INSTALLATION MANUAL FOR
DM² SERIES D
DUAL-SOLENOID VALVES

IMPORTANT: PLEASE REVIEW THIS ENTIRE PUBLICATION BEFORE INSTALLING, OPERATING OR MAINTAINING THE AIR VALVE.
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SECTION 1—IN GENERAL

Safety Precautions

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

This safety alert symbol identifies important safety messages in this manual. When you see this symbol, be alert to the possibility of personal injury, and carefully read the message that follows.

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Efficient and safe machine operation depends on the development, implementation and enforcement of a safety program. This program requires, among other things, the proper selection of point-of-operation guards and safety devices for each particular job or operation and a thorough safety training program for all machine personnel. This program should include instruction on the proper operation of the machine, instruction on the point-of-operation guards and safety devices on the machine, and a regularly scheduled inspection and maintenance program.

Rules and procedures covering each aspect of your safety program should be developed and published both in an operator’s safety manual, as well as in prominent places throughout the plant and on each machine. Some rules or instructions which must be conveyed to your personnel and incorporated into your program include:

DANGER Never place your hands or any part of your body in this machine.

Never operate this machine without proper eye, face and body protection.

Never operate this machine unless you are fully trained and instructed and unless you have read the instruction manual.

Never operate this machine if it is not working properly—stop operating it and advise your supervisor immediately.

Never use a foot switch to operate this machine unless a point-of-operation guard or device is provided and properly maintained.

Never operate this machine unless two-hand trip, two-hand control or presence-sensing device is installed at the proper safety distance. Consult your supervisor if you have any questions regarding the proper safety distance.

Never tamper with, rewire or bypass any control or component on this machine.

A company’s safety program must involve everyone in the company, from top management to operators, since only as a group can any operational problems be identified and resolved. It is everyone’s responsibility to implement and communicate the information and material contained in catalogs and instruction manuals to all persons involved in machine operation. If a language barrier or insufficient education would prevent a person from reading and understanding various literature available, it should be translated, read or interpreted to the person, with assurance that it is understood.

FOR MAINTENANCE AND INSPECTION ALWAYS REFER TO THE OEM’S (ORIGINAL EQUIPMENT MANUFACTURER’S) MAINTENANCE MANUAL OR OWNER’S MANUAL. If you do not have an owner’s manual, please contact the original equipment manufacturer.

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Rockford Systems, LLC—www.rockfordsystems.com
Call: 1-800-922-7533
Safety References

OSHA ACT AND FEDERAL REGULATIONS

Since the enclosed equipment can never overcome a mechanical deficiency, defect or malfunction in the machine itself, OSHA (Occupational Safety and Health Administration) has established certain safety regulations that the employers (users) must comply with so that the machines used in their plants, factories or facilities are thoroughly inspected and are in first-class operating condition before any of the enclosed equipment is installed.


   Duties

   SEC. 5. (a) Each employer—

   (1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;

   (2) shall comply with occupational safety and health standards promulgated under this Act.

   (b) Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct.

2. OSHA 29 CFR Sections that an employer (user) must comply with include:

   1910.211 Definitions.
   1910.212 General requirements for all machines.
   1910.217 Mechanical power presses.
   1910.219 Mechanical power-transmission apparatus.

3. OSHA 29 CFR 1910.147 The control of hazardous energy (lockout/tagout).

4. OSHA Publication


   This publication can be obtained by contacting:

   U.S. Government Printing Office
   P.O. Box 371954
   Pittsburgh, PA 15250-7954
   Phone: (202) 512-1800
   http://bookstore.gpo.gov

ANSI SAFETY STANDARDS FOR MACHINES

The most complete safety standards for machine tools are published in the ANSI (American National Standards Institute) B11 series. The following is a list of each ANSI B11 Standard available at the printing of this publication.

B11–2008 General Safety Requirements
B11.1 Mechanical Power Presses
B11.2 Hydraulic Power Presses
B11.3 Power Press Brakes
B11.4 Shears
B11.5 Iron Workers
B11.6 Lathes
B11.7 Cold Headers and Cold Formers
B11.8 Drilling, Milling, and Boring Machines
B11.9 Grinding Machines
B11.10 Metal Sawing Machines
B11.11 Gear and Spline Cutting Machines
B11.12 Roll Forming and Roll Bending Machines
B11.13 Automatic Screw/Bar and Chucking Machines
B11.14 Withdrawn (Now see ANSI B11.18)
B11.15 Pipe, Tube and Shape Bending Machines
B11.16 Metal Powder Compacting Presses
B11.17 Horizontal Hydraulic Extrusion Presses
B11.18 Coil Processing Systems
B11.19 Performance Criteria for Safeguarding
B11.20 Integrated Manufacturing Systems
B11.21 Lasers
B11.22 CNC Turning Machines
B11.23 Machining Centers
B11.24 Transfer Machines
B11.TR1 Ergonomic Guidelines
B11.TR2 Mist Control Considerations
B11.TR3 Risk Assessment
B11.TR4 Programmable Electronic Systems (PES/PLC)
B11.TR5 Sound Level Measurement Guidelines
B11.TR7 Risk Assessment
B15.06 Robotic Safeguarding
B15.1 Mechanical Power Transmission Apparatus
B56.5 Guided Industrial Vehicles and Automated Function of Manned Industrial Vehicles
B65.1 Printing Press Systems
B65.2 Binding and Finishing Systems
B65.5 Stand-Alone Patten Presses
B151.1 Horizontal (Plastic) Injection Molding Machines
B152.1 Hydraulic Die Casting Presses
B154.1 Rivet Setting Machines
B155.1 Packaging Machinery
01.1 Woodworking Machinery

These standards can be purchased by contacting:

   ANSI—American National Standards Institute
   25 West 43rd Street, 4th Floor
   New York, New York 10036
   Phone: (212) 642-4900
   www.ansi.org

(Continued on next page.)
SECTION 1—IN GENERAL

DM² Series D Dual-Solenoid Valves

NATIONAL SAFETY COUNCIL SAFETY MANUALS

Other good references for safety on machine tools are the National Safety Council’s Safety Manuals. These manuals are written by various committees including the Power Press, Forging and Fabricating Executive Committee. Copies of the following publications are available from their library:

- Safeguarding Concepts Illustrated - 7th Edition
- Forging Safety Manual

These manuals can be obtained by contacting:

National Safety Council
1121 Spring Lake Drive
Itasca, IL 60143-3201
1-800-621-7615
www.nsc.org

OTHER SAFETY SOURCES (CONTINUED)

Robotic Industries Association (RIA)
900 Victors Way, Suite 140
P.O. Box 3724
Ann Arbor, MI 48106
Phone: (734) 994-6088
www.roboticsonline.com

NEMA (National Electrical Manufacturers Association)
1300 North 17th Street, Suite 1847
Rosslyn, VA 22209
Phone: (703) 841-3200
www.nema.org

NFPA (National Fire Protection Association)
1 Batterymarch Park
Quincy, MA 02269-9101
Phone: (617) 770-3000
www.nfpa.org

For additional safety information and assistance in devising, implementing or revising your safety program, please contact the machine manufacturer, your state and local safety councils, insurance carriers, national trade associations and your state’s occupational safety and health administration.

OTHER SAFETY SOURCES

National Institute of Occupational Safety and Health (NIOSH)

4676 Columbia Parkway
Cincinnati, OH 45226
Toll-Free: 1-800-35-NIOSH (1-800-356-4674)
Phone: (513) 533-8328
www.cdc.gov/niosh

National Safety Council

SECTION 1—IN GENERAL

Warranty, Disclaimer and Limitation of Liability

WARRANTY

Rockford Systems, LLC warrants that this product will be free from defects in material and workmanship for a period of 12 months from the date of shipment thereof. ROCKFORD SYSTEMS LLC’s OBLIGATION UNDER THIS WARRANTY IS EXPRESSLY AND EXCLUSIVELY LIMITED to repairing or replacing such products which are returned to it within the warranty period with shipping charges prepaid and which will be disclosed as defective upon examination by Rockford Systems, LLC. This warranty will not apply to any product which will have been subject to misuse, negligence, accident, restriction and use not in accordance with Rockford Systems, LLC’s instructions or which will have been altered or repaired by persons other than the authorized agent or employees of Rockford Systems, LLC. Rockford Systems, LLC’s warranties as to any component part is expressly limited to that of the manufacturer of the component part.

DISCLAIMER

The foregoing Warranty is made in lieu of all other warranties, expressed or implied, and of all other liabilities and obligations on the part of Rockford Systems, LLC, including any liability for negligence, strict liability, or otherwise, and any implied warranty of merchantability or fitness for a particular purpose is expressly disclaimed.

LIMITATION OF LIABILITY

Under no circumstances, including any claim of negligence, strict liability, or otherwise, shall Rockford Systems, LLC be liable for any incidental or consequential damages, or any loss or damage resulting from a defect in the product of Rockford Systems, LLC.
INTRODUCTION

Mechanical power presses and other potentially hazardous machinery using a pneumatically controlled clutch and brake mechanism must use a press control dual-solenoid valve with a monitoring device. The consensus requirements of the regulations and good safety practices require that, in case of a failure within the valve, the clutch and brake mechanisms be quickly exhausted, a monitor takes action to prevent further operation, and a method to alert personnel is incorporated.

The DM² Series D dual-solenoid valve has two valve elements independently controlled by two solenoid pilots. The two valve elements share common inlet, outlet, and exhaust ports. When the pilot valves are simultaneously energized, the valve elements operate so that the valve functions as a 3/2 normally closed valve. If the valve elements fail to move simultaneously, the dynamic monitoring of the valve detects this failure and thereby exhausts downstream air, locks out the valve, and prohibits further operation. When a valve lockout occurs, the valve will retain the fault information regardless of air or electrical changes. The system can only be reset by a defined operation/procedure, and will not self reset (turn off and on), or reset when inlet air supply is removed and re-applied.

Valve element redundancy provides an additional safety factor, as the likelihood of a malfunction in both valve elements in the same cycle is considered extremely remote. Therefore, a lockout condition is not necessarily an indication that the valve has become faulty; rather, it is an indication that the monitor has detected nonsimultaneous movement of the main valve elements, and that there is a condition in the system that needs correction.

⚠️ For safety reasons, do not install any pneumatic devices between the valve and the clutch/brake or air cylinder, including quick-dump valves.

⚠️ If both valves fail simultaneously on the same stroke (cycle), this valve will not prevent a repeat stroke.

⚠️ Never place the hands or any body part in the point of operation of this press at any time, for any reason.
SECTION 2—OVERVIEW

DM² Series D Dual-Solenoid Valves

Self Monitored - Clutch/Brake Control

Features
- Base mounted
- Highly contaminant tolerant poppet construction
- High flow, clog-resistant silencers
- Provides redundancy, dynamic monitoring and memory for the mechanical press industry regarding the control of pneumatically controlled clutch and brake applications

Valve Sizes
DM² Series D dual-solenoid valves are available in five sizes, providing a broad range of flow capabilities. For convenience, valves are designated by the nominal sizes 2, 4, 8, 12, and 30 with outlet ports ranging from ¼” to 2”.

Sizes 2, 4, 8, 12 and 30
- Dynamic Monitoring With Complete Memory—Memory, monitoring, and air flow control functions are simply integrated into two identical valve elements. Valves lock out due to asynchronous movement of valve elements during actuation or de-actuation, resulting in a residual outlet pressure of less than 1% of supply. Overt action is required for reset—cannot be reset by removing and re-applying supply pressure. Reset can only be accomplished by remote air signal, optional electrical solenoid reset signal, or optional manual reset.
- Basic 3/2 Normally Closed Valve Function—Dirt tolerant, wear compensating poppet design for quick response and high flow capacity. Teflon back-up rings on pistons to enhance valve endurance—operates with or without inline lubrication.
- Status Indicator (Optional)—Includes a pressure switch with both normally open and normally closed contacts to provide status feedback to the press control system indicating whether the valve is in the lockout or ready-to-run condition. The status indicator can be ordered installed or purchased separately and added to any DM² Series D base.
- Silencers—All models include high-flow, clog-resistant silencers.
- Mounting—Base mounted with NPT pipe threads. Inlet and outlet ports on both sides provide for flexible piping. Plugs for unused ports are included.

Sizes 12 and 30
- Intermediate Pilots—Increases pilot air flow for fast valve response, making it possible to use the same size solenoids as valve sizes 2, 4, and 8, thereby reducing electrical power requirements for these larger valves.
## DIMENSIONS

### SIZE 2

<table>
<thead>
<tr>
<th>Size</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE 2</td>
<td>1/4&quot;</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td></td>
<td>1/2&quot;</td>
<td>3/4&quot;</td>
</tr>
</tbody>
</table>

| C<sub>v</sub> | 1 to 2: 2.17  | 2 to 3: 3.66  |

### SIZE 4

<table>
<thead>
<tr>
<th>Size</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE 4</td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
</tr>
<tr>
<td></td>
<td>1/4&quot;</td>
<td>1/2&quot;</td>
</tr>
</tbody>
</table>

| C<sub>v</sub> | 1 to 2: 2.80  | 2 to 3: 6.70  |

### SIZE 8

<table>
<thead>
<tr>
<th>Size</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE 8</td>
<td>3/4&quot;</td>
<td>3/4&quot;</td>
</tr>
<tr>
<td></td>
<td>1&quot;</td>
<td>1&quot;</td>
</tr>
</tbody>
</table>

| C<sub>v</sub> | 1 to 2: 4.63  | 2 to 3: 12.55  |

(Continued on next page.)
SECTION 3—SPECIFICATIONS

DM² Series D Dual-Solenoid Valves

SIZE 12
1" inlet–1" outlet
1" inlet–1½” outlet

CV:
1 to 2: 8.86
2 to 3: 20.78

SIZE 30
1½” outlet–2” outlet

CV:
1 to 2: 20.22
2 to 3: 53.68

STANDARD SPECIFICATIONS

Pilot Solenoids—According to VDE 0580. Enclosure rating according to DIN 40050, IEC 60529 IP65. Two solenoids, rated for continuous duty (additional solenoid on optional reset).

Standard Voltages—24 volts DC; 110 volts AC, 50/60 Hz.

Power Consumption (each solenoid)

Sizes 2, 4, 12, 30—For primary and reset solenoids
6.0 watts on DC; 15.8 VA inrush and 10.4 VA holding on AC.

Size 8—Primary solenoids:
15 watts on DC; 36 VA inrush and 24.6 VA holding on AC.

Reset solenoid:
6.0 watts on DC; 15.8 VA inrush and 10.4 VA holding on AC.

Electrical connection—DIN 43650, Form A.

Ambient Temperature—15° to 120°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—Size 2: 45 to 150 psig (3.1 to 10.3 bar).
Sizes 4, 8, 12, 30: 30 to 120 psig (2.1 to 8.3 bar).

Reset Pressure—For remote air reset option—must be equal to inlet pressure.

Manual Pressure—Encapsulated, push button actuation.

Pressure Switch (Status Indicator) Rating—Contacts—5 amps @ 250 volts AC, or 5 amps @ 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—Preferably horizontally (valve on top of base) or vertically (with pilot solenoids on top).

Port Threads—NPT

Functional Safety Data—Category 4 PL e; B10d: 20,000,000; PFH: 7.71x10^-9; MTTFd: 301.9 (nop: 662400).

Certifications—CE Marked for applicable directives, BG, CSA/UL, TSSA for appropriately tested valves.

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

Valve Weight—Valve and base assembly with status indicator and solenoid reset:

Size 2: 5.0 lb (2.3 kg)
Size 4: 6.0 lb (2.8 kg)
Size 8: 9.1 lb (4.2 kg)
Size 12: 15.5 lb (7.1 kg)
Size 30: 32.6 lb (14.8 kg)
SECTION 4—VALVE FUNCTION
DM² Series D Dual-Solenoid Valves

MAIN VALVE INTERNALS

- Pilot Valve B
- Piston
- Exhaust chamber
- Exhaust poppet
- Crossover passages
- Inlet chamber
- Spring stop
- Return spring
- Pilot Valve A
- Pilot supply/timing chamber A
- Outlet chamber
- Inlet poppet
- Timing orifice
- Flow restrictor
- Reset poppet
- Reset piston

VALVE SCHEMATIC

Optional reset solenoid valve
Optional Status Indicator
Pressure Switch
Pilot booster on size 12 & 30 only
Reset port
SECTION 4—VALVE FUNCTION

DM² Series D Dual-Solenoid Valves

VALVE DE-ACTUATED (READY-TO-RUN)

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. (Air passages drawn out of position and 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 quickly pressurized, and pressure in the inlet, crossovers, outlet, and timing chambers is quickly equalized. 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 (air or electric), or a manual push button actuation 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 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 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.

Size 12 and 30 valves require relatively large pilots to actuate and de-actuate the main valve elements. In order to achieve extremely quick valve response for such large pilots, a two-stage solenoid pilot system is incorporated into the design. This keeps the electrical current required to operate the pilots to a minimum.
SECTION 5—INSTALLATION
DM² Series D Dual-Solenoid Valves

INSTALLATION CONSIDERATIONS

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

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

The exhaust air muffler must be kept clean at all times. Never operate the machine unless the muffler is clean. The muffler must be cleaned on a regular basis.

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 a 5-micron-rated 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 have any restrictions (e.g., 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 8), but must also provide an adequate flow of air on demand. Otherwise, the valve elements will be momentarily starved for air and the valve may fail to operate.

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 restrictions (e.g., a crimp in the line, a sharp bend, or a clogged filter element).

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 muffler. Only the muffler furnished should be used.

Reset Port (RESET)—If your valve is not equipped with a reset solenoid on the valve, then the RESET port should be supplied, externally, from a 3/2 normally closed valve. The lines must be of adequate size and be free of restrictions (e.g., a crimp in the line, a sharp bend, or a clogged filter element). Reset signals must be momentary.

Electrical Supply—DM² Series D dual-solenoid valves get electrical power through plug-in connectors. The electrical supply must correspond to the voltage and Hertz ratings of the solenoids. Otherwise, the solenoids are subject to early failure. If power is supplied by a transformer, it must be capable of handling the inrush current without significant voltage drop. See standard specifications on page 8 for inrush current data.

Operating Pressures and Temperatures—Allowable ranges for pressure and temperatures are given in the standard specifications on page 8. Exceeding these values can adversely affect performance and shorten valve life.

Pipe Installation—To install pipe in base ports, engage the pipe by one turn, then 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-G, etc.) do not use sealant. After installing pipe into the base ports, use compressed air to blow any debris out of the piping, then install the valve onto the base.

Test—Always perform a test procedure after installation and/or repair prior to normal use. Observe normal press operation safety precautions during these tests to avoid personal injury or damage to equipment. Note: Reset may need to be performed prior to beginning the test procedure. Also, both pilot solenoids must be de-energized prior to reset and must remain de-energized until after the reset signal is removed.

Test Procedure—
1. Electrically energize both pilot solenoids simultaneously, then de-energize one pilot solenoid. This should result in a valve lockout and prevent the valve from operating.
2. Energize both solenoids and the valve should remain in the lockout condition.
3. De-energize both pilot solenoids and reset the valve.
4. Electrically energize both pilot solenoids simultaneously again. De-energize the other pilot solenoid this time. Again, this should result in a lockout.
5. Energize both pilot solenoids. The valve should remain in a lockout condition.
6. De-energize both pilot solenoids and then reset the valve. After satisfying these tests, energizing both pilot solenoids simultaneously should result in normal operation.

Fault Indication—If fault indication is desired, Rockford Systems, LLC offers a status indicator option that can be used to signal to the press controls that a fault has occurred. The status indicator utilizes a pressure switch. The pressure switch has four electrical contacts. During normal operation, the pressure switch is pressurized. A lockout condition depressurizes the switch until the valve is reset. 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).
**SECTION 5 — INSTALLATION**

*DM² Series D Dual-Solenoid Valves*

**ELECTRICAL CONSIDERATIONS**

**DIN Connectors**

Each DM² Series D dual-solenoid valve is furnished with two 3-pin DIN connectors for electrical connection to the pilot solenoids. See page 15 for replacement connectors and/or for electrical connectors with a light and translucent housing to serve as indicator lights.

**WIRING**

**Pilot Solenoids**—Should be fired simultaneously from separate channels to operate the valve normally.

![Diagram of pilot solenoids](image)

**Status Indicator (Pressure Switch) Terminal Designations**

Terminal 1 - common
Terminal 2 - N.C. (normally closed) contact (N.O. contact held closed with normal operation and inlet pressure within specifications)
Terminal 3 - N.O. (normally open) contact (N.C. contact held open with normal operation and inlet pressure within specifications)
Ground symbol terminal - not used

Terminals 1 and 3 are connected when air pressure is present and the valve is ready-to-run. If a fault has occurred or pressure is removed from the valve inlet, terminals 1 and 2 are connected.

![Diagram of status indicator](image)

**Pin 1: Common**
**Pin 2: Normally Closed**
**Pin 3: Normally Open**
**Pin 4: Not Used**

**Note**—In the event of a fault, remove power from pilot solenoids A & B, then momentarily energize the reset solenoid to return the valve to the ready-to-run state. Wait at least 250 ms after removing power from the reset solenoid before trying to re-energize the pilot solenoids.
SECTION 6—PRELIMINARY INFORMATION

DM² Series D Dual-Solenoid Valves

STARTUP

Before startup, the installation must be checked thoroughly by persons trained and experienced in the operation of pneumatic equipment. Make sure that specifications given on the valve label (e.g., max. operating pressure and electrical characteristics) will be in accordance with the operating specifications of the press. When operating pressure is initially applied, it may be necessary to actuate the reset valve momentarily to move the main valve into the ready-to-run condition. Make sure that the inlet supply and the exhaust path are not restricted. Operating pressure must comply with the minimum and maximum limits.

FUNCTIONAL TEST

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Solenoid A actuated</td>
<td>Valve moves into lockout mode, slight leakage at exhaust port 3</td>
</tr>
<tr>
<td>2. Solenoid B actuated</td>
<td>Valve moves into lockout mode, slight leakage at exhaust port 3</td>
</tr>
<tr>
<td>3. Solenoids A and B actuated with ( \Delta t &lt; 0.1 \text{ s} )</td>
<td>Valve operates properly</td>
</tr>
<tr>
<td>4. Solenoids A and B actuated with ( \Delta t &gt; 0.1 \text{ s} )</td>
<td>Valve moves into lockout mode, slight leakage at exhaust port 3</td>
</tr>
<tr>
<td>5. After lockout, permanent signal on reset valve—solenoids A and B or only A/only B actuated</td>
<td>Valve cannot be moved into ready-to-run mode</td>
</tr>
</tbody>
</table>

PRESSURE TEST

After a valve lockout, the dual-solenoid valve must be moved into the ready-to-run position by using the reset valve. In general, if the valve is in the lockout mode and one or both of the solenoids are energized, the valve should not reset with application or application and removal of the reset signal. If the valve is in the ready-to-run mode after the reset solenoid valve has been actuated momentarily, the valve will function normally with application and removal of pilot solenoid signal. However, if the valve elements cycle asynchronously, the valve will go to the lockout mode. Provided that both solenoids are de-energized, removal of reset signal will return the valve to the ready-to-run mode.

An additional test to perform:
- With the valve in the ready-to-run mode, exhaust and repressurize the inlet port. The valve should remain in the ready-to-run mode.
- With the valve in the lockout mode, exhaust and repressurize the inlet port. The valve should remain in the lockout mode.

LOCKOUTS

Any asynchronous movement between both piston elements for a time period > 0.1 s will result in a lockout of the valve. This can be due to one or more of the various causes below:
- worn piston seals
- delayed response of the main valve elements due to dirt or varnished lubricant
- electrical signals to solenoid incomplete or unable to maintain proper voltage
- independent electrical signals to solenoids are not received concurrently
- delayed response of solenoid pilots or booster pilots due to damaged components, dirt, or varnished lubricant
- collection of excessive water or lubrication

MAINTENANCE, TESTING

Maintenance and testing procedures must follow the rules and regulations set by the respective national work-safety institutions. These procedures should only be performed by persons trained and experienced in the use of pneumatic equipment. Regulations generally require that maintenance and test procedures be performed at least once a year.

REPAIR

Rockford Systems, LLC would be happy to service this specialized dual-solenoid valve for you at its factory repair center. Call 1-800-922-7533 for information. If you service 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 lockout all power sources before beginning any disassembly operation. Customers maintaining their own valves should make sure that only original spare parts are used.

Pneumatic equipment should be repaired only by persons trained and experienced in the repairing of such equipment, guided by these operating instructions. Information about valve repair and/or the exchange of a valve must be written down in the machine operation documentation.
SECTION 7—MAINTENANCE

DM² Series D Dual-Solenoid Valves

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

After any maintenance, always operate the machine numerous times in all modes of operation before allowing the operator to start production. Always make sure all point-of-operation safeguarding is in place, adjusted and operating properly for the job and the operator.

Supply Clean Air—Foreign material lodging in valves is a major cause of breakdowns. The use of a 5-micron-rated 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 dual-solenoid 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 below. 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.

COMPATIBLE LUBRICANTS

<table>
<thead>
<tr>
<th>Maker</th>
<th>Brand Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoco</td>
<td>American Industrial Oil 32</td>
</tr>
<tr>
<td></td>
<td>Amoco Spindle Oil C</td>
</tr>
<tr>
<td></td>
<td>Amolite 32</td>
</tr>
<tr>
<td>Citgo</td>
<td>Pacemaker 32</td>
</tr>
<tr>
<td>Exxon</td>
<td>Spinesstic 22</td>
</tr>
<tr>
<td></td>
<td>Teresstic 32</td>
</tr>
<tr>
<td>Mobil</td>
<td>Velocite 10</td>
</tr>
<tr>
<td>Non-Fluid Oil</td>
<td>Air Lube 10H/NR</td>
</tr>
<tr>
<td>Shell</td>
<td>Turbo T32</td>
</tr>
<tr>
<td>Sun</td>
<td>Sunvis 11</td>
</tr>
<tr>
<td></td>
<td>Sunvis 722</td>
</tr>
<tr>
<td>Texaco</td>
<td>Regal R&amp;O 32</td>
</tr>
<tr>
<td>Union</td>
<td>Union Turbine Oil</td>
</tr>
</tbody>
</table>

Cleaning the Valve—If the air supplied to the valve has not been well filtered, the interior of the valve may accumulate dirt and varnish which can affect the valve’s performance. A schedule should be established for cleaning all valves, the frequency depending on the cleanliness of the air being supplied. To clean the valve, use any good commercial solvent. Do not scrape varnished surfaces. Do not use chlorinated solvents or abrasive materials. The former damages seals, and abrasives can do permanent damage to metal parts. Before reassembling the valve, lubricate all sliding surfaces with a grease such as Dow Corning BR 2 Plus.

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. See page 16 for repair kits.
SECTION 8—ORDERING INFORMATION

**DM² Series D Dual-Solenoid Valves**

### COMPLETE DM² SERIES D DUAL-SOLENOID VALVES*

<table>
<thead>
<tr>
<th>Cross Ref. Item Number</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCL-528</td>
<td>12</td>
<td>1&quot; dual sol valve w/ sol reset w/ electric reset pushbutton &amp; status indicator</td>
</tr>
<tr>
<td>RCL-532</td>
<td>4</td>
<td>¾&quot; dual sol valve w/ sol reset w/ electric reset pushbutton &amp; status indicator</td>
</tr>
<tr>
<td>RCL-535</td>
<td>30</td>
<td>1 ⅛&quot; dual sol valve w/ sol reset w/ electric reset pushbutton &amp; status indicator</td>
</tr>
<tr>
<td>RCL-551</td>
<td>4</td>
<td>⅜&quot; dual sol valve</td>
</tr>
<tr>
<td>RCL-552</td>
<td>4</td>
<td>¼&quot; dual sol valve &amp; status indicator</td>
</tr>
<tr>
<td>RCL-553</td>
<td>4</td>
<td>⅝&quot; in ⅜' out dual sol valve</td>
</tr>
<tr>
<td>RCL-554</td>
<td>4</td>
<td>⅝&quot; in ⅜' out dual sol valve w/ status indicator</td>
</tr>
<tr>
<td>RCL-555</td>
<td>8</td>
<td>1&quot; dual sol valve remote w/ air pushbutton reset</td>
</tr>
<tr>
<td>RCL-556</td>
<td>8</td>
<td>1&quot; dual sol valve remote w/ air pushbutton reset &amp; status indicator</td>
</tr>
<tr>
<td>RCL-557</td>
<td>30</td>
<td>1 ½’ in 2&quot; out dual sol valve remote w/ air pushbutton reset</td>
</tr>
<tr>
<td>RCL-558</td>
<td>30</td>
<td>1 ½’ in 2&quot; out dual sol valve remote w/ air pushbutton reset &amp; status indicator</td>
</tr>
<tr>
<td>RCL-559</td>
<td>8</td>
<td>1&quot; dual sol valve w/ remote reset</td>
</tr>
<tr>
<td>RCL-560</td>
<td>8</td>
<td>1&quot; dual sol valve w/ remote reset &amp; status indicator</td>
</tr>
<tr>
<td>RCL-561</td>
<td>30</td>
<td>1 ¼” in 2” out sol valve w/ remote reset</td>
</tr>
<tr>
<td>RCL-562</td>
<td>30</td>
<td>1 ¼” in 2” out sol valve w/ remote reset &amp; status indicator</td>
</tr>
<tr>
<td>RCL-570</td>
<td>2</td>
<td>¼&quot; dual sol valve</td>
</tr>
<tr>
<td>N/A</td>
<td>12</td>
<td>1&quot; dual sol valve</td>
</tr>
</tbody>
</table>

*Two RCY-315 electrical connectors supplied with each dual-solenoid valve.

### REPLACEMENT PARTS/ACCESSORIES

#### STATUS INDICATOR—RCY-319

The status indicator pressure switch actuates when the valve is in a ready-to-run condition and de-actuates when the valve is in a lockout condition or when the inlet air pressure has been removed. Although the valves can be purchased with this option already installed, the status indicator can be purchased separately. This includes a 4-pin DIN connector (without cable) that can be field wired.

#### RESET VALVES FOR MODELS WITH REMOTE RESET

Dual valves with an electrical reset require a direct solenoid control, base, and electric reset pushbutton.

- **Part No. RCY-317-110**—Direct Solenoid Control (110 VAC)
- **Part No. RCY-317-24**—Direct Solenoid Control (24 VDC)
- **Part No. RCY-318**—Base
- **Part No. LLD-1172**—Electric Reset Pushbutton

#### ELECTRICAL CONNECTORS

Electrical connectors are required to connect the valve solenoids to the drop cords supplying electrical power.

- Each 3-pin DIN connector can be positioned so that the cord exits upward or to the side. Cords of 6mm to 10mm diameter can be used (not included). Connectors with a light in a translucent housing are also available to serve as indicator lights.

#### AIR PUSHBUTTON RESET—RCD-055

Dual valves with remote reset require a small reset valve and the installation of a ¼ line from the reset valve to the reset port. This air pushbutton is suitable for this purpose.

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**CAUTION**

Do not use electrical connectors with surge suppressors, as this may increase valve response time when de-actuating the solenoids.
**SECTION 9—REPAIR KITS**

*DM² Series D Dual-Solenoid Valves*

**REPAIR KITS**

Specify -110 for 110VAC or -24 for 24VDC when ordering part numbers in gray.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Size 2</th>
<th>Size 4</th>
<th>Size 8</th>
<th>Size 12</th>
<th>Size 30</th>
<th>110VAC</th>
<th>24VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Valve body service kit</td>
<td>RCY-300</td>
<td>RCY-301</td>
<td>RCY-302</td>
<td>RCY-303</td>
<td>RCY-304</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>B</td>
<td>Complete primary solenoid pilot</td>
<td>RCY-305</td>
<td>RCY-306</td>
<td>RCY-307</td>
<td>RCY-308</td>
<td>RCY-309</td>
<td>-110</td>
<td>-24</td>
</tr>
<tr>
<td>C</td>
<td>Complete reset solenoid pilot</td>
<td>RCY-309</td>
<td>RCY-309</td>
<td>RCY-309</td>
<td>RCY-309</td>
<td>RCY-309</td>
<td>-110</td>
<td>-24</td>
</tr>
<tr>
<td>D</td>
<td>Solenoid coil – pilots</td>
<td>RCY-310</td>
<td>RCY-310</td>
<td>RCY-314</td>
<td>RCY-310</td>
<td>RCY-310</td>
<td>-110</td>
<td>-24</td>
</tr>
<tr>
<td>E</td>
<td>Solenoid coil reset</td>
<td>RCY-310</td>
<td>RCY-310</td>
<td>RCY-310</td>
<td>RCY-310</td>
<td>RCY-310</td>
<td>-110</td>
<td>-24</td>
</tr>
<tr>
<td>F</td>
<td>Pilot booster service kit</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>RCY-311</td>
<td>-110</td>
<td>-24</td>
</tr>
<tr>
<td>Not shown</td>
<td>Status indicator assembly kit</td>
<td>RCL-312</td>
<td>RCL-312</td>
<td>RCL-312</td>
<td>RCL-312</td>
<td>RCL-312</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Not Shown</td>
<td>Replacement pressure switch</td>
<td>RCL-313</td>
<td>RCL-313</td>
<td>RCL-313</td>
<td>RCL-313</td>
<td>RCL-313</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

**Example:** RCY-310-24 for solenoid coil reset with 24VDC

**SIZES 2, 4 & 8**

- ¼” inlet–¼” outlet
- ¾” inlet–¾” outlet
- ½” inlet–½” outlet
- ⅜” inlet–⅜” outlet
- ⅝” inlet–⅝” outlet
- 1” inlet–1” outlet

**SIZES 12 & 30**

- 1” inlet–1” outlet
- 1” inlet–1½” outlet
- 1½” inlet–2” outlet

*Add voltage modifier to part no.*
SECTION 10—ORDER FORM FOR LITERATURE

DM² Series D Dual-Solenoid Valves

This instruction manual references signs and literature available for your machines. This order form is for your convenience to order additional signs and/or literature as needed. (This order form is part of your installation manual so please make a copy of it when ordering.)

Company

Address

City ___________________________ State ________________ Zip __________________

Phone __________________________ Fax __________________

Name ___________________________ Purchase Order No. ___________________________ Date __________________

Part No.        Description                                                                 Quantity Required
KSL-288        Installation Manual for DM² Series D Dual-Solenoid Valves
KSL-051        Booklet - Mechanical Power Press Safety (MPPS)
CNTRLS        Catalog - Press and Press Brake Control Systems
SFM          Catalog - Shields For Machinery

For prices and delivery, please use address, phone or fax number listed on the front cover of this manual.

Your Signature ___________________________ Date __________________

SECTION 11—RETURN MATERIALS AUTHORIZATION REQUEST FORM

To return material for any reason contact our sales department at 1-800-922-7533 for an RMA Number. All returned materials shipments must be prepaid. Complete this form and send with material to Rockford Systems, LLC, 4620 Hydraulic Road, Rockford, IL 61109-2695. Make sure the RMA Number is plainly identified on the outside of the shipping container.

Company

Address

City ___________________________ State __________________ Zip __________________

Phone ___________________________ Fax __________________

Contact Name ___________________ Representative __________________

Items Authorized To Return on RMA No. ___________________ Original Invoice No. ___________________ Date __________________

Part No. ___________________ Serial No. ___________________ Description __________________

Service Requested  □ Full Credit  □ 25% Restocking  □ Repair & Return  □ Warranty Replacement

Reason for return (describe in detail): ________________________________________________

Return Materials Authorized By ___________________________ Date __________________