Łukasiewicz
GIT

Łukasiewicz Research Network
– Upper Silesian Institute of Technology

44-100 Gliwice, ul. Karola Miarki 12-14, POLAND
Tel.: +48 32 23 45 251
E-mail: rm@git.lukasiewicz.gov.pl

CERTIFICATE OF ANALYSIS

IMZ 116

REFERENCE MATERIAL
LOW ALLOY STEEL

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

C	0.64	Cu	0.33
Mn	0.94	Mo	0.074
Si	0.25	V	0.076
P	0.025	Al	0.025
S	0.035	Al_{sol}	0.012
Cr	0.72	N	0.0130
Ni	0.022	Ti	(0.0008)

Values in brackets are informative

Certificate Number: IMZ116-11072024

Certificate revision history on page 4

Analysis	C	Mn	Si	P	S	Cr	Ni
1	0.630	0.923	0.227	0.0227	0.0324	0.713	0.0180
2	0.633	0.929	0.240	0.0227	0.0333	0.717	0.0200
3	0.637	0.933	0.246	0.0233	0.0338	0.720	0.0213
4	0.637	0.937	0.247	0.0233	0.0340	0.720	0.0213
5	0.637	0.940	0.250	0.0236	0.0352	0.726	0.0213
6	0.640	0.943	0.250	0.0237	0.0353	0.733	0.0217
7	0.640	0.944	0.253	0.0238	0.0353	0.736	0.0237
8	0.641	0.947	0.253	0.0247	0.0357	0.737	0.0253
9	0.641	0.950	0.257	0.0293	0.0358		
10	0.643	0.953	0.260	0.0297	0.0367		
11	0.643				0.0369		
12	0.643				0.0370		
13	0.648						
Average	0.639	0.940	0.248	0.0247	0.0351	0.7253	0.0216
SD	0.005	0.009	0.009	0.0026	0.0014	0.009	0.0022
Certified value	**0.64**	**0.94**	**0.25**	**0.025**	**0.035**	**0.72**	**0.022**
C(95%)	0.003	0.007	0.007	0.0019	0.0009	0.007	0.0018

Analysis	Cu	Mo	V	Ti	Al	Al_{sol}	N
1	0.313	0.0703	0.0703	0.0003	0.0203	0.0090	0.0119
2	0.320	0.0720	0.0747	0.0004	0.0217	0.0110	0.0124
3	0.322	0.0723	0.0750	0.0015	0.0250	0.0113	0.0126
4	0.324	0.0730	0.0757		0.0256	0.0117	0.0127
5	0.327	0.0731	0.0760		0.0257	0.0117	0.0130
6	0.327	0.0746	0.0770		0.0260	0.0123	0.0133
7	0.330	0.0755	0.0777		0.0263	0.0128	0.0134
8	0.330	0.0770	0.0793		0.0271	0.0130	0.0136
9	0.333	0.0783	0.0793		0.0271	0.0133	0.0138
10	0.333		0.0802				
11	0.333						
12	0.337						
Average	0.327	0.0740	0.0765	0.0008	0.0250	0.0118	0.0130
SD	0.007	0.0026	0.0029	0.0006	0.0024	0.0013	0.00062
Certified value	**0.33**	**0.074**	**0.076**		**0.025**	**0.012**	**0.0130**
C(95%)	0.0040	0.0020	0.0021		0.0021	0.0010	0.00049

$C(95\%) = (t \cdot SD)/\sqrt{n-1}$ - 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. 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);
Mn - flame AAS, ICP-AES, photometric with potassium periodate, titrimetric arsenite-nitrite;
Si - ICP-AES, photometric as silicon-molybdenum blue, gravimetric;
P - photometric as molybdenum blue, photometric as phosphovanado-molybdate, titrimetric, ICP-AES;
Cr - flame AAS, ICP-AES, photometric with diphenylcarbazide, potentiometric, titrimetic;
Ni - flame AAS, ICP-AES, photometric with dimethylglyoxime, potentiometric;
Cu - flame AAS, ICP-AES, photometric with diethyldithiocarbamate;
Mo - flame AAS, ICP-AES, photometric with ammonium thiocyanate;
V - flame AAS, ICP-AES, potentiometric, photometric;
Ti - flame AAS, ICP-AES;
N - high temperature extraction;
Al - flame AAS, ICP-AES, photometric with aluminon, photometric with eriochromocyanin R;
Al (soluble) - flame AAS, ICP-AES, photometric with aluminon, photometric with eriochromocyanin R.

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

Huta Baildon, Katowice, Poland
Huta Częstochowa, Częstochowa, Poland
Huta Katowice S.A., Dąbrowa Górnicza, Poland
Huta Łabędy, Gliwice, Poland
Huta Ostrowiec S.A., Ostrowiec Świętokrzyski, Poland
Huta im. Tadeusza Sendzimira, Kraków, Poland
Huta Stalowa Wola - Zakład Hutniczy Sp. z o.o., Stalowa Wola, Poland
Instytut Metalurgii Żelaza, Gliwice, Poland
Hilger Analytical Ltd, Margate, Great Britain,
Nova hut Ostrava s.p., Ostrava, Czech Republic
Ströhlein West Gmbh & Co., Kaarst, Germany
Třinecke Żelezarny, a.s., Třinec, Czech Republic
VSZ Labortest, spol. s r.o., Košice, 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 compatible to the following CRMs: SS 431-435, SS 401-410, SS 50-60, SS 456-460, SS 421-424, CKD 162A-171A.

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

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 116 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: 11 July 2024

Certificate revision history:
11 July 2024 (editorial changes)
28 January 2021 (change of information regarding validity of certification, editorial changes);
January 2004, August 2002 (editorial changes);
August 1997 (Original certificate date).