

Certified Reference Material

Certificate of Analysis

Product ID: MBH 13X 32180 A

ISO
17034:2016

ISO/IEC
17025:2017

ISO
9001:2015

Product Description: Austenitic Stainless Steel, UNS S32180

Revision No.: 001
Revision Date: 03/25/2022

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 0.043 ± 0.002	As 0.003 ± 0.001	B 0.0011 ± 0.0006	C 0.031 ± 0.001
Co 0.040 ± 0.002	Cr 18.92 ± 0.07	Cu 0.49 ± 0.01	Mn 2.11 ± 0.02
Mo 0.245 ± 0.006	N 0.0067 ± 0.0008	Nb 0.0021 ± 0.0008	Ni 10.16 ± 0.06
P 0.007 ± 0.001	S 0.0093 ± 0.0008	Sb 0.0011 ± 0.0007	Si 0.485 ± 0.006
Sn 0.0116 ± 0.0008	Ti 0.81 ± 0.01	V 0.026 ± 0.002	W 0.039 ± 0.002

Indicative Values listed in ppm

Fe (66.6%) O (21) Zr (10)

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.

- LGC Standards - Manchester, NH
- Connecticut Metallurgical, Inc. - East Hartford, CT
- Dirats Laboratories - Westfield, MA
- IMR Test Labs - Lansing, NY
- Applied Technical Services - Marietta, GA
- Luvak Inc. - Boylston, MA
- Instytut Metalurgii Żelaza - Gliwice, Poland
- NSL Analytical Services - Cleveland, OH
- SGS MSi - Melrose Park, IL
- EAG Laboratories - Liverpool, NY
- New Hampshire Materials Laboratory - Somersworth, NH
- Scrooby's Laboratory Service - Benoni, South Africa
- Raghavendra Spectro Metallurgical Laboratory - Bengaluru, India
- IMR Test Labs - Louisville, KY

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.


Kimberly Halkotis, Global Product Manager

March 25, 2022
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	Co	Cr	Cu	Fe	Mn	Mo	N	Nb	Ni
1	0.0380	0.0013	0.0001	0.0272	0.0320	18.560	0.4560	66.250	2.0260	0.2120	0.0050	0.0010	9.810
2	0.0380	0.0020	0.0002	0.0272	0.0344	18.650	0.4570	66.400	2.0300	0.2140	0.0051	0.0011	9.920
3	0.0400	0.0020	0.0007	0.0290	0.0350	18.699	0.4600	66.480	2.0600	0.2330	0.0060	0.0015	10.000
4	0.0400	0.0020	0.0010	0.0290	0.0350	18.700	0.4650	66.600	2.0600	0.2397	0.0069	0.0025	10.050
5	0.0410	0.0021	0.0010	0.0300	0.0350	18.760	0.4710	67.210	2.0620	0.2400	0.0071	0.0026	10.100
6	0.0417	0.0023	0.0015	0.0300	0.0360	18.770	0.4790		2.0670	0.2400	0.0072	0.0030	10.120
7	0.0420	0.0035	0.0019	0.0300	0.0360	18.852	0.4800		2.0940	0.2400	0.0074	0.0030	10.126
8	0.0420	0.0035	0.0020	0.0310	0.0369	18.909	0.4800		2.0990	0.2407	0.0074	<0.0010	10.141
9	0.0421	0.0040	<0.0004	0.0310	0.0384	18.930	0.4810		2.1000	0.2410	0.0080	<0.002	10.146
10	0.0431	0.0062	<0.0010	0.0317	0.0387	18.940	0.4827		2.1000	0.2437		<0.002	10.149
11	0.0432	<0.002	<0.005	0.0320	0.0390	18.949	0.4840		2.1000	0.2440		<0.002	10.158
12	0.0440	<0.002	<0.005	0.0323	0.0406	18.950	0.4844		2.1040	0.2451		<0.002	10.160
13	0.0452	<0.002		0.0330	0.0409	18.970	0.4860		2.1150	0.2452		<0.005	10.160
14	0.0452	<0.005		0.0331	0.0420	18.972	0.4940		2.1160	0.2470			10.167
15	0.0460	<0.005		0.0333	0.0428	18.990	0.4980		2.1270	0.2490			10.210
16	0.0461	<0.0050		0.0340	0.0430	19.024	0.5040		2.1306	0.2500			10.220
17	0.0470			0.0343	0.0435	19.070	0.5080		2.1380	0.2551			10.269
18	0.0476				0.0440	19.075	0.5092		2.1580	0.2610			10.276
19	0.0510				0.0460	19.080	0.5100		2.1860	0.2620			10.330
20					0.0460	19.103	0.5183		2.1899	0.2640			10.340
21					0.0476	19.124	0.5290		2.1987	0.2650			10.360
22						19.180	0.5310		2.2100	0.2690			10.380
Mean	0.0433	0.0029	0.0011	0.0311	0.0397	18.921	0.4894	66.588	2.1123	0.2455	0.0067	0.0021	10.163
STDV	0.0034	0.0014	0.0007	0.0022	0.0044	0.1677	0.0219	3.702	0.0521	0.0144	0.0011	0.0009	0.1390
Certified	0.043	0.003	0.0011	0.031	0.040	18.92	0.49	(66.6)	2.11	0.245	0.0067	0.0021	10.16
U _{CRM}	0.002	0.001	0.0006	0.001	0.002	0.07	0.01		0.02	0.006	0.0008	0.0008	0.06
Methods	I,IM,O,X,G	I,IM,O,X	I,IM,O	C,O,G	I,IM,O,X,G	I,O,X,G	I,O,X,G,IM	I,O,X	I,O,X,G	I,O,X,G,IM	F,O	IM,I,X,G,O	I,O,X,G

	O	P	S	Sb	Si	Sn	Ti	V	W	Zr
1	0.0020	0.0050	0.0070	0.0005	0.4620	0.0095	0.7550	0.0180	0.0295	0.0001
2	0.0022	0.0052	0.0072	0.0005	0.4660	0.0100	0.7740	0.0220	0.0330	0.0002
3		0.0053	0.0074	0.0010	0.4730	0.0100	0.7800	0.0223	0.0335	0.0010
4		0.0060	0.0080	0.0012	0.4730	0.0100	0.7800	0.0230	0.0355	0.0024
5		0.0060	0.0084	0.0012	0.4778	0.0100	0.7830	0.0230	0.0360	0.0035
6		0.0060	0.0084	0.0023	0.4800	0.0101	0.7890	0.0230	0.0370	<0.0010
7		0.0060	0.0090	<0.0010	0.4800	0.0105	0.7920	0.0235	0.0370	<0.002
8		0.0061	0.0090	<0.002	0.4810	0.0110	0.7920	0.0240	0.0384	<0.002
9		0.0064	0.0091		0.4810	0.0112	0.7970	0.0240	0.0390	<0.005
10		0.0070	0.0093		0.4810	0.0114	0.8140	0.0252	0.0400	<0.005
11		0.0072	0.0100		0.4810	0.0119	0.8145	0.0256	0.0400	
12		0.0075	0.0100		0.4830	0.0130	0.8200	0.0258	0.0405	
13		0.0080	0.0101		0.4840	0.0130	0.8220	0.0260	0.0410	
14		0.0100	0.0104		0.4850	0.0130	0.8250	0.0261	0.0421	
15		0.0110	0.0104		0.4868	0.0140	0.8300	0.0280	0.0425	
16		0.0110	0.0110		0.4870	0.0140	0.8310	0.0280	0.0430	
17		0.0110	0.0112		0.4895	0.0143	0.8310	0.0300	0.0430	
18		<0.0050	0.0120		0.4940	<0.01	0.8431	0.0301	0.0446	
19					0.5000		0.8600	0.0312		
20					0.5040		0.8680	0.0350		
21					0.5100					
22					0.5170					
Mean	0.0021	0.0073	0.0093	0.0011	0.4853	0.0116	0.8100	0.0257	0.0386	0.0014
STDV	0.0001	0.0021	0.0014	0.0007	0.0133	0.0016	0.0298	0.0039	0.0040	0.0015
Certified	(0.0021)	0.007	0.0093	0.0011	0.485	0.0116	0.81	0.026	0.039	(0.001)
U _{CRM}		0.001	0.0008	0.0007	0.006	0.0008	0.01	0.002	0.002	
Methods	F	I,IM,O,X	C,I,O,X,G	IM,O,I,X	I,O,X,G	IM,O,I,X	I,O,X,G	I,IM,O,X,G	I,IM,O,X	I,IM,O,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

