

Certified Reference Material

Certificate of Analysis

Product ID: IARM-NI330-21

ISO
17034:2016

ISO/IEC
17025:2017

ISO
9001:2015

Product Description: Nickel Alloy, Nickel Iron, Alloy 330 / N08330

Revision No.: 000
 Revision Date: 04/17/2023

Description and Intended Use: This **Certified Reference Material** is covered under the scope of accreditation to **ISO 17034** by LGC Standards - Manchester, NH. As an ISO 17034 certified reference material, appropriate use of this material will fulfill the certified reference material and traceability requirements for use in **ISO 17025** accredited laboratories. This CRM may come in the form of a solid disk, or chips. The intended use of this CRM may include, but is not limited to, the calibration of instruments and the validation of analytical methods.

Certified Values listed in wt.% with associated uncertainties

Al	0.008	±0.002	Cu	0.046	±0.002	Ni	34.8	±0.2	Ti	0.0088	±0.0009
As	0.003	±0.001	Fe	43.9	±0.2	O	0.0026	±0.0003	V	0.051	±0.002
B	0.0016	±0.0004	Mn	1.382	±0.009	P	0.015	±0.002	Zr	0.0016	±0.0009
C	0.062	±0.002	Mo	0.142	±0.005	S	0.0010	±0.0003			
Co	0.057	±0.003	N	0.032	±0.001	Si	1.35	±0.02			
Cr	18.18	±0.08	Nb	0.067	±0.003	Sn	0.0015	±0.0002			

Indicative Values listed in ppm

Ca 22 H 4 Hf 13 Mg 10 Sb 24 Ta 50 W 78

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.

$$1. N_{MIN} = \max(10, \sqrt[3]{N_{PROD}}) \qquad 2. U_{CRM} = \frac{\sqrt{H^2 + S^2}}{\sqrt{n}} * t$$

Certification Laboratories: Much of the analytical work performed to assess this material has been carried out by laboratories with proven competence, as indicated by their accreditation to ISO 17025. It is an implicit requirement for this accreditation that analytical work should be performed with due traceability, via an unbroken chain of comparisons, each with stated uncertainty, to primary standards such as the mole, or to nationally- or internationally-recognized reference materials. Of the individual results herein, some have traceability (to the mole) via primary analytical methods. Some are traceable to substances of known stoichiometry. Most have traceability via commercial solutions. Furthermore, some results have additional traceability to NIST standards, as part of the analytical calibration or process control.

- Anderson Laboratories, Inc. - Greendale, WI
- Applied Technical Services - Marietta, GA
- Dirats Laboratories - Westfield, MA
- EAG Laboratories - Liverpool, NY
- Elemental Analysis Inc. - Lexington, KY
- IMR Test Labs - Lansing, NY
- Laboratory Testing, Inc. - Hatfield, PA
- LGC Standards - Manchester, NH
- New Hampshire Materials Laboratory Inc - Somersworth, NH
- NSL Analytical Services - Cleveland, OH
- Scrooby's Laboratory Service Pty Ltd - Benoni, South Africa
- SGS MSi - Melrose Park, IL
- Sheffield Assay Office - Sheffield, England
- TEC Eurolab - Campogalliano, Italy

Instructions for Use: 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. 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. The material should be stored in a cool, dry location when not in use.

Chips are not recommended for gas analysis.

Period of Validity: 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.



Chuck Goudreau, Certifying Officer

April 17, 2023
 Certification Date



ISO 17034 Accredited: Reference Materials
 Producer, Certificate # 2848.02
 ISO/IEC 17025 Accredited: Chemical
 Testing, Certificate # 2848.01

Conditions of Sale and Supply: All CRMs & RMs sold are subject to applicable LGC Standard Terms and Conditions of Sale.

The following data represents all pertinent information reported as it applies to the chemical characterization of this material.

	Al	As	B	C	Ca	Co	Cr	Cu	Fe	H	Hf	Mg	Mn	Mo
1	0.0028	0.0010	0.0006	0.0580	0.0019	0.0461	17.8100	0.0405	43.46	0.0004	0.0010	0.0001	1.3500	0.1247
2	0.0036	0.0023	0.0007	0.0580	0.0020	0.0490	18.0100	0.0420	43.60		0.0016	0.0003	1.3600	0.1300
3	0.0040	0.0026	0.0009	0.0596	0.0021	0.0511	18.0920	0.0429	43.63		<0.00005	0.0003	1.3613	0.1340
4	0.0050	0.0028	0.0013	0.0600	0.0021	0.0550	18.1100	0.0430	43.70		<0.0001	0.0004	1.3670	0.1350
5	0.0050	0.0039	0.0015	0.0601	0.0023	0.0569	18.1275	0.0430	43.79		<0.001	0.0019	1.3690	0.1370
6	0.0052	0.0040	0.0016	0.0610	0.0027	0.0570	18.1420	0.0462	43.83		<0.0010	0.0020	1.3699	0.1385
7	0.0061	0.0046	0.0016	0.0613	<0.0010	0.0570	18.1700	0.0463	43.89		<0.005	0.0022	1.3731	0.1390
8	0.0071	0.0047	0.0017	0.0620	<0.005	0.0570	18.1751	0.0465	43.91			<0.005	1.3800	0.1396
9	0.0072	0.0054	0.0018	0.0620		0.0570	18.1900	0.0470	43.98			<0.0005	1.3890	0.1400
10	0.0080	<0.002	0.0022	0.0630		0.0573	18.2272	0.0470	44.00			<0.005	1.3900	0.1409
11	0.0090	<0.002	0.0023	0.0631		0.0573	18.2433	0.0470	44.11			<0.01	1.3920	0.1433
12	0.0090	<0.002	0.0027	0.0638		0.0577	18.3190	0.0473	44.29			<0.01	1.3970	0.1440
13	0.0109	<0.005	<0.005	0.0641		0.0586	18.3300	0.0480	44.40				1.3980	0.1450
14	0.0125	<0.005	<0.005	0.0659		0.0600	18.3470	0.0480	44.48				1.3980	0.1460
15	0.0133	<0.01	<0.01	0.0670		0.0601	18.3700	0.0488					1.3980	0.1480
16	0.0139	<0.01	<0.01	0.0691		0.0607		0.0490					1.4000	0.1510
17	0.0160					0.0670		0.0517					1.4010	0.1530
18	<0.01					0.0700								0.1670
19														
Mean	0.0082	0.0035	0.0016	0.0624	0.0022	0.0575	18.1775	0.0461	43.93	0.0004	0.0013	0.0010	1.3820	0.1420
STDV	0.0040	0.0014	0.0006	0.0031	0.0003	0.0055	0.1451	0.0029	0.303		0.0004	0.0009	0.0167	0.0094
Certified	0.008	0.003	0.0016	0.062	(0.0022)	0.057	18.18	0.046	43.9	(0.0004)	(0.0013)	(0.0010)	1.382	0.142
U _{CRM}	0.002	0.001	0.0004	0.002		0.003	0.08	0.002	0.2				0.009	0.005
Methods	I,IM,O,X	I,IM	I,IM,O	C,G,O	I	I,IM,O,X	I,O,X	I,IM,O,X	I,G,O,X	F	I	IM,O,I	I,G,O,X	I,IM,G,O,X

	N	Nb	Ni	O	P	S	Sb	Si	Sn	Ta	Ti	V	W	Zr
1	0.0277	0.0560	33.92	0.0022	0.0110	0.0005	0.0004	1.2917	0.0011	0.0001	0.0070	0.0468	0.0013	0.0001
2	0.0298	0.0562	34.30	0.0022	0.0110	0.0005	0.0004	1.2930	0.0012	0.0019	0.0072	0.0470	0.0028	0.0010
3	0.0314	0.0613	34.36	0.0022	0.0111	0.0005	0.0006	1.3100	0.0014	0.0021	0.0075	0.0476	0.0029	0.0011
4	0.0314	0.0640	34.55	0.0023	0.0119	0.0006	0.0007	1.3120	0.0016	0.0100	0.0079	0.0478	0.0031	0.0013
5	0.0315	0.0643	34.70	0.0023	0.0121	0.0008	0.0024	1.3160	0.0016	0.0109	0.0080	0.0480	0.0041	0.0016
6	0.0319	0.0660	34.70	0.0024	0.0124	0.0008	0.0049	1.3200	0.0017	<0.0005	0.0084	0.0496	0.0047	0.0019
7	0.0319	0.0670	34.76	0.0024	0.0126	0.0008	0.0077	1.3237	0.0017	<0.0010	0.0085	0.0499	0.0050	0.0024
8	0.0320	0.0670	34.81	0.0025	0.0127	0.0009	<0.002	1.3326	0.0017	<0.002	0.0086	0.0499	0.0080	0.0037
9	0.0322	0.0670	34.82	0.0028	0.0132	0.0012	<0.002	1.3360	<0.002	<0.002	0.0091	0.0500	0.0105	<0.00005
10	0.0325	0.0698	34.90	0.0030	0.0140	0.0017	<0.002	1.3600	<0.002	<0.002	0.0094	0.0503	0.0112	<0.0005
11	0.0331	0.0700	34.91	0.0033	0.0142	0.0018	<0.005	1.3700	<0.002	<0.005	0.0103	0.0508	0.0129	<0.0010
12	0.0340	0.0701	34.93	0.0037	0.0154	0.0019		1.3700	<0.005	<0.005	0.0111	0.0512	0.0159	<0.005
13		0.0712	34.97		0.0156	<0.002		1.3810	<0.01	<0.01	0.0117	0.0520	0.0190	<0.005
14		0.0719	34.99		0.0170	<0.002		1.3850	<0.01	<0.01	<0.01	0.0520	<0.005	
15		0.0720	35.02		0.0180	<0.002		1.3980			<0.01	0.0530		
16		0.0732	35.06		0.0190			1.4140				0.0560		
17			35.21		0.0200			1.4430				0.0570		
18			35.26		0.0220							0.0580		
19			35.49		0.0260									
Mean	0.0316	0.0667	34.82	0.0026	0.0152	0.0010	0.0024	1.3504	0.0015	0.0050	0.0088	0.0509	0.0078	0.0016
STDV	0.0016	0.0053	0.363	0.0005	0.0042	0.0005	0.0028	0.0441	0.0002	0.0050	0.0015	0.0033	0.0056	0.0011
Certified	0.032	0.067	34.8	0.0026	0.015	0.0010	(0.0024)	1.35	0.0015	(0.0050)	0.0088	0.051	(0.0078)	0.0016
U _{CRM}	0.001	0.003	0.2	0.0003	0.002	0.0003		0.02	0.0002		0.0009	0.002		0.0009
Methods	F	I,IM,O,X	I,G,O,X	F	I,IM,G,O,X	C,G	I,IM	I,G,O,X	I,IM	I,IM	I,IM,O,X	I,IM,G,O,X	I,IM,O	I,O,IM,X

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