

Polatrak[®] Deep C Meter 300 Series ROV Mounted CP Measurement System

Operation Manual



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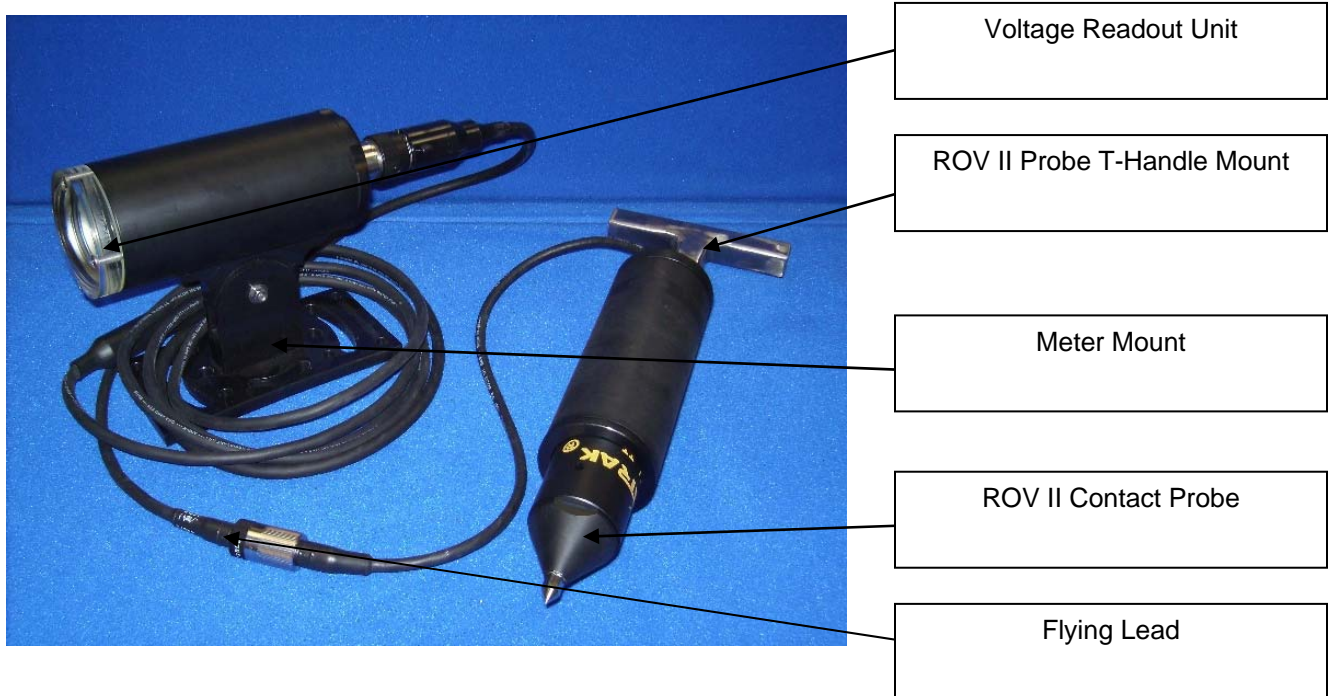
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Overview

The Deep-C-Meter 300 is a complete ROV interfaced Cathodic Protection Monitoring System. The system is comprised of three basic parts; The Readout Unit, twin voltmeters housed in a (black) Delrin® pressure housing. The Probe, a twin element, tip contact, CP probe (*Polatrak® Model ROV II™*). The Flying Lead, a three-meter-long umbilical that connects the probe to the readout.



The Deep-C-Meter 300 has the following changes over the Mk II instrument:

- Smaller Pressure Housing
- Ultra-Bright LED Displays
- Simpler Lens Maintenance
- Modified Probe Handle
- Simplified Articulated Mount

Parts & Specifications

The major components along with specifications are described below:

Voltage Readout Unit

The readout unit has two major sub-assemblies:

Pressure Housing

Housing Body - The pressure housing is made from a single solid piece of black Delrin® and is rated for 300 meters (1000 feet) water depth.

Lens - One end of the housing contains an acrylic lens that seals with o-rings into the pressure housing. Four stainless-steel (SS) screws keep the lens seated in the pressure housing. Access to the inside of the pressure housing is gained by pulling the lens. See maintenance and repair section for details on lens removal/replacement.

Bulkhead Connector - The back end of the pressure housing is sealed with a bulkhead connector. Said connector threads into the back of the pressure housing and also seals with an o-ring. It should not be necessary to remove this connector during normal maintenance. A blank (dummy) connector is provided and should be in place whenever the mating connector is removed.

Voltmeter Module - The voltmeter module is located within the pressure housing. The voltmeter module contains two independent 4-Digit LED voltmeters. Default factory range is +/- 2.000 VDC on both readouts. A 9V alkaline battery powers each one of the readouts. On the face of the module is a photocell that switches each measurement circuit on when exposed to light from ROV.



Exploded view of pressure housing



Voltmeter module

Articulated Mount

The Articulated mount is designed to secure the Readout to the ROV frame, and provides angled adjustment to optimize camera viewing of the displays. The mount is made of Delrin® and secured with SS screws; the mount has to be adjusted prior to ROV deployment. The voltmeter module slides onto a “dovetail” joint on the mount.



Meter Mount

Probe Unit

The Deep-C-Meter 300 utilizes the popular POLATRAK ROV II Tip Contact Probe. This probe can be used independently of the readout unit as a standard topside wired CP probe. For reference, the entire manual for this equipment is included herein as Attachment 1.0.

The Probe Unit comprises of the Nose Cone which houses the contact tip, the Main Body section, the Tail Unit which houses the reference electrode female plugs and the connection cable with strain relief, the Reference Electrode Elements, the Compliant Tee Handle Mount for manipulator mounting and the Flying Lead Connection back to the Readout Unit.

Nose Cone

The nose cone assembly is screwed into the main body section. The cone houses the replaceable contact tip; it also has the female connector that attaches to the male pin on the extension cable from the tail unit. Tips are made from stainless steel; the nose cone is fabricated from black Delrin®.

Main Body Section

The body section provides protection to the reference electrode elements. It is made from black Delrin® and is designed to fit the compliant tee handle mount for convenient manipulator mounting. The holes in the side of the body are the potential measurement ports. **Do not cover or modify these or add additional holes in the body.**

Tail Unit

The tail unit attaches to the main body section with 2 stainless steel cap screws. The connection cable passes through this unit and is strain relieved with a PVC strain relief fitting. One male connector for the contact tip and two female connectors for each of the reference electrodes.

Reference Electrode Elements

Two plug-in sintered silver/silver chloride elements are included. Electrode elements are accurate to +/- 5 mV. See the operations and maintenance section for instructions on electrode replacement.

CAUTION: NEVER HANDLE ELECTRODE ELEMENTS WITH BARE HANDS, or EXPOSE ELEMENTS TO ANY LIQUID OTHER THAN WATER. PERMANENT DAMAGE MAY RESULT.

ROV II Probe T-Handle Mount

The T-Handle Mount allows easy interface with most manipulator systems. The T-Handle is made from 316 stainless steel and the mount housing is black Delrin®. In order to mate the Delrin housing onto the SS T-Handle; unscrew the female lock ring on the back portion of the housing, slide housing on by way of the dovetail joint, finally replace screw-on ring to the back side of the housing, this will ensure that the housing will not slide off of the T-Handle.

Flying Lead

The standard flying lead is 3 Meters long, a longer lead can be provided if it is necessary to use a rear facing camera to look at the Readout. The lead has a polyethylene abrasion resistant sheath and has connectors on either end that mate with the bulkhead connector on the Readout and the whip cable on the Probe unit.



ROV II Probe



Exploded view of ROV II probe

Spare Parts and Accessories

The Deep-C-Meter is shipped in a waterproof case and should contain the following spares and accessories.

Zinc Calibration Block	(1)
Contact Tips	(3)
Lens Retaining Screws	(4)
O-Ring Lube	(1)
Silicone Connector Lube	(1)
Bulkhead Connector Dummy Plug	(1)
Ag/AgCl Electrode Element	(1)
Lens Back-Up Ring	(2)
Lens O-Ring	(4)

Part No.	Description	No. Required	No. Spares
DCM0003-300	<i>Pressure Housing</i>	1	0
Call	<i>Meter Mount</i>	1	0
MLT0014	<i>Lens</i>	1	0
GSK0009	<i>Lens - O Ring</i>	2	4
GSK0008	<i>Lens - Backup Ring</i>	1	2
FAS0107	<i>Lens Retaining Screw</i>	4	1
MFR0016	<i>Lens Cover</i>	1	0
UWC0003	<i>Bulkhead Male Connector</i>	1	0
Call	<i>Bulkhead O Ring</i>	1	0
UWC0019	<i>Bulkhead Dummy Plug</i>	1	0
MLT0026	<i>ROV II Probe Nose Cone</i>	1	0
MLT0022	<i>Contact Tip</i>	1	3
Call	<i>Main Connector</i>	1	0
MLT0004	<i>Replaceable Silver Chloride Element</i>	2	1
MLT0010	<i>Voltmeter Module</i>	1	0
Call	<i>ROV II Probe T-Handle Mount</i>	1	0
GSK0006	<i>Tube O-Ring Lubricant</i>	1	0
EOR0015	<i>Tube Silicone Grease</i>	1	0
Call	<i>Zinc Calibration Block</i>	1	0
358-MN01-ENG	<i>Instruction Manual</i>	1	0
Call	<i>Storm Case</i>	1	0
Call	<i>Storm Case O-Ring</i>	1	0
Call	<i>Storm Case Foam Pack</i>	1	0

Calibration

With the system hooked up, the probe should be bucket calibrated prior to deploying the ROV.

Bucket Calibration Procedure

Fill a non-metallic bucket or container with seawater, approximately 16 –18 inches deep.

Place the probe in the bucket with the tip pointing up to fill body with seawater. The entire probe, including tip must be immersed.

Stab the zinc coupon firmly onto the probe tip The upper displays on the readout unit should read between (+) 1.000 & (+) 1.100 Volts. The lower unit should read within +/- 5 mV (+/- 50 on the display, the decimal point is not displayed.)

Note: If the probe has not been used in a while it may take 15-30 minutes for the probe to reach equilibrium.

Online Calibration

While free flying both voltmeters are reading the potential of the tip contact, this number will vary depending on ROV speed , time of immersion, and whether a protected structure has been recently stabbed. Normally the reading will be in the (-) 0.200 to (-) 0.400 Volt range, both meters should however be within +/- 0.005 V.

If instrument will not calibrate go to the Troubleshooting Section in this manual.

Operation

Mounting on ROV

- Find a good location on the vehicle to mount the display unit, and attach the articulated mount. The lens on the unit must be camera visible and have a light source directed at it in order to activate the displays. Ensure that all fasteners are good and tight and that all lock nuts and washers are in place. Leave the lens cover in place while the unit is on deck (unless calibrating), the displays are light activated and battery life will be reduced.
- Insert the Probe unit into the compliant tee-handle probe mount and position in a manipulator, or tool basket that is manipulator accessible.
- Ensure that lock rings for the dove tails are properly mounted and secured.
- Route the flying lead in such a way that it will not be stressed, entangled or pinched during manipulator operation.
- Using the silicone grease provided, connect the flying lead to the probe and tighten the connector lock ring.
- Perform Bucket Calibration (see section 3.0)
- Ensure that the contact tip is tight on the nose cone and that the tip is sharp.
- Remove the lens cover from the instrument.

Taking CP Potential Readings

Simply stab the tip contact probe onto the point on the structure where the reading is required, when a good contact is made the reading on the meters will be steady.

CAUTIONS

- *Avoid stabbing painted or coated surfaces whenever possible, try to take readings on bare steel or on spots specially designated for CP measurement.*
- Avoid trying to stab through heavy hard marine growth if possible.
- If the readings are not steady or don't match the criteria in the table below, it's probably due to a high resistance contact, **DO NOT RECORD THESE NUMBERS** continue to stab until readings are in specification. See troubleshooting section if problems persist.
- *Never operate the system with any of the connectors un-mated unless the blanking plugs are installed.*

Data Interpretation

Under normal conditions the readings obtained should be within the following ranges, exceptions may occur under the following circumstances:

- The probe is stabbed onto an isolated section of a corrosion resistant alloy, stainless steel, copper nickel etc. In these cases readings less negative than the indicated range may be noted. If this is the case ensure that the readings are steady and within the 5 mV allowable range.
- The structure under investigation is fitted with impressed current cathodic protection. In this case, the readings may be more negative than those indicated below. Use the same procedure as above.

Normal Cathodic Protection Ranges in Seawater

Range Interpretation

>(-)0.500 Probable Error
(-)0.500 – (-)0.650 Native state potential, no CP applied.
(-)0.650 – (-)0.800 Under-Protected
(-)0.800 – (-)0.850 Marginal Protection
(-)0.850 – (-)1.050 Optimal Protection
(-)1.050 – (-)1.150 Galvanic Anode Potential
<(-)1.150 Probable Error – Check Contact

Removal from ROV

When equipment is removed from the ROV, wash thoroughly with fresh water and allow to dry. Replace lens cover and return to storage case provided.

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Maintenance and Repair

This section covers general operational maintenance, do not attempt any tasks not described in this section as it may damage the system.

Tip Replacement

From time to time it will be necessary to replace tips. Remove the old tip with a wrench (flats are provided). Ensure that the new tip is tight.

Electrode Element Replacement

Remove the probe from the ROV and un-mate the connector. Install the blank plug provided onto the exposed flying lead connector. Next determine which element is bad.

Put the probe into a bucket and stab the zinc coupon as described in section 3.0.

Using a digital voltmeter set on 2.00 VDC range stab the large pin with the positive voltmeter lead, and pin 1 (first clockwise of large pin) with the negative lead (note reading). Then repeat stabbing pin 2 with the negative lead, note the reading. The faulty electrode will be the one that gives the lowest (least negative) reading.

Ensure that the probe is drained of seawater.

Take the probe unit to a clean area. **Do not handle the small electrode pellets with bare hands.**

Remove the two screws securing the tail unit and gently pull out the tail unit exposing the electrode elements. Try to avoid un-mating the tip connector.

Visually inspect to ensure that the wire is not damaged or the connector is improperly mated.

Remove the bad electrode and discard.

Take the new electrode and carefully place a **small** amount of silicone grease on the pin and sealing section of the connector. Plug the new electrode into the connector.

Check that all connectors are fully mated, then carefully put the electrodes back into the housing and re-attach the tail unit and nose cone.

Repeat calibration as described above. (Note a new dry element may take up to 30 minutes to reach equilibrium)

NEVER IMMERSER AN ELECTRODE ELEMENT IN WATER WITH THE CONNECTOR PIN EXPOSED.

Battery Replacement

Batteries will need replacing after approximately 48-60 Hours of actual operation. In order to replace batteries, the readout must be removed from the vehicle and taken to a clean dry location. This is best done in a workshop. Follow these steps:

- Remove the lens-retaining screws.
- Screw in the 4 ¼"x 20 Allen head screws and use them to pull the lens out of the body.
- Remove the Allen screws.
- Carefully remove the voltmeter module from the housing, there is enough slack cable to allow this. Remove and replace the 2 batteries.
- Carefully re-insert the voltmeter module, illuminate the photocells to ensure that the displays light up.

- Remove and discard the O-Rings and Back-up ring from the lens, and replace with the spares provided. Ensure that the back-up ring goes under the o-ring in the correct groove with the concave side facing out. Use the lubricant provided and coat the sealing surfaces with a thin layer.
- Insert the lens into the housing so that the first o-ring is just above the housing. Use the 4 lens retaining screws to gently pull the lens into the housing until fully seated. Do not over-tighten the screws.

Troubleshooting

For any problem not described here call our Technical Hotline(s) - (713) 983 7117 x 222 or x 228

Symptom	Possible Problem	Action
Instrument will not calibrate	One electrode is bad Zinc Coupon is passive Electrodes are dry	See Section 5.3 Remove zinc and clean with rasp Allow to soak for 30 minutes and retry
Both electrodes reading low	Tip wire damaged	Remove probe tail unit, unplug tip wire, remove nose cone, inspect tip wire and repair with ScotchKote as temporary measure. Order replacement nose cone.
Readings are not steady, they continue to change.	Batteries are low Poor structure contact	Replace batteries Re-stab to ensure contact.
One reading suddenly goes less negative	Connector is flooded Lead wire (Flying lead) is nicked.	Check Connectors Inspect and repair / replace as necessary
Displays are blank	Not enough light to photo-cells Batteries are dead	Increase light intensity and re-direct to center of lens. Replace batteries