



Operation Manual

PRODUCT NAME

*Air Saving Speed Controller
with Pressure Regulation / Rapid Supply Function*

MODEL/ Series/ Product Number

*AS*2R Series
AS*2Q Series*

SMC Corporation

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Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “Caution,” “Warning” or “Danger.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)*1), and other safety regulations.

*1) ISO 4414: Pneumatic fluid power -- General rules relating to systems.

ISO 4413: Hydraulic fluid power -- General rules relating to systems.

IEC 60204-1: Safety of machinery -- Electrical equipment of machines .(Part 1: General requirements)

ISO 10218-1992: Manipulating industrial robots -Safety.

etc.



Caution

Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.



Warning

Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



Danger

Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

Warning

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results.

The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product.

This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly.

The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.

2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.

3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.

2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.

3. An application which could have negative effects on people, property, or animals requiring special safety analysis.

4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.



Safety Instructions

Caution

1. The product is provided for use in manufacturing industries.

The product herein described is basically provided for peaceful use in manufacturing industries.

If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.

If anything is unclear, contact your nearest sales branch.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.

Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.*2)

Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.

This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

***2) Vacuum pads are excluded from this 1 year warranty.**

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction(WMD) or any other weapon is strictly prohibited.

2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulation of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

2. Precautions

Design / Selection

Warning

1. Confirm the specifications.

Do not operate at pressures or temperatures outside of the specification, as this could cause damage or malfunction (Refer to the specifications).

Please contact SMC when using a fluid other than compressed air (including vacuum).

SMC does not guarantee against any damage if the product is used outside of the specification range.

(2) The product cannot be used as a stop valve to achieve zero leakage.

A certain amount of leakage is allowed in the products specifications.

Tightening the needle to achieve zero leakage may result in equipment damage.

(3) Do not disassemble the product or make any modifications.

Do not modify or reconstruct (including additional machining) the product. This may cause human injury and/or an accident.

(4) The flow characteristics are representative values for each product.

Flow characteristics are for individual products. Actual values may differ depending on the piping, circuitry, pressure conditions, etc.

(5) Sonic conductance and critical pressure ratio values for products are representative values.

The needle has to be fully opened to achieve controlled flow direction values. For free flow direction values, the needle should be fully closed.

(6) Check if PTFE is compatible with application.

The sealing agent for the male thread type taper pipe thread includes PTFE (polytetrafluoroethylene) powder. Check whether or not it could cause issues in your application. Contact SMC if Material Safety Data Sheet (MSDS) is required.

Mounting

Warning

(1) Operation Manual

Install and operate only after reading the operation manual carefully and understanding the contents. Also, keep the manual where it can be referred to as necessary.

(2) Maintenance space

When installing the products, allow access for maintenance.

(3) Screw tightening and tightening with proper tightening torque

Tighten the screws to the appropriate torque for mounting the product.

(4) Do not use tools such as pliers to rotate the handle.

If the knob is excessively rotated, it may cause damage.

Mounting

(5) Mount after confirming the direction of flow.

Mounting backwards is dangerous. The speed adjustment needle will not work and the actuator may move suddenly.

(6) Do not apply excessive force or shock to the body of fittings with an impact tools.

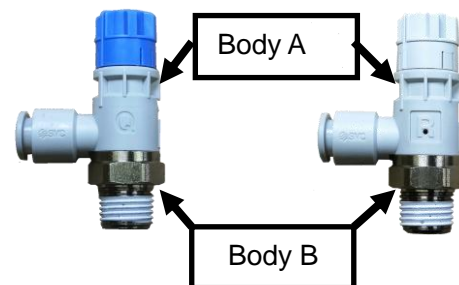
It can cause damage or air leakage.

(7) Refer to the Fittings and Tubing Precautions (Best Pneumatics No. 6) for handling One-touch fittings.

(8) Mounting and removal is conducted by holding with an appropriate wrench the width across flats of the body B and turning it.

Holding the parts other than the specified part to screw the product may cause damage to the product. Positioning after mounting should be performed by rotating the body A by hand.

(9) Rotation of body A should only be performed to adjust the position. Frequent rotation of body A may cause damage to the product.



(10) Chamfer dimension of R and NPT threads with sealant

Recommended female thread chamfer is 45°.

Thread chamfer as shown in the table below makes the threads easier to manufacture and reduces burrs and other machining defects.

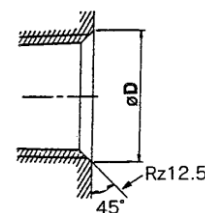


Table 1

Thread size	Chamfered port size ϕD (Recommended value)	
	Rc	NPT
1/8	10.2 to 10.4	10.5 to 10.7
1/4	13.6 to 13.8	14.1 to 14.3
3/8	17.1 to 17.3	17.4 to 17.6
1/2	21.4 to 21.6	21.7 to 21.9

Mounting

Caution

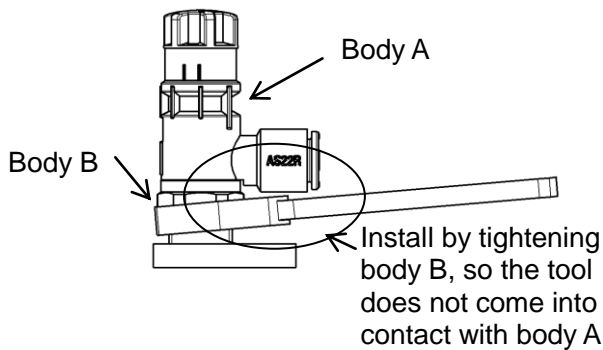
- (1) There is a stopper for full close/open turn. Therefore excessive torque applied to the handle may cause damage. Table below shows the maximum allowable torque of the handle.

Table 2

Body size	Allowable max. torque
1/4	0.07
3/8	0.13
1/2	0.25



- (2) The torque for installation and tightening should be applied to flats of the body B (metal fitting). If the tightening is applied to body A it will cause disassembly of the product.

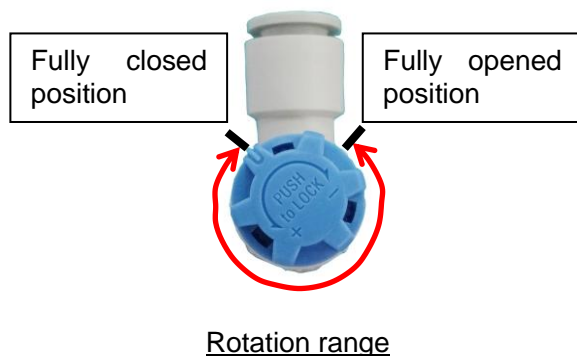


- (3) To adjust the speed, start with the needle in the closed position, and then adjust by opening gradually.

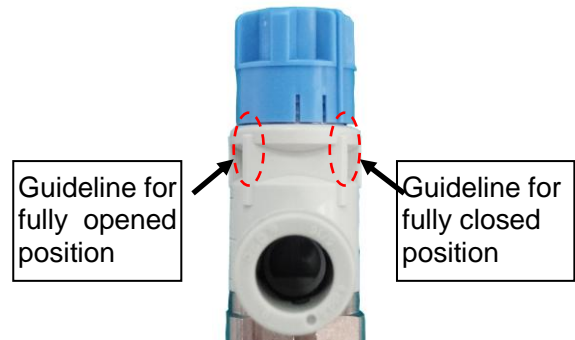
When the needle valve is open, the actuator may move suddenly. When the needle valve is turned clockwise (closed) the cylinder speed decreases. When the needle valve is turned counterclockwise (opened) the cylinder speed increases.

- (4) Check the rotation angle of the needle valve.

The handle cannot be rotated beyond the specified range shown in the figure below. Excessive rotation will cause damage to the product. Please check the rotation angle before using the product.



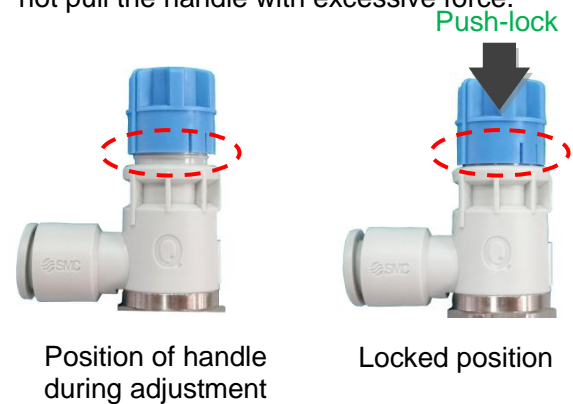
Mounting



- (5) Make sure that the push-lock handle is locked.

Lock the handle by pushing it down and confirm that it is locked. It should not be possible to rotate it.

If the handle is pulled with force, it may break. Do not pull the handle with excessive force.

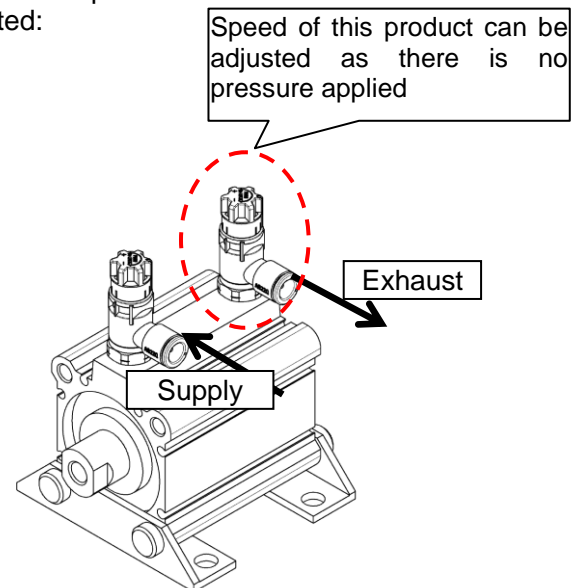


- (6) Adjust the handle with no pressure being supplied to the product.

If the adjustment is carried out on the pressurized product, it may cause a breakage of the internal components.

(Example)

When the product mounted on the head side is adjusted:



Connecting threads with sealant

Caution

- (1) Tighten the screw to the appropriate torque shown in the table below. As a guideline, it should be tightened by 2 to 3 rotations with a tool after tightening it manually. Check the width across flats by referring to the dimension table of each product.

Table 3

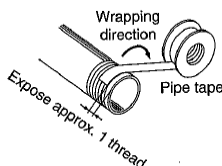
Thread size	Appropriate tightening torque
1/8	3 to 5
1/4	8 to 12
3/8	15 to 20
1/2	20 to 25

- (2) If the product is mounted with excessive torque, some sealant will seep out. Remove the excess sealant.
- (3) Insufficient tightening may cause sealing failure or a loose connection.
- (4) Reuse
 1. Normally, the fittings with sealant can be reused 2 to 3 times.
 2. Remove loose sealant that is stuck to the fitting by blowing air over the threaded portion of the fitting before reusing. If the loose sealant enters adjacent machinery, it may cause air leakage or malfunction.
 3. When the sealant loses its sealing effect, wrap sealant tape over the sealant before reusing.
Only use sealant tape, do not use other types of sealant.
- (5) When positioning is required, loosening the fitting after it is once tightened may cause air leakage. Rotate body A to position the product.
- (6) R threaded studs with Rc threaded ports and use NPT threaded studs with NPT threaded ports.

Piping

Caution

- (1) Refer to the Fittings and Tubing Precautions (Best Pneumatics No. 6) for handling One-touch fittings.
- (2) Before piping
Before piping is connected, flush thoroughly with air or wash to remove chips, cutting oil and other debris from inside the pipe.
- (3) Sealant tape
When screwing piping or fittings into ports, ensure that chips from the pipe threads or sealing material do not enter the piping. Also, if sealant tape is used, leave 1 thread ridge exposed at the end of the threads.



Precautions for One-Touch Tube Fitting

Mounting/ Piping

Caution

- (1) Tube attachment/detachment for One-touch fittings
 1. Insertion of tube
 - 1) Cut the tube perpendicularly, being careful not to damage the external surface. When cutting the tube, use tube cutters TK-1, 2 or 3. Do not cut the tube with pliers, nippers, scissors, etc. These tools result in a poor quality cut (e.g. flattening, rough edges, poor angle) and can result in a bad connection between the tube and the fitting, causing disconnection of the tube and air leakage.
 - 2) The outside diameter of polyurethane tubing swells when internal pressure is applied; therefore, it may not be possible to re-insert used tubing into One-touch fittings. Confirm the outside diameter of the tubing. If the accuracy of the outside diameter is +0.07 mm or more for $\phi 2$, and +0.15 mm or more for other sizes, insert into the one-touch fitting again without cutting it. When tubing is re-inserted into a One-touch fitting, confirm that the tubing is able to go through the release button smoothly.
 - 3) Hold the tube and push it in slowly, inserting it securely all the way into the fitting.
 - 4) After inserting the tubing, pull on it gently to confirm that it will not come out. If it is not installed securely all the way into the fitting, this can cause problems such as leakage or the tube pulling out.
 - (2) Removal of the tubing
 - 1) Press the release button firmly. Push the collar evenly around its circumference.
 - 2) Hold down the release button while pulling out the tube. If the release button is not pressed down sufficiently, there will be increased bite on the tube and it will become more difficult to pull it out.
 - 3) If the removed tubing is to be used again, cut off the section that has been secured in the fitting. Re-using this portion of the tube can cause problems such as air leakage or difficulty in removing the tubing.
 - (2) Connection of the metal rod accessories
Do not install tubing, resin plug, reducer, etc. after connecting a fitting with a metal rod (KC series, etc.) to a One-touch fitting. This can cause the tubing to disconnect.
 - (3) When mounting the tubing, resin plug or metal rod, do not press the release button.
Do not press the release button unnecessarily before inserting tubing, resin plugs and metal rods. This can cause the tube to disconnect.

Air Supply



Warning

(1) Type of fluids

The operating fluid must be compressed air. Contact SMC if using the product with other fluids.

(2) When there is a large amount of condensate

Compressed air containing a large amount of drainage can cause malfunction of pneumatic equipment. An air dryer or water droplet separator should be installed upstream from filters.

(3) Drain flushing

If condensate in the drain bowl is not emptied on a regular basis, the bowl will overflow and this may cause the malfunction of pneumatic equipment. If the drain bowl is difficult to check and remove, installation of a drain bowl with an auto drain option is recommended.

For detailed information regarding the quality of the compressed air described above, refer to SMC's "Air Cleaning Systems".

(4) Types of air

Do not use compressed air which contains chemicals, synthetic oils containing organic solvents, salts or corrosive gases, etc., as this can cause damage or malfunction.



Caution

(1) Install an air filter.

Install an air filter upstream near the valve. Select an air filter with a filtration size of 5µm or smaller.

(2) Install an aftercooler, air dryer or water separator, etc.

Do not use compressed air containing a lot of condensate, which can cause failure of the flow control or other pneumatic equipment. Take measures to ensure air quality, such as installing an aftercooler, air dryer, or water separator.

(3) Use the product within the specified fluid and ambient temperature range.

When operating at temperatures 5°C or lower, water in the circuit may freeze and cause breakage of seals or malfunction. Measures should be taken to prevent freezing.

For detailed information regarding the quality of the compressed air described above, refer to SMC's "Air Cleaning Systems".

Operating environment



Warning

(1) Do not use in an environment where corrosive gases, chemicals, sea water, water or steam are present.

For materials of the flow control equipment, refer to their construction drawings.

(2) Do not use in direct sunlight.

(3) Do not operate in a location subject to vibration or impact.

(4) Do not mount the product in locations where it is exposed to radiant heat.

Maintenance check



Warning

(1) Maintenance should be performed according to the procedure indicated in the Operation Manual.

Improper handling can cause damage and malfunction of equipment and machinery.

(2) Maintenance operations

If handled improperly, compressed air can be dangerous. Assembly, handling, repair and element replacement of pneumatic systems should be performed by a knowledgeable and experienced person.

(3) Draining

Remove drainage moisture from air filters regularly.

(4) Removal of equipment, and supply/exhaust of compressed air

When components are removed, first confirm that measures are in place to prevent workpieces from dropping and/or equipment running away, etc. Cut the supply pressure and electric power and exhaust all compressed air from the system. Turn off the power supply, stop the air supply and exhaust all compressed air from the system.

3. Application

This product is designed to control the speed of a pneumatic actuator.

4. Specifications

Table 4

Item		AS*2R with pressure regulation	AS*2Q with rapid supply function
Fluid		Air	
Proof pressure		1.05 MPa	
Max. operating pressure		0.7 MPa	
Min. operating pressure		0.3 MPa	
Set pressure (at a supply pressure of 0.5 MPa)	Set pressure for pressure reduction function	-	0.2 +/- 0.05 MPa
	Minimum pressure for rapid supply function initiation	0.2 +/- 0.05 MPa	-
Ambient and fluid temperature		-5 to 60°C (No freezing)	
Applicable tube materials		Nylon, soft nylon, polyurethane	

Note) Pay attention to the maximum operating pressure for soft nylon and polyurethane.
(Refer to the web catalog on the SMC website or Best Pneumatics No. 6 for details)

5. How to use

Only meter-in type is available.

Mount on a cylinder as follows:

1) To perform operation on the cylinder extended side:

Head side: AS*2**Q** Series

Rod side: AS*2**R** Series

2) To perform operation on the cylinder retracted side:

Head side: AS*2**R** Series

Rod side: AS*2**Q** Series

6. Troubleshooting

Problem	Possible causes	Countermeasure
Speed (flow) cannot be adjusted	Dust inside	Fully open the needle and apply air blow from the free flow side. If the problem is not solved even after air blow, install an air filter to the piping, and replace the product with a new one.
Air leakage from the One-touch fitting.	Tubing has been cut using pliers or nipper.	Use tube cutters.
Disconnection of the tubing	The tolerance of the outside diameter of the tubing is outside of the specification.	If tubings made by manufacturers other than SMC are used, check the accuracy of the tubing's outside diameter. Nylon tube: +/-0.1 mm at max. Soft nylon tube: +/-0.1 mm at max. Polyurethane tube: +0.15 mm or -0.2 mm at max.
It does not reduce the speed (For AS*2R)	Incorrect product mounting position.	Check if the mounting position of the product is correct (rod side / head side).
It does not supply air rapidly. (For AS*2Q)		

7. Construction

AS*2R

R thread / NPT thread type

G thread type

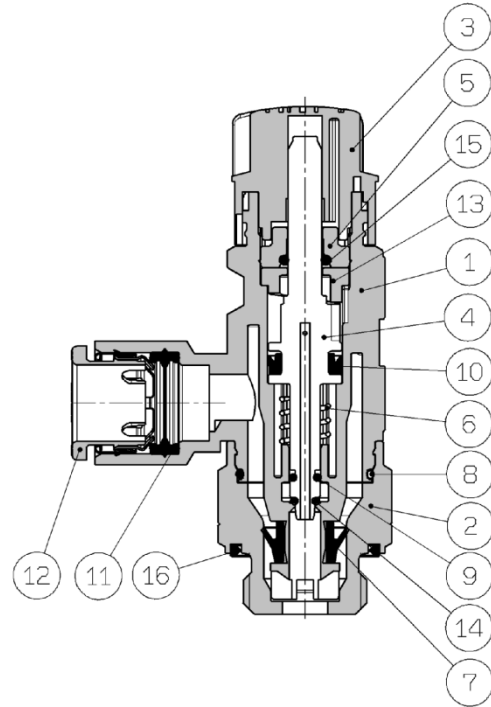
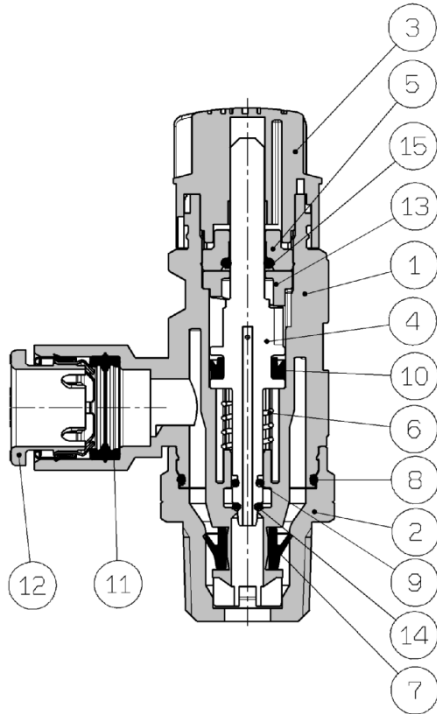


Table 5
Components

No.	Name	Material	Remark
1	Body A	PBT	
2	Body B	Brass	Electroless nickel plating
3	Handle	POM	
4	Needle	POM	
5	End cover	Brass	Electroless nickel plating
6	Spring	Steel wire	
7	U-seal	HNBR	
8	O-ring	NBR	
9	Needle O-ring	NBR	
10	Y seal	NBR	
11	Seal for fitting	NBR	
12	Cassette	-	
13	Stator	POM	
14	Valve O-ring	HNBR	
15	Shaft O-ring	NBR	
16	Seal	NBR	For G thread only.

AS*2Q

R thread / NPT thread type

G thread type

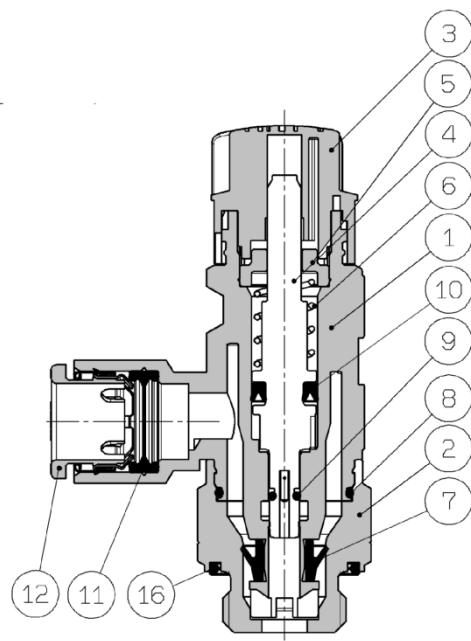
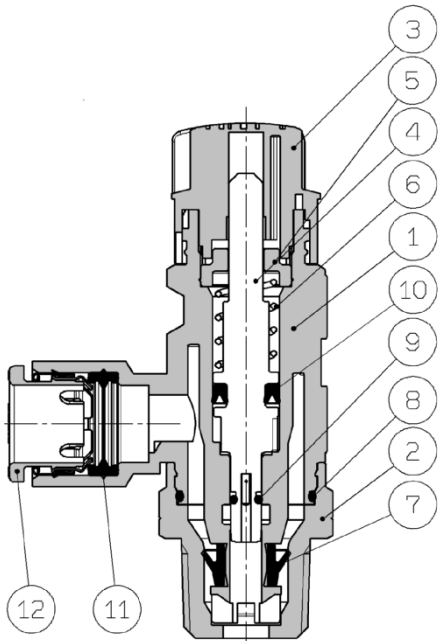


Table 6
Components

No.	Name	Material	Remark
1	Body A	PBT	
2	Body B	Brass	Electroless nickel plating
3	Handle	POM	
4	Needle	POM	
5	End cover	Brass	Electroless nickel plating
6	Spring	Steel wire	
7	U-seal	HNBR	
8	O-ring	NBR	
9	Needle O-ring	NBR	
10	Y seal	NBR	
11	Seal for fitting	NBR	
12	Cassette	-	
16	Seal	NBR	For G thread only.

Revision history

SMC Corporation

4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021 JAPAN

Tel: + 81 3 5207 8249 Fax: +81 3 5298 5362

URL <http://www.smcworld.com>

Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.
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