

National Institute of Advanced Industrial Science and Technology

## National Metrology Institute of Japan



## Reference Material Certificate

NMIJ CRM 4052-c01



## Propane

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.

**Certified Value**

The certified value for propane in this CRM is given in the table below. The quoted uncertainty 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
Propane	74-98-6	0.9995	0.0005	GAJ69114

**Analysis**

The certified value was determined by the subtracting method which complied with requirement described in the ISO 6142-1:2015. Impurities in this CRM were determined by a gas chromatograph with a thermal conductivity detector (GC-TCD), gas chromatograph with a flame ionization detector (GC-FID), and a capacitance type hygrometer.

Impurities	Analytical Instruments
Nitrogen	Gas chromatograph with thermal conductivity detector (GC-TCD)
Oxygen	Gas chromatograph with thermal conductivity detector (GC-TCD)
Carbon dioxide	Gas chromatograph with thermal conductivity detector (GC-TCD)
Ethane	Gas chromatograph with flame ionization detector (GC-FID)
Propene (Propylene)	Gas chromatograph with flame ionization detector (GC-FID)
Cyclopropane	Gas chromatograph with flame ionization detector (GC-FID)
Isobutane	Gas chromatograph with flame ionization detector (GC-FID)
Butane	Gas chromatograph with flame ionization detector (GC-FID)
Water	Capacitance type hygrometer

**Metrological Traceability**

The gas chromatographs were calibrated using NMIJ's primary reference gases prepared by the gravimetric method. The capacitance type hygrometer was calibrated using a reference dew point meter which is traceable to the International System of Units (SI). Therefore the certified value is traceable to the SI.

**Mutual Recognition Arrangement under Meter Convention**

The certified value 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 for one year from the date of shipment, provided that the material is stored in accordance with the instructions given in this certificate.

### Sample Form

This CRM is supplied in a manganese steel cylinder with an inner volume of approximately 4.8 L. Specification of the outlet of the cylinder is W22.5-14threads left female.

### Instructions for Storage

This CRM should be stored in compliance with regulations of high pressure gas and so on. The CRM should not be exposed to direct sunlight. The CRM should be kept temperature below 40 °C and stored at a place with good ventilation. The CRM should be fastened with chain to avoid it from falling down. Since propane is flammable, open flames and other source of ignition should not be permitted near the CRM. The CRM should be taken care to leaks.

### Instructions for Use

We recommend sufficient substitution of residual gas in a regulator, valves, piping, measuring instruments, and so on with this CRM before use. To avoid contamination, we recommend checking leakage from the joints of piping. Do not elute this CRM as liquid phase. The certification is not valid if the CRM is used as liquid. To avoid change in purity, do not use the CRM below 0.2 kg of residual amount. It is desirable that this CRM is used at 19 °C to 28 °C.

### Precautions for Handling

Wear a protective equipment during handling. Open flames should not be permitted near this CRM. The CRM should be used at a place with good ventilation. Refer to the safety data sheet (SDS) on the CRM before use.

### Preparation

This CRM is a commercially available high-purity propane gas whose certified value was determined by NMIJ.

### NMIJ Analysts

The technical manager for this CRM is SHIMOSAKA T., the production manager is WATANABE T., and the analysts are WATANABE T., 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 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/>

Sample

National Institute of Advanced Industrial Science and Technology

## National Metrology Institute of Japan



## Reference Material Certificate

NMIJ CRM 4052-c02



## Propane

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.

**Certified Value**

The certified value for propane in this CRM is given in the table below. The quoted uncertainty 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
Propane	74-98-6	0.9995	0.0005	GAJ72009

**Analysis**

The certified value was determined by the subtracting method which complied with requirement described in the ISO 6142-1:2015. Impurities in this CRM were determined by a gas chromatograph with a thermal conductivity detector (GC-TCD), gas chromatograph with a flame ionization detector (GC-FID), and a capacitance type hygrometer.

Impurities	Analytical Instruments
Nitrogen	Gas chromatograph with thermal conductivity detector (GC-TCD)
Oxygen	Gas chromatograph with thermal conductivity detector (GC-TCD)
Carbon dioxide	Gas chromatograph with thermal conductivity detector (GC-TCD)
Ethane	Gas chromatograph with flame ionization detector (GC-FID)
Propene (Propylene)	Gas chromatograph with flame ionization detector (GC-FID)
Cyclopropane	Gas chromatograph with flame ionization detector (GC-FID)
Isobutane	Gas chromatograph with flame ionization detector (GC-FID)
Butane	Gas chromatograph with flame ionization detector (GC-FID)
Water	Capacitance type hygrometer

**Metrological Traceability**

The gas chromatographs were calibrated using NMIJ's primary reference gases prepared by the gravimetric method. The capacitance type hygrometer was calibrated using a reference dew point meter which is traceable to the International System of Units (SI). Therefore the certified value is traceable to the SI.

**Mutual Recognition Arrangement under Meter Convention**

The certified value 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 for one year from the date of shipment, provided that the material is stored in accordance with the instructions given in this certificate.

### Sample Form

This CRM is supplied in a manganese steel cylinder with an inner volume of approximately 4.8 L. Specification of the outlet of the cylinder is W22.5-14threads left female.

### Instructions for Storage

This CRM should be stored in compliance with regulations of high pressure gas and so on. The CRM should not be exposed to direct sunlight. The CRM should be kept temperature below 40 °C and stored at a place with good ventilation. The CRM should be fastened with chain to avoid it from falling down. Since propane is flammable, open flames and other source of ignition should not be permitted near the CRM. The CRM should be taken care to leaks.

### Instructions for Use

We recommend sufficient substitution of residual gas in a regulator, valves, piping, measuring instruments, and so on with this CRM before use. To avoid contamination, we recommend checking leakage from the joints of piping. Do not elute this CRM as liquid phase. The certification is not valid if the CRM is used as liquid. To avoid change in purity, do not use the CRM below 0.2 kg of residual amount. It is desirable that this CRM is used at 19 °C to 28 °C.

### Precautions for Handling

Wear a protective equipment during handling. Open flames should not be permitted near this CRM. The CRM should be used at a place with good ventilation. Refer to the safety data sheet (SDS) on the CRM before use.

### Preparation

This CRM is a commercially available high-purity propane gas whose certified value was determined by NMIJ.

### NMIJ Analysts

The technical manager for this CRM is SHIMOSAKA T., the production manager is WATANABE T., and the analysts are WATANABE T., 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 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

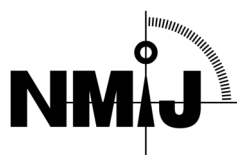
National Institute of Advanced Industrial Science and Technology

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/>

Sample

National Institute of Advanced Industrial Science and Technology

## National Metrology Institute of Japan



## Reference Material Certificate

NMIJ CRM 4052-c03



## Propane

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.

**Certified Value**

The certified value for propane in this CRM is given in the table below. The quoted uncertainty 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
Propane	74-98-6	0.9995	0.0005	GAJ75034

**Analysis**

The certified value was determined by the subtracting method which complied with requirement described in the ISO 6142-1:2015. Impurities in this CRM were determined by a gas chromatograph with a thermal conductivity detector (GC-TCD), gas chromatograph with a flame ionization detector (GC-FID), and a capacitance type hygrometer.

Impurities	Analytical Instruments
Nitrogen	Gas chromatograph with thermal conductivity detector (GC-TCD)
Oxygen	Gas chromatograph with thermal conductivity detector (GC-TCD)
Carbon dioxide	Gas chromatograph with thermal conductivity detector (GC-TCD)
Ethane	Gas chromatograph with flame ionization detector (GC-FID)
Propene (Propylene)	Gas chromatograph with flame ionization detector (GC-FID)
Cyclopropane	Gas chromatograph with flame ionization detector (GC-FID)
Isobutane	Gas chromatograph with flame ionization detector (GC-FID)
Butane	Gas chromatograph with flame ionization detector (GC-FID)
Water	Capacitance type hygrometer

**Metrological Traceability**

The gas chromatographs were calibrated using NMIJ's primary reference gases prepared by the gravimetric method. The capacitance type hygrometer was calibrated using a reference dew point meter which is traceable to the International System of Units (SI). Therefore the certified value is traceable to the SI.

**Mutual Recognition Arrangement under Meter Convention**

The certified value 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 for one year from the date of shipment, provided that the material is stored in accordance with the instructions given in this certificate.

### Sample Form

This CRM is supplied in a manganese steel cylinder with an inner volume of approximately 4.8 L. Specification of the outlet of the cylinder is W22.5-14threads left female.

### Instructions for Storage

This CRM should be stored in compliance with regulations of high pressure gas and so on. The CRM should not be exposed to direct sunlight. The CRM should be kept temperature below 40 °C and stored at a place with good ventilation. The CRM should be fastened with chain to avoid it from falling down. Since propane is flammable, open flames and other source of ignition should not be permitted near the CRM. The CRM should be taken care to leaks.

### Instructions for Use

We recommend sufficient substitution of residual gas in a regulator, valves, piping, measuring instruments, and so on with this CRM before use. To avoid contamination, we recommend checking leakage from the joints of piping. Do not elute this CRM as liquid phase. The certification is not valid if the CRM is used as liquid. To avoid change in purity, do not use the CRM below 0.2 kg of residual amount. It is desirable that this CRM is used at 19 °C to 28 °C.

### Precautions for Handling

Wear a protective equipment during handling. Open flames should not be permitted near this CRM. The CRM should be used at a place with good ventilation. Refer to the safety data sheet (SDS) on the CRM before use.

### Preparation

This CRM is a commercially available high-purity propane gas whose certified value was determined by NMIJ.

### NMIJ Analysts

The technical manager for this CRM is SHIMOSAKA T., the production manager is WATANABE T., and the analysts are WATANABE T., 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 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/>

Sample

National Institute of Advanced Industrial Science and Technology

## National Metrology Institute of Japan



## Reference Material Certificate

NMIJ CRM 4052-c04



## Propane

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.

**Certified Value**

The certified value for propane in this CRM is given in the table below. The quoted uncertainty 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
Propane	74-98-6	0.9995	0.0005	GAJ76432

**Analysis**

The certified value was determined by the subtracting method which complied with requirement described in the ISO 6142-1:2015. Impurities in this CRM were determined by a gas chromatograph with a thermal conductivity detector (GC-TCD), gas chromatograph with a flame ionization detector (GC-FID), and a capacitance type hygrometer.

Impurities	Analytical Instruments
Nitrogen	Gas chromatograph with thermal conductivity detector (GC-TCD)
Oxygen	Gas chromatograph with thermal conductivity detector (GC-TCD)
Carbon dioxide	Gas chromatograph with thermal conductivity detector (GC-TCD)
Ethane	Gas chromatograph with flame ionization detector (GC-FID)
Propene (Propylene)	Gas chromatograph with flame ionization detector (GC-FID)
Cyclopropane	Gas chromatograph with flame ionization detector (GC-FID)
Isobutane	Gas chromatograph with flame ionization detector (GC-FID)
Butane	Gas chromatograph with flame ionization detector (GC-FID)
Water	Capacitance type hygrometer

**Metrological Traceability**

The gas chromatographs were calibrated using NMIJ's primary reference gases prepared by the gravimetric method. The capacitance type hygrometer was calibrated using a reference dew point meter which is traceable to the International System of Units (SI). Therefore the certified value is traceable to the SI.

**Mutual Recognition Arrangement under Meter Convention**

The certified value 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 for one year from the date of shipment, provided that the material is stored in accordance with the instructions given in this certificate.

### Sample Form

This CRM is supplied in a manganese steel cylinder with an inner volume of approximately 4.8 L. Specification of the outlet of the cylinder is W22.5-14threads left female.

### Instructions for Storage

This CRM should be stored in compliance with regulations of high pressure gas and so on. The CRM should not be exposed to direct sunlight. The CRM should be kept temperature below 40 °C and stored at a place with good ventilation. The CRM should be fastened with chain to avoid it from falling down. Since propane is flammable, open flames and other source of ignition should not be permitted near the CRM. The CRM should be taken care to leaks.

### Instructions for Use

We recommend sufficient substitution of residual gas in a regulator, valves, piping, measuring instruments, and so on with this CRM before use. To avoid contamination, we recommend checking leakage from the joints of piping. Do not elute this CRM as liquid phase. The certification is not valid if the CRM is used as liquid. To avoid change in purity, do not use the CRM below 0.2 kg of residual amount. It is desirable that this CRM is used at 19 °C to 28 °C.

### Precautions for Handling

Wear a protective equipment during handling. Open flames should not be permitted near this CRM. The CRM should be used at a place with good ventilation. Refer to the safety data sheet (SDS) on the CRM before use.

### Preparation

This CRM is a commercially available high-purity propane gas whose certified value was determined by NMIJ.

### NMIJ Analysts

The technical manager for this CRM is SHIMOSAKA T., the production manager is WATANABE T., and the analysts are WATANABE T., 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 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/>

Sample