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3 position air valves

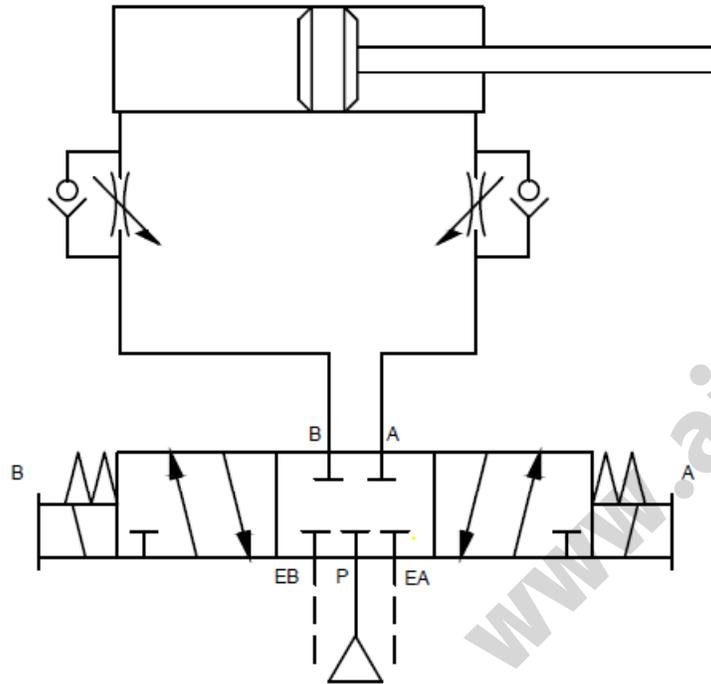
A great amount of confusion exists and many misapplications result when 3-position valves are used for emergency stop or cylinder jogging applications.

Many times the engineer or circuit designer is asked to provide either or both of the above actions when they are not absolutely necessary and without realizing the additional cost or complexity to achieve such actions.

Improper application of 3-position air valves to satisfy the above applications could, during start-up or during normal maintenance or repair, create safety hazards.

The purpose of this discourse is to point out and help rectify such misapplications.

3-POSITION ALL PORTS BLOCKED IN CENTER OR MID POSITION

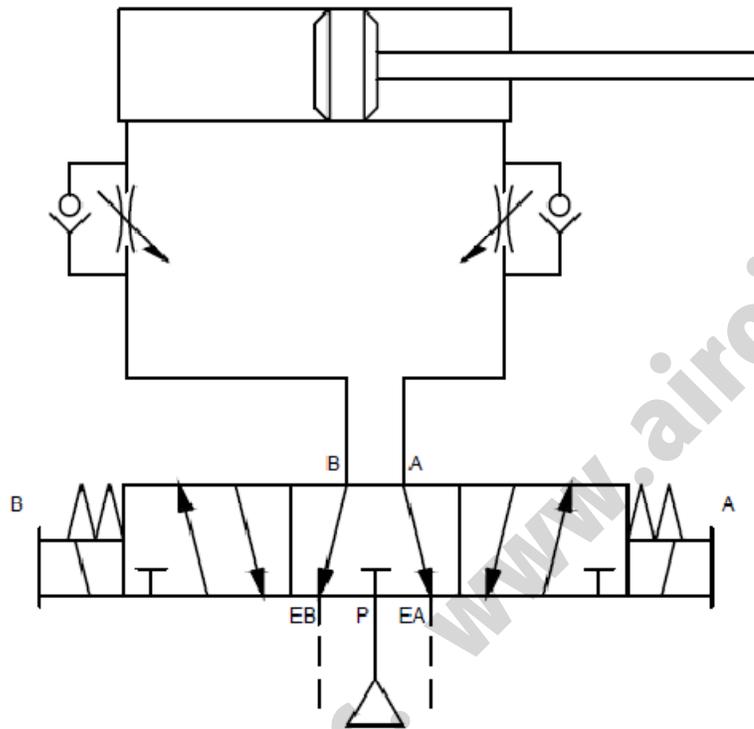


This is the type of valve most frequently selected to stop or jog an air cylinder. Be aware of the following when the valve is in mid position:

- A. The cylinder will not stop until the residual air, cylinder volumes, and forces equalize.
- B. Air is trapped in the cylinder; fittings, piston seal, rod seal, or valve leakage will allow the cylinder to move or drift.
- C. When air is exhausted by a lock-out or dump valve, air will be trapped in the cylinder.
- D. If it is a vertical cylinder application supporting a load, and if a cylinder line was exhausted inadvertently, the load could drop unexpectedly.
- E. During start-up when the system or valve is pressurized, the all ports blocked condition does not allow the air to pressurize the cylinder. When the valve is actuated the first stroke of the cylinder could be at high speed due to the potential lack of air in either end of the cylinder.
- F. If a cylinder line were to be disconnected for maintenance, rapid cylinder movement would occur because of the trapped air.

NOTE: B THROUGH F ACTIONS CAN OCCUR WHEN LEAST EXPECTED!

3-POSITION SUPPLY BLOCKED, CYLINDER PORTS EXHAUSTED



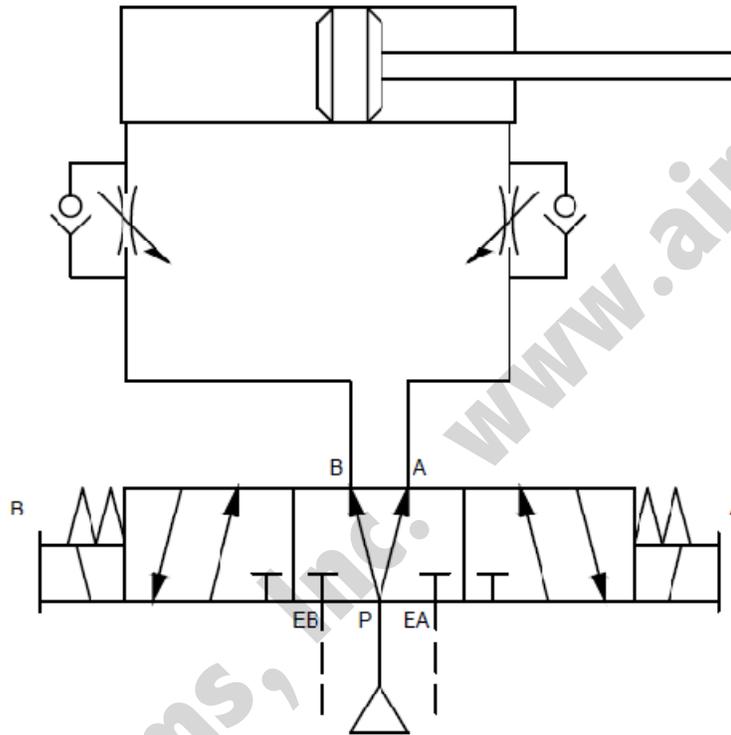
Be aware of the following when the valve is in the mid position:

- A. The mid position provides an exhaust path for both ends of the cylinder.
- B. The exhausted condition does not allow the cylinder to hold position against external loads.
- C. When the valve is re-actuated to either position, the cylinder will advance or retract rapidly without control due to the lack of pressure in the opposite end of the cylinder.

NOTE: This type of 3-position valve might be better applied to a reversing air motor which would be capable of manual movement when the valve is in the mid position exhausting both pressure ports.

3-POSITION PRESSURE TO A AND B CYLINDER PORTS

(Exhaust ports blocked, both cylinder ports pressurized)



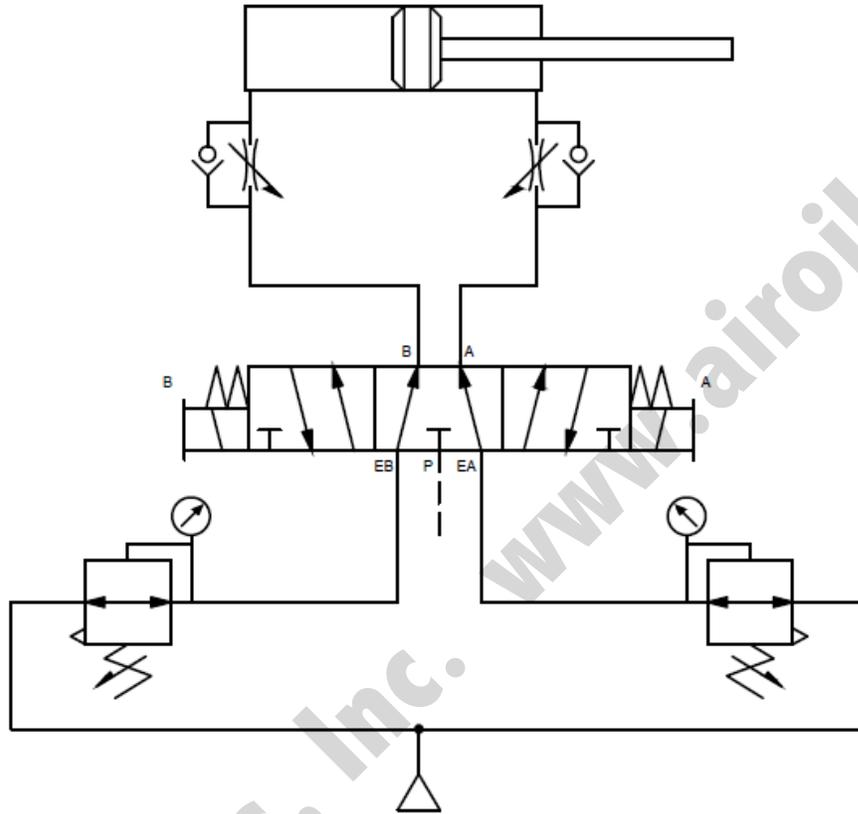
Be aware of the following when the valve is in the mid position:

- A. Equal pressure applied to both ends of the cylinder would create an unequal force due to rod area differential. Consequently this application will not let or cause a cylinder to stop in the mid position or to be jogged effectively.
- B. Should not be used to support vertical loads.

NOTE: This type of 3-position valve might be applied to a reversing air motor. In the mid position with both pressure ports of the air motor pressurized it would create a stall condition, thereby stopping and holding.

3-POSITION VALVE DUAL PRESSURE WITH REGULATORS

NO CHECK VALVES



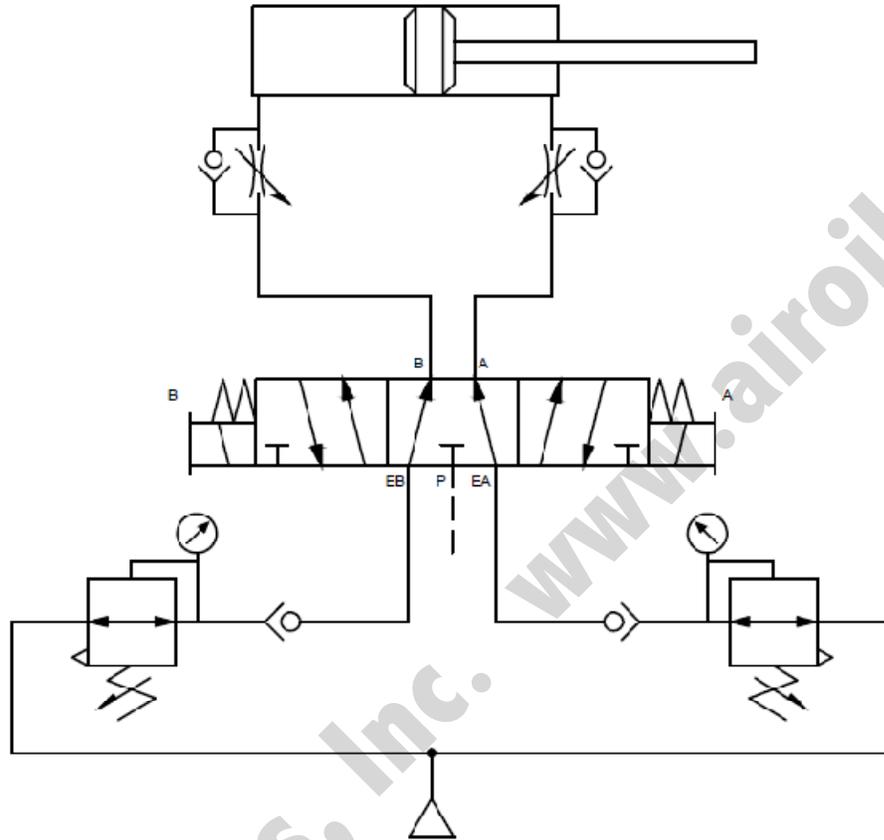
Be aware of the following when the valve is in the mid position:

- A. This circuit provides constant pressure to overcome fitting, valve, and rod seal leakage.
- B. Regulator can be adjusted to compensate for differential piston area to provide jog or emergency stop control.
- C. When air is exhausted by a lock out or dump valve, all air is exhausted leaving no trapped air.
- D. During start up, when the lock out valve is opened, air is supplied simultaneously to both ends of the cylinder preventing a runaway condition when the valve is first actuated.

NOTE: Not recommended for vertical mounted cylinders supporting heavy loads.

3-POSITION VALVES, DUAL PRESSURE

(With regulators and check valves without pressure relief)



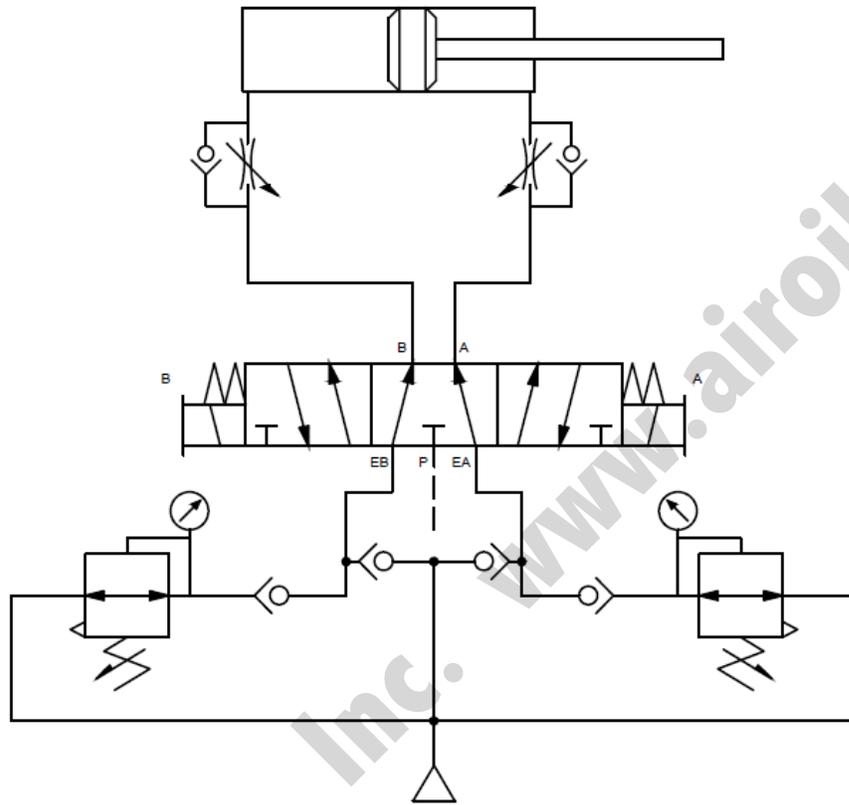
Be aware of the following when the valve is in the mid position:

- A. This circuit provides constant pressure to overcome fitting, valve, and rod seal leakage.
- B. Regulator can be adjusted to compensate for differential cylinder area to provide jog or emergency stop control.
- C. During start up, when the lock out valve is opened, air is supplied simultaneously to both ends of the air cylinder preventing runaway condition when the 3-position valve is first actuated.
- D. The check valves provide back pressure to the cylinder to hold against external loads, especially if the cylinder is mounted in a vertical position. The check valve also helps to protect the regulator against sudden inertial loads.

NOTE: When air is exhausted by a lock out valve, air can be trapped in the cylinder by virtue of the check valves. If or when a cylinder line is opened or broken, a vertically mounted cylinder supporting a load may unexpectedly drop or cylinder movement could occur because of trapped air.

3-POSITION VALVES, DUAL PRESSURE

(With regulators and check valves with downstream pressure relief)



Be aware of the following when the valve is in the mid position:

- This circuit provides constant pressure to overcome fitting, valve, and cylinder rod seal leakage.
- Regulators can be adjusted to compensate for differential piston area to provide jog or emergency stop control.
- During start up, when the lock out valve is opened, air is supplied simultaneously to both ends of the cylinder preventing a runaway condition when the valve is first actuated.
- The check valves provide back pressure to the cylinder to hold against external loads, especially if the cylinder is mounted in a vertical position. The check valves also help to protect the regulators against sudden inertial loads.

NOTE: When air is exhausted by a lock out valve, air cannot be trapped in the cylinder by virtue of the relieving check valves.