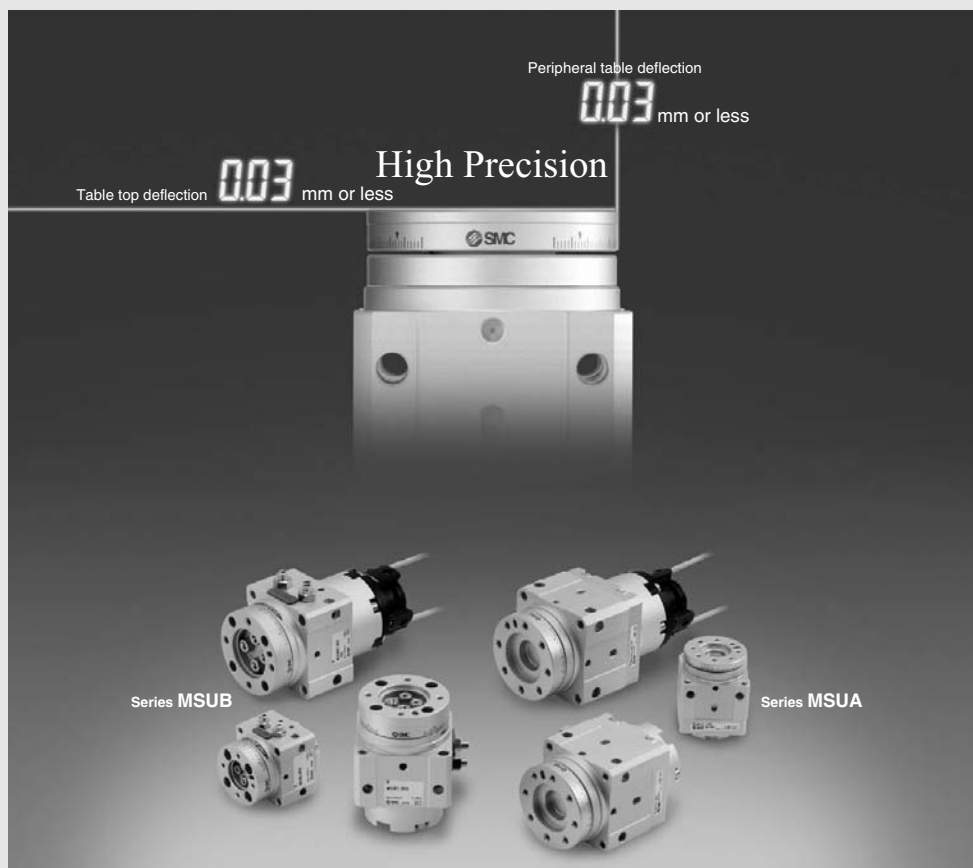


# Rotary Table/Vane Style

Series **MSU**

Size: 1, 3, 7, 20



CRB2

-Z

CRBU2

CRB1

**MSU**

**CRJ**

CRA1

-Z

CRA1

CRQ2

**MSQ**

**MSZ**

CRQ2X

MSQX

**MRQ**

D-□

# Rotary

# Series

## Vane Style/

Rotary actuator with lightweight,



**High precision type**

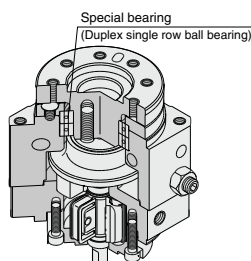
**Size: 1, 3, 7, 20**

# Series MSUA

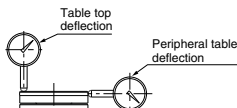
Improved table deflection accuracy:

0.03 mm or less

## High precision/High rigidity



Deflection accuracy: Displacement for 180° rotation



Model	MSUA
Table top deflection	0.03 (0.1 to 0.2)
Peripheral table deflection	0.03 (0.1 to 0.2)

Values inside ( ) are for Series MSUB

## Disengageable

Maintenance work is simplified.

The drive unit can be replaced with the load mounted.

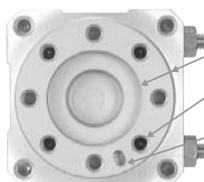


Table unit



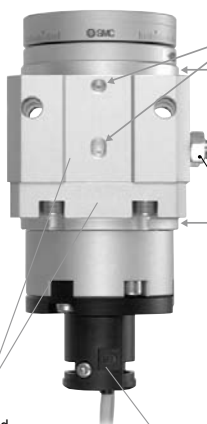
Drive unit

## Easy alignment when mounting the load



- Table inside/outside diameter tolerance H9/h9
- Female threads for load mounting provided in eight places. (Increases freedom in mounting the load)
- Mounting reference pin holes

## Easy alignment when mounting the body

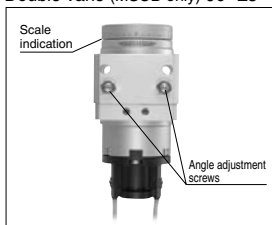


- Mounting reference pin holes (Alignment with center of body)  
Provided on three sides, excluding port side
- Reference diameter h9 (Alignment with center of table rotation)

## Angle adjustable

90° ±10°, 180° ±10°

Double vane (MSUB only) 90° ±5°



## Auto switch capable

Since switches can be moved anywhere on the circumference, they can be mounted at positions which accommodate the specifications.

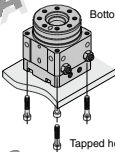
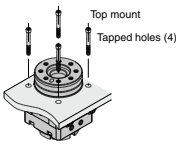
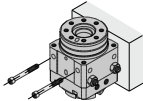
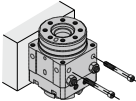
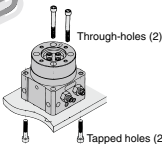
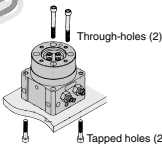
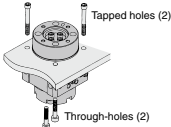
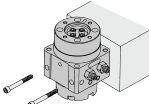
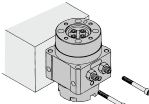
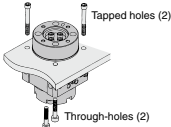
# Table MSU

Size: 1, 3, 7, 20

compact table for robotic hands

## Free mount type

Can be mounted from three directions: axial, lateral, vertical

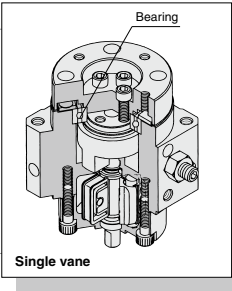
Axial mounting		Lateral mounting	Vertical mounting
<div>MSUA</div> 			
			
<div>MSUB</div> 			
			



## Basic type *Series MSUB*

Size: 1, 3, 7, 20

- Single vane and double vane standardized
- Double vane has the same dimensions as single vane (Except size 1)



## Series Variations

Series	Size	Rotating angle	Vane type	Applicable auto switch
High precision type MSUA	1	90°	Single vane	D-9, D-T99 D-9□A, D-S99, S9P
	3			
	7			
	20	180°		D-R73, D-T79 D-R80, D-S79, S7P
Basic type MSUB	1	90°	Single vane	D-9, D-T99 D-9□A, D-S99, S9P
	3			
	7			
	20	180°	Double vane *	D-R73, D-T79 D-R80, D-S79, S7P

\* Double vane is available with 90° rotation setting only.

CRB2

-Z

CRBU2

CRB1

MSU

CRJ

CRA1

-Z

CRA1

CRQ2

MSQ

MSZ

CRQ2X

MSQX

MRQ

D-□

# Rotary Table: High Precision Type Vane Style

## Series **MSUA**

Size: 1, 3, 7, 20



### How to Order

**Bearing type**  
A High precision type

**Free mount type**

**Connection port location**  
Nil Side ported  
E Axial ported  
Available with side ported only, when equipped with auto switch unit.

**Without auto switch**  
MSUA 20 - 90 S

**With auto switch**  
M D SUA 20 - 90 S - T79 L

**With auto switch**  
(Built-in magnet)

**Nominal size (Torque)**

1	MSUA 1
3	MSUA 3
7	MSUA 7
20	MSUA20

**Rotating angle**

Applicable vane	Symbol	Rotating angle
Single	90	90°
180	180	180°

Rotation adjustment range  
Single vane: Both ends  $\pm 5^\circ$  each

**Vane type**  
S Single vane

**Number of auto switches**

S	1 pc. *
Nil	2 pcs. **

\* S (1 auto switch) is shipped with a right-hand auto switch.  
\*\* Nil (2 auto switches) is shipped with a right-hand and a left-hand switch.

**Electrical entry/Lead wire length**

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

\* Available only with R73, R80 and T79 type connectors.  
\*\* 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

**Auto switch**  
Nil Without auto switch (built-in magnet)  
\*Refer to the table below for the applicable auto switch model.

### Applicable Auto Switches/Refer to pages 807 to 856 for further information on auto switches.

Applicable model	Type	Special function	Electrical entry	Indicate 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)	3 (L)	5 (Z)	None (N)				
MDSUA1 MDSUA3	Solid state auto switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	S99V S9PV	S99 S9P	Heavy-duty cord	●	●	○	—	○	IC circuit	Relay, PLC
					3-wire (PNP)		12 V	—	T99V	T99		●	●	○	—	○		
	Reed auto switch	—		No	2-wire		5 V, 12 V	5 V, 12 V, 24 V	—	90	Parallel cord	●	●	●	—	—	IC circuit	
							5 V, 12 V, 100 V	5 V, 12 V, 24 V, 100 V	—	90A	Parallel cord	●	●	●	—	—		
MDSUA7 MDSUA20	Solid state auto switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	—	S79 S7P	Heavy-duty cord	●	●	○	—	○	IC circuit	Relay, PLC
					3-wire (PNP)		12 V	—	—	T79 T79C		●	●	○	—	○		
	Reed auto switch	—		No	2-wire		—	100 V	—	R73 R73C	●	●	○	—	—	IC circuit		
							48 V, 100 V	100 V	—	R80	●	●	○	—	—			
			—			24 V or less	—	R80C	●	●	●	—	—					
			Connector			—	—	—	—	—	—	—	—	—	—	—	—	
	Grommet	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
	Grommet	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
Connector	—	—	—	—	—	—	—	—	—	—	—	—	—	—				

\* 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).

\* Auto switches marked with "O" are made-to-order specifications.

Order example: MSUA20 single vane type (connection port side location selected)

- Standard type (Without auto switches), Rotation 90°, side port location  
MSUA20-90S
- With auto switch unit (Without auto switches), Rotation 180°, side port location  
MDSUA20-180S
- With auto switch unit + Auto switch R73, Rotation 180°, Side port location  
MDSUA20-180S-R73



Refer to pages 843 and 844 for detailed solid state auto switches with pre-wired connectors.

## Specifications

Model <sup>*2</sup>	MSUA1		MSUA3		MSUA7		MSUA20	
Vane type	Single vane							
Rotating angle <sup>*1</sup>	90° ± 10°	180° ± 10°	90° ± 10°	180° ± 10°	90° ± 10°	180° ± 10°	90° ± 10°	180° ± 10°
Fluid	Air (Non-lube)							
Proof pressure (MPa)	1.05						1.5	
Ambient and fluid temperature	5 to 60°C							
Operating pressure range (MPa)	0.2 to 0.7		0.15 to 0.7				0.15 to 1.0	
Rotation time adjustment range (s/90°)	0.07 to 0.3 (0.5 MPa)							
Shaft load	Allowable radial load	20 N	40 N	50 N		60 N		
	Allowable thrust load	15 N	30 N	60 N		80 N		
	Allowable moment	0.3 N·m	0.7 N·m	0.9 N·m		2.9 N·m		
Bearing	Special bearing							
Port location	Side ported or Top ported							
Port size	Side ported	M3 x 0.5		M5 x 0.8				
	Top ported	M3 x 0.5				M5 x 0.8		
Deflection accuracy	0.03 mm or less							

\* 1 Single vane 90° can be adjusted to 90° ± 10° (both ends of rotation ± 5° each)  
Single vane 180° can be adjusted to 180° ± 10° (both ends of rotation ± 5° each)

(Note) Refer to page 35 for allowable kinetic energy.

Rotary table	Free-mount rotary actuator
MSUA 1	CRBU2W10
MSUA 3	CRBU2W15
MSUA 7	CRBU2W20
MSUA20	CRBU2W30

### Moisture Control Tube Series IDK

When operating an actuator with a small diameter and a short stroke at a high frequency, the dew condensation (water droplet) may occur inside the piping depending on the conditions.

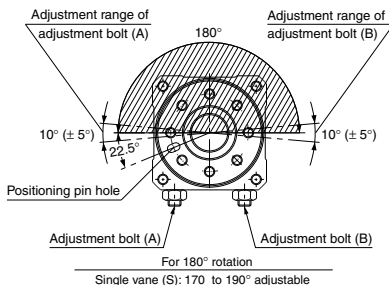
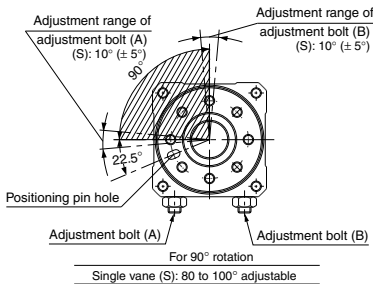
Simply connecting the moisture control tube to the actuator will prevent dew condensation from occurring. For details, refer to [Series IDK in the WEB catalog](#).

Symbol



## Table Rotation Range

Angle adjustment is possible as shown in the drawings below using adjustment bolts (A) and (B).



## Weight

Size	Rotating angle	Basic weight	Auto switch unit (Note)
		Single vane	
1	90°	162	15
	180°	161	
3	90°	262	20
	180°	260	
7	90°	440	28
	180°	436	
20	90°	675	38
	180°	671	

(Note) Values above do not include auto switch weight.

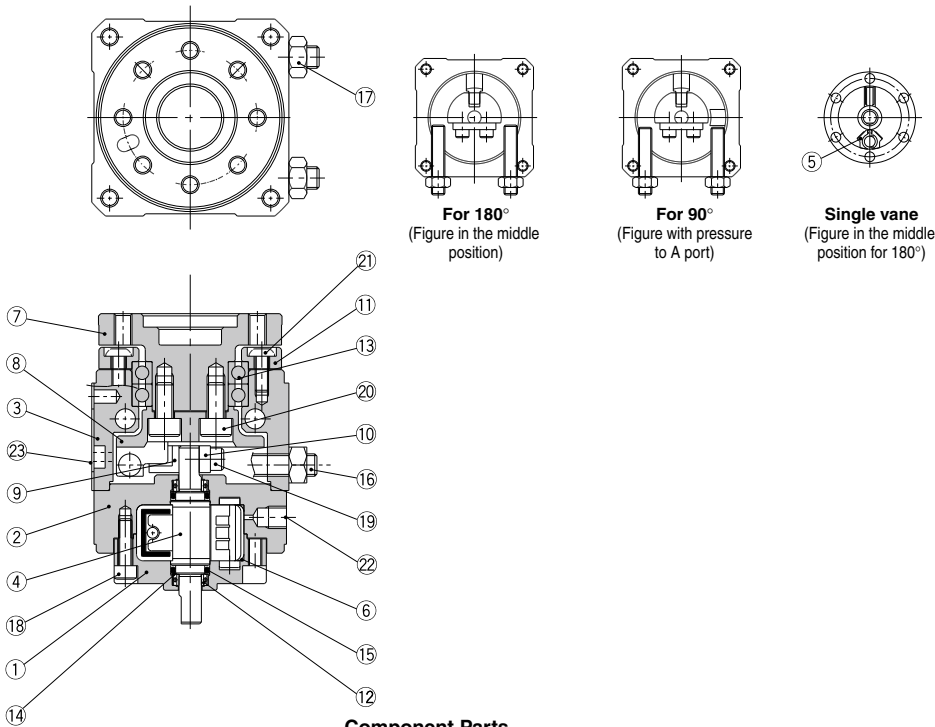
## Allowable Load

Do not permit the load and moment applied to the table to exceed the allowable values shown in the table below. (Operation above the allowable values can cause adverse effects on service life, such as play in the table and loss of accuracy.)

Size	Allowable radial load (N)	Allowable thrust load (N)	Allowable moment (N·m)
1	20	15	0.3
3	40	30	0.7
7	50	60	0.9
20	60	80	2.9


Construction

Internal Construction of Rotary Table



Component Parts

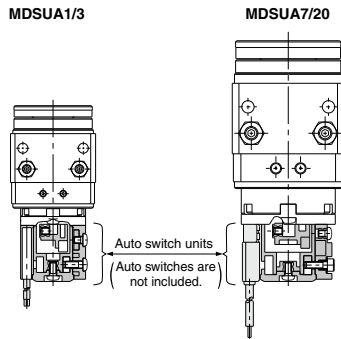
No.	Description	Material	Note
1	Body A	Aluminum alloy	Anodized
2	Body B	Aluminum alloy	Anodized
3	Body C	Aluminum alloy	Anodized
4	Vane shaft	Stainless steel (MSUA20 is carbon steel)	Single vane
5	Stopper	Resin	Single vane
6	Stopper seal	NBR	
7	Table	Aluminum alloy	Anodized, Serigraph
8	Stopper lever	Carbon steel	Heat treated, Electroless nickel plated
9	Stopper guide	Stainless steel	Nitriding
10	Lever retainer	Carbon steel	Zync Chromated
11	Bearing retainer	Aluminum alloy	Anodized
12	Bearing	High carbon chrome bearing steel	
13	Special bearing	High carbon chrome bearing steel	
14	Back-up ring	Stainless steel	
15	O-ring	NBR	
16	With adjustment bolt	Carbon steel	Heat treated
17	Hexagon nut	Carbon steel	
18	Hexagon socket head cap screw		
19	Hexagon socket head cap screw		
20	Hexagon socket head cap screw		
21	Button bolt		
22	Hexagon socket head cap screw		SE type only
23	Label		

\* The plug  is used only when the connection port is type SE.

\* Individual part cannot be shipped. Please purchase the whole unit. (Refer to page 178.)

## Construction

### Internal construction with auto switch



\* Refer to page 57 for the component parts.

\* The auto switch unit can be retrofitted on a rotary actuator.  
Auto switches should be ordered separately since they are not included.

Model	Auto switch unit part no.
<b>M(D)SUA 1</b>	P211070-1
<b>M(D)SUA 3</b>	P211090-1
<b>M(D)SUA 7</b>	P211060-1
<b>M(D)SUA20</b>	P211080-1

Auto switch block unit			
MDSUA1/3		MDSUA7/20	
For reed auto switch		For solid state auto switch	Combination of reed and solid state auto switches
Right-handed	Left-handed	Combination left & right-handed	Combination left & right-handed
Part no.: P211070-8	Part no.: P211070-9	Part no.: P211070-13	Part no.: P211060-8

- \* The auto switch block unit is included in the auto switch unit.
- \* Auto switch block unit shows the necessary assembly for mounting 1 piece of auto switch to the auto switch unit.
- \* Individual part cannot be shipped.

CRB2-Z
CRBU2
CRB1
<b>MSU</b>
CRJ
CRA1-Z
CRA1
CRQ2
MSQ
<b>MSZ</b>
CRQ2X
MSQX
<b>MRQ</b>

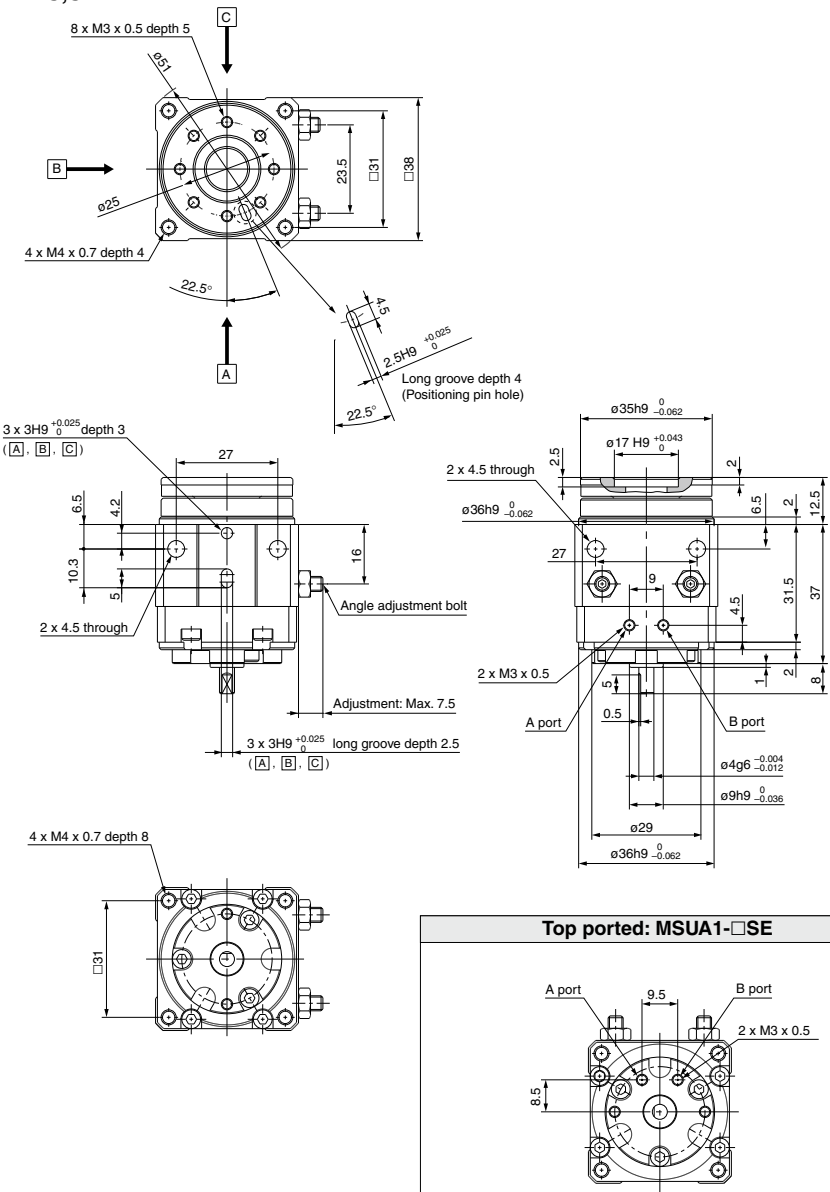
D-□

Dimensions

These drawings indicate the condition when the B port is pressurized.

MSUA1

MSUA1-□S,SE

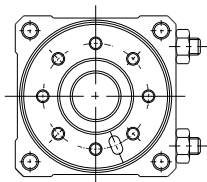




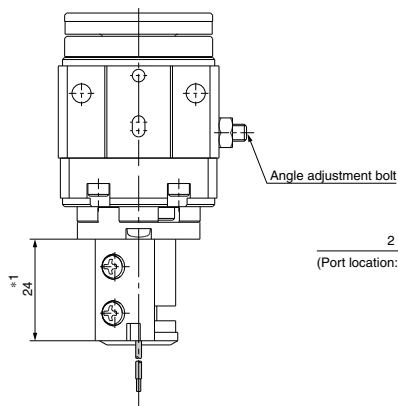
# Rotary Table: High Precision Type Vane Style **Series MSUA**

These drawings indicate the condition when the B port is pressurized.

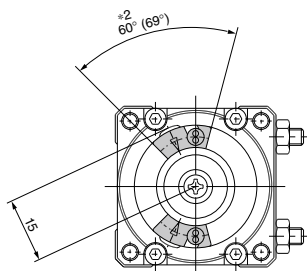
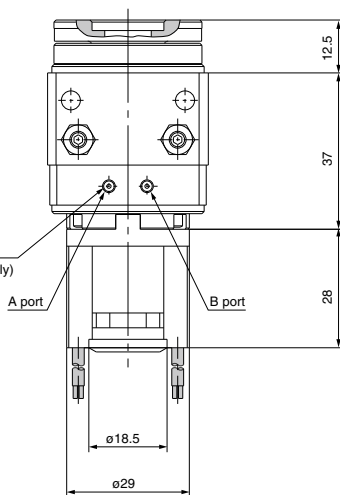
With auto switch: MDSUA1-□S



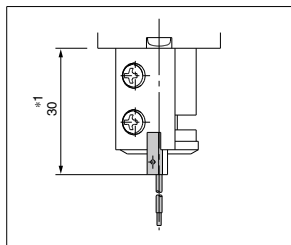
- \*1) 24: When using D-90/90A/S99/S99V/S9P/S9PV/T99/T99V  
30: When using D-97/93A
- \*2) 60°: When using D-90/90A/97/93A  
69°: When using D-S99/S99V/S9P/S9PV/T99/T99V



2 x M3 x 0.5  
(Port location: Side ported type only)



D-97/93A



CRB2
-Z
CRBU2
CRB1
MSU
CRJ
CRA1
-Z
CRA1
CRQ2
MSQ
MSZ
CRQ2X
MSQX
MRQ

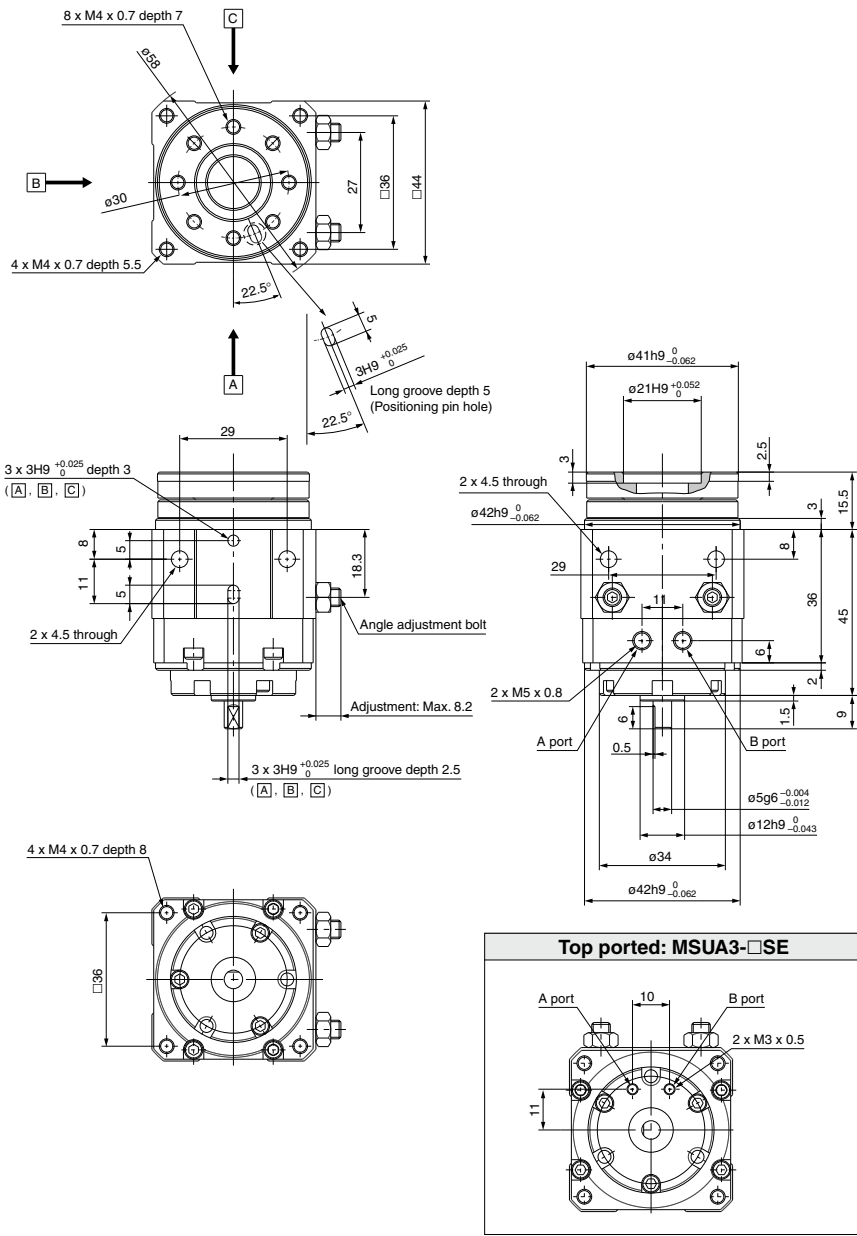
D-□

Dimensions

These drawings indicate the condition when the B port is pressurized.

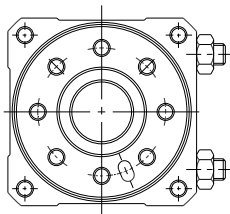
MSUA3

MSUA3-□S/SE

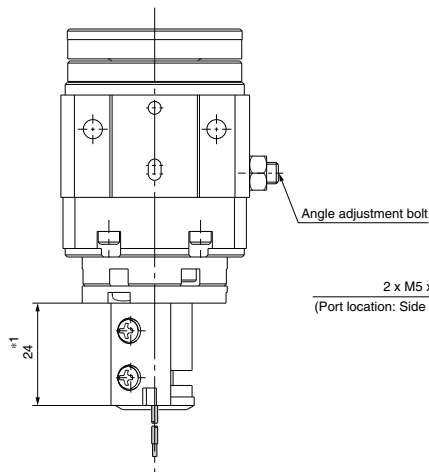


These drawings indicate the condition when the B port is pressurized.

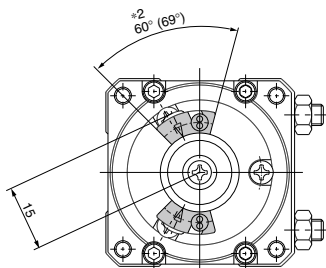
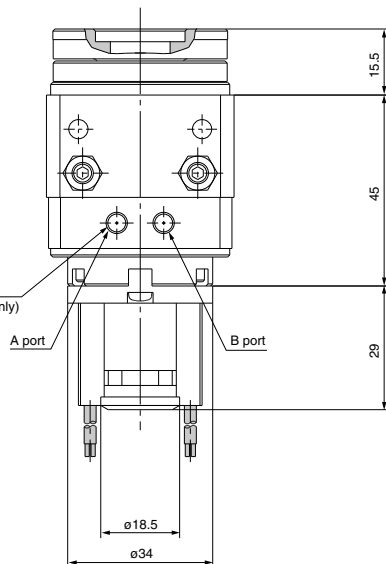
With auto switch: MDSUA3-□S



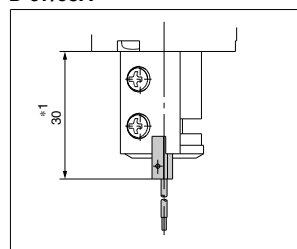
- \* 1) 24: When using D-90/90A/S99/S99V/S9P/S9PV/T99/T99V  
30: When using D-97/93A
- \* 2) 60°: When using D-90/90A/97/93A  
69°: When using D-S99/S99V/S9P/S9PV/T99/T99V



2 x M5 x 0.8  
(Port location: Side ported type only)



D-97/93A



CRB2
-Z
CRBU2
CRB1
MSU
CRJ
CRA1
-Z
CRA1
CRQ2
MSQ
MSZ
CRQ2X
MSQX
MRQ

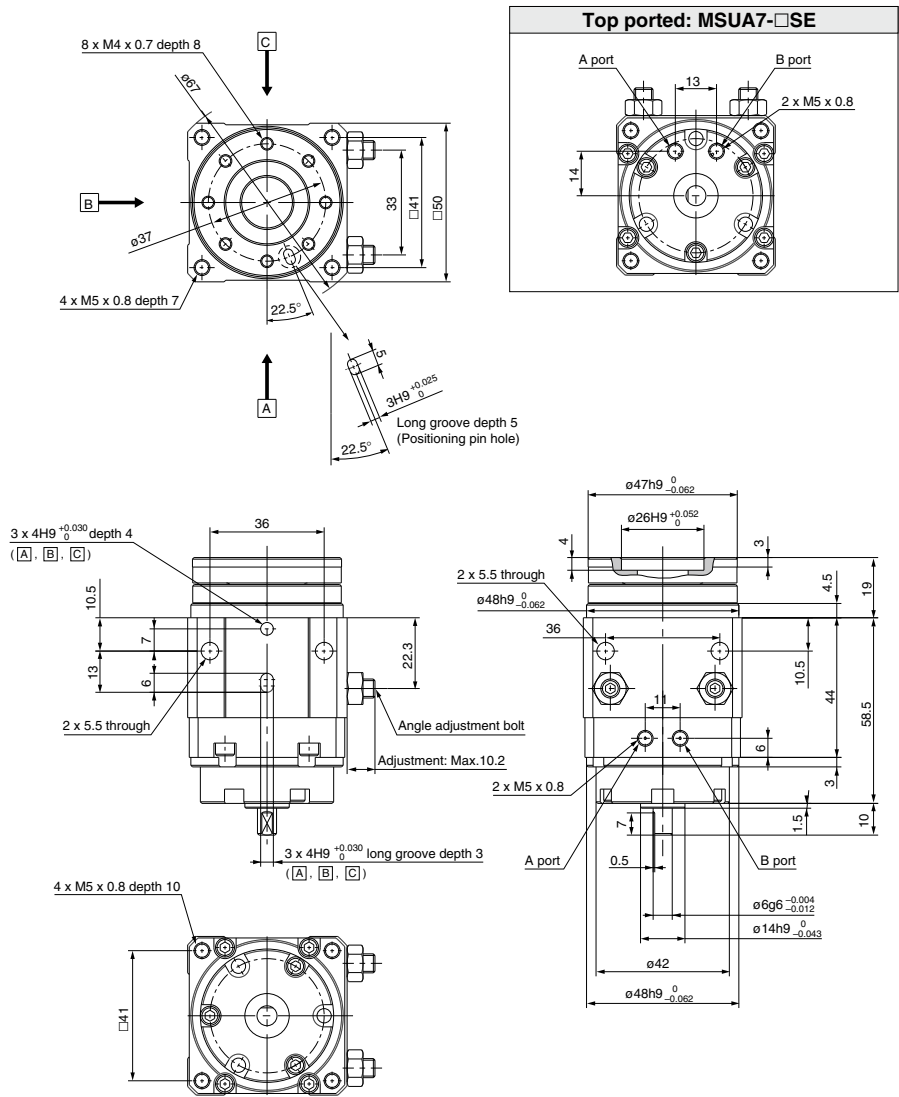
D-□

Dimensions

These drawings indicate the condition when the B port is pressurized.

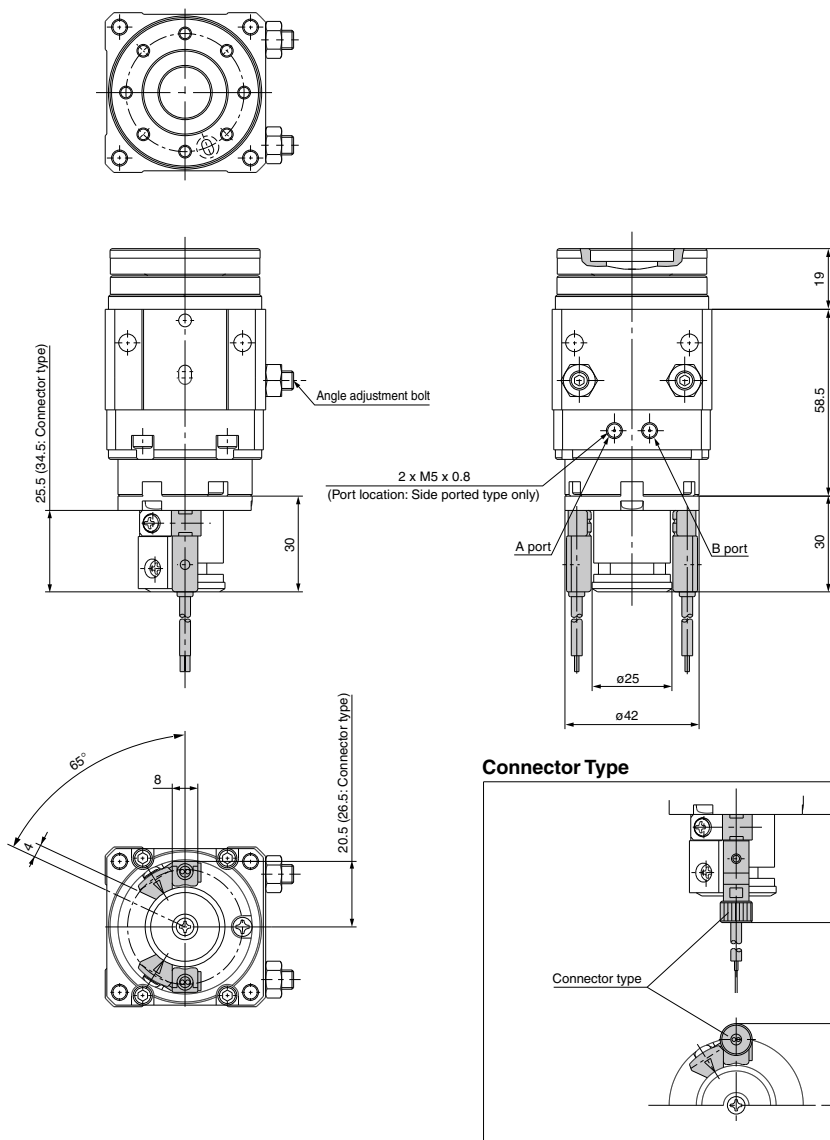
MSUA7

MSUA7-□S/SE



These drawings indicate the condition when the B port is pressurized.

With auto switch: MDSUA7-□S



CRB2-Z
CRBU2
CRB1
<b>MSU</b>
CRJ
CRA1-Z
CRA1
CRQ2
MSQ
MSZ
CRQ2X
MSQX
MRQ

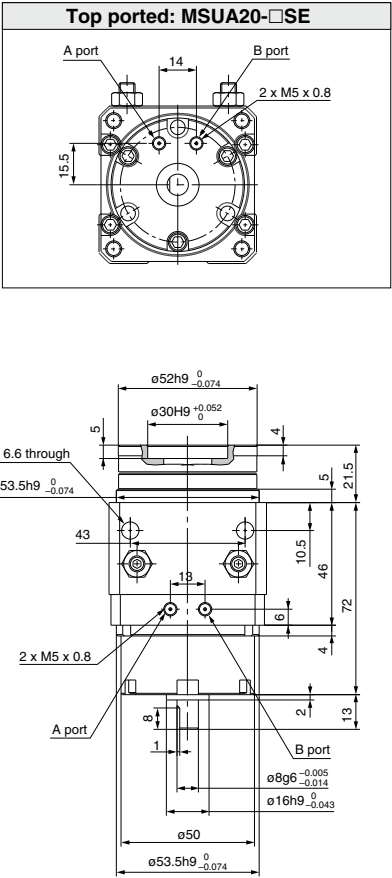
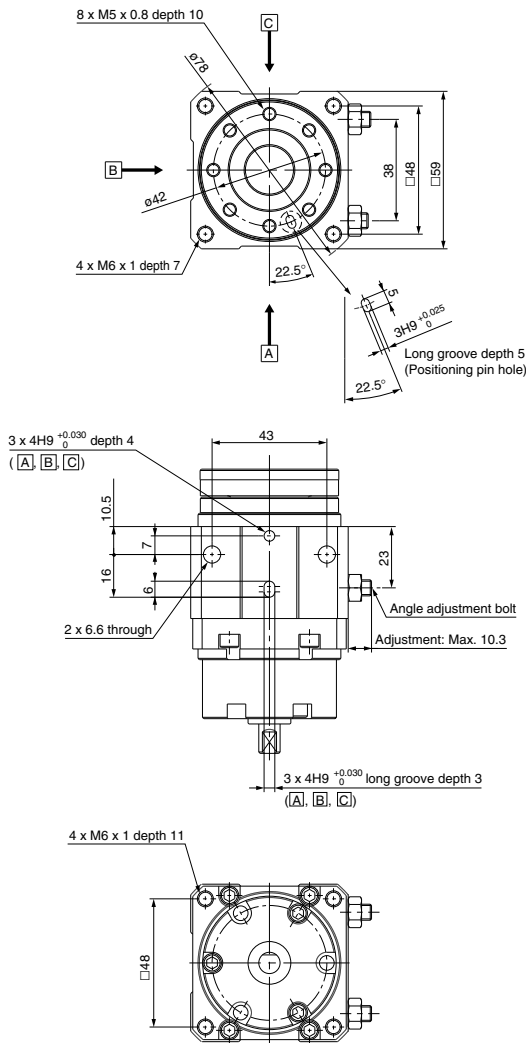
D-□

Dimensions

These drawings indicate the condition when the B port is pressurized.

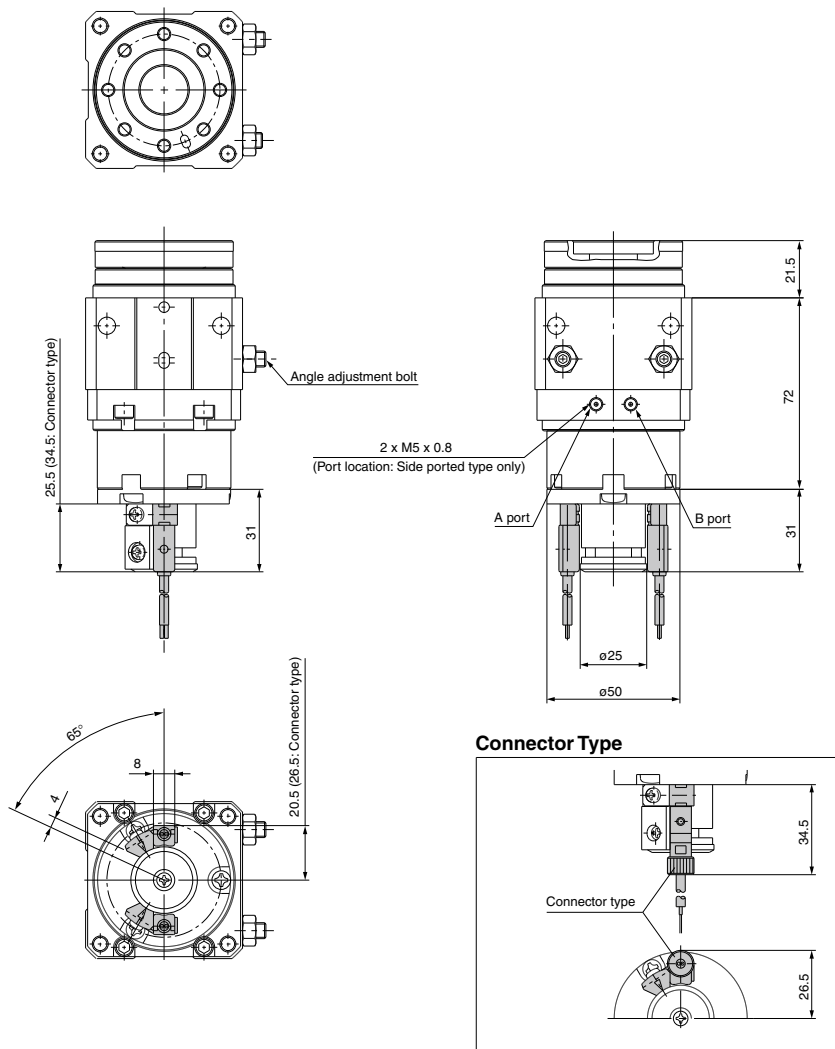
MSUA20

MSUA20-□S/SE



These drawings indicate the condition when the B port is pressurized.

With auto switch: MDSUA20-□S



CRB2-Z
CRBU2
CRB1
<b>MSU</b>
CRJ
CRA1-Z
CRA1
CRQ2
MSQ
MSZ
CRQ2X
MSQX
MRQ

D-□

# Rotary Table: Basic Type Vane Style

## Series MSUB

Size: 1, 3, 7, 20



### How to Order

**Bearing type**  
B Basic type

**Connection port location**  
Nil Side ported  
E Axial ported  
Available with side ported only, when equipped with auto switch unit.

**Free mount type**

**Without auto switch**  
MSUB 20 - 90 S

**With auto switch**  
M D SUB 20 - 90 S - T79 L

**With auto switch (Built-in magnet)**

**Nominal size (Torque)**

1	MSUB 1
3	MSUB 3
7	MSUB 7
20	MSUB20

**Rotating angle**

Application	Symbol	Rotating angle
Single vane	90	90°
	180	180°
Double vane	90	90°

Rotation adjustment range  
Single vane: Both ends  $\pm 5^\circ$  each  
Double vane: Both ends  $\pm 2.5^\circ$  each

**Vane type**  
S Single vane  
D Double vane

**Number of auto switches**

S	1 pc. *
Nil	2 pcs. **

\* S (1 auto switch) is shipped with a right-hand auto switch.  
\*\* Nil (2 auto switches) is shipped with a right-hand and a left-hand switch.

**Electrical entry/Lead wire length**

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

\* Available only with R73, R80 and T79 type connectors.  
\*\* 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

**Auto switch**  
Nil Without auto switch (built-in magnet)

**Applicable Auto Switches** Refer to pages 807 to 856 for further information on auto switches.

Applicable model	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)	3 (L)	5 (Z)	None (N)								
MDSUB1 MDSUB3	Solid state auto switch	—	Grommet	Yes	3-wire (NPN) 3-wire (PNP)	24 V	5V, 12V	—	S99V S9PV T99V	S99 S9P T99	Heavy-duty cord	●	●	○	—	○	IC circuit	Relay, PLC				
				No	2-wire		12V	—	—	—		—	—	—	—	—			○	—		
	Reed auto switch	—	Grommet	Yes	2-wire		5 V, 12 V, 100 V	5 V, 12 V, 24 V, 24 V, 100 V	—	90A 97 93A		—	Heavy-duty cord	●	●	●	—		—	IC circuit		
				No	—		100 V	—	—	—		—		—	—	—	—		—		—	
MDSUB7 MDSUB20	Solid state auto switch	—	Grommet	Yes	3-wire (NPN) 3-wire (PNP)	24 V	5V, 12V	—	— — —	S79 S7P T79	Heavy-duty cord	●		●	○	—	○	IC circuit	Relay, PLC			
				No	2-wire		12V	—	—	—		—		—	—	—	—			—	—	
	Reed auto switch	—	Connector Grommet Connector Grommet Connector	Yes	2-wire		—	100 V	—	R73 R73C		—	Heavy-duty cord	●	●	○	—	—		IC circuit		
				No	—		100 V	—	—	—		—		—	—	—	—	—				
				Reed auto switch	—	Connector	Yes	2-wire	48V, 100V	100 V	—	R80		—	Heavy-duty cord	●	●	○		—	—	IC circuit
							No	—	24 V or less	—	—	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).

\* Auto switches marked with "○" are made-to-order specifications.

Order example: MSUB20 single vane type (connection port side location selected)

- Standard type (Without auto switches), Rotation 90°, side port location MSUB20-90S
- With auto switch unit (Without auto switches), Rotation 180°, Side port location MDSUB20-180S
- With auto switch unit + Auto switch R73, Rotation 180°, Side port location MDSUB20-180S-R73



Refer to pages 843 to 844 for detailed solid state auto switches with pre-wired connectors.



## Specifications

Model <sup>*3</sup>	MSUB1		MSUB3		MSUB7		MSUB20	
Vane type	Single vane	Double vane	Single vane	Double vane	Single vane	Double vane	Single vane	Double vane
Rotating angle <sup>*1</sup>	90° ± 10° 180° ± 10°	90° ± 5°	90° ± 10° 180° ± 10°	90° ± 5°	90° ± 10° 180° ± 10°	90° ± 5°	90° ± 10° 180° ± 10°	90° ± 5°
Fluid	Air (Non-lube)							
Proof pressure (MPa)	1.05						1.5	
Ambient and fluid temperature	5 to 60°C							
Operating pressure range (MPa)	0.2 to 0.7		0.15 to 0.7				0.15 to 1.0	
Rotation time adjustment range (s/90°)	0.07 to 0.3 (0.5 MPa)							
Shaft load	Allowable radial load	20 N	40 N	50 N	60 N			
	Allowable thrust load <sup>*2</sup>	15 N	30 N	60 N	80 N			
		10 N	15 N	30 N	40 N			
	Allowable moment	0.3 N·m	0.7 N·m	0.9 N·m	2.9 N·m			
Bearing	Bearing							
Port location	Side ported or Top ported							
Port size	Side ported	M3 x 0.5			M5 x 0.8			
	Top ported	M3 x 0.5			M5 x 0.8			

- \*1 Single vane 90° can be adjusted to 90° ± 10° (both ends of rotation ± 5° each)  
Single vane 180° can be adjusted to 180° ± 10° (both ends of rotation ± 5° each)  
Double vane 90° type can be adjusted to 90° ± 5° (both ends of rotation ± 2.5° each)  
• Rotation angles other than 90° and 180° (single vane) are available by special order.
- \*2 The allowable thrust load is directional. Refer to the allowable load table below for details.

\*3 Correspondence to equivalent conventional free-mount types

Rotary table	Free-mount rotary actuator
MSUB 1	CRBU2W10
MSUB 3	CRBU2W15
MSUB 7	CRBU2W20
MSUB20	CRBU2W30

Symbol



(Note) Refer to page 35 for allowable kinetic energy.

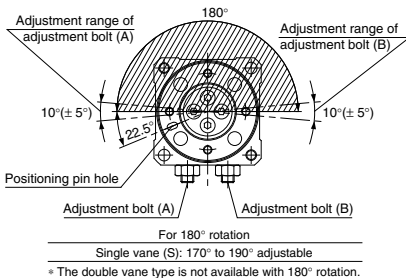
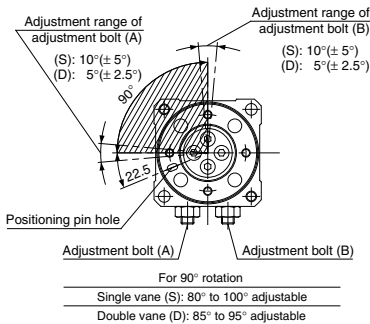
### Moisture Control Tube Series IDK

When operating an actuator with a small diameter and a short stroke at a high frequency, the dew condensation (water droplet) may occur inside the piping depending on the conditions. Simply connecting the moisture control tube to the actuator will prevent dew condensation from occurring. For details, refer to [Series IDK in the WEB catalog](#).



## Table Rotation Range

Angle adjustment is possible as shown in the drawings below using adjustment bolts (A) and (B).



## Weight

Size	Rotation angle	Basic weight		Auto switch unit <sup>(Note)</sup>
		Single vane	Double vane	
1	90°	145	150	15
	180°	140	—	
3	90°	230	240	20
	180°	225	—	
7	90°	360	375	28
	180°	355	—	
20	90°	510	580	38
	180°	505	—	

(Note) Values above do not include auto switch weight.

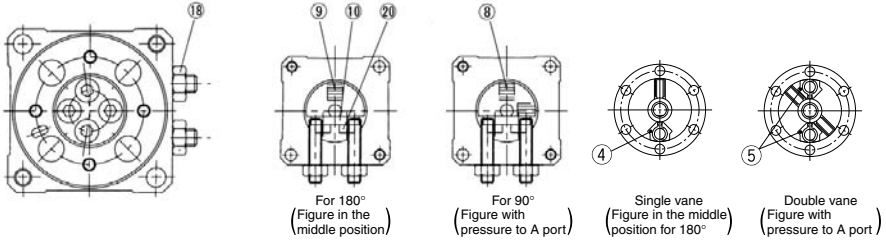
## Allowable Load

Do not permit the load and moment applied to the table to exceed the allowable values shown in the table below. (Operation above the allowable values can cause adverse effects on service life, such as play in the table and loss of accuracy.)

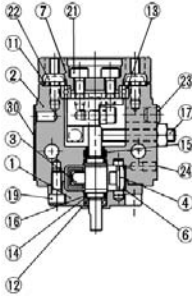
Size	Allowable radial load (N)		Allowable thrust load (N)		Allowable moment (N·m)
	(A)	(B)	(A)	(B)	
1	20	15	10	10	0.3
3	40	30	15	15	0.7
7	50	60	30	30	0.9
20	60	80	40	40	2.9

## Construction

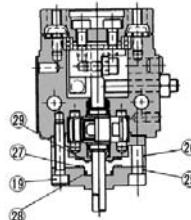
### Internal Construction of Rotary Table



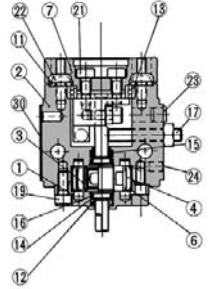
Single vane: Size 1, 3, 7, 20



Double vane: Size 1



Double vane: Size 3, 7, 20



### Component Parts

No.	Description	Material	Note
1	Body (A)	Aluminum alloy	Anodized
2	Body (B)	Aluminum alloy	Anodized
3	Vane shaft	Stainless steel (MSUB20: Carbon steel)	Single vane
		Carbon steel	Double vane
4	Stopper	Resin	Single vane
5	Stopper	Stainless steel	Double vane
6	Stopper seal	NBR	
7	Table	Aluminum alloy	Anodized, Serigraph
8	Stopper lever (D)	Carbon steel	Heat treated, Electroless nickel plated
9	Stopper lever (S)	Carbon steel	Heat treated, Electroless nickel plated
10	Lever retainer	Carbon steel	Zync Chromated
11	Ring collar	Carbon steel	Zync Chromated
12	Bearing	High carbon chrome bearing steel	
13	Bearing	High carbon chrome bearing steel	
14	Back-up ring	Stainless steel	
15	Scraper	NBR	
16	O-ring	NBR	
17	Adjustment bolt	Carbon steel	Heat treated
18	Hexagon nut	Carbon steel	
19	Hexagon socket head cap screw		
20	Hexagon socket head cap screw		
21	Hexagon socket head cap screw		
22	Button bolt		
23	Rubber cap	NBR	
24	Hexagon socket head set screw		SE type only
25	Cover	Aluminum alloy	
26	Plate	Resin	
27	Gasket	NBR	
28	O-ring	NBR	
29	O-ring	NBR	
30	Label		

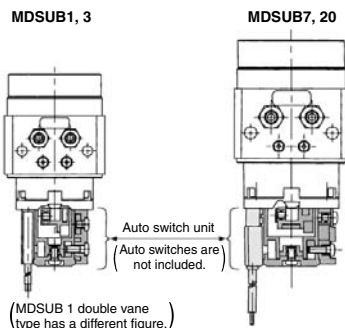
\* The plug 24 is used only when the connection port is type SE.

\* Individual part cannot be shipped.

## Construction

### Internal construction with auto switch

Units are common for both single and double vane.



\* Refer to page 57 for the component parts.

\* The auto switch unit can be retrofitted on a rotary actuator.  
Auto switches should be ordered separately since they are not included.

Model	Auto switch unit part no.
<b>M(D)SUB 1</b>	P211070-1
<b>M(D)SUB 3</b>	P211090-1
<b>M(D)SUB 7</b>	P211060-1
<b>M(D)SUB20</b>	P211080-1

Auto switch block unit			
MDSUB1/3		MDSUB7/20	
For reed auto switch		For solid state auto switch	Combination of reed and solid state auto switches
Right-handed	Left-handed	Combination left & right-handed	Combination left & right-handed
Part no.: P211070-8	Part no.: P211070-9	Part no.: P211070-13	Part no.: P211060-8

\* The auto switch block unit is included in the auto switch unit.

\* Auto switch block unit shows the necessary assembly for mounting 1 piece of auto switch to the auto switch unit.

\* Individual part cannot be shipped.

CRB2  
-Z

CRBU2

CRB1

**MSU**

**CRJ**

CRA1  
-Z

CRA1

CRQ2

**MSQ**

**MSZ**

CRQ2X  
MSQX

**MRQ**

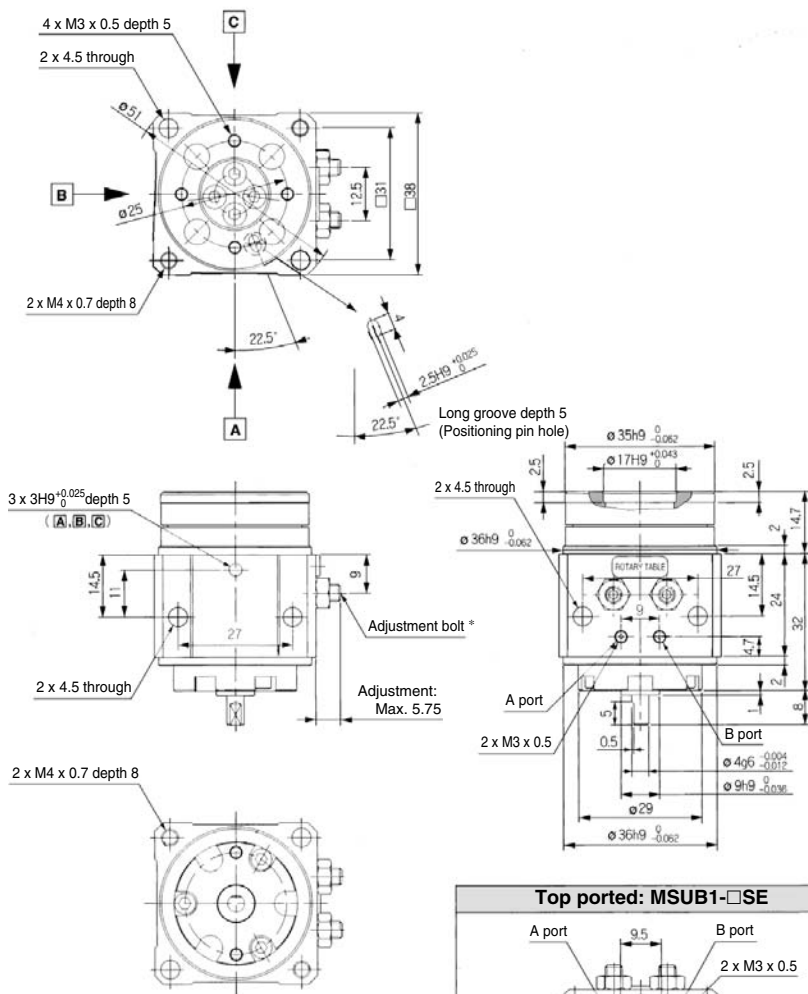
D-□

## Dimensions

These drawings indicate the condition when the B port is pressurized.

### MSUB1 (Single vane)

#### MSUB1-□S/SE

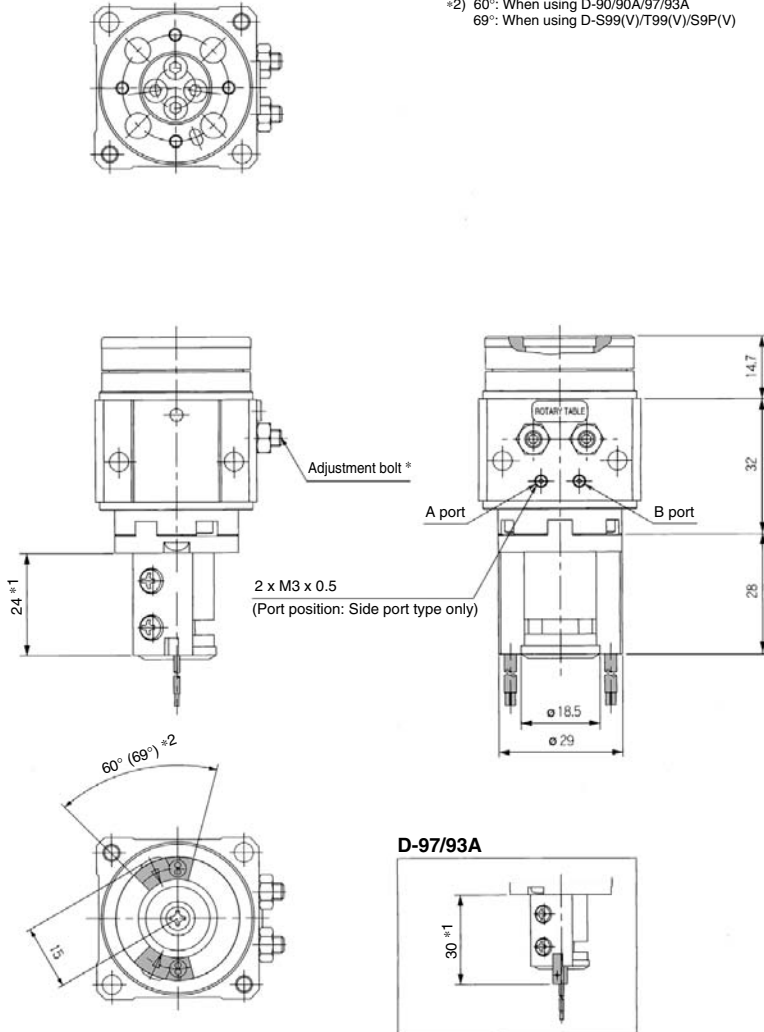


\* If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

These drawings indicate the condition when the B port is pressurized.

**With auto switch: MDSUB1-□S**

- \*1) 24: When using D-90/90A/S99(V)/T99(V)/S9P(V)  
30: When using D-97/93A  
\*2) 60°: When using D-90/90A/97/93A  
69°: When using D-S99(V)/T99(V)/S9P(V)



\* If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

CRB2
-Z
CRBU2
CRB1
MSU
CRJ
CRA1
-Z
CRA1
CRQ2
MSQ
MSZ
CRQ2X
MSQX
MRQ

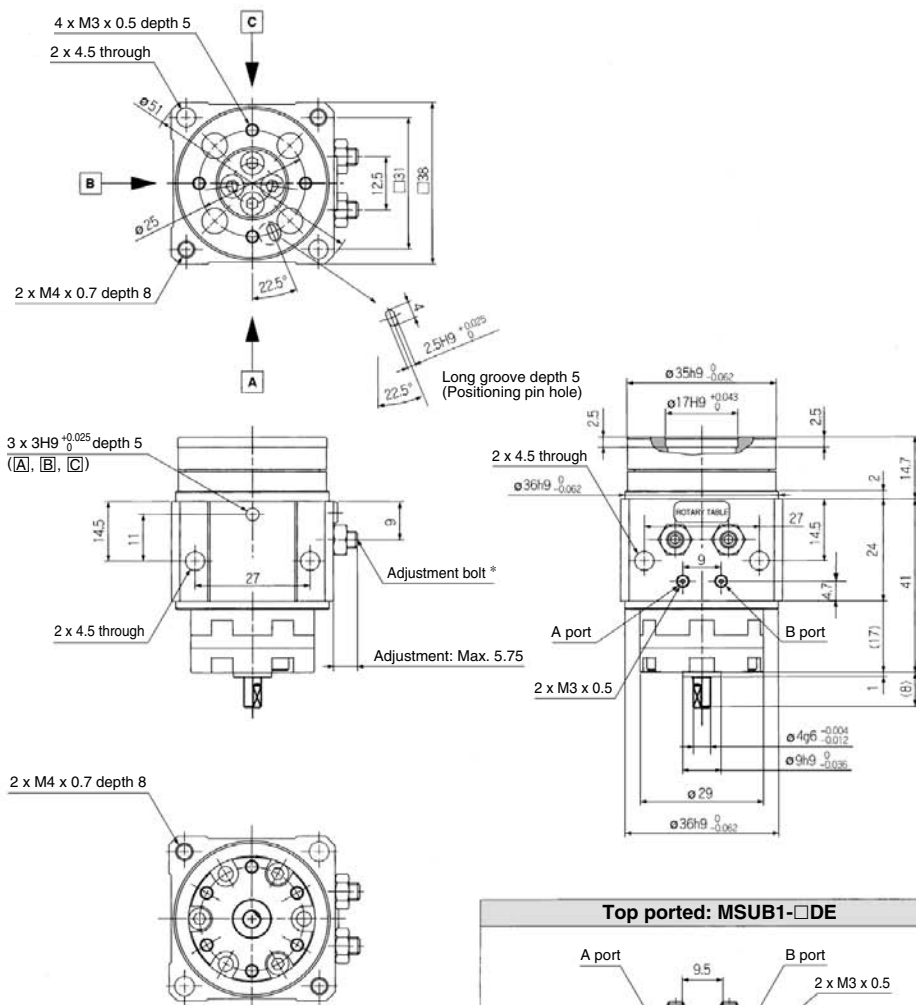
D-□

## Dimensions

These drawings indicate the condition when the B port is pressurized.

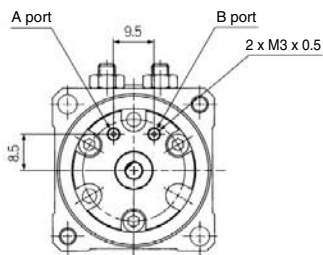
### MSUB1 (Double vane)

#### MSUB1-□D



\* If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

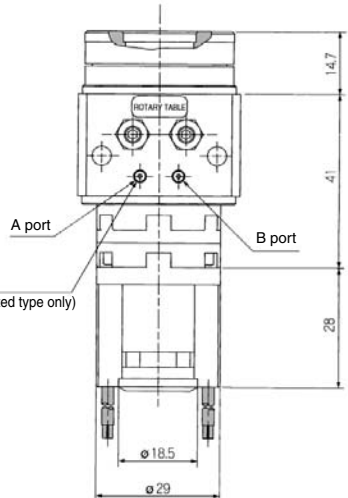
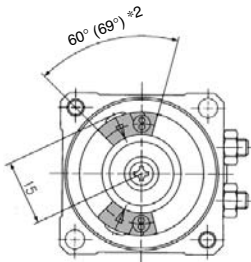
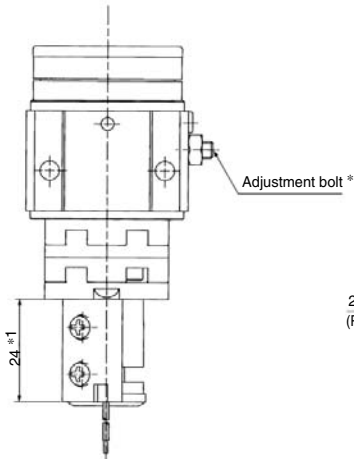
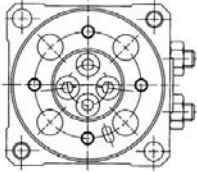
#### Top ported: MSUB1-□DE



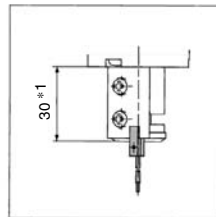
These drawings indicate the condition when the B port is pressurized.

**With auto switch: MDSUB1-□□**

- \*1) 24: When using D-90/90A/S99(V)/T99(V)/S9P(V)  
30: When using D-97/93A  
\*2) 60°: When using D-90/90A/97/93A  
69°: When using D-S99(V)/T99(V)/S9P(V)



**D-97/93A**



\* If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

CRB2
-Z
CRBU2
CRB1
MSU
CRJ
CRA1
-Z
CRA1
CRQ2
MSQ
MSZ
CRQ2X
MSQX
MRQ

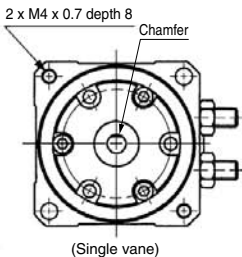
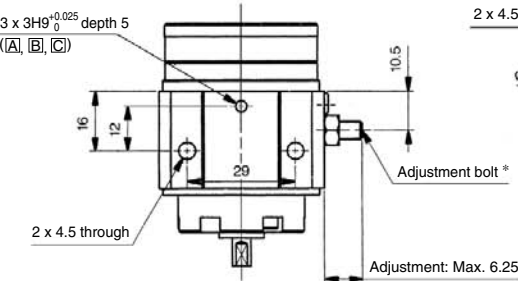
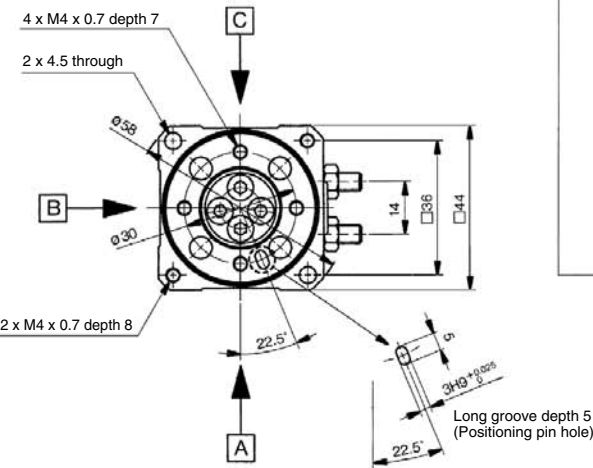
D-□

**Dimensions**

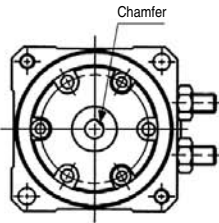
These drawings indicate the condition when the B port is pressurized.

**MSUB3 (Single vane/Double vane)**

**MSUB3-□S/D**

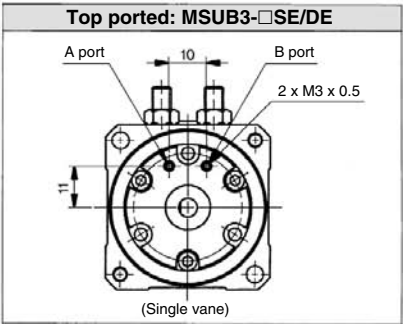


(Single vane)

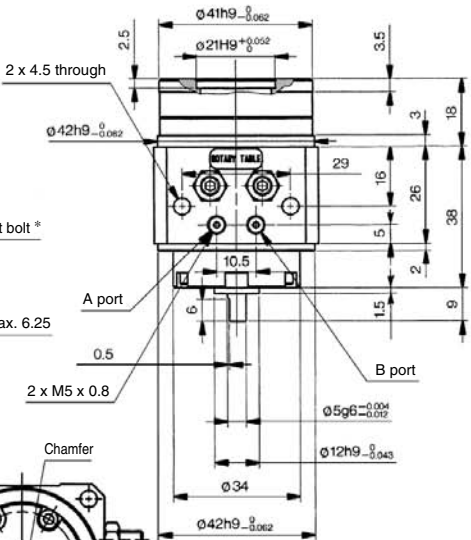


(Double vane)

The outside drawings show the single vane type, but only the position of the chamfered sections shown in the above drawings differs from single and double vane.



(Single vane)



\* If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

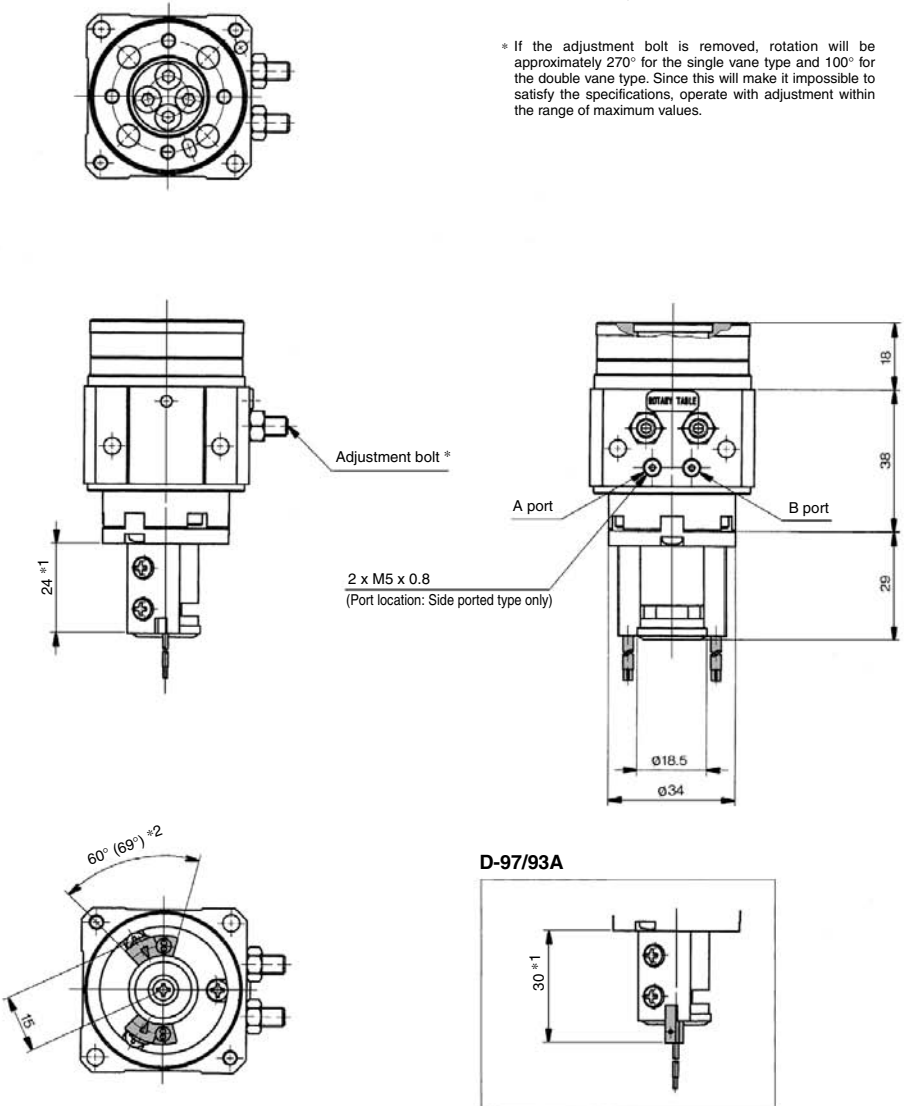


These drawings indicate the condition when the B port is pressurized.

## With auto switch: MDSUB3

- \*1) 24°: When using D-90/90A/S99(V)/T99(V)/S9P(V)  
30°: When using D-97/93A
- \*2) 60°: When using D-90/90A/97/93A  
69°: When using D-S99(V)/T99(V)/S9P(V)

\* If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.



CRB2  
-Z  
CRBU2  
CRB1  
MSU  
CRJ  
CRA1  
-Z  
CRA1  
CRQ2  
MSQ  
MSZ  
CRQ2X  
MSQX  
MRQ

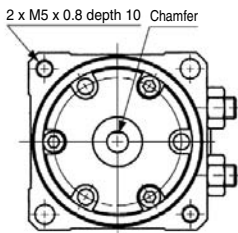
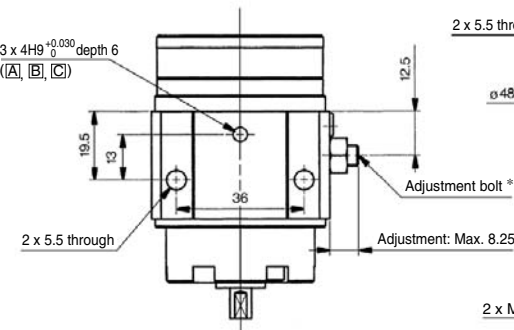
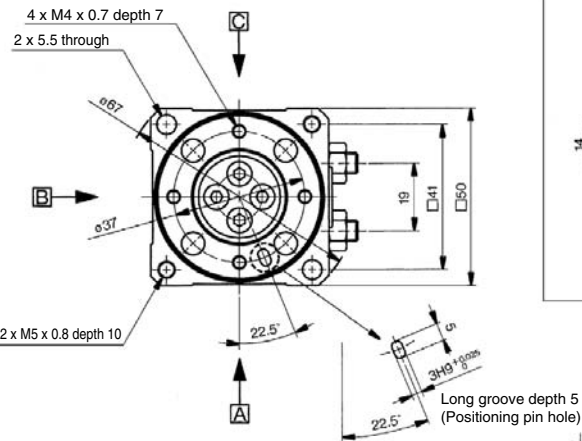
D-□

**Dimensions**

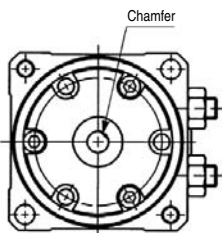
These drawings indicate the condition when the B port is pressurized.

**MSUB7 (Single vane/Double vane)**

**MSUB7-□S/D**



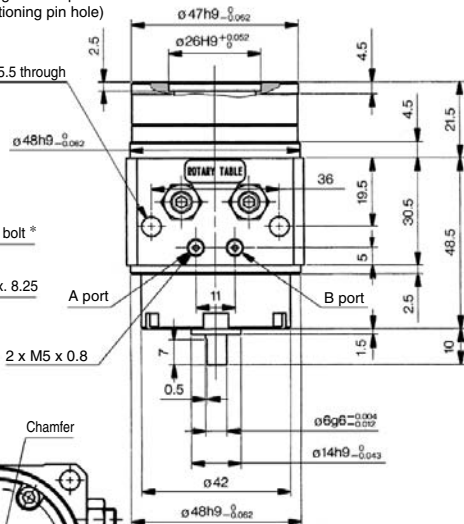
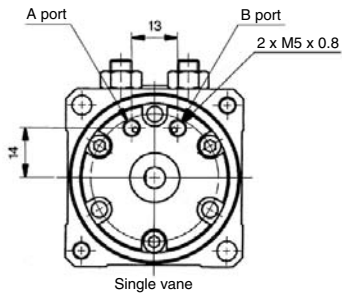
(Single vane)



(Double vane)

The outside drawings show the single vane type, but only the position of the chamfered sections shown in the above drawings differs from single and double vane.

**Top ported: MSUB7-□SE**

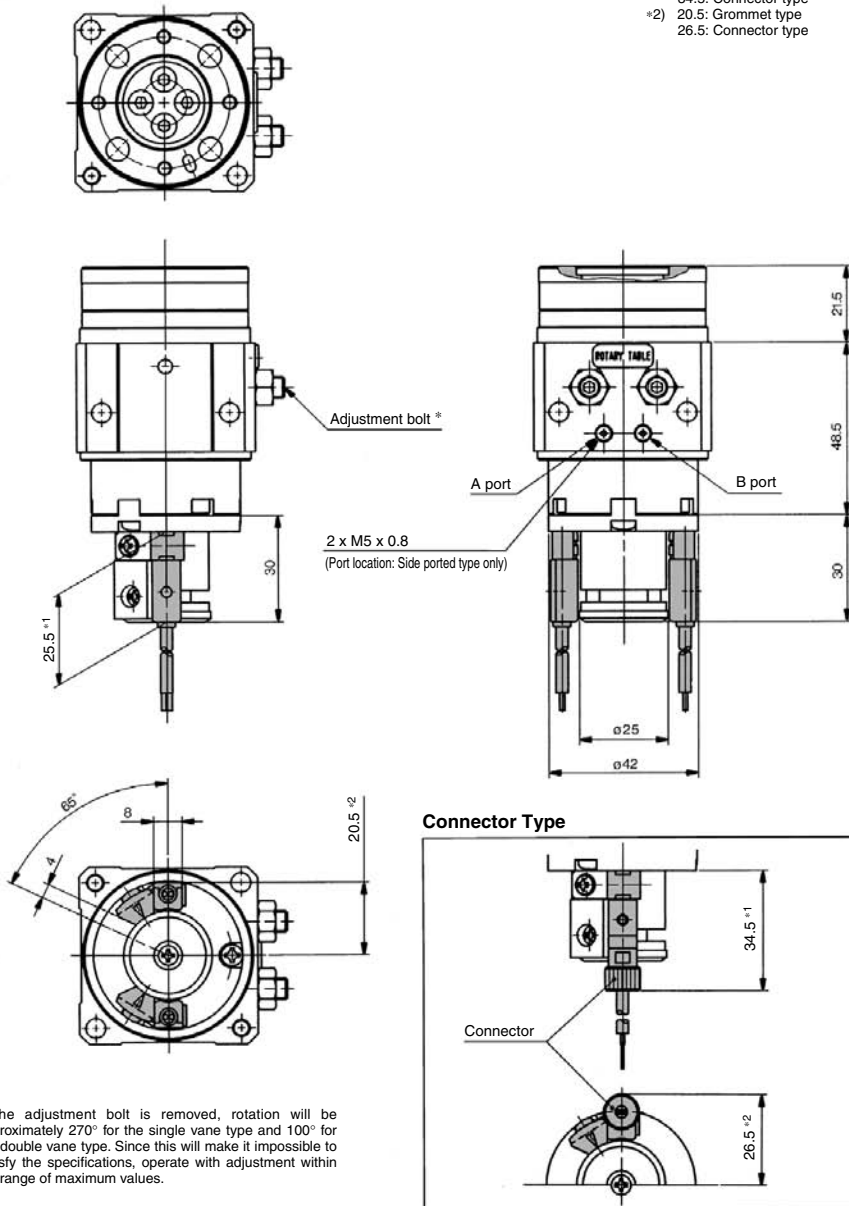


\* If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

These drawings indicate the condition when the B port is pressurized.

## With auto switch: MDSUB7

- \*1) 25.5: Grommet type  
34.5: Connector type
- \*2) 20.5: Grommet type  
26.5: Connector type



\* If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

CRB2-Z
CRBU2
CRB1
<b>MSU</b>
CRJ
CRA1-Z
CRA1
CRQ2
MSQ
MSZ
CRQ2X
MSQX
MRQ

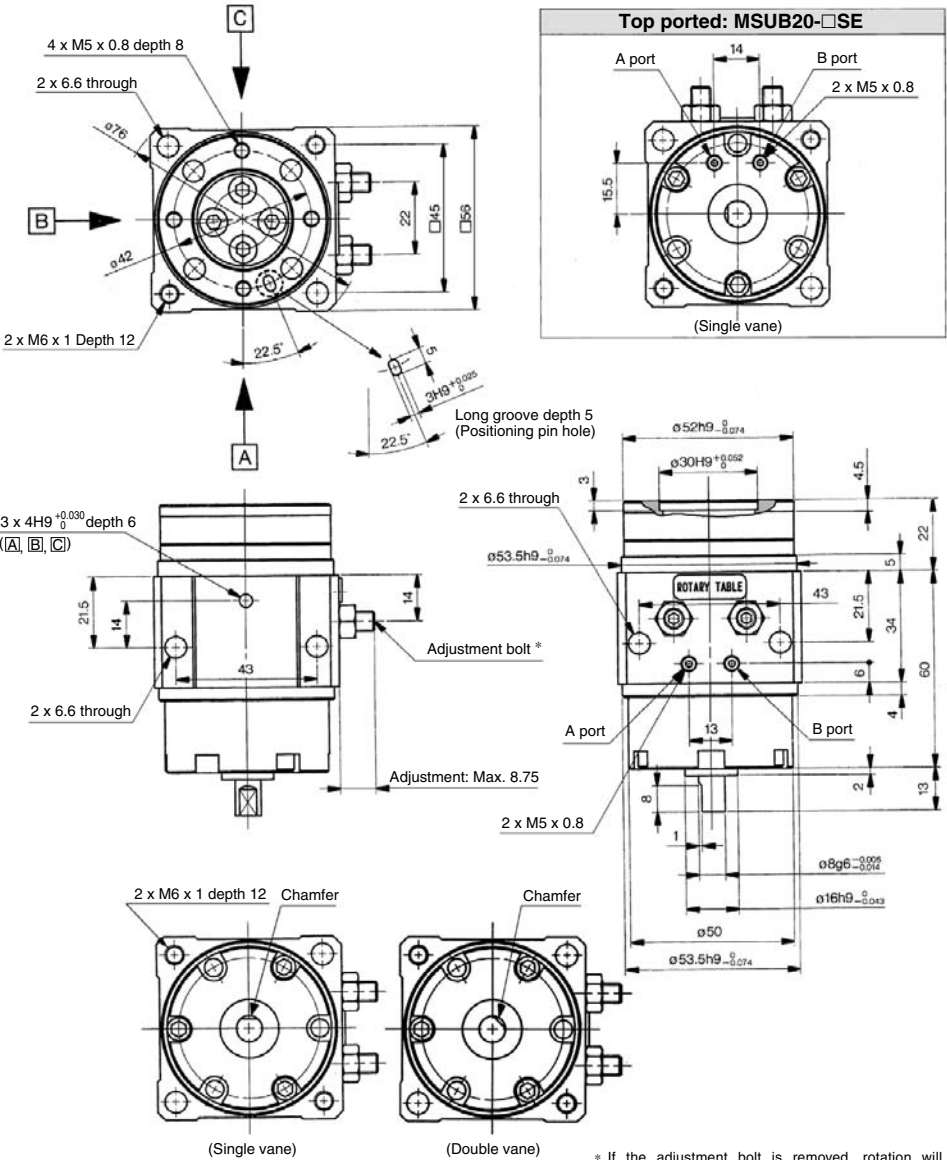
D-□

**Dimensions**

These drawings indicate the condition when the B port is pressurized.

**MSUB20 (Single vane/Double vane)**

**MSUB20-□S/D**



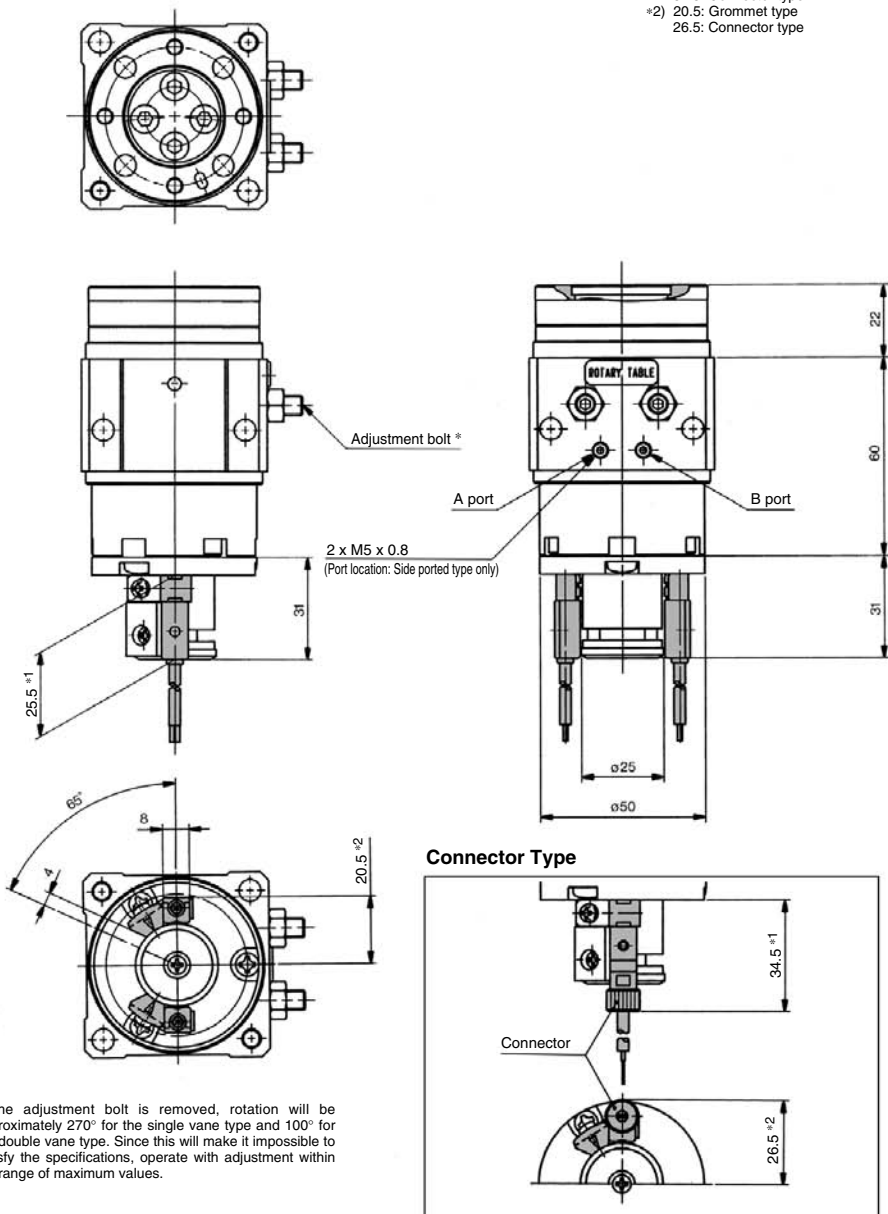
The outside drawings show the single vane type, but only the position of the chamfered sections shown in the above drawings differs from single and double vane.

\* If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

These drawings indicate the condition when the B port is pressurized.

### With auto switch: MDSUB20

- \*1) 25.5: Grommet type  
34.5: Connector type
- \*2) 20.5: Grommet type  
26.5: Connector type



\* If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

CRB2-Z
CRBU2
CRB1
<b>MSU</b>
CRJ
CRA1-Z
CRA1
CRQ2
MSQ
MSZ
CRQ2X
MSQX
MRQ

D-□

# Auto Switch Mounting

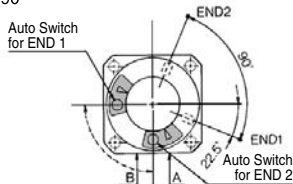


Table Positioning Pin Hole Rotation Range and Auto Switch Mounting Position

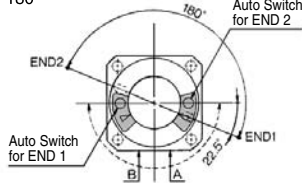
## MSU□1/3

### Single vane type

90°

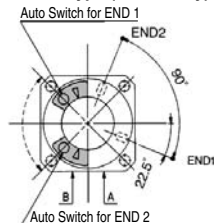


180°



### Double vane type (MSUB only)

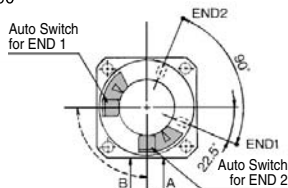
90°



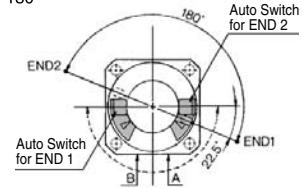
## MSU□7/20

### Single vane type

90°

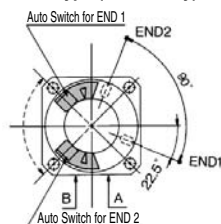


180°



### Double vane type (MSUB only)

90°



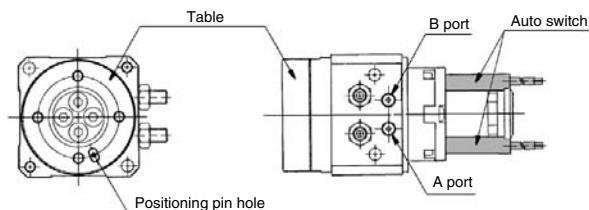
- In drawings that show the rotation range, the arrows on the solid line 90° (180°) indicate the rotation range of the positioning pin holes on the table surface. When the pin hole is at END1, the END1 auto switch operates, and when the pin hole is at END2, the END2 auto switch operates.
- The arrows on the broken line indicate the rotation range of the internal magnet. The rotation range of each auto switch can be reduced by moving the END1 auto switch clockwise and the END2 auto switch counterclockwise.

### Auto Switch Operating Angle and Hysteresis Angle

Model	Operating angle	Hysteresis angle
MDSU□1, 3	110°	10°
MDSU□7, 20	90°	

Note) Since the above values are only provided as a guideline, they are not guaranteed. In the actual setting, adjust them after confirming the auto switch performance.

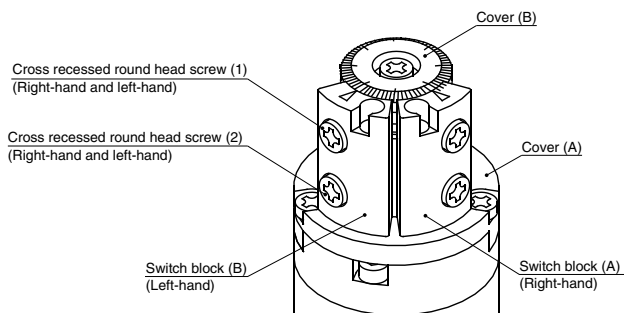
Refer to page 142 for operating angle of auto switch and angle of hysteresis and the procedure for moving the auto switch detection position.



## MSU□1·3Auto Switch Mounting

### External view and descriptions of auto switch unit

The following shows the external view and typical descriptions of the auto switch.



### Solid state auto switch

#### <Applicable auto switch>

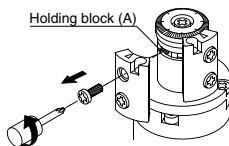
**3-wire..... D-S99(V)□/S9P(V)□**

**2-wire..... D-T99(V)□**

\* For details about shape and specifications of the auto switch, refer to SMC's catalog.

#### ① Switch block detaching

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



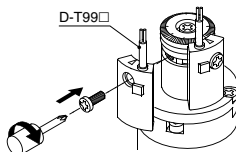
#### ② Solid state auto switch mounting

Secure the solid state 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 block (A) moves inside the groove, move it to the mounting position beforehand.

\* Use the auto switch after the operating position has been adjusted with the cross recessed round head screw (1). For details about how to adjust the operating position, refer to SMC's catalog.



### Reed auto switch

#### <Applicable auto switch>

**D-97/93A(With indicator light)**

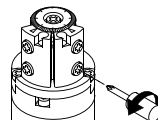
**D-90/90A(Without indicator light)**

\* For details about shape and specifications of the auto switch, refer to SMC's catalog.

#### ① Preparations

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

\* This screw has been secured temporarily at shipment.

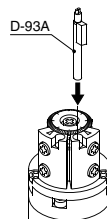


#### ② Reed auto switch mounting

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

\* Insert the D-97/93A in the direction shown in the figure on the right.

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

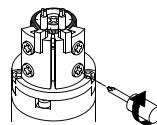


#### ③ Reed auto switch securing

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

Proper tightening torque:  
0.4 to 0.6(N·m)

\* Use the auto switch after the operating position has been adjusted with the cross recessed round head screw (1). For details about how to adjust the operating position, refer to SMC's catalog.



CRB2

-Z

CRBU2

CRB1

**MSU**
**CRJ**

CRA1

-Z

CRA1

CRQ2

**MSQ**
**MSZ**

CRQ2X

MSQX

**MRQ**

D-□



# Series MSU

## Specific Product Precautions

Be sure to read before handling. Refer to front matter 35 for Safety Instructions and pages 4 to 14 for Rotary Actuator and Auto Switch Precautions.

### Selection

#### ⚠ Warning

1. Ensure the load energy within the product's allowable energy value.

Operation with a load kinetic energy exceeding the allowable value can cause human injury and/or damage to equipment or machinery. (Refer to model section procedures in this catalog.)

#### ⚠ Caution

1. When there are load fluctuations, allow a sufficient margin in the actuator torque.  
In case of horizontal mounting (operation with product facing sideways), malfunction may occur due to load fluctuations.

### Mounting

#### ⚠ Caution

1. Adjust the rotation angle within the prescribed ranges.

Single vane type: (90°±10°, 180°±10°) (±5° at end of rotation)

Double vane type: (90°±10°) (±2.5° at end of rotation)

\* Series MSUB only.

Adjustment outside the prescribed ranges may cause malfunction of the product or failure of switches to operate.

2. Adjust the rotation time within the prescribed values using a speed controller, etc. (0.07 to 0.3 s/90°)

Adjustment to a speed slower than 0.3 s/90° can cause sticking and slipping or stopping of operation.

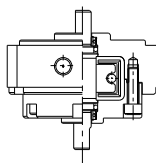
### Maintenance

#### ⚠ Caution

<High precision type/MSUA>

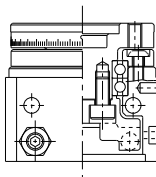
In case a rotary unit and table unit are required for maintenance, order with the unit part numbers shown below.

#### Rotary unit



Model	Unit part no.
MSUA 1-□S	P402070-2A
MSUA 1-□SE	P402070-2B
MSUA 3-□S	P402090-2A
MSUA 3-□SE	P402090-2B
MSUA 7-□S	P402060-2A
MSUA 7-□SE	P402060-2B
MSUA20-□S	P402080-2A
MSUA20-□SE	P402080-2B

#### Table unit



Model	Unit part no.
MSUA 1- 90□	P402070-3A
MSUA 1-180□	P402070-3B
MSUA 3- 90□	P402090-3A
MSUA 3-180□	P402090-3B
MSUA 7- 90□	P402060-3A
MSUA 7-180□	P402060-3B
MSUA20- 90□	P402080-3A
MSUA20-180□	P402080-3B

Note 1) Note that the rotation angle should not be changed even though the rotary unit has been changed. For maintenance, order units with a part number suitable for the model being used.

Note 2) Due to the integral construction of the MSUB series, the rotary and table units cannot be ordered separately.