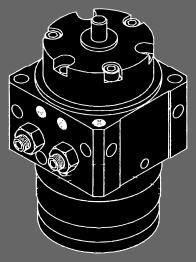
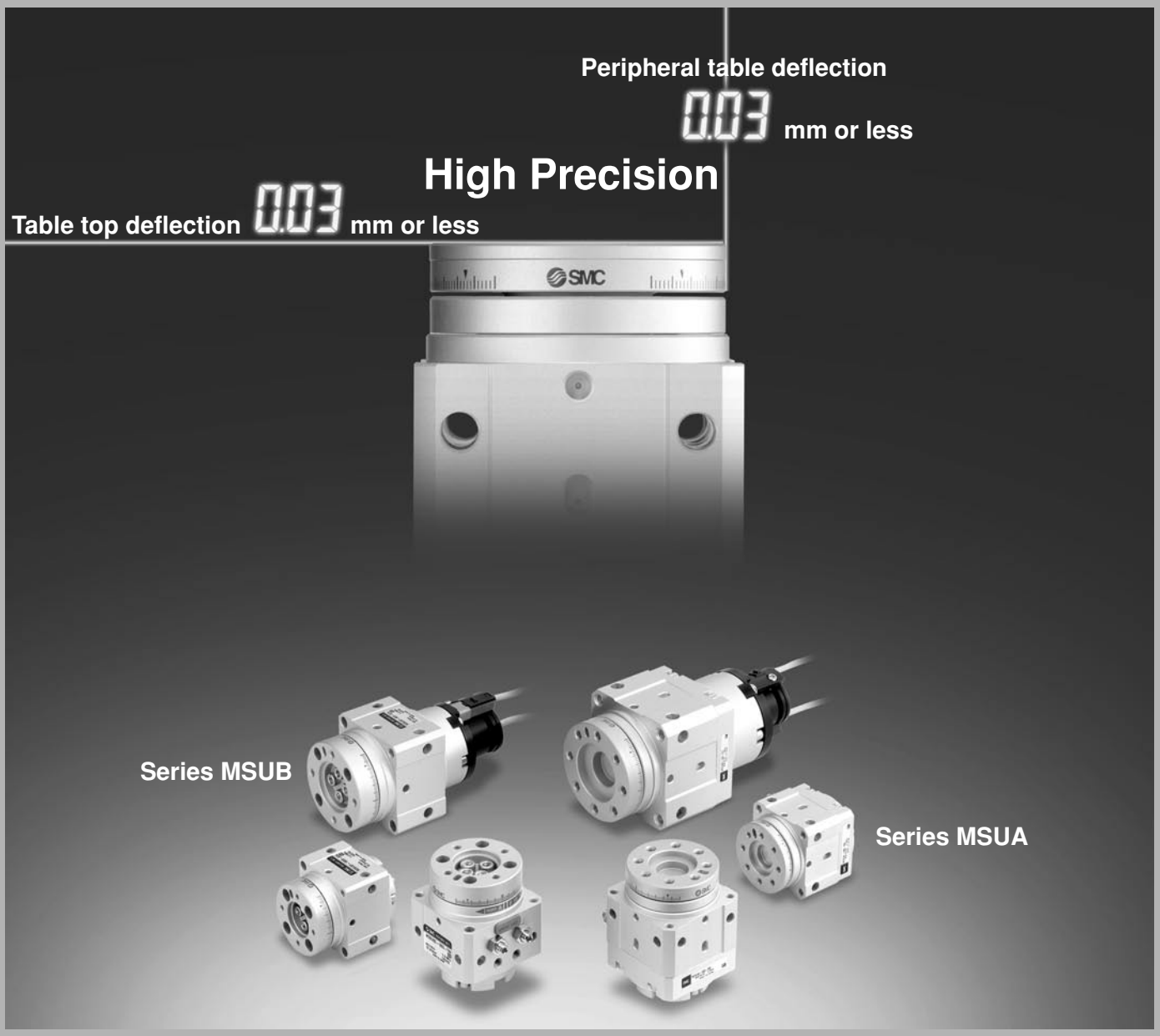


Rotary Table
Series MSU

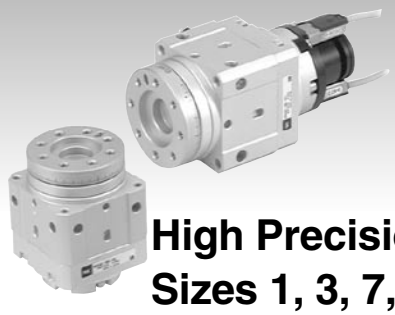
Vane style (Single, Double)/Size: 1, 3, 7, 20



High precision series MSUA introduced to vane type rotary tables

Rotary Table
Series MSU

Vane type/Sizes 1, 3, 7, 20



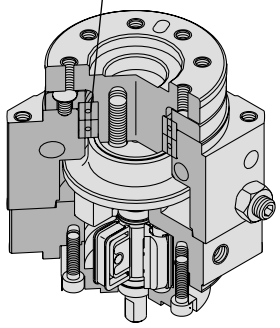
High Precision Type
Sizes 1, 3, 7, 20

Series MSUA

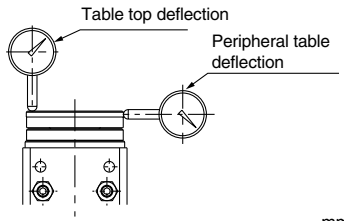
Improved table deflection accuracy:
0.03mm or less

High precision/High rigidity

Special bearing
(duplex single row ball bearing)



Deflection accuracy:
Displacement for 180° rotation

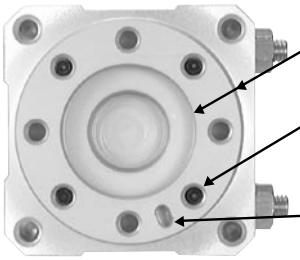


mm

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

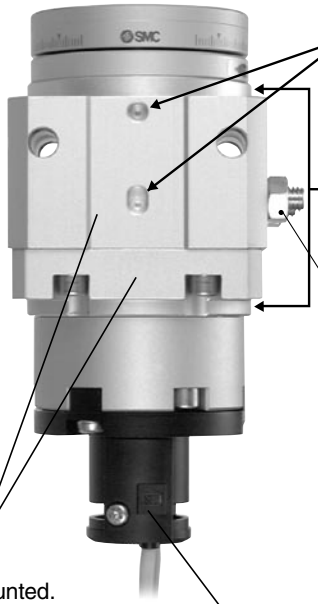
Values inside ( ) are for series MSUB

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**

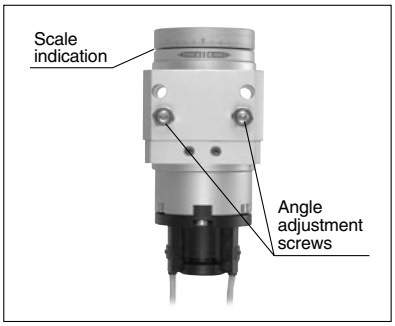
Easy alignment when mounting the body



- **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)

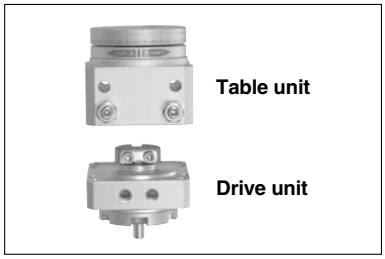
Angle is adjustable

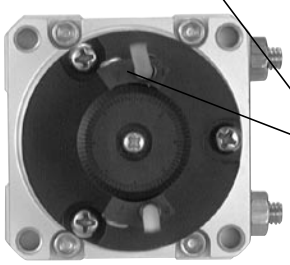
90°±10°, 180°±10°
Double vane (MSUB only) 90°±5°



Disengageable

Maintenance work is simplified.
The drive unit can be replaced with the load mounted.





Auto switch capable

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

Rotary actuator with lightweight, compact table for robotic hands

■ Free-mount type

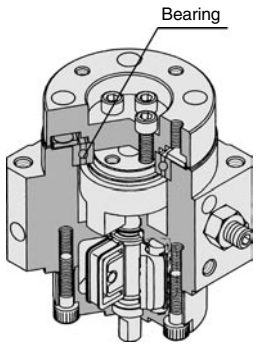
Can be mounted from three directions: axial, lateral, perpendicular

	Axial mounting		Lateral mounting	Perpendicular mounting
MSUA	Bottom mount Tapped holes (4)	Top mount Tapped holes (4)		
MSUB	Through hole (1) Tapped holes (2)	Tapped holes (2) Through hole (1)		

Basic Type *Series MSUB*

Sizes 1, 3, 7, 20

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



Single vane

■ Series variations

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

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

Rotary Table/Vane Type: High Precision

Series MSUA

Sizes 1, 3, 7, 20

How to Order

Without Auto Switch Unit

With Auto Switch Unit

MSUA 20 — 90 S □

M D SUA 20 — 90 S — R73 □

Bearing type

A	High precision

Free-mount

Connection port position

Nil	Side ports
E	Top ports

Available with side ports only, when equipped with switch unit.

With auto switch unit

Nominal size (torque)

1	MSUA 1
3	MSUA 3
7	MSUA 7
20	MSUA 20

Rotation

Application	Symbol	Rotation
Single vane	90	90°
	180	180°

Rotation adjustment range
Single vane: Both ends ±5° each

Vane type

S	Single vane

Number of auto switches

S	1 pc.*
Nil	2 pcs.

* For 1 piece, a right hand auto switch is installed.

Type of auto switch

Nil	Without auto switch

* Select applicable auto switches from the table below.

Applicable auto switches

Applicable model	Type	Electrical entry	Indicator light	Wiring (output)	Load voltage DC	Load voltage AC	Auto switch part no.	Lead wire type	Lead wire length (m)* 0.5 (Nil)	3 (L)	5 (Z)	None (N)	Applicable loads	
MDSUA1 MDSUA3	Reed	Grommet	No	2 wire	5V, 12V	5V, 12V, 24V	90	Parallel cord	●	●	●	—	IC circuit	Relay, PLC
					5V, 12V, 100V	5V, 12V, 24V, 100V	90A	Heavy duty	●	●	●	—		
			Yes		—	—	97	Parallel cord	●	●	●	—	—	
						100V	93A	Heavy duty	●	●	●	—		
	Solid state				24V 12V	—	T99	Heavy duty	●	●	—	—		
							T99V		●	●	—	—		
				3 wire (NPN)	5V, 12V		S99		●	●	—	—	IC circuit	
							S99V		●	●	—	—		
				3 wire (PNP)			S9P		●	●	—	—		
							S9PV		●	●	—	—		
MDSUA7 MDSUA20	Reed	Grommet	Yes	2 wire	24V —	100V	R73	Heavy duty	●	●	—	—	—	Relay, PLC
		Connector					R73C		●	●	●	●		
		Grommet	No		48V, 100V	24V, 48V, 100V	R80		●	●	—	—	IC circuit	
		Connector					R80C		●	●	●	●		
	Solid state	Grommet	Yes		12V	—	T79		●	●	—	—	—	
		Connector					T79C		●	●	●	●		
		Grommet		3 wire (NPN)	5V, 12V		S79		●	●	—	—	IC circuit	
				3 wire (PNP)			S7P		●	●	—	—		

* Lead wire length symbols 0.5m .... Nil (Example) R73C
3m ..... L (Example) R73CL
5m ..... Z (Example) R73CZ
None ..... N (Example) R73CN

● Operating time —— 1.2ms ● Operating temperature range —— 5 to 60°C
● Impact resistance —— 300m/s² (reed), 1000m/s² (solid state)

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

1. Standard type (without auto switches), rotation 90°, side port position MSUA20-90S
2. With switch unit (without auto switches), rotation 180°, side port position MDSUA20-180S
3. With switch unit + auto switch R73, rotation 180°, side port position MDSUA20-180S-R73

Specifications

Model [2*]		MSUA1		MSUA3		MSUA7		MSUA20	
Vane type		Single vane		Single vane		Single vane		Single vane	
Rotation [1*]		90°±10°	180°±10°	90°±10°	180°±10°	90°±10°	180°±10°	90°±10°	180°±10°
Fluid		Air (unlubricated)							
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 sec/90°		0.07 to 0.3							
Shaft load	Allowable radial load	20N		40N		50N		60N	
	Allowable thrust load	15N		30N		60N		80N	
	Allowable moment	0.3N·m		0.7N·m		0.9N·m		2.9N·m	
Bearing		Special bearings							
Port position		Side ports or Top ports							
Port size	Side ports	M3		M5					
	Top ports	M3				M5			
Deflection accuracy		0.03mm or less							

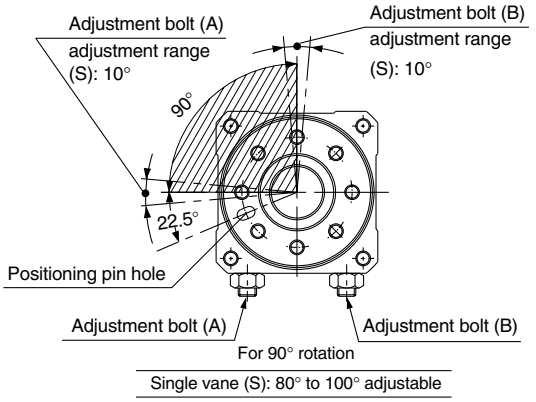
∗1. Single vane 90° can be adjusted to 90°±10° (both ends of rotation ±5° each)
Single vane 180° can be adjusted to 180°±10° (both ends of rotation ±5° each)
∗2. Correspondance to equivalent conventional free-mount types

∗2

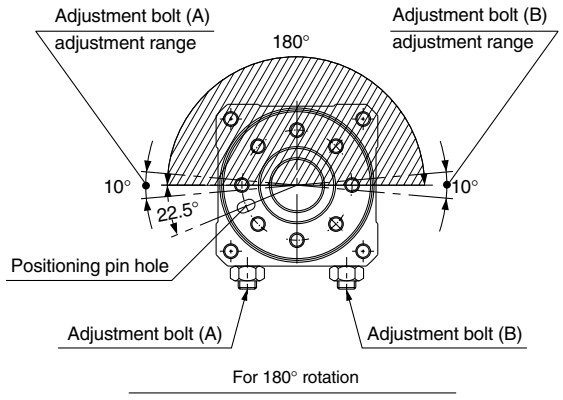
Rotary table		Free-mount/Rotary actuator
MSUA 1	→	CRBUW10
MSUA 3	→	CRBUW15
MSUA 7	→	CRBUW20
MSUA20	→	CRBUW30

Table Rotation Range

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



Single vane (S): 80° to 100° adjustable



Single vane (S): 170° to 190° adjustable

Applicable Auto Switches

Auto switch type	MDSUB1, 3	MDSUB7, 20
Reed switch	D-90/97, D-90A/93A	D-R7, R8
Solid state switch	D-S99, D-T99, D-S9P	D-S7, S7P, T7

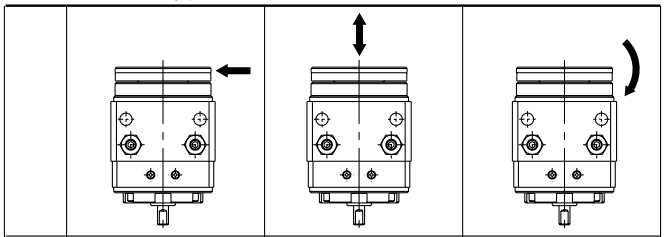
Weights

Unit: g

Size	Rotation	Basic weight Single vane	Auto switch unit + Auto switch 2 pcs.
1	90	162	25
	180	161	
3	90	261.5	30
	180	259.5	
7	90	440	50
	180	436	
20	90	675	60
	180	670.5	

Allowable Loads

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

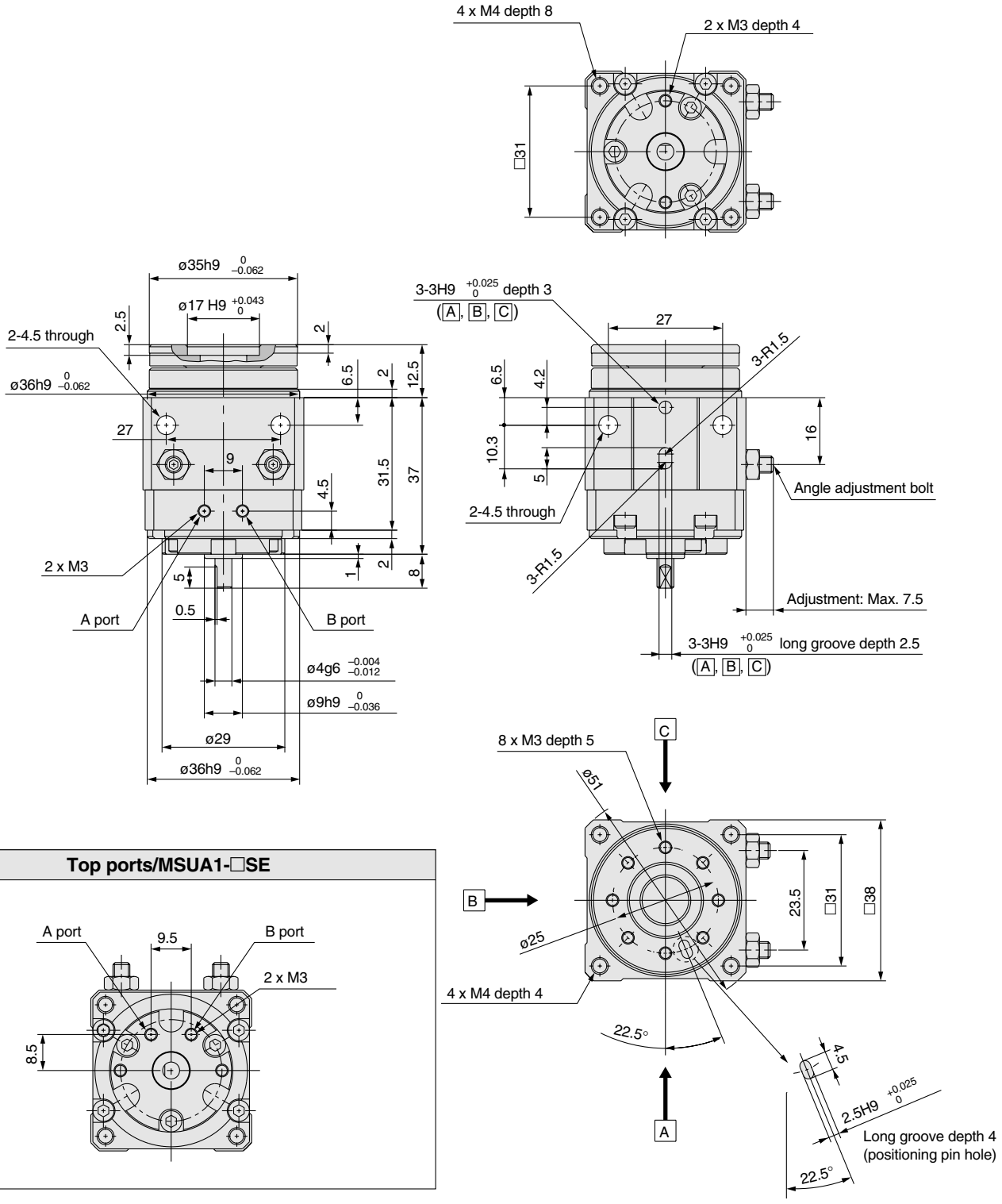
Dimensions

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

MSUA1

Scale: 70%

MSUA1-□S, SE

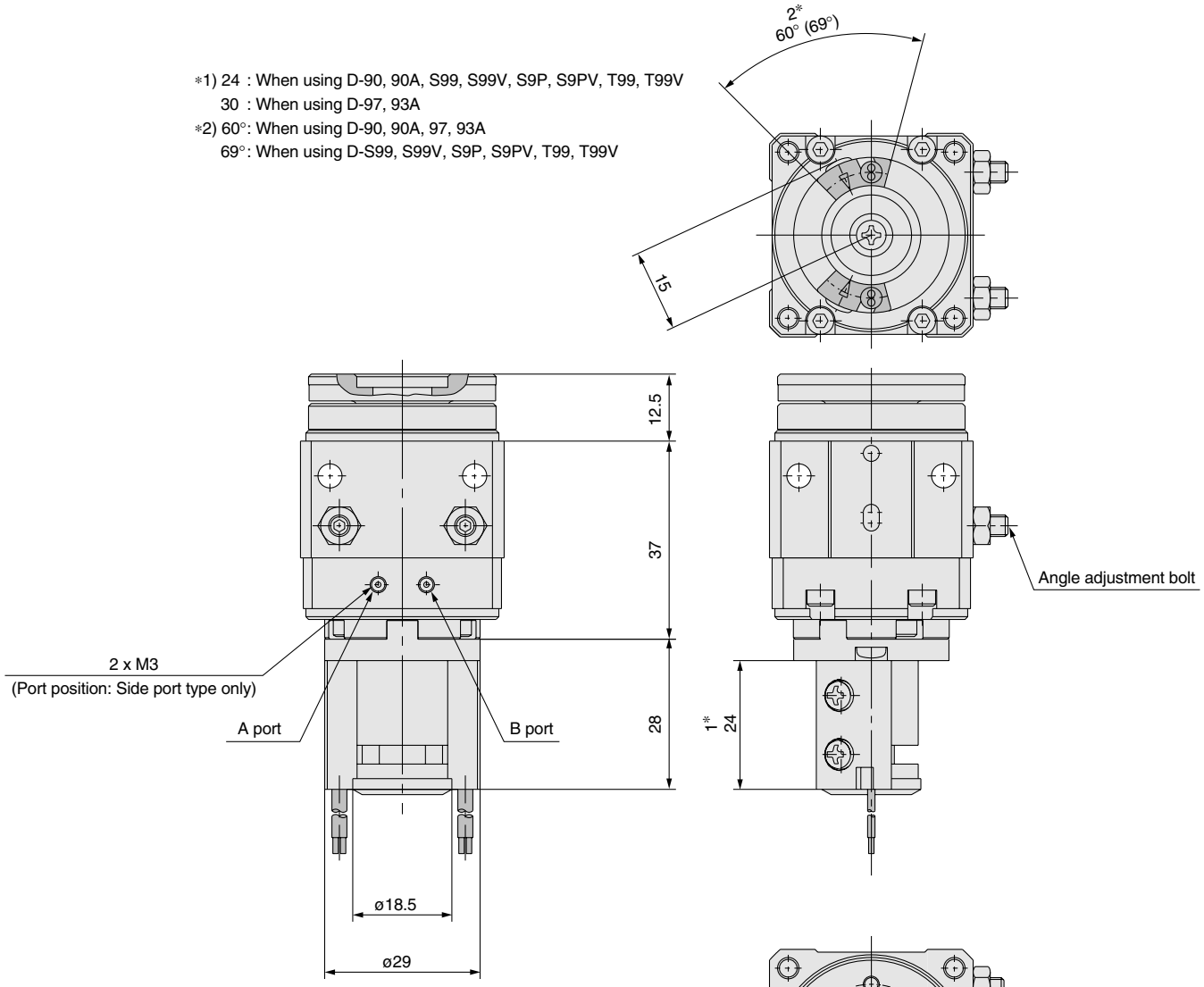


Top ports/MSUA1-□SE

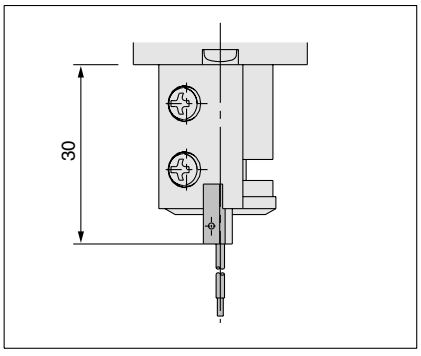
These drawings indicate the condition when the B port is pressurized.

Scale: 80%

With auto switch: MSUA1-□S



For D-97, 93A



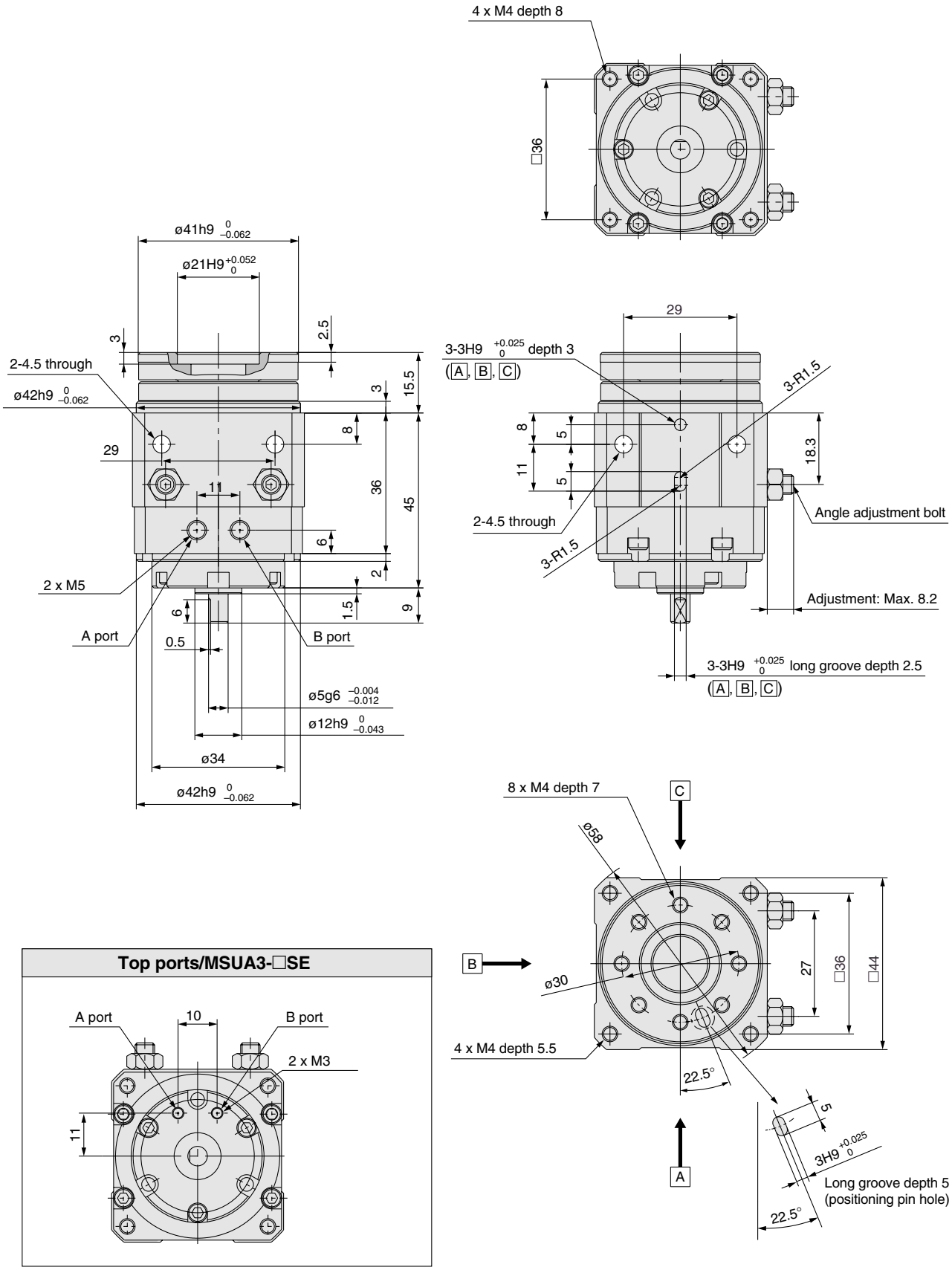
Dimensions

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

MSUA3

Scale: 70%

MSUA3-□S, SE



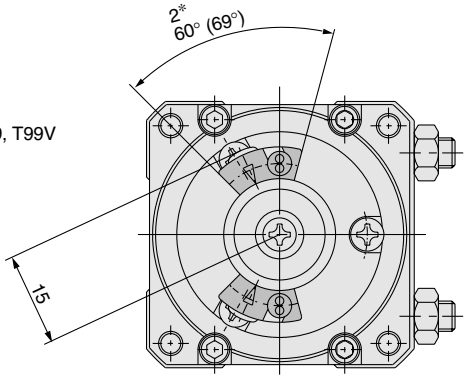
Top ports/MSUA3-□SE

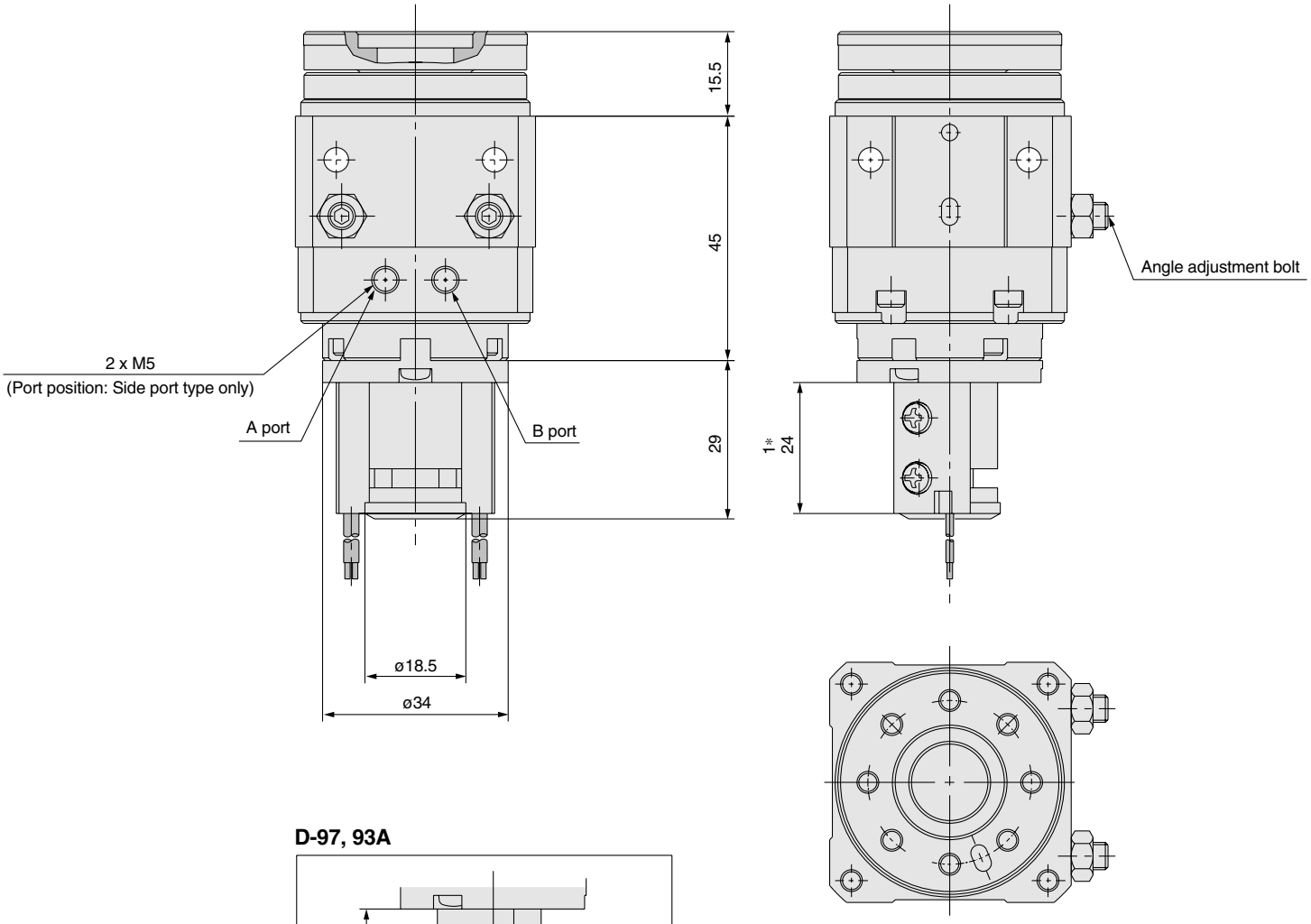
These drawings indicate the condition when the B port is pressurized.

Scale: 80%

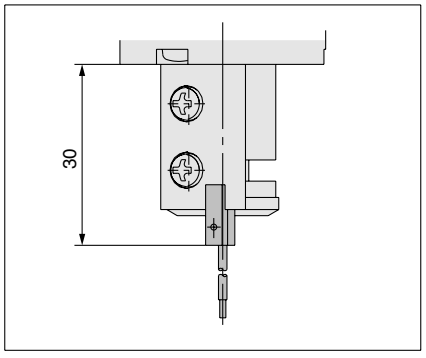
With auto switch: MDSUA3-□S

∗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





D-97, 93A



Dimensions

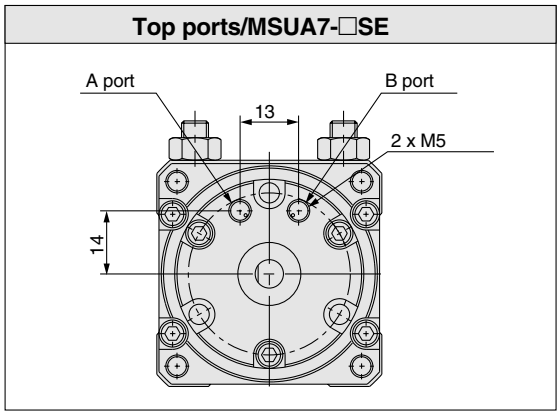
These drawings indicate the condition when the B port is pressurized.

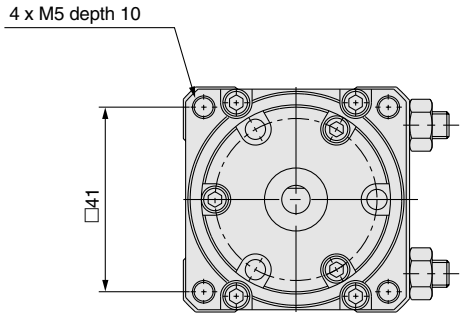
MSUA7

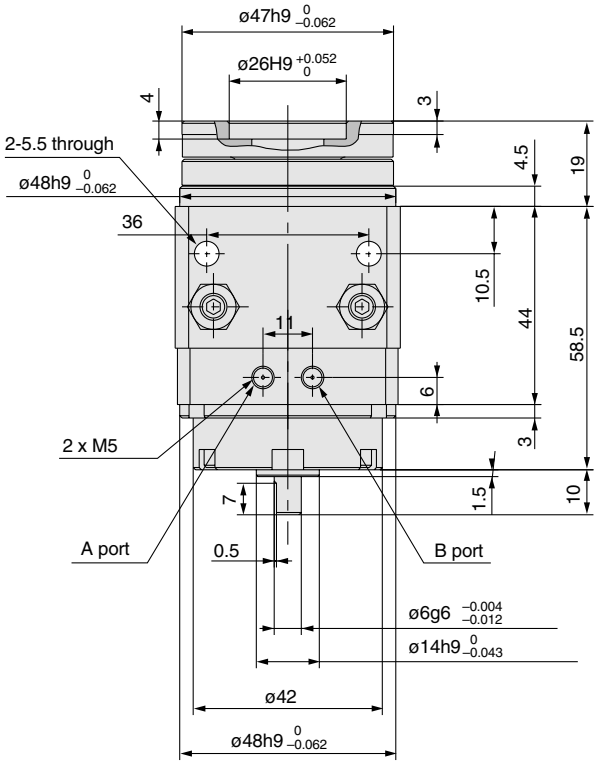
Scale: 60%

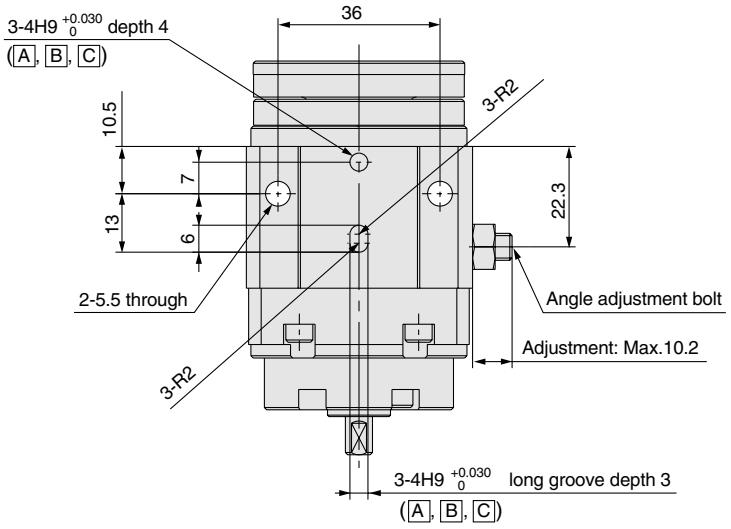
MSUA7-□S, SE

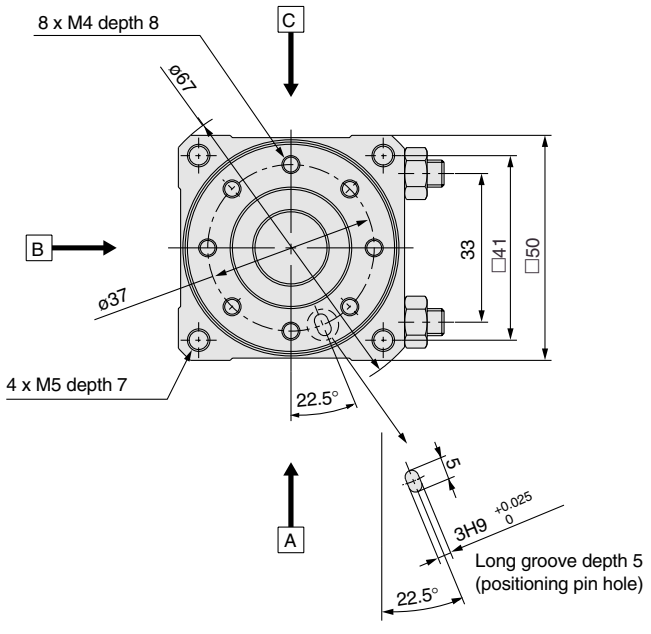
Top ports/MSUA7-□SE









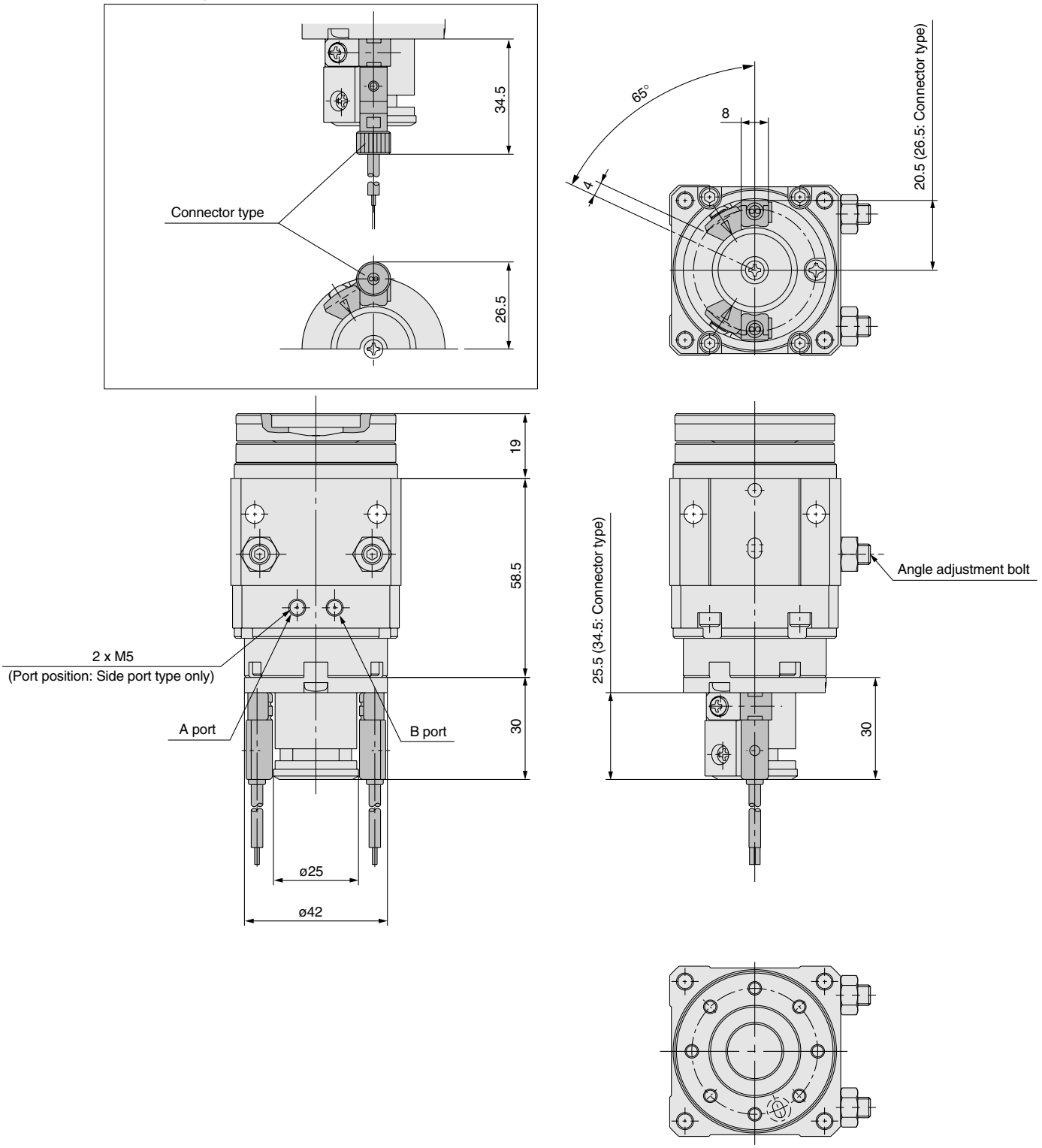


These drawings indicate the condition when the B port is pressurized.

Scale: 60%

With auto switch: MDSUA7-□S

Connector type



Dimensions

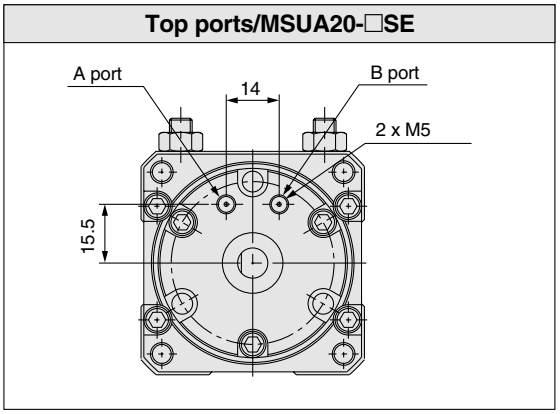
These drawings indicate the condition when the B port is pressurized.

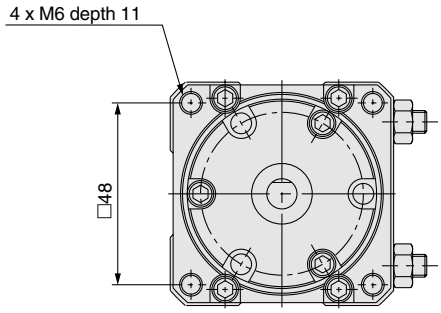
MSUA20

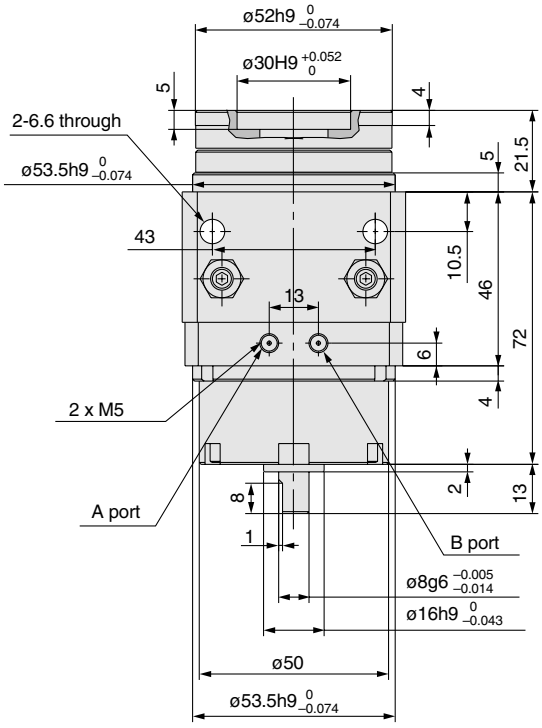
Scale: 50%

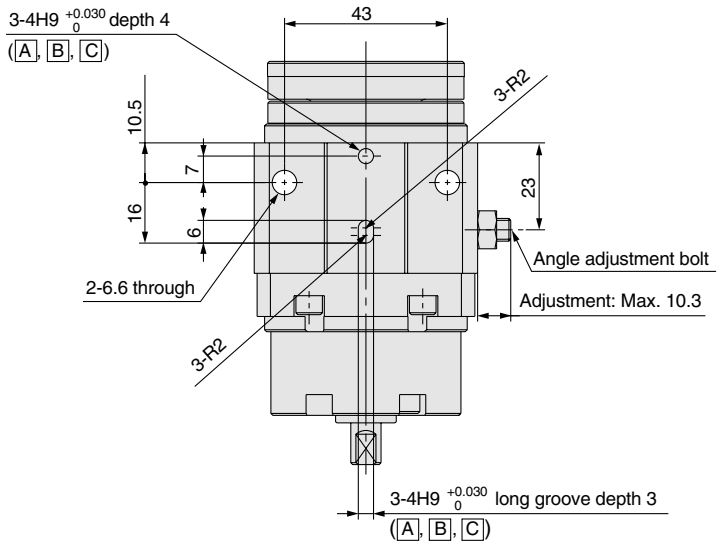
MSUA20-□S, SE

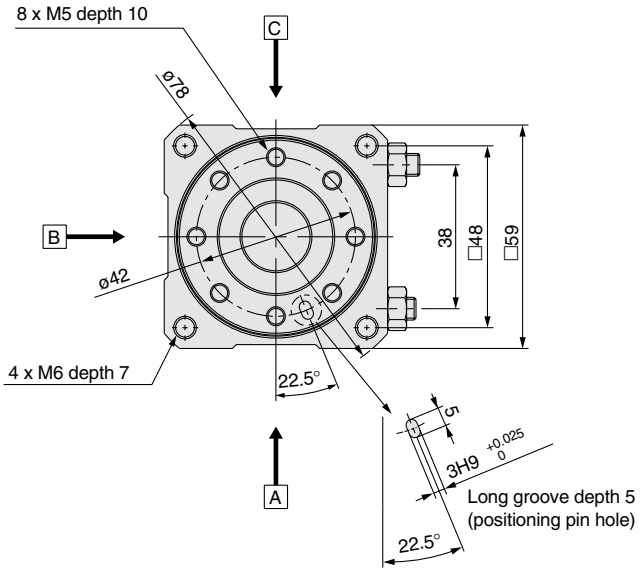
Top ports/MSUA20-□SE









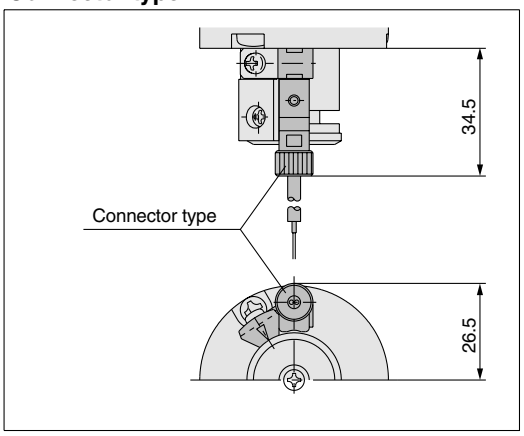


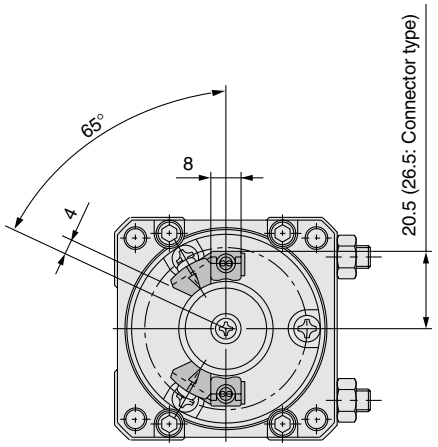
These drawings indicate the condition when the B port is pressurized.

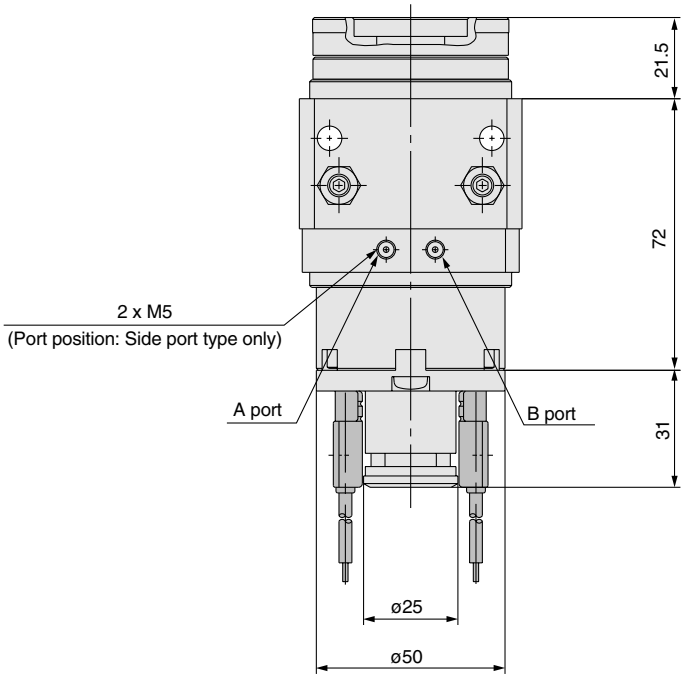
Scale: 50%

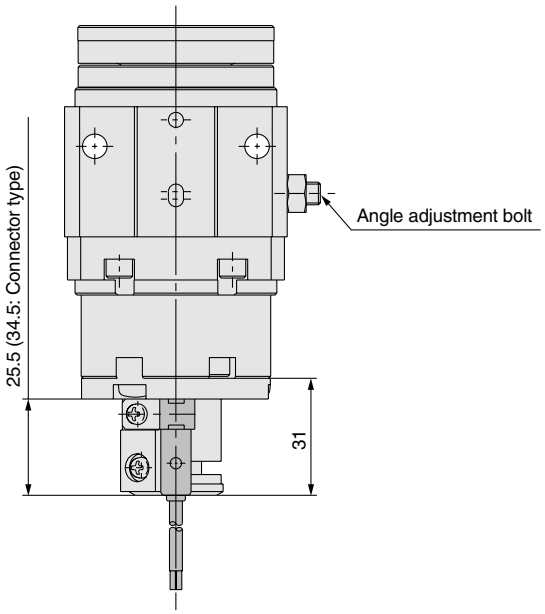
With auto switch: MDSUA20-□S

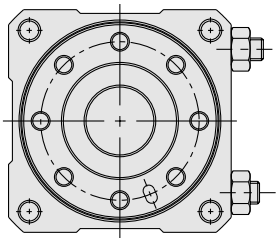
Connector type



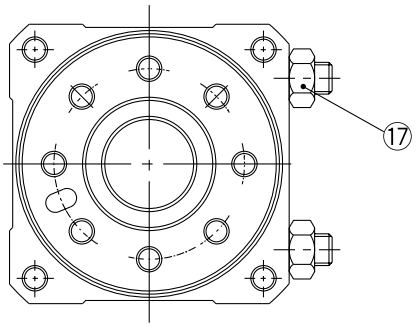


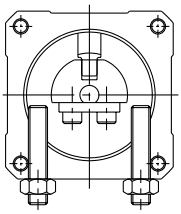




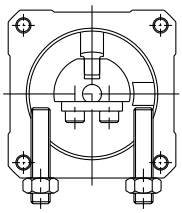


Construction

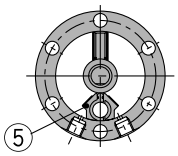




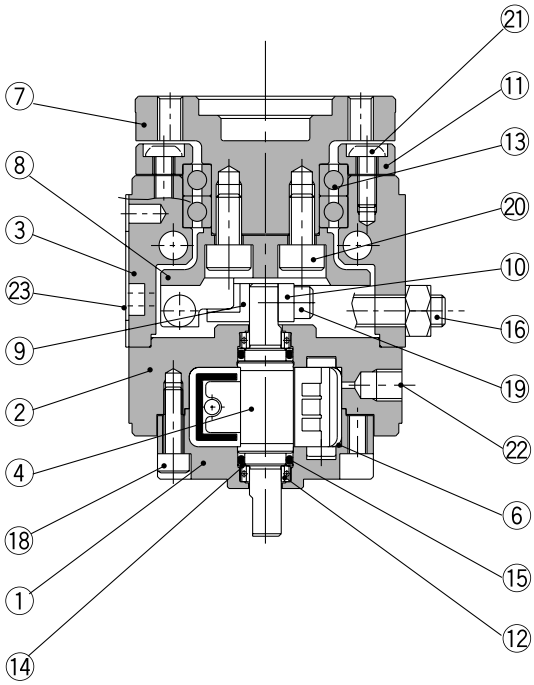
180°
(Indicates intermediate position)



90°
(Indicates A port pressurized)



Single vane



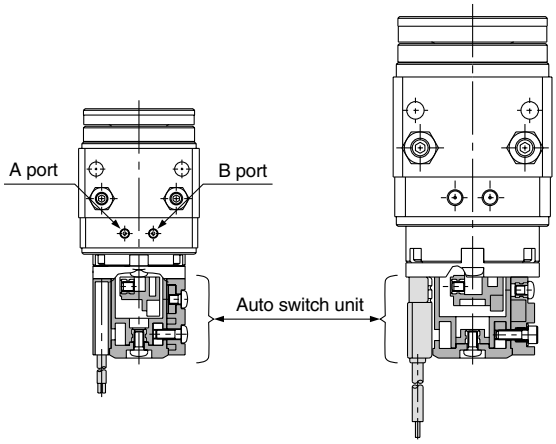
Parts list

No.	Description	Material	Note
1	**Body A**	Aluminum alloy	Light gray color
2	**Body B**	Aluminum alloy	Light gray color
3	**Body C**	Aluminum alloy	Light gray color
4	**Vane shaft**	Stainless steel (MSUA20 is carbon steel)	Single vane
5	**Stopper**	Resin	Single vane
6	**Stopper seal**	NBR	
7	**Table**	Aluminum alloy	Light gray color
8	**Stopper lever**	Carbon steel	
9	**Stopper guide**	Stainless steel	
10	**Lever retainer**	Carbon steel	
11	**Bearing retainer**	Aluminum alloy	Light gray color
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	**Adjustment bolt**	Carbon steel	
17	**Hexagon nut**	Carbon steel	
18	**Hexagon socket head cap screw**	Stainless steel	
19	**Hexagon socket head cap screw**	Stainless steel	
20	**Hexagon socket head cap screw**	Carbon steel	
21	**Button bolt**	Carbon steel	
22	**Hexagon socket head set screw**	Stainless steel	SE type only
23	**Label**		

∗ The plug 22 is used only when the connection port is type SE.

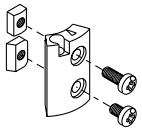
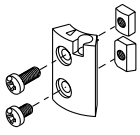
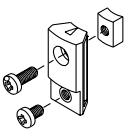
Internal construction with auto switch

MDSUA1, 3 **MDSUA7, 20**



Model	Auto switch unit part number
MDSUA 1	P211070-1
MDSUA 3	P211090-1
MDSUA 7	P211060-1
MDSUA20	P211080-1

∗ Auto switches are not included with switch units.

Auto switch block unit		
MDSUA1, 3		**MDSUA7, 20**
Right-handed	Left-handed	Combination left & right-handed
		
Part no.: P211070-8	Part no.: P211070-9	Part no.: P211060-8

∗ A switch block unit is the assembly required to mount one auto switch on a switch unit.

Rotary Table/Vane Type: Basic

Series MSUB

Sizes 1, 3, 7, 20

How to Order

Without Auto Switch Unit

With Auto Switch Unit

MSUB 20 — 90 S

M D SUB 20 — 90 S — R73

Bearing type

B	Basic type

Free-mount

Connection port position

Nil	Side ports
E	Top ports

Available with side ports only, when equipped with switch unit.

With auto switch unit

Nominal size (torque)

1	MSUB 1
3	MSUB 3
7	MSUB 7
20	MSUB 20

Rotation

Application	Symbol	Rotation
Single vane	90	90°
	180	180°
Double vane	90	90°

Rotation adjustment range
Single vane: Both ends ±5° each
Double vane: Both ends ±2.5° each

Vane type

S	Single vane
D	Double vane

Type of auto switch

Nil	Without auto switch

∗ Select applicable auto switches from the table below.

Number of auto switches

S	1 pc.∗
Nil	2 pcs.

∗ For 1 piece, a right hand auto switch is installed.

Applicable auto switches

Applicable model	Type	Electrical entry	Indicator light	Wiring (output)	Load voltage DC	Load voltage AC	Auto switch part no.	Lead wire type	Lead wire length (m)∗ 0.5 (Nil)	3 (L)	5 (Z)	None (N)	Applicable loads	
MDSUB1 MDSUB3	Reed	Grommet	No	2 wire	5V, 12V	5V, 12V, 24V	90	Parallel cord	●	●	●	—	IC circuit	Relay, PLC
					5V, 12V, 100V	5V, 12V, 24V, 100V	90A	Heavy duty	●	●	●	—		
			Yes		—	—	97	Parallel cord	●	●	●	—	—	
						100V	93A	Heavy duty	●	●	●	—		
	Solid state				12V	—	T99		●	●	—	—		
							T99V		●	●	—	—		
				3 wire (NPN)	5V, 12V		S99		●	●	—	—	IC circuit	
				3 wire (PNP)			S99V		●	●	—	—		
							S9P		●	●	—	—		
							S9PV		●	●	—	—		
MDSUB7 MDSUB20	Reed	Grommet	Yes	2 wire	—	100V	R73	Heavy duty	●	●	—	—	—	Relay, PLC
		Connector					R73C		●	●	●	●		
		Grommet	No		48V, 100V	24V, 48V, 100V	R80		●	●	—	—	IC circuit	
		Connector					R80C		●	●	●	●		
	Solid state	Grommet	Yes		12V	—	T79		●	●	—	—	—	
		Connector					T79C		●	●	●	●		
		Grommet		3 wire (NPN)	5V, 12V		S79		●	●	—	—	IC circuit	
				3 wire (PNP)			S7P		●	●	—	—		

∗ Lead wire length symbols 0.5m .... Nil (Example) R73C
3m ..... L (Example) R73CL
5m ..... Z (Example) R73CZ
None ..... N (Example) R73CN

● Operating time —— 1.2ms ● Operating temperature range —— 5 to 60°C
● Impact resistance —— 300m/s² (reed), 1000m/s² (solid state)

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

1. Standard type (without auto switches), rotation 90°, side port position MSUB20-90S
2. With switch unit (without auto switches), rotation 180°, side port position MDSUB20-180S
3. With switch unit + auto switch R73, rotation 180°, side port position MDSUB20-180S-R73

Specifications

Model [3*]		MSUB1			MSUB3			MSUB7			MSUB20		
Vane type		Single vane		Double vane	Single vane		Double vane	Single vane		Double vane	Single vane		Double vane
Rotation [1*]		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 (unlubricated)											
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 sec/90°		0.07 to 0.3											
Shaft load	**Allowable radial load**	20N			40N			50N			60N		
	Allowable thrust load [2*]	15N			30N			60N			80N		
		10N			15N			30N			40N		
	Allowable moment	0.3N·m			0.7N·m			0.9N·m			2.9N·m		
Bearing		Bearings											
Port position		Side ports or Top ports											
Port size	**Side ports**	M3			M5								
	Top ports	M3						M5					

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

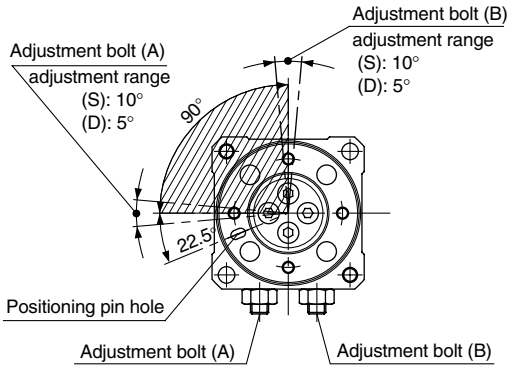
∗2. The allowable thrust load is directional. For details refer to the allowable load table below.

∗3. Correspondence to equivalent conventional free-mount types

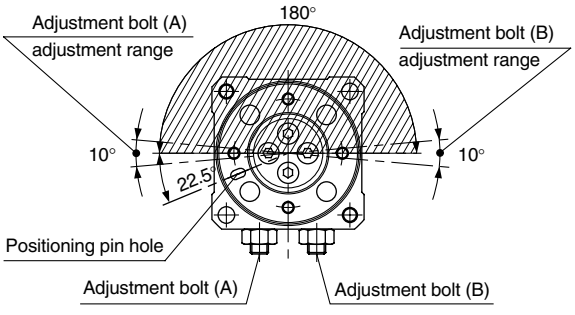
Rotary table		Free-mount rotary actuator
MSUB 1	→	**CRBUW10**
MSUB 3	→	**CRBUW15**
MSUB 7	→	**CRBUW20**
MSUB20	→	**CRBUW30**

Table Rotation Range

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



For 90° rotation
Single vane (S): 80° to 100° adjustable
Double vane (D): 85° to 95° adjustable



For 180° rotation
Single vane (S): 170° to 190° adjustable
∗ The double vane type is not available with 180° rotation.

Applicable Auto Switches

Auto switch type	MDSUB1, 3	MDSUB7, 20
Reed switch	D-90/97, D-90A/93A	D-R7, R8
Solid state switch	D-S99, D-T99, D-S9P	D-S7, D-S7P, T7

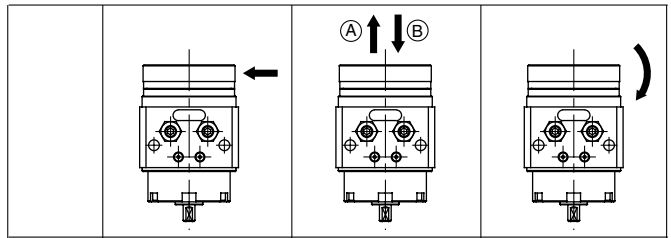
Weights

Unit: g

Size	Rotation	Basic weight		Auto switch unit + Auto switch 2 pcs.
		Single vane	Double vane	
1	90	145	150	25
	180	140	—	
3	90	230	240	30
	180	225	—	
7	90	360	375	50
	180	355	—	
20	90	510	580	60
	180	505	—	

Allowable Loads

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.)



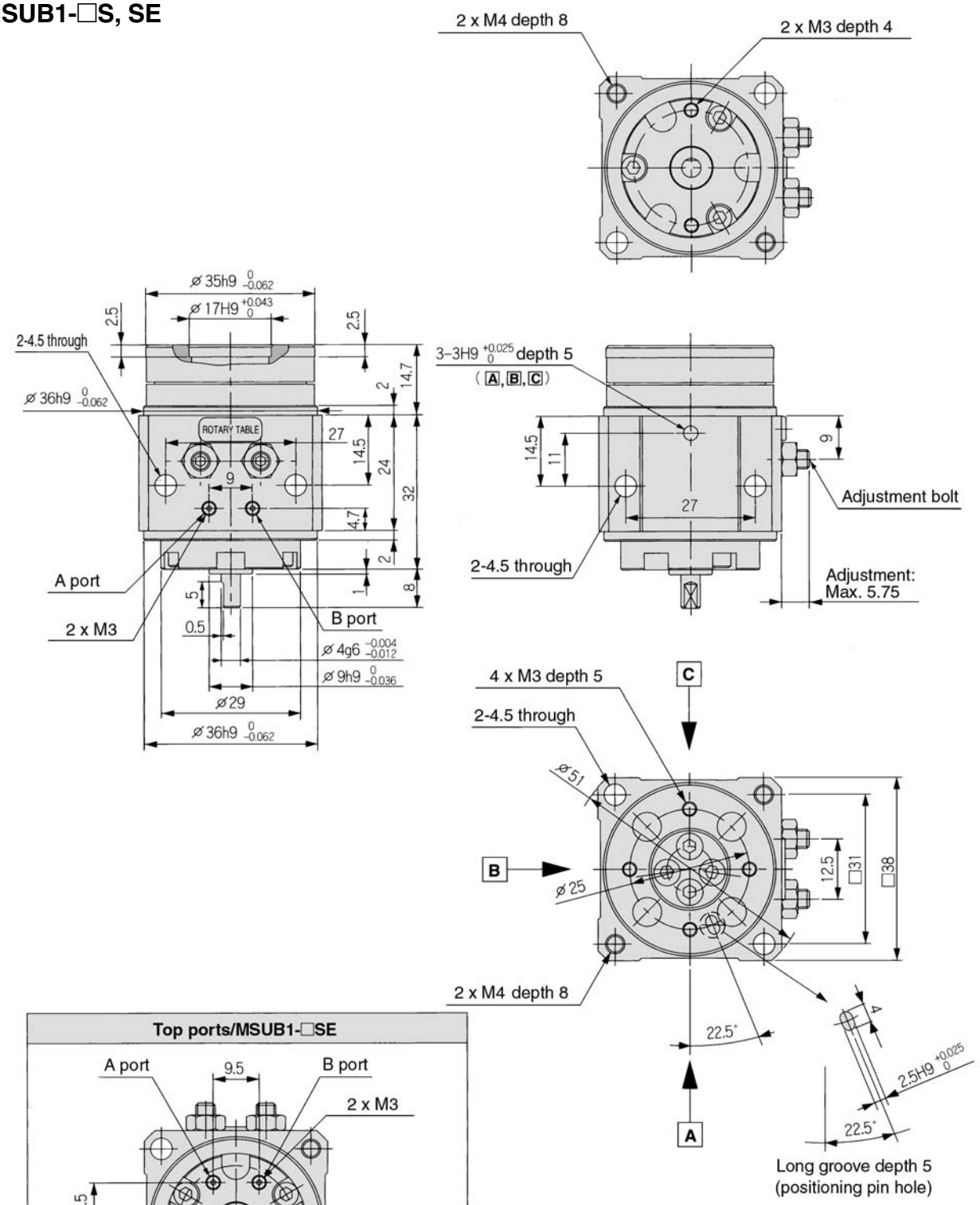
Size	Allowable radial load (N)	Allowable thrust load (N)		Allowable moment (N·m)
1	20	Ⓐ 15	Ⓑ 10	0.3
3	40	30	15	0.7
7	50	60	30	0.9
20	60	80	40	2.9

Dimensions

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

MSUB1 (Single vane)

MSUB1-□S, SE

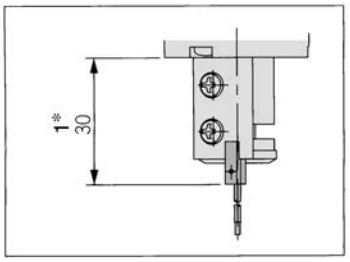


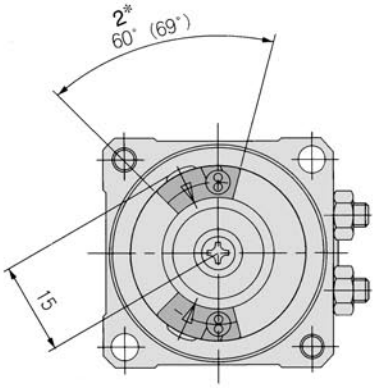
∗ If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

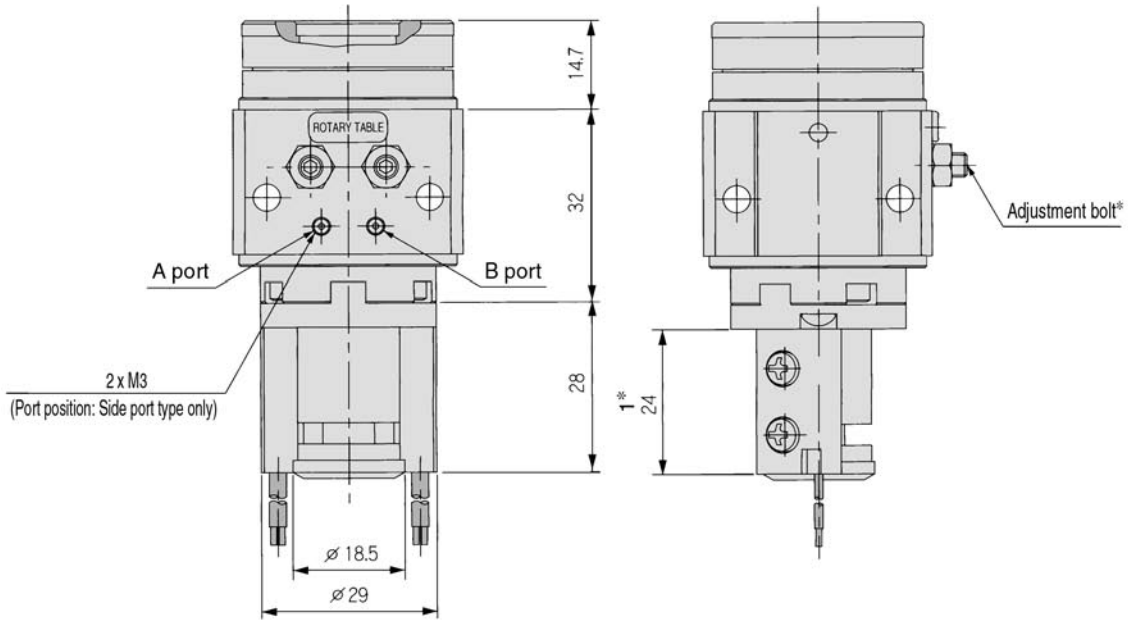
With auto switch: MDSUB1-□S

∗1) When using 24 : D-90, 90A, S99(V), T99(V), S9P(V)
When using 30 : D-97, 93A

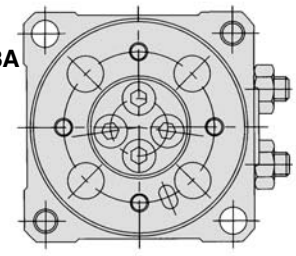
∗2) When using 60°: D-90, 90A, 97, 93A
When using 69°: D-S99(V), T99(V), S9P(V)







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.

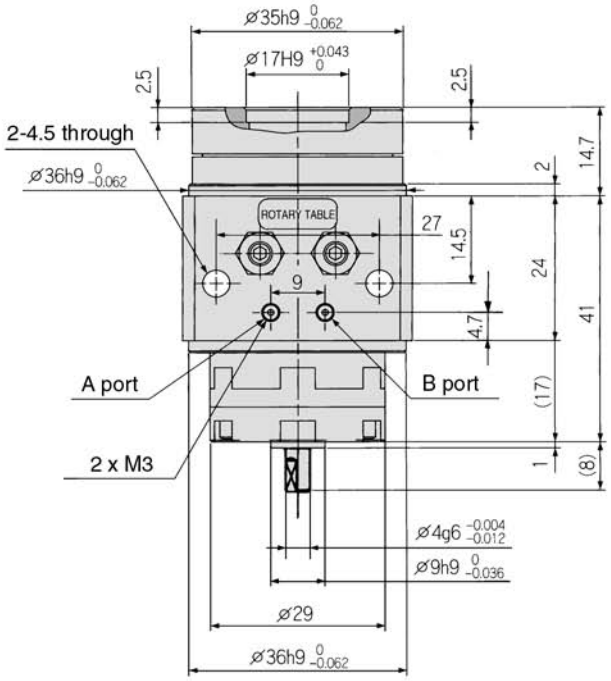
Dimensions

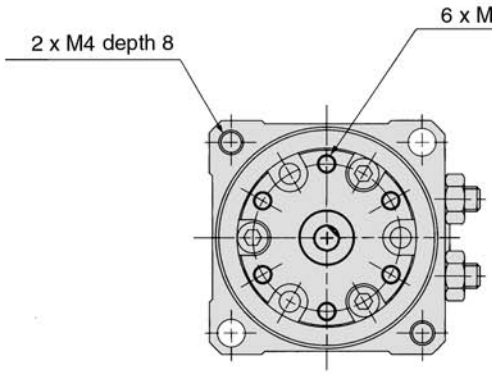
These drawings indicate the condition when the B port is pressurized.

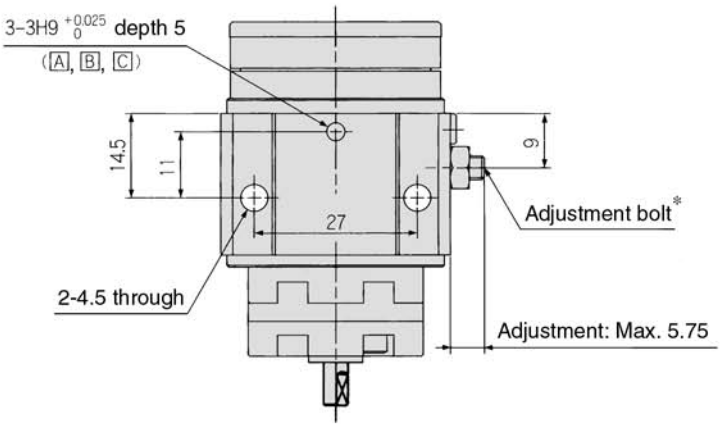
MSUB1 (Double vane)

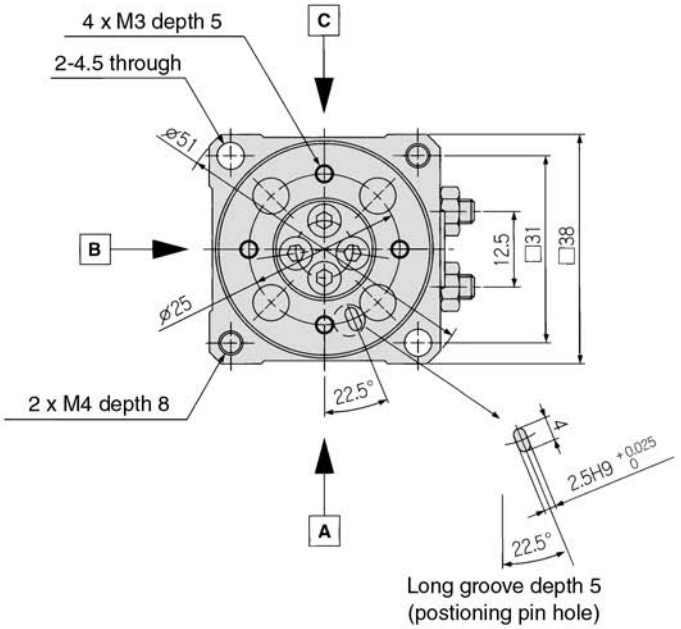
MSUB1-□D

∗ 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.

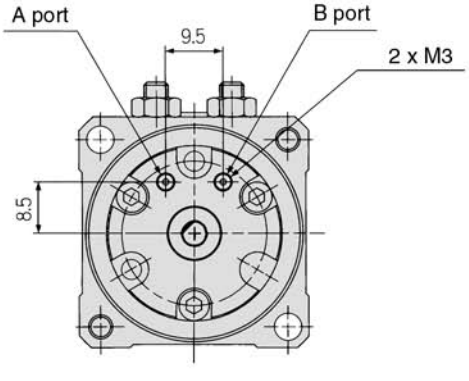








Top ports/MSUB1-□DE

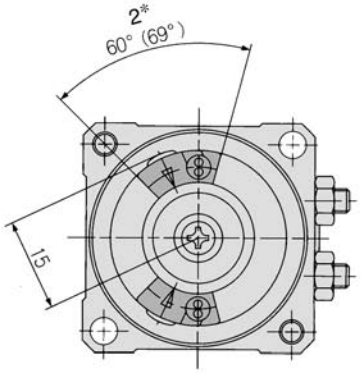


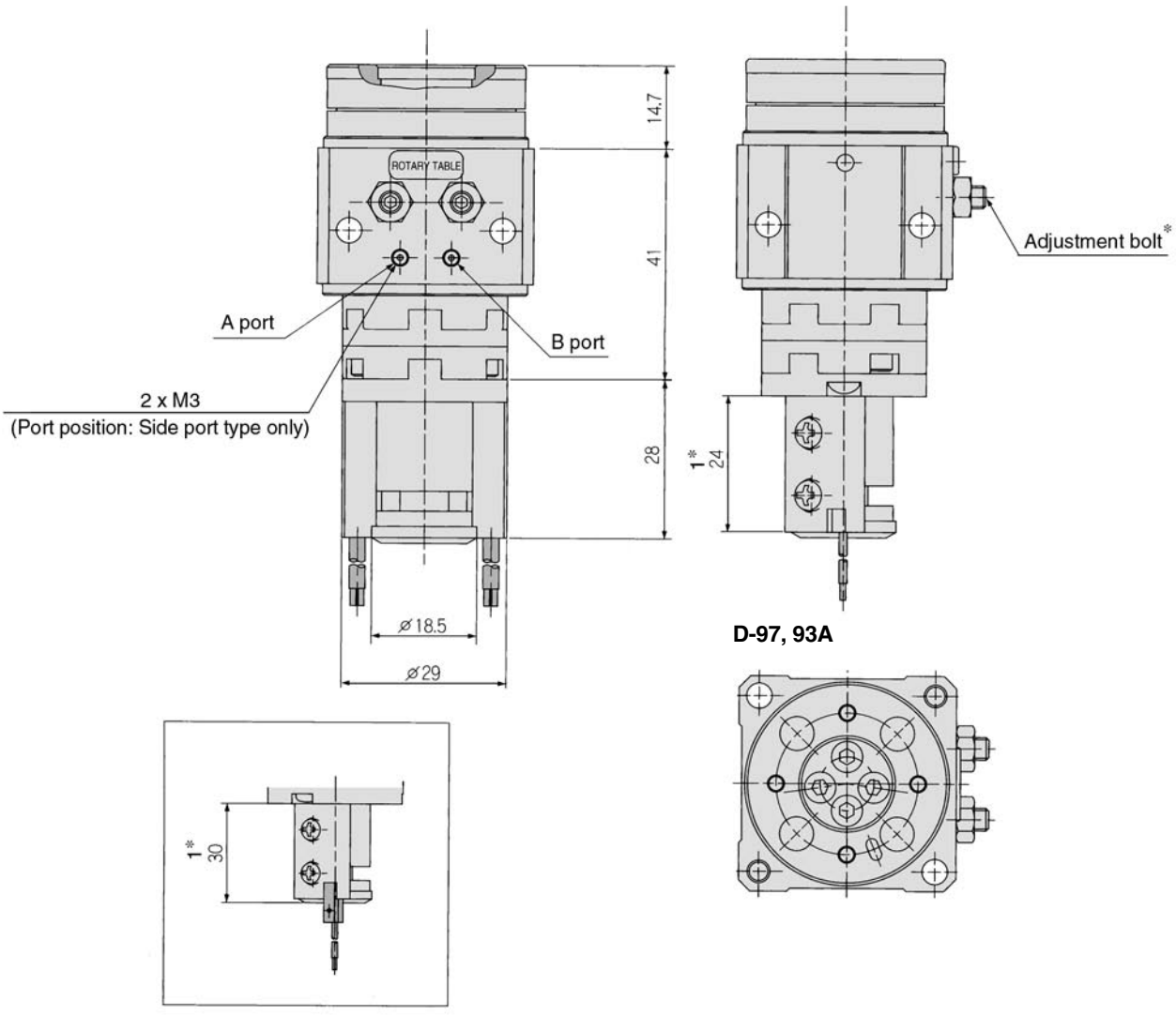
These drawings indicate the condition when the B port is pressurized.

With auto switch: MDSUB1-□D

∗1) When using 24 : D-90, 90A, S99(V), T99(V), S9P(V)
When using 30 : D-97, 93A

∗2) When using 60° : D-90, 90A, 97, 93A
When using 69° : D-S99(V), T99(V), S9P(V)





D-97, 93A

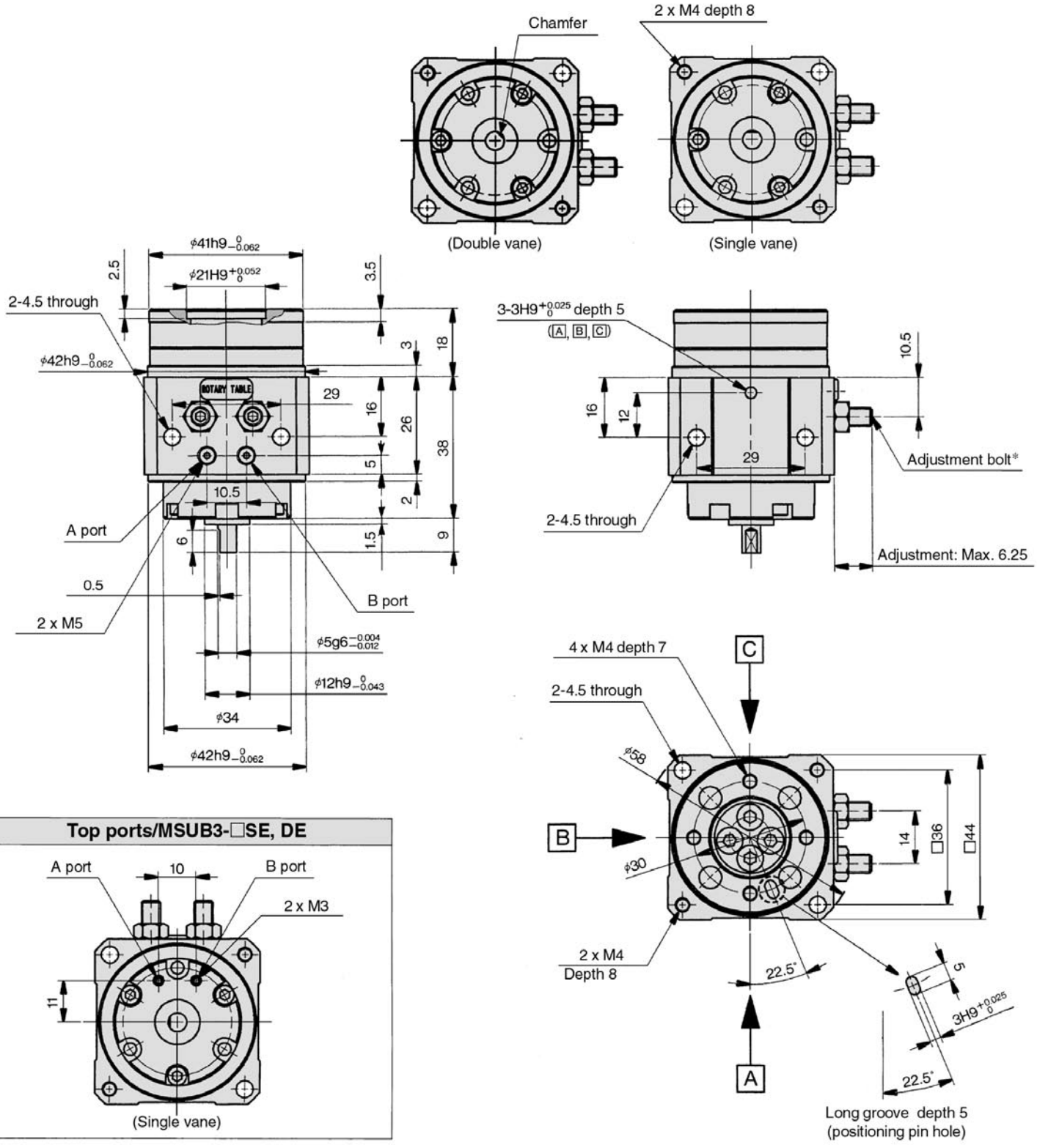
∗ If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

Dimensions

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

MSUB3 (Single vane, Double vane)

MSUB3-□S, D



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

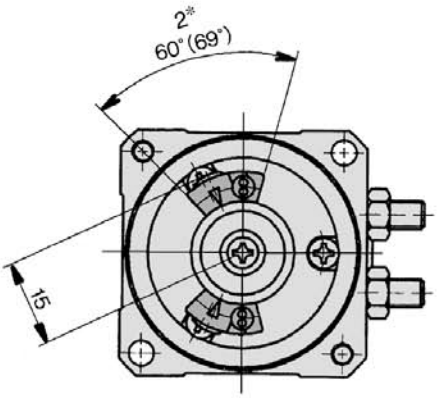
These drawings indicate the condition when the B port is pressurized.

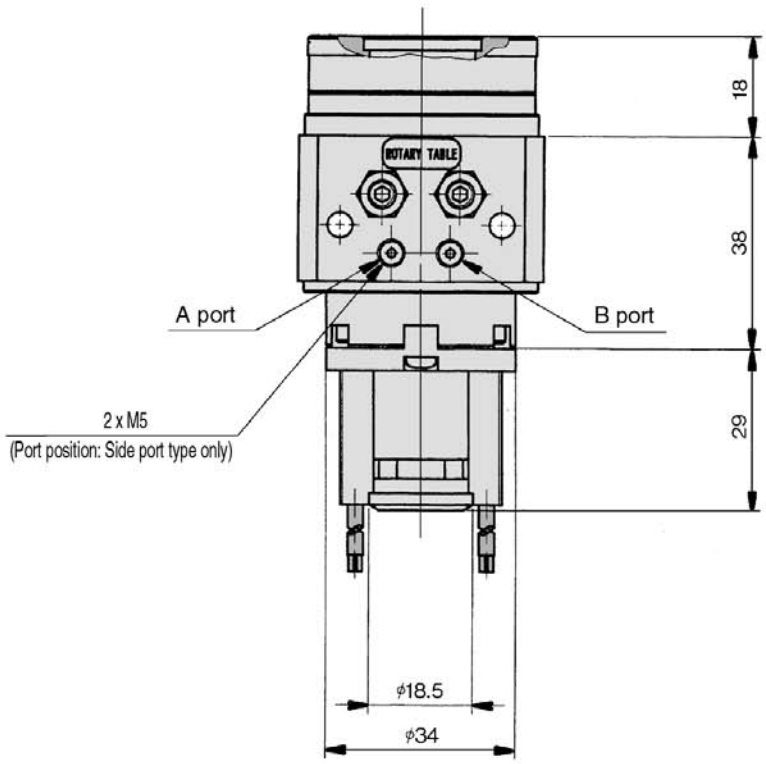
With auto switch: MDSUB3

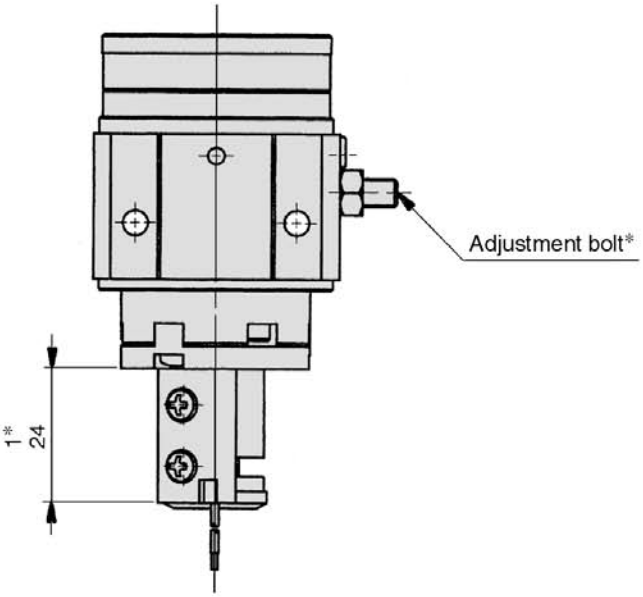
∗1) When using 24 : D-90, 90A, S99(V), T99(V), S9P(V)
When using 30 : D-97, 93A

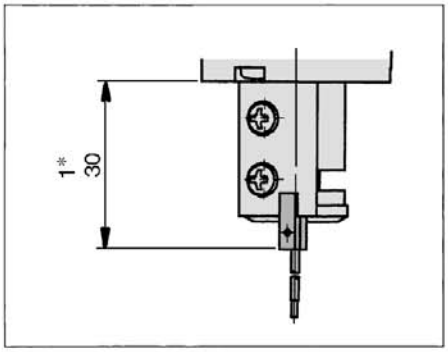
∗2) When using 60°: D-90, 90A, 97, 93A
When using 69°: D-S99(V), T99(V), S9P(V)

∗ 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.

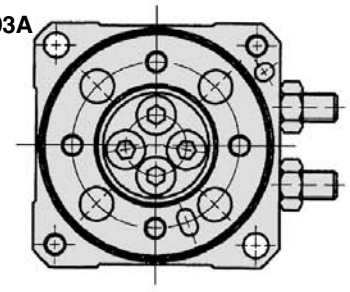








D-97, 93A

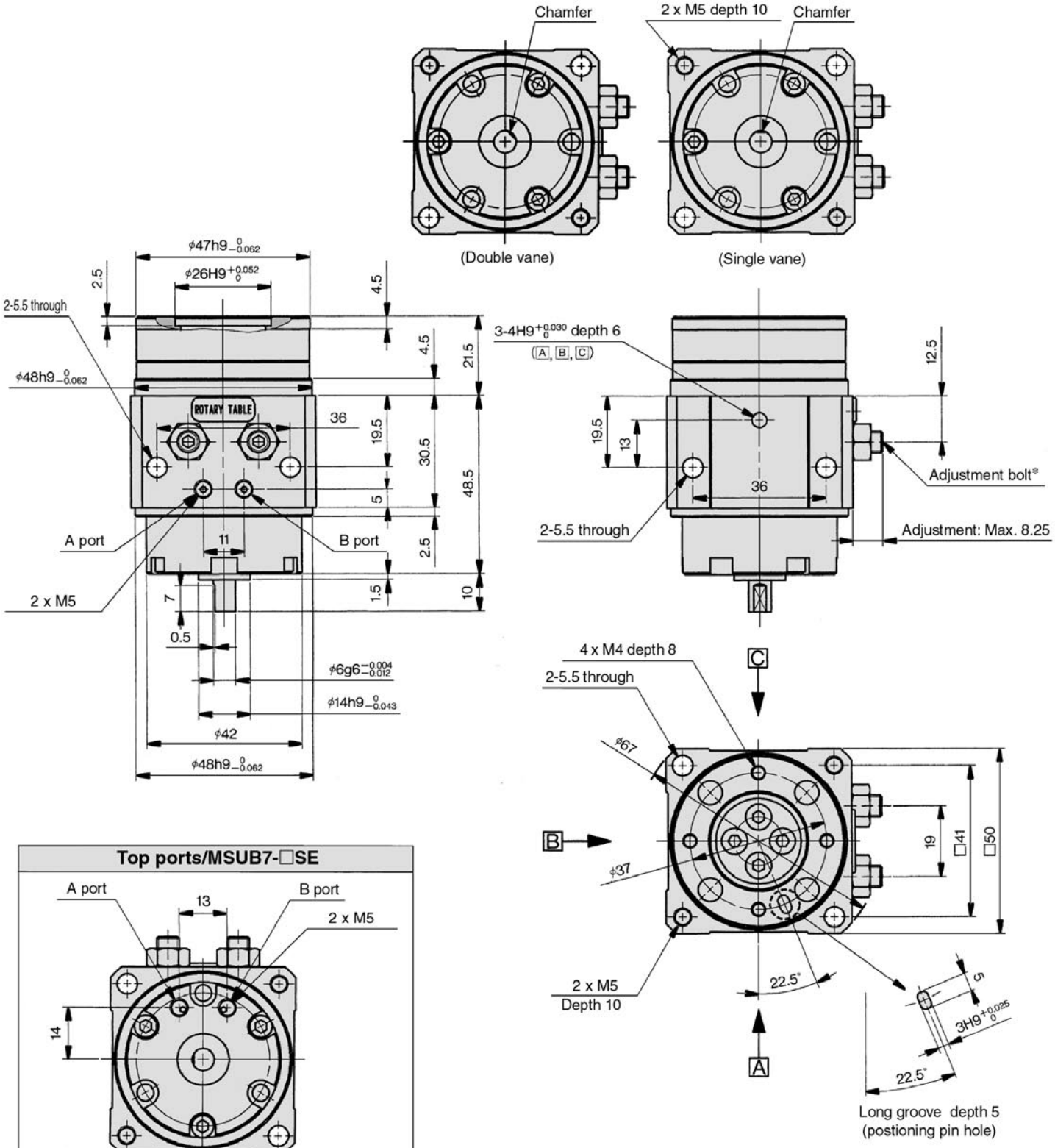


Dimensions

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

MSUB7 (Single vane, Double vane)

MSUB7-□S, D



Top ports/MSUB7-□SE

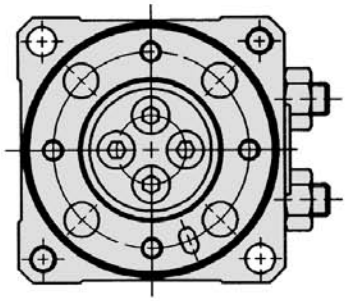
The outside drawings show the single vane type, but only the position of the chamfered sections shown in the above drawings differs for single and double vane.

* 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.

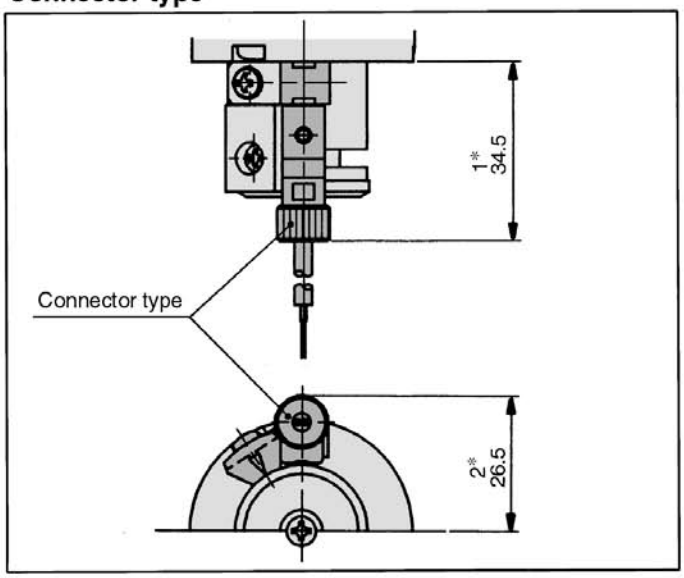
These drawings indicate the condition when the B port is pressurized.

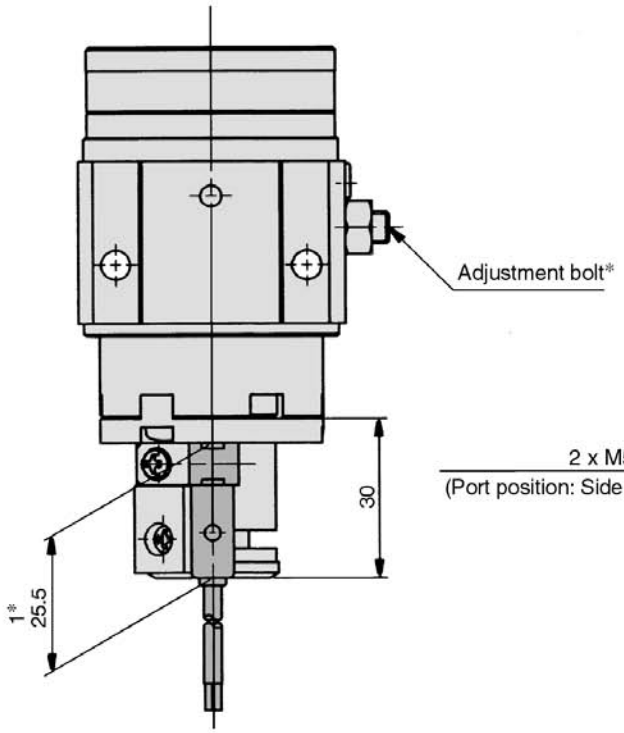
With auto switch: MDSUB7

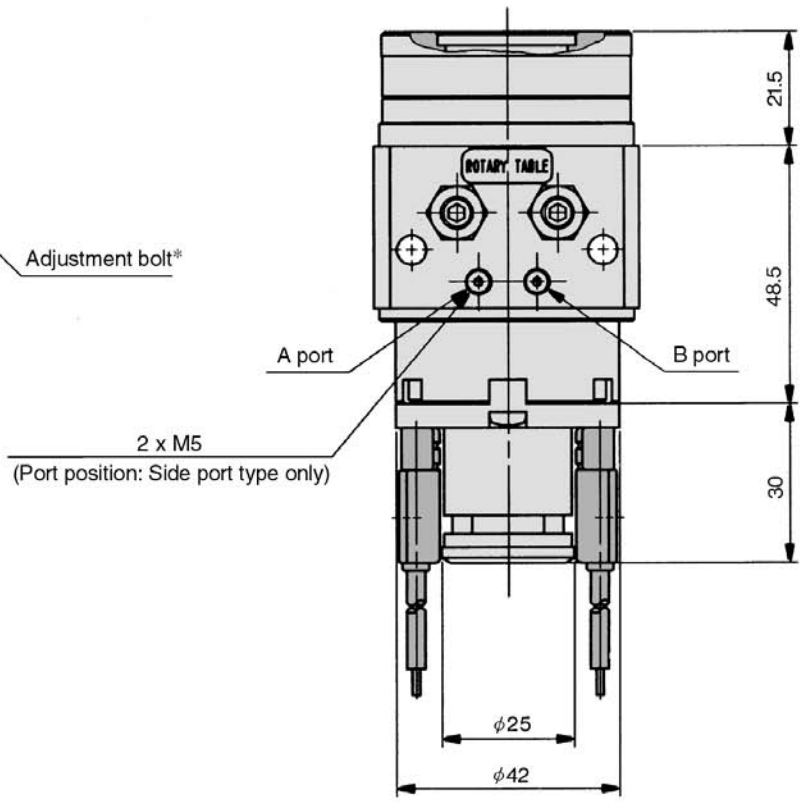
* If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

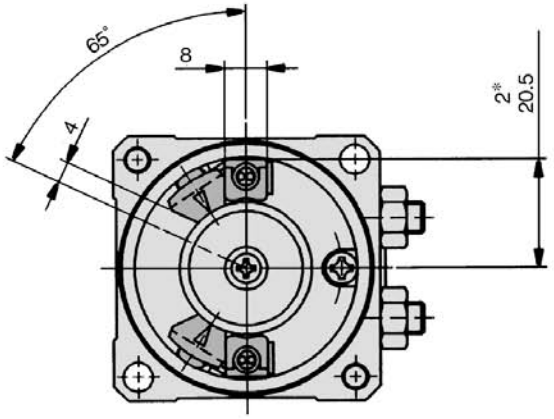


Connector type









*1) 25.5: Grommet type
34.5: Connector type

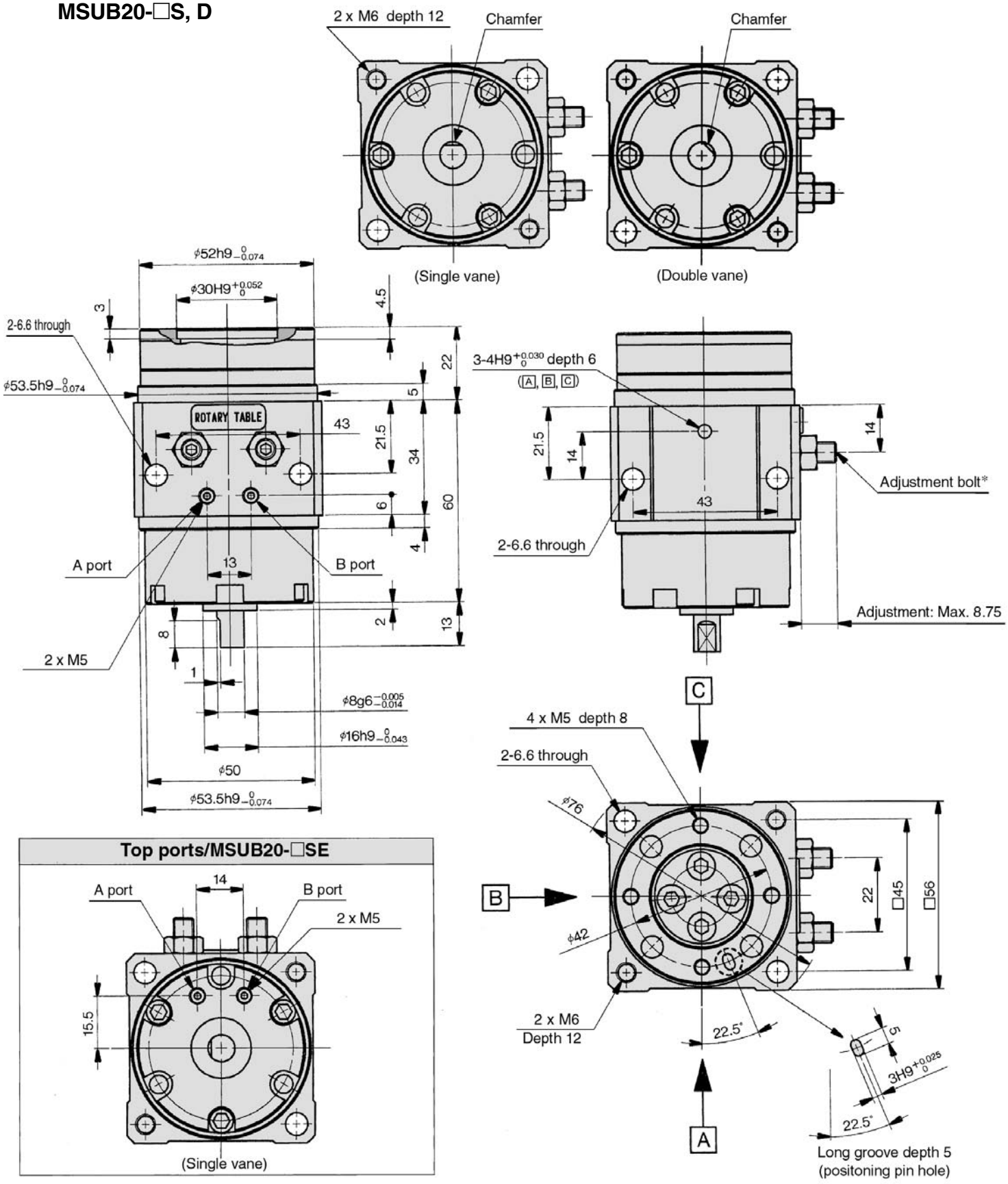
*2) 20.5: Grommet type
26.5: Connector type

Dimensions

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

MSUB20 (Single vane, Double vane)

MSUB20-□S, D



Top ports/MSUB20-□SE

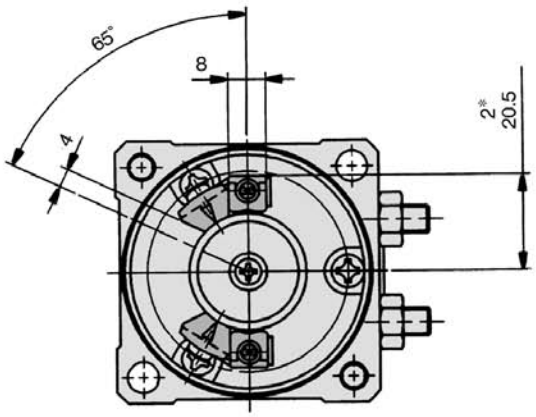
The outside drawings show the single vane type, but only the position of the chamfered sections shown in the above drawings differs for single and double vane.

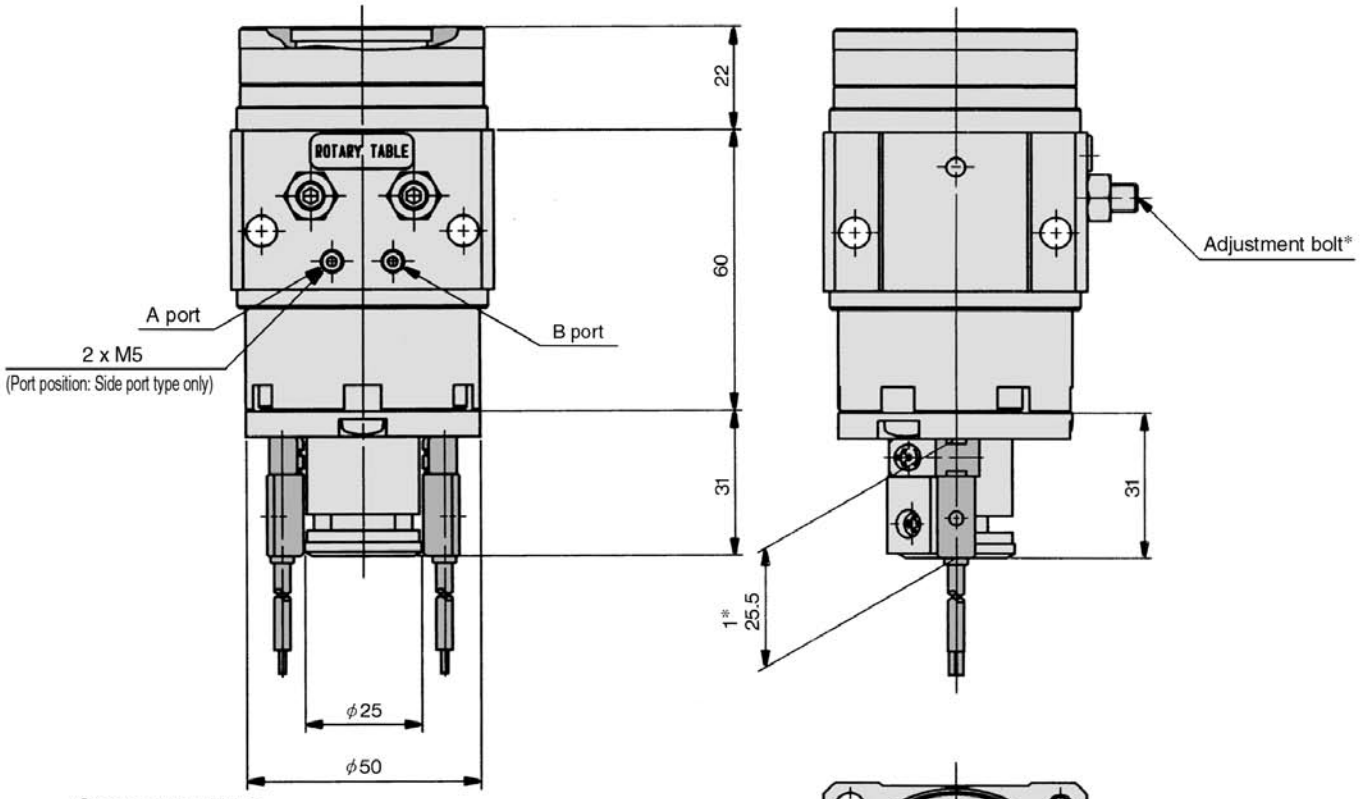
* If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

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

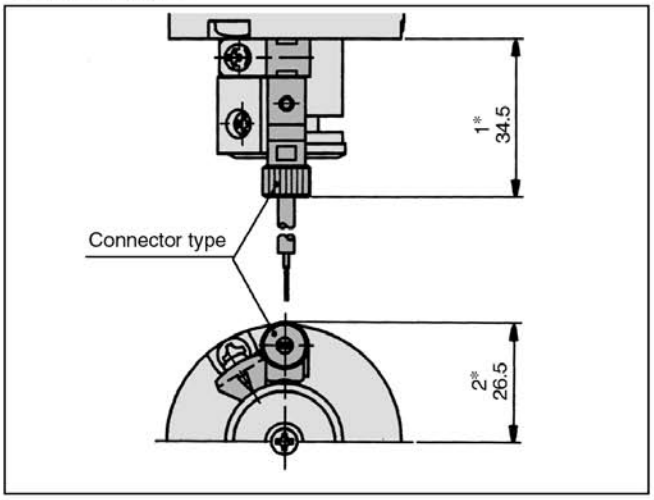
With auto switch: MDSUB20

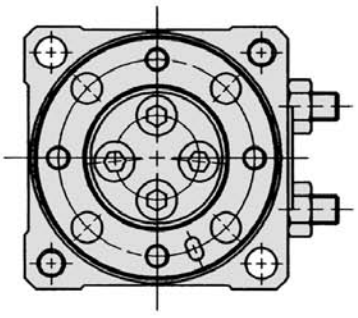
∗ If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.





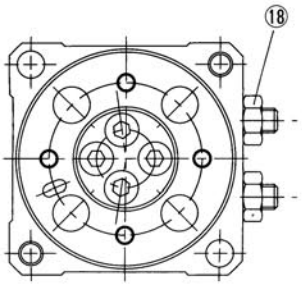
Connector type

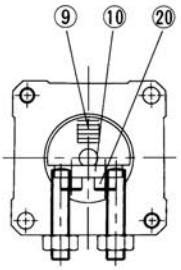




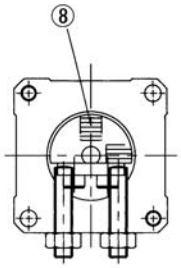
∗1) 25.5: Grommet type
34.5: Connector type
∗2) 20.5: Grommet type
26.5: Connector type

Construction/Parts List

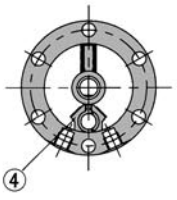




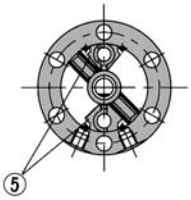
180°
(Indicates intermediate position)



90°
(Indicates A port pressurized)

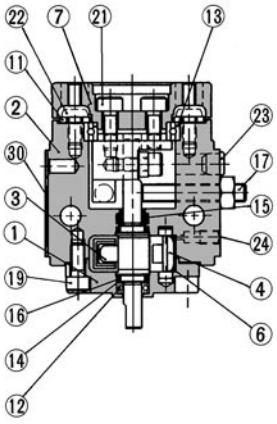


Single vane
(Indicates intermediate position for 180°)

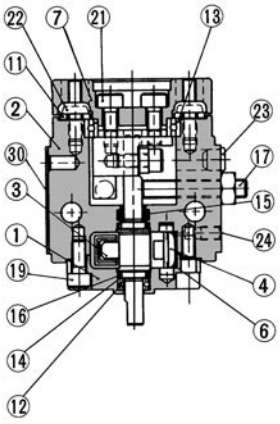


Double vane
(Indicates A port pressurized)

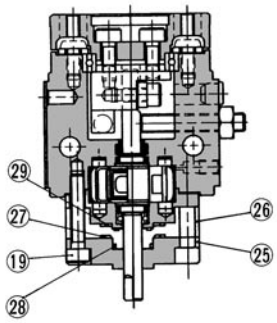
Single vane: Size 1



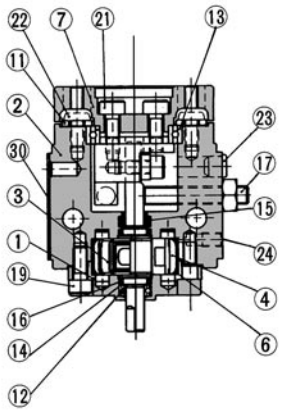
Single vane: Sizes 3, 7, 20



Double vane: Size 1



Double vane: Sizes 3, 7, 20



Parts list

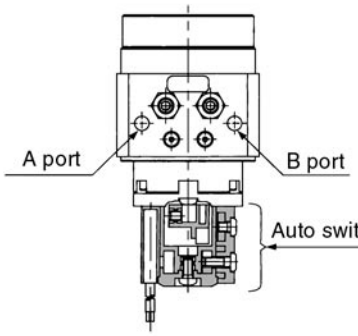
No.	Description	Material	Note
1	**Body (A)**	Aluminum alloy	Light gray color
2	**Body (B)**	Aluminum alloy	Light gray color
3	**Vane shaft**	Stainless steel (MSUB20: Carbon steel)	Single vane
		Carbon steel	Double vane
4	**Stopper**	Resin	Single vane
5	**Stopper**	Stainless steel	Double vane
6	**Stopper seal**	NBR	
7	**Table**	Aluminum alloy	Light gray color
8	**Stopper lever (D)**	Carbon steel	
9	**Stopper lever (S)**	Carbon steel	
10	**Lever retainer**	Carbon steel	
11	**Ring collar**	Carbon steel	
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	
18	**Hexagon nut**	Stainless steel	
19	**Hexagon socket head cap screw**	Stainless steel	
20	**Hexagon socket head cap screw**	Stainless steel	
21	**Hexagon socket head cap screw**	Stainless steel	
22	**Button bolt**	Carbon steel	
23	**Rubber cap**	NBR	
24	**Hexagon socket head set screw**	Stainless steel	
25	**Cover**	Aluminum alloy	SE type only
26	**Plate**	Resin	
27	**Gasket**	NBR	
28	**O-ring**	NBR	
29	**O-ring**	NBR	
30	**Label**		

∗ The plug number 24 is used only when the connection port is type SE.

Internal construction with auto switch

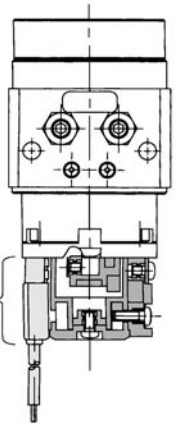
Units are common for both single and double vane.

MDSUB1, 3



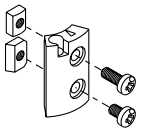
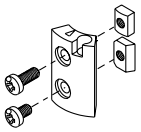
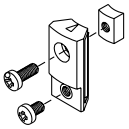
(The external configuration of the MDSUB1 double vane is different.)

MDSUB7, 20



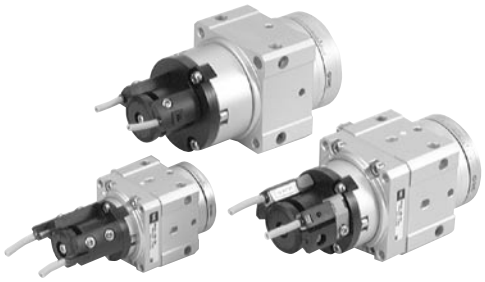
Model	Auto switch unit part no.
MDSUB 1	P211070-1
MDSUB 3	P211090-1
MDSUB 7	P211060-1
MDSUB20	P211080-1

∗ Auto switches are not included with switch units.

Auto switch block unit		
For MDSUB1, 3		**For MDSUB7, 20**
Right-handed	Left-handed	Combination left & right-handed
		
Part no.: P211070-8	Part no.: P211070-9	Part no.: P211060-8

∗ A switch block unit is the assembly required to mount one auto switch on a switch unit.

Auto Switch Specifications



Applicable auto switches

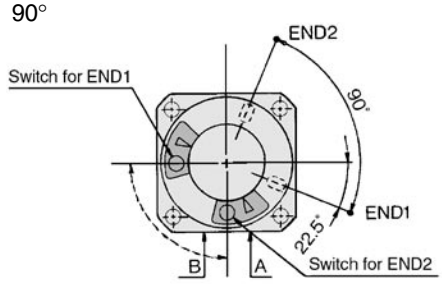
Applicable series	Auto switch model		Electrical entry
MDSU□1 **MDSU□3**	Reed switch	**D-90, 90A**	Grommet (2 wire)
		D-97, 93A	Grommet (2 wire)
	Solid state switch	**D-S99, S99V**	Grommet (3 wire)
		D-S9P, S9PV	Grommet (3 wire) PNP
		D-T99, T99V	Grommet (2 wire)
MDSU□7 **MDSU□20**	Reed switch	**D-R73**	Grommet (2 wire)
		D-R80	Grommet (2 wire), Connector (2 wire)
	Solid state switch	**D-S79**	Grommet (3 wire)
		D-S7P	Grommet (3 wire) PNP
		D-T79	Grommet (2 wire), Connector (2 wire)

Table Positioning Pin Hole Rotation Range and Auto Switch Mounting Position

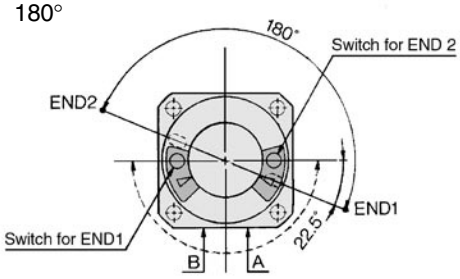
MSU□1, 3

Single vane type

90°

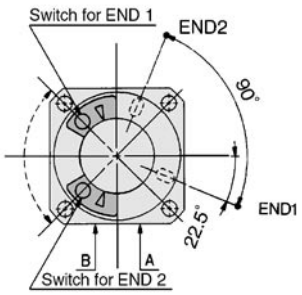


180°



Double vane type (MSUB only)

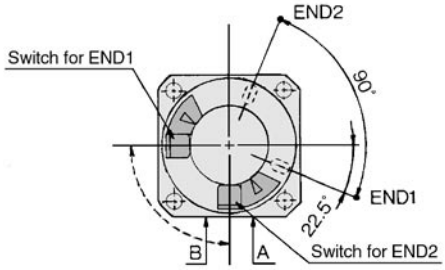
90°



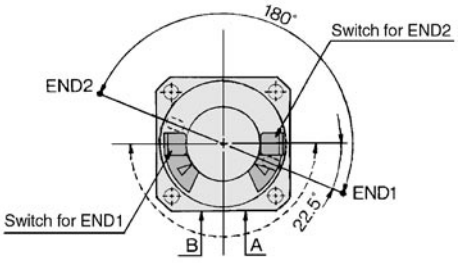
MSU□7, 20

Single vane type

90°

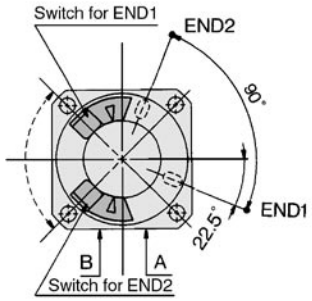


180°



Double vane type (MSUB only)

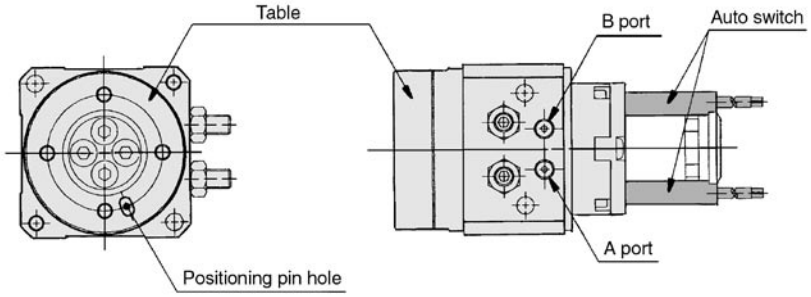
90°



- 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 switch operates, and when the pin hole is at END2, the END2 switch operates.
- The arrows on the broken line indicate the rotation range of the internal magnet. The rotation range of each switch can be reduced by moving the END1 switch clockwise and the END2 switch counterclockwise.

Auto switch rotation and actuation ranges

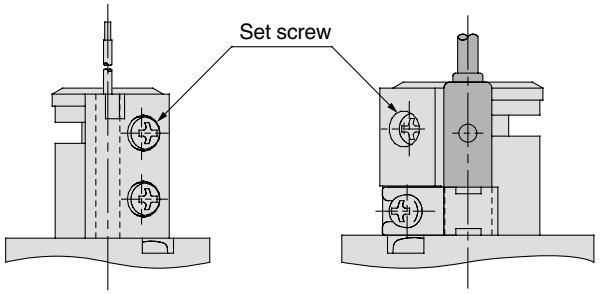
Model	Rotation range	Actuation range
MDSU□1, 3	110°	10°
MDSU□7, 20	90°	



Auto Switch Specifications

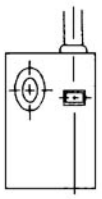
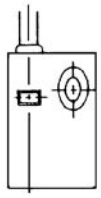
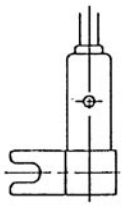
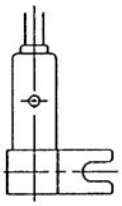
How to change Auto switch Detecting Positions

To set a new detection position, slightly loosen the set screw, move the switch to the desired position and retighten the screw. Over-tightening can damage the screw making it impossible to hold the position. Use a tightening torque of about 0.5N·m.



MDSU□1, 3 **MDSU□7, 20**

Auto Switch Mounting Classifications

MDSU□1, 3	
	
Left-handed D-□992	Right-handed D-□991
MDSU□7, 20	
	
Left-handed D-□□□2	Right-handed D-□□□1

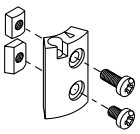
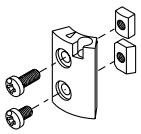
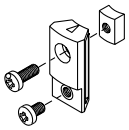
Auto Switch Units

Auto switch unit part numbers

Model	Unit part number
MDSU□ 1	P211070-1
MDSU□ 3	P211090-1
MDSU□ 7	P211060-1
MDSU□20	P211080-1

∗The magnet lever is included.

Auto switch block units

MDSU□1, 3		**MDSU□7, 20**
Right-handed	Left-handed	Combination left & right-handed
		
Part no.: P211070-8	Part no.: P211070-9	Part no.: P211060-8

∗ A switch block unit is the assembly required to mount one switch on a switch unit.

⚠ Caution

Be sure to read before handling.
Refer to pages 2.11-2 through 2.11-4 before using auto switches.

Series MSU
Specific Product Specifications 1

Be sure to read before handling.

Selection

⚠Warning

1. Keep 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. (90°±10°, 180°±10°) (±5° at end of rotation)

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 0.3s/90°)

The product is provided with a fixed throttle and is designed not to operate faster than 0.07s/90°. However, in cases such as a large load inertia, it can exceed the allowable energy causing damage to equipment. (Refer to the model selection procedures in this catalog.)
Furthermore, adjustment to a speed slower than 0.3s/90° can cause sticking and slipping or stopping of operation.

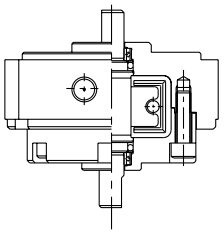
Maintenance

⚠Caution

<High precision type/MSUA>

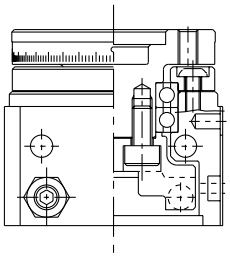
In case a rotary unit and table unit are required for maintenance, order with the unit part numbers shown below.

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.