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CP Test Stations for Subsea Pipelines

Efficient and Reliable Acquisition of Subsea CP Potentials

With a significant percentage of the offshore pipeline infrastructure exceeding its original design life, the need for life extension is increasing. Pipelines need improved surveillance to evaluate the optimum time to repair (retrofit) and to ensure integrity through an extended life cycle.

Deepwater leads the industry in innovation of offshore corrosion integrity management and has spent years working on improvements to current technologies to compensate for their shortcomings, improve their accuracy and repeatability, standardize procedures and, above all, deliver a significant cost benefit. CP Test Stations provide:

Faster Surveys

Inspection vehicles can move directly from station to station. Costly inspection time is significantly reduced because survey speeds are be increased If an ROV or AUV only has to take a reading every 10 Km.

More Useful Data

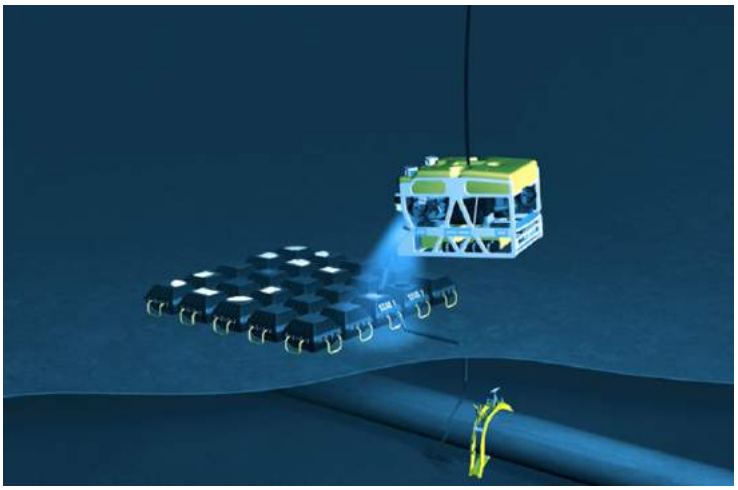
Use of Deepwater's Test Stations result in dramatically better data quality and repeatability over time. Stations perform reliably for 20 years. Attenuation modeling and aggregate data allow for superior asset management.

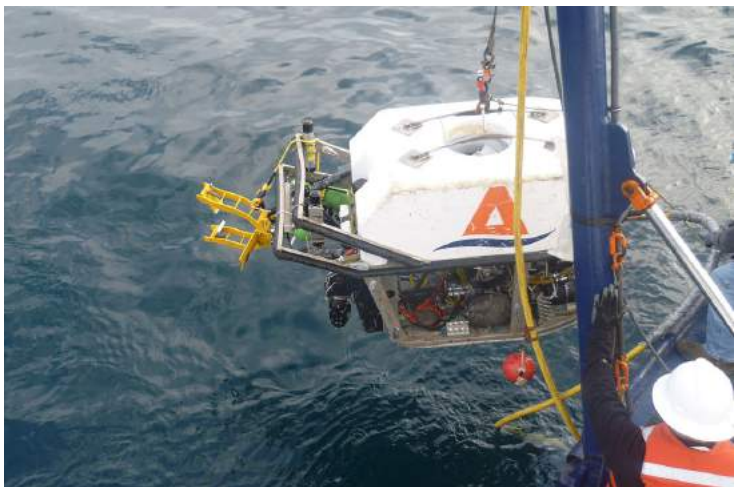
Real-time Results

Data for three-electrode surveys is computer generated, making post-project reporting expensive and time-consuming. Deepwater's Test Stations allow real-time assessment of the results using purpose-built Polatrak SurveyTM Software.

Superior Survey ROI

The system practically pays for itself the very first year. A CP test station system provides accurate, repeatable data for the design life of the pipeline and costs the same as a single three-electrode survey.





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CP Test Stations for ROVs

Deepwater's CP Test Stations for ROVs are a more cost-effective method for gathering accurate pipeline readings. For unburied pipelines, a modified RetroClamp with a stab plate is electrically connected to any pipeline every 1, 5, or 10 km. For buried pipelines, Deepwater's RetroMat stabilization mattress is used as a semi-remote stab test station. The RetroMat, fitted with stab plates and coupons, is laid on the seabed and is electrically attached to the buried pipeline using a RetroClamp. CP readings can be easily taken from the RetroClamp test station or the RetroMat's stab surface by the ROV's contact probe, resulting in far more accurate readings than the three-electrode method can provide.

The RetroClamp (with and without CP test stabplate) is designed to provide a constant tension mechanical and electrical connection to subsea tubulars. It may be used to establish electrical continuity between two subsea metallic entities. RetroClamp it is designed to be installed by diver or ROV and is available for installation on all pipe diameters from 4" to 65" with custom sizes available upon request.

Frame **(Item 1)**

	RetroClamp	**RetroClamp HD**
Steel grade	ASTM A36 [EN 10025 S355]	ASTM A36 [EN 10025 S355]
Steel thickness	3/8" [9.5 mm] Plate	3/8" [9.5 mm] Plate
Fulcrums & spacers	Ø 1/2" Rod [Ø 12.7 mm]	Ø 3/4" Rod [Ø 19 mm]
Fasteners	SS316 and Zinc Plated Carbon Steel	SS316 and Zinc Plated Carbon Steel
Cable connection	2 x Ø 1/2" [M12] Stud	2 x Ø 1/2" [M12] Stud

Flappers **(Item 2)**	Tensioned by springs to allow easy installation onto tubular assets. In the event of snagging, flappers are designed to fail to prevent damage to asset. Can be fitted with pipeline protectors if required.
Floating plate **(Item 3)**	Spring-tensioned by Belleville spring washers to ensure the low resistance electrical contact is maintained under constant pressure.
Continuity	Electrical continuity throughout RetroClamp provided by SS316 bonding cable with swaged connector lugs (4 required.)
Cable grip **(Item 4)**	Provides strain relief and routing for the anode connection cables.
Floating plate separation indicator	Indicates floating plate separation when visibility is obstructed (option).

Contact screw **(Item 5)**

The contact screw runs through the floating plate and establishes electrical continuity with the target member or pipeline; it is tensioned against the Belleville spring washers. The user interface for the contact screw is customized to suit the installation requirements i.e. diver or ROV installation. Custom handle geometries are available by request.

User interface options

Rigid tee handle (Diver or ROV installation)	Ø 3/4" [Ø 19 mm] Length to suit installation - 6" [152 mm] long handle as standard]
Fish handle (ROV installation)	3/4" [19 mm] Plate
Hexagonal head) (Diver installation)*	Ø 3/4" [Ø 19 mm] Length to suit installation

**To drive the hexagonal head, removable handles with socket attachments are provided*

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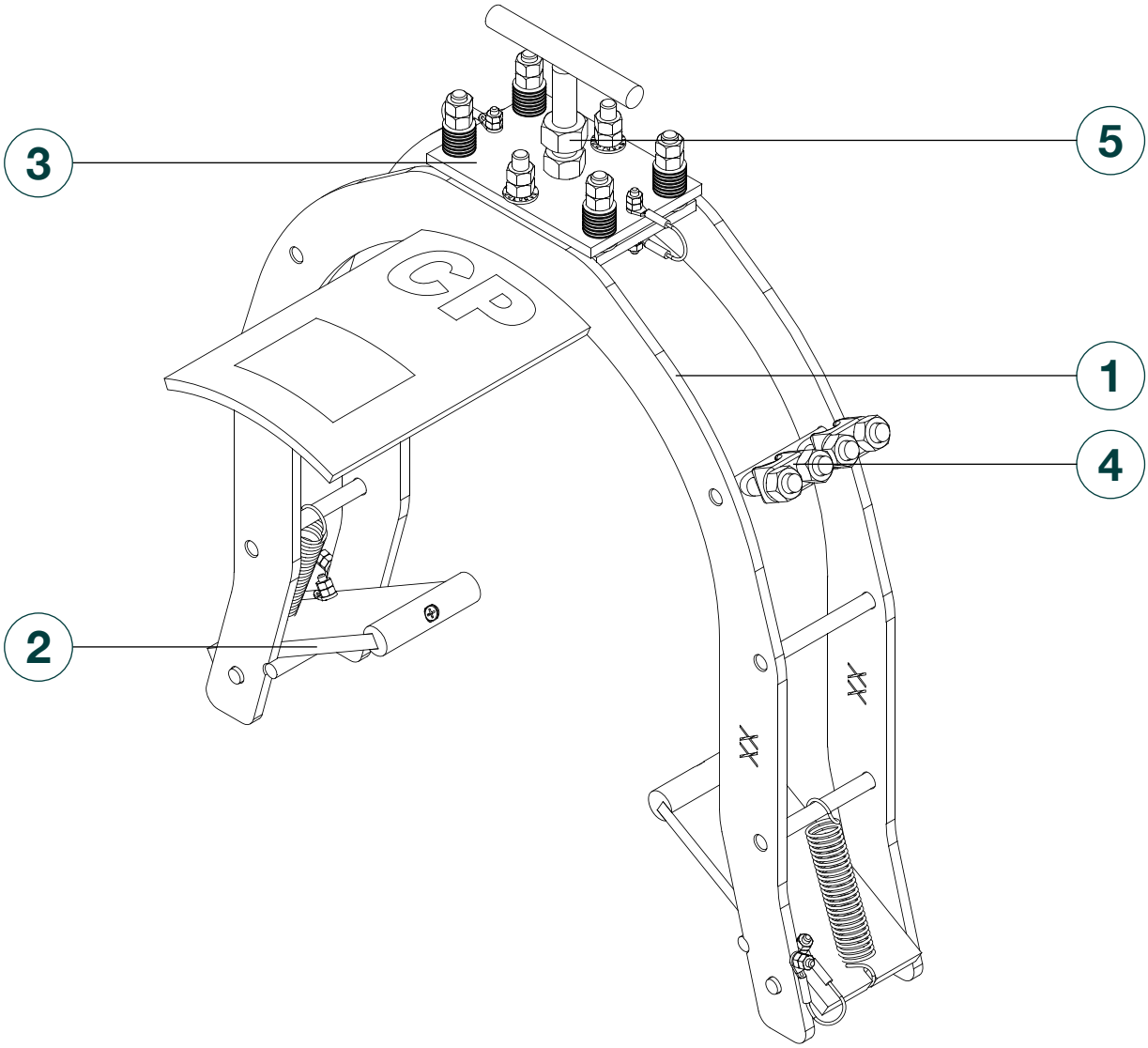
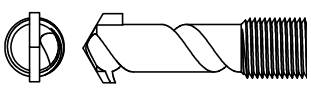


Contact tip options

The contact tip is selected based on the target structure and coating.

Target structure and coating	Contact tip		Plate separator	
			Recommended	Maximum
Structural connections (Bare steel or painted)	Ø 3/4”-10 Stainless Steel 316 45° point tip		6 mm	10 mm
Pipelines with thin film coating (<6 mm) or Pipelines with Concrete Weight Coating (CWC) (Concrete pre-removed)	Ø 3/4”-10 Stainless Steel 316 Volcano tip with transverse slot		6 mm	10 mm
Pipelines with Concrete Weight Coating (CWC) or Thick polymer coatings up to (76mm) (ROV installable with the use of a RetroReader)	Ø 5/8”-18 Stainless Steel 316 driver Tungsten-Carbide concrete piercing masonry bit		8 mm	10 mm

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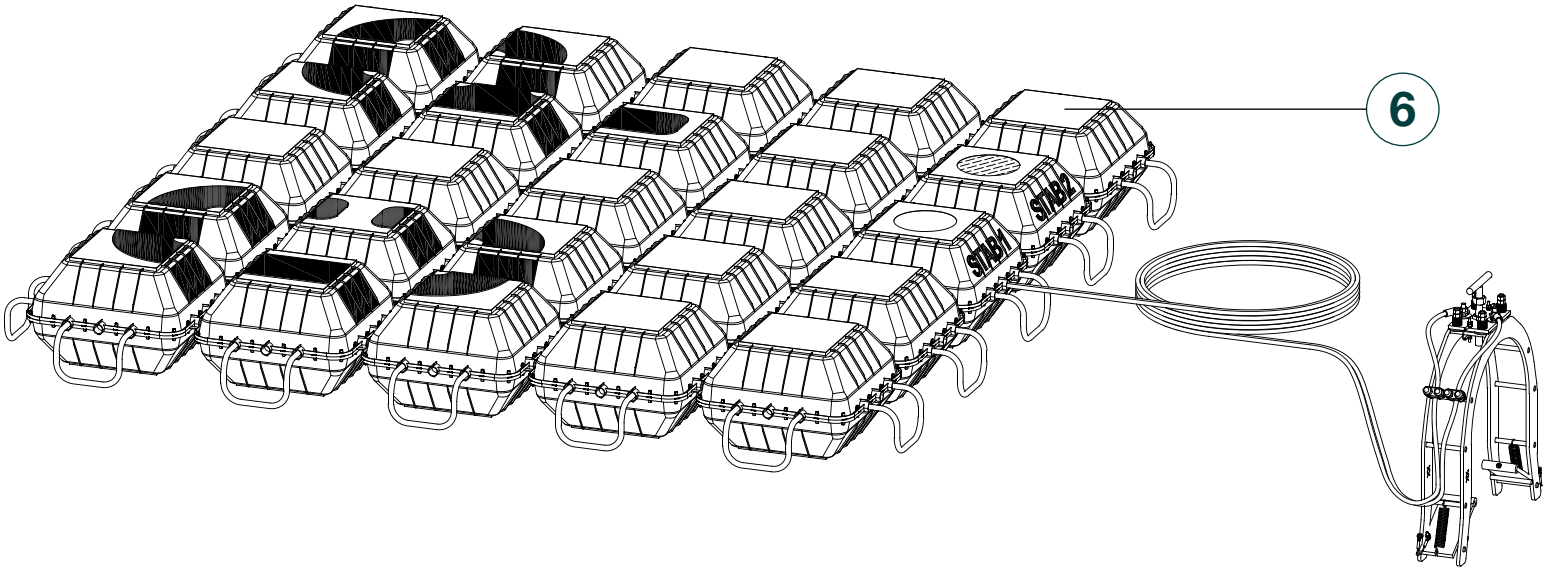
Contact tip options

The CP Test Staton mattress is formed using plastic FLXMAT shells, which allows the concrete to be poured locally on-site.

Single concrete block **(Item 6)**

Shell	Plastic FLXMAT shell
Size	20” x 20” x 12” (500 x 500 x 300 mm)
Volume	1.5 ft^3 (0.042 m^3)
Weight	(air) 225 lb (100 kg)
Weight	(water) 130 lb (60 kg)
Lifting	(16 mm) polypropylene rope
Concrete	Typical density 150 lb/ft^3 (2400 kg/m^3)

Quantity as per requirements, typically 2 per RetroMat CP Cable (Item 7) 3/4” Galvanized wire rope 2 per RetroClamp



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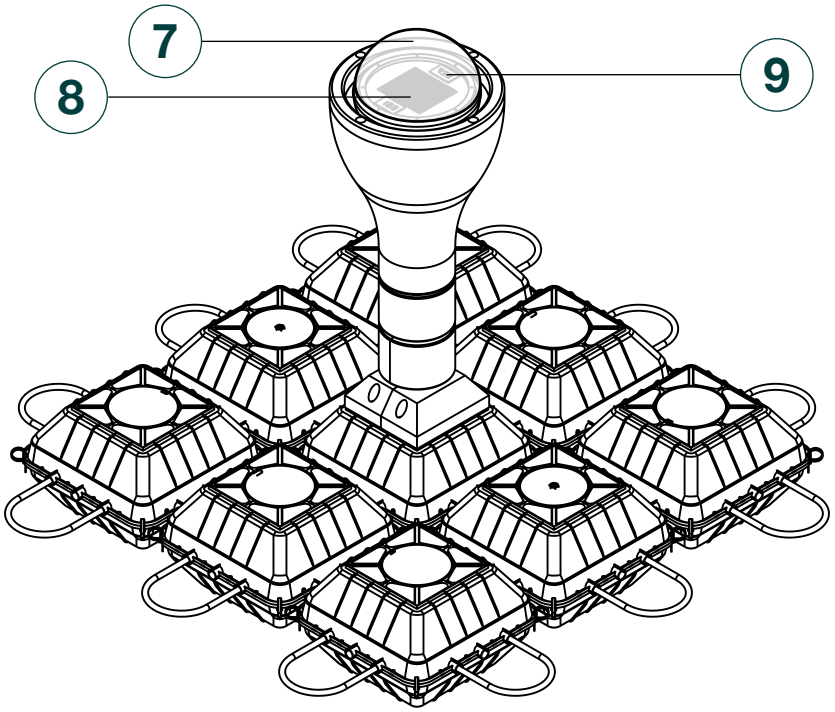
Touchless CP Test Stations for AUVs

Instead of an ROV tracing the entire length of the pipeline, a touchless CP test station is electrically attached to the pipeline every 1, 5, or 10 km. Operators create an efficient and autonomous survey plan sending the AUV directly from one test station to the next, gathering CP potentials at each location. The station is powered by the AUV's external lights and the camera on the AUV records the readings.

The system is connected to the pipeline in less than one hour using Deepwater's field-proven RetroClamps. A touchless CP test station system allows for full coverage spanning buried and unburied sections of the pipeline and provides up to 20 years of continued monitoring. Surveys that once took a week are reduced to two or three days. Engineers can calculate potentials between the test stations with attenuation modeling techniques to create a remarkably accurate CP profile.



Total height	60 in [1524 mm]
Total length	60 in [1524 mm]
Total width	60 in [1524 mm]
Total weight	approx. 1900 lbs [861.83 Kg]

Compatible instruments
Dual Reference Cell (DR-2)
Monitored Al Anode (MA-1)
Zinc Reference Electrode (V-String)
Current Density Monitor (DR-2 CD)
RetroClamp Mounted Dual Reference Cell (DR2-Mini)

Glass housing (Item 7)

Anti-fouling	Ø 1/2" Rod [Ø 12.7 mm]
Material	Low-expansion borosilicate
Weight (Air)	32 lbs (14.5 kg)

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Weight (Water)	17 lbs (7.7 kg) positive
Sphere diameter	Ø13”
Protection casing	17” x 17” x 8” Neutrally buoyant polyethylene ribbed hardhat
Fasteners	0.38”-18 x 2.5 full thread 40% long glass filled polyurethane (Isoplast)
Power source **(Item 8)**	Ø 11” [280mm] Mono-crystalline Silicon Solar panel, 5W at 1000W/ m2 irradiance
Power cabling	Polyurethane 18 AWG 4 core
Data cabling	Polyurethane 18 AWG - Spliced to project specific cabling with subsea rated encapsulation

LCD Readouts (Item 9)

Dimensions	Ø 3.5" x 7
Weight (air)	9lb [4.1kg]"
Lens	Clear acrylic
Voltage ranges	+1999 mV to -1999mV (1mV resolution) -199.9 mV to -199.9mV (0.1mV resolution
Operating temp.	1°C to 55°C)
Display	2 No. 3.5 digit 0.4” [10 mm] Ultra low power LCD display
Accuracy	± 1 mV
Connector	4 pin wet-pluggable
Design life	30 years
Interrogation maximum distance	8 ft [2.5m] (with 500W light source in very good visibility)
Monitor	Polatrak DR2-Mini

Quantity as per requirements, typically 2 per RetroMat CP Cable (Item 7) 3/4” Galvanized wire rope 2 per RetroClamp. See DR-2 Mini Technical Datasheet for DR2-Mini information.

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