ECISS

EUROPEAN COMMITTEE FOR IRON AND STEEL STANDARDISATION
COMITÉ EUROPÉEN DE NORMALISATION DU FER ET DE L'ACIER
EUROPÄISCHES KOMITEE FÜR EISEN- UND STAHLNORMUNG

EUROPEAN CERTIFIED REFERENCE MATERIAL (EURONORM – CRM)

CERTIFICATE OF CHEMICAL ANALYSIS

EURONORM – CRM No. 484-1 WHITEHEART MALLEABLE IRON

LABORATORY MEANS (4 Values)
mass content in %

Line No	C	Si	Mn	P	S	Cr
1	3.172	—	—	0.1112	—	—
2	3.180	—	0.3826	0.1135	0.2140	0.1450
3	3.180	0.6760	0.3890	0.1145	0.2164	0.1488
4	3.182	0.6950	0.3898	0.1158	0.2182	0.1490
5	3.182	0.6982	0.3908	0.1158	0.2215	0.1508
6	3.183	0.7075	0.3912	0.1170	0.2230	0.1508
7	3.183	0.7110	0.3930	0.1175	0.2242	0.1525
8	3.183	0.7125	0.3935	0.1179	0.2272	0.1532
9	3.188	0.7140	0.3938	0.1188	0.2275	0.1533
10	3.189	0.7154	0.3942	0.1195	0.2289	0.1535
11	3.189	0.7162	0.3960	0.1208	0.2292	0.1538
12	3.192	0.7196	0.3962	0.1228	0.2293	0.1540
13	3.192	0.7218	0.3970	0.1230	0.2294	0.1552
14	3.212	0.7235	0.3975	0.1246	0.2320	0.1552
15	3.214	0.7255	0.3978	0.1246	0.2332	0.1588
16	3.227	0.7275	0.3980	0.1254	0.2345	0.1618
17	3.244	0.7275	0.3987	0.1255	0.2360	0.1628
18	3.252	0.7290	0.4000	0.1278	0.2365	0.1629
19	3.252	0.7340	0.4010	0.1289	0.2400	0.1630
20	3.265	0.7372	0.4050	0.1295	0.2425	0.1660
21	—	0.7375	—	—	0.2480	—
M_M	**3.203**	**0.7173**	**0.3950**	**0.1207**	**0.2296**	**0.1553**
s_M	0.029	0.0155	0.0051	0.0054	0.0087	0.0058
s_W	0.021	0.0095	0.0052	0.0033	0.0038	0.0027

M_M: Mean of the intralaboratory means, s_M: Standard deviation of the intralaboratory means, s_W: Intralaboratory standard deviation

The laboratory mean values have been examined statistically to eliminate outlying values. Where a "—" appears in the table it indicates that an outlying value has been eliminated by either the Cochran or Grubbs Test. Values reported as "less than" values by the participating laboratories have not been taken into account in the statistical calculations.

CERTIFIED VALUES
Mass content in %

	C	Si	Mn	P	S	Cr
M_M	**3.203**	**0.717**	**0.395**	**0.121**	**0.230**	**0.155**
C(95%)	0.014	0.008	0.003	0.003	0.004	0.003

The half-width confidence interval C(95%) = $\frac{t \times s_M}{\sqrt{n}}$ where "t" is the appropriate Student's t value and "n" is the number of acceptable mean values

For further information regarding the confidence interval for the certified value see ISO Guide 35:2006 sections 6.1 and 10.5.2

This Certified Reference Material was prepared in accordance with the principles and recommendations set out in ISO Guides 30 – 35 and issued by:

BUREAU OF ANALYSED SAMPLES LIMITED

Newham Hall, Middlesbrough, England TS8 9EA

On behalf of:- The Iron and Steel Nomenclature Co-ordinating Committee (COCOR) of the ECISS, after approval by all the participating laboratories and all the producing organizations. (France – IRSID/CTIF, Germany – Iron and Steel CRM Working Group: Stahlinstitut VDEh, BAM Bundesanstalt für Materialforschung und –prüfung & MPI für Eisenforschung, Nordic Countries – Nordic CRM Working Group, UK – BAS Ltd.)

revised AUGUST 2002

Reprinted March 2014 with editorial amendements

(first published in February 1980 without uncertainty values for the certified elements)

EURONORM – CRM No. 484-1

PARTICIPATING LABORATORIES

Arbed, Division d'Esch Belval, Esch-sur-Alzette, Luxembourg
BCIRA, Birmingham, UK
British Steel Corporation, Stanton and Staveley, Nottingham, UK.
Bundesanstalt für Materialprüfung (BAM), Berlin-Dahlem, Germany
Centre Technique des Industries de la Fonderie (CTIF), Sèvres, France
Centro Sperimentale Metallurgico (CSM), Rome, Italy
Cockerill, Seraing, Belgium
Creusot Loire, Le Creusot, France
Hoogovens-ESTEL, IJmuiden, Holland
Institute for Industrial Research and Standards (IIRS), Dublin, Republic of Ireland
Institut für Giessereitechnik, Düsseldorf, Germany
Institut de Recherches de la Sidérugie Français (IRSID), Saint Germain-en-Laye, France
Laboratoire National d'Essais, Paris, France
Leys Malleable Castings, Derby, UK
Luxcontrol S.A., Esch-sur-Alzette, Luxembourg
Midland Research Laboratories, Dudley, UK
Ridsdale & Co Ltd., Middlesbrough, UK
Société Metallurgique Hainaut Sambre, Couillet, Belgium
Staatliches Materialprüfungsamt NW, Dortmund, Germany
Stahlwerke Peine-Salzgitter AG, Salzgitter 41, Germany
Tubi Ghisa, Genova, Italy
Usinor, Neuves Maisons, France

METHODS USED

Element	Line Number	Methods
C	1-4-6-7-17	Combustion, non-aqueous titration in organic solvent
	2-12	Combustion, gravimetry
	3-9-15-20	Combustion, Infrared absorption
	5-10	Combustion, conductimetry
	8-11-13-18	Combustion, thermal conductivity
	14-16	Combustion, coulometric titration
	19	Combustion, titration
Si	3-5-6-7-9-10-11-12-14-15-16-17-19-20-21	Gravimetry, dehydration with perchloric acid
	4	Acidimetric titration of fluosilicate
	8	Gravimetry, dehydration with hydrochloric acid
	13-18	Spectrophotometry, molybdenum blue
Mn	2-3-5-9-10-11-14-17-19-20	Spectrophotometry, periodate oxidation
	4-6-8-12-15-16-18	Flame Atomic Absorption Spectrometry
	7	Titration with Fe (II), oxidation with persulphate/silver nitrate
	13	Titration with arsenite, oxidation with persulphate
P	1-5-15-16-17	Spectrophotometry, molybdenum blue without extraction
	2-8-9-11-13	Acidimetric titration of ammonium phosphomolybdate
	3-4-6-10-18	Spectrophotometry, phosphovanadomolybdate, extraction
	7-19	Spectrophotometry, molybdenum blue, extraction
	12-20	Gravimetry, ammonium phosphomolybdate
	14	Spectrophotometry, phosphovanadomolybdate, without extraction
S	2-7-8-15	Combustion, acidimetric titration, absorption in H_2O_2
	3-5-9-13-19	Combustion, Infrared absorption
	4-10-14-20-21	Combustion, oxidation reduction titration
	6-12	Combustion conductimetry
	11-16-18	Gravimetry as $BaSO_4$ without separation
	17	Combustion, thermal conductivity
Cr	2-17	Titration with Fe (II), oxidation with persulphate, potentiometric end point
	3-5-11-12-13-19	Titration with Fe (II), oxidation with persulphate
	4-6-9-10-14-15-16-18-20	Flame Atomic Absorption Spectrometry
	7-8	Spectrophotometry, diphenylcarbazide

DESCRIPTION OF THE SAMPLE

The sample consists of chips passing a nominal 710µm aperture sieve from which the fines passing a nominal 180µm sieve have been removed. It is supplied in bottles containing 100g. NB: a significant portion of the carbon content is in the graphitic form.

INTENDED USE & STABILITY

ECRM 484-1 is intended for the verification of analytical methods, such as those used by the participating laboratories, for the calibration of analytical instruments in cases where calibration with primary substances (pure metals or stoichiometric compounds) is not possible and for establishing values for secondary reference materials.
It will remain stable provided that the bottle remains sealed and is stored in a cool, dry atmosphere. When the bottle has been opened the lid should be secured immediately after use. If the contents should become discoloured (e.g. oxidised) by atmospheric contamination they should be discarded.

TRACEABILITY

The traceability of ECRM 484-1 has been established in accordance with principles of ISO Guides 30 – 35 and the International Vocabulary of Basic and General Terms In Metrology.

The characterisation of this material has been achieved by inter-laboratory study, each laboratory using the method of their choice, details of which are given above. These methods are either stoichiometric analytical techniques or methods which are calibrated against pure metals or stoichiometric compounds. Most methods used were either international or national standard methods or methods which are technically equivalent.

FURTHER INFORMATION

For information regarding the preparation, certification and supply of these European Certified Reference Materials (EURONORM-CRMs) and the use of the statistical information given on this certificate, please refer either to the producer of this Certified Reference Material or to Technical Reports CEN/TR 10317:2013 and CEN/TR 10350:2013, both of which are available from the national standards body in your country. (In the UK this is the BSI, 389 Chiswick High Road, London W4 4AL).

Further information and advice on this or other Certified Reference Materials or Reference Materials produced by Bureau of Analysed Samples Ltd. may be obtained from the address below.

Pour disposer d'informations sur la fabrication, la certification et la distribution des Matériaux de Référence Certifiés Européens (EURONORM-MRC) ainsi que sur l'utilisation des informations statistiques données sur ce certificat, se reporter soit au producteur de ce Matériau de Référence Certifié, soit aux Rapports Techniques CEN/TR 10317:2013 et CEN/TR 10350:2013. On peut se procurer ces deux documents auprès des organismes nationaux de normalisation. (Pour la France: AFNOR, 11 Avenue Francis de Pressensé, 93571 – St Denis la Plaine Cedex).

D'autres informations et avis au sujet de ce Matériau de Référence Certifié, ou de tout autre Matériau de Référence Certifié ou Matériau de Référence produits par le Bureau of Analysed Samples Ltd., peuvent être demandés en contactant l'adresse figurant dans le bas de ce Certificat.

Angaben über Herstellung, Zertifizierung und Bezugsmöglichkeiten dieser Europäischen Zertifizierten Referenzmaterialien (EURONORM-ZRM) sowie über die Anwendungen der in diesem Zertifikat enthaltenen statistischen Daten sind erhältlich beim Hersteller dieses zertifizierten Referenzmaterials, oder sie finden sich in den CEN-Reports CEN/TR 10317:2013 und CEN/TR 10350:2013, beide zu beziehen durch die nationalen Normenorganisationen. (In Deutschland bei der Vertriebsstelle des DIN: Beuth-Verlag GmbH, Burggrafenstraße 4-10, 10787 Berlin).

Weitere Informationen und Hinweise zu diesem oder anderen durch Bureau of Analysed Samples Ltd. hergestellten zertifizierten Referenzmaterialien oder Referenzmaterialien können unter der unten angegebenen Adresse erhalten werden.

För information angående tillverkning, certifiering och anskaffning av dessa europeiska certifierade referensmaterial (EURONORM CRM) och för användning av statistisk information, som angivits i detta certifikat, refereras antingen till producenten av detta certifierade referensmaterial eller till Teknisk Rapport CEN/TR 10317:2013 och CEN/TR 10350:2013 som kan erhållas från den nationella standardiseringsorganisationen. (Sverige: SIS, S:t Paulsgatan 6, SE-118 80 Stockholm, Finland: SFS, PL. 116, FIN-002 41, Helsingfors, Danmark: DS, Kollegievej 6, DK-Charlottenlund 2920, Norge: NSF, Drammensveien, 145 A, Postboks 353 Skøyen, NO-0213 Oslo, Island: STRI, Holtagardar, IS-104 Reykjavik).

Ytterligare information och rådfrågan om detta eller andra Certifierade Referensmaterial/Referensmaterial, producerade av Bureau of Analysed Samples Ltd. kan erhållas från angiven adress enligt nedan.

NEWHAM HALL, NEWBY,
MIDDLESBROUGH, ENGLAND, TS8 9EA
Email: enquiries@basrid.co.uk
Website: www.basrid.co.uk

For BUREAU OF ANALYSED SAMPLES LTD.

R P MEERES,
MANAGING DIRECTOR