Safe Exhaust Double Valves

M35 Series

Product Catalog

a global family

Safe Exhaust Control Reliable Double Valves M35 Series
Product Overview

Safe Exhaust Safety Function

The M35 Series valve safety function is to shut off supply or pneumatic energy and to exhaust any pneumatic energy from downstream of the valve.

Model with Soft-Start EEZ-ON® Module	Model without Soft-Start EEZ-ON® Module
	

Illustration examples.

The M35 Series valve is designed to supply air to a zone or entire machine/system until signaled to shut off and exhaust residual downstream pneumatic energy from the machine. Thus, reducing the hazards associated with the presence of residual energy during employee access and/or minor servicing.

VALVE FEATURES	
Redundant Control	Redundant control can achieve Category 4, PL e, when used with proper safety controls
External Monitoring	Each valve element in the M35 Series is equipped with a solid state pressure sensor. Monitoring both of these sensors on each actuation and de-actuation of the M35 Series valve provides a diagnostic coverage up to 99%.
Poppet Design	Dirt tolerant, wear compensating for quick response and high flow capacity
PTFE Backup Piston Rings	Enhances valve endurance enabling operation with or without in-line lubrication
Optional Soft-Start Module	On energization, the Soft-Start (EEZ-ON®) module allows outlet pressure to increase at a slower rate until it reaches approximately 50% of inlet pressure, at which point the valve will then open fully to finish filling the system at full rate
Threaded or Modular Port Connection	Modular port connection allows modular connection to Air Entry System (Lockout Valve, FRLs)
LED Indicators	Provides visual display of valve status and aids troubleshooting
Silencer Option	Include built-in module or threaded flange for remote exhaust
SISTEMA Library	Available for download

These valves are not designed for controlling clutch/brake mechanisms on mechanical power presses, see DM²® Series D double valves for mechanical power press applications.

Specifications

STANDARD SPECIFICATIONS

GENERAL	Function		3/2 Valve	Normally Closed
	Construction Design		Dual Poppet	
	Actuation	Electrical	Solenoid Pilot Controlled	
			Solenoid pilot operated with air assisted spring return; one solenoid per valve element (2 total), both to be operated synchronously	
	Mounting	Type	Inline mounted - modular/threaded	
		Orientation	Any, preferably vertical	
	Connection		Threaded	NPT, G
	Monitoring		Dynamic, cyclical, external with customer supplied equipment Monitoring should check state of both valve pressure sensors with any and all changes in state of valve control signals	
	Minimum Operation Frequency		Once per month, to ensure proper function	
OPERATING CONDITIONS	Temperature	Ambient	40° to 120°F (4° to 50°C)	
		Media	40° to 175°F (4° to 80°C)	
	Flow Media		Compressed air according to ISO 8573-1 Class 7:4:4	
	Operating Pressure		30 to 150 psig (2 to 10 bar)	
	Pressure Sensors (2 per valve)		PNP solid state	
	Pressure Sensors Current Consumption (each sensor)		<23mA (each without contacts)	
ELECTRICAL DATA	Solenoids		Current Flow	Operating Voltage / Power Consumption (each solenoid)
			DC	24 volts / 1.5 watts
			Rated for continuous duty	
	Enclosure Rating		DIN 400 50 IP 65, IEC 60529	
	Electrical Connection		Two 5-pin M12 connectors	
	Pressure Switch (Status Indicator) Rating		Contacts - 5 amps at 250 volts AC, or 5 amps at 30 volts DC	
CONSTRUCTION MATERIAL	Valve Body		Cast Aluminum	
	Poppet		Acetal and Stainless Steel	
	Seals		Buna-N	
SAFETY DATA	Functional Safety Data		Category	CAT 4, PL e
			B_{10D}	25,000,000
			PFH_D	$7.71x10^{-9}$
			$MTTF_D$	301.9 (n_{op}: 662400)
	Vibration/Impact Resistance		Tested to DIN EN 60068-2-6	

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

PRODUCT CREDENTIALS

Performance Level	Safety Integrity Level	DGUV	Declaration of Conformity	Certificate of Compliance
Per ISO 13849-1:2015	Per IEC 2061:2001			
Cat. 4 PL e	SIL 3 Functional Safety	DGUV Test HM 230177 Sicherheit geprüft tested safety	CE, UKCA, EAC	CSA C US

Ordering Information

MODEL NUMBER CONFIGURATOR — 3-Way 2-Position Valves

M35	S	40	N	A	E	X	AA	G	A

Series

Soft-Start Function

With Soft-Start	S
No Soft-Start	X

Basic Size	Port Size In-Out	Port Size Exhaust	Exhaust Type	
8	1/2	–	Built-in Silencer	40
		1	Threaded Exhaust Flange*	46
	3/4	–	Built-in Silencer	50
		1	Threaded Exhaust Flange*	56

* Silencer not included but recommended, see accessories.

Port Thread

NPT	N
G	G

Voltage

24 V DC

Revision Level

Pressure Measuring Device

With Gauge	G
No Gauge	X
With Digital Transducer	T

Pin Configuration Combination

Solenoid	Sensor	
A	A	AA
A	B	AB
A	C	AC
C	C	CC
D	B	DB
D	C	DC

Communication

None

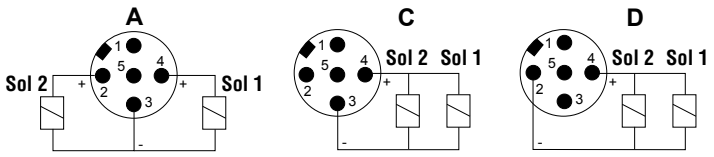
Monitoring

External

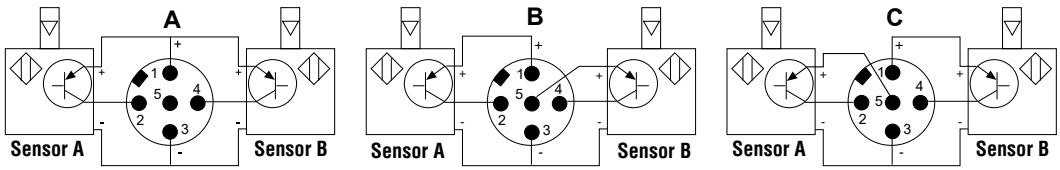
Model Number examples: M35S40NAEXABGA, M35X46GAEXAAXA.

Valve Connector Pinouts

Solenoid



Pressure Sensor



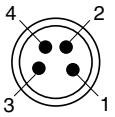
Size: Basic	Size: Port 1, 2	Size: Port 3	Soft-Start	Valve with Built-in Silencer: Flow Cv (Nl/min) 1-2	Valve with Built-in Silencer: Flow Cv (Nl/min) 2-3	Valve with Built-in Silencer: Weight lb (kg)	Valve with Threaded Exhaust Flange: Flow Cv (Nl/min) 1-2	Valve with Threaded Exhaust Flange: Flow Cv (Nl/min) 2-3	Valve with Threaded Exhaust Flange: ≈ Weight lb (kg)
8	1/2	–	With	4.1 (4000)	7.6 (7400)	6.5 (2.9)	4.1 (4000)	7.6 (7400)	6.6 (3.0)
		1	Without	4.3 (4200)	7.6 (7400)	4.2 (1.9)	4.3 (4200)	7.6 (7400)	4.3 (2.0)
	3/4	–	With	4.1 (4000)	7.6 (7400)	6.5 (2.9)	4.1 (4000)	7.6 (7400)	6.6 (3.0)
		1	Without	4.3 (4200)	7.6 (7400)	4.2 (1.9)	4.3 (4200)	7.6 (7400)	4.3 (2.0)

These valves are not designed for controlling clutch/brake mechanisms on mechanical power presses, see DM2® Series D double valves for mechanical power press applications.

Digital Pressure Transducer Specifications				
Pressure Range psig (bar)	**Electrical Output**	**Electrical Connection**	**Pressure Port Size/Type**	**Weight** lb (kg)
0 (0) to 145 (10)	(1) PNP with (1) 4-20ma	M8, 4 Pin	1/8 Male	0.099 (0.045)

Pinout

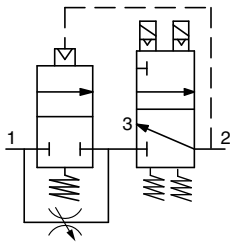
Sensor Pinout with Analog Output



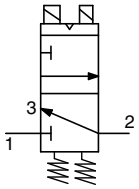
1 - Brown - 24 VDC
2 - White - 4 to 20mA
3 - Blue - 0 VDC
4 - Black PNP Open Collector Output 1

Simplified Schematics

with Soft-Start (EEZ-ON®)



without Soft-Start EEZ-ON®



Safety Solution Options

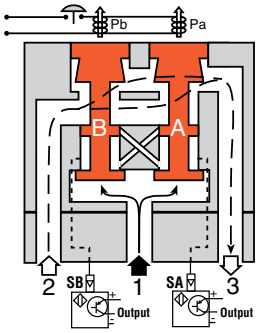
Safe Air Entry System Assemblies with M35 Series Double Valves

Air Entry System Assemblies with manual Lockout L-O-X® valve, air preparation FRL combinations, M35 Series Safe Exhaust Double Valve with or without Soft-Start module, and with Drip Leg option are available.

Valve Operation

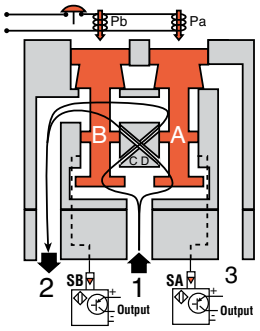
Conditions at Start

Inlet 1 is closed to outlet 2 by both valve elements A and B. Outlet 2 is open to exhaust 3. Pressure signals at both sensors SA and SB are exhausted. Sensors outputs SA and SB are ON.



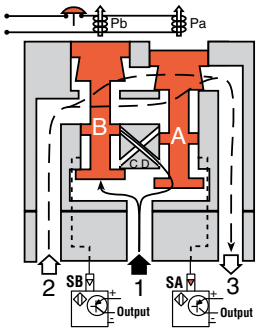
Normal Operation

Simultaneously energizing both solenoids actuates both pilots and causes valve elements A and B to shift. Inlet 1 is then connected to outlet 2 via crossflow passages C and D. Exhaust 3 is closed. Sensing pressure signals go to each pressure sensor and become equal to inlet pressure. Sensors outputs SA and SB are OFF.



Detecting a Malfunction

A malfunction in the system or the valve itself could cause one valve element to be open and the other closed. Air then flows past the inlet poppet on valve element A, into crossflow passage D, but is substantially blocked by the spool portion of element B. The large size of the open exhaust passage past element B keeps the pressure at the outlet port below 2 % of inlet pressure. Full sensing air pressure from side A goes to sensor SA, and a reduced pressure goes to sensor SB. This full pressure signal causes sensor outputs SA to turn OFF. Sensor outputs SB, with a reduced pressure signal, does not turn OFF. An external monitoring system can detect the malfunction by monitoring the condition of the sensors SA and SB. The external monitoring system may then react accordingly by shutting down the power to the valve solenoids and any other components deemed necessary to stop the machine.



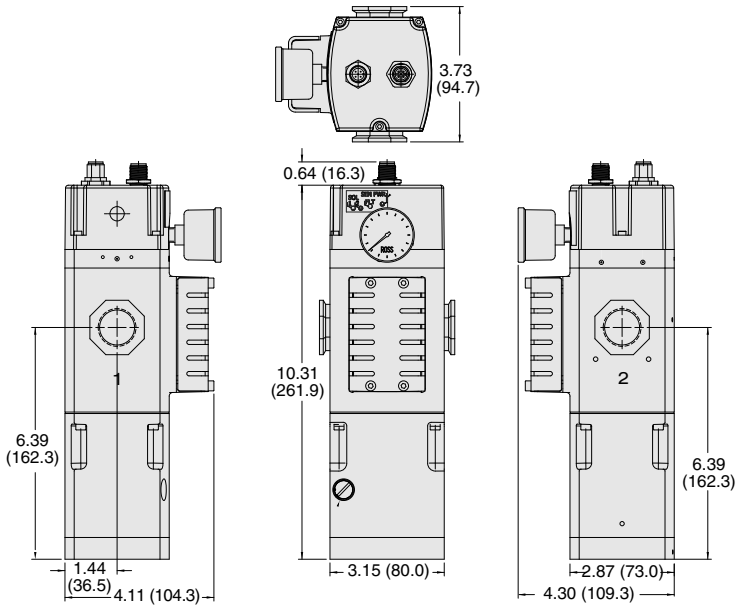
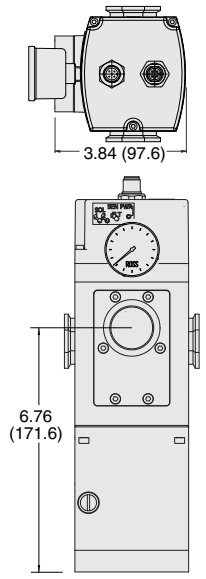
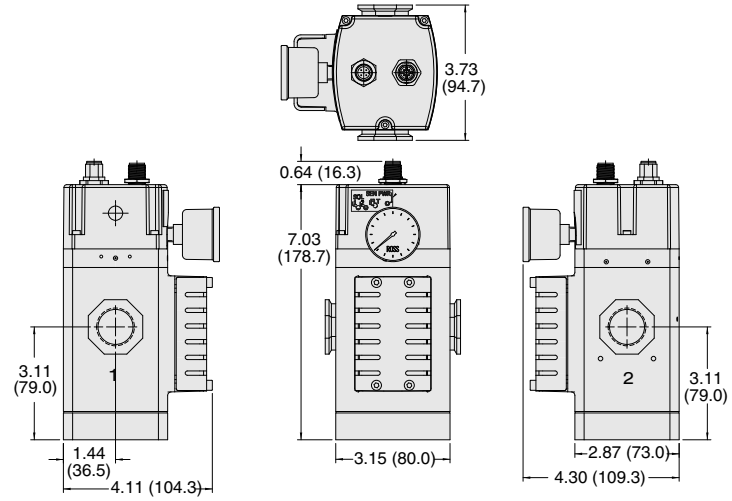
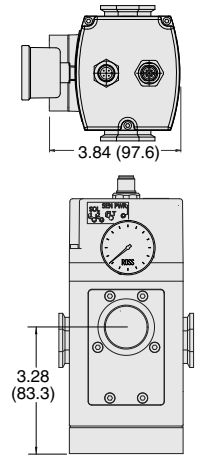
Valve Reset

Automatic reset by de-energizing the solenoids.

An Integration Guide for the M35 Series valves is available from ROSS to provide information such as operation & monitoring, and validation test procedure for valve operation and external monitoring logic.

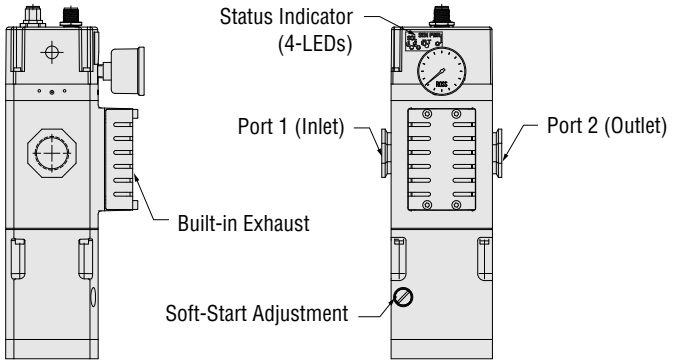
Integration Guide - M35 Series Safe Exhaust Double Valves

DIMENSIONS — Inches (mm)

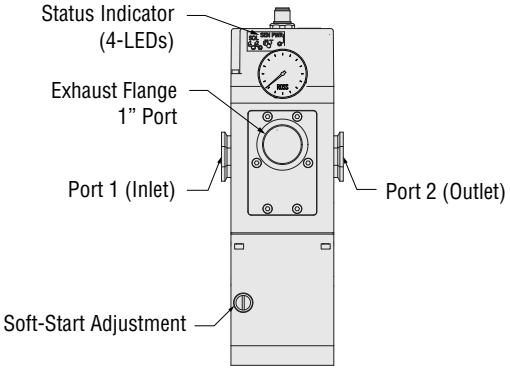
	Model with Built-In Exhaust	Model with Threaded Exhaust Flange
Model with Soft-Start EEZ-ON® Module		
Model without Soft-Start EEZ-ON® Module		

Downloadable CAD models available.

Model with Built-In Exhaust

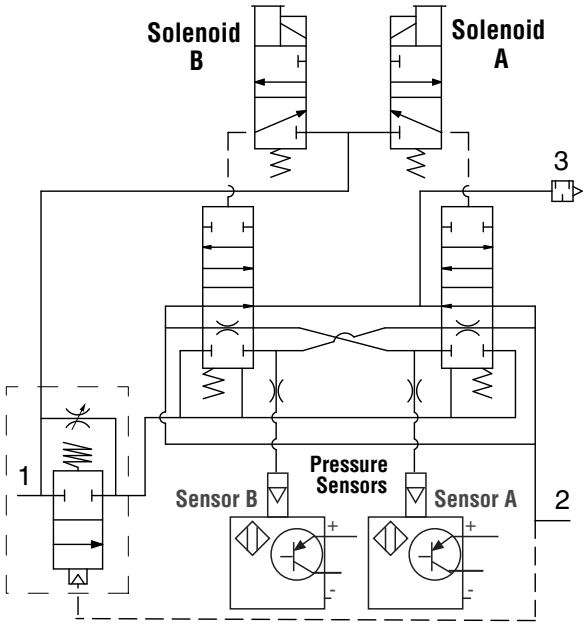


Model with Threaded Exhaust Flange

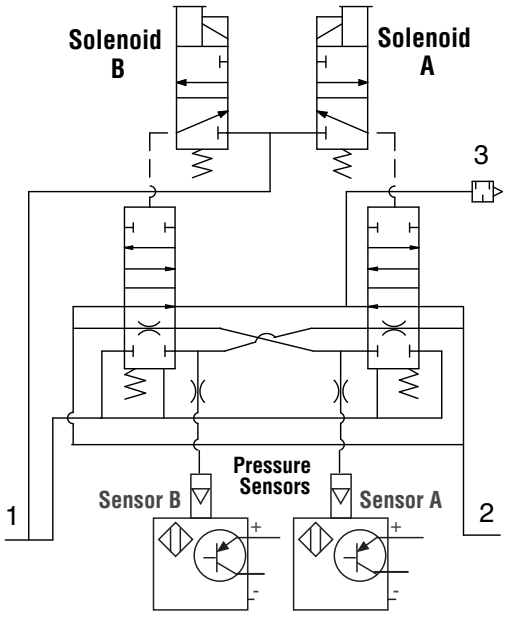


Valve Schematics

with Soft-Start EEZ-ON® module



without Soft-Start EEZ-ON® module



EXHAUST TIME

Normal and Faulted Condition (s)								
M35 Valve	Volume ft³ (L)	Condition	Operating Pressure psig (bar)					
			30 (2)		90 (6)		145 (10)	
			to 15 (1)	to 7 (0.5)	to 15 (1)	to 7 (0.5)	to 15 (1)	to 7 (0.5)
Valve with Built-in Silencer	0.071 (2)	Normal	0.055	0.071	0.094	0.112	0.120	0.135
		Faulted	0.072	0.098	0.147	0.183	0.200	0.247
	0.35 (10)	Normal	0.131	0.208	0.317	0.393	0.424	0.507
		Faulted	0.185	0.301	0.533	0.710	0.789	1.024
	0.71 (20)	Normal	0.226	0.379	0.597	0.746	0.804	0.971
		Faulted	0.326	0.555	1.016	1.368	1.526	1.997
	1.41 (40)	Normal	0.416	0.721	1.155	1.451	1.564	1.899
		Faulted	0.608	1.063	1.983	2.685	3.000	3.941
	5.30 (150)	Normal	1.462	2.604	4.227	5.326	5.743	7.006
		Faulted	2.160	3.855	7.298	9.929	11.107	14.635
Valve with Threaded Exhaust Flange	0.071 (2)	Normal	0.052	0.070	0.093	0.113	0.123	0.142
		Faulted	0.065	0.091	0.137	0.175	0.203	0.272
	0.35 (10)	Normal	0.120	0.191	0.308	0.409	0.437	0.520
		Faulted	0.163	0.300	0.503	0.697	0.805	1.048
	0.71 (20)	Normal	0.204	0.342	0.577	0.779	0.829	0.992
		Faulted	0.285	0.562	0.961	1.349	1.558	2.017
	1.41 (40)	Normal	0.373	0.645	1.115	1.519	1.615	1.937
		Faulted	0.530	1.086	1.878	2.655	3.064	3.957
	5.30 (150)	Normal	1.301	2.310	4.071	5.588	5.934	7.130
		Faulted	1.874	3.968	6.919	9.834	11.345	14.622

Accessories

PRESSURE GAUGE

Illustration example.

Analog Pressure Gauge	Mounting	Port Size	Thread Type	Model Number	Pressure Range psig (bar)	Case Diameter inches (mm)
	Center Back	1/8	Male	5400A1002	0-160 (0-11)	1.5 (38)

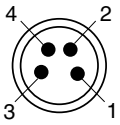
PRESSURE TRANSDUCERS

Illustration example.

Digital Pressure Transducers	Monitoring Type	Electrical Connection	Electrical Output	Model Number		Pressure Port Size	Pressure Range psig (bar)	≈ Weight lb (kg)
				NPT Thread	G Thread			
	Electrical	M8, 4 Pin	(1) PNP with (1) 4-20ma	760B94	D760B94	1/8	0 to 145 (0 to 10)	0.099 (0.045)
	For Digital Pressure Readout, Analog 4-20mA Output, and Transistor Switching Output.							

Pinout

Sensor Pinout with Analog Output



1 - Brown - 24 VDC
2 - White - 4 to 20mA
3 - Blue - 0 VDC
4 - Black PNP Open Collector Output 1

ENERGY RELEASE VERIFICATION

Pressure Switch	Redundant Pressure Switch Assembly
	

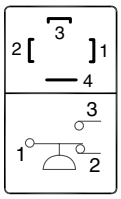
Illustration examples.

	Verification Type	Installation Location	Connector Type	Model Number	Port Thread	Factory Preset psi (bar)
Pressure Switch	Electrical	Pressure Sensing Port or Downstream	DIN EN 175301-803 Form A	586A86	1/8 NPT	5 (0.3) falling

	Verification Type	Installation Location	Connector Type	Model Number	Port Thread	Factory Preset psi (bar)
Redundant Pressure Switch Assembly	Electrical (Dual)	Downstream	DIN EN 175301-803 Form A	RC026-13	3/8 NPT	5 (0.3) falling

Pinout

DIN EN 175301-803 Form A



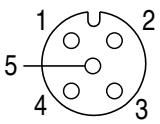
1 - Common
2 - Normally Closed
3 - Normally Open
4 - Ground (Not Used)

PREWIRED ELECTRICAL CONNECTORS

Illustration example.

	Cable						Kit Number
	End 1	End 2	Length meters (feet)	Connection	Quantity Included	Cord Diameter mm	Without Light
	Connector	Cord / Connector					
Prewired Connector Kits	M12, Female 5-pin straight A-coded	Flying Leads	5 (16.4)	Solenoid	1	6	2644B77
				Sensor	1	6	
			10 (32.8)	Solenoid	1	6	2370B77
				Sensor	1	6	
		Male Connector	5 (16.4)	Solenoid	1	6	2645B77
				Sensor	1	6	
			10 (32.8)	Solenoid	1	6	2371B77
				Sensor	1	6	

Connector Pinout



1 - Brown
2 - White
3 - Blue
4 - Black
5 - Grey

EXHAUST SILENCERS

Silencers for Valves with Threaded Exhaust Flange Option

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	Male	18 (18000)	5500A6003	D5500A6003	5.4 (14)	2.0 (51)	0.9 (0.4)

Accessories

MODULAR CONNECTION

M35 Series valves have both modular receptacles for piping and female threaded ports inside receptacles, which allows either modular connection or direct piping. Mounting accessories listed below are used for modular connection to ROSS MD Series filter-regulator units.

Clamp	Bracket, Screw, and Clamp
	

Extra Port Blocks	Female End Ports	Male End Ports
		

Illustration examples.

	Options	Model Number
Mounting Brackets & Clamp for Module Connections	Clamp only	R-A118-105
	Bracket, Screw, and Clamp	R-A118-105M

	Options	Port Size	Model Number	
			NPTF Thread	G Thread
Port Block and End Ports	Extra Port Blocks	1/2	R-118-106-4	R-118-106-4W
	Female End Ports	1/2	R-118-100-4	R-118-100-4W
		3/4	R-118-100-6	R-118-100-6W
	Male End Ports	1/2	R-118-109-4F	R-118-109-4FW
		3/4	R-118-109-6F	R-118-109-6FW

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.

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