

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. **090-1** 1% CARBON STEEL

LABORATORY MEANS (4 Values)
mass content in %

Line No.	C	Si	Mn	P	S	Cr	Mo	Ni	N	V
1	-	-	0.2178	0.0116	0.0083	0.1076	0.0078	0.0482	-	-
2	1.042	0.2650	0.2218	0.0119	0.0085	0.1105	0.0080	0.0504	0.0141	0.1952
3	1.043	0.2728	0.2226	0.0120	0.0088	0.1128	0.0082	0.0504	0.0142	0.1954
4	1.045	0.2743	0.2234	0.0121	0.0089	0.1150	0.0082	0.0506	0.0143	0.1966
5	1.046	0.2744	0.2238	0.0121	0.0090	0.1185	0.0082	0.0508	0.0144	0.1968
6	1.049	0.2768	0.2238	0.0122	0.0090	0.1190	0.0082	0.0509	0.0144	0.1999
7	1.050	0.2778	0.2242	0.0122	0.0091	0.1193	0.0084	0.0510	0.0145	0.2005
8	1.051	0.2786	0.2250	0.0124	0.0092	0.1200	0.0084	0.0514	0.0146	0.2009
9	1.052	0.2798	0.2250	0.0125	0.0094	0.1204	0.0085	0.0517	0.0146	0.2015
10	1.052	0.2806	0.2250	0.0127	0.0094	0.1208	0.0086	0.0520	0.0147	0.2018
11	1.054	0.2835	0.2255	0.0129	0.0094	0.1212	0.0087	0.0527	0.0147	0.2032
12	1.055	0.2836	0.2255	0.0130	0.0095	0.1229	0.0088	0.0527	0.0147	0.2038
13	1.055	0.2850	0.2258	0.0133	0.0095	0.1230	0.0090	0.0529	0.0148	0.2040
14	1.058	0.2850	0.2268	0.0135	0.0100	0.1237	0.0091	0.0536	0.0148	0.2056
15	1.058	0.2857	0.2274	0.0135	0.0100	0.1256	0.0092	0.0544	0.0149	0.2062
16	1.064	0.2860	0.2280	0.0135	0.0100	0.1259	0.0093	0.0545	0.0150	0.2084
17	1.064	0.2865	0.2287	0.0135	0.0100	0.1265	0.0096	0.0549	0.0152	0.2090
18	1.065	0.2895	0.2289	0.0136	0.0104	0.1268	0.0104	0.0572		0.2106
19	1.066	0.2898	0.2298	0.0137	0.0107	0.1280	0.0106	0.0588		0.2122
20		0.2908	0.2335	0.0141	0.0108	0.1288	0.0110	0.0590		0.2184
M_M	1.054	0.2813	0.2256	0.0128	0.0095	0.1208	0.0089	0.0529	0.0146	0.2037
s_M	0.008	0.0067	0.0033	0.0007	0.0007	0.0058	0.0009	0.0029	0.0003	0.0061
s_w	0.003	0.0041	0.0022	0.0005	0.0004	0.0027	0.0005	0.0007	0.0003	0.0024

M_M: Mean of the laboratory means s_M: Standard deviation of the laboratory means

s_w: Intralaboratory standard deviation s_b: Interlaboratory standard deviation

$$s_M = \sqrt{s_b^2 + s_w^2/4}$$

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 omitted by either the Cochran or Grubbs Test.

CERTIFIED VALUES mass content in %

	C	Si	Mn	P	S	Cr	Mo	Ni	N	V
M_M	1.054	0.281	0.226	0.0128	0.0095	0.121	0.0089	0.053	0.0146	0.204
C(95%)	0.004	0.003	0.002	0.0003	0.0003	0.003	0.0004	0.002	0.0002	0.003

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.

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, ECRM 090-1(C). It is also supplied in the form of 38mm dia discs, ECRM 090-1(D).



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 ECIS, 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, UK—BAS Ltd.)

Revised MAY 2000

(First issued in May 1983 before certification of Nitrogen in 1998)



Certificate No. Q3993

PARTICIPATING LABORATORIES

AG der Dillinger Huttenwerke, Dillingen-Saar (Germany)
 Arbed, Division d'Esch-Belval, Esch-sur-Alzette (Luxembourg)
 Aubert & Duval, Les Ancizes (France)
 Automobiles Peugeot, Voujeaucourt (France)
 Babcock Power Ltd., Renfrew (UK)
 Böhler Edelstahl GmbH, Kapfenberg (Austria)
 Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin (Germany)
 Centro Technique des Industries de la Fonderie (CTIF), Sèvres (France)
 Centro Sperimentale Metalurgico (CSM), Rome (Italy)
 Cockerill-Sambre, Couillet (Belgium)
 Cockerill-Sambre, Seraing (Belgium)
 Corus (formerly British Steel), Scunthorpe (UK)
 Dantest, Copenhagen (Denmark)
 EWK Edelstahl Witten-Krefeld GmbH, Witten (Germany)
 Hoogovens Staal BV, IJmuiden (Netherlands)
 Howmet Ltd., Exeter (UK)

Hüttenwerke Krupp-Mannesmann GmbH, Duisburg (Germany)
 Imphy SA, Imphy (France)
 IncoTest Ltd, Hereford (UK)
 Krupp-Hoesch Stahl AG, Dortmund (Germany)
 Laboratoire Boudet et Dussaix, Croissy-sur-Seine (France)
 Laboratoire National d'Essais, Paris (France)
 Ridsdale & Co. Ltd., Middlesbrough (UK)
 Sanderson Kayser Ltd., Sheffield (UK)
 Soc AFL Falck, Milan (Italy)
 SOLLAC, Florange (France)
 Stahlwerke Peine-Salzgitter AG, Salzgitter (Germany)
 Stahlwerke Röchling-Burbach GmbH, Volklingen-Saar (Germany)
 USINOR, Longwy (France)
 Voest-Alpine Stahl Linz GmbH, Linz (Austria)
 Willan Metals Ltd., Rotherham (UK)

INTENDED USE & STABILITY

The chip sample, ECRM 090-1(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 090-1(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. 090-1

Element	Line Number	Methods
C	2-4-6-8-10-13-16-17-18-19	Combustion, infra-red absorption
	3	Combustion, conductimetric
	5-7-15	Combustion, non-aqueous titration
	9-12	Combustion, coulometric titration
	11	Combustion, thermal conductivity
Si	14	Combustion, gravimetric
	2-3-4-5-6-8-13-14-15-19-20	Gravimetric, dehydration with perchloric acid
	7-10-12-17	FAAS
	9	ICP AES
Mn	11-16-18	Photometric as molybdenum blue
	1-3-4-5-6-9-10-12-20	Photometric, periodate oxidation
	2-7-11-13-15-18	FAAS
	8-14-16-19	Photometric, persulphate oxidation
P	17	ICP AES
	1-3-4-5-7-9-10-11-16-19-20	Photometric as molybdenum blue, without extraction
	2-6-8-12-13-14-15-17-18	Photometric as phosphovanadomolybdate, after extraction
S	1-18	Combustion, oxidation/reduction titration
	2-3-4-12	Combustion, acidimetric titration, absorption in hydrogen peroxide or silver nitrate
	5	Combustion, coulometric
	6-7-8-9-10-13-14-16-19-20	Combustion, infra-red absorption
	11	Gravimetric as barium sulphate after separation on alumina
Cr	15	Combustion, conductimetric
	17	Combustion, photometric with p-rosaniline
	1-2-7-11-19	Photometric with diphenylcarbazide
	3-4-5-6-10-14-15-16-17-18-20	FAAS
	8-12	Titrimetric with Fe II, persulphate oxidation
Mo	9	Photometric with diphenylcarbazide, separation of iron
	13	ICP AES
	1-3-4-7-8-10-13-15-17	FAAS
	2-5-9-11-12-16-18	Photometric with thiocyanate in presence of Sn II after extraction
	6	Photometric with thiocyanate in presence of ascorbic acid, after extraction
Ni	14	ICP AES
	19-20	Photometric with thiocyanate without extraction
	1-5-6-18-20	Photometric with dimethylglyoxime
	2-3-4-7-9-10-11-12-14-15-16-17-19	FAAS
	8	ICP AES
N	13	Photometric with dimethylglyoxime, after extraction
	2-4-5-6-7-8-10-11-12-13-14-15-16-17	Thermal conductivity, decomposition in graphite crucible
	3-9	Acidimetric titration after distillation, visual end point
V	2-3-4-7-8-9-11-12-15-17	FAAS
	5-19	Photometric with N-benzoylphenylhydroxylamine, after extraction
	6-10-18	Photometric with dimethylnaphthidine
	13-14	Titrimetric with Fe II, Mn VII oxidation
	16	ICP AES
	20	Photometric with hydrogen peroxide

Abbreviations:-

FAAS: Flame Atomic Absorption Spectrometry

ICP-AES: Inductively Coupled Plasma Atomic Emission Spectrometry

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).