

CERTIFICATE OF ANALYSIS

IMZ 184

REFERENCE MATERIAL NICKEL ALLOY

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

Al	4.37	Ti	3.43
B	0.016	P	(0.001)
C	0.086	Mg	(0.004)
Co	14.32	Nb	(0.032)
Cr	14.16	Si	(0.018)
Mo	4.30	Zr	(0.012)

Values in brackets are informative

Certificate Number: IMZ 184-29072024

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Analysis	C	Si*	Mn	P*	S	Al	B	Co
1	0.080	0.0094	0.0003	0.001	0.0003	4.15	0.0130	13.85
2	0.080	0.01	0.0007	0.001	0.0004	4.22	0.014	13.98
3	0.082	0.019	0.001	0.001	0.0005	4.24	0.014	14.24
4	0.082	0.02	0.003	0.0013	0.0006	4.26	0.014	14.29
5	0.082	0.02		0.0015	0.0007	4.39	0.015	14.30
6	0.082	0.02			0.0010	4.40	0.016	14.40
7	0.083	0.02			0.0013	4.41	0.018	14.41
8	0.089	0.021			0.0014	4.41	0.020	14.48
9	0.091	0.024				4.42		14.48
10	0.092					4.58		14.55
11	0.093					4.60		14.59
12	0.095							
Average	0.086	0.0182		0.0011		4.37	0.0155	14.32
SD	0.006	0.0050		0.0003		0.14	0.0024	0.23
Certified	0.086					4.37	0.016	14.32
C(95%)	0.0037					0.10	0.002	0.16
Analysis	Cr	Cu	Fe	Mo	Nb*	Ta	Ti	V
1	14.01	0.000	0.010	4.00	0.025	0.000	3.30	0.001
2	14.02	0.0000	0.050	4.14	0.0264	0.001	3.34	0.0018
3	14.10	0.0005	0.053	4.18	0.0300	0.024	3.34	0.0056
4	14.11	0.001	0.060	4.25	0.03	0.0250	3.37	
5	14.17	0.001	0.064	4.26	0.0380	0.031	3.40	
6	14.24	0.0026	0.069	4.30	0.044	0.031	3.45	
7	14.25	0.003	0.070	4.44		0.043	3.46	
8	14.38	0.006	0.078	4.53			3.48	
9			0.083	4.56			3.49	
10							3.50	
11							3.57	
Average	14.16			4.30	0.032		3.43	
SD	0.13			0.19	0.007		0.08	
Certified	14.16			4.30			3.43	
C(95%)	0.11			0.15			0.06	
Analysis	W	Zr*	Mg*	Hf	N			
1	0.002	0.009	0.0004	0.0005	0.0017			
2	0.0043	0.0098	0.0016					
3	0.01	0.010	0.0055					
4	0.0380	0.0103	0.0061					
5	0.064	0.0110	0.0072					
6	0.07	0.01						
7		0.018						
9		0.019						
Average		0.0121	0.0042					
SD		0.0040	0.0030					
Certified								
C(95%)								

* - informative value

$C(95\%) = (t \cdot SD) / \sqrt{n-1}$ - 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 on bulk samples. Single values in the above table are the means obtained by individual laboratories. Some laboratories performed analysis with the use of more than one analytical technique. The following methods were used for analysis:

C	- HFIR, GD OES, AES spark;
Al	- AES-ICP, photometric, XRF, AAS, GD OES, AES spark;
Co	- AES-ICP, XRF, AAS, GD OES, AES spark;
Cr	- AES-ICP, titrimetric, XRF, AAS, GD OES, AES spark;
Fe	- AES-ICP, XRF, AAS, GD OES, AES spark;
Mo	- AES-ICP, XRF, AAS, GD OES, AES spark;
Nb	- AES-ICP, XRF, AES spark;
Ti	- AES-ICP, XRF, AAS, GD OES, AES spark;
Zr	- AES-ICP, XRF, AAS, GD OES;
Ta	- AES-ICP, XRF, GD MS;
Hf	- ICP-MS;
Si	- gravimetric, XRF, GD OES, GD MS;
P	- XRF, photometric; GD MS; ICP MS;
B	- GD OES, GD MS, AES spark;
V	- AES-ICP, XRF;
W	- AES-ICP, XRF; ICP-MS;
S	- HFIR, XRF;
Mn	- AES-ICP, XRF, AAS, GD MS;
Cu	- AES-ICP, XRF, AAS, GD MS;
Mg	- XRF, AAS, GD MS;
N	- HT extraction.

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

- Leco Instrumente Plzen – Application Laboratory, Prague, Czech Republic
- ŽĎAS, a.s. Žďár nad Sázavou, Czech Republic
- TŘINECKÉ ŽELEZÁRNY, a.s., Czech Republic
- Matex , Plzen, Czech Republic
- PBS Velká Bíteš, a.s., Velká Bíteš, Czech Republic
- PCS, Prague, Czech Republic
- Mieczel, Czelabinskij metalurgiczkieskij kombinat, Russia
- Institute for Ferrous Metallurgy - Gliwice, Poland

Homogeneity: The homogeneity of this Reference Material was evaluated in agreement to ASTM E826-85 (R-1990) with the use of X-ray fluorescence spectrometry and glow discharge optical emission spectrometry and was found acceptable.

Traceability: This Reference Material was tested with the use X-ray fluorescence spectrometry and glow discharge optical emission spectrometry and was found compatible to the following CRMs and RMs:

NIST: 1243, 1244, 1249; IARM: 52A, 54A, 57B, 59A, 62A, 66B, 67B, 68A, 69A, 256A, 203A, 207B, Brammer: 197, 200-3, 617, 718B, 925, H-6A, H-8; Carpenter: IS0070A; Claxton Standards: 718D, Rene41C, UDIMET500 Glen Spectra RM: R77, R80; BCS: 310/1, 387; BAS: 345A, 346A; MBH: 219x1867, 211x11224, 215xHC5, 213x200H3, 210x11774, 25x10230, 28x7183, 212x4001, 22x751, 22x755, 22x801, 22x808, 22x9012, 22x1053, 22x1055, 24x11005; Chaîne Nationale Dietalonnage BNM-COFRAC: KC20FeN

Available form: 1/4 section of 80 mm cylinder and 30 mm high.

Material origin: This material was manufactured by Canon Muskegon, USA

Intended use: This Reference Material is intended for use in X-ray spectrometric methods and optical emission spectrometry with spark and glow discharge excitation.

Validity of certification: The certification of IMZ 184 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.

Safety: This Reference Material and packing do 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)

18 May 2020 (change of information regarding validity of certification, editorial changes, material origin added);

March 2007 (Original certificate date)