

ta3000R Method A-003

Determination of Trace Levels of Ethylene in Air

Introduction

The Trace Analytical™ ta3000R Gas Analyzer, from AMETEK Process Instruments, is ideally suited for determination of ppb to ppm levels of ethylene (C₂H₄) in ambient air. In this analysis, the Reduction Gas Detector (RGD) is used to provide rapid and reproducible measurements. Several unique qualities of the RGD enable the quantitation of ethylene down to extremely low concentrations.

Ethylene, sometimes referred to as ethene, plays numerous roles in the life cycle of plant life. At concentrations as low as a few parts per billion (ppb) fruit depend on it for ripening, flowers use it to bloom, while trees rely on ethylene to turn the leaves brown in the autumn (senescence

process). Thus, in order to preserve the ecological balance, environmental agencies require continuous monitoring to detect ethylene leakage at the property fence line of chemical facilities where large quantities of ethylene are produced or stored.

In order to maintain protect local vegetation, it is imperative to determine if a release has occurred at the earliest possible moment so that a facility operator can be notified and corrective action taken. The ta3000R/A-003 routinely detects ethylene in air at levels down to 3 ppb or lower, without needed complicated trap/release or cryo-focusing routines. This feature enables rapid cycle times and reliable, long-term operation.

The Trace Analytical Method

A 10-port valve (V1) injects sample from the sample loop to the pre-column (see Figure 1). We selected a column for this application package that elutes ethylene prior to heavier organic compounds. This allows isolation of the ethylene peak while preventing potential interfering contaminants, which cause unnecessary baseline upsets and excessive run times, from reaching the detector.

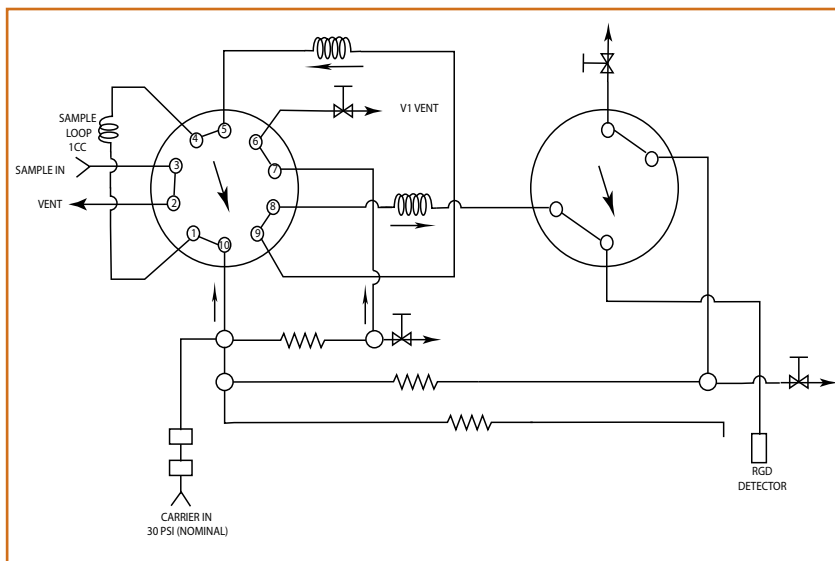


Figure 1. Flow diagram for method A-003.

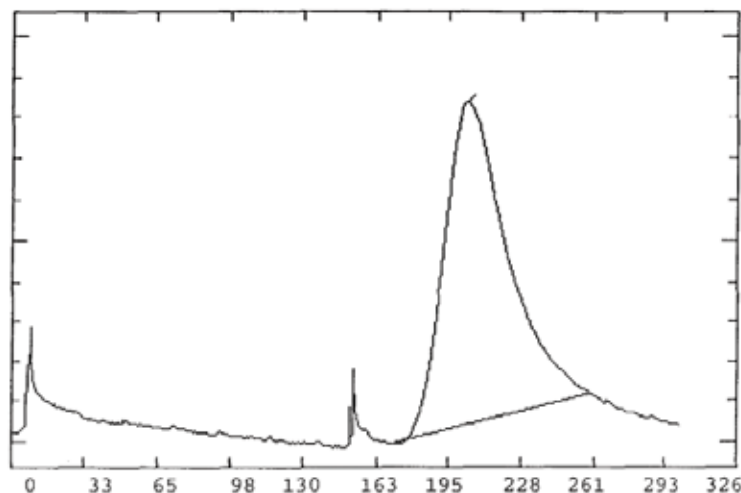
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After the light compounds have sufficient time to elute from the pre-column, the 1a-port valve returns to the load position. In addition to preparing the analyzer for the next sample injection, the valve in this position is used to back flush moisture and higher molecular weight components from the pre-column through the vent port of valve V1.

The analytical column separates ethylene from light elements

such as H₂ and CO. A 4-port valve (V2) situated downstream of the analytical column can be used to divert the air peak to vent, especially when CO is high, preventing potential overlap with the ethylene peak. Air carrier gas is preferred because it gives a minimum of upset in the baseline from the injection, it is inexpensive and it is readily available.

Method A-003 is one of several application packages developed by Trace Analytical. 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 Trace Analytical gas purity analyzers.



DATA	START-	16:09:29	RUN	3	
Name:	PPB:	Rt:	Area:	Rfact:	Det:
C2H4	30.8	204	349355	11336	A00

Figure 2. ta3000R C₂H₄ in Air.

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