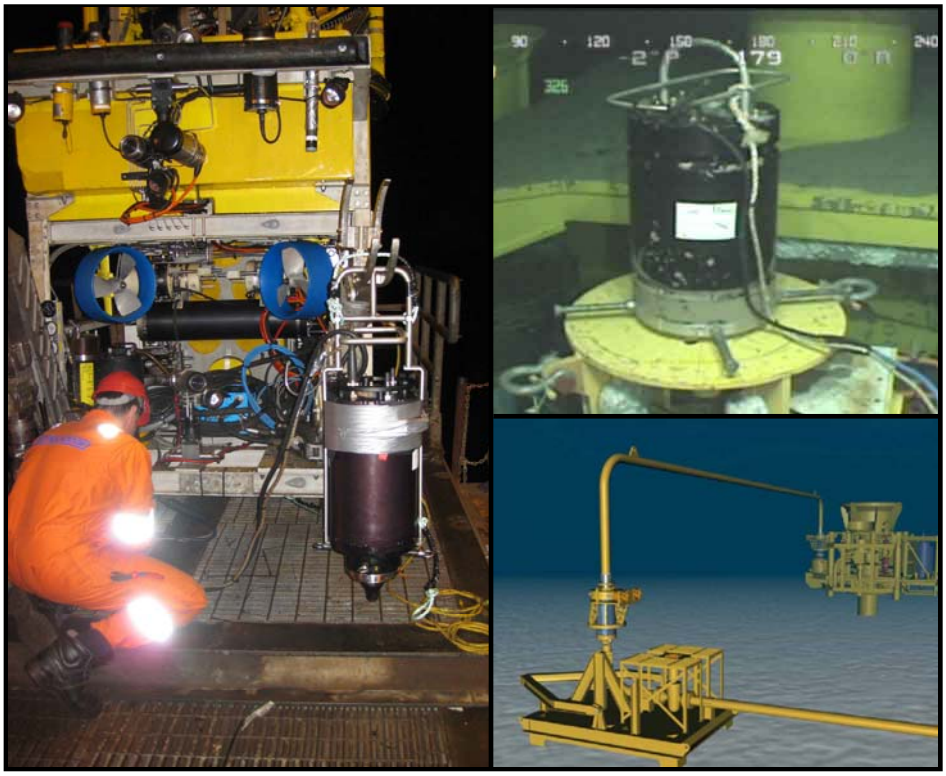
Solutions - Service - Support

Highly Productive Metrology

Subsea Precise Inertial Navigation System (C-PINS Metrology)™



Zupt delivers operationally aware inertial technologies to improve the productivity associated with high cost operations for oil and gas exploration and field development. These capabilities are offered and supported worldwide.

Subsea Precise Inertial Navigation System (C-PINS™ Metrology)

C-PINS™ Metrology is a precise metrology survey tool that significantly reduces the time taken for jumper or spool measurements. This fully proven system has completed multiple jobs in West Africa and the U.S. Gulf of Mexico. A single channel is needed on the ROV for integration.

C-PINS™ delivers the same precision as conventional metrology methods and combines all position, heading, pitch, roll and route survey bathymetry tools into a single package.

C-PINS™ is a fully integrated system including:

- High-performance inertial sensors
- Data fusion software
- I-O hardware interfacing multiple aiding sensors
- Subsea housings and interconnecting cables
- Real time position, attitude, velocity at 5Hz
- Real time quality metrics

C-PINS™ Metrology interfaces the following sensors:

- Internal quartz pressure transducer
- External quartz pressure transducer
- Altimeter
- Sound Velocity sensor

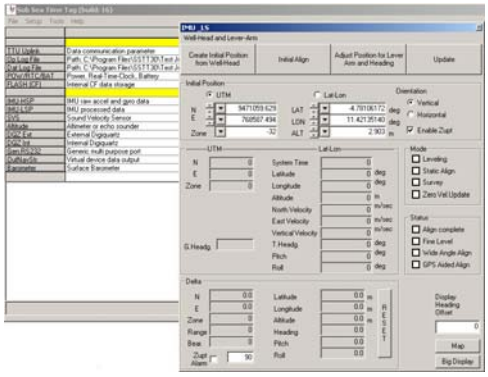
During multiple comparisons with conventional acoustic techniques C-PINS has delivered complete metrology surveys in approximately 6 hours. A single dive is needed to collect all of the required deliverables. After multiple jobs the following comparisons prove the precision:

Average horizontal difference is	37mm
Average vertical difference is	20mm

PN: Subsea Precise Inertial Navigation system C-PINS Metrology

Capabilities:

The surface software for C-PINS metrology is a single application SSTT. All data acquisition, data logging and initial QC data processing is completed within SSTT. Data is exported in a simple *.csv format for client quality checks in the field.



Specification:

4,000m rated system
- 31cm dia by 50cm long
- Weight in air 72kg
- Weight in water 35kg

1,000m rated system
- 29cm dia by 40cm long
- Weight in air 44kg
- Weight in water 18kg

Power/Comms Requirements:

Power	24 Vdc 50 Watts
Communications	Single 38,400bps RS232 Channel
Connector	13 pin Burton (1,000m) 24 pin Seacon (4,000m)

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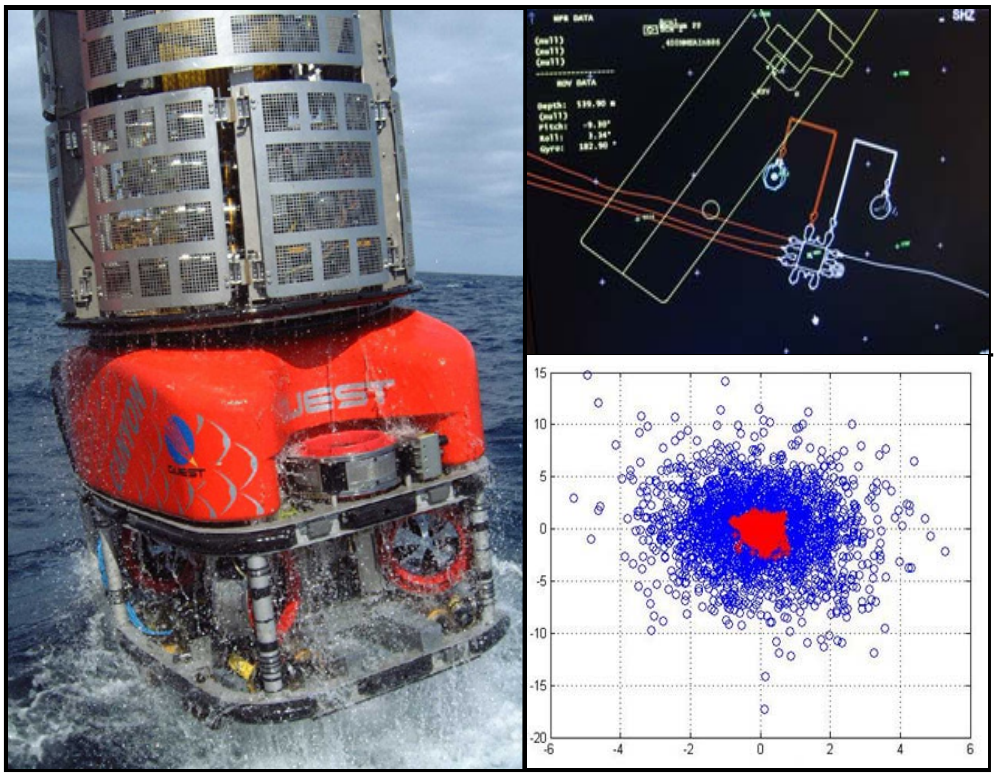
Subsea Precise Inertial Navigation System (C-PINS USBL Smoothing)



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C-PINS for USBL Smoothing

C-PINS™ is a survey tool specifically designed to provide precise, high update rate positioning and navigation for most offshore subsea marine construction operations.

C-PINS™ reduces the positioning noise seen in conventional USBL systems by up to 65% . Position, attitude and velocity information is available at rates up to 100Hz.

C-PINS™ is a fully integrated system including:

- High-performance inertial sensors
- Data fusion software
- I-O hardware interfacing multiple aiding sensors
- Subsea housings and interconnecting cables
- Real time position, attitude, velocity ≥100Hz
- Job design and post processing software

C-PINS™ configured for USBL Smoothing is the ideal system to speed up field data acquisition as well as enable cleaner post processing operations:

- Integrity management Surveys
- Image orthorectification
- Pipeline Inspection
- Multibeam surveys
- Field layout – manifold, SSIV, PLEM installations
- Pipeline out-of- straightness surveys
- Decommissioning

The navigation data fusion techniques contained within C-PINS delivers very high quality position and attitude data with real time quality metrics. Multiple aiding options are available depending on the application and requirements of the system

- Conventional USBL
- Tightly coupled LBL, dynamic use of lines of position
- Precise LBL time of validity (tov)
- DVL is coupled at the beam level
- Navigation processing on the vehicle
- No slip ring outage issues or high bandwidth demands
- IMU flexible – select IMU based on job

Capabilities:

C-PINS can be configured to integrate any or all of the following aiding sensors:

- Navigation grade Inertial Measurement Unit (IMU)
- Ultra Short Baseline acoustic positioning (USBL)
- Precise pressure (depth) transducer (dual freq quartz)
- Speed of sound - real time sound velocity profile (SVP)
- Altimeter (Echo sounder)
- Doppler velocity Log (DVL) beam data
- Long Baseline lines of position (LoP)
- GPS range and time data (1PPS to UTC)
- Seawater CTD profile

Options:

- Various IMUs depending on overall error budget
- Various water depth packaging
- Configurations for towfish, AUV as well as ROV

Specification:

4,000m rated system
- 28cm dia by 45cm long
- Weight in air 35kg
- Weight in water 20kg

1,000m rated system
- 28cm dia by 40cm long
- Weight in air 30kg
- Weight in water 18kg

Power/Comms Requirements:

Power	24 Vdc 50 Watts
Communications	Single 38,400bps RS232 Channel
Connector	13 pin Burton (1,000m) 24 pin Seacon (4,000m)

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