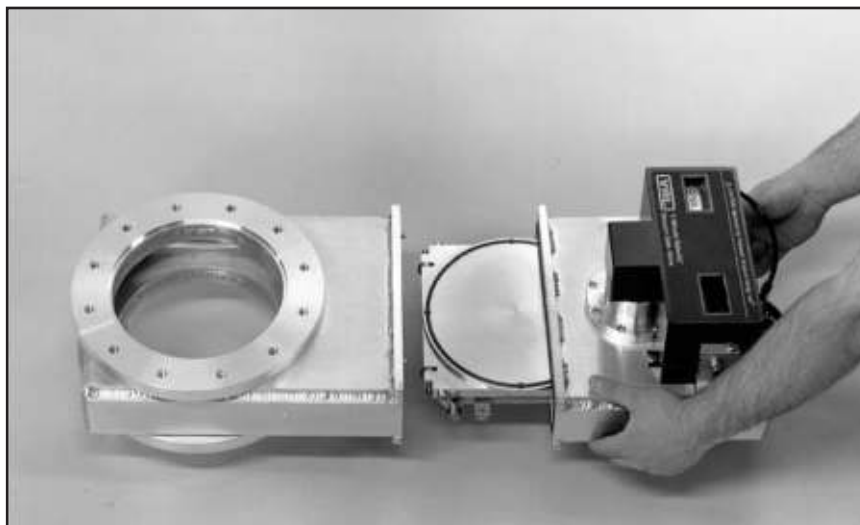




Vacuum Research Corp.



Vacuum Valve Catalog



- **Up to 1 Million Cycles Without Service**
- **“5 Minute Rebuild” Vacuum Gate Valves**
- **Replace All Moving Parts in 5 Minutes**
- **The Port Section Stays in Your System**
- **All Valves (RoHS) 2015/863/EU Compliant**



Model Numbering System

VRC Valves are
Manufactured in
the USA.



Vacuum Research valves are available with dozens of options to allow you to select exactly the features you need for your vacuum system. The model number system illustrated below will accurately describe most valves, but if you have any questions about the best way to specify what you need, just call or fax our customer service department and we will be happy to help you. All Valves are (RoHS) 2015/863/EU Compliant.

Basic Valve Style

LPWA	Bonnet Style, Large Port Aluminum
TBWA	Thick Body Valves for Dirty Environments
X-LPWA	Bonnet Style, Extra Large Port Aluminum
LPSS	Bonnet Style, Large Port Stainless Steel
X-LPSS	Bonnet Style, Extra Large Port Stainless Steel
BEL	Bellows Seal, Welded Aluminum
END STD	Standard Port Aluminum Gate Valves
END LP	Oversize Large Port Aluminum Gate Valves
AVAL	Aluminum Poppet Style Valves
AVMS	Mild Steel Poppet Valves
REB	Rectangular Port, Bellows Seal
REQ	Rectangular Port, Quad Ring Seal

Roughing & Gauge Ports

Specify location (R-1, R-2, etc.) and size of port (NW-16, NW-25, etc.)
Refer to page 42 in this catalog:
Roughing and Gauge Ports, for the range of port sizes available in each location for your basic valve style.

Limit Switches (Position Indicators)

Visual Position Indicators are included on All Bonnet Gate Valves. Limit switches are described in the "Optional Features and Accessories" section on page 41. (Sold by the pair, 1 for open, 1 for closed)

LSS	Enclosed Limit Switch (SPDT)
LSD	Enclosed Limit Switch (DPDT)
LSO	Open Type Limit Switch (SPDT)
LSE	Electronic Type Limit Switch (SPDT)
LSX-C	Explosion Proof, Grps. C, D (SPDT)
LSX-B	Explosion Proof, Grp. B (SPDT)

Flange Bolt Pattern

ASA	ANSI Bolt Pattern
CF	Conflat® Flanges
CF-MET	Metric Conflat®
JIS	Japan Industrial Std.
DEP	Dependex Flanges
ISO	ISO Bolt Pattern
SPEC	Customer Special Flange
BLANK	No Holes or O-Ring

Flange O-Rings

20	O-Rings both flanges
NO	No flange O-Rings
10	O-Ring Open Side
1S	O-Ring Seal Side

LPWA - 12 - ASA - N8 - 20 - B - R2 - NW-16 - EP - 115 - LSS

Port Flange Neck Style

N1	Tapped Holes Both Sides
N5	Neck Flange on Both Sides
N6	Neck Flange on Seal Side
N8	Neck Flange on Open Side
TAP	Tapped Holes on Neck Flanges
Our standard neck style valves (N5, N6, N8) have slots rather than holes for bolts. For tapped holes instead of slots add "TAP" to Model number. No extra charge.	

Type of Operator

EP	Electro-Pneumatic
A	Air Pilot
3 POS	3 Position Electro-Pneumatic
P	Pneumatic only (no solenoid)
M	Manual Lever
T	Manual Throttle
MO	Motor Actuator

Nominal Valve Port Size

Inches:	2, 3, 4, 6, 8, 10, 12, 16, 20, 24, 32
ISO:	63 mm to 630 mm
JIS:	63 mm to 630 mm
Conflat®:	2.75, 4.5, 6, 8, 10, 12 Inch OD

O-Ring Material

B	Buna-N
V	Viton®
S	Silicone
K	Kalrez®
C	Chemraz®

Solenoid Voltage Only Used With EP Operator

115	115V, 50/60 Hz
220	220-240 V, 50 Hz
24D	24 VDC
115 EX	Expl. Proof 115V, 50/60 Hz
220 EX	Expl. Proof 220V, 50 Hz
24 EX	Expl. Proof 24 VDC

Ordering Information



Call our toll free number (800) 426-9340, or (412) 261-7630 to place orders or for customer service. Our FAX number is (412) 261-7220. Address orders by mail to Vacuum Research Corporation, 100 Chapel Harbor Drive, #4, Pittsburgh, PA 15238 USA. Prices in this catalog are FOB factory. CIF or C&F prices available. Contact factory for pro forma invoice or price quotation. Terms are Net 30 days.



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Phone: 800-426-9340 • 412-261-7630 • FAX: 412-261-7220 • e-mail: VRC@vacuumresearch.com

ANSI Gate Valves

5 Minute Rebuild Stylepage 4

Stainless Steel and 6061 Aluminum Gate Valves from 2 inch to 16 inch. Smooth surface finish gives low out-gassing and fast pump down

Large Gate Valvespages 8 & 9

Aluminum Gate Valves with ports from 2 inch to 32 inch. Closing speeds as fast as 75 mSeconds



Throttle & Isolation Valves

Throttemaster™page 20

Manual Throttle Valves ...page 22

3 Position Throttlepage 23

- Aluminum or Stainless Steel Valves
- ISO Flanges from 63 to 630 mm
- ANSI Sizes from 2 inch to 24 inch
- Manual or Closed Loop Operation
- Seals up to 3 Atmospheres Differential
- Vacuum or Pressure Either Side
- 3 Position or P.I.D. Pressure



ISO Gate Valves

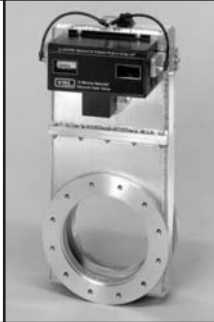
5 Minute Rebuild Stylepage 12

Stainless Steel and Aluminum Gate Valves from 63 mm to 400 mm. All valves (RoHS) 2015/863/EU Compliant

Large Gate Valvespage 14

Simple End Operated Air Cylinder Aluminum Gate Valves up to 630 mm

Clamps & Centering Rings 41



Bellows Sealed Valves

page 15

- Conflat® Flanges from 2 inch to 12 inch
- ANSI Flanges from 2 inch to 10 inch
- ISO Flanges from 60 mm to 250 mm
- 6 Locations for Roughing or Gauge Ports
- Fail Safe Pneumatic or Manual Actuators
- Available with Metal or Viton® Bonnet Seal
- Welded Non-Magnetic Aluminum Body
- Leak Rate Less Than 5×10^{-10} scc/sec



JIS Gate Valves

5 Minute Rebuild Style ...page 10

250,000 Cycle Rotary Shaft Seal, Million Cycle Valves also available. Electro pneumatic or manual operation. Stainless Steel and Aluminum Gate Valves from 65 mm to 300 mm



Rectangular Valves

page 19

- 1 inch X 6 inch to 4 inch X 24 inch Ports
- Fabricated Entirely From 6061-T6 Alum.
- Leak Rate Less Than 5×10^{-10} scc/sec
- Port Sizes to Fit Any Wafer or Display
- Bolt Pattern to Fit Any Tool or Chamber



Conflat® Gate Valves

5 Minute Rebuild Style ...page 16

Bellows Sealed Valves .page 15

Stainless Steel and Aluminum with 4 1/2 to 12 inch OD Conflat® flanges

Angle Style Valvespage 24

Stainless Steel from 1.33 to 3.38 inch



Poppet Valves

2 to 24 inch ANSI Flanges..... 26

Low Profile Poppet Style 26

ISO-63 to ISO-500 Flanges..... 27

NW-16 to NW-50 Flanges 24

- Easy to Maintain Bonnet Design
- Leak Rate Less Than 5×10^{-10} scc/sec



NW Valves and Clamps

Gate Valvespage 18

NW-25 to NW-50 Manual & Pneumatic

Clamps & Center Rings page 25

Sizes from NW-16 to NW-50

Angle Style Valvespage 24

NW-16 to NW-50 Manual & Pneumatic



Water Cooled Valves & Valves for Dust & Dirt

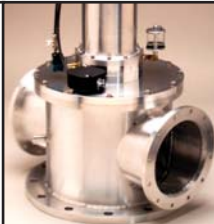
pages 32 - 35

- Water Cooled Gates and Port Flanges
- Limit Switches/Position Indicators
- Port Sizes from 2 - 24 Inch, 63 - 630 mm



Outgassing and Conductance Data page 39

- Bibliography of Technical Papers regarding Outgassing of Aluminum & Stainless Steel
- Molecular Conductance, Cylinder Capacity, Open/Close Times for Gate & Angle Valves



Custom Alum. Welding Elbows, Nipples, Chambers

pages 29 - 31

- Leak Rate Better Than 5×10^{-10} scc/sec
- Aluminum Weldments to Your Drawings
- ANSI, JIS, ISO, CF, NW or Special Flanges



Feedthroughs

Rotary & Push-Pull Motion page 38

- Rotary & Push/Pull in Same Feedthrough
- High Torque, Use Solid or Hollow Shafts
- Hi Speeds, Intermittent Use to 1200 rpm
- 303 Stainless Steel or Ni Plated Brass



Optional Features and Spare Parts

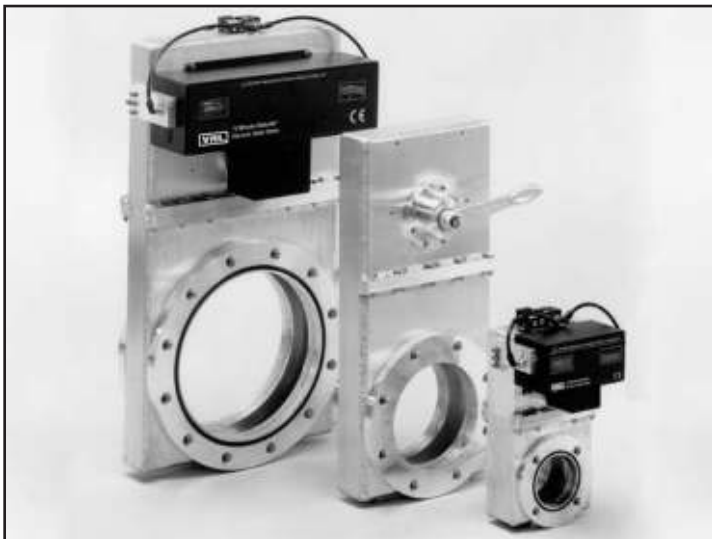
pages 35 & 40 - 49

- Optional Quick Release Bonnet
- Limit Switches/Position Indicators
- Limit Switches/Position Indicators
- Replacement O-Rings and Seals





Stainless and Aluminum Gate Valves



Aluminum valves with (left to right): Electro Pneumatic, Manual, and Motor Actuators. Stainless Steel valves also available.

ANSI, ISO, JIS, or Special Flanges

These Vacuum Research 5 minute rebuild valves are available with virtually any flange or combination of flanges at no extra charge. Combinations of ISO on one flange and ANSI on the other are easily accommodated. Even different sizes such as 4 inch on one flange and 6 inch on the other.

Insertable "Flangeless" Valves

It is sometimes helpful to keep the flange to flange dimension ("A" dimension on the dimensions pages) as short as possible. In such cases your valves can be provided with no port flanges at all and with either O-Ring grooves machined into the valve body or with a precision machined surface on the body to seal against the O-rings on your pump or chamber. Contact the factory for prices.

Aluminum or Stainless Steel

Vacuum Research Bonnet Style valves are available in stainless steel or 6061 aluminum. Smooth surface finish gives low outgassing and fast pump down.

High Conductance

In addition to the oversize ports used in the LPWA Series for the last 40 years, we now offer the X-LPWA Series where a 4 inch valve has a 6 inch port, an 8 inch valve has a 10 inch port, etc. Conductance values are shown on page 39.

Fail Safe

All Vacuum Research Valves can be installed for fast close on power failure and air operated valves can be manually positioned without air or electricity.

Long Life

More than 250,000 cycles for aluminum valves. That's one cycle every 2 minutes, 24 hours/day for a year. An optional million cycle design is available.

SolidWorks *.STEP Files

Contact us to obtain SolidWorks 3D *.STEP format modeling files that plug formatted VRC valve 3-D models into your computer-aided design projects.



Less Outgassing Than Stainless Steel

Dozens of papers show the 6000 Series aluminum used in VRC valves outgasses up to 2 orders of magnitude less than 300 Series stainless steel and of course no hydrogen. A bibliography of 70 peer reviewed papers about outgassing compiled by Dr. M. Wong at Fermi Labs can be found at http://home.fnal.gov/~mlwong/outgas_rev.htm. See page 39 for more information

Vacuum & Pressure

Vacuum Research valves stay sealed with vacuum or atmosphere on either side.

Satisfaction Guaranteed

Vacuum Research has been building high vacuum valves for almost 50 years and has earned a reputation for world class product quality and customer service. If you are not satisfied with our valve just send it back.

No Leaks

All Vacuum Research valves have total leak rates of less than 5×10^{-10} std cc/sec. By total leak we mean that each completed valve is tested in a He filled bag.

RoHS Compliant

All Valves are (RoHS) 2015/863/EU Compliant and carry the CE mark.

Electric Motor, Air or Manual Actuators

All Vacuum Research gate valves are available with 3 types of actuators. Manual actuators are the least expensive. Electro-pneumatic actuators use 70 psi (4.9 kg/cm) compressed air and include the solenoid (specify the solenoid voltage that is most convenient for you). Electric motor actuators use high torque servo motors and operate from 115V or 230V, 1Ø 50 or 60 Hz. CE Mark included.

Roughing and Gauge Ports

There are six locations for optional gauge and roughing ports described on page 42.

Position Indicators, Limit Switches

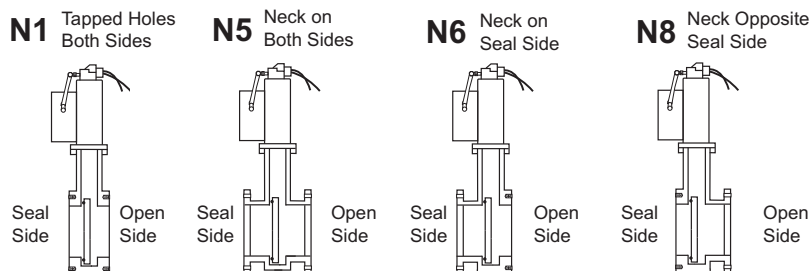
Visual indication of valve position is included on all valves. Limit switches for remote indication are available and are described on the Optional Features pages in the Accessories & Parts section.

Complete Rebuild



in 5 Minutes!

With no special tools or training you can replace every moving part in your Vacuum Research Bonnet Style Valve in 5 minutes. (Our best guys can do it in less time, but they practice.)



For valves with ports up to 8 inches the actuator is on the same side as the gate seal, valves with ports 10 inches and larger have the actuator opposite the gate seal side.

Slots or Tapped Holes on Neck Flanges: Our standard neck style valves (N5, N6, N8) have slots rather than holes for bolts. For tapped holes instead of slots add "tapped" to Model number. No extra charge.

Stainless Steel Gates in Aluminum Valves: To specify a stainless steel gate in an aluminum valve add a suffix to the model number "SS Gate". Refer to the "Optional Features and Accessories" page in this catalog for pricing information.

ORDERING INFORMATION

Model Number: Refer to page 2 for instructions on how to specify the features you need.

Electric Motor Actuators: Any Vacuum Research valve can be supplied with a high torque electric motor actuator. Refer to Electric Motor Actuator page in the Accessories & Parts section.

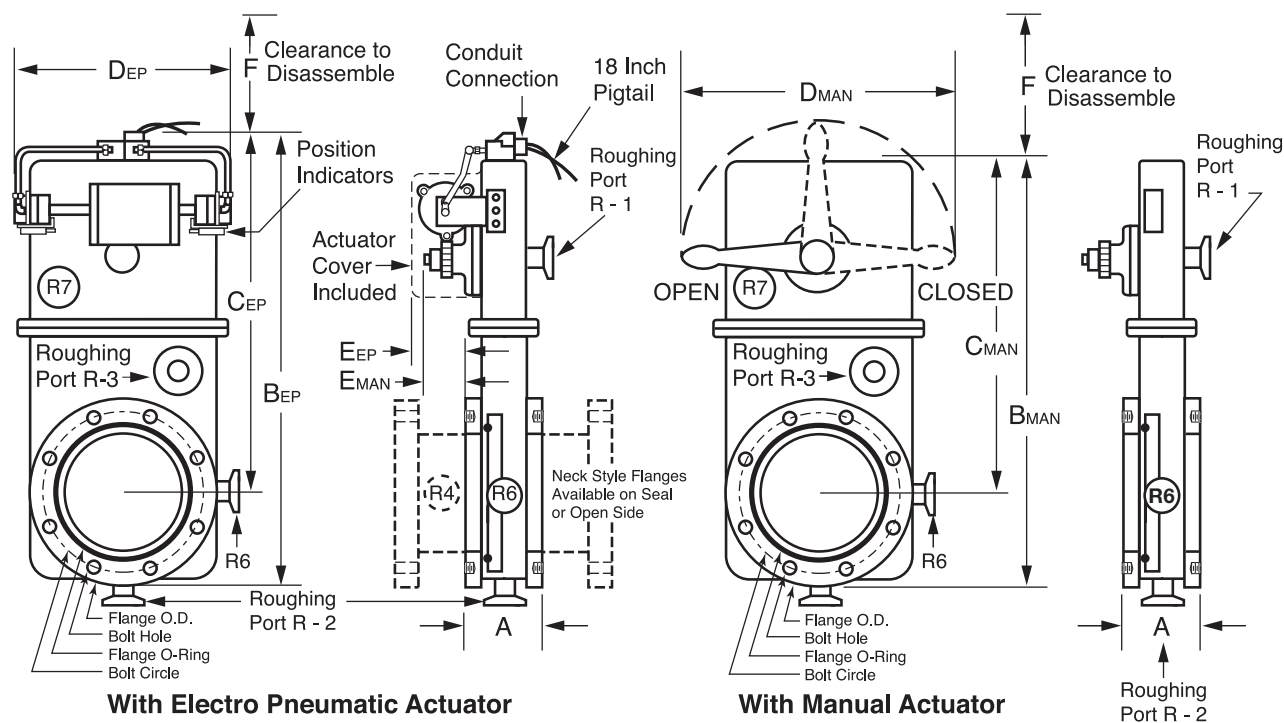
Special Features: Refer to pages 40 - 42 for specifications for roughing and gauge ports, position indicators & other special features.

Viton® or Kalrez® or Silicone O-Rings Our standard Valves use a Viton® O-Ring for the gate seal and Buna-N O-Rings for all other locations. You may specify Viton® (or other materials) throughout the valve with a "V", "S", or "K" in the model number. For Viton® add the following to the price. (For Silicone or Kalrez® contact the factory for prices.)

2 or 3 in. valves	\$59.	8 inch valves	\$177.
4 inch valves	\$90.	10 inch valves	\$231.
6 inch valves	\$111.	12 inch valves	\$297.

Nominal Size	Electro-Pneumatic Operator "EP" Suffix				Manual Operator "M" Suffix			
	Aluminum Model & Neck Style	Price	Stainless Steel Model & Neck Style	Price	Aluminum Model & Neck Style	Price	Stainless Steel Model & Neck Style	Price
2 inch ANSI (ASA) (3.375" Port)	LPWA-2-ANSI-N1-EP	\$1728.	LPSS-2-ANSI-N1-EP	\$5289.	LPWA-2-ANSI-N1-M	\$1481.	LPSS-2-ANSI-N1-M	\$5013.
	LPWA-2-ANSI-N5-EP	\$1938.	LPSS-2-ANSI-N5-EP	\$5722.	LPWA-2-ANSI-N5-M	\$1686.	LPSS-2-ANSI-N5-M	\$5446.
	LPWA-2-ANSI-N6-EP	\$1734.	LPSS-2-ANSI-N6-EP	\$5505.	LPWA-2-ANSI-N6-M	\$1537.	LPSS-2-ANSI-N6-M	\$5230.
	LPWA-2-ANSI-N8-EP	\$1734.	LPSS-2-ANSI-N8-EP	\$5505.	LPWA-2-ANSI-N8-M	\$1537.	LPSS-2-ANSI-N8-M	\$5230.
	(4" Port)	X-LPWA same price as LPWA		X-LPSS same price as LPSS	X-LPWA same price as LPWA		X-LPSS same price as LPSS	
3 inch ANSI (ASA) (3.375" Port)	LPWA-3-ANSI-N1-EP	\$1946.	LPSS-3-ANSI-N1-EP	\$5570.	LPWA-3-ANSI-N1-M	\$1695.	LPSS-3-ANSI-N1-M	\$5294.
	LPWA-3-ANSI-N5-EP	\$2069.	LPSS-3-ANSI-N5-EP	\$6057.	LPWA-3-ANSI-N5-M	\$1872.	LPSS-3-ANSI-N5-M	\$5781.
	LPWA-3-ANSI-N6-EP	\$2020.	LPSS-3-ANSI-N6-EP	\$5814.	LPWA-3-ANSI-N6-M	\$1769.	LPSS-3-ANSI-N6-M	\$5538.
	LPWA-3-ANSI-N8-EP	\$2020.	LPSS-3-ANSI-N8-EP	\$5814.	LPWA-3-ANSI-N8-M	\$1769.	LPSS-3-ANSI-N8-M	\$5538.
	(4" Port)	X-LPWA same price as LPWA		X-LPSS same price as LPSS	X-LPWA same price as LPWA		X-LPSS same price as LPSS	
4 inch ANSI (ASA) (5 3/8" Port)	LPWA-4-ANSI-N1-EP	\$2080.	LPSS-4-ANSI-N1-EP	\$6165.	LPWA-4-ANSI-N1-M	\$1804.	LPSS-4-ANSI-N1-M	\$5835.
	LPWA-4-ANSI-N5-EP	\$2367.	LPSS-4-ANSI-N5-EP	\$6760.	LPWA-4-ANSI-N5-M	\$2087.	LPSS-4-ANSI-N5-M	\$6430.
	LPWA-4-ANSI-N6-EP	\$2251.	LPSS-4-ANSI-N6-EP	\$6463.	LPWA-4-ANSI-N6-M	\$1976.	LPSS-4-ANSI-N6-M	\$5538.
	LPWA-4-ANSI-N8-EP	\$2251.	LPSS-4-ANSI-N8-EP	\$6463.	LPWA-4-ANSI-N8-M	\$1976.	LPSS-4-ANSI-N8-M	\$5538.
	(6" Port)	X-LPWA same price as LPWA		X-LPSS same price as LPSS	X-LPWA same price as LPWA		X-LPSS same price as LPSS	
6 inch ANSI (ASA) (7.125" Port)	LPWA-6-ANSI-N1-EP	\$2397.	LPSS-6-ANSI-N1-EP	\$7355.	LPWA-6-ANSI-N1-M	\$2050.	LPSS-6-ANSI-N1-M	\$7025.
	LPWA-6-ANSI-N5-EP	\$2747.	LPSS-6-ANSI-N5-EP	\$8166.	LPWA-6-ANSI-N5-M	\$2391.	LPSS-6-ANSI-N5-M	\$7836.
	LPWA-6-ANSI-N6-EP	\$2541.	LPSS-6-ANSI-N6-EP	\$7760.	LPWA-6-ANSI-N6-M	\$2192.	LPSS-6-ANSI-N6-M	\$7431.
	LPWA-6-ANSI-N8-EP	\$2541.	LPSS-6-ANSI-N8-EP	\$7760.	LPWA-6-ANSI-N8-M	\$2192.	LPSS-6-ANSI-N8-M	\$7431.
	(8" Port)	X-LPWA same price as LPWA		X-LPSS same price as LPSS	X-LPWA same price as LPWA		X-LPSS same price as LPSS	
8 inch ANSI (ASA) (8" Port)	LPWA-8-ANSI-N1-EP	\$3905.	LPSS-8-ANSI-N1-EP	\$7733.	LPWA-8-ANSI-N1-M	\$3494.	LPSS-8-ANSI-N1-M	\$7404.
	LPWA-8-ANSI-N5-EP	\$4210.	LPSS-8-ANSI-N5-EP	\$8599.	LPWA-8-ANSI-N5-M	\$3791.	LPSS-8-ANSI-N5-M	\$8269.
	LPWA-8-ANSI-N6-EP	\$4056.	LPSS-8-ANSI-N6-EP	\$8166.	LPWA-8-ANSI-N6-M	\$3642.	LPSS-8-ANSI-N6-M	\$7836.
	LPWA-8-ANSI-N8-EP	\$4056.	LPSS-8-ANSI-N8-EP	\$8166.	LPWA-8-ANSI-N8-M	\$3642.	LPSS-8-ANSI-N8-M	\$7836.
	(10" Port)	X-LPWA same price as LPWA		X-LPSS same price as LPSS	X-LPWA same price as LPWA		X-LPSS same price as LPSS	
10 inch ANSI (ASA) (11.625" Port)	LPWA-10-ANSI-N1-EP	\$4800.	LPSS-10-ANSI-N1-EP	\$12,438.	LPWA-10-ANSI-N1-M	\$4319.	LPSS-10-ANSI-N1-M	\$11,773.
	LPWA-10-ANSI-N5-EP	\$5183.	LPSS-10-ANSI-N5-EP	\$13,698.	LPWA-10-ANSI-N5-M	\$4689.	LPSS-10-ANSI-N5-M	\$12,963.
	LPWA-10-ANSI-N6-EP	\$4992.	LPSS-10-ANSI-N6-EP	\$13,033.	LPWA-10-ANSI-N6-M	\$4504.	LPSS-10-ANSI-N6-M	\$12,368.
	LPWA-10-ANSI-N8-EP	\$4992.	LPSS-10-ANSI-N8-EP	\$13,033.	LPWA-10-ANSI-N8-M	\$4504.	LPSS-10-ANSI-N8-M	\$12,368.
	(12" Port)	X-LPWA same price as LPWA		X-LPSS same price as LPSS	X-LPWA same price as LPWA		X-LPSS same price as LPSS	
12 inch ANSI (ASA) (12" Port)	LPWA-12-ANSI-N1-EP	\$5965.	LPSS-12-ANSI-N1-EP	\$13,844.	LPWA-12-ANSI-N1-M	\$5449.	LPSS-12-ANSI-N1-M	\$13,920.
	LPWA-12-ANSI-N5-EP	\$6331.	LPSS-12-ANSI-N5-EP	\$15,142.	LPWA-12-ANSI-N5-M	\$5804.	LPSS-12-ANSI-N5-M	\$14,477.
	LPWA-12-ANSI-N6-EP	\$6133.	LPSS-12-ANSI-N6-EP	\$14,493.	LPWA-12-ANSI-N6-M	\$5611.	LPSS-12-ANSI-N6-M	\$13,828.
	LPWA-12-ANSI-N8-EP	\$6133.	LPSS-12-ANSI-N8-EP	\$14,493.	LPWA-12-ANSI-N8-M	\$5611.	LPSS-12-ANSI-N8-M	\$13,828.
	(16" Port)	X-LPWA same price as LPWA		X-LPSS same price as LPSS	X-LPWA same price as LPWA		X-LPSS same price as LPSS	
16 inch ANSI (ASA) (16" Port)	LPWA-16-ANSI-N1-EP	\$11,979.	LPSS-16-ANSI-N1-EP	Contact Factory	LPWA-16-ANSI-N1-M	\$10,854.	LPSS-16-ANSI-N1-M	Contact Factory
	Contact factory for prices of 16 inch aluminum valves with N5, N6, and N8 neck styles, and for all 16 inch stainless steel valves							

Welded Aluminum Gate Valves, ANSI Flanges, Bonnet Style

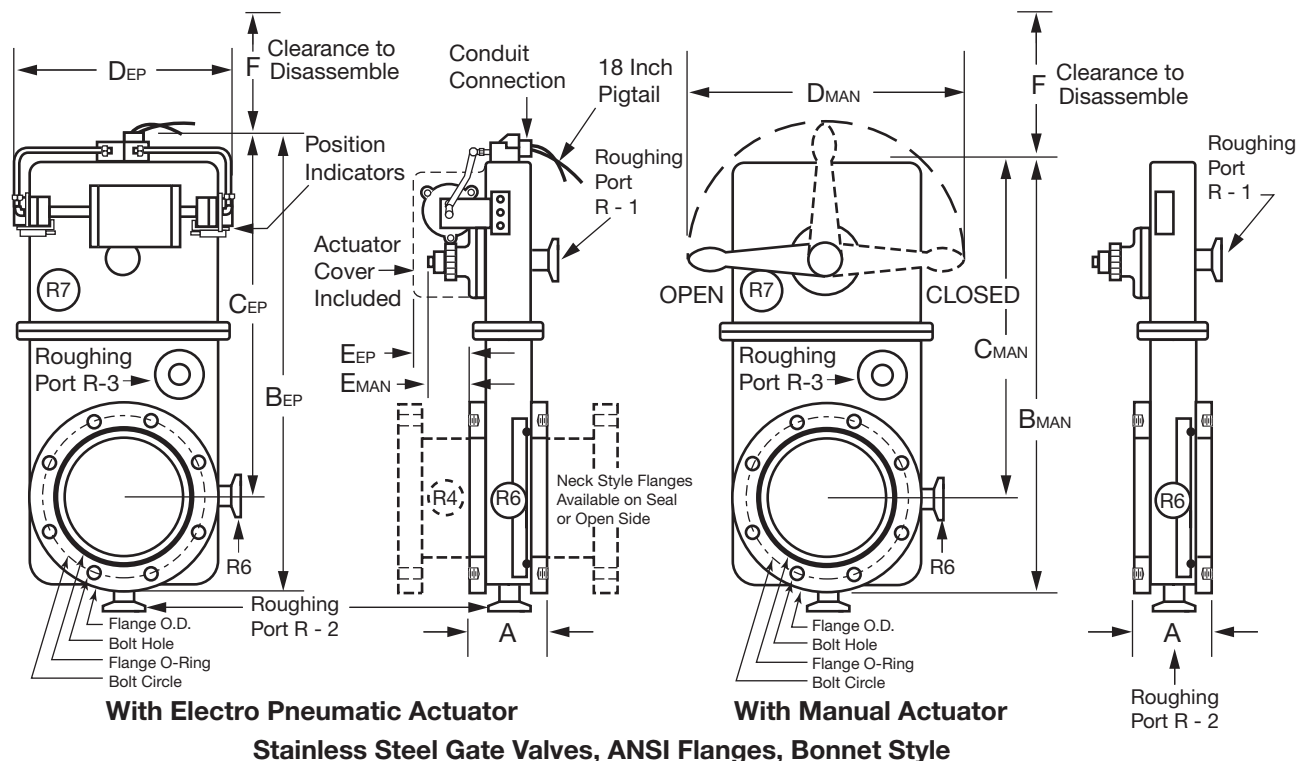


Welded Aluminum Gate Valves, ANSI Flanges, Bonnet Style

All dimensions in inches. Roughing ports and position indicator limit switches optional. Flanges available without O-rings.

For valves with ports up to 8 inches the actuator is on the same side as the gate seal, valves with ports 10 inches and larger have the actuator opposite the gate seal side.

Nominal ANSI Size	Model No. ANSI Flange	Port Diam. Choose LPWA or X-LPWA	ANSI Flange Out. Diam.	LPWA Flange O-Rings Contact factory for X-LPWA O-Rings	Bolt Circle	(no. of bolts) x bolt size	A Flange to Flange	BMAN Manual Overall Height	BEP EP Overall Height	CEP Port CL to Top of Valve	DMAN Manual Overall Width	DEP EP Overall Width	EMAN Manual	E _{EP} EP	F Disassy. Clearance	Net Wt. lbs.	Ship Wt. lbs.
2 inch	LPWA 2 N1	LPWA 3.375 in.	6.00	3.625 ID X .139	4.75	(4) 5/8-11	3.75	12.875	14.25	11.25	10.00	8.50	2.063	2.375	2.625	13	20
2 inch	LPWA 2 N5	X-LPWA	6.00	3.625 ID X .139	4.75	(4) Slotted	6.50	12.875	14.25	11.25	10.00	8.50	2.063	2.375	2.625	13	20
2 inch	LPWA 2 N6 & 8	4 inch	6.00	3.625 ID X .139	4.75	Neck Side Slotted	5.125	12.875	14.25	11.25	10.00	8.50	2.063	2.375	2.625	13	20
3 inch	LPWA 3 N1	LPWA 3.375 in.	7.50	4.00 ID x .139	6.00	(4) 5/8-11	3.75	13.625	15.00	11.25	10.00	8.50	2.063	2.375	2.625	15	22
3 inch	LPWA 3 N5	X-LPWA	7.50	4.00 ID x .139	6.00	(4) Slotted	6.50	13.625	15.00	11.25	10.00	8.50	2.063	2.375	2.625	15	22
3 inch	LPWA 3 N6 & 8	4 inch	7.50	4.00 ID x .139	6.00	Neck Side Slotted	5.125	13.625	15.00	11.25	10.00	8.50	2.063	2.375	2.625	15	22
4 inch	LPWA 4 N1	LPWA 5.375 in.	9.00	5.75 ID x .139	7.50	(8) 5/8-11	4.125	20.25	21.50	17.00	16.00	10.125	2.25	3.50	4.50	31	45
4 inch	LPWA 4 N5	X-LPWA	9.00	5.75 ID x .139	7.50	(8) Slotted	7.125	20.25	21.50	17.00	16.00	10.125	2.25	3.50	4.50	31	45
4 inch	LPWA 4 N6 & 8	6 inch	9.00	5.75 ID x .139	7.50	Neck Side Slotted	5.625	20.25	21.50	17.00	16.00	10.125	2.25	3.50	4.50	31	45
6 inch	LPWA 6 N1	LPWA 7.125 in.	11.00	7.50 ID x .139	9.50	(8) 3/4-10	4.375	24.875	26.00	20.375	16.00	12.50	2.625	3.375	5.50	49	60
6 inch	LPWA 6 N5	X-LPWA	11.00	7.50 ID x .139	9.50	(8) Slotted	7.875	24.875	26.00	20.375	16.00	12.50	2.625	3.375	5.50	49	60
6 inch	LPWA 6 N6 & 8	8 inch	11.00	7.50 ID x .139	9.50	Neck Side Slotted	6.125	24.875	26.00	20.375	16.00	12.50	2.625	3.375	5.50	49	60
8 inch	LPWA 8 N1	LPWA 8 inch	13.50	9.00 ID x .275	11.75	(8) 3/4-10	4.375	26.125	27.25	20.375	16.00	12.50	2.625	3.125	5.50	55	66
8 inch	LPWA 8 N5	X-LPWA	13.50	9.00 ID x .275	11.75	(8) Slotted	7.875	26.125	27.25	20.375	16.00	12.50	2.625	3.125	5.50	55	66
8 inch	LPWA 8 N6 & 8	10 inch	13.50	9.00 ID x .275	11.75	Neck Side Slotted	6.125	26.125	27.25	20.375	16.00	12.50	2.625	3.125	5.50	55	66
10 inch	LPWA 10 N1	LPWA 11.625 in.	16.00	12.00 ID x .275	14.25	(12) 7/8-9	4.625	30.438	31.688	23.688	21.00	18.00	2.938	3.125	4.75	109	130
10 inch	LPWA 10 N5	X-LPWA	16.00	12.00 ID x .275	14.25	(12) Slotted	8.125	30.438	31.688	23.688	21.00	18.00	2.938	3.125	4.75	109	130
10 inch	LPWA 10 N6 & 8	12 inch	16.00	12.00 ID x .275	14.25	Neck Side Slotted	6.375	30.438	31.688	23.688	21.00	18.00	2.938	3.125	4.75	109	130
12 inch	LPWA 12 N1	12.00	19.00	13.00 ID X .275	17.00	(12) 7/8-9	4.625	32.00	33.25	23.688	21.00	18.00	2.938	3.125	4.75	129	150
12 inch	LPWA 12 N5	12.00	19.00	13.00 ID X .275	17.00	(12) Slotted	8.125	32.00	33.25	23.688	21.00	18.00	2.938	3.125	4.75	129	150
12 inch	LPWA 12 N6 & 8	12.00	19.00	13.00 ID X .275	17.00	Neck Side Slotted	6.375	32.00	33.25	23.688	21.00	18.00	2.938	3.125	4.75	129	150
16 inch	LPWA 16 N1	16.00	23.50	17.00 ID X .275	21.25	(16) 1-8	6.50	41.75	43.00	31.188	22.00	23.00	5.50	6.625	7.00	200	350
20 inch	LPWA 20 N1	20.00	27.50	22.00 ID X .275	25.00	(20) 1 1/8-7	7.31	51.06	52.31	38.56	42.00	25.56	5.50	6.63	10.00	250	400



Note: All dimensions in inches. Roughing ports and position indicator limit switches optional. Flanges available without O-rings.

For valves with ports up to 8 inches the actuator is on the same side as the gate seal, valves with ports 10 inches and larger have the actuator opposite the gate seal side.

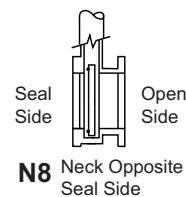
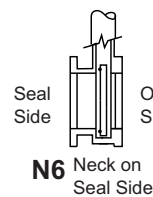
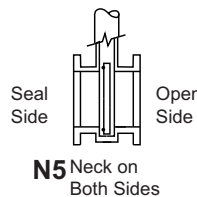
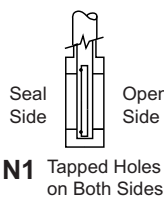
Nominal ANSI Size	Model No. ANSI Flange	Port Diam. Choose LPSS or X-LPSS	ANSI Flange Out. Diam.	LPSS Flange O-Rings Contact factory for X-LPSS O-Rings	Bolt Circle	(no. of bolts) size - pitch	A Flange to Flange	BMAN Manual Overall Height	BEP EP Overall Height	CEP Port CL to Top of Valve	DMAN Manual Overall Width	DEP EP Overall Width	EMAN Manual	EEP EP	F Disassy. Clearance	Net Wt. lbs.	Ship Wt. lbs.
2 inch	LPSS 2 N1	LPSS	6.00	3.625 ID X .139	4.75	(4) 3/8-16	2.970	11.00	12.25	9.25	10.00	8.50	2.063	2.375	2.625	30	40
2 inch	LPSS 2 N5	3.375 in.	6.00	3.625 ID X .139	4.75	(4) Slotted	5.720	11.00	12.25	9.25	10.00	8.50	2.063	2.375	2.625	30	40
2 inch	LPSS 2 N6 & 8	X-LPSS 4 inch	6.00	3.625 ID X .139	4.75	Neck Side Slotted	4.345	11.00	12.25	9.25	10.00	8.50	2.063	2.375	2.625	30	40
3 inch	LPSS 3 N1	LPSS	7.50	4.00 ID x .139	6.00	(4) 3/8-16	2.970	11.75	13.00	9.25	10.00	8.50	2.063	2.375	2.625	40	50
3 inch	LPSS 3 N5	3.375 in.	7.50	4.00 ID x .139	6.00	(4) Slotted	5.720	11.75	13.00	9.25	10.00	8.50	2.063	2.375	2.625	40	50
3 inch	LPSS 3 N6 & 8	X-LPSS 4 inch	7.50	4.00 ID x .139	6.00	Neck Side Slotted	4.345	11.75	13.00	9.25	10.00	8.50	2.063	2.375	2.625	40	50
4 inch	LPSS 4 N1	LPSS	9.00	5.75 ID x .139	7.50	(8) 3/8-16	3.610	17.25	18.50	14.00	16.00	10.125	2.25	3.50	4.50	75	85
4 inch	LPSS 4 N5	5.375 in.	9.00	5.75 ID x .139	7.50	(8) Slotted	6.610	17.25	18.50	14.00	16.00	10.125	2.25	3.50	4.50	75	85
4 inch	LPSS 4 N6 & 8	X-LPSS 6 inch	9.00	5.75 ID x .139	7.50	Neck Side Slotted	5.110	17.25	18.50	14.00	16.00	10.125	2.25	3.50	4.50	75	85
6 inch	LPSS 6 N1	LPSS	11.00	7.50 ID x .139	9.50	(8) 3/4-10	3.860	20.75	22.00	16.375	16.00	12.50	2.625	3.375	5.50	83	108
6 inch	LPSS 6 N5	7.125 in.	11.00	7.50 ID x .139	9.50	(8) Slotted	7.360	20.75	22.00	16.375	16.00	12.50	2.625	3.375	5.50	83	108
6 inch	LPSS 6 N6 & 8	X-LPSS 8 inch	11.00	7.50 ID x .139	9.50	Neck Side Slotted	5.610	20.75	22.00	16.375	16.00	12.50	2.625	3.375	5.50	83	108
8 inch	LPSS 8 N1	LPSS	13.50	9.00 ID x .275	11.75	(8) 3/4-10	3.860	21.875	23.125	16.375	16.00	12.50	2.625	3.375	5.50	100	120
8 inch	LPSS 8 N5	8 inch	13.50	9.00 ID x .275	11.75	(8) Slotted	7.360	21.875	23.125	16.375	16.00	12.50	2.625	3.375	5.50	100	120
8 inch	LPSS 8 N6 & 8	X-LPSS 10 inch	13.50	9.00 ID x .275	11.75	Neck Side Slotted	5.610	21.875	23.125	16.375	16.00	12.50	2.625	3.375	5.50	100	120
10 inch	LPSS 10 N1	LPSS	16.00	12.00 ID x .275	14.25	(12) 3/4-10	4.110	30.438	31.688	23.688	21.00	18.00	2.938	3.125	4.75	147	171
10 inch	LPSS 10 N5	11.625 in.	16.00	12.00 ID x .275	14.25	(12) Slotted	7.610	30.438	31.688	23.688	21.00	18.00	2.938	3.125	4.75	147	171
10 inch	LPSS 10 N6 & 8	X-LPSS 12 inch	16.00	12.00 ID x .275	14.25	Neck Side Slotted	5.860	30.438	31.688	23.688	21.00	18.00	2.938	3.125	4.75	147	171
12 inch	LPSS 12 N1	LPSS	19.00	13.00 ID X .275	17.00	(12) 3/4-10	4.110	32.00	33.25	23.688	21.00	18.00	2.938	3.125	4.75	150	180
12 inch	LPSS 12 N5	12.00	19.00	13.00 ID X .275	17.00	(12) Slotted	7.610	32.00	33.25	23.688	21.00	18.00	2.938	3.125	4.75	150	180
12 inch	LPSS 12 N6 & 8	12.00	19.00	13.00 ID X .275	17.00	Neck Side Slotted	5.860	32.00	33.25	23.688	21.00	18.00	2.938	3.125	4.75	150	180
16 inch	LPSS 16 N1	LPSS	23.50	17.00 ID X .275	21.25	(16) 1-8	5.750	41.63	42.63	30.88	21.00	21.00	4.94	6.33	7.75	250	400

End Operated Aluminum Gate Valves; Standard Size Ports with ANSI Flanges

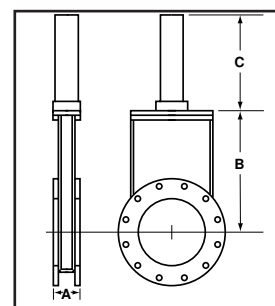


Stainless Steel Gates in Aluminum Valves: Add suffix "SS Gate" to the model number to specify a stainless steel gate in an aluminum valve. Refer to the "Optional Features and Accessories" page for pricing information.

- Less Outgassing Than Stainless, See Page 39
- Seal with Vacuum or Atmosphere on Either Side
- Helium Tested to 5×10^{-10} scc per second
- All Valves (RoHS) 2015/863/EU Compliant
- Flanges to Match Diffusion & Cryo Pumps
- Closing Speeds as Fast as 75 mSec. Available
- Optional Operation to 10 Bar, 147 PSIG; \$260.
- Optional Remote Position Indicators
- NW & Compression Gauge & Roughing Ports
- Automatic Closure on Power Failure



Nominal Size	Model No. Dimensions in Inches	Port Dia.	Flange O.D.	Flange O-Rings	Bolt Circle	(no. of bolts) x bolt size	Flange to Flange A	B	C	List Price
2 inch	END STD 2 N1	2.00	6.00	3.50 ID x .139	4.75	(4) 5/8-11	3.125	6.25	7.375	\$1302.
2 inch	END STD 2 N5	2.00	6.00	3.50 ID x .139	4.75	(4) Slotted	4.875	6.25	7.375	\$1546.
2 inch	END STD 2 N6 & 8	2.00	6.00	3.50 ID x .139	4.75	Neck Side Slotted	4.00	6.25	7.375	\$1422.
3 inch	END STD 3 N1	3.00	7.50	4.00 ID x .139	6.00	(4) 5/8-11	3.75	8.375	9.406	\$1946.
3 inch	END STD 3 N5	3.00	7.50	4.00 ID x .139	6.00	(4) Slotted	6.50	8.375	9.406	\$2069.
3 inch	END STD 3 N6 & 8	3.00	7.50	4.00 ID x .139	6.00	Neck Side Slotted	5.125	8.375	9.406	\$2020.
4 inch	END STD 4 N1	4.00	9.00	5.75 ID x .139	7.50	(8) 5/8-11	4.125	8.375	9.406	\$1998.
4 inch	END STD 4 N5	4.00	9.00	5.75 ID x .139	7.50	(8) Slotted	7.125	8.375	9.406	\$2288.
4 inch	END STD 4 N6 & 8	4.00	9.00	5.75 ID x .139	7.50	Neck Side Slotted	5.625	8.375	9.406	\$2174.
6 inch	END STD 6 N1	6.00	11.00	7.50 ID x .139	9.50	(8) 3/4-10	4.375	11.375	11.656	\$2130.
6 inch	END STD 6 N5	6.00	11.00	7.50 ID x .139	9.50	(8) Slotted	7.875	11.375	11.656	\$2479.
6 inch	END STD 6 N6 & 8	6.00	11.00	7.50 ID x .139	9.50	Neck Side Slotted	6.125	11.375	11.656	\$2275.
8 inch	END STD 8 N1	8.00	13.50	9.00 ID x .275	11.75	(8) 3/4-10	4.375	14.313	13.719	\$3368.
8 inch	END STD 8 N5	8.00	13.50	9.00 ID x .275	11.75	(8) Slotted	7.875	14.313	13.719	\$3674.
8 inch	END STD 8 N6 & 8	8.00	13.50	9.00 ID x .275	11.75	Neck Side Slotted	6.125	14.313	13.719	\$3521.
10 inch	END STD 10 N1	10.00	16.00	12.00 ID x .275	14.25	(12) 7/8-9	4.625	19.063	15.969	\$4671.
10 inch	END STD 10 N5	10.00	16.00	12.00 ID x .275	14.25	(12) Slotted	8.125	19.063	15.969	\$5052.
10 inch	END STD 10 N6 & 8	10.00	16.00	12.00 ID x .275	14.25	Neck Side Slotted	6.375	19.063	15.969	\$4866.
12 inch	END STD 12 N1	12.00	19.00	13.00 ID x .275	17.00	(12) 7/8-9	4.625	21.00	18.00	\$5833.
12 inch	END STD 12 N5	12.00	19.00	13.00 ID x .275	17.00	(12) Slotted	8.125	21.00	18.00	\$6203.
12 inch	END STD 12 N6 & 8	12.00	19.00	13.00 ID x .275	17.00	Neck Side Slotted	6.375	21.00	18.00	\$6025.
14 inch	END STD 14 N1	14.00	21.00	15.00 ID x .275	18.75	(12) 1-8	6.50	27.625	22.03	\$10,207.
16 inch	END STD 16 N1	16.00	23.50	17.50 ID x .275	21.25	(16) 1-8	6.50	27.625	22.03	\$11,177.
18 inch	END STD 18 N1	18.00	25.00	19.00 ID x .275	22.75	(16)	7.81	35.56	28.50	\$16,749.
20 inch	END STD 20 N1	20.00	27.50	22.00 ID x .275	25.00	(20) 1 1/8-7	7.88	35.75	27.031	\$17,506.
22 inch	END APD CRYO SHI-APD CP-22	21.75	27.50	No O-Ring on Pump (Seal) Side	25.00	(20) 1 1/8-7	7.625	35.75	27.031	\$17,533.
24 inch	END STD 24 N1	24.00	32.00	26.00 ID x .275	29.50	(20) 1 1/4-7	8.56	42.50	30.50	\$25,223.



ORDERING INFORMATION

Model Number: Refer to page 2 for instructions on how to specify the features you need.

Position Indicators: Two reed switches activated by a magnet inside the pneumatic actuator provide closure for open and closed position. SPST contacts rated 0.5A @ 110 or 220 VAC non-inductive. Add LSE to Model No. \$162.00 /pair

Gauge and Roughing Ports: See page 42 for sizes and prices.

200 PSI Shaft Seal \$270.

Special Features: Refer to page 40 and 41 for information on special features and accessories.

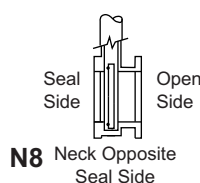
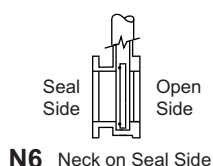
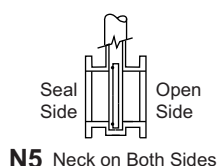
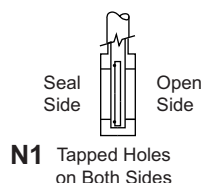
Viton® or Kalrez® or Silicone O-Rings: Our standard Valves use a Viton® O-Ring for the gate seal and Buna-N O-Rings for all other locations. You may specify Viton® (or other materials) throughout the valve with a "V", "S", or "K" in the model number. For Viton® add the following to the price. (Contact factory for Silicone or Kalrez® prices.)

2 or 3 in. valves \$59.
4 in. valves \$90.
6 in. valves \$111.
8 in. valves \$177.
10 in. valves \$231.
12 in. valves \$297.

End Operated Aluminum Gate Valves; Over Size Large Ports with ANSI Flanges

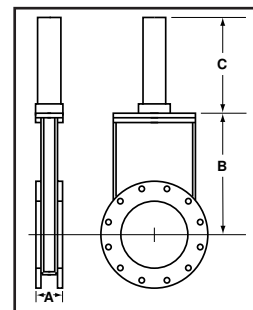


- Less Outgassing Than Stainless, See Page 39
- Simple End Operated Air Cylinder
- Over 100,000 Cycles Without Maintenance
- Helium Tested to 5×10^{-10} scc/s
- All Valves (RoHS) 2015/863/EU Compliant
- Flanges to Match Diffusion & Cryo Pumps
- Closing Speeds as Fast as 75 mSec. Available
- Optional Operation to 10 Bar, 147 PSIG; \$260.
- Optional Remote Position Indicators
- NW & Compression Gauge & Roughing Ports
- Automatic Closure on Power Failure



Stainless Steel Gates in Aluminum Valves: To specify a stainless steel gate in an aluminum valve add suffix "SS Gate" to the model number. Refer to "Optional Features and Accessories" section of this catalog for pricing information.

Nominal Size	Model No. Dimensions in Inches	Port Dia.	Flange O.D.	Flange O-Rings	Bolt Circle	(no. of bolts) x bolt size	Flange to Flange A	B	C	List Price
2 inch	END LP2 N1	2.50	6.00	3.50 ID x .139	4.75	(4) $\frac{5}{8}$ -11	3.125	8.375	9.406	\$1265.
2 inch	END LP2 N5	2.50	6.00	3.50 ID x .139	4.75	(4) Slotted	4.875	8.375	9.406	\$1499.
2 inch	END LP2 N6 & 8	2.50	6.00	3.50 ID x .139	4.75	Neck Side Slotted	4.00	8.375	9.406	\$1381.
3 inch	END LP3 N1	4.00	7.50	4.5 ID x .139	6.00	(4) $\frac{5}{8}$ -11	3.75	8.375	9.406	\$1890.
3 inch	END LP3 N5	4.00	7.50	4.5 ID x .139	6.00	(4) Slotted	6.50	8.375	9.406	\$2009.
3 inch	END LP3 N6 & 8	4.00	7.50	4.5 ID x .139	6.00	Neck Side Slotted	5.125	8.375	9.406	\$1962.
4 inch	END LP4 N1	6.00	9.00	6.25 ID x .139	7.50	(8) $\frac{5}{8}$ -11	4.125	11.375	11.656	\$1939.
4 inch	END LP4 N5	6.00	9.00	6.25 ID x .139	7.50	(8) Slotted	7.125	11.375	11.656	\$2221.
4 inch	END LP4 N6 & 8	6.00	9.00	6.25 ID x .139	7.50	Neck Side Slotted	5.625	11.375	11.656	\$2110.
6 inch	END LP6 N1	8.00	11.00	8.25 ID x .139	9.50	(8) $\frac{3}{4}$ -10	4.375	14.313	13.719	\$2215.
6 inch	END LP6 N5	8.00	11.00	8.25 ID x .139	9.50	(8) Slotted	7.875	14.313	13.719	\$2544.
6 inch	END LP6 N6 & 8	8.00	11.00	8.25 ID x .139	9.50	Neck Side Slotted	6.125	14.313	13.719	\$2357.
8 inch	END LP8 N1	10.00	13.50	10.50 ID x .139	11.75	(8) $\frac{3}{4}$ -10	4.375	19.063	15.969	\$3677.
8 inch	END LP8 N5	10.00	13.50	10.50 ID x .139	11.75	(8) Slotted	7.875	19.063	15.969	\$3973.
8 inch	END LP8 N6 & 8	10.00	13.50	10.50 ID x .139	11.75	Neck Side Slotted	6.125	19.063	15.969	\$3827.
10 inch	END LP10 N1	12.00	16.00	12.50 ID x .275	14.25	(12) $\frac{7}{8}$ -9	4.625	21.00	18.00	\$4535.
10 inch	END LP10 N5	12.00	16.00	12.50 ID x .275	14.25	(12) Slotted	8.125	21.00	18.00	\$4905.
10 inch	END LP10 N6 & 8	12.00	16.00	12.50 ID x .275	14.25	Neck Side Slotted	6.375	21.00	18.00	\$4720.
22 inch	END APD CRYO SHI-APD CP-22	21.75	27.50	No O-Ring on Pump (Seal) Side	25.00	(20) $1\frac{1}{8}$ -7	7.625	37.75	27.031	\$17,533.



ORDERING INFORMATION

Model Number: Refer to pg. 2 for instructions on how to specify the features you need.

Position Indicators: Two reed switches activated by a magnet inside the pneumatic actuator provide closure for open and closed position. SPST contacts rated 0.5A @ 110 or 220 VAC non-inductive. Add LSE to Model No. . . . \$162.00 /pair

Gauge and Roughing Ports: See page 42 for sizes and prices.

200 PSI Shaft Seal \$270.

Special Features: Refer to pages 40 and 41 for information on special features and accessories.

Viton® or Kalrez® or Silicone O-Rings: Our standard Valves use a Viton® O-Ring for the gate seal and Buna-N O-Rings for all other locations. You may specify Viton® (or other materials) throughout the valve with a "V", "S", or "K" in the model number. For Viton® add the following to the price. (For Silicone or Kalrez® contact the factory for prices.)

2 or 3 in. valves \$59.
4 in. valves \$90.
6 in. valves \$111.
8 in. valves \$177.
10 in. valves \$231.
12 in. valves \$297.

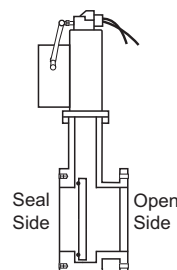
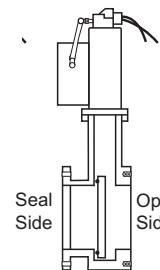
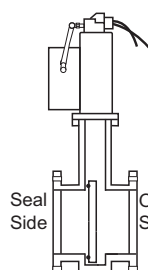
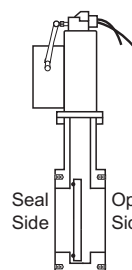


- Less Outgassing Than Stainless, See Page 39
- 250,000 Cycle Rotary Shaft Seal
- Million Cycle Valves Also Available
- Large Port, Mates With JIS Flanges
- 6 Optional Roughing Port Locations
- Helium Leak Less Than 5×10^{-10} scc/sec
- All Valves (RoHS) 2015/863/EU Compliant
- Fail Safe Design, Close On Power Loss
- Vacuum & Pressure; Optional Seal to 3 ATM.
- Optional Operation to 10 Bar, 147 PSIG

N1 Tapped Holes
Both Sides

N5 Neck on
Both Sides

N6 Neck on
Seal Side

N8 Neck Opposite
Seal Side


For valves with ports up to 200 mm the actuator is on the same side as the gate seal, valves with ports 250 mm and larger have the actuator opposite the gate seal side.

ORDERING INFORMATION

Model Number: Refer to page 2 for instructions on how to specify the features you need.

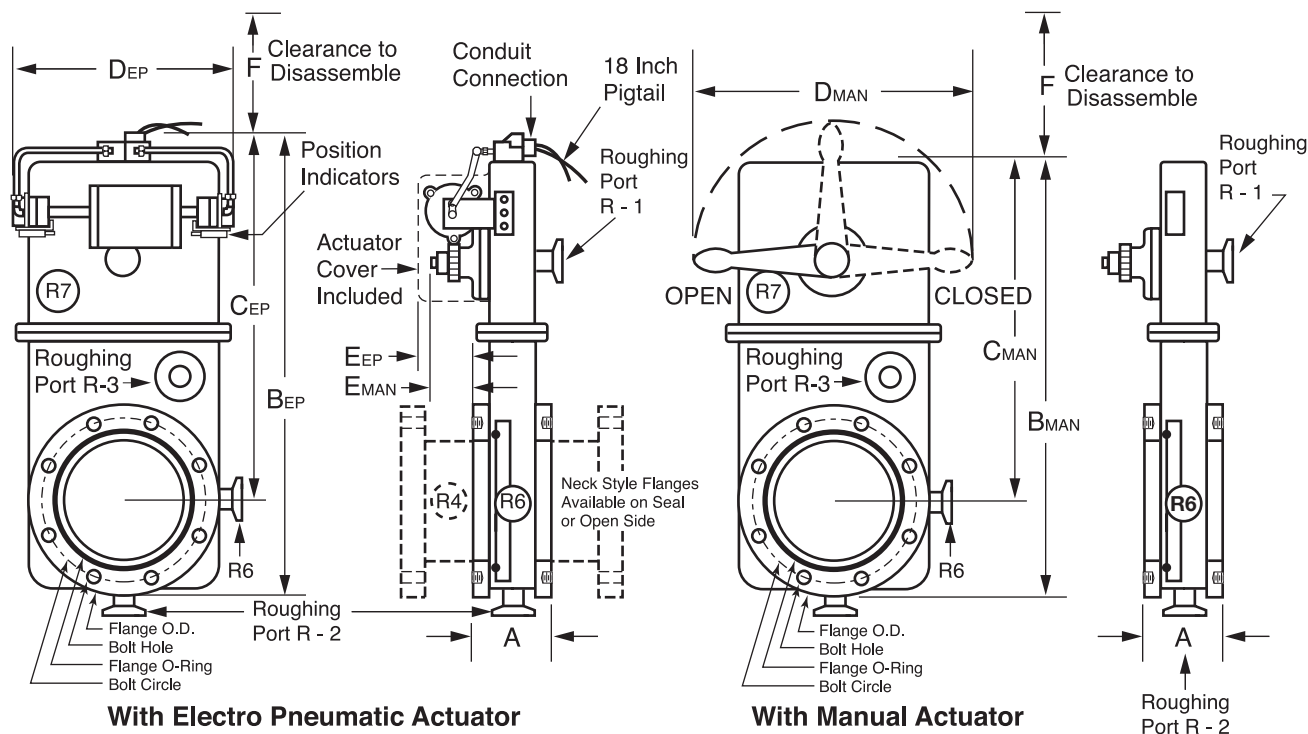
Electric Motor Actuators: Any Vacuum Research valve can be supplied with a high torque electric motor actuator. Refer to "Electric Motor Actuator" Page in the Accessories and Parts section.

Special Features: Refer to pages 40-43 for specifications for roughing and gauge ports, position indicators & other special features.

Viton® or Kalrez® or Silicone O-Rings Our standard Valves use a Viton® O-Ring for the gate seal and Buna-N O-Rings for all other locations. You may specify Viton® or other materials throughout the valve with a "V", "S", or "K" in the model number. For Viton® add the following to the price. (For Silicone or Kalrez® contact the factory for prices.)

65 or 80 mm valves . . . \$59.	200 mm valves . . . \$177.
100 mm valves . . . \$90.	250 mm valves . . . \$231.
150 mm valves . . . \$111.	300 mm valves . . . \$297.

Nominal Size	Electro-Pneumatic Operator "EP" Suffix				Manual Operator "M" Suffix			
	Aluminum Model & Neck Style	Price	Stainless Steel Model & Neck Style	Price	Aluminum Model & Neck Style	Price	Stainless Steel Model & Neck Style	Price
65 mm One piece style	OP-65-JIS-N1-EP	\$1340.	OPSS-65-JIS-N1-EP	\$4597.	OP-65-JIS-N1-M	\$1114.	OPSS-65-JIS-N1-M	\$4321.
	OP-65-JIS-N5-EP	\$1987.	OPSS-65-JIS-N5-EP	\$4813.	OP-65-JIS-N5-M	\$1351.	OPSS-65-JIS-N5-M	\$4537.
	OP-65-JIS-N6-EP	\$1459.	OPSS-65-JIS-N6-EP	\$4705.	OP-65-JIS-N6-M	\$1234.	OPSS-65-JIS-N6-M	\$4429.
	OP-65-JIS-N8-EP	\$1459.	OPSS-65-JIS-N8-EP	\$4705.	OP-65-JIS-N8-M	\$1234.	OPSS-65-JIS-N8-M	\$4429.
80 mm	LPWA-80-JIS-N1-EP	\$1820.	LPSS-80-JIS-N1-EP	\$5289.	LPWA-80-JIS-N1-M	\$1573.	LPSS-80-JIS-N1-M	\$5338.
	LPWA-80-JIS-N5-EP	\$1961.	LPSS-80-JIS-N5-EP	\$5559.	LPWA-80-JIS-N5-M	\$1832.	LPSS-80-JIS-N5-M	\$5284.
	LPWA-80-JIS-N6-EP	\$1908.	LPSS-80-JIS-N6-EP	\$5424.	LPWA-80-JIS-N6-M	\$1708.	LPSS-80-JIS-N6-M	\$5148.
	LPWA-80-JIS-N8-EP	\$1908.	LPSS-80-JIS-N8-EP	\$5424.	LPWA-80-JIS-N8-M	\$1708.	LPSS-80-JIS-N8-M	\$5148.
100 mm	LPWA-100-JIS-N1-EP	\$1831.	LPSS-100-JIS-N1-EP	\$5354.	LPWA-100-JIS-N1-M	\$1635.	LPSS-100-JIS-N1-M	\$5087.
	LPWA-100-JIS-N5-EP	\$2025.	LPSS-100-JIS-N5-EP	\$5538.	LPWA-100-JIS-N5-M	\$1827.	LPSS-100-JIS-N5-M	\$5262.
	LPWA-100-JIS-N6-EP	\$1934.	LPSS-100-JIS-N6-EP	\$5500.	LPWA-100-JIS-N6-M	\$1739.	LPSS-100-JIS-N6-M	\$5224.
	LPWA-100-JIS-N8-EP	\$1934.	LPSS-100-JIS-N8-EP	\$5500.	LPWA-100-JIS-N8-M	\$1739.	LPSS-100-JIS-N8-M	\$5224.
150 mm	LPWA-150-JIS-N1-EP	\$1992.	LPSS-150-JIS-N1-EP	\$6219.	LPWA-150-JIS-N1-M	\$1782.	LPSS-150-JIS-N1-M	\$5889.
	LPWA-150-JIS-N5-EP	\$2281.	LPSS-150-JIS-N5-EP	\$6544.	LPWA-150-JIS-N5-M	\$1994.	LPSS-150-JIS-N5-M	\$6214.
	LPWA-150-JIS-N6-EP	\$2139.	LPSS-150-JIS-N6-EP	\$6381.	LPWA-150-JIS-N6-M	\$1931.	LPSS-150-JIS-N6-M	\$6052.
	LPWA-150-JIS-N8-EP	\$2139.	LPSS-150-JIS-N8-EP	\$6381.	LPWA-150-JIS-N8-M	\$1931.	LPSS-150-JIS-N8-M	\$6052.
200 mm	LPWA-200-JIS-N1-EP	\$3867.	LPSS-200-JIS-N1-EP	\$7517.	LPWA-200-JIS-N1-M	\$3592.	LPSS-200-JIS-N1-M	\$7187.
	LPWA-200-JIS-N5-EP	\$4201.	LPSS-200-JIS-N5-EP	\$7863.	LPWA-200-JIS-N5-M	\$3925.	LPSS-200-JIS-N5-M	\$7533.
	LPWA-200-JIS-N6-EP	\$3986.	LPSS-200-JIS-N6-EP	\$7690.	LPWA-200-JIS-N6-M	\$3708.	LPSS-200-JIS-N6-M	\$7360.
	LPWA-200-JIS-N8-EP	\$3986.	LPSS-200-JIS-N8-EP	\$7690.	LPWA-200-JIS-N8-M	\$3708.	LPSS-200-JIS-N8-M	\$7360.
250 mm	LPWA-250-JIS-N1-EP	\$4661.	LPSS-250-JIS-N1-EP	\$11,789.	LPWA-250-JIS-N1-M	\$4342.	LPSS-250-JIS-N1-M	\$11,124.
	LPWA-250-JIS-N5-EP	\$5032.	LPSS-250-JIS-N5-EP	\$12,157.	LPWA-250-JIS-N5-M	\$4714.	LPSS-250-JIS-N5-M	\$11,492.
	LPWA-250-JIS-N6-EP	\$4847.	LPSS-250-JIS-N6-EP	\$11,973.	LPWA-250-JIS-N6-M	\$4529.	LPSS-250-JIS-N6-M	\$11,633.
	LPWA-250-JIS-N8-EP	\$4847.	LPSS-250-JIS-N8-EP	\$11,973.	LPWA-250-JIS-N8-M	\$4529.	LPSS-250-JIS-N8-M	\$11,633.
300 mm	LPWA-300-JIS-N1-EP	\$5791.	LPSS-300-JIS-N1-EP	\$13,899.	LPWA-300-JIS-N1-M	\$5473.	LPSS-300-JIS-N1-M	\$13,588.
	LPWA-300-JIS-N5-EP	\$6147.	LPSS-300-JIS-N5-EP	\$14,288.	LPWA-300-JIS-N5-M	\$5824.	LPSS-300-JIS-N5-M	\$13,947.
	LPWA-300-JIS-N6-EP	\$5954.	LPSS-300-JIS-N6-EP	\$14,093.	LPWA-300-JIS-N6-M	\$5633.	LPSS-300-JIS-N6-M	\$13,753.
	LPWA-300-JIS-N8-EP	\$5954.	LPSS-300-JIS-N8-EP	\$14,093.	LPWA-300-JIS-N8-M	\$5633.	LPSS-300-JIS-N8-M	\$13,753.



Stainless or Welded Aluminum Gate Valves, JIS Flanges, Bonnet Style

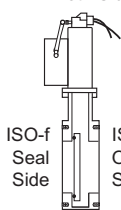
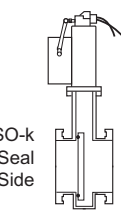
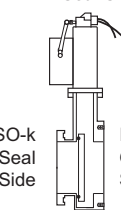
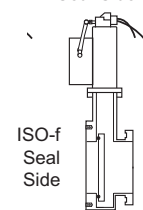
Note: All dimensions in millimeters. Roughing ports and position indicator limit switches optional. Centering rings not included.

For valves with ports up to 200 mm the actuator is on the same side as the gate seal, valves with ports 250 mm and larger have the actuator opposite the gate seal side.

JIS Port Size	Model No.	Flange		Bolt Circle	(number of bolts) size - pitch	A Flange to Flange		BMAN Manual Overall Height	BEP EP Overall Height	CEP Port CL to Top of Valve	DMAN Manual Overall Width	DEP EP Overall Width	EMAN Manual	EEP EP	F Disassy. Clearance	Weight kgs. Aluminum	
		Out-side Diam.	O-Ring Inside Diam.			Stainless	Alum.									Net	Ship
65 mm one piece style	OP 65 JIS N1, both sides tapped holes	145	85	120	(4) M 8 - 1.25	53	70	246	278	205	100	175	45	60	67	8	13
	OP 65 JIS N5, both sides through holes	145	85	120	thru holes 12 mm	98	140	246	278	205	100	175	45	60	67	8	13
	OP 65 JIS N6 & N8, 1 tapped, 1 through	145	85	120	Neck Side Slotted	83	105	246	278	205	100	175	45	60	67	8	13
80 mm	LPWA JIS 80 N1, both sides tapped holes	160	101	135	(4) M 10 - 1.5	60	95	360	392	312	254	228	52	60	67	10	15
	LPWA JIS 80 N5, both sides through holes	160	101	135	thru holes 12 mm	105	165	360	392	312	254	228	52	60	67	10	15
	LPWA JIS 80 N6 & N8, 1 tapped, 1 through	160	101	135	Neck Side Slotted	80	130	360	392	312	254	228	52	60	67	10	15
100 mm	LPWA JIS 100 N1, both sides tapped holes	185	120	160	(8) M 10 - 1.5	60	95	373	405	312	254	228	52	60	100	10	15
	LPWA JIS 100 N5, both sides through holes	185	120	160	thru holes 12 mm	105	165	373	405	312	254	228	52	60	100	10	15
	LPWA JIS 100 N6 & N8, 1 tapped, 1 through	185	120	160	Neck Side Slotted	80	130	373	405	312	254	228	52	60	100	10	15
150 mm	LPWA JIS 150 N1, both sides tapped holes	235	177	210	(8) M 10 - 1.5	60	105	518	550	432	406	257	57	89	114	14	21
	LPWA JIS 150 N5, both sides through holes	235	177	210	thru holes 12 mm	105	181	518	550	432	406	257	57	89	114	14	21
	LPWA JIS 150 N6 & N8, 1 tapped, 1 through	235	177	210	Neck Side Slotted	80	143	518	550	432	406	257	57	89	114	14	21
200 mm	LPWA JIS 200 N1, both sides tapped holes	300	228	270	(8) M 12 - 1.75	82	111	636	668	518	406	318	67	86	140	25	30
	LPWA JIS 200 N5, both sides through holes	300	228	270	thru holes 12 mm	120	200	636	668	518	406	318	67	86	140	25	30
	LPWA JIS 200 N6 & N8, 1 tapped, 1 through	300	228	270	Neck Side Slotted	104	156	636	668	518	406	318	67	86	140	25	30
250 mm	LPWA JIS 250 N1, both sides tapped holes	350	279	320	(12) M 12 - 1.75	82	117	745	777	602	533	458	50	79	121	50	59
	LPWA JIS 250 N5, both sides through holes	350	279	320	thru holes 12 mm	120	206	745	777	602	533	458	50	79	121	50	59
	LPWA JIS 250 N6 & N8, 1 tapped, 1 through	350	279	320	Neck Side Slotted	104	162	745	777	602	533	458	50	79	121	50	59
300 mm	LPWA JIS 300 N1, both sides tapped holes	400	330	370	(12) M 12 - 1.75	82	117	770	802	602	533	458	50	79	121	58	68
	LPWA JIS 300 N5, both sides through holes	400	330	370	thru holes 12 mm	120	206	770	802	602	533	458	50	79	121	58	68
	LPWA JIS 300 N6 & N8, 1 tapped, 1 through	400	330	370	Neck Side Slotted	104	162	770	802	602	533	458	50	79	121	58	68



- Less Outgassing Than Stainless Steel, See Page 39
- 250,000 Cycle Rotary Shaft Seal; Million Cycle Available
- Large Port, ISO Flanges; 6 Roughing Port Options
- All Valves (RoHS) 2015/863/EU Compliant
- Helium Leak Less Than 5×10^{-10} scc/sec
- Operate Manually If Air or Power Fail
- Vacuum & Pressure; Optional Seal to 3 ATM.
- Optional Operation to 10 Bar, 147 PSIG

N1 Tapped Holes Both Sides

N5 Neck on Both Sides

N6 Neck on Seal Side

N8 Neck Opposite Seal Side


ISO-f
Seal
Side

ISO-f
Open
Side

ISO-k
Seal
Side

ISO-k
Open
Side

ISO-k
Seal
Side

ISO-k
Open
Side

ISO-k
Seal
Side

ISO-f
Open
Side

ISO-f
Seal
Side

ISO-f
Open
Side

ISO-f
Seal
Side

ISO-k
Open
Side

ISO-k
Seal
Side

For valves with ports up to 200 mm the actuator is on the same side as the gate seal, valves with ports 250 mm and larger have the actuator opposite the gate seal side.

Stainless Steel Gates in Aluminum Valves: To specify a stainless steel gate in an aluminum valve add a suffix to the model number "SS Gate". Refer to the "Optional Features and Accessories" section for pricing information.

ORDERING INFORMATION

Model Number: Refer to page 2 for instructions on how to specify the features you need.

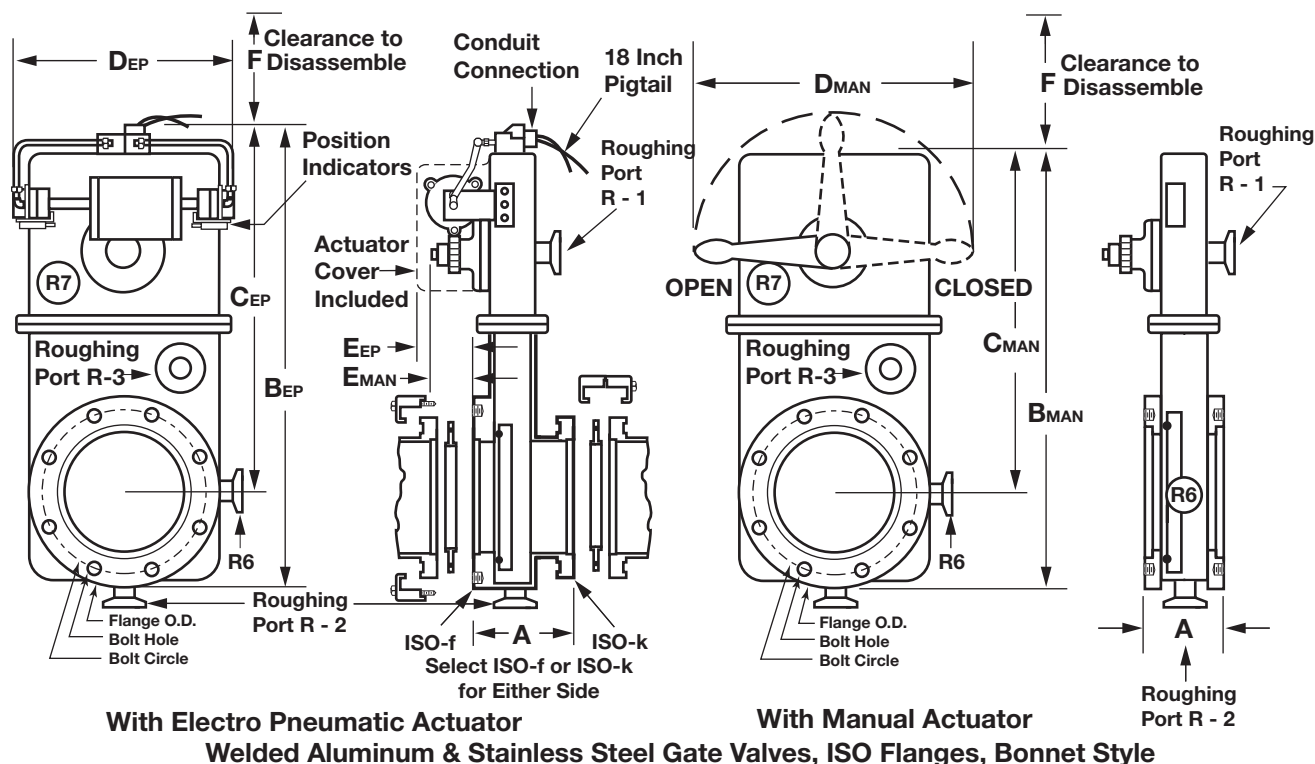
Electric Motor Actuators: Any Vacuum Research valve can be supplied with a high torque electric motor actuator. Refer to "Electric Motor Actuator" Page in the Accessories and Parts section.

Special Features: Refer to page 40 - 43 for specifications for roughing and gauge ports, position indicators & other special features.

Viton® or Kalrez® or Silicone O-Rings Our standard Valves use a Viton® O-Ring for the gate seal and Buna-N O-Rings for all other locations. You may specify Viton® (or other materials throughout the valve with a "V", "S", or "K" in the model number. For Viton® add the following to the price. (For Silicone or Kalrez® contact the factory for prices.)

63 or 80 mm valves . . . \$57.	200 mm valves . . . \$177.
100 mm valves . . . \$90.	250 mm valves . . . \$231.
160 mm valves . . . \$107.	320 mm valves . . . \$286.

Nominal Size	Electro-Pneumatic Operator "EP" Suffix				Manual Operator "M" Suffix			
	Aluminum Model & Neck Style	Price	Stainless Steel Model & Neck Style	Price	Aluminum Model & Neck Style	Price	Stainless Steel Model & Neck Style	Price
63 mm One piece style	OP-63-ISO-N1-EP	\$1728.	OPSS-63-ISO-N1-EP	\$4597.	OP-63-ISO-N1-M	\$1481.	OPSS-63-ISO-N1-M	\$4321.
	OP-63-ISO-N5-EP	\$1938.	OPSS-63-ISO-N5-EP	\$4813.	OP-63-ISO-N5-M	\$1686.	OPSS-63-ISO-N5-M	\$4537.
	OP-63-ISO-N6-EP	\$1812.	OPSS-63-ISO-N6-EP	\$4705.	OP-63-ISO-N6-M	\$1537.	OPSS-63-ISO-N6-M	\$4429.
	OP-63-ISO-N8-EP	\$1812.	OPSS-63-ISO-N8-EP	\$4705.	OP-63-ISO-N8-M	\$1537.	OPSS-63-ISO-N8-M	\$4429.
80 mm	LPWA-80-ISO-N1-EP	\$1946.	LPSS-80-ISO-N1-EP	\$5289.	LPWA-80-ISO-N1-M	\$1695.	LPSS-80-ISO-N1-M	\$5338.
	LPWA-80-ISO-N5-EP	\$2069.	LPSS-80-ISO-N5-EP	\$5559.	LPWA-80-ISO-N5-M	\$1872.	LPSS-80-ISO-N5-M	\$5284.
	LPWA-80-ISO-N6-EP	\$2175.	LPSS-80-ISO-N6-EP	\$5500.	LPWA-80-ISO-N6-M	\$1909.	LPSS-80-ISO-N6-M	\$5224.
	LPWA-80-ISO-N8-EP	\$2175.	LPSS-80-ISO-N8-EP	\$5500.	LPWA-80-ISO-N8-M	\$1909.	LPSS-80-ISO-N8-M	\$5224.
100 mm	LPWA-100-ISO-N1-EP	\$2073.	LPSS-100-ISO-N1-EP	\$5354.	LPWA-100-ISO-N1-M	\$1804.	LPSS-100-ISO-N1-M	\$5078.
	LPWA-100-ISO-N5-EP	\$2287.	LPSS-100-ISO-N5-EP	\$5538.	LPWA-100-ISO-N5-M	\$2017.	LPSS-100-ISO-N5-M	\$5262.
	LPWA-100-ISO-N6-EP	\$2175.	LPSS-100-ISO-N6-EP	\$5500.	LPWA-100-ISO-N6-M	\$1909.	LPSS-100-ISO-N6-M	\$5224.
	LPWA-100-ISO-N8-EP	\$2175.	LPSS-100-ISO-N8-EP	\$5500.	LPWA-100-ISO-N8-M	\$1909.	LPSS-100-ISO-N8-M	\$5224.
160 mm	LPWA-160-ISO-N1-EP	\$2397.	LPSS-160-ISO-N1-EP	\$6219.	LPWA-160-ISO-N1-M	\$2050.	LPSS-160-ISO-N1-M	\$5889.
	LPWA-160-ISO-N5-EP	\$2747.	LPSS-160-ISO-N5-EP	\$6544.	LPWA-160-ISO-N5-M	\$2391.	LPSS-160-ISO-N5-M	\$6214.
	LPWA-160-ISO-N6-EP	\$2451.	LPSS-160-ISO-N6-EP	\$6381.	LPWA-160-ISO-N6-M	\$2192.	LPSS-160-ISO-N6-M	\$6055.
	LPWA-160-ISO-N8-EP	\$2451.	LPSS-160-ISO-N8-EP	\$6381.	LPWA-160-ISO-N8-M	\$2192.	LPSS-160-ISO-N8-M	\$6055.
200 mm	LPWA-200-ISO-N1-EP	\$3905.	LPSS-200-ISO-N1-EP	\$7517.	LPWA-200-ISO-N1-M	\$3494.	LPSS-200-ISO-N1-M	\$6976.
	LPWA-200-ISO-N5-EP	\$4210.	LPSS-200-ISO-N5-EP	\$7863.	LPWA-200-ISO-N5-M	\$3791.	LPSS-200-ISO-N5-M	\$7533.
	LPWA-200-ISO-N6-EP	\$4056.	LPSS-200-ISO-N6-EP	\$7690.	LPWA-200-ISO-N6-M	\$3642.	LPSS-200-ISO-N6-M	\$7360.
	LPWA-200-ISO-N8-EP	\$4056.	LPSS-200-ISO-N8-EP	\$7690.	LPWA-200-ISO-N8-M	\$3642.	LPSS-200-ISO-N8-M	\$7360.
250 mm	LPWA-250-ISO-N1-EP	\$4777.	LPSS-250-ISO-N1-EP	\$11,789.	LPWA-250-ISO-N1-M	\$4319.	LPSS-250-ISO-N1-M	\$11,124.
	LPWA-250-ISO-N5-EP	\$5183.	LPSS-250-ISO-N5-EP	\$12,157.	LPWA-250-ISO-N5-M	\$4689.	LPSS-250-ISO-N5-M	\$11,492.
	LPWA-250-ISO-N6-EP	\$4992.	LPSS-250-ISO-N6-EP	\$11,973.	LPWA-250-ISO-N6-M	\$4504.	LPSS-250-ISO-N6-M	\$11,654.
	LPWA-250-ISO-N8-EP	\$4992.	LPSS-250-ISO-N8-EP	\$11,973.	LPWA-250-ISO-N8-M	\$4504.	LPSS-250-ISO-N8-M	\$11,654.
320 mm	LPWA-320-ISO-N1-EP	\$5965.	LPSS-320-ISO-N1-EP	\$13,899.	LPWA-320-ISO-N1-M	\$5473.	LPSS-320-ISO-N1-M	\$13,558.
	LPWA-320-ISO-N5-EP	\$6331.	LPSS-320-ISO-N5-EP	\$14,288.	LPWA-320-ISO-N5-M	\$5824.	LPSS-320-ISO-N5-M	\$13,947.
	LPWA-320-ISO-N6-EP	\$6133.	LPSS-320-ISO-N6-EP	\$14,288.	LPWA-320-ISO-N6-M	\$5635.	LPSS-320-ISO-N6-M	\$13,753.
	LPWA-320-ISO-N8-EP	\$6133.	LPSS-320-ISO-N8-EP	\$14,288.	LPWA-320-ISO-N8-M	\$5635.	LPSS-320-ISO-N8-M	\$13,753.
400 mm	LPWA-400-ISO-N1-EP	\$11,984.	LPSS-400-ISO-N1-EP	Contact Factory	LPWA-400-ISO-N1-M	\$10,524.	LPSS-400-ISO-N1-M	Contact Factory
	Contact factory for prices of 400 mm aluminum valves with N5, N6, and N8 neck styles, and for all 400 mm stainless steel valves.							

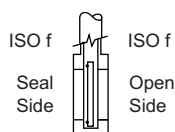


All dimensions in millimeters. Roughing ports and position indicator limit switches optional. Centering rings not included. For valves with ports up to 200 mm the actuator is on the same side as the gate seal, valves with ports 250 mm and larger have the actuator opposite the gate seal side.

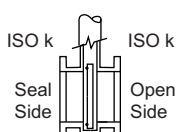
ISO Port Size	Model No. ISO Flange	Port Dia.	Flange O.D.	Bolt Circle	(number of bolts) size - pitch	A Flange to Flange		BMAN Manual Overall Height	BEP EP Overall Height	CEP Port CL to Top of Valve	DMAN Manual Overall Width	DEP EP Overall Width	EMAN Manual	EEP EP	F Disassy. Clearance	Weight kgs. Aluminum	
						Stainless	Alum.									Net	Ship
63mm one piece style	OP 63 N1, both sides ISO-f	70	130	110	(4) M 8 - 1.25	75	70	238	270	205	100	175	45	60	67	8	13
	OP 63 N5, both sides ISO-k	70	95	110	no bolts, ISO-k	120	105	238	270	205	100	175	45	60	67	8	13
	OP 63 N6 & N8, ISO-f & ISO-k	70	130/95	110	(4) M 8 - 1.25	95	90	238	270	205	100	175	45	60	67	8	13
80 mm	LPWA 80 N1, both sides ISO-f	83	145	125	(8) M 8 - 1.25	75	95	353	385	312	254	228	52	60	67	10	15
	LPWA 80 N5, both sides ISO-k	83	110	125	no bolts, ISO-k	120	127	353	385	312	254	228	52	60	67	10	15
	LPWA 80 N6 & N8, ISO-f & ISO-k	83	145/110	125	(8) M 8 - 1.25	95	111	353	385	312	254	228	52	60	67	10	15
100 mm	LPWA 100 N1, both sides ISO-f	102	165	145	(8) M 8 - 1.25	75	95	362	394	312	254	228	52	60	100	10	15
	LPWA 100 N5, both sides ISO-k	102	130	145	no bolts, ISO-k	120	127	362	394	312	254	228	52	60	100	10	15
	LPWA 100 N6 & N8, ISO-f & ISO-k	102	165/130	145	(8) M 8 - 1.25	95	111	362	394	312	254	228	52	60	100	10	15
160 mm	LPWA 160 N1, both sides ISO-f	153	225	200	(8) M 10 - 1.5	91	105	513	544	432	406	257	57	89	114	14	21
	LPWA 160 N5, both sides ISO-k	153	180	200	no bolts, ISO-k	135	143	513	544	432	406	257	57	89	114	14	21
	LPWA 160 N6 & N8, ISO-f & ISO-k	153	225/180	200	(8) M 10 - 1.5	111	127	513	544	432	406	257	57	89	114	14	21
200 mm	LPWA 200 N1, both sides ISO-f	213	285	260	(12) M 10 - 1.5	98	111	629	660	518	406	318	67	86	140	25	30
	LPWA 200 N5, both sides ISO-k	213	240	260	no bolts, ISO-k	143	155	629	660	518	406	318	67	86	140	25	30
	LPWA 200 N6 & N8, ISO-f & ISO-k	213	285/240	260	(12) M 10 - 1.5	124	127	629	660	518	406	318	67	86	140	25	30
250 mm	LPWA 250 N1, both sides ISO-f	261	335	310	(12) M 10 - 1.5	105	117	738	770	602	533	458	50	79	121	50	59
	LPWA 250 N5, both sides ISO-k	261	290	310	no bolts, ISO-k	155	219	738	770	602	533	458	50	79	121	50	59
	LPWA 250 N6 & N8, ISO-f & ISO-k	261	335/290	310	(12) M 10 - 1.5	127	168	738	770	602	533	458	50	79	121	50	59
320 mm	LPWA 320 N1, both sides ISO-f	318	425	395	(12) M 12 - 1.75	105	117	783	815	602	533	458	50	79	121	58	68
	LPWA 320 N5, both sides ISO-k	318	370	395	no bolts, ISO-k	155	219	783	815	602	533	458	50	79	121	58	68
	LPWA 320 N6 & N8, ISO-f & ISO-k	318	425/370	395	(12) M 12 - 1.75	127	168	783	815	602	533	458	50	79	121	58	68
400 mm	LPWA 400 N1, both sides ISO-f	400	510	480	(16) M 12 - 1.75	146	165	1060	1092	792	559	584	140	168	178	91	159
Contact factory for dimensions of 400 mm valves with N5, N6, and N8 neck styles																	



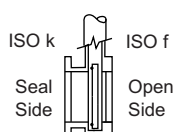
- Less Outgassing Than Stainless, See Page 39
- Simple End Operated Air Cylinder
- Over 100,000 Cycles Without Maintenance
- Helium Tested to 5×10^{-10} scc/s
- All Valves (RoHS) 2015/863/EU Compliant
- Flanges to Match Diffusion & Cryo Pumps
- Closing Speeds as Fast as 75 mSec. Available
- Optional Operation to 10 Bar, 147 PSIG; \$260.
- Optional Remote Position Indicators
- NW & Compression Gauge & Roughing Ports
- Automatic Closure on Power Failure



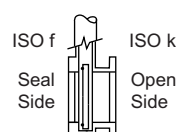
N1 Tapped Holes
on Both Sides



N5 Neck on Both Sides



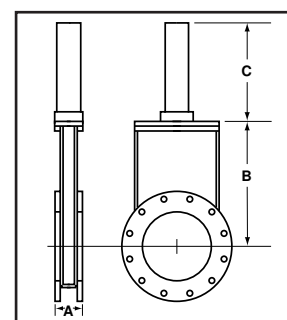
N6 Neck on Seal Side



N8 Neck Opposite
Seal Side

Stainless Steel Gates in Aluminum Valves: To specify a stainless steel gate in an aluminum valve add a suffix to the model number "SS Gate". Refer to "Optional Features and Accessories" pages in this catalog for pricing information.

ISO Port Size	Model No. ISO Flange	Dimensions in mm	Port Dia.	Flange O.D.	Bolt Circle	(number of bolts) size - pitch	A Flange to Flange	B mm	C mm	List Price
NW-50	END ISO NW-40		50	Not Applicable. STD. NW-40			95	159	187	\$1,093.
NW-50	END ISO NW-50		50	Not Applicable. STD. NW-50			95	159	187	\$1,131.
63 mm	END ISO 63, N1, both sides ISO-f		70	130	110	(4) M 8 - 1.25	80	159	187	\$1,182.
	END ISO 63, N5, both sides ISO-k		70	95	110	no bolts, ISO-k	105	159	187	\$1,429.
	END ISO 63, N6 & N8, ISO-f & ISO-k		70	130/95	110	(4) M 8 - 1.25	90	159	187	\$1,297.
100 mm	END ISO 100, N1, both sides ISO-f		102	165	145	(8) M 8 - 1.25	105	213	239	\$1,887.
	END ISO 100, N5, both sides ISO-k		102	130	145	no bolts, ISO-k	127	213	239	\$2,085.
	END ISO 100, N6 & N8, ISO-f & ISO-k		102	165/130	145	(8) M 8 - 1.25	111	213	239	\$2,009.
160 mm	END ISO 160, N1, both sides ISO-f		153	225	200	(8) M 10 - 1.5	105	289	296	\$2,046.
	END ISO 160, N5, both sides ISO-k		153	180	200	no bolts, ISO-k	143	289	296	\$2,299.
	END ISO 160, N6 & N8, ISO-f & ISO-k		153	225/18	200	(8) M 10 - 1.50	127	289	296	\$2,204.
200 mm	END ISO 200, N1, both sides ISO-f		213	285	260	(12) M 10 - 1.5	111	364	348	\$3,115.
	END ISO 200, N5, both sides ISO-k		213	240	260	no bolts, ISO-k	155	364	348	\$3,591.
	END ISO 200, N6 & N8, ISO-f & ISO-k		213	285/240	260	(12) M 10 - 1.5	127	364	348	\$3,431.
250 mm	END ISO 250, N1, both sides ISO-f		261	335	310	(12) M 10 - 1.5	117	484	406	\$4,232.
	END ISO 250, N5, both sides ISO-k		261	290	310	no bolts, ISO-k	219	484	406	\$4,589.
	END ISO 250, N6 & N8, ISO-f & ISO-k		261	335/290	310	(12) M 10 - 1.5	168	484	406	\$4,385.
320 mm	END ISO 320, N1, both sides ISO-f		318	425	395	(12) M 12 - 1.75	117	533	457	\$5,833.
	END ISO 320, N5, both sides ISO-k		318	370	395	no bolts, ISO-k	219	533	457	\$6,005.
	END ISO 320, N6 & N8, ISO-f & ISO-k		318	425/370	395	(12) M 12 - 1.75	168	533	457	\$5,916.
400 mm	END ISO 400, N1, ISO-f both sides		400	510	480	(16) M 12 - 1.75	165	702	560	\$11,173.
500 mm	END ISO 500, N1, ISO-f both sides		500	610	580	(16) M 12 - 1.75	203	908	730	\$17,533.
630 mm	END ISO 630, N1, ISO-f both sides f		630*	780	720	(20) M 12 - 1.75	216	978	851	\$25,228.



ORDERING INFORMATION

Model Number: Refer to page 2 for instructions to specify features you need.

Position Indicators: Two reed switches activated by a magnet inside the pneumatic actuator provide closure for open and closed position. SPST contacts rated 0.5A @ 110 or 220 VAC non-inductive. Add LSE to Model Number \$159.00 /pair

Gauge and Roughing Ports: See page 42 for sizes and prices.

200 PSI Shaft Seal \$270.

Special Features: Refer to pages 40 to 43 for information on special features and accessories.

Viton® or Kalrez® or Silicone O-Rings: Our standard Valves use a Viton® O-Ring for the gate seal and Buna-N O-Rings for all other locations. You may specify Viton® (or other materials) throughout the valve with a "V", "S", or "K" in the model number. For Viton® add the following to the price. (For Silicone or Kalrez® contact the factory for prices.)

63 mm valves \$59.
100 mm valves \$89.
160 mm valves \$110.
200 mm valves \$176.
250 mm valves \$229.
320 mm valves \$295.

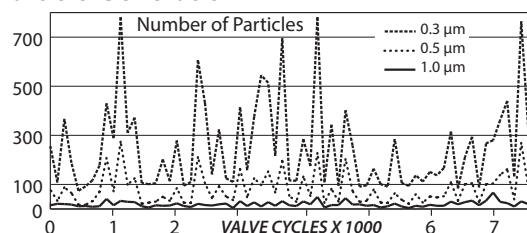


Aluminum Conflat® Flanges The Aluminum Conflat® Flanges on the VRC valves provide an all metal reusable seal using low cost solid aluminum gaskets (available from VRC, see catalog page 42).

Mate Directly to Stainless Steel Conflat® Flanges The bolt circle, number of holes, threads, flange diameter, etc. are the same as stainless steel CF flanges, and mate directly to stainless steel flanges using aluminum gaskets.

Less Outgassing Than Stainless Steel Dozens of papers show the 6000 Series aluminum used in VRC valves outgasses up to 2 orders of magnitude less than 300 Series stainless steel and of course no hydrogen. A bibliography of 70 peer reviewed papers about outgassing compiled by Dr. M. Wong at Fermi Labs can be found at http://home.fnal.gov/~mlwong/outgas_rev.htm.

Low Particle Generation



High Speed Closing speeds as fast as 75 mSeconds available.

Fast Pumpdown VRC valve bodies are not cast. The internal surfaces are smooth extruded or machined 6061 aluminum and pump down at speeds comparable to or faster than stainless steel.

Satisfaction Guaranteed Vacuum Research has been building high vacuum valves for more than 50 years and has earned a reputation for world class product quality and customer service. If you are not satisfied with our valve just send it back.

Metal Bonnet Seals Our standard bonnet & hub seal is Viton® but metal seals are available. Kalrez® is optional.

Rotatable Flanges Rotatable flanges are available on one or both sides of all valve sizes. Our rotatable flanges have through holes. Our fixed flanges have tapped holes.

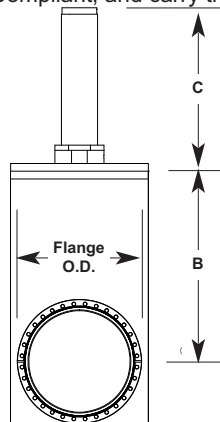
Maximum Temperature All VRC valves use Viton® for the gate seal which can operate up to 190 °C (375 °F). Kalrez® available.

Fail Safe All Vacuum Research air operated valves can be installed for fast close on power failure.

Long Life More than 250,000 cycles for standard valves.

No Leaks All VRC valves have total leak rates of less than 5 X 10⁻¹⁰ std. cc/sec. By total leak we mean that each completed valve is tested in a He filled bag.

RoHS Compliant and CE Mark All Valves (RoHS) 002/95/EC Compliant, and carry the CE Mark.



Conflat® Flange O.D.	Flange to Flange	B Port C/L to Top	C Actuator Height	D Body Width	(Number) Bolt Size
2.75 in. (1.6 in. Port)	3.1	6.3	7.4	4.63	(6) 1/4-28
3.375 in. (2 in. Port)	3.4	6.3	7.4	4.63	(8) 5/16-24
4.50 in. (2.5 in. Port)	3.5	8.38	9.4	6.48	(8) 5/16-24
6.00 in. (4 in. Port)	4.3	8.38	9.4	6.48	(16) 5/16-24
8.00 in. (6 in. Port)	4.5	11.38	11.66	9.0	(20) 5/16-24
10.00 in. (8 in. Port)	4.7	14.3	12.72	11.0	(24) 5/16-24
12.00 in. (10 in. Port)	5.0	19.0	16.0	13.63	(32) 5/16-24

Aluminum Conflat® Valves, Electro-Pneumatic Operator				
Conflat® Outside Diameter	Viton® Gate & Bonnet Seal	Price	Viton® Gate Seal, Metal Bonnet Seal Insert "Metal" in Model No.	Price
2.75 in. Outside Diameter Conflat® Flange (1.6 in. Port)	END-2.75-CF-N1-EP	\$1318.	END-2.75-CF-N1-METAL-EP	\$1499.
	END-2.75-CF-N5-EP	\$1469.	END-2.75-CF-N5-METAL-EP	\$1649.
	END-2.75-CF-N6-EP	\$1397.	END-2.75-CF-N6-METAL-EP	\$1577.
	END-2.75-CF-N8-EP	\$1397.	END-2.75-CF-N8-METAL-EP	\$1577.
3.375 in. Outside Diameter Conflat® Flange (2 in. Port)	END-3.375-CF-N1-EP	\$1697.	END-3.375-CF-N1-METAL-EP	\$1878.
	END-3.375-CF-N5-EP	\$1937.	END-3.375-CF-N5-METAL-EP	\$2117.
	END-3.375-CF-N6-EP	\$1919.	END-3.375-CF-N6-METAL-EP	\$2099.
	END-3.375-CF-N8-EP	\$1919.	END-3.375-CF-N8-METAL-EP	\$2099.
4.50 in. Outside Diameter Conflat® Flange (2.5 in. Port)	END-4.50-CF-N1-EP	\$1978.	END-4.50-CF-N1-METAL-EP	\$2158.
	END-4.50-CF-N5-EP	\$2302.	END-4.50-CF-N5-METAL-EP	\$2448.
	END-4.50-CF-N6-EP	\$2129.	END-4.50-CF-N6-METAL-EP	\$2308.
	END-4.50-CF-N8-EP	\$2129.	END-4.50-CF-N8-METAL-EP	\$2308.
6.00 in. Outside Diameter Conflat® Flange (4 in. Port)	END-6-CF-N1-EP	\$2519.	END-6-CF-N1-METAL-EP	\$2818.
	END-6-CF-N5-EP	\$2853.	END-6-CF-N5-METAL-EP	\$3154.
	END-6-CF-N6-EP	\$2717.	END-6-CF-N6-METAL-EP	\$3016.
	END-6-CF-N8-EP	\$2717.	END-6-CF-N8-METAL-EP	\$3016.
8.00 in. Outside Diameter Conflat® Flange (6 in. Port)	END-8-CF-N1-EP	\$3166.	END-8-CF-N1-METAL-EP	\$3556.
	END-8-CF-N5-EP	\$3526.	END-8-CF-N5-METAL-EP	\$3915.
	END-8-CF-N6-EP	\$3377.	END-8-CF-N6-METAL-EP	\$3766.
	END-8-CF-N8-EP	\$3377.	END-8-CF-N8-METAL-EP	\$3766.
10.00 in. Outside Diameter Conflat® Flange (8 in. Port)	END-10-CF-N1-EP	\$4413.	END-10-CF-N1-METAL-EP	\$4922.
	END-10-CF-N5-EP	\$4833.	END-10-CF-N5-METAL-EP	\$5342.
	END-10-CF-N6-EP	\$4682.	END-10-CF-N6-METAL-EP	\$5192.
	END-10-CF-N8-EP	\$4682.	END-10-CF-N8-METAL-EP	\$5192.
12.00 in. Outside Diameter Conflat® Flange (10 in. Port)	END-12-CF-N1-EP	\$5337.	END-12-CF-N1-METAL-EP	\$7555.
	END-12-CF-N5-EP	\$5864.	END-12-CF-N5-METAL-EP	\$8032.
	END-12-CF-N6-EP	\$5756.	END-12-CF-N6-METAL-EP	\$7855.
	END-12-CF-N8-EP	\$5756.	END-12-CF-N8-METAL-EP	\$7855.
Optional Operation to 10 Bar, 147 PSIG; 200 PSI Shaft Seal add \$260.				
Aluminum Conflat Gaskets® Packs of 10, except larger sizes See next page				



Stainless steel & aluminum valves with Conflat® flanges. Aluminum has less outgassing than stainless steel. Up to 2 orders of magnitude less, see references on page 39.

Less Outgassing Than Stainless Steel Dozens of papers show the 6000 Series aluminum used in VRC valves outgasses up to 2 orders of magnitude less than 300 Series stainless steel and of course no hydrogen. A bibliography of 70 peer reviewed papers about outgassing compiled by Dr. M. Wong at Fermi Labs can be found at http://home.fnal.gov/~mlwong/outgas_rev.htm. Refer to page 39 for more information.

ORDERING INFORMATION

Model Number: Refer to page 2 for instructions to specify the features you need.

Electric Motor Actuators: Any Vacuum Research valve can be supplied with a high torque electric motor actuator. Refer to the "Electric Motor Actuator" page in the Accessories and Parts section of this catalog for pricing.

Special Features: Refer to pgs 40-43 for specifications of roughing & gauge ports, position indicators & other special features.

Viton® or Kalrez® or Silicone O-Rings: Our standard Valves use a Viton® O-Ring for the gate seal and Buna-N O-Rings for all other locations. You may specify Viton® (or other materials) throughout the valve with a "V", "S", or "K" in the model number. For Viton® add the following to the price. (For Silicone or Kalrez® contact the factory for prices.)

2 or 3 in. valves . . . \$59. | 4 in. valves \$90. | 6 in. valves \$111. | 8 in. valves \$177. | 10 in. valves . . . \$231. | 12 in. valves . . . \$297.

Metal Bonnet Seal: To specify a metal (rather than elastomer) bonnet seal add "MBS" to the model number & add the cost below:

Aluminum Valve		Stainless Steel		Aluminum Valve		Stainless Steel		Aluminum Valve		Stainless Steel	
2.75 in. valves	.....\$238.	.....\$291.	6 inch valves	.....\$277.	.....\$331.	12 inch valves	.....\$463.	.....\$663.			
3.38 in. valves	.....\$238.	.....\$291.	8 inch valves	.....\$291.	.....\$530.						
4.50 in. valves	.....\$238.	.....\$291.	10 inch valves	.....\$463.	.....\$663.						

CF® Flanges with Metric Threads: No extra charge for Conflat® flanges with metric threads. Bolt circle, gasket size, and other dimensions remain unchanged. Specify "CF-MET" in the model number.

Valve Port Diam.	Flange O. D.	Bolts	Valve Port Diam.	Flange O. D.	Bolts	Valve Port Diam.	Flange O. D.	Bolts
38 mm	70 mm	6, M-6	100 mm	152 mm	16, M-8	200 mm	254 mm	24, M-8
63 mm	114 mm	8, M-8	150 mm	203 mm	20, M-8	250 mm	304 mm	32, M-8

Aluminum Conflat Gaskets®: Prices shown below are for packs of 10, or each, depending on Gasket size.

Flange O.D.	Gasket O.D.	Part No.	Price	Flange O.D.	Gasket O.D.	Part No.	Price	Flange O.D.	Gasket O.D.	Part No.	Price
1.33 in.	0.838 in.	X701G01.33A	\$43./10	4.50 in.	3.25 in.	X701G04.50A	\$111./10	10.00 in.	8.73 in.	X701G10.00	\$249./10
2.75 in.	1.895 in.	X701G02.75A	\$67./10	6.00 in.	4.75 in.	X701G06.00A	\$156./10	12.00 in.	10.73 in.	X701G12.00	\$36./ea.
3.375 in.	2.425 in.	X701G03.375A	\$92./10	8.00 in.	6.73 in.	X701G08.00A	\$223./10	13.25 in.	11.55 in.	X701G13.25A	\$43./ea.
								14.00 in.	12.31 in.	X701G14.00A	contact factory

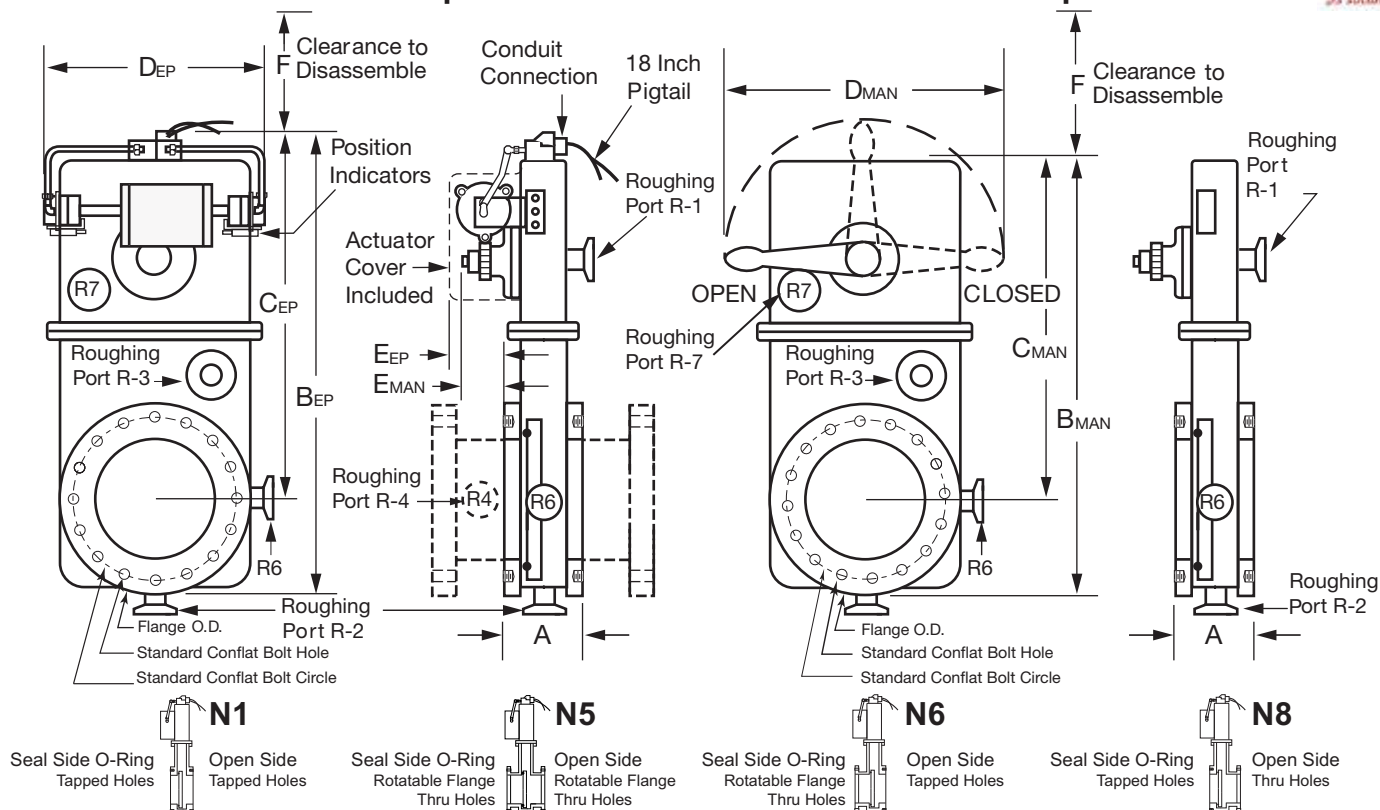
Conflat® Outside Diameter	Conflat® Valves with Electro-Pneumatic Operator				Conflat® Valves with Manual Operator			
	Aluminum Model & Neck Style	Price	Stainless Steel Model & Neck Style	Price	Aluminum Model & Neck Style	Price	Stainless Steel Model & Neck Style	Price
2.75 in. Outside Diameter Conflat® Flange (1.63" Port)	OPWA-2.75-CF-N1-EP	\$1269.	OPSS-2.75-CF-N1-EP	\$4597.	OPWA-2.75-CF-N1-M	\$1129.	OPSS-2.75-CF-N1-M	\$4321.
	OPWA-2.75-CF-N5-EP	\$1413.	OPSS-2.75-CF-N5-EP	\$4812.	OPWA-2.75-CF-N5-M	\$1274.	OPSS-2.75-CF-N5-M	\$4537.
	OPWA-2.75-CF-N6-EP	\$1343.	OPSS-2.75-CF-N6-EP	\$4705.	OPWA-2.75-CF-N6-M	\$1205.	OPSS-2.75-CF-N6-M	\$4429.
	OPWA-2.75-CF-N8-EP	\$1343.	OPSS-2.75-CF-N8-EP	\$4705.	OPWA-2.75-CF-N8-M	\$1205.	OPSS-2.75-CF-N8-M	\$4429.
3.375 in. Outside Diameter Conflat® Flange (2.01" Port)	LPWA-3.375-CF-N1-EP	\$1631.	LPSS-3.375-CF-N1-EP	\$5269.	LPWA-3.375-CF-N1-M	\$1494.	LPSS-3.375-CF-N1-M	\$5338.
	LPWA-3.375-CF-N5-EP	\$1861.	LPSS-3.375-CF-N5-EP	\$5559.	LPWA-3.375-CF-N5-M	\$1724.	LPSS-3.375-CF-N5-M	\$5284.
	LPWA-3.375-CF-N6-EP	\$1845.	LPSS-3.375-CF-N6-EP	\$5424.	LPWA-3.375-CF-N6-M	\$1706.	LPSS-3.375-CF-N6-M	\$5148.
	LPWA-3.375-CF-N8-EP	\$1845.	LPSS-3.375-CF-N8-EP	\$5424.	LPWA-3.375-CF-N8-M	\$1706.	LPSS-3.375-CF-N8-M	\$5148.
4.50 in. Outside Diameter Conflat® Flange (2.51" Port)	LPWA-4.50-CF-N1-EP	\$1746.	LPSS-4.50-CF-N1-EP	\$5354.	LPWA-4.50-CF-N1-M	\$1599.	LPSS-4.50-CF-N1-M	\$5078.
	LPWA-4.50-CF-N5-EP	\$2209.	LPSS-4.50-CF-N5-EP	\$5538.	LPWA-4.50-CF-N5-M	\$2068.	LPSS-4.50-CF-N5-M	\$5262.
	LPWA-4.50-CF-N6-EP	\$2153.	LPSS-4.50-CF-N6-EP	\$5500.	LPWA-4.50-CF-N6-M	\$2005.	LPSS-4.50-CF-N6-M	\$6133.
	LPWA-4.50-CF-N8-EP	\$2153.	LPSS-4.50-CF-N8-EP	\$5500.	LPWA-4.50-CF-N8-M	\$2005.	LPSS-4.50-CF-N8-M	\$6133.
6 in. Outside Diameter Conflat® Flange (4.01" Port)	LPWA-6-CF-N1-EP	\$2068.	LPSS-6-CF-N1-EP	\$6165.	LPWA-6-CF-N1-M	\$1919.	LPSS-6-CF-N1-M	\$5835.
	LPWA-6-CF-N5-EP	\$2172.	LPSS-6-CF-N5-EP	\$6500.	LPWA-6-CF-N5-M	\$2029.	LPSS-6-CF-N5-M	\$6500.
	LPWA-6-CF-N6-EP	\$2079.	LPSS-6-CF-N6-EP	\$6463.	LPWA-6-CF-N6-M	\$2005.	LPSS-6-CF-N6-M	\$6133.
	LPWA-6-CF-N8-EP	\$2079.	LPSS-6-CF-N8-EP	\$6463.	LPWA-6-CF-N8-M	\$2005.	LPSS-6-CF-N8-M	\$6133.
8 in. Outside Diameter Conflat® Flange (6.02" Port)	LPWA-8-CF-N1-EP	\$2364.	LPSS-8-CF-N1-EP	\$7355.	LPWA-8-CF-N1-M	\$2153.	LPSS-8-CF-N1-M	\$7025.
	LPWA-8-CF-N5-EP	\$2659.	LPSS-8-CF-N5-EP	\$8166.	LPWA-8-CF-N5-M	\$2456.	LPSS-8-CF-N5-M	\$7836.
	LPWA-8-CF-N6-EP	\$2456.	LPSS-8-CF-N6-EP	\$7760.	LPWA-8-CF-N6-M	\$2302.	LPSS-8-CF-N6-M	\$7431.
	LPWA-8-CF-N8-EP	\$2456.	LPSS-8-CF-N8-EP	\$7760.	LPWA-8-CF-N8-M	\$2302.	LPSS-8-CF-N8-M	\$7431.
10 in. Outside Diameter Conflat® Flange (8.02" Port)	LPWA-10-CF-N1-EP	\$3899.	LPSS-10-CF-N1-EP	\$7733.	LPWA-10-CF-N1-M	\$3491.	LPSS-10-CF-N1-M	\$7404.
	LPWA-10-CF-N5-EP	\$4201.	LPSS-10-CF-N5-EP	\$8899.	LPWA-10-CF-N5-M	\$3788.	LPSS-10-CF-N5-M	\$8269.
	LPWA-10-CF-N6-EP	\$4090.	LPSS-10-CF-N6-EP	\$8166.	LPWA-10-CF-N6-M	\$3641.	LPSS-10-CF-N6-M	\$7836.
	LPWA-10-CF-N8-EP	\$4090.	LPSS-10-CF-N8-EP	\$8166.	LPWA-10-CF-N8-M	\$3641.	LPSS-10-CF-N8-M	\$7836.
12 in. Outside Diameter Conflat® Flange (10.02" Port)	LPWA-12-CF-N1-EP	\$5245.	LPSS-12-CF-N1-EP	\$12,438.	LPWA-12-CF-N1-M	\$4905.	LPSS-12-CF-N1-M	\$11,773.
	LPWA-12-CF-N5-EP	\$5577.	LPSS-12-CF-N5-EP	\$13,628.	LPWA-12-CF-N5-M	\$5275.	LPSS-12-CF-N5-M	\$12,963.
	LPWA-12-CF-N6-EP	\$5349.	LPSS-12-CF-N6-EP	\$13,033.	LPWA-12-CF-N6-M	\$5126.	LPSS-12-CF-N6-M	\$12,368.
	LPWA-12-CF-N8-EP	\$5349.	LPSS-12-CF-N8-EP	\$13,033.	LPWA-12-CF-N8-M	\$5126.	LPSS-12-CF-N8-M	\$12,368.

Contact factory for SolidWorks 3D *.STEP format files. 2D drawing below for outline dimension reference.



Electro-Pneumatic Operator

Manual Operator



For valves with ports up to 8 inches the actuator is on the same side as the gate seal, valves with ports 10 inches and larger have the actuator opposite the gate seal side.

Nominal CF Flange Out- side Diameter	Model No. ANSI Flange All dimensions in Inches	Port Diameter	Flange O.D.	Flange Thickness	Bolt Circle	(no. of bolts) x bolt size	A Alumin. Flange to Flange	A St. Steel Flange to Flange	BMAN Manual Overall Height	BEP EP Overall Height	DEP EP Overall Width	F Disassy. Clearance	Weight lbs. Aluminum	
													Net	Ship
2.75 inch	OPWA 2.75 N1	1.50	2.75	0.500	2.312	(6) 1/4 - 28	3.88	2.38	10.41	11.13	6.75	2.63	8	13
2.75 inch	OPWA 2.75 N5	1.50	2.75	0.500	2.312	.265 thru hole on neck	6.63	5.12	10.41	11.13	6.75	2.63	8	13
2.75 inch	OPWA 2.75 N6 & 8	1.50	2.75	0.500	2.312		5.25	3.75	10.41	11.13	6.75	2.63	8	13
3.375 inch	LPWA 3.375 N1	2.01	3.38	0.625	2.85	(8) 5/16 - 24	3.88	2.630	10.41	11.13	6.75	2.63	8	13
3.375 inch	LPWA 3.375 N5	2.01	3.38	0.625	2.85	.332 thru hole on neck	7.13	5.88	10.41	11.13	6.75	2.63	8	13
3.375 inch	LPWA 3.375 N6 & 8	2.01	3.38	0.625	2.85		5.51	4.26	10.41	11.13	6.75	2.63	8	13
4.50 inch	LPWA 4.50 N1	2.51	4.50	0.680	3.628	(8) 5/16 - 24	3.88	2.74	10.75	11.5	6.75	2.63	8	13
4.50 inch	LPWA 4.50 N5	2.51	4.50	0.680	3.628	.332 thru hole on neck	7.35	6.21	10.75	11.5	6.75	2.63	8	13
4.50 inch	LPWA 4.50 N6 & 8	2.51	4.50	0.680	3.628		5.62	4.48	10.75	11.5	6.75	2.63	8	13
6 inch	LPWA 6 N1	4.01	6.00	0.780	5.128	(16) 5/16 - 24	4.43	2.94	14.18	14.93	7.80	4.00	10	15
6 inch	LPWA 6 N5	4.01	6.00	0.780	5.128	.332 thru hole on neck	8.30	6.81	14.18	14.93	7.80	4.00	10	15
6 inch	LPWA 6 N6 & 8	4.01	6.00	0.780	5.128		6.37	4.88	14.18	14.93	7.80	4.00	10	15
8 inch	LPWA 8 N1	6.02	8.00	0.880	7.128	(20) 5/16 - 24	4.63	3.14	19.75	20.5	10.50	4.48	14	21
8 inch	LPWA 8 N5	6.02	8.00	0.880	7.128	.332 thru hole on neck	8.90	7.41	19.75	20.5	10.50	4.48	14	21
8 inch	LPWA 8 N6 & 8	6.02	8.00	0.880	7.128		6.77	5.28	19.75	20.5	10.50	4.48	14	21
10 inch	LPWA 10 N1	8.02	10.00	0.970	9.128	(24) 5/16 - 24	4.81	4.05	25.81	26.6	12.0	5.51	25	30
10 inch	LPWA 10 N5	8.02	10.00	0.970	9.128	.332 thru hole on neck	9.44	8.68	25.81	26.6	12.0	5.51	25	30
10 inch	LPWA 10 N6 & 8	8.02	10.00	0.970	9.128		7.12	6.36	25.81	26.6	12.0	5.51	25	30
12 inch	LPWA 12 N1	10.02	12.00	1.020	11.18	(32) 5/16 - 24	4.91	4.15	25.75	26.5	16.50	5.51	50	59
12 inch	LPWA 12 N5	10.02	12.00	1.020	11.18	.332 thru hole on neck	9.74	8.98	25.75	26.5	16.50	5.51	50	59
12 inch	LPWA 12 N6 & 8	10.02	12.00	1.020	11.18		7.32	6.56	25.75	26.5	16.50	5.51	50	59



Valve on the left has NW-40 flange. Valve on the right has special 2.75 In. Conflat® flange. Standard practice is for bolt circle to straddle center line.

Small Size

These compact valves will fit even the most crowded systems. The valve body with EP actuator is only 3.75 inches wide by 10.88 inches high (95 x 275 mm).

Vacuum & Pressure

Standard valves seal and open with vacuum or atmosphere on either side.

Long Life

These small stainless steel valves provide straight through high conductance pumping and our usual 250,000 cycles without any need for service.

Fail Safe All Vacuum Research Valves can be installed for fast close on power failure.

- All Stainless Steel Welded Construction
- Straight Through, High Conductance Design
- No Sliding Surfaces to Generate Particles
- 250,000 Cycle Life Before Any Maintenance
- Closing Speeds as Fast as 75 mS Available
- Optional Seal Up To 3 Atmospheres
- Vacuum or Pressure on Either Side
- Electropneumatic or Manual Actuator
- Viton® Bonnet and Gate Seals are Standard
- Metal Bonnet & Kalrez® Gate Seals Available
- All Valves (RoHS) 2015/863/EU Compliant

Bake to 180°C With the standard Viton® O-Ring the valves can be baked to 180° C in open or closed position.

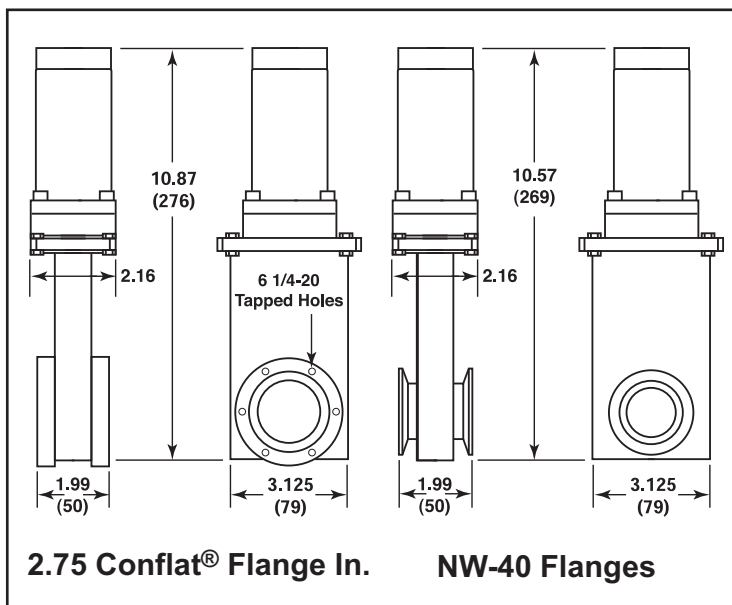
No Leaks All Vacuum Research valves have total leak rates of less than 5×10^{-10} std cc/sec. By total leak we mean that each completed valve is tested in a Helium filled bag.

NW Clamps & Centering Rings Prices on page 25 for clamps from NW-16 to NW-50.

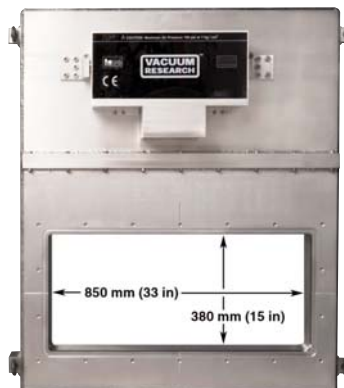
Kalrez® or Silicone Seals Available

Standard Valves use all Viton® seals. Contact factory for Kalrez® and silicone prices.

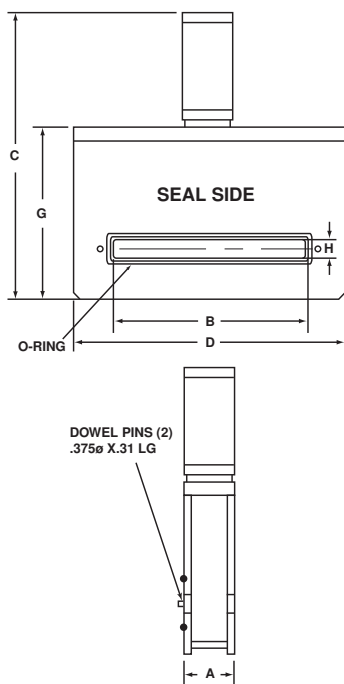
Small Stainless Steel Gate Valves	Electro-Pneumatic Actuator Add "EP" Suffix plus solenoid voltage
NW-16 Flanges P/N Mini-SS-NW-16-	\$1091.
NW-25 Flanges P/N Mini-SS-NW-25-	\$1091.
NW-40 Flanges P/N: Mini-SS-NW 40-	\$1091.
2.75 Non rotatable Flanges P/N: Mini-SS-275-	\$1080.
2.75 Rotatable Conflat® Flanges P/N: Mini-SS-275-ROT-	\$1111.



Conflat® is a registered trademark of Varian Associates. Kalrez® and Viton® are registered trademarks of Dupont Corp.



- Less Outgassing Than Stainless, See Page 39
- Choose Full Throttle Control or Open/Close
- Motorized Soft Open and Close Available
- Closing Speeds as Fast as 75 mSec. Available
- Aluminum, Steel or Stainless Steel
- Standard Quad Ring Shaft Seal or Bellows
- Leak Tested to Better Than 5×10^{-10} scc/sec
- All Valves (RoHS) 2015/863/EU Compliant
- Port Sizes to Fit Any Wafer or Solar Substrate
- Bolt Pattern to Match Your Tool or Chamber
- Select Automatic Close or Open on Power Fail
- Available with Viton®, Buna-N or Kalrez® Seals
- NW Style Gauge & Roughing Ports on Any Side



Electronic Position Indicators: Two reed switches activated by a magnet inside the pneumatic actuator provide contact closure for open and closed position. See page 40 for specifications. \$156. /pair

Gauge and Roughing Ports:

See page 42 for specifications and ordering information.

Model Number Bellows Seal - REB Quad Ring Seal - REQ	Port Size	Body Thickness	Overall Height	Body Width	Body Height	Price with Bellows (REB)	Price with Shaft Seal (REQ)
	H X B	A	C	D	G		
REB-1 X 6.3 REQ-1 X 6.3	1 X 6.30 in. (25 X 160 mm)	2.75 in. (70 mm)	16.375 in. (416 mm)	10.75 in. (273 mm)	9.5 in. (241 mm)	\$4282.	\$3727.
REB-1 X 8.3 REQ-1 X 8.3	1 X 8.30 in. (25 X 211 mm)	2.75 in. (70 mm)	16.375 in. (416 mm)	12.75 in. (324 mm)	9.5 in. (241 mm)	\$4758.	\$4164.
REB-1 X 10.4 REQ-1 X 10.4	1 X 10.40 in. (25 X 264 mm)	2.75 in. (70 mm)	16.375 in. (416 mm)	15 in. (381 mm)	9.5 in. (241 mm)	\$5066.	\$4758.
REB-1.25 X 8.75 REQ-1.25 X 8.75	1.25 X 8.75 in. (32 X 222 mm)	2.75 in. (70 mm)	16.375 in. (416 mm)	14 in. (356 mm)	9.5 in. (241 mm)	\$5306.	\$4609.
REB-1.81 X 9.3 REQ-1.81 X 9.3	1.81 X 9.30 in. (46 X 236 mm)	3.375 in. (86 mm)	16.53 in. (420 mm)	14.375 in. (406 mm)	9.53 in. (242 mm)	\$5465.	\$4758.
REB-1.8 X 13.2 REQ-1.8 X 13.2	1.81 X 13.20 in. (46 X 335 mm)	3.375 in. (86 mm)	16.53 in. (420 mm)	16 in. (406 mm)	9.53 in. (242 mm)	\$9714.	\$9072.
REB-2 X 16 REQ-2 X 16	2 X 16 in. (50 X 406 mm)	4.625 in. (117 mm)	22.06 in. (560 mm)	21 in. (533 mm)	11.56 in. (294 mm)	Contact Factory	Contact Factory
REB-2 X 27 REQ-2 X 27	2 X 27 in. (51 X 686 mm)	7 in. (178 mm)	36 in. (914 mm)	32 in. (813 mm)	245 in. (610 mm)	Contact Factory	Contact Factory
REB-3 X 16 REQ-3 X 16	3 X 16 in. (76 X 406 mm)	6.5 in. (165 mm)	37 in. (940 mm)	20 in. (508 mm)	25 in. (635 mm)	Contact Factory	Contact Factory
REB-3 X 30 REQ-3 X 30	3 X 30 in. (75 X 762 mm)	5.5 in. (139.7 mm)	35.13 in. (892 mm)	36 in. (914 mm)	21.75 in. (552 mm)	Contact Factory	Contact Factory
REB-3 X 43 REQ-3 X 43	3 X 43 in. (75 X 1100 mm)	5.56 in. (141 mm)	33.25 in. (845 mm)	51 in. (1297 mm)	20 in. (508 mm)	Contact Factory	Contact Factory
REB-4 X 20 REQ-4 X 20	4 X 20 in. (100 X 508 mm)	5.5 in. (139.7 mm)	35.13 in. (892 mm)	26 in. (660 mm)	21.75 in. (552 mm)	Contact Factory	Contact Factory
REB-4 X 24 REQ-4 X 24	4 X 24 in. (100 X 609 mm)	5.5 in. (139.7 mm)	37.0 in. (940 mm)	30 in. (762 mm)	21.75 in. (552 mm)	Contact Factory	Contact Factory
REB-4 X 27 REQ-4 X 27	4 X 27 in. (100 X 686 mm)	7 in. (178 mm)	39 in. (990 mm)	32 in. (813 mm)	27 in. (686 mm)	Contact Factory	Contact Factory
REB-5 X 27 REQ-5 X 27	5 X 27 in. (127 X 686 mm)	7 in. (178 mm)	39 in. (990 mm)	32 in. (813 mm)	27 in. (686 mm)	Contact Factory	Contact Factory
REB-15 X 27 REQ-15 X 27	15 X 27 in. (381 X 686 mm)	7 in. (178 mm)	67.8 in. (1722 mm)	32 in. (813 mm)	44 in. (1118 mm)	Contact Factory	Contact Factory
REB-15 X 33.5 REQ-15 X 33.5	15 X 33.5 in. (380 X 850 mm)	5.56 in. (141 mm)	49 in. (1245 mm)	40.75 in. (1035 mm)	N/A	Contact Factory	Contact Factory
REB-22 X 24 REQ-22 X 24	22 X 24 in. (560 X 610 mm)	7.7 in. (195 mm)	92 in. (2337 mm)	31 in. (787 mm)	61.25 in. (1556 mm)	Contact Factory	Contact Factory
REB-24 X 35 REQ-24 X 35	4 X 55 in. (100 X 1400 mm)	9.06 in. (230 mm)	101 in. (2565 mm)	42.5 in. (1080 mm)	66.125 in. (1680 mm)	Contact Factory	Contact Factory

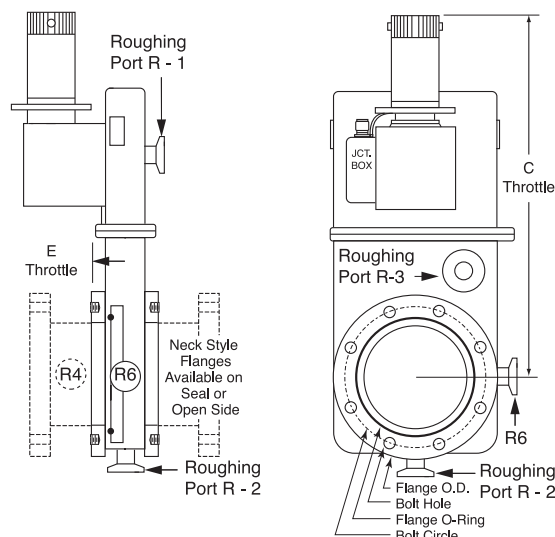


- Aluminum or Stainless Steel Valves
- Seals Up To 3 Atmospheres Differential
- Vacuum or Atmosphere on Either Side
- ANSI Sizes From 2 Inch to 24 Inch
- ISO Flanges From 63 to 630 mm
- Manual or Closed Loop Operation
- All Valves (RoHS) 2015/863/EU Compliant

The Vacuum Research Throttlemaster™ valve with positioner can be used in either of two control schemes. As a 3 position valve for upstream pressure control with an MFC, or for downstream pressure control with modulating gate position. For 3 position control the basic Throttlemaster™ consists of two components: an aluminum or stainless steel gate valve and a positioner/indicator to drive the fast response servo motor. This is all you need to operate the Throttlemaster™ as a 3 position valve in systems where the mass flow controller is controlling the pressure.

The Throttlemaster™ can also be used for downstream pressure control where the gas flow to the chamber is held constant and the Throttlemaster™ gate is moved to control conductance of the pumping system. This requires the use of a PID pressure controller to provide a signal to the valve positioner and a vacuum gauge with a 0 to 10 vdc signal to the PID controller. These may be purchased from Vacuum Research along with your Throttlemaster™ Valve and positioner or you may be able to use your present gauge and controller.

Throttlemaster™ Dimensions

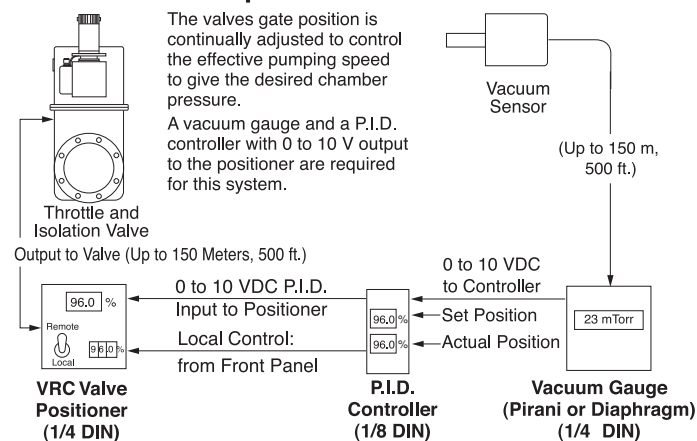


Port dimensions, bolt patterns, and other dimensions are shown on pages 6 and 7 for ANSI and page 13 for ISO valves. A few dimensions unique to the Throttlemaster™ servo actuator are listed here.

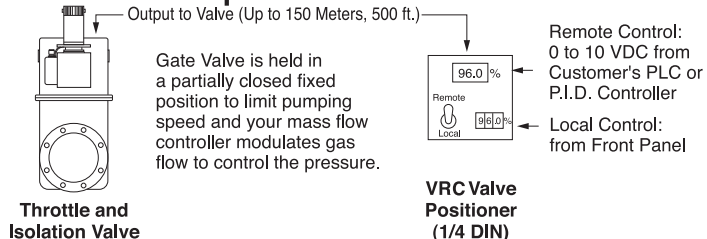
ANSI Flange Port Diameter	2 & 3 inch 4 inch Port	4 inch 6 inch Port	6 inch 8 inch Port	8 inch 10 inch Port	10 inch 12 inch Port	12 inch Port
C Throttle	15.90 inch	19.17 inch	22.00 inch	22.00 inch	20.67 inch	22.74 inch
E Throttle	4.34 inch	4.15 inch	4.03 inch	4.03 inch	3.90 inch	3.90 inch

ISO Port Size	63 & 80 mm	100 mm	160 mm	200 mm	250 mm	320 mm
C Throttle	403 mm	403 mm	487 mm	561 mm	525 mm	577 mm
E Throttle	110 mm	110 mm	105 mm	102 mm	99 mm	99 mm

P.I.D. Closed Loop Downstream Pressure Control



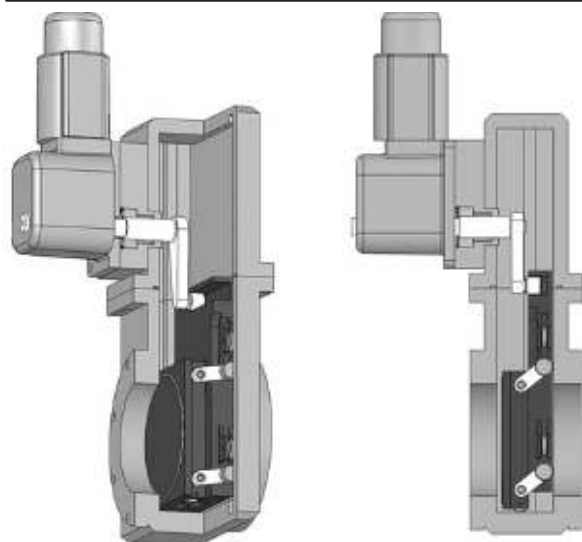
3 Position or Upstream Control



Stainless Steel Throttlmaster™

Valve System With Positioner

Port Size	Flange Style	Model	Price
25 mm	NW-25	STM-25	\$6219.
40 mm	NW-40	STM-40	\$6436.
50 mm	NW-50	STM-50	\$6652.
63 mm	ISO-f 63 mm	STM-63	\$7003.
80 mm	ISO-f 80 mm	STM-80	\$7393.
100 mm	ISO-f 100 mm	STM-100	\$7517.
160 mm	ISO-f 160 mm	STM-160	\$8355.
200 mm	ISO-f 200 mm	STM-200	\$11,086.
250 mm	ISO-f 250 mm	STM-250	\$15,954.
320 mm	ISO-f 320 mm	STM-320	\$16,711.
400 mm	ISO-f 400 mm	STM-400	Contact Factory
500 mm	ISO-f 500 mm	STM-500	Contact Factory
3.375 inch	ANSI 2 inch	STM-2	\$7452.
3.375 inch	ANSI 3 inch	STM-3	\$7706.
5.375 inch	ANSI 4 inch	STM-4	\$8491.
7.125 inch	ANSI 6 inch	STM-6	\$9729.
8 inch	ANSI 8 inch	STM-8	\$11,222.
11.625 inch	ANSI 10 inch	STM-10	\$16,116.
12 inch	ANSI 12 inch	STM-12	\$16,711.
16 inch	ANSI 16 inch	STM-16	Contact Factory
20 inch	ANSI 20 inch	STM-20	Contact Factory



Throttlmaster™ Fully Closed

Note that crank arm is vertical and links are near horizontal

Throttlmaster™ 90% Closed

Note that gate has moved only .036 inch (0.9mm) from the seal surface

Max Conductance Precision Where it's Most Important

The only Throttle Valve in the world that uses back-to-back sine law relationships to provide maximum conductance precision where you need it most; between 90% to 100% closed!

Why is the Throttlmaster™ conductance precision so good between 90% and 100% closed? There are two design features that allow both leak tight shut off and high resolution in the critical 90% to 100% closed range. The first of these is innovative mechanical design of our actuator, and the second is our high resolution feedback system.

The 180° arc of our actuator arm is double that of butterfly valves. More importantly, the critical 90% to 100% closed position is at bottom dead center where the motion per degree of rotation becomes zero. As this is happening, the gate links are approaching their full extension, which further enhances the resolution of the crank rotation and feed back sensor.

The Vacuum Research feedback element is directly coupled to the motor shaft, and provides stepless resolution of the valve position. The motor itself is a high torque servo that can repeatedly position the gate within a few thousandths of an inch and also lock the gate closed with a full atmosphere differential.

Aluminum Throttlmaster™

Valve System With Positioner

Port Size	Flange Style	Model	Price
25 mm	NW-25	ATM-25	\$3368.
40 mm	NW-40	ATM-40	\$3407.
50 mm	NW-50	ATM-50	\$3455.
63 mm	ISO-f 63 mm	ATM-63	\$3536.
80 mm	ISO-f 80 mm	ATM-80	\$3961.
100 mm	ISO-f 100 mm	ATM-100	\$4072.
160 mm	ISO-f 160 mm	ATM-160	\$4289.
200 mm	ISO-f 200 mm	ATM-200	\$5405.
250 mm	ISO-f 250 mm	ATM-250	\$7705.
320 mm	ISO-f 320 mm	ATM-320	\$9102.
400 mm	ISO-f 400 mm	ATM-400	\$15,743.
500 mm	ISO-f 500 mm	ATM-500	\$22,795.
630 mm	ISO-f 630 mm	ATM-630	\$31,356.
3 5/8 inch	ANSI 2 inch	ATM-2	\$3536.
4 inch	ANSI 3 inch	ATM-3	\$3961.
6 inch	ANSI 4 inch	ATM-4	\$4103.
8 inch	ANSI 6 inch	ATM-6	\$4943.
10 inch	ANSI 8 inch	ATM-8	\$5096.
12 inch	ANSI 10 inch	ATM-10	\$7705.
12 inch	ANSI 12 inch	ATM-12	\$9094.
16 inch	ANSI 16 inch	ATM-16	\$15,743.
20 inch	ANSI 20 inch	ATM-20	\$23,590.
24 inch	ANSI 24 inch	ATM-24	\$32,432.

Optional Features

The valves used in the Vacuum Research Throttlmaster™ are the same as the standard open/close valves discussed on pages 4 to 7 of this catalog. The difference is that the Throttlmaster™ gate position is precisely controlled by the servo motor actuator and the valve positioner to full open, full close, or anywhere in between. A Throttlmaster™ valve can be equipped with roughing and gauge ports and most of the options listed in optional features section.

Valve Motor Voltage

The standard valve motor is 115V, 60 Hz approximately 300 w for 220-240V, 50 Hz. Add suffix 220/50 to P/N No extra charge.

Viton® and Kalrez® O-Rings

Throttlmaster™ valves are shipped with Buna-N O-Rings except for the gate seal which is Viton®. For valves with all Viton® or Kalrez® see page 5 for prices on these special O-Rings.

Spare Valve Positioner

One positioner is included with each throttle valve system, but if a spare is desired please order P/N X801403 \$1,155.

Optional Hand Held Control



Approximately 3 X 2 inches, this hand held control includes selector switch for open, close, throttle and 3 digit selector for throttle position to 99.9%, ±.1%. 10 foot cable connects to valve positioner rear panel. P/N 801404 . . . \$437.

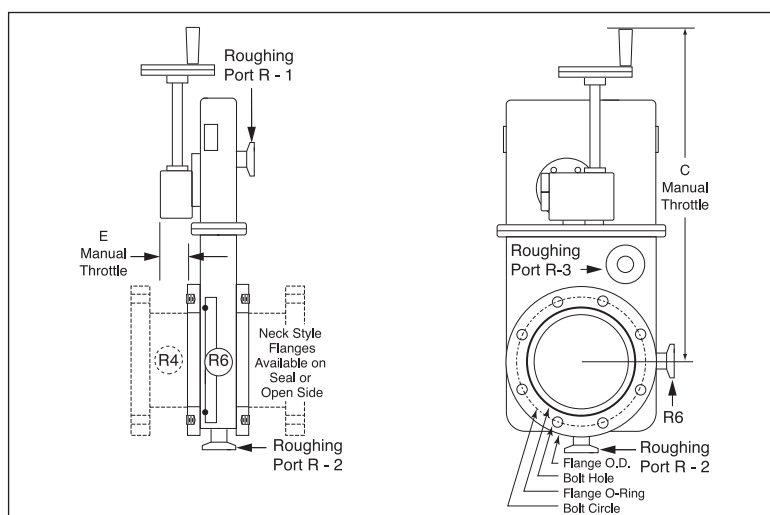
Cable Between Valve and Positioner

A 25 ft. (7m) cable is included with each Throttlmaster™ and cables up to 500 ft. (150 m) are available. If more than 25 ft. is required add the length as a suffix to the valve model number and add: \$1.00/ft.

Throttlmaster™ is a trademark of Vacuum Research.



- Less Outgassing Than S.S., See Page 39
- Throttle & Leak Tight Shut Off in One Valve
- Aluminum or Stainless Steel Valves
- Seals Up To 3 Atmospheres Differential
- Vacuum or Atmosphere on Either Side
- ANSI Flange Sizes From 2 Inch To 20 Inch
- Tapped Hole or Neck Style ANSI Flanges
- ISO-k or f style Flanges From 63 To 500 mm
- Locks in Open and Closed Positions
- All Valves (RoHS) 2015/863/EU Compliant



The Vacuum Research Manual Throttle Valves serve the dual purposes of high vacuum isolation valve with leak tight shutoff plus precision pump capacity control for sputtering or plasma. They are suitable for use with turbo, diffusion or cryo pumps, and are always leak tight during regeneration.

Both f and k style ISO flanges are available, as are neck style ANSI flanges. Optional ports for roughing and gauges can be located anywhere on the valve body; sizes from NW-16 to NW-50 are available.

ANSI Flanges

Nominal ANSI Size	Model No. ANSI Flange	Port Diameter	Flange O.D.	Flange O-Rings	Bolt Circle	(no. of bolts) x bolt size	A Flange to Flange	C Manual Throttle	E Manual Throttle	F Disassy. Clearance	Weight lbs.		Price
											Net	Ship	
2 inch	LPWA 2 N1	3.375	6.00	3.625 ID X .139	4.75	(4) 5/8-11	3.75	15.00	2.50	2.625	13	20	\$1721.
3 inch	LPWA 3 N1	4.00	7.50	4.00 ID X .139	6.00	(4) 5/8-11	3.75	15.00	2.50	2.625	15	22	\$1845.
4 inch	LPWA 4 N1	6.00	9.00	5.75 ID X .139	7.50	(8) 5/8-11	4.125	21.00	2.563	4.50	31	45	\$1987.
6 inch	LPWA 6 N1	8.00	11.00	7.50 ID X .139	9.50	(8) 3/4-10	4.375	24.00	2.563	5.50	49	60	\$2312.
8 inch	LPWA 8 N1	10.00	13.50	9.00 ID X .275	11.75	(8) 3/4-10	4.375	24.00	2.563	5.50	55	66	\$3783.
10 inch	LPWA 10 N1	12.00	16.00	12.00 ID X .275	14.25	(12) 7/8-9	4.625	27.188	1.50	4.75	109	130	\$4651.
12 inch	LPWA 12 N1	12.00	19.00	13.00 ID X .275	17.00	(12) 7/8-9	4.625	27.188	1.50	4.75	129	150	\$5756.
16 inch	LPWA 16 N1	16.00	23.50	17.00 ID X .275	21.25	(16) 1-8	6.50	37.00	1.50	7.00	200	350	\$11,600.

ISO Flanges

Nominal ISO Size	Model No. ISO Flange	Port Diameter	Flange O.D.	Flange O-Rings	Bolt Circle	(no. of bolts) x bolt size	A Flange to Flange	C Manual Throttle	E Manual Throttle	F Disassy. Clearance	Weight lbs.		Price
											Net	Ship	
63 mm	LPWA 63 N1	70	130	Use standard ISO centering rings. These are not included with the valve and should be purchased separately.	110	(4) M8-1.25	70	381	64	67	13	20	\$1619.
80 mm	LPWA 80 N1	83	145		125	(8) M8-1.25	95	381	64	67	15	22	\$1775.
100 mm	LPWA 100 N1	102	165		145	(8) M8-1.25	95	381	64	114	31	45	\$2032.
160 mm	LPWA 160 N1	153	225		200	(8) M10-1.5	105	533	65	140	49	60	\$2152.
200 mm	LPWA 200 N1	213	285		260	(12) M10-1.5	111	610	65	140	55	66	\$3843.
250 mm	LPWA 250 N1	261	335		310	(12) M10-1.5	117	690	38	120	109	130	\$4640.
320 mm	LPWA 320 N1	318	425		395	(12) M10-1.75	117	690	38	120	129	150	\$5658.
400 mm	LPWA 400 N1	400	510		480	(16) M12-1.75	165	940	38	178	200	350	\$11,600.



This precision 3 position system is available on Gate, Poppet and Rectangular Port Valves

- **Less Outgassing Than S.S., See Page 39**
- **Eliminates All Conductance Controllers**
- **For Any Sputter or Plasma Etch System**
- **Available on Gate and Poppet Style Valves**
- **All Sizes From 2 to 24 Inch, ISO 63 to 600**
- **Electropneumatic, Uses Standard Shop Air**
- **Specify Any Voltage, 115 or 230 VAC, 24 VDC**
- **Repeats Position to $\pm .015$ Inch, 0.4 mm**
- **Adjust Throttle At Vacuum or Atmosphere**

The Vacuum Research 3 Position Valve System was developed for use on sputter, plasma etch and other vacuum systems where it is desirable to reduce pumping speed to conserve gas and simplify pressure control. By utilizing the high vacuum valve for throttling the cost and maintenance of mechanical conductance controllers is completely eliminated. Even in the full open position all conductance controllers restrict pumping speed and this restriction can now be eliminated.

This precision 3 position system can be provided on Vacuum Research Poppet Valves, Rectangular Port Valves and Gate Valves with end-operated linear actuators. It is suitable for valves with port sizes from 2 inch to 24 inch, ISO-63 to ISO-600. The system can be provided on either aluminum or stainless steel valves.

The "3 POS" system consists of position indicators for full open and full closed plus a third position indicator for the throttle position. This throttle position indicator may be adjusted with a screw driver without any valve disassembly and with the valve either open or closed.

Ordering Information

To order this feature on a Vacuum Research Valve, add the suffix "3 POS" to the valve model number, and specify solenoid voltage of 115 V, 50/60 Hz; 230 V, 50 Hz or 24 VDC. Air pressure required is 70 PSI (5 kg/cm²)

Add to Valve Price\$423.

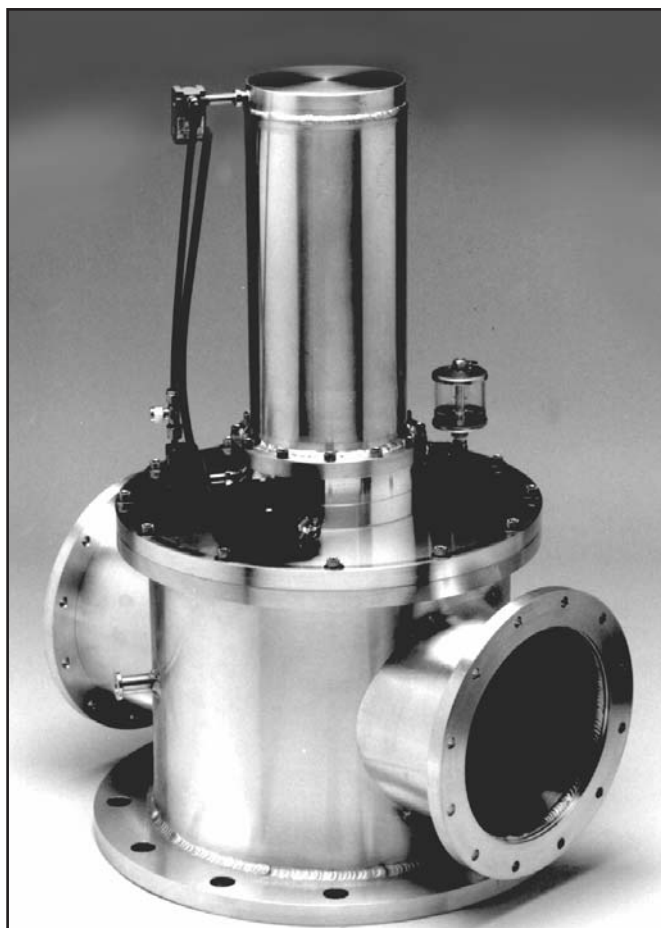
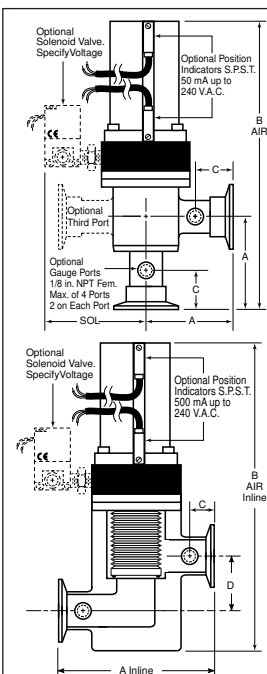


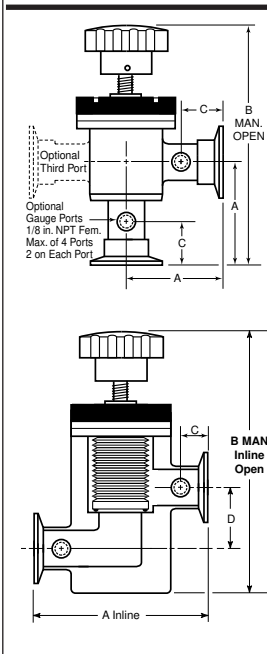
Photo shows a typical installation of the Vacuum Research "3 POS" Throttle System on a large poppet valve. Output signals to the vacuum system PLC or controller are available on a terminal strip in the black junction box. (Optional shaft seal oiler also shown.)



- Less Outgassing Than Stainless, See Pg. 39
- Aluminum or 304 Stainless Steel Bodies
- Leak Tested to Better Than 5×10^{-10} scc/s
- Select Welded Bellows or O-Ring Stem Seals
- Viton® Seat And Bonnet Seal Are Standard
- Kalrez® Seat & Bonnet Seals Also Available
- Gauge Fittings Available On Either Port
- Failsafe; Choose Spring Close Or Air Close
- All Valves (RoHS) 2015/863/EU Compliant



		Air To Open/Spring To Close (See "Optional Features" on next page for Air Open/Air Close or Spring to Open)									
	Part Number For Inline Style replace "ANG" with "INL"	Description	Angle Style				Inline Style				
			Price	A	B Air	C	Price	A	B Air	D	
Bellows Stem Seal 1,000,000 Cycles	SS-BEL-ANG-.75-AIR	No Flanges, 0.75 O.D.	\$333.	2.1	6.2	.85	\$339.	4.2	5.9	1.1	
	SS-BEL-ANG-133-AIR	1.33 CF on Both Ports	\$354.	2.1	6.2	.85	\$368.	4.2	5.9	1.1	
	SS-BEL-ANG-16-AIR	NW-16 on Both Ports	\$368.	2.1	6.2	.85	\$377.	4.2	5.9	1.1	
	ALUM-BEL-ANG-16-AIR	Aluminum Body, NW-16	\$312.	2.1	6.2	.85	\$340.	4.2	5.9	1.1	
	SS-BEL-ANG-1.0-AIR	No Flanges, 1.00 O.D.	\$395.	2.0	5.9	.82	\$408.	4.0	6.1	1.4	
	SS-BEL-ANG-212-AIR	2.12 CF on Both Ports	\$414.	2.0	5.9	.82	\$420.	4.0	6.1	1.4	
	SS-BEL-ANG-25-AIR	NW-25 on Both Ports	\$414.	2.0	5.9	.82	\$420.	4.0	6.1	1.4	
	ALUM-BEL-ANG-25-AIR	Aluminum Body, NW-25	\$355.	2.0	5.9	.82	\$353.	4.0	6.1	1.4	
	SS-BEL-ANG-1.5-AIR	No Flanges, 1.50 O.D.	\$443.	2.4	7.8	.90	\$469.	4.8	8.4	1.9	
	SS-BEL-ANG-275-AIR	2.75 CF on Both Ports	\$455.	2.4	7.8	.90	\$475.	4.8	8.4	1.9	
O-Ring Stem Seal 250,000 Cycles	SS-BEL-ANG-40-AIR	NW-40 on Both Ports	\$455.	2.4	7.8	.90	\$475.	4.8	8.4	1.9	
	ALUM-BEL-ANG-40-AIR	Aluminum Body, NW-40	\$419.	2.4	7.8	.90	\$464.	4.8	8.4	1.9	
	SS-BEL-ANG-2.0-AIR	No Flanges, 2.00 O.D.	\$567.	3.4	10.3	1.14	\$598.	6.8	11.0	2.6	
	SS-BEL-ANG-338-AIR	3.38 CF on Both Ports	\$573.	3.4	10.3	1.14	\$605.	6.8	11.0	2.6	
	SS-BEL-ANG-50-AIR	NW-50 on Both Ports	\$573.	3.4	10.3	1.14	\$605.	6.8	11.0	2.6	
	ALUM-BEL-ANG-50-AIR	Aluminum Body, NW-50	\$557.	2.8	10.3	1.14	\$562.	6.8	11.0	2.6	
	ALUM-O-ANG-16-AIR	Aluminum NW-16	\$297.	1.6	5.6	.85	\$297.	4.2	5.9	1.1	
	ALUM-O-ANG-25-AIR	Body with NW-25	\$312.	2.0	5.9	.82	\$320.	4.0	6.1	1.4	
	ALUM-O-ANG-40-AIR	O-Ring NW-40	\$405.	2.6	7.8	.90	\$416.	4.8	8.4	1.9	
	ALUM-O-ANG-50-AIR	Shaft Seal NW-50	\$495.	2.8	9.7	1.14	\$507.	6.8	11.0	2.6	



		Manual Valves									
	Part Number For Inline Style replace "ANG" with "INL"	Description	Angle Style				Inline Style				
			Price	A	B Man	C	Price	A	B Man	D	
Bellows Stem Seal 1,000,000 Cycles	SS-BEL-ANG-.75-MAN	No Flanges, 0.75 O.D.	\$309.	2.1	6.2	.85	\$350.	4.2	5.9	1.1	
	SS-BEL-ANG-133-MAN	1.33 CF on Both Ports	\$326.	2.1	6.2	.85	\$352.	4.2	5.9	1.1	
	SS-BEL-ANG-16-MAN	NW-16 on Both Ports	\$326.	2.1	6.2	.85	\$352.	4.2	5.9	1.1	
	ALUM-BEL-ANG-16-MAN	Aluminum Body, NW-16	\$297.	2.1	6.2	.85	\$323.	4.2	5.9	1.1	
	SS-BEL-ANG-1.0-MAN	No Flanges, 1.00 O.D.	\$309.	2.0	5.9	.82	\$358.	4.0	6.0	1.3	
	SS-BEL-ANG-212-MAN	2.12 CF on Both Ports	\$340.	2.0	5.9	.82	\$364.	4.0	6.0	1.3	
	SS-BEL-ANG-25-MAN	NW-25 on Both Ports	\$340.	2.0	5.9	.82	\$364.	4.0	6.0	1.3	
	ALUM-BEL-ANG-25-MAN	Aluminum Body, NW-25	\$320.	2.0	5.9	.82	\$358.	4.0	6.0	1.3	
	SS-BEL-ANG-1.5-MAN	No Flanges, 1.50 O.D.	\$461.	2.4	7.8	.90	\$461.	4.8	8.4	1.9	
	SS-BEL-ANG-275-MAN	2.75 CF on Both Ports	\$469.	2.4	7.8	.90	\$469.	4.8	8.4	1.9	
O-Ring Stem Seal 250,000 Cycles	SS-BEL-ANG-40-MAN	NW-40 on Both Ports	\$469.	2.4	7.8	.90	\$469.	4.8	8.4	1.9	
	ALUM-BEL-ANG-40-MAN	Aluminum Body, NW-40	\$461.	2.4	7.8	.90	\$461.	4.8	8.4	1.9	
	SS-BEL-ANG-2.0-MAN	No Flanges, 2.00 O.D.	\$507.	3.4	9.9	1.14	\$507.	6.8	10.6	2.6	
	SS-BEL-ANG-338-MAN	3.38 CF on Both Ports	\$566.	3.4	9.9	1.14	\$527.	6.8	10.6	2.6	
	SS-BEL-ANG-50-MAN	NW-50 on Both Ports	\$555.	3.4	9.9	1.14	\$527.	6.8	10.6	2.6	
	ALUM-BEL-ANG-50-MAN	Aluminum Body, NW-50	\$507.	2.8	9.9	1.14	\$481.	6.8	10.6	2.6	
	ALUM-O-ANG-16-MAN	Aluminum NW-16	\$277.	1.6	5.6	.85	\$300.	4.2	5.9	1.1	
	ALUM-O-ANG-25-MAN	Body with NW-25	\$304.	2.0	5.8	.82	\$326.	4.0	6.0	1.3	
	ALUM-O-ANG-40-MAN	O-Ring NW-40	\$405.	2.6	7.8	.90	\$416.	4.8	8.4	1.9	
	ALUM-O-ANG-50-MAN	Shaft Seal NW-50	\$468.	2.8	9.3	1.14	\$441.	6.8	10.6	2.6	

3 Way Valves, Manual or Air Operated



Photo shows an NW-40 valve with optional position indicators on one side and one optional gauge port. Up to 3 gauge ports available at \$28. each.

Aluminum bodies with bellows shaft seal. The standard pneumatic actuator is air to open, spring to close. Other options such as gauge ports and position indicators are available. Two 3-way solenoids required. See below for cost of solenoids.

NW-16, P/N: 3W-ALUM-BEL-16AIR.	\$671.
NW-25, P/N: 3W-ALUM-BEL-25AIR.	\$694.
NW-40, P/N: 3W-ALUM-BEL-40AIR.	\$765.
NW-50, P/N: 3W-ALUM-BEL-50AIR.	\$864.
NW-16, P/N: 3W-ALUM-BEL-16MAN.	\$633.
NW-25, P/N: 3W-ALUM-BEL-25MAN.	\$651.
NW-40, P/N: 3W-ALUM-BEL-40MAN.	\$720.
NW-50, P/N: 3W-ALUM-BEL-50MAN.	\$803.
1/8 In. NPT GAUGE PORTS Specify Location.	\$31. each

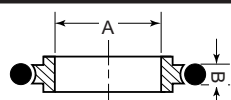
VCR or 1/8 Inch NPT Ports For Gauge Tubes

VCR-4 or 1/8 inch NPT female ports can be provided on the end or side valve ports. Any number of these ports in any combination can be specified by adding the appropriate suffix to the part number. For example, 1/8 RS suffix would specify a 1/8 inch NPT port on the right of the side port.

1/8 NPT Port Add: Alum. valves **\$31.** SS valves **\$91.**
VCR-4 Port Add: Stainless Steel only. **\$127.**

	Position Reference		P/N for 1/8 NPT Port	P/N for VCR Port
	RS	Right Side Port	H700020	H700033
	LS	Left Side Port	H700021	H700034
	RB	Right Bottom Port	H700022	H700035
	LB	Left Bottom Port	H700023	H700036

Centering Rings



**304 Stainless Steel
With Viton O-Rings
(Buna-N O-Rings Available)**

Flange Size	A	B	Part Number	Price
NW-16	0.63 (16)	0.21 (5.3)	CTR-RING 16	\$5.00
NW-25	0.984 (25)	0.21 (5.3)	CTR-RING 25	\$6.00
NW-40	1.575 (40)	0.21 (5.3)	CTR-RING 40	\$8.00
NW-50	1.969 (50)	0.21 (5.3)	CTR-RING 50	\$10.00

Position Indicators

Pneumatically activated valves can be equipped with a pair of SPST switches to indicate valve open and closed. These unpowered switches have contacts rated for up to 500 mA at up to 240 VAC, non-inductive.

Add the suffix 'PI'. (Open & Closed). . . Add \$119./pair

Optional Third Port for Angle or Inline Valves



Standard angle valves have two ports: one bottom and one side. To add an additional side port for vacuum gauge tube installation, specify the optional third port by simply adding the suffix "3-Port" to any valve part number and add the cost shown below:

NW-16. . .add \$119.	NW-40. . .add \$164.
NW-25. . .add \$144.	NW-50. . .add \$212.

Spring to Open/Air to Close

For this option, add "SO" to the P/N & add cost below:

NW-16add \$54.	NW-25add \$54.
NW-40add \$103.	NW-50add \$110.

Air to Open/Air To Close

Standard valves use air to open and spring to close but as an option the valves can be built for air to open and close. Add the suffix 'AC' to the part number. Note that with this option a 4 way solenoid is required.

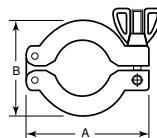
Air To Close and Open P/N: H700024 Add \$67.

1/8 NPT/ISO Adapter Fitting for Air P/N: H700032. N/C

Solenoids For Pneumatic Valves

Because many customers use central air manifolds to activate valves we offer these solenoids as an optional rather than standard feature. Solenoids are specified by adding a suffix to Valve part number below.

3 Way for Standard, Spring to Close Valves \$74.		4 Way for Air Open/Air Close Valves. \$106.	
add Suffix to P/N	Solenoid P/N	add Suffix to P/N	Solenoid P/N
SOL-120 VAC	X134003	SOL-120 VAC	X703005
SOL-230 VAC	X134013	SOL-230 VAC	X134010
SOL-24 VDC	X134032	SOL-24 VDC	X703041



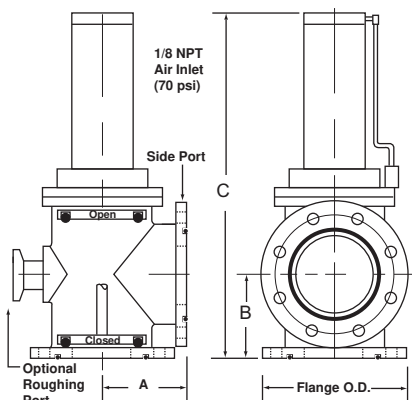
Clamps

Aluminum Clamps With Wing Nut & Screw Fastener

Flange Size	A	B	Thickness	Part Number	Price
NW-16	2.24 (57)	1.69 (43)	0.63 (16)	AL-Clamp 16	\$5.00
NW-25	2.76 (70)	2.17 (55)	0.63 (16)	AL-Clamp 25	\$6.00
NW-40	3.39 (88)	2.76 (70)	0.63 (16)	AL-Clamp 40	\$8.00
NW-50	4.33 (110)	3.70 (94)	0.79 (20)	AL-Clamp 50	\$10.00



- Less Outgassing Than Stainless, See Page 39
- 6061 Aluminum or Mild Steel Poppet Valves
- Electroless Nickel Optional on Steel Valves
- Over 100,000 Cycles Without Maintenance
- Optional Operation to 10 Bar, 147 PSIG
- 150 lb. ANSI Flanges Standard
- ISO and Special Flanges Available
- Flanges to Match Diffusion & Cryo Pumps
- 3 Port Valves Available in All Sizes
- Leak Tested To Better Than 5×10^{-10} scc/sec
- Automatic Closure on Power Failure
- All Valves (RoHS) 2015/863/EU Compliant



The standard configuration is with O-Rings on both flanges. However, valves can be provided without O-Rings, or with an O-Ring on only one side for no additional cost. If only one O-Ring is needed specify "open" or "seal" side.

ORDERING INFORMATION

Model Number: Refer to page 2 for instructions on how to specify the features you need.

Electronic Position Indicators: Two reed switches activated by a magnet inside pneumatic actuator provide closure for open & closed position. Add 'LSE' to Model No., see page 40 for specifications \$162. / pair

Roughing Ports or Gauge Ports: Standard location is 180° from side port as shown in drawing. Other locations and more than one port are available.

Available on Any Size Valve

NW-16 \$158. NW-40 \$198.
NW-25 \$172. NW-50 (Not On 2") . . . \$212.

Available on 6 Inch or Larger Valves

ANSI 2 Inch . . \$422. ISO k 63 . . \$284.
ANSI 3 Inch . . \$460. ISO k 80 . . \$371.
ANSI 4 Inch . . \$562. ISO k 100 . . \$405.

Special Features: Refer to pages 40 - 43 for information on special features and accessories.

Viton® or Kalrez® or Silicone O-Rings: Our standard Poppet Valves use Buna-N O-Rings. You may specify Viton® (or other materials) throughout the valve with a "V", "S", or "K" in the model number. For Viton® add the following to the price. (For Silicone or Kalrez® contact the factory for prices.)

2 or 3 in. valves \$59. 8 inch valves \$177. 16 inch valves contact factory
4 inch valves \$90. 10 inch valves \$231. 20 inch valves contact factory
6 inch valves \$111. 12 inch valves \$297.

Poppet valves with port sizes from 10 inch to 24 inch are designed to seal with vacuum on the bottom port and atmosphere on the side port. If you need to seal the valve with atmosphere on the bottom port (pushing the valve open) specify this on your inquiry and a larger cylinder will be provided.

Nominal Size	Model No.	Bottom Port Diameter	Side Port Diameter	Both Flanges				Flange Face to Flange C ₁		C Overall Height	Roughing Port Max. Size	Aluminum Weight, lbs (kg)		Alum. Price	Mild Steel Price
				Flange O.D.	Bolt Circle	Bolt Holes Tapped Holes Optional	Flange O-Rings	A	B			Net	Ship		
2 inch	AV-2	2.00	2.50	6.00	4.75	(4) 11/16	2.75 x .210	3.688	3.125	12.50	NW-40	7 (3.2)	12 (5.5)	\$1472.	\$1351.
3 inch	AV-3	3.00	3.188	7.50	6.00	(4) 11/16	4.00 x .210	4.50	4.125	17.125	NW-50	13 (5.9)	18 (8.2)	\$1771.	\$1573.
4 inch	AV-4	4.00	4.188	9.00	7.50	(8) 11/16	5.50 x .275	5.50	4.625	19.50	NW-50	15 (6.8)	24 (11)	\$2202.	\$1961.
6 inch	AV-6	6.00	6.188	11.00	9.50	(8) 13/16	7.50 x .275	6.25	6.375	30.40	4 in / ISO 100	28 (12.7)	42 (19)	\$2480.	\$2252.
8 inch	AV-8	8.00	8.50	13.50	11.75	(8) 13/16	9.00 x .275	8.25	7.00	30.375	4 in / ISO 100	55 (25)	75 (34)	\$4134.	\$3720.
10 inch	AV-10	10.00	10.344	16.00	14.25	(12) 15/16	12.00 x .275	9.16	9.25	35.50	6 in / ISO 160	70 (31.8)	95 (43)	\$5157.	\$4634.
12 inch	AV-12	12.00	12.00	19.00	17.00	(12) 15/16	14.50 x .275	12.00	8.63	40.00	8 in / ISO 200	95 (43)	130 (59)	\$6318.	\$5726.
16 inch	AV-16	16.00	16.00	23.50	21.25	(16) 1 1/8	17.50 x .275	14.00	9.25	43.30	8 in / ISO 200	125 (49)	180 (71)	\$10,362.	\$9426.
20 inch	AV-20	20.00	20.00	27.50	25.00	(20) 1 1/8	21.00 x .275	16.00	14.00	58.90	8 in / ISO 200	280 (127)	335 (152)	\$15,527.	\$14,439.
24 inch	AV-24	24.00	24.00	32.00	29.50	(20) 1 1/8	21.00 x .275	17.50	17.50	66.00	8 in / ISO 200	270 (122)	330 (150)	\$21,508.	\$19,880.
2 inch	2532-2	2.25	2.25	6.00	4.75	(4) 11/16	2.75 x .210	4.06	2.13	12.50	NW-40	7 (3.2)	12 (5.5)	\$1474.	\$1369.
3 inch	2532-3	3.00	3.00	7.50	6.00	(4) 11/16	4.00 x .210	4.81	2.60	17.10	NW-50	13 (5.9)	18 (8.2)	\$1771.	\$1605.
4 inch	2532-4	4.00	4.00	9.00	7.50	(8) 11/16	5.5 x .275	5.63	3.44	19.50	NW-50	15 (6.8)	24 (11)	\$2344.	\$2085.
6 inch	2532-4	6.00	6.00	11.00	9.50	(8) 13/16	7.5 x .275	7.06	4.63	23.30	NW-50	28 (12.7)	42 (19)	\$2480.	\$2221.

Dimensions shown in inches

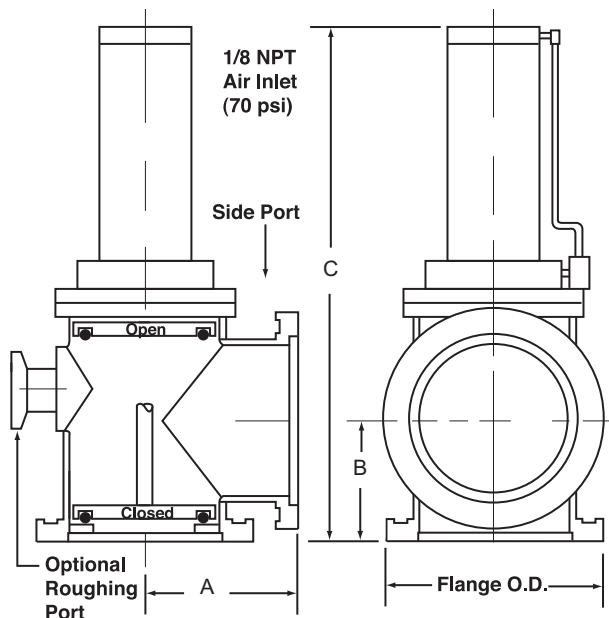
Standard Exterior of Mild Steel Valves Painted Turbine Blue.

Vacuum Research Corp. • 100 Chapel Harbor Drive, #4 • Pittsburgh, PA 15238 USA • www.vacuumresearch.com

Phone: 800-426-9340 • 412-261-7630 • FAX: 412-261-7220 • e-mail: VRC@vacuumresearch.com



- Less Outgassing Than S.S., See Page 39
- 6061 Aluminum or Mild Steel
- All Valves (RoHS) 2015/863/EU Compliant
- Electroless Nickel Optional on Steel Valves
- Optional Operation to 10 Bar, 147 PSIG
- ISO-k Flanges Standard, f Style Optional
- Flanges to Match Diffusion & Cryo Pumps
- Extremely Low Outgassing Rate
- Leak Tested To 5×10^{-10} Std. cc/sec
- Automatic Closure on Power Failure
- Optional Open/Closed Position Indicators
- High Conductance Full Opening Port



ORDERING INFORMATION

Model Number: Refer to page 2 for instructions on how to specify the features you need.
Electronic Position Indicators: Two reed switches activated by a magnet inside the pneumatic actuator provide contact closure for open and closed positions. Add 'LSE' to Model No., refer to page 40 for specifications. \$162. /pair
Roughing Ports or Gauge Ports: Standard location is 180° from side port as shown in drawing. Other locations and more than one port are available.

Available on Any Size Valve

NW-16	.....	\$158.
NW-25	.....	\$172.
NW-40	.....	\$198.
NW-50 (Not On 63, 100)	.....	\$212.

Available on 6 Inch or Larger Valves

ISO k 63	.....	\$284.
ISO k 80	.....	\$371.
ISO k 100	.....	\$405.

ISO-f flanges available for side or bottom ports at same price.

Special Features: See pages 40 to 43 for information on special features and accessories.

Viton® or Kalrez® or Silicone O-Rings: Our standard Poppet Valves use Buna-N O-Rings. You may specify Viton® (or other materials) throughout the valve with a "V", "S", or "K" in the model number. For Viton® add the following to the price. (For Silicone or Kalrez® contact the factory for prices.)

ISO-63	.....	\$59.	ISO-250	.....	\$231.
ISO-100	.....	\$90.	ISO-320	.....	\$297.
ISO-160	.....	\$111.	ISO-400	.....	contact factory
ISO-200	.....	\$177.	ISO-500	.....	contact factory

Poppet valves from ISO 250 to ISO 500 are designed to seal with vacuum on the bottom port and atmosphere on the side port. If you need to seal the valve with atmosphere on the bottom port (Pushing the valve open) specify this on your inquiry and a larger cylinder will be provided.

Nominal Size	Molecular Conductance	For Mild Steel Use "AVMS" Basic Valve Style in Model No.	Port Flanges Outside Diameter	Flange to Flange "A" Dimension	Overall Height "B" Dimension	Roughing Port Sizes Available	Aluminum Weight, lbs (kg)		Aluminum Price	Mild Steel Weight, lbs (kg)		Mild Steel Price
							Net	Ship		Net	Ship	
ISO 63	160	AV-63 ISO-k	95 mm	88 mm	373 mm	NW-16 to NW-40	13 (5.9)	18 (8.2)	\$1411.	25 (11)	40 (18)	\$1321.
ISO 100	440	AV-100 ISO-k	130 mm	108 mm	394 mm	NW-16 to NW-40	15 (6.8)	24 (11)	\$1815.	40 (18)	49 (22)	\$1704.
ISO 160	1,000	AV-160 ISO-k	180 mm	138 mm	424 mm	NW-16 to ISO-100	28 (13)	42 (19)	\$1924.	50 (27)	74 (34)	\$1845.
ISO 200	1,920	AV-200 ISO-k	240 mm	184 mm	800 mm	NW-16 to ISO-100	55 (25)	75 (34)	\$2813.	95 (43)	115 (52)	\$2640.
ISO 250	3,000	AV-250 ISO-k	290 mm	235 mm	850 mm	NW-16 to ISO-100	70 (32)	95 (43)	\$4165.	125 (57)	150 (68)	\$3918.
ISO 320	5,060	AV-320 ISO-k	370 mm	276 mm	869 mm	NW-16 to ISO-200	95 (43)	130 (59)	\$4997.	150 (68)	185 (84)	\$4795.
ISO 400	8,550	AV-400 ISO-k	450 mm	337 mm	1067 mm	NW-16 to ISO-320	125 (49)	180 (71)	\$10,362.	520 (236)	755 (343)	\$9426.
ISO 500	21,840	AV-500 ISO-k	550 mm	387 mm	1372 mm	NW-16 to ISO-320	280 (130)	335 (152)	\$15,527.	800 (363)	1200 (545)	\$14,439.

Standard Exterior of Mild Steel Valves Painted Turbine Blue.



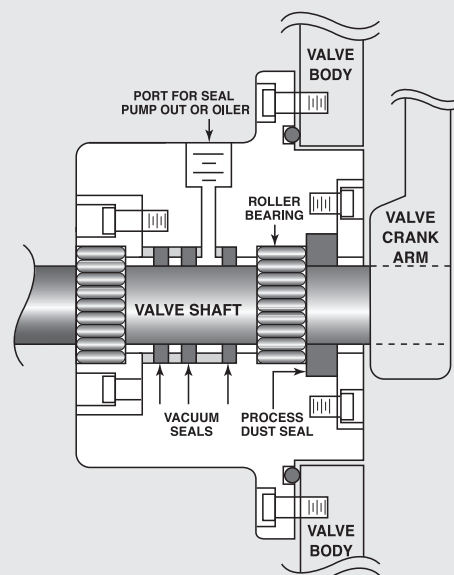
Our standard valves will give hundreds of thousands of cycles and years of service in most applications, however there are some industrial vacuum processes that are so dirty that the valves may need special features to provide long life and trouble free operation. Processes such as investment casting, tire reclamation and steel degassing often produce dust and particulate that can lead to frequent valve seal maintenance. Plasma systems may also need special care to protect the valve seals. The high temperature and corrosive nature of the plasma can cause the seals to quickly become dry and brittle and subsequently leak.

In these situations one of the most popular options is to apply a rough vacuum of approximately 0.1 Torr between the stages of the seal on the valve actuator shaft. Keeping a low pressure differential between seal stages can greatly extend the useful life of the seal.

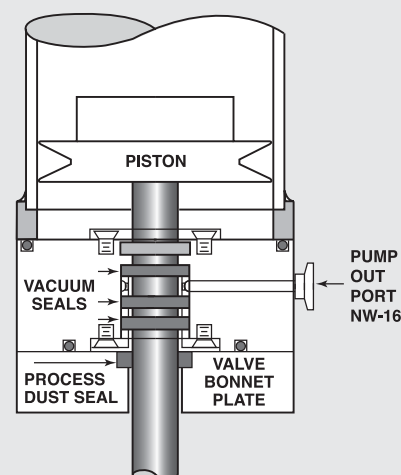
Other customers prefer to lubricate the shaft and seals with high quality oil from a continuous gravity oiler. In this case the valve hub may be provided with both an inlet and outlet port so that a continuous drip of lubricant can be supplied.

In certain situations high viscosity grease is preferred and an appropriate fitting can be provided.

In all such situations a compliant dust seal is installed around the shaft at the vacuum interface to keep dust and particulate away from the vacuum seals and shaft roller bearings.



**Rotary Actuator Valve (LPWA)
with Oiler/Pump Out Port**



**Poppet or End Operated Valve
with Oiler/Pump Out Port**

These inexpensive features are available on any size of our standard or water cooled gate or poppet valves. We recommend them on any application wherever dust and dirt from your process may contribute to increased maintenance and downtime.

Ordering Information

Although these options are not expensive they are always built to match the exact needs of each customer (for example, the pump out port may be pipe thread or 'NW' style flanges of various sizes). Because there are so many variables a firm price quotation will be provided after your discussion with our customer service people.



12 inch cylinder with 'L' gasket, optional Pyrex view port, handles, and top plate. Less outgassing than stainless steel, see page 39.

Aluminum Cylinders with 'L' Shaped Gaskets

Purchase base plates, ports, and gaskets as needed from the lists below.

Inside Diam. (kg)	Inside Height (kg)	Volume		Weight		Price
		In ³	liters	Lbs.	kg	
6 Inch (152)	9 Inch (228)	254	4.2	5	2.3	\$854.
8 Inch (203)	12 Inch (304)	603	9.9	8	3.6	\$1037.
10 Inch (254)	15 Inch (381)	1,178	19.3	15	6.8	\$1413.
12 Inch (304)	18 Inch (457)	2,035	33.4	20	9.0	\$1530.
16 Inch (406)	20 Inch (508)	4,021	65.9	30	13.0	\$2106.
18 Inch (457)	25 Inch (635)	6,361	104	43	20.0	\$2431.
20 Inch (508)	25 Inch (635)	7,854	128	50	23.0	\$3192.

Aluminum Cylinders With Flanges

Flanges with O-ring at each end. Purchase base and top plate from the lists below.

Inside Diam. (kg)	Inside Height (kg)	Volume		Weight		Price
		In ³	liters	Lbs.	kg	
6 Inch (152)	9 Inch (228)	254	4.2	2.5	1.1	\$980.
8 Inch (203)	12 Inch (304)	603	9.9	3.8	1.7	\$1182.
10 Inch (254)	15 Inch (381)	1,178	19.3	8	3.6	\$1741.
12 Inch (304)	18 Inch (457)	2,035	33.4	11	5.0	\$2018.

'L' Shaped Gaskets

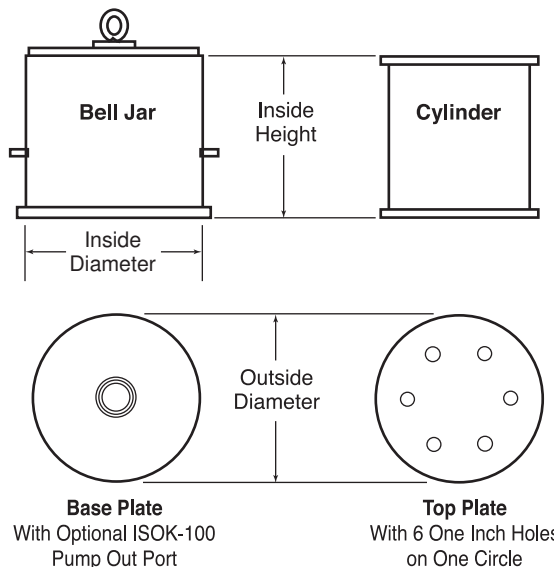
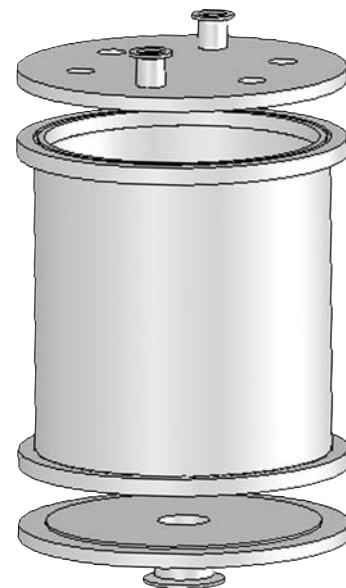
Cylin. Diam.	6 in.	8 in.	10 in.	12 in.	14 in.	18 in.	22 in.
Buna-N	\$53.	\$58.	\$56.	\$58.	\$63.	\$74.	\$94.
Viton	\$89.	\$107.	\$112.	\$149.	\$160.	\$231.	\$327.

Base Plates and Top Plates

For use with cylinders. Select pump out and view ports as needed for your process.

Use with Cylinder	Outside Diameter	Weight Lbs.(kg)	Price
6 Inch (152)	8 Inch (203)	2.5 (1.1)	\$85.
8 Inch (203)	10 Inch (254)	4 (1.8)	\$104.
10 Inch (254)	12 Inch (304)	6.5 (2.9)	\$401.
12 Inch (304)	14 Inch (355)	8.8 (4.0)	\$545.
16 Inch (406)	18 Inch (457)	15 (6.8)	\$711.
18 Inch (457)	20 Inch (508)	18 (8.2)	\$871.
20 Inch (508)	22 Inch (559)	22 (10.0)	\$1020.

Cylinder with top & bottom plate. Optional NW-25 ports and 1 inch diameter holes in top plate. NW-50 port for pump out on the bottom plate.



Pump Out Ports

Located at Center of Base Plate

NW-25	\$145.
NW-40	\$168.
NW-50	\$180.
ISO-100k	\$226.
ISO-160k	\$274.
ISO-200k	\$380.
ANSI LP 4 Inch	\$190.
ANSI LP 6 Inch	\$226.

Lifting Handles

Available on cylinders & plates.
Price per pair. . . \$149.

View Ports

Specify Location

NW-50	Polycarbonate	\$83.
ISO-100	Pyrex	\$356.
ISO-160	Pyrex	\$426.

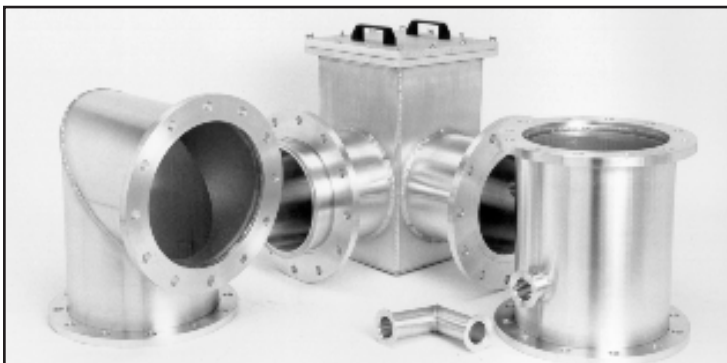
Feed Through Holes

1 inch diameter holes in base or top plates

Set up holes on 1 circle	\$71.
Plus cost for each hole	\$17.

Lifting Lug

On top center of plate.
1 inch diameter eye bolt.
Price each. \$142.



Aluminum has less outgassing than stainless steel. Up to 2 orders of magnitude less, see page 43.

- Custom Fabricated Aluminum Weldments
- Nipples, Spool Pieces, Elbows & Loadlocks
- Leak Tested To Better Than 5×10^{-10} scc/sec
- Specify Rectangular or Cylindrical Bodies
- ANSI, ISO, JIS, CF, NW & Special Flanges
- Rotatable or Non-Rotatable Flanges

50 Years Experience

Vacuum Research has been welding and machining aluminum as part of our vacuum valve business for almost 50 years. With aluminum now replacing stainless steel as the material of choice for many vacuum processes the need for custom aluminum weldments is growing and Vacuum Research is available to help. We can provide nipples, manifolds, elbows, load locks or just about any aluminum vacuum component needed for your system.

Any Flange Style

We can provide both fixed and rotatable flange styles with bolt circles to match ANSI, ISO, JIS, CF and NW specifications. Both heated and water cooled pieces are available.

No Leaks

Our years of aluminum welding experience provide leak free joints in material up to 1 inch thick and beyond. Of course, prior to shipment each piece is tested and certified leak free by our assembly technicians.

Fast Quotations

Our equipment can handle orders for one or two pieces or for hundreds of pieces. Send us a sketch, drawing, or electronic file for a quick quotation.

Custom Vacuum Valve Components

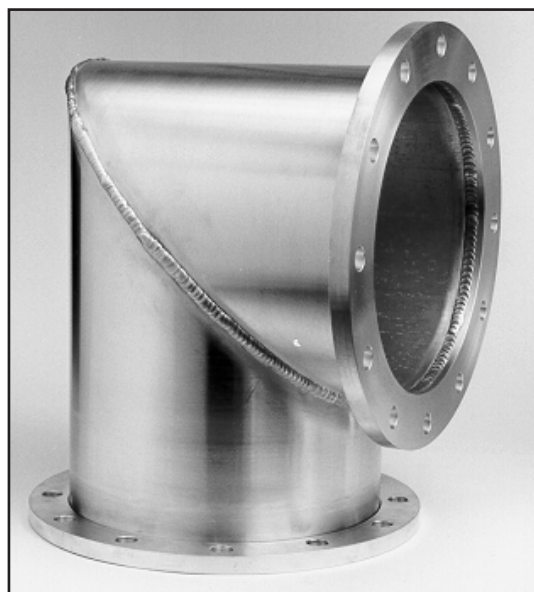


Valve gate with bellows

Some times the optimum system design requires the valves to be an integral part of the system structure. Vacuum Research can provide valve subassemblies and components such as gates and actuators to fit your chamber or tool. Send us a drawing showing the space available and we will provide dimensions of the Vacuum Research assembly that is best suited.



Modular vacuum chambers with ISO-320k flanges and lengths of 100, 200, 400 & 800 mm. Inside diameter is 362 mm.



Aluminum elbow with 12 inch ANSI flanges



Throttle valve with ISO-400 flange on one side and 16 inch ANSI flange on the other. An ISO-100 roughing port is located on both sides of the gate.



Aluminum cube with three, 10 inch ANSI flanges (11.7 inch ports) to join a cryo pump to two chambers.



Aluminum cylinder with optional lifting handles and view port connected to cube with a NW-50 port and 3 sight glass view ports. Cylinders and accessories are described on page 29.



Aluminum valve with 24 inch ANSI flanges on both ports and electric pneumatic actuator.



ISO 600 Valve with Water Cooled Gate

- Port Sizes from 2 to 32 Inch, 63 to 800 mm
- ANSI, ISO, JIS, Conflat® or Custom Flanges
- Electric Motor or Electro-Pneumatic Actuator
- Available for DIV. 1, grp. B, C, D, E, F, Environments
- All Aluminum For Maximum Thermal Exchange
- High Efficiency Internal Coolant Channels
- Helium Leak Tight to Better Than 10^{-10} scc/sec
- Vacuum From 10^{-9} Torr To 10 Atmosphere
- Water Cooled Gate and Body Flanges

As a leading supplier of vacuum valves and weldments Vacuum Research can provide either aluminum or mild steel valves with water cooled gates, bodies or flanges.

We have more than 50 years experience with vacuum valves on systems that include temperature, pressure, hazardous environments and of course, high vacuum.

Water cooled valves in both gate and poppet styles are available with ANSI flanges up to 32 inches and with ISO flanges up to 800 mm. Highly efficient cooling water circuits with low ΔP and high overall 'u' maximize thermal transfer and minimize cooling water consumption. In addition to water cooling all valve styles can be provided with thermal radiation shields on the gate.



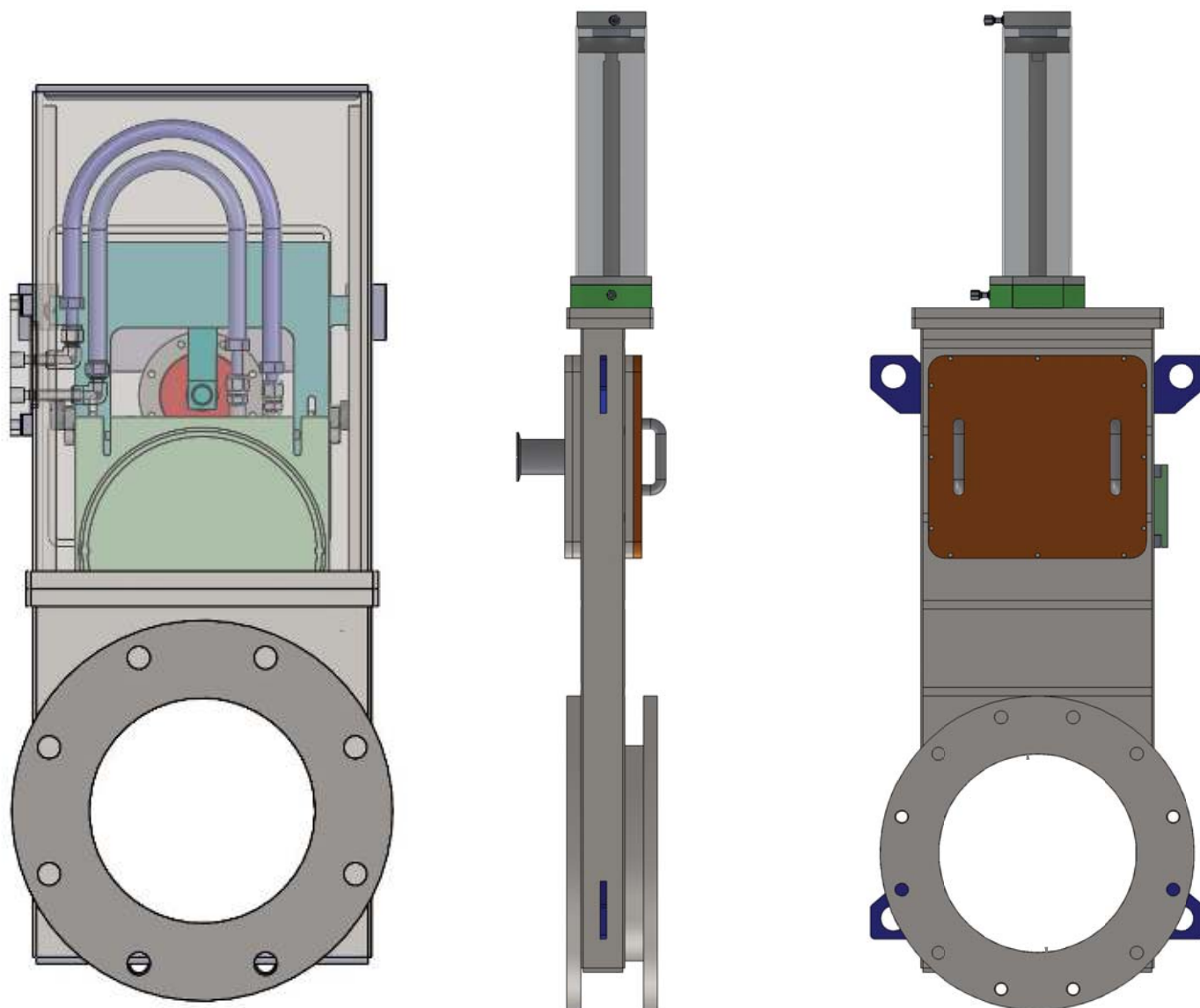
Poppet Valve with Cooling Shroud



Water Cooled Flanges with Port Shroud



Water Cooled Gate and Port Flanges



Ordering Information

Water Cooled Valves are always custom-built to provide the features required for each application, however the starting place is our standard LPWA, End-Operated, or Poppet Valves described in this valve catalog and on our web site: www.vacuumresearch.com.

Select the valve style and size that fits your needs and we will send a SolidWorks drawing showing the water cooling and radiation shield needed.

Also available are the many standard options described in the accessories section of this catalog. The most popular of these options are position indicators for remote indication of the valve position, and gauge or roughing ports with NW style flanges. Special solenoids and position indicators for hazardous areas and combinations of ISO, ANSI and Conflat® flanges are also available.



Valve on left is fully open with protective ring in place. Particles are directed through the port instead of into the valve body.

- Protective Ring Keeps Dirt Out of Valve
- Aluminum, Stainless Steel or Mild Steel
- Water Cooled Port Flanges Available
- Radiation Shield for Gate is Optional
- Water Cooled Gate Described on Page 32
- Easy to Clean Dirt Sump Bonnet
- Helium Leak Rate Less Than 5×10^{-10} scc/s
- Port Sizes From 2 to 24 Inch, 50 to 600 mm
- ANSI, ISO, JIS or Special Flanges
- Fail Safe Design, Close on Power Loss

Although Vacuum Research valves are not affected by small amounts of dust and dirt some processes are so dirty that frequent cleaning is required. For such processes our Protective Ring Valve with the Dirt Sump can substantially reduce your costs by increasing the time between cleanouts. The Protective Ring and Dirt Sump are available on valves with port sizes from 2 to 24 inch (50 to 600 mm ISO). Other Vacuum Research options such as Position Indicators and ports for gauges and roughing can also be provided on these valves.

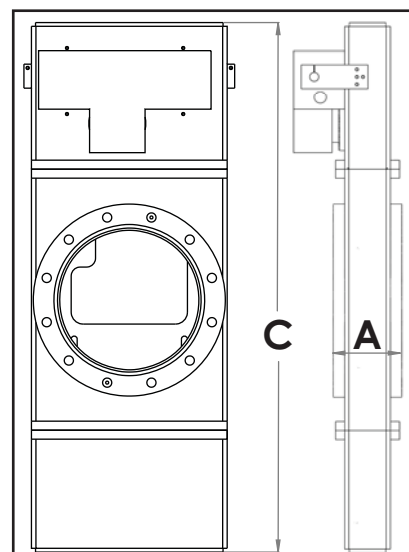
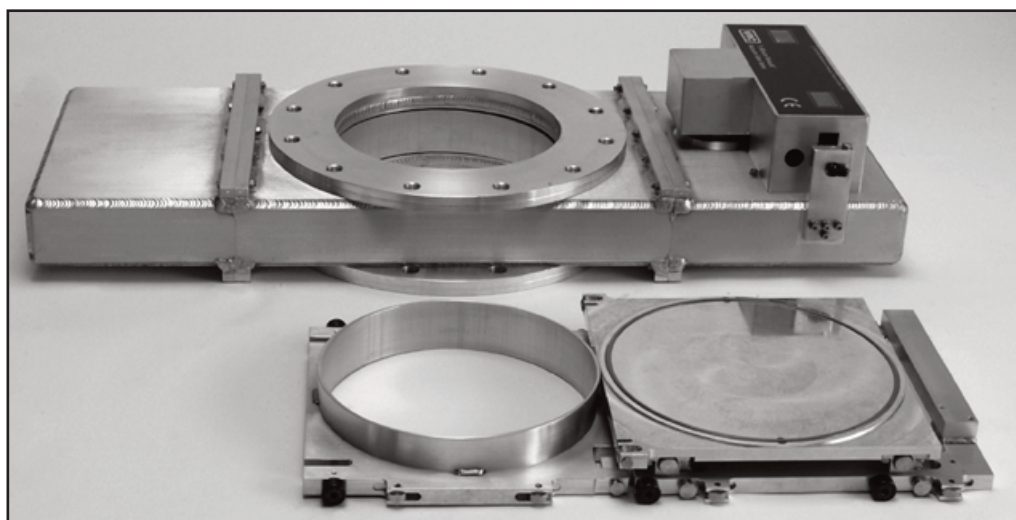
Our protective ring valves are operating in multiple process configurations. We are especially proud of our success in large valve production of the Protective Ring Valves and we'd like the opportunity to meet your requirements. Call or email us with your application design. Our engineering and production teams can work with you to fit our valve to your process. We may already have designed a valve that is close to fitting your system and we can work with you on the details to finish the job.



ISO 600 Powder and Chunk with Water Cooled Gate



500 mm Powder and Chunk Valve Final Assembly



Fully open valve with protective ring in place. Gate/carriage assembly showing standard protective ring.

ANSI Flanges				ISO f Flanges			Operator Type	A Flange To Flange (in.)	C OAL With Sump	Body Width (in.)	Net Weight lbs. (kg)	Ship Weight lbs. (kg)	Price without Water Cooled Gate or Port Flanges
Nominal Size	Port Diameter	Bolts (no.)-thrs.	Flange O-Rings	Nominal Size	Port Diameter	Bolts (no.)-pitch							
2 Inch	2.7 in.	(4) 5/8-11	3.50 x .139	ISO 63	63 mm	(4) M8-1.25	The valves described here use VRC's Rotary Actuator. End Operated Actuators with a linear piston are also available.	4.0	21.0	6.5	20 (9)	30 (13)	\$4267.
4 Inch	6.0 in.	(8) 5/8-11	5.75 x .139	ISO 100	100 mm	(8) M8-1.25		4.1	21.0	6.5	50 (23)	65 (30)	\$5246.
6 Inch	8.0 in.	(8) 3/4-10	7.50 x .139	ISO 160	160 mm	(8) M10-1.5		5.3	30.0	12.0	70 (32)	85 (39)	\$6863.
8 Inch	10.0 in.	(8) 3/4-10	9.0 x .275	ISO 200	200 mm	(12) M10-1.5		5.3	30.0	12.0	74 (34)	89 (40)	\$7485.
10 Inch	12.0 in.	(12) 7/8-9	12.0 x .275	ISO 250	250 mm	(12) M10-1.5		5.5	44.0	14.2	150 (68)	172 (78)	\$9140.
12 Inch	12.0 in.	(12) 7/8-9	13.0 x .275	ISO 320	320 mm	(12) M12-1.75		5.5	46.0	16.3	163 (74)	183 (83)	\$9437.
16 Inch	16.0 in.	(16) 1-8	17.5 x .275	ISO 400	400 mm	(16) M12-1.75		6.5	55.0	22.0	650 (295)	750 (341)	\$17,554.
20 Inch	20.0 in.	(20) 1 1/8-7	22.0 x .275	ISO 500	500 mm	(16) M12-1.75		8.1	69.6	25.8	800 (363)	950 (432)	contact factory
24 Inch	24.0 in.	(20) 1 1/4-7	26.0 x .275	ISO 630	630 mm	(16) M12-1.75		8.5	79.0	30.4	1100 (295)	1400 (635)	contact factory

Stainless Steel Gates in Aluminum Valves: To specify a stainless steel gate in an aluminum valve add a suffix to the model number "SS Gate". See "Optional Features and Accessories" page in this catalog for pricing information.

Optional Quick Release Bonnet

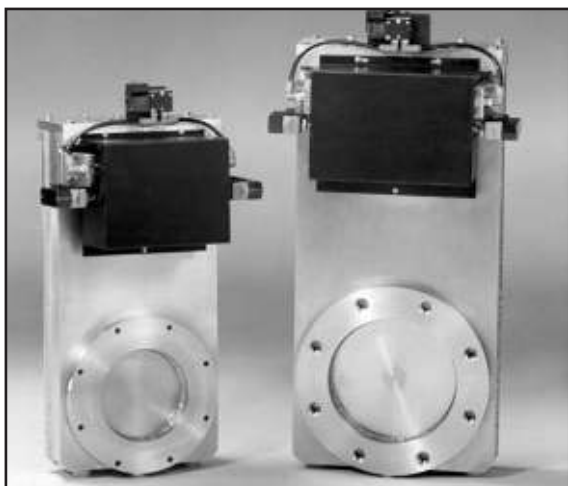


- 5 Seconds for Complete Disassembly
- No Tools Required for Bonnet Removal
- Leak Tight to 5×10^{-10} STD. CC/Sec.
- 2" to 10" and ISO 63 to ISO 250 Available
- Manual, Pneumatic, or Motor Actuators
- Safe Lever Prevents Accidental Release

In extremely dusty and dirty furnaces and coating systems where frequent cleaning is needed the Quick Release Bonnet will save operator time and reduce labor cost. The double locking safety lever prevents accidental release but still allows removal of the internal mechanism without tools in just a few seconds. Clamps are all stainless steel with vinyl grips.

Quick Release Bonnet for Valves with Aluminum Bodies: part no. X810927\$811.

Quick Release Bonnet for Valves with Stainless Steel Bodies: part no. X810927SS\$757.



The old Vacuum Research "T" Valves were in production from approximately 1955 to 1980, and many are still in service. These valves were available with "T1" and "T2" flanges, and various combinations of "T1" and "T2" with necks on either or both sides.

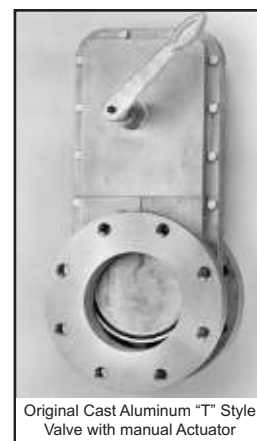
- T1 flanges are 150 lb. ANSI with standard ports; not "large ports." That is, the 2" flange had a 2" port diameter. The 6" flange had a 6" port diameter, etc.
- T2 flanges also had standard port sizes, i.e. 2" port in 2" flange, but the T2 flanges had a smaller outside diameter, smaller bolts, smaller bolt circle, and smaller diameter flange O-rings. T2 flanges were offered in sizes from 1 inch to 6 inch.

- 250,000 Cycle Rotary Shaft Seal
- Million Cycle Valves Also Available
- All Welded 6061 Aluminum Body
- All Valves (RoHS) 2015/863/EU Compliant
- Low Temperature Bake Out, 200 °C
- Uses Standard ISO Centering Rings
- He Leak Less Than 5×10^{-10} scc/sec
- Operate Manually If Air or Power Fail
- Fail Safe Design, Close On Power Loss

Although out of production for 20 years and no longer supported with spare parts, we can, however, provide direct replacement valves with identical bolt circle, O-ring and flange 'A' dimension.

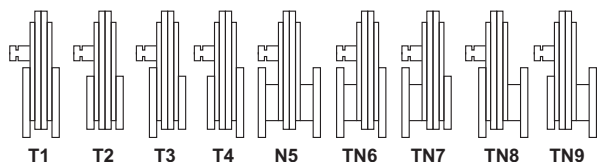
Other dimensions such as overall height and actuator size may be different, so please review the drawing carefully to make sure there are no interferences.

Some T1 and T2 valves were built with plain and special flanges, so you must be certain of which flanges need O-rings, the bolt size and bolt circle. For electro-pneumatic valves, be sure to verify the solenoid voltage. Since these replacement valves will be custom made to your order, they may not be returned for credit for any reason. Of course, they have our usual warranty and will be repaired for no charge if defective in any way.



Original Cast Aluminum "T" Style Valve with manual Actuator

Ordering Information



Viton® or Kalrez® or Silicone O-Rings:

Our standard Valves use a Viton® O-Ring for the gate seal and Buna-N O-Rings for all other locations. You may specify Viton® (or other materials) throughout the valve with a "V", "S", or "K" in the model number. For Viton® add the following to the price. (For Silicone or Kalrez® contact the factory for prices.)

2 & 3 in. valves	\$55.	8 inch valves	\$164.
4 inch valves	\$83.	10 inch valves	\$214.
6 inch valves	\$103.	12 inch valves	\$275.

Roughing And Gauge Ports

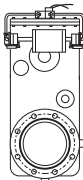
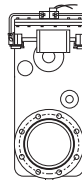
NW-16 to NW-50 ports can be added to the valve body in a variety of locations to provide easy connections for gauge tubes or roughing lines. Refer to the Roughing and Gauge ports page in the Accessories and Parts section of this catalog for details and prices.

Position Indicators

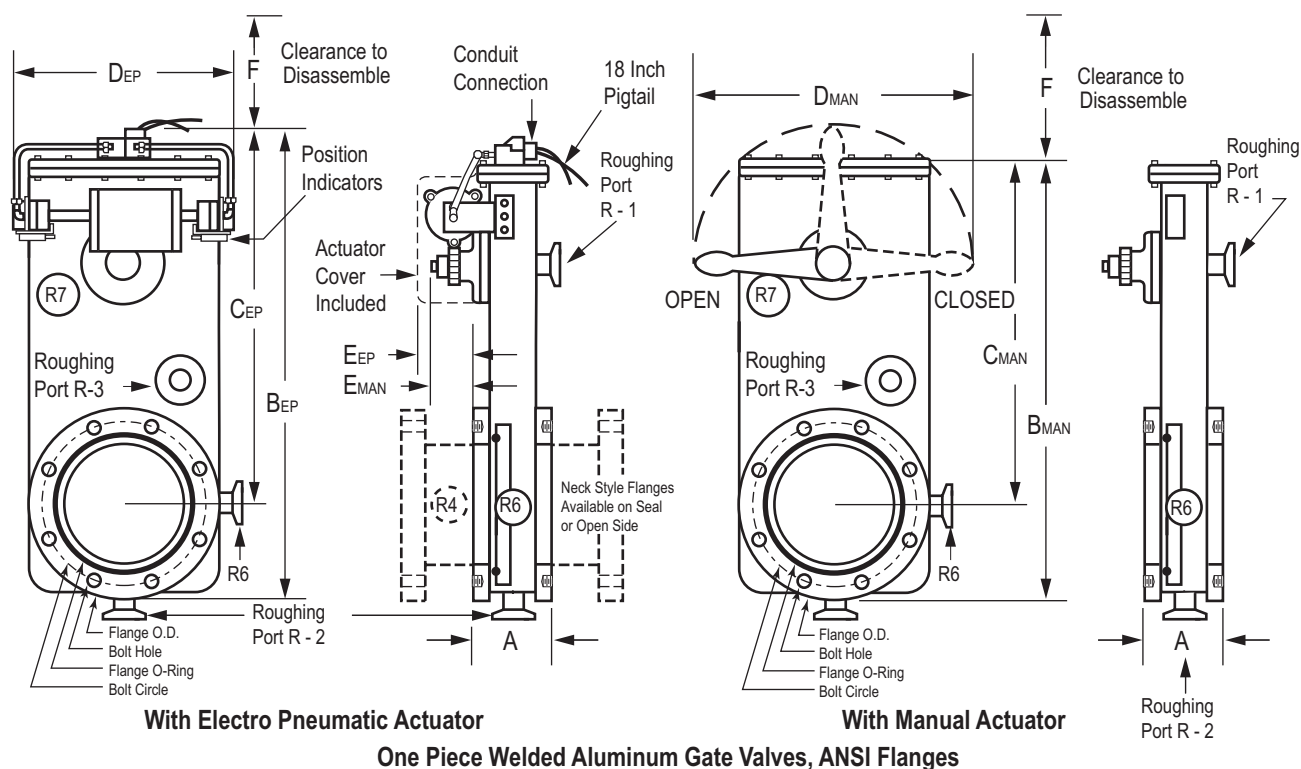
Remote indication of valve position is provided by these SPST and SPDT limit switches. Refer to the Optional Features pages in the Accessories and Parts section of this catalog for details and prices.

Port Flange O-Rings and Bolt Circle

The standard configuration for replacement 'T' Style valves is O-Rings on both flanges and the bolt circle straddling the vertical centerline. No charge for other configurations.

 With Electro-Pneumatic Operator "EP" Suffix			 With Manual Operator "M" Suffix	
Port Diam.	Model No.	Price	Model No.	Price
2 Inch	OP-2-N1-T1-EP	\$1678.	OP-2-N1-T1-M	\$1481.
	OP-2-N1-T2-EP	\$1873.	OP-2-N1-T2-M	\$1676.
	OP-2-N5-T1-EP	\$1882.	OP-2-N5-T1-M	\$1684.
3 Inch	LPWA-3-N1-T1-EP	\$1926.	LPWA-3-N1-T1-M	\$1729.
	LPWA-3-N1-T2-EP	\$2123.	LPWA-3-N1-T2-M	\$1925.
	LPWA-N5-T1-EP	\$2105.	LPWA-3-N5-T1-M	\$1907.
4 Inch	LPWA-4-N1-T1-EP	\$2057.	LPWA-4-N1-T1-M	\$1810.
	LPWA-4-N1-T2-EP	\$2218.	LPWA-4-N1-T2-M	\$2005.
	LPWA-4-N5-T1-EP	\$2345.	LPWA-4-N5-T1-M	\$2071.
6 Inch	LPWA-6-N1-T1-EP	\$2372.	LPWA-6-N1-T1-M	\$1967.
	LPWA-6-N1-T2-EP	\$2568.	LPWA-6-N1-T2-M	\$2280.
	LPWA-6-N5-T1-EP	\$2717.	LPWA-6-N5-T1-M	\$2428.
8 Inch	LPWA-8-N1-T1-EP	\$3868.	LPWA-8-N1-T1-M	\$3579.
	LPWA-8-N5-T2-EP	\$4170.	LPWA-8-N5-T2-M	\$3881.
10 Inch	LPWA-10-N1-T1-EP	\$4755.	LPWA-10-N1-T1-M	\$4410.
	LPWA-10-N5-T2-EP	\$5132.	LPWA-10-N5-T2-M	\$4786.
12 Inch	LPWA-12-N1-T1-EP	\$5906.	LPWA-12-N1-T1-M	\$5559.
	LPWA-12-N5-T2-EP	\$6269.	LPWA-12-N5-T2-M	\$5923.

One Piece T1 and T2 Welded Aluminum Gate Valves



Note: All dimensions in inches. Roughing ports and position indicator limit switches optional. Bolt holes straddle vertical centerline. O-Rings on both flanges are standard. Flanges also available without O-Rings.

These dimensions are identical to the original 'T' Style Valves								These dimensions may be different than 'T' Style									
Nominal ANSI Size	Model No. ANSI Flange	Port Diameter	Flange O.D.	Flange O-Rings Inside Diameter	Bolt Circle	(no. of bolts) x bolt size	A Flange to Flange	B _{MAN} Manual Overall Height	B _{EP} EP Overall Height	C _{EP} Port CL to Top of Valve	D _{MAN} Manual Overall Width	D _{EP} EP Overall Width	E _{MAN} Manual	E _{EP} EP	F Disassy. Clearance	Weight (lbs) Net	Ship
2 inch	OP 2 N1-T1	2	6	2 3/4	4 3/4	(4) 5/8-11	3 1/4	12 5/8	14 5/8	11 5/8	10	7 3/8	3 15/16	4 3/8	7 1/2	13	20
2 inch	OP 2 N1-T2	2	4 3/4	2 1/4	3 5/16	(6) 1/4-20	3 1/4	12 5/8	14 5/8	11 5/8	10	7 3/8	3 15/16	4 3/8	7 1/2	13	20
2 inch	OP 2 N5-T1	2	6	2 3/4	4 3/4	(4) Slotted	5 1/2	12 5/8	14 5/8	11 5/8	10	7 3/8	3 15/16	4 3/8	7 1/2	13	20
3 inch	LPWA 3 N1-T1	3	7 1/2	4	6	(4) 5/8-11	3 5/16	13 3/8	15 3/8	11 5/8	10	7 3/8	3 15/16	4 3/8	7 1/2	15	22
3 inch	LPWA 3 N1-T2	3	6	3 1/2	4 3/4	(6) 3/8-16	3 5/16	13 3/8	15 3/8	11 5/8	10	7 3/8	3 15/16	4 3/8	7 1/2	15	22
3 inch	LPWA 3 N5-T1	3	7 1/2	4	6	(4) Slotted	5 7/8	13 3/8	15 3/8	11 5/8	10	7 3/8	3 15/16	4 3/8	7 1/2	15	22
4 inch	LPWA 4 N1-T1	4	9	5 1/4	7 1/2	(8) 5/8-11	3 3/4	14 1/2	16 1/2	12 1/2	16	7 3/8	4 5/16	5 9/16	11 1/2	31	45
4 inch	LPWA 4 N1-T2	4	7 1/4	4 1/4	5 1/4	(6) 3/8-16	3 3/4	14 1/2	16 1/2	12 1/2	16	7 3/8	4 5/16	5 9/16	11 1/2	31	45
4 inch	LPWA 4 N5-T1	4	9	5 1/4	7 1/2	(8) Slotted	7 3/4	14 1/2	16 1/2	12 1/2	16	7 3/8	4 5/16	5 9/16	11 1/2	31	45
6 inch	LPWA 6 N1-T1	6	11	7 1/4	9 1/2	(8) 3/4-10	4	20 5/16	23	14 5/8	16	10 1/2	4 7/16	5 11/16	13 1/2	49	60
6 inch	LPWA 6 N1-T2	6	9 1/4	6 1/2	8	(8) 3/8-16	4	20 5/16	23	14 5/8	16	10 1/2	4 7/16	5 11/16	13 1/2	49	60
6 inch	LPWA 6 N5-T1	6	11	7 1/4	9 1/2	(8) Slotted	7 3/4	20 5/16	23	14 5/8	16	10 1/2	4 7/16	5 11/16	13 1/2	49	60
8 inch	LPWA 8 N1-T1	8	13 1/2	9	11 3/4	(8) 3/4-10	6 5/8	25 9/16	28 1/4	21 1/2	16	12 3/8	4 7/16	6 5/16	13 1/2	55	66
8 inch	LPWA 8 N5-T1	8	13 1/2	9	11 3/4	(8) Slotted	7 7/8	25 9/16	28 1/4	21 1/2	16	12 3/8	4 7/16	6 5/16	13 1/2	55	66
10 inch	LPWA 10 N1-T1	10	16	11	14 1/4	(12) 7/8-9	6 5/8	30 1/8	33	25	21	16 1/2	5 15/16	3 3/8	15 1/2	109	130
10 inch	LPWA 10 N5-T1	10	16	11	14 1/4	(12) Slotted	8 5/8	30 1/8	33	25	21	16 1/2	5 15/16	3 3/8	15 1/2	109	130
12 inch	LPWA 12 N1-T1	12	19	13	17	(12) 7/8-9	6 7/8	31 5/8	34 1/2	25	21	16 1/2	5 15/16	3 3/8	15 1/2	129	150
12 inch	LPWA 12 N5-T1	12	19	13	17	(12) Slotted	8 5/8	31 5/8	34 1/2	25	21	16 1/2	5 15/16	3 3/8	15 1/2	129	150



Shaft finish and hardness should be 4 to 12 RMS with a minimum surface hardness of RC 50 for best results. Softer shafting can be used, but both bearing and shafting may wear at accelerated rates. For any given RMS value radiused or polished peaks will provide best rate of wear so

electropolished shafts give best results.

Lubrication with a vacuum grease or oil can reduce friction and improve the seal life. Silicone and flourocarbon lubricants are not recommended as these lubricant types can inhibit heat flow and increase the seal temperature.

- Rotary and Push/Pull in the Same Feedthrough
- High Torque. Use Either Solid or Hollow Shafts
- High Speeds. Tested at 1100 RPM, 24/7 for 90 Days
- Leak Rate Better Than 5×10^{-10} Standard cc/sec
- All Feedthroughs (RoHS) 2015/863/EU Compliant
- 303 Stainless Steel or Nickel Plated Brass
- Easy to Replace Viton® or Buna-N Chevron Seals
- Conflat®, NW or Pipe Thread Connection to System
- Available For Four Shaft Sizes: 1/4", 3/8", 1/2", 5/8"
- Includes Frelon® Bearing On Atmosphere Side

Test Results

These very rugged and reliable seals have been in production for 50 years and have been tested extensively.

• 800,000 Reciprocal Motions

Leak rate less than 5×10^{-10} scc/sec after 800,000 reciprocal motions of 1 inch.

• 90 Days at 1,100 RPM

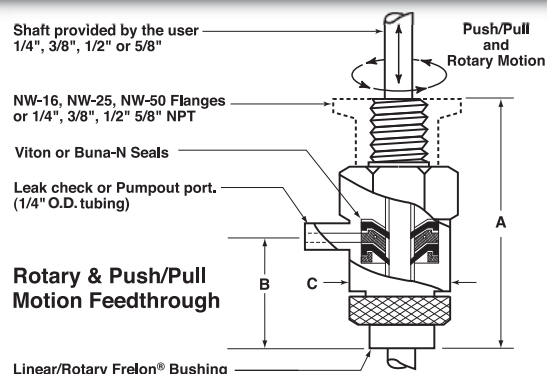
Feedthrough operated at 1100 RPM for 90 days, 24/7. Leak rate was also less than 5×10^{-10} scc/sec.

• 15 Years on Test Chamber

Feedthrough on a chamber testing ion thrusters was left under vacuum and unmoved for 15 years. Feedthrough still did not leak when finally used.

Shaft Diameter Shaft is not included. Best performance will result when your shaft diameter is held to these dimensions, but smaller diameters are acceptable. See below for optional shaft material.

Connection to System	1/4 inch .2495 - .0000 + .0005	3/8 inch .3745 - .0000 + .0005	1/2 inch .4995 - .0000 + .0005	5/8 inch .6245 - .0000 + .0005
2.75 In. Conflat®	Model No. 2.75-B01-SS 303 Stainless Steel \$461.	Model No. 2.75-B02-SS 303 Stainless Steel \$492.	Model No. 2.75-B03-SS 303 Stainless Steel 1/2" \$516. 5/8" \$668.	
NW-16	Model No. 16-B01-SS 303 Stainless Steel \$455.	Model No. 16-B02-SS 303 Stainless Steel \$498.	Model No. 16-B03-SS 303 Stainless Steel 1/2" \$498. 5/8" \$644.	
NW-25	Model No. 25-B01-SS 303 Stainless Steel \$498.	Model No. 25-B02-SS 303 Stainless Steel \$498.	Model No. 25-B03-SS 303 Stainless Steel 1/2" \$496. 5/8" \$644.	
NW-50	Model No. 50-B01-SS 303 Stainless Steel \$595.	Model No. 50-B02-SS 303 Stainless Steel \$589.	Model No. 50-B03-SS 303 Stainless Steel 1/2" \$621. 5/8" \$779.	
Pipe Thread	Model No. P-B01-NB Nickel Plated Brass \$237.	Model No. P-B02-NB Nickel Plated Brass \$255.	Model No. P-B03-NB Nickel Plated Brass 1/2" \$267. 5/8" \$419.	
	Model No. P-B01-SS 303 Stainless Steel \$498.	Model No. P-B02-SS 303 Stainless Steel \$516.	Model No. P-B03-SS 303 Stainless Steel 1/2" \$547. 5/8" \$700.	
For 1 Inch Baseplate Through Hole	Model No. 1in-B01-NB Nickel Plated Brass \$388.	Model No. 1in-B02-NB Nickel Plated Brass \$413.	Model No. 1in-B03-NB Nickel Plated Brass \$455.	
	Model No. 1in-B01-SS 303 Stainless Steel \$742.	Model No. 1in-B02-SS 303 Stainless Steel \$759.	Model No. 1in-B03-SS 303 Stainless Steel \$808.	
Replace-ment Seal Washers 2 Req'd.	Buna-N, P/N X701101-B \$5.00 each	Buna-N, P/N X701102-B \$5.00 each	Buna-N, P/N X701103-B \$10.00 each	
	Viton®, P/N X701101-V \$10.00 each	Viton®, P/N X701102-V \$10.00 each	Viton®, P/N X701103-V \$15.00 each	



SHAFT DIAM.	NW-16			NW-25			NW-50			PIPE THREAD		
	A	B	C	A	B	C	A	B	C	A	B	C
1/4 INCH SHAFT	2.35	1.00	1.00	2.26	.09	1.0	2.26	.09	1.0	1/4 IN. NPT		
										2.73	1.39	1.00 ACROSS FLATS
3/8 INCH SHAFT	2.35	1.00	1.13	2.35	1.00	1.13	2.8	1.50	1.13	3/8 IN. NPT		
										2.75	1.38	1.125 ACROSS FLATS
1/2 & 5/8 INCH SHAFT	2.38	1.00	1.25	2.38	1.00	1.25	2.50	1.13	1.25	1/2 IN. NPT		
										2.76	1.38	1.25 ACROSS FLATS

Optional Precision Shaft Material, 316 S.S. The shaft is not included with the feedthrough. Most customers provide their own shaft but we offer this material as a convenience.

1/4 inch O.D. by 18 inch (457 mm) long P/N: SHFT-.25-18-316 . . . \$36. ea.

3/8 inch O.D. by 18 inch (457 mm) long P/N: SHFT-.37-18-316 . . . \$77. ea.

1/2 inch O.D. by 18 inch (457 mm) long P/N: SHFT-.50-18-316 . . . \$89. ea.

GATE VALVES

ANSI Flange Size	Port Diameter	Molecular Conductance liter/sec.	Cylinder Capacity Liters	Approximate Close/Open Times @ 70 PSI
2 Inch	2.25 Inch	192	0.207	1.5/1.5 sec.
3 Inch	3.37 Inch	567	0.408	1.5/1.5 sec.
4 Inch	5.37 Inch	1,219	0.408	2/2 sec.
6 Inch	7.12 Inch	3,887	0.985	2/2 sec.
8 Inch	8 Inch	9,213	1.223	3/2 sec.
10 Inch	10 Inch	17,014	1.704	3/2 sec.
12 Inch	12 Inch	29,400	3.063	4/4 sec.
16 Inch	16 Inch	49,600	3.887	5/5 sec.
20 Inch	20 Inch	79,970	10.207	7/8 sec.
24 Inch	24 Inch	128,010	14.95	11/12 sec.
ISO Flange Size	Port Diameter	Molecular Conductance liter/sec.	Cylinder Capacity Liters	Approximate Close/Open Times @ 70 PSI
ISO 63	63 mm	192	0.207	1.5/1.5 sec.
ISO 100	100 mm	1,219	0.408	2/2 sec.
ISO 160	160 mm	3,887	0.985	2/2 sec.
ISO 200	200 mm	9,213	1.223	3/2 sec.
ISO 250	250 mm	17,014	1.740	3/2 sec.
ISO 320	320 mm	29,400	3.063	4/4 sec.
ISO 400	400 mm	49,600	3.90	6/7 sec.
ISO 500	500 mm	79,970	10.20	7/8 sec.
ISO 630	630 mm	128,010	14.95	1 1/12

ANGLE VALVES

ANSI Flange Size	Port Diameter	Molecular Conductance liter/sec.	Cylinder Capacity Liters	Approximate Close/Open Times @ 70 PSI
2 Inch	2 Inch	113	0.285	<1/<1 sec.
3 Inch	3 Inch	295	0.348	<1/<1 sec.
4 Inch	4 Inch	440	0.782	1/1 sec.
6 Inch	6 Inch	1,000	1.020	2/2 sec.
8 Inch	8 Inch	1,920	4.598	2/2 sec.
10 Inch	10 Inch	3,000	6.697	2/2 sec.
12 Inch	12 Inch	5,065	6.985	3/2 sec.
16 Inch	16 Inch	8,550	8.622	4/3 sec.
20 Inch	20 Inch	13,567	9.5	5/6 sec.
24 Inch	24 Inch	21,847	9.5	7/8 sec.
ISO Flange Size	Port Diameter	Molecular Conductance liter/sec.	Cylinder Capacity Liters	Approximate Close/Open Times @ 70 PSI
ISO 63	63 mm	160	0.285	<1/<1 sec.
ISO 100	100 mm	440	0.782	1/1 sec.
ISO 160	160 mm	1,000	1.020	2/2 sec.
ISO 200	200 mm	1,920	4.598	2/2 sec.
ISO 250	250 mm	3,000	6.697	2/2 sec.
ISO 320	320 mm	5,065	6.985	3/2 sec.
ISO 400	400 mm	8,550	8.622	4/4 sec.
ISO 500	500 mm	13,560	9.5	5/6 sec.
ISO 630	630 mm	21,847	12.5	8/9 sec.

Outgassing Rates for Aluminum and Stainless Steel

Dozens of papers show the 6000 Series aluminum used in VRC valves outgasses up to 2 orders of magnitude less than 300 Series stainless steel and of course no hydrogen. A bibliography of 70 peer reviewed papers about outgassing compiled by Dr. M. Wong at Fermi Labs can be found at http://home.fnal.gov/~mlwong/outgas_rev.htm.

6063 Aluminum soaked in water 24 hrs., baked 24 hrs. at 150 - 180 °C
 Torr l/sec cm^2
 1.5×10^{-13}

SUS 304 Stainless Steel, soaked in water 24 hrs., baked 24 hrs. at 150 - 180 °C
 $\approx 7 \times 10^{-13}$
J. Vac. Sci. Technology, A5 (2) Mar/Apr 1987
 A Comparison of 6063 Aluminum and SUS 304, J. R. Chen, Y.C.L. IV

Aluminum baked 20 hours at 100 °C
 mbar l/sec cm^2
 5×10^{-14}

304 Stainless Steel, electro polished, 30 hours at 250 °C
 4×10^{-12}
Vacuum Technology, CERN Accelerator
 Scanticon Conference Centre, Snekersten, Denmark, 28 May-3 June 1999: Proceedings, editors [sic], S. Turner ISBN 10 9290831499

Aluminum baked 20 hours at 100 °C
 mbar l/sec cm^2
 5×10^{-14}

304 Stainless Steel, electro polished, 30 hours at 250 °C
 4×10^{-12}
Vacuum Science & Technology
 CERN CAS Accelerator, Platja D'Aro, Spain, May 16-24, 2006; H.F. Dylla, Thomas Jefferson National Accelerator Facility, Newport News, VA

Aluminum, detergent cleaned-acetone rinse, baked 15 hours at 250 °C
 mbar l/sec cm^2
 4×10^{-13}

304 Stainless Steel, glass beaded, 30 hours at 250 °C
 2×10^{-12}
Vacuum Technology - Practice for Scientific Instruments
 Nagamitsu Yoshimura; 2008 Springer-Verlag Berlin Heidelberg; ISBN 978-3-540-74432-0

Aluminum, 5 hours after 24 hours at 150 °C - 250 °C
 mbar l/sec cm^2
 1×10^{-9}

304 Stainless Steel, 5 hours after 24 hours at 150 °C - 250 °C
 $\approx 1.5 \times 10^{-8}$
Vacuum System
 CAS, Small Accelerator course, Zeegse, Netherlands, 24 May - 2 June, 2005; Oswald Gröbner, retired, CERN Vacuum Group

Million Cycle Valves Vacuum Research Valves have been designed to eliminate sliding friction to extend operating life and reduce particle generation. For example, all of our valves use roller bearings on the actuator shaft and stainless steel rollers to guide the gate when opening and closing. This results in our standard operating life specification of 250,000 cycles without maintenance. For most situations our standard 250,000 cycle valve will out live the system it is installed on, but for some applications an even longer life is needed. For million cycle lifetime on VRC Welded Aluminum or Stainless Steel Valves add to the model number "10⁶ Cycles" and add the price shown below:

2 to 8 inch ANSI, or 63 to 200 mm ISO valves \$536.
10 & 12 in. ANSI, or 250 to 320 mm ISO valves \$674.

Kits to Convert Manual Valves to Electro-Pneumatic Operators for LPWA or OP Valves

LPWA ISO 63	X810355	\$443.	OP 2 or 3 in.	X810355	\$490.
LPWA ISO 100	X810089	\$490.	OP 4 in.	X810355	\$557.
LPWA ANSI 2", 3"	X810022	\$557.	OP 6 or 8 in.	X810355	\$557.
LPWA ANSI 4"	X810061	\$557.			
LPWA ANSI 6" or 8"	X810304	\$557.			
LPWA ANSI 10" or 12"	X810529	\$805			

Double Solenoid in place of standard, P/N: X702942 .. \$217.

Explosion-Proof Solenoids

Class I, Div. 1, Groups A,B,C,D; Class II, Div. 2, Groups E,F, & G
24 VDC, P/N: X134020 \$320.
120V, 50/60 Hz, P/N: X134022 \$320.
220V, 50/60 Hz, P/N: X134023 \$320.

Lock Out / Tag Out Hasps for lockout are available for manual valves and LPWA style valves add \$200.

Non-magnetic Valves The standard VRC valve is constructed of aluminum with non-magnetic stainless steel fasteners. There are, however, a few steel components that can be replaced with stainless steel at extra cost if completely non-magnetic valves are needed. (The Solenoid Valve is always magnetic, but can be located remotely.)

2 to 8 inch valves (63 mm to 200 mm) \$184.
10 and 12 inch valves (250 mm and 320 mm) \$252.

OSHA Style EP Covers for VRC LPWA & OP Gate Valves

Completely enclosed OSHA style covers with CE mark. This cover style is now standard on LPWA and OP gate valves with electro-pneumatic operators, but it may also be retrofitted to valves in the field. (Prices for LPWA and OP valves shown in this catalog include the OSHA style cover.)

Valve Size	Cover P/N	OSHA Style EP Cover with CE Mark
2 & 3 inch ANSI	X02WA152	\$95.
63, 80, 100 mm ISO 65, 80, 100 mm JIS	X703042	\$95.
4 inch ANSI 160 mm ISO 150 mm JIS	X04WA152	\$122.
6 & 8 inch ANSI 200 mm ISO 200 mm JIS	X06WA152	\$143.
10 & 12 inch ANSI 250, 320 mm ISO 250, 300 mm JIS	X10WA152	\$171.

Position Indicators (Limit Switches)

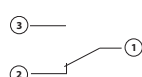
Electrical position indicators (Limit Switches) are available on all Valves to provide remote indication of valve position. Position indicators are available for air operated or manually operated valves. Several styles are offered, all are RoHS compliant.

For LPWA, Rotary Actuator Valves

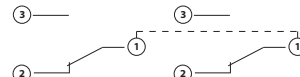
LSS or LSD - Fully Enclosed switches with 1/2-14 NPT conduit connection for unprotected industrial applications where physical protection of the wiring is required.

LSS - Fully Enclosed Limit Switches, SPDT. Contact rating is 15 A@115 or 230 VAC, 0.5 A@115 VDC. Kit P/N: X706901 \$162./pair

LSD - Fully Enclosed Limit Switches, DPDT. Contact rating is 10 A @ 125 or 250 VAC, 0.3 A@125 VDC, 0.15A@250 VDC., Kit P/N: X706900 \$449./pair



Wiring Schematic for
LSS, LSX, LSO, Form C



Wiring Schematic for LSD
Form C

Explosion Proof

LSX-C - Explosion Proof SPDT switches Class I, Division 1, Group C or D, and Class II, Division 1, Groups E,F,G (NEMA 7 & 9), Kit P/N: X706904 \$886./pair

LSX-B - Explosion Proof SPDT same as LSX-C but for Group B(H₂), Kit P/N: X706909 \$1083./pair

Splash Proof

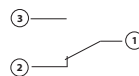
NEMA 1, 3, 4 and IP-66 enclosures contact factory

GMR - Gate Magnet Style

Magnets on the gate activate reed switches mounted in IP-65 enclosures on the outside of the valve body. Schematic and contact rating same as for LSE shown below. P/N: X706014 \$425./pair

LSO - Open Style

switches are often used when the valve is inside a cabinet or is otherwise protected. Open Style Limit Switches SPDT. Contacts: non-inductive 15A, 125-277 VAC; 5A, 125-250 VDC. Inductive 5A, 125 VAC; 0.2A, 250 VDC. Kit P/N: X706907 \$102./pair



Wiring Schematic for LSO, Form C



For Motor and Throttle Valves

2 SPDT relays for open and closed position indication for throttle and motor actuated valves. Unpowered (form C) contacts rated for 3 A up to 220 V, non-inductive. Screw terminals for NO, C, NC wiring. Enclosure is 3" X 3" X 1.5" high with tabs for surface mounting. 6 ft. power cord, 6 ft. pigtail for connection to valve and LED indicators are included. P/N: X801410 (specify 115 or 220 V) \$290./ea.

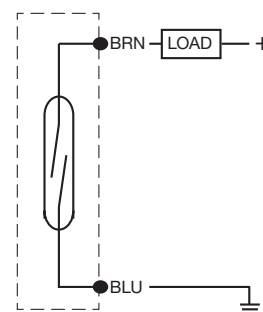
For End Operated & Angle Style Valves

LSE - Electronic Position Indicators for Bellows Sealed, End Operated, Poppet and Rectangular Port Valves. Two reed switches activated by a magnet inside the pneumatic actuator provide contact closure for open and closed position.

LSE Model Specifications:
Contacts: SPST Form A (Normally Open)
Contact Rating: 50 W maximum
Voltage Rating: 200 VDC max.,
141 VAC max.

Switching Current: 1A maximum
Initial Contact Resistance: 1 ohm max.
Minimum Breakdown
Voltage: 225 VDC, 275 VAC
Temp. Range: -40 °F to 200 °F
(-40 °C to 93 °C)

Contact factory for P/N
for your particular valve \$162./pair



Wiring Schematic for
LSE and GMR Form A

Plain, Blank Or Special Flanges Valves may be specified with Plain or Blank flanges. Plain means without O-ring groove but with bolt holes. Blank means neither O-ring grooves nor bolt holes. Standard valves have O-rings and bolt holes on both sides. Special bolt circles and seal surfaces are also available but if non-standard flanges are required, be sure to specify "seal side" or "open side."no extra charge

JIS - ANSI - ISO - Conflat® Flange Combination VRC Valves are often used as an adapter to mate components of different flange styles. For example, valves can be provided with an ISO flange on one port and a Conflat®, or special flange on the other. Any combination can be provided to mate with your pumps, traps, or chamber.no extra charge

Reducer Valves Similar to adapting different flange styles as described above, valves can also be provided with port flanges of different sizes. Virtually any mix of port flange sizes or styles are available; for example, you may order a valve with a 6 inch flange on one side and an 8 inch on the otherno extra charge

Stainless Steel Gates in Aluminum Valves To substitute a stainless steel gate on an aluminum valve add the suffix "SS Gate" to the model No. and increase the price as shown below.
LP 2 inch, LP 3 inch & NW-50 & ISO-100 \$362.
LP 4 inch & ISO-160 \$706.
LP 6 inch & ISO-200 \$1076.
LP 8 inch & ISO-250 \$1406.
LP 10 inch & ISO-320 \$1738.

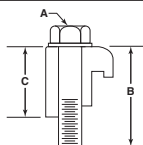
ISO Centering Rings and Claw Clamps

Aluminum Centering Ring with O-Ring

ISO Flange Size	With Buna-N O-Ring		With Viton O-Ring	
	Part No.	List Price	Part No.	List Price
ISO 63	063-ALBU	\$13.00	063-ALVI	\$17.00
ISO 80	080-ALBU	\$16.00	080-ALVI	\$21.00
ISO 100	100-ALBU	\$19.00	100-ALVI	\$23.00
ISO160	160-ALBU	\$38.00	160-ALVI	\$45.00
ISO 200	200-ALBU	\$77.00	200-ALVI	\$85.00
ISO 250	250-ALBU	\$95.00	250-ALVI	\$107.00
ISO 320	320-ALBU	\$124.00	320-ALVI	\$149.00
ISO 400	400-ALBU	\$260.00	400-ALVI	\$266.00
ISO 500	500-ALBU	\$320.00	500-ALVI	\$374.00
ISO 630	630-ALBU	contact factory	630-ALVI	contact factory

Aluminum Single Claw Clamps

With Stainless Steel Bolt and Washer for Joining k to f Flanges



ISO Flange Size (Quantity Needed)	A (THD)	B (mm)	C (mm)	Part Number	Price Each
ISO 63 (4)	M8	35	24	100-SGLAL	\$2.00
ISO 83 (8)					
ISO 100 (8)					
ISO 160 (8)	M10	35	24	250-SGLAL	\$4.00
ISO 200 (12)					
ISO 250 (12)					
ISO 320 (12)	M12	50	30	630-SGLAL	\$4.00
ISO 400 (16)					
ISO 500 (16)					
ISO 630 (20)					

Reverse Carriage On standard VRC Bonnet Style valve sizes 2 to 8 inch (63 to 200 mm) the actuator is on the seal side. It is possible to build these valves with the actuator on the open side. Add to the model no. "REV. CARR." and add \$199. to the price.

Viton®, Kalrez® or Silicone O-Rings Our standard Valves use a Viton® O-Ring for the gate seal and Buna-N O-Rings for all other locations. For special or higher temperature applications you may specify Viton® (or other materials) throughout the valve with a "V", "S", or "K" in the model number. Viton® prices are listed on valve pages in the catalog. (For Silicone or Kalrez® contact the factory for prices.)

Port Flange O-Rings The standard and most commonly ordered configuration is with O-Rings on both port flanges. As shown on page 2, this is specified in the model no. as "20". There is no extra cost however for valves with O-Rings on one or neither flange. Please be sure to specify "open" or "seal" side if only one O-Ring is required.no extra charge

Port Flange Spacer Washers Aluminum flat washers, .090 thick to insert between two flanges that both have O-Rings. O.D. will fit inside of bolts on ANSI Flanges.

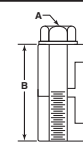
ANSI Size	Outside Dia.	Bore	Part No.	Price
2 inch ANSI	3.8 inch O.D.	3.3 inch Bore	X708403	\$23.00 each
3 inch ANSI	5.3 inch O.D.	3.9 inch Bore	X708404	\$28.00 each
4 inch ANSI	6.8 inch O.D.	5.5 inch Bore	X708405	\$34.00 each
6 inch ANSI	8.7 inch O.D.	7.3 inch Bore	X708406	\$39.00 each
8 inch ANSI	10.9 inch O.D.	8.8 inch Bore	X708407	\$44.00 each
10 inch ANSI	13.3 inch O.D.	11.8 inch Bore	X708408	\$50.00 each

Replacement O-Ring Only

ISO Flange Size	Buna-N O-Ring		Viton O-Ring	
	Part No.	List Price	Part No.	List Price
ISO 63	063-OBV	\$1.00	063-OVI	\$5.00
ISO 80	080-OBV	\$1.00	080-OVI	\$6.00
ISO 100	100-OBV	\$1.00	100-OVI	\$8.00
ISO160	160-OBV	\$2.00	160-OVI	\$16.00
ISO 200	200-OBV	\$3.00	200-OVI	\$19.00
ISO 250	250-OBV	\$4.00	250-OVI	\$22.00
ISO 320	320-OBV	\$6.00	320-OVI	\$36.00
ISO 400	400-OBV	\$12.00	400-OVI	\$41.00
ISO 500	500-OBV	\$16.00	500-OVI	\$51.00
ISO 630	630-OBV	contact factory	630-OVI	contact factory

Aluminum Double Claw Clamps

With Stainless Steel Bolt and Washer for Joining Two k Flanges



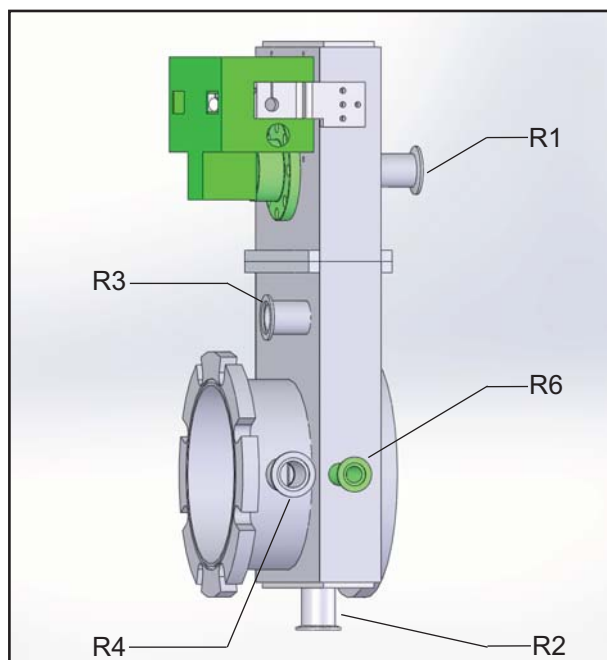
ISO Flange Size (Quantity Needed)	A (THD)	B (mm)	Part Number	Price Each
ISO 63 (4)	M8	35	100-DBLAL	\$2.00
ISO 83 (4)				
ISO 100 (4)				
ISO 160 (4)	M10	35	250-DBLAL	\$4.00
ISO 200 (6)				
ISO 250 (6)				
ISO 320 (8)	M12	50	630-DBLAL	\$4.00
ISO 400 (8)				
ISO 500 (12)				
ISO 630 (16)				

All Vacuum Research Valves can be supplied with one or several extra ports in a variety of locations, sizes and styles. The most common use is for the connection of roughing pumps and gauge tubes, but these ports can also be used for vent, backfill and purge gas connections.

NW Flanges

This is the least expensive style and is usually the easiest for the user because connection requires no tools. The NW port is welded to the valve in the location you select. Centering ring, clamp, and blank-off flange not included. The table below lists the 'NW' sizes available in each location. NW Clamps and Centering Rings are shown at the bottom of the page.

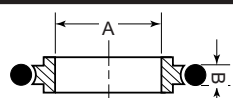
Location R-4	Locations R-1, R-2, R-3, R-6, R-7 & R-9
NW-16 . . . \$162.	NW-16 \$136.
NW-25 . . . \$176.	NW-25 \$149.
NW-40 . . . \$203.	NW-40 \$176.
NW-50 . . . \$217.	NW-50 \$190.



Gauge & Roughing Port Locations

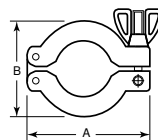
Nominal Valve Sizes	R-1	R-2	R-3	R-4 available only on valves with N5 or N6 necks	R-6 & R-9	R-7
2 inch and 63 mm	NW-16 NW-40 NW-25 NW-50	NW-16 NW-40 NW-25	NW-16 NW-25	NW-16 NW-25	NW-16 NW-25	NW-16 NW-40 NW-25 NW-50
3 inch and 80 mm	NW-16 NW-40 NW-25 NW-50	NW-16 NW-40 NW-25	not available	NW-16 NW-25	NW-16 NW-25	NW-16 NW-40 NW-25 NW-50
4 inch and 100 mm	NW-16 NW-40 NW-25 NW-50	NW-16 NW-40 NW-25	NW-16 NW-40 NW-25 NW-50	NW-16 NW-25	NW-16 NW-25	NW-16 NW-40 NW-25 NW-50
6 inch and 160 mm	NW-16 NW-40 NW-25 NW-50	NW-16 NW-40 NW-25	NW-16 NW-40 NW-25 NW-50	NW-16 NW-25	NW-16 NW-25	NW-16 NW-40 NW-25 NW-50
8 inch and 200 mm	NW-16 NW-40 NW-25 NW-50	NW-16 NW-40 NW-25	not available	NW-16 NW-25	NW-16 NW-25	NW-16 NW-40 NW-25 NW-50
10 inch and 250 mm	NW-16 NW-40 NW-25 NW-50	NW-16 NW-40 NW-25 NW-50	NW-16 NW-40 NW-25 NW-50	NW-16 NW-25	NW-16 NW-25	NW-16 NW-40 NW-25 NW-50
12 inch and 320 mm	NW-16 NW-40 NW-25 NW-50	NW-16 NW-40 NW-25 NW-50	not available	NW-16 NW-25	NW-16 NW-25	NW-16 NW-40 NW-25 NW-50

Centering Rings



**304 Stainless Steel
With Viton O-Rings**

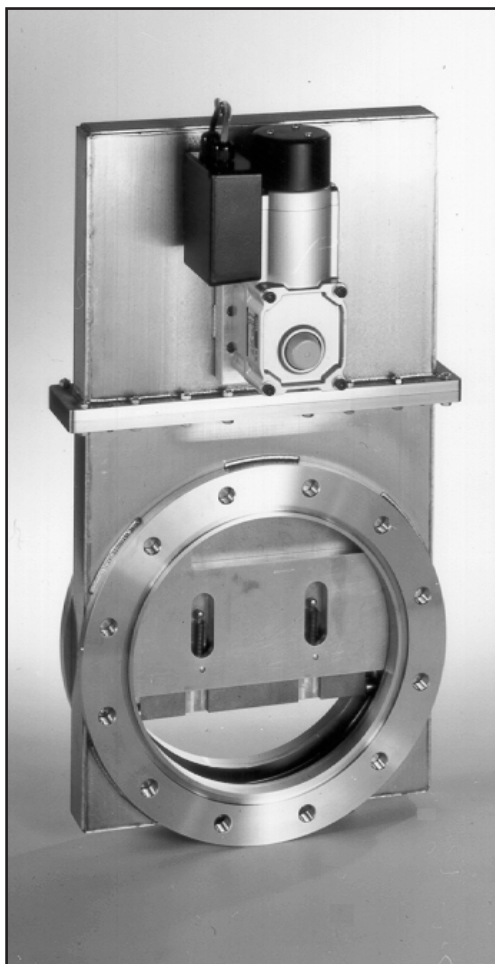
Flange Size	A	B	Part Number	Price
NW-16	0.63 (16)	0.21 (5.3)	CTR-RING 16	\$5.00
NW-25	0.984 (25)	0.21 (5.3)	CTR-RING 25	\$6.00
NW-40	1.575 (40)	0.21 (5.3)	CTR-RING 40	\$8.00
NW-50	1.969 (50)	0.21 (5.3)	CTR-RING 50	\$10.00



Clamps

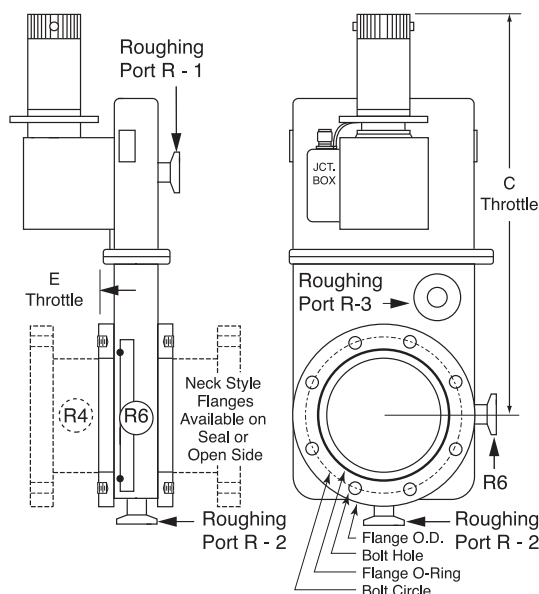
**Aluminum Clamps With Wing
Nut & Screw Fastener**

Flange Size	A	B	Thickness	Part Number	Price
NW-16	2.24 (57)	1.69 (43)	0.63 (16)	AL-Clamp 16	\$5.00
NW-25	2.76 (70)	2.17 (55)	0.63 (16)	AL-Clamp 25	\$6.00
NW-40	3.39 (88)	2.76 (70)	0.63 (16)	AL-Clamp 40	\$8.00
NW-50	4.33 (110)	3.70 (94)	0.79 (20)	AL-Clamp 50	\$10.00



12 In. Stainless Valve with Electric Motor Actuator
All Valves (RoHS) 2015/863/EU Compliant

2 Position (open / closed) electric actuators are available for all LPWA valves from 2 to 16 inch ANSI and 50 to 400 mm ISO sizes. These actuators replace the standard electro-pneumatic actuators and can be installed on either aluminum or stainless steel valves. In addition to these open / closed actuators our Throttlemaster® series provides full modulation from 0% to 100% for 3 position or PID throttling. Refer to the Throttlemaster® specifications in this catalog.



ANSI Port Size	Motor C	Motor E
2 & 3 inch	15.9 inch	4.34 inch
4 inch	19.7 inch	4.15 inch
6 inch	22 inch	4.03 inch
8 inch	22 inch	4.03 inch
10 inch	20.67 inch	3.90 inch
12 inch	22.74 inch	3.90 inch

ISO Port Size	Motor C	Motor E
63 & 80 mm	403 mm	110 mm
100 mm	403 mm	110 mm
160 mm	487 mm	105 mm
200 mm	561 mm	102 mm
250 mm	525 mm	99 mm
320 mm	577 mm	99 mm

Dimensions: Port dimensions, bolt patterns, and other dimensions are shown on pages 6 and 7 for ANSI and page 13 for ISO valves. A few dimensions unique to the Electric Motor Actuator are listed here.

Electric Motor Actuator for Gate Valves

Electric Actuator includes motor with Thermal Protection and open/close switch with 25 ft. of cable.

Power Required

5 A @ 115V 50/60 Hz at the valve site, 230 V optional.

Open / Close; Manual Switch

In a surface mount box with LEDs to indicate open and closed, and 25 ft. (7.7 m) of cable (longer cable can be added). No power required at the switch site. Switch box is approximately 3 X 4 inches.

Open / Close; Remote Input

In addition to the Manual Switch for Open/Close the valve may also be actuated by a signal from your PLC or other system controller. Any signal between 5 and 30 VDC will open the valve. Zero volts will close the valve. A 4 - 20 mA current signal may also be used.

Ordering Information

Cost shown below should be added to the cost of valve with Electro Pneumatic actuator.

2 or 3 inch ANSI or 63 or 80 mm ISO Port LPWA Valve Electric Motor Actuator

p/n: V806101add \$607.

4, 6 or 8 inch ANSI or 100 or 160 mm ISO Port LPWA Valve Electric Motor Actuator

p/n: V806102add \$701.

10, 12, 16, 20, 24 inch ANSI; or 250, 320, 400, 500, 630 mm ISO Port LPWA Valve Electric Motor Actuator

p/n: V806103add \$1081.

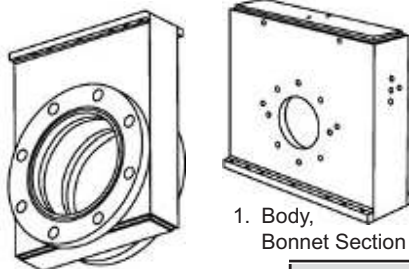
Position Indicators (Optional)

GMR - Gate Magnet Style

Magnets on the gate activate reed switches mounted in IP-65 enclosures on the outside of the valve body.

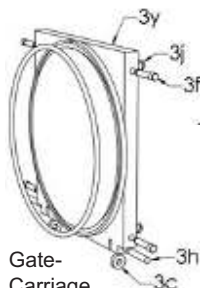
Contacts: non-inductive 15A, 125-277 VAC; 5A, 125-250 VDC. Inductive 5A, 125 VAC; 0.2A, 250 VDC.

P/N: X706014\$425./pair



1. Body,
Bonnet Section

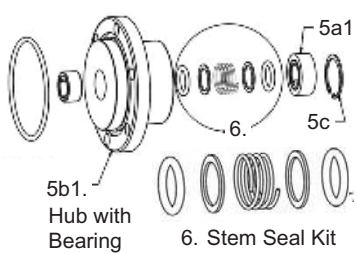
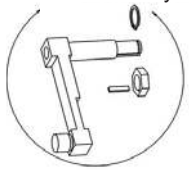
2. Body, Port Section



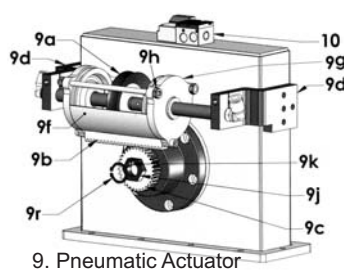
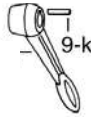
3. Gate-
Carriage
Assembly
with
O-Ring



4. Stem Crank Assy with Key,
Retaining
Ring, and
Nut



7. Manual
Lever Kit



	LPWA 2 & 3 Built Before Sept. 2005		LPWA 2 & 3 Built Sept. 2005 and Later		LPWA-4	
	ISO-80 Any Date		ISO-100 Any Date		ISO-160	
	P/N		P/N		P/N	
Clean & Test Valves Returned to Pittsburgh, PA						
Complete O-Ring Kits BUNA-N, Stem Seal & 2 Flange O-Rings; 1 ea. Hub, Gate & Body O-Rings			X810604B		X701WA400B	
LPWA 2	X701WA200B		No Centering Rings			
LPWA 3	X701WA300B					
VITON, 2 ea. Stem & 2 Flange O-Rings; 1 ea. Hub, Gate & Body O-Rings			X810604V		X701WA400V	
LPWA 2	X701WA200V		No Centering Rings			
LPWA 3	X701WA300V					
Piston & Seal Kit for 'EP' Actuators						
For Valves Shipped 1989 & before: Piston Tee Seal, 2 Shaft & 2 End Cap O-Rings	X701201B		X701201B		X701401B	
For Valves Shipped 1990 or later: Piston Cup, 2 Shaft & 2 End Cap O-Rings	X701204B		X701204B		X701404B	
1. Body, Bonnet Section* (*Before ordering ports or bonnets please verify and specify the rail to rail dimension of 98 mm or 104 mm.)						
2. Body, Port Section		LPWA-2* LPWA-3*		LPWA ISO 100*		LPWA 4*
N1 Style, no neck						
N6 Style, on seal side						
N8 Style, neck on open side						
N5 Style, neck both sides						
3. Gate-Carriage Assembly with O-ring	X706103rev1		X810084		X706203rev2	
3 Kit of 4 ea. Carriage Shaft, Roller & Link a,b,g Assembly with Bushings & Retaining Ring	X806500		X806500		X806500	
3c. Gate Rollers - Set of 2	X706102		X706102		X706202	
3d. Carriage Side Rollers - Set of 4	X706108		X706108		X706108	
3e. Spring (set)	X706106		X706256		X706206	
3f. Gate Link Shafts - Set of 4	X706110rev1		X706110rev1		X706110rev1	
3h. Roll Pin-Set of 6 (2 Gate, 4 Carriage)	X706105		X706105		X706205	
3j. Retaining Ring (gate shafts) - Set/4	X706119		X706119		X706119	
3r. Retain. Ring (carriage shafts) - Set/4	X706119		X706119		X706119	
3y. Gate w/o Shafts, Links, Rollers	X02WA116		X700051		X04WA116	
3z. Carriage w/o Shafts, Links, Rollers	X02LP117rev1		X700270		X04LP117rev1	
4. Stem-Crank Assembly with Key, Retaining Ring & Nut	X706116rev2		X810657		X706216rev2	
5. Hub Assy (spacer design) w/o seal kit	X706WA117		X706WA117		X706WA210	
5-a1. Gland spacer with bearing	X02LP108A		X02LP108A		X04LP108A	
5-b1. Modified hub with bearing	X02WA118		X02WA118		X04WA118	
5c. Retaining Ring (internal type)	X702176		X702176		X702177	
6. Stem Seal Kit: 2 O-rings, (BUNA-N)	X706118		X706118		X706318	
2 washers, 1 spring (VITON)	X706118V		X706118V		X706318V	
LPWA-16, 3 Quad Ring, 3 Spacers						
7. Manual Lever Kit Includes Handle, Washer, Key, Retaining Ring	X706112rev1		X706112rev1		X706312rev2	
8. Body Bolts, S.S. Complete set with nuts	1/4-20X1 (8)		1/4-20X1 (8)		1/4-20X1 1/4 (6)	
9. Pneumatic Operator (without solenoid)	X806104rev1		X810089		X806204rev1	
9a. Piston Assy (w/o O-Rings & Piston Cup)	X02LP200		X02LP200		X04LP200	
9b. Rack Assembly	X706114		X706114		X706214	
9c. Pinion Gear Assembly	X706126		X706126		X706226	
9d. Mounting Brackets (2)	X706131		X706131		X706231	
9e. Cylinder Air Lines (2)	X701101		X701101		X701101	
9f. Cylinder	X02LP150		X02LP150		X04LP150	
9g. Cylinder End Caps (2)	X706132		X706132		X706232	
9h. Cylinder Studs & Nuts	X706130		X706130		X706230	
9i. Guard, OSHA Style	X02WA152		X703042		X04WA152	
9j. Hex Nut	X02LP202		X02LP202		X04LP202	
9k. Key	X02LP203		X02LP203		X04LP203	
9r. Retaining ring (ext. fits stem crank)	X702170		X702170		X702171	
10. Solenoid Valve only (specify voltage)						
24 VDC Solenoid	X703031-24VDC		X703031-24VDC		X703031-24VDC	
100 VAC Solenoid	X703005-100VAC		X703005-100VAC		X703005-100VAC	
115 VAC Solenoid	X703005-115VAC		X703005-115VAC		X703005-115VA	
220 VAC Solenoid	X134010-220VAC		X134010-220VAC		X134010-220VAC	
11. Solenoid Mounting Hardware with Air Line Fittings (1/4" OD Airline)	X706094		X706094		X706094	

Contact Factory for Spare Parts and Repair Prices.

'LPWA' SERIES VALVES

LPWA-6 & LPWA 8		ISO-250		LPWA-10 & LPWA-12 ISO-250 & 320		LPWA-10 & LPWA-12 ISO-250 & 320		TBWA-10 & TBWA-12 Thick Body Valves		LPWA-16 ISO-400	
ISO -200		For Valves with Extruded Bodies (June 08 & Later)		For Valves with Extruded Bodies (Sept. 01 & later), Except ISO-250 (Sept. 01 to May 08)		For Valves with Bodies Fabricated From Plates (Aug. 01 & Before)		For Valves Built for Dirty Environments Bonnet is 3.75" (95mm) Thick			
P/N		P/N		P/N		P/N		P/N		P/N	
X701WA600B (6")		X810772B		X701WA1000BR1 (10")		X701WA1000B (10")		X706015B		X810394 BUNA N	
X701WA800B (8")		No Centering Rings		X701WA1200BR1 (12")		X701WA1200B (12")					
X701WA600V (6")		X810772V		X701WA1000VR1 (10")		X701WA1000V (10")		X706015V		X810395 VITON	
X701WA800V (8")		No Centering Rings		X701WA1200VR1 (12")		X701WA1200V (12")					
X701401B		NA		NA		X7011001B				NA	
X701404B		X7011004B		X7011004B		X7011004B		X7011004B		X810396	
LPWA 6* LPWA 8*		LPWA ISO 250		PWA 10 LPWA 12*		LPWA 10 LPWA 12		TBWA 10 & TBWA 12		LPWA 16	
				Contact Factory for Spare Parts and Repair Prices.							
X706303rev2		X810439R1		X810439		X810507		X810777		X810624	
X806500		X806502		X806502		X806502		X810780		X810397	
X706302		X810536		X810536		X810536		X810778		X810398	
X706108		X706408		X706408		X706408		X810779		X810635	
X706306		X706406		X706406		X706406		X706406		X810636	
X706110rev1		X706410rev1		X706410rev1		X706410rev1		X810781		X810637	
X706205rev1		X706405rev1		X706405rev1		X706405rev1		X810782		X810638	
X706119		X706419		X706419		X706419		X810783		X810639	
X706119		X706419		X706419		X706419		X810784		X810640	
X406116		X700044		X700269		X10WA116		X700599		X700206	
X06LP117rev1		X708008		X700285		X10WA117		X740059revA		X740057	
X706316rev2		X706ISO416		X706WA416		X706WA416		X706016		X810641	
X706WA317		X706WA417		X706WA417		X706WA417		X706WA417		X810642	
X04LP108A		X10LP108A		X10LP108A		X10LP108A		X10LP108A		X810643	
X06WA118		X10WA118		X10WA118		X10WA118		X10WA118		X810644	
X702177		X702177		X702177		X702177		X702177		NA	
X706318		X706418		X706418		X706418		X706418		X810645	
X706318V		X706418V		X706418V		X706418V		X706418V		X810646	
X706312rev1		X706412rev1		X706412rev1		X706412rev1		X706412rev1		X810647	
1/4-20X1 1/4 (14)		1/4-20X1 3/4 (16)		1/4-20X1 3/4 (16)		1/4-20X1 3/4 (16)		1/4-20X1 3/4 (10)		3/8-16X2 (12)	
X806304rev2		X806404rev3		X806404rev3		X806404rev2		X706019		X810648	
X06LP200		X10LP200rev2		X10LP200rev2		X10LP200rev1		X10LP200rev1		X810649	
X706314		X706414rev1		X706414rev1		X706414		X706414rev1		X810650	
X706326		X706426rev1		X706426rev1		X706426		X706426rev1		X810651	
X706231		X706431rev1		X706431rev1		X706431rev1		X706431rev1		X810652	
X701101		X701101		X701101		X701101		X701101		X810653	
X06LP150		X700337		X700337		X10LP150		X700337		X700581	
X706232		X706432		X706432		X706432		X706018		X810654	
X706330		X706430rev1		X706430rev1		X706430		X706430rev1		X810655	
X06WA152		X700284		X700284		X10WA152		X740101		X700545	
X04LP202		X10LP202		X10LP202		X10LP202		X10LP202		X700569	
X04LP203		X04LP203		X04LP203		X04LP203		X04LP203		X700568	
X702171		X702172		X702172		X702172		X702172		X702092	
X703031-24VDC		X703031-24VDC		X703031-24VDC		X703031-24VDC		X703031-24VDC		X134016	
X703005-100VAC		X703005-100VAC		X703005-100VAC		X703005-100VAC		X703005-100VAC		X134036	
X703005-115VAC		X703005-115VAC		X703005-115VAC		X703005-115VAC		X703005-115VAC		X134012	
X134010-220VAC		X134010-220VAC		X134010-220VAC		X134010-220VAC		X134010-220VAC		X134019	
X706094		X706094		X706094		X706094		X706094		X810656	

SPARE PARTS FOR VACUUM RESEARCH END OPERATED VALVES

DESCRIPTION Contact Factory for Spare Parts Prices.	END STD 2 END ISO 63	END LP 2 END LP 3 END STD 3 END ISO 100 END CF 6 IN. OD	END LP 4 END STD 4 END ISO 160 END CF 8 IN. OD	END LP 6 END STD 6 END STD 8 END ISO 200 END CF 10 IN. OD	END LP 8 END STD 10 END ISO 250 END CF 12 IN. OD	END LP 10 END STD 12 END ISO 320 END CF 14 IN. OD Oct. 31 2005 and Before
Clean and test Valves Returned to Factory	X815000	X815001	X815002	X815003	X815004	X815005
Complete Shaft Seal & O-Ring Kit, Buna-N w/o Flange O-Rings	X701EO100B	X701EO200B	X701EO400B	X701EO600B	X701EO1000B	X701EO1200B
Seal & O-Ring Kit as above Viton	X701EO100V	X701EO200V	X701EO400V	X701EO600V	X701EO1000V	X701EO1200V
Shaft Seal Kit Only BUNA-N	X706EO116B	X706EO116B	X706EO118B	X706EO118B	X706EO118B	X706EO318B
Shaft Seal Kit As Above VITON	X706EO116V	X706EO116V	X706EO118V	X706EO118V	X706EO118V	X706EO318V
Gate Carriage Assembly with Gate O-Ring	X810541	X810537	X810538	X810539	X810540	X810617
Carriage Shaft, Roller and Link Assembly with Bushings and Retaining Ring, Set of 4	X806504	X806500	X806500Rev1	X806500	X806503	X806503
1. Piston Hold Down Bolt	X702014	X702014	X702210	X702210	X702210	X702210
2. Magnet Retainer	X700463	X700046	X700031	X700031	X700031	X700031
3. Magnet	X132003	X132003	X132002	X132002	X132002	X132002
4. Shaft to Carriage Roll Pin	X702036	X702036	X702036	X702084	X702084	X702084
5. Bonnet Plate O-Ring B or V	X701153	X701249	X701260	X701265	X701274	X701274
6. Carriage	X700139	X700052	4EO117M	X700117	X700018	X700228
7. Seal Housing to Bonnet Plate O-Ring B or V	NA	X701226	X701226	X701226	X701226	X701228
8. Cylinder to Seal Housing O-Ring B or V	X701134	X701231	X701235	X701235	X701238	X701243
9. Gate Link Shaft (4)	X02LP131R2	X02LP131R2	X02LP131R2	X02LP131R 2	X700022	X700022
10. Link With Bearings (4)	X700137A	X04LP133	X04LP133	X04LP133	X700020	X700020
11. Carriage Roller Assembly (4)	X706124	X706124	X706124	X706124	X706424	X706424
12. Piston Cup	X205006	X205002	X205004	X205004	X205001	X205007
13. Actuator Shaft	X700245	X700048	X700316	X700202	X700050	X700216
14. Top or Bottom Seal Retainer	X700404	X700045	X700029	X700029	X700029	X700135
15. Seal Spacers (3)-Only 2 pc on 2"- ISO 63	X700054 (2)	X700054	X700028	X700028	X700028	X700134
16. Air Cylinder Weldment	X740015	X740003	X740024	X740011	X740044	X740020
17. Bonnet Plate Bushing	NA	X702142	X702254	X702254	X702254	X702232
18. Cylinder Retaining Bolts	X702045 (4)	X702048 (6)	X702219 (6)	X702219 (6)	X702219 (6)	X702219 (6)
19. Seal Retainer Screws (4) per Retainer	X702055	X702055	X702055	X702055	X702055	X702055
20. Bonnet Plate Bolts	X702220 (2)	X702016 (8)	X702016 (8)	X702016 (8)	X702018 (12)	X701020 (12)
22. High Pressure Seal B or V	X70112500500	X70112500500	X70112500625	X70112500625	X70112500625	X70112500750
23. Vacuum Shaft Seals (3) B or V	X701Q4206	X701Q4206	X701Q4208	X701Q4208	X701Q4208	X701Q4210
24. Seal Housing	X700138	X700067	X700333	X700333	X700414	X700294
25. Valve Body	P/N as required to indicate roughing ports and O-Rings on Flanges					
26. Solenoid	115VAC P/N X703005, 24VDC P/N X703031, 220VAC P/N X134010					
27. Nipple	X300009	X300009	X300009	X300009	X300009	X300009
28. Elbow (2)	X702043	X702043	X702043	X702043	X702043	X702043
29. Hose	X701101	X701101	X701101	X701101	X701101	X701101
30. Position Indicator Switch	X703016	X703016	X703016	X703016	X703016	X703016
31. Cylinder Seal Housing Bolts	NA	NA	NA	NA	NA	X702009(4)
32. Bonnet Plate	X700138	X700241	X700242	6END110	10END110	X700215
33. Flat Washer for Bonnet Plate Bolts	X702250(8)	X702250(8)	X702250(8)	X702250(8)	X702250(8)	X702250(8)
34. Clamp for Position Indicator	X703101	X703101	X703101	X703101	X703100	X703100
35. Gate	X700140	X700051	X04WA116	X406116	X700017	X700227
36. Gate Roller (2)	X02LP136A	X02LP136A	X04LP136A	X06LP136B	X700021	X700021
37. Side Roller Pin (4)	X702032	X702032	X702032	X702032	X702035	X702634
38. Carriage Side Roller (4)	X700049	X02LP137A	X700310 (4)	F-X02LP137A	X700023	X700369
39. Seal Side O-Ring B or V						
40. Gate O-Ring B or V	X701232	X701244	X701259	X701369	X701450	X701453
41. Open Side Port O-Ring B or V						X701453
42. Carriage Block	X700136	X700053	NA	X700019	X700019	X700019
43. Gate Roller Pin	X702030	X702030	X702037	X702084	X702084	X702084
44. Spring Set	X706122	X706106	X706206	X706306	X706406	X706406

END LP 10
END STD 12
END ISO 320
END CONFLAT 14
Nov 1, 2005 and Later

X815005

X810749

X810755

X810701

X810702

X810617

X806503

X702210

X700031

X132002

X702084

X701274

X700228

X701232

X701244

X700022

X700020

X706424

X205003

X700748

X700126 Top X700132

X700130

X740108

X702143

X702219

X702141

X702018

X70125001000

X701Q4214

X700742

X300009

X702043

X701101

X703016

NA

X700743

X702250

X703100

X700269

X700021

X702634

X700369

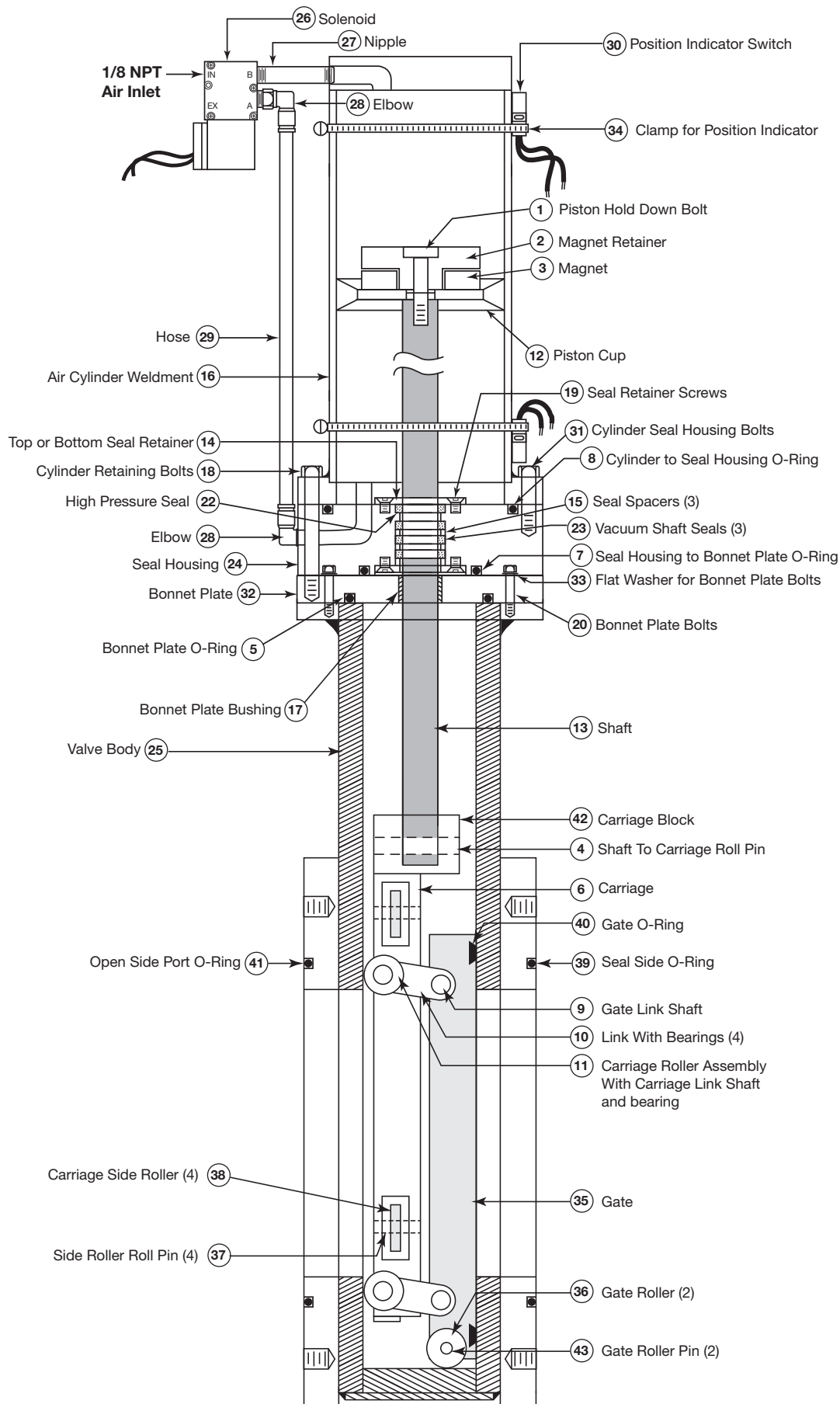
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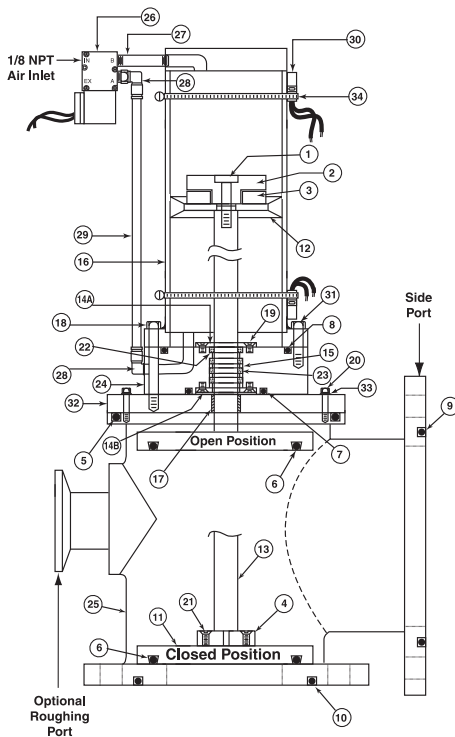
X700816

X702084

X706406



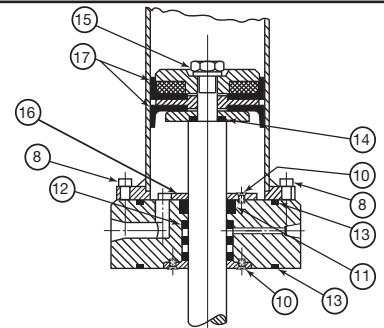
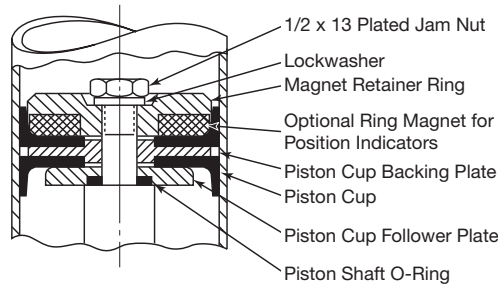
Welded Aluminum poppet valves shipped in 2001 and later. Please contact factory by phone or email for parts and repair prices.



Item	Description
1.	Piston hold down bolt
2.	Magnet retainer
3.	Magnet
4.	Shaft retainer clamp
5.	Bonnet plate O-ring
6.	Seal plate O-ring
7.	Seal housing to bonnet plate O-ring
8.	Cylinder to seal housing O-ring
9.	Side port O-ring
10.	Bottom Port O-ring
11.	Seal plate
12.	Piston cup
13.	Shaft
14A.	Top seal retainer
14B.	Bottom seal retainer
15.	Seal spacers 3 required
16.	Air cylinder weldment
17.	Bonnet plate bushing

Item	Description
18.	Cylinder retaining bolts 6 Required
19.	Seal retainer screws 4 required per retainer
20.	Bonnet plate bolts
21.	Screws for shaft retainer clamp 4 required
22.	High pressure seal
23.	Vacuum shaft seals
24.	Seal housing
25.	Body with no roughing ports
26.	Solenoid
27.	Nipple
28.	Elbow 2 required
29.	Hose
30.	Position indicator switch
31.	Cylinder seal housing bolts 6 required
32.	Bonnet plate
33.	Flat washer for bonnet plate bolts
34.	Clamp for position indicator

Welded Poppet Valves Shipped in 2000 and Before



8	8	Cylinder Retaining Screws, Four (4) 1/4 -20 x 2 1/2 Long Steel Socket Head Cap and Four (4) 4 -20 x 3/4 Long Steel Socket Head Cap Screws (price per set of 8)	X2AV08 →				
10	8	10/32 x 3/8 Long Steel Flat Head Cap Screws for top & bottom Seal Retainers (per set of 8)	X2AV10	X2AV10	X2AV10	X2AV10	X2AV10
11	1	Actuating Shaft Wiper Seal	X70118700625	X70125001000	X70125001000	X70125001000	X70125001000
12	3	Shaft Seal Rings (per set of 3)	X701Q4208	X701Q4214	X701Q4214	X701Q4214	X701Q4214
13	2	Seal Housing O-Ring	X701227B	X701236B	→		
14	1	Piston Shaft O-Ring	X701110B	X701206B	→		
15	1	1/2-13 Steel Hex Jam Nut	X2AV15	X2AV15	X2AV15	X2AV15	X2AV15
16	1	Top Seal Retainer	X2AV16 →				
17	2	Piston Cup (price each, 2 required)	X7012000500	X7013000625	→		
N/A	1	O-ring Kit, Buna-N	X701305B	X701306	X701406B	X701606B	X7011006B

SPARE PARTS FOR CAST ALUMINUM LP VALVES BUILT AFTER MAY OF 1990

Part Name Contact Factory for Spare Parts Prices.	LP-2 & LP-3 LP ISO-100 & LP CF 6 IN. OD P/N		LP-4 LP ISO-160 & LP CF 8 IN. OD P/N	LP-6 & LP-8 LP ISO-200 & LP CF 8 IN. OD P/N		LP-10 & LP-12 LP ISO-320 & LP CF 14 IN. OD P/N	
Clean & Test Valves Returned to Pgh.							
Complete O-Ring Kits, BUNA-N..... 2 ea. Stem & Flange; 1 ea. Hub, Gate, Body	X701200B		X701400B	X701600B (6") X701800B (8")		X7011000B (10") X7011200B (12")	
Complete O-Ring Kits, VITON..... 2 ea. Stem & Flange; 1 ea. Hub, Gate, Body	X701200V		X701400V	X701600V (6") X701800V (8")		X7011000V (10") X7011200V (12")	
Piston & Seal Kit for 'EP' Actuators For Valves Shipped 1990 or Later..... Piston Tee Seal, 2 shaft & 2 End Cap O-Rings	X701201B		X701401B	X701401B		X7011001B	
For Valves Shipped 1989 or before..... Piston Cup, 2 Shaft & 2 End Cap O-Rings	X701204B		X701404B	X701404B		X7011004B	
1. Body, Bonnet Section..... If roughing ports are required specify as R1-NW-16 etc. as described in the Valve Catalog and add the cost to the bonnet section prices shown above.	X02LP110M		X04LP110M	X06LP110M		X10LP110M	
2. Body, Port Section N1 Style, no neck..... N6 Style, on seal side..... N8 Style, neck on open side..... N5 Style, neck both sides.....	LP-2	LP-3	LP-4	LP-6	LP-8	LP-10	LP-12
Contact Factory for Spare Parts Prices.							
3. Gate-Carriage Assembly with O-ring..... 3a,b,g. Carriage Shaft, Roller and Link Assembly with Bushings and Retaining Ring. Set of 4 3c. Gate Rollers - Set of 2..... 3d. Carriage Side Rollers - Set of 4..... 3e. Spring (set)..... 3f. Gate Link Shafts - Set of 4..... 3h. Roll Pin-Set of 6 (2 Gate, 4 Carriage) 3j. Retaining Ring (gate shafts) - Set/4 3r. Retain, Ring (carriage shafts) - Set/4 3y. Gate w/o Shafts, Links, Rollers..... 3z. Carriage w/o Shafts, Links, Rollers..	LP-2 & LP-3		LP-4	LP-6 & LP-8		LP-10 & LP-12	
	X706103rev1		X706203rev2	X706303rev2		X706403	
	X806500		X806500	X806500		X806501	
	X706102		X706202	X706302		X706402	
	X706108		X706108	X706108		X706408	
	X706106		X706206	X706306		X706406	
	X706110		X706110rev1	X706110rev1		X706410rev1	
	X706105		X706205	X706205		X706405	
	Not Used		X706119	X706119		X706419	
	X706119		X706119	X706119		X706419	
	X02LP116M		X04LP116rev1	X06LP116rev1		X10LP116rev1	
	X02LP117rev1		X04LP117rev1	X06LP117rev1		X10LP117rev1	
4. Stem-Crank Assy, with key, Retaining ring & nut	X706116rev2		X706216rev2	X706316rev1		X706416rev1	
5. Hub Assy (spacer design) w/o seal kit 5-a1. Gland spacer with bearing..... 5-b1. Modified hub with bearing..... 5c. Retaining Ring (internal type).....	X706117rev1 X02LP108A X02LP118rev1 X702176		X706210rev1 X04LP108A X04LP118rev1 X702177	X706317rev1 X04LP108A X06LP118rev1 X702177		X706417rev1 X10LP108A X10LP118rev1 X702177	
6. Stem Seal Kit: 2 O-rings, (BUNA-N).... 2 washers, 1 spring (VITON).....	X706118 X706118V		X706318 X706318V	X706318 X706318V		X706418 X706418V	
7. Manual Lever Kit Includes Handle, Washer, Key, Retaining Ring	X706112rev1		X706312rev2	X706312rev1		X706412rev1	
8. Body Bolts, S.S.Complete set with nuts...	1/4-20X1(6)		1/4-20X1 1/4(6)	1/4-20X1 1/4(14)		1/4-20X1 3/4(16)	
9. Pneumatic Operator (without solenoid) 9a. Piston Assy (w/o O-Rings & TSeal) 9b. Rack Assembly..... 9c. Pinion Gear Assembly..... 9d. Mounting Brackets (2)..... 9e. Cylinder Air Lines (2)..... 9f. Cylinder..... 9g. Cylinder End Caps (2)..... 9h. Cylinder Studs & Nuts..... 9i. Guard, OSHA Style..... 9j. Hex Nut..... 9k. Key 9r. Retaining ring (ext. fits stem crank)	X806104rev1 X02LP200 X706114 X706126 X706131 X701101 X02LP150 X706132 X706130 X02LP152Z X02LP202 X02LP203 X702170		X806204rev1 X04LP200 X706214 X706226 X706231 X701101 X04LP150 X706232 X706230 X04LP152Z X04LP202 X04LP203 X702171	X806304rev1 X06LP200 X706314 X706326 X706231 X701101 X06LP150 X706232 X706330 X06LP152Z X04LP202 X04LP203 X702171		X806404rev1 X10LP200 X706414 X706426 X706431 X701101 X10LP150 X706432 X706430 X10LP152Z X10LP202 X04LP203 X702172	
10. Solenoid Valve only (specify voltage).... 4 Way (3 Way available)	X706100		X706100	X706100		X706100	
11. Solenoid (with bracket & fittings)	X806100		X806100	X806100		X806100	

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