

Analytical Technology Division, HORIBA TECHNO SERVICE Co., Ltd.

Certificate

Certified Reference Material HORIBA CRM 1601-1A

(Iron and steel certified reference material, for analysis of sulfur, carbon, and nitrogen)



This iron and steel certified reference material is produced and provided in bottles containing 100 grams of chip type material in accordance with a management system that conforms to ISO 17034 (JIS Q 17034). It is mainly intended for use in creating calibration curves or validating analytical values when employing the infrared absorption method after combustion*1 or thermal conductivity method after fusion in inert gas. *1: While this is referred to as combustion in an induction furnace in JIS G 1215-4, simply "combustion" is used in this document.

Certified Values

The certified values for this reference material are shown below. The uncertainty of each certified value is the expanded uncertainty determined from the combined standard uncertainty and a coverage factor of $k = 2$, and represents half the width of the interval estimated to have a level of confidence of approximately 95%.

Name of reference material	Component	Certified value (Mass fraction %)	Uncertainty (Mass fraction %)
HORIBA CRM 1601-1A	Sulfur	0.545	0.010
	Carbon	0.0602	0.0009
	Nitrogen	0.0082	0.0004

Determination of Certified Values

The certified values for this reference material were determined as follows based on a sample of 10 bottles extracted at random from the total number produced in the same lot.

The sulfur values were determined using infrared absorption after combustion with potassium sulfate as a standard (JIS G 1215-4*2), while the carbon values were determined using infrared absorption after combustion with sodium carbonate as a standard (JIS G 1211-3). The nitrogen values were determined using the thermal conductivity method after fusion in inert gas with potassium nitrate as a standard (JIS G 1228-3). All three of the reagents mentioned here are substances with a high degree of guaranteed purity.

*2: The upper concentration limit was expanded to 0.7% and 10.2 barium sulfate was changed to potassium sulfate for the application.

Evaluation of Uncertainties

Regarding the uncertainties of the certified values for this reference material, in order to calculate the certified values, the principal uncertainties involved in their measurement were determined after taking into account the expanded uncertainties calculated from the combined standard uncertainties and a coverage factor of $k = 2$. The value of $k = 2$ was adopted for the coverage factor after also considering the effective degrees of freedom.

Metrological Traceability

The certified values for this reference material are based on an analysis of the values obtained from calibration curves created using the mass fractions of the target elements included in materials of guaranteed high purity. They have been determined in conjunction with their respective uncertainties. All values are traceable to the International System of Units (SI) via the stoichiometric masses of the high purity materials.

Precautions for Use

1. After opening, store the material in humidity-controlled equipment such as a desiccator, or in a cool, dark place^{*3} and consume as soon as possible.
2. When removing the reference material from the container, use a clean spatula or forceps to prevent contamination.
3. Do not cut or process the reference material.
4. If any reference material remains in the container, immediately place the cap back on the container. Do not leave it in an open state.
5. Once the reference material is removed from the container, perform operations such as measuring and chemical processing immediately.
6. Do not return any reference material to the container after it has been removed. In addition, when the amount of sample in the container becomes low, many fine-grained chips will remain. Do not use this material.
7. Use 0.5 g to 1.0 g of reference material to perform analysis.

*3: Care is required regarding humidity.

Precautions for Storage, Period of Certificate Validity

This certificate is valid until June 26, 2030. If the material is stored with unopened in humidity-controlled equipment such as a desiccator, or in a cool, dark place, no changes in the certified values are expected. However, HORIBA TECHNO SERVICE will continue to perform periodic monitoring stability of unopened product and report the results as necessary on our Website.

Production Method and Homogeneity

This reference material was first cut from the surface of sulfur free-cutting steel and then reduced to chip shape in a milling machine, after which it was sieved to further regulate the grain size to 500 µm to 1000 µm. These chips were then cleaned in alcohol, dried, and thoroughly agitated to mix them. Finally, they were divided into 100 g bottles and stored at room temperature. To test the homogeneity, 10 bottles were extracted at random from the total number produced in a single lot and 2 samples were taken from each of these bottles. This total of 20 samples was then quantitatively analyzed for sulfur, carbon, and nitrogen levels. If the relative standard deviations at that time were respectively within 1.5%, the samples were confirmed to be sufficiently homogeneous.

Date of Analysis

June 26, 2020

Supervisor Responsible for Approval

Shintaro Komatani

General Manager of Analytical Technology Division, HORIBA TECHNO SERVICE Co., Ltd.

Contact

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Additional Information

Further technical information related to this reference material can be obtained by using the contact details provided above. If there are any changes to the certified values or other major revisions, a notification will also be sent to purchasers who have performed user registration^{*4}.

*4: Please send the following details via the e-mail address above: 1) CRM type and number recorded on the bottle(s), 2) company name, 3) supervisor name, and 4. date of receipt.

Reference Information

Manufacturing partner: SEISHIN TRADING Co., Ltd.

Sales partner: SEISHIN TRADING Co., Ltd.

Other Details

HORIBA TECHNO SERVICE has been certified by the Japan Accreditation Board as a reference material producer under ISO 17034 (cert. no. RMP00040) and as an accredited laboratory under ISO/IEC 17025 (cert. no. RTL00880).

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