

Gas Withdrawal Rates for Liquified Gases

Cylinder Withdrawal Rates

Cylinder withdrawal rates are specified with regard to safety codes and limitations due to certain physical properties of the gases. Recommended cylinder withdrawal rates vary with cylinder size and accordingly affect the manifold design and capacity. Maximum recommended withdrawal rates are listed below. Loss of cylinder pressure will result when withdrawal rates are exceeded.

Maximum Withdrawal Rates @ 70°F

Acetylene (300 cu ft/cylinder)	43 scfh
Propane (100 pounds per cylinder)	100 scfh
APACHI Gas (100 pounds/cylinder)	130 scfh
MAPP Gas (70 pounds/cylinder)	100 scfh
Carbon Dioxide (50 pounds/cylinder)	25 scfh
Nitrous Oxide (60 pounds/cylinder)	33 scfh
Propylene (100 pounds/cylinder)	180 scfh

- Ammonia
 - 150 lb (AA) NH₃ cylinder – Max sustainable flowrate = 1.3 lbs/hr
- HCL
 - 65 lbs (A) HCl cylinder – Max sustainable flowrate = 2.3 lbs/hr
 - 60 lbs (B) HCl cylinder – Max sustainable flowrate = 2.2 lbs/hr
 - 600 lbs (Y) HCl cylinder – Max sustainable flowrate = 12 lbs/hr

Acetylene

Acetylene is stored in cylinders containing acetone at a cylinder pressure of 250 psig at 70°F. High flowrates withdraw acetone along with the acetylene gas, resulting in decreased flame temperature and higher consumption.

AA Acetylene

When the head pressure in the acetylene cylinder drops to 70 psi, acetone will enter the gas stream. The cylinder must be changed out or an Atomic Absorption Filter (see AA Filter specifications) must be used to prevent damage to the detector.

Propane

Propane is a liquefied petroleum gas and is maintained in the cylinder in both liquid and gaseous states. The cylinder pressure varies directly with ambient temperature. The cylinder pressure at 70°F is approximately 109 psig. Each pound of propane is equal to 8.67 cubic feet of gaseous propane. The most common propane cylinder size used in

industry contains 100 pounds of propane; therefore, a standard cylinder contains 867 cubic feet of gaseous propane. The ability of a liquid to flash into a gas is determined by the heat transfer through the cylinder wall. The limitation of heat transfer necessitates a gaseous withdrawal limit for a propane cylinder. Good operating practice dictates withdrawal for a 100-pound cylinder to be approximately 100 cubic feet per hour. If the withdrawal rate is excessive, the propane cylinder will lose pressure.

Carbon Dioxide

A standard cylinder contains 50 pounds of liquid carbon dioxide. Each pound is equal to 8.7 cubic feet of gaseous carbon dioxide. At 70°F the cylinder pressure is approximately 837 psig. Because of its physical properties, chilled carbon dioxide expanded across cylinder valve and regulator orifices can cause dry ice formation within these devices which can cause malfunction. Carbon dioxide heaters may be required for high-volume applications to preheat gas entering the regulators. Heaters are listed in the Manifold Accessories section.

Nitrous Oxide

A standard cylinder of nitrous oxide contains 60 pounds of liquid. At 70°F the cylinder pressure is approximately 745 psig. Nitrous oxide produces low temperatures when expanded across cylinder valve and regulator orifices. Heaters may be required for high volume applications. Never heat cylinders with a torch. Nitrous oxide can decompose and explode at temperatures above 1200°F. Heaters are listed in the Manifold Accessories section.

Dewar's (Liquefied Gas Cylinders) Nitrogen

Under ideal conditions (72°F, 50% relative humidity), the maximum attainable delivery rates are:

one cylinder	325 scfh
two cylinders	400 scfh
three cylinders	600 scfh

CO₂ Dewar Withdrawal Rate Limitation

Continuous delivery rates greater than 110 scfh may require an external vaporizer due to a manifold temperature below -20°F.

A cylinder of CO₂ will only produce 25 scfh sustained flow at ambient temperature. A dewar of CO₂ will produce a maximum of 110 scfh.