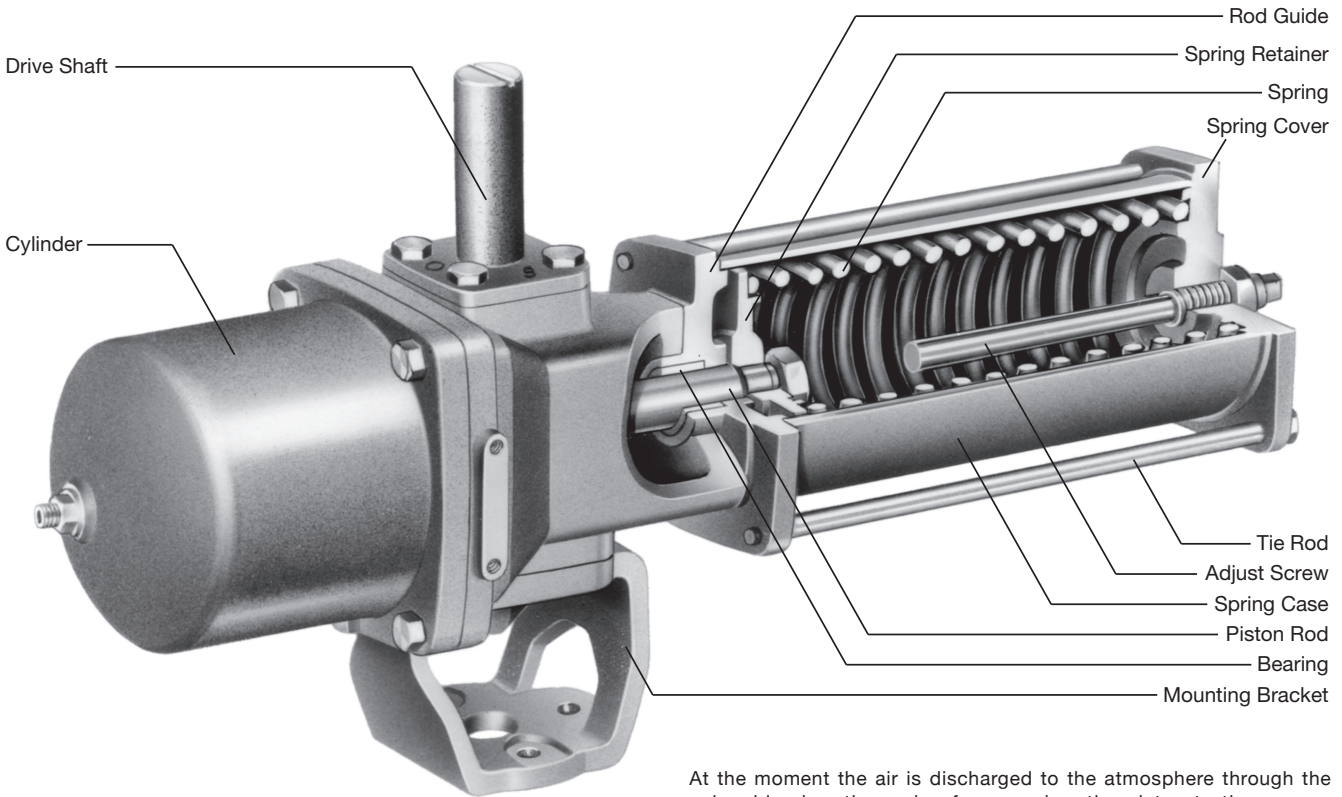


Internationally patented

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



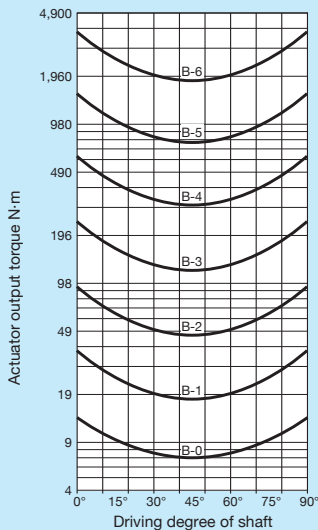
**Operational Mechanism**

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.

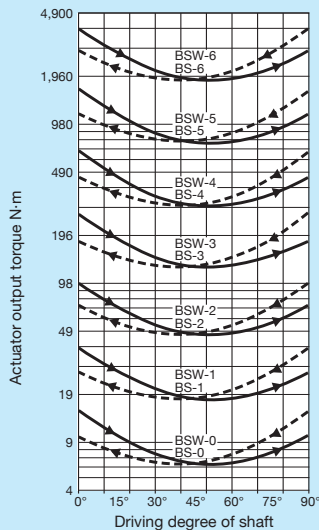
At the moment the air is discharged to the atmosphere through the solenoid valve, the spring force pushes the piston to the reverse direction, and the scotch-yoke activates clockwise rotation of the shaft to reversely operate the valve. Air failure will cause the valve to return to the original open 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**

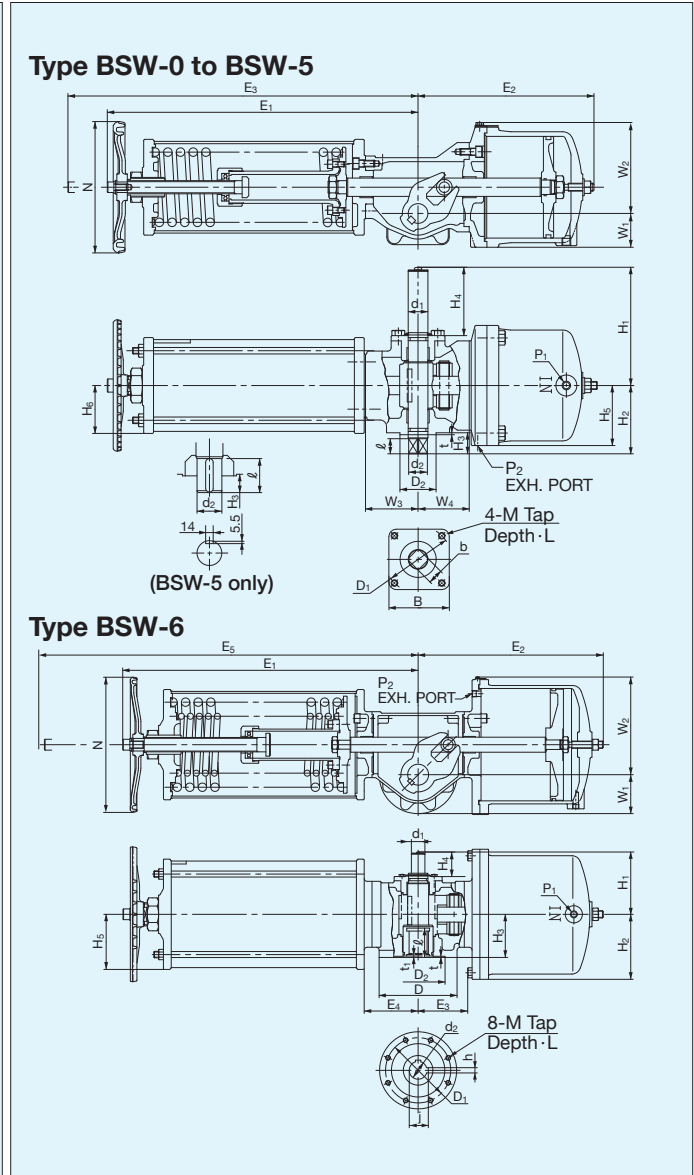
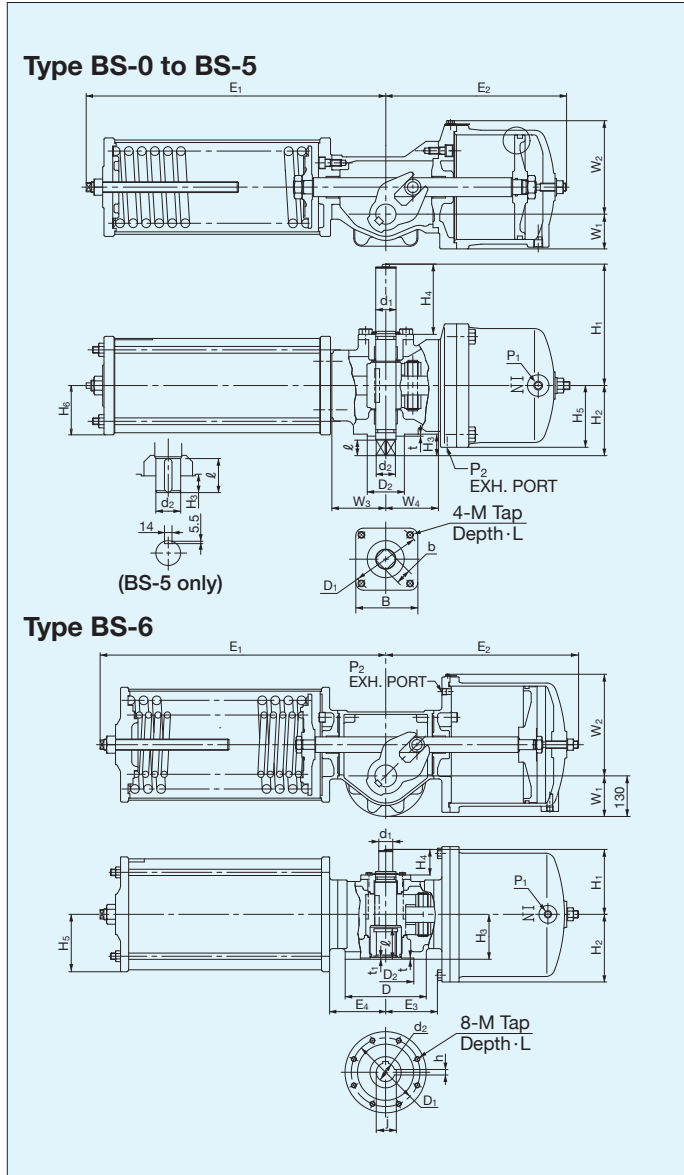


— Output torque when air pressure is supplied.  
 --- Output torque caused by spring force when air pressure is exhausted.

Operating pressure:  
 0.4 MPa

## 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

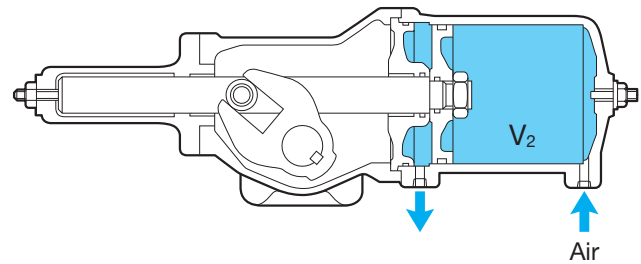
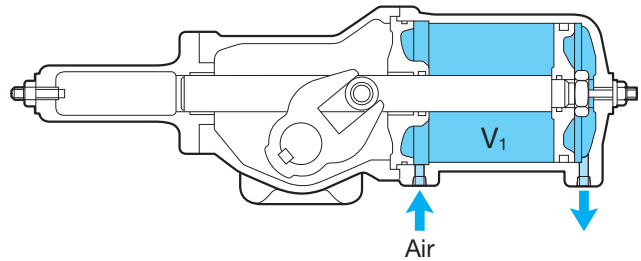
On installation of control system for actuators, air requirements of actuators should be carefully studied to ensure that a sufficient pressure is provided. Actuators should be activated by clean

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          |

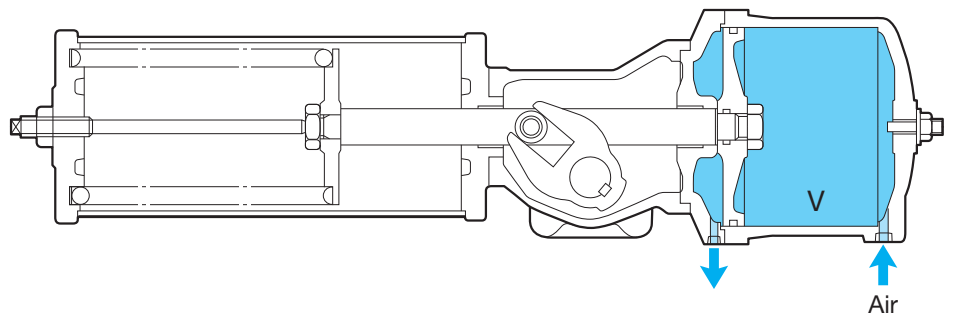
(unit: ℓ)



### 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 |

(unit: ℓ)



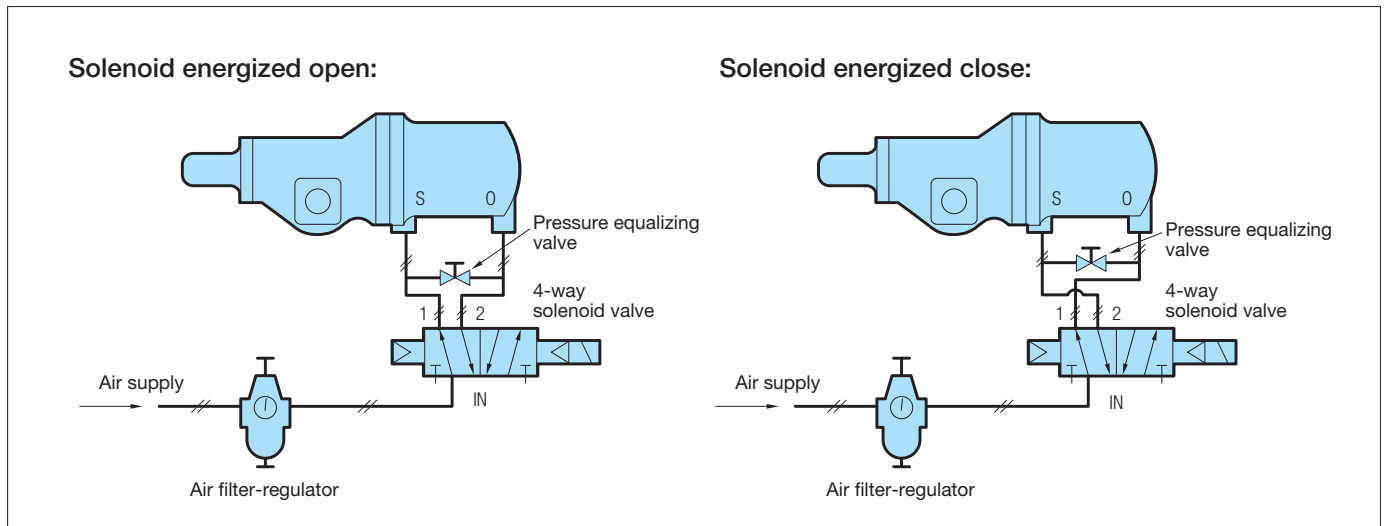
# Air Piping for Actuators

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

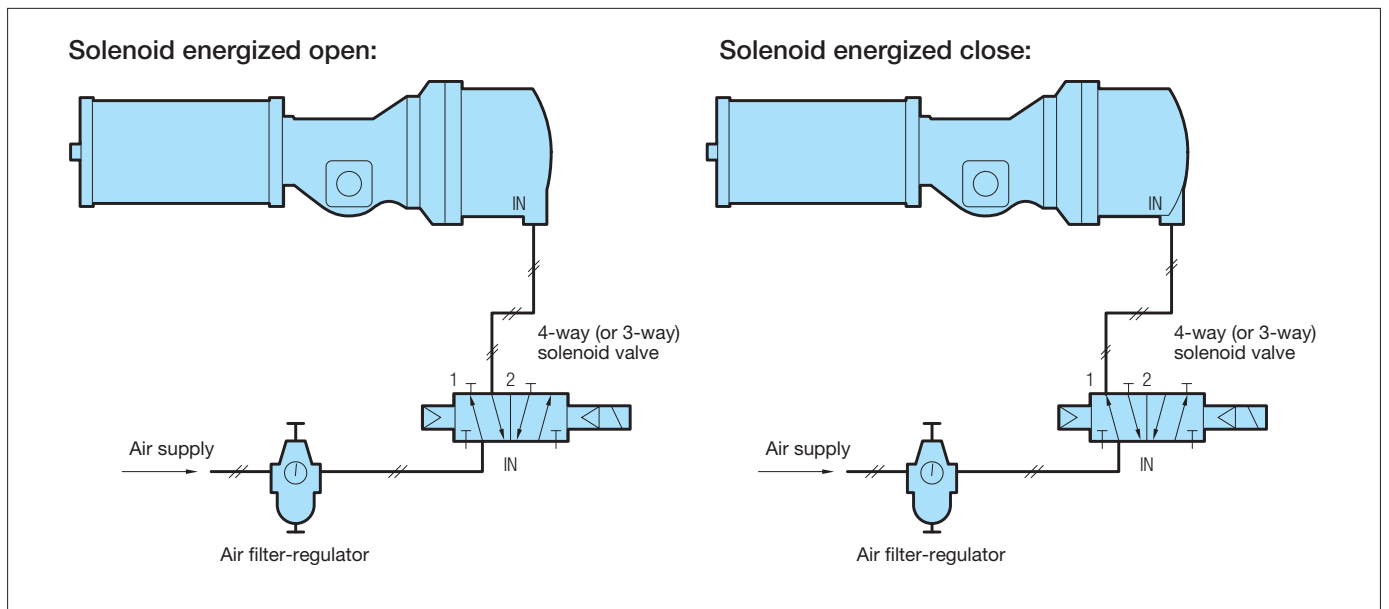
1. Select pipes of suitable diameter and wall thickness.

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.

## Type B Actuators (Double-Action)

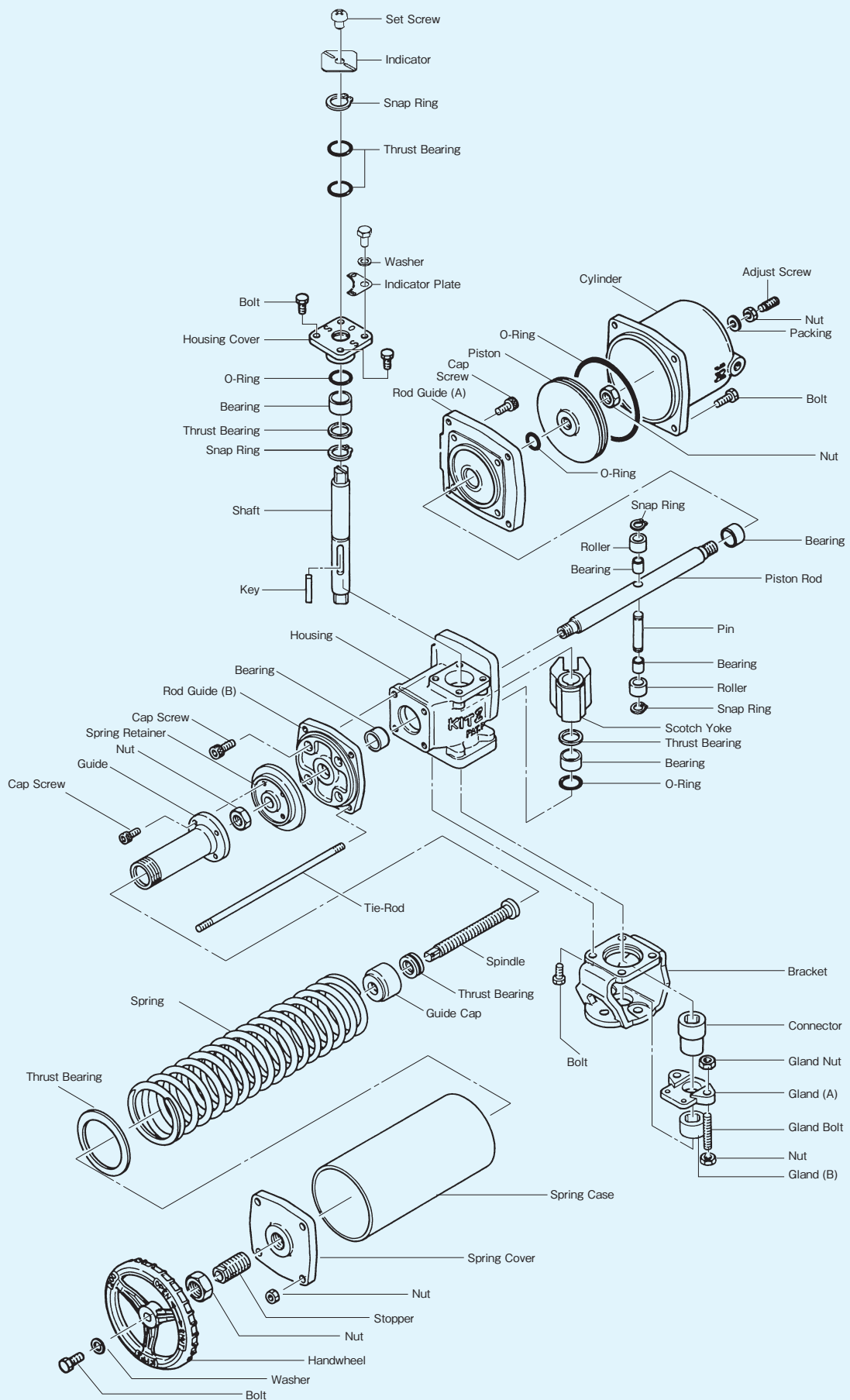


## Type BS/BSW Actuators (Spring-return)



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

# Construction Details of Type BSW Actuators



Type BSW-3 is illustrated here.