

# Instruction Guide

Feb. 2011



## Copper Anti-Fouling Solutions



This document provides guidance for effective use of copper as an anti-fouling tool for Hydrolab sondes and covers the application of copper tape, sonde guard, and mesh.

### Tools Needed:

The tools needed for copper application are specific to the type of copper protection used:

**Copper tape:** utility gloves and knife or scissors for cutting the tape

**Copper mesh:** heavy duty scissors or tin snips for cutting, cable ties or similar fastening tool for attachment to the sensor guard, utility gloves, and metal file

**CAUTION: Potential Cut and Exposure Hazards.** *The copper mesh wires are very sharp after being cut. Wear utility gloves during the copper mesh preparation and installation procedure. Additionally, because aquatic environments may have biological and chemical health hazards present, the cut copper mesh wires should be filed or sanded to blunt their surfaces to reduce the potential risk of cuts or lacerations and subsequent blood borne infection and/or exposure.*

**ATTENTION: Risque de coupure et d'exposition.** *Le grillage de cuivre est très coupant après avoir été coupé. Portez des gants pendant la procédure de préparation et de l'installation du grillage de cuivre. De plus, parce que les environnements aquatiques peuvent contenir des risques biologiques ou chimiques, les fils coupés du grillage de cuivre devraient être frottés pour épouiser leurs surfaces pour réduire le risque de coupures et d'infection sanguins.*

**Copper sensor guard:** no special tools necessary

### General Tape Application Instructions:

**CAUTION: Potential Cut Hazard. Copper tape edges are very sharp. Wear utility gloves during the copper tape preparation and installation procedure.**

**ATTENTION : Risque de coupure. Les bords du ruban de cuivre sont très coupants. Portez des gants pendant la procédure de préparation et de l'installation du ruban de cuivre.**

- Do not cover active sensor surfaces with tape – for example DO membranes, pH bulbs, optical windows, etc.
- Clean and dry surfaces before applying tape for best adhesion results
- Tape and sensor surfaces should be near room temperature for best adhesion results
- New copper is reflective and can contribute to measurement error with optical sensors. As copper is exposed to the environment its reflection will dull, reducing the chance of measurement error.
- Do not store a copper-covered sensor in pH buffer. This will increase the rate that the copper dissolves and create a byproduct that may stick to sensor surfaces

### Taping Guidelines by Sensor

#### Temperature

Do not apply copper tape to the Hydrolab temperature sensor. Data from field deployments in biologically active environments have shown no noticeable effects of biofouling on the temperature sensor and temperature measurements.

#### Conductivity

Apply tape to the body of the sensor. Do not apply tape to the top and inside the oval shaped window of the sensor.



#### Li-Cor Ambient Light

Do not use copper tape on this sensor. Beware of the reflective nature of copper and its potential effects on ambient light. It may be best to avoid using copper on sondes with a Li-Cor Ambient Light sensor.

#### pH Sensor

Apply tape to the plastic on the body of the sensor only. Do not cover the glass portion with any tape



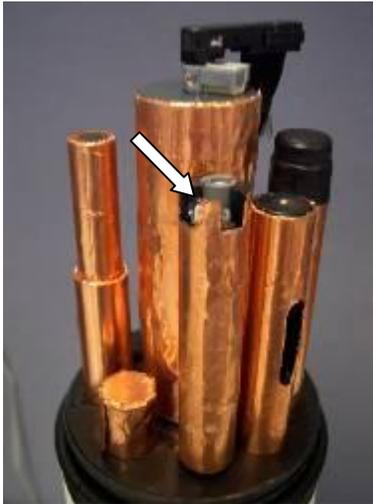
### pH Reference Sensor

Remove the reference junction prior to installation of tape. Apply tape to the plastic body of the sensor only.



### Integrated pH Sensor

Apply tape to the plastic body of the sensor only. Do not apply tape to the glass bulb, nor the reference junction. Application of tape is easier when the reference junction sleeve is removed.



### Depth

The depth sensor does not require any copper tape.

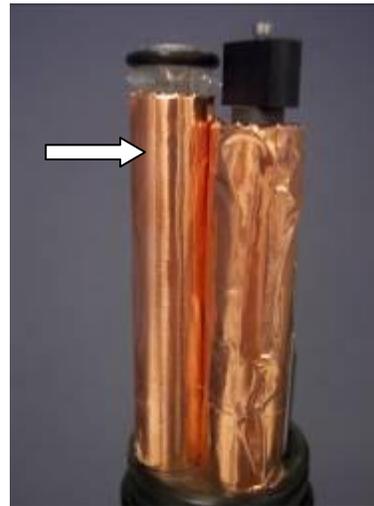
### LDO

Remove the LDO cap prior to tape application. Only apply tape to the body of the sensor. Do not allow tape to contact the optical lens of the LDO cap.



### Clark DO

Apply tape to the body of the sensor. Do not allow tape to contact the membrane and sensor end.



### Combination Clark DO and Conductivity

Apply tape to the sensor body. Do not allow tape to contact the membrane, sensor end, or inside the oval-shaped window of the sensor.



### Chlorophyll a, Blue-Green Algae, and Rhodamine WT Sensors

Apply tape to the body of the sensor only. Do not place tape on the sensor end, especially the optical window.



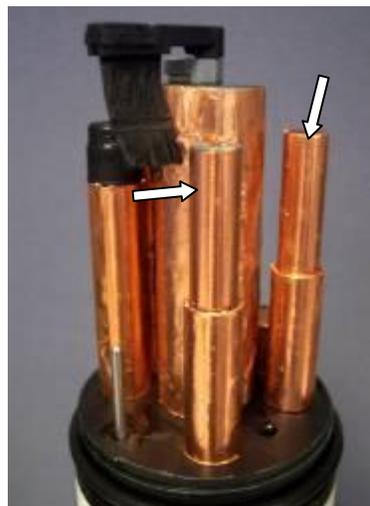
### Self-Cleaning Turbidity Sensor

Remove the extended wiper, if applicable, prior to tape installation. Apply tape to the body of the sensor. Do not allow tape to contact the sensor end – especially the optical window – and places where the tape could interfere with the wiper and/or brush. Do not turn the wiper because this will damage the sensor.



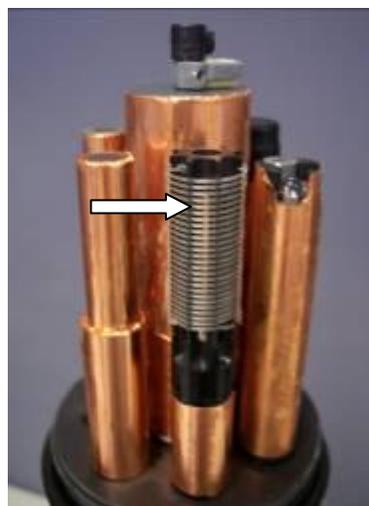
### ISE (nitrate, ammonium, chloride)

Apply tape to the body of the sensor. Tape can also be applied to the body of the consumable tip. Do not apply tape to the sensing end of the tip.



## Total Dissolved Gas (TDG)

Apply tape to the body of the sensor. Do not apply tape to the TDG membrane.



## Sensor Dimensions

Cutting out the correctly-sized piece of copper tape before application is recommended. Listed below are the dimensions of the sensors used on Series 5 sondes. Users may wish to cut tape slightly larger than the circumference of the sensor to allow for overlap.

Sensor	Part number (Hach Hydromet)	Circumference (in.)	Height (in.)
LDO	9152000	1.98	2.625
Conductivity	004468	1.88	2.8125
Standard pH - lower	007264	1.57	1.3125
Standard pH - upper	007264	1.01	1.9375
Standard pH/ORP	007235	1.57	1.25
Integrated pH/Reference	007234	1.88	3.125
Standard Reference	004463	1.88	2
Integrated pH/ORP/Reference	007233	1.88	3.125
Self Cleaning Turbidity DS5X	007453	3.77	3.6875
Chlorophyll a	007202	2.76	3.375
Blue-Green Algae	007291	2.76	3.375
Rhodamine WT	007204	2.76	3.375
TDG	007700	1.88	1.125
ISE	007257, 007259, 007261	1.89	1.6875
ISE Tip	003522, 003948, 003951	1.57	1.5
Clark Cell DO	004470	1.88	2.875
Clark Cell DO/Conductivity	004467	1.88	2.875
Self cleaning motor only	007211	3.71	3.625
SC Turb for DS5	007140	3.71	3.625
Circulator	007245	1.95	2.875

## **Copper Tape Removal and Replacement**

Copper tape naturally dissolves in water over time; the rate at which it dissolves depends on the aggressiveness of the water conditions where it is deployed. Typically, warmer environments with higher salinity will cause copper to dissolve quicker than other environments.

To maintain maximum protective effectiveness, copper tape should periodically be removed and replaced.

## **Copper Mesh**

Copper mesh can be fastened to the outside of the sensor guard (copper or plastic versions) to prevent matter from entering the area inside the sensor guard and building up near sensors. Copper mesh is more effective at preventing accumulation than other protective materials because copper limits biological growth that would attach to other protective materials and restrict flow of water into the space inside the sensor guard. While effective, it will still be possible for small particles to penetrate the mesh, including small organisms that can grow to be much larger.

### **Application instructions:**

***CAUTION: Potential Cut and Exposure Hazards. The copper mesh wires are very sharp after being cut. Wear utility gloves during the copper mesh preparation and installation procedure. Additionally, because aquatic environments may have biological and chemical health hazards present, the cut copper mesh wires should be filed or sanded to blunt their surfaces to reduce the potential risk of cuts or lacerations and subsequent blood borne infection and/or exposure.***

***ATTENTION: Risque de coupure et d'exposition. Le grillage de cuivre est très coupant après avoir été coupé. Portez des gants pendant la procédure de préparation et de l'installation du grillage de cuivre. De plus, parce que les environnements aquatiques peuvent contenir des risques biologiques ou chimiques, les fils coupés du grillage de cuivre devraient être frottés pour épointer leurs surfaces pour réduire le risque de coupures et d'infection sanguins.***

Carefully cut a sheet of copper mesh to fit the outside of a sensor guard. One 12 x 12 inch piece of copper mesh is enough material to make two individual wraps of a DS5 or DS5X sensor guard. Fasten the mesh to the outside of the sensor guard using small cable ties (sometimes called zip ties) or some other fastener. Be sure the fasteners do not interfere with any of the sensors installed on the sonde. It is best to fasten the copper mesh to the outside of the sensor guard to prevent mechanical interference with any of the sensors installed on the sonde.

Hach Hydromet offers 4x4 copper mesh (item 930xxx) that is 12 inches by 12 inches in dimension and can be wrapped around the outside of a DS5/DS5X sensor guard with cable ties that are included with the item. The 4x4 mesh size minimizes the impact on sample flow to and around the sensors on the sonde. Smaller mesh sizes can be used to filter out smaller particles that may foul sensors. Care needs to be taken so that the copper mesh does not prevent representative water samples from reaching the sensors.

## **Sensor Guard**

The copper sensor guard (item 9304200) is designed for use on Hydrolab DS5 and DS5X sondes. It is used the same as the standard sensor guard. Use the threads to screw the guard onto and off the sonde.

## **Sonde Body**

Pantyhose and duct tape are low-cost, practical tools to minimize the time it takes to clean the sonde after it was deployed in biologically active waters and is encased in biological growth. First, cover the sonde body with a length of pantyhose to cover the sonde surface, leaving a little space at both ends. Starting at one exposed end, wrap the sonde in duct tape so that the first wrap has some contact with the sonde housing. Continue wrapping with duct tape in a spiral fashion, covering the pantyhose below with tape until the other end is reached and covered. At the end of the deployment, remove the tape and pantyhose to reveal a sonde body that is free of biological growth.

*For more information, please contact:*

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