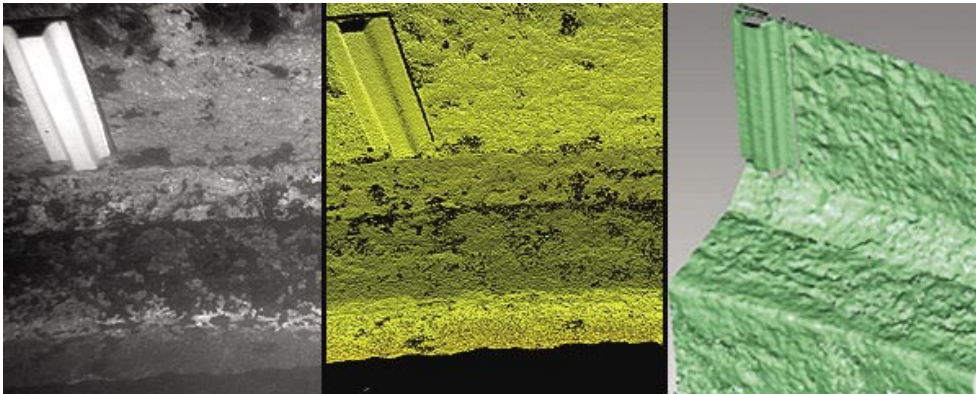


## Extended Range Underwater Laser Scanner

Model M310UW



Pictured is the same section of a pump seat flange inside a large underwater intake pipe. (left) The real-time video image. (center) The laser scan point cloud. (right) The point cloud rendered as a fully-measurable CAD file. (Note: 3-D software not included)

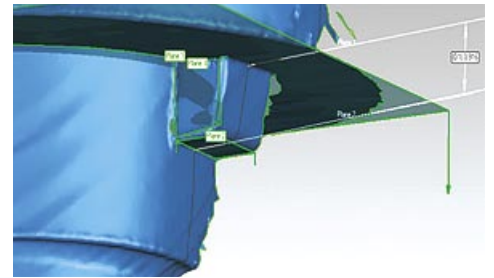
**T**ime-efficient surveys capturing precise measurements of larger underwater facilities are now possible with the M310UW, a revolutionary, laser-based non-contact measuring system featuring sub-millimeter accuracy at a greater stand-off distance.

- Sophisticated, Newton-developed algorithms compensate for refraction, turbulence and suspended particulates.
- Outputs a point cloud so detailed, that when utilized with industry standard 3-D software, a fully-measurable CAD model can be generated.
- Provides precise dimensioning of as-built features, cracks, welds, rust, pitting and other deformities on ships, marine substructures and submerged pipes.
- Constructed of rugged, industrial-grade hardware and electronic components.
- Cable-supplied and rated to 100 meter depths. Other available models are designed to be ROV-mounted and rated to much greater depths.

***The M310UW is specifically designed to deliver precise measurement scans underwater with a laser-to-target distance ranging from 1.5 feet to 10 feet.***



M310UW laser/camera scanning head

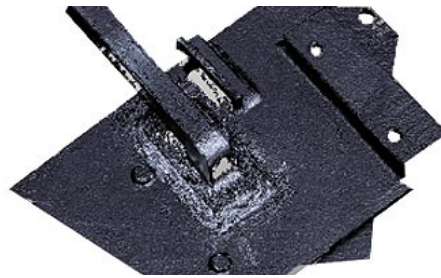
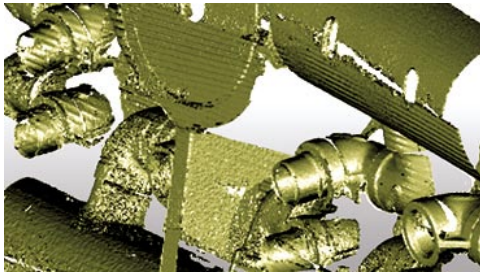


A fully-measurable CAD rendering of a select area of an underwater pump.

### M310UW Scanner Operation

- **The M310UW operates by triangulation** - The laser sweeps the target and the high resolution camera records any deformation of the beam as a point cloud.
- **The M310UW scans a target** as distant as 10 feet (3.0 m) and as close as 1.5 feet (0.46 m), for a scan coverage area of 9 ft. X 7 ft. (2.7 m X 2.13 m). The system measures underwater targets up to an accuracy of +/- .001 in. (0.025 mm).
- **M310UW software can capture much larger target areas** by combining several point clouds together to form larger composites.

- **Operators may select from several levels of scan quality.** The shortest, coarse scan takes 15 seconds; the longest and most detailed takes about three minutes
- **In the visual observation mode,** the LED ring arrays illuminates the area and the camera transmits a monochrome image to the control console screen.
- **Deployment of the scanner head** can be by a pole mounting, articulated arm, ROV, or other robots.



(Left) A wide area, scan of an underwater plumbing manifold prior to 3-D software processing.  
 (Right) A combination of three scans of an underwater tie bar assembly which, when processed in 3-D software, will render a fully-measurable CAD file. (Note: 3-D software not included)

## Background of Newton Labs

Newton Labs is a Seattle area-based privately held developer and manufacturer of machine vision and robotic systems. For 20 years Newton has built powerful, easy to use, and industrially rugged systems that provide solutions for wide ranging applications in many industries, including aerospace, automotive, bottling, electronics, medical, packaging, and nuclear, among others.

Newton has deployed more than 20,000 machine vision and automation systems worldwide, many are the first-of-their-kind.

**H**ardware, piping and structures installed underwater change over time which can affect their function and integrity. Obtaining precise underwater measurements to track changes and degradation is generally difficult and in some cases, be dangerous. The M310UW laser scanner by Newton Labs captures those underwater measurements with sub-millimeter precision, as well as being able to quantify corrosion, wear and deformation.

### M310UW Technical Specifications & System Performance

Item	Control Console	Laser/Camera Head
Height	9.5 in. (241.3 mm)	14.5 in. (368.3 mm)
Width	15 in. (381 mm)	5.25 in. (133.35 mm)
Length	22.5 in. (571.5 mm)	5.0 in. (127 mm)
Weight	98.2 lbs. (44.5 k)	[Air - 17 lbs. (7.7 k)] [Water - 11 lbs. (5 k)]
Construction	Metal electronics cabinet within a molded, high-impact, airline-transportable case	Machined from solid billet of 6061-T6 aluminum stock
Laser power	---	35 mW
Video camera	---	High Resolution Monochrome
LED arrays	---	3,336 lumens
Data storage	Internal solid state & USB stick data	---
Output format	.ply point cloud file	---
Data file size	Approximately 100 MB per scan	---
Maximum scanner-to-target distance	---	10 ft. (3.0 m)
Minimum scanner-to-target distance	---	18.0 in. (0.46 m)
Maximum Resolution accuracy (after processing with 3-D software)	---	+/- .001 in. (0.025 mm)*
Scan area	---	9 ft. X 7 ft. (2.7 m X 2.13 m)
Watertight depth rating	---	320 ft. (100 m) (Deeper depth models available)

Depth of Field Distance (Distance to object)	Field of View Height ----- Width		Raw Accuracy (Single Point Cloud point, rms)	Approximate CAD Model Accuracy**
1.5 ft. (0.5 m)	0.33 m	0.43 m	+/- .005 in. (0.13 mm)	+/- .001 in. (0.025 mm)*
3.0 ft. (0.9 m)	0.66 m	0.86 m	+/- .010 in. (0.25 mm)	+/- .002 in. (0.050 mm)
6.0 ft. (1.8 m)	1.32 m	1.72 m	+/- .027 in. (0.68 mm)	+/- .005 in. (0.137 mm)
8.0 ft. (2.4 m)	1.68 m	2.24 m	+/- .050 in. (1.27 mm)	+/- .010 in. (0.254 mm)
10.0 ft. (3.0 m)	2.08 m	2.80 m	+/- .072 in. (1.83 mm)	+/- .010 in. (0.254 mm)

\*\*After 3rd-party 3-D software processing

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\*All M310UW accuracy is related to the field of view, distance from the object to be measured and can vary by the parameters of the object. Consult Newton for the specific accuracy that can be obtained for your proposed object.

