Nucleus 1000

1000 m

A deep-water-rated sensor hub that makes vehicle control and navigation possible.



The Nucleus 1000 is a sensor package that has all the necessary sensors and data products to aid in subsea navigation and vehicle control. This includes estimates of distance from the surface and bottom, attitude, heading and velocity. To learn more about the Nucleus 1000's capabilities, click here.

A shallow water (300 m rated) version of the Nucleus 1000 is also available in both standard and OEM housings.

Highlights

- Compact size optimal for small ROVs and AUVs
- Integrated AHRS for pre-calibrated attitude and heading information
- Dedicated vertical beam for altimeter information

Applications

- Integration with small ROVs or AUVs where payload is limited
- Navigation for vehicles which don't require survey-grade accuracy
- Backup navigational aid for coastal USVs
- Increase vehicle capabilities with combined current profiling and navigation solution

Technical specifications

Bottom tracking	
Maximum altitude	60 m
Minimum altitude	10 cm
Long-term accuracy	<0.3% (export-controlled), >1% (license-free)
Velocity resolution	0.01 mm/s
Single ping standard deviation	0.5 cm/s
Maximum ping rate	8 Hz [1)]

[1)] Maximum ping rate is range dependent

Water tracking	
Minimum accuracy	0.5% of measured value / +-0.5 cm/s
Minimum range	2.0 m

Current profiling	
Minimum accuracy	0.5% of measured value / +-0.5 cm/s

Current profiling

Velocity resolution	0.1 cm/s
Interval	User specified N^{th} ping
Maximum range*	30 m
Blanking	0.1 m
Cell size	0.2-2.0 m
Max # cells	150

*Dependent on measurement conditions

Altimeter

Range	50 m
Accuracy	1% of measured value
Resolution	1 cm

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Position accuracy of distance travelled[2)]	2% (export controlled), 4% (license-free)
Output rate	Configurable

[2)] Nominal position error, given as % of Distance Travelled. Value given is a reflection of a given set of operational conditions. Note that deviations from this specification can be expected in line with varying environmental conditions and integration parameters.

AHRS

Pitch and roll accuracy	0.35 deg
Heading accuracy[3)]	0.5 deg (export controlled), 2.5 deg (license-free)
Output rate	Configurable

[3)] Heading accuracy for nominal conditions. Vehicles or environments which disturb the magnetic field will degrade performance

Pressure sensor

Pressure accuracy	0.3% FS (precision better than 0.003% of full scale per sample)
Temperature	-4° to +40°C ± 0.1 °C

Magnetometer

Range	800 µT
Repeatability over ±200µT	20 nT
Noise	50 nT
Sampling	75 Hz

Accelerometers

Range	40 g
Bias - repeatability	6 mg
Velocity random walk	0.039 m/sec/√hr
Bias instability	135e-6 m/sec^2
Scale factor stability	0.10 %
Sampling rate	100 Hz

Gyroscopes

Range	2000 deg/sec

Gyroscopes

Bias - repeatability	1.4 deg/sec
Angular random walk	0.3 deg/√hr
Bias instability	8 deg/hr
Linear acceleration effect	$1.02x10^{-3}$(deg/sec)/(m/sec²)
Vibration rectification error	$5.6x10^{-6}$(deg/sec)/(m/sec²)²
Sampling rate	100 Hz

Environmental

Operating temperature	-4 to +40 °C
Storage temperature	-20 to +60 °C

Mechanical design

Depth rating	1000 m (300 m version available)
Height	47 mm
Diameter	90 mm
Weight in air	690 g
Weight in water	415 g

Power

Voltage range	10-28 Volts
Average power	< 4 W
Maximum peak power	35 W

Communication

Serial	RS-422 / RS-232
Ethernet	10/100 Mbits Auto MDI-X.TCP/IP. Fixed IP /mDNS/DHCP client /Auto IP address assignment. (Multiple simultaneous data format transmission possible).
Data formats	Nortek proprietary (binary) DVL ASCII

Hardware

Frequency of operation	1 MHz
Beam width	3.4°
Slanted beam angle	20 deg