

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. **084-1** 0.4% CARBON STEEL

LABORATORY MEANS (4 Values)
mass content in %

Line No.	C	Si	Mn	P	S	Mo	Ni	Cu	Sn
1	0.3842	—	0.8425	0.0166	0.0268	0.0300	—	0.2600	0.0184
2	0.3850	0.2581	0.8425	0.0172	0.0268	0.0315	0.1454	0.2630	0.0204
3	0.3852	0.2582	0.8450	0.0174	0.0271	0.0318	0.1475	0.2632	0.0204
4	0.3857	0.2610	0.8495	0.0176	0.0272	0.0320	0.1512	0.2635	0.0206
5	0.3868	0.2615	0.8500	0.0176	0.0275	0.0322	0.1512	0.2638	0.0207
6	0.3870	0.2620	0.8562	0.0178	0.0279	0.0322	0.1525	0.2638	0.0216
7	0.3885	0.2622	0.8568	0.0181	0.0279	0.0322	0.1525	0.2650	0.0218
8	0.3887	0.2628	0.8585	0.0182	0.0279	0.0322	0.1527	0.2650	0.0218
9	0.3892	0.2630	0.8588	0.0185	0.0282	0.0328	0.1530	0.2650	0.0218
10	0.3895	0.2638	0.8590	0.0185	0.0282	0.0332	0.1537	0.2660	0.0221
11	0.3920	0.2642	0.8600	0.0185	0.0282	0.0333	0.1542	0.2662	0.0235
12	0.3922	0.2645	0.8600	0.0186	0.0285	0.0334	0.1545	0.2665	0.0235
13	0.3925	0.2650	0.8615	0.0186	0.0292	0.0334	0.1545	0.2667	0.0252
14	0.3930	0.2660	0.8650	0.0188	0.0292	0.0335	0.1558	0.2675	0.0252
15	0.3948	0.2675	0.8660	0.0188	0.0293	0.0340	0.1560	0.2682	0.0257
16	0.3960	0.2680	0.8670	0.0189	0.0294	0.0352	0.1565	0.2688	0.0260
17	0.3965	0.2685	0.8700	0.0196	0.0294	0.0352	0.1582	0.2698	0.0260
18	0.3970	0.2698	0.8725	—	0.0300	0.0360	0.1587	0.2712	0.0270
19	0.3972	0.2698	0.8775	—	0.0302	0.0364	0.1589	0.2725	0.0285
20	0.3985	0.2712	0.8808	—	0.0305	—	0.1595	0.2730	—
21	—	0.2750	—	—	0.0307	—	0.1608	0.2760	—
M_M	0.3910	0.2651	0.8600	0.0182	0.0286	0.0332	0.1544	0.2669	0.0232
s_M	0.0046	0.0044	0.0107	0.0007	0.0012	0.0016	0.0039	0.0039	0.0027
s_w	0.0035	0.0049	0.0052	0.0004	0.0006	0.0015	0.0031	0.0032	0.0011

M_M : Mean of the intralaboratory means s_M : Standard deviation of the intralaboratory means $s_w = \sqrt{s_b^2 + s_w^2/4}$
 s_w : Intralaboratory standard deviation s_b : Interlaboratory 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 omitted by either the Cochran or Grubbs Test.

CERTIFIED VALUES
mass content in %

	C	Si	Mn	P	S	Mo	Ni	Cu	Sn
M_M	0.391	0.265	0.860	0.018	0.029	0.033	0.154	0.267	0.023
C(95%)	0.002	0.002	0.005	0.001	0.001	0.001	0.002	0.002	0.002

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

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.)

(Issued in October 1979 with values for P, first published in May 1976 without values for P)

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 Steel Castings Research and Trade Association, Sheffield (UK)
 Usinor, Thionville (France)

DESCRIPTION OF THE SAMPLE

This sample is available in the form of chips passing a 710µm aperture sieve from which the fines passing a 180µm aperture sieve have been removed. It is supplied in bottles containing 100g.....ref ECRM 084-1(C). It is also supplied in the form of 38mm dia discs.....ref ECRM 084-1(D).

INTENDED USE & STABILITY

The chip sample, ECRM 084-1(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 stoichiometric metals or 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) due to atmospheric contamination they should be discarded.

The solid (disc) sample, ECRM 084-1(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 (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.

METHODS USED EURONORM – CRM No. 084-1

Element	Line Number	Methods
C	1-12-16	Combustion, Non aqueous titration
	2-4-5-15	Combustion, conductimetric
	3	Combustion, Gravimetric
	6	Combustion, Low pressure gasometric
	7-14-19	Combustion, Coulometric
	8-10-20	Combustion, Infrared absorption
	9-11-13-17-18	Combustion, Thermal conductivity
	2-4-9-10-11-18	Photometric as molybdenum blue
Si	3-5-6-8-12-13-15-17-19-20-21	Gravimetric after dehydration with perchloric acid
	7-14-16	Atomic absorption spectroscopy
Mn	1-2-7-16-19	Titrimetric after oxidation with persulphate
	3-4-12-14	Atomic absorption spectroscopy
	5-6-8-9-11-13-15-17-18-20	Photometric with periodate
P	10	Photometric with persulphate
	1-3-7-11-13-16	Photometric as molybdenum blue without extraction
	2-6-9-10-12-14-15	Photometric as phosphovanadomolybdate with extraction
	4	Photometric as phosphovanadomolybdate without extraction
S	5-8-17	Photometric as molybdenum blue with extraction
	1-2	Combustion, oxidation-reduction titration
	3-5-11-16-18-20	Combustion, acidimetric titration
	4-13-14-21	Combustion, conductimetric
	6-7-8-10-12-15-19	Combustion, infrared absorption
Mo	9	Gravimetric, chromatographic separation on alumina
	17	Combustion, coulometric
	1-3-9-10-11-12-13-15-19	Photometric with thiocyanate after extraction
	2-4-5-6-8-14	Atomic absorption spectroscopy
Ni	7-16-17-18	Photometric with thiocyanate without extraction
	2-6-8-9-11-13-17-18-19-21	Photometric with dimethylglyoxime
	3-4-5-7-10-12-15-16-20	Atomic absorption spectroscopy
Cu	14	Dimethylglyoxime precipitation, titration with dichromate
	1-2-5-6-7-11-12-13-16-17	Atomic absorption spectroscopy
	3-4-8-9-18	Photometric with 2,2' diquinolyl
	10	Photometric with bis-cyclohexanone oxalyldihydrazone
Sn	14-15-20	Photometric with cuproine
	19-21	Photometric with diethyldithiocarbamate
	1-6-8-9-18	Atomic absorption spectroscopy
	2-4-5-10-11-15	Photometric with phenylfluorone
	3-17	Iodate titration, separation as sulphide
	7-12-13-14-16-19	Iodate titration, reduction with aluminium

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 Information Circulars No. 1 (ECISS) and No. 5 (ECSC), 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 les circulaires d'information No. 1 (ECISS) et No. 5 (CECA). On peut se procurer ces deux circulaires auprès des organismes nationaux de normalisation. (Pour la France: AFNOR, Tour Europe - Cedex 7, 92080 Paris La Défense).

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 in den Mitteilungen Nr. 1 (ECISS) und Nr. 5 (EGKS), beide zu beziehen durch die nationalen Normenorganisationen. (In Deutschland bei der Vertriebsstelle des DIN: Beuth-Verlag GmbH, Burggrafenstrasse 4-10, 10787 Berlin).