SINGER VALVE
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SINGER MODEL 106/206-RPS-L&H

Anticipating Surge Control Valve Schematic A0401C (Size 8" to 16" 106, 10" to 24" 206)
Installation, Operating and Maintenance Instructions

DESCRIPTION:

The Model 106/206-RPS-L&H dissipates surges caused by power failure to pumps. The valve anticipates the surge by opening on low line pressure associated with sudden stopping by pumps. This assures that the valve is open when the return high pressure surge arrives.

The 106/206-RPS-L&H is a hydraulically operated, single seated valve controlled by two pilot valves. The valve is closed when the line pressure is between the set points of the two pilots. The valve opens when the line pressure drops below the setting of Low Surge Pilot (8). The valve also opens when the line pressure exceeds the setting of High Surge Pilot (9).

Unless otherwise specified, 106/206-RPS-L&H is assembled for service temperatures up to 180°F (80°C).

NOTE: Sizing and set point selection are critical for 106/206-RPS-L&H operation. The valve is not suitable for all pumping systems. Please refer to "Adjustment and Test Procedure" for details. Several models derived from 106/206-RPS-L&H for special applications are available; consult the factory or your SINGER Representative for details.

DESCRIPTION OF OPERATION:

Main Valve (1) is normally open when pressure is applied to the valve inlet. When this same pressure is applied to the bonnet, the Main Valve closes tight because the area of the diaphragm is greater than the area of the seat. Pressure above the diaphragm determines the position of the Main Valve.

Bonnet pressure is controlled with a pilot circuit consisting primarily of the following items:

1. A pilot line with Strainer (3) and Closing Speed Control (4) from the header to the bonnet.
2. A pilot line from the Main Valve bonnet through High Surge Pilot (9), Isolating Valve (2C) and Check Valve (11) to the outlet of the Main Valve.
3. A pilot line from the Main Valve bonnet through Isolating Valves (2D) and (2C), Booster Valve (12) and Check Valve (11) to the outlet of the Main Valve.

Booster Valve (12) is operated by Low Surge Pilot (8).Pressure from the header is directed to the bonnet of the Booster Valve (12) through Fixed Restriction (13), keeping the booster valve closed if there is no flow through Low Surge Pilot (8).

Pressure from the upstream side of the Main Valve is directed to the bonnet of the Main Valve (1) through Closing Speed Control (4), keeping the Main Valve closed.

If Low Surge Pilot (8) opens, there will be more flow out of the bonnet of Booster Valve (12) than is coming in, resulting in opening of the Booster Valve. Booster Valve (12) drops the pressure in the bonnet of the Main Valve and opens the Main Valve.

If High Surge Pilot (9) opens, it drops the bonnet pressure of the Main Valve directly and opens the Main Valve.

INSTALLATION AND START-UP:

Model 106/206-RPS-L&H is installed on a "Tee" from the main line (header) into atmosphere.

1. Refer to 106/206-PG "Installation". Bypass and strainer are normally not used.
2. Model 106/206-RPS-L&H operates normally under conditions which cause very high velocities and severe cavitation. These conditions may cause considerable vibration. The supports for the valve must be designed accordingly.
3. **CONNECT THE PILOT SUPPLY LINE (2A) TO THE HEADER. Use ½" copper or larger. Note that hole into the header must be 3/8" or larger.**
4. To fill the system, the 106/206-RPS-L&H must be closed manually. Close Isolating Valve (2C) in the downstream side of the pilot line. As soon as the header pressure is above the setting of Low Surge Pilot (8), open Isolating Valve (2C) to put the valve into automatic operation.

WARNING: Isolating Valve (2C) must be open, otherwise Main Valve will not function.

ADJUSTING AND TEST PROCEDURE:

To assure satisfactory performance, it must be determined that the line pressure will recover above the setting of Low Surge Pilot (8) with the Main Valve fully open.

Following procedure should be used to establish that this condition is satisfied:

1. After filling the system as outlined in section "Installation and Start-Up", stop the pumps.
2. Open Needle Valve (5) one-half turn. Open Needle Valve (7) slowly. The pressure shown on Pressure Gauge (6) will drop slowly. Observe the pressure at which Low Surge Pilot (8) opens the Main Valve. This is the setting of Low Surge Pilot (8). Let the Main Valve open fully.

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Adjusting and Test Procedure (Cont.):

3. When the Main Valve is fully open, close Needle Valve (7). The reading of Pressure Gauge (6) is now the pressure in the header.
4. This pressure should recover to above the setting of Low Surge Pilot (8) and the Main Valve should close slowly without causing a surge.
5. If the pressure in the header does not recover to above the setting of Low Surge Pilot (8), the Main Valve will not close and that Low Surge Pilot setting is too high. Note the pressure to which the line pressure recovers. Low Surge Pilot (8) must be set lower than this pressure to assure that the valve closes after dissipating the surge. Also see "Sizing".
6. Adjust Closing Speed Control (4) to give desired closing speed. The closing speed should be slow enough to keep the Main Valve open from low pressure surge to the arrival of the high pressure surge and also slow enough not to cause excessive surges while the valve is closing. Turn Closing Speed Control (4) clockwise for reduced speed, counterclockwise for increased speed. Unnecessarily slow speed settings should be avoided because this increases the possibility of the Closing Speed Control being obstructed by dirt or scale.
   NOTE: If secondary surges caused by closing speed become difficult to control with Closing Speed Control (4), installation of a Closing Speed Control Pilot should be considered; consult the factory or your SINGER Representative.
7. High Surge Pilot (9) can be set approximately by removing the tubing from the outlet of Pilot (9) and observing Pilot (9) under maximum pumping pressure. Pilot (9) should be set about one turn of the adjusting screw higher than that point where it starts leaking.

SERVICE SUGGESTIONS:

In addition to the service suggestions listed under Model 106/206-PG, we list the following:

TROUBLE: FAILS TO OPEN ON LOW SURGE

1. Remove pilot piping from the outlet of Pilots (8) and (9) and close Isolating Valve (2C). This allows observation of any flow through Pilots (8) and (9) and Booster Valve (12).
2. Close Isolating Valve (2A) and Closing Speed Control (4).

a) Loosen a fitting between Low Surge Pilot (8) and Booster Valve (12).

b) If there is flow from the loose fitting and the Main Valve opens, tighten the fitting and open upstream Isolating Valve (2A) and Closing Speed Control (4). The Main Valve should close. If the Main Valve opened, the problem is in Low Surge Pilot (8). If the Main Valve did not open, Isolating Valve (2D) is closed or there is an obstruction in the piping associated with Booster Valve (12) operation or Booster Valve (12) is faulty.

c) If there is no flow from the loose fitting and the Main Valve does not open, open Closing Speed Control (4) and close Isolating Valve (2A). If flow now appears from the loose fitting and the Main Valve opens (slowly), the problem is in Booster Valve (12).

- If there is no flow, the Main Valve is faulty, there is an obstruction close to the bonnet or the inlet gate valve is closed.

TROUBLE: FAILS TO CLOSE

Refer to "Adjustment & Test Procedure" for discussion on Low Surge Pilot (8) setting. Remove pilot piping from the outlet of Pilots (8) and (9). See previous section "Fails to Open". If there is no flow from either Pilot (8) or Pilot (9), follow these steps:

If there is flow through Booster Valve (12), Booster Valve (12) is obstructed or there is an obstruction in the fixed restriction or piping and fittings from the inlet of the Main Valve to Booster Valve (12) bonnet or the Booster Valve is faulty. If there is no flow through Booster Valve (12) and the Main Valve does not close, the inlet side of the pilot piping, Strainer (3) or Closing Speed Control (4) is obstructed, Isolating Valve (2D) is closed, Main Valve diaphragm is ruptured, the Resilient Disc/Seat area is damaged or there is an obstruction in the Main Valve.

SIZING:

There are no simple formulas for sizing anticipating relief valves. SINGER VALVE recommends the following procedure for sizing 106/206-RPS-L&H:

1. Size for relief capacity of 25% of maximum pumping capacity.
2. Refer to Singer Bulletin 106-411 (106-PG) or Curve 206 414 (206-PG) for capacity of the valve. Do not use capacity beyond maximum momentary velocity (45 ft/sec) as shown on the bulletin.
3. Alternately use the formula **Q = Cv** $\sqrt{\Delta P}$

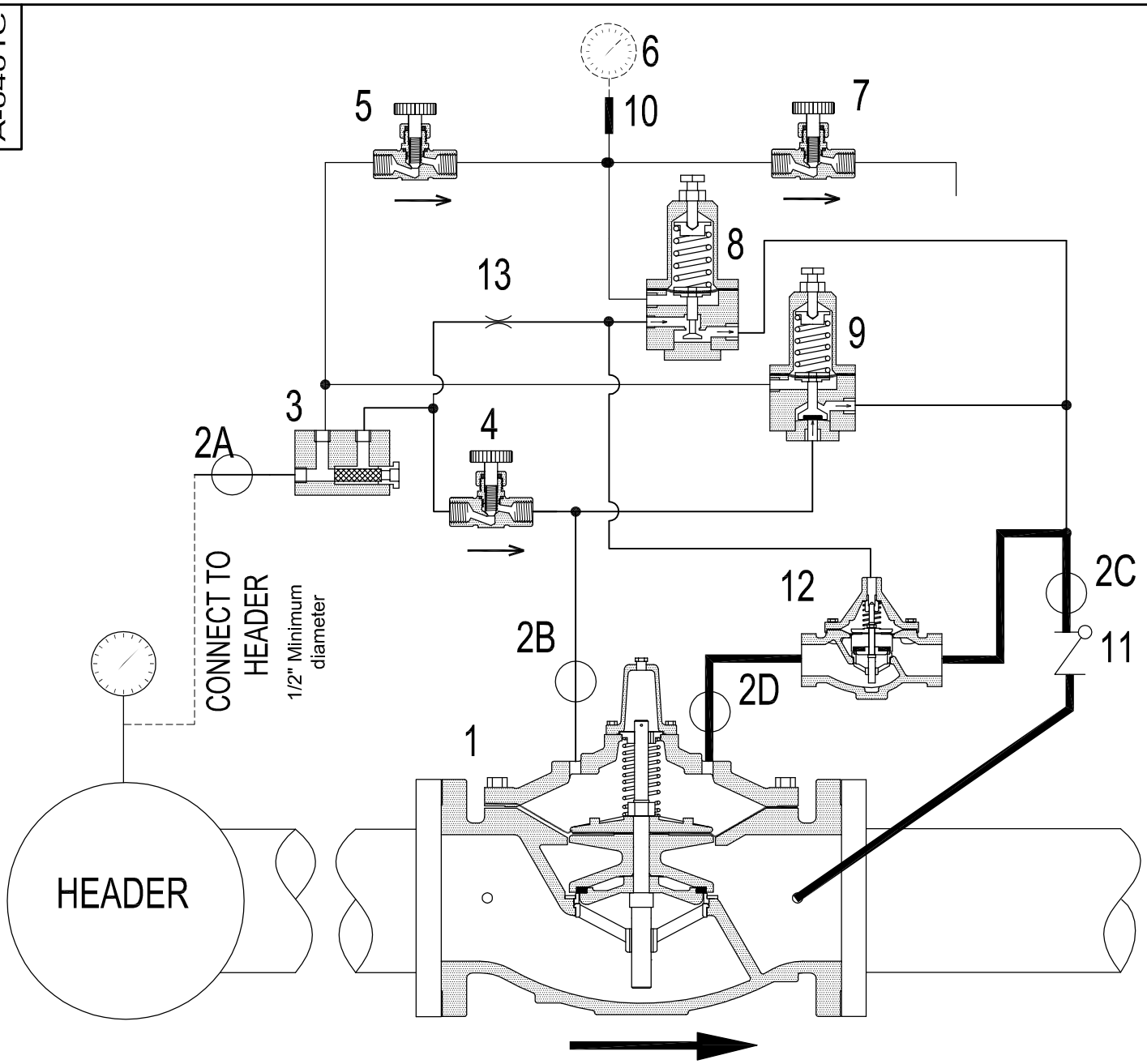
   Q = Flow (U.S.G.P.M.)
   Cv = Flow Coefficient
   ΔP = Pressure drop across valve (psi)

Use for pressure drops over 20 psi. Do not use pressure drop over 80 psi regardless of what the actual pressure drop is.

NOTE:

Most 106/206-RPS-L&H valves operate deep in the cavitation zone (See Bulletin 106-410). This is acceptable for the short periods that the valve is open. Where the valve is operated frequently or for long periods, periodic replacement of wearing parts may be required. Warranty does not cover damage due to cavitation.

A-0401C



1. Main Valve - 106/206PG.
2. Isolation Valves - A, B, C - standard all sizes.
3. Strainer - 40 mesh - J0097A.
4. Closing Speed Control - Model 852-B.
5. Needle Valve - Normal Position Fully Open.
6. Pressure Gauge - BY OTHERS.
7. Needle Valve - Normal Position Fully Closed.
8. Low Surge Pilot - Model 82-PR.
9. High Surge Pilot - Model 81-RP.
10. Pipe Plug for gauge connection.
11. Swing Check Valve.
12. Booster Valve - Model 106-PG.
13. Fixed Restriction - 1/16".

Anticipating Relief Valve
Sizes 8" to 16" 106, 10" to 24" 206.

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November 5, 2004	A-0401C

Model 106 or 206-RPS-L&H