Ultrahigh-Purity Valves

for Atomic Layer Processing

Atomic Layer Deposition (ALD) Valves

- Ultrahigh cycle life with high-speed actuation
- C_v range from 0.27 to 1.7
- Full immersion capability up to 392°F (200°C) with thermal actuators
- Electronic or optical actuator position-sensing option
- Suitable for ultrahigh-purity applications with 316L VIM-VAR stainless steel body
- Modular surface-mount, tube butt weld, and VCR® end connections

Swagelok

Contents

ALD3 and ALD6 Diaphragm Valve Features

- Normally closed and normally open pneumatic actuation
- Flow coefficients of 0.27 to 0.62 standard; custom flow coefficients available
- Two-port straight and elbow configurations
- Two-, three-, and four-port multiport valves and multivalve manifolds
- Two- and three-port modular surface-mount valves in 1.125 in. (ALD3 series only) and 1.5 in. platforms
  - C-seal design (all valves)
  - W-seal design (ALD3 series only)
- VCR, “H” Type VCR, and tube butt weld end connections in 1/4, 3/8, and 1/2 in. and 6, 10, and 12 mm sizes

Diaphragm

- Cobalt-based superalloy (UNS R30003) material for strength and corrosion resistance
- Optimized design for ultrahigh cycle life

Seat

- Fully contained seat design
- High-purity grade PFA, fully fluorinated
- Ultrahigh cycle life
- Broad range of chemical compatibility
- Excellent resistance to swelling and contamination
- High-integrity seat seal performance

Body

- Body seal provides ultrahigh cycle life
- 316L VIM-VAR stainless steel body material for ultrahigh-purity applications
- Fully swept flow path
  - minimizes entrapment areas
  - facilitates purging
  - maximizes flow capacity
- Optional body holes to accommodate heater cartridges

Actuators

Standard

- Pneumatic actuator for high-speed and repeatable actuation
- Capable of valve opening or closing time of less than 5 ms
- Factory-set flow adjusting mechanism ensures precise and consistent C_v from valve to valve
- Optional factory-set electronic actuator-position sensor verifies open position of pneumatically actuated valves
- Optional solenoid pilot valve for electronic control of high-speed actuation

Thermal

Same performance and options as standard actuator with the following additional features:

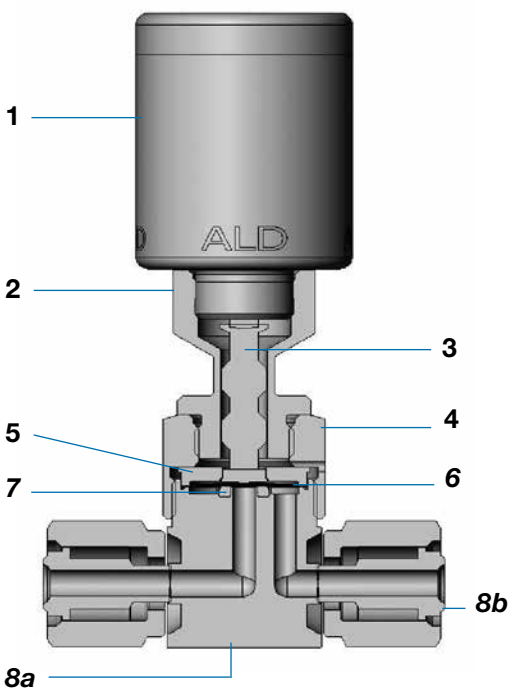
- Includes thermal isolation coupling for thermal applications
- Limits conductive heat transfer from the body to the actuator
- Provides a more uniform valve body temperature to reduce cold spots
- Significantly reduces electrical power required to heat the valve
- Extends the life of the actuator in applications where the body is heated

Materials of Construction (ALD3 and ALD6)

	Component	Material Grade/ASTM Specification
1	Pneumatic actuator assembly	—
	Cylinder, cap	Aluminum
	Pistons	Powdered metal 300 series SS—normally open; aluminum—normally open and normally closed
	Base	Powdered metal 300 series SS—normally open; none—normally closed
	Flow adjusting mechanism	316 SS/A479
	O-rings	Fluorocarbon FKM
	Springs	S17700
	Button	316 SS/A479
	Bushing	Carbon-filled PTFE
2	Thermal isolation coupling housing (thermal model only)	316 SS/A479
3	Thermal isolation coupling stem (thermal model only)	S17400
4	Bonnet nut	316 SS/A479
5	Bonnet	S17400
6	*Diaphragm*	*Cobalt-based superalloy (UNS R30003)/AMS 5876*
7	*Seat*	*High-purity PFA Type II/D3307*
8a	*Body*	*316L VIM-VAR SS/SEMI F20 Ultrahigh-Purity*①
8b	*Welded VCR end connections*	*316L VAR SS/SEMI F20 High-Purity*①
	Lubricant	PTFE-based

Wetted components listed in *italics*.

① 20 % minimum elongation allowed.



Normally Closed Actuator Shown

Process Specifications (ALD3 and ALD6)

See Swagelok® *Ultrahigh-Purity Process Specification (SC-01)* catalog, MS-06-61 for details on processes, process controls, and process verification.

Cleaning	Assembly and Packaging	Wetted Surface Roughness (R_a)	Testing
Ultrahigh-purity cleaning with a continuously monitored, deionized water, ultrasonic cleaning system	Performed in ISO Class 4 work areas; valves are double bagged and vacuum sealed in cleanroom bags.	Electropolished and finished to an average of 5 µin. (0.13 µm)	ALD3 normally closed: Inboard helium leak tested to a rate of 1×10^{-9} std cm³/s at the seat, envelope, and all seals. ALD3 and ALD6 normally open and ALD6 normally closed: Inboard helium leak tested to a rate of 1×10^{-8} std cm³/s at the seat and to a rate of 1×10^{-9} std cm³/s at the envelope and all other seals.

Technical Data (ALD3 and ALD6)

Valve Series	Working Pressure psig (bar)		Temperature Rating °F (°C)			Flow Coefficient (C_v)④	Orifice in. (mm)	Internal Volume⑤ in.³ (cm³)		Pneumatic Actuator⑤	
			Operating②③		Short-Term Bakeout			Tube Butt Weld Body	2-Port Surface-Mount	Actuation Pressure psig (bar)	Air Displacement in.³ (cm³)
	Operating①	Burst	Standard Actuator	Thermal Actuator②							
Normally Closed Actuation											
ALD3	Vacuum to 145 (10.0)	>3200 (220)	32 to 248 (0 to 120)	32 to 392 (0 to 200)	392 (200) (valve open)	0.27	0.16 (4.1)	0.086 (1.4)	0.048 (0.79)	50 to 90 (3.5 to 6.2)	0.042 (0.69)
ALD6						0.62	0.23 (5.8)	0.26 (4.3)	0.084 (1.4)		0.075 (1.2)
Normally Open Actuation											
ALD3	Vacuum to 145 (10.0)	>3200 (220)	32 to 248 (0 to 120)	32 to 392 (0 to 200)	392 (200) (valve open)	0.27	0.16 (4.1)	0.086 (1.4)	0.048 (0.79)	70 to 90 (4.9 to 6.2)	0.027 (0.44)
ALD6						0.62	0.23 (5.8)	0.26 (4.3)	0.084 (1.4)		0.046 (0.75)

① Recommended operating pressure of less than 35 psig (2.4 bar) for optimal cycle life.

② Actuator temperature is limited to 248°F (120°C); valve body temperature is rated to 392°F (200°C).

③ See pages 6 and 7 for maximum operating temperatures for products with an electronic actuator-position sensor, solenoid pilot valve, or both.

④ Custom flow coefficients available; contact your authorized Swagelok representative for more information.

⑤ ALD3 series 1.125 in. platform surface-mount valve:
- Internal volume for 2-port body: 0.078 in.³ (1.3 cm³)
- Actuation pressure: normally closed, 60 to 90 psig (4.2 to 6.2 bar); normally open, 70 to 90 psig (4.9 to 6.2 bar).
- Air displacement: 0.03 in.³ (0.49 cm³).

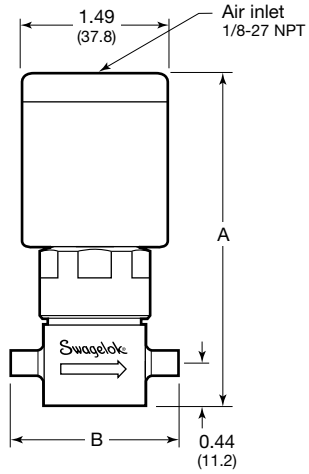
Ordering Information and Dimensions (ALD3 and ALD6)

Dimensions, in inches (millimeters), are for reference only and are subject to change.

Two-Port Valves

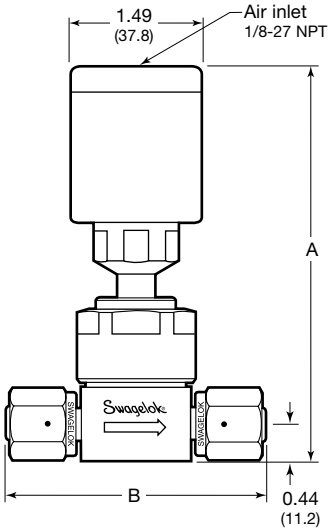
For a complete ordering number, add **C** for a normally closed actuator or **NO** for a normally open actuator.

Normally Closed Standard Actuator



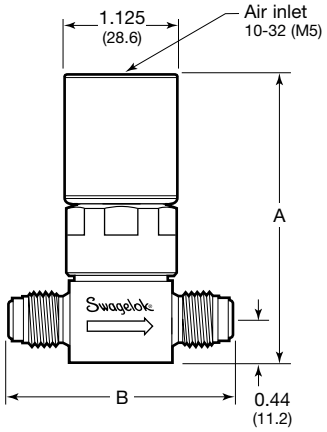
Butt Weld End Connections

Normally Closed Thermal Actuator



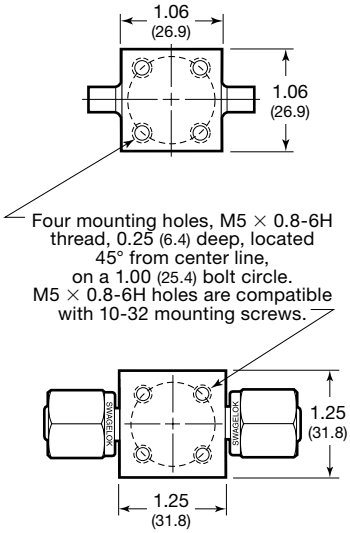
Female VCR Fitting End Connections

Normally Open Standard Actuator



Integral Male VCR Fitting End Connections

ALD3 Bottom



ALD6 Bottom

End Connections		Standard Actuator Ordering Number	Thermal Actuator Ordering Number	Dimensions, in. (mm)		
				A		
Inlet/Outlet	Size			Normally Closed	Normally Open	B
ALD3 Series						
Female VCR fitting	1/4 in.	6LVV-ALD3FR4-P-	6LVV-ALD3TFR4-P-	3.50 (88.9) (standard actuator)	3.22 (81.8) (standard actuator)	2.78 (70.6)
Integral male VCR fitting	1/4 in.	6LVV-ALD3VR4-P-	6LVV-ALD3TVR4-P-			2.30 (58.4)
Rotatable male VCR fitting	1/4 in.	6LVV-ALD3MR4-P-	6LVV-ALD3TMR4-P-			2.78 (70.6)
Tube butt weld, 0.30 in. long	1/4 × 0.035 in.	6LVV-ALD3BW4-P-	6LVV-ALD3TBW4-P-	4.50 (114) (thermal actuator)	4.22 (107) (thermal actuator)	1.74 (44.2)
Tube butt weld, 0.26 in. long	1/4 × 0.035 in.	6LVV-ALD3BW4S-P-	6LVV-ALD3TBW4S-P-			1.61 (40.9)
Tube butt weld, 7.6 mm long	6 × 1 mm	6LVV-ALD3BW6M-P-	6LVV-ALD3TBW6M-P-			1.74 (44.2)
ALD6 Series						
Female VCR fitting	1/2 in.	6LVV-ALD6FR8-P-	6LVV-ALD6TFR8-P-	3.76 (95.5) (standard actuator)	3.48 (88.4) (standard actuator)	4.16 (106)
Female “H” type VCR fitting	1/4 in.	6LVV-ALD6HFR4-P-	6LVV-ALD6THFR4-P-			2.78 (70.6)
Female/rotatable male “H” type VCR fitting	1/4 in.	6LVV-ALD6HFR4HMR4-P-	6LVV-ALD6THFR4HMR4-P-			2.96 (75.2)
Rotatable male VCR fitting	1/2 in.	6LVV-ALD6MR8-P-	6LVV-ALD6TMR8-P-			4.16 (106)
Rotatable male “H” type VCR fitting	1/4 in.	6LVV-ALD6HMR4-P-	6LVV-ALD6THMR4-P-	4.76 (121) (thermal actuator)	4.48 (114) (thermal actuator)	2.96 (75.2)
Tube butt weld, 0.50 in. long	3/8 × 0.035 in.	6LVV-ALD6BW6-P-	6LVV-ALD6TBW6-P-			2.25 (57.2)
	1/2 × 0.049 in.	6LVV-ALD6BW8-P-	6LVV-ALD6TBW8-P-			
Tube butt weld, 12.7 mm long	10 × 1 mm	6LVV-ALD6BW10M-P-	6LVV-ALD6TBW10M-P-			
	12 × 1 mm	6LVV-ALD6BW12M-P-	6LVV-ALD6TBW12M-P-			

Ordering Information and Dimensions (ALD3 and ALD6)

Dimensions, in inches (millimeters), are for reference only and are subject to change.

Modular Surface-Mount Valves

Standard and High-Flow C-Seal Design

For a complete ordering number, add **C** for a normally closed actuator or **NO** for a normally open actuator.

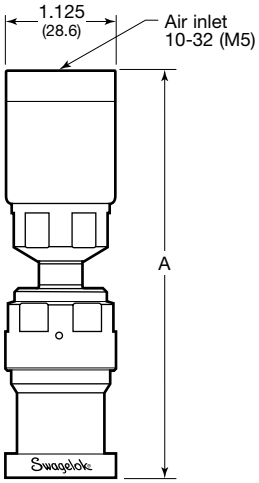
W-Seal Design

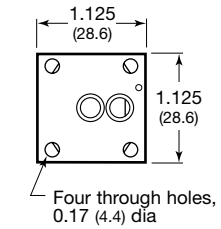
Insert **W** into an ALD3 series ordering number as shown.

Examples:

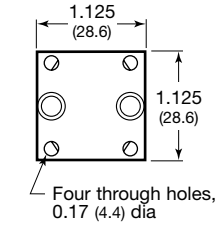
- 6LVV-MSM-ALD3E-**W**2-P-C for a 1.125 in. 2-port valve with standard actuator
- 6LVV-MSM-ALD3T-**W**3-P-C for a 1.5 in. 3-port valve with thermal actuator

Normally Closed Thermal Actuator, 1.125 in. Platform



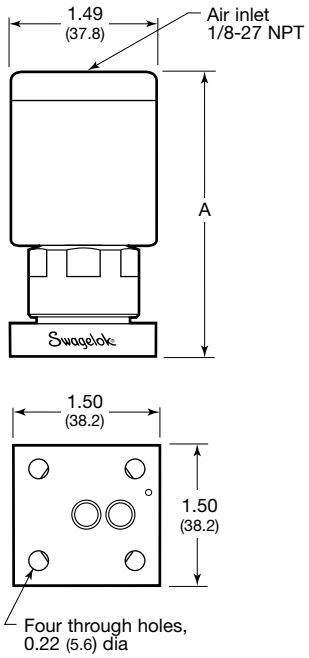


1.125 in. C-Seal Platform Bottom



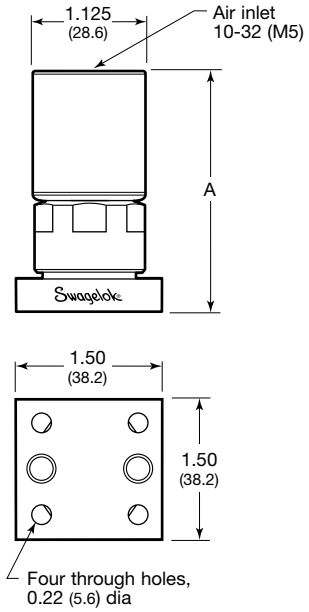
1.125 in. W-Seal Platform Bottom

Normally Closed Standard Actuator 1.5 in. Platform



1.5 in. C-Seal Platform Bottom

Normally Open Standard Actuator 1.5 in. Platform

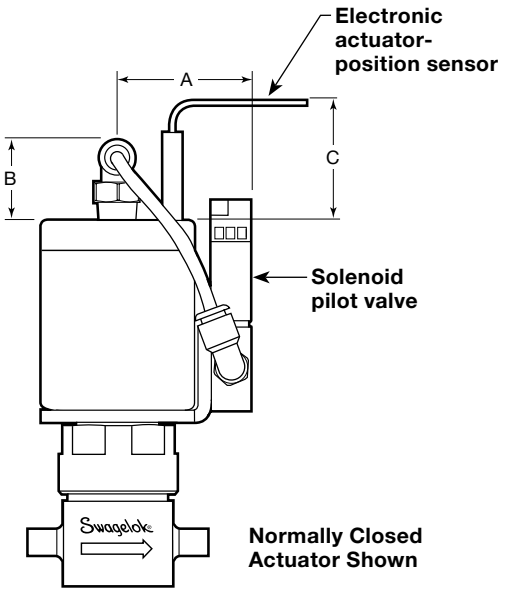


1.5 in. W-Seal Platform Bottom

Surface-Mount Platform	Ports	Standard Actuator Ordering Number	Thermal Actuator Ordering Number	**A,** in. (mm)			
				Normally Closed		Normally Open	
				C-Seal	W-Seal	C-Seal	W-Seal
ALD3 Series							
1.125 in.	2	6LVV-MSM-ALD3E-2-P-	6LVV-MSM-ALD3ET-2-P-	3.40 (86.4) (standard) 4.40 (112) (thermal)	3.40 (86.4) (standard) 4.40 (112) (thermal)	3.45 (87.6) (standard) 4.45 (113) (thermal)	3.45 (87.6) (standard) 4.45 (113) (thermal)
	3	6LVV-MSM-ALD3E-3-P-	6LVV-MSM-ALD3ET-3-P-				
1.5 in.	2	6LVV-MSM-ALD3-2-P-	6LVV-MSM-ALD3T-2-P-	3.02 (76.7) (standard) 4.02 (102) (thermal)	3.70 (94.0) (standard) 4.70 (119) (thermal)	2.74 (69.6) (standard) 3.74 (95.0) (thermal)	3.42 (86.9) (standard) 4.42 (112) (thermal)
	3	6LVV-MSM-ALD3-3-P-	6LVV-MSM-ALD3T-3-P-				
ALD6 Series							
1.5 in.	2	6LVV-MSM-ALD6-HF2-P-	6LVV-MSM-ALD6T-HF2-P-	3.15 (80.0) (standard) 4.15 (105) (thermal)	—	2.87 (72.9) (standard) 3.87 (98.3) (thermal)	—
	3	6LVV-MSM-ALD6-HF3-P-	6LVV-MSM-ALD6T-HF3-P-				

Options and Accessories (ALD3 and ALD6)

Valves with electronic actuator-position sensors (right), solenoid pilot valve assemblies, page 7, heater cartridge holes, page 7, and optical position sensors, page 12, are available.



Dimensions

Actuator	Dimensions, in. (mm)		
	A	B	C
Normally closed	1.32 (33.5)	0.70 (17.8)	1.18 (30.0)
Normally open	1.14 (29.0)	0.63 (16.0)	

Ordering Information

To order one option, add a designator to the valve ordering number. To order two or more options, add the designators in the sequence shown below.

6LVV – ALD3BW4-P-C **S V H**

- **S**: Electronic actuator-position sensor
- **V**: Solenoid pilot valve assembly
- **H**: Heater cartridge holes

Examples:

6LVV-ALD3BW4-P-C**H** for a valve with heater cartridge holes

6LVV-ALD3BW4-P-C**S** for a valve with electronic actuator-position sensor with short pigtail electrical connector

6LVV-ALD3BW4-P-C**SLH** for a valve with electronic actuator-position sensor with long cable with flying leads electrical connector and heater cartridge holes

6LVV-A3T1V333P-AA**V** for a multivalve manifold with solenoid pilot valve assembly on valve 2

6LVV-A31V333P-A**SV**A**SV** for a multivalve manifold with electronic actuator-position sensor with short pigtail electrical connector and solenoid pilot valve assembly on both valves

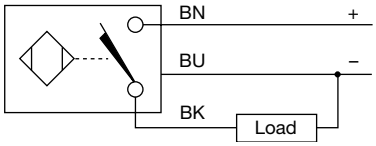
Electronic Actuator-Position Sensors

Transmit a signal to an electrical device indicating the open position of pneumatically actuated valves. Sensors and electrical connectors described below are third-party products.

Sensor Technical Information

Output	3-wire V (dc)—transistor (current-sourcing)
Output Function	Normally open
Voltage	10 to 30 V (dc) polarity protected—pulsed SCP
Operating Temperature	–23 to 70°C (–10 to 158°F)

Wiring Diagram



Factory-Assembled Electronic Actuator-Position Sensors

Factory-assembled position sensors are set for optimum performance and sealed with a tamper-evident paste that provides visible evidence of disassembly or adjustment.

To order an electronic actuator-position sensor factory assembled to a valve, add a designator to the valve ordering number.

Examples:

6LVV-ALD3BW4-P-C**S**
6LVV-MSM-ALD6-HF2-P-C**SL**

Sensor Electrical Connector	Designator
Short pigtail①	S
Long cable with flying leads	SL

① A mating direct-current M8 3-wire push-on straight female connector is available.
Ordering number: **MS-CS-BALF-1**

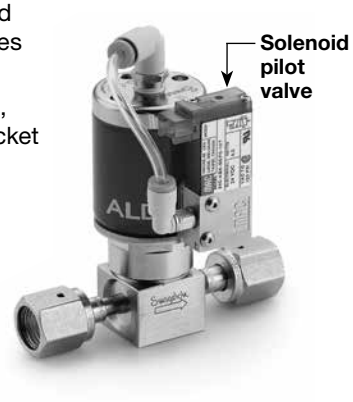
Note: optical sensors for ALD3 and ALD6 are available on page 12.

Options and Accessories (ALD3 and ALD6)

Solenoid Pilot Valve Assemblies

Fast-acting, high-flow solenoid pilot valve enhances ALD series valve response time.

- Includes tubing, connectors, and rotatable mounting bracket for installation versatility.
- See illustration on page 6 for assembly dimensions.
- See table below for technical information. For additional technical information, see MAC® valve part number 34C-ABA-GDFC-1KT.



Solenoid Pilot Valve Technical Information

Component	MAC valve 34C-ABA
Solenoid Pilot Valve	24 V, 4 W
	Temperature rating: 50°C (122°F) maximum, continuous use
	Porting: M5 × 0.8-6H thread, compatible with 10-32 screws
Push-to-Connect Fitting	Material: C3604 brass, 304 SS, polybutylene terephthalate (PBT), polypropylene (PP), polyoxymethylene (POM), Nitrile rubber (NBR) (Buna N)
Tubing	Material: polyurethane
Bracket	Material: 316 SS
O-Ring	Material: Fluorocarbon FKM
Washer	Material: Nylon

Factory-Assembled Solenoid Pilot Valves

To order a solenoid pilot valve factory assembled, add **V** to the ordering number.

Examples: 6LVV-ALD3BW4-P-C**V**
6LVV-MSM-ALD6-2-P-C**V**

In modular surface-mount systems, the solenoid pilot valve may interfere with adjacent components.

Solenoid Pilot Valves for Field Assembly

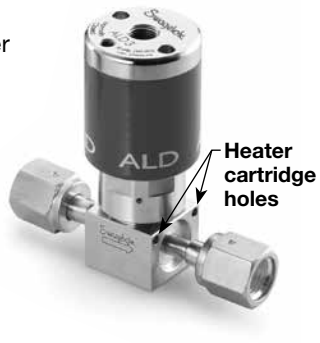
Ordering number for a solenoid pilot valve component only:

MS-PVK-ALD-MAC34CA

Heater Cartridge Holes

Valves are available with holes in the body to accommodate heater cartridges.

- Hole size: 1/8 in. through holes for two-port, three-port, and elbow bodies; 1/8 by 1 in. deep holes for monoblock bodies.
- Two-port and monoblock bodies feature two body holes; three-port and elbow bodies feature one body hole. For more information, contact your authorized Swagelok representative.



Ordering Information.

To order a valve with heater cartridge holes, add **H** to the ordering number.

Examples: 6LVV-ALD3BW4-P-C**H**
6LVV-MSM-ALD6-2-P-C**H**

ALD20 Valve Features

- Normally closed pneumatic actuation
- Flow coefficients of 1.2 to 1.7 standard; custom flow coefficients available
- Two-port straight and elbow configurations
- Two-, three- and four-port multiport valves
- 1.5 in. platforms with C-seal design
- 1/2 in. VCR and tube butt weld end connections
- Patent-pending design

Seat

- Fully contained seat design
- High-purity grade PFA, fully fluorinated
- Ultrahigh cycle life
- Broad range of chemical compatibility
- Excellent resistance to swelling and contamination
- High-integrity seat seal performance

Body

- 316L VIM-VAR stainless steel body material for ultrahigh-purity applications
- Alloy 22 available for enhanced corrosion resistance

Bellows

- Highly polished (5 µin. R_a) bellows designed for ultra-high purity applications
- Alloy 22 material for enhanced corrosion resistance
- Optimized design for ultrahigh cycle life

Actuators

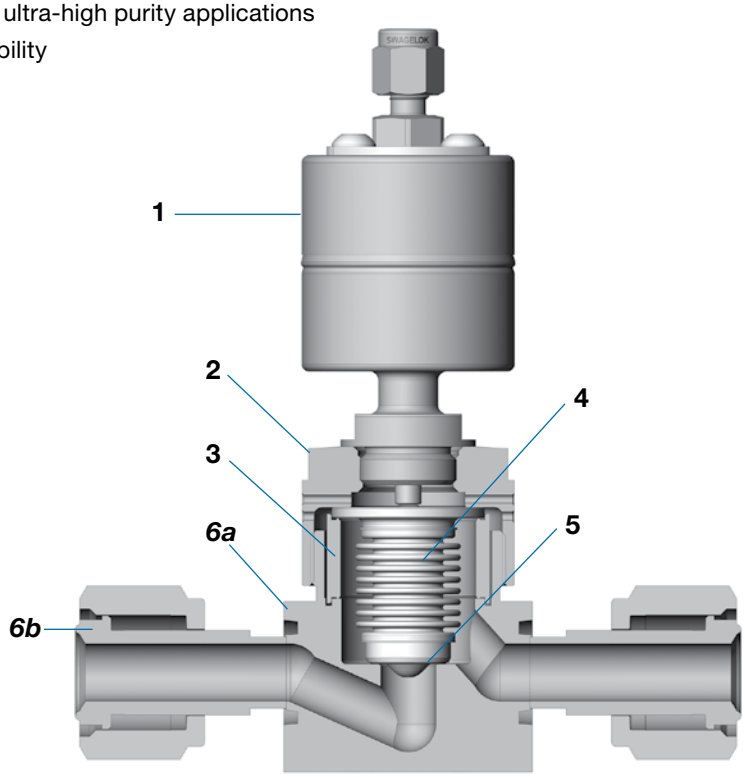
Thermal

- Pneumatic actuator for high-speed and repeatable actuation
- Fully temperature immersible
- Capable of valve opening or closing time of less than 10 ms
- Factory-set flow adjusting mechanism ensures precise and consistent C_v from valve to valve

ALD20 Valve for High Flow Applications

Features

- High flow capacity (up to 1.7 Cv) in a compact footprint
- Valve and actuator fully immersible at elevated temperatures
- Allows configurable flow path to optimize systems
- Highly polished (5 µin. R_a) alloy 22 bellows designed for ultra-high purity applications
- PFA seat for enhanced purity and improved thermal stability



Materials of Construction (ALD20)

Component	Material Grade/ ASTM Specification
1 Pneumatic actuator assembly	316 SS/A479
Lubricant	PTFE-based
2 Bonnet nut	316 SS/A479
3 *Spacer ring*	*Alloy 22/B574*
4 *Polished bellows assembly*	*Alloy 22/B575*
5 *Seat*	*High-purity PFA Type II/D3307*
6a *Body*	*316L VIM-VAR SS/ SEMI F20 Ultrahigh-Purity*①
	Alloy 22/B574
6b *Welded VCR end connections*	*316L VAR SS/ SEMI F20 High-Purity*① 316 SS/A479 VCR nut
	Alloy 22/B574 316 SS/A479 VCR nut

Wetted components listed in *italics*.
① 20 % minimum elongation allowed.

Process Specifications (ALD20)

See Swagelok *Ultrahigh-Purity Process Specification (SC-01)* catalog, MS-06-61 for details on processes, process controls, and process verification. (For the alloy 22 option, reference the cleaning, assembly, and packaging sections in MS-06-61.)

Cleaning	Assembly and Packaging	Wetted Surface Roughness (R_a)	Testing
Ultrahigh-purity cleaning with a continuously monitored, deionized water, ultrasonic cleaning system	Performed in ISO Class 4 work areas; valves are double bagged and vacuum sealed in cleanroom bags.	316L VIM-VAR SS electropolished and finished to an average of 5 µin. (0.13 µm) Alloy 22 finished to an average of 5 µin. (0.13 µm)	*Inboard Helium Leak Test:* ALD20 normally closed valves inboard helium leak tested to a rate of 1×10^{-9} std cm^3/s at the envelope and all external seals.
			Internal Helium Leak Test: ALD20 normally closed valves internal helium leak tested to a rate of 1×10^{-7} std cm^3/s at the seat.
			Internal seat seal may change during valve life cycle, contact Swagelok technical service for additional information.

Technical Data (ALD20)

Body Style	Working Pressure psig (bar)		Temperature Rating °F (°C)	Flow Coefficient (C_v)	Orifice in. (mm)	Internal Volume in.³ (cm³)	Pneumatic Actuator	
	Operating	Burst	Operating (Immersion)				Actuation Pressure psig (bar)	Air Displacement in.³ (cm³)
Normally Closed Actuation								
1/2 in. Ported	Vacuum to 20 (1.4)	>3200 (220)	50 to 392 (10 to 200)	1.7	0.36 (9.1)	0.75 (12.3) Tube Butt Weld	70 to 90 (4.9 to 6.2)	0.10 (1.6)
MSM High Flow C-seal				1.2	0.29 (7.2)	0.50 (8.1) 2-Port		

Ordering Information and Dimensions (ALD20)

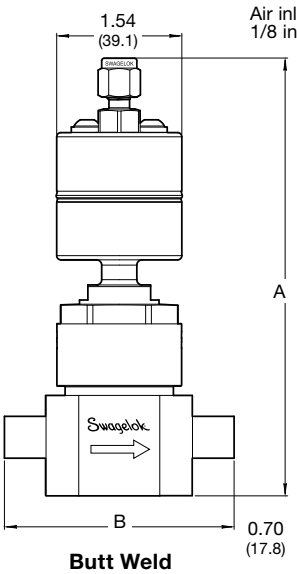
Dimensions, in inches (millimeters), are for reference only and are subject to change.

To order, add a body material designator to an ALD20 basic ordering number.

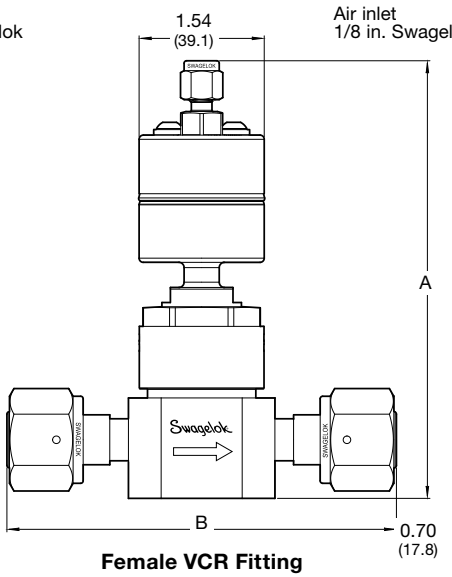
Material	Designator
316L VIM-VAR SS	6LVV
Alloy 22	HC22

Example: **6LVV**-ALD20FR8-P-C

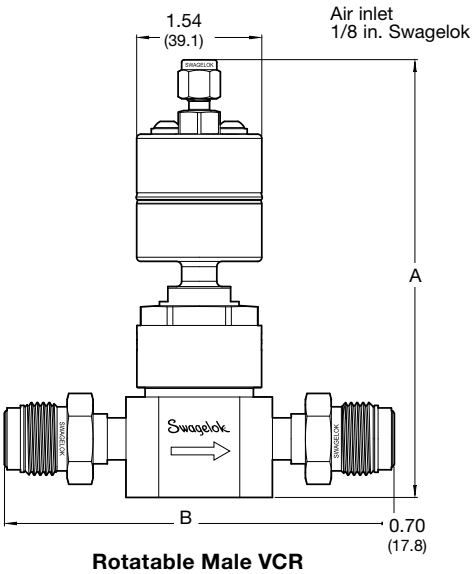
Two-Port Valves



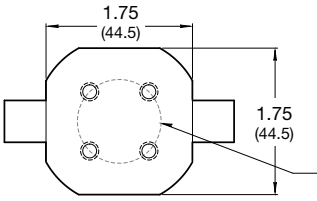
Butt Weld End Connections



Female VCR Fitting End Connections



Rotatable Male VCR Fitting End Connections



Two-Port Bottom

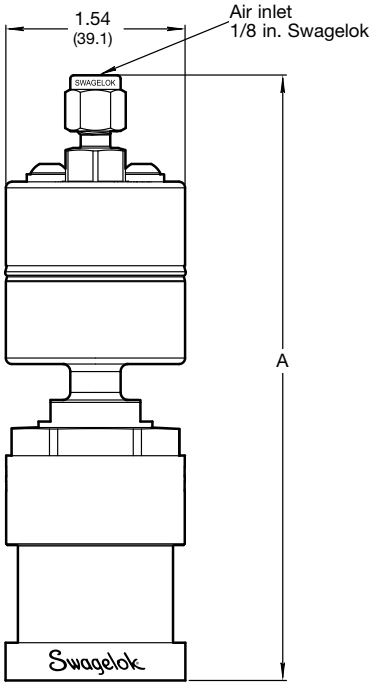
End Connections		Ordering Number	Dimensions, in. (mm)	
Inlet/Outlet	Size		A	B
Female VCR fitting	1/2 in.	-ALD20FR8-P-C	5.23 (133)	4.65 (118)
Rotatable male VCR fitting	1/2 in.	-ALD20MR8-P-C		
Female/Rotatable male VCR fitting	1/2 in.	-ALD20FR8MR8-P-C		
Tube butt weld, 0.50 in. long	1/2 × 0.049 in.	-ALD20BW8-P-C		2.74 (69.7)
Tube butt weld, 0.50 in. long/ Female VCR fitting	1/2 × 0.049 in./ 1/2 in.	-ALD20BW8FR8-P-C		3.70 (94.0)

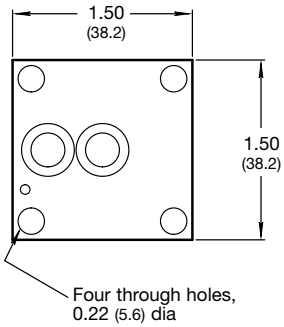
Ordering Information and Dimensions (ALD20)

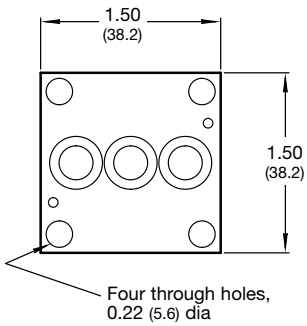
Dimensions, in inches (millimeters), are for reference only and are subject to change.

Modular Surface-Mount Valves

High-Flow C-Seal Design







Ports	Ordering Number	**A,** in. (mm)
2	-MSM-ALD20-HF2-P-C	5.05 (128)
3	-MSM-ALD20-HF3-P-C	

Options and Accessories (ALD3, ALD6, ALD20)

Optical Position Sensors

Features

- Fast response times
- Compatible with high temperatures
- Unaffected by Radio Frequency (RF) noise
- Transferable from one valve to another, without loss of factory settings

Optical Sensor Kits

Optical sensors detect the open position on normally closed pneumatically actuated valves. Optical sensor kits contain the hardware required to install the sensor onto an optical sensor ready valve and connect it to an amplifier.

Optical sensors kits are factory set to the correct depth and tested for proper functionality.

Sensor Kit Technical Information

Fiber Unit	FU-87
Temperature Rating	–76°F to 356°F (–60°C to 180°C)
Max Ambient Temperature	302°F (150°C)
Fiber Length①	6.56 ft. (2 m)

① Every optical sensor kit includes a single use fiber cutting tool

Ordering Information

Optical Sensor Kit Ordering number:

MS-SOK-ALD-FU87

To order an Optical Sensor Kit with an amplifier add, **-AMP** to the ordering number.

MS-SOK-ALD-FU87**-AMP**

Optical Sensor Ready ALD3 and ALD6 Valves*

Optical sensor ready valves are designed to allow an optical sensor kit to be easily installed onto the actuator. The modifications from standard ALD valves include the following:

- A sensor target is included in the actuator
- The actuator is 0.115 in. (2.9 mm) taller
- The 1/8-27 NPT air inlet is replaced with a 10-32 (M5) connection

Ordering Information (ALD3 and ALD6)*

To order an optical sensor ready valve, add **SO** to the ordering number.

Example: 6LVV-ALD3BW4-P-LI-C**SO**

Note: Optical sensor is only available on normally closed valves. LI indicates “less indicator” as sensor kits are sold separately for field assembly.

* All **ALD20** valves are optical sensor-ready. No special order information is required.

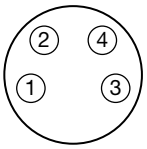
Caution: Do not mix or interchange parts with those of other manufacturers.

Optical Sensor Amplifiers

The optical sensor amplifiers work in conjunction with an Optical Sensor Kit and an Optical Sensor Ready Valve to transmit a signal to an electrical device. The signal indicates the open position of pneumatically actuated valves.

Amplifier Technical Information

Amplifier	FS-N11CP
Output	PNP, M8 Connector
Temperature Rating	–4° to 131°F (–20° to 55°C)
Power Requirement	12-24V DC ± 10% Ripple (P-P) 10 % or Less



M8 Connector Pin Layout

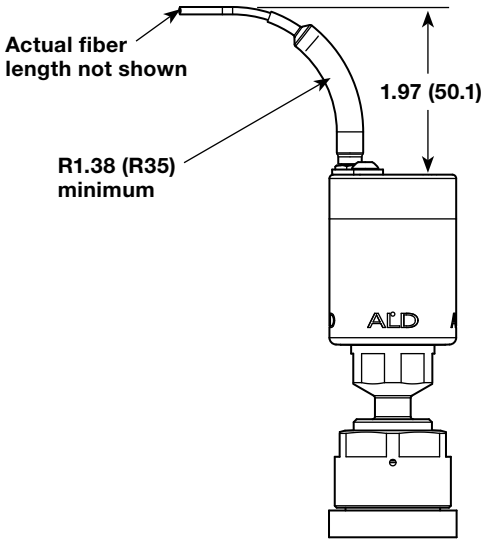
1	Power (12-24V DC)
2	Input
3	Ground (0V)
4	Digital Output

Factory Programmed Amplifiers

Factory programmed amplifiers are preset for optimum performance with Swagelok optical sensor ready valves and optical sensor kits. All factory programmed amplifiers are tested for proper functionality.

Optical Sensor Amplifier Ordering Number:

MS-SOK-ALD-AMP-M8



Multiport and Elbow Valves and Monoblock Manifolds

ALD series valves are available in multiport and elbow configurations and monoblock manifolds; refer to *Bellows- and Diaphragm-Sealed Multiport and Elbow Valves and Monoblock Manifolds* catalog, MS-02-442.

Swagelok

Introduction

Since 1947, Swagelok has designed, developed, and manufactured high-quality, general-purpose and specialty fluid system products to meet the evolving needs of global industries. Our focus is on understanding our customers' needs, finding timely solutions, and adding value with our products and services.

We are pleased to provide this global edition of the book-bound *Swagelok Product Catalog,* which compiles more than 100 separate product catalogs, technical bulletins, and reference documents into one convenient, easy-to-use volume. Each product catalog is up to date at the time of printing, with its revision number shown on the last page of the individual catalog. Subsequent revisions will supersede the printed version and will be posted on the Swagelok website and in the Swagelok electronic Desktop Technical Reference (eDTR) tool.

For more information, visit your Swagelok website or contact your authorized Swagelok sales and service representative.

Safe Product Selection
When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Caution: Do not mix or interchange parts with those of other manufacturers.