

11 – Installation Report

Client:	South Dakota Board of Regents		
Quotation Number:	17325	Date:	06/09/2023
Job Number:	IN1325	Date:	31/10/2023

Contact:	Janet Miller		
Date of Visit:	19 th February 2024	No. of Days:	5
Engineer:	James Hanson		

Details of visit:

Day 1 – Original GSL system decommissioned, tubes removed and system placed on another table in the lab. New isoEArth lifted onto table, original PC used for comms with isoEArth project copied from USB drive. Customer has 2 new PCs from Sercon from within the last 2 years. Comms established. All gas lines connected, using same prep inlet line from previous unit. Gases turned on. MFC and thermocouple readbacks not working, restarted the unit and restarted the board, MFC readbacks now working. New tubes made for combustion and reduction and water traps x2 (customer originally not using CO2 traps so doubled up on water traps). System passed pressure test from He inlet to block valve in isoEArth. ~70ml sample flow measured on pigtail of prep isolation valve. CO2 and N2 peak shapes found. System set to operating temperature in stages.

Day 2 – Blanks run to condition tube, low blank under 3.0×10^{-10} quickly established. 5ul samples of 400-100 used to check combustion and timing settings. Sample time of around 380s used in test so replicated here, good combustion and decent species separation at 60ml He and 60ml O2 flows. GC at 60 Celsius seems OK but later driven to 65 Celsius. CO2 peak shape found and tuned, stability looking good. Nitrogen peak shape found, stability looking good also. ~15nA signal for both species. Dual precision run put on but both species looking poor. Some instability observed on N2 stability run, system controller restarted but no improvement. Customer advised me that the filament and oil had not been changed since early 2022. System vented to change filament and oil. System set to pump back down after getting new filament, new oil, new gasket and new PTFE source inlet ferrule. Good vacuum achieved an hour or two later, filament conditioned and left overnight to outgas.

Day 3 - Peak shapes for CO2 and N2 found again, vacuum down at 2.8×10^{-8} mBar. Source cable reseated in system controller due to beam instability. Head amp cables checked and reseated. Dual precision run failed again for both species. Instability can be seen during sample runs. New combustion tube made, blanks run and tube conditioned. Dual precision run nitrogen fails but CO2 passes. Second batch run for dual precision, again N2 fails but CO2 passes. Swapped PC for newer one.

Day 4 – Head amp investigated, found to be loose on the ground connection and other cup soldering not good quality. Resoldered and refitted. Dual precision runs still only passing CO2. Dual linearity run put on, with CO2 passing linearity spec. Nitrogen retuned and combined precision and linearity run overnight.

Day 5 – Overnight samples for Dual Precision and Linearity looked stable. Nitrogen failed both specs, but CO2 passed both. Leak angle investigated, valco tee opened from prep 2 trapping loop side and replaced with 6 thou pipe with fully closed crimp on the end. Trapping loop isolation valve used to swap out prep isolation valve, presumed leaking. System checked for blanks, various system connections tightened to try and bring ambient nitrogen down. Eventually settled around 5.5×10^{-11} ambient nitrogen. Nitrogen only mode used to check precision, sample directed through CO2 trap and precision achieved of 0.05 permil. Full batch of dual precision and linearity samples made. System set to bypass CO2 scrubber, blanks checked and confirmed low. Retuned CO2 and N2, batch set off again over lunch. Batch failed both precision and linearity for Nitrogen. V10 oxygen purge event removed from events as purge is not present in N2 only events. Batch failed N2 but passed CO2. System condition as left – Not in spec, at full temperature, standby source mode, 15ml He flow.

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Recommendations:

Considerable amounts of static electricity in the lab – chromasorb physically jumping off the spatula when put near the tin caps. Get electrics checked for grounding and stability of power supply.
Communicate with us to find the fastest suitable date for a revisit from one of the engineers.

Faults and Shortages:

Follow up:

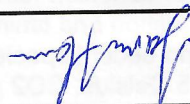
Revisit to be organised.

Engineer:

James Hanson

Date: 23rd February 2024

Signed:



Contract:	Label Miller
Date of Visit:	10 th February 2024
Engineer:	James Hanson
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Date:	31/10/2023
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