

## QGA Software

### Quantitative gas analysis software

The screenshot displays the Hiden QGA software interface (Beta v 2.0). The interface is divided into several functional panels:

- System Status:** Includes a 'CONNECT' button, status indicators for 'Run', 'Emission', 'Filament 1', and 'Filament 2', a 'Turbo Pump Speed' slider set to 0%, and a 'Total Pressure' field showing 0. A 'Disconnect & Exit' button is also present.
- Current Analysis:** Features a list of gas inputs (Gas 1 to Gas 8) with dropdown menus. Gas 1 is set to Nitrogen, Gas 2 to Oxygen, Gas 3 to Argon, and Gas 4 to Carbon dioxide. Other settings include 'MODE: Mixture', 'Scan Speed: Default', and a 'View Current Multistream Setup' button. 'New Analysis' and 'Load Analysis' buttons are also available.
- Calibration Settings:** Shows the 'Last Calibrated' date as 12 Feb 2009. It contains two columns: 'Background' and 'Calibration Value'. The 'Background' column has eight input fields, all set to 0. The 'Calibration Value' column has corresponding fields with values: 1.01306, 0.95796, 0.91452, 1.04311, 0.781655, 1, 1, and 1. 'Get Background' and 'Calibrate' buttons are at the bottom.
- Data Preferences:** Includes 'View Saved Data' and 'Export Data to Excel' buttons. A 'Save data to' field is set to 'data\_2.tdms' with an 'Edit' button.

At the bottom of the interface is a schematic diagram of the gas analysis system. The diagram shows a 'QIC - Fused silica lined capillary inlet 160 C' leading to a '3 mbar' pressure point, then through a '2 Micron Screen Filter Cartridge' and a 'VR1' valve. The flow then passes through a 'QMS' (Quadrupole Mass Spectrometer) and a 'G1' gauge. The system is equipped with a 'P1 - 70 litre/sec turbo drag pump' and two 'P2, P3 - 2.5 m3/hr rotary pumps' connected to 'Exhaust Vent' ports. A 'KEY' defines the symbols: G1 - Penning (Cold cathode) gauge, VR1 - QIC inlet bypass control valve, P1 - 70 litre/sec turbo drag pump, and P2, P3 - 2.5 m3/hr rotary pump.

Version 2.0 (BETA)

### Key Features:

- Template operation from pre defined analysis set up for up to 8 gases and vapours.
- Automatic data acquisition.
- Data export direct to Excel
- Multi stream capability for up to 80 gas sample streams

Manufactured in England by:

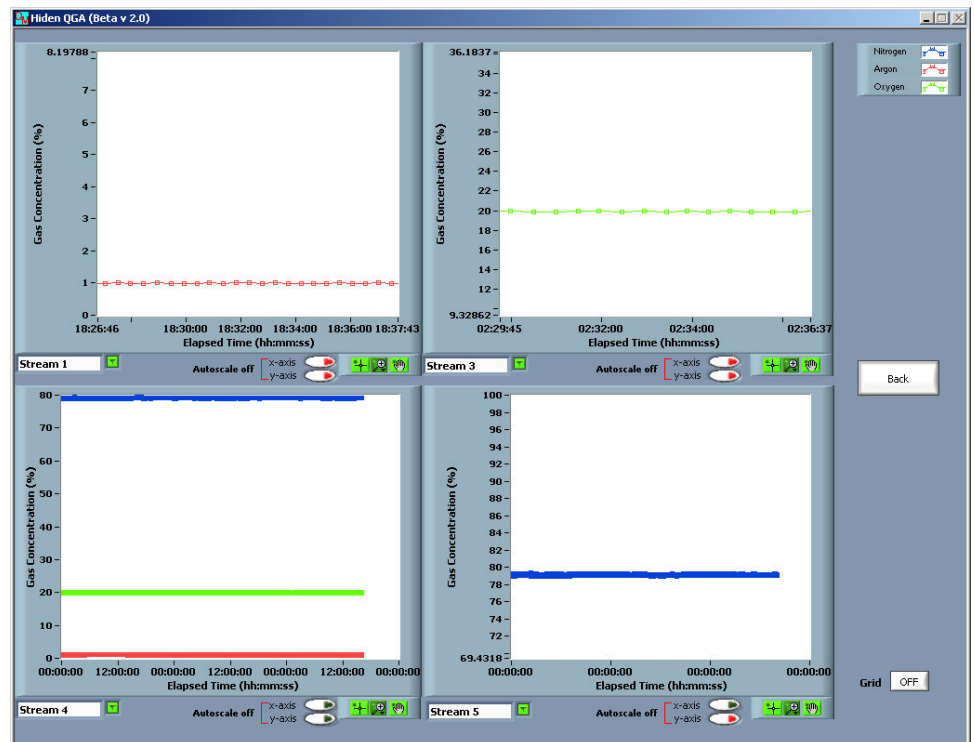
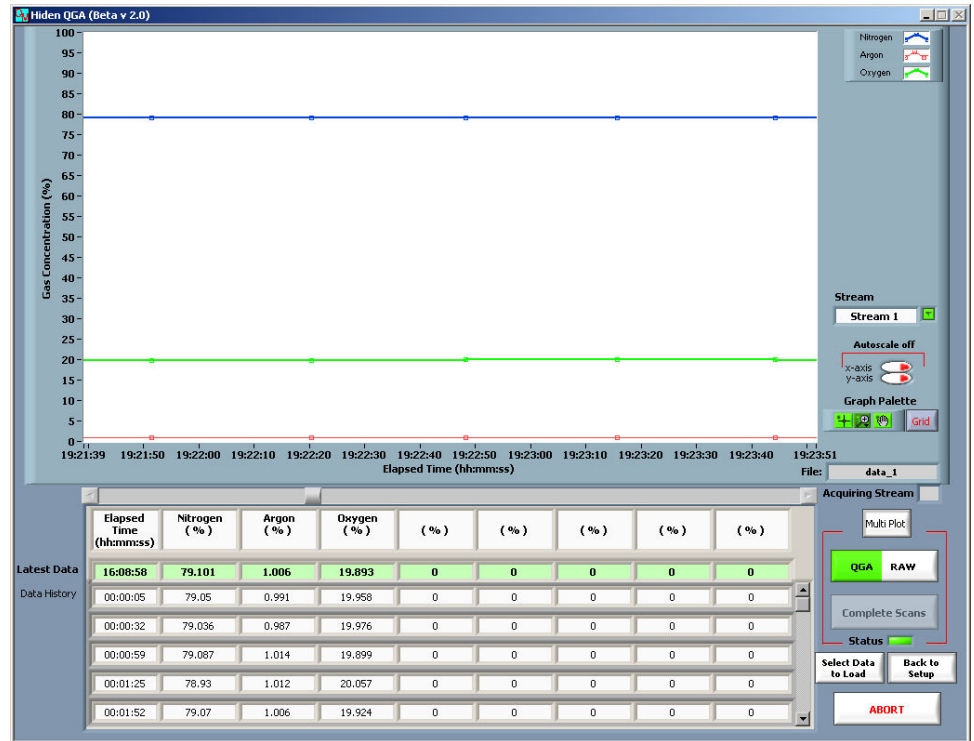
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# QGA Software

## Quantitative gas analysis

### Real time analysis

- QGA: Quantitative gas analysis with graphical trend analysis.
- RAW: View instrument partial pressure values.
- Tabular: Display real time trend update with data history.
- Y axis and X axis data zoom during data acquisition and post analysis.
- Multi-plot view for multistream systems. Show graphical trend



# QGA Software

## Quantitative gas analysis data export.

### Data Export

- Data export to MS Excel.
- New workbook for each data file.
- Quantitative data, raw data values and corrected data values are exported.
- Calibration factors and background correction values are recorded.

Gas composition					RAW data					Corrected data				
Time (ms)	Nitrogen 28	Argon 40	Oxygen 32	Water 18	Time (ms)	Nitrogen 28	Argon 40	Oxygen 32	Water 18	Time (ms)	Nitrogen 28	Argon 40	Oxygen 32	Water 18
5638	80.148	1.014	18.124	0.714	5.64E+03	1.27E-07	1.45E-09	2.67E-08	1.06E-09	5.64E+03	1.25E-07	1.58E-09	2.82E-08	1.11E-09
35480	80.138	1.004	18.094	0.704	3.55E+04	1.26E-07	1.43E-09	2.66E-08	1.04E-09	3.55E+04	1.25E-07	1.56E-09	2.81E-08	1.09E-09
64565	80.137	1.002	18.142	0.719	6.46E+04	1.26E-07	1.42E-09	2.66E-08	1.06E-09	6.46E+04	1.24E-07	1.55E-09	2.81E-08	1.11E-09
93416	80.173	1.001	18.121	0.705	9.34E+04	1.26E-07	1.42E-09	2.66E-08	1.04E-09	9.34E+04	1.24E-07	1.55E-09	2.80E-08	1.09E-09
122302	80.225	1.005	18.045	0.725	1.23E+05	1.26E-07	1.43E-09	2.64E-08	1.07E-09	1.23E+05	1.24E-07	1.55E-09	2.79E-08	1.12E-09

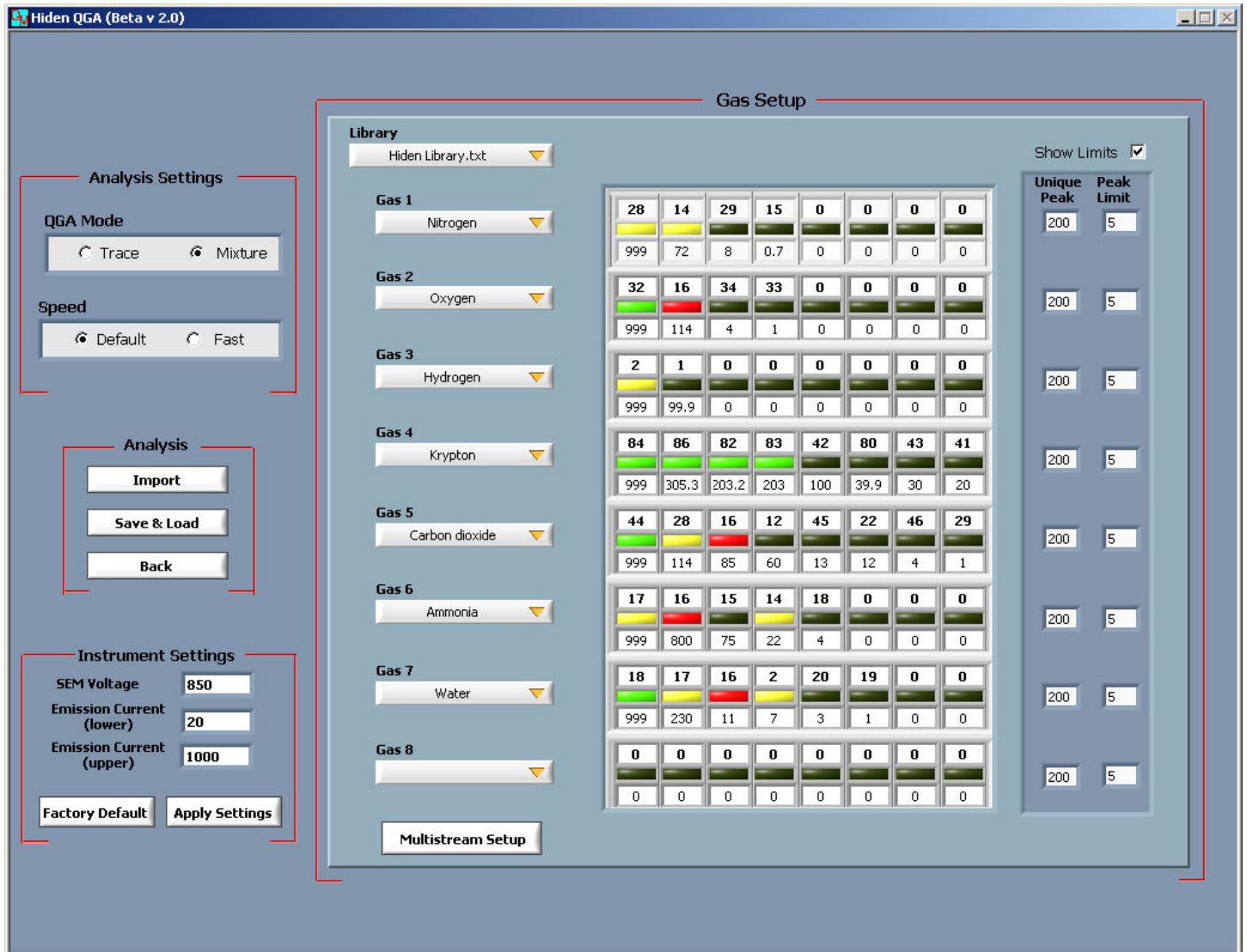
09-Feb-09		Calibration factor			
gen 28	Argon 40	Oxygen 32	Water 18	Background	Calibration Factor
25E-07	1.58E-09	2.82E-08	1.11E-09	8.19E-11	1.01349
25E-07	1.56E-09	2.81E-08	1.09E-09	1.58E-10	0.91654
24E-07	1.55E-09	2.81E-08	1.11E-09	1.54E-10	0.9474
24E-07	1.55E-09	2.80E-08	1.09E-09	1.14E-09	0.95104
24E-07	1.55E-09	2.79E-08	1.12E-09	0	1
24E-07	1.54E-09	2.82E-08	1.11E-09	0	1

38	903940	80.193	1.009	18.102	0.695
39	932948	80.203	1.016	18.076	0.705
40	961778	80.065	1.018	18.221	0.696
41	990701	80.181	1.015	18.091	0.714
42	1019570	80.185	1.031	18.077	0.707
43	1048680	80.149	1.023	18.125	0.704
44	1077430	80.12	1.023	18.155	0.702
45	1106301	80.076	1.013	18.218	0.693
46	1135051	80.207	0.996	18.099	0.698
47	1163923	80.185	1.018	18.089	0.708
48	1192796	80.148	0.997	18.172	0.684
49	1221907	80.195	1.011	18.1	0.694

Data for up to 80 gas sample streams

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## Quantitative gas analysis set up.



Each template file is set up using the mass spectral library calculator.

The calculator shows the principle peaks for each species by mass number and intensity.

The intensity is normalized to 1000 as used by the NIST library.

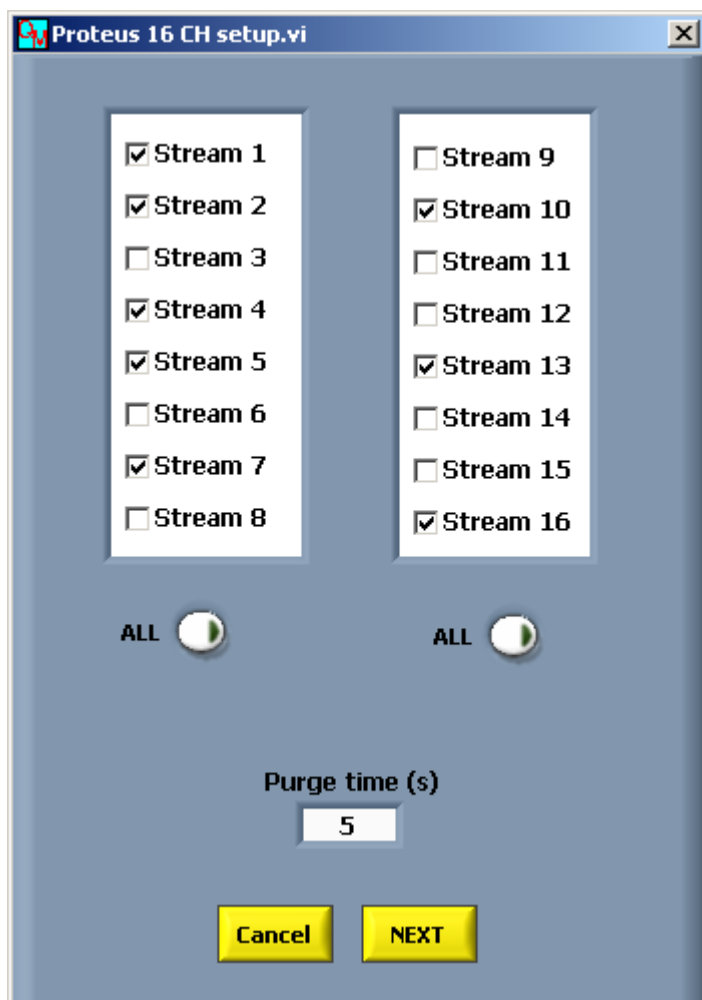
The mass spectral library calculator automatically subtracts resolvable overlaps indicated by yellow.

Green indicates a unique peak is available for the species analysis, and red indicates peaks that will not be used.

Peak limits allow the expert user to adjust limits for which peaks within the library become significant.

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### Multiple sample stream analysis.



Multi stream sampling enables a single mass spectrometer to analyse sample from up to 80 streams in a continuous loop sequence.

The example shown is for QGA software configured to sample from 16 streams.

The user interface provides for selection of the streams to include in the analysis and to set the purge time that the system will use between streams.

QGA software provides for quantitative gas analysis in single stream or multi stream gas analysis applications with a simple user interface providing data for real time trend analysis and for post processing.