REGULATOR TROUBLESHOOTING

EMERSON™

Troubleshooting

Symptom	Problem	Details / Solutions
Outlet pressure is above expected setpoint (at zero flow demand)	Valve plug or orifice damaged	A damaged valve plug or orifice prevents proper sealing, causing higher lockup pressures. Preventative maintenance of your regulator can identify worn or damaged parts. Consider filtration in your process line.
		Improper seal between orifice and body due to improper installation, incorrect torque, or debris can cause leakage downstream. Keep in mind that metal seats are allowed leakage to ANSI/FCI 70-3 Class IV.
		For pilot-operated regulators, check the valve plug and orifice of both the pilot and main valve. Tip: block valves can be used to isolate whether the pilot or main valve is the leak source.
	Operating pressures and temperatures outside published limits	Exceeding maximum pressure, differential pressure or temperature specifications can result in leakage downstream. Consult product bulletin for proper specifications.
	Physical obstruction	Foreign debris in the trim or spring case can prevent a regulator from closing, preventing shutoff.
	Setpoint made at unrepresentative process conditions	Setpoint made at a higher than recommended flow may result in higher than desired lockup pressure. Setpoint should typically be made at 1-5% of flowing capacity. Turn the adjusting screw until you've reached the desired setpoint.
	Moving parts damaged	Inspect metal parts for scoring, deformation, or other damage. Inspect elastomeric parts for cuts, cracks, tears or chemical attack. Damaged parts can keep your regulator from functioning properly. Preventative maintenance of your regulator can identify worn or damaged parts. Consider filtration in your process line
	Thermal buildup	Sunlight on the outlet piping can heat the gas, increasing pressure.
	Leakage through alternate flowpath	Verify that bypass lines, parallel runs and associated equipment are not leaking. Some pilot-operated monitor setups bleed downstream through the bleed line until setpoint is met.
Outlet pressure is above expected setpoint (under flowing conditions)	Incorrect control spring	Verify the spring is correct using product literature.
	Using product beyond published capacities	Verify that the flowrate is within the published capacity. Keep in mind that some internal sensing self-operated regulators boost above setpoint rather than drooping.
	Fluctuating inlet pressure (Inlet Sensitivity)	Consider adding a regulator in series upstream to remove inlet variations to the final regulator (two-stage pressure cut setup).
		A pilot supply regulator can be used to deliver a constant pilot supply pressure.
	Control line disconnected	If the control line is open to the atmosphere (disconnected, damaged, etc.), the regulator will sense a pressure lower than setpoint and remain fully open.
	Restrictor is plugged	If the restrictor is plugged, the main valve may not close properly. Remove the obstruction and consider installing a filter in the supply line to reduce the risk of future obstructions.
	Moving parts are damaged	Inspect metal parts for scoring, deformation or other damage. Inspect elastomeric parts for cuts, cracks, tears or chemical attack. Damaged parts can keep your regulator from functioning properly. Preventative maintenance of your regulator can identify worn or damaged parts. Consider filtration in your process line.

Applicable only for Pilot-Operated Regulators

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Outlet pressure is below expected setpoint	Droop	Self-operated regulators typically show reduction in outlet pressure below setpoint with increasing flow (droop) as published.
	Improper sizing	An undersized regulator will not reach the flow requirements because it will travel towards the wide open position as outlet pressure decreases.
	Using product beyond published capacities	Verify that the flowrate is within the published capacity. Self-operated regulators typically show reduction in outlet pressure below setpoint with increasing flow (droop).
	Setpoint made at unrepresentative process conditions	Setpoint made at a lower than recommended flow may result in lower than desired control pressure. Setpoint should typically be made at 1-5% of flowing capacity. Turn the adjusting screw until you've reached the desired setpoint.
	Incorrect control spring	Verify the spring is correct using product literature.
	Low inlet pressure	If the actual inlet pressure is lower than was used while sizing, the regulator could have insufficient capacity or minimum differential pressure.
		Inlet pressure must always be higher than the expected setpoint.
	Obstructed orifice or flowpath	Debris, ice build-up at the orifice and closed block valves can obstruct the flow path and prevent the regulator from reaching the outlet pressure setpoint. Clear obstruction from the lines and regulator body and make the appropriate process changes.
	Obstructed spring case vent	Clear the vent if clogged.
Slow speed of response	Incorrect product selection	Self-operated regulators have the fastest speed of response. See Regulator Best Practice section on Sizing and Selection
	Improper control line placement	For units with external control lines, the control line should be located in a straight run of pipe, at least 6 pipe diameters downstream from any area of turbulence such as elbows, pipe swages, meters or block valves.
		Sense location should be closer to demand source for quicker reaction
	Control line size inadequate for long length	Use control lines of equal or greater size than the control tap on the regulator. For every 10 feet of control line, increase the entire control line by one nominal pipe size. Control line size is most critical on low pressure systems.
	Alternative solution: If your pilot-operated regulator is closing too slowly	Increase restrictor size to increase closing speed.
		Consider a quick dumping pilot or adding a booster pilot.
		A pilot supply regulator can be used to reduce pilot gain
		Switching to a self-operated regulator will increase the speed of response
	Alternative solution: If your pilot-operated regulator is opening too slowly	Decrease restrictor size to increase opening speed.
		Increasing differential pressure allows pilot-operated pressures to open quicker.
		Consider a different pilot or larger pilot orifice size.
		Adding an additional pilot, tubed in parallel, can increase opening speed.
		Switching to a self-operated regulator will increase the speed of response
Excessive Aerodynamic Noise	Noise generated by flowrate and pressure drop	See Regulator Best Practice sections on Sizing and Selection and Station Design

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Instability or Cycling - Condition in which the regulator vibrates or the setpoint does not stabilize	Oversizing	Be sure to choose the smallest regulator and orifice that will meet the application's maximum flow requirement. Oversizing causes the disk to operate too close to the orifice, resulting in instability. Consult your local sales office to verify proper sizing
	Improper control line placement	For units with external control lines, the control line should be located in a straight run of pipe, at least 6 pipe diameters downstream from any areas of turbulence such as elbows, pipe swages, meters or block valves. Turbulence near the sensing port of the regulator leads to rapid fluctuations in sensed inlet pressure, leading to instability.
		For units with internal sensing, the piping should be on a straight run. Turbulence near the sensing port of the regulator from sources such as rotary meters, elbows and block valves leads to rapid fluctuations in sensed inlet pressure.
	Restriction in Control Line	Valves used in the control line, should be full port valves. Needle valves or other restrictions in the lines may affect speed-of-response so use only when all other options have been exhausted.
	Control line size inadequate for long length	Use control lines of equal or greater size than the control tap on the regulator. For every 10 ft. of control line, increase the entire control line by one nominal pipe size. Control line size is most critical on low pressure.
	Insufficient piping volume	Small pipeline volume can cause the controlled pressure to change rapidly when the regulator opens or closes.
	Regulator's gain is too high	Increase restrictor opening. A larger opening decreases the operating speed, leading to a more stable system.
		On a loading-style (two-path) pilot-operated regulator, add a pilot supply regulator to dampen out the pressure cycles in the control system. Set the pilot supply regulator slightly above the main valve's required minimum differential value.
	Operating pressures outside published limits	Exceeding maximum pressure or pressure differential specifications can result in instability. Consult product bulletin for proper specifications.
	The spring case vent is obstructed	Clear the vent if clogged. Ensure the screen is in place.
		Verify the vent is oriented downward to protect it from the weather on applications without vent piping and ensure there is no moisture in the spring case. In colder climates, ensure snow and ice build-up does not block the vent.
		Vent piping should be as large as the nominal size of the vent connection and as a rule-of-thumb increase one nominal pipe size for every 50 ft. of linear pipe. (One elbow is equivalent to 3 ft. of linear pipe). (Note: regulators with internal relief require larger piping to prevent ensure adequate overpressure protection)
	Pilot bleed interfering with the pilot's sensing	If the regulator is designed to use combined pilot bleed and control lines, use a control line at least as large as the control line port. If the line is not large enough, the exhaust can cause backpressure or erratic flow, leading to instability.
		If the regulator is designed to use separate pilot bleed and control lines, use an individual tap for the bleed and control lines within the same pipe section.
	Alternative solution if above methods are unsuccessful	Use a heavier control spring. If the desired setpoint is within the next largest control spring's published range, replace the current control spring.

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