

EUROPEAN COMMITTEE FOR IRON AND STEEL STANDARDIZATION
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. **064-1** Nb/Ti INTERSTITIAL FREE STEEL

Similar to EN 10130 AND EN 10142
LABORATORY MEANS (4 Values)

mass content in %

Line No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al (Tot.)	Al (Sol.)
1	0.0022	0.0051	0.1608	0.0080	—	0.0165	0.00050	0.0102	0.0305	0.0287
2	0.0022	0.0053	0.1609	0.0085	0.0094	0.0167	0.00060	0.0105	0.0312	0.0294
3	0.0024	0.0054	0.1611	0.0086	0.0097	0.0173	0.00063	0.0106	0.0317	0.0295
4	0.0025	0.0054	—	0.0087	0.0099	0.0176	0.00065	0.0107	0.0320	0.0296
5	0.0026	0.0055	0.1614	0.0087	0.0100	0.0178	0.00070	0.0110	0.0327	0.0298
6	0.0026	0.0055	0.1622	0.0089	0.0101	0.0181	0.00075	0.0111	0.0329	0.0300
7	0.0026	0.0060	0.1636	0.0089	0.0102	0.0182	0.00075	0.0114	0.0329	0.0300
8	0.0027	0.0061	0.1636	0.0089	0.0103	0.0183	0.00078	0.0114	0.0329	0.0301
9	0.0027	0.0062	0.1637	0.0090	0.0104	0.0185	0.00080	0.0115	0.0330	0.0302
10	0.0027	0.0062	0.1638	0.0090	0.0104	0.0185	0.00083	0.0116	0.0332	0.0303
11	0.0027	0.0071	0.1638	0.0090	0.0105	0.0185	0.00083	0.0116	0.0333	0.0304
12	0.0027	0.0075	0.1641	0.0092	0.0105	0.0186	0.00085	0.0116	0.0333	0.0306
13	0.0029	0.0075	0.1643	0.0092	0.0105	0.0187	0.00090	0.0118	0.0335	0.0308
14	0.0031	0.0077	0.1650	0.0092	0.0108	0.0188	0.00090	0.0118	0.0336	0.0308
15	0.0031	0.0078	0.1658	0.0092	0.0108	0.0189	0.00095	0.0121	0.0340	0.0309
16	—	0.0079	0.1659	0.0093	0.0108	0.0190	0.00097	0.0122	0.0340	0.0314
17	—	0.0082	0.1660	0.0097	0.0109	0.0192	—	0.0122	0.0341	0.0317
18	—	—	0.1660	0.0098	0.0112	0.0194	—	0.0123	0.0346	—
19	—	—	0.1675	0.0098	0.0112	0.0195	—	0.0123	—	—
20	—	—	0.1686	0.0102	0.0112	0.0196	—	0.0125	—	—
M_M	0.0026	0.0065	0.1641	0.0091	0.0104	0.0184	0.00077	0.0115	0.0330	0.0302
<i>s_M</i>	0.0003	0.0011	0.0022	0.0005	0.0005	0.0009	0.00013	0.0007	0.0011	0.0008
<i>s_w</i>	0.0001	0.0005	0.0008	0.0003	0.0002	0.0003	0.00009	0.0003	0.0005	0.0005

Line No	As	Co	Cu	N	Nb	Pb	Sn	Ti	V	W
1	—	0.0023	0.0071	—	0.0138	0.00014	0.00035	0.0173	0.00008	0.00010
2	0.0030	0.0023	0.0072	0.0022	0.0138	0.00015	0.00042	0.0179	0.00010	0.00018
3	0.0031	0.0026	0.0074	0.0023	0.0138	0.00015	0.00048	—	0.00010	0.00020
4	0.0033	0.0027	0.0074	0.0024	0.0139	0.00017	0.00048	0.0184	0.00012	0.00020
5	0.0033	0.0027	0.0075	0.0024	0.0142	0.00018	0.00048	0.0184	0.00012	0.00022
6	0.0033	0.0028	0.0075	0.0025	0.0144	0.00019	0.00050	0.0185	0.00015	0.00042
7	0.0034	0.0028	0.0076	0.0025	0.0145	0.00019	0.00050	0.0187	0.00015	—
8	0.0034	0.0028	0.0076	0.0026	0.0145	0.00020	0.00050	0.0188	0.00020	—
9	—	0.0028	0.0077	0.0026	0.0145	0.00020	0.00052	0.0189	0.00022	—
10	0.0036	0.0028	0.0078	0.0026	0.0145	0.00020	0.00053	0.0189	0.00023	—
11	0.0036	0.0028	0.0078	0.0026	0.0146	0.00020	0.00055	0.0191	—	—
12	0.0036	0.0029	0.0078	0.0027	0.0146	—	0.00058	0.0192	—	—
13	0.0036	0.0029	0.0079	0.0027	0.0149	—	0.00058	0.0192	—	—
14	0.0039	0.0029	0.0080	0.0027	0.0151	—	0.00070	0.0193	—	—
15	0.0039	0.0030	0.0080	0.0027	0.0151	—	—	0.0193	—	—
16	0.0040	—	0.0080	0.0028	0.0152	—	—	0.0193	—	—
17	0.0040	—	0.0081	0.0028	0.0152	—	—	0.0194	—	—
18	0.0040	—	0.0081	—	0.0154	—	—	0.0197	—	—
19	0.0041	—	—	—	0.0154	—	—	0.0200	—	—
20	—	—	0.0086	—	—	—	—	—	—	—
M_M	0.0036	0.0027	0.0077	0.0026	0.0146	0.00018	0.00051	0.0189	0.00015	
<i>s_M</i>	0.0004	0.0002	0.0004	0.0002	0.0006	0.00003	0.00008	0.0007	0.00005	
<i>s_w</i>	0.0002	0.0001	0.0002	0.0001	0.0002	0.00002	0.00006	0.0002	0.00005	

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 outstanding values. Where a "—" appears in the table it indicates that an outlying value has been omitted by either the Cochran or Grubbs Test.

CERTIFIED VALUES

Mass content in %

	C	Si	Mn	P	S	Cr	Mo	Ni	Al (Tot.)	Al (Sol.)
M_M	0.0026	0.0065	0.1641	0.0091	0.0104	0.0184	0.00077	0.0115	0.0330	0.0302
C(95%)	0.0002	0.0006	0.0011	0.0003	0.0003	0.0004	0.00007	0.0003	0.0006	0.0004

	As	Co	Cu	N	Nb	Pb	Sn	Ti	V
M_M	0.0036	0.0027	0.0077	0.0026	0.0146	0.00018	0.00051	0.0189	0.00015
C(95%)	0.0002	0.0001	0.0002	0.0001	0.0003	0.00002	0.00005	0.0004	0.00004

The half-width confidence interval C(95%) = $\frac{t \cdot s_M}{\sqrt{n}}$ 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

Values given above in italic type are for information only

NB An area 6mm in diameter in the centre of the disc should be avoided for optical emission spectrometry
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.)

NOVEMBER 2002

METHODS USED
EURONORM – CRM NO. 064-1

Element	Line Number	Methods
C	1-2-3-4-5-6-7-8-9-10-11-13-15	Combustion, infra-red absorption
	12	Combustion, coulometric titration
	14	Combustion, non-aqueous titration
Si	1	Photometric as silicomolybdate, without extraction
	2-3-4-5-6-8-11-12-15-16	ICP-OES
	7-9-10-13-17	Photometric as molybdenum blue without extraction
	14	Photometric as silicomolybdate, without extraction
Mn	1-7-16	FAAS
	2-9-10-12	Photometric, oxidation with periodate
	3-5-6-8-11-13-14-15-17-18-19-20	ICP-OES
P	1-2-3-4-6-7-10-11-13-17-19	ICP-OES
	5-8-9-15-16-20	Photometric as phosphovanadomolybdate, extraction
	12	ICP-MS
S	14-18	Photometric as molybdenum blue, without extraction
	2-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19	Combustion, infrared absorption
Cr	3	Gravimetric as barium sulphate after chromatographic separation of sulphate on alumina
	1-2-3-4-5-6-7-8-9-10-12-14-15-19-20	ICP-OES
Mo	11-13-17-18	FAAS
	16	ICP-MS
	1-2-3-4-5-6-7-9-12-13	ICP-OES
Ni	8-10-11-14	ICP-MS
	15	FAAS
	16	Photometric with thiocyanate in presence of Sn(II), extraction
	1-3-4-5-7-8-9-10-13-14-15-16-19-20	ICP-OES
Al (Total)	2-17	FAAS
	6-11-12-18	ICP-MS
	1-4-8-9-10-12-14-17-18	ICP-OES
	2-3-5-6-7-13	FAAS
Al (Acid sol.)	11	Photometric with chrome azurol S, after ion exchange separation
	15-16	ICP-MS
	1-2-4-5-8-10-11-13-14-16	ICP-OES
As	3-6-7-9-12-15	FAAS
	17	Photometric with chrome azurol S, after ion exchange separation
	2-3-4-8-10-11-14-18	ICP-OES
	5-12-13-15-17	ICP-MS
	6	Photometric with silver diethyldithiocarbamate, separation as arsine
	7	ETAAS
Co	16	FAAS, evolution as arsine
	19	Photometric as molybdenum blue, halide extraction
	1-4-5-6-7-8-9-10-14-15	ICP-OES
Cu	2-3-11-12	ICP-MS
	13	FAAS
	1-2-3-4-5-7-8-9-10-11-13-14-15-16	ICP-OES
N	6-12-17-18	FAAS
	20	ICP-MS
	2-3-4-5-6-7-10-11-12-13-14-15-16-17	Thermal conductivity, decomposition in graphite crucible
Nb	8	Photometric with indophenol blue, after distillation
	9	Acidimetric titration after distillation, visual end point
	1-2-3-4-5-6-7-8-9-10-11-12-13-14-17-19	ICP-OES
Pb	15-16-18	ICP-MS
	1-9	FAAS
	2-3-7-10-11	ICP-MS
Sn	4-6-8	ETAAS
	5	ICP-OES
	1-5-6-7-9-13-14	ICP-OES
	2-4-8-10-12	ICP-MS
Ti	3	ETAAS
	11	FAAS
	1-2-4-5-6-7-8-9-12-13-15-16-17-19	ICP-OES
V	10-11-14	ICP-MS
	18	Photometric with diantipyrylmethane
	1	Photometric with N-benzoylphenylhydroxylamine, extraction
W	2-5-7-8-10	ICP-OES
	3-4-6-9	ICP-MS
W	1-3-4-6	ICP-MS
	2-5	ICP-OES

Abbreviations:

ETAAS: Electrothermal Atomic Absorption Spectrometry
 FAAS: Flame Atomic Absorption Spectrometry
 ICP-MS: Inductively Coupled Plasma-Mass Spectrometry
 ICP-OES: Inductively Coupled Plasma-Optical Emission Spectrometry

PARTICIPATING LABORATORIES

Acerinox S.A. Algeciras, Spain
AG der Dillinger Hüttenwerke AG, Dillingen-Saar, Germany
Avesta Polarit AB, Avesta, Sweden
Böhler Edelstahl GmbH & Co. KG, Kapfenberg, Austria
Bundesanstalt für Materialforschung und -prüfung, (BAM), Berlin, Germany
Carsid SA, Couillet, Belgium
Centre Technique des Industries de la Fonderie (CTIF), Sèvres, France
Centro Nacional de Investigaciones Metalúrgicas (CENIM), Madrid, Spain
Corus, Construction & Industrial, Scunthorpe, UK
Corus, Iron Services, IJmuiden, Netherlands
Corus Strip Products, Llanwern, UK

Luxcontrol S.A., Esch-sur-Alzette, Luxembourg
Ovako Steel, AB Hofors, Sweden
Ridsdale & Co Ltd., Middlesbrough, UK
SGAB Analytica, Luleå, Sweden
SOLLAC Atlantique, Dunkerque, France
SOLLAC, Florange, France
SOLLAC, Fos-sur-Mer, France
Swedish Institute for Metals Research (SIMR), Stockholm, Sweden
Thyssen Krupp Stahl AG, Dortmund, Germany
Voest-Alpine Stahl GmbH, Linz, Austria

DESCRIPTION OF SAMPLE

This sample is available in the form of chips passing a 1700µm aperture sieve from which the dust passing a 250µm aperture sieve has been removed. It is supplied in bottles containing 100g...ref ECRM 064-1 (C). It is also supplied in the form of 38mm dia discs...ref ECRM 064-1 (D).

INTENDED USE & STABILITY

The chip sample, ECRM 064-1(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 064-1(D), 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 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 normalisations. (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. (In Deutschland bei der Vertriebsstelle des DIN: Beuth-Verlag GmbH, Burggrafenstrasse 4-10, 10787 Berlin).

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 till CEN rapport CR 10317 och till 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 är det STRI, Holtagarðar, IS-104 Reykjavík).