RoHS

For wide variety of applications from semiconductor to general.

Multiple port available in various configurations Compression, Rc, R, NPT

Cleaned for O_2 service

Air Operated Type
AK3542/4542 Series

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

Weight **280 g** Height **57 mm**

Manually Operated Type
AK3652/4652 Series

- 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.

Weight **260 g** Height **55 mm**

Direction of a raised rectangular section indicate open/close status

APTech

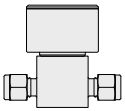
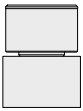
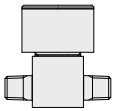
Air Operated Type
AK3542/AK4542 Series

Manually Operated Type
AK3652/AK4652 Series

Body material

316 SS
Passivation internals

Various configurations available

Body			
Connection	Compression	Rc NPT female	R NPT male
Connection size (inch)	1/4, 3/8		

Air Operated Type

 Female thread type	 Compression	Series	Status	Body material	Max. operating pressure psig (MPa)	Cv Note)	Connections: Fitting	Page
		AK3542	**N.C.**	**316 SS**	**125 (0.9)**	**0.29**	**Compression Rc, R, NPT**	**P.814**
		AK4542				**0.5**		

Manually Operated Type

 Female thread type	 Compression	Series	Knob	Body material	Max. operating pressure psig (MPa)	Cv Note)	Connections: Fitting	Page
		AK3652	**Knob with a raised section on top (indication window)**	**316 SS**	**250 (1.7)**	**0.29**	**Compression Rc, R, NPT**	**P.816**
		AK4652				**0.5**		

Note) Cv calculation based on SEMI Standard

AZ Series

- **SEMI standard**
- **Body material: 316L SS**
- **Face seal**
  Tube weld


Air Operated Type


Manually Operated Type

Refer to page 801 for details.

AK 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
Argon	Ar
Halocarbon 114	$C_2Cl_2F_4$
Halocarbon 115	C_2ClF_5
Halocarbon 116	C_2F_6
Acetylene	C_2H_2
Halocarbon 134A	$C_2H_2F_4$
Halocarbon 125	C_2HF_5
Halocarbon R218	C_3F_8
Propene	C_3H_6
Propane	C_3H_8
Halocarbon C318	C_4F_8
Butene-1	C_4H_8
Halocarbon 13B1	$CBrF_3$
Halocarbon 12	CCl_2F_2

Process Gas	Molecular Formula
Halocarbon 13	$CClF_3$
Halocarbon 14	CF_4
Halocarbon 32	CH_2F_2
Methane	CH_4
Halocarbon 23	CHF_3
Carbon Dioxide	CO_2
Hydrogen	H_2
Helium	He
Krypton	Kr
Nitrogen	N_2
Neon	Ne
Oxygen	O_2
Xenon	Xe

· Following * symbols indicate toxic gas (allowable concentration 200 ppm or less). In Japan, according to METI, pipe thread (Rc, R, NPT etc) should not be used as connections of piping, fittings, and valves installed in gas systems.

Process Gas	Molecular Formula
Boron 11 Trifluoride*	$11BF_3$
Arsine*	AsH_3
Boron Trichloride*	BCl_3
Boron Trifluoride*	BF_3
Ethylene*	C_2H_4
Dimethylsilane*	C_2SiH_8
Perfluoro-butadiene*	C_4F_6
Octafluorocyclopentene*	C_5F_8
Halocarbon 12B2*	CBr_2F_2
Trimethylsilane*	$(CH_3)_3SiH$
Methyl Chloride*	CH_3Cl
Methyl Fluoride*	CH_3F
Methanol*	CH_3OH
Methylsilane*	CH_3SiH_3
Halocarbon 21*	$CHCl_2F$
Chlorine*	Cl_2
Chlorine Trifluoride*	ClF_3
Carbon Monoxide*	CO
Germane*	GeH_4
Hydrogen Sulfide*	H_2S
Hydrogen Selenide*	H_2Se

Process Gas	Molecular Formula
Hydrogen Bromide*	HBr
Hydrogen Chloride*	HCl
Hydrogen Fluoride*	HF
Nitrogen Oxide*	N_2O
Nitrogen Trifluoride*	NF_3
Ammonia*	NH_3
Nitric Oxide*	NO
Phosphorous Pentafluoride*	PF_5
Phosphine*	PH_3
Sulfur Tetrafluoride*	SF_4
Sulfur 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

· 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

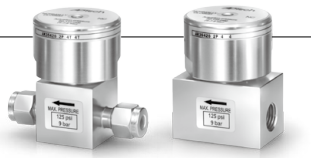
Since the product specified here is used under various operating conditions, its compatibility with fluid and specific equipment must be decided by the person who designs the equipment or decided its specifications based on necessary analysis and test results. The expected performance and safety assurance 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 Valves for General Applications

Air operated type

AK3542 & 4542 Series

- **Body material: 316 SS**
- **Normally closed**



RoHS

How to Order

AK 3 542 S 2P (Inlet) 4T (Outlet) 4T

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	316 SS

Ports

Code	Ports
2P	2 ports

Seat material

Code	Material
No code	PCTFE (Standard)
VS	Polyimide

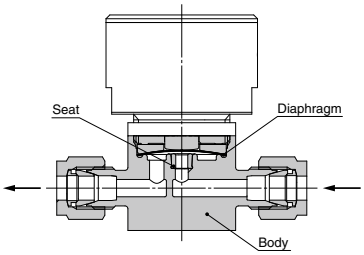
Connections

Code	Connections	AK3	AK4
4T	1/4 inch compression	●	—
4BR	Rc 1/4		
4BRN	R 1/4		
4	NPT 1/4 female		
4N	NPT 1/4 male		
6T	3/8 inch compression	—	●
6BR	Rc 3/8		
6BRN	R 3/8		
6	NPT 3/8 female		
6N	NPT 3/8 male		

Note) Only available with same type fittings inlet and outlet.

Construction

AK3542



Wetted Parts Material

Wetted Parts	S
Body	316 SS
Diaphragm	Ni-Co Alloy
Seat	PCTFE (Option: Polyimide)

Specifications

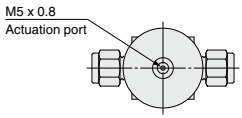
Operating Parameters	AK3542	AK4542
Status	Normally closed (N.C.)	
Gas	Select compatible materials of construction for the gas	
Operating pressure	Vacuum to 125 psig (0.9 MPa)	
Proof pressure	1.5 times the maximum operating pressure	
Burst pressure	3 times the maximum operating pressure	
Ambient and operating temperature	−10 to 71°C (No freezing)	
Cv	0.29	0.5
Leak rate	1 x 10^{-10} Pa·m^3/s	
Connections	Compression, Rc, R, NPT	
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 in^3 (1.07 cm^3)	
Weight	0.28 kg Note)	

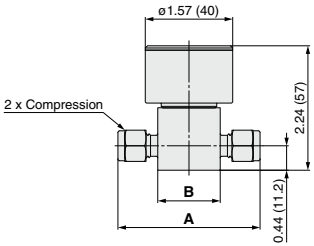
Note) Weight for AK3542S2P4T4T including individual boxed weight. It may vary depending on connections or options.

Dimensions

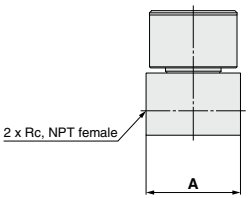
inch (mm)

AK3542 & 4542

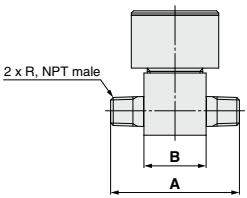




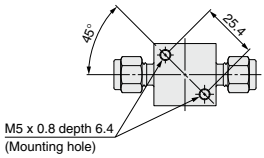
Connections: 4T, 6T



Connections: 4, 6, 4/6BR



Connections: 4/6N, 4/6BRN

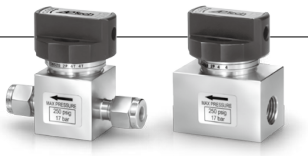


Ports	A		B		Connections
	inch	(mm)	inch	(mm)	
4T	2.56	(65.0)	1.12 sq.	(28.4)	1/4 inch compression
4BR	1.70	(43.2)	—	—	Rc 1/4
4BRN	2.32	(58.9)	1.12 sq.	(28.4)	R 1/4
4	1.70	(43.2)	—	—	NPT 1/4 female
4N	2.32	(58.9)	1.12 sq.	(28.4)	NPT 1/4 male
6T	2.68	(68.1)	1.12 sq.	(28.4)	3/8 inch compression
6BR	2.32	(58.9)	—	—	Rc 3/8
6BRN	2.32	(58.9)	1.12 sq.	(28.4)	R 3/8
6	2.32	(58.9)	—	—	NPT 3/8 female
6N	2.32	(58.9)	1.12 sq.	(28.4)	NPT 3/8 male

Diaphragm Valves for General Applications

AK3652 & 4652 Series

- **Body material: 316 SS**



RoHS

How to Order

AK 3 652 S 2P 4T 4T
(Inlet) (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	316 SS

Ports

Code	Ports
2P	2 ports

Seat material

Code	Material
No code	PCTFE (Standard)
VS	Polyimide

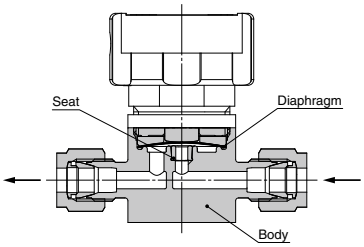
Connections

Code	Connections	AK3	AK4
4T	1/4 inch compression	●	—
4BR	Rc 1/4		
4BRN	R 1/4		
4	NPT 1/4 female		
4N	NPT 1/4 male		
6T	3/8 inch compression	—	●
6BR	Rc 3/8		
6BRN	R 3/8		
6	NPT 3/8 female		
6N	NPT 3/8 male		

Note) Only available with same type fittings inlet and outlet.

Construction

AK3652



Wetted Parts Material

Wetted Parts	S
Body	316 SS
Diaphragm	Ni-Co Alloy
Seat	PCTFE (Option: Polyimide)

Specifications

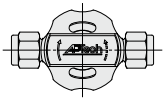
Operating Parameters	AK3652	AK4652
Gas	Select compatible materials of construction for the gas	
Operating pressure	Vacuum to 250 psig (1.7 MPa)	
Proof pressure	1.5 times the maximum operating pressure	
Burst pressure	3 times the maximum operating pressure	
Ambient and operating temperature	–40 to 71°C (No freezing)	
Cv	0.29	0.5
Leak rate	1 x 10^{-10} Pa·m^3/s	
Connections	Compression, Rc, R, NPT	
Installation	Bottom mount	
Internal volume	0.06 in^3 (1.07 cm^3)	
Weight	0.26 kg Note)	
Knob	1/4 turn indicating round knob with a raised rectangular section	

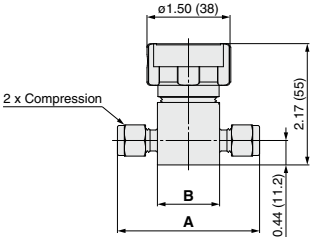
Note) Weight for AK3652S2P4T4T including individual boxed weight. It may vary depending on connections.

Dimensions

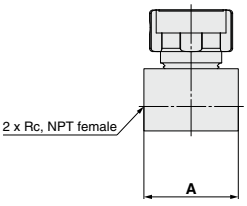
inch (mm)

AK3652 & 4652

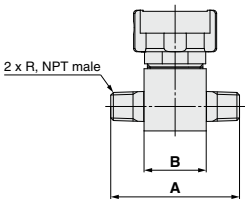




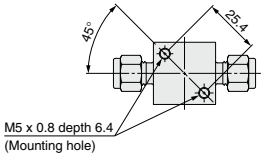
Connections: 4T, 6T



Connections: 4, 6, $^4_6$BR



Connections: $^4_6$N, $^4_6$BRN



Ports	A		B		Connections
	inch	(mm)	inch	(mm)	
4T	2.56	(65.0)	1.12 sq.	(28.4)	1/4 inch compression
4BR	1.70	(43.2)	—	—	Rc 1/4
4BRN	2.32	(58.9)	1.12 sq.	(28.4)	R 1/4
4	1.70	(43.2)	—	—	NPT 1/4 female
4N	2.32	(58.9)	1.12 sq.	(28.4)	NPT 1/4 male
6T	2.68	(68.1)	1.12 sq.	(28.4)	3/8 inch compression
6BR	2.32	(58.9)	—	—	Rc 3/8
6BRN	2.32	(58.9)	1.12 sq.	(28.4)	R 3/8
6	2.32	(58.9)	—	—	NPT 3/8 female
6N	2.32	(58.9)	1.12 sq.	(28.4)	NPT 3/8 male

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.

Direction of gas flow from inlet to outlet is indicated by an arrow on each label.
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. Tighten thread to recommended torque value.

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.