ISO 17034:2016   ISO/IEC 17025:2017   ISO 9001:2015

Product ID: MBH-12X 86200-21

Revision No.: 000
Revision Date: 07/05/2022

Product Description: Low Alloy Steel, AISI 8620, UNS G86200

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	0.0241	±0.0009	As	0.0045	±0.0006	C	0.211	±0.004	Co	0.0072	±0.0006
Cr	0.507	±0.005	Cu	0.199	±0.002	Mn	0.811	±0.008	Mo	0.190	±0.002
N	0.0082	±0.0007	Nb	0.0014	±0.0005	Ni	0.551	±0.006	P	0.0128	±0.006
S	0.0224	±0.0008	Sb	0.0024	±0.0005	Si	0.237	±0.006	Sn	0.0094	±0.0005
V	0.0039	±0.0002	W	0.003	±0.001	Zr	0.0014	±0.0007			

Indicative Values listed in ppm

B	(3)	Fe	(97.0%)	Pb	(10)	Ti	(12)

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 calculated 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.

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

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-recognised 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.

- NSL Analytical Services - Cleveland, OH
- SGS MSi - Melrose Park, IL
- Applied Technical Services - Marietta, GA
- EAG Laboratories - Liverpool, NY
- LGC Standards - Manchester, NH
- Cleveland Cliffs - Cleveland, OH
- New Hampshire Materials Laboratory - Somersworth, NH
- Genitest - Montreal, Canada
- Dirats Laboratories - Westfield, MA
- Luvak Inc - Boylston, MA
- Connecticut Metallurgical, Inc. - East Hartford, CT
- Sheffield Assay Office - Sheffield, England
- Scrooby's Laboratory Service - Benoni, South Africa
- IMR Test Labs - Louisville, KY
- IMR Test Labs - Lansing, NY

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

July 05, 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	0.0200	0.0025	0.0003	0.2040	0.0050	0.4800	0.1853	97.160	0.7513	0.1780	0.0060	0.0001	0.5280
2	0.0210	0.0040	0.0004	0.2040	0.0060	0.4810	0.1910	97.617	0.7850	0.1820	0.0073	0.0003	0.5300
3	0.0217	0.0040		0.2040	0.0060	0.4900	0.1940		0.7920	0.1840	0.0080	0.0010	0.5310
4	0.0220	0.0041		0.2050	0.0064	0.4978	0.1950		0.7970	0.1859	0.0082	0.0014	0.5330
5	0.0220	0.0041		0.2050	0.0066	0.4990	0.1960		0.8030	0.1860	0.0083	0.0015	0.5360
6	0.0232	0.0043		0.2060	0.0069	0.4993	0.1971		0.8050	0.1870	0.0085	0.0015	0.5440
7	0.0239	0.0043		0.2080	0.0070	0.5020	0.1972		0.8060	0.1870	0.0086	0.0018	0.5480
8	0.0239	0.0044		0.2080	0.0070	0.5050	0.1980		0.8060	0.1870	0.0087	0.0020	0.5500
9	0.0240	0.0048		0.2090	0.0071	0.5068	0.1980		0.8132	0.1888	0.0089	0.0022	0.5516
10	0.0240	0.0052		0.2100	0.0074	0.5100	0.1989		0.8170	0.1890	0.0092	0.0023	0.5530
11	0.0240	0.0057		0.2100	0.0078	0.5100	0.1990		0.8193	0.1900		<0.0005	0.5540
12	0.0240	0.0057		0.2110	0.0080	0.5100	0.1990		0.8194	0.1900		<0.001	0.5540
13	0.0240	0.0060		0.2130	0.0080	0.5100	0.2000		0.8200	0.1903		<0.0010	0.5560
14	0.0241	<0.005		0.2130	0.0081	0.5110	0.2000		0.8213	0.1907		<0.005	0.5578
15	0.0241	<0.005		0.2139	0.0090	0.5120	0.2000		0.8220	0.1909		<0.005	0.5580
16	0.0250	<0.005		0.2230	0.0092	0.5134	0.2009		0.8220	0.1910		<0.005	0.5600
17	0.0250	<0.005		0.2330	<0.005	0.5139	0.2010		0.8220	0.1910		<0.005	0.5626
18	0.0250	<0.0050			<0.005	0.5142	0.2020		0.8230	0.1910		<0.01	0.5640
19	0.0260	<0.01			<0.005	0.5154	0.2027		0.8230	0.1920			0.5650
20	0.0270	<0.01			<0.005	0.5180	0.2070		0.8289	0.1925			0.5650
21	0.0279				<0.01	0.5200	0.2080		0.8340	0.1980			0.5730
22	0.0280				<0.01	0.5310				0.2000			
23										0.2000			
Mean	0.0241	0.0045	0.0003	0.2106	0.0072	0.5068	0.1986	97.388	0.8110	0.1897	0.0082	0.0014	0.5511
STDV	0.0020	0.0009	0.00004	0.0075	0.0011	0.0121	0.0049	0.3229	0.0185	0.0051	0.0009	0.0007	0.0130
Certified	0.0241	0.0045	(0.0003)	0.211	0.0072	0.507	0.199	(97.0)	0.811	0.190	0.0082	0.0014	0.551
U_{CRM}	0.0009	0.0006		0.004	0.0006	0.005	0.002		0.008	0.002	0.0007	0.0005	0.006
Methods	IM,I,O,X,G	IM,I,X,O,G,A	O	C,G,O	IM,I,X,O,G	I,X,O,G	IM,I,X,O,G	I	I,X,O,G	IM,I,X,O,G	C,F,O	IM,I,X,O,G	I,X,O,G

	P	Pb	S	Sb	Si	Sn	Ti	V	W	Zr
1	0.0110	0.0001	0.0191	0.0016	0.2040	0.0060	0.0009	0.0030	0.0012	0.0003
2	0.0110	0.0001	0.0200	0.0018	0.2100	0.0080	0.0010	0.0031	0.0016	0.0010
3	0.0113	0.0003	0.0204	0.0018	0.2300	0.0085	0.0010	0.0034	0.0018	0.0016
4	0.0120	0.0010	0.0210	0.0019	0.2300	0.0088	0.0010	0.0037	0.0019	0.0018
5	0.0120	0.0011	0.0210	0.0020	0.2312	0.0090	0.0012	0.0038	0.0020	0.0020
6	0.0120	0.0020	0.0220	0.0020	0.2325	0.0090	0.0013	0.0039	0.0025	0.0020
7	0.0121	0.0020	0.0220	0.0030	0.2341	0.0092	0.0020	0.0039	0.0032	<0.00005
8	0.0123	<0.00005	0.0220	0.0032	0.2347	0.0094		0.0039	0.0040	<0.0005
9	0.0124	<0.0005	0.0222	0.0032	0.2350	0.0096		0.0039	0.0040	<0.0010
10	0.0125	<0.0010	0.0222	0.0034	0.2360	0.0096		0.0040	0.0043	<0.005
11	0.0126	<0.005	0.0222	<0.005	0.2360	0.0097		0.0040	0.0054	<0.005
12	0.0130	<0.005	0.0224	<0.005	0.2360	0.0098		0.0040	0.0057	<0.005
13	0.0130	<0.005	0.0225	<0.005	0.2370	0.0098		0.0040	0.0059	<0.01
14	0.0134	<0.005	0.0230		0.2380	0.0098		0.0041	<0.005	<0.01
15	0.0135	<0.01	0.0230		0.2380	0.0099		0.0043	<0.005	
16	0.0137	<0.01	0.0237		0.2400	0.0100		0.0043	<0.005	
17	0.0142		0.0238		0.2400	0.0100		0.0045	<0.005	
18	0.0145		0.0240		0.2408	0.0100		0.0045	<0.01	
19	0.0150		0.0251		0.2420	0.0101		<0.005	<0.01	
20	0.0150		0.0260		0.2470	0.0110		<0.005		
21					0.2493	<0.01		<0.005		
22					0.2510			<0.005		
23					0.2830					
Mean	0.0128	0.0009	0.0224	0.0024	0.2372	0.0094	0.0012	0.0039	0.0034	0.0014
STDV	0.0012	0.0008	0.0017	0.0007	0.0145	0.0010	0.0004	0.0004	0.0017	0.0007
Certified	0.0128	(0.001)	0.0224	0.0024	0.237	0.0094	(0.0012)	0.0039	0.003	0.0014
U_{CRM}	0.0006		0.0008	0.0005	0.006	0.0005		0.0002	0.001	0.0007
Methods	IM,I,X,O,G	IM,I,O,G,A,X	C,O,I,X,G	IM,I,O,A,X	IM,I,X,O,G	IM,I,X,O,G,A	X,I,O	IM,I,X,O,G	IM,I,X,O,G	IM,I,G,O

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

LGC