Directional Control Headline Vacuum Valves
21 Series

Product Catalog
Vacuum and Full Vacuum Applications

a global family

Headline Valves 21 Series for Vacuum and Full Vacuum Applications
Product Overview

Valves for Vacuum Applications

Vacuum service valves are ideal for lifting, holding, vacuum packaging and moving anything from large objects to tiny particles. They also provide an effective means for leak testing. The vacuum source typically comes from either a vacuum pump or a venturi. In vacuum service applications, the pressure within the valve is reduced below atmospheric pressure. Consequently, atmospheric pressure actually pushes air into the valve, instead of the common belief that air is “sucked” in by the vacuum.

Valves for Full Vacuum Applications

Full vacuum valves are ideal for applications where compressed air is unavailable. Full vacuum valves use the difference in force between atmospheric pressure and the vacuum within the valve to actuate the valve. The full vacuum valve performs with atmospheric pressure in port 1 and 10 to 30 inches of Mercury vacuum in the valve body.

Solenoid Pilot Controlled	Pressure Controlled
	

Illustration examples.

VALVE FEATURES

Poppet Design	Poppet construction for high dirt tolerance ROSS vacuum valves have larger orifices, allowing greater flow and easing the transport of air even though there is a small differential between the vacuum within the valve and atmospheric pressure outside the valve
Mounting Options	Can be mounted close to actuator, reducing length of pipe to be pressurized/exhausted on each cycle
Pilot Supply	Internal or external; easily field-convertible for use with an external pilot supply
High Velocity	Near zero leakage
Positive Sealing	No sliding action to prevent damage and wear
Reliability	Consistent response times over the life of the valve

Valve models for external pilot supply available, consult ROSS.

Explosion-Proof solenoid pilot valves available, see valves for Hazardous Locations.

Actuation	Application	Available Inlet Port Sizes									Functions		Maximum Flow C_v (Nl/min)	Page
		1/4	3/8	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	2/2	3/2		
Solenoid Controlled	Vacuum	●	●	●	●	●	●	●	●	●	●	●	71 (70000)	3 – 7
	Full Vacuum		●				●					●	33 (32000)	8 – 9
Pressure Controlled	Vacuum	●	●	●	●	●	●	●	●	●	●	●	71 (70000)	10 – 13
Accessories and Options														14 – 16

Specifications

STANDARD SPECIFICATIONS

GENERAL	Function		2/2 and 3/2 Valve		
	Construction Design		Poppet		
	Actuation		Electrical	Solenoid Pilot Controlled	
			Pneumatic	Pressure Controlled	
	Mounting	Type	Inline		
		Orientation	Any, preferably vertical		
	Connection		Threaded	NPT, G	
	Manual Override	Solenoid Pilot Controlled	Non-locking metal button, standard		
OPERATING CONDITIONS	Temperature	Low Temperature	Solenoid Pilot Controlled	Ambient	-40° to 120°F (-40° to 50°C)
				Media	-40° to 175°F (-40° to 80°C)
			Pressure Controlled	Ambient	-40° to 175°F (-40° to 80°C)
				Media	
			For temperatures below 40°F (4°C) air must be free of water vapor to prevent formation of ice.		
	Flow Media		Vacuum and/or filtered-compressed air		
	Operating Pressure		Vacuum to 150 psig (Vacuum to 10 bar)		
	External Pilot Supply	Solenoid Pilot Controlled	Must be equal to or greater than inlet pressure, but no less than 30 psig (2 bar)		
ELECTRICAL DATA FOR SOLENOID PILOT VALVES	Solenoids		Current Flow	Operating Voltage	Power Consumption (each solenoid)
			DC	24 volts	14 watts
			AC	110-120 volts, 50/60 Hz	87 VA inrush, 30 VA holding
				230-240 volts, 60 Hz	
			Rated for continuous duty		
CONSTRUCTION MATERIAL	Valve Body		Cast Aluminum		
	Poppet		Aluminum and Stainless Steel		
	Seals		Fluorocarbon		
SAFETY DATA	Safety Integrity Level (SIL)		Certified by TÜV Rheinland in accordance to IEC 61508 and IEC 61511 safety integrity level 2 (SIL 2) and EN ISO 13849-1, PL c (with application specific diagnosis) in singular application with HFT = 0 and SIL 3 and PL e in redundant application with HFT≥1, for details see certificate.		

IMPORTANT NOTE: Please read carefully and thoroughly all of the CAUTIONS, WARNINGS on the inside back cover.

High temperature valves also available. Please contact ROSS.

PRODUCT CREDENTIALS

Safety Integrity Level	Declaration of Conformity		Certificate of Compliance
Per IEC 2061:2001			
SIL 2 Functional Safety	CE	EAC	CSA C US

Ordering Information

2/2 Solenoid Pilot Controlled Valves for Vacuum Applications

Piping 2/2 Normally Closed (NC) or Normally Open (NO) Valves

Pipe the unit into the system by connecting the vacuum source or pump to the normal air pressure inlet port (port 1). The normal outlet port is the work port (port 2).

Note: 2/2 vacuum valves provide only on/off control and do not have an exhaust function.

SOLENOID PILOT CONTROLLED VALVES — 2-Way 2-Position Valves

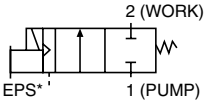
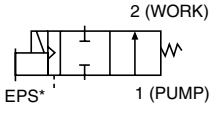
Body Size	Port Size In-Out	Function	Valve Model Number					
			NPT Thread			G Thread		
			24 V DC	110-120 V AC	230 V AC	24 V DC	110-120 V AC	230 V AC
3/8	1/4	NC	2171B2901W	2171B2901Z	2171B2901Y	D2171B2901W	D2171B2901Z	D2171B2901Y
	3/8	NC	2171B3906W	2171B3906Z	2171B3906Y	D2171B3906W	D2171B3906Z	D2171B3906Y
	1/2	NC	2171A4917W	2171A4917Z	2171A4917Y	D2171A4917W	D2171A4917Z	D2171A4917Y
3/4	3/4	NC	2171B5905W	2171B5905Z	2171B5905Y	D2171B5905W	D2171B5905Z	D2171B5905Y
	1	NC	2171B6904W	2171B6904Z	2171B6904Y	D2171B6904W	D2171B6904Z	D2171B6904Y
1-1/4	1	NC	2171B6916W	2171B6916Z	2171B6916Y	D2171B6916W	D2171B6916Z	D2171B6916Y
	1-1/4	NC	2171B7901W	2171B7901Z	2171B7901Y	D2171B7901W	D2171B7901Z	D2171B7901Y
	1-1/2	NC	2171B8906W	2171B8906Z	2171B8906Y	D2171B8906W	D2171B8906Z	D2171B8906Y
		NO	2172B8900W	2172B8900Z	2172B8900Y	D2172B8900W	D2172B8900Z	D2172B8900Y
2	1-1/2	NC	2171B8900W	2171B8900Z	2171B8900Y	D2171B8900W	D2171B8900Z	D2171B8900Y
	2-1/2	NC	2171B9901W	2171B9901Z	2171B9901Y	D2171B9901W	D2171B9901Z	D2171B9901Y

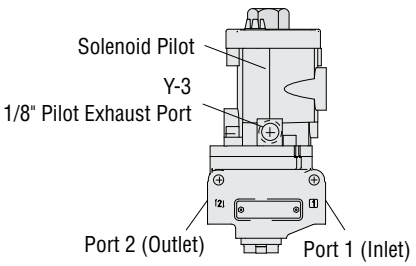
For other voltages, consult ROSS.

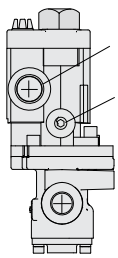
Size		Function	Flow C_v (Nl/min)	Average Response Constants*		Weight lb (kg)
Body	Port 1, 2		1 – 2	M	F	
3/8	1/4	NC	1.7 (1700)	10	0.96	3.0 (1.4)
	3/8	NC	2.2 (2200)	10	0.90	
	1/2	NC	2.6 (2600)	10	0.82	
3/4	3/4	NC	6.6 (6500)	14	0.39	3.3 (1.5)
	1	NC	7.7 (7600)	14	0.32	
1-1/4	1	NC	8.3 (8200)	14	0.31	7.5 (3.4)
	1-1/4	NC	20 (20000)	26	0.19	
	1-1/2	NC	29 (29000)	26	0.14	
		NO	31 (31000)	26	0.17	
2	1-1/2	NC	57 (56000)	##	##	15.5 (6.9)
	2-1/2	NC	64 (63000)	##	##	

***Valve Response Time** – Response Time (msec) = M + (F • V). This is the average time required to fill a volume V (cubic inches) to 90% of supply pressure or to exhaust it to 10% of supply pressure. M and F values are shown above.
Consult ROSS.

Valve Schematic

Normally Closed	Normally Open
	

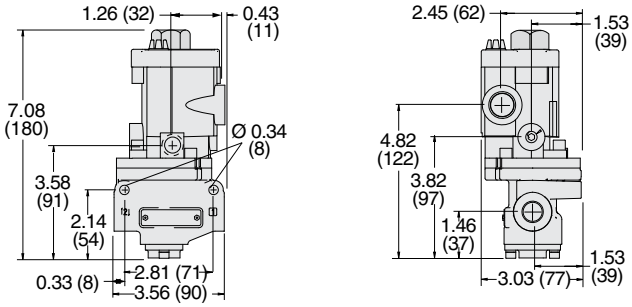




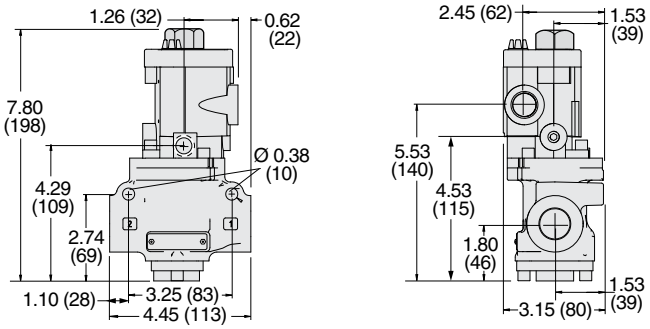
2/2 Solenoid Pilot Controlled Valves for Vacuum Applications

DIMENSIONS	Inches (mm)

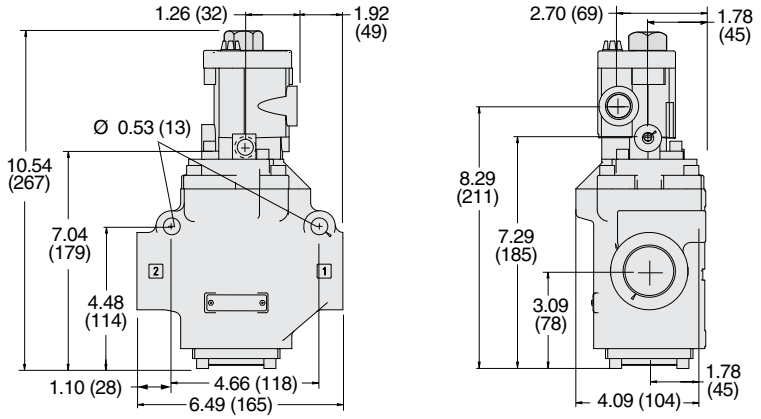
Body Size 3/8



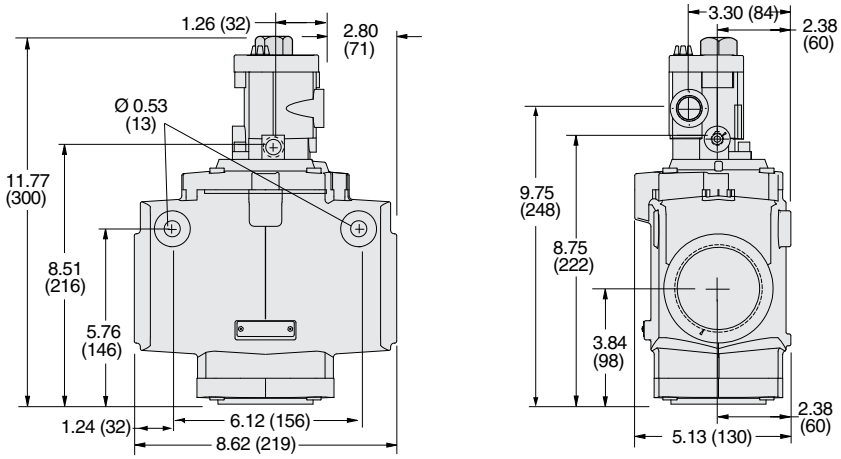
Body Size 3/4



Body Size 1-1/4



Body Size 2



Downloadable CAD models available.

Ordering Information

3/2 Solenoid Pilot Controlled Valves for Vacuum Applications

Piping 3/2 Normally Closed (NC) Valves

In this valve configuration, pipe the unit into the system by connecting the vacuum source or pump to the normal air pressure inlet port (port 1). The normal outlet port is the work port (port 2), and the normal air pressure exhaust port becomes the atmosphere port (port 3).

Piping 3/2 Normally Open (NO) Valves

To obtain a 3/2 normally open ROSS vacuum valve, simply pipe the 3/2 normally closed body slightly differently. Connect the vacuum source or pump to port 3, the normal exhaust. Leave port 1 open to atmosphere, and the normal outlet remains as the work port (port 2).

SOLENOID PILOT CONTROLLED VALVES — 3-Way 2-Position Valves

Body Size	Port Size		Function	Valve Model Number					
	In-Out	Exhaust		NPT Thread			G Thread		
				24 V DC	110-120 V AC	230 V AC	24 V DC	110-120 V AC	230 V AC
3/8	1/4	1/2	NC	2173B2900W	2173B2900Z	2173B2900Y	D2173B2900W	D2173B2900Z	D2173B2900Y
	3/8	1/2	NC	2173A3908W	2173A3908Z	2173A3908Y	D2173A3908W	D2173A3908Z	D2173A3908Y
	1/2	1/2	NC	2173B4901W	2173B4901Z	2173B4901Y	D2173B4901W	D2173B4901Z	D2173B4901Y
3/4	1/2	1	NC	2173B4902W	2173B4902Z	2173B4902Y	D2173B4902W	D2173B4902Z	D2173B4902Y
	1/2	1	NO	2174A4912W	2174A4912Z	2174A4912Y	D2174A4912W	D2174A4912Z	D2174A4912Y
	3/4	1	NC	2173B5900W	2173B5900Z	2173B5900Y	D2173B5900W	D2173B5900Z	D2173B5900Y
	1	1	NC	2173B6901W	2173B6901Z	2173B6901Y	D2173B6901W	D2173B6901Z	D2173B6901Y
1-1/4	1	1-1/2	NC	2173B6902W	2173B6902Z	2173B6902Y	D2173B6902W	D2173B6902Z	D2173B6902Y
	1	1-1/2	NO	2174A6914W	2174A6914Z	2174A6914Y	D2174A6914W	D2174A6914Z	D2174A6914Y
	1-1/4	1-1/2	NC	2173B7901W	2173B7901Z	2173B7901Y	D2173B7901W	D2173B7901Z	D2173B7901Y
	1-1/4	1-1/2	NC	2173A7917W	2173A7917Z	2173A7917Y	D2173A7917W	D2173A7917Z	D2173A7917Y
	1-1/2	1-1/2	NC	2173B8900W	2173B8900Z	2173B8900Y	D2173B8900W	D2173B8900Z	D2173B8900Y
2	2	2-1/2	NC	2173A9905W	2173A9905Z	2173A9905Y	D2173A9905W	D2173A9905Z	D2173A9905Y
	2-1/2	2-1/2	NC	2173A9906W	2173A9906Z	2173A9906Y	D2173A9906W	D2173A9906Z	D2173A9906Y

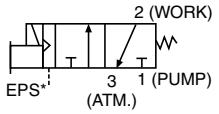
For other voltages, consult ROSS.

Size			Function	Flow C_v (Nl/min)		Average Response Constants*			Weight lb (kg)
Body	Port 1, 2	Port 3		1-2	2-3	M	F 1-2	F 2-3	
3/8	1/4	1/2	NC	1.7 (1700)	3.2 (3100)	10	1.76	2.08	3.0 (1.4)
	3/8	1/2	NC	2.5 (2500)	4.4 (4300)	10	0.95	1.07	
	1/2	1/2	NC	2.6 (2600)	4.6 (4600)	10	0.94	0.98	
3/4	1/2	1	NC	6.0 (5900)	8.8 (8700)	11	0.58	0.64	3.3 (1.5)
	1/2	1	NO	7.5 (7400)	8.0 (7900)	11	0.58	0.64	
	3/4	1	NC	7.5 (7400)	11 (11000)	11	0.38	0.41	
	1	1	NC	7.9 (7800)	12 (12000)	11	0.24	0.36	
1-1/4	1	1-1/2	NC	20 (20000)	27 (27000)	28	0.16	0.18	7.5 (3.4)
	1	1-1/2	NO	19 (19000)	23 (23000)	28	0.16	0.18	
	1-1/4	1-1/2	NC	28 (28000)	33 (32000)	28	0.12	0.17	
	1-1/4	1-1/2	NO	22 (22000)	25 (25000)	28	0.15	0.19	
	1-1/2	1-1/2	NC	29 (29000)	33 (32000)	28	0.12	0.16	
2	2	2-1/2	NC	70 (69000)	70 (69000)	##	##	##	16.5 (7.4)
	2-1/2	2-1/2	NC	70 (69000)	71 (70000)	##	##	##	

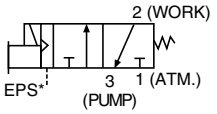
***Valve Response Time** – Response Time (msec) = M + (F • V). This is the average time required to fill a volume V (cubic inches) to 90% of supply pressure or to exhaust it to 10% of supply pressure. M and F values are shown above. ## Consult ROSS.

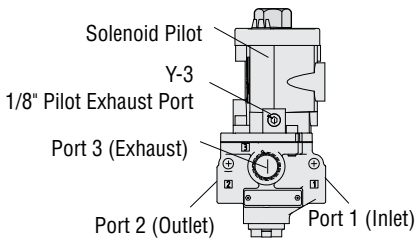
Valve Schematic

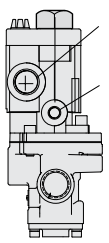
Normally Closed



Normally Open



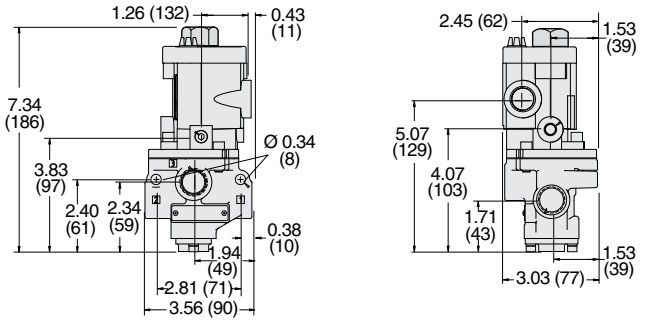




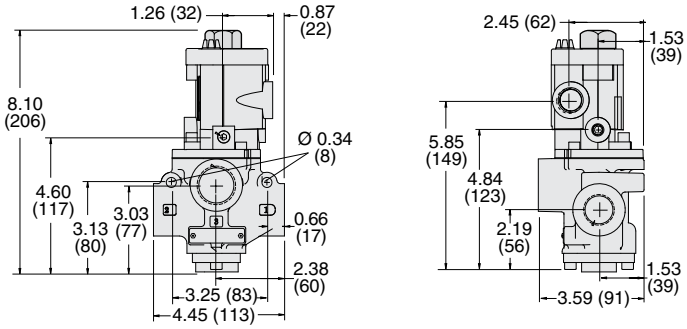
3/2 Solenoid Pilot Controlled Valves for Vacuum Applications

DIMENSIONS	Inches (mm)

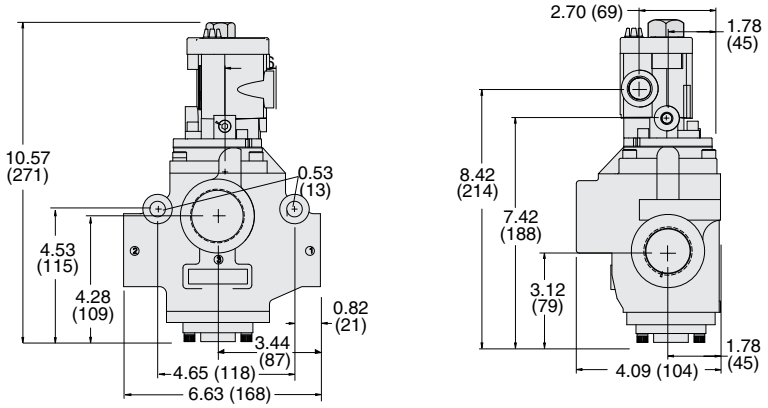
Body Size 3/8



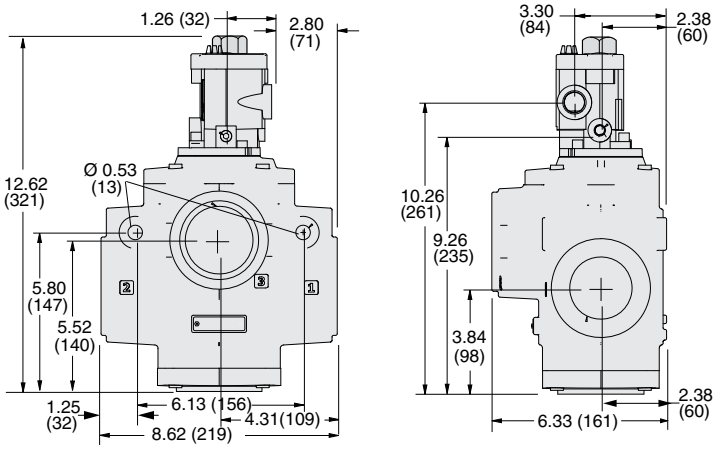
Body Size 3/4



Body Size 1-1/4



Body Size 2



Downloadable CAD models available.

Ordering Information

3/2 Solenoid Pilot Controlled Valves for Full Vacuum Applications

Full Vacuum – 3/2 Normally Closed (NC) Valves

This valve functions as a normally open valve. Pipe the unit into the system by connecting the vacuum source or pump to port 3, the normal exhaust. Leave port 1 open to atmosphere, and the normal outlet remains as the work port (port 2).

Full Vacuum – 3/2 Normally Open (NO) Valves

This valve functions as a normally closed valve. Pipe the unit into the system by connecting the vacuum source or pump to port 3, the normal exhaust. Leave port 1 open to atmosphere, and the normal outlet remains as the work port (port 2).

SOLENOID PILOT CONTROLLED VALVES — **3-Way 2-Position Valves**

Body Size	Port Size		Function	Valve Model Number					
				NPT Thread			G Thread		
	In-Out	Exhaust		24 V DC	110-120 V AC	230 V AC	24 V DC	110-120 V AC	230 V AC
3/8	1/2	1/2	NC	2173B4914W	2173B4914Z	2173B4914Y	D2173B4914W	D2173B4914Z	D2173B4914Y
			NO	2174B4900W	2174B4900Z	2174B4900Y	D2174B4900W	D2174B4900Z	D2174B4900Y
1-1/4	1-1/4	1-1/2	NC	2173B7904W	2173B7904Z	2173B7904Y	D2173B7904W	D2173B7904Z	D2173B7904Y
			NO	2174B7903W	2174B7903Z	2174B7903Y	D2174B7903W	D2174B7903Z	D2174B7903Y

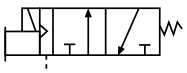
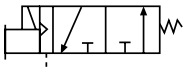
For other voltages, consult ROSS.

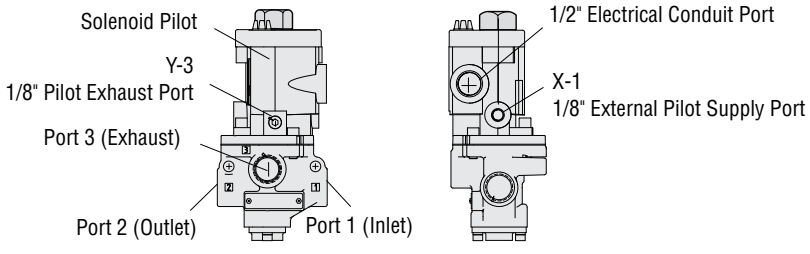
Size			Function	Flow C_V (Nl/min)		Average Response Constants*			Weight lb (kg)
Body	Port 1, 2	Port 3		1-2	2-3	M	F 1-2	F 2-3	
3/8	1/2	1/2	NC	2.6 (2600)	4.6 (4600)	11	0.50	0.70	3.0 (1.4)
			NO	3.0 (3000)	2.8 (2800)	11	0.58	0.64	
1-1/4	1-1/4	1-1/2	NC	28 (28000)	33 (32000)	28	0.15	0.19	7.5 (3.4)
			NO	22 (22000)	25 (25000)	28	0.12	0.17	

***Valve Response Time** – Response Time (msec) = M + (F • V). This is the average time required to fill a volume V (cubic inches) to 90% of supply pressure or to exhaust it to 10% of supply pressure. M and F values are shown above.

Consult ROSS.

Valve Schematic

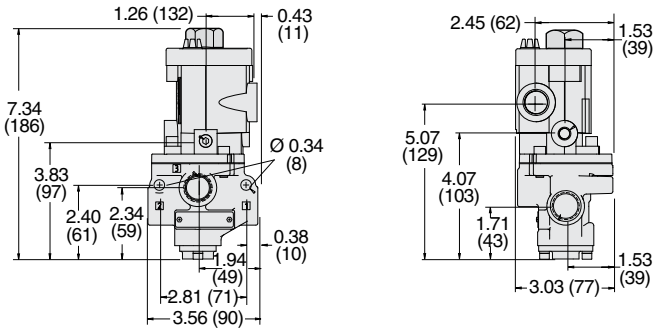
Normally Closed	Normally Open
	



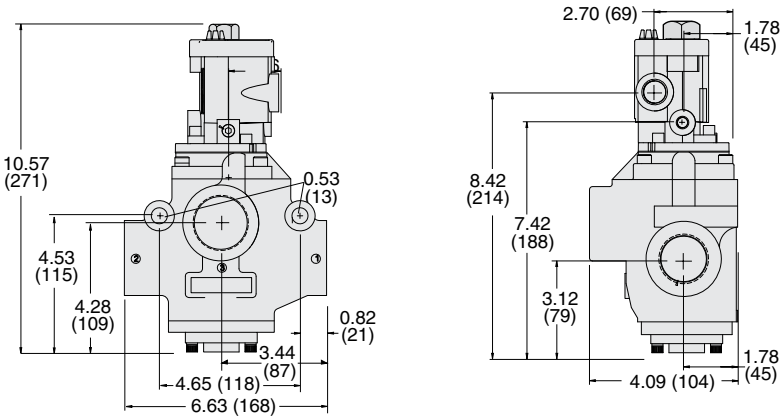
3/2 Solenoid Pilot Controlled Valves for Full Vacuum Applications

DIMENSIONS	Inches (mm)

Body Size 3/8



Body Size 1-1/4



Downloadable CAD models available.

Ordering Information

2/2 Pressure Controlled Valves for Vacuum Applications

Piping 2/2 Normally Closed (NC) or Normally Open (NO) Valves

Pipe the unit into the system by connecting the vacuum source or pump to the normal air pressure inlet port (port 1). The normal outlet port is the work port (port 2).

Note: 2/2 vacuum valves provide only on/off control and do not have an exhaust function.

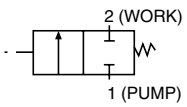
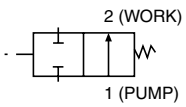
PRESSURE CONTROLLED VALVES — **2-Way 2-Position Valves**

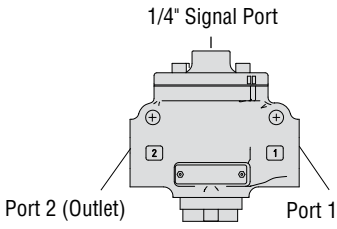
Body Size	Port Size	Function	Valve Model Number	
	In-Out		NPT Thread	G Thread
3/8	1/4	NC	2151A2901	D2151A2901
	1/2	NC	2151A4910	D2151A4910
3/4	1/2	NC	2151B4904	D2151B4904
	3/4	NC	2151A5913	D2151A5913
	3/4	NO	2152A5901	D2152A5901
	1	NC	2151B6900	D2151B6900
1-1/4	1	NC	2151A7909	D2151A7909
	1-1/4	NC	2151B8900	D2151B8900
	1-1/2	NO	2152B7900	D2152B7900

Size		Function	Flow C_V (Nl/min)	Average Response Constants*		Weight lb (kg)
Body	Port 1, 2		1-2	M	F	
3/8	1/4	NC	1.7 (1700)	10	0.96	1.8 (0.8)
	1/2	NC	2.6 (2600)	10	0.90	
3/4	1/2	NC	6.6 (6500)	10	0.82	4.5 (2.0)
	3/4	NC	7.7 (7600)	14	0.39	
	3/4	NO	7.4 (7300)	14	0.37	
	1	NC	8.3 (8200)	14	0.19	
1-1/4	1	NC	20 (20000)	26	0.14	11.0 (5.0)
	1-1/4	NC	29 (29000)	26	0.13	
	1-1/2	NO	23 (23000)	26	0.17	

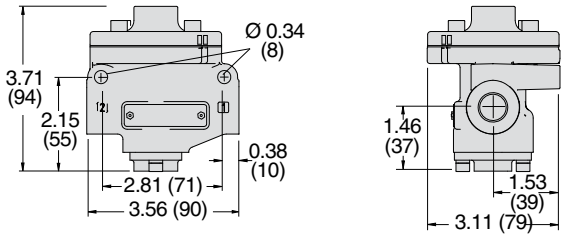
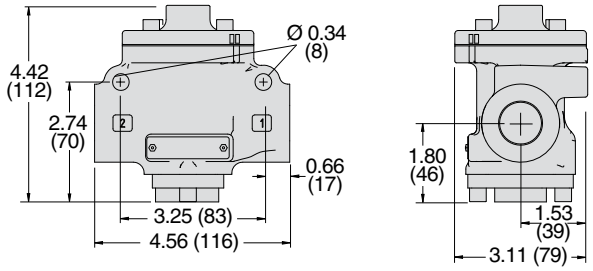
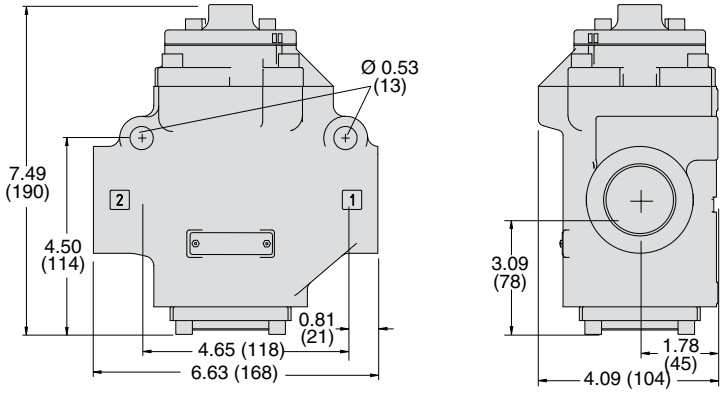
***Valve Response Time** – Response Time (msec) = M + (F • V). This is the average time required to fill a volume V (cubic inches) to 90% of supply pressure or to exhaust it to 10% of supply pressure. M and F values are shown above.
Consult ROSS.

Valve Schematic

Normally Closed (NC)	Normally Open (NO)
	



2/2 Pressure Controlled Valves for Vacuum Applications

DIMENSIONS	Inches (mm)
Body Size 3/8	
Body Size 3/4	
Body Size 1-1/4	
Downloadable CAD models available.	

Ordering Information

3/2 Pressure Controlled Valves for Vacuum Applications

Piping 3/2 Normally Closed Valves

In this valve configuration, pipe the unit into the system by connecting the vacuum source or pump to the normal air pressure inlet port (port 1). The normal outlet port is the work port (port 2), and the normal air pressure exhaust port becomes the atmosphere port (port 3).

PRESSURE CONTROLLED VALVES — **3-Way 2-Position Valves**

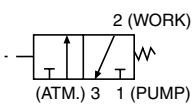
Body Size	Port Size		Valve Model Number	
	In-Out	Exhaust	NPT Thread	G Thread
3/8	1/4	1/2	2153B2900	D2153B2900
	3/8	1/2	2153A3913	D2153A3913
	1/2	1/2	2153B4903	D2153B4903
3/4	3/4	1	2153B5903	D2153B5903
	1	1	2153A6906	D2153A6906
	1	1-1/2	2153C6905	D2153C6905
1-1/4	1-1/4	1-1/2	2153A7906	D2153A7906
	1-1/2	1-1/2	2153B8900	D2153B8900
	2	2-1/2	2153A9903	D2153A9903
2	2-1/2	2-1/2	2153A9902	D2153A9902

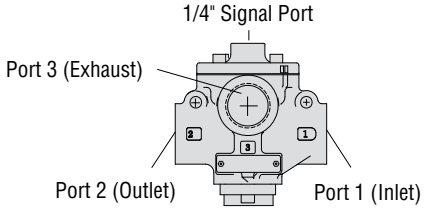
Size			Flow C_V (Nl/min)		Average Response Constants*			Weight lb (kg)
Body	Port 1, 2	Port 3	1-2	2-3	M	F 1-2	F 2-3	
3/8	1/4	1/2	1.7 (1700)	3.2 (3100)	10	1.60	2.30	1.8 (0.8)
	3/8	1/2	2.5 (2500)	4.4 (4300)	10	0.95	1.07	
	1/2	1/2	2.6 (2600)	4.6 (4600)	10	0.94	0.98	
3/4	1/2	1	6.0 (5900)	8.8 (8700)	11	0.38	0.41	4.5 (2.0)
	3/4	1	7.5 (7400)	11 (11000)	11	0.24	0.36	
	1	1	7.9 (7800)	12 (12000)	28	0.17	0.20	
1-1/4	1	1-1/2	20 (20000)	27 (27000)	28	0.15	0.19	11.0 (5.0)
	1-1/4	1-1/2	28 (28000)	33 (32000)	28	0.12	0.16	
	1-1/2	1-1/2	29 (29000)	33 (32000)	28	0.12	0.16	
2	2	2-1/2	70 (69000)	70 (69000)	##	##	##	15.3 (6.9)
	2-1/2	2-1/2	70 (69000)	71 (70000)	##	##	##	

***Valve Response Time** – Response Time (msec) = M + (F • V). This is the average time required to fill a volume V (cubic inches) to 90% of supply pressure or to exhaust it to 10% of supply pressure. M and F values are shown above.

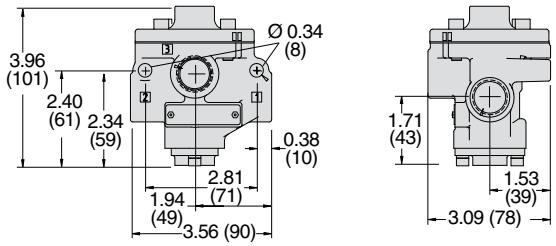
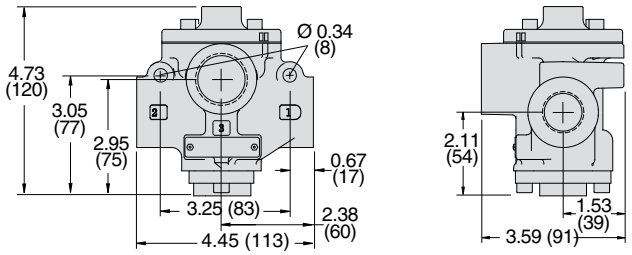
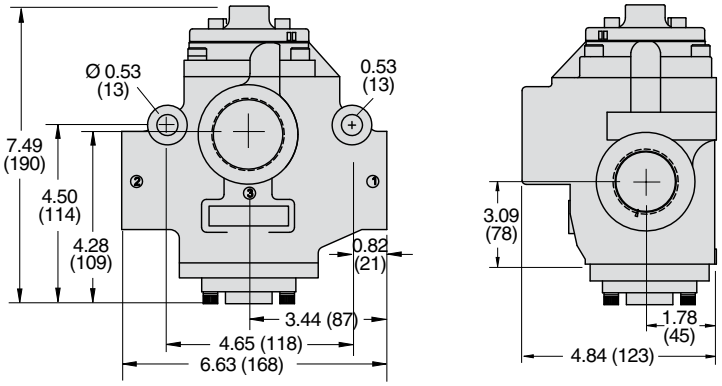
Consult ROSS.

Valve Schematic
Normally Closed





3/2 Pressure Controlled Valves for Vacuum Applications

DIMENSIONS	Inches (mm)
Body Size 3/8	
Body Size 3/4	
Body Size 1-1/4	

Downloadable CAD models available.

EXHAUST SILENCERS

Illustration example.

Silencers

SPECIFICATIONS	Silencer Material	Pressure Range psig (bar)	Schematic
	Aluminum	0-290 (0-20) maximum	

Port Size	Thread Type	Flow C_v (Nl/min)	Model Number		Dimensions inches (mm)		Weight lb (kg)
			NPT Thread	R/Rp Thread	Length	Hex Size (D)	
1/2	Male	6.8 (6700)	5500A4003	D5500A4003	3.6 (9)	1.25 (32)	0.2 (0.1)
1	Male	18 (18000)	5500A6003	D5500A6003	5.4 (14)	2.0 (51)	0.9 (0.4)
1-1/2	Female	39 (38000)	5500A8001	D5500A8001	5.7 (14)	2.5 (64)	1.3 (0.6)
2-1/2	Female	104 (100000)	5500A9002	D5500A9002	4.0 (102)	5.7 (145)	2.9 (1.4)

FEMALE SILENCER CONNECTORS

Hex Nipples

Material	Fitting Pipe Size	Thread Type	Model Number		
			NPT Thread	BSPT Thread	
Steel	1-1/2	Male - Male	488J27	122J39	
	2-1/2	Male - Male	490J27	123J39	

SOLENOID PILOT INDICATOR LIGHT KITS

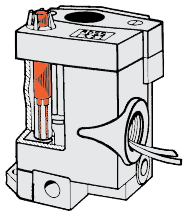


Illustration example.

	Kit Number		
	24 V DC	**110-120 V AC, 50-60 Hz**	**230 V AC, 50-60 Hz**
Indicator Light Kits	862K87-W	862K87-Z	862K87-Y
	To visually verify valve operation, indicator light kits are available for single solenoid models. Indicator lights are standard on double solenoid valves. The indicator light is illuminated when the solenoid is energized.		

SOLENOID PILOT MANUAL OVERRIDE KITS

Flush Button	Extended Button	Extended Button with Palm
		

Illustration examples.

Manual Override Kits

Manual Override Type	Kit Number	
	Locking Type	Non-Locking Type
Flush Button	792K87	790K87
Extended Button	–	791K87
Extended Button with Palm	–	984H87

Flush rubber button, non-locking manual override is standard on solenoid models.

Each of the buttons in the override kits is made of metal and is spring-returned. The locking type button, however, can be kept in the actuated position by turning the slot in the top of the button with a screwdriver.

Notes

CAUTIONS, WARNINGS And STANDARD WARRANTY

ROSS OPERATING VALVE, ROSS CONTROLS®, ROSS DECCO®, and AUTOMATIC VALVE INDUSTRIAL, collectively the "ROSS Group".

PRE-INSTALLATION or SERVICE

1. Before servicing a valve or other pneumatic component, be sure all sources of energy are turned off, the entire pneumatic system is shut down and exhausted, and all power sources are locked out (ref: OSHA 1910.147, EN 1037).

2. All ROSS Group Products, including service kits and parts, should be installed and/or serviced only by persons having training and experience with pneumatic equipment. Because any product can be tampered with and/or need servicing after installation, persons responsible for the safety of others or the care of equipment must check ROSS Group Products on a regular basis and perform all necessary maintenance to ensure safe operating conditions.

3. All applicable instructions should be read and complied with before using any fluid power system to prevent harm to persons or equipment. In addition, overhauled or serviced valves must be functionally tested prior to installation and use. If you have any questions, call your nearest ROSS Group location.

4. Each ROSS Group Product should be used within its specification limits. In addition, use only ROSS Group components to repair ROSS Group Products.

WARNINGS:
Failure to follow these instructions can result in personal injury and/or property damage.

FILTRATION and LUBRICATION

1. Dirt, scale, moisture, etc., are present in virtually every air system. Although some valves are more tolerant of these contaminants than others, best performance will be realized if a filter is installed to clean the air supply, thus preventing contaminants from interfering with the proper performance of the equipment. The ROSS Group recommends a filter with a 5-micron rating for normal applications.

2. All standard ROSS Group filters and lubricators with polycarbonate plastic bowls are designed for compressed air applications only. Use the metal bowl guard, where provided, to minimize danger from high pressure fragmentation in the event of bowl failure. Do not expose these products to certain fluids, such as alcohol or liquefied petroleum gas, as they can cause bowls to rupture, creating a combustible condition and hazardous leakage. Immediately replace crazed, cracked, or deteriorated bowls.

3. Only use lubricants which are compatible with materials used in the valves and other components in the system. Normally, compatible lubricants are petroleum base oils with oxidation inhibitors, an aniline point between 180°F (82°C) and 220°F (104°C), and an ISO 32, or lighter, viscosity. Avoid oils with phosphate type additives which can harm polyurethane components, potentially leading to valve failure which risks personal injury, and/or damage to property.

WARNINGS:
Failure to follow these instructions can result in personal injury and/or property damage.

AVOID INTAKE/EXHAUST RESTRICTION

1. Do not restrict air flow in the supply line. To do so could reduce the pressure of the supply air below minimum requirements for the valve and thereby causing erratic action.

2. Do not restrict a valve's exhaust port as this can adversely affect its operation. Exhaust silencers must be resistant to clogging and must have flow capacities at least as great as the exhaust capacities of the valves. Contamination of the silencer can result in reduced flow and increased back pressure.

WARNINGS: ***Failure to follow these instructions can result in personal injury and/or property damage.***

SAFETY APPLICATIONS

1. Mechanical Power Presses and other potentially hazardous machinery using a pneumatically controlled clutch and brake mechanism must use a press control double valve with a monitoring device. A double valve without a self-contained monitoring device should be used only in conjunction with a control system which assures monitoring of the valve. All double valve installations involving hazardous applications should incorporate a monitoring system which inhibits further operation of the valve and machine in the event of a failure within the valve mechanism.

2. Safe Exhaust (dump) valves without a self-contained monitoring device should be used only in conjunction with a control system which assures monitoring of the valve. All Safe Exhaust valve installations should incorporate a monitoring system which inhibits further operation of the valve and machine in the event of a failure within the valve mechanism.

3. Per specifications and regulations, the ROSS L-O-X® and L-O-X® with EEZ-ON®, N06 and N16 Series operation products are defined as energy isolation devices, NOT AS EMERGENCY STOP DEVICES.

WARNINGS:
Failure to follow these instructions can result in personal injury and/or property damage.

STANDARD WARRANTY

All products sold by the ROSS Group are warranted for a one-year period [with the exception of Filters, Regulators and Lubricators ("FRLs") which are warranted for a period of seven (7) years] from the date of purchase. All products are, during their respective warranty periods, warranted to be free of defects in material and workmanship. The ROSS Group's obligation under this warranty is limited to repair, replacement or refund of the purchase price paid for products which the ROSS Group has determined, in its sole discretion, are defective. All warranties become void if a product has been subject to misuse, misapplication, improper maintenance, modification or tampering. Products for which warranty protection is sought must be returned to the ROSS Group freight prepaid.

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Other literature is available for engineering, maintenance, and service requirements.

If you need products or specifications not shown in this catalog, please visit ROSS' website, contact ROSS or your ROSS distributor. The ROSS Support Team will be happy to assist you in selecting the best product for your application.