International Standard 3530

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Vacuum technology — Mass-spectrometer-type leak-detector calibration

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

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.

International Standard ISO 3530 was developed by Technical Committee ISO/TC 112, *Vacuum technology*, and was circulated to the member bodies in December 1978.

It has been approved by the member bodies of the following countries :

Australia	Italy	South Africa, Rep. of
Belgium	Japan	Spain
Chile	Korea, Rep. of	United Kingdom
Czechoslovakia	Mexico	USA
France	Netherlands	USSR
Germany, F.R.	Poland	
India	Romania	

No member body expressed disapproval of the document.

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Vacuum technology — Mass-spectrometer-type leak-detector calibration

0 Introduction

This International Standard specifies procedures to be used for calibrating leak detectors of the mass-spectrometer type; that is, for determining a sensitivity figure for such leak detectors. The procedures require the use of a calibrated leak and a standard gas mixture; the preparation and standardization of these are outside the scope of this International Standard. Hereafter, the designation "leak detector" will be used to refer to a detector of the mass-spectrometer type.

A leak detector permits detection of leakage due to mechanical openings, such as pinholes, and of leakage due to permeation, such as occurs through many polymeric materials. Virtual leaks, such as those due to surface desorption, vaporization, and gas pockets, cannot, in general, be detected by a leak detector.

The range of leakage-rate calibration is limited to a specified level since factors that are unimportant for larger leaks may become significant for leak rates that are substantially smaller than 10^{-12} Pa·m^3·s^{-1}.

Objects being tested by a leak detector may be under high vacuum, or, at the other extreme, under pressure greater than atmospheric. The leak-detection techniques will, in general, differ in the two situations. In the first case, the leak detector usually will be operating near its ultimate low pressure; in the second case, the detector is frequently used at or near its maximum operating pressure. Corresponding to these two conditions of operation, two sensitivity terms are defined, "minimum detectable leak rate" and "minimum detectable concentration ratio" (see clause 2).

The two quantities thus defined are related, but in practice it is not feasible to obtain either figure from the other by calculation. Methods are therefore specified for determining both.

This International Standard is one of a series standardizing leak-testing procedures and apparatus, prepared for use in the field of vacuum technology.

Applications fall into the categories : leak tightness, leak-detector calibration, calibration of leaks, gas mixtures, acceptance specifications for leak-detection instruments and general procedures for tightness-proving of vacuum plant.

The above-mentioned requirements will form the subjects of future International Standards.

1 Scope and field of application

This International Standard specifies procedures to be used for the calibration of mass-spectrometer-type leak detectors.

It deals only with leak detectors which have an integral high vacuum system to maintain the sensing element (mass spectrometer tube) at a low pressure. Specifically excepted from treatment are sensing elements without such a vacuum system. It is also to be understood that the procedures are not intended to constitute a complete acceptance test; such tests will be the subject of a future International Standard.

This International Standard concerns the use of helium-4. Nevertheless, the procedures described may be used for other search gases such as argon-40, subject to appropriate precautions.

The application of this International Standard is restricted to leak detectors not capable of detecting leaks smaller than 10^{-12} Pa·m^3·s^{-1}.

Two procedures are outlined, one for determining the minimum detectable leak rate and the other for determining the minimum detectable concentration ratio. These are applicable to the use of the leak detector for high vacuum and for pressures greater than atmospheric, respectively.

2 Definitions

NOTES

1 An ISO glossary of terms used in vacuum technology is not yet available. In view of this, the following list of definitions has been prepared; usage in this International Standard will conform to these definitions.

2 Where a word may be either a noun or a verb, the letters "*n*" or "*v*", in parentheses, indicate which usage is involved.

2.1 Background (or residual signal)

2.1.1 background : In general, the total spurious indication given by the leak detector without injected search gas. Background can originate in either the mass spectrometer tube (see below) or the associated electric and electronic circuitry, or both. (Frequently, the term is used to refer specifically to the indication due to ions other than those produced from injected search gas.)