

Connecting Gas Cylinders

Gas chromatography requires the use of a carrier gas to carry a sample from the injection port to the column and onto the detector. Depending on the type of detector, other gases may be required. The FID detector for instance, requires hydrogen and air to support the flame. This document will discuss how carrier and detector gases are connected to the gas chromatograph and how to properly manage gas cylinders.

Gas cylinders should **always** be safely and properly secured to the wall through the use of straps, chains or other securing devices. Cylinder straps are available from the company which supplies the gas cylinders.

Carrier/detector gases can be either flammable or non-flammable. Hydrogen and argon/methane are commonly used flammable gases while helium, argon, and nitrogen are common non-flammable gases.

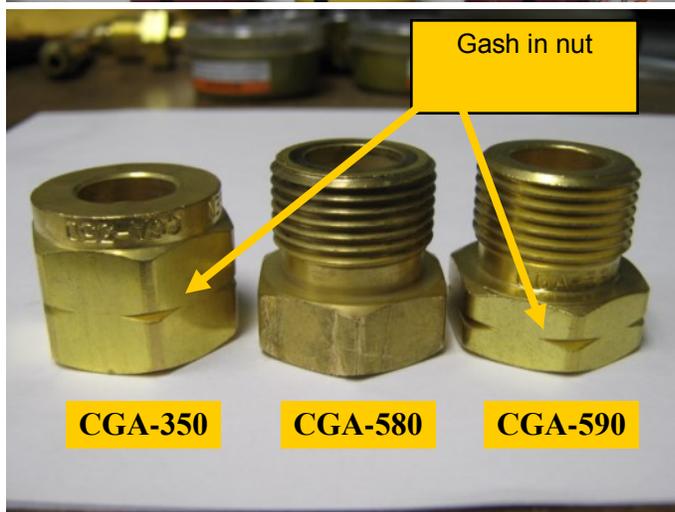
Different nuts are used to connect the gas cylinder regulator to the different gases. CGA stands for Compressed Gas Association.

- 1) CGA-350 is used for hydrogen and argon/methane.
- 2) CGA-580 is for helium, nitrogen or argon.
- 3) CGA-590 is for air.

Notice that the CGA 350 and 590 nuts have a gash in the nuts. This indicates that the nuts tighten up in the reverse direction from normal (counter-clockwise instead of clockwise).



Typical gas cylinder

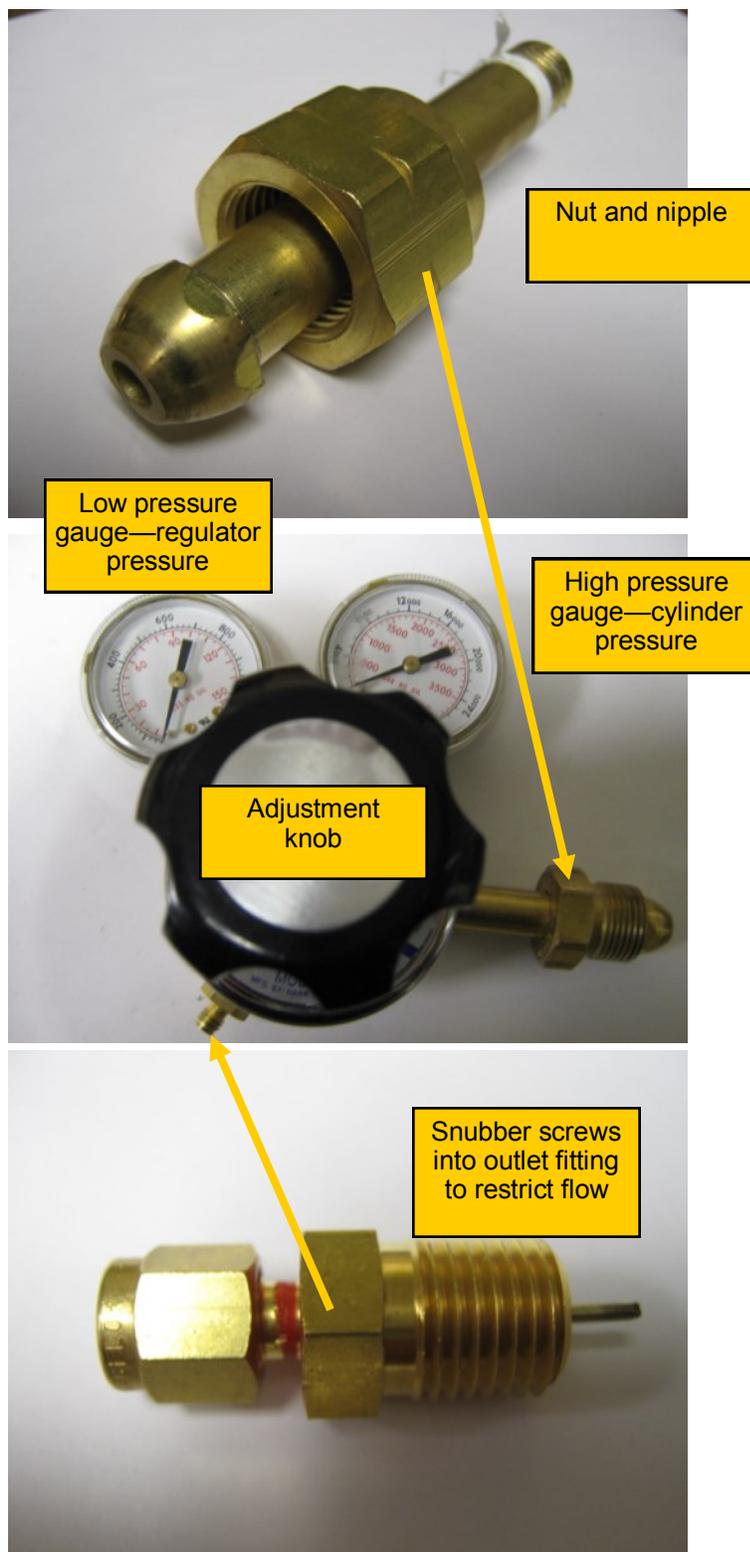


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The nuts fit onto the “nipple” of the regulator in order to provide a gas-tight seal between the tank of carrier gas and the regulator. The seal is made by the round bulb-like projection which fits into a corresponding recess in the top of the gas cylinder. The threaded end of the nipple screws into the regulator body. The nut and nipple must match (have the same CGA number).

The cylinder regulator has two pressure gauges. The right hand gauge shows the pressure remaining in the cylinder. This can be as high as 2500psi when the cylinder is full. The cylinder should be re-filled when the pressure falls to 200 psi. Don't let the cylinder become totally empty since this will let ambient air contaminate the inside surfaces. The left hand gauge shows the reduced pressure supplied to the outlet of the regulator. This is typically a pressure of 15-90 psi. The knob adjusts the pressure. Set the cylinder output pressure 10-20 psi higher than the pressure set on the GC. So if the carrier gas pressure is set to 20 psi using the built-in pressure regulator inside the GC, set the cylinder output pressure to 35-40 psi.

Regulators used for flammable gases such as hydrogen or argon/methane should be equipped with a “snubber” for safety reasons. The snubber restricts the flow so that in the event of a total leak (tubing breaks) the amount of gas released is reduced. The snubber fitting has a very small hole for the gas to pass through (.1mm). Since the GC only uses small amounts of flammable gas (20-50 ml/minute), there is no need for a large flow rate.



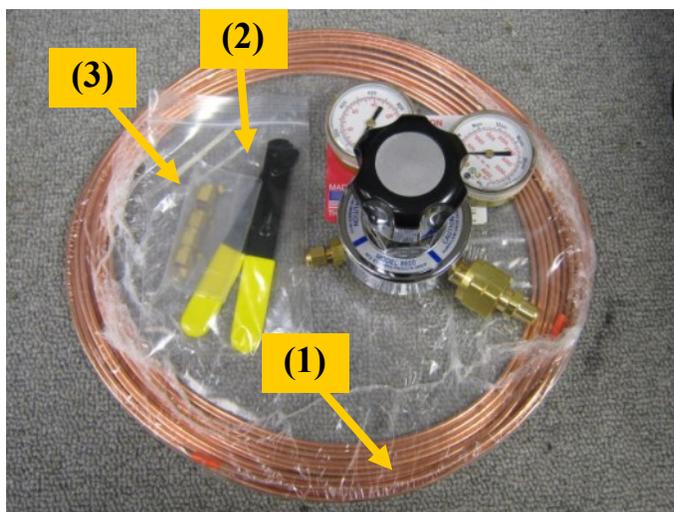
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To tighten the gas regulator onto the cylinder first ensure that the CGA fitting is the proper one for the given cylinder of carrier gas. This number is usually stamped on the metal valve at the top of the cylinder and also on the nut and nipple. Flammable gases tighten up in the reverse direction.

Once the regulator is secured tightly, use the palm of the hand to firmly tap the wrench to secure an even tighter seal. When a dull metal thud sound is heard, similar to a muffled bell, then the regulator is attached properly.

A gas line installation kit is available from SRI and provides everything required to connect the cylinder to the gas chromatograph. A snubber is included in kits for flammable gases.

The gas line installation kit comes with the regular and includes 1) 50 feet of 1/8" copper tubing, 2) tubing cutters, and, 3) 1/8" brass nuts and ferrules.



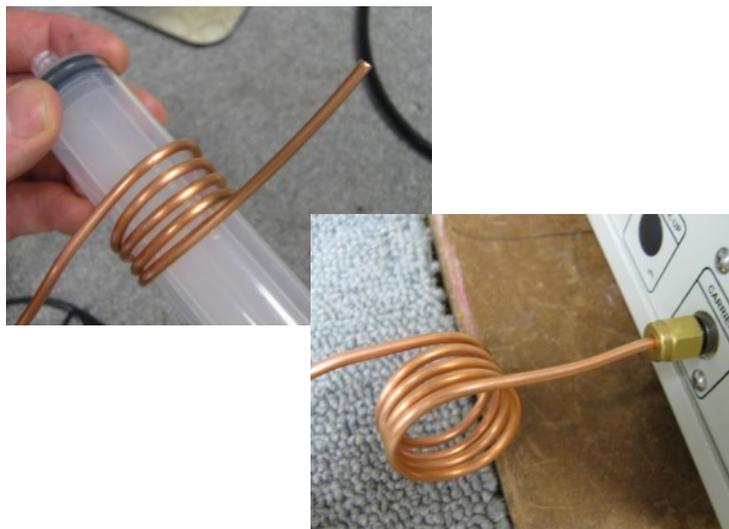
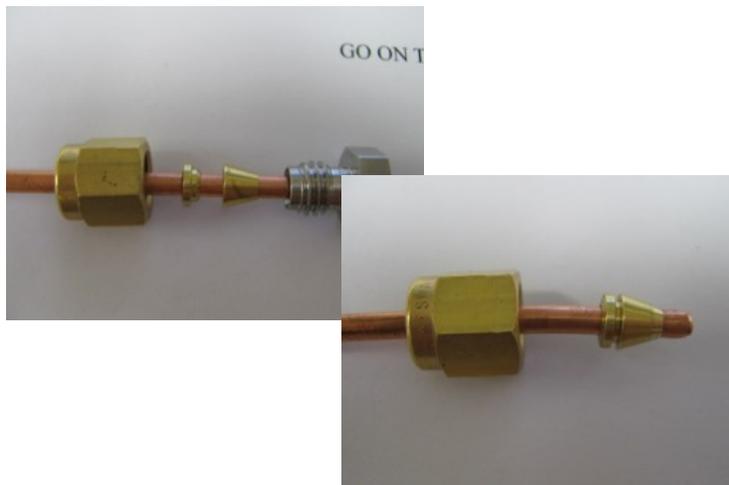
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Cut the copper tubing to the desired length using the tubing cutters and secure the nuts and ferrules to both ends of the tubing (see our *Cutting Tubing* and *Using Ferrules* documents for more information). Stainless steel 1/8" tubing can also be used, but it is harder to cut and more expensive than copper tubing.

Connect one end of the copper tubing to the regulator outlet fitting (snubber) and the other end to the inlet fitting on the gas chromatograph.

It's a good idea to momentarily flush the tubing with gas before connecting to the GC to blow out any dust or liquids in the tubing.

It is recommended that the copper tubing be coiled right before it connects to the gas EPC. The end of the copper tubing can be coiled over any cylinder-like object (in the picture to the right, a gas syringe is used) with 4-6 coils being sufficient. The coiling acts as a stress relief and can prevent damage to the tubing and EPC if the line is pulled on or otherwise stressed.



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Turn on the flow of gas by turning the valve on the top of the gas cylinder counterclockwise in the direction of the arrows labeled "Open". To turn off the flow of gas turn the valve the other way, in the direction of the arrows indicating "Close".

It is very important that there are no leaks between the gas cylinder and the EPC connection on the GC. Not only do leaks waste precious gas, but they can also lead to safety hazards including fires and explosions.

To check for leaks, turn off the GC and pressurize the gas cylinder by briefly opening up the valve. Close the valve again and note the reading on the tank pressure gauge. Come back in a few hours or the following day and look at the gauge again. The reading should be the same. If the reading is not the same there may be a leak. Tighten all the connections and check the tubing in order to seal up the system.

