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**Gas analysis — Preparation of calibration  
gas mixtures using dynamic volumetric  
methods —**

**Part 5:  
Capillary calibration devices**

*Analyse des gaz — Préparation des mélanges de gaz pour étalonnage  
à l'aide de méthodes volumétriques dynamiques —*

*Partie 5: Dispositifs d'étalonnage par capillaires*



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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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 6145-5 was prepared by Technical Committee ISO/TC 158, *Analysis of gases*.

This second edition cancels and replaces the first edition (ISO 6145-5:2001), which has been technically revised. Some subclauses (such as Procedure and Calculations) have been detached from other closely related clauses and readability has been improved by bringing these subclauses closer together. The principle and verification parts have been clarified and separated, the uncertainty section has been checked and slightly updated and Annex A has been revised. An informative derivation of the relative combined standard uncertainty calculation has been added as Annex B.

ISO 6145 consists of the following parts, under the general title *Gas analysis — Preparation of calibration gas mixtures using dynamic volumetric methods*:

- *Part 1: Methods of calibration*
- *Part 2: Volumetric pumps*
- *Part 4: Continuous syringe injection method*
- *Part 5: Capillary calibration devices*
- *Part 6: Critical orifices*
- *Part 7: Thermal mass-flow controllers*
- *Part 8: Diffusion method*
- *Part 9: Saturation method*
- *Part 10: Permeation method*
- *Part 11: Electrochemical generation*

ISO 6145-3, entitled *Periodic injections into a flowing gas stream*, has been withdrawn.

# Gas analysis — Preparation of calibration gas mixtures using dynamic volumetric methods —

## Partie 5: Capillary calibration devices

### 1 Scope

This part of ISO 6145 is one of a series of International Standards dealing with the various dynamic volumetric techniques used for the preparation of calibration gas mixtures. This part specifies a method for the continuous production of calibration gas mixtures from pure gases or gas mixtures using capillary calibration devices in single or multiple combinations (gas dividers).

Single capillary systems can be used to provide gas mixtures where the minor component is in the range of volume fractions from  $10^{-8}$  to 0,5.

The relative expanded uncertainty of this technique is less than  $\pm 2\%$  ( $k = 2$ ) relative. This application is used in industrial gas mixing panels for the production of specific gas atmospheres.

Gas dividers can be used to divide gas mixtures prepared from gases or gas mixtures into controlled proportions by volume. These devices are capable of dilutions in the range of volume fractions from 0,000 5 to 0,9 of the primary gas concentration with a relative repeatability of better than 0,5 %.

Traceability of the gas mixtures produced by a gas divider is achieved by comparison of a mixture with gas mixtures related to national or international gas standards. An example is given in Annex A.

### 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6143, *Gas analysis — Comparison methods for determining and checking the composition of calibration gas mixtures*

ISO 6145-1, *Gas analysis — Preparation of calibration gas mixtures using dynamic volumetric methods — Part 1: Methods of calibration*

### 3 Principle

A constant flow of gas from a capillary tube under conditions of constant pressure drop is added to a controlled flow of complementary gas. The complementary gas flow may also be derived from another capillary tube.

The appropriate capillaries are selected to give the required flows of gases into the mixing manifold. If an appropriate capillary is selected, the required flow is obtained by adjusting the pressure drop across the capillary.