

# BUREAU OF ANALYSED SAMPLES LTD

## *Certified Reference Materials*



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Certificate GB94/3993

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## INTRODUCTION

The Certified Reference Materials have been prepared under rigorous laboratory conditions and are issued by Bureau of Analysed Samples Ltd. under the auspices of an Honorary Advisory Committee and a body of approximately 150 co-operating analysts representing Independent Laboratories and Manufacturers and Users of the materials concerned.

### (a) **CERTIFIED REFERENCE MATERIALS (CRMs)**

**British Chemical Standard Certified Reference Materials (BCS-CRMs)** are normally analysed by at least five analysts, and a certificate showing the individual mean values obtained by each analyst and a summary of the methods used is supplied with each sample. Certificates issued since 1984 also give the standard deviation of the intralaboratory means, and those issued since 1994 express the level of confidence of the certified value as the 95% half width confidence interval.

**EURONORM Certified Reference Materials (ECRMs)** are prepared under the auspices of the European Committee for Iron and Steel Standardization (ECISS) and are issued with a certificate giving the names of the participating laboratories, the mean values obtained by each laboratory for each element and a statistical evaluation of the laboratory means. The certificate also includes a summary of the methods of analysis used. Before publication each certificate is approved by the four Producing Organisations, namely Bureau of Analysed Samples Ltd. (BAS) in the UK, Institut de Recherches de la Siderurgie Française (IRSID)/Centre de Développement des Industries de Mise en Forme des Matériaux (CTIF) in France, Stahlinstitut VDEh (VDEh), BAM Bundesanstalt für Materialforschung und prüfung and Max-Planck-Institut für Eisenforschung (MPI) in Germany and the Nordic CRM Working Group (NCRMWG) in the Nordic countries.

Pending their eventual replacement by ECRMs, some existing BCS-CRMs have been accepted as interim ECRMs after examination by laboratories in the EU. These are indicated with an ECRM number alongside the existing BCS-CRM number.

Bureau of Analysed Samples Ltd. act as UK distributors for ECRMs prepared by IRSID/CTIF in France, BAM in Germany and Jernkontoret in Sweden, and details of these samples, most of which are held in UK stock, are given in a separate BAS 'Outside Source' Reference Materials Catalogue, copies of which will be supplied on request. Further information regarding the preparation, certification and supply of ECRMs, and the use of the statistical information given on their certificates is given in Technical Reports **CEN/TR 10317:2009** (formerly **ECISS Information Circular No. 1**) and **CEN/TR 10350:2009** (formerly **ECISS Information Circular No. 5**) which are available in the UK from the BSI, 389 Chiswick High Road, London W4 4AL.

All BCS-CRM and ECRM samples are supplied in the finely divided form and many of them are also available in disc form for optical emission and X-ray fluorescence spectrometry.

**Spectroscopic Standard Certified Reference Materials (SS-CRMs)** have been specially prepared to provide samples of uniform composition in a form suitable for use with optical emission and X-ray fluorescence spectrometers. Each sample has been analysed by at least five laboratories, and a certificate showing the individual mean values obtained by each laboratory and a summary of the methods used is supplied with each sample or set of samples.

Steel samples are usually in the form of discs cut from round bar. Cast iron samples, which are prepared in conjunction with Castings Technology International (formerly BCIRA), are in the form of chill cast rectangular blocks.

### (b) **REFERENCE MATERIALS (RMs)**

British Chemical Standard Reference Materials (BCS-RMs) and Spectroscopic Reference Materials, e.g. high purity metals and ceramic materials (p.16), low alloy cast irons, high chromium irons, nickel chromium irons and austenitic (Ni-resist) irons (p. 22) and copper base alloys (p. 23) are normally analysed by only two laboratories and are not given certified status. When the British Non Ferrous Metals Technology Centre (BNF) closed down in 1992, BAS purchased their entire stock of copper, nickel and lead base spectroscopic RMs (see the separate BAS 'Outside Source' Reference Materials Catalogue). When supplies of these have become exhausted BAS have prepared replacements using the same casting techniques as BNF (see p. 23).

### (c) **SPECTROSCOPIC SETTING-UP SAMPLES (SUS)**

These Setting-up Samples (SUS) have been specially prepared to meet the day to day setting-up requirements of laboratories using direct reading spectrometers for production control analysis. Their use will conserve supplies of Spectroscopic Standard CRMs for calibration purposes only and will relieve spectrographers of the problem of finding suitable samples within their works for their daily setting-up requirements.

The steel samples are in the form of round bar. The cast iron samples, prepared in conjunction with Castings Technology International (formerly BCIRA), are in the form of chill cast rectangular blocks.

## GENERAL INFORMATION

Every endeavour is made to maintain a continuous supply of all samples in this catalogue by completing the preparation of an appropriate replacement by the time each sample becomes exhausted. When orders are received for obsolete samples the relevant replacements will normally be supplied. If for any reason such a sample is not acceptable, full credit will be allowed if it is returned carriage paid provided that the seal on the carton containing finely divided samples is unbroken.

Information regarding new samples in course of preparation will be supplied on request. When these are available for distribution a notice to this effect will be made on our website.

## QUALITY ASSURANCE

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

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REG. No. 307549 (ENGLAND)

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## BRITISH CHEMICAL STANDARD AND EURONORM CERTIFIED REFERENCE MATERIALS - High Purity Irons and Unalloyed Steels

The figures are listed primarily as a guide to purchasers. In some cases provisional figures are given which may differ slightly from those given on the Certificate. **Always consult the Certificate issued with the sample to obtain the accurate analysis.**

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

### High Purity Irons (Finely divided material - units of 100g: 097-1 also available as 38mm dia. x 30, 25 or 3mm discs - see page 17)

ECRM No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al (Total)	As	B	Co	Cu	N
088-2	High Purity Iron	<b>0.0006</b>	<b>0.0052</b>	<b>0.0809</b>	<b>0.0048</b>	<b>0.0070</b>	<b>0.0244</b>	<i>0.0025</i>	<b>0.0275</b>	<i>0.0005</i>	...	...	<b>0.0061</b>	<b>0.0163</b>	<i>0.001</i>
097-1(C)	High Purity Iron	<i>&lt;0.0005</i>	<i>&lt;0.01</i>	<b>0.0064</b>	<b>0.0016</b>	<b>0.0022</b>	<b>0.0016</b>	<i>&lt;0.001</i>	<b>0.0025</b>	...	<b>0.0051</b>	<b>0.0003</b>	<b>0.0037</b>	<b>0.0020</b>	<b>0.0007</b>

ECRM No.	Description	Nb	Pb	Sn	Ti	V	W	Zr	Bi	Ca	Mg	O	Sb	Ta	Zn
088-2	High Purity Iron (cont)	...	...	...	...	<b>0.00029</b>	...	...	...	<b>0.00072</b>	...	...	...	...	...
097-1(C)	High Purity Iron (cont)	<i>&lt;0.001</i>	<i>&lt;0.0005</i>	<i>&lt;0.0025</i>	<i>&lt;0.0015</i>	<i>&lt;0.001</i>	<i>≤0.001</i>	<i>&lt;0.001</i>	<i>&lt;0.0005</i>	<i>&lt;0.0005</i>	<i>&lt;0.0005</i>	<i>0.05</i>	<i>≤0.001</i>	<i>&lt;0.0005</i>	<i>&lt;0.0001</i>

### Unalloyed Steels (Finely divided material - units of 100g; 111 & 056-2 also available as 44mm dia. x 19 or 50mm discs/057-2, 058-2, 059-2, 064-1, 084-1, 085-1, 086-1, 087-1, 090-1 and 096-2 also available as 38mm dia. x 30 or 25mm discs - see page 17)

BCS-CRM No.	ECRM No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al (Acid Sol)	Al (Total)	As	Co	Cu	N	Nb	Pb	Sn	Ti	V	Sb	Ca	Zn
111	...	Low Carbon Steel	<b>0.0258</b>	<b>0.0253</b>	<b>0.155</b>	<b>0.0033</b>	<b>0.0054</b>	<b>0.0197</b>	<b>0.0008</b>	<b>0.0387</b>	...	<b>0.0348</b>	<b>0.0017</b>	<b>0.0144</b>	<b>0.0171</b>	<b>0.0034</b>	<i>0.0005</i>	<i>&lt;0.001</i>	<b>0.0015</b>	<b>0.0004</b>	<b>0.0009</b>	<i>&lt;0.001</i>	<i>&lt;0.0005</i>	...
159/3	055-1	0.5% Carbon Steel	<b>0.51</b>	<b>0.24</b>	<b>0.77</b>	<b>0.016</b>	<b>0.036</b>	<i>0.16</i>	<i>0.02</i>	<i>0.12</i>	...	...	...	...	<i>0.15</i>	...	...	...	...	...	...	...	...	...
161/4	...	0.8% Carbon Steel	<b>0.817</b>	<b>0.202</b>	<b>0.504</b>	<b>0.0105</b>	<b>0.0096</b>	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
163/2	063-1	1.2% Carbon Steel	<b>1.26</b>	<b>0.24</b>	<b>0.30</b>	<b>0.019</b>	<b>0.022</b>	<i>0.16</i>	<i>0.012</i>	<i>0.10</i>	...	...	<i>0.02</i>	...	<i>0.09</i>	<i>0.005</i>	...	...	...	...	...	...	...	...
232/2	051-1	0.1% Sulphur Steel	<b>0.181</b>	<i>0.11</i>	<b>1.18</b>	<i>0.025</i>	<b>0.126</b>	<i>0.05</i>	...	<i>0.14</i>	...	...	...	...	<i>0.15</i>	...	...	...	...	...	...	...	...	...
237/2	060-1	0.1% Carbon Steel	<b>0.122</b>	<i>0.17</i>	<b>0.45</b>	<i>0.024</i>	<i>0.031</i>	<i>0.028</i>	<i>&lt;0.005</i>	<i>0.039</i>	...	<i>0.004</i>	...	...	<i>0.060</i>	<b>0.004</b>	...	<i>0.005</i>	...	...	...	...	...	...
238/2	061-1	0.2% Carbon Steel	<b>0.21</b>	<b>0.12</b>	<i>0.61</i>	<i>0.019</i>	<i>0.034</i>	...	...	<i>0.21</i>	...	...	...	...	<i>0.10</i>	...	...	...	...	...	...	...	...	...
270	054-1	0.09% Phosphorus Steel	<b>0.22</b>	<i>0.05</i>	<i>0.88</i>	<b>0.092</b>	<i>0.11</i>	<i>0.17</i>	<i>0.02</i>	<i>0.14</i>	...	...	<i>0.03</i>	...	<i>0.21</i>	...	...	...	...	...	<i>&lt;0.01</i>	...	...	...
...	056-2(C)	0.8% Carbon Steel	<b>0.8181</b>	<b>0.2006</b>	<b>0.5073</b>	<b>0.0103</b>	<b>0.0093</b>	<b>0.0146</b>	...	<b>0.0218</b>	<b>0.00024</b>	<i>&lt;0.001</i>	...	...	<b>0.0129</b>	...	...	...	...	...	...	...	...	...
...	057-2(C)	0.05% Carbon Steel	<b>0.0507</b>	<i>0.003</i>	<b>0.246</b>	<b>0.0120</b>	<b>0.0127</b>	<b>0.0114</b>	...	<b>0.0096</b>	<i>0.055</i>	<b>0.059</b>	...	...	<b>0.0146</b>	<b>0.00230</b>	...	...	...	...	...	...	...	...
...	058-2(C)	0.15% Sulphur Steel	<b>0.424</b>	<b>0.1080</b>	<b>1.186</b>	<b>0.0098</b>	<b>0.1712</b>	<b>0.1211</b>	<b>0.0589</b>	<b>0.199</b>	...	...	<b>0.0095</b>	...	<b>0.261</b>	<b>0.0107</b>	...	...	...	...	...	...	...	...
...	059-2(C)	0.7% Carbon Steel	<b>0.721</b>	<b>0.188</b>	<b>0.495</b>	<b>0.0046</b>	<b>0.0084</b>	<b>0.0090</b>	<b>0.0018</b>	<b>0.0198</b>	<b>0.00020</b>	<b>0.00045</b>	...	...	<b>0.0074</b>	<b>0.0051</b>	...	...	...	...	...	...	...	...
...	064-1(C)	Nb/Ti Interstitial Free Steel	<b>0.0026</b>	<b>0.0065</b>	<b>0.1641</b>	<b>0.0091</b>	<b>0.0104</b>	<b>0.0184</b>	<b>0.00077</b>	<b>0.0115</b>	<b>0.0302</b>	<b>0.0330</b>	<b>0.0036</b>	<b>0.0027</b>	<b>0.0077</b>	<b>0.0026</b>	<b>0.0146</b>	<b>0.00018</b>	<b>0.00051</b>	<b>0.0189</b>	<b>0.00015</b>	...	...	...
...	084-1(C)	0.4% Carbon Steel	<b>0.391</b>	<b>0.265</b>	<b>0.860</b>	<b>0.018</b>	<b>0.029</b>	...	<b>0.033</b>	<b>0.154</b>	...	...	...	...	<b>0.267</b>	...	...	...	<b>0.023</b>	...	...	...	...	...
...	085-1(C)	0.3% Sulphur Steel	<b>0.067</b>	<b>0.008</b>	<b>0.977</b>	<b>0.062</b>	<b>0.336</b>	...	...	...	...	...	...	<b>0.019</b>	<b>0.291</b>	...	...	<b>0.0010</b>	...	...	<b>0.0021</b>	<b>0.0073</b>	...	<b>0.0025</b>
...	086-1(C)	0.3% Carbon Steel	<b>0.297</b>	<b>0.206</b>	<b>0.879</b>	<b>0.0238</b>	<b>0.0371</b>	<b>0.150</b>	...	<b>0.168</b>	...	...	<b>0.0230</b>	...	<b>0.320</b>	...	...	...	<b>0.0263</b>	...	...	...	...	...
...	087-1(C)	0.15% Carbon Steel	<b>0.1740</b>	<b>0.2631</b>	<b>0.6711</b>	<b>0.0103</b>	<b>0.0461</b>	<b>0.0781</b>	<b>0.0206</b>	<b>0.1177</b>	...	...	<b>0.0243</b>	<b>0.0148</b>	<b>0.1707</b>	...	...	...	<b>0.0171</b>	...	...	<b>0.0046</b>	...	...
...	090-1(C)	1% Carbon Steel	<b>1.054</b>	<b>0.281</b>	<b>0.226</b>	<b>0.0128</b>	<b>0.0095</b>	<b>0.121</b>	<b>0.0089</b>	<b>0.053</b>	...	...	...	...	...	<b>0.0146</b>	<b>0.00043</b>	<b>0.00239</b>	...	...	<b>0.204</b>	<b>0.00090</b>	...	<b>0.00209</b>
...	091-1	0.5% Carbon Steel	<b>0.518</b>	...	...	...	...	<b>0.312</b>	<b>0.098</b>	<b>0.310</b>	...	...	...	...	<b>0.0111</b>	...	...	...	...	...	...	...	...	...
...	096-2(C)	Low S, Ca-Treated Steel	<b>0.1050</b>	<b>0.262</b>	<b>1.320</b>	<b>0.0128</b>	<b>0.0016</b>	<b>0.0243</b>	<b>0.0020</b>	<b>0.0253</b>	...	<b>0.0460</b>	...	...	<b>0.0170</b>	...	<b>0.0252</b>	...	...	...	...	...	<b>0.0020</b>	...

BCS-CRM No.	ECRM No.	Description	Bi	Cd	Ga	Hg	Se	Te	Tl
...	090-1(C)	1% Carbon Steel (cont)	<i>&lt;0.00002</i>	<i>&lt;0.00002</i>	<b>0.00228</b>	<i>&lt;0.00001</i>	<i>&lt;0.0002</i>	<i>&lt;0.0002</i>	<i>&lt;0.0001</i>



**BRITISH CHEMICAL STANDARD AND EURONORM CERTIFIED REFERENCE MATERIALS - Unalloyed Steels and High Speed Tool Steels**

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

**Unalloyed Steels (cont.)** (Finely divided material - units of 100g; 431/2-435/2, 453/1 & 456/2-460/2, also available as 38mm dia. x 19mm discs - see page 17)

BCS-CRM No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al (Acid Sol)	Al (Total)	As	B	Co	Cu	N	Nb	Pb	Sn	Ti	V	W	Zr	Sb
431/2	Plain Carbon Steels	<b>0.0249</b>	<b>0.015</b>	<b>0.902</b>	<b>0.121</b>	<b>0.0065</b>	<b>0.049</b>	<i>0.004</i>	<b>0.040</b>	...	<i>0.01</i>	<i>0.005</i>	...	<i>0.006</i>	<i>0.015</i>	<b>0.0052</b>	<b>0.0040</b>	...	< <i>0.001</i>	<i>0.005</i>	<i>0.003</i>	<i>0.004</i>	...	...
432/2		<b>0.0065</b>	<b>0.0822</b>	<b>0.712</b>	<b>0.0171</b>	<b>0.036</b>	<b>0.0166</b>	<i>0.002</i>	<b>0.0196</b>	...	< <i>0.002</i>	...	...	<i>0.006</i>	<i>0.015</i>	<b>0.0066</b>	<b>0.0174</b>	...	...	...	< <i>0.001</i>	<i>0.003</i>	...	...
433/2		<b>0.096</b>	<b>0.0071</b>	<b>1.188</b>	<b>0.011</b>	<b>0.0083</b>	<b>0.0262</b>	<i>0.004</i>	<b>0.037</b>	...	...	...	...	<i>0.006</i>	<i>0.025</i>	...	<b>0.0590</b>	...	...	...	<i>0.001</i>	<i>0.003</i>	...	...
434/2		<b>0.275</b>	<b>0.510</b>	<b>1.546</b>	<b>0.0611</b>	<b>0.0141</b>	<b>0.238</b>	<i>0.014</i>	<b>0.037</b>	...	...	...	...	<i>0.006</i>	<i>0.025</i>	<b>0.0104</b>	<b>0.038</b>	...	...	...	<i>0.04</i>	<i>0.04</i>	...	...
435/2		<b>0.489</b>	<b>0.328</b>	<b>0.390</b>	<b>0.0373</b>	<b>0.0424</b>	<b>0.184</b>	<i>0.018</i>	<b>0.133</b>	...	...	...	...	<b>0.0116</b>	<i>0.05</i>	...	<b>0.134</b>	...	...	...	<i>0.005</i>	<i>0.015</i>	...	...
451/1	Carbon Steel Residual Series (Group A)	<b>0.051</b>	<b>0.116</b>	<b>0.62</b>	<b>0.009</b>	<b>0.014</b>	<b>0.104</b>	<b>0.039</b>	<b>0.016</b>	...	...	<b>0.041</b>	...	...	<b>0.47</b>	...	...	<i>0.0005</i>	<b>0.002</b>	<b>0.105</b>	...	<b>0.099</b>	...	...
452/1		<b>0.323</b>	<b>0.055</b>	<b>1.30</b>	<b>0.035</b>	<b>0.017</b>	<b>0.067</b>	<b>0.054</b>	<b>0.19</b>	...	...	<b>0.015</b>	...	...	<b>0.22</b>	...	...	<i>0.0002</i>	<b>0.094</b>	<b>0.031</b>	...	<b>0.054</b>	...	...
453/1		<b>0.160</b>	<b>0.34</b>	<b>1.38</b>	<b>0.044</b>	<b>0.026</b>	<b>0.26</b>	<b>0.081</b>	<b>0.11</b>	...	...	<b>0.052</b>	...	...	<b>0.099</b>	...	...	<i>0.0001</i>	<b>0.022</b>	<b>0.073</b>	...	<b>0.30</b>	...	...
456/2	Carbon Steel Residual Series (Group B)	<b>0.112</b>	<b>0.297</b>	<b>0.220</b>	<b>0.0212</b>	<b>0.0221</b>	...	...	...	< <i>0.002</i>	<b>0.0018</b>	...	<b>0.0015</b>	<b>0.0504</b>	...	...	<b>0.0057</b>	<b>0.0189</b>	...	...	<b>0.0221</b>	...	<i>0.013</i>	<b>0.0172</b>
457/2		<b>0.307</b>	<b>0.105</b>	<b>0.327</b>	<b>0.0098</b>	<b>0.0448</b>	...	...	...	<b>0.082</b>	<b>0.087</b>	...	<b>0.0046</b>	<b>0.0217</b>	...	...	<b>0.0174</b>	<b>0.0098</b>	...	...	<b>0.153</b>	...	<b>0.025</b>	<b>0.050</b>
458/2		<b>0.198</b>	<b>0.504</b>	<b>0.479</b>	<b>0.0281</b>	<b>0.0314</b>	...	...	...	<b>0.052</b>	<b>0.055</b>	...	<b>0.0069</b>	<b>0.198</b>	...	...	<b>0.0510</b>	<b>0.0140</b>	...	...	<b>0.105</b>	...	<i>0.062</i>	<b>0.089</b>
459/2		<b>0.467</b>	<b>0.640</b>	<b>0.909</b>	<b>0.0482</b>	<b>0.0481</b>	...	...	...	<b>0.0134</b>	<b>0.0154</b>	...	<b>0.0110</b>	<b>0.0890</b>	...	...	<b>0.0102</b>	<b>0.0044</b>	...	...	<b>0.0585</b>	...	<b>0.074</b>	<b>0.0121</b>
460/2		<b>0.383</b>	<b>0.126</b>	<b>0.616</b>	<b>0.0374</b>	<b>0.0099</b>	...	...	...	<b>0.0193</b>	<b>0.0240</b>	...	<b>0.0027</b>	<b>0.0106</b>	...	...	<b>0.068</b>	<b>0.0005</b>	...	...	<b>0.0322</b>	...	< <i>0.0005</i>	<b>0.0006</b>

**Unalloyed Steels (cont.)** (Rod material – BCS-CRM 318A is a pair of 6.35mm dia. x 95mm rods, BCS-CRM 318B is a single 12.7mm dia. x 127mm rod)

BCS-CRM No.	Description	Form	C	Si	Mn	P	S	Al	O
318A	0.01% Oxygen Steel	6.35mm dia. x 95mm rod	<i>0.083</i>	<i>0.12</i>	<i>0.39</i>	<i>0.018</i>	<i>0.035</i>	< <i>0.002</i>	<b>0.0096</b>
318B	0.01% Oxygen Steel	12.7mm dia. x 127mm rod	<i>0.083</i>	<i>0.12</i>	<i>0.39</i>	<i>0.018</i>	<i>0.035</i>	< <i>0.002</i>	<b>0.0103</b>

**High Speed Tool Steels** (Finely divided material - units of 100g; 483/1 also available in disc form for spectroscopic analysis - see page 20)

BCS-CRM No.	ECRM No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	Co	Cu	Sn	V	W	
220/2	254-1	High Speed Tool Steels	<b>0.88</b>	<b>0.19</b>	<b>0.30</b>	<b>0.023</b>	<b>0.029</b>	<b>5.12</b>	<b>4.92</b>	<b>0.12</b>	...	...	<b>0.32</b>	<b>0.09</b>	<b>0.019</b>	<b>1.94</b>	<b>6.97</b>	
241/2	251-1		<b>0.84</b>	<b>0.21</b>	<b>0.27</b>	<b>0.024</b>	<b>0.025</b>	<b>5.35</b>	<b>0.53</b>	<b>0.15</b>	<i>0.009</i>	...	...	<b>5.70</b>	<b>0.08</b>	<b>0.025</b>	<b>1.59</b>	<b>19.9</b>
481	...		<b>0.69</b>	<b>0.14</b>	<b>0.29</b>	<b>0.021</b>	<b>0.027</b>	<b>3.56</b>	<b>0.22</b>	...	...	...	...	<b>0.21</b>	...	...	<b>0.52</b>	<b>14.2</b>
482	...		<b>0.70</b>	<b>0.13</b>	<b>0.28</b>	<b>0.021</b>	<b>0.025</b>	<b>4.09</b>	<b>0.27</b>	...	...	...	...	<b>0.24</b>	...	...	<b>0.98</b>	<b>18.1</b>
483	...		<b>0.67</b>	<b>0.11</b>	<b>0.29</b>	<b>0.019</b>	<b>0.025</b>	<b>3.21</b>	<b>0.17</b>	...	...	...	...	<b>1.94</b>	...	...	<b>0.54</b>	<b>10.8</b>
484	...		<b>0.85</b>	<b>0.20</b>	<b>0.21</b>	<b>0.030</b>	<b>0.024</b>	<b>5.17</b>	<b>1.07</b>	...	...	...	...	<b>10.2</b>	...	...	<b>0.93</b>	<b>22.4</b>

**BRITISH CHEMICAL STANDARD AND EURONORM CERTIFIED REFERENCE MATERIALS - Alloy Steels**

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

**Alloy Steels** (Finely divided material - units of 100g; 112-114 also available as 44mm dia. x 19 or 50mm discs; 186-1, 195-1, 404/1, 401/2-410/2 & 421-424 also available in disc form for spectroscopic analysis - see page 18)

BCS-CRM No.	ECRM No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Co	Cu	N	Nb	Pb	Sn	Ti	V	W	Zr	Ca	Sb	Zn	
112	...	Low Alloy Steel	<b>0.394</b>	<b>0.289</b>	<b>0.436</b>	<b>0.0043</b>	<b>0.0026</b>	<b>1.236</b>	<b>0.190</b>	<b>1.461</b>	<b>0.0148</b>	<b>0.0021</b>	<b>0.0007</b>	<b>0.0175</b>	<b>0.149</b>	<b>0.0024</b>	<b>0.0065</b>	<i>&lt;0.001</i>	<b>0.0086</b>	<b>0.0100</b>	<b>0.0088</b>	...	<i>&lt;0.001</i>	<i>&lt;0.0005</i>	<i>&lt;0.001</i>	...	
113	...	Low Alloy Steel	<b>0.837</b>	<b>0.931</b>	<b>1.207</b>	<b>0.0595</b>	<b>0.0294</b>	<b>1.248</b>	<b>0.056</b>	<b>0.0784</b>	<b>0.0151</b>	<b>0.0020</b>	<b>0.0066</b>	<b>0.0415</b>	<b>0.179</b>	<b>0.0109</b>	<b>0.0487</b>	<i>&lt;0.001</i>	<b>0.0067</b>	<b>0.0390</b>	<b>0.201</b>	<b>0.012</b>	<b>0.0029</b>	<i>&lt;0.001</i>	<i>&lt;0.003</i>	...	
114	...	Low Alloy Steel	<b>0.403</b>	<b>0.295</b>	<b>0.416</b>	<b>0.0044</b>	<b>0.0046</b>	<b>0.187</b>	<b>0.184</b>	<b>1.502</b>	<b>0.078</b>	<b>0.0025</b>	<b>0.0008</b>	<b>0.0171</b>	<b>0.360</b>	<b>0.0043</b>	<b>0.0042</b>	<i>&lt;0.001</i>	<b>0.041</b>	<b>0.0096</b>	<b>0.0086</b>	<i>&lt;0.001</i>	<b>0.0051</b>	<i>&lt;0.001</i>	<i>&lt;0.0025</i>	...	
214/2	152-1	Mn-Mo Steel	<b>0.39</b>	<b>0.18</b>	<b>1.61</b>	<b>0.032</b>	<b>0.043</b>	<b>0.09</b>	<b>0.26</b>	<b>0.15</b>	...	...	...	...	<b>0.21</b>	...	...	...	...	<i>&lt;0.01</i>	...	...	...	...	...	...	
219/4	153-1	Ni-Cr-Mo Steel	<b>0.314</b>	<b>0.079</b>	<b>0.81</b>	<b>0.011</b>	<b>0.027</b>	<b>0.66</b>	<b>0.58</b>	<b>2.55</b>	<i>0.003</i>	...	...	...	<b>0.088</b>	...	...	...	<b>0.011</b>	...	...	...	...	...	...	...	
222/1	154-1	Ni Steel	<i>0.31</i>	<i>0.22</i>	<i>0.62</i>	<i>0.020</i>	<i>0.009</i>	<i>0.05</i>	<i>0.029</i>	<b>3.54</b>	...	...	...	<i>0.038</i>	<i>0.14</i>	...	...	...	...	...	...	...	...	...	...	...	
225/2	155-1	Ni-Cr-Mo Steel	<b>0.40</b>	<b>0.23</b>	<b>0.56</b>	<b>0.019</b>	<b>0.012</b>	<b>1.08</b>	<b>0.34</b>	<b>1.43</b>	<i>0.01</i>	<i>0.04</i>	<i>0.007</i>	<i>0.02</i>	<i>0.17</i>	<i>0.012</i>	<i>0.003</i>	...	<i>0.02</i>	...	<i>&lt;0.01</i>	...	<i>&lt;0.01</i>	...	<i>0.006</i>	...	
317	151-1	Low C, High Si Steel	<b>0.028</b>	<b>3.49</b>	<b>0.085</b>	<b>0.015</b>	<b>0.023</b>	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
...	186-1(C)	Silico Manganese Steel	<b>0.6104</b>	<b>1.719</b>	<b>0.870</b>	<b>0.0223</b>	<b>0.0354</b>	<b>0.218</b>	<b>0.0482</b>	<b>0.190</b>	<b>0.0143</b>	...	...	...	<b>0.281</b>	...	...	...	...	...	...	...	...	...	...	...	
...	195-1(C)	Cr-Mo-Ni Steel	<b>0.756</b>	<b>0.466</b>	<b>0.571</b>	<b>0.0160</b>	<b>0.0121</b>	<b>1.566</b>	<b>0.768</b>	<b>0.327</b>	...	...	...	...	<b>0.0355</b>	<b>0.0100</b>	...	<b>0.0010</b>	<i>0.002</i>	...	<b>0.312</b>	...	...	<b>0.0017</b>	<i>0.0008</i>	<b>0.0046</b>	
405	...	Low Alloy Steels	<b>0.058</b>	<b>1.38</b>	<b>1.28</b>	<b>0.017</b>	<b>0.060</b>	<b>0.21</b>	<b>0.017</b>	<b>0.12</b>	...	...	...	...	<b>0.015</b>	...	...	...	...	...	<b>0.32</b>	...	...	...	...	...	
408	...		<b>0.28</b>	<b>0.24</b>	<b>0.64</b>	<b>0.043</b>	<b>0.030</b>	<b>0.090</b>	<b>0.14</b>	<b>4.58</b>	...	...	...	...	<b>0.73</b>	...	...	...	...	...	<b>0.063</b>	...	...	...	...	...	
404/1	...	Low Alloy Steels	<b>0.74</b>	<b>0.87</b>	<b>0.31</b>	<b>0.057</b>	<b>0.024</b>	<b>0.48</b>	<b>0.31</b>	<b>0.40</b>	...	...	...	...	<b>0.34</b>	...	...	...	...	...	<b>0.11</b>	...	...	...	...	...	
405/1	...		<b>0.032</b>	<b>1.71</b>	<b>1.28</b>	<b>0.018</b>	<b>0.069</b>	<b>0.15</b>	<b>0.002</b>	<b>0.22</b>	...	...	...	...	<b>0.013</b>	...	...	...	...	...	...	<b>0.28</b>	...	...	...	...	...
407/1	...		<b>0.47</b>	<b>0.59</b>	<b>0.047</b>	<b>0.030</b>	<b>0.010</b>	<b>2.95</b>	<b>0.78</b>	<b>0.59</b>	...	...	...	...	<b>0.57</b>	...	...	...	...	...	...	<b>0.18</b>	...	...	...	...	...
408/1	...		<b>0.285</b>	<b>0.23</b>	<b>0.51</b>	<b>0.037</b>	<b>0.028</b>	<b>0.102</b>	<b>0.09</b>	<b>4.45</b>	...	...	...	...	<b>0.66</b>	...	...	...	...	...	...	<b>0.031</b>	...	...	...	...	...
409/1	...		<b>0.082</b>	<b>1.46</b>	<b>0.44</b>	<b>0.025</b>	<b>0.021</b>	<b>0.94</b>	<b>0.65</b>	<b>3.06</b>	...	...	...	...	<b>0.014</b>	<b>0.048</b>	...	...	...	...	...	<b>0.09</b>	...	...	...	...	...
401/2	...	Low Alloy Steels	<b>0.935</b>	<b>0.602</b>	<b>1.197</b>	<b>0.0265</b>	<b>0.0078</b>	<b>0.138</b>	<b>0.495</b>	<b>0.019</b>	<b>0.074</b>	...	...	<b>0.0042</b>	<b>0.101</b>	<i>0.015</i>	...	...	...	...	<b>0.496</b>	...	...	...	...	...	
402/2	...		<b>1.311</b>	<b>0.111</b>	<b>0.228</b>	<b>0.0161</b>	<b>0.0138</b>	<b>0.652</b>	<b>0.140</b>	<b>0.808</b>	<b>0.161</b>	...	...	...	<b>0.302</b>	<b>0.0069</b>	...	...	...	...	<b>0.194</b>	...	...	...	...	...	
403/2	...		<b>0.750</b>	<b>0.209</b>	<b>1.677</b>	<b>0.055</b>	<b>0.0381</b>	<b>0.463</b>	<b>0.088</b>	<b>0.223</b>	<b>0.0485</b>	...	...	...	<b>0.221</b>	<i>0.010</i>	...	...	...	...	<b>0.341</b>	...	...	...	...	...	
404/2	...		<b>0.696</b>	<b>1.121</b>	<b>0.532</b>	<b>0.0479</b>	<b>0.0228</b>	<b>0.774</b>	<b>0.307</b>	<b>0.393</b>	<b>0.017</b>	...	...	...	<b>0.427</b>	<b>0.0089</b>	...	...	...	...	<b>0.107</b>	...	...	...	...	...	
405/2	...		<b>0.044</b>	<b>0.947</b>	<b>0.903</b>	<b>0.0095</b>	<b>0.058</b>	<b>0.206</b>	<b>0.025</b>	<b>0.102</b>	<b>0.330</b>	...	...	...	<i>0.009</i>	<b>0.022</b>	<i>0.011</i>	...	...	...	<b>0.411</b>	...	...	...	...	...	
406/2	...		<b>0.173</b>	<b>0.342</b>	<b>0.447</b>	<b>0.0102</b>	<b>0.043</b>	<b>2.001</b>	<b>0.98</b>	<b>1.62</b>	<b>0.013</b>	<b>0.012</b>	...	...	<i>0.006</i>	<b>0.289</b>	<i>0.009</i>	...	<b>0.0002</b>	<i>0.001</i>	...	<b>0.010</b>	...	...	...	...	
407/2	...		<b>0.490</b>	<b>0.66</b>	<b>0.195</b>	<b>0.038</b>	<b>0.0105</b>	<b>3.03</b>	<b>0.83</b>	<b>0.527</b>	<b>0.040</b>	...	...	...	<b>0.0068</b>	<b>0.397</b>	<i>0.011</i>	...	...	...	<b>0.19</b>	...	...	...	...	...	
408/2	...		<b>0.289</b>	<b>0.237</b>	<b>0.557</b>	<b>0.056</b>	<b>0.030</b>	<b>0.111</b>	<b>0.098</b>	<b>4.13</b>	<b>0.154</b>	<b>0.0046</b>	...	...	...	<b>0.694</b>	<b>0.0075</b>	...	<b>0.0006</b>	<i>0.002</i>	...	<b>0.067</b>	...	...	...	...	
409/2	...		<b>0.086</b>	<b>1.18</b>	<b>0.559</b>	<b>0.0141</b>	<b>0.0179</b>	<b>1.318</b>	<b>0.599</b>	<b>3.02</b>	<b>0.094</b>	...	...	...	...	<b>0.205</b>	<b>0.0108</b>	...	...	...	<b>0.008</b>	...	...	...	...	...	
410/2	...		<b>0.428</b>	<b>1.10</b>	<b>0.419</b>	<b>0.074</b>	<b>0.041</b>	<b>1.684</b>	<b>0.432</b>	<b>2.07</b>	<b>0.046</b>	<b>0.0053</b>	...	...	<b>0.0248</b>	<b>0.436</b>	<b>0.0155</b>	...	...	...	<b>0.44</b>	...	...	...	...	...	
421	...	Low Tungsten Steels	<i>0.049</i>	<i>0.07</i>	<i>0.11</i>	<i>0.012</i>	<i>0.027</i>	...	<i>0.028</i>	...	...	...	...	...	...	...	...	...	...	...	<i>&lt;0.02</i>	<b>0.52</b>	...	...	...	...	
422	...		<i>0.036</i>	<i>0.06</i>	<i>0.09</i>	<i>0.015</i>	<i>0.025</i>	...	<i>0.033</i>	...	...	...	...	...	...	...	...	...	...	...	...	<i>&lt;0.02</i>	<b>1.28</b>	...	...	...	...
423	...		<i>0.030</i>	<i>0.05</i>	<i>0.07</i>	<i>0.017</i>	<i>0.027</i>	...	<i>0.027</i>	...	...	...	...	...	...	...	...	...	...	...	...	<i>&lt;0.02</i>	<b>2.06</b>	...	...	...	...
424	...		<i>0.024</i>	<i>0.05</i>	<i>0.09</i>	<i>0.02</i>	<i>0.024</i>	...	<i>0.036</i>	...	...	...	...	...	...	...	...	...	...	...	...	<i>&lt;0.02</i>	<b>3.02</b>	...	...	...	...

**BRITISH CHEMICAL STANDARD AND EURONORM CERTIFIED REFERENCE MATERIALS - Highly Alloyed Steels**

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

**Highly Alloyed Steels** (Finely divided material - units of 100g; 272-1, 276-2, 285-2, 287-1, 292-1, 295-1, 296-1, 340 (SS70), 461/1-468/1, 466/2, 469-473, 475 also available in disc form for spectroscopic analysis - see pages 19 & 20)

BCS-CRM No.	ECRM No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Co	Cu	N	Nb	Pb	Sn	Ti	V	Mg	Sb	Others
...	<b>272-1(C)</b>	12% Chromium Steel	<b>0.2815</b>	<b>0.420</b>	<b>0.600</b>	<b>0.0156</b>	<b>0.0197</b>	<b>11.927</b>	<b>0.0030</b>	<b>0.244</b>	<b>0.0046</b>	<b>0.0116</b>	<b>0.0018</b>	<b>0.0145</b>	<b>0.0192</b>	<b>0.0508</b>	<b>0.0028</b>	<i>0.0004</i>	<i>0.0008</i>	<b>0.00096</b>	<b>0.0167</b>	<i>0.0002</i>	<b>0.0007</b>	<b>0.00090 Ca</b> <b>0.0031 Zn</b>
...	<b>276-2(C)</b>	5% Cr-Mo-V Steel	<b>0.399</b>	<b>1.034</b>	<b>0.365</b>	<b>0.0093</b>	<b>0.0189</b>	<b>4.975</b>	<b>1.134</b>	<b>0.203</b>	...	...	...	...	<b>0.183</b>	<b>0.0116</b>	...	...	<b>0.0133</b>	...	<b>0.296</b>	...	...	...
...	<b>281-1</b>	18/9 Stainless Steel & Ti	<b>0.048</b>	<b>0.929</b>	<b>0.786</b>	<b>0.012</b>	<b>0.016</b>	<b>18.17</b>	...	<b>9.37</b>	<b>0.015</b>	<i>0.015</i>	<b>0.0012</b>	<b>0.023</b>	<b>0.076</b>	<b>0.023</b>	...	<b>0.0005</b>	<b>0.009</b>	<b>0.216</b>	...	...	...	...
...	<b>285-2(C)</b>	Maraging Steel	<b>0.0018</b>	<b>0.0117</b>	<b>0.0168</b>	<b>0.0053</b>	<b>0.0025</b>	<b>0.0236</b>	<b>4.99</b>	<b>18.07</b>	<b>0.1067</b>	...	...	...	<b>7.76</b>	<b>0.0094</b>	<b>0.0007</b>	...	<i>0.001</i>	<b>0.520</b>	...	...	...	<b>0.0050 Zr</b>
...	<b>287-1(C)</b>	High B Stainless Steel	<b>0.0164</b>	<b>0.569</b>	<b>1.478</b>	<b>0.0267</b>	<b>0.0014</b>	<b>18.61</b>	<b>0.247</b>	<b>10.35</b>	...	...	<b>0.924</b>	<b>0.148</b>	<b>0.203</b>	<b>0.0194</b>	...	...	...	...	...	...	...	...
...	<b>292-1(C)</b>	Nb-Stabilised Stainless Steel	<b>0.0367</b>	<b>0.402</b>	<b>1.744</b>	<b>0.0175</b>	<b>0.0055</b>	<b>18.00</b>	<b>0.0464</b>	<b>10.09</b>	<i>0.002</i>	<i>0.008</i>	<i>0.0003</i>	<b>0.0255</b>	<b>0.0391</b>	<b>0.0640</b>	<b>0.571</b>	...	...	...	...	...	...	<i>0.001 Ta</i>
...	<b>295-1(C)</b>	4% Mo-Cr-Ni Steel	<b>0.0166</b>	<b>0.418</b>	<b>1.758</b>	<b>0.0167</b>	<b>0.0003</b>	<b>19.51</b>	<b>3.996</b>	<b>24.40</b>	<b>0.0203</b>	<b>0.0041</b>	<b>0.0018</b>	<b>0.0450</b>	<b>1.481</b>	<b>0.0615</b>	...	...	<b>0.0025</b>	...	<b>0.0456</b>	<i>0.0003</i>	<b>0.0007</b>	<b>48.36 Fe</b>
...	<b>296-1(C)</b>	Jethete Steel	<b>0.1166</b>	<b>0.242</b>	<b>0.676</b>	<b>0.0178</b>	<b>0.0026</b>	<b>11.82</b>	<b>1.700</b>	<b>2.790</b>	<b>0.0275</b>	<b>0.0139</b>	<i>0.0003</i>	<b>0.0218</b>	<b>0.1498</b>	<b>0.0214</b>	...	<b>0.00016</b>	<b>0.0131</b>	...	<b>0.363</b>	...	...	...
<b>332</b>	...	Austenitic Stainless Steel	<b>0.063</b>	<b>0.44</b>	<b>0.80</b>	<b>0.015</b>	<b>0.020</b>	<b>12.80</b>	...	<b>12.45</b>	...	...	...	<i>0.037</i>	<i>0.10</i>	...	...	...	...	...	<i>0.02</i>	...	...	...
<b>339</b>	...	Ferritic Stainless Steels	<b>0.29</b>	<b>0.36</b>	<b>0.41</b>	<b>0.022</b>	<b>0.022</b>	<b>12.40</b>	...	<b>0.37</b>	...	...	...	...	<i>0.08</i>	...	...	...	...	...	...	...	...	...
<b>340</b>	...		<b>0.18</b>	<b>0.35</b>	<b>0.38</b>	<b>0.024</b>	<b>0.020</b>	<b>16.35</b>	...	<b>0.40</b>	...	...	...	...	<i>0.06</i>	...	...	...	...	...	...	...	...	...
<b>341</b>	...		<b>0.100</b>	<b>0.31</b>	<b>0.43</b>	<b>0.016</b>	<b>0.024</b>	<b>24.00</b>	...	<b>0.56</b>	...	...	...	...	<i>0.10</i>	...	...	...	...	...	...	...	...	...
<b>342</b>	...		<b>0.18</b>	<b>0.92</b>	<b>0.91</b>	<b>0.030</b>	<b>0.026</b>	<b>16.15</b>	<b>0.69</b>	<b>2.16</b>	...	...	...	...	<i>0.08</i>	...	...	...	...	...	...	...	...	...
<b>462</b>	...	Austenitic Stainless Steels	<b>0.092</b>	<b>0.46</b>	<b>0.74</b>	<b>0.010</b>	<b>0.018</b>	<b>12.35</b>	...	<b>12.55</b>	...	<b>0.007</b>	...	...	...	...	...	<b>0.0005</b>	...	...	...	...	...	...
<b>463</b>	...		<b>0.088</b>	<b>0.51</b>	<b>0.77</b>	<b>0.015</b>	<b>0.017</b>	<b>18.30</b>	...	<b>9.65</b>	...	...	...	<i>0.0004</i>	...	...	...	...	...	...	...	...	...	...
<b>461/1</b>	...		<b>0.0103</b>	<b>0.374</b>	<b>0.686</b>	<b>0.0053</b>	<b>0.0051</b>	<b>14.727</b>	<b>0.0138</b>	<b>6.124</b>	<i>0.002</i>	<i>0.004</i>	...	<i>0.004</i>	<b>0.0091</b>	...	...	<i>0.005</i>	...	...	...	...	...	...
<b>462/1</b>	...		<b>0.0345</b>	<b>0.463</b>	<b>0.722</b>	<b>0.0053</b>	<b>0.0041</b>	<b>11.888</b>	<b>0.0304</b>	<b>12.85</b>	...	...	...	...	<b>0.0112</b>	...	...	...	...	...	...	...	...	...
<b>463/1</b>	...		<b>0.019</b>	<b>0.270</b>	<b>1.400</b>	<b>0.025</b>	<b>0.019</b>	<b>18.46</b>	<b>0.265</b>	<b>10.20</b>	...	...	...	<b>0.0022</b>	<b>0.116</b>	<b>0.276</b>	<b>0.063</b>	...	...	...	<i>&lt;0.005</i>	<i>0.04</i>	...	...
<b>464/1</b>	...		<b>0.086</b>	<b>0.57</b>	<b>0.791</b>	<b>0.020</b>	<b>0.028</b>	<b>25.39</b>	...	<b>20.05</b>	...	...	<i>0.003</i>	...	<b>0.054</b>	...	...	...	<b>0.0004</b>	...	...	...	...	...
<b>465/1</b>	...		<b>0.066</b>	<b>0.405</b>	<b>1.380</b>	<b>0.021</b>	<b>0.012</b>	<b>17.31</b>	<b>0.092</b>	<b>9.24</b>	<b>0.026</b>	...	...	<b>0.0006</b>	<b>0.053</b>	<b>0.098</b>	<b>0.010</b>	...	<i>&lt;0.001</i>	...	<b>0.40</b>	<b>0.102</b>	...	...
<b>466/2</b>	...		<b>0.0141</b>	<b>0.480</b>	<b>1.311</b>	<b>0.0105</b>	<b>0.0069</b>	<b>17.84</b>	<b>2.776</b>	<b>10.20</b>	<i>0.002</i>	<b>0.0020</b>	<b>0.0039</b>	<b>0.0184</b>	<b>0.0278</b>	<b>0.0508</b>	<i>0.001</i>	<i>&lt;0.0001</i>	<i>&lt;0.001</i>	<i>0.002</i>	<b>0.0346</b>	...	...	...
<b>467/1</b>	...		<b>0.082</b>	<b>0.52</b>	<b>0.788</b>	<b>0.018</b>	<b>0.019</b>	<b>18.09</b>	...	<b>9.21</b>	...	...	<b>0.004</b>	...	...	...	...	<b>0.99</b>	<b>0.004</b>	...	...	...	...	<b>0.0017 Ta</b>
<b>468/1</b>	...		<b>0.143</b>	<b>1.41</b>	<b>1.70</b>	<b>0.014</b>	<b>0.020</b>	<b>17.96</b>	...	<b>8.90</b>	...	...	...	...	<b>0.018</b>	...	...	...	...	...	...	...	...	...
<b>469</b>	...	Ferritic Stainless Steels	<b>0.279</b>	<b>0.421</b>	<b>0.598</b>	<b>0.015</b>	<b>0.020</b>	<b>11.93</b>	...	<b>0.246</b>	...	...	...	<i>0.01</i>	<i>0.02</i>	...	...	...	...	...	<i>0.02</i>	...	...	...
<b>470</b>	...		<b>0.153</b>	<b>0.335</b>	<b>0.235</b>	<b>0.024</b>	<b>0.035</b>	<b>17.68</b>	...	<b>0.369</b>	...	...	...	<i>0.02</i>	<i>0.02</i>	...	...	...	...	...	<i>0.02</i>	...	...	...
<b>471</b>	...		<b>0.095</b>	<b>0.326</b>	<b>0.417</b>	<b>0.018</b>	<b>0.023</b>	<b>23.85</b>	...	<b>0.96</b>	...	...	...	<i>0.02</i>	<i>0.02</i>	...	...	...	...	...	<i>0.03</i>	...	...	...
<b>472</b>	...		<b>0.227</b>	<b>1.05</b>	<b>1.02</b>	<b>0.032</b>	<b>0.029</b>	<b>15.82</b>	<b>0.661</b>	<b>1.95</b>	...	...	...	<i>0.02</i>	<i>0.02</i>	...	...	...	...	...	<i>0.02</i>	...	...	...
<b>473</b>	...		<b>0.172</b>	<b>0.604</b>	<b>0.494</b>	<b>0.019</b>	<b>0.030</b>	<b>9.06</b>	<b>0.95</b>	<i>0.06</i>	...	...	...	<i>0.01</i>	<i>0.03</i>	...	...	...	...	...	<i>0.02</i>	...	...	...
<b>474</b>	...	Stainless Steels	<b>0.022</b>	<b>0.17</b>	<b>1.70</b>	<b>0.008</b>	<b>0.020</b>	<b>19.06</b>	<b>3.55</b>	<b>14.74</b>	<i>0.006</i>	<b>0.030</b>	...	<i>0.02</i>	<b>0.35</b>	...	...	...	...	...	<b>0.30</b>	...	...	...
<b>475</b>	...		<b>0.050</b>	<b>0.21</b>	<b>0.89</b>	<b>0.037</b>	<b>0.008</b>	<b>14.14</b>	<b>1.59</b>	<b>5.66</b>	<b>0.013</b>	...	...	...	<b>0.22</b>	<b>1.94</b>	...	<b>0.22</b>	...	<b>0.015</b>	...	...	...	...
<b>290/2</b>	<b>253-1</b>	High Manganese Steels	<b>1.15</b>	<b>0.34</b>	<b>12.5</b>	<b>0.042</b>	<b>0.019</b>	<b>0.16</b>	<i>0.031</i>	<b>0.29</b>	...	...	...	<i>0.35</i>	<i>0.17</i>	<i>0.013</i>	...	...	...	...	<i>0.02</i>	...	...	...
<b>491</b>	...		<b>0.92</b>	<b>0.90</b>	<b>16.1</b>	<b>0.026</b>	<b>0.012</b>	<b>1.45</b>	<b>0.60</b>	<b>0.05</b>	<b>0.042</b>	...	...	...	<i>0.04</i>	...	...	...	...	...	<i>0.06</i>	...	...	...
<b>494</b>	...		<b>1.24</b>	<b>0.26</b>	<b>13.55</b>	<b>0.040</b>	<b>0.005</b>	<b>0.56</b>	<b>0.079</b>	<b>0.69</b>	<b>0.004</b>	...	...	...	<i>0.43</i>	<i>0.19</i>	...	...	...	...	<i>0.02</i>	...	...	...
<b>495</b>	...		<b>0.82</b>	<b>0.46</b>	<b>13.6</b>	<b>0.036</b>	<b>0.014</b>	<b>1.93</b>	<b>0.035</b>	<b>1.05</b>	<b>0.103</b>	...	...	...	...	<i>0.09</i>	...	...	...	...	<i>0.02</i>	...	...	...
<b>495/1</b>	...		<b>0.81</b>	<b>0.58</b>	<b>13.1</b>	<b>0.054</b>	<b>0.026</b>	<b>1.93</b>	<b>0.11</b>	<b>1.13</b>	<b>0.17</b>	...	...	...	...	...	...	...	...	...	<i>0.02</i>	...	...	...

**BRITISH CHEMICAL STANDARD AND EURONORM CERTIFIED REFERENCE MATERIALS - Special Alloys, Cast Irons and Ferro-Alloys**

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

**Special Alloys** (Finely divided material - units of 100g)

BCS-CRM No.	ECRM No.	Description	C	Si	Mn	S	Ni	Al	Co	Cu	Nb	Ti	Ta
383	...	Alcomax III	0.025	...	0.07	0.20	13.2	7.7	24.4	2.63	0.51	...	...
398	...	Alnico HC	0.025	0.11	0.065	0.19	16.59	9.98	14.92	6.09	0.13	0.765	...
...	376-1	24% Cobalt Magnet Alloy	0.0256	0.313	0.046	0.0040	13.37	8.12	23.70	2.94	0.309	0.158	0.016

**Cast Irons** (Finely divided material - units of 100g)

BCS-CRM No.	ECRM No.	Description	C	Graphite	Si	Mn	P	S	Cr	Mo	Ni	Al	As	Cu	N	Sn	Ti	V	Mg
...	451-2	Austenitic Cast Iron	2.059	...	2.092	1.079	0.0593	0.0315	1.097	...	14.01	...	...	6.26	...	...	...	...	...
206/3	453-1	High Si and P Iron	2.44	2.37	3.17	0.72	1.63	0.049	0.053	...	0.068	...	0.019	0.10	...	...	0.040	0.050	...
236/3	454-1	Hematite Iron	2.53	1.96	2.00	1.16	0.046	0.068	...	...	0.21	...	0.025	0.07	...	...	0.052	...	...
...	481-1	Nodular Iron	3.907	...	2.288	0.448	0.0192	0.0040	0.063	0.0110	1.190	0.0229	0.0096	0.150	...	...	...	...	0.0507
...	482-2	Low Alloy Cast Iron	2.599	...	1.815	0.728	0.0974	0.0491	0.675	0.454	2.284	...	...	1.231	...	...	...	...	...
...	483-1	High Duty Iron	2.463	1.65	1.755	0.596	0.615	0.103	0.039	...	...	...	...	...	...	0.130	...	...	...
...	484-1	Whiteheart Malleable Iron	3.203	...	0.717	0.395	0.121	0.230	0.155	...	...	...	...	...	...	...	...	...	...
...	486-1	Foundry Iron	2.212	...	2.429	0.841	0.996	0.0233	0.104	...	0.0571	...	...	0.548	...	0.074	...	0.0197	...
...	489-1	White Iron	2.860	...	1.524	0.510	0.815	0.155	...	...	...	...	...	0.274	0.0056	...	...	...	...
527	...	Blast Furnace Iron	3.873	...	0.999	0.317	0.1271	0.0368	...	...	0.0229	...	...	0.0104	...	...	0.0187	...	...

**Ferro-Alloys** (Finely divided material - units of 100g)

BCS-CRM No.	ECRM No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al (Acid Sol)	Al (Total)	B	Co	Cu	N	Nb	Sn	Ti	V	W	Ta	Fe
242/2	555-1	Ferro-Tungsten	0.025	1.75	...	0.02	0.018	...	...	...	...	0.14	...	...	...	...	...	0.034	...	...	79.9	...	15.2
...	576-1	Ferro-Niobium (40% Nb)	0.201	1.79	...	...	...	...	...	...	...	2.53	...	...	...	...	43.90	0.195	1.32	...	...	0.306	...
...	577-1	Ferro-Vanadium	0.089	1.79	0.158	0.035	0.034	...	...	0.053	0.21	0.414	...	...	0.054	...	...	...	...	50.16	...	...	...
...	578-1	Ferro-Molybdenum	0.016	0.208	...	0.024	0.065	...	72.23	...	...	...	...	...	0.136	...	...	...	...	...	...	...	...
...	579-1	Ferro-Niobium (60% Nb)	0.037	1.03	...	0.064	0.021	...	...	...	...	1.86	...	0.0051	...	...	62.87	0.344	0.567	...	...	3.85	...
...	580-1	Low C Ferro-Chromium	0.019	0.306	...	0.011	...	72.18	...	...	...	...	...	0.047	...	0.035	...	...	...	0.083	...	...	...
...	583-1	Ferro-Manganese	0.333	0.396	86.42	0.146	0.007	...	...	...	...	...	...	...	...	0.041	...	...	...	...	...	...	12.3
...	584-1	Ferro-Titanium	0.044	1.80	1.13	0.032	0.030	...	...	...	6.0	7.19	...	...	...	...	...	...	37.17	...	...	...	...
...	585-2	High C Ferro-Chromium	5.488	4.69	0.801	0.0255	0.0320	49.05	...	0.294	...	...	...	0.062	...	0.0127	...	...	0.263	0.282	...	...	38.67
...	587-1	Ferro-Boron	0.738	0.129	0.272	0.020	0.001	0.10	0.005	...	...	0.047	18.7	0.010	...	...	...	...	0.04	0.004	...	...	...
...	590-1	Ferro-Tungsten	0.0250	1.05	0.136	...	0.07	...	0.101	...	...	0.37	...	...	0.0484	...	...	0.045	...	...	79.55	...	17.9

## BRITISH CHEMICAL STANDARD CERTIFIED REFERENCE MATERIALS - Aluminium, Magnesium & Copper Base Alloys

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

### Aluminium and Magnesium Base Alloys (Finely divided material - units of 100g)

BCS-CRM No.	Description	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Pb	Sn	Ni	Sb	Zr	Be	Total Rare Earths	Al
181/3	2.5% Cu Aluminium Alloy	<b>0.30</b>	<b>0.72</b>	<b>2.48</b>	<b>1.10</b>	<b>1.57</b>	<b>0.04</b>	<b>2.52</b>	<b>0.058</b>	<b>0.101</b>	...	<b>2.00</b>	...	...	...	...	Bal.
182/3	11% Si Aluminium Alloy	<b>11.03</b>	<b>0.51</b>	<b>0.037</b>	<b>0.26</b>	<b>0.067</b>	...	<b>0.128</b>	<b>0.107</b>	<b>0.056</b>	<b>0.027</b>	<b>0.046</b>	...	...	...	...	Bal.
216/3	5% Cu Aluminium Alloy	<b>0.74</b>	<b>0.77</b>	<b>5.45</b>	<b>0.76</b>	<b>0.76</b>	<b>0.108</b>	<b>0.214</b>	<b>0.20</b>	<b>0.052</b>	<b>0.052</b>	<b>0.24</b>	<i>0.01</i>	<b>0.084</b>	...	...	Bal.
262/1	10% Mg Aluminium Alloy	<b>0.16</b>	<b>0.20</b>	<b>0.039</b>	<b>0.084</b>	<b>10.75</b>	<i>0.002</i>	<b>0.085</b>	<b>0.005</b>	<i>0.05</i>	<i>0.04</i>	<b>0.071</b>	...	...	<i>&lt;0.01</i>	...	Bal.
263/2	5% Mg Aluminium Alloy	<b>0.14</b>	<b>0.26</b>	<b>0.019</b>	<b>0.36</b>	<b>4.67</b>	<b>0.074</b>	<b>0.056</b>	<b>0.022</b>	...	...	...	...	...	<i>&lt;0.001</i>	...	Bal.
268/1	5% Si Aluminium Alloy	<b>5.49</b>	<b>0.47</b>	<b>1.35</b>	<b>0.24</b>	<b>0.49</b>	...	<b>0.028</b>	<i>0.008</i>	<b>0.028</b>	<b>0.031</b>	<b>0.16</b>	...	...	...	...	Bal.
300/1	6% Zn Aluminium Alloy	<b>0.14</b>	<b>0.24</b>	<b>1.27</b>	<b>0.33</b>	<b>2.74</b>	<b>0.13</b>	<b>5.87</b>	<b>0.09</b>	...	...	...	...	<b>0.18</b>	...	...	Bal.
343	Wrought Aluminium Alloy	<b>0.52</b>	<b>0.39</b>	<b>0.28</b>	<b>0.69</b>	<b>0.70</b>	<b>0.14</b>	<b>0.028</b>	<b>0.024</b>	...	...	...	...	...	...	...	Bal.
349	3.5% Cu Aluminium Alloy	<b>1.19</b>	<b>0.154</b>	<b>3.40</b>	<b>0.111</b>	<b>0.024</b>	...	<b>0.298</b>	<b>0.034</b>	<b>0.077</b>	<b>0.074</b>	...	...	...	...	...	Bal.
380/1	2% Si Aluminium Alloy	<b>1.93</b>	<b>1.24</b>	<b>0.91</b>	<b>0.094</b>	<b>0.24</b>	<i>&lt;0.001</i>	<b>0.025</b>	<b>0.024</b>	<i>0.014</i>	...	<b>0.94</b>	...	...	...	...	Bal.
307	Magnesium Alloy (ZRE 1)	<i>&lt;0.001</i>	<b>0.002</b>	<b>0.005</b>	<b>0.006</b>	Bal.	...	<b>2.08</b>	...	...	<i>&lt;0.001</i>	<i>&lt;0.001</i>	...	<b>0.56</b>	...	<b>2.84</b>	<i>0.008</i>
316	8% Al Magnesium Alloy	<b>0.055</b>	<b>0.009</b>	<b>0.040</b>	<b>0.28</b>	Bal.	...	<b>0.68</b>	...	<b>0.024</b>	<b>0.005</b>	<b>0.004</b>	...	...	...	...	<b>8.01</b>
505	Aluminium-Silicon Alloys	<b>12.8</b>	<b>0.30</b>	<b>0.05</b>	<b>0.52</b>	<b>0.05</b>	...	<b>0.24</b>	<b>0.03</b>	<b>0.09</b>	<b>0.17</b>	<b>0.20</b>	...	...	...	...	Bal.
506		<b>13.9</b>	<b>0.40</b>	<b>0.02</b>	<b>0.21</b>	<b>0.12</b>	...	<b>0.30</b>	<b>0.07</b>	<b>0.02</b>	<b>0.13</b>	<b>0.13</b>	...	...	...	...	Bal.

### Copper Base Alloys (Finely divided material - units of 100g)

BCS-CRM No.	Description	Cu	Sn	Zn	Pb	P	Ni	Fe	Al	Mn	Sb	As	Si	Bi	Mg	S	C	Cd
179/2	High Tensile Brass (Cast)	<b>58.5</b>	<b>0.70</b>	<b>35.8</b>	<b>0.35</b>	...	<b>0.56</b>	<b>1.02</b>	<b>2.22</b>	<b>0.86</b>	...	<i>0.008</i>	<b>0.044</b>	...	...	...	...	<i>0.003</i>
180/2	Copper Nickel	<b>68.12</b>	...	...	<i>0.003</i>	...	<b>30.35</b>	<b>0.68</b>	...	<b>0.75</b>	...	...	<i>0.018</i>	...	...	<b>0.006</b>	<b>0.04</b>	...
183/4	Leaded Gunmetal	<b>84.08</b>	<b>7.27</b>	<b>3.47</b>	<b>3.15</b>	<b>0.090</b>	<b>1.30</b>	<b>0.056</b>	<i>&lt;0.002</i>	<i>0.01</i>	<b>0.23</b>	<b>0.13</b>	<i>0.01</i>	<b>0.005</b>	...	<b>0.11</b>	...	...
207/2	Gunmetal	<b>87.35</b>	<b>9.74</b>	<b>1.60</b>	<b>0.70</b>	<i>0.018</i>	<b>0.28</b>	<b>0.029</b>	<b>0.013</b>	...	<b>0.10</b>	<b>0.066</b>	<b>0.016</b>	<b>0.04</b>	...	...	...	...
304/1	Copper-Aluminium	<b>80.23</b>	<b>0.03</b>	<b>0.31</b>	<b>0.010</b>	...	<b>4.82</b>	<b>4.64</b>	<b>9.71</b>	<b>0.12</b>	...	...	<b>0.08</b>	...	<i>&lt;0.01</i>	...	...	...
344	70/30 Brass	<b>68.98</b>	...	<b>30.98</b>	...	...	...	...	...	...	...	...	...	...	...	...	...	...
364	Leaded Bronze	<b>80.6</b>	<b>9.35</b>	<b>0.13</b>	<b>9.25</b>	<b>0.056</b>	<b>0.28</b>	<i>&lt;0.005</i>	<i>&lt;0.002</i>	...	<b>0.18</b>	<i>0.07</i>	<i>&lt;0.005</i>	<i>&lt;0.01</i>	...	<b>0.06</b>	...	...
374	Phosphor Bronze	<b>89.5</b>	<b>9.80</b>	<b>0.006</b>	<b>0.064</b>	<b>0.59</b>	<b>0.014</b>	<i>&lt;0.005</i>	<i>&lt;0.005</i>	...	<i>0.01</i>	...	<i>&lt;0.005</i>	<i>0.007</i>	...	<b>0.012</b>	...	...
385	Leaded Brass	<b>58.7</b>	<b>0.27</b>	<b>38.5</b>	<b>2.24</b>	...	<b>0.13</b>	<b>0.15</b>	<i>&lt;0.005</i>	<i>&lt;0.005</i>	<i>&lt;0.01</i>	...	...	...	...	...	...	...
390	High Tensile Brass (Wrought)	<b>57.1</b>	<b>0.34</b>	<b>38.6</b>	<b>1.04</b>	...	<b>0.033</b>	<b>0.83</b>	<b>0.83</b>	<b>1.30</b>	...	...	<i>0.023</i>	...	...	...	...	<i>0.011</i>
399	Phos. Deoxidised Copper	<i>99.93</i>	<i>0.003</i>	<i>0.003</i>	<i>0.002</i>	<b>0.045</b>	<i>0.002</i>	<i>0.006</i>	...	...	<i>&lt;0.001</i>	<i>&lt;0.001</i>	...	<i>0.001</i>	...	...	...	<i>0.003</i>

## BRITISH CHEMICAL STANDARD CERTIFIED REFERENCE MATERIALS - Lead, Tin, Nickel & Titanium Base Alloys, Chromium Metal and Cements

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

### Lead and Tin Base Alloys (Finely divided material - units of 100g)

nominal mass content in %

BCS-CRM No.	Description	Pb	Sn	Sb	Cu	As	Bi	Cd	Fe	Ni	Zn	Al	Ag	Au	In
177/2	Lead Base White Metal	<b>84.5</b>	<b>5.07</b>	<b>10.1</b>	<b>0.12</b>	<b>0.05</b>	<b>0.028</b>	...	...	<b>0.007</b>	...	...	<i>0.008</i>	...	...
178/2	Tin Base White Metal	<b>3.18</b>	<b>82.2</b>	<b>9.45</b>	<b>4.58</b>	<b>0.15</b>	<b>0.11</b>	<b>0.14</b>	<b>0.024</b>	<b>0.17</b>	<b>0.040</b>	<i>0.005</i>	<i>0.02</i>	...	...
347	Electronic Fluxsolder	Bal.	<b>62.6</b>	<b>0.191</b>	<b>0.169</b>	<i>0.02</i>	<b>0.080</b>	<b>0.0040</b>	<i>0.002</i>	<b>0.0072</b>	<b>0.0015</b>	<i>&lt;0.001</i>	<b>0.099</b>	<b>0.037</b>	<i>0.006</i>

### Nickel Base Alloys (Finely divided material - units of 100g - 345, 346 (346A), 350, 351, 363/1 & 387/1 also available in disc form for spectroscopic analysis - see page 21)

MAJOR ELEMENTS - nominal mass content in %

BCS-CRM No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	B	Co	Cu	N	Nb	Ti	V	W	Zr	Fe
310/1	Nimonic '90' Alloy	<b>0.068</b>	<b>0.46</b>	<b>0.35</b>	...	...	<b>19.45</b>	...	<b>58.6</b>	<b>1.06</b>	...	<b>17.0</b>	...	...	...	<b>2.43</b>	...	...	...	<b>0.25</b>
345	IN 100 Alloy	<b>0.153</b>	...	...	...	...	<b>9.95</b>	<b>3.01</b>	Bal.	<b>5.58</b>	<b>0.019</b>	<b>14.71</b>	...	...	...	<b>4.74</b>	<b>1.00</b>	...	<b>0.044</b>	...
346	IN 100 Alloy	<i>0.15</i>	...	...	...	...	<i>10</i>	<i>3</i>	Bal.	<i>5.5</i>	...	<i>15</i>	...	...	...	<i>5</i>	<i>1</i>	...	...	...
350	IN 713 Alloy	<b>0.138</b>	<b>0.110</b>	<b>0.019</b>	...	...	<b>13.43</b>	<b>4.29</b>	<b>70.8</b>	<b>5.97</b>	<b>0.013</b>	<b>0.338</b>	...	...	<b>2.17</b>	<b>0.87</b>	...	<b>0.094</b>	<b>0.072</b>	<b>1.50</b>
351/1	IN 718 Alloy	<b>0.026</b>	<b>0.080</b>	<b>0.0562</b>	<b>0.0045</b>	<b>0.00037</b>	<b>19.14</b>	<b>3.04</b>	<b>53.35</b>	<b>0.554</b>	<b>0.0035</b>	<b>0.145</b>	<b>0.0222</b>	<b>0.0077</b>	<b>5.31</b>	<b>0.938</b>	<b>0.0181</b>	<b>0.0209</b>	<b>0.0017</b>	<b>17.20</b>
363/1	Monel Alloy 400	<b>0.140</b>	<b>0.028</b>	<b>1.26</b>	...	<i>0.002</i>	<i>0.05</i>	...	<b>64.7</b>	<b>0.027</b>	...	<b>0.032</b>	<b>31.90</b>	...	...	<i>0.03</i>	...	...	...	<b>1.86</b>
371	Commercial Nickel	<b>0.30</b>	<b>0.34</b>	...	...	<b>0.013</b>	...	...	Bal.	...	...	<b>0.39</b>	...	...	...	...	...	...	...	...
387/1	Nimonic 901 Alloy	<b>0.033</b>	<b>0.06</b>	<b>0.025</b>	<b>0.0033</b>	<b>0.0028</b>	<b>11.35</b>	<b>5.83</b>	<b>41.2</b>	<b>0.24</b>	<b>0.017</b>	<b>0.020</b>	<b>0.0076</b>	...	<i>0.006</i>	<b>3.00</b>	...	...	...	<b>38.4</b>

### Nickel Base Alloys (continued)

TRACE ELEMENTS - nominal mass content in µg/g

BCS-CRM No.	Description	Pb	Bi	Ag	Se	Te	Tl	Sb	Ta	As	Cd	Ga	Sn	Zn	Mg	Ca	In
345	IN 100 Alloy	<b>0.21</b>	<i>&lt;0.2</i>	<i>&lt;0.2</i>	<i>&lt;0.5</i>	<i>&lt;0.2</i>	<i>&lt;0.2</i>	<i>&lt;2</i>	...	<i>2</i>	<i>&lt;0.1</i>	<b>8.2</b>	<b>5.6</b>	<i>&lt;0.5</i>	<b>5.5</b>	<i>&lt;5</i>	...
346	IN 100 Alloy	<b>21.0</b>	<b>10.4</b>	<b>35.0</b>	<b>9.1</b>	<b>11.7</b>	<b>1.8</b>	<b>47</b>	...	<b>50.3</b>	<b>0.42</b>	<b>50.6</b>	<b>91</b>	<b>28.9</b>	<b>147</b>	<b>36</b>	<b>19</b>
351/1	IN 718 Alloy	<i>&lt;1</i>	<i>&lt;1</i>	<i>&lt;1</i>	<i>&lt;1</i>	<i>&lt;1</i>	<i>&lt;1</i>	<b>2.4</b>	<b>33</b>	<i>&lt;10</i>	<i>&lt;0.1</i>	<i>&lt;20</i>	<b>3.3</b>	<i>&lt;10</i>	<b>16</b>	<i>&lt;10</i>	...
371	Commercial Nickel	...	...	...	...	...	...	...	...	...	...	...	...	...	<b>600</b>	...	...
387/1	Nimonic 901 Alloy	<i>0.3</i>	<i>&lt;1.0</i>	<i>≤0.2</i>	...	...	...	<b>3</b>	...	...	...	...	...	...	...	...	...

### Titanium Base Alloys (Finely divided material - units of 50g)

nominal mass content in %

BCS-CRM No.	Description	Al	V	Fe	Cu	Ni	Cr	Mo	N	Sn	Si	W	C	H	O	B	Zr	Y
356	Titanium Alloy	<b>6.25</b>	<b>4.05</b>	<b>0.124</b>	<b>0.0055</b>	<b>0.0070</b>	<b>0.0112</b>	<b>0.0020</b>	<b>0.0103</b>	<i>0.0155</i>	<i>0.0200</i>	<i>0.0010</i>	<i>0.0085</i>	<i>0.0019</i>	<i>0.2000</i>	<i>&lt;0.0005</i>	<i>&lt;0.0005</i>	...
357	Titanium Alloy	<b>5.46</b>	<b>3.53</b>	<b>0.202</b>	<b>0.0537</b>	<b>0.0511</b>	<b>0.0521</b>	<b>0.053</b>	<b>0.0148</b>	<i>0.0620</i>	<i>0.0500</i>	<i>&lt;0.001</i>	<i>0.0072</i>	<i>0.0012</i>	<i>0.2500</i>	<i>0.0013</i>	<i>0.0455</i>	<i>0.0046</i>

### Chromium Metal (Finely divided material - units of 100g)

nominal mass content in %

BCS-CRM No.	Description	C	Si	S	N	Fe	O	Al (Total)
361	Chromium Metal	<b>0.0039</b>	<b>0.0449</b>	<b>0.0043</b>	<b>0.0079</b>	<b>0.092</b>	<b>0.101</b>	<i>0.083</i>

### Cements (Finely divided material - units of 100g)

nominal mass content in %

BCS-CRM 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>	Cr <sub>2</sub> O <sub>3</sub>	Mn <sub>2</sub> O <sub>3</sub>	CaO	MgO	Na <sub>2</sub> O (Acid Sol)	K <sub>2</sub> O (Acid Sol)	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	SrO	Cl
353	Sulphate Resisting Portland Cement	<b>20.5</b>	<b>3.77</b>	<b>0.16</b>	<b>4.82</b>	<i>0.02</i>	<b>0.23</b>	<b>64.8</b>	<b>2.42</b>	<b>0.10</b>	<b>0.49</b>	<b>0.077</b>	<b>2.25</b>	<b>0.23</b>	<i>0.01</i>
354	White Portland Cement	<b>21.8</b>	<b>4.85</b>	<i>0.04</i>	<b>0.30</b>	<i>0.003</i>	<b>0.057</b>	<b>70.0</b>	<b>0.42</b>	<b>0.10</b>	<b>0.11</b>	<b>0.12</b>	<b>2.25</b>	<b>0.11</b>	<i>0.005</i>

**BRITISH CHEMICAL STANDARD AND EURONORM CERTIFIED REFERENCE MATERIALS - Non-Metallic Materials**

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

**Ores** (Finely divided material - units of 100g)

BCS-CRM No.	ECRM No.	Description	Fe	FeO	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Cr <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	CaO	MgO	S	P	Mn	MnO	Na <sub>2</sub> O	K <sub>2</sub> O	CO <sub>2</sub>	As <sub>2</sub> O <sub>3</sub>	BaO	Pb	L.O.I.
176/2	...	Manganese Ore	<b>6.86</b>	...	<b>2.53</b>	<b>5.2</b>	...	<b>0.30</b>	<b>0.09</b>	<b>0.04</b>	<b>0.018</b>	<b>0.087</b>	<b>47.5</b>	...	<b>0.11</b>	<b>1.30</b>	...	<b>0.22</b>	<b>0.19</b>	<i>0.01</i>	...
301/1	651-1	Lincolnshire Iron Ore	<b>23.85</b>	...	<b>7.40</b>	<b>4.26</b>	...	<b>0.16</b>	<b>22.6</b>	<b>1.73</b>	<b>0.40</b>	<b>0.35</b>	...	<b>1.25</b>	<b>0.07</b>	<b>0.32</b>	<i>22.1</i>	...	...	...	<i>25.8</i>

**Fluorspar & Bauxite** (Finely divided material - units of 100g)

BCS-CRM No.	Description	Fe <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaF <sub>2</sub>	TiO <sub>2</sub>	CaO	MgO	BaO	Na <sub>2</sub> O	K <sub>2</sub> O	S	CO <sub>2</sub>	Cr	Cu	Mn	Ni	Pb	Sr	Zn	L.O.I.
392	Fluorspar	...	<b>0.67</b>	...	<b>97.2</b>	...	<b>0.52</b>	...	<b>0.37</b>	...	...	<b>0.12</b>	<b>0.48</b>	...	...	...	...	<b>0.18</b>	...	...	...
395	Bauxite	<b>16.3</b>	<b>1.24</b>	<b>52.4</b>	...	<b>1.93</b>	<b>0.05</b>	<b>0.02</b>	...	<i>0.02</i>	<i>0.02</i>	...	...	<i>0.0453</i>	<i>0.0021</i>	<i>0.0042</i>	<i>0.0034</i>	<i>0.0028</i>	<i>0.0023</i>	<i>0.0043</i>	<b>27.8</b>

**Tin Ore** (Finely divided material - units of 100g)

BCS-CRM No.	Description	Sn	Fe	Cu	As	Bi	Zn	Pb	S	W	Ni	Si	Ti	Al	Ca	F
355	Tin Ore	<b>31.42</b>	<b>17.08</b>	<b>0.085</b>	<b>0.14</b>	<b>0.015</b>	<b>0.059</b>	<b>0.012</b>	<b>0.50</b>	<b>0.35</b>	<b>0.0040</b>	<b>7.14</b>	<b>0.37</b>	<b>4.12</b>	<b>2.63</b>	<b>2.07</b>

**Ores & Dust** (Finely divided material - units of 100g)

BCS-CRM No.	ECRM No.	Description	Fe	Si	Ca	Mg	Al	Ti	Mn	P	S	Na	K	F	V	Cr	Ni	C	Zn	Pb	Cl <sub>(sol)</sub>	Co	Cu	Hg	LOI
517	...	Brazilian Iron Ore	<b>66.30</b>	<b>0.519</b>	<b>0.033</b>	<b>0.0311</b>	<b>0.508</b>	<b>0.0332</b>	<b>0.679</b>	<b>0.0408</b>	<b>0.0090</b>	<b>0.0097</b>	<b>0.0105</b>	...	<b>0.0040</b>	...	...	<b>0.061</b>	<b>0.0047</b>	<b>0.0028</b>	<b>0.00075</b>	...	<b>0.0088</b>	...	<b>1.898</b>
...	676-1	Iron Ore Sinter	<b>39.76</b>	<b>6.40</b>	<b>12.78</b>	<b>1.16</b>	<b>3.40</b>	<b>0.19</b>	<b>0.83</b>	<b>0.59</b>	<b>0.12</b>	<b>0.095</b>	<b>0.43</b>	<b>0.10</b>	<b>0.070</b>	...	...	...	...	...	...	...	...	...	...
...	682-2	Iron Ore	<b>66.12</b>	<b>0.833</b>	<i>0.007</i>	<b>0.0133</b>	<b>0.325</b>	<b>0.0441</b>	<b>0.0311</b>	<b>0.0529</b>	<b>0.0140</b>	<i>0.003</i>	...	...	<b>0.0015</b>	<i>0.0015</i>	...	...	<i>0.0014</i>	<b>0.0004</b>	...	<i>0.0006</i>	<b>0.0005</b>	<i>&lt;1µg/g</i>	<i>(3.01)</i>
...	683-1	Iron Ore Sinter	<b>56.06</b>	<b>3.38</b>	<b>5.70</b>	<b>1.04</b>	<b>1.30</b>	<b>0.097</b>	<b>0.462</b>	<b>0.148</b>	<i>0.013</i>	<b>0.045</b>	<b>0.148</b>	<b>0.020</b>	<b>0.026</b>	<b>0.018</b>	...	...	<b>0.010</b>	...	...	...	...	...	...
...	884-1	Furnace Dust	<b>31.67</b>	<b>2.101</b>	<b>5.22</b>	<b>1.848</b>	<b>0.379</b>	<b>0.0230</b>	<b>5.85</b>	<b>0.079</b>	<i>0.49</i>	<b>0.585</b>	<b>0.979</b>	<b>0.411</b>	<b>0.0303</b>	<b>1.86</b>	<b>0.197</b>	<i>0.82</i>	<b>17.50</b>	<b>0.442</b>	...	<b>0.0046</b>	<b>0.1569</b>	<i>0.0002</i>	<i>2.94</i>

**Ores & Dust (cont.)** (Finely divided material - units of 100g)

BCS-CRM No.	ECRM No.	Description	Ag	As	Bi	Cd	Mo	Sn	Cl	H <sub>2</sub> O
...	884-1	Furnace Dust (cont)	<b>0.0028</b>	<b>0.0054</b>	<b>0.0280</b>	<b>0.0045</b>	<b>0.208</b>	<b>0.0186</b>	<b>0.991</b>	<i>0.30</i>

**Copper Concentrate** (Finely divided material - units of 100g)

BCS-CRM No.	Description	SiO <sub>2</sub>	MgO	CaO	Cu	Zn	Pb	S	Fe	Ag	Au	Cd	Mn	Ni	Al <sub>2</sub> O <sub>3</sub>	Na <sub>2</sub> O	K <sub>2</sub> O	As	Bi
514	Copper Concentrate	<b>2.97</b>	<b>0.184</b>	<b>0.263</b>	<b>25.24</b>	<b>0.268</b>	<b>0.010</b>	<b>35.89</b>	<b>31.34</b>	<b>0.0034</b>	<b>0.00193</b>	<b>0.0043</b>	<b>0.058</b>	<b>0.0021</b>	<i>0.59</i>	<i>0.074</i>	<i>0.070</i>	<i>&lt;0.005</i>	<i>&lt;0.005</i>

BCS-CRM No.	Description	C	Mn	Cl	Co	Cr	F	Hg	In	P	Sb	Se	Te	Ti	Ba	Be	Ge	Sn	Tl
514	Copper Concentrate (cont.)	<i>0.064</i>	<i>0.058</i>	<i>&lt;0.005</i>	<i>0.010</i>	<i>&lt;0.005</i>	<i>0.005</i>	<i>&lt;0.0005</i>	<i>&lt;0.003</i>	<i>0.006</i>	<i>&lt;0.01</i>	<i>0.021</i>	<i>&lt;0.005</i>	<i>0.017</i>	<i>&lt;0.005</i>	<i>&lt;0.0005</i>	<i>&lt;0.002</i>	<i>&lt;0.01</i>	<i>&lt;0.002</i>

**Slags** (Finely divided material - units of 100g)

BCS-CRM No.	ECRM No.	Description	SiO <sub>2</sub>	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe	FeO	CaO	MgO	Cr <sub>2</sub> O <sub>3</sub>	MnO	V <sub>2</sub> O <sub>5</sub>	P <sub>2</sub> O <sub>5</sub> (Cit Sol)	P <sub>2</sub> O <sub>5</sub> (Form Sol)	P <sub>2</sub> O <sub>5</sub> (Total)	S	F
381	...	Basic Slag	<b>8.78</b>	<b>0.35</b>	<b>0.67</b>	<b>13.3</b>	<b>3.69</b>	<b>49.0</b>	<b>1.03</b>	<b>0.33</b>	<b>3.16</b>	<b>0.94</b>	<b>15.2</b>	...	<b>15.7</b>	<b>0.19</b>	...
...	879-1	Basic Slag	<b>8.82</b>	<b>0.535</b>	<b>0.803</b>	<b>18.97</b>	...	<b>43.70</b>	<b>2.19</b>	<b>0.477</b>	<b>4.45</b>	<b>0.738</b>	<b>7.59</b>	<i>5.73</i>	<b>8.46</b>	<b>0.102</b>	<b>0.368</b>

**Tungsten Carbide and Silicon Carbide Refractories** (Finely divided material - units of 100g)

BCS-CRM No.	ECRM No.	Description	C (Total)	Si (Total)	Al (Total)	C (Free)	Si (Free)	Fe (Total)	Mn	P	Cr	Mo	Ni	B	O	N	Ti	V	Ca	Mg	Na	K
352/1	...	Tungsten Carbide	<b>6.154</b>	...	...	<b>0.036</b>	...	<b>0.0029</b>	...	...	...	...	...	...	<i>0.11</i>	...	...	...	...	...	...	...
...	783-1	Tungsten Carbide	<b>6.188</b>	...	...	<i>0.04</i>	...	<b>0.0022</b>	...	...	...	...	...	...	<i>0.01</i>	...	...	...	...	...	...	...
...	781-1	Silicon Carbide Refractory	<b>48.25</b>	<b>35.56</b>	<b>4.39</b>	<i>37.22</i>	<i>4.646</i>	<i>0.8061</i>	<i>0.0274</i>	<i>0.0117</i>	<i>0.0240</i>	<i>0.0264</i>	<i>0.0210</i>	<i>0.0149</i>	...	<i>0.0282</i>	<i>0.0320</i>	<i>0.0216</i>	<i>0.0433</i>	<i>0.0421</i>	<i>0.0308</i>	<i>0.3765</i>
359	...	Nitrogen Bearing Silicon Carbide	<b>23.46</b>	<b>67.6</b>	<b>0.118</b>	<i>0.061</i>	<i>0.325</i>	<b>0.175</b>	<i>&lt;0.01</i>	...	...	...	<i>0.014</i>	...	<i>0.532</i>	<i>7.84</i>	<b>0.022</b>	<i>0.027</i>	<b>0.108</b>	<i>&lt;0.01</i>	<i>&lt;0.01</i>	<i>&lt;0.01</i>
360	...	Sialon Bonded Silicon Carbide	<b>23.53</b>	<b>60.8</b>	<b>6.52</b>	<i>0.085</i>	<i>0.538</i>	<i>0.19</i>	<i>&lt;0.01</i>	...	<i>&lt;0.01</i>	...	<i>0.013</i>	...	<i>4.03</i>	<i>4.77</i>	<b>0.025</b>	...	<b>0.115</b>	<i>&lt;0.02</i>	<i>&lt;0.01</i>	<i>&lt;0.01</i>

**BRITISH CHEMICAL STANDARD CERTIFIED REFERENCE MATERIALS - Ceramic Materials and Minerals**

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

**Ceramic Materials & Minerals** (Finely divided material - units of 100g)

BCS-CRM No.	ECRM 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	Mn <sub>2</sub> O <sub>3</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	BaO	Cr <sub>2</sub> O <sub>3</sub>	PbO	ZnO
309	...	Sillimanite	34.1	61.1	1.92	1.51	<i>0.03</i>	...	0.22	0.17	0.34	0.46	<i>0.006</i>	...	...	...
313/1	...	High Purity Silica	99.78	0.036	0.017	0.012	0.00013	...	0.006	0.0013	0.003	0.005	...	<0.0002	...	...
319/1	...	Magnesia	1.093	0.109	0.0070	0.291	0.108	...	3.00	95.38	...	...	<i>0.0038</i>	0.0035	...	...
348	...	Ball Clay	51.1	31.6	1.08	1.04	...	...	0.17	0.30	0.34	2.23	0.04	0.016	...	...
358	...	Zirconia	0.20	0.08	0.20	0.064	...	...	1.50	3.42	<0.01	<0.01	0.10	...	...	...
362 <sup>#</sup>	...	Mine Tailings Sample	9.03	0.667	0.047	0.483	...	0.829	44.21	0.068	0.084	0.14	2.02	0.003	2.63	2.59
369	...	Magnesite-Chrome	2.59	14.7	0.14	10.3	0.11	...	1.17	53.5	0.05	0.03	<0.01	17.2	...	...
370	...	Magnesite-Chrome	3.01	12.3	0.13	7.23	0.11	...	1.54	61.8	0.06	0.03	<0.01	13.4	...	...
375/1*	...	Soda Feldspar	69.26	17.89	0.313	0.291	...	Mn <sub>2</sub> O <sub>3</sub>	0.78	0.180	8.89	1.47	0.0106	0.0018	0.0004	0.0005
376/1	...	Potash Feldspar (SGT Feldspar 1)	65.77	18.63	<0.01	0.085	...	0.004	0.421	0.03	3.00	11.59	0.0210	0.001	0.0090	...
388	...	Zircon	32.7	0.291	0.232	0.049	...	...	0.04	<0.05	<0.02	<0.03	...	...	...	...
389/1	...	High Purity Magnesia	0.274	0.104	0.0051	0.607	0.100	...	0.880	97.89	...	...	0.0015	0.004	...	0.0029
393	752-1	Limestone	0.70	0.12	0.009	0.045	0.010	...	55.4	0.15	0.02	0.02	0.006	...	...	...
396	...	Low Silica Magnesite Chrome	1.37	5.73	0.26	10.9	0.17	...	1.12	64.6	0.06	0.03	...	15.6	...	...
512	...	Dolomite (SGT Dolomite 1)	0.379	0.055	0.0020	0.030	0.0036	...	30.61	21.59	0.1	<0.02	<0.02	<0.001	<0.001	<0.01
513	...	Limestone (SGT Limestone 1)	0.228	0.108	0.004	0.0275	0.0095	...	55.59	0.182	<0.3	0.0150	0.01	0.0012	0.0009 Pb	0.0014 Zn
516	...	Standard Glass Sand (SGT Glass Sand 10)	98.73	0.513	0.172	0.0596	...	0.0012	0.0243	0.0387	0.0195	0.127	0.0040	0.0081	0.0127	<0.01
528	...	Standard Glass Sand (SGT Glass Sand 11)	95.62	2.447	0.0486	0.1111	...	...	0.237	0.0887	0.101	0.875	0.0298	0.0008	0.0006	...
...	776-1	Firebrick	62.76	29.28	1.62	1.43	...	...	0.310	0.476	0.488	2.92	0.122	0.022	...	...
...	782-1	Dolomite	0.266	0.104	0.0042	0.450	0.081	...	30.34	21.29	...	0.0260	0.0008	0.0009	0.0029	0.0082

<sup>#</sup>Additional certified values available for Aqua Regia soluble content and pH in BCS-CRM 362: As=0.0030%, Cd=0.0200%, Cr=0.0011%, Cu=0.0056%, Ni=0.0012%, Pb=2.30%, Zn=2.03% and pH=8.14

\*Information is also given on approximate levels of Ce, Cs, Eu, Ga, La, Nb, Nd, Rb, Sc, Sm and Yb in BCS-CRM 375/1

**Ceramic Materials & Minerals (continued)**

BCS-CRM No	ECRM No	P <sub>2</sub> O <sub>5</sub>	ZrO <sub>2</sub>	S	L.O.I.	B <sub>2</sub> O <sub>3</sub>	HfO <sub>2</sub>	Li <sub>2</sub> O	SrO	ThO <sub>2</sub>	U <sub>3</sub> O <sub>8</sub>	Y <sub>2</sub> O <sub>3</sub>	As	C	Cd	F	Mn	Ni	Sn
309	...	...	...	...	0.1	...	...	0.01	0.003	...	...	...	...	...	...	...	...	...	...
313/1	...	...	0.002	...	0.1	...	...	0.0005	...	...	...	...	...	...	...	...	...	...	...
319/1	...	0.007	0.0008	...	...	0.002	...	...	0.0060	...	...	0.0014	...	...	...	...	...	0.0075	...
348	...	0.071	0.03	0.1	11.8	...	...	...	...	...	...	...	...	1.64	...	...	...	...	...
358	...	...	92.70	...	0.08	...	1.63	...	0.07	0.0007	0.08	...	...	...	...	...	...	...	...
362 <sup>#</sup>	...	0.014	...	1.48	32.81	...	...	...	0.034	...	...	...	...	9.9	0.020	...	...	0.001	...
369	...	...	...	...	...	...	...	0.03	<0.01	...	...	...	...	...	...	...	...	0.15	...
370	...	...	...	...	...	...	...	0.03	<0.01	...	...	...	...	...	...	...	...	0.08	...
375/1*	...	0.226	0.0107	...	0.72	...	0.0004	...	0.012	0.0011	0.0002	0.0023	...	...	...	...	...	...	...
376/1	...	0.02	<0.01	...	0.203	...	...	...	...	...	...	...	...	...	...	...	...	...	...
388	...	0.12	64.9	...	0.20	...	1.30	...	...	0.018	0.034	0.136	...	...	...	...	...	...	...
389/1	...	0.0295	0.0008	...	...	0.015	...	...	0.0007	...	...	0.0029	...	...	...	...	...	0.0012	...
393	752-1	0.005	...	0.007	43.4	...	...	...	0.019	...	...	...	...	...	...	<0.01	...	...	...
396	...	...	...	...	0.04	0.09	...	0.05	...	...	...	...	...	...	...	...	...	...	...
512	...	<0.02	...	<0.05	46.80	...	...	...	0.024	...	...	...	<0.003	12.4	<0.0003	0.01	...	<0.001	...
513	...	0.005	...	0.0097	43.61	...	...	...	0.0176	...	...	...	<0.001	11.9	<0.001	0.002	...	<0.001	...
516	...	0.013	0.075	...	0.24	...	<0.01	...	<0.01	...	...	...	...	...	...	...	...	...	...
528	...	0.20	0.014	...	0.271	...	...	...	...	...	...	...	...	...	...	...	<0.002	...	0.0016
...	776-1	0.062	0.04	...	0.3	...	...	0.019	...	...	...	...	...	...	...	...	...	...	...
...	782-1	0.0128	...	0.016	47.25	0.0039	...	...	...	...	...	...	...	...	...	...	...	0.0004	...



## BRITISH CHEMICAL STANDARD CERTIFIED REFERENCE AND REFERENCE MATERIALS - Soda Ash, High Purity Metals, Ceramic Materials and Benzoic Acids

Although the High Purity Metals, Ceramic Materials and Benzoic Acid samples below have been carefully analysed by both BAS Ltd. and an independent laboratory, they have been classified as RMs and not CRMs in order to distinguish them from BAS CRMs which are normally analysed by at least five laboratories.

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

#### Soda Ash Certified Reference Material (Finely divided material - units of 100g)

BCS-RM No.	Description	Na <sub>2</sub> CO <sub>3</sub>	NaCl	Fe <sub>2</sub> O <sub>3</sub>	Na <sub>2</sub> SO <sub>4</sub>	Insoluble Residue
526	Soda Ash (SGT Soda Ash 1)	99.74	0.126	0.0005	0.008	<0.02

#### High Purity Metal Reference Materials (Finely divided material or blocks/bars - see below)

BCS-RM No.	Description	Cu	Sn	Zn	Pb	Ni	Fe	Al	Mn	Sb	Si
192g	High Purity Tin (300g blocks)	0.00007	99.997	0.00006	0.0007	<0.00005	0.0002	...	...	0.0007	...
192h	High Purity Tin (100g millings)	<0.0001	99.998	<0.0001	0.0006	<0.0001	<0.0001	...	...	<0.0005	...
194e	High Purity Zinc (300g blocks)	<0.0005	<0.001	99.99	0.002	...	0.001	...	...	...	...
195g	High Purity Aluminium (100g millings or 300g blocks)	0.001	...	0.015	...	...	0.080	99.85	0.001	...	0.035
198f	Super Pure Aluminium (100g blocks)	0.005	...	...	...	...	0.001	99.99	...	...	0.002
210e	High Purity Lead (500g bars)	0.0006	<0.002	<0.005	99.996	<0.001	0.0005	<0.001	<0.001	<0.002	...

#### High Purity Metal Reference Materials (continued)

BCS-RM No.	Description	Bi	Ti	Ag	C	S	V	Tl	Ga	Melting Point
192g	High Purity Tin (continued)	0.00003	...	...	0.001	0.0002	...	...	...	231.9°C
192h	High Purity Tin (continued)	<0.0001	...	...	0.001	0.0002	...	...	...	231.9°C
194e	High Purity Zinc (continued)	...	...	...	...	...	...	...	...	419.5°C
195g	High Purity Aluminium (continued)	...	0.002	...	...	...	0.004	...	0.009	659.2°C
210e	High Purity Lead (continued)	0.0008	...	0.0001	...	...	...	0.001	...	327.3°C

#### Ceramic Reference Materials (Finely divided material - units of 100g). These samples have been prepared jointly by Ceram Research Limited and BAS.

BCS-RM 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>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	BaO	Mn <sub>2</sub> O <sub>3</sub>	SnO <sub>2</sub>	SrO	SO <sub>3</sub>	ZrO <sub>2</sub> + HfO <sub>2</sub>	L.O.I.
201a	Nepheline Syenite	57.3	23.54	0.05	0.12	1.07	0.025	7.53	8.90	0.025	0.37	0.007	...	0.43	...	...	0.76
202a	Plaster (Gypsum)	1.38	0.33	0.03	0.10	37.4	0.39	<0.03	0.10	<0.01	...	...	...	0.33	53	...	7.0
203a	Talc	59.7	0.30	<0.01	0.22	0.25	32.08	0.02	0.005	0.13	...	...	...	...	...	...	6.78
204a	Zircon	37.6	0.74	2.22	0.18	0.15	0.012	0.014	0.017	0.77	...	...	1.69	...	...	53.8	0.50

#### Benzoic Acid Reference Material (Finely divided material - units of 100g; also available as 0.2g and as 1.0g tablets)

BCS-RM No.	Description	
190t	Benzoic Acid	Purity 100.0±0.05%, Calorific Value, 26,439.7±12.2 joules per gramme based on mass (Certified by Pattinson and Stead, Middlesbrough, UK)

**SPECTROSCOPIC STANDARD CERTIFIED REFERENCE MATERIALS - Unalloyed Steels**

The figures are listed primarily as a guide to purchasers. In some cases provisional figures are given which may differ slightly from those given on the Certificate. **Always consult the Certificate issued with the sample to obtain the accurate analysis.**

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

**Plain Carbon Steels (Wrought)** (SS-CRM: 38mm dia. x 19mm discs, ECRM: 38mm dia. x 30 or 25mm discs except 056-2(D): 44mm dia. x 30 or 25mm discs)

Ref No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al (Acid Sol)	Al (Total)	As	Co	Cu	N	Nb	Pb	Sn	Ti	V	Ca	Sb	Zn	
SS-CRM 432/1	Plain Carbon Steels	0.102	0.043	1.34	0.024	0.039	0.31	0.02	0.14	...	0.01	...	...	0.04	...	<0.002	...	...	...	...	...	...	...	
SS-CRM 433/1		0.195	0.18	0.60	0.074	0.069	0.26	0.01	0.064	...	<0.01	...	...	0.06	...	0.020	...	...	...	...	...	...	...	
SS-CRM 434/1		0.41	0.31	1.49	0.050	0.027	0.055	0.01	0.044	...	<0.01	...	...	0.05	...	0.078	...	...	...	...	...	...	...	...
SS-CRM 435/1		0.52	0.54	0.41	0.033	0.031	0.14	<0.01	0.060	...	<0.01	...	...	0.05	...	0.039	...	...	...	...	...	...	...	...
SS-CRM 431/2	Plain Carbon Steels	0.0249	0.015	0.902	0.121	0.0065	0.049	0.004	0.040	...	...	...	0.006	...	0.0052	0.0040	...	...	...	...	...	...	...	...
SS-CRM 432/2		0.0065	0.0822	0.712	0.0171	0.036	0.0166	0.002	0.0196	...	...	...	0.006	...	0.0066	0.0174	...	...	...	...	...	...	...	...
SS-CRM 433/2		0.096	0.0071	1.188	0.011	0.0083	0.0262	0.004	0.037	...	...	...	0.006	...	...	0.0590	...	...	...	...	...	...	...	...
SS-CRM 434/2		0.275	0.510	1.546	0.0611	0.0141	0.238	0.014	0.037	...	...	...	0.006	...	0.0104	0.038	...	...	...	...	...	...	...	...
SS-CRM 435/2		0.489	0.328	0.390	0.0373	0.0424	0.184	0.018	0.133	...	...	...	0.0116	...	...	0.134	...	...	...	...	...	...	...	...
ECRM 056-2(D)	0.8% Carbon Steel	0.8181	0.2006	0.5073	0.0103	0.0093	0.0146	...	0.0218	0.00024	<0.001	...	...	0.0129	...	...	...	...	...	...	...	...	...	...
ECRM 057-2(D)	0.05% Carbon Steel	0.0507	0.003	0.246	0.0120	0.0127	0.0114	...	0.0096	...	0.059	...	...	0.0146	0.0023	...	...	...	...	...	...	...	...	...
ECRM 058-2(D)	0.15% Sulphur Steel	0.424	0.1080	1.186*	0.0098	0.1712*	0.1211	0.0589	0.199	...	...	0.0095	...	0.261	0.0107	...	...	...	...	...	...	...	...	...
ECRM 059-2(D)	0.7% Carbon Steel	0.721	0.188	0.495	0.0046	0.0084	0.0090	0.0018	0.0198	0.00020	0.00045	...	...	0.0074	0.0051	...	...	...	...	...	...	...	...	...
ECRM 064-1(D)	Nb/Ti Interstitial Free Steel	0.0026	0.0065	0.1641	0.0091	0.0104	0.0184	0.00077	0.0115	0.0302	0.0330	0.0036	0.0027	0.0077	0.0026	0.0146	0.00018	0.00051	0.0189	0.00015	...	...	...	...
ECRM 084-1(D)	0.4% Carbon Steel	0.391	0.265	0.860	0.018	0.029	...	0.033	0.154	...	...	...	...	0.267	...	...	...	0.023	...	...	...	...	...	...
ECRM 085-1(D)	0.3% Sulphur Steel	0.067	0.008	0.977*	0.062	0.336*	...	...	...	...	...	...	0.019	0.291	...	...	0.0010	...	0.0021	...	0.0073	0.002	...	
ECRM 086-1(D)	0.3% Carbon Steel	0.297	0.206	0.879	0.0238	0.0371	0.150	...	0.168	...	...	0.0230	...	0.320	...	...	...	0.0263	...	...	...	...	...	
ECRM 087-1(D)	0.15% Carbon Steel	0.174	0.263	0.671	0.010	0.046	0.078	0.021	0.118	...	...	0.024	0.015	0.171	...	...	...	0.017	...	...	...	0.0046	...	
ECRM 090-1(D)	1% Carbon Steel	1.054	0.281	0.226	0.0128	0.0095	0.121	0.0089	0.053	...	...	...	...	...	0.0146	0.00043	...	...	...	0.204	...	...	...	
ECRM 096-2(D)	Low S, Ca-Treated Steel	0.1050	0.262	1.320	0.0128	0.0016	0.0243	0.0020	0.0253	...	0.0460	...	0.0170	...	...	0.0252	...	...	...	...	0.0020	...	...	

\*The metallurgical conditions of ECRMs 058-2(D) and 085-1(D) render them unsuitable for the determination of Mn and S by Optical Emission Spectrometry.

**Plain Carbon Steels (Wrought)** (continued)

Ref No.	Description	Bi	Cd	Ga	Hg	Pb	Sb	Se	Te	Tl	Zn
ECRM 090-1(D)	1% Carbon Steel (cont)	<0.00002	<0.00002	0.00228	<0.00001	0.00239	0.00090	<0.0002	<0.0002	<0.0001	0.00209

**Carbon Steels Residual Series (Wrought)** (38mm dia. x 19mm discs except SS-CRM 51: 38mm dia. x 13mm discs)

Ref No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al (Total)	As	Cu	Pb	Sn	Ti	W	Sb
SS-CRM 53	Carbon Steel Residual Series	0.25	0.37	0.29	0.02	0.009	0.22	0.100	0.172	...	0.058	...	...	0.024	0.018	0.25	0.004
SS-CRM 55		0.19	0.25	0.42	0.018	0.010	0.22	0.16	0.23	0.028	0.013	...	...	0.046	0.013	0.12	0.002
SS-CRM 453/1		0.160	0.34	1.38	0.044	0.026	0.26	0.081	0.11	...	0.052	0.099	0.0001	0.022	0.073	0.30	...
SS-CRM 454/1		0.376	0.31	0.80	0.061	0.047	0.062	0.20	0.069	...	0.070	0.051	0.0001	0.054	0.010	0.15	...
Ref No.	Description	C	Si	Mn	P	S	Al (Acid Sol)	Al (Total)	B	Co	Cu	Nb	Pb	V	Zr	Sb	
SS-CRM 56	Carbon Steel Residual Series	0.23	0.36	0.32	0.019	0.009	0.003	0.005	0.001	0.023	0.36	...	0.014	0.057	...	0.005	
SS-CRM 456/2		0.112	0.297	0.220	0.0212	0.0221	<0.002	0.0018	0.0015	0.0504	...	0.0057	0.0189	0.0221	0.013	0.0172	
SS-CRM 457/2		0.307	0.105	0.327	0.0098	0.0448	0.082	0.087	0.0046	0.0217	...	0.0174	0.0098	0.153	0.025	0.050	
SS-CRM 458/2		0.198	0.504	0.479	0.0281	0.0314	0.052	0.055	0.0069	0.198	...	0.0510	0.0140	0.105	0.062	0.089	
SS-CRM 459/2		0.467	0.640	0.909	0.0482	0.0481	0.0134	0.0154	0.0110	0.0890	...	0.0102	0.0044	0.0585	0.074	0.0121	
SS-CRM 460/2		0.383	0.126	0.616	0.0374	0.0099	0.0193	0.0240	0.0027	0.0106	...	0.068	0.0005	0.0322	<0.0005	0.0006	

Many of the above samples are also available in the finely divided form - see pages 7 and 8.

## SPECTROSCOPIC STANDARD CERTIFIED REFERENCE MATERIALS - High Purity Iron and Low Alloy Steels

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

### High Purity Iron (Wrought) (38mm dia. x 30, 25mm or 3mm discs)

Ref No.	Description	C	Si	Mn	P	S	Cr	Ni	As	B	Co	Cu	N	Sn	Ti	O	Zn	W,Sb	Mo,Nb,V,Zr	Pb,Bi,Ca,Mg,Ta
ECRM 097-1(D)	High Purity Iron	0.00025	<0.01	0.0064	0.0016	0.0022	0.0016	0.0025	0.0051	0.0003	0.0037	0.0020	0.0007	<0.0025	<0.0015	0.05	<0.0001	≤0.001	<0.001	<0.0005

### Low Alloy Steels (Wrought) (SS-CRM 111A-114: 44mm dia. x 19 or 50mm discs. Other SS-CRM: 38mm dia. x 19mm discs. ECRM: 38mm dia. x 30 or 25mm discs)

Ref. No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Co	Cu	N	Nb	Pb	Sn	Ti	V	W	Zr	Ca	Sb	Zn
SS-CRM 111A	Low Alloy Steels	0.0258	0.0253	0.155	0.0033	0.0054	0.0197	0.0008	0.0387	0.0348	0.0017	<0.001	0.0144	0.0171	0.0034	0.0005	<0.001	0.0015	0.0004	0.0009	...	<0.001	<0.0005	<0.001	...
SS-CRM 112		0.394	0.289	0.436	0.0043	0.0026	1.236	0.190	1.461	0.0148	0.0021	0.0007	0.0175	0.149	0.0024	0.0065	<0.001	0.0086	0.0100	0.0088	...	<0.001	<0.0005	<0.001	...
SS-CRM 113		0.837	0.931	1.207	0.0595	0.0294	1.248	0.056	0.0784	0.0151	0.0020	0.0066	0.0415	0.179	0.0109	0.0487	<0.001	0.0067	0.0390	0.201	0.012	0.0029	<0.001	<0.003	...
SS-CRM 114		0.403	0.295	0.416	0.0044	0.0046	0.187	0.184	1.502	0.078	0.0025	0.0008	0.0171	0.360	0.0043	0.0042	<0.001	0.041	0.0096	0.0086	<0.001	0.0051	<0.001	<0.0025	...
SS-CRM 401/2	Low Alloy Steels	0.935	0.602	1.197	0.0265	0.0078	0.138	0.495	0.019	0.074	...	...	0.0042	0.101	0.015	...	...	...	...	0.496	...	...	...	...	...
SS-CRM 402/2		1.311	0.111	0.228	0.0161	0.0138	0.652	0.140	0.808	0.161	...	...	...	0.302	0.0069	...	...	...	...	0.194	...	...	...	...	...
SS-CRM 403/2		0.750	0.209	1.677	0.055	0.0381	0.463	0.088	0.223	0.0485	...	...	...	0.221	0.010	...	...	...	...	0.341	...	...	...	...	...
SS-CRM 404/2		0.696	1.121	0.532	0.0479	0.0228	0.774	0.307	0.393	0.017	...	...	...	0.427	0.0089	...	...	...	...	0.107	...	...	...	...	...
SS-CRM 405/2		0.044	0.947	0.903	0.0095	0.058	0.206	0.025	0.102	0.330	...	...	0.009	0.022	0.011	...	...	...	...	0.411	...	...	...	...	...
SS-CRM 406/2		0.173	0.342	0.447	0.0102	0.043	2.001	0.98	1.62	0.013	0.012	...	0.006	0.289	0.009	...	0.0002	0.001	...	0.010	...	...	...	...	...
SS-CRM 407/2		0.490	0.66	0.195	0.038	0.0105	3.03	0.83	0.527	0.040	...	...	0.0068	0.397	0.011	...	...	...	...	0.19	...	...	...	...	...
SS-CRM 408/2		0.289	0.237	0.557	0.056	0.030	0.111	0.098	4.13	0.154	0.0046	...	...	0.694	0.0075	...	0.0006	0.002	...	0.067	...	...	...	...	...
SS-CRM 409/2		0.086	1.18	0.559	0.0141	0.0179	1.318	0.599	3.02	0.094	...	...	...	0.205	0.0108	...	...	...	...	0.008	...	...	...	...	...
SS-CRM 421		Low Tungsten Steels	0.049	0.07	0.11	0.012	0.027	...	0.028	...	...	...	...	...	...	...	...	...	...	...	<0.02	0.52	...	...	...
SS-CRM 422	0.036		0.06	0.09	0.015	0.025	...	0.033	...	...	...	...	...	...	...	...	...	...	...	<0.02	1.28	...	...	...	...
SS-CRM 423	0.030		0.05	0.07	0.017	0.027	...	0.027	...	...	...	...	...	...	...	...	...	...	...	<0.02	2.06	...	...	...	...
SS-CRM 424	0.024		0.05	0.09	0.02	0.024	...	0.036	...	...	...	...	...	...	...	...	...	...	...	<0.02	3.02	...	...	...	...
ECRM 186-1(D)	Si-Mn Steel	0.6104	1.719	0.870	0.0223	0.0354	0.218	0.0482	0.190	0.0143	...	...	...	0.281	...	...	...	...	...	...	...	...	...	...	
ECRM 195-1(D)	Cr-Mo-Ni Steel	0.73	0.466	0.571	0.0160	0.0121	1.566	0.768	0.327	...	...	...	0.0355	0.0100	...	0.0010	0.002	...	0.312	...	...	0.0017	0.0008	0.0046	

Most of these samples are also available in the finely divided form - see page 9.

### Low Alloy Cast Steel (44mm dia. x 19mm discs)

Ref. No.	Description	C	Si	Mn	S	Cr	Mo	Ni	Cu	V
SS-CRM 615/1	Low Alloy Cast Steel	0.30	0.17	1.68	0.02	0.49	0.21	4.01	0.05	0.10

## SPECTROSCOPIC STANDARD CERTIFIED REFERENCE MATERIALS - Highly Alloyed Steels and Plain Carbon Cast Steels

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

### Highly Alloyed Steels (Wrought) (38mm dia. x 30 or 25mm discs)

Ref. No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Co	Cu	N	Nb	Pb	Sn	Ti	V	Zr	Sb	Fe	Others
ECRM 272-1(D)	12% Chromium Steel	0.2815	0.420	0.600	0.0156	0.0197	11.927	0.0030	0.244	0.0046	0.0116	0.0018	0.0145	0.0192	0.0508	0.0028	0.0004	0.0008	0.00096	0.0167	...	0.0007	...	0.00090 Ca 0.0031 Zn
ECRM 276-2(D)	5%Cr-Mo-V Steel	0.399	1.034	0.365	0.0093	0.0189	4.975	1.134	0.203	...	...	...	...	0.183	0.0116	...	...	0.0133	...	0.296	...	...	...	...
ECRM 285-2(D)	Maraging Steel	0.0018	0.0117	0.0168	0.0053	0.0025	0.0236	4.99	18.07	0.1067	...	0.0009	7.76	0.0094	0.0007	...	...	0.001	0.520	...	0.0050	...	...	...
ECRM 287-1(D)	High B Stainless Steel	0.0164	0.569	1.478	0.0267	0.0014	18.61	0.247	10.35	...	...	0.924	0.148	0.203	0.0194	...	...	...	...	...	...	...	...	...
ECRM 292-1(D)	Nb-Stabilised Stainless Steel	0.0367	0.402	1.744	0.0175	0.0055	18.00	0.0464	10.09	0.002	0.008	0.0003	0.0255	0.0391	0.0640	0.571	...	...	...	...	...	...	...	{ 0.001 Ta 0.0006 Ca
ECRM 295-1(D)	4% Mo-Cr-Ni Steel	0.0166	0.418	1.758	0.0167	0.0003	19.51	3.996	24.40	0.0203	0.0041	0.0018	0.0450	1.481	0.0615	...	...	0.0025	...	0.0456	...	0.0007	48.36	0.0003 Mg
ECRM 296-1(D)	Jethete Steel	0.1166	0.242	0.676	0.0178	0.0026	11.82	1.700	2.790	0.0275	0.0139	0.0003	0.0218	0.1498	0.0214	...	0.00016	0.0131	...	0.363	...	...	...	...

These samples are also available in the finely divided form - see page 10

### Austenitic Stainless Steels (Wrought) (38mm dia. x 19mm discs)

Ref. No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Co	Cu	N	Nb	Pb	Sn	Ti	V	Ta	
SS-CRM 462	Austenitic Stainless Steels	0.092	0.46	0.74	0.010	0.018	12.35	...	12.55	...	0.007	...	...	...	...	...	0.0005	...	...	...	...	
SS-CRM 461/1		0.0103	0.374	0.686	0.0053	0.0051	14.727	0.0138	6.124	0.002	0.004	...	0.004	0.0091	...	...	0.0005	...	...	...	...	
SS-CRM 462/1		0.0345	0.463	0.722	0.0053	0.0041	11.888	0.0304	12.85	...	...	...	...	0.0112	...	...	...	...	...	...	...	
SS-CRM 463/1		0.019	0.270	1.400	0.025	0.019	18.46	0.265	10.20	...	...	0.0022	0.116	0.276	0.063	...	...	...	...	<0.005	0.04	...
SS-CRM 464/1		0.086	0.57	0.791	0.020	0.028	25.39	...	20.05	...	0.003	...	0.054	...	...	...	0.0004	...	...	...	...	
SS-CRM 465/1		0.066	0.405	1.380	0.021	0.012	17.31	0.092	9.24	0.026	...	0.0006	0.053	0.098	0.010	...	<0.001	...	0.40	0.102	...	
SS-CRM 466/2		0.0141	0.480	1.311	0.0105	0.0069	17.84	2.776	10.20	0.002	0.0020	0.0039	0.0184	0.0278	0.0508	0.001	<0.0001	<0.001	0.002	0.0346	...	
SS-CRM 467/1		0.082	0.52	0.788	0.018	0.019	18.09	...	9.21	...	0.004	...	...	...	...	0.99	0.004	...	...	...	0.0017	
SS-CRM 468/1		0.143	1.41	1.70	0.014	0.020	17.96	...	8.90	...	...	...	0.018	...	...	...	...	...	...	...	...	
SS-CRM 475		0.050	0.21	0.89	0.037	0.008	14.14	1.59	5.66	0.013	...	...	0.22	1.94	...	0.22	...	0.015	...	...	...	

These samples are also available in the finely divided form - see page 10

### Plain Carbon Cast Steels (44mm dia. x 19mm discs)

Ref No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al (Total)	Co	Cu	V	Zr
SS-CRM 601/2	Plain Carbon Cast Steels	0.102	0.263	1.30	0.034	0.024	0.14	0.006	0.03	0.033	0.09	0.04	0.002	<0.005
SS-CRM 602/2		0.94	0.057	0.66	0.023	0.031	0.03	0.004	0.02	0.096	0.007	0.06	0.001	<0.005
SS-CRM 603/2		0.78	0.97	0.236	0.020	0.056	0.04	0.004	0.03	0.076	0.01	0.05	0.001	<0.005
SS-CRM 604/2		0.199	0.75	1.91	0.016	0.072	0.06	0.02	0.09	0.008	0.01	0.07	0.001	<0.005
SS-CRM 605/2		0.400	0.54	0.345	0.054	0.015	0.06	0.01	0.05	0.027	0.008	0.06	0.001	0.12

## SPECTROSCOPIC STANDARD CERTIFIED REFERENCE MATERIALS - Highly Alloyed Steels

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

### Ferritic Stainless Steels (Wrought) (SS-CRM 469-473: 38mm dia. x 19mm discs, SS-CRM 70: 44mm dia. x 13mm disc)

Ref. No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Co	Cu	V
SS-CRM 70	Ferritic Stainless Steels	<b>0.18</b>	<b>0.35</b>	<b>0.38</b>	<b>0.024</b>	<b>0.020</b>	<b>16.35</b>	...	<b>0.40</b>	...	<i>0.06</i>	...
SS-CRM 469		<b>0.279</b>	<b>0.421</b>	<b>0.598</b>	<b>0.015</b>	<b>0.020</b>	<b>11.93</b>	...	<b>0.246</b>	<i>0.01</i>	<i>0.02</i>	<i>0.02</i>
SS-CRM 470		<b>0.153</b>	<b>0.335</b>	<b>0.235</b>	<b>0.024</b>	<b>0.035</b>	<b>17.68</b>	...	<b>0.369</b>	<i>0.02</i>	<i>0.02</i>	<i>0.02</i>
SS-CRM 471		<b>0.095</b>	<b>0.326</b>	<b>0.417</b>	<b>0.018</b>	<b>0.023</b>	<b>23.85</b>	...	<b>0.96</b>	<i>0.02</i>	<i>0.02</i>	<i>0.03</i>
SS-CRM 472		<b>0.227</b>	<b>1.05</b>	<b>1.02</b>	<b>0.032</b>	<b>0.029</b>	<b>15.82</b>	<b>0.661</b>	<b>1.95</b>	<i>0.02</i>	<i>0.02</i>	<i>0.02</i>
SS-CRM 473		<b>0.172</b>	<b>0.604</b>	<b>0.494</b>	<b>0.019</b>	<b>0.030</b>	<b>9.06</b>	<b>0.95</b>	<i>0.06</i>	<i>0.01</i>	<i>0.03</i>	<i>0.02</i>

Samples 469 to 473 are also available in the finely divided form - see page 10

### High Speed Tool Steels (Wrought) (38mm dia. x 19mm discs)

Ref No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	Co	Sn	V	W
SS-CRM 481/1	High Speed Tool Steels	<b>0.68</b>	<b>0.15</b>	<b>0.25</b>	<b>0.023</b>	<b>0.022</b>	<b>3.40</b>	<b>0.28</b>	<i>0.09</i>	...	...	<b>0.31</b>	...	<b>0.56</b>	<b>14.0</b>
SS-CRM 482/1		<b>0.67</b>	<b>0.14</b>	<b>0.26</b>	<b>0.027</b>	<b>0.027</b>	<b>3.95</b>	<b>0.40</b>	<i>0.16</i>	...	...	<b>0.29</b>	...	<b>1.04</b>	<b>17.8</b>
SS-CRM 483/1		<b>0.65</b>	<b>0.16</b>	<b>0.22</b>	<b>0.023</b>	<b>0.023</b>	<b>2.90</b>	<b>0.18</b>	<i>0.08</i>	...	...	<b>2.06</b>	...	<b>0.22</b>	<b>9.28</b>
SS-CRM 485/1		<b>0.94</b>	<b>0.30</b>	<b>0.41</b>	<b>0.043</b>	<b>0.039</b>	<b>4.02</b>	<b>0.66</b>	<i>0.14</i>	<i>0.006</i>	<i>0.022</i>	<b>4.97</b>	<b>0.019</b>	<b>1.02</b>	<b>17.8</b>
SS-CRM 486/1		<b>0.74</b>	<b>0.27</b>	<b>0.21</b>	<b>0.029</b>	<b>0.021</b>	<b>4.54</b>	<b>5.20</b>	<i>0.06</i>	<i>0.005</i>	<i>0.016</i>	<b>0.08</b>	<b>0.014</b>	<b>1.82</b>	<b>5.80</b>
SS-CRM 487/1		<b>1.02</b>	<b>0.18</b>	<b>0.26</b>	<b>0.022</b>	<b>0.029</b>	<b>3.91</b>	<b>9.41</b>	<i>0.14</i>	<b>0.006</b>	<i>0.012</i>	<b>7.95</b>	<i>0.006</i>	<b>1.14</b>	<b>1.80</b>

### High Manganese Steels (Cast) (48mm x 42mm x 12mm blocks, except 491/2: 50mm dia. x 10mm chill cast disc). These samples have been prepared jointly by Castings Technology International (formerly BCIRA) and BAS.

Ref Nos.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Co	Cu	N	V	As	Sn	Ti
SS-CRM 491/2	High Manganese Steels	<b>0.994</b>	<b>1.101</b>	<b>16.73</b>	<b>0.0494</b>	<b>0.0112</b>	<b>1.482</b>	<b>0.608</b>	<b>0.0745</b>	<b>0.110</b>	...	<i>0.04</i>	<b>0.0215</b>	<b>0.0839</b>	...	...	...
SS-CRM 492/3		<b>1.18</b>	<b>0.299</b>	<b>8.33</b>	<b>0.0318</b>	<b>0.0093</b>	<b>1.076</b>	<b>1.318</b>	<b>4.17</b>	<b>0.131</b>	<b>0.0048</b>	<b>0.0211</b>	<b>0.0225</b>	<i>0.004</i>	<i>0.002</i>	...	<b>0.0024</b>
SS-CRM 493/3		<b>0.819</b>	<b>0.861</b>	<b>11.15</b>	<b>0.12</b>	<b>0.009</b>	<b>0.259</b>	<b>1.04</b>	<b>3.24</b>	<b>0.035</b>	...	<b>0.017</b>	<b>0.024</b>	<b>0.025</b>	...	...	...
SS-CRM 495/4		<b>0.796</b>	<b>0.674</b>	<b>13.11</b>	<b>0.093</b>	<b>0.0128</b>	<b>2.223</b>	<b>0.266</b>	<b>1.620</b>	<b>0.0082</b>	<b>0.0120</b>	<b>0.0222</b>	<b>0.0416</b>	<b>0.0525</b>	<i>0.02</i>	<i>&lt;0.05</i>	<i>&lt;0.002</i>

## SPECTROSCOPIC STANDARD CERTIFIED REFERENCE MATERIALS - Cast Irons and Nickel Base Alloys

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

**Cast Irons** (All are 48mm x 42mm x 12mm chill cast blocks except SCRM 671-675 which are 40mm x 37mm x 10mm chill cast blocks.)

These samples are prepared jointly by Castings Technology International (formerly BCIRA) and BAS. nominal mass content in %

Ref. No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	Co	Cu	Sn	Ti	V	Ce	Mg	Zn
SCRM 651/4	Malleable Irons	<b>2.66</b>	<b>0.541</b>	<b>0.92</b>	<b>0.249</b>	<b>0.100</b>	<i>1</i>	...	...	...	...	...	...	...	...	...	...	...	...
SCRM 652/4		<b>2.34</b>	<b>0.878</b>	<b>1.19</b>	<b>0.071</b>	<b>0.129</b>	<i>1</i>	...	...	...	...	...	...	...	...	...	...	...	...
SCRM 653/4		<b>3.10</b>	<b>1.22</b>	<b>0.110</b>	<b>0.023</b>	<b>0.050</b>	<i>1</i>	...	...	...	...	...	...	...	...	...	...	...	...
SCRM 654/4		<b>2.28</b>	<b>1.635</b>	<b>0.74</b>	<b>0.130</b>	<b>0.170</b>	<i>1</i>	...	...	...	...	...	...	...	...	...	...	...	...
SCRM 655/4		<b>1.90</b>	<b>2.110</b>	<b>0.44</b>	<b>0.180</b>	<b>0.076</b>	<i>1</i>	...	...	...	...	...	...	...	...	...	...	...	...
SCRM 656/8	Low Phosphorus Engineering Irons	<b>2.61</b>	<b>2.59</b>	<b>0.823</b>	<b>0.062</b>	<b>0.107</b>	<i>1</i>	...	...	...	...	...	...	...	...	...	...	...	...
SCRM 657/8		<b>2.93</b>	<b>3.02</b>	<b>0.062</b>	<b>0.100</b>	<b>0.024</b>	<i>1</i>	...	...	...	...	...	...	...	...	...	...	...	...
SCRM 658/10		<b>3.338</b>	<b>1.943</b>	<b>0.532</b>	<b>0.187</b>	<b>0.074</b>	...	...	...	...	...	...	...	...	...	...	...	...	...
SCRM 659/8		<b>3.96</b>	<b>1.40</b>	<b>1.00</b>	<b>0.025</b>	<b>0.039</b>	<i>1</i>	...	...	...	...	...	...	...	...	...	...	...	...
SCRM 660/9		<b>3.461</b>	<b>1.699</b>	<b>0.406</b>	<b>0.153</b>	<b>0.105</b>	<i>1</i>	...	...	...	...	...	...	...	...	...	...	...	...
SCRM 661/4	High Phosphorus Engineering Irons	<b>2.56</b>	<b>2.96</b>	<b>0.30</b>	<b>0.84</b>	<b>0.068</b>	<i>1</i>	...	...	...	...	...	...	...	...	...	...	...	...
SCRM 662/4		<b>2.95</b>	<b>2.33</b>	<b>0.76</b>	<b>0.30</b>	<b>0.087</b>	<i>1</i>	...	...	...	...	...	...	...	...	...	...	...	...
SCRM 663/4		<b>3.28</b>	<b>1.97</b>	<b>1.04</b>	<b>0.13</b>	<b>0.024</b>	<i>1</i>	...	...	...	...	...	...	...	...	...	...	...	...
SCRM 664/4		<b>2.84</b>	<b>2.71</b>	<b>0.57</b>	<b>0.44</b>	<b>0.112</b>	<i>1</i>	...	...	...	...	...	...	...	...	...	...	...	...
SCRM 665/4		<b>3.25</b>	<b>1.66</b>	<b>0.24</b>	<b>1.09</b>	<b>0.053</b>	<i>1</i>	...	...	...	...	...	...	...	...	...	...	...	...
SCRM 666/11	Ductile (Nodular) Irons	<b>3.371</b>	<b>1.77</b>	<b>0.065</b>	...	...	<b>0.129</b>	<b>0.1070</b>	<b>1.648</b>	...	...	...	<b>0.0506</b>	...	<b>0.0860</b>	<b>0.0549</b>	<b>0.0035</b>	<b>0.073</b>	...
SCRM 667/12		<b>3.06</b>	<b>2.966</b>	<b>0.236</b>	...	...	<b>0.298</b>	<b>0.0063</b>	<b>1.298</b>	...	...	...	<b>0.550</b>	...	<b>0.0029</b>	<b>0.096</b>	<b>0.081</b>	<b>0.0400</b>	...
SCRM 668/12		<b>3.741</b>	<b>1.427</b>	<b>0.701</b>	...	...	<b>0.999</b>	<b>0.0206</b>	<b>0.105</b>	...	...	...	<b>0.655</b>	...	<b>0.0817</b>	<b>0.194</b>	<b>0.0234</b>	<b>0.0093</b>	...
SCRM 669/13		<b>3.17</b>	<b>2.523</b>	<b>0.584</b>	...	...	<b>0.205</b>	<b>0.0586</b>	<b>0.509</b>	...	...	...	<b>0.2141</b>	...	<b>0.0549</b>	<b>0.502</b>	<b>0.052</b>	<b>0.0267</b>	...
SCRM 670/15		<b>3.711</b>	<b>2.155</b>	<b>0.354</b>	...	...	<b>0.497</b>	<i>0.02</i>	<b>0.889</b>	...	...	...	<b>0.923</b>	...	<b>0.1096</b>	<b>0.0249</b>	<b>0.0085</b>	<b>0.041</b>	...
SCRM 671	Blast Furnace Irons	<b>2.865</b>	<b>0.980</b>	<b>0.835</b>	<b>0.1062</b>	<b>0.0499</b>	<b>0.0586</b>	<b>0.0182</b>	<b>0.0555</b>	<b>0.0379</b>	<b>0.0220</b>	<b>0.097</b>	<b>0.0470</b>	<b>0.0070</b>	<b>0.0896</b>	<b>0.0105</b>	...	...	<b>0.0004</b>
SCRM 672/1		<b>4.322</b>	<b>0.143</b>	<b>0.474</b>	<b>0.198</b>	<b>0.036</b>	<b>0.0186</b>	<b>0.117</b>	<b>0.083</b>	<b>0.0104</b>	<b>0.0079</b>	<b>0.139</b>	<b>0.100</b>	<b>0.0047</b>	<b>0.0373</b>	<b>0.0988</b>	...	...	<i>0.008</i>
SCRM 673		<b>2.474</b>	<b>1.715</b>	<b>0.1334</b>	<b>0.328</b>	<b>0.0067</b>	<b>0.0374</b>	<b>0.0057</b>	<b>0.143</b>	<b>0.0282</b>	<b>0.044</b>	<b>0.0540</b>	<b>0.0230</b>	<b>0.0191</b>	<b>0.0722</b>	<b>0.0586</b>	...	...	<b>0.0004</b>
SCRM 674		<b>3.322</b>	<b>0.474</b>	<b>1.457</b>	<b>0.0104</b>	<b>0.0810</b>	<b>0.0211</b>	<b>0.0477</b>	<b>0.144</b>	<b>0.0040</b>	<b>0.0275</b>	<b>0.0143</b>	<b>0.1014</b>	<b>0.0140</b>	<b>0.0233</b>	<b>0.0235</b>	...	...	<b>0.0187</b>
SCRM 675		<b>1.916</b>	<b>1.300</b>	<b>1.798</b>	<b>0.0453</b>	<b>0.0724</b>	<b>0.0794</b>	<b>0.0342</b>	<b>0.205</b>	<b>0.0072</b>	<b>0.0342</b>	<b>0.0230</b>	<b>0.0117</b>	<b>0.0062</b>	<b>0.0070</b>	<b>0.179</b>	...	...	<b>0.0006</b>

**Nickel Base Alloys** (38, 41 or 50mm dia. x 13 or 19mm discs)

MAJOR ELEMENTS - nominal mass content in %

Ref. No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al	B	Co	Cu	N	Nb	Ti	V	W	Zr	Fe
SS-CRM 310/1	Nimonic '90' Alloy	<b>0.068</b>	<b>0.46</b>	<b>0.35</b>	...	...	<b>19.45</b>	...	<b>58.6</b>	<b>1.06</b>	...	<b>17.0</b>	...	...	...	<b>2.43</b>	...	...	...	<b>0.25</b>
SS-CRM 345	IN 100 Alloy (cast)	<b>0.153</b>	...	...	...	...	<b>9.95</b>	<b>3.01</b>	Bal.	<b>5.58</b>	<b>0.019</b>	<b>14.71</b>	...	...	...	<i>5</i>	<b>1.00</b>	...	<b>0.044</b>	...
SS-CRM 346A	IN 100 Alloy (cast)	<i>0.15</i>	...	...	...	...	<i>10</i>	<i>3</i>	Bal.	<i>5.5</i>	...	<i>15</i>	...	...	...	<i>5</i>	<i>1</i>	...	...	...
SS-CRM 350	IN 713 Alloy (cast)	<b>0.138</b>	<b>0.110</b>	<b>0.019</b>	...	...	<b>13.43</b>	<b>4.29</b>	<b>70.8</b>	<b>5.97</b>	<b>0.013</b>	<b>0.338</b>	...	...	<b>2.17</b>	<b>0.87</b>	...	<b>0.094</b>	<b>0.072</b>	<b>1.50</b>
SS-CRM 351	IN 718 Alloy (wrought)	<i>0.025</i>	<b>0.14</b>	<b>0.037</b>	<i>0.006</i>	<b>0.0006</b>	<b>18.12</b>	<b>3.06</b>	<b>53.1</b>	<b>0.55</b>	<b>0.0051</b>	<b>0.136</b>	<b>0.016</b>	...	<b>5.20</b>	<b>1.06</b>	...	...	...	<b>18.26</b>
SS-CRM 351/1	IN 718 Alloy (wrought)	<b>0.026</b>	<b>0.080</b>	<b>0.0562</b>	<b>0.0045</b>	<b>0.00037</b>	<b>19.14</b>	<b>3.04</b>	<b>53.35</b>	<b>0.554</b>	<b>0.0035</b>	<b>0.145</b>	<b>0.0222</b>	<b>0.0077</b>	<b>5.31</b>	<b>0.938</b>	<b>0.0181</b>	<b>0.0209</b>	<b>0.0017</b>	<b>17.20</b>
SS-CRM 363/1	Monel Alloy 400 (wrought)	<b>0.140</b>	<b>0.028</b>	<b>1.26</b>	...	<i>0.002</i>	<i>0.05</i>	...	<b>64.7</b>	<b>0.027</b>	...	<b>0.032</b>	<b>31.90</b>	...	...	<i>0.03</i>	...	...	...	<b>1.86</b>
SS-CRM 387/1	Nimonic 901 Alloy (wrought)	<b>0.033</b>	<b>0.06</b>	<b>0.025</b>	<b>0.0033</b>	<b>0.0028</b>	<b>11.35</b>	<b>5.83</b>	<b>41.2</b>	<b>0.24</b>	<b>0.017</b>	<b>0.020</b>	<b>0.0076</b>	...	<i>0.006</i>	<b>3.00</b>	...	...	...	<b>38.4</b>

**Nickel Base Alloys (continued)**

TRACE ELEMENTS-nominal mass content in µg/g

Ref. No.	Description	Pb	Bi	Ag	Se	Te	Tl	Sb	Ta	As	Cd	Ga	Sn	Zn	Mg	Ca	In
SS-CRM 345	IN 100 Alloy (cont)	<b>0.21</b>	<0.2	<0.2	<0.5	<0.2	<0.2	<2	...	<i>2</i>	<0.1	<b>8.2</b>	<b>5.6</b>	<0.5	<b>5.5</b>	<5	...
SS-CRM 346A	IN 100 Alloy (cont)	<b>22.2</b>	<b>10.3</b>	<b>42.5</b>	<b>5.7</b>	<b>9.3</b>	<b>1.9</b>	<b>45</b>	...	<b>50.4</b>	<b>0.37</b>	<b>49.6</b>	<b>93</b>	<b>28.8</b>	<b>130</b>	<i>20</i>	<i>20</i>
SS-CRM 351/1	IN 718 Alloy (wrought) (cont)	<1	<1	<1	<1	<1	<1	<b>2.4</b>	<b>33</b>	<10	<0.1	<20	<b>3.3</b>	<10	<b>16</b>	<10	...
SS-CRM 387/1	Nimonic 901 Alloy (cont)	<i>0.3</i>	<1.0	<0.2	...	...	...	<b>3</b>	...	...	...	...	...	...	...	...	...

## SPECTROSCOPIC REFERENCE MATERIALS - Cast Irons

These samples are intended for the calibration of optical emission and XRF instruments with respect to the alloying and trace elements below. Although they have been carefully analysed by both BAS Ltd. and an independent laboratory, they have been classified as RMs and not CRMs in order to distinguish them from BAS CRMs which are normally analysed by at least five laboratories.

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

**Cast Iron Reference Materials** ( All are 40mm x 37mm x 10mm chill cast blocks except NIRM 2/1, NIRM 8/1, SIMO 1/2 and SIMO 2/2 which are 48mm x 42mm x 12mm chill cast blocks)

These samples have been prepared jointly by Castings Technology International (formerly BCIRA) and BAS

Ref No.	Description	C	Si	Mn	P	S	Cr	Mo	Ni	Al (Total)	As	B	Co	Cu	Nb	Pb	Sn	Ti	V	Bi	Ce	Mg
LARM 1	Low Alloy Cast Irons	(3.0)	(2.0)	(0.3)	(0.05)	(<0.01)	0.50	...	0.49	...	...	0.006	...	2.49	...	...	...	0.14	0.11	0.011	0.005	...
LARM 2		(3.0)	(2.0)	(0.3)	(0.05)	(<0.01)	2.50	0.22	...	0.066	0.044	...	...	...	...	0.007	0.22	0.33	...	...	0.008	...
LARM 3		(3.0)	(2.0)	(0.3)	(0.05)	(<0.01)	...	...	1.80	0.042	0.092	0.003	...	1.20	...	...	...	...	0.55	0.022	...	...
LARM 4		(3.0)	(2.0)	(0.3)	(0.05)	(<0.01)	1.19	1.00	...	0.014	...	...	...	0.26	...	0.018	0.11	0.17	...	...	0.008	...
LARM 5		(3.0)	(2.0)	(0.3)	(0.05)	(<0.01)	...	0.62	2.46	...	0.018	0.0012	...	...	...	0.0005	0.025	...	0.24	0.0010	...	...
CRRM 1/1	High Chromium Cast Irons	1.83	1.53	1.45	0.132	0.099	11.18	3.05	2.03	0.117	...	...	...	2.01	...	...	...	0.096	0.040	...	...	...
CRRM 2/1		1.92	1.18	1.11	0.097	0.079	14.13	2.44	1.61	0.054	...	...	...	1.59	...	...	...	0.070	0.063	...	...	...
CRRM 3/1		2.42	0.82	0.85	0.068	0.059	17.48	1.65	1.28	0.084	...	...	...	1.21	...	...	...	0.021	0.022	...	...	...
CRRM 4/1		3.00	0.56	0.60	0.044	0.039	22.42	1.19	0.62	<0.005	...	...	...	0.58	...	...	...	0.027	0.092	...	...	...
CRRM 4/2		2.93	0.45	0.58	0.049	0.042	21.93	1.15	0.58	<0.005	...	...	...	0.53	...	...	...	0.008	0.11	...	...	...
CRRM 5/1		3.46	0.25	0.32	0.029	0.019	29.09	0.54	0.29	0.17	...	...	...	0.23	...	...	...	0.026	0.063	...	...	...
NCRM 1	Nickel Chromium Cast Irons	3.05	0.95	1.21	0.300	0.156	0.55	1.02	0.57	...	...	...	...	2.17	...	...	...	...	...	...	...	...
NCRM 2		2.97	1.82	0.95	0.068	0.119	1.99	0.36	2.10	...	...	...	...	1.67	...	...	...	...	...	...	...	...
NCRM 3		3.24	0.29	0.67	0.125	0.090	3.95	0.78	3.64	...	...	...	...	1.21	...	...	...	...	...	...	...	...
NCRM 4		2.66	2.13	0.40	0.203	0.012	7.94	0.57	5.34	...	...	...	...	0.68	...	...	...	...	...	...	...	...
NCRM 5		3.70	1.15	0.27	0.025	0.015	10.44	0.10	6.74	...	...	...	...	0.204	...	...	...	...	...	...	...	...
NIRM 1	Austenitic (Ni-Resist) Cast Irons	2.05	3.15	6.72	0.055	0.005	0.246	...	11.80	...	...	...	...	0.20	...	...	...	...	...	...	0.018	0.021
NIRM 2/1		2.81	1.50	2.08	0.129	0.010	1.48	...	13.95	...	...	...	...	5.98	...	...	...	...	...	...	0.015	0.050
NIRM 3		2.51	2.21	0.51	0.208	0.096	2.43	...	17.8	...	...	...	...	1.00	0.09	...	...	...	...	...	0.007	...
NIRM 4		1.97	3.03	2.37	0.051	0.008	3.56	...	20.2	...	...	...	...	0.52	0.37	...	...	...	...	...	0.011	0.014
NIRM 5		2.93	1.73	1.09	0.126	0.004	0.50	...	22.1	...	...	...	...	0.22	0.20	...	...	...	...	...	<0.002	0.040
NIRM 6		2.44	2.43	4.00	0.217	0.062	1.07	0.45	26.7	...	...	...	...	0.10	...	...	...	...	...	...	0.003	...
NIRM 7		2.05	3.05	0.71	0.058	0.020	3.53	0.99	32.9	...	...	...	...	0.52	...	...	...	...	...	...	0.005	0.019
NIRM 8/1		1.34	5.42	1.60	0.109	0.010	2.34	0.75	35.2	...	...	...	...	0.23	...	...	...	...	...	...	0.013	0.043
SIMO 1/3	Silicon Molybdenum Cast Irons	2.70	4.07	0.333	0.040	0.007	0.899	0.776	0.030	0.026	0.047	...	0.013	0.028	...	...	0.048	0.007	0.007	...	...	0.036
SIMO 2/2		2.14	4.75	0.434	0.025	0.007	0.856	0.484	0.0189	0.013	0.039	...	0.0029	0.010	...	...	0.038	0.005	0.009	...	0.006	0.026

### SPECTROSCOPIC STANDARD REFERENCE MATERIALS - Copper Base Alloys

These samples are intended for the calibration of optical emission and XRF instruments with respect to the alloying and trace elements below. Although they have been carefully analysed by both BAS Ltd. and an independent laboratory, they have been classified as RMs and not CRMs in order to distinguish them from BAS CRMs which are normally analysed by at least five laboratories.

**Note that all CURM samples are now available in the finely divided (chip) form as well as in disc form**

CHEMICAL COMPOSITION (nominal mass content in %)

#### Copper Base Alloy Reference Materials (Approx. 50mm dia. x 12 or 10mm discs)

Ref. No.	Description	Cu	Sn	Pb	Zn	Ni	P	Fe	Si	Mn	As	Sb	Bi	Al	S	Mg	Cr	Cd	Co	Ag	Te
CURM 09.01-4	Phosphorus Deoxidised Coppers	99.82	<0.001	<0.0005	0.0008	<0.0005	0.151	0.0019	<0.001	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	...	...	...	...	<0.0005	0.011	<0.001
CURM 09.02-4		99.90	<0.001	<0.001	<0.001	<0.0005	0.078	0.0042	<0.002	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	...	...	...	...	<0.0005	0.0055	<0.001
CURM 09.03-4		99.92	<0.001	<0.0005	<0.001	<0.0005	0.056	0.0033	<0.001	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	...	...	...	...	<0.0005	0.012	<0.001
CURM 09.04-4		99.96	<0.001	<0.001	<0.001	<0.0005	0.0174	0.0047	<0.002	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	...	...	...	...	<0.0005	0.0033	<0.001
CURM 30.04-4	Main Elements in Brasses	64.34	0.009	0.003	35.62	<0.001	...	0.009	0.016	<0.001	<0.001	<0.005	<0.003	<0.001	...	...	...	...	...	...	...
CURM 30.05-4		69.48	<0.001	0.002	30.53	<0.0005	...	<0.003	0.001	<0.0005	<0.001	<0.005	<0.003	<0.001	...	...	...	...	...	...	...
CURM 30.09-4		89.53	<0.001	<0.001	10.45	<0.0003	...	0.0005	<0.001	<0.0003	<0.001	<0.001	<0.001	<0.001	...	...	...	...	...	...	...
CURM 30.11-4		59.86	<0.002	0.005	38.17	1.70	...	0.002	<0.001	0.23	<0.001	<0.001	<0.002	<0.001	...	...	...	...	...	...	...
CURM 30.15-4		60.66	<0.002	<0.005	38.88	<0.001	...	0.50	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	...	...	...	...	...	...	...
CURM 30.16-4		60.53	<0.002	<0.005	38.33	<0.001	...	1.14	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	...	...	...	...	...	...	...
CURM 30.18-4		63.66	0.58	<0.005	32.33	<0.001	...	0.006	0.131	<0.001	<0.005	<0.001	<0.001	3.28	...	...	...	...	...	...	...
CURM 30.20-4		61.46	0.40	<0.002	35.71	<0.001	...	<0.005	0.17	<0.001	<0.001	<0.002	<0.002	2.32	...	...	...	...	...	...	...
CURM 30.21-4	56.23	2.01	0.004	40.08	<0.001	...	0.003	0.213	<0.001	<0.001	<0.002	...	1.44	...	...	...	...	...	...	...	
CURM 42.21-2	Admiralty & Naval Brasses	66.78	0.60	0.259	31.61	0.120	0.087	0.119	0.15	<0.001	<0.003	0.25	0.013	0.003	0.034	...	...	...	...	...	...
CURM 42.22-2		70.46	1.10	1.10	26.32	0.061	0.177	0.23	0.042	0.122	0.217	0.173	0.046	0.042	<0.001	...	...	...	...	...	...
CURM 42.23-2		74.36	1.63	0.575	22.13	0.168	0.128	0.354	0.015	0.019	0.168	0.356	0.034	0.008	0.045	...	...	...	...	...	...
CURM 42.24-2		62.45	2.25	0.91	33.75	0.025	0.226	0.066	0.093	0.065	0.065	0.060	0.054	0.067	0.012	...	...	...	...	...	...
CURM 42.25-2		57.78	2.72	0.0023	39.20	<0.001	0.050	0.003	<0.001	0.169	0.118	<0.001	<0.001	0.021	0.005	...	...	...	...	...	...
CURM 43.01-4	Aluminium Brasses	74.36	0.116	<0.002	22.44	0.121	...	0.008	0.063	0.064	0.118	<0.001	<0.002	2.75	...	...	...	...	...	...	...
CURM 43.02-4		76.21	0.060	0.064	20.82	0.068	...	0.128	0.038	0.035	0.083	<0.001	<0.001	2.40	...	...	...	...	...	...	...
CURM 48.01-1	Cartridge Brasses	66.98	<0.002	0.106	32.6	0.134	0.016	0.049	0.041	<0.001	0.067	0.047	0.038	<0.001	<0.001	0.0008	<0.0005	<0.0003	...	...	...
CURM 48.02-1		67.16	0.035	0.084	32.58	<0.001	0.012	0.053	0.010	0.067	0.025	0.037	0.004	0.013	0.007	<0.0005	0.004	<0.0005	...	...	...
CURM 48.04-1		72.68	0.018	0.043	26.99	0.096	0.006	0.008	0.004	0.012	0.034	0.026	0.014	<0.001	0.011	0.0005	<0.002	<0.0003	...	...	...
CURM 48.05-1		68.69	0.083	<0.003	31.0	0.117	0.007	0.066	0.026	0.016	<0.001	<0.0005	<0.0005	<0.002	0.013	<0.0005	<0.0005	<0.0003	...	...	...
CURM 50.01-4	Leaded Bronzes	74.08	9.45	11.74	1.17	2.24	0.113	0.243	0.007	0.024	0.22	0.59	0.029	0.018	0.113	...	...	...	...	...	...
CURM 50.02-4		78.84	10.34	10.67	0.006	<0.0005	0.046	<0.001	<0.002	<0.0005	<0.002	<0.0005	<0.0005	<0.001	<0.001	...	...	...	...	...	...
CURM 50.03-4		77.42	8.41	8.86	1.72	2.89	0.159	0.018	0.005	0.037	0.11	0.24	0.051	0.005	0.064	...	...	...	...	...	...
CURM 50.04-4		76.11	11.30	9.94	0.66	1.10	0.032	0.10	0.011	0.028	0.06	0.50	0.10	0.014	0.14	...	...	...	...	...	...
CURM 51.11-4	Aluminium Bronzes	93.95	0.027	0.33	0.111	0.012	0.035	0.060	0.159	<0.001	<0.001	...	...	5.27	...	...	...	...	...	...	...
CURM 51.12-4		88.29	0.196	0.219	0.45	0.112	<0.001	2.87	0.005	1.33	0.111	...	...	6.36	...	...	...	...	...	...	...
CURM 51.13-4		88.79	0.270	0.104	0.335	0.057	0.022	1.81	0.174	0.898	0.215	...	...	7.30	...	...	...	...	...	...	...
CURM 51.14-4		88.57	0.113	0.003	0.656	0.219	0.012	0.72	0.286	0.55	0.44	...	...	8.42	...	...	...	...	...	...	...
CURM 52.52-5		79.26	0.044	0.074	0.094	3.56	...	6.02	0.011	0.145	...	...	...	10.69	...	0.007	0.004	...	...	...	...
CURM 52.54-4		81.59	0.135	0.086	0.39	5.40	...	3.31	0.022	1.20	...	...	...	7.85	...	<0.005	<0.005	...	...	...	...
CURM 54.01-4	Phosphor Brasses	95.42	3.17	0.307	0.346	0.348	0.053	0.028	0.039	0.158	0.044	0.070	...	0.040	0.023	0.008	...	...	...	...	
CURM 54.02-4		92.87	5.53	0.663	0.410	0.109	0.107	0.102	0.012	0.101	0.023	0.026	...	0.020	0.030	0.0020	...	...	...	...	...
CURM 54.03-4		91.74	7.30	0.003	0.003	0.0019	0.954	0.005	<0.002	<0.0005	0.006	0.0007	...	<0.001	<0.001	<0.0003	...	...	...	...	...
CURM 54.03-5		92.56	6.67	0.0012	<0.002	0.0006	0.786	0.015	<0.002	<0.0003	<0.001	<0.001	...	<0.001	<0.001	<0.0003	...	...	...	...	...
CURM 54.04-4		86.54	9.47	0.79	1.09	0.536	...	0.250	0.065	0.419	0.106	0.33	...	0.074	0.046	0.0009	...	...	...	...	...
CURM 54.05-4		84.78	11.36	1.14	0.554	1.28	0.501	0.051	0.006	0.078	0.063	0.111	...	0.055	0.063	0.0021	...	...	...	...	...
CURM 62.12-4	Cupro-Nickel	89.42	0.111	0.053	0.180	7.94	...	0.45	0.109	1.59	...	...	...	0.034	0.002	...	...	0.081	...	...	
CURM 71.31-5	Leaded Gunmetals	83.00	4.06	6.07	3.98	1.98	0.060	0.118	0.020	0.037	0.110	0.128	0.030	0.023	0.059	...	0.039	...	...	0.046	...
CURM 71.32-5		82.69	6.07	4.14	6.02	0.570	<0.001	0.056	<0.001	<0.0005	0.213	<0.002	<0.002	<0.001	0.082	...	<0.0005	...	...	0.029	...
CURM 71.33-8		83.60	4.96	6.84	3.60	0.938	<0.001	0.018	<0.005	<0.0005	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.0005	...	...	<0.002	...



## SETTING-UP SAMPLES FOR DIRECT READING SPECTROGRAPHS

These samples have been thoroughly examined both spectrographically and chemically to confirm the homogeneity of the bulk samples. Their compositions have NOT, however, been accurately determined since it is not intended that they should be used as Spectroscopic Standard CRMs or as RMs. An Information Sheet is supplied with each sample giving the approximate composition.

### Carbon, Low Alloy and Stainless Steels (Wrought) (Approx. 44mm dia. x 25, 75 or 150mm lengths)

Ref. No.	Description	Approximate Chemical Compositions (mass content in %)																					
		C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Co	Cu	N	Nb	Sn	Ti	V	W	Zr	Ca	Others
SUS A/11	Low Carbon Steel	0.02	0.01	0.15	<0.005	0.005	0.02	0.01	0.05	0.07	...	...	0.01	0.01	...	<0.005	<0.005	<0.001	<0.005	<0.005	...	...	...
SUS B/6	Low Alloy Steel	0.39	0.29	0.44	0.005	<0.005	1.2	0.20	1.5	0.01	0.005	0.001	0.02	0.15	...	0.005	0.01	0.01	0.01	0.005	...	<0.001	<0.001 Pb
SUS C/19	Low Alloy Steel	0.16	0.18	0.77	0.07	0.05	0.19	0.11	3.5	0.05	...	0.008	0.06	0.43	0.004	0.02	0.04	0.04	0.41	0.25	0.03	<0.001	...
SUS D/11	Low Alloy Steel	0.80	0.80	0.40	0.01	0.03	3.0	1.3	0.10	0.19	...	<0.001	0.29	0.11	0.01	0.05	0.01	0.10	0.12	0.16	...	...	...
SUS E/6	Highly Alloyed Steel	0.07	0.69	1.5	0.006	0.003	14.8	1.3	25.3	0.21	...	0.005	0.09	0.01	0.01	<0.1	...	2.1	0.31	0.04	...	...	53.7 Fe
SUS F/5	Duplex Stainless Steel	0.02	0.26	0.50	0.02	<0.005	24.7	3.5	7.0	<0.005	0.005	0.002	0.01	0.59	0.23	<0.005	<0.001	<0.005	0.03	0.62	...	...	62.9 Fe
SUS G/7	Stainless Steel	0.03	0.34	1.5	0.04	0.03	17.0	2.1	10.0	0.004	...	...	0.32	0.36	0.07	0.01	0.006	0.002	0.08	0.12	0.003	0.003	<0.001 Ta

### Cast Irons (Approx. 60mm x 35mm x 18mm chill cast blocks.) These samples have been prepared jointly by Castings Technology International (formerly BCIRA) and BAS

Ref. No.	Description	Approximate Chemical Compositions (mass content in %)																		
		C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	B	Cu	Sn	Ti	V	Bi	Mg	Sb	Ce
SUS 1/19	Low Phosphorus Iron	3.1	2.8	0.44	0.05	0.07	0.50	0.33	0.19	0.02	...	...	0.47	0.05	<0.005	0.04	...	...	...	...
SUS 2/44	Medium Phosphorus Iron	3.6	1.7	0.72	0.19	0.14	0.07	0.10	0.48	<0.005	...	...	0.20	0.10	0.06	0.51	...	...	...	...
SUS 3/20	High Phosphorus Iron	3.3	2.2	0.92	1.0	0.10	0.26	<0.005	0.03	<0.005	...	...	0.03	<0.005	0.12	0.30	...	...	...	...
SUS 4/25	Ductile (Nodular) Iron	3.3	2.6	0.14	...	0.01	0.08	...	0.08	0.01	0.07	...	0.76	<0.005	0.05	0.46	...	0.03	<0.005	...
SUS 5/49	Ductile (Nodular) Iron	3.8	1.9	0.61	...	0.01	0.01	...	1.0	0.04	<0.005	...	0.006	0.07	<0.005	0.51	...	0.08	<0.005	0.03
SUS 6/6	Malleable Iron	2.5	1.8	0.65	0.05	0.12	0.10	...	...	<0.005	...	<0.001	0.02	0.05	0.02	0.02	0.01	...	...	...
SUS 7/8	Malleable Iron	2.8	0.94	0.29	0.09	0.18	0.07	...	...	0.02	...	0.004	0.21	<0.01	...	0.06	<0.001	...	...	...

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Certificates may be reprinted from time to time to accommodate updated text or statistical treatment. In certain cases, where chemical analyses carried out after issuance of the original certificate lead to additional or revised certified data, the "Date of Latest Certificate" below is stated in bold. If the certificate in your possession is not the current one, we shall gladly supply this to you on request.

BRITISH CHEMICAL STANDARD CRMs		Date of Latest Certificate	Page
Ref. No.	Description		
BCS-CRM 111	Low Carbon Steel	<b>Nov 10</b>	7
BCS-CRM 112	Low Alloy Steel	Jul 04	9
BCS-CRM 113	Low Alloy Steel	Jul 04	9
BCS-CRM 114	Low Alloy Steel	Jul 04	9
BCS-CRM 159/3 (ECRM 055-1)	0.5% Carbon Steel	<b>Dec 75</b>	7
BCS-CRM 161/4	0.8% Carbon Steel	May 06	7
BCS-CRM 163/2 (ECRM 063-1)	1.2% Carbon Steel	Feb 72	7
BCS-CRM 176/2	Manganese Ore	Dec 79	14
BCS-CRM 177/2	Lead Base White Metal	Sep 77	13
BCS-CRM 178/2	Tin Base White Metal	Mar 76	13
BCS-CRM 179/2	High Tensile Brass	Apr 75	12
BCS-CRM 180/2	Copper-Nickel	Mar 76	12
BCS-CRM 181/3	2.5% Cu Aluminium Alloy	Sep 84	12
BCS-CRM 182/3	11% Si Aluminium Alloy	Apr 88	12
BCS-CRM 183/4	Leaded Gunmetal	Mar 84	12
BCS-CRM 206/3 (ECRM 453-1)	High Si and P Cast Iron	May 11	11
BCS-CRM 207/2	Gunmetal	May 76	12
BCS-CRM 214/2 (ECRM 152-1)	Mn-Mo Steel	Sep 04	9
BCS-CRM 216/3	5% Cu Aluminium Alloy	<b>Oct 89</b>	12
BCS-CRM 219/4 (ECRM 153-1)	Ni-Cr-Mo Steel	<b>Feb 03</b>	9
BCS-CRM 220/2 (ECRM 254-1)	High Speed Steel	Sep 10	8
BCS-CRM 222/1 (ECRM 154-1)	3% Ni Steel	<b>Jul 11</b>	9
BCS-CRM 225/2 (ECRM 155-1)	Ni-Cr-Mo Steel	Dec 10	9
BCS-CRM 232/2 (ECRM 051-1)	0.1% Sulphur Steel	Oct 10	7
BCS-CRM 236/3 (ECRM 454-1)	Hematite Iron	May 11	11
BCS-CRM 237/2 (ECRM 060-1)	0.1% Carbon Steel	Oct 10	7
BCS-CRM 238/2 (ECRM 061-1)	0.2% Carbon Steel	Oct 10	7
BCS-CRM 241/2 (ECRM 251-1)	High Speed Steel	<b>Nov 10</b>	8
BCS-CRM 242/2 (ECRM 555-1)	Ferro-Tungsten	<b>Jun 11</b>	11

BRITISH CHEMICAL STANDARD CRMs		Date of Latest Certificate	Page
Ref. No.	Description		
BCS-CRM 262/1	10% Mg Aluminium Alloy	Aug 78	12
BCS-CRM 263/2	5% Mg Aluminium Alloy	Jul 75	12
BCS-CRM 268/1	5% Si Aluminium Alloy	Apr 81	12
BCS-CRM 270 (ECRM 054-1)	0.09% Phosphorus Steel	<b>Nov 10</b>	7
BCS-CRM 290/2 (ECRM 253-1)	13% Manganese Steel	Jun 11	10
BCS-CRM 300/1	6% Zn Aluminium Alloy	Mar 74	12
BCS-CRM 301/1 (ECRM 651-1)	Lincolnshire Iron Ore	Aug 11	14
BCS-CRM 304/1	Copper Aluminium	Oct 79	12
BCS-CRM 307	Ce-Zn-Zr Magnesium Alloy	Jan 63	12
BCS-CRM 309	Sillimanite	<b>Jul 74</b>	15
BCS-CRM 310/1	Nimonic 90	Sep 69	13
BCS-CRM 313/1	High Purity Silica	Apr 89	15
BCS-CRM 316	8% Al Magnesium Alloy	Dec 69	12
BCS-CRM 317 (ECRM 151-1)	Low C High Si Steel	Sep 11	9
BCS-CRM 318A	0.01% O Steel	Sep 76	8
BCS-CRM 318B	0.01% O Steel	Sep 80	8
BCS-CRM 319/1	Magnesia	Mar 09	15
BCS-CRM 332	Austenitic Stainless Steel	Jun 66	10
BCS-CRM 339	Ferritic Stainless Steel	Feb 68	10
BCS-CRM 340	Ferritic Stainless Steel	Feb 68	10
BCS-CRM 341	Ferritic Stainless Steel	Feb 68	10
BCS-CRM 342	Ferritic Stainless Steel	Feb 68	10
BCS-CRM 343	Wrought Aluminium Alloy	May 86	12
BCS-CRM 344	70/30 Brass	Oct 81	12
BCS-CRM 345	Nickel Alloy IN100	<b>Jun 03</b>	13
BCS-CRM 346	Nickel Alloy IN100	Jun 03	13
BCS-CRM 347	Electronic Flowsolder	Jan 88	13

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BRITISH CHEMICAL STANDARD CRMs		Date of Latest Certificate	Page
Ref. No.	Description		
BCS-CRM 348	Ball Clay	Jun 11	15
BCS-CRM 349	3.5% Cu Aluminium	Oct 89	12
BCS-CRM 350	Nickel Alloy IN713	Nov 05	13
BCS-CRM 351/1	Nickel Alloy IN718	Jan 12	13
BCS-CRM 352/1	Tungsten Carbide	Mar 02	14
BCS-CRM 353	Sulphate Resisting Portland Cement	Oct 11	13
BCS-CRM 354	White Portland Cement	<b>Oct 11</b>	13
BCS-CRM 355	Tin Ore	Sep 90	14
BCS-CRM 356	Titanium Alloy	Jan 94	13
BCS-CRM 357	Titanium Alloy	Jan 94	13
BCS-CRM 358	Zirconia	Jun 94	15
BCS-CRM 359	Nitrogen Bearing Silicon Carbide	Jun 96	14
BCS-CRM 360	Sialon Bonded Silicon Carbide	Jun 96	14
BCS-CRM 361	Chromium Metal	<b>May09</b>	13
BCS-CRM 362	Mine Tailings Sample	<b>Sep 10</b>	15
BCS-CRM 363/1	Monel Alloy 400	Oct 85	13
BCS-CRM 364	Leaded Bronze	<b>Mar 73</b>	12
BCS-CRM 369	Magnesite Chrome	Oct 71	15
BCS-CRM 370	Magnesite Chrome	Oct 71	15
BCS-CRM 371	Commercial Nickel	May 73	13
BCS-CRM 374	Phosphor Bronze	Jul 73	12
BCS-CRM 375/1	Soda Feldspar	Nov 04	15
BCS-CRM 376/1	Potash Feldspar	<b>May09</b>	15
BCS-CRM 380/1	2% Si Aluminium Alloy	Jul 89	12
BCS-CRM 381	Basic Slag	Jul 73	14
BCS-CRM 383	Alcomax III	Dec 77	11
BCS-CRM 385	Leaded Brass	Feb 75	12
BCS-CRM 387/1	Nimonic 901 Alloy	Jan 91	13
BCS-CRM 388	Zircon	<b>Jul 93</b>	15
BCS-CRM 389/1	High Purity Magnesia	Feb 02	15
BCS-CRM 390	High Tensile Brass	Oct 74	12
BCS-CRM 392	Fluorspar	Jun 79	14

BRITISH CHEMICAL STANDARD CRMs		Date of Latest Certificate	Page
Ref. No.	Description		
BCS-CRM 393 (ECRM 752-1)	Limestone	Dec 10	15
BCS-CRM 395	Bauxite	Jul 89	14
BCS-CRM 396	Low Silica Magnesite Chrome	May 84	15
BCS-CRM 398	Alnico H C	<b>Jul 91</b>	11
BCS-CRM 399	Phosphorus Deoxidised Copper	May 87	12
BCS-CRM 405, 408	Low Alloy Steels	Jan 10	9
BCS-CRM 404/1,405/1	Low Alloy Steels	Dec 09	9
BCS-CRM 401/2-405/2	Low Alloy Steels	Dec 05	9
BCS-CRM 407/1-409/1	Low Alloy Steels	Dec 09	9
BCS-CRM 406/2-410/2	Low Alloy Steels	Feb 06	9
BCS-CRM 421-424	Low Tungsten Steels	May 74	9
BCS-CRM 431/2-435/2	Plain Carbon Steels	Jul 97	8
BCS-CRM 451/1-453/1	Carbon Steels - Residual Series (Gp A)	Aug 10	8
BCS-CRM 456/2-460/2	Carbon Steels - Residual Series (Gp B)	May 01	8
BCS-CRM 462, 463	Austenitic Stainless Steels	Jul 80	10
BCS-CRM 461/1, 462/1	Austenitic Stainless Steels	Jul 96	10
BCS-CRM 463/1-465/1	Austenitic Stainless Steels	Jun 10	10
BCS-CRM 466/2	Austenitic Stainless Steel	Dec 04	10
BCS-CRM 467/1, 468/1	Austenitic Stainless Steels	Jun 10	10
BCS-CRM 469-473	Ferritic Stainless Steels	Sep 10	10
BCS-CRM 474, 475	Stainless Steels	Sep 10	10
BCS-CRM 481-484	High Speed Steels	Feb 70	8
BCS-CRM 491, 494, 495	High Manganese Steels	Nov 72	10
BCS-CRM 495/1	High Manganese Steel	Oct 78	10
BCS-CRM 505,506	Aluminium-Silicon Alloys	Sep 85	12
BCS-CRM 512	Dolomite	Dec 04	15
BCS-CRM 513	Limestone	Dec 04	15
BCS-CRM 514	Copper Concentrate	Apr 12	14
BCS-CRM 516	Standard Glass Sand	May 09	15
BCS-CRM 517	Brazilian Iron Ore	<b>Dec 09</b>	14
BCS-CRM 526	Soda Ash	Jul 11	16
BCS-CRM 527	Blast Furnace Iron	Apr 12	16
BCS-CRM 528	Standard Glass Sand	Feb 11	15

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EURONORM CRMs		Date of Latest Certificate	Page
Ref. No.	Description		
ECRM 056-2(C)	0.8% Carbon Steel	May 09	7
ECRM 057-2(C)	0.05% Carbon Steel	Mar 99	7
ECRM 058-2(C)	0.15% Sulphur Steel	Aug 02	7
ECRM 059-2(C)	0.7% Carbon Steel	Nov 02	7
ECRM 064-1(C)	Nb/Ti Interstitial Free Steel	Nov 02	7
ECRM 084-1(C)	0.4% Carbon Steel	Feb 00	7
ECRM 085-1(C)	0.3% Sulphur Steel	Feb 03	7
ECRM 086-1(C)	0.3% Carbon Steel	Jan 01	7
ECRM 087-1(C)	0.15% Carbon Steel	Aug 07	7
ECRM 088-2	High Purity Iron	Jan 01	7
ECRM 090-1(C)	1% Carbon Steel	May 00	7
ECRM 091-1	0.5% Carbon Steel	Feb 05	7
ECRM 096-2(C)	Low S, Ca-Treated Steel	Mar 99	7
ECRM 097-1(C)	High Purity Iron	Feb 98	7
ECRM 186-1(C)	Silico Manganese Steel	Jul 08	9
ECRM 195-1(C)	Cr-Mo-Ni Steel	Mar 92	9
ECRM 272-1(C)	12% Chromium Steel	Jul 05	10
ECRM 276-2(C)	5% Cr-Mo-V Steel	Feb 93	10
ECRM 281-1	18/9 Stainless Steel + Ti	Dec 82	10
ECRM 285-2(C)	Maraging Steel	May 97	10
ECRM 287-1(C)	High Boron Stainless Steel	Jul 04	10
ECRM 292-1(C)	Nb Stabilized Stainless Steel	Nov 90	10
ECRM 295-1(C)	4% Mo-Cr-Ni Steel	Mar 95	10
ECRM 296-1(C)	Jethete Steel	Mar 97	10
ECRM 376-1	24% Co Magnet Alloy	Nov 90	11
ECRM 451-2	Austenitic Cast Iron	Jan 99	11
ECRM 481-1	Nodular Iron	Sep 10	11
ECRM 482-2	Low Alloy Cast Iron	Jul 94	11
ECRM 483-1	High Duty Cast Iron	Sep 03	11
ECRM 484-1	Whiteheart Malleable Iron	Aug 02	11
ECRM 486-1	Foundry Iron	Mar 04	11
ECRM 489-1	White Iron	Dec 91	11
ECRM 576-1	Ferro-Niobium	May 84	11
ECRM 577-1	Ferro-Vanadium	Sep 80	11
ECRM 578-1	Ferro-Molybdenum	Nov 78	11
ECRM 579-1	Ferro-Niobium	May 83	11
ECRM 580-1	Ferro-Chromium	Jan 87	11
ECRM 583-1	Ferro-Manganese	May 84	11
ECRM 584-1	Ferro-Titanium	Jan 88	11
ECRM 585-2	High C, Ferro-Chromium	Jul 07	11
ECRM 587-1	Ferro-Boron	May 86	11
ECRM 590-1	Ferro-Tungsten	Mar 91	11
ECRM 676-1	Iron Ore Sinter	Nov 75	14
ECRM 682-2	Iron Ore	Apr 09	14
ECRM 683-1	Iron Ore Sinter	Aug 85	14
ECRM 776-1	Firebrick	May 83	15
ECRM 781-1	Silicon Carbide Refractory	Mar 93	14
ECRM 782-1	Dolomite	Jul 96	15
ECRM 783-1	Tungsten Carbide	Jul 05	14
ECRM 879-1	Basic Slag	Jun 82	14
ECRM 884-1	Furnace Dust	Mar 11	14

SPECTROSCOPIC STANDARD CRMs		Date of Latest Certificate	Page
Ref. No.	Description		
SS-CRM 53,55,56	Carbon Steels – Residual Series	Jan 10	17
SS-CRM 70	Ferritic Stainless Steel	Feb 68	20
SS-CRM 111A	Low Carbon Steel	Nov 10	18
SS-CRM 112-114	Low Alloy Steels	Jul 04	18
SS-CRM 310/1	Nimonic 90 Alloy	Sep 69	21
SS-CRM 345, 346A	Nickel Alloy IN100	Jun 03	21
SS-CRM 350	Nickel Alloy IN713	Nov 05	21
SS-CRM 351	Nickel Alloy IN718	Nov 05	21
SS-CRM 351/1	Nickel Alloy IN718	Jan 12	21
SS-CRM 363/1	Monel Alloy 400	Oct 85	21
SS-CRM 387/1	Nimonic 901 Alloy	Jan 91	21
SS-CRM 401/2-405/2	Low Alloy Steels	Dec 05	18
SS-CRM 406/2-410/2	Low Alloy Steels	Feb 06	18
SS-CRM 421-424	Low Tungsten Steels	May 74	18
SS-CRM 432/1-435/1	Plain Carbon Steels	Jan 79	17
SS-CRM 431/2-435/2	Plain Carbon Steels	Jul 97	17
SS-CRM 453/1, 454/1	Carbon Steels - Residual Series (Gp A)	Aug 10	17
SS-CRM 456/2-460/2	Carbon Steels - Residual Series (Gp B)	May 01	17
SS-CRM 462	Austenitic Stainless Steel	Jul 80	19
SS-CRM 461/1, 462/1	Austenitic Stainless Steels	Jul 96	19
SS-CRM 463/1-465/1	Austenitic Stainless Steels	Jun 10	19
SS-CRM 466/2	Austenitic Stainless Steel	Dec 04	19
SS-CRM 467/1, 468/1	Austenitic Stainless Steel	Jun 10	19
SS-CRM 469-473	Ferritic Stainless Steels	Sep 10	20
SS-CRM 475	Stainless Steel	Sep 10	19
SS-CRM 481/1-487/1	High Speed Tool Steels	May 84	20
SS-CRM 491/2	High Manganese Steel (Cast)	Aug 96	20
SS-CRM 492/3	High Manganese Steel (Cast)	May 10	20
SS-CRM 493/3	High Manganese Steel (Cast)	Apr 12	20
SS-CRM 495/4	High Manganese Steel (Cast)	Apr 09	20
SS-CRM 601/2-605/2	Plain Carbon Cast Steels	Sep 90	19
SS-CRM 615/1	Low Alloy Cast Steel	Aug 84	18
ECRM 056-2(D)	0.8% Carbon Steel	Mar 09	17
ECRM 057-2(D)	0.05% Carbon Steel	Mar 99	17
ECRM 058-2(D)	0.15% Sulphur Steel	Aug 02	17
ECRM 059-2(D)	0.7% Carbon Steel	Nov 02	17
ECRM 064-1(D)	Nb/Ti Interstitial Free Steel	Nov 02	17
ECRM 084-1(D)	0.4% Carbon Steel	Feb 00	17
ECRM 085-1(D)	0.3% Sulphur Steel	Feb 03	17
ECRM 086-1(D)	0.7% Carbon Steel	Jan 01	17
ECRM 087-1(D)	0.15% Carbon Steel	Aug 07	17
ECRM 090-1(D)	1% Carbon Steel	May 00	17
ECRM 096-2(D)	Low S, Ca-Treated Steel	Mar 99	17
ECRM 097-1(D)	High Purity Iron	Feb 98	18
ECRM 186-1(D)	Silico Manganese Steel	Jul 08	18
ECRM 195-1(D)	Cr-Mo-Ni Steel	Mar 92	18
ECRM 272-1(D)	12% Chromium Steel	Jul 05	19
ECRM 276-2(D)	5% Cr-Mo-V Steel	Feb 93	19
ECRM 285-2(D)	Maraging Steel	May 97	19
ECRM 287-1(D)	High Boron Stainless Steel	Mar 04	19
ECRM 292-1(D)	Nb-Stabilized Stainless Steel	Nov 90	19
ECRM 295-1(D)	4% Mo-Cr-Ni Steel	Mar 95	19
ECRM 296-1(D)	Jethete Steel	Mar 97	19
SCRm 651/4-655/4	Malleable Irons	Jan 91	21
SCRm 656/8, 657/8, 659/8	Low Phosphorus Engineering Irons	Jul 94	21
SCRm 658/10	Low Phosphorus Engineering Iron	Jul 08	21
SCRm 660/9	Low Phosphorus Engineering Iron	Nov 05	21
SCRm 661/4-665/4	High Phosphorus Engineering Irons	Oct 93	21
SCRm 666/11	Ductile (Nodular) Irons	Jan 05	21
SCRm 667/12	Ductile (Nodular) Irons	Nov 07	21
SCRm 668/12	Ductile (Nodular) Iron	Sep 11	21
SCRm 669/13, 670/15	Ductile (Nodular) Iron	Nov 10	21
SCRm 671, 673, 674, 675	Blast Furnace Irons	Jan 05	21
SCRm 672/1	Blast Furnace Iron	Jan 12	21

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REFERENCE MATERIALS & SETTING-UP SAMPLES		Date of Latest Analysis Report or Information Sheet	Page
Ref. No.	Description		
BCS-RM 190t	Benzoic Acid	Aug 04	16
BCS-RM 192g	High Purity Tin (300g blocks)	Jan 87	16
BCS-RM 192h	High Purity Tin (millings)	Apr 01	16
BCS-RM 194e	High Purity Zinc (300g blocks)	Jul 75	16
BCS-RM 195g	High Purity Aluminium (300g blocks)	Aug 78	16
BCS-RM 195g	High Purity Aluminium (millings)	Aug 78	16
BCS-RM 198f	Super Pure Aluminium (100g blocks)	Dec 77	16
BCS-RM 201a	Nepheline Syenite	Mar 91	16
BCS-RM 202a	Plaster (Gypsum)	Mar 91	16
BCS-RM 203a	Talc	Mar 91	16
BCS-RM 204a	Zircon	Mar 91	16
BCS-RM 210e	High Purity Lead (500g bars)	Apr 71	16
LARM 1-5	Low Alloy Cast Irons	May 88	22
CRRM 1 & 3	High Chromium Irons	Feb 91	22
CRRM 1/1-5/1	High Chromium Irons	May 00	22
CRRM 4/2	High Chromium Iron	Jul 11	22
NCRM 1-5	Nickel Chromium Irons	May 95	22
NIRM 1, 3, 4, 5, 6 & 7	Austenitic (Ni-Resist) Irons	Jan 93	22
NIRM 2/1	Austenitic (Ni-Resist) Iron	Jun 10	22
NIRM 8/1	Austenitic (Ni-Resist) Iron	May 07	22
SIMO 1/3	Silicon Molybdenum Cast Iron	Mar 11	22
SIMO 2/2	Silicon Molybdenum Cast Iron	May 10	22
SUS A/11	Low Carbon Steel	Mar 06	24
SUS B/6	Low Alloy Steel	Oct 95	24
SUS C/19	Low Alloy Steel	Jul 02	24
SUS D/11	Low Alloy Steel	Aug 97	24
SUS E/6	Highly Alloyed Steel	Jul 08	24
SUS F/5	Duplex Stainless Steel	Aug 00	24
SUS G/7	Stainless Steel	Dec 10	24
SUS 1/19	Low Phosphorus Iron	Mar 08	24
SUS 2/44	Medium Phosphorus Iron	Jun 09	24
SUS 3/20	High Phosphorus Iron	Oct 06	24
SUS 4/25	Ductile (Nodular) Iron	Sep 11	24
SUS 5/49	Ductile (Nodular) Iron	Sep 11	24
SUS 6/6	Malleable Iron	Dec 93	24
SUS 7/8	Malleable Iron	May 95	24

SPECTROSCOPIC REFERENCE MATERIALS		Date of Latest Analysis Report	Page
Ref. No.	Description		
CURM 09.01-4	Phosphorus Deoxidised Copper	Sep 03	23
CURM 09.02-4	Phosphorus Deoxidised Copper	Sep 03	23
CURM 09.03-4	Phosphorus Deoxidised Copper	Sep 03	23
CURM 09.04-4	Phosphorus Deoxidised Copper	Sep 03	23
CURM 30.04-4	Main Elements in Brass	Jul 09	23
CURM 30.05-4	Main Elements in Brass	Jul 09	23
CURM 30.09-4	Main Elements in Brass	Sep 03	23
CURM 30.11-4	Main Elements in Brass	Sep 03	23
CURM 30.15-4	Main Elements in Brass	Sep 03	23
CURM 30.16-4	Main Elements in Brass	Sep 03	23
CURM 30.18-4	Main Elements in Brass	Sep 03	23
CURM 30.20-4	Main Elements in Brass	Sep 03	23
CURM 30.21-4	Main Elements in Brass	Sep 03	23
CURM 42.21-2	Admiralty & Naval Brass	Jul 09	23
CURM 42.22-2	Admiralty & Naval Brass	Jul 09	23
CURM 42.23.2	Admiralty & Naval Brass	Jul 09	23
CURM 42.24-2	Admiralty & Naval Brass	Jul 09	23
CURM 42.25-2	Admiralty & Naval Brass	Jul 09	23
CURM 43.01-4	Aluminium Brass	Sep 03	23
CURM 43.02-4	Aluminium Brass	Sep 03	23
CURM 48.01-1	Cartridge Brass	Sep 03	23
CURM 48.02-1	Cartridge Brass	Sep 03	23
CURM 48.04-1	Cartridge Brass	Sep 03	23
CURM 48.05-1	Cartridge Brass	Sep 03	23
CURM 50.01-4	Leaded Bronze	Sep 03	23
CURM 50.02-4	Leaded Bronze	Sep 03	23
CURM 50.03-4	Leaded Bronze	Sep 03	23
CURM 50.04-4	Leaded Bronze	Sep 03	23
CURM 51.11-4	Aluminium Bronze	Sep 03	23
CURM 51.12-4	Aluminium Bronze	Sep 03	23
CURM 51.13-4	Aluminium Bronze	Sep 03	23
CURM 51.14-4	Aluminium Bronze	Sep 03	23
CURM 52.52-5	Aluminium Bronze	Mar 09	23
CURM 52.54-4	Aluminium Bronze	Nov 08	23
CURM 54.01-4	Phosphor Bronze	Sep 03	23
CURM 54.02-4	Phosphor Bronze	Sep 03	23
CURM 54.03-4	Phosphor Bronze	Sep 03	23
CURM 54.03-5	Phosphor Bronze	May 10	23
CURM 54.04-4	Phosphor Bronze	Sep 03	23
CURM 54.05-4	Phosphor Bronze	Sep 03	23
CURM 62.12-4	Cupro-Nickel	Sep 03	23
CURM 71.31-5	Leaded Gunmetal	Sep 03	23
CURM 71.32-5	Leaded Gunmetal	Apr 09	23
CURM 71.33-8	Leaded Gunmetal	Jul 09	23

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