



Quick Look Test Report

Document No.: 3167-27000 v1.01

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|---|--------------------|---|-----------------------------------|--|------------------------|---------------------|
| Test Event Name: | | Open-ocean Glider PVT CG-VE-3100 | | Test Plan Document No.: | Test Plan Rev.: | Report Date: |
| | | | | 3167-20000 | 2-00 | 2012-10-15 |
| Test Report Reviewed & Approved By | | | | | | |
| Quality Engineer (Print Name) | Signature | Date | Test Director (Print Name) | Signature | Date | |
| Michael A. Zernick | Michael A. Zernick | 10/17/12 | Ed Dever | In lieu of electronic signature | 10/15/2012 | |

Test Event Description

This document summarizes OOI Open-ocean Glider Product Verification test activities occurring prior to the deployment of the glider in the Southern California Bight. Activities were performed by Teledyne Webb Research (TWR) in and around the TWR factory in Massachusetts. Details of individual requirements verified in these tests are documented in DCN3167-20101-00001 and 3167-20102-00001.

| Test Results | | | | | |
|----------------------|-------------------------|--|--|--|--|
| Test Case ID | Test Name / Description | Test Results / Data | Test Conclusions | Corrective Action | Requirement ID |
| TC-001/ Ver-CG-67 | Inspections | Inspections showed the relevant requirements were met by the glider. | The relevant requirements are verified for the open-ocean glider design. | None | L4-CG-GD-RQ-214 L4-CG-GD-RQ-120 L4-CG-GD-RQ-155 L4-CG-GD-RQ-89 L4-CG-GD-RQ-167 |
| TC-001/ Ver-CG-67 | Inspections | Inspections showed the relevant requirements were met by the glider. L4-CG-GD-RQ-168 was waived. | The relevant requirements are verified for the open-ocean glider design. | Requirements partially waived. Requirements are not realistic for the deployment locations of the open-ocean glider. See Appendix A: | L4-CG-GD-RQ-168 |
| TC-002/ Ver-CG-69 | Sheltered Water Testing | Demonstrations showed the relevant requirements were met by the glider. | The relevant requirements are verified for the open-ocean glider design. | None. Modem development is ongoing. | L4-CG-GD-RQ-216 L4-CG-GD-RQ-146 |

Appendix A: Glider ballasting limits and requirement and L4-CG-GD-RQ-168

The TWR Slocum Glider platform is used in a wide variety of deployment conditions from lakes to the Arctic and Antarctic oceans. When correctly ballasted, typical commercial off-the-shelf (COTS) Slocum Gliders can operate in waters with densities ranging from 995kg/m^3 to 1032kg/m^3 . These densities cover the environmental extremes specified in requirements L4-CG-GD-RQ-167 and L4-CG-GD-RQ-168 (-2°C to 30°C temperature, 0PSU to 40PSU salinity). Additionally, the engineering and scientific systems are able to tolerate these extremes in temperature and salinity individually. So, the COTS configuration can satisfy these requirements both as individual extremes and in their combined effect on water density. It should be noted that, while the glider can be ballasted to either extreme of density, the density range accessible to the glider in any one deployment is $\sim\pm 5\text{ kg/m}^3$ owing to the limited amount of ballast water (a total of 500cc) the glider can take on and expel.

Compared with the typical COTS glider, the OOI Open-ocean Glider design incorporates an extended-range battery bay with 36 additional Li primary DD cells. This raises both the glider displaced volume and weight relative to the COTS design. Since the weight of the additional batteries is greater than the weight of the water displaced by the extended-range bay, the minimum density water in which the glider can operate is increased to 1003.8 kg/m^3 . The maximum density of seawater is found at $\sim 4^\circ\text{C}$, and the density/temperature curve is fairly flat near the minimum, as shown in Figure 1 for the 1003.8 kg/m^3 isopycnal. Even at the 30°C (i.e. the temperature requiring the greatest salinity required to achieve a given density), the salinity required to reach the 1003.8 kg/m^3 isopycnal is $\sim 11\text{PSU}$.

As a result, ECR 1303-00842 was requested and approved as a waiver for requirement L4-CG-GD-RQ-168. The historically-encountered salinity ranges at the global sites are:

- Station Papa: 32.58
- Irminger Sea: 34.65
- Argentine Basin: 34.48
- Global South (55 S): 34.11

which are all well in excess of the minimum 0PSU salinity from L4-CG-GD-RQ-168.

No waiver is required for L4-CG-GD-RQ-167.

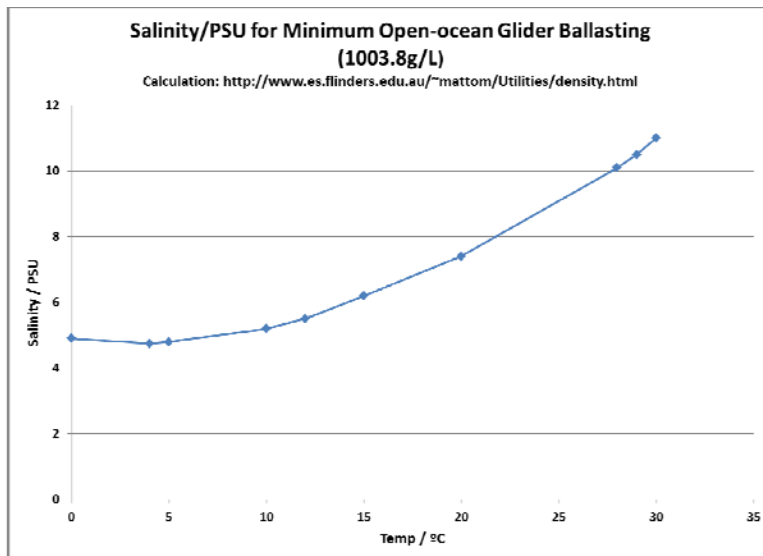


Figure 1: Temperature/salinity curve for seawater at the minimum density for which the OOI Open-ocean Glider can be ballasted.