World Top Valve Automation Company

Air Motor Multi-turn Valve Actuators

KA SERIES

KVA CO., LTD.

KA SERIES

Air Motor Multi-turn Actuator

Air motor operated valve actuator (AOV) is an actuator for automatic open/close of valves and dampers installed in the site by adjusting torque with the media of decelerator device such as gear using air motor which is rotated by gas pressure such as air or nitrogen.

Special Features

- Automation of manual valve is available just with existing air supply in the plant.
- Compared with electric type, it is more economical because the burden of the construction cost is remarkably low.
- Applicable for both new or existing manual valves.
- Applicable regardless of valve type (Multi-Turn, Quarter-Turn).
- Easy for automation in severe environments such as high temperature, high pressure and/or explosion proof area.

Product Features

Appearance

› Front located controls and indicator bring better accessibility and easy operation no matter its installation direction.
› Per cent(%) Continuous Type indicator enables continuous valve positioning check and it has high visual stability.

Safety

› No risk of explosion by spark as it uses air.
› Self-locking design performs solid rock reliability on its open/close position even the valve's load change. High stability at the area of much fluctuation of vibration and/or pressure.
› Redundantly designed safety devices(Open, Close Torque Limit & Geared Limit) perform higher reliability in case of valve over-fastening or valve component problem while the valve is open or close.
› Excellent in wear resistance and durability due to the internal main power transmission gear operates in oil bath condition.
› It has more stable characteristics compared to electrical type because there is no interferences. None of electrical signal processing inside, free from outer electrical noise of vibration.

Convenience

› May use manual handwheel for valve's open, close by selecting manual mode by lever.
› Easy maintenance and repair by modular type components by each unit.
› The use of stainless steel is obligated to prevent internal component corrosion by humidity.
› Adopted ball bearing at the top and bottom of operating axis, enables easy open and close operation by handwheel with less power.

Control Type

A Type

› It is the most general valve automation method that enables the valve's open, close operation by using Open/Stop/Close select switch at the AOV body.

[A Type]

B Type

› Enables the valve operation in remote distance via control switch box. If necessary, it can visualize the valve's open, close status by receiving feedback signal.(Max. distance 30~40m)

B1 : Valve control via switch box, but no feedback.
B2 : Valve control via remote switch box or AOV body. Valve state visualization by receiving air feedback.

› B type is recommended for the valves in high place where an operator is hard to reach, or stack, top valve of storage tank, underground piping valve and a valve is hardly accessible in case of fire.

[B2 Type]

C Type

› It is automation type that enables valve control in Local or control room remote control.
- Signal Output : Position transmitter(Limit switch integrated) outputs electrical signal (Dry contact) for full close or open.
- Solenoid valve is attached to the AOV body or control panel for its operation. It has 2 different type upon control method.

C1 : Position Transmitter(PT-01) is attached to AOV body that outputs dry contact, and it will be controlled by remote control panel(solenoid valve attached) in a distance to AOV body.
C2 : AOV Solenoid valve, Position transmitter(PT-01) are attached to AOV body for dry contact output and open, close operation. Once it turned to remote, remote control is available.

[C1 Type]

D Type

› Basically it is similar to C type. But it uses position transmitter(attached Limit switch, R/I converter potentiometer) which is available for 4~20mA and dry contact output.

D1 : Control valve by the Solenoid valve attached control panel, and display the valve state at the control panel.
D2 : Solenoid valve and position transmitter(PT-01) are attached to AOV body, and it features 4~20mA positioning signal and dry contact output, and the valve on, off control by AOV body. Once it switched to remote control is available.

[D2 Type]

Function Table

Function \ Type	A	B1	B2	C1	C2	D1	D2
Selector Switch(Open/Stop/Close)	o	o	o	o	o	o	o
Selector Switch(Local/Remote)	×	o	o	o	o	o	o
Air Lamp	×	×	o	×	×	×	×
Solenoid Valve(Open/Close)	×	×	×	o	o	o	o
Electric Limit Switch	×	×	×	o	o	o	o
Transmitter(4~20mA	×	×	×	o	o	o	o

Applicable Valves

> Gate Valve (Solid Wedge, Slide Flexible Wedge)
> Globe Valve (Rising & Nonrising)

> Ball Valve / Plug Valve
> Butterfly Valve & Damper

> Polymer Valve
> All type of valves which has manual hand wheel.

Structure

Main Components

1. Switch Unit
› Components integration ensures reduction of failure and increase of maintenance convenience.
› Consists of Logic Valve, Limit Switch, Torque Switch

2. Indicator
› Per cent(%) Continuous Type indicator enables continuous valve positioning check and it has high visual stability through rotation type indicator.
› Double seal design prevents dew condensation at the Window.

3. Air Motor
› Adopted Vane type Air Motor secures Torque and RPM for smooth operation.

4. Driving Line
› Excellent in wear resistance and durability due to the internal main power transmission gear operates in OIL BATH condition.
› Internal power and signal transmission shafts are secured by Oil Seal structure for a good sealing performance.
› Top and bottom part of operating shafts are secured by Quad-ring against leakage.

5. Manual Handwheel
› Wheel rotates during automatic operation. It directly connect to Drive shaft and its hammer blow device enables easier valve operation.

6. Declutch Selector Lever
› Manual Declutch Type needs to convert its position by select lever. Converting Manual · Auto mode will be made by the lever and clutch. In Manual mode, it enables hand wheel operation, and Auto mode, it enables valve open, close operating by select switch.
Option : Key lock Function

7. Selector Switch
› Using of metallic material secures safety against external damages. Oil seals used for operation shaft prevents penetration of moisture.

8. Sealing and Cover Design
› The sealing function is remarkably increased by using o-rings for Cover assembly parts and its bolting type is designed to meet explosion proof standard to secure safety for the components fixation. Quad rings adopted for the top and bottom of operating axis are prevent leakage.

9. Standardized the Signal Air Supply Connection is NPT1/4”

10. Position Transmitter
› Perfect operation of open, close, Dry Contact or 4~20mA.
(Certified SGS Baseefa“Exd IIC T6 Gb”)

KA SERIES

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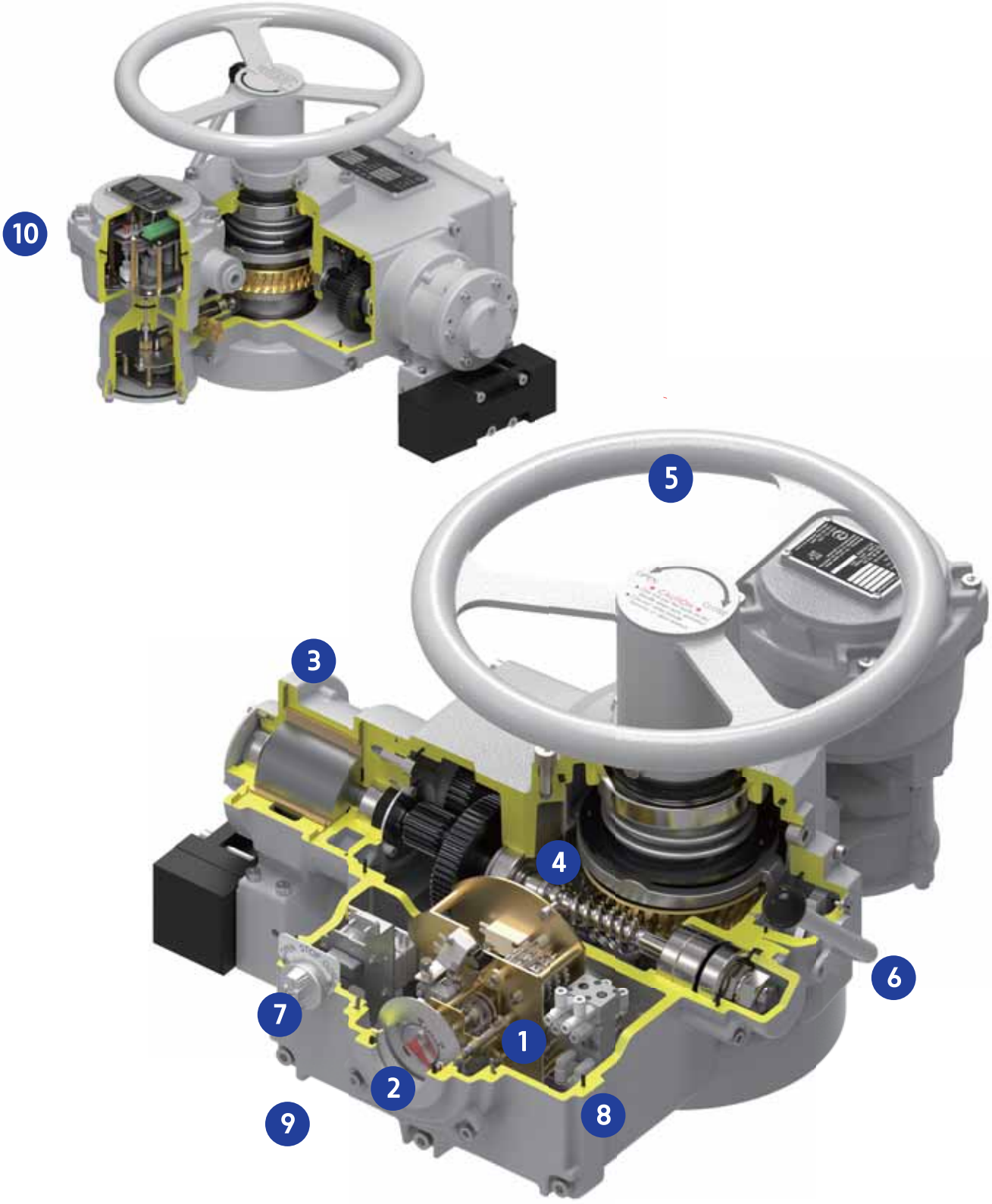


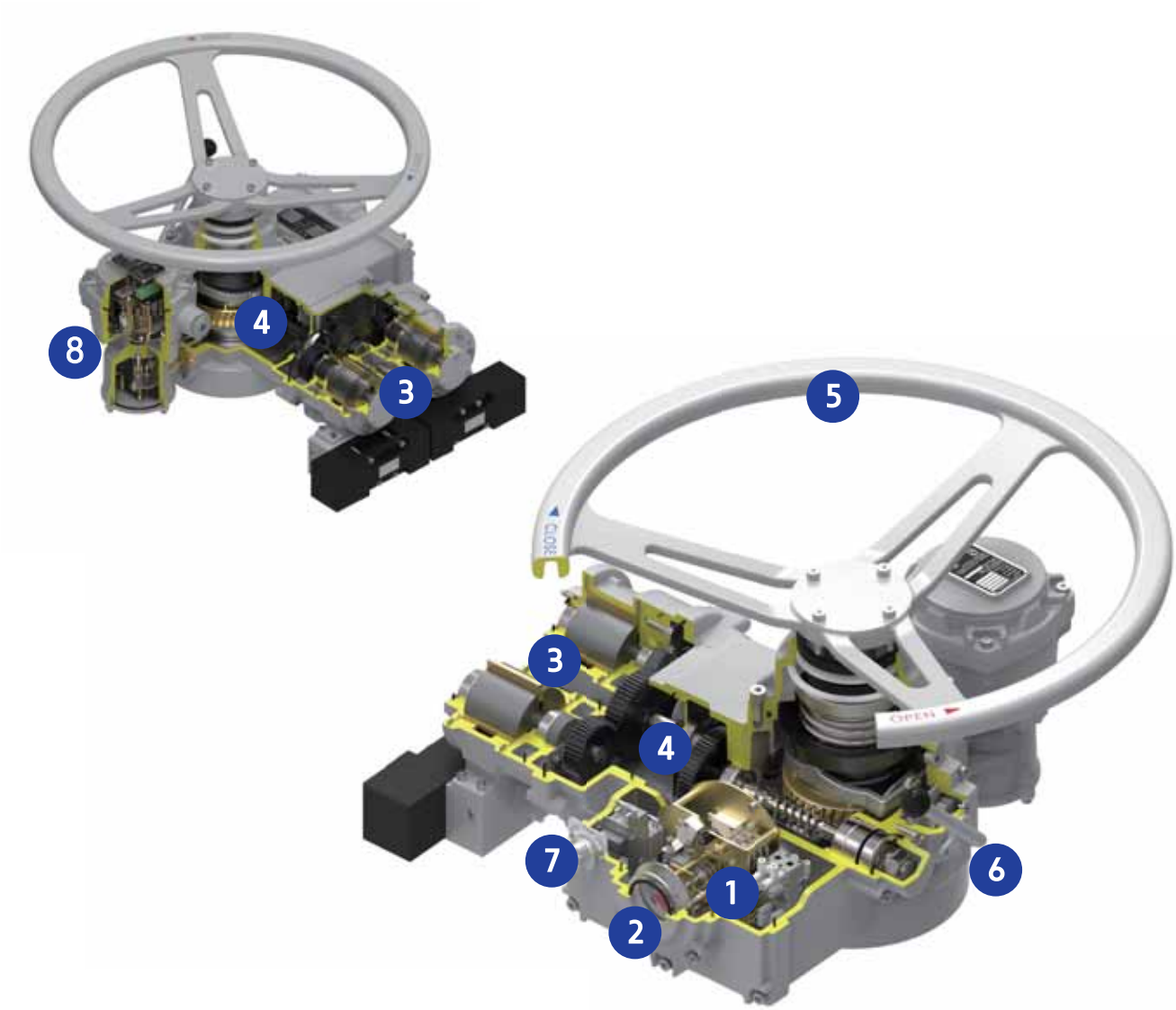
Double Motor AOV Main Components

① Switch Unit
② Indicator
③ Air Motor
- Vane - type air motors with the safety of torque and RPM are arranged in parallel to ensure high-speed, high-torque power transmission characteristics.

④ Driving Line
⑤ Manual Hand Wheel
- The wheel is irritational during automatic operation.
It directly connects to Drive Shaft and it's hammer blow device enables easier valve operation.

⑥ Declutch Lever
- When manually changing to Auto Declutch type, the valve can be operated with the manual hand wheel.
- When the motor is operating, it is automatically switched to the auto state and the valve can be opened and closed by the motor power.

⑦ Selector Switch
⑧ Position Transmitter



Specifications

Speed-Torque Table

MODEL	Ratio	A	B	C	Weight [kg]
	RPM	26RPM	40RPM	65RPM	
	Capacity	Max Torque(Setting Torque)[kgf-m]			
4AM	1Hp	30(20)	20(14)	10(8)	36
6AM	4Hp	60(40)	40(30)	25(20)	40
12AM (Double Motor)	8Hp	-	60(40)	40(30)	50

Mechanical Table

MODEL	INSTALL TYPE					
	BRACKET	THRUST TYPE				
	key*1)	Max Thrust		Max Stem Dia		ISO No.
		ton	Kn	key	Threaded	
4AM	100L 150L 200L	9	88	50*3)	40	F14 (F16)
6AM						
12AM (Double Motor)	N/A	13	127.4	50*3)	50	

1) Bracket Type : Following Valve Yoke Sleeve's standard.

2) None Thrust Unit : Direct Mounting Type

SPECIFICATION

Design Specification	KA Series Actuator is perfect air operate actuator for applications that use multi-turn valves.
Motor	Air Supply Pressure : 4.0 to 7.0[kg/㎠]

Size	RPM	Air Consumption*1)	Min Pipe Size
4AM	2800	850	15A
6AM	2800	1100	15A
12AM	2800	2200	20A

1) Air Consumption(Based, ⊿p=4.0 kgf/cm2)[Nl/min]

Noise Level	Not over than 85db within 1m
Hand Wheel, Select Lever	Rotation type hand wheel, Fixed type lever
Operating Temperature	Operational ambient temperature is - 20~70℃(-22 to +158°F)
IP GRADE	IP66
Position Limit Switch	Gear Drive, Cam Operated, Snap Action Type Max Drive Sleeve Turns : 5000 turns
Torque Limit Switch	Open, Close : Slip Action Type
Indicator	Type : Mechanical of Continuous Pointer(0~100%)
Lubrication	Grease Moly(EP0 type)
Materials	Aluminium Alloy, Nodular Graphite Casting, Steel or Bronze
Surface Treatment	Anodizing : 10 micron min
External Coating	Power Coating : 60 micron min / Colour: Munsell No. 4.9B 6.7 / 0.2

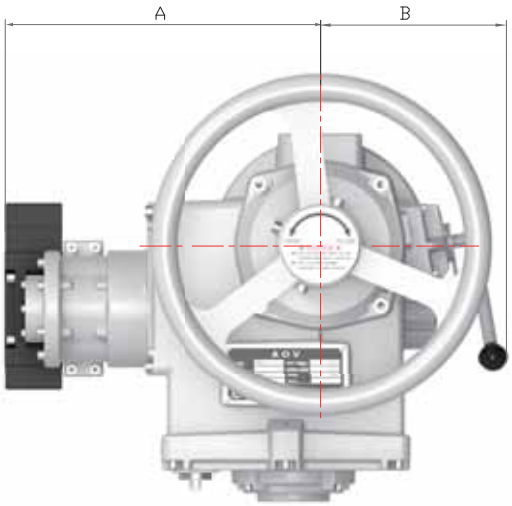
OPTIONS

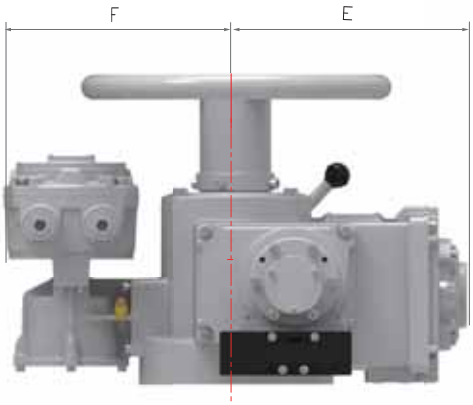
Manual Hand Wheel	Manual Declutch Type(None Rotation) Auto Declutch Type (Auto Return)
Key Lock	Manual and Automatic Locking
Position Transmitter (PT - 01)	International Hazardous Area - IECEx_BAS_17.0090X_ Ex db IIC T6 / Ta -30 to +70℃(-22 to +158°F) Limit Switch : Open & Close 1C Contact Transmitter - 4Wire Type Input : AC100V~250V, Output 4~20mA, Precision ±0.5%
FireProofing	FR Coating(FR SHELL) Type
Paint	Non-standard

※ Please contact us for specifications other than above.

Size

Standard Model (4AM, 6AM)

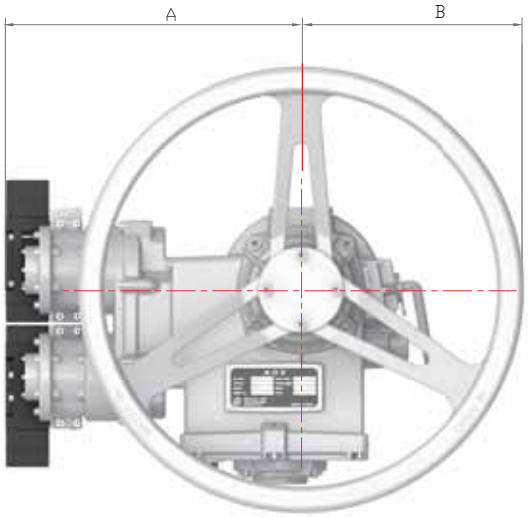


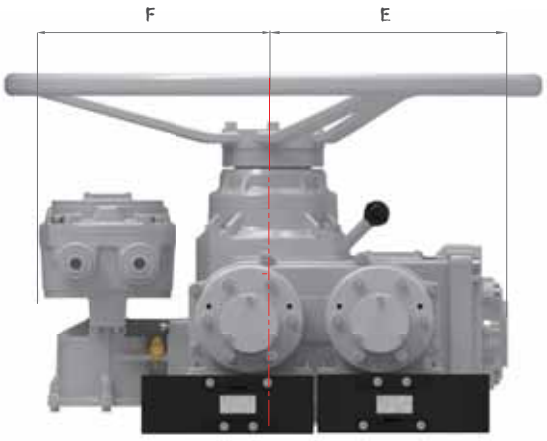


Size / Capacity	A	B	C	D	E	F
4AM	299	191	350	350	262	262
6AM	322	191	350	350	262	262

※ F dimensions are for C Type, D Type only.
※ Size is subject to change according to specifications and options, please refer to detail size in the approval documents.

Double Motor (12AM)

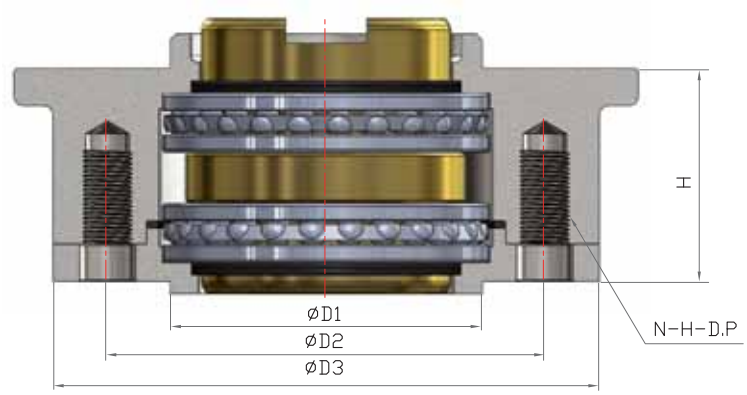




Size / Type	A	B	C	D	E	F
12AM	399	300	391	600	262	262

※ Size is subject to change according to specifications and options, please refer to detail size in the approval documents.

Thrust Unit(ISO-5210/5211)

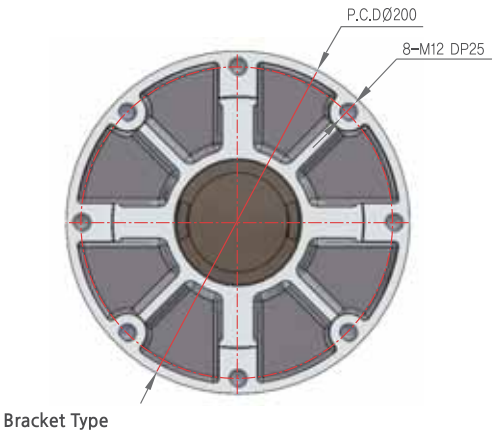


[Unit : mm]

MODEL	ISO	D1	D2	D3	N-H-DP	H	Weight [kg]	Remark
4AM 6AM 12AM	F14	100	140	175	4-M16-35	64	10	
	F16	130	165	210	4-M20-40	64	11.5	

※12AM is applocable only with F16.

Standard Bracket Type - Direct Mounting



Bracket Type

Screw Operated Valve Torque Calculation

Thrust F = A×⊿P×C+E ·····(kgf)
Torque T = K · F ····· (kgf-m)
A : Cross sectional area of valve port(cm^2)
=($\pi \times D^2$)/4 (D=Valve Port Diameter)
P : Maximum differential (kg/cm^2)·····Generally
Maximum at fully closed valve position

When the differential is less than $10kg/cm^2$ Take $10kg/cm^2$
C : Valve Factor
E : Gland Friction Allowance ·····(kgf)
K : Stem Factor

Table 1. Valve Factor(C)

Valve	Valve Factor(C)			
	Liquid		Gas	
	Below 400℃	Above 400℃	Below 400℃	Above 400℃
Parallel Slide	0.25	0.3	0.35	0.45
Wedge Gate	0.35	0.4	0.45	0.5
Lobe	1.2	1.2	1.2	1.2

Table 2. Gland Allowances(E)

Stem Dia	Gland Allowances(E)
Below 25mmØ 25-50mmØ 51mmØ & Above	400kg 700kg 1100kg

Table 3. Stem Factor(K)

Stem Dia	Dialead of Screw[mm]										
	3	5	6	7	8.5	10	12.5	17	25	44	51
19	.0020	.0023	.0023	.0026	.0026	.0030					
25	.0023	.0026	.0030	.0030	.0033	.0033	.0039				
32		.0033	.0033	.0036	.0036	.0039	.0043				
38		.0036	.0039	.0039	.0043	.0043	.0046	.0053	.0066		
44			.0043	.0046	.0046	.0049	.0053	.0062	.0075		
51			.0049	.0046	.0053	.0053	.0056	.0066	.0079		
57			.0053	.0056	.0056	.0059	.0062	.0072	.0085		
64			.0059	.0059	.0062	.0062	.0066	.0075	.0089		
70			.0062	.0066	.0066	.0069	.0072	.0082	.0095		
76			.0069	.0069	.0072	.0072	.0075	.0085	.0098		
83			.0072	.0075	.0075	.0079	.0082	.0092	.0105		
89						.0082	.0085	.0098	.0105	.0131	
94						.0089	.0092	.0102	.0115	.0138	.0158
102						.0092	.0095	.0105	.0118	.0141	.0164
108						.0098	.0102	.0112	.0125	.0148	.0167
114						.0102	.0105	.0115	.0128	.0151	.0174
121						.0108	.0112	.0121	.0135	.0158	.0177
127						.0112	.0115	.0125	.0138	.0161	.0184
133						.0118	.0121	.0131	.0144	.0167	.0187
140						.0121	.0125	.0135	.0148	.0171	.0194
147						.0131	.0135	.0144	.0158	.0181	.0203
160								.0154	.0167	.0190	.0213

● Note : - The above formula is a auidance only in sizing the actuators.
- The factors given above shall be a bit different form those of each valve manufacturer.
Please refer use details to valve manufacturer.
- K = Dm (COS ϕ tanα+ μ) / (COS ϕ - tanα+ μ) where Dm=Mean Stem Diameter ≒ D-2p
ϕ =15 °α= $\tan^{-1}$L/πD μ=0.2

Valve Data

Gate Valve Torque Table

Size(inch) \ Flange Rating	ANSI 150# (⊿P=10)	ANSI 300# (⊿P=20)	ANSI 600 (⊿P=42)	ANSI 900# (⊿P=63)	ANSI 1500# (⊿P=105)	ANSI 2500# (⊿P=176)
2	1.3	1.4	1.8	3.2	4.9	6.3
2 1/2	1.3	1.6	2.7	4.6	6.8	9.8
3	1.8	2.3	3.9	5.3	8.7	11.5
4	2.7	3.6	6.3	8.6	15.3	18.3
5	3.3	4.6	-	-	23.4	-
6	4.3	6.7	15.7	21.2	33.7	44.5
8	6.0	12.1	22.7	35.3	53.0	94.2
10	10.1	18.3	37.3	56.3	94.3	160.1
12	14.2	26.0	53.1	79.1	134.1	218.9
14	16.8	32.4	63.7	102.1	188.1	263.5
16	22.9	42.1	96.1	112.3	267.6	382.1
18	28.5	54.5	117.9	196.1	283.9	584.0
20	36.4	69.6	153.2	254.7	473.5	890.5
24	54.5	117.0	234.9	419.3	675.9	1762.7
26	70.9	144.9				
28	82.0	182.1				
30	94.2	225.0				
32	104.2	244.3				
36	134.3	282.3				
40	160.1	301.3				
42	209.1	383.8				
48	249.4	603.8				
52	304.4	745.0				

Globe Valve Torque Table

Size(inch) \ Flange Rating	ANSI 150# (⊿P=10)	ANSI 300# (⊿P=20)	ANSI 600 (⊿P=42)	ANSI 900# (⊿P=63)	ANSI 1500# (⊿P=105)	ANSI 2500# (⊿P=176)
2	1.7	2.3	4.6	8.3	12.3	24.8
2 1/2	2.0	3.6	7.1	11.5	17.6	30
3	2.8	5.3	10.8	16.1	29.9	40
4	4.8	9.6	17.7	29.1	46.0	81.6
5	6.6	18.2	33.3	47.2	-	-
6	15.0	27.7	46.9	71.4	130.7	182.6
8	20.3	49.0	87.1	129.9	147.6	430.0
10	33.7	77.2	169.3	239.9	297.6	773.3
12	40.2	101.2	289.4	509.4	573.0	1224.2
14	69.1	137.5				
16	92.8	191.5				

It is applied to new valves as reference material of valve companies. It may be different to existing valves' torque value.
⊿P Unit : kgf/cm²
Torque Unit : kgf · m
Torque value of stem itself(Torque value before attaching gear box)
Unspecified as normal valve conforms ANSI standard
Temperature : ANSI 150, 300, 600, 900 : 400℃ Max

Ball Valve Torque Table

Flange Rating / Size(inch)	ANSI 150# (⊿P=10)	ANSI 300# (⊿P=20)	ANSI 600 (⊿P=42)	ANSI 900# (⊿P=63)
2	3.3	5.8	14.5	23.2
3	10.2	14.9	28.3	46.8
4	19.6	25.0	49.7	84.1
6	49.7	78.3	94.3	152.2
8	94.2	156.3	166.7	272.5
10	126.9	169.6	284.1	463.8
12	156.6	239.2	463.8	753.8
14	218.9	351.5	672.5	1043.5
16	313.1	489.9	898.6	1460.9
18	407.3	649.3	1147.9	1981.9
20	521.8	834.8	1460.9	2608.7

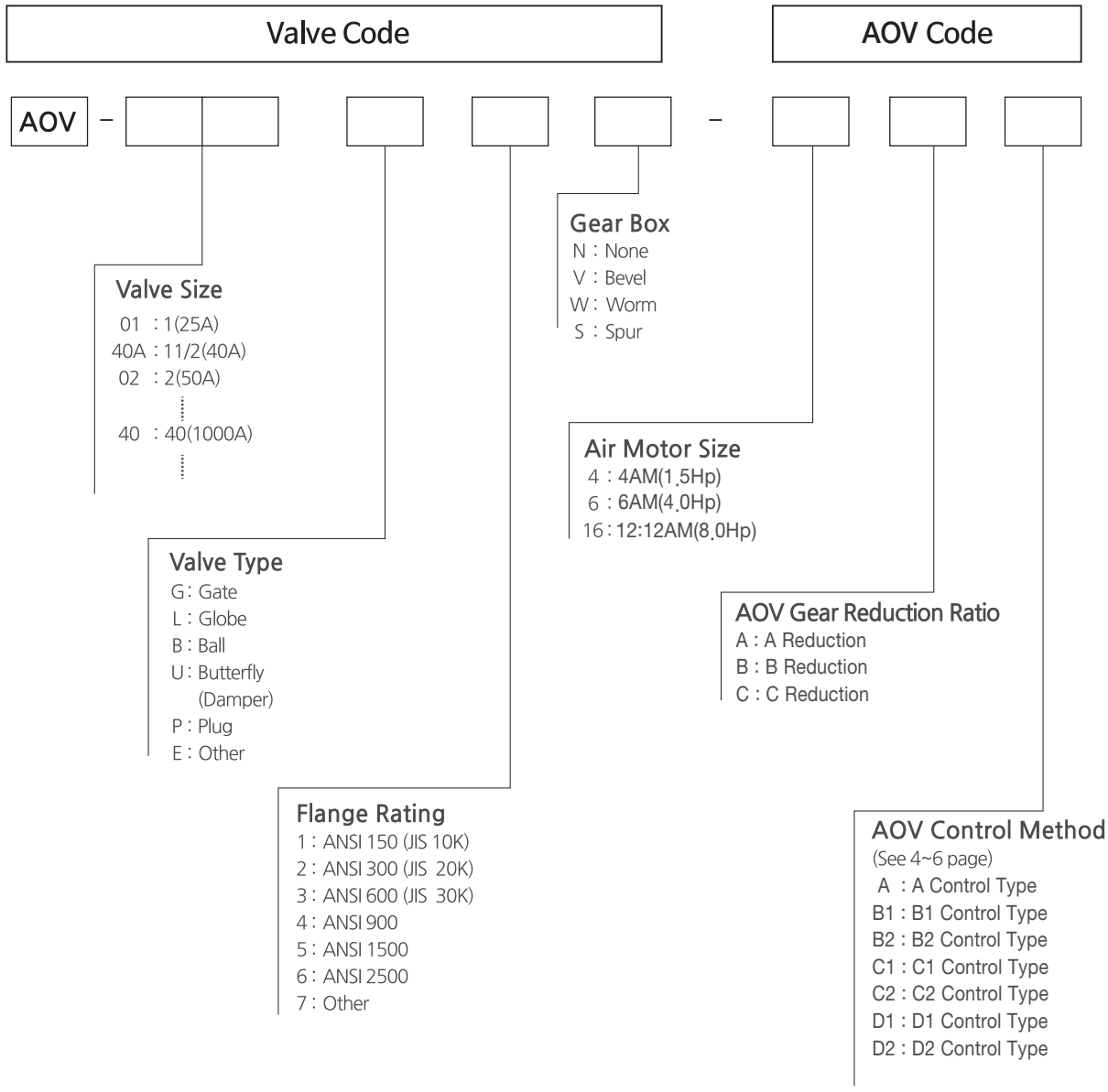
Based on 2 seat general trunnion ball valve
⊿P Unit : kgf/cm², Torque Unit : kgf/cm²
Torque value of stem itself(torque value before attaching gear box)
Referred Korean Valve manufacturers' data, and it may be different to each company. Based on new valves.
Plug valve may applicable similar with ball valve

Butterfly Valve Torque Calculation Table

Valve Nominal Diameter [mm]	Minimum Operating Torque (Kg - m)					
	△P = 10Kg/㎠		△P = 7.5Kg/㎠		△P = 4.5Kg/㎠	
	A (3 m/s)	B (6 m/s)	A (3 m/s)	B (6 m/s)	A (3 m/s)	B (6 m/s)
200	21.4	21.4	15.4	15.4	8	8
250	38.3	38.3	26.5	26.5	14	14
300	61.9	61.9	43.4	43.4	22.4	22.4
350	90.9	90.9	64	64	33.5	33.5
400	137	137	90.1	90.1	47.7	49.6
450	186	186	122	122	65.5	70.2
500	247	247	175	175	87.3	95.9
600	403	403	272	272	147	165
700	613	613	420	420	218	257
800	887	887	614	614	325	386
900	1230	1230	860	860	465	552
1000	1660	1660	1170	1170	614	746
1100	2240	2240	1540	1540	824	1000
1200	2870	2370	1990	1990	1040	1280
1350	4010	4010	2730	2730	1460	1820
1500	5430	5430	3740	3740	2040	2510
1600	6540	6540	4480	4480	2440	3040
1650	7280	7280	5190	5190	2900	3655
1800	9160	9160	6270	6270	3450	4310
2000	12370	12370	8480	8480	4750	5940

• Note : The above data are based on the butterfly valves for the water works(KSB-2333)

AOV Model Selection Guide



EX) AOV-08G1N-6AA : It is 8" Gate Valve ANSI150lbs that has no gear box.
It is actuator with 4.0hp air motor that directly controls open/close at site valve.

www.kva.co.kr

KE-SERIES(MOV)

KQ-SERIES(MOV)

KA-SERIES(AOV)

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