

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. **292-1** NIOBIUM STABILISED STAINLESS STEEL

LABORATORY MEANS (4 values) mass content in %

Line No.	C	Si	Mn	P	S	Cr	Mo	Ni	Co	Cu	N	Nb
1	0.0332	—	1.7237	0.0145	—	—	0.0424	—	—	0.0360	0.0604	0.5326
2	0.0343	0.3801	1.7238	0.0158	0.0050	17.9196	0.0432	10.0318	—	0.0363	0.0614	0.5336
3	0.0353	0.3893	1.7333	0.0161	0.0052	—	—	10.0400	0.0224	0.0374	0.0620	0.5353
4	0.0353	0.3905	1.7348	0.0163	0.0052	17.9683	0.0441	10.0463	0.0225	0.0375	0.0620	0.5516
5	0.0353	0.3920	1.7350	0.0164	0.0053	17.9688	0.0448	10.0525	0.0229	0.0376	0.0634	0.5538
6	0.0353	0.3921	1.7359	0.0166	0.0053	17.9720	0.0451	10.0543	0.0231	0.0378	0.0639	0.5560
7	0.0358	0.3978	1.7400	0.0169	0.0053	17.9800	0.0460	10.0618	0.0238	0.0379	0.0642	0.5618
8	0.0364	0.3991	1.7419	0.0169	0.0054	17.9850	0.0460	10.0639	0.0240	0.0381	0.0644	0.5655
9	0.0366	0.4012	1.7433	0.0171	0.0054	17.9938	0.0464	10.0817	0.0247	0.0382	0.0648	0.5704
10	0.0368	0.4030	1.7443	0.0176	—	18.0046	0.0469	10.0825	0.0248	0.0385	0.0652	0.5735
11	0.0368	0.4050	1.7448	0.0180	0.0056	18.0083	0.0474	10.0848	—	0.0388	0.0653	0.5748
12	0.0370	0.4051	1.7450	0.0182	0.0056	18.0102	0.0477	10.0999	0.0252	0.0389	0.0654	0.5825
13	0.0375	0.4060	1.7463	0.0185	0.0056	18.0150	0.0479	10.1050	0.0253	0.0393	0.0670	0.5868
14	0.0376	0.4064	1.7478	0.0187	0.0056	18.0228	0.0484	10.1172	0.0258	0.0395	0.0670	0.5875
15	0.0378	0.4067	1.7572	—	0.0057	18.0275	0.0488	10.1180	0.0258	0.0396	—	0.5946
16	0.0381	0.4078	1.7573	0.0192	0.0057	18.0363	0.0488	10.1209	0.0261	0.0398	—	0.6038
17	0.0384	0.4090	1.7595	0.0193	0.0057	18.0380	0.0492	10.1275	0.0268	0.0407	—	0.6039
18	0.0388	0.4106	1.7614	0.0195	0.0058	18.0403	—	10.1278	0.0280	0.0433	—	0.6101
19	0.0390	0.4150	1.7652	0.0195	0.0059	18.0450	—	10.1375	0.0282	0.0435	—	—
20	0.0397	0.4251	—	—	—	—	—	10.1565	0.0295	0.0436	—	—
21	—	—	—	—	—	—	—	—	0.0296	—	—	—
M_M	0.0367	0.4022	1.7442	0.0175	0.0055	18.0021	0.0464	10.0900	0.0255	0.0391	0.0640	0.5710
s_M	0.0017	0.0104	0.0119	0.0014	0.0003	0.0335	0.0021	0.0368	0.0023	0.0022	0.0020	0.0244
s_w	0.0007	0.0060	0.0065	0.0005	0.0002	0.0223	0.0008	0.0350	0.0006	0.0007	0.0009	0.0056

Al	As	B	Ca	Ta
0.0005	0.0049	0.0002	0.0004	0.0004
0.0014	0.0064	0.0002	0.0005	0.0012
0.0016	—	0.0002	0.0005	0.0017
0.0016	0.0066	0.0002	0.0005	0.0019
0.0018	0.0067	0.0003	0.0005	—
0.0024	0.0070	0.0003	0.0006	—
0.0030	0.0071	0.0004	0.0006	—
—	0.0083	—	0.0007	—
—	0.0083	0.0006	0.0007	—
—	0.0090	—	0.0008	—
—	0.0092	—	—	—
—	0.0098	—	—	—
0.002	0.008	0.0003	0.0006	0.001

M_M: Mean of the intralaboratory means **s_M**: Standard deviation of the intralaboratory means
s_w: Mean 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 any 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	Co	Cu	N	Nb
M_M	0.0367	0.402	1.744	0.0175	0.0055	18.00	0.0464	10.09	0.0255	0.0391	0.0640	0.571
C(95%)	0.0008	0.005	0.006	0.0007	0.0002	0.02	0.0011	0.02	0.0011	0.0010	0.0012	0.012

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

For further information regarding the confidence interval for the certified value see ISO Guide 35:1989 section 4.



This reference material prepared and issued by:

BUREAU OF ANALYSED SAMPLES LIMITED

Newham Hall, Middlesbrough, England

NOVEMBER 1990

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.)

DESCRIPTION OF THE SAMPLE

This sample is available in the form of chips all passing a 1700 µm aperture sieve from which the dust passing a 250 µm aperture sieve has been removed.

It is supplied in bottles containing 100g...ref 292-1(C) It is also supplied in the form of 38mm dia. x 30mm thick discs...ref 292-1(D)

An area 6mm in diameter in the centre of the discs, 292-1(D), should be avoided for optical emission spectrometry.

PARTICIPATING LABORATORIES

AB Sandvik Steel, Sandviken (Sweden)	Institutet för Metallforskning, Stockholm (Sweden)
Acerinox (Spain)	Klöckner Stahl GmbH, Bremen (Germany)
Aubert & Duval, Les Ancizes (France)	Laborlux S.A., Esch-sur-Alzette (Luxembourg)
Bundesanstalt für Materialforschung und -prüfung (BAM) Berlin (Germany)	Langley Alloys Ltd., Slough (UK)
Böhler GmbH, Kapfenberg (Austria)	Max-Planck-Institut für Eisenforschung GmbH, Düsseldorf (Germany)
Centro Nacional de Investigaciones Metalurgicas (CENIM), Madrid (Spain)	Ridsdale & Co. Ltd., Middlesbrough (UK)
Centro Sviluppo Materiali, Rome (Italy)	Sheffield Testing Laboratories Ltd., Sheffield (UK)
Cockerill Sambre, Charleroi (Couillet) (Belgium)	Staatliches Materialprüfungsamt Nordrhein-Westfalen, Dortmund (Germany)
Department of Quality Assurance/Technical Support, MOD, London (UK)	Stocksbridge Engineering Steels Ltd., Sheffield (UK)
Hoogovens Groep BV, IJmuiden (Holland)	Ugine A.C.G., Isbergues (France)
Institute de Recherches de La Sidérurgie Francaise, (IRSID), Maizières-lès-Metz (France)	Ugine, Savoie (France)

METHODS USED EURONORM-CRM 292-1

Element	Line Number	Methods
C	1- 2-12	Combustion, non aqueous titration
	3- 4- 5- 6- 7- 9-10-11-13-16-17-18-19-20	Combustion, infrared absorption
	8	Combustion, coulometric titration
	14-15	Combustion, conductimetry
Si	2- 5- 9-11-12-13-14-17-18-19-20	Gravimetry, dehydration with perchloric acid
	3- 6-15-16	Plasma emission spectrometry
	4	Gravimetry, dehydration with sulphuric acid
	7-10	Photometric, molybdenum blue without extraction
Mn	8	Photometric, silicovanadomolybdate without extraction
	1- 3- 7- 8-10-16-17-18	Photometric, periodate oxidation
	2- 4- 6- 9-12-15	Plasma emission spectrometry
	5-19	FAAS
P	11-13	Photometric, persulphate oxidation
	14	Titration with Mn (VII), zinc oxide separation
	1	Acidimetric titration of ammonium phosphomolybdate
	2- 4- 7-16-18	Plasma emission spectrometry
S	3- 8-11	Photometric, molybdenum blue without extraction
	5-13	Photometric, molybdenum blue with extraction
	6-10-12-14-17	Photometric, phosphovanadomolybdate with extraction
	9	Photometric, phosphovanadomolybdate without extraction
Cr	19	Photometric, molybdenum blue after separation of interfering elements
	2- 4- 5- 6- 7- 9-12-13-15-16-17-18-19	Combustion, infrared absorption
	3	Gravimetric as BaSO ₄ after chromatographic separation on alumina
	8-11	Combustion, conductimetry
Mo	14	Combustion, acidimetric titration; absorption in hydrogen peroxide or silver nitrate
	2-11-16	Titration with Fe (II), oxidation with perchloric acid
	4- 5- 6- 7- 8- 9-10-12-13-14-15-17-18-19	Titration with Fe (II), oxidation with persulphate
	1- 4- 9-10-11-14-15-17	Plasma emission spectrometry
Ni	2- 6- 9-12-13-14-16-17-18	Photometric, thiocyanate in presence of Sn (II), extraction
	3-11	FAAS
	4	Photometric, thiocyanate in presence of ascorbic acid, extraction
	5-10	
Co	7-15-19	Gravimetry, dimethylglyoxime
	8	Complexometric titration, visual end point
	20	Cyanometric titration
	3- 5- 6- 9-12-13-16-18-19-20-21	Plasma emission spectrometry
Cu	4-17	FAAS
	7- 8-10-14-15	Photometric, Nitroso-R-salt
	1- 3-11-15-17-20	Plasma emission spectrometry
	2- 4- 5- 6- 8-12-13-14-16-18-19	FAAS
N	7- 9-10	Photometric, cuproine, without extraction
	1- 2- 3- 5- 6- 7- 8- 9-10-11-12-13	Thermal conductivity, decomposition in graphite crucible
	4	Acidimetric titration after distillation, visual end point
	14	Photometric, indophenol blue, distillation
Nb	1- 7-10-11-14-15	Photometric, PAR
	2- 4- 5- 8- 9-12-17-18	Plasma emission spectrometry
	3- 6	Gravimetry, sum of Ta and Nb oxides separated by hydrolysis
	13-16	Photometric, PAN, extraction

**METHODS USED
EURONORM-CRM 292-1**

Element	Line Number	Methods
Al	1- 2- 3- 4	AAS, graphite furnace
	5	FAAS, without separation
	6- 7	Plasma emission spectrometry
As	1- 6- 7- 12	Plasma emission spectrometry
	2- 5-11	AAS, graphite furnace
	4	Photometric, diethyldithiocarbamate, separation as arsine
	8	FAAS
	9	AAS, evolution as arsine
	10	Photometric, molybdenum blue, halide extraction
B	1- 3- 5- 6- 9	Photometric, curcumin
	2- 4- 7	Plasma emission spectrometry
Ca	1- 5- 6	Plasma emission spectrometry
	2- 3- 4- 7- 8- 9-10	FAAS
Ta	1	Photometric, phenylfluorone, separation
	2	Photometric, pyrogallol, separation of the oxides
	3- 4	Plasma 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, 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 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, 1000 Berlin 30).