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CERTIFICATE OF ANALYSIS

IMZ 196

REFERENCE MATERIAL
VM12 grade steel

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

C	0.179	Cu	0.080
Si	0.46	Al	0.029
Mn	0.42	V	0.34
P	0.018	B	0.065
S	0.012	W	1.54
Cr	11.04	N	0.058
Ni	0.44	Co	1.55
Mo	0.65	Nb	0.074

Certificate Number: IMZ196-29072024

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Analysis	C	Si	Mn	P	S	Cr	Ni	Mo	Cu
1	0.167	0.437	0.403	0.0146	0.0096	10.767	0.417	0.617	0.0750
2	0.167	0.450	0.409	0.0157	0.0108	10.800	0.420	0.621	0.0760
3	0.168	0.454	0.409	0.0158	0.0109	10.870	0.420	0.630	0.0764
4	0.169	0.460	0.410	0.0164	0.0110	10.960	0.424	0.640	0.0770
5	0.171	0.466	0.410	0.0164	0.0111	11.002	0.430	0.644	0.0770
6	0.173	0.467	0.415	0.0170	0.0114	11.033	0.431	0.648	0.0787
7	0.175	0.470	0.416	0.0174	0.0114	11.050	0.436	0.649	0.0792
8	0.176	0.470	0.420	0.0180	0.0115	11.050	0.438	0.650	0.0792
9	0.177	0.471	0.420	0.0188	0.0115	11.052	0.439	0.650	0.0797
10	0.177	0.476	0.420	0.0193	0.0116	11.056	0.440	0.656	0.0800
11	0.179	0.477	0.420	0.0198	0.0117	11.077	0.441	0.658	0.0804
12	0.181	0.480	0.421	0.0200	0.0123	11.082	0.443	0.660	0.0810
13	0.182	0.484	0.430	0.0200	0.0128	11.086	0.443	0.662	0.0817
14	0.188		0.430		0.0130	11.150	0.445	0.666	0.0818
15	0.190		0.431		0.0130	11.160	0.466	0.668	0.0850
16	0.192		0.437		0.0142	11.200			0.0863
17	0.193		0.439		0.0144				0.0870
18	0.194		0.442						0.0870
19			0.464						
Average	0.179	0.466	0.421	0.018	0.012	11.037	0.436	0.648	0.080
SD	0.009	0.013	0.011	0.002	0.001	0.125	0.013	0.013	0.004
Certified	**0.179**	**0.46**	**0.42**	**0.018**	**0.012**	**11.04**	**0.44**	**0.65**	**0.080**
C(95%)	0.005	0.008	0.006	0.001	0.001	0.069	0.007	0.007	0.002

Analysis	Al	V	B	W	N	Co	Nb	Ti*	Sn*
1	0.0259	0.317	0.0586	1.470	0.0526	1.476	0.0700	0.0030	0.0047
2	0.0263	0.322	0.0630	1.476	0.0528	1.482	0.0704	0.0046	0.0055
3	0.0264	0.326	0.0633	1.480	0.0560	1.485	0.0711	0.0050	0.0064
4	0.0266	0.328	0.0644	1.486	0.0572	1.500	0.0715	0.0050	0.0110
5	0.0270	0.330	0.0671	1.490	0.0585	1.500	0.0723	0.0054	
6	0.0275	0.334	0.0682	1.531	0.0596	1.560	0.0739	0.0063	
7	0.0290	0.336	0.0698	1.566	0.0598	1.576	0.0746		
8	0.0298	0.341		1.570	0.0598	1.600	0.0750		
9	0.0300	0.343		1.577	0.0600	1.605	0.0790		
10	0.0301	0.347		1.579	0.0608	1.653	0.0820		
11	0.0305	0.348		1.580		1.658			
12	0.0310	0.350		1.591					
13	0.0311	0.350		1.625					
14		0.353							
15		0.360							
16		0.360							
17		0.366							
Average	0.029	0.342	0.065	1.540	0.0577	1.554	0.074	*0.005*	*0.007*
SD	0.002	0.014	0.004	0.053	0.0030	0.069	0.004	*0.001*	*0.003*
Certified	**0.029**	**0.34**	**0.065**	**1.54**	**0.058**	**1.55**	**0.074**		
C(95%)	0.001	0.008	0.004	0.034	0.0023	0.049	0.003		

* - informative values

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 of the certified portion of the bars. Single values in the above table are the means obtained by individual laboratories. The following methods were used for analysis:

C - high frequency infra-red absorption (HFIR), AES spark;
S - high frequency infra-red absorption (HFIR), AES spark; X-ray fluorescence spectrometry;
Mn - ICP-AES, AES spark; X-ray fluorescence spectrometry;
Si - ICP-AES, spectrophotometric, gravimetric; AES spark; X-ray fluorescence spectrometry;
P - ICP-AES, AES spark; X-ray fluorescence spectrometry;
Cr - titrimetric, ICP-AES, AES spark; X-ray fluorescence spectrometry;
Ni - ICP-AES, AES spark; X-ray fluorescence spectrometry, spectrophotometric;
Cu - spectrophotometric, ICP-AES, AES spark; X-ray fluorescence spectrometry;
N - high temperature extraction, distillation / acidimetry, AES spark;
Mo - - ICP-AES, AES spark; X-ray fluorescence spectrometry, spectrophotometric;
Al - ICP-AES, AES spark; X-ray fluorescence spectrometry, spectrophotometric;
Ti - AES spark, ICP-AES;
V - - ICP-AES, AES spark; X-ray fluorescence spectrometry;
Nb - ICP-AES, AES spark; X-ray fluorescence spectrometry, spectrophotometric;
W - ICP-AES, AES spark; X-ray fluorescence spectrometry, spectrophotometric;
Co - ICP-AES, AES spark; X-ray fluorescence spectrometry, spectrophotometric;
B - ICP-AES, AES spark; spectrophotometric;
Sn - ICP-AES, AES spark; X-ray fluorescence spectrometry.

The laboratories participating in certification analysis:

- ALSTOM Power, Elbląg, Poland
- ArcelorMittal, Ostrava, Czech Republic
- ArcelorMittal, Warszawa, Poland
- EnviChem, Elbląg, Poland
- Ferrostal Łabędy, Gliwice, Poland
- Huta MałaPanew, Ozimek, Poland
- ICO, Yekaterinburg, Russia
- Instytut Metalurgii Żelaza, Gliwice, Poland
- SEROV, Sverdlovsk, Russia
- Třinecke Żelezarny, a.s., Třinec, Czech Republic.
- Vitkowice Testing Center, Ostrava, Czech Republic
- ŽĎAS, a.s. Žďár nad Sázavou, Czech Republic

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 SS483, BCS SS422, BCS SS423, BCS SS69,IMŻ 157, IMŻ 171, IMŻ 119, IMŻ 1.18/5, IMŻ 1.14/1, IMŻ 1.8/4, MW 13A, BS 99-5, ECRM296-1, AR646, AR 872.

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

Available form: Discs 37 mm in diameter and 30 mm thick.

Intended use: This Reference Material is intended for use in optical emission and X-ray spectrometric methods (bulks sample) and also in classical wet methods, UV-Vis spectrometry, AAS, ICP-AES, C,S- and N- analyzers and other wet methods (chips).
Caution: In optical emission spectrometry with spark excitation the central part of the surface of discs (approximately 5 mm) should be avoided because of possible segregation of the material.
Validity of certification: The certification of IMZ 196 is valid indefinitely 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.
Chips: if the contents of the bottle becomes changed (for example oxidized) or contaminated, the whole contents of bottle should be discarded.

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: 29 July 2024

Certificate revision history:
29 July 2024 (editorial changes)
28 January 2020 (change of information regarding validity of certification, correction of Nb value at the page 1, editorial changes);
December 2010 (Original certificate date)