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. 296-1 JETHETE STEEL

LABORATORY MEANS (4 Values)

mass content in %

Line No.	C	Si	Mn	P	S	Cr	Mo	Ni	Al	As	Co	Cu	N	Pb	Sn	V	*B*
1	0.1141	0.2345	0.6584	0.0163	0.0023	11.7247	—	2.7535	0.0238	0.0111	0.0197	0.1444	0.0198	0.00010	0.0121	0.3413	*0.0001*
2	0.1145	0.2348	0.6605	0.0171	0.0024	11.7315	1.6696	2.7603	0.0240	0.0129	0.0200	0.1447	0.0201	0.00010	0.0122	0.3492	*0.0001*
3	0.1150	0.2364	0.6688	0.0171	0.0025	11.7450	1.6711	2.7633	0.0259	0.0131	0.0204	0.1480	0.0204	0.00010	0.0126	0.3528	*0.0002*
4	0.1151	0.2391	0.6688	0.0172	0.0025	11.7656	1.6760	2.7775	0.0264	0.0131	0.0208	0.1483	0.0204	0.00010	0.0126	0.3529	*0.0002*
5	0.1154	0.2395	0.6706	0.0173	0.0026	11.7688	1.6813	2.7786	0.0265	0.0132	0.0210	0.1483	0.0205	0.00010	0.0129	0.3560	*0.0003*
6	0.1155	0.2400	0.6708	0.0173	0.0026	11.7730	1.6827	2.7793	0.0266	0.0133	0.0212	0.1490	0.0210	0.00012	0.0129	0.3579	*0.0004*
7	0.1156	0.2405	0.6717	0.0176	0.0026	11.7897	1.6868	2.7864	0.0272	0.0135	0.0213	0.1490	0.0211	0.00012	0.0130	0.3607	*0.0005*
8	0.1160	0.2428	0.6727	0.0176	0.0026	11.7900	1.6918	2.7872	0.0274	0.0136	0.0213	0.1491	0.0212	0.00013	—	0.3616	
9	0.1161	0.2430	0.6728	0.0177	0.0026	11.7975	1.7044	2.7893	0.0274	0.0138	0.0215	0.1496	0.0213	0.00015	0.0132	0.3626	
10	0.1171	0.2434	0.6753	0.0177	0.0027	11.8000	1.7045	2.7951	0.0274	0.0139	0.0216	0.1501	0.0214	0.00020	0.0133	0.3640	
11	0.1173	0.2434	0.6762	0.0178	0.0027	11.8177	1.7056	2.7969	0.0275	0.0143	0.0217	0.1502	0.0216	0.00020	0.0133	0.3665	
12	0.1173	0.2435	0.6782	0.0178	0.0027	11.8373	1.7072	2.7971	0.0279	0.0145	0.0220	0.1503	0.0217	0.00025	0.0133	0.3669	
13	0.1173	0.2437	0.6783	0.0179	0.0027	11.8469	1.7094	2.7984	—	0.0148	0.0221	0.1506	0.0222	0.00025	0.0136	0.3677	
14	0.1180	0.2445	0.6795	0.0179	0.0027	11.8500	1.7103	2.8033	0.0287	0.0148	0.0223	0.1509	0.0223	0.00030	0.0136	0.3703	
15	0.1180	0.2446	0.6810	0.0180	0.0027	11.8784	1.7131	2.8043	0.0287	0.0148	0.0225	0.1510	0.0224	—	0.0136	—	
16	0.1180	0.2447	0.6824	0.0187	0.0028	11.8800	1.7179	2.8048	0.0291	0.0152	0.0227	0.1517	0.0228	—	0.0140	0.3714	
17	0.1186	0.2455	0.6856	0.0187	0.0029	11.8939	1.7213	2.8063	0.0296	0.0166	0.0232	0.1522	0.0234			0.3743	
18	0.1196	0.2499	0.6882	0.0187	0.0029	11.9459	1.7239	2.8086	0.0298		0.0235	0.1533				0.3755	
19		0.2538	0.6959	0.0195		11.9898	1.7248	2.8097	0.0309		0.0248	0.1561				0.3823	
M_M	**0.1166**	**0.2425**	**0.6756**	**0.0178**	**0.0026**	**11.8224**	**1.7001**	**2.7895**	**0.0275**	**0.0139**	**0.0218**	**0.1498**	**0.0214**	**0.00016**	**0.0131**	**0.3630**	*0.0003*
s_M	0.0015	0.0047	0.0090	0.0007	0.0002	0.0715	0.0183	0.0169	0.0019	0.0012	0.0012	0.0027	0.0010	0.00007	0.0005	0.0102	
s_W	0.0008	0.0035	0.0043	0.0004	0.0001	0.0293	0.0103	0.0074	0.0006	0.0004	0.0006	0.0010	0.0004	0.00003	0.0003	0.0030	

M_M: Mean of the intralaboratory means, s_M: Standard deviation of the intralaboratory 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	Al	As	Co	Cu	N	Pb	Sn	V
M_M	**0.1166**	**0.242**	**0.676**	**0.0178**	**0.0026**	**11.82**	**1.700**	**2.790**	**0.0275**	**0.0139**	**0.0218**	**0.1498**	**0.0214**	**0.00016**	**0.0131**	**0.363**
C(95%)	0.0008	0.003	0.005	0.0004	0.0001	0.04	0.009	0.008	0.0009	0.0006	0.0006	0.0013	0.0005	0.00004	0.0003	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 35:1989 section 4

This reference material was prepared and issued by:

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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, UK – BAS Ltd.)

MARCH 1997

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DESCRIPTION OF SAMPLE

This sample is available in the form of chips passing a 1700µm aperture sieve from which the dust passing a 250µm aperture sieve has been removed. It is supplied in bottles containing 100g.... ref 296-1 (C). It is also supplied in the form of 38mm dia. discs… 296-1-(D).

METHODS USED

EURONORM – CRM NO. 296-1

Element	Line Number	Methods
C	1-2-3-4-5-6-8-9-10-12-14-15-16-17-18	Combustion, infrared absorption
	7	Combustion, non-aqueous titration
	11	Combustion, conductimetry
	13	Combustion, coulometric titration
Si	1-4-5-6-7-8-9-10-12-13-15-16-19	Gravimetric, dehydration with perchloric acid
	2-3-17-18	Photometric as molybdenum blue, without extraction
	11-14	PES
Mn	1-2-7-11	FAAS
	3-5-6-10-12-15-18	Photometric, periodate oxidation
	4-8-13-14-16-17-19	PES
	9	Photometric, persulphate oxidation
P	1-2-3-7-10	Photometric as molybdenum blue without extraction
	4-5-8-12-13-14-16-17-18	Photometric as phosphovanadomolybdate, extraction
	6-9-15-19	PES
	11	Photometric as molybdenum blue, extraction
S	1-2-3-5-6-7-8-9-10-11-13-14-15-16-17-18	Combustion, infrared absorption
	4	Gravimetric as $BaSO_4$ after chromatographic separation on alumina
	12	Combustion, conductimetry
Cr	1-4-5-6-7-8-10-11-13-17-18-19	Titration with Fe(II), oxidation with persulphate
	2-12-15	Titration with Fe(II), oxidation with perchloric acid
	3-9-14-16	PES
Mo	2-11-14	Photometric with thiocyanate in presence of Sn(II), extraction
	3-9-13	FAAS
	4-5-7-8-10-16-17-19	PES
	6	Photometric with thiocyanate in presence of ascorbic acid, extraction
	12-15-18	Photometric with thiocyanate in presence of Sn(II), without extraction
Ni	1-5-10	FAAS
	2-3-6-9-11-12	Gravimetric, dimethylglyoxime
	4-7-14-15-16	PES
	8-19	Complexometric titration
	13	Cyanometric titration
	17	Photometric, dimethylglyoxime, without extraction
	18	Titration with dichromate after separation with dimethylglyoxime
Al	1-2-6-11-14-19	PES
	3	GF-AAS
	4-5-7-8-9-10-12-16-17	FAAS
	15	Photometric with eriochrome cyanine, NaOH separation of iron
	18	ICP-MS
As	1-2-3-7-16-17	PES
	4-14	FAAS, evolution as arsine
	5-6-9-10-13	GF-AAS
	8-11	Photometric as molybdenum blue, halide extraction
	12	Photometric, with silver diethyldithiocarbamate, separation as arsine
	15	FAAS
Co	1-6-8-10-11	PES
	2-4-5-7-9-12-13-14-15-16-17-18-19	FAAS
	3	Photometric with nitroso-R-salt
Cu	1-2-3-5-6-8-9-10-11-14-18-19	FAAS
	4-7-12-13-15-16-17	PES
N	1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17	Thermal conductivity, decomposition in graphite crucible

METHODS USED

EURONORM – CRM NO. 296-1

Element	Line Number	Methods
Pb	1-2-3-4-5-7-8-12	GF-AAS
	6-14	ICP-MS
	9-10-11-13	FAAS
Sn	1-4-5-6	FAAS
	2	FAAS after separation with TOPO
	3-9-11-13-14	GF-AAS
	7-12-15-16	PES
	10	ICP-MS
V	1-2-4-5-8-10-12	FAAS
	3-6-7-11-13-14-16-17-19	PES
	9	Titration with Fe(II), oxidation with Mn (VIII)
	18	Photometric with dimethylnaphthidine
B	1-3-6-7	Photometric with curcumin
	2	Photometric with 1-1-dianthrimide, separation
	4-5	PES

Abbreviations:

FAAS:	Flame Atomic Absorption Spectrometry
GF-AAS	Graphite-Furnace Atomic Absorption Spectrometry
ICP-MS:	Inductively Coupled Plasma – Mass Spectrometry
PES:	Plasma Emission Spectrometry
TOPO:	Tri-octylphosphine oxide

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 normalisations. (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 Mittellungen 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 30).