

Navis Autonomous Profiling Float



SUMMARY

- Sufficient power for 300 CTD profile cycles to 2000 dbars
- SBE 41CP CTD; same CTD family as used on current Argo floats
 - Pump-controlled, T-C ducted flow minimizes salinity spiking
 - Anti-foulant devices provide effective bio-fouling protection
- Iridium continuous circuit switched, 2-way communications for low-cost download of large amounts of data
- Self-ballasting, 1 day to equilibrate; ballasting and setup done at Sea-Bird prior to shipment
- Easy-to-use interface for mission programming, and for reprogramming while deployed
- Firmware based on field-proven Argo firmware
- Lightweight and easy to deploy (< 18.5 kg)
- Expandable and scalable design for future missions, such as biogeochemical floats, deep floats
- Warranty — 100 profiles at 100% of purchase price, pro-rated thereafter

FLOAT DESCRIPTION

The Navis float has a traditional layout, with the sensor head at the top, and the buoyancy bladders at the bottom. The Navis buoyancy engine uses a positive displacement piston pump to transfer silicon oil from internal to external reservoirs to increase the float volume and cause it to rise. The closed-loop, recirculating oil system utilizes a seamless natural rubber external bladder, and an oil reservoir filled to 300 ml (> 175 ml required for operation to 2000 dbars in Pacific Ocean). This system provides improved energy efficiency, better parking stability, and increased depth range over existing floats. Navis is self-ballasting, yielding reduced deployment preparation time.

The Navis buoyancy engine is augmented at the sea surface by inflation of an air reservoir. This *surface-following function* provides 400 ml of excess buoyancy to improve surface communications. The open-loop air buoyancy system uses a seamless, natural-rubber, external bladder and oil-augmented bladder crush prevention.

At the surface, Navis uses a Garmin 15xL-W GPS to acquire positional information, with a mean acquisition time of 70 seconds. It then transmits the acquired data via an Iridium Transceiver 9522B, with a nominal transmission time of 275 seconds for a 2000 dbar profile cycle (2 dbar bins of CTD data). The Iridium antenna is mounted on the CTD end cap, and is supported by the CTD cell guard.

The Navis aluminum hull has a smaller diameter and length than existing floats, providing a lightweight and cost-effective package that requires less energy to operate. The float is powered by twelve lithium DD batteries in a Sea-Bird battery pack. The battery pack provides sufficient power for 300 CTD profile cycles to 2000 dbars.

CTD DESCRIPTION

The SBE 41CP CTD measures temperature, conductivity, and pressure continuously at 1 Hz through ascent and provides high accuracy, resolution, and stability. The pump-controlled, T-C ducted flow configuration minimizes salinity spiking caused by mismatch of temperature and conductivity measurements. The carefully engineered anti-foul protection includes anti-foulant devices, a U-shaped flow path, and an integral pump. On the float's ascent, as it approaches 10 to 5 dbars beneath the ocean surface, the pump turns off. The U-shaped flow path prevents sea surface oils and contaminants from being ingested while proceeding through the ocean surface skin and sitting at the surface during data transmittal. Between profiles, the pump is off. The U-shaped flow path prevents water flow through the system caused by waves or currents; minute amounts of anti-foulant concentrate inside the conductivity cell to minimize bio-fouling.



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SPECIFICATIONS

Science Data (SBE 41CP CTD)

	Initial Accuracy	Stability
Temperature	± 0.002 °C	0.0002 °C/year
Salinity	± 0.002 PSS-78	0.001 PSS-78/year
Pressure	± 2 decibars	0.8 decibars/year

Float Operation

Minimum fractional volume change	1.70%
Depth rating	2000 decibars
Communications	Iridium Transceiver 9522B -- RUDICS, circuit switched. Nominal transmission time 275 sec for 2000 dbar profile cycle (2 dbar bins of 1 Hz CTD data)
Position	GPS, Garmin 15xL-W, mean acquisition time 70 sec
Park interval	1 - 15 days
Materials	Aluminum hull, seamless natural-rubber external bladders
Oil reservoir	300 ml
Ballasting	Self-ballasting, 1 day to equilibrate
Weight in air	Less than 18.5 kg
Box	Stackable, export-compliant
Self-activation	Starts operating automatically on deployment, when pressure reaches user-programmable setpoint
Internal batteries	4 packs of 3 DD lithium sulfuryl chloride cells (cannot ship in passenger aircraft; Class 9 Dangerous Goods). Each pack has open circuit voltage of 10.8 V with 30 AH capacity, yielding 1166 kJ (4664 kJ for 4 packs).
Power consumption	11 kJ for a 2000-dbar CTD profile cycle
Power endurance	10 years or 300 2000-dbar cycles
Memory	CTD stores one 2000-dbar CTD profile; Navis stores 64 2000-dbar CTD profiles
Dimensions	Hull diameter 14 cm (5.5 inches), Ring diameter 24 cm (9.5 inches), Total length 159 cm (62.7 inches)



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