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CERTIFICATE OF ANALYSIS

IMZ 197

CERTIFIED REFERENCE MATERIAL
HIGH ALUMINIUM STEEL

Analysis listed as percent by weight [% m/m]

	Certified value	Uncertainty		Certified value	Uncertainty
C	0.130	± 0.015	Cr	0.20	± 0.015
Si	0.47	± 0.02	Ni	0.053	± 0.005
Mn	0.45	± 0.02	Cu	0.11	± 0.01
P	0.021	± 0.001	Ti	0.025	± 0.003
S	0.007	± 0.001	V	0.025	± 0.003
Al	8.45	± 0.16	Sn	0.015	± 0.002

the uncertainty bases on 95% confidence limit and material inhomogeneity

Certificate Number: IMZ197-20082024

Certificate revision history on page 4

Analysis	C	Si	Mn	P	S	Al	Cr	Mo*
1	0.1238	0.45	0.414	0.0200	0.0050	8.20	0.189	0.0078
2	0.125	0.452	0.426	0.0204	0.0067	8.25	0.195	0.011
3	0.1250	0.462	0.440	0.0206	0.0069	8.30	0.200	0.0116
4	0.128	0.466	0.458	0.0210	0.007	8.51	0.206	0.0118
5	0.1304	0.474	0.459	0.0215	0.0073	8.53	0.220	0.013
6	0.142	0.476	0.462	0.0217	0.0076	8.55		
7		0.489	0.462	0.022	0.0077	8.60		
8		0.50				8.64		
Average	0.129	0.474	0.446	0.0210	0.0069	8.447	0.202	0.0110
SD	0.007	0.016	0.020	0.0007	0.0009	0.170	0.012	0.0020
Certified	**0.130**	**0.47**	**0.45**	**0.021**	**0.007**	**8.45**	**0.20**	
C(95%)	0.007	0.014	0.017	0.0007	0.0008	0.14	0.0136	

Analysis	Ni	Cu	Ti	V	Nb*	B*	Sn
1	0.046	0.0992	0.022	0.020	0.0065	0.0069	0.013
2	0.049	0.103	0.023	0.024	0.0100	0.0073	0.0144
3	0.0509	0.104	0.024	0.024	0.011	0.0076	0.0153
4	0.0519	0.105	0.0267	0.0247	0.0115		0.016
5	0.056	0.109	0.0275	0.0247	0.0143		
6	0.057	0.114	0.028	0.030			
7	0.060	0.121		0.0306			
Average	0.0529	0.1079	0.0252	0.0254	0.0107	0.0073	0.0148
SD	0.0050	0.0075	0.0026	0.0037	0.0028	0.0004	0.0014
Certified	**0.053**	**0.11**	**0.025**	**0.025**			**0.015**
C(95%)	0.0044	0.0067	0.003	0.0033			0.0019

* informative value

C(95%) = (t · SD)/$\sqrt{n-1}$ - The half-width confidence interval, calculated for the 95 % confidence level, where t is the appropriate Student's t value, SD is the interlaboratory standard deviation and n is the number of acceptable mean values. For further information regarding the confidence interval for the certified value see ISO Guide 35:1989 section 4.

Certification Process: Both preparation of this reference material and certification process were prepared according to requirements of ISO Guide 31. ISO Guide 34 and ISO Guide 35. This reference material is in agreement with ISO Guide 30.

Chemical Analysis: Chemical analyses were carried out on chips prepared by milling and also for bulk samples. Single values in the above table are the means obtained by individual laboratories. The following methods were used for analysis:

C - coulometric, high frequency infra-red absorption (HFIR), AES spark;
Si - ICP-AES, gravimetric; photometric, AES spark, X-ray fluorescence spectrometry;
Mn - ICP-AES, flame AAS, titrimetric, AES spark, X-ray fluorescence spectrometry;
P - ICP-AES, photometric, visual colorimetric, AES spark, X-ray fluorescence spectrometry;
S - coulometric, high frequency infra-red absorption (HFIR), AES spark, X-ray fluorescence spectrometry;
Al - ICP-AES, flame AAS, complexometric, AES spark, X-ray fluorescence spectrometry;
Cr - ICP-AES, flame AAS, photometric, AES spark;
Mo - - ICP-AES, flame AAS, photometric, X-ray fluorescence spectrometry;
Ni - ICP-AES, flame AAS, photometric, AES spark, X-ray fluorescence spectrometry;
Cu - ICP-AES, flame AAS, AES spark, X-ray fluorescence spectrometry;
Ti - ICP-AES, flame AAS, photometric, AES spark, X-ray fluorescence spectrometry;
V - - ICP-AES, flame AAS, potentiometric titration, AES spark, X-ray fluorescence spectrometry;
Nb - ICP-AES, flame AAS, photometric, X-ray fluorescence spectrometry;
B - ICP-AES, spectrophotometric;
Sn - ICP-AES, flame AAS, X-ray fluorescence spectrometry.

The laboratories participating in certification analysis:

- Brammer Standards, Houston, Texas, USA - A2LA-ISO17025
- Exova (UK) Ltd, Middlesbrough, UKAS 0239
- Institute for Ferrous Metallurgy – Gliwice, Poland; PCA 17025 - AB554
- JSC “Electrometallurgical works “Dneprospetsstal”, Zaporozhye, Ukraine
- Ukrainian Special Steels Institute , Zaporozhye, Ukraine
- Universal Scientific Laboratory PTY LTD, Revesby Australia, NATA No.492 ISO/IEC 17025

Homogeneity: The homogeneity of this Reference Material was evaluated with the use of statistic parameters obtained during interlaboratory tests in 1996 and found acceptable. Optical emission spectrometry with spark excitation method was used.

Traceability: This Reference Material was tested with the use of optical emission spectrometry with spark excitation and was found compatible to the following CRMs: BCS SS491, BCS SS495, BCS SS290/2.

Production of melt: This material was manufactured by SPL Bohumin, Czechy

Available form: Discs 37 mm in diameter and 15 mm high.

Intended use: This Reference Material is intended for use in spark atomic emission and X-ray spectrometric methods.
Note: In optical emission spectrometry with spark excitation it is recommended to avoid using the central part of the surface (diameter approx. 5 mm) due to possible segregation of material.

Validity of certification: The certification of IMZ 197 is valid indefinitely within the uncertainty specified provided this Reference Material is stored in dry place and in environment free from chemical or other aggressive vapours. Periodic recertification is not required. The certification is nullified if this Reference Material is damaged, contaminated or otherwise modified.

Safety: This Reference Material and packing does not contain substances which can directly influence health.

Storage: This Reference Material should be stored in dry place and in environment free from chemical or other aggressive vapours.

Inquiries regarding this Reference Material should be directed to:
rm@git.lukasiewicz.gov.pl

Approved by
Director of the Institute

Prof. Dr. Hab. Eng. Adam Zieliński

Certificate issue date: 20 August 2024

Certificate revision history:
20 August 2024 (editorial changes)
28 January 2021 (change of information regarding validity of certification, editorial changes;
November 2012 (Original certificate date)