



SAFE CONTROL & LOAD HOLDING CC4 SERIES VALVES



PRODUCT CATALOG

Control Reliable Double Valves CROSSCHECK™ CC4 Series

Product Overview

Safe Control and Load Holding Safety Function

The CC4 Series valve safety function is of safe cylinder control, safe cylinder stop, and/or load-holding. This function is accomplished by blocking further supply of pneumatic energy through the valve and blocking the exhaust of any pneumatic energy from the cylinder lines and cylinder downstream of the valve whenever the valve is shut off or a fault occurs within the valve.



Illustration example.

The CC4 Series double valve is a 4/3 safety directional valve, closed center, designed to control the direction of air flow into and out of a double-acting cylinder or other pneumatic actuator in order to drive the cylinder forward or backward to suit the requirements of the machine operation until signaled to shut off and trap pneumatic energy in the cylinder in order to stop cylinder motion (load holding). Thus, reducing the potential hazard of unexpected cylinder motion during employee access for production-related tasks and/or minor servicing. Turning off all solenoids on the 4/3 CC4 Series valve returns the valve to the center position in order to stop cylinder motion - this also allows jogging of the cylinder.

The CC4 Series valve offers this function with the required level of control expected of the machine's (system's) safety control system up to Category 4, PL e. Such a control system must be capable of inhibiting further operation of the valve in the event of a fault within the valve.

VALVE FEATURES

Redundant Control	Redundant control with position feedback - can achieve Category 4, PL e, when used with proper safety controls.
Poppet Type Design	ROSS poppet technology - fast, reliable, dirt-tolerant, face-sealing, low friction. Redundant poppets prevent air from being supplied and exhausted from each outlet port.
Mid-position Sensing	Mid-position sensing using magnetic proximity sensors (PNP) for detection of closed center position providing feedback to the safety control system for external monitoring.
External Monitoring	Dynamic, cyclical, external with customer supplied safety control system. Monitoring should check state of both valve mid-position sensors with any and all changes in state of valve control signals.
LED Indicators	LED indicators on solenoids - aids troubleshooting
Trapped Pressure Relief	Manual trapped pressure relief to remove stored energy when required
SISTEMA Library	Available for download

These valves are not designed for controlling clutch/brake mechanisms on mechanical power presses.

PRODUCT CREDENTIALS

Performance Level Per ISO 13849-1:2015	Safety Integrity Level Per IEC 2061:2001	DGV	Declaration of Conformity	Certificate of Compliance
			 	

STANDARD SPECIFICATIONS					
GENERAL	Function		4/3 Valve	Closed Center	
	Construction Design		Dual Poppet		
	Actuation	Electrical	Solenoid Pilot Controlled		
			Solenoid pilot operated with air assisted spring return; Two solenoids per valve element (4 total) – two for extending and two for retracting		
	Mounting	Type	Sub-Base		
		Orientation	Any, but horizontally with solenoids on top is preferred		
	Connection		Threaded Port	NPT	
				G	
	Monitoring		Dynamic, cyclical, external with customer supplied equipment. Monitoring should check state of both valve mid-position sensors with any and all changes in state of valve control signals.		
	Trapped Pressure Relief		Manual		
Minimum Operation Frequency		Once per month, to ensure proper function			
Maximum Recommended Allowable Discordance Time		150 msec			
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 7:4:2		
	Pilot Supply		Internal		
			External		
	Operating Pressure	With Internal Pilot Supply	60 to 120 psig (4 to 8 bar)		
		With External Pilot Supply	0 to 120 psig (0 to 8 bar)		
		Pilot Supply	60 to 120 psig (4 to 8 bar)		
	<i>Pressure must be equal to or greater than inlet pressure</i>				
Static Pressure		0 to 150 psig (0 to 10.3 bar)			
ELECTRICAL DATA	Solenoids		Current Flow	Operating Voltage	Power Consumption (each solenoid)
			DC	24 volts	3.5 watts
			Rated for continuous duty		
			Design according to VDE 0580		
	Enclosure Rating		According to DIN 400 50 IP 65		
	Electrical Connection		Two 5-pin M12 connectors		
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}		10,000,000
			PFH _D		1.62x10 ⁻⁸
			MTTF _D		151 (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.					

Ordering Information

MODEL NUMBER CONFIGURATOR

4-Way 3-Position Valves

CC4

M

23

N

A

E

X

S

A

Series

Pressure Release

Manual

Port Size

In-Out

Exhaust

1/4

1/4

22

3/8

3/8

23

1/2

1/2

44

3/4

3/4

45

Port Thread

NPT

N

G

G

Revision Level

Pin Configuration

Standard

Communication

None

Monitoring

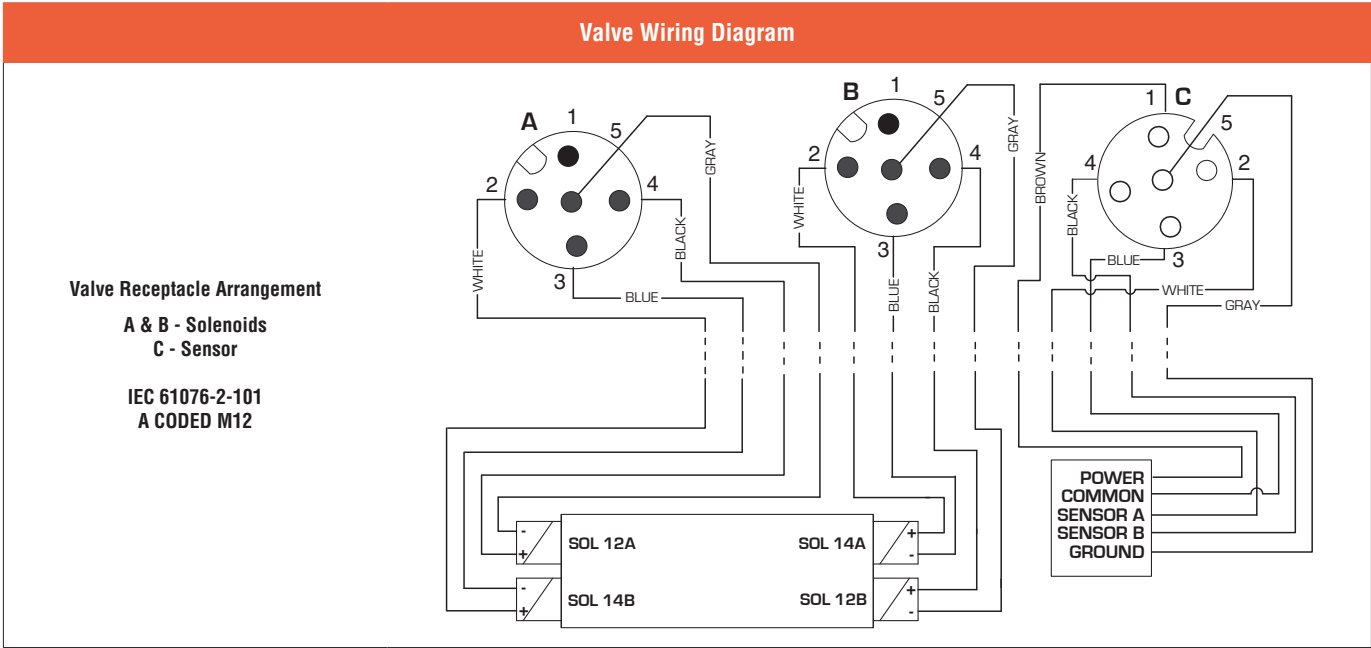
External

Voltage

24 V DC

Model Number examples: CC4M22GAEXSA, CC4M23NAEXSA.

Size		Flow Cv (NI/min)				Weight ≈ lb (kg)	Simplified Schematic
Port 1, 2, 4	Port 3	1-2	1-4	2-3	4-3		
1/4	1/4	0.9 (900)	0.9 (900)	0.7 (700)	0.6 (600)	11.2 (5.1)	
3/8	3/8						
1/2	1/2	1.7 (1700)	1.6 (1600)	1.8 (1800)	1.7 (1700)	18.3 (8.3)	
3/4	3/4						



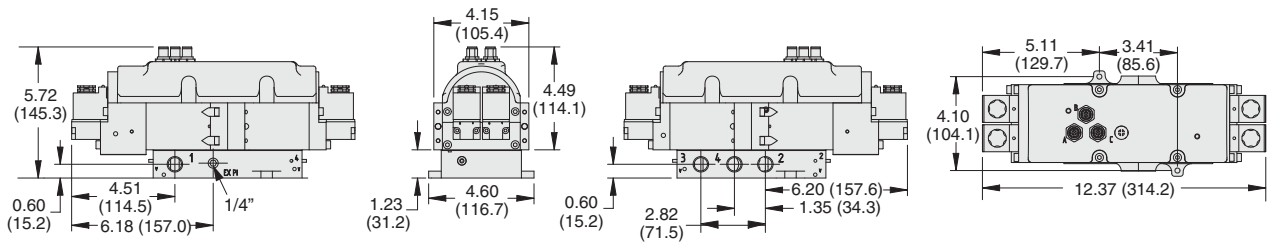
An Integration Guide for CC4 Series Double Valves is available from ROSS to provide information such as operation, monitoring, and integration into users control circuits, please visit www.rosscontrols.com.

Integration Guide - CC4 Series Safe Control and Load Holding Double Valves

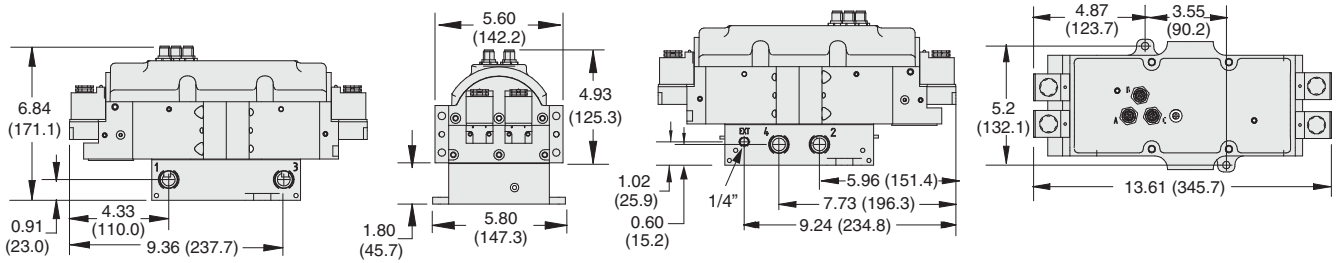
DIMENSIONS

Inches (mm)

Port Size 1/4 & 3/8

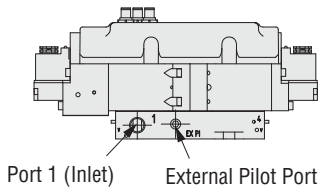


Port Size 1/2 & 3/4

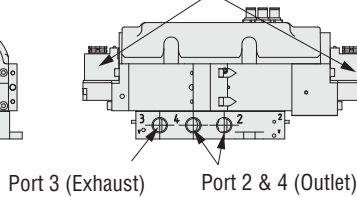


Downloadable CAD models available.

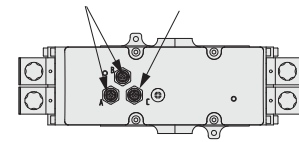
Trapped Pressure Release Valve



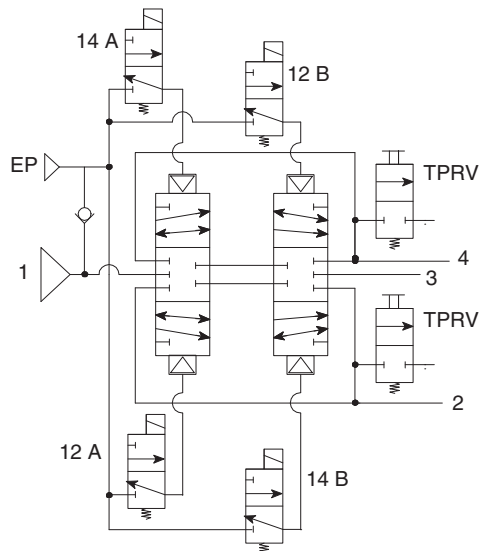
Solenoids



Solenoids and Sensor Connectivity



Valve Schematic

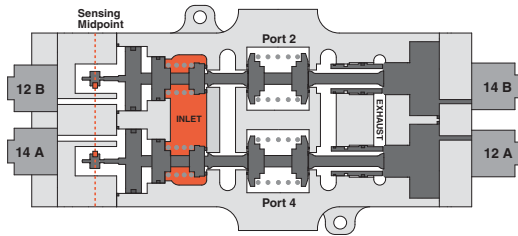


- 1 - Port 1 (Inlet)
- 2 - Port 2 (Outlet)
- 3 - Port 3 (Exhaust)
- 4 - Port 4 (Outlet)
- 14A - Pilot Valve
- 12A - Pilot Valve
- EP - External Pilot
- TPRV - Trapped Pressure Release Valve

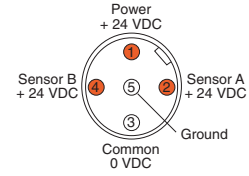
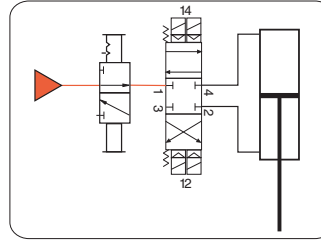
Valve Operation

Conditions at Start

Pressure applied to port 1, but all solenoids off. All ports (1, 2, 3, & 4) are blocked.



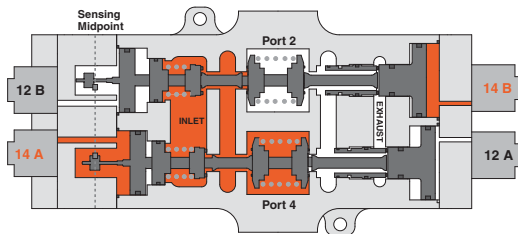
Valve De-energized



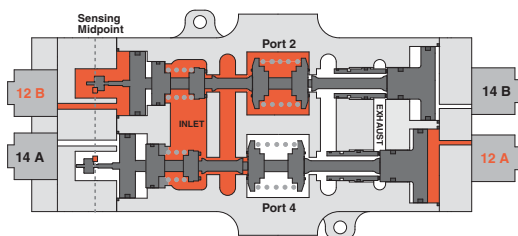
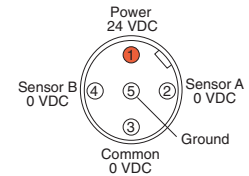
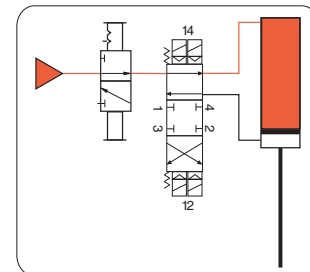
Normal Operation

Energizing both solenoids 14A & 14B causes the valve to shift and supply pressure to port 4 while exhausting pressure from port 2, thus, extending the cylinder. Conversely, energizing solenoids 12A & 12B causes the valve to shift and supply pressure to port 2 while exhausting pressure from port 4, thus, causing the cylinder to retract. Turning all the solenoids off allows the strong return springs to shift the redundant valves back to the center position, which blocks all ports. This traps any downstream pressure in the cylinder and holds it in its current position (see below on the right, image of valve de-energized trapping pressure). Each of the mid-position feedback sensors provide a voltage output when the valve is in the center, safe position, but no voltage output when the valve internals are shifted out of the center position. This provides a detectable center position for both sets of valve internals.

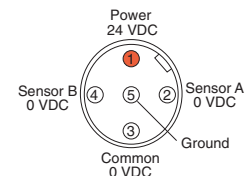
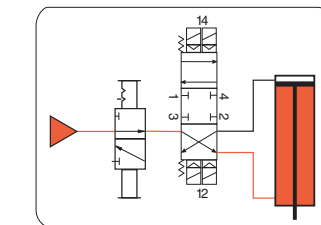
NOTE: Momentary operation of either the 12A & 12B solenoids (or 14A & 14B solenoids) can be utilized to jog the cylinder to intermediate positions instead of just fully extended or fully retracted. This is sometimes referred to as "inching."



Solenoids 14A & 14B Energized Port 4 Presurized



Solenoids 12A & 12B Energized Port 2 Presurized



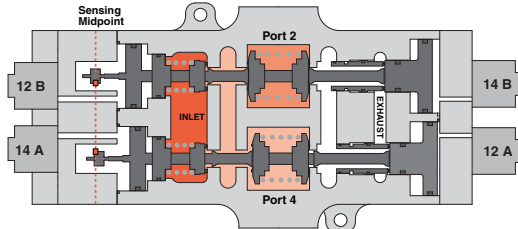
Monitoring

External monitoring of the CROSSCHECK™ mid-position sensors must be performed by an external monitoring system. Such a monitoring system must be capable of inhibiting the operation of the valve. The safety control system must de-energize the valve's solenoids in the event of a fault within the valve and/or within the safety control system, and check for achievement of the valve center position before allowing an attempt to re-energize the valve. Valve reset is accomplished by de-energizing all of the valve's solenoids. Reset of the safety control system should not occur unless the valve has fully returned to its center position (both sets of internals).

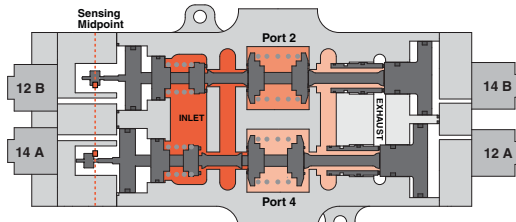
The output voltage of the sensors, when switched on (center position), equals approximately the voltage supplied to the sensors by the safety controller. For example, 24 volts DC In = 24 volts DC Out, etc.

Abnormal Operation

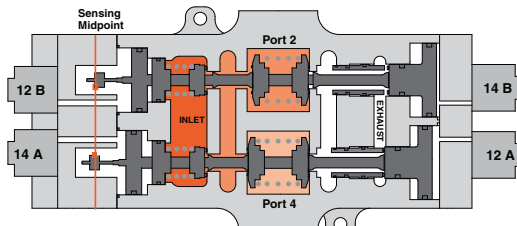
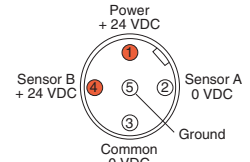
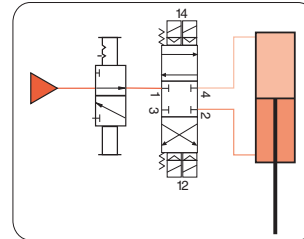
When energizing, if both sets of valve internals do not shift synchronously (either on or off), the CROSSCHECK™ valve will block all ports. While in this fault condition, the valve cannot further pressurize or exhaust the cylinder lines. Also, as long as the fault condition exists, there will be a voltage output from the valve internals that did not shift from center, but there will not be an output from the other valve internals that did shift off center. This provides a detectable fault condition as both sensors need to agree in order to not indicate a fault.



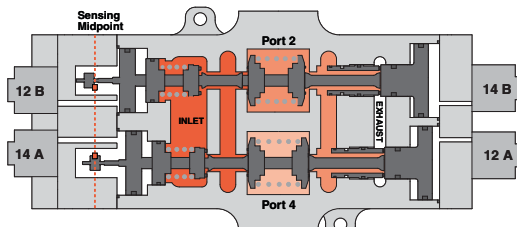
Valve Faulted Side A, Right



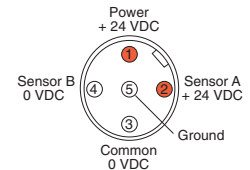
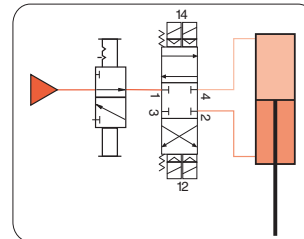
Valve Faulted Side A, Left



Valve Faulted Side B, Right



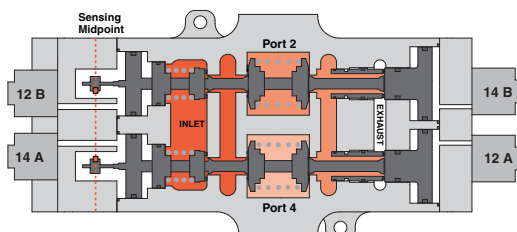
Valve Faulted Side B, Left



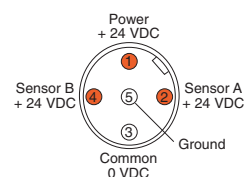
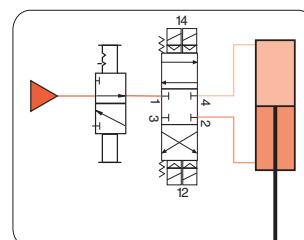
Trapped Pressure Release

In order to perform machine maintenance, after stopping the machine and performing lockout/tagout, pressure trapped in the cylinder by the CROSSCHECK™ valve can be released (exhausted) by the two manually-operated 2-way valves that are provided in the CROSSCHECK™ valve sub-base - one each per valve outlet port. This provides a way to slowly lower the cylinder to its lowest position.

NOTE: Operating the manual trapped pressure release valves will cause movement of the cylinder. Use caution to avoid any hazards associated with this movement.



Valve De-energized Trapping Pressure



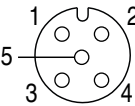
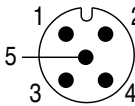
Accessories

PREWIRED ELECTRICAL CONNECTORS



Illustration example.

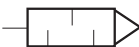
Prewired Connector Kits	Cable					Kit Number
	End 1	End 2	Connection	Quantity Included	Length meters (feet)	Without Light
	Connector	Cord				
	M12 5-pin, Female	Flying Leads	Solenoid	2	5 (16.4)	2642K77
	M12 5-pin, Male	Flying Leads	Sensor	1		

Connector Pinout	
Solenoid	Sensor
 1 - Brown 2 - White 3 - Blue 4 - Black 5 - Grey	 1 - Brown 2 - White 3 - Blue 4 - Black 5 - Grey

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 (NI/min)	Model Number		Dimensions inches (mm)		Weight ≈ lb (kg)
				NPT Thread	R/Rp Thread	Length	Hex Size (D)	
	1/4	Male	2.3 (2300)	D5500A2003	5500A2003	2.2 (6)	0.81 (21)	0.07 (0.03)
	3/8	Male	2.9 (2900)	D5500A3013	5500A3013			
	1/2	Male	6.8 (6700)	D5500A4003	5500A4003	3.6 (9)	1.25 (32)	0.2 (0.1)
	3/4	Male	18 (18000)	D5500A5013	5500A5013			

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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GLOBAL LOCATIONS

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