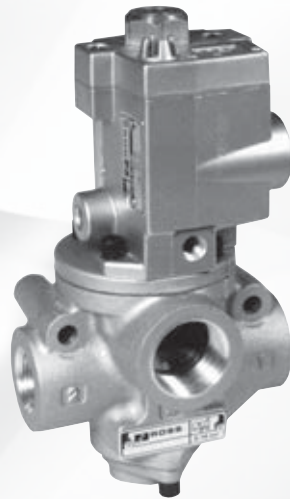


ROSS CONTROLS®



POPPET VALVES 21 SERIES
HIGH TEMPERATURE AND LOW TEMPERATURE APPLICATIONS



POPPET 21 SERIES VALVES – KEY FEATURES

- Low weight; compact size
- Available with choices of internal components for three different temperature ranges
- Can be mounted close to actuator, reducing length of pipe to be pressurized/exhausted on each cycle
- Long life expectancy
- Consistent response times over the life of the valve
- Construction makes them readily adaptable to vacuum service
- Easily field-convertible for use with an external pilot supply
- Models with external pilot supply available, consult ROSS

Type H (High Temperature) Service:

Fluorocarbon seals are used to ensure high temperature stability.
Ambient Temperature: Up to 250°F (122°C) for solenoid models;
 up to 300°F (150°C) for pressure controlled models.
Media Temperature: 0° to 300°F (-17° to 150°C).

Type O (Low Temperature) Service:

Buna-N seals are used to ensure good performance at low temperatures.
Ambient Temperature: Down to -40°F (-40°C).
Media Temperature: -40° to 175°F (-40° to 80°C).

Vacuum Service Valves

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.

Explosion-Proof solenoid pilot valves available, see explosion proof valves.

VALVE TYPE/SERIES	DESCRIPTION		AVAILABLE INLET PORT SIZES												FUNCTIONS					Page						
	Spool & Sleeve	Poppet	1/8	1/4	3/8	1/2	3/4	1	1¼	1½	2	2½	2/2	3/2	3/4	4/2	5/2 Single	5/2 Double	5/3 Closed Center		5/3 Open Center	5/3 Pressure Center	Max Flow (Cv)	Solenoid Control	Direct Solenoid Control	Pressure Control
21																						40				B3.3 - B3.5
21																						40				B3.6 - B3.8
21 Vacuum																						71				B3.9 - B3.10 B3.12 - B3.13
21 Full Vacuum																						71				B3.11
Options & Accessories																								B3.14		

Solenoid Pilot Controlled Valves

For High and Low Temperature Applications

21 Series

2-Way 2-Position Valves, Spring Return

Port Size 1,2	Body Size	Valve Model Number*				Avg. C _v		Average Response Constants#			Weight lb (kg)	
		High Temperature		Low Temperature				M	F			
		Normally Closed	Normally Open	Normally Closed	Normally Open	NC	NO		NC	NO		
1/4	3/8	2171B2001**	2172B2001**	2171B2002**	2172B2002**	2.3	2.3	10	0.96	0.96	3.0 (1.4)	Normally Closed
3/8	3/8	2171B3001**	2172B3001**	2171B3002**	2172B3002**	3.8	3.3	10	0.90	0.93	3.0 (1.4)	
1/2	3/8	2171B4011**	2172B4011**	2171B4012**	2172B4012**	4.0	3.5	10	0.82	0.88	3.0 (1.4)	Normally Open
1/2	3/4	2171B4001**	2172B4001**	2171B4002**	2172B4002**	7.7	6.5	14	0.39	0.50	3.3 (1.5)	
3/4	3/4	2171B5001**	2172B5001**	2171B5002**	2172B5002**	9.0	7.3	14	0.32	0.37	3.3 (1.5)	Normally Open
1	3/4	2171B6011**	2172B6011**	2171B6012**	2172B6012**	9.0	7.9	14	0.31	0.36	3.3 (1.5)	
1	1 1/4	2171B6001**	2172B6001**	2171B6002**	2172B6002**	24	21	26	0.19	0.20	7.5 (3.4)	Normally Open
1 1/4	1 1/4	2171B7001**	2172B7001**	2171B7002**	2172B7002**	29	20	26	0.14	.18	7.5 (3.4)	
1 1/2	1 1/4	2171B8011**	2172B8011**	2171B8012**	2172B8012**	29	21	26	0.13	0.17	7.5 (3.4)	Normally Open

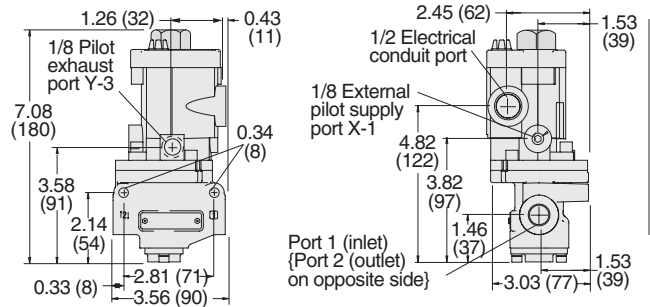
* NPT port threads. For BSPP threads add a "D" prefix to the model number e.g., D2171B2001W.

** Insert voltage code: "W" = 24 volts DC; "Z" = 110-120 volts AC, 50/60 Hz; e.g., 2171B2001W. For other voltages, consult ROSS.

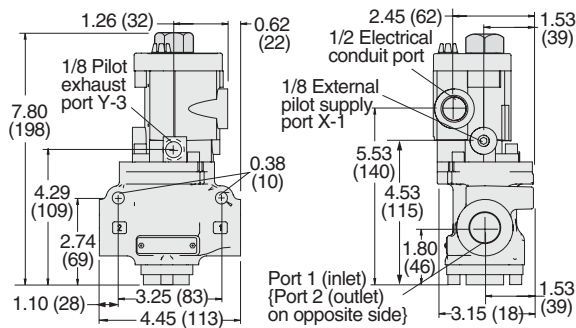
Valve Response Time – Response Time (msec) = M + (F • V). This is the average time required to fill a volume V (cubic inches) to 90% of supply pressure or to exhaust it to 10% of supply pressure. M and F values are shown above.

Valve Dimensions – inches (mm)

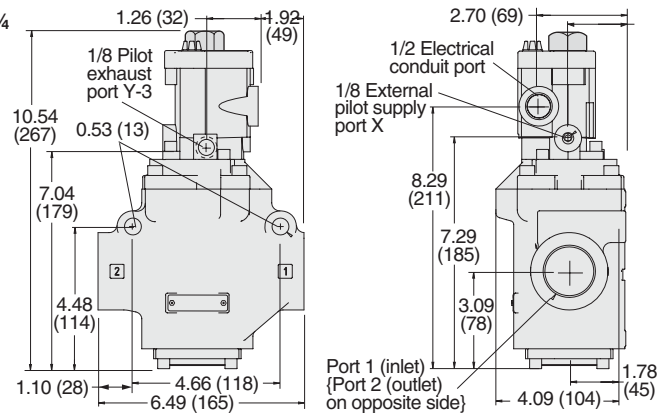
Body Size 3/8



Body Size 3/4



Body Size 1 1/4



Options: Indicator Light Kit, Manual Override Kits; refer to page B3.14.

STANDARD SPECIFICATIONS (for valves on this page):

Construction: Poppet; Metal.

Mounting Type: Inline.

Solenoid Pilot: Rated for continuous duty.

Standard Voltages: 24 volts DC; 110-120 volts AC, 50/60 Hz.

Power Consumption: 87 VA inrush, 30 VA holding on 50 or 60 Hz; 14 watts on DC.

Ambient Temperature: High Temp: 0° to 250°F (-17° to 122°C).

Low Temp: -40° to 120°F (-40° to 50°C).

Media Temperature: High Temp: 0° to 300°F (-17° to 150°C).

Low Temp: -40° to 175°F (-40° to 80°C).

For temperatures below 40°F (4°C) air must be free of water vapor to prevent formation of ice.

Flow Media: Filtered air.

Inlet Pressure: 30 to 150 psig (2 to 10 bar).

Pilot Pressure: When external supply is used, pressure must be equal to or greater than inlet pressure.

Manual Override: Non-locking metal button, standard.

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 or PL d (with application specific diagnosis) in singular application with HFT = 0 and SIL 3 and PL e in redundant application with HFT ≥ 1.

Valve models with EN connector available, consult ROSS.

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



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B3.3

Solenoid Pilot Controlled Valves

For High and Low Temperature Applications

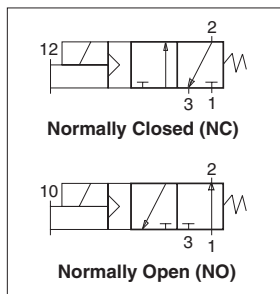
21 Series

B

3-Way 2-Position Valves, Spring Return																	
Port Size			Body Size	Valve Model Number*				C _v				Average Response Constants#				Weight lb (kg)	
				High Temperature		Low Temperature		NC		NO		M		F			
1, 2	3			Normally Closed	Normally Open	Normally Closed	Normally Open	1-2	2-3	1-2	2-3	1-2	2-3	1-2	2-3		
1/4	1/2	3/8		2173B2001**	2174B2001**	2173B2002**	2174B2002**	2.4	3.4	2.0	2.1	10	1.76	2.08	1.60	2.30	3.0 (1.4)
3/8	1/2	3/8		2173B3001**	2174B3001**	2173B3002**	2174B3002**	3.0	5.8	2.3	2.4	10	0.95	1.07	1.03	1.60	3.0 (1.4)
1/2	1/2	3/8		2173B4011**	2174B4011**	2173B4012**	2174B4012**	3.0	5.2	2.9	2.8	10	0.94	0.98	11.00	2.00	3.0 (1.4)
1/2	1	3/4		2173B4001**	2174B4001**	2173B4002**	2174B4002**	6.6	12	6.5	7.0	11	0.58	0.64	0.50	0.70	3.3 (1.5)
3/4	1	3/4		2173B5001**	2174B5001**	2173B5002**	2174B5002**	7.8	13	7.5	7.5	11	0.38	0.41	0.43	0.67	3.3 (1.5)
1	1	3/4		2173B6011**	2174B6011**	2173B6012**	2174B6012**	7.5	12	7.7	7.6	11	0.24	0.36	0.42	0.60	3.3 (1.5)
1	1½	1¼		2173B6001**	2174B6001**	2173B6002**	2174B6002**	24	40	15	17	28	0.16	0.18	0.17	0.20	7.5 (3.4)
1¼	1½	1¼		2173B7001**	2174B7001**	2173B7002**	2174B7002**	29	39	21	23	28	0.12	0.17	0.15	0.19	7.5 (3.4)
1½	1½	1¼		2173B8011**	2174B8011**	2173B8012**	2174B8012**	30	38	22	23	28	0.12	0.16	0.13	0.18	7.5 (3.4)

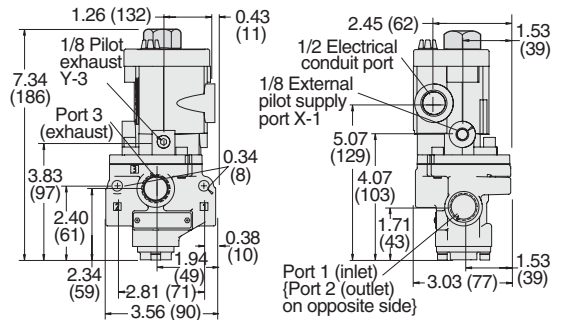
* NPT port threads. For BSPP threads add a "D" prefix to the model number e.g., D2173B2001W.
 ** Insert voltage code: "W" = 24 volts DC; "Z" = 110-120 volts AC, 50/60 Hz; e.g., 2173B2001W. For other voltages, consult ROSS.
 # Valve Response Time – Response Time (msec) = M + (F • V). This is the average 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.

B3

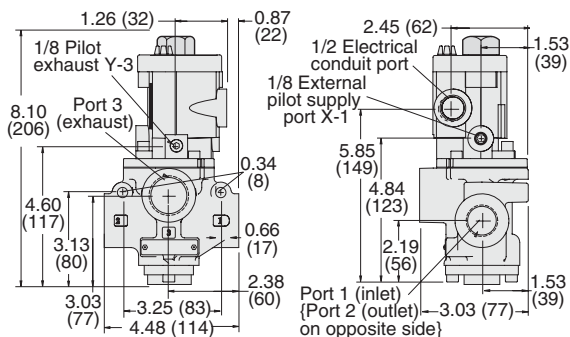


Valve Dimensions – inches (mm)

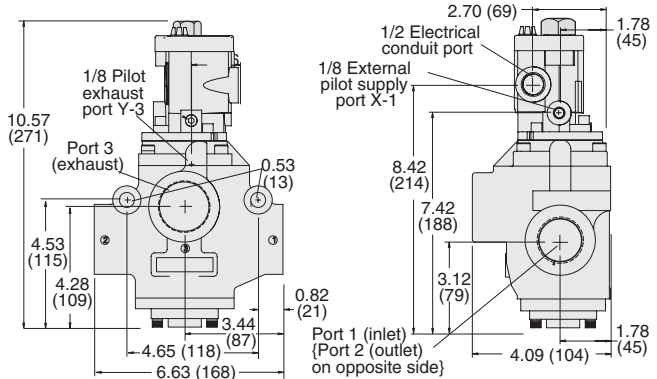
Body Size 3/8



Body Size 3/4



Body Size 1¼



Options: Indicator Light Kit, Manual Override Kits; refer to page B3.14. Silencers ordered separately, refer to page B3.14.

STANDARD SPECIFICATIONS (for valves on this page):

Construction: Poppet; Metal.
Mounting Type: Inline.
Solenoid Pilot: Rated for continuous duty.
Standard Voltages: 24 volts DC; 110-120 volts AC, 50/60 Hz.
Power Consumption: 87 VA inrush, 30 VA holding on 50 or 60 Hz; 14 watts on DC.
Ambient Temperature: High Temp: 0° to 250°F (-17° to 122°C). Low Temp: -40° to 120°F (-40° to 50°C).
Media Temperature: High Temp: 0° to 300°F (-17° to 150°C). Low Temp: -40° to 175°F (-40° to 80°C).
 For temperatures below 40°F (4°C) air must be free of water vapor to prevent formation of ice.

Flow Media: Filtered air.
Inlet Pressure: 30 to 150 psig (2 to 10 bar).
Pilot Pressure: When external supply is used, pressure must be equal to or greater than inlet pressure.
Manual Override: Non-locking metal button, standard.

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 or PL d (with application specific diagnosis) in singular application with HFT = 0 and SIL 3 and PL e in redundant application with HFT ≥ 1.

Valve models with EN connector available, consult ROSS.

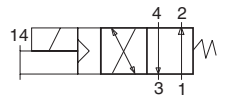
IMPORTANT NOTE: Please read carefully and thoroughly all of the **CAUTIONS, WARNINGS** on the inside back cover.

Solenoid Pilot Controlled Valves

For High and Low Temperature Applications

21 Series

4-Way 2-Position Valves, Spring Return											
Port Size		Body Size	Valve Model Number*		C _v		Average Response Constants#			Weight lb (kg)	
1, 2, 4	3		High Temperature	Low Temperature	1-2, 1-4	4-3, 2-3	M	F			
								1-2, 1-4	4-3, 2-3		
1/4	1/2	3/8	2176B2001**	2176B2002**	2.1	2.2	30	1.70	2.28	3.0 (1.4)	
3/8	1/2	3/8	2176B3001**	2176B3002**	2.5	3.1	30	1.13	1.33	3.0 (1.4)	
1/2	1/2	3/8	2176B4011**	2176B4012**	2.9	3.8	30	1.00	1.22	3.0 (1.4)	
1/2	1	3/4	2176B4001**	2176B4002**	5.7	6.5	46	0.50	0.76	5.8 (2.6)	
3/4	1	3/4	2176B5001**	2176B5002**	7.1	8.7	46	0.36	0.55	5.8 (2.6)	
1	1	3/4	2176B6011**	2176B6012**	7.7	10	46	0.36	0.50	5.8 (2.6)	
1	1½	1¼	2176B6001**	2176B6002**	18	23	99	0.19	0.22	12.0 (5.4)	
1¼	1½	1¼	2176B7001**	2176B7002**	20	28	99	0.19	0.22	12.0 (5.4)	
1½	1½	1¼	2176B8011**	2176B8012**	21	29	99	0.16	0.22	12.0 (5.4)	

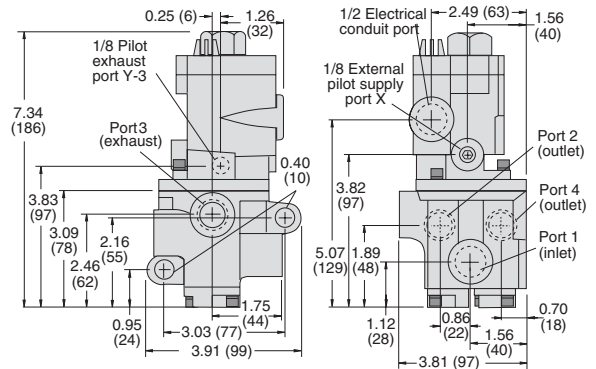


B

* NPT port threads. For BSPP threads add a "D" prefix to the model number e.g., D2176B2001W.
 ** Insert voltage code: "W" = 24 volts DC; "Z" = 110-120 volts AC, 50/60 Hz; e.g., 2176B2001W. For other voltages, consult ROSS.
 # 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.

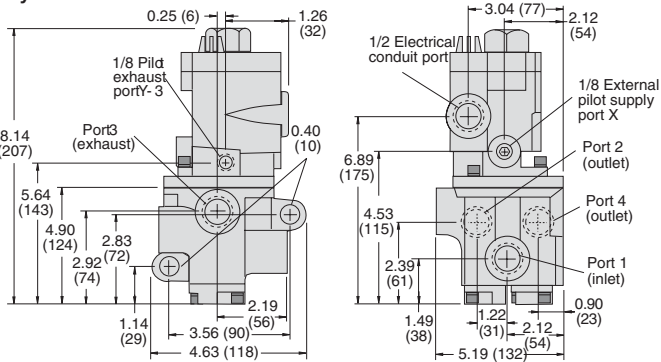
Valve Dimensions – inches (mm)

Body Size 3/8

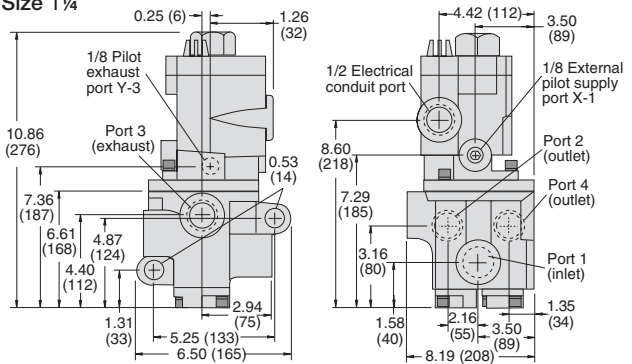


B3

Body Size 3/4



Body Size 1¼



Options: Indicator Light Kit, Manual Override Kits; refer to page B3.14. Silencers ordered separately, refer to page B3.14.

STANDARD SPECIFICATIONS (for valves on this page):

Construction: Poppet; Metal.
Mounting Type: Inline.
Solenoid Pilot: Rated for continuous duty.
Standard Voltages: 24 volts DC; 110-120 volts AC, 50/60 Hz.
Power Consumption: 87 VA inrush, 30 VA holding on 50 or 60 Hz; 14 watts on DC.
Ambient Temperature: High Temp: 0° to 250°F (-17° to 122°C).
 Low Temp: -40° to 120°F (-40° to 50°C).
Media Temperature: High Temp: 0° to 300°F (-17° to 150°C).
 Low Temp: -40° to 175°F (-40° to 80°C).
 For temperatures below 40°F (4°C) air must be free of water vapor to prevent formation of ice.

Flow Media: Filtered air.
Inlet Pressure: 30 to 150 psig (2 to 10 bar).
Pilot Pressure: When external supply is used, pressure must be equal to or greater than inlet pressure.
Manual Override: Non-locking metal button, standard.

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 or PL d (with application specific diagnosis) in singular application with HFT = 0 and SIL 3 and PL e in redundant application with HFT ≥ 1.

Valve models with EN connector available, consult ROSS.

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



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B3.5

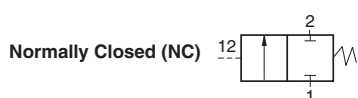
Pressure Controlled Valves

For High and Low Temperature Applications

21 Series

2-Way 2-Position Valves, Spring Return

Port Size	Body Size	Valve Model Number*				Avg. C _v		Average Response Constants#			Weight lb (kg)
		High Temperature		Low Temperature		NC	NO	M	F		
		Normally Closed	Normally Open	Normally Closed	Normally Open				NC	NO	
1/4	3/8	2151B2001	2152B2001	2151B2002	2152B2002	2.3	2.3	10	0.91	0.91	1.8 (0.8)
3/8	3/8	2151B3001	2152B3001	2151B3002	2152B3002	3.8	3.3	10	0.70	0.76	1.8 (0.8)
1/2	3/8	2151B4011	2152B4011	2151B4012	2152B4012	4.0	3.5	10	0.64	0.72	1.8 (0.8)
1/2	3/4	2151B4001	2152B4001	2151B4002	2152B4002	7.7	6.5	16	0.37	0.43	4.2 (2.0)
3/4	3/4	2151B5001	2152B5001	2151B5002	2152B5002	9.0	7.3	16	0.34	0.39	4.2 (2.0)
1	3/4	2151B6011	2152B6011	2151B6012	2152B6012	9.0	7.9	16	0.34	0.37	4.2 (2.0)
1	1¼	2151B6001	2152B6001	2151B6002	2152B6002	24	21	27	0.17	0.17	11.0 (5.0)
1¼	1¼	2151B7001	2152B7001	2151B7002	2152B7002	29	20	27	0.19	0.19	11.0 (5.0)
1½	1¼	2151B8011	2152B8011	2151B8012	2152B8012	29	21	27	0.18	0.18	11.0 (5.0)

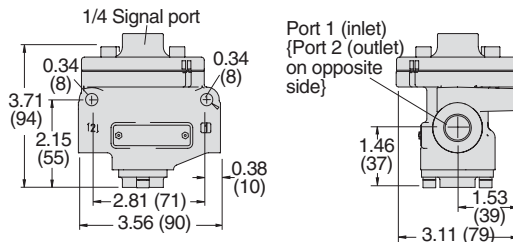


* NPT port threads. For BSPP threads add a "D" prefix to the model number e.g., D2151B2001.

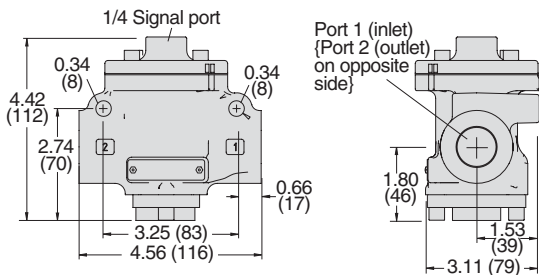
Valve Response Time – Response Time (msec) = M + (F • V). This is the average time required to fill a volume V (cubic inches) to 90% of supply pressure or to exhaust it to 10% of supply pressure. M and F values are shown above.

Valve Dimensions – inches (mm)

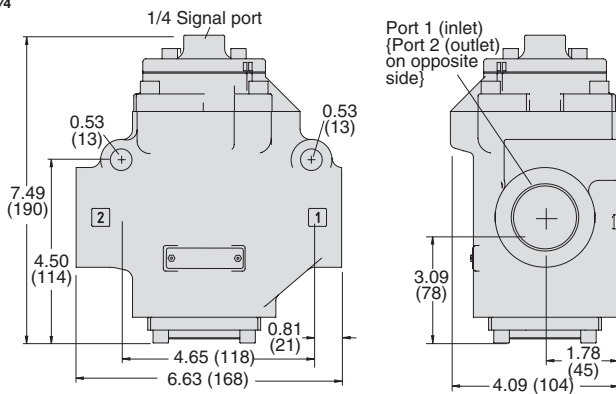
Body Size 3/8



Body Size 3/4



Body Size 1¼



Silencers ordered separately, refer to page B3.14.

STANDARD SPECIFICATIONS (for valves on this page):

Construction: Poppet; Metal.

Mounting Type: Inline.

Ambient/Media Temperatures:

High Temperature: 0° to 300°F (-17° to 150°C).

Low Temperature: -40° to 175°F (-40° to 80°C).

For temperatures below 40°F (4°C) air must be free of water vapor to prevent formation of ice.

Flow Media: Filtered air.

Inlet Pressure: 30 to 150 psig (2 to 10 bar).

Pilot Pressure: Must be equal to or greater than inlet pressure.

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 or PL d (with application specific diagnosis) in singular application with HFT = 0 and SIL 3 and PL e in redundant application with HFT ≥ 1.

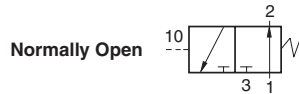
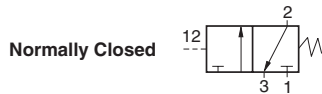
IMPORTANT NOTE: Please read carefully and thoroughly all of the **CAUTIONS, WARNINGS** on the inside back cover.

Pressure Controlled Valves

For High and Low Temperature Applications

21 Series

3-Way 2-Position Valves, Spring Return																									
Port Size		Body Size	Valve Model Number*				C _v				Average Response Constants#				Weight lb (kg)										
			High Temperature		Low Temperature		NC		NO		F														
1, 2	3		Normally Closed	Normally Open	Normally Closed	Normally Open	1-2	2-3	1-2	2-3	M	NC		NO											
											1-2	2-3	1-2	2-3											
1/4	1/2	3/8	2153B2001	2154B2001	2153B2002	2154B2002	2.4	3.4	2.0	2.1	10	1.76	2.08	1.60	2.30	1.8 (0.8)									
3/8	1/2	3/8	2153B3001	2154B3001	2153B3002	2154B3002	3.0	5.8	2.3	2.4	10	0.95	1.07	1.03	1.60	1.8 (0.8)									
1/2	1/2	3/8	2153B4011	2154B4011	2153B4012	2154B4012	3.0	5.2	2.9	2.8	10	0.94	0.98	11.00	2.00	1.8 (0.8)									
1/2	1	3/4	2153B4001	2154B4001	2153B4002	2154B4002	6.6	12	6.5	7.0	11	0.58	0.64	0.50	0.70	4.5 (2.1)									
3/4	1	3/4	2153B5001	2154B5001	2153B5002	2154B5002	7.8	13	7.5	7.5	11	0.38	0.41	0.43	0.67	4.5(2.1)									
1	1	3/4	2153B6011	2154B6011	2153B6012	2154B6012	7.5	12	7.7	7.6	11	0.24	0.36	0.42	0.60	4.5 (2.1)									
1	1½	1¼	2153B6001	2154B6001	2153B6002	2154B6002	24	40	15	17	28	0.16	0.18	0.17	0.20	11.0 (5.0)									
1¼	1½	1¼	2153B7001	2154B7001	2153B7002	2154B7002	29	39	21	23	28	0.12	0.17	0.15	0.19	11.0 (5.0)									
1½	1½	1¼	2153B8011	2154B8011	2153B8012	2154B8012	30	38	22	23	28	0.12	0.16	0.13	0.18	11.0 (5.0)									

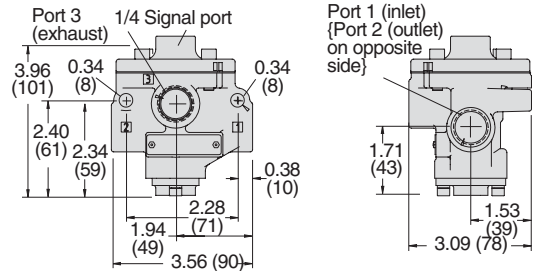


* NPT port threads. For BSPP threads add a "D" prefix to the model number e.g., D2153B2001.

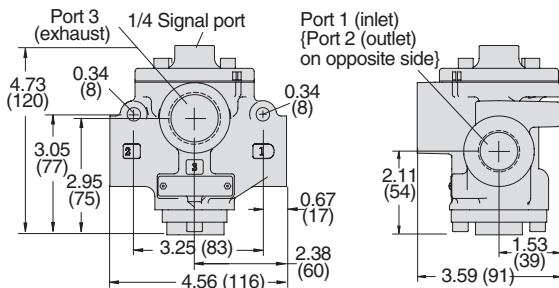
Valve Response Time – Response Time (msec) = M + (F • V). This is the average time required to fill a volume V (cubic inches) to 90% of supply pressure or to exhaust it to 10% of supply pressure. M and F values are shown above.

Valve Dimensions – inches (mm)

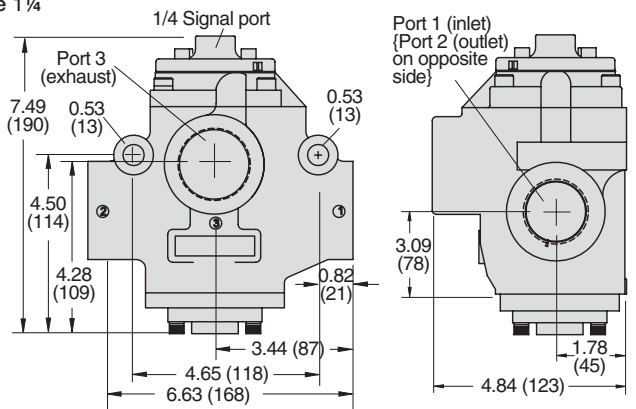
Body Size 3/8



Body Size 3/4



Body Size 1¼



Silencers ordered separately, refer to page B3.14.

STANDARD SPECIFICATIONS (for valves on this page):

Construction: Poppet; Metal.

Mounting Type: Inline.

Ambient/Media Temperatures:

High Temperature: 0° to 300°F (-17° to 150°C).

Low Temperature: -40° to 175°F (-40° to 80°C).

For temperatures below 40°F (4°C) air must be free of water vapor to prevent formation of ice.

Flow Media: Filtered air.

Inlet Pressure: 30 to 150 psig (2 to 10 bar).

Pilot Pressure: Must be equal to or greater than inlet pressure.

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 or PL d (with application specific diagnosis) in singular application with HFT = 0 and SIL 3 and PL e in redundant application with HFT ≥ 1.

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



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B3.7

Pressure Controlled Valves

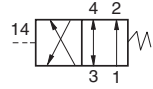
For High and Low Temperature Applications

21 Series

B

4-Way 2-Position Valves, Spring Return

Port Size		Body Size	Valve Model Number*		C _v		Average Response Constants#			Weight lb (kg)
1, 2, 4	3		High Temperature	Low Temperature	1-2, 1-4	4-3, 2-3	M	F		
								1-2, 1-4	4-3, 2-3	
1/4	1/2	3/8	2156B2001	2156B2002	2.1	2.9	30	1.70	2.28	3.0 (1.4)
3/8	1/2	3/8	2156B3001	2156B3002	2.9	4.2	30	1.13	1.33	3.0 (1.4)
1/2	1/2	3/8	2156B4011	2156B4012	3.1	4.3	30	1.00	1.22	3.0 (1.4)
1/2	1	3/4	2156B4001	2156B4002	5.6	8.1	46	0.50	0.76	5.8 (2.6)
3/4	1	3/4	2156B5001	2156B5002	7.0	9.3	46	0.36	0.55	5.8 (2.6)
1	1	3/4	2156B6011	2156B6012	7.8	10	46	0.36	0.50	5.8 (2.6)
1	1½	1¼	2156B6001	2156B6002	19	26	99	0.19	0.22	12.0 (5.4)
1¼	1½	1¼	2156B7001	2156B7002	21	27	99	0.19	0.18	12.0 (5.4)
1½	1½	1¼	2156B8011	2156B8012	22	27	99	0.16	0.15	12.0 (5.4)

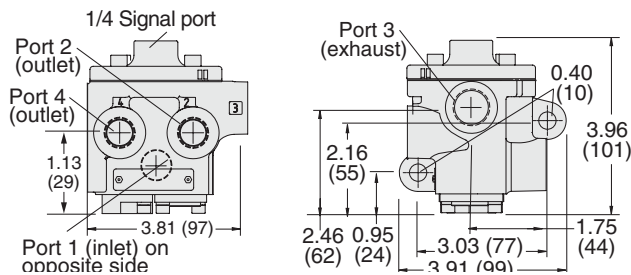


* NPT port threads. For BSPP threads add a "D" prefix to the model number e.g., D2156B2001.

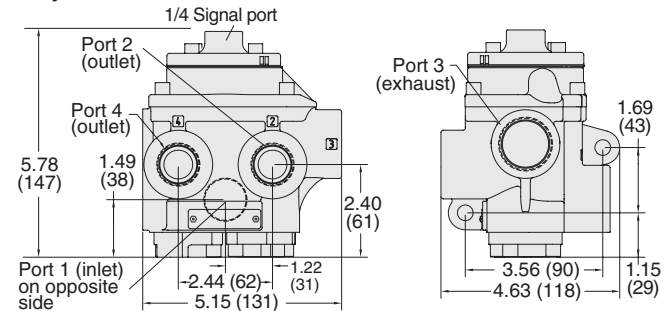
Valve Response Time – Response Time (msec) = M + (F • V). This is the average time required to fill a volume V (cubic inches) to 90% of supply pressure or to exhaust it to 10% of supply pressure. M and F values are shown above.

Valve Dimensions – inches (mm)

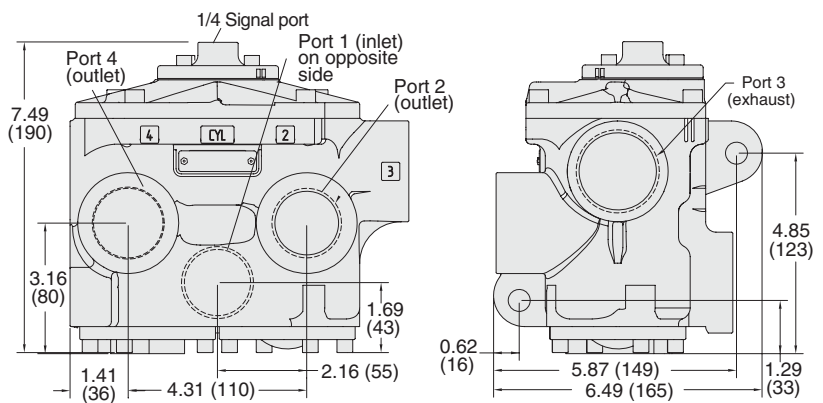
Body Size 3/8



Body Size 3/4



Body Size 1¼



Silencers ordered separately, refer to page B3.14.

STANDARD SPECIFICATIONS (for valves on this page):

Construction: Poppet; Metal.

Mounting Type: Inline.

Ambient/Media Temperatures:

High Temperatures: 0° to 300°F (-17° to 150°C).

Low Temperatures: -40° to 175°F (-40° to 80°C).

For temperatures below 40°F (4°C) air must be free of water vapor to prevent formation of ice.

Flow Media: Filtered air.

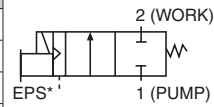
Inlet Pressure: 30 to 150 psig (2 to 10 bar).

Pilot Pressure: Must be equal to or greater than inlet pressure.

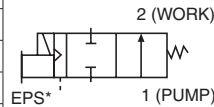
Safety Integrity Level (SIL) – Certified by TÜV Rheinland in accordance to IEC 61508 and IEC 61511 safety integrity level 2 (SIL 2) and EN ISO 13849-1, PL c or PL d (with application specific diagnosis) in singular application with HFT = 0 and SIL 3 and PL e in redundant application with HFT ≥ 1.

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

2-Way 2-Position Valves, Spring Return							
Port Size	Body Size	Valve Model Number*	Function	C _v	Average Response Constants#		Weight lb (kg)
					M	F	
1/4	3/8	2171B2901**	NC	2.1	10	0.96	3.0 (1.4)
3/8	3/8	2171B3906**	NC	2.6	10	0.90	3.0 (1.4)
1/2	3/8	2171A4917**	NC	2.6	10	0.82	3.0 (1.4)
3/4	3/4	2171B5905**	NC	7.8	14	0.39	3.3 (1.5)
1	3/4	2171B6904**	NC	8.3	14	0.32	3.3 (1.5)
1	1¼	2171B6916**	NC	20	14	0.31	3.3 (1.5)
1¼	1¼	2171B7901**	NC	30	26	0.19	7.5 (3.4)
1¼	1¼	2171B8906**	NC	31	26	0.14	7.5 (3.4)
1½	1¼	2172B8900**	NO	21	26	0.17	7.5 (3.4)
1½	2	2171B8900**	NC	57	##	##	15.5 (6.9)
2½	2	2171B9901**	NC	64	##	##	15.5 (6.9)



Normally Closed (NC)



Normally Open (NO)

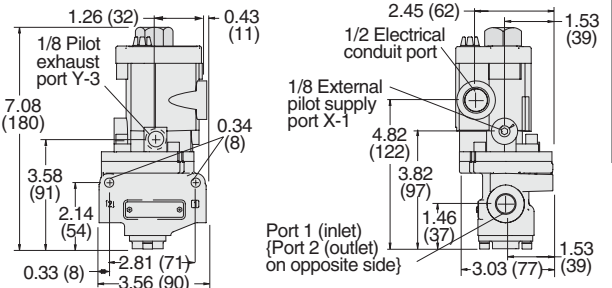
* NPT port threads. For BSPP threads add a "D" prefix to the model number e.g., D2171B2901W.
 ** Insert voltage code: "W" = 24 volts DC; "Z" = 110-120 volts AC, 50/60 Hz; e.g., 2171B2901W.
 For other voltages, consult ROSS.
 # **Valve Response Time** – Response Time (msec) = M + (F • V). This is the 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.

Piping 2/2 Normally Closed or Normally Open Valves

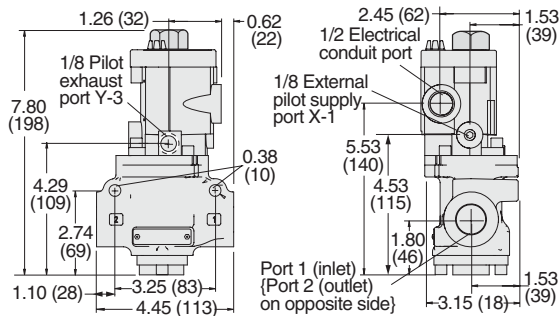
Pipe the unit into the system by connecting the vacuum source or pump to the normal air pressure inlet port (port 1). The normal outlet port is the work port (port 2).
Note: 2/2 vacuum valves provide only on/off control and do not have an exhaust function.

Valve Dimensions – inches (mm)

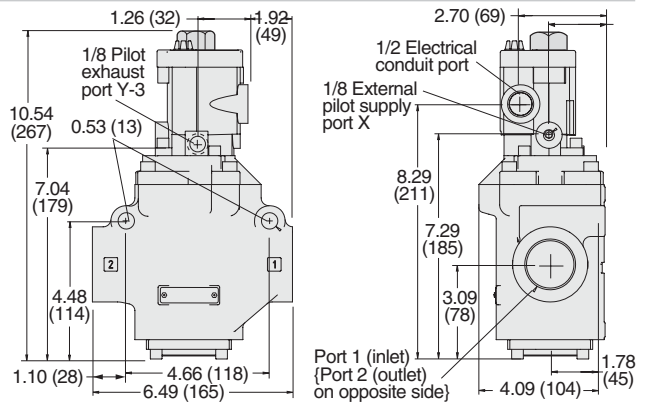
Body Size 3/8



Body Size 3/4



Body Size 1¼



Options: Indicator Light Kit, Manual Override Kits; refer to page B3.14.

STANDARD SPECIFICATIONS (for valves on this page):

Construction: Poppet; Metal.
Mounting Type: Inline.
Solenoid Pilot: Rated for continuous duty.
Standard Voltages: 24 volts DC; 110-120 volts AC, 50/60 Hz.
Power Consumption: 87 VA inrush, 30 VA holding on 50 or 60 Hz; 14 Watts on DC.
Ambient Temperature: -40° to 120° F (-40° to 50° C), for low temperature valves. High temperature valves also available.
Media Temperature: -40° to 175° F (-40° to 80° C).

Flow Media: Vacuum and/or filtered-compressed air.
Pressure: Vacuum to 150 psig (vacuum to 10 bar).
***External Pilot Pressure:** Equal or higher than inlet pressure, but not less than 30 psig.

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 or PL d (with application specific diagnosis) in singular application with HFT = 0 and SIL 3 and PL e in redundant application with HFT ≥ 1.

Valve models with EN connector available, consult ROSS.

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



Solenoid Pilot Controlled Valves

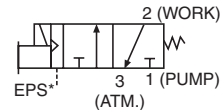
For Vacuum Applications

21 Series

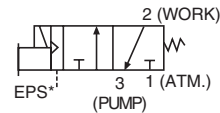
3-Way 2-Position Valves, Spring Return

Port Size		Body Size	Valve Model Number*	C _v		Function	Average Response Constants#			Weight lb (kg)	
1, 2	3			1-2	2-3		M	F			
								In-Out	Out-Exh.		
1/4	1/2	3/8	2173B2900**	2.4	3.4	NC	10	1.76	2.08	3.0 (1.4)	
3/8	1/2	3/8	2173B3900**	3.0	5.8	NC	10	0.95	1.07	3.0 (1.4)	
3/8	1/2	3/8	2174B3900**	3.0	5.8	NC	10	0.95	1.07	3.0 (1.4)	
3/8	1/2	3/8	2173B3908**	3.0	5.8	NO	10	0.95	1.07	3.0 (1.4)	
1/2	1/2	3/8	2173B4901**	3.0	5.2	NC	10	0.94	0.98	3.0 (1.4)	
1/2	1	3/4	2173B4902**	6.6	12	NC	11	0.58	0.64	3.3 (1.5)	
1/2	1	3/4	2174A4912**	6.5	7.0	NC	11	0.58	0.64	3.3 (1.5)	
3/4	1	3/4	2173B5900**	7.8	13	NC	11	0.38	0.41	3.3 (1.5)	
3/4	1	3/4	2174B5903**	7.5	7.5	NC	11	0.38	0.41	3.3 (1.5)	
1	1	3/4	2173B6901**	7.5	12	NC	11	0.24	0.36	3.3 (1.5)	
1	1 1/2	1 1/4	2173B6902**	24	40	NC	28	0.16	0.18	7.5 (3.4)	
1	1 1/2	1 1/4	2174A6914**	15	17	NO	28	0.16	0.18	7.5 (3.4)	
1 1/4	1 1/2	1 1/4	2173B7901**	29	39	NC	28	0.12	0.17	7.5 (3.4)	
1 1/4	1 1/2	1 1/4	2173B7917**	29	39	NO	28	0.12	0.17	7.5 (3.4)	
1 1/2	1 1/2	1 1/4	2173B8900**	30	38	NC	28	0.12	0.16	7.5 (3.4)	
1 1/2	2 1/2	2	2173A8915**	68	70	NC	##	##	##	16.5 (7.4)	
2	2 1/2	2	2173A9905**	70	70	NC	##	##	##	16.5 (7.4)	
2 1/2	2 1/2	2	2173A9906**	70	71	NC	##	##	##	16.5 (7.4)	

* NPT port threads. For BSPP threads add a "D" prefix to the model number, e.g., D2173B2900W.
 ** Insert voltage code: "W" = 24 volts DC; "Z" = 110-120 volts AC, 50/60 Hz; e.g., 2173B2900W.
 For other voltages, consult ROSS.
 # 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.



Normally Closed



Normally Open

Piping 3/2 Normally Closed (NC) Valves

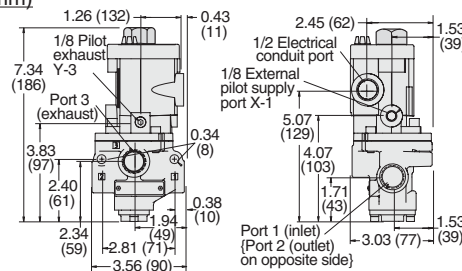
In this valve configuration, pipe the unit into the system by connecting the vacuum source or pump to the normal air pressure inlet port (port 1). The normal outlet port is the work port (port 2), and the normal air pressure exhaust port becomes the atmosphere port (port 3).

Piping 3/2 Normally Open (NO) Valves

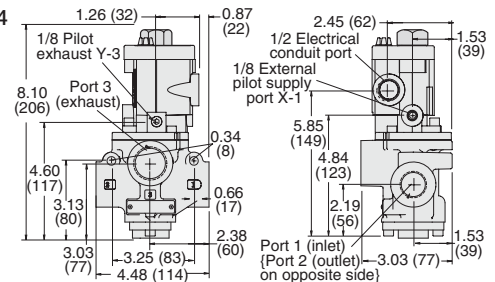
To obtain a 3/2 normally open ROSS vacuum valve, simply pipe the 3/2 normally closed body slightly differently. Connect the vacuum source or pump to port 3, the normal exhaust. Leave port 1 open to atmosphere, and the normal outlet remains as the work port (port 2).

Valve Dimensions – inches (mm)

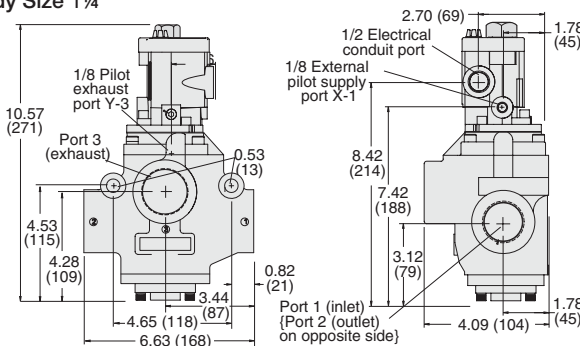
Body Size 3/8



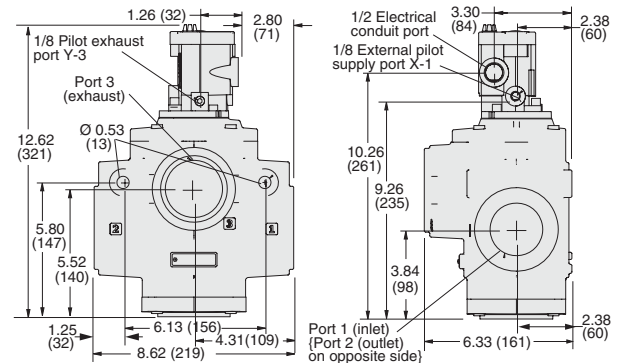
Body Size 3/4



Body Size 1 1/4



Body Size 2



Options: Indicator Light Kit, Manual Override Kits; refer to page B3.14. Silencers ordered separately, refer to page B3.14.

STANDARD SPECIFICATIONS (for valves on this page):

Construction: Poppet; Metal.
Mounting Type: Inline.
Solenoid Pilot: Rated for continuous duty.
Standard Voltages: 24 volts DC; 110-120 volts AC, 50/60 Hz.
Power Consumption: 87 VA inrush, 30 VA holding on 50 or 60 Hz; 14 watts on DC.
Ambient Temperature: -40° to 120° F (-40° to 50° C), for low temperature valves. High temperature valves also available.
Media Temperature: -40° to 175° F (-40° to 80° C).

Flow Media: Vacuum and/or filtered-compressed air.
Pressure: Vacuum to 150 psig (vacuum to 10 bar).
***External Pilot Pressure:** Equal or higher than inlet pressure, but not less than 30 psig.

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 or PL d (with application specific diagnosis) in singular application with HFT = 0 and SIL 3 and PL e in redundant application with HFT ≥ 1.

Valve models with EN connector available, consult ROSS.

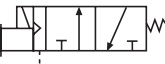
IMPORTANT NOTE: Please read carefully and thoroughly all of the **CAUTIONS, WARNINGS** on the inside back cover.


Solenoid Pilot Controlled Valves

For Full Vacuum Applications

21 Series

3-Way 2-Position Valves, Spring Return										
Port Size		Body Size	Valve Model Number*	C _v		Function	Average Response Constants#			Weight lb (kg)
1, 2	3			1-2	2-3		M	F		
							In-Out	Out-Exh.		
1/2	1/2	3/8	2174B4900**	2.8	2.8	NC	11	0.58	0.64	3.0 (1.4)
1/2	1/2	3/8	2173B4914**	3.0	5.2	NO	11	0.50	0.70	3.0 (1.4)
1¼	1½	1¼	2174B7903**	23	23	NC	28	0.12	0.17	7.5 (3.4)
1¼	1½	1¼	2173B7904**	39	39	NO	28	0.15	0.19	7.5 (3.4)

Normally Closed 

Normally Open 

* NPT port threads. For BSPP threads add a "D" prefix to the model number e.g., D2173B4914W.

** Insert voltage code: "W" = 24 volts DC; "Z" = 110-120 volts AC, 50/60 Hz; e.g., 2173B4914W. For other voltages, consult ROSS.

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.

Full Vacuum – 3-Way Normally Closed (NC) Valves

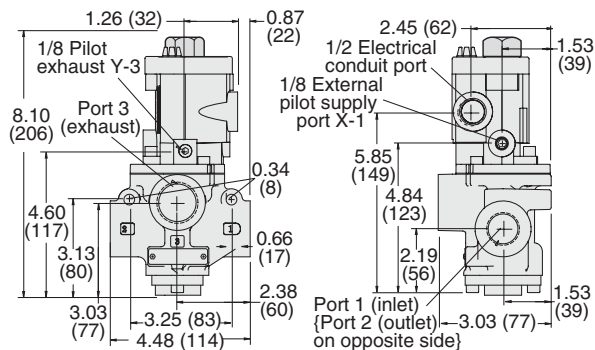
This valve functions as a **normally open** valve. Pipe the unit into the system by connecting the vacuum source or pump to port 3, the normal exhaust. Leave port 1 open to atmosphere, and the normal outlet remains as the work port (port 2).

Full Vacuum – 3-Way Normally Open (NO) Valves

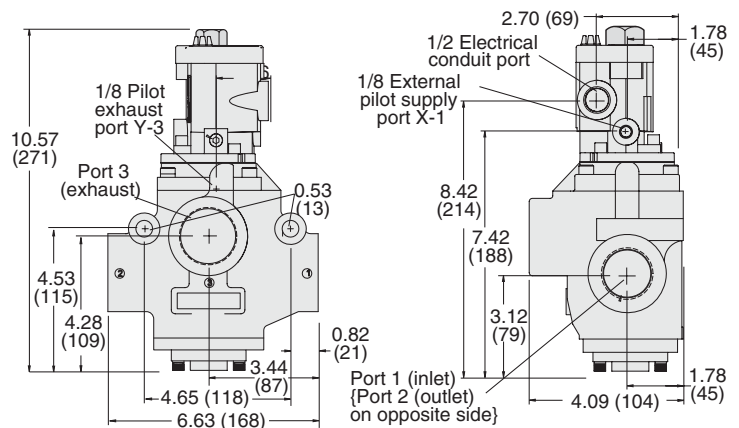
This valve functions as a normally closed valve. Pipe the unit into the system by connecting the vacuum source or pump to port 3, the normal exhaust. Leave port 1 open to atmosphere, and the normal outlet remains as the work port (port 2).

Valve Dimensions – inches (mm)

Body Size 3/8



Body Size 1¼



Options: Indicator Light Kit, Manual Override Kits; refer to page B3.14. Silencers ordered separately, refer to page B3.14.

STANDARD SPECIFICATIONS (for valves on this page):

Construction: Poppet; Metal.

Mounting Type: Inline.

Solenoids: Rated for continuous duty.

Standard Voltages: 24 volts DC; 110-120 volts AC, 50/60 Hz.

Power Consumption: 87 VA inrush, 30 VA holding on 50 or 60 Hz; 14 Watts on DC.

Ambient Temperature: -40° to 120° F (-40° to 50° C), for low temperature valves. High temperature valves also available.

Media Temperature: -40° to 175° F (-40° to 80° C).

Flow Media: Vacuum and/or filtered-compressed air.

Pressure: Vacuum to 150 psig (vacuum to 10 bar).

***External Pilot Pressure:** Equal or higher than inlet pressure, but not less than 30 psig.

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 or PL d (with application specific diagnosis) in singular application with HFT = 0 and SIL 3 and PL e in redundant application with HFT ≥ 1.

Valve models with EN connector available, consult ROSS.

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

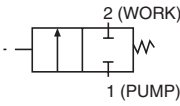
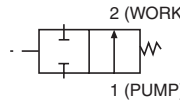


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B3.11

2-Way 2-Position Valves, Spring Return

Port Size	Body Size	Valve Model Number*	Function	C _v	Average Response Constants#		Weight lb (kg)	 Normally Closed (NC)
					M	F		
1, 2								
1/4	3/8	2151A2901	NC	2.1	10	0.96	1.8 (0.8)	 Normally Open (NO)
1/2	3/8	2151A4910	NC	3.0	10	0.90	1.8 (0.8)	
1/2	3/4	2151B4904	NC	6.9	10	0.82	4.5 (2.0)	
3/4	3/4	2151A5913	NC	7.8	14	0.39	4.5 (2.0)	
3/4	3/4	2152A5901	NO	7.0	14	0.37	4.5 (2.0)	
1	3/4	2151B6900	NC	8.3	14	0.19	4.5 (2.0)	
1 1/4	1 1/4	2151A7909	NC	30	26	0.14	11.0 (5.0)	
1 1/2	1 1/4	2151B8900	NC	31	26	0.13	11.0 (5.0)	
1 1/2	1 1/4	2152B7900	NO	23	26	0.17	11.0 (5.0)	

* NPT port threads. For BSP threads add a "D" prefix to the model number e.g., D2151A2901.

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.

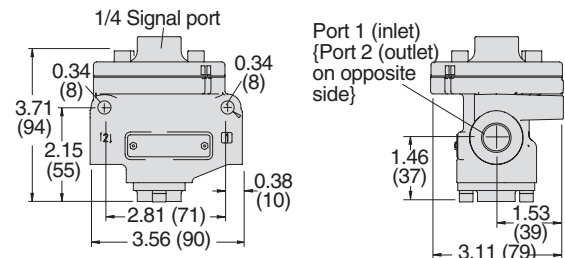
Piping 2/2 Normally Closed (NC) Valves

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).

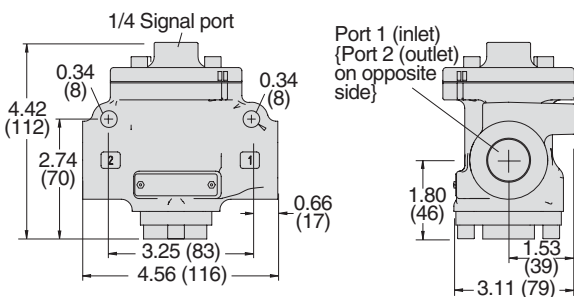
Note: 2/2 vacuum valves provide only on/off control and do not have an exhaust function.

Valve Dimensions – inches (mm)

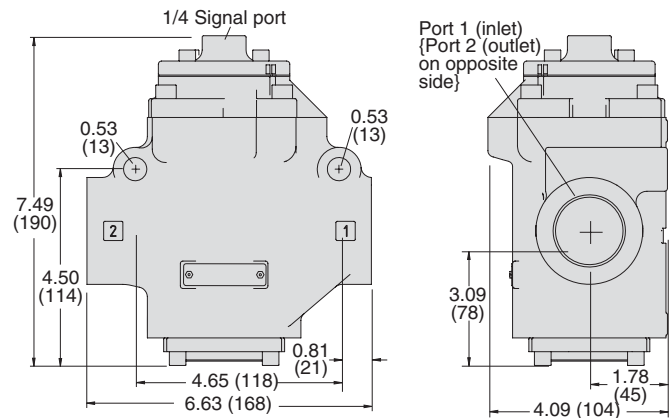
Body Size 3/8



Body Size 3/4



Body Size 1 1/4



STANDARD SPECIFICATIONS (for valves on this page):

Construction: Poppet; Metal.

Mounting Type: Inline.

Media Temperature: -40° to 175° F (-40° to 80° C).

Flow Media: Vacuum and/or filtered-compressed air.

Pressure: Vacuum to 150 psig (vacuum to 10 bar).

Signal Pressure: Equal or higher than inlet pressure, but not less than 30 psig (2 bar).

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 or PL d (with application specific diagnosis) in singular application with HFT = 0 and SIL 3 and PL e in redundant application with HFT ≥ 1.

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

3-Way 2-Position Valves, Spring Return												
Port Size			Body Size	Valve Model Number*	Function	C _v		Average Response Constants#			Weight lb (kg)	
1, 2	3	1-2				2-3	M	F				
						In-Out		Out-Exh.				
1/4	1/2	3/8	2153B2900	NO	2.4	3.4	10	1.60	2.30	1.8 (0.8)		
3/8	1/2	3/8	2153A3913	NC	2.4	3.4	10	0.95	1.07	1.8 (0.8)		
1/2	1/2	3/8	2153B4903	NC	3.0	5.2	10	0.94	0.98	1.8 (0.8)		
3/4	1	3/4	2153B5903	NC	7.8	13	11	0.38	0.41	4.5 (2.0)		
1	1	3/4	2153A6906	NC	7.4	12	11	0.24	0.36	4.5 (2.0)		
1	1 1/2	1 1/2	2153C6905	NO	24	40	28	0.17	0.20	11.0 (5.0)		
1 1/4	1 1/2	1 1/2	2153A7906	NO	29	39	28	0.15	0.19	11.0 (5.0)		
1 1/2	1 1/2	1 1/2	2153B8900	NC	30	38	28	0.12	0.16	11.0 (5.0)		
2	2 1/2	2	2153A9903	NC	70	71	##	##	##	15.3 (6.9)		
2 1/2	2 1/2	2	2153A9902	NC	70	71	##	##	##	15.3 (6.9)		

* NPT port threads. For BSPP threads add a "D" prefix to the model number e.g., D2153B2900.
 # 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.

B

B3

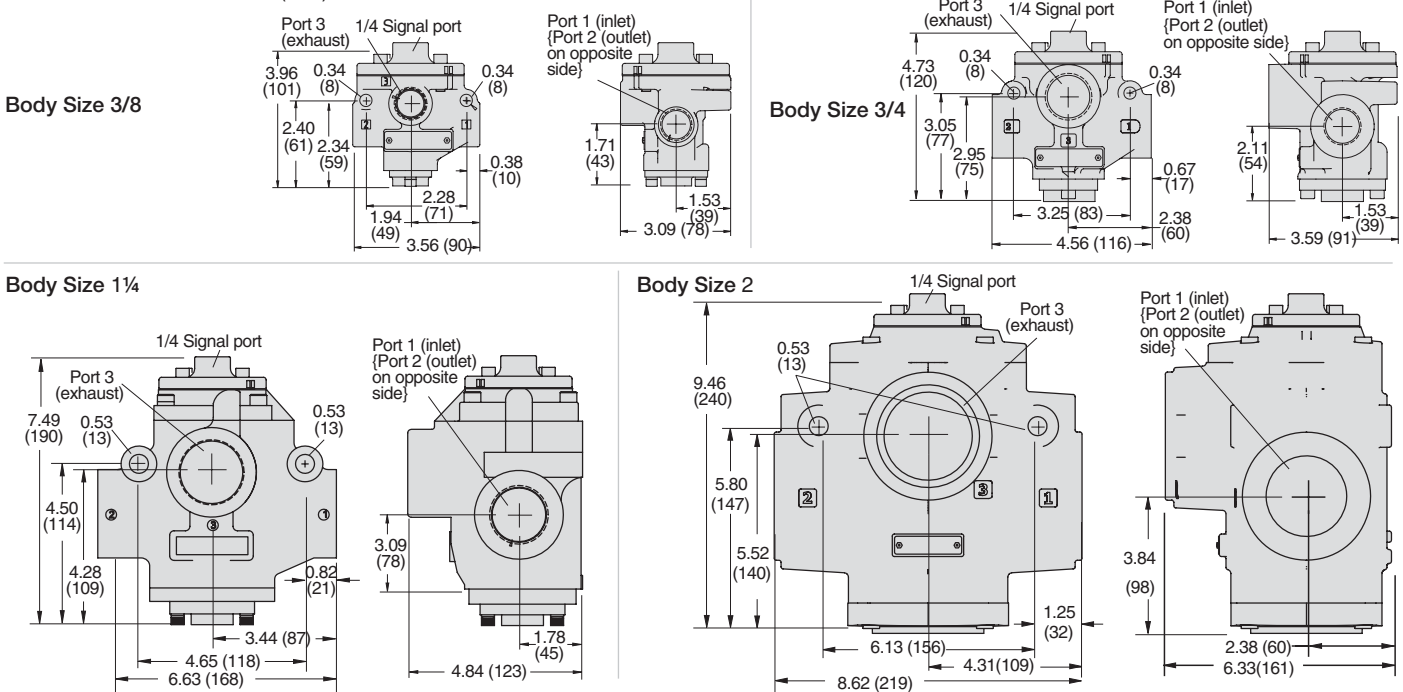
Piping 3/2 Normally Closed (NC) Valves

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).

Valve Dimensions – inches (mm)



Silencers ordered separately, refer to page B3.14.

STANDARD SPECIFICATIONS (for valves on this page):

- Construction:** Poppet; Metal.
- Mounting Type:** Inline.
- Media Temperature:** -40° to 175° F (-40° to 80° C).
- Flow Media:** Vacuum and/or filtered-compressed air.
- Pressure:** Vacuum to 150 psig (vacuum to 10 bar).
- Signal Pressure:** Equal or higher than inlet pressure, but not less than 30 psig (2 bar).

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 or PL d (with application specific diagnosis) in singular application with HFT = 0 and SIL 3 and PL e in redundant application with HFT ≥ 1.

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

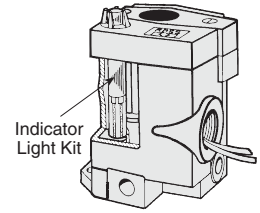
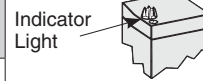


Indicator Light Kit

To visually verify valve operation indicator lights are available in kit form. The indicator light extends through the solenoid or pilot cover and is illuminated when the solenoid is energized. Such lights are standard on double solenoid valves. Indicator light kit is available for single solenoid models (type O only).

B

Kit Number		
24 volts DC	110-120 volts AC 50-60 Hz	220 volts 50-60 Hz
862K87-W	862K87-Z	862K87-Y



Manual Override Kits

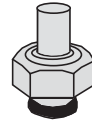
Flush flexible manual overrides are standard on single solenoid models. Double solenoid models have flush metal-button overrides. Both types are non-locking. Each of the buttons in the override kits below is made of metal and is spring-returned. The locking type button, however, can be kept in the actuated position by turning the slot in the top of the button with a screwdriver.

B3

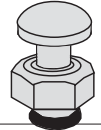
FLUSH BUTTON	
Locking Type	Kit Number
Non-Locking	790K87
Locking	792K87



EXTENDED BUTTON	
Locking Type	Kit Number
Non-Locking	791K87



EXTENDED BUTTON with PALM	
Locking Type	Kit Number
Non-Locking	984H87



Electrical Connector

Valves available with installed prewired connectors, please consult ROSS.

System 8 Pilot

Models available with preinstalled System 8 solenoid pilot, consult ROSS.

Silencers

Port size 1/4 thru 2



Port size 2 1/2



Port Size	Thread Type	Model Number		Avg. C _v	Dimensions inches (mm)		Weight lb (kg)
		NPT Treads	BSPT Threads		A	B	
3/8	Male	5500A3003	D5500A3003	4.3	1.3 (32)	3.5 (88)	0.2 (0.1)
1/2	Male	5500A4003	D5500A4003	4.7	1.3 (32)	3.6 (91)	0.2 (0.1)
1	Male	5500A6003	D5500A6003	14.6	2.0 (51)	5.4 (138)	0.6 (0.3)
1 1/2	Female	5500A8001	D5500A8001	29.9	2.5 (64)	5.7 (144)	1.0 (0.5)
2 1/2	Female	5500A9002	D5500A9002	103.7	4.0 (102)	5.7 (145)	2.9 (1.4)

Pressure Range: 0 to 150 psig (0 to 10.3 bar) maximum.
Flow Media: Filtered air.

Male Pipe Threads

Female Pipe Threads

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

General Information

Standard Specifications

The standard specifications for the products on each page of this catalog are given on the same page or referenced. For solenoid pilot valves, models with internal pilot supply are listed. Most models are also available for use with external pilot supply or have a built-in pilot supply selector valve.

The products in this catalog are intended for use in industrial pneumatic systems. Most products are adaptable to other uses and conditions not covered by the standard specifications given in this catalog. Weights shown are approximate and are subject to change. Dimensions given, unless otherwise noted, are envelope dimensions (not for mounting). Consult ROSS for further information.

Port Threads

Ports of valves and bases described in this catalog have NPT (ANSI B2.1) threads. Other thread types can be specified by putting an appropriate prefix letter on the model or part number when ordering.

Thread Types by Model Prefix Letter

Pneumatic Port Threads	Prefix Letter	Threaded Electrical Opening
NPT (ANSI B2.1)	None	NPT
ISO 228 - DIN 259 Parallel, BSPP [#]	C*	—
ISO 228 - DIN 259 Parallel, BSPP [#]	D	G
ISO 228 - JIS B0203 Tapered [#]	J	ISO
SAE 1926- ISO 11926	S	NPT

* Used only for filters, regulators, lubricators.

[#] ISO 228 threads supersedes BSPP, G and JIS thread types.

Flow Ratings

Flow ratings are expressed as C_v where $C_v = 1$ corresponds to a steady state air flow of approximately 32 scfm under the following conditions:

Inlet pressure = 100 psig (6.7 bar)
Pressure drop = 10 psi (0.69 bar)
Air temperature = 68°F (20°C)
Relative humidity = 36%

Note: Because widely differing test standards are used to measure C_v values, the figures given in this catalog should not be used to compare ROSS valves with those of other makers. The C_v ratings given here are intended only for use with performance charts published by ROSS. The C_v ratings are averages for the various flow paths through the valve and are for steady flow conditions.

Approvals and Certifications

ROSS products are designed to meet a number of industrial standards, including the Canadian Standards Association (C.S.A.) guidelines. For more information on specific product approvals, contact your local distributor or ROSS.

Solenoids

All ROSS standard solenoids are rated for continuous duty (unless noted otherwise) and will operate the valve within the air pressure range specified in this catalog.

Explosion-Proof Solenoid Pilot available, for more information consult ROSS.

Voltage & Hertz

When ordering a solenoid valve, also specify the desired solenoid voltage and hertz.

Voltage Types by Model Suffix Letter

Voltage	Suffix Letter
120 volts AC	Z
220 volts AC	Y
12 volts DC	H
24 volts DC	W
48 volts DC	M
90 volts DC	K
110 volts DC	P
125 volts DC	C

Recommended Solenoid Voltages: 100-110 volts AC, 50 Hz; 100-120 volts AC, 60 Hz; 24 volts DC; 110 volts DC.

In addition, the following voltages are available:

200, 220 volts AC, 50 Hz
200, 240, 480 volts AC, 60 Hz
24, 48, 220 volts AC, 50 Hz
240 volts AC, 60 Hz
200, 220 volts AC, 50 Hz
200, 240 volts AC, 60 Hz.

For example: Model 2773B5001, 120 volts AC, 60 Hz.
Model W6076B2401, 220 volts AC, 50 Hz.

Please note that not all configurations are available for all models.

For additional information or help with voltage configuration, please contact your local distributor or ROSS.

Port Identification

Valve symbols in this catalog conform to the ISO 1219-1:1991 standard of the International Organization for Standardization (ISO) and the SAE J2051 standard of the Society of Automotive Engineers (SAE) respectively.

Information or Technical Assistance

For additional information or application assistance concerning ROSS products, consult ROSS or your local ROSS distributor (see contact information on the back cover).

Order Placement

For order placement, consult ROSS or your local ROSS distributor.

For a current list of countries and local distributors, visit ROSS' website at www.rosscontrols.com.

CAUTIONS, WARNINGS and STANDARD WARRANTY

PRE-INSTALLATION or SERVICE

1. Before servicing a valve or other pneumatic component, be sure that all sources of energy are turned off, the entire pneumatic system is shut off and exhausted, and all power sources are locked out (ref: OSHA 1910.147, EN 1037).
2. All ROSS products, including service kits and parts, should be installed and/or serviced only by persons having training and experience with pneumatic equipment. Because any installation can be tampered with or need servicing after installation, persons responsible for the safety of others or the care of equipment must check every installation on a regular basis and perform all necessary maintenance.
3. All applicable instructions should be read and complied with before using any fluid power system in order 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 location listed on the cover of this document.
4. Each ROSS product should be used within its specification limits. In addition, use only ROSS parts to repair ROSS products.

WARNING: Failure to follow these directions can adversely affect the performance of the product or result in the potential for human injury or damage to property.

FILTRATION and LUBRICATION

5. 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. ROSS recommends a filter with a 5-micron rating for normal applications.
6. All standard ROSS filters and lubricators with polycarbonate plastic bowls are designed for compressed air applications only. Do *not* fail to 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, hazardous leakage, and the potential for human injury or damage to property. Immediately replace a crazed, cracked, or deteriorated bowl. When bowl gets dirty, replace it or wipe it with a clean dry cloth.

7. Only use lubricants which are compatible with materials used in the valves and other components in the system. Normally, compatible lubricants are petroleum based 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 human injury, and/or damage to property.

AVOID INTAKE/EXHAUST RESTRICTION

8. Do not restrict the air flow in the supply line. To do so could reduce the pressure of the supply air below the minimum requirements for the valve and thereby cause erratic action.
9. 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.

WARNING: ROSS expressly disclaims all warranties and responsibility for any unsatisfactory performance or injuries caused by the use of the wrong type, wrong size, or an inadequately maintained silencer installed with a ROSS product.

POWER PRESSES

10. 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.

ENERGY ISOLATION/EMERGENCY STOP

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

STANDARD WARRANTY

limited to repair or replacement of the product or refund of the purchase price paid solely at the discretion of ROSS and provided such product is returned to ROSS freight prepaid and upon examination by ROSS is found to be defective. This warranty becomes void in the event that product has been subject to misuse, misapplication, improper maintenance, modification or tampering.

THE WARRANTY EXPRESSED ABOVE IS IN LIEU OF AND EXCLUSIVE OF ALL OTHER WARRANTIES AND ROSS EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES EITHER EXPRESSED OR IMPLIED WITH RESPECT TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ROSS MAKES NO WARRANTY WITH RESPECT TO ITS PRODUCTS MEETING THE PROVISIONS OF ANY GOVERNMENTAL OCCUPATIONAL SAFETY AND/OR HEALTH LAWS OR REGULATIONS. IN NO EVENT IS ROSS LIABLE TO PURCHASER, USER, THEIR EMPLOYEES OR OTHERS FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM A BREACH OF THE WARRANTY DESCRIBED ABOVE OR THE USE OR MISUSE OF THE PRODUCTS. NO STATEMENT OF ANY REPRESENTATIVE OR EMPLOYEE OF ROSS MAY EXTEND THE LIABILITY OF ROSS AS SET FORTH HEREIN.

All products sold by ROSS CONTROLS are warranted for a one-year period [with the exception of all Filters, Regulators and Lubricators ("FRLs") which are warranted for a period of seven years] from the date of purchase to be free of defects in material and workmanship. ROSS' obligation under this warranty is

