

High Vacuum Ball Valves

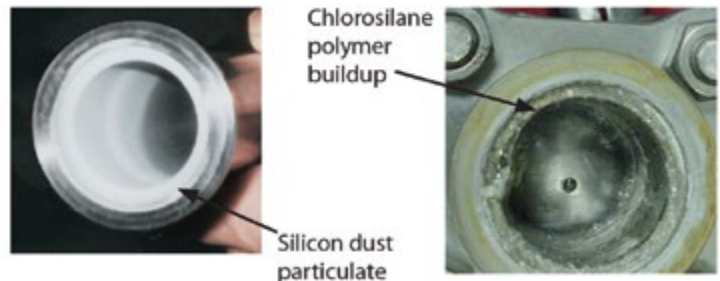
Provide a clean, dynamic seal that prevents failure due to contamination.



Challenges

Process Challenges

Byproduct buildup is one of the major challenges of many coating operations such as etching of CVD, PCVD, and MOCVD in which metals, plastics, or glass are deposited in vapor form inside and around chambers, valves, and other vacuum components. The buildup of these particles greatly reduces efficiency and conductance of the application process leading to valve failure.



Conductance Limiters such as:

- Chlorosilane polymers, Siloxane polymers and Silicon dust contribute to byproduct buildup.

The Solution to Byproduct Buildup:

- High Foreline/Exhaust temperatures.

High Throughput

- Process uptime critical to reduce cost.

Contamination Challenges

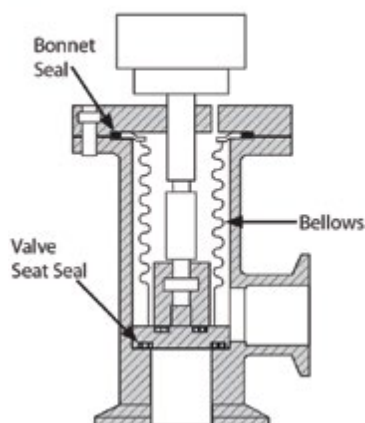
Poppet Valve

- Byproducts can etch/crack bellows
- Sealing surface can accumulate byproduct

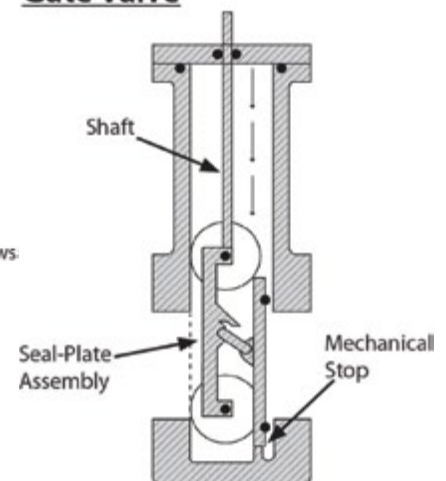
Gate Valve

- Numerous surfaces for byproduct to collect
- Complicated internals
- Particles generated by mechanical operation, friction, and microscopic fractures in metal

Poppet Valve



Gate Valve



Extended-Life (XL) Design Response

When leading OEM's came to ANCORP looking for a more durable valve for today's harsh coating processes, ANCORP engineers went to work testing new stem designs – the XL design was born. This patented design extends the stem seal life by 10X, has fewer wetted components, and features a fully stabilized stem along with all the other features of ANCORP ball valves. In short, the XL ball valve reduces the need for valve maintenance, decreases tool downtime, and increases throughput. It's the reason ANCORP remains the leading innovator in vacuum ball valves.

The corrosive resistant design of ANCORP vacuum ball valves make them ideal for isolating reactors, traps, and scrubbers on vacuum coating tools used for MOCVD, PVD, CVD, and other thin-film coating processes.

Ball valves offer a straight-through, unimpeded flow (or a diverting flow in 3-way ball valves) with a minimal valve body footprint. Due to their unique design, ball valves are less sensitive than other vacuum valves to particulate contamination; therefore, they are especially useful in vacuum applications with high amounts of particulate effluent. For example, ball valves are almost always used to isolate scrubbers and traps downstream of the rough pumping system.

XL Benefits

- Stabilized stem seal to eliminate atmospheric intrusion into the process line
- Sealing capabilities maintain vacuum under high temperature/harsh process conditions
- Stem seal assembly accommodates all perfluoroelastomers (FKM or FFKM) (i.e. varying TCE's)
- Increased the MTBFF of the valve 10X
- Improved stem seal assembly life 100X
- Reduced end-user maintenance complications

ANCORP offers three types of XL High Vacuum Ball Valves, each with their own benefits:

- 2-way valves (excluding B-series)
- 3-way valves
- High Conductance valves

This brochure will cover the features, specifications, ideal applications, and dimensions of the valves offered for each configuration.



ANCORP's XL High Vacuum Ball Valve

Built for the harsh environments of today's coating applications

2-Way High Vacuum Ball Valve

ANCORP's 2-way ball valves consist of a body, stem, ball, and two end caps machined from corrosive resistant 316L stainless steel. Fluoroelastomers (FKM) are used to seal the stem and end caps from atmosphere while the PTFE seats cold flow around the ball to isolate the process when closed. The valve is opened and closed manually or pneumatically by 90 degree turn, quick actuation. The PTFE sealing surface is protected from direct deposition, maintaining a clean dynamic seal to prevent failure due to contamination.

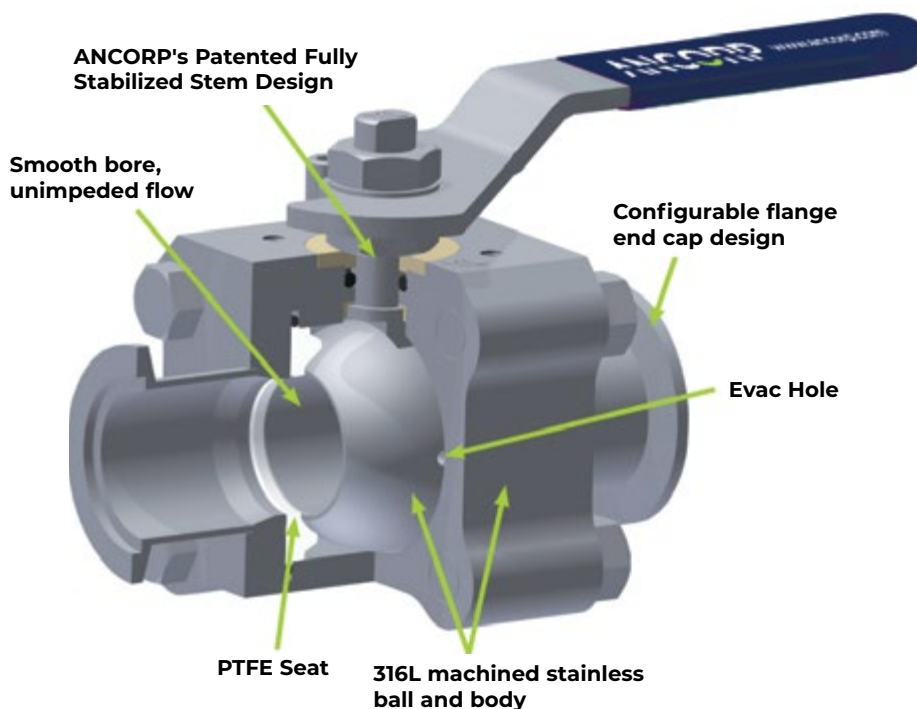
Features

- Poppetless design
- 90 degree turn actuation
- Machined from corrosive-resistant 316L SS
- Rugged construction with few wetted components
- Leak tight in static and dynamic operation
- Ball and seat design reduces particulate buildup



Applications

The corrosive resistant, fast actuating design of ANCORP'S vacuum ball valves makes them ideal for isolating reactors, traps, and scrubbers on vacuum coating tools used for thin-film coating processes.



US Patents:

- US 8,496,227 B2
- US 8,905,375 B2
- US 8,936,231 B2

2-Way Ball Valve Specifications

Vacuum and Temperature Ratings

- Vacuum rated to 1×10^{-8} Torr
- Helium leak rated less than 1×10^{-9} std. cc/s
- Standard fluoroelastomer (FKM) seal: -26°C to 150°C (-15°F to 302°F)

Materials

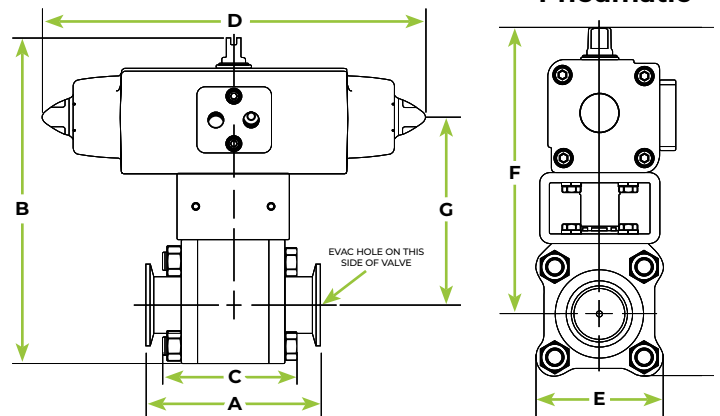
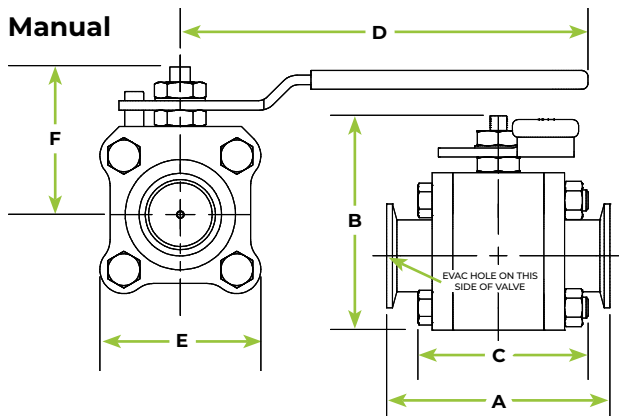
- Valve body, ball, stem, and end caps: machined from solid 316L stainless steel
- Standard seal: fluoroelastomer (FKM)
- Seats: PTFE
- Lubricant: Dow Corning® High Vacuum Grease

Other Options

- Custom configurations, materials, and seals available upon request
- Heater-ready options available for C, D, E, and F series valves

Pneumatic

- Actuator operating pressure: 80 - 120 psig
- Actuator temperature range:
 - Moist air: 0°C to 150°C (32°F to 302°F)
 - Dry air: -20°C to 150°C (-4°F to 302°F)
- Air-to-Open, Spring-to-Close (AS) single acting actuators and Air-to-Open, Air-to-Close (AA) double acting actuators are available
- “Fail-safe open” or “fail-safe closed” configuration available for ball valves with AS actuators
- 1/8 NPT air line hook-up
- Visual and electrical position indicators available
- Solenoids available for 120VAC or 24VDC versions



NOTE: All dimensions measured in inches unless otherwise specified.

Manual

Part ID	Reference Number	Ball Port	Flange	End Cap Tube O.D.	Conduct. (L/s)	A	B	C	D	E	F
3000028	B4075-QF16	0.56	QF16	3/4	5.3	3.47	2.7	1.90	4.6	2	1.7
3000030	C4100-QF25	0.81	QF25	1	13	3.92	3.7	2.5	5.5	2.4	2.5
3000031	C4150-QF40	0.81	QF40	1 1/2	21	3.92	3.7	2.5	5.5	2.4	2.5
3000032	D4150-QF40	1.25	QF40	1 1/2	35	4.65	4.5	3.5	8.25	3.2	2.9
3000035	E4200-QF50	1.50	QF50	2	57	4.97	4.9	3.9	8.25	3.5	3.1
3002035	F4200-QF50	1.87	QF50	2	87	6.31	5.4	4.3	8.25	4.1	3.4

Pneumatic

Part ID	Reference Number	Ball Port	Flange	End Cap Tube O.D.	Conduct (L/s)	A	B	C	D	E	F	G
3008120	B4075-QF16-AA	0.56	QF16	3/4	5	3.47	6.9	1.9	6.3	2	5.9	4.1
3009120	B4075-QF16-AS	0.56	QF16	3/4	5	3.47	7.1	1.9	9.2	2	6.1	4.2
3008128	C4100-QF25-AA	0.81	QF25	1	13	3.92	7.2	2.5	6.3	2.4	6	4.2
3009128	C4100-QF25-AS	0.81	QF25	1	13	3.92	7.5	2.5	9.2	2.4	6.3	4.5
3008135	D4150-QF40-AA	1.25	QF40	1 1/2	35	4.65	8.6	3.5	7.8	3.2	7.0	4.9
3009135	D4150-QF40-AS	1.25	QF40	1 1/2	35	4.65	8.6	3.5	10.2	3.2	7.0	4.9
3008150	E4200-QF50-AA	1.50	QF50	2	57	4.97	9.0	3.9	7.8	3.5	7.2	5.1
3009150	E4200-QF50-AS	1.50	QF50	2	57	4.97	9.0	3.9	10.2	3.5	7.2	5.1
3008160	F4200-QF50-AA	1.87	QF50	2	87	6.31	10.0	4.3	9.3	4.1	8.0	5.6
3009160	F4200-QF50-AS	1.87	QF50	2	87	6.31	10.0	4.3	11.8	4.1	8.0	5.6

3-Way High Vacuum Ball Valve

ANCORP's 3-way ball valve is designed to divert flow between a common port and either of two side ports. The 3-way ball valve consists of a body, stem, L-port ball, and three end caps. Components are machined from corrosive resistant 316L stainless steel. Fluoroelastomers are used to seal the stem and end caps from atmosphere while PTFE seats cold flow around the ball to isolate one port while diverting flow through the other. Flow through the valve is diverted manually or pneumatically by 1/4 turn, quick actuation.

Features

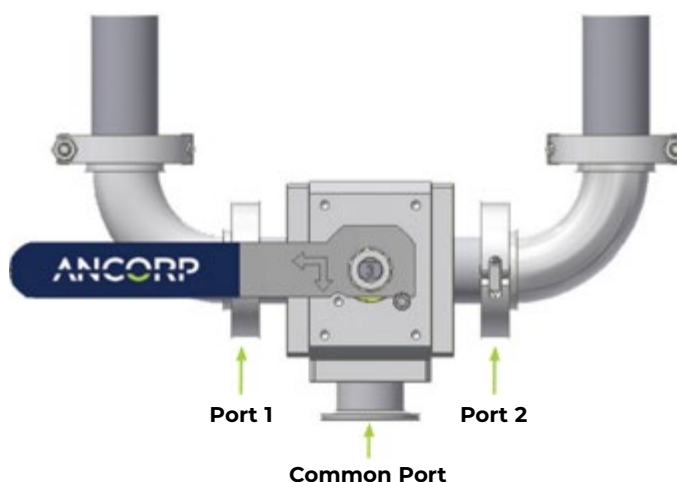
ANCORP's 3-way ball valve maximizes design efficiencies in high vacuum systems when compared to multi-valve systems with equivalent functionality:

- Reduced bill of materials
- Reduced footprint
- Reduced overall weight
- Reduced design complexity
- Fewer actuated components
- Fewer leak paths
- Less total area to heat
- Reduced maintenance costs from MRO parts
- Heater-ready design

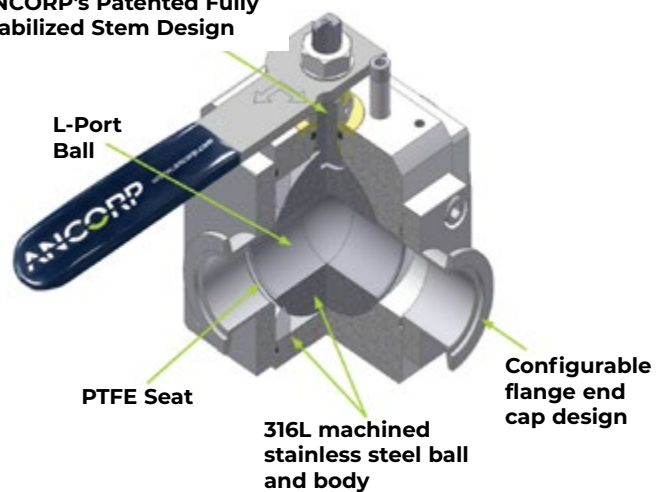


Applications

The corrosive resistant, fast actuating design of ANCORP'S vacuum ball valves makes them ideal for diverting flow in reactors, traps, and scrubbers on vacuum coating tools used for thin-film coating processes.



ANCORP's Patented Fully Stabilized Stem Design



3-Way Ball Valve Specifications

Vacuum and Temperature Ratings

- Vacuum rated to 1×10^{-8} Torr
- Helium leak rated less than 1×10^{-9} std. cc/s
- Standard fluoroelastomer (FKM) seal:
 - -26°C to 150°C (-15°F to 302°F)

Materials

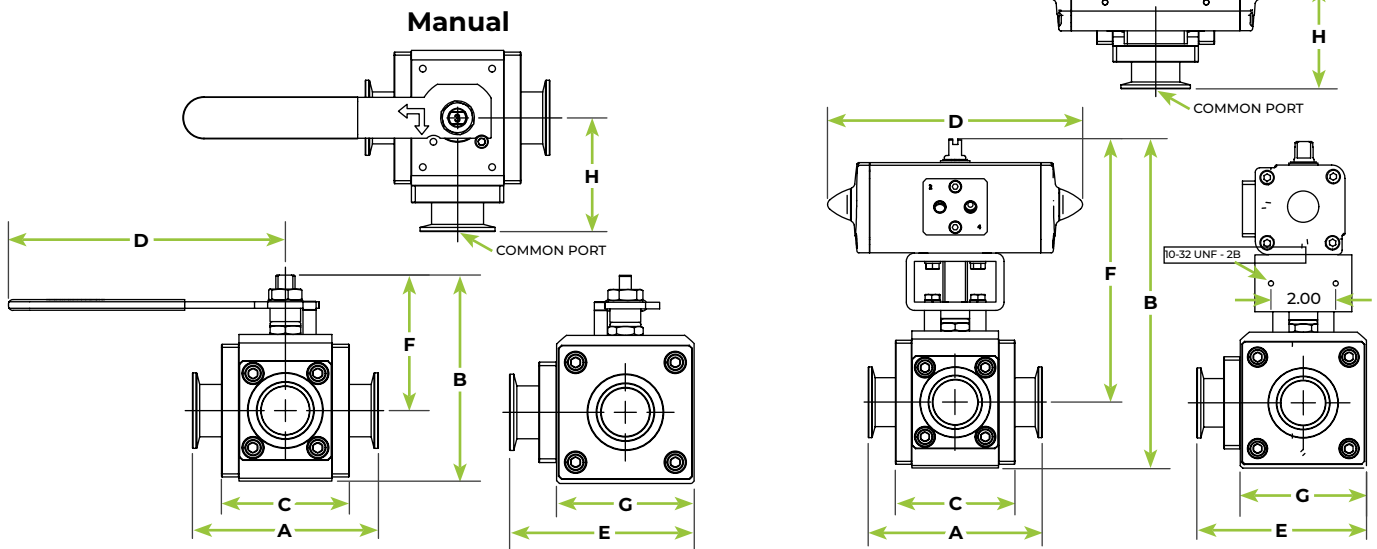
- Valve body, ball, stem, and end caps: machined from solid 316L stainless steel
- Standard seal: fluoroelastomer (FKM)
- Seats: PTFE
- Lubricant: Dow Corning® High Vacuum Grease

Pneumatic

- Actuator operating pressure: 80 - 120 psig
- Actuator temperature range:
 - Moist air: 0°C to 150°C (32°F to 302°F)
 - Dry air: -20°C to 150°C (-4°F to 302°F)
- 1/8 NPT air line hook-up
- Visual and electromechanical position indicators available
- Solenoids available for 120VAC or 24VDC versions

Other Options

- Custom configurations, materials, and seals available upon request



NOTE: All dimensions measured in inches unless otherwise specified.

Manual

Part ID	Reference Number	Ball Port	Flange	End Cap Tube O.D.	Conduct. (L/s)	A	B	C	D	E	F	G	H
3008305	TL4150-QF40-H075	1.375	QF40	1 1/2	29	5.33	5.9	3.7	8.25	5.2	3.9	3.9	3.28
3008306	TL4200-QF50-H075	1.375	QF50	2	34	6.31	5.9	3.7	8.25	5.7	3.9	3.9	3.78

Pneumatic

Part ID	Reference Number	Ball Port	Flange	End Cap Tube O.D.	Conduct. (L/s)	A	B	C	D	E	F	G	H
3008325	TL4150-QF40-AA-H062	1.375	QF40	1 1/2	29	5.33	10.1	3.7	7.8	5.2	8.1	3.9	3.28
3008326	TL4200-QF50-AA-H062	1.375	QF50	2	34	6.31	10.1	3.7	7.8	5.7	8.1	3.9	3.78

High Conductance Ball Valve

ANCORP's High Conductance (HC) Vacuum Ball Valve provides maximum conductance with its fully ported ball and reduced overall length, two-piece 316L stainless steel body. Its improved smooth contour maximizes heat transfer between the valve and heating components. The valve is opened or closed manually or pneumatically by 1/4 turn, quick actuation.

Features

- Fully bored ball port: Maximizes conductance with straight-through, unimpeded flow
- Minimized overall length and slimmer profile: Increases conductance and reduces weight and footprint
- Two-piece body: One less body O-ring seal means one less potential leak path and huge maintenance cost reductions when using perfluoroelastomers (FFKM)
- Smooth contour: Maximizes heat transfer from heating components
- Extra space between body & handle brackets: Minimum of 5/8" clearance allows more room for heating components
- Adjustable stroke pneumatic actuator: Adjusts to +/-5° to ensure proper open/close over life of the valve
- Integrated handle lock: Prevents accidental opening/closing. Lock out-tag out ready
- Heater-ready design

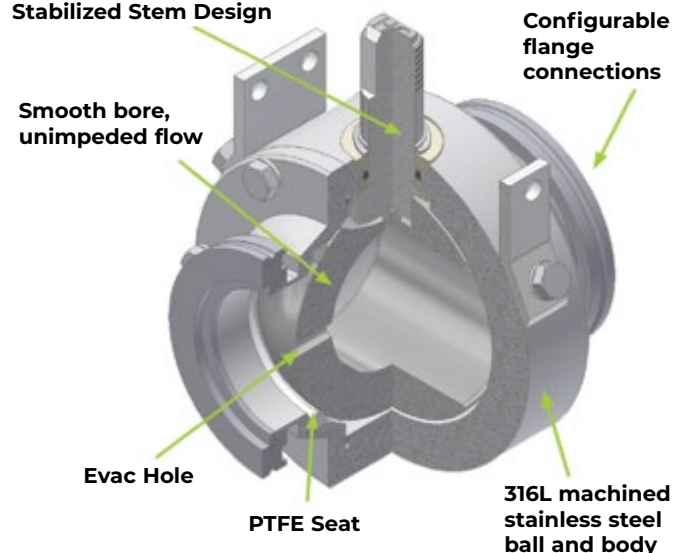


Applications

The HC Ball Valve is manufactured from corrosive resistant materials to perform effectively in aggressive processes and on exhaust lines. This valve can be configured to be heated and insulated for temperature stability inside the valve. Body and stem seals can be changed to meet customer specific processes as required.

This valve also works exceptionally well in systems that create deposition within the vacuum lines. The PTFE sealing surface is protected from direct deposition, maintaining a clean dynamic seal to prevent failure due to contamination. The HC Ball Valve is an extremely robust high vacuum valve designed to perform in the most challenging environments.

ANCORP's Patented Fully Stabilized Stem Design



High Conductance Ball Valve Specifications

Vacuum and Temperature Ratings

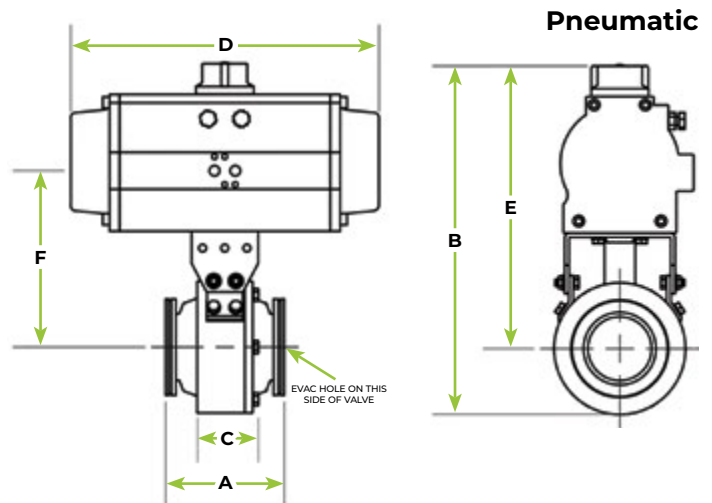
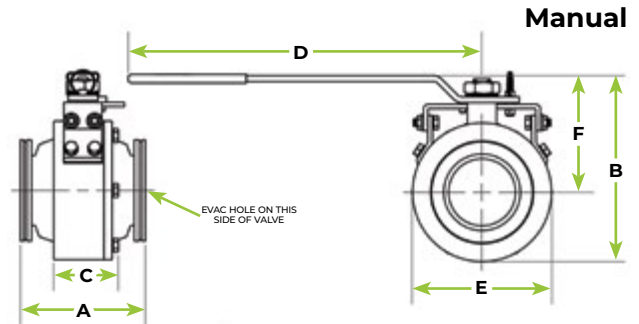
- Vacuum rated to 1×10^{-8} Torr
- Helium leak rated less than 1×10^{-9} std. cc/s
- Standard fluoroelastomer (FKM) seal: -26°C to 150°C (-15°F to 302°F)

Materials

- Valve body, ball, stem, and end caps: machined from solid 316L stainless steel
- Standard seal: fluoroelastomer (FKM)
- Seats: PTFE
- Lubricant: Dow Corning® High Vacuum Grease (other options available)

Pneumatic

- Actuator operating pressure: 40-120 psig
- Actuator temperature range:
 - Dry air: -20°C to 150°C (-4°F to 302°F)
- Both Air-to-Open, Spring-to-Close (AS) single acting actuators and Air-to-Open, Air-to-Close (AA) double acting actuators are available
- “Fail-safe open” or “fail-safe closed” configuration available for ball valves with AS actuators
- 1/4 NPT air line hook-up
- The actuators used with HC valves have visual position indication as standard, and electrical position indicators are available
- Solenoids available for 120VAC or 24VDC versions



Other Options

- Custom configurations, materials, and seals available upon request

NOTE: All dimensions measured in inches unless otherwise specified.

Manual

Part ID	Reference Number	Ball Port	Flange	End Cap Tube O.D.	Conduct. (L/s)	A	B	C	D	E	F
3007210	HC4250-LF63	2.375	LF63	2.5	205	5.10	7.4	2.8	15.3	5.4	4.7
3007310	HC4300-LF80	2.875	LF80	3.0	347	5.35	8.0	2.8	15.3	6.0	5.0
3007410	HC4400-LF100	3.875	LF100	3.5	657	6.86	9.4	2.8	15.3	7.4	5.7

Pneumatic

Part ID	Reference Number	Ball Port	Flange	End Cap Tube O.D.	Conduct. (L/s)	A	B	C	D	E	F
3007220	HC4250-LF63-AS	2.375	LF63	2.5	205	5.10	13.5	2.8	10.9	10.8	7.0
3007230	HC4250-LF63-AA	2.375	LF63	2.5	205	5.10	13.5	2.8	10.9	10.8	7.0
3007320	HC4300-LF80-AS	2.875	LF80	3.0	347	5.35	15.8	2.8	13.9	12.9	8.0
3007330	HC4300-LF80-AA	2.875	LF80	3.0	347	5.35	15.8	2.8	13.9	12.9	8.0
3007420	HC4400-LF100-AS	3.875	LF100	4.0	657	6.86	17.3	2.8	13.9	13.6	8.7
3007430	HC4400-LF100-AA	3.875	LF100	4.0	657	6.86	17.3	2.8	13.9	13.6	8.7

Ball Valve Service Kits

ANCORP offers several different ball valve service kits. When performing routine ball valve service, it is strongly recommended that all kit components provided be replaced to prevent future leaks and system failures (note that the upper PEEK bearing is not replaced during regular maintenance, but replacements can be ordered upon request). Stem replacement kits and replacement balls are also available.

If you are still experiencing leaks after you have completed maintenance on your valve, your valve may have experienced damage beyond the usual wear and tear on the seats and O-Rings. Please contact ANCORP for more information and help on this matter.

For maintenance kit instructions, please refer to the instructions given on ANCORP's site at: <https://ancorp.com/manuals-technical-data-sheets>

What's in the Box



A) PTFE Seat



B) Body O-Ring



C) Stem O-Ring



D) Nylon Jam Nut



E) Lower PEEK Bearing



F) PTFE Spacer (Legacy)



G) Brass Bushing (Legacy)



H) Wave Spring Washer



I) Spiral Retaining Ring

Part ID	Reference Number	Description	A	B	C	D	E	F	G	H	I
3010068	B-RK-S	B-Series Maintenance Kit	2	2	1	1		1			
3010109	C-RK-S	C-Series Maintenance Kit	2	2	1	1	1	1			
3010141	D-RK-S	D-Series Maintenance Kit	2	2	1	1	1	1	2		
3010181	E-RK-S	E-Series Maintenance Kit	2	2	1	1	1	1	2		
3010084	F-RK-S	F-Series Maintenance Kit	2	2	1	1	1	1	2		
3010930	TL-RK-S	3-Way Ball Valve Maintenance Kit	2	2	1	1	1				
3010799	HC250-RK-S	HC Series 2-1/2" Ball Valve Maintenance Kit	2	1	1		1			1	1
3010849	HC300-RK-S	HC Series 3" Ball Valve Maintenance Kit	2	1	1		1			1	1
3010899	HC400-RK-S	HC Series 4" Ball Valve Maintenance Kit	2	1	1		1			1	1

O-ring Materials

Note: Double check that the material you selected is compatible with the process you are running.

FKM O-Rings are standard to ANCORP's ball valve line and offer good chemical and heat resistance. Operating temperatures for FKM are from -26°C to 150°C (-15°F to 302°F). ANCORP recommends you do not exceed 150°C for FKM O-Rings included in your valve, as they will begin to outgas past this temperature.

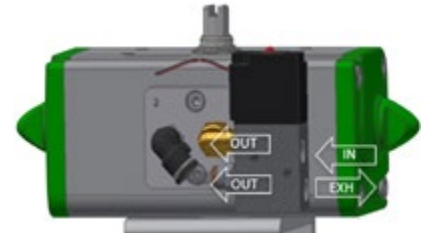
For custom configurations, please refer to the valve drawing to check for the O-Ring material used. Other materials available upon request are Buna, Silicone, and Perfrez®. Please contact ANCORP for more information on these materials.

Ball Valve Accessories

Pneumatic Actuators

Air-to-Air (AA) (Double-Acting)

AA actuators use air pressure to cycle valves counterclockwise and clockwise. As air pressure is supplied in the left port, internal pistons move inward towards the center of the actuator, rotating the actuator stem counterclockwise and cycling the valve open. To cycle the valve closed, compressed air is supplied to the right port, to move the pistons outward and rotate the actuator stem clockwise.



Air-to-Spring (AS) (Single-Acting)

AS actuators use air pressure to cycle the actuator counterclockwise, which will both cycle the valve and compress springs in the actuator. Once the air pressure is removed, the springs cycle the actuator clockwise. These springs act as a fail-safe: if the compressed air supply is disrupted, the springs automatically cycle the valve back to the default position (which is closed unless specifically requested). AS actuators have one compressed air inlet and one exhaust outlet for air to escape as the actuator is cycled to the default position.



Position Indicators

A **visual position indicator** is a cap installed on the stem protruding from the top of the actuator. The stripe on the cap will be aligned with the bore of the ball. **Electromechanical position indicators, or switchboxes**, are mounted to the top of the actuator while engaging the stem. Cams within the switchbox activate electrical switches as the actuator cycles, which pass signals to a control system that will interpret valve position.



Solenoids

Solenoids are electrically activated valves one can install on an actuator that control the flow of compressed air to the actuator. Three-way solenoids are used for air-to-spring actuators, and four-way solenoids used for air-to-air actuators. Solenoids are available in 24 VDC and 120 VAC operating voltages. There is a manual override located on the top of the solenoid that will actuate its valve's main stem, permitting the spring to return the valve to the 'normal' position.

Note: When installing a solenoid, the outlets of the solenoid must be connected to the inlets of the actuator.

Lock Kits

A lock kit prevents a valve from cycling, which is especially useful for lock-out tag-out. The kit for manual valves utilizes a modified handle and a quick release pin to prevent accidental actuation. A padlock can pass through the handle and into either a metal plate or the valve body to prevent cycling altogether.

Note: HC valves will come with this kit as a standard.





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