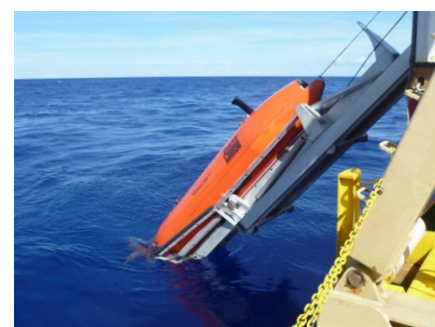


FUGRO ECHO SURVEYOR V

Echo Surveyor V is a “state of the art” Kongsberg Hugin 1000 autonomous underwater vehicle (AUV), specifically designed for high resolution and efficient survey operations in water depths down to 3000 metres.

AUV's are the ultimate choice of instrument platform for deep sea and remote surveys. Placing survey sensors onboard an AUV means the geophysical measurements take place close to the seafloor, dramatically improving data resolution and accuracy. The AUV is based on a Kongsberg Maritime manufactured Hugin 1000 body with a payload selected by Fugro to meet the demands of the offshore survey industry. In comparison to towed systems, the tight turning circle enormously reduces the time to change between survey lines. The inertial Navigation System (INS) adds rigor to the positioning of hazards and features. Compared to an ROV, the AUV operates without an umbilical and is able to move

both faster and more quietly, collection data with a very high signal-to-noise ratio. The survey is completed sooner and the results are more accurate. Clients within the oil and gas industry, the utilities sector and government agencies utilize Fugro's AUVs to obtain engineering grade, high resolution data for deep sea field development and seabed mapping. Design is optimized and risk is reduced. Fugro own and operate five deep water Echo class AUV's which are mobilised either from one of Fugro's dedicated fleet of international survey vessels or from 3rd party charter ship's. AUV container system is ready for rapid deployment to survey locations worldwide.



AUV recovery.

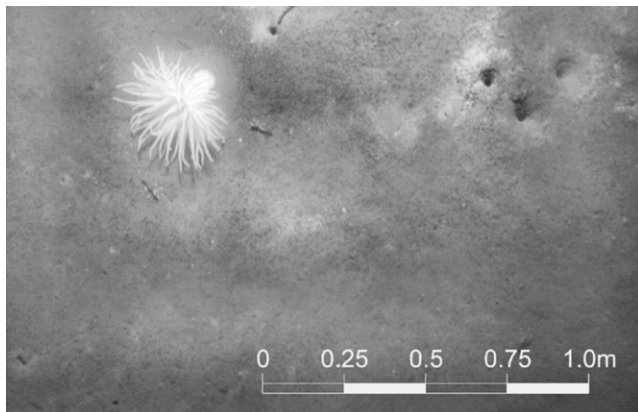


AUV ready for data recovery.

ECHO SURVEYOR V

CAPABILITIES

- Efficient lithium-polymer cell battery
- Up to 24 hour dive endurance
- Nominal survey speed 3 – 4 knots
- Inertial Navigation System
- Standard payload comprises:
 - Multibeam echosounder
 - Sidescan sonar
 - Sub-bottom profiler
 - CTD profiler
 - Digital camera
- Typically survey operations:
 - Deep water field developments
 - Site surveys
 - Pipeline and cable routes
 - Regional mapping
 - Environmental habitat mapping



The Hugin 1000 is a modular design with improved obstacle avoidance and we offer our clients the option of two sub-bottom profilers that best suits the geology. The AUV also has a LED illuminated Digital stills camera to identify seabed features of interest.

The camera system may be used for environmental purposes to assess the characteristics of benthic communities and habitats, such as deep water coral reefs and chemosynthetic communities, in addition to ascertaining the presence of sensitive species or biotopes. The high resolution stills enable scientists to zoom into the photograph without a significant deterioration in photograph quality and permits identification of specimens to species level.

Technical Specifications

Physical Data

Length	4.75 m
Weight (air)	850 kg
Diameter	0.75 m
Depth	3000 m
Hull Material	Carbon fibre reinforced epoxy, titanium and syntactic foam

Power System

Battery	Three Lithium Polymer
Battery Capacity	15 kWh
Propulsion	Smart Motor, Rudders & Propellor

Acoustic Navigation System

Aided Inertial Navigation System	Simrad HiPAP 500 USBL
Inertial Measurement Unit (IMU)	Honeywell HG 9900
Depth Pressure Sensor	Paroscientific Digiquartz
Doppler Velocity Log (DVL)	RDI Workhorse Navigator WHN-300 Khz

Acoustic Communication

Command Link	Kongsberg 24 to 28 kHz, 55 bps
ACL Transducers	TP324, TP331
Data Link	LinkQuest UWM4000 12.75 to 21.25Khz
DCL Transducers	UVM4010
Emergency Link	Kongsberg 25 to 25.6 kHz, 10bps

Surface Communication

Radio Frequency Link	Wood & Douglas M971, UHF SX450, 458 MHz
Satellite Link	Iridium Datalink

Control Sensors

CTD	Falmouth FSI 2" Micro CTS
Avoidance Sonar	Mesotech 1007, 675 kHz
	Imaginex DeltaT 837A
Altimeter Height	Mesotech 1007, 200 kHz

Payload Sensors

Multibeam Echo Sounder	Simrad EM 2000, 150 degrees coverage, Frequency 200kHz
Side Scan Sonar	Edgetech Full Spectrum Sidescan Sonar
	Simultaneous Frequency 105 & 410 kHz
Sub-Bottom Profiler	EdgeTech Full Spectrum Chirp
	Frequency 2 to 16 kHz
Digital Camera	Kongsberg LED illuminated digital stills Camera
	Turbidity sensor

Information may be subject to change without prior notice.