

This reference material was certified by the consensus of a network of expert laboratories using different methodologies, and can be used for calibration, assessment of precision and trueness and, to demonstrate traceability of results in chemical analysis by classical and instrumental methods.

This material is a white cast iron presented in the form of chips.

Properties	Certified Values	Expanded Uncertainties	Unit
C	2,11	0,02	%
Si	0,78	0,01	%
Mn	0,272	0,003	%
Cu	0,040	0,003	%
Ni	0,021	0,002	%
Cr	0,020	0,003	%
S	0,019	0,002	%
P	0,012	0,001	%

Lot Number: 01

Valid until : 10/2030

The certified values and uncertainties are assured by the validity period, considering that the material is handled and stored in accordance with the given instructions, except in case of damage or contamination. IPT will monitor periodically the properties of this reference material during its validity period, and any observed significant change will be reported to the user.

Sao Paulo, 06/2020

Center for Chemistry and Manufactured Goods
Metrological References Laboratory

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Uncertainties

The expanded uncertainties of the certified values were estimated by the combination, according to ISO Guide 35:2006, of uncertainties of characterization, obtained experimentally from the interlaboratory certification program data, and where relevant, with contributions of stability of material, both estimated at IPT. The coverage factor used is approximately 2, providing a confidence level of 95%.

Traceability

The certified values of the properties of this material were obtained by means of measurements performed at IPT and by a network of collaborating laboratories, using one or more methods for each property studied. These methods were verified using reference materials with certified values and standards with values traceable to the International System of Units (SI) through NIST and other qualified producers. The measuring instruments were calibrated adequately.

Mass of samples

The mass of sample required for the proper realization of the determinations depends on the particular methodology, levels of analytes, and other factors. It is recommended using the masses established in the most current editions of recognized standard methods. However, to guarantee the validity of all the certified values stated herein and their respective uncertainties, should not be employed samples with masses smaller than 100 mg. This limit was estimated from the sample masses used in the study of homogeneity of this material.

Handling and storage

Handling: The withdrawal of samples of this material must be accomplished in appropriate environment with clean accessories. Never return material to the bottle. Keep the material in its original bottle, tightly closed. Storage: This material should be stored in a clean place, at room temperature. The ideal relative humidity for storage is under 60% RH.

Technical Notes

None.

Additional Information

The certification of this material was coordinated by Sylvia Lourdes Moro.

This Certificate replaces CRM IPT n° 1943-103

Collaborating Laboratories

INSTITUTO DE PESQUISAS TECNOLÓGICAS DO ESTADO DE SÃO PAULO S.A. – IPT – São Paulo, SP
Tsai Soi Mui Lee, Vagner Tadeu Vallerde, Angela Maria Rabello.

SOCIEDADE TÉCNICA DE FUNDIÇÕES GERAIS S.A. – SOFUNGE – São Paulo, SP
Hélio Jorge, Urbano Daolio, Silvestre F. Oliveira.

COMPANHIA FABRICADORA DE PEÇAS – COFAP – Santo André, SP
Antonio Olavo Stachi, João Moreira de Andrade, Claudio Alberto Dondon.

AÇOS ANHANGÜERA S.A. – Mogi das Cruzes, SP
José de Queiroz Lemos, Irineu Alabarce de Paiva, Mauro Antonio Cangnioni.

COMPANHIA SIDERÚRGICA NACIONAL – CSN – Volta Redonda, RJ
Acy Ely Viana, Maria Losada F. Rodrigues, Carlinhos M. da Silva, José Maria da Silva, Marcos Sérgio de Souza.

COMPANHIA FERRO E AÇO DE VITÓRIA – COFAVI – Cariacica, ES
Wolfgang E. Riegert, Ademir F. Dias, Alberto G. Santos, Ednaldo Avelino.

CENTRO TÉCNICO AEROESPACIAL – CTA – São José dos Campos, SP
Maria Tereza C. Cunha, Lucila T. G. Pessôa, Rui de Araujo Ribeiro, Neusa Maria A. Coelho.

FUNDIÇÃO TUPY S.A. – Joinville, SC
Walmor Krause, Azídio Prochnow, Luiz Carlos de Mira.

Methodologies Employed in the Certification of CRM IPT 49

C	Direct combustion (infrared) Combustion (gas - volumetry)
Cr	UV-Visible spectrophotometry (perchloric acid) Titrimetry (ferrous ammonium - permanganate) Atomic Absorption Spectrometry
Cu	Electrogravimetry Titrimetry (iodometry) UV-Visible spectrophotometry (diethyldithiocarbamate) Atomic Absorption Spectrometry
Mn	Titrimetry (Persulfate-arsenite) UV-Visible spectrophotometry (persulfate) Atomic Absorption Spectrometry
Ni	Atomic Absorption Spectrometry Gravimetry (dimethylglyoxime)
P	Titrimetry (sodium hydroxide - Acidimetry) UV-Visible spectrophotometry (molybdenum blue)
S	Combustion / Titrimetry (hydrogen peroxide-potassium hydroxide) Combustion / Titrimetry (iodide-iodate) Direct combustion (infrared)
Si	Gravimetry (dehydration with perchloric acid)

The latest version of the Certificates of IPT Reference Materials are available for download at: www.ipt.br/nmr.htm

Sistema Certificados 9.1.acddb