



Certificate of Analysis

IARM Fe303-18

Stainless Steel AISI 303 / UNS S30300

Certified Reference Material

Certified Values listed in wt.% with associated uncertainties

As	0.007 ± 0.001	B	0.0012 ± 0.0009	C	0.046 ± 0.002	Co	0.140 ± 0.004
Cr	17.2 ± 0.1	Cu	0.61 ± 0.02	Mn	1.55 ± 0.03	Mo	0.42 ± 0.01
N	0.069 ± 0.004	Nb	0.015 ± 0.002	Ni	8.12 ± 0.09	O	0.006 ± 0.003
P	0.033 ± 0.003	S	0.35 ± 0.02	Si	0.47 ± 0.02	Sn	0.015 ± 0.004
V	0.072 ± 0.005	W	0.029 ± 0.005				

Indicative Values listed in ppm

Al (40)	Bi (<1)	Ca (20)	Cd (<1)	H (<20)	Mg (<10)	Pb (<1)
Sb (<10)	Se (<10)	Ta (<50)	Ti (40)	Zn (<50)	Zr (<50)	

Description and Intended Use

This CRM may come in the form of a solid disk, chips, or powder. The intended use of this CRM may include, but is not limited to, the calibration of instruments and the validation of analytical methods.

Instructions for Use

1. The test surface is on the opposite side of the labeled surface, which includes the material identification. The entire thickness of the unit is certified. However, the user is cautioned not to measure disks less than 2 mm thick when using X-ray fluorescence spectrometry. Each packaged disk has been prepared by finishing the test surface using a lathe. The user must determine the correct surface preparation procedure for each analytical technique. The user is cautioned to use care when either resurfacing the disk or performing additional polishing, as these processes may contaminate the surface.
2. The minimum sample size for chips should be individually evaluated based on the analytical technique used; this would typically be greater than 0.1 grams.
3. The material should be stored in a cool, dry location when not in use.
4. Chips are not certified for Oxygen analysis.



The following data and accompanying statements represent all pertinent information reported in the ILAP as it applies to the chemical characterization of this material.

	Al	As	B	Bi	C	Ca	Cd	Co	Cr	Cu	Fe	H	Mg	Mn	Mo	N
1	0.000491	0.005633	0.000251	<0.0001	0.041	0.0008	<0.0001	0.129	17.031	0.528	70.9515	0.000914	0.000112	1.43	0.397	0.065
2	0.0015	0.006	0.000833		0.0441	0.0016		0.131	17.0533	0.5861	71.88	0.00104	0.00048	1.505	0.397	0.0666
3	0.0024	0.0067	0.001		0.0443	0.0026		0.131	17.08	0.599		<0.002	<0.001	1.528	0.405	0.0668
4	0.0029	0.0076	0.0011		0.045	<0.001		0.1351	17.0967	0.607			<0.0001	1.53	0.408	0.067067
5	0.0135	0.008	0.0014		0.0454	<0.005		0.1376	17.132	0.607				1.5392	0.41	0.069
6	<0.001	0.0081	0.0028		0.0457			0.138	17.152	0.61				1.55	0.4103	0.0692
7	<0.001				0.0459			0.141	17.18129	0.61033				1.56	0.41817	0.074
8	<0.005				0.047			0.144	17.21	0.625				1.57	0.41833	0.078
9					0.051			0.145	17.228	0.625				1.573	0.4234	
10					0.05233			0.145	17.307	0.62933				1.579	0.424	
11								0.145	17.41	0.63				1.59	0.428	
12								0.14546	17.44	0.632707				1.591366	0.431	
13								0.146	17.4459					1.601	0.433	
14								0.148024	17.58					1.618	0.46	
15																
Mean	0.004	0.007	0.0012		0.046	0.002		0.14	17.2	0.61	71.40	0.001	0.0003	1.55	0.42	0.069
STDV.	0.005	0.001	0.0009		0.003	0.0009		0.006	0.2	0.03	0.7	0.00009	0.0003	0.05	0.02	0.004
Certified	(0.004)	0.007	0.0012	(<0.0001)	0.046	(0.002)	(<0.0001)	0.140	17.2	0.61	(71.4)	(<0.002)	(<0.001)	1.55	0.42	0.069
U _{CRM}	0.001	0.001	0.0009		0.002			0.004	0.1	0.02				0.03	0.01	0.004
Methods	I,D,O	I,A,O	I,D,O	I	C,G	I,D	I	I,O,X,D,G	I,O,X,D,G	I,D,G,X,O	I,X	F	I,D	I,O,X,D,G	I,O,X,D,G	C,F

	Nb	Ni	O	P	Pb	S	Sb	Se	Si	Sn	Ta	Ti	V	W	Zn	Zr
1	0.0068	7.86	0.0031	0.024	0.0000433	0.312	0.002133	<0.001	0.419	0.01	<0.001	0.0016	0.056	0.011	0.000451	0.001367
2	0.013	7.9433	0.0038	0.0269	0.0000635	0.33	0.00227	<0.0001	0.442	0.013033	<0.0010	0.0016	0.060333	0.0236	<0.001	0.004
3	0.01429	7.975	0.004	0.0277	0.0003	0.3308	0.0032	<0.0010	0.446	0.014	<0.002	0.0032	0.0645	0.0261	<0.0001	<0.0001
4	0.015	8.04	0.0044	0.031267	<0.001	0.333	<0.001		0.446	0.014	<0.005	0.0082	0.06936	0.0288	<0.0005	<0.002
5	0.0155	8.04705	0.00563	0.03156	<0.0010	0.3379	<0.0005		0.451317	0.014367		<0.001	0.07	0.03	<0.005	<0.005
6	0.015733	8.096	0.0096	0.0321		0.3384			0.452	0.015		<0.001	0.070467	0.0314		
7	0.0159	8.1195	0.00973	0.033		0.3446			0.459	0.01537		<0.005	0.073	0.032		
8	0.016	8.12		0.033567		0.355			0.46	0.0163			0.07317	0.032732		
9	0.016976	8.14		0.03373		0.364			0.462	0.027			0.0735	0.03372		
10	0.018	8.153		0.034		0.375			0.47167				0.074	0.036		
11		8.172		0.034		0.424659			0.472				0.0749	0.039		
12		8.254		0.035					0.48067				0.075			
13		8.356		0.041					0.5022				0.079			
14		8.437		0.0411					0.5652				0.0884			
15																
Mean	0.015	8.12	0.006	0.033	0.0001	0.35	0.003		0.47	0.015		0.004	0.072	0.029		
STDV.	0.003	0.2	0.003	0.005	0.0001	0.03	0.0006		0.03	0.005		0.003	0.008	0.007		
Certified	0.015	8.12	0.006	0.033	(0.0001)	0.35	(<0.001)	(<0.001)	0.47	0.015	(<0.005)	(0.004)	0.072	0.029	(<0.005)	(<0.005)
U _{CRM}	0.002	0.09	0.003	0.003		0.02			0.02	0.004			0.005	0.005		
Methods	I,X,D,O	I,O,X,D,G	C,F	I,O,X,D,G	I,A	C,G,X	I,A	A,I	I,O,X,D,G	I,O,X,A	D,I	I,D	I,O,X,D,G	I,D,G,X,O	I,D	I,D

Legend: W = Classical, C = Combustion, F = Fusion, A = AA or GFAA, I = ICP or DCP, IM=ICP-MS, D = DC Arc, O = AES, X = XRF, G = GDAES or GDMS, H = Hollow Cathode AES

Certification Laboratories

Connecticut Metallurgical Inc
IMR Test Labs
EAG Laboratories
Luvak Laboratories Inc.
New Hampshire Materials Lab

East Hartford, CT
Lansing, NY
Liverpool, NY
Boylston, MA
Somersworth, NH

Dirats Laboratories
VHG Labs
Laboratory Testing, Inc.
Massachusetts Materials Research Inc.

Westfield, MA
Manchester, NH
Hatfield, PA
West Boylston, MA

Certification laboratories have demonstrated performance and traceability by utilizing test methods under the scope of ISO 17025 or have shown competence through a proficiency testing program. Some of the specific SRMs used in the analysis of the material covered by this certificate are:

NIST 101G

NIST 121D

NIST 160B

Nist 3100 Series

NIST 363

Homogeneity and Uncertainty

"Uncertainty" values, as reported adjacent to certified concentration values, are based on a 95% Confidence Interval. These estimated uncertainties include the combined effects of method imprecision, material inhomogeneity, and any bias between methods. Homogeneity data from experimental XRF results are reflected in both the overall statistics and certified data. Homogeneity samples are selected by a systematic sampling procedure. The number of samples may be determined by equation 1, where N_{prod} is the number of units produced and N_{min} is the number of samples used for homogeneity testing. These samples are arranged in a simple randomized design such that each sample is analyzed multiple times by XRF. Homogeneity may also be determined within sample using an applied version of ASTM E826. A single factor ANOVA is used to calculate uncertainty due to inhomogeneity (U_{hom}). Uncertainty of the material is calculated by equation 2, where $H=U_{hom}$, S = Standard deviation, t = t-value at 95% CI, and n = number of observations.

$$1. N_{min} = \max(10, \sqrt[3]{N_{prod}})$$

$$2. U_{CRM} = \frac{\sqrt{H^2 + S^2}}{\sqrt{n}} * t$$

Expiration

The certification of this material is valid indefinitely, within the uncertainty specified, provided the material is handled and stored in accordance with the instructions stated on this certificate. The certification is nullified if the material is damaged, contaminated, otherwise modified, or used in a manner for which it was not intended.



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