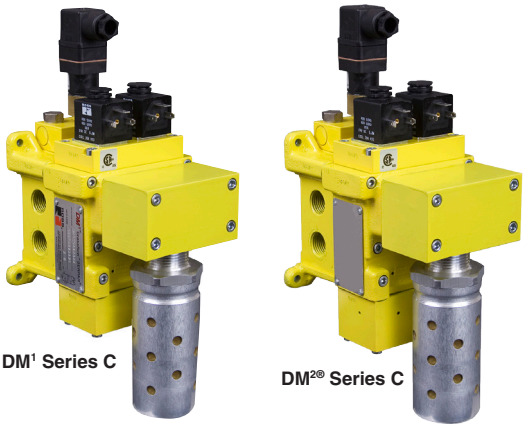
DM[1] Series C versus DM[2®] Series C Category 4 Safety Valves – Product Comparison

ROSS Controls offers two DM Series C safety valves, a DM[1] Series C and a DM[2®] Series C. The primary difference is that, should a fault occur in the valve, the DM[1] Series C can reset automatically, while the DM[2®] Series C requires a dedicated reset signal in order to return to its ready-to-run state.



DM[1] Series C

DM[2®] Series C

But what does this difference really mean?

First, we should define what is considered a fault within the ROSS DM Series C valve. Being a redundant valve with two sets of internal elements that must shift in synchronization in order to supply air downstream, a fault occurs when one of the internal elements moves out of synch with the second element by more than the designed discordance time. This results in the supply of air being blocked, the downstream pressure being bled to exhaust, and the element that is out of synch being unable to complete its shifting function until the valve is de-energized and reset.

Auto reset means that should a fault occur, the valve will return to a ready-to-run state once both main solenoid coils are de-energized, and the internal elements return to the home state due to the internal valve dynamics. While this appears to be very convenient, the potential issue is that a fault could go unobserved by the operator or control system if the fault occurs during certain operations of the machine. Because of this, the ROSS DM[1] Series C valves are available with an optional status indicator for additional diagnostics.

If using a DM[2®] Series C valve, as opposed to a DM[1] Series C valve, reset does not occur automatically when de-energizing the valve, but requires an actual dedicated reset procedure to unlatch a fault. This means that when a fault occurs the valve will maintain the fault (latched-out) condition until electrical power is removed from the main solenoids, and a separate dedicated reset signal is applied. This reset procedure requires air pressure to be present at the inlet of the valve. The inlet pressure is used by the reset solenoid valve to return all internal moving parts to the home position and puts the valve back into the ready-to-run state. The reset signal must be momentary because the DM[2®] Series C valve has an anti-tie-down feature built into it to prevent inadvertent or intentional attempts to continuously override the latch-out feature. As long as the reset signal is present, valve operation cannot be initiated, and the valve will remain in the faulted state. This anti-tie-down feature prevents a person from holding the reset signal in place and, in essence, converting the valve into an automatic reset valve.

Another important feature is that if the DM valve, both DM[1] and DM[2®] Series C, is energized and not faulted, removal of supply pressure will be sensed by the valve and it will fault accordingly. Main supply should never be able to be removed and re-applied without causing the valve to fault and go to the safe mode, as long as the valve is energized. The resulting fault is the same if the main solenoids are energized prior to supplying air to the valve. This fault operation is very similar to how a safety monitoring relay works. When the supply power is lost the safety monitoring relay will go into its safe mode, you would then have to go through a startup procedure which would include a reset. No machine safety system should allow a machine to restart automatically.

These features allow the DM Series valves to meet the standard requirements for Energy Sources as well as Interruption of Energy Sources in ANSI B11.0. The ANSI B11.0 Safety of Machinery: General Requirements and Risk Assessment standard is quoted below but similar requirements are found within machine safety standards throughout the world.

7.3.4 Energy sources

Activating an internal or external energy source, including starting after a power interruption, shall not result in a hazardous condition.

7.3.5 Interruption of energy source

Machinery shall be designed to prevent hazardous conditions resulting from interruption or excessive fluctuation of the energy source (e.g., electrical, pneumatic, hydraulic). In the event of loss of energy, the following minimum requirements shall be met:

- The stopping function of the machine shall remain available;
- All devices whose permanent operation is required for safety shall operate in an effective way to maintain safety (e.g., locking, clamping devices, cooling or heating devices, braking); hazardous stored energy shall be safely controlled or dissipated.

SUMMARY:

DM[1] Series valve without Status Indicator:

- Energization faults may be detected by an operator or controls system due to the machine operation not occurring properly, i.e., some part of the machine does not operate as expected. This situation can be observed by the operator and/or possibly by the controls system, indirectly. The operator may not know specifically that it was a valve fault and normal operation could occur on the next machine cycle.
- De-energization faults may not be detected by the operator or control system if the machine operation occurs normally and the fault clears prior to the next operation of the valve. In other words, the valve is being de-energized and we expect it to be going to the off position anyway, which outwardly results in the same condition – inlet shut off and outlet open to exhaust. Therefore, this fault could go undetected.

DM[1] Series valve with Status Indicator:

- Same as above except that the Status Indicator will change state during the fault condition and can be captured (recognized) by the control system so that the fault is annunciated, and therefore can be acknowledged by the operator.

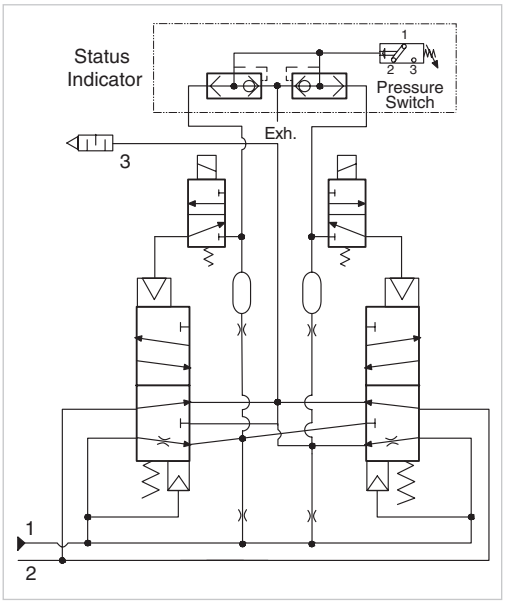
DM[2®] Series valve without Status Indicator:

- Energization faults may be detected by an operator or controls system due to the machine operation not occurring properly, i.e., some part of the machine does not operate as expected. Also, the valve will latch in the faulted condition and will require a reset before proper operation can resume. The operator may not know specifically that it is the valve that faulted because there is no Status Indicator to signal a fault.
- De-energization faults may not be detected by the operator or control system if the machine operation occurs as normal. However, the valve will be latched in the faulted condition and will require a reset before proper operation can resume. The operator may not know specifically that it is the valve that faulted because there is no Status Indicator to signal a fault.

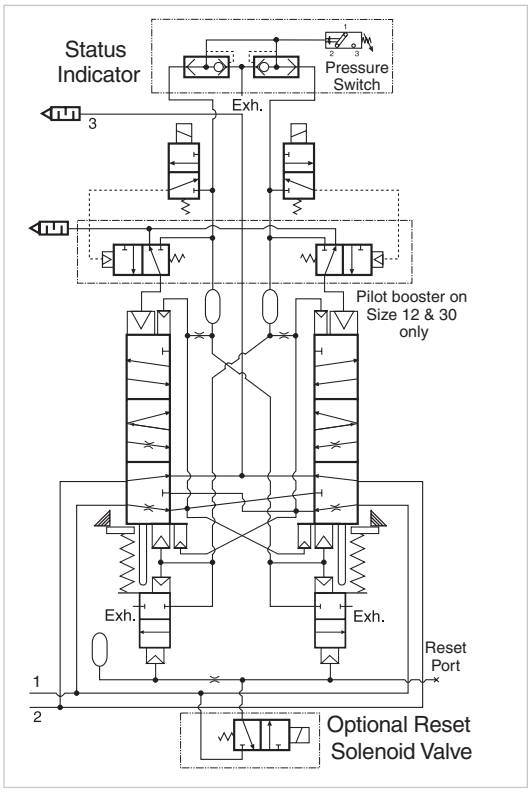
DM[2®] Series valve with Status Indicator:

- Energization faults may be detected by an operator or controls system due to the machine operation not occurring properly, i.e., some part of the machine does not operate as expected. However, the valve will be latched in the faulted condition and will have to be reset before proper operation can resume. The Status Indicator will indicate that the valve is faulted and needs to be reset.
- De-energization faults may not be detected by the operator or control system if the machine operation occurs as normal. However, the valve will latch in the faulted condition and will have to be reset before proper operation can resume. The Status Indicator switch will indicate that the valve is faulted and needs to be reset.

Valve Schematics



DM[1] Series C – Valve de-actuated



DM[2®] Series C – Valve de-actuated

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