JORDANVALVE
3170 Wasson Road • Cincinnati, OH 45209
Phone 513.533.5600 • Fax 513.871.0105 (f)
info@richardsind.com • www.jordanvalve.com

I & M Mark 5108 Series

Installation & Maintenance Instructions for the Mark 5108 Back Pressure Regulating Valve

Warning: Jordan Valve Control Valves must only be used, installed and repaired in accordance with these Installation & Maintenance Instructions. Observe all applicable public and company codes and regulations. In the event of leakage or other malfunction, call a qualified service person; continued operation may cause system failure or a general hazard. Before servicing any valve, disconnect, shut off, or bypass all pressurized fluid. Before disassembling a valve, be sure to release all spring tension.

INTRODUCTION

The Mark 5108 may be generically described as a **back pressure control valve**, i.e., it controls the pressure at its inlet. With this type of control, the Mark 5108 may be employed in two different ways:

1. **As a Pressure Relief Valve**. Here the 5108 is installed on a bypass from a main line. It opens to relieve any pressure above its set point.

2. **As a Pressure Sustaining Valve**. Here the Mark 5108 is installed in the main line itself. It functions to control the incoming pressure at the set point, or more commonly, to prevent the pressure from falling below a predetermined minimum. For example, it may be installed on the discharge of a pump to ensure that the pump remains "on its curve."

The Mark 5108 consists of the following components, arranged as shown on the schematic diagram:

1. **Basic Control Valve**, a hydraulically operated, diaphragm-actuated, globe or angle valve which closes with an elastomer-on-metal seal.

2. **Pressure Relief Pilot,** a two-way, normally closed pilot valve which senses up-stream presure under its diaphragm and balances it against an adjustable spring load. An increase in upstream pressure tends to make the pilot open.

3. **Ejector**, a simple "tee" fitting with a fixed orifice in its inlet port. It provides the proper pressure to the diaphragm chamber of the main valve depending on the position of the pressure relief pilot.

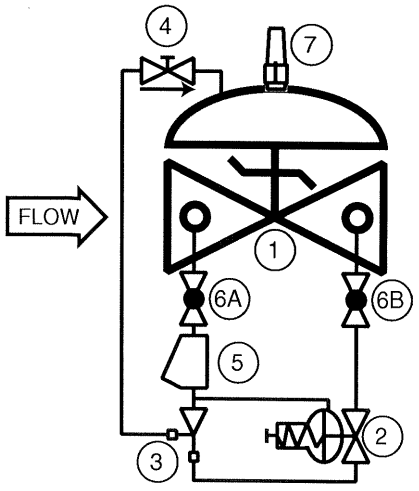
4. **Flow Control Valve,** a needle-type valve which provides adjustable, restricted flow in one direction, and free flow in the opposite direction. On the Mark 5108, the flow control valve is connected as a closing speed control.

5. The **Y-Strainer** (standard on water service valves) or Mark 5123 Inline Strainer (standard on fuel service valves). The strainer protects the pilot system from solid contaminants in the line fluid.

6. Two **Ball Valves** (standard on water service valves, optional on fuel service valves), useful for isolating the pilot system for maintenance or trouble shooting.

At user option, the 5108 may also be equipped with the following:

1. Visual Indicator.
2. Limit Switch Assembly (includes visual indicator).
3. Opening Speed Control.



THEORY OF OPERATION

To understand how the Mark 5108 operates, it is best to start with the Ejector (3). Due to the orifice in its upstream port, the ejector creates a pressure drop proportional to the flow through it. The flow through the ejector is in turn controlled by the degree of opening of the Pressure Relief Pilot (2). The wider the pilot opens, the greater the flow through the ejector and the lower the pressure downstream of the orifice. Conversely, the more the pilot closes, the lower the flow through the ejector and the greater the pressure downstream of the orifice.

Now note that the diaphragm chamber of the Main Valve (1) is connected to the branch port of the ejector and is thus downstream of the orifice. Therefore, the pressure in the diaphragm chamber of the main valve is effectively controlled by the pressure relief pilot in the manner described above. As the pilot opens, the diaphragm pressure decreases and the main valve opens; as the pilot closes, the diaphragm pressure increases and the main valve closes.

If the Mark 5108 is installed as a pressure relief valve, the pressure upstream of the main valve is normally below the set point of the relief pilot. Therefore, the pilot is fully closed, and so is the main valve. However, if, for any reason, the pressure rises above the set point, the pilot will open, and the main valve will follow in turn. The net effect is that the main valve will open and control the pressure at the set point, not allowing it to rise any further. Once pressure returns to normal, the pilot and main valve will return to the closed position.

If the Mark 5108 is installed as a pressure sustaining valve, the pressure upstream of the main valve is normally above the set point of the relief pilot. Therefore, the pilot is wide open as is the main valve. However, if system demand increases to the point that the upstream pressure tries to fall below the set point, the pilot will start to close and the main valve will follow, throttling as required to keep the pressure from falling any further.

INSTALLATION

Figure 1 shows a typical installation of an angle pattern Mark 5108 in pressure service. Here it will relieve the startup surges of the centrifugal pump, but this time in pressure sustaining service. Here it will keep a minimum back pressure on the pump to keep it from running off the right of its curve in periods of high system demand. These illustrations are intended only as rough guides for valve installation, as indeed there are many other places in a system where the Mark 5108 can be effectively employed. However, note the use of isolation valves. While these do not affect the operation of the 5108, they can be extremely useful if the valve needs to be isolated from the line for maintenance or repair.

For full installation details, the user is referred to the Main Valve section of this manual.

START- UP AND ADJUSTMENTS

The following procedures should be followed in the order presented in order to affect an initial startup of the Mark 5108. Note that the procedure differs somewhat between a pressure relief valve and a pressure sustaining valve.

Procedure A. Pressure Relief Valve

1. Install a pressure gauge of the proper range upstream of the Mark 5108. The unused inlet side port in the main valve body may be used for this purpose if there is no convenient location in the upstream piping.
2. Remove the plastic cap from the pressure relief pilot (2) and loosen the adjusting screw jam nut. Turn the adjusting screw clockwise to a full stop.
3. Loosen the adjusting screw jam nut on the flow control valve (4) (closing speed control). Turn the adjusting screw clockwise to a full stop, then counterclockwise three full turns.
4. Make sure both pilot system isolation ball valves (6A and 6B) are open.
5. Start the pump or otherwise start the system flowing. The main valve at this time should be fully closed.
6. Carefully loosen a pipe plug in the main valve bonnet until fluid begins to discharge around the threads. When only clear fluid (no air) is discharging, retighten the plug.

7. While observing the inlet pressure gauge ,retard flow in the system by closing valves or otherwise reducing demand until the pressure increases to approximately 5 psi above the desired set point.
8. Slowly turn the adjusting screw of the pressure relief pilot (2) counterclockwise until the valve opens and the pressure falls to the set point. Tighten the adjusting screw jam nut and replace the plastic cap.
9. Increase flow in the system or otherwise increase demand until pressure returns to normal. Observe the closing speed of the valve. Ideally, the valve should close just slow enough to avoid inducing any secondary surges in the system. Turn the adjusting screw of the flow control valve (4) clockwise to decrease closing speed; counterclockwise to increase closing speed. **CAUTION:** Do NOT adjust the/low control valve fully closed. To do so can keep the valve from closing at all.
10. Shut down the pump.

Procedure B. Pressure Sustaining Valve

1. Install a pressure gauge of the proper range upstream of the Mark 5108. The unused inlet side port in the main valve body may be used for this purpose if there is no convenient location in the upstream piping.
2. Remove the plastic cap from the pressure relief pilot (2) and loosen the adjusting screw jam nut. Turn the adjusting screw clockwise to a full stop.
3. Loosen the adjusting screw jam nut on the flow control valve (4) (closing speed control). Turn the adjusting screw clockwise to a full stop, then counterclockwise three full turns.
4. Make sure both pilot system isolation ball valves (6A and 6B) are open.
5. Start the pump or otherwise start the system flowing. The main valve at this time should be fully closed.
6. Carefully loosen a pipe plug in the main valve bonnet until fluid begins to discharge around the threads. When only clear fluid (no air) is discharging, retighten the plug.
7. Turn the adjusting screw of the pressure relief pilot (2) counterclockwise until it is loose enough to be turned with the fingers. The main valve should open fully.
8. Observing the inlet pressure gauge, open valves or otherwise increase flow until the pressure falls to a point approximately 5 psi below the desired set point.
9. Slowly turn the adjusting screw of the pressure relief pilot (2) clockwise until the pressure rises to the set point. Tighten the adjusting screw jam nut and replace the plastic cap.
10. Shut down the pump.

MAINTENANCE

Because of the simplicity of design of the Mark 5108, required maintenance is minimal. However, the following checks, periodically performed, can do much to keep the valve operating properly and efficiently.

1. Check for chipped or peeling paint. Touch up as required.
2. Check for leaks at fittings and around flanges and connections. Tighten as required.
3. If the valve is equipped with a Y-strainer, check the screen for buildup of solid material. Clean as required. This point is most important, as 1 a clogged strainer can keep the valve from closing. On new installations, it is recommended that the strainer be checked every day or two until experience dictates a greater or lesser interval. Strainer maintenance is covered in detail on a special page later in this manual.

TROUBLESHOOTING

In the event of malfunction of the Mark 5108, the following guide should enable the technician to isolate the specific cause of the problem and take the appropriate corrective action.

A. Main Valve fails to Open:

1. Valve closed upstream or downstream of the Mark 5108. Open as required.
2. Downstream pilot system ball valve (6B) closed. Open as required.
3. Pressure relief pilot (2) adjusted too far clockwise. See Adjustment instructions.
4. Diaphragm of pressure relief pilot (2) ruptured. This will be evidenced by a discharge of fluid from the vent hole in the pilot bonnet. Replace diaphragm.
5. Stem of pressure relief pilot (2) binding. Disassemble pilot and determine cause.
6. Stem of main valve binding. Disassemble valve and determine cause.

B. Main Valve fails to Close:

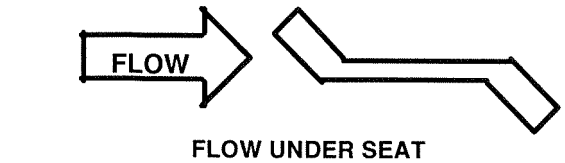
1. Upstream pilot system ball valve (A) closed. Open as required.
2. Strainer (5) clogged. Clean as required.
3. Closing speed control adjusted fully closed. Open as required. See Adjustment instructions.
4. Pressure relief pilot (2) adjusted too far counter-clockwise. See Adjustment instructions.
5. Close the downstream pilot system ball valve (6B).
   (a) If valve closes, proceed to Step 6.
   (b) If valve remains open, proceed to Step 7.
6. Pressure relief pilot (2) stem binding or seat badly deteriorated. Disassemble pilot and determine cause.
7. Close both pilot system ball valves (6A and 6B) and loosen a pipe plug in the main valve bonnet. A continuous discharge of fluid from the loosened plug indicates that the main valve diaphragm is ruptured. Replace diaphragm.

NOTE: Certain valves, predominantly those in fuel service, are assembled "fail closed." In this case, a ruptured diaphragm would keep the valve from opening, rather than keep it from closing. To determine which type you have, examine the "bridgemark" cast into the side of the main valve body and compare it with the diagram below.

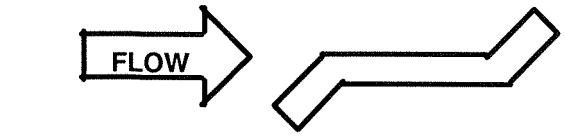
8. Main valve stem binding or object caught in valve. Disassemble valve and determine cause.

C. Main Valve Opens and Closes, but Leaks When Closed

1. Pressure relief pilot (2) adjusted slightly too low. See Adjustment instructions.
2. Close downstream pilot system ball valve (6B).
   (a) If the leak stops, the problem is in the pressure relief pilot (2), likely a damaged seat. Disassemble pilot and determine cause.
   (b) If the leak continues, the problem is in the main valve, likely a damaged seat. Disassemble valve and determine cause.



FLOW UNDER SEAT
DIAPHRAGM FAILURE = VALVE FAILS TO CLOSE



FLOW OVER SEAT
DIAPHRAGM FAILURE = VALVE FAILS TO OPEN

Jordan Valve, a division of Richards Industries
3170 Wasson Road • Cincinnati, OH 45209
513.533.5600 • 800.543.7311 • 513.871.0105 (f)
info@richardsind.com • www.jordanvalve.com