Low-temperature GLOBE sleeve control valve MK-GC

The internal structure is identical to that of Fisher. For models sharing the same structure, the spare parts of Fisher can be fully substituted.

The MK-GC cryogenic control valve is a sleeve-guided control valve with stainless steel structural materials and an extended valve cover. The valve is available in both pressure-balanced and non-pressure-balanced designs.

These cryogenic valves are designed for throttling or on-off control of liquids and gases in cryogenic conditions as low as -198 ° C.

If necessary, these robust valves can reliably provide a tight shut-off for special applications in the chemical and hydrocarbon processing industries, such as certain liquefied natural gas conditions and air separation.

High-flow valves with pressure balancing valve internals allow for the use of smaller, lower-cost actuators, thereby reducing installation costs in high-pressure and high-flow applications.

Product Features:

- Interchangeable, limit valve internals and full-size valve internals meet a wide range of process flow requirements for highly specialized applications. Standard valve cages typically have two different flow characteristics: equal and linear.
- **Low-temperature spring-loaded seals -** Seals and associated valve parts in valves are specially designed and manufactured to perform exceptionally well at low temperatures.
- **Stable control** - The robust cage guide in the valve stabilizes the valve core at all points of its stroke to reduce vibration, mechanical noise and act as a hydraulic shock absorber
- **Cost-effective operation and maintenance economy** - Enhanced wear resistance of hardened stainless steel valve internals means longer operating hours. The balanced valve core structure of the valve allows for the use of smaller, lower-cost actuators
- **Low-temperature design** - Stainless steel valve bodies and valve covers with prefabricated extension parts can meet the requirements of low-temperature conditions. The unique metal-to-metal valve seat design can repeatedly achieve a tight shut-off, reducing maintenance costs.
- **Robust metal valve seats** - Metal-to-metal valve seats are designed and manufactured to provide long-lasting, reliable, and tight shut-off at ambient and low temperatures without the need for

regular grinding. This reduces the need for a soft valve seat even in applications with strict shut-off requirements.

- **Prevent fugitive emissions -** The optional low leakage packing system provides an improved valve stem seal that helps prevent the loss of valuable or harmful process fluids and keeps emissions below EPA limit 100 ppm. In addition, these dynamically loaded packing systems can work stably for a long time at low temperatures, helping to reduce maintenance costs and downtime.
- **Fully tested** - These valves have undergone extensive low-temperature testing during their design and development, eliminating the need for expensive low-temperature testing required for most applications, thus speeding up delivery and reducing costs.
- **Easy to maintain** - Convenient for quick replacement of valve internals, with clamping valve seat rings for shortened disassembly time. When disassembling the valve internals for inspection or maintenance, there is no need to remove the valve from the pipeline.
- **Acidic working conditions** - For information on NACE applications, please consult your local sales representative.

Table 1: Valve Specifications

Specifications	EN	ANSI
Nominal bore	DN 15,20,25,40,50,80,100,150,250,300	0.5, 0.75, 1,1.5, 2,3,4,6,8,10,12 inches
Nominal pressure	PN 10/16/25/40/63/100 complies with EN 1092-1	Class 150/300/600 complies with ASME B16.34
Connection method	EN 1092-1 standard requirements for convex flanges (RF,RTJ,MFM) HG/T 20592-2009	Requirements for convex flanges in ASME B16.5 standard (RF,RTJ,MFM) HG/T 20615-2009; SH/T 3406-2013 ASME B16.11 Threaded or sleeve welded SME B16.25 butt-weld type
Faran distance	Compliant with EN 558-1	Compliant with ANSI/ISA 75.08.01
Upper valve cover type	Common type, extended type I, extended type II, bellows type	
Leak grade	Metal valve seat ANSI/FCI 70.2 Class IV, optional Class V, soft valve core Class VI	
Flow direction	Upward flow	
Flow characteristics	Fast open, equal percentage, linear	
Adjustable ratio	50:1	
Valve internals type	Small flow valve internals, sleeve guided valve internals, multi-hole guided valve internals, labyrinth valve internals, multi-stage valve internals	
Operating temperature	WCB:-29 ° C -232 ° C, LCB:-46 ° C -232 ° C. Up to 371 ° C with an extended valve cover	
	CF8/CF8M/CF3/CF3M stainless steel: -29℃-232℃. With an extended valve cover, -196 ° C to 565 ° C is available	

Table 2: Material combinations

Valve body material		A216WCB,A217-WC6,A217-WC9,A352-LCB			
Valve core		17-4 PH	316+RTFE	316	316+ surfacing hardening
Valve seat		410	316	316	316+ surfacing hardened
Sleeve		410	316	316	316
The valve seat allows for leakage		Class IV,V	Class VI	Class IV,V	Class IV,V
Pad ring		Wound gaskets (316L+ polytetrafluoroethylene, 316L+ flexible graphite, etc.)			
Valve cover packing		Ptfe fiber braided packing & PTFE fiber & carbon fiber braided packing, flexible graphite packing			
Operating temperature	WCB valve body	- 29-425 ℃	- 29-200 ℃	- 29-425 ℃	- 29-425 ℃
	WC6 valve body				
	LCB valve body	---	- 46-200 ℃	- 46-232 ℃	- 46-232 ℃

Valve body material	A351-CF8,A351-CF8M		
Valve core	316+RTFE	316	316+ surfacing hardening
Valve seat	316	316	316+ surfacing hardened
Sleeve	316	316	316
The valve seat allows for leakage	Class VI	Class IV,V	Class IV,V
Pad ring	Wound gaskets (316L+ polytetrafluoroethylene, 316L+ flexible graphite, etc.)		
Valve cover packing	Polytetrafluoroethylene fiber braided packing & polytetrafluoroethylene fiber & carbon fiber braided packing (oxygen packing) flexible graphite packing		
Operating temperature	- 75-200 ℃	- 196-565 ℃	- 196-565 ℃

Notes:

1) The temperature and pressure range for the material treatment of valve internals can be found in the valve internals material treatment selection reference;

2) If cavitation is likely to occur, select a control valve that is resistant to cavitation;

3) If flash vaporization may occur, please choose the type with a reduced cavity, and the surface of the valve core and valve seat should be fully overlay welded with Stellite alloy;

4) For valve cores 1/4 "and below, there is only full Stellite surfacing and no partial Stellite surfacing.

Table 3： Common Special Specification Requirements

Special materials	Super bidirectional stainless steel, Hastelloy, Inconel, Monel, 20, titanium, zirconium, etc
Special inspection of the main body	Material inspection (liquid penetrant inspection (PT), radiographic inspection (RT)), flow characteristic inspection, low-temperature test, steam test
Cleaning and degreasing treatment	Complete oil-free and water-free treatment
Special specifications for the body and electric actuator	Sand-proof, water-proof, salt-resistant, for cold regions, for tropical regions, copper-free treatment, hydrogen sulfide resistant treatment, special air piping and special air joints, for vacuum working conditions, bolts and nuts in contact with the atmosphere made of stainless steel, specified coating color

Table 4: Pressure Resistance Range of Valve Body Materials

Temperature	Class 150					Class 300					Class 600				
	LCB	WCB	WC6	CF8	CF8M	LCB	WCB	WC6	CF8	CF8M	LCB	WCB	WC6	CF8	CF8M
(℃)		A105	F11	F22	F316		A105	F11	F22	F316		A105	F11	F22	F316
- ~ 196-45	-	-	-	1.9	1.9	-	-	-	4.96	4.96	-	-	-	9.93	9.93
- 45 ~ - 29	1.84	-	-	1.9	1.9	4.8	-	-	4.96	4.96	9.60	-	-	9.93	9.93
- 29 ~ - 38	1.84	1.96	2	1.9	1.9	4.8	5.11	5.17	4.96	4.96	9.60	10.21	10.34	9.93	9.93
50	1.82	1.92	1.95	1.83	1.84	4.75	5.01	5.17	4.78	4.81	9.49	10.02	10.34	9.56	9.62
100	1.74	1.77	1.77	1.57	1.62	4.53	4.66	5.15	4.09	4.22	9.07	9.32	10.30	8.17	8.44
150	1.58	1.58	1.58	1.42	1.48	4.39	4.51	4.97	3.70	3.85	8.79	9.02	9.95	7.40	7.70
200	1.38	1.38	1.38	1.32	1.37	4.28	4.38	4.80	3.45	3.57	8.51	8.76	9.59	6.90	7.13
250	1.21	1.21	1.21	1.21	1.21	4.08	4.19	4.63	3.25	3.34	8.16	8.39	9.27	6.50	6.68
300	1.02	1.02	1.02	1.02	1.02	3.87	3.98	4.29	3.09	3.16	7.74	7.96	8.57	6.18	6.32
325	0.93	0.93	0.93	0.93	0.93	3.76	3.87	4.14	3.02	3.09	7.52	7.74	8.26	6.04	6.18
350	0.84	0.84	0.84	0.84	0.84	3.64	3.76	4.03	2.96	3.03	7.28	7.51	8.04	5.93	6.07
375		0.74	0.74	0.74	0.74		3.64	3.89	2.90	2.99		7.27	7.76	5.81	5.98
400		0.65	0.65	0.65	0.65		3.47	3.65	2.84	2.94		6.94	7.33	5.69	5.89
425		0.55	0.55	0.55	0.55		2.88	3.52	2.80	2.91		5.75	7.00	5.60	5.83
450			0.46	0.46	0.46			3.37	2.74	2.88			6.77	5.48	5.77
475			0.37	0.37	0.37			3.17	2.69	2.87			6.34	5.39	5.73
500			0.28	0.28	0.28			2.57	2.65	2.82			5.15	5.30	5.65
538			0.14	0.14	0.14			1.49	2.44	2.52			2.98	4.89	5.00
550			0.14	0.14				1.20	1.27				2.54		
575			0.14					0.88					1.76		
600															
625															
650															

Valve internals material treatment selection reference

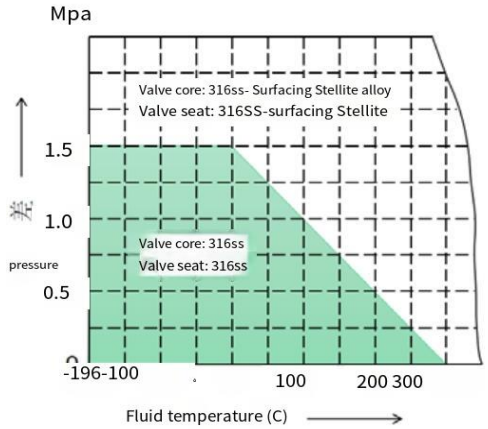

Figure 1 Metal seal

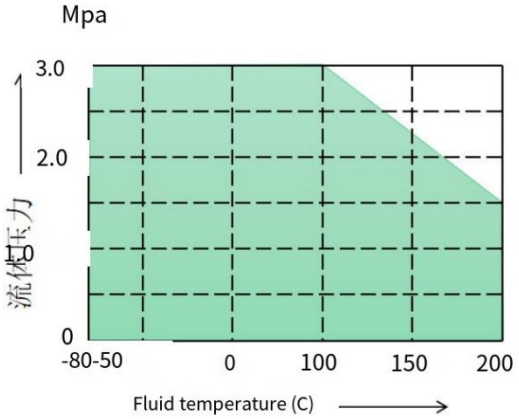

Figure 2 Soft seal (reinforced polytetrafluoroethylene)

Balance the sealing ring operating temperature · pressure range

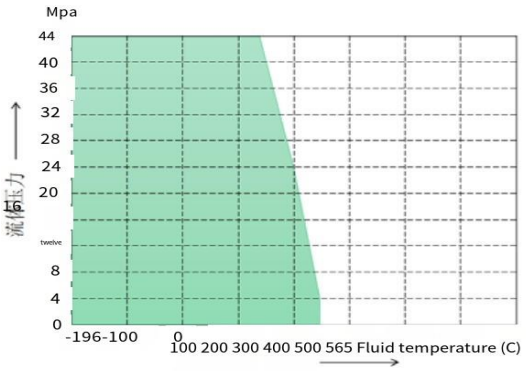

Figure 3 Reinforced polytetrafluoroethylene

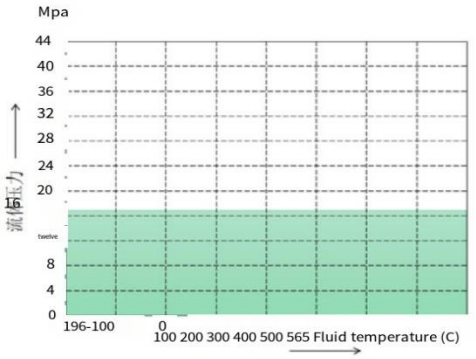

Figure 4 Flexible graphite

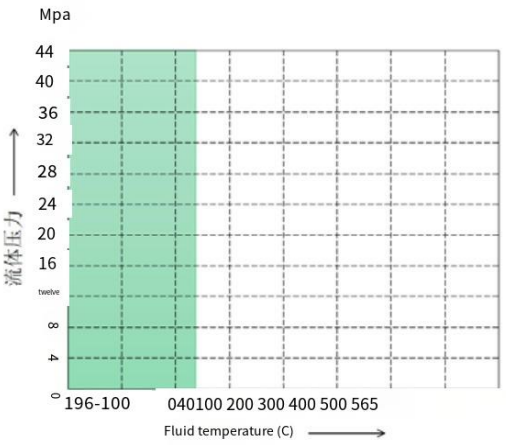

Figure 5 ultra-low temperature type

Packing operating temperature · pressure range

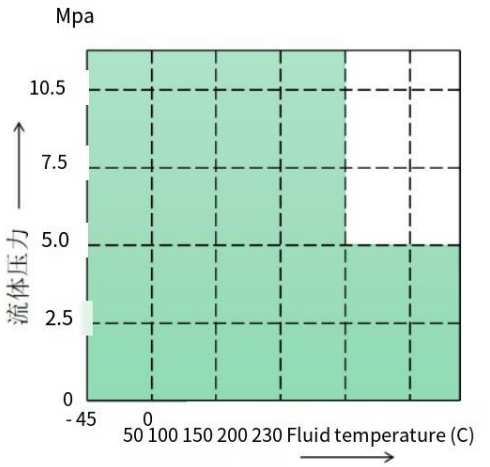

Figure 6 Polytetrafluoroethylene fiber

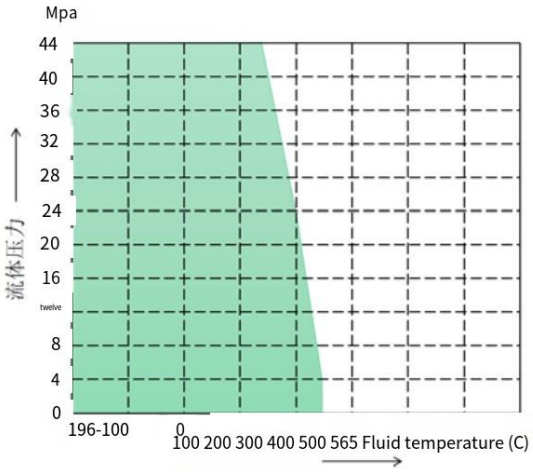

Figure 7 Carbon fiber/polytetrafluoroethylene fiber

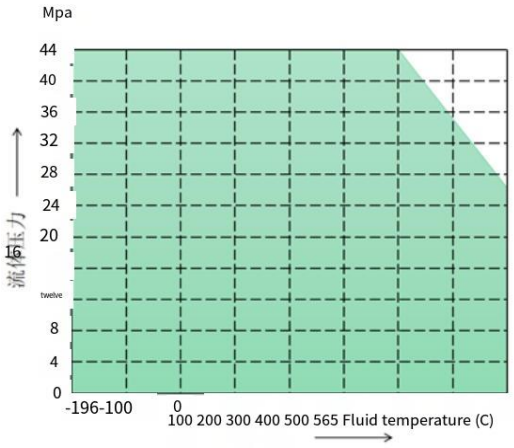

Figure 8 Flexible graphite

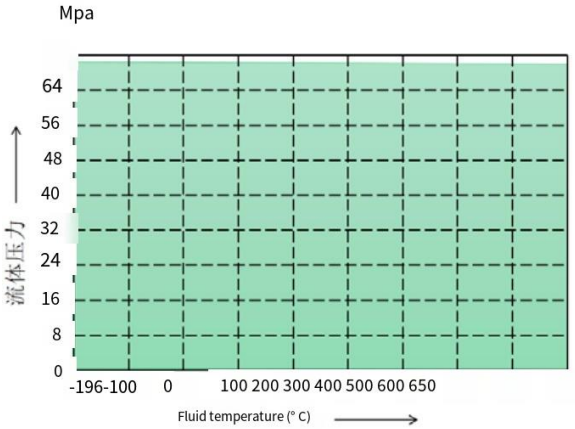

Figure 9 Super Flexible graphite

Wound gasket operating temperature · pressure temperature

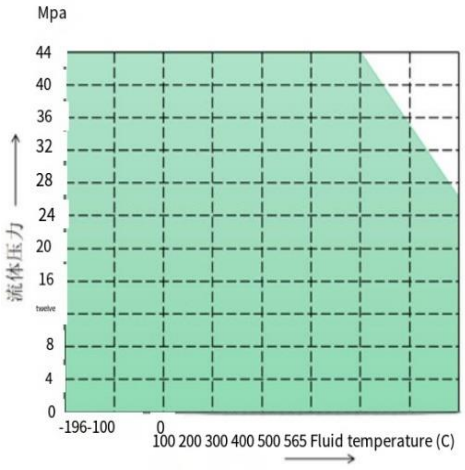

Figure 11 316L+ Flexible graphite

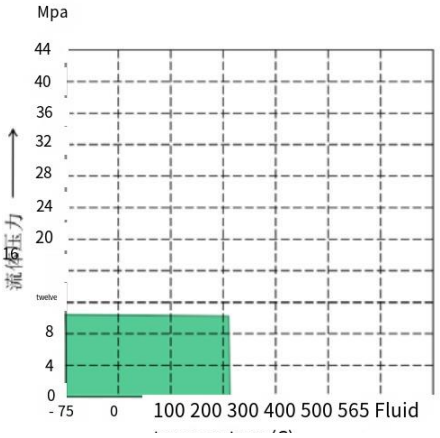

Figure 12 316L+ pure polytetrafluoroethylene

Table 5 MK-GC core-guided quick-opening Flow characteristics, FTO

Valve dimensions	Valve opening diameter (mm)	Stroke (mm	Valve opening - total stroke percentage									
			10	20	30	40	50	60	70	80	90	100
1/2"	25.4	19	1.76	3.29	4.29	4.44	4.44	4.44	4.44	4.44	4.44	4.44
3/4"	25.4	19	3.85	7.19	9.40	9.72	9.72	9.729.72	9.72	9.72	9.72	9.72
1"	25.4	19	4.39	10.3	14.0	15.5	16.2	16.6	16.8	16.8	16.9	16.9
1 1/2"	25.4	19	4.17	8.94	14.6	17.4	18.3	18.8	18.9	19.0	19.1	19.4
	38.1	19	5.64	11.9	20.6	27.4	30.5	32.4	33.4	33.7	34.1	34.2
2"	25.4	19	4.35	9.79	14.9	16.6	17.3	17.5	17.5	17.6	17.7	17.9
	50.8	29	13.0	30.1	44.3	52.4	56.4	57.8	58.4	58.5	58.6	58.6
3"	50.8	29	9.99	27.6	44.9	61.0	71.9	78.4	83.1	86.2	87.5	88.4
	76.2	38	30.8	65.1	92.4	110	118	123	126	128	129	129
4"	50.8	29	13.5	32.3	52.2	66.2	74.4	81.1	85.0	85.8	86.3	86.7
	101.6	51	50.8	116	159	185	201	212	219	222	223	223

Valve dimensions	Valve opening diameter (mm)	Stroke (mm)	Valve opening - total stroke percentage									
			10	20	30	40	50	60	70	80	90	100
1"	25.4	19	2.21	3.87	5.29	6.56	8.2	9.82	11.1	12.1	13.0	13.6
1 1/2"	25.4	19	1.96	3.42	4.94	6.11	7.8	9.3	10.9	13	15.1	16.7
	38.1	19	3.99	7.53	11.1	14.8	18.7	22.5	25.8	29.2	31.2	31.9
2"	25.4	19	1.88	3.41	4.95	6.49	8.06	9.67	11.23	12.79	14.35	15.7
	50.8	29	6.08	11.9	18.0	24.1	30.1	36.4	42.8	49.9	52.0	52.4
3"	50.8	29	6.59	13.3	20.7	28.1	36.0	44.0	55.6	67.5	76.2	80.4
	76.2	38	15.4	29.6	43.4	58.3	71.8	83.9	93.8	103	108	110.4
4"	50.8	29	6.16	12.8	20.0	27.8	36.1	45.1	58.8	67.5	78.8	86.8
	101.6	51	21.3	39.7	57.5	75.8	100	129	157	180	199	209

Valve dimensions	Valve opening diameter (mm)	Stroke (mm)	Valve opening - total stroke percentage									
			10	20	30	40	50	60	70	80	90	100
1"	25.4	19	0.79	1.25	1.80	2.53	3.63	5.28	7.59	10.7	12.7	13.2
1 1/2"	25.4	19	0.77	1.25	1.78	2.58	3.67	5.54	8.30	12.0	15.1	17.3
	38.1	19	0.795	1.23	1.91	2.95	4.30	6.46	9.84	16.4	22.2	28.1
2"	25.4	19	1.02	1.50	2.05	2.78	3.90	5.57	8.16	11.8	14.5	15.9
	50.8	29	1.65	2.61	4.30	6.62	11.1	20.7	32.8	44.7	50.0	53.8
3"	50.8	29	2.11	3.11	4.58	6.76	10.7	20.7	34.3	48.3	61.5	71.6
	76.2	38	3.11	5.77	9.12	13.7	21.7	36.0	60.4	86.4	104	114
4"	50.8	29	1.96	3.05	4.43	6.98	11.9	22.3	36.7	50.9	61.8	72.7
	101.6	51	4.90	8.19	13.5	20.1	31.2	52.6	96.7	140	170	190

Table 8 MK-GC Micro Flow type Equal Percentage Flow characteristics, FTO

Valve dimensions	Valve opening straight diameter	Stroke (mm)	Valve opening - total stroke percentage										
			5	10	20	30	40	50	60	70	80	90	100
1/2 "- 2"	6.4	19	0.075	0.088	0.124	0.175	0.236	0.327	0.464	0.641	0.881	1.22	1.52
1/2"	9.5	19	0.102	0.134	0.202	0.313	0.448	0.613	0.879	1.27	1.77	2.47	3
	12.7	19	0.137	0.193	0.324	0.496	0.737	1.07	1.52	2.13	2.93	3.89	4.52
3/4"	9.5	19	0.101	0.131	0.205	0.312	0.446	0.618	0.882	1.28	1.80	2.45	3.03
	12.7	19	0.133	0.190	0.318	0.486	0.732	1.07	1.52	2.15	3.07	4.20	5.06
	19.1	19	0.276	0.373	0.617	0.948	1.44	2.14	3.10	4.43	6.14	7.58	8.35
1"	9.5	19	0.099	0.129	0.199	0.308	0.448	0.620	0.882	1.29	1.80	2.43	3.07
	12.7	19	0.133	0.189	0.319	0.492	0.735	1.08	1.53	2.12	2.99	4.17	4.91
	19.1	19	0.276	0.374	0.622	0.965	1.47	2.17	3.15	4.57	6.52	8.17	8.84
1 1/2 "2 "	9.5	19	0.096	0.121	0.190	0.302	0.435	0.600	0.864	1.26	1.80	2.56	3.20
	12.7	19	0.145	0.199	0.323	0.503	0.735	1.07	1.54	2.14	3.08	4.36	5.18
	19.1	19	0.336	0.434	0.683	1.00	1.49	2.21	3.18	4.61	6.73	8.88	10.2

Valve dimensions	Valve opening diameter (mm)	Stroke (mm)	Valve opening - total stroke percentage									
			10	20	30	40	50	60	70	80	90	100
1/2 "- 2"	6.4(1 slot)	19	0.0385	0.0455	0.0560	0.0719	0.0942	0.124	0.162	0.212	0.278	0.354
	6.4(3 slots)	19	0.0562	0.0725	0.101	0.146	0.216	0.312	0.433	0.588	0.802	1.07

Valve dimensions	Valve opening diameter (mm)	Stroke (mm)	Valve opening - total stroke percentage									
			10	20	30	40	50	60	70	80	90	100
1/2 "- 2"	4.8	19	0.003	0.003	0.003	0.003	0.005	0.008	0.011	0.015	0.019	0.022
	4.8	19	0.004	0.006	0.008	0.011	0.014	0.018	0.022	0.026	0.031	0.036
	4.8	19	0.015	0.02	0.024	0.028	0.034	0.041	0.048	0.056	0.066	0.075
	4.8	19	0.016	0.026	0.038	0.052	0.07	0.088	0.107	0.127	0.153	0.181

Table 9 MK-GC Cage-guided Unbalanced Quick-opening Flow characteristics, FTO

Valve dimensions	Valve opening diameter (mm)	Stroke (mm)	Valve opening - total stroke percentage									
			10	20	30	40	50	60	70	80	90	100
1"	33.3	19	5.24	10	15	18.4	20.3	21	21.1	21.3	21.4	21.4
1 1/2"	33.3	19	4.83	10.4	16.2	21.4	25.6	28.2	29.8	30.2	30.3	30.4
	47.6	19	7.6	15.1	22.3	28.2	33.4	37	38	38	38	38
2"	33.3	19	5.12	10.5	16.7	22.2	26.9	30.9	33.9	36.3	38.1	39.4
	58.7	29	14.3	31.1	48.6	59.3	65.2	67.2	67.2	67.2	67.2	67.2
2 1/2"	47.6	19	7.4	15.5	23.3	31.4	39.8	48.4	56.1	61.7	62.3	69.2
	73.0	38	21.8	42	66.6	83.8	91.1	93.1	93.1	93.1	93.1	93.1
3"	58.7	29	14.7	32.4	51.2	68.8	83.1	94.3	103	108	112	115
	87.3	38	23.3	45.5	78.3	106	120	130	136	143	146	150
4x2”	58.7	29	13.7	26.9	42.1	60	76.8	90.2	101	110	117	123
4"	73.0	29	26.9	47.2	76.4	108	135	156	169	178	181	183
	111.1	51	39	77.3	132	174	198	215	225	230	234	235
6x4”	111.1	51	39.4	85.2	147	208	268	321	355	373	379	382
6"	111.1	51	49.8	108	164	217	255	274	282	290	291	302
	177.8	51	89.9	162	255	322	365	395	418	436	455	469
8"	203.2	51	94.4	205	323	441	539	622	677	720	759	787
	203.2	76	156	337	490	612	700	759	796	827	844	875

Valve dimensions	Valve opening diameter (mm)	Stroke (mm)	Valve opening - total stroke percentage									
			10	20	30	40	50	60	70	80	90	100
1"	33.3	19	2.27	4.12	6.23	8.54	11	13.4	15.8	17.8	19.3	20.1
1 1/2"	33.3	19	2.42	4.3	6.4	8.77	11.5	14.6	17.8	21.1	24.3	26.9
	47.6	19	3.56	7.01	11.1	15.1	19	22.9	26.7	30	33.1	34.9
2"	33.3	19	2.22	4.11	6.06	8.25	11	14.3	18	21.8	26	30.9
	58.7	29	8.49	17.1	25.9	35.3	44.4	52.9	59.2	62	63.9	65.3
2 1/2"	47.6	19	3.5	6.85	10.8	14.8	18.9	23.3	28.2	34.1	41.1	48.6
	73.0	38	10.4	22.2	34.9	47.1	58.2	66.6	73.7	79.3	84.4	86.5
3"	58.7	29	6.39	13	20.7	29.1	38.2	47.9	58	68.4	79.3	88.8
	87.3	38	15.3	34.3	52.8	71.4	87.8	101	112	121	129	135
4x2”	58.7	29	6.88	13.7	21.5	29.9	39.1	49	60	72.2	84.5	96.2
4"	73.0	29	10.6	22.5	35	47.5	60.2	73.1	88	103	120	139
	111.1	51	23.7	46.4	72.9	98.2	122	145	165	183	199	212
6x4”	111.1	51	26.2	52.5	78.4	105	133	162	197	236	281	320
6"	111.1	51	15.7	35.8	60.2	86.2	115	146	179	215	247	271
	177.8	51	55	118	180	235	280	312	341	368	390	417
8"	203.2	51	66.6	147	221	292	375	450	522	592	652	701
	203.2	76	100	213	330	451	553	648	719	773	809	836

Table 11 MK-GC Cage-guided Unbalanced Equal Percentage Flow characteristics, FTO

Valve dimensions	Valve opening diameter (mm)	Stroke (mm)	Valve opening - total stroke percentage									
			10	20	30	40	50	60	70	80	90	100
1"	33.3	19	0.783	1.29	1.86	2.71	4.18	6.44	9.54	13.1	15.7	17.4
1 1/2"	33.3	19	0.822	1.35	1.89	2.52	3.68	5.52	8.13	12	16.6	21
	47.6	19	1.54	2.52	3.57	4.94	7.41	11.6	17.2	23.5	28.7	33.4
2"	33.3	19	0.849	1.34	1.83	2.39	3.43	5.12	7.49	11.2	15.8	20.8
	58.7	29	1.74	3.15	4.72	6.91	10.6	16.3	25	36.7	47.8	56.2
2 1/2"	47.6	19	1.43	2.37	3.34	4.76	7.25	11.3	17.3	24.2	31.8	40.3
	73.0	38	4.05	7.19	10.6	14.5	21.2	31.6	45.5	64.2	77.7	82.7
3"	58.7	29	2.74	3.44	4.86	6.95	10.6	16.5	25	37.7	52.7	67.5
	87.3	38	4.05	6.84	10	15	23.8	37.8	59	87.1	110	121
4x2”	58.7	29	2.4	4.16	5.97	8.37	12.2	17.6	26.3	38.1	52.7	67.5
4"	73.0	29	3.96	7.14	10.6	14.5	21.1	31.7	48	69.7	95.6	121
	111.1	51	6.56	11.4	17.3	27	42.2	66.4	103	146	184	203
6x4”	111.1	51	7.18	12.3	18.2	26.7	39.8	61	100	158	217	271
6"	111.1	51	4.96	9.02	14.0	24.2	39.4	60.8	94.6	144	199	233
	177.8	51	13.2	24.6	41.1	62.5	97.1	155	223	286	326	357
8"	203.2	51	18.8	33.6	53.6	79.8	114	168	242	345	467	570
	203.2	76	25.9	53.3	97.8	178	299	461	618	727	768	808

Table 12: MK-GC-W Cage-guided Unbalanced Single-stage Noise-reducing Flow Characteristics, FTO

Valve dimensions	Valve opening diameter (mm)	Stroke (mm)	Valve opening - total stroke percentage									
			10	20	30	40	50	60	70	80	90	100
1"	33.3	19	3.16	6.97	11.8	15.1	16.5	17.2	17.3	17.4	17.4	18.4
1 1/2"	33.3	19	2.84	6.74	11.3	17.4	22.1	25.6	27.7	28.7	29.1	29.3
	47.6	19	3.42	8.78	14.6	22.2	27.7	31.6	34	35.1	36	37.2
2"	33.3	19	3.62	7.07	12.2	18.4	23.3	27.6	31.1	34	35.8	37
	58.7	29	8.27	21.8	35.3	47.3	55.1	60.2	63.2	65.3	66.8	67.8
2 1/2"	47.6	19	3.07	8.65	15.3	23.4	31.2	36.8	43.4	48.3	52.1	55.8
	73.0	38	12.8	33.9	55	70.6	80	85.4	88.5	90.3	91.1	91.7
3"	58.7	29	6.63	18.1	30.8	43.4	56.1	67.1	77.8	87.2	95.9	102
	87.3	38	11.1	36	60.3	81.9	99.6	111	119	124	128	131
4x2”	58.7	4x2”	14.2	27.7	39.8	51.7	63.8	76.2	88.3	99.9	111	118
4"	73.0	4"	12.8	33.9	56.6	76.4	96.3	114	130	143	156	164
	111.1	51	25.1	56.5	85.6	111	128	139	147	151	208	211
6x4”	111.1	6x4”	30.9	71.5	110	150	185	221	252	280	302	325
6"	177.8	51	54.1	114	174	231	281	319	349	369	387	401
8"	203.2	76	84.6	229	360	462	531	607	660	695	712	735

Table 13: MK-GC-W Cage-guided Unbalanced Multi-stage Noise-reducing Flow Characteristics, FTO

Valve dimensions	Valve opening diameter (mm)	Stroke (mm)	Noise reduction level	Valve opening - total stroke percentage									
				10	20	30	40	50	60	70	80	90	100
1"	33.3	19	A1	2.5	4.8	6.7	8.5	10.3	11.9	13.3	14.7	15.4	15.9
1 1/2"	33.3	19	A3	0.5	0.6	3.7	6.4	9.2	12.1	14.9	17.8	20.7	21.6
	33.3	19	B1	0.5	0.5	3.9	5.7	7.4	9.2	10.9	12.7	14.5	16.1
	33.3	19	B3	0.5	0.6	2.4	3.8	5.2	6.6	8	9.5	10.9	11.7
	19.1	29	C1	0.1	1.4	2.3	3	3.8	4.6	5.4	6.1	6.9	7.4
	19.1	29	C3	0.1	1.5	2.4	3.4	4.4	5.3	6.3	7.3	8.2	8.3
	19.1	29	D1	0.1	1.4	2.3	3	3.8	4.6	5.4	6.1	6.9	7.4
	19.1	29	D3	0.1	1.5	2.4	3.4	4.4	5.3	6.3	7.3	8.2	8.3
	47.6	19	A1	0.7	5	14	19.1	22.7	24	25	25.7	25.7	25.8
2"	33.3	32	A3	0.4	3.1	7.7	12.8	17.1	21.6	24.5	27.3	28.5	29.7
	33.3	32	B1	0.5	4.1	7	9.7	12.7	15.8	18.8	21.8	24.5	24.7
	33.3	32	B3	0.5	1.3	4.4	7	9.5	11.8	14.1	16.3	18.5	19.8
	33.3	32	C1	0.5	3	4.6	5.9	7.5	9.1	10.7	12.3	13.9	14
	33.3	32	C3	0.5	1.7	3.6	5.3	6.9	8.5	10	11.4	12.8	13.8
	33.3	32	D1	0.5	3	4.6	5.9	7.5	9.1	10.7	12.3	13.9	14
	33.3	32	D3	0.5	1.7	3.6	5.3	6.9	8.5	10	11.4	12.8	13.8
	58.7	35	A1	8.7	18.7	28.7	36.7	41.6	45.3	47.4	48.4	48.9	49.4
2 1/2"	47.6	38	A3	0.7	3.5	11.6	18.7	25.4	31.9	38.2	44.2	49.8	52
	47.6	38	B1	0.8	3.5	8	11.8	15.4	18.9	22.2	25.5	28.7	29
	47.6	38	B3	0.7	2.6	7.6	12.1	16.3	20.3	24.1	28	31.6	35.2
	47.6	38	C1	0.7	3.5	7.5	10.6	13.5	16.3	19	21.7	24.3	25.2
	47.6	38	C3	0.7	2.1	5.1	7.7	10.3	12.7	15.1	17.4	19.6	21.4
	47.6	38	D1	0.7	3.5	7.5	10.6	13.5	16.3	19	21.7	24.3	25.2
	47.6	38	D3	0.7	2.1	5.1	7.7	10.3	12.7	15.1	17.4	19.6	21.4
	73.0	38	A1	1.2	12.1	28.7	41.7	52	60.1	66.3	70	73.3	74
3"	58.7	38	A3	6.6	18.4	30.2	41.6	52.5	63	72.2	80.1	87.7	89.3
	58.7	38	B1	7.4	15.6	23.2	30.9	38.4	45.9	53.3	60.4	67.1	67.6
	58.7	38	B3	5.4	13.8	22	30.2	38.4	46.4	54.3	61.9	69	74.8
	58.7	38	C1	5.8	11	15.6	20.2	24.7	29.2	33.8	38.3	42.7	45.5
	58.7	38	C3	4.1	8.7	13.3	17.9	22.5	27	31.5	36	40.5	45
	58.7	38	D1	5.8	11	15.6	20.2	24.7	29.2	33.8	38.3	42.7	45.5
	58.7	38	D3	4.1	8.7	13.3	17.9	22.5	27	31.5	36	40.5	45
	87.3	38	A1	10.3	25	42.5	59.8	71	79.9	87.3	92.7	96.8	99.5
4x2”	58.7	35	A1	8.7	18.7	28.7	36.7	41.6	45.3	47.4	48.4	48.9	49.4
	33.3	32	A3	0.4	3.1	7.7	12.8	17.1	21.6	24.5	27.3	28.5	29.7
	33.3	32	B1	2.2	6.2	9.2	12	14.7	17.3	19.9	22.3	24.6	26
	33.3	32	B3	0.5	1.3	4.4	7	9.5	11.8	14.1	16.3	18.5	19.8
	33.3	32	C1	0.5	3	4.6	5.9	7.5	9.1	10.7	12.3	13.9	14
	33.3	29	C3	0.4	0.7	2.1	3.9	5.5	7.2	9	10.7	12.4	13.8

Valve Dimensions	Valve opening diameter (mm)	Stroke (mm)	Noise Reduction level	Valve opening - total stroke percentage									
				10	20	30	40	50	60	70	80	90	100
	33.3	32	D1	0.5	3	4.6	5.9	7.5	9.1	10.7	12.3	13.9	14
	33.3	29	D3	0.4	0.7	2.1	3.9	5.5	7.2	9	10.7	12.4	13.8
4"	87.3	51	A3	11.2	27.4	49.4	70	90.6	110	125	135	139	139
	87.3	51	B1	4.3	19.6	32	43.8	55.3	66.6	77.9	88.9	99.8	109
	87.3	51	B3	8.4	21.2	32.9	43.7	54.2	64.5	74.8	85.1	95.5	102
	87.3	51	C1	6.5	15.3	23.7	31.9	39.8	47.6	55.2	62.8	70.3	76.6
	87.3	51	C3	10.1	18.4	26.2	33.5	40.5	47.3	54	60.6	67.2	73.8
	87.3	51	D1	6.5	15.3	23.7	31.9	39.8	47.6	55.2	62.8	70.3	76.6
	87.3	51	D3	10.1	18.4	26.2	33.5	40.5	47.3	54	60.6	67.2	73.8
	111.1	51	A1	28	49	78	96.4	116	126	137	142	148	158
6X4”	111.1	51	A1	28	49	78	96.4	116	126	137	142	148	158
	111.1	51	A3	20	41	60	81	101	120	135	147	158	164.8
	111.1	51	B1	6.7	19.5	31.7	43.3	56	68.3	80.2	92.8	105	115
	111.1	51	B3	7	19	32	44	55	68	79	91	104	109.6
	87.3	51	C1	6.5	15.3	23.7	31.9	39.8	47.6	55.2	62.8	70.3	76.6
	87.3	76	C3	9.3	19.2	28	37.4	46.6	56.2	65.3	73.8	83.5	89.3
	87.3	51	D1	6.5	15.3	23.7	31.9	39.8	47.6	55.2	62.8	70.3	76.6
	87.3	76	D3	9.3	19.2	28	37.4	46.6	56.2	65.3	73.8	83.5	89.3
6"	177.8	51	A1	25.5	32.5	73.7	120	165	204	234	256	273	285.6
	136.5	76	A1	17.8	67.6	126	176	216	246	267	281	290	294.9
	136.5	76	A3	17.8	67.6	126	176	216	246	267	281	290	295
	136.5	76	B1	21.5	45.2	68.8	92.5	116.2	140	163.6	187.3	211	231.2
	136.5	76	B3	12.6	38.2	66.9	94.5	120	144	167	190	211	228
	136.5	76	C1	6.5	20.6	34	48.5	63.7	77.4	91.3	107.2	121	129.3
	136.5	76	C3	11	28	41.3	55.3	69.3	83	97	110	124	138
	136.5	76	D1	6.5	20.6	34	48.5	63.7	77.4	91.3	107.2	121	129.3
	136.5	76	D3	5.1	6.7	9.5	19.9	31.4	46	61	75.7	89.7	104
8"	203.2	76	A1	20	77.9	136.1	194.4	249.3	300.3	347.1	384	416	425.7
	203.2	101.6	A1	51.9	144	213	282	374	443	495	558	601	638
	203.2	101.6	A3	51.9	144	213	282	374	443	495	558	601	638
	203.2	101.6	B1	43	85	126	168	209	250	292	333	374	406
	203.2	101.6	B3	32.3	75.8	119	163	206	241	285	328	363	407
	203.2	101.6	C1	34	61	88	116	143	171	198	226	253	280
	203.2	101.6	C3	26.7	47.1	74.4	102	129	156	184	204	232	259

Table 14 MK-GC-C Cage-guided unbalanced anti-cavitation flow characteristics, FTO

Valve dimensions	Valve opening diameter (mm)	Stroke (mm	Valve opening - total stroke percentage									
			10	20	30	40	50	60	70	80	90	100
1"	22.2	19	0.02	0.04	0.05	0.07	0.09	0.12	0.16	0.21	0.26	0.3
	25.4	38	0	0.07	0.12	0.21	0.3	0.41	0.53	0.68	0.84	1.02
	25.4	29	0	0.02	0.17	0.32	0.48	0.65	0.8	1.04	1.36	1.66
	25.4	25	0	0.06	0.16	0.39	0.6	0.94	1.28	1.63	1.98	2.3
1 1/2"	22.2	19	0.02	0.04	0.05	0.07	0.09	0.12	0.16	0.21	0.26	0.3
	25.4	29	0	0.02	0.17	0.32	0.48	0.65	0.8	1.04	1.36	1.66
	25.4	25	0	0.06	0.16	0.39	0.6	0.94	1.28	1.63	1.98	2.3
	25.4	38	0.02	0.08	0.27	0.62	1.02	1.4	1.9	2.3	2.7	3.1
2"	22.2	19	0.02	0.04	0.05	0.07	0.09	0.12	0.16	0.21	0.26	0.3
	25.4	38	0.02	0.16	0.45	0.95	1.47	2	2.5	3.1	3.7	4.1

Table 15: MK-GC Cage-Guided Balanced Quick-Opening Flow Characteristics, FTO

Valve dimensions	Valve opening diameter (mm)	Stroke (mm)	Valve opening - total stroke percentage									
			10	20	30	40	50	60	70	80	90	100
1"	33.3	19	4.86	9.39	13.4	16.9	18.9	20.3	21.1	21.8	21.9	22.1
1 1/2"	33.3	19	5.05	9.99	14.7	20	24	25.7	26.2	27.4	28.6	29.9
	47.6	19	7.79	14.4	20.5	26.8	32	36.6	39.4	41.3	42.7	44
2"	33.3	19	4.8	9.58	14.9	20.2	25.7	29.3	31.2	31.2	31.2	31.2
	58.7	29	13.4	26.8	39.9	51.3	62.9	70.6	73.7	75.6	76.8	77.6
2 1/2"	47.6	19	7.83	15.2	22.8	31	40	48.3	54.9	60.3	66.4	71.2
	73.0	38	20.9	39.6	58.8	74.2	84.9	97	103	106	108	109
3"	58.7	29	15.9	31.7	47.2	60.7	74.4	83.6	87.3	89.5	91	91.9
	87.3	38	27.2	52.2	77.9	99.5	124	140	149	154	158	161
4x2”	58.7	29	13.8	26.5	42.7	61.8	78.1	93.3	105	114	119	124
4"	73.0	29	25	47.2	70.1	88.5	101	116	123	127	129	130
	111.1	51	37.7	75	125	163	193	220	238	247	251	251
6x4”	111.1	51	40.8	85.3	140	196	242	277	306	326	340	340
6"	177.8	51	73.6	150	232	306	353	389	416	441	451	460
8x4”	111.1	51	43.2	88.7	147	202	252	294	328	354	371	379
8x6”	177.8	51	79	158	247	338	413	471	531	569	610	637
8"	203.2	51	80.3	188	290	389	480	554	615	658	705	744
	203.2	76	135	291	434	551	639	706	759	807	841	863
10x8”	203.2	76	138	306	468	607	725	824	903	960	998	1040
12x6”	177.8	51	80.1	156	250	348	449	539	621	683	743	817
12x8”	203.2	76	149	315	481	640	780	898	1000	1100	1180	1260

Table 16 MK-GC Cage-guided Balanced Linear Flow characteristics, FTO

Valve dimensions	Valve opening diameter (mm)	Stroke (mm)	Valve opening - total stroke percentage									
			10	20	30	40	50	60	70	80	90	100
1"	33.3	19	3.21	5.5	8.18	10.9	13.2	15	16.9	18.6	19.9	20.6
1 1/2"	33.3	19	2.92	5.7	9.05	12.5	15.6	18.5	21.1	23.9	26.8	29.2
	47.6	19	4.23	7.84	11.8	15.8	20.4	25.3	30.3	34.7	37.2	39.2
2"	33.3	19	3.53	6.36	9.92	13.3	16.5	19.7	22.7	25.6	29.3	33.3
	58.7	29	7.87	16	24.9	33.4	42.1	51.8	62	68.1	70.6	72.9
2 1/2"	47.6	19	4.1	8.09	12.3	16.7	21.1	26.8	33.7	41.3	49.2	57
	73.0	38	9.34	21.6	35.5	49.5	62.7	74.1	83.6	93.5	102	108
3"	58.7	29	8.06	16.9	26.7	37.5	49	61.4	73.8	85.3	94.7	102
	87.3	38	14.5	32.9	52.1	70.4	88.5	105	118	133	142	148
4x2”	58.7	29	6.8	14.6	23	32.7	43.9	56.6	70.8	85	97.2	107
4"	73.0	29	9.77	22.6	37.2	51.8	65.7	77.5	87.5	97.9	107	113
	111.1	51	23.3	50.3	78.1	105	127	152	181	203	223	236
6x4”	111.1	51	21.4	49	78.7	109	137	166	201	245	286	320
6"	177.8	51	46.3	107	171	228	279	327	367	402	420	433
8x4”	111.1	51	23.2	51	80.6	111	141	173	211	254	299	340
8x6”	177.8	51	44	108	170	234	293	354	405	474	552	617
8"	203.2	51	60.2	129	206	285	363	444	526	581	640	688
	203.2	76	91.4	207	325	440	550	639	711	760	795	846
10x8”	203.2	76	95.9	212	336	459	586	696	798	876	928	975
12x6”	177.8	51	51.7	111	176	249	319	391	458	540	632	729
12x8”	203.2	76	104	223	348	490	638	781	907	999	1080	1160

Table 17: MK-GC Valve Cage Guided Balanced Equal Percentage Flow Characteristic, FTO

Valve dimensions	Valve port diameter (mm	Stroke (mm)	Valve opening - total stroke percentage									
			10	20	30	40	50	60	70	80	90	100
1"	33.3	19	0.783	1.54	2.2	2.89	4.21	5.76	7.83	10.9	14.1	17.2
1 1/2"	33.3	19	1.12	1.56	2.22	3.1	4.27	6.17	9.01	13.1	18.2	23.1
	47.6	19	1.52	2.63	3.87	5.41	7.45	11.2	17.4	24.5	30.8	35.8
2"	33.3	19	0.923	1.42	2.09	2.84	4.11	5.83	8.58	12.8	18.5	24.3
	58.7	29	1.66	2.93	4.66	6.98	10.8	16.5	25.4	37.3	50.7	59.7
2 1/2"	47.6	19	1.57	2.57	3.82	5.44	7.64	11.5	18.2	26.7	35.1	43.9
	73.0	38	3.43	7.13	10.8	15.1	22.4	33.7	49.2	71.1	89.5	99.4
3"	58.7	29	1.75	3.11	4.77	7.07	10.7	17	27.9	41.5	58	70.7
	87.3	38	4.32	7.53	10.9	17.1	27.2	43.5	66	97	120	136
4x2”	58.7	29	2.53	4.52	6.66	9.29	13.6	19.9	29.4	45.2	65.8	82.2
4"	73.0	29	3.82	7.65	11.4	16.9	25.5	38.2	60.5	85.7	105	112
	111.1	51	5.85	11.6	18.3	30.2	49.7	79.7	125	171	205	224
6x4”	111.1	51	7.34	13.1	19.8	30.6	46.6	69.1	108	168	225	271

Valve dimensions	Valve openin g diameter (mm)	Stroke (mm)	Valve opening - total stroke percentage									
			10	20	30	40	50	60	70	80	90	100
6"	177.8	51	12.9	25.8	43.3	67.4	104	162	239	316	368	394
8x4”	111.1	51	8.01	14.1	21.1	31.7	47.2	73.5	118	180	240	286
8x6”	177.8	51	13.2	26.4	45.4	71.1	112	178	256	342	431	508
8"	203.2	51	18.5	38	58.4	86.7	130	189	268	371	476	567
	203.2	76	27	58.1	105	188	307	478	605	695	761	818
10x8”	203.2	76	32.3	65.7	111	184	303	462	635	778	876	924
12x6”	177.8	51	23.6	36.2	52.8	76.3	110	164	248	348	453	565
12x8”	203.2	76	28.4	61	112	196	311	481	687	839	992	1090

Table 18: MK-GC-W Cage-guided Balanced Type First-stage Noise-reducing Flow Characteristics, FTO

Valve dimensions	Valve opening diameter (mm)	Stroke (mm)	Valve opening - total stroke percentage									
			10	20	30	40	50	60	70	80	90	100
1"	33.3	19	3.28	7.39	12	14.2	14.9	15.3	15.7	16	16.4	16.8
1 1/2"	33.3	19	3.12	7.36	13	18.5	20.7	21.4	21.8	23.1	23.9	25.2
	47.6	19	2.62	7.42	13.9	20.8	23.2	24.2	24.9	25.4	26.1	26.7
2"	33.3	19	2.86	6.79	11.7	18.4	23.6	27.9	30.9	33.5	35.3	36.7
	58.7	29	7.3	19.2	24.6	42.2	45.5	47	47.1	47.2	47.2	48
2 1/2"	47.6	19	3.11	8.31	14.9	22.4	29.9	36	41.6	46.4	50.5	53.6
	73.0	38	12.2	32.6	49.7	54.4	55.9	59.8	64	67.7	71.4	74
3"	58.7	29	8.15	19.1	33.2	47.6	60.8	72.1	81.8	90.1	97.4	103
	87.3	38	16.5	40.3	70.8	88	92.1	90.7	90.3	92.6	95.6	99.1
4x2”	58.7	29	14.8	28.9	40.8	52.9	65.1	77.2	89	100	111	118
4"	73.0	29	13.6	32.5	54.3	75.5	94.6	112	127	141	153	160
	111.1	51	33.9	76.6	117	135	137	137	141	149	157	169
6x4”	111.1	51	30.9	69.9	110	149	187	223	253	281	307	325
6"	177.8	51	55.8	125	196	245	270	286	297	308	323	338
8x4”	111.1	51	36.2	77.6	116	155	193	231	266	298	326	345
8x6”	177.8	51	42.8	99.7	164	224	290	352	422	473	523	545
8"	203.2	51	100	226	337	436	502	581	641	655	659	681
	203.2	76	142	303	428	542	611	652	669	689	700	726
10x8”	203.2	76	82	186	297	414	486	580	673	743	803	851
12x6”	177.8	51	113	258	343	469	572	641	755	828	884	953
12x8”	203.2	76	147	268	358	445	537	624	702	772	842	900

Table 19: MK-GC-W Valve Cage Guided Balanced Multi-stage Noise Reduction Linear Flow Characteristic, FTO

Valve dimensions	Valve opening diameter (mm)	Stroke (mm)	Noise reduction level	Valve opening - total stroke percentage									
				10	20	30	40	50	60	70	80	90	100
1"	33.3	19	A1	2.5	4.8	6.7	8.5	10.3	11.9	13.3	14.7	15.4	15.9
1 1/2"	33.3	19	A3	0.5	0.6	3.7	6.4	9.2	12.1	14.9	17.8	20.7	21.6
	33.3	19	B1	0.5	0.5	3.9	5.7	7.4	9.2	10.9	12.7	14.5	16.1

Valve Dimensions	Valve port diameter (mm	Stroke (mm)	Noise reduction level	Valve opening - total stroke percentage									
				10	20	30	40	50	60	70	80	90	100
	33.3	19	B3	0.5	0.6	2.4	3.8	5.2	6.6	8	9.5	10.9	11.7
	47.6	19	A1	0.7	5	14	19.1	22.7	24	25	25.7	25.7	25.8
2"	33.3	29	A3	0.4	3.1	7.7	12.8	17.1	21.6	24.5	27.3	28.5	29.7
	33.3	29	B1	0.5	4.1	7	9.7	12.7	15.8	18.8	21.8	24.5	24.7
	33.3	29	B3	0.5	1.3	4.4	7	9.5	11.8	14.1	16.3	18.5	19.8
	33.3	29	C1	0.5	3	4.6	5.9	7.5	9.1	10.7	12.3	13.9	14
	33.3	29	C3	0.5	1.7	3.6	5.3	6.9	8.5	10	11.4	12.8	13.8
	33.3	29	D1	0.5	3	4.6	5.9	7.5	9.1	10.7	12.3	13.9	14
	33.3	29	D3	0.5	1.7	3.6	5.3	6.9	8.5	10	11.4	12.8	13.8

	58.7	35	A1	8.7	18.7	28.7	36.7	41.6	45.3	47.4	48.4	48.9	49.4
2 1/2"	47.6	38	A3	0.7	3.5	11.6	18.7	25.4	31.9	38.2	44.2	49.8	52
	47.6	38	B1	0.8	3.5	8	11.8	15.4	18.9	22.2	25.5	28.7	29
	47.6	38	B3	0.7	2.6	7.6	12.1	16.3	20.3	24.1	28	31.6	35.2
	47.6	38	C1	0.7	3.5	7.5	10.6	13.5	16.3	19	21.7	24.3	25.2
	47.6	38	C3	0.7	2.1	5.1	7.7	10.3	12.7	15.1	17.4	19.6	21.4
	47.6	38	D1	0.7	3.5	7.5	10.6	13.5	16.3	19	21.7	24.3	25.2
	47.6	38	D3	0.7	2.1	5.1	7.7	10.3	12.7	15.1	17.4	19.6	21.4
	73.0	38	A1	1.2	12.1	28.7	41.7	52	60.1	66.3	70	73.3	74
3"	58.7	38	A3	6.6	18.4	30.2	41.6	52.5	63	72.2	80.1	87.7	89.3
	58.7	38	B1	7.4	15.6	23.2	30.9	38.4	45.9	53.3	60.4	67.1	67.6
	58.7	38	B3	5.4	13.8	22	30.2	38.4	46.4	54.3	61.9	69	74.8
	58.7	38	C1	5.8	11	15.6	20.2	24.7	29.2	33.8	38.3	42.7	45.5
	58.7	38	C3	4.1	8.7	13.3	17.9	22.5	27	31.5	36	40.5	45
	58.7	38	D1	5.8	11	15.6	20.2	24.7	29.2	33.8	38.3	42.7	45.5
	58.7	38	D3	4.1	8.7	13.3	17.9	22.5	27	31.5	36	40.5	45
	87.3	38	A1	10.3	25	42.5	59.8	71	79.9	87.3	92.7	96.8	99.5
4x2"	58.7	35	A1	8.7	18.7	28.7	36.7	41.6	45.3	47.4	48.4	48.9	49.4
	33.3	32	A3	0.4	3.1	7.7	12.8	17.1	21.6	24.5	27.3	28.5	29.7
	33.3	32	B1	2.2	6.2	9.2	12	14.7	17.3	19.9	22.3	24.6	26
	33.3	32	B3	0.5	1.3	4.4	7	9.5	11.8	14.1	16.3	18.5	19.8
	33.3	32	C1	0.5	3	4.6	5.9	7.5	9.1	10.7	12.3	13.9	14
	33.3	29	C3	0.4	0.7	2.1	3.9	5.5	7.2	9	10.7	12.4	13.8
	33.3	32	D1	0.5	3	4.6	5.9	7.5	9.1	10.7	12.3	13.9	14
	33.3	29	D3	0.4	0.7	2.1	3.9	5.5	7.2	9	10.7	12.4	13.8
4"	73.0	51	A3	11.2	27.4	49.4	70	90.6	110	125	135	139	139
	73.0	51	B1	4.3	19.6	32	43.8	55.3	66.6	77.9	88.9	99.8	109
	73.0	51	B3	8.4	21.2	32.9	43.7	54.2	64.5	74.8	85.1	95.5	102
	73.0	51	C1	6.5	15.3	23.7	31.9	39.8	47.6	55.2	62.8	70.3	76.6
	73.0	51	C3	10.1	18.4	26.2	33.5	40.5	47.3	54	60.6	67.2	73.8
	73.0	51	D1	6.5	15.3	23.7	31.9	39.8	47.6	55.2	62.8	70.3	76.6
	73.0	51	D3	10.1	18.4	26.2	33.5	40.5	47.3	54	60.6	67.2	73.8

Valve Dimensions	Valve opening diameter (mm)	Stroke (mm)	Noise Reduction level	Valve opening - total stroke percentage									
				10	20	30	40	50	60	70	80	90	100
8"	203.2	76	A1	20	77.9	136.1	194.4	249.3	300.3	347.1	384	416	425.7
	203.2	102	A1	51.9	144	213	282	374	443	495	558	601	638
	203.2	102	A3	51.9	144	213	282	374	443	495	558	601	638
	203.2	102	B1	43	85	126	168	209	250	292	333	374	406
	203.2	102	B3	32.3	75.8	119	163	206	241	285	328	363	407
	203.2	102	C1	34	61	88	116	143	171	198	226	253	280
	203.2	102	C3	26.7	47.1	74.4	102	129	156	184	204	232	259
	136.5	127	A1	50	97.6	156	215	270	326	383	427	457	459.9
	177.8	76	A1	56.8	98.9	141	183.1	225.2	267.3	309.4	354.5	393.6	416.1
	177.8	102	A1	99.2	166.8	229.4	287.5	340.9	389.4	431.5	465.7	489.9	494

10x6”	177.8	95	A1	99.2	166.8	229.4	287.5	340.9	389.4	431.5	465.7	489.9	494
	136.5	127	A3	50	97.6	159	215	270	326	383	427	457	460
	177.8	102	A3	47.5	112.1	171	226.6	285.7	337.9	393.5	442	487.4	520.4
	177.8	95	A3	47.5	112.1	171	226.6	285.7	337.9	393.5	442	487.4	520.4
	136.5	127	B1	38.2	76.2	112	144.2	176.1	207.7	239.1	270.7	302.2	330.9
	136.5	127	B3	40	72.3	108	143	178	213	248	280	314	347
	136.5	127	C1	30.5	57.9	83.5	107.8	131	153.6	175.7	197.7	219.6	236.1
	136.5	127	C3	28	50	74.7	99.3	124	149	173	197	221	245
	136.5	127	D1	30.5	57.9	83.5	107.8	131	153.6	175.7	197.7	219.6	236.1
	136.5	127	D3	28	50	74.7	99.3	124	149	173	197	221	245.3
10x8”	203.2	152	A1	130	266	391	508	616	712	793	854	882	882.3
	203.2	152	A3	135	270	396	512	620	715	796	855	882	882.3
	203.2	152	B1	60	117	174	230	287	344	400	457	514	578
	203.2	152	B3	57	113	169	225	281	336	392	448	504	553.1
	203.2	152	C1	44	83	122	162	205	240	290	319	358	392
	203.2	152	C3	44	83	122	162	205	240	290	319	358	391.6
	177.8	152	D1	44	83	122	162	205	240	290	319	358	392
	177.8	152	D3	39	75	110	145	180	216	251	286	321	347.5
12x6”	136.5	165	A1	62	151	238	324	407	492	573	651	697	698
	136.5	165	A3	62	151	238	324	407	492	573	651	697	698
	136.5	165	B1	51	94	141	187	233	278	324	370	413	457
	136.5	165	B3	51	94	141	187	233	278	324	370	413	457
	136.5	165	C1	39.1	73.7	105.7	136	165.2	194	222.6	251.2	280	301.8
	136.5	165	C3	4	64	96	127	160	191	222	254	284	315
	136.5	165	D1	39.1	73.7	105.7	136	165.2	194	222.6	251.2	280	301.8
	136.5	165	D3	4	64	96	127	160	191	222	254	284	315.3
12x8”	203.2	152	A1	130	266	391	508	616	712	793	854	882	882.3
	203.2	152	A3	135	270	396	512	620	715	796	855	882	882.3
	203.2	152	B1	60	117	174	230	287	344	400	457	514	578
	203.2	152	B3	57	113	169	225	281	336	392	448	504	553.1
	203.2	152	C1	44	83	122	162	205	240	290	319	358	392

Valve dimensions	Valve opening diameter (mm)	Stroke (mm)	Noise reduction level	Valve opening - total stroke percentage									
				10	20	30	40	50	60	70	80	90	100
	111.1	51	A1	28	49	78	96.4	116	126	137	142	148	158
6x4”	111.1	51	A1	28	49	78	96.4	116	126	137	142	148	158
	111.1	51	A3	20	41	60	81	101	120	135	147	158	164.8
	111.1	51	B1	6.7	19.5	31.7	43.3	56	68.3	80.2	92.8	105	115
	111.1	51	B3	7	19	32	44	55	68	79	91	104	109.6
	87.3	51	C1	6.5	15.3	23.7	31.9	39.8	47.6	55.2	62.8	70.3	76.6
	87.3	51	C3	9.3	19.2	28	37.4	46.6	56.2	65.3	73.8	83.5	89.3
	87.3	76	D1	6.5	15.3	23.7	31.9	39.8	47.6	55.2	62.8	70.3	76.6
	87.3	76	D3	9.3	19.2	28	37.4	46.6	56.2	65.3	73.8	83.5	89.3
6"	136.5	76	A1	17.8	67.6	126	176	216	246	267	281	290	294.9
	177.8	51	A1	25.5	32.5	73.7	120	165	204	234	256	273	285.6
	136.5	76	A3	17.8	67.6	126	176	216	246	267	281	290	295
	136.5	76	B1	21.5	45.2	68.8	92.5	116.2	140	163.6	187.3	211	231.2
	136.5	76	B3	12.6	38.2	66.9	94.5	120	144	167	190	211	228
	136.5	76	C1	6.5	20.6	34	48.5	63.7	77.4	91.3	107.2	121	129.3
	136.5	76	C3	11	28	41.3	55.3	69.3	83	97	110	124	138
	136.5	76	D1	6.5	20.6	34	48.5	63.7	77.4	91.3	107.2	121	129.3
	136.5	76	D3	5.1	6.7	9.5	19.9	31.4	46	61	75.7	89.7	104
8x4”	111.1	51	A1	28	49	78	96.4	116	126	137	142	148	158
	87.3	51	A3	11.2	27.4	49.4	70	90.6	110	125	135	139	137
	11.1	51	B1	6.7	19.5	31.7	43.3	56	68.3	80.2	92.8	105	115
	87.3	51	B3	8.4	21.2	32.9	43.7	54.2	64.5	74.8	85.1	95.5	102
	87.3	51	C1	6.5	15.3	23.7	31.9	39.8	47.6	55.2	62.8	70.3	76.6
	87.3	51	C3	10.1	18.4	26.2	33.5	40.5	47.3	54	60.6	67.2	73.8
	87.3	76	C3	9.2	18.7	28	37.7	46.6	56.3	63.2	74.2	83.6	89.3
	87.3	51	D1	6.5	15.3	23.7	31.9	39.8	47.6	55.2	62.8	70.3	76.6
	87.3	51	D3	10.1	18.4	26.2	33.5	40.5	47.3	54	60.6	67.2	73.8
	87.3	76	D3	9.2	18.7	28	37.7	46.6	56.3	63.2	74.2	83.6	89.3
8x6”	136.5	127	A1	50	97.6	156	215	270	326	383	427	457	459.9
	177.8	76	A1	56.8	98.9	141	183.1	225.2	267.3	309.4	354.5	393.6	416.1
	177.8	102	A1	99.2	166.8	229.4	287.5	340.9	389.4	431.5	465.7	489.9	494
	177.8	95	A1	99.2	166.8	229.4	287.5	340.9	389.4	431.5	465.7	489.9	494
	136.5	127	A3	50	97.6	159	215	270	326	383	427	457	460
	177.8	102	A3	47.5	112.1	171	226.6	285.7	337.9	393.5	442	487.4	520.4
	177.8	95	A3	47.5	112.1	171	226.6	285.7	337.9	393.5	442	487.4	520.4
	136.5	127	B1	38.2	76.2	112	144.2	176.1	207.7	239.1	270.7	302.2	330.9
	136.5	127	B3	40	72.3	108	143	178	213	248	280	314	347

	136.5	127	C1	30.5	57.9	83.5	107.8	131	153.6	175.7	197.7	219.6	236.1
	136.5	127	C3	28	50	74.7	99.3	124	149	173	197	221	245
	136.5	127	D1	30.5	57.9	83.5	107.8	131	153.6	175.7	197.7	219.6	236.1
	136.5	127	D3	28	50	74.7	99.3	124	149	173	197	221	245.3

Valve dimensions	Valve port diameter (mm	Stroke (mm)	Noise reduction level	Valve opening - total stroke percentage									
				10	20	30	40	50	60	70	80	90	100
	203.2	152	C3	44	83	122	162	205	240	290	319	358	391.6
	177.8	152	D1	44	83	122	162	205	240	290	319	358	392
	177.8	152	D3	39	75	110	145	180	216	251	286	321	347.5

Table 20: MK-GC-C Valve Cage Guided Balanced Anti-Cavitation Linear Flow Characteristics, FTO

Valve dimensions	Valve opening diameter (mm)	Stroke (mm)	Grade	Valve opening - total stroke percentage									
				10	20	30	40	50	60	70	80	90	100
1"	33.3	25	I	0.25	0.48	2.36	5.04	7.36	9.47	11.2	13.1	14.6	15.5
	33.3	25	II	0.11	0.41	1.08	1.75	2.43	3.1	3.78	4.45	5.12	5.8
1 1/2"	47.6	22	I	0.59	0.72	2.54	6.03	9.32	12.8	15.6	18.2	20.8	22.5
	47.6	22	II	0.22	1.2	2.23	3.26	4.29	5.31	6.35	7.37	8.4	9.4
2"	58.7	29	I	0.84	1.49	6.68	12.3	17.3	22.1	26.7	30.9	34.4	36.1
	58.7	29	II	0.8	3.05	5.29	7.56	9.83	12.1	14.3	16.5	18.8	21
2 1/2"	73	73	I	0.84	6.83	16.2	25	33	41.2	48.8	55.5	61.7	64.4
	73	73	II	1.75	5.25	8.71	12.2	15.6	19.1	22.6	26.1	29.6	33
3"	87.3	41	I	1.65	10.8	22.3	34.3	45.3	55.5	64.7	72.7	80	86.7
	87.3	41	II	3.14	8.23	13.3	18.5	23.5	28.7	33.8	38.9	44	49
4x2”	58.7	29	I	0.52	1.87	5.71	11.7	17.4	23	28.9	35.1	41.1	43.6
	58.7	29	II	0.84	3.19	5.54	7.92	10.3	12.5	15.4	17.3	19.7	22
4"	111.1	54	I	3.64	22.4	41.7	60.1	78.3	96.5	115	129	136	140
	111.1	54	II	2.83	11.2	19.4	27.4	35.5	43.2	50.5	57.1	63.2	69
6x4”	111.1	54	I	2.03	20.3	41.1	61.5	81.5	101	121	140	158	169
	111.1	54	II	3.48	11	18.5	26	33.4	41	48.5	56	63.2	71
6"	177.8	57	I	4.6	30	65.3	99.7	134	165	195	219	241	259
	177.8	57	II	6.05	22.5	38	53.7	69.4	85.2	100	115	130	144
8x4”	111.1	54	I	2.57	21	42	62.6	82.9	103	124	143	161	171
	111.1	54	II	10.9	29.4	47.9	66.6	85.1	104	122	140	160	178
8x6”	177.8	57	I	4.4	29	63.9	99.9	136	171	205	237	269	293
	177.8	57	II	3.48	11	18.5	26	33.4	41	48.5	56	63.2	71
8"	203.2	86	I	16.2	70.2	124	176	227	276	324	370	412	439
	203.2	86	II	19.8	47.5	74.5	101	129	156	184	211	238	265
12x6”	177.8	57	I	5.49	34.5	71.1	106	143	179	216	250	283	305
	177.8	57	II	14.1	35.6	57	78.6	100	121	143	165	186	208
12x8”	203.2	86	I	13.6	62.3	117	171	225	278	331	385	438	487
	203.2	86	II	27.7	54.7	81.6	109	137	163	190	218	245	272

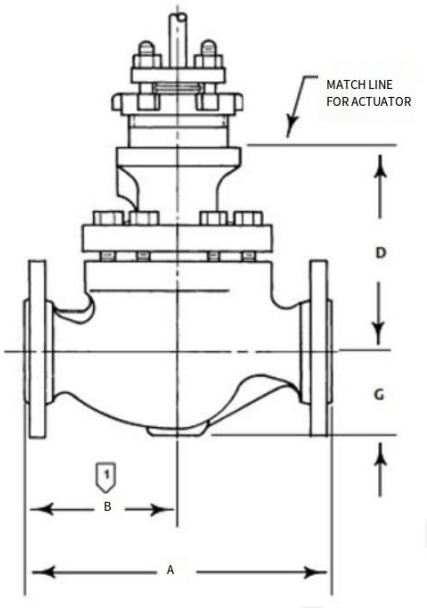

Figure 12 MK-G valve size diagram

Table 21 Valve Dimensions and Weights (Standard Type)

Valve diameter	A								D				G
	CL150 RF	CL150 RTJ	CL300 RF	CL300 RTJ	BW or CL600 RF	CL600 RTJ	PN16-40	PN63-100	Ordinary upper valve cover				
									Valve stem diameter				
									9.5	12.7	19.1	25.4 or 31.8	
1/2"									127	149	--	--	55
3/4"									127	149	--	--	55
1"	184	197	197	210	210	210	160	230	127	149	--	--	60
1 1/2"	222	235	235	248	251	251	200	260	124	146	--	--	71
2"	254	267	267	282	286	286	230	300	--	165	162	--	78
2 1/2"	276	292	292	308	311	314	290	340	--	187	184	--	90
3"	298	311	311	333	337	337	310	380	--	191	187	--	97
4x2”	352	--	368	384	394	397	--	430	--	216	213	--	108
4"	353	365	368	384	394	394	350	430	--	221	217	264	129
6x4”	451	--	473	489	508	511	480	550	--	257	254	300	135
6"	451	464	473	489	508	511	480	550	--	--	312	330	140
8x4”	543	--	568	584	610	613	600	650	--	259	256	302	176
8x6”	543	--	568	584	610	613	600	650	--	287	287	332	183
8"	543	556	568	584	610	613	600	650	--	--	375	426	191
10x6”	603	--	603	619	625	629	--	--	--	287	287	332	183
10x8”	673	--	708	724	752	756	--	--	--	--	375	--	275
12x6”	737	--	775	775	819	822	--	--	--	--	356	400	254
12x8”	737	--	775	791	819	822	850	900	--	--	411	--	356

Table 22. Valve Dimensions and Weights (Extended Bonnet Type) Unit: mm

Valve diameter	A								D							G
									Extended Type I				Extension II			
									Valve stem diameter							
	CL150 RF	CL150 RTJ	CL300 RF	CL300 RTJ	BW or CL600 RF	CL600 RTJ	PN16-40	PN63-100	9.5	12.7	19.1	25.4 or 31.8	9.5	12.7	19.1	
1/2"									213	251	--	--	303	319	--	55
3/4"									213	251	--	--	303	319	--	55
1"	184	197	197	210	210	210	160	230	213	251	--	--	303	319	--	60
1 1/2"	222	235	235	248	251	251	200	260	210	248	--	--	300	316	--	71
2"	254	267	267	282	286	286	230	300	--	267	272	--	--	465	--	78
2 1/2"	276	292	292	308	311	314	290	340	--	289	272	--	--	492	--	90
3"	298	311	311	333	337	337	310	380	--	292	297	--	--	495	487	97
4x2”	352	--	368	384	394	397	--	430	--	318	322	--	--	516	513	108
4"	353	365	368	384	394	394	350	430	--	322	327	370	--	529	518	129
6x4”	451	--	473	489	508	511	480	550	--	359	363	432	--	562	554	135
6"	451	464	473	489	508	511	480	550	--	--	--	462	--	--	604	140
8x4”	543	--	568	584	610	613	600	650	--	360	365	433	--	564	556	176
8x6”	543	--	568	584	610	613	600	650	--	--	394	464	--	--	579	183
8"	543	556	568	584	610	613	600	650	--	--		450	--	--	621	191
10x6”	603	--	603	619	625	629	--	--	--	--	394	464	--	--	579	183
10x8”	673	--	708	724	752	756	--	--	--	--	421	449	--	--	621	275
12x6”	737	--	775	775	819	822	--	--	--	--	462	532	--	--	648	254
12x8”	737	--	775	791	819	822	850	900	--	--	457	486	--	--	--	356

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