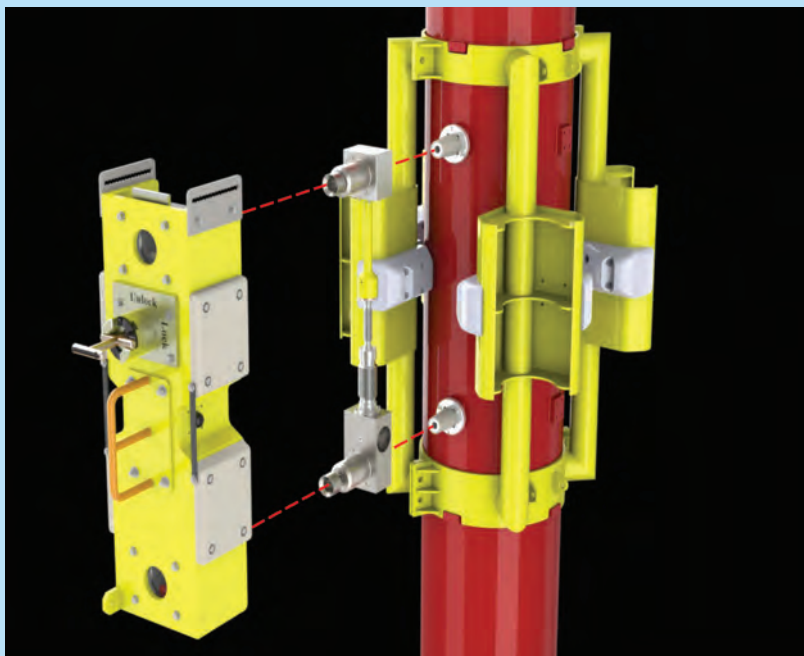


## ROV-Serviceable Strain Sensor Assembly

BMT has evolved its proven diver-serviceable subsea strain sensor assembly into one that is serviceable by ROV, giving Riser Integrity Managers and Offshore Platform Operators increased reliability and quicker sensor replacement operations.



ROV Serviceable Subsea Strain Sensor Assembly (SSSA)



ROV pulling tool away from the sensor during ROV qualification tank testing

BMT Scientific Marine Services has launched a fully-qualified ROV-Serviceable Subsea Strain Sensor Assembly (SSSA) for monitoring the structural integrity of subsea structures (tendons, production risers, steel catenary risers, platform legs and braces, etc).

Until now, sensors were limited to diver serviceability. Because of the high cost and risk associated with mobilizing a diver spread to change out a failed sensor, these systems had to rely on redundancy, with multiple sensors deployed to achieve the system design life.

With the ROV-serviceable SSSA, Riser Integrity Managers and Offshore Platform Operators can now replace or service individual sensors without interrupting data collection and reporting. This allows the monitoring system as a whole to remain operational and allows for the preservation of the absolute bending or tension measurement when a sensor is removed and replaced.

## Design:

The design of BMT's ROV-serviceable SSSA is an evolution of the diver-serviceable design. Both ends of the sensor have been modified to allow for a single, socket-head screw connection to the pipe on each end, which can be easily manipulated by an ROV. A tool and a cage surrounding the strain sensors are used to provide the precise and repeatable alignment required for installation and removal.



ROV-Serviceable Strain Sensor

## Performance:

The ROV-serviceable SSSA underwent full scale bending and tension testing to prove the following:

- a) the new sensor-to-pipe attachment scheme did not impair the sensor's ability to measure strain, and
- b) the sensor could be removed and installed by an ROV without affecting the sensitivity of the sensor to strain.

Laboratory testing demonstrated the full-scale accuracy of the sensor to be equal to that of the diver-serviceable designs. In addition, full-scale ROV tank testing has proved the ability of a typical work-class ROV to completely remove and replace a sensor repeatedly.



Laboratory performance qualification testing of ROV-serviceable SSSA

	Diver-serviceable		ROV-serviceable	
	$\pm\mu\epsilon$	$\pm\%FS$	$\pm\mu\epsilon$	$\pm\%FS$
Accuracy	5.3	0.9%	2.3	0.5%
Resolution	0.4	0.1%	0.8	0.2%
Hysteresis	1.9	0.3%	3.1	0.7%
Repeatability	1.5	0.3%	0.8	0.2%

Summary of results and comparison with Diver-Serviceable SSSA



Locking SSSA into installation tool