



## Instruction Sheet PTC1 Paint Test Cell Kit

### **Product Description**

The Gamry Instruments' PTC1 Paint Test Cell kit is a simple, inexpensive cell used for electrochemical corrosion testing. This cell was originally developed by Dr. Richard Granata of Lehigh University.

The PTC1 was designed for electrochemical impedance testing of flat, coated metal specimens. It's can also be used for testing bare metal sample corrosion in highly conductive media. It is not recommended for testing bare metals in more resistive solutions.

### **Initial Inspection**

Check that your PTC1 Cell Kit contains the following parts.

1	900-00038	Instruction Sheet, Paint Test Cell
1	930-00026	Cell Body, PTC1, w/ o-ring
1	935-00035	Stopper, Rubber, PTC1
1	935-00036	Clamp, PTC1, Ace 7669-18
1	935-00014	Graphite Rod, 8 mm x 6" (1/2 of 935-03)
1	935-00039	Base, PTC1

Check that none of the parts have been damaged in shipping. If damage has occurred, contact Gamry Instruments or your local representative as soon as possible.

### **Assembly of the Cell Top**

CAUTION: The reference and counter electrodes can break during this procedure. If you are not careful, a broken electrode can pierce your hand . These precautions are vital for your safety.

- a) Always lubricate the reference electrode with water before inserting it into the top.
- b) Grasp the electrode as near to the stopper as possible and twist the electrode as you are inserting it.
- c) When inserting the electrodes, hold the stopper between your thumb and your first finger. Do not place your palm under the stopper.
- d) Double check that you are inserting each electrode in its proper hole.

Assembly of the top is simple. Follow these simple instructions:

- 1) Locate the rubber stopper. Notice that the holes in the stopper have different diameters.
- 2) Gently push the graphite counter electrode into the smaller of the two holes in the top.
- 3) The counter electrode should be inserted until approximately 5 cm of the electrode extends below the top.
- 4) Wet the outside of the reference electrode with a few drops of water.
- 5) Gently push the reference electrode into the larger of the two holes in the top.
- 6) The reference electrode should be inserted until approximately 5 cm of the electrode extends below the top.

## **Metal Sample Requirements**

If a rectangular metal sample is used it must measure at least 6 cm on each side. The sample must be flat enough that a water tight o-ring seal can be made.

The area to be tested must be within 2 cm of one of the edges on the sample. If it is farther away the clamp cannot hold the cell on the sample.

The minimum sample thickness depends on the type of metal, with 0.05 mm a useful guideline. Samples between 7 mm and 15 mm thick require testing without the base.

Painted samples must have an area outside of the cell free from paint. This area is used to make electrical contact with the sample.

## **Chemical Compatibility**

The o-ring used in this cell is made from an ethylene/propylene elastomer. The top is made from a carbon filled natural rubber. These materials are not universally chemically resistant. They should give acceptable performance with dilute acids, bases and chloride salts.

We do not recommend use of the PTC1 with strong acids and bases, oxidizing or reducing agents, or organic solvents. Gamry Instruments is not responsible for damage caused to the cell, your laboratory, or your person by use of the PTC1 with an incompatible test solution.

## **Cell Setup**

Thin samples are tested in a setup that includes the PTC1 base, which is a polypropylene block equipped with 4 rubber feet. The sample is placed on the side of the base without the feet.

The cell body is then placed on top of the sample, making sure that the o-ring fits in the groove on the cell body. This o-ring makes a watertight seal between the cell body and the sample.

The clamp is then used to clamp the glass to the base. The knurled knob on the cell clamp should always be used - it compresses the o-ring.

Once the cell has been tightly clamped into place on the metal sample, it can be filled with the test solution. Approximately 40 ml of solution are required.

The top, with the reference and counter electrode already in place, is then placed on the cell. Make sure that the protective cap has been removed from the reference electrode. With the top lightly pressed into the cell body, you should get a watertight seal.

Before making the connections to the test instrument, it's a good idea to check that the cell isn't leaking from the o-ring seal. Once you are sure the cell isn't leaking, you can connect the test instrument. The metal sample is used as the working electrode.

## **Working Electrode Area**

The area of the sample exposed to the test solution varies somewhat due to variation in the compression in the o-ring and variation in the glass cell body. We have measured the active area to be nominally 14.6 cm<sup>2</sup>. At worst, the real area should be within  $\pm 5\%$  of this value.

## **Replacement Parts**

With the exception of the o-ring, all of the part numbers for replacement parts can be found in the table near the top of this document. The cell body includes an o-ring. O-rings can also be ordered separately using P/N 935-00037 which is a package of 5 o-rings.

## **Reference Electrode Maintenance**

It is generally best if both electrodes are left in the cell top when the cell is not in use. The small protective cap shipped with the reference can be used to cover the electrode tip if you want to store the top dry. Many chemists believe that reference electrodes should be stored immersed in solution. If you wish to do so, the top can be placed on top of a beaker containing distilled water or KCl.

The tubing over the breather hole in the side of the electrode should be moved to allow a small opening whenever the electrode is in use. After a long period of use, you may need to add KCl crystals to the reference filling solution or replace the filling solution entirely.

