

M35 Series Safe Exhaust Double Valves

Supplemental Service and Troubleshooting Guide



This guide is intended to be a quick reference to frequently asked questions and is not intended to provide complete details for valve installation, operation, and integration into the electrical safety control system.

VALVE FUNCTION

The M35 is not internally monitored. Due to its unique internal SERPAR® Crossflow design any instance of one internal element not shifting correctly will result in the blocking of supply pressure and the exhausting of downstream pressure. The two independent internal valve sensors will indicate internal position status and requires the electrical safety system to monitor these signals to indicate valve faults and take appropriate action. The pressure sensors are set to change state at 15 psi (1 bar). They are PNP and when there is no pressure the output of the sensor is high (24 VDC). When there is pressure (provided power is supplied to the sensors) present on the sensor, the output is low (0 VDC). Sensor output load current output is limited to 50 mA each.

For detailed valve operation instructions follow link: <https://www.rosscontrols.com/literature>

For valve integration guide follow link: <https://www.rosscontrols.com/literature>



EEZ-ON® (SOFT-START) ADJUSTMENT

The M35 has the optional EEZ-ON® (Soft-Start) included in the valve assembly. When using the EEZ-ON® (Soft-Start) feature, the time it takes for the outlet pressure to reach approximately 50% of inlet pressure can be changed by adjusting the flow control in the EEZ-ON® (Soft-Start) module. Turning the flow control clockwise will increase the time it takes the outlet pressure to reach 50% of inlet pressure. Turning the flow control counter-clockwise will reduce this time. This time interval is directly affected by the volume of the system being filled.

Turning the adjustment completely in to the maximum EEZ-ON® (Soft-Start) can cause the valve to not shift properly or in a timely manner. This issue can be complicated if the external monitor is comparing the timing of energization of the solenoids to the change in state of the sensors.

WIRING

What if I connect my M12 cable incorrectly?

The M35 electrical connections to the solenoids and sensors are made with two male 5-pin M12 receptacles on the valve. Female connectors and cables are sold separately. These two connectors are keyed the same and could potentially be wired incorrectly – cables swapped. If this occurs in any of the wiring pinout options there is no way for the solenoids to be energized inadvertently or for the sensors to provide correct information. For example, connection type AA is shown below with the connectors shown correctly and incorrectly. If incorrect neither solenoid would ever receive power to shift and the sensor light would not be on.

Figure 1 - AB Correct

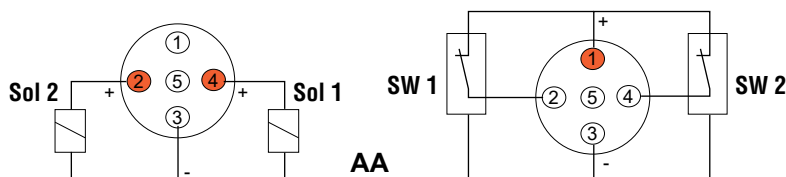
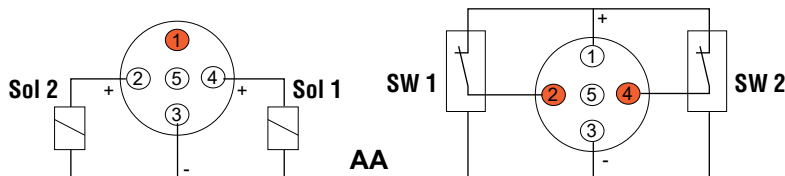


Figure 2 - AB Incorrect



The examples are showing APPLIED voltage only.

Which wiring connection is correct for my application?

Solenoid option A can be used in most applications. Solenoid options C and D are specific to safety PLC controllers with bipolar outputs and should not be used by a non bi-polar safety controller. If specific bi-polar controller blocks are used the C and D pinouts can allow the use of M12-M12 connectors with these blocks.

Sensor connection A can be used in most applications. Sensor connections B and C are specific to suppliers of safety PLC controllers with bipolar outputs and allow the use of M12-M12 connectors with their controller blocks.

PULSE TESTING

Pulse testing of the solenoids is required in dual channel circuits in order to reach performance level e (PL e). However, pulse testing of the feedback sensors is not required.

Pulse testing of the solenoids will not affect the performance of the ROSS M35 valve. Pulse testing of the sensors is discouraged because the sensors are solid state. This means that certain pulse testing frequencies will create issues that are perceived by the controller as valve faults. These issues are entirely dependent on the specific controller being used.

VALVE RESET

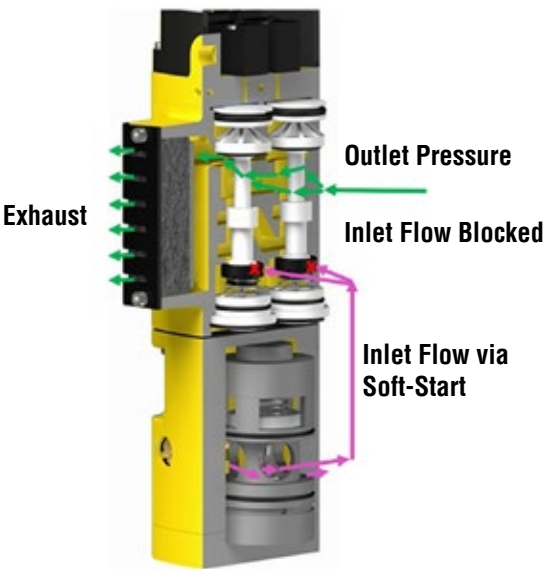
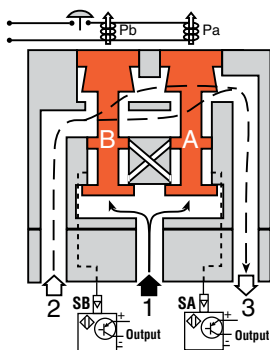
Because the M35 valve requires external monitoring via the safety controller it is considered an automatic reset valve. If both sides are energized and only one side shifts correctly the valve will block supply and exhaust downstream pressure while one sensor output will be high and one will be low indicating a fault. The safety controller should detect this discordance and de-energize the valve. De-energizing the valve solenoids should result in both sides of the valve returning to the at-rest state which should result in both sensors going high. At this point the valve is reset (off) and ready to be energized. If the sensors remain out of synch, with one high and one low, the valve should be replaced. The assumption is that the monitoring is working properly. See valve test procedure in the Installation Instructions manual and the monitoring validation procedure in the Integration Guide.

M35 Series Service and Troubleshooting Guide – Valve Function

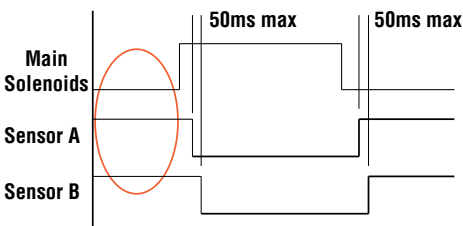
When the Valve is De-Actuated

Air flows into the inlet (through the Soft-Start) but can't flow out.
Its blocked by A & B pistons.
Outlet 2 is open to exhaust.
The normally closed sensors both provide voltage feedback signals to the external monitoring system.

Nothing is happening.



Operation Timing Chart

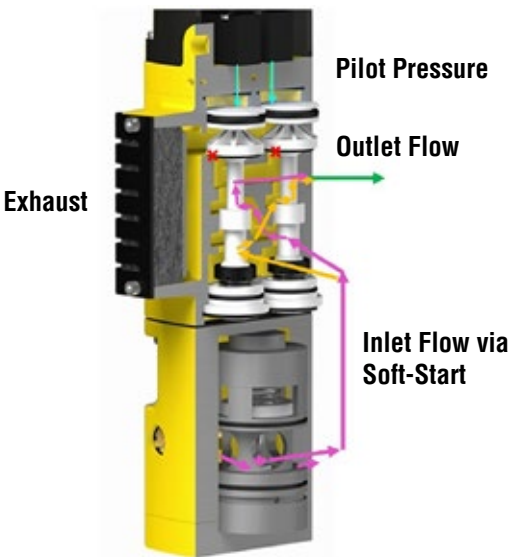
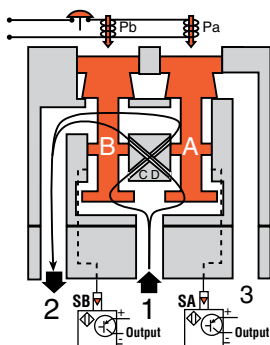


When the Valve is in Normal Operation

Solenoids are energized causing the pistons to move.
Air can now flow from inlet 1 to outlet 2 and into the machine. Exhaust is closed.

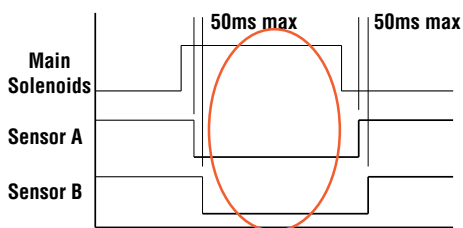
Machine fills.

Both sensor contacts open and no voltage signals are provided to the external monitoring system. This indicates both sides of the valve actuated as expected.



The soft start will open to full flow at approx. 60% of inlet pressure.

Operation Timing Chart



M35 Series Service and Troubleshooting Guide – Valve Function

When the Valve Faults while De-energizing

If a malfunction causes one piston to be open and the other closed.

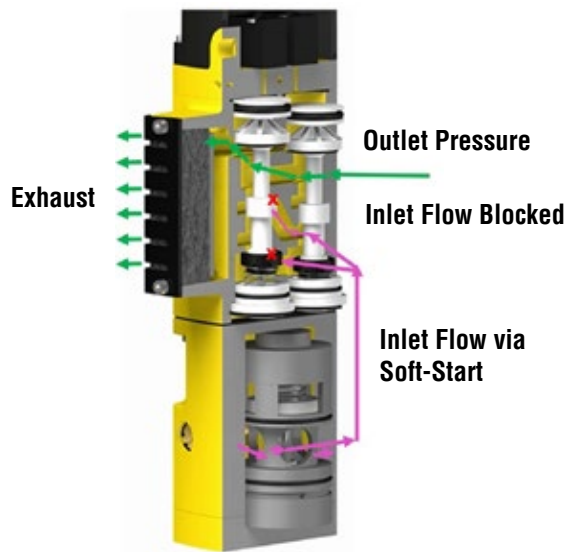
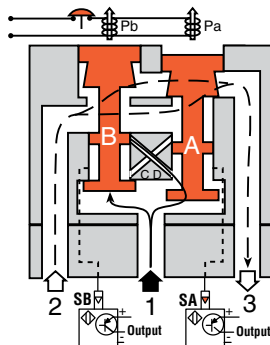
One sensor is switching from high to low, the other stays high. This needs to be detected at the monitoring device (monitoring the outputs).

The monitoring system reacts and turns off the solenoids.

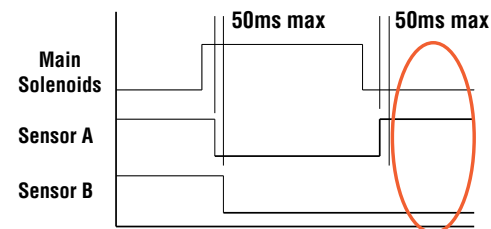
The valve is open to exhaust from outlet 2 and will not re-pressurize.

The machine exhausts.

Important – This is a fail safe design. The loss of one channel does not lead to the loss of the safety function.



Operation Timing Chart



When the Valve Faults while Energizing

If a malfunction causes one piston to be open and the other closed.

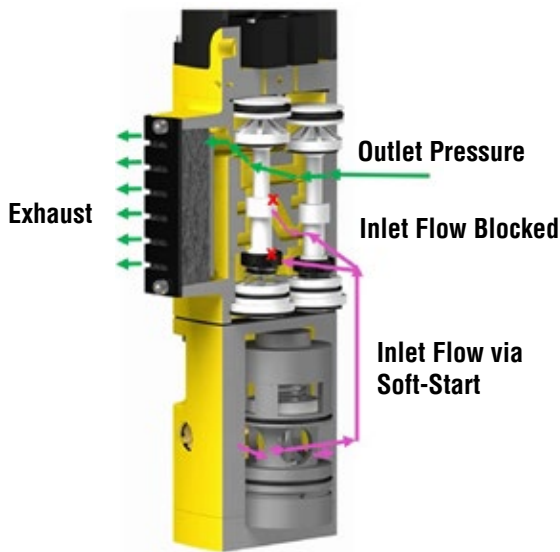
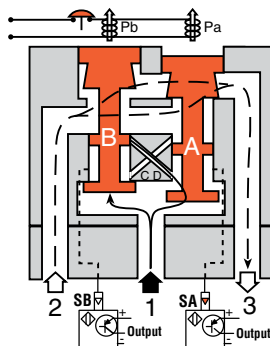
One sensor is switching from high to low, the other stays high. This needs to be detected at the monitoring device (monitoring the outputs).

The monitoring system reacts and turns off the solenoids.

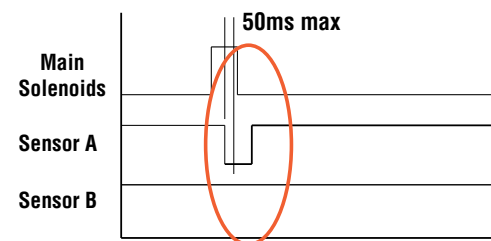
The valve is open to exhaust from outlet 2 and will not re-pressurize.

The machine remains un-pressurized.

Important – This is a fail safe design. The loss of one channel does not lead to the loss of the safety function.



Operation Timing Chart



M35 Series Service and Troubleshooting Guide

M35 LED Status Lights (Operation)

Solenoid Power LED's: These LED's operate independently to indicate power is applied to the solenoids.

Green: Power applied.

OFF: No power applied.



Sensor Power (SEN PWR): This LED indicates whether or not power is applied to the feedback sensors.

Green: Power applied.

OFF: No power applied.

FAULT (FLT): Flashing Red: Sensors are in different States.

OFF: Sensors in same state – no issue.

VALVE TROUBLESHOOTING MATRIX

Solenoid Lights		Sensor Power (Light)	Sensor Signal		Fault Indicator (Red Light)	Air Coming from Exhaust	Downstream Pressurized	Issue	Troubleshooting
A	B		A	B					
Off	Off	On	High	High	Off	No	No	Correct; supply blocked, outlet exhausted	
Off	Off	Off	Low	Low	Off	No	No	No power to sensors	Incorrect wiring?
Off	Off	Off	Low	Low	Flashing	No	No	No power to sensors	Incorrect wiring? Both sensors do not have power, valve could have sensor pinout B or C but is wired for A
Off	Off	On	High	Low	Flashing	Yes	No	One side is faulted	Exhaust leakage indicates one internal is shifted or partially shifted
Off	Off	On	High	Low	Flashing	No	No	One side is faulted	No exhaust indicates potential sensor issue
On	On	On	Low	Low	Off	No	Yes	Correct; exhaust blocked, outlet pressurized	
Off	Off	On	High	High	Off	No	No	No power to solenoids	Incorrect solenoid wiring
On	On	On	High	High	Off	No	No	No downstream pressure	No supply pressure or EEZ-ON® (Soft-Start) severely limiting flow
On	On	Off	Low	Low	Off	No	Yes	No power to sensors	Monitor should detect this and turn off solenoids
On	On	On	High	Low	Flashing	Yes	Yes	One side is faulted	Monitor should detect this and turn off solenoids, could be solenoid or internal
On	Off	On	Low	High	Flashing	Yes	No	Only one solenoid is on	Check solenoid wiring and validate monitoring
Off	On	On	High	Low	Flashing	Yes	No	Only one solenoid is on	Check solenoid wiring and validate monitoring
On	Off	On	Low	High	One Blink	Momentary	No	Only one solenoid is on	Check solenoid wiring
Off	On	On	High	Low	One Blink	Momentary	No	Only one solenoid is on	Check solenoid wiring

Side is defined as pilot, internal component, and sensor system. Fault could be in any of those components.



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