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CERTIFICATE OF ANALYSIS

IMZ 204

CERTIFIED REFERENCE MATERIAL
HIGH ALUMINIUM STEEL

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

	Certified value	Uncertainty*		Certified value	Uncertainty*
C	0.085	± 0.007	Al	4.21	± 0.07
Si	0.40	± 0.01	Cr	0.111	± 0.006
Mn	0.36	± 0.01	Ni	0.034	± 0.001
P	0.014	± 0.001	Ti	0.035	± 0.002
S	0.008	± 0.001	Cu	0.075	± 0.006

* - the uncertainty bases on 95% confidence limit and material inhomogeneity

Informative values:

Mo	(0.007)	N	(0.0052)

Certificate Number: IMZ 204-020625

Certificate revision history on page 4

Analysis	C	*	Si	*	Mn	*	P	*	S	*	Al	*	Cr	*	Ni	*
1	0.08	2	0.38	12	0.346	13	0.013	5	0.007	2	4.08	1	0.100	9	0.032	9
2	0.0817	2	0.39	5	0.349	7	0.0131	12	0.0076	2	4.20	7	0.11	5	0.0328	7
3	0.084	2	0.39	7	0.356	7	0.0139	7	0.0078	2	4.21	7	0.110	12	0.033	13
4	0.085	2	0.40	1	0.360	5	0.014	12	0.0079	2	4.221	7	0.110	7	0.033	1
5	0.0860	2	0.407	7	0.360	7	0.0147	1	0.0080	2	4.256	10	0.111	7	0.035	5
6	0.088	5	0.408	8	0.367	12	0.0150	12	0.0082	2	4.27	5	0.111	7	0.035	7
7	0.088	2	0.408	7	0.367	7	0.0150	7	0.0085	5			0.112	7	0.035	7
8	0.0910	2	0.422	7	0.380	12	0.015	7	0.009	2			0.115	13		
9			0.426	8	0.38	1	0.015	7	0.0091	2			0.124	1		
10																
Average	0.085		0.404		0.363		0.0143		0.0081		4.206		0.111		0.034	
SD	0.004		0.015		0.012		0.0008		0.0007		0.067		0.006		0.001	
Certified	**0.085**		**0.40**		**0.36**		**0.014**		**0.008**		**4.21**		**0.111**		**0.034**	
C(95%)	0.003		0.012		0.009		0.0006		0.0005		0.071		0.005		0.001	

Analysis	Mo**	*	Nb	*	Ti	*	V	*	Cu	*	B	*	Sn	*	N**	*
1	0.0064	7	*0.0013*	7	0.0328	7	0.009	5	0.068	5	*0.0037*	5	*0.0073*	7	0.0041	3
2	0.007	7	*< 0.001*	7	0.033	7	0.0104	7	0.072	7			*0.013*	5	0.0052	3
3	0.0079	7			0.0350	7			0.074	7					0.0055	3
4					0.035	1			0.075	7					0.0059	3
5					0.0351	12			0.075	12						
6					0.0357	12			0.077	13						
7					0.0360	5			0.082	1						
8					0.0370	7										
9																
Average	0.007				0.035		0.010		0.075						0.0052	
SD	0.001				0.001				0.004						0.0008	
Certified					**0.035**				**0.075**							
C(95%)					0.001				0.004							

Analysis	W	*	Co	*	As	*	Pb	*	Sb	*
1	*0.001*	7	*0.0068*	7	*0.0028*	7	*0.0090*	7	*0.010*	7
2	*0.009*	7								
3										
Average										
SD										

* - analytical method used
** informative value

$C(95\%) = (t \cdot SD)/\sqrt{n-1}$ - *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:

1 – wavelength dispersive x-ray fluorescencje spectrometry (WDXRF);
2 – high frequency infra-red absorption (HFIR);
3 – high temperature extraction;
4 – graphite furnace atomic absorption spectrometry (GF AAS);
5 – spark atomic emission spectrometry (AES spark);
7 – inductive coupled plasma atomic emission spectrometry (ICP-AES);
8 – gravimetry;
9 – potentiometric titration;
10 – titration;
12 – spectrophotometric;
13 – flame atomic emission spectrometry (flame AAS);

The laboratories participating in certification analysis:

- ArcelorMittal, Ostrava, Czech Republic; Testing laboratory Nr. 1178 accredited by CAI
- Enviform a.s., Třinec, Czech Republic; Testing laboratory Nr. 1371; Accreditation Certificate No. 810/2014 by the Czech Accreditation Institute
- Huta Stali Jakościowych, Zakładowe Laboratorium Badawczo-Doświadczalne; UDT LB-032/22
- Institute for Certified Reference Materials, Jekatierinburg, Russia, accreditation RU.0001.510008
- Institute for Ferrous Metallurgy – Gliwice, Poland; PCA 17025 - AB554
- MATERIÁLOVÝ A METALURGICKÝ VÝZKUM, s.r.o., Ostrava, Czech Republic; Testing laboratory Nr. 1300 accredited by CAI, according to ČSN EN ISO/IEC 17025
- Ukrainian Special Steels Institute , Zaporozhye, Ukraine
- U.S. Steel Košice - Labortest, s.r.o., Slovakia, Slovenská národná akreditačná služba ISO/IEC 17025:2005, Reg. No. 026/S-010 and 026/S-011

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: IMZ 197, 198, 199.

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

Available form: Discs 36 mm in diameter and 20 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 204 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: 02 June 2025

Certificate revision history:
02 June 2025 (editorial changes);
28 January 2021 (change of information regarding validity of certification, editorial changes;
November 2015 (Original certificate date)