



Operation Manual

PRODUCT NAME

Speed Controller with One-touch Fitting
In-line Type

MODEL / Series / Product Number

A S * 0 * 2 F S e r i e s

SMC Corporation

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Speed Controller with One-Touch Fitting In-line Type / AS Series

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)^{*)}, and other safety regulations.

*1) ISO 4414: Pneumatic fluid power - General rules and safety requirements for systems and their components
ISO 4413: Hydraulic fluid power - General rules and safety requirements for systems and their components
IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots
etc.



Danger

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



Warning

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



Caution

Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate 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. Our products cannot be used beyond their specifications. Our products are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not covered.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, fuel equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.



Speed Controller with One-Touch Fitting In-line Type / AS Series **Safety Instructions**

Caution

We develop, design, and manufacture our products to be used for automatic control equipment, and provide them for peaceful use in manufacturing industries.

Use in non-manufacturing industries is not covered.

Products we manufacture and sell cannot be used for the purpose of transactions or certification specified in the Measurement Act.

The new Measurement Act prohibits use of any unit other than SI units in Japan.

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 regulations 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. Specific Product Precautions

Design/ Selection

Warning

(1) Confirm the specifications.

Do not operate at pressures or temperatures, etc., beyond the range of specifications, as this can cause damage or malfunction. (Refer to the specifications.)

We do not guarantee against damage if the product is used outside of the specifications.

(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) No not disassemble the product or make any modifications.

An accident and/or injury may occur.

(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. Also, there are variations in the closed zero-position of the needle.

Installation

Warning

(1) Operation Manual

Install and operate only after reading the operation manual carefully and understanding the contents. Keep the manual where it can be referred to if necessary.

(2) Maintenance space

Allow sufficient space for maintenance and inspection.

(3) Confirm that the lock nut is tight.

If the lock nut is not tight, changes in the actuator speed may occur.

(4) Check the number of opening and closing rotations of the needle valve.

It is not possible to remove the needle valve completely, over rotation will cause damage to the product.

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

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

(6) Mount after confirming the direction of flow.

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

Installation

Warning

(7) 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.

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

It can cause damage or air leakage.

(9) Refer to the Fittings and Tubing Precautions for handling One-touch fittings.

(10) Tube O.D. $\varphi 2$

Tubing other than that from SMC cannot be used, as it may not be possible to connect to the product.

Caution

(1) The correct tightening torque for the lock nut is shown below.

Be careful not to over torque the product.

Model No.	Appropriate tightening torque (N · m)	Lock nut Width across flats
AS1002F-02	0.07	4.5
AS1002F	0.2	7
AS2002F	0.3	9
AS2052F	1	12
AS3002F	2	14
AS4002F	4	17

Piping

Caution

(1) Refer to the Fittings and Tubing Precautions for handling One-touch fittings.

(2) Before piping

Before piping, perform air blow (flushing) or cleaning to remove cutting chips, cutting oil, dust, etc. from the pipe.

Air Supply

Warning

(1) Type of fluids

Use compressed air as the fluid used.

(2) When there is a large amount of condensate

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

(3) Drain flushing

If condensation in the drain bowl is not emptied on a regular basis, the bowl will overflow and allow the condensation to enter the compressed air lines. This causes 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 compressed air quality, refer to SMC catalog "Compressed Air Purification System".

(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 close to the upstream side of the valve. A filtration degree of 5mm or less should be selected.

(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. Install an aftercooler, air dryer or water droplet 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 the details of compressed air mentioned above, refer to SMC catalog "Compressed Air Purification System".

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 expose the product to direct sunlight for an extended period of time.

(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

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. A knowledgeable and experienced person should perform assembly, handling, repair and element replacement of pneumatic systems.

(3) Draining

Remove condensate 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. Before restarting the equipment, confirm that measures are taken to prevent sudden movement.

Precautions for One-Touch Tube Fitting

Mounting/ Piping

Caution

(1) Connection and disconnection of tube from one-touch fitting

① Insertion of tube

1) Cut the tube perpendicularly, being careful not to damage the external surface. Use SMC's tube cutter TK-1, 2 or 3 for cutting. Do not cut the tube with pliers, nippers, scissors, etc.

This may flatten the tube and connection to the fitting may fail, causing disconnection of the tube and air leakage.

2) The outside diameter of polyurethane tubing swells when internal pressure is applied, so 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 +0.07mm or more for $\phi 2$, and +0.15mm 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, problems such as leakage or disconnection of the tube can occur.

② Removal of the tube

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 held down fully, it will be more difficult to pull out the tube.

3) If the removed tubing is to be used again, cut off the section of the tubing which has been gripped. Re-using the gripped portion of the tube can cause problems such as air leakage or difficulty in removing the tube.

(2) Connection of the metal rod accessories

Do not use tube, resin plug, reducer, etc. after connecting a fitting with a metal rod (KC series, etc.) to a One-touch fitting. This can cause the tube to disconnect.

(3) When mounting the tube, resin plug or metal rod, do not press the release button.

Do not press the release button unnecessarily before mounting tubing, resin plugs and metal rods. This can cause the tube to disconnect.

Mounting/ Piping

Caution

(4) When using tubing from a manufacturer other than SMC, be careful of the tolerance of the tubing O.D. and tubing material.

- | | |
|------------------------|------------------------------------|
| 1) Nylon tubing | Within ± 0.1 mm |
| 2) Soft nylon tubing | Within ± 0.1 mm |
| 3) Polyurethane tubing | Within +0.15 mm,
Within -0.2 mm |

Do not use tubing which does not satisfy the specified tubing O.D. accuracy, or tubing with an I.D., material, hardness, or surface roughness that differs from SMC's tubing. Please consult SMC if anything is unclear. It may cause difficulty in connecting the tubing, leakage, disconnection of the tubing, or fitting damage.

(5) Tubing O.D. $\phi 2$

Tubing other than that from SMC cannot be used because it may result in the inability to connect the tube, air leakage after connecting the tube, or disconnection of the tube.

Recommended Piping Conditions

(1) When connecting piping to the One-touch fitting, use a pipe length with sufficient margin, in accordance with the piping conditions shown in Figure 1.

Also, when using a tying band, etc., to bind the piping together, make sure that external force does not come to bear on the fitting.

(See Fig.2)

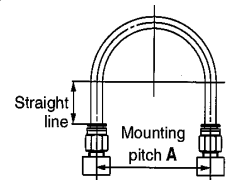


Figure 1 Recommended piping

Unit: [mm]

Tubing size	Mounting pitch A			Straight line length
	Nylon tubing	Soft nylon tubing	Polyurethane tubing	
$\phi 2$	-	-	13 or more	10 or more
$\phi 3.2, 1/8''$	44 or more	35 or more	25 or more	16 or more
$\phi 4, \phi 5/32''$	56 or more	44 or more	26 or more	20 or more
$\phi 6$	84 or more	66 or more	39 or more	30 or more
$\phi 1/4''$	89 or more	70 or more	57 or more	32 or more
$\phi 8, \phi 5/16''$	112 or more	88 or more	52 or more	40 or more
$\phi 10$	140 or more	110 or more	69 or more	50 or more
$\phi 3/8''$	134 or more	105 or more	69 or more	48 or more
$\phi 12$	168 or more	132 or more	88 or more	60 or more
$\phi 1/2''$	178 or more	140 or more	93 or more	64 or more

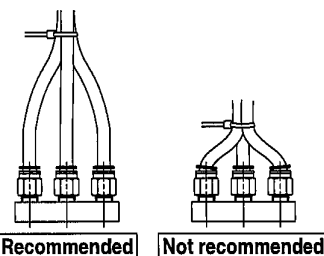


Fig. 2 When using a tying band to bind the piping together

3. Application

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

4. Specifications

Model		AS1002F		AS2002F	AS2052F	AS3002F	AS4002F
Tube O.D.	Metric	φ2	φ3.2,φ4,φ6	φ4,φ6	φ6,φ8	φ6,φ8,φ10,φ12	φ10,φ12
	Inch	-	φ1/8",φ5/32,φ1/4	φ5/32",φ1/4"	φ1/4",φ5/16"	φ1/4",φ5/16",φ3/8"	φ3/8",φ1/2"
Fluid		Air					
Proof pressure		1.05MPa	1.5MPa				
Max. operating pressure		0.7MPa	1.0Mpa				
Min. operating pressure		0.1MPa					
Ambient and fluid temperature		-5 to 60 °C (No freezing)					
Applicable tube material ^{Note 1)}		Nylon ,Soft nylon, Polyurethane					

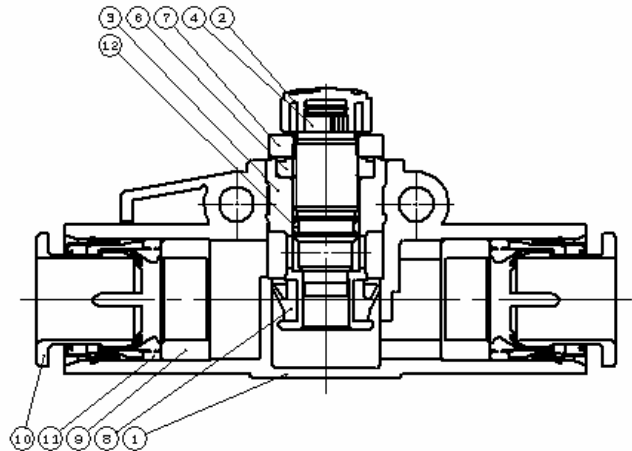
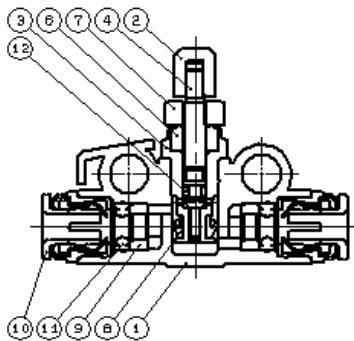
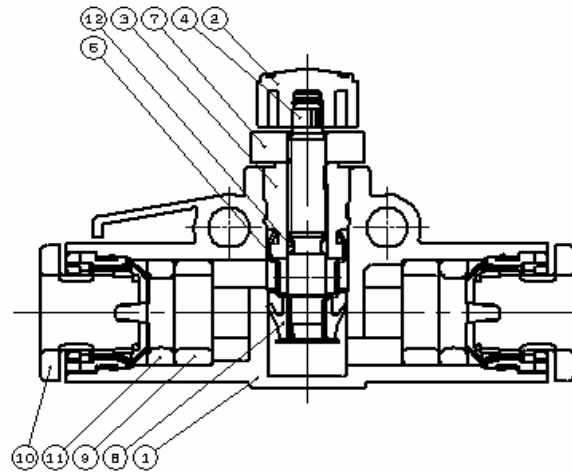
Note 1) Note the max. operating pressure for soft nylon and polyurethane.

5. Troubleshooting

Trouble	Possible causes	Countermeasures
The speed (flow rate) cannot be controlled.	The product is mounted the wrong way round.	Check if the JIS symbol is suitable for the operating conditions.
	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 leaks from the One-touch fitting. Or the tube disconnects.	Tube has been cut using pliers or nipper.	Use a tube cutter.
	The tolerance of the outside diameter of the tube is outside of the specification.	If tubing used is other than SMC, note the accuracy of the outside tolerances. Nylon tube: +/-0.1 mm at max. Soft nylon tube: +/-0.1 mm at max. Polyurethane tube: +0.15mm or -0.2 at max.

6. Construction

AS1002F, AS2002F, AS2052F



No.	Description	Material	Note
1	Body A	PBT	
2	Handle	PBT	
3	Body B	Brass	Electroless nickel plated
4	Needle	Brass	Electroless nickel plated
5	Seat ring	Brass	Electroless nickel plated
6	Needle guide	Brass	Electroless nickel plated

No.	Description	Material	Note
7	Lock nut	Steel wire ^{Note 2)}	Zinc chromated ^{Note 2)}
8	U-seal	HNBR	
9	Spacer	POM ^{Note 1)}	
10	Cassette	—	
11	Seal	NBR	
12	O-ring	NBR	

Note 1) AS2052F, AS3002F, AS4002F are made of PBT. AS3002F-11, AS4002F-11, AS4002F-13 are made of electroless nickel plated brass.

Note 2) For the material and surface treatment of the lock nut option-J (round type), only the AS1002F-02, AS3002F, and AS4002F types use brass and electroless nickel plated.

Revision history

A : Added the Safety Instructions sentences and Recommended Piping Conditions Table.
B: Delete SMC address. "Safety Instruction" changed.

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