Key comparison COOMET.QM-K118b

Natural gas

26.08.2024

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# 1 Background

COOMET key comparison COOMET.QM–K118b is designed as linking to the appropriate CCQM comparison - CCQM-K118b and is intended to support CMCs on natural gas components of the National Metrological Institutes of the countries - members of COOMET.

In the key comparison CCQM-K118 two gases were studied. One mixture was a hydrogen-enriched natural gas with low calorific value; the other mixture - was a LNG-type natural gas with high calorific value, a type of gas which has not been addressed before in GAWG. The object of the COOMET.QM–K118b is LNG-type natural gas.

**2 Participants**

**-------------------------------------------------------------------------------------------------------**

VNIIM, Russia (Pilot laboratory)

KazStandart, Kazakhstan

BelGIM, Belarus

NIM, China

# 3 Measurands

Amount-of-substance fractions of the components given in Table 1.

# 4 Transfer standards

A set of mixtures will be prepared gravimetrically and subsequently verified against other PSM, including PSMs used in CCQM –K118. The pressure in the cylinders will be approximately 5 MPa; cylinders of 5 or 10 dm3 nominal volume will be used. The nominal compositions of the two mixtures will be as follows:

Table 1: Nominal amount-of-substance fractions (cmol/mol).

|  |  |
| --- | --- |
| Component | LNG-type natural gas  *x* cmol/mol |
| Nitrogen | 0.12 |
| Carbon dioxide | 0.02 |
| Ethane | 10.0 |
| Propane | 2.0 |
| *iso*-Butane | 0.15 |
| *n*-Butane | 0.15 |
| *iso*-Pentane | 0.02 |
| *n*-Pentane | 0.02 |
| Methane | 87.52 (balance) |

# 5 Reference Values

The amount-of-substance fractions as calculated from gravimetry and purity data will be used as key comparison reference value. Each cylinder will have its own reference value and associated expanded uncertainty.

# Reporting

Tables with measurement data should be presented in Excel tables attached to this protocol. Please provide the measurement details (composition of calibration mixtures, purity of source gases, description of equipment, uncertainty assessment) in the report in Word format. The information to be provided in this part of the report is indicated at the end of this protocol (page 6 of the 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: (a) method of evaluation (type A or type B), (b) (assumed) probability distribution, (c) standard uncertainties and (d) 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.

Transport of the cylinders to the participating laboratories and back to the coordinating laboratory will be arranged and paid for by the participants. The participants are also responsible for returning the cylinders promptly after completing the measurements.

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.

# 7 Supported claims

Results from key comparisons can be used to support CMCs (calibration and measurement capabilities) claims. This key comparison can be used to underpin CMCs within the range of supported compositions as given in Table 2.

Table 2: CMC claims with components and amount-of-substance fractions ranges that can be supported by CCQM-K118b.

|  |  |  |
| --- | --- | --- |
| Component | High CV (LNG-type mixture) | |
| Composition | Suggested range |
| Nitrogen | 0.12 | 0.1 - 20 |
| Carbon dioxide | 0.02 | 0.02 - 10 |
| Ethane | 10.0 | 0.5 – 25 |
| Propane | 2.0 | 0.1 - 12 |
| *iso*-Butane | 0.15 | 0.05 – 1.5 |
| *n*-Butane | 0.15 | 0.05 – 1.5 |
| *iso*-Pentane | 0.02 | 0.01 – 0.25 |
| *n*-Pentane | 0.02 | 0.01 – 0.25 |
| Methane | 87.52 | 50 – 99.9 |

(all values are in cmol/mol)

# 8 Schedule

The schedule for this key comparison reads as follows

Table3: Key comparison schedule

|  |  |
| --- | --- |
| **Date** | Event |
| **September 2024** | Preparation of the protocol |
| **October 2024** | Agreement of the protocol |
| **November 2024** | Registration of participants |
| **before February 2025** | Transfer standards prepared by coordinators |
| **February 2025** | Samples verified by coordinators |
| **March 2025** | Dispatch of samples to participants |
| **April -August 2025** | Measurements by participants |
| **September 2025** | Dispatch of samples back to coordinators  Reports are sent to coordinator |
| **October -December 2025** | Re-verification of the samples by coordinators |
| **April 2026** | Draft A report available |

# Contacts

|  |  |
| --- | --- |
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Date: 26.08.2024

### Measurement details for COOMET.QM-K118 to be returned to coordinator

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.

### Authorship

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