



Global  
Analyser  
Solutions

Chlorine

Cl

35.45

## Impurities in chlorine gas

- Highly corrosion resistant analyser
- Flush valve for extended lifetime
- Benchtop or 19" instrument

*Get ready for tomorrow's analytics*

GAS offers custom configured GC analysers for many application fields for over 50 years. GAS analysers are designed to meet many standardised methods from GPA, ASTM, UOP, ISO, EN and others. The efficient configurations are based on proven GC technology, resulting in robust, highly productive instruments with an optimal return on investment.

Chlorine is used in a wide range of products like commercial bleaches and disinfectants. It is also used in organic chemicals such as polyvinyl chloride and many intermediates for the production of plastics and other end products. Due to the high oxidising potential, chlorine is extremely dangerous and poisonous. To avoid corrosion special precautions are mandatory for chlorine analysers.



**Figure 1** Impurities in chlorine gas analyser, with:

- all wetted parts in corrosion resistant material
- independent heated valve oven
- easy accessibility
- small footprint
- robust design
- Chromeleon data system

### Highly Corrosive

Due to its high oxidising potential, chlorine is highly corrosive and therefore extreme destructive. For analysing impurities in chlorine special precautions are mandatory to protect the analyser.

Therefore all parts that are in contact with the sample like valves, couplings, tubing and columns are Dursan-coated, Hastelloy-C, or co-polymer which are well known for corrosion resistiveness.

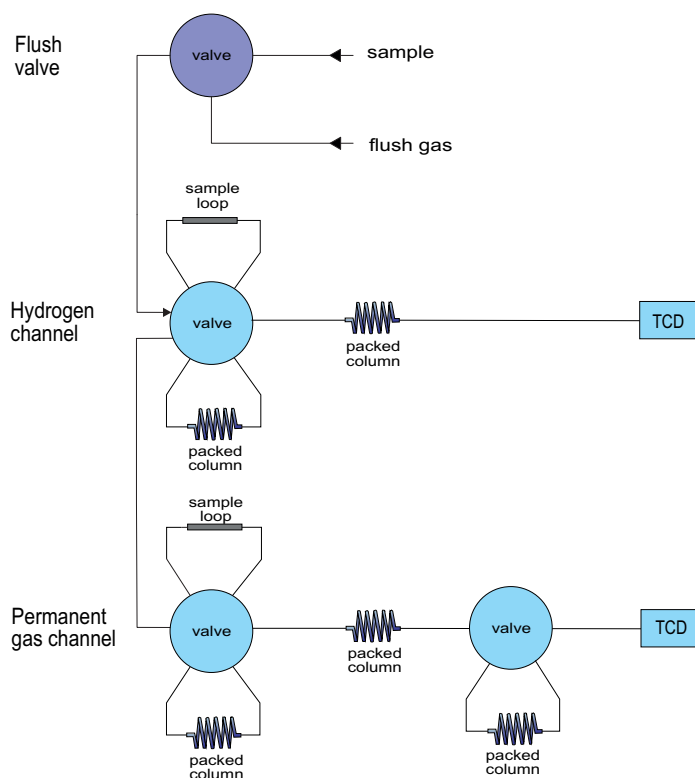
### Flush facility

Despite the use of these material, it is known that corrosion will be seen in time, especially in the presence of water, which causes formation of hydrochloric and hypochlorous acid. Therefore GAS offers an extra flush valve with high inertness to chlorine and acids, to purge the sample path immediately after sample injection. In this way contact with chlorine is minimised for the rest of the analyser, with increased lifetime as a result.

### Principle

Figure 1 shows the analyser diagram.  $O_2$ ,  $N_2$ ,  $CH_4$ ,  $CO$  and  $CO_2$  are analysed on the permanent gas channel, using TCD and helium carrier gas. These components are measured from low ppm to high %.

A separate channel for analysing  $H_2$  (and He) is shown using argon or nitrogen as carrier gas. This channel can be left out when  $H_2$  is present in the range of 0.1 to 10%; in that case this component is analysed on the permanent gas channel.



**Figure 2** Schematic diagram

## Results

Figures 3 and 4 show chromatograms of impurities in chlorine (permanent gas channel and separate hydrogen channel). Figure 5 shows the excellent method repeatability.

The concentration is 1% for all shown components. The limit of detection is 0.001% using TCD. For low level ppm/ppb detection, a High Purity Analyser based on Pulsed Discharge Detector is available (see application note AN6WA0723E).

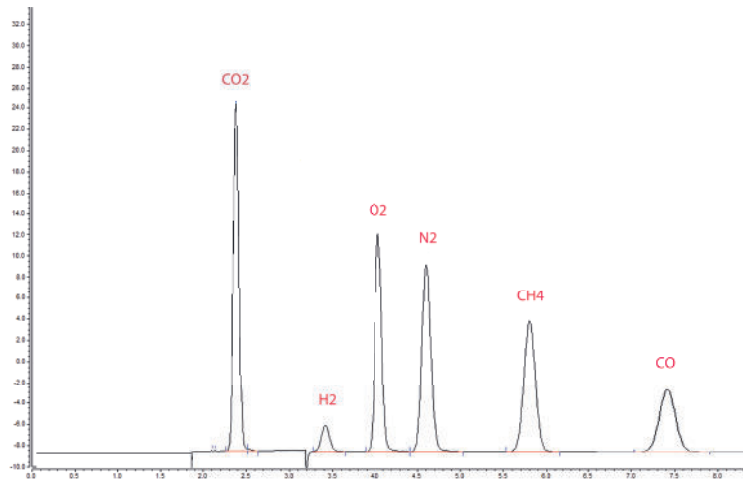


Figure 3 Chromatogram permanent gas channel (TCD)

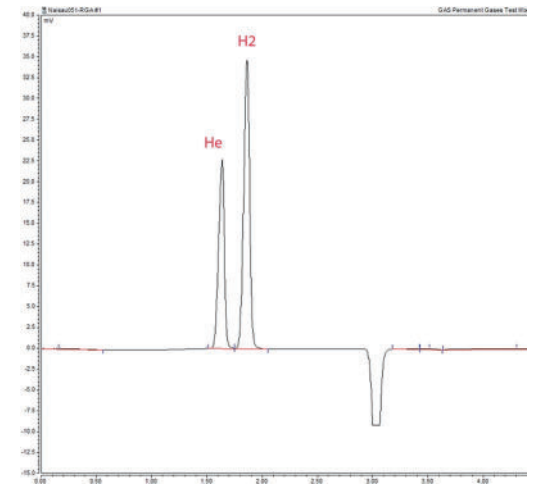


Figure 4 Chromatogram helium / hydrogen channel (TCD)

Inj. No.	Injection Name	Type	Area mV*min				
			AuxLeftDetec CO2	H2	O2	N2	CH4
21	GAS Permanent Gases	Unknown	1.2504	0.1262	0.5206	1.1328	0.9137
22	GAS Permanent Gases	Unknown	1.2482	0.1258	0.5203	1.1304	0.9135
23	GAS Permanent Gases	Unknown	1.2459	0.1265	0.5195	1.1277	0.9122
24	GAS Permanent Gases	Unknown	1.2433	0.1262	0.5197	1.1271	0.9142
25	GAS Permanent Gases	Unknown	1.2433	0.1261	0.5182	1.1252	0.9156
26	GAS Permanent Gases	Unknown	1.2434	0.1261	0.5200	1.1277	0.9160
27	GAS Permanent Gases	Unknown	1.2433	0.1262	0.5199	1.1268	0.9154
28	GAS Permanent Gases	Unknown	1.2440	0.1258	0.5197	1.1258	0.9146
29	GAS Permanent Gases	Unknown	1.2409	0.1258	0.5188	1.1239	0.9150
30	GAS Permanent Gases	Unknown	1.2395	0.1260	0.5194	1.1251	0.9151
Maximum			1.2504	0.1265	0.5206	1.1328	0.9160
Average			1.2442	0.1261	0.5196	1.1272	0.9145
Minimum			1.2395	0.1258	0.5182	1.1239	0.9122
Standard Deviation			0.0032	0.0002	0.0007	0.0027	0.0011
Relative Standard Deviation			0.26%	0.18%	0.13%	0.24%	0.12%

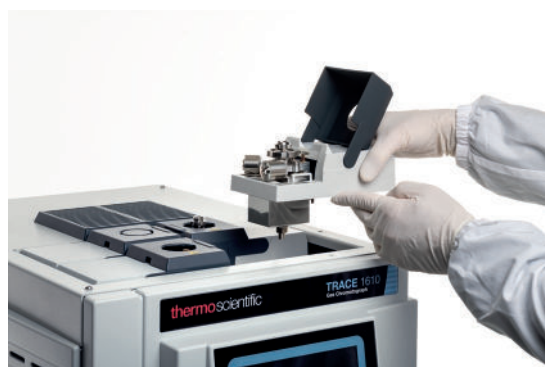
Figure 5 Repeatability



Figure 6 Impurities in chlorine analyser based on CompactGC<sup>40</sup>

# Specification

Configuration:	1 or 2 channel instrument based on Thermo Trace 1600 GC with InstantConnect TCD, or based on CompactGC <sup>4.0</sup>
Optional:	Heated Perma Pure sample dryer Pulsed Discharge Detector for low ppm/ppb detection
Sample path:	Dursan, Hastelloy-C, co-polymer Corrosion free sample purge valve for extended lifetime
Application:	H <sub>2</sub> , O <sub>2</sub> , N <sub>2</sub> , CH <sub>4</sub> , CO and CO <sub>2</sub> in (wet) chlorine gas, using 1 or 2 TCDs
Range	10 ppm to 50% for all components 0.1-10% for H <sub>2</sub> when analysed on the permanent gas channel (see text page 2)
Repeatability	< 1% RSD
Sample requirements:	See our pre-installation guide for additional requirements
Analysis time:	8 minutes
Chromatography	
Data system:	Chromeleon



**Figure 7** Thermo Trace GC 1600: User-installable InstantConnect modules place the expertise and control in the hands of the operators without the requirement for special training, dedicated tools, or on-site service engineers. This unique modular design offers many advantages to the analytical laboratory when compared to traditional GC systems.

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