NEWTON

Powerful Tools for Nuclear Energy

Nuclear Underwater Laser Scanner

Model NM260UW

The NM260UW Nuclear Underwater Laser Scanner is a landmark technology by Newton Labs that delivers precise dimensional measurements in the underwater radiation environments found in BWR and PWR vessels. The scanner has a demonstrated underwater accuracy of 0.005" (0.127mm) or much better (see datasheet below), and is designed to work in concert with industry standard, three-dimensional software, producing a point cloud output so dense and detailed that a fully measurable CAD model can be generated.

NM260UW Measurement Head

The NM260UW system combines rugged, industrial-grade hardware and electronics with sophisticated, Newton-developed software that compensates for the disruption of refraction, turbulence, heat and radioactivity typical of the in-vessel environment.

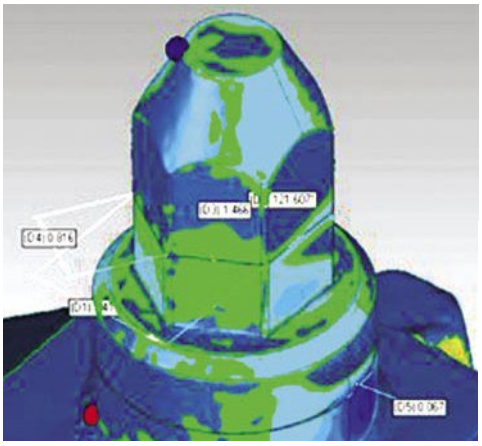
- The NM260UW operates by laser triangulation. The laser line sweeps the target surface and the high resolution camera, centered on the target, captures and re- cords any deformation of the line as a point cloud, enabling ultimate 3D computation.

- The NM260UW is able to scan a target as close as 6 in. (150 mm) and out to a distance of 5 ft. (1520 mm) for a scan coverage area of 1.6 ft. x 2.2 ft. (500 mm x 680 mm)

- The NM260UW is designed to scan and capture much larger underwater target areas by combining several point clouds together to form larger composites.

- In the visual observation mode, the LED ring array on the head illuminates the area and the camera transmits an image to the control console screen to as- sist the operator for optimum positioning and on-site analysis. The high resolution picture is stored and available to the user for later human analysis.

- Scanner deployment is by pole mounting, an articulated arm, an ROV, or other robots.



NM260UW Control Console with screen and keyboard

*An NM260UW (upper left) deployed within the belt-line area of the jet pump of a BWR. Image distortion in the photo is due to high radiation.***

*CAD model of a bracket bolt rendered in 3-D software from point clouds of consecutive scans at different positions. Greenish areas indicate corrosion.***

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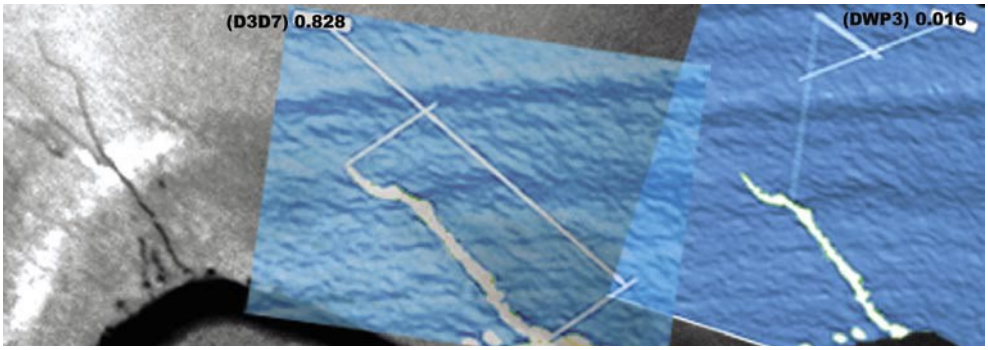

The image at left from a standard IVVI video shows a crack in a BWR steam dryer door. The NM260UW scans (in blue) of the same crack and processed with 3-D software, precisely captures the width at all points along the length (shown in inches). (Images are the property of Westinghouse Electric Company LLC. Used with permission)

(Left) The PT200UW Pan-Tilt Arm enables precise and rapid positioning of a NM260UW scanner with a pole, ROV or robot in order to capture dimensional measurements from multiple angles of a target within a BWR or PWR vessel.

Background of Newton Labs

Newton Labs is a Seattle area-based privately held developer and manufacturer of machine vision and robotic systems. Newton's powerful, easy to use, and industrially rugged systems provide solutions for wide ranging applications in many sectors, including aerospace, automotive, bottling, electronics, medical, packaging, and nuclear, among others. In 20 years Newton has deployed more than 20,000 machine vision and automation systems worldwide, many that are first-of-a-kind.

*NM260UW Technical Specifications & System Performance**

Item	Control Unit	Measurement Head
Height	14.75 in. (374.65 mm)	4.250 in. (107,950 mm)
Width	26.75 in. (679.45 mm	4.625 in. (117,475 mm)
Length	27.50 in. (698.5 mm)	9.375 in. (238,125 mm)
Weight	84.5 lbs. (38.3 kg)	[Air - 8 lbs. (3.6 k)] [Water - 2 lbs. (1 k)]
Construction	Metal electronics rack suspended on eight shock absorbers within a molded, high-impact, airline-transportable case	Machined from solid billet of 6061-T6 aluminum stock
Power/Data Umbilical Cable	Gel filled gel-filled with LLDPE polyurethane jacket and a rated yield point of 80 lb/ft (11 Kg/M) - 150 ft. (45,7 m) standard (other lengths available)	
Cable weight	23.6 lbs. (10.7 kg)	---
Laser power	---	460 mW
Video camera	---	High Resolution
LED ring array	---	2,320 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	---	5 ft. (1520 mm)
Minimum scanner-to-target distance	---	6.0 in. (150 mm)
Maximum Resolution accuracy (after processing with 3-D software)	---	+/-0.0004 in. (0.01 mm)*
Scan range	---	6.0 in. (150 mm) to 60 in. (1520 mm)
Watertight depth rating	---	100 meters

Depth of Field Distance *(Distance to object)*	Field of View *Height---------- Width*		Approximate CAD Model Accuracy***
200 mm	150 mm	190 mm	0.15 mm
300 mm	250 mm	330 mm	0.1 mm
600 mm	450 mm	470 mm	0.03 mm
900 mm	650 mm	880 mm	0.15 mm
1200 mm	1000 mm	1250 mm	0.2 mm
1500 mm	1500 mm	1800 mm	0.25 mm

*All NM260UW 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

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