



TAZ GMBH



Certificate

Certified Reference Material (CRM)

TAZ-045

Iron powder for CS determination by combustion

Certified Values

Element	Mass fraction ¹⁾	Uncertainty ²⁾	Unit ³⁾
C	3.50	0.04	%
S	0.0084	0.0010	%

¹⁾ Unweighted mean values of the accepted data set mean values, whereby the data sets originate from different laboratories or were determined using different methods.

²⁾ Expanded uncertainty U_{CRM} corresponding to a confidence level of 95 %.

³⁾ Although widely accepted in the industry, the "mass fraction in %" is neither an SI- nor an IUPAC-supported unit. Multiplying the certified values and uncertainties by 10^4 yields the values in $\mu\text{g/g}$.

Description of the Material

The reference material is available as a powder in 500 g and 250 g units.

Intended Use

The reference material is intended for establishing and checking calibrations for analytical methods, such as those used by the participating laboratories, for the analysis of samples of similar composition and to demonstrate traceability.

Instructions for Use

Once the bottle has been opened, the cap should be screwed back on immediately. If the contents have changed as a result of external factors (e.g. oxidation), they must be discarded.

Transport and Storage

The material must be stored in a dry and clean environment at room temperature. It must be transported under normal environmental conditions.



TAZ GMBH

End of Validity

The material is considered stable provided the unit has not been opened and is not exposed to extreme heat or moisture (e.g. high humidity). Once opened, the material can be used for 10 years, based on a statistical estimate assuming that the unit is left open for 30 minutes on each working day under laboratory conditions. The certification becomes invalid if the ZRM is damaged, contaminated or otherwise modified.

Homogeneity

A homogeneity assessment according to ISO 33405:2024 was carried out by TAZ GmbH using Infrared absorption method after combustion in an induction furnace to determine the batch inhomogeneity.

Estimation of Uncertainty

The estimation of uncertainty takes into account the results of the homogeneity assessment and the characterization study. u_{hom} is obtained from the contributions of the homogeneity assessment between the units u_{bu} and within the units u_{wu} . u_{char} is the standard uncertainty of the characterization study, which results from the standard deviation s_{char} and the number n of accepted data set mean values. u_{CRM} is the combined uncertainty of the homogeneity assessment and the characterisation study. The coverage factor $t_{(n-1)}$ is the two-sided quantile of the Student t -distribution and U_{CRM} is the expanded uncertainty. The reported uncertainties and the certified values have been rounded according to DIN 1333:1992.

$$u_{\text{hom}} = \sqrt{u_{\text{bu}}^2 + u_{\text{wu}}^2}$$

$$u_{\text{char}} = \frac{s_{\text{char}}}{\sqrt{n}}$$

$$u_{\text{CRM}} = \sqrt{u_{\text{char}}^2 + u_{\text{hom}}^2}$$

$$U_{\text{CRM}} = t_{(n-1)} \cdot u_{\text{CRM}}$$

Metrological Traceability

The analytical values are traceable to the SI (Système International d'Unités) via calibration using pure metals, stoichiometric compounds or the certified reference materials listed below:

ECRM 042-1, ECRM 082-1, ECRM 128-1, ECRM 128-1, ECRM 180-1, ECRM 193-1, ECRM 194-1, ECRM 235-1, ECRM 237-2, ECRM 286-1, ECRM 291-1, ECRM 327-2, ECRM 428-1, ECRM 479-2, ECRM 480-1, ECRM 481-1, ECRM 483-1, ECRM 486-1, ECRM 487-2, TAZ-027.

Laboratories involved in characterisation

Accreditation

AG der Dillinger Hüttenwerke, Dillingen/Saar, DE	DIN EN ISO/IEC 17025
FEM - Forschungsinstitut Edelmetalle und Metallchemie, Schwäbisch Gmünd, DE	DIN EN ISO/IEC 17025
Schunk Sintermetalltechnik GmbH, Thale, DE	DIN EN ISO/IEC 17025
TAZ Gesellschaft für Analyse und Messtechnik mbH, Aichach, DE	DIN EN ISO/IEC 17025
thyssenkrupp Steel Europe AG, Duisburg, Bruckhausen/Hamborn, DE	DIN EN ISO/IEC 17025
thyssenkrupp Steel Europe AG, Duisburg, Beeckerwerth, DE	DIN EN ISO/IEC 17025
voestalpine Böhler Welding Germany GmbH, Hamm, DE	DIN EN ISO/IEC 17025
Bruker AXS SE, Karlsruhe, DE	-



TAZ GMBH

Mean values of accepted data sets

No.	C		S	
	%	M	%	M
1	3.45	a	0.0072	a
2	3.48	a	0.0076	a
3	3.49	a	0.0079	a
4	3.49	b	0.0080	d
5	3.49	d	0.0087	b
6	3.54	a	0.0095	c
7	3.54	a	0.0100	a
8	3.54	b	---	
<i>M</i>	3.50		0.0084	
<i>s_M</i>	0.04		0.0011	
<i>s_i</i>	0.02		0.0002	

Analytical methods used for certification (M)

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- a DIN EN ISO 15350:2010-08 - Stahl und Eisen - Bestimmung der Gesamtgehalte an Kohlenstoff und Schwefel - Infrarotabsorptionsverfahren nach Verbrennung in einem Induktionsofen (Standardverfahren) (ISO 15350:2000)
 - b ASTM E1019-24 - Standard Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel, Iron, Nickel, and Cobalt Alloys by Combustion and Inert Gas Fusion Techniques
 - c ASTM E1019-24, modified - SO₂ measurement via UV instead of IR detection
 - d Infrarotabsorptionsspektrometrisches Verfahren - Handbuch für das Eisenhüttenlaboratorium 1994, Band 2 „Analyse der Metalle“, Teil 2; S. 6.6-100-6.6-106
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The laboratory values were analysed statistically in order to eliminate outliers. If “---” appears in the table, this means that an outlier has been excluded. A data set consists of at least 2 individual values. Figures in italics are non-certified values for information purposes.

M: mean value of the data set values *s_M*: Standard deviation of the data set mean values
s_i: averaged standard deviation of repeatability (square root of the mean value of the data set variances)

Accepted as TAZ CRM (Rev. 0) on 8 July 2026

Moritz Winter, M.Sc.
Head of Reference Materials Production

This certified reference material was manufactured in accordance with DIN EN ISO 17034 in combination with DIN EN ISO/IEC 17025. TAZ GmbH is accredited as a reference material producer according to DIN EN ISO 17034. The accreditation is valid for the scope specified in the annex to the accreditation certificate D-RM-11169-02-00. The Deutsche Akkreditierungsstelle (DAkkS) is a signatory of the Multilateral Agreement (MLA) between EA, ILAC and IAF for mutual recognition.

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