

Certified Reference Material

Certificate of Analysis

Product ID: MBH-31X B10 N

ISO
17034:2016

ISO/IEC
17025:2017

ISO
9001:2015

Product Description: Major Elements in Brass

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					
Ag	0.0030	± 0.0003	Al	0.149	± 0.004
Cd	0.0005	± 0.0001	Co	0.0062	± 0.0003
Fe	0.135	± 0.002	Mn	0.160	± 0.002
Pb	0.022	± 0.001	Sb	0.0207	± 0.0007
Sn	0.047	± 0.002	Zn	36.6	± 0.2
			As	0.0099	± 0.0003
			Cr	0.0006	± 0.0003
			Ni	1.56	± 0.02
			Se	0.0009	± 0.0005
			Bi	0.021	± 0.001
			Cu	60.9	± 0.1
			P	0.033	± 0.001
			Si	0.012	± 0.002

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.

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

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

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
- Dirats Laboratories - Westfield, MA
- Laboratory Testing, Inc. - Hatfield, PA
- Universal Scientific Laboratory - Revesby, Australia
- Connecticut Metallurgical, Inc. - East Hartford, CT
- NSL Analytical Services - Cleveland, OH
- TEC Eurolab - Campogalliano, Italy
- IMR Test Labs - Lansing, NY
- SGS MSI - Melrose Park, IL
- Scrooby's Laboratory Service - Rynfield, South Africa
- EAG Laboratories - Liverpool, NY
- AnchorCert Analytical - Birmingham, UK
- TCR Engineering Services - Maharashtra, India
- Institute of Non-Ferrous Metals - Gliwice, Poland
- Applied Technical Services - Marietta, GA
- Sheffield Assay Office - Sheffield, England

Instructions for Use: The test surface is on the opposite side of the labeled surface, which includes the material identification. This material is individually chill cast per piece. This manner of casting can cause the formation of inhomogeneous segregates in the upper, engraved portion of the disk. Therefore, the certification information above is not applicable to within 3mm of the engraved surface. 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

November 5, 2021
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.

	Ag	Al	As	Bi	Cd	Co	Cr	Cu	Fe	Mn	Ni	P	Pb
1	0.0020	0.1310	0.0085	0.0170	0.0002	0.0050	0.0001	60.610	0.1266	0.1508	1.4440	0.0280	0.0180
2	0.0021	0.1380	0.0090	0.0181	0.0002	0.0050	0.0002	60.700	0.1270	0.1530	1.4900	0.0280	0.0182
3	0.0026	0.1391	0.0090	0.0189	0.0004	0.0059	0.0002	60.760	0.1290	0.1540	1.4933	0.0300	0.0200
4	0.0027	0.1400	0.0094	0.0190	0.0005	0.0060	0.0003	60.840	0.1309	0.1573	1.5030	0.0312	0.0200
5	0.0028	0.1430	0.0096	0.0192	0.0005	0.0060	0.0004	60.860	0.1310	0.1580	1.5110	0.0318	0.0202
6	0.0028	0.1440	0.0097	0.0194	0.0005	0.0060	0.0010	60.860	0.1320	0.1590	1.5260	0.0320	0.0207
7	0.0028	0.1448	0.0100	0.0200	0.0005	0.0061	0.0010	60.890	0.1350	0.1590	1.5270	0.0320	0.0210
8	0.0029	0.1460	0.0100	0.0200	0.0006	0.0061	0.0010	60.900	0.1350	0.1600	1.5300	0.0326	0.0219
9	0.0030	0.1470	0.0100	0.0200	0.0006	0.0062	0.0010	60.930	0.1352	0.1600	1.5403	0.0330	0.0222
10	0.0032	0.1470	0.0100	0.0202	0.0006	0.0063	<0.0001	61.077	0.1360	0.1601	1.5468	0.0330	0.0225
11	0.0033	0.1503	0.0100	0.0204	0.0007	0.0064	<0.0005	61.130	0.1379	0.1602	1.5510	0.0334	0.0226
12	0.0034	0.1504	0.0101	0.0207	0.0008	0.0064	<0.001		0.1380	0.1621	1.5620	0.0340	0.0230
13	0.0035	0.1508	0.0102	0.0207	<0.0005	0.0064	<0.001		0.1380	0.1624	1.5700	0.0347	0.0230
14	0.0036	0.1510	0.0102	0.0208	<0.001	0.0065	<0.001		0.1380	0.1628	1.5726	0.0348	0.0230
15	0.0036	0.1527	0.0102	0.0210	<0.002	0.0067	<0.0010		0.1380	0.1640	1.5786	0.0350	0.0232
16	0.0040	0.1528	0.0104	0.0250	<0.002	0.0069	<0.002		0.1386	0.1660	1.5900	0.0350	0.0232
17	<0.005	0.1532	0.0104	0.0260	<0.005	0.0069	<0.002		0.1408	0.1680	1.6080	0.0357	0.0245
18		0.1580	0.0108	0.0270		0.0070	<0.005		0.1410		1.6100	0.0360	0.0250
19		0.1588	0.0110	0.0276							1.6120	0.0360	0.0252
20		0.1670									1.6400	0.0361	0.0268
21		0.1670									1.6530	0.0380	
Mean	0.0030	0.1491	0.0099	0.0211	0.0005	0.0062	0.0006	60.869	0.1349	0.1598	1.5552	0.0333	0.0222
STDV	0.0005	0.0089	0.0006	0.0030	0.0002	0.0006	0.0004	0.1500	0.0045	0.0044	0.0528	0.0026	0.0023
Certified	0.0030	0.149	0.0099	0.021	0.0005	0.0062	0.0006	60.9	0.135	0.160	1.56	0.033	0.022
U _{CRM}	0.0003	0.004	0.0003	0.001	0.0001	0.0003	0.0003	0.1	0.002	0.002	0.02	0.001	0.001
Methods	O,IM,I,X,A	O,I,IM,X	O,I,IM,X	O,I,IM,X,A	O,I,IM,X,A	O,I,IM,X,A	O,I,IM,X,A	W,O,I,X	O,I,IM,X,A	O,I,IM,X	O,I,X,A	W,O,I,IM,X	O,I,IM,X,A

	Sb	Se	Si	Sn	Zn
1	0.0180	0.0001	0.0066	0.0413	36.100
2	0.0183	0.0003	0.0075	0.0430	36.101
3	0.0187	0.0007	0.0082	0.0433	36.109
4	0.0196	0.0010	0.0090	0.0436	36.150
5	0.0200	0.0010	0.0090	0.0449	36.170
6	0.0206	0.0010	0.0093	0.0450	36.241
7	0.0208	0.0015	0.0100	0.0450	36.260
8	0.0209	0.0017	0.0100	0.0451	36.290
9	0.0210	<0.0005	0.0100	0.0456	36.340
10	0.0210	<0.0005	0.0105	0.0460	36.353
11	0.0210	<0.001	0.0114	0.0466	36.520
12	0.0212	<0.001	0.0124	0.0475	36.710
13	0.0216	<0.002	0.0124	0.0480	36.810
14	0.0219	<0.005	0.0128	0.0480	36.850
15	0.0220	<0.005	0.0143	0.0489	36.878
16	0.0220	<0.0050	0.0147	0.0490	36.950
17	0.0225		0.0180	0.0495	36.990
18			0.0190	0.0520	37.100
19			0.0200	0.0550	37.220
20					37.570
21					
Mean	0.0207	0.0009	0.0119	0.0467	36.586
STDV	0.0013	0.0005	0.0038	0.0033	0.4380
Certified	0.0207	0.0009	0.012	0.047	36.6
U _{CRM}	0.0007	0.0005	0.002	0.002	0.2
Methods	O,I,IM,X,A	O,IM,I,X	W,O,I,IM,X	O,I,IM,X	W,O,I,X,A

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

