Process Gas Diaphragm Valve

AZ Series

Cleaned for high purity semiconductor applications. RoHS

Cleanroom assembled and He leaked tested.

Valve meets dimensional requirements of

SEMI F36-0299, Option I.

Manually Operated Type
Series AZ3652 and 4652

- Compact and lightweight by modifying the knob design
- The knob is a unique design that combines a scalloped round knob with a raised rectangular section to provide two choices of gripping.

  Actuation is 90 degrees open to closed with a cutout window, on both sides of raised rectangular section, providing visual status of open or closed state.

Height **57 mm**

Weight **240 g**

Direction of a raised rectangular section indicate open/close status

Open

Close

Air Operated Type
Series AZ3542 and 4542

- Compact and lightweight by making the actuator shorter
- M5 actuation port

Height **55 mm**

Weight **220 g**

APTech

Air operated type
AZ3542/AZ4542 Series

Manually operated type
AZ3652/AZ4652 Series

Body material

316L SS
Electropolish and passivation internals

User-friendly forged body

Rounded corner for safety and easy operation
(forged body is for machined type.)

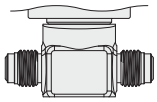
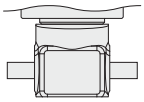
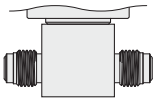
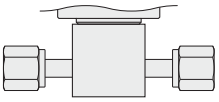
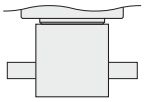
SEMI standard

Mounting hole, dimension, and face to face dimension are interchangeable (Guide for Dimensions and Connections of Gas Distribution Components).

Port

Machined type　　Welded type

Multiple port available in various configurations

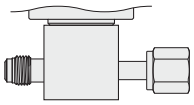
	Machined		Welded		
Body					
Connection	Face seal fitting (Male)	Tube weld (Tube stub)	Face seal fitting (Male)	Face seal fitting (Female)	Tube weld (Tube stub)
Connection size (inch)	1/4, 3/8	1/4, 3/8, 1/2	1/4, 3/8		
Interchangeability	No		Yes		

Welded type, inlet and outlet available with any combination of fitting type and size.

Further information How to order **P.804, 806**

Example)

Outlet
Face seal fitting
(Male) 1/4



Inlet
Face seal fitting
(Female) 3/8

Welded type, ports (2, 3, 4 ports) and porting configuration (flow direction 2, 3, 4) selectable

Further information Optional porting configuration **P.808**

■ Air operated type

	Series	Status	Body material	Max. operating pressure (MPa)	Cv ∗1)	Connections: Fitting	Page
 Machined type　Welded type	AZ3542	N.C.	316L SS	0.9	0.29	Face seal fitting Tube weld	P.804
	AZ4542				0.5		

■ Manually operated type

	Series	Knob	Body material	Max. operating pressure (MPa)	Cv ∗1)	Connections: Fitting	Page
 Machined type　Welded type	AZ3652	Knob with a raised section on top (indication window)	316L SS	1.7	0.29	Face seal fitting Tube weld	P.806
	AZ4652				0.5		

∗ 1) Cv calculation based on SEMI Standard

AZ Series
Applicable Fluid

Precautions for selection

The proper regulator and valve selection can be significantly affected by parameters such as system design, flow duration, frequency of use, ambient conditions and outlet pressure. It is important to understand that one may follow this guide's recommendation, yet have a failure due to a parameter specific to the given application, as noted.

Applicable Fluid

Process Gas	Molecular Formula
Boron11 Trifluoride	$11BF_3$
Argon	Ar
Arsine	AsH_3
Boron Trichloride	BCl_3
Boron Trifluoride	BF_3
Halocarbon114	C_2ClF_4
Halocarbon115	C_2ClF_5
Halocarbon116	C_2F_6
Acetylene	C_2H_2
Halocarbon134A	$C_2H_2F_4$
Ethylene	C_2H_4
Halocarbon125	C_2HF_5
Dimethylsilane	C_2SiH_8
HalocarbonR218	C_3F_8
Propene	C_3H_6
Propane	C_3H_8
Perfluoro-butadiene	C_4F_6
HalocarbonC318	C_4F_8
Butene-1	C_4H_8
Octafluorocyclopentene	C_5F_8
Halocarbon12B2	CBr_2F_2
Halocarbon13B1	$CBrF_3$
Halocarbon12	CCl_2F_2
Halocarbon13	$CClF_3$
Halocarbon14	CF_4
Halocarbon32	CH_2F_2
Trimethylsilane	$(CH_3)_3SiH$
Methyl Chloride	CH_3Cl
Methyl Fluoride	CH_3F
Methanol	CH_3OH
Methylsilane	CH_3SiH_3
Methane	CH_4
Halocarbon21	$CHCl_2F$
Halocarbon23	CHF_3

Process Gas	Molecular Formula
Chlorine	Cl_2
Chlorine Trifluoride	ClF_3
Carbon Monoxide	CO
Carbon Dioxide	CO_2
Germane	GeH_4
Hydrogen	H_2
Hydrogen Sulfide	H_2S
Hydrogen Selenide	H_2Se
Hydrogen Bromide	HBr
Hydrogen Chloride	HCl
Helium	He
Hydrogen Fluoride	HF
Krypton	Kr
Nitrogen	N_2
Nitrogen Oxide	N_2O
Neon	Ne
Nitrogen Trifluoride	NF_3
Ammonia	NH_3
Nitric Oxide	NO
Oxygen	O_2
Phosphorous Pentafluoride	PF_5
Phosphine	PH_3
Sulfer Tetrafluoride	SF_4
Sulfer Hexafluoride	SF_6
Disilane	Si_2H_6
Silicon Tetrachloride	$SiCl_4$
Silicon Tetrafluoride	SiF_4
Dichlorosilane	SiH_2Cl_2
Silane	SiH_4
Trichlorosilane	$SiHCl_3$
Sulfur Dioxide	SO_2
Diethyltelluride	$Te(C_2H_5)_2$
Tungsten Hexafluoride	WF_6
Xenon	Xe

· This applicable fluid is a reference guide and does not apply to product guarantee.
· Please consult SMC for a specific recommendation beyond the scope of this document.

⚠ Caution

Since the product specified here is used under various operating conditions, its compatibility with fluid and specific equipment must be decided by the person who designs the equipment or decided its specifications based on necessary analysis and test results.
The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product regardless of any recommendation.
Proper installation, operation and maintenance are also required to assure safe, trouble free performance.

Diaphragm Valve for Ultra High Purity

Air operated type

AZ3542 & 4542 Series

- **Suitable for UHP gas supply line**
- **Body material: 316L SS**
- **Pneumatically actuated normally closed**

RoHS

How to Order

AZ [3] [542] [S] [2P] [MV4] [MV4] [ ]

(Inlet) (Outlet)

Size

Code	Cv
3	0.29
4	0.5

Model

Code	Status	Maximum operating pressure
542	Normally closed (N.C.)	125 psig (0.9 MPa)

Material

Code	Body material
S	316L SS

Ports

Code	Ports	Connection
2P	2 ports	Machined
2PW		Welded

Optional portings and porting configurations available.
Please refer to page 808.

Seat material

Code	Material
No code	PCTFE (Standard)
VS	Polyimide

Connections

Code	Connections	Size	AZ3		AZ4	
		Port	**2P**	**2PW**	**2P**	**2PW**
MV4	1/4 inch face seal (Male) *1)		●	○	●	○
FV4	1/4 inch face seal (Female)			○		○
TW4	1/4 inch tube weld		●	○		
MV6	3/8 inch face seal (Male) *1)				●	○
FV6	3/8 inch face seal (Female)					○
TW6	3/8 inch tube weld				●	○
TW8	1/2 inch tube weld				●	

●: Only available with the same type fittings inlet and outlet.
○: Inlet and outlet available with any combination of fitting type and size.
∗ 1) Fixed fitting (no rotating nut)

Specifications

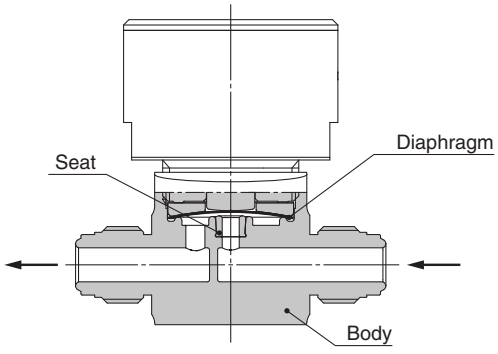
Operating Parameters		AZ3542	AZ4542
Status		Normally closed (N.C.)	
Gas		Select compatible materials of construction for the gas	
Operating pressure		Vacuum to 125 psig (0.9 MPa)	
Proof pressure		1.5 times the maximum operating pressure	
Burst pressure		3 times the maximum operating pressure	
Ambient and operating temperature		-10 to 71°C (No freezing)	
Cv		0.29	0.5
Leak rate	**Inboard leakage**	2×10^{-11} Pa·m³/s	
	Outboard leakage	2×10^{-10} Pa·m³/s *1)	
Across the seat leak		1×10^{-10} Pa·m³/s	
Surface finish		Ra 10µin. (0.25 µm)	
Connections		Face seal, Tube weld	
Actuation pressure		60 to 110 psig (0.4 to 0.76 MPa)	
Actuation port connection		M5 x 0.8	
Actuation port location		Top	
Installation		Bottom mount	
Internal volume		0.06 in³ (1.07 cm³)	
Weight		0.24 kg *2)	

∗ 1) Tested with Helium gas inlet pressure 125 psig (0.9 MPa).
∗ 2) Weight for AZ3542S2PMV4MV4 including individual boxed weight. It may vary depending on connections or options.

Wetted Parts Material

Wetted Parts	S
Body	316L SS
Surface finish	Electropolish + Passivation
Diaphragm	Ni-Co Alloy
Seat	PCTFE (Option: Polyimide)

Construction

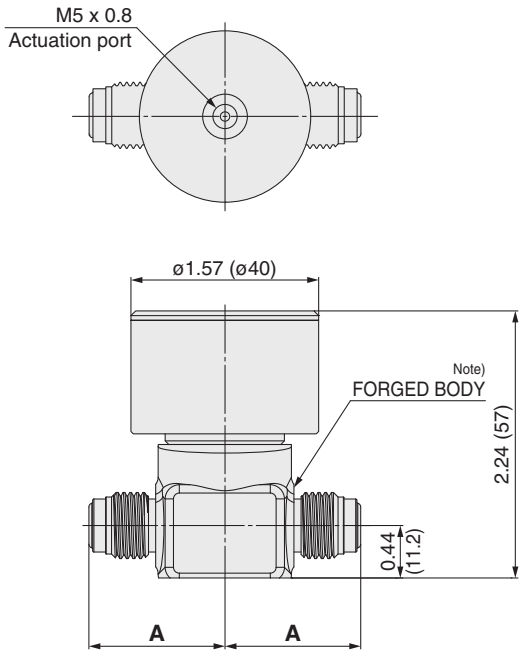


Dimensions

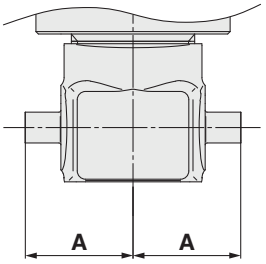
inch (mm)

AZ3542 & 4542

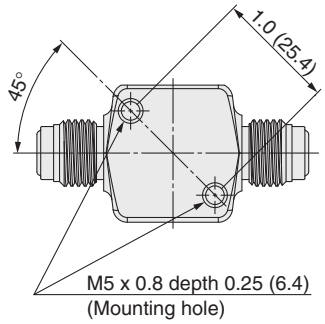
Ports: 2P (Machined)



Connections: MV□



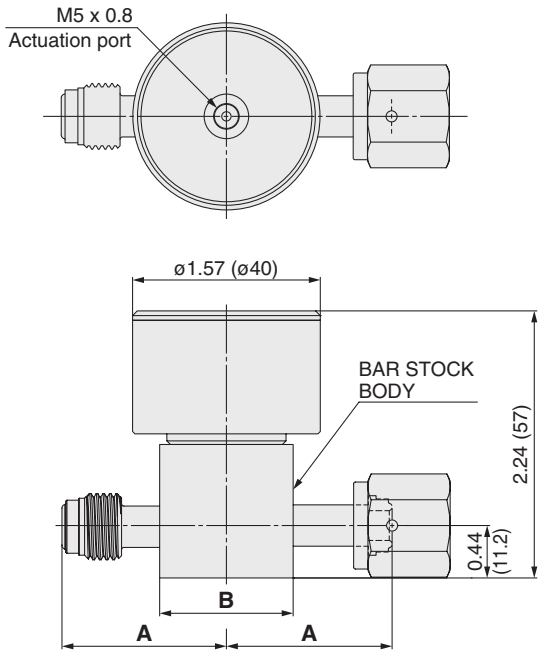
Connections: TW□



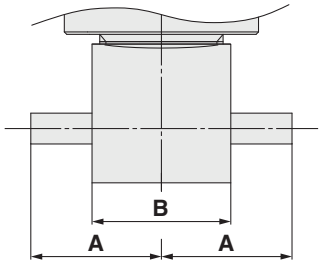
Note) MV6 is bar stock body.

Ports	Connections	A	
		inch	(mm)
2P (Machined)	**MV4**	1.14	(29.0)
	TW4	0.875	(22.2)
	MV6	1.5	(38.1)
	TW6	0.875	(22.2)
	TW8	1.125	(28.6)

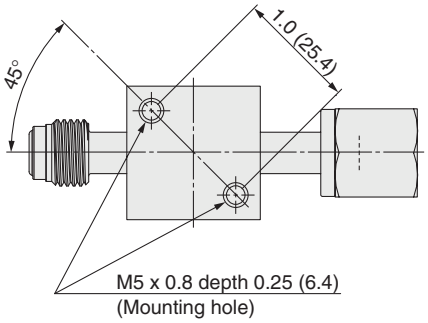
Ports: 2PW (Welded)



Connections: MV□, FV□



Connections: TW□



Ports	Connections	A		B	
		inch	(mm)	inch	(mm)
2PW (Welded)	**MV4**	1.39	(35.3)	1.12 sq.	(28.4)
	FV4				
	TW4	1.06	(26.9)		
	MV6	1.93	(49.0)		
	FV6				
	TW6	1.325	(33.7)		

Diaphragm Valve for Ultra High Purity

Manually operated type

AZ3652 & 4652 Series

- **Suitable for UHP gas supply line**
- **Body material: 316L SS**

RoHS

How to Order

AZ 3 652 S 2P MV4 (Inlet) MV4 (Outlet) [ ]

Size

Code	Cv
3	0.29
4	0.5

Model

Code	Knob	Maximum operating pressure
652	1/4 turn indicating round knob with a raised rectangular section	250 psig (1.7 MPa)

Material

Code	Body material
S	316L SS

Ports

Code	Ports	Connection
2P	2 ports	Machined
2PW		Welded

Optional portings and porting configurations available.
Please refer to page 808.

Seat material

Code	Material
No code	PCTFE (Standard)
VS	Polyimide

Connections

Code	Connections	Size	AZ3		AZ4	
		Port	**2P**	**2PW**	**2P**	**2PW**
MV4	1/4 inch face seal (Male) *1)		●	○	●	○
FV4	1/4 inch face seal (Female)			○		○
TW4	1/4 inch tube weld		●	○		
MV6	3/8 inch face seal (Male) *1)				●	○
FV6	3/8 inch face seal (Female)					○
TW6	3/8 inch tube weld				●	○
TW8	1/2 inch tube weld				●	

●: Only available with the same type fittings inlet and outlet.
○: Inlet and outlet available with any combination of fitting type and size.
∗ 1) Fixed fitting (no rotating nut)

Specifications

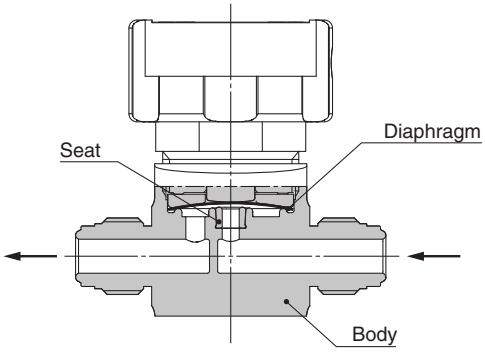
Operating Parameters		AZ3652	AZ4652
Gas		Select compatible materials of construction for the gas	
Operating pressure		Vacuum to 250 psig (1.7 MPa)	
Proof pressure		1.5 times the maximum operating pressure	
Burst pressure		3 times the maximum operating pressure	
Ambient and operating temperature		-40 to 71 °C (No freezing)	
Cv		0.29	0.5
Leak rate	**Inboard leakage**	2×10^{-11} Pa·m³/s	
	Outboard leakage	2×10^{-10} Pa·m³/s *1)	
Across the seat leak		1×10^{-10} Pa·m³/s	
Surface finish		Ra 10 μin.(0.25 μm)	
Connections		Face seal, Tube weld	
Installation		Bottom mount	
Internal volume		0.06 in³ (1.07 cm³)	
Weight		0.22 kg *2)	
Knob		1/4 turn indicating round knob with a raised rectangular section	

∗ 1) Tested with Helium gas inlet pressure 250 psig (1.7 MPa).
∗ 2) Weight for AZ3652S2PMV4MV4 including individual boxed weight. It may vary depending on connections.

Wetted Parts Material

Wetted Parts	S
Body	316L SS
Surface finish	Electropolish + Passivation
Diaphragm	Ni-Co Alloy
Seat	PCTFE (Option: Polyimide)

Construction

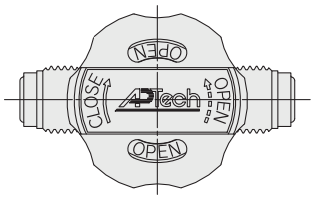


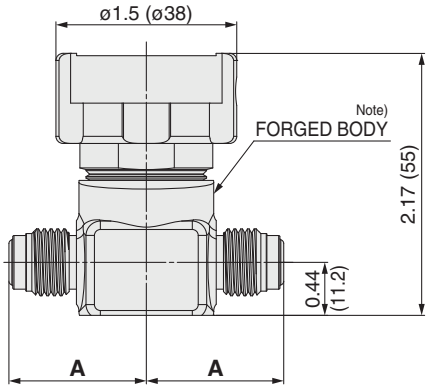
Dimensions

inch (mm)

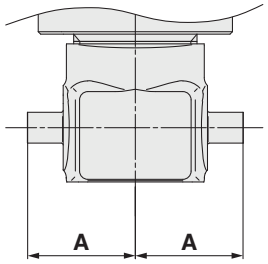
AZ3652 & 4652

Ports: 2P (Machined)

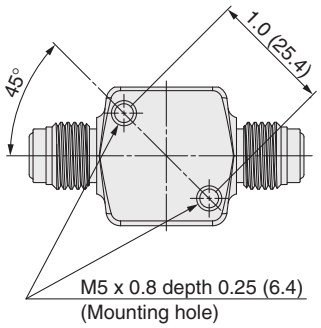




Connections: MV□



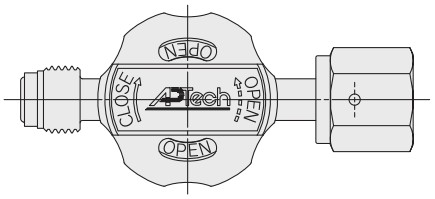
Connections: TW□

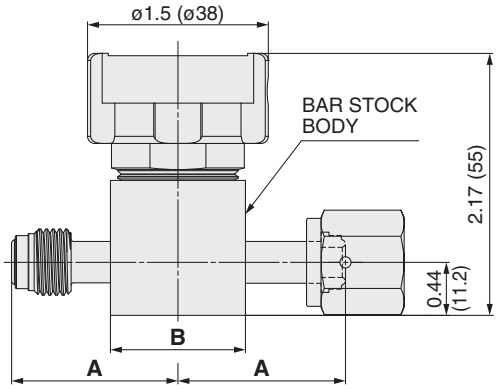


Note) MV6 is bar stock body.

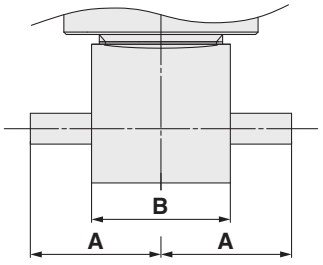
Ports	Connections	A	
		inch	(mm)
2P (Machined)	**MV4**	1.14	(29.0)
	TW4	0.875	(22.2)
	MV6	1.5	(38.1)
	TW6	0.875	(22.2)
	TW8	1.125	(28.6)

Ports: 2PW (Welded)

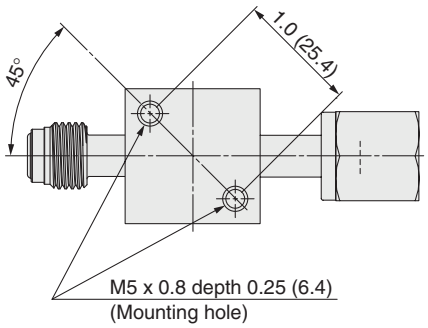




Connections: MV□, FV□



Connections: TW□



Ports	Connections	A		B	
		inch	(mm)	inch	(mm)
2PW (Welded)	**MV4**	1.39	(35.3)	1.12 sq.	(28.4)
	FV4				
	TW4	1.06	(26.9)		
	MV6	1.93	(49.0)		
	FV6				
	TW6	1.325	(33.7)		

Made to Order

Optional knob color available. Red, blue, green, gold, silver, purple, etc.
Please contact SMC for further information.

AZ Series / Diaphragm Valve
Optional Porting Configuration

How to Order

AZ **3652** **S** **4PWM** **MV4** **TW4** **FV4** **FV4** **[ ]**

① ② ③ ④

Size

Code
3542
4542
3652
4652

Material

Code	Body material
S	316L SS

Ports

Code	Ports	Configulation	Connections
2PW	2 ports	Refer to the port configuration	Welded
2PWA			
2PWC			
3PWD	3 ports		
3PWG			
3PWE			
4PWM	4 ports		

Connections (number indicates the port location)

Code	Connections	AZ3	AZ4
MV4	1/4 inch face seal (Male *1)	○	○
FV4	1/4 inch face seal (Female)	○	○
TW4	1/4 inch tube weld	○	
MV6	3/8 inch face seal (Male *1)		○
FV6	3/8 inch face seal (Female)		○
TW6	3/8 inch tube weld		○

○: Available with any combination of fitting type and size.
∗ 1) Fixed fitting

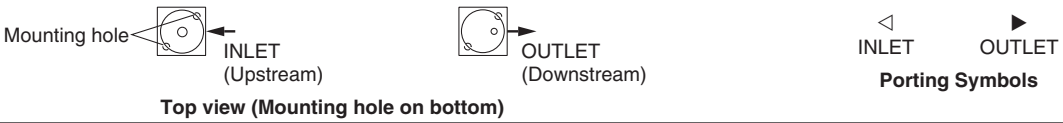
Seat material

Code	Material
No code	PCTFE (Standard)
VS	Polyimide

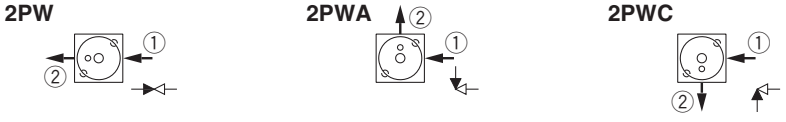
All multiple port options are welded type.
Please refer to the welded type for dimensions.

Port Configuration

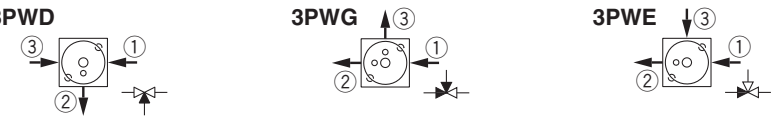
· Valves are illustrated top view looking down through the valve.
· Inlet (Upstream) is defined as a port connected to the region below the valve seat. It is illustrated with an arrow pointing towards the valve body or an "empty" triangle on the schematic. Outlet (Downstream) is defined as a port connected to the region above the seat and below the diaphragm. It is illustrated with an arrow pointing away from the valve body or a "filled" triangle on the schematic.
· The traditional flow direction is INLET to OUTLET, but AP Tech valves may be employed in either flow direction.
· End connections are specified in numerical order per the diagram's numbered arrows.



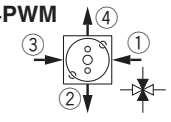
Top view (Mounting hole on bottom)



2 PORTS



3 PORTS



4 PORTS

Process Gas Equipment / Diaphragm Valve Specific Product Precautions

Be sure to read this before handling the products.
Refer to back page 50 for Safety Instructions and pages 633 and 634 for Process Gas Equipment Precautions.

Selection

⚠ Warning

1. Confirm the specifications.

This product is used in gas delivery systems to shutoff gas flow. When selecting the product, confirm the operating conditions, such as type of gas, operating pressure (inlet and outlet), flow rate, actuating pressure, operating temperature etc., and use within the operating range specified in the catalog. The product may not be suitable for use with specific gases and applications/environments. Check the compatibility of the product materials with the process gas.
Design the equipment and select the product by understanding the characteristics of gas.

Mounting

⚠ Warning

1. Confirm the mounting direction of the product.

Inlet ports are labeled with an “IN” mark. The outlet ports are usually not labeled but may be labeled with an “OUT” mark. Orient the valve as specified by the system designer.

2. Connect actuation pressure to the valve actuator connection. (Air operated type)

Use nitrogen or clean dry air for actuation pressure. The connection M5 thread.

3. After installation, check internal leakage (leakage across seat) with inert gases.

Perform a helium leak test depending on applications.

Maintenance

⚠ Warning

1. If a valve requires repair, contact SMC or sales representative.

Operation (Air operate type)

⚠ Warning

1. Use nitrogen or clean dry air as actuation pressure.

2. Confirm the valve type (N.C.).

In the case of N.C. (Normally Closed), valve will open when applying actuation pressure to the valve actuator connection and valve will close when actuation pressure is vented to atmospheric pressure.

3. Apply actuation pressure within the range of specifications.

Operation (Manually operated type)

⚠ Warning

1. When closing the valve, rotate the handle clockwise until it completely stops.

There is the internal stop in the handle or in the valve body. Rotate the handle clockwise until the internal stop is reached and it completely stops.

2. When opening the valve, rotate the handle counterclockwise until it completely stops.

There is the internal stop in the handle. Rotate the handle counterclockwise until the internal stop is reached and it completely stops.

3. Do not use a tool when rotating the handle.

When the handle is rotated with a tool, it may apply excessive torque to the handle or inside the valve body and it may cause damage. Rotate the handle by hand.