Safe Exhaust Double Valves

DM[1] Series C

Product Catalog

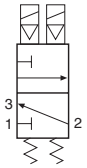
ROSS™
a global family

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.

Simplified Schematic



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 at rosscontrols.com

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 Normally Closed Valve		
	Construction Design		Dual Poppet		
	Actuation		Electrical		
	Mounting	Type	Base		
		Orientation	Vertically with pilot solenoids on top		
	Connection		Threaded; G, NPT		
	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**		According to VDE 0580. Enclosure rating according to DIN 400 50 IP 65 Three solenoids, rated for continuous duty		
	Operating Voltage		24 volts DC 110 volts AC, 50 Hz; 120 volts AC, 50/60 Hz 230 volts AC, 50/60 Hz		
	Power Consumption (each solenoid)	**Primary Solenoids**	Valve Basic Size	2, 4	24 V DC, 110/120 V AC, 230 V AC – 5.8 watts nominal, 6.5 watts maximum
				8	24 V DC – 15 watts 110/120 V AC – 36 VA inrush and 24.6 VA holding 230 V AC – 32 VA inrush and 22 VA holding
	Enclosure Rating		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

Safety Category	DGUV (German Social Accident Insurance)	CE Conformity Declaration	EAC Conformity Declaration	ISO Standard	CSA Certificate of Compliance	CRN Certification
Cat. 4 PL e SIL 3 Functional Safety	HSM 16008 Sicherheit geprüft tested safety	CE	EAC	ISO 13849-1:2015	C SP US	Available for appropriately tested valves

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Ordering Information

MODEL NUMBER CONFIGURATOR

3-Way 2-Position Valves

DM1C	D	B21	A	3	1	
Series	Thread	Basic Size / Port Size	Voltage	Reset Type	Status Indicator	Other Options

Series

DM1C

Thread

G	D
NPT	N

Basic Size / Port Size

Basic Size	Port Size Inlet	Outlet	Exhaust	
2	1/4	1/4	3/4	B20
	3/8	3/8	3/4	B21
4	1/2	1/2	1	B42
8	3/4	3/4	1	A54
	1	1	1	A55

Voltage*

24 volts DC	A
110 volts AC, 50 Hz; 120 volts AC, 50/60 Hz	B
230 volts AC, 50/60 Hz	C**

* For other voltages consult ROSS.
** 230 V AC not available in the U.S. (OSHA regulations limit control voltage to no more than 120 volts AC).

Reset Type

Automatic

Status Indicator

Mechanical Pressure Switch, DIN EN 175301-803 Form A	1
Solid State Pressure Sensor, M12	2
None	X

Other Options*

Connector	Description		
DIN EN 175301-803 Form A	Solenoids	Connector not included	Leave Blank
	Mechanical Pressure Switch**	DIN EN Connector included	
M12 (24 V DC only)	Solid State Pressure Sensor**	M12 Built-in Connector included	
M12 (24 V DC only)	Solenoids	Adapter DIN EN to M12 Connector included	005
	Mechanical Pressure Switch**		
	Solid State Pressure Sensor**	M12 Built-in Connector included	

*See options for connectors or wiring kits.
** If the specific status indicator option is selected.

Basic Size	Port Size 1	2	3	Flow Cv 1-2	2-3	Weight# lb (Kg)
2	1/4	1/4	3/4	1.7	2.6	5.3 (2.4)
	3/8	3/8	3/4	2.2	3.6	
4	1/2	1/2	1	3.0	6.5	5.9 (2.6)
8	3/4	3/4	1	4.2	9.4	8.4 (3.7)
	1	1	1	4.3	9.4	

Valve and base assembly with status indicator.

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.

For information please visit www.rosscontrols.com.

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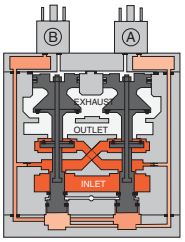
Valve Operation

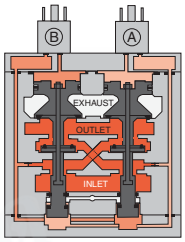
Valve De-actuated (ready-to-run)

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. (Internal air passages shown out of the valve body for clarity.)



Valve Actuated

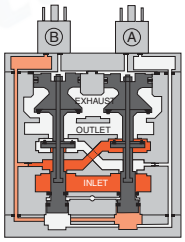
Energizing the pilot solenoids simultaneously applies pressure to both pistons, forcing the internal parts to move to their actuated position, where inlet air flow to outlet is open and both exhaust poppets are closed. The outlet is then quickly pressurized, and pressure in the inlet, crossovers, outlet, 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

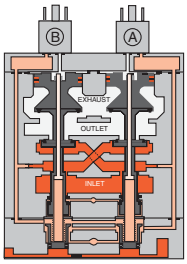
If the valve elements operate in a sufficiently asynchronous manner on ACTUATION, the valve will shift into a position where one crossover and its related timing chambers will be exhausted, and the other crossover and its related timing chambers will be pressurized.
In the illustration, side B is in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



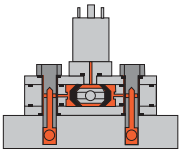
WARNING

The valve will remain in the locked-out position, even if the inlet air supply is removed and re-applied.
A remote reset signal must be applied to reset the valve. Reset is accomplished by momentarily pressurizing the reset port. Actuation of the reset piston physically pushes the main valve elements to their closed position. Inlet air fully pressurizes the crossovers and holds the inlet poppets on seat. Actuation of the reset piston opens the reset poppet, thereby, immediately exhausting pilot supply air, thus, preventing valve operation during reset (Reset adapter added to illustration.). De-actuation of reset pistons causes the reset poppets to close and pilot supply to fully pressurize. Reset pressure can be applied by a remote 3/2 normally closed valve, or from an optional 3/2 normally closed solenoid mounted on the reset adapter. De-actuation of reset pistons causes the reset poppets to close and pilot supply to fully pressurize. Reset air pressure can be applied by a remote 3/2 normally closed valve, or from an optional 3/2 normally closed solenoid, or a manual push button mounted on the reset adapter.



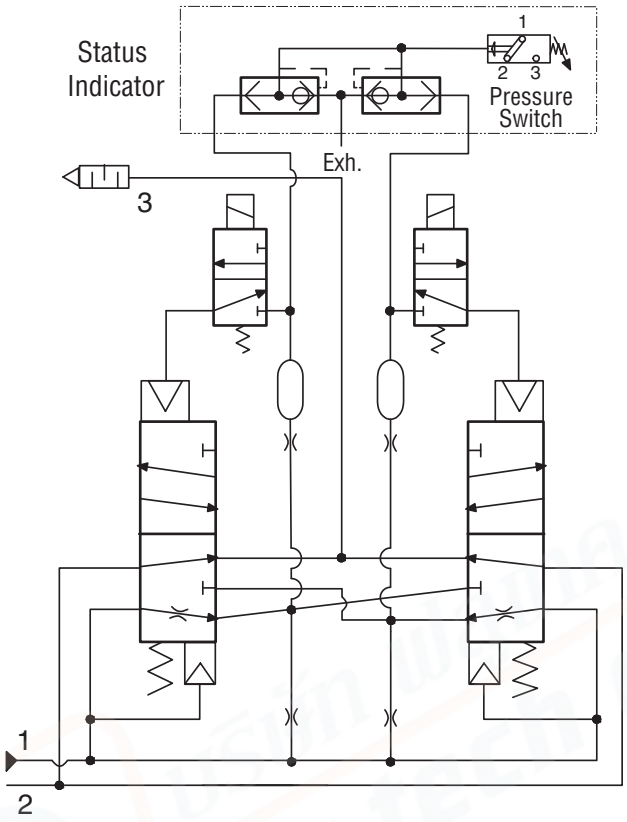
Status Indicator

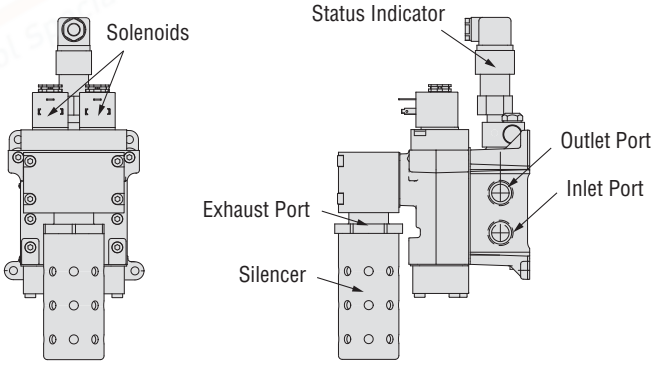
The status indicator pressure switch will actuate when the main valve is operating normally, and will de-actuate when the main valve operation is sufficiently asynchronous or inlet pressure is removed. This device is not part of the valve lockout function, but, rather, only reports the status of the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



Status Indicator in normal ready-to-run position

Valve Schematic





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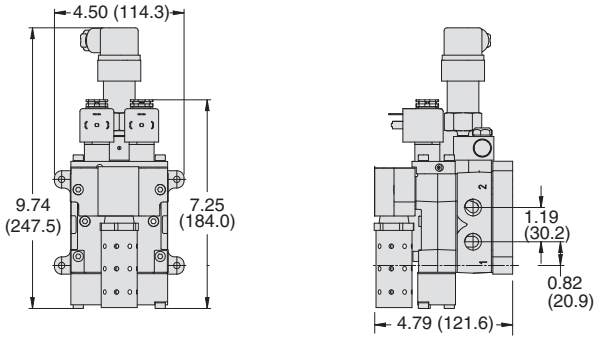
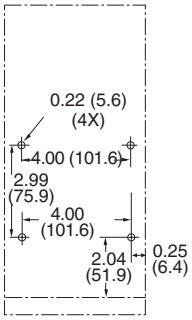
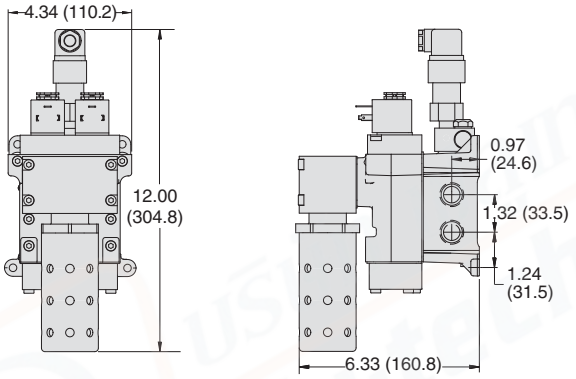
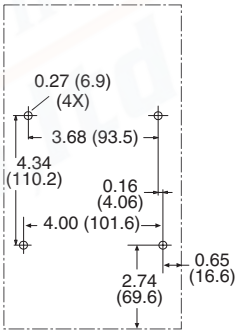
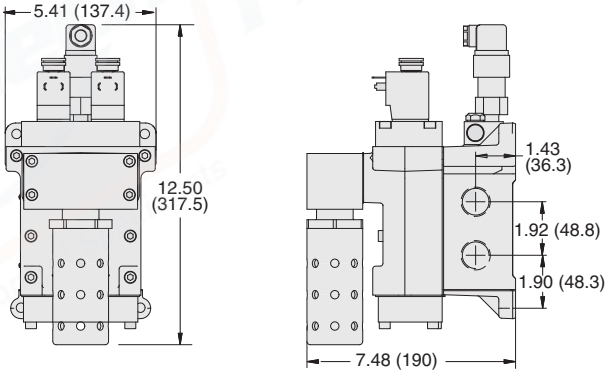
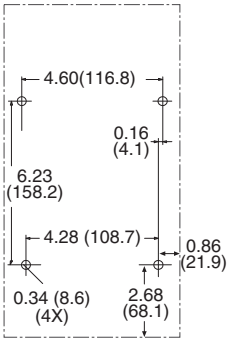
DIMENSIONS

Inches (mm)

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

For additional information, and to assist you with piping and connectivity designs, our products are available in downloadable 2D drawings and 3D CAD models in a wide range of options including native formats, visit www.rosscontrols.com.

Accessories & Options

PRESSURE STATUS INDICATION

Pressure Switches for Status Indicator

Indicator Type	Connector Type	Model Number	Port Thread	Factory Preset psi (bar)
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

Status Indicator Assemblies

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

Not compatible with Size 4 valves manufactured before 3/2021, e.g., DM1CDA4***or DM1CNA4***. For Size 4 valves manufactured before 3/2021, use part number Y670B94.

ENERGY RELEASE VERIFICATION

Pressure Switch

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

Redundant Pressure Switch Assembly

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

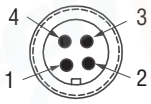
Connectors Pinout

Mechanical Pressure Switch

DIN EN 175301-803 Form A

1 - Common
2 - Normally Closed
3 - Normally Open
G - Ground

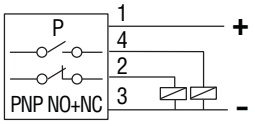
M12



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

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ELECTRICAL CONNECTORS

Pre-wired Connector Kits

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

Pre-wired Connectors

Connection Type	Connector Type	End 1	End 2	Quantity	Length meters (feet)	Cord Diameter mm	Model Number Without Light	Lighted Connector 24 V DC	120 V AC	230 V AC
Solenoid	DIN EN 175301-803 Form A	Connector	Flying leads	1	2 (6.5)	6	721K77	720K77-W	720K77-Z	720K77-Y
				1		10	371K77	383K77-W	383K77-Z	383K77-Y
Status Indicator	DIN EN 175301-803 Form A	Connector	Flying leads	1	5 (16.4)	–	2247H77	–	–	–
				1	10 (32.8)	–	2248H77	–	–	–
	M12 5-pin, Female	Connector	Flying leads	1	5 (16.4)	–	2666H77	–	–	–
				1	10 (32.8)	–	2667H77	–	–	–

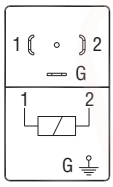
Connectors (no cable)

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

Connectors Pinout

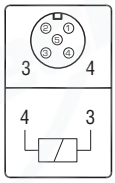
Solenoid

DIN EN 175301-803 Form A



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

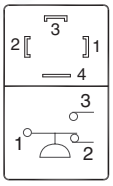
M12



3 - Blue
4 - Black

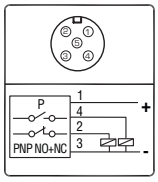
Status Indicator

DIN EN 175301-803 Form A



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

M12



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

Options

JUNCTION BOX OPTIONS

Wiring Kits with J-Box

J-Box			Cord Connector Type				Kit Number
Connection Type		J-Box Quantity	Connector Type		Length meters (feet)	Cord Quantity	
Control System	Solenoids/Status Indicator		End 1	End 2			
10-pin Mini	M12 (5-pin)	1	M12	DIN EN 175301-803 Form A	1.0 (3.3)	4	2249H77
		1	M12	M12	1.0 (3.3)	4	2250H77

10-Pin MINI Cables

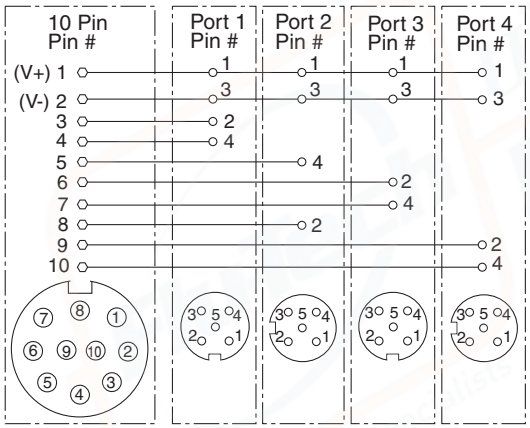
Connection Type	Cord Connector Type			Length meters (feet)	Kit Number
	End 1	End 2	Cable Conductors		
J-Box to Control System	10-pin Mini	Flying Leads	18-gauge wire	3.7 (12)	2253H77
				6.1 (20)	2254H77
				9.1 (30)	2255H77
				15.2 (50)	2256H77

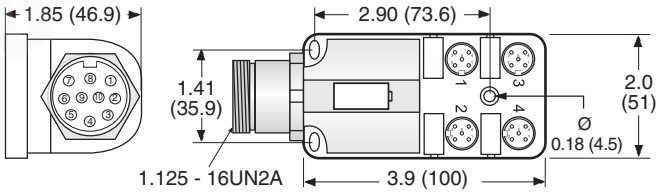
Outlet Port Pressure Monitoring Wiring Kit

Port Splitter			Cord Connector Type				Kit Number
Port Connectors	Number of Ports	Splitter Quantity	End 1	End 2	Length meters (feet)	Cord Quantity	
M12	3	1	M12	DIN EN 175301-803 Form A	1.0 (3.3)	1	2251H77

Connectors Pinout and Wiring Diagram

J-Box Wiring

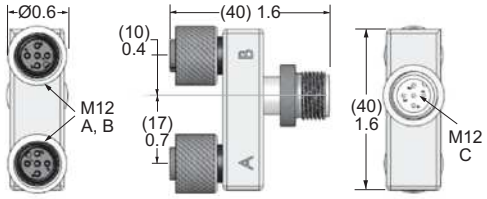


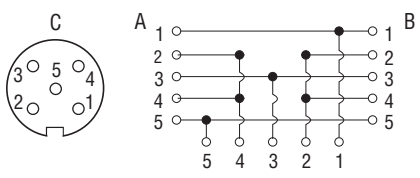


10-Pin MINI Cable

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





A & B Female
C Male

NOISE REDUCTION SILENCERS

High Flow Noise Reduction Silencer Kits

Valve Basic Size	Kit Number*	
	R/Rp Thread	NPT Thread
2	2328H77	2323H77
4	2329H77	2324H77
8		2325H77

* Kits include all plumbing required for installation.

Reduces the Exponentially Perceived Noise (EPNdB), Impact noise reduction in the 35–40 dB range.
Recommended for air exhaust applications for pressures up to 125 psig (8.6 bar).
Pressure Range – 125 psig (8.6 bar) maximum.

Valve Basic Size	Flow scfm (L/s)	Dimensions** inches (mm)				Pressure Range psig (bar)
		Width	Height (R)	Height (NPT)	Depth	
2	800 (378)	4.96 (126.1)	16.05 (407.7)	14.24 (361.7)	5.73 (145.5)	0-125 (0-8.6) maximum
4	800 (378)	4.34 (110.2)	21.40 (543.6)	19.06 (484.1)	7.27 (184.7)	
8	800 (378)	5.41 (137.4)	23.52 (597.4)	21.18 (538.0)	8.41 (213.6)	

** Dimensions reflect valve with installed silencer.

Replacement Valves and Sub-Bases

REPLACEMENT VALVES (VALVE ONLY NO BASE)

MODEL NUMBER CONFIGURATOR

3-Way 2-Position Valves

DM2C	D	B2X	A	3	X	
Series	Thread		Voltage	Reset Type	Status Indicator	Other Options

Thread

G	D
NPT	N

Reset Type

Automatic

Status Indicator

None

Other Options*

Connector	Description		
DIN EN 175301-803 Form A	Solenoids	Connector not included	Leave Blank
M12 (24 V DC only)	Solenoids	Adapter DIN EN to M12 Connector included	005

*See options for connectors or wiring kits.

Basic Size	Port Size			
	Inlet	Outlet	Exhaust	
2	1/4	1/4	3/4	B2X
	3/8	3/8	3/4	
4	1/2	1/2	1	B4X
8	3/4	3/4	1	A5X
	1	1	1	

Voltage*

24 volts DC	A
110 volts AC, 50 Hz; 120 volts AC, 50/60 Hz	B
230 volts AC, 50/60 Hz	C**

* For other voltages consult ROSS.
** 230 V AC not available in the U.S. (OSHA regulations limit control voltage to no more than 120 volts AC).

REPLACEMENT SUB-BASES

Valve Basic Size	Port Size			Status Indicator	Sub-Base Model Number		Weight lb (kg)
	Inlet	Outlet	Exhaust		G Thread	NPT Thread	
2	1/4	1/4	3/4	No	YD1872C91	Y1872C91	1.7 (0.8)
				Yes	YD1873C91	Y1873C91	2.1 (1.0)
	3/8	3/8	3/4	No	YD1874C91	Y1874C91	1.7 (0.8)
				Yes	YD1875C91	Y1875C91	2.1 (1.0)
4	1/2	1/2	1	No	YD1697C91	Y1697C91	1.7 (0.8)
				Yes	YD1698C91	Y1698C91	2.3 (1.1)
8	3/4	3/4	1	No	YD1701C91	Y1701C91	3.6 (1.6)
				Yes	YD1702C91	Y1702C91	4.2 (1.9)
	1	1	1	No	YD1703C91	Y1703C91	3.6 (1.6)
				Yes	YD1704C91	Y1704C91	4.2 (1.9)