

DM¹ Series C Control Reliable

Double Valves with Dynamic Monitoring Basic Size 2, 4 & 8



Thank You!

You have purchased a premium-quality ROSS[®] pneumatic valve. It is a high quality DM¹ Series C Control Reliable double valve with Dynamic Monitoring for Category 3 and 4 applications. Monitoring and air flow control functions are integrated into two identical valve elements for CAT 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 E and DM² Series C products that require an intentional reset following lockout. With care in its installation and maintenance you can expect it to have a long and economical service life. Before you install this valve, read the information in this folder completely, and save it for future reference.

IMPORTANT APPLICATION NOTE: Because its characteristics are for Category 4 applications this valve is not for use in press clutch/brake applications. ROSS produces the DM² Series D and a number of other double valve configurations with flow, exhaust and lockout characteristics for press clutch/brake applications.

VALVE INSTALLATION

Please read and make sure you understand all installation instructions before proceeding with the installation.

Additional technical documentation is available for download at www.rosscontrols.com.

If you have any questions about installation or servicing your valve, please contact ROSS or your authorized ROSS distributor, see contact information listed at the back of this document, or visit www.rosscontrols.com to find your distributor.

Pneumatic equipment should be installed only by persons trained and experienced in such installation.

Air Lines: Before installing this valve in a new or existing system, the air lines must be blown clean of all contaminants. It is recommended that an air filter be installed in the inlet line close to the valve.

Valve Inlet (Port 1): Be sure that the supply line is of adequate size and does not restrict the air supply because of a crimp in the line, a sharp bend, or a clogged filter element. The air supply must not only provide sufficient pressure (see *Standard Specifications*, page 3), but must also provide an adequate flow of air on demand.

Valve Outlet (Port 2): For faster pressurizing and exhausting of the mechanism being operated by the valve, locate the valve as close as possible to the mechanism. The lines must be of adequate size and be free of crimps and sharp bends.

Valve Exhaust (Port 3): Do not restrict the air flow from the exhaust port as this can adversely affect the operation of the valve. The valves are factory equipped with a properly sized silencer. ROSS silencers reduce impact noise by as much as 25 dB, with minimum back pressure.

Electrical Supply: DM¹ Series C valves get electrical power through plug-in connectors. The electrical supply must correspond to the voltage and frequency ratings of the solenoids; otherwise the solenoids are subject to early failure. If power is supplied by a transformer, the power supply must be capable of handling the maximum power. See *Valve Specifications* on page 3 for information on maximum power.

Operating Pressures and Temperatures: Allowable ranges for pressure and temperatures are given in the *Standard Specifications* on page 3. Exceeding these values can adversely affect performance and shorten valve life.

Pipe Installation: To install pipe in ports, engage pipe one turn, apply pipe thread sealant (tape not recommended), and tighten pipe. This procedure will prevent sealant from entering and contaminating the valve. To install pipe with parallel threads (e.g., SAE, ISO 228-1, etc.) do not use sealant.

Test: After installation or repair and prior to normal use, the valve must be tested for proper functioning. Observe normal equipment operation safety precautions such as lockout procedures during these tests to avoid personal injury or damage to equipment.

DM¹ Series C Testing Procedure:

NOTE: After DM¹ Series C valves do "lockout" they may not stay in the "lockout condition" as do the DM² Series E and DM² Series C valves that remember abnormal function. The valves that include memory functions, once "locked-out", must be reset by a dedicated reset function in order to be operated again. DM¹ Series C valves will operate again as soon as the fault condition has cleared. Removing electrical power to both pilot solenoids may clear the lockout condition if the situation that caused the valve internals to not operate simultaneously is no longer in effect. This is referred to as "automatic reset." This may result in momentary lockout going undetected during machine operation without the use of the optional status indicator.

- A)** Electrically energize both pilot solenoids simultaneously. The valve should supply pressure from inlet port (1) to outlet port (2). There should be no flow to the exhaust port (3) at this time.
- B)** De-energize one of the pilot solenoids. The valve should go into a lockout condition such that any downstream pressure in the outlet port (2) will be exhausted to atmosphere through exhaust port (3). There should also be a small, but audible, flow of air out the exhaust port (3) as long as the valve remains in the lockout condition.
- C)** Re-energize the pilot solenoid that was de-energized in step B above. The valve must remain in the lockout condition.
- D)** De-energize both pilot solenoids and the DM¹ Series C valve should return to the "ready-to-run" condition. There should be no pressure present at outlet port (2) and there should no longer be any audible flow of air to exhaust port (3).
- E)** Energize both pilots simultaneously again. As in step A above, the valve should supply pressure from inlet port (1) to outlet port (2), there should be no flow to the exhaust port (3).
- F)** De-energize the other pilot solenoid. As in step B above, the valve should again go into a lockout condition.
- G)** Re-energize the pilot solenoid that was de-energized in step F above. The valve must remain in the lockout condition.
- H)** De-energize both pilot solenoids and the DM¹ Series C valve should again return to the "ready-to-run" condition as in step D above.

Fault Indication: The status indicator shall be used to signal the machine controls that a lockout has occurred. The status indicator utilizes a pressure switch. The pressure switch has 4 electrical contacts (**NOTE:** Contact 4 is a ground). During normal operation the pressure switch is pressurized. A lockout condition depressurizes the switch until the valve is ready to run (after power has been removed from both pilot solenoids). Contacts 1 and 2 are closed when the switch is depressurized (normally closed) and contacts 1 and 3 are closed when an adequate pressure signal is applied to the switch (normally open).

VALVE OPERATION

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

NOTE: DM¹ Series C valves do not “lockout” like the DM^{2®} Series E and DM^{2®} Series C valves that remember abnormal function. The valves that include memory functions, once “locked-out”, must be reset by a dedicated reset function in order to be operated again. DM¹ Series C valves are ready to operate again as soon as the abnormal condition has cleared. Removing electrical power to both pilot solenoids may clear the abnormal condition if the situation that caused the valve internals to not operate simultaneously is no longer in effect. This is referred to as “automatic reset.” This may result in abnormal function going undetected during machine operation without the use of the optional status indicator.

The overall function of the DM¹ Series C double valve is that of a 3-way, 2-position (3/2) normally closed single solenoid valve. When in the normal “at-rest” condition, the valve inlet port (1) is closed and the outlet port (2) is open to the exhaust port (3). Normal actuation of the valve opens the valve inlet port (1) to the outlet port (2) and closes the exhaust port (3). De-actuation returns the valve to the normal “at-rest” condition. However, being a double valve, there are two solenoid pilots and two sets of valve elements for redundancy. That being the case, both solenoids must be energized virtually simultaneously in order for the valve to actuate normally to supply air from inlet to outlet. Likewise, both solenoids de-energize simultaneously in order to de-actuate and return the valve to its normal at rest condition, thus shutting off the inlet and dumping downstream air to exhaust.

If one of the valve elements does not shift fully within a preset discordance time, the valve will go into a condition such that any downstream pressure in the outlet port (2) will be exhausted to atmosphere through exhaust port (3). There should also be a small, but audible, flow of air out the exhaust port (3) as long as the valve remains in this condition.

De-energizing the main pilot solenoids may clear the abnormal condition if the situation that caused the valve elements to not operate simultaneously is no longer in effect. This is referred to as “automatic reset.” Once the abnormal condition is cleared the valve is “ready-to-run” again. If you equip your valve with the optional status indicator, an abnormal condition will be indicated by a change in state of the status indicator pressure switch.

If de-energizing the pilot solenoids and/or removing supply air pressure do not cause the abnormal condition to clear, the circuit and valve must be exhausted and may need to be serviced.

VALVE MAINTENANCE

Pneumatic equipment should be maintained only by persons trained and experienced in the maintenance of such equipment.

Supply Clean Air. Foreign material lodging in valves is a major cause of breakdowns. The use of an air filter located close to the valve is strongly recommended. The filter bowl should be drained regularly, and if its location makes draining difficult, the filter should be equipped with an automatic drain.

Check Lubricator Supply Rate. A lubricator should put a fine oil mist into the air line in direct proportion to the rate of air flow. Excessive lubrication can cause puddling in the valve and lead to malfunctions. For most applications an oil flow rate in the lubricator of one drop per minute is adequate. *Note that the double valve itself does not require air line lubrication.*

Compatible Lubricants. Although this valve does not require air line lubrication, it may be used with lubricated air being supplied to other mechanisms. Some oils contain additives that can harm seals or other valve components and so cause the valve to malfunction. Avoid oils with phosphate additives (e.g., zinc dithiophosphate) and diester oils; both types can harm valve components. The best oils to use are generally 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.

Some compatible oils are listed at the right. These oils, although believed to be compatible, could change without notice because manufacturers sometimes reformulate their oils. Therefore, use oils specifically compounded for air line service. If it is a synthetic oil, contact the oil manufacturer for compatibility information.

Cleaning the Valve. It is recommended that the inlet air to the valve should be filtered. Disassembly of the valve for cleaning and repair must be done by qualified persons. The testing procedures must be done for valves that have been

COMPATIBLE LUBRICANTS

Maker	Brand Name
Amoco.....	American Industrial Oil 32 Amoco Spindle Oil C Amolite 32
Citgo	Pacemaker 32
Exxon	Spinesstic 22 Teresstic 32
Mobil	Velocite 10
Non-Fluid Oil.....	Air Lube 10H/NR
Shell	Turbo T32
Sun.....	Sunvis 11 Sunvis 722
Texaco.....	Regal R&O 32
Union.....	Union Turbine Oil

disassembled and repaired. Lubrication recommended is Owens Corning BR2 Plus grease. It is applied only to the piston seals and bores. Do not lubricate the poppet seals.

Repair kits are available for internal components. Valves can be returned to Ross Controls for repair.

Electrical Contacts. In the electrical circuits associated with the valve solenoids, keep all switches or relay contacts in good condition to avoid solenoid malfunctions.

Replace Worn Components. In most cases it is not necessary to remove the valve from its installation for servicing. However, turn off the electrical power to the valve, shut off the air supply, exhaust the air in the system, and lock-out before beginning any disassembly operation. Service kits are listed on page 3.

STANDARD SPECIFICATIONS

Construction: Dual poppet.

Mounting Type: Base mounted.

Pilot Solenoids: According to VDE 0580. Enclosure rating according to DIN 400 50 IP 65. Connector socket according to DIN 43650 Form A. Three solenoids, rated for continuous duty.

Standard Voltages/Pilot Solenoids Power Consumption (each solenoid):

Basic Size 2 & 4:

24 volts DC; 110 volts AC, 50 Hz; 120 volts AC, 50/60 Hz.

5.8 watts nominal on AC and DC; 6.5 watts maximum on AC and DC.

Basic Size 8:

15 watts on DC; 36 VA inrush and 24.6 VA holding on AC.

Enclosure Rating: IP65, IEC 60529.

Electrical Connection: EN 175301-803 Form A, or M12.

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).

Inlet Pressure: *Basic Size 2:* 45 to 150 psig (3.1 to 10.3 bar).

Basic Size 4, 8, 12, 30: 30 to 120 psig (2.1 to 8.3 bar).

Pressure Switch (Status Indicator) Rating: Contacts - 5 amps at 250 volts AC, or 5 amps at 30 volts DC.

Monitoring: Dynamically, cyclically, internally during each actuating and de-actuating movement.

Mounting orientation: Preferably horizontally (valve on top of base) or vertically with pilot solenoids on top.

Functional Safety Data: Category 4 PL e; B10D: 20,000,000; PFHD: 4.29×10^{-8} ; MTTFD: 100 (n_{op} : 662400).

Certifications: CE Marked for applicable directives, DGUV Test, CSA/UL, TSSA for appropriately tested valves.

Vibration/Impact Resistance: Tested to BS EN 60068-2-27.

IMPORTANT NOTE: Please read carefully and thoroughly all the **CAUTIONS** and **WARNINGS** on page 4.

Electrical Connectors	Electrical Connector Form	Electrical Connector Type	Cord Length meter (feet)	Cord Diameter	Electrical Connector Model Number		
					Without Light	Lighted Connector	
						24 Volts DC	120 Volts AC
	EN 175301-803 Form A	Prewired Connector (18 gauge)	2 (61/2)	6-mm	721K77	720K77-W	720K77-Z
		Prewired Connector (18 gauge)	2 (61/2)	10-mm	371K77	383K77-W	383K77-Z
		Connector for threaded conduit (1/2 inch electrical conduit fittings)	—	—	723K77	724K77-W	724K77-Z
		Connector Only	—	—	937K87	936K87-W	936K87-Z

CAUTIONS: Do not use electrical connectors with surge suppressors, as this may increase valve response time when de-actuating the solenoids.

For additional wiring kit accessories, please see product web page or product literature at www.rosscontrols.com.

VALVE SERVICE

ROSS would be happy to service this valve for you at its factory repair center. If you purchased your valve from ROSS please contact ROSS customer service, if you purchased your valve thru an authorized ROSS distributor please contact the distributor for return instructions.

However, if you choose to service this valve yourself, it is strongly recommended that you visit our website at www.rosscontrols.com for available downloadable technical documentation.

When servicing the valve yourself, be sure to turn off electrical power to the valve, shut off the air supply, exhaust the air in the system, and lock-out all power sources before beginning any disassembly operation. Listed below are kits for servicing DM¹ Series C double valves, as well as replacement solenoid information.

CAUTION: Before operating the DM¹ Series C double valve, be sure to complete the Test Procedure, on page 1, upon installation and after any maintenance is performed on the valve. Failure to do so could result in personal injury or equipment damage.

Valve Body Service Kits. These kits contain all parts needed for complete reconditioning of a valve body. Included are poppets, spindles, gaskets, seals, and instructions for use.

Status Indicator Assembly Service Kit. This kit includes all parts needed for complete reconditioning of the status indicator assembly. Pressure switch and connector sold separately.

Replacement Pressure Switch. This kit includes a replacement pressure switch and electrical connector for the status indicator assembly.

Solenoid Coils. Order replacement by part number provided at the right. For other voltages consult ROSS.

Complete Solenoid Pilot Assemblies. These assemblies consist of new pilot valve mechanisms and a new solenoid coil, ready to bolt in position on the valve. For other voltages consult ROSS.

Replacement Solenoid Coils		
Basic Size	Model Number	
	Voltage	
	24 volts DC	110 or 120 volts AC
2 & 4	411B3316	411B33105
8	360K3316	360K33105

Complete Solenoid Pilot Assemblies		
Basic Size	Model Number	
	Voltage	
	24 volts DC	110 or 120 volts AC
2	1520C7916	1520C79105
4	1524C7916	1524C79105
8	1526C7916	1526C79105

Basic Size	Valve Body Service Kit Number	Status Indicator Assembly Service Kit Number	Replacement Pressure Switch Kit Number
2	2579K77	2151H77	1104A30
4	2540K77	2151H77	1104A30
8	2541K77	2151H77	1104A30

If you have any questions about installing or servicing your valve, call ROSS *Technical Services* at your nearest ROSS location (see page 4) or in the U.S.A. at: **1-888-TEK-ROSS(835-7677)**.

CAUTIONS And WARNINGS



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

WARNINGS: 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.

WARNINGS: 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**[®] valves and **L-O-X**[®] valves with **EEZ-ON**[®] operation 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.

ROSS CONTROLS	USA	TEL: 1-248-764-1800	web site: www.rosscontrols.com
ROSS EUROPA GmbH	Germany	TEL: 49-6103-7597-0	web site: www.rosseuropa.com
ROSS ASIA K.K.	Japan	TEL: 81-42-778-7251	web site: www.rossasia.co.jp
ROSS UK Ltd.	UK	TEL: 44-1543-671495	web site: www.rossuk.co.uk
ROSS SOUTH AMERICA Ltda.	Brazil	TEL: 55-11-4335-2200	email: vendas@rosscontrols.com
ROSS CONTROLS INDIA Pvt. Ltd.	India	TEL: 91-44-2624-9040	email: ross.chennai@rosscontrols.com
ROSS CONTROLS (CHINA) Ltd.	China	TEL: 86-21-6915-7961	web site: www.rosscontrolschina.com
ROSS FRANCE S.A.S.	France	TEL: 33-1-49-45-65-65	web site: www.rossfrance.com
ROSS CANADA (6077170 CANADA INC. AN INDEPENDENT REPRESENTATIVE)	Canada	TEL: 1-416-251-7677 (416-251-ROSS)	web site: www.rosscanada.com