



Operation Manual

PRODUCT NAME

REGULATOR

MODEL/ Series

AR20-(F,N)01 ~ (F,N)02(B,G,H,M)(-1,N,R,Y,Z)-A
AR25-(F,N)02 ~ (F,N)03(B,G,H,M)(-1,N,R,Y,Z)-A
AR30-(F,N)02 ~ (F,N)03(B,G,H,M)(-1,N,R,Y,Z)-A
AR40-(F,N)02 ~ (F,N)04(B,G,H,M)(-1,N,R,Y,Z)-A
AR40-(F,N)06(B,G,H,M)(-1,N,R,Y,Z)-A

SMC Corporation

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REGULATOR

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), Japan Industrial Standards (JIS)*1) and other safety regulations*2).

*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
JIS B 8370: General rules for pneumatic equipment.
JIS B 8361: General rules for hydraulic equipment.
JIS B 9960-1: Safety of machinery -- Electrical equipment for machines. (Part 1: General requirements)
JIS B 8433-1993: Manipulating industrial robots - Safety, etc.

*2) Labor Safety and Sanitation Law, etc.



Caution Operator error could result in injury or equipment damage.



Warning Operator error could result in serious injury or loss of life.



Danger In extreme conditions, there is a possibility of serious injury or loss of life.

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.

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.

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.

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.



REGULATOR Safety Instructions

Caution

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

The warranty period of the product is 1 year in service or 1.5 years after the product is delivered. Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

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.

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

When the product is exported, strictly follow the laws required by the Ministry of Economy, Trade and Industry (Foreign Exchange and Foreign Trade Control Law).

Precautions for design

WARNING

- ① External parts including the bonnet, handle, cover (Material: polyacetal) are made of resin. Organic solvents including synthetic fluid, chemicals including acetone, alcohol, ethylene chloride, sulphuric acid, nitrate, hydrochloric acid, cutting oil, kerosene, gasoline, lock material of screw are harmful. Do not use the regulator where containing those.
- ② Consult SMC if no leakage is allowed due to the environment, or operating fluid is not air.
- ③ Protect from ultra violet ray and radiation heat by shield.
- ④ A safety device needs to be installed if output pressure is exceeding the set pressure, otherwise this can cause the breakage of outlet device and equipment or malfunction.

CAUTION

- ① Air consumption from release port is 0.1L/min(ANR) or less.

Selection

WARNING

- ① Mineral grease used on internal surfaces and packing may leak to the outlet. Please contact SMC if this is a problem.
- ② It is possible to exhaust the residual pressure to the inlet when releasing the inlet pressure, but the exhaust can fail at a set pressure of 0.15MPa or less. When the backflow function is necessary at 0.15MPa or less, a regulator with backflow function is recommended.
- ③ Long absence of operation or operation with outlet circuit sealed or balance circuit may cause pressure fluctuation in outlet set pressure. Please consult SMC if this is a problem.
- ④ Set pressure of outlet pressure shall be 85% or less of inlet pressure. Pressure over 85% makes operation susceptible to flow and inlet pressure which lead to cause unstable operation.
- ⑤ Maximum set pressure range in the spec. has margin. Pressure set may be higher than the maximum value.
- ⑥ If regulator is used with circuit which requires high exhaust sensitivity or set precision, please consult SMC.

Installation

WARNING

- ① Connect the regulator ensuring the direction of "IN" and "OUT" for air direction or an arrow. Wrong connection may cause malfunction.
- ② Install with enough space around regulator to perform regular maintenance and operation. The required space is shown on 「11. Dimensions」 (P14).
- ③ Do not drop nor apply impact during transportation or installation. This can cause damage to the product.
- ④ Do not install in areas of high humid or high temperature. Or pressure gauge may malfunction.

Adjustment

WARNING

- ① Adjust the pressure adjusting handle ensuring correct inlet pressure and outlet pressure. Excessive rotation may cause damage to internal parts.
- ② Operate the pressure adjusting handle manually. Tools may break the handle.

CAUTION

- ① Check inlet pressure before setting up.
- ② Be sure to unlock the handle before adjusting the pressure and lock it after setting the pressure. Failure to follow this procedure can damage the handle and the outlet pressure may fluctuate.

- Pull the pressure regulator handle to unlock. (You can visually verify this with the "orange mark" that appears in the gap.)
 - Push the pressure regulator handle to lock. When the handle is not easily locked, turn it left and right a little and then push it. (When the handle is locked, the "orange mark", i.e., the gap will disappear.)
- ③ For the regulator with the pressure gauge, do not apply pressure exceeding the maximum scale of the pressure gauge in order to protect the gauge.
 - ④ Adjust pressure incrementally. Pressure may become lower than set pressure if adjusted by decreasing the value. Rotate the handle clockwise to raise the set pressure. Counterclockwise to reduce the pressure. Moreover, please lock the handle after setting pressure.
 - ⑤ Outlet pressure may rise if eliminate the inlet pressure after pressure setting and supply pressure again. The pressure becomes close to the set pressure after air is consumed in outlet.
 - ⑥ Outlet pressure may change if regulator is used for long periods. Please confirm set pressure regularly.
 - ⑦ When pressure difference between the inlet side and the outlet side is large, chattering may occur. In that case, please reduce and use pressure difference between the inlet side and the outlet side. Please consult SMC if chattering continues.

Piping

WARNING

- ① Blow out or clean piping before piping to eliminate swarf, cutting oil, solid foreign material. Contamination of piping may cause damage or malfunction.
- ② When installing piping, avoid chips and sealing materials from piping screws entering the inside of equipment. Or malfunction may occur. When use sealing tapes, leave 1.5~2 threads of the end of thread exposed.
- ③ Hold the female screw side and screw in piping with recommended tightening torque. Insufficient tightening torque lead to cause loose piping or sealing failure. Excessive torque may lead to cause screw breakage. Tightening without holding female screw side applies excessive force to the piping bracket which lead to cause breakage.

Recommended torque		unit: N·m			
Screw	1/8	1/4	3/8	1/2	3/4
Torque	7~9	12~14	22~24	28~30	28~30

- ④ Do not apply any torsional moment, or bending moment except the weight of the regulator itself. External piping needs to be supported separately. Hard piping like steel tube is susceptible to excessive moment load or vibration. Insert the flexible tube to cancel the influence.

Air Source

WARNING

- ① Use clean air. Compressed air containing chemicals, organic solvent, synthetic oil or corrosive gas may lead to cause breakage of parts or malfunction.
- ② Air containing too much moisture may cause malfunction. Install the air drier or the aftercooler before the regulator.

Maintenance

WARNING

- ① Maintenance and checks should be done by following the procedure in the operation manual. Incorrect handling of the product may cause breakage or malfunction of the equipment or device.
- ② When using the regulator with backflow function between a solenoid valve and an actuator, check the pressure gauge periodically. Sudden pressure fluctuations may shorten the durability of the pressure gauge. A digital pressure gauge is recommended for such situation or as deemed necessary.

**CAUTION**

- ① If the first operation is performed and defective setting and the exhaust leakage is found, it is likely there is foreign object in an internal valve seat part. Failure to remove these parts may cause damage to internal parts.

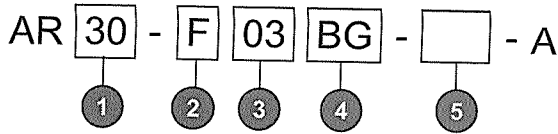
2. APPLICATION

This product aims at controlling the pressure of air lines.

3. SPECIFICATIONS

Model	AR20-A	AR25-A	AR30-A	AR40-A	AR40-06-A
Port size	1/8, 1/4	1/4, 3/8	1/4, 3/8	1/4, 3/8, 1/2	3/4
Gauge port size	1/8				
Fluid	Air				
Ambient and fluid temperature	-5 ~ 60°C (Should be no freezing)				
Proof pressure	1.5 MPa				
Max. operating pressure	1.0 MPa				
Set pressure range	0.05 ~ 0.7 MPa				
Construction	Relieving type				
Mass (kg)	0.17	0.19	0.34	0.58	0.60

4. HOW TO ORDER



•Option / Semi-standard : Select one each for a to g.
 •Option / Semi-standard symbol : When more than one specification is required, indicate in alphanumeric order.
 Example) AR30-03BG-1N-A

		Symbol	Description	1						
				Body size						
				20	25	30	40			
2	Thread type	Nil	Rc	●	●	●	●			
		N	NPT	●	●	●	●			
		F	G	●	●	●	●			
		+								
3	Port size	01	1/8	●	—	—	—			
		02	1/4	●	●	●	●			
		03	3/8	—	●	●	●			
		04	1/2	—	—	—	●			
		06	3/4	—	—	—	●			
		+								
4	Option	a	Mounting	Nil	Without mounting option		●	●	●	●
			B ^{Note 2)}	With bracket		●	●	●	●	
			H	With set nut (for panel mounting)		●	●	●	●	
	+									
	b	Pressure gauge ^{Note 3)}	Nil	Without pressure gauge		●	●	●	●	
			G	Round type pressure gauge (with limit indicator)		●	●	●	●	
M			Round type pressure gauge (with colour zone)		●	●	●	●		
+										
5	Semi-standard	c	Set pressure ^{Note 4)}	Nil	0.05 to 0.7 MPa setting		●	●	●	●
				1	0.02 to 0.2 MPa setting		●	●	●	●
		+								
		d	Exhaust mechanism	Nil	Relieving type		●	●	●	●
				N	Non-relieving type		●	●	●	●
		+								
		e	Flow direction	Nil	Flow direction : Left to right		●	●	●	●
				R	Flow direction : Right to left		●	●	●	●
		+								
		f	Handle	Nil	Downward		●	●	●	●
Y	Upward			●	●	●	●			
+										
g	Pressure unit	Nil	Name plate, caution plate for bowl, and pressure gauge in imperial units:MPa, °C		●	●	●	●		
		Z ^{Note 5)}	Name plate, caution plate for bowl, and pressure gauge in imperial units:psi, °F		○	○	○	○		

Note 1) Option B, G, H, M are not assembled and supplied loose at the time of shipment.

Note 2) Assembly of a bracket and set nuts.

Note 3) Pressure gauge is 1.0MPa specification for a standard setting, also available is 0.4MPa specification for 0.2MPa setting.

Note 4) Although the pressure can be set at the upper limit of the set pressure or more, use the product within the specification.

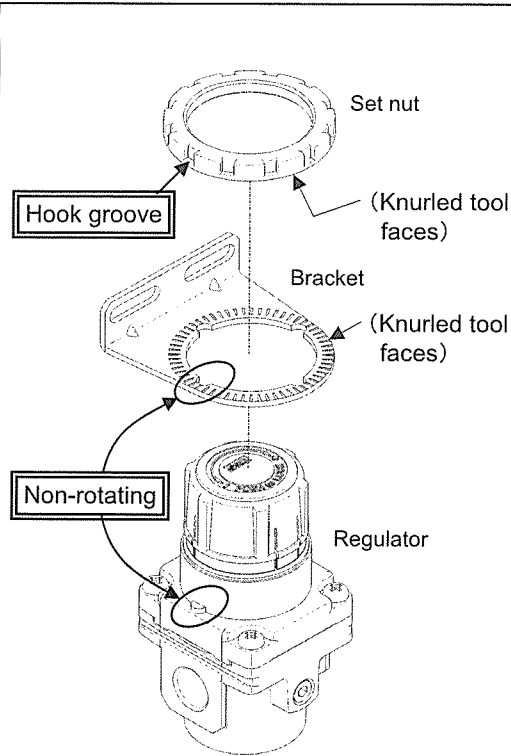
Note 5) For thread type: NPT. This product is for overseas use only according to the new Measurement Law. (The SI unit type is provided for use in Japan.)

Round type pressure gauge (with colour zone): It is not possible to combine with M. It separately becomes request for price quotation correspondence.

Note 6) ○: For thread type: NPT only.

5. ASSEMBLY OF OPTIONAL PARTS

1) Bracket



1) Installation of bracket

Mount the bracket in the direction as shown in the figure. Assemble so that the bracket and non-rotating parts can align properly.

2) Secure with the set nut

Ensure knurling tool side of the bracket of the knurling tool side of the set nut are facing each other.

3) Tightening

Knurled surface on bracket and set nut is used to lock the assembly.

It is recommended that the set nut is tightened securely by hand usually.

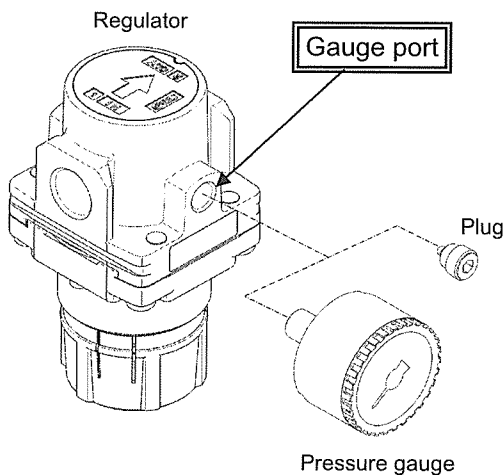
* When retightening

Please use hook spanner on hook groove of the set nut, and tighten.

Please follow the table below for hand tightening and retightening.

Regulator	Tool size	Amount of retightening	Tightening torque
AR20-A	34/38	2 to 5 notch	2.0±0.2 N·m
AR25-A	40/42		2.5±0.2 N·m
AR30-A	52/55		3.5±0.2 N·m
AR40-A	52/55		4.5±0.2 N·m

2) Round type pressure gauge



1) Installation of pressure gauge

Use sealing material on pressure gauge thread and gauge port of the regulator.

Please refer to "Piping" on page 4 when using sealing tape.

Please refer to the following for the size of the spanner when the pressure gauge is installed.

Regulator	Tool size	Regulator	Tool size
AR20-A	12	AR30-A	12
AR25-A		AR40-A	14

Note 1) Positioning of pressure gauge

Please adjust the pressure gauge orientation by tightening the thread.

Don't unscrew gauge, air leakage may occur.

Note 2) The plug is not used if the pressure gauge is in front of regulator.

Please detach the plug when you install the pressure gauge on the back of the regulator.

Please install the plug on the front side.

When shipping, the sealing tape is attached to the pressure gauge.

Note 3) Tightening torque

Please use the value in the torque table described in "Piping" on page 4 when tightening pressure gauge.

The pressure gauge connection port of AR20-A to AR40-A series is 1/8 (7 to 9 N·m).

6. TROUBLESHOOTING

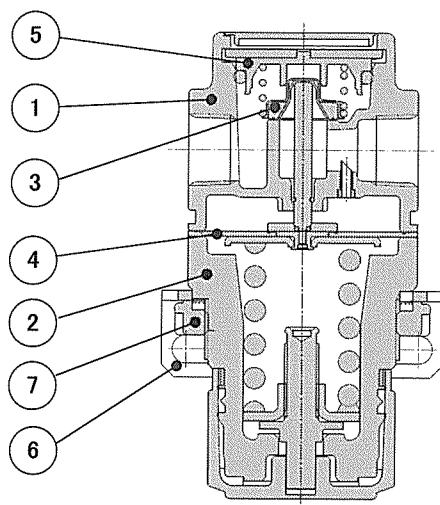
Refer to 「7. CONSTRUCTION / PARTS LIST」 (P10), 「10. DISASSEMBLY DRAWING」 (P12 to P13).

TROUBLE		POSSIBLE CAUSE	REMEDY
DEMARCATION	PHENOMENON		
Pressure	Pressure is not regulated.	1. Opposite flow direction or opposite installation of regulator.	1. Install piping or regulator correctly as shown in manual.
		2. Adjust spring is damaged.	2. Replace the adjust spring.
		3. Valve spring is damaged.	3. Replace the valve spring.
		4. Foreign materials caught in valve seat.	4. Remove the valve guide to clean valve and valve seat.
		5. Valve rubber seat is damaged.	5. Replace the valve assembly.
	Set pressure does not return to zero when pressure handle is loosened.	1. Foreign materials caught in valve seat.	1. Remove the valve guide to clean valve and valve seat.
2. Valve rubber seat is damaged.		2. Replace the valve assembly.	
3. Valve spring is damaged.		3. Replace the valve spring.	
Air leaks	Air leaks from the bonnet exhaust port.	1. Diaphragm is damaged.	1. Replace the diaphragm assembly.
		2. Foreign material is caught in the relieving valve seat.	2. Clean the relieving valve seat, or replace the diaphragm assembly.
		3. Foreign materials caught in valve seat.	3. Remove the valve guide to clean valve and valve seat.
		4. Valve rubber seat is damaged.	4. Replace the valve spring.
		5. Back pressure exceeding the set pressure is applied to the outlet.	5. Revise the air circuit so that back pressure does not exceed the set
	Air leaks between the bonnet and the body.	1. Loosened bonnet.	1. Fasten the bonnet.
		2. Diaphragm is damaged.	2. Replace the diaphragm assembly.

Note) The grease used recommends JX Nippon oil & Energy corporation diamond multipurpose No.2.

7. CONSTRUCTION / PARTS LIST

AR20-A / AR25-A / AR30-A / AR40-A



Component Parts

No.	Description	Material	Note
①	Body	Aluminium die cast	Urban white 1
②	Bonnet	Polyacetal	Urban white 1

Option / Replacement Parts

No.	Description	Thread		Option	Material	Part No.					
		Type	Symbol			AR20-A	AR25-A	AR30-A	AR40-A	AR40-06-A	
③	Valve assembly	—	—	—	HNBR	AR22P-060AS		AR32P-060AS	AR42P-060AS		
④	Diaphragm assembly	—	—	—	Weatherproof NBR	AR22P-150AS		AR32P-150AS	AR42P-150AS		
		—	N	Non-relieving type	Weatherproof NBR	AR22P-150AS-N		AR32P-150AS-N	AR42P-150AS-N		
⑤	Valve guide assembly	—	—	—	Polyacetal / NBR	AR22P-050AS		AR32P-050AS	AR42P-050AS		
⑥	Note1) Bracket assembly	—	—	—	Steel plate / Polyacetal	AR22P-270AS	AR27P-270AS	AR32P-270AS	AR42P-270AS		
⑦	Set nut	—	—	—	Polyacetal	AR22P-260S		AR32P-260S	AR42P-260S		
⑧	Round type pressure gauge	Rc	—	—	—	G36-10-01		G46-10-01			
		G	1	0.2MPa setting	—	G36-4-01		G46-4-01			
		NPT	—	—	—	—	G36-10-N01		G46-10-N01		
			1	0.2MPa setting	—	—	G36-4-N01		G46-4-N01		
			Z	Imperial unit: psi	—	—	G36-P10-N01		G46-P10-N01		
	Round type pressure gauge (with colour zone)	Rc	—	—	—	—	G36-10-01-L		G46-10-01-L		
			G	1	0.2MPa setting	—	G36-4-01-L		G46-4-01-L		
		NPT	—	—	—	—	G36-10-N01-L		G46-10-N01-L		
			1	0.2MPa setting	—	—	G36-4-N01-L		G46-4-N01-L		
			—	—	—	—	G36-10-N01-L		G46-10-N01-L		
⑨	Plug assembly	Rc	—	—	—	AR22P-320AS-01					
		NPT	—	—	—	AR22P-320AS-N01					

Note1) With set nut.

Note2) The number in the table is corresponding to the number in structural drawing (above-mentioned figure) and "10. DISASSEMBLY DRAWING" (P12 to P13).

9. REPLACEMENT PROCEDURE

WARNING

- Before replacement, ensure that the regulator is not pressurized.
- Rotate the pressure adjusting handle to zero.
- Replace referring to "10. DISASSEMBLY DRAWING" (P12 to P13).
- After replacement, ensure that specified function is satisfied and external leakage is not found before starting

1) Diaphragm assembly

Process	Procedure	Tool	Check item							
Disassembly	1. Remove the bonnet. Four screws are removed and the bonnet is detached. Please do not lose parts in the bonnet. <Parts in the bonnet > <ul style="list-style-type: none"> • Adjust screw assembly • Adjust spring • Diaphragm assembly 	Cross pointed driver	—							
Assembly	2. Disassembled parts are set in the body. Please assemble while confirming "Assembly drawing" (P12).	—	<ul style="list-style-type: none"> • Direction of diaphragm assembly • Direction of adjust screw assembly 							
	3. Mount the bonnet. Convex of the bonnet is adjusted to the IN side, it attaches to the body, and the installation screw is tightened with cross pointed driver temporarily. Four screws are tightened evenly by the tightening torque shown at opposite angle configuration.	Cross pointed driver	Tightening torque: <table border="1"> <tr> <td>AR20-A</td> <td>0.62±0.3 N·m</td> </tr> <tr> <td>AR25-A</td> <td>0.62±0.3 N·m</td> </tr> <tr> <td>AR30-A</td> <td>3.5±0.3 N·m</td> </tr> <tr> <td>AR40-A</td> <td>2.6±0.3 N·m</td> </tr> </table>	AR20-A	0.62±0.3 N·m	AR25-A	0.62±0.3 N·m	AR30-A	3.5±0.3 N·m	AR40-A
AR20-A	0.62±0.3 N·m									
AR25-A	0.62±0.3 N·m									
AR30-A	3.5±0.3 N·m									
AR40-A	2.6±0.3 N·m									

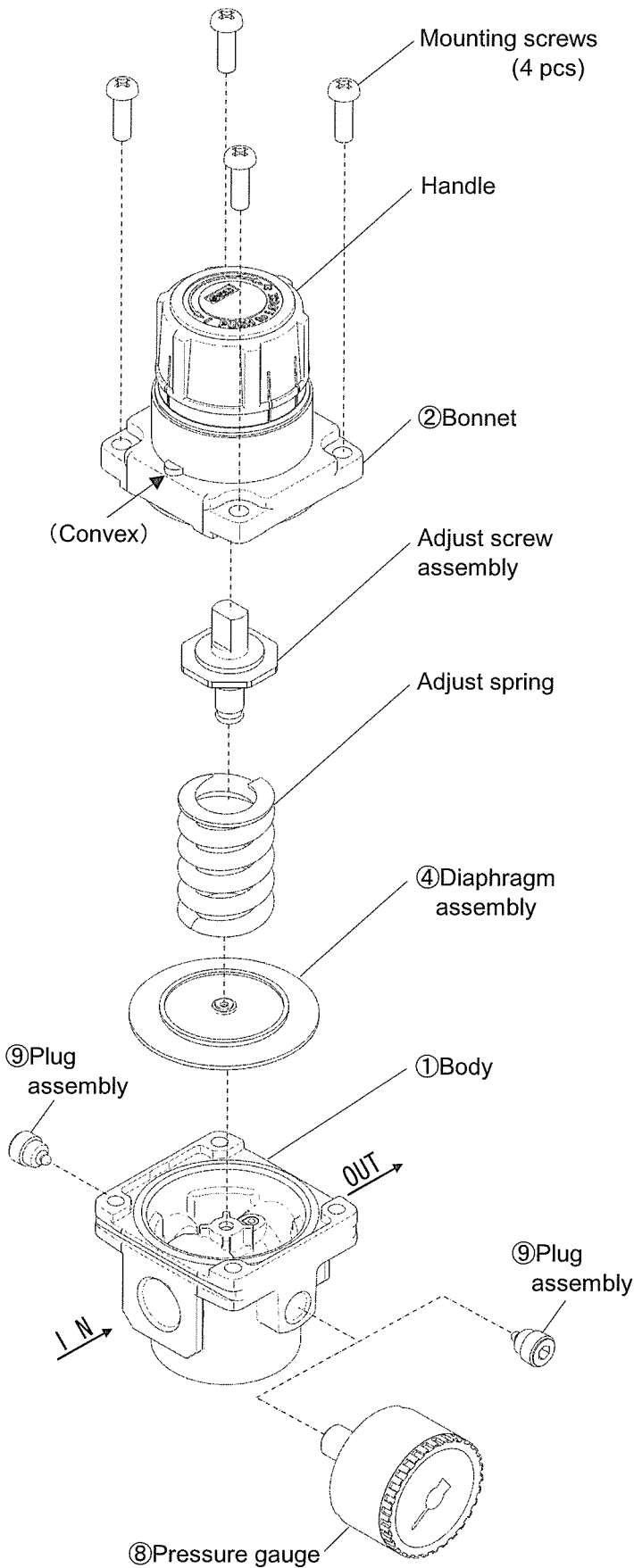
2) Valve guide assembly, Valve

Process	Procedure	Tool	Check item
Disassembly	1. Remove the cap. Insert a small screw driver in the gap between the body and the cap and dislodge the cap.	Small driver	—
	2. Remove the cover. Insert circular pliers to two holes of the cover and rotate 45 degrees, and lift off.	Circular pliers Nominal: 125	—
	3. Remove the valve guide assembly. Remove valve guide by lifting part off using apertures around circumference with a small screw driver.	Small driver	—
	4. Remove the valve spring.	—	—
	5. Remove the valve assembly.	—	—
Assembly	6. Disassembled parts are set in the body. Please assemble while confirming "Assembly drawing" (P12).	—	<ul style="list-style-type: none"> • Direction of valve • Direction of cap

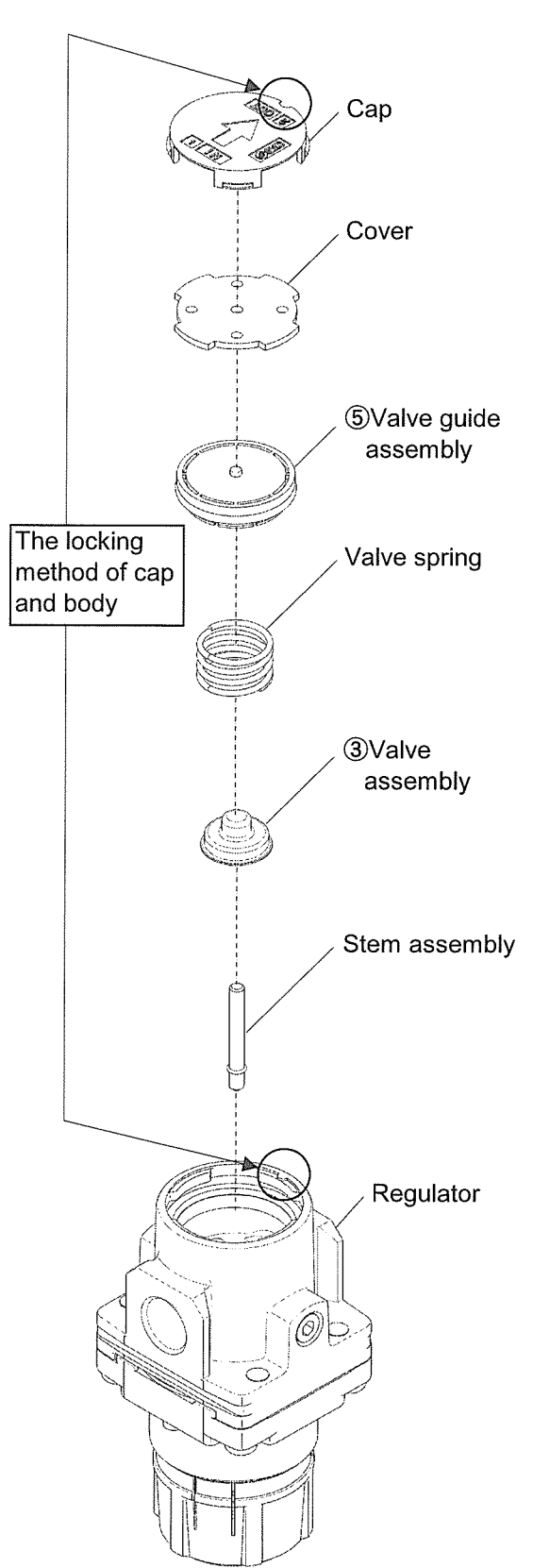
10. DISASSEMBLY DRAWING

1) Regulator disassembly drawing

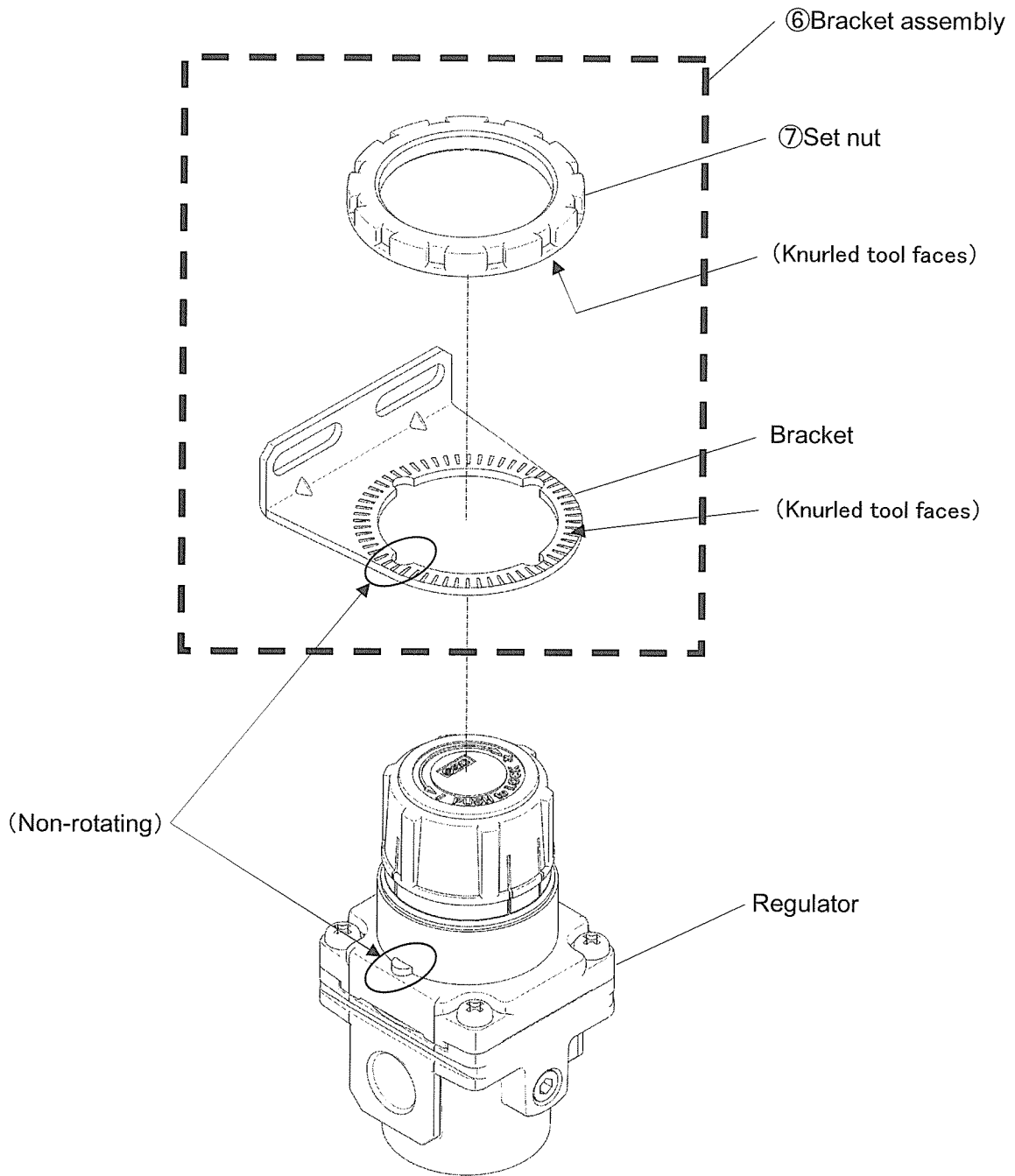
[Diaphragm side disassembly drawing]



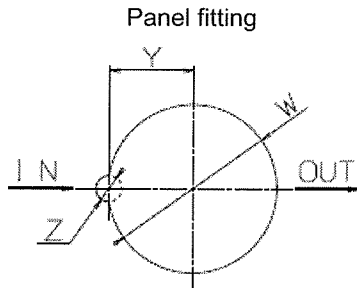
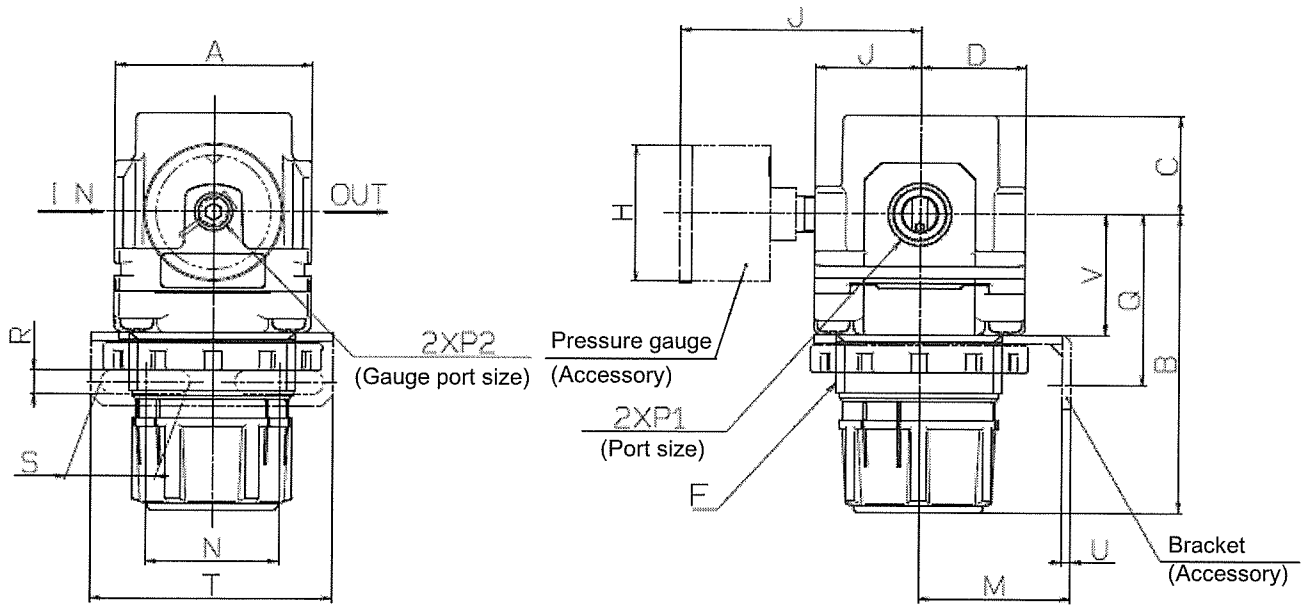
[Valve side disassembly drawing]



2) Bracket assembly / Panel mounting Disassembly drawing



11. DIMENSIONS



Thickness of plate

Model	Thickness of plate (mm)
AR20-A	MAX: 4
AR25-A	
AR30-A	MAX: 8
AR40-A	
AR40-06-A	

Model	Standard specifications							
	P1	P2	A	Note 1) B	C	D	F	J
AR20-A	1/8-1/4	1/8	40	67.4	23.5	22	M36X1.5	22
AR25-A	1/4-3/8	1/8	53	70.4	23.5	22	M36X1.5	22
AR30-A	1/4-3/8	1/8	53	83.5	27	28.5	M45X1.5	28.5
AR40-A	1/4-3/8-1/2	1/8	70	100	33.5	34.5	M52X1.5	34.5
AR40-06-A	3/4	1/8	75	101.5	33.5	34.5	M52X1.5	34.5

Model	Optional specifications														
	Round type pressure gauge		Round type pressure gauge (with colour zone)		Bracket mount dimensions							Panel mount dimensions			
	H	J	H	J	M	N	Q	R	S	T	U	V	W	Y	Z
AR20-A	φ37.5	58.5	φ37.5	59.5	30	34	43.9	5.4	15.4	55	2.3	27.3	36.5	17.5	6
AR25-A	φ37.5	58.5	φ37.5	59.5	30	34	44.3	5.4	15.4	55	2.3	30.3	36.5	17.5	6
AR30-A	φ37.5	65	φ37.5	66	41	36	46	6.5	24	65	2.3	32.5	45.5	22.5	7
AR40-A	φ42.5	72	φ42.5	72	50	38	54	8.5	26.5	70	2.3	38.4	52.5	26	7
AR40-06-A	φ42.5	72	φ42.5	72	50	38	55.5	8.5	26.5	70	2.3	39.9	52.5	26	7

Note 1) B dimension is a size in the state to unlock the handle.

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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