific way so that a layer of packing is sitting on top of a split line from the previous layer, as shown in Figure 19.
5. Install packing gland with studs, Bellville Washers, flat washers and nuts as shown in Figure 20. Purpose of Belleville washers are to act as a lock washer for nut. For initial tightening of packing gland, tighten packing gland to achieve a compression between 0.125-0.375". Use Loctite 262 (Red) on studs to secure in body.
6. Tension must be placed on nut to prevent nut from backing out. First stack starts on bottom, cupped up on flat washer and alternates, as shown in Figure 21.

NOTE
Ensure each stack is facing the opposite direction and the final stack is cupped downward before adding the nut.

NOTES

1. Stop all small leaks as soon as possible as considerable damage can be done to the valve and the surrounding area if leakage is allowed to continue.
2. Replacement parts including replacement liners, hand wheel and yoke assemblies, gates, packing glands, and packing can be provided from our factory. If valve requires further repair, please contact our office for an estimate of feasibility and cost of repair.
3. Use packing tool for packing, starting at the hump of each piece of packing

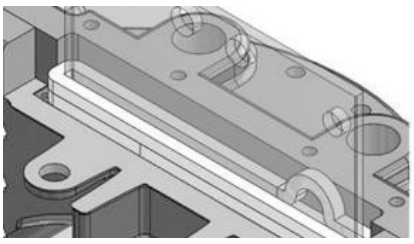


Figure 16
Installation of packing (OS1700-24 Shown)

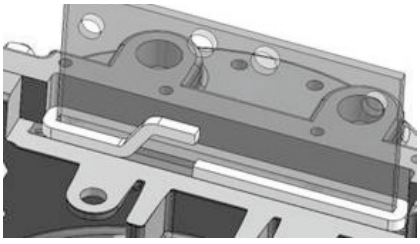


Figure 17
Installation of packing (OS1700-24 Shown)

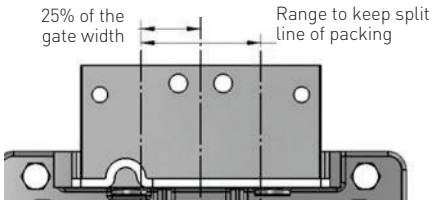


Figure 18
Installation of packing (OS1700-24 Shown)

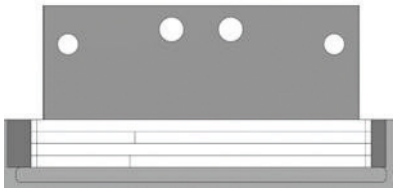


Figure 19
Packing layers alternating (OS1700-24 Shown)

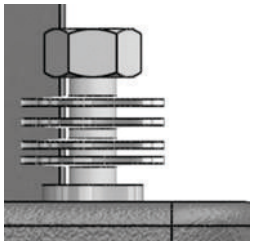


Figure 20
Stacking of Belleville washers to act as lockwashers (OS1700-20 Shown)

OPTIONAL LIVE-LOADED GLAND

Install packing gland with studs, Belleville washers, and nuts, as shown in Figure 21. Belleville washers are stacked in a specific order to achieve live loading. First stack starts on gland.

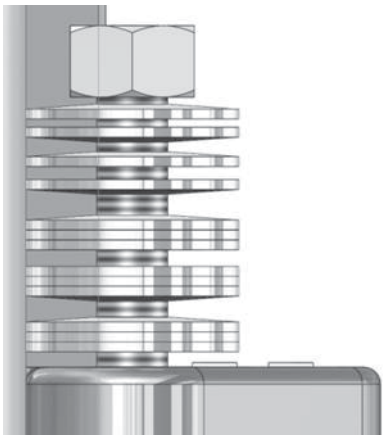


Figure 21
Stacking of Belleville washers for optional live-loading (OS1700-12 Shown)

BELLEVILLE WASHER STACKING PATTERN FOR OPTIONAL LIVE-LOADING

Valve size NPS (DN)	First stack	Second stack	Third stack	Fourth stack	Fifth stack	Sixth stack	Seventh stack
2 (50)	2 Down	2 Up	2 Down	1 Up	1 Down	1 Up	1 Down
3 (80)	3 Down	3 Up	3 Down	1 Up	1 Down	1 Up	1 Down
4 (100)	4 Down	4 Up	4 Down	1 Up	1 Down	1 Up	1 Down
6 (150)	3 Down	3 Up	3 Down	1 Up	1 Down	1 Up	1 Down
8 (200)	3 Down	3 Up	3 Down	1 Up	1 Down	1 Up	1 Down
10 (250)	3 Down	3 Up	3 Down	1 Up	1 Down	1 Up	1 Down
12 (300)	4 Down	4 Up	4 Down	1 Up	1 Down	1 Up	1 Down
14 (350)	2 Down	2 Up	2 Down	1 Up	1 Down	1 Up	1 Down
16 (400)	2 Down	2 Up	2 Down	1 Up	1 Down	1 Up	1 Down
18 (450)	3 Down	3 Up	3 Down	1 Up	1 Down	1 Up	1 Down
20 (500)	4 Down	4 Up	4 Down	1 Up	1 Down	1 Up	1 Down
24 (600)	4 Down	4 Up	4 Down	1 Up	1 Down	1 Up	1 Down
26 (650)	2 Down	2 Up	2 Down	1 Up	1 Down	1 Up	1 Down
28 (700)	3 Down	3 Up	3 Down	1 Up	1 Down	1 Up	1 Down
30 (750)	4 Down	4 Up	4 Down	1 Up	1 Down	1 Up	1 Down
32 (800)	4 Down	4 Up	4 Down	1 Up	1 Down	1 Up	1 Down
36 (900)	3 Down	3 Up	3 Down	1 Up	1 Down	1 Up	1 Down

PACKING SIZES

Valve size NPS (DN)	No. of rows	Packing size	Length per row (in)
2 (50)	4	⅜	8.25
3 (80)	4	⅜	12.00
4 (100)	4	⅜	12.00
6 (150)	4	⅜	16.50
8 (200)	4	½	21.00
10 (250)	4	½	25.50
12 (300)	4	½	30.00
14 (350)	4	½	33.00
16 (400)	4	½	36.00
18 (450)	4	⅝	40.50
20 (500)	4	⅝	45.00
24 (600)	4	⅝	54.00
26 (650)	4	⅝	58.50
28 (700)	4	⅝	64.50
30 (750)	4	⅝	67.50
32 (800)	4	⅝	74.50
36 (900)	4	⅝	81.00

CYLINDER SUPPORT METHODS FOR HORIZONTALLY OR OFF-VERTICAL MOUNTING

Cylinders may require additional support when mounted in the other than vertical position. Failure to do so could lead to premature failure of cylinder and/or valve.
The following illustrations are suggestions; specific details will have to be determined by customer so support best suits surrounding area. It is important that the cylinder/ gate alignment be maintained during valve operation. Supports should be designed to maintain alignment and support bulk of cylinder weight.

RECOMMENDED LONG TERM STORAGE

The following are recommendations for storage procedures to retain maximum product integrity during long term storage of 1 to 5 years.

Storage facility
The preferred storage location is a clean, dry protected warehouse. If valves are to be stored outside, precautions should be taken to keep valves clean and dry. Standard packaging materials cannot be considered sufficient for outdoor storage.

HANDWHEEL OR BEVEL GEAR OPERATED VALVES

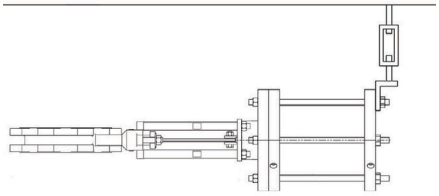
Equipment orientation
Valves may be stored in the vertical or horizontal position

Preparation for storage
Valves may be stored as shipped, provided the storage facility and equipment orientation instructions above are followed. If valve packaging is altered or removed for receiving inspection, repackage valve as originally received. Standard packaging materials cannot be considered sufficient for outdoor storage.

INSTALLATION A

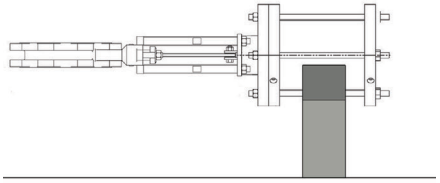
Appropriate tie-in capable of supporting load

Turnbuckle for adjustment saddle style hanger



INSTALLATION B

Saddle style support



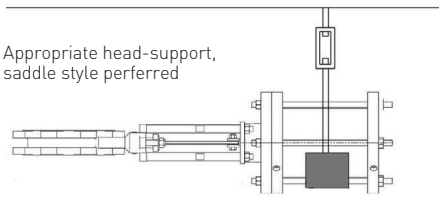
Appropriate tie-in capable of supporting load

INSTALLATION C

Appropriate tie-in capable of supporting load

Turnbuckle for adjustment

Appropriate head-support, saddle style perferred



Storage inspection
Visual inspection shall be performed on a semi-annual basis and results recorded. Inspection as a minimum shall include reviewing the following:
- Packaging
- Flange covers
- Dryness
- Cleanliness

Maintenance
Maintenance shall consist of correcting deficiencies noted during inspection. All maintenance shall be recorded. Contact factory prior to performing any maintenance if valve is still covered under warranty.

CYLINDER OPERATED VALVES

Equipment orientation
The preferred orientation for optimum protection is with the cylinder in the vertical position. This position gives the best support to the cylinder rod and helps reduces the chance of a "flat spot" developing on the cylinder seals. An acceptable alternate position for valves with cylinder diameters of less than 6 inches (150 mm) is with the cylinder in the horizontal position.

Preparation for storage
Valves may be stored as shipped, provided the storage facility and equipment orientation instructions above are followed. If valve packaging is altered or removed for receiving inspection, repackage valve as originally received. Standard packaging materials cannot be considered sufficient for outdoor storage

Cylinder storage
These cylinder storage instructions are not intended to replace the instructions of the specific cylinder manufacturer and are to be used as a guide only. If specific instructions are required, please contact our office. For storage of up to 3 years; Squirt a high quality grade of hydraulic oil or synthetic lubricant into the cylinder ports and operate cylinder 6-12 times on a yearly basis. For storage 3-5 years; Lubricate as above. Additionally, extend cylinder rod until the valve is fully closed. Coat cylinder rod with high quality heavy grease or synthetic lubricant. Retract cylinder rod until valve is fully open, drawing lubricant into rod end of cylinder. Securely plug cylinder ports with pipe plugs, if cylinder is not prepiped to control accessories. If cylinder is prepiped to accessories, plug all input and output ports of accessories.

Storage inspection
Visual inspection shall be performed on a semi-annual basis and results recorded. Inspection as a minimum shall include reviewing the following:
- Packaging
- Flange covers
- Dryness
- Cleanliness

Maintenance
Maintenance shall consist of correcting deficiencies noted during inspection. All maintenance shall be recorded. Contact factory prior to performing any maintenance if valve is still covered under warranty.

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