INTERNATIONAL STANDARD

ISO 14802

First edition
2012-07-15

Corrosion of metals and alloys — Guidelines for applying statistics to analysis of corrosion data

Corrosion des métaux et alliages — Lignes directrices pour l'application des statistiques à l'analyse des données de corrosion

Reference number
ISO 14802:2012(E)

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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ISO 14802 was prepared by Technical Committee ISO/TC 156, *Corrosion of metals and alloys.*

Corrosion of metals and alloys — Guidelines for applying statistics to analysis of corrosion data

1 Scope

This International Standard gives guidance on some generally accepted methods of statistical analysis which are useful in the interpretation of corrosion test results. This International Standard does not cover detailed calculations and methods, but rather considers a range of approaches which have applications in corrosion testing. Only those statistical methods that have wide acceptance in corrosion testing have been considered in this International Standard.

2 Significance and use

Corrosion test results often show more scatter than many other types of tests because of a variety of factors, including the fact that minor impurities often play a decisive role in controlling corrosion rates. Statistical analysis can be very helpful in allowing investigators to interpret such results, especially in determining when test results differ from one another significantly. This can be a difficult task when a variety of materials are under test, but statistical methods provide a rational approach to this problem.

Modern data reduction programs in combination with computers have allowed sophisticated statistical analyses to be made on data sets with relative ease. This capability permits investigators to determine whether associations exist between different variables and, if so, to develop quantitative expressions relating the variables.

Statistical evaluation is a necessary step in the analysis of results from any procedure which provides quantitative information. This analysis allows confidence intervals to be estimated from the measured results.

3 Scatter of data

3.1 Distributions

When measuring values associated with the corrosion of metals, a variety of factors act to produce measured values that deviate from expected values for the conditions that are present. Usually the factors which contribute to the scatter of measured values act in a more or less random way so that the average of several values approximates the expected value better than a single measurement. The pattern in which data are scattered is called its distribution, and a variety of distributions such as the normal, log–normal, bi-nominal, Poisson distribution, and extreme-value distribution (including the Gumbel and Weibull distribution) are observed in corrosion work.

3.2 Histograms

A bar graph, called a histogram, may be used to display the scatter of data. A histogram is constructed by dividing the range of data values into equal intervals on the abscissa and then placing a bar over each interval of a height equal to the number of data points within that interval.

The number of intervals, k, can be calculated using the following equation:

$$k = 1 + (3{,}32)\log n \quad (1)$$

where

n is the total number of data.