

National Institute of Advanced Industrial Science and Technology
National Metrology Institute of Japan



Reference Material Certificate

NMIJ CRM 3406-f01



Carbon Monoxide

This certified reference material (CRM) is produced in accordance with the NMIJ's management system and is in compliance with ISO 17034 and ISO/IEC 17025. This CRM is intended for use in the calibration of instruments for carbon monoxide determination.

Certified Value

The certified value of this CRM is amount-of-substance fraction of carbon monoxide, which is given in the table below. The uncertainty of the certified value is the expanded uncertainty obtained by multiplying the combined standard uncertainty by a coverage factor (k) of 2, and it is the half-width of an interval estimated to have a level of confidence of approximately 95 %.

Substance	CAS No.	Certified value Amount-of-substance fraction (mol/mol)	Expanded uncertainty Amount-of-substance fraction (mol/mol)	Cylinder Number
Carbon Monoxide	630-08-0	0.999966	0.000020	CPB16081

Analysis

The amount-of-substance fraction of each impurity was determined by the analytical equipment listed below. The certified value was determined by the subtraction method. The subtraction method was described in the ISO 6142-1:2015 "Gas analysis--Preparation of calibration gas mixtures--Gravimetric method".

Impurity	Analytical equipment
Nitrogen	Gas chromatograph with thermal conductivity detector
Oxygen	Gas chromatograph with thermal conductivity detector
Carbon dioxide	Gas chromatograph with thermal conductivity detector
Hydrogen	Gas chromatograph with thermal conductivity detector
Helium	Gas chromatograph with thermal conductivity detector
Water	Capacitive hygrometer

Metrological Traceability

The gas chromatographs used for the certification were calibrated using NMIJ's primary reference gases prepared by the gravimetric method (ISO 6142-1:2015). The capacitive hygrometer was calibrated using a hygrometer which was traceable to the International System of Units (SI). Therefore, the certified value is traceable to the SI.

Mutual Recognition Arrangement under Metre Convention

The certified value of this CRM is recognized for international equivalence based on the Mutual Recognition Arrangement under the Metre Convention (CIPM MRA). The calibration measurement capability (CMC) of NMIJ related to this CRM is registered in the Key Comparison Database (KCDB) (see <https://www.bipm.org/kcdb/>) of the International Bureau of Weights and Measures (BIPM).

Date of Shipment: Xxxxx xx, 20xx

3406f01-230928-230928

Expiration of Certification

This certificate is valid for one year from the date of shipment, provided that this CRM is stored in accordance with the instructions given in this certificate.

Description of the Material

This CRM is toxic and odorless gas, and it is supplied in an aluminum alloy cylinder with an inner volume of 10 L. Specification of the outlet of the cylinder is W22-14thread left (male). The residual pressure of the CRM in the cylinder is more than 9 MPa (at 35 °C).

Instructions for Storage

This CRM should be stored in compliance with regulations for high pressure gases. Avoid direct sunlight, and keep temperature below 40 °C at any time. Store the CRM at a place with good ventilation. Fasten the cylinder with chain to avoid it from falling down. Since carbon monoxide gas is flammable, toxic, and odorless gas, take care to leaks, do not use fire near the cylinder and do not place any flammable objects nearby. Store the CRM according to its material safety data sheet (SDS).

Instructions for Use

This CRM should be used around room temperature because the certified value is based on the analytical results at room temperature. The purity of carbon monoxide in the CRM may be dependent on its residual pressure. When the pressure inside the cylinder becomes less than 2 MPa, please stop use of the CRM. We recommend sufficient substitution of residual gas in stainless regulators, valves, piping, measuring instruments, and so on with this CRM gas before use. To avoid contamination, we recommend check leakage from joints of piping.

Precautions for Handling

This CRM is toxic and odorless high-pressure gas. Refer to the safety data sheet (SDS) on this CRM before use.

Preparation

This CRM is filled in a 9.5 liter aluminum alloy cylinder by Taiyo Nippon Sanso JFP Corporation.

NMIJ Analysts

The technical manager for this CRM is SHIMOSAKA T., the production manager is MATSUMOTO N., and the analysts are MATSUMOTO N. and TAKADA K.

Information

If substantive technical changes occur that affect the certification before the expiration of this certificate, NMIJ will notify the registered customers. Customer registration on the NMIJ Website (given below) will facilitate notification. Technical reports regarding this CRM can be obtained from the contact details given below.

Reproduction of Certificate

In reproducing this certificate, it should be clearly indicated that the document is a copy.

September 28, 2023

ISHIMURA Kazuhiko
President

National Institute of Advanced Industrial Science and Technology

Date of Shipment: Xxxxx xx, 20xx

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If you have any questions about this CRM, please contact:
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