



Outgassing and Conductance Data

GATE VALVES					ANGLE VALVES				
ANSI Flange Size	Port Diameter	Molecular Conductance liter/sec.	Cylinder Capacity Liters	Approximate Close/Open Times @ 70 PSI	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.	2 Inch	2 Inch	113	0.285	<1/<1 sec.
3 Inch	3.37 Inch	567	0.408	1.5/1.5 sec.	3 Inch	3 Inch	295	0.348	<1/<1 sec.
4 Inch	5.37 Inch	1,219	0.408	2/2 sec.	4 Inch	4 Inch	440	0.782	1/1 sec.
6 Inch	7.12 Inch	3,887	0.985	2/2 sec.	6 Inch	6 Inch	1,000	1.020	2/2 sec.
8 Inch	8 Inch	9,213	1.223	3/2 sec.	8 Inch	8 Inch	1,920	4,598	2/2 sec.
10 Inch	10 Inch	17,014	1.704	3/2 sec.	10 Inch	10 Inch	3,000	6.697	2/2 sec.
12 Inch	12 Inch	29,400	3.063	4/4 sec.	12 Inch	12 Inch	5,065	6.985	3/2 sec.
16 Inch	16 Inch	49,600	3.887	5/5 sec.	16 Inch	16 Inch	8,550	8.622	4/3 sec.
20 Inch	20 Inch	79,970	10.207	7/8 sec.	20 Inch	20 Inch	13,567	9.5	5/6 sec.
24 Inch	24 Inch	128,010	14.95	11/12 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 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 63	63 mm	160	0.285	<1/<1 sec.
ISO 100	100 mm	1,219	0.408	2/2 sec.	ISO 100	100 mm	440	0.782	1/1 sec.
ISO 160	160 mm	3,887	0.985	2/2 sec.	ISO 160	160 mm	1,000	1.020	2/2 sec.
ISO 200	200 mm	9,213	1.223	3/2 sec.	ISO 200	200 mm	1,920	4.598	2/2 sec.
ISO 250	250 mm	17,014	1.740	3/2 sec.	ISO 250	250 mm	3,000	6.697	2/2 sec.
ISO 320	320 mm	29,400	3.063	4/4 sec.	ISO 320	320 mm	5,065	6.985	3/2 sec.
ISO 400	400 mm	49,600	3.90	6/7 sec.	ISO 400	400 mm	8,550	8.622	4/4 sec.
ISO 500	500 mm	79,970	10.20	7/8 sec.	ISO 500	500 mm	13,560	9.5	5/6 sec.
ISO 630	630 mm	128,010	14.95	1 1/12	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 1.5×10^{-13} Torr l/sec cm²
 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 5×10^{-14} mbar l/sec cm²
 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 5×10^{-14} mbar l/sec cm²
 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 4×10^{-13} mbar l/sec cm²
 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 1×10^{-9} mbar l/sec cm²
 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