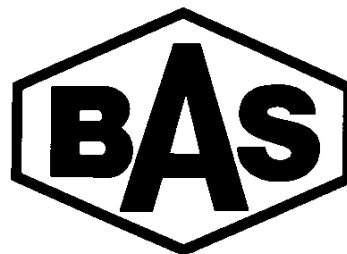


OUTSIDE-SOURCE REFERENCE MATERIALS

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ACIRS: Australian Coal Industry Reference Samples, Australia	53	IA: Industrial Analytical, South Africa	40
ALCAN: Alcan International Ltd., Canada	3	IPT: Instituto de Pesquisas Tecnologicas, Brazil	41
BAM: Bundesanstalt für Materialforschung und -prüfung, Germany	4	IRSID: Institut de Recherches de la Sidérurgie Française, France	42
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BUREAU OF ANALYSED SAMPLES LTD



CATALOGUE NO. 806

MARCH 2012



4004

Certificate GB94/3993

INTRODUCTION

For over seventy five years Bureau of Analysed Samples Ltd (BAS) have been preparing British Chemical Samples, now known as BCS Certified Reference Materials (CRMs) for the metallurgical industries. **Full particulars of all BAS-produced materials are given in a separate catalogue.**

When the UK joined the EEC in 1973 BAS were invited to co-operate with BAM in Germany and IRSID in France in the production of CRMs for the iron and steel industry on a European basis and this European Producers Group has recently been augmented by the inclusion of the Nordic CRM Working Group: this work is now under the auspices of the European Committee for Iron and Steel Standardization (ECISS). These EURONORM Certified Reference Materials (ECRMs) are normally analysed by approximately twenty laboratories from countries in the European Economic Area (EEA) and are issued with a Certificate of Analysis approved by the participating laboratories and all four producing organizations. These ECRMs are indicated by an asterisk in this list.

Pending their eventual replacement by ECRMs analysed on a European basis, a number of National CRMs prepared by BAM, BAS & IRSID have been accepted as interim ECRMs following examination by laboratories within the EU.

All ECRMs are available from BAS. Data regarding the BAS-produced ECRMs is given in the BAS Certified Reference Materials Catalogue, whilst the data re BAM, IRSID/CTIF- and Jernkontoret (JK)-produced ECRMs are given in this catalogue.

Further details of ECRMs, including their method of preparation, certification and supply of ECRMs, and the use of the statistical information given on ECRM certificates are given in Technical Reports **CEN/TR 10317:2009** (formerly **ECISS Information Circular No. 1**) and **CEN/TR 10350:2009** (formerly **ECISS Information Circular No. 5**) which are available in the UK from the BSI, 389 Chiswick High Road, London W4 4AL.

In September 1992, the BNF – Fulmer organisation was closed down. BAS purchased their Reference Materials business, including the considerable stock of BNF samples, and are continuing the business as before. Thus, BAS are now the primary source of BNF copper, nickel and lead base Reference Materials. Replacement samples are being produced by BAS in order to maintain continuity of supply of these samples: (see the latest BAS Catalogue for details of such samples already produced by BAS).

In order to assist our customers to obtain complementary Reference Materials from other reputable producers, BAS are now holding a stock, and most of the Reference Materials detailed in this catalogue are immediately available, with delivery of non-stock items usually achieved within two to three weeks.

In this catalogue Reference Materials which are supplied with a Certificate of Analysis giving the information specified in ISO Guide 31 "Contents of Certificates of Reference Materials" are referred to as "Certified Reference Materials" and the remainder as "Reference Materials", in accordance with the definitions given in ISO Guide 30 "Terms and definitions used in connection with Reference Materials". (ISO Guides are available from Case Postale 56, CH-1211 Geneva 20, Switzerland).

The Certificate accompanying each CRM, or Analysis Report/Information Sheet accompanying each RM, should be consulted to obtain the accurate analysis of each sample, since in some cases the figures shown in this catalogue may differ slightly from those given on the Certificate or Analysis Report/Information Sheet.

QUALITY ASSURANCE

Bureau of Analysed Samples Ltd, are very pleased to advise customers that in November 1994 their Quality System was formally approved and recognised by the award of a Certificate of Registration to the Quality Standard BS EN ISO 9002:1994 for the production and supply of CRMs, RMs and SUS. This certificate has now been revalidated to the new standard BS EN ISO 9001:2008. Furthermore, they were accredited, in June 2006, to the International Guide, ISO Guide 34:2000 and the accreditation has since been updated to the current version, ISO Guide 34:2009.

ALCAN INTERNATIONAL LTD., ARVIDA LABORATORIES, (ALCAN), Canada

CHEMICAL COMPOSITION (nominal mass content in %) - figures in brackets are for information only.

Wrought Aluminium Alloy Spectroscopic Reference Materials (57mm dia. x 25mm discs)

ALCAN No.	Cu	Fe	Mg	Mn	Ni	Si	Ti	Zn	Bi	Cr	Pb	Sn	Ga	V	Be	Ca	Li	Na	Others	
HP FD	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001 P
2014 AD	4.6	0.46	0.45	0.81	0.03	0.88	0.03	0.03	0.03	0.02	0.02	0.04	0.03	0.03	0.001	0.003	0.002	0.002	0.002	0.004 P
2219 AA	6.5	0.20	0.02	0.28	0.03	0.15	0.05	0.10	0.03	0.02	0.02	0.02	0.02	0.06	...	...	...	...	...	0.004 P
5056 AD	0.05	0.27	5.0	0.13	0.03	0.12	0.03	0.04	0.01	0.09	0.01	0.01	0.02	0.02	0.001	0.002	0.003	0.003	0.003	0.002 Zr
5083 AF	0.078	0.34	4.85	0.74	0.03	0.17	0.03	0.05	0.008	0.15	0.008	0.02	0.02	0.02	0.03	0.003	(0.004)	(0.004)	(0.004)	0.004 Zr
6063 BA	0.090	0.22	0.59	0.080	0.030	0.51	0.032	0.029	0.0082	0.015	0.0080	0.014	0.020	0.021	0.00112	0.0029	(0.0018)	(0.0019)	(0.0019)	0.0029 Zr
6111 AE	0.75	0.24	0.77	0.20	0.028	0.60	0.065	0.027	0.025	0.072	0.016	0.018	0.019	0.023	0.0013	(0.0023)	(0.0025)	(0.0019)	(0.0019)	0.0031 Zr
6351 AK	0.06	0.23	0.65	0.56	0.03	1.08	0.05	0.05	0.007	0.03	0.008	0.02	0.02	0.02	0.001	0.003	0.003	0.004	0.004	0.003 Zr
7075 AF	1.75	0.17	2.66	0.031	0.027	0.19	0.092	5.75	0.007	0.22	0.007	0.014	0.019	0.020	0.001	0.0034	0.003	0.003	0.003	0.002 Zr
42S AA	2.3	1.1	1.5	0.05	1.3	0.78	0.08	0.06	0.03	0.02	0.03	0.03	0.02	0.02	...	...	...	...	...	...

Foundry and Casting Aluminium Alloy Spectroscopic Reference Materials (57mm dia. x 25mm discs)

ALCAN No.	Cu	Fe	Mg	Mn	Ni	Si	Ti	Zn	Bi	Cr	Pb	Sn	Ga	V	Ca	Na	Be	Zr	Others
125 AQ	1.2	0.24	0.04	0.04	0.03	5.5	0.15	0.03	0.02	0.03	0.02	0.03	0.01	0.02	...	...	...	...	...
160 DP	0.05	0.30	0.02	0.03	0.03	11.8	0.05	0.04	0.02	0.02	0.03	0.03	0.01	0.01	...	0.004	...	...	...
340 AB	0.05	0.37	8.1	0.06	0.05	0.2	0.04	0.06	0.04	0.04	0.04	0.03	0.01	0.01	...	...	...	...	...
A143 AW	3.03	0.73	0.91	0.3	0.89	10.0	0.11	0.03	0.03	0.04	0.04	0.03	0.01	0.02	0.006	0.0004	0.002	...	0.0005 Li
A333.0 AE	3.5	0.78	0.08	0.32	0.13	9.1	0.03	2.4	0.02	0.02	0.02	0.03	0.03	0.02	0.002	...	<0.0001	0.02	0.006 Sb
B319.1 AF	3.1	0.64	0.33	0.43	0.05	6.1	0.06	0.72	0.02	0.02	0.13	0.01	0.02	0.02	0.004	...	0.002	0.003	0.002 P

APPROXIMATE CHEMICAL COMPOSITION (nominal mass content in %)

Aluminium Alloy Setting-up Samples (57mm dia. x 50mm discs)

ALCAN No.	Cu	Fe	Mg	Mn	Ni	Si	Ti	Zn	Cr
SSLA-1	(4.7)	(0.5)	(1.2)	(0.1)	(2.3)	(1.1)	(0.15)	(0.2)	...
SSLC	(0.1)	...	(5.1)	(1.1)	...	(0.3)	...	...	(0.2)
SSLD	...	(1.2)	...	...	...	(5.7)	...	(5.6)	...

The above constitutes a selection of ALCAN samples normally held in stock by BAS. Additional ALCAN aluminium alloy spectroscopic reference materials are available, and information on these will be provided on request.

BUNDESANSTALT FÜR MATERIALFORSCHUNG UND -PRÜFUNG (BAM), Germany

CHEMICAL COMPOSITION (nominal mass content in %) – Figures in bold type certified, figures in small italic type only approximate.

Unalloyed Steel Certified Reference Materials (All finely divided material - units of 100g, except 026-1, 026-2, 027-1, 028-1, and 029-1 which are 8mm dia. x 80mm rods, 098-1 which is in solid block form 36-39mm dia x 26mm and 099-1 which is supplied in the form of gold plated balls: ECRM 035-2 also available as 35mm dia. x 30mm discs)

BAM No.	Cert. Date	C	Si	Mn	P	S	Cr	Mo	Ni	Al (Acid Sol.)	Al (Total)	As	Cu	N	Nb	Pb	Sn	Ti	V	O	Te
ECRM 026-1	1969	0.44	...	...	...	...	...	...	...	...	...	...	...	0.0053	...	...	...	...	...	0.0031	...
ECRM 026-2	1973	...	...	...	...	...	...	...	...	...	...	...	...	0.0042	...	...	...	...	...	0.0025	...
ECRM 027-1	1970	0.05	0.003	0.4	0.03	0.03	...	...	...	...	0.001	...	...	0.0157	...	...	...	...	...	0.0084	...
ECRM 028-1	1970	0.1	0.002	0.3	0.06	0.03	...	...	...	...	0.001	...	...	0.0029	...	...	...	...	...	0.0113	...
ECRM 029-1	1970	0.05	0.003	0.3	0.03	0.03	...	...	...	...	0.001	...	...	0.0083	...	...	...	...	...	0.0312	...
ECRM 030-4	1973	0.456	0.318	0.603	0.018	0.021	0.117	...	0.042	...	0.042	0.012	0.061	0.0051	...	...	0.0055	...	...	...	...
ECRM 031-3	1972	0.055	0.037	0.329	0.014	0.021	...	...	...	...	0.054	0.013	0.020	0.0050	...	...	...	...	...	...	...
ECRM 032-2	1968	0.271	0.282	0.556	0.0129	0.0254	0.088	...	0.040	...	...	0.020	0.085	0.0044	...	...	...	...	...	...	...
*ECRM 035-2	1998	1.277	0.216	0.305	0.0038	0.0111	0.0104	0.0056	0.0190	0.0177	0.0193	0.0017	0.0085	0.0230	...	...	...	0.0030	...	...	...
ECRM 036-1	1968	0.858	0.194	0.327	0.0074	0.0095	0.091	...	0.058	...	0.015	0.023	0.065	0.0100	...	...	0.006	...	0.019	...	...
ECRM 039-2	1971	0.107	0.011	1.274	0.083	0.310	0.048	...	0.051	...	...	0.018	0.117	0.0113	...	0.207	0.016	...	...	...	...
ECRM 042-1	1972	0.108	0.037	0.666	0.0057	0.024	0.016	...	0.029	...	0.010	...	0.041	0.0078	0.0054	...	...	...	...	...	...
*ECRM 077-2	1976	0.151	0.293	1.28	0.022	0.014	0.016	0.003	0.021	...	0.034	0.007	0.029	0.0054	...	...	0.0025	...	0.058	...	...
*ECRM 079-2	1989	0.596	0.247	0.743	0.0234	0.192	0.0382	...	0.022	...	0.021	0.004	0.046	0.0074	...	...	0.0037	...	...	...	...
*ECRM 082-1	1976	0.415	0.235	0.769	0.013	0.030	0.018	...	0.027	...	0.032	0.029	0.025	0.0047	...	0.149	...	...	...	...	0.030
*ECRM 083-1	2009	0.0262	...	0.289	0.0076	0.0100	0.013	...	0.014	...	0.004	0.004	0.016	0.00189	...	...	...	...	...	...	...
*ECRM 098-1	1993	0.00051	0.00008	0.00048	0.00006	0.00031	0.00571	0.00085	...	...	...	...	...	0.00024	...	...	...	...	...	...	...
*ECRM 099-1	1987	...	...	...	...	...	...	...	...	...	...	...	...	0.0078	...	...	...	...	...	0.0008	...

Alloy Steel Certified Reference Materials (Finely divided material - units of 100g; 129-3, 179-2, 187-2, 191-2, 192-1, 193-1 and 194-1 also available as 35mm dia. x 30mm discs)

BAM No.	Cert. Date	C	Si	Mn	P	S	Cr	Mo	Ni	Al (Total)	As	B	Co	Cu	N	Sn	Ti	V	Others	
ECRM 126-1	1963	0.841	0.24	1.817	0.009	0.005	0.317	...	0.038	...	...	...	...	0.098	...	...	...	0.143	...
ECRM 128-1	1972	0.085	0.949	0.839	0.007	0.007	0.108	...	0.046	0.286	...	...	...	0.055	0.0024	...	0.890	0.008	...
*ECRM 129-3	2008	0.3684	0.2087	0.371	0.0110	0.0165	1.702	0.206	1.022	1.016	0.0049	0.00014	0.0148	0.0804	0.0046	0.0067	0.030	0.0045	0.00059 Sb	
ECRM 130-1	1968	0.546	0.313	1.593	0.0209	0.0158	0.032	...	0.031	0.0037	0.0167	...	...	0.072	0.0093	...	...	0.003	0.0019 Al (Acid Sol.)
*ECRM 179-2	1990	0.598	0.579	0.539	0.0267	0.0006	1.08	0.070	0.078	...	...	...	0.0153	0.111	0.0068	...	0.0014	0.188	{ 1.87 W, <0.00003 Bi, <0.00003 Cd, 0.00129 Ga, 0.00144 Nb, 0.00013 Pb, 0.00175 Sb, <0.0002 Te, 0.00023 Zn
*ECRM 180-1	1973	0.197	0.362	1.286	0.0174	0.0249	1.250	...	0.096	...	0.030	...	...	0.115	0.0068	...	...	...	...
*ECRM 181-1	1973	0.590	1.054	1.047	0.018	0.035	0.126	...	0.070	0.022	0.026	...	...	0.174	0.0068	0.015	...	...	...
*ECRM 182-1	1993	0.790	0.368	0.389	0.0076	0.011	0.591	...	0.152	0.020	...	...	...	0.141	0.0102	...	...	0.177	0.0039 Pb, 0.0042 Sb, 0.0015 Zn
*ECRM 183-1	1973	0.083	0.421	0.354	0.089	0.031	0.670	...	0.073	0.027	...	...	...	0.445	0.0064	...	...	...	...
*ECRM 184-1	1988	0.333	0.218	0.528	0.0047	0.0032	1.287	0.457	3.318	0.0052	0.0180	...	0.0560	0.060	0.0051	0.0044	...	0.108	...	
*ECRM 187-1	1986	0.195	0.026	1.354	0.014	0.025	1.186	0.035	0.096	0.046	0.018	0.0004	0.014	0.161	0.014	0.011
*ECRM 187-2	2011	0.2038	0.2111	1.257	0.0066	0.0300	1.132	0.0623	0.1755	0.0223	0.0057	0.00048	0.0112	0.1288	0.0105	0.0237	...	0.0122	0.0018 Sb	...
*ECRM 191-2	2006	0.0043	3.267	0.1334	0.0087	0.0029	0.0314	0.0020	0.0224	0.985	0.0018	0.0165	0.00105	0.0050	0.0024
*ECRM 192-1	1995	0.188	0.219	1.377	0.0029	0.0010	0.072	0.482	0.755	0.0308	0.003	0.0002	0.0055	0.045	0.0118	0.003	0.001	0.003	0.029 Al (Acid Sol.)	...
*ECRM 193-1	1990	0.139	0.404	0.972	0.0063	0.0086	0.182	0.347	1.178	0.0257	0.0062	0.0002	0.0073	0.598	0.0108	...	0.0013	0.0019	0.0232 Nb	...
*ECRM 194-1	1993	0.153	0.431	1.188	0.0097	0.00059	0.733	0.286	0.342	0.0837	0.0042	0.0020	...	0.075	0.0115	0.0243	0.0026 Ca	...

* Denotes Full EURONORM-Certified Reference Materials

BUNDESANSTALT FÜR MATERIALFORSCHUNG UND -PRÜFUNG (BAM), Germany

CHEMICAL COMPOSITION (nominal mass content in %) – Figures in bold type certified, figures in small italic type only approximate.

Highly Alloyed Steel Certified Reference Materials (Finely divided material – units of 100g; 284-2, 288-1, 289-1, 290-1 and 291-1 also available as 35mm dia. x 30mm discs; 271-1 as a 37mm dia. x 25mm disc, 294-1 as a 40mm dia. x20mm disc and both 297-1 and 299-1 as a 36mm dia. x 25mm disc)

BAM No.	Cert. Date	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Co	Cu	N	Nb	Sn	Ti	V	Ca	W	O	Sb	Zr
ECRM 226-1	1967	0.416	0.514	0.434	0.0207	0.0094	13.67	0.024	0.139	...	0.026	...	0.025	...	0.0362	...	...	...	0.022	...	...	...	...	...
ECRM 227-1	1994	0.950	0.272	0.236	0.016	0.022	4.25	2.64	0.114	...	...	...	...	0.124	0.040	...	0.0251	...	2.44	...	3.03	...	0.0035	...
*ECRM 231-2	2002	0.0140	0.368	1.263	0.0179	0.0250	18.07	0.301	10.105	0.0032	0.0048	0.0020	0.0402	0.0941	0.0444	...	0.0043	0.0007	0.0708	0.00074	0.0141	...	0.0011	...
ECRM 235-1	1972	0.912	0.094	12.73	0.045	0.0072	0.354	0.032	...	...	...	...	...	0.073	0.020	...	...	...	...	...	...	...	...	...
ECRM 237-1	1973	0.068	0.482	1.443	0.032	0.012	17.24	0.306	10.32	...	...	...	0.221	0.123	0.035	0.660	...	...	0.057	...	...	...	...	...
*ECRM 271-1	2007	0.3698	0.923	0.437	0.0120	0.00045	5.002	1.247	0.1552	0.0234	0.0057	...	0.0139	0.1371	0.0137	...	0.0084	0.0020	0.850	0.0009	0.0054	0.0020	...	...
*ECRM 278-1	1973	0.903	0.336	0.405	0.0154	0.0052	18.11	1.040	0.236	...	...	...	...	0.077	...	...	...	...	0.077	...	...	...	...	...
*ECRM 283-1	1985	1.219	0.345	0.217	0.022	0.029	4.15	3.41	...	0.010	...	0.0003	10.27	...	0.033	...	...	...	3.28	...	9.66	...	...	...
*ECRM 284-2	2000	0.0201	0.537	1.745	0.0258	0.0237	16.811	2.111	10.72	0.0027	0.0063	0.0026	0.0525	0.1831	0.0151	...	0.0047	0.191	0.0425	...	...	0.0099	...	...
*ECRM 286-1	1985	0.100	...	1.92	0.026	0.280	18.13	0.329	8.54	0.0023	...	0.0003	0.150	...	0.043	...	0.0084	...	...	...	0.0315	0.0014	...	...
*ECRM 288-1	1986	2.08	0.260	0.292	0.024	0.0012	12.00	0.103	0.298	0.012	0.006	...	0.018	0.060	0.0151	...	0.0043	0.020	0.055	...	0.68	...	0.0014	...
*ECRM 289-1	1990	0.0489	0.531	1.016	0.0114	0.0027	14.63	1.102	24.68	0.199	0.006	0.0044	0.065	...	...	...	0.111	2.01	0.260	...	...	...	0.0013	...
*ECRM 290-1	1990	0.911	0.072	0.244	0.0160	0.0160	4.18	4.83	0.329	...	...	...	5.12	0.081	0.0325	...	...	...	1.91	...	6.27	...	...	...
*ECRM 291-1	1990	0.903	0.907	0.808	0.0168	0.0087	17.10	2.10	0.563	0.0030	...	...	0.0233	0.0711	0.1142	0.006	...	...	0.388	...	...	...	...	...
*ECRM 294-1	2005	0.0657	0.283	18.68	0.0271	0.00031	17.98	0.0861	0.429	0.001	0.0037	<0.0005	0.0288	0.0242	0.566	<0.004	0.001	<0.002	0.0694	<0.0006	<0.004	...	<0.0007	...
*ECRM 297-1	2005	0.0223	0.344	0.897	0.0135	0.0101	18.37	0.290	12.33	0.0195	0.0040	1.146	0.0413	0.204	0.0152	0.009	...	0.0072	0.535	<0.0005	0.006	...	...	...
*ECRM 299-1	2009	0.0154	0.299	0.2678	0.0152	0.00022	22.32	0.0186	0.172	5.33	0.0054	0.0002	0.0187	0.0382	0.0198	0.004	0.008	0.1289	0.0329	0.0004	0.0002	...	0.0005	0.1775

Also available: BAM Steel-H1, highly alloyed steel, with a certified hydrogen content of 0.9725% (100 x 1g discs)

Special Alloy Certified Reference Materials (Finely divided material – units of 100g)

BAM No.	Cert. Date	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Co	Cu	N	Nb	V	W	Zr	Ta	Fe
ECRM 326-1	1972	0.092	1.46	0.406	0.0093	0.0028	16.37	0.025	61.16	0.79	0.223	0.027	0.036	...	0.024	...	0.129	...	...
ECRM 327-2	1972	0.152	2.052	1.289	0.0228	0.0046	24.35	0.174	19.72	0.070	0.159	0.060	0.059	...	0.044	...	...	...	...
ECRM 328-1	1973	0.390	0.629	1.395	0.005	0.003	20.54	4.41	20.38	0.070	41.65	0.013	0.027	3.61	...	4.16	...	0.18	2.40

Cast Iron Certified Reference Materials (Finely divided material – units of 100g)

BAM No.	Cert. Date	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	Cu	N	Ti	V	Mg
*ECRM 428-2	1998	2.747	1.752	0.750	0.0691	0.1105	0.0366	0.0014	0.0358	...	0.0156	0.0996	...	0.0311	0.0120	...
*ECRM 476-3	1996	3.390	1.813	0.987	0.0908	0.0493	0.0648	...	0.0549	...	0.0145	0.2445	0.0038	0.0222	0.0115	...
*ECRM 478-2	1996	4.003	2.411	0.321	0.202	0.0460	0.251	...	0.151	...	0.0018	0.1276	0.0023	0.0328	0.0113	...
*ECRM 479-1	1978	2.86	2.02	0.136	0.076	0.089	1.00	0.196	1.012	0.014	...	...	...	...	...	...
*ECRM 480-1	1988	3.03	2.41	0.151	0.0021	0.0086	...	...	0.483	0.016	...	...	...	...	...	0.017

Ferro-Alloy Certified Reference Materials (Finely divided material – units of 100g)

BAM No.	Cert. Date	C	Si	Mn	P	S	Cr	Mo	Ni	Al	B	Co	Cu	Pb	N	Sn	Ti	V	Zr	Ca	Mg	Fe
*ECRM 502-2	2004	6.94	0.10	77.87	0.148	0.002	0.0265	...	0.0384	...	0.0003	...	0.0370	0.0179	0.02	...	0.0034	...	...	...	...	14.6
ECRM 529-1	1975	0.10	91.11	0.04	0.013	...	...	...	...	0.86	...	...	...	...	...	...	0.09	...	...	0.46	0.04	6.15
*ECRM 589-1	1991	0.132	0.412	0.151	0.011	0.0152	0.506	0.934	0.663	5.34	...	0.115	0.146	...	0.64	0.55	68.4	2.32	0.866	...	...	16.93
*ECRM 591-1	1996	0.141	0.847	0.307	0.0299	0.0153	...	...	0.0141	3.19	...	...	0.0596	...	...	...	0.044	79.72	...	...	...	14.59

* Denotes Full EURONORM-Certified Reference Materials

BUNDESANSTALT FÜR MATERIALFORSCHUNG UND -PRÜFUNG (BAM), Germany
CHEMICAL COMPOSITION (nominal mass content in %) – Figures in bold type certified, figures in small italic type only approximate.

Ore Certified Reference Materials (Finely divided material – units of 100g)

BAM No.	Description	Cert. Date	Fe	SiO ₂	Al ₂ O ₃	TiO ₂	CaO	MgO	Mn	P	S	Na ₂ O	K ₂ O	As	Ba	Cr	Cu	CO ₂	H ₂ O
ECRM 627-2	Minette Ore	1966	31.77	9.24	4.49	0.225	15.67	1.57	0.250	0.661	0.114	...	...	0.020	...	0.018	<i>0.002</i>	...	...
ECRM 630-1	Borni-Hill Concentrate	1969	65.63	5.88	0.88	0.066	0.10	0.47	0.060	0.043	0.032	...	...	...	...	...	...	...	...
ECRM 631-1	Venezuela Iron Ore	1969	61.09	3.20	1.06	0.109	0.75	0.54	0.044	0.114	0.033	<i>0.04</i>	<i>0.04</i>	...	...	...	...	...	...
ECRM 633-1	Manganese Ore	1967	1.64	10.39	1.64	0.079	2.02	0.58	47.85	0.170	0.227	...	...	<i>0.0040</i>	1.13	...	...	<i>3.48</i>	<i>7.11</i>

Iron Ore Certified Reference Materials (Finely divided material – units of 100g; 686-1 supplied as 2 x 50g)

BAM No.	Description	Cert. Date	Fe	Si	Al	Ti	Ca	Mg	Mn	P	S	Na	K	Zn	Cl	Co	Cr	Cu	Ni	Others
*ECRM 678-1	Kiruna D Iron Ore	1975	60.75	1.73	0.280	0.128	3.93	0.572	0.075	1.61	0.021	0.107	0.110	...	...	...	...	...	...	0.29 F, 0.11 V
*ECRM 680-1	Purple Ore	1977	59.98	4.20	0.66	0.045	0.45	0.14	0.025	0.018	0.544	0.128	0.078	0.165	...	0.013	0.005	0.063	0.007	0.317 Pb, 0.057 As
*ECRM 686-1	Iron Oxide	2002	69.44	0.0083	0.0407	0.0014	0.0097	0.0027	0.231	0.0078	...	0.0058	0.0024	0.0004	0.095	0.0019	0.0182	0.0003	0.0004	0.0007 Mo, 0.0002 Sn
*ECRM 687-1	Iron Oxide	2009	69.66	0.0157	0.0356	0.0303	0.0113	0.0018	0.1658	0.0120	...	0.0030	0.0011	0.0051	0.0173	<i>(0.002)</i>	0.0227	0.0030	0.0122	0.0020 Mo, 0.0006 Sn

Ceramic Certified Reference Materials (Finely divided material – units of 100g; 777-1 supplied as 2 x 50g)

BAM No.	Cert. Date	Description	Si	Ca	Mg	Al	Ti	Mn	P	Fe	Na	K	B	Cr
*ECRM 777-1	1984	Silica Brick	44.44	2.02	0.043	0.42	0.27	...	...	0.23	...	0.13	...	...
*ECRM 779-1	1991	Magnesite	0.182	1.691	<i>54.6</i>	0.105	0.0081	0.503	0.0267	3.73	<i>0.006</i>	<i>0.002</i>	0.0116	<i>0.003</i>

Slag Certified Reference Materials (Finely divided material – units of 100g)

BAM No.	Cert. Date	Description	SiO ₂	CaO	P ₂ O ₅ (Citric Acid Sol.)	P ₂ O ₅ (Total)	Cr	Al	V	K	Na	Mo	Ni	B	Cu	Pb	F
ECRM 826-1	1994	Phosphate Slag	8.96	46.48	10.73	14.65	0.182	0.696	0.503	0.0278	0.375	<i>0.001</i>	<i>0.002</i>	<i>0.003</i>	<i>0.002</i>	<i>0.005</i>	<i>0.37</i>
ECRM 827-1	1991	Thomas Phosphate	6.21	47.38	18.79	20.70	...	...	...	...	...	...	...	...	...	...	...

* Denotes Full EURONORM-Certified Reference Materials

Aluminium Alloy Certified Reference Materials (201-301 finely divided material – units of 100g; 307-ERM-EB316 – approx. 60mm dia. x 25mm discs)

BAM No.	Si	Mn	Fe	Cu	Ti	Zn	Mg	Pb	Al	Cr	Ni	V	Be	Bi	Ca	Cd	Li	Na	Sn	Zr	Ga
201	13.20	0.38	0.18	0.009	0.011	0.038	0.0024	...	Bal.	...	...	...	...	...	...	...	...	...	...	...	...
300	0.14	0.018	0.203	0.046	0.011	0.128	2.67	0.016	Bal.	0.23	...	...	...	...	...	...	...	...	<i><0.0005</i>	...	...
301	0.061	0.001	0.054	0.0016	0.005	0.033	0.0008	...	Bal.	...	...	0.0018	...	...	...	...	...	...	<i><0.0005</i>	...	...
307	0.155	0.701	0.412	0.104	0.101	0.063	4.58	...	Bal.	0.162	...	...	0.0011	...	0.00053	0.0049	0.00044	0.0021	...	...	...
308	0.071	0.034	0.163	1.32	0.029	5.67	2.29	...	Bal.	0.196	0.012	...	0.00022	...	...	...	...	...	...	0.0078	...
310	0.080	0.003	0.070	0.0017	0.003	0.009	0.994	0.0035	Bal.	0.0009	0.002	0.0044	0.00013	...	0.00073	0.0024	0.00037	<i>0.0003</i>	0.0024	0.0014	0.0115
311	0.204	0.694	0.310	4.653	0.056	0.200	1.567	0.0504	Bal.	0.104	0.052	0.0240	0.00052	0.0500	0.00056	0.0013	0.00053	<i>0.0018</i>	0.0127	0.140	0.0159
312	0.415	0.042	0.185	0.042	0.029	0.029	4.409	0.0044	Bal.	0.028	0.004	0.0062	...	0.0023	...	0.0023	...	...	<i>0.002</i>	0.0010	0.0115
ERM-EB313	0.363	0.495	0.391	0.0932	0.0947	0.1579	3.40	0.00433	Bal.	0.1224	0.0278	0.0299	0.000547	0.0095	0.00057	0.00074	0.00060	0.00370	0.0197	0.0359	0.0121
314	11.49	0.400	0.757	2.071	0.1638	1.195	0.1805	0.221	Bal.	0.0517	0.221	0.0192	0.000396	0.0094	...	0.00130	...	...	0.199	0.00552	0.0154
M315	9.18	0.314	0.59	2.51	0.143	0.77	0.422	0.079	Bal.	0.0311	0.096	0.0054	0.0005	0.0041	<i><0.002</i>	0.0011	<i><0.002</i>	<i><0.008</i>	0.0771	0.0030	0.0101
ERM-EB316	11.98	0.204	0.1054	0.2970	0.0790	0.0611	0.045	0.0087	Bal.	0.00593	0.0235	0.0098	0.000295	0.0140	<i>0.0011</i>	0.00208	<i>0.00010</i>	0.0206 Sr	<i>0.011</i>	0.00328	0.0105

BUNDESANSTALT FÜR MATERIALFORSCHUNG UND - PRÜFUNG (BAM), Germany

CHEMICAL COMPOSITION (nominal mass content in %) – Figures in bold type certified, figures in small italic type only approximate.

Copper and Copper Alloy Certified Reference Materials (223-366 Finely divided material – units of 100g; 366 to ERM-EB389 - 40mm dia. x 30mm discs)

BAM No.	Cu	Sn	Zn	Pb	Fe	Ni	Al	Mn	Bi	As	Sb	Si	P	S	Cd	Co	Cr	Ag	Se	Te	Mg	Ti	Zr
223	58.74	0.089	38.82	2.13	0.091	0.0214	<0.002	<0.001	0.0018	0.0084	0.0040	<0.003	0.0003	0.0011	...	...	...	...	<0.0001	...	...	...	...
224	57.40	0.066	39.38	1.13	0.136	0.038	0.0012	1.70	0.0007	0.002	0.0026	0.002	0.0113	0.0004	...	...	...	...	...	...	...	...	...
227	85.57	6.01	3.46	4.12	0.129	0.284	<0.0001	...	0.0088	0.081	0.160	<0.01	0.0002	0.122	...	...	...	...	0.0028	0.0012	...	...	...
228	85.34	9.76	3.32	1.24	0.036	0.109	0.0001	<0.001	0.0086	0.024	0.078	...	0.019	0.036	...	...	...	...	0.0012	...	...	...	...
229	63.334	0.0048	36.63	0.0192	0.0106	0.0111	...	...	...	0.0022	0.0007	...	0.0011	...	...	...	...	...	0.0034	...	...	...	...
366	Bal.	0.011	0.0016	0.0011	0.0023	0.0003	...	<0.0001	<0.00003	0.0001	0.0001	...	0.0263	0.0009	0.00003	...	...	0.0008	<0.00001	<0.00003	...	...	...
367	87.88	0.0105	0.0715	0.0298	1.443	9.72	...	0.723	...	...	...	...	0.0124	0.0162	...	...	...	...	...	...	0.0347	...	...
368	77.05	0.0147	Bal.	0.0131	0.0193	0.0258	1.972	0.0203	...	0.0246	...	0.013	0.0090	0.0019	...	...	...	...	...	...	0.0062	...	...
369	...	...	0.0022	...	...	...	...	...	0.00097	...	...	...	...	...	...	...	...	...	...	...	0.00036	...	...
370	...	0.00168	...	0.00158	...	...	0.00126	...	...	...	0.00156	0.00187	0.00117	...	...	...	...	...	...	...	...	...	...
371	...	...	...	...	0.00183	...	...	...	...	...	...	...	...	0.00121	0.00016	...	...	...	...	0.00144	...	...	...
372	...	...	...	...	...	0.00117	...	0.00114	...	0.00103	...	...	...	...	...	...	0.00090	0.00084	...	...	...	...	...
ERM-EB374	92.22	7.60	0.00404	0.00083	0.0040	0.00327	<0.0001	0.00043	0.00022	0.00043	0.00063	<0.001	0.1697	0.0013	<0.0001	...	...	0.00121	<0.0002	<0.0001	<0.0001	...	...
ERM-EB375	58.32	0.209	38.02	2.90	0.207	0.1053	0.0270	0.0222	0.00686	0.0231	0.0122	0.0211	0.00086	...	0.00859	...	...	0.0166	...	0.00538	...	...	...
376	Bal.	0.0247	0.0217	0.0236	0.0235	0.0209	...	0.0206	0.0200	0.0200	0.0202	...	0.0203	0.0133	0.0186	...	...	0.0163	0.0210	0.0215	0.0124	...	...
ERM-EB377	94.04	5.92	0.01006	0.00449	0.01042	0.01074	0.00451	0.00921	0.00422	<0.001	0.0013	<0.0134	<0.001	0.00068	<0.0001	...	...	0.00644	0.0055	<0.0001	<0.0001	...	...
ERM-EB378	94.13	5.74	0.00073	0.00042	0.00182	0.00183	<0.0001	0.000074	<0.0001	0.00995	0.00861	<0.0010	0.0602	0.00091	0.01007	0.0089	0.0311	0.00266	<0.0002	0.00850	0.00287	...	...
ERM-EB387	75.18	0.00301	19.57	0.00108	0.0617	5.020	...	0.0796	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
ERM-EB388	89.27	0.857	4.81	0.000969	0.0303	0.00736	4.972	0.0512	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
ERM-EB389	74.3	0.0262	0.1125	0.0098	0.107	24.7	0.0123	0.415	0.0044	...	0.0046	0.0349	0.0093	0.0308	0.0016	0.0770	0.0153	...	...	...	0.067	0.0660	0.098

Also available: 373/1, 373/2 and 373/3 which are certified for phosphorus at 33.8µg/g, 226.5µg/g and 455.7µg/g respectively (50mm dia. x 30mm discs)
 379/1, 379/2 and 379/3 which are certified for oxygen at 38µg/g, 212µg/g and 378µg/g respectively (30mm dia. x 40mm discs)

Pure Copper Certified Reference Materials (40mm dia. x 30mm discs) Mass fraction in µg/g

BAM No.	Cu	Sn	Zn	Pb	Fe	Ni	Al	Mn	Bi	As	Sb	Si	P	S	Cd	Co	Cr	Ag	Se	Te	Mg	Ti	Zr
M381	Bal.	3.86	5.3	0.59	3.3	0.7	<1	0.22	<0.3	<0.5	<1	<3	...	3.2	<0.4	<0.3	<0.4	<1	<1	<0.3	<0.6	<0.3	<6
M382	Bal.	4.29	6.0	1.0	6.0	1.7	<2.5	0.76	0.53	0.6	0.7	<6	...	3.2	0.90	0.73	0.56	1.8	0.6	0.61	1.4	0.6	<3
ERM-EB383	Bal.	4.7	7.8	1.31	10.9	3.59	2.3	1.24	1.02	1.93	1.44	<10	...	2.8	1.48	1.37	1.03	4.70	1.16	1.40	2.37	1.56	...
ERM-EB385	Bal.	18.0	57.9	11.3	45.4	11.9	28.6	10.1	5.81	11.4	19.9	7.2	12.9	31.2	5.8	6.93	9.81	28.6	7.2	10.0	29.1	...	...
ERM-EB386	Bal.	28.3	49.5	23.4	64.7	25.0	36.5	13.3	9.6	24.2	31.2	14.3	7.2	21.9	7.8	5.20	12.4	47.4	11.6	38.3	36.1	...	...
M390	Bal.	<0.01	...	...	0.79	...	...	...	...	...	...	...	1.3	...	...	...	...	...	...	...	...	...	...
M391	Bal.	<0.01	...	...	0.90	...	...	...	...	...	...	...	3.3	...	...	...	...	...	...	...	...	...	...
M392	Bal.	<0.01	...	...	0.80	...	...	...	...	...	...	...	7.0	...	...	...	...	...	...	...	...	...	...

Lead Alloy Certified Reference Materials (disc samples – dimensions as below) Mass fraction in %

BAM No.	Description	Disc Dimensions	Ca	Sb	As	Sn	Se	Bi	Ag	Al	Cu	Tl	Ni	Cd	S	Te	Zn
ERM-EB101a	PbCaSnAl	40mm dia. x 40mm	0.136	<0.00012	<0.0002	0.294	...	0.0165	0.00290	0.0227	0.00243	0.00102	<0.00006	(0.0002)	(<0.0003)	<0.0003	0.00010
ERM-EB102a	PbCaSn	40mm dia. x 40mm	0.0635	0.0004	<0.0002	1.01	...	0.00737	0.0170	0.0124	0.00013	0.00302	...	...	(<0.0003)	<0.00011	<0.00005
ERM-EB103	PbSb1.6	40mm dia. x 30mm	...	1.64	0.097	0.183	0.0180	0.0158	0.0066	...	0.00097	0.00152	0.000302	0.000020	0.00054	0.00019	...
ERM-EB104	PbCaSn	40mm dia. x 40mm	0.0530	...	...	1.27	...	0.0126	0.00293	...	...	...	...	...	...	...	...
ERM-EB105	PbCaSn	40mm dia. x 40mm	0.0595	...	...	1.43	...	0.0133	0.00321	...	...	...	...	...	...	...	...
ERM-EB106	PbCaSn	40mm dia. x 40mm	0.0782	...	...	1.72	...	...	...	...	...	...	...	...	...	...	...

Zinc (Pure) Certified Reference Material (45mm dia. X 30mm disc) Mass fraction in µg/g

BAM No.	Cd	Fe	Cu	Tl	Pb	Al	In	Zn
M601	0.55	2.20	1.89	2.25	15.7	<0.5	<0.05	Bal.

BUNDESANSTALT FÜR MATERIALFORSCHUNG UND - PRÜFUNG (BAM), Germany

CHEMICAL COMPOSITION – Figures in bold type certified, figures in small italic type only approximate.

High Purity Substances Certified Reference Materials (Finely divided material - units of 100g) Mass fraction in µg/g

BAM No.	Description	Cert. Date	CO ₂	H ₂ O	Ag	Al	As	B	Ba	Be	Bi	C	Ca	Cd	Ce	Cl
RS 1	SiO ₂ (>99.99%)	1991	...	...	...	8.7	<0.1	...	...	...	...	...	0.42	<0.05	...	...
RS 2	Al ₂ O ₃ (99.76%)	1994	...	2280	...	...	<0.5	<5	<0.5	<0.2	...	...	3.1	<0.2	<0.1	<10
RS 3	CaCO ₃ (99.79%)	1994	43970	1320	...	<5	...	<1	45.3	...	...	...	...	<0.5	...	...
RS 4	Ni (99.995%)	1996	...	...	<1	<1	<0.5	<2	...	...	<2	9.4	<1	<0.2	...	...
RS 5	NiO (Ni (79.3%))	1996	...	150	<1	6	<0.2	...	<1	...	<1	14	2.2	<0.2	...	...
RS 6A	MgO (Mg (60.19%))	1997	...	110	...	46	...	...	<10	...	...	<50	994	...	...	...
RS 6B	MgO (Mg (60.17%))	1997	...	283	...	49	...	...	<20	...	...	<210	956	...	...	...

BAM No.	Co	Cr	Cu	Fe	Ga	Ge	Hg	In	K	La	Li	Mg	Mn	Mo	N	Na
RS 1 continued	...	0.062	<0.1	0.62	...	<1	<0.05	...	0.48	...	0.25	<0.5	<0.2	...	...	<2
RS 2 continued	<1	<1.5	<2.5	3.3	<2	...	...	<0.5	<5	<0.3	<1	<3	<1.5	<1	...	<15
RS 3 continued	<1	<1	<1	<5	<1.5	...	...	...	<20	<0.5	...	183	3.0	...	...	47.5
RS 4 continued	<1	<0.5	<2	4.2	<0.2	...	<1	<0.2	...	...	...	<0.8	<0.5	<0.2	2.5	<1
RS 5 continued	<2	10	1.53	27	<0.5	...	...	<1	<2	...	<2	<1	<1	<5	...	<2
RS 6A continued	<5	9.2	<6	82	...	...	...	...	...	...	...	601900	5.4	<10	...	...
RS 6B continued	<5	8.1	<6	80	...	...	...	...	...	...	...	601700	5.2	<10	...	...

BAM No.	Ni	O	Pb	S	Sb	Se	Si	Sn	Sr	Te	Ti	Tl	V	W	Zn	Zr
RS 1 continued	<0.2	...	<0.15	...	...	...	...	...	...	...	1.3	...	...	...	<1.3	<0.1
RS 2 continued	<10	...	...	...	...	...	<20	<1	...	...	<2	...	<1	...	<2	3.2
RS 3 continued	<3	...	<0.1	...	...	...	<20	<1	173	...	<0.5	...	...	...	<2	<0.2
RS 4 continued	999950	29	<1	<2	<0.2	<1	<2	0.3	...	<0.2	...	<0.2	<0.2	<0.1	<4	...
RS 5 continued	793000	207000	<2	<4	<0.1	<1	<5	<1	<1	<0.2	<2	<0.5	<1	<1	3.4	<1
RS 6A continued	3.9	...	<5	...	...	...	...	...	2.0	...	1.3	...	8.4	...	<6	<20
RS 6B continued	3.3	...	<5	...	...	...	...	...	2.1	...	1.2	...	7.8	...	<6	<160

Silicon Nitride Powder Certified Reference Material (finely divided material - units of 50g) Mass fraction in µg/g

BAM No.	Al	Ca	Co	Fe	Mg	Na	W	C	N	O	β-phase
ERM-ED101	469	14.1	43.5	79.5	4.3	7.59	41.3	1620	381000	19100	74300

Tungsten Metal Powder Certified Reference Material (Finely divided material - units of 100g) Mass fraction in µg/g

BAM No.	Al	Ca	Co	Cr	Cu	Fe	K	Mg	Mn	Mo	Na	Ni	P	Si	Sn
S002	29.4	46	45	47.0	28.4	53	40.0	38.8	16.7	59	41	29	7.2	106	42

Glass Containing Hexavalent Chromium Certified Reference Material (Finely divided material - units of 50g) Mass fraction in %

BAM No.	SiO ₂	Na ₂ O	CaO	Al ₂ O ₃	BaO	MgO	ZnO	SO ₃	K ₂ O	Cr ₂ O ₃	Fe ₂ O ₃	CuO	Cr Hexavalent	Cr Total
S004	70.9	14.5	9.4	2.15	1.2	0.90	0.33	0.17	0.16	0.07	0.06	0.04	0.0094	0.0471

Multielement Glass for XRF Analysis Certified Reference Materials (39mm x 5mm discs) Mass fraction in µg/g

BAM No.	As ₂ O ₃	BaO	CaO	Ce ₂ O ₃	Cl	CoO	Cr ₂ O ₃	CuO	Fe ₂ O ₃	MnO ₂	MoO ₃	NiO	PbO	Sb ₂ O ₅	Se	SnO ₂	SO ₃	SrO	TiO ₂	V ₂ O ₅	ZnO	ZrO ₂
S005A - Type A	132	115	62	105	247	49.4	15.6	112	422	124	343	59.0	202	132	19.6	100	1942	151	164	350	203	842
S005B - Type B	132	115	62	105	247	49.4	15.2	112	422	124	343	59.0	202	132	19.6	100	1942	151	163	349	203	842

COMMUNITY BUREAU OF REFERENCE (BCR), Belgium

CHEMICAL COMPOSITION (nominal mass content in µg/g) - Figures in bold type certified, figures in small italic type only approximate.

Biological and Environmental Certified Reference Materials (Finely divided material - unit weights as shown below)

BCR No.	Description	Unit	Al	As	C	Ca	Cd	Cl	Cr	Cu	Fe	Hg	I	K	Mg	Mn
060	Lagarosiphon Major (Aquatic Plant)	25g	4180	...	...	...	2.20	<i>10000</i>	...	51.2	...	0.34	...	...	...	1759
063R	Skim Milk Powder-natural	50g	...	...	...	13490	...	9940	...	0.602	2.32	...	<i>0.81</i>	17680	1263	...
100	Beech Leaves	30g	435	...	<i>500000</i>	<i>5100</i>	<i>0.34</i>	1490	6.7	<i>12.0</i>	<i>550</i>	...	...	<i>9600</i>	<i>873</i>	<i>1.330</i>
129	Hay Powder	30g	...	...	<i>45200</i>	6400	...	...	...	<i>10</i>	<i>114</i>	...	0.167	33800	1450	70
184	Bovine Muscle	15g	...	0.26	...	<i>150</i>	0.013	<i>2000</i>	<i>0.076-0.153*</i>	2.36	79	0.0026	<i>0.04</i>	<i>16600</i>	<i>1020</i>	334
185R	Bovine Liver	15g	...	0.033	...	...	0.544	...	...	277	...	...	...	...	...	11.07
191	Brown Bread	40g	...	<i>0.023</i>	...	<i>410</i>	0.0284	<i>16500</i>	<i>0.068-0.360*</i>	2.6	40.7	<i>0.002</i>	...	<i>3100</i>	<i>500</i>	20.3
279	Ulva Lactuca (Sea Lettuce)	35g	...	3.09	...	<i>27000</i>	0.274	...	...	13.14	<i>2400</i>	<i>0.05</i>	<i>1.54</i>	<i>13000</i>	...	...
402	White Clover	25g	...	0.093	...	...	...	...	...	...	<i>244</i>	...	...	...	...	...
414	Plankton	5g	...	6.82	...	...	0.383	...	23.8	29.5	<i>1.85</i>	0.276	...	...	...	299
482	Lichen	15g	1103	0.85	...	...	0.56	...	4.12	7.03	...	0.48	...	...	...	...
679	White Cabbage	15g	...	0.0070	...	...	1.66	...	...	2.89	55.0	0.0063	...	...	...	...

* Range of results observed

BCR No.	Mo	N	Na	Ni	P	Pb	S	Se	Sr	Tl	Zn	Others
060 continued	...	<i>41200</i>	...	...	...	63.8	<i>5200</i>	...	...	...	313	...
063R continued	<i>0.33</i>	62300	4370	...	11100	0.0185	...	<i>0.129</i>	...	...	49.0	...
100 continued	...	26290	...	...	1550	<i>16.3</i>	2690	...	...	...	<i>69</i>	...
129 continued	<i>1</i>	37200	...	...	2360	...	3160	<i>0.025</i>	...	...	32.1	...
184 continued	...	...	<i>2000</i>	<i>0.27</i>	<i>8300</i>	0.239	...	0.183	...	...	166	...
185R continued	...	...	...	...	...	0.172	...	1.680	...	...	138.6	...
191 continued	...	...	<i>10000</i>	<i>0.44</i>	<i>2100</i>	0.187	...	<i>0.025</i>	...	...	19.5	...
279 continued	...	<i>20800</i>	...	...	<i>1800</i>	13.48	...	0.593	...	...	51.3	<i>345 Br</i>
402 continued	6.93	...	...	<i>8.25</i>	...	...	...	6.70	...	...	<i>25.2</i>	0.178 Co
414 continued	...	...	...	18.8	...	3.97	...	1.75	261	...	112	8.23 V
482 continued	...	...	...	2.47	...	40.9	...	...	...	...	100.6	...
679 continued	14.8	...	...	27.0	...	...	...	...	11.8	0.00295	79.7	27.7 B, 0.0103 Ba, 0.0206 Sb

COMMUNITY BUREAU OF REFERENCE (BCR), Belgium

CHEMICAL COMPOSITION (nominal mass content as shown in tables) - Figures in bold type certified, figures in small italic type only approximate.

Environmental Certified Reference Materials (Finely divided material – unit weights as shown below)

BCR No.	Description	Unit	As	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Se	Na	Zn	Others	
038	Coal Fly Ash	µg/g	5g	48.0	4.6	53.8	192	176	33800	2.10	479	<i>194</i>	262	...	3740	581	<i>17.3 Th, 334 V</i>
142R	Light Sandy Soil	"	40g	...	0.34	12.1	<i>113</i>	69.7	...	0.067	970	64.5	40.2	<i>101</i>	} Data on Aqua Regia Solubles
143R	Sewage Sludge- amended soil	"	40g	...	71.8	12.3	<i>577</i>	130.6	...	1.10	904	299	179.7	<i>0.6</i>	...	1055	
144R	Sewage Sludge- domestic origin	"	40g	...	1.82	15.0	104	308	...	3.14	208	47.7	106	...	...	932
145R	Sewage Sludge- mixed origin	"	40g	...	3.50	5.61	<i>313</i>	696	...	2.01	156	247	286	...	...	2122
146R	Sewage Sludge- industrial origin	"	40g	...	18.8	7.39	196	838	...	8.62	324	69.7	609	3061	

Particle Size Distribution and Surface Area Certified Reference Materials

BCR No.	Type of Quartz	Unit	Certified Property	Size Range
066	Powder	10g	Stokes' Diameter	0.35 - 3.50 µm
067	Powder	10g	"	2.4 - 32 µm
068	Sand	100g	Volume Diameter	160 - 630 µm
069	Powder	10g	Stokes' Diameter	14 - 90 µm
070	Powder	10g	"	1.2 - 20 µm
130	Powder	50g	Volume Diameter	50 - 220 µm
131	Powder	200g	"	0.48 - 1.80 mm
132	Gravel	700g	"	1.4 - 5 mm
169	Alpha alumina	60g	Specific Surface Area	0.104 m ² /g
170	Alpha alumina	60g	" " "	1.05 m ² /g
171	Alumina	50g	" " "	2.95 m ² /g
172	Quartz	10g	" " "	2.56 m ² /g
173	Rutile Titania	46g	" " "	8.23 m ² /g
175	Tungsten	200g	" " "	0.181 m ² /g

Sulphur in Fuel Certified Reference Materials

BCR No.	Description	Unit	S
106	"	%	25g
107	"	%	25g
331	Low Volatile Steam Coal	mg/g	20g
332	HV Industrial Coal	mg/g	20g
333	Coking Steam Coal	mg/g	20g
334	Anthracite	mg/g	20g
335	Flame Coal	mg/g	20g
336	HV Steam Coal	mg/g	20g

Zinc and Zinc Alloy Certified Reference Materials (80mm dia x 20mm discs)

BCR No.	Description	Al	Cd	Cu	Fe	In	Mg	Ni	Pb	Sn	Tl
321	Unalloyed Zinc	µg/g	<0.7	<i>0.22</i>	<i>0.95</i>	<i>2.3</i>	...	...	4.7	<0.5	0.8
EB322	"	"	...	15.08	5.89	19.1	...	...	15.0	5.6	5.28
EB323	"	"	...	6.51	18.9	11.3	...	...	48.6	18.7	10.8
EB324	"	"	...	48.6	9.87	58.5	...	...	26.1	9.8	19.9
EB325	"	"	...	94.7	47.5	56.1	...	...	142	46.1	36.8
326	"	"	<i><0.7</i>	204	105	265	...	...	307	...	...
327	"	"	...	302	<i>0.56</i>	144	...	...	408	...	...
351	Zamak 3	"	43500	<i>0.2</i>	12.1	...	<0.2	130	<i>1.9</i>	4.5	<1
352	"	"	41500	2.9	31.2	...	3.0	282	<i>6.5</i>	3.0	3.2
353	"	"	39500	10.5	100	...	2.6	452	...	24.7	5.5
354	"	"	37300	30	311	...	9.8	604	83.5	31.0	11.0
355	"	"	34400	58	1034	...	24.6	786	267	57	29.4
356	Zamak 5	"	44300	0.73	3940	...	<0.2	133	3.4	10	0.3
357	"	"	42300	2.8	5850	...	3.3	273	9.8	14	3.5
359	"	"	37100	30	9880	...	15.5	560	92	36	17.2
360	"	"	34200	60	12320	...	30	707	267	75	33.3
361	"	"	<i>40700</i>	<i>0.80</i>	798	...	10.4	...	...	5.3	46.8

COMMUNITY BUREAU OF REFERENCE (BCR), Belgium

CHEMICAL COMPOSITION (nominal mass content as shown in tables) - Figures in bold type certified, figures in small italic type only approximate.

Water Certified Reference Materials (Concentrations and unit weights as shown below)

BCR No.	Description	Unit	Al	As	Ca	Cd	Cl	Cu	K	Mg	Na	Ni	Pb	Zn	NO ₃	SO ₄	Mn
505	Estuarine Water	nmol/kg	1litre	...	...	...	0.80	...	29.4	...	...	24.1	...	172	...	...	...
609	Ground Water	mg/kg	500ml	47.7	1.20	...	0.164	...	2.48	...	...	...	1.63	...	...	...	...
610	Ground Water	mg/kg	500ml	159	10.8	...	2.94	...	45.7	...	...	...	7.78	...	...	...	...
617	Ground Water	mg/kg	75ml	...	...	14.6	...	26.4	...	9.93	7.32	14.6	...	...	25.8	26.3	0.050

Coal Certified Reference Material (Finely divided material – units of 40g) nominal mass content in µg/g

BCR No.	Description	F
460	Fluorine in Coal	225

Copper Certified Reference Materials nominal mass content in µg/g

BCR No.	Description	Ag	As	Bi	Cd	Co	Cr	Fe	Mn	Ni	O	P	Pb	S	Sb	Se	Sn	Te	Zn
017	Phosphorus Deoxidised Copper	...	...	...	...	...	...	...	...	...	...	6.9	...	10.4	...	...	...	...	...
022	Electrolytic Copper	...	...	...	...	...	...	...	...	...	138	...	...	...	...	...	...	...	...
054R	Low Oxygen in Copper	...	...	...	...	...	...	...	...	...	0.47	...	...	...	...	...	...	...	...
058	Continuous Cast Copper	...	...	...	...	...	...	...	...	...	390	...	...	...	...	...	...	...	...
074	Electrolytic Copper (OFHC)	12.8	0.78	<i>0.10</i>	<0.02	<0.05	<0.1	1.14	1.27	1.04	...	...	0.97	...	0.58	0.37	<0.07	<i>0.21</i>	0.46

These copper CRMs are available in the following forms:

017A 42mm dia x 30mm discs
022A 26mm dia x 9mm discs
054R 7mm dia x 50mm rods

058 7mm dia x 50mm rods
074A 40mm dia x 30mm discs

Lead Certified Reference Materials (All available as finely divided material units of 160g, 286 and 287 also available as blocks, 60 x 60 x 12mm) nominal mass content in µg/g

BCR No.	Description	Ag	As	Bi	Cd	Cu	Ni	Pb	Sb	Se	Sn	Tl	Ti	Zn
286	Electrorefined Lead	0.015	<0.002	21.5	0.125	1.49	0.041	Bal.	0.10	<0.05	<0.05	<0.1	2.5	<0.1
287	Thermally Refined Lead	15.2	<0.003	67.3	0.36	0.98	0.024	Bal.	0.040	<0.05	<0.05	<0.2	0.73	<0.1
288	Lead with added impurities	30.5	55.7	215.8	33.3	19.3	4.57	Bal.	32.5	<0.2	30.6	32.8	2.3	8.2

These tables represent only a small selection from the BCR range, which includes samples under the headings:

Gases in Metals
Non Ferrous Metals
Ores
Coke

Coal
PCBs
Lead Crystal Glass
Fertilizers

Organic Compounds
Flash Point
Limiting Viscosity Number
Cosmetic Preservatives

Biomedical
Thermal Conductivity
Gas Mixtures
Polycyclic Aromatic Compounds

BNF - FULMER, (BNF) UK
CHEMICAL COMPOSITION (nominal mass content in %)

Following the closure of the BNF-Fulmer organization in October 1992, BAS purchased their entire stock of non-ferrous spectroscopic reference materials and will continue to supply these until exhausted. Replacement samples are being produced by BAS in order to maintain continuity of these samples (see BAS Catalogue for details of such samples which are designated as CURMs).

Copper Base Reference Materials (Approx. 50mm dia x 10mm discs)

BNF No.	Description	Cu	Sn	Pb	Zn	Ni	P	Fe	Si	Mn	As	Sb	Bi	Al	Mg	Co	S	Ag	Te
C09.05	Phos. Deoxidised Copper	Bal.	<0.001	<0.001	<0.005	<0.001	0.027	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.001	...	<0.0005	...	<0.001	<0.002
C11.01	Copper Tin Binary Bronzes	Bal.	3.4	0.01	<0.005	0.006	0.009	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0005	<0.005	<0.001	...	<0.001	...	...
C11.02	"	Bal.	5.5	0.02	<0.005	0.006	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0005	<0.005	<0.001	...	<0.001	...	...
C11.03	"	Bal.	7.4	0.01	<0.005	<0.005	0.04	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0005	<0.005	<0.001	...	<0.001	...	...
C11.04	"	Bal.	9.6	0.01	<0.005	<0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0005	<0.005	<0.001	...	<0.001	...	...
C30.01	Main Elements in Brasses	51.48	<0.01	<0.01	Bal.	<0.005	...	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.002	...	...	...	...	...
C30.02	"	55.6	<0.01	<0.01	Bal.	<0.005	...	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	...	...	...	...	...
C30.03	"	60.6	<0.01	<0.01	39.3	<0.01	...	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	...	...	...	...	...
C30.06	"	74.8	<0.01	<0.01	Bal.	<0.01	...	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	...	...	...	...	...
C30.07	"	82.0	<0.01	<0.01	Bal.	<0.01	...	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	...	...	...	...	...
C30.09	"	89.5	<0.01	<0.01	Bal.	<0.01	...	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	...	...	...	...	...
C30.10	"	93.8	<0.01	<0.01	6.1	<0.01	...	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	...	...	...	...	...
C30.12	"	60.85	<0.01	<0.01	Bal.	0.52	...	<0.005	<0.005	0.90	<0.005	<0.005	<0.002	<0.005	...	...	...	...	...
C30.13	"	60.6	<0.01	<0.01	Bal.	<0.01	...	<0.005	<0.005	1.9	<0.005	<0.005	<0.002	<0.002	...	...	...	...	...
C30.14	"	60.5	<0.005	<0.01	Bal.	1.0	...	<0.01	<0.005	2.4	<0.005	<0.005	<0.005	<0.005	...	...	...	...	...
C30.15	"	60.6	<0.01	<0.01	Bal.	<0.01	...	0.55	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	...	...	...	...	...
C30.16	"	61.2	<0.01	<0.01	Bal.	<0.01	...	0.90	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	...	...	...	...	...
C30.17	"	61.6	<0.01	0.01	Bal.	0.01	...	1.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	...	...	...	...	...
C30.18	"	64.36	0.65	<0.01	Bal.	<0.005	...	<0.005	0.10	<0.005	<0.005	<0.005	<0.003	2.91	...	...	...	...	...
C30.19	"	69.9	1.07	<0.01	Bal.	<0.01	...	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002	4.65	...	...	...	...	...
C30.21	"	56.0	1.96	<0.005	Bal.	<0.005	...	<0.005	0.18	<0.005	<0.005	<0.01	...	1.44	...	...	...	...	...
C30.22	"	58.28	0.009	1.05	Bal.	<0.01	...	0.006	<0.005	<0.005	0.011	<0.012	<0.005	<0.003	...	...	...	...	...
C38.01	Impurities in Brasses	61	0.20	0.20	Bal.	0.01	...	0.01	<0.0005	0.009	0.03	0.02	<0.0005	0.003	...	...	...	...	...
C38.02	"	61	0.10	0.10	Bal.	0.03	...	0.09	0.01	0.14	0.06	0.06	0.005	0.004	...	...	...	...	...
C38.03	"	61	0.05	0.06	Bal.	0.13	...	0.05	0.07	0.07	0.08	0.08	0.008	0.07	...	...	...	...	...
C38.04	"	61	0.02	0.03	Bal.	0.06	...	0.04	0.12	0.22	0.04	0.12	0.008	0.02	...	...	...	...	...
C38.05	"	61	0.01	0.02	Bal.	0.19	...	0.008	0.14	0.02	0.01	0.01	0.01	0.12	...	...	...	...	...
C38.06	"	61	<0.005	0.002	Bal.	<0.005	...	<0.005	<0.0005	<0.001	<0.001	<0.002	<0.0005	<0.001	...	...	...	...	...
C38.07	60/40 Brass Setting-Up Sample	60	0.2	0.2	Bal.	0.2	...	0.1	0.03	0.2	0.1	0.1	0.1	0.1	...	...	...	...	...

BNF - FULMER, (BNF) UK
CHEMICAL COMPOSITION (nominal mass content in %)

Copper Base Reference Materials (Approx. 50mm dia x 10mm discs)

BNF No.	Description	Cu	Sn	Pb	Zn	Ni	P	Fe	Si	Mn	As	Sb	Bi	Al	Mg	Co	S	Cr	Ag	Cd
C42.21	Admiralty and Naval Brasses	66.1	0.54	0.23	Bal.	0.096	0.081	0.06	0.081	<0.005	<0.005	0.19	0.012	0.005	...	...	0.007	...	...	...
C42.25	"	58.5	2.2	<0.01	Bal.	<0.005	0.06	<0.005	<0.002	0.13	0.10	<0.005	<0.002	0.02	...	...	0.001	...	...	...
C43.03	Aluminium Brass	80.0	<0.01	0.11	Bal.	<0.003	...	0.044	<0.005	<0.002	<0.005	<0.01	<0.005	1.41	...	...	...	...	...	...
C48.03	Cartridge Brasses	70.45	0.047	0.054	Bal.	0.030	<0.001	<0.001	<0.002	0.040	0.079	0.097	0.029	0.007	0.001	...	0.004	0.0005	...	0.013
C48.06	"	71.6	0.03	0.02	Bal.	0.11	0.002	0.02	0.006	0.006	0.008	0.006	0.004	0.002	0.001	...	0.006	0.0006	...	0.008
C51.11	Aluminium Bronzes	Bal.	0.025	0.31	0.07	0.15	0.03	0.07	0.11	<0.005	<0.01	...	...	5.0	...	...	...	...	...	...
C51.12	"	Bal.	0.18	0.25	0.42	0.11	<0.005	2.90	<0.01	1.25	0.11	...	...	6.06	...	...	...	...	...	...
C51.13	"	Bal.	0.19	0.12	0.30	0.053	0.021	2.05	0.16	0.77	0.21	...	...	6.93	...	...	...	...	...	...
C52.51	Aluminium Bronzes	Bal.	<0.01	<0.01	0.02	5.1	...	4.3	<0.01	<0.01	...	...	...	10.0	<0.01	...	...	<0.01	...	...
C52.53	"	Bal.	0.07	0.04	0.11	4.1	...	5.5	0.10	0.38	...	...	...	10.7	0.07	...	...	0.19	...	...
C52.55	"	Bal.	0.03	0.14	0.10	4.6	...	4.9	0.03	1.1	...	...	...	9.3	0.13	...	...	0.05	...	...
C52.56	"	Bal.	0.11	0.17	0.28	5.6	...	4.6	0.15	0.74	...	...	...	8.9	0.09	...	...	0.14	...	...
C54.01	Phosphor Bronzes	Bal.	3.2	0.29	0.31	0.26	0.05	0.01	0.006	0.13	0.04	0.08	...	0.009	<0.001	...	0.03	...	...	...
C62.11	Cupro-Nickels	Bal.	0.04	<0.005	0.097	29.8	...	0.60	0.36	0.52	...	...	...	...	0.03	<0.005	<0.005	...	...	...
C62.13	"	Bal.	0.06	0.046	0.01	14.2	...	<0.005	0.071	0.95	...	...	...	...	0.014	0.055	0.12	...	...	...
C62.14	"	Bal.	0.12	0.01	0.12	20.2	...	1.49	0.022	0.24	...	...	...	...	0.002	0.03	0.083	...	...	...
C62.15	"	Bal.	0.03	0.016	0.04	25.9	...	2.36	0.014	0.23	...	...	...	...	0.004	0.042	0.023	...	...	...
C65.26	Nickel Silvers	56.7	<0.01	0.06	30.5	11.9	0.11	<0.01	<0.002	0.70	...	...	...	...	<0.01	...	0.0006	...	...	...
C65.27	"	57.0	0.01	0.04	28.7	13.9	0.02	0.26	<0.002	0.13	...	...	...	...	<0.01	...	0.03	...	...	...
C65.28	"	56.9	0.15	0.06	26.7	15.3	0.07	0.13	0.01	0.57	...	...	...	...	0.01	...	0.03	...	...	...
C65.29	"	58.9	0.08	0.11	23.4	16.8	0.07	0.39	0.02	0.17	...	...	...	...	0.01	...	0.07	...	...	...
C65.30	"	55.0	0.04	0.25	23.5	19.8	0.05	1.0	0.10	0.09	...	...	...	...	0.01	...	0.04	...	...	...
C71.34	Gunmetal	Bal.	8.20	2.47	1.55	<0.01	0.020	0.29	0.04	0.05	0.18	0.071	0.029	0.007	...	...	0.16	0.03	0.025	...

BNF - FULMER, (BNF) UK
CHEMICAL COMPOSITION (nominal mass content in %)

Nickel Base Alloy Reference Materials (Approx. 28.6mm dia. x 25mm discs)

BNF No.	Description	C	Si	Cu	Fe	Mn	Cr	Ti	Al	Co	Mo	Mg	Ni
B6998	MONEL alloy 400	0.09	0.04	31.3*	2.30	0.29	0.02	0.11	0.008	0.025	...	0.079	Bal.
B7000	"	0.05	0.11	31.5*	0.64	0.87	0.035	0.03	0.028	0.50	...	0.026	Bal.
B7001	"	0.01	0.28	31.4*	0.32	1.66	0.05	0.025	0.040	0.25	...	0.010	Bal.
B7002	"	0.015	0.15	31.7*	0.13	2.65	0.10	0.015	0.060	0.10	...	0.007	Bal.
E3918	NIMONIC Alloy 75	0.05	1.14	0.005	1.57	0.85	19.4*	0.72	0.25	0.22	0.49	0.058	Bal.
E3919	"	0.07	0.89	0.055	2.62	0.47	19.6*	0.40	0.15	1.00	0.25	0.040	Bal.
E3920	"	0.07	0.57	0.11	3.02	0.28	19.2*	0.35	0.13	2.02	0.095	0.020	Bal.
E3921	"	0.11	0.34	0.27	3.50	0.14	19.4*	0.20	0.045	0.53	0.05	...	Bal.
E3922	"	0.14	0.16	0.50	3.98	0.10	19.2*	0.08	0.035	0.115	0.03	0.014	Bal.
B7004	NIMONIC Alloy 80A	0.01	0.17	0.14	0.97	0.08	19.6*	2.63	1.64	0.06	0.06	0.002	Bal.
B7005	"	0.035	0.23	0.045	0.32	0.16	19.6*	2.52	1.55	1.04	0.10	0.005	Bal.
B7006	"	0.08	1.03	0.075	0.61	0.25	19.6*	2.14	1.19	0.35	0.20	0.008	Bal.
B7007	"	0.14	0.66	0.22	0.22	0.53	19.4*	2.31	1.36	0.15	0.39	0.019	Bal.
B7008	"	0.21	0.36	0.025	0.19	0.02	19.3*	2.33	1.46	2.00	<0.01	0.030	Bal.
B7010	NIMONIC Alloy 90	0.05	0.22	0.04	0.62	0.24	19.7*	2.48	1.61	16.9*	0.10	0.004	Bal.
B7011	"	0.095	1.02	0.065	0.34	0.16	19.7*	2.05	1.20	17.0*	0.20	0.010	Bal.
B7012	"	0.16	0.39	0.11	0.25	0.53	19.6*	2.28	1.25	17.0*	0.39	0.018	Bal.
B7013	"	0.22	0.65	0.20	0.22	0.06	19.6*	2.39	1.46	17.0*	<0.01	0.030	Bal.
E3923	NIMONIC Alloy 800	0.01	0.17	0.54	Bal.	1.00	20.6*	0.29	0.57	0.06	0.51	...	32.0*
E3924	"	0.03	0.30	0.29	Bal.	0.85	20.6*	0.30	0.28	0.13	0.26	...	32.3*
E3925	"	0.08	0.41	0.14	Bal.	0.68	20.8*	0.28	0.24	0.28	0.10	...	32.2*
E3926	"	0.06	0.60	0.085	Bal.	0.50	20.2*	0.39	0.08	0.54	0.05	...	32.0*
E3927	"	0.08	0.75	0.055	Bal.	0.40	20.4*	0.58	0.10	1.02	0.025	...	32.1*
E3928	INCOLOY Alloy DS	0.10	1.77	0.05	Bal.	1.44	18.2*	0.24	0.115	1.01	0.025	...	36.5*
E3929	"	0.085	1.80	0.085	Bal.	1.30	17.9*	0.14	0.07	0.52	0.055	...	36.3*
E3930	"	0.08	2.09	0.135	Bal.	1.18	18.6*	0.065	0.03	0.26	0.105	...	36.2*
E3931	"	0.05	2.32	0.28	Bal.	1.06	18.5*	0.035	0.015	0.12	0.25	...	36.4*
E3932	"	0.04	2.50	0.55	Bal.	0.93	18.5*	0.025	0.01	0.07	0.49	...	36.4*

* These values are not designed for calibration purposes and are quoted for reference only.(MONEL, NIMONIC and INCOLOY are all trade marks of INCO Ltd.)

BNF - FULMER, (BNF) UK
CHEMICAL COMPOSITION (nominal mass content)

Nickel Base Alloy Reference Materials (Approx. 28.6. x 25mm discs) Nominal mass content in %

BNF No.	Description	C	Si	Cu	Fe	Mn	Cr	Ti	Al	Co	Mg	Mo	Nb	Ni
B5789	INCONEL Alloy 600	...	0.61	0.24	6.10	0.39	16.5*	0.52	0.09	0.60	0.017	...	...	Bal.
B5871	"	...	0.88	0.02	6.34	0.57	16.0*	0.27	0.18	1.09	0.013	...	...	Bal.
B5967	"	...	0.45	0.41	7.18	0.23	16.0*	0.28	0.09	0.31	0.038	...	...	Bal.
B5968	"	...	0.22	0.80	8.05	0.12	16.0*	0.11	0.03	0.18	0.059	...	...	Bal.
B7047	INCONEL Alloy X-750	0.035	0.17	0.49	5.51	1.29	15.0*	2.71	0.49	...	...	0.58	1.36†	Bal.
B7048	"	0.075	0.23	0.30	6.09	1.00	15.1*	2.52	0.71	...	...	0.30	1.18†	Bal.
B7049	"	0.09	0.33	0.155	7.08	0.81	15.0*	2.30	0.91	...	...	0.20	0.97†	Bal.
B7050	"	0.125	0.44	0.075	8.09	0.61	15.0*	2.27	1.01	...	...	0.10	0.77†	Bal.

* These values are not designed for calibration purposes and are quoted for reference only.

† Samples contain less than 0.01% Ta.

(INCONEL is a trade mark of INCO Ltd.)

Lead Base Alloy Reference Materials (Approximately 50mm square x 20mm blocks) Nominal mass content in µg/g

BNF No.	Description	Cu	Sn	Pb	Zn	Ni	Cd	As	Sb	Bi	Ag	Te
L01.02-1	Impurities in lead	18.0	≤0.7	Bal.	4	8	22.6	0.95	3	101	1.3	7.4
L01.03-1	"	24.3	≤0.7	Bal.	4.5	5.1	6.2	1.3	2.7	6	52	6.1

Lead Base Alloy Reference Materials (Approximately 50mm square x 20mm blocks) Nominal mass content in %

BNF No.	Description	Cu	Sn	Pb	Zn	Ni	Cd	Sb	Bi	Ca	Ag
L21.01-1	Battery Alloys	0.0008	0.10	Bal.	0.002	0.0005	0.0015	0.0005	0.03	0.05	0.005
L21.02-1	"	0.0013	0.27	Bal.	0.0016	≤0.0002	≤0.0002	0.0003	0.01	0.03	0.008
L21.03-1	"	0.002	0.35	Bal.	0.001	≤0.0002	0.001	0.0006	0.03	0.1	0.015
L21.04-1	"	0.003	0.45	Bal.	0.001	≤0.0002	0.001	0.0008	<0.001	0.1	0.002

BRAMMER STANDARD COMPANY, Inc. (BS), USA

CHEMICAL COMPOSITION (nominal mass content in %) - Figures in brackets are for information only.

Chill Cast Iron Reference Material (32mm dia. x 17mm disc)

BRAMMER No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Co	Cu	N
BS 4C	3.82	0.52	0.21	0.003	0.001	0.111	0.105	0.068	0.003	0.007	0.0002	0.014	0.014	0.008

BRAMMER No.	Nb	Pb	Sn	Ti	V	W	Zr	Ca	Ce	La	Mg	Sb	Te
BS 4C (continued)	(0.0005)	(0.0004)	(0.0004)	0.002	0.0005	(0.006)	0.010	0.0013	0.010	0.002	0.0002	0.0012	0.0011

Low Alloy Steel Reference Materials (CSN 2-1, CSN 2-2, CSN 3 & CSN 4 are 500 x 1g pins; HON T is 100 x 1g pins; CSN 2C is 100g finely divided material)

BRAMMER No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	H	N	O	V	Ca
BS CSN 2-1	0.476	...	...	...	0.034	...	...	...	...	...	...	0.064	...	...	...
BS CSN 2-2	0.548	...	...	...	0.028	...	...	...	...	...	...	0.076	...	...	...
BS CSN 2C	0.469	0.17	0.60	0.012	0.0305	0.072	(0.008)	0.071	0.046	0.073	...	0.0173	...	0.004	0.0033
BS CSN 3	0.892	...	...	...	0.0035	...	...	...	...	...	...	0.0047	...	...	...
BS CSN 4	0.011	(0.20)	(1.6)	(0.04)	0.0008	(18.2)	...	(9.4)	...	(3.8)	...	0.026	...	...	...
BS HON T	0.050	...	...	...	0.0040	...	...	...	...	...	0.00027	0.0365	0.0044	...	...

Low Alloy Steel Reference Material with minor Elements - Chill Cast (32mm dia. x 17mm discs)

BRAMMER No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Co	Cu	N	Nb	Pb
BS 13B	0.211	0.015	0.316	0.018	0.005	0.081	0.050	0.43	0.016	0.050	(0.00002)	0.19	0.023	0.0099	0.003	0.0009

BRAMMER No.	Sn	Ti	V	W	Zr	Bi	Ca	Ce	La	Mg	Sb	Se	Ta	Zn
BS 13B (continued)	0.061	0.004	0.010	0.04	(0.01)	(<0.0001)	(<0.0001)	(<0.0005)	(<0.0005)	(0.00005)	0.027	0.023	0.005	0.0003

Calcium Treated Carbon Steel Reference Materials (41-42mm dia. x 19mm disc)

BRAMMER No.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Al	As	B	Ca	Co	Nb	N	O	Pb	Sb	Sn	Ti	V	W
BS 2931A	0.178	0.842	0.0046	0.0262	0.244	0.199	0.064	0.086	0.018	0.0011	0.005	0.0004	0.0014	0.0067	(0.0004)	0.0099	0.0050	0.0008	0.0021	0.0094	0.0006	0.0006	(0.0013)
BS 3941	0.41	0.80	0.016	0.023	0.25	0.053	0.019	0.068	0.006	0.002	0.003	...	0.0013	0.004	0.031	0.0070	(0.006)	0.0010	(0.0007)	(0.002)	(0.002)	0.003	...
BS 3942	0.47	0.72	0.023	0.032	0.26	0.281	0.14	0.165	0.037	0.004	0.009	...	0.0012	0.010	0.019	(0.0088)	(0.0041)	0.0003	0.003	0.012	0.003	0.0019	0.003

BRAMMER STANDARD COMPANY, Inc. (BS), USA

CHEMICAL COMPOSITION (nominal mass content in %) - Figures in brackets are for information only.

High Manganese Steel Reference Materials (32mm dia. x 17mm discs)

BRAMMER No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Co	Cu	N	Nb	Sn	V
BS 17A	0.588	0.22	19.38	0.043	0.005	1.37	0.52	0.060	0.052	0.013	0.135	0.038	0.06	0.012	0.016
BS 18A	1.13	0.64	11.30	0.019	0.043	0.22	0.049	0.36	0.019	0.009	0.029	0.042	0.05	0.007	0.32
BS 19A	1.57	1.46	8.76	0.092	0.009	3.75	1.97	1.48	0.057	0.014	0.51	0.039	0.040	0.037	0.10

Stainless and High Temperature Steel Reference Materials (35 to 45mm dia. x 12mm discs)

BRAMMER No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	B	Ca	Co	Cu	N	O	Nb	Sn	Ti	V	W	Others
BS 17-4PHA	0.018	0.40	0.85	0.023	0.022	15.40	0.34	4.69	0.004	0.0016	0.0009	0.072	3.30	0.022	0.006	0.204	0.007	(0.002)	0.043	0.04	(0.002) Ta
BS 17-4PHB	0.042	0.42	0.56	0.021	0.024	15.60	0.11	4.53	0.0935	0.0036	(0.0003)	0.040	3.35	0.046	(0.0021)	0.31	0.012	0.005	0.059	(0.01)	(0.002) Ta
BS 81P	0.026	0.36	1.35	0.023	0.012	18.15	0.41	10.06	(0.003)	0.0026	(0.0004)	0.21	0.19	0.069	(0.0064)	...	0.007	0.003	0.078	0.037	...
BS 82E	0.062	0.58	1.61	0.027	0.001	22.38	0.31	12.49	0.006	0.0024	0.0014	0.12	0.26	0.072	...	0.062	0.006	0.003	0.064	0.041	...
BS 83G	0.073	0.56	1.66	0.024	0.004	24.50	0.085	19.15	(0.004)	(0.0001)	...	0.153	0.114	0.026	0.0064	0.061	0.003	(0.003)	0.077	0.007	...
BS 84J	0.017	0.57	1.46	0.035	0.025	17.12	2.08	10.34	(0.002)	0.0005	0.0010	0.23	0.46	0.056	0.0063	0.024	0.007	(0.002)	0.09	0.054	...
BS 85D	0.049	0.55	1.69	0.025	0.024	17.09	0.59	10.03	0.13	0.0006	0.0004	0.97	0.45	0.016	0.0014	0.065	(0.006)	0.48	0.134	0.06	{ 0.006 As 0.001 Sb
BS 86F	0.054	1.22	1.30	0.021	0.0011	18.74	0.24	34.99	(0.007)	0.0020	(0.001)	0.098	0.23	0.035	...	0.19	0.004	(0.006)	0.061	(0.03)	{ 0.003 As 0.001 Pb
BS 87F	0.055	0.67	1.64	0.024	0.025	17.30	0.29	10.12	0.004	(0.0006)	0.0007	0.17	0.28	0.037	0.005	0.57	0.004	0.004	0.13	0.050	0.005 As
BS 90F	0.085	0.58	0.53	0.023	0.328	13.01	0.14	0.30	(0.006)	...	...	0.021	0.12	0.037	0.011	0.011	0.005	...	0.076	0.032	...
BS 92B	0.150	0.42	0.42	0.021	0.003	15.92	0.17	2.12	(0.002)	...	(0.0009)	0.04	0.13	0.073	0.0064	(0.006)	0.006	...	0.07	(0.02)	...
BS 94C	0.057	0.62	0.45	0.024	0.002	25.90	0.20	0.43	0.004	...	0.0008	0.042	0.056	0.065	0.0061	0.032	0.006	...	0.12	...	...
BS 180A	0.018	0.32	5.05	0.012	0.001	21.09	2.04	13.19	0.012	(0.0023)	...	0.039	0.067	0.334	0.003	0.20	(0.002)	(0.002)	0.20	0.02	...
BS 181A	0.071	4.03	8.16	0.019	0.001	16.52	0.21	8.15	0.022	0.0009	...	0.07	0.18	0.148	0.0010	0.017	0.005	0.007	0.094	0.04	...
BS 183A	0.172	0.37	0.35	0.016	0.004	12.14	0.12	1.85	0.002	(<0.0005)	0.0020	0.036	0.093	0.0256	0.0065	0.006	0.003	0.002	0.090	2.60	...
BS 184A	0.035	0.08	0.06	0.007	0.001	12.66	2.20	8.34	1.00	(0.0004)	(0.0003)	0.036	0.041	0.0045	(0.0003)	0.006	(0.002)	0.051	0.014	0.032	...
BS 185A	0.033	0.38	0.49	0.022	0.002	14.46	0.30	4.43	0.002	0.0012	(0.0002)	0.026	3.41	0.027	(0.0021)	0.32	0.007	(0.001)	0.048	(0.014)	(0.002) Ta
BS 186A	0.040	0.19	0.72	0.008	0.005	0.16	0.003	35.86	(0.001)	...	...	0.028	0.016	0.0026	...	<0.002	(0.002)	<0.003	0.001	<0.03	0.229 Se
BS 187C	0.020	0.77	0.77	0.024	<0.002	20.16	2.07	32.93	0.10	(0.0019)	...	0.096	3.17	0.022	0.0024	0.36	0.004	(0.001)	0.059	...	...
BS 188A	0.050	0.15	0.14	0.015	0.005	14.04	1.10	24.61	0.19	0.0065	...	0.18	0.099	0.0029	0.0012	0.050	0.002	2.21	0.24	0.055	...
BS 318	0.020	0.48	1.39	0.019	0.002	22.30	3.31	5.61	0.006	(0.0004)	(0.0004)	0.101	0.17	0.159	(0.0004)	...	0.004	(0.003)	0.064	<0.02	...
BS 9841	0.067	0.54	1.69	0.024	0.024	24.30	0.57	19.55	(<0.006)	0.0026	(0.0002)	0.116	0.356	0.064	(0.011)	0.070	0.006	(0.002)	0.070	0.06	(0.006) Sb
BS 9842	0.059	0.99	1.50	0.025	0.0016	24.19	0.111	20.02	0.014	0.0025	0.0010	0.237	0.147	0.037	(0.0044)	0.026	0.005	0.003	0.075	0.011	(0.002) As
BS 9941	0.021	0.33	1.78	0.027	0.024	18.48	3.24	13.68	0.004	0.0025	(0.0003)	0.178	0.424	0.036	(0.0058)	0.015	0.007	(0.002)	0.062	0.068	(0.010) As

BRAMMER STANDARD COMPANY, Inc. (BS), USA
CHEMICAL COMPOSITION (nominal mass content in %) - Figures in brackets are for information only.

Nickel Base Alloy Reference Materials (disc samples – dimensions as below)

Brammer No.	Description	Disc dimensions mm	C	Si	Mn	P	S	Cr	Mo	Ni	Al	B	Co	Cu	Nb	Pb	Sn	Ti	V	W	Fe	Mg	Others
BS 200A	Nickel 200	38 dia. x 12	0.077	0.007	0.15	<0.003	0.004	(0.001)	<0.002	Bal.	0.029	0.0044	0.057	0.004	(0.001)	<0.0005	...	0.043	0.001	<0.01	0.076	0.013	...
BS 200-1	"	38 dia. x 20	0.042	0.039	0.113	(0.002)	0.001	0.001	0.001	Bal.	0.005	0.0033	0.090	0.008	(0.002)	0.0012	...	0.021	0.001	<0.001	0.050	0.031	...
BS 200-2	"	"	0.051	0.060	0.242	(0.003)	0.007	0.010	(0.001)	Bal.	0.006	0.0040	0.104	0.052	(0.002)	0.0007	...	0.020	0.002	<0.001	0.120	0.036	...
BS 200-3	"	"	0.014	0.011	0.16	0.002	0.004	0.008	(0.002)	Bal.	(0.007)	0.0041	0.103	0.108	(0.002)	0.0009	...	0.024	0.003	<0.001	0.142	0.023	...
BS 200-4	"	"	0.11	0.100	0.31	0.003	0.008	0.130	0.001	Bal.	(0.007)	0.0037	0.091	0.049	0.002	0.0010	...	0.019	0.003	<0.001	0.290	0.030	...
BS 600C	Inconel Alloy	38 dia. x 12	0.071	0.39	0.50	0.008	0.001	15.64	0.03	73.5	0.21	0.0012	0.033	0.05	0.021	0.005	0.002	0.21	0.03	0.002	9.31	0.0022	0.002 Ta
BS 600-1	"	40 dia. x 6	0.07	0.11	0.39	0.006	0.006	15.30	0.011	74.5	0.23	0.01	0.10	0.14	0.024	0.004	0.003	0.31	0.028	0.003	8.77	0.021	<0.001 Ta
BS 600-2	"	38 dia. x 12	0.07	0.24	0.31	0.006	0.007	16.34	0.008	75.4	0.16	0.01	0.09	0.10	0.029	0.003	0.003	0.37	0.029	<0.001	6.80	0.011	0.004 Ta
BS 600-3	"	"	0.02	0.19	0.28	0.009	0.005	14.77	0.005	75.1	0.18	0.009	0.10	0.25	0.023	0.004	0.003	0.20	0.018	<0.001	8.84	0.011	0.002 Ta
BS 600-4	"	"	0.04	0.22	0.20	0.008	0.004	14.68	0.001	76.0	0.06	0.006	0.09	0.09	0.022	0.003	0.002	0.19	0.022	...	8.37	0.017	0.004 Ta
BS 600-5	"	"	0.047	0.26	0.21	0.005	<0.002	15.59	0.049	74.83	0.19	0.0018	0.029	0.10	(0.03)	(<0.001)	(<0.003)	0.23	0.054	...	8.36	0.004	0.011 N
BS 600-6	"	"	0.083	0.31	0.21	0.007	0.001	14.86	0.12	76.00	0.278	0.0028	0.066	0.24	0.14	(<0.001)	(<0.003)	0.24	0.030	...	7.33	0.004	0.0078 N
BS 625B	Inconel 625	"	0.023	0.12	0.10	0.010	<0.003	21.28	9.58	(59.8)	0.33	(0.0021)	0.24	0.22	3.53	...	...	0.20	0.015	0.06	4.51	0.003	0.017 N
BS 800	Cr/Fe Nickel Alloy	44 dia. x 12	0.075	0.55	0.80	0.016	0.0006	19.92	0.19	31.38	0.28	0.0034	0.056	0.32	(0.02)	...	...	0.475	...	...	45.9	...	...
BS 197A	Ra 333 Alloy	50 dia. x 12	0.050	0.96	1.56	0.021	<0.001	25.11	2.99	Bal.	0.18	0.0019	3.06	0.12	0.20	...	...	0.017	0.051	2.79	18.07	...	...
BS 199A	Waspaloy	"	0.033	0.05	0.014	0.006	<0.001	19.25	3.99	Bal.	1.26	(0.004)	13.47	0.022	0.040	...	...	3.07	0.020	...	1.05	...	...
BS 263	Nickel Alloy 263	"	0.071	0.28	0.36	0.005	<0.002	19.84	5.70	(50.56)	0.38	(0.001)	19.92	0.024	0.04	...	...	2.21	0.004	0.24	0.47	...	0.002 Zr
BS 718B	In 718 Alloy	38 dia. x 12	0.036	0.12	0.125	(0.006)	0.001	17.60	2.93	52.1	0.57	0.0042	0.19	0.044	5.29	...	...	0.95	...	...	19.64	...	...
BS 825E	Nickel Alloy 825	"	0.010	0.24	0.51	0.015	0.0010	21.87	2.74	39.92	0.080	0.0025	0.26	1.72	0.19	...	...	0.82	0.049	0.166	31.45	...	0.0105 N
BS 400C	Monel Alloy	"	0.160	0.18	1.05	0.012	0.001	0.48	0.059	64.55	0.056	(0.0002)	0.053	31.68	0.021	0.0007	0.0009	0.056	(0.005)	...	1.61	0.009	0.0019 As
BS 400-1	"	38 dia. x 20	0.109	0.16	1.07	0.022	0.008	0.033	0.001	66.0	0.004	(0.0005)	0.37	30.97	0.0003	0.0020	0.0010	(0.001)	(0.001)	...	1.27	0.048	0.004 As
BS 400-2	"	"	0.170	0.17	1.17	0.027	0.008	0.091	0.0012	65.9	0.006	(0.0006)	0.46	30.75	0.0004	(0.001)	0.0012	0.011	(0.003)	...	1.42	0.033	0.004 As
BS 400-3	"	"	0.153	0.063	0.85	0.026	0.006	0.21	0.003	65.4	0.001	(0.0002)	0.46	31.25	(0.0004)	(0.0015)	0.0014	0.004	0.003	...	1.60	0.012	0.004 As
BS 500D	"	38 dia. x 12	0.15	0.07	0.69	0.009	<0.002	0.21	0.024	Bal.	2.98	...	0.033	29.7	...	...	...	0.45	...	...	0.73	0.010	...
BS H-1 B	Hastelloy (B-2)	38 dia. x 12	0.006	0.049	0.82	0.003	0.000	<0.01	26.52	(71.3)	0.12	0.003	<0.02	(0.01)	0.005	...	...	0.11	<0.01	0.01	1.00	...	...
BS H-3B	(x)	"	0.078	0.63	0.11	0.013	<0.001	22.23	8.84	44.9	0.14	0.0052	1.96	0.27	0.28	...	...	0.020	0.060	0.49	19.92	...	...
BS H-6A	(C-22)	"	0.005	(0.03)	0.31	0.010	<0.002	21.37	13.37	(55.8)	0.24	0.0012	1.11	0.070	(0.029)	...	0.003	0.007	0.17	3.09	4.34	...	...

BRAMMER STANDARD COMPANY, Inc. (BS), USA

CHEMICAL COMPOSITION (nominal mass content in %) - Figures in brackets are for information only.

Copper Base Alloy Reference Materials (38 to 41mm dia. x 12mm discs)

BRAMMER No.	Cu	Pb	Sn	Zn	Mn	Al	Fe	Ni	P	As	Si	Sb	C	S	Others
BS 172 Be-1 (Wrought)	97.68	(0.002)	0.033	0.007	0.001	(0.02)	0.052	0.039	...	...	0.055	...	...	...	1.89 Be, 0.21 Co
BS 314B (Wrought)	89.8	1.68	0.001	8.58	0.001	0.001	0.013	0.006	0.0007	0.002	0.01	0.001	0.002	(0.002)	...
BS 464A (Wrought)	60.6	0.056	0.62	38.73	0.0002	(0.001)	0.013	0.004	0.012	<0.002	<0.01	(0.001)	(0.003)	(0.003)	...
BS 482A (Wrought)	60.0	0.50	0.65	38.8	<0.002	(0.003)	0.020	(0.007)	<0.003	<0.002	(0.002)	0.0012	(0.0006)	0.001	...
BS 510A (Wrought)	96.10	0.016	4.6	0.21	<0.002	<0.002	0.005	0.020	0.11	0.0008	<0.003	(0.003)	(0.0006)	0.008	...
BS 544A (Wrought)	88.4*	4.16	4.42	3.42	<0.002	(0.0005)	0.092	0.16	0.021	0.011	<0.002	0.040	0.003	0.038	...
BS 623A (Wrought)	88.13	0.001	0.002	0.008	0.273	9.12	2.19	0.146	<0.002	0.006	0.014	<0.002	(0.002)	(0.0005)	...
BS 630A (Wrought)	81.0	0.007	0.019	0.17	0.11	10.05	3.65	4.75	<0.01	(0.002)	0.037	<0.001	0.005	(0.005)	...
BS 655A (Wrought)	95.74	0.008	0.07	0.02	0.91	(0.002)	0.075	0.008	(0.004)	<0.002	3.14	<0.002	(0.0006)	(0.0006)	...
BS 675A (Wrought)	58.5	0.074	0.80	39.1	0.32	<0.002	1.12	0.019	0.010	0.003	(0.005)	0.0011	(0.0007)	(0.0005)	...
BS 706B (Wrought)	87.00	0.006	0.006	0.054	0.61	<0.003	1.56	10.9	0.009	<0.0005	<0.002	<0.002	(0.004)	0.009	0.005 Co
BS 715A (Wrought)	68.0	(0.007)	0.008	0.10	0.82	(0.01)	0.61	30.22	0.006	(0.0014)	0.10	(0.003)	0.03	0.001	...
BS 836A-1 (Cast)	84.64	5.32	4.59	4.52	(<0.002)	(0.001)	0.023	0.46	0.08	0.008	0.003	0.068	...	0.042	0.023 Ag
BS 857B-1 (Cast)	61.3	1.22	1.14	34.91	0.003	0.35	0.30	0.61	0.004	(0.001)	0.004	(0.002)	...	...	(0.002) Ag
BS 903B (Cast)	86.7	0.10	7.9	4.39	0.0004	(0.001)	0.049	0.50	0.073	0.003	0.002	0.003	(0.0004)	0.006	...
BS 932E (Cast)	82.15	7.3	7.33	2.86	0.0001	(<0.001)	0.029	0.16	0.022	0.048	(<0.005)	0.097	...	0.053	...
BS 938-1 (Cast)	77.1	14.8	7.16	0.26	(0.001)	(<0.002)	0.015	0.49	0.059	(0.004)	(<0.004)	0.033	...	0.009	0.0048 Ag
BS 954B (Cast)	83.9	0.047	0.07	0.10	0.27	10.20	3.90	1.38	0.012	(0.005)	0.07	(0.001)	(0.005)	(<0.0005)	...
BS 955C (Cast)	80.60*	0.003	0.003	0.150	0.062	10.72	4.04	4.30	0.012	0.001	0.025	0.001	...	...	0.014 Ag

* Cu by difference

Cobalt Base Reference Materials (38mm dia. X 9mm discs)

BRAMMER No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	B	Co	Cu	Nb	V	W	Fe	La
BS 171B	Stellite 4605	0.09	0.29	1.90	0.008	<0.001	20.5	0.65	10.68	0.08	(0.0025)	Bal.	0.035	0.035	(0.02)	15.1	1.82	...
BS 172A	Stellite 188	0.10	0.37	0.77	(0.011)	<0.0005	21.85	0.30	23.7	0.08	(0.003)	Bal.	0.027	0.09	0.07	14.0	1.76	0.045

CANADA CENTRE FOR MINERAL AND ENERGY TECHNOLOGY (CANMET), Canada

CHEMICAL COMPOSITION (nominal mass content in %) - Figures in bold type certified, figures in italic type only approximate and figures in brackets are for information only.

Base Metal Ore Certified Reference Materials (Finely divided material – units of 200g)

CANMET No.	Description	Si	Al	S	Fe	K	Na	Ca	As	Mg	C	Cd	Pb	Cu	Ti	W
BH-1	Tungsten Ore	<i>38.0</i>	<i>3.5</i>	<i>0.8</i>	<i>3.2</i>	<i>0.7</i>	<i>0.1</i>	<i>0.5</i>	...	<i>0.4</i>	<i>0.1</i>	...	...	...	<i>0.4</i>	0.422
CD-1	Antimony Ore	<i>32.9</i>	<i>5.5</i>	<i>3.1</i>	<i>2.8</i>	<i>1.8</i>	<i>0.1</i>	<i>1.4</i>	0.66	<i>0.6</i>	<i>0.21</i>	...	<i>0.02</i>	<i><0.01</i>	...	...
CT-1	Tungsten Ore	<i>17.2</i>	<i>2.9</i>	<i>8.2</i>	<i>17.5</i>	<i>0.7</i>	<i>0.2</i>	<i>12.2</i>	...	<i>2.0</i>	<i>1.7</i>	...	...	...	<i>0.2</i>	1.04
HV-2	Copper-Molybdenum Ore	...	...	<i>0.57</i>	<i>1.09</i>	...	...	...	...	...	<i>0.61</i>	...	<i>0.0008</i>	0.57	...	<i>0.0003</i>
MP-1b	Zinc-Tin-Copper-Lead Ore	16.79	<i>3.46</i>	13.79	8.19	<i>(0.2)</i>	...	2.47	2.30	0.024	<i>(0.028)</i>	0.0527	2.091	3.069	<i>0.075</i>	<i>(0.11)</i>
MW-1	Iron Ore	2.15	0.17	<i>0.011</i>	66.08	0.011	<i>0.008</i>	0.040	...	0.021	...	...	...	...	<i>0.08</i>	...
OKA-1	Niobium Ore	<i>2.4</i>	<i>0.9</i>	<i>0.6</i>	<i>2.8</i>	<i>0.3</i>	<i>0.2</i>	<i>31.3</i>	...	<i>1.3</i>	...	...	...	...	...	...
SCH-1	Iron Ore	3.78	0.509	0.007	60.73	0.026	0.019	0.029	...	0.020	...	...	...	...	0.031	...
TAN-1	Tantalum Ore	<i>33.42</i>	<i>8.2</i>	...	<i>0.2</i>	<i>1.5</i>	<i>4.6</i>	<i>0.5</i>	...	<i>0.02</i>	...	...	...	...	...	...
TLG-1	Tungsten Ore	<i>21.5</i>	<i>3.0</i>	...	<i>8.6</i>	<i>0.4</i>	<i>0.2</i>	<i>16.6</i>	...	<i>2.7</i>	<i>1.4</i>	...	...	...	<i>0.1</i>	0.083

(Continued from above)

CANMET No.	Mn	Mo	P	Bi	Zn	Sr	In	Nb	Ta	Sn	Sb	Ag	H ₂ O (105°C)	LOI
BH-1 (continued)	<i>0.2</i>	<i>0.02</i>	...	...	...	...	...	...	...	...	...	...	...	...
CD-1 (continued)	...	...	...	...	...	...	...	...	...	...	3.57	...	<i>0.2</i>	<i>4.0</i>
CT-1 (continued)	<i>0.7</i>	<i>0.03</i>	...	...	...	...	...	...	...	...	...	...	...	...
HV-2 (continued)	...	0.048	...	...	<i>0.0056</i>	...	...	...	...	...	<i>0.0007</i>	<i>0.00022</i>	...	<i>4.72</i>
MP-1b (continued)	<i>(0.048)</i>	0.0285	<i>(0.02)</i>	0.0954	16.67	...	<i>0.056</i>	...	...	1.61	<i>0.0054</i>	0.00470	...	...
MW-1 (continued)	<i>0.012</i>	...	0.011	...	...	...	...	...	...	...	...	...	...	...
OKA-1 (continued)	<i>1.1</i>	...	<i>1.1</i>	...	<i>0.05</i>	<i>1.0</i>	...	0.37	...	...	...	...	...	<i>31.9</i>
SCH-1 (continued)	0.777	...	0.054	...	...	...	...	...	...	...	...	...	...	...
TAN-1 (continued)	<i>0.02</i>	...	...	...	...	...	...	<i>0.02</i>	0.236	<i>0.01</i>	...	...	...	...
TLG-1 (continued)	<i>1.3</i>	<i><0.01</i>	...	...	...	...	...	...	...	...	...	...	<i>1.6</i>	...

Noble Metal Ore, Concentrate and Matte Certified Reference Materials

(Finely divided material – CH-4, MA-1b, MA-3a, PTC-1a, SU-1b in units of 200g, GTS-2a in units of 350g, DS-1, MA-2c, PTA-1, PTM-1a and UMT-1 in units of 400g)

CANMET No.	Description	Si	SiO ₂	Fe	Al	Ca	K	Na	S	Mg	Ni	Cu	Co	Pb	Ag	As	Pd	Pt	Au	Rh	C	Zn	H ₂ O	LOI
CH-4	Gold Ore	...	62.75	5.32	7.73	1.96	1.80	3.18	0.65	1.40	<i>0.0051</i>	0.20	0.0026	<i>(0.0014)</i>	0.00021	0.00082	...	...	0.000088	...	<i>0.12</i>	0.020	...	<i>(0.9)</i>
DS-1	Gold Ore	<i>25.68</i>	...	<i>(3.0)</i>	4.48	<i>6.248</i>	<i>1.1</i>	...	<i>2.85</i>	2.76	0.00487	0.00271	0.00095	0.00138	0.000047	0.6960	...	...	0.003259	...	...	0.0206	...	<i>13</i>
GTS-2a	Gold Ore Mill Tailings	23.65	...	7.56	6.96	4.01	2.021	0.617	0.348	2.412	0.00771	0.00886	0.00221	<i>0.00179</i>	<i>(0.000064)</i>	0.0124	<i>(0.002)</i>	...	0.0000272	...	2.011	0.0208	...	<i>9.87</i>
MA-1b	Gold Ore	<i>24.5</i>	...	<i>4.62</i>	<i>6.11</i>	<i>4.6</i>	<i>4.45</i>	<i>1.49</i>	<i>1.17</i>	<i>2.6</i>	...	...	...	...	<i>0.0004</i>	...	...	...	0.00170	...	<i>2.44</i>	...	<i>0.1</i>	<i>7.9</i>
MA-2c	Gold Ore	<i>24.40</i>	...	<i>5.39</i>	<i>6.70</i>	<i>4.76</i>	<i>3.20</i>	<i>2.23</i>	<i>0.23</i>	<i>2.91</i>	<i>0.0064</i>	<i>0.0095</i>	<i>0.0029</i>	<i>0.0029</i>	<i>0.000051</i>	<i>0.0009</i>	...	...	0.000302	...	<i>1.78</i>	<i>0.0093</i>	...	<i>7.55</i>
MA-3a	Gold Ore	<i>21</i>	...	<i>5</i>	<i>6</i>	<i>5.5</i>	<i>4</i>	<i>1.5</i>	<i>1</i>	<i>3</i>	<i>0.007</i>	<i>0.01</i>	<i>0.003</i>	<i>0.002</i>	<i>0.00024</i>	<i>0.0008</i>	...	...	0.000856	...	<i>2.5</i>	<i>0.008</i>	...	<i>10</i>
PTA-1	Platiniferous Black Sand	...	<i>3.6</i>	<i>63.0</i>	<i>2.9</i>	<i>1.2</i>	...	...	...	<i>0.6</i>	...	...	...	...	...	...	...	0.000305	...	...	...	...	...	...
PTC-1a	Sulphide Concentrate	...	...	<i>34.6</i>	...	...	...	...	<i>31.8</i>	...	10.03	13.51	<i>0.30</i>	<i>0.05</i>	0.0056	<i>0.012</i>	0.000448	0.000272	<i>0.000131</i>	0.000033	...	...	...	...
PTM-1a	Nickel, Copper, Matte	...	...	<i>1.48</i>	...	...	...	...	<i>22.4</i>	...	47.44	24.96	<i>1.97</i>	<i>0.029</i>	<i>0.0135</i>	<i>0.22</i>	0.001001	0.000731	<i>0.00033</i>	<i>0.00007</i>	...	...	...	...
SU-1b	Nickel Copper Cobalt Ore	15.23	...	25.54	4.30	2.21	<i>(0.6)</i>	<i>(1.6)</i>	14.14	1.790	1.953	1.185	0.0672	0.0058	0.00639	0.000249	0.0000791	0.0000491	<i>(0.00002)</i>	...	<i>0.04</i>	0.0235	<i>(0.6)</i>	<i>(8)</i>
UMT-1	Ultramafic Ore Tailings	...	...	...	...	...	...	...	...	...	<i>0.1396</i>	<i>0.0743</i>	<i>0.0077</i>	...	...	...	0.0000106	0.0000129	0.0000048	0.000001	...	...	...	...

DS-1 also certified for Ba: 0.0221%, Hg: 0.0082%, Mn: 0.0437%, P: 0.034% and Ti: 0.0020%

GTS-2a also certified for Ba: 0.0186%, Mn: 0.1510%, P: 0.0892%, Sr: 98.2µg/g and Th: 1.244µg/g and SU-1b is also certified for Mn: 0.0703%

PTC-1a, PTM-1a and UMT-1 also have provisional constituent values for Ir and Ru. SU-1b has provisional constituent values for Bi, Se and V.

CANADA CENTRE FOR MINERAL AND ENERGY TECHNOLOGY (CANMET), Canada

CHEMICAL COMPOSITION (nominal mass content in %) - Figures in bold type certified, figures in italic type only approximate and figures in brackets are for information only.

Ore Concentrate Certified Reference Materials (Finely divided material – units of 200g)

CANMET No.	Description	SiO ₂	Al ₂ O ₃	MgO	CaO	Cu	Zn	Pb	Ag	Hg	Au	S	Fe	Sb	As	Bi	C	Cd	Co	Mn	Mo	Se
CCU-1d	Copper Concentrate	3.036	0.191 Al	0.508 Mg	0.195 Ca	23.93	2.63	0.262	0.01207	<i>0.0007</i>	0.001401	32.76	29.95	0.00619	0.0545	<i>(0.0003)</i>	<i>0.088</i>	0.02459	0.0330	0.00994	<i>0.00181</i>	<i>0.0244</i>
CPB-2	Lead Concentrate	<i>0.652</i>	0.074 Al	0.0683 Mg	<i>0.0776 Ca</i>	0.1213	6.04	63.52	<i>0.03573</i>	<i>0.001003</i>	<i>0.000002</i>	<i>17.82</i>	7.065	<i>0.423</i>	<i>0.04</i>	<i>0.02112</i>	...	0.0167	<i>(0.0004)</i>	<i>0.0395</i>	<i>0.009</i>	<i>0.01</i>
CZN-4	Zinc Concentrate	0.295 Si	0.0715 Al	<i>0.0352 Mg</i>	<i>0.0419 Ca</i>	0.403	55.24	0.1861	0.00514	0.000454	<i>(0.04)</i>	33.07	<i>9.086</i>	<i>(0.001)</i>	0.0356	<i>(0.001)</i>	<i>(0.09)</i>	0.2604	0.00935	<i>(0.009)</i>	...	0.00867

Sulphide Ore Mill Tailings and Concentrate/Tailings Certified Reference Materials (Finely divided material – RTS-1, RTS-2, RTS-3a, TLS-1 in units of 100g, TPO-1 in units of 25g)

CANMET No.	Description	Al	As	Ca	Co	Cu	Fe	Mg	Ni	Pb	Si	SiO ₂	S (Sulphate)	S (Total)	Zn
RTS-1	Sulphide Ore Mill Tailings	4.26	0.00082	2.67	0.00166	0.0595	19.64	2.67	0.0022	0.0105	19.89	...	1.26	1.66	0.0553
RTS-2	Sulphide Ore Mill Tailings	0.83	0.00063	0.53	0.0072	0.0670	37.4	0.35	0.2430	0.0045	2.92	...	3.87	18.95	0.0117
RTS-3a	Sulphide Ore Mill Tailings	5.12	0.00182	2.14	0.0143	0.2353	20.49	2.483	0.00613	0.0209	18.28	...	<i>(1.1)</i>	9.59	0.289
TLS-1	Unoxidised Tailings	<i>(6.92)</i>	...	<i>(4.73)</i>	<i>0.0008</i>	0.078	10.51	<i>(3.45)</i>	0.151	<i>(0.023)</i>	...	<i>51.87</i>	...	1.81	<i>(0.013)</i>
TPO-1	Iron Sulphide Conc./Tailings	<i>3.51</i>	...	<i>2.17</i>	0.021	0.118	34.85	<i>1.66</i>	0.617	...	...	25.52	...	18.03	<i>0.02</i>

CANMET No.	Ag	Au	Ba	Bi	C	Cd	CO ₂	Cr	Fe	H ₂ O	K
RTS-1 (continued)	<i><0.0003</i>	<i>0.0000262</i>	<i>0.0123</i>	<i>0.0081</i>	<i><0.9</i>	<i>0.0002</i>	<i><0.1</i>	<i>0.0050</i>	<i>19.89</i>	<i>1.5</i>	<i>0.52</i>
RTS-2 (continued)	<i><0.0002</i>	<i>0.0000038</i>	<i>0.0072</i>	<i>0.0003</i>	<i><2</i>	<i>0.0002</i>	<i><2</i>	<i>0.0125</i>	<i>37.90</i>	<i>1.7</i>	<i>0.12</i>
RTS-3a (continued)	0.00111	<i>0.0000561</i>	0.0106	0.00313	<i>(0.04)</i>	0.00092	<i>(0.04)</i>	<i>0.0176</i>	<i>(20.49)</i>	...	0.460
TLS-1 (continued)	...	...	...	...	...	...	...	<i>(0.030)</i>	...	...	<i>(1.025)</i>
TPO-1 (continued)	...	...	...	...	...	...	...	<i>0.03</i>	...	...	<i>0.56</i>

CANMET No.	Mn	Na	Pd	Pt	P	Se	Sr	S (Elemental)	S (Sulphide)	Ti	Zr
RTS-1 (continued)	<i>0.19</i>	<i>0.50</i>	<i><0.0000020</i>	<i><0.0000070</i>	<i>0.06</i>	<i>0.0040</i>	<i>0.0060</i>	<i>0.50</i>	<i>0.0</i>	<i>0.40</i>	<i>0.0060</i>
RTS-2 (continued)	<i>0.04</i>	<i>0.22</i>	<i>0.0000136</i>	<i>0.0000217</i>	<i>0.02</i>	<i>0.0057</i>	<i>0.0030</i>	<i>14.47</i>	<i>0.61</i>	<i>0.16</i>	<i>0.0030</i>
RTS-3a (continued)	0.1585	0.684	<i>(0.0000004)</i>	...	<i>0.0446</i>	<i>0.00448</i>	0.00447	<i>(1.2)</i>	<i>(8)</i>	<i>0.351</i>	<i>0.0078</i>
TLS-1 (continued)	<i>(0.120)</i>	<i>(1.690)</i>	...	...	<i>(0.087)</i>	...	...	...	...	<i>(0.553)</i>	...
TPO-1 (continued)	<i>0.08</i>	<i>0.85</i>	<i>0.02</i>	...	<i>0.03</i>	...	...	...	...	<i>0.35</i>	...

CANADA CENTRE FOR ENERGY AND MINERAL TECHNOLOGY (CANMET), Canada
CHEMICAL COMPOSITION (nominal mass content)

Lake and Stream Sediment Reference Materials (Finely divided material – units of 100g)

CANMET No.	Description	Mass content	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MgO	CaO	Na ₂ O	K ₂ O	MnO	TiO ₂	P ₂ O ₅	C	Fe	S	H ₂ O	LOI (500 °C)	LOI (1000 °C)
LKSD-2	Lake Sediment	%	58.9	12.3	6.2	1.7	2.2	1.9	2.6	0.3	0.6	0.3	4.5	4.3	0.14	2.23	12.3	13.6
LKSD-3	Lake Sediment	%	58.5	12.5	5.7	2.0	2.3	2.3	2.2	0.2	0.5	0.2	4.5	4.0	0.14	2.07	11.8	13.4
LKSD-4	Lake Sediment	%	41.6	5.9	4.1	0.9	1.8	0.7	0.8	0.1	0.4	0.3	17.7	2.8	0.99	6.55	40.8	43.6
STSD-1	Stream Sediment	%	42.5	9.0	6.5	2.2	3.6	1.8	1.2	0.5	0.8	0.4	12.3	4.7	0.18	4.46	29.7	31.6
STSD-3	Stream Sediment	%	48.6	10.9	6.2	2.2	3.3	1.5	1.8	0.3	0.7	0.4	8.4	4.4	0.14	3.47	21.6	23.6
STSD-4	Stream Sediment	%	58.9	12.1	5.7	2.1	4.0	2.7	1.6	0.2	0.8	0.2	4.1	4.1	0.09	1.73	10.2	11.6

CANMET No.	Mass content	Ag	As	Au	B	Ba	Be	Br	Ce	Co	Cr	Cs	Cu	Dy	Eu	F	Hf	La	Li	Lu	Mn	Mo
LKSD-2 (continued)	µg/g	0.8	11	0.003	65	780	2.5	18	108	17	57	3.0	37	7.3	1.9	590	7.0	69	20	0.6	2020	<5
LKSD-3 (continued)	µg/g	2.7	27	0.003	25	680	1.9	16	90	30	87	2.3	35	4.9	1.5	490	4.8	52	25	0.4	1440	<5
LKSD-4 (continued)	µg/g	<0.5	16	0.002	22	330	1.0	49	48	11	33	17	31	3.7	1.1	260	2.8	26	12	0.5	500	<5
STSD-1 (continued)	µg/g	<0.5	23	0.008	89	630	1.6	40	51	17	67	1.8	36	5.6	1.6	950	6.1	30	11	0.8	3950	<5
STSD-3 (continued)	µg/g	<0.5	28	0.007	82	1490	2.6	24	63	16	80	5.2	39	5.4	1.3	850	5.1	39	23	0.8	2730	6
STSD-4 (continued)	µg/g	<0.5	15	0.004	46	2000	1.7	13	44	13	93	1.9	65	3.8	1.2	380	5.5	24	14	0.5	1520	<5

CANMET No.	Mass content	Nb	Nd	Ni	Pb	Rb	Sb	Sc	Sm	Sn	Sr	Ta	Tb	Th	Ti	U	V	W	Y	Yb	Zn	Zr
LKSD-2 (continued)	µg/g	8	58	26	44	85	1.1	13	11	5	220	0.8	1.4	13.4	3460	7.6	77	<4	44	4.0	209	254
LKSD-3 (continued)	µg/g	8	44	47	29	78	1.3	13	8	3	240	0.7	1.0	11.4	3330	4.6	82	<4	30	2.7	152	178
LKSD-4 (continued)	µg/g	9	25	31	91	28	1.7	7	5	5	110	0.4	1.2	5.1	2270	31.0	49	<4	23	2.0	194	105
STSD-1 (continued)	µg/g	5	28	24	35	30	3.3	14	6	4	170	0.4	1.2	3.7	4600	8.0	98	<4	42	4.0	198	218
STSD-3 (continued)	µg/g	12	33	30	40	68	4.0	13	7	4	230	0.9	1.1	5.5	4400	10.5	134	<4	36	3.4	204	196
STSD-4 (continued)	µg/g	9	21	30	16	39	7.3	14	5	2	350	0.6	0.9	4.3	4530	3.0	106	<4	24	2.6	107	190

Information is also given on the certificates of analysis re values for several Partial Extraction Elements using HNO₃/HCl.

Soil Certified Reference Materials (Finely divided material – units of 200g) Nominal mass content in %

CANMET No.	Description	Al	Ca	Fe	K	Mg	Mn	Na	P	Si	Ti	Cr	Cu	Hg	Ni	Pb	Sr	V	Zn	Ba	Rb	Co
SO-3	Calcereous C Horizon Soil	3.06	14.63	1.51	1.16	4.98	0.052	0.74	0.048	15.86	0.20	0.0026	0.0017	0.0000017	0.0016	0.0014	0.0217	0.0038	0.0052	0.0296	0.0039	0.0008
SO-4	Chernozemic A Horizon Soil	5.46	1.11	2.37	1.73	0.56	0.060	1.00	0.090	31.97	0.34	0.0061	0.0022	0.0000030	0.0026	0.0016	0.0170	0.0090	0.0094	...	...	0.0011

CANADA CENTRE FOR ENERGY AND MINERAL TECHNOLOGY (CANMET), Canada
CHEMICAL COMPOSITION (nominal mass content)

Geochemical Soil and Till Reference Materials (Finely divided material – units of 100g)

CANMET No.	Description	Mass content	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MgO	CaO	Na ₂ O	K ₂ O	MnO	TiO ₂	P ₂ O ₅	S	LOI (500°C)	LOI (1000°C)
TILL-1	Soil	%	60.9	13.7	6.82	2.15	2.72	2.71	2.22	0.18	0.98	0.22	<0.05	6.3	7.3
TILL-2	Till	%	60.8	16.0	5.39	1.83	1.27	2.19	3.07	0.10	0.88	0.17	<0.05	6.8	8.1
TILL-3	Soil	%	69.1	12.2	3.92	1.71	2.63	2.64	2.42	0.06	0.49	0.11	<0.05	3.6	4.6
TILL-4	Till	%	65.0	14.4	5.63	1.26	1.25	2.46	3.25	0.06	0.81	0.20	0.08	4.4	5.7

CANMET No.	Mass content	As	Au	Ba	Be	Bi	Br	Ce	Co	Cr	Cs	Cu	Eu	Er	Hf	La	Li	Lu	Mn	Mo	Nb
TILL-1 (continued)	µg/g	18	0.013	702	2.4	<5	6.4	71	18	65	1.0	47	1.3	3.6	13	28	15	0.6	1420	2	10
TILL-2 (continued)	µg/g	26	0.002	540	4.0	<5	12.2	98	15	74	12	150	1.0	3.7	11	44	47	0.6	780	14	20
TILL-3 (continued)	µg/g	87	0.006	489	2.0	<5	4.5	42	15	123	1.7	22	<1	1.4	8	21	21	0.2	520	2	7
TILL-4 (continued)	µg/g	111	0.005	395	3.7	40	8.6	78	8	53	12	237	<1	3.2	10	41	30	0.5	490	16	15

CANMET No.	Mass content	Nd	Ni	P	Pb	Rb	Sb	Sc	Sm	Sr	Ta	Tb	Th	Ti	U	V	W	Y	Yb	Zn	Zr
TILL-1 (continued)	µg/g	26	24	930	22	44	7.8	13	5.9	291	0.7	1.1	5.6	5990	2.2	99	<1	38	3.9	98	502
TILL-2 (continued)	µg/g	36	32	750	31	143	0.8	12	7.4	144	1.9	1.2	18.4	5300	5.7	77	5	40	3.7	130	390
TILL-3 (continued)	µg/g	16	39	490	26	55	0.9	10	3.3	300	<0.5	<0.5	4.6	2910	2.1	62	<1	17	1.5	56	230
TILL-4 (continued)	µg/g	30	17	880	50	161	1.0	10	6.1	109	1.6	1.1	17.4	4840	5.0	67	204	33	3.4	70	385

Information is also given on the certificate of analysis re several partial extraction elements using HNO₃/HCl.

Rock and Mineral Certified Reference Materials (Finely divided material – units of 400g, except WMG-1a - 350g and WMS-1a - 200g) Nominal mass content in %

CANMET No.	Description	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	Fe	TiO ₂	CaO	MgO	K ₂ O	Na ₂ O	MnO	P ₂ O ₅	Cu	Cr _(total)	Ni	S	LOI
TDB-1	Diabase Rock	50.2	13.6	14.4	10.4	2.3	9.6	5.9	0.89	2.2	0.20	0.23	0.0323	0.0251	0.0092	0.03	0.3
WGB-1	Gabbro Rock	49.1	11.15	6.71	...	0.84	15.78	9.40	0.94	2.15	0.143	0.099	0.0106	0.0291	0.0076	0.02	4
WMG-1a	Mineralized Gabbro	18.27 Si	4.75 Al	...	12.71	0.419 Ti	10.06 Ca	7.41 Mg	0.1021 K	0.1119 Na	0.1141 Mn	0.0731 P	0.7120	0.0804	0.2480	3.43	4.31
WMS-1a	Massive Sulphide	(4.7) Si	1.350 Al	...	45.4	0.084 Ti	3.09 Ca	0.331 Mg	0.0991 K	0.0329 Na	0.060 Mn	(0.018) P	1.396	0.0068	3.02	28.17	...
WPR-1	Altered Peridotite	36.2	2.95	14.6	...	0.29	2.07	31	0.12	0.041	0.166	0.037	0.164	0.33	0.29	0.94	10.2

Nominal mass content in ng/g

CANMET No.	As	Au	Pt	Pd	Rh	Ru	Ir	Os	Ba	Ce	Ag	Co	Sb	Th	V	Zn
TDB-1 (continued)	...	6.3	5.8	22.4	0.7	0.3	0.15	...	241000	41000	(500)	47000	1000	2700	471000	155000
WGB-1 (continued)	...	2.9	6.1	13.9	0.32	0.3	0.33	...	851000	(<20000)	(<1000)	29800	2000	(<1600)	222000	31500
WMG-1a (continued)	5990	617	899	484	(15)	(20)	(27)	...	216	17180	3030	191	1550	1070	158000	112
WMS-1a (continued)	30900	300	1910	1450	222	145	322	(150)	(70000)	(7900)	3700	1450000	6920	(1200)	140000	130000
WPR-1 (continued)	1400	42.2	285	235	13.4	21.6	13.5	13.3	22000	6000	700	180000	900	400	65000	95000

CANADA CENTRE FOR ENERGY AND MINERAL TECHNOLOGY (CANMET), Canada

CHEMICAL COMPOSITION (nominal mass content in %) – Figures in bold type certified, figures in small italic type only approximate.

Rock Certified Reference Materials (Finely divided material – units of 100g)

CANMET No.	Description	SiO ₂	TiO ₂	Al ₂ O ₃	Fe _T	FeO	Fe ₂ O ₃	MnO	MgO	CaO	Na ₂ O	K ₂ O	CO ₂	P ₂ O ₅	F	S	Cr ₂ O ₃	ZnO	Cu	Ni	Co	H ₂ O	
FER-4	Iron Formation Sample	50.07	0.07	1.70	...	15.54	22.7	0.19	1.41	2.23	0.05	0.29	4.86	0.13	<i>0.02</i>	0.11	...	...	...	...	...	...	0.72
SY-4	Diorite Gneiss	49.9	0.29	20.69	...	2.86	6.21	0.108	0.54	8.05	7.10	1.66	3.5	0.131	...	...	...	...	0.0007	0.0009	0.0003	...	...
UM-2	Sulphide Bearing Ultramafic Rock	<i>39.2</i>	<i>0.24</i>	<i>7.23</i>	<i>12.95</i>	...	...	<i>0.08</i>	<i>25.45</i>	<i>4.68</i>	<i>0.32</i>	<i>0.11</i>	<i>0.10</i>	<i>0.02</i>	...	<i>0.94</i>	<i>1.51</i>	<i>0.004</i>	0.095	0.29	0.012	<i>6.27</i>	...
UM-4	Sulphide Bearing Ultramafic Rock	<i>39.35</i>	<i>0.35</i>	<i>8.89</i>	<i>12.8</i>	...	...	<i>0.15</i>	<i>22.5</i>	<i>6.79</i>	<i>0.45</i>	<i>0.18</i>	<i>0.26</i>	<i>0.02</i>	...	<i>0.44</i>	<i>2.59</i>	<i>0.008</i>	0.054	0.19	0.007	<i>4.86</i>	...

Samples FER-4 and SY-4 also show values for trace levels of many elements, including Ba, Be, Co, Cr, Cs, Cu, La, Li, Lu, Ni, Pb, Rb, Sc, Sm, Sr, Th, V, Y, Yb, Zn, Zr

Petroleum Coke Reference Materials (Finely divided material – units of 75g)

CANMET No.	Description	Moisture (%)	Ash Content (% dry basis)	Total Sulphur (% dry basis)	Calorific Value BTU/lb	Calorific Value MJ/kg
PC-2	Petroleum Coke	<2	<i>2.57</i>	<i>6.04</i>	<i>14.737</i>	<i>34.23</i>
PC-3	Petroleum Coke	<2	<i>1.13</i>	<i>2.73</i>	<i>15.400</i>	<i>35.80</i>

Non Ferrous Dust Certified Reference Material (Finely divided material – units of 200g)

CANMET No.	Description	Zn	Fe	S _T	S _{SO4}	Cu	Si	Pb	As	Cd	Hg	H ₂ O
PD-1	Non Ferrous Dust	<i>35.9</i>	<i>12.2</i>	<i>8.23</i>	<i>4.27</i>	<i>7.03</i>	<i>3.05</i>	2.75	0.77	<i>0.28</i>	0.0389	<i>0.4</i>

Commercially Pure Copper Certified Reference Materials (8mm dia. x 300mm rod)

CANMET No.	Description	Ag	As	Bi	Cd	Fe	Ni	O	Pb	S	Sb	Se	Sn	Te	Zn
SSC-3	Copper Rod	0.00161	0.000545	0.000059	none found	0.00400	0.00480	0.0176	0.000458	0.00167	0.000167	0.000387	0.00120	0.000253	0.00153

Zinc-Aluminium Foundry Alloy Certified Reference Materials (50mm dia. x 12mm discs; also as finely divided material – units of 80g)

CANMET No.	Description	Al	Cu	Mg	Fe	Sn	Pb	Cd
NZA-1	Zinc-Aluminium Foundry Alloy	28.70	1.51	0.020	0.046	0.0069	0.0030	0.00098
NZA-2	Zinc-Aluminium Foundry Alloy	23.81	3.00	0.029	0.021	0.0045	0.0076	0.0047
NZA-3	Zinc-Aluminium Foundry Alloy	25.99	2.00	0.0049	0.066	0.0034	0.0045	0.0064
NZA-4	Zinc-Aluminium Foundry Alloy	26.65	2.45	0.0106	0.027	0.0087	0.0101	0.0029
NZA-5	Zinc-Aluminium Foundry Alloy	10.85	1.04	0.021	0.016	0.0017	0.0012	0.0095
NZA-6	Zinc-Aluminium Foundry Alloy	7.54	3.17	0.00037	0.0105	0.0051	0.0809	0.0147
NZA-7	Zinc-Aluminium Foundry Alloy	13.17	0.212	0.052	0.016	0.0116	0.0136	0.00020

CERAM Research, (CERAM) UK
CHEMICAL COMPOSITION (nominal mass content in %)

Siliceous, Zircon Bearing and Basic Reference Materials (Finely divided material – units of 25g or 100g; 2CAS1, 2CAS2, 2CAS7 in units of 25g only)

CERAM No.	Description	SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	Na ₂ O	K ₂ O	Li ₂ O	BaO	P ₂ O ₅	Mn ₃ O ₄	Cr ₂ O ₃	ZrO ₂ + HfO ₂	CuO	PbO	ZnO	B ₂ O ₃	LOI	
AN25	Alumina	<0.01	<0.01	99.39	0.03	0.03	<0.01	0.53	0.01	...	...	<0.01	...	...	...	...	...	...	...	# (0.34)	
AN26	Alumina	0.12	<0.01	99.76	0.03	0.03	<0.01	0.02	<0.01	...	...	...	...	...	...	...	...	...	...	...	# (0.08)
AN27	Alumina	0.08	<0.01	99.76	0.02	0.03	<0.01	0.08	<0.01	...	...	...	...	...	...	...	...	...	...	...	#
2CAS1	Ball Clay	52.5	1.16	32.0	1.03	0.20	0.28	0.34	2.25	0.03	...	...	...	...	...	...	...	...	...	...	9.80
AN41	China Clay	54.8	0.05	41.5	0.71	0.16	0.41	<0.05	1.81	...	...	...	...	...	...	...	...	...	...	...	# (12.4)
AN29	Bauxite	6.15	3.44	88.3	1.75	0.08	0.09	0.03	0.04	<0.01	...	...	...	...	...	...	...	...	...	...	0.09
2CAS2	Bauxite	5.93	3.14	89.0	1.74	0.10	0.08	0.01	0.02	<0.01	...	...	<0.01	...	...	...	...	...	...	...	0.10
CAS8	Feldspar	67.15	0.03	18.63	0.11	0.22	0.02	3.53	10.6	...	...	...	...	...	...	...	...	...	...	...	# (0.30)
2CAS7	Firebrick	49.9	1.35	44.4	2.58	0.36	0.45	0.13	0.54	0.07	0.08	...	...	...	...	...	...	...	...	...	0.07
CEB 1	Earthenware Body †	74.0	0.34	16.2	0.48	0.52	0.16	0.71	1.75	...	0.05	0.14	<0.01	<0.01	...	...	...	...	...	<0.01	5.60
2CAS12	Sillimanite	34.0	1.34	63.6	0.30	0.31	0.06	0.13	0.12	<0.01	...	...	...	...	...	...	...	...	...	...	0.12
AN40	Molochite	58.9	0.02	38.2	0.90	0.15	0.27	0.10	1.48	...	...	...	...	...	...	...	...	...	...	...	...
2CAS14	Steatite	62.5	0.01	0.15	0.35	0.28	31.7	0.02	<0.01	<0.01	...	...	...	...	...	...	...	...	...	...	5.15
AN28	Lead Bisilicate Frit	32.76	<0.01	2.46	0.018	0.05	<0.01	0.05	0.05	...	...	...	...	...	...	...	64.33	...	...	...	0.15
AN46	Zircon Batt	45.46	0.48	30.52	0.85	0.20	5.34	0.15	1.03	0.02	...	...	...	...	15.68	...	...	...	...	...	0.08
2CAS15	Zircon	34.1	0.18	0.36	0.08	0.52	0.11	0.03	0.02	<0.01	...	...	...	...	64.6	...	...	...	...	...	0.25
AN35	Magnesite	0.49	0.01	0.44	1.34	0.83	96.4	<0.05	<0.01	...	...	0.011	0.11	0.046	...	...	...	...	...	0.10	#
AN36	Magnesite	0.48	0.01	0.42	4.66	0.94	93.30	<0.05	<0.01	...	...	0.008	0.11	0.004	...	...	...	...	...	0.11	...
AN37	Magnesite	1.39	0.03	1.06	1.80	1.46	94.00	<0.05	<0.01	...	...	0.02	0.12	0.005	...	...	...	...	...	0.11	...
AN43	Magnesite	...	...	...	...	...	...	...	0.06	...	...	...	...	...	...	...	...	...	...	0.005	...
AN45	Magnesite	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.222	...
AN100	Chrome Ore	11.1	0.21	24.7	12.88	1.16	22.38	0.04	0.01	...	...	...	0.13	26.60	...	0.02	...	0.04	...	...	# (5.03)
2CAS5	Chrome Ore	5.55	0.29	23.2	16.4*	0.57	16.8	0.03	0.03	<0.01	...	...	0.13	35.8	...	...	...	...	...	...	0.76
CCB1	Calcined Bone ††	1.28	<0.01	0.05	0.04	53.4	1.14	0.52	0.011	...	0.031	40.5	...	<0.01	...	...	<0.02	...	...	...	2.60

AN46 has individual values for ZrO₂ and HfO₂ of 15.41% and 0.32% * Total iron as Fe₂O₃.

† Additional elements: SrO 0.02% plus ZrO₂, HfO₂, ZnO, SnO₂ and CuO are all <0.01%

†† Additional elements: ZnO 0.01%, SrO 0.049%, HfO₂ <0.01%, SnO₂ <0.01%, CuO <0.01%, ZrO₂ <0.02%, SO₃ 0.114%, F 0.130% and moisture 0.12%

Results calculated on the ignited basis (otherwise calculated on the dried basis at 110°C)

Please note that CERAM Research also prepare Reference Materials giving Thermal Expansion and Bulk Density data for Polycrystalline Alumina. Further details of these Alumina Calibration Bars will gladly be provided on request. In addition, Cordierite Thermal Expansion CRMs are also available.

CERAM Research also supplies a Dental Frit Particle Size Distribution CRM, with D50% 3.2 µm, Median diameter 3.2 µm, with 90% between 0.6 and 10.0 µm. This is available in units of 75g.

Please ask us for further details of these Alumina & Cordierite Thermal Expansion CRMs and Dental Frit Particle Size Distribution CRM.

RESEARCH INSTITUTE CKD, (CKD), Czech Republic

CHEMICAL COMPOSITION (nominal mass content in %) – Figures in bold type certified, figures in small italic type only approximate.

Cast Iron Certified Reference Materials (38mm x 38mm x 20mm Chill Cast Blocks)

CKD No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Co	Cu	Nb	N
241b	1.84	3.15	0.060	0.007	0.123	0.683	0.61	0.021	0.003	0.002	<i>0.001</i>	0.004	0.011	0.003	0.0053
242a	1.84	3.06	0.060	0.039	0.036	0.029	1.13	0.039	0.036	0.015	0.008	0.002	0.055	0.013	...
242b	2.06	2.81	0.189	0.044	0.028	0.031	1.21	0.022	0.042	0.009	0.005	0.004	0.040	0.009	0.0092
244c	2.57	2.15	0.715	0.027	0.012	0.248	0.059	0.344	0.071	0.043	0.086	0.050	0.301	0.006	...
245a	2.94	1.58	1.38	0.41	0.039	0.168	0.114	0.161	0.019	0.002	0.007	0.003	0.076	<i>0.001</i>	...
245b	2.95	1.59	1.38	0.42	0.035	0.197	0.115	0.194	0.038	0.006	0.003	0.007	0.081	0.029	...
246b	2.73	0.76	0.354	0.66	0.020	1.16	0.009	0.065	0.101	0.003	0.000	0.012	1.39	<i>0.001</i>	...
251	2.25	1.14	1.97	0.017	0.015	1.07	0.12	19.7	<i>0.02</i>	...	...	0.09	0.38	0.10	...
253	2.45	2.28	0.74	0.060	0.008	2.92	0.01	23.6	<i>0.035</i>	...	...	0.105	0.29	0.00	...
254	2.78	2.60	4.50	0.043	0.018	0.23	0.41	14.3	<i>0.05</i>	...	...	0.06	0.11	0.26	...

Cast Iron Certified Reference Materials (continued)

CKD No.	Pb	Sn	Ti	V	W	Zr	Bi	Ce	La	Mg	Sb	Se	Te	Zn	Fe
241b (cont)	0.001	<i>0.003</i>	0.001	0.080	0.001	0.000	0.000	0.000	0.000	0.000	0.139	<i>0.00</i>	<i>0.000</i>	0.000	<i>93.2</i>
242a (cont)	<i>0.012</i>	0.010	0.19	0.37	<i>0.007</i>	<i>0.000</i>	<i>0.015</i>	<i>0.00</i>	<i>0.00</i>	0.000	0.007	<i>0.000</i>	<i>0.08</i>	<i>0.00</i>	<i>92.9</i>
242b (cont)	0.027	0.010	0.28	0.46	<i>0.002</i>	<i>0.000</i>	0.020	<i>0.00</i>	0.000	0.000	0.005	<i>0.002</i>	<i>0.031</i>	<i>0.00</i>	<i>92.6</i>
244c (cont)	0.003	0.027	0.034	0.002	0.052	0.037	0.000	0.017	0.008	0.031	0.004	<i>0.000</i>	<i>0.000</i>	0.027	<i>92.9</i>
245a (cont)	0.016	0.076	0.087	0.073	0.021	0.003	0.008	<i>0.00</i>	<i>0.00</i>	0.003	0.050	<i>0.036</i>	<i>0.018</i>	0.000	<i>92.7</i>
245b (cont)	0.020	0.076	0.110	0.055	0.020	0.004	0.009	<i>0.00</i>	<i>0.00</i>	0.003	0.052	<i>0.029</i>	<i>0.017</i>	<i>0.00</i>	<i>92.5</i>
246b (cont)	<i>0.002</i>	0.002	0.014	0.013	<i>0.011</i>	0.000	<i>0.001</i>	0.007	0.003	0.016	0.004	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>92.6</i>
251 (cont)	<i>0.009</i>	<i>0.01</i>	<i>0.005</i>	<i>0.02</i>	...	...	...	0.017	...	0.022	...	...	...	...	...
253 (cont)	<i>0.00</i>	<i>0.005</i>	<i>0.005</i>	<i>0.02</i>	...	...	...	0.018	...	0.038	...	...	...	...	...
254 (cont)	<i>0.012</i>	<i>0.02</i>	<i>0.005</i>	<i>0.005</i>	...	...	...	0.039	...	0.058	...	...	...	...	...

Some other CKD samples are available, and information on these will be provided on request.

CENTRE DE DÉVELOPPEMENT DES INDUSTRIES DE MISE EN FORME DES MATÉRIAUX (CTIF), France

CHEMICAL COMPOSITION (nominal mass content in %) – Figures in bold type certified, figures in small italic type only approximate.

Highly Alloyed Steel Certified Reference Material (Finely divided material units of 100g or a 40mm dia x 20mm disc)

CTIF No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	As	Co	Cu	N	Nb	Sn	V	Al _{Sol.}	Al _{Rot.}	Ga
*ECRM 273-1	Highly Alloyed Steel	0.0336	0.378	0.785	0.0131	0.00037	14.747	0.246	4.852	0.0030	0.0391	3.047	0.0444	0.221	0.0021	0.0512	<i>0.0032</i>	<i>0.0062</i>	<i>0.0023</i>

Special Alloy Certified Reference Materials (40mm dia x 20mm discs: ECRM 378-1 is also available in the finely divided form in units of 100g.)

CTIF No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	B	Co	Cu	Nb	Ti	W	Fe
*ECRM 377-1	Nickel Alloy IN 625	0.0202	0.077	0.0225	0.0036	0.0006	21.72	8.94	61.45	0.216	<i>0.0006</i>	0.0348	0.0110	3.50	0.255	...	3.77
*ECRM 377-2	Nickel Alloy IN 625	0.0202	0.077	0.0225	0.0036	0.0006	21.72	8.94	61.45	0.232	<i>0.0006</i>	0.0348	0.0104	3.50	0.264	...	3.77
*ECRM 378-1	Cobalt Alloy, Stellite grade 6	1.181	1.172	0.0579	<i>0.0023</i>	0.0055	28.22	0.0503	0.617	...	...	63.52	...	...	...	4.43	0.606

Cast Iron Certified Reference Materials (Finely divided material units of 100g)

CTIF No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	Co	Cu	N	Sn	Te	Ti	V	Zn
*ECRM 485-2	3.308	0.508	0.190	0.610	0.165	0.0845	...	0.0742	...	...	...	0.0303	0.0058	...	...	...	...	...
*ECRM 485-3	3.514	...	...	...	0.1488	...	...	...	...	...	...	...	0.0081	...	...	...	...	...
*ECRM 487-1	3.27	0.0060	0.094	0.0020	0.0007	0.063	...	0.040	...	0.011	0.009	...	0.004	...	...	...	<i>0.0005</i>	...
*ECRM 487-2	3.573	0.0899	0.0491	0.0066	0.0031	0.0249	0.0034	0.0219	0.079	0.0064	0.0151	0.0136	0.0044	0.0045	0.0064	0.0021	0.0117	0.0012
*ECRM 488-2	3.956	0.374	0.201	0.0111	0.1173	0.303	<i>0.0008</i>	0.1247	...	...	...	0.0256	0.0052	0.0013	<i>0.0089</i>	0.0636	0.0545	<i>0.0006</i>
*ECRM 490-1	4.813	<i>0.03</i>	10.83	0.0267	0.0040	0.0183	...	<i>0.02</i>	...	...	...	0.0088	0.0030	...	...	0.0035	0.0152	...
*ECRM 491-1	3.616	...	...	...	0.0866	...	...	...	...	...	...	...	...	...	...	...	...	...
*ECRM 492-1	3.258	...	...	...	0.0854	...	...	...	...	...	...	...	0.0048	...	...	...	...	...

* Denotes Full EURONORM Certified Reference Materials

Low Alloy Iron Reference Materials (43mm dia x 5mm chill cast discs) Supplied as a pair of discs of the same material.

CTIF No.	C	Si	Mn	P	S	Cr	Mo	Ni	Co	Cu	Sn	Ti	V	Others
FPA-1	<i>3.1</i>	<i>0.03</i>	<i>0.10</i>	<i>0.002</i>	<i>0.0009</i>	<i>0.07</i>	<i>0.0109</i>	<i>0.045</i>	<i>0.0097</i>	<i>0.062</i>	...	<i>0.0010</i>	<i>0.0010</i>	<i>0.0109 As, 0.01 N</i>
FL 1-1	<i>2.14</i>	<i>3.24</i>	<i>0.820</i>	<i>0.118</i>	<i>0.0765</i>	<i>0.063</i>	<i>0.038</i>	<i>0.245</i>	...	<i>0.0195</i>	<i>0.305</i>	<i>0.02</i>	<i>0.0205</i>	...
FL 3-1	<i>2.45</i>	<i>2.11</i>	<i>0.270</i>	<i>0.729</i>	<i>(0.013)</i>	<i>0.107</i>	<i>0.106</i>	<i>0.553</i>	<i>(0.022)</i>	<i>0.102</i>	<i>0.111</i>	<i>0.054</i>	<i>0.049</i>	<i>0.0060 N</i>
FO 1-5	<i>2.02</i>	<i>3.18</i>	<i>0.715</i>	<i>0.112</i>	<i>0.074</i>	<i>0.08</i>	<i>0.04</i>	<i>0.120</i>	...	<i>0.036</i>	<i>0.382</i>	<i>0.018</i>	<i>0.019</i>	...
FO 3-6	<i>2.56</i>	<i>1.93</i>	<i>0.735</i>	<i>0.27</i>	<i>0.175</i>	<i>0.10</i>	<i>0.105</i>	<i>0.458</i>	<i>(0.006)</i>	<i>0.108</i>	<i>0.104</i>	<i>0.054</i>	<i>0.036</i>	<i>(0.002) As</i>
FO 4-3	<i>2.81</i>	<i>1.51</i>	<i>0.64</i>	<i>0.58</i>	<i>0.009</i>	<i>0.17</i>	<i>0.10</i>	<i>0.32</i>	...	<i>0.31</i>	<i>0.013</i>	<i>0.075</i>	<i>0.049</i>	...
FO 5-4	<i>3.2</i>	<i>0.7</i>	<i>0.2</i>	<i>1.30</i>	<i>0.027</i>	<i>0.24</i>	<i>0.40</i>	<i>0.172</i>	<i>(0.019)</i>	<i>0.12</i>	<i>0.109</i>	<i>0.04</i>	<i>0.14</i>	<i>(0.001) As</i>
FO 6-4	<i>3.5</i>	<i>0.55</i>	<i>0.7</i>	<i>0.87</i>	<i>0.106</i>	<i>0.50</i>	<i>0.21</i>	<i>0.128</i>	...	<i>0.12</i>	<i>0.039</i>	<i>0.09</i>	<i>0.11</i>	...
FO 7-2	<i>2.45</i>	<i>0.675</i>	<i>0.70</i>	<i>0.84</i>	<i>0.085</i>	<i>0.45</i>	<i>0.26</i>	<i>0.15</i>	...	<i>0.125</i>	...	<i>0.065</i>	<i>0.13</i>	<i>0.0113 N</i>
FO 8-2	<i>3.6</i>	<i>1.04</i>	<i>0.37</i>	<i>0.107</i>	<i>0.021</i>	<i>0.26</i>	...	<i>0.30</i>	...	<i>0.215</i>	<i>0.05</i>	<i>0.055</i>	<i>0.014</i>	...
FO 9-2	<i>2.7</i>	<i>1.5</i>	<i>0.7</i>	<i>0.02</i>	<i>0.015</i>	<i>0.18</i>	<i>0.12</i>	<i>0.355</i>	...	<i>0.31</i>	<i>0.144</i>	<i>0.017</i>	<i>0.022</i>	...
FO 12-1	<i>3.71</i>	<i>1.86</i>	<i>0.44</i>	<i>0.038</i>	<i>0.004</i>	...	...	...	...	<i>0.77</i>	<i>0.011</i>	...	...	...
FO 18-1	<i>3.25</i>	<i>1.33</i>	<i>0.52</i>	<i>1.11</i>	<i>0.132</i>	<i>0.09</i>	<i>0.16</i>	<i>0.18</i>	...	<i>0.09</i>	<i>0.15</i>	<i>0.17</i>	<i>0.17</i>	...
FO 19-2	<i>4.04</i>	<i>1.05</i>	<i>1.05</i>	<i>0.032</i>	<i>0.057</i>	...	...	...	...	...	...	...	...	<i>0.0005 Te</i>
FT 1-3	<i>2.9</i>	<i>2.25</i>	<i>0.7</i>	<i>0.118</i>	<i>(0.006)</i>	<i>0.07</i>	...	<i>0.134</i>	...	<i>0.018</i>	...	<i>0.04</i>	<i>0.7</i>	...
FT 2-1	<i>3.4</i>	<i>1.4</i>	<i>0.78</i>	<i>0.045</i>	<i>0.095</i>	<i>0.03</i>	...	<i>0.07</i>	...	<i>0.01</i>	...	<i>0.10</i>	<i>0.405</i>	...
FT 3-1	<i>3.2</i>	<i>1.55</i>	<i>0.345</i>	<i>0.063</i>	<i>0.051</i>	<i>0.685</i>	...	<i>0.092</i>	...	<i>0.015</i>	...	<i>0.2</i>	<i>0.016</i>	...

CENTRE DE DÉVELOPPEMENT DES INDUSTRIES DE MISE EN FORME DES MATÉRIAUX (CTIF), France

CHEMICAL COMPOSITION (nominal mass content in %)

Cu, Ni, Cr, Mo Iron Reference Materials (43mm dia. x 5mm chill cast discs) Supplied as a pair of discs of the same material.

CTIF No.	C	Si	Mn	P	S	Cr	Mo	Ni	Cu
NH 1-2	2.98	1.35	0.90	0.060	0.105	0.83	1.45	1.38	1.99
NH 2-2	2.50	1.81	1.04	0.047	0.058	1.26	1.01	1.78	1.02
NH 3-2	3.47	0.85	0.175	0.36	0.024	1.76	0.73	2.53	0.031
NH 4-2	2.84	0.49	0.28	0.12	0.022	2.46	0.30	3.60	0.09
NH 5-2	2.31	0.31	0.24	0.115	0.04	2.85	0.017	4.90	0.035
NH 6-1	2.70	2.28	0.355	0.066	0.036	6.60	0.11	7.06	0.115
NH 7-1	3.43	0.95	0.63	0.035	0.022	9.02	...	5.53	0.105
NH 8-1	2.98	0.80	0.57	0.052	0.076	5.03	0.125	8.16	0.065
NH 9-1	3.13	1.24	0.65	0.087	0.029	11.70	0.059	4.11	0.203

Austenitic (Ni-resist) Iron Reference Materials (43mm dia. x 5mm chill cast discs) Supplied as a pair of discs of the same material.

CTIF No.	C	Si	Mn	P	S	Cr	Ni	Cu
NR CU 1	3.1	1.0	1.5	0.17	0.09	1.0	18.0	5.0
NR CU 2	2.6	2.1	1.1	0.12	0.05	2.0	15.9	6.5
NR CU 3	2.0	3.1	0.6	0.05	0.02	3.5	13.3	8.0
NR 1S	2.6	3.0	1.5	0.19	...	2.0	20.6	0.11
NR 2S	2.3	1.4	0.53	0.06	...	0.51	36.4	0.21
NR 3S	3.0	2.9	0.77	0.02	...	3.1	24.6	0.33
NR 4S	2.5	4.9	1.7	0.14	...	1.5	18.3	0.63
NR 5S	1.7	2.0	1.2	0.04	...	0.20	27.0	0.50
NR 6S	1.8	2.4	0.99	0.02	...	1.1	30.7	0.03
NR 8S	3.1	1.4	4.4	0.12	...	0.19	14.2	0.07
NR 1L	2.5	3.0	1.3	0.12	0.10	1.7	25.9	0.49
NR 3L	3.0	3.1	0.73	0.09	0.05	3.0	21.6	0.26
NR 4L	2.4	5.3	1.5	0.15	0.02	1.4	16.0	0.75
NR 5L	1.8	3.0	1.2	0.04	0.08	0.27	33.9	0.48
NR 6L	1.8	2.1	0.70	0.03	0.06	3.5	30.4	0.02
NR 8L	2.9	1.7	5.2	0.06	0.03	0.15	14.0	0.06
NR4-1G	2.3	5.6	1.7	0.11	...	1.4	21.3	0.64

Chromium Iron Reference Materials (43mm dia. x 5mm chill cast discs) Supplied as a pair of discs of the same material.

CTIF No.	C	Si	Mn	P	S	Cr	Mo	Ni	Cu	N
FCR 1-3	2.45	0.45	0.60	0.019	0.007	18.71	1.41	1.30	0.031	...
FCR 2-4	2.8	1.07	0.74	0.137	0.055	11.8	3.88	1.87	0.135	...
FCR 3-1	2.03	0.255	0.99	0.034	0.035	14.85	0.91	0.65	0.049	...
FCR 4-1	2.45	1.40	2.05	0.097	0.066	24.2	2.16	0.57	1.32	...
FCR 5-1	3.43	0.30	0.55	0.052	0.018	28.5	3.27	2.69	1.02	...
FCR 6-1	1.3	0.75	1.4	0.201	0.086	30.84	0.46	0.19	0.480	...
FCR 7-1	3.3	1.07	0.365	0.099	0.043	33.65	2.62	0.95	0.74	...
FCR NI 1	1.27	1.63	0.71	0.41	0.06	26.20	...	16.50	0.02	...
FCR NI 2	2.0	1.51	0.60	0.185	0.024	29.07	...	13.11	...	0.1
FCR NI 3	2.74	0.67	0.46	0.036	0.011	31.65	...	11.05	...	...

CENTRE DE DÉVELOPPEMENT DES INDUSTRIES DE MISE EN FORME DES MATÉRIAUX (CTIF), France

CHEMICAL COMPOSITION (nominal mass content in %) - Figures in brackets are for information only.

Brass Reference Materials (60mm dia. x 6 mm mushrooms, except EA1 which is a 40mm dia. x 18mm disc)

CTIF No.	Cu	Sn	Pb	Zn	Fe	Ni	Mn	Al	Si	Sb	P	Others
L 1	58.9	0.05	0.06	40.6	<0.02	0.11	...	...	0.38	...	...	...
L 2	61.6	0.50	0.41	35.2	0.22	0.70	0.35	0.50	0.20	...	...	...
L 3-1	58.5	1.62	1.32	35.5	0.36	0.99	0.21	1.22	0.026	0.32	0.031	0.07 As
L 4-1	61.7	0.69	2.0	34.6	0.47	0.23	0.11	0.06	0.12	...	...	...
L 5-1	61.0	0.88	2.99	31.5	(1.0)	0.49	0.50	0.64	(0.50)	0.17	(0.15)	0.13 As
L 6	66.6	0.25	0.20	30.3	0.08	1.2	0.06	0.14	1.25	...	...	...
L 7	55.6	0.04	0.71	42.4	0.03	0.02	0.62	0.30	0.13	...	...	...
L 20	85.5	0.56	0.27	13.2	0.12	0.20	0.04	0.01	0.04	...	...	0.12 As
L 21	82.5	1.5	0.21	15.6	0.09	0.16	<0.01	<0.02	0.04	...	...	0.10 As
L 22	84.3	1.0	0.10	15.0	0.20	0.10	<0.01	<0.02	<0.05	0.088	0.06	<0.05 Mg
L 23	81.2	0.20	0.06	17.9	0.25	0.03	...	<0.02	0.28	...	...	0.05 As
LH 1-1	64.9	(0.01)	0.02	16.9	4.48	0.094	5.18	7.99	0.20	0.081	0.079	...
LH 2	61.9	0.06	0.08	22.1	3.1	3.0	3.6	6.2	0.09	...	...	...
LH 5	65.9	0.12	0.18	25.5	1.2	1.6	1.2	4.3	0.11	...	...	...
LH 6-1	63.2	0.26	0.25	19.0	3.1	3.2	4.5	6.1	0.20	...	...	...
LH 7-1A	63.4	0.23	0.33	26.9	2.4	0.70	3.0	3.2	0.06	...	...	...
LH 10	59.0	0.20	1.8	29.0	1.0	1.5	3.6	2.7	1.3	...	...	...
LH 11	66.8	0.44	1.3	26.2	0.36	2.9	0.71	0.46	0.88	...	...	...
LH 12	62.8	0.83	0.20	33.2	1.2	0.50	0.12	1.0	0.06	...	...	...
LH 13	55.8	1.2	0.60	31.8	2.0	3.2	3.1	2.0	0.21	...	...	...
LS 1	78.5	0.25	0.2	16.0	0.5	0.5	0.04	0.02	4.2	0.05	...	...
LS 2	79.6	0.34	0.89	11.6	1.02	1.11	0.22	0.16	4.91	0.010	0.064	...
LS 3	76	0.15	0.58	19	0.10	0.11	0.15	0.43	3.3	0.11	0.011	...
UZ 5	59.9	0.06	0.07	39.6	0.02	0.02	...	...	0.32	...	...	...
UZ 30	63.8	1.3	1.0	33.0	0.07	0.05	0.07	0.50	0.05	...	...	...
UZ 50	85.4	0.50	0.25	13.2	0.04	0.16	0.09	0.02	0.10	...	...	...
UZ 51	83.7	1.5	0.19	14.2	0.10	0.16	...	...	0.01	...	...	0.09 As
UZ 52-3	81.2	1.1	0.11	16.9	0.32	0.084	0.002	...	0.12	0.08	0.068	0.040 Mg, 0.014 Be
UZ 53	82.6	0.20	0.02	16.7	0.26	0.02	≤0.001	...	0.14	...	0.055	0.01 As
UZHR 1	64.8	0.52	0.96	17.8	2.5	2.4	5.4	5.1	0.28	...	...	...
UZHR 3	65.2	0.23	0.65	23.8	2.8	1.0	3.1	3.2	...	...	...	...
UZHR 4	66.8	0.40	0.22	23.4	1.4	0.52	4.3	2.9	0.06	...	...	...
UZHR 6	60.7	...	...	23.5	4.5	...	3.0	8.5	...	...	...	...
UZHR 7	59.5	...	...	26	3.8	...	4.0	7.0	...	...	...	...
UZHR 8	60.1	...	...	29.6	3.0	...	2.0	5.5	...	...	...	...
UZHR 9	60.2	...	...	27.7	2.2	...	6.0	3.8	...	...	...	...
UZHR 10	59.1	...	...	32	1.5	...	5.0	2.5	...	...	...	...
UZS 60	78.9	0.40	0.57	15.3	0.47	0.49	...	...	3.7	...	0.07	...
EA1*	(57.8)	(0.20)	(2.95)	(38.5)	(0.14)	(0.065)	...	...	(<0.01)	...	...	(0.09) As

* This denotes a Setting Up Sample giving approximate composition only.

CENTRE DE DÉVELOPPEMENT DES INDUSTRIES DE MISE EN FORME DES MATÉRIAUX (CTIF), France

CHEMICAL COMPOSITION (nominal mass content in %) - Figures in brackets are for information only.

Bronze Reference Materials (60mm dia. x 6 mm mushrooms)

CTIF No.	Cu	Sn	Pb	Zn	Fe	Ni	Mn	Si	S	P	Al	Sb	As
B1	83.0	15.1	0.2	0.9	0.09	0.06	...	0.05	0.03	0.03	0.06	0.44	...
B2	85.9	13.5	0.02	0.11	0.05	<0.01	...	0.2	0.05	0.17	<0.01	<0.01	...
B3	80.2	13.0	1.6	2.3	0.22	1.5	0.20	0.06	0.05	0.48	0.10	0.20	...
B4	84.0	10.8	2.5	1.2	<0.05	0.6	...	<0.05	0.02	0.5	...	0.1	...
B5	86.0	9.9	0.5	0.4	0.18	2.3	0.08	0.05	0.07	0.04	0.04	0.5	...
B10	83.9	6.6	4.0	2.6	0.17	0.97	<0.01	<0.01	0.05	0.02	0.17	1.1	0.01
B11	84.8	8.0	1.9	2.0	0.17	2.0	...	0.13	0.09	0.06	...	0.70	...
B12	85.7	9.6	0.2	0.6	0.2	2.6	0.25	0.05	0.01	0.5	0.1	0.1	0.1
B13	86.4	10.0	0.99	1.1	0.25	0.50	0.05	0.08	0.07	0.22	0.02	0.24	0.06
B14	87.0	10.8	0.5	0.2	0.11	0.3	0.02	0.08	0.02	0.64	<0.01	0.08	0.04
B20-1	83.4	6.4	5.1	3.8	0.17	0.5	...	0.06	0.12	0.07	0.04	0.52	...
B21	83.0	5.1	3.8	6.2	0.28	1.2	...	0.14	0.05	<0.01	...	0.18	...
B22-1	83.0	3.5	6.0	4.0	<0.1	2.5	...	<0.1	0.03	...	...	0.05	...
B23-1	83.4	7.2	7.2	1.5	(0.04)	0.09	...	0.03	0.02	0.07	0.0	0.38	...
B30-1	76.5	11.1	9.6	1.0	0.07	1.2	0.10	(<0.06)	0.08	0.05	(<0.05)	0.21	...
B31	78.6	7.7	11.8	0.8	(0.02)	0.50	...	(0.05)	0.03	...	(0.03)	0.48	...
B32	74.6	6.0	16.1	1.2	0.11	1.5	...	0.08	0.03	0.04	0.08	0.13	<0.01
UE-30	88.0	7.2	2.0	2.0	0.02	0.15	0.15	0.10	0.04	0.07	...	0.1	...

Cupro - Beryllium Cobalt and Cupro-Nickel Reference Materials (60mm dia. x 6mm mushrooms)

CTIF No.	Cu	Sn	Pb	Zn	Fe	Ni	Mn	Si	S	Al	Be	Co	Ag	C	Nb	Others
4583	96.3	0.25	0.08	0.09	0.15	2.0	0.06	0.08	...	0.03	0.8	0.002	...	...	...	...
4584	97.0	0.02	0.002	0.02	0.12	0.02	<0.01	0.17	...	0.03	2.5	0.04	...	...	...	...
4594	95.5	0.002	0.003	<0.01	0.10	0.06	...	0.12	0.07	0.03	0.14	3.0	0.99	...	...	0.067 Cr
4640	95.7	0.05	0.06	0.06	0.13	1.1	0.06	0.17	0.1	0.10	0.70	1.4	0.50	...	...	0.1 Cr
4766	96.8	0.10	0.05	0.07	0.16	0.20	<0.01	0.11	0.2	0.03	1.6	0.64	...	...	...	0.2 Cr
4868	96.2	0.02	0.02	0.06	0.20	0.04	0.02	0.21	...	0.04	2.9	0.25	...	...	...	...
4872	97.0	0.04	0.02	0.12	0.08	0.10	<0.01	0.16	0.04	0.06	1.9	0.40	...	...	...	0.04 Cr
4873	98.4	0.007	0.003	0.02	0.10	0.05	<0.01	0.09	...	0.10	0.17	1.0	...	...	...	0.105 Cr
CN1	85.0	(0.005)	0.085	0.2	1.1	12.3	0.8	(0.05)	0.046	(0.003)	...	...	...	(0.002)	(0.1)	...
CN2	88.5	(0.005)	0.055	0.5	1.6	7.8	1.1	0.24	0.028	(0.005)	...	...	...	(0.005)	(0.005)	...
CN3	87.5	<0.01	0.02	0.1	0.7	9	1.5	0.2	0.01	0.1	...	...	...	0.05	0.6	...
CN4	84.0	0.058	0.006	0.07	1.8	11.2	1.5	(0.01)	(0.001)	(0.02)	...	...	...	(0.001)	0.7	...
CN33	67.1	(0.003)	0.053	0.37	1.6	29.75	0.45	0.47	0.013	(0.01)	...	...	...	0.02	0.06	0.02 P, 0.0212 Bi 0.006 Cd, <0.06 Mg 0.0224 Te
UN 3S	92.6	0.22	0.20	1.6	0.30	3.4	0.07	1.2	...	0.11	...	...	...	...	...	...

CENTRE DE DÉVELOPPEMENT DES INDUSTRIES DE MISE EN FORME DES MATÉRIAUX (CTIF), France

CHEMICAL COMPOSITION (nominal mass content in %)

Cupro-Aluminium Reference Materials (60mm dia. x 6mm mushrooms)

CTIF No.	Cu	Sn	Pb	Zn	Fe	Ni	Mn	Al	Si	Cd	Mg	Bi	Cr
2 206-B	81.0	0.07	0.08	0.18	1.6	5.7	2.5	8.7	0.17	...	...	...	...
2 499-C	80.8	0.16	0.16	0.08	4.7	3.5	0.38	9.8	0.45	...	...	...	...
2 549-D	80.1	0.5	0.43	0.76	2.4	4.4	0.8	10.1	0.3	...	...	...	...
2 504-E	79.5	0.5	0.60	0.55	3.6	6.4	0.7	8.1	0.08	...	...	...	...
3 018-F	81.9	0.06	0.02	0.06	4.5	4.5	1.6	7.2	0.08	...	...	...	...
3 011-G	84.8	0.12	0.10	0.25	2.0	2.0	0.17	10.4	0.16	...	...	...	...
4 149-G	85.0	0.34	0.15	0.37	2.0	2.0	0.21	9.8	0.18	...	...	...	...
2 794-H	90.3	0.11	...	...	0.82	0.70	...	8.0	0.05	...	...	...	...
3 299-J	87.6	0.11	0.11	0.19	0.38	0.21	1.1	10.1	0.14	...	...	...	...
2 552-K	85.7	0.41	0.10	0.40	0.18	0.18	0.59	12.2	0.20	...	...	...	...
3 296-L	88.5	0.06	0.30	0.62	0.07	0.41	0.37	9.4	0.20	...	...	...	...
3 300-M	89.5	0.21	0.21	0.08	0.45	0.21	0.17	8.7	0.42	...	...	...	...
2 505-N	79.2	0.07	0.3	0.4	2.8	2.5	3.1	11.2	0.25	...	...	...	...
3 010-O	81.3	0.82	0.48	1.2	5.6	1.7	1.2	7.6	0.05	...	...	...	...
2 205-P	81.2	...	0.003	...	3.2	3.2	0.08	12.2	0.05	...	...	...	...
4 065-P	81.2	0.18	0.03	0.03	3.4	3.2	0.08	11.9	0.03	...	...	...	...
3 610-Q	82.3	0.25	0.25	0.5	4.0	5.4	0.05	7.1	0.06	0.090	...	...	...
2 151-R	84.7	...	...	...	4.5	0.55	0.7	9.4	0.02	...	...	...	...
2 152-S	85.0	...	...	...	4.0	0.7	0.4	9.8	0.02	...	...	...	...
2 154-V	85.0	...	...	0.01	3.1	0.4	0.1	11.3	0.02	...	...	...	...
2 158-W	85.0	...	...	0.01	2.5	0.1	0.25	12.0	0.02	...	...	...	...
3 297-Y	87.4	0.1	0.1	0.3	1.9	...	0.03	10.0	0.15	...	...	...	...
3 301-Z	87.3	0.03	0.03	0.06	4.0	0.13	0.26	8.1	0.06	...	...	...	...
CA 3	86.5	0.20	0.15	0.30	0.80	0.80	0.06	10.9	0.08	...	...	...	...
CA 10	80.7	0.16	0.16	0.067	4.55	3.39	0.333	10.1	0.46	...	...	...	...
CA 11	84.5	0.26	0.11	0.21	1.27	1.95	0.78	10.5	0.25	...	0.1	...	...
CA 12	84.1	0.036	0.047	0.45	2.77	1.39	3.09	8.0	0.058	...	...	...	...
CA 13	82.4	(0.01)	0.023	0.65	3.82	0.50	1.22	11.2	0.11	...	...	...	...
CA 20	87.2	0.19	0.18	0.41	0.79	1.18	1.85	8.0	0.17	0.05	...	...	...
CA 21	81.9	0.07	0.05	0.100	3.45	3.09	0.30	10.8	0.07	0.010	...	...	...
CA 22	80.5	0.30	0.243	0.605	2.5	4.5	0.74	10.4	0.32	...	...	...	...
CA 25	79.1	0.18	0.03	0.252	6.1	5.7	0.51	8.0	0.084	...	...	...	...
CA 26	81.2	0.005	0.058	0.038	4.36	4.87	0.188	9.1	0.035	0.034	...	...	...
CA 27	81.1	0.054	0.11	0.428	2.81	3.88	1.20	10.2	0.127	0.012	...	...	...
CA 30	81.6	0.10	0.142	0.066	5.2	3.10	2.05	7.6	0.15	...	...	...	...
CA 31	76.5	0.063	0.020	0.145	3.18	7.51	3.27	9.2	0.064	...	0.02	...	...
CA 35	75.6	0.30	0.10	0.56	6.1	3.80	1.6	11.4	0.25	...	...	...	...
CA 36	77.3	0.20	0.015	0.24	3.0	6.3	0.13	12.6	0.11	...	0.1	0.058	0.041
CA 37	76.8	0.147	0.050	0.36	6.85	4.98	0.752	9.8	0.04	...	0.08	0.012	0.085

DILLINGER LABORATORY (DL), Germany
CHEMICAL COMPOSITION (nominal mass content in %)

Ferro-Alloy, Calcium-Silicon, Silico-Chromium, Silico-Manganese, Titanium and Electrolytic Manganese Reference Materials (Finely divided material - units of 50g)

Dillinger No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	B	Co	O
DL SL01-07	Silico – Manganese	1.65	17.36	77.82	0.135	...	...	...	0.021	...	...	0.030	...
DL SL04-03	Calcium – Silicon	0.40	60.12	0.611	0.014	...	0.018	0.003	0.008	1.59	...	...	...
DL SL17-03	Ferro – Boron	0.318	0.326	0.246	0.018	...	0.080	...	0.359	0.141	18.78	...	...
DL SL12-07	Ferro – Manganese	1.630	1.113	88.00	0.081	...	0.060	...	0.022	...	...	0.039	...
DL SL19-06	Ferro – Manganese, high C	6.895	0.040	77.09	0.167	...	0.010	...	0.057	...	...	0.069	...
DL SL20-20	Ferro – Molybdenum	0.028	0.210	0.013	0.034	0.079	0.057	62.20	0.019	...	...	...	0.068
DL SL23-05	Ferro – Silicon	0.238	76.58	0.070	0.016	...	0.021	...	0.004	1.64	...	...	...
DL SL24-14	Ferro – Titanium	0.132	...	0.151	...	0.0152	0.506	0.934	0.663	5.34	...	0.115	...
DL SL28-09	Ferro – Niobium	0.495	3.47	0.530	0.097	...	0.035	...	0.017	2.22	...	0.003	0.912
DL SL54-03	Silico – Chromium	0.034	40.46	0.41	0.022	...	36.93	...	0.190	0.579	...	...	...
DL SL27-03	Titanium	...	...	0.017	<0.006	...	0.059	0.016	0.031	0.024	...	0.0019	...
DL SL77-01	Electrolytic Manganese	0.120	1.09	95.85	0.056	0.016	0.411	...	0.0068	0.0015	...	0.0012	...

Dillinger No.	Cu	N	Nb	Pb	Sn	Ti	V	W	Zr	Ca	Mg	Ta	Zn	Fe
DL SL01-07 (cont)	0.012	...	...	...	...	0.122	0.015	...	...	...	...	...	...	2.64
DL SL04-03 (cont)	0.016	...	...	...	...	0.169	...	...	...	28.60	0.188	...	...	5.56
DL SL17-03 (cont)	0.064	...	...	...	...	0.017	0.004	...	...	...	...	...	...	79.36
DL SL12-07 (cont)	0.016	...	...	...	...	...	0.026	...	...	...	...	...	0.009	8.78
DL SL19-06 (cont)	0.040	...	...	...	...	0.003	0.035	...	...	...	...	...	0.007	15.40
DL SL20-20 (cont)	0.376	0.026	...	...	...	...	...	0.155	...	...	...	...	...	36.71
DL SL23-05 (cont)	0.009	...	...	...	...	0.107	0.005	...	...	1.45	0.013	...	...	18.62
DL SL24-14 (cont)	0.146	0.64	...	...	0.550	68.40	2.32	...	0.866	...	...	...	...	16.93
DL SL28-09 (cont)	0.037	0.043	60.12	0.010	...	1.35	0.878	...	0.238	...	...	0.217	...	27.46
DL SL54-03 (cont)	0.020	...	...	...	...	0.124	0.074	...	...	...	...	...	...	20.93
DL SL27-03 (cont)	0.002	...	...	0.00030	...	98.42	...	0.015	0.0002	...	...	...	0.00067	0.238
DL SL77-01 (cont)	0.007	...	...	...	...	...	...	...	...	...	...	...	0.0011	2.07

The above represents a selection of samples prepared by Dillinger Laboratory in which the reference values have been obtained after a preliminary multi-element analysis by a complete reconstitution of the test sample using pure and ultrapure compounds as primary references. Sets of Dillinger samples are available to provide ranges of values for most categories of materials stated, and details can be provided on request.

The Dillinger certified values are based on the SI units kg and mole and are obtained by means of absolute calibration.

DILLINGER LABORATORY (DL), Germany
CHEMICAL COMPOSITION (nominal mass content in %)

Ore, Sinter, Dust and Slag Reference Materials (Finely divided material - all units of 100g except DL SX62-05-units of 20g)

Dillinger No.	Description	CaO	SiO ₂	Fe	FeO	Fe ₂ O ₃	Mn	Mn ₃ O ₄	P ₂ O ₅	S	SO ₃	CuO
DL SX15-01	Dust	7.11	6.13	52.32	3.24	...	...	0.327	0.104	...	0.830	...
DL SX74-02	Zinc Slag	0.405	11.01	0.207	...	...	...	0.113	14.03	0.114	...	7.02
DL SX39-21	Converter Slag	50.05	10.56	16.92	...	...	2.31	...	1.36	0.196	...	0.007
DL SX66-04	Tundish Slag	1.609	24.75	...	...	4.62	...	0.098	0.084	...	0.026	...
DL SX51-17	Vacuum Ladle Slag	54.57	5.62	2.13	...	...	1.93	...	0.042	0.28	...	...
DL SX56-20	Iron Ore Sinter	8.19	5.84	58.04	7.64	...	0.241	...	0.126	...	...	...
DL SX62-05	Cupola Dust	4.91	34.52	...	...	9.49	...	2.57	0.147	...	2.70	0.163
DL SX67-04	Ilmenite	1.30	7.93	36.23	...	...	0.097	...	0.025	0.311	...	0.020

Dillinger No.	Al ₂ O ₃	MgO	NiO	Cr ₂ O ₃	Nb ₂ O ₅	SnO ₂	V ₂ O ₅	MoO ₃	TiO ₂	Pb	PbO	SrO	BaO
DL SX15-01 (cont)	1.23	1.49	...	...	...	...	...	...	0.107	0.096	...	...	...
DL SX74.02 (cont)	5.99	0.118	...	0.086	...	...	...	...	0.274	...	...	...	...
DL SX39-21 (cont)	4.79	2.99	...	0.196 Cr	0.030	...	0.422	...	0.780	...	...	...	...
DL SX66-04 (cont)	1.884	64.65	0.165	0.255	...	...	...	...	0.141	...	...	...	...
DL SX51-17 (cont)	20.34	11.23	...	0.092	0.124	...	0.129	...	1.18	...	...	0.036	0.014
DL SX56-20 (cont)	1.41	1.54	0.006	0.027	...	...	0.016	...	0.131	...	...	...	...
DL SX62-05 (cont)	1.30	1.85	0.005	0.041	...	...	0.018	0.030	0.060	...	2.43	...	...
DL SX67-04 (cont)	4.64	2.81	0.038	0.109	...	...	0.286	...	31.92	...	...	...	...

Dillinger No.	SnO ₂	Zn	ZnO	Co ₃ O ₄	Cd	Cl	F	Na ₂ O	K ₂ O	CO ₂	C(tot)	H ₂ O (900°C)	H ₂ O (600°C)
DL SX15-01 (cont)	...	0.010	...	...	0.001	1.11	0.377	0.121	1.59	2.59	2.78	...	1.04
DL SX74.02 (cont)	0.386	...	45.16	...	...	...	...	0.133	0.164	...	11.92	0.077	...
DL SX39-21 (cont)	0.500	0.020	0.013	...	...	...	...
DL SX66-04 (cont)	0.516	0.089	0.35	0.471	1.02	...
DL SX51-17 (cont)	0.010	...	...	...	...
DL SX56-20 (cont)	0.013	...	...	...	...	0.022	0.043	0.041	0.033	...	...
DL SX62-05 (cont)	21.01	2.88	0.096	2.26	3.68	3.84	6.80	0.107	...
DL SX67-04 (cont)	0.019	0.023	0.642	0.127	0.160	...	0.502	...

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DILLINGER LABORATORY (DL), Germany
CHEMICAL COMPOSITION (nominal mass content in %)

Refractory, Manganese Ore, Magnesite, Dunite and Tundish Slag Reference Materials (Finely divided material - units of 100g)

Dillinger No.	Description	CaO	SiO ₂	Fe	FeO	Fe ₂ O ₃	Mn	MnO	Mn ₃ O ₄	P ₂ O ₅
DL SX05-01	Chromium Magnesite	1.30	3.88	...	...	11.02	...	...	0.27	0.028
DL SX10-01	Dunite	2.00	40.66	5.66	1.92	5.96	...	0.125	...	0.031
DL SX26-12	Refractory	1.80	40.80	...	...	3.10	...	...	0.135	0.279
DL SX42-07	Magnesite	2.23	7.72	...	...	1.49	...	...	0.074	0.086
DL SX43-04	Manganese Ore	0.078	2.41	28.25	...	...	30.65	...	...	0.253
DL SX59-03	Tundish Slag	61.81	21.41	...	...	1.36	...	...	0.046	0.151

Dillinger No.	SO ₃	CuO	Al ₂ O ₃	MgO	NiO	TiO ₂	Cr ₂ O ₃	V ₂ O ₅	PbO	ZnO	Co ₃ O ₄
DL SX05-01 (cont)	0.025	0.012	11.59	50.74	0.119	0.070	20.73	0.100	...	0.038	0.023
DL SX10-01 (cont)	0.101	...	3.01	35.35	0.243	0.119	0.373	0.012	...	0.006	0.014
DL SX26-12 (cont)	...	...	36.45	13.3	0.032	1.25	0.385	0.027	...	...	...
DL SX42-07 (cont)	0.037	...	2.38	83.61	...	0.148	...	...	...	...	...
DL SX43-04 (cont)	0.016	...	2.96	0.064	...	0.104	0.001	0.004	0.002	0.002	0.001
DL SX59-03 (cont)	...	...	3.70	10.07	...	0.183	...	...	...	...	...

Dillinger No.	ZrO ₂	Ba	Na ₂ O	K ₂ O	C (elem)	C (tot)	CO ₂	H ₂ O (900°C)	LOI
DL SX05-01 (cont)	0.00	...	0.011	0.06	...	0.002	0.007	0.024	...
DL SX10-01 (cont)	0.005	...	0.133	0.063	0.057	...	0.395	10.00	9.85
DL SX26-12 (cont)	0.163	...	0.242	0.759	...	0.437	0.54	0.75	...
DL SX42-07 (cont)	0.011	...	0.385	0.074	...	0.539	0.536	0.838	...
DL SX43-04 (cont)	0.015	0.204	0.012	0.261	...	0.041	0.056	4.46	9.05
DL SX59-03 (cont)	...	...	0.174	0.599	...	...	0.016	0.023	...

The above represents a selection of samples prepared by Dillinger Laboratory in which the reference values have been obtained after a preliminary multi-element analysis by a complete reconstitution of the test sample using pure and ultrapure compounds as primary references. Sets of Dillinger samples are available to provide ranges of values for most categories of materials stated, and details can be provided on request.

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DILLINGER LABORATORY (DL), Germany
CHEMICAL COMPOSITION (nominal mass content in %)

Dolomite, Limestone, Fluorspar, Gravel and Continuous Casting Powder Reference Materials (Finely divided material - all units of 100g)

Dillinger No.	Description	Ca	CaO	SiO ₂	Fe ₂ O ₃	MnO	Mn ₃ O ₄	P ₂ O ₅
DL SX07-08	Dolomite	...	28.36	7.93	3.12	...	0.527	0.123
DL SX35-15	Limestone	...	48.91	8.75	1.293	0.028	...	0.036
DL SX27-07	Fluorspar	46.76	...	6.16	0.257	0.008	...	...
DL SX36-09	Gravel	...	0.047	96.35	0.706	...	0.20	0.019
DL SX30-05	Continuous Casting Powder	27.35	...	43.10	0.233	0.007	...	0.091

Dillinger No.	S	SO ₄	Al ₂ O ₃	MgO	TiO ₂	Na ₂ O	K ₂ O	BaO	F
DL SX07-08 (cont)	0.171	...	13.45	45.22	0.255	...	0.171	...	...
DL SX35-15 (cont)	0.025	...	0.787	0.379	0.048	0.032	0.187	...	...
DL SX27-07 (cont)	...	0.042	0.371	0.070	...	0.061	0.042	<0.006	41.79
DL SX36-09 (cont)	...	...	1.46	0.104	0.086	0.045	0.334	...	...
DL SX30-05 (cont)	0.019	...	5.14	0.39	0.086	7.93	0.376	...	7.18

Dillinger No.	V ₂ O ₅	Cr ₂ O ₃	Co ₃ O ₄	NiO	PbO	SrO	ZnO	CO ₂	H ₂ O (900°C)
DL SX07-08 (cont)	0.024	0.082	...	0.009	...	0.016	0.021	...	...
DL SX35-15 (cont)	...	...	...	...	...	0.050	...	...	...
DL SX27-07 (cont)	...	...	...	...	0.00019	...	...	2.91	0.363
DL SX36-09 (cont)	<0.006	0.029	0.005	...	...	...	...	<0.025	0.043

Rice Straw Ash and Rutile Reference Materials (Finely divided material - DL SX57-04 - units of 20g, DL SX58-02 - units of 100g,)

Dillinger No.	Description	CaO	SiO ₂	Fe ₂ O ₃	Mn ₃ O ₄	P ₂ O ₅	SO ₃	Al ₂ O ₃	MgO
DL SX57-04	Rice Straw Ash	0.302	92.49	0.090	0.067	0.273	0.071 S	0.198	0.362
DL SX58-02	Rutile	0.048	2.04	0.629	0.007	0.025	...	0.449	...

Dillinger No.	Cr ₂ O ₃	TiO ₂	Na ₂ O	K ₂ O	V ₂ O ₅	Nb ₂ O ₅	ZrO ₂	C	CO ₂	H ₂ O (900°C)
DL SX57-04 (cont)	...	...	0.070	0.97	...	...	...	3.60	0.008	1.38
DL SX58-02 (cont)	0.213	93.76	0.021	...	0.454	0.297	1.60	...	...	0.245

The above represents a selection of samples prepared by Dillinger Laboratory in which the reference values have been obtained after a preliminary multi-element analysis by a complete reconstitution of the test sample using pure and ultrapure compounds as primary references. Sets of Dillinger samples are available to provide ranges of values for most categories of materials stated, and details can be provided on request.

The Dillinger certified values are based on the SI units kg and mole and are obtained by means of absolute calibration.

DILLINGER LABORATORY (DL), Germany
CHEMICAL COMPOSITION (nominal mass content)

Iron Ore Reference Materials (Finely divided material – units of 100g) nominal mass content in %

Dillinger No.	Description	CaO	SiO ₂	Fe	FeO	Mn	P ₂ O ₅	S	Al ₂ O ₃	MgO	Cr ₂ O ₃	V ₂ O ₅	TiO ₂	Na ₂ O	K ₂ O	C(tot)	CO ₂	H ₂ O (900°C)
DL SX11-13	...	0.030	1.80	66.33	0.04	0.432	0.084	0.002	1.11	0.040	0.010	0.007	0.046	<0.003	0.010	0.035	...	1.244
DL SX11-14	...	0.421	7.47	65.55	27.20	0.029	0.028	0.019	0.271	0.565	0.006	0.002	0.060	0.078	0.061	0.125	...	...
DL SX11-15	...	0.494	5.79	63.17	...	0.074	0.101	...	2.68	0.244	0.005	0.010	0.128	0.020	0.008	...	...	...
DL SX11-16	...	1.149	4.67	64.69	...	0.198	0.058	...	0.722	0.400	0.038	0.009	0.078	0.016	0.023	0.016	0.026	0.059
DL SX11-18	...	0.052	1.56	64.72	...	0.713	0.141	0.009	1.785	0.057	...	0.017	0.075	0.014	0.020	0.085	0.033	2.51
DL SX11-24	Samarco Pellets	2.05	2.54	65.47	0.109	0.034	0.081	0.004	1.26	0.135	0.003	...	0.045	0.014	0.031	0.068	0.098	0.079
DL SX11-25	Samarco Pellets	2.53	2.52	64.05	0.193	0.068	0.087	0.010	1.20	0.421	0.002	0.008	0.045	0.016	0.033	0.671	0.929	...
DL SX11-26	Carol Concentrate	0.424	4.64	65.88	8.07	0.095	0.011	0.004	0.151	0.306	0.002	0.009	0.046	0.001	0.001	0.280	0.97	0.097
DL SX11-28	Samarco Pellets	2.08	2.55	65.52	0.144	0.044	0.094	0.004	1.23	0.110	...	0.005	0.043	0.011	0.024	0.030	0.075	0.059
DL SX11-32	Morro Agudo Sinter-feed	0.023	5.00	65.21	0.588	0.072	0.052	0.005	0.811	0.025	0.017	0.008	0.053	0.001	0.005	0.033	0.005	0.628
DL SX11-35	...	0.011	0.696	64.69	0.06	1.520	0.140	0.006	1.49	0.033	...	...	0.052	...	0.016	0.069	0.007	2.31
DL SX11-36	...	0.370	3.35	65.74	...	1.21	0.017	0.002	0.345	0.083	0.025	0.006	0.023	0.025	0.033	0.016	0.030	0.057
DL SX11-37	...	1.930	2.365	66.15	0.32	0.038	0.113	0.003	0.442	0.164	0.017	...	0.032	0.020	0.011	0.101	0.089	0.080

Some additional information is also given regarding the following oxides and trace element in these iron ore samples:- CuO, NiO, ZnO, Co₃O₄ and U.

Cement Reference Materials (Finely divided material – units of 100g) nominal mass content in %

Dillinger No.	Ca	CaO	SiO ₂	Fe ₂ O ₃	Mn ₃ O ₄	P ₂ O ₅	S	Al ₂ O ₃	MgO	TiO ₂	ZrO ₂	SrO	K ₂ O	Na ₂ O	BaO	V ₂ O ₅	Cr	F
DL SX02-02	27.17	...	4.08	15.83	0.039	0.043	0.046	39.31	0.487	1.81	0.056	0.017	0.111	0.033	...	...	0.070	0.009
DL SX02-09	48.78	...	21.95	0.204	0.025	0.043	1.19	4.63	0.717	0.095	...	0.051	1.01	0.078	0.028	...	...	...
DL SX02-10	33.39	46.72	30.30	1.66	0.327	0.066	1.77	9.99	4.96	0.421	...	0.077	0.541	0.236	0.071	0.011	...	...
DL SX02-11	40.63	...	25.04	2.98	0.172	0.137	1.48	6.86	2.79	0.319	...	0.083	0.524	0.156	0.041	0.014	...	...
DL SX02-12	46.48	...	21.16	3.94	0.062	0.191	1.18	4.41	0.945	0.242	...	0.086	0.495	0.084	...	...	...	...

Information is also given regarding the following trace elements in the cement sample DL SX02-02:- As, Ba, Be, Bi, Cd, Ce, Co, Cu, In, La, Mo, Ni, Pb, Sb, Se, Te, Th, Tl, U, V and Zn.

The above represents a selection of samples prepared by Dillinger Laboratory in which the reference values have been obtained after a preliminary multi-element analysis by a complete reconstitution of the test sample using pure and ultrapure compounds as primary references. Sets of Dillinger samples are available to provide ranges of values for most categories of materials stated, and details can be provided on request.

The Dillinger certified values are based on the SI units kg and mole and are obtained by means of absolute calibration.

INSTITUTE OF GEOLOGICAL SCIENCES/BRITISH GEOLOGICAL SURVEY (IGS), U.K. AND SOCIETY OF GLASS TECHNOLOGY (SGT), U.K.

CHEMICAL COMPOSITION (nominal mass content in %) - Figures in bold type certified, figures in italic type only approximate and figures in brackets are for information only.

Ore and Concentrate Reference Materials (Finely divided material - approximate unit weights as shown in table)

IGS No.	Description	Unit Weight	Ba	Co	Cu	F	Fe	MnO ₂	Nb	Ni	Sr	Ti	W	SiO ₂	Others
21	Nickel Ore (Norite)	50g	...	<i>0.069</i>	<i>0.798</i>	...	<i>23.59</i>	...	...	<i>1.97</i>	...	...	...	...	...
27	Molybdenum-Tungsten Ore	65g	...	...	...	...	<i>1.76</i>	...	...	...	...	...	<i>0.036</i>	...	<i>0.276 Mo</i>
29	Pyrolusite	40g	<i>0.59</i>	...	<i>0.185</i>	...	...	<i>93.38</i>	...	...	...	...	...	<i>2.21</i>	...
30	Chromite	55g	...	...	...	...	<i>11.20</i>	...	...	...	...	<i>0.14</i>	...	<i>2.76</i>	<i>23.95 Cr, 16.63 MgO 29.12 Al₂O₃</i>
32	Rutile	45g	...	...	...	...	...	...	<i>0.26</i>	...	...	<i>57.19</i>	...	...	...
35	Zircon	50g	...	...	...	...	...	...	...	...	...	<i>0.16</i>	...	...	<i>1.20 Hf, 48.96 Zr</i>
39	Fluorite	55g	<i>0.44</i>	...	...	<i>46.85</i>	...	...	...	...	<i>0.014</i>	...	...	...	...

Glass Certified Reference Materials from Society of Glass Technology (SGT), U.K. (Broken pieces - units of 25g) (G4, G6, G7, G10 & G11 are also available as 40mm dia. glass discs)

SGT No.	Description	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	BaO	Na ₂ O	K ₂ O	PbO	As ₂ O ₃	B ₂ O ₃	TiO ₂	Cr ₂ O ₃	ZnO	ZrO ₂	Mn ₃ O ₄	F	SO ₃	LOI (550°C)
G4	Fluoride Opal Glass	69.49	3.02	0.099	4.24	<i><0.05</i>	...	15.45	0.57	...	...	0.19	0.041	...	3.28	...	...	4.96	<i><0.05*</i>	0.22
G6	Soda-Lime-Silica Glass	73.06	1.70	0.034*	9.97	<i><0.1</i>	...	14.65	<i><0.1</i>	...	...	...	0.02	...	...	...	...	...	0.20*	...
G7	Soda-Lime-Silica Glass	72.64	1.50	0.044*	11.03	0.14	...	13.90	0.43	...	...	...	0.042	...	...	...	...	...	0.19*	0.07
G8	Lead Oxide-Potassium Oxide-Silica Glass	56.34	0.05	0.010*	<i><0.02</i>	<i><0.02</i>	...	0.23	11.85	30.59	0.32*	0.36	0.02	...	...	...	...	...	...	0.21
G10	Amber Soda-Lime-Silica Container Glass	72.7	1.62	0.325	10.7	1.81	0.02	12.2	0.35	...	...	...	0.097	0.020	...	<i>(0.024)</i>	<i>(0.038)</i>	...	0.05	...
G11	Green Soda-Lime-Silica Container Glass	70.7	1.83	0.342	10.3	2.14	0.03	13.6	0.69	...	...	...	0.068	0.205	...	<i>(0.015)</i>	<i>(0.034)</i>	...	0.06	...

* Total iron as iron (III) oxide Fe₂O₃

* Total arsenic as As₂O₃

* Total sulphur as SO₃

Glass Sand Certified Reference Materials from Society of Glass Technology (SGT), U.K. (Finely divided material - units of 200g)

SGT No.	Description	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	TiO ₂	CaO	MgO	Na ₂ O	K ₂ O	Cr ₂ O ₃	LOI
S6	Standard Glass Sand	98.66	0.60	0.032*	0.024	<i><0.02</i>	<i><0.02</i>	<i><0.02</i>	0.40	<i>(0.0003)</i>	0.14
S8	Standard Glass Sand	95.63	2.07	0.26*	0.073	0.06	0.12	0.20	1.06	<i>(0.0011)</i>	0.48

*Total iron as iron (III) oxide Fe₂O₃

IMI WOLVERHAMPTON METAL (IMI), U.K.
CHEMICAL COMPOSITION (nominal mass content in %)

Aluminium Alloy Reference Materials to BS 1490: LM 2 (mushroom samples, approx 58mm diameter x 7mm thick)

IMI Ref No.	Cu	Mg	Si	Fe	Mn	Ni	Zn	Pb	Sn	Ti	Cr
IMI 2WM1	1.69	0.005	8.90	0.26	0.60	0.39	2.42	0.21	0.20	0.20	<0.005
IMI 2WM2	1.10	0.095	9.76	0.85	0.48	0.30	1.20	0.15	0.14	0.16	0.05
IMI 2WM3	0.41	0.19	8.33	1.19	0.35	0.21	0.70	0.10	0.10	0.11	0.09

Aluminium Alloy Reference Materials to BS 1490: LM 4 (mushroom samples, approx 58mm diameter x 7mm thick)

IMI Ref No.	Cu	Mg	Si	Fe	Mn	Ni	Zn	Pb	Sn	Ti	Cr
IMI 4P1	1.80	0.25	5.92	0.25	0.63	0.40	0.01	0.19	0.19	0.21	<0.005
IMI 4P2	2.35	0.19	5.50	0.40	0.54	0.31	0.16	0.14	0.15	0.15	0.05
IMI 4P3	3.04	0.09	5.10	0.61	0.45	0.22	0.31	0.10	0.10	0.10	0.09
IMI 4P4	3.69	0.045	4.55	0.84	0.30	0.11	0.46	0.05	0.055	0.05	0.15
IMI 4P5	4.25	<0.005	3.94	1.03	0.14	<0.005	0.61	<0.005	<0.005	<0.005	0.19

Aluminium Alloy Reference Materials to BS 1490: LM6/9/20 (mushroom samples, approx 58mm diameter x 7mm thick)

IMI Ref No.	Cu	Mg	Si	Fe	Mn	Ni	Zn	Pb	Sn	Ti	Cr
IMI 620WM4	0.055	0.11	11.76	0.35	0.62	0.04	0.055	0.04	0.03	0.06	0.095
IMI 620WM5	<0.005	0.005	12.85	0.15	0.84	<0.005	0.005	<0.005	<0.005	0.005	0.14

Aluminium Alloy Reference Materials to BS 1490: LM 20 (mushroom samples, approx 58mm diameter x 7mm thick)

IMI Ref No.	Cu	Mg	Si	Fe	Mn	Ni	Zn	Pb	Sn	Ti	Cr
IMI 231P2	0.41	0.22	12.64	0.46	0.48	0.10	0.16	0.055	0.055	0.16	0.14
IMI 231P4	1.08	0.39	10.23	0.88	0.29	0.22	0.46	0.15	0.16	0.055	0.05
IMI 231P6	0.90	0.39	12.00	0.87	0.34	0.16	0.41	0.17	0.08	0.13	0.04

Note that the IMI RMs have a dimple, approx 15mm diameter, in the surface and hence are unsuitable for XRF analysis.

IMI WOLVERHAMPTON METAL (IMI), U.K. and NILAB, Sweden
CHEMICAL COMPOSITION (nominal mass content in %)

Aluminium Alloy Reference Materials to BS 1490: LM 24 (mushroom samples, approx 58mm diameter x 7mm thick)

IMI Ref No.	Cu	Mg	Si	Fe	Mn	Ni	Zn	Pb	Sn	Ti	Cr
IMI 24WM4	2.93	0.26	8.85	0.69	0.43	0.45	1.50	0.24	0.16	0.16	0.045
IMI 24WM6	1.85	0.20	6.55	1.02	0.63	0.45	0.56	0.26	0.10	0.23	0.19

Aluminium Alloy Reference Materials to BS 1490: LM 25 (mushroom samples, approx 58mm diameter x 7mm thick)

IMI Ref No.	Cu	Mg	Si	Fe	Mn	Ni	Zn	Pb	Sn	Ti	Cr
IMI 25WM1	<0.005	0.87	5.92	0.59	0.24	0.19	0.20	<0.005	0.12	0.19	<0.005
IMI 25WM4	0.16	0.31	7.35	0.025	<0.005	0.14	0.045	0.10	0.06	0.16	0.02
IMI 25WM5	0.075	0.19	8.36	0.42	0.15	<0.005	0.015	0.07	<0.005	<0.005	0.10

Aluminium Alloy Reference Materials to BS 1490: LM27 (mushroom samples, approx 58mm diameter x 7mm thick)

IMI Ref No.	Cu	Mg	Si	Fe	Mn	Ni	Zn	Pb	Sn	Ti	Cr
IMI 27WM1	0.94	0.005	7.77	0.17	0.66	0.39	0.40	0.17	<0.005	0.21	0.14
IMI 27WM2	1.52	0.12	7.79	0.35	0.57	0.30	0.63	0.14	0.045	0.16	0.12
IMI 27WM3	1.98	0.18	7.50	0.55	0.40	0.20	0.80	0.10	0.085	0.11	0.075
IMI 27WM4	2.45	0.31	6.50	0.76	0.24	0.11	0.98	0.05	0.12	0.06	0.035
IMI 27WM5	2.79	0.36	5.60	0.91	0.10	0.005	1.13	<0.005	0.15	0.005	<0.005

Note that all the IMI RMs have a dimple, approx 15mm diameter, in the surface and hence are unsuitable for XRF analysis.

Alloy Steel Certified Reference Materials from Nordisk Industrilaboratorium AB (NILAB), Sweden (Available in both finely divided and in disc form - see table)

NILAB No.	Description	Unit sizes	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	Co	Cu	N	Nb	Ti	V
100 LA	Bearing Steel	150g chips 34mm dia. x 20mm disc	1.002	0.283	0.333	0.012	0.018	1.517	0.012	0.027	0.005	0.004	0.007	0.019	0.0046	...	0.0007	0.004
500 HA	Stainless Steel	150g powder 38mm dia. x 20mm disc	0.041	0.720	1.541	0.024	0.012	16.93	2.73	11.00	...	...	0.139	0.182	0.1154	0.023	...	0.074
501 HA	Highly Alloyed Steel	150g powder 38mm dia. x 20mm disc	0.014	0.676	0.858	0.020	0.003	19.79	6.14	17.69	0.003	...	0.159	0.761	0.2243	0.007	...	0.044

INDUSTRIAL ANALYTICAL (PTY) LTD, SOUTH AFRICA

CHEMICAL COMPOSITION (nominal mass content) – Figures in brackets are for information only.

Concentrate/Tailing Reference Materials (Finely divided material – unit of 120g) (nominal mass content in %)

IA No.	Description	SiO ₂	Al ₂ O ₃	CaO	MgO	Pb	Cu	Zn	Fe	C	S	Mn	As	Sn	Cd	Ni	Ag
RPZ-PC	Lead Concentrate	1.26	0.22	4.06	2.30	52.13	0.66	7.05	5.03	3.45	16.76	0.39	0.059	0.012	0.015	0.00052	0.0660
RPZ-PF	Lead Feed Stock	14.32	1.66	14.12	8.48	3.85	0.29	12.85	5.16	5.77	1.57	1.35	0.023	0.018	0.026	0.00071	0.0070
RPZ-ZC	Zinc Concentrate	0.53	0.14	1.80	0.89	3.53	0.65	55.26	4.02	0.89	31.75	0.77	0.023	0.012	0.11	0.00032	0.0310

Concentrate/Tailing Reference Materials (Finely divided material – units of 120g) (nominal mass content in µg/g)

IA No.	Description	Co	Cu	Ni	Au	Pt	Pd	Rh	Ru	Ir	Ag
HGC	High Grade Sulphide Concentrate	1600	69500	61500	9.7	81.5	47.5	4.79	4.44	2.42	(14.7)
HGT	High Grade Tail	97	230	78	0.13	0.40	0.32	0.05	0.051	0.016	(0.27)
LGC	Low Grade Sulphide Concentrate	1000	29100	34900	5.39	38.5	27.0	2.89	2.74	1.44	(0.98)
LGT	Low Grade Tail	97	220	700	0.097	0.37	0.28	0.05	0.053	0.023	(0.18)
MGC-A	Medium Grade Sulphide Concentrate A	1030	31900	35700	5.56	40.4	29.1	3.28	3.02	1.55	(1.17)
MIM C2	PGM bearing Pyroxenite Concentrate	1230	33100	42800	4.90	44.5	33.4	4.01	3.76	2.18	(5.5)
MIM T2	PGM bearing Pyroxenite Tailing	70	180	840	0.13	0.358	0.384	0.048	0.055	(<0.5)	(0.15)
MIM O1	Pyroxenite Ore	117	1134	2104	0.31	1.97	1.55	0.16	0.18	0.11	...

Nickel Ore/Concentrate/Tailing Reference Materials (Finely divided material – unit of 130g) (nominal mass content in %)

IA No.	Description	Ni	Co	Cu	Si	Fe	Ca	Mg	Al	S	Ti
TN-C 01	Tati Nickel Concentrate	6.24	0.18	4.22	4.00	39.86	1.47	0.83	1.78	30.05	...
TN-O 01	Tati Nickel Ore	0.40	0.014	0.31	22.52	7.07	6.41	5.48	9.32	1.94	...
TN-T 01	Tati Nickel Tailing	0.083	0.0047	0.047	...	...	...	...	...	0.22	0.20

Nickel Ore/Concentrate/Tailing RMs (continued) (nominal mass content in µg/g)

IA No.	Au	Pt	Pd	Rh	Ag	Ru	Ir	Sn	Sb	Se	Te	Zn	Pb	Cd	Cr	As	Mn	Bi	V
TN-C 01 (cont.)	0.32	1.58	8.09	0.27	4.5	(0.07)	0.15	(0.66)	(1.21)	1.29	8.28	141	19.4	1.56	456	...	...	...	...
TN-O 01 (cont.)	0.04	0.15	0.65	(<0.01)	0.60	...	...	0.73	...	11.50	0.82	46.5	10.80	22.10	547	12.0	771	0.75	101
TN-T 01 (cont.)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	490	...	860	...	...

Ferro-Chrome Metal Reference Materials (Finely divided material – unit of 120g) (nominal mass content in %)

IA No.	Description	Cr	Fe	Si	Al	C	P	S	Ti	V	Ni	Mn	Co	Ca	Mg
XS-FCMA	Ferro-Chrome Metal A	50.65	36.59	4.64	0.037	6.26	0.010	0.036	0.38	0.36	0.17	0.19	0.054	(<0.01)	(0.024)
XS-FCME	Ferro-Chrome Metal E	49.30	37.11	4.06	0.36	6.05	0.011	0.054	0.31	0.34	0.16	0.16	0.048	(<0.01)	(0.134)

Ferro-Alloy Slag Reference Materials (Finely divided material – units of 120g) (nominal mass content in %)

IA No.	Description	SiO ₂	Al ₂ O ₃	FeO	Fe ₂ O ₃	MnO	MgO	CaO	B ₂ O ₃	Cr ₂ O ₃
XS-FCS	Ferro-Chrome Slag	24.34	23.72	10.82	...	...	15.39	3.91	...	22.45
SAM-FMS1	Ferro-Manganese Slag	30.21	4.95	...	0.065	...	7.38	30.26	0.59	...
SAM-SMS1	Silico-Manganese Slag	43.28	8.96	...	0.178	16.81	5.16	19.47	0.26	...

INSTITUTO DE PESQUISAS TECNOLOGICAS (IPT), BRAZIL

CHEMICAL COMPOSITION (nominal mass content in %) – Figures in bold type certified, figures in italic type only approximate and figures in brackets are for information only.

Cast Iron Certified Reference Materials (Finely divided material – units of 80g)

IPT No.	Description	C (Total)	C (Graphitic)	Si	Mn	P	S	Cr	Mo	Ni	Cu	Ti	V
37B	Gray Iron	3.37	2.85	1.66	0.737	0.148	0.069	0.088	...	0.074	0.052	0.034	...
49	White Iron	2.11	...	0.78	0.272	0.012	0.019	0.020	...	0.021	0.040	...	...
69	Cast Iron	3.34	2.50	2.07	0.715	0.267	0.018	0.353	0.004	0.272	0.473	0.019	...
75A	Ni-Cr-Mo-Cu Iron	3.4	2.7	1.98	0.722	0.250	0.033	0.487	0.439	0.425	0.433	0.022	0.030

Copper Base Alloy Certified Reference Materials (Finely divided material – unit weights as shown).

IPT No.	Description	Unit Weight	Cu	Sn	Pb	Zn	Ni	P	Fe	As	Sb	Bi	Al	S	Ag	Cd	Se	Te
10B	Bronze	80g	85.2	4.61	4.74	4.73	0.33	0.003	0.211	0.019	0.114	...	...	0.068	...	...	...	...
40	Brass	100g	58.10	0.18	2.45	39.1	0.001	...	0.007	...	0.023	...	0.010	...	0.0015	0.049	...	...
64	Pure Copper	50g	99.98	<i><0.0005</i>	0.00006	<i>0.001</i>	0.00018	...	0.00045	<i>0.0002</i>	<i>0.0002</i>	<i><0.0001</i>	<i><0.0006</i>	...	0.0010	...	<i><0.0002</i>	<i><0.0001</i>
74	Bronze	60g	80.41	2.84	6.24	9.88	0.15	0.002	0.315	0.002	0.016	...	...	0.056	...	0.013	...	...

Silicon Metal Certified Reference Materials (Finely divided material – units of 60g)

IPT No.	Fe	Ca	Al	C	S	Mn	Ti	Mg	P	Cu	Cr	Ni	V	Pb
134	0.29	0.102	0.085	0.025	0.002	0.0113	0.0097	0.0048	0.0033	0.0014	0.0011	0.0006	0.0004	<i>0.0002</i>
135	0.125	0.011	0.045	0.018	0.002	0.0070	0.0113	0.0012	0.0027	0.0008	0.0006	0.0005	0.0003	<i>0.0002</i>

Clay, Limestone, Feldspar Refractory, Glass Sand and Bauxite Certified Reference Materials (Finely divided material – unit weights as shown)

IPT No.	Description	Unit Weight	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	TiO ₂	ZrO ₂	SrO	CaO	MgO	MnO	Li ₂ O	Na ₂ O	K ₂ O	P ₂ O ₅	LOI
28	Clay	50g	45.1	37.6	0.83	2.04	...	...	0.09	0.04	...	...	0.02	0.03	0.15	13.9
32	Plastic Clay	50g	51.8	28.5	3.46	1.49	...	...	0.17	0.39	...	...	0.16	0.80	0.13	12.6
42	Clay	50g	51.9	32.2	1.09	0.96	...	...	0.05	0.19	...	...	0.02	0.47	0.07	12.9
122	Dolomitic Limestone	80g	4.3	1.24	0.65	0.06	...	0.018	32.0	17.5	0.042	...	0.019	0.43	0.048	43.3
51	Burnt Refractory	80g	55.0	40.3	1.19	2.19	0.070	...	0.06	0.20	...	0.018	0.09	0.69	0.09	0.16
53	Potash Feldspar	80g	65.8	18.3	0.13	0.013	...	...	0.27	0.05	...	...	2.5	12.1	0.072	0.51
57	Burnt Refractory	80g	24.3	71.5	1.25	1.19	0.20	0.009	0.05	0.13	...	0.008	0.35	0.83	0.054	0.20
63	Silica Refractory	80g	96.28	0.48	0.52	0.030	<i>0.002</i>	...	2.21	0.18	0.008	<i>0.0005</i>	0.013	0.043	0.013	0.17
61	Glass Sand	100g	99.79	0.054	0.014	0.026	0.010	...	<i>0.004</i>	<i>0.003</i>	...	...	<i>0.002</i>	<i>0.007</i>	...	<i>0.06</i>
62	Glass Sand	100g	99.62	0.11	0.072	0.036	0.010	...	<i>0.004</i>	<i>0.004</i>	...	...	<i>0.002</i>	<i>0.007</i>	...	0.10
72	Soda Feldspar	80g	66.2	20.26	0.09	0.005	...	...	0.18	<i>0.022</i>	...	...	10.0	1.47	1.03	0.66
131	Bauxite	70g	0.78	54.1	11.5	1.77	0.35	...	...	...	0.31	...	...	0.022	0.15	30.0

INSTITUT DE RECHERCHES DE LA SIDÉRURGIE FRANÇAISE (IRSID), France
CHEMICAL COMPOSITION (nominal mass content in %) – Figures in bold type certified, figures in small italic type only approximate.

Unalloyed Steel Certified Reference Materials (Finely divided material – units of 100g)

IRSID. No.	C	Si	Mn	P	S	Cr	Ni	Al Total	Co	Cu	N	Pb	Sn
ECRM 012-1	0.082	...	...	0.083	0.255	...	...	...	...	...	...	...	...
ECRM 017-1	0.261	0.266	0.725	0.0132	0.022	0.044	0.085	...	...	0.062	0.0091	...	...
ECRM 021-1	0.243	0.271	1.29	0.0121	0.0087	0.125	0.255	...	...	0.167	...	...	...
ECRM 022-1	0.115	...	0.797	0.057	0.300	...	...	...	...	...	...	...	...
ECRM 023-1	0.331	0.264	0.667	0.021	0.0156	...	...	...	...	...	...	0.280	...
ECRM 024-1	0.104	0.139	0.726	0.0155	0.235	...	...	...	...	...	...	0.287	...
*ECRM 080-1	0.452	0.317	1.116	0.028	0.024	0.025	...	...	...	...	0.0073	...	<i>0.006</i>
*ECRM 081-1	0.099	0.105	0.605	0.0129	0.014	...	0.042	0.023	0.017	0.026	...	...	<i>0.0039</i>

Alloy Steel Certified Reference Materials (Finely divided material – units of 100g; 190-1 also available as 35mm x 35mm x 30mm blocks)

IRSID No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Co	Cu	N	Sn	V	W
ECRM 102-1	0.389	0.281	0.367	0.012	<i>0.006</i>	0.261	1.20	4.40	...	...	0.169	...	...	...	...
ECRM 106-2	0.153	0.238	0.727	...	...	1.030	0.054	1.430	...	...	0.078	...	...	...	...
ECRM 107-1	0.407	0.286	0.611	...	...	1.443	0.323	0.191	0.345	...	0.108	...	...	...	...
ECRM 108-1	0.384	0.340	0.690	0.0176	0.017	2.92	0.538	0.215	...	...	0.118	...	...	...	...
ECRM 112-1	0.348	1.00	0.191	...	...	4.78	1.21	0.234	...	...	0.115	...	...	0.604	1.78
ECRM 113-1	0.680	0.249	0.586	<i>0.013</i>	<i>0.006</i>	0.816	0.413	1.744	...	...	0.146	...	...	...	...
*ECRM 185-1	1.172	<i>0.25</i>	<i>0.41</i>	<i>0.02</i>	0.0209	0.990	...	<i>0.17</i>	...	...	<i>0.17</i>	...	0.0212	...	...
*ECRM 188-1	1.094	...	...	...	0.0113	1.538	<i>0.17</i>	<i>0.28</i>	...	<i>0.06</i>	...	...	...	<i>0.02</i>	...
*ECRM 190-1	0.395	0.278	1.28	0.0112	0.0044	2.18	0.410	0.934	...	0.034	...	0.0096	...	...	...

Alloy Steel Certified Reference Materials (continued)

IRSID. No.	Bi	Cd	Ga	Hg	Nb	Pb	Sb	Se	Te	Tl	Zn
*ECRM 188-1	<0.00002	<0.00005	0.00251	<0.00001	0.00013	<0.0001	0.00048	<0.0002	<0.0002	<0.00002	<0.0003

Highly Alloyed Steel Certified Reference Materials (Finely divided material – units of 100g)

IRSID. No.	C	Si	Mn	P	S	Cr	Mo	Ni	Cu	N	Sn	Ti	V	Ca	Zn
ECRM 201-1	0.291	0.843	0.363	...	...	12.33	0.050	0.202	0.099	...	0.0193	...	<i>0.020</i>	0.0018	0.0005
*ECRM 276-1	0.364	0.985	0.368	0.012	0.011	5.29	1.47	0.178	0.083	0.0207	...	...	0.541	...	...
*ECRM 279-2	0.088	0.516	0.258	...	...	15.64	...	1.603	0.107	<i>0.043</i>	...	...	...	...	...
*ECRM 282-1	0.086	0.734	1.64	0.019	0.0042	16.72	2.19	10.86	0.109	...	...	0.488	<i>0.031</i>	...	...

* Denotes Full EURONORM-Certified Reference Material

INSTITUT DE RECHERCHES DE LA SIDÉRURGIE FRANÇAISE (IRSID), France

CHEMICAL COMPOSITION (nominal mass content in %) – Figures in bold type certified, figures in small italic type only approximate.

Ferro-Alloy Certified Reference Materials (Finely divided material – units of 100g)

IRSID No.	C	Si	Mn	P	S	Cr	Al	Co	N	Ti	V	Fe	Ca
ECRM 503-1	0.700	0.865	80.8	0.069	<i>0.009</i>	...	...	...	...	...	...	...	...
ECRM 507-1	5.40	1.20	0.270	0.017	...	70.30	...	...	0.049	...	...	...	...
ECRM 509-1	0.012	0.230	...	<i>0.019</i>	...	72.85	...	...	<i>0.03</i>	...	...	...	...
ECRM 510-1	0.058	4.65	...	<i>0.035</i>	...	...	<i>4.9</i>	...	<i>0.014</i>	26.95	...	...	...
ECRM 511-1	0.049	0.341	...	<i>0.016</i>	0.018	...	...	...	...	...	80.7	...	...
*ECRM 582-2	0.150	75.2	0.230	0.0184	<i>0.003</i>	0.074	1.154	...	...	0.225	...	21.42	0.405
*ECRM 586-1	0.025	34.0	62.5	0.041	...	0.044	0.022	0.007	...	...	0.041	2.89	0.039

Mineral, Concentrate and Ore Certified Reference Materials (Finely divided material – units of 100g)

IRSID No.	Description	Fe	Si	Ca	Mg	Al	Ti	Mn	P	S	Na	K	V	Cr	Ni	Co	C(T)	Zn	Fe ⁺⁺	Others
ECRM 601-1	Iron Ore	36.76	8.95	4.05	1.21	2.33	0.114	0.370	0.590	0.065	...	...	...	...	...	...	...	...	<i>8.8</i>	...
ECRM 603-1	Iron Ore	53.65	1.28	<i>0.91</i>	<i>0.2</i>	4.20	0.137	0.440	0.084	0.097	...	...	...	...	...	...	...	...	<i>0.3</i>	...
ECRM 604-1	Iron Ore	65.69	1.27	<i>0.107</i>	<i>0.049</i>	0.93	0.060	0.092	0.053	0.015	...	...	...	...	...	...	...	...	<i>0.5</i>	...
ECRM 606-1	Iron Ore	59.66	1.04	1.04	0.32	0.34	0.019	2.59	0.026	0.033	...	...	...	...	...	...	...	...	<i>0.1</i>	...
ECRM 607-1	Iron Ore	30.89	3.07	13.74	0.77	2.48	0.123	0.254	0.529	0.050	...	...	...	...	...	...	...	...	<i>6.0</i>	...
ECRM 608-1	Ferriferrous Marl	4.00	28.23	6.22	0.81	5.26	0.428	0.044	0.053	0.455	...	...	...	...	...	...	...	...	<i>1.8</i>	...
ECRM 609-1	Iron Ore	30.52	7.83	6.87	2.00	2.26	0.118	0.472	0.608	1.000	...	...	...	...	...	...	...	...	<i>15.6</i>	...
ECRM 610-1	Laterite	47.46	3.16	<i>0.1</i>	1.86	1.96	0.015	0.581	0.007	0.189	...	...	...	1.84	1.48	0.075	...	...	...	...
ECRM 611-1	Iron Ore Sinter	62.22	2.07	2.85	0.32	0.69	0.035	1.97	0.030	<i>0.008</i>	...	...	...	...	...	...	...	...	<i>13.8</i>	...
ECRM 612-1	Iron Ore Sinter	42.43	5.94	12.06	1.20	3.00	0.151	0.363	0.885	0.053	...	...	...	...	...	...	...	...	<i>9.2</i>	...
*ECRM 677-1	Iron Ore	51.54	11.78	0.038	0.012	0.32	0.013	0.016	0.017	<i>0.005</i>	0.007	0.008	...	<i>0.002</i>	<i>0.0015</i>	<i>0.0006</i>	...	<i>0.002</i>	...	0.43 H₂O+
*ECRM 679-1	Iron Ore	24.20	3.43	18.07	0.70	1.99	0.106	0.295	0.557	0.099	0.054	0.157	0.035	0.012	<i>0.0095</i>	...	5.80	0.021	<i>5.2</i>	0.018 As
*ECRM 685-1	Pre-reduced Iron Ore	91.10	0.795	0.140	0.239	0.320	0.220	0.042	0.017	0.0031	0.077	0.042	0.144	...	0.018	0.013	1.49	...	<i>7.72</i>	80.80 Fe_m

Refractory Certified Reference Materials (Finely divided material – units of 100g)

IRSID No.	Description	Fe	Si	Ca	Mg	Al	Ti	Cr	Mn	B	N	P	S	C(T)	H ₂ O	LOI
ECRM 701-1	Calcite	0.73	0.93	37.66	0.36	0.29	0.018	<i><0.002</i>	0.022	...	...	0.022	0.040	<i>11.5</i>	<i>0.47</i>	<i>42.4</i>
ECRM 702-1	Dolomite	0.440	1.04	21.48	12.37	0.21	0.013	<i><0.002</i>	0.098	...	...	0.024	0.027	<i>12.3</i>	0.5	45.6
*ECRM 778-1	High Carbon Magnesite	0.67	0.489	0.883	48.87	0.297	<i>0.008</i>	0.102	0.011	0.0012	...	<i>0.004</i>	...	14.00	...	15.38
*ECRM 780-1	Silicon Carbide	1.30	63.5	0.84	0.051	1.86	...	...	0.029	...	0.32	...	...	26.38	...	...

Slag and Dust Certified Reference Materials (Finely divided material – units of 100g)

IRSID No.	Description	Fe	Si	Ca	Mg	Al	Ti	Mn	P	S	Na	K	F	V	Cr	Ni	Zn	Cu	As	Pb	C(T)	Cl	Others
ECRM 802-1	Blast Furnace Slag	0.576	15.16	30.62	2.87	8.53	0.366	0.460	0.109	0.714	0.236	0.491	0.243	0.028	0.0053	...	0.0025	...	...	...	...	...	0.0245 B
ECRM 803-1	Blast Furnace Slag	0.613	17.01	30.93	2.44	6.98	0.301	0.552	0.118	0.767	...	...	...	...	...	...	...	...	...	...	...	...	...
ECRM 804-1	Basic Slag	11.92	2.59	36.88	0.88	<i>0.42</i>	0.152	1.48	7.67	0.127	...	...	...	0.460	...	...	...	...	...	...	...	...	...
ECRM 805-1	Basic Slag	14.87	3.10	34.96	1.12	0.326	0.205	1.59	7.07	0.092	...	...	...	0.514	...	...	...	...	...	...	...	...	...
ECRM 806-1	Basic Slag	17.89	5.48	32.97	1.82	0.477	0.302	4.60	0.982	0.110	...	...	...	0.288	...	...	...	...	...	...	...	...	...
*ECRM 876-1	Electric Furnace Dust	24.85	1.72	3.43	1.31	0.34	0.048	2.84	0.128	0.87	1.98	1.63	0.24	...	0.17	0.034	23.29	0.42	0.023	7.82	0.26	3.63	{ 0.13 Cd 0.094 Sn
*ECRM 880-1	Blast Furnace Dust	31.0	3.34	3.15	0.714	1.28	0.081	0.218	0.038	0.425	0.041	0.108	0.034	...	0.027	0.014	0.064	0.005	...	0.017	<i>37.8</i>	0.086	...

* Denotes Full EURONORM Certified Reference Materials

JERNKONTORET / SWEREA KIMAB (JK), Sweden

CHEMICAL COMPOSITION (nominal mass content in %) – Figures in bold type certified, figures in small italic type only approximate.

Iron, Steel and Special Alloy Certified Reference Materials (Finely divided and/or disc material – as shown in table)

Ref No.	Description	Unit	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Co	Cu	N	Nb	Pb	Sn	Ti	V	W	Ca	Ce	Sb	Fe	O
ECRM 197-1	Low alloy Steel	100g & disc	0.219	0.275	0.792	0.0073	0.0232	0.451	0.402	0.148	0.0313	0.0083	...	0.0135	0.152	0.0114	...	0.0003	0.0097	0.0005	0.005	...	...	...	0.002	...	...
ECRM 270-1	Stainless Steel	100g & disc	0.0742	1.517	0.540	0.0196	0.0007	20.88	0.2099	10.86	...	...	...	0.0685	0.1076	0.1417	...	...	...	0.0256	...	...	0.0487	...	...	...	...
ECRM 274-1	Vanadium Steel	100g & disc	1.563	1.057	0.397	0.0148	0.0096	8.041	1.455	0.077	0.0033	0.0013	0.0005	...	0.0281	0.0769	...	0.00006	0.001	0.0011	4.010	0.0087	...	...	0.0002	...	0.0026
ECRM 298-1	Duplex Steel	100g & disc	0.0146	0.262	0.398	0.0198	0.0006	24.72	3.799	7.056	0.0285	0.003	0.0021	0.055	0.201	0.263	0.004	0.00008	0.004	0.0014	0.0607	0.02	0.002	0.00004	0.0007	63.38	0.0036
ECRM 379-1	Stainless Steel	100g & disc	0.0121	0.393	1.804	0.0166	0.0006	26.79	3.290	30.83	0.0246	0.0027	0.00190	0.0390	0.984	0.0550	0.0024	0.00002	0.0021	0.0014	0.0663	...	0.0033	...	0.00057	35.6	0.0043
JK 3B	Unalloyed Steel	150g	0.742	0.251	0.803	0.0101	0.0071	0.0529	0.0051	0.0591	0.0036	0.002	...	0.0048	0.0175	0.0054	...	0.0002	0.0044	0.0015	0.002	...	0.0005	...	0.0005	...	0.018
JK 7B	Low Alloy Steel	150g	0.342	0.267	0.697	0.0057	0.0064	1.34	0.182	1.34	0.014	...	...	...	0.021	0.0050	...	...	...	0.004	...	...	...	...	...	...	...
JK 12A	Tool Steel	150g	0.886	0.30	0.312	0.020	0.023	4.04	4.85	0.191	...	...	...	0.189	0.062	0.0259	...	0.0004	0.007	...	1.94	6.42	...	...	...	...	...
JK 20A	Unalloyed Steel	150g	1.263	...	...	...	0.0094	...	...	...	...	...	...	...	0.0027	...	...	0.160	...	...	0.161	1.75	...	...	...	...	...
JK 25	Stainless Steel	150g	...	...	1.7	...	...	22.3	0.1	11.3	...	...	...	...	...	...	...	...	...	...	...	...	...	0.096	...	...	...
JK 27A	Stainless Steel	150g & disc	0.0477	0.411	1.589	0.0222	0.0168	16.76	2.531	12.04	0.0169	...	0.0018	0.089	0.199	0.0629	0.002	0.00016	0.0040	<0.005	0.041	0.028	0.0033	...	0.0011	...	...
JK 36	Stainless Steel	150g	0.0125	...	...	...	0.0126	...	...	...	...	...	...	...	...	0.0337	...	...	...	...	...	...	...	...	...	...	...
JK 37	Stainless Steel	150g	0.0133	0.141	1.73	0.0160	0.0009	26.72	3.55	30.82	0.008	0.039	0.0012	0.058	0.936	0.0344	0.0012	...	...	...	0.075	...	...	0.123	0.001	...	...
JK 49	High Alloy Steel	25g & disc	1	0.5	0.4	0.02	0.01	5	3	0.2	...	...	...	0.3	0.1	1.89	...	...	...	...	9	4	...	...	...	...	...

JK 37 also certified for Bi: 0.000032%, Ga: 0.0043%, Ir: 0.000021%, Nd: 0.0362% and Pr: 0.0139%. ECRM 270-1 also certified for La: 0.0154%

Ferro-Alloy Certified Reference Materials (Finely divided material – unit weights as shown in table)

JK No.	Description	Unit	C	Si	Mn	P	S	Cr	Ni	Al	As	Co	Cu	N	Ti	V	W	Fe	Others
JK 17	Ferro-Tungsten	100g	0.74	0.23	...	...	...	...	...	...	0.076	...	...	...	...	...	81.0	...	0.05 Sn
JK 39	Ferro-Silicon	50g	0.105	75.9	0.165	0.018	...	0.01	0.008	1.45	...	0.002	0.013	...	0.116	0.007	...	21.6	0.24 Ca

Iron Ore Certified Reference Material (Finely divided material – unit of 150g)

JK No.	Description	SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	CaO	MgO	P ₂ O ₅	S	V ₂ O ₅	Cu	Na ₂ O	K ₂ O	Co	Fe	Ni	P	Pb	Zn	Cr	Sn
ECRM 688-1	Iron Ore	3.383 Si	0.408 Ti	0.679 Al	...	...	0.0457 Mn	1.449 Ca	1.061 Mg	...	0.047	0.135 V	0.0023	0.333 Na	0.180 K	0.0096	61.38	0.0136	0.337	0.00025	0.0015	0.002	0.0003
JK 28	Iron Ore	4.20	0.20	0.60	91.5	2.4	0.059	0.30	0.30	0.102	0.004	0.21	0.002	0.106	0.120	...	65.86	...	0.045	...	...	...	...

Slag and Fluorspar Reference Materials (Finely divided material – unit weights as shown in table)

JK No.	Description	Unit	SiO ₂	Al ₂ O ₃	TiO ₂	FeO	Fe ₂ O ₃	Ca	CaO	CaF ₂	MgO	MnO	P	S	C	F	V ₂ O ₅	Pb	BaO
JK S9	Electro Slag Refining	100g	1.4	31.5	0.05	0.04	...	39.0	29.1	35.5	2.2	0.04	0.005	...	0.042	17.3	0.11	...	...
JK S10	Electro Slag Refining	100g	7.8	0.54	0.05	0.10	...	50.8	20.3	70.7	0.30	0.03	0.002	...	0.022	34.4	<0.01	...	...
JK C	Fluorspar	100g	8.2	0.66	...	...	0.70	...	...	76.91	...	...	0.026	1.75	...	37.43	...	0.070	8.2
JK D	Fluorspar	100g	1.5	0.04	...	...	0.20	...	...	97.07	...	...	0.035	0.004	...	47.24	...	<0.001	...

Industrial Fly Ash Certified Reference Material (Finely divided material – unit of 100g)

ECRM No.	Description	Fe	Ca	Al	Na	K	Zn	Pb	Cd	Cr	Ni	Cu	V	As	Bi	Sb	Hg	Sn
882-1	Industrial Fly Ash	22.20	10.11	0.375	0.697	0.960	28.49	1.324	0.0183	0.490	0.0263	0.218	0.0090	0.0054	0.0026	0.0116	0.000075	0.021

MBH ANALYTICAL LTD., U.K.

CHEMICAL COMPOSITION (nominal mass content in %) - Figures in brackets are for information only.

Pure Zinc (Cast) Reference Materials (50mm dia. x 20mm discs)

MBH No.	Pb	Mg	Al	Cd	Fe	Sn	Cu	Ni	Mn	Ti	In	Tl	Bi	Sb	Si	Hg
41X Z2(N)	0.00264	0.00014	0.00082	0.00168	0.0027	0.00162	0.00179	0.00131	0.00053	...	0.00057	0.0012	0.00052	0.00057	...	0.0031
41X Z3(L)	0.0080	0.0138	0.0164	0.0050	0.0022	0.0029	0.0066	0.0029	0.0029	...	0.0010	0.0012	0.0022	0.0045	...	(0.0013)
41X Z4(L)	0.0058	0.0033	0.0065	0.00437	0.0148	0.00221	0.00326	0.00320	0.00286	<0.0005	0.00300	0.00277	0.00310	0.00340	(0.0014)	0.0025
41X Z5(N)	0.0286	0.0107	0.0243	0.0165	0.0262	0.0063	0.0109	0.00052	0.0050	0.00044	0.0057	0.0066	0.0054	0.0054	...	0.0048
41X Z6(A)	0.031	<0.0005	0.0096	0.0093	(0.002)	0.0038	0.0088	0.0002	0.0002	...	0.0228	0.0004	0.0122	...	...	...
41X Z11(A)	0.0077	...	0.0261	0.0155	0.0019	0.0072	0.0116	...	...	...	0.0345	(0.0010)	0.0189	0.0026	...	(0.0009)

Low Alloy Zinc (Cast) Reference Materials (50mm dia. x 20mm discs)

MBH No.	Pb	Mg	Al	Cd	Fe	Sn	Cu	Ni	Mn	Cr	Ti
41X 2951Zn1(A)	0.0042	0.0029	0.029	0.0005	0.011	(0.0007)	0.79	0.0038	0.0013	0.083	0.278
41X 2951Zn2(A)	0.0040	0.0123	0.032	0.0037	0.019	(0.0015)	1.37	0.0027	0.0011	0.142	0.209
41X 2951Zn3(A)	0.0065	0.0164	0.078	0.0062	0.029	(0.006)	1.89	0.0010	0.0018	0.184	0.133

Zinc/Aluminium (Cast) Reference Materials (50mm dia. x 20mm discs)

MBH No.	Pb	Mg	Al	Cd	Fe	Sn	Cu	Ni	Mn	Cr	In	Ti	Tl	Si	Sb	Ce	La
42X Z1(H)	0.0022	0.0041	4.61	0.0005	0.0024	0.0006	0.0019	0.0017	0.0007	<0.0005	...	...	...	0.0046	(0.0009)	0.0027	0.0026
42X Z2(H)	0.0064	0.0146	4.07	0.0020	0.0074	0.0061	0.0305	0.0032	0.0058	0.0013	...	...	...	0.011	0.0013	0.0071	0.0029
42X Z3(H)	0.0060	0.0288	3.72	0.0048	(0.047)	0.0030	0.159	0.0102	0.0252	0.0020	...	...	...	0.015	0.003	(0.0003)	(0.0003)
42X Z4(J)	0.0133	0.0663	3.52	0.0065	0.019	0.0060	0.0752	0.0170	0.0083	(0.0002)	0.0037	...	...	0.006	...	0.0361	0.0183
42X Z5(L)	0.0051	0.0471	4.24	0.0027	0.021	0.0022	0.1095	0.0325	0.0023	(0.0002)	0.0019	...	(0.001)	...	...	0.0277	0.0138
42X Z6(B)	0.0093	0.177	3.67	0.0039	0.008	0.0057	0.238	0.00030	0.0157	0.0034	0.00191	...	0.0021	(0.010)	0.0169	(0.012)	(0.011)
42X Z7(B)	0.0097	0.0095	4.39	0.030	0.027	0.012	0.0249	0.0067	0.0045	(0.0001)	...	(0.0001)	...	0.006	...	0.072	0.061
42X Z8(A)	0.0025	0.0033	7.03	0.0003	0.013	(0.0023)	0.0215	0.0019	0.0014	(0.0002)	...	(0.0001)	...	0.013	...	0.0081	0.0079
42X Z9(A)	0.0021	0.0464	5.58	0.0054	0.032	(0.00035)	0.0070	(0.0003)	0.0006	...	...	0.020	...	(0.004)	0.01 Zr	0.0047	0.0044
42X Z11(A)	0.0058	0.0329	3.19	0.0020	(0.036)	0.0017	0.093	0.0241	0.0196	0.0016	0.0037	...	0.0047	...	0.0047	0.0014	(0.0009)
42X Z12(A)	0.0079	0.0488	4.72	0.00277	0.0457	0.0022	0.156	0.0413	0.0483	0.00063	0.0068	...	0.0076	...	0.0070	0.0116	0.0084

Zinc/Aluminium/Copper (Cast) Reference Materials (50mm dia. x 20mm discs)

MBH No.	Pb	Mg	Al	Cd	Fe	Sn	Cu	Ni	Mn	Cr	Ti	In	Tl	Sb	Bi	Si
43X Z1(J)	0.0017	0.0145	4.50	0.00037	0.0058	(0.0007)	0.501	0.0010	0.0005	0.0009	0.0014	...	...	0.0016	0.0031	(0.0037)
43X Z2(M)	0.0110	0.0826	3.88	0.0053	0.0078	0.0103	1.005	0.0025	0.0086	0.0062	...	...	...	0.0065	...	0.011
43X Z3(L)	0.0132	0.0143	3.64	0.0132	0.061	0.0125	1.58	0.0061	0.0125	0.004(5)	...	(0.0019)	(0.0035)	(0.0030)	0.018	0.005
43X Z4(B)	(0.0024)	0.043	4.76	0.0025	(0.064)	(0.0023)	3.21	0.0286	0.088	0.0063	0.0017	...	...	0.0043	0.012	(0.0065)
43X Z5(A)	0.0045	0.041	3.05	0.0111	0.023	0.0032	6.05	0.0021	0.0030	0.0010	0.0009	...	...	...	...	0.003
43X Z6(A)	0.0016	0.0256	4.02	0.0016	0.019	0.0053	2.72	0.029	0.0006	0.0006	0.0013	...	...	0.0045	0.0049	0.012
43X Z7(A)	0.0058	0.062	3.68	0.00092	0.029	0.0031	3.14	0.0005	0.0025	0.0003	0.067	0.0194 Be	...	0.0016	(0.0009)	...
43X Z8(A)	0.0027	0.00155	2.51	0.00090	(0.0017)	(0.0005)	0.481	0.00033	0.00021	0.00024	...	...	...	...	...	...
43X Z9(A)	0.0078	0.0472	3.17	0.0034	0.073	0.0020	4.82	0.0027	0.0108	0.0034	0.0012	0.0010 Be	...	0.0033	0.0033	...
43X Z10(A)	0.0046	0.0405	3.98	0.0014	0.0072	0.0012	2.97	0.0036	0.0050	0.00027	...	...	...	...	...	0.0094
43X Z11(E)	0.0305	0.053	11.61	0.0224	0.0091	0.0206	0.515	0.0014	0.0089	0.0010	0.013	...	...	0.0091	0.0035	0.020
43X Z12(D)	0.0133	0.027	10.05	0.0114	0.047	0.0089	0.796	0.0035	0.0059	0.0023	0.0054	...	...	0.0039	(0.002)	(0.008)
43X Z13(D)	0.0125	0.0204	9.55	0.0100	0.05	0.0111	0.981	0.0109	0.0070	...	...	...	...	0.009	...	(0.0048)
43X Z14(E)	0.015	0.0133	8.05	0.0083	0.031	0.0054	1.13	0.0066	0.0050	0.0047	0.0014	...	...	0.0089	0.0096	0.016
43X Z15(C)	0.0054	0.0024	7.36	0.0030	0.009	0.004	1.53	0.0019	0.0020	0.0025	0.0020	...	...	0.005	0.005	(0.011)

MBH ANALYTICAL LTD., U.K.

CHEMICAL COMPOSITION (nominal mass content in %) - Figures in brackets are for information only.

Aluminium/Silicon/Copper (Cast) Reference Materials (50mm dia. x 15mm discs)

MBH No.	Cu	Mg	Si	Fe	Mn	Ni	Zn	Pb	Sn	Ti	Cr	Co	V	Sb	Cd	Be
55X G02D5(A)	0.406	0.331	10.03	0.557	0.391	0.0652	0.131	0.067	0.051	0.0180	0.760	0.0752	0.0129	0.031	0.0182	0.0037
55X G02D6(K)	0.510	0.376	11.55	0.528	0.300	0.0511	0.577	0.0580	0.0355	0.055	0.366	0.0195	0.0182	0.0150	0.0115	0.0026
55X G02D7(M)	1.48	0.304	10.19	1.001	0.547	0.234	1.688	0.292	0.368	0.157	0.0106	0.0179	0.0179	0.0042	0.0032	0.0025
55X G02D8(K)	2.54	0.112	9.08	0.505	0.398	0.352	1.44	0.141	0.241	0.185	0.0504	0.0094	0.0646	0.046	0.0055	0.0017
55X G02D9(J)	3.22	0.108	8.33	0.644	0.222	0.150	2.17	0.245	0.261	0.124	0.136	0.0377	0.0154	0.123	0.0011	0.0038
55X G02D10(L)	4.59	0.0206	7.33	0.975	0.0524	0.645	2.77	0.022	0.138	0.0302	0.128	0.0544	0.0341	0.0086	0.0012	0.0389

Magnesium/Aluminium/Zinc (Cast) Reference Materials (40-45mm dia. x 15-20mm discs)

MBH No.	Al	Zn	Mn	Cu	Si	Fe	Ni	Ca	Sn	Pb	Ag	Be	Cd	Ce	La	Sr	Ti	Zr
65X MgA1(J)*	5.45	1.26	0.060	0.221	0.20	0.021	0.021	0.029	0.072	0.012	0.012	0.006	0.013	0.009	0.007	...	(0.005)	(0.0015)
65X MgA5(A)	8.00	0.411	0.401	0.0195	0.110	0.006	0.0201	(0.014)	0.0124	0.042	0.0050	0.0013	0.0035	...	...	0.0004	(0.001)	...
65X MgA11(A)	3.63	1.59	0.044	0.0496	0.022	0.0048	0.0134	0.102	0.093	0.0190	(0.0002)	0.0021	0.0014	(0.0005)	(0.0005)	0.006 Hg	...	...
65X MgA12(A)	5.68	3.18	0.198	0.266	0.0142	0.0053	0.0148	0.037	0.0021	0.010	0.0128	(0.0036)	0.0121	0.0009	0.0007	(0.016) Hg	...	...
65X MgA13(A)	7.45	0.925	0.092	0.125	0.022	(0.008)	0.0039	0.0064	0.043	0.0085	0.0074	(0.010)	0.0055	0.0024	0.0021	(0.033) Hg	...	...
65X MgA14(A)	9.09	0.685	0.282	0.0102	0.080	0.008	0.0082	0.016	0.0085	0.006	0.0016	0.0029	0.0014	0.0120	0.0111	(0.082) Hg	...	...
65X MgA15(A)	10.67	0.348	0.067	0.0273	0.034	0.010	0.0026	(0.0014)	0.0021	0.0051	0.030	0.0062	0.0034	0.0069	0.0048	0.011) Hg	...	...
65X MgA16(A)	6.78	4.03	0.271	0.099	0.023	0.0073	0.0057	0.0024	0.028	0.050	0.0035	0.0011	0.0066	0.0017	0.0012	0.005) Hg	...	...
65X MgA17(A)	4.20	0.128	0.203	0.0215	0.33	0.0069	0.0141	0.021	0.0050	0.009	0.0064	...	0.0049	...	...	...	...	...
65X MgB2(C)	2.67	0.95	0.333	0.113	0.069	0.010	0.0028	0.011	0.0047	0.0036	0.0099	0.0008	0.0115	0.0009	0.0007	...	0.0003	<0.001
65X MgB3(B)*	3.19	0.608	0.0122	0.0214	0.012	(0.0047)	0.0020	0.030	0.0050	0.0037	(0.0024)	0.0029	0.012	...	...	...	(0.0028)	<0.001
65X MgB4(C)	3.86	0.333	0.031	0.0183	0.037	(0.009)	0.0003	0.0010	0.0050	0.0037	0.0046	0.0033	0.0002	0.0003	(0.00016)	...	(0.0008)	<0.001

* Denotes that samples may be unsuitable for use with glow discharge analysis.

Tin with Impurities (Cast) Reference Materials (40mm dia. x 15mm discs)

MBH No.	Sb	As	Bi	Pb	Cu	Fe	Ni	Al	Ag	Cr	Cd	Zn	In	Au	Te	Se	Ga	Hg	Ge
71X SR0(B)	0.0034	0.0008	(0.0025)	0.0113	0.0013	0.0008	0.0004	0.0197	0.0018	...	0.0015	0.0034	0.0047	0.0007	0.0009	0.0005	0.0027	0.0044	...
71X SR1(E)	0.0156	0.0102	0.0107	0.0324	0.0111	(0.0021)	0.0041	(0.0016)	0.0121	...	0.0104	0.0146	0.0120	0.0014	0.0112	(0.0015)	0.0049	0.0142	...
71X SR2(F)	0.074	0.0070	0.0403	0.151	0.116	0.0133	0.0183	0.0022	0.0212	0.0031	0.0351	0.0058	0.0597	0.0077	0.0246	...	...	0.140	0.009
71X SR3(F)	0.128	0.097	0.123	0.306	0.121	0.0203	0.0371	(0.0014)	0.050	...	0.100	0.054	0.104	0.0145	0.070	0.0031	0.0339	0.115	...

Cobalt Alloy (Cast) Reference Materials (40-43mm dia. x 15-20mm discs (112X 14944 is wrought material)

MBH No.	C	Si	Mn	Ni	Cr	W	Mo	Ta	Fe	Al	Ti	Cu	Nb	P	S	B	N	Pb	Sn
111X 12667(M)	0.008	0.749	0.52	(0.70)	21.79	8.22	0.161	0.145	1.36	0.005	...	0.047	1.50	(0.003)	0.0068	...	0.085	...	...
111X 12670(N)	(0.007)	0.589	0.48	1.10	19.24	10.95	(0.057)	0.105	1.28	(0.004)	...	(0.059)	2.53	0.0052	0.026	...	0.006	...	0.021
111X 12673(A)	(0.005)	0.82	0.52	1.69	19.0	9.75	0.086	0.06	1.70	<0.005	...	0.104	2.35	0.010	0.022	...	0.031	(0.003)	0.074
112X 14937(S)	0.340	1.18	0.407	2.88	25.17	2.84	7.16	...	2.28	0.012	0.017	0.093	0.191	0.009	0.0242	0.0123	0.142	...	...
112X 14943(G)	0.129	0.58	1.20	0.138	30.64	0.060	7.94	...	1.23	(0.024)	...	0.229	0.119	0.006	0.026	0.00591	0.056	...	...
112X 14944(A)	0.225	0.71	0.744	0.128	29.24	<0.02	6.29	...	0.14	<0.01	...	0.006	<0.01	0.0017	0.0040	(0.0004)	0.148	(0.0001)	(0.0001)
119X ST3(K)	2.39	0.794	1.09	2.55	29.8	12.1	0.353	...	3.10	0.078	0.063	0.148	0.040

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CHEMICAL COMPOSITION (nominal mass content in %) - . Figures in bold type certified, figures in italic type only approximate and figures in brackets are for information only.

Electrolytic Iron and Low Alloy Steel Certified Reference Materials

(SRMs 361-364 finely divided material, units of 150g; SRMs 1264a-1265a 31mm dia x 19mm discs & 1761a-1768 31-34mm dia. x 19mm discs)

NIST No.	Description	Cert. Date	C	Si	Mn	P	S	Cr	Mo	Ni	Al (Total)	As	B	Co	Cu
... (SRM 361)	AISI 4340	2001	0.383	0.222	0.66	0.014	0.0143	0.694	0.19	2.00	0.021	0.017	0.000478	0.032	0.042
... (SRM 363)	Cr-V (Mod)	2001	0.62	0.74	1.50	0.029	0.0068	1.31	0.028	0.30	0.24	0.010	0.00131	0.048	0.10
SRM 1264a (364)	High Carbon (Mod)	2006	0.87	0.067	0.258	0.010	0.025	0.066	0.49	0.142	<i>0.008</i>	0.052	<i>0.011</i>	0.15	0.250
SRM 1265a	Electrolytic Iron	1989	0.0067	0.0080	0.0057	0.0011	0.0055	0.0072	0.0050	0.041	<i>0.0007</i>	<i>0.0002</i>	0.00013	0.0070	0.0058
SRM 1761a	Low Alloy Steel	2008	<i>1.05</i>	<i>0.182</i>	0.679	0.042	0.037	0.222	0.103	1.981	0.055	<i>0.011</i>	0.0023	<i>0.027</i>	0.298
SRM 1762a	Low Alloy Steel	2009	0.341	0.351	1.99	0.0346	0.0295	0.923	0.353	1.156	0.0706	0.0173	0.0042	0.0616	0.1186
SRM 1763a	Low Alloy Steel	2010	0.202	0.663	1.584	0.0123	0.022	0.498	0.490	0.513	0.0435	0.055	0.0054	0.093	0.42
SRM 1764a	Low Alloy Steel	2009	0.592	0.0595	1.193	0.0210	0.0118	1.468	0.2007	0.2006	0.0098	0.0100	<i>0.0010</i>	<i>0.012</i>	0.5178
SRM 1765	Low Alloy Steel	1993	0.006	<i>0.004</i>	0.144	0.0052	0.0038	0.051	0.005	0.154	<i>0.006</i>	0.0010	0.0009	0.0012	0.0013
SRM 1766	Low Alloy Steel	1993	0.015	0.010	0.067	0.002	0.0024	0.024	0.0035	0.021	0.012	0.0035	0.00012	0.0020	0.015
SRM 1767	Low Alloy Steel	1993	0.052	0.026	0.022	0.0031	0.0090	0.0015	0.020	0.002	0.004	0.0005	0.001	0.0050	0.0014
SRM 1768	High Purity Iron	2011	0.0010	<i>(<0.001)</i>	0.0014	0.0013	0.0003	<i>(<0.0002)</i>	<i>(<0.0003)</i>	0.0014	0.0024	<i>(<0.0001)</i>	<i>(<0.0002)</i>	0.0025	0.0006

Electrolytic Iron and Low Alloy Steel CRMs (continued)

NIST No.	N	Nb	Pb	Sn	Ta	Ti	V	W	Zr	Ag	Bi	Ca	Ce
... (SRM 361)	<i>0.0037</i>	0.022	0.000025	0.010	0.020	0.020	0.011	0.017	0.009	0.0004	<i>0.0004</i>	0.00010	0.0040
... (SRM 363)	<i>0.0041</i>	0.049	0.00186	0.104	<i>0.053</i>	0.050	0.31	0.046	0.049	0.0037	<i>0.0008</i>	0.00022	0.0030
SRM 1264a (364)	<i>0.0032</i>	0.157	0.024	<i>0.008</i>	0.11	0.24	0.106	0.102	0.069	<i>0.00002</i>	<i>0.0009</i>	0.00004	0.00022
SRM 1265a	<i>0.0011</i>	...	0.000015	<i>0.0002</i>	<i><0.0005</i>	<i>0.0001</i>	0.0006	<i>0.00004</i>	<i><0.00001</i>	<i>0.000002</i>	<i><0.00001</i>	<i><0.00001</i>	<i><0.000005</i>
SRM 1761a	<i>0.0042</i>	0.021	...	<i>0.050</i>	<i>0.050</i>	0.173	0.054	...	0.012	...	...	...	...
SRM 1762a	<i>0.002</i>	0.0692	...	0.0479	0.0203	0.0952	0.2010	...	0.0285	...	...	...	...
SRM 1763a	<i>0.0045</i>	0.100	...	<i>0.011</i>	<i>0.012</i>	0.308	0.307	<i>(0.002)</i>	0.044	...	...	...	...
SRM 1764a	<i>0.0023</i>	0.0416	...	<i>0.024</i>	0.0297	0.0286	0.1063	<i>(0.0016)</i>	<i>0.0012</i>	...	...	...	...
SRM 1765	0.0010	0.0004	0.0003	0.002	<i>0.004</i>	0.0055	0.0040	...	<i>0.0002</i>	0.0002	<i><0.0001</i>	...	...
SRM 1766	0.0033	0.005	0.003	0.0010	<i>0.006</i>	0.0005	0.009	<i>0.001</i>	<i>0.0004</i>	0.0005	<i><0.0001</i>	...	<i>0.002</i>
SRM 1767	0.0008	0.010	<i>0.0001</i>	0.006	<i>0.002</i>	0.011	0.033	...	<i>0.004</i>	0.0008	<i><0.0001</i>	<i>0.0003</i>	...
SRM 1768	0.002	<i>(<0.0005)</i>	<i>(<0.0001)</i>	<i>(<0.0001)</i>	<i>(<0.0001)</i>	<i>(<0.001)</i>	<i>(<0.0001)</i>	<i>(<0.0002)</i>	<i>(<0.0001)</i>	...	<i>(<0.0004)</i>	<i>(<0.0001)</i>	...

Electrolytic Iron and Low Alloy Steel CRMs (continued)

NIST No.	Fe	Au	Ge	H	Hf	La	Mg	Nd	O	Pr	Sb	Te	Zn
... (SRM 361)	<i>95.6</i>	<i><0.00005</i>	<i>0.006</i>	<i><0.0005</i>	<i>0.0002</i>	<i>0.001</i>	0.00026	0.00029	<i>0.0009</i>	<i>0.0003</i>	0.0042	<i>0.0006</i>	<i>0.0001</i>
... (SRM 363)	<i>94.4</i>	0.0005	<i>0.010</i>	<i><0.0005</i>	<i>0.0005</i>	<i>0.002</i>	0.00062	0.0012	<i>0.00066</i>	<i>0.0004</i>	0.002	<i>0.0009</i>	<i>0.0004</i>
SRM 1264a (364)	<i>96.7</i>	0.0001	<i>0.003</i>	<i><0.0005</i>	<i>0.0013</i>	0.00007	0.00015	0.00007	<i>0.0010</i>	<i>0.00003</i>	0.034	0.00018	<i>0.001</i>
SRM 1265a	<i>99.9</i>	<i><0.000002</i>	<i>0.0014</i>	<i>0.0001</i>	<i><0.00002</i>	<i><0.000005</i>	<i><0.00002</i>	<i><0.000005</i>	<i>0.0063</i>	<i><0.000005</i>	<i><0.00001</i>	<i><0.00001</i>	<i><0.0001</i>
SRM 1761a	<i>95.0</i>	...	...	...	...	...	...	...	...	...	<i>0.0052</i>	...	...
SRM 1762a	<i>94.2</i>	...	...	...	...	...	...	...	...	...	...	...	...
SRM 1763a	<i>(95.3)</i>	...	...	...	...	...	...	...	...	...	<i>0.011</i>	...	...
SRM 1764a	<i>(95.1)</i>	...	...	...	...	...	...	...	...	...	...	...	...
SRM 1768	<i>99.9</i>	...	...	...	...	...	<i>(<0.0006)</i>	...	0.036	...	<i>(<0.0001)</i>	<i>(<0.0001)</i>	<i>(<0.0001)</i>

Information on NIST samples not included in this list will be provided on request.

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CHEMICAL COMPOSITION (nominal mass content in %) - . Figures in bold type certified, figures in italic type only approximate and figures in brackets are for information only.

Ore and Concentrate Certified Reference Materials (Finely divided material – unit weights as shown in table)

NIST No.	Description	Cert. Date	Unit Weight	Fe ₂ O ₃	SiO ₂	Al ₂ O ₃	TiO ₂	CaO	MgO	MnO	P ₂ O ₅	SO ₃	K ₂ O
SRM 25d	Manganese Ore	2010	60g	<i>3.91</i>	2.54	<i>5.33</i>	<i>0.136</i>	<i>(0.052)</i>	...	51.78 Mn	0.251	...	<i>0.928</i>
SRM 69b	Bauxite, Arkansas	1991	60g	7.14	13.43	48.8	1.90	0.13	0.085	0.110	0.118	0.63	0.068
SRM 113b	Zinc Concentrate	1995	100g	2.077 Fe	...	...	...	0.8196 Ca	0.4460 Mg	...	...	30.032 S	...
SRM 120c	Phosphate Rock (Florida)	1988	90g	1.08	<i>5.5</i>	1.30	0.103	<i>48.00</i>	<i>0.32</i>	0.027	<i>33.34</i>	...	0.147
SRM 277	Tungsten Concentrate	1978	100g	<i>7.4 Fe</i>	<i>(0.85) Si</i>	...	<i>(2.2) Ti</i>	<i>(0.37) Ca</i>	...	<i>(10.0) Mn</i>	<i>(0.03) P</i>	<i>(0.25) S</i>	...
SRM 600	Bauxite, Australian	1991	90g	17.0	20.3	40.0	1.31	0.22	0.05	0.013	0.039	0.19	0.23
SRM 670	Rutile Ore	1993	90g	0.86	0.51	...	96.16	...	...	...	...	...	...
SRM 690	Iron Ore, Canada	1992	100g	66.85 Fe	3.71	0.18	0.022	0.20	0.18	0.23	0.011 P	0.003 S	0.0030
SRM 691	Iron Oxide, Reduced	1991	100g	90.8 Fe	3.7	1.22	0.27	0.63	0.52	0.043	0.006 P	0.008 S	...
SRM 692	Iron Ore, Labrador	1992	150g	59.58 Fe	10.14	1.41	0.045	0.023	0.035	0.46	0.039 P	0.005 S	0.039
SRM 693	Iron Ore, Nimba	1990	100g	65.11 Fe	3.87	1.02	0.035	0.016	0.013	0.091	0.056 P	0.005 S	0.0028
SRM 694	Phosphate Rock (Western)	1993	90g	0.79	11.2	1.8	<i>0.11</i>	43.6	0.33	0.0116	30.2	...	0.51
SRM 696	Bauxite, Surinam	1991	60g	8.70	3.79	54.5	2.64	0.018	0.012	0.004	0.050	0.21	0.009
SRM 697	Bauxite, Dominican	1991	60g	20.0	6.81	45.8	2.52	0.71	0.18	0.41	0.97	0.0769	0.062
SRM 698	Bauxite, Jamaican	1991	60g	19.6	0.69	48.2	2.38	0.62	0.058	0.38	0.37	0.22	0.010
SRM 699	Alumina (Reduction grade)	2006	60g	0.013	0.0120	...	...	0.036	0.0006	0.0005	0.0002	...	...
SRM 1835	Borate Ore	1987	60g	1.141	18.408	3.47	0.133	21.622	3.411	0.0333	...	1.477	1.261
SRM 2430	Scheelite Ore	1987	100g	<i>(1.0) Fe</i>	<i>(4)</i>	<i>(0.04) Al</i>	...	...	<i>(0.5) Mg</i>	<i>(0.12) Mn</i>	0.017 P	0.26 S	<i>(0.16) K</i>

Ore and Concentrate CRMs (continued)

NIST No.	Na ₂ O	Cr ₂ O ₃	Ga ₂ O ₃	Li ₂ O	V ₂ O ₅	WO ₃	ZnO	ZrO ₂	Bi	Cu	F	Mo	Pb	Others	LOI
SRM 25d (continued)	...	...	...	...	...	...	...	...	...	...	...	...	...	<i>(1) Moisture</i>	...
SRM 69b (continued)	<i>0.025</i>	0.011	...	...	0.028	...	0.0035	0.29	...	...	...	...	...	...	25.72
SRM 113b (continued)	...	...	...	...	...	...	56.49 Zn	...	...	0.2953	...	...	2.731	0.04607 Ag	...
SRM 120c (continued)	0.52	...	...	...	...	...	...	...	...	...	<i>3.82</i>	...	...	0.0128 U	...
SRM 277 (continued)	...	...	...	...	...	67.4	...	...	...	...	...	<i>(0.06)</i>	<i>(0.07)</i>	<i>(21.4) O₂</i>	...
SRM 600 (continued)	0.022	0.024	...	...	0.060	...	0.003	0.060	...	...	...	...	...	...	...
SRM 670 (continued)	...	0.23	...	...	0.66	...	...	0.84	...	...	...	...	...	...	...
SRM 690 (continued)	0.003	...	...	...	...	...	...	...	...	...	...	...	...	...	...
SRM 691 (continued)	0.186	...	...	...	...	...	...	...	...	0.032	...	...	...	0.030 Co	...
SRM 692 (continued)	0.008	...	...	...	...	...	...	...	...	...	...	...	...	...	...
SRM 693 (continued)	0.0028	...	...	...	...	...	...	...	...	...	...	...	...	...	...
SRM 694 (continued)	0.86	<i>0.10</i>	...	...	0.31	...	<i>0.19</i>	...	...	...	3.2	...	...	0.0141 U	...
SRM 696 (continued)	<i>0.007</i>	0.047	...	...	0.072	...	0.0014	0.14	...	...	...	...	...	...	29.9
SRM 697 (continued)	<i>0.036</i>	0.100	...	...	0.063	...	0.037	0.065	...	...	...	...	...	<i>0.0013 Co</i>	22.1
SRM 698 (continued)	<i>0.015</i>	0.080	...	...	0.064	...	0.029	0.061	...	...	...	...	...	...	27.3
SRM 699 (continued)	0.59	0.0002	0.010	0.002	0.0005	...	0.013	...	...	...	...	...	...	0.000281 Be	0.69
SRM 1835 (continued)	3.484	...	...	...	...	...	...	...	...	...	0.348	...	...	...	...
SRM 2430 (continued)	<i>(0.02) Na</i>	...	...	...	...	70.26	...	...	0.078	<i>(0.01)</i>	...	0.22	...	0.002 As	...

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST), USA

CHEMICAL COMPOSITION (nominal mass content in %) – Figures in bold type certified, figures in italic type only approximate and figures in brackets are for information only.

Rock, Mineral and Refractory Certified Reference Materials (Finely divided material – unit weights as shown in table)

NIST No.	Description	Cert. Date	Unit Weight	SiO ₂	Al ₂ O ₃	TiO ₂	FeO	Fe ₂ O ₃	Cr ₂ O ₃	MnO	CaO	MgO	BaO	Na ₂ O	K ₂ O	Li ₂ O	P ₂ O ₅	SrO	ZrO ₂	LOI
SRM 1d	Limestone, Argillaceous	2005	70g	4.080	0.526	0.07	...	0.3191	<i>0.0012</i>	...	52.85	0.301	<i>0.0033</i>	0.0109	0.1358	...	0.0413	0.0303	...	39.9
SRM 76a	Burnt Refractory (Al ₂ O ₃ -40%)	1992	75g	54.9	38.7	2.03	...	1.60	...	...	0.22	0.52	...	0.07	1.33	0.042	0.120	0.037	...	<i>0.34</i>
SRM 77a	Burnt Refractory (Al ₂ O ₃ -60%)	1992	75g	35.0	60.2	2.66	...	1.00	...	...	0.05	0.38	...	0.037	0.090	0.025	0.092	0.009	...	<i>0.22</i>
SRM 78a	Burnt Refractory (Al ₂ O ₃ -70%)	1992	75g	19.4	71.7	3.22	...	1.2	...	...	0.11	0.70	...	0.078	1.22	0.12	1.3	0.25	...	<i>0.42</i>
SRM 81a	Glass Sand	1978	75g	...	0.66	0.12	...	0.082	0.0046	...	...	...	...	...	...	...	...	...	0.034	...
SRM 88b	Limestone, Dolomitic	1994	75g	1.13	0.34	0.016	...	0.28	...	0.016	30.12	21.03	...	0.029	0.10	...	0.004	0.008	...	<i>47.0</i>
SRM 165a	Glass Sand (low iron)	1992	75g	...	0.059	0.011	...	0.012	0.00011	...	...	...	...	...	...	...	...	...	0.006	...
SRM 198	Silica Brick	1960	45g	...	0.16	0.02	...	0.66	...	0.008	2.71	0.07	...	0.012	0.017	0.001	0.022	...	<0.01	0.21
SRM 199	Silica Brick	1991	45g	...	0.48	0.06	...	0.74	...	0.007	2.41	0.13	...	0.015	0.094	0.002	0.015	...	0.01	0.17
SRM 278	Obsidian Rock	1992	35g	73.05	14.15	0.245	...	2.04	...	0.052	0.983	...	...	4.84	4.16	...	0.036	...	...	...
SRM 688	Basalt Rock	1981	60g	48.4	17.36	1.17	7.64	10.35	...	0.167	...	...	...	2.15	0.187	...	0.134	...	...	...
SRM 1413	Glass Sand (high alumina)	1985	75g	82.77	9.90	0.11	...	0.24	ZnO	Mn₂O₃	0.74	0.06	0.12	1.75	3.94	...	...	...	...	...
SRM 2696	Silica Fume	2007	70g	95.61	0.2080	0.11	...	<i>0.055</i>	0.051	0.032	0.426	0.235	...	<i>0.129</i>	0.652	...	<i>0.0863</i>	...	...	<i>2.11</i>

Cement Certified Reference Materials (Finely divided material – units of 4 x 5g sealed vials, except SRM 634a units of 100g, SRM 1884b units of 5 x 4.5g sealed vials and SRM 114q – units of 20 x 5g vials)

NIST No.	Cert. Date	CaO	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MgO	SO ₃	Na ₂ O	K ₂ O	TiO ₂	SrO	Mn ₂ O ₃	P ₂ O ₅	Cl	F	ZnO	Cr ₂ O ₃	LOI		
SRM 634a	2006	65.07	20.493	5.015	3.362	1.0057	2.780	<i>0.0842</i>	0.3572	0.2463	<i>0.0735</i>	<i>0.0229</i>	0.1767	...	...	<i>0.0222</i>	<i>0.0114</i>	<i>1.66</i>
SRM 1880b	2010	64.16	20.42	5.183	3.681	1.176	2.710	0.0914	0.646	0.236	<i>0.0272</i>	0.1981	0.2443	0.01830	<i>0.0539</i>	<i>0.01054</i>	0.01927	<i>1.666</i>		
SRM 1881a	2002	57.58	22.26	7.060	3.09	2.981	3.366	0.199	1.228	0.3663	0.036	0.1042	0.1459	<i>0.013</i>	<i>0.09</i>	0.0489	0.0588	<i>1.59</i>		
SRM 1882a	1999	39.29	4.01	39.14	14.67	0.51	...	0.021	0.051	1.786	<i>0.024</i>	<i>0.060</i>	<i>0.070</i>	...	...	<i>0.004</i>	<i>0.113</i>	<i>0.20</i>
SRM 1883a	1999	29.52	0.24	70.04	0.078	0.19	...	0.30	0.014	<i>0.02</i>	<i>0.019</i>	<i>0.003</i>	<i>0.003</i>	...	...	...	<i>0.006</i>	<i>0.35</i>
SRM 1884b	2009	61.31	19.30	4.851	2.937	4.74	4.034	0.278	0.957	0.2651	0.0258	0.0750	0.0965	<i>0.0065</i>	<i>0.0394</i>	<i>0.0042</i>	0.00791	<i>0.597</i>		
SRM 1885a	2001	62.39	20.909	4.026	1.929	4.033	2.830	1.068	0.206	0.195	0.638	0.0478	0.220	<i>0.0040</i>	<i>0.13</i>	<i>0.0029</i>	0.0195	<i>1.68</i>		
SRM 1886a	2002	67.87	22.38	3.875	0.152	1.932	2.086	0.021	0.093	0.084	<i>0.018</i>	0.0073	0.022	<i>0.0042</i>	<i>0.02</i>	<i>0.001</i>	0.0024	<i>1.56</i>		
SRM 1887a	2001	60.90	18.637	6.202	2.861	2.835	4.622	0.4778	1.100	0.2658	0.322	0.1186	0.306	<i>0.0104</i>	<i>0.09</i>	0.0667	<i>0.009</i>	<i>1.43</i>		
SRM 1888a	2002	63.23	21.22	4.265	3.076	2.982	2.131	0.1066	0.526	0.263	0.082	0.1256	<i>0.080</i>	<i>0.0036</i>	<i>0.11</i>	0.107	<i>0.0186</i>	<i>1.75</i>		
SRM 1889a	2002	65.34	20.66	3.89	1.937	0.814	2.69	0.195	0.605	0.227	0.110	0.2588	0.110	<i>0.0019</i>	<i>0.05</i>	0.0048	0.0072	<i>3.28</i>		
SRM 114q	2008	Specific Surface Area by ASTM C204-96a, 3818 cm²/g ; Specific Surface Area by ASTM C115-96a, 2183 cm²/g ; Sieve Residue on 45µm sieve by ASTM C430-96, 0.79% ;																		

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST), USA

CHEMICAL COMPOSITION – Figures in bold type certified, figures in small italic type only approximate.

Biological Certified Reference Materials (Finely divided material – unit weights as shown in table), nominal mass content in %

NIST No.	Description	Cert. Date	Unit Weight	Ca	Cl	Mg	N	P	K	Na	S
SRM 1515	Apple leaves	1993	50g	1.526	0.0579	0.271	2.25	...	1.61	0.00244	<i>0.18</i>
SRM 1547	Peach leaves	1993	50g	1.56	0.0360	0.432	2.94	...	2.43	0.0024	<i>0.2</i>
SRM 1566b	Oyster Tissue	2011	25g	0.0838	0.514	0.1085	<i>7.6</i>	...	0.652	0.3297	0.687
SRM 1567a	Wheat Flour	1988	80g	0.0191	...	0.040	...	0.134	0.133	0.00061	0.165
SRM 1568a	Rice Flour	1995	80g	0.0118	<i>0.0300</i>	0.056	...	0.153	0.128	0.00066	0.120
SRM 1569	Brewers Yeast	1976	50g	...	...	...	...	...	...	...	...
SRM 1570a	Spinach Leaves	2001	60g	1.527	...	<i>0.89</i>	<i>6.06</i>	0.518	2.903	1.818	<i>0.46</i>
SRM 1573a	Tomato Leaves	1995	50g	5.05	<i>0.66</i>	<i>1.2</i>	3.03	0.216	2.70	0.0136	<i>0.96</i>
SRM 1575a	Pine Needles	2002	50g	0.25	0.0421	<i>0.106</i>	...	0.107	0.417	<i>0.0063</i>	...

Biological CRMs (continued) nominal mass content in µg/g

NIST No.	Al	As	B	Ba	Cu	Fe	Mn	Rb	Sr	Zn
SRM 1515 (continued)	286	0.038	27	49	5.64	<i>80</i>	54	10.2	25	12.5
SRM 1547 (continued)	249	0.060	29	124	3.7	<i>220</i>	98	19.7	53	17.9
SRM 1566b (continued)	197.2	7.65	<i>4.5</i>	<i>8.6</i>	71.6	205.8	18.5	3.26	<i>6.8</i>	1424
SRM 1567a (continued)	5.7	...	...	...	2.1	14.1	9.4	...	...	11.6
SRM 1568a (continued)	4.4	0.29	...	...	2.4	7.4	20.0	6.14	...	19.4
SRM 1569 (continued)	...	...	...	...	...	...	...	...	...	...
SRM 1570a (continued)	310	0.068	37.6	...	12.2	...	75.9	<i>13</i>	55.6	82
SRM 1573a (continued)	598	0.112	33.3	<i>63</i>	4.70	368	246	14.89	<i>85</i>	30.9
SRM 1575a (continued)	580	<i>0.039</i>	<i>9.6</i>	6.0	2.8	46	488	16.5	...	38

Biological CRMs (continued) nominal mass content in ng/g

NIST No.	Cd	Cr	Co	I	Pb	Hg	Mo	Ni	Se	Ag	Th	U	V
SRM 1515 (continued)	<i>14</i>	<i>300</i>	<i>90</i>	<i>300</i>	470	44	94	910	50	...	30	<i>6</i>	260
SRM 1547 (continued)	26	<i>1000</i>	<i>70</i>	<i>300</i>	870	31	60	690	120	...	50	<i>15</i>	370
SRM 1566b (continued)	2480	...	371	...	308	37.1	...	1040	2060	666	36.7	<i>255.0</i>	577
SRM 1567a (continued)	26	...	...	...	...	...	480	...	1100	...	...	...	...
SRM 1568a (continued)	22	...	<i>18</i>	<i>9</i>	...	5.8	1460	<i>160</i>	380	...	...	<i>0.3</i>	<i>7</i>
SRM 1569 (continued)	...	2120	...	...	...	...	...	...	...	...	...	...	...
SRM 1570a (continued)	2890	...	390	...	<i>200</i>	30	...	2140	117	...	48	<i>155</i>	570
SRM 1573a (continued)	1520	1990	570	<i>850</i>	10800	34	<i>460</i>	1590	54	...	<i>120</i>	<i>35000</i>	835
SRM 1575a (continued)	233	<i><0.5</i>	61	...	<i>167</i>	39.9	...	<i>1470</i>	<i>99</i>	...	...	...	...

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST), USA

CHEMICAL COMPOSITION – Figures in bold type certified, figures in small italic type only approximate and figures in brackets for information only.

Environmental Certified Reference Materials (Finely divided materials – unit weights as shown in table) nominal mass content in %

NIST No.	Description	Cert. Date	Unit Weight	Al	Ca	Cl	C	Fe	H	K	Mg	N	Na	P	Pb	S	Si	Ti	Ash content	Calorific Value (Btu/lb)
SRM 1634c	Trace Elements in Fuel Oil	2002	100ml	...	...	45	...	...	...	...	...	37	0.004	...	...	2	...	...	...	...
SRM 1646a	Estuarine Sediment	2004	70g	2.297	0.519	...	...	2.008	...	0.864	0.388	...	0.741	0.027	0.00117	0.352	40.00	0.456	...	...
SRM 1648a	Urban Particulate	2012	2g	3.43	5.84	0.4543	(12.7)	3.92	...	1.056	0.813	...	0.4240	...	0.655	5.51	12.8	0.4021	...	...
SRM 2584	Trace Elements in Indoor Dust	2010	8g	2.32	6.33	...	...	1.64	...	0.950	1.59	...	2.77	0.20	0.9761	...	(10.6)	0.42	3.87	...
SRM 2689	Fly Ash, Low Lime	1993	Set (3)	12.94	2.18	...	...	9.32	...	2.20	0.61	...	0.25	0.10	(0.0052)	...	24.06	0.75	15.94	11582
SRM 2690	Fly Ash, Medium Lime	1993	Set (3)	12.35	5.71	...	...	3.57	...	1.04	1.53	...	0.24	0.52	(0.0039)	0.15	25.85	0.52	(12)	(12000)
SRM 2691	Fly Ash, High Lime	1993	Set (3)	9.81	18.45	...	...	4.42	...	0.34	3.12	...	1.09	0.51	(0.0029)	0.83	16.83	0.90	(5.3)	(9700)
SRM 2709a	San Joaquin Soil	2009	50g	7.37	1.91	...	...	3.36	...	2.11	1.46	...	1.22	0.0688	0.00173	...	30.3	0.336	...	...
SRM 2710a	Montana I Soil	2009	50g	5.95	0.964	...	...	4.32	...	2.17	0.734	...	0.894	0.105	0.552	...	31.1	0.311	...	...
SRM 2711a	Montana II Soil	2009	50g	6.72	0.00541	...	...	2.82	...	2.53	1.07	...	1.20	0.0842	0.140	...	31.4	0.317	...	...
RM 8704	Buffalo River Sediment	2008	50g	6.10	2.641	...	3.351	3.97	...	2.001	1.200	...	0.553	...	0.0150	...	...	0.457	...	...

SRM 1643e, Trace Elements in Water, is also available (250ml units) with certified contents in µg/kg and µg/L for Ag, Al, As, B, Ba, Be, Bi, Ca, Cd, Cr, Co, Cu, Fe, K, Li, Pb, Mg, Mn, Mo, Na, Ni, Rb, Sb, Se, Sr, Te, Tl, V, Zn

Environmental CRMs (continued) nominal mass content in µg/g.

NIST No.	Ag	As	Ba	Cd	Co	Cr	Cu	Hg	Mn	Ni	Rb	Sb	Se	Sr	Th	Tl	U	V	Zn
SRM 1634c (continued)	...	0.1426	1.8	...	0.1510	...	...	...	...	17.54	...	...	0.1020	...	...	...	...	28.19	...
SRM 1646a (continued)	<0.3	6.23	210	0.148	5	40.9	10.01	0.04	234.5	22.5	38	0.3	0.193	68	5.8	...	2.0	44.84	48.9
SRM 1648a (continued)	6.0	115.5	...	73.7	17.93	402	610	...	790	81.1	51.0	45.4	28.4	215	...	...	...	127	4800
SRM 2584 (continued)	...	17.4	(1300)	10.0	(10)	135.0	(320)	5.20	(370)	(90)	(33)	(14)	(2)	(160)	(4)	...	(1.6)	(34)	2580
SRM 2689 (continued)	...	(200)	(800)	(3)	(48)	(170)	...	(<0.003)	(300)	(122)	...	(9)	(7)	(700)	(25)	...	...	...	(240)
SRM 2690 (continued)	...	(26)	(5800)	(0.7)	(19)	(67)	...	(<0.003)	(300)	(46)	...	(6)	(0.8)	(2000)	(25)	...	...	...	(120)
SRM 2691 (continued)	...	(30)	(5900)	(0.9)	(26)	(68)	...	(<0.003)	(200)	(53)	...	(3)	(17)	(2700)	(26)	...	...	...	(120)
SRM 2709a (continued)	...	10.5	979	0.371	12.8	130	33.9	0.9	529	85	99	1.55	(1.5)	239	10.9	0.58	3.15	110	103
SRM 2710a (continued)	(40)	1540	792	12.3	5.99	6	3420	9.88	2149	8	117	52.5	(1)	255	18.1	1.52	9.11	82	4180
SRM 2711a (continued)	(6)	107	730	54.1	9.89	52.3	140	7.42	675	21.7	120	23.8	(2)	242	15	(3)	3.01	80.7	414
RM 8704 (continued)	...	(17)	413	2.94	13.57	121.9	...	...	544	42.9	...	3.07	...	...	9.07	...	3.09	94.6	408

Please note that other categories of NIST SRMs (Standard Reference Materials) are available from BAS if required.

NATIONAL RESEARCH COUNCIL CANADA (NRCC), CANADA

CHEMICAL COMPOSITION (nominal mass content) – Figures in bold type certified, figures in italic type only approximate and figures in brackets are for information only.

Marine and Environmental Certified Reference Materials (Finely divided material or liquid – unit weights/volumes as shown in table)

NRCC No.	Description	Mass Content	Unit Weight/Vol.	Ag	Al	As	Ba	Be	Cd	Co	Cr	Cu	Fe	CH ₃ Hg (as Hg)	Hg
DOLT-4	Dogfish Liver	mg/kg	25g	0.93	<i>200</i>	9.66	...	...	24.3	<i>0.25</i>	<i>1.4</i>	31.2	1833	1.33	2.58
DORM-3	Dogfish Muscle	mg/kg	20g	<i>0.04</i>	<i>1700</i>	6.88	...	...	0.290	...	1.89	15.5	347	0.355	0.382
FEBS-1	Sagittal Otolith	mg/kg	1g	...	...	...	5.09	...	<i>(0.002)</i>	...	...	<i>(5.5)</i>	...	...	...
LUTS-1	Lobster Pancreas(non defatted)	mg/kg	6 x 10g	0.580	...	2.83	...	...	2.12	0.051	0.079	15.9	11.6	...	...
TORT-2	Lobster Pancreas	mg/kg	35g	...	...	21.6	...	...	26.7	0.51	0.77	106	105	0.152	0.27
HISS-1	Sandy Sediment	mg/kg	100g	0.016	7300	0.801	...	0.129	0.024	<i>0.65</i>	30.0	2.29	2460	...	<i>0.01</i>
MESS-3	Estuarine Sediment	mg/kg	50g	0.18	85900	1.2	...	2.30	0.24	4.4	105	33.9	43400	...	0.091
PACS-2	Harbour Marine Sediment	mg/kg	65g	1.22	66200	26.2	...	1.0	2.11	11.5	90.7	310	40900	...	3.04
CASS-4	Seawater (Coastal)	µg/l	470 ml	...	...	1.11	...	...	0.026	0.026	0.144	0.592	0.713	...	...
NASS-5	Seawater (Open Ocean)	µg/l	470 ml	...	...	1.27	...	...	0.023	0.011	0.110	0.297	0.207	...	...
SLEW-3	Estuarine Water	µg/l	470 ml	<i>0.003</i>	...	1.36	...	...	0.048	0.042	0.183	1.55	0.568	...	...
SLRS-5	Riverine Water	µg/l	470 ml	...	49.5	0.413	14.0	0.005	0.0060	0.05	0.208	17.4	91.2	...	...
ORMS-5	River Water	pg/g	3 x 50ml	...	...	...	...	...	...	...	...	...	...	...	26.2
BEST-1	Marine Sediment	mg/kg	50g	...	...	...	...	...	...	...	...	...	...	...	12.6

Also PACS 2; Tributyltin (as Sn) = 0.98mg/kg, Dibutyltin (as Sn) = 1.09mg/kg, Monobutyltin (as Sn) = 0.45mg/kg

NRCC No.	Mass Content	Li	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Th	U	V	Zn
DOLT-4 (continued)	mg/kg	...	...	<i>1</i>	0.97	0.16	...	8.3	<i>0.17</i>	<i>5.5</i>	...	...	<i>0.6</i>	116
DORM-3 (continued)	mg/kg	...	<i>4.6</i>	...	1.28	0.395	...	<i>3.3</i>	0.066	...	...	...	...	51.3
FEBS-1 (continued)	mg/kg	0.305	0.686	...	<i>(0.002)</i>	<i>(0.58)</i>	...	...	...	0.2055	...	...	...	<i>(4.8)</i>
LUTS-1 (continued)	mg/kg	...	1.20	...	0.200	0.010	...	0.641	...	2.46	...	...	...	12.4
TORT-2 (continued)	mg/kg	...	13.6	0.95	2.50	0.35	...	5.63	<i>0.04</i>	45.2	...	...	1.64	180
HISS-1 (continued)	mg/kg	2.83	66.1	<i>0.13</i>	2.16	3.13	<i>0.13</i>	0.050	<i>0.11</i>	96.9	<i>0.06</i>	<i>0.26</i>	6.80	4.94
MESS-3 (continued)	mg/kg	73.6	324	2.78	46.9	21.1	1.02	0.72	2.50	129	<i>0.90</i>	<i>4</i>	243	159
PACS-2 (continued)	mg/kg	32.2	440	5.43	39.5	183	11.3	0.92	19.8	276	<i>0.6</i>	<i>3</i>	133	364
CASS-4 (continued)	µg/l	...	2.78	8.78	0.314	0.0098	...	<i>0.043</i>	...	...	...	3.0	1.18	0.381
NASS-5 (continued)	µg/l	...	0.919	9.6	0.253	0.008	...	<i>0.017</i>	...	...	...	<i>2.6</i>	<i>1.2</i>	0.102
SLEW-3 (continued)	µg/l	...	1.61	<i>5.1</i>	1.23	0.0090	...	...	...	...	...	<i>1.8</i>	<i>2.57</i>	0.201
SLRS-5 (continued)	µg/l	...	4.33	0.5	0.476	0.081	0.3	...	...	53.6	...	0.1	0.317	0.845

NRCC No.	Mass Content	C	Ca	Cl	K	Mg	Na	P	S	Si	Ti
DOLT-4 (continued)	%	...	<i>0.068</i>	...	<i>0.98</i>	<i>0.15</i>	<i>0.68</i>	...	...	...	...
FEBS-1 (continued)	%	...	38.3	...	...	0.00236	0.2594	...	...	...	...
LUTS-1 (continued)	%	...	0.0203	...	0.0948	0.00895	...	...	...	...	...
HISS-1 (continued)	%	...	1.14	<i>0.35</i>	0.332	0.075	0.375	...	...	<i>44</i>	0.076
MESS-3 (continued)	%	<i>2</i>	1.97	...	<i>0.26</i>	<i>1.6</i>	<i>1.6</i>	<i>0.12</i>	<i>0.19</i>	<i>27</i>	<i>0.44</i>
PACS-2 (continued)	%	<i>3.3</i>	1.96	<i>3</i>	1.24	1.47	3.45	0.096	1.29	<i>28</i>	0.443
SLRS-5 (continued)	mg/l	...	10.5	...	0.839	2.54	5.38	...	...	...	...

STANDARDS AUSTRALIA (SAA), Australia
CHEMICAL COMPOSITION (nominal mass content in %)

Electrode Carbon Reference Material (Units of 1.5 kg)

ASRM No.	Description	Moisture	Ash	Volatiles	Relative Density	Size Fraction + 212µm
003-2	Electrode Carbon	<1.0	<5.0	<1.5	2.2-2.3	<5.0

Coal Ash Reference Material (Finely divided material – units of 100g)

ASRM No.	Description	Al ₂ O ₃	BaO	CaO	Fe ₂ O ₃	K ₂ O	MgO	Mn ₃ O ₄	P ₂ O ₅	SiO ₂	Na ₂ O	SrO	SO ₃	TiO ₂
010-2	Coal Ash	27.1	0.14	3.47	10.80	0.92	1.40	0.16	1.13	52.2	0.47	0.11	0.21	1.34

Also: Data given for Ash Fusion temperatures

Coal Reference Materials (Finely divided material – unit weights as shown in table)

ASRM No.	Description	Unit Weight	Ash	Volatile Matter	Total C	H	N	P	Total S	Hardgrove Grindability Index	Gross Calorific Value	Relative Density
011-12	Coal	4 x 2kg	...	...	...	...	...	...	...	34 to 96	...	...
012A-2	Coal	125g	...	...	...	...	...	...	0.33	...	...	...
012B-4	Coal	250g	...	...	...	...	...	...	0.72	...	...	...
012C-3	Coal	125g	...	...	...	...	...	...	1.22	...	...	...
012D-2	Coal	125g	...	...	...	...	...	...	5.21	...	...	...
014	Coke	200g	12.23	1.04	85.65	0.32	0.82	0.09	0.314	...	28.26 MJ/kg	1.87
015	Coal	250g	...	...	...	...	...	...	...	...	...	1.42

Alumina Reference Materials (Finely divided material – unit weights as shown in table)

ASRM No.	Description	Unit weight	Attrition Index (AI units)	Minus 20 Micron %
025	Alumina	750g	18.8	...
026	Alumina	210g	...	1.0

Australian Coal Industry Reference Samples (ACIRS), Australia
CHEMICAL COMPOSITION (nominal mass content in %)

Coal Reference Material (Finely divided material – units of 250g)

ACIRS No.	Description	Ash	Volatile Matter	Total C	H	N	P	C as CO ₃	Cl	Total S	Pyritic S	Sulphate S	Gross Calorific Value	Relative Density
G3	Coal	10.16	20.65	79.87	4.47	1.80	0.035	0.055	0.050	0.598	0.074	0.010	32.55	1.38

SOUTH AFRICAN BUREAU OF STANDARDS (SABS), South Africa

CHEMICAL COMPOSITION – Figures in bold type certified, figures in small italic type only approximate.

Igneous Rock Certified Reference Materials (Finely divided material – units of 100g) nominal mass content in %

SABS No.	Description	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MgO	CaO	Na ₂ O	K ₂ O	MnO	TiO ₂	P ₂ O ₅	ZrO ₂	BaO	SrO	Nb ₂ O ₅	Cl	F	H ₂ O ⁺	CO ₂
SARM 1	NIM-G Granite	75.7	12.08	<i>0.6</i>	1.30	<i>0.06</i>	0.78	3.36	4.99	...	...	...	...	...	...	...	...	0.42	0.49	<i>0.1</i>
SARM 2	NIM-S Syenite	63.63	17.34	1.11	0.30	0.46	0.68	0.43	15.35	...	...	0.12	...	0.27	...	...	...	...	0.22	0.09
SARM 3	NIM-L Lujavrite	52.40	13.64	8.78	1.13	0.28	3.22	8.37	5.51	0.77	0.48	...	1.49	...	0.54	0.14	0.12	0.44	2.31	0.17
SARM 4	NIM-N Norite	52.64	16.50	0.8	7.47	7.50	11.50	2.46	0.25	0.18	0.20	NiO	...	Cr ₂ O ₃	...	...	...	...	0.33	<i>0.1</i>
SARM 5	NIM-P Pyroxenite	51.10	4.18	0.87	10.59	25.33	2.66	0.37	0.09	0.22	0.20	...	...	3.50	...	...	...	...	0.26	<i>0.08</i>
SARM 6	NIM-D Dunite	38.96	<i>0.3</i>	0.71	14.63	43.51	0.28	<i>0.04</i>	<i>0.01</i>	0.22	...	0.26	...	0.42	...	...	...	...	0.30	0.40

Values are also given for the following minor and trace elements:- Ba, Ce, Co, Cr, Cu, Dy, Eu, F, Ga, Gd, La, Li, Lu, Mn, Nb, Ni, P, Pb, Rb, S, Sm, Sr, Tb, Th, Ti, Tm, U, V, Y, Yb, Zn, and Zr.

PGM and Gold Ore Certified Reference Materials (Finely divided material – unit weights as shown in table) nominal mass content in µg/g

SABS No	Description	Units	Pt	Pd	Au	Ag	Rh	Ru	Ir	Ni
SARM 56	Gold Calcine	500g	...	...	2.69	<i>1.7</i>	...	...	...	...
SARM 64	Platinum Ore Tails	500g	0.475	0.210	0.018	...	0.080	0.240	0.052	...
SARM 75	Sheba Sulphide Zone	3kg	0.32	0.61	0.053	...	...	...	...	2300
SARM 76	Gold Ore	3kg	3.59	1.53	<i>0.23</i>	...	0.256	0.49	<i>0.14</i>	1890
SARM 81	Gold Ore	500g	2.50	1.48	<i>0.034</i>	...	0.490	<i>0.76</i>	<i>0.18</i>	...

Chromium Ore Certified Reference Materials (Finely divided material – units of 100g) nominal mass content in %

SABS No.	Description	Al ₂ O ₃	CaO	Cr ₂ O ₃	Fe (Total)	MgO	MnO	SiO ₂	TiO ₂	V ₂ O ₅	P	S	FeO
SARM 8	Chromium Ore	10.57	0.26	48.97	14.13	14.69	0.25	4.30	0.24	0.14	0.0039	0.0341	<i>13.9</i>
SARM 9	Chromium Ore	15.17	<i>0.16</i>	46.45	19.41	10.85	0.21	0.61	0.56	0.32	0.0024	0.0028	<i>17.5</i>

Ferro-Alloy Certified Reference Materials (Finely divided material – units of 100g) nominal mass content in %

SABS No.	Description	C	Cr	Fe	Mn	Ni	Si	Ti	V	Co	P	S
SARM 33	Ferro-silicon	1.01	0.43	80.2	0.75	0.28	15.60	...	...	...	0.043	...
SARM 74	Ferro-chromium	6.44	49.7	37.5	<i>0.193</i>	0.21	4.34	<i>0.47</i>	0.36	<i>0.06</i>	<i>0.018</i>	<i>0.04</i>

Iron Ore Certified Reference Material (Finely divided material – units of 100g) nominal mass content in %

SABS No.	Description	Fe	Al	K	Si	As	Ca	Cd	Co	Cr	Cu	Mg	Mn	Na	Ni	P	Pb	S	Ti	Zn	V
SARM 12	Magnetite Ore	66.63	0.41	0.0108	0.16	<i>0.0002</i>	0.78	<i>0.0005</i>	0.0223	0.0021	0.0502	1.69	0.17	0.0091	0.0281	0.0477	0.0025	0.0695	0.43	0.0142	0.0520

Zirconium Concentrate Certified Reference Material (Finely divided material – units of 100g) nominal mass content in %

SABS No.	Description	ZrO ₂	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	TiO ₂	P ₂ O ₅	HfO ₂	CaO	MgO	Cr
SARM 13	Zirconium Concentrate	64.01	32.45	0.61	0.187	0.295	0.23	1.29	<i>0.14</i>	<i>0.044</i>	<i>0.0023</i>

SOUTH AFRICAN BUREAU OF STANDARDS (SABS), South Africa

CHEMICAL COMPOSITION (nominal mass content in %) – Figures in bold type certified, figures in small italic type only approximate.

Fluorspar Certified Reference Materials (Finely divided material – units of 100g)

SABS No.	Description	CaF ₂	CaCO ₃	MgCO ₃	P ₂ O ₅	Mn	SiO ₂	Fe ₂ O ₃
SARM 14	Acid Grade, Buffalo	97.32	<i>0.3</i>	<i>0.03</i>	<i>0.18</i>	...	<i>0.57</i>	<i>0.06</i>
SARM 15	Acid Grade, Zeerust	97.84	0.95	0.55	0.017	0.0213	<i>0.26</i>	<i>0.23</i>

Manganese Ore Certified Reference Materials (Finely divided material – units of 100g)

SABS No.	Description	Mn	Fe	SiO ₂	CaO	MgO	Al ₂ O ₃	P	Na ₂ O	K ₂ O	BaO	S	CO ₂	Zn
SARM 16	Manganese Ore (Wessels)	49.17	11.48	5.04	4.70	0.76	<i>0.3</i>	0.033	<i>0.03</i>	0.02	0.60	0.17	<i>1.3</i>	0.0364
SARM 17	Manganese Ore (Mamatwan)	38.81	4.27	4.69	<i>14.4</i>	3.03	0.24	0.018	0.09	0.09	<i>0.08</i>	<i>0.01</i>	15.40	0.0043

Coal Certified Reference Materials (Finely divided material – units of 120g)

SABS No.	Description	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	TiO ₂	CaO	MgO	Na ₂ O	K ₂ O	P ₂ O ₅	S	LOI
SARM 18	Witbank Coal	6.20	2.57	0.29	0.114	0.18	0.11	...	0.145	...	0.56	90.11
SARM 19	OFS Coal	15.00	8.01	1.75	0.341	1.39	0.20	0.29	0.24	...	1.49	71.28
SARM 20	Sasolburg Coal	17.66	11.27	1.17	0.63	1.87	0.43	0.27	0.14	0.14	0.51	64.66

Values are also given for the following minor and trace elements:- As, Ba, Be, Ce, Co, Cr, Cs, Cu, Ga, Ge, Hf, Hg, La, Mn, Ni, P, Pb, Rb, Sc, Se, Sm, Sr, Ta, Th, U, V, Y, Zn and Zr.

Phosphate Rock Certified Reference Material (Finely divided material – units of 100g)

SABS No.	Description	P ₂ O ₅	CaO	F	CO ₂	MgO	SrO	Fe ₂ O ₃
SARM 32	Phosphate rock	39.96	54.44	2.49	1.61	0.50	0.52	0.14

Andalusite Certified Reference Material (Finely divided material – units of 100g)

SABS No.	Description	Al ₂ O ₃	SiO ₂	Fe (as Fe ₂ O ₃)	TiO ₂	K ₂ O	Na ₂ O	MgO	CaO	LOI
SARM 34	Andalusite	59.15	39.04	0.75	0.168	0.238	0.093	0.131	<i>0.13</i>	0.622

Vanadium Pentoxide Certified Material (Finely divided material – units of 100g)

SABS No.	Description	Al ₂ O ₃	CaO	Fe ₂ O ₃	K ₂ O	MgO	Na ₂ O	P ₂ O ₅	SiO ₂	As	S	V (Total)
SARM 38	Vanadium Pentoxide	0.14	<i>0.019</i>	0.119	0.060	0.0037	0.22	<i>0.008</i>	0.11	<i>0.001</i>	<i>0.0045</i>	55.84

SOUTH AFRICAN BUREAU OF STANDARDS (SABS), South Africa

CHEMICAL COMPOSITION (nominal mass content) – Figures in bold type certified, figures in small italic type only approximate.

Rock, Mineral and Sediment Certified Reference Materials (finely divided material – units of 100g)

SABS No.	Description	Mass content	SiO ₂	Al ₂ O ₃	Fe as Fe ₂ O ₃	FeO	MgO	CaO	Na ₂ O	K ₂ O	MnO	TiO ₂	P ₂ O ₅	Cr ₂ O ₃	S
SARM 39	Kimberlite	%	33.44	4.29	9.29	<i>4.0</i>	26.24	9.69	<i>0.5</i>	1.04	0.17	1.58	1.46	0.19	0.15
SARM 40	Carbonatite	%	3.08	0.41	2.75	<i>0.4</i>	1.97	49.77	<i>0.05</i>	<i>0.03</i>	0.18	0.05	2.05	...	<i>0.05</i>
SARM 41	Carbonaceous Shale	%	56.67	13.50	4.23	<i>0.3</i>	8.10	1.50	0.93	1.39	0.06	0.55	0.05	...	0.15
SARM 42	Soil	%	74.09	10.03	4.68	<i>4.0</i>	1.92	0.89	<i>0.15</i>	0.45	0.10	0.36	<i>0.04</i>	0.63	0.02
SARM 43	Magnesite	%	5.99	<i>0.06</i>	0.26	<i>0.1</i>	44.11	0.75	<i>0.05</i>	<i>0.04</i>	<i>0.01</i>	<i>0.01</i>	<i>0.02</i>	...	0.04
SARM 44	Sillimanite Schist	%	38.84	58.80	2.60	<i>1.0</i>	<i>0.1</i>	0.14	<i>0.05</i>	0.18	0.03	1.83	0.10	...	0.03
SARM 45	Kinzingite	%	49.62	26.22	12.60	<i>10.0</i>	3.39	0.78	0.84	3.18	0.10	1.82	0.08	...	0.05
SARM 46	Stream Sediment	%	35.90	6.71	28.16	<i>18.0</i>	3.16	1.32	0.28	0.35	1.14	0.60	0.11	...	0.17
SARM 47	Serpentinite	%	36.30	1.09	4.14	<i>0.4</i>	42.09	<i>0.10</i>	<i>0.05</i>	<i>0.02</i>	0.06	<i>0.01</i>	<i>0.02</i>	0.29	0.02
SARM 48	Fluorspar Granite	%	67.11	11.24	0.58	<i>0.2</i>	0.18	8.90	3.22	4.26	0.02	0.10	<i>0.09</i>	...	...
SARM 49	Quartz	%	99.60	<i>0.05</i>	<i>0.05</i>	...	<i>0.05</i>	<i>0.01</i>	<i>0.05</i>	<i>0.01</i>	<i>0.01</i>	<i>0.01</i>	...	...	...
SARM 50	Dolerite	%	51.56	15.28	11.00	8.49	7.57	10.80	2.30	0.61	0.17	0.86	0.15	...	0.03
SARM 52	Stream Sediment	%	57.81	9.38	19.71	<i>4.0</i>	0.60	0.37	<i>0.1</i>	0.25	0.27	1.30	0.09	0.19	<i>0.02</i>

Rock, Mineral and Sediment Certified Reference Materials (continued)

SABS No.	Mass content	Ba	Ce	Co	Cr	Cu	Ga	Mo	Nb	Ni	Pb	Rb	Sr	Th	V	Y	Zn	Zr
SARM 39 (continued)	µg/g	1700	85	77	...	58	<i>10</i>	<i>5</i>	110	994	<i>25</i>	52	1400	<i>10</i>	109	17	70	239
SARM 40 (continued)	µg/g	<i>310</i>	<i>160</i>	<i>20</i>	<i>35</i>	<i>10</i>	<i>10</i>	<i>10</i>	<i>10</i>	<i>25</i>	<i>20</i>	<i>10</i>	1600	<i>12</i>	27	33	25	87
SARM 41 (continued)	µg/g	820	<i>60</i>	<i>15</i>	123	53	<i>20</i>	<i>5</i>	8	122	<i>30</i>	59	54	<i>12</i>	139	17	76	146
SARM 42 (continued)	µg/g	<i>250</i>	<i>30</i>	35	...	17	<i>12</i>	<i>5</i>	8	125	<i>10</i>	22	37	<i>5</i>	94	11	44	192
SARM 43 (continued)	µg/g	<i>25</i>	<i>20</i>	4	<i>195</i>	<i>15</i>	...	...	...	252	...	...	8	...	...	...	<i>10</i>	...
SARM 44 (continued)	µg/g	<i>50</i>	<i>220</i>	<i>8</i>	384	<i>10</i>	<i>55</i>	<i>15</i>	96	<i>15</i>	<i>30</i>	13	5	50	395	84	271	405
SARM 45 (continued)	µg/g	<i>900</i>	<i>100</i>	41	256	11	<i>35</i>	...	27	80	<i>20</i>	142	92	<i>21</i>	266	63	74	322
SARM 46 (continued)	µg/g	<i>180</i>	<i>110</i>	56	559	566	...	<i>10</i>	...	<i>125</i>	<i>1.3</i>	<i>20</i>	25	...	225	<i>20</i>	5900	101
SARM 47 (continued)	µg/g	<i>75</i>	<i>20</i>	79	...	<i>5</i>	<i>5</i>	...	...	2221	<i>60</i>	...	<i>3</i>	...	<i>16</i>	<i>5</i>	45	...
SARM 48 (continued)	µg/g	<i>290</i>	<i>850</i>	...	23	<i>10</i>	...	<i>5</i>	202	...	135	291	5	113	<i>8</i>	436	53	300
SARM 49 (continued)	µg/g	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...	...	...
SARM 50 (continued)	µg/g	220	<i>30</i>	40	357	84	...	...	<i>10</i>	<i>85</i>	<i>25</i>	14	195	<i>6</i>	216	23	81	86
SARM 52 (continued)	µg/g	<i>410</i>	<i>210</i>	81	...	219	<i>15</i>	...	11	182	1200	20	25	<i>11</i>	346	20	264	250

Rock, Mineral and Sediment Certified Reference Materials (continued) (Finely divided material - units of 100g)

SABS No.	Description	Total Ti as TiO ₂	Total Fe as Fe ₂ O ₃	SiO ₂	Al ₂ O ₃	MgO	CaO	MnO	Cr ₂ O ₃	P ₂ O ₅	Ti ₂ O ₃	ThO ₂	U ₃ O ₈	V ₂ O ₅	ZrO ₂	HfO ₂	GOI
SARM 57	Titanium Slag (RBM)	85.4	11.8	1.72	1.23	0.98	0.16	1.76	0.16	...	<i>27.1</i>	...	...	0.39	...	...	<i>3.92</i>
SARM 62	Zircon (RBM)	0.13	0.07	32.8	0.88	<i>0.04</i>	<i>0.11</i>	...	...	0.12	...	0.0158	0.0354	...	64.2	1.31	...

SOUTH AFRICAN BUREAU OF STANDARDS (SABS), South Africa

CHEMICAL COMPOSITION (nominal mass content in %) - Figures in bold type certified, figures in italic type only approximate.

Ceramic Certified Reference Material (Finely divided material – units of 100g)

SABS No.	Description	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	MnO	K ₂ O	Na ₂ O	P ₂ O ₃	TiO ₂	Ba	Cr	Zn	Ni	Cu	Co	Sc	LOI
SARM 69	Ceramic-1	66.6	14.4	7.18	2.37	1.85	0.129	1.96	<i>0.79</i>	<i>0.28</i>	0.777	0.0518	0.223	0.0068	0.0053	0.0046	0.0028	0.0020	<i>3.6</i>

Ferro-Chrome Slag Certified Reference Material (Finely divided material – units of 100g)

SABS No.	Description	Cr ₂ O ₃	SiO ₂	Al ₂ O ₃	Fe _{Total}	CaO	MgO	S
SARM 77	Ferro-Chrome Slag	12.5	26.8	27.5	5.31	3.64	22.99	<i>0.32</i>

Coal Certified Reference Materials (Finely divided material – units of 150g)

SABS No.	Description	Gross Calorific Value MJ/kg	Ash	Volatile Matter	Total Sulphur	Phosphorus	Total Carbon	Hydrogen	Nitrogen
CRM 001	Coal, Bituminous	...	14.50	24.50	0.50	...	...	...	...
CRM 022	Coal, Sub-bituminous	...	11.44	34.96	0.98	0.01	71.49	4.70	1.36
CRM 024	Coal, Sub-bituminous	...	10.94	33.05	0.96	0.01	71.01	4.35	1.90
CRM 026	Coal, Steam	...	37.83	22.07	0.65	0.001	46.63	2.59	1.11
CRM 029	Coal, Steam	...	32.97	23.96	0.86	0.001	50.86	2.86	1.17
CRM 037	Coal	...	15.26	24.84	0.48	0.001	71.17	3.67	1.72
CRM 039	Coal	...	24.51	23.34	0.75	0.001	59.97	2.93	1.56
CRM 040	Coal	...	26.63	23.00	0.86	0.001	58.36	3.14	1.51
CRM 041	Coal	...	27.62	22.84	0.94	0.001	57.61	3.08	1.48
CRM 046	Coal	...	11.86	26.87	0.66	...	74.21	3.77	1.76
CRM 047	Coal	...	13.58	25.45	0.60	0.001	71.85	3.81	1.66
CRM 051	Coal	...	39.70	20.89	0.72	0.001	44.44	2.45	1.10
CRM 052	Coal	...	7.94	5.17	0.85	0.020	85.79	2.47	1.77
CRM 053	Coal	...	29.42	27.86	1.20	0.041	55.76	3.61	1.28
CRM 055	Coal	...	14.14	11.54	0.88	0.031	75.70	2.93	1.93
CRM 057	Coal	...	15.49	25.42	0.48	1.093	71.19	3.85	1.70
CRM 058	Coal	20.18	31.1	23.1	0.50	0.023	53.64	3.06	1.33
CRM 059	Coal	28.33	16.0	11.0	0.82	0.031	74.5	2.84	1.79

Hardgrove Grindability Index Certified Reference Material (Finely divided material – units of 4x4kg)

SABS No.	Description	Hardgrove Grindability Index
CRM 1001	Coal	37 to 71

SUS, Germany

CHEMICAL COMPOSITION (nominal mass content in %) – figures in small italic type only approximate.

Aluminium and Aluminium Alloy Setting-up Samples (50mm dia. x 50mm discs)

SLICKERS No.	Al	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	Bi	Cd	Co	Ga	P	Pb	Sn	V	Zr	Sb
SL RA10	99.99	0.0010	0.0005	0.0002	<0.0001	<0.0001	<0.0001	<0.0002	<0.0003	<0.0001	<0.0001	<0.0003	...	<0.0001	<0.0001	...	<0.0003	<0.0003	<0.0002	<0.0001	<0.0003
SL RA18	75	15	0.2	7.5	0.3	0.2	0.0003	3	0.3	0.001	0.01	0.001	0.0005	<0.001	0.008	0.015	0.37	0.37	0.001	0.005	0.45
SL RA19	78	1.7	1.3	0.8	1.3	8	0.2	0.6	7	0.2	0.3	0.2	0.04	0.3	0.06	0.0009	0.01	0.02	0.1	0.2	0.007

Copper and Copper Alloy Setting-up Samples (40mm dia. x 40mm discs)

SLICKERS No.	Cu	Zn	Pb	Sn	Mn	Fe	Ni	Si	Sb	Al	C	S
SL RC11	99.99	0.0002	0.0002	0.0004	0.0001	0.0005	0.0005	0.0001	0.0001	0.0001	...	0.0010
SL RC32	60	35	(0.6)	(0.2)	(0.5)	(0.3)	(1.5)	0.5	...	1.5	...	...
SL RC33	80	(0.02)	(0.01)	...	(0.4)	4.5	4	...	...	10	...	...
SL RC36	80	(0.4)	12	7	...	(0.01)	(1.7)	...	(0.3)	...	...	...
SL RC38	65	(0.02)	(0.01)	...	0.75	0.5	30	...	...	...	(0.05)	(0.015)
SL RC40	82	(0.01)	(0.02)	...	5	1.5	2	...	...	9	...	...

Iron and Steel Setting-up Samples (40mm dia. x 40mm discs, except SL CFE3, CFE4 and CFE5 which are 35-40 dia. x 30mm)

SLICKERS No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Co	Cu	Nb	Pb	Sn	Ti	V	W
SL RE12	<0.005	0.003	<0.01	<0.005	<0.002	<0.01	<0.005	<0.01	<0.005	<0.001	<0.0001	0.002	<0.01	0.002	<0.002	0.001	0.0003	<0.001	<0.01
SL RG13	3	2	1	0.3	0.05	1	0.3	0.6	0.02	...	...	...	0.05	...	...	0.2	0.04	0.3	...
SL RG14	3	2	0.2	0.02	0.005	1	...	...	0.02	...	...	...	0.05	...	...	0.2	...	0.1	...
SL RH12	0.5	0.6	17	(0.01)	(0.01)	4	...	...	...	...	...	...	...	...	...	...	...	...	...
SL RH18	1.3	(0.04)	(0.3)	(0.01)	(0.01)	4	3.5	...	...	...	...	...	10	...	...	...	...	3	10
SL RH31	0.03	0.3	1.2	(0.01)	(0.01)	17	2	20	...	...	...	...	2	0.3	2	...	...	...	...
SL RN13	1	(0.05)	1.8	(0.005)	(0.005)	(0.05)	(0.01)	3	0.4	(0.002)	(0.0005)	(0.01)	(0.01)	(0.005)	(0.001)	0.05	(0.01)	(0.01)	(0.01)
SL RN14	(0.05)	1.8	(0.07)	0.08	0.08	3	0.5	(0.01)	(0.01)	0.05	0.006	0.4	0.4	0.5	0.03	(0.0005)	0.1	0.5	0.4
SL RN19	1	1	1.5	0.08	0.07	3	1	1	0.5	0.05	0.006	0.8	0.5	0.5	(0.03)	0.1	0.1	0.5	0.5
SL CFE3	0.04	0.4	1.7	0.3	0.002	16.7	2.0	11	0.007	...	0.005	0.21	0.09	0.77	...	...	0.005	0.07	0.03
SL CFE4	1.7	0.4	0.4	0.01	0.01	11	0.8	0.3	0.008	0.008	0.002	0.03	0.06	0.04	0.005	0.005	0.003	1	0.03
SL CFE5	4	0.3	0.3	0.1	0.03	0.1	0.1	0.1	0.1	...	...	...	0.1	...	...	0.04	...	0.1	...

Zinc and Zinc Alloy Setting-up Samples (40mm dia. x 40mm discs)

SLICKERS No.	Zn	Pb	Sn	Cd	Cu	Fe	Al	Mg	Ti	Ni	Mn	Ag	In	Sb	Tl
SL RZN11	99.99	0.0008	<0.0001	<0.0001	0.0003	0.0005	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	...	...	...	...
SL RZN13	99	0.6	0.3	0.3	0.3	0.02	0.3	<0.001	<0.001	0.05	<0.001	0.05	0.3	0.2	0.03
SL RZN14	87.5	0.03	0.02	0.02	4	0.05	10	0.08	0.1	0.004	0.015	0.007	<0.01	<0.01	...

The above figures are target levels and may vary between batches. Bracketed figures may vary more significantly

VASIPARI KUTATO ES FEJLESZTO VALLALAT (VASKUT), Hungary

CHEMICAL COMPOSITION (nominal mass content in %) – Figures in bold type certified, figures in small italic type only approximate.

Unalloyed and Low Alloy Steel Certified Reference Materials (35mm dia. x 19mm discs)

VASKUT No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Co	Cu	Nb	Sn	Ti	V	Sb
A11/1	0.043	1.46	0.21	0.011	0.014	0.02	1.08	0.04	0.02	...	...	0.008	0.047	0.16	0.002	0.17	0.46	<0.001
A12	0.031	1.19	0.31	0.014	0.082	1.25	0.47	2.43	0.18	0.007	...	0.012	0.18	0.03	...	0.05	0.042	0.013
A13	0.104	0.81	0.49	0.053	0.073	0.14	0.91	1.93	0.042	0.070	0.002	0.013	0.166	...	0.060	0.11	0.23	0.024
A14	0.12	0.73	0.75	0.041	0.052	0.59	0.25	1.32	0.01	0.13	0.004	0.070	0.20	0.044	0.10	0.12	0.67	0.047
A17	0.78	0.37	1.73	0.039	0.024	0.24	0.074	0.59	0.016	0.03	0.012	0.036	0.53	0.043	0.05	0.022	0.15	0.10
A18	1.16	0.15	1.99	0.014	0.007	0.90	...	0.125	0.02	0.003	0.011	...	0.066	0.035	0.016	0.01	0.10	0.005

Unalloyed and Low Alloy Steel Certified Reference Materials (35mm dia. x 20mm discs)

VASKUT No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Co	Cu	Nb	Ti	V	W	Zr	Others
B1/1	0.98	1.79	0.08	0.019	0.020	1.83	...	4.08	...	...	...	...	0.50	...	...	...	...	0.074	...
B2/1	0.067	0.34	1.34	0.047	0.046	...	1.09	1.49	0.082	...	...	...	0.24	...	0.22	0.91	...	...	...
B3	0.20	0.53	0.14	0.015	0.025	5.95	...	...	...	...	...	...	0.25	...	...	1.15	1.20	...	...
B4	0.54	1.72	1.08	0.048	0.043	...	...	...	...	...	...	...	0.49	...	...	...	...	0.09	...
B14	1.16	1.21	0.65	0.028	0.005	3.17	1.25	0.16	...	...	0.0006	0.30	0.107	0.41	0.26	0.14	...	...	0.002 Ce
B15	0.98	0.80	0.69	0.030	0.031	3.70	1.20	0.15	...	...	...	0.21	0.14	...	0.32	0.33	...	...	...
B16	0.16	1.95	2.05	0.068	0.051	0.26	0.11	3.74	0.037	...	...	...	0.09	0.11	0.075	0.53	...	...	...
B20	0.008	0.005	0.09	0.012	0.013	0.03	<0.01	0.038	0.02	0.003	...	<0.01	0.034	...	<0.002	<0.005	...	...	0.003 Sn 0.002 Pb
K3	1.03	0.32	0.46	0.02	0.010	1.63	...	0.18	...	...	...	...	0.09	...	...	...	...	...	...
K4	0.52	0.46	0.84	0.02	0.025	1.24	...	0.1	...	...	...	...	0.28	...	...	0.20	...	...	...
K6	0.51	0.30	0.79	0.02	0.026	0.96	0.37	1.72	...	...	...	...	0.26	...	...	...	...	...	...
K9	0.096	0.59	1.53	0.01	0.018	0.64	0.56	0.97	0.01	...	...	...	0.73	0.04	0.11	0.27	...	...	...

Austenitic Stainless Steel Certified Reference Materials (30mm dia. x 20mm discs)

VASKUT No.	C	Si	Mn	P	S	Cr	Mo	Ni	Cu	Nb	Ti	Fe
K7	0.063	0.89	1.35	0.025	0.010	17.5	...	10.42	0.20	...	0.28	...
K10	0.155	0.88	1.77	0.022	0.020	17.5	2.98	11.2	0.16	0.98	...	...
S15	0.043	0.26	0.38	0.02	0.013	16.7	2.46	3.90	1.54	0.64	...	74.0
S16	0.59	0.25	0.54	0.02	0.017	23.6	0.46	7.51	2.06	1.41	...	63.5
S19	0.26	2.32	0.32	0.012	0.021	7.00	0.11	12.7	0.19	0.81	0.048	76.1
S20	0.097	1.80	1.50	0.011	0.025	2.06	3.15	18.2	0.44	1.22	0.01	71.5
S21	0.37	1.26	0.19	0.017	0.021	3.99	4.12	22.3	0.11	...	0.50	67.1
S22	0.014	0.61	0.34	0.009	0.008	1.00	0.82	28.2	0.02	...	0.13	68.8
S23	0.007	0.12	0.82	0.007	0.008	0.13	0.021	33.4	0.04	...	...	65.4
S24	0.65	0.77	0.94	0.062	0.036	10.28	0.41	9.19	0.12	1.65	0.27	75.6
S25	0.067	1.49	1.90	0.045	0.015	15.6	1.77	13.8	0.07	0.07	0.46	64.7
S26	0.076	0.67	0.99	0.027	0.026	18.9	2.59	3.31	0.14	0.07	0.11	73.1
S27/1	0.61	1.20	2.01	0.030	0.025	25.22	0.14	6.20	0.09	0.12	0.50	65.9

OTHER OTHER MATERIALS

Endecotts sieve calibration samples

Sample No.	For Sieve Aperture Size	Approx Sample Quantity
ZSICSA-020	20 Micron	4 grms
ZSICSA-025	25 Micron	4 grms
ZSICSA-032	32 Micron	5 grms
ZSICSA-038	38 Micron	5 grms
ZSICSA-045	45 Micron	5 grms
ZSICSA-053	53 Micron	5 grms
ZSICSA-063	63 Micron	5 grms
ZSICSA-075	75 Micron	5 grms
ZSICSA-090	90 Micron	5 grms
ZSICSA-106	106 Micron	5 grms

Sample No.	For Sieve Aperture Size	Approx Sample Quantity
ZSICSA-125	125 Micron	5 grms
ZSICSA-150	150 Micron	7.5 grms
ZSICSA-180	180 Micron	7.5 grms
ZSICSA-212	212 Micron	7.5 grms
ZSICSA-250	250 Micron	12.5 grms
ZSICSA-300	300 Micron	12.5 grms
ZSICSA-355	355 Micron	12.5 grms
ZSICSA-425	425 Micron	12.5 grms
ZSICSA-500	500 Micron	12.5 grms
ZSICSA-600	600 Micron	12.5 grms

Sample No.	For Sieve Aperture Size	Approx Sample Quantity
ZSICSA-710	710 Micron	12.5 grms
ZSICSA-850	850 Micron	15 grms
ZSICSA-1.00	1.00 mm	35 grms
ZSICSA-1.18	1.18 mm	50 grms
ZSICSA-1.40	1.40 mm	75 grms
ZSICSA-1.70	1.70 mm	75 grms
ZSICSA-2.00	2.00 mm	100 grms
ZSICSA-2.36	2.36 mm	100 grms
ZSICSA-2.80	2.80 mm	125 grms
ZSICSA-3.35	3.35 mm	125 grms

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Telephone: National: Middlesbrough (01642) 300500

International: + 44 1642 300500

Fax: National: Middlesbrough (01642) 315209

International: + 44 1642 315209

Website: www.basrid.co.uk

Email: enquiries@basrid.co.uk

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