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CERTIFICATE OF ANALYSIS

IMZ 300

CERTIFIED REFERENCE MATERIAL
FERRITIC STAINLESS STEEL

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

	Certified value	Expanded uncertainty		Certified value	Expanded uncertainty
C	0.020	± 0.001	W	0.011	± 0.002
Si	0.71	± 0.01	Ti	0.165	± 0.006
Mn	0.78	± 0.01	Cu	0.159	± 0.004
P	0.032	± 0.001	Al	0.012	± 0.001
S	0.0071	± 0.0005	Nb	0.36	± 0.02
Cr	17.20	± 0.12	N	0.008	± 0.001
Ni	0.311	± 0.008	Sn	0.007	± 0.001

the uncertainty bases on statistical evaluation of the contributions of the material homogeneity and the interlaboratory certification analysis

Informativevalues:

Mo	(0.010)	Co	(0,004)
B	(0.0005)	As	(0.004)
V	(0,008)		

Certificate Number: IMZ300-170225
Certificate revision history on page 4

Analysis	C	*	Si	*	Mn	*	P	*	S	*	Cr	*	Ni	*	Mo**	*
1	0.0174	2	0.6130	8	0.74	5	0.029	5	0.0056	5	16.8	7	0.28	1	0.005	5
2	0.018	13	0.660	1	0.74	6	0.0299	7	0.006	5	16.94	1	0.29	6	0.0059	7
3	0.0181	5	0.684	6	0.76	7	0.030	5	0.00601	7	16.94	1	0.296	5	0.006	7
4	0.0184	2	0.688	7	0.77	5	0.0306	5	0.0062	2	16.9560	5	0.30	7	0.0074	7
5	0.019	2	0.69	12	0.77	5	0.031	5	0.0065	2	16.970	17	0.30	5	0.0077	6
6	0.0190	5	0.6954	7	0.77	1	0.031	7	0.007	2	17.00	5	0.30	7	0.010	5
7	0.019	2	0.696	5	0.770	5	0.0312	5	0.0070	2	17.03	6	0.302	5	0.01	5
8	0.0192	5	0.7030	5	0.771	1	0.032	12	0.007	5	17.1	10	0.3098	5	0.0104	5
9	0.0192	2	0.71	5	0.7710	5	0.032	6	0.007	5	17.1862	7	0.31	5	0.01076	7
10	0.020	2	0.71	5	0.78	1	0.032	5	0.0071	5	17.20	7	0.31	7	0.012	7
11	0.020	5	0.71	8	0.7857	7	0.032	1	0.0072	2	17.20	7	0.31	5	0.013	5
12	0.020	5	0.710	1	0.79	7	0.0324	5	0.0072	2	17.22	17	0.3132	7	0.0140	5
13	0.021	2	0.718	1	0.79	17	0.0325	1	0.0073	2	17.23	10	0.3184	7	0.016	12
14	0.0227	5	0.719	5	0.790	5	0.034	7	0.0076	13	17.28	5	0.32	5	0.019	1
15	0.023	2	0.72	5	0.79	5	0.0347	12	0.0083	1	17.29	5	0.32	1		
16	0.024	5	0.72	17	0.792	5	0.036	7	0.0084	5	17.2904	7	0.328	1		
17			0.720	5	0.794	7	0.038	5	0.009	2	17.30	5	0.33	9		
18			0.723	5	0.796	12			0.010	5	17.35	1	0.333	5		
19			0.727	8	0.8048	7					17.36	5	0.34	17		
20			0.73	8	0.81	12					17.410	5				
21					0.84	7					17.432	5				
22					0.90	17					17.50	9				
23											17.51	10				
Average[1]	0.0195		0.7071		0.7836		0.0319		0.0071		17.2001		0.3110		0.0103	
SD[2]	0.0011		0.0153		0.0187		0.0015		0.0008		0.1880		0.0138		0.0037	
u characterization[3]	0.00034		0.00429		0.00500		0.00046		0.00024		0.04912		0.00397		0.00124	
u homogeneity[4]	0.0004		0.0038		0.0009		0.0004		0.0001		0.037		0.0005		0.0002	
Certified value[5]	**0.020**		**0.71**		**0.78**		**0.032**		**0.0071**		**17.20**		**0.311**			
Expanded uncertainty[6]	**0.001**		**0.01**		**0.01**		**0.001**		**0.0005**		**0.12**		**0.008**			

Analysis	Co**	*	V**	*	W	*	Ti	*	Cu	*	Al	*	Nb	*	N	*
1	0.0019	7	0.0028	7	0.0083	7	0.135	5	0.1490	5	0.009	5	0.323	1	0.0079	3
2	0.0030	5	0.0037	7	0.0088	1	0.15	1	0.15	12	0.010	7	0.3244	7	0.0079	3
3	0.0034	7	0.0041	6	0.0088	7	0.153	1	0.15	6	0.0108	5	0.342	5	0.0080	3
4	0.0037	7	0.0048	7	0.009	7	0.157	5	0.1506	7	0.011	5	0.3498	5	0.0080	3
5	0.0038	6	0.0076	7	0.0099	6	0.158	6	0.155	1	0.011	7	0.35	7	0.0081	3
6	0.01	5	0.008	5	0.0138	5	0.158	5	0.155	5	0.012	5	0.3522	7	0.0081	3
7	0.0105	7	0.008	7	0.014	7	0.159	7	0.157	1	0.012	6	0.36	5	0.0087	5
8			0.010	5	0.015	5	0.1593	5	0.157	1	0.012	5	0.37	7	0.0090	3
9			0.01	5	0.02	5	0.165	5	0.159	7	0.015	7	0.380	1	0.0090	3
10			0.010	1			0.166	7	0.159	5	0.0153	7	0.384	5	0.0098	5
11			0.0150	5			0.166	5	0.16	5			0.404	5	0.010	5
12							0.166	12	0.16	1			0.410	5	0.010	5
13							0.169	1	0.16	7						
14							0.171	7	0.16	7						
15							0.1737	7	0.165	5						
16							0.174	5	0.17	5						
17							0.178	1	0.1701	2						
18							0.18	5	0.179	5						
19							0.1812	7	0.18	5						
Average[1]	0.0038		0.0075		0.0110		0.1649		0.1589		0.0116		0.3610		0.0082	
SD[2]	0.0011		0.0030		0.0024		0.0099		0.0063		0.0012		0.0256		0.0003	
u characterization[3]	0.00052		0.00113		0.00100		0.00285		0.00181		0.00048		0.00926		0.00011	
u homogeneity[4]	0.0007		0.00006		0.0005		0.0004		0.0006		0.0002		0.0025		0.0006	
Certified value[5]					**0.011**		**0.165**		**0.159**		**0.012**		**0.36**		**0.008**	
Expanded uncertainty[6]					**0.002**		**0.006**		**0.004**		**0.001**		**0.02**		**0.001**	

Analysis	**Sn**	*	**As****	*	**Sb****	*	**Pb****	*	**B****	*
1	0.0050	5	0.0016	7	0.0026	4	0.0008	4	0.00015	7
2	0.0053	7	0.0030	7					0.0003	5
3	0.0061	6	0.0037	6					0.0004	6
4	0.0063	7	0.0045	7					0.0004	5
5	0.0066	7	0.0047	5					0.0010	5
6	0.007	5	0.0055	5					0.0036	7
7	0.0075	5	0.007	4						
8	0.0076	7								
9	0.009	5								
Average[1]	0.0067		0.0043						0.0005	
SD[2]	0.0011		0.0015						0.0003	
u characterization[3]	0.00046		0.00071						0.00015	
u homogeneity[4]	0.0001		0.0006						0.00002	
Certified value[5]	**0.007**									
Expanded uncertainty[6]	**0.001**									

* - analytical method used
** informative value

All values are based on recommendations of the ISO GUIDE 35:2017(E) standard:
1. Average is calculated according to Algorithm A (Guide clause A.2.3.4: Robust statistics);
2. Standard deviation is calculated according to Algorithm A (Guide clause A.2.3.4: Robust statistics);
3. Uncertainty of material characterization is based on the data obtained from the analysis performed by Network of competent labs (Guide clause 9.5) and calculated according to Guide clause B.5.2.
4. Uncertainty associated with homogeneity of material is calculated In agreement with Guide clause 7.11 (Uncertainty evaluation from homogeneity studies)
5. Cerified value is the average value rounded to one or two significant digits of expanded uncertainty
6. Expanded uncertainty is an geometric average of u characterization and u homogeneity multiplied by coverage factor k = 2.

Certification Process: Both preparation of this reference material and certification process were prepared according to requirements PN-EN 17034 and ISO GUIDE 35:2017(E).

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 fluorescence spectrometry,
2 – combustion and infra red detection,
3 – high temperature extraction and thermo conductivity detection,
4 – graphite furnace atomic absorption spectrometry,
5 – spark atomic emission spectrometry,
6 – inductive coupled plasma mass spectrometry,
7 – inductive coupled plasma atomic emission spectrometry,
8 – gravimetry,
9 – potentiometric titration,
10 – titrimetry,
12 – spectrophotometry,
13 – coulometry,
17 – energy dispersive x-ray fluorescence spectrometry,

The laboratories participating in certification analysis:

- Deutsche Edelstahlwerke GmbH; Abteilung PP-CH, Witten, Germany - accreditation DakkS D-PL-19654-01-00, DIN EN ISO/IEC 17025;
- Enviform a.s., Třinec, Czech Republic; Testing laboratory Nr. 1371; Accreditation Certificate No. 219/2016 by the Czech Accreditation Institute; ČSN EN ISO/IEC 17025:2005;
- Huta Stali Jakościowych Stalowa Wola, Zakładowe Laboratorium Badawczo-Doświadczalne; UDT LB-032/22-16;
- Institute for Certified Reference Materials, Jekatierinburg, Russia, accreditation RU.0001.510008;
- Instytut Metalurgii Żelaza – Gliwice, Poland; PCA 17025 - AB554;
- Lithea, Ltd. Czech Republic;

- OnderzoeksCentrum voor de Aanwending van Staal, Zelzate, Belgium;
- PJSC “Electrometallurgical works “Dneprospetsstal”, Zaporozhye, Ukraine;
- Laboratorium Badań Chemicznych i Metalograficznych ISD Huty Częstochowa, Poland.

Homogeneity: The homogeneity of this Reference Material was evaluated in accordance with guidelines of ISO GUIDE 35:2017(E). Optical emission spectrometry with spark excitation method was used.

Traceability: This Reference Material was found traceable to the following CRMs: 7-2/2, 7-3/2, 16C2/2,BAS 276-2, , BAS461/1-468/1, BAS469-473, BCS235/1, BCS235/2, BCS261/1, BSC304-1, BCS 320, BCS 323, BCS 335, BCS 337, BCS342,BCS 434, BS 89E, BS91F, BS92B, BS93E, BS96F, BS303, BS304A,BSS465/1, BSS466/2, C7/6, C37/5, C47/5, C35/5, C38/6, C41/5, C62, C1296, CRM 502-016, CRM 502-416, CRM 502-328, CRRM1-CRRM4, E-AKP 278-1, EURO 85, EURO 86, EURO 87, EZRM 194-2, EZRM 289-1, EZRM 297-1EZRM 274-1, HS21702-21706, ICRM LG1/3-11/3, LG32/5-LG36/5, ICRMLG56-LG64, ICRM LG76-82, IMZ1.3/6, IMZ1.5/3, IMZ1.12/1, IMZ1.12/3, IMZ1.19/1, IMZ1.23 , IMZ1.71IMZ1.21/1, , IMZ115, IMZ154, MBH 12x41300(A), MBH 12xLA3(B), MBH 12xLA5, MBH 12 353(F), BCS 459, BCS 45,1 MBH 12xLA2(D), MBH 12x15260(W), MBH 12x 353(F), MBH 12x14072(A), MBH 12x356(B), MBH 13x14211, MBH 13x17005(D), MBH 13x32154, MBH 13x12853(K), MBH 13x14713(A), MBH 13xNSC3(Y), MBH 13x14212(R), MBH 13xNSA2(H), MW13, MW14, MW19, MW28, MW29, MW31, MW33. MW34, JSS 650-8, JSS 652-13, NCS HS 20701-1, NCS HS 20701-3, SPL RM 2003, SPL RM 2005, SPL RM 2006, SPL RM2014, CRM AR 1653, SPL RM N100, SS465/1, ST38-3

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

Available form: Discs 38 mm in diameter and 20 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 IMZ300 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: 17 February 2025

Certificate revision history:
17 February 2025 (editional change); 26 May 2020 (change of information regarding validity of certification, editorial changes;
21st of November 2018 (Original certificate date)