



KONGSBERG

Kongsberg Maritime Subsea Training

HUGIN autonomous underwater vehicle (AUV) training





INTRODUCTION

The HUGIN AUV is capable of performing high-speed surveys with excellent navigation and payload data quality. There are three depth ratings to suit diverse requirements –1000m, 3000m, 4500m.



The vehicle has two operational modes, supervised or autonomous to suit varied operational requirements. It has an exceptional hydrodynamic shape enabling a compact physical size while maintaining the ability to carry several types of survey sensors for synchronized and simultaneous operation. The HUGIN concept allows integration of alternative sensors for geophysical, search and inspection purposes, dependant on customer demands. HUGIN can conduct operations in autonomous mode, independent of the support vessel for the complete mission or in a supervised mode, as decided by the Operator. The HUGIN Operator Station (user interface) allows the operator to monitor vehicle systems, payload operations and vessel mounted sensors like dGPS, HiPAP, ship attitude sensor, acoustic link and RF link systems. It also allows direct communication with the vehicle while submerged or on the surface via acoustic, radio, satellite and hardwired links.



Customer benefits and Competitive strengths

- High manoeuvrability ensuring agile turning performance
- Unmatched "in-stride" control system selection for operator monitoring: supervised ("acoustic tether"), semiautonomous or autonomous modes
- Highly portable yet relatively low system footprint to provide operational flexibility
- Large capacity modular payload systems which are flexible in configuration and integration while still allowing customer choice.
- Very stable and low noise hydrodynamic platform for payload sensors
- Typical payload sensors are synthetic aperture sonar or side-scan sonar, multibeam echo sounder, sub-bottom profiler, CTD, forward looking sonar, turbidity sensor and still digital camera.
- Latest battery technology, up to 24 hours endurance (@ 4 kts), on the standard vehicle
- Increased endurances are available on the long variant with more battery modules
- Swappable battery modules (as single modules or multiple power packs)
- Flexible and accurate, state of the art, Aided Inertial Navigation System (AINS), built in-house by KM especially for KONGSBERG AUVs.
- Unmatched terrain following system, maximizing payload utilization in challenging terrains
- Multiple redundancy of components and systems, incorporating a stand-alone emergency system
- State of the art collision avoidance system employing a forward looking multi-beam sonar
- Designed with operational safety in mind (personnel and equipment focused)
- Reliable from extensive field testing
- Optimized system design for performing the tasks you need done from an AUV



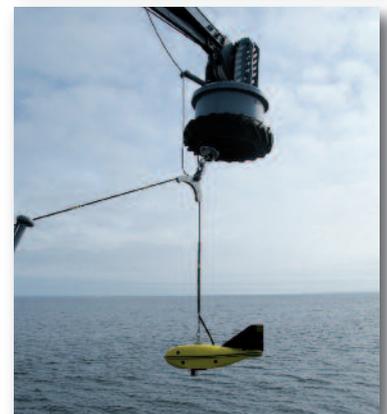
Training

Kongsberg Maritime offers several training packages on our line of HUGIN AUVs. Customers may chose courses with various duration and complexity depending on their specific requirements. Training is normally carried out as a combination of theoretical lessons, discussions and practical components from our new training facility in Horten, Norway. The new AUV training facility has been developed to take advantage of all AUV resources available and provides an easy transition between the various training areas.

The new classroom and student recreation space is located in the same building as the AUV Assembly Hall and less than 100m from the Kongsberg test vessel, *Simrad Echo*. This setting allows teaching to be more interactive and flexible to customer learning requirements.

Training courses offered for the HUGIN Autonomous Underwater Vehicle (AUV) range are as follows:

Courses	Length (days)	Remarks
HUGIN Operator Course	17	This is the preliminary course for all new operators. It includes 10 days operator training, an onboard maintenance phase, NavLab introduction and Level 1 Battery Certification. The culmination of the course is a practical day at sea where students combine all they have learnt. It enables our customers to safely operate their HUGIN AUV in the field including theoretical and practical lessons.
HUGIN Operator Refresher Course	5	Bringing HUGIN Operators "back up to speed" on topics that may need to be refreshed. It also provides opportunity to present updates and training for new components or systems added to vehicles. The "Refresher" is tailored to customer needs.
HUGIN Maintenance Course <ul style="list-style-type: none"> Onboard level Depot level 	5 10	Covering maintenance procedures and techniques targeted at the two common levels required by our customers. Onboard maintenance is for operators to conduct daily routines pre and post dive requirements. Depot maintenance is for more technical procedures beyond daily routines.
NavLab Course	2	Targeted at customers who require a greater understanding of the navigation component and accuracies within the vehicle. How it relates to the data collected and practical guidance on improving and monitoring those accuracies. The course also discusses calibration of sensors, and in-situ navigation (NavP) versus post-mission navigation (NavLab). Day one is mainly theory and day two is practical exercises to consolidate information learnt in day one.
Post Mission Analysis (PMA) Course	2	This course is provided for customers who have incorporated the HISAS system to their AUV. The course details the procedures to facilitate the use of the collected HISAS data.
Battery Certification Courses <ul style="list-style-type: none"> Level 1 Level 2 	1 2	Level 1 focuses on safety and transportation requirements of the HUGIN batteries, it is incorporated into the Operator Course. The Level 2 course is targeted at those customers who have a need to conduct Depot Level maintenance; due to the higher technical component, maximum numbers for this course are limited to four students.
HiPAP Operator Course (HUGIN)	3	For those customers who have selected HiPAP with their AUV, a comprehensive user course is offered.
Coaching at sea or on site		Duration and content to be negotiated



Much of the content may be tailored to fit any special needs of the customer, based on the experience of the students and configuration of the AUV. Any special training requirements can be discussed with the HUGIN Training Staff, prior to the course.

Maximum number of students per class is eight, with the exception of the Level 2 Battery Course which is four.

REMUS AUVs

KONGSBERG offers a complete range of AUVs with the HUGIN and REMUS vehicles. REMUS is manufactured by Hydroid (a KONGSBERG company). Training can be arranged to include or solely focus on REMUS Operation. Please contact us for details on content, duration and price.



Course Fees per student:

The following course fees apply. Courses include electronic course documentation, lunch and refreshments in our modern training centre.

Horten, Norway:	
Fee per student / per day: (minimum cost of four students per day)	5000,- NOK
At customer's premises:	
Fee on request	Negotiable

Instructor Biography

Greg Camburn has been instructing HUGIN since January 2010. Prior to joining the KM Team Greg spent 20 years in the New Zealand Navy as a Seaman Officer specialising in Clearance Diving, Bomb Disposal and Mine Countermeasures gaining experience with AUVs while commanding the Mine Countermeasures Team. His operational experience and passion for teaching ensures students get the skills they need to safely operate the KONGSBERG AUVs.



Further HUGIN AUV information is available online at: www.km.kongsberg.com/auv

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KONGSBERG

WORLD CLASS – through people, technology and dedication

Our values: Determined, Innovate, Collaborative, Reliable