Double Valves with Dynamic Monitoring & Memory

Dynamic Monitoring With Memory: Memory, monitoring, and air flow control functions are integrated into two identical valve elements. Valves lock-out if asynchronous movement of valve elements occurs during actuation or de-actuation, resulting in a residual outlet pressure of less than 1% of supply.

An Action is Required for Reset: Cannot be reset by removing and re-applying supply pressure. Reset can be accomplished by the integrated electrical (solenoid) reset or by the manual reset button.

Basic 3/2 Normally Closed Valve Function: Dirt tolerant, wear compensating poppet design for quick response and high flow capacity. PTFE back-up rings on pistons to enhance valve endurance – operates with or without inline lubrication.

LED Indication: Light-emitting diode (LED) indicators of main solenoid operation, reset solenoid operation, and status indicator condition.

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 lockout or ready-to-run condition.

Transducer (optional): For monitoring of downstream pressure in the system.

Silencers: All models include high flow, clog resistant silencers.

ISO 13849-1:2006
Category 4 PL e
applications

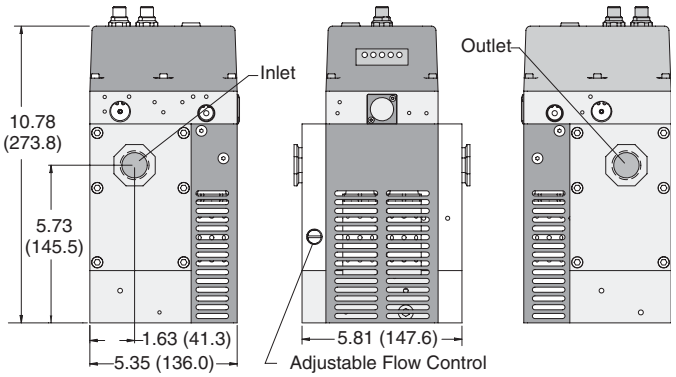
U.S. Patent
No. 6840258, 6840259
(Worldwide Patents
Pending)

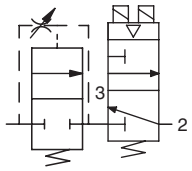
F3

Port Size		Basic Size	Transducer	Valve Model Number*	C_v		Weight lb (Kg)
Inlet	Outlet				1 to 2	2 to 3	
3/4	3/4	8	With	MDM2CNA55A23	3.7	8.5	16.3 (7.4)
3/4	3/4	8	Without	MDM2CNA55A21	3.7	8.5	16.1 (7.3)

* NPT port threads. For BSPP threads , replace "N" in the model number with a "D", e.g., MDM2CDA55A23.

Valve Dimensions – inches (mm)

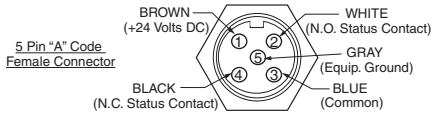


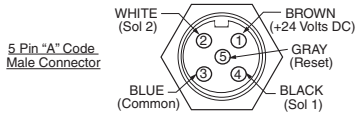


Simplified Schematic

F

Valve Wiring





Mounting brackets are required to install valve in the system, see M DM²® Series C accessories for ordering information page F3.18.

STANDARD SPECIFICATIONS (for valves on this page):

Construction: Dual Poppet.
Mounting Type: Base mounted.
Pilot Solenoids: According to VDE 0580. Enclosure rating according to DIN 400 50 IP 65. Three solenoids, rated for continuous duty.
Standard Voltages: 24 volts DC.
Pilot Solenoids Power Consumption (each solenoid)**:**
Primary and reset solenoids: 1.2 watts on DC.
Enclosure Rating: IP65, IEC 60529.
Solenoid & Status Indicator Connection:
M12, 5-pin Male Receptacle, A-Coded.
Ambient Temperature: 15° to 122°F (-10° to 50°C).
Media Temperature: 40° to 175°F (4° to 80°C).
Flow Media: Filtered, lubricated or unlubricated (mineral oils according to DIN 51519, viscosity classes 32-46); 5-micron recommended.

Inlet Pressure: 30 to 150 psig (2 to 10 bar). Under certain circumstances, such as maximum restriction of the adjustable flow control or a very large downstream system volume, the minimum inlet pressure may need to be set up to 60 psig (4 bar) to prevent nuisance valve faults.
Pressure Switch (Status Indicator) Rating: 5 amps at 30 volts DC.
Monitoring: Dynamically, cyclically, internally during each actuating and de-actuating movement. Monitoring function has memory and requires an overt act to reset unit after lockout.
Mounting Orientation: Vertically with pilot solenoids on top.

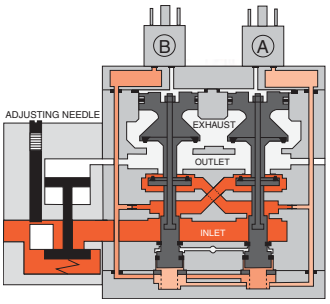
Functional Safety Data: Category 4 PL e; B10d: 20,000,000; PFHd: 7.71×10^{-9} ; MTTFd: 301.9 (n_{op}: 662400).
Certifications: CE Marked for applicable directives, CSA/UL.
Vibration/Impact Resistance: Tested to BS EN 60068-2-27.

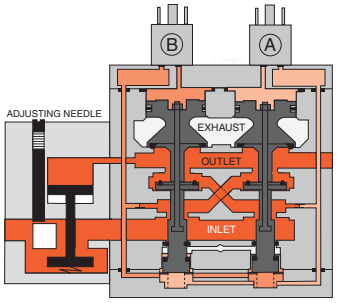
This valve is not designed for controlling clutch/brake mechanisms on mechanical power presses, see DM2® series D for mechanical power press applications.

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

© 2016, ROSS CONTROLS®. All Rights Reserved.

Valve de-actuated (ready-to-run): The flow of inlet air pressure to the inlet chamber of the main valve internals is restricted by a fixed orifice and an adjustable flow control as well as an air piloted 2-way normally closed poppet valve. The flow of inlet air pressure into the crossover passages is restricted by the size of the passage between the stem and the valve body opening. Flow is sufficient to quickly pressurize pilot supply/timing chambers A and B. The inlet poppets prevent air flow from crossover passages into the outlet chamber. Air pressure acting on the inlet poppets and return pistons securely hold the valve elements in the closed position. (Reset adapter omitted for clarity.)



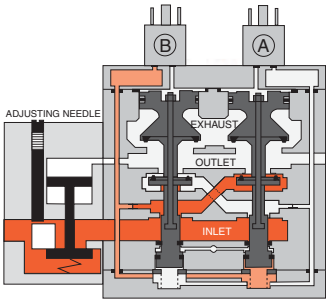


Valve actuated: Energizing the pilot valves simultaneously applies pressure to both pistons, forcing the internal parts to move to their actuated (open) position, where inlet air flow to crossover passages is fully open, inlet poppets are fully open and exhaust poppets are fully closed. The outlet is then pressurized at a rate allowed by the fixed orifice and the adjusted flow control. Once the air pressure in the outlet chamber reaches approximately 60% of inlet pressure, the air piloted 2-way normally closed poppet valve opens fully and the pressure in the inlet, crossovers, outlet, and timing chambers are quickly equalized. The adjustable flow control will control the time it takes for the outlet air pressure to reach approximately 60% of inlet pressure. Green "SOL. 1" and SOL. 2" LEDs will be displayed when the main solenoids are energized.

De-energizing the pilots quickly causes the valve elements to return to the ready-to-run position.

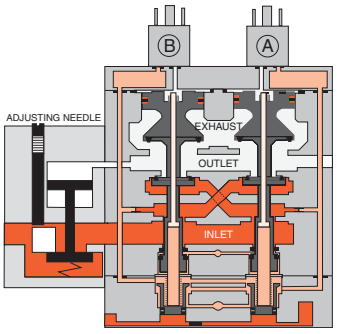
Valve locked-out: Whenever the valve elements operate in a sufficiently asynchronous manner, either on actuation or de-actuation, the valve will move to a locked-out position. In the locked-out position, one crossover and its related timing chamber will be exhausted, and the other crossover and its related timing chamber will be fully pressurized. The valve element (side B) that is partially actuated has pilot air available to fully actuate it, but no air pressure on the return piston to fully de-actuate the valve element.

Air pressure in the crossover acts on the differential of side B stem diameters creating a latching force. Side A is in a fully closed position, and has no pilot air available to actuate, but has full pressure on the inlet poppet and return piston to hold the element in the fully closed position. Inlet air flow on side A into its crossover is restricted, and flows through the open inlet poppet on side B, 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. The return springs are limited in travel, and can only return the valve elements to the intermediate (locked-out) position. Sufficient air pressure acting on the return pistons is needed to return the valve elements to a fully closed position.



Resetting the valve: 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. A momentary, remote electrical signal must be applied to the reset solenoid to apply pressure to the reset pistons in the valve. 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 air pressure is applied by a 3/2 normally closed solenoid, or a manual push button mounted on the reset adapter in the top valve cover. A green "RESET SOL." LED will be displayed when the reset solenoid is energized.

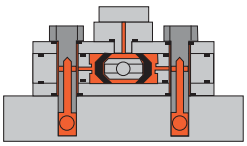


The reset procedure is as follows:

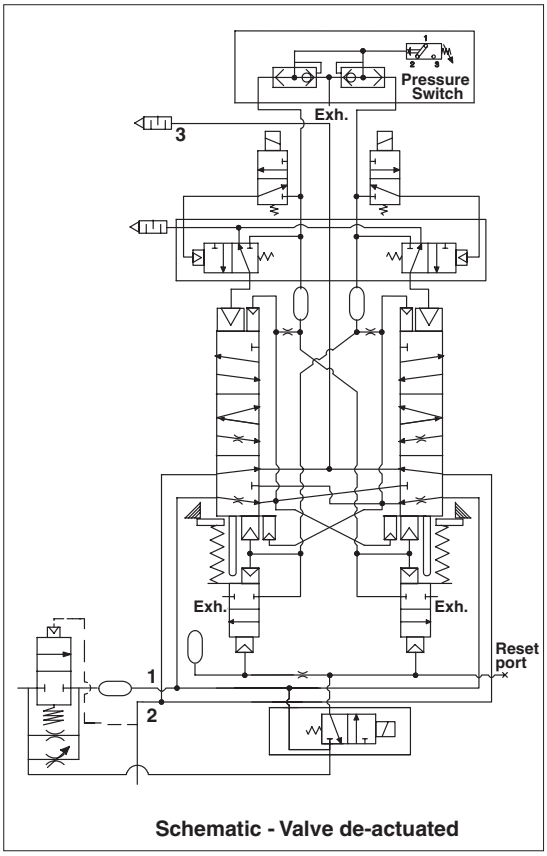
- *Remove the electrical signals to the main coils*
- *Ensure there is air supplied to the valve*
- *Energize the reset solenoid for a minimum of 200 ms*
- *Allow a 200 ms delay after de-energizing the reset solenoid and re-energizing the main solenoids*

Status Indicator:

The status indicator pressure switch will actuate when the main valve is operating normally, and will de-actuate when the main valve is in the locked-out position 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. If the valve is in a ready-to-run condition, a green "STATUS" LED will be displayed. If the valve is faulted or there is no air pressure at the inlet, a red "STATUS" LED will be displayed.



Status indicator in normal ready-to-run position



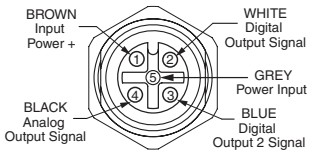
Schematic - Valve de-actuated

F3

F

Digital Pressure Transducer

Model Number
2447H77



Precision digital pressure transducer with 5 pin female connection

- Two PNP digital outputs which may be set individually, 4-20 mA analog output
- Three operation modes: Easy, Window and Hysteresis
- Selectable response times to eliminate output chattering
- Powered by 12-24 vots DC
- 6 pressure unit conversions
- Lockable keypad
- Fast zero reset

Wiring Kits

Kit Number	Length
2431H77	Wiring Kit - 5 meters (16.4 feet). Includes two cords, and the cord grips.
2432H77	Wiring Kit with Transducer - 5 meters (16.4 feet). Includes three cords, and the cord grips.

Mounting Accessories

At least two mounting brackets should be used.
This can consist of two clamp mounting brackets or one clamp mounting bracket and one mounting bracket Kit Number 2433H77.

F3

Clamp for Module Connections

Specially designed clamps provide a quick and easy assembly or disassembly of MD3™ modules. Two allen-head bolts quickly tighten or loosen the clamp using a 5/32 or 4mm hex key. The clamp contains a plate carrying two O-rings to provide positive sealing between modules.

Order clamp by part number **R-A118-105**.

Combined clamp and bracket (below) can be ordered by part number **R-A118-105M**.

Mounting Brackets

Two brackets are normally used to mount an FRL to a vertical surface. The mounting bracket attaches to the module connecting clamp (see above) with a single screw. Each bracket then employs two bolts (1/4" or 6mm) to connect the assembly to the mounting surface.

Order bracket and screw by part number **R-A118-103**.

Combined bracket and clamp (above) can be ordered by part number **R-A118-105M**.

F

Module Connecting Clamp
Part No. R-A118-105

Mounting Bracket
Part No. R-A118-103

Combined Clamp & Bracket
Part No. R-A118-105M

Male and Female End Ports

Either male or female end ports can be attached to threaded inlet and outlet lines. This allows all modules of an FRL assembly to be removed easily and quickly without having to unthread the end modules. The end ports are attached to the modules with clamps (see at left). End ports can be included in an assembled FRL or ordered separately by the following part numbers:

Port Size	Male Part Number*
1/4	R-118-109-2F
3/8	R-118-109-3F
1/2	R-118-109-4F
3/4	R-118-109-6F

Port Size	Female Part Number*
1/4	R-118-100-2
3/8	R-118-100-3
1/2	R-118-100-4
3/4	R-118-100-6

* For BSPP threads, add a "W" suffix to the model number, e.g., R-118-109-2FW.

Extra Port Blocks

An extra port block can be placed between modules to provide two auxiliary 1/4 NPTF ports. Its mounting position can be rotated to obtain the most convenient operating orientation. If only one auxiliary port is to be used, the unused port must be closed with a pipe plug. (The inlet and outlet are not threaded.)

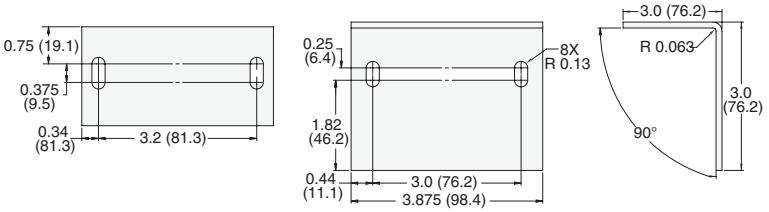
Port Size	Part Number*
1/4	R-118-106-2
3/8	R-118-106-3
1/2	R-118-106-4

* For BSPP threads, add a "W" suffix to the model number, e.g., R-118-106-2W.

Mounting Bracket Kit

Mounting Bracket Kit includes bracket and bolts to mount to the valve end plate.

Kit Number	2433H77



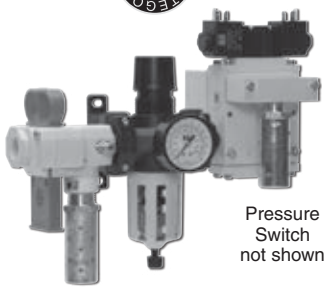
IMPORTANT NOTE: Please read carefully and thoroughly all of the **CAUTIONS, WARNINGS** on the inside back cover.

© 2016, ROSS CONTROLS®. All Rights Reserved.

DM[1] Series E Double Valves, Manual Lockout L-O-X® Valves with Integrated Filter/Regulator

CONTROL CATEGORY 4

Pre-engineered panel-mounted design with air entry via a filter and regulator "FR", or filter, regulator and lubricator "FRL".
Includes DM[1] Series E Double Valve with Monitoring:
a) Self-contained dynamic monitoring system requires no further valve monitoring controls,
b) 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 & stay in a locked-out state until intentionally reset. Therefore, cumulative abnormalities may go undetected,
c) Status indicator switch for valve condition (ready-to-run) feedback.
Mounting plate included.



Pressure Switch not shown

Air Entry Combination	Port Size		Model Number*	Air Entry Type	C_v		Dimensions inches (mm)		
	1, 2	3			1-2	2-3	Length	Width	Depth
Cat-4 with DM1 Series E	1/4	1/2	RC304-09**	FR	1.3	2.4	13.00 (330.0)	11.00 (279.0)	5.40 (134.7)
Cat-4 with DM1 Series E	3/8	1/2	RC306-09**	FR	2.2	2.4	13.00 (330.0)	11.00 (279.0)	5.40 (134.7)
Cat-4 with DM1 Series E	1/4	1/2	RC304L-09**	FRL	1.3	2.4	13.00 (330.0)	11.00 (279.0)	5.40 (134.7)
Cat-4 with DM1 Series E	3/8	1/2	RC306L-09**	FRL	2.2	2.4	13.00 (330.0)	11.00 (279.0)	5.40 (134.7)

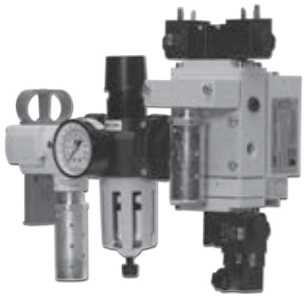
* NPT pressure port threads.
** Specify voltage when ordering. Insert voltage code: "W" = 24 volts DC; "Z" = 110-120 volts AC, 50/60 Hz; e.g., RC304-09W. M12 connectors available, consult ROSS.
Standard Air Entry Packages supplied with metal bowl and manual drain. For automatic drain insert an "A" before the dash (-) in the model number, e.g., RC304A-09.

Custom designs available, consult ROSS.

DM[2]® Series E Double Valves, Manual Lockout L-O-X® Valves with Integrated Filter/Regulator

CONTROL CATEGORY 4

Pre-engineered panel-mounted design with air entry via a filter and regulator "FR", or filter, regulator and lubricator "FRL".
Includes DM[2]® Series E Double Valve with Monitoring & Memory:
a) Self-contained dynamic monitoring system requires no further valve monitoring controls,
b) Dynamic memory of abnormal function prevents unintentional reset with removal of air or electricity.
All necessary features for safety applications are included:
a) Electrical reset valve,
b) Status indicator switch for valve condition (ready-to-run) feedback.
Mounting plate included.



Air Entry Combination	Port Size		Model Number*	Air Entry Type	C_v		Dimensions inches (mm)		
	1, 2	3			1-2	2-3	Length	Width	Depth
Cat-4 with DM2® Series E	1/4	1/2	RC404-09**	FR	1.3	2.4	13.00 (330.0)	11.00 (279.0)	5.40 (134.7)
Cat-4 with DM2® Series E	3/8	1/2	RC406-09**	FR	2.2	2.4	13.00 (330.0)	11.00 (279.0)	5.40 (134.7)
Cat-4 with DM2® Series E	1/4	1/2	RC404L-09**	FRL	1.3	2.4	13.00 (330.0)	11.00 (279.0)	5.40 (134.7)
Cat-4 with DM2® Series E	3/8	1/2	RC406L-09**	FRL	2.2	2.4	13.00 (330.0)	11.00 (279.0)	5.40 (134.7)

* NPT pressure port threads.
** Specify voltage when ordering. Insert voltage code: "W" = 24 volts DC; "Z" = 110-120 volts AC, 50/60 Hz; e.g., RC404-09W. M12 connectors available, consult ROSS.
Standard Air Entry Packages supplied with metal bowl and manual drain. For automatic drain insert an "A" before the dash (-) in the model number, e.g., RC404A-09.

Custom designs available, consult ROSS.

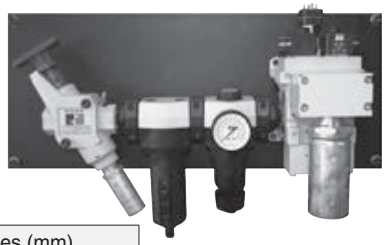
NOTE: Per specifications and regulations, these products are defined as energy isolation devices, NOT AS EMERGENCY STOP DEVICES.

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

DM2® Series C Double Valves, Manual Lockout L-O-X® Valves with Filter and Regulator

CONTROL CATEGORY 4

Pre-engineered panel-mounted design with air entry via a filter and regulator "FR", or filter, regulator and lubricator "FRL"
Includes DM2® Series C Double Valve with Monitoring & Memory:
a) Self-contained dynamic monitoring system requires no further valve monitoring controls,
b) Dynamic memory of abnormal function prevents unintentional reset with removal of air or electricity
All necessary features for safety applications are included:
a) Electrical reset valve,
b) Status indicator switch for valve condition (ready to run) feedback



Air Entry Combination	Port Size		Model Number*	Air Entry Type	C_v		Dimensions inches (mm)		
	1, 2	3			1-2	2-3	Length	Width	Depth
Cat-4 with DM2® Series C	1/2	1/2	RC408-06**	FR	3	10	24.0 (610)	14.5 (369)	7.4 (187)
Cat-4 with DM2® Series C	1/2	1/2	RC408L-06**	FRL	4.4	13	24.0 (610)	15.7 (399)	8.3 (211)
Cat-4 with DM2® Series C	3/4	3/4	RC412-06**	FR	4.4	13	27.0 (686)	19.0 (483)	9.0 (229)
Cat-4 with DM2® Series C	3/4	3/4	RC412L-06**	FR	3	10	24.0 (610)	14.5 (369)	7.4 (187)
Cat-4 with DM2® Series C	1	1	RC416-06**	FRL	4.4	13	24.0 (610)	15.7 (399)	8.3 (211)
Cat-4 with DM2® Series C	1	1	RC416L-06**	FRL	4.4	13	31.0 (788)	19.0 (483)	9.0 (229)

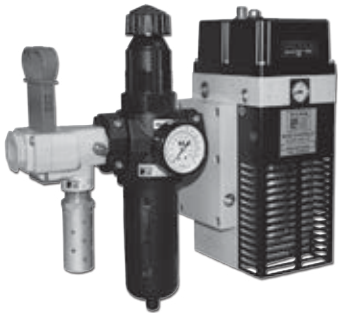
* NPT pressure port threads.
** Specify voltage when ordering. Insert voltage code: "W" = 24 volts DC; "Z" = 110-120 volts AC, 50/60 Hz; e.g., RC408-06W. M12 connectors available, consult ROSS.
Standard Air Entry Packages supplied with metal bowl and manual drain. For automatic drain insert an "A" before the dash (-) in the model number, e.g., RC408A-06.

Custom designs available, consult ROSS.
Explosion proof solenoid pilot available, for more information consult ROSS.

M DM2® Series C Double Valves with Integrated Soft Start, Manual Lockout L-O-X® Valves with Integrated Filter/Regulators

CONTROL CATEGORY 4

Pre-engineered panel mountable design with air entry via a filter and regulator "FR", or filter, regulator and lubricator "FRL"
Includes M DM2® Series C Double Valve with Monitoring & Memory:
a) Self-contained dynamic monitoring system requires no further valve monitoring controls,
b) Dynamic memory of abnormal function prevents unintentional reset with removal of air or electricity
All necessary features for safety applications are included:
a) Electrical reset valve,
b) Status indicator switch for valve condition (ready to run) feedback



HOW TO ORDER

(Choose your options (in red) to configure your valve assembly model number.)

M	5	1	1	X	A	2	1	2	1	1

PIPE SIZE

1/2 NPTF	4
3/4 NPTF	5
1/2 BSPP	D
3/4 BSPP	E

LOCKOUT VALVE TYPE

Modular L-O-X®	**1**
L-O-X®	2
No L-O-X®	X

LUBRICATOR FILL TYPE

Fill Port	2
No lubricator	X

FILTER-REGULATOR (0-125 psi with 0-200 gauge)

5 Micron, Manual Drain, Metal Bowl	**1**
5 Micron, Auto Drain, Metal Bow	2
None	X

EXTRA PORTS (Prior to M DM2® Exhaust Valve)

1/4	**2**
3/8	3
1/2	4
None	X

M DM2® VALVE

Without Transducer	1
With Transducer	3

DOWNSTREAM PRESSURE SWITCH (includes 1/4" Extra Port)

586A86	1
None	X

EXTRA PORTS (Downstream of M DM2®)

1/4	**2**
3/8	3
1/2	4
None	X

CABLE OPTIONS

Yes	1
No	X

Custom designs available, consult ROSS.

NOTE: Per specifications and regulations, these products are defined as energy isolation devices, NOT AS EMERGENCY STOP DEVICES.

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

© 2016, **ROSS** CONTROLS®. All Rights Reserved.

General Information

Standard Specifications

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

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

Port Threads

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

Thread Types by Model Prefix Letter

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

* Used only for filters, regulators, lubricators.

ISO 228 threads superseds BSPP, G and JIS thread types.

Flow Ratings

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

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

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

Approvals and Certifications

ROSS products are designed to meet a number of industrial standards, including the Canadian Standards Association (C.S.A.) guidelines.

For more information on specific product approvals, contact your local distributor or ROSS.

Solenoids

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

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

Voltage & Hertz

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

Voltage Types by Model Suffix Letter

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

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

In addition, the following voltages are available:

200, 220 volts AC, 50 Hz
200, 240, 480 volts AC, 60 Hz

24, 48, 220 volts AC, 50 Hz
240 volts AC, 60 Hz

200, 220 volts AC, 50 Hz
200, 240 volts AC, 60 Hz.

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

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

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

Port Identification

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

Information or Technical Assistance

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

Order Placement

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

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

© 2016, **ROSS** CONTROLS®. Content subject to change.

CAUTIONS, WARNINGS and STANDARD WARRANTY

PRE-INSTALLATION or SERVICE

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

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

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

4. Each ROSS product should be used within its specification limits. In addition, use only ROSS parts to repair ROSS products.

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

FILTRATION and LUBRICATION

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

6. All standard ROSS filters and lubricators with polycarbonate plastic bowls are designed for compressed air applications only. Do *not* fail to use the metal bowl guard, where provided, to minimize danger from high pressure fragmentation in the event of bowl failure. Do not expose these products to certain fluids, such as alcohol or liquefied petroleum gas, as they can cause bowls to rupture, creating a combustible condition, hazardous leakage, and the potential for human injury or damage to property. Immediately replace a crazed, cracked, or deteriorated bowl. When bowl gets dirty, replace it or wipe it with a clean dry cloth.

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

AVOID INTAKE/EXHAUST RESTRICTION

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

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

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

POWER PRESSES

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

ENERGY ISOLATION/EMERGENCY STOP

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

STANDARD WARRANTY

All products sold by ROSS CONTROLS are warranted for a one-year period [with the exception of all Filters, Regulators and Lubricators ("FRLs") which are warranted for a period of seven years] from the date of purchase to be free of defects in material and workmanship. ROSS' obligation under this warranty is limited to repair or replacement of the product or refund of the purchase price paid solely at the discretion of ROSS and provided such product is returned to ROSS freight prepaid and upon examination by ROSS is found to be defective. This warranty becomes void in the event that product has been subject to misuse, misapplication, improper maintenance, modification or tampering.

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