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Merlin vessel-based lidar system

Map the full environment in one pass

Scanning the full marine environment in a single operation reduces the amount of time crew spend in hazardous locations.

Cut the cost of vessel-based laser surveying

Seamless integration with hydrographic surveying equipment enables the capture of data above and below the waterline simultaneously.

Add value to projects

Expand your surveying capabilities at low cost without duplicating expensive equipment that you already own.

Expand your surveying capabilities at low cost

What is Merlin?

Engineered by Renishaw, Merlin is the marine lidar system developed specifically for cost-effective coastal, offshore and inland waterway surveying. Merlin is designed to complement your vessel's existing hardware and software infrastructure. Seamless integration with your below-water sensors enables the fast and effective acquisition of time-tagged survey data above and below the waterline simultaneously.

Merlin is the only plug-and-play laser scanner of its class in this price bracket, which enables you to expand your marine surveying capabilities and improve your service offering at low cost.

Merlin provides eye-safe, long-range laser scanning that enables you to capture, process and analyse geospatial point cloud data quickly and accurately in order to plan and manage complex projects.

The benefits to your business

Vessel-based surveying can be time consuming, costly and potentially dangerous given the changeable nature of the marine environment. Therefore, Merlin is designed to support safer, faster and more efficient surveying, with the following business benefits:

- **Low cost of investment:** Seamless integration with your existing vessel hardware and software means you do not duplicate equipment, infrastructure or technologies that you already own.
- **Reduce project timescales:** Merlin enables the capture of full 360° data both above and below the waterline in a single trip. Merlin's time-tagged data synchronises with your below-water sonar equipment for ease of data capture and processing.
- **Cut training costs:** The low-maintenance Merlin vessel-based lidar system is easy to install and operate, which significantly reduces the need for training specialist survey crews.
- **Add value:** By expanding your product offering, you not only beat the competition by offering your clients complex project capability, but you also stay competitive in an evolving market.
- **Improve worker safety:** Fast installation, deployment and speed of data capture reduce the amount of time spent in the potentially hazardous marine environment.

What if you could map the full environment in a single trip?

Accurately mapping the full landscape both above and below the waterline – including the seabed, shoreline, coastal features, manmade structures and so on – has long presented surveyors with major challenges.

It was previously difficult and expensive to achieve fully integrated sonar (below water) and lidar (above water) data capture in order to obtain a full, three-dimensional model of a marine environment. It could take a minimum of two operations to capture enough data to formulate a complete, useful 3D environment: one to collect sonar data and a second to gather lidar data. This effectively required twice the time, twice the manpower and often twice the money.

The marine surveying industry needs a dedicated marine laser scanner for high-performance data acquisition in extreme environments.

Time-saving laser technology

By augmenting your survey vessel's existing bathymetric equipment with Renishaw's time-tagged Merlin marine laser scanner, you can synchronise lidar scans and multibeam acoustic data in a single pass to simultaneously produce precisely timed data both above and below the waterline.

Obtaining a full 360° point cloud of your environment, quickly and safely, speeds up project timescales, minimises the amount of time surveyors spend in potentially hazardous areas and, ultimately, reduces the surveying costs associated with complex vessel-based surveying assignments.

Why Merlin is a great investment

Most survey vessels are already equipped with some form of data-acquisition system. Multibeam echosounders, for example, use positional information derived from Global Navigation Satellite Systems (GNSS) and Inertial Measurement Units (IMU). Vessel operators do not, therefore, need to duplicate these high-cost components with each additional piece of surveying kit they acquire. Incorporating a GNSS or IMU into Merlin when those items are already present on the vessel would add unnecessary expense to the cost of laser-based surveying. Instead, Merlin integrates flawlessly with your existing hardware infrastructure for cost-effective laser-based surveying.

Merlin supports faster and more accurate data collection, minimising the amount of time operators need to spend in the field.

Data for decision making

Merlin's scanning laser sensor has a 250 m range capability for the accurate, long-range mapping of coastal and inland waterways. The scanner also has a 360° field of view, which aids the collection of detailed above-water 3D point clouds. The information acquired by Merlin combines seamlessly with below-water acoustic bathymetric data for complete datasets that reveal the full landscape above and below the waterline.

Merlin can either be internally time tagged at source, using its own on-board L1 GPS receiver or time tagging can be provided by the appropriate National Marine Electronics Association (NMEA) data stream from the vessel's existing on-board positional equipment. This ensures ease of software processing and vastly improves the quality of the 3D models that are created when the two data types are combined.

Key features

- IP66 water and dust resistance
- 250 m range
- ±1 cm accuracy
- 360° field of view

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Safe, flexible and easy to operate for a wide range of applications

The custom-made mounting plate ensures rapid installation and deployment.

Rapid deployment and flexible mounting options

Deployment couldn't be quicker or simpler. The low-maintenance mounting system includes a custom-made mounting plate, which ensures Merlin is ready to install off the shelf, with no customisation required. The mounting plate can be either permanently welded into place, or attached temporarily to a mast or cabin roof by three simple screws.

To ensure optimum data acquisition for individual projects, Merlin offers fast and flexible mounting options. In just seconds, the unit can be rotated in the horizontal and vertical planes – at 0˚, 15˚, 30˚ and 45˚ – without de-mobilisation of the system. Easy-release camlock clamps lock the unit into position for secure yet flexible deployment.

Merlin is an extremely robust, portable and well-engineered laser scanner, and with no delicate spinning mirrors, it has been designed specifically with the marine environment in mind.

The portable Merlin laser scanner can be deployed for offshore surveying in remote locations.

Connect an additional sensor

The option to connect a second Merlin unit via a specialised top-side interface box further helps to reduce project timescales and improve point cloud density. Deploying two Merlin units on one vessel reduces the amount of shadowing encountered during scanning, and enables the capture of more points per second for more detailed datasets in shorter time periods.

Combined with the flexible mounting options, the ability to connect multiple Merlin units on the port and starboard sides, bow or stern of the vessel increases the quality and quantity of scan data that can be captured, for improved decision making.

Merlin is suitable for deployment on board the latest unmanned survey vessels.

Merlin applications

Hydrographic survey companies have already selected Merlin because its wide range of applications enable them to complete complex projects that traditional surveying technologies simply cannot achieve. Merlin applications include:

- Offshore construction
- Oil and gas operations
- Wind farm installations
- Coastal erosion monitoring
- Canals / inland waterways
- Bridge condition surveys
- Offshore decommissioning
- Flood-risk management
- Rock groyne scanning
- Navigation chart updates
- Port and harbour surveys
- Infrastructure planning

The unique challenges of surveying marine environments include avoiding hazardous natural features, such as cliffs, rocks and reefs, as well as unpredictable weather conditions. Merlin's 250 m range enables accurate data acquisition from a safe distance, ensuring crew and vessel safety are paramount.

Merlin's high-quality 3D data has many uses, including:

- Comparing old and new information to monitor coastal change
- Creating navigation charts without venturing into hazardous coastal zones
- Using historic data to update risk management and flood models to predict future events
- Identifying key marine features to assist with urban planning
- Collecting detailed information safely and quickly from high-traffic waterways

Accurately manage and monitor coastal erosion by comparing new and old data with ease.

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Data-acquisition software and support

Compatible with all major software

The Merlin vessel-based lidar system quickly measures and records time-tagged geo-referenced data points, which can be used to create detailed 3D maps using a variety of CAD and point cloud processing packages.

Renishaw has worked closely with the world's leading hydrographic software companies to integrate Merlin into their workflow. Merlin is currently fully compatible with the following major industry-standard software packages:

- HYSWEEP® multibeam collection and editing software from HYPACK®. Fully operational in the HYSWEEP_15.0.18 version of HYPACK® 15.
- NaviScan and Kuda sonar and laser data acquisition software from EIVA.
- QINSy (Quality Integrated Navigation System) hydrographic data acquisition software from QPS.
- Teledyne PDS software for hydrographic survey and dredging operations (version 3.9.5.4 and newer).

Merlin's universal interface, compatible with the above hydrographic data acquisition software packages, ensures operator familiarity and ease of use.

All four software packages can support the deployment of two connected Merlin units in a single project, with the option to start/stop the rotation of the scanning laser module and set it to rotate at 5, 10, 15 or 20 Hz. A real-time display of the scanning laser module can also be set up to view the laser data coverage that is collected.

Basic driver functional tools enable the laser data to be segmented in terms of the range and the angular field of view, depending on the project requirement.

Merlin is also supplied with its own diagnostic tool, which can be used to set up the system with existing infrastructure, such as port numbers and IP addresses. It also enables you to select and test a timing source, and carry out troubleshooting.

Global support and training

Renishaw offers remote diagnostics support, which enables one of our experienced engineers to view your screen and perform instant software and hardware diagnostics wherever you are in the world.

Our customers also enjoy expert training and support provided by our team of in-house surveyors. We offer training courses available at a venue to suit you, either on site at your location or at our offices in the UK, USA, Canada and Australia.

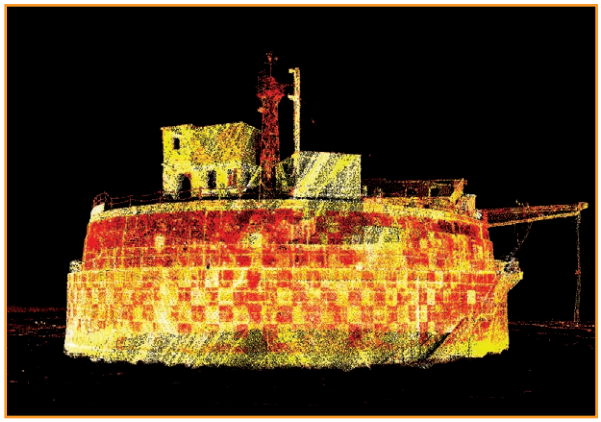
Please email **spatialmeasurement@renishaw.com** for all Merlin enquiries and for details of your local office.

Renishaw

A world-leading FTSE-250 engineering technologies company, Renishaw plc has over 30 years' experience in the laser measurement industry. We also have the scale, resources and worldwide reputation to guarantee design excellence, robust construction, and outstanding customer service.

Our significant research and development programme ultimately leads to the development of products like Merlin, which has been engineered to cut the cost of vessel-based laser scanning for marine surveyors.

The Merlin marine laser scanner provides high-performance range, accuracy and marine resistance.



With improved data you can better analyse the landscape for complex mapping projects with ease and confidence.

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About Renishaw

Renishaw is an established world leader in engineering technologies, with a strong history of innovation in product development and manufacturing. Since its formation in 1973, the company has supplied leading-edge products that increase process productivity, improve product quality and deliver cost-effective automation solutions.

A worldwide network of subsidiary companies and distributors provides exceptional service and support for its customers.

Products include:

- Additive manufacturing and vacuum casting technologies for design, prototyping, and production applications
- Dental CAD/CAM scanning systems and supply of dental structures
- Encoder systems for high-accuracy linear, angle and rotary position feedback
- Fixturing for CMMs (co-ordinate measuring machines) and gauging systems
- Gauging systems for comparative measurement of machined parts
- High-speed laser measurement and surveying systems for use in extreme environments
- Laser and ballbar systems for performance measurement and calibration of machines
- Medical devices for neurosurgical applications
- Probe systems and software for job set-up, tool setting and inspection on CNC machine tools
- Raman spectroscopy systems for non-destructive material analysis
- Sensor systems and software for measurement on CMMs
- Styli for CMM and machine tool probe applications

For worldwide contact details, visit www.renishaw.com/contact

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