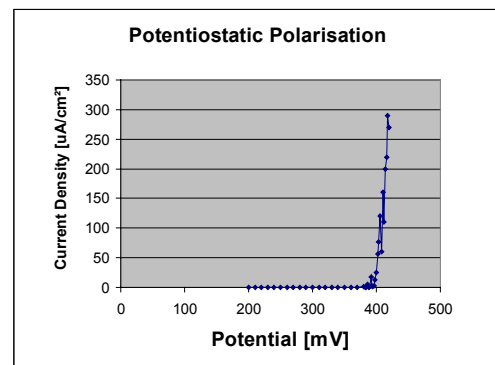


## The Determination of Pitting Potentials and Critical Pitting Temperatures

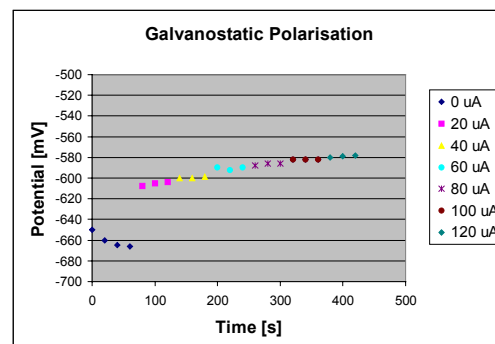
The determination of pitting potentials of a stainless steel alloy is one of the relevant tasks within the field of materials science, but also an advanced one, because a variety of parameters has to be regarded, and different troubles will bother you. Assume e.g. chloride as the main constituent of the electrolyte: then the main parameters are concentration, temperature, within a certain range the pH, and other constituents and their concentration. Assume further, that the alloy itself, or its constituents, are the variables in the test.

For this task, you need either a potentiostat or a galvanostat, able to scan a potential (or current) from a "safe" (i.e. stable passive) region to the pitting region. A wide variety of test methods are cited in the literature, but there are common demands:

In potentiostatic methods, the potential of a passive metal specimen is varied from a "secure" region in positive direction. Pitting is indicated by a sharp increase of the anodic current. Some specifications additionally require to reverse the potential scan until repassivation occurs, using the repassivation potential as a second parameter.



In galvanostatic methods, the current passing through a passive electrode is linearly increased from zero, and the potential is monitored. The onset of pitting is defined by the current which forces pits to start. The potential which is established at a certain current density is then defined as "pitting potential".



Following the technical literature, potentiostatic methods are preferentially used for steel alloys, and galvanostatic methods are used for aluminium alloys.

### Problems to overcome

Alloys which suffer from pitting corrosion typically also suffer from crevice corrosion. So, the specimen preparation and handling has to be done in a way which prevents crevice corrosion as good as possible. Coatings usually lead to crevice problems. For steels, and if all faces of the specimen may be immersed, wrapping the specimen to a platinum wire for contacting and mechanical fastening is common, also clip fixtures where the specimen is mounted between sharp tips. If only one face is to be tested, the so-called "Avesta cell", also called "Quarfort cell" is a good solution. This cell avoids crevice corrosion by flushing the crevice gap around the measurement area with distilled water.



MLab Potentiostat



Avesta Cell Setup

### Potentiostats and Galvanostats

Most laboratory potentiostats, either with built-in ramp generator or suitably interfaced to a personal computer are able to do such work.

Bank Elektronik - Intelligent Controls recommends 2 models of its wide model range:

PGS 95 is a rugged all-purpose potentiostat, able to act as stand - alone unit, which requires not more than a strip chart recorder or XY- recorder. This model is especially valuable if other tests require IR-drop - compensation. Suitable interface and software allows to build a test set which can do most electrochemical tests for corrosion.

For small budgets, and if no high currents are required, the PC - operated twin - potentiostat MLab allows to operate 2 cells simultaneously.

For more information, visit [www.bank-ic.de](http://www.bank-ic.de)