

**ECISS**  
**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	-	0.0196	-	0.0125	-	-
<b>M<sub>M</sub></b>	<b>0.0026</b>	<b>0.0065</b>	<b>0.1641</b>	<b>0.0091</b>	<b>0.0104</b>	<b>0.0184</b>	<b>0.00077</b>	<b>0.0115</b>	<b>0.0330</b>	<b>0.0302</b>
<b>s<sub>M</sub></b>	0.0003	0.0011	0.0022	0.0005	0.0005	0.0009	0.00013	0.0007	0.0011	0.0008
<b>s<sub>w</sub></b>	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	-	-	-	-	-	-	-
<b>M<sub>M</sub></b>	<b>0.0036</b>	<b>0.0027</b>	<b>0.0077</b>	<b>0.0026</b>	<b>0.0146</b>	<b>0.00018</b>	<b>0.00051</b>	<b>0.0189</b>	<b>0.00015</b>	
<b>s<sub>M</sub></b>	0.0004	0.0002	0.0004	0.0002	0.0006	0.00003	0.00008	0.0007	0.00005	
<b>s<sub>w</sub></b>	0.0002	0.0001	0.0002	0.0001	0.0002	0.00002	0.00006	0.0002	0.00005	

M<sub>M</sub>: Mean of the intralaboratory means s<sub>M</sub>: Standard deviation of the intralaboratory means  
 s<sub>w</sub>: Intralaboratory standard deviation s<sub>b</sub>: 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.)
<b>M<sub>M</sub></b>	<b>0.0026</b>	<b>0.0065</b>	<b>0.1641</b>	<b>0.0091</b>	<b>0.0104</b>	<b>0.0184</b>	<b>0.00077</b>	<b>0.0115</b>	<b>0.0330</b>	<b>0.0302</b>
<b>C(95%)</b>	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
<b>M<sub>M</sub></b>	<b>0.0036</b>	<b>0.0027</b>	<b>0.0077</b>	<b>0.0026</b>	<b>0.0146</b>	<b>0.00018</b>	<b>0.00051</b>	<b>0.0189</b>	<b>0.00015</b>
<b>C(95%)</b>	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%) =  $\frac{t \times s_M}{\sqrt{n}}$  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 35:1999 section 4.

Values given above in italic type are for information only.

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

This reference material was prepared and issued by:

**BUREAU OF ANALYSED SAMPLES LIMITED**

Newham Hall, Middlesbrough, England

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



Certificate No: Q3993

**METHODS USED**  
**EURONORM – CRM No. 064-1**

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

## DESCRIPTION OF THE SAMPLE

This sample is available in the form of chips passing a 1700µm aperture sieve from which the fines passing a 250µm aperture sieve have 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 (eg 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 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 (eg, 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 normalisation. (Pour la France: AFNOR, 11 Avenue Francis de Pressensé, 93571 - Saint 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 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 är det STRI, Holtagardar, IS-104 Reykjavik).