CCQM Working Group on Gas Analysis (GAWG)

CCQM-K118.1 – Natural gas

Protocol and Report Forms

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# Background

At the CCQM GAWG meeting in April 2013 it was agreed to organise a further key comparison on Primary Standard Mixtures for natural gas. In CCQM-K1e-g (1996-1997) and CCQM-K23a-c (2004-2005), three synthetic natural gas mixtures were used up to C4. In CCQM-K16a-b (2001-2002), the range of components was expanded to include pentanes and *n*-hexane.

This key comparison is a follow-up of CCQM-K118 Natural gas. In this key comparison, one type of natural gas (type IVa, hydrogen-enriched natural gas) will be provided.

# Measurands

Amount fractions of the components given in Table 1.

# Travelling standards

VSL will prepare a mixture with a nominal composition as shown in table 1, with a pressure not smaller than 5 MPa in a cylinder with a water volume of 5 dm3. The preparation will be performed in accordance with the requirements of ISO 6142-1 and ISO 19229.

One travelling standard will be verified by VSL and BAM. The verification measurements will include a comparison with standards used in CCQM-K118, to enable demonstrating equivalence across the participants in CCQM-K118 and in this key comparison.

Table 1: Nominal composition of the travelling standard, given in amount fractions (cmol/mol).

| Component | hydrogen-enriched natural gas*x* / % |
| --- | --- |
| Nitrogen | 12.0 |
| Carbon dioxide | 4.0 |
| Hydrogen | 3.0 |
| Helium | 0.50 |
| Ethane | 0.75 |
| Propane | 0.30 |
| *iso*-Butane | 0.20 |
| *n*-Butane | 0.20 |
| *iso*-Pentane | 0.050 |
| *n*-Pentane | 0.050 |
| *neo*-Pentane | 0.050 |
| *n*-Hexane | 0.050 |
| Methane | 78.85 (balance) |

The target amount fractions may deviate slightly from the nominal amount fractions mentioned in table 1 to ensure that the key comparison has the usual challenge.

# Reference Values

The amount fractions from gravimetry will be used as key comparison reference value.

# Reporting

VSL will be responsible for reporting the results to the CCQM. The measurement reports will be collected by VSL. The corresponding reporting forms can be found at the end of this protocol.

Please note that:

* Reporting of the results should be done using an Excel reporting form accompanying this protocol.
* Participating laboratories are requested to specify in detail which analytical method(s) have been used and how the evaluation of measurement uncertainty was performed.
* Participating laboratories are responsible for the calibration of their own equipment. For a proper evaluation of the data, it is necessary that the calibration method, as well as the way in which the calibration mixtures have been prepared is reported to the co-ordinator in sufficient detail to check the data for obvious omissions.
* Participating laboratories are to express the uncertainty on all results submitted, as expanded uncertainty. The evaluation of measurement uncertainty should be in accordance to the “Guide to the expression of uncertainty in measurement”. The participant should provide a detailed description of the uncertainty budget, including
* method of evaluation (type A or type B)
* (assumed) probability distribution
* standard uncertainties and sensitivity coefficients
* After the measurements, the participants have to return the cylinders with a sufficient amount of gas (pressure at least 2 MPa) to the coordinators for re-analysis.
* The measurement report requires per transfer standard at least three independent measurement sequences, each consisting of several measurements obtained under repeatability conditions. This is a strict requirement to come to proper statistical analysis of the reported data.
* Measurement reports and additional information shall be submitted jointly with the report forms to VSL and will be taken into consideration during the evaluation.
* The report shall be submitted by email and its receipt is to be confirmed by the coordinator.

# Supported claims

The support of CMCs is the same as for CCQM-K118.

# Participants

The following NMIs participate in this key comparison: BAM, IPQ, KRISS, Ukrmetteststandard, VSL. The coordinating laboratory is underlined.

# Schedule

The schedule for this key comparison reads as follows.

|  |  |
| --- | --- |
| **Date** | **Event** |
| April 2023 | Agreement on the protocol and participants list |
| September 2023 | Preparation of mixtures |
| February 2025 | Distribution of mixtures |
| July 2025 | Reports due |
| June 2025 | Cylinder returned at VSL |
| September 2025 | Draft A1 report |

Failing to meet the agreed timetable may have consequences with respect to the participation in this key comparison.

# Contact point

**Co-ordinator (VSL)**

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# Measurement details for CCQM-K118.1

Please complete the following data regarding the description of the methods, and the uncertainty evaluation.

Laboratory :
Laboratory code :

### Calibration standards

Please provide a brief description of the calibration standards used, including

* Method of preparation
* Weighing data
* Purity tables (composition) of the parent gases
* Verification measures

### Instrumentation

Please provide a brief description of the particulars of the instrument(s) used in this key comparison

### Calibration method and value assignment

Please provide a brief description how the equipment was calibrated and how the assigned value was calculated (including the necessary formulae).

### Uncertainty evaluation

Please provide a brief description of the evaluation of measurement uncertainty, including the expressions used.

### References

Any literature references you may wish to refer to come here …

### Authorship

Please provide the authorship of the measurement report (2-3 persons typically)

Final note: please remove all text in green before submission! Thank you for your cooperation.