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Reference Half Cell Electrode
Model Ag/AgCL Sea Water & Land Kit
Part # 13175

Introduction:

This Manual contains instructions for the M.C. Miller Co. Silver/Silver Chloride **Sea Water** reference electrode**.** **(See page 4 for land instructions)**

Equipment:

- **Meter** – Any high resistance, 20 megohm or greater voltmeter.
- **Test Lead** – 8 foot submersible adapter, longer lengths available.
- **Reference Electrode** – AgCl rod assembly, protective chamber, brass weight.

Preparation:

1. Remove thumb nut from rod assembly
2. Screw rod assembly into submersible adapter.
3. Screw Brass weight into bottom of protective chamber.
4. Connect electrode test lead to meter.

Measurement Procedure:

A stable junction potential may be developed by following these steps:

1. Immerse the complete electrode into electrolyte, sea water.
2. When lowering the reference electrode into the seawater, avoid immersing the electrode through a film of oil which could coat the electrode element and cause abnormal readings.
3. Allow the potential measurement to stabilize over a five to ten minute period. This time is Necessary if the Ag/Cl Element is dry before immersion.
4. Position the reference electrode as close as possible to the structure (minimizing IR drop).
5. Potential measurements can now be recorded.

Storage:

To ensure quick response time and fast potential stabilization, the Ag/AgCl element should be moist.

Daily – soak Ag/Cl rod assembly in the solid storage tube filled with local sea water.

Long term – Disassemble and wash with distilled water. Before returning to service, prepare as for a new Electrode. (Allow to stabilize for five to ten minutes before recording readings)

Maintenance:

Cleaning – Rinse or brush away any foreign deposits with distilled water. If grease or oil is encountered, Clean with mild detergent and rinse with distilled water.

Ag/AgCl/Sea Water – Cu/CuS04

ELECTRODE @ 25° C	SEA WATER 20 Ohm-cm	BRACKISH 100 Ohm-cm	BRACKISH 500 Ohm-cm
Cu/CuSo4/	0.85 V	0.85 V	0.85 V
Ag/AgCl	0.79 V	0.83 V	0.88 V

Additional Technical Information:

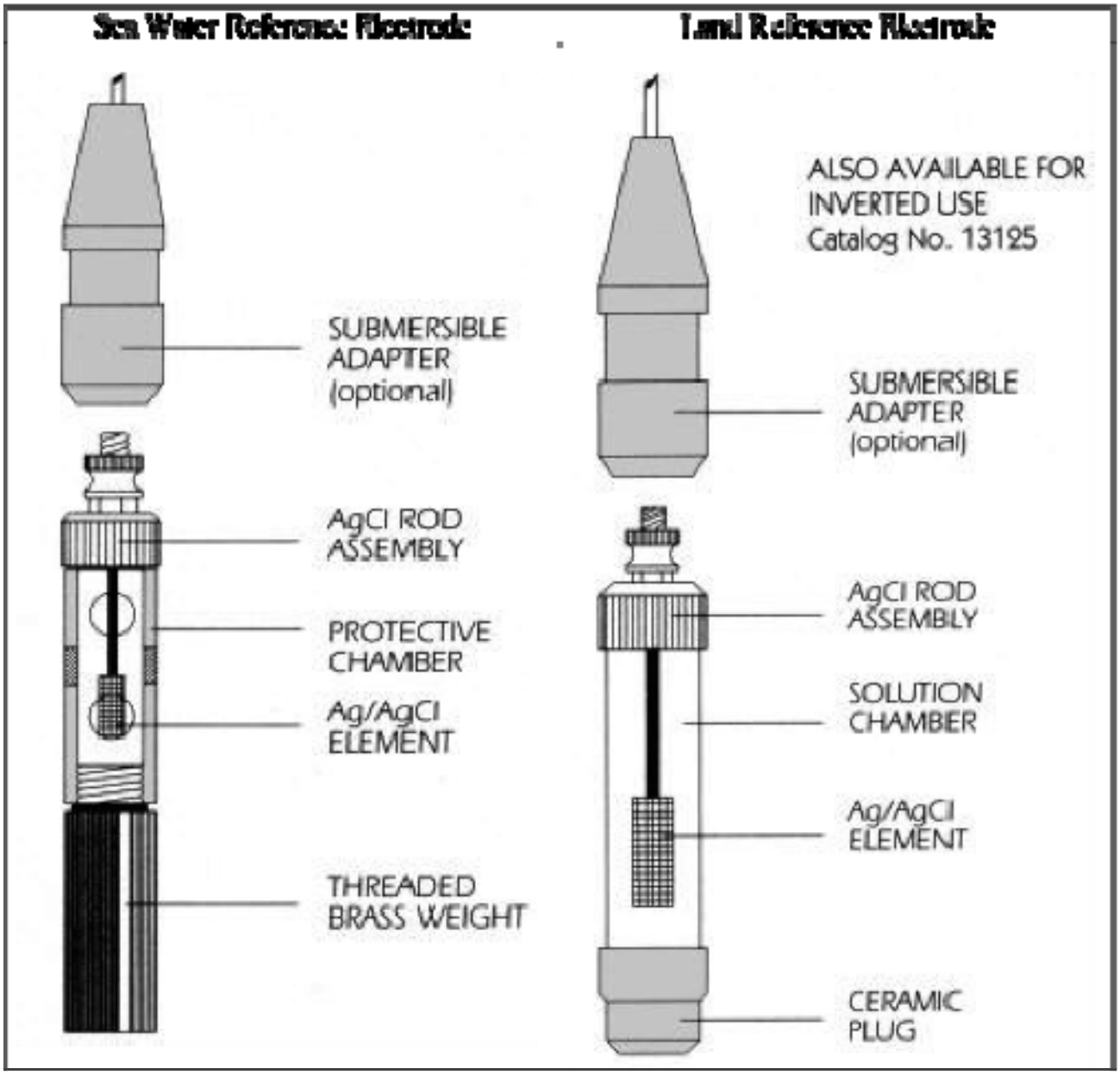
- NACE Standard RP-01-76 (1983 Revision) Item No. 53105
- "Tests Indicate the Ag/AgCl Electrode is ideal reference Cell in Sea Water" Peterson & Groover. Materials Protection and Performance, Vol. 121, No. 5, pp. 19 - 22,May, 1972

Specifications:

Temperature Range	0 to 90° C
Length, excluding Cap	5.15 in.
Diameter max.	1.15 in.
Thread	¼ -20

Parts Available:

Ag/AgCl rod assembly	SUB148
Protective Chamber	SUB162
Protective Chamber w/Holes	SUB160
Ceramic Plug	13185
Brass Weight	13180
3.5 M KCL 2oz	13200
3.5 M KCL 8oz	13330
Submersible Adapter 8 Ft	16305
Submersible Adapter 25 Ft	16407
Submersible Adapter 50 Ft	16509
Submersible Adapter 100 Ft	16600
Submersible Adapter 150 Ft	16702
Submersible Adapter 200 Ft	16804


Sea Water Reference Electrode
Land Reference Electrode
SUBMERSIBLE ADAPTER (optional)
AgCl ROD ASSEMBLY
PROTECTIVE CHAMBER
Ag/AgCl ELEMENT
THREADED BRASS WEIGHT
ALSO AVAILABLE FOR INVERTED USE Catalog No. 13125
SUBMERSIBLE ADAPTER (optional)
AgCl ROD ASSEMBLY
SOLUTION CHAMBER
Ag/AgCl ELEMENT
CERAMIC PLUG

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Reference Half Cell Electrode
Model Ag/AgCL Sea Water & Land Kit
Part # 13175

Introduction:

This Manual contains instructions for the M.C. Miller Co. Silver/Silver Chloride **Land** reference electrode.
(See page 1 for Sea Instruction)

Equipment:

- **Meter** – Any high resistance, 20 megohm or greater voltmeter.
- **Test Lead** – 8 foot submersible adapter, longer lengths available.
- **Internal Filling Solution** – 3.5 M KCL
- **Storage Solution** - .1 M KCL (35 parts distilled water to 1 part internal filling solution).

Preparation:

1. Remove orange protective cap and save for future use.
2. Unscrew ceramic plug assembly.
3. Fill electrode with internal filling solution.
4. Replace ceramic plug assembly and tighten by hand.
5. Soak electrode in storage solution for 2 hours.
6. Remove thumb nut from rod assembly.
7. Screw rod assembly to submersible adapter.
8. Connect electrode test lead to meter.

Measuring Procedure:

A Stable junction potential may be developed in three ways:

1. Pressing the ceramic tip of the electrode into the desired area of earth.
2. Immersing the tip or complete electrode into to the electrolyte.
3. Attaching a sponge wetted with storage solution to the ceramic plug with a rubber band and contacting the dry surface.

Storage:

To ensure quick response and free flowing liquid junction, the ceramic tip must not be allowed to dry out.

Daily – soak electrode in storage solution or ad a few drops into the protective cap.

L**ong term** – disassemble and wash with distilled water. Before returning to service prepare as for a new electrode.

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Maintenance:

Cleaning – soak or brush Ag/AgCl element with distilled water, then soak in storage solution for 2 hours.

To unclog a blocked ceramic plug, heat the plug assembly in .1 M KCL storage solution at 70° C for 15 minuts, Drain and refill with fresh filling solution. To verify function flow, hang electrode in the air and let solution flow out and crystallize. Soak in storage solution for 2 hours before using.

Standard Potentials to Hydrogen

Temperature	10° C	25° C	35° C
Ag/AgCl/KCL 0.1 M *	298 mV	288 mV	278 mV
Ag/AgCl/KCL 1.0 M +	231 mV	222 mV	216 mV
Ag/AgCl/KCL 3.5 M ^	215 mV	205 mV	196 mV
Ag/AgCl/KCL Satd. ^	214 mV	199 mV	189 mV
Cu/$CuSo_4$/ $CuSo_4$ Satd.*	330 mV	316 mV	303 mV

* Treseder, NACE Corr. Eng. Ref., 60, (1980)

\+ Dean, Lange's Hand. Chem. 11^{th}., 5-69, (1974)

^ Bates, Determination of pH, 175, (1973)

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