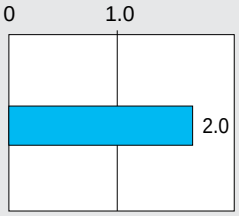
Anti-Vibration Check Valve

MKT® Series

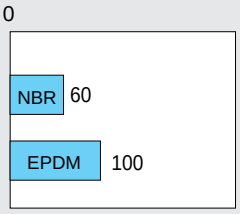
Valve nominal size

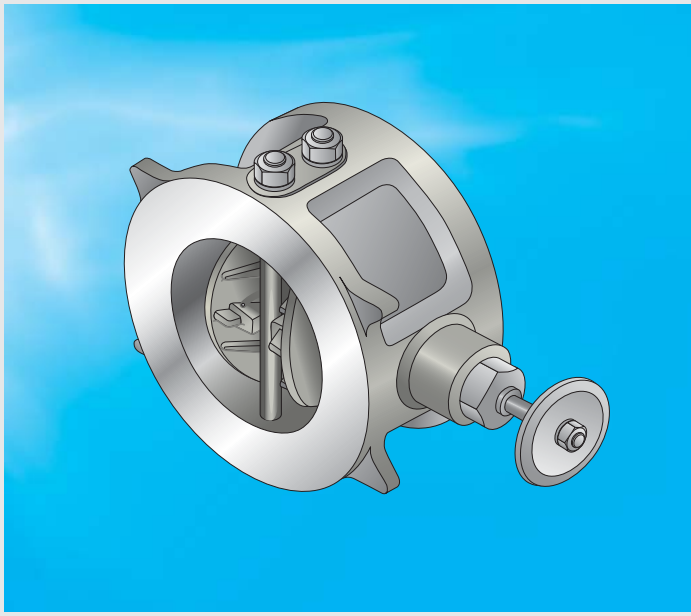
50 to 300mm

Max.working pressure MPa



Working temperature range ℃



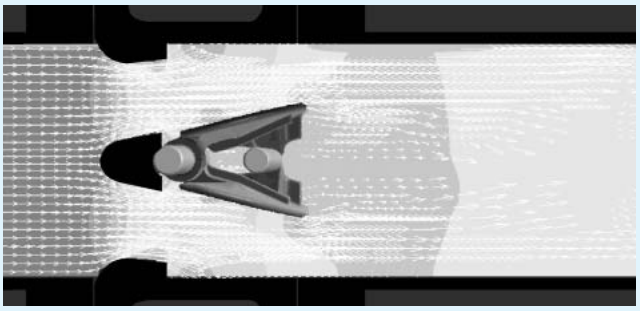


Complete prevention of chattering.
A new generation of check valves that reduce piping space and allow direct attachment of the pump.

MKT Standard specifications		
Valve Design		Wafer-type double-plate check valve
Valve nominal size		50, 65, 80, 100, 125, 150, 200, 250, 300mm　Valve size below 50mm and above 300mm are manufacture to order.
Valve type		Check valve with bypass
Applicable flange standard		JIS 10K, 16K, 20K,　ASME B16.5 Class125/150
Face-to-face dimensions		JV8-1 (stainless steel valves, wafer-type check valves), SAS358
Max. working pressure		2.0MPa
Allowed flow velocity		0.5 m/s to 10 m/s
Seat leakage		Tight shut
Test pressure	Pressure resistance of body	3.0MPa
	Valve seat leak	High-pressure test 2.2MPa(hydraulic), Low-pressure test 0.04MPa(pneumatic)
Working temperature range (without freezing)		NBR sheet : 0 to 60 degrees C EPDM sheet : 0 to 100 degrees C
Standard materials	Main body	A536 Gr. 65 — 45-12 (ductile iron), or A351 CF8 (stainless steel)✶
	Plate	A351 CF8 (SCS 13 equivalent)
	Pin	304 stainless steel
	Spring	304 stainless steel
	Seat ※1	NBR, EPDM✶
Pipe gasket		Required (please purchase a commercially available gasket that satisfies the flange standards)
Coating		Resin baked finish (Munsell 2.5BG 6/12-Green) CF8 valve body is without coating

※ Main body: stainless steel. Seat: Regarding Teflon®, we will inform you when decided at the time of product launch.
※1. A rubber seat has been baked onto the valve seat surface.
✶ Never use an EPDM rubber seat is ring if the valve being used for oil or for a fluid containing even a slight amount of oil.
✶ In order to prevent the valve vibration at the time of operation, please keep the "MKT SELECYTION CRITERIA"

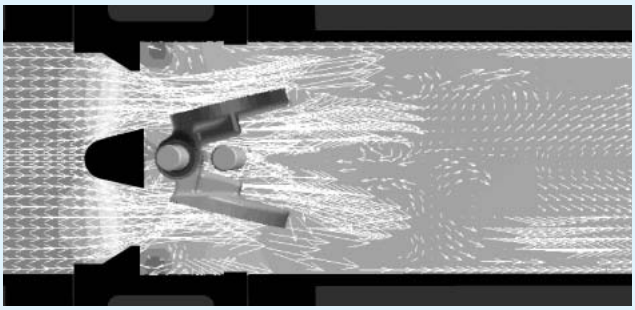
MKT Series



Note: The colors indicate the pressure distribution. Red indicates high pressure and blue indicates low pressure. Flow speed is indicated by arrow size.

High pressure ← → Low pressure

Previous product



Based on fluid theory and vibration analysis, we have achieved a new mechanism that does not allow chattering even at high flow speeds and during fluid fluctuations.

Helps reduce installation space, resulting less cost and lesser time.

MKT Theory of chattering prevention

Based on laboratory work centering on the chattering phenomenon in conventional check valves, we revealed the nature of the various mechanical problems that cause chattering. By means of a theoretical quantification of the factors that affect chattering based on fluid analysis and vibration analysis, we have succeeded in developing a check valve that provides stable operation without chattering even at high flow speeds and during fluid fluctuations.

When conventional check valves are used at high flow speeds or during speed fluctuations, the fluid force causes rotational movement of the disc and changes its angle. The change of angle in turn changes the action of the fluid force on the disc. This cyclical change in the fluid force continuously causes the rotational vibration of the disc that is called chattering. Using our self-developed TOMOE OAM33 fluid analysis program (based on the Navier-Stoke equations with the addition of reverse-flow analysis capability), we obtained the fluid force for a variety of shapes, and by combining these with vibration equations for the disc system, we were able to obtain a quantitative understanding of the chattering phenomena in check valves.

The angle of rotation θ of the disc is given by

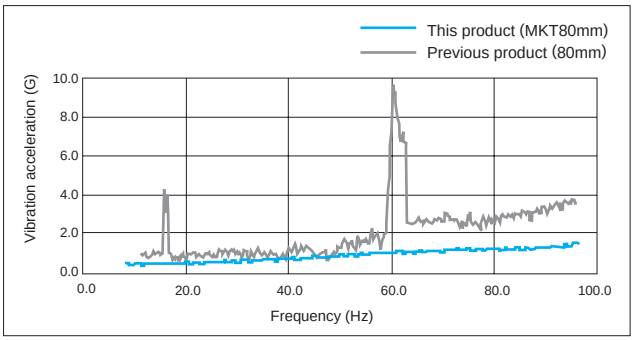
$$I\frac{d^2\theta}{dt^2}+\left\{C-\alpha(\theta,V)\right\}\frac{d\theta}{dt}+K\theta=0 \quad \cdots\cdots\cdots (1)$$

where I is the moment of inertia of the disc, C is the damping coefficient of the disc support, K is the elastic modulus of the disc spring, V is the flow velocity, and α is the coefficient of variation of the fluid which varies depending on the angle of rotation of the disc θ and the fluid velocity. When α > C in the second term on the left side of Equation (1), self-excited vibration occurs.

By quantifying the effects of various factors (flow path shape, stopper position, etc.) on the coefficient of variation of the fluid α based on fluid analysis and laboratory work, we were able to create an optimum design. Based on this optimum design, we have developed the MKT Series of Anti-Vibration Check Valves. In addition to preventing chattering at high flow speeds and during speed fluctuations, these valves dramatically reduce cavitation.

* Patent are pending for this product in 126 countries throughout the world.

Vibration frequency characteristics



As indicated above, there are no vibration peaks at any of the frequencies and damage due to vibration is prevented.

MKT Features

Over 80% of piping space reduced around pump

Designed for anti-vibration, that previouly found on the upstream side of check valves is no longer necessary and the piping space around the pump has been greatly reduced.

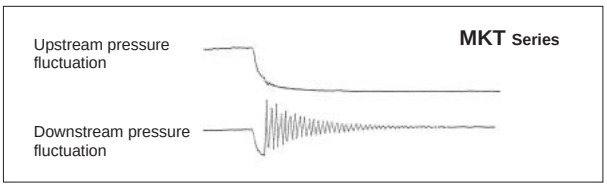
Direct pump installation possible

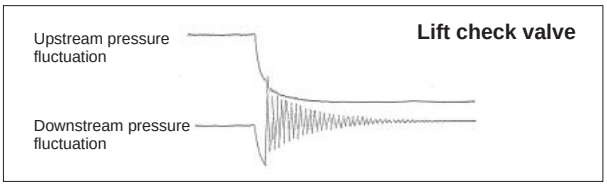
Designed for anti-vibration, the pump can now be installed directly. In fact, it achieved a smaller bore diameter that is 2 to 3 sizes smaller than previous one.

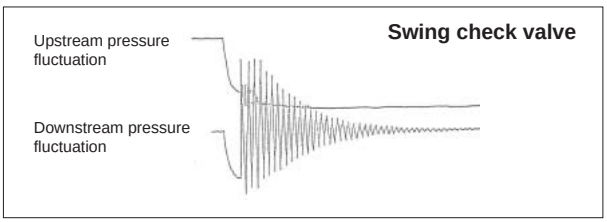
Prevents water hammer

The combination of a light, compact plate with a small moment of inertia and an optimized spring quickly stop the flow when the pump is turned off, preventing water hammer.

The figure below contains measurement data of pressure fluctuations when the pump is suddenly stopped. Compared to other models, the MKT series has a smaller pressure fluctuation amplitude on the downstream side which makes it effective in preventing water hammer.



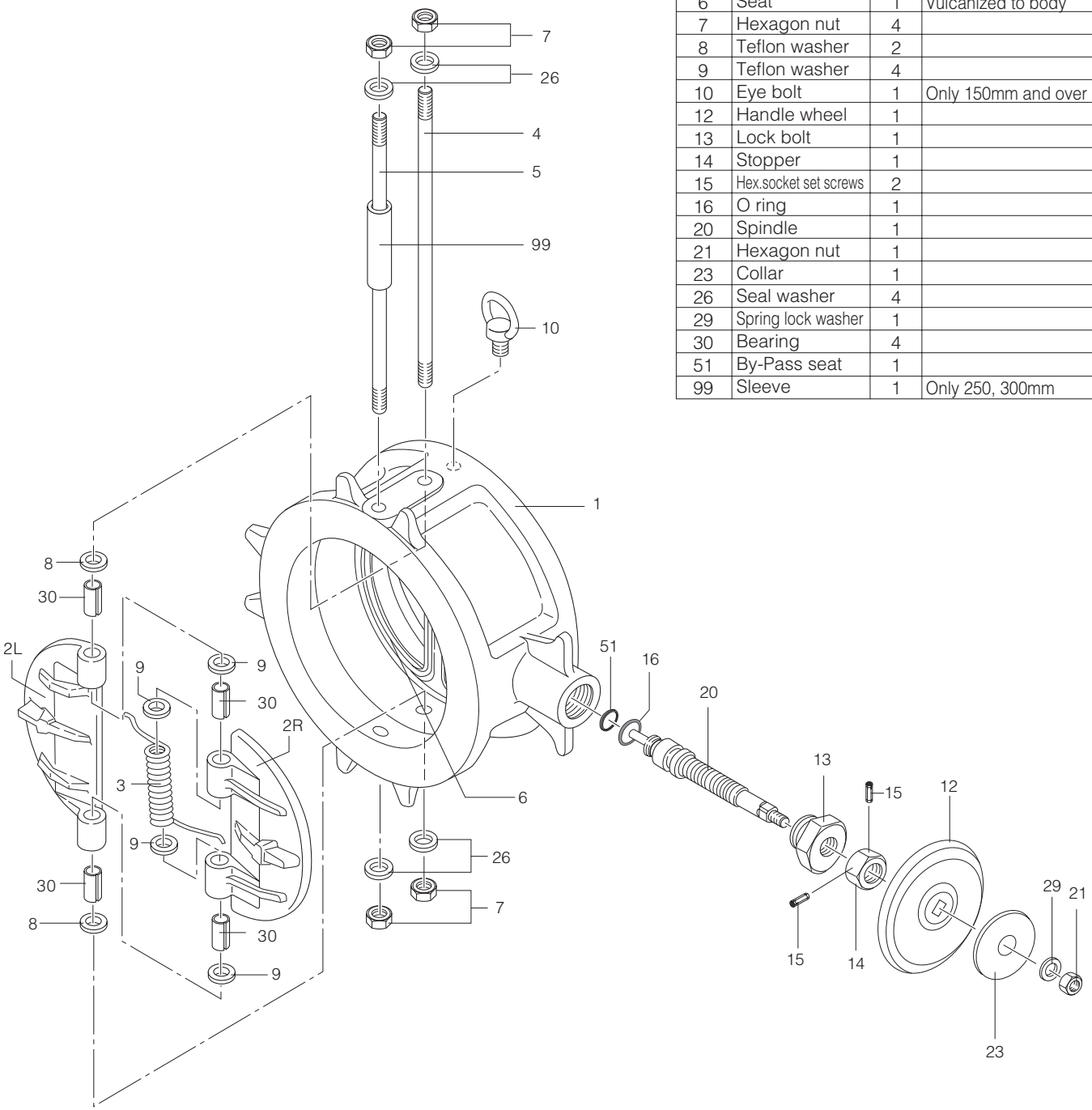




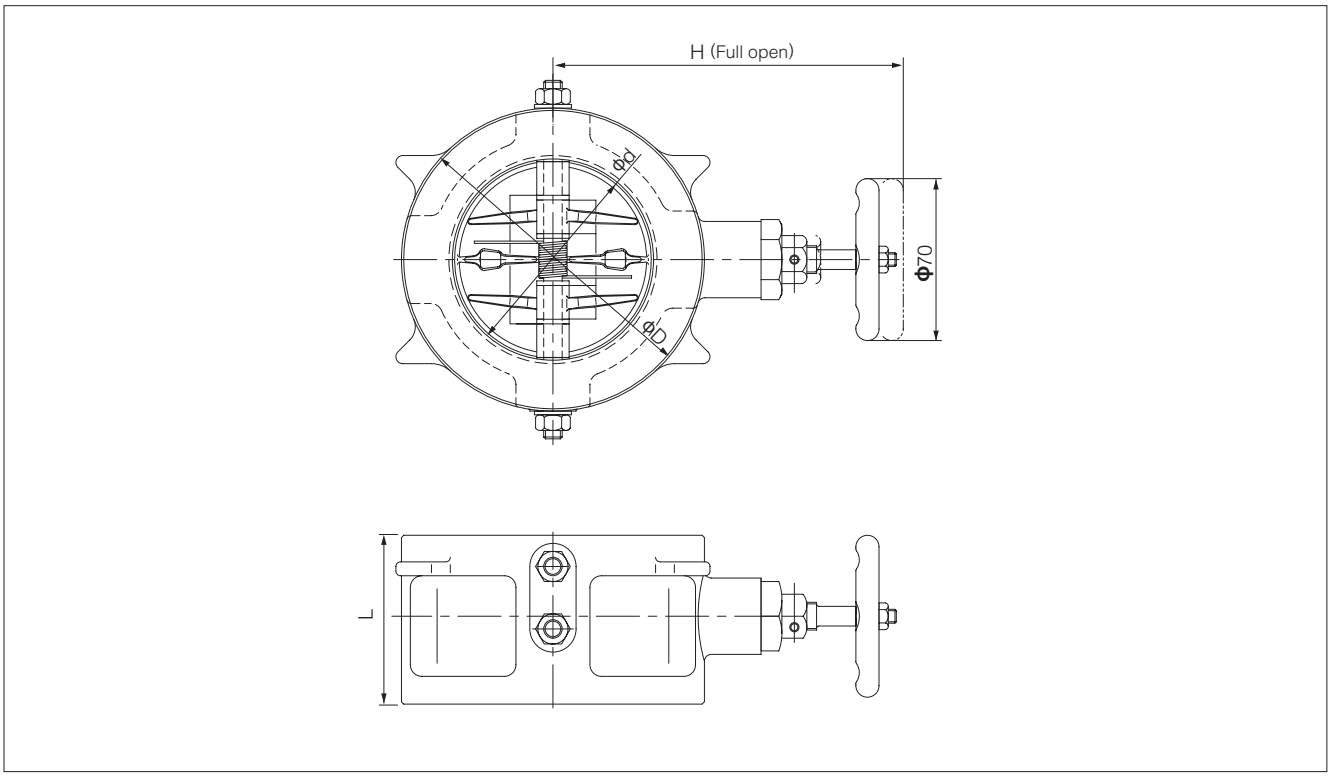
MKT Expanded view of components

■MKT Disc Expanded View/ Parts List

No.	Description	Q'ty	Remarks
1	Body	1	
2L	Left plate	1	
2R	Right plate	1	
3	Spring	1	200 mm, 250 mm, 300 mm: 2
4	Hinge pin	1	
5	Stop pin	1	
6	Seat	1	Vulcanized to body
7	Hexagon nut	4	
8	Teflon washer	2	
9	Teflon washer	4	
10	Eye bolt	1	Only 150mm and over
12	Handle wheel	1	
13	Lock bolt	1	
14	Stopper	1	
15	Hex.socket set screws	2	
16	O ring	1	
20	Spindle	1	
21	Hexagon nut	1	
23	Collar	1	
26	Seal washer	4	
29	Spring lock washer	1	
30	Bearing	4	
51	By-Pass seat	1	
99	Sleeve	1	Only 250, 300mm



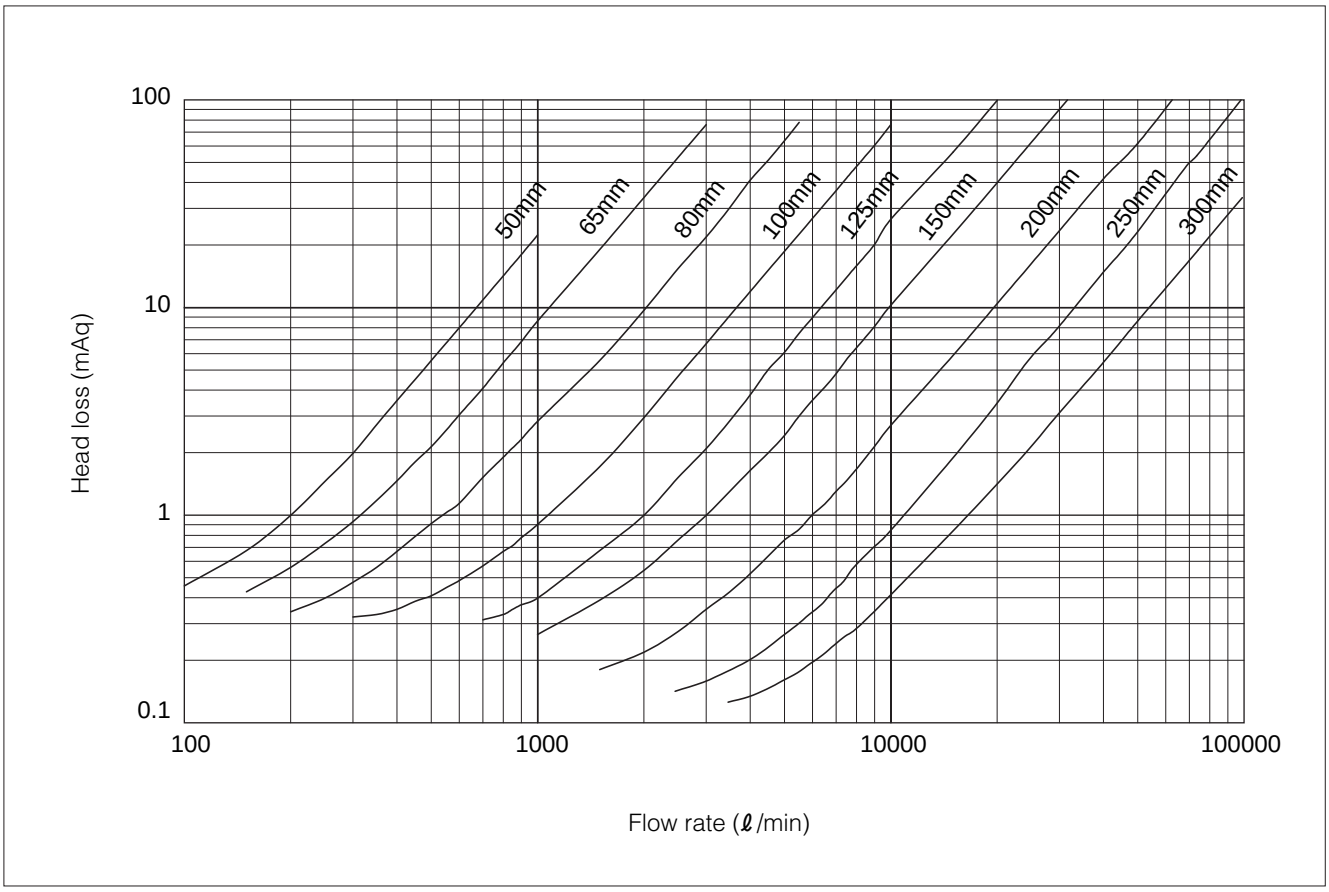
MKT Principal dimensions



MKT Dimension

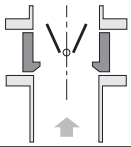
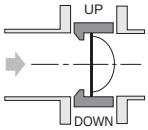
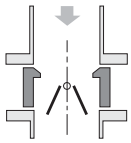
Nominal size		Dimension (mm)				Approx.Mass (kg)	
mm	inch	Φd	ΦD	L	H	SCS	FCD
50	2	58	101	60	135	2.7	2.5
65	2 1/2	74	121	67	142	3.7	3.5
80	3	87	131	73	149	4.7	4.4
100	4	105	156	73	186	6.2	5.9
125	5	134	187	86	200	9.2	8.7
150	6	160	217	98	213	13.1	12.4
200	8	210	267	127	239	22.6	21.5
250	10	258	330	146	282	37.5	35.6
300	12	306	375	181	308	56.2	53.4

MKT Head loss vs. Flow



MKT SELECYTION CRITERIA

1. For water use

Flow Direction	Ave. Flow Velocity	MKT specification	
		Valve structure	Spring
Up Flow 	0.5m/s to 2m/s	Standard	Low Torque (*2)
	2m/s to 10m/s		Standard
Horizontal Piping 	2m/s to 10m/s		Standard
Down flow (*1) 	1m/s to 5m/s		High Torque

*1: Depending on the conditions, valve seat leakage may occur during check valve when there is down flow. Please inquire with our sales persons.
*2: In the case of 250, 300mm. It is used standard torque spring.
*3: When used out of the above-mentioned range, and an expansion pipe is after a pump exit or a bend pipe and MKT is installed immediately after that, there is no problem in use though a little metallic sound might be generated.
*4: In the cases of other than the above. Please inquire with our sales persons.

2. For Gas Use

It can use with only Up Flow and differential pressure are only in 0.1MPa to 2.0MPa.
And please use the Low torque spring.

MKT Applicable pipe list in case of A

Nominal size		SGP	Sch20	Sch40	Sch10S	Sch20S
mm	inch					
50	2	○	○	○	○	○
65	2 1/2	○	○	○	○	○
80	3	○	○	○	○	○
100	4	○	○	○	○	○
125	5	○	○	○	○	○
150	6	○	○	○	○	○
200	8	○	○	○	○	○
250	10	○	○	○	○	○
300	12	○	○	○	○	○

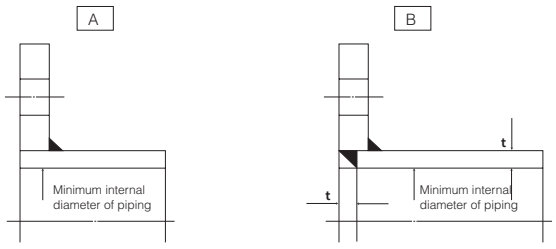
MKT Applicable pipe list in case of B

Nominal size		SGP	Sch20	Sch40	Sch10S	Sch20S
mm	inch					
50	2	○	○	○	○	○
65	2 1/2	○	○	○	○	○
80	3	○	○	○	○	○
100	4	○	○	○	○	○
125	5	○	○	○	○	○
150	6	○	○	○	○	○
200	8	○	○	○	○	○
250	10	○	○	○	○	○
300	12	○	○	○	○	○

Remark: ○: Installation possible, —: No standard

Minimum internal diameters of piping (mm)

Nominal size		Minimum internal diameters of piping (mm)
mm	inch	
50	2	35.0
65	2 1/2	45.5
80	3	56.0
100	4	80.6
125	5	98.2
150	6	122.1
200	8	156.8
250	10	204.7
300	12	222.9



MKT CRACKING PRESSURE (OPENING PRESSURE)

Minimum required pressure difference for flowing in forward direction

Nominal size		CV value	Standard torque spring		Low torque spring	
mm	inch		mmAq	MPa	mmAq	MPa
50	2	46.0	116	0.00114	12	0.00012
65	2 1/2	74.5	113	0.00111	13	0.00013
80	3	138	160	0.00157	22	0.00022
100	4	251	82	0.00080	16	0.00016
125	5	435	49	0.00048	12	0.00012
150	6	685	58	0.00057	15	0.00015
200	8	1340	79	0.00077	16	0.00016
250	10	2330	59	0.00058	12	0.00012
300	12	3760	50	0.00049	10	0.00010

MKT Piping bolt and nut sizes

Nominal size		JIS10K	JIS16K	JIS20K	ASME B16.5 Class150
mm	inch				
50	2	4-M16×140×35	8-M16×140×35	8-M16×140×35	4-U5/8-11×145×40
65	2 1/2	4-M16×150×40	8-M16×150×40	8-M16×150×40	4-U5/8-11×160×40
80	3	8-M16×160×40	8-M20×175×50	8-M20×175×50	4-U5/8-11×170×40
100	4	8-M16×160×40	8-M20×175×50	8-M20×175×50	8-U5/8-11×170×40
125	5	8-M20×180×50	8-M22×200×50	8-M22×200×50	8-U3/4-10×190×50
150	6	8-M20×200×50	12-M22×215×50	12-M22×215×50	8-U3/4-10×205×50
200	8	12-M20×230×50	12-M22×240×50	12-M22×240×50	8-U3/4-10×240×50
250	10	12-M22×260×50	12-M24×275×60	12-M24×275×60	12-U7/8-9×265×55
300	12	16-M22×300×50	16-M24×315×60	16-M24×315×60	12-U7/8-9×305×55

●The bolt lengths are in accordance with JIS and thickness of steel flanges.

Remark: *Use a hexagon nut with 80% threading.
*Material: "SS400" (Unichrome plating)

Example

Long bolts: 16 - M22 × 300 × 45
N M L S

Long bolts and nuts