



Nucleus 1000

300 m

A 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 [deep water](#) (1000 m rated) version and an OEM housing version of the Nucleus 1000 are also available.

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 | 50 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 |

INS

| | |
|---|---|
| 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/vhr |
| Bias instability | 8 deg/hr |
| Linear acceleration effect | $1.02 \times 10^{-3}(\text{deg/sec})/(\text{m/sec}^2)$ |
| Vibration rectification error | $5.6 \times 10^{-6}(\text{deg/sec})/(\text{m/sec}^2)^2$ |
| Sampling rate | 100 Hz |

Environmental

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

Mechanical design

| | |
|-----------------|----------------------------------|
| Depth rating | 300 m (1000 m version available) |
| Height | 42 mm |
| Diameter | 90 mm |
| Weight in air | 535 g |
| Weight in water | 295 g |

Mechanical design, OEM version

| | |
|---------------|--------|
| Depth rating | 300 m |
| Height | 46 mm |
| Diameter | 100 mm |
| Weight in air | 570 g |

Power

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|--------------------|-------------|
| 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 |