

National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan



Reference Material Certificate

NMIJ CRM 3404-c01



Oxygen

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 oxygen determination.

Certified Value

The certified value of O₂ in this CRM is given in the table below. The uncertainty of the certified value is the half-width of the expanded uncertainty interval calculated using a coverage factor (*k*) of 2, which gives a level of confidence of approximately 95 %.

	CAS No.	Certified Value Amount-of- substance fraction (mol/mol)	Expanded Uncertainty Amount-of-substance fraction (mol/mol)	Cylinder Number
Oxygen	7782-44-7	1.0000000	3.1×10^{-6}	PLP-18172

Analysis

The certified value was determined by the paramagnetic oxygen analyzer which was calibrated by standard gases prepared from oxygen CRM (NMIJ CRM 3404a No. 03) with a dynamic blending method.

Metrological Traceability

The paramagnetic oxygen analyzer was calibrated using the CRM oxygen and calibration gases which were prepared by diluting the CRM oxygen whose amount of subtraction is traceable to the International System of Units (SI). Therefore the certified value is traceable to the SI.

Mutual Recognition Arrangement under Meter Convention

This certificate is consistent with the calibration and measurement capabilities (CMCs) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures (CIPM). Under the MRA, all participating institutes recognize the validity of each other's calibration and measurement certificates for the quantities, ranges and measurement uncertainties specified in Appendix C (as for Appendix C of MRA, see <http://kcdb.bipm.org/AppendixC/default.asp>).

Expiration of Certification

This certificate is valid until March 31, 2021 from the date of shipment, provided the material is stored in accordance with the instructions given in this certificate.

Sample Form

This CRM is high-pressure gas and supplied in a 47-liter high-pressure manganese steel cylinder with W22-14 thread right male outlet. At the time of supply, the in-cylinder pressure of the oxygen is 12 MPa or more.

Instructions for Storage

This CRM should be stored in compliance with regulations of high pressure gas and so on. A cylinder of this CRM should be stored away from direct sunlight and fire at a temperature of 40 °C or less in a well-ventilated place. The CRM should be fixed with chain to avoid overturning. Since oxygen gas supports combustion, do not use fire near the cylinder and do not place any flammable objects nearby. Care must be taken to avoid leakage.

Instructions for Use

Displace residual gas in a regulator, valves, piping systems, measuring instruments, and so on thoroughly with this CRM before use. To avoid contamination, we recommend check that there is no leakage from the joint of piping. This CRM should be used only when the internal pressure is 2 MPa or more.

Precautions for Handling

This CRM should be handled in compliance with any relevant regulations relating to high-pressure gas. Use personal protective equipment when handling this CRM. Keep away from open flames. The CRM should be used in a well-ventilated place. Refer to the safety data sheet (SDS) on this CRM before use.

Preparation

A highly pure oxygen gas, which is commercially available, was filled into a manganese steel cylinder with an inner volume of 47 L by Japan Fine Products.

NMIJ Analysts

The technical manager for this CRM is KATO K., and the production manager and the analyst is SHIMOSAKA T.

Information

If substantive technical changes occur that affect the certification before the expiration of this certificate, NMIJ will notify the registered customer. 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.

April 1, 2020

ISHIMURA Kazuhiko
President

National Institute of Advanced Industrial Science and Technology

If you have any questions about this CRM, please contact:
National Institute of Advanced Industrial Science and Technology,

National Metrology Institute of Japan,
Center for Quality Management of Metrology, Reference Materials Office,
1-1-1 Umezono, Tsukuba, Ibaraki 305-8563, Japan

Phone: +81-29-861-4059; Fax: +81-29-861-4009, <https://unit.aist.go.jp/nmij/english/refmate/>

Revision history

April 1, 2020: "Metrology Management Center" was renamed to "Center for Quality Management of Metrology."
March 17, 2016: The expiration date of this certificate was extended to March 31, 2021 from March 31, 2017.

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National Metrology Institute of Japan



Reference Material Certificate

NMIJ CRM 3404-c02



Oxygen

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 oxygen determination.

Certified Value

The certified value of O₂ in this CRM is given in the table below. The uncertainty of the certified value is the half-width of the expanded uncertainty interval calculated using a coverage factor (*k*) of 2, which gives a level of confidence of approximately 95 %.

	CAS No.	Certified Value Amount-of- substance fraction (mol/mol)	Expanded Uncertainty Amount-of-substance fraction (mol/mol)	Cylinder Number
Oxygen	7782-44-7	1.0000002	3.1×10^{-6}	PLP-18173

Analysis

The certified value was determined by the paramagnetic oxygen analyzer which was calibrated by standard gases prepared from oxygen CRM (NMIJ CRM 3404a No. 03) with a dynamic blending method.

Metrological Traceability

The paramagnetic oxygen analyzer was calibrated using the CRM oxygen and calibration gases which were prepared by diluting the CRM oxygen whose amount of subtraction is traceable to the International System of Units (SI). Therefore the certified value is traceable to the SI.

Mutual Recognition Arrangement under Meter Convention

This certificate is consistent with the calibration and measurement capabilities (CMCs) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures (CIPM). Under the MRA, all participating institutes recognize the validity of each other's calibration and measurement certificates for the quantities, ranges and measurement uncertainties specified in Appendix C (as for Appendix C of MRA, see <http://kcdb.bipm.org/AppendixC/default.asp>).

Expiration of Certification

This certificate is valid until March 31, 2021 from the date of shipment, provided the material is stored in accordance with the instructions given in this certificate.

Sample Form

This CRM is high-pressure gas and supplied in a 47-liter high-pressure manganese steel cylinder with W22-14 thread right male outlet. At the time of supply, the in-cylinder pressure of the oxygen is 12 MPa or more.

Instructions for Storage

This CRM should be stored in compliance with regulations of high pressure gas and so on. A cylinder of this CRM should be stored away from direct sunlight and fire at a temperature of 40 °C or less in a well-ventilated place. The CRM should be fixed with chain to avoid overturning. Since oxygen gas supports combustion, do not use fire near the cylinder and do not place any flammable objects nearby. Care must be taken to avoid leakage.

Instructions for Use

Displace residual gas in a regulator, valves, piping systems, measuring instruments, and so on thoroughly with this CRM before use. To avoid contamination, we recommend check that there is no leakage from the joint of piping. This CRM should be used only when the internal pressure is 2 MPa or more.

Precautions for Handling

This CRM should be handled in compliance with any relevant regulations relating to high-pressure gas. Use personal protective equipment when handling this CRM. Keep away from open flames. The CRM should be used in a well-ventilated place. Refer to the safety data sheet (SDS) on this CRM before use.

Preparation

A highly pure oxygen gas, which is commercially available, was filled into a manganese steel cylinder with an inner volume of 47 L by Japan Fine Products.

NMIJ Analysts

The technical manager for this CRM is KATO K., and the production manager and the analyst is SHIMOSAKA T.

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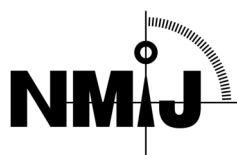
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Reference Material Certificate

NMIJ CRM 3404-c03



Oxygen

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 oxygen determination.

Certified Value

The certified value of O₂ in this CRM is given in the table below. The uncertainty of the certified value is the half-width of the expanded uncertainty interval calculated using a coverage factor (*k*) of 2, which gives a level of confidence of approximately 95 %.

	CAS No.	Certified Value Amount-of- substance fraction (mol/mol)	Expanded Uncertainty Amount-of-substance fraction (mol/mol)	Cylinder Number
Oxygen	7782-44-7	0.9999991	3.1×10^{-6}	PLP-18174

Analysis

The certified value was determined by the paramagnetic oxygen analyzer which was calibrated by standard gases prepared from oxygen CRM (NMIJ CRM 3404a No. 03) with a dynamic blending method.

Metrological Traceability

The paramagnetic oxygen analyzer was calibrated using the CRM oxygen and calibration gases which were prepared by diluting the CRM oxygen whose amount of subtraction is traceable to the International System of Units (SI). Therefore the certified value is traceable to the SI.

Mutual Recognition Arrangement under Meter Convention

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Expiration of Certification

This certificate is valid until March 31, 2021 from the date of shipment, provided the material is stored in accordance with the instructions given in this certificate.

Sample Form

This CRM is high-pressure gas and supplied in a 47-liter high-pressure manganese steel cylinder with W22-14 thread right male outlet. At the time of supply, the in-cylinder pressure of the oxygen is 12 MPa or more.

Instructions for Storage

This CRM should be stored in compliance with regulations of high pressure gas and so on. A cylinder of this CRM should be stored away from direct sunlight and fire at a temperature of 40 °C or less in a well-ventilated place. The CRM should be fixed with chain to avoid overturning. Since oxygen gas supports combustion, do not use fire near the cylinder and do not place any flammable objects nearby. Care must be taken to avoid leakage.

Instructions for Use

Displace residual gas in a regulator, valves, piping systems, measuring instruments, and so on thoroughly with this CRM before use. To avoid contamination, we recommend check that there is no leakage from the joint of piping. This CRM should be used only when the internal pressure is 2 MPa or more.

Precautions for Handling

This CRM should be handled in compliance with any relevant regulations relating to high-pressure gas. Use personal protective equipment when handling this CRM. Keep away from open flames. The CRM should be used in a well-ventilated place. Refer to the safety data sheet (SDS) on this CRM before use.

Preparation

A highly pure oxygen gas, which is commercially available, was filled into a manganese steel cylinder with an inner volume of 47 L by Japan Fine Products.

NMIJ Analysts

The technical manager for this CRM is KATO K., and the production manager and the analyst is SHIMOSAKA T.

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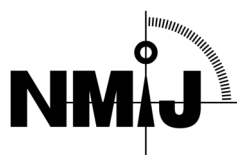
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Reference Material Certificate

NMIJ CRM 3404-c04



Oxygen

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 oxygen determination.

Certified Value

The certified value of O₂ in this CRM is given in the table below. The uncertainty of the certified value is the half-width of the expanded uncertainty interval calculated using a coverage factor (*k*) of 2, which gives a level of confidence of approximately 95 %.

	CAS No.	Certified Value Amount-of- substance fraction (mol/mol)	Expanded Uncertainty Amount-of-substance fraction (mol/mol)	Cylinder Number
Oxygen	7782-44-7	1.0000002	3.1×10^{-6}	PLP-18175

Analysis

The certified value was determined by the paramagnetic oxygen analyzer which was calibrated by standard gases prepared from oxygen CRM (NMIJ CRM 3404a No. 03) with a dynamic blending method.

Metrological Traceability

The paramagnetic oxygen analyzer was calibrated using the CRM oxygen and calibration gases which were prepared by diluting the CRM oxygen whose amount of subtraction is traceable to the International System of Units (SI). Therefore the certified value is traceable to the SI.

Mutual Recognition Arrangement under Meter Convention

This certificate is consistent with the calibration and measurement capabilities (CMCs) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures (CIPM). Under the MRA, all participating institutes recognize the validity of each other's calibration and measurement certificates for the quantities, ranges and measurement uncertainties specified in Appendix C (as for Appendix C of MRA, see <http://kcdb.bipm.org/AppendixC/default.asp>).

Expiration of Certification

This certificate is valid until March 31, 2021 from the date of shipment, provided the material is stored in accordance with the instructions given in this certificate.

Sample Form

This CRM is high-pressure gas and supplied in a 47-liter high-pressure manganese steel cylinder with W22-14 thread right male outlet. At the time of supply, the in-cylinder pressure of the oxygen is 12 MPa or more.

Instructions for Storage

This CRM should be stored in compliance with regulations of high pressure gas and so on. A cylinder of this CRM should be stored away from direct sunlight and fire at a temperature of 40 °C or less in a well-ventilated place. The CRM should be fixed with chain to avoid overturning. Since oxygen gas supports combustion, do not use fire near the cylinder and do not place any flammable objects nearby. Care must be taken to avoid leakage.

Instructions for Use

Displace residual gas in a regulator, valves, piping systems, measuring instruments, and so on thoroughly with this CRM before use. To avoid contamination, we recommend check that there is no leakage from the joint of piping. This CRM should be used only when the internal pressure is 2 MPa or more.

Precautions for Handling

This CRM should be handled in compliance with any relevant regulations relating to high-pressure gas. Use personal protective equipment when handling this CRM. Keep away from open flames. The CRM should be used in a well-ventilated place. Refer to the safety data sheet (SDS) on this CRM before use.

Preparation

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Reference Material Certificate

NMIJ CRM 3404-c05



Oxygen

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Certified Value

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	CAS No.	Certified Value Amount-of- substance fraction (mol/mol)	Expanded Uncertainty Amount-of-substance fraction (mol/mol)	Cylinder Number
Oxygen	7782-44-7	0.9999995	3.1×10^{-6}	PLP-18176

Analysis

The certified value was determined by the paramagnetic oxygen analyzer which was calibrated by standard gases prepared from oxygen CRM (NMIJ CRM 3404a No. 03) with a dynamic blending method.

Metrological Traceability

The paramagnetic oxygen analyzer was calibrated using the CRM oxygen and calibration gases which were prepared by diluting the CRM oxygen whose amount of subtraction is traceable to the International System of Units (SI). Therefore the certified value is traceable to the SI.

Mutual Recognition Arrangement under Meter Convention

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Instructions for Storage

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