

**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. 376-1 24% COBALT MAGNET ALLOY

LABORATORY MEANS (4 values)

mass content in %

Line No.	C	Si	Mn	S	Ni	Al	Co	Cu	Nb	Ti	Ta
1	—	0.2950	—	0.0030	13.21	7.950	23.40	2.866	—	0.1480	0.0048
2	0.0223	0.2998	0.0400	0.0030	13.23	7.975	23.44	2.888	0.2800	0.1509	0.0072
3	0.0235	0.3025	0.0405	0.0032	13.26	8.000	23.45	2.893	0.2952	0.1512	0.0088
4	0.0240	0.3038	0.0426	0.0033	13.28	8.020	23.50	2.902	0.2992	0.1522	0.0100
5	0.0242	0.3062	0.0429	0.0034	13.33	8.082	23.54	2.920	0.2995	0.1532	0.0128
6	0.0245	0.3100	0.0435	0.0038	13.34	8.088	23.62	2.922	0.3000	0.1542	0.0140
7	0.0248	0.3114	0.0436	0.0038	13.37	8.090	23.67	2.934	0.3000	0.1550	0.0182
8	0.0248	0.3125	0.0441	0.0039	13.38	8.092	23.67	2.942	0.3000	0.1560	0.0184
9	0.0250	0.3125	0.0450	0.0041	13.38	8.095	23.67	2.950	0.3100	0.1575	0.0200
10	0.0250	0.3150	0.0458	0.0041	13.39	8.098	23.68	2.955	0.3112	0.1580	0.0208
11	0.0252	0.3150	0.0468	0.0042	13.39	8.100	23.71	2.955	0.3125	0.1585	0.0219
12	0.0252	0.3182	0.0470	0.0042	13.40	8.145	23.79	2.955	0.3172	0.1592	0.0220
13	0.0258	0.3195	0.0475	0.0042	13.42	8.190	23.80	2.958	0.3175	0.1600	0.0230
14	0.0260	0.3205	0.0485	0.0045	13.42	8.195	23.92	2.959	0.3180	0.1625	
15	0.0270	0.3208	0.0500	0.0047	13.42	8.198	23.94	2.970	0.3240	0.1625	
16	0.0270	0.3225	0.0501	0.0048	13.43	8.222	23.94	2.981	0.3250	0.1640	
17	0.0285	0.3230	0.0537	0.0050	13.46	8.242	23.95	3.002	0.3300	0.1650	
18	0.0288	0.3290	0.0550	—	13.49	8.304	23.99	3.030		0.1675	
19	0.0289	—	—	—	13.51	—	—	—		0.1680	
M_M	0.0256	0.3132	0.0463	0.0040	13.37	8.116	23.70	2.943	0.3087	0.1581	0.016-
s_M	0.0018	0.0090	0.0042	0.0006	0.08	0.096	0.19	0.041	0.0132	0.0058	

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 any outlying values. Where a "—" appears in the table it indicates that an outlying value has been omitted.

CERTIFIED VALUES

mass content in %

	C	Si	Mn	S	Ni	Al	Co	Cu	Nb	Ti
M_M	0.0256	0.313	0.046	0.0040	13.37	8.12	23.70	2.94	0.309	0.158
C(95%)	0.0009	0.005	0.002	0.0003	0.04	0.05	0.10	0.02	0.007	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 laboratories

DESCRIPTION OF THE SAMPLE

This sample consists of material passing a 250 µm aperture sieve from which the fines passing a 53 µm aperture sieve have been removed. It is supplied only in bottles of 100g.

PARTICIPATING LABORATORIES

Aubert et Duval, Les Ancizes (France)	Institut de Recherches de la Sidérurgie Française (IRSID), Saint Germain-en-Laye (France)
Böhler AG, Düsseldorf-Oberkassel (Germany)	Laborlux s.a. Esch-sur-Alzette (Luxembourg)
Breda Siderurgica, Milan (Italy)	London and Scandinavian Metallurgical Co. Ltd., Rotherham, (UK)
Bundesanstalt für Materialforschung und-prüfung (BAM), Berlin (Germany)	Murex Ltd., Rainham (UK)
Centro Sperimentale Metallurgico (CSM), Rome (Italy)	Ridsdale and Co. Ltd., Middlesbrough (UK)
Cockerill, Seraing (Belgium)	Ross and Catherall Ltd., Sheffield (UK)
Darwins Magnets International, Sheffield (UK)	SNIAS, Suresnes (France)
Eclipse Tools Ltd., Sheffield (UK)	Société Metallurgique Hainaut Sambre, Couillet (Belgium)
Hoesch Stahl AG, Dortmund (Germany)	Sollac, Florange (France)
Imphy s.a., Imphy (France)	Stahlwerke Röchling-Burbach GmbH, Völklingen-Saar (Germany)
Institut de Recherches de la Sidérurgie Française (IRSID), Malzieres-les-Metz (France)	Thyssen Edelstahlwerke AG, Krefeld (Germany)

This reference material 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; German Federal Republic—Iron and Steel CRM Working Group; UK—BAS Ltd.)

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(First issued in July 1980 before re-certification of Ti)



METHODS USED EURONORM-CRM 376-1

Element	Line Number	Methods
C	2-13-15	Combustion, gravimetric
	3- 4- 5- 7- 9-10-16-17-18	Combustion, infrared absorption
	6- 8-19	Combustion, conductimetric
	11	Combustion, non aqueous titration
	12	Combustion, thermal conductivity
	14	Combustion, coulometric
Si	1- 4- 5- 6- 8- 9-10-11-12-13-14-15-16-17-18	Gravimetric, dehydration with perchloric acid
	2	Gravimetric, dehydration with hydrochloric acid
	3	Atomic absorption spectrometry
	7	Photometric as molybdenum blue
Mn	2- 5- 6- 8- 9-10-13-14-17-18	Photometric, oxidation with periodate
	3- 4- 7-11-12-16	Atomic absorption spectrometry
	15	Photometric, oxidation with persulphate/silver nitrate
S	1- 2-16	Combustion, oxidation/reduction titration
	3- 5- 6- 7- 8- 9-10-11-12-13-15-17	Combustion, infrared absorption
	4	Gravimetric as BaSO ₄ after chromatographic separation on alumina
	14	Combustion, conductimetric
Ni	1-16	Dimethylglyoxime precipitation, titration with EDTA
	2- 8-13-18	Photometric with dimethylglyoxime
	3- 4- 5- 6-12-15	Dimethylglyoxime precipitation, gravimetric
	7- 9-14-19	Atomic absorption spectrometry
	10	Dimethylglyoxime precipitation, titration with dichromate
	11	Photometric with dimethylglyoxime with extraction
	17	Dimethylglyoxime precipitation, titration with cyanide
Al	1- 3- 9	Complexometric
	2- 8-10-11-12-13-14-15-18	Atomic absorption spectrometry
	4- 6- 7-16	Gravimetric with 8-hydroxyquinoline
	5	Gravimetric as oxide
	17	Photometric with eriochrome cyanine
Co	1	Photometric with thiocyanate
	2- 6-11-14-16	Atomic absorption spectrometry
	3- 7-10-12-18	Titration with ferricyanide, potentiometric end point
	4- 5	Photometric with nitroso-R-salt
	8	Photometric with isonitrosomalonylguanidine
	9	Photometric with stannous chloride
	13-17	Photometric with ferricyanide
	15	Precipitation with 1-nitroso-2-naphthol, gravimetric
Cu	1- 2- 4- 8- 9-13-14-16-17	Atomic absorption spectrometry
	3	Electrogravimetric
	5-15	Photometric with biscyclohexanone oxalyldihydrazone
	6	Photometric with cuproine
	7	Photometric with diethyldithiocarbamate
	10	Iodimetric titration after separation as sulphide
	11-12	Precipitation with salicylaldoxime, gravimetric
	18	Photometric with 2, 2' diquinolyl
Nb	2- 9-12	Gravimetric after separation by hydrolysis
	3	Photometric with PAR after ion exchange separation
	4- 6-11	Photometric with PAR after precipitation with phenylarsonic acid
	5	Photometric with thiocyanate after ion exchange separation
	7- 8	Photometric with PAN
	10	Photometric with PAR
	13	Photometric with PAN with extraction
	14	Photometric with pyrogallol
15-16-17	Atomic absorption spectrometry	
Ti	1-16	Photometric with chromotropic acid
	2- 7	Photometric with chromotropic acid after ion exchange separation
	3-18	Photometric with hydrogen peroxide after cupferron separation
	4- 5- 6- 9-12	Plasma Emission Spectrometry
	8-14-15	Atomic absorption spectrometry
	10-11-13-17-19	Photometric with diantipyrylmethane
Ta	1	X-ray fluorescence spectrometry
	2	Photometric with phenylfluorone after ion exchange separation
	3	Photometric with malachite green
	4	Photometric with hydrogen peroxide
	5- 9-10-11-12	Photometric with pyrogallol after precipitation with phenylarsonic acid
	6	Photometric with Nile blue
	7	Photometric with PAR
	8	Photometric with methyl violet with extraction
13	Atomic absorption 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, 2 Park Street, London W1A 2BS).

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 Zertifizierten Europäischen Referenzmaterialien (EURONORM-ZRM) sowie über die Anwendung der in diesem Zertifikat enthaltenen statistischen Daten finden sich in der Mitteilung en 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, 1000 Berlin 30).