

# OUTSIDE-SOURCE REFERENCE MATERIALS

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AR: Alpha Resources Inc., USA .....	3	IA: Industrial Analytical, South Africa .....	38
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BAM: Bundesanstalt für Materialforschung und -prüfung, Germany .....	6	JK: Jernkontoret / Narema, Sweden .....	40
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## INTRODUCTION

For over eighty years Bureau of Analysed Samples Ltd (BAS) has 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 was 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 been augmented by the inclusion of the Nordic CRM Working Group: this work was 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 the producing organizations. These ECRMs are indicated by an asterisk in this list. Although BAS is no longer a part of the ECRM Producers Group, all ECRMs (prepared by BAM, IRSID (now ARCELORMITTAL), CTIF and Jernkontoret) are available from BAS. Data regarding the BAS-produced ECRMs are given in the BAS Certified Reference Materials Catalogue, whilst the data re BAM, ARCELORMITTAL, CTIF and Jernkontoret -produced ECRMs are given in this catalogue.

Further details of ECRMs, including their method of preparation, certification and supply and the use of the statistical information given on ECRM certificates are given in Technical Reports CEN/TR 10317:2014 and CEN/TR 10350:2013 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 is continuing the business as before. Thus, BAS is 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 is now holding a stock, and many 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. Please note that the disc/block sizes stated in this catalogue are approximate and may vary from sample to sample.

## GENERAL INFORMATION

**Our website, at [www.basrid.co.uk](http://www.basrid.co.uk), is continuously being improved and now includes a page of downloadable certificates for all currently available BAS products.**

## QUALITY ASSURANCE

Bureau of Analysed Samples Ltd, is very pleased to advise customers that in November 1994 its 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 9001:2015. Furthermore, BAS was accredited, in June 2006, to the International Guide, ISO Guide 34 (General Requirements for the Competence of Reference Material Producers) and the accreditation has since been updated to the Standard ISO 17034.

Please note that, whilst BAS is accredited to ISO 17034, only two of the Producers detailed in this catalogue (Brammer Standard Company, Inc. and Bundesanstalt für Materialforschung und -prüfung) are so accredited. The CRM/RMs prepared by the other producers in this catalogue will not have been produced under ISO 17034 accreditation.

**Australian Coal Industry Reference Samples (ACIRS), Australia**  
**CHEMICAL COMPOSITION (nominal mass content in %) - Figures in brackets are for information only**

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

ACIRS No.	Description	Unit Weight	Ash	Volatile Matter	Total C	H	N	P	C as CO	Cl	F	Hg	Cd	As	Se	Total S	Hardgrove Grindability Index	Gross Calorific Value MJ/kg	Relative Density
<b>S2A-2020</b>	Coal	125g	...	...	...	...	...	...	...	...	...	...	...	...	...	0.43	...	...	...
<b>S2B-2015</b>	Coal	125g	...	...	...	...	...	...	...	0.027	0.0037	0.0000057	...	...	...	0.69	...	...	...
<b>G9-2021</b>	Coal	125g	10.69	20.00	79.07	4.31	1.79	0.036	...	0.056	0.01	0.000003	...	...	...	0.601	...	32.105	1.386
<b>H7-2019</b>	Coal	4 x 1kg	...	...	...	...	...	...	...	...	...	...	...	...	...	...	30, 46, 63 & 86	...	...
<b>M1-2014 (Lot#2)</b>	Coal	125g	18.68	(32.8)	(67.4)	(4.73)	(1.34)	0.098	(0.04)	0.014	0.0160	0.0000122	0.000018	0.00039	0.00015	2.39	...	(28.36)	1.417
<b>M2-2018</b>	Coal	50g	9.32	...	...	...	...	...	...	...	0.0176	0.0000041	0.000002	0.00003	(0.00003)	...	...	...	...

**Coal Fly Ash Reference Material** (Units of 80g)

ACIRS No.	Description	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	TiO <sub>2</sub>	Mn <sub>3</sub> O <sub>4</sub>	BaO	SrO	SO <sub>3</sub>	Co	Cr	Cu	Ni	Pb	V	Zn
<b>A1-2016</b>	Coal Fly Ash	44.1	28.9	14.6	6.05	1.25	0.43	0.46	1.26	1.56	0.22	0.183	0.16	0.32	(0.0043)	(0.0058)	(0.0099)	(0.0047)	(0.0047)	(0.0176)	(0.0090)

Values are also given for Ash Fusibility Reducing Temperatures:- Deformation 1257°C; Spherical 1287°C; Hemispherical 1309°C; Flow 1367°C  
 Ash Fusibility Oxidising Temperatures:- Deformation 1349°C; Spherical 1383°C; Hemispherical 1398°C; Flow 1429°C

**ALPHA RESOURCES Inc. (AR), USA**  
**CHEMICAL COMPOSITION (nominal mass content in %)**

**Oxygen & Nitrogen in Steel Reference Materials** (units as shown)

AR No.	Units	Oxygen	Nitrogen
<b>644</b>	100 x 1g pins	0.0003	0.0140
<b>645</b>	"	0.0035	0.0089
<b>646</b>	"	0.0035	0.0738
<b>654</b>	100 x 0.5g pins	0.0044	0.0536
<b>655</b>	"	0.0037	0.392
<b>659</b>	"	0.0110	0.0056
<b>661</b>	"	0.0008	0.0091
<b>668</b>	"	0.0010	0.0024
<b>1647</b>	100 x 1g pins	0.0031	0.140
<b>1650</b>	"	0.0100	0.0102
<b>1651</b>	"	0.0031	0.0202
<b>1652</b>	"	0.0034	0.0530
<b>1653</b>	"	0.0007	0.0030
<b>1657</b>	"	0.0034	0.0319

**Hydrogen in Steel Reference Materials** (units as shown)

AR No.	Units	Hydrogen
<b>546</b>	100 x 1g pins	0.000095
<b>555</b>	"	0.00023
<b>556</b>	"	0.00045
<b>558</b>	"	0.00067

**Hydrogen, Oxygen & Nitrogen in Titanium Reference Materials** (units as shown)

AR No.	Units	Hydrogen	Oxygen	Nitrogen
<b>637</b>	100 x 0.1g pins	0.0015	0.152	0.008
<b>641</b>	"	0.0045	0.196	0.032
<b>650</b>	"	0.0090	0.100	0.0060
<b>651</b>	"	0.0029	0.1262	0.0065

The above figures are target levels and may vary between batches.  
 The above only constitutes a selection of Alpha Resource samples. Additional samples are available and information on these will be provided on request.

# ARCELORMITTAL MAIZIÈRES RESEARCH SA (formerly 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)

AMMZ/IRSID No.	C	Si	Mn	P	S	Cr	Ni	Al Total	Co	Cu	Pb	Sn
ECRM 012-1	<b>0.082</b>	...	...	<b>0.083</b>	<b>0.255</b>	...	...	...	...	...	...	...
ECRM 021-1	<b>0.243</b>	<b>0.271</b>	<b>1.288</b>	<b>0.0121</b>	<b>0.0087</b>	<b>0.125</b>	<b>0.255</b>	...	...	<b>0.167</b>	...	...
ECRM 022-1	<b>0.115</b>	...	<b>0.797</b>	<b>0.057</b>	<b>0.296</b>	...	...	...	...	...	...	...
ECRM 023-1	<b>0.331</b>	<b>0.264</b>	<b>0.667</b>	<b>0.021</b>	<b>0.0156</b>	...	...	...	...	...	<b>0.280</b>	...
ECRM 024-1	<b>0.104</b>	<b>0.139</b>	<b>0.726</b>	<b>0.0155</b>	<b>0.235</b>	...	...	...	...	...	<b>0.287</b>	...
*ECRM 081-1	<b>0.099</b>	<b>0.105</b>	<b>0.605</b>	<b>0.0129</b>	<b>0.014</b>	...	<b>0.042</b>	<b>0.023</b>	<b>0.017</b>	<b>0.026</b>	...	<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)

AMMZ/IRSID No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Co	Cu	N	V	W
ECRM 106-2	<b>0.153</b>	<b>0.238</b>	<b>0.727</b>	...	...	<b>1.030</b>	<b>0.054</b>	<b>1.430</b>	...	...	<b>0.078</b>	...	...	...
ECRM 107-1	<b>0.407</b>	<b>0.286</b>	<b>0.611</b>	...	...	<b>1.443</b>	<b>0.323</b>	<b>0.191</b>	<b>0.345</b>	...	<b>0.108</b>	...	...	...
ECRM 108-1	<b>0.384</b>	<b>0.340</b>	<b>0.690</b>	<b>0.0176</b>	<b>0.017</b>	<b>2.92</b>	<b>0.538</b>	<b>0.215</b>	...	...	<b>0.118</b>	...	...	...
ECRM 112-1	<b>0.348</b>	<b>1.00</b>	<b>0.191</b>	...	...	<b>4.78</b>	<b>1.21</b>	<b>0.234</b>	...	...	<b>0.115</b>	...	<b>0.604</b>	<b>1.78</b>
ECRM 113-1	<b>0.680</b>	<b>0.249</b>	<b>0.586</b>	<i>0.013</i>	<i>0.006</i>	<b>0.816</b>	<b>0.413</b>	<b>1.744</b>	...	...	<b>0.146</b>	...	...	...
*ECRM 188-1	<b>1.094</b>	...	...	...	<b>0.0113</b>	<b>1.538</b>	...	...	...	...	...	...	...	...
*ECRM 190-1	<b>0.395</b>	<b>0.278</b>	<b>1.28</b>	<b>0.0112</b>	<b>0.0044</b>	<b>2.18</b>	<b>0.410</b>	<b>0.934</b>	...	<b>0.034</b>	...	<b>0.0096</b>	...	...

## Alloy Steel Certified Reference Materials (continued)

AMMZ/IRSID No.	Bi	Cd	Ga	Hg	Nb	Pb	Sb	Se	Te	Tl	Zn
*ECRM 188-1	<b>&lt;0.00002</b>	<b>&lt;0.00005</b>	<b>0.00251</b>	<i>&lt;0.00001</i>	<b>0.00013</b>	<b>&lt;0.0001</b>	<b>0.00048</b>	<i>&lt;0.0002</i>	<b>&lt;0.0002</b>	<i>&lt;0.00002</i>	<i>&lt;0.0003</i>

## Highly Alloyed Steel Certified Reference Materials (Finely divided material – units of 100g; ECRM 269-1 also available as 35mm diameter x 25mm discs)

AMMZ/IRSID No.	C	Si	Mn	P	S	Cr	Mo	Ni	As	Co	Cu	N	Nb	Sn	Ti	V	W	Ca	Zn
ECRM 201-1	<b>0.291</b>	<b>0.843</b>	<b>0.363</b>	...	...	<b>12.33</b>	<b>0.050</b>	<b>0.202</b>	...	...	<b>0.099</b>	...	...	<b>0.0193</b>	...	<i>0.020</i>	...	<b>0.0018</b>	<b>0.0005</b>
*ECRM 269-1	<b>0.0499</b>	<b>0.441</b>	<b>1.262</b>	<b>0.0313</b>	<b>0.0010</b>	<b>18.150</b>	<b>0.397</b>	<b>8.044</b>	<b>0.0061</b>	<b>0.1116</b>	<b>0.366</b>	<b>0.0460</b>	<b>0.0242</b>	<b>0.0099</b>	<b>0.0006</b>	<b>0.0991</b>	<b>0.0306</b>	...	...
*ECRM 279-2	<b>0.0885</b>	<b>0.5160</b>	<b>0.2584</b>	...	...	<b>15.642</b>	...	<b>1.603</b>	...	...	<b>0.1067</b>	...	...	...	...	...	...	...	...
*ECRM 282-1	<b>0.086</b>	<b>0.734</b>	<b>1.64</b>	<b>0.019</b>	<b>0.0042</b>	<b>16.72</b>	<b>2.19</b>	<b>10.86</b>	...	...	<b>0.109</b>	...	...	...	<b>0.488</b>	<i>0.031</i>	...	...	...

\* Denotes Full EURONORM-Certified Reference Material

# ARCELORMITTAL MAIZIÈRES RESEARCH SA (formerly 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)

AMMZ/IRSID No.	Description	C	Si	Mn	P	S	Cr	Al	N	Ti
ECRM 503-1	Ferro-Manganese	<b>0.700</b>	<b>0.865</b>	<b>80.8</b>	<b>0.069</b>	<i>0.009</i>	...	...	...	...
ECRM 507-1	Ferro-Chromium	<b>5.43</b>	<b>1.20</b>	<b>0.270</b>	<b>0.018</b>	...	<b>70.27</b>	...	<b>0.050</b>	...
ECRM 509-1	Ferro-Chromium	<b>0.013</b>	<b>0.229</b>	...	<b>0.018</b>	...	<b>72.85</b>	...	<b>0.026</b>	...
ECRM 510-1	Ferro-Titanium	<b>0.058</b>	<b>4.65</b>	...	<i>0.035</i>	...	...	<i>4.9</i>	<i>0.014</i>	<b>26.95</b>

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

AMMZ/IRSID No.	Description	Fe	Si	Ca	Mg	Al	Ti	Mn	P	S	Na	K	V	Cr	Ni	Co	C(T)	Zn	Fe (II)	Others
ECRM 601-1	Iron Ore	<b>36.76</b>	<b>8.95</b>	<b>4.05</b>	<b>1.21</b>	<b>2.33</b>	<b>0.114</b>	<b>0.370</b>	<b>0.590</b>	<b>0.065</b>	...	...	...	...	...	...	...	...	<i>8.8</i>	...
ECRM 603-1	Iron Ore	<b>53.65</b>	<b>1.28</b>	<i>0.91</i>	<i>0.2</i>	<b>4.20</b>	<b>0.137</b>	<b>0.440</b>	<b>0.084</b>	<b>0.097</b>	...	...	...	...	...	...	...	...	<i>0.3</i>	...
ECRM 604-1	Iron Ore	<b>65.69</b>	<b>1.27</b>	<b>0.107</b>	<b>0.049</b>	<b>0.93</b>	<b>0.060</b>	<b>0.092</b>	<b>0.053</b>	<b>0.015</b>	...	...	...	...	...	...	...	...	<i>0.5</i>	...
ECRM 606-1	Iron Ore	<b>59.66</b>	<b>1.04</b>	<b>1.04</b>	<b>0.32</b>	<b>0.34</b>	<b>0.019</b>	<b>2.59</b>	<b>0.026</b>	<b>0.033</b>	...	...	...	...	...	...	...	...	<i>0.1</i>	...
ECRM 607-1	Iron Ore	<b>30.89</b>	<b>3.07</b>	<b>13.74</b>	<b>0.77</b>	<b>2.48</b>	<b>0.123</b>	<b>0.254</b>	<b>0.529</b>	<b>0.050</b>	...	...	...	...	...	...	...	...	<i>5.95</i>	...
ECRM 608-1	Ferriferrous Marl	<b>4.00</b>	<b>28.23</b>	<b>6.22</b>	<b>0.81</b>	<b>5.26</b>	<b>0.428</b>	<b>0.044</b>	<b>0.053</b>	<b>0.455</b>	...	...	...	...	...	...	...	...	<i>1.85</i>	...
ECRM 611-1	Iron Ore Sinter	<b>62.22</b>	<b>2.07</b>	<b>2.85</b>	<b>0.32</b>	<b>0.69</b>	<b>0.035</b>	<b>1.97</b>	<b>0.030</b>	<i>0.008</i>	...	...	...	...	...	...	...	...	<i>13.84</i>	...
ECRM 612-1	Iron Ore Sinter	<b>42.43</b>	<b>5.94</b>	<b>12.06</b>	<b>1.20</b>	<b>3.00</b>	<b>0.151</b>	<b>0.363</b>	<b>0.885</b>	<b>0.053</b>	...	...	...	...	...	...	...	...	<i>9.19</i>	...
*ECRM 677-1	Iron Ore	<b>51.54</b>	<b>11.78</b>	<b>0.038</b>	<b>0.012</b>	<b>0.32</b>	<b>0.013</b>	<b>0.016</b>	<b>0.0170</b>	<i>0.005</i>	<b>0.007</b>	<b>0.008</b>	...	<i>0.002</i>	<i>0.0015</i>	<i>0.0006</i>	...	<i>0.002</i>	...	<b>0.43 H<sub>2</sub>O+</b>
*ECRM 685-1	Pre-reduced Iron Ore	<b>91.10</b>	<b>0.795</b>	<b>0.140</b>	<b>0.239</b>	<b>0.320</b>	<b>0.220</b>	<b>0.042</b>	<b>0.017</b>	<b>0.0031</b>	<b>0.077</b>	<b>0.042</b>	<b>0.144</b>	...	<b>0.018</b>	<b>0.013</b>	<b>1.49</b>	...	<i>7.72</i>	<b>80.80 Fe<sub>m</sub></b>
*ECRM 691-1	Iron Ore	<b>64.39</b>	<b>0.556</b>	<b>0.999</b>	<b>2.022</b>	<b>0.475</b>	<b>0.966</b>	<b>0.1734</b>	<b>0.0877</b>	<b>0.0632</b>	<b>0.0164</b>	<b>0.0504</b>	<b>0.0603</b>	<b>0.0095</b>	<b>0.0299</b>	<i>(0.0216)</i>	<b>0.307</b>	<b>0.0195</b>	<b>20.71</b>	<b>{ 0.0768 Cu 0.0008 Pb</b>

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

AMMZ/IRSID No.	Description	Fe	Si	Ca	Mg	Al	Ti	Cr	Mn	B	N	P	S	C(T)	H <sub>2</sub> O	LOI
ECRM 702-1	Dolomite	<b>0.440</b>	<b>1.04</b>	<b>21.48</b>	<b>12.37</b>	<b>0.21</b>	<b>0.013</b>	<i>&lt;0.002</i>	<b>0.098</b>	...	...	<b>0.024</b>	<i>0.027</i>	<i>12.3</i>	<b>0.5</b>	<b>45.6</b>
*ECRM 778-1	High Carbon Magnesite	<b>0.67</b>	<b>0.489</b>	<b>0.883</b>	<b>48.87</b>	<b>0.297</b>	<i>0.008</i>	<b>0.102</b>	<b>0.011</b>	<b>0.0012</b>	...	<i>0.004</i>	...	<b>14.00</b>	...	<b>15.38</b>
*ECRM 780-1	Silicon Carbide	<b>1.30</b>	<b>63.5</b>	<b>0.84</b>	<b>0.051</b>	<b>1.86</b>	...	...	<b>0.029</b>	...	<b>0.32</b>	...	...	<b>26.38</b>	...	...

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

AMMZ/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	<b>0.576</b>	<b>15.16</b>	<b>30.62</b>	<b>2.87</b>	<b>8.53</b>	<b>0.366</b>	<b>0.460</b>	<b>0.109</b>	<b>0.714</b>	<b>0.236</b>	<b>0.491</b>	<b>0.243</b>	<b>0.028</b>	<b>0.0053</b>	...	<b>0.0025</b>	...	...	...	...	...	<b>0.0245 B</b>
ECRM 803-1	Blast Furnace Slag	<b>0.613</b>	<b>17.01</b>	<b>30.93</b>	<b>2.44</b>	<b>6.98</b>	<b>0.301</b>	<b>0.552</b>	<b>0.118</b>	<b>0.767</b>	...	...	...	...	...	...	...	...	...	...	...	...	...
ECRM 804-1	Basic Slag	<b>11.92</b>	<b>2.59</b>	<b>36.88</b>	<b>0.88</b>	<b>0.407</b>	<b>0.152</b>	<b>1.48</b>	<b>7.67</b>	<b>0.127</b>	...	...	...	<b>0.460</b>	...	...	...	...	...	...	...	...	...
ECRM 805-1	Basic Slag	<b>14.87</b>	<b>3.10</b>	<b>34.96</b>	<b>1.12</b>	<b>0.326</b>	<b>0.205</b>	<b>1.59</b>	<b>7.07</b>	<b>0.092</b>	...	...	...	<b>0.514</b>	...	...	...	...	...	...	...	...	...
ECRM 806-1	Basic Slag	<b>17.89</b>	<b>5.48</b>	<b>32.97</b>	<b>1.82</b>	<b>0.477</b>	<b>0.302</b>	<b>4.60</b>	<b>0.982</b>	<b>0.110</b>	...	...	...	<b>0.288</b>	...	...	...	...	...	...	...	...	...
*ECRM 876-1	Electric Furnace Dust	<b>24.85</b>	<b>1.72</b>	<b>3.43</b>	<b>1.31</b>	<b>0.34</b>	<b>0.048</b>	<b>2.84</b>	<b>0.128</b>	<b>0.87</b>	<b>1.98</b>	<b>1.63</b>	<b>0.24</b>	...	<b>0.17</b>	<b>0.034</b>	<b>23.29</b>	<b>0.42</b>	<b>0.023</b>	<b>7.82</b>	<b>0.26</b>	<b>3.63</b>	<b>{ 0.13 Cd 0.094 Sn</b>
*ECRM 880-1	Blast Furnace Dust	<b>31.0</b>	<b>3.34</b>	<b>3.15</b>	<b>0.714</b>	<b>1.28</b>	<b>0.081</b>	<b>0.218</b>	<b>0.038</b>	<b>0.425</b>	<b>0.041</b>	<b>0.108</b>	<b>0.034</b>	...	<b>0.027</b>	<b>0.014</b>	<b>0.064</b>	<b>0.005</b>	...	<b>0.017</b>	<i>37.77</i>	<b>0.086</b>	...

\* 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.**

**Unalloyed Steel Certified Reference Materials** (All finely divided materials - units of 100g, except 026-1, 026-2, 027-1, 028-1, and 029-1 which are 10mm dia. x 90mm rods and 098-1 which is in solid disc form 36-39mm dia. x 26mm: ECRM 035-2 also available as 38mm dia. x 20mm discs and ECRM 083-2 also available as 39mm dia. x 28mm discs)

BAM No.	Cert. Date	C	Si	Mn	P	S	Cr	Mo	Ni	Al (Acid Sol.)	Al (Total)	As	Co	Cu	N	Pb	Sn	Ti	V	Others
ECRM 026-1	1969	<i>0.44</i>	...	...	...	...	...	...	...	...	...	...	...	...	<b>0.0053</b>	...	...	...	...	<b>0.0031 O</b>
ECRM 026-2	1973	...	...	...	...	...	...	...	...	...	...	...	...	...	<b>0.0042</b>	...	...	...	...	<b>0.0025 O</b>
ECRM 027-1	1970	<i>0.05</i>	<i>0.003</i>	<i>0.4</i>	<i>0.03</i>	<i>0.03</i>	...	...	...	...	<i>0.001</i>	...	...	...	<b>0.0157</b>	...	...	...	...	<b>0.0084 O</b>
ECRM 028-1	1970	<i>0.1</i>	<i>0.002</i>	<i>0.3</i>	<i>0.06</i>	<i>0.03</i>	...	...	...	...	<i>0.001</i>	...	...	...	<b>0.0029</b>	...	...	...	...	<b>0.0113 O</b>
ECRM 029-1	1970	<i>0.05</i>	<i>0.003</i>	<i>0.3</i>	<i>0.03</i>	<i>0.03</i>	...	...	...	...	<i>0.001</i>	...	...	...	<b>0.0083</b>	...	...	...	...	<b>0.0312 O</b>
ECRM 030-4	1973	<b>0.456</b>	<b>0.318</b>	<b>0.603</b>	<b>0.018</b>	<b>0.021</b>	<b>0.117</b>	...	<b>0.042</b>	...	<b>0.042</b>	<b>0.012</b>	...	<b>0.061</b>	<b>0.0051</b>	...	<b>0.0055</b>	...	...	...
ECRM 031-3	1972	<b>0.055</b>	<b>0.037</b>	<b>0.329</b>	<b>0.014</b>	<b>0.021</b>	...	...	...	...	<b>0.054</b>	<b>0.013</b>	...	<b>0.020</b>	<b>0.0050</b>	...	...	...	...	...
ECRM 032-2	1968	<b>0.271</b>	<b>0.282</b>	<b>0.556</b>	<b>0.0129</b>	<b>0.0254</b>	<i>0.088</i>	...	<i>0.040</i>	...	...	<b>0.020</b>	...	<b>0.085</b>	<b>0.0044</b>	...	...	...	...	...
*ECRM 035-2	1998	<b>1.277</b>	<b>0.216</b>	<b>0.305</b>	<b>0.0038</b>	<b>0.0111</b>	<b>0.0104</b>	<b>0.0056</b>	<b>0.0190</b>	<b>0.0177</b>	<b>0.0193</b>	<b>0.0017</b>	...	<b>0.0085</b>	<b>0.0230</b>	...	...	<b>0.0030</b>	...	...
ECRM 036-1	1968	<b>0.858</b>	<b>0.194</b>	<b>0.327</b>	<b>0.0074</b>	<b>0.0095</b>	<i>0.091</i>	...	<i>0.058</i>	...	<i>0.015</i>	<b>0.0233</b>	...	<b>0.065</b>	<b>0.0100</b>	...	<i>0.006</i>	...	<i>0.019</i>	...
ECRM 042-1	1972	<b>0.108</b>	<b>0.037</b>	<b>0.666</b>	<b>0.0057</b>	<b>0.024</b>	<b>0.016</b>	...	<b>0.029</b>	...	<b>0.010</b>	...	...	<b>0.041</b>	<b>0.0078</b>	...	...	...	...	<b>0.0054 Nb</b>
ECRM 049-1	2020	<b>0.701</b>	...	...	...	<b>0.00404</b>	...	...	...	...	...	...	...	...	<b>0.00317</b>	...	...	...	...	...
*ECRM 077-3	2017	<b>0.1650</b>	...	...	...	<b>0.01623</b>	...	...	...	...	...	...	...	...	<b>0.00852</b>	...	...	...	...	...
*ECRM 079-2	1989	<b>0.596</b>	<b>0.247</b>	<b>0.743</b>	<b>0.0234</b>	<b>0.192</b>	<b>0.0382</b>	...	<b>0.022</b>	...	<b>0.021</b>	<b>0.004</b>	...	<b>0.046</b>	<b>0.0074</b>	...	<b>0.0037</b>	...	...	...
*ECRM 082-1	1976	<b>0.415</b>	<b>0.235</b>	<b>0.769</b>	<b>0.013</b>	<b>0.030</b>	<b>0.018</b>	...	<b>0.027</b>	...	<b>0.032</b>	<i>0.029</i>	...	<b>0.025</b>	<i>0.0047</i>	<b>0.149</b>	...	...	...	<b>0.030 Te</b>
*ECRM 083-1	2009	<b>0.0262</b>	...	<b>0.289</b>	<b>0.0076</b>	<b>0.0100</b>	<i>0.013</i>	...	<b>0.014</b>	...	<i>0.004</i>	<i>0.004</i>	...	<b>0.016</b>	<b>0.00189</b>	...	...	...	...	...
*ECRM 083-2	2017	<b>0.0315</b>	<b>0.00747</b>	<b>0.2160</b>	<b>0.0106</b>	<b>0.00561</b>	<b>0.0219</b>	...	<b>0.0116</b>	...	<b>0.0784</b>	<b>0.00177</b>	<b>0.00236</b>	<b>0.0127</b>	<b>0.00157</b>	<i>(0.0002)</i>	...	<i>(0.0003)</i>	<i>(0.0005)</i>	<b>0.00439 Zn</b>
*ECRM 098-1	1993	<b>0.00051</b>	<b>0.00048</b>	<b>0.00008</b>	<i>0.00006</i>	<b>0.00031</b>	<b>0.00571</b>	<b>0.00085</b>	...	...	...	...	...	...	<b>0.00024</b>	...	...	...	...	...

**Alloy Steel Certified Reference Materials** (Finely divided material - units of 100g; 129-3, 179-2, 187-2, 191-3, 192-1, 193-1 and 194-2 also available as 37-40mm dia. x 25-35mm 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	<b>0.841</b>	<i>0.24</i>	<b>1.817</b>	<b>0.009</b>	<b>0.005</b>	<b>0.317</b>	...	<i>0.038</i>	...	...	...	...	<i>0.098</i>	...	...	...	<b>0.143</b>	...
ECRM 128-1	1972	<b>0.085</b>	<b>0.949</b>	<b>0.839</b>	<b>0.007</b>	<b>0.007</b>	<b>0.108</b>	...	<b>0.046</b>	<b>0.286</b>	...	...	...	<b>0.055</b>	<i>0.0024</i>	...	<b>0.890</b>	<i>0.008</i>	...
*ECRM 129-3	2008	<b>0.3684</b>	<b>0.2087</b>	<b>0.371</b>	<b>0.0110</b>	<b>0.0165</b>	<b>1.702</b>	<b>0.206</b>	<b>1.022</b>	<b>1.016</b>	<b>0.0049</b>	<i>0.00014</i>	<b>0.0148</b>	<b>0.0804</b>	<b>0.0046</b>	<b>0.0067</b>	<b>0.030</b>	<i>0.0045</i>	<b>0.00059 Sb</b>
ECRM 130-1	1968	<b>0.546</b>	<b>0.313</b>	<b>1.593</b>	<b>0.0209</b>	<b>0.0158</b>	<i>0.032</i>	...	<i>0.031</i>	<b>0.0037</b>	<b>0.0167</b>	...	...	<b>0.072</b>	<b>0.0093</b>	...	...	<i>0.003</i>	<b>0.0019 Al (Acid Sol.)</b>
*ECRM 179-2	1990	<b>0.598</b>	<b>0.579</b>	<b>0.539</b>	<b>0.0267</b>	<i>0.0006</i>	<b>1.08</b>	<b>0.070</b>	<b>0.078</b>	...	...	...	<i>0.0153</i>	<b>0.111</b>	<b>0.0068</b>	...	<i>0.0014</i>	<b>0.188</b>	<b>1.87 W, &lt;0.00003 Bi, &lt;0.00003 Cd, 0.00129 Ga, 0.00144 Nb, 0.00013 Pb, 0.00175 Sb, &lt;0.0002 Te, 0.00023 Zn</b>
*ECRM 180-1	1973	<b>0.197</b>	<b>0.362</b>	<b>1.286</b>	<b>0.0174</b>	<b>0.0249</b>	<b>1.250</b>	...	<b>0.096</b>	...	<b>0.030</b>	...	...	<b>0.115</b>	<b>0.0068</b>	...	...	...	...
*ECRM 181-1	1973	<b>0.590</b>	<b>1.054</b>	<b>1.047</b>	<b>0.018</b>	<b>0.035</b>	<b>0.126</b>	...	<b>0.070</b>	<b>0.022</b>	<i>0.026</i>	...	...	<b>0.174</b>	<b>0.0068</b>	<i>0.015</i>	...	...	...
*ECRM 182-1	1993	<b>0.790</b>	<b>0.368</b>	<b>0.389</b>	<b>0.009</b>	<b>0.011</b>	<b>0.591</b>	...	<b>0.152</b>	<b>0.020</b>	...	...	...	<b>0.141</b>	<b>0.0102</b>	...	...	<b>0.177</b>	<b>0.0039 Pb, 0.0042 Sb, 0.0015 Zn</b>
*ECRM 183-1	1973	<b>0.083</b>	<b>0.421</b>	<b>0.354</b>	<b>0.089</b>	<b>0.031</b>	<b>0.670</b>	...	<b>0.073</b>	<b>0.027</b>	...	...	...	<b>0.445</b>	<b>0.0064</b>	...	...	...	...
*ECRM 187-1	1986	<b>0.195</b>	<b>0.026</b>	<b>1.354</b>	<b>0.014</b>	<b>0.025</b>	<b>1.186</b>	<b>0.035</b>	<b>0.096</b>	<b>0.046</b>	<b>0.018</b>	<b>0.0004</b>	<b>0.014</b>	<b>0.161</b>	<b>0.014</b>	<b>0.011</b>	...	...	...
*ECRM 187-2	2011	<b>0.2038</b>	<b>0.2111</b>	<b>1.257</b>	<b>0.0066</b>	<b>0.0300</b>	<b>1.132</b>	<i>0.0623</i>	<b>0.1755</b>	<b>0.0223</b>	<b>0.0057</b>	<b>0.00048</b>	<b>0.0112</b>	<b>0.1288</b>	<b>0.0105</b>	<b>0.0237</b>	...	<b>0.0122</b>	<i>0.0018 Sb</i>
*ECRM 191-2	2006	<b>0.0043</b>	<b>3.267</b>	<b>0.1334</b>	<b>0.0087</b>	<b>0.0029</b>	<b>0.0314</b>	<b>0.0020</b>	<b>0.0224</b>	<b>0.985</b>	<b>0.0018</b>	...	...	<b>0.0165</b>	<b>0.00105</b>	<b>0.0050</b>	<b>0.0024</b>	...	...
*ECRM 191-3	2021	<b>0.0027</b>	<b>3.226</b>	<b>0.1539</b>	<b>0.0097</b>	<b>0.0005</b>	<b>0.0242</b>	<b>0.00127</b>	<b>0.0124</b>	<b>0.8152</b>	<b>0.00144</b>	<b>0.00024</b>	...	<b>0.0097</b>	<b>0.00105</b>	<b>0.00131</b>	<b>0.00199</b>	<b>0.00043</b>	<b>0.0036 Mg</b>
*ECRM 192-1	1995	<b>0.188</b>	<b>0.219</b>	<b>1.377</b>	<b>0.0029</b>	<b>0.0010</b>	<b>0.072</b>	<b>0.482</b>	<b>0.755</b>	<b>0.0308</b>	<i>0.003</i>	<i>0.0002</i>	<b>0.0055</b>	<b>0.045</b>	<b>0.0118</b>	<i>0.003</i>	<i>0.001</i>	<i>0.003</i>	<b>0.029 Al (Acid Sol.)</b>
*ECRM 193-1	1990	<b>0.139</b>	<b>0.404</b>	<b>0.972</b>	<b>0.0063</b>	<b>0.0086</b>	<b>0.182</b>	<b>0.347</b>	<b>1.178</b>	<b>0.0257</b>	<b>0.0062</b>	<i>0.0002</i>	<b>0.0073</b>	<b>0.598</b>	<b>0.0108</b>	...	<i>0.0013</i>	<i>0.0019</i>	<b>0.0232 Nb</b>
*ECRM 194-1	2015	<b>0.1532</b>	<b>0.431</b>	<b>1.188</b>	<b>0.0097</b>	<b>0.00059</b>	<b>0.733</b>	<b>0.2857</b>	<b>0.3417</b>	<b>0.0837</b>	<b>0.0042</b>	<b>0.0020</b>	...	<b>0.0751</b>	<b>0.0115</b>	...	...	<b>0.0243</b>	<b>0.0026 Ca</b>
*ECRM 194-2	2015	<b>0.1694</b>	<b>0.2974</b>	<b>1.282</b>	<b>0.0137</b>	<b>0.00049</b>	<b>0.760</b>	<b>0.402</b>	<b>0.3316</b>	<b>0.0669</b>	<b>0.00208</b>	<b>0.00155</b>	<b>0.00328</b>	<b>0.0313</b>	<b>0.00319</b>	<i>0.0004</i>	<b>0.00322</b>	<b>0.00161</b>	<b>0.0290 Nb, 0.0003 Sb</b>

\* 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; 284-3, 288-1, 289-1, 290-1 and 291-1 also available as 36-40mm dia. x 25-35mm discs; 271-1 as a 37mm dia. x 25mm disc, 294-1 as a 40mm dia. x 20mm 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	Sn	Ti	V	W	Others
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 Sb
*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	0.0141	0.00074 Ca 0.0011 Sb
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	...	...	0.057	...	0.660 Nb
^ECRM 267-1	2021	...	...	...	...	...	...	...	...	...	...	...	...	...	0.0266	...	...	...	...	0.00096 O
*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	0.0054	0.0009 Ca 0.0020 O
*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 O
*ECRM 284-3	2016	0.0025	0.0442	0.0615	0.0049	0.0066	17.37	2.236	12.09	0.002	0.00131	0.00020	0.0366	0.0105	0.0418	0.00074	0.0050	0.005	0.0039	...
*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	...	...	...	0.0014 Sb
*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	...
*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	...	...
*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	...	...	0.388	...	...
*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	0.001	<0.002	0.0694	<0.004	...
*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	...	0.0072	0.535	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	0.008	0.1289	0.0329	0.0002	0.1775 Zr

Also available: **BAM Steel-H1**, highly alloyed steel, with a certified hydrogen content of **0.97 mg/kg** (100 x 1g pins) ^ECRM 267-1 is supplied as 100 x 1g pins

## 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

\* 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.

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

BAM No.	Cert. Date	C	Si	Mn	P	S	Cr	Ni	Al	B	Cu	Pb	N	Ti	Ca	Mg	Fe
*ECRM 502-2	2004	<b>6.94</b>	<i>0.10</i>	<b>77.87</b>	<b>0.148</b>	<i>0.002</i>	<b>0.0265</b>	<b>0.0384</b>	...	<i>0.0003</i>	<b>0.0370</b>	<b>0.0179</b>	<i>0.02</i>	<b>0.0034</b>	...	...	<i>14.6</i>
ECRM 529-1	1975	<b>0.10</b>	<b>91.11</b>	<b>0.04</b>	<b>0.013</b>	...	...	...	<b>0.86</b>	...	...	...	...	<b>0.09</b>	<b>0.46</b>	<b>0.04</b>	<b>6.15</b>

\* Denotes Full EURONORM-Certified Reference Materials

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

BAM No.	Cert. Date	Description	Fe	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	CaO	MgO	Mn	P	S	Na <sub>2</sub> O	K <sub>2</sub> O	As	Ba	CO <sub>2</sub>	H <sub>2</sub> O
ECRM 630-1	1969	Bomi-Hill Concentrate	<b>65.63</b>	<b>5.88</b>	<b>0.88</b>	<b>0.066</b>	<b>0.10</b>	<b>0.47</b>	<b>0.060</b>	<b>0.043</b>	<b>0.032</b>	...	...	...	...	...	...
ECRM 631-1	1969	Venezuela Iron Ore	<b>61.09</b>	<b>3.20</b>	<b>1.06</b>	<b>0.109</b>	<b>0.75</b>	<b>0.54</b>	<b>0.044</b>	<b>0.114</b>	<b>0.033</b>	<i>0.04</i>	<i>0.04</i>	...	...	...	...
ECRM 633-1	1967	Manganese Ore	<b>1.64</b>	<b>10.39</b>	<b>1.64</b>	<b>0.079</b>	<b>2.02</b>	<b>0.58</b>	<b>47.85</b>	<b>0.170</b>	<b>0.227</b>	...	...	<i>0.0040</i>	<b>1.13</b>	<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.	Cert. Date	Description	Fe	Si	Al	Ti	Ca	Mg	Mn	P	S	Na	K	Zn	Cl	Co	Cr	Cu	Ni	Others
*ECRM 680-1	1977	Purple Ore	<b>59.98</b>	<b>4.20</b>	<b>0.66</b>	<b>0.045</b>	<b>0.45</b>	<b>0.14</b>	<b>0.025</b>	<b>0.018</b>	<b>0.544</b>	<b>0.128</b>	<b>0.078</b>	<b>0.165</b>	...	<b>0.013</b>	<b>0.005</b>	<b>0.063</b>	<b>0.007</b>	<b>0.317 Pb, 0.057 As</b>
*ECRM 686-1	2002	Iron Oxide	<b>69.44</b>	<b>0.0083</b>	<b>0.0407</b>	<b>0.0014</b>	<b>0.0097</b>	<b>0.0027</b>	<b>0.231</b>	<b>0.0078</b>	...	<b>0.0058</b>	<b>0.0024</b>	<b>0.0004</b>	<b>0.095</b>	<b>0.0019</b>	<b>0.0182</b>	<b>0.0003</b>	<b>0.0004</b>	<b>0.0007 Mo, 0.0002 Sn</b>
*ECRM 687-1	2009	Iron Oxide	<b>69.66</b>	<b>0.0157</b>	<b>0.0356</b>	<b>0.0303</b>	<b>0.0113</b>	<b>0.0018</b>	<b>0.1658</b>	<b>0.0120</b>	...	<b>0.0030</b>	<b>0.0011</b>	<b>0.0051</b>	<b>0.0173</b>	<i>(0.002)</i>	<b>0.0227</b>	<b>0.0030</b>	<b>0.0122</b>	<b>0.0020 Mo, 0.0006 Sn</b>

## 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	<b>44.44</b>	<b>2.02</b>	<b>0.043</b>	<b>0.42</b>	<b>0.27</b>	...	...	<b>0.23</b>	<i>0.02</i>	<b>0.13</b>	...	...
*ECRM 779-1	1991	Magnesite	<b>0.182</b>	<b>1.691</b>	<i>54.6</i>	<b>0.105</b>	<b>0.0081</b>	<b>0.503</b>	<b>0.0267</b>	<b>3.73</b>	<i>0.006</i>	<i>0.002</i>	<b>0.0116</b>	<i>0.003</i>

## Molybdenum Oxide Certified Reference Material (Finely divided material – units of 100g)

BAM No.	Cert. Date	Ca	Mg	Ti	P	Bi	Cu	Fe	Pb	K	Al	As	Mo	Si	S	Na	C	W	Ba	V
*ECRM 784-1	2018	<b>0.888</b>	<b>0.0883</b>	<b>0.0223</b>	<b>0.0113</b>	<b>0.00326</b>	<b>0.390</b>	<b>1.870</b>	<b>0.0215</b>	<b>0.164</b>	<b>0.468</b>	<b>0.0126</b>	<i>57.85</i>	<i>2.651</i>	<i>0.0083</i>	<i>0.0396</i>	<i>0.0103</i>	<i>0.0145</i>	<i>(0.006)</i>	<i>(0.127)</i>

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

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

\* Denotes Full EURONORM-Certified Reference Materials

# BUNDESANSTALT FÜR MATERIALFORSCHUNG UND - PRÜFUNG (BAM), Germany

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

## Copper and Copper Alloy Certified Reference Materials (223-229 finely divided material – units of 100g; all others are 40mm dia. x 30mm discs)

Mass fraction in %

BAM No.	Cu	Sn	Zn	Pb	Fe	Ni	Al	Mn	Bi	As	Sb	Si	P	S	Cd	Ag	Mg	Others
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 Se
224	57.40	0.066	39.40	1.13	0.136	0.038	0.0012	1.70	0.0006	0.0025	0.0026	(0.002)	0.0112	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 Se, 0.0012 Te
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 Se
229	63.334	0.00485	36.63	0.0192	0.01061	0.01114	...	...	...	0.00217	0.00072	...	0.0011	...	...	...	...	0.0034 Se
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	0.00129 Ti
369	...	...	0.0022	...	...	...	...	...	0.00097	...	...	...	...	...	...	...	0.00036	0.001042 Co, 0.000921 Cr
370	...	0.00168	...	0.00158	...	...	0.00126	...	...	...	0.00156	0.00187	0.00117	...	...	...	...	...
371	...	...	...	...	0.00183	...	...	...	...	...	...	...	...	0.00121	0.00016	...	...	0.00144 Te
372	...	...	...	...	...	0.00117	...	0.00114	...	0.00103	...	...	...	...	...	0.00090	...	0.00084 Se
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	<0.0001	<0.0002 Se, <0.0001 Te
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 Te
M376a	Bal.	0.0247	0.0217	0.0236	0.0235	0.0209	0.0182	0.0206	0.0200	0.0200	0.0202	...	0.0203	0.0133	0.0186	0.0163	0.0124	0.0210 Se, 0.0215 Te 0.00422 Zr
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	<0.0001	0.0055 Se, <0.0001 Te
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	0.00266	0.00287	<0.0002 Se, 0.00850 Te 0.0089 Co, 0.0311 Cr
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	...	0.067	0.0770 Co, 0.0153 Cr 0.0660 Ti, 0.098 Zr
ERM-EB393a	75.8	39.0	(20.8)	0.0104	0.0143	0.00297	0.00021	0.00185	0.000019	0.000134	0.000093	3.35	0.0454	...	0.000061	...	...	0.000047 Se, 0.0000156 Cr
M394	57.70	0.232	...	1.93	0.1191	0.0399	0.00010	0.00141	0.00081	0.01001	0.00238	0.00053	0.00157	...	0.00070	...	...	<0.0002 Cr
M394a	57.64	0.174	...	1.92	0.1323	0.0386	0.00079	0.00125	0.00083	0.00959	0.00241	0.00058	0.00172	...	0.00073	...	...	0.00013 Cr
M396	65.49	0.0367	...	0.592	0.0235	0.0143	0.223	0.00445	0.00032	0.0590	0.00061	0.187	0.00089	...	0.00022	...	...	0.00012 Co, 0.00079 Cr
M397	...	3.99	1.96	0.229	...	0.336	...	...	...	0.00029	0.097	...	...	0.459	...	...	...	<0.0001 Se, <0.0001 Te
M397a	...	3.98	1.87	0.227	...	0.337	...	...	...	0.00020	0.097	...	...	0.45	...	...	...	<0.0001 Se, <0.0001 Te

## Pure Copper Certified Reference Materials (M365a finely divided material – units of 100g; all others are 40mm dia. x 30mm discs, except M383b - M385a which are 38mm dia. x 30mm discs)

Mass fraction in µg/g, except where marked

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
M365a*	99.73%	(29)	30	141	6.1	235	...	...	30.0	40.4	12.1	...	...	...	...	2.13	...	159	179	1.27	...	...	...
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
M383b	Bal.	0.8	9.3	1.01	3.6	1.43	<1.2	0.18	1.85	2.8	1.69	<2	<1	3.6	0.93	1.02	<1	10.6	1.17	5.7	<1	<1	<1
M384a	Bal.	2.6	5.3	11.7	2.7	6.1	<1.5	0.22	6.16	5.4	5.4	<2.5	<1.5	4.6	4.1	3.64	<0.2	10.7	5.8	9.3	<0.2	<1	0.1
M384b	Bal.	2.1	2.6	1.6	5.1	4.7	2.9	8.1	6.81	6.6	5.8	<2.5	<2	3.8	4.0	10.4	2.3	11.3	2.9	7.2	3.3	2.9	1.3
M385a	Bal.	16.0	9.2	10.8	44.5	10.8	13.3	9.9	5.62	9.3	14.9	7.2	10.0	35.4	2.73	7.5	10.4	24.9	5.2	8.1	(32)	6.7	(18)
M386a	Bal.	21.6	36.7	19.8	59.3	21.1	26.9	11.1	9.5	20.6	25.2	12	6.5	15.3	5.4	4.9	11.5	44.2	9.7	31.1	76.7	34.7	...
M390	Bal.	<0.1	...	...	0.79	...	...	...	...	...	...	...	1.3	...	...	...	...	...	...	...	...	...	...
M391	Bal.	<0.1	...	...	0.90	...	...	...	...	...	...	...	3.3	...	...	...	...	...	...	...	...	...	...
M392	Bal.	<0.1	...	...	0.80	...	...	...	...	...	...	...	7.0	...	...	...	...	...	...	...	...	...	...

\*O=(1712) µg/g

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

# 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.**

**Aluminium Alloy Certified Reference Materials** (201-301 and M319 finely divided material – units of 100g; ERM-EB307a, EB312a, EB315a, M313a, M318, M320 and M321 – approx. 65mm dia. x 30mm discs; M308a – approx. 60mm dia. x 30mm discs; 310 and 311 – approx. 60mm dia. x 25mm discs; ERM-EB316 and EB317 – approx. 50mm dia. x 30mm discs)

BAM No.	Si	Mn	Fe	Cu	Ti	Zn	Mg	Pb	Al	Cr	Ni	V	Be	Bi	Ca	Cd	Li	Na	Sn	Zr	Ga	Sc
201	<b>13.20</b>	<b>0.38</b>	<b>0.18</b>	<b>0.009</b>	<b>0.011</b>	<b>0.038</b>	<b>0.0024</b>	...	Bal.	...	...	...	...	...	...	...	...	...	...	...	...	...
300	<b>0.14</b>	<b>0.018</b>	<b>0.203</b>	<b>0.046</b>	<b>0.011</b>	<b>0.128</b>	<b>2.67</b>	<b>0.016</b>	Bal.	<b>0.23</b>	...	...	...	...	...	...	...	...	<i>&lt;0.0005</i>	...	...	...
301	<b>0.061</b>	<b>0.001</b>	<b>0.054</b>	<b>0.0016</b>	<b>0.005</b>	<b>0.033</b>	<b>0.0008</b>	...	Bal.	...	...	<b>0.0018</b>	...	...	...	...	...	...	<i>&lt;0.0005</i>	...	...	...
ERM-EB307a	<b>0.152</b>	<b>0.811</b>	<b>0.345</b>	<b>0.0939</b>	<b>0.0595</b>	<b>0.0690</b>	<b>4.80</b>	<b>0.0084</b>	Bal.	<b>0.1536</b>	<b>0.0097</b>	<b>0.0119</b>	<b>0.000537</b>	...	<b>0.00192</b>	<b>0.00326</b>	<b>0.00081</b>	<i>0.00084</i>	<b>0.0075</b>	<b>0.00319</b>	<b>0.0124</b>	...
M308a	<b>0.072</b>	<b>0.0343</b>	<b>0.164</b>	1.36	<b>0.0257</b>	5.61	2.28	<b>0.00436</b>	Bal.	<b>0.192</b>	<b>0.0147</b>	...	<b>0.00018</b>	...	<i>0.00108</i>	...	...	<b>0.00158</b>	...	<b>0.00873</b>	...	...
310	<b>0.080</b>	<b>0.003</b>	<b>0.070</b>	<b>0.0017</b>	<b>0.003</b>	<b>0.009</b>	<b>0.994</b>	<b>0.0035</b>	Bal.	<b>0.0009</b>	<b>0.002</b>	<b>0.0044</b>	<b>0.00013</b>	...	<b>0.00073</b>	<b>0.0024</b>	<b>0.00037</b>	<i>0.0003</i>	<b>0.0024</b>	<b>0.0014</b>	<b>0.0115</b>	...
311	<b>0.204</b>	<b>0.694</b>	<b>0.310</b>	<b>4.653</b>	<b>0.056</b>	<b>0.200</b>	<b>1.567</b>	<b>0.0504</b>	Bal.	<b>0.104</b>	<b>0.052</b>	<b>0.0240</b>	<b>0.00052</b>	<b>0.0500</b>	<b>0.00056</b>	<b>0.0013</b>	<b>0.00053</b>	<i>0.0018</i>	<b>0.0127</b>	<b>0.140</b>	<b>0.0159</b>	...
ERM-EB312a	<b>0.403</b>	<b>0.0488</b>	<b>0.198</b>	<b>0.0509</b>	<b>0.0291</b>	<b>0.0297</b>	<b>0.379</b>	<b>0.00497</b>	Bal.	<b>0.0320</b>	<b>0.00407</b>	<b>0.00673</b>	...	<b>0.00180</b>	<i>0.00169</i>	<b>0.00167</b>	<b>0.00060</b>	<i>0.00040</i>	...	<b>0.00085</b>	<b>0.0129</b>	...
M313a	<b>0.346</b>	<b>0.486</b>	<b>0.388</b>	<b>0.0932</b>	<b>0.099</b>	<b>0.1481</b>	<b>3.35</b>	<b>0.00380</b>	Bal.	<b>0.117</b>	<b>0.0296</b>	<b>0.0308</b>	<b>0.00054</b>	<b>0.0092</b>	<b>0.00104</b>	<b>0.00047</b>	<b>0.00113</b>	<b>0.0025</b>	<b>0.0193</b>	<b>0.0355</b>	<b>0.01067</b>	...
ERM-EB315a	<b>9.88</b>	<b>0.311</b>	<b>0.621</b>	<b>2.46</b>	<b>0.142</b>	<b>0.801</b>	<b>0.446</b>	<b>0.077</b>	Bal.	<b>0.0274</b>	<b>0.0955</b>	<b>0.00470</b>	<b>0.000433</b>	<b>0.0036</b>	...	<b>0.00079</b>	...	...	<b>0.0764</b>	<b>0.00310</b>	<b>0.0089</b>	...
ERM-EB316	<b>11.98</b>	<b>0.204</b>	<b>0.1054</b>	<b>0.2970</b>	<b>0.0790</b>	<b>0.0611</b>	<b>0.045</b>	<b>0.0087</b>	Bal.	<b>0.00593</b>	<b>0.0235</b>	<b>0.0098</b>	<b>0.000295</b>	<b>0.0140</b>	<i>0.00113</i>	<b>0.00208</b>	...	...	<i>0.0106</i>	<b>0.00328</b>	<b>0.0105</b>	...
ERM-EB317	<b>0.0271</b>	<b>0.0912</b>	<b>0.112</b>	<b>1.77</b>	<b>0.0952</b>	<b>6.93</b>	<b>2.39</b>	<b>0.00481</b>	Bal.	<b>0.141</b>	<b>0.0359</b>	<b>0.0105</b>	<b>0.00101</b>	<b>0.0041</b>	<i>0.00060</i>	...	...	...	<b>0.0237</b>	<b>0.130</b>	<b>0.0183</b>	...
M318	<b>1.210</b>	<b>0.0908</b>	<b>0.246</b>	<b>0.0986</b>	<b>0.0238</b>	<b>0.0486</b>	<b>0.356</b>	<b>0.0056</b>	Bal.	<b>0.0208</b>	<b>0.00500</b>	<b>0.0104</b>	<b>0.00047</b>	...	0.00091	<b>0.00096</b>	<b>0.00060</b>	0.00037	<b>0.00206</b>	<b>0.00329</b>	<b>0.0189</b>	...
M319	<b>0.1043</b>	<b>0.371</b>	<b>0.291</b>	<b>0.0015</b>	<b>0.0030</b>	<b>0.0073</b>	<b>4.96</b>	<i>&lt;0.001</i>	...	<i>0.060</i>	<i>0.037</i>	<i>0.0093</i>	...	<i>&lt;0.001</i>	...	<i>&lt;0.0002</i>	...	...	<i>&lt;0.001</i>	<b>0.324</b>	<i>0.015</i>	<b>0.847</b>
M320	<b>0.197</b>	<b>0.699</b>	<b>0.206</b>	<b>0.147</b>	<b>0.102</b>	<b>0.252</b>	<b>3.98</b>	<b>0.00448</b>	...	<b>0.1044</b>	<b>0.00209</b>	<b>0.00759</b>	<b>0.00224</b>	...	<b>0.00119</b>	<b>0.00152</b>	<b>0.00091</b>	<b>0.0064</b>	<b>0.00456</b>	<b>0.102</b>	<b>0.0208</b>	<b>0.282</b>
M321	<b>0.0496</b>	<b>0.812</b>	<b>0.0495</b>	<b>4.38</b>	<b>0.0436</b>	<b>0.147</b>	<b>1.51</b>	<b>0.0099</b>	...	<b>0.0558</b>	<b>0.0504</b>	<b>0.0105</b>	<b>0.00049</b>	<b>0.0323</b>	<b>0.00052</b>	<b>0.0030</b>	<b>0.00058</b>	<b>0.00029</b>	<b>0.0286</b>	<b>0.1554</b>	<b>0.00880</b>	<b>0.0502</b>

ERM-EB307a also certified for Co: **0.00051%** and Sb: **0.0046%**, M308a for Ag: **0.00065%**, ERM-EB312a for Sr: **0.00111%**, ERM-EB315a for Sb: **0.0051%**, ERM-EB316 for Sr: **0.0260%**, ERM-EB317 for Ag: **0.0073%** and In: **0.0162%**.

**Lead Alloy Certified Reference Materials** (Disc samples – dimensions as below)

BAM No.	Description	Disc Dimensions	Ca	Sb	As	Sn	Se	Bi	Ag	Al	Cu	Tl	Ni	Cd	Hg	Pt	S	Te	Zn
ERM-EB101a	PbCaSnAl	40mm dia. x 20mm	<b>0.136</b>	<i>&lt;0.00012</i>	<i>&lt;0.0002</i>	<b>0.294</b>	...	<b>0.0165</b>	<b>0.00290</b>	<b>0.0227</b>	<b>0.00243</b>	<b>0.00102</b>	<i>&lt;0.00006</i>	<i>(0.0002)</i>	...	...	<i>(&lt;0.0003)</i>	<i>&lt;0.0003</i>	<b>0.00010</b>
ERM-EB102a	PbCaSn	40mm dia. x 40mm	<b>0.0635</b>	<i>0.0004</i>	<i>&lt;0.0002</i>	<b>1.01</b>	...	<b>0.00737</b>	<b>0.0170</b>	<b>0.0124</b>	<b>0.00013</b>	<b>0.00302</b>	...	...	...	...	<i>(&lt;0.0003)</i>	<i>&lt;0.00011</i>	<i>&lt;0.00005</i>
ERM-EB103	PbSb1.6	40mm dia. x 30mm	...	<b>1.64</b>	<b>0.097</b>	<b>0.183</b>	<b>0.0180</b>	<b>0.0158</b>	<b>0.0066</b>	...	<b>0.00097</b>	<b>0.00152</b>	<b>0.000302</b>	<b>0.000020</b>	...	...	<i>0.00054</i>	<i>0.00019</i>	...
ERM-EB104	PbCaSn	40mm dia. x 40mm	<b>0.0530</b>	...	...	<b>1.27</b>	...	<i>0.0126</i>	<i>0.00293</i>	...	...	...	...	...	...	...	...	...	...
ERM-EB105	PbCaSn	40mm dia. x 40mm	<b>0.0595</b>	...	...	<b>1.43</b>	...	<b>0.0133</b>	<b>0.00321</b>	...	...	...	...	...	...	...	...	...	...
ERM-EB106	PbCaSn	40mm dia. x 40mm	<b>0.0782</b>	...	...	<b>1.72</b>	...	<i>(0.0135)</i>	<i>(0.00323)</i>	...	...	...	...	...	...	...	...	...	...
ERM-EB107	Pure Lead	40mm dia. x 40mm	...	...	...	...	...	...	...	...	...	...	...	<b>0.00261</b>	<b>0.00113</b>	...	...	...	...
ERM-EB108	Pure Lead	40mm dia. x 40mm	...	...	...	...	...	...	...	...	...	...	...	<b>0.00260</b>	<b>0.00083</b>	...	...	...	...
M109	Refined Lead	40mm dia. x 28mm	...	<b>0.0098</b>	<b>0.0113</b>	<b>0.115</b>	...	<b>0.0193</b>	<b>0.00451</b>	<i>&lt;0.00021</i>	<b>0.00196</b>	<b>0.00030</b>	<b>0.00035</b>	<b>0.00353</b>	...	...	...	<b>0.00306</b>	<b>0.00318</b>
M110	PbSb3	40mm dia. x 28mm	<i>&lt;0.0002</i>	<b>3.08</b>	<b>0.107</b>	<b>0.131</b>	<b>0.0106</b>	<b>0.0126</b>	<b>0.00226</b>	...	<b>0.00064</b>	...	...	<i>&lt;0.0001</i>	...	...	...	<b>0.00038</b>	<i>&lt;0.0001</i>
M112	Pure Lead	38mm dia. x 38mm	...	...	...	...	<b>0.00052</b>	...	...	...	<b>0.00082</b>	...	<b>0.00053</b>	...	...	<b>0.00054</b>	...	<b>0.00053</b>	...

**Gold Alloy Certified Reference Materials** (15.8mm dia. x 0.25mm discs)

BAM No.	Description	Au	Ag	Cu	Ni	Zn
ERM-EB506	Rose Gold	<b>58.56</b>	<b>3.90</b>	<b>35.65</b>	...	<b>1.891</b>
ERM-EB507	White Gold	<b>75.10</b>	<b>3.02</b>	<b>14.69</b>	<b>4.99</b>	<b>2.107</b>
ERM-EB508	Yellow Gold	<b>75.12</b>	<b>24.90</b>	...	...	...

**Iron in Float Glass Certified Reference Materials** (100mm x 50mm x 3.5mm plates)

BAM No.	Fe (total)	Fe(II)	Fe(II) as Fe <sub>2</sub> O <sub>3</sub>	Fe(III)
S050	<b>0.0084</b>	<b>0.0026</b>	<b>0.0037</b>	<b>0.0058</b>
S051	<b>0.0481</b>	<b>0.0155</b>	<b>0.0326</b>	<b>0.0326</b>
S052	<b>0.597</b>	<b>0.160</b>	<b>0.229</b>	<b>0.437</b>

# BUNDESANSTALT FÜR MATERIALFORSCHUNG UND - PRÜFUNG (BAM), Germany

CHEMICAL COMPOSITION (nominal mass content) – 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 <sub>2</sub>	H <sub>2</sub> O	Ag	Al	As	B	Ba	Be	Bi	C	Ca	Cd	Ce	Cl
RS 1	SiO <sub>2</sub> (>99.99%)	1991	...	...	...	<b>8.7</b>	<b>&lt;0.1</b>	...	...	...	...	...	<b>0.42</b>	<b>&lt;0.05</b>	...	...
RS 2	Al <sub>2</sub> O <sub>3</sub> (99.76%)	1994	...	<b>2280</b>	...	...	<i>&lt;0.5</i>	<i>&lt;5</i>	<i>&lt;0.5</i>	<i>&lt;0.2</i>	...	...	<b>3.1</b>	<i>&lt;0.2</i>	<i>&lt;0.1</i>	<i>&lt;10</i>
RS 3	CaCO <sub>3</sub> (99.79%)	1994	<b>43970</b>	<b>1320</b>	...	<i>&lt;5</i>	...	<i>&lt;1</i>	<b>45.3</b>	...	...	...	...	<i>&lt;0.5</i>	...	...
RS 4	Ni (99.995%)	1996	...	...	<b>&lt;1</b>	<b>&lt;1</b>	<b>&lt;0.5</b>	<b>&lt;2</b>	...	...	<b>&lt;2</b>	<b>9.4</b>	<b>&lt;1</b>	<b>&lt;0.2</b>	...	...
RS 5	NiO (Ni: 79.3%)	1996	...	<b>150</b>	<b>&lt;1</b>	<b>6</b>	<b>&lt;0.2</b>	...	<b>&lt;1</b>	...	<b>&lt;1</b>	<b>14</b>	<b>2.2</b>	<b>&lt;0.2</b>	...	...
RS 6A	MgO (Mg: 60.19%)	1997	...	<b>110</b>	...	<b>46</b>	...	...	<i>&lt;10</i>	...	...	<i>&lt;50</i>	<b>994</b>	...	...	...
RS 6B	MgO (Mg: 60.17%)	1997	...	<b>283</b>	...	<b>49</b>	...	...	<i>&lt;20</i>	...	...	<i>&lt;210</i>	<b>956</b>	...	...	...

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

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

## Platinum Group Elements in Used Automobile Catalyst Certified Reference Material (Finely divided material - units of 200g) Mass fraction in µg/g

BAM No.	Pt	Pd	Rh
ERM-EB504a	<b>1414</b>	<b>1596</b>	<b>210.0</b>

## Electronic Scrap Certified Reference Material (Finely divided material - units of 200g) Mass fraction in µg/g

BAM No.	Cu	Ni	Ag	Pb	Cr	Sn	Au	Pd	Pt	As	Be	Cd	In	Hg
M505a	<b>167600</b>	<b>6940</b>	<b>633</b>	<b>11300</b>	<b>9800</b>	<b>4680</b>	<b>52.4</b>	<b>48.0</b>	<b>5.7</b>	<b>372</b>	<b>6.8</b>	<b>16.4</b>	<i>43</i>	<i>&lt;5</i>

## 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	<b>29.4</b>	<b>46</b>	<b>45</b>	<b>47.0</b>	<b>28.4</b>	<b>53</b>	<b>40.0</b>	<b>38.8</b>	<b>16.7</b>	<b>59</b>	<b>41</b>	<b>29</b>	<i>7.2</i>	<b>106</b>	<b>42</b>

## Glass Certified Reference Materials (S004 finely divided material - units of 50g; S005c – approx. 38mm dia. x 4mm discs) Mass fraction in %

BAM No.	Description	SiO <sub>2</sub>	Na <sub>2</sub> O	CaO	Al <sub>2</sub> O <sub>3</sub>	BaO	MgO	ZnO	SO <sub>3</sub>	K <sub>2</sub> O	Cr <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	CuO	Cr Hexavalent	Cr Total
S004	Containing Hexavalent Chromium	<i>70.9</i>	<i>14.5</i>	<i>9.4</i>	<i>2.15</i>	<i>1.2</i>	<i>0.90</i>	<i>0.33</i>	<i>0.17</i>	<i>0.16</i>	<i>0.07</i>	<i>0.06</i>	<i>0.04</i>	<b>0.0094</b>	<b>0.0471</b>
S005c	Multielement	<b>70.8</b>	<b>13.92</b>	<b>10.39</b>	<b>1.109</b>	<b>0.0114</b>	<b>2.28</b>	<b>0.0196</b>	...	<b>0.717</b>	<b>0.00158</b>	<b>0.0422</b>	<b>0.0107</b>	...	<b>0.00108</b>

## 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	S
C11.01-1	Copper Tin Binary Bronze	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
C30.01-2	Main Elements in Brass	51.48	<0.01	<0.01	Bal.	<0.005	...	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.002	...	...
C30.02-1	"	55.6	<0.01	<0.01	Bal.	<0.005	...	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	...	...
C30.03-2	"	60.6	<0.01	<0.01	39.3	<0.01	...	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	...	...
C30.06-1	"	74.8	<0.01	<0.01	Bal.	<0.01	...	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	...	...
C30.07-1	"	82.0	<0.01	<0.01	Bal.	<0.01	...	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	...	...
C30.10-2	"	93.8	<0.01	<0.01	6.1	<0.01	...	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	...	...
C30.12-2	"	60.85	<0.01	<0.01	Bal.	0.52	...	<0.005	<0.005	0.90	<0.005	<0.005	<0.002	<0.005	...	...
C30.13-1	"	60.6	<0.01	<0.01	Bal.	<0.01	...	<0.005	<0.005	1.9	<0.005	<0.005	<0.002	<0.002	...	...
C30.14-2	"	60.5	<0.005	<0.01	Bal.	1.0	...	<0.01	<0.005	2.4	<0.005	<0.005	<0.005	<0.005	...	...
C30.15-1	"	60.6	<0.01	<0.01	Bal.	<0.01	...	0.55	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	...	...
C30.16-1	"	61.2	<0.01	<0.01	Bal.	<0.01	...	0.90	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	...	...
C30.17-2	"	61.6	<0.01	0.01	Bal.	0.01	...	1.4	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	...	...
C30.18-1	"	64.36	0.65	<0.01	Bal.	<0.005	...	<0.005	0.10	<0.005	<0.005	<0.005	<0.003	2.91	...	...
C30.19-1	"	69.9	1.07	<0.01	Bal.	<0.01	...	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002	4.65	...	...
C30.21-1	"	56.0	1.96	<0.005	Bal.	<0.005	...	<0.005	0.18	<0.005	<0.005	<0.01	...	1.44	...	...
C30.22-2	"	58.28	0.009	1.05	Bal.	<0.01	...	0.006	<0.005	<0.005	0.011	<0.012	<0.005	<0.003	...	...
C38.01-1	Impurities in Brass	61	0.20	0.20	Bal.	0.01	...	0.01	<0.0005	0.009	0.03	0.02	<0.0005	0.003	...	...
C38.02-1	"	61	0.10	0.10	Bal.	0.03	...	0.09	0.01	0.14	0.06	0.06	0.005	0.004	...	...
C38.03-1	"	61	0.05	0.06	Bal.	0.13	...	0.05	0.07	0.07	0.08	0.08	0.008	0.07	...	...
C38.04-1	"	61	0.02	0.03	Bal.	0.06	...	0.04	0.12	0.22	0.04	0.12	0.008	0.02	...	...
C38.05-1	"	61	0.01	0.02	Bal.	0.19	...	0.008	0.14	0.02	0.01	0.01	0.01	0.12	...	...
C38.06-1	"	61	<0.005	0.002	Bal.	<0.005	...	<0.005	<0.0005	<0.001	<0.001	<0.002	<0.0005	<0.001	...	...

**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
C42.21-1	Admiralty and Naval Brass	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	...	...	...
C43.03-1	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	...	...	...	...	...	...
C48.03-1	Cartridge Brass	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
C51.12-2	Aluminium Bronze	Bal.	0.18	0.25	0.42	0.11	<0.005	2.90	<0.01	1.25	0.11	...	...	6.06	...	...	...	...	...	...
C51.13-2	"	Bal.	0.19	0.12	0.30	0.053	0.021	2.05	0.16	0.77	0.21	...	...	6.93	...	...	...	...	...	...
C52.51-3	Aluminium Bronze	Bal.	<0.01	<0.01	0.02	5.1	...	4.3	<0.01	<0.01	...	...	...	10.0	<0.01	...	...	<0.01	...	...
C52.56-3	"	Bal.	0.11	0.17	0.28	5.6	...	4.6	0.15	0.74	...	...	...	8.9	0.09	...	...	0.14	...	...
C54.01-3	Phosphor Bronze	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	...	...	...
C62.11-2	Cupro-Nickel	Bal.	0.04	<0.005	0.097	29.8	...	0.60	0.36	0.52	...	...	...	...	0.03	<0.005	<0.005	...	...	...
C62.14-2	"	Bal.	0.12	0.01	0.12	20.2	...	1.49	0.022	0.24	...	...	...	...	0.002	0.03	0.083	...	...	...
C62.15-2	"	Bal.	0.03	0.016	0.04	25.9	...	2.36	0.014	0.23	...	...	...	...	0.004	0.042	0.023	...	...	...
C65.27-1	Nickel Silver	57.0	0.01	0.04	28.7	13.9	0.02	0.26	<0.002	0.13	...	...	...	...	<0.01	...	0.03	...	...	...
C65.28-1	"	56.9	0.15	0.06	26.7	15.3	0.07	0.13	0.01	0.57	...	...	...	...	0.01	...	0.03	...	...	...
C65.29-1	"	58.9	0.08	0.11	23.4	16.8	0.07	0.39	0.02	0.17	...	...	...	...	0.01	...	0.07	...	...	...

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

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

<b>BNF No.</b>	<b>Description</b>	<b>C</b>	<b>Si</b>	<b>Cu</b>	<b>Fe</b>	<b>Mn</b>	<b>Cr</b>	<b>Ti</b>	<b>Al</b>	<b>Co</b>	<b>Mo</b>	<b>Mg</b>	<b>Ni</b>
<b>B6998</b>	MONEL Alloy 400	0.09	0.04	31.3	2.30	0.29	0.02	0.11	0.008	0.025	...	0.079	Bal.
<b>B7000</b>	"	0.05	0.11	31.5	0.64	0.87	0.035	0.03	0.028	0.50	...	0.026	Bal.
<b>B7001</b>	"	0.01	0.28	31.4	0.32	1.66	0.05	0.025	0.040	0.25	...	0.010	Bal.
<b>B7002</b>	"	0.015	0.15	31.7	0.13	2.65	0.10	0.015	0.060	0.10	...	0.007	Bal.
<b>E3918</b>	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.
<b>E3919</b>	"	0.07	0.89	0.055	2.62	0.47	19.6	0.40	0.15	1.00	0.25	0.040	Bal.
<b>E3920</b>	"	0.07	0.57	0.11	3.02	0.28	19.2	0.35	0.13	2.02	0.095	0.020	Bal.
<b>E3921</b>	"	0.11	0.34	0.27	3.50	0.14	19.4	0.20	0.045	0.53	0.05	...	Bal.
<b>E3922</b>	"	0.14	0.16	0.50	3.98	0.10	19.2	0.08	0.035	0.115	0.03	0.014	Bal.
<b>B7004</b>	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.
<b>B7005</b>	"	0.035	0.23	0.045	0.32	0.16	19.6	2.52	1.55	1.04	0.10	0.005	Bal.
<b>B7006</b>	"	0.08	1.03	0.075	0.61	0.25	19.6	2.14	1.19	0.35	0.20	0.008	Bal.
<b>B7007</b>	"	0.14	0.66	0.22	0.22	0.53	19.4	2.31	1.36	0.15	0.39	0.019	Bal.
<b>B7008</b>	"	0.21	0.36	0.025	0.19	0.02	19.3	2.33	1.46	2.00	<0.01	0.030	Bal.
<b>B7010</b>	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.
<b>B7011</b>	"	0.095	1.02	0.065	0.34	0.16	19.7	2.05	1.20	17.0	0.20	0.010	Bal.
<b>B7012</b>	"	0.16	0.39	0.11	0.25	0.53	19.6	2.28	1.25	17.0	0.39	0.018	Bal.
<b>B7013</b>	"	0.22	0.65	0.20	0.22	0.06	19.6	2.39	1.46	17.0	<0.01	0.030	Bal.

**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	Mg	Mo	Nb	Ni
E3923	INCOLOY 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*
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.

(MONEL, NIMONIC, INCOLOY and INCONEL are all trade marks of Special Metals Corporation)

† Samples contain less than 0.01% Ta

**Lead Base Alloy Reference Material** (Approx. 50mm square x 20mm blocks)

BNF No.	Description	Cu	Sn	Pb	Zn	Ni	Cd	Sb	Bi	Ca	Ag
L21.02-1	Battery Alloy	0.0013	0.27	Bal.	0.0016	≤0.0002	≤0.0002	0.0003	0.01	0.03	0.008



## BRAMMER STANDARD COMPANY, Inc. (BS), USA

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

### C, S, N, H & O in Steel Reference Materials (CSN 2-1 and CSN 2-2 are 500 x 1g pins; CSN 2C and CSN A are 100g of finely divided material; HON U is 100 x 1g balls)

BRAMMER No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	H	V	O	Ca	Sn	Ti	Co	N
BS CSN 2-1	0.476	(0.03)	(0.4)	(0.004)	0.034	(16.8)	(0.5)	(0.2)	...	...	...	...	...	...	...	...	...	0.064
BS CSN 2-2	0.548	(0.03)	(0.4)	(0.004)	0.028	(16.8)	(0.5)	(0.2)	...	...	...	...	...	...	...	...	...	0.076
BS CSN 2C	0.469	0.17	0.60	0.012	0.0305	0.072	(0.006)	0.071	0.046	0.073	...	0.004	...	0.0033	(0.006)	0.002	(0.006)	0.0173
BS CSN A	0.068	(0.05)	(1.0)	(0.14)	0.305	(0.06)	...	(0.05)	...	(0.06)	...	...	...	...	...	...	...	0.0081
BS HON U	0.0500	...	...	...	0.0018	...	...	...	...	...	0.00010	...	0.0023	...	...	...	...	0.0254

### Calcium Treated Carbon Steel Reference Materials (38-41mm dia. x 19-30mm discs)

BRAMMER No.	C	Si	Mn	P	S	Cr	Ni	Mo	Al	As	B	Ca	Co	Cu
BS 1018	0.195	0.237	0.79	0.012	0.024	0.177	0.104	0.044	0.029	0.0041	(0.0002)	(0.0004)	0.0058	0.130
BS 3941	0.407	0.257	0.802	0.016	0.023	0.069	0.018	0.0061	0.0019	0.0036	(0.0001)	0.0011	0.0042	0.053
BS 9325A	0.203	0.612	0.969	0.0079	0.0045	1.50	3.29	0.358	0.0056	0.0024	(0.0001)	0.0039	0.0093	0.163
BS HiCal-1	0.271	1.29	1.00	(0.007)	0.0007	1.55	3.28	0.379	0.070	0.0022	(0.0001)	0.0140	0.0024	0.152

BRAMMER No.	Fe	Mg	Nb	N	O	Pb	Sb	Sn	Ta	Ti	V	W	Zr
BS 1018 (continued)	98.2	(0.0003)	(0.0006)	0.0079	0.0014	(0.0006)	(0.001)	0.0099	...	0.0009	0.0009	0.0014	(0.001)
BS 3941 (continued)	(98.3) <sup>#</sup>	(0.0002)	0.033	0.0069	0.0055	0.0010	0.0005	0.0019	(0.0004)	0.0017	0.0025	(0.0004)	(0.0003)
BS 9325A (continued)	92.8	(0.0002)	0.0017	0.0076	...	(0.0003)	...	(0.0003)	(0.010)	0.0030	0.0024	0.024	(0.001)
BS HiCal-1 (continued)	91.9	(0.0003)	(0.002)	...	...	(0.0005)	...	(0.0002)	...	0.0037	0.0027	(0.0009)	(0.0008)

<sup>#</sup> Calculated by difference

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

BRAMMER No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	B	Co	Cu	N	Nb	Sn	Ti	V
BS 17A	0.588	0.22	19.38	0.043	0.005	1.37	0.52	0.060	0.052	(0.0001)	0.013	0.135	0.038	0.06	0.012	(0.002)	0.016
BS 19A	1.57	1.46	8.76	0.092	0.009	3.75	1.97	1.48	0.057	(0.0005)	0.014	0.51	0.039	0.040	0.037	(0.007)	0.10

# BRAMMER STANDARD COMPANY, Inc. (BS), USA

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

## Stainless and High Temperature Steel Reference Materials (37-44mm dia. x 10-19mm 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	0.035	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 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 85D	0.048	0.54	1.69	0.024	0.024	17.09	0.59	9.98	0.13	(0.001)	0.0004	0.97	0.45	(0.02)	(0.002)	0.062	0.0062	0.48	0.132	(0.07)	{ (0.01) As (0.001) Sb
BS 86F	0.054	1.22	1.30	0.021	0.0011	18.74	0.24	34.99	(0.007)	0.0026	(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	(0.002)	0.076	0.032	...
BS 94C	0.057	0.62	0.45	0.024	0.002	25.90	0.20	0.43	0.004	(0.0005)	0.0008	0.042	0.056	0.065	0.0061	0.032	0.006	...	0.12	(0.03)	...
BS 180B	0.022	0.46	4.65	0.017	0.0008	21.5	2.20	11.9	(0.007)	0.0011	0.0009	0.111	0.201	0.315	0.0043	0.131	0.0040	(0.005)	0.149	0.050	58.5 Fe
BS 181B	0.070	3.94	8.07	0.021	0.0009	16.17	0.173	8.18	0.0119	(0.0008)	(0.001)	0.044	0.206	0.158	0.0010	0.026	(0.004)	0.0051	0.044	0.016	62.8 Fe
BS 183A	0.172	0.37	0.35	0.016	0.0040	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	(0.002) As
BS 184A	0.035	0.080	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	(0.002) Ta
BS 185A	0.033	0.38	0.49	0.022	0.002	14.46	0.30	4.43	0.002	0.0017	(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	0.0053	0.16	0.0032	35.86	(0.001)	...	...	0.028	0.016	0.0026	...	(<0.002)	(0.002)	(<0.003)	0.0012	(0.01)	0.229 Se
BS 187D	0.0337	0.669	0.938	0.0155	0.0021	19.91	2.17	32.3	0.0164	0.0026	0.0063	0.089	3.52	0.046	0.0026	0.621	0.0085	0.0027	0.073	0.086	{ 0.0019 Pb 0.0008 Ta
BS 188B	0.046	0.266	0.247	0.016	(0.0007)	14.32	1.30	24.81	0.168	0.0047	(0.00003)	0.274	0.120	0.0021	0.0006	0.099	0.0051	2.20	0.264	0.043	{ 0.0045 As 55.8 Fe
BS 189A	0.0147	0.30	0.639	0.019	(0.001)	20.4	6.04	23.8	0.0129	(0.0002)	(0.0004)	0.100	0.184	0.198	0.0024	0.13	0.0035	0.0065	0.054	0.037	{ 0.0039 As (0.001) Zr
BS 316F	0.015	0.55	1.46	0.029	0.026	16.79	2.10	10.09	(0.002)	0.0019	0.0018	0.126	0.437	0.061	0.0055	0.011	0.0092	0.011	0.062	0.045	{ 0.0067 As 68.1 Fe
BS 430	0.061	0.37	0.71	0.024	0.002	16.5	0.052	0.22	<0.05	<0.005	<0.005	<0.5	0.12	0.06	(0.006)	0.01	0.009	<0.05	0.057	<0.05	{ 0.0045 As 81.7 Fe
BS 2205	0.0199	0.564	1.029	0.0227	0.0005	22.92	3.26	5.27	0.0080	0.0016	0.0014	0.041	0.196	0.169	0.0034	0.0052	0.0050	0.0019	0.0560	0.0309	{ 0.0059 As 0.0010 Sb
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
BS 9942	0.021	0.49	1.84	0.025	0.006	18.21	3.30	13.55	0.004	0.0014	0.0014	0.086	0.305	0.071	(0.0023)	0.005	0.006	(0.002)	0.072	0.032	(0.004) As
BS SS 3951	0.014	0.61	1.56	0.023	0.031	18.71	0.303	9.18	0.002	(0.0006)	0.0005	0.16	0.22	0.077	0.0074	0.085	0.007	(0.002)	0.067	0.040	(0.003) 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
<b>BS 200A</b>	Nickel 200	38 dia. x 19	0.078	0.0051	0.151	0.0007	0.0037	0.0006	0.0004	99.54	0.0281	0.0044	0.0564	0.0038	0.0004	(0.00005)	(0.00002)	0.0427	0.0006	0.0005	0.074	0.0131	0.0013 O
<b>BS 200-1</b>	"	38 dia. x 15	0.0413	0.037	0.111	0.0009	0.0011	0.0011	0.0004	99.60	0.0048	0.0033	0.089	0.0077	0.0004	0.0010	(0.0001)	0.0209	0.0008	0.00016	0.046	0.0307	0.0015 O
<b>BS 200-2</b>	"	"	0.050	0.060	0.244	0.0020	0.0068	0.0094	0.0005	99.31	0.0041	0.0031	0.104	0.053	0.0009	0.0006	(0.0002)	0.0197	0.0014	(0.0003)	0.115	0.0368	0.0025 O
<b>BS 200-3</b>	"	"	0.0145	0.0110	0.157	0.0015	0.0032	0.0091	0.0004	99.4	0.0068	0.0037	0.103	0.108	0.0004	0.0008	0.0003	0.0235	0.0009	(0.0004)	0.138	0.0240	0.0026 O
<b>BS 200-4</b>	"	"	0.107	0.101	0.310	0.0023	0.0076	0.132	0.0013	98.9	0.0057	0.0037	0.0911	0.0482	0.0010	0.00087	0.00020	0.0191	0.0024	0.00095	0.297	0.0312	0.0015 O
<b>BS 600-2</b>	Nickel 600 Alloy	38 dia. x 20	0.071	0.23	0.31	0.006	0.004	16.36	0.007	75.34	0.16	0.0098	0.10	0.089	(0.02)	(<0.002)	(0.002)	0.37	0.028	...	6.80	0.012	0.030 N
<b>BS 600-3</b>	"	"	0.020	0.19	0.28	0.008	0.005	14.77	0.007	75.05	0.09	0.0082	0.10	0.24	(0.02)	(0.001)	(0.002)	0.20	0.020	...	8.88	0.012	0.0081 N
<b>BS 600-4</b>	"	"	0.034	0.22	0.20	0.007	0.004	14.72	(0.002)	75.88	0.06	0.0060	0.09	0.08	(0.015)	(<0.001)	(0.002)	0.20	0.023	...	8.40	0.020	0.021 N
<b>BS 600-5</b>	"	38 dia. x 19	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
<b>BS 600-6</b>	"	"	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	0.022	0.0078 N 0.0012 O
<b>BS 625E</b>	"	"	0.049	0.065	0.050	0.004	0.0005	22.44	8.77	60.7	0.214	0.0022	0.031	0.024	3.56	(0.00005)	(0.0006)	0.27	0.020	0.016	3.81	0.0021	(0.003) As 0.0074 N 0.0015 O
<b>BS 800A</b>	Cr/Fe Nickel Alloy	38 dia. x 19	0.075	0.361	0.883	0.013	(0.0007)	21.09	0.117	33.3	0.362	0.0018	0.069	0.244	0.021	(0.001)	0.0041	0.526	0.058	(0.030)	42.7	0.0022	0.0126 N 0.0014 O
<b>BS 197A</b>	Ra 333 Alloy	38 dia. x 19	0.050	0.96	1.56	0.021	(<0.001)	25.11	2.99	44.44	0.185	0.0019	3.06	0.119	0.20	(0.0002)	...	0.017	0.051	2.80	18.07	(0.0030)	(0.052) N
<b>BS 718D</b>	In 718 Alloy	"	0.037	0.072	0.100	0.0083	0.0004	18.32	3.00	52.5	0.631	0.0041	0.368	0.071	5.16	(0.00006)	0.0020	0.93	0.038	0.049	18.51	0.0038	0.0011 As 0.0084 N 0.0015 O
<b>BS 825F</b>	Nickel Alloy 825	"	0.012	0.59	0.521	0.018	(0.005)	23.2	3.19	38.9	0.081	0.0023	0.064	1.78	(0.02)	(0.0008)	0.0036	0.91	0.086	0.015	30.7	0.0013	0.0085 N 0.0009 O
<b>BS 400D</b>	Monel Alloy	"	0.130	0.146	0.993	(0.0010)	0.0006	0.0057	0.0024	63.4	0.0231	0.0009	0.032	33.0	(0.0001)	0.0004	0.00012	0.064	(0.0002)	0.0004	2.00	0.0217	0.00017 N 0.0008 O 0.0003 Zr
<b>BS 400-1</b>	"	38 dia. x ~18	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	0.007	(0.001)	...	1.27	0.048	0.004 As
<b>BS 400-2</b>	"	"	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
<b>BS 400-3</b>	"	"	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
<b>BS 500E</b>	"	38 dia. x 19	0.134	0.148	0.605	0.0022	0.0006	0.0174	0.0044	64.7	2.94	0.0017	0.017	29.9	(0.002)	(0.0008)	(0.0008)	0.607	(0.001)	(0.002)	0.722	0.0058	0.0005 O 0.0133 Zr
<b>BS H1C</b>	Hastelloy (B-2)	"	0.0022	(0.01)	0.51	0.0049	(0.0004)	0.70	27.2	69.8	0.15	(0.001)	(0.01)	(0.002)	(0.009)	(0.00002)	(0.002)	(0.008)	(0.02)	(0.009)	1.29	(0.0012)	(0.001) As (0.009) Ta
<b>BS H2E</b>	" (C-276)	32 dia. x 19	0.0030	0.030	0.55	0.005	0.00045	15.85	15.98	58.3	0.35	0.0028	0.032	0.0070	(0.009)	(0.002)	(0.001)	0.007	0.15	3.28	5.41	0.0019	0.0119 N 0.0005 O
<b>BS H3C</b>	" (x)	38 dia. x 19	0.087	0.36	0.492	0.0150	(0.0003)	21.50	8.82	46.6	0.149	0.0020	1.37	0.106	0.095	...	0.0019	(0.0064)	0.047	0.623	19.54	0.0020	0.0266 N 0.0013 O
<b>BS H6B</b>	" (C-22)	"	(0.008)	(0.035)	0.226	0.0054	0.0005	22.3	14.05	55.9	0.23	0.0016	0.079	0.035	(0.1)	...	(0.0007)	0.050	0.0063	3.20	3.45	0.0010	0.0118 N 0.0007 O

**BS 200A to 200-4 also certified for As and Ca, plus some for N, Sb and Ta**

## BRAMMER STANDARD COMPANY, Inc. (BS), USA

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

### Copper Base Alloy Reference Materials (38-41mm dia. x 12-19mm 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 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)	(0.0006)	(0.001)	...
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	(0.0015)	<0.002	...
BS 510B (Wrought)	95.0	0.0112	4.6	0.251	0.0004	(0.006)	0.009	0.0211	0.074	0.0010	(0.003)	(0.002)	0.0010	0.007	(0.0001) N, 0.0009 O
BS 544B (Wrought)	88.2	3.9	4.06	3.51	(0.0009)	(0.0009)	0.087	0.068	0.0258	0.0043	0.0042	0.0244	0.0031	0.0249	0.0173 Ag, 0.0005 O
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 630C (Wrought)	80.7	0.0093	0.0152	0.234	0.325	9.90	3.82	4.82	0.0043	0.0007	0.064	0.0003	0.0060	(<0.0005)	0.0019 Co, 0.0030 Cr 0.0011 Mg
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)	(0.0003)	...
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 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 903E (Cast)	87.0	0.100	8.63	4.11	...	(0.001)	0.0072	0.293	0.056	(0.002)	(0.0018)	0.010	(0.002)	0.0092	(0.007) O
BS 905A-1 (Cast)	87.3	0.030	10.25	2.27	(<0.0003)	(<0.003)	0.015	0.018	0.055	(0.001)	(<0.004)	0.004	...	...	(0.002) Ag
BS 932F (Cast)	82.1	7.32	6.30	3.39	(0.0002)	(0.0008)	0.057	0.388	0.0105	0.0091	0.0011	0.199	(0.0053)	0.0368	(0.0003) N, 0.0025 O
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)	0.003 Ag
BS 955C (Cast)	80.6	0.003	0.003	0.15	0.06	10.68	4.04	4.31	0.012	(<0.002)	0.025	(<0.002)	...	...	0.014 Ag

### Cobalt Base Reference Materials (38mm dia. X 19mm discs)

BRAMMER No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	B	Co	Cu	N	Nb	Ti	V	W	Fe	O	La
BS 171B	L605	0.087	0.29	1.90	0.008	<0.001	20.5	0.65	10.68	0.08	(0.0025)	Bal.	0.035	...	0.046	...	(0.02)	15.1	1.82	...	...
BS 171C	Stellite 25	0.119	(0.1)	1.47	(0.008)	(0.0008)	20.3	(0.08)	10.1	(0.04)	(0.004)	51.2	(0.02)	0.0045	(0.006)	(0.07)	(0.009)	15.3	1.07	(0.002)	(0.030)
BS 171D	Stellite 25	0.120	(0.1)	1.47	(0.01)	(0.0009)	20.2	(0.08)	10.1	(0.05)	(0.004)	51.2	(0.02)	0.0046	(0.006)	(0.05)	(0.01)	15.3	1.07	(0.0008)	(0.02)
BS 172B	Stellite 188	0.055	0.33	0.97	(0.008)	(0.0009)	22.8	0.28	22.5	0.21	(0.004)	34.8	(0.02)	0.033	0.042	0.079	0.0081	15.2	2.46	0.0011	0.059

# 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
<b>BH-1</b>	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>	<b>0.422</b>
<b>CD-1</b>	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>	<b>0.66</b>	<i>0.6</i>	<i>0.21</i>	...	<i>0.02</i>	<i>&lt;0.01</i>	...	...
<b>CT-1</b>	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>	<b>1.04</b>
<b>HV-2a</b>	Copper-Molybdenum Ore	<b>31.34</b>	<b>7.96</b>	<b>0.344</b>	<b>2.044</b>	<b>2.31</b>	<b>2.335</b>	<b>1.891</b>	<b>0.00121</b>	<b>0.329</b>	<i>(0.4)</i>	<i>(0.2)</i>	<b>0.00069</b>	<b>0.3808</b>	<b>0.0000128</b>	<i>0.000789</i>
<b>MP-1b</b>	Zinc-Tin-Copper-Lead Ore	<b>16.79</b>	<i>3.46</i>	<b>13.79</b>	<b>8.19</b>	<i>(0.2)</i>	...	<b>2.47</b>	<b>2.30</b>	<b>0.024</b>	<i>(0.028)</i>	<b>0.0527</b>	<b>2.091</b>	<b>3.069</b>	<i>0.075</i>	<i>(0.11)</i>
<b>MP-2a</b>	Tungsten-Molybdenum Ore	<b>31.2</b>	<b>5.99</b>	<b>0.716</b>	<b>5.00</b>	<i>1.226</i>	<i>(0.03)</i>	<b>3.22</b>	<i>0.558</i>	<b>0.0923</b>	...	<b>0.00145</b>	<b>0.277</b>	<b>0.0459</b>	<b>0.0268</b>	<b>0.338</b>
<b>OKA-1</b>	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>	...	...	...	...	...	...
<b>TAN-1</b>	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>	...	...	...	...	...	...
<b>TLG-1</b>	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>	<b>0.083</b>

## (Continued from above)

CANMET No.	Bi	Cr	Mn	Mo	P	Zn	Zr	Sr	In	Nb	Ta	Sn	Sb	Ag	H <sub>2</sub> O (105°C)	LOI
<b>BH-1</b> (continued)	...	...	<i>0.2</i>	<i>0.02</i>	...	...	...	...	...	...	...	...	...	...	...	...
<b>CD-1</b> (continued)	...	...	...	...	...	...	...	...	...	...	...	...	<b>3.57</b>	...	<i>0.2</i>	<b>4.0</b>
<b>CT-1</b> (continued)	...	...	<i>0.7</i>	<i>0.03</i>	...	...	...	...	...	...	...	...	...	...	...	...
<b>HV-2a</b> (continued)	<b>0.000158</b>	<b>0.0100</b>	<b>0.0545</b>	<b>0.01254</b>	<b>0.0427</b>	<b>0.00565</b>	<i>0.00658</i>	<b>0.00123</b>	...	<i>(0.0002)</i>	<i>(0.00002)</i>	<i>(0.00012)</i>	<b>0.000689</b>	<b>0.0001448</b>	<i>(0.3)</i>	<i>3.01</i>
<b>MP-1b</b> (continued)	<b>0.0954</b>	...	<i>(0.048)</i>	<b>0.0285</b>	<i>(0.02)</i>	<b>16.67</b>	...	...	<i>0.056</i>	...	...	<b>1.61</b>	<i>0.0054</i>	<b>0.00470</b>	...	...
<b>MP-2a</b> (continued)	<b>0.0989</b>	<b>0.0150</b>	<b>0.1018</b>	<b>0.1586</b>	...	<b>0.566</b>	<b>0.0134</b>	<b>0.00123</b>	<i>0.001209</i>	<b>0.0097</b>	<b>0.0016</b>	<b>0.0537</b>	<i>0.00078</i>	<b>0.000482</b>	...	<i>(4)</i>
<b>OKA-1</b> (continued)	...	...	<i>1.1</i>	...	<i>1.1</i>	<i>0.05</i>	...	<i>1.0</i>	...	<b>0.37</b>	...	...	...	...	...	<i>31.9</i>
<b>TAN-1</b> (continued)	...	...	<i>0.02</i>	...	...	...	...	...	...	<i>0.02</i>	<b>0.236</b>	<i>0.01</i>	...	...	...	...
<b>TLG-1</b> (continued)	...	...	<i>1.3</i>	<i>&lt;0.01</i>	...	...	...	...	...	...	...	...	...	...	<i>1.6</i>	...

**HV-2a** also certified for Ba: **869** µg/g, Ce: **19.1** µg/g, Co: **3.40** µg/g, Cs: **2.70** µg/g, Dy: **1.126** µg/g, Er: **0.646** µg/g, Gd: **1.40** µg/g, La: **9.1** µg/g, Nd: **8.77** µg/g, Ni: **6.47** µg/g, Rb: **48.3** µg/g, Sm: **1.69** µg/g, Th: **1.28** µg/g and U: **1.08** µg/g.

**MP-2a** also certified for Ba: **12.3** µg/g, Ce: **357** µg/g, Co: **5.50** µg/g, Cs: **5.78** µg/g, Dy: **32.5** µg/g, Gd: **24.8** µg/g, Hf: **9.40** µg/g, La: **157** µg/g, Li: **81** µg/g, Lu: **4.36** µg/g, Nd: **117.9** µg/g, Rb: **229** µg/g, Sc: **4.87** µg/g, Sm: **26.7** µg/g,

Tb: **4.82** µg/g, Th: **61.3** µg/g, Tm: **4.10** µg/g, U: **37** µg/g and Yb: **28.8** µg/g.

## Noble Metal Ore, Concentrate and Matte Certified Reference Materials

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

CANMET No.	Description	Si	SiO <sub>2</sub>	Fe	Al	Ca	K	Na	S	Mg	Ni	Cu	Co	Pb	Ag	As	Pd	Pt	Au	Rh	C	Zn	H <sub>2</sub> O	LOI	
<b>CH-4</b>	Gold Ore	...	<b>62.75</b>	<b>5.32</b>	<b>7.73</b>	<b>1.96</b>	<b>1.80</b>	<b>3.18</b>	<b>0.65</b>	<b>1.40</b>	<i>0.0051</i>	<b>0.20</b>	<b>0.0026</b>	<i>(0.0014)</i>	<b>0.00021</b>	<b>0.00082</b>	...	...	<b>0.000088</b>	...	<i>0.12</i>	<b>0.020</b>	...	<i>(0.9)</i>	
<b>DS-1</b>	Gold Ore	<i>25.68</i>	...	<i>(3.0)</i>	<b>4.48</b>	<i>6.248</i>	<i>1.1</i>	...	<i>2.85</i>	<b>2.76</b>	<b>0.00487</b>	<b>0.00271</b>	<b>0.00095</b>	<b>0.00138</b>	<b>0.000047</b>	<b>0.6960</b>	...	...	<b>0.003259</b>	...	...	<b>0.0206</b>	...	<i>13</i>	
<b>GTS-2a</b>	Gold Ore Mill Tailings	<b>23.65</b>	...	<b>7.56</b>	<b>6.96</b>	<b>4.01</b>	<b>2.021</b>	<b>0.617</b>	<b>0.348</b>	<b>2.412</b>	<b>0.00771</b>	<b>0.00886</b>	<b>0.00221</b>	<i>0.00179</i>	<i>(0.000064)</i>	<b>0.0124</b>	<i>(0.002)</i>	...	<b>0.0000272</b>	...	<b>2.011</b>	<b>0.0208</b>	...	<i>9.87</i>	
<b>MA-1b</b>	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>	...	...	...	<b>0.00170</b>	...	<i>2.44</i>	...	<i>0.1</i>	<i>7.9</i>	
<b>MA-2c</b>	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>	...	...	<b>0.000302</b>	...	<i>1.78</i>	<i>0.0093</i>	...	<i>7.55</i>	
<b>MA-3a</b>	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>	...	...	<b>0.000856</b>	...	<i>2.5</i>	<i>0.008</i>	...	<i>10</i>	
<b>PTA-1</b>	Platiniferous Black Sand	...	<i>3.6</i>	<i>63.0</i>	<i>2.9</i>	<i>1.2</i>	...	...	...	<i>0.6</i>	...	...	...	...	...	...	...	<b>0.000305</b>	...	...	...	...	...	...	
<b>PTC-1b</b>	Nickel-Copper Sulphide	<b>2.468</b>	...	<b>36.78</b>	<i>0.752</i>	<i>0.571</i>	<i>0.15</i>	<i>(0.17)</i>	<b>29.95</b>	<b>0.441</b>	<b>11.256</b>	<b>7.919</b>	<b>0.3253</b>	<b>0.0795</b>	<b>0.00531</b>	<b>0.0222</b>	<b>0.000946</b>	<b>0.000647</b>	<b>0.000199</b>	<i>(0.00005)</i>	...	<b>0.2083</b>	<b>0.81</b>	<i>13.44</i>	
<b>SU-1b</b>	Nickel Copper Cobalt Ore	<b>15.23</b>	...	<b>25.54</b>	<b>4.30</b>	<b>2.21</b>	<i>(0.6)</i>	<i>(1.6)</i>	<b>14.14</b>	<b>1.790</b>	<b>1.953</b>	<b>1.185</b>	<b>0.0672</b>	<b>0.0058</b>	<b>0.00639</b>	<b>0.000249</b>	<b>0.0000791</b>	<b>0.0000491</b>	<i>(0.00002)</i>	...	<i>0.04</i>	<b>0.0235</b>	<i>(0.6)</i>	<i>(8)</i>	
<b>UMT-1</b>	Ultramafic Ore Tailings	...	...	...	...	...	...	...	...	...	<i>0.1396</i>	<i>0.0743</i>	<i>0.0077</i>	...	...	...	...	<b>0.0000106</b>	<b>0.0000129</b>	<b>0.0000048</b>	<b>0.0000001</b>	...	...	...	...

**DS-1** also certified for Ba: **0.0221**%, Hg: **0.0082**%, Mn: **0.0437**%, P: **0.034**% and Tl: **0.0020**%. **GTS-2a** also certified for Ba: **0.0186**%, Mn: **0.1510**%, P: **0.0892**%, Sr: **98.2** µg/g and Th: **1.244** µg/g. **SU-1b** is also certified for Mn: **0.0703**% and has provisional constituent values for Bi, Se and V. **UMT-1** also has provisional constituent values for Ir and Ru.

## 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, CCU-1 and CZN-4 – units of 200g; CPB-3 – units of 100g)

CANMET No.	Description	SiO <sub>2</sub>	Al	Mg	Ca	Cu	Zn	Pb	Ag	Hg	Au	S	Fe	Sb
<b>CCU-1e</b>	Copper Concentrate	<b>3.134</b>	<b>0.1385</b>	<b>0.706</b>	<b>0.129</b>	<b>23.07</b>	<b>3.02</b>	<b>0.703</b>	<b>0.02052</b>	<b>0.00104</b>	<b>0.002027</b>	<b>35.28</b>	<b>30.7</b>	<b>0.0104</b>
<b>CPB-3</b>	Lead Concentrate	<b>2.62</b>	<b>0.203</b>	<b>0.1062</b>	<b>0.059</b>	<b>0.240</b>	<b>5.96</b>	<b>58.53</b>	<b>0.2790</b>	<b>0.00408</b>	<i>0.0000119</i>	<i>17.03</i>	<b>8.45</b>	<b>0.580</b>
<b>CZN-4</b>	Zinc Concentrate	<b>0.295 Si</b>	<b>0.0715</b>	<i>0.0352</i>	<i>0.0419</i>	<b>0.403</b>	<b>55.24</b>	<b>0.1861</b>	<b>0.00514</b>	<b>0.000454</b>	<i>(0.000004)</i>	<b>33.07</b>	<i>9.086</i>	<i>(0.001)</i>

CANMET No.	As	Bi	C	Cd	Co	Cr	Mn	Mo	Ni	Se	Te	Tl	H <sub>2</sub> O	LOI
<b>CCU-1e</b> (continued)	<b>0.101</b>	<i>(0.0003)</i>	<b>0.100</b>	<b>0.00742</b>	<b>0.0301</b>	...	<b>0.0096</b>	<b>0.00181</b>	...	<b>0.0244</b>	<b>0.00618</b>	<b>0.000269</b>	<i>0.150</i>	<i>17.14</i>
<b>CPB-3</b> (continued)	<i>0.0391</i>	...	<i>1.037</i>	<b>0.0652</b>	<b>0.00136</b>	<b>0.0102</b>	<i>0.421</i>	...	<b>0.00168</b>	...	...	...	<i>(0.15)</i>	...
<b>CZN-4</b> (continued)	<b>0.0356</b>	<i>(0.0010)</i>	<i>(0.09)</i>	<b>0.2604</b>	<b>0.00935</b>	...	<i>(0.009)</i>	...	...	<b>0.00867</b>	...	...	<i>0.149</i>	...

### Sulphide Ore Mill Tailings and Concentrate/Tailings Certified Reference Materials (Finely divided material – RTS-3a and RTS-5 in units of 100g, TPO-1 in units of 25g)

CANMET No.	Description	Al	As	Ca	Co	Cu	Fe	Mg	Ni	Pb	Si	SiO <sub>2</sub>	S (Sulphate)	S (Total)	Zn
<b>RTS-3a</b>	Sulphide Ore Mill Tailings	<b>5.12</b>	<b>0.00182</b>	<b>2.14</b>	<b>0.0143</b>	<b>0.2353</b>	<b>20.49</b>	<b>2.483</b>	<b>0.00613</b>	<b>0.0209</b>	<b>18.28</b>	...	<i>(1.1)</i>	<b>9.59</b>	<b>0.2890</b>
<b>RTS-5</b>	Nickel-Copper-Gold Tailings	<b>6.25</b>	<b>0.1286</b>	<b>3.86</b>	<b>0.00769</b>	<b>0.0647</b>	<b>11.9</b>	<b>3.59</b>	<b>0.1104</b>	<b>0.00663</b>	<b>19.20</b>	...	<i>1.23</i>	<b>1.924</b>	<b>0.0105</b>
<b>TPO-1</b>	Iron Sulphide Conc./Tailings	<i>3.51</i>	...	<i>2.17</i>	<b>0.021</b>	<b>0.118</b>	<b>34.85</b>	<i>1.66</i>	<b>0.617</b>	...	...	<b>25.52</b>	...	<b>18.03</b>	<i>0.02</i>

CANMET No.	Ag	Au	Ba	Bi	C	Cd	CO <sub>2</sub>	Cr	H <sub>2</sub> O	K	Mn
<b>RTS-3a</b> (continued)	<b>0.00111</b>	<i>0.0000561</i>	<b>0.0106</b>	<b>0.00313</b>	<i>(0.04)</i>	<b>0.00092</b>	<i>(0.04)</i>	<i>0.0176</i>	...	<b>0.460</b>	<b>0.1585</b>
<b>RTS-5</b> (continued)	<b>0.000150</b>	<b>0.0000408</b>	<b>0.0252</b>	<i>0.000205</i>	<i>1.617</i>	...	...	<b>0.0261</b>	<i>(1.4)</i>	<b>0.850</b>	<b>0.1092</b>
<b>TPO-1</b> (continued)	...	...	...	...	...	...	...	<i>0.03</i>	...	<i>0.56</i>	<i>0.08</i>

CANMET No.	Na	Pd	Pt	P	Se	Sr	S (Elemental)	S (Sulphide)	Ti	Zr	LOI
<b>RTS-3a</b> (continued)	<b>0.684</b>	<i>(0.0000004)</i>	...	<i>0.0446</i>	<i>0.00448</i>	<b>0.00447</b>	<i>(1.2)</i>	<i>(8)</i>	<i>0.351</i>	<i>0.0078</i>	<i>(10.6)</i>
<b>RTS-5</b> (continued)	<b>1.285</b>	<i>(0.000014)</i>	<i>(0.00002)</i>	<b>0.0369</b>	<i>0.000803</i>	<b>0.01306</b>	<i>(0.3)</i>	...	<b>0.3132</b>	<i>(0.0075)</i>	<i>9.90</i>
<b>TPO-1</b> (continued)	<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)** - Figures in bold type certified, figures in small italic type only approximate and figures in brackets for information only.

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

CANMET No.	Description	Mass content	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	MnO	TiO <sub>2</sub>	P <sub>2</sub> O <sub>5</sub>	S	LOI (500°C)	LOI (1000°C)
<b>TILL-2</b>	Till	%	<i>60.8</i>	<i>16.0</i>	<i>5.39</i>	<i>1.83</i>	<i>1.27</i>	<i>2.19</i>	<i>3.07</i>	<i>0.10</i>	<i>0.88</i>	<i>0.17</i>	<i>&lt;0.05</i>	<i>6.8</i>	<i>8.1</i>
<b>TILL-3</b>	Soil	%	<i>69.1</i>	<i>12.2</i>	<i>3.92</i>	<i>1.71</i>	<i>2.63</i>	<i>2.64</i>	<i>2.42</i>	<i>0.06</i>	<i>0.49</i>	<i>0.11</i>	<i>&lt;0.05</i>	<i>3.6</i>	<i>4.6</i>

CANMET No.	Mass content	As	Au	Ba	Be	Bi	Br	Ce	Co	Cr	Cs	Cu	Eu	Er	Hf	La	Li	Lu	Mn	Mo	Nb
<b>TILL-2</b> (continued)	µg/g	<i>26</i>	<i>0.002</i>	<i>540</i>	<i>4.0</i>	<i>&lt;5</i>	<i>12.2</i>	<i>98</i>	<i>15</i>	<i>74</i>	<i>12</i>	<i>150</i>	<i>1.0</i>	<i>3.7</i>	<i>11</i>	<i>44</i>	<i>47</i>	<i>0.6</i>	<i>780</i>	<i>14</i>	<i>20</i>
<b>TILL-3</b> (continued)	µg/g	<i>87</i>	<i>0.006</i>	<i>489</i>	<i>2.0</i>	<i>&lt;5</i>	<i>4.5</i>	<i>42</i>	<i>15</i>	<i>123</i>	<i>1.7</i>	<i>22</i>	<i>&lt;1</i>	<i>1.4</i>	<i>8</i>	<i>21</i>	<i>21</i>	<i>0.2</i>	<i>520</i>	<i>2</i>	<i>7</i>

CANMET No.	Mass content	Nd	Ni	P	Pb	Rb	Sb	Sc	Sm	Sr	Ta	Tb	Th	Ti	U	V	W	Y	Yb	Zn	Zr
<b>TILL-2</b> (continued)	µg/g	<i>36</i>	<i>32</i>	<i>750</i>	<i>31</i>	<i>143</i>	<i>0.8</i>	<i>12</i>	<i>7.4</i>	<i>144</i>	<i>1.9</i>	<i>1.2</i>	<i>18.4</i>	<i>5300</i>	<i>5.7</i>	<i>77</i>	<i>5</i>	<i>40</i>	<i>3.7</i>	<i>130</i>	<i>390</i>
<b>TILL-3</b> (continued)	µg/g	<i>16</i>	<i>39</i>	<i>490</i>	<i>26</i>	<i>55</i>	<i>0.9</i>	<i>10</i>	<i>3.3</i>	<i>300</i>	<i>&lt;0.5</i>	<i>&lt;0.5</i>	<i>4.6</i>	<i>2910</i>	<i>2.1</i>	<i>62</i>	<i>&lt;1</i>	<i>17</i>	<i>1.5</i>	<i>56</i>	<i>230</i>

Information is also given on the certificate of analysis re several partial extraction elements using HNO<sub>3</sub>/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 <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Fe	TiO <sub>2</sub>	CaO	MgO	K <sub>2</sub> O	Na <sub>2</sub> O	MnO	P <sub>2</sub> O <sub>5</sub>	Cu	Cr <sub>(total)</sub>	Ni	S	LOI
<b>TDB-1</b>	Diabase Rock	<i>50.2</i>	<i>13.6</i>	<i>14.4</i>	<b>10.4</b>	<i>2.3</i>	<i>9.6</i>	<i>5.9</i>	<i>0.89</i>	<i>2.2</i>	<i>0.20</i>	<i>0.23</i>	<b>0.0323</b>	<b>0.0251</b>	<b>0.0092</b>	<i>0.03</i>	<i>0.3</i>
<b>WGB-1</b>	Gabbro Rock	<i>49.1</i>	<i>11.15</i>	<b>6.71</b>	...	<i>0.84</i>	<i>15.78</i>	<b>9.40</b>	<b>0.94</b>	<i>2.15</i>	<i>0.143</i>	<i>0.099</i>	<i>0.0106</i>	<b>0.0291</b>	<i>0.0076</i>	<i>0.02</i>	<i>4</i>
<b>WMG-1a</b>	Mineralized Gabbro	<b>18.27 Si</b>	<b>4.75 Al</b>	...	<b>12.71</b>	<b>0.419 Ti</b>	<b>10.06 Ca</b>	<b>7.41 Mg</b>	<b>0.1021 K</b>	<b>0.1119 Na</b>	<i>0.1141 Mn</i>	<b>0.0731 P</b>	<b>0.7120</b>	<b>0.0804</b>	<b>0.2480</b>	<b>3.43</b>	<i>4.31</i>
<b>WMS-1a</b>	Massive Sulphide	<i>(4.7) Si</i>	<b>1.350 Al</b>	...	<b>45.4</b>	<i>0.084 Ti</i>	<b>3.09 Ca</b>	<i>0.331 Mg</i>	<b>0.0991 K</b>	<b>0.0329 Na</b>	<i>0.060 Mn</i>	<i>(0.018) P</i>	<b>1.396</b>	<i>0.0068</i>	<b>3.02</b>	<b>28.17</b>	...
<b>WPR-1a</b>	Altered Peridotite	<b>17.62 Si</b>	<b>2.621 Al</b>	...	<b>11.34</b>	<b>0.3527 Ti</b>	<b>2.528 Ca</b>	<i>15.22 Mg</i>	<b>0.156 K</b>	<i>0.050 Na</i>	<b>0.138 Mn</b>	<b>0.0303 P</b>	<b>0.299</b>	<i>0.322</i>	<b>0.439</b>	<b>1.764</b>	<i>8.42</i>

Nominal mass content in ng/g

CANMET No.	As	Au	Pt	Pd	Rh	Ru	Ir	Os	Ba	Ce	Ag	Co	Sb	Th	V	Zn
<b>TDB-1</b> (continued)	...	<b>6.3</b>	<b>5.8</b>	<b>22.4</b>	<i>0.7</i>	<i>0.3</i>	<i>0.15</i>	...	<b>241000</b>	<b>41000</b>	<i>(500)</i>	<i>47000</i>	<i>1000</i>	<b>2700</b>	<i>471000</i>	<b>155000</b>
<b>WGB-1</b> (continued)	...	<b>2.9</b>	<b>6.1</b>	<b>13.9</b>	<i>0.32</i>	<i>0.3</i>	<i>0.33</i>	...	<i>851000</i>	<i>(&lt;20000)</i>	<i>(&lt;1000)</i>	<i>29800</i>	<i>2000</i>	<i>(&lt;1600)</i>	<i>222000</i>	<i>31500</i>
<b>WMG-1a</b> (continued)	<b>5990</b>	<i>617</i>	<b>899</b>	<b>484</b>	<i>(15)</i>	<i>(20)</i>	<i>(27)</i>	...	<b>216</b>	<i>17180</i>	<b>3030</b>	<b>191</b>	<i>1550</i>	<b>1070</b>	<b>158000</b>	<b>112</b>
<b>WMS-1a</b> (continued)	<b>30900</b>	<b>300</b>	<b>1910</b>	<b>1450</b>	<b>222</b>	<i>145</i>	<i>322</i>	<i>(150)</i>	<i>(70000)</i>	<i>(7900)</i>	<i>3700</i>	<i>1450000</i>	<i>6920</i>	<i>(1200)</i>	<i>140000</i>	<i>130000</i>
<b>WPR-1a</b> (continued)	<b>9300</b>	<i>50</i>	<b>452</b>	<b>614</b>	...	...	<i>20</i>	...	<b>70600</b>	<b>9690</b>	<b>1020</b>	<b>213000</b>	<b>3130</b>	<i>640</i>	<b>135000</b>	<b>160000</b>

**WPR-1a** also certified for Bi, Cd, Cs, Dy, Er, Eu, Ga, Gd, Hf, Ho, La, Li, Lu, Nd, Pb, Pd, Rb, Sc, Sm, Sr, Tb, Tm, Y and Yb.

## CANADA CENTRE FOR ENERGY AND MINERAL 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.**

### Rare Earth Elements with Zirconium and Niobium Certified Reference Materials (Finely divided material – units of 100g)

CANMET No.	Description	Al	As	Ba	Be	Ca	Ce	Co	Cr	Cs	Cu	Dy	Er	Eu	Fe	Gd	Hf
REE-1	Rare Earth Elements	<b>3.59</b>	<b>0.0124</b>	<b>0.01001</b>	<i>0.0590</i>	<b>2.30</b>	<b>0.3960</b>	<b>0.000158</b>	<b>0.0277</b>	<b>0.000107</b>	<b>0.00797</b>	<b>0.0847</b>	<b>0.0701</b>	<b>0.00235</b>	<i>4.16</i>	<b>0.0433</b>	<b>0.0479</b>
REE-2	Rare Earth Elements	<b>0.761</b>	...	<b>5.02</b>	<i>0.00331</i>	<b>13.68</b>	<b>0.9610</b>	<b>0.000771</b>	<i>0.00327</i>	<i>(0.000009)</i>	<b>0.000555</b>	<b>0.00692</b>	<b>0.00140</b>	<b>0.00966</b>	<b>12.14</b>	<i>0.0219</i>	<i>0.000095</i>
REE-3	Rare Earth Elements	<b>4.372</b>	...	<b>0.00691</b>	<b>0.00823</b>	<b>1.644</b>	<b>0.4540</b>	<i>0.000092</i>	<b>0.0082</b>	<b>0.0001118</b>	<b>0.00163</b>	<b>0.03303</b>	<b>0.01872</b>	<b>0.002085</b>	<b>8.28</b>	<b>0.0346</b>	<b>0.0448</b>

CANMET No.	Ho	K	La	La (Total)	Li	Lu	Mg (Total)	Mn (Total)	Mo	Na	Nb	Nd	Ni	P	Pb	Pr	Rb	S(Total)
REE-1 (continued)	<b>0.0208</b>	<b>3.09</b>	<b>0.1661</b>	...	<i>0.0205</i>	<i>0.00924</i>	<i>0.895</i>	<i>0.155</i>	<b>0.00366</b>	<b>1.445</b>	<b>0.4050</b>	<b>0.1456</b>	<b>0.00247</b>	<b>0.0261</b>	<b>0.1137</b>	<b>0.0435</b>	<b>0.1047</b>	<i>(0.03)</i>
REE-2 (continued)	<b>0.000787</b>	<i>0.0172</i>	<i>(0.46)</i>	<b>0.5130</b>	<b>0.000961</b>	<i>0.000092</i>	<b>6.26</b>	<b>1.316</b>	<i>0.0154</i>	<i>0.120</i>	<i>0.1060</i>	<b>0.3660</b>	<i>0.000899</i>	<b>0.461</b>	<i>0.00408</i>	<b>0.1075</b>	<b>0.000122</b>	<b>1.745</b>
REE-3 (continued)	<b>0.00650</b>	<b>3.76</b>	<b>0.2121</b>	...	<i>(0.0060)</i>	<b>0.2153</b>	<b>0.0594</b>	<i>0.313</i>	<b>0.00597</b>	<i>2.328</i>	<b>0.1073</b>	<b>0.2083</b>	<b>0.001083</b>	<b>0.0201</b>	<b>0.0534</b>	<b>0.0550</b>	<b>0.0887</b>	<i>(0.04)</i>

CANMET No.	Sc	Si	Si (Total)	Sm	Sn	Sr	Ta	Tb	Th	Ti	Tm	U	W	Y	Yb	Zn	Zr	L.O.I
REE-1 (continued)	<i>(0.0008)</i>	<b>31.36</b>	...	<b>0.0381</b>	<b>0.0498</b>	<b>0.0129</b>	<i>0.0231</i>	<b>0.01062</b>	<b>0.0719</b>	<i>0.384</i>	<b>0.01060</b>	<b>0.0137</b>	<i>(0.001)</i>	<b>0.548</b>	<b>0.0678</b>	<i>0.187</i>	<b>1.91</b>	<i>(2)</i>
REE-2 (continued)	<b>0.00575</b>	...	<b>1.377</b>	<b>0.0410</b>	<b>0.00241</b>	<b>0.2300</b>	<b>0.000117</b>	<b>0.00203</b>	<b>0.0737</b>	<b>0.1969</b>	<b>0.0001383</b>	<b>0.000373</b>	<b>0.00099</b>	<b>0.0176</b>	<i>0.00072</i>	<i>0.042</i>	<i>0.00322</i>	<b>31.38</b>
REE-3 (continued)	<i>(0.0003)</i>	<b>29.66</b>	...	<b>0.0398</b>	<b>0.01211</b>	<b>0.01337</b>	<b>0.00607</b>	<b>0.00552</b>	<b>0.01355</b>	<b>0.3202</b>	<b>0.002580</b>	<i>0.00299</i>	<i>(0.0001)</i>	<b>0.1725</b>	<b>0.01594</b>	<b>0.1499</b>	<b>1.866</b>	<b>0.346</b>

### Copper Anode Certified Reference Material (finely divided material – units of 425g)

CANMET No.	Description	Ag	As	Au	Bi	Cu	Fe	Ni	Pb	Sb	Se	Sn	Te	Zn
CUAR-1	Copper Anode	<b>0.0294</b>	<b>0.0145</b>	<b>0.00023</b>	<i>0.0083</i>	<i>(98.6)</i>	<b>0.0076</b>	<i>0.4109</i>	<b>0.0864</b>	<i>0.0798</i>	<i>0.0026</i>	<b>0.0113</b>	<b>0.0033</b>	<i>(0.0032)</i>

### 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	<b>28.70</b>	<b>1.51</b>	<b>0.020</b>	<b>0.046</b>	<b>0.0069</b>	<b>0.0030</b>	<b>0.00098</b>
NZA-2	Zinc-Aluminium Foundry Alloy	<b>23.81</b>	<b>3.00</b>	<b>0.029</b>	<b>0.021</b>	<b>0.0045</b>	<b>0.0076</b>	<b>0.0047</b>
NZA-3	Zinc-Aluminium Foundry Alloy	<b>25.99</b>	<b>2.00</b>	<b>0.0049</b>	<b>0.066</b>	<b>0.0034</b>	<b>0.0045</b>	<b>0.0064</b>
NZA-4	Zinc-Aluminium Foundry Alloy	<b>26.65</b>	<b>2.45</b>	<b>0.0106</b>	<b>0.027</b>	<b>0.0087</b>	<b>0.0101</b>	<b>0.0029</b>
NZA-5	Zinc-Aluminium Foundry Alloy	<b>10.85</b>	<b>1.04</b>	<b>0.021</b>	<b>0.016</b>	<b>0.0017</b>	<b>0.0012</b>	<b>0.0095</b>
NZA-6	Zinc-Aluminium Foundry Alloy	<b>7.54</b>	<b>3.17</b>	<b>0.00037</b>	<b>0.0105</b>	<b>0.0051</b>	<b>0.0809</b>	<b>0.0147</b>
NZA-7	Zinc-Aluminium Foundry Alloy	<b>13.17</b>	<b>0.212</b>	<b>0.052</b>	<b>0.016</b>	<b>0.0116</b>	<b>0.0136</b>	<b>0.00020</b>



# CENTRE TECHNIQUE DES INDUSTRIES DE LA FONDERIE (CTIF), France

**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.**

## 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 <sub>Sol.</sub>	Al <sub>Tot.</sub>	Ga
*ECRM 273-1	Highly Alloyed Steel	<b>0.0336</b>	<b>0.378</b>	<b>0.785</b>	<b>0.0131</b>	<b>0.00037</b>	<b>14.747</b>	<b>0.246</b>	<b>4.852</b>	<b>0.0030</b>	<b>0.0391</b>	<b>3.047</b>	<b>0.0444</b>	<b>0.221</b>	<b>0.0021</b>	<b>0.0512</b>	<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	<b>0.0202</b>	<b>0.077</b>	<b>0.0225</b>	<b>0.0036</b>	<b>0.0006</b>	<b>21.72</b>	<b>8.94</b>	<b>61.45</b>	<b>0.216</b>	<i>0.0006</i>	<b>0.0348</b>	<b>0.0110</b>	<b>3.50</b>	<b>0.255</b>	...	<b>3.77</b>
*ECRM 377-2	Nickel Alloy IN 625	<b>0.0202</b>	<b>0.077</b>	<b>0.0225</b>	<b>0.0036</b>	<b>0.0006</b>	<b>21.72</b>	<b>8.94</b>	<b>61.45</b>	<b>0.232</b>	<i>0.0006</i>	<b>0.0348</b>	<b>0.0104</b>	<b>3.50</b>	<b>0.264</b>	...	<b>3.77</b>
*ECRM 378-1	Cobalt Alloy, Stellite grade 6	<b>1.181</b>	<b>1.172</b>	<b>0.0579</b>	<i>0.0023</i>	<b>0.0055</b>	<b>28.22</b>	<b>0.0503</b>	<b>0.617</b>	...	...	<b>63.52</b>	...	...	...	<b>4.43</b>	<b>0.606</b>

## 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 485-3	<b>3.514</b>	...	...	...	<b>0.1488</b>	...	...	...	...	...	...	...	<b>0.0081</b>	...	...	...	...	...
*ECRM 487-2	<b>3.573</b>	<b>0.0899</b>	<b>0.0491</b>	<b>0.0066</b>	<b>0.0031</b>	<b>0.0249</b>	<b>0.0034</b>	<b>0.0219</b>	<b>0.079</b>	<b>0.0064</b>	<b>0.0151</b>	<b>0.0136</b>	<b>0.0044</b>	<b>0.0045</b>	<b>0.0064</b>	<b>0.0021</b>	<b>0.0117</b>	<b>0.0012</b>
*ECRM 488-2	<b>3.956</b>	<b>0.374</b>	<b>0.201</b>	<b>0.0111</b>	<b>0.1173</b>	<b>0.303</b>	<i>0.0008</i>	<b>0.1247</b>	...	...	...	<b>0.0256</b>	<b>0.0052</b>	<b>0.0013</b>	<i>0.0089</i>	<b>0.0636</b>	<b>0.0545</b>	<i>0.0006</i>
*ECRM 490-1	<b>4.813</b>	<i>0.03</i>	<b>10.83</b>	<b>0.0267</b>	<b>0.0040</b>	<b>0.0183</b>	...	<i>0.02</i>	...	...	...	<b>0.0088</b>	<b>0.0030</b>	...	...	<b>0.0035</b>	<b>0.0152</b>	...
*ECRM 491-1	<b>3.616</b>	...	...	...	<b>0.0866</b>	...	...	...	...	...	...	...	...	...	...	...	...	...
*ECRM 492-1	<b>3.258</b>	...	...	...	<b>0.0854</b>	...	...	...	...	...	...	...	<b>0.0048</b>	...	...	...	...	...

\* 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
FL 1-1	<i>2.1</i>	<i>3.2</i>	<i>0.80</i>	<i>0.118</i>	<i>0.0765</i>	<i>0.06</i>	<i>0.038</i>	<i>0.245</i>	...	<i>0.0195</i>	<i>0.305</i>	<i>0.020</i>	<i>0.015</i>	...
FL 3-1	<i>2.3</i>	<i>2.1</i>	<i>0.27</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>0.008 N</i>
FL 7-1	<i>3.1</i>	<i>2.55</i>	<i>0.1</i>	<i>1.34</i>	<i>0.048</i>	<i>0.043</i>	<i>0.335</i>	<i>0.232</i>	...	<i>0.351</i>	<i>0.0291</i>	<i>0.05</i>	<i>0.0796</i>	<i>0.0266 As, 0.004 N</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>0.23</i>	<i>0.41</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>(0.003) 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>0.45</i>	<i>0.202</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>0.455</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>0.019</i>	<i>0.30</i>	<i>0.0086</i>	<i>0.30</i>	...	<i>0.215</i>	<i>0.051</i>	<i>0.05</i>	<i>0.010</i>	<i>0.0095 As, 0.0067 N</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>0.13</i>	<i>0.355</i>	...	<i>0.31</i>	<i>0.144</i>	<i>0.017</i>	<i>0.022</i>	...
FO 10-3	<i>3.5</i>	<i>0.65</i>	<i>1.05</i>	<i>0.196</i>	<i>0.101</i>	<i>0.379</i>	<i>0.202</i>	<i>0.117</i>	<i>0.0275</i>	<i>0.116</i>	<i>(0.002)</i>	<i>0.1</i>	<i>0.085</i>	<i>0.0012 As</i>
FO 12-1	<i>3.7</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 17-1	<i>3.0</i>	<i>2.48</i>	<i>0.47</i>	<i>0.470</i>	<i>0.168</i>	<i>(0.016)</i>	...	<i>0.021</i>	<i>0.032</i>	<i>(0.006)</i>	<i>0.024</i>	<i>0.032</i>	<i>0.018</i>	...
FO 18-2	<i>3.4</i>	<i>1.2</i>	<i>0.60</i>	<i>1.34</i>	<i>0.136</i>	<i>0.170</i>	<i>0.179</i>	<i>0.140</i>	...	<i>0.049</i>	<i>0.046</i>	<i>0.055</i>	<i>0.102</i>	<i>0.004 N</i>
FO 19-2	<i>4.04</i>	<i>1.05</i>	<i>1.05</i>	<i>0.030</i>	<i>0.057</i>	<i>0.0420</i>	...	<i>(0.075)</i>	<i>0.0392</i>	<i>0.0298</i>	<i>0.0012</i>	<i>0.029</i>	<i>0.0419</i>	<i>0.0005 Te, 0.0070 N</i>
FPA-1-3	<i>3.10</i>	<i>0.029</i>	<i>0.105</i>	<i>0.002</i>	<i>0.0009</i>	<i>0.073</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, 0.012 N</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 TECHNIQUE DES INDUSTRIES DE LA FONDERIE (CTIF), France

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

**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	3.00	1.35	0.90	0.060	0.105	0.83	1.45	1.38	1.99
NH 2-3	2.45	1.80	1.05	0.043	0.065	1.26	1.00	1.82	1.00
NH 3-2	3.45	0.85	0.175	0.36	0.024	1.76	0.73	2.53	0.031
NH 4-2	2.85	0.49	0.28	0.12	0.022	2.46	0.30	3.60	0.09
NH 5-2	2.30	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 7-2	3.20	1.20	0.91	0.034	0.0120	8.87	...	5.53	0.108
NH 8-1	3.00	0.80	0.57	0.052	0.076	5.03	0.125	8.16	0.065
NH 9-1	3.15	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	N	Nb	Mg
NR CU 1-1B	3.1	1.0	1.465	0.172	0.09	0.994	18.02	4.95	...	...	...
NR CU 2	2.52	2.07	1.07	0.115	0.049	2.05	15.9	6.50	...	...	...
NR CU 3	1.94	3.12	0.597	0.047	0.017	3.49	13.30	8.07	(0.008)	...	...
NR 1-2L	2.50	2.99	1.34	0.125	0.10	1.74	25.87	0.49	...	...	...
NR 3-2L	2.99	3.04	0.72	0.088	0.052	2.97	21.58	0.26	...	...	...
NR 5-2L	1.77	2.99	1.207	0.037	0.083	0.27	33.89	0.48	...	...	...
NR 6-2L	1.76	2.07	0.70	0.031	0.063	3.49	30.37	0.020	...	...	...
NR 8-2L	2.89	1.74	5.19	0.054	0.025	0.165	13.33	0.075	...	...	...
NR 1-2S	2.58	3.02	1.54	0.19	...	2.00	20.60	0.11	...	...	...
NR 2-2S	2.32	1.43	0.53	0.062	...	0.51	36.3	0.21	...	...	...
NR 3-2S	2.92	2.91	0.77	0.024	...	3.05	24.63	0.33	...	...	...
NR 4-2S	2.47	4.87	1.71	0.145	...	1.50	18.30	0.63	...	...	...
NR 6-2S	1.815	2.44	0.99	0.019	...	1.06	30.75	0.03	...	...	...
NR 8-2S	3.05	1.41	4.39	0.124	...	0.191	14.20	0.071	...	...	...
NR 2-1G	2.2	1.5	0.4	0.05	<0.01	0.40	36.3	0.23	...	0.25	...
NR 4-1G	2.3	5.6	1.72	0.11	...	1.40	21.30	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	2.46	0.48	0.63	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	0.652	0.0490	...
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	0.0175	28.5	3.27	2.69	1.02	...
FCR 6-1	1.3	0.75	1.4	0.201	0.086	30.84	0.455	0.188	0.480	...
FCR 7-1	3.3	1.07	0.365	0.099	0.0427	33.65	2.62	0.947	0.704	...
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 TECHNIQUE DES INDUSTRIES DE LA FONDERIE (CTIF), France

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

## Brass Reference Materials (60mm dia. x 5-6 mm mushrooms)

CTIF No.	Cu	Sn	Pb	Zn	Fe	Ni	Mn	Al	Si	Sb	P	Others
L 1-1	58.7	0.046	0.06	39.7	0.017	0.106	...	0.01	0.36	...	0.08	...
L 2	61.55	0.48	0.408	35.55	0.216	0.71	0.350	0.485	0.202	...	...	...
L 3-1	58.5	1.62	1.32	35.5	0.357	0.993	0.214	1.22	0.0256	0.032	0.0306	0.073 As
L 4-1	61.70	0.693	2.017	34.60	0.466	0.227	0.109	0.104	0.12	...	...	...
L 5-1	61.0	0.88	2.99	31.5	(1.0)	0.494	0.50	0.64	(0.50)	0.174	(0.15)	0.13 As
L 6	65.95	0.193	0.159	30.70	0.108	1.30	0.029	0.130	1.28	0.060	0.040	0.102 As
L 7	55.60	0.038	0.71	42.45	0.031	0.020	0.62	0.308	0.13	...	...	...
L 20-1	85.2	0.49	0.274	13.3	0.039	0.223	0.130	(0.06)	0.106	...	0.026	0.099 As
L 21	82.50	1.50	0.209	15.40	0.086	0.156	0.004	...	0.036	...	...	0.103 As
L 22	83.0	1.05	0.123	15.0	0.15	0.105	<0.001	...	0.05	0.088	0.06	<0.05 Mg
L 23	81.20	0.20	0.058	17.90	0.246	0.033	...	...	0.280	...	...	0.051 As
LH 1-1	64.9	(0.007)	0.022	16.9	4.48	0.0944	5.18	7.99	0.205	0.081	0.079	...
LH 2-1	61.2	0.051	0.103	22.4	3.15	3.27	3.19	6.50	0.057	...	...	...
LH 5-1	66.0	0.141	0.110	25.72	1.26	1.57	1.37	3.65	0.114	...	...	...
LH 6-1	63.18	0.257	0.25	19.04	3.13	3.19	4.54	6.09	0.20	...	...	...
LH 7-1A	63.40	0.227	0.327	(26.85)	(2.35)	0.70	2.96	3.16	0.055	...	...	...
LH 10	59.05	0.203	1.76	28.90	(1.0)	1.49	3.57	2.66	1.30	...	...	...
LH 11	66.80	0.44	1.26	26.20	0.36	2.91	0.71	0.46	0.88	...	...	...
LH 12	62.75	0.83	0.21	33.15	(1.2)	0.505	0.125	1.13	(0.06)	...	...	...
LH 13	55.75	1.19	0.67	31.8	(2.00)	3.22	3.14	2.00	0.21	...	...	...
LS 1	77.7	0.243	0.213	16.3	0.448	0.55	0.039	(0.02)	4.35	...	0.128	...
LS 3-1	76.05	0.154	0.576	18.95	0.101	0.113	0.151	0.426	3.32	0.107	0.0110	...
UZ 52-3	81.18	1.06	0.11	16.90	0.32	0.084	0.002	...	0.12	0.08	0.068	0.040 Mg, 0.014 Be
UZ 53	82.60	0.205	0.025	16.67	0.255	0.025	≤0.001	...	0.145	...	0.055	0.01 As

# CENTRE TECHNIQUE DES INDUSTRIES DE LA FONDERIE (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
<b>B 1</b>	83.0	15.10	0.202	0.88	0.085	0.063	...	0.053	0.030	0.034	0.061	0.444	...
<b>B 2</b>	85.90	13.55	0.02	0.11	0.051	(0.004)	...	0.17	0.048	0.17	(0.003)	(≤0.002)	...
<b>B 3</b>	80.2	12.8	1.6	2.2	0.2	1.5	0.20	0.07	0.04	0.45	0.1	0.2	...
<b>B 4</b>	83.75	11.10	2.53	1.34	0.021	0.57	...	0.015	0.019	0.52	...	0.10	...
<b>B 5</b>	85.95	9.90	0.48	0.42	0.18	2.28	0.082	0.049	0.067	0.041	0.039	0.47	...
<b>B 10</b>	83.90	6.60	4.03	2.55	0.17	0.97	<0.01	<0.01	0.05	0.015	0.17	1.09	0.009
<b>B 11-1</b>	84.5	8.3	2.0	2.0	0.2	2.06	0.02	0.2	0.098	0.07	...	0.73	...
<b>B 12</b>	85.65	9.57	0.201	0.6	0.162	2.63	0.235	0.050	0.013	0.520	0.120	0.117	0.111
<b>B 13</b>	86.35	10.05	0.99	1.09	0.250	0.50	0.046	0.085	0.070	0.210	0.016	0.243	0.065
<b>B 14</b>	87.00	10.75	0.50	0.15	0.11	0.30	0.02	0.075	0.02	0.64	<0.01	0.08	0.04
<b>B 20-1</b>	83.35	6.35	5.10	3.77	0.165	0.51	...	0.055	0.115	0.072	0.040	0.520	...
<b>B 21</b>	83.0	5.13	3.79	6.22	0.285	1.21	...	0.135	0.047	(0.004)	...	0.18	...
<b>B 22-1</b>	83.0	3.5	6.0	4.0	<0.10	2.5	...	<0.1	0.03	...	...	0.05	...
<b>B 23-1</b>	83.45	7.18	7.20	1.46	(0.040)	0.086	...	0.025	0.019	0.070	0.020	0.384	...
<b>B 30-1</b>	76.5	11.1	9.6	1.0	0.07	1.19	0.1	(<0.06)	0.075	0.05	(<0.05)	0.214	0.0088
<b>B31</b>	78.65	7.65	11.79	0.79	(0.015)	0.489	...	(0.047)	0.028	...	(0.031)	0.475	...
<b>B 32</b>	74.65	5.96	16.10	1.21	0.11	1.49	...	0.075	0.027	0.041	0.085	0.13	0.0056

## 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
<b>4583</b>	96.35	0.25	0.084	0.094	(0.15)	2.02	0.064	0.08	...	0.029	0.84	(0.002)	...	...	...	...
<b>4584</b>	97.05	0.022	(0.002)	0.022	0.120	0.015	(0.002)	0.166	...	0.033	2.53	0.04	...	...	...	...
<b>4766</b>	96.83	0.100	0.053	0.070	0.160	0.203	0.008	0.110	...	0.027	1.58	0.64	...	...	...	(0.2) Cr
<b>4872</b>	97.00	0.044	0.019	0.119	0.104	0.103	<0.008	0.16	...	0.059	1.93	0.400	...	...	...	(0.04) Cr
<b>4873</b>	98.40	(0.007)	(0.003)	(0.003)	0.078	0.049	(0.002)	0.088	...	0.094	0.17	0.98	...	...	...	0.105 Cr
<b>CuBeCo6</b>	93.09	0.0135	0.0397	0.0330	0.12	(1.45)	0.0173	0.26	...	0.135	1.5	(1.90)	1.37	...	...	0.0576 Cr
<b>CN 1</b>	85.0	(0.005)	0.085	0.2	1.1	12.3	0.8	(0.05)	0.046	(0.003)	...	...	...	(0.002)	(0.1)	...
<b>CN 2</b>	88.5	(0.005)	0.055	0.5	1.6	7.8	1.1	0.24	0.028	(0.005)	...	...	...	(0.005)	(0.005)	...
<b>CN 4</b>	84.0	0.058	0.006	0.07	1.8	11.2	1.5	(0.01)	(0.001)	(0.02)	...	...	...	(0.001)	0.7	...
<b>CN 33</b>	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
<b>UN 3S</b>	92.65	0.215	0.20	1.62	0.30	3.45	0.07	1.24	...	0.11	...	...	...	...	...	...

## DEGERFORS LABORATORIUM AB (D-LAB), Sweden

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

### Ferro-Alloy Certified Reference Materials from Degerfors Laboratorium AB (D-LAB), Sweden (Finely divided material – units of 50g)

D-LAB No.	Description	C	Si	P	S	Cr	N	O	H
<b>DFS 1</b>	Ferro-chromium - Low Carbon	<b>0.0549</b>	<i>0.87</i>	<i>0.027</i>	<i>0.0017</i>	<b>69.8</b>	<b>0.0973</b>	<i>0.56</i>	<i>0.0024</i>
<b>DFS 2</b>	Ferro-chromium - High Carbon	<b>9.03</b>	<i>0.2</i>	<i>0.021</i>	<i>0.0174</i>	<b>69.6</b>	<i>0.0178</i>	<i>0.2</i>	...
<b>DFS 3</b>	Ferro-chromium - High Nitrogen	<i>0.068</i>	<i>0.54</i>	<i>0.023</i>	<i>0.016</i>	<b>64.2</b>	<b>9.71</b>	<i>3</i>	...

## Nordisk Industrilaboratorium AB (NILAB), Sweden

**CHEMICAL COMPOSITION (nominal mass content in %)**

### Alloy Steel Certified Reference Materials (500 HA and 501 HA available in finely divided form and all available in disc form – see table)

NILAB No.	Description	Unit sizes	C	Si	Mn	P	S	Cr	Mo	Ni
<b>100 LA</b>	Bearing Steel	34mm dia. x 20mm disc	<b>1.002</b>	<b>0.283</b>	<b>0.333</b>	<b>0.012</b>	<b>0.018</b>	<b>1.517</b>	<b>0.012</b>	<b>0.027</b>
<b>500 HA</b>	Stainless Steel	150g powder 38mm dia. x 20mm disc	<b>0.041</b>	<b>0.720</b>	<b>1.541</b>	<b>0.024</b>	<b>0.012</b>	<b>16.93</b>	<b>2.73</b>	<b>11.00</b>
<b>501 HA</b>	Highly Alloyed Steel	150g powder 38mm dia. x 20mm disc	<b>0.014</b>	<b>0.676</b>	<b>0.858</b>	<b>0.020</b>	<b>0.003</b>	<b>19.79</b>	<b>6.14</b>	<b>17.69</b>

### Alloy Steel Certified Reference Materials (continued)

NILAB No.	Al	As	Co	Cu	N	Nb	Ti	V
<b>100 LA</b> (cont.)	<b>0.005</b>	<b>0.004</b>	<b>0.007</b>	<b>0.019</b>	<b>0.0046</b>	...	<b>0.0007</b>	<b>0.004</b>
<b>500 HA</b> (cont.)	...	...	<b>0.139</b>	<b>0.182</b>	<b>0.1154</b>	<b>0.023</b>	...	<b>0.074</b>
<b>501 HA</b> (cont.)	<b>0.003</b>	...	<b>0.159</b>	<b>0.761</b>	<b>0.223</b>	<b>0.007</b>	...	<b>0.044</b>

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

**Ferro-Alloy, Calcium-Silicon, Silico-Chromium, Silico-Manganese 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	N
DL SL01-07	Silico – Manganese	1.65	17.36	77.82	0.135	...	...	...	0.021	...	...	0.030	...
DL SL04-06	Calcium – Silicon	0.61	60.79	0.056	0.031	0.022	<0.009	<0.021	<0.007	0.333	...	...	...
DL SL12-07	Ferro – Manganese	1.630	1.113	88.00	0.081	...	0.060	...	0.022	...	...	0.039	...
DL SL17-05	Ferro – Boron	0.62	1.011	0.416	0.061	...	0.925	0.023	0.097	0.085	20.23	0.025	...
DL SL20-10	Ferro – Molybdenum	0.026	0.161	0.010	0.015	0.092	0.035	78.09	0.112	0.008	...	0.020	...
DL SL23-10	Ferro – Silicon	0.11	75.94	0.139	0.021	...	0.019	...	0.006	2.041	...	...	...
DL SL25-10	Ferro – Vanadium	0.120	0.894	1.154	0.051	0.016	0.201	0.029	0.009	0.783	...	0.008	...
DL SL28-15	Ferro – Niobium	0.043	1.580	0.842	0.065	0.056	0.028	0.020	0.019	4.82	...	...	...
DL SL29-02	Fe-Si-Ti	0.284	59.25	1.64	0.010	0.005	0.059	0.126	0.043	0.613	...	...	...
DL SL30-01	Fe-Si-Zr	0.338	51.14	0.210	0.033	0.002	0.004	...	0.013	0.852	...	...	0.027
DL SL54-03	Silico – Chromium	0.034	40.46	0.41	0.022	...	36.93	...	0.190	0.579	...	...	...
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	Nb	Pb	Ti	V	W	Zr	Ba	Ca	Mg	Ta	Zn	Fe
DL SL01-07 (cont.)	0.012	...	...	0.122	0.015	...	...	...	...	...	...	...	2.64
DL SL04-06 (cont.)	<0.010	...	...	0.055	...	...	...	...	30.48	0.010	...	...	5.17
DL SL12-07 (cont.)	0.016	...	...	...	0.026	...	...	...	...	...	...	0.009	8.78
DL SL17-05 (cont.)	0.072	...	...	0.025	0.006	0.127	...	...	...	...	...	...	75.71
DL SL20-10 (cont.)	0.464	...	...	...	...	...	...	...	...	...	...	...	20.66
DL SL23-10 (cont.)	0.011	...	...	0.093	...	...	...	0.042	1.019	0.029	...	...	19.42
DL SL25-10 (cont.)	0.038	0.013	...	0.071	80.85	0.025	...	...	...	0.010	...	...	14.25
DL SL28-15 (cont.)	0.209	60.15	0.140	0.185	0.013	...	0.105	...	...	...	0.856	...	28.77
DL SL29-02 (cont.)	0.022	...	...	11.21	0.154	...	0.046	...	0.220	0.234	...	...	24.80
DL SL30-01 (cont.)	...	...	...	0.073	...	...	36.06	...	0.157	...	...	...	8.87
DL SL54-03 (cont.)	0.020	...	...	0.124	0.074	...	...	...	...	...	...	...	20.93
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 unit's kg and mole and are obtained by means of absolute calibration.**

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

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

Dillinger No.	Description	CaO	SiO <sub>2</sub>	Fe	Fe <sub>2</sub> O <sub>3</sub>	Mn <sub>3</sub> O <sub>4</sub>	P <sub>2</sub> O <sub>5</sub>	S	SO <sub>3</sub>	CuO	Al <sub>2</sub> O <sub>3</sub>	MgO	NiO	Cr <sub>2</sub> O <sub>3</sub>
DL SX62-05	Cupola Dust	4.91	34.52	...	9.49	2.57	0.147	...	2.70	0.163	1.30	1.85	0.005	0.041
DL SX66-04	Tundish Slag	1.609	24.75	...	4.62	0.098	0.084	...	0.026	...	1.884	64.65	0.165	0.255
DL SX74-02	Zinc Slag	0.405	11.01	0.207	...	0.113	14.03	0.114	...	7.02	5.99	0.118	...	0.086

Dillinger No.	SnO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>	MoO <sub>3</sub>	TiO <sub>2</sub>	PbO	SnO <sub>2</sub>	ZnO	Cl	F	Na <sub>2</sub> O	K <sub>2</sub> O	CO <sub>2</sub>	C(tot)	H <sub>2</sub> O (900°C)
DL SX62-05 (cont.)	0.018	0.019	0.030	0.060	2.43	...	21.01	2.88	0.096	2.26	3.68	3.84	6.80	0.107
DL SX66-04 (cont.)	...	...	...	0.141	...	...	...	...	...	0.516	0.089	0.35	0.471	1.02
DL SX74-02 (cont.)	...	...	...	0.274	...	0.386	45.16	...	...	0.13	0.164	...	11.92	0.077

**Refractory, Magnesite and Uncover Compound Reference Materials** (Finely divided material - units of 100g)

Dillinger No.	Description	CaO	SiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	Mn <sub>3</sub> O <sub>4</sub>	P <sub>2</sub> O <sub>5</sub>	S	SO <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	MgO
DL SX26-12	Refractory	1.80	40.80	3.10	0.135	0.279	...	...	36.45	13.13
DL SX42-08	Magnesite	2.06	5.09	1.49	0.070	0.077	...	0.018	41.66	47.83
DL SX59-06	Uncover Compound	33.29	30.78	0.598	0.052	0.037	0.061	...	14.43	19.38

Dillinger No.	NiO	TiO <sub>2</sub>	Cr <sub>2</sub> O <sub>3</sub>	V <sub>2</sub> O <sub>5</sub>	ZrO <sub>2</sub>	Na <sub>2</sub> O	SrO	K <sub>2</sub> O	C (tot)	CO <sub>2</sub>	H <sub>2</sub> O (900°C)
DL SX26-12 (cont.)	0.032	1.25	0.385	0.027	0.163	0.242	...	0.759	0.437	0.54	0.75
DL SX42-08 (cont.)	...	0.066	<0.080	...	0.091	...	...	0.037	0.353	0.58	0.89
DL SX59-06 (cont.)	...	0.037	...	...	...	0.32	0.015	0.210	...	...	...

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 %)**

**Fluorspar, Limestone and Gravel Reference Materials** (Finely divided material - all units of 100g)

Dillinger No.	Description	Ca	CaO	SiO <sub>2</sub>	Fe	Fe <sub>2</sub> O <sub>3</sub>	MnO	Mn <sub>3</sub> O <sub>4</sub>	P <sub>2</sub> O <sub>5</sub>
DL SX27-12	Fluorspar	44.18	...	8.91	...	0.373	0.237	...	...
DL SX35-15	Limestone	...	48.91	8.75	1.293	1.293	0.028	...	0.036
DL SX36-09	Gravel	...	0.047	96.35	0.706	0.706	...	0.20	0.019

Dillinger No.	S	SO <sub>4</sub>	Al <sub>2</sub> O <sub>3</sub>	MgO	TiO <sub>2</sub>	Na <sub>2</sub> O	K <sub>2</sub> O	V <sub>2</sub> O <sub>5</sub>	Cr <sub>2</sub> O <sub>3</sub>	F
DL SX27-12 (cont.)	...	0.103	1.01	0.739	0.069	...	0.125	...	0.106	40.6
DL SX35-15 (cont.)	0.025	...	0.787	0.379	0.048	0.032	0.187	...	...	...
DL SX36-09 (cont.)	...	...	1.46	0.104	0.086	0.045	0.334	<0.006	0.029	...

Dillinger No.	Co <sub>3</sub> O <sub>4</sub>	NiO	CuO	ZnO	SnO <sub>2</sub>	PbO	SrO	CO <sub>2</sub>	H <sub>2</sub> O (900°C)
DL SX27-12 (cont.)	...	0.153	0.199	0.103	0.054	0.102	...	2.11	0.370
DL SX35-15 (cont.)	...	...	...	...	...	...	0.050	...	...
DL SX36-09 (cont.)	0.005	...	...	...	...	...	...	<0.025	0.043

**Cover Powder and Rutile Reference Materials** (Finely divided material - DL SX57-04 - units of 20g, DL SX58-05 - units of 100g)

Dillinger No.	Description	CaO	SiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	Mn <sub>3</sub> O <sub>4</sub>	P <sub>2</sub> O <sub>5</sub>	S	Al <sub>2</sub> O <sub>3</sub>	MgO
DL SX57-04	Cover Powder	0.302	92.49	0.090	0.067	0.273	0.071	0.198	0.362
DL SX58-05	Rutile	0.035	0.297	3.53	0.124	0.147	0.027	0.500	0.032

Dillinger No.	Cr <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	Na <sub>2</sub> O	K <sub>2</sub> O	V <sub>2</sub> O <sub>5</sub>	Nb <sub>2</sub> O <sub>5</sub>	ZrO <sub>2</sub>	C	CO <sub>2</sub>	H <sub>2</sub> O (900°C)
DL SX57-04 (cont.)	...	...	0.070	0.97	...	...	...	3.60	0.008	1.38
DL SX58-05 (cont.)	0.117	93.35	...	...	0.243	0.532	0.198	0.23	...	...

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 unit's kg and mole and are obtained by means of absolute calibration.**



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

**Iron Ore and Sinter Reference Materials** (Finely divided material – units of 100g)

Dillinger No.	CaO	SiO <sub>2</sub>	Fe	FeO	Mn	P <sub>2</sub> O <sub>5</sub>	S	Al <sub>2</sub> O <sub>3</sub>	MgO	TiO <sub>2</sub>	Na <sub>2</sub> O	K <sub>2</sub> O	V <sub>2</sub> O <sub>5</sub>	Cr <sub>2</sub> O <sub>3</sub>	ZnO	C(tot)	CO <sub>2</sub>	H <sub>2</sub> O (900°C)
DL SX11-13	0.030	1.80	66.33	0.04	0.432	0.084	0.002	1.11	0.040	0.046	<0.003	0.010	0.007	0.010	...	0.035	...	1.24
DL SX11-14	0.421	7.47	65.55	27.20	0.029	0.028	0.019	0.271	0.565	0.060	0.078	0.061	0.002	0.006	...	0.125	...	...
DL SX11-15	0.494	5.79	63.17	...	0.074	0.101	...	2.68	0.244	0.128	0.020	0.008	0.010	0.005	...	...	...	...
DL SX11-16*	1.149	4.67	64.69	...	0.198	0.058	...	0.722	0.400	0.078	0.016	0.023	0.009	0.038	0.0010	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	0.075	0.014	0.020	0.017	...	0.005	0.085	0.033	2.51
DL SX11-23	0.034	2.67	64.80	0.133	0.049	0.123	0.011	1.619	0.037	0.047	0.006	0.008	0.005	...	0.0009	0.058	...	...
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	0.023	0.025	0.033	0.006	0.025	...	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	0.032	0.020	0.011	...	0.017	...	0.101	0.089	0.080
DL SX56-32	10.79	5.55	55.03	4.06	0.208	0.104	0.061	1.281	2.070	0.068	0.048	0.174	...	...	0.026	...	...	...
DL SX56-35	6.11	4.81	59.22	5.27	0.368	0.120	0.013	1.392	0.882	0.224	0.047	0.066	...	0.031	0.010	...	...	1.27

\* DL SX11-16 has the following additional constituent value: NiO 0.011%.

**Cement Reference Materials** (Finely divided material – units of 100g)

Dillinger No.	Ca	CaO	SiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	Mn <sub>3</sub> O <sub>4</sub>	P <sub>2</sub> O <sub>5</sub>	S	Al <sub>2</sub> O <sub>3</sub>	MgO	TiO <sub>2</sub>	SrO	K <sub>2</sub> O	Na <sub>2</sub> O	BaO	V <sub>2</sub> O <sub>5</sub>
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	...	...

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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# FLUXANA GMBH & CO. KG REFERENCE MATERIALS (FLX), GERMANY

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

## Cement Reference Materials (Finely divided material – unit weights as shown)

FLX No.	Unit Weight	Al <sub>2</sub> O <sub>3</sub>	CaO	Cl	Cr <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	Mn <sub>2</sub> O <sub>3</sub>	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	S	SiO <sub>2</sub>	SO <sub>3</sub>	SO <sub>4</sub> as SO <sub>3</sub>	SrO	TiO <sub>2</sub>	ZnO	LOI
FLX-CRM 100	50g	5.54	64.51	(0.09)	0.009	2.62	0.82	1.47	0.066	0.23	0.166	(0.06)	20.89	2.97	...	0.286	0.283	0.051	2.37
FLX-CRM 101	50g	8.86	48.43	...	0.011	3.54	2.1	1.72	0.116	0.657	0.189	...	30.29	3.12	...	0.248	0.463	0.046	5.13
FLX-CRM 103	50g	7.75	54.9	...	0.007	1.78	0.77	4.44	0.17	0.33	0.09	...	26.95	2.73	...	0.07	0.372	0.014	...
FLX-CRM 105	30g	4.27	65.24	0.049	0.008	2.5	1.24	1.57	0.04	0.21	0.0053	...	20.84	3.37	...	0.146	0.179	0.054	(2.61)
FLX-CRM 106	30g	5.7	66.05	0.055	0.008	1.98	0.86	0.96	0.161	0.12	0.111	...	20.29	3.01	...	0.206	0.271	0.012	(2.06)
FLX-CRM 107	30g	4.23	67.19	0.043	0.006	1.29	0.7	0.7	0.04	0.18	0.16	...	21.81	3.13	...	0.151	0.194	0.013	(6.59)
FLX-CRM 108	30g	4.66	65.15	0.042	0.007	2.97	0.74	2.15	0.219	0.09	0.169	...	20.06	3.31	...	0.083	0.186	0.036	(2.68)
FLX-CRM 109	30g	4.25	66.45	0.049	0.008	2.32	1.06	1.59	0.051	0.18	0.052	...	20.39	3.11	...	0.144	0.0203	0.042	(5.96)
FLX-CRM 110	30g	4.7	68.13	0.008	0.004	0.18	0.94	0.65	0.029	0.05	0.037	...	22.01	2.88	...	0.041	0.17	0.003	(3.46)
FLX-CRM 130	30g	11.62	56.6	...	0.021	2.88	0.682	1.84	0.062	0.277	0.067	...	14.35	10.91	(10.18)	0.052	0.563	0.018	(5.12)
FLX-CRM 131	30g	23.1	42.89	...	0.038	3.24	0.287	1.62	0.029	0.466	0.06	...	8.73	18.19	(17.85)	0.067	1.15	0.006	(2.03)
FLX-CRM 137	30g	4.99	64.77	...	(0.007)	3.07	0.769	1.64	0.266	(0.107)	0.171	...	20.78	3.17	...	0.076	0.221	0.029	(2.66)
FLX-CRM 138	30g	4.39	68.6	...	(0.005)	1.78	0.77	1.09	0.095	0.15	0.114	...	19.0	3.44	...	0.189	0.220	0.017	(9.5)

## Glass Reference Materials (Discs - dimensions as shown)

FLX No.	Description	Dimensions	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	MnO	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	SO <sub>3</sub>	BaO	Cr <sub>2</sub> O <sub>3</sub>	PbO	ZnO	ZrO <sub>2</sub>
FLX-DGG1	Soda-lime Glass	40mm dia. x 10mm	71.72	1.23	0.137	0.191	...	6.73	4.18	14.95	0.338	0.436	...	...	...	...	...
FLX-DGG2	Float Glass	40mm dia. x 5mm	72.26	0.1	0.033	0.021	...	10.05	3.4	13.78	...	0.27	...	...	...	...	...
FLX-Q0	Quartz Glass	40mm dia. x ~5mm	...	<0.1	0.0103	0.0103	<0.0002	<0.0002	<0.1	<0.1	<0.0003	<0.01	<0.025	<0.0002	<0.0007	<0.0003	<0.02

FLX No.	As <sub>2</sub> O <sub>3</sub>	CdO	CeO <sub>2</sub>	Co <sub>3</sub> O <sub>4</sub>	CuO	Gd <sub>2</sub> O <sub>3</sub>	La <sub>2</sub> O <sub>3</sub>	NiO	Sb <sub>2</sub> O <sub>3</sub>	SeO <sub>2</sub>	SnO <sub>2</sub>	SrO	TeO <sub>2</sub>	Y <sub>2</sub> O <sub>3</sub>
FLX-Q0 (continued)	<0016	<0.0009	<0.05	<0.0002	<0.000	<0.3	<0.0005	<0.0003	<0.0014	<0.0004	<0.0013	<0.8	<0.0018	<0.3

## XRF Monitor Glass (40mm dia. x approx. ~3mm disc)

FLX No.	Description	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	MnO	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	SO <sub>3</sub>	P <sub>2</sub> O <sub>5</sub>	B <sub>2</sub> O <sub>3</sub>	SrO	Cl	F
FLX-Z1	XRF Monitor Glass	14.01	0.62	0.09	0.09	0.04	30.22	0.44	5.80	0.09	2.97	0.23	bal.	0.01	0.84	3.23

# INSTITUTE OF CERTIFIED REFERENCE MATERIALS (ICRM), RUSSIA

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

**High Alloy Steel Certified Reference Materials** (LG57-LG64 38-42mm dia. x 25-35mm discs; LG66-LG68 38-40mm dia. x 15-23mm discs; LG69 48-52mm dia x 24-28mm dia. discs; LG73-LG78 40-50mm dia. x 25-32mm discs)

ICRM No.	Description	C	Si	Mn	Cr	P	S	Mo	Ni	Al	Co	Cu	N	Ti	Nb	V	W
LG57	High Alloy Steel	<b>0.016</b>	<b>0.56</b>	<b>0.52</b>	<b>13.70</b>	<b>0.011</b>	<b>0.0023</b>	<b>0.401</b>	<b>25.2</b>	<b>0.151</b>	...	<b>0.080</b>	...	<b>1.81</b>	<i>(0.008)</i>	<b>0.65</b>	<b>4.24</b>
LG58	Stainless Steel	<b>0.48</b>	<b>0.292</b>	<b>0.99</b>	<b>23.4</b>	<b>0.0135</b>	<b>0.0280</b>	<b>2.41</b>	<b>4.26</b>	<i>(0.006)</i>	...	<b>0.388</b>	...	<b>0.039</b>	<b>0.214</b>	<b>0.264</b>	<b>0.21</b>
LG59	High Alloy Steel	<b>0.073</b>	<b>0.63</b>	<b>1.15</b>	<b>15.81</b>	<b>0.011</b>	<b>0.0083</b>	<b>0.094</b>	<b>35.1</b>	<b>0.079</b>	...	<b>0.083</b>	...	<b>1.12</b>	<b>0.106</b>	<b>0.273</b>	<b>3.08</b>
LG60	High Alloy Steel	<b>0.020</b>	<b>0.289</b>	<b>2.31</b>	<b>21.8</b>	<b>0.028</b>	<b>0.0205</b>	<b>3.62</b>	<b>19.86</b>	<b>0.040</b>	...	<b>0.027</b>	...	<b>0.265</b>	<b>0.83</b>	<b>0.229</b>	<b>0.115</b>
LG63	High Alloy Steel	<b>0.068</b>	<b>0.285</b>	<b>0.356</b>	<b>10.13</b>	<b>0.010</b>	<b>0.0050</b>	<b>1.65</b>	<b>22.15</b>	<b>0.45</b>	...	<b>0.024</b>	...	<b>2.98</b>	<b>0.113</b>	<b>0.086</b>	<b>0.43</b>
LG64	High Alloy Steel	<b>0.049</b>	<b>0.76</b>	<b>0.75</b>	<b>24.7</b>	<b>0.017</b>	<b>0.0032</b>	<b>2.89</b>	<b>28.3</b>	<b>0.189</b>	...	<b>2.88</b>	...	<b>0.64</b>	<b>0.048</b>	<b>0.094</b>	<b>0.013</b>
LG66	High Mn Steel	<b>0.44</b>	<b>0.41</b>	<b>16.1</b>	<b>0.30</b>	<b>0.031</b>	<b>0.010</b>	...	<b>0.059</b>	<b>2.6</b>	...	<b>0.104</b>	...	...	...	...	...
LG68	High Mn Steel	<b>0.89</b>	...	<b>28.8</b>	<b>0.13</b>	<i>(0.02)</i>	<b>0.003</b>	<b>0.46</b>	<b>0.20</b>	<b>8.6</b>	...	<b>0.11</b>	...	...	<b>0.46</b>	...	...
LG69	Mn Alloy Steel	<b>0.45</b>	<b>0.50</b>	<b>18.6</b>	<b>0.428</b>	<b>0.033</b>	<b>0.0048</b>	<b>0.020</b>	<b>0.178</b>	<b>2.78</b>	...	<b>0.088</b>	<b>0.011</b>	...	...	...	...
LG73	Stainless Steel	<b>0.098</b>	<b>0.570</b>	<b>1.26</b>	<b>22.60</b>	<b>0.019</b>	<b>0.0073</b>	<b>0.061</b>	<b>17.74</b>	...	<b>0.247</b>	<b>0.140</b>	<b>0.0319</b>	<b>0.0022</b>	...	...	<b>0.018</b>
LG74	Stainless Steel	<b>0.373</b>	<b>2.49</b>	<b>0.962</b>	<b>18.30</b>	<b>0.024</b>	<b>0.0049</b>	<b>0.104</b>	<b>23.66</b>	<b>0.035</b>	<b>0.031</b>	<b>0.093</b>	<b>0.030</b>	<b>0.030</b>	...	...	<b>0.052</b>
LG75	Stainless Steel	<b>0.027</b>	<b>0.298</b>	<b>0.728</b>	<b>14.80</b>	<b>0.0046</b>	<b>0.0026</b>	<b>0.052</b>	<b>24.5</b>	<b>0.113</b>	<b>0.019</b>	<b>0.029</b>	<b>0.0044</b>	<b>1.76</b>	...	...	<b>4.14</b>
LG76	Stainless Steel	<b>0.445</b>	<b>0.455</b>	<b>0.342</b>	<b>13.77</b>	<b>0.021</b>	<b>0.0076</b>	<b>0.263</b>	<b>13.39</b>	<b>0.034</b>	...	<b>0.098</b>	<b>0.031</b>	<b>0.020</b>	...	<b>0.041</b>	<b>2.38</b>
LG78	Stainless Steel	<b>0.074</b>	<b>0.58</b>	<b>1.60</b>	<b>14.71</b>	<b>0.017</b>	<b>0.0017</b>	<b>0.061</b>	<b>35.4</b>	<b>0.15</b>	...	<b>0.053</b>	<b>0.0062</b>	<b>1.31</b>	<b>0.004</b>	<b>0.020</b>	<b>3.16</b>

**Slag, Flux and Refractory Certified Reference Materials** (Finely divided material – unit weights as shown)

ICRM No.	Description	Unit Weight	Fe	Fe <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	CaO	MgO	Al <sub>2</sub> O <sub>3</sub>	MnO	P	S	TiO <sub>2</sub>	K <sub>2</sub> O	Na <sub>2</sub> O	CaF <sub>2</sub>	C	FeO	V <sub>2</sub> O <sub>5</sub>	Cr <sub>2</sub> O <sub>3</sub>	CaCO <sub>3</sub>
SH6/2	Flux	125g	...	<b>1.30</b>	<b>39.2</b>	<b>12.72</b>	<b>1.60</b>	<b>3.00</b>	<b>38.5</b>	<b>0.069</b>	<b>0.0092</b>	...	...	...	<b>7.71</b>	...	...	...	...	...
SH7/3	Flux	100g	...	...	<b>23.4</b>	<b>24.0</b>	<b>11.4</b>	<b>29.8</b>	<b>0.40</b>	<b>0.011</b>	<b>0.031</b>	...	<b>0.94</b>	<b>1.41</b>	<b>28.5</b>	...	<b>0.56</b>	...	...	...
SH8/4	Flux	100g	<b>0.147</b>	...	<b>1.77</b>	<i>(52.7)</i>	...	<b>26.5</b>	...	<b>0.013</b>	<b>0.013</b>	...	...	...	<b>68.6</b>	<b>0.039</b>	...	...	...	...
SH9/3	Vanadium Slag	150g	<b>28.9</b>	...	<b>16.63</b>	<b>1.61</b>	<b>3.53</b>	<b>1.76</b>	<b>9.73</b>	<b>0.015</b>	<b>0.015</b>	<b>7.39</b>	...	...	...	...	...	<b>22.2</b>	<b>3.32</b>	...
SH12/3	Alumina, Semi-conc.	75g	<b>0.66</b>	...	<b>0.76</b>	<b>18.8</b>	<b>2.15</b>	<b>73.6</b>	...	...	...	...	...	...	...	...	...	...	<b>0.46</b>	...
SH13	Fluorite Concentrate	100g	<b>0.353</b>	...	...	...	...	...	...	<b>0.012</b>	<b>0.103</b>	...	...	...	<b>84.7</b>	...	...	...	...	<b>0.51</b>
K10/3	Corundum	125g	...	<b>1.82</b>	<i>(0.2)</i>	<i>(0.03)</i>	...	<b>97.0</b>	...	...	...	<b>0.35</b>	<i>(0.03)</i>	<i>(0.5)</i>	...	<i>(0.05)</i>	...	...	...	...

# INSTITUTE OF CERTIFIED REFERENCE MATERIALS (ICRM), RUSSIA

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

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

ICRM No.	Description	C	Si	Mn	Cr	S	P	Al	Cu	Ti	Fe	V	Zn	N	As	Sn	Pb	Mo	Others
F5/3	Manganese, Metallic	<b>0.079</b>	<b>1.25</b>	<b>95.9</b>	...	<b>0.0095</b>	<b>0.062</b>	...	<b>0.0055</b>	...	<b>2.73</b>	...	...	...	...	...	...	...	...
F7/5	Ferro-Manganese	<b>6.79</b>	<b>0.366</b>	<b>77.2</b>	...	<b>0.0039</b>	<b>0.123</b>	...	...	...	<b>15.65</b>	...	...	...	...	...	...	...	...
F17/4	Ferro-Molybdenum	<b>0.081</b>	<b>0.54</b>	...	...	<b>0.066</b>	<b>0.032</b>	...	<b>0.52</b>	...	...	...	<b>0.0064</b>	...	<b>0.0111</b>	<b>0.0023</b>	<b>0.0029</b>	<b>59.2</b>	<b>0.022 W, 0.0039 Sb, 0.00056 Bi</b>
F19/3	Ferro-Vanadium	<b>0.418</b>	<b>1.47</b>	<b>3.30</b>	<b>1.21</b>	<b>0.0102</b>	<b>0.059</b>	<i>(0.005)</i>	<b>0.204</b>	...	...	<b>42.6</b>	...	...	<b>0.0009</b>	...	...	...	...
F20/3	Ferro-Niobium	<b>0.136</b>	<b>0.67</b>	...	...	<b>0.0091</b>	<b>0.039</b>	<b>0.35</b>	...	<b>0.292</b>	<b>33.3</b>	...	...	<b>0.067</b>	...	<b>0.0014</b>	...	...	<b>63.5 Nb+Ta, 0.0056 Co</b>
F21/2	Ferro-Boron	<b>0.047</b>	<b>0.73</b>	...	...	...	<b>0.0119</b>	<b>1.546</b>	<b>0.0120</b>	...	...	...	<b>0.0055</b>	...	...	...	...	...	<b>20.91 B</b>
F22/3	Ferro-Boron	<b>0.161</b>	<b>7.82</b>	...	...	<b>0.018</b>	<b>0.021</b>	<b>7.78</b>	<b>3.43</b>	...	...	...	...	...	...	...	...	...	<b>8.95 B</b>
F24/2	Ferrosilicochromium	<b>0.019</b>	<b>49.9</b>	...	<b>29.18</b>	<b>0.0015</b>	<b>0.027</b>	<b>0.87</b>	...	...	...	...	...	...	...	...	...	...	...
F25/3	Ferro-Calcium	...	<b>51.5</b>	...	...	<b>0.0056</b>	<b>0.011</b>	<b>0.67</b>	...	...	<b>23.06</b>	...	...	...	...	...	...	...	<b>21.3 Ca</b>
F26/2	Ferro-Calcium	...	<b>59.5</b>	...	...	<b>0.030</b>	<b>0.024</b>	<b>1.52</b>	...	<b>0.156</b>	<b>6.29</b>	...	...	...	<i>(&lt;0.001)</i>	...	...	...	<b>29.9 Ca</b>
F27/2	Ferrosilicozirconium	<b>0.111</b>	<b>26.1</b>	...	...	<i>(0.001)</i>	<b>0.044</b>	<b>7.48</b>	<b>1.47</b>	<b>0.215</b>	<i>(12)</i>	...	...	...	...	...	...	...	<b>51.5 Zr</b>
F28/2	Ferro-Phosphorus	...	<b>1.11</b>	<b>1.20</b>	...	<b>0.021</b>	<b>16.05</b>	...	...	...	...	...	...	...	...	...	...	...	...
F29/3	Manganese, Metallic	<b>0.146</b>	...	<b>87.5</b>	...	<b>0.031</b>	<b>0.055</b>	...	...	...	<b>2.26</b>	...	...	<b>4.63</b>	...	...	...	...	...
F30/4	Ferro-Titanium	<b>0.154</b>	<b>0.163</b>	<b>0.189</b>	<b>0.154</b>	<b>0.0054</b>	<b>0.0030</b>	<b>3.83</b>	<b>0.065</b>	<b>70.3</b>	<b>21.51</b>	<b>2.29</b>	...	<b>0.38</b>	...	<b>0.077</b>	...	<b>0.60</b>	<b>0.053 Ni, 0.231 Zr</b>
F32/3	Ferro-Vanadium, Nitrated	<i>(0.4)</i>	<i>(1.2)</i>	<b>3.14</b>	...	<i>(0.008)</i>	<i>(0.05)</i>	<i>(&lt;0.05)</i>	<i>(0.2)</i>	...	...	<b>40.2</b>	...	<b>7.51</b>	<i>(&lt;0.001)</i>	...	...	...	...
F35/2	Ferro-Chromium	<b>0.79</b>	<b>0.181</b>	...	<b>68.9</b>	<b>0.0022</b>	<b>0.027</b>	...	...	...	<b>28.16</b>	...	...	<b>0.185</b>	...	...	...	...	...
F40	Ferro-Vanadium	<b>0.096</b>	<b>1.31</b>	<b>1.49</b>	<b>0.185</b>	<b>0.014</b>	<b>0.022</b>	<b>2.12</b>	<b>0.081</b>	...	...	<b>80.1</b>	...	...	...	...	...	...	...
F41	Ferro-Nickel - low Fe	<b>0.0124</b>	...	...	...	<b>0.132</b>	...	...	<b>0.47</b>	...	<b>5.68</b>	...	...	...	<b>0.058</b>	...	...	...	<b>91.4 Ni, 2.04 Co</b>
F42	Ferro-Titanium	<b>0.55</b>	<b>6.74</b>	<b>1.10</b>	<b>2.22</b>	<b>0.023</b>	<b>0.050</b>	<b>11.41</b>	<b>1.32</b>	<b>27.15</b>	...	<b>0.249</b>	<b>0.129</b>	<i>(0.15)</i>	...	<b>0.033</b>	...	<b>0.106</b>	<i>(0.44)</i> Zr
F43	Ferro-Titanium	<b>0.098</b>	<b>2.50</b>	<b>1.22</b>	<b>0.354</b>	<b>0.0058</b>	<b>0.038</b>	<b>11.11</b>	<b>0.336</b>	<b>31.9</b>	...	<b>0.152</b>	<b>0.032</b>	<b>0.085</b>	...	<b>0.013</b>	...	<b>0.0036</b>	<b>0.059 Zr</b>
F44	Silico-calcium with Mg	<b>0.166</b>	<b>49.7</b>	...	...	<b>0.0066</b>	<b>0.014</b>	<b>1.68</b>	...	...	<b>19.91</b>	<i>(2.5)</i>	...	...	...	...	...	...	<b>12.6 Ca, 9.6 Mg</b>
F45	Ferro-Chromium	<b>0.071</b>	<b>1.10</b>	...	<b>69.0</b>	<b>0.0024</b>	<b>0.027</b>	<b>0.041</b>	...	...	...	...	...	<b>0.082</b>	...	...	...	...	...
F46	Ferro-Chromium	<b>5.47</b>	<b>1.05</b>	...	<b>68.8</b>	<b>0.015</b>	<b>0.030</b>	...	...	...	...	...	...	<b>0.055</b>	...	...	...	...	...
F47	Ferro-Chromium	<b>8.80</b>	<b>0.103</b>	...	<b>69.8</b>	<b>0.036</b>	<b>0.025</b>	...	...	...	...	...	...	<b>0.020</b>	...	...	...	...	...
F48	Ferro-Tungsten	<b>0.074</b>	<b>0.47</b>	<b>0.695</b>	...	<b>0.211</b>	<b>0.035</b>	<b>0.64</b>	<b>0.096</b>	...	...	...	...	...	<b>0.037</b>	<b>0.031</b>	<b>0.0048</b>	<b>0.047</b>	<b>71.0 W, 0.014 Sb</b>
F50	Ferro-Chromium	<b>0.079</b>	<b>1.29</b>	...	<b>64.3</b>	<b>0.0058</b>	<b>0.0048</b>	<b>0.168</b>	...	...	...	...	...	<b>11.2</b>	...	...	...	...	...

**INSTITUTE OF GEOLOGICAL SCIENCES/BRITISH GEOLOGICAL SURVEY (IGS), U.K.**

**CHEMICAL COMPOSITION (nominal mass content in %)**

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

IGS No.	Description	Unit Weight	Ba	Cu	F	Fe	MnO <sub>2</sub>	Nb	Sr	Ti	W	SiO <sub>2</sub>	Others
27	Molybdenum-Tungsten Ore	65g	...	2.11	...	1.76	...	...	...	...	0.036	...	0.276 Mo
29	Pyrolusite	40g	0.59	0.185	...	...	93.38	...	...	...	...	2.21	...
30	Chromite	55g	...	...	...	11.20	...	...	...	0.14	...	2.76	23.95 Cr, 16.63 MgO 29.12 Al <sub>2</sub> O <sub>3</sub>
32	Rutile	45g	...	...	...	...	...	0.26	...	57.19	...	...	...
35	Zircon	50g	...	...	...	...	...	...	...	0.16	...	...	1.20 Hf, 48.96 Zr
39	Fluorite	55g	0.44	...	46.85	...	...	...	0.014	...	...	...	...

**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.**

**Glass Certified Reference Materials** (Broken pieces - units of 25g) (G4, G7, G10 and G11 are also available as 40mm dia. glass discs)

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

\* Total iron as iron (III) oxide Fe<sub>2</sub>O<sub>3</sub>

\* Total arsenic as As<sub>2</sub>O<sub>3</sub>

\* Total sulphur as SO<sub>3</sub>

**HEALTH AND SAFETY LABORATORY (HSL), UK**  
**CHEMICAL COMPOSITION (nominal mass content in %)**

**Welding Fume Reference Materials** (Finely divided material – units of 1g)

HSL No.	Description	Fe	Mn	Ni	Cr	Zn
<b>MSWF-1</b>	Elements in Mild Steel Welding Fume	42.8	1.48	...	...	21.7
<b>SSWF-1</b>	Elements in Stainless Steel Welding Fume	29.8	22.9	3.7	8.4	...

**Respirable  $\alpha$ -Quartz Reference Material** (Finely divided material – units of 5g)

HSL No.	Description	% Crystallinity
<b>A9950</b>	Respirable $\alpha$ -Quartz Powder	89.3

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

**Aluminium Alloy Reference Materials** (Mushroom samples, approx. 58mm dia. x 7mm thick)

IMI Ref No.	Description	Cu	Mg	Si	Fe	Mn	Ni	Zn	Pb	Sn	Ti	Cr
<b>IMI 2WM1</b>	<b>BS 1490: LM 2</b>	1.69	0.005	8.90	0.26	0.60	0.39	2.42	0.21	0.20	0.20	<0.005
<b>IMI 2WM3</b>		0.41	0.19	8.33	1.19	0.35	0.21	0.70	0.10	0.10	0.11	0.09
<b>IMI 4P1</b>	<b>BS 1490: LM 4</b>	1.80	0.25	5.92	0.25	0.63	0.40	0.01	0.19	0.19	0.21	<0.005
<b>IMI 4P4</b>		3.69	0.045	4.55	0.84	0.30	0.11	0.46	0.05	0.055	0.05	0.15
<b>IMI 4P5</b>		4.25	<0.005	3.94	1.03	0.14	<0.005	0.61	<0.005	<0.005	<0.005	0.19
<b>IMI 620WM5</b>	<b>BS 1490: LM 6/9/20</b>	<0.005	0.005	12.85	0.15	0.84	<0.005	0.005	<0.005	<0.005	0.005	0.14
<b>IMI 24WM6</b>	<b>BS 1490: LM 24</b>	1.85	0.20	6.55	1.02	0.63	0.45	0.56	0.26	0.10	0.23	0.19
<b>IMI 25WM1</b>	<b>BS 1490: LM 25</b>	<0.005	0.87	5.92	0.59	0.24	0.19	0.20	<0.005	0.12	0.19	<0.005
<b>IMI 25WM5</b>		0.075	0.19	8.36	0.42	0.15	<0.005	0.015	0.07	<0.005	<0.005	0.10
<b>IMI 27WM2</b>	<b>BS 1490: LM 27</b>	1.52	0.12	7.79	0.35	0.57	0.30	0.63	0.14	0.045	0.16	0.12
<b>IMI 27WM5</b>		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.

## INDUSTRIAL ANALYTICAL (PTY) LTD. (IA), 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 <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	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)

### 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-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	Sn	Se	Te	Zn	Pb	Cd	Cr	As	Mn	Bi	V
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-Alloy Slag Reference Materials (Finely divided material – units of 120g) (nominal mass content in %)

IA No.	Description	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	FeO	Fe <sub>2</sub> O <sub>3</sub>	MnO	MgO	CaO	B <sub>2</sub> O <sub>3</sub>	Cr <sub>2</sub> O <sub>3</sub>
XS-FCS	Ferro-Chrome Slag	24.34	23.72	10.82	...	...	15.39	3.91	...	22.45
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 and figures in italic type only approximate.**

## 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
49	White Iron	<b>2.11</b>	...	<b>0.78</b>	<b>0.272</b>	<b>0.012</b>	<b>0.019</b>	<b>0.020</b>	...	<b>0.021</b>	<b>0.040</b>	...	...
69	Cast Iron	<b>3.34</b>	<b>2.50</b>	<b>2.07</b>	<b>0.715</b>	<b>0.267</b>	<b>0.018</b>	<b>0.353</b>	<b>0.004</b>	<b>0.272</b>	<b>0.473</b>	<b>0.019</b>	...
75A	Ni-Cr-Mo-Cu Iron	<b>3.4</b>	<b>2.7</b>	<b>1.98</b>	<b>0.722</b>	<b>0.250</b>	<b>0.033</b>	<b>0.487</b>	<b>0.439</b>	<b>0.425</b>	<b>0.433</b>	<b>0.022</b>	<b>0.030</b>

## 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	<b>85.2</b>	<b>4.61</b>	<b>4.74</b>	<b>4.73</b>	<b>0.33</b>	<b>0.003</b>	<b>0.211</b>	<b>0.019</b>	<b>0.114</b>	...	...	<b>0.068</b>	...	...	...	...
40	Brass	100g	<b>58.10</b>	<b>0.18</b>	<b>2.45</b>	<b>39.1</b>	<b>0.001</b>	...	<b>0.007</b>	...	<b>0.023</b>	...	<b>0.010</b>	...	<b>0.0015</b>	<b>0.049</b>	...	...
64	Pure Copper	50g	<b>99.98</b>	<i>&lt;0.0005</i>	<b>0.00006</b>	<i>0.001</i>	<b>0.00018</b>	...	<b>0.00045</b>	<i>0.0002</i>	<i>0.0002</i>	<i>&lt;0.0001</i>	<i>&lt;0.0006</i>	...	<b>0.0010</b>	...	<i>&lt;0.0002</i>	<i>&lt;0.0001</i>
74	Bronze	60g	<b>80.41</b>	<b>2.84</b>	<b>6.24</b>	<b>9.88</b>	<b>0.15</b>	<b>0.002</b>	<b>0.315</b>	<b>0.002</b>	<b>0.016</b>	...	...	<b>0.056</b>	...	<b>0.013</b>	...	...

## 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	<b>0.29</b>	<b>0.102</b>	<b>0.085</b>	<b>0.025</b>	<b>0.002</b>	<b>0.0113</b>	<b>0.0097</b>	<b>0.0048</b>	<b>0.0033</b>	<b>0.0014</b>	<b>0.0011</b>	<b>0.0006</b>	<b>0.0004</b>	<i>0.0002</i>
135	<b>0.125</b>	<b>0.011</b>	<b>0.045</b>	<b>0.018</b>	<b>0.002</b>	<b>0.0070</b>	<b>0.0113</b>	<b>0.0012</b>	<b>0.0027</b>	<b>0.0008</b>	<b>0.0006</b>	<b>0.0005</b>	<b>0.0003</b>	<i>0.0002</i>

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

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



## JERNKONTORET / NAREMA (JK), Sweden

**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.

### Alloy Steel and Special Alloy Certified Reference Materials (Finely divided material – units of 100g; also available as discs of 38mm dia. x 25mm depth)

JK No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Co	Cu	N	Pb
*ECRM 196-2	Silicon Steel	<b>0.0060</b>	<b>1.808</b>	<b>0.364</b>	<b>0.00369</b>	<b>0.00065</b>	<b>0.0282</b>	<b>0.0142</b>	<b>0.0401</b>	<b>0.2167</b>	<b>0.00033</b>	<b>0.00014</b>	<b>0.0138</b>	<b>0.0057</b>	<b>0.00178</b>	...
*ECRM 197-1	Low Alloy Steel	<b>0.219</b>	<b>0.275</b>	<b>0.792</b>	<b>0.0073</b>	<b>0.0232</b>	<b>0.451</b>	<b>0.402</b>	<b>0.148</b>	<b>0.0313</b>	<b>0.0083</b>	...	<b>0.0135</b>	<b>0.152</b>	<b>0.0114</b>	<i>0.0003</i>
*ECRM 268-1	Tool Steel	<b>1.134</b>	<b>0.373</b>	<b>0.293</b>	<b>0.0209</b>	<b>0.0154</b>	<b>4.578</b>	<b>3.208</b>	<b>0.1437</b>	<i>(0.00005)</i>	<b>0.0062</b>	<b>0.0009</b>	<b>0.0290</b>	<b>0.1232</b>	<b>2.030</b>	<i>(0.00016)</i>
*ECRM 270-1	Stainless Steel	<b>0.0742</b>	<b>1.517</b>	<b>0.540</b>	<b>0.0196</b>	<b>0.0007</b>	<b>20.88</b>	<b>0.2099</b>	<b>10.86</b>	<i>0.0023</i>	<i>0.0034</i>	...	<b>0.0685</b>	<b>0.1076</b>	<b>0.1417</b>	...
*ECRM 274-1	Vanadium Steel	<b>1.563</b>	<b>1.057</b>	<b>0.397</b>	<b>0.0148</b>	<b>0.0096</b>	<b>8.036</b>	<b>1.4551</b>	<b>0.077</b>	<i>0.0025</i>	<i>0.0013</i>	<i>0.0005</i>	<i>0.023</i>	<b>0.0281</b>	<b>0.0769</b>	<i>0.000064</i>
*ECRM 298-1	Duplex Steel	<b>0.0146</b>	<b>0.262</b>	<b>0.398</b>	<b>0.0198</b>	<b>0.0006</b>	<b>24.72</b>	<b>3.799</b>	<b>7.056</b>	<b>0.0285</b>	<i>0.003</i>	<b>0.0021</b>	<b>0.055</b>	<b>0.201</b>	<b>0.263</b>	<b>0.00008</b>
*ECRM 379-1	Stainless Steel	<b>0.0121</b>	<b>0.393</b>	<b>1.804</b>	<b>0.0166</b>	<b>0.0006</b>	<b>26.79</b>	<b>3.290</b>	<b>30.83</b>	<i>0.0246</i>	<i>0.0028</i>	<b>0.00190</b>	<b>0.0390</b>	<b>0.984</b>	<b>0.0550</b>	<i>0.000038</i>

### Alloy Steel and Special Alloy Certified Reference Materials (continued)

JK No.	Sn	Ti	V	W	Bi	Ca	Ce	Ga	Ir	La	Mg	Nb	Pr	Sb	Zn	Fe	O
*ECRM 196-2 (cont.)	<b>0.00047</b>	<b>0.00253</b>	<b>0.00368</b>	...	...	<b>0.00071</b>	...	...	...	...	<b>0.00075</b>	...	...	...	<b>0.00019</b>	...	...
*ECRM 197-1 (cont.)	<b>0.0097</b>	<b>0.0005</b>	<i>0.005</i>	...	...	...	...	...	...	...	...	...	...	<i>0.002</i>	...	...	...
*ECRM 268-1 (cont.)	<b>0.0078</b>	<i>&lt;0.0012</i>	<b>8.478</b>	<b>3.707</b>	<i>(0.00002)</i>	<i>(0.0004)</i>	...	<i>(0.0019)</i>	...	...	...	<i>&lt;0.0019</i>	...	<b>0.0017</b>	<i>(0.0010)</i>	...	...
*ECRM 270-1 (cont.)	<i>0.0035</i>	<i>0.0019</i>	<b>0.0256</b>	<i>0.0244</i>	...	...	<b>0.0487</b>	<i>0.0021</i>	<i>0.0002</i>	<b>0.0154</b>	<i>0.0009</i>	...	<i>0.00295</i>	<i>0.0007</i>	<i>0.00074</i>	...	...
*ECRM 274-1 (cont.)	<i>0.001</i>	<i>0.0011</i>	<b>4.010</b>	<b>0.0087</b>	...	...	...	...	...	...	...	...	...	<i>0.0002</i>	...	...	<i>0.0026</i>
*ECRM 298-1 (cont.)	<i>0.004</i>	<b>0.0014</b>	<b>0.0607</b>	<i>0.02</i>	<i>0.000006</i>	<i>0.002</i>	<i>0.00004</i>	<i>0.0023</i>	<i>0.00002</i>	...	<i>0.0008</i>	<i>0.004</i>	...	<i>0.0007</i>	...	<b>63.38</b>	<i>0.0036</i>
*ECRM 379-1 (cont.)	<b>0.0021</b>	<i>0.0014</i>	<b>0.0663</b>	<i>0.0091</i>	<i>0.00001</i>	<b>0.0033</b>	<i>0.00001</i>	<i>0.0023</i>	<i>0.00001</i>	...	<i>0.0006</i>	<i>0.0028</i>	<i>0.00002</i>	<b>0.00057</b>	...	<i>35.6</i>	<i>0.0027</i>

\* Denotes Full EURONORM-Certified Reference Materials

### Alloy Steel and Special Alloy Certified Reference Materials (Finely divided or disc material – as shown in table) (Note: discs of JK 27B are 38mm dia. x 25mm)

JK No.	Description	Unit	C	Si	Mn	P	S	Cr	Mo	Ni	Al <sub>tot</sub>	Co	Cu	N	Pb	Sn	V	W	Ce
JK 3B	Unalloyed Steel	150g	<b>0.742</b>	<b>0.251</b>	<b>0.803</b>	<b>0.0101</b>	<b>0.0071</b>	<b>0.0529</b>	<b>0.0051</b>	<b>0.0591</b>	<b>0.0036</b>	<b>0.0048</b>	<b>0.0175</b>	<b>0.0054</b>	<i>0.0002</i>	<b>0.0044</b>	<i>0.002</i>	...	...
JK 7B	Low Alloy Steel	150g	<b>0.342</b>	<b>0.267</b>	<b>0.697</b>	<b>0.0057</b>	<b>0.0064</b>	<b>1.34</b>	<b>0.182</b>	<b>1.34</b>	<b>0.014</b>	...	<b>0.021</b>	<b>0.0050</b>	...	...	<b>0.004</b>	...	...
JK 12A	Tool Steel	150g	<b>0.886</b>	<b>0.30</b>	<b>0.312</b>	<b>0.020</b>	<b>0.023</b>	<b>4.04</b>	<b>4.85</b>	<b>0.191</b>	...	<b>0.189</b>	<b>0.062</b>	<b>0.0259</b>	<b>0.0004</b>	<b>0.007</b>	<b>1.94</b>	<b>6.42</b>	...
JK 20A	Tool Steel	150g	<b>1.263</b>	...	...	...	<b>0.0094</b>	...	...	...	...	...	...	<b>0.0027</b>	<b>0.160</b>	...	<b>0.161</b>	<b>1.75</b>	...
JK 21	Low Alloy Steel	150g	<b>0.1741</b>	<b>0.36</b>	<b>1.46</b>	<b>0.0148</b>	<b>0.011</b>	<b>0.024</b>	<b>0.004</b>	<b>0.035</b>	...	<b>0.008</b>	<b>0.045</b>	<b>0.008</b>	<i>0.0010</i>	<b>0.006</b>	<b>0.002</b>	<i>0.0006</i>	...
JK 25	Stainless Steel	150g	...	...	<i>1.7</i>	...	...	<i>22.3</i>	<i>0.1</i>	<i>11.3</i>	...	...	...	...	...	...	...	...	<b>0.096</b>
JK 27B	Austenitic Stainless Steel	150g/disc	<b>0.0089</b>	<b>0.401</b>	<b>1.510</b>	<b>0.0298</b>	<b>0.0207</b>	<b>17.36</b>	<b>2.510</b>	<b>12.56</b>	<i>0.0021</i>	<b>0.142</b>	<b>0.265</b>	<b>0.0630</b>	<i>0.000097</i>	<b>0.0068</b>	<b>0.057</b>	<b>0.031</b>	...

### Alloy Steel and Special Alloy Certified Reference Materials (continued)

JK No.	Al Acid Sol.	Al Non-Acid	As	B	Nb	Sb	Ta	Ti	Zr	Ca	O	Mg	Ag	Bi	Zn	Cd
JK 3B (cont.)	...	...	<i>0.002</i>	...	...	<i>0.0007</i>	...	<i>0.0020</i>	...	<i>0.0005</i>	<i>0.018</i>	<i>0.0001</i>	<i>0.00002</i>	<i>0.0001</i>	...	...
JK 21 (cont.)	<b>0.032</b>	<b>0.005</b>	<i>0.0100</i>	...	<b>0.0175</b>	<i>0.0010</i>	<i>0.0010</i>	<b>0.0008</b>	<i>0.0010</i>	...	...	...	...	...	<i>0.0007</i>	<i>0.0001</i>
JK 27B (cont.)	...	...	<i>(0.006)</i>	<b>0.00072</b>	...	<i>(0.0014)</i>	...	<i>0.0002</i>	...	<b>0.0022</b>	<i>0.008</i>	...	...	...	<i>0.00017</i>	...

## JERNKONTORET / NAREMA (JK), Sweden

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

### C, S, N & O in Steel Certified Reference Materials (Finely divided or rod material – as shown in table)

JK No.	Description	Unit	C	Si	Mn	S	Cr	Ni	Al Tot.	Al Sol.	N	O
<b>JK 31</b>	Alloy Steel	8mm dia. x 500mm rod	<i>1.03</i>	<i>0.32</i>	<i>0.36</i>	...	...	...	<i>0.021</i>	<i>0.020</i>	...	<b>0.0015</b>
<b>JK 32</b>	Alloy Steel	10mm dia. x 500mm rod	<i>1.02</i>	<i>0.32</i>	<i>0.30</i>	...	<i>1.38</i>	...	<i>0.011</i>	<i>0.008</i>	...	<b>0.0028</b>
<b>JK 34</b>	Alloy Steel	8mm dia. x 500mm rod	<i>0.13</i>	<i>0.31</i>	<i>1.40</i>	...	...	...	<i>0.051</i>	<i>0.047</i>	...	<b>0.0068</b>
<b>JK 36</b>	Stainless Steel	150g	<b>0.0125</b>	...	...	<b>0.0126</b>	...	...	...	...	<b>0.0337</b>	...

### Iron Powder Certified Reference Material (Finely divided material – unit weight of 35g)

JK No.	Description	O	N	C	S
<b>JK 47A</b>	Iron Powder	<b>0.69</b>	<b>0.0062</b>	<b>0.370</b>	<i>0.0090</i>

### Ferro-Alloy Certified Reference Material (Finely divided material – unit weight of 50g)

JK No.	Description	C	Si	Mn	P	Cr	Ni	Al	Ca	Co	Cu	Fe	Ti	V
<b>JK 39</b>	Ferro-Silicon	<b>0.105</b>	<b>75.9</b>	<b>0.165</b>	<b>0.018</b>	<i>0.01</i>	<i>0.008</i>	<b>1.45</b>	<b>0.24</b>	<i>0.002</i>	<b>0.013</b>	<b>21.6</b>	<b>0.116</b>	<i>0.007</i>

### Iron Ore Certified Reference Material (Finely divided material – ECRMs 688-1 and 689-1 in units of 100g, JK 28 in units of 150g, JK 29A and JK 42A in units of 100g)

JK No.	Description	Fe <sub>2</sub> O <sub>3</sub>	FeO	Fe	SiO <sub>2</sub>	CaO	MgO	Al <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	MnO	P <sub>2</sub> O <sub>5</sub>	P	S
<b>*ECRM 688-1</b>	Iron Ore	...	...	<b>61.38</b>	<b>3.383 Si</b>	<b>1.449 Ca</b>	<b>1.061 Mg</b>	<b>0.679 Al</b>	<b>0.408 Ti</b>	<b>0.0457 Mn</b>	...	<b>0.337</b>	<i>0.047</i>
<b>*ECRM 689-1</b>	Iron Ore	...	...	<b>57.05</b>	<i>5.4 Si</i>	<b>1.183 Ca</b>	<b>0.980 Mg</b>	<b>1.185 Al</b>	<b>0.3264 Ti</b>	<b>0.1196 Mn</b>	...	<b>0.0706</b>	<i>0.058</i>
<b>JK 28</b>	Iron Ore	<b>91.5</b>	<b>2.4</b>	<b>65.86</b>	<b>4.20</b>	<b>0.30</b>	<b>0.30</b>	<b>0.60</b>	<b>0.20</b>	<b>0.059</b>	<b>0.102</b>	<b>0.045</b>	<b>0.004</b>
<b>JK 29A</b>	Magnetite	...	...	<b>71.36</b>	<b>0.33</b>	<b>0.082</b>	<b>0.223</b>	<b>0.232</b>	<b>0.292</b>	<b>0.0632</b>	...	<b>0.0059</b>	<b>0.0059</b>
<b>JK 42A</b>	Magnetite	...	...	<b>70.66</b>	<b>0.800</b>	<b>0.199</b>	<b>0.382</b>	<b>0.278</b>	<b>0.385</b>	<b>0.0506</b>	...	<b>0.0247</b>	<b>0.0082</b>

### Iron Ore Certified Reference Materials (continued)

JK No.	Na <sub>2</sub> O	K <sub>2</sub> O	V <sub>2</sub> O <sub>5</sub>	Cr	Ni	Co	Cu	Sn	Pb	Zn
<b>*ECRM 688-1</b> (cont.)	<b>0.333 Na</b>	<b>0.180 K</b>	<b>0.135 V</b>	<i>0.002</i>	<b>0.0136</b>	<b>0.0096</b>	<b>0.0023</b>	<i>0.0003</i>	<b>0.00025</b>	<b>0.0015</b>
<b>*ECRM 689-1</b> (cont.)	<b>0.638 Na</b>	<b>0.462 K</b>	<b>0.1020 V</b>	<i>&lt;0.002</i>	<b>0.0195</b>	<b>0.0103</b>	<b>0.0068</b>	<i>&lt;0.0004</i>	<i>(0.0005)</i>	<b>0.0042</b>
<b>JK 28</b> (cont.)	<b>0.11</b>	<b>0.12</b>	<b>0.21</b>	...	...	...	<b>0.002</b>	...	...	...
<b>JK 29A</b> (cont.)	<b>0.015</b>	<b>0.0087</b>	<b>0.266</b>	<b>0.0057</b>	<b>0.0167</b>	<b>0.0106</b>	<b>0.0007</b>	<i>0.0002</i>	<i>&lt;0.001</i>	<b>0.0016</b>
<b>JK 42A</b> (cont.)	<b>0.043</b>	<b>0.0157</b>	<b>0.251</b>	<b>0.0010</b>	<b>0.0129</b>	<b>0.0105</b>	<b>0.0007</b>	<i>0.0003</i>	<i>&lt;0.001</i>	<b>0.0015</b>

\* Denotes Full EURONORM-Certified Reference Materials

## JERNKONTORET / NAREMA (JK), Sweden

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

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

JK No.	Description	Unit	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	FeO	Fe <sub>2</sub> O <sub>3</sub>	Ca	CaO	CaF <sub>2</sub>	MgO	MnO	P	S	C	F	P <sub>2</sub> O <sub>5</sub>	V <sub>2</sub> O <sub>5</sub>	Cr <sub>2</sub> O <sub>3</sub>	Pb
<b>JK S10</b>	Electro Slag Refining	100g	<b>7.8</b>	<b>0.54</b>	<b>0.05</b>	<b>0.10</b>	...	<b>50.8</b>	<b>20.3</b>	<b>70.7</b>	<b>0.30</b>	<b>0.03</b>	<b>0.002</b>	...	<b>0.022</b>	<b>34.4</b>	...	<i>&lt;0.01</i>	...	...
<b>JK S11</b>	AOD Slag	100g	<b>26.8</b>	<b>2.85</b>	<b>0.95</b>	<b>0.2</b>	...	...	<b>60.0</b>	...	<b>4.7</b>	<b>0.12</b>	...	<b>0.30</b>	...	<b>7.9</b>	<i>&lt;0.005</i>	<i>&lt;0.01</i>	<b>0.17</b>	...
<b>JK D</b>	Fluorspar	100g	<i>1.5</i>	<b>0.04</b>	...	...	<b>0.20</b>	...	...	<b>97.07</b>	...	...	<b>0.035</b>	<b>0.004</b>	...	<b>47.24</b>	...	...	...	<i>&lt;0.001</i>

### Blast Furnace Slag Certified Reference Material (Finely divided material – unit of 100g)

JK No.	Description	Fe	Si	Ca	Mg	Al	Ti	Mn	P	S	Na	K	V	Cr	Ni	Mo	Ba	Sr	Zr
<b>*ECRM 883-1</b>	Blast Furnace Slag	<b>0.9820</b>	<b>16.67</b>	<b>21.32</b>	<b>8.86</b>	<b>6.55</b>	<b>1.3331</b>	<b>0.546</b>	<b>0.0033</b>	<b>1.0885</b>	<b>0.316</b>	<b>0.393</b>	<b>0.122</b>	<b>0.0130</b>	<b>0.00053</b>	<b>≤0.001</b>	<b>0.0436</b>	<b>0.0380</b>	<b>0.0276</b>

### Industrial Fly Ash Certified Reference Materials (Finely divided material – unit weights as shown in table)

JK No.	Description	Unit	Fe	Ca	Al	Na	K	Zn	Pb	Cd	Cr	Ni	Cu	V	As	Bi	Sb	Hg	Sn
<b>*ECRM 882-1</b>	Industrial Fly Ash	100g	<b>22.20</b>	<b>10.11</b>	<b>0.375</b>	<b>0.697</b>	<b>0.960</b>	<b>28.49</b>	<b>1.324</b>	<b>0.0183</b>	<b>0.490</b>	<b>0.0263</b>	<b>0.218</b>	<b>0.0090</b>	<b>0.0054</b>	<b>0.0026</b>	<b>0.0116</b>	<b>0.000075</b>	<i>0.021</i>
<b>JK 43</b>	Industrial Fly Ash	15g	<i>20</i>	<i>12</i>	<i>0.2</i>	<i>0.5</i>	<i>0.3</i>	<b>4.96</b>	<b>0.21</b>	<b>0.0023</b>	<i>8</i>	<i>2</i>	<i>0.2</i>	<i>0.02</i>	...	...	...	<b>0.00039</b>	...
<b>JK 44</b>	Industrial Fly Ash	25g	<i>27</i>	<i>5</i>	<i>0.2</i>	<i>1</i>	<i>1.3</i>	<b>27.3</b>	<b>2.74</b>	<b>0.0469</b>	<i>0.2</i>	<i>0.02</i>	<i>0.2</i>	<i>0.02</i>	...	...	...	<b>0.00028</b>	...
<b>JK 45</b>	Industrial Fly Ash	15g	<i>40</i>	<i>7</i>	<i>0.1</i>	<i>7</i>	<i>0.4</i>	<b>1.53</b>	<b>0.11</b>	<b>0.0047</b>	<i>0.3</i>	<i>0.05</i>	<i>0.01</i>	<i>0.1</i>	...	...	...	<b>0.000025</b>	...

\* Denotes Full EURONORM-Certified Reference Materials

### Ceramic (high oxygen) Setting-up Sample (Disc – 25mm dia. x 8mm)

JK No.	Description	O	Al	C <sub>Total</sub>	Ti	Fe	W
<b>CE 650A</b>	Ceramic (high oxygen)	<i>30</i>	<i>34</i>	<i>6</i>	<i>21</i>	<i>2.1</i>	<i>0.8</i>

### Depth Profile Setting-up Sample (Plate – 102mm x 68mm x 0.5mm)

JK No.	Description	P	Al	Ni	Layer thickness
<b>JK SUS NiP-1</b>	Steel plate with a layer of electroplated nickel (NiP alloy)	<i>5.8 ± 0.02</i>	<i>0.26 ± 0.02</i>	<i>bal.</i>	<i>8.7 ± 0.5 μm</i>

## LUCIDEON (formerly CERAM Research) (LUCIDEON), UK

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

### Siliceous, Zircon Bearing and Basic Reference Materials (Finely divided material – units of 100g)

LUCIDEON No.	Description	SiO <sub>2</sub>	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	CaO	MgO	K <sub>2</sub> O	Na <sub>2</sub> O	Li <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	Cr <sub>2</sub> O <sub>3</sub>	Mn <sub>3</sub> O <sub>4</sub>	B <sub>2</sub> O <sub>3</sub>	BaO	CuO	PbO	ZnO	SrO	ZrO <sub>2</sub>	HfO <sub>2</sub>	LOI		
AN25	Alumina	<0.01	<0.01	99.39	0.03	0.03	<0.01	0.01	0.53	...	<0.01	...	...	...	...	...	...	...	...	...	...	...	#(0.34)	
AN26	Alumina	0.12	<0.01	99.76	0.03	0.03	<0.01	<0.01	0.02	...	...	...	...	...	...	...	...	...	...	...	...	...	...	#(0.08)
AN28	Lead Bisilicate Frit	32.76	<0.01	2.46	0.018	0.05	<0.01	0.05	0.05	...	...	...	...	...	...	...	64.33	...	...	...	...	...	0.15	
AN36	Magnesite	0.48	0.01	0.42	4.66	0.94	93.30	<0.01	<0.05	...	0.008	0.004	0.11	0.09	...	...	...	...	...	...	...	...	...	
AN37	Magnesite	1.39	0.03	1.06	1.80	1.46	94.00	<0.01	<0.05	...	0.02	0.005	0.12	0.09	...	...	...	...	...	...	...	...	...	
AN46	Zircon Batt	45.46	0.48	30.52	0.85	0.20	5.34	1.03	0.15	0.02	...	...	...	...	...	...	...	...	...	15.41	0.32	0.08	...	
AN100	Chrome Ore	11.1	0.21	24.7	12.88	1.16	22.38	0.01	0.04	...	...	26.60	0.13	...	...	0.02	...	0.04	...	...	...	...	...	#(5.03)
2CAS12	Sillimanite	33.9	1.31	63.8	0.31	0.25	0.12	0.13	0.15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.13
2CAS14	Steatite	62.7	0.005	0.149	0.314	0.249	31.28	0.002	0.008	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5.10
2CAS15	Zircon	33.9	0.20	0.38	0.07	0.28	0.07	0.01	0.02	...	...	...	...	...	...	...	...	...	...	...	63.6	1.28	0.23	...
CCB1*	Calcined Bone	1.28	<0.01	0.05	0.04	53.4	1.14	0.011	0.52	...	40.5	...	...	...	0.031	...	...	...	0.049	...	...	...	...	2.60
CEB1	Earthenware Body	74.0	0.34	16.2	0.48	0.52	0.16	1.75	0.71	...	0.14	...	...	...	0.05	...	...	...	0.02	...	...	...	...	5.60

\* CCB1 has the following additional constituent values: F 0.13%, SiO<sub>2</sub> as quartz (0.5%), SO<sub>3</sub> (0.114%) and H<sub>2</sub>O (0.12%). Hydroxyapatite is the major constituent, estimated as 99.5% (by difference).

# Results calculated on the ignited 1025°C basis (otherwise calculated on the dried basis at 110°C)

Please note that LUCIDEON (formerly CERAM Research) also provides a series of RMs for physical properties of ceramic materials. These include two thermal expansion RMs, one of alumina and the other of cordierite. Further details of how these RMs are supplied, as special cut bars or pieces, will gladly be provided on request.

LUCIDEON (formerly 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 and Cordierite Thermal Expansion CRMs and Dental Frit Particle Size Distribution CRM.

# MBH ANALYTICAL LTD. (MBH), U.K. (via Analytical Reference Materials International, USA)

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

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

MBH No.	Pb	Mg	Al	Cd	Fe	Sn	Cu	Ni	Mn	Ti	In	Tl	Bi	Sb	Si	Hg
41X Z3(M)	0.00502	(0.00034)	0.00158	0.00327	0.00605	0.00297	0.00345	0.00209	0.00524	...	0.00233	0.00210	0.00315	0.00167	...	0.00289
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	0.00632	0.0109	0.00514	0.00494	...	0.00573	0.0068	0.0056	0.0054	...	0.0050
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 (Approx. 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 (Approx. 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(J)	0.0017	0.0009	4.66	0.0014	0.013	0.0007	0.0050	0.0014	0.0038	0.0004	...	...	...	(0.0018)	0.0011	0.0011	(0.0008)
42X Z2(K)	0.0029	0.0146	3.79	0.0017	0.0055	0.0011	0.0300	0.00155	0.0274	(0.0001)	...	...	...	0.0011	0.0010	0.0055	0.0026
42X Z3(J)	0.0068	0.0503	3.84	0.0065	0.0145	0.0048	0.135	0.0071	0.0090	...	...	...	...	(0.0018)	0.0006	0.0032	0.0013
42X Z4(J)	0.0133	0.0663	3.52	0.0065	0.019	0.0052	0.0752	0.0170	0.0083	(0.0002)	0.0025	...	...	0.006	...	0.0361	0.0183
42X Z5(M)	0.0030	0.0508	4.33	0.0013	(0.05)	0.0012	0.111	0.041	0.0049	(0.0002)	0.0047	...	0.0017	...	...	0.0328	0.0150
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(D)#	0.004	0.010	4.35	0.002	0.025	0.0025	0.025	0.008	0.005	...	...	...	...	0.002	...	0.060	0.025
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)	0.011 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	0.0028	0.046	0.0022	0.156	0.0413	0.0483	0.00063	0.0068	...	0.0076	...	0.0070	0.0116	0.0084

# Supplied with a provisional certificate.

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

MBH No.	Pb	Mg	Al	Cd	Fe	Sn	Cu	Ni	Mn	Cr	Ti	Sb	Bi	Si	Be
43X Z1(L)	0.0011	0.0345	4.48	0.0004	0.0009	(0.0005)	0.720	0.0069	0.0075	...	0.0037 Ag	(0.0006)	(0.0008)	...	...
43X Z2(P)	0.0048	0.0614	4.07	0.0031	0.0013	0.0033	1.019	0.0100	0.0162	...	0.0098 Ag	0.0012	0.0038	...	...
43X Z3(M)	0.0077	0.114	3.40	0.0109	(0.042)	0.0058	1.499	0.0062	0.0013	0.0046	...	0.0029	0.0092	...	...
43X Z4(C)	0.0062	0.0480	4.79	0.0033	0.0017	0.0030	2.69	0.0258	0.0153	...	...	(0.0023)	0.0113	(0.0012)	...
43X Z5(B)	0.0029	0.0144	3.164	0.0030	0.10	(0.0004)	5.92	0.0056	0.0061	...	0.0254 Ag	0.065	0.0148	(0.0005) As	(0.0013) Sr
43X Z6(B)	0.004	0.0238	4.51	0.0031	0.024	0.0052	2.85	0.0027	0.0022	0.0005	...	0.0044	0.0054	...	...
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	0.0016	(0.0009)	...	0.0194
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	0.0033	0.0033	...	0.0010
43X Z10(A)	0.0046	0.0403	3.99	0.0014	0.007	0.0012	2.97	0.0036	0.0050	0.00027	...	...	...	0.009	...
43X Z11(F)	0.0202	0.0357	11.12	0.0175	0.015	0.0145	0.335	0.0014	0.0032	(0.0003)	...	0.0009	0.0046	0.0013	...
43X Z12(E)	0.0041	0.0287	10.38	0.0045	0.037	0.0017	0.791	0.0033	0.0026	0.0008	0.0050	0.0032	0.0021	(0.002)	...
43X Z13(E)	0.0086	0.0198	9.01	0.0072	0.0045	0.056	1.113	0.0036	0.0025	0.0004	...	0.0020	0.0014	(0.0012)	...
43X Z14(F)	0.0019	0.0123	7.98	0.00567	0.0025	0.0005	1.238	0.0058	(0.0003)	0.0037	(0.0001)	0.0105	0.0106	(<0.001)	...
43X Z15(D)	0.0029	0.0236	8.33	0.0036	0.0056	0.0020	1.18	0.0082	0.0067	...	...	(0.0010)	0.0055	...	...

# MBH ANALYTICAL LTD. (MBH), U.K. (via Analytical Reference Materials International, USA)

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

## Aluminium/Silicon/Copper (Cast) Reference Materials (All approx. 50mm dia. x 15mm discs, except 55X G02D7(P) approx. 65mm dia. x 30mm & G02D8(M) approx. 50mm dia. x 50mm 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(P)*	1.489	0.343	10.24	1.02	0.493	0.209	0.908	0.352	0.171	0.214	0.0558	0.0378	0.0242	0.0021	0.0008	0.00008
55X G02D8(M)*	2.481	0.1517	9.24	0.776	0.256	0.406	1.415	0.201	0.201	0.1535	0.0756	0.0107	0.0536	0.0112	0.0029	0.0008
55X G02D9(K)	3.51	0.093	8.49	0.423	0.269	0.494	2.48	0.10	0.187	0.096	0.185	0.0074	0.0223	0.049	0.0012	0.0035
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

\* Supplied as HIP material (Please note that G02D7(P) also has the following additional constituent values: B 0.0010% and Ca 0.0070%).

## Magnesium/Aluminium/Zinc (Cast) Reference Materials (Approx. 40-50mm 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 MgA11(B)	3.63	1.59	0.047	0.0496	(0.024)	0.0048	0.0134	(0.09)	0.093	0.0183	(0.0002)	0.0022	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(B)	9.50	0.752	0.246	0.0181	0.205	0.0219	0.0069	...	0.014	0.0086	0.0047	0.0018	0.0015	0.0151	0.0074	(0.031) 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(C)	3.38	0.711	0.277	0.0222	0.042	0.0028	0.0027	(0.003)	0.0017	0.0023	0.0028	0.0019	0.0025	...	...	...	...	...
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	0.00016	0.0003	(0.0001)	...	(0.0008)	<0.001

\* Unsuitable for use with glow-discharge systems

## Tin with Impurities (Cast) Reference Material (Approx. 40mm dia. x 20mm discs)

MBH No.	Sb	As	Bi	Pb	Cu	Fe	Co	Ni	Al	Ag	P	Cd	Zn	In	Au	Te	Se	Hg	Ge
71X SR1(F)	0.0203	0.0032	0.0102	0.0256	0.0016	(0.002)	0.0016	0.0058	(0.002)	0.012	0.0014	0.0109	0.0126	0.0104	0.0022	0.0010	0.004	0.0178	0.011

## MBH ANALYTICAL LTD. (MBH), U.K. (via Analytical Reference Materials International, USA)

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

### Tin White Metal (Pewter, Babbit) Reference Materials (Approx. 40mm dia. x 15mm discs)

MBH No.	As	Bi	Sb	Pb	Cu	Fe	Cd	Zn	Ni	Al	Ag	Co	In	S	P
73X SC2(B)	0.0355	0.602	3.05	0.0457	1.028	0.0037	0.0282	(0.0007)	0.0156	...	0.0318	0.0217	0.0099	...	...
73X SC4(B)	0.0268	0.153	5.94	0.429	2.63	0.0014	0.0085	(0.001)	0.0130	(0.0015)	0.0525	0.0020	0.0143	...	0.005
73X SC5(A)	0.013	0.43	7.03	0.136	0.57	0.004	0.008	0.001	0.0058	0.003	0.063	0.011	0.036	(0.001)	...
73X SC7(B)	0.059	0.013	13.86	0.32	5.71	(0.043)	0.0019	0.0033	0.016	(0.001)	0.0059	0.0143	0.0194	(0.0007)	...
73X SC8(B)	0.11	0.0531	5.52	0.110	3.78	0.055	0.098	0.004	0.0351	(0.0007)	0.0253	0.0267	0.0325	0.004	...
73X SC9(B)	0.117	0.0825	8.31	0.305	8.03	0.053	0.0506	...	0.0084	(0.0010)	0.0055	0.0051	0.0059	...	...
73X SC11(C)	0.248	0.554	12.98	0.0630	11.51	0.0052	1.72	0.005	0.110	...	(0.056)	...	...	...	0.025
73X SC12(B)	(0.034)	0.0301	7.50	0.091	6.03	0.024	0.758	0.0212	0.115	0.0015	0.842	0.0210	...	...	...
73X SC13(A)	0.054	0.0188	4.21	0.259	4.19	0.053	0.0021	0.0126	...	(0.01)	...	...	...	...	(0.02)

### Lead with Impurities Reference Materials (Approx. 40mm dia. x 15mm discs)

MBH No.	Sn	Sb	Bi	Cu	As	Ag	Fe	Zn	Cd	In	Ni	Te	Se	Au	Tl	Na	Hg	Pt	S
83X PR1(K)	0.016	0.0100	0.0508	0.0465	0.0338	0.1029	...	(0.002)	0.074	0.0080	(0.0004)	0.0058	0.0008	0.0019	...	...	...	...	...
83X PR2(G)	0.0948	0.0499	0.0404	0.0309	0.0233	0.055	...	0.0005	0.0020	0.0010	0.0006	0.0100	0.0005	0.0005	(0.0017)	0.0013	0.003	...	...
83X PR3(G)	0.0417	0.0888	0.144	0.694	0.0011	0.0029	...	(0.0007)	0.0462	0.0093	0.0116	0.0039	0.0166	0.0036	0.0033	(0.0038)	0.0008	...	...
83X PR4(H)	...	0.0050	0.0150	0.0454	0.0003	0.0114	...	...	0.0081	...	0.0029	0.0229	(0.004)	0.0021	0.0021	...	0.019	...	...
83X PR7(C)	0.218	0.789	0.497	0.148	0.0503	0.287	...	...	0.450	0.550	0.0027	0.0094	0.0069	...	...	...	...	0.0047	...
83X PR8(D)	0.604	0.257	1.18	0.0448	0.134	0.497	...	0.0004	0.199	0.293	0.0008	0.0014	(0.0003)	0.0106	...	...	0.086	...	...
83X PR11(A)	0.119	0.497	0.0117	0.0551	0.0095	0.0030	(0.0003)	...	0.0008	...	0.0011	...	(0.0001)	...	0.0042	...	...	...	0.009
83X PR12(A)	0.0005	0.0011	0.0119	0.0353	(0.0003)	0.0030	(0.0003)	...	0.0011	...	0.0009	...	(0.0002)	...	0.0051	...	...	...	(0.0002)

**Please note that the batches of MBH samples denoted (A), (B), (C) etc., may change from time to time and that the compositions may therefore vary from those stated above.  
Please check at the time of ordering which batch is currently available.**

# 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.**

## Electrolytic Iron and Low Alloy Steel Certified Reference Materials

(SRMs 361 and 363 finely divided material, units of 150g; SRMs 1264a and 1265a 31mm dia x 19mm discs and 1761a-1767 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	2016	<b>0.383</b>	<b>0.222</b>	<b>0.66</b>	<b>0.014</b>	<b>0.0143</b>	<b>0.694</b>	<b>0.19</b>	<b>2.00</b>	<b>0.021</b>	<b>0.017</b>	<b>0.000478</b>	<b>0.032</b>	<b>0.042</b>
SRM 363	Cr-V (Mod)	2012	<b>0.62</b>	<b>0.74</b>	<b>1.50</b>	<b>0.029</b>	<b>0.0068</b>	<b>1.31</b>	<b>0.028</b>	<b>0.30</b>	<b>0.24</b>	<b>0.010</b>	<b>0.00131</b>	<b>0.048</b>	<b>0.10</b>
SRM 1264a	High Carbon (Mod)	2019	<b>0.87</b>	<b>0.067</b>	<b>0.258</b>	<b>0.010</b>	<b>0.025</b>	<b>0.066</b>	<b>0.49</b>	<b>0.142</b>	<i>0.008</i>	<b>0.052</b>	<i>0.011</i>	<b>0.15</b>	<b>0.250</b>
SRM 1265a	Electrolytic Iron	2019	<b>0.0067</b>	<b>0.0080</b>	<b>0.0057</b>	<b>0.0011</b>	<b>0.0055</b>	<b>0.0072</b>	<b>0.0050</b>	<b>0.041</b>	<i>0.0007</i>	<i>0.0002</i>	<b>0.00013</b>	<b>0.0070</b>	<b>0.0058</b>
SRM 1761a	Low Alloy Steel	2008	<i>1.05</i>	<i>0.182</i>	<b>0.679</b>	<b>0.042</b>	<b>0.037</b>	<b>0.222</b>	<b>0.103</b>	<b>1.981</b>	<b>0.055</b>	<i>0.011</i>	<b>0.0023</b>	<i>0.027</i>	<b>0.298</b>
SRM 1762a	Low Alloy Steel	2015	<b>0.341</b>	<b>0.351</b>	<b>1.912</b>	<b>0.0346</b>	<b>0.0295</b>	<b>0.923</b>	<b>0.353</b>	<b>1.156</b>	<b>0.0706</b>	<b>0.0173</b>	<b>0.0042</b>	<b>0.0616</b>	<b>0.1186</b>
SRM 1763b	Low Alloy Steel	2019	<b>0.201</b>	<b>0.6275</b>	<b>1.605</b>	<b>0.01233</b>	<b>0.0229</b>	<b>0.5039</b>	<b>0.491</b>	<b>0.5075</b>	<b>0.0422</b>	<b>0.0539</b>	<b>0.00535</b>	<b>0.09248</b>	<b>0.4170</b>
SRM 1764a	Low Alloy Steel	2009	<b>0.592</b>	<b>0.0595</b>	<b>1.193</b>	<b>0.0210</b>	<b>0.0118</b>	<b>1.468</b>	<b>0.2007</b>	<b>0.2006</b>	<b>0.0098</b>	<b>0.0100</b>	<i>0.0010</i>	<i>0.012</i>	<b>0.5178</b>
SRM 1765	Low Alloy Steel	1993	<b>0.006</b>	<i>(0.004)</i>	<b>0.144</b>	<b>0.0052</b>	<b>0.0038</b>	<b>0.051</b>	<b>0.005</b>	<b>0.154</b>	<i>(0.006)</i>	<b>0.0010</b>	<b>0.0009</b>	<b>0.0012</b>	<b>0.0013</b>
SRM 1767	Low Alloy Steel	1993	<b>0.052</b>	<b>0.026</b>	<b>0.022</b>	<b>0.0031</b>	<b>0.0090</b>	<b>0.0015</b>	<b>0.020</b>	<b>0.002</b>	<b>0.004</b>	<b>0.0005</b>	<b>0.001</b>	<b>0.0050</b>	<b>0.0014</b>

## 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>	<b>0.022</b>	<b>0.000025</b>	<b>0.010</b>	<b>0.020</b>	<b>0.020</b>	<b>0.011</b>	<b>0.017</b>	<b>0.009</b>	<b>0.0004</b>	<i>0.0004</i>	<b>0.00010</b>	<b>0.0040</b>
SRM 363	<i>0.0041</i>	<b>0.049</b>	<b>0.00186</b>	<b>0.104</b>	<i>0.053</i>	<b>0.050</b>	<b>0.31</b>	<b>0.046</b>	<b>0.049</b>	<b>0.0037</b>	<i>0.0008</i>	<b>0.00022</b>	<b>0.0030</b>
SRM 1264a	<i>0.0032</i>	<b>0.157</b>	<b>0.024</b>	<i>0.008</i>	<b>0.11</b>	<b>0.24</b>	<b>0.106</b>	<b>0.102</b>	<b>0.069</b>	<i>0.00002</i>	<i>0.0009</i>	<b>0.00004</b>	<b>0.00022</b>
SRM 1265a	<i>0.0011</i>	...	<b>0.000015</b>	<i>0.0002</i>	<i>&lt;0.0005</i>	<i>0.0001</i>	<b>0.0006</b>	<i>0.00004</i>	<i>&lt;0.00001</i>	<i>0.000002</i>	<i>&lt;0.00001</i>	<i>&lt;0.00001</i>	<i>&lt;0.000005</i>
SRM 1761a	<i>0.0042</i>	<b>0.021</b>	...	<i>0.050</i>	<i>0.050</i>	<b>0.173</b>	<b>0.054</b>	...	<b>0.012</b>	...	...	...	...
SRM 1762a	<i>(0.002)</i>	<b>0.0692</b>	...	<b>0.0479</b>	<b>0.0203</b>	<b>0.0952</b>	<b>0.2010</b>	...	<b>0.0285</b>	...	...	...	...
SRM 1763b	...	<b>0.0998</b>	...	<b>0.01098</b>	<b>0.0119</b>	<b>0.313</b>	<b>0.3075</b>	<b>0.00216</b>	<b>0.0445</b>	...	...	...	...
SRM 1764a	<i>0.0023</i>	<b>0.0416</b>	...	<i>0.024</i>	<b>0.0297</b>	<b>0.0286</b>	<b>0.1063</b>	<i>(0.0016)</i>	<i>0.0012</i>	...	...	...	...
SRM 1765	<b>0.0010</b>	<b>0.0004</b>	<b>0.0003</b>	<b>0.002</b>	<i>(0.004)</i>	<b>0.0055</b>	<b>0.0040</b>	...	<i>(0.0002)</i>	<b>0.0002</b>	<i>(&lt;0.0001)</i>	...	...
SRM 1767	<b>0.0008</b>	<b>0.010</b>	<i>0.0001</i>	<b>0.006</b>	<i>0.002</i>	<b>0.011</b>	<b>0.033</b>	...	<i>0.004</i>	<b>0.0008</b>	<i>&lt;0.0001</i>	<i>0.0003</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>&lt;0.00005</i>	<i>0.006</i>	<i>&lt;0.0005</i>	<i>0.0002</i>	<i>0.001</i>	<b>0.00026</b>	<b>0.00029</b>	<i>0.0009</i>	<i>0.0003</i>	<b>0.0042</b>	<i>0.0006</i>	<i>0.0001</i>
SRM 363	<i>94.4</i>	<b>0.0005</b>	<i>0.010</i>	<i>&lt;0.0005</i>	<i>0.0005</i>	<i>0.002</i>	<b>0.00062</b>	<b>0.0012</b>	<i>0.00066</i>	<i>0.0004</i>	<b>0.002</b>	<i>0.0009</i>	<i>0.0004</i>
SRM 1264a	<i>96.7</i>	<i>0.0001</i>	<i>0.003</i>	<i>&lt;0.0005</i>	<i>0.0013</i>	<b>0.00007</b>	<b>0.00015</b>	<b>0.00007</b>	<i>0.0010</i>	<i>0.00003</i>	<b>0.034</b>	<b>0.00018</b>	<i>0.001</i>
SRM 1265a	<i>99.9</i>	<i>&lt;0.000002</i>	<i>0.0014</i>	<i>0.0001</i>	<i>&lt;0.00002</i>	<i>&lt;0.000005</i>	<i>&lt;0.00002</i>	<i>&lt;0.000005</i>	<i>0.0063</i>	<i>&lt;0.000005</i>	<i>&lt;0.00001</i>	<i>&lt;0.00001</i>	<i>&lt;0.0001</i>
SRM 1761a	<i>95.0</i>	...	...	...	...	...	...	...	...	...	<i>0.0052</i>	...	...
SRM 1762a	<i>(94.2)</i>	...	...	...	...	...	...	...	...	...	...	...	...
SRM 1763b	<i>(95.0)</i>	...	...	...	...	...	...	...	...	...	<i>0.0110</i>	...	...
SRM 1764a	<i>(95.1)</i>	...	...	...	...	...	...	...	...	...	...	...	...

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



# 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.**

## High Temperature Alloy and Specialty Steel Certified Reference Materials (Approx. 32-35mm dia x 19mm discs except SRM 126c, SRM 867 and SRM 868 which are finely divided material, units of 150g, 100g and 150g respectively)

NIST No.	Description	Cert. Date	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	Cu	N	Nb
SRM 1158 (SRM 126c)	High Nickel Steel (36% Ni)	2017	<b>0.02540</b>	<b>0.1936</b>	<b>0.4684</b>	<i>0.00350</i>	<i>0.0050</i>	<i>0.0625</i>	<i>0.0110</i>	<b>36.054</b>	...	...	<i>0.0396</i>	...	...
SRM 1230	High Temperature Alloy A286	2016	<b>0.0428</b>	<b>0.411</b>	<b>0.652</b>	<b>0.0239</b>	<b>0.00095</b>	<b>14.65</b>	<b>1.15</b>	<b>24.08</b>	<b>0.249</b>	<i>(&lt;0.005)</i>	<b>0.137</b>	<i>(0.003)</i>	<i>0.067</i>
SRM 1247 (SRM 867)	Ni-Fe-Cr Alloy UNS N08825	2015	<b>0.0212</b>	<b>0.3234</b>	<b>0.3806</b>	<b>0.0203</b>	<i>0.0017</i>	<b>23.375</b>	<b>2.723</b>	<b>43.47</b>	<b>0.0630</b>	<b>0.00257</b>	<b>1.767</b>	<i>0.0170</i>	<b>0.458</b>
SRM 1250 (SRM 868)	High Temperature Alloy Fe-Ni-Co	1993	<b>0.022</b>	<b>0.097</b>	<b>0.052</b>	<i>(&lt;0.003)</i>	<b>0.0025</b>	<b>0.077</b>	<b>0.014</b>	<b>37.78</b>	<b>0.99</b>	...	<b>0.022</b>	...	<b>2.99</b>
SRM C2400	Fe-Cr-Ni Alloy UNS J92180	2016	<b>0.036</b>	<b>0.61</b>	<b>0.71</b>	<b>0.013</b>	<b>0.003</b>	<b>17.06</b>	<b>0.23</b>	<b>4.07</b>	<i>(&lt;0.01)</i>	...	<b>2.63</b>	...	<b>0.15</b>

## High Temperature Alloy and Specialty Steel CRMs (continued)

NIST No.	Pb	Sn	Ta	Ti	Tl	V	W	Zr	Ag	B	Bi	Co	Fe	Ga	O
SRM 1158 (SRM 126c)	...	...	...	...	...	<i>(0.001)</i>	...	...	...	...	...	<i>0.0080</i>	...	...	...
SRM 1230	<i>(&lt;0.0003)</i>	<i>(&lt;0.033)</i>	<i>(&lt;0.001)</i>	<b>2.18</b>	...	<b>0.229</b>	<i>0.0695</i>	<i>(&lt;0.018)</i>	<i>(0.000025)</i>	<b>0.00519</b>	<i>(&lt;0.0001)</i>	<b>0.151</b>	<b>55.6</b>	...	...
SRM 1247 (SRM 867)	<b>0.0000340</b>	<i>(0.0030)</i>	<i>(&lt;0.0010)</i>	<b>0.755</b>	<b>0.000000223</b>	<b>0.0478</b>	<i>0.0056</i>	...	<i>0.000025</i>	<b>0.00198</b>	<i>(&lt;0.00005)</i>	<b>0.092</b>	<b>26.564</b>	<i>0.0112</i>	<i>0.0050</i>
SRM 1250 (SRM 868)	...	...	<b>0.003</b>	<b>1.48</b>	...	<b>0.077</b>	...	...	...	<b>0.0078</b>	...	<b>16.1</b>	<b>40.5</b>	...	...
SRM C2400	...	...	...	<i>(&lt;0.01)</i>	...	<b>0.092</b>	<i>(0.1)</i>	<i>(&lt;0.01)</i>	...	<i>(0.0004)</i>	...	<b>0.10</b>	...	...	...

## Tool Steel Certified Reference Materials (SRM 1772 approx. 34mm dia x 19mm discs, SRMs 50c, 132b and 134a are all finely divided materials, units of 150g)

NIST No.	Description	Cert. Date	C	Si	Mn	P	S	Cr	Mo	Ni	As	Cu	N	V	W	Pb	Sn	B	Ca	Co
SRM 50c	W-Cr-V Steel	2011	<i>0.7193</i>	<b>0.3102</b>	<b>0.3417</b>	<b>0.0222</b>	<b>0.006367</b>	<b>4.128</b>	<b>0.0821</b>	<b>0.0686</b>	<b>0.0225</b>	<b>0.0792</b>	<b>0.0117</b>	<b>1.158</b>	<b>18.445</b>	...	<b>0.0183</b>	...	...	<i>(0.035)</i>
SRM 132b	Tool Steel (AISI M2)	1995	<b>0.864</b>	<b>0.185</b>	<b>0.341</b>	<b>0.012</b>	<b>0.004</b>	<b>4.38</b>	<b>4.9</b>	<b>0.23</b>	...	<b>0.088</b>	...	<b>1.83</b>	<b>6.28</b>	...	...	...	...	<b>0.029</b>
SRM 134a	Mo-W-Cr-V Steel	1957	<b>0.808</b>	<b>0.323</b>	<b>0.218</b>	<b>0.018</b>	<b>0.007</b>	<b>3.67</b>	<b>8.35</b>	<b>0.088</b>	...	<b>0.101</b>	...	<b>1.25</b>	<b>2.00</b>	...	...	...	...	...
SRM 1772	Tool Steel (S-7)	1995	<b>0.477</b>	<b>0.264</b>	<b>0.61</b>	<b>0.008</b>	<b>0.0031</b>	<b>3.10</b>	<b>1.39</b>	<b>0.105</b>	...	<b>0.083</b>	...	<b>0.236</b>	<i>0.002</i>	<i>&lt;0.001</i>	<i>0.008</i>	<i>&lt;0.001</i>	<i>0.001</i>	<i>0.007</i>

## White Cast and Ductile Iron Certified Reference Materials (Approx. 32mm dia x 19mm discs except SRM 892 which is finely divided material, units of 150g)

NIST No.	Description	Cert. Date	C	Si	Mn	P	S	Cr	Mo	Ni	Cu	Ti	V
SRM 892	White Cast Iron (Ni-Hard Type IV)	1982	<b>3.33</b>	<b>1.83</b>	<b>0.76</b>	<b>0.054</b>	<b>0.015</b>	<b>10.18</b>	<b>0.20</b>	<b>5.53</b>	<b>0.270</b>	<i>(0.02)</i>	<b>0.041</b>
SRM C1145a	White Cast Iron	1988	<b>2.92</b>	<b>0.271</b>	<b>0.187</b>	<b>0.215</b>	<b>0.191</b>	<b>0.63</b>	<b>0.48</b>	<b>0.62</b>	<b>0.46</b>	<b>0.012</b>	<b>0.112</b>
SRM C1290	White Cast Iron (HC-250+V)	1985	<b>3.04</b>	<b>0.971</b>	<b>0.66</b>	<b>0.030</b>	<b>0.013</b>	<b>30.5</b>	<i>(0.041)</i>	<b>0.917</b>	<b>0.065</b>	...	<b>0.442</b>
SRM C1291	White Cast Iron (Ni-Hard Type I)	1985	<b>2.67</b>	<b>1.34</b>	<b>1.14</b>	<b>0.028</b>	<b>0.032</b>	<b>2.78</b>	<b>0.32</b>	<b>4.34</b>	<b>0.26</b>	...	<b>0.031</b>
SRM C1292	White Cast Iron (Ni-Hard Type IV)	1985	<b>3.47</b>	<b>0.59</b>	<b>0.55</b>	<b>0.049</b>	<b>0.016</b>	<b>11.4</b>	<b>0.25</b>	<b>5.04</b>	<b>0.36</b>	...	<b>0.041</b>
SRM C2424	Ductile Iron	1985	<b>2.68</b>	<b>3.37</b>	<b>0.268</b>	<b>0.041</b>	<b>0.024</b>	<b>0.13</b>	<b>0.019</b>	<b>0.061</b>	...	<b>0.050</b>	<b>0.083</b>

## White Cast and Ductile Iron CRMs (continued)

NIST No.	Mg	Pb	Sb	Sn	Zr	Al	As	B	Bi	Ce	Co	La	Fe
SRM 892	...	...	<i>(0.0012)</i>	<i>(0.02)</i>	<i>(&lt;0.001)</i>	<i>(0.009)</i>	<i>(0.006)</i>	<i>(0.0020)</i>	...	...	<b>0.31</b>	...	<i>(77.4)</i>
SRM C1145a	...	<b>0.0012</b>	<i>(0.04)</i>	<i>(0.10)</i>	<i>(0.002)</i>	<i>(0.04)</i>	<i>(0.03)</i>	<i>(0.02)</i>	<i>(&lt;0.01)</i>	...	<b>0.058</b>	...	...
SRM C2424	<b>0.006</b>	...	...	...	...	<i>(&lt;0.01)</i>	...	<i>(0.002)</i>	...	<b>0.0046</b>	<i>(0.05)</i>	<b>0.0011</b>	...

# 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.

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

NIST No.	Description	Cert. Date	Unit Weight	Fe <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	CaO	MgO	MnO	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	K <sub>2</sub> O
SRM 25d	Manganese Ore	2010	60g	<i>3.91</i>	<b>2.54</b>	<i>5.33</i>	<i>0.136</i>	<i>(0.052)</i>	...	<b>51.78 Mn</b>	<b>0.251</b>	...	<i>0.928</i>
SRM 69b	Bauxite, Arkansas	1991	60g	<b>7.14</b>	<b>13.43</b>	<b>48.8</b>	<b>1.90</b>	<b>0.13</b>	<b>0.085</b>	<b>0.110</b>	<b>0.118</b>	<b>0.63</b>	<b>0.068</b>
SRM 277	Tungsten Concentrate	2013	100g	<i>7.47 Fe</i>	<i>0.842 Si</i>	...	<i>2.20 Ti</i>	<i>0.38 Ca</i>	...	<i>10.2 Mn</i>	<i>0.034 P</i>	<i>0.267 S</i>	...
SRM 423	Molybdenum Oxide Conc.	2019	50g	<i>1.708 Fe</i>	...	...	...	...	...	...	...	...	...
SRM 600	Bauxite, Australian	1991	90g	<b>17.0</b>	<b>20.3</b>	<b>40.0</b>	<b>1.31</b>	<b>0.22</b>	<b>0.05</b>	<b>0.013</b>	<b>0.039</b>	<b>0.19</b>	<b>0.23</b>
SRM 670	Rutile Ore	1993	90g	<b>0.86</b>	<b>0.51</b>	...	<b>96.16</b>	<i>(0.10) Ca</i>	...	...	...	...	...
SRM 690	Iron Ore, Canada	2021	100g	<b>66.87 Fe</b>	<b>3.7</b>	<b>0.175</b>	<b>0.0217</b>	<b>0.2004</b>	<b>0.1778</b>	<b>0.2306</b>	<b>0.0098 P</b>	<i>0.004 S</i>	<b>0.00303</b>
SRM 691	Iron Oxide, Reduced	2021	100g	<b>90.55 Fe</b>	<b>3.66</b>	<b>1.215</b>	<b>0.275</b>	<b>0.640</b>	<b>0.517</b>	<b>0.0428</b>	<b>0.0052 P</b>	<i>0.009 S</i>	<b>0.0656 K</b>
SRM 692	Iron Ore, Labrador	1992	100g	<b>59.58 Fe</b>	<b>10.14</b>	<b>1.41</b>	<b>0.045</b>	<b>0.023</b>	<b>0.035</b>	<b>0.46</b>	<b>0.039 P</b>	<b>0.005 S</b>	<b>0.039</b>
SRM 693	Iron Ore, Nimba	2021	100g	<b>65.08 Fe</b>	<b>3.860</b>	<b>1.043</b>	<b>0.0345</b>	<b>0.0158</b>	<b>0.0143</b>	<b>0.0900</b>	<b>0.0563 P</b>	<i>0.005 S</i>	<b>0.00283</b>
SRM 694	Phosphate Rock (Western)	1993	90g	<b>0.79</b>	<b>11.2</b>	<b>1.8</b>	<i>(0.11)</i>	<b>43.6</b>	<b>0.33</b>	<b>0.0116</b>	<b>30.2</b>	...	<b>0.51</b>
SRM 696	Bauxite, Surinam	1991	60g	<b>8.70</b>	<b>3.79</b>	<b>54.5</b>	<b>2.64</b>	<b>0.018</b>	<b>0.012</b>	<b>0.004</b>	<b>0.050</b>	<b>0.21</b>	<b>0.009</b>
SRM 697	Bauxite, Dominican	1991	60g	<b>20.0</b>	<b>6.81</b>	<b>45.8</b>	<b>2.52</b>	<b>0.71</b>	<b>0.18</b>	<b>0.41</b>	<b>0.97</b>	<b>0.0769</b>	<b>0.062</b>
SRM 698	Bauxite, Jamaican	1991	60g	<b>19.6</b>	<b>0.69</b>	<b>48.2</b>	<b>2.38</b>	<b>0.62</b>	<b>0.058</b>	<b>0.38</b>	<b>0.37</b>	<b>0.22</b>	<b>0.010</b>
SRM 1835	Borate Ore	1987	60g	<b>1.141</b>	<b>18.408</b>	<b>3.47</b>	<b>0.133</b>	<b>21.622</b>	<b>3.411</b>	<b>0.0333</b>	...	<b>1.477</b>	<b>1.261</b>
SRM 2430	Scheelite Ore	2016	100g	<i>1.13 Fe</i>	<b>1.74 Si</b>	<i>(0.4) Al</i>	...	<b>19.44</b>	<i>(0.5) Mg</i>	<b>0.1178 Mn</b>	<i>(0.02) P</i>	<i>0.25 S</i>	<b>0.179 K</b>

## Ore and Concentrate CRMs (continued)

NIST No.	Na <sub>2</sub> O	Cr <sub>2</sub> O <sub>3</sub>	V <sub>2</sub> O <sub>5</sub>	WO <sub>3</sub>	ZnO	ZrO <sub>2</sub>	As	Bi	Cu	Cr	F	Mo	Ni	Pb	Others	LOI
SRM 25d (continued)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	<i>(1) H<sub>2</sub>O</i>	...
SRM 69b (continued)	<i>0.025</i>	<b>0.011</b>	<b>0.028</b>	...	<b>0.0035</b>	<b>0.29</b>	...	...	...	...	...	...	...	...	...	<b>25.72</b>
SRM 277 (continued)	...	...	...	<b>67.50</b>	...	<i>(&lt;0.8) Zr</i>	...	<i>(&lt;0.01)</i>	<i>(0.014)</i>	...	...	<i>0.060</i>	...	<i>0.068</i>	<i>(22.0) O<sub>2</sub></i>	...
SRM 423 (continued)	...	...	...	...	...	...	...	<i>(0.006)</i>	<b>0.0640</b>	...	...	<b>58.61</b>	...	<i>0.0433</i>	<b>7.69 Acid-Insoluble Residue</b>	...
SRM 600 (continued)	<b>0.022</b>	<b>0.024</b>	<b>0.060</b>	...	<b>0.003</b>	<b>0.060</b>	...	...	...	...	...	...	...	...	...	...
SRM 670 (continued)	...	<b>0.23</b>	<b>0.66</b>	...	...	<b>0.84</b>	...	...	...	...	...	...	...	...	...	...
SRM 690 (continued)	<b>0.003</b>	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
SRM 691 (continued)	<b>0.1775</b>	...	...	...	...	...	...	...	<b>0.0309</b>	<b>0.0256</b>	...	...	...	...	<b>0.031 Co</b>	...
SRM 692 (continued)	<b>0.008</b>	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
SRM 693 (continued)	<b>0.0023</b>	...	...	...	...	...	<i>0.0012</i>	...	...	<i>0.0048</i>	...	...	<i>0.0009</i>	...	<i>0.0043 V, 0.0009 Zr</i>	...
SRM 694 (continued)	<b>0.86</b>	<i>(0.10)</i>	<b>0.31</b>	...	<i>(0.19)</i>	...	...	...	...	...	<b>3.2</b>	...	...	...	<b>0.0141 U</b>	...
SRM 696 (continued)	<i>0.007</i>	<b>0.047</b>	<b>0.072</b>	...	<b>0.0014</b>	<b>0.14</b>	...	...	...	...	...	...	...	...	...	<b>29.9</b>
SRM 697 (continued)	<i>0.036</i>	<b>0.100</b>	<b>0.063</b>	...	<b>0.037</b>	<b>0.065</b>	...	...	...	...	...	...	...	...	<i>0.0013 Co</i>	<b>22.1</b>
SRM 698 (continued)	<i>0.015</i>	<b>0.080</b>	<b>0.064</b>	...	<b>0.029</b>	<b>0.061</b>	...	...	...	...	...	...	...	...	...	<b>27.3</b>
SRM 1835 (continued)	<b>3.484</b>	...	...	...	...	...	...	...	...	<b>0.348</b>	...	...	...	...	...	...
SRM 2430 (continued)	<i>0.018 Na</i>	...	...	<b>70.30</b>	...	...	...	<i>0.080</i>	<i>0.0086</i>	...	<i>(1.3)</i>	<i>0.22</i>	...	...	<i>0.0022 As</i>	...

# NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST), USA

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

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

NIST No.	Description	Cert. Date	Unit Weight	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	FeO	Fe <sub>2</sub> O <sub>3</sub>	Cr <sub>2</sub> O <sub>3</sub>	MnO	CaO	MgO	BaO	Na <sub>2</sub> O	K <sub>2</sub> O	Li <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SrO	ZrO <sub>2</sub>	LOI
SRM 1d	Limestone, Argillaceous	2005	70g	<b>4.080</b>	<b>0.526</b>	<b>0.07</b>	...	<b>0.3191</b>	<i>0.0012</i>	...	<b>52.85</b>	<b>0.301</b>	<i>0.0033</i>	<b>0.0109</b>	<b>0.1358</b>	...	<b>0.0413</b>	<b>0.0303</b>	...	<b>39.9</b>
SRM 76a	Burnt Refractory (Al <sub>2</sub> O <sub>3</sub> -40%)	1992	75g	<b>54.9</b>	<b>38.7</b>	<b>2.03</b>	...	<b>1.60</b>	...	...	<b>0.22</b>	<b>0.52</b>	...	<b>0.07</b>	<b>1.33</b>	<b>0.042</b>	<b>0.120</b>	<b>0.037</b>	...	<i>0.34</i>
SRM 77a	Burnt Refractory (Al <sub>2</sub> O <sub>3</sub> -60%)	1992	75g	<b>35.0</b>	<b>60.2</b>	<b>2.66</b>	...	<b>1.00</b>	...	...	<b>0.05</b>	<b>0.38</b>	...	<b>0.037</b>	<b>0.090</b>	<b>0.025</b>	<b>0.092</b>	<b>0.009</b>	...	<i>0.22</i>
SRM 78a	Burnt Refractory (Al <sub>2</sub> O <sub>3</sub> -70%)	1992	75g	<b>19.4</b>	<b>71.7</b>	<b>3.22</b>	...	<b>1.2</b>	...	...	<b>0.11</b>	<b>0.70</b>	...	<b>0.078</b>	<b>1.22</b>	<b>0.12</b>	<b>1.3</b>	<b>0.25</b>	...	<i>0.42</i>
SRM 81a	Glass Sand	1978	75g	...	<b>0.66</b>	<b>0.12</b>	...	<b>0.082</b>	<b>0.0046</b>	...	...	...	...	...	...	...	...	...	<b>0.034</b>	...
SRM 165a	Glass Sand (low iron)	1992	75g	...	<b>0.059</b>	<b>0.011</b>	...	<b>0.012</b>	<b>0.00011</b>	...	...	...	...	...	...	...	...	...	<b>0.006</b>	...
SRM 198	Silica Brick	1960	45g	...	<b>0.16</b>	<b>0.02</b>	...	<b>0.66</b>	...	<b>0.008</b>	<b>2.71</b>	<b>0.07</b>	...	<b>0.012</b>	<b>0.017</b>	<b>0.001</b>	<b>0.022</b>	...	<b>&lt;0.01</b>	<b>0.21</b>
SRM 199	Silica Brick	1991	45g	...	<b>0.48</b>	<b>0.06</b>	...	<b>0.74</b>	...	<b>0.007</b>	<b>2.41</b>	<b>0.13</b>	...	<b>0.015</b>	<b>0.094</b>	<b>0.002</b>	<b>0.015</b>	...	<b>0.01</b>	<b>0.17</b>
SRM 278	Obsidian Rock	1992	35g	<b>73.05</b>	<b>14.15</b>	<b>0.245</b>	...	<b>2.04</b>	...	<b>0.052</b>	<b>0.983</b>	...	...	<b>4.84</b>	<b>4.16</b>	...	<b>0.036</b>	...	...	...
SRM 688	Basalt Rock	1981	60g	<b>48.4</b>	<b>17.36</b>	<b>1.17</b>	<b>7.64</b>	<b>10.35</b>	...	<b>0.167</b>	...	...	...	<b>2.15</b>	<b>0.187</b>	...	<b>0.134</b>	...	...	...
SRM 1413	Glass Sand (high alumina)	1985	75g	<b>82.77</b>	<b>9.90</b>	<b>0.11</b>	...	<b>0.24</b>	<b>ZnO</b>	<b>Mn<sub>2</sub>O<sub>3</sub></b>	<b>0.74</b>	<b>0.06</b>	<b>0.12</b>	<b>1.75</b>	<b>3.94</b>	...	...	...	...	...
SRM 2696	Silica Fume	2017	70g	<b>95.61</b>	<b>0.2080</b>	<b>0.11</b>	...	<i>0.055</i>	<b>0.051</b>	<b>0.032</b>	<b>0.426</b>	<b>0.235</b>	...	<i>0.129</i>	<b>0.652</b>	...	<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 1880b units of 5 x 5g, SRM 1884b units of 5 x 4.5g sealed vials, SRM 1885b, 1886b and 1889b units of 5 x 5g vials and SRM 1887b units of 5 x 4g vials)

NIST No.	Cert. Date	CaO	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	MgO	SO <sub>3</sub>	Na <sub>2</sub> O	K <sub>2</sub> O	TiO <sub>2</sub>	SrO	Mn <sub>2</sub> O <sub>3</sub>	P <sub>2</sub> O <sub>5</sub>	Cl	F	ZnO	Cr <sub>2</sub> O <sub>3</sub>	LOI
SRM 634a	2015	<b>65.07</b>	<b>20.493</b>	<b>5.015</b>	<b>3.362</b>	<b>1.0057</b>	<b>2.780</b>	<i>0.0842</i>	<b>0.3572</b>	<b>0.2463</b>	<i>0.0735</i>	<i>0.0229</i>	<b>0.1767</b>	...	...	<i>0.0222</i>	<i>0.0114</i>	<i>1.683</i>
SRM 1880b	2018	<b>64.16</b>	<b>20.42</b>	<b>5.183</b>	<b>3.681</b>	<b>1.176</b>	<b>2.710</b>	<b>0.0914</b>	<b>0.646</b>	<b>0.236</b>	<i>0.0272</i>	<b>0.1981</b>	<b>0.2443</b>	<b>0.01830</b>	<i>0.0539</i>	<i>0.01054</i>	<b>0.01927</b>	<i>1.666</i>
SRM 1882a	2014	<b>39.29</b>	<b>4.01</b>	<b>39.14</b>	<b>14.67</b>	<b>0.51</b>	...	<b>0.021</b>	<b>0.051</b>	<b>1.786</b>	<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	2019	<b>29.52</b>	<b>0.24</b>	<b>70.04</b>	<b>0.078</b>	<b>0.19</b>	...	<b>0.30</b>	<b>0.014</b>	<i>0.020</i>	<i>0.019</i>	<i>0.003</i>	<i>0.003</i>	...	...	...	<i>0.006</i>	<i>0.59</i>
SRM 1884b	2009	<b>61.31</b>	<b>19.30</b>	<b>4.851</b>	<b>2.937</b>	<b>4.74</b>	<b>4.034</b>	<b>0.278</b>	<b>0.957</b>	<b>0.2651</b>	<b>0.0258</b>	<b>0.0750</b>	<b>0.0965</b>	<i>0.0065</i>	<i>0.0394</i>	<i>0.0042</i>	<b>0.00791</b>	<i>0.597</i>
SRM 1885b	2013	<b>61.87</b>	<b>20.05</b>	<b>4.70</b>	<b>3.044</b>	<b>3.86</b>	<b>2.832</b>	<b>0.293</b>	<b>0.497</b>	<b>0.2361</b>	<b>0.0795</b>	<b>0.1282</b>	<b>0.0737</b>	<i>0.0021</i>	<i>0.0524</i>	<b>0.0354</b>	<b>0.02709</b>	<i>2.310</i>
SRM 1886a	2016	<b>67.87</b>	<b>22.38</b>	<b>3.875</b>	<b>0.152</b>	<b>1.932</b>	<b>2.086</b>	<b>0.021</b>	<b>0.093</b>	<b>0.084</b>	<i>0.018</i>	<b>0.0073</b>	<b>0.022</b>	<i>0.0042</i>	<i>0.02</i>	<i>0.001</i>	<b>0.0024</b>	<i>1.56</i>
SRM 1886b	2016	<b>67.05</b>	<b>22.08</b>	<b>3.903</b>	<b>0.297</b>	<b>1.526</b>	<b>2.757</b>	<b>0.01682</b>	<b>0.0164</b>	<b>0.2054</b>	<b>0.0886</b>	<b>0.02639</b>	<b>0.0413</b>	<b>0.00399</b>	<i>0.0118</i>	<i>0.00058</i>	<b>0.00404</b>	<i>3.344</i>
SRM 1887b	2013	<b>61.15</b>	<b>19.59</b>	<b>4.911</b>	<b>2.471</b>	<b>3.624</b>	<b>4.599</b>	<b>0.288</b>	<b>0.961</b>	<b>0.2034</b>	<b>0.2625</b>	<b>0.0957</b>	<b>0.1540</b>	<b>0.01001</b>	<i>0.101</i>	<b>0.01560</b>	<b>0.01551</b>	<i>2.121</i>
SRM 1888b	2010	<b>63.13</b>	<b>20.42</b>	<b>4.277</b>	<b>3.062</b>	<b>3.562</b>	<b>2.634</b>	<b>0.1364</b>	<b>0.658</b>	<b>0.2316</b>	<b>0.1009</b>	<b>0.0652</b>	<b>0.07307</b>	<b>0.0143</b>	<i>0.048</i>	<i>0.01253</i>	<i>0.01021</i>	<i>2.039</i>
SRM 1889b	2019	<b>60.11</b>	<b>18.39</b>	<b>5.79</b>	<b>2.891</b>	<b>2.82</b>	<b>4.3721</b>	<b>0.365</b>	<b>1.115</b>	<b>0.260</b>	<b>0.284</b>	<b>0.0840</b>	<b>0.297</b>	<b>0.0101</b>	<i>0.10</i>	<b>0.0770</b>	<b>0.0083</b>	<i>3.117</i>

# NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST), USA

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

## 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
<b>SRM 1515</b>	Apple Leaves	<b>2019</b>	50g	<b>1.525</b>	<b>0.0582</b>	<b>0.271</b>	<b>2.299</b>	<b>0.1593</b>	<b>1.608</b>	<b>0.00244</b>	<i>(0.18)</i>
<b>SRM 1547</b>	Peach Leaves	<b>2019</b>	50g	<b>1.559</b>	<b>0.0361</b>	<b>0.432</b>	<b>2.965</b>	<b>0.1371</b>	<b>2.433</b>	<b>0.00238</b>	<i>(0.20)</i>
<b>SRM 1566b</b>	Oyster Tissue	<b>2019</b>	25g	<b>0.0838</b>	<b>0.514</b>	<b>0.1085</b>	<i>7.6</i>	...	<b>0.652</b>	<b>0.3297</b>	<b>0.687</b>
<b>SRM 1567b</b>	Wheat Flour	<b>2014</b>	50g	<b>0.01914</b>	<b>0.05653</b>	<b>0.0398</b>	...	<b>0.1333</b>	<b>0.1325</b>	<b>0.000671</b>	<b>0.1645</b>
<b>SRM 1568b</b>	Rice Flour	<b>2013</b>	50g	<b>0.01184</b>	<b>0.03011</b>	<b>0.0559</b>	...	<b>0.1530</b>	<b>0.1282</b>	<b>0.000674</b>	<b>0.1200</b>
<b>SRM 1570a</b>	Spinach Leaves	<b>2014</b>	60g	<b>1.526</b>	...	<i>(0.9)</i>	<i>6.06</i>	<b>0.5187</b>	<b>2.900</b>	<b>1.821</b>	<i>(0.5)</i>
<b>SRM 1573a</b>	Tomato Leaves	<b>2018</b>	50g	<b>5.045</b>	<i>0.66</i>	<i>(1.2)</i>	<b>3.02</b>	<b>0.2161</b>	<b>2.676</b>	<b>0.01361</b>	<i>(0.96)</i>
<b>SRM 1575a</b>	Pine Needles	<b>2017</b>	50g	<b>0.25</b>	<b>0.0421</b>	<i>0.106</i>	...	<b>0.107</b>	<b>0.417</b>	<i>0.0063</i>	...

SRM 1568b also certified for Arsenic Species.

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

NIST No.	Al	As	B	Ba	Cr	Cu	Fe	Mn	Rb	Sr	Zn
<b>SRM 1515</b> (continued)	<b>284.5</b>	...	<b>27.6</b>	<b>48.8</b>	<i>(0.3)</i>	<b>5.69</b>	<b>82.7</b>	<b>54.1</b>	<b>10.2</b>	<b>25.1</b>	<b>12.45</b>
<b>SRM 1547</b> (continued)	<b>248.9</b>	<b>0.062</b>	<b>28.73</b>	<b>123.7</b>	<i>(1)</i>	<b>3.75</b>	<b>219.8</b>	<b>97.8</b>	<b>19.65</b>	<b>53.0</b>	<b>17.97</b>
<b>SRM 1566b</b> (continued)	<b>197.2</b>	<b>7.65</b>	<i>4.5</i>	<i>8.6</i>	...	<b>71.6</b>	<b>205.8</b>	<b>18.5</b>	<b>3.26</b>	<i>6.8</i>	<b>1424</b>
<b>SRM 1567b</b> (continued)	<i>4.4</i>	<i>0.0048</i>	<i>6.45</i>	...	...	<b>2.03</b>	<b>14.11</b>	<b>9.00</b>	<b>0.671</b>	...	<b>11.61</b>
<b>SRM 1568b</b> (continued)	<b>4.21</b>	<b>0.285</b>	...	...	...	<b>2.35</b>	<b>7.42</b>	<b>19.2</b>	<b>6.198</b>	...	<b>19.42</b>
<b>SRM 1570a</b> (continued)	<b>310</b>	<b>0.068</b>	<b>37.7</b>	...	...	<b>12.22</b>	...	<b>76.0</b>	<i>12.7</i>	<b>55.54</b>	<b>82.3</b>
<b>SRM 1573a</b> (continued)	<b>5984</b>	<b>0.1126</b>	<b>33.13</b>	<i>(63)</i>	<b>1.988</b>	<b>4.70</b>	<b>367.2</b>	<b>246.3</b>	<b>14.83</b>	<i>(85)</i>	<b>30.94</b>
<b>SRM 1575a</b> (continued)	<b>580</b>	<i>0.039</i>	<i>9.6</i>	<b>6.0</b>	<i>&lt;0.5</i>	<b>2.8</b>	<b>46</b>	<i>488</i>	<b>16.5</b>	...	<b>38</b>

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

NIST No.	Cd	Co	I	Pb	Hg	Mo	Ni	Se	Ag	Th	U	V
<b>SRM 1515</b> (continued)	<b>13.2</b>	<i>(90)</i>	<i>(300)</i>	<b>470</b>	<b>43.2</b>	<b>95</b>	<b>936</b>	...	...	<i>(30)</i>	<i>(6)</i>	<b>254</b>
<b>SRM 1547</b> (continued)	<b>26.1</b>	<i>(70)</i>	<i>(300)</i>	<b>869</b>	<b>31.7</b>	<b>60.3</b>	<b>689</b>	<b>120</b>	...	<i>(50)</i>	<i>(15)</i>	<b>367</b>
<b>SRM 1566b</b> (continued)	<b>2480</b>	<b>371</b>	...	<b>308</b>	<b>37.1</b>	...	<b>1040</b>	<b>2060</b>	<b>666</b>	<b>36.7</b>	<i>255.0</i>	<b>577</b>
<b>SRM 1567b</b> (continued)	<b>25.4</b>	...	...	<b>10.4</b>	<i>(0.5)</i>	<b>464</b>	...	<b>1140</b>	...	...	...	<i>(10)</i>
<b>SRM 1568b</b> (continued)	<b>22.4</b>	<i>17.7</i>	...	<i>5</i>	<b>5.91</b>	<b>1451</b>	...	<b>365</b>	...	...	...	...
<b>SRM 1570a</b> (continued)	<b>2876</b>	<b>393</b>	...	<i>(200)</i>	<b>29.7</b>	...	<b>2142</b>	<b>115.2</b>	...	<b>48.0</b>	<i>155</i>	<b>568</b>
<b>SRM 1573a</b> (continued)	<b>1517</b>	<b>577.3</b>	<i>(850)</i>	...	<b>34.1</b>	<i>(460)</i>	<b>1582</b>	<b>54.3</b>	...	<i>(120)</i>	<i>(35)</i>	<b>835</b>
<b>SRM 1575a</b> (continued)	<b>233</b>	<i>61</i>	...	<i>167</i>	<b>39.9</b>	...	<i>1470</i>	<i>99</i>	...	...	...	...

# NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST), USA

**CHEMICAL COMPOSITION (nominal mass content)** – 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	Na	P	Pb	S	Si	Ti	Ash content	Calorific Value (Btu/lb)
<b>SRM 1635a</b>	Trace Elements in Coal (Subbituminous)	<b>2017</b>	50g	<i>0.5437</i>	<i>1.087</i>	...	<i>(77.90)</i>	<b>0.2472</b>	<i>3.92</i>	...	<i>0.2303</i>	<b>0.1031</b>	<i>0.01874</i>	<b>0.000285</b>	<b>0.2909</b>	...	<i>0.0524</i>	<i>(6.29)</i>	<i>(11664)</i>
<b>SRM 1646a</b>	Estuarine Sediment	<b>2004</b>	70g	<b>2.297</b>	<b>0.519</b>	...	...	<b>2.008</b>	...	<b>0.864</b>	<b>0.388</b>	<b>0.741</b>	<b>0.027</b>	<b>0.00117</b>	<b>0.352</b>	<b>40.00</b>	<b>0.456</b>	...	...
<b>SRM 1648a</b>	Urban Particulate	<b>2015</b>	2g	<b>3.43</b>	<b>5.84</b>	<b>0.4543</b>	<i>(12.7)</i>	<b>3.92</b>	...	<b>1.056</b>	<b>0.813</b>	<b>0.4240</b>	...	<b>0.655</b>	<b>5.51</b>	<i>12.8</i>	<b>0.4021</b>	...	...
<b>SRM 2689</b>	Fly Ash, Low Lime	<b>2015</b>	Set (3)	<b>12.94</b>	<b>2.18</b>	...	...	<b>9.32</b>	...	<b>2.20</b>	<b>0.61</b>	<b>0.25</b>	<b>0.10</b>	<i>(0.0052)</i>	...	<b>24.06</b>	<b>0.75</b>	<i>(12)</i>	<i>(12000)</i>
<b>SRM 2690</b>	Fly Ash, Medium Lime	<b>2015</b>	Set (3)	<b>12.35</b>	<b>5.71</b>	...	...	<b>3.57</b>	...	<b>1.04</b>	<b>1.53</b>	<b>0.24</b>	<b>0.52</b>	<i>(0.0039)</i>	<b>0.15</b>	<b>25.85</b>	<b>0.52</b>	<i>(5.3)</i>	<i>(9700)</i>
<b>SRM 2691</b>	Fly Ash, High Lime	<b>2015</b>	Set (3)	<b>9.81</b>	<b>18.45</b>	...	...	<b>4.42</b>	...	<b>0.34</b>	<b>3.12</b>	<b>1.09</b>	<b>0.51</b>	<i>(0.0029)</i>	<b>0.83</b>	<b>16.83</b>	<b>0.90</b>	<i>(4.8)</i>	<i>(8800)</i>
<b>SRM 2710a</b>	Montana I Soil	<b>2018</b>	50g	<b>5.95</b>	<b>0.964</b>	...	...	<b>4.32</b>	...	<b>2.17</b>	<b>0.734</b>	<b>0.894</b>	<b>0.105</b>	<b>0.552</b>	...	<b>31.1</b>	<b>0.311</b>	...	<i>(0.0200)</i> Zr
<b>SRM 2711a</b>	Montana II Soil	<b>2018</b>	50g	<b>6.72</b>	<b>2.42</b>	...	...	<b>2.82</b>	...	<b>2.53</b>	<b>1.07</b>	<b>1.20</b>	<b>0.0842</b>	<b>0.140</b>	...	<b>31.4</b>	<b>0.317</b>	...	...

SRM 1648a also certified for PAH and PCB Congeners;

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

NIST No.	Ag	As	Ba	Br	Cd	Ce	Co	Cr	Cu	Hg	Mn	Ni	Rb	Sb	Se	Sr	Th	Tl	U	V	Zn
<b>SRM 1635a</b> (continued)	...	<b>0.860</b>	<b>3578</b>	...	<i>0.282</i>	...	<b>2.004</b>	<b>3.56</b>	<b>11.42</b>	<b>0.0836</b>	<b>6.69</b>	<b>5.37</b>	<b>1.226</b>	<b>0.251</b>	<b>0.662</b>	<b>160</b>	<b>1.299</b>	...	<b>0.4792</b>	<b>13.34</b>	<i>7.3</i>
<b>SRM 1646a</b> (continued)	<i>&lt;0.3</i>	<b>6.23</b>	<i>210</i>	...	<b>0.148</b>	<i>(64)</i>	<i>5</i>	<b>40.9</b>	<b>10.01</b>	<i>0.04</i>	<b>234.5</b>	<b>22.5</b>	<i>38</i>	<i>0.3</i>	<b>0.193</b>	<i>68</i>	<i>5.8</i>	...	<i>2.0</i>	<b>44.84</b>	<b>48.9</b>
<b>SRM 1648a</b> (continued)	<i>6.0</i>	<b>115.5</b>	...	<b>502</b>	<b>73.7</b>	<b>54.6</b>	<b>17.93</b>	<b>402</b>	<b>610</b>	<b>1.323</b>	<b>790</b>	<b>81.1</b>	<b>51.0</b>	<b>45.4</b>	<i>28.4</i>	<b>215</b>	...	...	...	<b>127</b>	<b>4800</b>
<b>SRM 2689</b> (continued)	...	<i>(200)</i>	<i>(800)</i>	...	...	...	<i>(48)</i>	<i>(170)</i>	...	<i>(0.018)</i>	<i>(300)</i>	<i>(122)</i>	...	<i>(9)</i>	<i>(7)</i>	<i>(700)</i>	<i>(25)</i>	...	...	...	<i>(240)</i>
<b>SRM 2690</b> (continued)	...	<i>(26)</i>	<i>(5800)</i>	...	...	...	<i>(19)</i>	<i>(67)</i>	...	<i>(0.0005)</i>	<i>(300)</i>	<i>(46)</i>	...	<i>(6)</i>	<i>(0.8)</i>	<i>(2000)</i>	<i>(25)</i>	...	...	...	<i>(120)</i>
<b>SRM 2691</b> (continued)	...	<i>(30)</i>	<i>(5900)</i>	...	...	...	<i>(26)</i>	<i>(68)</i>	...	<b>0.0578</b>	<i>(200)</i>	<i>(53)</i>	...	<i>(3)</i>	<i>(17)</i>	<i>(2700)</i>	<i>(26)</i>	...	...	...	<i>(120)</i>
<b>SRM 2710a</b> (continued)	<i>(40)</i>	<b>1540</b>	<b>792</b>	...	<b>12.3</b>	<i>(60)</i>	<b>5.99</b>	<i>23</i>	<b>3420</b>	<b>9.88</b>	<b>2149</b>	<i>8</i>	<i>117</i>	<b>52.5</b>	<i>(1)</i>	<b>255</b>	<i>18.1</i>	<i>1.52</i>	<b>9.11</b>	<i>82</i>	<b>4180</b>
<b>SRM 2711a</b> (continued)	<i>(6)</i>	<b>107</b>	<b>730</b>	...	<b>54.1</b>	<i>(70)</i>	<b>9.89</b>	<b>52.3</b>	<b>140</b>	<b>7.42</b>	<b>675</b>	<b>21.7</b>	<i>120</i>	<b>23.8</b>	<i>(2)</i>	<b>242</b>	<i>15</i>	<i>(3)</i>	<b>3.01</b>	<b>80.7</b>	<b>414</b>

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

# SOUTH AFRICAN BUREAU OF STANDARDS (SABS), South Africa

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

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

SABS No.	Description	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Total Fe as Fe <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	MnO	TiO <sub>2</sub>	P <sub>2</sub> O <sub>5</sub>	BaO	H <sub>2</sub> O <sup>+</sup>	CO <sub>2</sub>
SARM 4	NIM-N Norite	<b>52.64</b>	<b>16.50</b>	<b>8.97</b>	<i>0.8</i>	<b>7.47</b>	<b>7.50</b>	<b>11.50</b>	<b>2.46</b>	<b>0.25</b>	<b>0.18</b>	<b>0.20</b>	...	...	<b>0.33</b>	<i>0.1</i>
SARM 6	NIM-D Dunite	<b>38.96</b>	<i>0.3</i>	<b>17.00</b>	<b>0.71</b>	<b>14.63</b>	<b>43.51</b>	<b>0.28</b>	<i>0.04</i>	<i>0.01</i>	<b>0.22</b>	...	<b>0.26</b>	<b>0.42</b>	<b>0.30</b>	<b>0.40</b>

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.

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

SABS No.	Description	Al <sub>2</sub> O <sub>3</sub>	CaO	Cr <sub>2</sub> O <sub>3</sub>	FeO	Fe <sub>2</sub> O <sub>3</sub>	MgO	MnO	SiO <sub>2</sub>	TiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>
SARM 131	Chromium Ore	<b>14.60</b>	<i>0.24</i>	<b>41.83</b>	...	<b>30.7</b>	<b>9.15</b>	<b>0.243</b>	<b>3.13</b>	<b>0.944</b>	<b>0.414</b>
SARM 146	Chromium Ore	<b>14.54</b>	<b>0.10</b>	<b>46.91</b>	<b>25.58</b>	...	<b>10.62</b>	<b>0.22</b>	<b>0.616</b>	<b>0.57</b>	<b>0.32</b>

## Magnetite Iron Ore Certified Reference Material (Finely divided material – units of 100g)

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 Iron Ore	<b>66.63</b>	<b>0.41</b>	<b>0.0108</b>	<b>0.16</b>	<i>0.0002</i>	<b>0.78</b>	<i>0.0005</i>	<b>0.0223</b>	<b>0.0021</b>	<b>0.0502</b>	<b>1.69</b>	<b>0.17</b>	<b>0.0091</b>	<b>0.0281</b>	<b>0.0477</b>	<b>0.0025</b>	<b>0.0695</b>	<b>0.43</b>	<b>0.0142</b>	<b>0.0520</b>

## Magnetite Ore Certified Reference Material (Finely divided material – units of 100g)

SABS No.	Description	Fe	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	CuO	K <sub>2</sub> O	MgO	MnO	NiO	P <sub>2</sub> O <sub>5</sub>	TiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>	S	C	LOI
SARM 147	Magnetite Ore	<b>52.67</b>	<b>3.35</b>	<b>0.96</b>	<b>7.05</b>	<i>0.13</i>	<i>0.21</i>	<b>5.28</b>	<b>0.23</b>	<i>0.04</i>	<b>1.17</b>	<b>1.72</b>	<b>0.104</b>	<b>0.13</b>	<b>1.36</b>	<b>3.37</b>

## Hematite Iron Ore Certified Reference Material (Finely divided material – units of 100g)

SABS No.	Description	Fe	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	MnO	TiO <sub>2</sub>	P
SARM 132	Hematite Iron Ore	<b>62.2</b>	<b>7.82</b>	<b>1.84</b>	<i>0.09</i>	<i>0.03</i>	<b>0.22</b>	<i>0.020</i>	<i>0.09</i>	<b>0.054</b>

## Hematite Ore Certified Reference Material (Finely divided material – units of 100g)

SABS No.	Description	Fe	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	BaO	CaO	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	S	TiO <sub>2</sub>	LOI
SARM 145	Hematite Ore	<b>66.42</b>	<b>3.56</b>	<b>0.58</b>	<i>0.046</i>	<b>0.15</b>	<b>0.09</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.12</b>	<i>0.014</i>	<b>0.03</b>	<b>0.36</b>

## Zirconium Concentrate Certified Reference Material (Finely divided material – units of 100g)

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

## Rutile Ore Certified Reference Material (Finely divided material – units of 100g)

SABS No.	Description	Al <sub>2</sub> O <sub>3</sub>	CaO	Cr <sub>2</sub> O <sub>3</sub>	Fe	K <sub>2</sub> O	MgO	MnO	Nb <sub>2</sub> O <sub>5</sub>	P <sub>2</sub> O <sub>5</sub>	SiO <sub>2</sub>	Th	TiO <sub>2</sub>	U	V <sub>2</sub> O <sub>5</sub>	ZrO <sub>2</sub>	LOI
SARM 166	Rutile Ore	<b>0.45</b>	<b>0.11</b>	<b>0.122</b>	<b>0.60</b>	<i>0.061</i>	<b>0.022</b>	<b>0.016</b>	<b>0.31</b>	<b>0.024</b>	<b>1.90</b>	<b>0.00432</b>	<b>93.9</b>	<i>0.00442</i>	<b>0.46</b>	<b>1.08</b>	<i>0.35</i>

## SOUTH AFRICAN BUREAU OF STANDARDS (SABS), South Africa

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

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

SABS No.	Description	CaF <sub>2</sub>	CaCO <sub>3</sub>	MgCO <sub>3</sub>	P <sub>2</sub> O <sub>5</sub>	Mn	SiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>
<b>SARM 14</b>	Acid Grade, Buffalo	<b>97.32</b>	<i>0.3</i>	<i>0.03</i>	<i>0.18</i>	...	<i>0.57</i>	<i>0.06</i>
<b>SARM 15</b>	Acid Grade, Zeerust	<b>97.84</b>	<b>0.95</b>	<b>0.55</b>	<b>0.017</b>	<b>0.0213</b>	<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 <sub>2</sub>	CaO	MgO	Al <sub>2</sub> O <sub>3</sub>	P	Na <sub>2</sub> O	K <sub>2</sub> O	BaO	S	CO <sub>2</sub>	Zn
<b>SARM 16</b>	Manganese Ore (Wessels)	<b>49.17</b>	<b>11.48</b>	<b>5.04</b>	<b>4.70</b>	<b>0.76</b>	<i>0.3</i>	<b>0.033</b>	<i>0.03</i>	<b>0.02</b>	<b>0.60</b>	<b>0.17</b>	<i>1.3</i>	<b>0.0364</b>
<b>SARM 17</b>	Manganese Ore (Mamatwan)	<b>38.81</b>	<b>4.27</b>	<b>4.69</b>	<i>14.4</i>	<b>3.03</b>	<b>0.24</b>	<b>0.018</b>	<b>0.09</b>	<b>0.09</b>	<i>0.08</i>	<i>0.01</i>	<b>15.40</b>	<b>0.0043</b>
<b>SARM 149</b>	Manganese Ore (Kalahari)	<b>38.0</b>	<b>5.39</b>	<b>5.89</b>	<b>14.2</b>	<b>2.08</b>	<b>0.221</b>	<b>0.021</b>	<b>0.147</b>	<b>0.132</b>	<b>0.050</b>	...	...	...

The mineral content of SARM 149 is Braunite: 57.4%, Calcite: 24.6% and Ankerite: 18.0% (Quartz, Hematite and Iron Sulphate were also observed).

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

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

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 <sub>2</sub> O <sub>5</sub>	CaO	F	CO <sub>2</sub>	MgO	SrO	Fe <sub>2</sub> O <sub>3</sub>
<b>SARM 32</b>	Phosphate rock	<b>39.96</b>	<b>54.44</b>	<b>2.49</b>	<b>1.61</b>	<b>0.50</b>	<b>0.52</b>	<b>0.14</b>

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

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

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

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

## 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 and figures in brackets are for information only.

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

SABS No.	Description	Mass content	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe as Fe <sub>2</sub> O <sub>3</sub>	FeO	MgO	ZrO <sub>2</sub>	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	MnO	TiO <sub>2</sub>	P <sub>2</sub> O <sub>5</sub>	Cr <sub>2</sub> O <sub>3</sub>	HfO <sub>2</sub>	U <sub>3</sub> O <sub>8</sub>	ThO <sub>2</sub>	S
SARM 41	Carbonaceous Shale	%	<b>56.67</b>	<b>13.50</b>	<b>4.23</b>	<i>0.3</i>	<b>8.10</b>	...	<b>1.50</b>	<b>0.93</b>	<b>1.39</b>	<b>0.06</b>	<b>0.55</b>	<b>0.05</b>	...	...	...	...	<i>0.15</i>
SARM 42	Soil	%	<b>74.09</b>	<b>10.03</b>	<b>4.68</b>	<i>4.0</i>	<b>1.92</b>	...	<b>0.89</b>	<i>0.15</i>	<b>0.45</b>	<b>0.10</b>	<b>0.36</b>	<i>0.04</i>	<b>0.63</b>	...	...	...	<i>0.02</i>
SARM 43	Magnesite	%	<b>5.99</b>	<i>0.06</i>	<b>0.26</b>	<i>0.1</i>	<b>44.11</b>	...	<b>0.75</b>	<i>0.05</i>	<i>0.04</i>	<i>0.01</i>	<i>0.01</i>	<i>0.02</i>	...	...	...	...	<i>0.04</i>
SARM 44	Sillimanite Schist	%	<b>38.84</b>	<b>58.80</b>	<b>2.60</b>	<i>1.0</i>	<i>0.1</i>	...	<b>0.14</b>	<i>0.05</i>	<b>0.18</b>	<b>0.03</b>	<b>1.83</b>	<b>0.10</b>	...	...	...	...	<i>0.03</i>
SARM 47	Serpentinite	%	<b>36.30</b>	<b>1.09</b>	<b>4.14</b>	<i>0.4</i>	<b>42.09</b>	...	<i>0.10</i>	<i>0.05</i>	<i>0.02</i>	<b>0.06</b>	<i>0.01</i>	<i>0.02</i>	<b>0.29</b>	...	...	...	<i>0.02</i>
SARM 48	Fluorspar Granite	%	<b>67.11</b>	<b>11.24</b>	<b>0.58</b>	<i>0.2</i>	<b>0.18</b>	...	<b>8.90</b>	<b>3.22</b>	<b>4.26</b>	<b>0.02</b>	<b>0.10</b>	<i>0.09</i>	...	...	...	...	...
SARM 50	Dolerite	%	<b>51.56</b>	<b>15.28</b>	<b>11.00</b>	<b>8.49</b>	<b>7.57</b>	...	<b>10.80</b>	<b>2.30</b>	<b>0.61</b>	<b>0.17</b>	<b>0.86</b>	<b>0.15</b>	...	...	...	...	<i>0.03</i>
SARM 52	Stream Sediment	%	<b>57.81</b>	<b>9.38</b>	<b>19.71</b>	<i>4.0</i>	<b>0.60</b>	...	<b>0.37</b>	<i>0.1</i>	<b>0.25</b>	<b>0.27</b>	<b>1.30</b>	<b>0.09</b>	<b>0.19</b>	...	...	...	<i>0.02</i>
SARM 62	Zircon (RBM)	%	<b>32.8</b>	<b>0.88</b>	<b>0.07</b>	...	<b>0.04</b>	<b>64.2</b>	<b>0.11</b>	...	...	...	<b>0.13</b>	<b>0.12</b>	...	<b>1.31</b>	<b>0.0354</b>	<b>0.0158</b>	...

### 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 41 (cont.)	µg/g	<b>820</b>	<i>60</i>	<i>15</i>	<b>123</b>	<b>53</b>	<i>20</i>	<i>5</i>	<b>8</b>	<b>122</b>	<i>30</i>	<b>59</b>	<b>54</b>	<i>12</i>	<b>139</b>	<b>17</b>	<b>76</b>	<b>146</b>
SARM 42 (cont.)	µg/g	<i>250</i>	<i>30</i>	<b>35</b>	...	<b>17</b>	<i>12</i>	<i>5</i>	<b>8</b>	<b>125</b>	<i>10</i>	<b>22</b>	<b>37</b>	<i>5</i>	<b>94</b>	<b>11</b>	<b>44</b>	<b>192</b>
SARM 43 (cont.)	µg/g	<i>25</i>	<i>20</i>	<b>4</b>	<i>195</i>	<i>15</i>	...	...	...	<b>252</b>	...	...	<b>8</b>	...	...	...	<i>10</i>	...
SARM 44 (cont.)	µg/g	<i>50</i>	<i>220</i>	<i>8</i>	<b>384</b>	<i>10</i>	<i>55</i>	<i>15</i>	<b>96</b>	<i>15</i>	<i>30</i>	<b>13</b>	<b>5</b>	<b>50</b>	<b>395</b>	<b>84</b>	<b>271</b>	<b>405</b>
SARM 47 (cont.)	µg/g	<i>75</i>	<i>20</i>	<b>79</b>	...	<i>5</i>	<i>5</i>	...	...	<b>2221</b>	<i>60</i>	...	<i>3</i>	...	<i>16</i>	<i>5</i>	<b>45</b>	...
SARM 48 (cont.)	µg/g	<i>290</i>	<i>850</i>	...	<b>23</b>	<i>10</i>	...	<i>5</i>	<b>202</b>	...	<b>135</b>	<b>291</b>	<i>5</i>	<b>113</b>	<i>8</i>	<b>436</b>	<b>53</b>	<b>300</b>
SARM 50 (cont.)	µg/g	<b>220</b>	<i>30</i>	<b>40</b>	<b>357</b>	<b>84</b>	...	...	<i>10</i>	<i>85</i>	<i>25</i>	<b>14</b>	<b>195</b>	<i>6</i>	<b>216</b>	<b>23</b>	<b>81</b>	<b>86</b>
SARM 52 (cont.)	µg/g	<i>410</i>	<i>210</i>	<b>81</b>	...	<b>219</b>	<i>15</i>	...	<b>11</b>	<b>182</b>	<b>1200</b>	<b>20</b>	<b>25</b>	<i>11</i>	<b>346</b>	<b>20</b>	<b>264</b>	<b>250</b>

### PGM and Gold Ore Certified Reference Materials (Finely divided material – units of 3kg, except SARM 186 – units of 1kg) nominal mass content in µg/g

SABS No.	Description	Au	Pt	Pd	Rh	Ru	Ir	Fe	Si	Co	Cr	Cu	Ni	S	Al	Ca	Mg	Os	3E PGMs +Au
SARM 75	Sheba Sulphide Zone	<b>0.053</b>	<b>0.32</b>	<b>0.61</b>	...	...	...	...	...	...	...	...	<b>2300</b>	...	...	...	...	...	...
SARM 107	PGM Ore	<b>0.046</b>	<b>1.99</b>	<b>0.926</b>	<b>0.320</b>	<b>0.626</b>	<i>0.14</i>	...	...	...	...	...	...	...	...	...	...	...	...
SARM 186	PGM Concentrate	<b>2.58</b>	<b>67.1</b>	<b>28.1</b>	<b>7.63</b>	<b>11.4</b>	<b>3.01</b>	<b>109000</b>	<b>210000</b>	<b>1800</b>	<b>5900</b>	<b>12500</b>	<b>22900</b>	<i>45900</i>	<i>14800</i>	<i>12900</i>	<i>135000</i>	<i>1.48</i>	<i>108</i>

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

SABS No.	Description	C	Si	Mn	P	S	Cr	Ni	Al	Co	Mg	Ti	V	Fe
SARM 33	Ferro-silicon	<b>1.01</b>	<b>15.60</b>	<b>0.75</b>	<b>0.043</b>	...	<b>0.43</b>	<b>0.28</b>	...	...	...	...	...	<b>80.2</b>
SARM 144	Ferro-chromium	<b>6.64</b>	<b>5.30</b>	<b>0.32</b>	<i>0.02</i>	<i>0.04</i>	<b>49.02</b>	<b>0.20</b>	<i>0.06</i>	<i>0.06</i>	<i>(0.04)</i>	<b>0.67</b>	<b>0.36</b>	<b>36.87</b>

### Ferro-Chrome Slag Certified Reference Material (Finely divided material – units of 100g) nominal mass content in %

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



## SPL-LABMAT (SPL), Czech Republic

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

### Cast Iron Certified Reference Materials (Approx. 40mm dia. x 18mm depth discs)

SPL No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	B	Co
CZ02033-1F	3.23	2.68	0.693	0.030	0.005	0.035	0.182	0.373	0.073	0.0043	0.024
CZ02033-2G	3.78	1.10	0.096	0.125	0.009	0.027	0.002	0.650	0.019	0.0023	0.012
CZ02033-3D	3.24	2.12	0.317	0.008	0.006	0.236	0.453	0.025	0.055	0.0071	0.014
CZ02033-4E	4.45	0.090	0.034	0.023	0.006	0.030	0.002	0.049	0.003	...	0.033
CZ02033-5C	2.30	1.40	0.704	0.027	0.091	0.085	0.104	0.188	0.103	0.0078	0.013
CZ02033-6C	3.11	3.25	1.25	0.097	0.019	1.33	0.006	0.021	0.024	0.0024	0.005
CZ02033-7C	3.55	1.73	0.389	0.028	0.026	0.542	0.966	1.26	0.040	0.0008	0.048

SPL No.	Cu	Pb	Sn	Ti	V	W	Bi	Ce	Mg	Sb	Zn
CZ02033-1F (cont.)	0.018	0.009	0.030	0.041	0.014	0.022	0.001	0.036	0.070	...	0.004
CZ02033-2G (cont.)	0.88	0.008	0.015	0.029	0.017	0.004	0.006	0.013	0.036	0.029	0.020
CZ02033-3D (cont.)	0.396	0.005	0.009	0.016	0.072	...	0.002	0.006	0.016	0.007	...
CZ02033-4E (cont.)	0.005	0.002	0.001	0.011	0.015	...	0.002	...	...	...	...
CZ02033-5C (cont.)	0.013	...	0.002	0.008	0.054	...	0.007	...	...	0.002	...
CZ02033-6C (cont.)	0.273	0.003	0.131	0.107	0.192	0.007	...	...	...	0.044	...
CZ02033-7C (cont.)	0.016	...	0.004	0.026	0.067	0.037	0.002	...	...	...	...

### Cast Iron Certified Reference Materials (Approx. 40mm dia. x 18mm depth discs)

SPL No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	B	Co	Zr
CZ20034-11B	2.44	3.67	0.382	0.271	0.140	1.178	1.144	0.082	0.067	0.0032	0.007	0.007
CZ20034-12B	2.92	2.96	1.047	0.484	0.077	0.638	0.117	0.174	0.077	0.047	0.002	0.002
CZ20034-13C	3.15	2.23	0.704	0.0261	0.0044	0.124	0.360	1.299	0.022	...	0.02	0.02
CZ20034-14C	3.14	2.49	0.275	0.0162	0.0081	0.045	0.646	0.030	0.007	0.0123	0.013	0.013
CZ20034-15C	3.47	1.68	0.060	0.054	0.0028	0.078	0.002	0.728	0.010	0.0057	...	...
CZ20034-16C	3.87	0.95	1.311	0.173	0.0243	0.332	0.195	0.375	0.004	0.020	0.002	0.002
CZ20034-17C	4.08	0.150	0.503	0.104	0.0033	0.178	0.030	2.32	0.002	0.0006	...	...

SPL No.	Cu	Pb	Sn	Ti	V	W	Bi	Ce	Mg	Sb	As	Zn
CZ20034-11B (cont.)	0.130	0.007	0.074	0.041	0.182	0.005	0.007	...	...	0.011	0.005	...
CZ20034-12B (cont.)	0.223	0.009	0.042	0.071	0.326	0.002	0.006	...	...	0.046	0.024	0.004
CZ20034-13C (cont.)	0.089	...	0.014	0.015	0.043	0.003	...	0.011	0.064	0.002	0.002	...
CZ20034-14C (cont.)	0.585	...	0.025	0.018	0.013	0.003	...	0.019	0.017	0.020	0.035	0.010
CZ20034-15C (cont.)	1.123	...	0.006	0.036	0.019	0.004	0.008	0.030	0.040	0.056	0.003	...
CZ20034-16C (cont.)	0.345	0.015	0.125	0.057	0.027	0.015	...	...	...	0.010	0.003	0.017
CZ20034-17C (cont.)	0.037	0.002	0.002	0.015	0.076	0.004	0.002	0.003	0.007	...	0.005	...

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

## SUS (SUS), Germany

**CHEMICAL COMPOSITION (nominal mass content in %) – figures in small italic type only approximate and and figures in brackets are for information only.**

### Aluminium and Aluminium Alloy Setting-up Samples (Approx. 55mm dia. x 50mm discs)

SUS No.	Al	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Be	Bi	Ca	Cd	Co	Ga	Li	P	Pb	Sn	Sr	V	Zr	Na	Sb	In
<b>SUS-RA10</b>	<i>99.99</i>	<i>0.0010</i>	<i>0.0005</i>	<i>0.0002</i>	<i>&lt;0.0001</i>	<i>&lt;0.0001</i>	<i>&lt;0.0001</i>	<i>&lt;0.0002</i>	<i>&lt;0.0003</i>	<i>&lt;0.0001</i>	<i>&lt;0.0001</i>	<i>&lt;0.0002</i>	<i>&lt;0.0001</i>	<i>&lt;0.0003</i>	<i>&lt;0.00001</i>	...	<i>&lt;0.0001</i>	<i>&lt;0.0001</i>	<i>&lt;0.00002</i>	...	<i>&lt;0.0003</i>	<i>&lt;0.0003</i>	<i>&lt;0.00003</i>	<i>&lt;0.0002</i>	<i>&lt;0.0001</i>	<i>&lt;0.00001</i>	<i>&lt;0.0003</i>	...
<b>SUS-RA18</b>	<i>75</i>	<i>15</i>	<i>0.2</i>	<i>7.5</i>	<i>0.3</i>	<i>0.2</i>	<i>0.0003</i>	<i>3</i>	<i>0.3</i>	<i>0.001</i>	<i>0.01</i>	<i>0.0035</i>	<i>&lt;0.0001</i>	<i>0.001</i>	<i>0.004</i>	<i>0.0005</i>	<i>&lt;0.001</i>	<i>0.008</i>	<i>&lt;0.001</i>	<i>0.015</i>	<i>0.37</i>	<i>0.37</i>	<i>0.05</i>	<i>0.001</i>	<i>0.005</i>	<i>0.005</i>	<i>0.45</i>	...
<b>SUS-RA19</b>	<i>78</i>	<i>1.7</i>	<i>1.3</i>	<i>0.8</i>	<i>1.3</i>	<i>8</i>	<i>0.2</i>	<i>0.6</i>	<i>7</i>	<i>0.2</i>	<i>0.3</i>	<i>0.001</i>	<i>0.005</i>	<i>0.2</i>	<i>0.008</i>	<i>0.04</i>	<i>0.3</i>	<i>0.06</i>	<i>0.009</i>	<i>0.0009</i>	<i>0.01</i>	<i>0.02</i>	<i>0.009</i>	<i>0.1</i>	<i>0.2</i>	<i>0.001</i>	<i>0.007</i>	<i>0.01</i>
<b>SUS-RA20</b>	<i>75.8</i>	<i>13.5</i>	<i>0.7</i>	<i>5.2</i>	<i>0.3</i>	<i>1</i>	<i>0.09</i>	<i>2.7</i>	<i>0.2</i>	<i>0.05</i>	...	...	...	...	<i>0.005</i>	...	...	...	...	<i>0.02</i>	<i>0.1</i>	<i>0.06</i>	...	<i>0.1</i>	<i>0.09</i>	<i>0.008</i>	...	...

### Cobalt and Cobalt Alloy Setting-up Samples (Approx. 40mm dia. x 20mm discs)

SUS No.	Co	C	Si	Mn	P	S	Cr	Cu	Ni	Mo	Nb	Ti	V	W	Zr	Fe	Ta	Al
<b>SUS-RC011</b>	<i>99.9</i>	...	<i>0.01</i>	<i>&lt;0.005</i>	<i>&lt;0.003</i>	<i>0.0005</i>	<i>&lt;0.005</i>	<i>&lt;0.01</i>	<i>0.003</i>	<i>&lt;0.0005</i>	<i>&lt;0.0005</i>	<i>&lt;0.3</i>	<i>0.001</i>	<i>0.01</i>	<i>&lt;0.003</i>	<i>&lt;0.02</i>	...	...
<b>SUS-RC014</b>	<i>52</i>	<i>0.2</i>	<i>1</i>	<i>0.5</i>	<i>(0.005)</i>	<i>(0.005)</i>	<i>30</i>	...	<i>10</i>	...	...	...	...	<i>7</i>	...	<i>(0.7)</i>	...	...
<b>SUS-RC015</b>	...	<i>1</i>	<i>0.2</i>	...	<i>0.02</i>	<i>0.02</i>	...	<i>1</i>	...	<i>6</i>	<i>2</i>	<i>0.1</i>	<i>0.1</i>	...	...	<i>24</i>	<i>0.5</i>	<i>0.1</i>
<b>SUS-RC016</b>	...	<i>0.2</i>	<i>0.4</i>	...	...	...	...	<i>3</i>	...	<i>3</i>	<i>2</i>	<i>0.1</i>	<i>1</i>	...	...	<i>25</i>	<i>0.2</i>	<i>0.1</i>

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

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

### Iron and Steel Setting-up Samples (Disc samples – approx. dimensions as below)

SUS No.	Disc Dimensions	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Co	Cu	Nb	Pb	Sn	Ti	V	W
<b>SUS-RE12</b>	40mm dia. x 40mm	<i>&lt;0.005</i>	<i>0.003</i>	<i>&lt;0.01</i>	<i>&lt;0.005</i>	<i>&lt;0.002</i>	<i>&lt;0.01</i>	<i>&lt;0.005</i>	<i>&lt;0.01</i>	<i>&lt;0.005</i>	<i>&lt;0.001</i>	<i>&lt;0.0001</i>	<i>0.002</i>	<i>&lt;0.01</i>	<i>0.002</i>	<i>&lt;0.002</i>	<i>0.001</i>	<i>0.0003</i>	<i>&lt;0.001</i>	<i>&lt;0.01</i>
<b>SUS-RG13</b>	40mm dia. x 20mm	<i>3</i>	<i>2</i>	<i>1</i>	<i>0.3</i>	<i>0.05</i>	<i>1</i>	<i>0.3</i>	<i>0.6</i>	<i>0.02</i>	...	...	...	<i>0.05</i>	...	...	<i>0.2</i>	<i>0.04</i>	<i>0.3</i>	...
<b>SUS-RG14</b>	"	<i>3</i>	<i>2</i>	<i>0.2</i>	<i>0.02</i>	<i>0.005</i>	<i>1</i>	...	...	<i>0.02</i>	...	...	...	<i>0.05</i>	...	...	<i>0.2</i>	...	<i>0.1</i>	...
<b>SUS-RH12</b>	40mm dia. x 40mm	<i>0.5</i>	<i>0.6</i>	<i>17</i>	<i>(0.01)</i>	<i>(0.01)</i>	<i>4</i>	...	...	...	...	...	...	...	...	...	...	...	...	...
<b>SUS-RH18</b>	"	<i>1.3</i>	<i>(0.04)</i>	<i>(0.3)</i>	<i>(0.01)</i>	<i>(0.01)</i>	<i>4</i>	<i>3.5</i>	...	...	...	...	...	<i>10</i>	...	...	...	...	<i>3</i>	<i>10</i>
<b>SUS-RH31</b>	"	<i>0.03</i>	<i>0.3</i>	<i>1.2</i>	<i>(0.01)</i>	<i>(0.01)</i>	<i>17</i>	<i>2</i>	<i>20</i>	...	...	...	...	<i>2</i>	<i>0.3</i>	<i>2</i>	...	...	...	...
<b>SUS-RN13</b>	40mm dia. x 40mm	<i>1</i>	<i>(0.05)</i>	<i>1.8</i>	<i>(0.005)</i>	<i>(0.005)</i>	<i>(0.05)</i>	<i>(0.01)</i>	<i>3</i>	<i>0.4</i>	<i>(0.002)</i>	<i>(0.0005)</i>	<i>(0.01)</i>	<i>(0.01)</i>	<i>(0.005)</i>	<i>(0.001)</i>	<i>0.05</i>	<i>(0.01)</i>	<i>(0.01)</i>	<i>(0.01)</i>
<b>SUS-RN14</b>	"	<i>(0.05)</i>	<i>1.8</i>	<i>(0.07)</i>	<i>0.08</i>	<i>0.08</i>	<i>3</i>	<i>0.5</i>	<i>(0.01)</i>	<i>(0.01)</i>	<i>0.05</i>	<i>0.006</i>	<i>0.4</i>	<i>0.4</i>	<i>0.5</i>	<i>0.03</i>	<i>(0.0005)</i>	<i>0.1</i>	<i>0.5</i>	<i>0.4</i>
<b>SUS-RN19</b>	"	<i>1</i>	<i>1</i>	<i>1.5</i>	<i>0.08</i>	<i>0.07</i>	<i>3</i>	<i>1</i>	<i>1</i>	<i>0.5</i>	<i>0.05</i>	<i>0.006</i>	<i>0.8</i>	<i>0.5</i>	<i>0.5</i>	<i>(0.03)</i>	<i>0.1</i>	<i>0.1</i>	<i>0.5</i>	<i>0.5</i>
<b>SUS-CFE3</b>	40mm dia. x 30mm	<i>0.04</i>	<i>0.4</i>	<i>1.7</i>	<i>0.3</i>	<i>0.002</i>	<i>16.7</i>	<i>2.0</i>	<i>11</i>	<i>0.007</i>	...	<i>0.005</i>	<i>0.21</i>	<i>0.09</i>	<i>0.77</i>	...	...	<i>0.005</i>	<i>0.07</i>	<i>0.03</i>
<b>SUS-CFE4</b>	"	<i>1.7</i>	<i>0.4</i>	<i>0.4</i>	<i>0.01</i>	<i>0.01</i>	<i>11</i>	<i>0.8</i>	<i>0.3</i>	<i>0.008</i>	<i>0.008</i>	<i>0.002</i>	<i>0.03</i>	<i>0.06</i>	<i>0.04</i>	<i>0.005</i>	<i>0.005</i>	<i>0.003</i>	<i>1</i>	<i>0.03</i>
<b>SUS-CFE5</b>	40mm dia. x 20mm	<i>4</i>	<i>0.3</i>	<i>0.3</i>	<i>0.1</i>	<i>0.03</i>	<i>0.1</i>	<i>0.1</i>	<i>0.1</i>	<i>0.1</i>	...	...	...	<i>0.1</i>	...	...	<i>0.04</i>	...	<i>0.1</i>	...

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

## SUS (SUS), Germany

**CHEMICAL COMPOSITION (nominal mass content in %)** - figures in small italic type only approximate and figures in brackets for information only.

### Lead and Lead Alloy Setting-up Samples (Approx. 40mm dia. x 40mm discs)

SUS No.	Pb	Zn	Sn	Cd	As	Cu	Bi	Fe	Ti	Ni	Ag	Sb	Te	Se	S	Al	In	Ca	Cr	Co	Ge	Ba	Mn	Pt	Na	Au	Mg	Pd
SUS-RPB11	99.99	0.0005	0.0005	0.0005	0.0005	0.0002	0.0030	0.0002	0.0003	0.0002	0.0006	0.0003	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
SUS-RPB14	88	<0.003	0.015	0.002	1.2	0.06	0.005	...	0.01	0.001	0.005	10	0.01	0.01	0.01	...	...	...	...	...	...	...	...	...	...	...	...	...
SUS-RPB15	64	0.1	30	0.01	0.02	1.5	0.1	0.005	0.01	0.003	3	2	0.01	0.01	...	...	...	...	...	...	...	...	...	...	...	...	...	...
SUS-RPB16	97	0.001	0.18	...	...	...	...	...	...	...	0.003	...	...	...	0.02	...	...	0.3	...	0.01	0.02	...	...	0.01	...	0.0015	...	
SUS-RPB17	83	0.001	3.6	...	0.3	1.5	0.1	0.007	0.002	0.001	0.3	9.9	0.003	...	...	...	...	0.01	0.0009	0.001	0.001	...	0.0002	0.001	...	0.001	...	0.0003
SUS-RPB18	90	...	0.03	0.03	7.6	0.06	0.3	...	0.02	...	0.09	1.2	0.03	0.02	...	...	0.01	...	...	...	...	...	...	...	...	...	...	

### Magnesium and Magnesium Alloy Setting-up Samples (Approx. 50mm dia. x 50mm discs)

SUS No.	Mg	Si	Fe	Cu	Mn	Ni	Al	Zn	Pb	Sn	Zr	Cd	Na	Ce	La	Y	Nd	Pr
SUS-RMG11	99.9	<0.01	<0.03	<0.002	0.01	<0.001	0.01	0.01	0.001	0.001	0.001	...	...	...	...	...	...	...
SUS-RMG13	93	0.01	0.001	0.006	0.2	0.001	5.7	0.8	0.001	0.001	0.004	0.0001	0.001	...	...	...	...	...
SUS-RMG14	88	0.8	0.003	0.3	0.4	0.04	7.9	1	0.02	0.08	0.08	<0.01	<0.01	...	...	...	...	...
SUS-RMG16	...	...	0.001	...	...	...	...	...	...	...	0.06	...	...	2.2	1	2.2	1.6	0.26

### Nickel and Nickel Alloy Setting-up Samples (Approx. 40mm dia. x 40mm discs)

SUS No.	Ni	C	Si	Mn	P	S	Cr	Fe	Mo	V	Cu	Nb	Co	W	B	Ti	Al	Pb	Zn	Ag
SUS-RNI10	99.99	<0.0008	<0.0010	...	...	<0.0002	...	<0.0005	...	...	<0.0001	...	<0.0003	...	...	...	<0.0004	0.00008	0.0002	0.00003
SUS-RNI11	99.6	(0.03)	(0.1)	(0.25)	...	(0.25)	...	(0.25)	...	...	(0.03)	...	...	...	...	(0.03)	...	...	...	...
SUS-RNI12	65	(0.1)	(0.1)	(0.6)	...	(0.6)	...	(0.6)	...	...	30	...	...	...	...	0.5	2.5	...	...	...
SUS-RNI13	57	(0.02)	(0.05)	(0.5)	(0.01)	(0.5)	16	(0.5)	16	(0.2)	(0.1)	...	(1.5)	3.5	...	...	...	...	...	...
SUS-RNI14	50	0.05	(0.2)	(0.2)	...	(0.2)	20	(0.2)	6	...	(0.03)	...	20	...	(0.0005)	2	0.5	...	...	...
SUS-RNI15	51	0.05	(0.1)	(0.1)	(0.005)	(0.1)	18	(0.1)	3	...	(0.03)	5	(0.5)	...	0.005	1	0.6	...	...	...

### Zinc and Zinc Alloy Setting-up Samples (Approx. 40mm dia. x 30mm discs)

SUS No.	Zn	Pb	Sn	Cd	Cu	Fe	Al	Mg	Ti	Ni	Mn	Ag	In	Sb	TI
SUS-RZN11	99.99	0.0008	<0.0001	<0.0001	0.0003	0.0005	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	...	...	...	...
SUS-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
SUS-RZN14	85.7	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 and figures in brackets for information only.**

### Unalloyed and Low Alloy Steel Certified Reference Materials (32-35mm 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	0.0137	0.02	1.20	0.04	0.02	...	...	...	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
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	0.011	0.10	0.005

### Unalloyed and Low Alloy Steel Certified Reference Materials (All 32-35mm dia. x 19mm discs, except K3-K9 which are 32-35mm dia. x 38mm discs)

VASKUT No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Co	Cu	Nb	Ti	V	W	Zr
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	(0.012)	0.025	5.94	...	...	...	...	0.25	...	...	1.16	1.19	...
B4	0.55	1.72	1.07	0.047	0.043	...	...	...	...	...	0.49	...	...	...	...	0.09
B15	0.98	0.80	0.69	0.030	0.031	3.70	1.20	0.15	0.13	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	...	...
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 (All 32-35mm dia. x 19mm discs, except K7-K10/C which are 32-35mm dia. x 38mm discs)

VASKUT No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	Nb	Ti	Fe
K7	0.063	0.89	1.44	0.026	0.012	17.5	...	10.45	...	0.20	...	0.27	...
K8	0.061	1.38	1.10	0.026	0.017	23.5	...	...	1.53	(0.18)	...	...	...
K10/C	0.13	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)
S19	0.26	2.32	0.32	0.012	0.021	7.00	0.11	12.8	...	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)
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)

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