

**DETERMINATION OF TRACE LEVELS OF H₂ AND CO IN
ULTRA-HIGH-PURITY AR, N₂, HE, O₂ AND AIR**

ta3000R Method U-010

The AMETEK ta3000R reduction gas analyzer is ideally suited for the determination of parts-per-billion (ppb) to parts-per-million (ppm) levels of hydrogen (H₂) 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 breakthrough of CO. In this application, a reduction gas detector (RGD) is used to provide rapid and reproducible measurements.

Several unique qualities of the RGD enable the quantitation of H₂ 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 H₂ and CO, and no back flush is required.

METHOD U-010

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.

A 6-port valve is used to inject sample from the sample loop to the analytical column. Lighter compounds such as H₂ and

CO separate and elute from the analytical column into the detector for quantitation. There is no interference from the bulk gases – Ar, N₂, O₂, and air – in the quantitation of H₂ and CO on the RGD, as long as the carrier gas is N₂ or air.

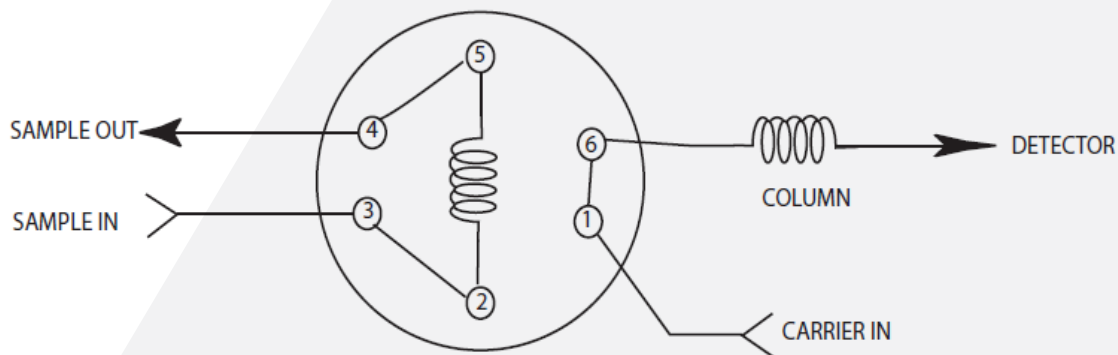


Figure 1. Flow diagram for method U-010

This is illustrated in Chromatogram 1 where H₂ is eluting on a flat baseline.

When analyzing helium (He) bulk gas, it is important to use He for the carrier gas. If air or N₂ 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 H₂. 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 H₂ and CO are achieved.

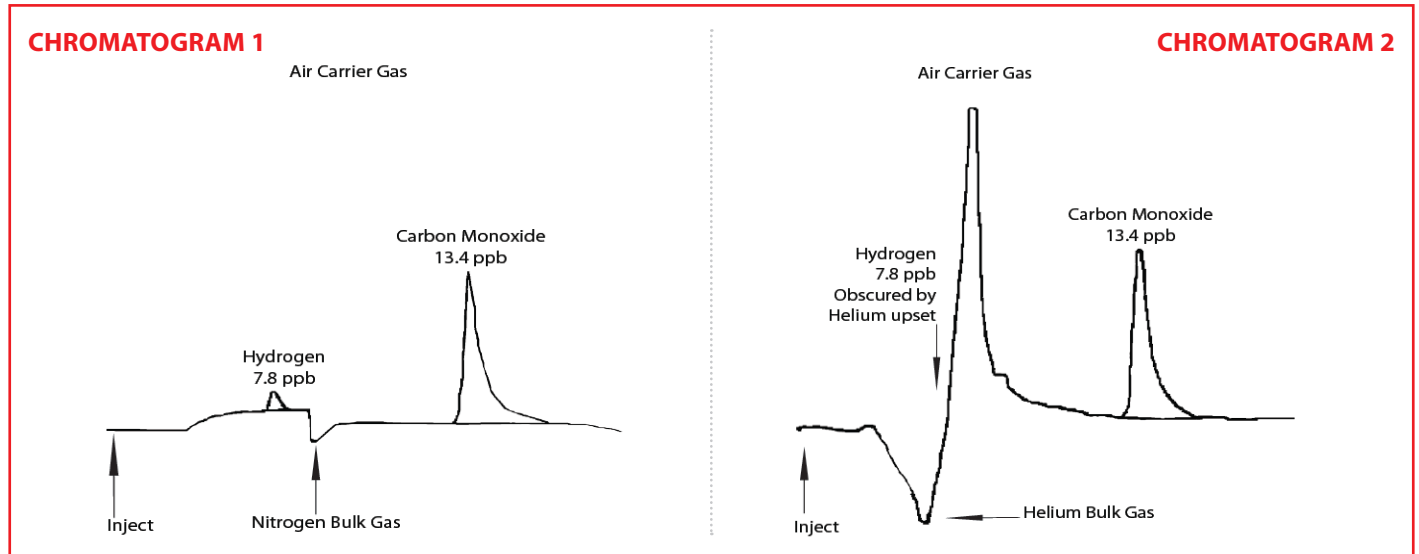


Figure 2. Chromatograms 1 and 2 show the separation of nitrogen bulk gas sample and a helium bulk gas sample respectively. Both samples contain 7.8 ppb of H₂ and 13.4 ppb of CO. Total analysis time for both chromatograms is about 4 minutes

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