



BUREAU OF ANALYSED SAMPLES LTD.



Certificate No. 94/3993

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BRITISH CHEMICAL STANDARD CERTIFIED REFERENCE MATERIAL

CERTIFICATE OF ANALYSIS

BCS*/SS§-CRM No. 462/1

AUSTENITIC STAINLESS STEEL

Prepared under rigorous laboratory conditions and, AFTER CERTIFICATION ANALYSIS IN GREAT BRITAIN,
issued by the Bureau of Analysed Samples Ltd.

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- JOWITT, R., British Steel Technical, Teesside Laboratories,
Middlesbrough.

ANALYSES

Mean of 4 values – mass content in %

Analyst No.	C	Si	Mn	P	S	Cr	Mo	Ni	Cu
1	0.0333	0.4545	0.7318	0.0059	0.0036	11.9000	0.0324	12.7775	0.0111
2	0.0357	0.4498	0.7278	0.0056	0.0035	11.8760	0.0273	12.9063	0.0119
3	0.0340	0.4625	0.7123	0.0056	0.0043	11.9145	0.0330	12.9095	0.0108
4	0.0355	0.4623	0.7399	0.0040	0.0048	11.8448	0.0279	12.8108	0.0103
5	0.0334	0.4736	0.7247	0.0054	0.0038	11.8930	0.0311	12.8379	0.0129
6	0.0376	0.4632	0.6978	...	0.0043	11.9395	...	12.9200	...
7	0.0348	0.4670	0.7163	0.0057	0.0042	11.8648	0.0305	12.8145	0.0106
8	0.0329	0.4638	0.7293	...	0.0049	11.8953	0.0310	12.7948	...
9	0.0332	0.4713	0.7175	0.0051	0.0035	11.8680	0.0301	12.8440	0.0108
M_M	0.0345	0.4631	0.7219	0.0053	0.0041	11.8884	0.0304	12.8461	0.0112
s_M	0.0016	0.0075	0.0125	0.0007	0.0006	0.0286	0.0020	0.0533	0.0009
s_W	0.0007	0.0055	0.0054	0.0006	0.0003	0.0358	0.0011	0.0399	0.0007

M_M : Mean of the intralaboratory means. s_M : Standard deviation of the intralaboratory means. s_W : Intralaboratory standard deviation.

The above figures are those which each analyst has decided upon after careful verification.

Figures in bold type certified, figures in small italic type only approximate.

CERTIFIED VALUES

mass content in %

	C	Si	Mn	P	S	Cr	Mo	Ni	Cu
M_M	0.0345	0.463	0.722	0.0053	0.0041	11.888	0.0304	12.85	0.0112
C(95%)	0.0012	0.006	0.010	0.0007	0.0005	0.022	0.0017	0.04	0.0009

The half-width confidence interval $C(95\%) = t \times \frac{s_M}{\sqrt{n}}$ 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.

*British Chemical Standard – chips graded 1700-250 μ m (10-60 mesh) for chemical analysis

§Spectroscopic Standard – discs 38 mm dia. x 19 mm thick for spectroscopic analysis

N.B. Due to slight segregation of certain elements an area 6mm in diameter in the centre of the disc samples should be avoided for emission spectroscopy

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NOTES ON METHODS USED

CARBON

Analysts Nos. 1, 2, 4, 6, 7, 8 and 9 determined carbon by high frequency combustion/infrared absorption according to BS 6200: 3.8.3:1990*. Nos. 3 and 5 used non-aqueous titration according to BS 6200: 3.8.2:1991*.

SILICON

All analysts determined silicon gravimetrically after dehydration with perchloric acid.

MANGANESE

Analysts Nos. 1 and 3 determined manganese using FAAS. Nos. 2, 4, 5, 6, 7 and 9 used photometric methods, all, except No. 7, oxidised manganese with periodate, No. 5 according to BS 6200: 3.18.2*. No. 7 oxidised with ammonium persulphate. No. 8 used ICP-AES.

PHOSPHORUS

Analysts Nos. 1, 3, 4, 5, 7 and 9 determined phosphorus photometrically as phosphovanadomolybdate, Nos. 1, 3, 5 and 7 according to BS EN 10184: 1992†. No. 2 used a titration method after separation as phosphomolybdate.

SULPHUR

Analysts Nos. 1, 2, 4, 6, 7, 8 and 9 determined sulphur using high frequency combustion/infrared absorption, according to BS EN 24935: 1991†. No. 3 determined sulphur titrimetrically after combustion. No. 5 determined sulphur gravimetrically after chromatographic separation on an alumina column according to BS 6200: 3.28.1:1985*.

CHROMIUM

All analysts determined chromium titrimetrically after oxidation with ammonium persulphate, No. 5 according to BS EN 24937: 1991†.

MOLYBDENUM

Analysts Nos. 1, 2, 3, 4 and 9 determined molybdenum using FAAS. Nos. 5 and 7 determined molybdenum photometrically as the oxythiocyanate according to BS 6200: 3.19.1: 1985*. No. 8 used ICP-AES.

NICKEL

Analysts Nos. 1 and 4 determined nickel gravimetrically. Nos. 2 and 8 determined nickel cyanometrically. Nos. 3, 5, 6, 7 and 9 determined nickel titrimetrically after separation with dimethylglyoxime. All, except No. 5, titrated with EDTA, according to BS EN 24938: 1990†. No. 5 dissolved the precipitate in dilute sulphuric acid, boiled with excess ferric sulphate, and titrated with dichromate (Analoid Method 62).

COPPER

Analysts Nos. 1, 2, 3, 4, 5 and 9 determined copper using FAAS according to BS EN 24943: 1990†. No. 7 determined copper photometrically with 2,2'-diquinolyl according to BS EN 24946: 1990†.

* BS 6200: Sampling and Analysis of Iron, Steel and Other Ferrous Metals: Part 3, Method of Analysis, published by the British Standards Institution, 389 Chiswick High Road, London W4 4AL.

†BS EN Standards are European Standards published by the European Committee for Standardization (CEN) which have the status of British Standards and replace any equivalent BS6200 standards.

Abbreviations

FAAS: Flame Atomic Absorption Spectrometry.
ICP-AES: Inductively Coupled Plasma - Atomic Emission Spectrometry.

NEWHAM HALL,
MIDDLESBROUGH,
ENGLAND.

For BUREAU OF ANALYSED SAMPLES LTD.
P.D. RIDSDALE,
Chairman.

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