INTERNATIONAL STANDARD

ISO
7066-2
First edition
1988-07-01

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
ORGANISATION INTERNATIONALE DE NORMALISATION
МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Assessment of uncertainty in the calibration and use of flow measurement devices —

Part 2:
Non-linear calibration relationships

Évaluation de l'incertitude dans l'étalonnage et l'utilisation des appareils de mesure du débit —

Partie 2: Relations d'étalonnage non linéaires

Reference number
ISO 7066-2 : 1988 (E)

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7066-2 was prepared by Technical Committee ISO/TC 30, *Measurement of fluid flow in closed conduits*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Printed in Switzerland

Contents

Assessment of uncertainty in the calibration and use of flow measurement devices —

Part 2:
Non-linear calibration relationships

0 Introduction

The method of fitting a straight line to flow measurement calibration data and of assessing the uncertainty in the calibration are dealt with in ISO 7066-1. ISO 7066-2 deals with the case where a straight line is inadequate for representing the calibration data.

1 Scope and field of application

This part of ISO 7066 describes the procedures for fitting a quadratic, cubic or higher degree polynomial expression to a non-linear[1] set of calibration data, using the least-squares criterion, and of assessing the uncertainty associated with the resulting calibration curve. It considers only the use of polynomials with powers which are integers.

Because it is generally not practicable to carry out this type of curve fitting and assessment of uncertainty without using a computer, it is assumed in this part of ISO 7066 that the user has access to one. In many cases it will be possible to use standard routines available on most computers; as an alternative the FORTRAN program listed in annex C may be used.

Examples of the use of these methods are given in annex D.

Extrapolation beyond the range of the data is not permitted.

Annexes A, B, C, D and E do not form integral parts of this part of ISO 7066.

2 References

ISO 5168, *Measurement of fluid flow — Estimation of uncertainty of a flow-rate measurement.*[2]

ISO 7066-1, *Assessment of uncertainty in the calibration and use of flow measurement devices — Part 1: Linear calibration relationships.*[3]

3 Definitions

For the purposes of this part of ISO 7066, the following definitions apply.

3.1 method of least squares: Technique used to compute the coefficients of a particular form of an equation which is chosen for fitting a curve to data. The principle of least squares is the minimization of the sum of squares of deviations of the data from the curve.

3.2 polynomial (function): For a variable x, a series of terms with increasing integer powers of x.

3.3 regression analysis: The process of quantifying the dependence of one variable on one or more other variables.

NOTE — Many of the available computer programs suitable for curve fitting have the word "regression" in the title. For the purposes of this part of ISO 7066, the terms regression and least squares may be regarded as interchangeable.

3.4 standard deviation: The positive square root of the variance.

3.5 variance: A measure of dispersion based on the mean of the squares of deviations of values of a variable from its expected value.

4 Symbols and abbreviations

b_j coefficient of x_j

C_{jb} element of the inverse matrix

1) These procedures are also suitable for a linear set of calibration data.

2) At present at the stage of draft. (Revision of ISO 5168 : 1978.)

3) At present at the stage of draft.