



## PDHID- Trace Impurity Gas Analyzer

**KEY WORDS:** Permanent gases, impurity, PDHID

### INTRODUCTION

SCION Instruments offers a complete solution for the detection of permanent gases at trace level with the SCION Instruments 456-Trace Impurity Gas Analyzer (TIGA). The Scion Instruments 456-GC platform is equipped with an inert sample path, purged valves and inline getter to ensure the quality of every analysis.

Low level detection of impurities in High Purity gases is essential for quality assurance of these gases. The quantification of trace gases is highly applicable using Gas Chromatography (GC) due to the excellent separation of the analytes. In combination with the Pulsed Discharge Helium Ionization Detector (PDHID) which is insensitive for the most used matrix Helium it is the perfect platform.

Figure 1 shows the SCION Instruments 456-GC Trace Impurity Gas Analyzer Configuration equipped with a PDHID.



Figure 1. SCION Instruments 456-GC Trace Impurity Gas Analyzer

# PDHID- Trace Impurity Gas Analyzer

## HARDWARE

The SCION Instruments TIGA analyser is the perfect solution for trace analysis in permanent gases. There are two standard TIGA configurations recommended, a single or multi dimensional configuration.

The single configuration is equipped with inert sample path tubing, purged valves, inline getter and one special treated column to ensure the purity of the carrier and minimize the oxygen inlet from the environment.

When looking at the multi dimensional configuration it shows a lot of similarities with the single configuration. It is also equipped with these special products to ensure the quality of every measurement but in addition it contains a pre column. This pre-column ensures even better separation from the matrix and column one is shorter which results in a shorter run time.

Table 1 shows the measurement possibilities for the two standard configurations.

It is also possible to customise the analyser, for example a two channel solution with one PDHID. This means the analyser contains a permanent gas channel and carbon dioxide channel suitable for trace impurities in ethylene or propylene. For the options please contact our pre-sales experts.

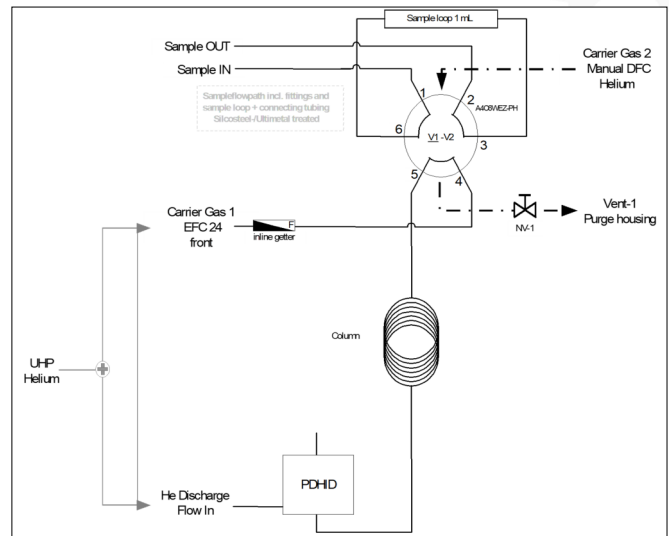


Figure 2. Single configuration.

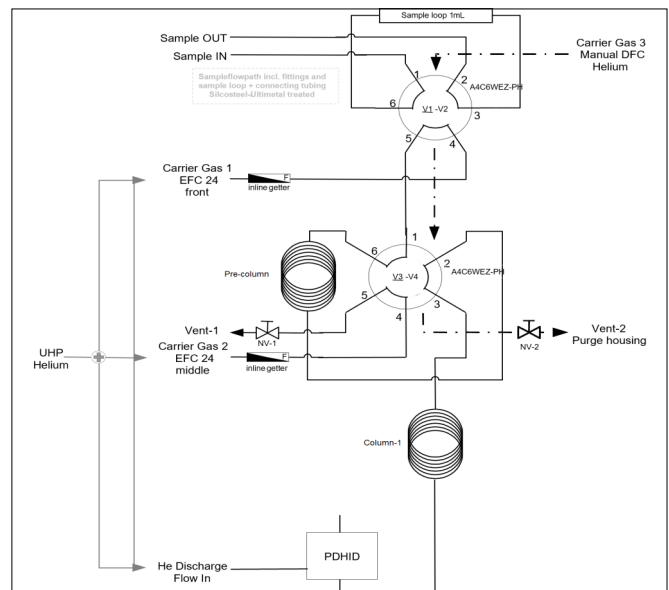


Figure 3. Multi dimensional configuration with backflush.

Table 1: Measurement options for the single and multi configuration

Sample Matrix	Trace impurities									
	Single					Multi				
	H <sub>2</sub>	O <sub>2</sub> /Ar	N <sub>2</sub>	CO	CH <sub>4</sub>	H <sub>2</sub>	O <sub>2</sub> /Ar	N <sub>2</sub>	CO	CH <sub>4</sub>
Hydrogen	-	+	+	+	+	-	+	+	+	+
Helium	++	++	++	++	++	+	+	+	+	+
Argon	++	-	++	++	++	+	-	+	+	+
Nitrogen	++	-	-	++	+	+	-	-	+	+
Ethylene	-	-	-	-	-	++	++	++	++	++
Propylene	-	-	-	-	-	++	++	++	++	++
Carbon Dioxide	-	-	-	-	-	++	++	++	++	++

++=Best, +=Reduced Performance, -=Not Possible \* O<sub>2</sub> and Ar can be separated with optional oven cryo cooling

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## RESULTS AND DISCUSSION

The SCION instruments TIGA analyser is perfectly capable in analysing permanent gases.

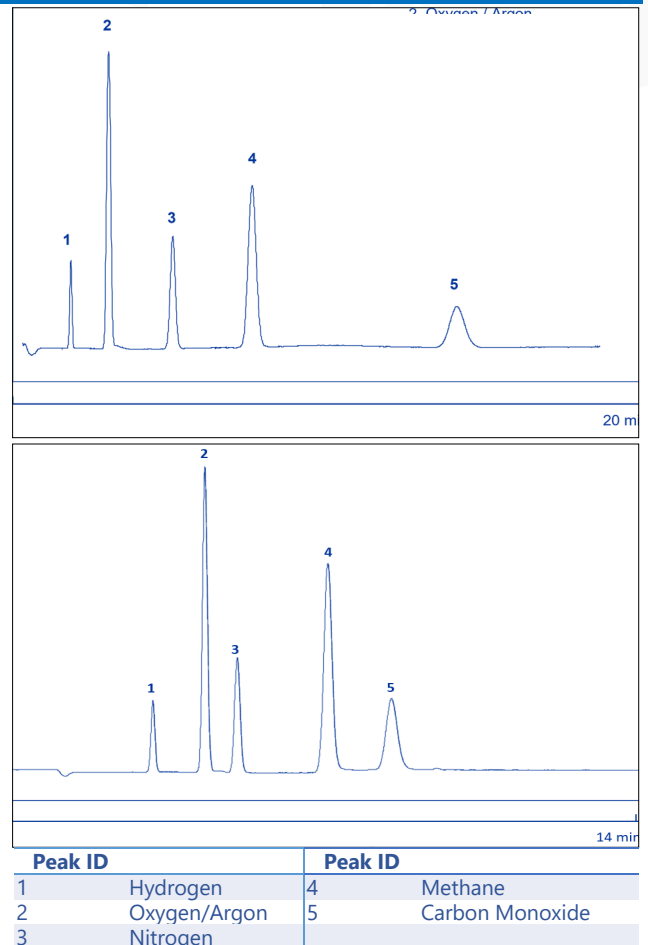
It was shown that the repeatability (RSD%) for 20 consecutive injections did not deviate more than 1% for all components. This means the analyser has excellent repeatability. The example given (Table 2) is for the single configuration but the excellent repeatability also counts for the multi configuration.

Figure 4 shows example chromatograms of the single and multi configuration. Both have excellent resolution and it shows that multi configuration is indeed faster than the single.

These configurations are linear over a wide range ( $10^4$ ) with a LOQ below ppbv.

**Table 2: Repeatability (RSD%) for 20 consecutive injections for the single configuration.**

Nr.	Area				
	H <sub>2</sub>	O <sub>2</sub>	N <sub>2</sub>	CH <sub>4</sub>	CO
1	630710	2256071	1973162	4948207	2271832
2	625734	2257507	1977277	4940651	2251245
3	626947	2251059	1971283	4939251	2247275
4	624767	2246310	1976287	4920734	2235288
5	624703	2240918	1971776	4917687	2243718
6	625018	2238814	1961481	4918113	2227563
7	622685	2235639	1961904	4909557	2236097
8	624241	2234230	1958433	4913270	2225255
9	620467	2235171	1954088	4910833	2250505
10	626490	2236462	1959449	4921587	2246286
11	629744	2252930	1974474	4966845	2263335
12	630129	2248935	1968253	4959841	2247244
13	627669	2240924	1965551	4933341	2231511
14	626431	2241616	1966826	4918632	2225714
15	627755	2245648	1964512	4937709	2268488
16	625784	2245628	1958599	4923243	2246914
17	621800	2235140	1960540	4916843	2248059
18	622578	2236201	1958213	4913674	2245189
19	620998	2230055	1952592	4897707	2223157
20	615052	2212957	1936726	4860894	2207158
<b>Rsd%</b>	0.58	0.44	0.48	0.45	0.70



**Figure 4. Chromatogram of a single (top) and multi (bottom) configuration.**

## CONCLUSION

Scion instruments provides a total turnkey solution for the analysis of permanent gases. The Scion 456-GC is equipped with industry standard inert hardware and can be fully automated.

This analyser has excellent repeatability and is perfectly capable of performing quantitative and qualitative analyses. Please contact our pre-sales experts for all the options.

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