

Valve

Solutions

WWW.MKSINST.COM

Series 150/160 and V-100 Valves

HIGH VACUUM BELLOWS SEALED VALVES



Features and Benefits

- Choice of manual, pneumatic or electropneumatic actuation
- Angle and Inline body styles
- Available in port sizes from .75" to 6"
- Choice of ISO-KF, ISO-Universal, and CF flanges, and weld stubs
- Type 304 stainless steel body insures freedom from corrosion
- Formed bellows made of 321 stainless steel for a long life and resistance to particulate damage
- Installs in any position
- Cylinder pressure isolated from bellows, extending bellows life
- Visual indication of valve position
- Optional limit switches for remote indication of open and closed positions

Applications

The MKS Series 150/160 and V-100 valves are designed to insure product quality, reliability and value. They function reliably in applications ranging from semiconductor manufacturing to plasma physics research to nuclear accelerators. MKS manufactures its valves with interchangeable parts, inspecting them at every step.

Description

Since bellows are a critical factor in valve reliability, MKS incorporates formed bellows into the 150/160 valves. The first major advantage of using formed bellows is consistency. Since formed bellows do not have welds joining each membrane, there is no stress concentration and fatigue failure from non-uniform welds. The second advantage is that the bellows convolutions never touch completely in the compressed position. Many vacuum processes, like chemical vapor or thin film deposition contain particulate contamination. If small particles fall between formed bellows, they have no effect. If similar particles fall between welded, nested bellows, they deform the membranes, cause stress concentration, and lead to early bellows failure.

An elastomer stem seal isolates the cylinder actuating pressure from the region within the bellows. The region within the bellows vents externally by grooves in the bonnet flange. If the stem seal fails, any air passing the seal would be vented harmlessly through these grooves. The vents also admit helium when leak checking the bellows.

The nosepiece O-ring must be firmly retained, especially in a valve that opens to a pressure differential. Vents in the O-ring groove eliminate the possibility of virtual leaks caused by air trapped in the corners of the groove.

A single acting cylinder opens the pneumatic valves up through the 3 inch size. When the cylinder is vented, a strong spring closes the valve. The spring within the bellows acts directly upon the nosepiece. Upon failure of the electric control voltage to the solenoid coil or upon failure of the pneumatic supply, the valve fails closed. Valves in the 4 inch size are available either with (V-100 series) or without (150 series) a closing spring, and 6 inch valves are only available without a closing spring. Valves without a closing spring have double acting cylinders. In all sizes the pneumatic cylinder is lubricated adequately for the service life of the valve.

The V-100 is a 4 inch valve that is available in both manual and pneumatic options, and either angle or inline configurations. The pneumatic versions are available with a closing spring. Ordering codes are different than the 150/160 series, with more sealing options.

MKS vacuum valves may be installed in any position, with either the bellows or the nosepiece facing the pump. In systems with condensable materials, it is advantageous to install the valve with the nosepiece toward the chamber. The electropneumatic valve has a solenoid valve attached to the cylinder with a nipple. The cap screws fixing the cylinder to the body may be removed and the cylinder indexed at 90° increments for valves of sizes .75" to 1.5", and 60° increments for valves with port sizes 2" to 6". If necessary, the solenoid valve can be removed and located remotely.

Limit switches provide a signal to the control circuit or operator confirming that the valve is opened or closed. This option is often used in large vacuum installations with a microprocessor or computer controller. Limit switch components are available factory installed or as a kit that may be fitted to the valve by the user.

MKS Solenoid Valves are reliable, small, and consistent with needed conductance. Solenoid coils are available for use with a wide range of voltages and frequencies. The complete catalog number for an electropneumatic valve with a solenoid valve is the part number and the solenoid voltage and the frequency. For example, the number 153-1040K-24V/50-60 designates a 1.5" angle valve with NW 40 ISO-KF flanges, limit switches and solenoid valve with a coil rated for 24 volts and 50-60Hz frequency.

Many accessories can be attached through the pneumatic connection port. Another feature of the solenoid control valve is the threaded vent port that can accept an exhaust fitting. This is crucial in applications where it is not allowable to vent waste air into the room, for example in cleanrooms.

The Series 150, 160 and V-100 valves are primarily vacuum valves. Sometimes the valves encounter pressures above atmospheric in gas handling, or in backfilled systems. MKS valves may be used over the pressure range from 10⁻⁹ Torr to 15 psig. The bellows design and closing force provide reliable operation to the maximum pressures stated.

For more information, call MKS Instruments at 1-800-227-8766 or visit our website at www.mksinst.com.



Specifications

Specifications for Series 150/160 Valves

Nominal Port Size in. (mm)	Vacuum Conductance ** (ltr / sec)		Cylinder Air Pressure psig (N/m ² abs)		Cylinder Volume ft ³ (m ³)	Actuation Time in Seconds opening (closing)	Blow-By Pressure ¹ psia (N/m ² abs)	Max. Internal Closing Pressure psia (N/m ² abs)	Solenoid Vent Thread
	Angle	Inline	Min.	Max.					
.75 (16)	6	5	50 (4.5 x 10 ⁵)	120 (9.3 x 10 ⁵)	1.4 x 10 ⁻³ (4.1 x 10 ⁻⁵)	.5 (1)	80 (5.5 x 10 ⁵)	40 (2.8 x 10 ⁵)	10-32
1.00 (25)	13	11	50 (4.5 x 10 ⁵)	120 (9.3 x 10 ⁵)	2.1 x 10 ⁻³ (5.8 x 10 ⁻⁵)	.5 (1)	80 (5.5 x 10 ⁵)	43 (3.0 x 10 ⁵)	10-32
1.50 (40)	33	30	50 (4.5 x 10 ⁵)	120 (9.3 x 10 ⁵)	2.8 x 10 ⁻³ (8.0 x 10 ⁻⁵)	1 (2)	50 (3.4 x 10 ⁵)	60 (4.1 x 10 ⁵)	10-32
2.00 (50)			50 (4.5 x 10 ⁵)	100 (7.9 x 10 ⁵)	7.7 x 10 ⁻³ (2.2 x 10 ⁻⁴)	1 (2)	45 (3.1 x 10 ⁵)	38 (2.6 x 10 ⁵)	10-32
2.50 (63)	75	60	60 (5.2 x 10 ⁵)	100 (7.9 x 10 ⁵)	7.7 x 10 ⁻³ (2.2 x 10 ⁻⁴)	2 (2)	40 (2.8 x 10 ⁵)	50 (3.4 x 10 ⁵)	10-32
3.00 (80)	120	90	60 (5.2 x 10 ⁵)	100 (7.9 x 10 ⁵)	1.6 x 10 ⁻² (4.6 x 10 ⁻⁴)	2 (2)	38 (2.6 x 10 ⁵)	40 (2.8 x 10 ⁵)	10-32
4.00 (100)*	190	160	55 (4.8 x 10 ⁵)	100 (7.9 x 10 ⁵)	1.3 x 10 ⁻² (3.7 x 10 ⁻⁴)	2 (2)	50 (3.4 x 10 ⁵)	45 (3.1 x 10 ⁵)	1/4" NPT
6.00 (160)*	390		50 (4.5 x 10 ⁵)	100 (7.9 x 10 ⁵)	3.4 x 10 ⁻² (9.6 x 10 ⁻⁴)	3 (3)	40 (2.8 x 10 ⁵)	35 (2.4 x 10 ⁵)	1/4" NPT
	1040								

* Double Acting Pneumatic

** See curve below

¹ Blow-by pressure is that pressure applied to the nosepiece port at which the nosepiece will not seal with the body port initially at vacuum.

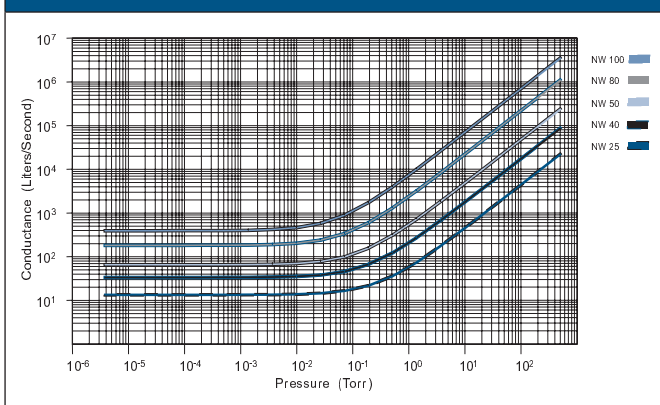
Specifications 150/160 Valves

Pressure Range	15 psig to 1.0 x 10 ⁶ Torr
Helium Leak Rate	1.0 x 10 ⁻⁹ std cc/sec
Maximum Bakeout Temp.	150°C - Body 70°C - Cylinder
Limit Switch Rating Single Pole, Single Throw	5A - 250 VAC 5A - 30 VDC
Materials	
Body, Nosepiece and Bellows Termination	Type 304 stainless steel
Bellows	Type 321 stainless steel
Nosepiece and Bonnet Seals	Viton [®]
Pneumatics	Anodized aluminum alloys, Buna and plated steel
Pneumatic Connection	1/8" NPT-F (through 3") 1/4" NPT-F (4" and 6")

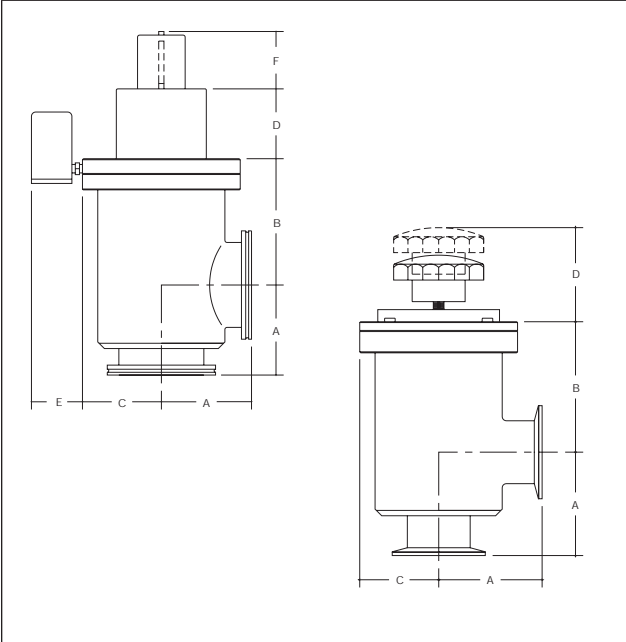
Specifications V-100 Valves

Conductance (see graph)	
Angle	390 ltr/sec
Inline	360 ltr/sec
Cylinder Air Pressure	
Minimum	50 psig (4.5 x 10 ⁵ N/m ² abs)
Maximum	100 psig (7.9 x 10 ⁵ N/m ² abs)
Cylinder Volume	1.6 x 10 ⁻² ft ³ (4.6 x 10 ⁻⁴ m ³)
Actuation Time in Seconds	Opening: 2 Closing: 2
Blow-by Pressure	32 psia (2.2 x 10 ⁵ N/m ² abs)
Maximum Internal Closing Pressure	30 psia (2.0 x 10 ⁵ N/m ² abs)
Pressure Range	15 psig to 10 ⁶ Torr
Helium Leak Rate	1.0 x 10 ⁻⁹ std cc/sec
Maximum Bakeout Temperature	150°C
Limit Switch Rating Single Pole, Single Throw	5A - 250 VAC 5A - 30 VDC
Materials	
Body, Nosepiece and Bellows Termination	Type 304 stainless steel
Bellows	Type 321 stainless steel
Nosepiece and Bonnet Seals	Choice - see table
Pneumatics	Anodized aluminum alloys, Buna and plated steel
Weight	
Angle	22 lbs. (10 kg)
Inline	27 lbs. (12.3 kg)
Pneumatic Connection	1/8" NPT-F

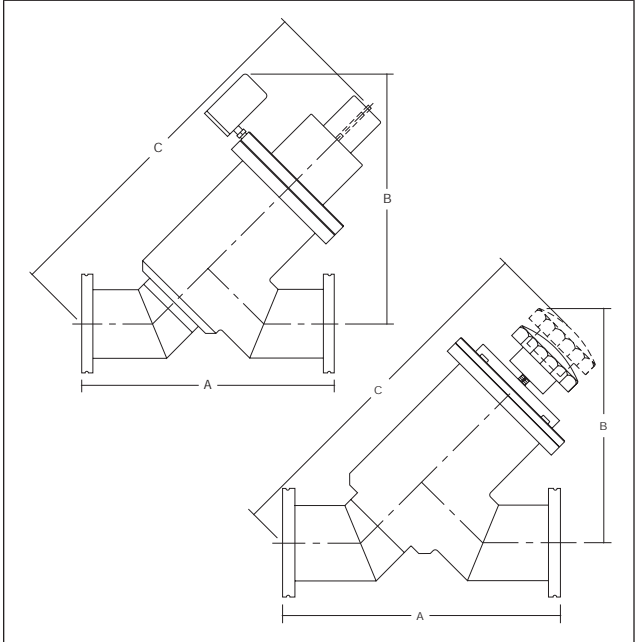
Conductance



Series 150 Angle Valves



Series 160 InLine Valves



150 Angle Dimension A

Valve Size	ISO Flange	CF Flange	Weld Stub
.75 (16)	1.57 (40)	1.97 (50)	1.50 (38)
1.00 (25)	1.97 (50)	2.02 (51)	1.88 (48)
1.50 (40)	2.56 (65)	2.43 (62)	2.25 (57)
2.00 (50)	2.76 (70)	3.19 (81)	3.00 (76)
2.50 (63)	3.46 (88)	4.10 (104)	3.00 (76)
3.00 (80)	3.86 (98)	3.50 (89)	3.25 (83)
4.00 (100)	4.25 (108)	5.28 (134)	4.00 (102)
6.00 (160)	5.43 (138)	6.56 (167)	5.18 (132)

160 Inline Dimension A

Valve Size	ISO Flange	CF Flange	Weld Stub
.75 (16)	3.14 (80)	3.94 (100)	3.00 (76)
1.00 (25)	3.94 (100)	4.62 (117)	4.35 (110)
1.50 (40)	5.12 (130)	5.19 (132)	4.83 (123)
2.00 (50)	7.00 (178)	7.88 (200)	7.20 (183)
2.50 (63)	8.25 (210)	8.44 (214)	7.75 (197)
3.00 (80)	10.55 (268)	10.55 (268)	10.06 (256)

150 Pneumatic Dimensions

Valve Size	B	C	D	E	F
.75 (16)	3.86 (98)	1.62 (41)	.87 (22)	1.84 (47)	1.33 (34)
1.00 (25)	4.14 (105)	1.74 (44)	1.00 (25)	1.84 (47)	1.43 (37)
1.50 (40)	3.88 (99)	1.98 (50)	1.00 (25)	1.84 (47)	1.43 (37)
2.00 (50)	5.05 (128)	2.35 (60)	1.57 (40)	2.44 (62)	1.93 (49)
2.50 (63)	4.80 (122)	2.35 (60)	1.57 (40)	2.44 (62)	1.93 (49)
3.00 (80)	5.63 (143)	2.93 (74)	2.03 (52)	2.44 (62)	2.24 (57)
4.00 (100)	6.12 (155)	3.72 (94)	3.10 (79)	1.70 (43)	2.72 (69)
6.00 (160)	9.94 (252)	3.72 (94)	4.05 (103)	2.33 (59)	3.51 (89)

160 Pneumatic Dimensions

Valve Size	B	C ISO Flange	C CF Flange	C Weld Stub
.75 (16)	6.59 (167)	7.94 (202)	7.91 (201)	7.66 (196)
1.00 (25)	7.09 (180)	7.78 (198)	8.82 (224)	8.74 (222)
1.50 (40)	7.23 (184)	9.21 (234)	9.01 (229)	8.89 (226)
2.00 (50)	9.36 (237)	11.91 (303)	12.13 (308)	12.03 (306)
2.50 (63)	9.36 (237)	12.26 (311)	12.22 (310)	12.03 (306)
3.00 (80)	10.79 (273)	14.99 (381)	14.95 (380)	14.00 (356)

150 Manual Dimensions

Valve Size	B	C	D
.75 (16)	3.31 (84)	1.62 (41)	2.46 (62)
1.00 (25)	3.59 (91)	1.74 (44)	2.56 (65)
1.50 (40)	3.33 (85)	1.98 (50)	2.56 (65)
2.00 (50)	4.50 (114)	2.35 (60)	3.62 (92)
2.50 (63)	4.25 (108)	2.35 (60)	3.62 (92)
3.00 (80)	5.08 (129)	2.93 (74)	3.87 (98)

160 Manual Dimensions

Valve Size	B	C ISO Flange	C CF Flange	C Weld Stub
.75 (16)	5.88 (149)	7.59 (193)	7.55 (192)	7.30 (185)
1.00 (25)	6.20 (157)	8.48 (215)	8.53 (217)	8.45 (215)
1.50 (40)	6.62 (168)	8.81 (224)	8.76 (223)	8.66 (220)
2.00 (50)	8.72 (222)	12.05 (306)	12.28 (312)	12.17 (309)
2.50 (63)	8.87 (225)	12.33 (313)	12.29 (312)	12.10 (307)
3.00 (80)	9.64 (245)	14.35 (365)	14.31 (364)	14.12 (359)



Ordering Information

150 Angle Valves with ISO Flanges - ISO-KF (.75" - 2.0") / ISO-Universal (2.5"-6.0")

ISO Flange Size (Port Size)	Shipping Weight lbs. (kg)	Manual	Pneumatic	Pneumatic w/ Limit Switches	Pneumatic w/ Solenoid Valve *	Pneumatic w/ Solenoid Valve * & Limit Switches
		Part Number	Part Number	Part Number	Part Number	Part Number
NW 16 (.75")	2.3 (1.0)	151-0016K	152-0016K	152-1016K	153-0016K	153-1016K
NW 25 (1.0")	3.5 (1.6)	151-0025K	152-0025K	152-1025K	153-0025K	153-1025K
NW 40 (1.5")	4.5 (2.0)	151-0040K	152-0040K	152-1040K	153-0040K	153-1040K
NW 50 (2.0")	7.5 (3.4)	151-0050K	152-0050K	152-1050K	153-0050K	153-1050K
NW 63 (2.5")	8.5 (3.9)	151-0063P	152-0063P	152-1063P	153-0063P	153-1063P
NW 80 (3.0")	14.0 (6.4)	151-0080P	152-0080P	152-1080P	153-0080P	153-1080P
NW 100 (4.0")	22.0 (10.0)		154-0100P	154-1100P	155-0100P	155-1100P
NW 160 (6.0")	29.0 (13.2)		154-0160P	154-1160P	155-0160P	155-1160P

150 Angle Valves with CF Flanges

CF Flange Size (Port Size)	Shipping Weight lbs. (kg)	Manual	Pneumatic	Pneumatic w/ Limit Switches	Pneumatic w/ Solenoid Valve *	Pneumatic w/ Solenoid Valve * & Limit Switches
		Part Number	Part Number	Part Number	Part Number	Part Number
1½" (.75")	2.3 (1.0)	151-0016C	152-0016C	152-1016C	153-0016C	153-1016C
2½" (1.0")	3.5 (1.6)	151-0025C	152-0025C	152-1025C	153-0025C	153-1025C
2¾" (1.5")	4.5 (2.0)	151-0040C	152-0040C	152-1040C	153-0040C	153-1040C
3¾" (2.0")	7.5 (3.4)	151-0050C	152-0050C	152-1050C	153-0050C	153-1050C
4½" (2.5")	8.5 (3.9)	151-0063C	152-0063C	152-1063C	153-0063C	153-1063C
4¾" (3.0")	14.0 (6.4)	151-0080C	152-0080C	152-1080C	153-0080C	153-1080C
6" (4.0")	22.0 (10.0)		154-0100C	154-1100C	155-0100C	155-1100C
8" (6.0")	29.0 (13.2)		154-0160C	154-1160C	155-0160C	155-1160C

150 Angle Valves with Weld Stubs

Nominal Port Size inch (mm)	Shipping Weight lbs. (kg)	Manual	Pneumatic	Pneumatic w/ Limit Switches	Pneumatic w/ Solenoid Valve *	Pneumatic w/ Solenoid Valve * & Limit Switches
		Part Number	Part Number	Part Number	Part Number	Part Number
.75" (16)	2.3 (1.0)	151-0016T	152-0016T	152-1016T	153-0016T	153-1016T
1.0" (25)	3.5 (1.6)	151-0025T	152-0025T	152-1025T	153-0025T	153-1025T
1.5" (40)	4.5 (2.0)	151-0040T	152-0040T	152-1040T	153-0040T	153-1040T
2.0" (50)	7.5 (3.4)	151-0050T	152-0050T	152-1050T	153-0050T	153-1050T
2.5" (63)	8.5 (3.9)	151-0063T	152-0063T	152-1063T	153-0063T	153-1063T
3.0" (80)	14.0 (6.4)	151-0080T	152-0080T	152-1080T	153-0080T	153-1080T
4.0" (100)	22.0 (10.0)		154-0100T	154-1100T	155-0100T	155-1100T
6.0" (160)	29.0 (13.2)		154-0160T	154-1160T	155-0160T	155-1160T

Solenoid Voltage & Frequency

	24 VDC	24 VAC 50-60 Hz	208 VAC 50-60 Hz (Up to 3" only)	100-120 VAC 50 Hz 110-130 VAC 60 Hz	210-240 VAC 50 Hz 220-250 VAC 60 Hz
Part Number Extension	-24VDC	-24V/50-60	-208V/50-60	-120V/50-60	-220V/50-60

* The complete part number for an electropneumatic valve with a solenoid valve is the part number listed above, plus the solenoid voltage and frequency extension.
Sample part number: 153-0016K-24VDC.

