

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

Part 8: Diffusion method

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National foreword

This British Standard is the UK implementation of EN ISO 6145-8:2008. It is identical with ISO 6145-8:2005. It supersedes BS ISO 6145-8:2005 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PTI/15, Natural gas and gas analysis.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Foreword

The text of ISO 6145-8:2005 has been prepared by Technical Committee ISO/TC 158 “Analysis of gases” of the International Organization for Standardization (ISO) and has been taken over as EN ISO 6145-8:2008 by Technical Committee CEN/SS N21 “Gaseous fuels and combustible gas” the secretariat of which is held by CMC.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2009, and conflicting national standards shall be withdrawn at the latest by February 2009.

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Endorsement notice

The text of ISO 6145-8:2005 has been approved by CEN as a EN ISO 6145-8:2008 without any modification.

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Introduction

This part of ISO 6145 is one of a series of International Standards that present various dynamic volumetric methods used for the preparation of calibration gas mixtures. In the lower part of the mole fraction range considered, it is difficult to prepare and maintain gas mixtures – for example of certain organic or reactive components – in cylinders. This dynamic method has the advantage of a practically unlimited supply of calibration component, whereby adsorption effects can be reduced or even eliminated.

If the complementary gas flow is measured as a gas mass flow, the preparation of calibration gas mixtures using diffusion is a dynamic-gravimetric method which gives contents in mole fractions. Principles for the measurement of the complementary gas flow are given in ISO 6145-1.

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

Part 8: Diffusion method

1 Scope

This part of ISO 6145 specifies a dynamic method using diffusion for the preparation of calibration gas mixtures containing component mole fractions ranging from 10^{-9} to 10^{-3} . A relative expanded uncertainty of measurement, U , obtained by multiplying the relative combined standard uncertainty by a coverage factor $k = 2$, of not greater than $\pm 2\%$ can be achieved by using this method.

By keeping the path between the diffusion source and place of use as short as possible, the method can be applied for the generation of low-concentration calibration gases of organic components that are liquid at room temperature, with boiling points ranging from about 40 °C to 160 °C.

This part of ISO 6145 is applicable not only for the generation of calibration gas mixtures of a wide range of hydrocarbons at ambient and indoor air concentration levels, but also for the generation of low-concentration gas mixtures of water.

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 6145-7, *Gas analysis — Preparation of calibration gas mixtures using dynamic volumetric methods — Part 7: Thermal mass-flow controllers*

3 Principle

The calibration component migrates by diffusion through a diffusion tube of suitable dimensions (length, diameter) into a flow of a complementary gas, i.e. the complementary gas of the mixture prepared. The liquid calibration component, of a known high purity, is contained in a reservoir that acts as the source of the component vapour. The reservoir is provided with a vertically placed diffusion tube. This assembly (the diffusion cell) is placed in a temperature-controlled containment that is purged at a known and constant flow rate by a high-purity complementary gas (see Figure 1). The composition of the mixture is determined from the diffusion mass flow of the calibration component and the flow rate of the complementary gas.

The diffusion mass flow rate of the calibration component in principle depends on

- its diffusion coefficient in the complementary gas,
- its vapour pressure at the temperature of the containment,
- the dimensions of the diffusion tube.