

COMPRESSOR UNLOADER SYSTEMS

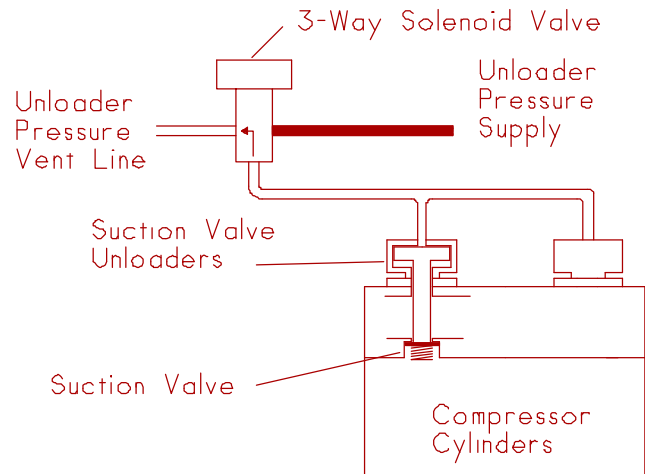
Suction valve unloaders are devices to prevent the compression of gas in the cylinder by holding the suction valves open. Unloaders allow the compressor to be started without a load and provide a method of controlling the compressor's capacity.

The unloader consists of a piston and an actuator rod to push the suction valve open. When pressure is applied to the top of the unloader piston, it moves toward the suction valve which is forced open via the actuator rod. The compressor is then 'Unloaded' - power requirements are greatly reduced and no gas is compressed. When the unloader pressure is vented, the unloader piston and actuator rod move away from the suction valve, allowing it to operate normally. The compressor is now 'Loaded' and operates at full rated capacity.

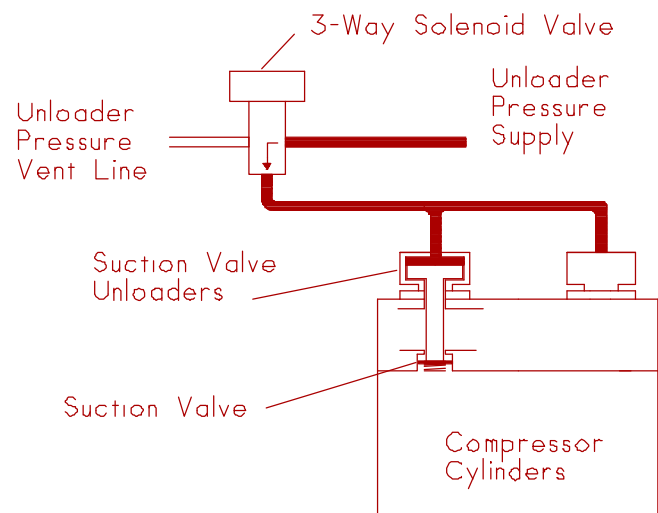
The unloader pressure is controlled by a 3-way solenoid valve which is normally positioned via a signal from a pressure switch or timer. These devices all work in conjunction to provide two distinct modes of operation - 'Loadless Starting' and 'Constant Speed Unloading'. The two are often combined into a 'Dual Control' System.

Loadless Starting

At compressor startup, a timed signal sets the 3-way solenoid valve to the 'Unload' position allowing pressure to the unloaders. The compressor is then able to start with very little load, protecting both the compressor and the drive motor. After a suitable delay (typically 10 - 30 seconds), the 3-way solenoid valve repositions to the 'Load' setting, the unloader pressure is vented, and the compressor operates normally. In practice, the timer used for loadless starting is also used to lock the low oil pressure switch out during startup.



LOADED



UNLOADED

Constant Speed Unloading (or Constant Run)

In a typical application, a pressure switch sets the 3-way solenoid valve to the 'Unload' position on high discharge pressure. The compressor then runs 'Unloaded' until the pressure falls, resetting the pressure switch, and returning the 3-way solenoid valve to the 'Load' position. The 'Load / Unload' signal can also be generated by a suction pressure switch, temperature switch, timer, etc. Constant Speed operation allows the capacity to be varied without stopping the compressor. If the compressor is to operate 'Unloaded' for extended periods (approximately 10 minutes), 'Dual Control' operation should be specified.

Dual Control

This system is a combination of the Loadless Start and Constant Speed Unloading functions. An additional timer is used to monitor the constant speed operation. If the compressor runs 'Unloaded' for an extended time, the motor is stopped. When the signal causing the 'Unload' operation resets, the compressor is restarted (via Loadless Start) and Constant Speed operation resumes. This allows the compressor to automatically supply gas when required, but to stop when there is no demand.

Application Notes

Discharge pressure gas may be used to actuate the unloaders by connecting the Unloader Pressure Supply line to the compressor discharge line downstream of any backcheck valves. The discharge pressure must be at least 30 - 35 psi (2.1 - 2.5 kg/cm²) greater than suction pressure for the unloaders to work properly. The Unloader Pressure Vent line is connected to the compressor suction line. This system vents no gas to the atmosphere.

If desired, an external gas source such as Nitrogen, Carbon Dioxide, or Dry Air may be used so long as the supply pressure is at least 30 - 35 psi (2.1 - 2.5 kg/cm²) greater than suction pressure. The Unloader Pressure Vent line may be routed to a safe area and vented to atmosphere or into the compressor suction line. Only the small amount of gas in the tubing between the 3-way solenoid valve and unloaders is vented each 'Load/Unload' cycle.

The suction line of a compressor fitted with suction valve unloaders must be adequately sized and free of any restrictions. Pressure regulators, back check valves or other control valves in the suction line are all potential problem sources. In general, if such devices are used on units with unloaders, they should be oversized by at least a factor of two. Additionally, a volume bottle should be placed between the device and the compressor inlet.