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. 486-1 FOUNDRY IRON

LABORATORY MEANS (4 Values)
mass content in %

Line No	C	Si	Mn	P	S	Cr	Ni	Cu	Sn	V
1	2.150	2.385	0.8025	0.934	0.0210	0.0940	-	-	0.0655	0.0142
2	2.176	2.408	0.8125	0.948	0.0215	0.0960	0.0518	0.5240	0.0670	0.0167
3	2.184	2.412	0.8208	0.952	0.0220	0.0962	0.0532	0.5250	0.0681	0.0168
4	2.190	2.412	0.8260	0.967	0.0224	0.0976	0.0534	0.5331	0.0703	0.0170
5	2.195	2.421	0.8268	0.968	0.0228	0.0991	0.0537	0.5350	0.0706	0.0171
6	2.198	2.422	0.8338	0.974	0.0230	0.0992	0.0545	0.5400	0.0712	0.0175
7	2.202	2.425	0.8365	0.982	0.0230	0.1007	0.0552	0.5412	0.0715	0.0175
8	2.208	2.425	0.8417	0.986	0.0230	0.1040	0.0555	0.5440	0.0728	0.0188
9	2.210	2.428	0.8425	0.995	0.0230	0.1042	0.0557	0.5460	0.0730	0.0195
10	2.211	2.430	0.8445	0.997	0.0232	0.1048	0.0560	0.5519	0.0735	0.0195
11	2.215	2.433	0.8465	1.000	0.0235	0.1058	0.0563	0.5525	0.0740	0.0198
12	2.215	2.438	0.8465	1.009	0.0236	0.1080	0.0570	0.5554	0.0760	0.0200
13	2.220	2.438	0.8475	1.010	0.0237	0.1081	0.0571	0.5555	0.0766	0.0212
14	2.230	2.440	0.8488	1.018	0.0238	0.1084	0.0575	0.5558	0.0780	0.0218
15	2.232	2.445	0.8505	1.019	0.0240	0.1106	0.0585	0.5560	0.0805	0.0221
16	2.235	2.446	0.8575	1.025	0.0242	0.1108	0.0600	0.5572	0.0843	0.0228
17	2.252	2.455	0.8585	1.026	0.0246	0.1112	0.0601	0.5600	0.0888	0.0242
18	2.256	2.458	0.8638	1.052	0.0250	0.1119	0.0605	0.5602	-	0.0280
19	2.258	-	0.8640	1.064	0.0257	0.1136	0.0710	0.5728		-
M_M	**2.212**	**2.429**	**0.8406**	**0.996**	**0.0233**	**0.1044**	**0.0571**	**0.5481**	**0.0742**	**0.0197**
s_M	0.028	0.018	0.0168	0.035	0.0012	0.0061	0.0043	0.0131	0.0061	0.0033
s_W	0.020	0.019	0.0059	0.012	0.0007	0.0017	0.0015	0.0044	0.0015	0.0010

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	Si	Mn	P	S	Cr	Ni	Cu	Sn	V
M_M	**2.212**	**2.429**	**0.841**	**0.996**	**0.0233**	**0.104**	**0.0571**	**0.548**	**0.074**	**0.0197**
C(95%)	0.014	0.009	0.008	0.017	0.0006	0.003	0.0022	0.007	0.003	0.0017

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 450µm aperture sieve from which the graphite rich fines passing a 125µm 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 MARCH 2004
with C(95%) and s_W values for each certified element
(First issued in May 1983)

PARTICIPATING LABORATORIES

Arbed, Division d'Esch Belval, Esch-sur-Alzette, Luxembourg
BCIRA, Birmingham, UK
Bundesanstalt für Materialprüfung (BAM), Berlin, Germany
Centro Sperimentale Metallurgico (CSM), Rome, Italy
Centre Technique des Industries de la Fonderie (CTIF), Sèvres, France
Cockerill-Sambre S.A., Seraing, Belgium
Cockerill-Sambre S.A., Montignies, Belgium
Dantest, Copenhagen, Denmark
ECAN, Indret-la-Montagne, France
Etablissement Technique Central de l'Armement (ETCA), Arcueil, France
GKN Sheepbridge Stokes Ltd., Chesterfield, UK
Hoogovens Groep BV, Ijmuiden, Holland
Institut de Recherches de la Sidérugie Française (IRSID), St. Germaine-en-Laye, France
Nuova Italsider, Naples, Italy
Ridsdale and Co. Ltd., Middlesbrough, UK
Rooney Laboratories Ltd., Camberley, UK
Société Metallurgique de Normandie, Mondeville, France
Stahlwerke Peine-Salzgitter AG, Salzgitter, Germany
Thyssen AG, Duisburg 11, Germany
Thyssen Henrichshütte AG, Hattingen, Germany

METHODS USED
EURONORM – CRM No. 486-1

Element	Line Number	Methods
C	1-9-12-17	Combustion, non-aqueous titration
	2-4	Combustion, coulometric,
	3-10	Combustion, gravimetric
	5-6-7-8-11-15-18-19	Combustion, infrared absorption
	13	Combustion, gas volumetric
	14-16	Combustion, conductimetric
Si	1-4-5-6-7-8-10-11-12-13-14-15-16-17-18	Gravimetric, dehydration with perchloric acid
	2-3	Photometric, as molybdenum blue without extraction
	9	Flame Atomic Absorption Spectrometry
Mn	1-6-10-11-12-14-16-19	Photometric, oxidation with periodate
	2-3-5-7-8-17	Flame Atomic Absorption Spectrometry
	4-9	Titrimetric, with arsenite, persulphate/silver nitrate oxidation
	13-18	Photometric, oxidation with persulphate/silver nitrate
	15	Titrimetric, with Mn (VII) in pyrophosphate medium
P	1-3-7-10-15-17-19	Photometric, as molybdenum blue without extraction
	2-4-5-6-8-11	Photometric, as phosphovanadomolybdate after extraction
	9	Gravimetric, as ammonium phosphomolybdate
	12-13-16-18	Acidimetric titration of ammonium phosphomolybdate
	14	Photometric, as phosphovanadomolybdate, without extraction
S	1-3-11-14-18	Combustion, acidimetric titration
	2-5	Combustion, conductimetric
	4-6-7-8-12-17-19	Combustion, infrared absorption
	9	Combustion, oxidation/reduction titration
	10-13	Gravimetric, as barium sulphate
	15	Combustion, gas volumetric
	16	Combustion, thermal conductivity
Cr	1-3-5-6-7	Photometric, with diphenylcarbazide
	2-4-8-9-10-11-12-13-15-16-17-18-19	Flame Atomic Absorption Spectrometry
	14	Titrimetric with Fe (II), persulphate/silver nitrate oxidation
Nl	2-3-4-5-6-7-8-9-10-12-13-16-18	Flame Atomic Absorption Spectrometry
	11-14-17-19	Photometric, with dimethylglyoxime, without extraction
	15	Photometric, with dimethylglyoxime, after extraction
Cu	2-3-4-5-6-7-11-12-13-14-15-18	Flame Atomic Absorption Spectrometry
	8	Photometric, with cuproin, without extraction
	9-17-19	Photometric with 2-2' diquinolol, after extraction
	10	Photometric, with dithio-oxamide
	16	Photometric, with diethyldithiocarbamate, after extraction
Sn	1-5-6-7-8-9-10-15-17	Flame Atomic Absorption Spectrometry
	2-11-14-16	Titrimetric, with iodate solution, reduction with aluminium
	3-4-12-13	Photometric, with pyridyl-3-fluorone, after extraction
V	1-4-7-8-9-10-13-14-15-17	Flame Atomic Absorption Spectrometry
	2-3-18	Photometric with N-benzoylphenylhydroxylamine, after extraction
	5-12	Inductively Coupled Plasma Optical Emission Spectrometry
	6	Titrimetric with Fe (II), oxidation with permanganate
	11	Photometric with dimethylnaphthidine
	16	Photometric with hydrogen peroxide

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 Certifiées 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).