Quantum Design

S-VSM Service Note 1500-203

Nitrogen Exhaust Plugged

There are cases when the nitrogen exhaust mechanism of the SQUID VSM fails due to plugging, presumably by air leaking into the dewar. If the rear, external exhaust fails to operate properly, this situation must be remedied before a transfer of more liquid nitrogen. While the front fill and exhaust ports for the nitrogen are a safety release, they should not show venting during normal transfers. If there are limited exhaust capabilities, an overpressure in the nitrogen tank can lead to a catastrophic failure of the dewar and damage to the probe.

The primary advice is to verify there are no leaks into the nitrogen dewar. Check that both front exhausts have the proper o-rings in place and are secure. Kink the rubber tubing coming from the rear exhaust and allow a slight pressure to build up such that releasing the kink results in a burst of nitrogen gas. This test would verify the rear pressure relief valve is operational and the exhaust is at least somewhat clear. If during the start of the transfer the rear exhaust does not open within the first 30 seconds, then stop transferring.

It is recommended to transfer the nitrogen and helium on separate days. Since there is no nitrogen level meter and the presence of nitrogen is critical for low temperature operation and minimizing consumption of helium, the nitrogen should be added once a week. Do not use a high pressure (~200 psi, ~14 bar) liquid nitrogen storage dewar, but instead stay with the lower pressure (22 psi, 1.5 bar) rated nitrogen containers. The helium should be added as needed.

It is well known that for nitrogen jacketed dewars, the transfer of helium will cause cooling of the nitrogen tank such that a vacuum is pulled. Even though there is plenty of nitrogen in the tank, this vacuum can lead to accumulation of ice inside the exhaust ports if there is a leak or if the nitrogen ports are opened shortly after a helium transfer. Normally, this situation will return to equilibrium within a few hours after the transfer of helium and the nitrogen gas boil-off will exhaust as expected. However, there could develop situations where the exhaust ports are frozen open or leak in such a way as to generate a large enough ice plug that completely prevents the exhaust port from working. The solution is to clear the ice plug, find the source of leak and fix it.

Do not confuse the accumulation of ice on the outside of the exhaust lines with a plugging of the exhaust. With high boil-off rates, ice is expected to appear, especially near the top of the dewar, under the foam insulation.

Please do not hesitate to contact customer service for additional guidance and the procedure for establishing proper flow out the rear exhaust.

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