

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. 186-1 SILICO - MANGANESE STEEL

**LABORATORY MEANS (4 Values)
 mass content in %**

Line No	C	Si	Mn	P	S	Cr	Mo	Ni	Al (Tot)	Cu
1	0.6025	1.6811	0.8550	0.0204	0.0320	0.2008	0.0426	—	—	0.2612
2	0.6062	1.6925	0.8600	0.0205	0.0336	0.2030	0.0430	0.1790	—	0.2650
3	0.6068	1.7018	0.8610	0.0206	0.0338	0.2065	0.0458	0.1839	0.0122	0.2700
4	0.6072	1.7060	0.8612	0.0207	0.0341	0.2068	0.0462	0.1840	0.0122	0.2745
5	0.6075	1.7093	0.8612	0.0208	0.0342	0.2102	0.0462	0.1840	0.0135	0.2762
6	0.6075	1.7095	0.8630	0.0210	0.0348	0.2122	0.0470	0.1862	0.0140	0.2764
7	0.6082	1.7100	0.8652	0.0213	0.0349	0.2125	0.0470	0.1872	0.0140	0.2782
8	0.6082	1.7158	0.8675	0.0217	0.0353	0.2126	0.0472	0.1875	0.0144	0.2785
9	0.6082	1.7160	0.8708	0.0220	0.0353	0.2132	0.0475	0.1885	0.0144	0.2798
10	0.6085	1.7188	0.8710	0.0221	0.0354	0.2133	0.0475	0.1885	0.0145	0.2798
11	0.6098	1.7200	0.8710	0.0221	0.0356	0.2218	0.0475	0.1898	0.0145	0.2800
12	0.6100	1.7213	0.8726	0.0225	0.0357	0.2222	0.0488	0.1900	0.0148	0.2808
13	0.6106	1.7215	0.8728	0.0228	0.0358	0.2225	0.0496	0.1900	0.0152	0.2815
14	0.6110	1.7230	0.8738	0.0228	0.0358	0.2225	0.0498	0.1905	0.0152	0.2818
15	0.6115	1.7275	0.8745	0.0230	0.0360	0.2230	0.0505	0.1923	0.0153	0.2825
16	0.6120	1.7318	0.8785	0.0232	0.0360	0.2260	0.0505	0.1932	0.0155	0.2878
17	0.6132	1.7324	0.8800	0.0235	0.0361	0.2270	0.0510	0.1950	0.0155	0.2880
18	0.6162	1.7350	0.8820	0.0238	0.0362	0.2270	0.0512	0.1956		0.2908
19	0.6170	1.7495	0.8847	0.0240	0.0368	0.2279	0.0513	0.1980		0.2929
20	0.6175	1.7525	—	0.0243	0.0375	0.2350	0.0528	0.1992		0.2950
21	0.6178	—		0.0245	0.0390	0.2355		0.2005		0.3000
M_M	0.6104	1.7188	0.8698	0.0223	0.0354	0.2182	0.0482	0.1901	0.0143	0.2810
S _M	0.0041	0.0173	0.0083	0.0014	0.0015	0.0100	0.0028	0.0056	0.0011	0.0094
S _W	0.0038	0.0092	0.0049	0.0005	0.0006	0.0068	0.0015	0.0046	0.0007	0.0041

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, $S_B = \sqrt{S_M^2 - (S_W^2 \div 4)}$

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 by either the Cochran or Grubbs Test.

**CERTIFIED VALUES
 Mass content in %**

	C	Si	Mn	P	S	Cr	Mo	Ni	Al (Tot)	Cu
M_M	0.6104	1.719	0.870	0.0223	0.0354	0.218	0.0482	0.190	0.0143	0.281
C(95%)	0.0019	0.009	0.004	0.0007	0.0007	0.005	0.0013	0.003	0.0006	0.005

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

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.)



METHODS USED
EURONORM – CRM No. 186-1

Element	Line Number	Methods
C	1-2-11-17-19	Combustion, coulometric
	3-10-14	Combustion, non-aqueous titration
	4	Combustion, gravimetric
	5-12-16	Combustion, conductimetric
	6-9	Combustion, thermal conductivity
	7-8-13-15-18-20-21	Combustion, infrared absorption
	Si	1
2-12		Atomic absorption spectrometry
3-4-5-7-8-10-11-13-16-17-18-19		Gravimetric, dehydration with perchloric acid
6-9		Photometric as molybdenum blue
14		Gravimetric, dehydration with hydrochloric acid
15		Titrimetric as potassium fluosilicate
20		Photometric, as molybdenum blue, with extraction
Mn	1-3-6-9-10-11-14-15-17	Photometric, oxidation with periodate
	2	Titrimetric with ammonium ferrous sulphate, zinc oxide separation
	4-5-8-12-13-19	Atomic absorption spectrometry
	7	Titrimetric with arsenite, oxidation with persulphate/silver nitrate
	16-18	Photometric, oxidation with persulphate/silver nitrate
P	1-4-5-7-9-11-18	Photometric as molybdenum blue
	2-6-8-10-15-16-21	Photometric as phosphovanadomolybdate with extraction
	3	Photometric as molybdenum blue, with extraction
	12-17	Photometric as phosphovanadomolybdate
	13-14-19-20	Titrimetric as phosphomolybdate
S	1-7	Combustion, oxidation/reduction titration
	2-13-21	Combustion, conductimetric
	3-4-6-10-14-15-16-17-18-20	Combustion, infrared absorption
	5-8-11-12	Gravimetric, as barium sulphate
	9	Combustion, acidimetric titration
	19	Combustion, coulometric
Cr	1-6-8-10-11-14-15-16-17-18-19-20-21	Atomic absorption spectrometry
	2-5-7-12-13	Titrimetric with ammonium ferrous sulphate, oxidation with persulphate/silver nitrate
	3-4-9	Photometric with diphenylcarbazide
Mo	1-3-4-5-9-20	Photometric as thiocyanate with extraction
	2-6-7-14-15-16-18	Atomic absorption spectrometry
	8-10-11-12-13-17-19	Photometric as thiocyanate
Ni	2-3-5-9-11-13-14-15-16-18-21	Atomic absorption spectrometry
	4-7-10-12-17-19-20	Photometric with dimethylglyoxime
	6	Dimethylglyoxime precipitation, titration with cyanide
	8	Dimethylglyoxime precipitation, titration with EDTA
Al (Tot)	3-4-5-6-8-9-10-11-14-15-16-17	Atomic absorption spectrometry
	7	Photometric with eriochrome cyanine
	12	Photometric with chrome azurol S
	13	Photometric with chrome azurol S, ion exchange separation
Cu	1	Photometric with biscyclohexanone oxalyldihydrazone
	2	Iodimetric, separation as thiocyanate
	3-6-7-8-9-10-12-13-14-16-17-19	Atomic absorption spectrometry
	4	Iodimetric, separation as sulphide
	5	Photometric with dithiooxamide
	11-20	Photometric with diethyldithiocarbamate
	15	Photometric with 2,2' diquinolyl
	18	Photometric as ammine complex
21	Polarography	

PARTICIPATING LABORATORIES

Arbed, Division d'Esch Belval, Esch-sur-Alzette, Luxembourg
Boudet et Dussaix, Croissy-sur-Seine, France
Breda Siderurgica, Milan, Italy
Bundensanstalt für Materialprüfung (BAM), Berlin-Dahlem, Germany
Brymbo Steel Works, Brymbo, UK
Centro Sperimentale Metallurgico (CSM), Rome, Italy
Cockerill, Seraing, Belgium
Creusot Loire, Le Creusot, France
Creusot Loire, Firminy, France
Etablissement Technique Central de l'Armement, Arcueil, France
Hadfields Ltd., Sheffield, UK

Hoogovens-ESTEL, IJmuiden, Netherlands
Institute for Industrial Research and Standards (IIRS), Dublin, Eire
Institut de Soudure, Paris, France
Ridsdale and Co. Ltd., Middlesbrough, UK
Rolls Royce Ltd., Derby, UK
Sheffield Testing Works Sheffield, UK
Société Métallurgique Hainaut Sambre, Couillet, Belgium
Staatliches Materialprüfungsamt Nordrhein-Westfalen, Dortmund, Germany
Stahlwerke Peine Salzgitter AG, Salzgitter, Germany
Thyssen AG, Duisburg, Germany

DESCRIPTION OF THE SAMPLE

The sample is available in the form of chips passing a 1700 μm aperture sieve from which the fines passing a 250 μm aperture sieve have been removed. It is supplied in bottles containing 100 g...ref ECRM 186-1(C). It is also supplied in the form of 38 mm dia. discs...ref ECRM 186-1(D).

INTENDED USE & STABILITY

The chip sample, ECRM 186-1 (C), 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.

The disc sample, ECRM 186-1 (D), is intended for establishing and checking the calibration of Optical Emission and X-Ray Spectrometers for the analysis of similar materials. The "as received" working surface of the sample should be lished before use to remove any protective coating. The disc will remain stable provided that it is not subject to excessive heat (e.g. during preparation of the working surface).

TRACEABILITY

The traceability of ECRM 186-1 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 to CEN Report CR 10317 and ECISS Information Circular No. 5, both of which are available from the national standards body in your country or from CEN in Brussels. (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 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, à l'adresse figurant sur ce Certificat soit au Rapport CEN CR 10317 et à la circulaire d'information No. 5 (ECISS). On peut se procurer ces deux documents auprès des organismes nationaux de normalisation ou auprès du CEN, Bruxelles. (Pour la France: AFNOR, 11 rue Francis de Pressensé, 93571 La Plaine St Denis cedex).

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REVISION HISTORY

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