UKAS
A world of confidence

TPS 54

Edition 5 December 2024 – Draft for consultation

UKAS policy on traceability of calibration gas standards used in stack emission monitoring

Contents

Changes since last edition

- CO and Total VOC added to section 3.1
- Section added at 4.7, and previous section 4.7 renumbered as 4.8
- References updated

1. Purpose

1.1 The general requirements for the traceability of measurement are defined in ISO/IEC 17025:2017.

1.2 In addition, the general principles and means by which traceability may be achieved and demonstrated are explained in UKAS publication TPS 41.

1.3 This document sets out the background of the application of these policies to the field of calibration of continuous gas analysers/detectors used for manual stack emission monitoring. The historical position is also explained together with the reasoning behind the formal introduction of the full requirements for traceability in this field of accreditation.

1.4 This Statement has been prepared in conjunction with the Environment Agency (England).

2. Policy

2.1 UKAS will apply the principles of ILAC P10, ILAC Policy on Traceability of Measurement Results (which may be viewed at https://ilac.org/) in the assessment and accreditation of laboratories.

3. Background

3.1 Laboratories engaged in the manual measurement of gas species from emission sources are commonly involved in the use of a variety of instrumental techniques to measure a number of different gas species (e.g. O_2, CO, CO_2, NO_x, SO_x, Total VOC *etc.*). These measurements may be made to enable correction of other measured parameters to standard conditions or be used for direct comparison with applicable emission limit values.

3.2 The calibration and initial validation of the instruments used for such measurements requires the use of in-service field checks using appropriate span and zero gases, together with full validation/calibration checks performed at defined intervals. These later checks are normally performed on receipt of instruments, following repair/service and at annual intervals.

3.3 To comply fully with the requirements set out above each of the gas species used in this process would have direct or first tier, traceability meeting the requirements of ILAC P10.

4. Traceability requirements

4.1 The full traceability requirements of ILAC P10 will be applied by UKAS in the assessment process of all laboratories engaged in manual stack emission monitoring of gaseous species as detailed below.

4.2 The traceability of the first-tier gas can be demonstrated by ensuring it is supplied by a reference material producer accredited to ISO 17034 or has been calibrated by a calibration laboratory accredited to ISO/IEC 17025 for the gas mixture/concentration of interest. The UKAS policy on selection and use of reference materials is further explained in UKAS publication TPS 57. The UKAS Policy on Traceability of measurement is described in UKAS publication TPS 41.

4.3 The full traceability requirements will be applied to the internal first tier gases held by the laboratory and used to perform full internal validations for all gaseous species for which accreditation is either held or sought.

4.4 For the purpose of this document the term “second tier gas” refers to working gas cylinders that a laboratory may use routinely in the field. This second-tier gas is checked against the reference first tier cylinders in accordance with this policy statement in order that traceability is maintained.

4.5 Traceability for oxygen measurement is also required. The use of cleaned dry ambient air with an oxygen content of 20.9% as a field check gas is acceptable (relative uncertainty 0.5 %) as defined in BS EN 14789:2017.

4.6 All second-tier gas must be checked against the first-tier gas before it can be used in the system. This should be done by direct comparison using a suitable gas analyser that has been directly calibrated/checked with a relevant first tier gas before the comparison. The associated measurement uncertainty for second tier gas value must be determined.

4.7 In the case of determining the value of the working (second tier) cylinder, this must be treated as an unknown. Tolerances must not be applied to the value of the working (second tier) cylinder that have been supplied on the certificate from the working (second tier) cylinder gas manufacturer. The measurement uncertainty of the working cylinder must be that evaluated by the laboratory undertaking the gas comparison exercise, resulting in the measured gas concentration value and its associated measurement uncertainty.

4.8 All second-tier gas values obtained must meet the uncertainty requirements as laid down in the relevant reference standards.

5. Internal calibration procedures

5.1 Laboratories performing such calibrations will be expected to comply with the requirements of ISO/IEC 17025 for such calibrations as summarised in Section 4 of TPS 41.

5.2 In order to meet the requirements of section 4 of this publication it should be noted that the use of gas dividers or dilution systems provides the preferred route. The use of such systems ensures that traceability is maintained across the full range of the instrument without the need for multiple cylinders of traceable gases for each species.

5.3 When using a gas divider or dilution system the uncertainty of measurement for all components of the divider or dilution system must be combined with the uncertainty of the reference gas to determine the overall uncertainty of the second-tier gas.

5.4 The recognised approach for the conduct of internal calibrations performed by a laboratory is that defined in ISO 12963:2017 that provides information for the determination of composition of gas mixtures using one and two-point calibration of gases using the comparison method.

6. Additional information

6.1 Several guidance documents on the application of ISO/IEC 17025 equipment calibration and the evaluation of the uncertainty of measurement are available from the UKAS website, www.ukas.com (see Publications List).

6.2 For further information about this statement, please contact the Assessment Manager for your organisation or the UKAS Information Helpdesk (Tel: +44 (0) 1784 429000 or email info@ukas.com).

7. References

7.1 ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories

7.2 TPS 41 UKAS Policy on Metrological Traceability (Edition 6, December 2022)

7.3 ILAC P10:07/2020 ILAC Policy on Metrological Traceability of Measurement Results

7.4 ISO 17034:2016 General requirements for the competence of reference material producers

7.5 TPS 57 Guidance and Policy on the Selection and Use of Reference Materials (Edition 5, December 2023)

7.6 BS EN 14789:2017 Stationary source emissions - Determination of volume concentration of oxygen - Standard reference method: Paramagnetism

7.7 BS ISO 12963:2017 Gas analysis - Comparison methods for the determination of the composition of gas mixtures based on one- and two-point calibration