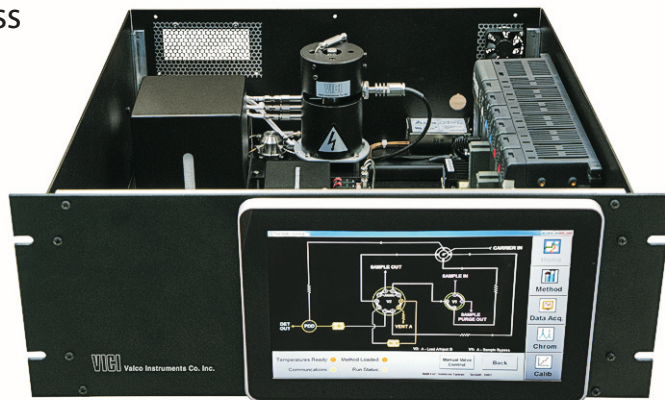


Trace Gas Analyzer Systems

- Turnkey analyzer for lab, mobile, or process
- MDQs for most analytes < 1 ppb
- Cost-effective stand-alone operation
- Fast temperature programming ovens with ramp rate up to 3000°C/minute
- Highly accessible data
- Flexible modular design



Turnkey Analyzer

VICI Trace Gas Analyzer Systems (TGAS) are fully configured and tested gas chromatographs designed for use in high purity and ultra high purity analysis. Each instrument is fully configured and tested per user requirements. A full documentation package delivered with each instrument includes a method validation report, capability data, bill of materials, and method parameters.

Market applications include:

- **Semiconductor/UHP/ASU** (H₂, CO, CH₄, CO₂, N₂O, Ar, N₂, THC, Kr, Xe, Ne, O₂, H₂O, etc.)
- **Petrochemical/natural gas** (C1-C5 [speciated], C6+, BTEX, CO, CO₂, etc.)
- **University/research** (H₂, CO, CO₂, CH₄, N₂, O₂, N₂O, etc.)

The TGAS can be set up to run automatically, or user-configured for single run analysis. This makes the TGAS an ideal option for benchtop applications in the lab or for continuous duty in a process. With the optional sampling system, the instrument can do batch or individual analysis from a fill manifold or trailer fill stanchion.

MDQs for Most Analytes < 1 ppb

Currently our conservative guarantee for method detection with a reasonable RSD is 10 ppb for atmospheric components, day-in and day-out. But some of customers find that once the analyzer is installed and running continuously in ultra high purity applications, TGAs are able to routinely integrate and quantify at levels of less than 1 ppb.

Stand-Alone Operation

The VICI TGAS is a complete stand-alone solution for autonomous chromatographic analysis, from sample prep to final report. Everything is included in the TGAS housing, from the computer with all the necessary software and hardware to the touch-enabled wide screen display. A wireless mouse and keyboard are optional.

The TGAS can be configured to select the sample and associated method, introduce the sample, run the analysis, store the data, integrate the chromatogram, and calculate the results — perfect for remote, continuous, process applications.

Fast Temperature Programming Ovens

With FTP technology (Fast Temperature Programming) the programmable rate oven becomes much smaller and more efficient in both size and use of power. The FTP technology can also be applied to injectors, transfer lines, valves, methanizers, traps, concentrators, and other zones that may require high rate programmable temperature control.

Up to 4 zones of Fast Temperature Program control can be applied in one TGA. Columns can be micropacked, metal open tubular, or capillary fused silica. Ramp rates up to 3000°C/min allow for increased sample throughput and/or more effective clear down of heavy components, drastically reducing overall sample run times.

Highly Accessible Data

Results data can be printed via a network printer or to a local user-provided printer. The same results can be output to an analog signal for DCS and other control schemes, or to the OPC server for database or spreadsheet updates. Functionality for copper-based LAN connection and secured WIFI make the instrument available and data accessible.

Data can be accessed in a variety of ways, such as Analog 4-20 mA loop, OPC, Profibus, Modbus, or other network communication protocols. Options can be configured at the factory or by the end user to handle a wide range of data access requirements where full remote control and operation is required.

Modular Design

The design of the TGAS allows a very wide range of applications to be run on a single instrument. A detector module can be configured with application-specific detectors.

The standard modules are:

- **Detectors:** PHID, PDPID, PDECD, FID, MicroTCD, and RGD
- **Oven/Temperature Zones:** Support for 12 programmable thermal zones and up to four Fast Temperature Programmed (FTP) zones. FTP zones can be micropacked columns, metal open tubular columns, capillary columns, programmable rate injectors, vaporizers, retention gap, or absorbers/concentrators.
- **Valve Controls:** Support for up to 16 two position, four multiposition, and 32 diaphragm valves.

In addition to the wide dynamic range and low level sensitivity, the TGAS can be configured for redundancy so that there is always a hot backup for any two channel method. Or, two channels can be configured for one or more gas method(s), with the other two channels available for an entirely different method or gas type. There are lots of possibilities with the modular design.

Additional specifications	TGAS-4U	TGAS-7U
Dimensions*	17"W x 17"L x 7"H	17"W x 22"L x 12.25"H
Weight	30 lbs	45 lbs
Max. number of detectors	2	4
Carrier gas	Purified helium Detector and sample gas dependent	
Carrier gas flow rate	~100 ml/min per detector, regulated @ 80 psig	
Actuator gas	Helium or instrument air regulated @ 60 psig	
Electrical requirement	100-120 VAC or 220-240 VAC, 50/60 Hz	

* Both models are rack mount compatible

North America, South America, and Australia/Oceania call:

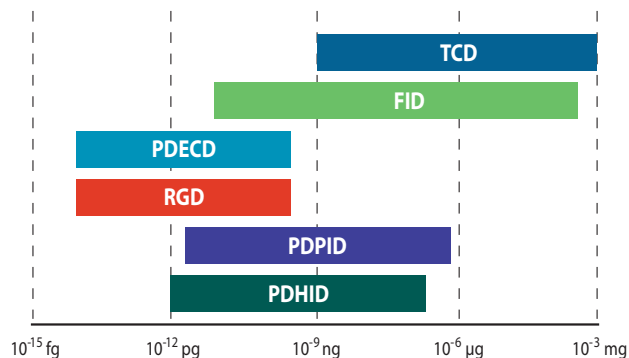
VICI Valco Instruments Co. Inc.
tel: 800 367-8424
fax: 713 688-8106
valco@vici.com

Unparalleled VICI Expertise

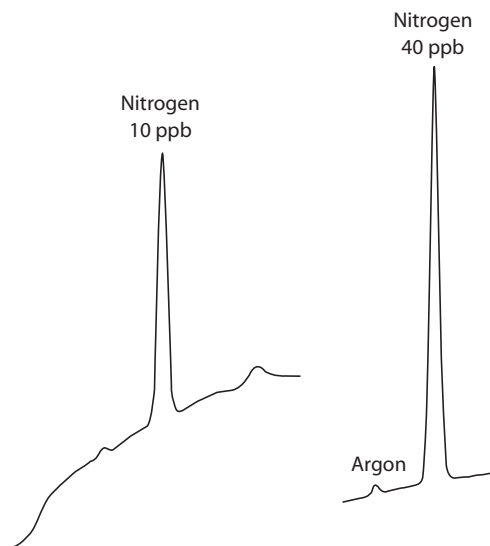
While the TGAS embodies the latest improvements in the VICI Trace Gas Analyzer product line, we have been a standard for analysis in the pure gas industry for more than 35 years. We continue to be the primary manufacturer of every major component in our systems, from valves and detectors to electrometers and Fast Temperature Programmers. We know that specifications and requirements in high purity gas supply are getting tougher, and are continuously working to improve the core products which have kept the TGA in demand over the decades.

For more information, please provide a detailed list of the requirements for your application. We will work diligently to prepare a quote in a timely fashion.

Linear dynamic range of TGA detector options



Nitrogen in oxygen



Europe, Asia, and Africa call:

VICI VICI AG International
tel: Int + 41 41 925-6200
fax: Int + 41 41 925-6201
info@vici.ch

Rev 2/17

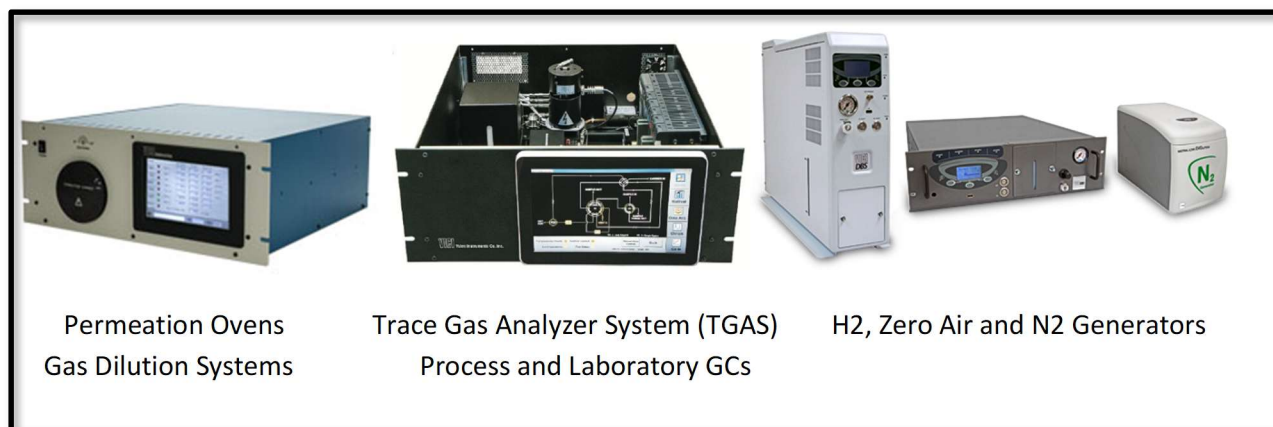
VICI® is a registered trademark of Valco Instruments Co. Instruments and VICI AG



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Tools for science and medicine

TECHNCIAL NOTE 6010 – Enhanced TGAS UHP APPLICATION H₂, CO, CH₄, CO₂, Ar, N₂



Permeation Ovens
Gas Dilution Systems

Trace Gas Analyzer System (TGAS)
Process and Laboratory GCs

H₂, Zero Air and N₂ Generators

UHP BULK He, H₂, Ar, N₂, O₂, CO₂ GAS APPLICATIONS

Valco Instruments is one of the leading global suppliers of GC parts, accessories and integrated TGA systems. Our vast knowledge of detector modules and the interconnecting components allow us to customize or standardize our TGAS platform to meet your most critical process or laboratory applications.

The semiconductor and display industries demand ultra high purity (UHP) gases to help produce consistent, quality product and the highest yield rate possible on ever shrinking geometries. Valco supplies the TGAS to verify only UHP gas is being used in the process.

The “best” configuration to meet your analytical needs depends on your bulk gas sample, detection limit requirements and impurities of interest. Valco offers a suite of detectors which can be used individually or combined in one system to optimize your configuration, minimize operating cost and simplify operation.

Detector options include, but are not limited to:

- Pulsed Discharge Detectors (PDD): known as a universal detector, it can be used to measure all impurities, but can require more valving/column features depending on bulk gas type.
- Flame Ionization Detector (FID): known as a selective “carbon” counter, it can be used to measure THC (as CH₄+nmhc) and CO, CO₂ (with methanization) depending on bulk gas type.
- Reduction Gas Detector (RGD): known as a selective reducing gas detector, it can be used to measure H₂, CO and unsaturated hydrocarbons depending on bulk gas type.



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	PH2 sample	PHe sample	PAr sample	PN2 sample	PO2 sample	PCO2 sample
* H2	n/a	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ
* CO	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ
* CH4	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ
* CO2	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ
** NMHC	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ
* Ar	< .5 ppb MDQ	< .5 ppb MDQ	n/a	< .5 ppb MDQ	< .5 ppb MDQ	< .5 ppb MDQ
* N2	< .3 ppb MDQ	< .3 ppb MDQ	< .3 ppb MDQ	n/a	< .3 ppb MDQ	< .3 ppb MDQ

* Optimized system, not standard. Based on intrinsic error and detector dependent. Repeatability +/- 2% FS

** As ethane

Utility details (depending on detectors installed):

- Purified N2 carrier supply: 60-60 psig (~100 ml/min)
- Purified He carrier supply: 60-80 psig (~ 100 ml/min)
- FID Air (medical or breathing air quality) supply: 10 – 40 psig ~ 300 ml/min
- FID H2 (99.999%) supply: 10 – 40 psig ~ 50 ml/min
- Deoxo H2 (99.999%) supply: 60-80 psig ~ 100 ml/min
- Inert gas acutator supply: 60-80 psig
- 110 or 220 VAC 50/60 Hz (~ 500W)
- Operating range: 15C – 40C
- TGA6K-4U dimension: 17"W x 22"L x 7"H
- TGA6K-4U weight: 35 lbs

Recommended service schedule (assumes continuous use):

- UV lamp: 1 per year
- Injection valve(s): 2 years
- HgO bed: 1 per 2 years

Global Service Centers:

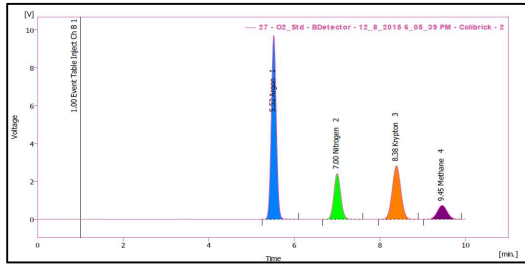
- USA: Texas, California
- Europe/Middle East: Switzerland
- Asia: Shanghai, China



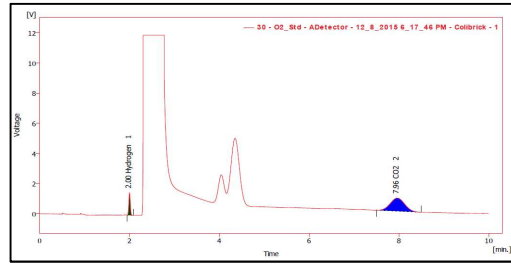
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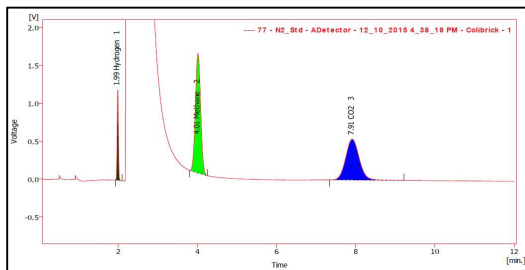
Examples of our GC-PD/HID chromatograms and linearity in bulk gas results are shown below:



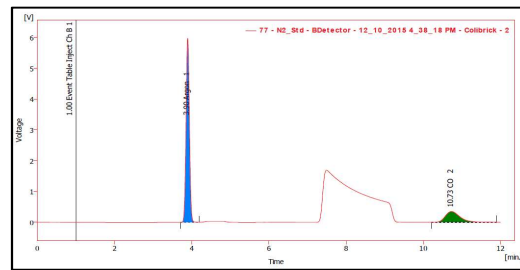
O2 standard channel B: Ar, N2, Kr, CH4 impurities



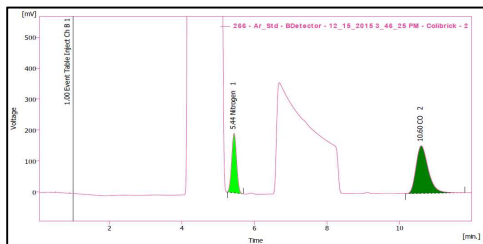
O2 standard channel A: H2, CO2 impurities



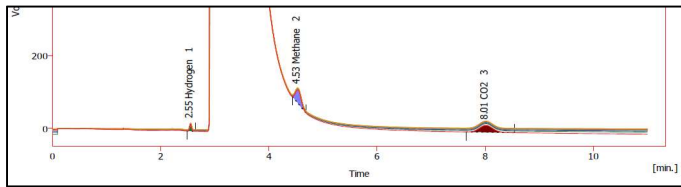
N2 standard channel A: H2, CH4, CO2 impurities



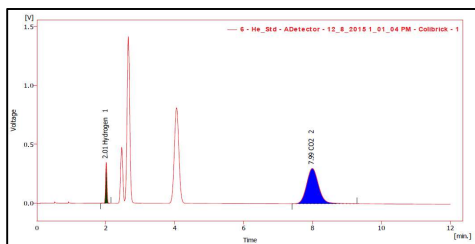
N2 standard channel B: Ar, CO impurities



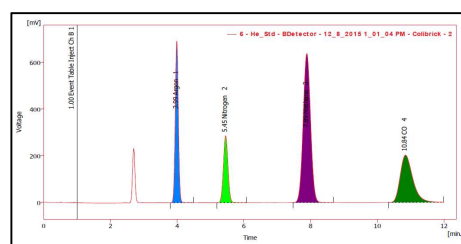
Ar standard channel B: N2, CO impurities



~ 10 ppb blend H2, CH4, CO2 in Ar channel B



He standard channel A: H2, CO2 impurities

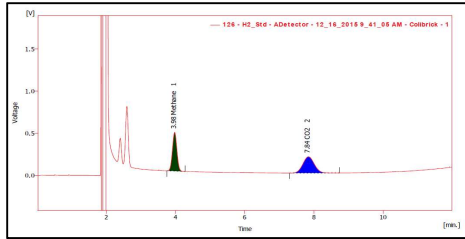


He standard channel B: Ar, N2, CH4, CO impurities

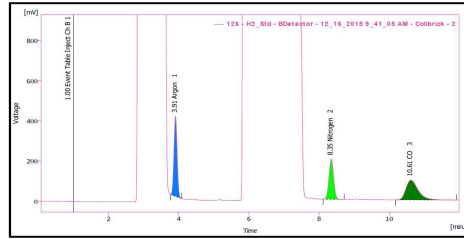


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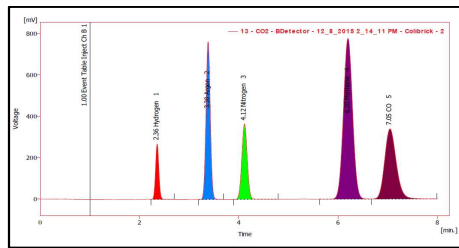
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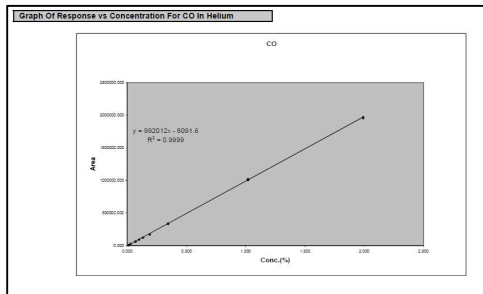
H2 standard channel A: CH4, CO2 impurities



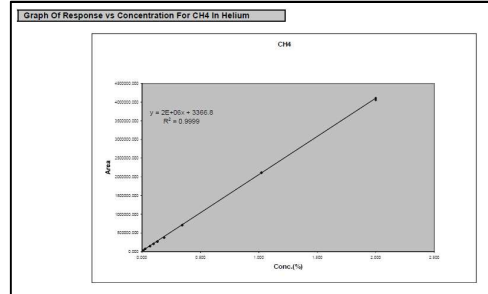
H2 standard channel B: Ar, N2, CO impurities



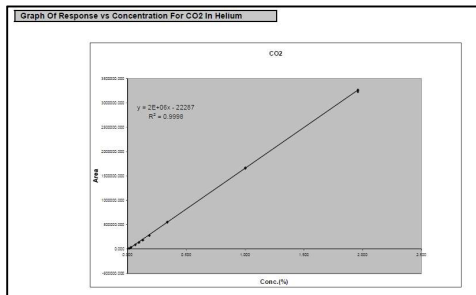
CO2 standard channel B: H2, Ar, N2, CH4, CO impurities



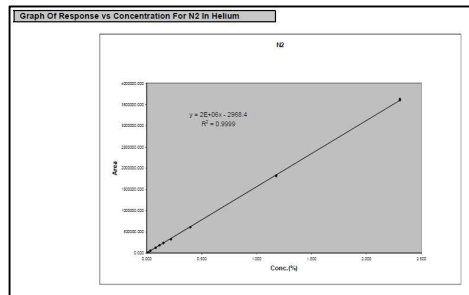
CO linearity 0 ~ 1000 ppb



CH4 linearity 0 ~ 1000 ppb



CO2 linearity 0 ~ 1000 ppb

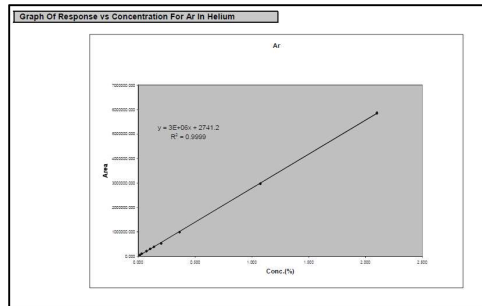


N2 linearity 0 ~ 1000 ppb

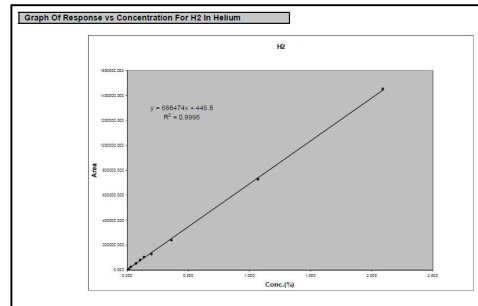


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Ar linearity 0 ~ 1000 ppb



H2 linearity 0 ~ 1000 ppb