

Head End Bypass Unloaders

Head end bypass unloaders are pneumatically actuated ports on the head end of the cylinder that allows the head end compression to be open to the suction gas pressure. This fully deactivates the head end of the cylinder for single acting configuration. Head end bypass unloaders are most often applied when the suction pressure is higher than suction valve unloaders can be applied (near 1000 psi and higher).

The pneumatic actuator is smaller, to fit within the unloader, so requires a higher actuation pressure, often in the few to several hundred psi range. Each application and cylinder size will require a specific actuation pressure. These can be found in the Ariel performance software on the device datasheet.

Most often, process gas can be regulated from a higher pressure stage discharge to the appropriate pressure and applied as the actuation gas. The actuation gas must be clean and dry. Sour gas cannot be used as actuation gas (greater than 100 ppm H₂S) for safety reasons. If the process gas contains hydrogen sulfide, nitrogen may be used for the actuation gas.

Actuation gas must be clean and dry. When regulating the higher pressure supply stream to the required actuation pressure, a liquid collection / separator device must be installed directly downstream of the regulator.

Head end bypass unloaders may not be as efficient as suction valve unloaders, but can be applied at higher suction pressures.

All deactivation configurations should be analyzed at all conditions to verify adequate rod load reversal.

Single acting cylinder operating cases should be considered when analyzing [torsional](#) responses and acoustical pulsation responses. Single Acting cylinders can present the worst case scenario for a torsional analysis due to a more dynamic torque effort curve and for an acoustical pulsation analysis due to a change in the number of pulses per cycle. High torsional vibration and / or high acoustically driven vibration can result from single acting cylinder operation when not considered in these analyses.

High torsional vibrations can increase coupling and shaft stresses, and affect driver functionality or auxiliary driven equipment integrity. High acoustical pulsations can increase frame, cylinder, gas piping and equipment vibrations.

An alternate method of single acting a cylinder is by removing the head end suction valves on one cylinder end. Suction valve removal will result in less horsepower loss as the unloaded flow area is greater. Cylinders with suction pressures above 1000 psi and or small valve sizes may not be suitable for suction valve unloaders.

