

AIR MIXER

INSTRUCTION MANUAL

For VA type Air Motor

1. Forword

Thank you very much for purchasing our product.

This mixer should be handled, used properly and also should be inspected periodically so that you can use this product for many years, safely and effectively.

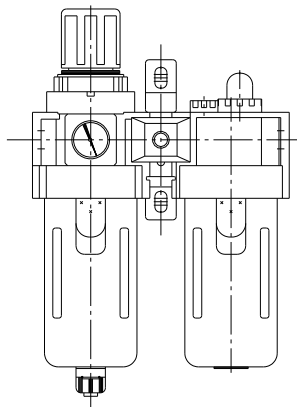
This instruction manual explains the handling of VA type air motor and accessories.

Please read it carefully before use.

And make sure that you keep this book close to you so that at any time you can clear up any questions and doubts.

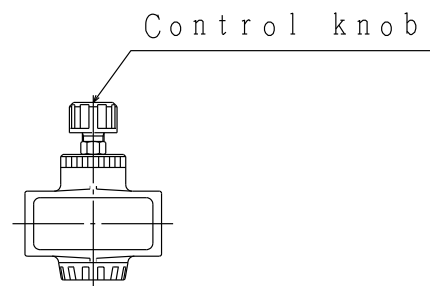
2. Precaution for air mixer

- (1) Small pipe diameters and long piping distance cause big pressure loss, not permitting the specified performance. Pipes shall be as large as or one-size larger than the air motor connection port.
- (2) Dust or water inside the piping causes a failure, certainly install an air filter.
- (3) Before connecting pipes to the air motor, remove dust from the pipe by blowing air.
- (4) Air control unit shall be installed as close to the air motor as possible on the input side piping line .
- (5) A regulator and a speed controller are used for adjustment of rotation speed of air motor.



Air control unit

(filter • regulator • lubricator)



Speed controller

- (6) The muffler shall be certainly opened to the atmosphere.
Piping such as increasing the exhausted pressure can not keep the specified performance.
- (7) In case that oil mist flying in the atmosphere is not permitted, please use a muffle cleaner.
It works for lowering the exhausted noise and separation of oil mist.

- (8) Except non-lubricated type air motor, oil should be sprayed in the supplied air and air motor should be operated by the air containing oil mist. It reduces the abrasion of inner parts, and extend the lifetime of motor.

In case of non-lubricated type, please take heed that the motor lifetime is shorter than standard lubricated type.

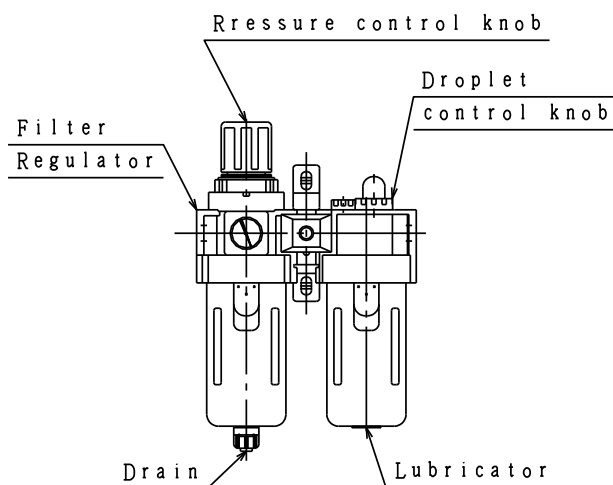
For either air motor the inner consumable parts should be exchanged periodically.

Recommended exchange period of consumable parts

Oil Lubrication	Recommended exchange period
Yes	Approx.4000 hrs operation
No	Approx,1000 hrs operation

- Disassembly and reassembly of air motor require a special technique. When the inner parts are to be replaced or motor trouble has occurred, contact us or our sales agent.

3. Handling of air control unit



Air control unit

The case is Polycarbonate made. If organic solution (thinner, toluene and etc.) or alkali solution adheres to the surface, the case may be broke up. Therefore do not use it at the place where they may be adhered to the case.

Waste water in the filter should be drained out before the liquid level reaches the upper limit level.

As necessary, push the tube horizontally to drain the waste water.

If the filter is filled with waste water in a short time, use an automatic drain valve type.

- Except non-lubricated type air motor, a lubricator should be installed.

Relating to the oil droplet speed, please refer to the following table as a guide and control the droplet by adjusting knob.

Lubricator oil droplet speed

Air motor	Drops / min.
VA30	1 ~ 2
VA50	2 ~ 3
VA100	3 ~ 4

Air control unit model

Air motor	Air control unit
VA30	EKL2-08 (TAIYO)
VA50	EKL2-10 (TAIYO)
VA100	EKL2-15 (TAIYO)

- Use lubricant oil equivalent to JIS K2213 Turbine Oil type1.
(additive-free, ISO VG32).

Lubricant oil comparison table

Oil Maker	Trade Name
JX Nippon Oil & Energy	Turbine Oil 32
COSMO OIL	Cosmo Turbine 32
SHOWA SHELL SEKIYU	Shell Vitrea Oil 32

The capacity of lubricator is approx. 100mL. When the air motor is operated continuously for long time, the oil consumption gets large. Then please pay attention to the remaining oil quantity and add oil as needed.

4. Troubleshooting

※This manual contains particular troubleshooting for air motor.

Regarding mixer main body, please refer to the manual for each mixer series which attached separately.

①Abnormal temperature rising

CAUSE	DETAIL	MEASURE
Improper air supply	① Imbalance of the supplied air, a lack of lubricant oil.	● Adjust the compressor. ● Control air pressure by the regulator. ● Adjust the air control unit. ● Lubricate the supplied air.

②Abnormal sound

CAUSE	DETAIL	MEASURE
Parts damage	① Damage of the motor inner parts.	● Replace the parts.

③Failure to start

CAUSE	DETAIL	MEASURE
Improper air supply	① Imbalance or quantity decreasing of the supplied air. ② The speed controller is closed too much.	● Adjust the compressor. ● Control air pressure by the regulator. ● Open the speed controller.
Parts damage	① Damage of motor, air control unit and so on.	● Replace the parts

5. After-sale service and Warranty

☆ If you have an abnormality during operation...

Please check the chapter “Troubleshooting” of this manual and the manual of mixer body first, and if you still cannot resolve the trouble, then please contact us or our agent.

We need the following information

- ① Information printed on the name plate: Product name, Serial number, Model, Manufacturing date.
- ② Condition of the mixer in detail as much as possible including the situation before and after the trouble: Date and time of occurrence of the trouble, Situation and condition, Degree of damage, Probable cause, Operating hours, Operating condition, Degree of urgency.
- ③ Sales agent or sales staff.(that you purchased from)
- ④ Information of you: Contact information, Name of a person who is in charge of the mixer, Means of transportation to you, etc.

☆ Warranty

Warranty period

The warranty period is as below.

Oil Lubrication	Warranty Period
YES	Shorter of 4,000hrs operation or 1 year from shipping.
NO	Shorter of 1,000hrs operation or 1 year from shipping.

However, an after-sale service may be nonfree in several cases. Please read this manual and the manual for mixer body carefully.

When the warranty period has already ended...

If the product can be fixed and if you request that, we can offer a paid repair on demand.

☆ After-sale service

When you have any question and unclear point, when you want to repair the mixer, or when you request consumable parts to replace, please contact us or our distributors agent.

6. Contact Information

■Osaka Office (Sales Department)

2-18-8, Toko-cho, Moriguchi-shi, Osaka 570-0035 JAPAN

TEL 81-6-6992-0371

FAX 81-6-6998-4947

■Tokyo Office (Sales Department)

66, Niizo, Toda-shi, Saitama 335-0021 JAPAN

TEL 81-48-433-8711

FAX 81-48-433-8541

■Chubu Sales Service Center

1-21-9,heiwa, Naka-ku, Nagoya-shi, Aichi 460-0026 JAPAN

TEL 81-52-331-6691

FAX 81-52-331-2162

◇ You could request for maintenance on our website.

Home page <http://www.satake.co.jp/>

To improve the quality, this product including parts and accessories may be changed in whole or part without notice. Please be forewarned. Thank you.

AM(E)-Rev2

A i r M o t o r

V A S e r i e s

I n s t r u c t i o n M a n u a l



SAN-EI SEIKI SEISAKUSHO CO., LTD.

1. Introduction

The VA air motor is a rotary vane type air motor driven by compressed air. A clockwise and a counterclockwise type are available.

This instruction manual explains the "method of correct operation." Carefully read the manual for maximum performance of the motor.

2. Specifications

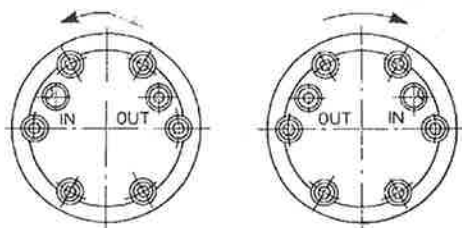
(When the rated pressure is 0.5MPa)

Type	At the max. output				Weight kg		
	Output kW	Number of revolutions rpm	Torque N·m	Air consumption m ³ /min(nor)	Face type	Flange type	Base type
VA30	0.23	1800	1.20	0.40	2.7	3.9	4.0
VA50	0.38	1800	2.00	0.68	3.8	5.0	5.1
VA100	0.75	1800	4.00	1.30	6.7	9.4	9.2

Note: In these specifications, the air outlet is open to the atmosphere and the pressure is measured at a location right before the air inlet. When a muffler is mounted or air equipment is installed in the pipe line, the performance will drop to approx. 70%. Select a proper type, allowing for some margin.

3. Mounting

- (1) Free mounting directions -- up, down, left, or right.
- (2) The face, flange, and base mounting types are available.
- (3) The direction of the air motor rotation is fixed. The relationship between the direction of rotation of the L and R types and the "IN" and "OUT" ports is shown below. Check it before piping.



L type

R type

- (4) The allowable radial load and thrust load of the output shaft shall be smaller than the values shown in the following table.

Allowable shaft load	VA30	VA50	VA100
Radial (N)	245	392	490
Thrust (N)	147	245	294

4. Piping

- (1) Small pipe diameters and long piping distance cause great pressure loss, not permitting the specified capacity. Pipes shall be as large as or one-size larger than the air motor connection port.
- (2) Compressed air containing much moisture causes rust formation or ices the muffler, lowering the level of performance. Install a water separator or after-cooler in the pipe line.
- (3) Dust or water inside the piping causes failure. Install an air filter.
- (4) A regulator and a speed controller are used for adjustment of the number of revolutions and torque of the air motor. Install them in the pipe line on the air supply side (meter-in circuit), as necessary. The size of the connection port of such air equipment shall also be the same as or one-size larger than the air motor port.
- (5) Before connecting pipes to the air motor, remove dust from the pipe by blowing air.
- (6) Install a muffler, as necessary, to cope with exhaust noise. The muffler capacity must be sufficient. Insufficient capacity increases the exhaust pressure, not permitting the specified capacity.

5. Lubrication

Lube oil must be included in the air supplied to the vane motor. Install a line oiler.

Lube oil differs in type by the ambient temperature.

See Table 1 below and use lube oil equivalent to JIS K2213 Turbine Oil Type 1.

Line oiler dripping qty		Line oil type	
VA30	1 ~ 2drop/min.	Ambient temperature	Line oil
VA50	2 ~ 3	Up to -10°C ~ $+40^{\circ}\text{C}$	VG32
VA100	3 ~ 4	Up to $+40^{\circ}\text{C}$ ~ $+70^{\circ}\text{C}$	VG68

Table 1

6. Notes on usage

- (1) Before initial operation, put approx. 5 drops of lube oil through the air inlet and then connect piping. (The same applies to the case where a line oiler is installed.)
 - (2) High-speed operation with no load for an extended period of time will substantially shorten the service life. The motor speed shall be 2000 rpm or less, if possible.
 - (3) Excessively slow speed may cause pulsation or may not permit the motor to be activated. The motor speed shall be more than 800 rpm. For operation at low speed, install a model equipped with a regulator.
 - (4) The starting torque is approx. 1.2 times the rated torque. An excessively large load will not permit the motor to be activated.
 - (5) The ambient temperature shall be from -10°C to +70°C.
- ※ Lube oil differs in type. See an entry under the lubrication.

7. Maintenance

7-1. Storage

Pay attention to the following when the motor is to be at rest for an extended period of time.

- (1) Put rust preventive oil into the motor and plug the air inlet and outlet.
- (2) Store the motor in a place with little moisture.
- (3) Never leave the motor in a place that may be exposed to rain or dew.

7-2. Disassembly

Disassembly and reassembly of the VA motor require a special technique.

When vanes are to be replaced or motor trouble has occurred, contact our distributor or our company for help.

Parts List

Face type

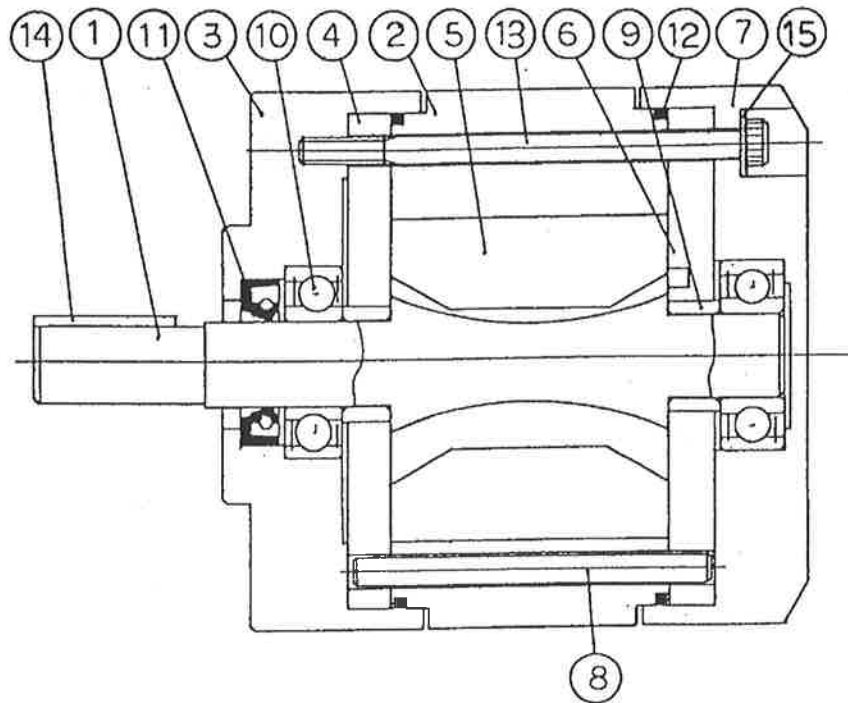
No.	Parts	Qty/ unit	Part No. (Size)		
			VA30	VA50	VA100
1	Rotor	1	H391-063	H391-068	H391-071
2	Rotor case	1	H391-066	H391-069	H391-072
3	Front cover	1	H491-109	H491-117	H391-073
4	Side plate(F)	1	H491-110	H491-118	H391-074
5	Vane	6	H491-116	H491-119	H491-122
6	Side plate(R)	1	H391-067	H391-070	H391-075
7	Rear cover	1	H491-112	H491-120	H491-123
8	Pin	1	H491-113	H477-195	H491-124
9	Spacer	2	H491-114	H491-121	H491-125
10	Ball bearing	2	6201ZZ	6202ZZ	6204ZZ
11	Oil seal	1	SC12257	SC15307	SC204011
12	O-ring	2	S75	S85	S105
13	Hexagon socket head cap screw	6	M5x70	M5x80	M6x100
14	Key	1	-	5x5x24	6x6x34
15	Seal washer	6	DS-1-5	DS-1-5	DS-1-6

Base type

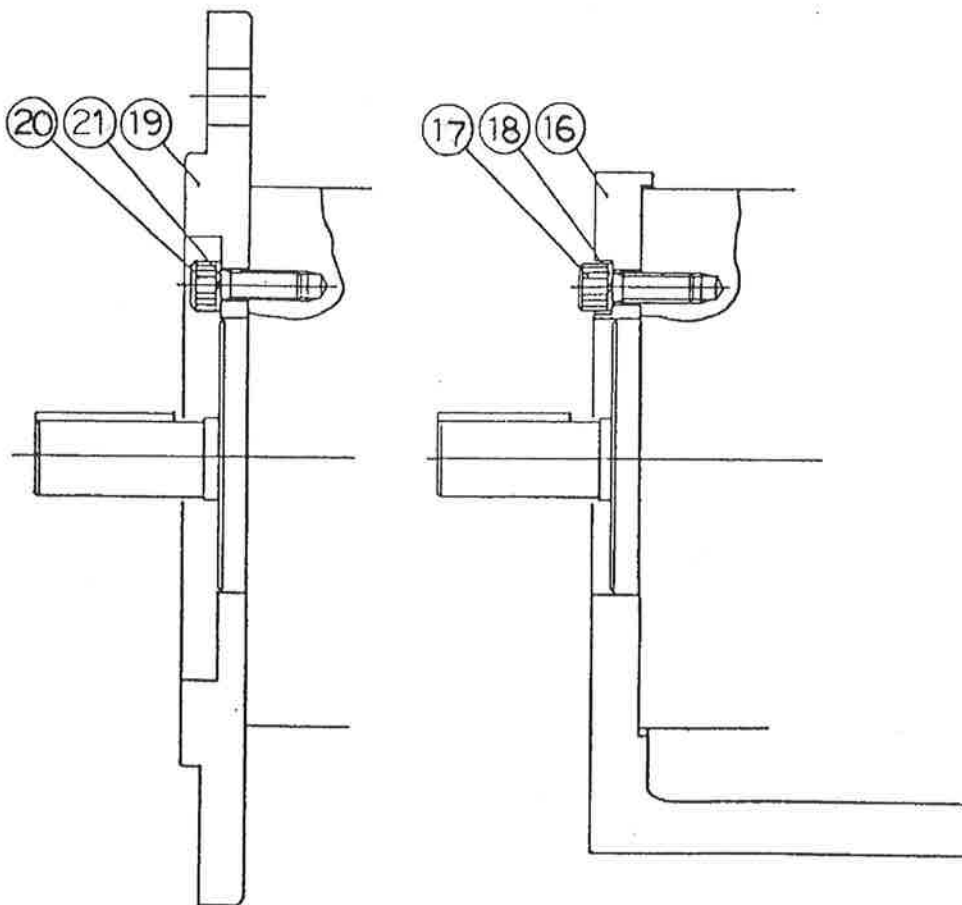
16	Base	1	H391-032	H391-032	H391-033
17	Hexagon socket head cap screw	4	M5x15	M5x15	M6x20
18	Spring washer	4	5 CAP	5 CAP	6 CAP

Flange type

19	Flange	1	H491-115	H491-115	H491-126
20	Hexagon socket head cap screw	4	M5x15	M5x15	M6x20
21	Spring washer	4	5 CAP	5 CAP	6 CAP



Face type



Flange type

Base type

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Phone: (03) 5651-8081 Fax: (03) 5651-8082

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Instruction Manual




Product name : Air Control Unit
: SFRL2/SKL2
: EFRL2/EKL2
: MFRL2/MKL2
: HFRL2/HKL2

<<For safe use of product>>

Wrong operation of the product may result in unavailability of exhibition of full performance of the product or lead to a serious accident. To prevent occurrence of an accident, be sure to read the Instruction Manual of the product carefully to completely understand the contents given therein before operating the product. Those described as precautions are items to which your careful attention has to be paid. Operators or products may be injured or damaged, unless these precautions are strictly observed. Accordingly, be sure to operate the product in strict conformance with the instructions given therein.
If you find any unclear point, contact us.

FOR SAFE USE

Cautionary descriptions given here are for correct use of the products and for prevention of hazard on you and other people in vicinity and damage with equipment. These descriptions are divided into three items of "DANGER", "WARNING" and "CAUTION" depending on the severity of hazard or damage and level of imminence. All bear important descriptions pertaining to safety. Strictly observe the instructions in addition to those of ISO4414*1) and other safety rules.

	DANGER :	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
	WARNING :	Indicates a potentially hazardous situation which could result in death or serious injury, if the equipment is operated wrongly.
	CAUTION :	Indicates a potentially hazardous situation which may result in injury and machine damage, if the equipment is operated wrongly.

*1) ISO4414: Pneumatic Fluid Power – Recommendations for the application of equipment to transmission control systems.



WARNING

- For decision of conformity of pneumatic equipment, the designer of a pneumatic system or a person deciding the specifications is requested to render judgment.
- Operators with sufficient knowledge and experiences should operate the equipment.
Compressed air, if handled wrongly, will cause a hazard. Personnel with sufficient knowledge and experiences only are requested to assemble, operate or maintain machines and devices which use pneumatic equipment.
- Do not handle the machines and devices or remove the equipment until safety is confirmed.
 - 1) Inspect or service the machines and devices after making sure of measures taken securely for prevention of drop of driven bodies and out-of-control run of them.
 - 2) Remove the equipment after making sure of the safety measures mentioned above duly taken and exhausting compressed air in the system.
 - 3) When restarting the machines and devices, make sure of a measures taken for prevention of protrusion in advance.
- Use the product in environment conforming to the specifications.
You are requested to be sure to inform us in advance, when you intend to use the product outdoors or for applications likely to have large effects on people and properties and requiring safety in particular such as atomic energy, railways, aircraft, rolling stocks, medical equipment, equipment to be in touch with beverage and foodstuff, amusement equipment, emergency shut-off devices, press safety devices, brake circuits and safety equipment.
Operate the product at the pressure range, electrical ratings and operating fluid within the catalog specification ranges.

TAIYO, LTD.

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TOKYO OFFICE

Imaasa Bldg 1-1-21, Higashi-shinbashi, Minato-ku, Tokyo
105, Japan
PHONE : (03)5568-5621 FAX : (03)5568-5632

WARNING

- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- Service according to procedures listed in these instructions.
- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Even after the inlet side compressed air of the Air Control Unit has been exhausted, the outlet side compressed air may not be exhausted according to circumstances. Be careful of residual pressure in case of maintenance etc.
- When there is a possibility that the equipment on the outlet side may be damaged and broken by pressure fluctuation due to a trouble of the Air Control Unit, be sure to install a safety device to protect the equipment.
- There is a possibility that a plastic bowl is damaged or broken by chemicals, solvent, paints, mineral oil, phosphate esters hydraulic fluid, substances that corrode polycarbonate, direct rays, etc., causing an accident resulting in injury or death and an equipment breakdown. Therefore, it should not be used in environments having these influences. (It should not be used in the operating environments shown in the separate list or in environments where chemicals are used.)

SOME OF THE MATERIALS THAT WILL ATTACK POLYCARBONATE PLASTIC BOWLS.

Acetaldehyde	Benzoic acid	Chloroform	Ethylene chlorohydrins	Nitric acid	Styrene
Acetic acid	Benzyl alcohol	Cresol	Ethylene dichloride	Nitrobenzene	Sulfuric acid
Acetone	Brake fluids	Cyclohexanol	Ethylene glycol	Nitrocellulose lacquer	Sulphural chloride
Acrylonitrile	Bromobenzene	Cyclohexanone	Formic acid	Perchlorethylene	Thiophene
Ammonia	Butyric acid	Cyclohexene	Freon	Phenol	Toluene
Ammonium fluoride	Carbolic acid	Dimethyl formamide	Gasoline	Phosphorous hydroxyl chloride	Turpentine
Ammonium hydroxide	Carbon disulfide	Dioxane	Hydrazine	Phosphorous trichloride	Tetrahydronaphtalene
Ammonium sulfide	Carbon tetrachloride	Ethane tetrachloride	Hydrochloric acid	Propionic acid	Xylene and others
Anaerobic adhesives And sealants	Caustic potash solution	Ethyl acetate	Methylene chloride	Pyridine	
Antifreeze	Caustic soda solution	Ethyl ether	Methylene salicylate	Sodium hydroxide	
Benzene	Chlorobenzene	Ethylamine	Milk of lime (CaOH)	Sodium sulfide	

WE CANNOT POSSIBLY LIST ALL HARMFUL SUBSTANCES. WHEN USING THEM IN SUCH ENVIRONMENTS OR ATMOSPHERE, CONTACT TAIYO.

Do daily check to detect crazing, cracking, damage or other deterioration on a Plastic bowl. If any abnormality is found, immediately stop using and replace any crazed, damaged or deteriorated bowl with a Metal bowl, provide a protective cover, change the installation location or take other countermeasures.

CAUTION

- Do not install the Air Control Unit at the place which is exposed to direct sunlight and rainwater.
- The Piston drain is intermittently operated by a pressure drop caused by switching the solenoid valve. Therefore, when air consumption on the outlet side of the product is small, it may not operate. Install it near the solenoid valve at a distance of less than 50 cm.
- Set the pressure of the outlet side to 85% less than that of the inlet side.
- When air flow to the lubricator is small, lubrication may not be performed according to circumstances.
- Install as close as possible to point where air is being used.

Application Limits

These products are intended for use in general-purpose compressed air systems only.

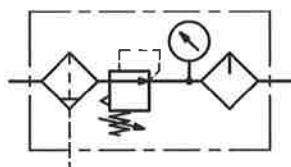
Specifications

Type Item	SFRL2 SKL2	EFRL2 EKL2	MFRL2 MKL2	HFRL2 HKL2
Port size	Rc1/8 Rc1/4	Rc1/4 Rc3/8 Rc1/2	Rc1/2 Rc3/4	Rc3/4 Rc1
Fluid	Air			
Max. operating pressure	0.93MPa			
Ambient and fluid temperature	+5 to +60°C			
Filtration	5 μm			
Bowl capacity(Filter)	15 cm ³	60 cm ³	100 cm ³	100 cm ³
Drain	Standard: Manual Drain Option: Piston Drain*1)	Standard: Manual Drain Option: Auto. Drain*1)		
Set pressure range(Regulator)	0.05 to 0.83 MPa			
Bowl capacity(Lubricator)	25 cm ³	60 cm ³	160 cm ³	160 cm ³
Recommended oil	Turbine oil class 1 ISO VG32			
Mass	0.6 kg	1.4 kg	2.2 kg	3.8 kg

*1) Minimum operating pressure: 0.15 MPa

Note: The maximum recommended pressure drop for a Air filter is 0.07MPa.

Symbols



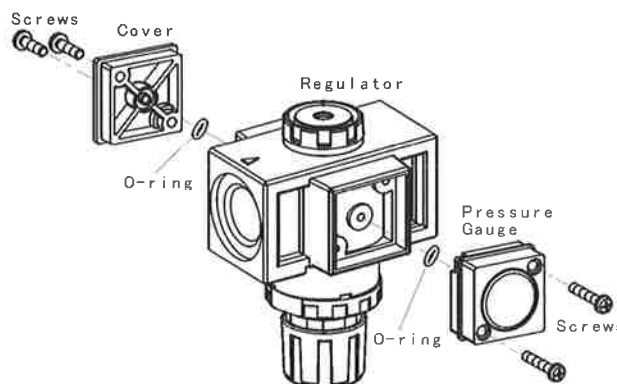
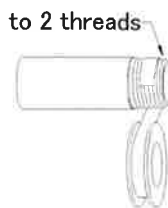
Model Combinations

Models	Filter-regulator	Air filter	Regulator	Lubricator
SFRL2-06	—	SAF2-06	SRV2-06	SAL2-06
SFRL2-08	—	SAF2-08	SRV2-08	SAL2-08
EFRL2-08	—	EAf2-08	ERV2-08	EAL2-08
EFRL2-10	—	EAf2-10	ERV2-10	EAL2-10
EFRL2-15	—	EAf2-15	ERV2-15	EAL2-15
MFRL2-15	—	MAf2-15	MRV2-15	MAL2-15
MFRL2-20	—	MAf2-20	MRV2-20	MAL2-20
HFRL2-20	—	HAf2-20	HRV2-20	HAL2-20
HFRL2-25	—	HAf2-25	HRV2-25	HAL2-25
SKL2-06	SFR2-06	—	—	SAL2-06
SKL2-08	SFR2-08	—	—	SAL2-08
EKL2-08	EFR2-08	—	—	EAL2-08
EKL2-10	EFR2-10	—	—	EAL2-10
EKL2-15	EFR2-15	—	—	EAL2-15
MKL2-15	MFR2-15	—	—	MAL2-15
MKL2-20	MFR2-20	—	—	MAL2-20
HKL2-20	HFR2-20	—	—	HAL2-20
HKL2-25	HFR2-25	—	—	HAL2-25

Installation

⚠ CAUTION

- Air Control Unit should be installed with reasonable accessibility for service whenever possible.
- Keep pipe or tubing lengths to a minimum with inside clean and free of dirt and chips.
- Pipe joint sealant (adhesive) should be used sparingly and applied only to the male pipe – never into the female port.
- When wrapping a seal tape around threaded area of the piping or joint, wrap the tape doubly or triply leaving 1 to 2 threads at the end as untapped.
- The upstream pipe work must be clear of accumulated dirt and liquids.
- Select Air Control Unit location as close as possible to the equipment being protected.
- Install Air Control Unit so that air flows in the direction of arrow on body.
- Install Air Control Unit vertically with the bowl drain mechanism at the bottom.
- Installation must be upstream (high pressure) side and as close to the devices it is to service (valve, cylinder, tool, etc.).
- Gauge ports are located on both sides of the regulator body for your convenience. It is necessary to install a gauge or cover into each port during installation.
- When fastening a joint, tighten the joint to the torque shown below.



Connecting thread	Proper tightening torque
Rc $\frac{1}{4}$	12 to 14 N·m
Rc $\frac{3}{8}$	28 to 30 N·m
Rc1	36 to 38 N·m
Rc1 $\frac{1}{2}$	48 to 50 N·m

Operation

⚠ WARNING

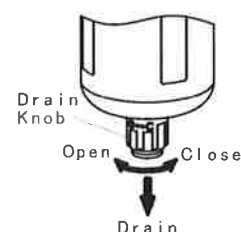
- Before supplying air to this product, confirm that bowl is being assembled securely.
- Before supplying air to this product, confirm the safety of equipment in the line.
- Do supply of first-time air slowly in preparation for the accident.

⚠ CAUTION

- Manual drain filters must be drained regularly before the separated liquid reaches the bottom of the baffle.
- Before turning on the air supply, turn the adjusting knob counterclockwise until compression is released from the pressure adjusting spring. Then turn adjusting knob clockwise and adjust regulator to desired downstream pressure. This permits pressure to build up slowly preventing any unexpected operation of the valve, cylinders, tools, etc., attached to the line.
- Adjustment to desired secondary pressure can be made only with primary pressure applied to the regulator.
- Suggest lubricant : Turbine Oil Class 1 ISO VG32
Do not use oils with adhesives, compound oils containing solvents, graphite, detergents, synthetic oils, spindle oils or machine oils.

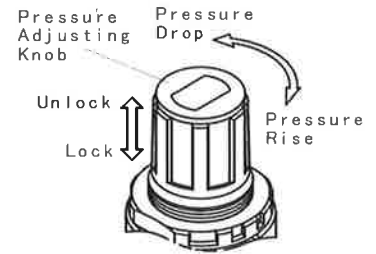
A. Draining

1. Turn the drain knob counter-clockwise. The liquid accumulated in the bowl is drained.
2. After draining, turn the drain knob clockwise and close the drain valve.
3. S series : Draining the drain port by pushing upward.



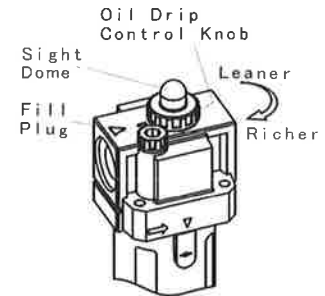
B. Pressure adjustment

1. Disengage the adjusting knob by pulling.
2. When the adjusting knob is turned clockwise, secondary pressure rises. When the adjusting knob is turned counterclockwise, secondary pressure reduces.
3. To decrease regulated pressure settings, always reset from a pressure lower than the final setting required. Example, lowering the secondary pressure from 0.55 to 0.41MPa is best accomplished by dropping the secondary pressure to 0.35MPa, then adjusting upward to 0.41MPa.
4. When desired secondary pressure settings have been reached, push the adjusting knob to lock this pressure setting.



C. Filling

1. The lubricator can be filled without turning off the upstream pressure.
2. Slowly remove the fill plug by turning counterclockwise. This allows the bowl pressure to vent.
3. Supply lubricating oil.
4. Replace the fill plug (by turning clockwise) and seat firmly. Excessive torque is not required. If leakage occurs, do not operate – conduct repairs again. The lubricator is now ready for setting.

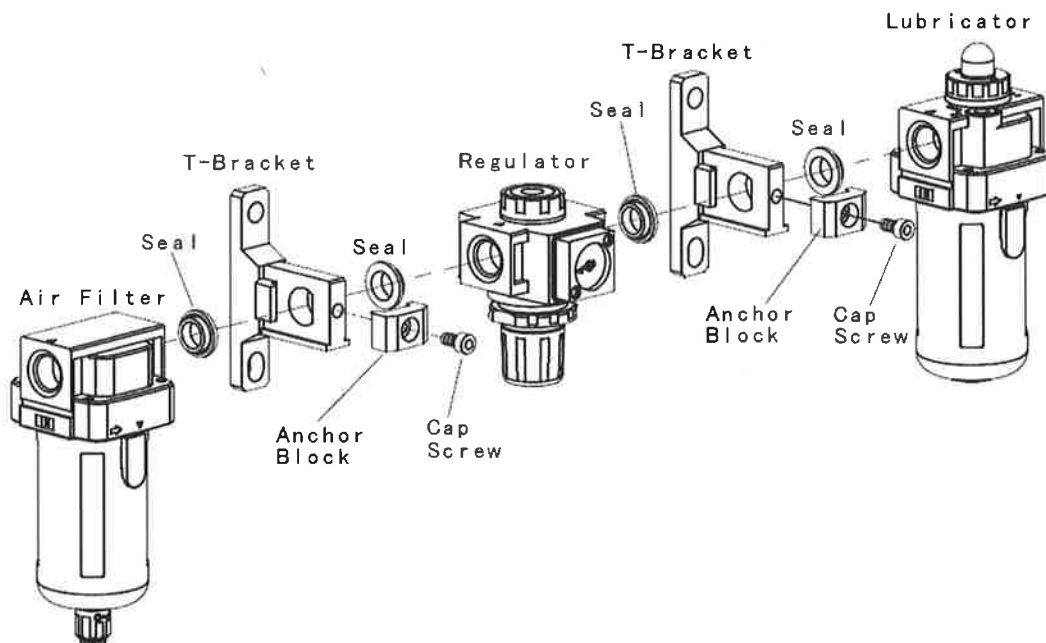


D. Oil delivery adjustment

1. To adjust oil delivery, turn adjustment knob on top of the lubricator.
Leaner – Clockwise
Richer – Counterclockwise
2. By counting the number of drops per minute in the sight dome, you can adjust to your requirements.
Mist lubricator – Every drop visible in the sight dome goes downstream.
Generally, one drop per minute downstream for every 300 – 400 l/min(ANR) flow is satisfactory.
25 drops per minute equals 70 gram per hour volume of oil passing through the sight dome.

NOTE : This is a constant density type lubricator which delivers a constant ratio of oil air flow. Therefore, if air flow increases or decreases, oil delivery will be adjusted proportionately. **Only if a different ratio is desired should your adjustment knob setting be change after your initial setting.**

Disassembled view of the combination





Operation Manual

PRODUCT NAME

*SPEED CONTROLLER STANDARD TYPE
IN-LINE TYPE*

MODEL/ Series/ Product Number

*AS 1000 / AS 2000 / AS 3000
AS 4000 / AS 5000*

SMC Corporation

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Speed Controller Standard Type 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)*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: 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.



Speed Controller Standard Type In-Line Type / AS Series 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.

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.

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.

Caution

SMC products are not intended for use as instruments for legal metrology.

Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country.

Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

2. Specific Product Precautions

Design/ Selection



Warning

(1) Confirm the specifications.

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

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

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

(2) Products mentioned in this catalog are not designed for use as stop valves with zero air leakage.

A certain amount of leakage is allowed in the products specifications. Tightening the needle to reduce leakage to zero may result in equipment damage.

(3) Do not disassemble the product or make any modifications, including additional machining.

Doing so may cause human injury and/or an accident.

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

The flow rate characteristics are characteristics of each individual product. Actual values may differ depending on the piping, circuitry, pressure conditions, etc. Also, depending on product specifications, there may be variations in the zero needle rotations position of the flow rate characteristics.

Mounting



Warning

(1) Operation Manual

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

(2) Ensure sufficient space for maintenance activities.

When installing the products, allow access for maintenance.

(3) Confirm that the lock nut is tightened.

A loose lock nut may cause speed changes in the actuator.

(4) Check the degree of rotation of the needle valve.

The Products in this catalog are retainer type so that the needle is not removed completely. Over rotation will cause damage.

Mounting



Warning

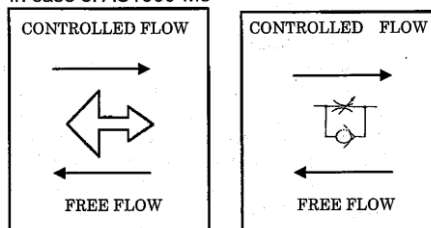
(5) Do not use tools such as pliers to rotate the knob.

This can cause idle rotation of the knob or damage.

(6) Confirm the air flow direction.

Mounting backward is dangerous, because the speed adjustment needle will not work and the actuator may lurch suddenly.

In case of AS1000-M3



(7) Adjust the speed by opening the needle slowly from the fully closed state.

Loose needle valves may cause unexpected sudden actuator lurching.

When a needle valve is turned clockwise, it is closed and cylinder speed decreases. When a needle valve is turned counterclockwise, it is open and cylinder speed increases.

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

This can cause damage or air leakage.



Caution

(1) The proper tightening torques for hexagon lock nuts are shown in the table below. For standard installation, turn 15 to 30° using a tool after fastening by hand.

Pay attention not to over tighten the product. Check the dimensions for each product for the width across flats.

Model Number	Proper tightening torque (N·m)	Lock nut width across flats
AS1000-M3	0.07	4.5
AS1000-M5	2	10
AS2000	5	12
AS3000	6	12
AS4000	10	29
AS5000	10	29

Piping



Caution

(1) Preparation before piping

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.

Air Supply



Warning

(1) Type of fluids

Please consult with SMC when using the product in applications other than compressed air.

(2) When there is a large amount of drainage

Compressed air containing a large amount of drainage can cause the malfunction of pneumatic equipment. An air dryer or water 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 the malfunction of pneumatic equipment.

If the drain bowl is difficult to check and remove, the 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) Use clean air

Do not use compressed air that contains chemicals, synthetic oils that include organic solvents, salt, corrosive gases, etc., as it 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 $5\mu\text{m}$ or smaller.

(2) Take measures to ensure air quality, such as by installing an aftercooler, air dryer, or water separator.

Compressed air that contains a large amount of drainage can cause the malfunction of pneumatic equipment, such as flow control equipment. Therefore, take appropriate measures to ensure air quality, such as by providing an aftercooler, air dryer, or water separator.

(3) Ensure that the fluid and ambient temperatures are within the specified range.

If the fluid temperature is 5°C or less, the moisture in the circuit could freeze, causing damage to the seals or leading to equipment malfunction. Therefore, take appropriate measures to prevent freezing.

For compressed air quality, refer to SMC catalog "Compressed Air Purification System".

Operating environment



Warning

(1) Do not use in an atmosphere containing corrosive gases, chemicals, sea water, water, water steam, or where there is direct contact with any of these.

Refer to each construction drawing for information on the materials of flow control equipment.

(2) Do not expose the product to direct sunlight for an extended period of time.

(3) Do not use in a place subject to heavy vibration and/or shock.

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

Maintenance



Warning

(1) Perform maintenance and inspection according to the procedures indicated in the operation manual.

If handled improperly, malfunction or damage of machinery and equipment may occur.

(2) Maintenance work

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) Drain flushing

Remove drainage from air filters regularly.

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

Before components are removed, first confirm that measures are in place to prevent workpieces from dropping, run-away equipment, etc.

Then, Cut the supply pressure and electric power, and exhaust all compressed air from the system using the residual pressure release function.

When machinery is restarted, proceed with caution after confirming that appropriate measures are in place to prevent sudden movement.

3. Application

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

4. Specifications

Fluid	Air
Proof pressure ^{Note1)}	1.5MPa(1.05MPa)
Max. operating pressure ^{Note1)}	1.0MPa(0.7MPa)
Min. operating pressure ^{Note1)}	0.05MPa(0.1MPa)
Ambient and fluid temperature	Standard : -5 to 60 deg.C (No freezing) -H ^{Note2)} : -5 to 80 deg.C (No freezing) -L ^{Note3)} : -30 to 60 deg.C (No freezing)

Note 1) (): Values for AS1000.

Note 2) AS5000 is available as special. AS1000 is not applicable.

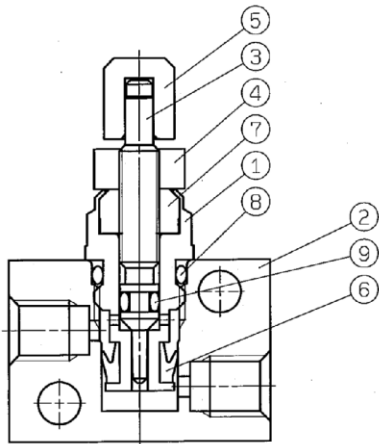
Note 3) AS1000, AS2000 are not applicable.

5. Troubleshooting

Trouble	Possible causes	Countermeasures
The speed (flow rate) cannot be controlled.	The direction of check valve is reverse.	Confirm which control is used meter-out or meter-in in accordance with operating conditions.
	There are some dust inside.	Fully open a needle and air blow from the free flow side.
	Rubber lining of valve is broken.	Change valve.
	Valve spring is broken.	Change spring.

6. Construction

AS1000-M3

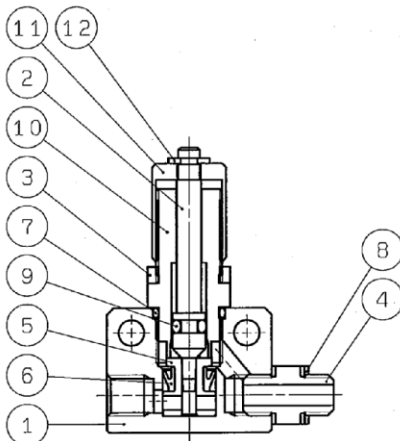


Component Parts

No.	Description	Material	Note
①	Body B	Brass	Electroless nickel plating
②	Body	Brass	Electroless nickel plating
③	Needle	Brass	Electroless nickel plating
④	Lock nut	Steel ^{Note)}	
⑤	Handle	Brass	Electroless nickel plating
⑥	U seal	HNBR	
⑦	Needle guide	Brass	Electroless nickel plating
⑧	O-ring	NBR	
⑨	O-ring	NBR	

Note) The round lock nut is made of electroless nickel plated brass.

AS1000-M5^{Note1)}



Component Parts

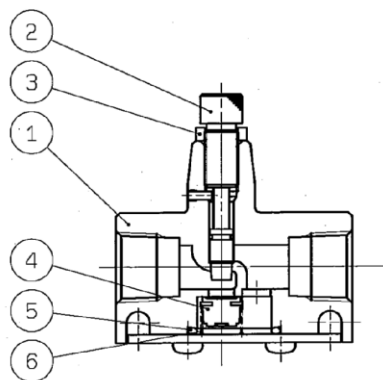
No.	Description	Material	Note
①	Body	Zinc alloy	
②	Needle	Stainless steel	
③	Lock nut	Steel ^{Note2)}	
④	Nipple	Stainless steel	
⑤	Valve seat	Brass	
⑥	U seal	HNBR	
⑦	O-ring	NBR	
⑧	Gasket	NBR/Stainless steel	
⑨	O-ring	NBR	
⑩	Needle guide	Brass	Electroless nickel plating
⑪	Handle	Brass	Electroless nickel plating
⑫	E type snap ring	Steel	

Note1) Construction drawing: AS1000-M5-N.

In case of AS1000-M5, nipples and gaskets are not attached.

Note2) The round lock nut is made of electroless nickel plated brass.

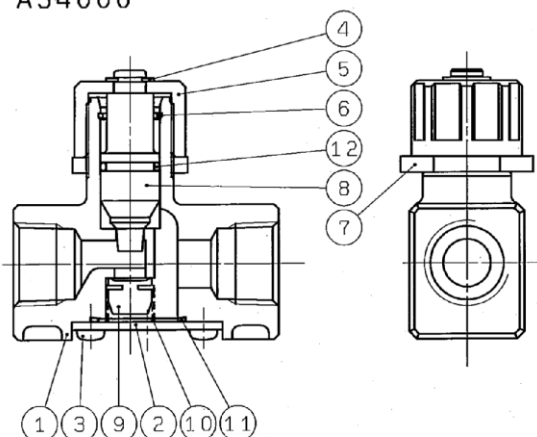
AS2000 • AS3000



Component Parts

No.	Description	Material		Note
		AS2000	AS3000	
①	Body	Zinc alloy	Aluminum alloy	
②	Needle	Brass	Brass	Electroless nickel plating
③	Lock nut	Brass	Carbon steel	AS2000 : Electroless nickel plating
④	Valve	NBR/Brass	NBR/Brass	
⑤	O-ring	NBR	NBR	
⑥	Spring	Stainless steel	Stainless steel	

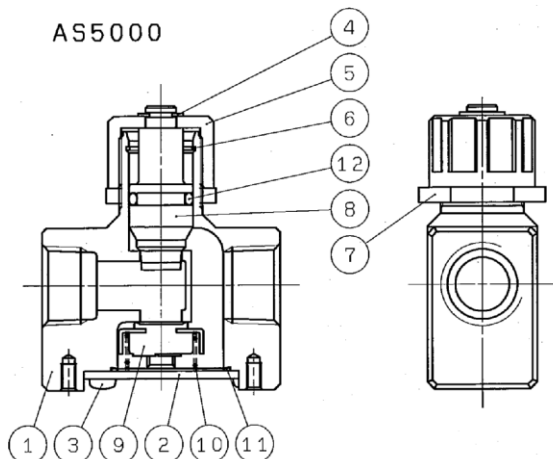
AS4000



Component Parts

No.	Description	Material	Note
①	Body	Aluminum alloy	
②	Cap	Rolled steel	
③	Cross-recessed head cap screw	Steel wire	
④	E type snap ring	Stainless steel	
⑤	Handle	Zinc alloy	
⑥	Ring	Steel wire	
⑦	Lock nut	Zinc alloy	
⑧	Needle	Aluminum alloy	
⑨	Valve	NBR/Brass	
⑩	Spring	Stainless steel	
⑪	O-ring	NBR	
⑫	O-ring	NBR	

AS5000



Component Parts

No.	Description	Material	Note
①	Body	Aluminum alloy	
②	Cap	Rolled steel	
③	Cross-recessed head cap screw	Steel wire	
④	E type snap ring	Stainless steel	
⑤	Handle	Zinc alloy	
⑥	Ring	Steel wire	
⑦	Lock nut	Zinc alloy	
⑧	Needle	Aluminum alloy	
⑨	Valve	NBR/Stainless steel	
⑩	Spring	Stainless steel	
⑪	Seal	NBR	
⑫	O-ring	NBR	

Revision history

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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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