

## Reducing or Replacing Helium Carrier Gas Usage in Model 500 Gas Chromatographs

The majority of online gas chromatographs with Thermal Conductivity Detectors (TCD) use Helium as a carrier gas. Recently, many suppliers of chromatograph grade helium have been experiencing supply shortages, in turn leading to increasing prices. Many users are looking for alternatives to decrease or eliminate the usage of helium.

Helium is used with TCD applications because it has a very high thermal conductivity compared to many of the components being detected (refer Figure 1) and therefore provides a large detector response to the measured components. Other inert gases (such as Argon) are not generally suitable as they have a thermal conductivity close to the measured components and will not provide the required amount of resolution for most applications.

Hydrogen can be used as an alternative carrier gas to helium as it has a similar thermal conductivity and therefore will provide a similar detector response. However, hydrogen is a flammable gas and therefore raises hazardous area approval issues.

The carrier gas is also commonly used as the actuation gas for the pneumatic analytical valves in the Model 500 as many installation locations lack a reliable source of high pressure air. This provides the largest potential for reducing helium usage by converting this actuation gas supply to nitrogen or instrument air.

There are two steps to reducing helium usage in installed Rosemount Analytical Model 500 gas chromatographs:

1. Convert the actuation gas to nitrogen or air.
2. Convert the actuation gas to nitrogen or air and the carrier gas to hydrogen.

### Converting the Actuation Gas

The analysis valves in the chromatograph oven typically use the carrier gas to actuate the pneumatic analytical valves. These valves switch the flow path to direct the analyzed sample and the carrier gas through columns and across the detector depending on the application. Converting the actuation gas to nitrogen or air will reduce the use of helium to less than 20 cc/min for a four-minute C6+ application. The alternative actuation gas should be at 115 PSI (800 kPa), be dry and free of particulates greater than two microns.

The actuation gas conversion kit: P/N 2-3-0500-185 – \$ 810.00

- Pneumatic shut-off valve
- Bracket for installing the shut-off valve
- Two-micron inline filter
- Pre-bent stainless tube
- Various Swagelok® fittings

Components that are not included in the conversion kit but may be required include:

- Actuation gas bottle regulator(s)
- Stainless tubing for connection to the gas supply

Figure 1 – Existing Flow Path with Helium as the Actuation Gas.

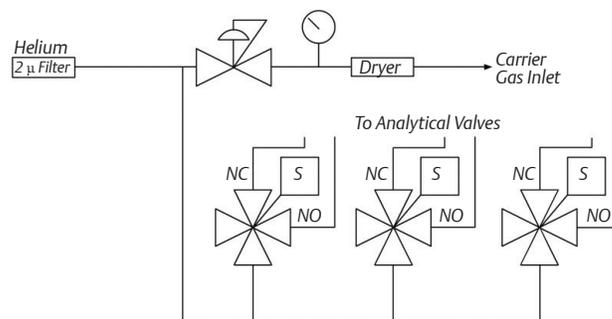


Figure 1 shows the flow path with helium as the carrier gas and the actuation gas.

**Figure 2 – Flow Path with Nitrogen or Air Actuation Gas and the Pneumatic Shut-off Valve Installed.**

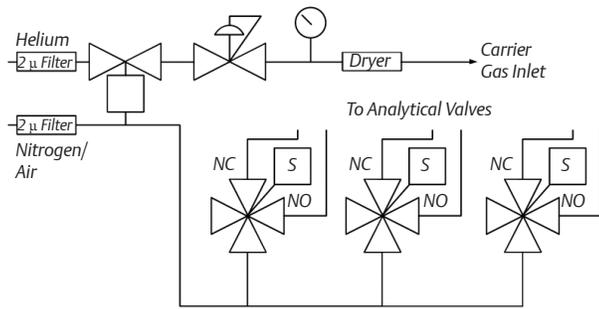
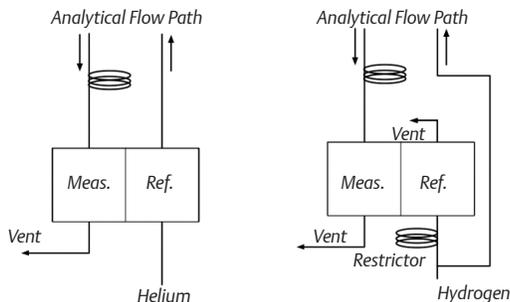


Figure 2 shows the flow path with the alternative actuation gas kit installed. The pneumatic shut-off valve will shut-off the flow of carrier gas in the event of the loss of actuation gas pressure. Without this shut-off, if the actuation gas pressure falls none of the pistons in the analyzer valves will seal. This will create multiple paths for the helium to escape to vent and dramatically increase the use of helium use, possibly emptying the helium supply.

### Converting to Hydrogen Carrier Gas

To convert to hydrogen as a carrier gas the analytical flow path will also need to be altered. Most helium carrier applications have the high-pressure helium supply pass over the reference detector (Figure 3). If high pressure hydrogen is passed over the detector, the thermistors will degrade rapidly.

**Figure 3 – Typical Detector Flow Path (left) and the Hydrogen Carrier Flow Path (right) Across the Detector.**



To avoid the rapid degradation of the detector, the hydrogen carrier is routed to the reference detector through a restrictor and the hydrogen supply to the analytical flow path is routed around the detector. The restrictor is matched to the restriction of flow of the analytical flow path to ensure the flow across the reference detector is similar to measure detector.

Additionally, the existing detectors should be replaced with thermistors designed for hydrogen use. For gas chromatographs installed inside an analyzer house, the hydrocarbon Lower Explosion Limit (LEL) room monitors may need to be replaced with monitors that detect hydrogen and hydrocarbons.



Rosemount Analytical’s factory trained engineers will arrive at your site with the needed kits to convert your carrier gas to hydrogen, install the kits and make all required modifications to your Model 500 gas chromatograph. Your analyzer will be calibrated, operation will be verified, all records updated and your Model 500 will be returned to operation once the conversion is complete.

### Rosemount Analytical Field Services Pricing to Retrofit Model 500 Gas Chromatographs in the Field.

#### Onsite labor pricing for each Model 500 Gas Chromatograph:

Model 500 Single regulator and detector: \$ 3000.00

#### Retrofit Kit Pricing:

Model 500 Single regulator and detector:

Can be used on REMOTE MOUNTED 2350 ONLY

The explosion proof 2350 must have a Z purge to meet group B division 2, or an X purge for division 1.

P/N 2-3-0500-186: \$ 2840.00

#### Travel time and expenses for onsite retrofit:

(Flat rate from Houston)

< 100 Miles	\$ 250.00
100–300 Miles	\$ 1000.00
> 300 Miles	\$ 2000.00

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