

# B/F Series Pneumatic Actuators



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The products introduced in this catalog are all covered by the ISO 9001 Certification awarded KITZ Corporation in 1989, the earliest in the valve industry in Japan.

## Foreword

Pneumatic actuators are generally recommended because they simplify piping arrangements and minimize environmental pollution problems. These are advantageous features when compared with hydraulically operated actuators. Also, unlike electric actuators, care required for inflammable or explosive servicing environments is much less when pneumatic actuators are installed.

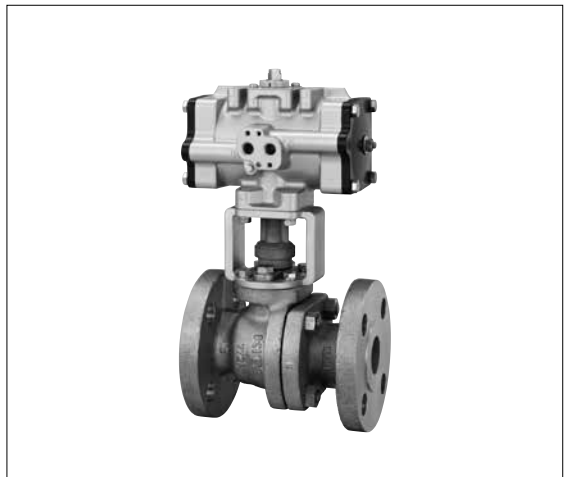
Application of pneumatic actuators has grown dramatically in recent days for their cost and energy saving advantages. KITZ proudly introduces B/F Series pneumatic actuators which are readily mountable on all KITZ ball and butterfly valves. Ball and butterfly valves constructed similarly to KITZ valves may also be satisfactorily operated with KITZ pneumatic actuators.



KITZ Ball Valve with Type BS Actuator

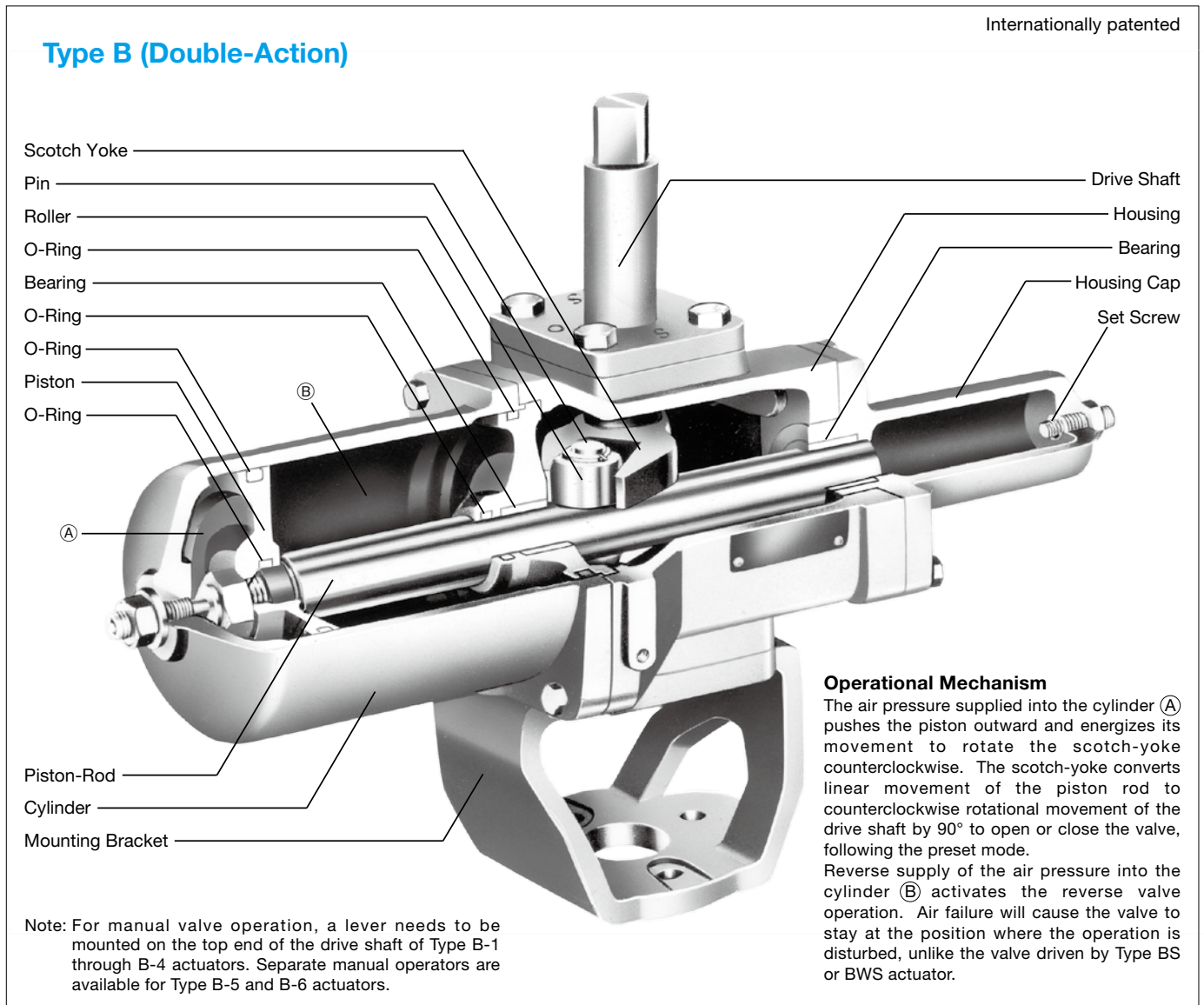


KITZ Ball Valve with Type B Actuator



KITZ Ball Valve with Type FA Actuator

# Features of KITZ B Series Pneumatic Actuators



### Smooth operation with minimum friction

Extensive use of fluorocarbon resin to coat inside parts of the actuator reduces friction to a minimum for smooth operation. This includes the inside of the cylinder, resulting in smooth sliding of the piston and O-rings, as well as the surfaces of driving shaft, piston rod, and all bearings. As a result, the actuator features long-term stable operation.

### Simple, trouble-free construction

The number of parts has been minimized to reduce mechanical problems and simplify periodical check, maintenance, disassembly, or reassembly.

### Separated turning mechanism and cylinder

Unlike conventional designs, in which the cylinder drive transmission mechanism is incorporated in the cylinder itself, the transmission mechanism of KITZ B Series actuators is designed with a scotch yoke installed separately from the cylinder.

This construction prevents air leakage even when the shaft clearance has increased during service.

### Drive characteristics suited to quarter-turn valves

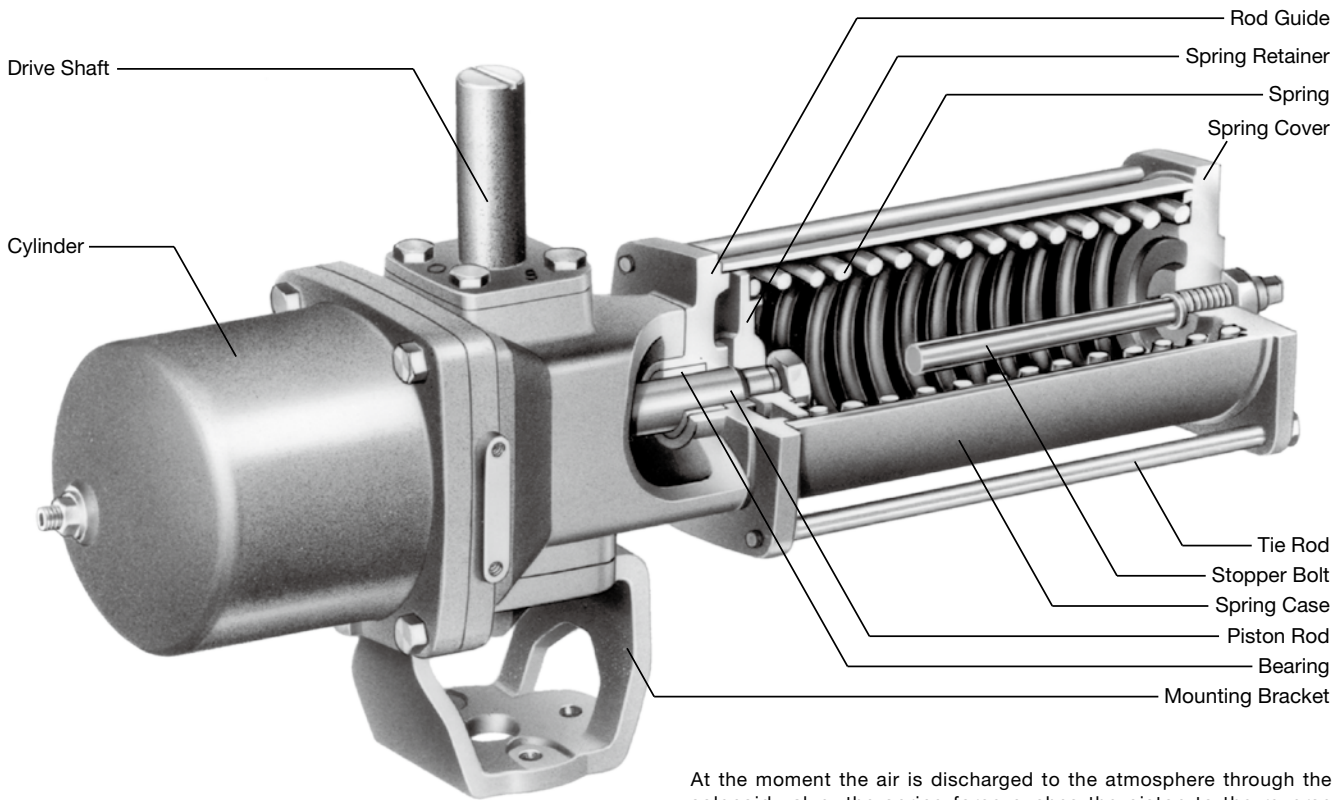
Unlike conventional cylinder actuators deploying linear drive characteristics, use of a scotch yoke mechanism provides a U-shape curve which maximizes the force obtained at the start and end areas of each stroke. This performance curve is similar to the torque characteristics of ball and butterfly valves in general, making KITZ B Series actuators suitable for such quarter-turn valves.

### Installation of accessories

The actuator housing is provided with an arrangement for mounting limit switches and valve positioners, etc. on its top, and solenoid valves, air filters, and regulators, etc. on its side.

Internationally patented

## Type BS (Spring-Return) Type BSW (Spring-Return with Manual Operation Device)



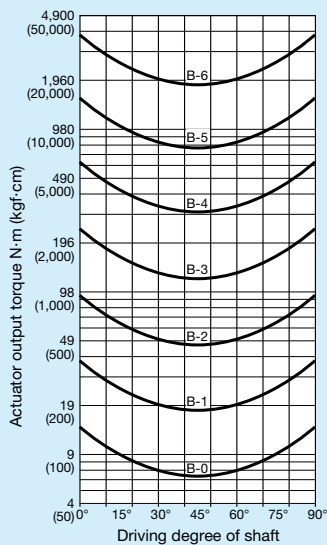
### Operational Mechanism

The air pressure supplied into the cylinder pushes the piston outward and energizes its movement to rotate the scotch-yoke counterclockwise, compressing the spring. The scotch-yoke converts linear movement of the piston rod to counterclockwise rotational movement of the drive shaft by 90°, to open or close the valve, following the preset mode.

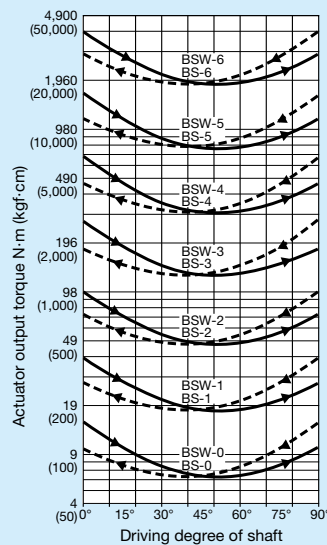
At the moment the air is discharged to the atmosphere through the solenoid valve, the spring force pushes the piston to the reverse direction, and the scotch-yoke activates clockwise rotation of the shaft to reversely operate the valve. Air failure will cause the valve to return to the original open or closed position automatically, following the preset mode, unlike the valve driven by Type B actuator.

The BSW actuator is driven with the same mechanism as Type BS, but provided with a handwheel for manual operation. Please bear it in mind that the handwheel must be **factory mounted**.

### Type B Actuator Output Torque



### Type BS/BSW Actuator Output Torque



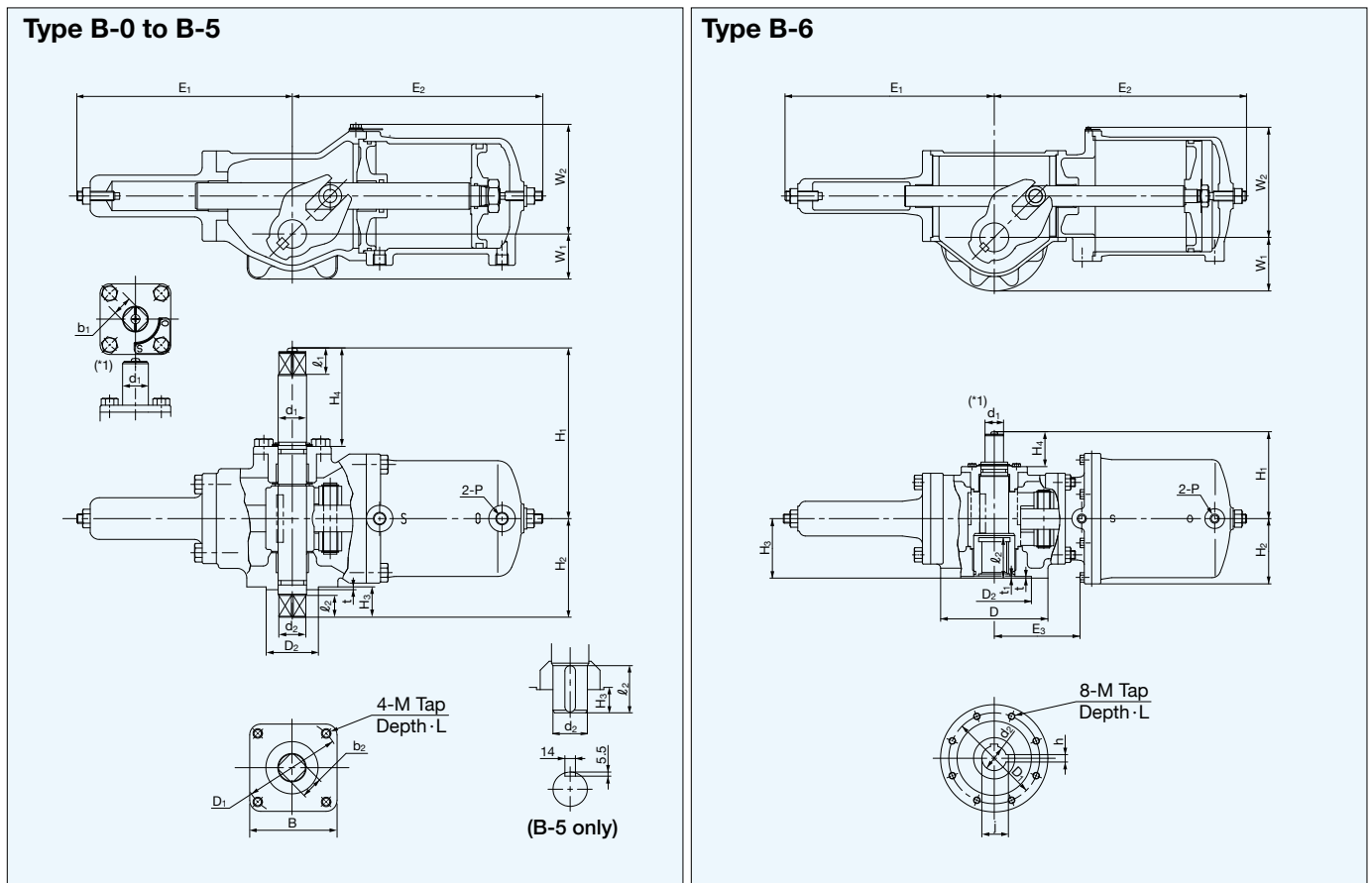
— Output torque when air pressure is supplied.  
- - - Output torque caused by spring force when air pressure is exhausted.

Operating pressure:  
0.4 MPa (or 60 psi)

# Specifications and Dimensions

Operating media	: Compressed instrument air
Standard operating pressure	: 0.4 MPa (60 psi): factory preset pressure
Pressure supply range	: 0.3 MPa (4.5 psi) to 0.7 MPa (100 psi)
Output torque	: Refer to Page 2
Standard durability	: 100,000 cycles under moderate service conditions
Housing test pressure	: 0.97 MPa (9.9 kgf/cm <sup>2</sup> or 140 psi)
Drive shaft rotation	: 100° (when the stopper is fully relaxed)
Rotation adjustment range	: 5° at each end
Service temperature range	: -20°C to +60°C (-4°F to +140°F)

## Type B (Double-Action)



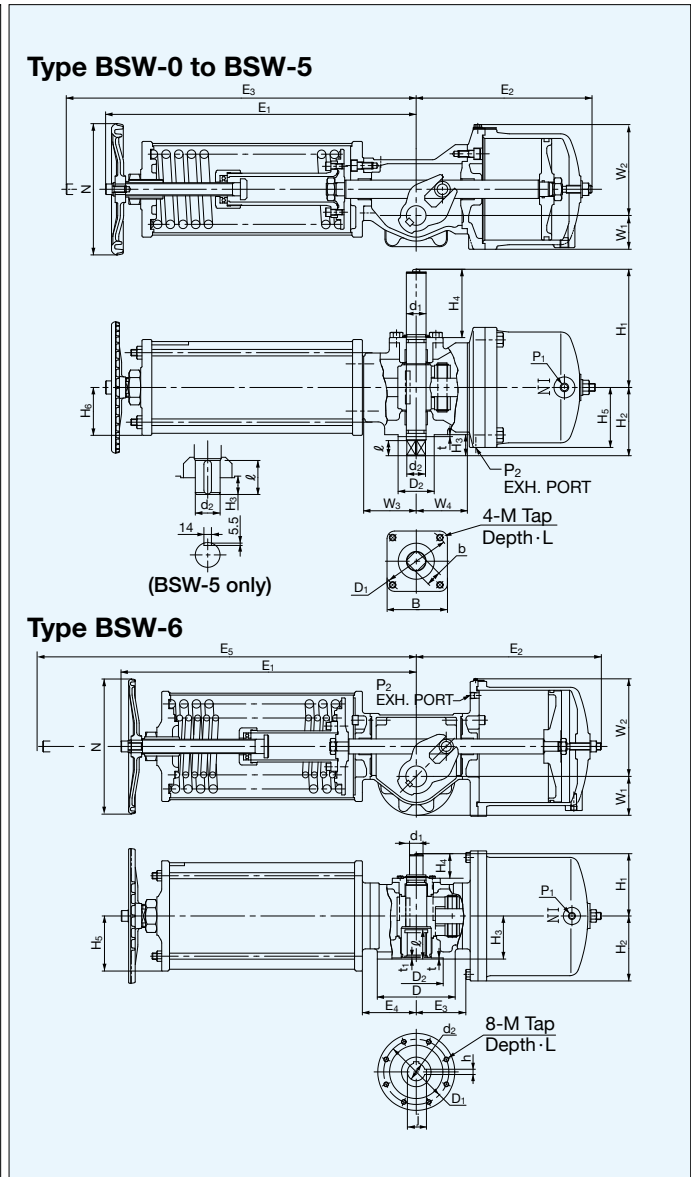
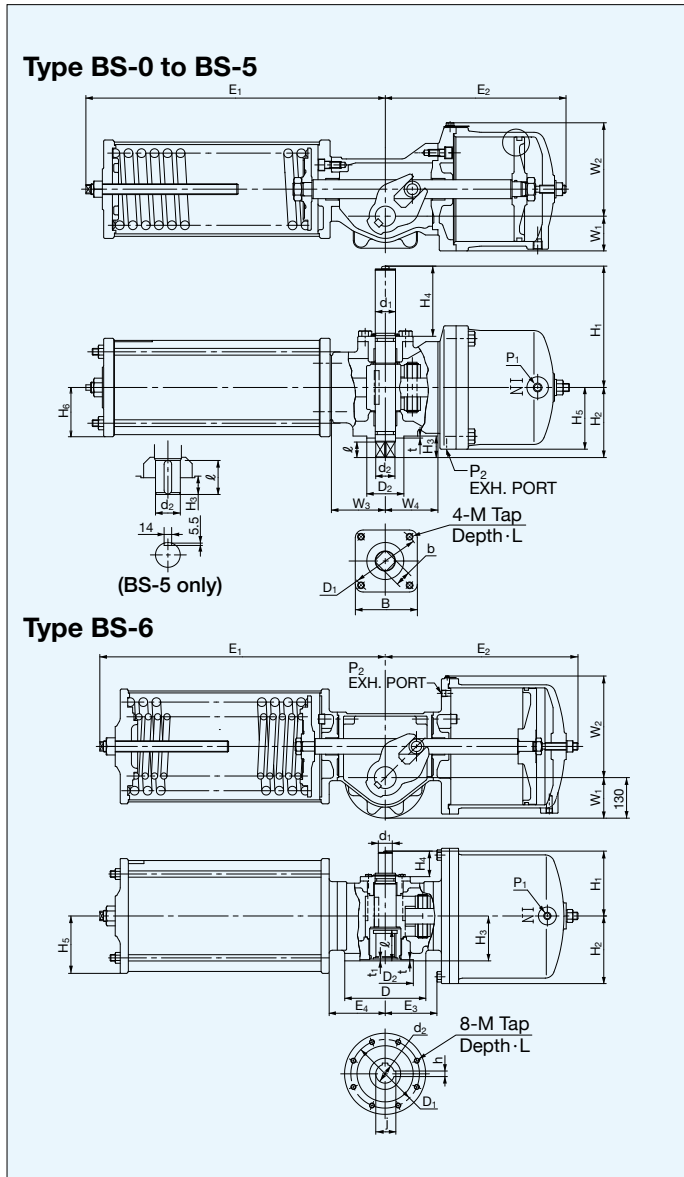
\*1. The operating lever cannot be mounted on the drive shaft of Type B-5 and B-6 actuators.

## Type B Actuator Dimensions

Type	E <sub>1</sub>	E <sub>2</sub>	E <sub>3</sub>	W <sub>1</sub>	W <sub>2</sub>	H <sub>1</sub>	H <sub>2</sub>	H <sub>3</sub>	H <sub>4</sub>	D	D <sub>1</sub>	D <sub>2</sub>	d <sub>1</sub>	d <sub>2</sub>	b <sub>1</sub>	b <sub>2</sub>	B	l <sub>1</sub>	l <sub>2</sub>	t	t <sub>1</sub>	P	L	M	h	j
B-0	92	111	—	25	54	75	53	18	40	—	50	35	12	15	10	12	50	10	12	2	—	BSPT <sup>1</sup> / <sub>8</sub>	9	M6	—	—
B-1	128	154	—	25	81	140	60	18	94	—	50	35	16	15	12	12	50	12	12	2	—	BSPT <sup>1</sup> / <sub>4</sub>	9	M6	—	—
B-2	177	205	—	35	89	153	77	23	99	—	70	55	22	21	17	17	70	17	17	2	—	BSPT <sup>1</sup> / <sub>4</sub>	12	M8	—	—
B-3	235	272	—	48	116	180	104	32	104	—	102	70	30	28.5	23	23	95	23	23	3	—	BSPT <sup>1</sup> / <sub>4</sub>	15	M10	—	—
B-4	289	333	—	57	149	230	138	43	127	—	125	85	45	41	32	32	114	32	32	3	—	BSPT <sup>1</sup> / <sub>4</sub>	19	M12	—	—
B-5	372	428	—	81	203	225	167	34	91	—	165	130	45	46	—	—	162	63	63	3	—	BSPT <sup>1</sup> / <sub>2</sub>	32	M20	—	—
B-6	532	636	212	130	267	208	158	144	82	260	220	180	45	60	—	—	—	—	99	4	5	BSPT <sup>1</sup> / <sub>2</sub>	26	M16	18	64.4

## Type BS (Spring-Return)

## Type BSW (Spring-Return with Manual Operation Device)



### Type BS Actuator Dimensions

mm

Type	E <sub>1</sub>	E <sub>2</sub>	E <sub>3</sub>	E <sub>4</sub>	W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	W <sub>4</sub>	H <sub>1</sub>	H <sub>2</sub>	H <sub>3</sub>	H <sub>4</sub>	H <sub>5</sub>	H <sub>6</sub>	D	D <sub>1</sub>	D <sub>2</sub>	d <sub>1</sub>	d <sub>2</sub>	b	B	ℓ	t	t <sub>1</sub>	M	L	h	j	P <sub>1</sub>	P <sub>2</sub>
BS-0	163	127	—	—	40	62	—	38	75	53	18	40	41	—	—	50	35	12	15	12	50	12	2	—	M6	9	—	—	BSPT <sup>1</sup> / <sub>8</sub>	BSPT <sup>1</sup> / <sub>8</sub>
BS-1	239	166	—	—	30	83	47	38	140	60	18	94	52	46	—	50	35	16	15	12	50	12	2	—	M6	9	—	—	BSPT <sup>1</sup> / <sub>4</sub>	BSPT <sup>1</sup> / <sub>8</sub>
BS-2	335	215	—	—	38	106	62	56	153	77	23	99	68	54	—	70	55	22	21	17	70	17	2	—	M8	12	—	—	BSPT <sup>1</sup> / <sub>4</sub>	BSPT <sup>1</sup> / <sub>8</sub>
BS-3	451	286	—	—	52	140	80	78	180	104	32	104	92	73	—	102	70	30	28.5	23	95	23	3	—	M10	15	—	—	BSPT <sup>1</sup> / <sub>4</sub>	BSPT <sup>1</sup> / <sub>4</sub>
BS-4	575	361	—	—	81	188	100	91	230	138	43	127	130	99	—	125	85	45	41	32	114	32	3	—	M12	19	—	—	BSPT <sup>1</sup> / <sub>2</sub>	BSPT <sup>1</sup> / <sub>4</sub>
BS-5	745	461	—	—	117	256	128	114	225	167	34	91	182	139	—	165	130	45	46	—	162	63	3	—	M20	32	—	—	BSPT <sup>1</sup> / <sub>2</sub>	BSPT <sup>1</sup> / <sub>4</sub>
BS-6	931	638	169	180	130	326	—	—	208	217	144	82	184	—	260	220	180	45	60	—	—	99	4	5	M16	26	18	64.4	BSPT <sup>1</sup> / <sub>2</sub>	BSPT <sup>1</sup> / <sub>2</sub>

### Type BSW Actuator Dimensions

mm

Type	E <sub>1</sub>	E <sub>2</sub>	E <sub>3</sub>	E <sub>4</sub>	E <sub>5</sub>	W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	W <sub>4</sub>	H <sub>1</sub>	H <sub>2</sub>	H <sub>3</sub>	H <sub>4</sub>	H <sub>5</sub>	H <sub>6</sub>	D	D <sub>1</sub>	D <sub>2</sub>	d <sub>1</sub>	d <sub>2</sub>	b	B	ℓ	t	t <sub>1</sub>	M	L	h	j	N	P <sub>1</sub>	P <sub>2</sub>
BSW-0	185	127	218	—	—	40	62	—	38	75	53	18	40	41	—	—	50	35	12	15	12	50	12	2	—	M6	9	—	—	90	BSPT <sup>1</sup> / <sub>8</sub>	BSPT <sup>1</sup> / <sub>8</sub>
BSW-1	259	166	315	—	—	30	83	47	38	140	60	18	94	52	46	—	50	35	16	15	12	50	12	2	—	M6	9	—	—	100	BSPT <sup>1</sup> / <sub>4</sub>	BSPT <sup>1</sup> / <sub>8</sub>
BSW-2	362	215	438	—	—	38	106	62	56	153	77	23	99	68	54	—	70	55	22	21	17	70	17	2	—	M8	12	—	—	140	BSPT <sup>1</sup> / <sub>4</sub>	BSPT <sup>1</sup> / <sub>8</sub>
BSW-3	482	286	582	—	—	52	140	80	78	180	104	32	104	92	73	—	102	70	30	28.5	23	95	23	3	—	M10	15	—	—	200	BSPT <sup>1</sup> / <sub>4</sub>	BSPT <sup>1</sup> / <sub>4</sub>
BSW-4	609	361	734	—	—	81	188	100	91	230	138	43	127	130	99	—	125	85	45	41	32	114	32	3	—	M12	19	—	—	250	BSPT <sup>1</sup> / <sub>2</sub>	BSPT <sup>1</sup> / <sub>4</sub>
BSW-5	795	461	956	—	—	117	256	128	114	225	167	34	91	182	139	—	165	130	45	46	—	162	63	3	—	M20	32	—	—	300	BSPT <sup>1</sup> / <sub>2</sub>	BSPT <sup>1</sup> / <sub>4</sub>
BSW-6	1006	638	169	180	1250	130	326	—	—	208	217	144	82	184	—	260	220	180	45	60	—	—	99	4	5	M16	26	18	64.4	450	BSPT <sup>1</sup> / <sub>2</sub>	BSPT <sup>1</sup> / <sub>2</sub>

## Cylinder Volume and Air Supply Requirements

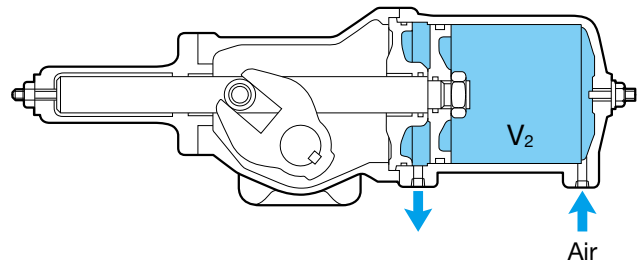
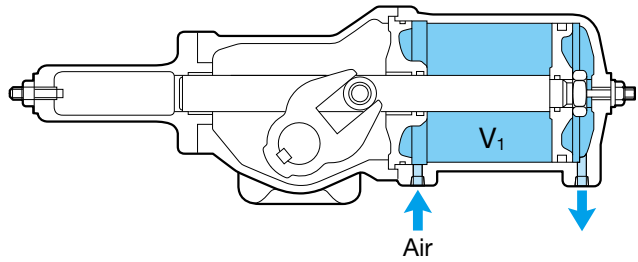
On installation of control system for actuators, air requirements of actuators should be carefully studied to ensure that a sufficient pressure is provided. Actuators should be activated by clean

air which is made free from moisture by air driers. For frequent operation, occasional lubrication is recommended for higher efficiency and longer service life.

### Cylinder volume for Type B actuators

Cylinder Type	V <sub>1</sub>	V <sub>2</sub>
B-0	0.05	0.07
B-1	0.17	0.17
B-2	0.43	0.43
B-3	1.04	1.09
B-4	2.69	2.75
B-5	6.53	6.80
B-6	15.90	14.20

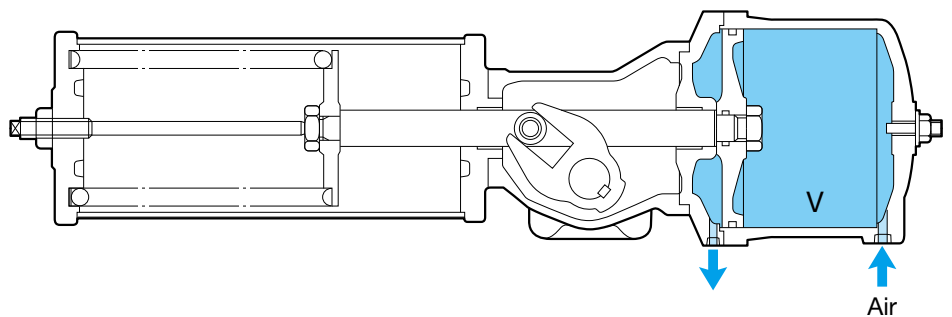
(liters)



### Cylinder volume for Type BS/BSW actuators

Type	Cylinder	V
BS-0/BSW-0		0.17
BS-1/BSW-1		0.33
BS-2/BSW-2		0.82
BS-3/BSW-3		2.23
BS-4/BSW-4		5.39
BS-5/BSW-5		13.70
BS-6/BSW-6		30.20

(liters)



## Air Supply Requirement (Flow Rate)

Actuators should be supplied with the air, sufficient to operate the valve through a full stroke from the open to closed position and vice versa in “t” seconds, as converted into flow rate per minute. The required air volume “Q” is calculated as follows.

$$Q = V \left( \frac{P+0.1013}{0.1013} \right) \times \frac{60}{t} \text{ (Nℓ/min.)}$$

Q= Air supply requirement per minute (Nℓ/min.)

V= Cylinder volume (liters)

V<sub>1</sub> or V<sub>2</sub>, whichever larger, for Type B actuators

P= Supply pressure (MPaG)

t = Time required per stroke (seconds)

All accessories to be mounted on the actuator such as solenoid valves, air filters, regulators, and air supply pipes, should have sufficient capacity to accommodate air flow rate (Q) calculated here.

## Air Consumption

Air consumption means the volume of air discharged into the atmosphere from actuator operation “n” cycles (double strokes) per hour as converted into volumes per minute. The value is calculated as follows.

Type B actuator:

$$Q = (V_1+V_2) \left( \frac{P+0.1013}{0.1013} \right) n \times \frac{1}{60} \text{ (Nℓ/min.)}$$

Type BS or BSW actuator:

$$Q = V \left( \frac{P+0.1013}{0.1013} \right) n \times \frac{1}{60} \text{ (Nℓ/min.)}$$

For selecting compressors and air reservoirs for these actuators, determine the capacities based on the air consumption values obtained from the above calculations, adding an extra 30% as allowance for possible loss of air caused by solenoid valves, accessories, piping, etc.

## ⚠ CAUTION

- For manual operation, ensure in advance to (a) shut off the supply of air and (b) discharge of the air left in the housing to the atmosphere.  
For double-action actuators, the pressure equalizing valve should be opened in advance.
- After manual operation, the lever handle should be removed. Operating actuators with handles attached is extremely dangerous.
- Long bolts securing the spring case should not be loosened or unscrewed, unless required for maintenance, particularly in case of manual operation of spring-return actuators. A compressed spring may suddenly break out, causing an extreme danger.
- KITZ Operation Manual is available for safe and efficient operation of KITZ B Series actuators, on request.

## Manual Operation

For double-action type actuators, manual lever handles for Type B-1 through B-4, and manual operation devices for Type B-5 and B-6 are readily available.

For spring-return type actuators, specify Type BSW on your order for provision of manual operation.



# Air Piping for Actuators

When assembling air supply pipes (either copper pipes or covered copper pipes) to actuators:

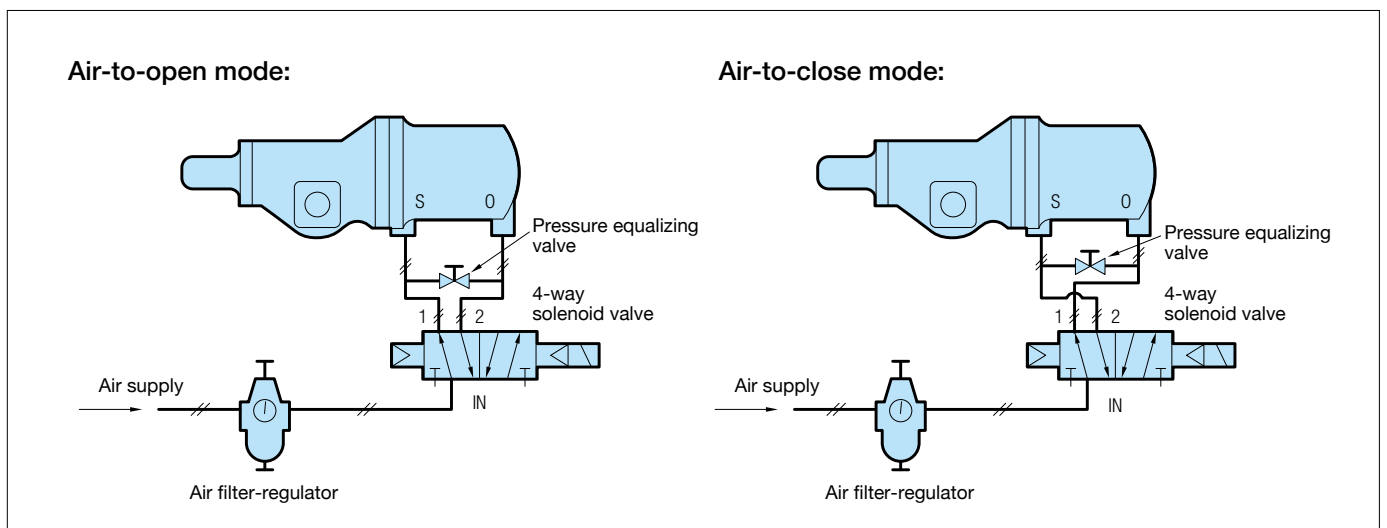
1. Select pipes of suitable diameter and wall thickness, according to the table given below.

2. Seal all pipe joints securely to avoid leakage since accessories are mounted along the pipes between air supply source and actuator. Use PTFE tapes for sealing, making sure that loose tape ends do not extend into the pipe: they may block ports and air supply may be adversely effected.

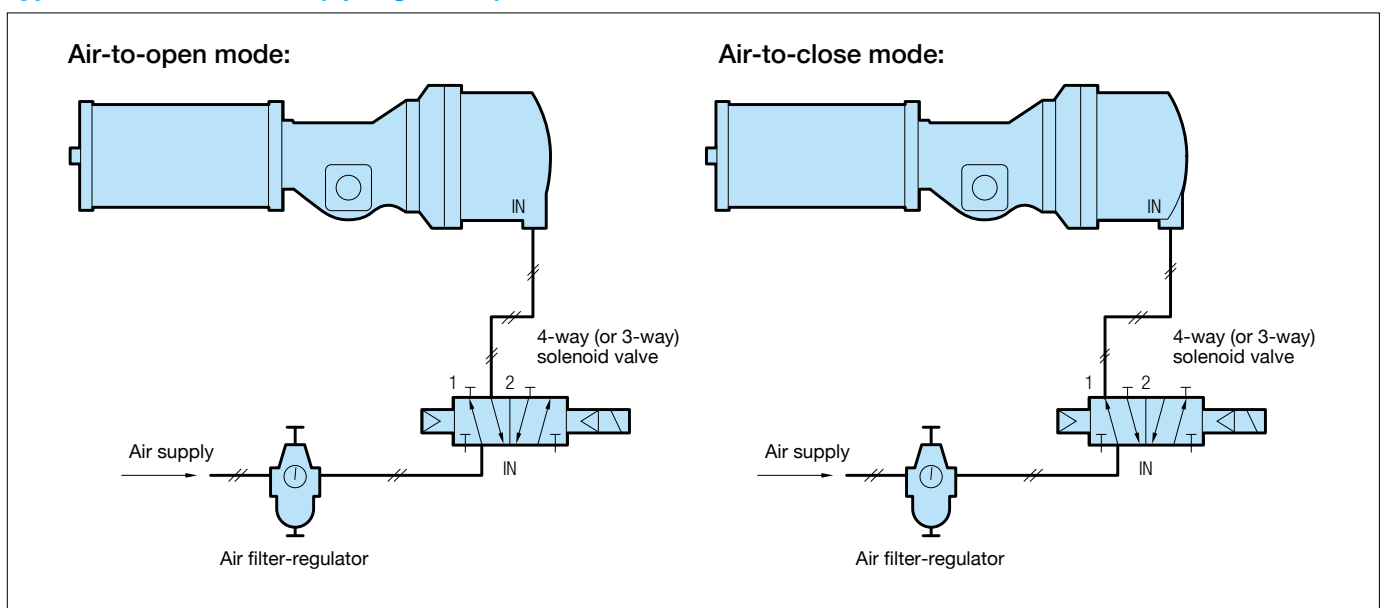
## Diameter of piping port threads (BSPT)

Size	-0	-1	-2	-3	-4	-5	-6
Type B	1/8	1/4	1/4	1/4	1/4	1/2	1/2
Type BS/BSW	1/8	1/4	1/4	1/4	1/2	1/2	1/2

## Type B Actuators (Double-Action)



## Type BS/BSW Actuators (Spring-return)



Circuit diagrams of solenoid valves indicate that they are NOT energized.

# Actuator Sizing

The operating torque of a valve varies according to fluid conditions such as pressure, temperature, velocity, viscosity and density. The following actuator sizes are recommended for typical light or heavy load service with the fluid conditions specified below. Selection of Type B listed here can be also applied to selection of Type BS and Type BSW.

## IMPORTANT

Selection of actuators is very critical when:

- (1) Fluid pressure is higher than that listed below.
- (2) Fluid velocity is extremely high.
- (3) Operational interval exceeds three months.
- (4) Operating pressure is lower than 0.4 MPa (60 psi)

## For TDZ Series (Full Bore Design)

Size	in	1/2 <sup>B</sup>	3/4 <sup>B</sup>	1 <sup>B</sup>	1 1/2 <sup>B</sup>	2 <sup>B</sup>	2 1/2 <sup>B</sup>	3 <sup>B</sup>	4 <sup>B</sup>	5 <sup>B</sup>	6 <sup>B</sup>	8 <sup>B</sup>	10 <sup>B</sup>
	mm	15 <sup>A</sup>	20 <sup>A</sup>	25 <sup>A</sup>	40 <sup>A</sup>	50 <sup>A</sup>	65 <sup>A</sup>	80 <sup>A</sup>	100 <sup>A</sup>	125 <sup>A</sup>	150 <sup>A</sup>	200 <sup>A</sup>	250 <sup>A</sup>
Service Condition		A B C	A B C	A B C	A B C	A B C	A B C	A B C	A B C	A B C	A B C	A B C	A B C
Service Pressure	MPa												
	0.5												
	1.0	B-0	B-0 B-1	B-1		B-2		B-3		B-4		B-5	B-6
	1.5						B-3						
	2.0									B-5			
2.5													

\*Consult KITZ distributors for availability of appropriate actuators.

## For TB Series

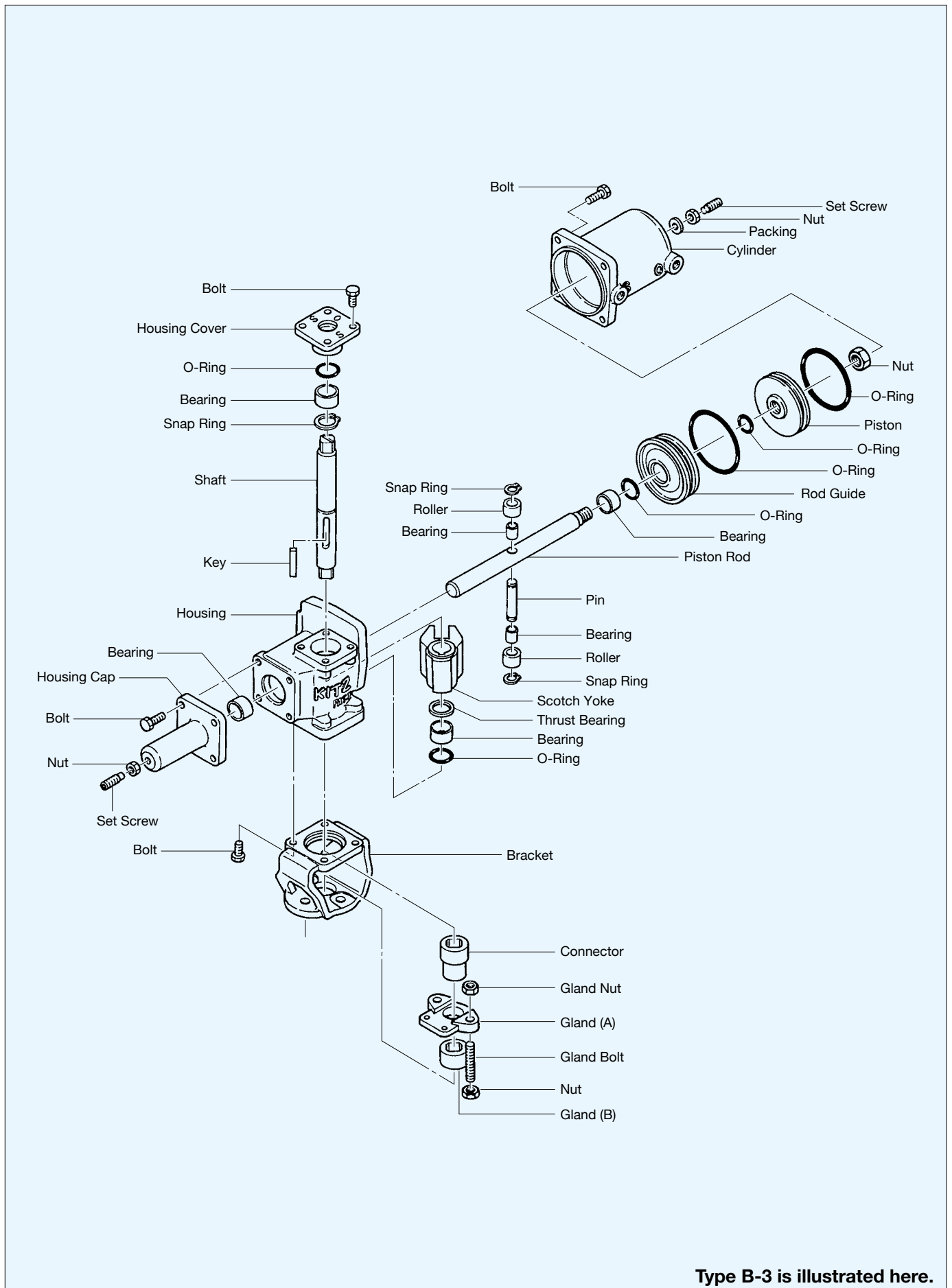
Size	Full Bore Type in(mm)	1/2 <sup>B</sup> (15 <sup>A</sup> )	3/4 (20)	1 (25)	1 1/4 (32)	1 1/2 (40)	2 (50)	2 1/2 (65)	3 (80)	4 (100)	5 (125)	6 (150)	8 (200)	10 (250)
	Reduced Bore Type in(mm)	3/4 <sup>B</sup> (20 <sup>A</sup> )	1 (25)	1 1/4 (32)	1 1/2 (40)	2 (50)	—	3 (80)	4 (100)	5 (125)	6 (150)	8 (200)	10 (250)	12 (300)
Service Condition		A B C	A B C	A B C	A B C	A B C	A B C	A B C	A B C	A B C	A B C	A B C	A B C	A B C
Service Pressure	MPa													
	0.5											B-4		
	1.0	B-0	B-0	B-0	B-1			B-2	B-3					B-6
	1.5					B-2					B-4		B-5	
	2.0						B-3		B-4	B-4	B-5			B-6
2.5														

\*Consult KITZ distributors for availability of appropriate actuators.

## Fluid Condition

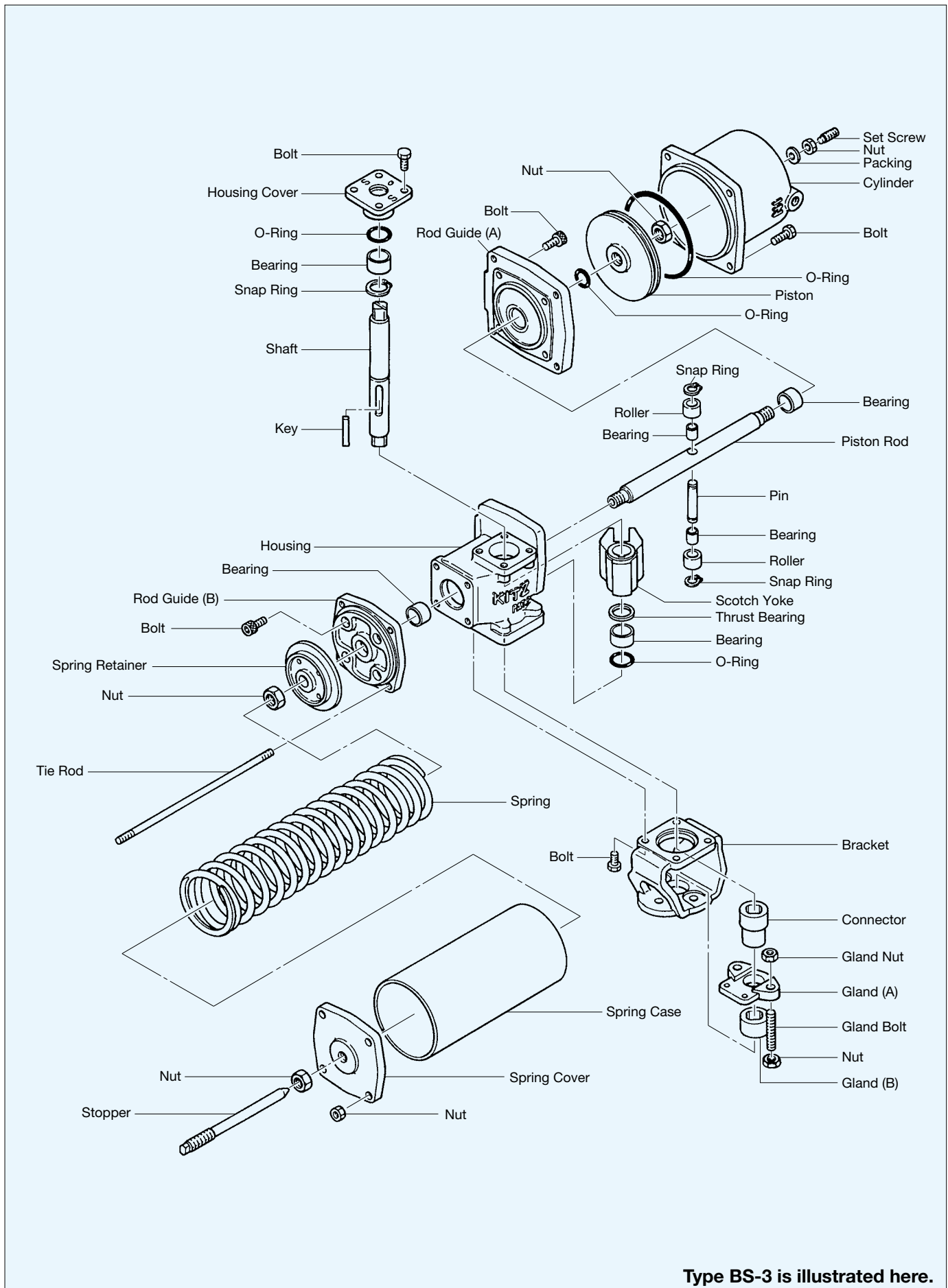
Fluids	Service Condition	Light Load Service	Heavy Load Service
Water		up to 1.0 MPa (150 psi.): A	1.0~2.5 MPa (150~350 psi.): B
Air, steam and gases		up to 0.7 MPa (150 psi.): A	0.7~1.8 MPa (100~255 psi.): B
Highly viscous fluid			up to 1.0 MPa (150 psi.) : B
Kerosene, naphtha, alcohol, and other solvents			up to 1.0 MPa (150 psi.) : B
Oil-free service			up to 1.0 MPa (150 psi.) : B
Slurry and other liquids containing foreign objects			up to 1.0 MPa (150 psi.) : C
Service temperature: Fluids temperature		See valve seat rating of "Ball Valves Catalog" (E-201)	

# Construction Details of Type B Actuators

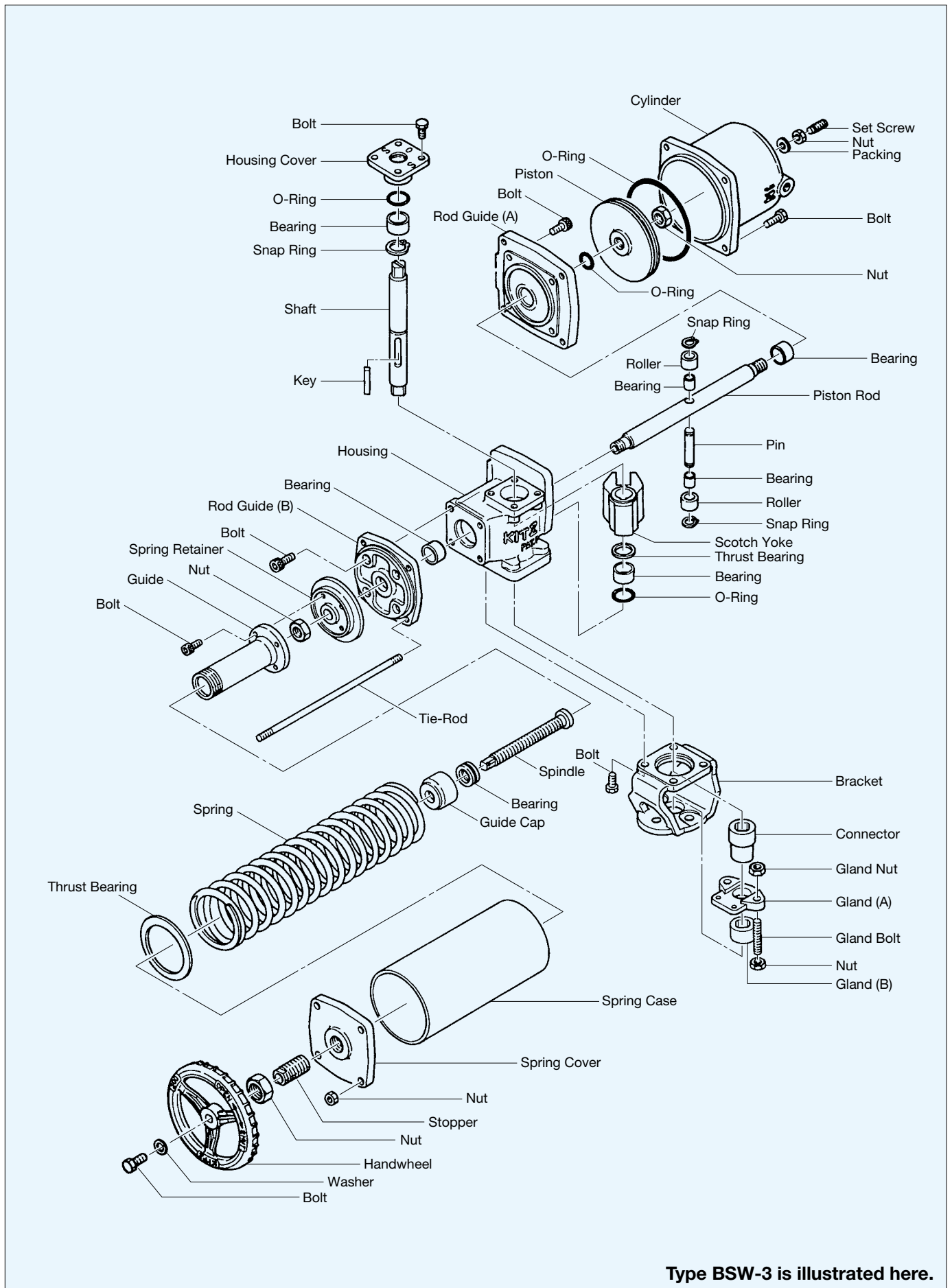


Type B-3 is illustrated here.

# Construction Details of Type BS Actuators



# Construction Details of Type BSW Actuators



Type BSW-3 is illustrated here.

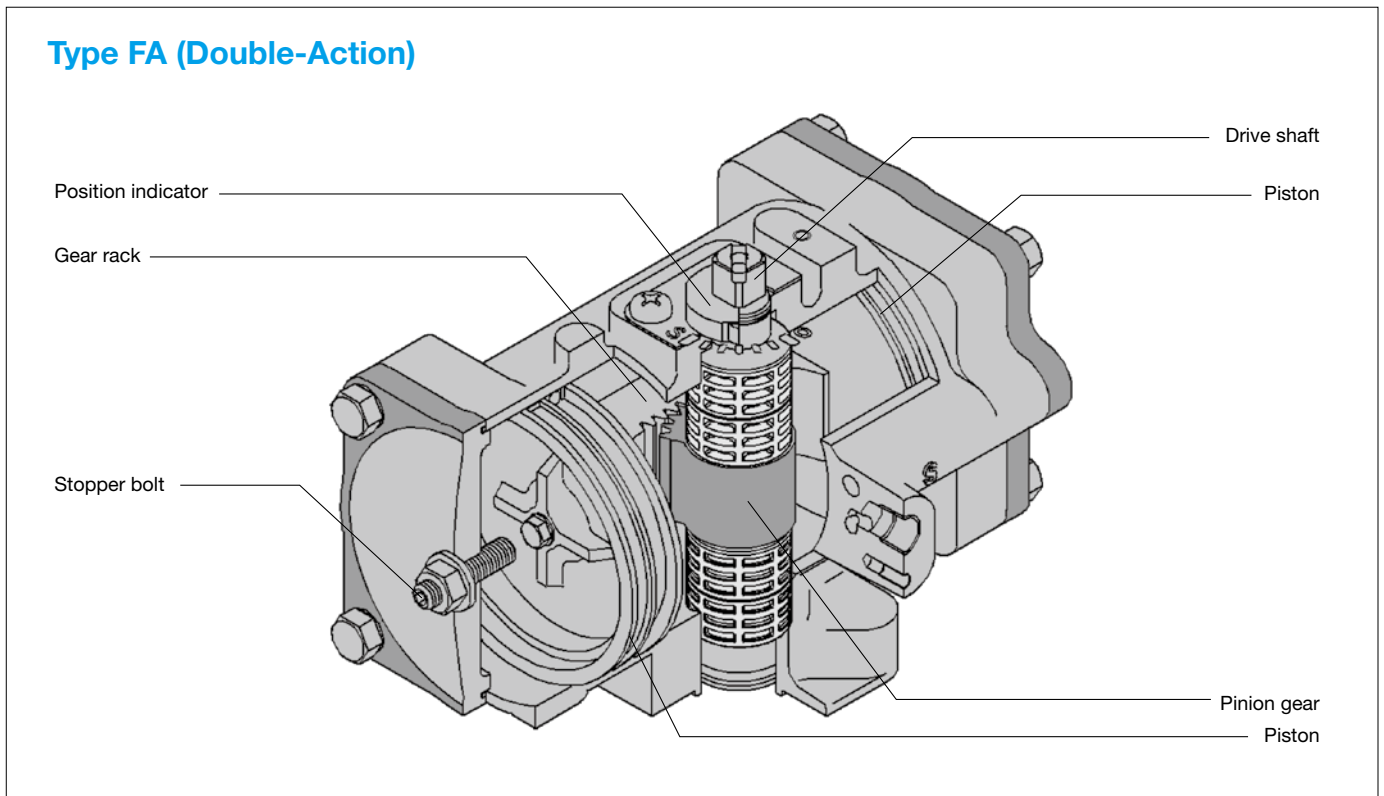
## Optional Accessories

The following optional accessories are recommended for KITZ B Series actuators.  
For supply of other accessories, contact your local KITZ distributors.

Product code	Purpose	Specifications
<b>Limit Switch</b>  <b>LS</b> Weather-proof <b>LS-F</b> Explosion-proof	For initiating electric signals to check open or close position of the valve: A separate limit switch is recommended for each of open and close indications.	<b>LS</b> AC: 10 A/125 V 10 A/250 V 10 A/480 V DC: 0.8 A/115 V 0.4 A/230 V <b>LS-F</b> AC: 5 A/125 V 5 A/250 V DC: 0.8 A/125 V 0.4 A/250 V Contact circuit: 2-Circuit double break
<b>Solenoid Valve</b>  <b>SOV</b> Weather-proof <b>SOV-F</b> Explosion-proof	Flow switching over air flow by electric signal; 4-way solenoid valves for double-action actuators, 4-way solenoid valves for spring-return actuators, with one OUT port plugged, or 3-way solenoid valves used.	Connected pipe: BSPT1/4 Working pressure: 0~0.97 MPa (0~9.9 kgf/cm <sup>2</sup> or 0~140 psi.) Orifice diam: 6 mm Electric current: 100 V/50 Hz 100 V/60 Hz 110 V/60 Hz 200 V/50 Hz 200 V/60 Hz 220 V/60 Hz Supply source connection Weather-proof: DIN terminals or terminal boxes Explosion-proof: Electric wire pipe threading
<b>Air Filter-Regulator</b>  <b>F + R</b> (With pressure gauge)	For removing moisture, water and other foreign objects from operating air and for regulating air pressure at a desire level.	Connected pipe: BSPT1/4, BSPT1/2 Working pressure: Max. inlet pressure; 0.97 MPa (9.9 kgf/cm <sup>2</sup> or 140 psi.) Setting pressure range: Max. outlet pressure; 0.04~0.83 MPa (0.5~8.5 kgf/cm <sup>2</sup> or 8~120 psi.)
<b>Speed Controller</b>  <b>SP</b>	For reducing actuator operating speeds.	Connected pipe: BSPT1/8, BSPT1/4, BSPT1/2 Operation pressure: 0.97 MPa (9.9 kgf/cm <sup>2</sup> or 140 psi.) max.
<b>Quick Exhaust Valve</b>  <b>QE</b>	For increasing actuator operation speed. This device can increase operation speed only when the actuator is operated by the spring. Positioners cannot be used together with a quick exhaust valves.	Connected pipe: BSPT1/4, BSPT1/2 Working pressure: 0.97 MPa (9.9 kgf/cm <sup>2</sup> or 140 psi.) max.
<b>Valve Positioner</b>  <b>P</b> (Complete with pressure gauge)	For controlling the flow rate. A positioner can be mounted on either double-action or spring-return actuators. Operation mode, air-to-open or air-to-close, can be changed simply by reversing cam direction.	Connected pipe: BSPT1/4 (pressure gauge: BSPT1/8) Supply pressure: 0.29~0.69 MPa (3~7 kgf/cm <sup>2</sup> or 43~100 psi.) Signal pressure: 0.02~0.1 MPa (0.2~1.0 kgf/cm <sup>2</sup> or 3~15 psi.) or specified Linearity: ±2% max. Hysteresis: 1% max. Air consumption: 20 Nℓ/min. max. (at supply pressure 0.49 MPa (5 kgf/cm <sup>2</sup> or 70 psi.))
<b>Silencer</b>  <b>K</b>	For reducing the air exhaust noise of solenoid valves. The device is installed at the exhaust port of a solenoid valve.	Connected pipe: BSPT1/8, BSPT1/4, BSPT1/2 Working pressure: 0.9 MPa (9.2 kgf/cm <sup>2</sup> or 130 psi.) max.
<b>Air Filter</b>  <b>F</b>	For removing moisture, water and other foreign objects from operating air.	Connected pipe: BSPT1/4, BSPT1/2 Working pressure: 0.97 MPa (9.9 kgf/cm <sup>2</sup> or 140 psi.) max.
<b>Pressure Equalizing Valve</b>  <b>C</b>	For equalizing the internal air pressure to the atmospheric level for manual operation of actuators.	Connected pipe: BSPT1/4 Working pressure: 1.37 MPa (14 kgf/cm <sup>2</sup> or 200 psi.) max.

Above specifications are KITZ standards. Different specifications are optionally available.

## Features of KITZ F Series Pneumatic Actuators



### Featured by the utmost handling ease and extended service life with high operational efficiency

#### Easy answers to engineering modification requirements

- Position indicator can be adjusted by 90°, when actuator mounting position is turned by 90°, for local piping or operating convenience.
- Actuator shaft rotating angle (valve opening/closing range) can be adjusted with optional longer stopper bolt to full 90° rotation for plus/minus 7°.
- Standard AIR-FAIL-CLOSE mode can be converted to AIR-FAIL-OPEN mode by means of mounting of spring cartridge on the actuator housing reverse end. (spring-return type only)
- Replacing modular units of blowoff-proof spring cartridge enables accommodation of higher output torque or lower operating pressure. (spring-return type only)
- Valve actuation mode is convertible between double-action and spring-return with addition or deletion of spring cartridge.

#### Economic advantage

Use of monobloc casting of piston-rack assembly results in reduced housing dimensions by 10% to 15% (compared with KITZ D Series actuators), and

saves air consumption for valve actuation.

#### Extended service life with monobloc casting of two pistons and a gear-rack

Pitch line of a gear-rack is positioned in the center of actuator housing, and two pistons are cast in integration with gear-rack as one-piece unit. This helps to keep piston position in parallel during actuator travel.

#### Light and compact housing

Employment of diecast aluminum for housings and piston-rack assemblies has reduced the actuator weight by 20% to 40% (compared with KITZ D Series actuators) for better torque-to-weight ratio.

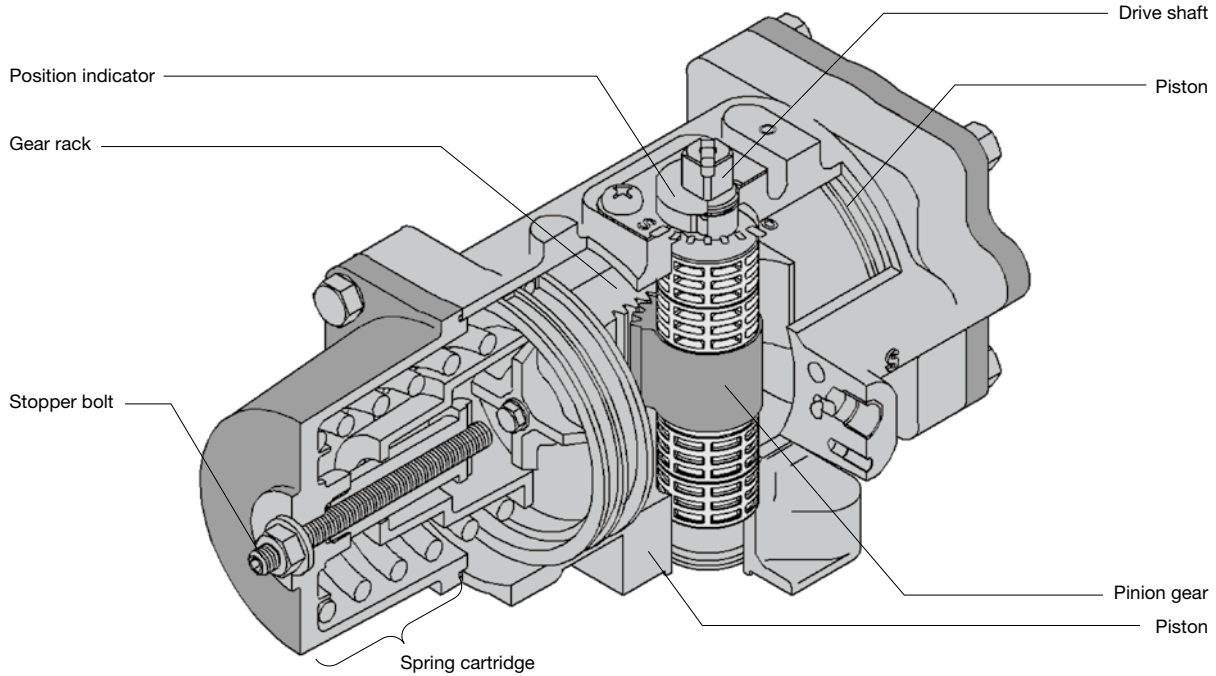
#### Conformity to international standards

NAMUR VDI/VDE 3845 designs are used for tubeless mounting of solenoid valve and switchbox on actuator housing besides the conformity to ISO 5211 requirements for valve mounting flanges. The stem top design also conforms to NAMUR dimensions.

#### Actuators can be directly mounted to KITZ DJ, XJ Series Butterfly Valves

Optional adaptors (connectors) to the valves on the bottom of actuators can be provided for wide mounting variations

## Type FAS (Spring-Return)



## Actuator Output Torque

### Double-action

unit : N·m (LB.-IN.)

Type	Operating pressure (air)		
	0.3 MPa (45 psi)	0.4 MPa (60 psi)	0.5 MPa (75 psi)
FA-1	14.12 ( 125)	18.83 ( 166)	23.54 ( 208)
FA-2	33.41 ( 296)	44.54 ( 394)	55.68 ( 493)
FA-3	67.37 ( 597)	89.83 ( 795)	112.3 ( 994)
FA-4	134 (1186)	179 (1584)	223 (1974)
FA-5	249 (2204)	332 (2939)	415 (3672)
FA-6	588 (5204)	784 (6939)	980 (8674)

### Spring-return

unit : N·m (LB.-IN.)

Type	Spring rating	Operating pressure (air)						Operating force (spring)	
		0.3 MPa (45 psi)		0.4 MPa (60 psi)		0.5 MPa (75 psi)		0° ※3	90° ※4
		0° ※1	90° ※2	0° ※1	90° ※2	0° ※1	90° ※2		
FAS-1	3K (45 psi)	9.25 ( 82)	6.51 ( 58)	14.06 ( 124)	11.32 ( 100)	18.87 ( 167)	16.12 ( 143)	5.18 ( 46)	7.92 ( 70)
	4K (60 psi)	—	—	11.66 ( 103)	7.64 ( 68)	16.47 ( 146)	12.45 ( 110)	7.58 ( 67)	11.60 ( 103)
	5K (75 psi)	—	—	—	—	14.60 ( 129)	9.60 ( 85)	9.44 ( 84)	14.45 ( 128)
FAS-2	3K (45 psi)	20.19 ( 179)	13.68 ( 121)	31.32 ( 277)	24.81 ( 220)	42.45 ( 376)	35.95 ( 318)	13.21 ( 117)	19.71 ( 174)
	4K (60 psi)	—	—	26.76 ( 237)	18.02 ( 159)	37.89 ( 335)	29.15 ( 258)	17.76 ( 157)	26.50 ( 235)
	5K (75 psi)	—	—	—	—	33.39 ( 296)	22.43 ( 199)	22.26 ( 197)	33.22 ( 294)
FAS-3	3K (45 psi)	42.83 ( 379)	32.72 ( 290)	64.00 ( 566)	52.89 ( 468)	87.16 ( 771)	75.06 ( 664)	23.68 ( 210)	35.79 ( 317)
	4K (60 psi)	—	—	53.52 ( 474)	35.54 ( 315)	75.69 ( 670)	57.71 ( 511)	35.16 ( 311)	53.14 ( 470)
	5K (75 psi)	—	—	—	—	66.79 ( 591)	44.41 ( 393)	44.06 ( 390)	66.43 ( 588)
FAS-4	3K (45 psi)	83.00 ( 735)	59.40 ( 526)	129 (1142)	106 ( 938)	175 (1549)	152 (1345)	55.60 ( 492)	79.10 ( 700)
	4K (60 psi)	—	—	110 ( 974)	74.60 ( 660)	157 (1390)	121 (1071)	74.30 ( 658)	110 ( 974)
	5K (75 psi)	—	—	—	—	138 (1221)	93.20 ( 825)	93.10 ( 824)	138 (1221)
FAS-5	3K (45 psi)	155 (1372)	109 ( 965)	240 (2124)	194 (1717)	325 (2877)	279 (2469)	101 ( 894)	147 (1301)
	4K (60 psi)	—	—	203 (1797)	138 (1221)	288 (2549)	222 (1965)	138 (1221)	203 (1797)
	5K (75 psi)	—	—	—	—	255 (2257)	171 (1514)	171 (1514)	254 (2248)
FAS-6	3K (45 psi)	354 (3133)	249 (2204)	551 (4877)	446 (3948)	748 (6621)	643 (5691)	237 (2098)	342 (3027)
	4K (60 psi)	—	—	473 (4187)	326 (2885)	670 (5930)	510 (4514)	326 (2788)	475 (4204)
	5K (75 psi)	—	—	—	—	591 (5231)	392 (3470)	394 (3487)	593 (5249)

※1 At starting point (close position) ※2 At ending point (open position) ※3 At ending point (close position) ※4 At starting point (open position)

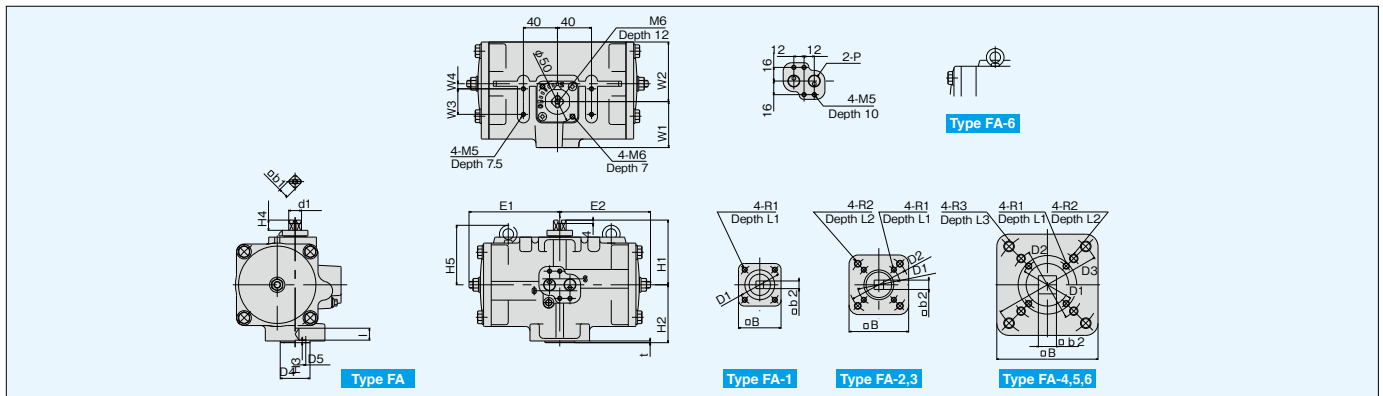


# Specifications and Dimensions

Operating medium	: Compressed instrument air or nitrogen gas
Operating pressure	: Standard operating pressure 0.4 MPa
Operating pressure range	: 0.3 MPa to 0.7 MPa *
Cylinder test pressure	: 0.97 MPa
Shaft rotating angle	: 90°±7°
Service temperature	: -20°C to +80°C (Supplied air should not be frozen.)
Opening degree indication	: Indicator has 15 degree graduation
Valve mounting flange	: ISO 5211
Accessory mounting connection	: NAMUR VDI/VDE 3845
Coating	: Baked Polyester Resin Coating

\*Be consulted by KITZ for non-standard operating pressure.

## Type FA (Double-action)

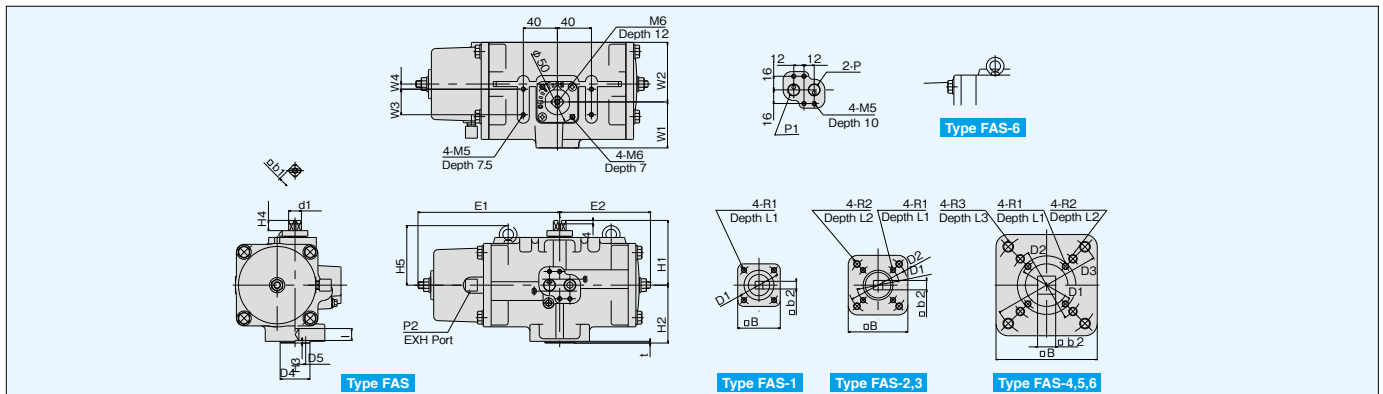


## Type FA Dimensions

Type	E <sub>1</sub>	E <sub>2</sub>	W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	W <sub>4</sub>	H <sub>1</sub>	H <sub>2</sub>	H <sub>3</sub>	H <sub>4</sub>	H <sub>5</sub>	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	d <sub>1</sub>	b <sub>1</sub>	b <sub>2</sub>	B	l	t	R <sub>1</sub> ×L <sub>1</sub>	R <sub>2</sub> ×L <sub>2</sub>	R <sub>3</sub> ×L <sub>3</sub>	P	Weight (kg)
FA-1	87	87	50	54	30	0	70	55	3	12	—	50	—	—	35	25	15	12	9	50	16	2	M6 × 9	—	—	BSPT1/4	1.7
FA-2	107	107	54	70	30	6	80	68	3	12	—	50	70	—	35	30	15	12	11	70	16	2	M6 × 9	M8 × 12	—	BSPT1/4	2.9
FA-3	128	128	57	87	30	13	86	78	3	12	—	50	70	—	35	32	21	17	13	70	25	2	M6 × 9	M8 × 12	—	BSPT1/4	4.4
FA-4	160	160	68	111	30	21	108	96	4	12	—	50	70	102	55	40	21	17	17	95	27	3	M6 × 9	M8 × 12	M10×15	BSPT1/4	8.0
FA-5	208	208	78	135	30	30	132	116	5	20	—	70	102	125	55	50	29	23	27	113	34	3	M8×12	M10×15	M12×18	BSPT1/4	13.6
FA-6	268	268	101	178	30	45	152	125	5	20	157	70	102	125	70	60	41	32	27	134	34	3	M8×12	M10×15	M12×18	BSPT1/4	28.2

unit : mm

## Type FAS (Spring-return)



## Type FAS Dimensions

Type	E <sub>1</sub>	E <sub>2</sub>	W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	W <sub>4</sub>	H <sub>1</sub>	H <sub>2</sub>	H <sub>3</sub>	H <sub>4</sub>	H <sub>5</sub>	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	d <sub>1</sub>	b <sub>1</sub>	b <sub>2</sub>	B	l	t	R <sub>1</sub> ×L <sub>1</sub>	R <sub>2</sub> ×L <sub>2</sub>	R <sub>3</sub> ×L <sub>3</sub>	P1	P2	Weight (kg)
FAS-1	132	87	50	54	30	0	70	55	3	12	—	50	—	—	35	25	15	12	9	50	16	2	M6 × 9	—	—	BSPT1/4	BSPT1/8	2.1
FAS-2	166	107	54	70	30	6	80	68	3	12	—	50	70	—	35	30	15	12	11	70	16	2	M6 × 9	M8 × 12	—	BSPT1/4	BSPT1/8	3.8
FAS-3	203	128	57	87	30	13	86	78	3	12	—	50	70	—	35	32	21	17	13	70	25	2	M6 × 9	M8 × 12	—	BSPT1/4	BSPT1/8	6.4
FAS-4	290	160	68	111	30	21	108	96	4	12	—	50	70	102	55	40	21	17	17	95	27	3	M6 × 9	M8 × 12	M10×15	BSPT1/4	BSPT1/8	12.8
FAS-5	363	208	78	135	30	30	132	116	5	20	—	70	102	125	55	50	29	23	27	113	34	3	M8×12	M10×15	M12×18	BSPT1/4	BSPT1/8	23.4
FAS-6	483	268	101	178	30	45	152	125	5	20	157	70	102	125	70	60	41	32	27	134	34	3	M8×12	M10×15	M12×18	BSPT1/4	BSPT1/8	50.0

unit : mm

# Operating Mechanism

## Type FA (Double-action)

- (1) Air pressure supplied into the chamber **A** through port ①, pushes gear rack with two pistons outward, and discharges the air residue (chamber **B**) through port ②.
- (2) The gear rack rotates the pinion gear and the shaft counter-clockwise, to drive the valve.
- (3) Reverse supply of the air pressure activates reverse valve operation.

## Type FAS (Spring-return)

- (1) Air pressure supplied into the chamber **A** through port ①, pushes gear rack with two pistons outward, compresses the spring and discharges the air residue through port ②.
- (2) The gear rack rotates the pinion gear and the shaft counter-clockwise, to drive the valve.
- (3) At the moment the air in the chamber **A** is discharged through the solenoid valve, the spring force pushes the pistons to the reverse direction, and the gear rack activates rotation of the shaft clockwise to reversely operate the valve.

### Cylinder volume

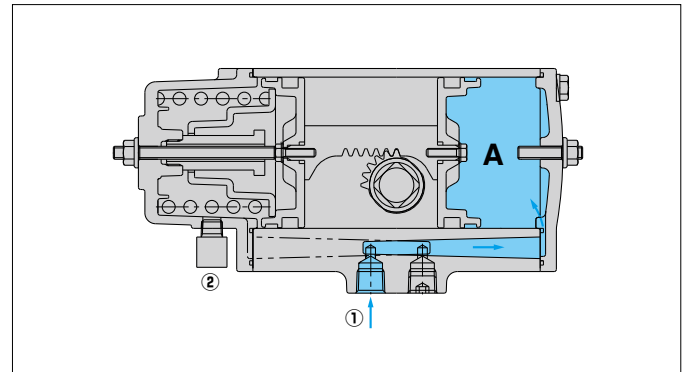
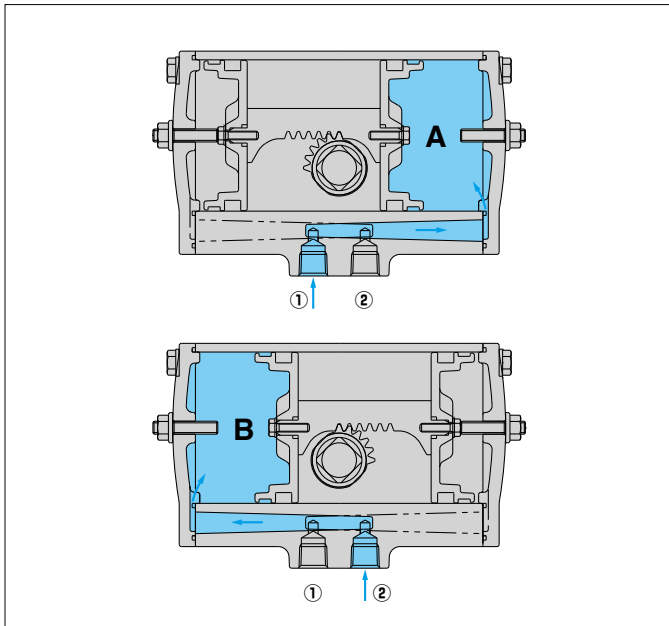
unit : ℓ

Type	Chamber A	Chamber B
FA-1	0.15	0.15
FA-2	0.31	0.31
FA-3	0.61	0.61
FA-4	1.29	1.29
FA-5	2.29	2.29
FA-6	5.27	5.27

### Cylinder volume

unit : ℓ

Type	Chamber A
FAS-1	0.15
FAS-2	0.31
FAS-3	0.61
FAS-4	1.29
FAS-5	2.29
FAS-6	5.27



# Actuator Sizing

The sizing shown below is based on the following conditions.

## Ball valves

Operating pressure	0.4 MPa
Fluid type	<ul style="list-style-type: none"> <li>Fresh water or lubricant, Max. 1.0 MPa</li> <li>(*The figures shown in the table indicate service pressure limit. Unit MPa)</li> <li>Air gas or steam, Max. 0.7 MPa</li> </ul>
Fluid temperature	-20oC to +230oC (Limited within seat rating)

Be consulted by KITZ, if:

- ① Valves handle
  - a. Solvents, such as kerosene, naphtha or alcohol.
  - b. Powder, slurry or dehydrated cake.
  - c. Vacuum or any other service requiring oil free treatment.
- ② Valves are not operated for more than 3 months.
- ③ Valves are used as a control valve.

## Butterfly valves

Operating pressure	0.4 MPa
Fluid type	<ul style="list-style-type: none"> <li>Smooth fluid</li> <li>Fresh water, lubricant (Max 1,000 cp)</li> </ul>
Velocity	Up to 2 m/sec
Fluid temperature	0oC to Max. working temperature

Type, temperature and pressure of the fluid shall be determined by the rubber seat. Valve selection must properly be made based on these conditions.

Extra care shall be taken on velocity, if valves are used at the pump exit.

## Type FA (Double-action)

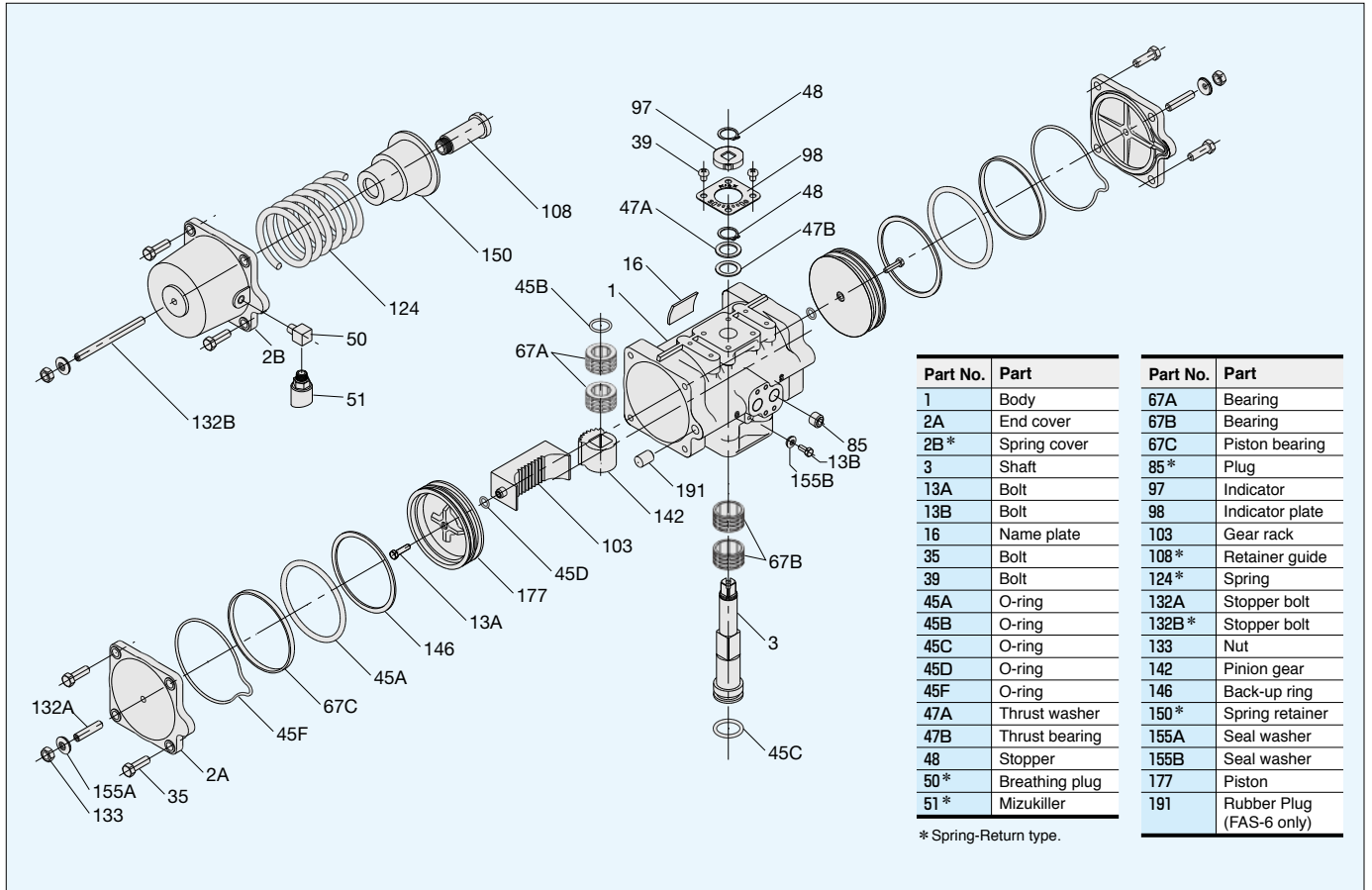
Type	Bore	Shell Material	Class	Conection	Size Product coding	Size																			
						A	10	15	20	25	32	40	50	65	80	100	125	150	200	250	300				
						B	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6	8	10	12				
Ball Valve	Full Bore	Cast Iron	JIS 10K	Threaded	10FCT																				
				Flanged	10FCTB																				
					10STBF																		FA-5	FA-6	
		Threaded		10UT																					
		Flanged		10/150UTB, 10/150UTDZ																					
				20/300UTB, 20/300UTDZ																					
	Carbon Steel	JIS 10K Class 150	Flanged	10/150SCTB, 10/150SCTDZ																					
		JIS 20K Class 300		20/300SCTB, 20/300SCTDZ																					
	Reduced Bore	Stainless Steel	JIS 10K Class 150	Flanged	10UTR · 150UTR																				
			JIS 20K Class 300		20UTR · 300UTR																				
		Carbon Steel	Class 150		150SCTR																				
			Class 300		300SCTR																				
Full Bore (3 way)	Stainless Steel	JIS 10K	Flanged	10UTB4T (L) A																					
Full Bore (PFA Lining)				10UTBLN																					
Butterfly Valve	Aluminum	JIS 10K	Wafer	10XJME																					
				10XJSME																					
	Ductile Iron			JIS 16K BS PN16	10DJ																				
				16DJ, PN16DJ																					

# Actuator Sizing

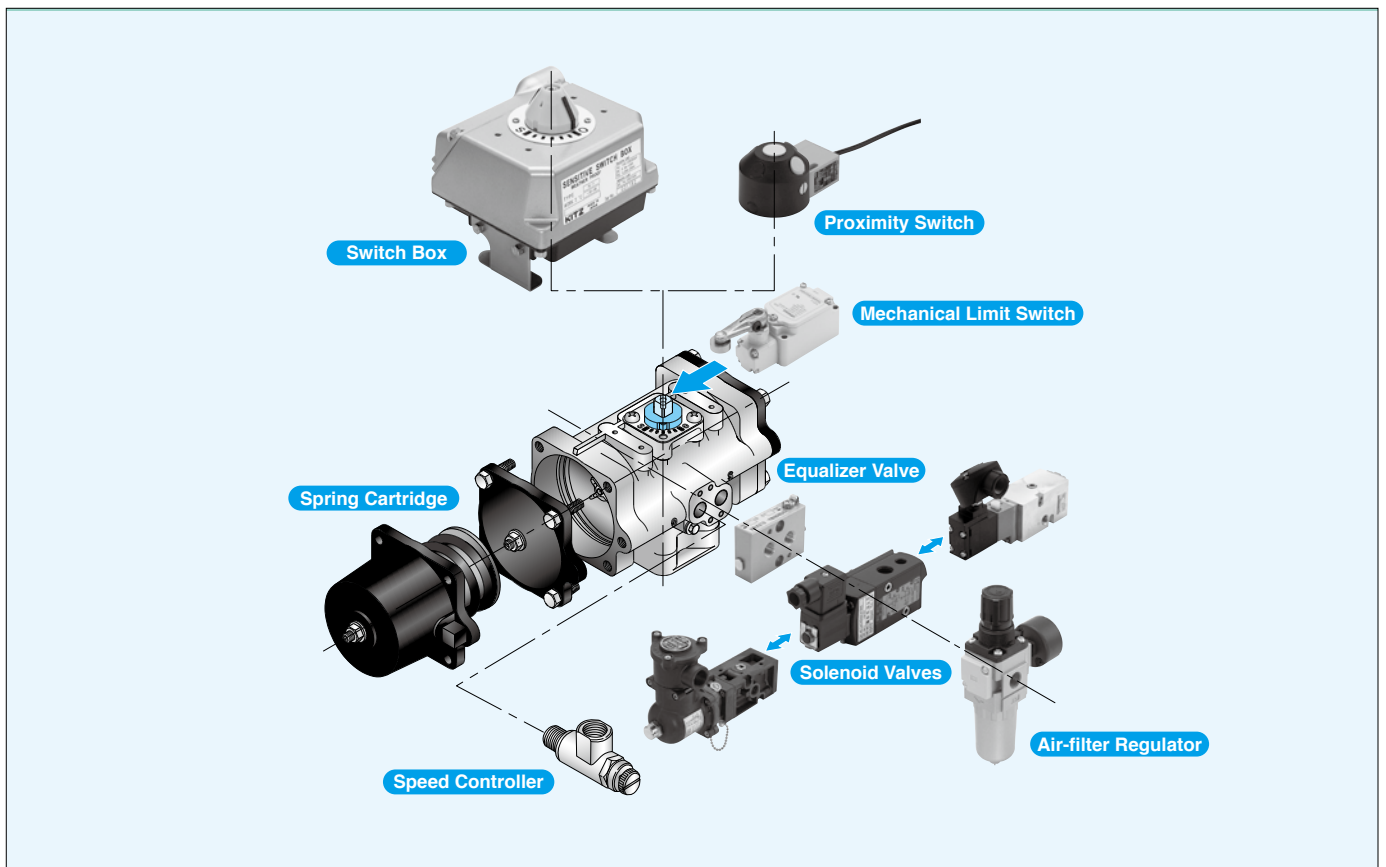
## Type FAS (Spring-Return)

Type	Bore	Shell Material	Class	Connection	Size Product coding	A	10	15	20	25	32	40	50	65	80	100	125	150	200	250	300		
						B	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6	8	10	12		
Ball Valve	Full Bore	Cast Iron	JIS 10K	Threaded	10FCT																		
				Flanged	10FCTB																		
		Ductile Iron	JIS 10K	Flanged	10STBF																		
				Threaded	10UT																		
		Stainless Steel	JIS 10K Class 150	Flanged	10/150UTB, 10/150UTDZ			FAS-1		FAS-2		FAS-3		FAS-4		FAS-5		FAS-6					
					20/300UTB, 20/300UTDZ																		
	Carbon Steel	JIS 10K Class 150	Flanged	10/150SCTB, 10/150SCTDZ																			
				20/300SCTB, 20/300SCTDZ																			
	Reduced Bore	Stainless Steel	JIS 10K Class 150	Flanged	10UTR · 150UTR																		
					20UTR · 300UTR																		
		Carbon Steel	Class 150	Flanged	150SCTR																		
					300SCTR																		
Full Bore (3 way)	Stainless Steel	JIS 10K	Flanged	10UTB4T (L) A			FAS-2		FAS-3		FAS-4	FAS-5		FAS-6									
				10UTBLN			FAS-1		FAS-2		FAS-3	FAS-4		FAS-5									
Full Bore (PFA Lining)	Stainless Steel	JIS 10K	Flanged	10UTB4T (L) A			FAS-2		FAS-3		FAS-4	FAS-5		FAS-6									
				10UTBLN			FAS-1		FAS-2		FAS-3	FAS-4		FAS-5									
Butterfly Valve	Aluminum	JIS 10K	Wafer	10XJME								FAS-2		FAS-3		FAS-4		FAS-5	FAS-6				
				10XJSME																			
	Ductile Iron	JIS 16K BS PN16	Wafer	10DJ																			
				16DJ, PN16DJ																			

## Construction Details



## Optional Accessories



## Valve and Actuator Handling Instructions

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1. Before installing valves on pipelines, remove welding chips, scales and other foreign objects from the ports; flush the insides thoroughly.
2. Both pneumatically operated ball and butterfly valves can be installed horizontally or vertically. Fluid can be discharged from either port. However, air filters and lubricators attached to actuators should be correctly positioned in consideration of the weight of actuators which may cause an extra stress on the pipeline.
3. For convenience of maintenance service, provide an adequate space around valves, such as 300 mm above, 500 mm below, and 300 mm wide from the sides.
4. Ambient temperatures allowable for actuators ranges between  $-20^{\circ}\text{C}$  and  $+60^{\circ}\text{C}$ . Valves should be adequately protected if the ambient temperature exceeds this range.
5. If a pipeline vibrates, take appropriate prevention measures.
6. In corrosive atmospheres such as  $\text{SO}_2$  or  $\text{Cl}_2$ , corrosive gas should not be intruded into the air supply.
7. Use air compressors and air reservoirs with a capacity of 130% of the piping capacity and air consumption.  
The maximum supply air pressure for KITZ B Series actuators is 0.7 MPa (or 100 psi).
8. During the initial operation, or after suspension of operation exceeding 3 month, operating torque may exceed the specified level. In these cases, actuators should be manually operated several times before starting pneumatic activation.

## Precautions

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### CAUTION

- Ensure to read and follow instructions of operation manual when handling F Series actuators.
- Ensure to select F Series actuators in consideration of specifications of this catalog.
- Refer to the valve catalogs for detailed specifications of the valves to mount actuators.
- Cylinder bodies of double-action type and spring-return type are interchangeable. Double-action type can be converted to spring return type by changing spring cartridge.
- Actuator sizing may differ for the particular service conditions when converting double-action type to spring-return type. Contact KITZ Corporation for proper sizing.
- Standard operating pressure built-in spring return type is 4K. (0.4 to 0.7 MPa)
- Spring cartridge with different operating pressures 3K (0.3 to 0.7 MPa) and 5K (0.5 to 0.7 MPa) is optionally available. Contact KITZ Corporation for actuator sizing of 3K and 5K types.
- Do not use excessive operating pressures to actuators, which will damage internal parts and result in malfunction.
- Ensure to use compressed instrumentation air or nitrogen gas as operating medium.
- It will damage internal and external parts to use actuators under corrosive environments.
  1. Holding valve position  
KITZ pneumatic actuators do not assure no leakage. Actuators do not hold valve positions long time without continuous air supply. If you need to hold valve position long time without continuous air supply, contact KITZ Corporation or its distributors.
  2. Internal air residue of spring-return type actuators  
Output torques of spring-return type actuators indicate valves without internal air residue remains inside their cylinders. Please design your systems to be able to exhaust internal air residue at spring-return action. If internal air residue remains in the cylinders, the output torque will be small and valves do not open or close by spring-return action.
- Air supply inlet threads are BSPT $\frac{1}{4}$  as standard. Ensure to use piping tubes which diameters are  $\phi 6$  and smaller. Contact KITZ Corporation to reduce operating time with larger diameter piping tube.
- It is recommended to use KITZ standard accessories for F Series actuators.

### CAUTION

- Ensure to select solenoid valves suitable for the service conditions.
- Specify piping positions when using actuated valves with positioners since piping positions may make opening slip.
- A part to avoid water to enter into a spring case (“Mizukiller”) is installed on spring-return type actuator’s breathing port. And the Mizukiller is sealed with a sticker. Remove the sticker before running automated operation.  
(For products shipped before December 2009, a cap is installed on spring-return type actuator’s breathing port instead of the Mizukiller. Remove the cap before running automated operation. If the cap remains, actuator speed may become slow.)
- When Type FAS spring-return actuator is used outside or in wet condition, the Mizukiller has to be installed into it. If the Mizukiller is not installed, water may enter into a spring cartridge and cause a malfunction.

### WARNING

- Spring cartridge for spring-return type has strongly compressed built-in spring. Careful handling of spring cartridge is required to avoid its blowing out. Do not loosen stopper bolt of spring cartridge.
- Do not remove end covers and spring covers or disassemble actuators while they are pressurized.

### DISCLAIMER

- KITZ does not take any responsibilities for damages arising from a result of natural disasters, accidents or fire which KITZ is not liable for, conduct of a third party, intentional act, misuse or use under abnormal conditions by a customer.
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## CAUTION

Pressure-temperature ratings and other performance data published in this catalog have been developed from our design calculation, in-house testing, field reports provided by our customers and/or published official standards or specifications. They are good only to cover typical applications as a general guideline to users of KITZ products introduced in this catalog.

For any specific application, users are kindly requested to contact KITZ Corporation for technical advice, or to carry out their own study and evaluation for proving suitability of these products to such an application. Failure to follow this request could result in property damage and/or personal injury, for which we shall not be liable.

While this catalog has been compiled with the utmost care, we assume no responsibility for errors, impropriety or inadequacy. Any information provided in this catalog is subject to from-time-to-time change without notice for error rectification, product discontinuation, design modification, new product introduction or any other cause that KITZ Corporation considers necessary. This edition cancels all previous issues.

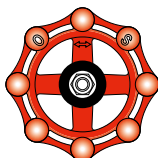
Read instruction manual carefully before use.

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If any products designated as strategic material in the Foreign Exchange and Foreign Trade Law, Cabinet Order Concerning Control of Export Trade, Cabinet order Concerning Control of Foreign Exchange and other related laws and ordinances ("Foreign Exchange Laws") are exported to any foreign country or countries, an export license issued by the Japanese Government will be required under the Foreign Exchange Laws.

Further, there may be cases where an export license issued by the government of the United States or other country will be required under the applicable export-related laws and ordinances in such relevant countries.

The contract shall become effective subject to that a relevant export license is obtained from the Japanese Government.



*A chrysanthemum-handle is a symbol of KITZ,  
the brand of valve reliability*

ISO 9001 certified since 1989

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