

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. 196-2, 2 % Silicon Steel

LABORATORY MEANS (4 values) - Mass content in %

Line No	C	Si	Mn	P	S	Cr	Mo	Ni	Al (tot)	As	B	Co	Cu
1	0.0052	---	0.3538	0.00265	0.00042	0.0253	0.0122	0.0364	0.2119	---	0.00005	0.0122	0.0051
2	0.0055	1.7804	0.3556	0.00273	0.00046	0.0264	0.0125	0.0381	0.2119	---	0.00009	0.0125	0.0051
3	0.0056	1.7829	0.3562	0.00330	0.00049	0.0264	0.0132	0.0382	0.2120	0.00027	0.00009	0.0131	0.0052
4	0.0057	1.7933	0.3588	0.00340	0.00051	0.0267	0.0137	0.0382	0.2129	0.00029	0.00010	0.0133	0.0052
5	0.0057	1.7966	0.3592	0.00345	0.00057	0.0268	0.0139	0.0383	0.2131	0.00030	0.00010	0.0135	0.0054
6	0.0057	1.8032	0.3597	0.00346	0.00058	0.0269	0.0139	0.0387	0.2139	0.00030	0.00013	0.0137	0.0055
7	0.0059	1.8057	0.3617	0.00353	0.00060	0.0270	0.0139	0.0389	0.2141	0.00030	0.00016	0.0137	0.0055
8	0.0060	1.8069	0.3632	0.00358	0.00061	0.0276	0.0141	0.0390	0.2146	0.00033	0.00017	0.0138	0.0055
9	0.0061	1.8120	0.3636	0.00363	0.00066	0.0289	0.0141	0.0397	0.2148	0.00035	0.00019	0.0138	0.0056
10	0.0061	1.8147	0.3640	0.00370	0.00069	0.0290	0.0143	0.0400	0.2161	0.00036	0.00020	0.0138	0.0056
11	0.0061	1.8150	0.3662	0.00376	0.00076	0.0290	0.0144	0.0405	0.2168	0.00037	0.00021	0.0140	0.0056
12	0.0063	1.8158	0.3670	---	0.00091	0.0291	0.0146	0.0406	0.2172	0.00037	---	0.0140	0.0057
13	0.0064	1.8185	0.3677	0.00380	0.00091	0.0292	0.0147	0.0410	0.2174	0.00038	---	0.0140	0.0057
14	0.0064	1.8270	0.3681	0.00409	0.00096	0.0293	0.0149	0.0410	0.2175	0.00038	---	0.0141	0.0058
15	0.0066	1.8389	0.3683	0.00424	---	0.0297	0.0150	0.0414	---	---	---	0.0141	0.0058
16	0.0069	---	0.3702	0.00442	---	0.0298	0.0154	0.0418	0.2208	---	---	0.0144	0.0060
17	---	---	0.3725	0.00448	---	0.0299	0.0166	0.0421	0.2238	---	---	0.0148	0.0061
18	---	---	---	0.00450	---	0.0301	---	0.0436	0.2238	---	---	0.0150	0.0061
19	---	---	0.3732	---	---	---	---	0.0436	0.2274	---	---	---	0.0062
20	---	---	0.3748	---	---	---	---	---	---	---	---	---	0.0064
21	---	---	---	---	---	---	---	---	---	---	---	---	0.0064
22	---	---	---	---	---	---	---	---	---	---	---	---	0.0064
M_M	0.0060	1.8079	0.3644	0.00369	0.00065	0.0282	0.0142	0.0401	0.2167	0.00033	0.00014	0.0138	0.0057
S_M	0.0005	0.0161	0.0062	0.00055	0.00018	0.0016	0.0011	0.0020	0.0046	0.00004	0.00006	0.0007	0.0004
S_w	0.0003	0.0109	0.0024	0.00017	0.00009	0.0006	0.0004	0.0007	0.0017	0.00004	0.00003	0.0002	0.0002

Line No	N	Sn	Ti	V	Ca	Mg	Zn
1	0.00142	---	0.00190	---	0.00045	0.00053	0.00007
2	0.00147	0.00032	0.00219	0.00325	0.00046	0.00064	0.00011
3	0.00147	0.00038	0.00228	---	0.00047	0.00065	0.00015
4	0.00158	0.00040	0.00237	0.00335	0.00060	0.00066	0.00017
5	0.00163	0.00043	0.00240	0.00350	0.00066	0.00066	0.00018
6	0.00164	0.00045	0.00241	0.00351	0.00068	0.00070	0.00019
7	0.00170	0.00045	0.00244	0.00355	0.00075	0.00074	0.00019
8	0.00174	0.00045	0.00251	0.00358	0.00078	0.00078	0.00020
9	0.00177	0.00051	0.00254	0.00359	0.00081	0.00080	0.00020
10	0.00179	0.00053	0.00257	0.00361	0.00082	0.00083	0.00021
11	0.00180	0.00054	0.00259	0.00362	0.00085	0.00083	0.00023
12	0.00188	0.00055	0.00265	0.00368	0.00089	0.00086	0.00023
13	0.00188	0.00063	0.00265	0.00370	0.00095	0.00090	0.00025
14	0.00192	---	0.00270	0.00373	---	0.00092	0.00027
15	0.00218	---	0.00274	0.00374	---	---	---
16	0.00220	---	0.00275	0.00386	---	---	---
17	0.00224	---	0.00280	0.00401	---	---	---
18	---	---	0.00310	0.00405	---	---	---
19	---	---	---	0.00418	---	---	---
20	---	---	---	---	---	---	---
21	---	---	---	---	---	---	---
22	---	---	---	---	---	---	---
M_M	0.00178	0.00047	0.00253	0.00368	0.00071	0.00075	0.00019
S_M	0.00025	0.00009	0.00027	0.00025	0.00017	0.00012	0.00006
S_w	0.00011	0.00004	0.00010	0.00008	0.00009	0.00004	0.00004

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" by the participating laboratories have not been taken into account in the statistical calculations.

Additional values from laboratories for information (in µg/g)

Bi: 0.01, <0.02, Ga: 39, Ge: 3, Hf: 0.05, Nb: 0.6, Pb: 0.5, Sb: 2, Ta: <0.02, Th: 0.04, U: 0.04, W: 0.4, Y: 0.03, Zr: 2, 2.6

CERTIFIED VALUES - Mass content in %

	C	Si	Mn	P	S	Cr	Mo
M_M	0.0060	1.808	0.364	0.00369	0.00065	0.0282	0.0142
C(95 %)	0.0003	0.010	0.003	0.00028	0.00011	0.0008	0.0006

	Ni	Al (tot)	As	B	Co	Cu	N
M_M	0.0401	0.2167	0.00033	0.00014	0.0138	0.0057	0.00178
C(95 %)	0.0010	0.0023	0.00003	0.00004	0.0004	0.0002	0.00013

	Sn	Ti	V	Ca	Mg	Zn
M_M	0.00047	0.00253	0.00368	0.00071	0.00075	0.00019
C(95 %)	0.00006	0.00014	0.00013	0.00011	0.00007	0.00004

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 recommendations set out in ISO Guides 30 – 35 and issued by:

swerea | KIMAB

Isafjordsgatan 28A, SE 164 40, Kista, Sweden

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 organisations.
(France- ArcelorMittal Maizières/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)



FEBRUARY 2014

EURONORM – CRM No. 196-2
METHODS USED

Element	Line number	Methods
C	1.2.3.4.5.7.8.9.10.11.13.15.16 6 12 14	Combustion, infrared absorption Combustion, coulometric titration Combustion, non-aqueous titration after absorption in organic solvent Combustion, gravimetry
Si	2.3.4.7.8.12.14.15 5.6.9.10.11.13	ICP-OES Gravimetry, dehydration with perchloric acid
Mn	1.2.3.4.6.7.8.9.11.13.14.16.17.19 5.12 10.15 20	ICP-OES MAS, periodate oxidation ICP-MS GD-MS
P	1.2.5.7.10.13.14.16.17 3 4.11.15.18 6.8 9	ICP-OES MAS, molybdenum blue, extraction MAS, phosphovanadomolybdate, extraction ICP-MS MAS, molybdenum blue, without extraction
S	1.2.4.5.6.7.8.9.10.11.13.14 3 12	Combustion, infrared absorption GD-MS MAS, methylene blue, evolution as H ₂ S in hypophosphoric and formic acid medium
Cr	1.3.4.5.6.7.8.9.10.11.13.14.15 2 12 16.17.18	ICP-OES FAAS GD-MS ICP-MS
Mo	1.2.3.5.6.8.9.10.11.12.13.14.17 4.7.15.16	ICP-OES ICP-MS
Ni	1.2.3.4.6.7.8.9.10.11.13.14.16.19 5.12.18 15 17	ICP-OES ICP-MS FAAS GD-MS
Al (tot)	1.2.3.4.5.6.7.8.9.10.12.13.14.16.17.18 11.19	ICP-OES ICP-MS
As	3 4.8 5.7.12.13 6.11 9.14 10	GD-MS MAS, diethyldithiocarbamate, separation as arsine ICP-MS ETAAS ICP-OES ICP-OES, evolution as arsine
B	1 2.7.9.11 3.4.5.6.8.10	ICP-OES MAS, curcumin ICP-MS
Co	1.7.10.12.15.18 2.3.4.5.8.9.11.13.14.17 6 16	ICP-MS ICP-OES FAAS GD-MS
Cu	1.2.10.11.19 3 4.5.7.8.9.12.13.14.16.18.21.22 6.15.17.20	ICP-MS GD-MS ICP-OES FAAS
N	1.2.3.4.5.6.7.8.9.10.11.12.14 13 15.16 17	Thermal conductivity, decomposition in graphite crucible MAS, Nessler reagent, distillation Acidimetric titration after distillation, visual end point MAS, bispyrazolone, distillation
Sn	2.3.7.9.10.11 4.5.12.13 6 8	ICP-MS ICP-OES ETAAS GD-MS
Ti	1.2.3.4.5.6.8.9.11.16.17.18 7.10.12.13.15 14	ICP-OES ICP-MS GD-MS
V	2.5.7.8.9.11.13.14.15.16.17.18. 4.6.10.12 19	ICP-OES ICP-MS GD-MS
Ca	1.2.4.5.7.8.9.11.12 3.13 6 10	ICP-OES ICP-MS GD-MS FAAS
Mg	1.5.6.7.8.9.12.13.14 2.3.10 4 11	ICP-OES ICP-MS GD-MS FAAS
Zn	1.3.5.11.14 2.6.7.9.10.12 4.8.13	ICP-OES ICP-MS FAAS

Abbreviations:

ETAAS	Electrothermal Atomic Absorption Spectrometry
FAAS	Flame Atomic Absorption Spectrometry
ICP-OES	Inductively Coupled Plasma – Optical Emission Spectrometry
ICP-MS	Inductively Coupled Plasma – Mass Spectrometry
GD-MS	Glow Discharge – Mass Spectrometry
MAS	Spectrophotometry

DESCRIPTION OF THE SAMPLE

The sample consists of chips passing a nominal 2000 µm aperture sieve from which the fines passing a nominal 250 µm sieve have been removed. It is supplied in bottles containing 100 g. It is also supplied in the form of 38 mm dia. discs.

INTENDED USE & STABILITY

ECRM 196-2 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 content should become discoloured (e.g. oxidised) due to atmospheric contamination it should be discarded.

The solid (disc) sample, ECRM 196-2, is intended for establishing and checking the calibration of Optical Emission and X-ray Spectrometers for the analysis of samples of similar materials. The “as received” working surface of the sample should be finished before use to remove any protective coating. It will remain stable provided that it is not subjected to excessive heat (e.g. during preparation of the working surface).

TRACEABILITY

The traceability of ECRM 196-2 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.

PARTICIPATING LABORATORIES

AG der Dillinger Hüttenwerke, Dillingen/Saar (Germany)
 ALS Scandinavia AB, Luleå (Sweden)
 ArcelorMittal Maizières Research SA, Maizières-lès-Metz (France)
 ArcelorMittal, Dunkerque (France)
 ArcelorMittal, Florange (France)
 Aubert & Duval, Les Ancizes (France)
 BAM Bundesanstalt für Materialforschung und -prüfung, Berlin (Germany)
 CTIF, Sèvres (France)
 DCNS, Indret (France)
 Exova, Teesside (UK)
 Heraeus Material Technology, Hanau (Germany)
 Höganäs Sweden AB, Höganäs (Sweden)
 Leibniz Institute for Solid State and Materials Research, Dresden (Germany)
 IncoTest, Hereford (UK)
 Max-Planck-Institut für Eisenforschung GmbH, Düsseldorf (Germany)
 OCAS, Zelzate (Belgium)
 Pattinson & Stead (2005) Ltd., Middlesbrough (UK)
 Ridsdale & Co. Ltd., Middlesbrough (UK)
 Sandvik Heating Technology, Hallstahammar (Sweden)
 Sandvik Materials Technology, Sandviken (Sweden)
 SSAB EMEA, Borlänge (Sweden)
 SSAB EMEA – Oxelösund (Sweden)
 Swerea KIMAB AB, Kista (Sweden)
 Institute of Certified Reference Materials, Yekaterinburg (Russia)
 Tata Steel, IJmuiden (The Netherlands)
 ThyssenKrupp Steel Europe AG, Duisburg (Germany)
 voestalpine Stahl GmbH, Linz (Austria)

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 Swerea KIMAB AB, may be obtained from the address below.

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, dessen Adresse auf diesem Zertifikat angegeben ist 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 Swerea KIMAB AB hergestellten zertifizierten Referenzmaterialien oder Referenzmaterialien können unter der unten angegebenen Adresse erhalten werden.

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 produit par le Swerea KIMAB AB, peuvent être demandés en contactant l'adresse figurant dans le bas de ce Certificat.

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 Swerea KIMAB AB, kan erhållas från angiven adress enligt nedan.

Karin Ingelgård
Responsible for CRM certification

Swerea KIMAB AB
Isafjordsgatan 28A
SE 164 40 Kista, Sweden
E-mail: crm@swerea.se
Website: www.swereakimab.se