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. 287-1 HIGH BORON STAINLESS STEEL

LABORATORY MEANS (4 Values)
mass content in %

Line No	C	Si	Mn	P	S	Cr	Mo	Ni	B*	Co	Cu	N
1	0.0148	0.5362	-	0.0248	0.0009	18.48	0.2330	10.24	-	0.1407	0.1930	0.0183
2	0.0156	0.5410	1.451	0.0249	0.0010	18.48	0.2370	10.24	0.9143	0.1418	0.1956	0.0184
3	0.0157	0.5470	1.464	0.0252	0.0011	18.50	0.2391	10.25	0.9155	0.1430	0.1972	0.0185
4	0.0157	0.5495	1.465	0.0258	0.0011	18.52	0.2399	10.26	0.9163	0.1430	0.1995	0.0185
5	0.0158	0.5523	1.467	0.0262	0.0012	18.52	0.2425	10.31	0.9171	0.1431	0.2005	0.0187
6	0.0158	0.5543	1.467	0.0264	0.0012	18.56	0.2445	10.32	0.9210	0.1457	0.2018	0.0192
7	0.0162	0.5550	1.472	0.0265	0.0014	18.57	0.2452	10.32	0.9223	0.1465	0.2018	0.0194
8	0.0162	0.5675	1.474	0.0267	0.0015	18.61	0.2455	10.32	0.9225	0.1470	0.2020	0.0196
9	0.0163	0.5680	1.475	0.0268	0.0015	18.62	0.2456	10.34	0.9233	0.1482	0.2033	0.0196
10	0.0166	0.5749	1.475	0.0268	0.0015	18.62	0.2456	10.36	0.9235	0.1488	0.2038	0.0196
11	0.0167	0.5778	1.477	0.0270	0.0016	18.63	0.2458	10.36	0.9242	0.1488	0.2042	0.0197
12	0.0168	0.5791	1.479	0.0270	0.0017	18.63	0.2480	10.38	0.9243	0.1490	0.2050	0.0197
13	0.0171	0.5805	1.480	0.0274	0.0018	18.63	0.2508	10.39	0.9257	0.1490	0.2050	0.0203
14	0.0173	0.5835	1.480	0.0276	0.0018	18.64	0.2527	10.40	0.9258	0.1504	0.2058	0.0206
15	0.0178	0.5844	1.482	0.0281	0.0021	18.65	0.2535	10.40	0.9262	0.1513	0.2062	0.0207
16	0.0179	0.5870	1.483	0.0282	-	18.66	0.2542	10.40	0.9287	0.1548	0.2070	-
17	-	0.5880	1.486	0.0293	-	18.67	0.2548	10.42	0.9345	0.1558	0.2095	
18		0.5888	1.504	-		18.74	0.2560	10.44	0.9360	-	0.2099	
19		0.5940	1.526			18.77	0.2650	10.44	-	-	-	
M_M	**0.0164**	**0.5689**	**1.478**	**0.0267**	**0.0014**	**18.61**	**0.2473**	**10.35**	**0.9236**	**0.1475**	**0.2028**	**0.0194**
s_M	0.0009	0.0182	0.017	0.0012	0.0004	0.08	0.0077	0.07	0.0060	0.0043	0.0045	0.0008
s_W	0.0005	0.0073	0.012	0.0006	0.0001	0.06	0.0028	0.05	0.0048	0.0017	0.0030	0.0003

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 by either the Cochran or Grubbs Test.

CERTIFIED VALUES
Mass content in %

	C	Si	Mn	P	S	Cr	Mo	Ni	B*	Co	Cu	N
M_M	**0.0164**	**0.569**	**1.478**	**0.0267**	**0.0014**	**18.61**	**0.247**	**10.35**	**0.924**	**0.148**	**0.203**	**0.0194**
C(95%)	0.0005	0.009	0.009	0.0006	0.0002	0.04	0.004	0.04	0.003	0.002	0.002	0.0005

*The standard deviation of 0.0060% for boron applies to the chemical analysis of the chip samples in the certification programme. Analysis of ten discs by optical emission spectroscopy, four sparks per disc, gave a standard deviation of 0.013%.

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

NB An area 6mm in diameter in the centre of the discs, ECRM 287-1(D) should be avoided for optical emission spectrometry.

DESCRIPTION OF THE SAMPLE

The sample is available in the form of chips passing a 1700µm aperture from which the fines passing a 250µm aperture sieve have been removed. It is supplied in bottles containing 100g…ref ECRM 287-1(C). It is also supplied in the form of 38mm dia. discs…ref ECRM 287-1(D).

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 July 2004
with new values for boron and with C(95%) and s_W values for each certified element
(First issued in October 1986)

METHODS USED
EURONORM – CRM No. 287-1

Element	Line Number	Methods
C	1	Combustion, coulometric titration
	2-3-4-5-6-7-9-10-11-13-16	Combustion, infrared absorption
	8-14-15	Combustion, non-aqueous titration
	12	Combustion, conductimetry
Si	1-2-3-4-5-6-7-8-9-10-11-12-14-15-17-18	Gravimetric, dehydration with perchloric acid
	13-19	Photometric, as molybdenum blue, without oxidation
	16	Flame atomic absorption spectrometry
Mn	2-5-9-18-19	Flame atomic absorption spectrometry
	3-4-6-8-10-11-17	Photometric, periodate oxidation
	7-16	Inductively coupled plasma optical emission spectrometry
	12	Photometric, persulphate oxidation
	13-14-15	Titration with Mn(VII), zinc oxide separation
P	1-2-4-5-6-7-10-11-12	Photometric, as phosphovanadomolybdate, with extraction
	3	Photometric, as molybdenum blue, with extraction
	8-13-15-16	Photometric, as molybdenum blue, without extraction
	9-14	Photometric, as phosphovanadomolybdate, without extraction
	17	Inductively coupled plasma optical emission spectrometry
S	1	Combustion, acidimetric titration
	2-4-5-6-7-8-9-11-12-14-15	Combustion, infrared absorption
	3-13	Gravimetric, as barium sulphate, after chromatographic separation on alumina
	10	Photometric, as methylene blue, separation as sulphide
Cr	1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-18-19	Titration with Fe (II), oxidation with persulphate
	17	Flame atomic absorption spectrometry
Mo	1-2-3-6-9-10-12-13-15-16	Photometric, with thiocyanate in presence of $SnCl_2$, with extraction
	4-8-11	Inductively coupled plasma optical emission spectrometry
	5	Photometric, with thiocyanate in presence of $SnCl_2$, without extraction
	7-14-17-18-19	Flame atomic absorption spectrometry
Ni	1	Flame atomic absorption spectrometry
	2-4-5-6-9-11-12-14-16-17-18	Gravimetric, with dimethylglyoxime
	3	Photometric, with dimethylglyoxime, with extraction
	7-19	Photometric, with dimethylglyoxime, without extraction
	8-15	Complexometric titration
	10	Cyanometric titration
	13	Titrimetric, with dichromate, separation with dimethylglyoxime
B	2-4-5-7-8-9-10-13-14-16-17-18	Inductively coupled plasma optical emission spectrometry
	3	Titration in presence of mannitol, hydroxide precipitation
	6	Isotope dilution mass spectrometry
	11	Photometric, with 1-1 dianthrimide, without distillation
	12	Titration in presence of mannitol, separation of boron by ion exchange
	15	Photometric, with Nile blue A, extraction with 1,2-dichlorobenzene
Co	1-4-5-6-7-9-10-14-16-17	Flame atomic absorption spectrometry
	2-8-11	Inductively coupled plasma optical emission spectrometry
	3-13-15	Photometric, with nitroso-R-salt
	12	Photometric, with nitroso-R-salt, separation with 1-nitroso-2-naphthol
Cu	1-5-6-8-10-11-13-14-16-18	Flame atomic absorption spectrometry
	2-4-12-15-17	Photometric, with cuproine, with extraction
	3-7-9	Inductively coupled plasma optical emission spectrometry
N	1-2-3-4-5-7-8-9-10-11-12-13-14	Thermal conductivity, decomposition in graphite crucible
	6-15	Acidimetric titration after distillation, visual end point

LABORATORIES PARTICIPATING IN THE ORIGINAL CERTIFICATION (1986)

AB Sandvik Steel, Sandviken, Sweden
Arbed, Division d'Esch Belval, Esch-sur-Alzette, Luxembourg
Bundesanstalt für Materialprüfung (BAM), Berlin, Germany
Central Electricity Generating Board, Leatherhead, UK
Centre Technique des Industries de la Fonderie (CTIF), Sèvres, France
Cockerill-Sambre S.A., Seraing, Belgium
Compagnie Francaise des Aciers Speciaux, Dunkerque, France
Ets Central de l'Armement, Arcueil, France
Hoesch Stahl AG, Dortmund, Germany
Hoogovens Groep BV, IJmuiden, Netherlands
IMPHY S.A. Imphy, France
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Stocksbridge Engineering Steels, Stocksbridge, UK
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LABORATORIES PARTICIPATING IN THE RE-CERTIFICATION OF BORON (2003)

Sandvik Materials Technology, Sandviken, Sweden
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Avesta Polarit AB, Avesta, Sweden
Böhler Edelstahlwerke GmbH, Kapfenberg, Austria
Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin, Germany
Corus Engineering Steels, Stocksbridge, UK
CRMC-Industeel, Le Creusot, France
Edelstahl Witten Krefeld GmbH, Witten, Germany
Harwell Scientifics Ltd., Didcot, UK
Kanthal AB, Hallstahammar, Sweden
Krupp Edelstahlprofile GmbH, Siegen, Germany
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London & Scandinavian Metallurgical Co. Ltd., Rotherham, UK
Max-Planck-Institut, Düsseldorf, Germany
Ridsdale & Co. Ltd., Middlesbrough, UK
Swedish Institute for Metals Research, Stockholm, Sweden
Techlab, Metz, France
USI Group Arcelor, Imphy, France

INTENDED USE & STABILITY

The chip sample, ECRM 287-1(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 (eg oxidised) by atmospheric contamination they should be discarded.
The disc sample, ECRM 287-1(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 linished before use to remove any protective coating. It will remain stable provided that it is not subject to excessive heat (e.g., during preparation of the working surface).

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 or from CEN in Brussels. (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 documents auprès des organismes nationaux de normalisation ou auprès du CEN, Bruxelles. (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 Mitteilung Nr. 5 (ECISS), beide zu beziehen durch die nationalen Normenorganisationen oder direckt von CEN, Brüssel. (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 eller från CEN, Bruxelles. (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).