



SPECIFICATIONS FOR 3-D SINGLE POINT CURRENT METER (VEL3D) INSTRUMENTS ON PROFILERS

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Specifications for 3-D Single Point Current Meter (VEL3D) Instruments on Profilers

Document Control Sheet

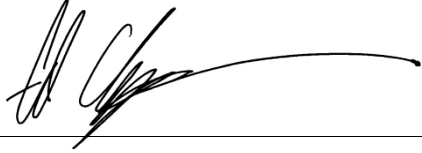
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1-03	05-05-2011	Revised VEL3D-00x to VEL3-00x spec ID code to be consistent with naming in other specs, changed velocity range to 4.8 m/s from 5 m/s, added CG req to temperature specs.	Lorraine Heilman
1-04	05-11-2011	Replace Common Spec with platform specs as applicable document; edited section 1.2; supplied open ocean range; removed \pm from resolution	Arthur Salwin (Noblis)
1-05	05-11-2011	Added references to requirements	Arthur Salwin (Noblis)
1-06	06-28-2011	Revised VEL3D definition per CCB; ECR 1300-00173	Arthur Salwin (Noblis)

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Signature Page

This document has been reviewed and approved for release to Configuration Management.

OOI Senior Systems Engineer:



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1 General

1.1 Ocean Observatories Initiative (OOI) Overview

Although the ocean is central to the habitability of our planet, it is largely unexplored. Biological, chemical, physical, and geological processes interact in complex ways in the ocean, at the seafloor, and at the air-sea interface. Our ability to learn more about these processes is severely limited by technical infrastructure, and developing a more fundamental scientific understanding of these relationships requires new and transformational approaches to ocean observation and experimentation.

The Ocean Observatories Initiative (OOI) will lay the foundation for future ocean science observations. OOI will enable powerful new scientific approaches by transforming the community's focus from expedition-based data gathering to persistent, controllable observations from a suite of interconnected sensors. The OOI's networked sensor grid will collect ocean and seafloor data at high sampling rates over years to decades. Researchers will make simultaneous, interdisciplinary measurements to investigate a spectrum of phenomena including episodic, short-lived events (tectonic, volcanic, oceanographic, biological, and meteorological), and more subtle, longer-term changes and emergent phenomena in ocean systems (circulation patterns, climate change, ocean acidity, and ecosystem trends).

The OOI will enable multiple scales of marine observations that are integrated into one observing system via common design elements and an overarching, interactive cyberinfrastructure. Coastal-scale assets of the OOI will expand existing observations off both U.S. coasts, creating focused, configurable observing regions. Regional cabled observing platforms will 'wire' a single region in the Northeast Pacific Ocean with a high speed optical and high power grid. Global components address planetary-scale changes via moored open-ocean buoys linked to shore via satellite. Through a unifying cyberinfrastructure, researchers will control sampling strategies of experiments deployed on one part of the system in response to remote detection of events by other parts of the system.

A more detailed discussion of the Oceans Observatories Initiative can be found in the OOI Final Network Design.

1.2 Document Scope and Purpose

This document provides specifications for instruments on profilers in the ocean that measure single point water velocity along three axes with the purpose of continuously determining point geospatial water velocities geospatial water velocities with resolution appropriate to making measurements of small-scale velocity changes. Two types of profilers are used: moored wire-following profilers and moored shallow/surface piercing profilers.

Moored wire-following profilers contain a suite of sensors that are raised and lowered through the water column on a regular basis. These are generally used for deep measurements and profiles that can extent to more than 1000 meters in depth. It is expected that these profilers will move vertically at speeds up to about 0.25 m/s.

Moored shallow/surface piercing profilers are expected to be used in the first 200 meters of the water column on OOI arrays. These profilers will carry a somewhat larger payload than wire-following profilers and can move vertically at speeds up to 0.5 m/s.

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1.3 Documents

1.3.1 Informational

The documents listed in this section are for informational purposes only.

- Consortium for Ocean Leadership, Inc. 2010, “Final Network Design”, Washington, D.C. [Online] Available: <http://www.oceanleadership.org/programs-and-partnerships/ocean-observing/ooi/network-design/>

1.3.2 Applicable

The documents in this section contain requirements and specifications applicable to the instruments being specified.

- See the relevant profiler specifications.

1.4 Definitions

1.4.1 Glossary and Acronyms

- **VEL3D** – The OOI five-letter code for a current meter that primarily measures point water velocity along three (3) axes. A temperature measurement is typically included with such instruments.
- **Burst sampling** – Sampling at an interval T1 for a short duration within a regularly scheduled interval T2. Typically $T1 \ll T2$.
- See the “Common Specifications for Instruments on Fixed Platforms” for other terms and acronyms.

1.4.2 Conventions

All values contained in this document are Threshold Values unless specifically stated otherwise.

References in angle brackets < > at the end of each specification are for information purposes only.

2 Specifications

2.1 Measurement

Values provided are threshold unless otherwise stated.

2.1.1 Single point 3-axis water velocity

a) Measurement with units

Single point 3-axis water velocity will be measured in m s^{-1} in magnetic earth coordinates (Magnetic North, Magnetic East, Up). Direction will be measured in compass degrees relative to magnetic north.

b) Range of speed measurement

VEL3-001 Single point 3-axis water velocities shall be measured in a speed range of 0 to 4.8 m s^{-1} for coastal locations and 0 to 2.0 m s^{-1} for open ocean locations. <L2-SR-RQ-3582, L2-SR-RQ-3851, L4-CG-IP-RQ-265, L4-RSN-IP-RQ-106>

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c) Range of direction measurement

VEL3-002 Single point 3-axis water velocities shall be measured in a direction range of 0 to 360 degrees. <L2-SR-RQ-3852, L4-CG-IP-RQ-606, L4-RSN-IP-RQ-682>

d) Accuracy

VEL3-003 The Single point 3-axis water Velocity instrument shall have a speed accuracy of $\pm 0.01 \text{ m s}^{-1}$ per sample at the sampling frequency listed in VEL3-007. <L2-SR-RQ-3139, L4-CG-IP-RQ-260, L4-RSN-IP-RQ-105>

VEL3-004 The Single point 3-axis water Velocity Instrument shall have a direction accuracy of ± 2 degrees. <L2-SR-RQ-3853, L4-CG-IP-RQ-266, L4-RSN-IP-RQ-683>

e) Precision

While precision is important to this measurement, a threshold value for precision is not provided in this document.

f) Resolution

VEL3-005 The Single point 3-axis water Velocity instrument shall have a speed resolution of 0.001 m s^{-1} . <L2-SR-RQ-3583, L4-CG-IP-RQ-261, L4-RSN-IP-RQ-415>

VEL3-006 The Single point 3-axis water Velocity instrument shall have a direction resolution of 0.1 degrees. <L2-SR-RQ-3854, L4-CG-IP-RQ-385, L4-RSN-IP-RQ-684>

g) Drift

While drift is important to this measurement, a threshold value for drift is not provided in this document.

h) Response Times

Not specified.

i) Sampling Frequency

VEL3-007 The Single point 3-axis water Velocity instrument shall be capable of sampling at a frequency of 10 Hz. <L2-SR-RQ-3584, L4-CG-IP-RQ-264, L4-RSN-IP-RQ-108>

j) Sampling Modes

VEL3-008 The Single point 3-axis water Velocity instrument shall be capable of burst sampling. <L4-CG-IP-RQ-607, L4-RSN-IP-RQ-685>

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2.1.2 Temperature

a) Measurement with units

Temperature (°C)

b) Temperature range

TEMP-001 The Single point 3-axis water Velocity instrument shall be capable of measuring water temperature over a temperature range of -2°C to +30°C. <L4-CG-IP-RQ-596, L4-RSN-IP-RQ-530>

c) Accuracy

TEMP-002 Temperature shall be measured with an accuracy of $\pm 0.1^\circ\text{C}$. <L4-CG-IP-RQ-597, L4-RSN-IP-RQ-111>

d) Resolution

TEMP-003 Temperature shall be measured with a resolution of 0.01°C . <L4-CG-IP-RQ-598, L4-RSN-IP-RQ-110>

2.2 Operational

2.2.1 Operational Depth Range

See platform specifications.

2.2.2 Environmental

See platform specifications.

2.2.3 Service Requirements

See platform specifications.

2.2.4 Calibration Requirements

See platform specifications.

2.2.5 Maintenance

See platform specifications.

2.2.6 Survivable Depth

See platform specifications.

2.3 Mechanical/Physical

See platform specifications.

2.4 Electrical

See platform specifications.

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2.5 Data Storage and Processing

DATA-001 Instruments shall be capable of vector averaging internally to compress the data and outputting the average. <L4-CG-IP-RQ-267>

2.6 Software/Firmware

See platform specifications.

2.7 Platform Interfaces

See platform specifications.

2.8 Compliance

See platform specifications.

2.9 Safety

See platform specifications.

2.10 Shipping and Storage

See platform specifications.

2.11 Identification

See platform specifications.

2.12 Quality

See platform specifications.