



Operation Manual

Model name

ROTARY ACTUATOR

With vertical auto switch unit

With angle adjustment unit

With vertical auto switch unit and angle adjustment unit

Part number / Series

*CRB*10 to 40-*-A*

*CRB*10 to 40-*-B*

*CRB*10 to 40-*-C*

SMC Corporation

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Safety Instructions

These safety instructions are intended to prevent hazardous situations and/ or equipment damage.

These instructions indicate the level of potential hazard with the labels of “**Caution**,” “**Warning**” or “**Danger**”. They are all important notes for safety and must be followed in addition to International Standards (ISO/ IEC) Japan Industrial Standards (JIS) ^{*1)} and other safety regulations.

- *1) ISO 4414: Pneumatic fluid power -- General rules relating to systems
ISO 4413: Hydraulic fluid power -- General rules relating to systems
IEC 60204-1: Safety of machinery -- Electrical equipment of machines (Part 1: General requirements)
ISO 10218-1992: Manipulating industrial robots -- Safety

etc.



Caution

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.

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.

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

- 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

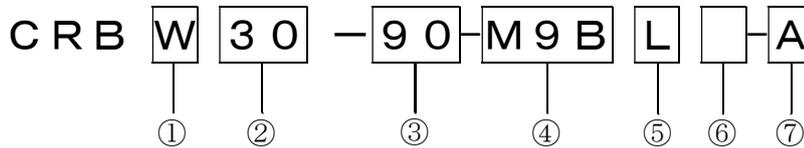
When the product is exported, strictly follow the laws required by the Ministry of Economy, Trade and Industry (Foreign Exchange and Foreign Trade Control Law).

1. Product Description

This operation manual is intended to be used for the compact rotary actuator vane type CRB series with vertical auto switch unit and angle adjustment unit.

How to Order

- With vertical auto switch unit



① Shaft Type

W	Double shaft with single flat (Sizes: 10 to 30)
	Long shaft end key, Short shaft with single flat (Size: 40)

② Size

10
15
20
30
40

⑤ Lead wire length

Nil	Grommet / Lead wire: 0.5 m
M	Grommet / Lead wire: 1 m
L	Grommet / Lead wire: 3 m
CN	Connector / Without lead wire
C	Connector / Lead wire: 0.5 m
CL	Connector / Lead wire: 3 m
Z*	Grommet / Lead wire: 5 m

* The 5m lead wire is produced upon receipt of order.

* Connectors are only available for the R73, R80, and T79.

** Lead wire with connector part nos.

D-LC05: Lead wire: 0.5 m

D-LC30: Lead wire: 3 m

D-LC50: Lead wire: 5 m

③ Rotation angle

90	90°
180	180°
270	270°

⑥ Number of auto switches

Nil	2
S	1

④ Auto switch

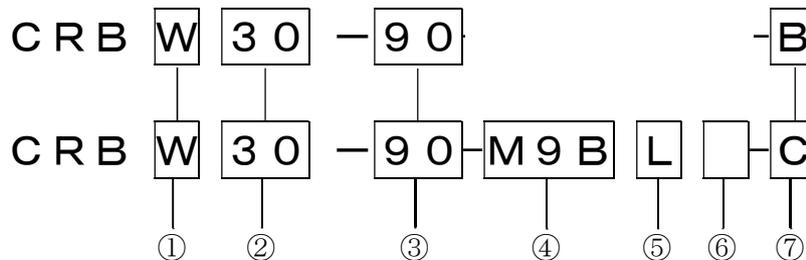
Nil	Without auto switch (Built-in magnet)
-----	---------------------------------------

* Please Select the model of the applicable auto switch from page 2.

⑦ Vertical auto switch unit

A	With vertical auto switch unit (Built-in magnet)
AM	With vertical auto switch unit for the D-M9 (Built-in magnet)

- With angle adjustment unit / With vertical auto switch unit and angle adjustment unit



① Shaft Type

W	Double shaft with single flat (Sizes: 10 to 30)
	Long shaft end key, Short shaft with single flat (Size: 40)

② Size

10
15
20
30
40

⑤ Lead wire length

Nil	Grommet / Lead wire: 0.5 m
M	Grommet / Lead wire: 1 m
L	Grommet / Lead wire: 3 m
CN	Connector / Without lead wire
C	Connector / Lead wire: 0.5 m
CL	Connector / Lead wire: 3 m
Z*	Grommet / Lead wire: 5 m

* The 5m lead wire is produced upon receipt of order.

* Connectors are only available for the R73, R80, and T79.

** Lead wire with connector part nos.

D-LC05: Lead wire: 0.5 m

D-LC30: Lead wire: 3 m

D-LC50: Lead wire: 5 m

③ Rotation angle

90	90°
180	180°
270	270°

⑥ Number of auto switches

Nil	2
S	1

④ Auto switch

Nil	Without auto switch (Built-in magnet)
-----	---------------------------------------

* Please Select the model of the applicable auto switch from page 2.

⑦ Vertical auto switch unit

B	With vertical auto switch unit (Built-in magnet)
C	With vertical auto switch unit and angle adjustment unit (Built-in magnet)
CM	With vertical auto switch unit for the D-M9 and angle adjustment unit (Built-in magnet)

Applicable auto switches

Applicable size	Type	Special function	Electrical entry	Indicator/light	Wiring (Output)	Load voltage		Auto switch model		Lead wire type	Lead wire length [m]					Pre-wired connector	Applicable load				
						DC	AC	Perpendicular	In-line		0.5 (Nil)	1 (M)	3 (L)	5 (Z)	None (N)		IC circuit	Relay, PLC			
For 10, 15	Solid state auto switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	M9NV	M9N	Oilproof heavy-duty cord	●	●	●	○	—	○	IC circuit	Relay, PLC		
					3-wire (PNP)				M9PV	M9P		●	●	●	○	—	○				
					2-wire				M9BV	M9B		●	●	●	○	—	○	IC circuit			
					3-wire (NPN)				S99V	S99		●	—	●	○	—	○				
					3-wire (PNP)				S9PV	S9P		●	—	●	○	—	○				
	2-wire	T99V	T99	●	—	●	○	—	○	—											
	Reed auto switch	—	—	No	2-wire	24 V	5 V, 12 V	5 V, 12 V, 24 V	—	90	Vinyl parallel cord	●	—	●	●	—	—	IC circuit			
							5 V, 12 V, 100 V	5 V, 12 V, 24 V, 100 V	—	90A	Oilproof heavy-duty cord	●	—	●	●	—	—				
—							100 V	—	97	Vinyl parallel cord	●	—	●	●	—	—	—				
For 20, 30, 40	Solid state auto switch	—	Grommet	Yes	24 V	2-wire	5 V, 12 V	—	M9NV	M9N	Oilproof heavy-duty cord	●	●	●	○	—	○	IC circuit			
									M9PV	M9P		●	●	●	○	—	○				
									M9BV	M9B		●	●	●	○	—	○	IC circuit			
									—	S79		●	—	●	○	—	○				
									—	S7P		●	—	●	○	—	○				
									—	T79		●	—	●	○	—	○	—			
	Reed auto switch	—	—	No	2-wire	24 V	—	100 V	—	R73	—	Oilproof heavy-duty cord	●	—	●	○	—	—	—		
										R73C	—		●	—	●	●	—	—			
										R80	—		●	—	●	○	—	—	IC circuit		
										R80C	—		●	—	●	●	—	—			
										—	24 V or loss		—	R80C	—	●	—	●	●	—	—
										—	24 V or loss		—	R80C	—	●	—	●	●	—	—

* Lead wire length symbols: 0.5 m..... Nil (Example) R73C

3 m..... L (Example) R73CL

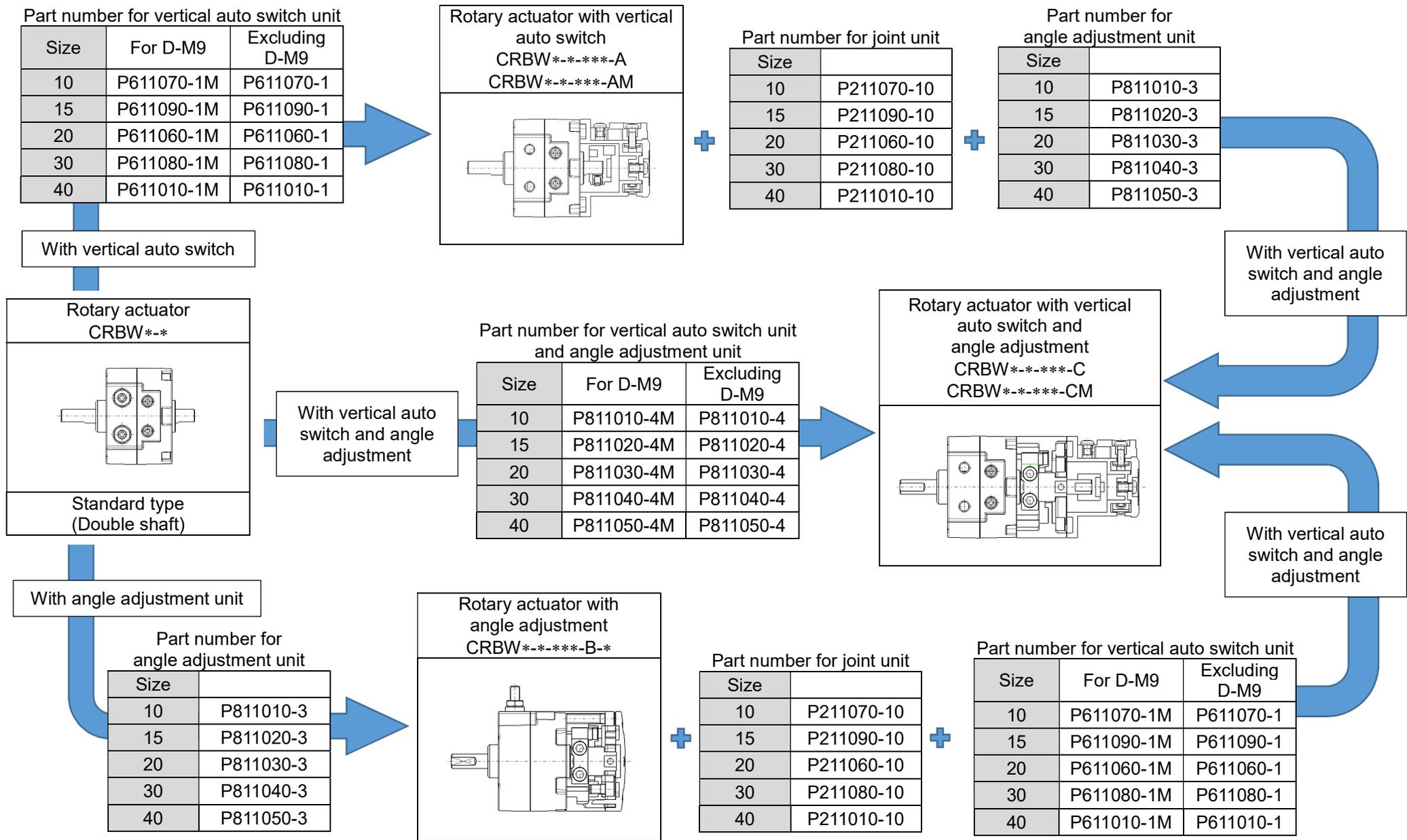
5 m..... Z (Example) R73CZ

None..... N (Example) R73CN

* Auto switches are shipped together, (but not assembled).

* Solid state auto switches marked with "○" are produced upon receipt of order.

CRB10 to 40 Rotary actuators / Unit combination illustration



2. Internal Construction and Description of Individual Parts

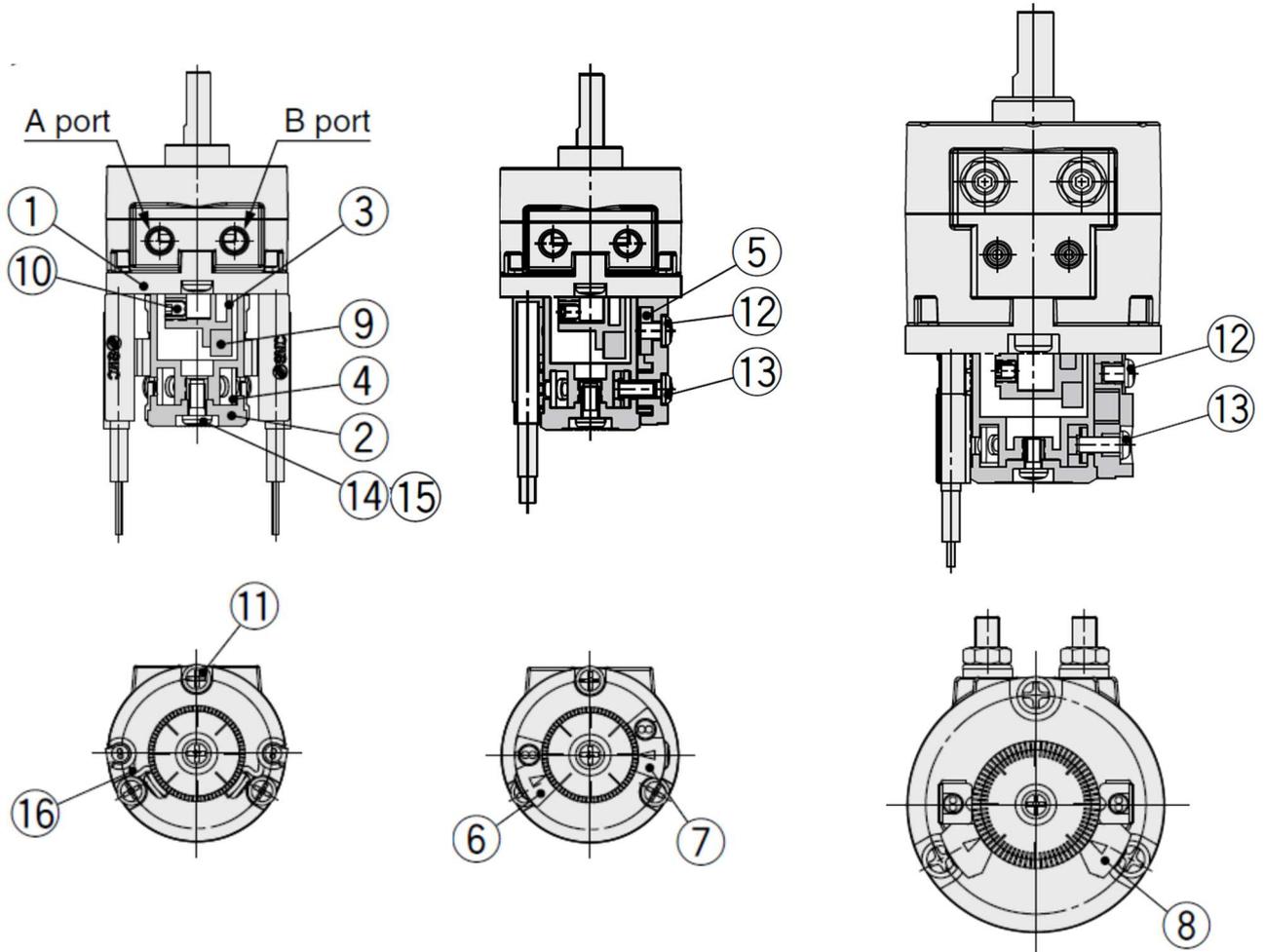
Construction: Vertical auto switch unit

Size 10,15

Size 20,30,40

D-M9

Other auto switches



Component Parts

No.	Description	Material	Note
1	Cover (A)	Resin	
2	Cover (B)	Resin	
3	Magnet lever	Resin	
4	Holding block	Aluminum alloy	
5	Holding block (B)	Aluminum alloy	Not included in the solid state auto switch
6	Switch block (A)	Resin	
7	Switch block (B)	Resin	
8	Switch block	Resin	
9	Magnet		
10	Hexagon socket set screw	Stainless steel	
11	Cross recessed round head screw	Stainless steel	
12	Cross recessed round head screw	Stainless steel	
13	Cross recessed round head screw	Stainless steel	
14	Cross recessed round head screw	Stainless steel	
15	Rubber cap	NBR	For size 40
16	Switch holder	Stainless steel	

3. Adjustment method

3.1 Vertical auto switch unit

■ Operating Range and Hysteresis

*Operating range: θm

The range is between the position where the auto switch turns ON as the magnet inside the auto switch unit moves rotationally and the position where the auto switch turns OFF as the magnet moves rotationally in the same direction.

*Hysteresis range: θd

The range is between the position where the auto switch turns ON as the magnet inside the auto switch unit moves rotationally and the position where the auto switch turns OFF as the magnet moves rotationally in the opposite direction.

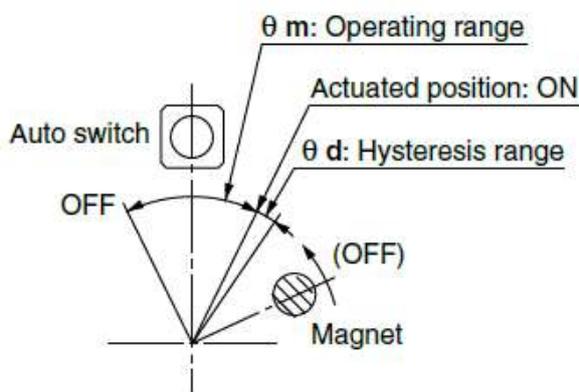


Fig. 3-1

D-M9□

Size	θm : Operating range	θd : Hysteresis range
10, 15	170°	20°
20, 30	100°	15°
40	86°	10°

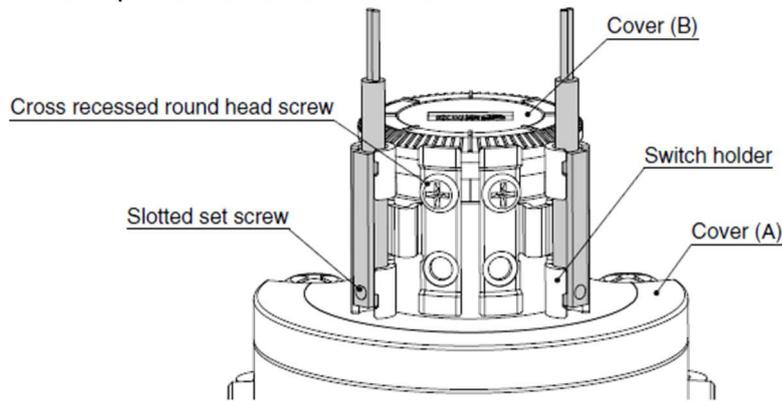
D-S/T99(V), S9P(V), S/T79□, S7P, D-97/93A, 90/90A, R73/80□

Size	θm : Operating range	θd : Hysteresis range
10, 15	110°	10°
20, 30	90°	
40	52°	8°

Auto Switch Mounting

D-M9□

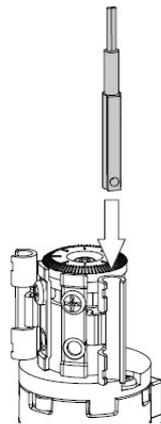
External view and descriptions of auto switch unit



For sizes 10, 15

1. Auto switch mounting

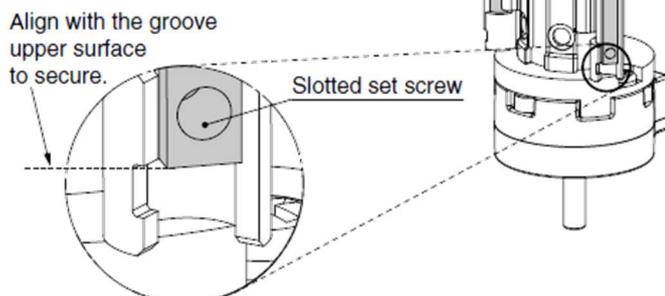
Insert the auto switch into the groove of the switch holder.



2. Auto switch securing

Align the auto switch with the upper surface of the groove on the side of the switch holder, and secure the slotted set screw. (Refer to the enlarged view.)

*Proper tightening torque:
0.05 to 0.1 [N·m]



Enlarged view

3. Switch holder securing

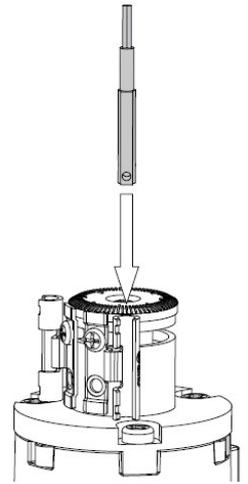
After the actuated position has been adjusted with the cross recessed round head screw, use the auto switch.

*When tightening the screw, take care that the auto switch does not tilt.

For sizes 20 to 40

1. Auto switch mounting

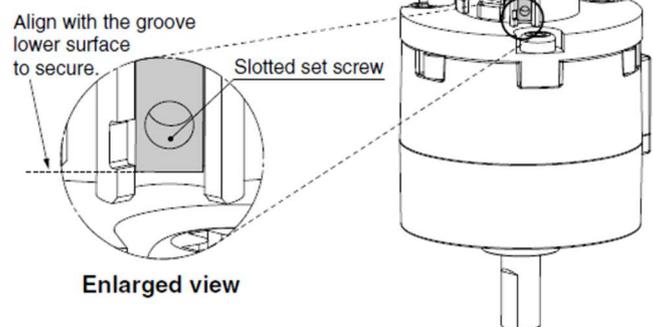
Insert the auto switch into the groove of the switch holder.



2. Auto switch securing

Align the auto switch with the upper surface of the groove on the side of the switch holder, and secure the slotted set screw. (Refer to the enlarged view.)

*Proper tightening torque:
0.05 to 0.1 [N·m]



Enlarged view

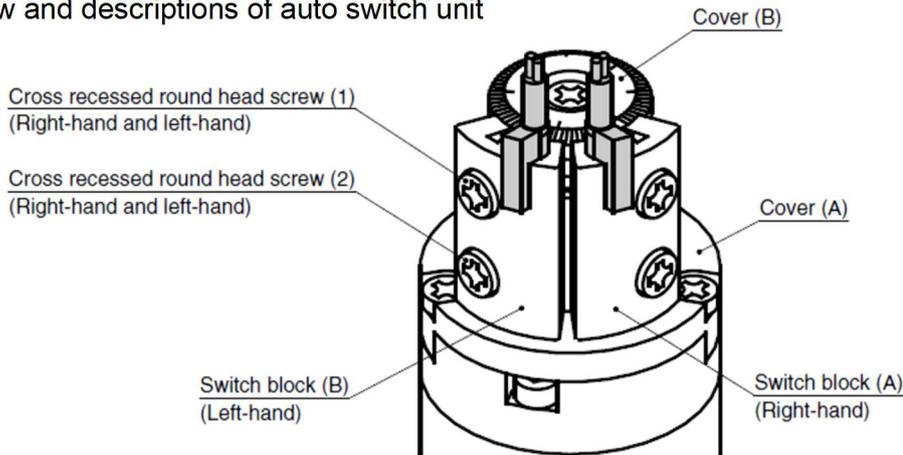
3. Switch holder securing

After the actuated position has been adjusted with the cross recessed round head screw, use the auto switch.

*When tightening the screw, take care that the auto switch does not tilt.

For sizes 10, 15 : D-S/T99(V)□, S9P(V), 97/93A, 90/90A

External view and descriptions of auto switch unit



Solid state auto switch

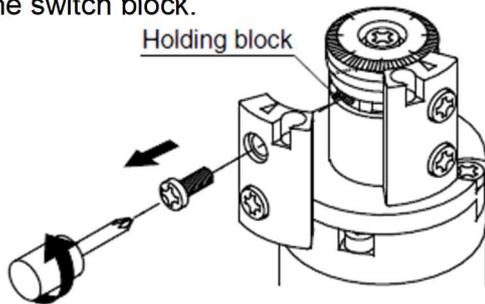
<Applicable auto switch>

3-wire type.....D-S99(V)□, S9P(V)□

2-wire type.....D-T99(V)□

1. Switch block detaching

Remove the cross recessed round head screw (1) to detach the switch block.

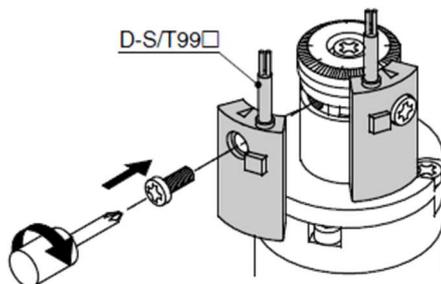


2. Auto switch mounting

Secure the auto switch with the cross recessed round head screw(1) and holding block (A).

Proper tightening torque: 0.4 to 0.6 [N·m]

*Since the holding (A) block moves inside the groove, move it to the mounting position beforehand.



For sizes 20 to 40 : D-S/T79□, S7P, R73/80□

Reed auto switch

<Applicable auto switch>

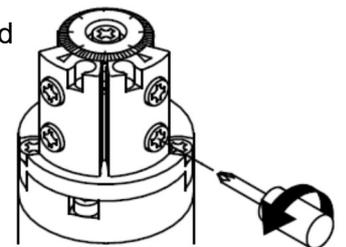
D-97/93A (With indicator light)

D-90/90A (Without indicator light)

1. Preparations

Loosen the cross recessed Round head screw (2) (About 2 to 3 turns).

* This screw has been Secured temporarily at shipment.

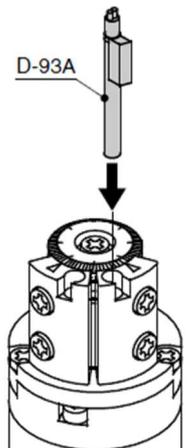


2. Auto switch mounting

Insert the auto switch until it is in contact with the switch block hole.

*For the D-97/93A, insert the auto switch in the direction shown in the figure on the right.

* Since the D-90/90A is a round type, it has no directionality.

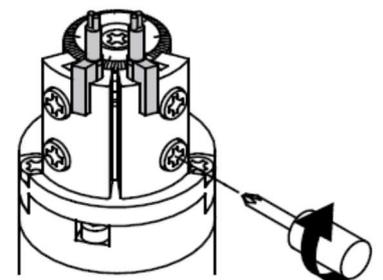


3. Auto switch securing

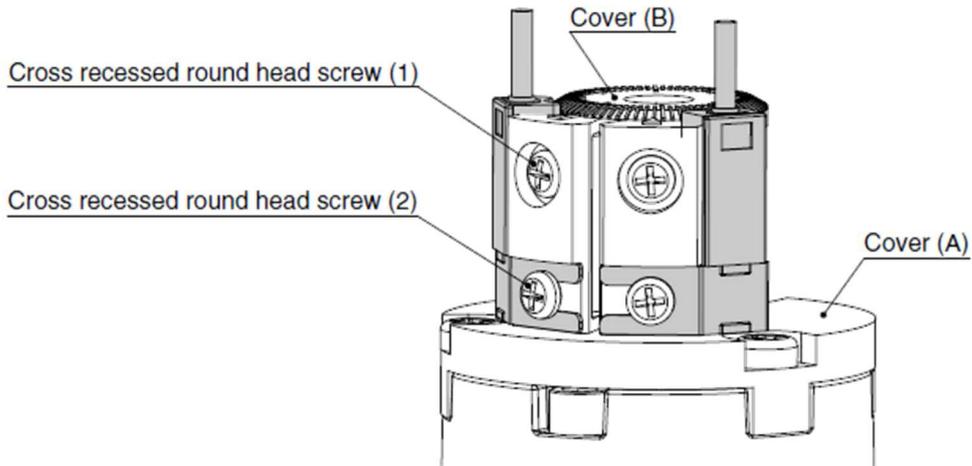
Tighten the cross recessed round head screw (2) to secure the auto switch.

Proper tightening torque: 0.4 to 0.6 [N·m]

After the actuated position has been adjusted with the cross recessed round head screw (1), use the auto switch.



External view and descriptions of auto switch unit



Mounting Procedure

<Applicable auto switch>

Solid state auto switch

D-S79, S7P

D-T79, T79C

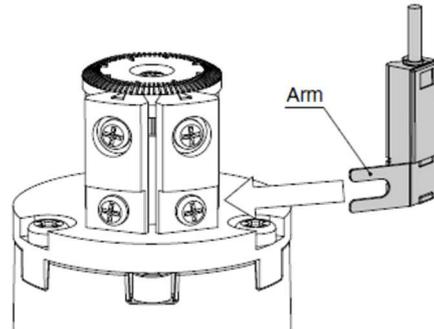
Reed auto switch

D-R73, R73C

D-R80, R80C

1. Auto switch mounting

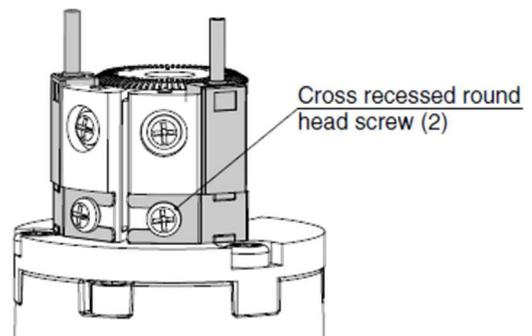
Loosen the cross recessed round head screw (2), and insert the arm of the auto switch.



2. Auto switch securing

Set the auto switch so that it is in contact with the switch block, and tighten the cross recessed round head screw (2).

*Proper tightening torque: 0.4 to 0.6 [N·m]



3. Switch holder securing

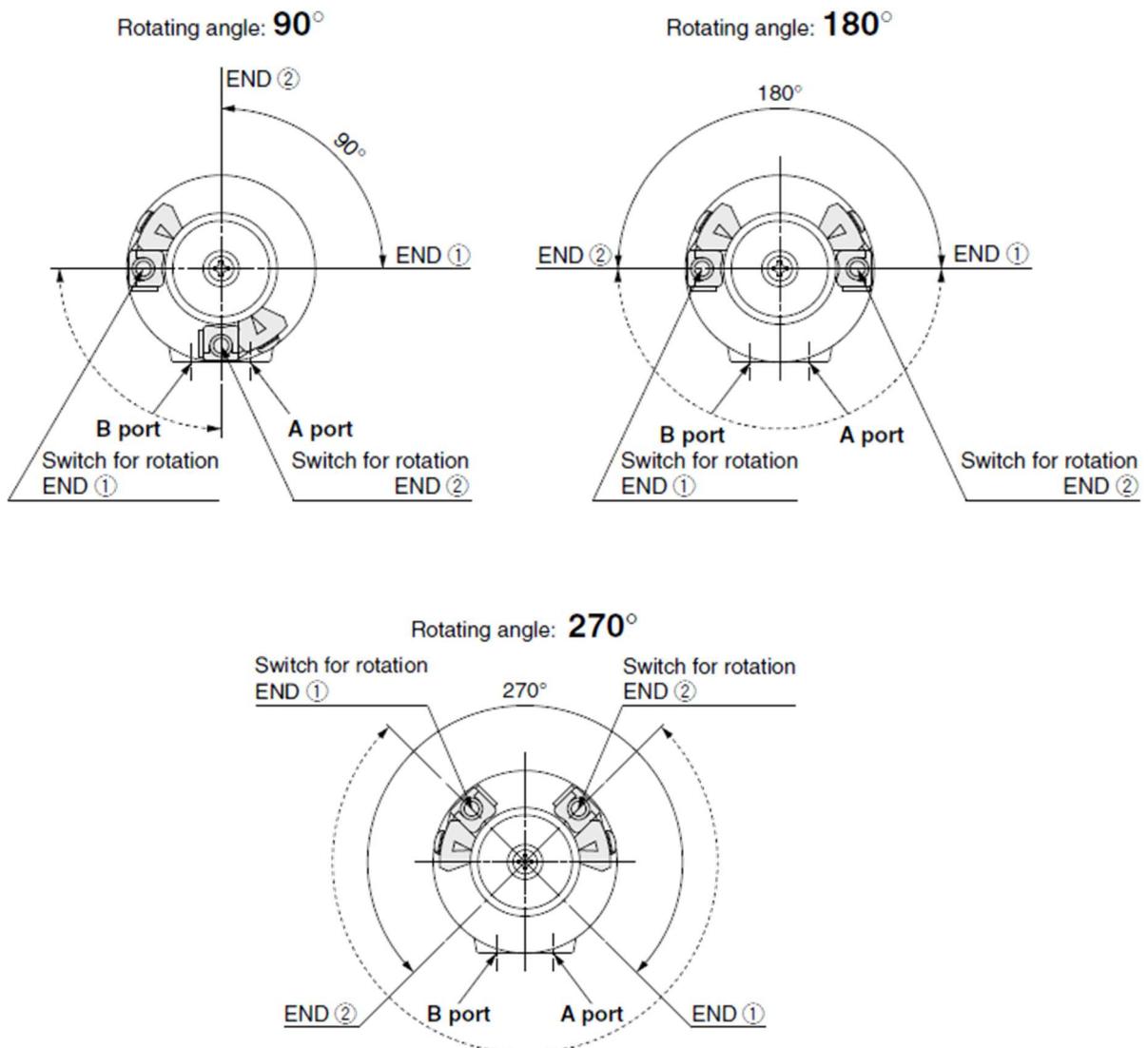
After the actuated position has been adjusted with the cross recessed round head screw (1), use the auto switch.

*Proper tightening torque: 0.4 to 0.6 [N·m]

Auto Switch Adjustment

Rotation range of the output shaft with single flat (key for size 40 only) and auto switch mounting position.

- ✓ Solid-lined curves indicate the rotation range of the output shaft with single flat (key). When the single flat (key) is pointing to the END ① direction, the switch for rotation END ① will operate, and when the single flat (key) is pointing to the END ② direction, the switch for rotation END ② will operate.
- ✓ Broken-lined curves indicate the rotation range of the built-in magnet. Operating angle of the switch can be decreased by either moving the switch for rotation END ① clockwise or moving the switch for rotation END ② counterclockwise. Auto switch in the figures on the left is at the most sensitive position.
- ✓ Each auto switch unit comes with one right-hand and one left-hand switches.

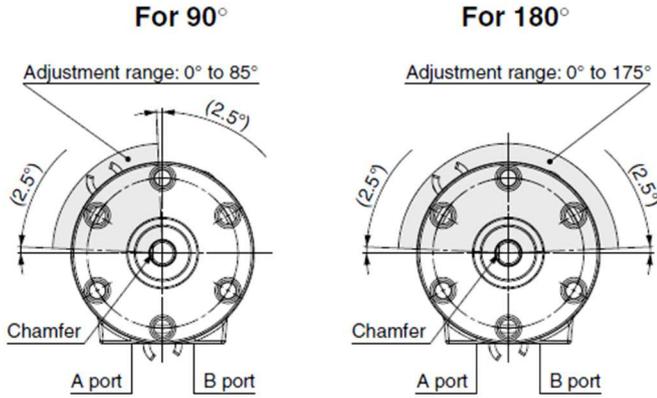


3.2 Angle adjustment unit

Rotating angle with angle adjustment unit

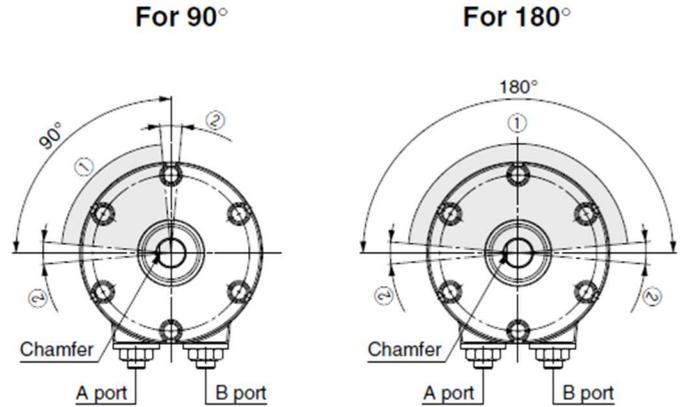
- Drawings below are viewed from the long shaft side.
- The position of the chamfered portion illustrates the conditions of actuators when B port is pressurized.
- Operate within the adjustment range.

Size: 10, 15



The shaded area shows the rotation adjustment range.

Size: 20, 30, 40



The shaded area shows the rotation adjustment range.

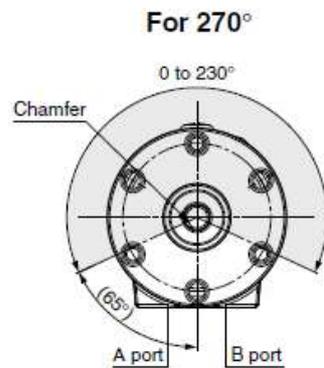
Size: 10, 15

Rotating angle (Body)	Size	
	10	15
90°	0 to 85°	
180°	0 to 175°	

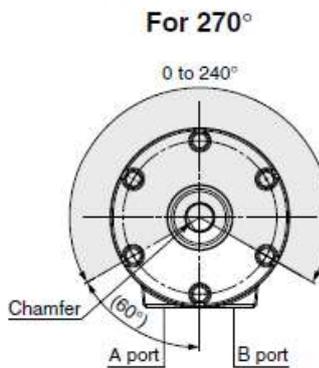
Size: 20, 30, 40

	Adjustment range	For 90°	For 180°
①	Angle adjustment unit	0° to 80°	0° to 170°
②	Adjustment bolt	90°±10° (One side ±5°)	180°±10° (One side ±5°)

Size: 10, 40

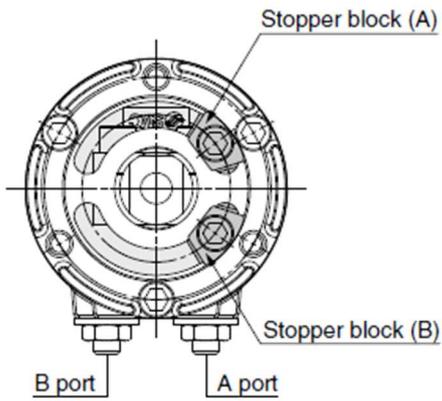


Size: 15, 20, 30



Rotating Angle Adjustment Method

- The rotating angle can be adjusted by moving the stopper blocks (A) and (B) shown in Fig. 1.
 - Fig. 1 shows the default position of the angle adjustment unit.
 - Fig. 1 shows size 20.
- * Make adjustments when pressure is not being applied.



Recommended tightening torque to fix a stopper block

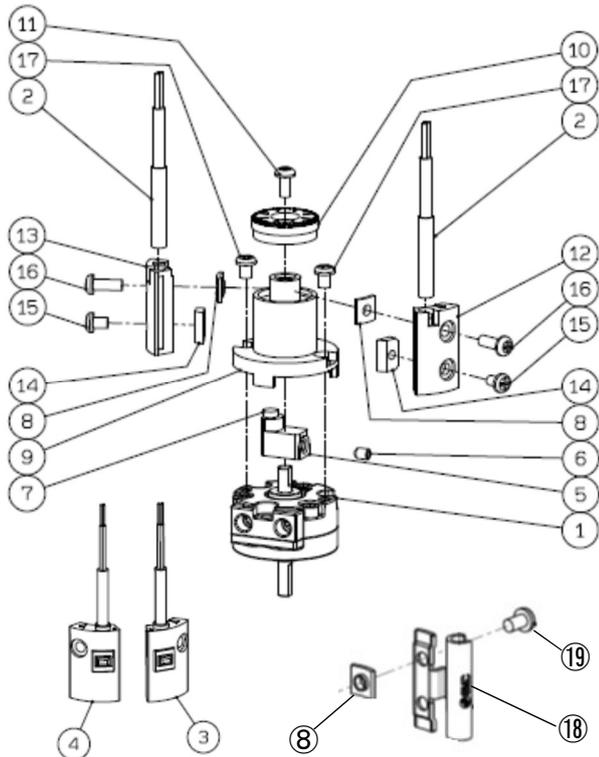
Size	Tightening torque [N · m]
10	1.0 to 1.2
15	
20	2.5 to 2.9
30	3.4 to 3.9
40	

Fig. 1 Default position

4. Assembly / Disassembly procedure

4.1 With vertical auto switch unit

■ Size: 10, 15



19	Cross recessed round head screw	2	For D-M9
18	Switch holder	2	For D-M9
17	Cross recessed round head screw	2	3pcs. for size 15
16	Cross recessed round head screw	2	
15	Cross recessed round head screw	2	
14	Holding block (B)	2	
13	Switch block (B)	1	
12	Switch block (A)	1	3pcs. for size 15
11	Cross recessed round head screw	1	
10	Cover (B)	1	
9	Cover (A)	1	
8	Holding block (A)	2	
7	Magnet	1	
6	Hexagon socket set screw	1	
5	Magnet lever	1	Including No.7
4	Auto switch	1	Solid state auto switch (one left-hand)
3	Auto switch	1	Solid state auto switch (one right-hand)
2	Auto switch	2	Reed auto switch
1	Rotary actuator	1	Product
No.	Description	Qty	Note

Assembly procedure

For D-S/T99(V)□, S9P(V), 97/93A, 90/90A

1. Mount the magnet lever (5) to the shaft of the body (1) using the hexagon socket set screw (6).
2. Mount the cover (A) (9) to the body (1) using the cross recessed round head screws (17) (Use three screws for size 15).
3. Insert the holding block (A) (8) into the groove of the cover (A) (9), place the cover (B) (10) on top, and fasten the cross recessed round head screw (11).
4. Insert the auto switches (2) into the switch blocks (A) (12) and (B) (13) and mount them to the holding block (B) (14) using the cross recessed round head screws (16).
Note: Skip step 4 for the solid state auto switches (3) and (4), as the switches are installed in the switch blocks (A) (12) and (B) (13).
5. Carefully fix the switch blocks (A) (12) and (B) (13) (or the solid state switches) to the holding block (A) (8) using the cross recessed round head screw (16).
6. Move the switch blocks (A) (12) and (B) (13) to the setting position and fasten them using the cross recessed round head screws (16).

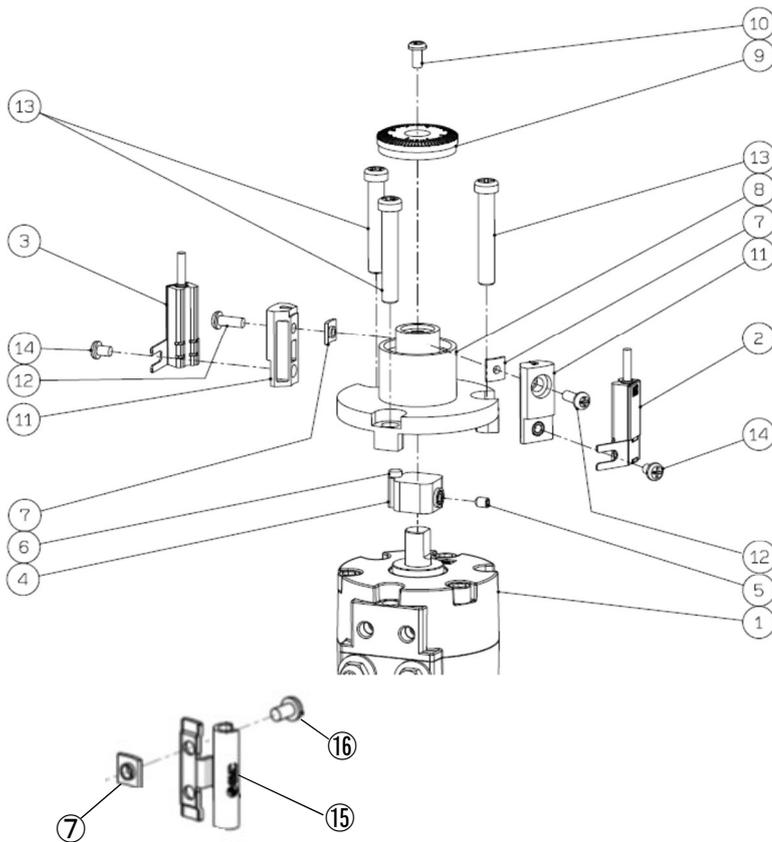
For D-M9□

1. Follow the same procedure up to step 3.
2. Carefully fix the switch holder (18) to the holding block (A) (8) using the hexagon socket set screw (19).
3. Insert the D-M9 auto switch into the switch holder (18) and carefully fasten it using the slotted set screw attached to the switch (tightening torque is 0.05 to 0.1 Nm).
4. Move the switch holder (18) to the setting position and fasten it using the cross recessed round head screw (19).

* When disassembling the product, disassemble it following the procedure in the reverse order.

* When the screw tightening torque is not specified, the tightening torque shall be approx. 0.49 Nm.

■ Size: 20, 30



16	Cross recessed round head screw	2	
15	Switch holder	2	
14	Cross recessed round head screw	2	
13	Cross recessed round head screw	3	
12	Cross recessed round head screw	2	
11	Switch block	2	
10	Cross recessed round head screw	1	
9	Cover (B)	1	
8	Cover (A)	1	
7	Holding block	2	
6	Magnet	1	
5	Hexagon socket set screw	1	
4	Magnet lever	1	Including No.6
3	Auto switch	1	One left-hand
2	Auto switch	1	One right-hand
1	Rotary actuator	1	Product
No.	Description	Qty	Note

Assembly procedure

For D-S/T79□, S7P, R73/80□

1. Mount the magnet lever (4) to the vane shaft of the body (1) using the hexagon socket set screw (5).
2. Mount the cover (A) (8) to the body (1) using the cross recessed round head screws (13) (tightening torque is approx. 0.8 Nm).
3. Insert the holding blocks (7) in the grooves of the cover (A) (8), place the cover (B) (9) on top and fasten them with the cross recessed round head screw (10).
4. Carefully fix the switch blocks (11) to the holding blocks (7) using the cross recessed round head screws (12).
5. Mount the auto switches (2) and (3) to the switch blocks (11) using the cross recessed round head screws (14).
6. Move the switch blocks (11) to the setting position and fasten them with the cross recessed round head screws (2).

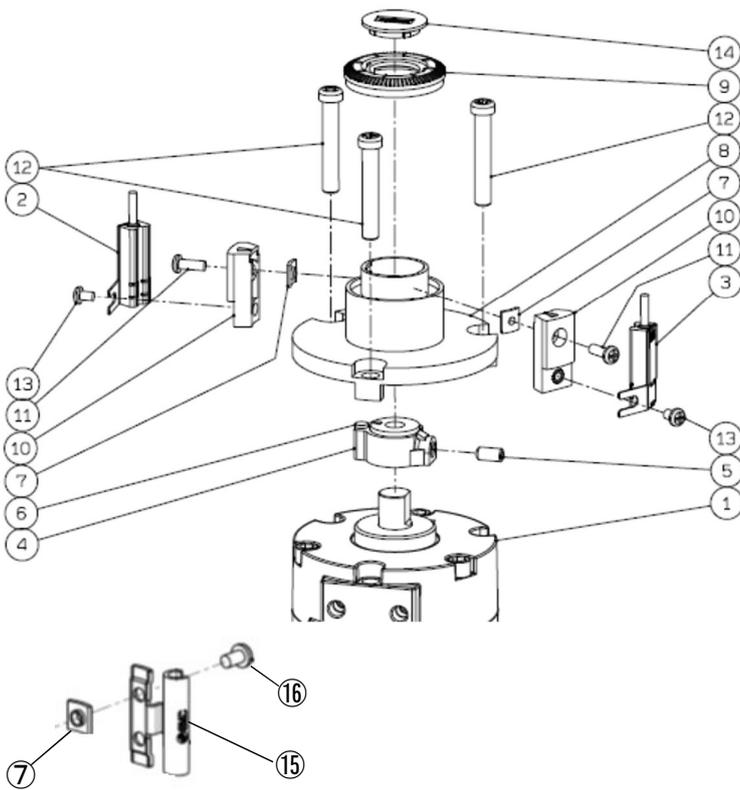
For D-M9□

1. Follow the same procedure up to step 3.
2. Carefully fix the switch holder (15) to the holding block (A) (7) using the hexagon socket set screw (16).
3. Insert the D-M9 auto switch into the switch holder (15) and carefully fasten it using the slotted set screw attached to the switch (tightening torque is 0.05 to 0.1 Nm).
4. Move the switch holder (15) to the setting position and fasten it using the cross recessed round head screw (16).

* When disassembling the product, disassemble it following the procedure in the reverse order.

* When the screw tightening torque is not specified, the tightening torque shall be approx. 0.49 Nm.

■ Size: 40



16	Cross recessed round head screw	2	
15	Switch holder	2	
14	Rubber cap	1	
13	Cross recessed round head screw	2	
12	Cross recessed round head screw	3	
11	Cross recessed round head screw	2	
10	Switch block	2	
9	Cover (B)	1	
8	Cover (A)	1	
7	Holding block	2	
6	Magnet	1	
5	Hexagon socket set screw	1	
4	Magnet lever	1	Including No.6
3	Auto switch	1	One left-hand
2	Auto switch	1	One right-hand
1	Rotary actuator	1	Product
No.	Description	Qty	Note

Assembly procedure

For D-S/T79□, S7P, R73/80□

1. Mount the magnet lever (4) to the shaft of the body (1) using the hexagon socket set screw (5).
2. Mount the cover (A) (8) to the body (1) using the cross recessed round head screws (12).
(tightening torque is approx. 0.8 Nm).
3. Insert the holding blocks (7) into the grooves of the cover (A) (8), place the cover (B) (9) on top, and mount the rubber cap (14).
4. Carefully fix the switch blocks (10) to the holding block (A) (7) using the cross recessed round head screw (11).
5. Mount the auto switches (2) to the switch blocks (5) using the cross recessed round head screws (12).
6. Move the switch blocks (10) to the setting position and fasten them with the cross recessed round head screws (11).

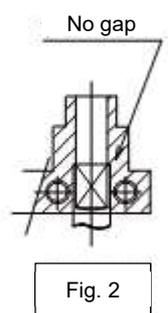
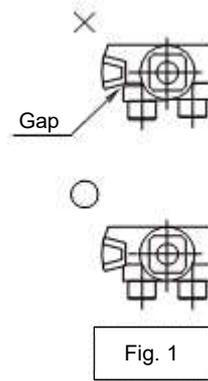
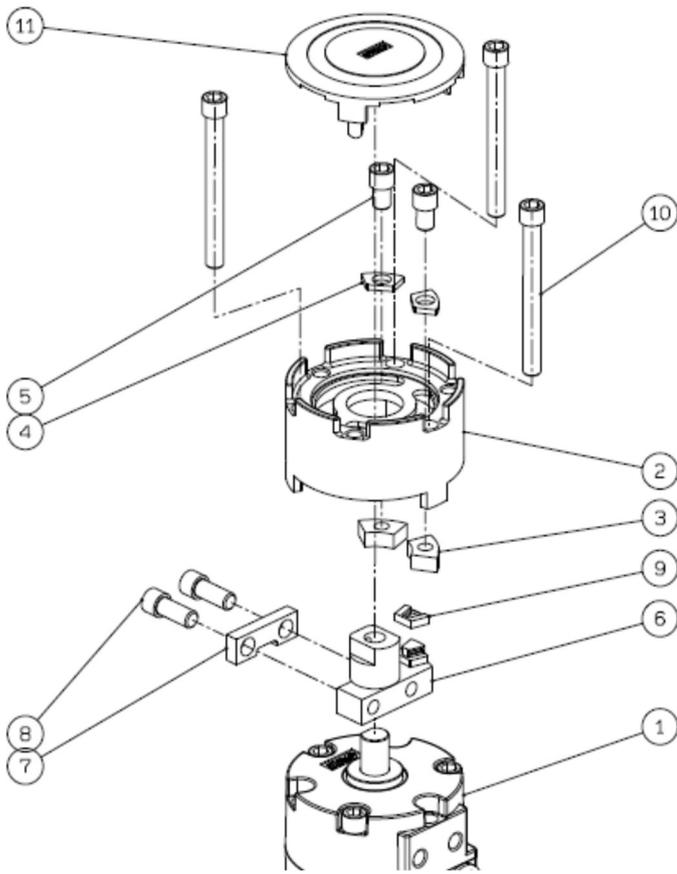
For D-M9□

1. Follow the same procedure up to step 3.
2. Carefully fix the switch holder (15) to the holding block (A) (7) using the hexagon socket set screw (16).
3. Insert the D-M9 auto switch into the switch holder (15) and carefully fasten it using the slotted set screw attached to the switch (tightening torque is 0.05 to 0.1 Nm).
4. Move the switch holder (15) to the setting position and fasten it using the cross recessed round head screw (16).

* When disassembling the product, disassemble it following the procedure in the reverse order.

* When the screw tightening torque is not specified, the tightening torque shall be approx. 0.49 Nm.

4.2 With angle adjustment unit



11	Cap	1	
10	Hexagon socket head cap screw	3	2pcs. for size 10
9	Rubber bumper	1	
8	Hexagon socket head cap screw	2	
7	Lever retainer	1	
6	Stopper lever	1	
5	Hexagon socket head cap screw	2	4pcs. for size 40
4	Block retainer	2	
3	Stopper block	2	
2	Stopper ring	1	
1	Rotary actuator	1	Product
No.	Description	Qty	Note

Assembly procedure

1. Mount the rubber bumper (9) onto the stopper lever (6).
2. Insert the stopper lever (6) onto the shaft of the body (1) and fasten it to the lever retainer (7) using the hexagon socket head cap screws (8).
(Refer to Fig. 1 and Fig. 2 for mounting precautions.)
3. Mount the stopper blocks (3) onto the stopper ring (2) and carefully fasten the block retainer (7) using the hexagon socket head cap screws (5).
4. Fasten the stopper ring (2) to the body (1) using the hexagon socket head cap screws (10).
5. Place the cap (11) on the stopper ring (2).

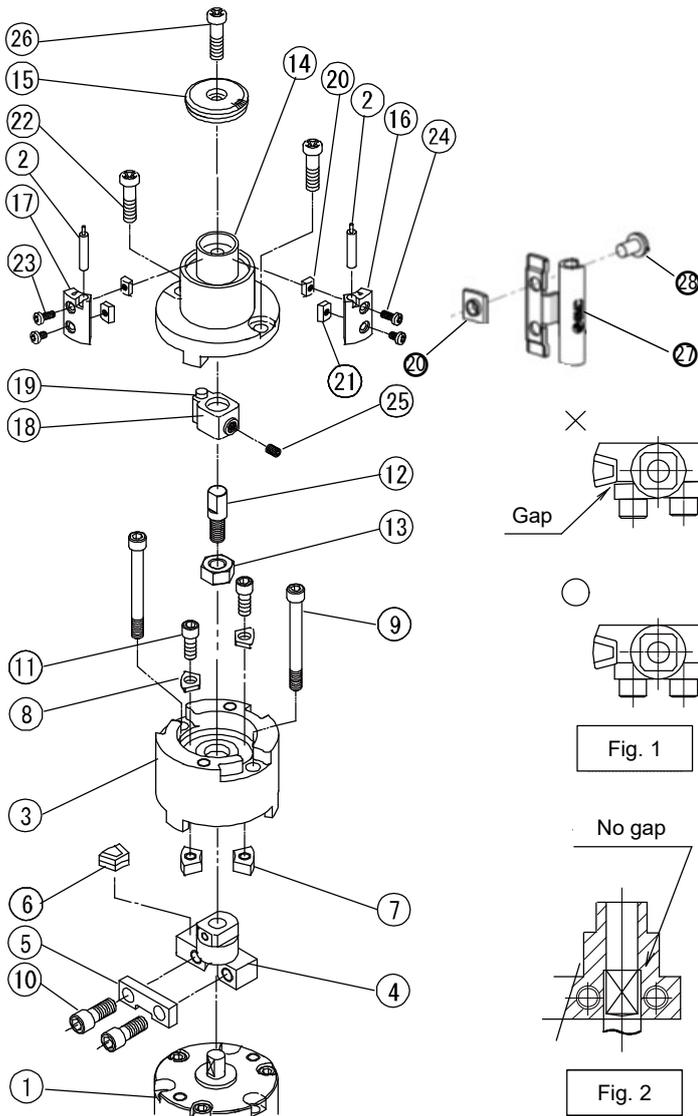
The tightening torque for each size is shown in the table below.

Size	Tightening torque [Nm]
10	1.0 to 1.2
15	
20	2.5 to 2.9
30	3.4 to 3.9
40	

* When disassembling the product, disassemble it following the procedure in the reverse order.

4.3 With vertical auto switch unit and angle adjustment unit

Size: 10



28	Cross recessed round head screw	2	
27	Switch holder	2	
26	Cross recessed round head screw	1	
25	Hexagon socket set screw	1	
24	Cross recessed round head screw	2	
23	Cross recessed round head screw	2	
22	Cross recessed round head screw	2	
21	Holding block (B)	2	
20	Holding block (A)	2	
19	Magnet	1	
18	Magnet lever	1	Including No.19
17	Switch block (B)	1	
16	Switch block (A)	1	
15	Cover (B)	1	
14	Cover (A)	1	
13	Hexagon nut	1	
12	Joint	1	
11	Hexagon socket head cap screw	2	
10	Hexagon socket head cap screw	2	
9	Hexagon socket head cap screw	2	
8	Block retainer	2	
7	Stopper block	2	
6	Rubber bumper	1	
5	Lever retainer	1	
4	Stopper lever	1	
3	Stopper ring	1	
2	Auto switch	2	
1	Rotary actuator	1	Product
No.	Description	Qty	Note

Assembly procedure

For D-S/T99(V)□, S9P(V), 97/93A, 90/90A

1. Assemble by following the assembly procedure on page 15.
2. Fully tighten the joint (12) in the stopper lever (4) and fasten it using the hexagon nut (13).
3. Mount the magnet lever (18) to the joint (12) and fasten it using the hexagon socket set screw (25).
4. Mount the stopper ring (3) to the cover (A) (14) and fasten it using the cross recessed round head screw (22).
5. Insert the holding blocks (20) in the grooves of the cover (A) (14), place the cover (B) (15) on top and fasten them with the cross recessed round head screw (26).
6. Assemble by following the assembly procedure on page 12.

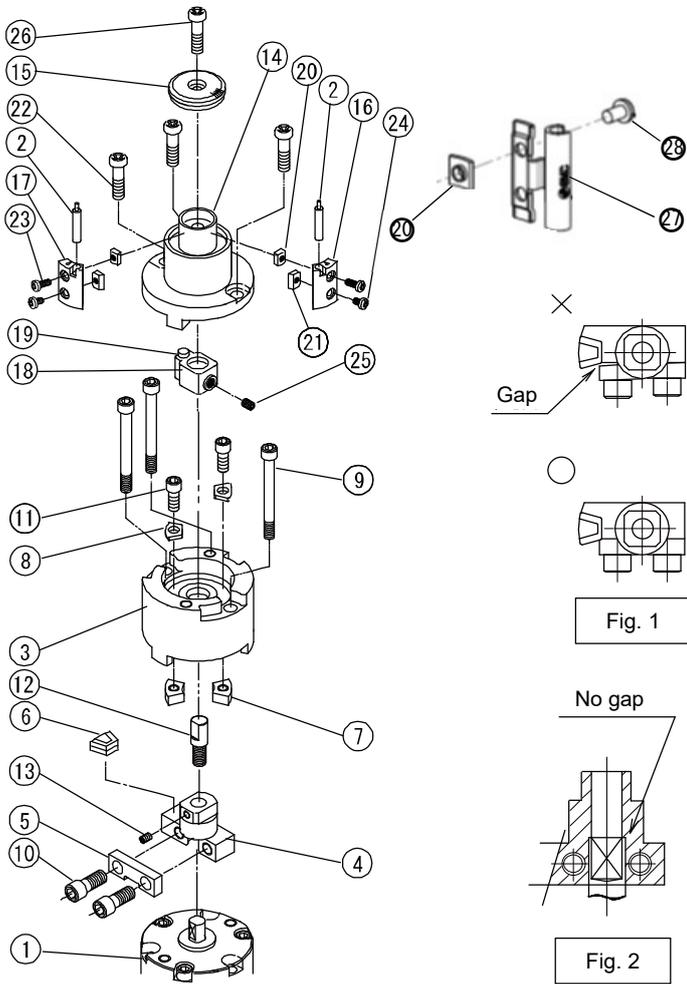
For D-M9□

1. Assemble by following steps 1 to 5 of the above procedure.
2. Carefully fix the switch holder (27) to the holding block (A) (20) using the cross recessed round head screw (28).
3. Insert the D-M9 auto switch into the switch holder (27) and carefully fasten it using the slotted set screw attached to the switch (tightening torque is 0.05 to 0.1 Nm).
4. Move the switch holder (27) to the setting position and fasten it using the cross recessed round head screw (28).

* When disassembling the product, disassemble it following the procedure in the reverse order.

* When the screw tightening torque is not specified, the tightening torque shall be approx. 0.49 Nm.

Size: 15



28	Cross recessed round head screw	2	
27	Switch holder	2	
26	Cross recessed round head screw	1	
25	Hexagon socket set screw	1	
24	Cross recessed round head screw	2	
23	Cross recessed round head screw	2	
22	Cross recessed round head screw	2	
21	Holding block (B)	2	
20	Holding block (A)	2	
19	Magnet	1	
18	Magnet lever	1	Including No.19
17	Switch block (B)	1	
16	Switch block (A)	1	
15	Cover (B)	1	
14	Cover (A)	1	
13	Hexagon socket set screw	1	
12	Joint	1	
11	Hexagon socket head cap screw	2	
10	Hexagon socket head cap screw	2	
9	Hexagon socket head cap screw	2	
8	Block retainer	2	
7	Stopper block	2	
6	Rubber bumper	1	
5	Lever retainer	1	
4	Stopper lever	1	
3	Stopper ring	1	
2	Auto switch	2	
1	Rotary actuator	1	Product
No.	Description	Qty	NOte

Assembly procedure

For D-S/T99(V)□, S9P(V), 97/93A, 90/90A

- Assemble by following the assembly procedure on page 15.
- Mount the joint (12) to the stopper lever (4) and fasten it using the hexagon socket set screw (13).
- Mount the magnet lever (18) to the joint (12) and fasten it using the hexagon socket set screw (25).
- Mount the stopper ring (3) to the cover (A) (14) and fasten it using the cross recessed round head screw (22).
- Insert the holding blocks (20) in the grooves of the cover (A) (14), place the cover (B) (15) on top and fasten them with the cross recessed round head screw (26).
- Assemble by following the assembly procedure on page 12.

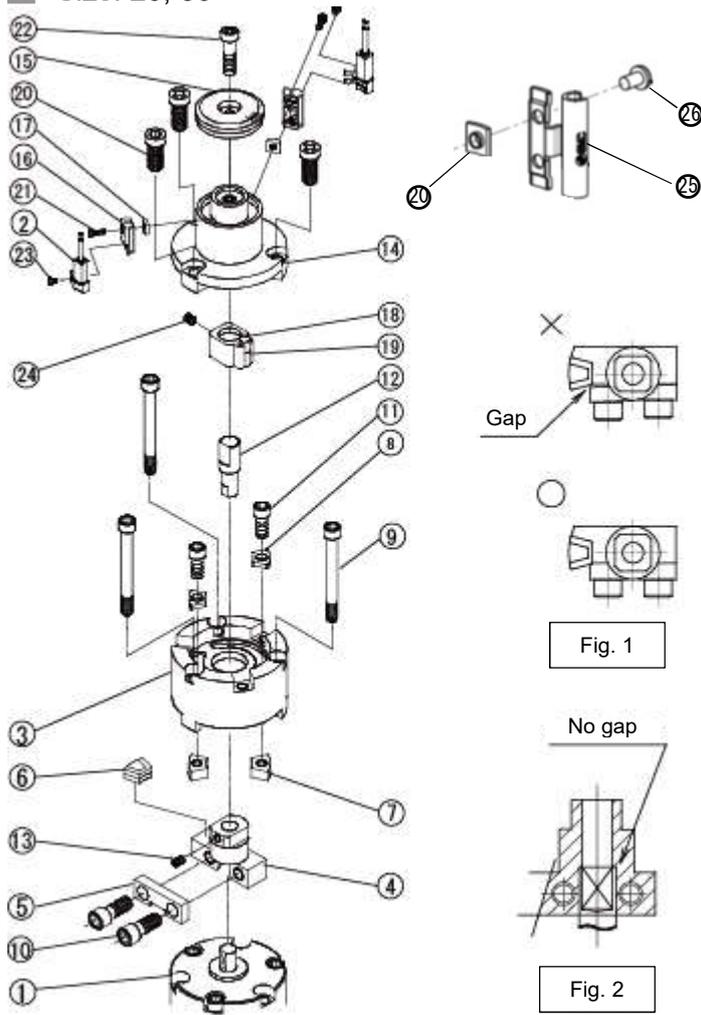
For D-M9□

- Assemble by following steps 1 to 5 of the above procedure.
- Carefully fix the switch holder (27) to the holding block (A) (20) using the cross recessed round head screw (28).
- Insert the D-M9 auto switch into the switch holder (27) and carefully fasten it using the slotted set screw attached to the switch (tightening torque is 0.05 to 0.1 Nm).
- Move the switch holder (27) to the setting position and fasten it using the cross recessed round head screw (28).

* When disassembling the product, disassemble it following the procedure in the reverse order.

* When the screw tightening torque is not specified, the tightening torque shall be approx. 0.49 Nm.

Size: 20, 30



26	Cross recessed round head screw	2	
25	Switch holder	2	
24	Hexagon socket set screw	1	
23	Cross recessed round head screw	2	
22	Cross recessed round head screw	1	
21	Cross recessed round head screw	2	
20	Cross recessed round head screw	3	
19	Magnet	2	
18	Magnet lever	1	Including No. 1
17	Holding block	1	
16	Switch block	1	
15	Cover (B)	1	
14	Cover (A)	1	
13	Hexagon socket set screw	1	
12	Joint	1	
11	Hexagon socket head cap screw	2	
10	Hexagon socket head cap screw	2	
9	Hexagon socket head cap screw	2	
8	Block retainer	2	
7	Stopper block	2	
6	Rubber bumper	1	
5	Lever retainer	1	
4	Stopper lever	1	
3	Stopper ring	1	
2	Auto switch	2	
1	Rotary actuator	1	Product
No.	Description	Qty	NOte

Assembly procedure

For D-S/T79□, S7P, R73/80□

1. Assemble by following the assembly procedure on page 15.
2. Mount the joint (12) to the stopper lever (4) and fasten it using the hexagon socket set screw (13).
3. Mount the magnet lever (18) to the joint (12) and fasten it using the hexagon socket set screw (24).
4. Mount the stopper ring (3) to the cover (A) (14) and fasten it using the cross recessed round head screw (20) (tightening torque is approx. 0.8 Nm).
5. Insert the holding blocks (17) in the grooves of the cover (A) (14), place the cover (B) (15) on top and fasten them with the cross recessed round head screw (22).
6. Assemble by following the assembly procedure on page 13.

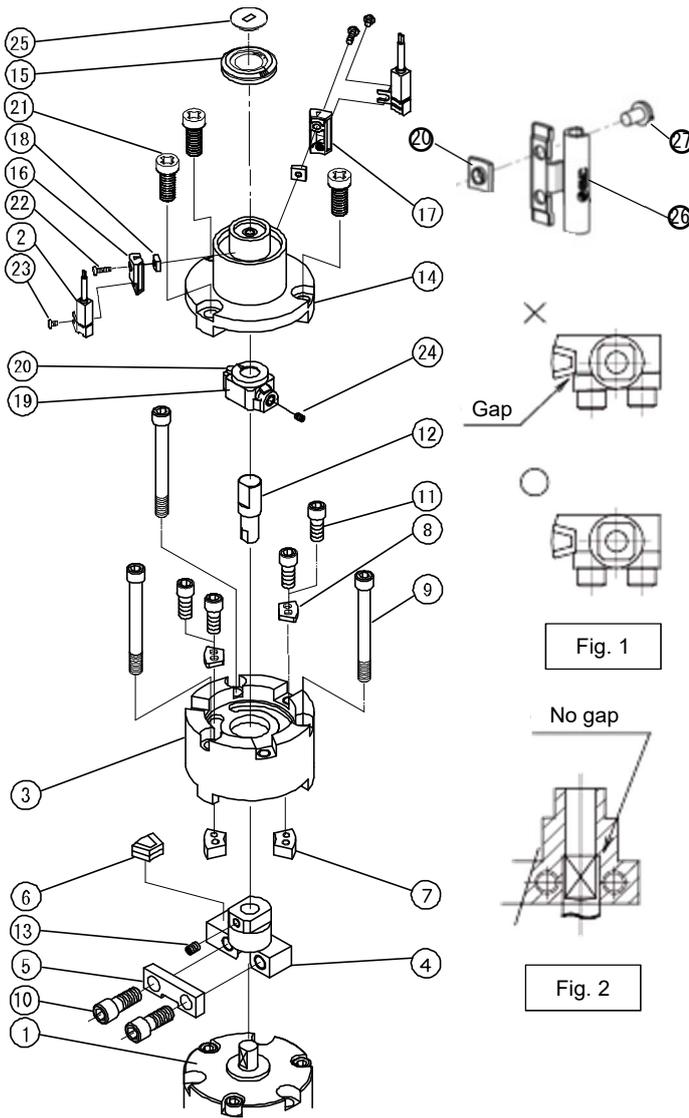
For D-M9□

1. Assemble by following steps 1 to 5 of the above procedure.
2. Carefully fix the switch holder (25) to the holding block (17) using the cross recessed round head screw (26).
3. Insert the D-M9 auto switch into the switch holder (27) and carefully fasten it using the slotted set screw attached to the switch (tightening torque is 0.05 to 0.1 Nm).
4. Move the switch holder (25) to the setting position and fasten it using the cross recessed round head screw (26).

* When disassembling the product, disassemble it following the procedure in the reverse order.

* When the screw tightening torque is not specified, the tightening torque shall be approx. 0.49 Nm.

Size: 40



27	Cross recessed round head screw	2	
26	Switch holder	2	
25	Rubber cap	1	
24	Hexagon socket set screw	1	
23	Cross recessed round head screw	2	
22	Cross recessed round head screw	2	
21	Cross recessed round head screw	3	
20	Magnet	1	
19	Magnet lever	1	Including No.20
18	Holding block	2	
17	Switch block (B)	1	
16	Switch block (A)	1	
15	Cover (B)	1	
14	Cover (A)	1	
13	Hexagon socket set screw	1	
12	Joint	1	
11	Hexagon socket head cap screw	4	
10	Hexagon socket head cap screw	2	
9	Hexagon socket head cap screw	3	
8	Block retainer	2	
7	Stopper block	2	
6	Rubber bumper	1	
5	Lever retainer	1	
4	Stopper lever	1	
3	Stopper ring	1	
2	Auto switch	2	
1	Rotary actuator	1	Product
No.	Description	Qty	Note

Assembly procedure

For D-S/T79□, S7P, R73/80□

- Assemble by following the assembly procedure on page 15.
- Mount the joint (12) to the stopper lever (4) and fasten it using the hexagon socket set screw (13).
- Mount the magnet lever (18) to the joint (12) and fasten it using the hexagon socket set screw (24).
- Mount the stopper ring (3) to the cover (A) (14) and fasten it using the cross recessed round head screw (20) (tightening torque is approx. 0.8 Nm).
- Insert the holding blocks (18) in the grooves of the cover (A) (14), place the cover (B) (15) on top and fasten them with the cross recessed round head screw (25).
- Assemble by following the assembly procedure on page 14.

For D-M9□

- Assemble by following steps 1 to 5 of the above procedure.
- Carefully fix the switch holder (26) to the holding block (18) using the cross recessed round head screw (27).
- Insert the D-M9 auto switch into the switch holder (26) and carefully fasten it using the slotted set screw attached to the switch (tightening torque is 0.05 to 0.1 Nm).
- Move the switch holder (26) to the setting position and fasten it using the cross recessed round head screw (27).

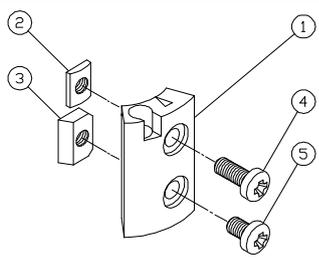
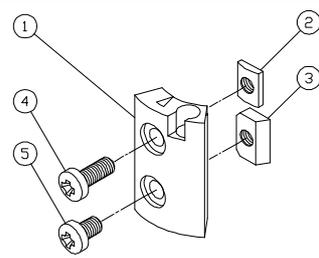
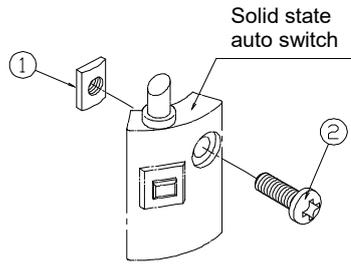
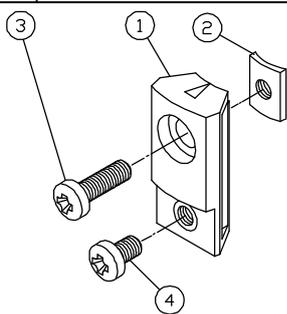
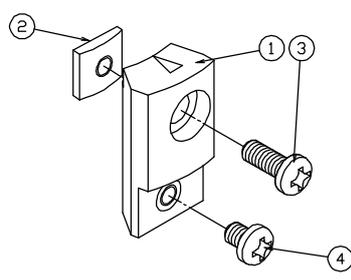
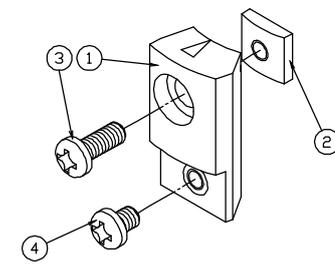
* When disassembling the product, disassemble it following the procedure in the reverse order.

* When the screw tightening torque is not specified, the tightening torque shall be approx. 0.49 Nm.

5. Various units

5.1 Switch block unit

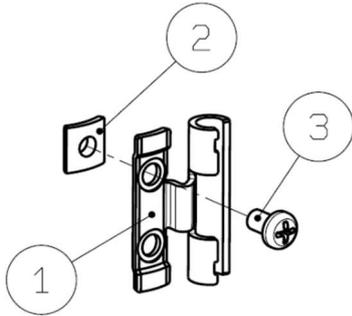
A switch block unit can be ordered when adding auto switches or when the switch block is broken. The solid state auto switch (D-S9*/T99) for sizes 10 and 15 has a built-in switch in the block. It requires only two parts for mounting (see P211070-13).

Size 10, 15											
For right-hand (Reed auto switch)				For left-hand (Reed auto switch)				Common to right-hand and left-hand (For solid state auto switch D-S9*/T99)			
Unit part number: P611070-8				Unit part number: P611070-9				Unit part number: P211070-13			
											
5	Cross recessed round head screw	1	M3×4L	5	Cross recessed round head screw	1	M3×4L				
4		1	M3×8L	4		1	M3×8L				
3	Holding block (B)	1		3	Holding block (B)	1					
2	Holding block (A)	1		2	Holding block (A)	1		2	Cross recessed round head screw	1	M3×8L
1	Switch block (A)	1		1	Switch block (B)	1		1	Holding block (A)	1	
No.	Description	Qty	Note	No.	Description	Qty	Note	No.	Description	Qty	Note
Size 20, 30						Size 40					
Common to right-hand and left-hand (For solid state auto switch and reed auto switch D-S7*/T79)						For right-hand (For solid state auto switch and reed auto switch D-S7*/T79)			For left-hand (For solid state auto switch and reed auto switch D-S7*/T79)		
Unit part number: P611060-8						Unit part number: P611010-8			Unit part number: P611010-9		
											
4	Cross recessed round head screw	1	M3×4L	4	Cross recessed round head screw	1	M3×4L	4	Cross recessed round head screw	1	M3×4L
3		1	M3×8L	3		1	M3×8L	3		1	M3×8L
2	Holding block	1		2	Holding block	1		2	Holding block	1	
1	Switch block	1		1	Switch block (A)	1		1	Switch block (B)	1	
No.	Description	Qty	Note	No.	Description	Qty	Note	No.	Description	Qty	Note

Size 20, 30

Common to right-hand and left-hand
(Reed auto switch D-M9)

Unit part number: P811030-8M

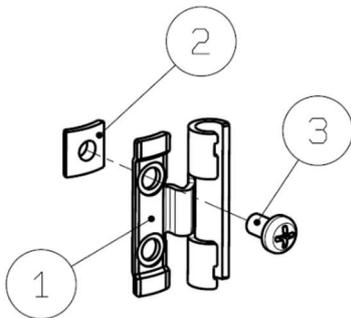


3	Cross recessed round head screw	1	M3×6L
2	Holding block	1	
1	Switch holder	1	
No.	Description	Qty	Note

Size 10, 15, 40

Common to right-hand and left-hand
(Reed auto switch D-M9)

Unit part number: P811010-8M



3	Cross recessed round head screw	1	M3×5L
2	Holding block	1	
1	Switch holder	1	
No.	Description	Qty	Note

5.2 Vertical auto switch unit

- Part number for auto switch unit
(An auto switch will not be included.)

Size	Part number for unit (For solid state auto switch and reed auto switch D-S*/T*)	Part number for unit (For reed auto switch D-M9)
10	P611070-1	P611070-1M
15	P611090-1	P611090-1M
20	P611060-1	P611060-1M
30	P611080-1	P611080-1M
40	P611010-1	P611010-1M

The auto switch unit can be retrofitted to the rotary actuator (can be added after the actuator has been delivered).

The auto switch is not included with the auto switch unit, and must be ordered separately.

If the switch block for solid state auto switch is used for sizes 10 and 15, it is not required to order block unit parts for the reed switch in the auto switch unit.

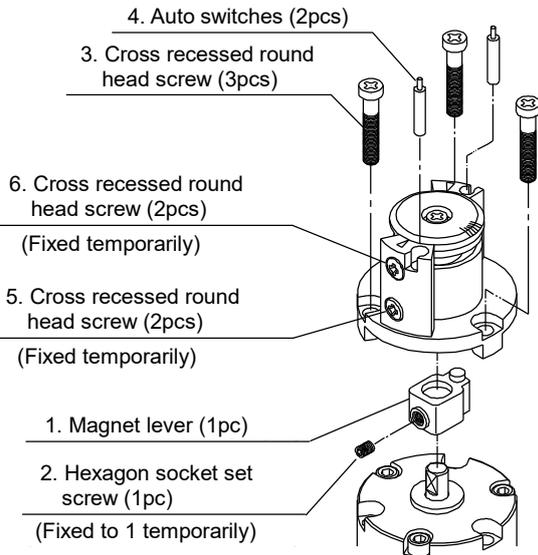
How to mount auto switch unit

Size 10	
Mounting for auto switch unit and auto switch (Reed switch)	Mounting for auto switch unit and auto switch (solid state switch D-S9*/T99)
<p>Follow the procedure below in numerical order starting from 1 to attach the auto switch unit. (Note1. Auto switch of (4) is not included when ordering only a unit.) (Note2. When the screw tightening torque is not specified, the tightening torque shall be approx. 0.49Nm.)</p> <ol style="list-style-type: none"> Magnet lever (1pc) (Fixed to 1 temporarily) Hexagon socket set screw (1pc) (Fixed to 1 temporarily) Cross recessed round head screw (2pcs) (Fixed temporarily) Auto switches (2pcs) Cross recessed round head screw (2pcs) (Fixed temporarily) Cross recessed round head screw (2pcs) (Fixed temporarily) 	<p>Follow the procedure below in numerical order starting from 1 to attach the auto switch unit. (Note1. Auto switch of (4) is not included when ordering only a unit.) (Note2. When the screw tightening torque is not specified, the tightening torque shall be approx. 0.49Nm.)</p> <ol style="list-style-type: none"> Magnet lever (1pc) (Fixed to 1 temporarily) Hexagon socket set screw (1pc) (Fixed to 1 temporarily) Cross recessed round head screw (2pcs) Auto switches (2pcs) Cross recessed round head screw (2pcs) (Fixed temporarily)

Size 15

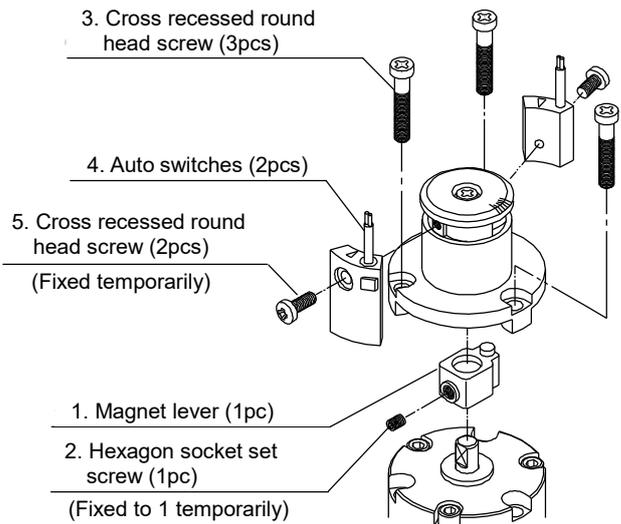
Mounting for auto switch unit and auto switch
(Reed switch)

Follow the procedure below in numerical order starting from 1 to attach the auto switch unit.
(Note1. Auto switch of (4) is not included when ordering only a unit.)
(Note2. When the screw tightening torque is not specified, the tightening torque shall be approx. 0.49Nm.)



Mounting for auto switch unit and auto switch
(solid state switch D-S9*/T99)

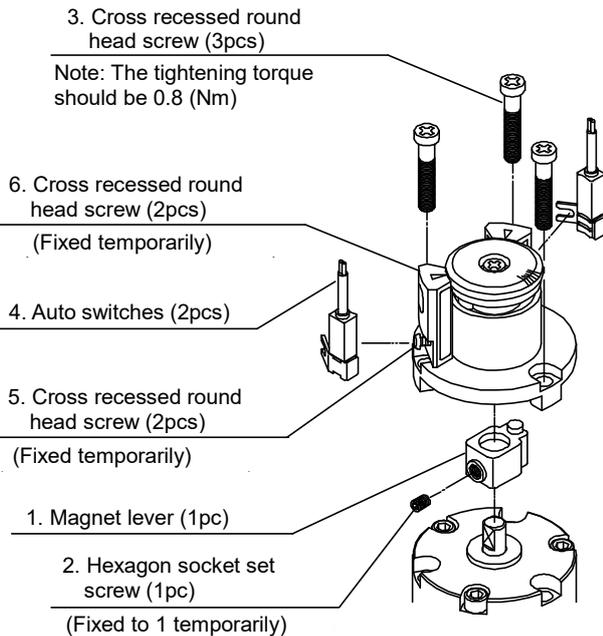
Follow the procedure below in numerical order starting from 1 to attach the auto switch unit.
(Note1. Auto switch of (4) is not included when ordering only a unit.)
(Note2. When the screw tightening torque is not specified, the tightening torque shall be approx. 0.49Nm.)



Size 20, 30

Mounting for auto switch unit and auto switch
(Reed switch or Solid state switch D-S7*/T79)

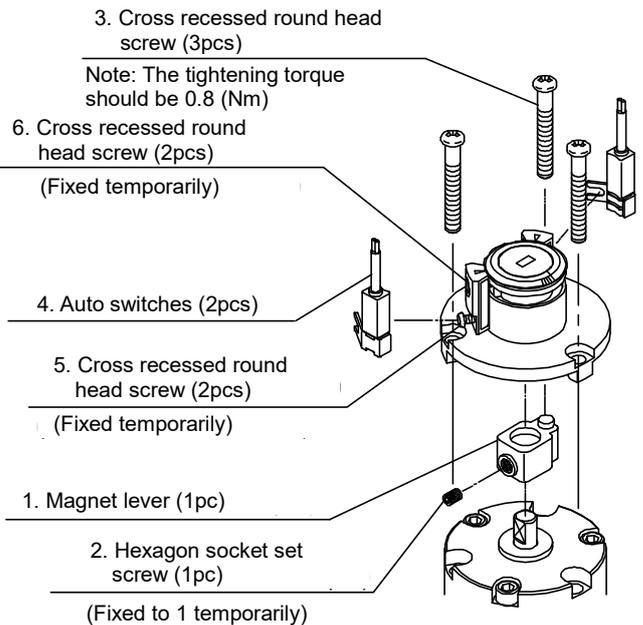
Follow the procedure below in numerical order starting from 1 to attach the auto switch unit.
(Note1. Auto switch of (4) is not included when ordering only a unit.)
(Note2. When the screw tightening torque is not specified, the tightening torque shall be approx. 0.49Nm.)



Size 40

Mounting for auto switch unit and auto switch
(Reed switch or Solid state switch D-S7*/T79)

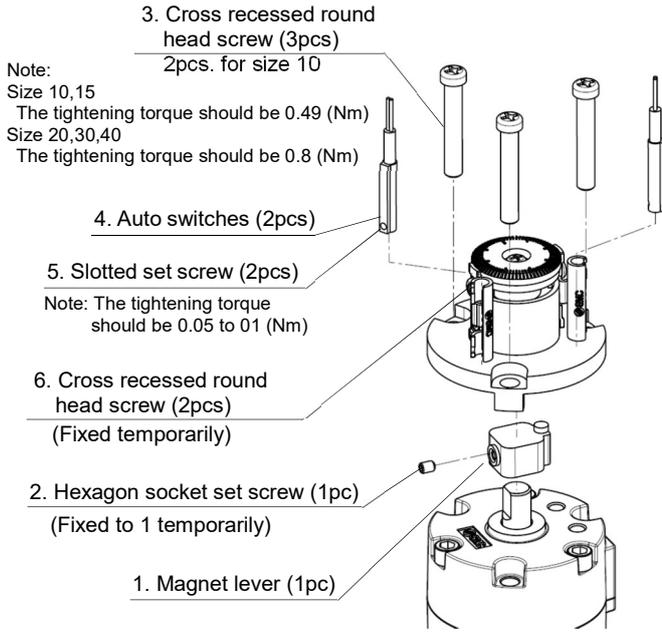
Follow the procedure below in numerical order starting from 1 to attach the auto switch unit.
(Note1. Auto switch of (4) is not included when ordering only a unit.)
(Note2. When the screw tightening torque is not specified, the tightening torque shall be approx. 0.49Nm.)



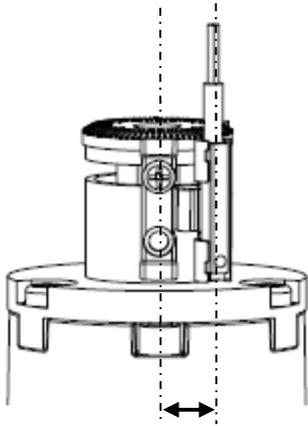
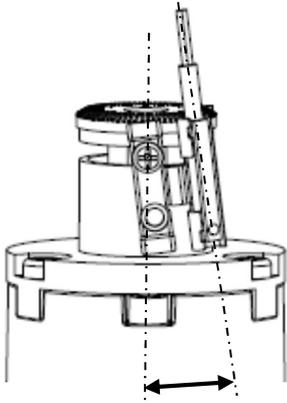
Size 10, 15, 20, 30, 40

Mounting for auto switch unit and auto switch
(Solid state switch D-M9)

Follow the procedure below in numerical order starting from 1 to attach the auto switch unit.
(Note1. Auto switch of (4) is not included when ordering only a unit.)
(Note2. When the screw tightening torque is not specified, the tightening torque shall be approx. 0.49Nm.)
(Note3. After the adjustment of the auto switch, hold the auto switch still while fixing. Please refer to the cautions.)



Caution for mounting D-M9 auto switch

Correct mounting condition	Incorrect mounting condition
<p>- Mount upright so that the auto switch is aligned with the product.</p>  <p>Parallel to the center of the product (recommended condition for mounting)</p>	<p>- Not mounted in parallel to the center of the product.</p> <p>*If the auto switch is not mounted in parallel to the center of the product, the switch will be displaced outward and the operation will be affected. Correct the mounting condition holding the switch referring to the drawing on the left.</p>  <p>Not parallel to the center of the product (Not the correct position - Re assemble)</p>

5.3 Angle adjustment unit

Part number for angle adjustment unit

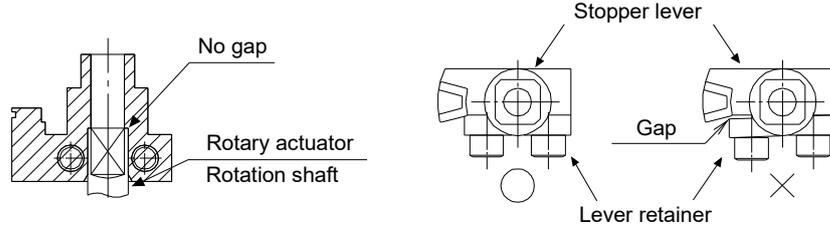
Size	Unit part number
10	P811010-3
15	P811020-3
20	P811030-3
30	P811040-3
40	P811050-3

Each unit can be additionally mounted to the rotary actuator.

Mounting of angle adjustment unit

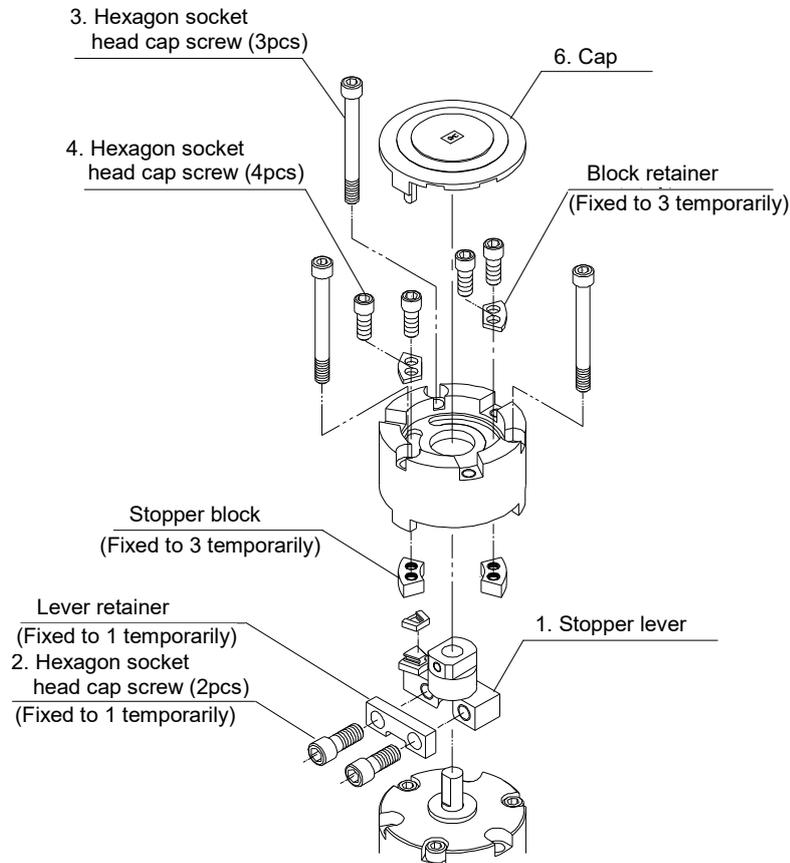
Size 10	Size 15, 20, 30
<p>Follow the procedure below (in order of part number) for assembling the angle adjustment unit. Note 1. Each screw shall be tightened at a torque of approx. 1.0 to 1.2Nm.</p>	<p>Follow the procedure below (in order of part number) for assembling the angle adjustment unit. Note 1. Each screw shall be tightened at a torque of approx. Size 15 :1.0 to 1.2 Nm Size 20 :2.5 to 3.4 Nm Size 30 :4.0 to 6.0 Nm</p>

Be careful with the notes on the right drawing for mounting the stopper lever and lever holder.

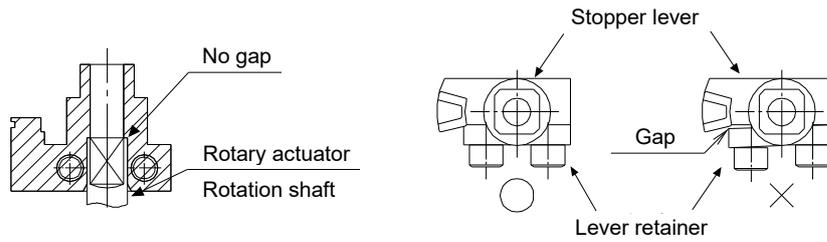


Size 40

Follow the procedure below (in order of part number) for assembling the angle adjustment unit.
 Note 1. Each screw shall be tightened at a torque of approx. 4.0 to 6.0Nm.



Be careful with the notes on the right drawing for mounting the stopper lever and lever holder.



5.4 Joint Unit for Combining Switch Unit and Angle Adjustment Unit

Joint unit is necessary for changing the rotary actuator with switch or angle adjustment function to the rotary actuator with switch degree adjusting type.

Size 10					Size 15				
P211070-10					P211090-10				
3	Hexagon nut	Stainless steel	1	M3	3	Hexagon socket set screw	Stainless steel	1	M3x3L
2	Cross recessed round head screw	Stainless steel	2	M3x4L	2	Cross recessed round head screw	Stainless steel	3	M3x12L
1	Joint	Stainless steel	1		1	Joint	Aluminum alloy	1	Chromated
No.	Description	Material	Qty	Note	No.	Description	Material	Qty	Note

Size 20					Size 30				
P211060-10					P211080-10				
3	Hexagon socket set screw	Stainless steel	1	M3x4L	3	Hexagon socket set screw	Stainless steel	1	M3x4L
2	Cross recessed round head screw	Stainless steel	3	M4x10L	2	Cross recessed round head screw	Stainless steel	3	M5x12L
1	Joint	Aluminum alloy	1	Chromated	1	Joint	Aluminum alloy	1	Chromated
No.	Description	Material	Qty	Note	No.	Description	Material	Qty	Note

Size 40				
P211010-10				
3	Hexagon socket set screw	SUS	1	M4×4L
2	Cross recessed round head screw	SUS	3	M5×12L
1	Joint	AL	1	Chromated
No.	Description	Material	Qty	Note

How to mount joint unit

Size 10	Size 15, 20, 30, 40
<p>Follow the procedure below for assembling the auto switch (including the unit). (Note1. When the screw tightening torque is not specified, the tightening torque shall be approx. 0.49Nm.)</p> <p>Cross recessed round head screw (2pcs)</p> <p>Cross recessed round head screw (2pcs) (Fixed temporarily)</p> <p>Cross recessed round head screw (2pcs) (Fixed temporarily)</p> <p>1. Joint</p> <p>2. Hexagon nut</p>	<p>Follow the procedure below for assembling the auto switch (including the unit). (Note1. When the screw tightening torque is not specified, the tightening torque shall be approx. 0.49Nm.)</p> <p>3. Cross recessed round head screw (3pcs)</p> <p>Note: Size 10,15 Tightening torque 0.49 (Nm) Size 20,30,40 Tightening torque 0.8 (Nm)</p> <p>1. Joint</p> <p>2. Hexagon socket set screw (1pc)</p>

6. Handling notes

6.1 Cautions for handling of the vertical auto switch unit

- (1) Be sure to connect a load to the switch before turning the power supply on.
- (2) Do not let objects drop onto or dent the product or subject it to strong impact when handling.
- (3) Do not use the product in the presence of a strong magnetic field.
- (4) When using two or more cylinders with auto switches closely in parallel, keep them at least 40mm apart.

Reed auto switch type

- (1) A light emitting diode is used for the indicator light for D-R73 (for DC24V), so it has polarity. When use at DC24V, the black lead wire is negative and red lead wire is positive. If these lead wires are connected reversely, the switch will work but the indicator light will not light up.
- (2) Operate within the operating current range. If the actuator is used at a current less than the operating current range, the indicator light will not light up. If the current exceeds the operating current range, the indicator light will be broken.
- (3) D-R73 can be used in parallel, but when it is connected in series, the voltage drop will increase due to internal resistance of the light emitting diode. (Approx. 2V for each switch)
- (4) A contact protection circuit is not installed in D-R7, D-R8 and D-9 switches. If inductive load is connected, the lead wire is 5m or longer, or the current is AC100V, use the contact protection box shown on the bottom.

Product number	Working voltage	Length of reed wire
CD-P11	AC100V	Auto switch connection side 0.5m Load connection side 0.5m
CD-P12	CD24V	

Solid state auto switch type

- (1) This actuator has reverse connection protection, output failure protection, and excessive load protection, so if wiring is wrongly connected, the switch will be protected, but depending on the wiring condition, the load might be adversely affected, so please connect the wiring carefully.
- (2) Do not connect the switches with two wire type (D-T79, D-T99 types) in series or parallel, because they may malfunction due to current leakage and internal voltage drop.
- (3) D-T79 and D-T99 types satisfy the input specifications of most sequence controllers, as the internal voltage drop is less than 3V and current leakage is less than 1MPa, but if there is a problem, use D-S79 or D-S99 types.

6.2 Cautions for handling of the vertical auto switch

Use the actuator within the allowable kinetic energy, otherwise there is a risk of deviation of the set rotation time, or breakage of parts.

Table 1 Moment of inertia

Size	Allowable kinetic energy (J)
10	0.00015
15	0.00025
20	0.0004
30	0.015
40	0.03

How to calculate the load energy

$$E = \frac{1}{2} \cdot I \cdot \omega^2$$

$$\omega = \frac{2\theta}{t}$$

E : Kinetic energy (J)

I : Moment of inertia (kg · m²)

* ω : Speed (rad/s)

θ : Rotation angle (rad)

180° = 3.14 rad

t : Rotation time (s)

Table 2 Safety operable rotation time adjustment range

Size	Rotation time (s / 90°)
10	0.03 to 0.5
15	
20	
30	0.04 to 0.5
40	0.07 to 0.5

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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