**Draft Protocol for CCQM-K175 hydrogen chloride in nitrogen**

Jinsang Jung

Gas Metrology Group

Korea Research Institute of Standards and Science

267 Gajeong-ro Yuseong-gu

Daejeon 34113, the Republic of Korea

Table of Contents

[Background 3](#_Toc2871924)

[Measurand 3](#_Toc2871925)

[Mixtures 3](#_Toc2871926)

[Reference values 3](#_Toc2871927)

Transport cylinders from and to KRISS 3

Stability of sample cylinder 3

[Reporting 3](#_Toc2871928)

[Proposed HFTLS 4](#_Toc2871929)

[Participants 4](#_Toc2871930)

[Schedule 4](#_Toc2871931)

[Coordinator 4](#_Toc2871932)

[Report form 5](#_Toc2871933)

[*Registration form*](#_Toc2871934) 7

# Background

Hydrogen chloride (HCl) is a colorless toxic and highly corrosive gas. It is harmful to humans and plants. HCl can be emitted from several sources, including fossil fuel combustion and municipal waste incineration. Thus, most governments have set and monitor an effluent quality standard for HCl depending on chimney types. To obtain reliable measurement data from chimneys, periodic calibration of an HCl monitor is necessary with standard gas mixtures. Because HCl is highly corrosive and easily adsorbed on the inner surface of cylinders and gas tubes, it is difficult to develop HCl standard gas mixtures in high-pressure cylinders. Thus, an international standard for an HCl gas mixture in a high-pressure cylinder has not been established. This comparison is designed to assess the measurement capability for providing traceability for HCl in nitrogen with an amount of substance fraction of 30 μmol mol-1.

# Measurand

Amount-of-substance fraction of HCl in nitrogen

# Mixtures

KRISS will prepare sample gas mixtures in aluminum cylinders gravimetrically. The pressure in the cylinders will be approximately 100 bar. The nominal amount-of-substance fraction is 30 μmol mol-1.

* Aluminum cylinder: Luxfer in UK, 10 L
* Valve: G-12, HAMAI industries in Japan, 22 mm diameter Whitworth screw thread

# Reference values

The amount-of-substance fractions determined gravimetrically by KRISS will be used as the key comparison reference value (KCRV). Each sample cylinder will have its own KCRV and associated uncertainty.

# Transport cylinders from and to KRISS

KRISS is responsible for dispatching sample cylinders to participating laboratories. Participating laboratories are responsible for shipping their sample cylinder back to KRISS. The returned cylinders should contain at least 50 bar of gas.

# Stability of sample cylinder

KRISS is responsible for reporting results of stability check after sample cylinders are returned to KRISS. KRISS will also analyze the KRISS sample cylinder every two months with new calibration standards until re-analysis of sample cylinders returned to KRISS.

# Reporting

KRISS will prepare the final report to the CCQM. Participating laboratories are responsible to report their measurement data (at least three independent results for statistical analysis) to KRISS in the requested reporting format. Participating laboratories are also responsible to submit detail information for their calibration standards, analytical methods, and uncertainty evaluation.

# Proposed HFTLS

The results from this comparison will be used to underpin laboratories’ calibration (analytical) capability for HCl in nitrogen at the amount-of-substance fraction from 10 µmol mol-1 – 100 µmol mol-1

# Participants

Potential participants: KRISS, NPL, VSL, VNIIM, NIST, PTB

# Tentative Schedule

|  |  |
| --- | --- |
| Datea | Event |
| September 2020 | Proposal of draft protocol |
| May 2021 | Agreement of draft protocol |
| June 2021 | Registration of participants |
| September 2021 | Preparation of sample cylinders |
| October-November 2021 | Analysis of sample cylinders by KRISS |
| December 2021 | Shipment of sample cylinders to NMIs |
| January – March 2022 | Measurement by NMIs |
| April 2022 | Return of sample cylinders to KRISS for stability |
| April 2022 | Measurement report due |
| May – June 2022 | Re-analysis of sample cylinders by KRISS |
| July 2022 | Draft A report to participants |
| October 2022 | Discussion of Draft A Report at GAWG meeting |
| April 2023 | Discussion of Draft B Report at GAWG meeting |

aSchedule for this comparison may be adjusted depending on reporting results, shipping samples, and discussion of results.

# Coordinator

Jinsang Jung

Korea Research Institute of Standards and Science

267 Gajeong-ro Yuseong-gu

Daejeon 34113, Republic of Korea

Phone: +82-42-868-5934

E-mail: jsjung@kriss.re.kr

# 

# **Report form**

**CCQM-K175: HCl in nitrogen at 30 μmol mol-1**

Laboratory:

Laboratory code:

Cylinder number:

Measurement 1#

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Component | Date  (dd/mm/yy) | Result  (nmol mol-1) | Standard deviation  (% relative) | Number of replicates |
| HCl |  |  |  |  |

Measurement 2#

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Component | Date  (dd/mm/yy) | Result  (nmol mol-1) | Standard deviation  (% relative) | Number of replicates |
| HCl |  |  |  |  |

Measurement 3#

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Component | Date  (dd/mm/yy) | Result  (nmol mol-1) | Standard deviation  (% relative) | Number of replicates |
| HCl |  |  |  |  |

Measurement X#

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Component | Date  (dd/mm/yy) | Result  (nmol mol-1) | Standard deviation  (% relative) | Number of replicates |
| HCl |  |  |  |  |

**Results**

|  |  |  |  |
| --- | --- | --- | --- |
| Component | Result  (nmol mol-1) | Expanded uncertainty  (nmol mol-1) | Coverage factor |
| HCl |  |  |  |

## Calibration standards

Please provide a description of the calibration standards used for measurement, including:

* Cylinder type/treatment applied
* Preparation date
* Purity analysis
* Method of preparation
* Verification procedure
* Stability testing (if possible)

## Analytical method

Please provide a description of the instrumentation and method used for analysis

* Sample lines/purge times
* Details on the instrumentation
* Analytical procedure

## Uncertainty evaluation

Please provide a description of the evaluation of measurement uncertainty

## Authorship

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

# **Registration form**

**:** CCQM-K175: HCl in nitrogen at 30 μmol mol-1

|  |
| --- |
| Please complete this document and send it back to:  Dr. Jinsang Jung  Gas Metrology Group  Korea Research Institute of Standards and Science  267 Gajeong-Ro Yuseong-Gu  Daejeon 34113, Rep. of Korea  Phone:+82-42-868-5934  Fax:+82-42-868-5042  Email: [jsjung@kriss.re.kr](mailto:jsjung@kriss.re.kr) |

A1. Participating Institute Information:

|  |  |
| --- | --- |
| Institute |  |
| Physical address (for the shipment of the cylinder) |  |
| Contact person |  |
| Phone |  |
| Fax |  |
| e-mail |  |
| Financial address (for the payment of the shipping invoice) |  |

A2. Cylinder import/export:

|  |
| --- |
| What special arrangements, if any, will be required for the import/export of an aluminium cylinder (at 100 bar pressure) containing 30 μmol mol-1 HClin nitrogen into your country? |