Application note 026



## CN analysis in very small samples using the Integra2



The Inetgra2 has expanded capability to measure C and N by elemental analysis – isotope ratio mass spectrometry (EA-IRMS). The extended range modifications now enable researchers to get down to sample sizes as low as 2.5 µg C and 1.5 µg N

The extended range set up reduces the amount of helium used to carry the sample through the system, thus reducing the dilution of the gas species of interest, whilst simultaneously offering researchers a reduction in operating costs due to whilst maintaining excellent precision. These modifications are invaluable for researchers wishing to measure small samples, samples which contain limited organic content, or samples with large C:N ratios.

the low consumption of helium. Extensive tests have been carried to ensure the background concentrations remain low. This application note details the hardware configuration alongside the operational conditions and timings necessary for the extended range set up.



Figure 2: Schematic overview of the extended range configuration





	Select Analysis File Total Time Per Sample Description		DUAL_LOW			-	
			340 seconds				
			Dual isotope			]	
	N peaks = 2	Peak	1	Peak 2		-	Delete Peak
	Gas Species	N2		C02			Add Back
	Type	Samp	(e	Sample			Add Peak
	Active	True		True			Insert Peak
	Isotope 1		15N		13C		
	Mode	Atom9	6	Atom%			Copy Peak
nter the timine	Isotope 2	None		None			Paste Peak
ind data	Mode		0 DeltaPDB				
presentation	Base 1 Start	68 160					
arameters for	Base 1 End	71 165					
each gas species	Integrate Start		71		165		Batch
o be analysed.	Integrate End		110 260		Preterence		
	Base 2 Start	110			260		Ignore
	Base 2 End		115		265		manushar
	Source File	N2		C02			Blank corr
	at Time		1		150		samples
	Element Mode	ug		ug			
	LinearRegression	True		False		-	

Figure 4: Analysis timings

Operating conditions - Temperatures, Pressures and Flows

Combustion Tube	1050°C
Reduction Tube	600°C
GC Oven	75°C
Helium Pressure	30PSI
Helium Flow	20ml/min
O2 Pressure	20PSI
O2 Flow	40ml/min



Name	Weight	Beam	µg N	<sup>15</sup> N (wrt	Beam	µg C	<sup>13</sup> C
	/Vol	Area		Air)	Area		(PDB)
Blank	0.00001	2.53E-10	0.08	-9.61	6.90E-11	0.01	-59.65
TEST	0.0071	4.61E-09	1.51	0.81	1.41E-08	2.66	-26.56
AS_BEET_MIX	0.0071	4.57E-09	1.51	0.40	1.36E-08	2.56	-25.83
1	0.0071	4.62E-09	1.53	0.14	1.35E-08	2.54	-25.86
2	0.0071	4.46E-09	1.48	0.91	1.28E-08	2.41	-26.33
3	0.0071	4.61E-09	1.53	0.63	1.35E-08	2.54	-26.09
4	0.0071	4.39E-09	1.46	0.46	1.36E-08	2.55	-26.29
5	0.0071	4.58E-09	1.53	0.76	1.43E-08	2.68	-26.17
AS_BEET_MIX	0.0071	4.48E-09	1.51	0.40	1.36E-08	2.56	-25.83
			STDEV	0.29			0.19

Table 1 CN data from low volume samples on the Integra2

Name	Beam Area	µg N	15N (Air)
Blank	6.24E-11	0.01	-49.93
TEST	3.72E-08	4.99	-0.66
AS_BEET_MIX	3.73E-08	5.00	-0.77
10	7.52E-08	10.08	-0.85
5	3.43E-08	4.61	-0.43
3	1.91E-08	2.57	-0.42
1	5.52E-09	0.74	0.04
AS_BEET_MIX	3.72E-08	5.00	-0.77

Table 2 Linearity on low level CN

As shown in table 1, with this configuration excellent precision of 0.2 % is achieved when analysing samples as low as 2.5  $\mu$ g C and precision of 0.3 % is achieved down to 1.5  $\mu$ g N. As shown in Table 2, linearity on the system remains excellent even at sub- $\mu$ g levels of N.

For more information on Sercon systems capable of analysing very small samples, please contact sales@sercongroup.com

