

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. 578-1 Ferro-Molybdenum

LABORATORY MEANS (4 Values)
mass content in %

Line No	C	Si	P	S	Mo	Cu
1	0.0129	—	0.0216	—	71.92	—
2	0.0132	0.1895	0.0218	0.0600	71.98	0.1142
3	0.0134	0.1925	0.0220	0.0610	72.04	0.1169
4	0.0135	0.1948	0.0222	0.0610	72.11	0.1225
5	0.0140	0.2010	0.0224	0.0615	72.13	0.1275
6	0.0145	0.2036	0.0229	0.0629	72.15	0.1300
7	0.0150	0.2050	0.0230	0.0635	72.18	0.1320
8	0.0152	0.2062	0.0230	0.0640	72.19	0.1322
9	0.0154	0.2062	0.0232	0.0641	72.20	0.1348
10	0.0158	0.2075	0.0235	0.0642	72.20	0.1350
11	0.0160	0.2075	0.0235	0.0645	72.20	0.1351
12	0.0166	0.2082	0.0235	0.0648	72.20	0.1360
13	0.0166	0.2082	0.0236	0.0656	72.24	0.1365
14	0.0169	0.2088	0.0240	0.0657	72.28	0.1370
15	0.0170	0.2088	0.0251	0.0660	72.31	0.1400
16	0.0172	0.2115	0.0255	0.0670	72.23	0.1422
17	0.0177	0.2120	0.0258	0.0676	72.33	0.1432
18	0.0180	0.2150	0.0264	0.0680	72.37	0.1435
19	0.0191	0.2150	0.0278	0.0695	72.50	0.1441
20	0.0198	0.2225	0.0281	0.0713	72.52	0.1445
21	0.0208	0.2242	0.0282	—	72.52	0.1475
22	—	0.2275	—	—	—	0.1500
M_M	0.0161	0.2084	0.0241	0.0649	72.23	0.1355
s_M	0.0022	0.0096	0.0021	0.0030	0.17	0.0095

M_M : Mean of the intralaboratory means, s_M : Standard deviation of the intralaboratory means

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.

CERTIFIED VALUES

Mass content in %

	C	Si	P	S	Mo	Cu
M_M	0.016	0.208	0.024	0.065	72.23	0.136
C(95%)	0.001	0.005	0.001	0.002	0.08	0.005

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

PARTICIPATING LABORATORIES

Alfred H Knight International, Wallasey, UK	Institut de Recherches de la Sidérurgie Français (IRSID), St Germaine en Laye, France
Anglo Blackwells Ltd., Widnes, UK	London and Scandinavian Metallurgical Co. Ltd., Rotherham, UK
ARBED, Division d'Esch Belval, Esch-sur-Alzette, Luxembourg	Minworth Metals Ltd., Stowmarket, UK
Böhler AG, Düsseldorf-Oberkassel, Germany	Murex Ltd., Rainham, UK
Bundesanstalt für Materialprüfung (BAM), Berlin-Dahlem, Germany	Ridsdale & Co Ltd., Middlesbrough, UK
Centro Sperimentale Metallurgico (CSM), Rome, Italy	SALEM, Spigno Monferrato, Italy
Cockerill-Sambre, Seraing, Belgium	Société Française d'Electrometallurgie (SOFREM), Bonneville, France
Creusot Loire, Le Creusot, France	Société Métallurgie de Normandie, Mondeville, France
Fried. Krupp, Hüttenwerke AG, Bochum, Germany	Stahlwerke Röchling-Burbach GmbH, Völklingen-Saar, Germany
Gesellschaft für Electrometallurgie mbH, Nürnberg, Germany	Thyssen Edelstahlwerke, Krefeld, Germany
GKN Lincoln Electric, Welwyn Garden City, UK	Usine de Longwy, Longwy, France

This certified reference material was prepared in accordance with the recommendations
set out in ISO Guides 30 – 35 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: Stahlinstitut VDEh, BAM Bundesanstalt für Materialforschung und –prüfung & MPI für Eisenforschung, Nordic Countries – Nordic CRM Working Group, UK – BAS Ltd.)



EURONORM – CRM No. 578-1

METHODS USED

Element	Line Number	Methods
C	1-6-16	Combustion, conductimetric
	2-4-7-9-11-12-13-15-18-20-21	Combustion, infrared absorption
	3-8-19	Combustion, thermal conductivity
	5-10	Combustion, coulometric
	14-17	Combustion, non-aqueous titration
	Si	2-3-4-6-8-9-10-13-14-15-16-17-19
5-18-21		Gravimetric, dehydration with perchloric acid
7-11-12-20		Atomic Absorption Spectrometry
22		Photometric as silicomolybdate after distillation as H ₂ SiF ₆
P	1-2-3-5-7-9-11-14-15-16	Photometric as phosphovanadomolybdate with extraction
	4-12-19	Photometric as molybdenum blue with extraction
	6-8-18	Photometric as molybdenum blue
	10	Photometric as molybdenum blue after ammonia separation
	13	Photometric as molybdenum blue after ion exchange separation
	17-20-21	Titrimetric as phosphomolybdate
S	2	Combustion, conductimetric
	3-5-8-9-10-11-13-16-17-19-20	Combustion, infrared absorption
	4-7-12-15	Combustion, oxidation/reduction titration
	6-18	Gravimetric as barium sulphate after separation on alumina
	14	Combustion, coulometric titration
Mo	1-5-11	Gravimetric as oxide after separation as sulphide
	2-4-8-9-13-15-17-18-19	Gravimetric as lead molybdate
	3	Precipitation with 8-hydroxyquinoline, gravimetric
	6	Gravimetric as oxide after precipitation with α -benzoinoxime
	7-10-14-16	X-ray fluorescence spectroscopy
	12	Photometric with thiocyanate
	20	Complexometric titration
	21	Titrimetric with lead nitrate
Cu	2-11-18	Photometric with diethyldithiocarbamate
	3-4-5-6-7-8-10-14-15-17-20-21-22	Atomic absorption spectrometry
	9	Photometric with 2'2' diquinolyl without extraction
	12-13	Photometric with 2'2' diquinolyl with extraction
	16-19	Photometric with bis(cyclohexanone oxalyldihydrazone

DESCRIPTION OF THE SAMPLE

The sample consists of a fine powder and is supplied in bottles containing 100g.

INTENDED USE & STABILITY

ECRM 578-1 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 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.

TRACEABILITY

The traceability of ECRM 578-1 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.

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 10317:2014 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 Bureau of Analysed Samples Ltd. may be obtained from the address below.

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 10317:2014 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).

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Ytterligare information och rådfrågan om detta eller andra Certifierade Referensmaterial/Referensmaterial, producerade av Bureau of Analysed Samples Ltd. kan erhållas från angiven adress enligt nedan.

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