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CERTIFICATE OF ANALYSIS

IMZ 110A

CERTIFIED REFERENCE MATERIAL
LOW ALLOY STEEL

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

	Certified value	Uncertainty		Certified value	Uncertainty
C	0.0034	± 0.0009	Ni	0.021	± 0.002
Mn	0.067	± 0.002	Mo	0.0035	± 0.0009
P	0.0051	± 0.0003	Cu	0.021	± 0.002
S	0.0045	± 0.0005	Co	0.0031	± 0.0005
Cr	0.027	± 0.003	N	0.0037	± 0.0006

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

Informative values:

Al	(0.001)	Ti	(0.0006)
V	(0.0014)		

Certificate Number: IMZ110A-040625
Certificate revision history on page 4

Analysis	C	*	Si**	*	Mn	*	P	*	S	*	Al**	*	Cr	*	Ni	*
1	0.0026	2	0.0020	1	0.062	7	0.0048	7	0.0035	14	0.0006	7	0.021	13	0.018	7
2	0.0031	2	0.0028	5	0.065	13	0.0048	5	0.0035	2	0.001	5	0.026	7	0.019	13
3	0.0035	14	0.0047	7	0.067	5	0.0049	12	0.004	2	0.001	7	0.026	1	0.0196	7
4	0.0036	5	0.0066	12	0.0672	7	0.005	15	0.0042	2	0.0012	7	0.0278	7	0.020	7
5	0.0036	2	< 0.010	7	0.0677	12	0.005	7	0.0046	2			0.028	12	0.0203	12
6	0.0040	2			0.068	7	0.005	12	0.0047	5			0.030	5	0.022	7
7	< 0.010	2			0.068	1	0.0051	12	0.005	2			0.030	9	0.023	12
8					0.069	13	0.0052	7	0.0050	1					0.023	1
9					0.069	12	0.0054	12	0.0051	2					0.024	9
10							0.0059	1	0.0052	2					0.025	5
12																
Average	0.0034				0.067		0.0051		0.0045		0.0009		0.0270		0.0214	
SD	0.0005				0.002		0.0003		0.0006		0.0003		0.0031		0.0023	
Certified vale	**0.0034**				**0.067**		**0.0051**		**0.0045**				**0.027**		**0.021**	
C(95%)	0.0005				0.002		0.0002		0.0005				0.0029		0.0017	

Analysis	Mo	*	Nb**	*	Ti**	*	V**	*	Cu	*	B**	*	Sn**	*	N	*
1	0.0030	7	< 0.001	7	0.0005	7	0.0010	7	0.015	12	0.0001	5	< 0.0005	4	0,0029	3
2	0.003	5	0.001	1	0.0006	5	0.0012	5	0.0193	7			0.0011	7	0,0037	3
3	0.0038	1			0.0006	7	0.0017	7	0.020	5			0.002	5	0,0038	3
4	0.0039	7					0.0017	1	0.020	7			0.0024	1	0,0038	3
5	0.004	7							0.0220	7					0,0042	3
6									0.022	13						
7									0.0226	12						
8									0.023	7						
9									0.024	13						
10									0.024	1						
12																
Average	0.0035				0.0006		0.0014		0.021				0.0018		0.0037	
SD	0.0005				0.0001		0.0004		0.003				0.0007		0.0005	
Certified vale	**0.0035**								**0.021**						**0.0037**	
C(95%)	0.0006								0.002						0.0006	

Analysis	W**	*	Co	*	Ca**	*	As**	*	Pb**	*	Sb**	*
1	< 0.001	7	0.0026	12	0.0002	4	0.0012	7	< 0.00005	4	< 0.0005	4
2	0.0017	7	0.0027	1	0.0007	7	0.0017	1	0.0006	1	0.0013	7
3			0.0028	7					0.0012	5		
4			0.003	7					0.0017	7		
5			0.0036	13								
6			0.0036	5								
7												
Average			0.0031									
SD			0.0004									
Certified vale			**0.0031**									
C(95%)			0.0005									

* - analytical method used
** 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

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,
2 – high frequency infra red absorption,
3 – high temperature extraction
4 – graphite furnace atomic absorption spektrometry
5 – spark atomic emission spektrometry
7 – inductive coupled plasma atomic emission spektrometry,
9 – potentiometric titration,
12 – spectrophotometric
13 – flame atomic emission spektrometry
14 – coulometry
15 – visual colorimetry

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
- JSC “Electrometallurgical works “Dneprospetsstal”, Zaporozhye, Ukraine
- 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: BS3951, IMZ 71-74, IMZ110-119, CKD 162A-171A, CKD180A-189A, NIST 1766, NIST1762, NIS1269, NIST1766.

Production of melt: This material was manufactured by Instytut Metalurgii Żelaza, Gliwice, Poland.

Available form: Discs 43 mm in diameter and 30 mm high.

Intended use: This Reference Material is intended for use in optical 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 110A 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: 4 June 2025

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