REMUS AUVs

100, 600, 6000

From the coastline to the deepest corners of the ocean, our AUVs meet your full range of autonomous needs.

HYDROID
A KONGSBERG COMPANY

KONGSBERG

REMUS 100

- COMPACT
- RELIABLE
- LIGHTWEIGHT
- MODULAR
- 100 METER DEPTH RATING

REMUS 100 FEATURES

COMPACT SIZE & WEIGHT: The compact size of the REMUS 100 allows for economical overnight shipping and two-man deployment and operation capability. The REMUS 100 also eliminates the need for larger vessels and costly special handling equipment.

PROVEN RELIABILITY: With a track record second to none, the REMUS 100 is the only compact AUV to be selected by the U.S. Navy Fleet for their mine counter measure operations. The system boasts over ten years of continuous product development and thousands of hours of field operations.

EASE OF OPERATION: An intuitive Vehicle Interface Program (VIP) allows anyone to become an AUV operator with just a few days of training.

POWERFUL & VERSATILE: The REMUS 100 contains a full suite of standard sensors, with new sensors being integrated on a continuous basis.

APPLICATIONS

- Hydrographic Surveys
- Mine Counter Measure Operations
- Harbor Security Operations
- Environmental Monitoring
- Debris Field Mapping
- Search and Salvage Operations
- Fishery Operations
- Scientific Sampling and Mapping

SENSORS & PAYLOAD

The capabilities of the REMUS 100 make it ideally suitable for scientific, commercial and/or military operations. The vehicle is small enough to be carried by two people, yet contains enough sophisticated sensor, navigation, and power resources to enable it to perform intricate sonar and oceanographic surveys over large areas.

STANDARD SENSORS

- Acoustic Doppler Current Profiling (ADCP)
- Navigation-Long Baseline Navigation (LBL) and Dead Reckoning Accuracies
- Sidescan Sonar
- Conductivity and Temperature
- Depth
- Bathymetry
- Heading, Roll and Pitch
- Sound Speed
- Mission Progress
- System Status
- Multi-Vehicle Capability

OPTIONAL SENSORS

Available on all new systems and as upgrades on existing fielded systems.

ENVIRONMENTAL

- ECO Sensors
- Conductivity, Temperature & Depth
- Dissolved Oxygen
- pH
- ORP

COMMUNICATIONS

- Acoustic Communications
- Iridium
- WiFi
- Gateway Buoy

IMAGING

- Dynamically Focused Sidescan Sonar
- Interferrometric Multi-Beam
- Dual Frequency Sidescan Sonar
- DIDSON
- Video Camera

NAVIGATION

- Global Positioning System (GPS)
- Digital Ultra Short Baseline (DUSBL)
- Inertial Navigation System (INS)

SOFTWARE

- Trackpoint Capability
- RECON Software (Remote Control Capability)
- Multi Vehicle Operations

SPECIFICATIONS

Vehicle Diameter	19 cm (7.5 in).
Vehicle Length	From 160 cm (63 in).
Weight in Air	From 37 kg (<80 lbs).
Trim Weight	1 kg (2.2 lbs).
Maximum Operating Depth	100 meters (328 ft). Can be configured to go to 120 meters (400 ft).
Energy	1 kw-hr internally rechargeable lithium-ion.
Endurance	Typical mission endurance is >10 hours at 2.3 m/s (4.5 knots) in standard configuration. Dependant on speed and sensor configuration, operating environment and mission program.
Propulsion	Direct dive DC brushless motor to open 3-bladed propeller.
Velocity Range	Up to 2.3 m/s (4.5 knots) variable over range. Dependant on sensor configuration.
External Hook-up	2-pin combined Ethernet, vehicle power and battery charging; 4-pin serial connector.
Navigation	Long baseline; Doppler-assisted dead reckoning; Inertial navigation system; GPS.
Transponders	4 transponders are provided 20–30 kHz operating frequency range.
Tracking	Emergency transponder, mission abort, and in-mission tracking capabilities.
Software	VIP-based laptop interface for programming, training, post-mission analysis, documentation, maintenance, and troubleshooting.
Data Exporting & Reporting	HTML report generator, and ASCII text export.
Operations	Capable of operating 4 vehicles simultaneously in the same water space.

Specifications subject to change without notice.

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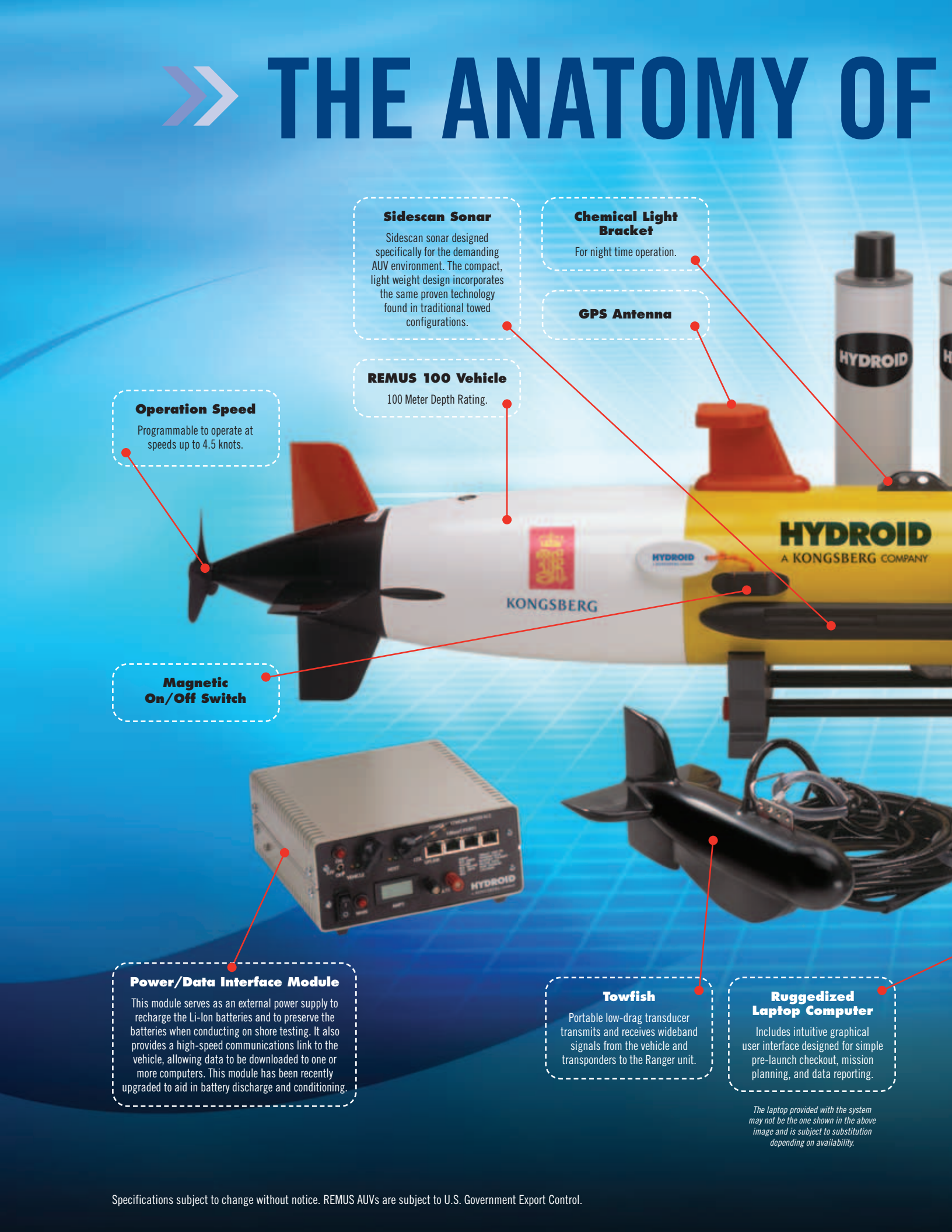

Sidescan Sonar

Sidescan sonar designed specifically for the demanding AUV environment. The compact, light weight design incorporates the same proven technology found in traditional towed configurations.

Chemical Light Bracket

For night time operation.

GPS Antenna

REMUS 100 Vehicle

100 Meter Depth Rating.

Operation Speed

Programmable to operate at speeds up to 4.5 knots.

Magnetic On/Off Switch

Power/Data Interface Module

This module serves as an external power supply to recharge the Li-Ion batteries and to preserve the batteries when conducting on shore testing. It also provides a high-speed communications link to the vehicle, allowing data to be downloaded to one or more computers. This module has been recently upgraded to aid in battery discharge and conditioning.

Towfish

Portable low-drag transducer transmits and receives wideband signals from the vehicle and transponders to the Ranger unit.

Ruggedized Laptop Computer

Includes intuitive graphical user interface designed for simple pre-launch checkout, mission planning, and data reporting.

The laptop provided with the system may not be the one shown in the above image and is subject to substitution depending on availability.

Specifications subject to change without notice. REMUS AUVs are subject to U.S. Government Export Control.

AUTONOMY

Navigation Transponders

Four small, lightweight transponders are supplied as reference beacons for the vehicle during operation. The transponders are preset to listen for a specific signal, which is transmitted by the vehicle,and then immediately reply. The vehicle may then easily compute the slant range to the transponder.

Acoustic Doppler Current Profiler (ADCP)/Doppler Velocity Log (DVL)

The specially designed Teledyne RD Instruments ADCP/DVL can be configured to include both downward and upward looking transducers, allowing for bi-directional current profiling, 3-D bottom track, altitude measurement and highly accurate dead reckoning navigation input. The altitude measurement, when coupled with the vehicle's position and depth, also provides seafloor bathymetry.

Conductivity & Temperature

The vehicle is equipped with a multi-parameter sensor sonde, which includes temperature and conductivity. Temperature information is stored in the REMUS 100's hard drive for plotting a profile of the water temperature in the search area. Conductivity and temperature inputs are used to accurately determine the speed of sound in water, which is used to increase navigational accuracy.

Navigation

The REMUS 100 navigates during a mission using Long Baseline (LBL) and Dead Reckoning (DR). The on-board computer automatically determines and chooses the preferred method through-out the mission.

REMUS Ranger

The Ranger is a small, highly portable, waterproof deck unit, designed to give the operator the ability to monitor the vehicle's progress, via its small towed transducer, while the mission is underway. The front panel display indicates the real-time range to the vehicle in meters and is used to send selected commands such as 'abort mission' or 'come home' to the vehicle during operation. Each REMUS 100 vehicle carries an emergency transponder; as it is completely independent of the vehicle's other systems and so may be interrogated at any time by the Ranger.

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REMUS 600

- DEEP OPERATIONS
- MODULAR DESIGN
- INCREASED PAYLOAD
- 600, 1500 METER DEPTH RATING

PHOTO COURTESY OF THE ITALIAN NAVY

REMUS 600 FEATURES

GO DEEPER: The slightly buoyant REMUS 600 has been designed to operate to depths of 600 meters, allowing for greatly increased operational scope. This highly versatile system can also be configured for 1500 meter operations.

GO FURTHER: The REMUS 600 delivers unprecedented endurance, with mission duration capability of up to 70 hours. Upon mission completion, simply recharge the internal battery, or swap out the battery section. *(Endurance is subject to speed and sensor configuration).*

FULLY MODULAR: The REMUS 600 has been designed with modularity in mind. The vehicle can easily be reconfigured for a wide variety of customer payloads. The vehicle is comprised of a series of hull sections that are quickly separated for vehicle reconfiguration, maintenance, and/or shipping.

INCREASED PAYLOAD: The REMUS 600 has been designed to be an autonomous workhorse. Its increased size and power capacity enable it to carry large, power-hungry payloads to meet your increasing mission demands.

EASE OF OPERATION: The REMUS 600 incorporates the same proven Vehicle Interface Program (VIP) used in the complete family of REMUS vehicles. The highly refined VIP makes vehicle maintenance, checkout, mission planning, and data analysis fast and easy. Windows® operation, quick look indicators, quality control checks, and a sophisticated data export capability all add to the user-friendly nature of this software package.

PROVEN REMUS TECHNOLOGY: The REMUS 600 is based on the same leading edge technology that has brought the REMUS 100 to the forefront of autonomous operations. With hundreds of thousands of REMUS mission hours to date, Hydroid has become the undisputed world's leading supplier of AUV systems.

APPLICATIONS

- Hydrographic Surveys
- Mine Counter Measure Operations
- Harbor Security Operations
- Environmental Monitoring
- Debris Field Mapping
- Search and Salvage Operations
- Fishery Operations
- Scientific Sampling and Mapping

SENSORS & PAYLOAD

STANDARD SENSORS

- Acoustic Doppler Current Profiler/Doppler Velocity Log (ADCP/DVL)
- Inertial Navigation System (INS)
- Acoustic Modem (Low and High Frequency Options Available)
- Sidescan Sonar
- Pressure
- Depth
- Conductivity & Temperature
- GPS/WiFi/Iridium

OPTIONAL SENSORS

- Dual Frequency Sidescan Sonar
- Dynamically Focused Sidescan Sonar
- Synthetic Aperture Sonar (SAS)
- ECO Sensors
- Video Camera
- Multi-Beam Echo Sounder (MBES)
- Electronic Still Camera (ESC)
- Sub-Bottom Profiler (SBP)

DEPLOYMENT OPTIONS

- Launch and Recovery System
- Operations Van

SHIPBOARD DEVICES

- Shipboard Communications Console
- Shipboard Communications Mast
- Power Box with Battery Charger
- Antenna Box (GPS, Iridium, WiFi and Optional Freewave)
- Acoustic Communications Bottle
- Ranger Deck Box
- Towfish
- Acoustic Transponders

SPECIFICATIONS

Vehicle Diameter	32.4 cm (12.75 in).
Vehicle Length	3.25 m (128 in); length varies depending upon module configuration.
Weight in Air	240 kg (530 lbs).
Max Operating Depth	600 meters (1500 meter configuration available).
Energy	5.2 kWh rechargeable Lithium ion battery. (Second 5.2 kWh battery tray is optional).
Endurance	Typical mission endurance is >50 hours in standard configuration. Subject to speed and sensor configuration.
Propulsion	Direct dive DC brushless motor to an open two bladed propeller.
Velocity Range	Up to 2.3 m/s (4.5 knots) variable over range.
Control	3 independent control fins providing yaw, pitch, and roll control. Altitude, depth, yo-yo, and, track-line following provided. Optional forward fins available for lateral and pitch control.
External Hook-up	Two connectors, one for shore power, and one for shore data. Alternatively, 802.11G wireless network provided via dorsal fin antenna.
Casualty Circuits	Ground fault, leak and low voltage detection, housing leak detection, and all sensors and systems have operational go/no-go fault indicators.
Navigation	Inertial navigator, Long Baseline (LBL), Acoustic, WAAS GPS.
Tracking	Acoustic transponder, acoustic modem, Iridium modem.
Communication	Acoustic modem, Iridium, WiFi-2.4 GHz, 100 base-T Ethernet.
Software	REMUS Vehicle Interface Program (VIP) GUI-based laptop interface for programming, training, documentation, maintenance and troubleshooting.

Specifications subject to change without notice.

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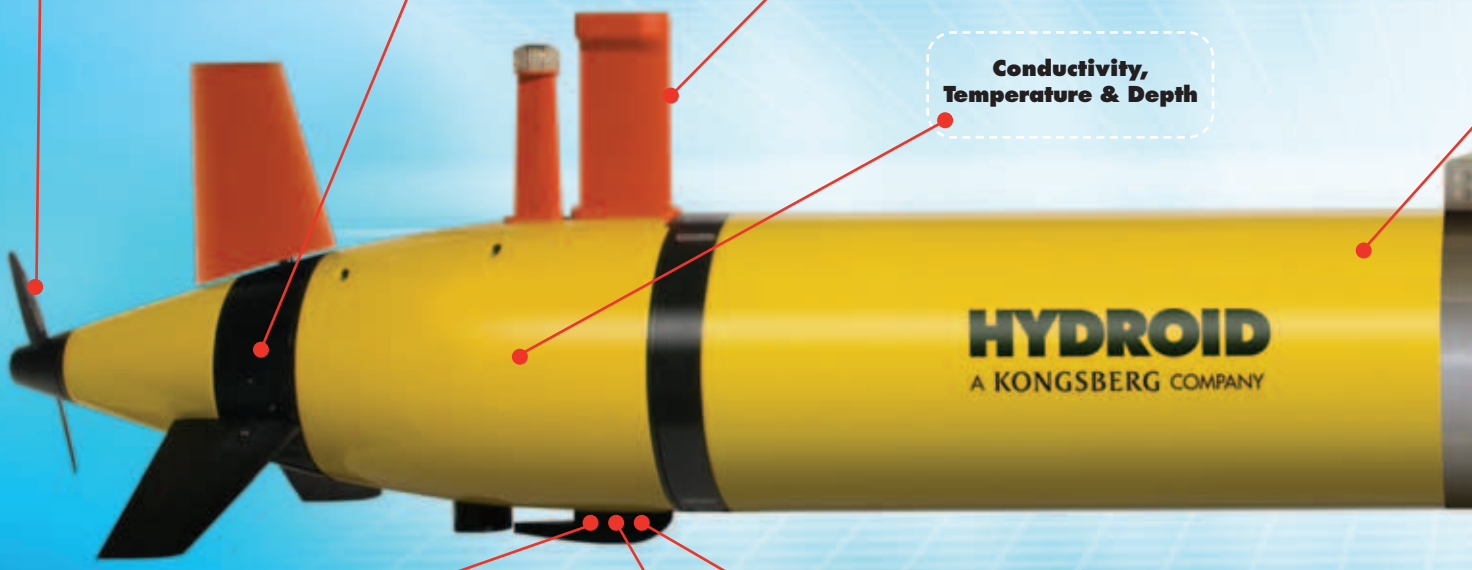


Operation Speed

Programmable to operate at speeds of up to 4.5 knots.

Control Section

Independent control fins providing pitch, yaw and roll control.

GPS/Iridium/ WiFi Antenna

Provides robust and convenient communication options when vehicle is on the surface.

Conductivity, Temperature & Depth

Acoustic Communications Transducer

For real-time underwater acoustic communications.

Navigation

Long baseline (LBL) transducer for LBL navigation. Supports multi-vehicle navigation of up to 4 vehicles.

Emergency Acoustic Transponder

VEHICLE INTERFACE PROGRAM (VIP)

The REMUS 600 utilizes the same Vehicle Interface Program (VIP) as our proven REMUS 100 AUV. This highly intuitive VIP greatly simplifies vehicle maintenance, mission planning, vehicle checkout, and data analysis; and will run on any PC or laptop operating under Windows® 95, 98, NT, 2000, or XP. Communication between the vehicle and the host is conducted via a standard Ethernet connection. Among other features, the VIP includes:

- An integrated text editor for construction of the mission file.
- A map view that illustrates the planned mission for review.
- Automatic error checking performed on all aspects of the planned mission, with warning messages that appear if any mission parameters are incorrect.
- A set of quick-look indicators that display system status, where green indicates OK, and red indicates a fault.

VERSATILITY

Electronics/Batteries

Electronics and rechargeable lithium-ion battery tray provides a typical mission endurance >50 hours of continuous operation.

REMUS 600 Vehicle

600 Meter Depth Rating.

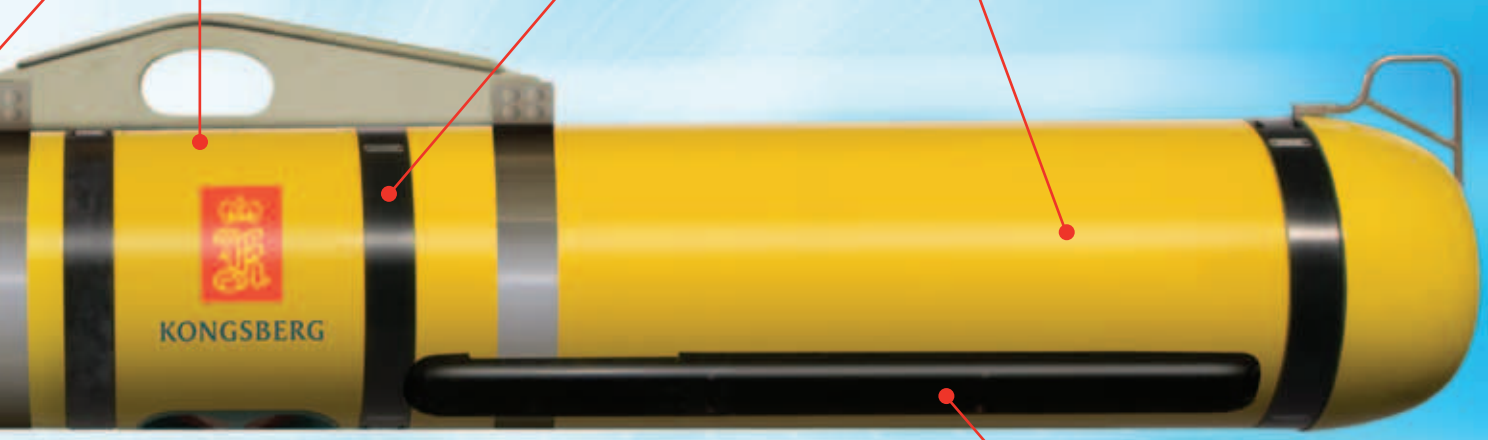
Acoustic Doppler Current Profiler (ADCP)/Inertial Navigation System (INS)

Provides combined precision navigation and current-profiling capability.

Modular Front-end

Payload area can be customized to meet your unique mission requirements and swapped out as required. Options include:

- Sidescan Sonar
- Synthetic Aperture Sonar
- Video Camera
- Acoustic Imaging System
- Forward Looking Sonar
- Customer Designed Instruments



Sidescan Sonar

Single or Dual Frequency Sidescan Sonar.

The laptop provided with the system may not be the one shown in the above image and is subject to substitution depending on availability.

REMUS 600

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REMUS 6000

- DEEP OPERATIONS
- CUSTOM DESIGN
- PROVEN LAUNCH & RECOVERY SYSTEM (LARS)
- 6000 METER DEPTH RATING

REMUS 6000 FEATURES

LITTORAL TO DEEP OPERATIONS: The REMUS 6000 has been designed to enable operations to water depths as great as 6000 meters. The versatile design also allows long mission durations in shallow littoral areas.

CUSTOM DESIGN: The REMUS 6000 can be configured to include a wide range of customer specified sensors. Its sensor suite can even be reconfigured in the field to meet specific, and varied, mission requirements.

EASE OF OPERATION: The REMUS 6000 incorporates the same proven Vehicle Interface Program (VIP) used in the complete family of REMUS vehicles. The highly refined VIP makes vehicle maintenance, checkout, mission planning, and data analysis fast and easy. Windows® operation, quick look indicators, quality control checks, and a sophisticated data export capability all add to the user-friendly nature of this software package.

LAUNCH AND RECOVERY SYSTEM (LARS): The REMUS 6000 Launch and Recovery System (LARS) is designed to function off the stern of a ship and can be set up for shipboard operations within a few hours. The LARS is a roll on/roll off system and can be installed easily on 'ships of opportunity.'

PROVEN REMUS TECHNOLOGY: The REMUS 6000 is based on the same leading-edge technology that has brought the REMUS 100 to the forefront of autonomous operations. With hundreds of thousands of REMUS mission hours to date, Hydroid has become the undisputed world's leading supplier of AUV systems.

APPLICATIONS

- Deep Ocean Search & Survey
- Deep Ocean Acoustic & Optical Surveys
- Debris Field Mapping

SENSORS AND PAYLOAD

STANDARD SENSORS

- Acoustic Doppler Current Profiler/Doppler Velocity Log (ADCP/DVL)
- Acoustic Modem (Low Frequency)
- Inertial Navigation System (INS)
- Sidescan Sonar
- Pressure
- Depth
- Conductivity & Temperature
- GPS/WiFi/Iridium

OPTIONAL SENSORS

- Dual Frequency Sidescan Sonar
- ECO Sensors
- Multi-Beam Echo Sounder (MBES)
- Video Camera
- Electronic Still Camera (ESC) with 200 watt-sec Strobe Lighting
- Sub-Bottom Profiler (SBP)

DEPLOYMENT OPTIONS

- Launch & Recovery System
- Operations Van

SHIPBOARD DEVICES

- Shipboard Communications Console
- Power Box with Battery Charger
- Antenna Box (GPS, Iridium, WiFi and Optional Freewave)
- Acoustic Communications Bottle
- Ranger Deck Box
- Towfish
- Acoustic Transponders

SPECIFICATIONS

Vehicle Diameter	71 cm (28 in).
Vehicle Length	3.84 m (12.6 ft).
Weight in Air	862 kg (1900 lbs).
Max Operating Depth	6000 meters (4000 meter configuration also available).
Energy	11 kWh rechargeable Li-ion battery pack in two pressure housings. A second 11 kWh set is provided with system permitting 2-hour turn around. Charge time is typically 8 hours and the batteries are rechargeable up to 300 cycles or for 5 years under recommended storage conditions.
Endurance	Typical mission duration of 22 hours. Subject to speed and sensor configuration.
Propulsion	Direct drive DC brushless motor to an open 2 bladed propeller.
Velocity Range	Up to 2.3 m/s (4.5 knots) variable over range.
Control	2 coupled yaw and pitch fins-altitude, depth, yo-yo, and track-line following provided.
External Hook-up	Two connectors, one for shore power and one for shore data. Alternatively, 802.11G wireless network provided via dorsal fin antenna.
Casualty Circuits	Ground fault, leak and low voltage detection and go/no go indicator.
Navigation	Long Baseline Transducer (7-15 kHz upward looking transducer) and Dead Reckon with ADCP Inertial Navigation System (INS).
Communication	Acoustic modem, Iridium, modem and 802.11G WiFi.
Reserve Payload	27 kg (50 pounds)(in water).
Launch and Recovery	Over centered lifting frame; vehicle is in vertical orientation for launch and recovery.
Software	VIP based laptop interface for programming, real time mission monitoring and redirection, training, documentation, maintenance & troubleshooting.

Specifications subject to change without notice.

THE ANATOMY

Control Section
Containing main propulsion, pitch, yaw actuators and electronics.

REMUS 6000 Vehicle
6000 Meter Depth Rating.

Acoustic Modem Transducer
For real-time underwater acoustic communication with the surface.

Navigation
Upper Long baseline (LBL) transducer for LBL navigation.

Electronic Still Camera (ESC) or Sub-Bottom Profiler (SBP) (Optional)

Operation Speed
Programmable to operate at speeds of up to 4.5 knots.

Navigation
Lower Long baseline (LBL) transducer for LBL navigation.

VEHICLE INTERFACE PROGRAM (VIP)

The REMUS 6000 utilizes essentially the same Vehicle Interface Program (VIP) as our proven REMUS 100 AUV. This highly intuitive VIP greatly simplifies vehicle maintenance, mission planning, vehicle checkout, and data analysis; and will run on any PC or laptop operating under Windows® 95, 98, NT, 2000, or XP. Communication between the vehicle and the host is conducted via a standard Ethernet connection. Among other features, the VIP includes:

- An integrated text editor for construction of the mission file.
- A map view that illustrates the planned mission for review.
- Automatic error checking performed on all aspects of the planned mission, with warning messages that appear if any mission parameters are incorrect.
- A set of quick-look indicators display system status, where green indicates OK, and red indicates a fault.

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OF DEPTH

Lifting Bail

Recovery Strobe Light

D-Battery operated, programmable emergency LED array flasher to aid in vehicle recovery.

GPS/Iridium/ WiFi Antenna

Provides robust communications options when vehicle is on surface.

Recovery Float and Pop-Off Float

Conductivity, Temperature and Depth Sensor

Nose Section

Ascent weight, recovery bail, and float and release mechanisms.

Foam Block

Fiberglass coated syntactic foam.

Sidescan Sonar

Single or dual frequency sidescan sonar.

Camera Strobe Light

Camera strobe light and reflector (optional).

Acoustic Doppler Current Profiler (ADCP)/Inertial Navigation System (INS)

Provides combined precision navigation and current profiling capability.

Electronics/Batteries

Electronics and 2 rechargeable lithium-ion battery trays provide up to 22 hours of operation.

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REMUS 6000

HYDROID

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The REMUS (Remote Environmental Measuring UnitS) Autonomous Underwater Vehicle (AUV) product and technology developed at the Woods Hole Oceanographic Institution (WHOI) is the culmination of many years of leading-edge research and development, combined with a proven track record for highly reliable and repeatable field operations.

HYDROID, INC was founded in 2001 following the execution of a technology transfer license with WHOI to allow REMUS technology to reach a wider market and to provide for continuous product development. This transition has proven to be a remarkable success. Over the past several years Hydroid has realized rapid growth providing world-class sales, service and support to an ever-increasing customer base. REMUS vehicles are in operation around the globe, serving customers within the military, scientific, and commercial market segments. In support of this growth Hydroid opened a European branch office in 2007 to service an ever increasing international market. This team is enhanced by the organization's growing representative network, which provides local sales and support at a global level.

Hydroid maintains a full service production and test facility on Cape Cod in Pocasset, Massachusetts, staffed by a highly skilled and experienced group of individuals committed to our customers' ultimate success. This facility has been uniquely designed to support Hydroid's growing product offerings. Since its inception, Hydroid has delivered a continuous stream of products through a highly efficient and well organized manufacturing system, which allows for volume production of REMUS vehicles, and ancillary system components and supporting equipment. The result is a highly repeatable system that produces quality products in a timely and efficient manner.

Hydroid's products are backed by the organization's skilled customer service staff, which provides on-site training, system commissioning, and continuous product service and support.

In June 2008 Hydroid was acquired by Kongsberg Maritime. The Hydroid-Kongsberg team will work together to raise the bar in autonomous underwater vehicle technology and exceed our customers demanding requirements to have the 'right tool.'

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A KONGSBERG COMPANY

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