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. 276-2 5% Cr-Mo-V STEEL

LABORATORY MEANS (4 Values)

mass content in %

Line No.	C	Si (Total)	Mn	P	S	Cr	Mo	Ni	Cu	N	Sn	V
1	0.3933	–	–	0.0083	0.0168	–	1.0802	0.1967	0.1761	0.0110	–	0.2785
2	0.3934	1.0159	0.3568	0.0084	0.0175	4.9325	1.0941	0.1968	0.1769	0.0110	0.0122	0.2790
3	0.3937	1.0166	0.3570	0.0085	0.0176	4.9389	1.0948	0.1973	–	0.0111	0.0125	0.2836
4	0.3949	1.0204	0.3573	0.0085	0.0181	4.9445	1.1023	0.1999	0.1793	0.0113	0.0125	0.2863
5	0.3953	–	0.3591	0.0086	0.0182	4.9478	1.1130	0.1999	0.1795	0.0113	0.0127	0.2864
6	0.3958	1.0273	0.3605	0.0086	0.0183	4.9496	1.1168	0.2003	0.1807	0.0114	0.0130	0.2886
7	0.3963	1.0278	0.3608	0.0087	0.0184	4.9500	1.1198	0.2005	0.1808	0.0115	0.0130	0.2891
8	0.3965	1.0293	0.3613	0.0088	0.0186	4.9525	–	0.2009	0.1815	0.0115	0.0130	0.2894
9	0.3978	1.0295	0.3617	0.0090	0.0187	4.9554	1.1256	0.2013	0.1818	0.0116	0.0131	0.2933
10	0.3978	1.0311	0.3617	0.0091	0.0188	4.9628	1.1269	0.2015	0.1823	0.0116	0.0131	0.2935
11	0.3983	1.0315	0.3618	0.0091	0.0192	4.9645	1.1272	0.2015	0.1823	0.0116	0.0133	0.2938
12	0.3990	1.0334	0.3649	0.0092	0.0192	4.9695	1.1375	0.2025	0.1824	0.0116	0.0134	0.2952
13	0.3993	1.0353	0.3653	0.0094	0.0193	4.9700	1.1380	0.2028	0.1828	0.0116	0.0134	0.2957
14	0.3995	1.0361	0.3667	0.0095	0.0193	4.9750	1.1386	0.2036	0.1830	0.0117	0.0135	0.2974
15	0.3995	1.0361	0.3672	0.0096	0.0193	4.9811	1.1405	0.2053	0.1839	0.0117	0.0135	0.2985
16	0.3996	1.0363	0.3672	0.0097	0.0194	4.9811	1.1440	0.2053	0.1845	0.0118	0.0135	0.2999
17	0.3996	1.0383	0.3700	0.0098	0.0194	4.9844	1.1501	0.2063	0.1846	0.0118	0.0136	0.3002
18	0.3998	1.0410	0.3703	0.0098	0.0194	5.0024	1.1510	0.2065	0.1858	0.0118	0.0138	0.3013
19	0.4002	1.0428	0.3707	0.0103	0.0195	5.0025	1.1595	0.2080	0.1865	0.0118	0.0139	0.3029
20	0.4029	1.0435	0.3711	0.0103	0.0196	5.0098	1.1621	0.2083	0.1869	0.0120	0.0139	0.3118
21	0.4059	1.0445	0.3720	0.0115	0.0199	5.0440	1.1658	0.2094	0.1890	0.0122	0.0140	0.3121
22	0.4060	1.0495	0.3745	–	0.0201	5.0520	1.1673	0.2112	0.1893	0.0124	0.0141	0.3245
23	0.4075	1.0565	0.3750		0.0205		1.1868		0.1898			
M_M	**0.3988**	**1.0344**	**0.3651**	**0.0093**	**0.0189**	**4.9748**	**1.1337**	**0.2030**	**0.1832**	**0.0116**	**0.0133**	**0.2955**
s_M	0.0039	0.0101	0.0057	0.0008	0.0009	0.0323	0.0269	0.0041	0.0037	0.0003	0.0005	0.0110
s_W	0.0022	0.0068	0.0026	0.0004	0.0004	0.0165	0.0099	0.0026	0.0015	0.0002	0.0004	0.0032

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 outstanding 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 (Total)	Mn	P	S	Cr	Mo	Ni	Cu	N	Sn	V
M_M	**0.399**	**1.034**	**0.365**	**0.0093**	**0.0189**	**4.975**	**1.134**	**0.203**	**0.183**	**0.0116**	**0.0133**	**0.296**
C(95%)	0.002	0.004	0.002	0.0003	0.0003	0.012	0.010	0.002	0.002	0.0001	0.0002	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.

DESCRIPTION OF THE 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 276-2(C). It is also supplied in the form of 38mm dia discs ...ref 276-2(D).

This reference material was prepared and issued by:

BUREAU OF ANALYSED SAMPLES LIMITED

Newham Hall, Middlesbrough, England FEBRUARY 1993

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, UK–BAS Ltd.)

PARTICIPATING LABORATORIES

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Uddeholm Tooling AB, Hagfors (Sweden)
Ugine S.A., Isbergues (France)
Voest Alpine Stahl Linz GmbH., Linz (Austria)

METHODS USED
EURONORM – CRM No. 276-2

Element	Line Number	Methods
C	1-2-3-4-6-7-8-9-10-11-12-14-15-16-17-18-19-20-23	Combustion, infrared absorption
	5-22	Combustion, non-aqueous titration
	13	Combustion, conductimetry
	21	Combustion, coulometry
Si	2-4-6-7-9-10-12-13-16-17-19-20-22	Gravmetric, dehydration with perchloric acid
Total	3-11-14-18	Photometric as molybdenum blue with extraction
	8-15-23	Plasma Emission Spectrometry
	21	Atomic Absorption Spectrometry
Mn	2-3-12-14-15-18-21-22	Plasma Emission Spectrometry
	4-9-13-17-19	Atomic Absorption Spectrometry
	5-6-7-10-16-20	Photometric - Periodate oxidation
	8-11-23	Photometric - Persulphate oxidation
P	1-3-14-17	Photometric as molybdenum blue
	2	Photometric as molybdenum blue with extraction
	4-5-6-8-9-11-12-13-15-19-20-21	Photometric as phosphovanado-molybdate with extraction
	7-10-16-18	Plasma Emission Spectrometry
S	1-2-3-4-5-6-7-9-10-11-12-13-14-15-16-19-20-21-22-23	Combustion, infrared absorption
	8	Combustion, acidimetric titration
	17	Gravimetric as $BaSO_4$
	18	Combustion, conductimetry
Cr	2-3-9-11-18-20-22	Plasma Emission Spectrometry
	4	Titration with Fe(II), oxidation with perchloric acid
	5-6-7-8-10-12-13-14-15-16-17-19-21	Titration with Fe(II), oxidation with persulphate
Mo	1-3-4-11-14-15-17-19-22-23	Plasma Emission Spectrometry
	2-9-12-21	Photometric with thiocyanate in presence of Sn(II)
	5-6-10-13-16-18-20	Photometric with thiocyanate in presence of Sn(II), extraction
	7	Atomic Absorption Spectrometry
Ni	1-13-15-22	Photometric with dimethylglyoxime
	2-4-8-9-10-16-21	Plasma Emission Spectrometry
	3-6-7-11-12-14-17-18-19-20	Atomic Absorption Spectrometry
	5	Titration with potassium dichromate after separation with dimethylglyoxime
Cu	1-4-7-8-13-14-16-19-20-23	Atomic Absorption Spectrometry
	2-5-9-10-11-12-15-17-21	Plasma Emission Spectrometry
	6-22	Photometric with cuproine, without extraction
	18	Photometric as oxalyldihydrazone
N	1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-19-22	Thermal conductivity, decomposition in graphite crucible
	18	Gas Volumetry, oxidising fusion, CO_2 as carrier gas
	20	Acidimetric titration, distillation
	21	Photometric with indophenol blue distillation
Sn	2-4-7-8-9-15-18-19-21	Plasma Emission Spectrometry
	3-6-11-12-13-14-20	Graphite Furnace AAS
	5-17-22	Atomic Absorption Spectrometry
	10	Plasma Emission Mass Spectrometry
	16	Photometric with substituted fluorone, halide separation
V	1-6-7-8-10-12-14-16-17-21	Plasma Emission Spectrometry
	2-4-9-18-22	Atomic Absorption Spectrometry
	3-5-13-19-20	Titration with Fe(II), oxidation with Mn(VII)
	11-15	Photometric with N-benzoylphenyl-hydroxylamine, with extraction

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 den 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).