GLOBAL™ ANALYSER SOLUTIONS G·A·S

Robust Highest uptime: > 99% 10 ppb N₂O Air, water and soil samples No radioactive source

APPLICATION NOTE 219WA0614A

Greenhouse gas analysers

GAS offers custom configured GC analysers for complex separations, data processing and reporting. We have over 35 years of experience in designing and building turnkey analysers for many application fields. Our analysers are designed to meet many accepted standard methods (like GPA, ASTM, UOP, ISO, etc.) in the Oil and Gas industry. The efficient configurations are based on proven GC technology, resulting in robust instruments with an optimal return on investment.

Human activities - particularly burning fossil fuels (like coal, oil and natural gas), agriculture and land clearing - are increasing the concentrations of greenhouse gases, which are contributing to warming of the earth. G·A·S offers two greenhouse gas analysers for the analysis of CO_2 , CH_4 , N_2O and SF_6 . Type A is based on ECD and methaniser-FID, while type B uses Plasma Emission Detection.

Greenhouse gas analyser A - ECD / FID

Analyser type A is configured with 2 analytical channels (see figure 1). The first channel separates CH_4 and CO_2 from air, while water is backflushed to vent. CO_2 is converted to methane by a methaniser, for sub ppm detection by FID (see figure 2). An optional TCD is available, placed in series with methaniser-FID, in case of high level of CO_2 .

 $\rm N_2O$ is measured by ECD (Electron Capture Detector) on the second channel, after separation from Air and CO₂ (figure 3). Water is backflused to vent. SF₆ can be measured as well on this channel, with sub-ppt level detection limit.

Results

All component are analysed with repeatability < 1 % RSD. Figure 4 shows statistical result for N₂O at 330 ppb concentration level in air. The minimum detectability is < 50 ppb for CH_4 , < 100 ppb for CO_2 and < 10 ppb for N₂O. SF₆ is analysed in the sub-ppt range.

(H4, CO2) FID United Street St	Holdedd y Holdedd y Holdedd y		N2 GAS p H2 NV1
L			AUX ² GAS +14+14
	Hayeene Q.	1 m sample out	N2 AUX 3 GAS
(N2O, SF6)		vent 7654	- NIV/2
ECD			- NV3
HEC	Hayesep Q. 18° SS		
ront	column oven	valve oven	

Figure 1. Diagram greenhouse gas analyser using ECD/methaniser-FID



TRACE 1300 G	<u>iC-C</u>	N20
Sample ID		Area
niowag_N2O_0	67	4713403.00
niowag_N2O_0	68	4695494.00
niowag_N2O_0	69	4689598.00
niowag_N2O_0	70	4779851.00
niowag_N2O_0	71	4731030.00
niowag_N2O_0	72	4706694.00
niowag_N2O_0	73	4780556.00
niowag_N2O_0	74	4778467.00
niowag_N2O_0	75	4748329.00
niowag_N2O_0	76	4784289.00
	Min:	4689598.00
	Max	4784289.00
	Mean:	4740771.10
S	td Dev:	38232.97
	%RSD	0.81

Figure 4. Repeatability for N₂O in air at 330 ppb





Figure 4. Greenhouse gas analyser with Plasma Emission Detector



Figure 5. 8 ppm CH₄, 50 ppm CO₂,10 ppm N₂O in He (PED)



Figure 6. 30 ppb N_2O in air (PED)

Greenhouse gas analyser B - PED

Analyser type B uses Plasma Emission Detector (PED) for the analysis of greenhouse gases. This detector only requires Argon or Helium (no FID detector gases needed), and avoids the uses of a radioactive source (like ECD). See our application note for HPA (High Purity Analyser) for further explanation. Two analysis channels are combined on a single PED using selection valve E2 (see figure 4), with figure 5 and 6 as a result. Levels of detection are <100 ppb CO_2 , <10 ppb CH_4 , and < 10 ppb N_2O .

Instruments



Figure 6. Greenhouse gas analyser based on Trace 1310GC with ECD/methaniser-FID or PED



Figure 7. CompactGC^{4.0} with PED for greenhouse gas analysis



Figure 8. Greenhouse gas analyser with Head Space sampler for water, soil or organic material samples. Sample trays for up to 1 liter vials are optional available.



Specifications

Application:	Analysis of greenhouse gases in air, water, soil or organic material samples
Configuration:	Dual channel instrument based on Thermo Trace 1300 GC or CompactGC ^{4.0} with (A) Methaniser-FID and ECD detection (TCD optional for high CO_2 levels) (Trace 1300GC) (B) Plasma Emission Detector (Trace 1300GC or CompactCC ^{4.0})
Injection:	GSV (Gas Sampling Valve) or Head Space (Autosampler using syringe and SSL injector)
Optional:	Head Space sampling using GSV (closed loop sampling)
Analytes:	CH_4 , CO_2 , N_2O , SF_6 ; chlorofluorohydrocarbons on request
Analysis Time:	Type A (methaniser-FID): 5 minutes Type B (PED): 10 minutes
Minimum Detectability:	Type A: $CH_4 < 50$ ppb, $CO_2 < 100$ ppb; $N_2O < 10$ ppb (Ar/ CH_4 as ECD make-up gas); SF_6 : sub-ppt range Type B: $CH_4 < 10$ ppb; $CO_2 < 100$ ppb, $N_2O < 10$ ppb; $SF_6 < 10$ ppb
Repeatability:	1% RSD (n=10) or better (N ₂ O @ 330 ppb; CH ₄ @ 2 ppm; CO ₂ @ 10 ppm; Gas Sampling Valve)
Data systems	Chromeleon, OpenLab, EZChrom



Figure 9. InstantConnect detector technology for high uptime and high flexibility



Figure 10. Diaphragm valve with internal purge for extreme low leak rate (mandatory for ECD and PED)



Figure 11. Plasma Emission Detector



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