

Operation Manual

Manual Diaphragm Valves

(Models AP3100, AP3102, AP3125, AP3150, AP3157, AP3260, AK/AP/AZ3600, AK/AP/AZ3604, AK/AP/AZ3624, AK/AP/AZ3625, AK/AP/AZ3627, AK/AP/AZ3650, AK/AP/AZ3652, AK/AP/AZ3657, AP/AZ/AK3672, AP/AZ/AK3675, AP3800, AP3900, AP/AZ4127, AP/AZ4150, AK/AP/AZ4600, AK/AP/AZ4625, AK/AP/AZ4650, AK/AP/AZ4652, and AK/AP/AZ4657)

A. General information

AP Tech manual diaphragm valves are used in gas delivery systems to control gas flow. Many models are available with different pressure ratings, flow capacities, and porting configurations. Refer to the appropriate catalog data sheet for specific product information.

B. System Design/Product Selection

1. When selecting the valve model and configuration, verify the following information.
 - a. Verify the materials of construction are compatible with the intended process gas.
 - b. Verify the pressure and temperature ratings are acceptable for the intended application.
 - c. Verify that the flow capacity (C_v) of the valve is appropriate for the application.
2. Valves can be used under a large variety of operation conditions. The system designers shall decide product selection based upon their own analysis and testing to verify acceptable operation with specific equipment.

C. Installation

1. Verify the pressure rating is acceptable.
2. Inspect the valve to determine the flow path through the valve and how the valve will be installed in the system.
 - a. An inlet (upstream) port is defined as a port connected to the region below the valve seat and may be labeled with an "IN" marked into the body near the port.
 - b. An outlet (downstream) port is defined as a port connected to the region above the seat and below the diaphragm. The outlet port is usually not labeled but may be marked "OUT".
 - c. The traditional flow direction is inlet to outlet, but AP Tech valves may be employed in either traditional flow direction or the reverse.
 - d. On Series DV Monoblock valves the port that is common with the block valves is marked with a "C". No other marking is shown. Technical Bulletin 205 has schematics of the monoblock configurations and more detailed information.
3. Install the valve using the appropriate method described below.
 - a. For tube stub connections, weld connectors or other components to the tube stubs per standard industry practice (reference SEMI standard F78).

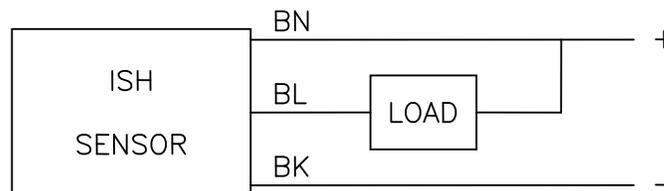
- b. For metal face seal connectors, assemble connections per standard practice described by fitting supplier (typically 1/8 turn past finger tight).
 - c. For compression-type connectors, insert the tube into the fitting until it stops. Tighten the fitting by applying 1-1/4 turns of nut rotation.
 - i) For reinstallation, mark the nut and the valve body before disassembly. This will allow the nut to be returned to the original assembly position. Insert the tube and attached ferrules into the fitting until fully seated. Rotate the nut until it is returned to the original assembly position, and tighten slightly beyond marked position.
 - d. Most valves can be attached to panels or mounting plates using the 10-32 or M5 female thread mounting holes located in the bottom of the body (valves with M5 mounting holes will be marked with a “5” on the bottom of the body). Special configurations or multi-valve blocks may not have mounting holes or may have different size holes. Refer to the specific data sheet or Technical Bulletin for detailed mounting information.
4. After installation, perform a leak test of all connections and welds per standard industry practice (reference SEMI standard F1).

D. Indicating Switch Option Installation

- 1. ISH option for AK/AP/AZ3650 or AK/AP/AZ4650 (refer to Figure 1):
 - a. Review the following specifications to verify the switch is appropriate for the installation.

| | |
|-----------------------|---|
| Switch model | Honeywell 2SS52M |
| Switch type | NPN (current sinking) |
| Operating temperature | -40 to 150 C |
| Supply voltage | 3.8 to 30.0 VDC |
| Output voltage | 0.4 VDC max. |
| Supply current | 11 mA max. |
| Output current | 20 mA max. |
| Life expectancy | up to 5,000,000 cycles at 1.2 VA |
| Connectors | Stranded 24 AWG wire (blue, black, and brown leads) |

- b. Connect black (BK) lead to ground.
- c. Connect brown (BN) lead to supply voltage.
- d. Connect blue lead (BL) to load that is connected to supply voltage.



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NPN OUTPUT SENSOR

Figure 1. ISH Sensor Wiring Diagram

E. Operation

1. Perform the following to close the valve.
 - a. Rotate the valve handle clockwise as viewed from the top until a sudden, large increase in torque indicates that the internal hard stop in the actuator or in the valve body is reached.

Caution: Torque to operate a valve may noticeably increase as the valve is closed due to load from the internal pressure. Higher internal pressure will require higher operation torque. Do not mistake an actuation torque increase due to the internal pressure with that due to contacting the valve internal stop. This could result in the valve being left in the open position when the intention was to close the valve.
 - b. For valves with OPEN/CLOSED status indication, verify that handle indicator shows the valve is in the CLOSED position.
 - c. For AP3157, AK/AP/AZ3657, and AK/AP/AZ4657 valves, turn the handle fully clockwise until the handle drops down. AP3157, AK/AP/AZ3657, and AK/AP/AZ4657 valves have a small detent in the open position, which requires a slightly higher torque at the initial portion of the valve travel to exit the detent.
 - d. For AP3900 valves, turn the handle fully clockwise until the handle drops all the way down. The top edge of the flange on the lock stem (the part at the center of the handle) should be flush with the top surface of the handle when the valve is in the closed position.
 - e. If an ISH switch option was installed, verify that the output signal changed states.
 - f. AP/AZ/AK3672 and AP/AZ/AK3675 are metering valves intended for flow control. As such, there are a few important considerations:
 - i) The number of valve handle rotations to traverse the metered range is 14-15 turns. For best results, choose a metering valve range for flow in the control range away from full closed and full open positions.
 - ii) For the best repeatability correlating flow to a knob scale setting, rotate the knob in one direction for either increasing or decreasing flow. If the desired flow set point is missed, return the knob to a setting below (or above) the intended set point and adjust the knob by rotating it the same direction each time.
 - iii) Metering valves are bubble tight when placed in the closed position. They are intended for metering flow rather than for shut-off. AP Tech recommends use of a conventional valve in conjunction with the metering valve when the installation requires positive shut off.
2. Perform the following to open the valve.
 - a. Rotate the valve handle counterclockwise until an increase in torque indicates that the internal stop in the actuator is reached.
 - b. For AP3157, AK/AP/AZ3657, AK/AP/AZ4657, and AP3900 valves, pull the handle up and turn counterclockwise to open the valve. This feature prevents the valve from being accidentally opened.
 - c. For valves with OPEN/CLOSED status indication, verify that handle rotation has reached the OPEN indication. On AP3800 and AP3900 valves, only solid dots of increasing size will be visible through the handle window when the valve is fully open.

- d. If an ISH switch option was installed, verify that the output signal changed states.

Caution: Do not use a tool to apply excessive opening or closing torque to the valve handle as damage may result.

3. When a valve is in the closed position, the inlet ports are isolated from the outlet ports. When a valve is in the open position, all ports are common.

F. Lock Out Tag Out Valves

1. AP3157, AK/AP/AZ3657, AK/AP/AZ4657, and AP3900 valves have a built in lock out tag out (LOTO) capability. A non-interlocking scissor type padlockable safety lockout hasp with a 1/8 inch or thinner hasp arm thickness is required to use this feature. A Master Lock[®] No. 420 safety lockout hasp is suggested.
2. If the lock out tag out feature is to be used, verify that the lock stem center piece slot clearances are compatible with the available safety hasp as follows.
 - a. Turn the knob fully clockwise to close the valve. Verify that the lockout hasp can be inserted through the lock stem slot and closed. Remove the hasp.
 - b. Lift up on the knob and turn fully counter-clockwise to open the valve. Verify that the lockout hasp cannot be inserted through the lock stem slot.
3. The valves can be locked out as follows.
 - a. Turn the handle fully clockwise to close the valve. Insert an arm of the safety lockout hasp through the slot in the lock stem located on top of the valve. Close the safety lockout hasp and insert a padlock through one of the padlock holes in the safety lockout hasp.

Please contact the factory or your local representative to answer questions or for further information.