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. 483-1 CAST IRON

LABORATORY MEANS (4 Values)
mass content in %

Line No	C (Total)	C (Graphitic)	Si	Mn	P	S	Cr	Sn
1	2.424	1.591	-	0.5750	-	-	0.0327	0.1240
2	2.425	1.592	1.720	0.5800	0.5775	-	0.0328	0.1240
3	2.430	1.605	1.734	0.5812	0.5850	0.0990	0.0348	0.1267
4	2.434	1.612	1.735	0.5820	0.5938	0.1005	0.0352	0.1275
5	2.442	1.612	1.740	0.5828	0.6005	0.1005	0.0360	0.1285
6	2.445	1.632	1.742	0.5850	0.6054	0.1006	0.0365	0.1285
7	2.452	1.637	1.742	0.5950	0.6060	0.1010	0.0368	0.1292
8	2.452	1.652	1.745	0.5950	0.6065	0.1018	0.0375	0.1295
9	2.458	1.655	1.746	0.5950	0.6162	0.1018	0.0384	0.1298
10	2.458	1.670	1.749	0.5964	0.6168	0.1022	0.0384	0.1302
11	2.462	1.672	1.754	0.5975	0.6190	0.1023	0.0402	0.1306
12	2.462	1.680	1.754	0.6010	0.6200	0.1025	0.0403	0.1320
13	2.479	1.685	1.754	0.6015	0.6205	0.1030	0.0406	0.1320
14	2.480	1.705	1.757	0.6018	0.6225	0.1032	0.0408	0.1325
15	2.480	1.712	1.758	0.6025	0.6235	0.1045	0.0415	0.1332
16	2.482	-	1.760	0.6042	0.6262	0.1052	0.0420	0.1342
17	2.485		1.770	0.6048	0.6272	0.1052	0.0424	0.1342
18	2.500		1.777	0.6062	0.6338	0.1055	0.0439	-
19	2.500		1.782	0.6070	0.6421	0.1062	0.0440	
20	2.506		1.786	0.6112	0.6488	0.1082	0.0442	
21	-		1.788	0.6122		0.1087	0.0465	
M_M	**2.463**	**1.647**	**1.755**	**0.5961**	**0.6153**	**0.1033**	**0.0393**	**0.1298**
s_M	0.026	0.040	0.018	0.0110	0.0181	0.0027	0.0039	0.0031
s_W	0.018	0.028	0.015	0.0075	0.0088	0.0015	0.0013	0.0021

M_M: Mean of the intralaboratory means, s_M: Standard Deviation of the intralaboratory means.

s_W: Intralaboratory standard deviation, s_b: Interlaboratory standard deviation, $s_b = \sqrt{s_M^2 - s_W^2/4}$

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.

CERTIFIED VALUES
Mass content in %

	C (Total)	C (Graphitic)	Si	Mn	P	S	Cr	Sn
M_M	**2.463**	**1.65**	**1.755**	**0.596**	**0.615**	**0.103**	**0.039**	**0.130**
C(95%)	0.012	0.02	0.008	0.005	0.009	0.002	0.002	0.002

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 35:1989 section 4

DESCRIPTION OF THE SAMPLE

The sample is available in the form of finely divided turnings passing a 1000µm aperture sieve from which the graphite rich fines passing a 250µm aperture sieve have been removed. It is supplied only in bottles containing 100g.

This reference material was prepared 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: VDEh, BAM & MPI für Eisenforschung, Nordic Countries – Nordic CRM Working Group, UK – BAS Ltd.)

Revised **SEPTEMBER 2003** with uncertainty values for all elements.
(First issued in September 1980 without uncertainty values and certified value for graphitic carbon)

PARTICIPATING LABORATORIES

Arbed, Division d'Esch Belval, Esch-sur-Alzette, Luxembourg
BCIRA, Birmingham, UK
British Steel Corporation, Workington, UK
British Steel Corporation, Ebbw Vale, UK
Bundesanstalt für Materialprüfung (BAM), Berlin, Germany
Centre de Recherches de Maidières, Pont a Mousson, France
Centro Sperimentale Metallurgico (CSM), Rome, Italy
Cockerill, Seraing, Belgium
Centre Technique des Industries de la Fonderie (CTIF), Sèvres, France
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Ridsdale and Co. Ltd., Middlesbrough, UK
Société National Chemin de Fer (SNCF), Levallois Perret, France
Société Metallurgique Hainaut Sambre, Couillet, Belgium
Société Metallurgique de Normandie, Mondeville, France
Thyssen AG, Duisburg 11, Germany

METHODS USED
EURONORM – CRM No. 483-1

Element	Line Number	Methods
C	1-5-13-19	Combustion, thermal conductivity
(Total)	2-7-8-9-16-17-20	Combustion, infrared absorption
	3	Combustion, conductimetric
	4-6-10-11	Combustion, non aqueous titration
	12-15-18	Combustion, coulometric titration
	14	Combustion, gravimetric
C	1-2	Combustion, thermal conductivity, separation by acid dissolution
(Graphitic)	3-11	Combustion, non aqueous titration, separation by acid dissolution
	4-7-12-13-14	Combustion, gravimetric, separation by acid dissolution
	5-6-10	Combustion, coulometric, separation by acid dissolution
	8	Combustion, infrared absorption, separation by acid dissolution
	9-15	By difference, photometric measurement of combined carbon
Si	3-4-5-6-7-8-9-10-11-12-13-14-15-16-21	Gravimetric, dehydration with perchloric acid
	2-18	Photometric, as molybdenum blue
	17	Titrimetric, as fluosilicate
	19	Gravimetric, dehydration with sulphuric acid
	20	Flame atomic absorption spectrometry
Mn	1-2-3-4-6-10-18-20	Flame atomic absorption spectrometry
	5-7-11-12-13-14-16-17-21	Photometric, oxidation with periodate
	8	Titrimetric with arsenite, oxidation with persulphate/silver nitrate
	9-15	Photometric, oxidation with persulphate/silver nitrate
	19	Inductively coupled plasma optical emission spectrometry
P	2-12-19-20	Photometric as phosphovanadomolybdate with extraction
	3-6-7-13-14-16	Titrimetric as phosphomolybdate
	4-9-10-17	Photometric as phosphovanadomolybdate
	5-8-15-18	Photometric as molybdenum blue
	11	Gravimetric as phosphomolybdate
S	3-11-15-16	Combustion, acidimetric titration
	4-5-6	Combustion, coulometric
	7-8-10-13-14-18	Combustion, infrared absorption
	9-17-21	Combustion, oxidation/reduction titration
	12-20	Gravimetric as barium sulphate
	19	Combustion, conductimetric
Cr	1	Photometric, with diphenylcarbazide, removal of iron by extraction
	2	Titrimetric with ammonium ferrous sulphate, potentiometric end point
	3-5-7-9-10-12-13-15-17-18-20-21	Flame atomic absorption spectrometry
	4-6-14-16	Photometric with diphenylcarbazide
	11	Inductively coupled plasma optical emission spectrometry
	19	Titrimetric with ammonium ferrous sulphate
Sn	1	Photometric with 3-pyridyl-fluorone with extraction
	2-6-11-16	Titrimetric with iodate, reduction with aluminium
	3-4-5-7-9-10-13-15-17	Flame atomic absorption spectrometry
	8-14	Titrimetric with iodate, reduction with aluminium, sulphide separation
	12	Inductively coupled plasma optical emission spectrometry

INTENDED USE & STABILITY

This sample 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 the 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 this ECRM is ensured by the use of either stoichiometric analytical techniques or methods which are calibrated against pure metals or stoichiometric compounds.

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 to CEN Report CR 10317 and ECISS Information Circular No. 5, 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).

Des informations complémentaires 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 le certificat se trouvent dans le Rapport CEN CR 10317 et dans la circulaire d'information No. 5 (ECISS). On peut se procurer ces deux circulaires auprès des organismes nationaux de normalisation. (Pour la France: AFNOR, 11 Avenue Francis de Pressensé, 93571 – St Denis la Plaine Cedex).

Angaben über Herstellung, Zertifizierung und Bezugsmöglichkeiten dieser Europäischen Zertifizierten Referenzmaterialien (EURONORM-ZRM) sowie über die Anwendungen der in diesem Zertifikat enthaltenen statistischen Daten finden sich im CEN-Report CR 10317 und in der Mittteilung Nr. 5 (ECISS), beide zu beziehen durch die nationalen Normenorganisationen. (In Deutschland bei der Vertriebsstelle des DIN: Beuth-Verlag GmbH, Burggrafenstrasse 4-10, 10787 Berlin).

För information angående tillverkning, certifiering och distribuering av dessa europeiska certifierade referensmaterial (EURONORM CRM) och för användning av statistisk information, som angivits i detta certifikat, refereras till CEN rapport CR 10317 och dill informationscirkulär Nr. 5 (ECISS) från den nationella standardiseringsorganisationen. (I Sverige är det SIS, S:t Paulsgatan 6, SE-118 80 Stockholm, i Finland är det SFS, PL. 116, FIN-002 41, Helsinki, i Danmark är det DS, Kollegievej 6, DK-Charlottenlund 2920, i Norge är det NSF, Drammensveien, 145 A, Postboks 353 Skøyen, NO-0213 Oslo, på Island år det STRI, Holtagardar, IS-104 Reykjavik).