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Job Number:	IN1330	Date:	18/12/2023

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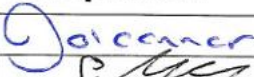
ADDITIONAL:

Payment Terms:
 50% / 40% / 10%
Other: please specify _____

Penalty Clause Yes / No

Please specify: _____

Blue Book Completion:

Signed		Date	8/5/25
Verified	J. Palmer	Date	8/5/25

3 - MACHINE SPECIFICATION

Client:	The University of Arizona		
Quotation Number:	17518	Date:	06/11/2023
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Ref No.	Product Description	Required
HS2022 (continuous flow)		
20402/1	HS2022 Ref Gas + P Mag	
20402/2	HS2022 Ref Gas + E-Mag	
20402/3	HS2022 Ref Gas + Hd Collector + E-Mag	
20402/4	HS2022 Ref Gas + Hd Collector+E-Mag+Trap Loop	
20501	Hd Collector Assy	***
50101/2	Trapping Loop Assy	
70201-1	70201-1 Analyser spares kit – Included	
EA Units		
10202/11	iso-EArth	
10202/13	iso-EArth+	
10202/14	iso-Earth HT Furnace Upgrade	
10202/15	Iso-Earth (Without Autosampler)	
11802/1	Earth+PC	
11802/2	EArth+Clarity+PC	
70501-1	Consumables for C and N for Combustion Only	
70501-11	Simultaneous CNS Consumables Kit (approx. 10000 analysis)	
70501-3	Sample Prep Kit (Inc.)	
70501-4	GSL Combustion and Gas C & N Start Up Kit	
70501-5	Simultaneous NCS Consumables Kit	
70501-6	C&N Combustion Only Consumables Kit (approx. 5000 samples)	
70501-8	Simultaneous CNS Consumables Kit (approx. 5000 samples)	
70601-1	Sulphur Start Up Kit (Inc. with Sercon EA Systems)	
70601-2	Sulphur Consumables Kit for 1000 Samples	
70601-4	Sulphur Consumables Kit (approx. 5000 Samples)	
70801-2	Pyrolysis Consumables Kit-Low temp for Solids	
71701-1	Sub Microgram Nitrogen Analysis Start Up Kit	
SI2040	PN150 Pneumatic Autosampler with one no.50 pos. carousel	
SI2345	ME Micro Balance	
SI2737/A	Sercon 50 Position Autosampler Assy	
SI2789	Extra 50 Position Carousel	
SI2744	Automatic Liquid Sampler 15 Position	
SI2743	Liquid Sampler Mounting Plate	
Headspace Equilibration		
10202/10	XYZ Gas Sampling Control Box	
10302/1	Aqua System	
11103	µCarbs for CF	
11103-1	µCarbs for DI	
11601	200 Place Dual Heated Block 240 Volt	
11801	Sercon XYZ Gas Autosampler	
71107-1	CF oxygen-18 equilibration kit	
71107-2	DI Oxygen-18 Equilibration kit	
71201-1	CF deuterium equilibration kit	
71201-2	DI Deuterium Equilibration kit	
71801-1	WES-DI start up kit (Inc. with WES-DI)	
GC Units		
10402/2	Orchid module 1500C (Will run Hd 70901-1 C Spares Kit Inc)	
10901	Nitrogen Option (71301-1 N Spares kit Included)	
HP7890/1	Agilent 7890B GC System	
HP7890/2	Agilent 7890B GC with Auto Injector	
HP7890/3	Agilent 7890B GC + Auto Injector + 150 Vial Sample Tray	
SI2561	Nexus GC 2010 Plus	

3 - MACHINE SPECIFICATION

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Ref No.	Product Description	Required
GC Units <i>continued</i>		
SI2564	Nexis GC-2030	
70901-3	GC Pyrolysis H and O Start Up Kit	
70901-4	GC Pyrolysis H Spares Kit	
70901-5	GC Combustion C Spares Kit (approx. 5000 samples)	
70901-6	GC Pyrolysis h Start Up Kit (approx. 5000 samples)	
71301-1	GC N Spares kit	
ABCA2 Units		
10502/1	ABCA2 Sercon XYZ Autosampler	
10602	ABCA2 Gas Box	
20602	Complete Sercon ABCA2 system	
20603	ABCA IR Analyser	
70101-1	ABCA2 spares kit (<i>Inc. With ABCA2</i>)	
70101-2	ABCA2 Spares Kit for AB Analytica Systems	
70101-3	ABCA2 Autosampler Upgrade Kit	
SI1767	CVL505 – Barcode Reader	
SC9973	13C Urea breath test kit for Helicobacter pylori infection	
SC9974	Helicobacter Test kit for children age 3-11 (45mg)	
Integra2 Units		
20802/4	Integra2	
70201-2	Integra2 analyser spares kit - Included	
70401-1	Integra-2 consumables (<i>Inc. With Integra2</i>)	
Trace Gas Systems		
10802/4	CryoPrep	
10802/5	Automated LN refiller	
10802/6	CryoFlex (TOC)	
10802/7	CryoGas	
10802/8	CryoFlex (LA)	
SI2533	Silicon Carbide Vertical Furnace	
SI2731	213nm Laser Ablation System	
SI2733	isoScell 100 sampler chamber	
71001-1	Cryoprep Spares Kit	
71001-5	CryoGas Consumables Kit	
TOC Units		
14001	Thermalox Environmental TOC-IRMS	
14002	Thermalox Environmental TOC-Standalone	
14003	Thermalox Environmental TOC-Standalone No Sampler	
SI2772	CO2 detector, High sensitivity Option	
SI2773	NOx detector Option	
SI2774	Vacuum pump Option	
SI2775	Stirred Vial rack Option	
72101-1	TOC Start Up Kit	
72101-2	TOC Chem Pack	
72101-3	TOC & TN Instrument with heavy usage - one year	
72101-4	TOC only - economy holding	
GEO 20-22 (dual inlet)		
10702	GEO 20-22 Water Equilibration System (D & 18O)	
21802/1	GEO 20-22	
21802/2	GEO 20-22 + E-Mag	

3 - MACHINE SPECIFICATION

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21802/3	GEO 20-22 + E-Mag +Hd	
21802/4	GEO 20-22 Inlet	
70301-1	GEO start up kit - Included	
70301-3E	Comprehensive GEO 20-22 spares kit for 5 years operation	
HT-EA		
11501/4	HT-EA (With Autosampler)	
11501/5	HT-EA With Liquid Option	
11501/6	HT-EA Stand Alone	
11501/7	HT-EA (Without Autosampler)	
SI2622	CTC PAL3-LSI-L-S	
SI2624	CTC PAL3-Kit-Standalone	
70801-1	Pyrolysis Consumables Kit-High Temp for Solids	
71501-1	HT-EA Pyrolysis Start Up kit O and H	
71501-2	HT-EA Pyrolysis Kit for Water injections	
71501-3	HT-EA Sensitivity Start Up Kit for O & H in small samples	
71501-4	HT-EA Sensitivity Consumables Kit for O & H in small samples	
71501-5	HT-EA Sensitivity Kit for O&H in Small Samples (5000 samples)	
71501-7	HT-EA Kit for Room Temp Equilibration	
71501-8	HT-EA Pyrolysis Kit for Water injections (approx. 1 year kit)	

Ref No.	Product Description	Required
Upgrades		
12101	Evacuation System ***	
12102	2 Ref Gas+ Dilutor Box ***	
20101	Standard Source Assy ***	
20102	HS Source Assy ***	
20301	Standard Collector Assy ***	
30202/1	System Control Upgrade (Pmag) installation not included	Edwards Or Pfeiffer
30202/2	System Controller Upgrade (Emag) installation not included	Edwards Or Pfeiffer
10202/7	Preparation PCB Upgrade	
30202/3	Hijack Box ***	
30302/4	nEXT85 Edwards Pumping System Upgrade Single - installation not included	
30302/5	nEXT85 Edwards Pumping System Upgrade Dual - installation not included	
30302/6	nEXT85 Edwards Pumping System Upgrade Triple- installation not included	
SI2542	ABCA2 Upgrade Kit	
CALLISTOW	Callisto software upgrade ***	
Specials		
11702	LC-I interface	
12202	Leco Interface Unit	
SI2320	Agilent 1260 Series Refractive Index Detection HPLC System	
71401-1	ABCA-G Start Up/Spares Kit	
71401-2	ABCA-G Equilibration Spares Kit - Room temp O only	
71401-3	ABCA-G Equilibration Spares Kit - Room Temp O & H	
71601-1	LC Interface Spares Kit	
ADDITIONS		
PC	Windows 7 based PC System with Callisto Software	
Printer	Printer	
INST1	Installation and start up training at customer's site by Sercon Engineer	
INST2	Installation and start up training at customer's site by Agents Engineer	
WARR	1 year warranty	
WARR2	2 year warranty	
TRAIN	Training in UK for one person for 3 days	
SCONTRACT	Maintenance Service Contract – 1 year	

3 - MACHINE SPECIFICATION

Client:	The University of Arizona		
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SPECIFICATION REQUIREMENTS			
Voltage	Volts 50/60Hzs		
Plug Type	SI2510	3 Metre USA/Japan plug to IEC C 13	
	SI2511	2.5 Metre Australian plug to IEC C 13	
	SI2512	3 Metre UK 13 amp Fused plug to IEC C 13	
	SI2523	3metre Schuko (Euro) Plug to IEC C13 Socket	
	SI2514	2.5 metre Chinese mains to IEC C13	
Pallet	Stamped for export heat treated for 30 min @ 56 °C		
	Complies with all Export Requirements		

4 - LOG SHEET

Client:	The University of Arizona		
Quotation Number:	17518	Date:	06/11/2023
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Date	Action Taken	By Whom
26/7/24	He reconnected after productions work	AD
	Attempted to set ref gas flows but ratios not correct - replacing	
30/7/24	Source inlet for Samples connected but valve missing (ferrule and screw connection) - added in	AD
	Vacuum not reaching - Sample iso valve not got a fitted ferrule - replaced	
31/7/24	Pumps turned back on waiting for vacuum	AD/PH
	Vacuum not reaching 10^{-7} , blanked off ref isolation valve	
1/8/24	Overnight vacuum 10^{-8} , Filament fired OK	
	Ref gases set to around 2ml/min	
	Blanked off ref iso + Sample iso, pumping down	
06 Sep 24	Ref gas isolation valve damaged. does not pump down. Ref gas tailing. Replaced Ref gas isolation valve for new. Now OK.	AD/H
06 Sep 24	Retuned + moved magnet for HD ref gas. Peak shape + Stability OK. Ran Ref gas Prec + Linearity, Results OK. Prec = 0.197% Linearity = 0.533%	AD/H
06 Sept	Emissions high. Filament needs changing	AD/H

4 - LOG SHEET

Client:	The University of Arizona		
Quotation Number:	17518	Date:	06/11/2023
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Date	Action Taken	By Whom
9-9	Values 8, 9, 10 wired to incorrect pins on terminal block, changed to correct	AD/HIC
	C and N retested After magnet move looks OK, removed source to replace filament as emissions very high	
10-9	Problem with grub screw on source magnet, removed by SM. Source fitted again and left to pump down overnight	HC
11-9	Filament conditioned in morning. left to settle. Attempted to find CO2 - no response removed source to check gas feedthrough still in place checked filament and changed for new Refilled source and left to pump down conditioned at end of day	HC
12-9	Still no response from source, checked head amp for shorts - nothing found checked plumbing for leaks - nothing found	HC
	Swapped source for test rig source, response on beams - looking over source for problem	
17 Sep 24	Removed source - found several issues. Main issue HP not connected to correct bulk head. Refilled & pumped down. Trap with not fire + limits. Removed & rebuilt fitted new source back & wrapped	DTT

4 - LOG SHEET

Client:	The University of Arizona		
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Date	Action Taken	By Whom
7 Sep 24	Fitted newly rebuilt Source. Pumped down - ok. Conditioned - ok. Emissions 120 μ A Trap @ 500 μ A - ok.	DJH
19-9	Emissions really high for N_2 , flashovers keep occurring, removed source filament looks okay but lots of burn on back plate, replaced for new. System pumping down.	AD
27 Sep 24	Beams unstable. Emissions rise the larger the source is in place + powered. Removed source and replaced with new filament. Refilled with new filament and conditioned. Initial emission ok @ 1750 trap at 600 μ A. left with isolation valve close closed in N_2 tuning for 6 hrs. Checked again and emission had risen to 2500 μ A. Unable to check stability as He cylinder empty.	DJH
2-10	Spec'd out CO_2 and N_2 - passed leaving emag on lower current for H_2 tomorrow	AD
3-10	H_2 gas passed, setting emag higher again	AD
9-10	laser furnace heated to 600 @ 110V	SM

4 - LOG SHEET

Client:	The University of Arizona		
Quotation Number:	17518	Date:	06/11/2023
Job Number:	IN1330	Date:	18/12/2023

Date	Action Taken	By Whom
27/2/24	PC Set up, 2022 Setup and pumping down 2:40pm	EW
19/3/24	Manifold not supplying enough air for Valco or -20/3/24 Cryotrap to function - checked for leaks in the air supply & rearranged positions of blanks in the manifold. Valco (V11) & frontmost cryotrap (V14) then worked when clicked on Callisto	
20/3/24	Backmost cryotrap (V13) not lowering when V13 clicked on callisto due to sticky pneumatic actuator. Attempts to resolve the issue with lubrication were unsuccessful, so actuator was removed for repair/replacement	
21/3/24	Found HD peak roughly with emag still on C, N1 setting. Left emag to cool down to hydrogen parameters	AD/HC
22/3/24	Emag at 4000, attempting to locate HD. Checked head amp connections were correct, checked VCF connected. Checked the wires in the HD amp, needed to swap them over.	AD/HC
	Source keeps flashing over when looking for HD - internal bake carried out	
	Baked out the flight tube, moved the magnet and found HD peak, nitrogen looks okay, carbon not the best. leaving Emag on HD over weekend.	
21/8/24	Ref gas isolation valve swapped with IN1339B, not yet been respected for ref gas	HC



5 - FAULT REPORTING

Client:	The University of Arizona		
Quotation Number:	17518	Date:	06/11/2023
Job Number:	IN1330	Date:	18/12/2023

[illegible]

6 - TEST / ACCEPTANCE SPECIFICATION

Customer:	The University of Arizona		
Quotation Number:	17518	Date:	06/11/2023
Job Number:	IN1330	Date:	18/12/2023

HS20-22			
Reference Gas Precision (n=5)			
¹³ C	(CO ₂)	0.06	
¹⁵ N		0.06	
¹⁸ O	(CO ₂)	0.06	
³⁴ S	(SO ₂)	0.1	
² H		0.4	

Reference Gas Linearity			
¹³ C	≤0.02‰/nA		
¹⁵ N	≤0.02‰/nA		

IsoEarth & IsoEarth+					
Combustion (n=5)					
¹³ C	100 µg C	0.1		10 µg C	0.8
¹⁵ N	100 µg N	0.15		10 µg N	1.5
³⁴ S	25 µg S	0.3		10 µg S	1.0
Dual	400 µg C	0.1		100 µg N	0.15

Integra2			
¹³ C	100 µg C	0.2	
¹⁵ N	100 µg N	0.3	
Dual	100 µg N & 400 µg C	0.4 & 0.15	
³⁴ S	30 µg S	0.5	
¹⁸ O	100 µg O	0.5	

6 - TEST / ACCEPTANCE SPECIFICATION

Customer:	The University of Arizona		
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HT-EA			
Pyrolysis (n=5)			
¹⁸ O	100 µg O or 1 µl water	0.3	
² H	200 µg H or 1 µl water	1.0	

Aqua, µCarbs & GasBox					
Equilibrations (n=5)					
¹⁸ O	0.2 ml water	0.1			
² H	0.2 ml water	2.0			
Carbonates (n=5)					
¹³ C	100 µg CaCO ₃	0.08			
¹⁸ O	100 µg CaCO ₃	0.1			
Gas Analysis (n=5)					
¹³ C	5% CO ₂	0.1		Air CO ₂	0.1
¹⁸ O	5% CO ₂	0.1		Air CO ₂	0.2
² H	0.5 ml H ₂	1.5			
¹⁵ N	0.5 ml N ₂	0.1		100 ppm N ₂ O	0.5
¹³ C	Breath (12 ml)	0.1			
DIC (n=5)					
¹³ C	15ppm (0.5ml)	0.15			

LC-I			
(n=5)			
¹³ C		0.2	

6 - TEST / ACCEPTANCE SPECIFICATION

Customer:	The University of Arizona		
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GC Orchid						
Combustion (n=3 for each analyte)						
¹³ C	3 Alkanes	100 ng C	0.2		10 ng C	0.5
¹⁵ N	2 Amines	100 ng N	0.5		14 ng N	1.5
Pyrolysis (n=3 for each analyte)						
² H	3 Alkanes	250 ng H	3.0		25 ng H	10.0
¹⁸ O	3 FAMES	100 ng O	0.5		20 ng O	2.0
Water pyrolysis (n=5)						
² H	0.1 µl water	3.0				
¹⁸ O	0.1 µl water	0.4				

CryoRange						
(n=5)						
¹³ C	Air CO ₂ (12ml)	0.1		Air CH ₄ (125ml)	0.2	
¹⁵ N	Air N ₂ (1ml)	0.1		Air N ₂ O (125ml)	0.4	
¹⁸ O	Air CO ₂ (12ml)	0.15		Air N ₂ O (125ml)	0.7	
¹⁸ O	Air O ₂ (1ml)	0.1				
² H	Air CH ₄	3.0				
¹³ C	TOC (5ppm)	0.4				
¹³ C	Laser					

6 - TEST / ACCEPTANCE SPECIFICATION

Customer:	The University of Arizona		
Quotation Number:	17518	Date:	06/11/2023
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Geo2			
Internal precision (no change overs)			
² H	200 Bar µl	0.15	
¹³ C	100 Bar µl	0.01	
¹⁵ N	100 Bar µl	0.01	
¹⁸ O	100 Bar µl	0.015	
³⁴ S	100 Bar µl	0.015	
Single cold finger volumes (10 change overs)			
¹³ C	20 Bar µl	0.01	
¹⁸ O	20 Bar µl	0.015	
¹³ C	3 Bar µl	0.02	
¹⁸ O	3 Bar µl	0.03	
CAPS (n=5)			
¹³ C	50 µg CaCO ₃	0.03	
¹⁸ O	50 µg CaCO ₃	0.06	
WES (n=5)			
² H		1.0	
¹⁸ O		0.05	
Manifold (10 tubes)			
² H		0.5	
¹³ C		0.02	
¹⁵ N		0.02	
¹⁸ O		0.03	
³⁴ S		0.03	



Test acceptance - 6

Sercon Ltd, Unit 3B Crewe Trade Park, Gateway
Crewe, Cheshire CW1 6JT, UK
Tel: +44 (0)1270 580008 Fax: +44 (0)1270 252310
Company Registration No. 4290072 Vat No. 771 1100 74

6 - TEST / ACCEPTANCE SPECIFICATION

Customer:	The University of Arizona		
Quotation Number:	17518	Date:	06/11/2023
Job Number:	IN1330	Date:	18/12/2023

Special tests

Sales Signature: <i>[Signature]</i>	Date: <i>17/10/24</i>
Test Signature: <i>[Signature]</i>	Date: <i>17/10/24</i>

7: ASSEMBLY AND TEST RECORD

Client:			
Quotation Number:		Date:	
Job Number:		Date:	

PRODUCT:

CRYOPLEX

SERIAL NUMBER:

10802/8-2024-1330

 ASSEMBLED:
 (Name)

[Signature]

Date:

7/2/24

 PRE-TEST
 INSPECTION:
 (Production name)

P. Hays

Date:

7/2/24

 PRE-TEST
 INSPECTION:
 (Test name)

S. Moser

Date:

7/2/24

 SYSTEM TEST:
 (Name)

S. Moser

Date:

15/10/24

 PRE-DESPATCH
 INSPECTION:
 (Name)

P. Hays

Date:

17/10/24

P.A.T. Test results

 In compliance with Low Voltage directive 73/23/EEC
 To Low Voltage standard EN61010 – 1:1993

Earth Continuity

0.071 Ω

Insulation

7300 $M\Omega$

Earth Leakage Current

0.75 mA. @ 0.7 kVA.

Tested by:

[Signature]

Date:

7/2/24

7: ASSEMBLY AND TEST RECORD

Client:	The University of Arizona		
Quotation Number:	17518	Date:	06/11/2023
Job Number:	IN1330	Date:	18/12/2023

PRODUCT:

2022

SERIAL NUMBER:

20402/4-2024-1330

 ASSEMBLED:
 (Name)

[Signature]

Date:

27/2/24

 PRE-TEST
 INSPECTION:
 (Production name)

P. Harp.

Date:

27/2/24

 PRE-TEST
 INSPECTION:
 (Test name)

S. Moss

Date:

27/2/24

 SYSTEM TEST:
 (Name)

S. Moss

Date:

15/10/24

 PRE-DESPATCH
 INSPECTION:
 (Name)

P. Harp

Date:

17/10/24

P.A.T. Test results

 In compliance with Low Voltage directive 73/23/EEC
 To Low Voltage standard EN61010 – 1:1993

Earth Continuity

0.064
 Ω

Insulation

7300
 $M\Omega$

Earth Leakage Current

< 0.25

mA. @

0.05

kVA.

Tested by:

[Signature]

Date:

27/2/24

8 - Serial Numbers Record Document

Client:	The University of Arizona		
Quotation Number:	17518	Date:	06/11/2023
Job Number:	IN1330	Date:	18/12/2023

Units	S/N
MS/ABCA	20402/4 - 2024/1330
Integra 2	
Prep Unit 1	10802/8 - 2024/1330
Prep Unit 2/Misc	
Electronics Upgrade	
CETAC	
Gas Box	
Autosampler	42701
BCR	
Dual Heater Block	

Pump Kit and Optics	S/N
Turbo pump S	240333333
Turbo pump A	240279204
Rotary Pump	230719830
Voltage	110 / 240
Gauge S	140112606
Gauge A	240027073
Source	20101MS-233
Collector 1	20301 - 151
Collector 2	20501 - 063
Magnet	

Parts	S/N
Fan PSU	
24V PSU	

PCBs	S/N
Electronics Box	2024008
Prep PCB	20230016 - CRYO
VFC PCB	2024004 - P120
Watchdog PCB	VFC 23015
Head Amp PCB 1	24001
Head Amp PCB 2	24008
Electromagnet RP	143

Furnaces	S/N
Combustion	
Reduction	
HT-EA	
GC Oven	
Furnace 1	
Furnace 2	

PC	S/N
PC	HX189X3
Monitor	1JWP4V3
Printer	N/A

Key

Pumps:	E: Edwards P: Pfeiffer
Furnaces:	V/S: Vecstar E: Elite
Magnet:	E: Electromagnet S: Standard
Turbos & Gauges:	S: Source A: Analyser
Collectors:	Std: Standard S: Sulphur HD: Hydrogen Deuterium

Additional System Info:

Furnace Controller - 3809/02/24.

11 – Installation Report

Client:	Uni of Arizona Tucson USA		
Quotation Number:		Date:	
Job Number:	IN1330 / IN1331	Date:	17 Jan. 25

Contact:	Soumaya Belmecheri / Peter Brewer		
Date of Visit:	6 th – 17 th Jan 2025	No. of Days:	10
Engineer:	David Harris		

Details of visit:

Arrived on site and began setup of instruments.

Lab is not in a finished condition with construction work being carried out in and around the lab at all times during the 2 week installer period. There is an especially high prevalence of dust within the lab.

The aircon in the lab is not functioning correctly at the start of the install, resulting in the room being very warm during the first week. It was found that the temp detectors had been fitted in the control office and not within the lab. Advised users of the importance of temperature control within the lab and the effects on magnet drift if the temperatures are constantly changing.

UA Contractors moved thermostat to lab area towards the end of the first week – Temp in labs dropped – All OK.

Removed all parts from boxes. No surface damage noted to most instruments. Front left foot of Cryo-LA is at slight angle due to possible knock during transport.

Set instruments on desk tops. The power lead and the USB comms port for the PyroEarth are very short which dictates the positions of the units – All OK

Installed rotary pumps with new oil – All OK

Fitted perm magnet – All OK.

Installed PC and established comms to all units. All readbacks respond as normal – All OK.

Gas lines are not fully installed. O2 line and regulator not installed for first week of install. Customer has had a large number of issues with the leaking backline plumbing as a result Helium, Hydrogen and Oxygen lines in unusable state once installed by contractors. Cylinders brought to rear of instrument for install purposes. UA is to finish installing gas lines and regulators fully and plumb lines in themselves after engineer has finish install.

Engineer installed backline plumbing into instruments using steel pipework supplied by customer. Leak checked all lines – All OK.

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HS2022

Pumped down instrument. 2022 Vac pressure got down to 8.4e-8mBar within a few hours – All OK.

Turbo pump readback speed @93K rpm – All OK.

Powered on Ion Source, left in Standby setting over night to stabilise – All OK.

Overnight vac of 1.0e-08mBar – All OK.

Emissions approx. 112µA with Trap set to 50µA – All OK.

Beams present but IR setting not responding via tuning window. Constant 0 readback. Investigated Ion Source. Found short between IR and HT. Vented instrument and removed Ion Source. Inspected IR location and cleaned out area. Short now fixed. Reseated Source and pumped down system. All tuning parameters now respond – All OK.

Tuned instrument using Ref gas via Callisto – All OK

Positioned magnet as required – All OK.

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2/1 & 3/1 peak shapes & stability good – Pass.
 Precision and linearity tests also good.
 Checked background scan. Background very low – All OK.
 Setup crimps and flows are required – All OK.

Precision test - n=5 (5 second CO₂ / N₂ / H₂ pulses) with two 5 second REF points and drift corrected.
 Linearity test – N=6 (1,2,4,6,8,10 second CO₂ / N₂ / H₂ pulses) with two 5 second REF points and drift corrected.

CO₂ Peak Shape (2/1) = Pass
 CO₂ Stability (2/1) = Pass
 CO Peak Shape (3/1) = Pass
 CO Stability (3/1) = Pass

Ref Gas ¹³C Precision = 0.018‰ S.D.
 Ref Gas ¹³C Linearity = 0.033‰ S.D.
 Ref Gas ¹⁸O Precision = 0.052‰ S.D.

N₂ Peak Shape (2/1) = Pass
 N₂ Stability (2/1) = Pass

Ref Gas ¹⁵N Precision = 0.043‰ S.D.
 Ref Gas ¹⁵N Linearity = 0.042‰ S.D.

HD Peak Shape (2/1) = Pass
 HD Stability (2/1) = Pass

Ref Gas HD Precision = 0.058‰ S.D.

HS2022 was stable for the first week, however on the Monday of the 2nd week high levels of instability on all 3 beams began to present themselves.

Investigated Head amp and fittings – Found connections to be loose, especially to suppressor. Retightened connections, now secure – All OK. Instability still present.

eMag settings fluctuating and peak position on Ref Gas drifting. Remove eMag panel to inspect. Found connections to be loose. Secured connections – All OK. Instability improved but still present.

Opened up System Controller to inspect. Adjusted current resistor settings. eMag readbacks now stabilised - All OK.

Instability issue resolved – All OK.

HS2022 passes all Specs required – System good to use.

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PyroEArth

Set up PyroEArth.

No comm issues – All OK.

Main furnace temp readback not functioning correctly. Furnace heats but readback remains at room temp.

Removed back panels to PyroEArth to investigate. Thermocouple had become detached from main furnace. Reseated thermocouple and secured holding screws to holding bracket. Temp readback now responds correctly – All OK.

Reduction tube for N&C analysis does not fit correctly into 2nd furnace. Repositioned furnace at rear brackets – All OK.

Earthing connection to 3rd furnace no attached. Fails visible inspection, not in correct position. Removed 3rd furnace and reattached earthing connections. Reseated 3rd furnace in to correct position – All OK.

All 3 furnaces now respond as normal – All OK.

Baked out GC column at 130°C over night.

Set to 100°C for HD pyrolysis, 65°C for ¹⁸O pyrolysis – All OK.

All valves function okay. No issues with pneumatics – All OK.

Blank tests good after line purging by customer (>3.0e-10 major beam height) – All OK.

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Engineer suspects that units had been rattled about during transit to Arizona causing the loose fittings issues on the HS2022 & PyroEarth.

Demonstrated to user how to make up combustion/pyro/Water & CO₂ trap tubes.

User made and fitted pyro-tube for ¹⁸O & HD analysis – All OK.

Small sized scrubber tubes not present within spares/start up kits. Adjusted plumbing accordingly to fit larger scrubber tube types. This should provide no issues for required analysis.

Set He flow to 80ml/min for pyrolysis analysis.

Adjusted timing windows and events as required within method for HD and ¹⁸O analysis.

Results go for spec batches.

HD precision = 200µg H using sucrose samples, n=5. Results drift corrected.

¹⁸O Precision = 100µg O using sucrose samples, n=5 Results drift corrected.

Pyrolysis HD Precision = 0.164‰ S.D.

Pyrolysis ¹⁸O Precision = 0.101‰ S.D.

All pyrolysis Specs pass – All OK.

Cooled off HT furnace and changed over to combustion mode – All OK.

Pressure tested system. Pass – All OK

Customer is not currently planning to use the instrument for sulphur analysis. Set up for N&C mode. 3rd furnace bypassed – All OK.

Adjusted timing windows and events as required within method for DUAL ¹⁵N & ¹³C analysis – All OK.

Batch samples used AS BEET MIX liquid samples.

Precision batch range = N 100µg, C 400µg, n=5, results drift corrected

Linearity batch range = N 10-200µg, C 25-500µg, n=6, results drift corrected.

Combustion ¹³C Precision = 0.026‰ S.D.

Combustion ¹³C Linearity = 0.105‰ S.D.

Combustion ¹⁵N Precision = 0.022‰ S.D.

Combustion ¹⁵N Linearity = 0.059‰ S.D.

All Specs pass for PyroEarth – All OK.

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Cryo-LA + Teledyne LSX-213 G2+

Setup pressures and flows on unit – All OK.

Set GC flow to 12ml/min as max flow.

Baked out GC column at 130°C over night. Set to below room temp for analysis, (heater off) – All OK.

All valves function okay. No issues with pneumatics – All OK.

Teledyne engineer joined lab for setup of laser – Laser passes all specs and is installed with no issues – All OK.

Fault with furnace – lower fitting which houses thermocouple was blocking aperture. Removed assembly and filled out screw holes so that part can be fitted correctly. Reseated all parts. Combustion tube now fits through furnace – All OK.

Furnace responds as normal. No further issues with furnace – All OK.

User prepped and fitted combustion tube for furnace. Temp set to 860°C – All OK.

Cryo-LA shows no signs of leaking during analysis. Blank is approx. 1nA in signal. This is normal for laser sampling technique.

Issue with software setup for trigger cable. Software setup for incorrect ports. Re-setup software to reflect current workings -All OK. HS2022 successfully triggers laser ablation.

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Teledyne engineer provided training on setup and use of LSX-213 G2+ - All OK.
Current method does not require O₂ line in to be present. Internally remove 3 way t-connection between furnace/He carrier flow/O₂ input the reduce dead-volume effect on flows. Piping in still in place if the user wished to refit the O₂ lines at a later date. No O₂ pulse required for combustion of sample.
Set up auto LN₂ delivery system. Issue with comms. Reinstalled software – This scrambles comms to all Sercon instruments. Reset comms for all units – All OK. Comms established
LN not fully tested during install as customer did not want to fill vessel with LN₂ due to shortage of supply.

Flow set to 30ml/min via laser MFC control.
Laser setup = 40% power – Fluence 6.06 – Rep 10 – Iteration 1 - 100µm circle - 50µm speed 0.5-0.7mm cellulose.
Tested samples using cellulose IAEA-C3.
Normal mode n=5, RGI mode n=3.

Laser Ablation (normal mode) ¹³C Precision = 0.115‰ S.D.
Laser Ablation (RGI mode) ¹³C Precision = 0.074‰ S.D

All Spes passed.
All units handed over to customer for general use.

Provided training on software.
Provided over view of MS theory.
Explained how MS tunes and how the beams react to different settings.
Explained how different prep units function.
Gave training on daily checks and tests.
Gave training on how to set up and run batches
Gave training on use of Reprocessor software - How to alter timing windows / change sample lists, etc.
Gave training on how to build methods (timings, tune settings, events, etc) for normal and RGI mode.
Gave over view of Sercon Folder and where data results can be located.

Customer had ordered UPS from Sercon. Supplier set item with incorrect power plug sockets. Sercon to contact supplier and resolve issue. As a results UPS was not used or powered on during engineer visit.

Install complete.

12 – Installation Acceptance and Warranty Certificate

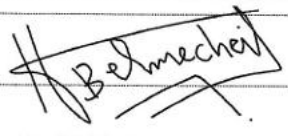
Client:	Uni of Arizona Tucson USA		
Quotation Number:		Date:	
Job Number:	IN1330 / IN1331	Date:	17 Jan. 25

Contact:	Soumaya Belmecheri / Peter Brewer
System:	HS20-22, PyroEarth, Cryo-LA with Teledyne LSX-213 GC+
Software:	Callisto V50.0.0 CallistoRepro V50.0.0
Engineer:	David Harris
Installation Date:	17 th January 2025

Warranty commences:	17 th January 2025
Warranty Expires:	17 th January 2027

Customer Acceptance:

Name: SOUMAYA BELMECHERI

Signature: 

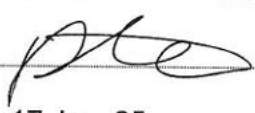
Date: 17 JAN 2025

Notes:
N/A

Engineer's Signature:

On behalf of Sercon Limited

Name: David Harris

Signature: 

Date: 17 Jan. 25