Safe Exhaust Double Valves

DM[1] Series C

Product Catalog

ROSS™
a global family

Safe Exhaust Control Reliable Double Valves DM¹ Series C
Product Overview

Safe Exhaust Safety Function

The DM¹ Series C valve safety function is to shut off supply or pneumatic energy and to exhaust any pneumatic energy from downstream of the valve.

Basic Size 2	Basic Size 4 & 8
	

Illustration examples.

The DM¹ Series C Safe Exhaust valves are dual valves used to block the supply and remove the downstream pressure from the circuit or machine. It is integrated into the electrical safety system to remove potentially hazardous energy in order to provide employees safe access to a machine or zone. By quickly removing the pneumatic energy with a safety valve, determined by the risk assessment, the safety system integrity is maintained allowing the employee to complete their tasks safely and rapidly.

VALVE FEATURES	
Redundant Control	Redundant control can achieve Category 4, PL e, when used with proper safety controls
Dynamic Monitoring	Monitoring and air flow control functions are integrated into two identical valve elements for Category 4 applications. The valve exhausts downstream air if asynchronous movement of valve elements occurs during actuation or de-actuation, resulting in a residual outlet pressure of less than 1% of supply. If the abnormality clears itself, the valve will return to the ready-to-run state; there is no memory of the abnormal behavior, as in the ROSS DM²® Series C products that require an intentional reset following lockout.
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
Ready-to-run	If an abnormality clears itself upon the removal of electricity to both solenoids, it will be ready-to-run again. It does not remember the abnormality and stay in a locked-out state until intentionally reset. Therefore, cumulative abnormalities may go undetected.
Status Indicator	Includes a pressure switch with both normally open (NO) and normally closed (NC) contacts to provide status feedback to the control system indicating whether the valve is in the “ready-to-run” condition or has experienced abnormal function. MUST be integrated into machine controls in order to prevent run signal until fault is cleared in valve. This indicator only reports status, it is not part of a lockout function.
Silencer	Includes high flow, clog resistant silencer
Mounting	Inlet and outlet ports on both sides provide for flexible piping (plugs for unused ports included); captive valve-to-base mounting screws
Flexible Piping	Inlet and outlet ports on both sides (plugs for unused ports included)
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		
	Mounting	Type	Base		
		Orientation	Vertically with pilot solenoids on top		
	Connection	Threaded	NPT, G		
	Monitoring	Dynamically, cyclically, internally during each actuating and de-actuating movement			
	Minimum Operation Frequency	Once per month, to ensure proper function			
OPERATING CONDITIONS	Temperature	Ambient	15° to 122°F (-10° to 50°C)		
		Media	40° to 175°F (4° to 80°C)		
	Flow Media	Filtered, lubricated or unlubricated (mineral oils according to DIN 51519, viscosity classes 32-46)			
	Operating Pressure	Valve Basic Size	2	45 to 150 psig (3.1 to 10.3 bar)	
			4, 8	30 to 120 psig (2.1 to 8.3 bar)	

ELECTRICAL DATA	Solenoids	Current Flow	Operating Voltage	Valve Basic Size	Power Consumption (each solenoid)
		DC	24 volts	2, 4	5.8 watts nominal, 6.5 watts maximum
				8	15 watts
		AC	110 volts, 50 Hz; 120 volts, 50/60 Hz	2, 4	5.8 watts nominal, 6.5 watts maximum
				8	36 VA inrush and 24.6 VA holding
			230 volts, 50/60 Hz	2, 4	5.8 watts nominal, 6.5 watts maximum
				8	32 VA inrush and 22 VA holding
		Rated for continuous duty			
		Design according to VDE 0580			
	Enclosure Rating	DIN 40050, IP65, IEC 60529			
	Electrical Connection	DIN EN 175301-803 Form A, or M12			
	Mechanical Pressure Switch (Status Indicator) Rating	NO/NC Contacts - 0.1 A, 125/250 volts AC; 0.1 A, 30 volts DC; 0.3 A, 60 volts DC			
	Solid State Pressure Sensor (Status Indicator) Rating	Supply Voltage - 8-30 volts DC Current Consumption <4mA			

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}	20,000,000
		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 Per ISO 13849-1:2015	Safety Integrity Level Per IEC 2061:2001	DGUV	Declaration of Conformity	Certificate of Compliance
Cat. 4 PL e	SIL 3 Functional Safety	DGUV Test HM 230017 Sicherheit geprüft tested safety	CE UKCA EAC	CSA C US

Ordering Information

MODEL NUMBER CONFIGURATOR — 3-Way 2-Position Valves

DM1C	D	B21	A	3	1	
Series	Port Thread	Basic Size / Port Size	Current / Voltage	Reset Type	Status Indicator Type / Connection	Solenoid Connection Type / Voltage

Series

Port Thread

NPT	N
G	D

Basic Size / Port Size

Basic Size	Port Size In-Out	Port Size Exhaust	
2	1/4	3/4	B20
	3/8	3/4	B21
4	1/2	1	B42
8	3/4	1	A54
	1	1	A55

Current / Voltage*

Current	Voltage*	
DC	24 V	A
AC	110 V, 50 Hz 120 V, 50/60 Hz	B
	230 V, 50/60 Hz	C

* For other voltages consult ROSS.

Reset Type

Automatic

Status Indicator Type / Connection

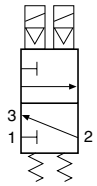
Status Indicator Type	Connection	
Mechanical Pressure Switch (connector included)	DIN EN 175301-803 Form A or M12	1
Solid State Pressure Sensor (built-in connector)	M12 only	2
None		X

Solenoid Connection Type * / Voltage

Solenoid Connection Type *	Voltage	
DIN EN 175301-803 Form A (connectors sold separately) Leave Blank	AC or DC	
M12	24 V DC only	005

* See options for connectors or wiring kits.

Model Number examples: DM1CNB20A31005, DM1CDB42B32,

Size			Flow Cv (Nl/min)		Weight# lb (Kg)	Simplified Schematic
Basic	Port 1, 2	Port 3	1-2	2-3		
2	1/4	3/4	1.7 (1700)	2.6 (2600)	5.3 (2.4)	
	3/8	3/4	2.2 (2200)	3.6 (3500)		
4	1/2	1	3.0 (3000)	6.5 (6400)	5.9 (2.6)	
8	3/4	1	4.2 (4100)	9.4 (9300)	8.4 (3.7)	
	1	1	4.3 (4200)	9.4 (9300)		

Safety Solutions Options

Safe Air Entry System Assemblies with DM¹ Series C Double Valves

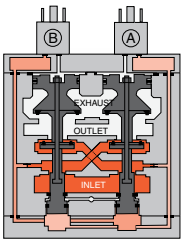
Air Entry System Assemblies with manual Lockout L-O-X® valve, air preparation FRL combinations, and Safe Exhaust Double Valves are available.

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.

Valve Operation

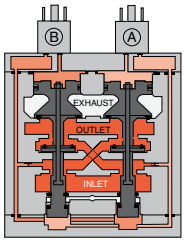
Valve De-actuated (ready-to-run)

The flow of inlet air pressure into the crossover passages from the inlet chamber is restricted by orifices that allow air pressure to bypass the lower inlet poppets. Flow is sufficient to quickly pressurize the pilot supply/timing chambers on both sides A and B. The upper inlet poppets prevent air flow from the crossover passages into the outlet chamber. Air pressure acting on the inlet poppets and return pistons securely hold the valve elements in the de-actuated position.



Valve Actuated

Energizing the pilot solenoids simultaneously applies pressure to both pistons, forcing the internal parts to move to their actuated position, where inlet air flow to outlet is open and both exhaust poppets are closed. The outlet is then quickly pressurized, and pressure in the inlet, crossovers, outlet, and timing chambers are quickly equalized. De-energizing the main solenoids causes the valve elements to return to the ready-to-run (de-actuated) position.



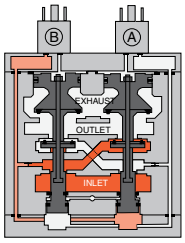
Asynchronous Operation

If the valve elements operate in a sufficiently asynchronous manner on ACTUATION, the valve will shift into a position where one crossover and its related timing chambers will be exhausted, and the other crossover and its related timing chambers will be pressurized.

In the illustration, side B is in the de-actuated position, but has no pilot air available to actuate with and has full pressure on its upper and lower inlet poppets and return piston to hold it in place.

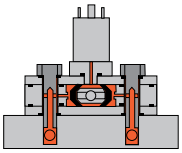
Inlet air flow on side B into its crossover is restricted and flows through the open upper inlet poppet on side A, through the outlet into the exhaust port, and from the exhaust port to atmosphere. Residual pressure in the outlet is less than 1% of inlet pressure.

Once the main solenoids are de-energized, actuating pressure is removed from the top of the main pistons and then the lower inlet poppet return spring along with inlet air pressure acting on the side A return piston will push side A back into the de-actuated position. Inlet air pressurizes the crossovers and volume chambers. Pressure in the crossovers helps hold the upper inlet poppets on seat. The valve will then be in the ready-to-run position. On the next attempt to actuate normally, if side B is still unable to actuate synchronously with side A, the same sequence of events described above will occur again.



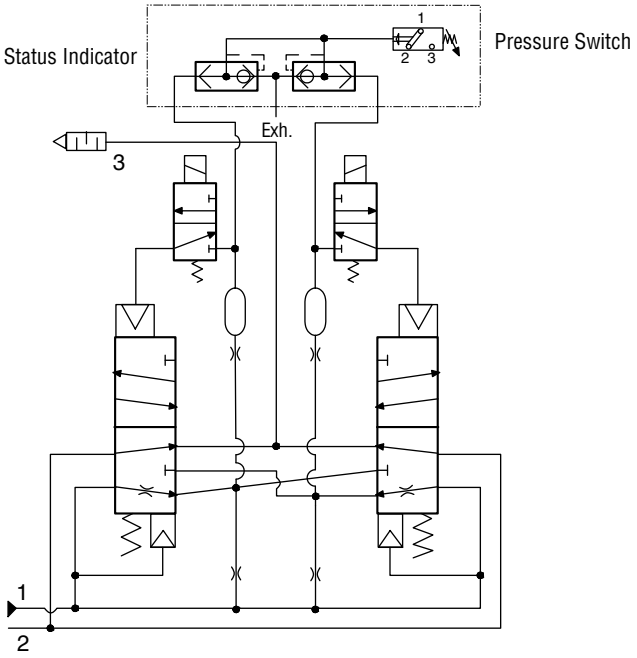
Status Indicator

The status indicator pressure switch will actuate when the main valve is operating normally, and will de-actuate when the main valve operation is sufficiently asynchronous or inlet pressure is removed. This device is not part of the valve lockout function, but, rather, only reports the status of the main valve.

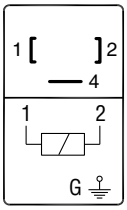
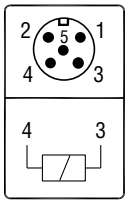


Status Indicator in normal ready-to-run position

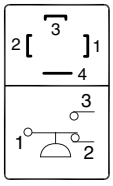
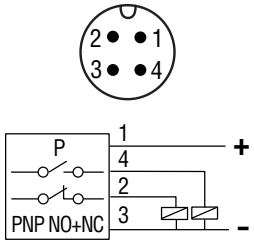
Valve Schematic



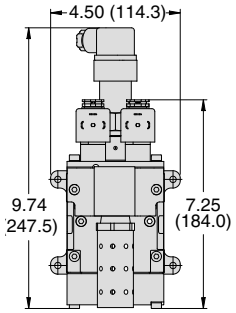
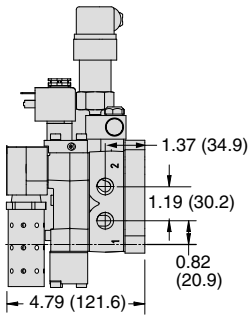
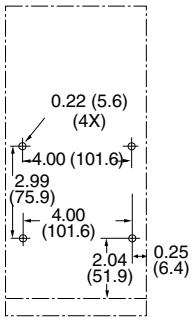
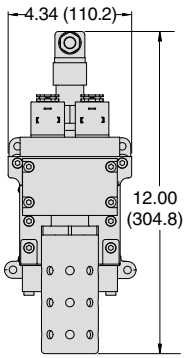
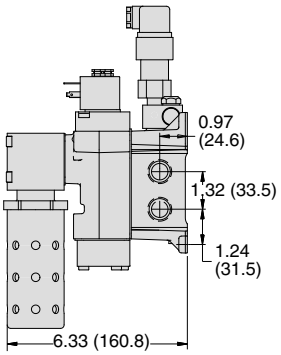
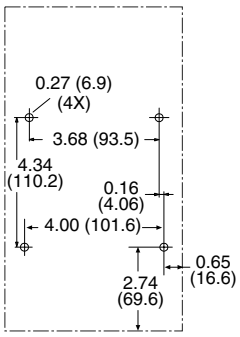
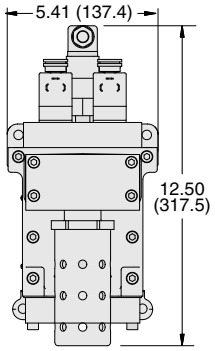
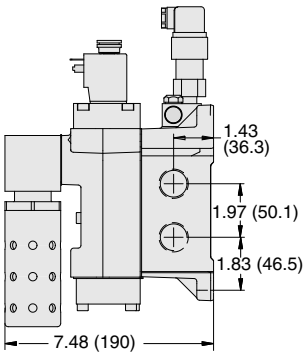
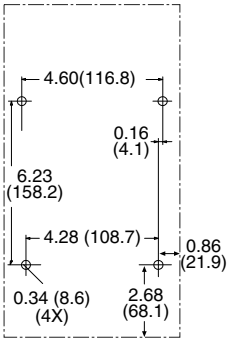
Solenoid & Pressure Swich for Status Indicator Pinouts

	DIN EN 175301-803 Form A	M12
Solenoid	 1 - Positive 2 - Negative 4 - Ground	 3 - Positive 4 - Negative

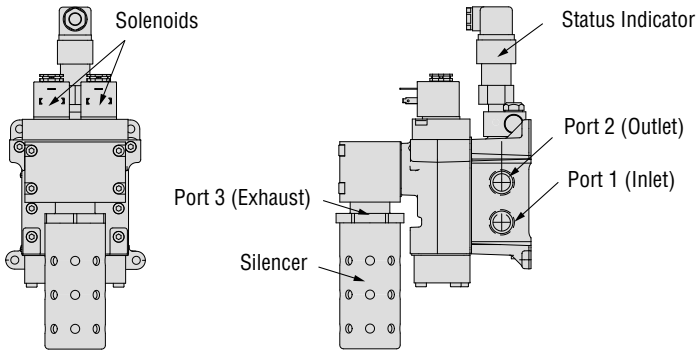
Pressure Switch

Mechanical Pressure Switch		Solid State Pressure Sensor
DIN EN 175301-803	**M12**	**M12**
 1 - Common 2 - Normally Closed 3 - Normally Open 4 - Ground (Not Used)	 1 - Common 2 - Normally Closed 3 - Not Used 4 - Normally Open	 1, 2, 3, 4 - Pin PNP - Switched Positive NO - Normally Open NC - Normally Closed

DIMENSIONS — Inches (mm)

Basic Size	Port Size			View X (base mounting hole pattern)
2	1/4 & 3/8			
4	1/2			
8	3/4 & 1			

Downloadable CAD models available.



Accessories

ELECTRICAL STATUS INDICATION

Pressure Switch

Illustration example.

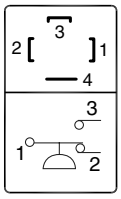
	Indicator Type	Connector Type	Model Number	Port Thread	Factory Preset psi (bar)
Pressure Switches for Status Indicator	Mechanical Pressure Switch	DIN EN 175301-803 Form A	1104A30	M10x1	22 (1.5) falling
		M12	1153A30		
	Solid State Pressure Sensor	M12	1335B30W	M10x1	17 (1.2) falling

	Indicator Type	Connector Type	Model Number	Factory Preset psi (bar)
Status Indicator Assemblies	Mechanical Pressure Switch	DIN EN 175301-803 Form A	Y670B94	22 (1.5) falling
	Solid State Pressure Sensor	M12	Y766B94	17 (1.2) falling

Pinouts

Mechanical Pressure Switch

DIN EN 175301-803



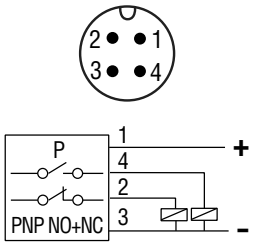
1 - Common
2 - Normally Closed
3 - Normally Open
4 - Ground (Not Used)

M12

1 - Common
2 - Normally Closed
3 - Not Used
4 - Normally Open

Solid State Pressure Sensor

M12



1, 2, 3, 4 - Pin
PNP - Switched Positive
NO - Normally Open
NC - Normally Closed

ENERGY RELEASE VERIFICATION

Pressure Switch	Redundant Pressure Switch Assembly
	

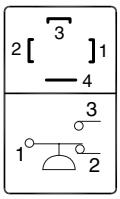
Illustration examples.

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

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

Pinout

DIN EN 175301-803



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

PREWIRED ELECTRICAL CONNECTORS

DIN EN 175301-803	M12
	

Illustration examples.

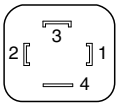
	Cable						Kit Number
	End 1	End 2	Length meters (feet)	Connection	Quantity Included	Cord Diameter mm	Without Light
	Connector	Cord					
Prewired Connector Kits	DIN EN 175301-803 Form A	Flying leads	5 (16.4)	Solenoid	2	6	2243H77
			10 (32.8)	Solenoid	2	6	2244H77
	M12 5-pin, Female	Flying leads	5 (16.4)	Solenoid	2	6	2245H77
			10 (32.8)	Solenoid	2	6	2246H77

	Cable						Model Number			
	End 1	End 2	Connection	Quantity Included	Length feet (meters)	Cord Diameter mm	Without Light	Lighted Connector		
	Connector	Cord						24 V DC	120 V AC	230 V AC
Prewired Connectors	DIN EN 175301-803 Form A	Flying leads	Solenoid	1	6.5 (2)	6	721K77	720K77-W	720K77-Z	720K77-Y
				1	6.5 (2)	10	371K77	383K77-W	383K77-Z	383K77-Y
	DIN EN 175301-803 Form A	Flying leads	Status Indicator	1	16.4 (5)	–	2247H77	–	–	–
				1	32.8 (10)	–	2248H77	–	–	–
	M12 5-pin, Female	Flying leads		1	16.4 (5)	–	2266H77	–	–	–
				1	32.8 (10)	–	2267H77	–	–	–

Connector Pinouts

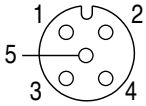
Solenoid

DIN EN 175301-803



1 - Black
2 - Black
4 - Green/Yellow (Ground)

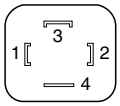
M12



3 - Blue
4 - Black

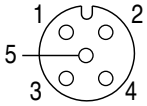
Status Indicator

DIN EN 175301-803



1 - Brown
2 - Grey
3 - Black
4 - Green/Yellow (Ground)

M12



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

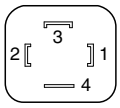
ELECTRICAL CONNECTORS

Cable Grip	
Without Light	**With Light**
	

Illustration examples.

Connectors	Connector					Model Number			
	Type	Connection	Fitting Connection	Quantity Included	Cord Diameter mm	Without Light	Lighted Connector		
							24 V DC	120 V AC	230 V AC
	DIN EN 175301-803 Form A	Solenoid	Cable grip	1	8 to 10	937K87	936K87-W	936K87-Z	936K87-Y
			1/2” NPT conduit	1	–	723K77	724K77-W	724K77-Z	724K77-Y

Connector Pinout
DIN EN 175301-803



1 - Black
2 - Black
4 - Green/Yellow (Ground)

JUNCTION BOX OPTIONS

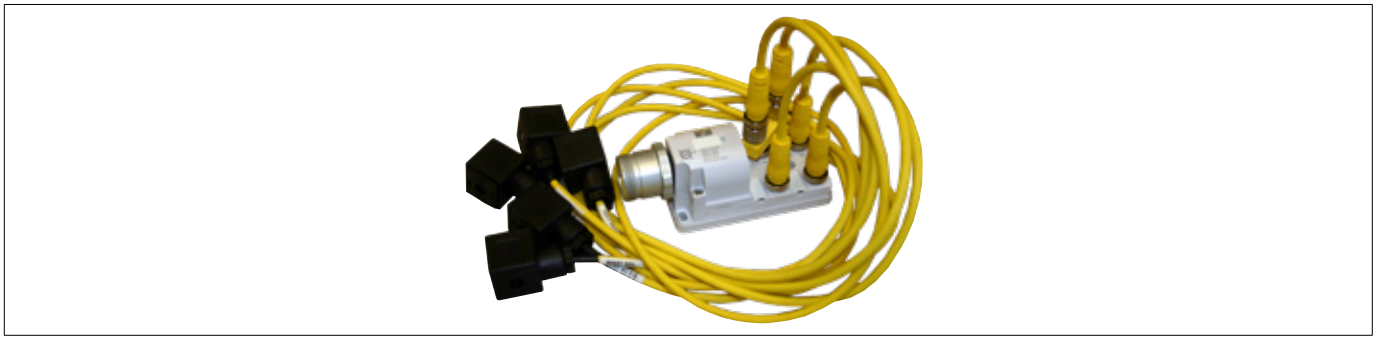


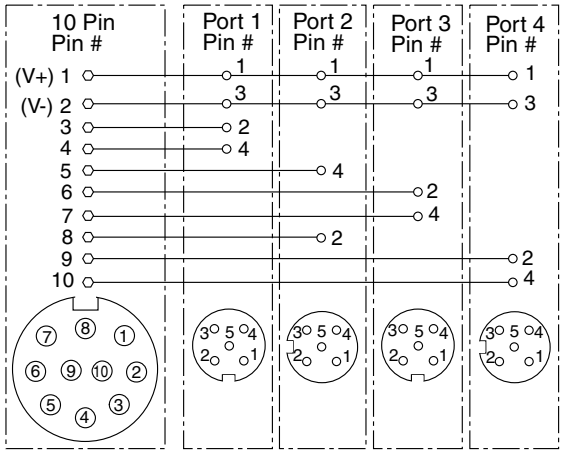
Illustration example.

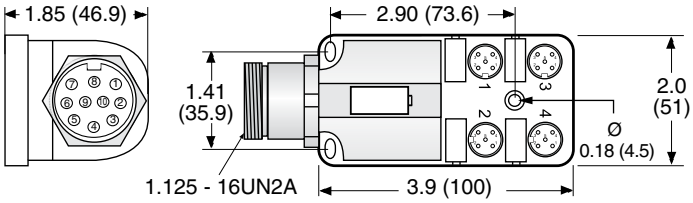
Wiring Kits with J-Box	J-Box			Cable				Kit Number
	Connection		J-Box Quantity	Connector Type		Quantity Included	Length feet (meters)	
	Control System	Solenoids / Status Indicator		End 1	End 2			
	10-pin Mini	M12 (5-pin)	1	M12	DIN EN 175301-803 Form A	4	3.3 (1)	2249H77
			1	M12	M12	4	3.3 (1)	2250H77

Connectors Pinout and Wiring Diagram

J-Box Wiring

Dimmensions: Inches (mm)





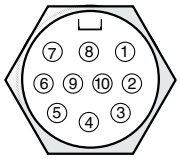
JUNCTION BOX OPTIONS

	Connection	Cable					Kit Number
		End 1	End 2	Conductors Type	Quantity Included	Length feet (meters)	
10-Pin MINI Cables	J-Box to Control System	10-pin Mini	Flying leads	18-gauge wire	1	12 (3.7)	2253H77
					1	20 (6.1)	2254H77
					1	30 (9.1)	2255H77
					1	50 (15.2)	2256H77

	Port Splitter			Cable				Kit Number
	Port Connectors	Number of Ports	Splitter Quantity	End 1 Connector	End 2 Connector	Quantity Included	Length feet (meters)	
Outlet Port Pressure Monitoring Wiring Kit	M12	3	1	M12	DIN EN 175301-803 Form A	1	3.3 (1)	2251H77

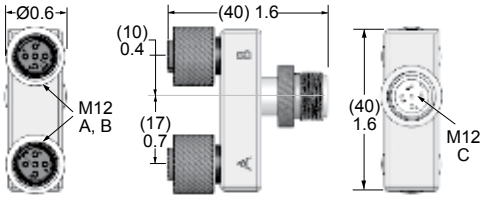
10-Pin MINI Cable

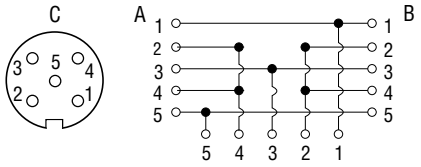
PIN #	Wire Colors	PIN #	Wire Colors
1 +24 V DC	Orange	6 -	Orange w/Black
2 Common V DC	Blue	7 Remote Reset	Red
3 -	White w/Black	8 -	Green/Yellow
4 Solenoid A	Red w/Black	9 Remote Valve Fault Light	Black
5 Solenoid B	Green w/Black	10 Remote System OK Light	White



Outlet Port Pressure Monitoring – Port Splitter

Dimmensions: Inches (mm)





A & B Female
C Male

HIGH FLOW NOISE REDUCTION SILENCER KITS

Silencers	Pressure Range psig (bar)
	0-125 (0-8.6) maximum

Reduces the Exponentially Perceived Noise (EPNdB), Impact noise reduction in the 17–25 dB range
Kits include all plumbing required for installation.

DM Valve Basic Size	Model Number		Flow scfm (L/s)	Dimensions inches (mm)			
	NPT Thread	R/Rp Thread		Width	Height (NPT)	Height (R/Rp)	Depth
2	2323H77	2328H77	800 (380)	4.96 (126.1)	14.24 (361.7)	16.05 (407.7)	5.73 (145.5)
4	2324H77	2329H77	800 (380)	4.34 (110.2)	19.06 (484.1)	21.40 (543.6)	7.27 (184.7)
8	2325H77	2329H77	800 (380)	5.41 (137.4)	21.18 (538.0)	23.52 (597.4)	8.41 (213.6)
12	2326H77	2330H77	2100 (980)	6.74 (117.2)	25.85 (656.6)	28.20 (716.3)	10.66 (270.8)
30	2327H77	2331H77	7200 (3400)	9.85 (250.2)	41.55 (1055.4)	41.55 (1055.4)	13.47 (342.1)

CAUTIONS, WARNINGS And STANDARD WARRANTY

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

PRE-INSTALLATION or SERVICE

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

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

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

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

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

FILTRATION and LUBRICATION

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

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

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

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

AVOID INTAKE/EXHAUST RESTRICTION

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

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

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

SAFETY APPLICATIONS

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

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

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

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

STANDARD WARRANTY

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

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

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