# ta3000R METHOD U-010

## Determination of Trace Levels of $H_2$ and CO in Ultra High Purity Ar, $N_2$, HE, $O_2$ and Air

### Introduction

The Trace Analytical™ ta3000R Reduction Gas Analyzer, from AMETEK Process Instruments, is ideally suited for the determination of ppb to ppm levels of $H_2$ and CO in Ultra High Purity (UHP) bulk gases. Getters and catalytic purifiers are used to create UHP gases. When a purifier starts to fail, there is early break through of CO. In this application, the Reduction Gas Detector (RGD) is used to provide rapid and reproducible measurements. Several unique qualities of the RGD enable the quantitation of $H_2$ and CO to extremely low concentrations.

The application is designed to overcome interferences from the bulk gases being analyzed. This is done through proper column selection and the right choice of carrier gas. Since the bulk gases are of UHP quality there are no other significant components interfering with the quantitation of $H_2$ and CO, and no back flush is required.

### The Trace Analytical Method

The plumbing diagram for method U-010 is shown in Figure 1. Carrier gas used in this application depends upon the type of bulk gas analyzed as explained below.

A 6-port valve is used to inject sample from the sample loop to the analytical column. Lighter compounds such as $H_2$ and CO separate and elute from the analytical column into the detector for quantitation. There is no interference from the bulk gases Ar, $N_2$, $O_2$, and Air in the quantitation of $H_2$ and CO on the RGD as long as the carrier gas is $N_2$ or air. This is illustrated in Chromatogram 1 where $H_2$ is eluting on a flat baseline.

When analyzing He bulk gas, it is important to use He for the carrier gas. If Air or $N_2$ is used for the carrier gas, the He in the sample will result in a large upset-peak that will interfere with the quantitation of $H_2$ This is demonstrated in Chromatogram 2. Note, however, that CO is not affected and can be properly determined regardless of the carrier gas used. With He as the carrier gas, there is no upset-peak and reproducible results for both $H_2$ and CO are achieved.

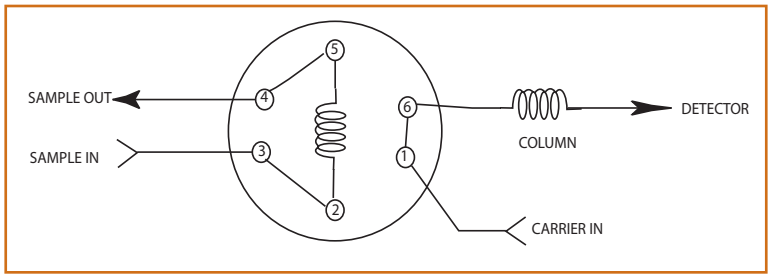
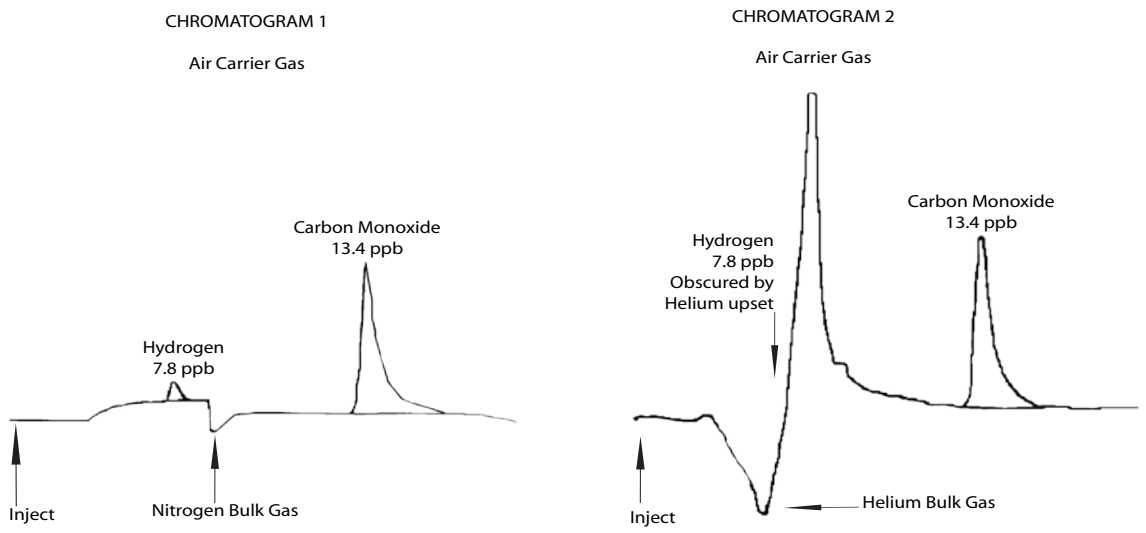



*Figure 1. Flow diagram for method U-010.*

# Determination of Trace Levels of $H_2$ and CO in Ultra High Purity Ar, $N_2$, HE, $O_2$ and Air






Chromatograms 1 and 2 show the separation of a nitrogen bulk gas sample and a helium bulk gas sample respectively. Both samples contain 7.8 ppb of $H_2$ and 13.4 ppb of CO. Total analysis time for both chromatograms is about 4 minutes.

Method U-010 is one of several application packages developed for Trace Analytical analyzers. Our applications group is always ready to consult with you about your specific analytical requirements. Please contact AMETEK Process Instruments or your local AMETEK representative for information on our line of Trace Analytical gas purity monitors.

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REGISTERED ISO 9001 MANAGEMENT SYSTEM

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