

CERTIFICATE OF ANALYSIS

IMZ 165

REFERENCE MATERIAL AUSTENITIC STEEL

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

C	0.082	V	0.042
Si	1.42	Mo	0.025
Mn	0.98	Co	0.029
P	0.017	N	0.105
S	0.007	Sn	0.003
Cr	23.28	Ti	(0.002)
Ni	19.01	As	(0.003)
Cu	0.040	Pb	(0.0008)
Al	0.038		

Values in brackets are informative

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Analysis	C	Si	Mn	P	S	Cr	Ni	Mo
1	0.0770	1.379	0.948	0.0160	0.0060	23.024	18.840	0.0200
2	0.0772	1.390	0.958	0.0160	0.0065	23.040	18.840	0.0200
3	0.0780	1.400	0.975	0.0160	0.0066	23.043	18.878	0.0210
4	0.0807	1.406	0.980	0.0164	0.0070	23.090	18.900	0.0210
5	0.0824	1.411	0.983	0.0169	0.0071	23.107	18.967	0.0249
6	0.0832	1.420	0.988	0.0170	0.0072	23.200	18.990	0.0256
7	0.0833	1.420	0.990	0.0170	0.0075	23.227	19.018	0.0280
8	0.0833	1.423	0.990	0.0173	0.0079	23.284	19.063	0.0291
9	0.0845	1.435	0.990	0.0173	0.0080	23.390	19.080	0.0298
10	0.0846	1.450	1.000	0.0190	0.0080	23.440	19.092	0.0300
11	0.0847	1.463	1.000	0.0190	0.0080	23.470	19.230	
12			1.009		0.0084	23.520	19.240	
13						23.547		
14						23.573		
Average	0.0817	1.418	0.984	0.0171	0.0074	23.283	19.012	0.0249
SD	0.0030	0.025	0.017	0.0011	0.0007	0.204	0.137	0.0042
Certified	0.082	1.42	0.98	0.017	0.007	23.28	19.01	0.025
C(95%)	0.0021	0.018	0.011	0.0008	0.0005	0.122	0.091	0.0031

Analysis	Cu	Al	V	Sn	Ti*	As*	Co	N
1	0.0352	0.0323	0.0387	0.0023	0.0012	0.0028	0.0250	0.1024
2	0.0361	0.0325	0.0401	0.0033	0.0016	0.0031	0.0273	0.1028
3	0.0367	0.0332	0.0406	0.0038	0.0027	0.0035	0.0308	0.1030
4	0.0375	0.0345	0.0407	0.0039	0.0030		0.0312	0.1031
5	0.0390	0.0430	0.0410				0.0320	0.1085
6	0.0420	0.0450	0.0429					0.1099
7	0.0451	0.0463	0.0440					
8	0.0455		0.0445					
Average	0.0396	0.0381	0.0416	0.0033	0.002	0.003	0.0293	0.1050
SD	0.0041	0.0063	0.0020	0.0007	0.0009	0.0004	0.0030	0.0033
Certified	0.040	0.038	0.042	0.003			0.029	0.105
C(95%)	0.0036	0.0063	0.0018	0.0013			0.0041	0.0038

Analysis	Pb*	Sb	W	Nb	Hg	Bi	Zr	Al(sol)
1	0.0005	0.0004	0.012	0.0072	< 0.0001	< 0.0001	0.0070	0.032
2	0.0009	0.0022	0.021	0.0115				
3	0.0010							
Average	0.0008							
SD	0.0003							
Certified								
C(95%)								

* - informative values

$C(95\%) = (t \cdot SD) / \sqrt{n-1}$ - 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 of the certified portion of the bars and also for some solid samples. Single values in the above table are the means obtained by individual laboratories. The following methods were used for analysis:

C and S	- high frequency infra-red absorption (HFIR), AES spark;
Mn	- flame AAS, AES spark, XRF, ICP-AES, photometric, titrimetric;
Si	- ICP-AES, AES spark, XRF, ICP-AES, photometric, gravimetric;
P	- ICP-AES, AES spark, XRF, photometric, titrimetric;
Cr	- flame AAS, AES spark, XRF, ICP-AES, photometric, titrimetric;
Ni	- flame AAS, AES spark, XRF, ICP-AES, photometric, gravimetric;
Cu, Mo	- flame AAS, AES spark, XRF, ICP-AES, photometric;
V	- flame AAS, AES spark, XRF, ICP-AES, photometric;
Ti	- GF AAS, AES spark, ICP-AES;
W, Zr	- AES spark;
Co, Nb	- AES spark, ICP-AES;
Al	- flame AAS, AES spark, ICP-AES, photometric;
Al(soluble)	- ICP-AES;
As, Sn, Pb	- GF AAS, AES spark, ICP-AES,
Sb, Bi	- GF AAS;
Hg	- CV AAS;
N	- high temperature extraction.

The laboratories participating in the testing of this Reference Material were:

- Alstom Power, Elbląg, Poland
- Ferrostal, Gliwice, Poland
- Huta Lucchini, Warszawa, Poland
- Huta Małapanew, Ozimek, Poland
- Huta Trzyniec, Czech Republic
- Instytut Metalurgii Żelaza, Gliwice, Poland
- ISH Ołomuniec, Czech Republic
- Laboratorium Aplikacyjne firmy GNR, Italy
- Laboratorium Aplikacyjne firmy LECO, Praga, Czech Republic
- Laboratorium Aplikacyjne firmy Thermo-ARL, Switzerland
- Magnesy Baildon, Katowice, Poland
- Mittal Steel Poland, Oddział Dąbrowa Górnicza, Poland
- Mittal Steel Poland, Oddział Kraków, Poland
- US Steel - Labortest, Koszyce, Slovakia

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 SS 460/1-468/1, BS SS 3951, BS CA 316-2, BS 316A, MW13-37.

Production of melt: This material was produced by Huta Baildon, Katowice. The melt was made in an open induction furnace.

Available form: Discs: 40 mm in diameter and 40 mm thick; chips: bottles 100 g.

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 165 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:
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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)

21 January 2021 (change of information regarding validity of certification, editorial changes);

November 2003 (Original certificate date)