MAIN EDITION

BUREAU OF ANALYSED SAMPLES LTD

BRITISH CHEMICAL STANDARD CERTIFIED REFERENCE MATERIAL

CERTIFICATE OF ANALYSIS

BCS-CRM No. 318A

0.01% OXYGEN IN STEEL

6.35mm DIAMETER RODS*

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

CO-OPERATING ANALYSTS

INDEPENDENT ANALYST

1 SCHOLES, P. H., *AMet, LRIC, MIM,*
Bisra, The Corporate Laboratories of the British Steel Corporation, Sheffield.

2 SWINBURN, D. G., *MIM,*
Steel Castings Research & Trade Association, Sheffield.

GOVERNMENT DEPARTMENT

3 MCLAUCHLAN, E. J., *MSc, PhD, CChem, MRIC,*
National Physical Laboratory, Teddington.

ANALYSTS representing MANUFACTURERS and USERS

4 BAGSHAWE, B., *AMet, FIM,*
Brown-Firth Research Laboratories, Sheffield.

ANALYSTS representing MANUFACTURERS and USERS (Cont.)

5 ELWELL, W. T., *PhD, CChem, FRIC,*
Imperial Metal Industries Ltd., Birmingham.

6 GALE, P., *BSc, CChem, MRIC,* BSC, Port Talbot Works, Port Talbot.

7 HARRISON, T. S., *BSc, PhD, BMet, CChem, FRIC,*
BSC, Appleby-Frodingham Works, Scunthorpe.

8 KIDMAN, L., *AMet, MIM, AMInstF,*
BSC, Rotherham Works, Rotherham.

9 PADGET, G., *AMet,*
BSC, Special Steels Division, Research Dept., Rotherham.

10 STATHAM, R. F., *AMet, MIM,*
BSC, Stocksbridge and Tinsley Park Works, Stocksbridge.

ANALYSES

Mean of 4 values - mass content in %.

Analyst No.	O
1	0.0090
2	0.0094
3	0.0088
4	0.0097
5	0.0102
6	0.0099
7	0.0089
8	0.0101
9	0.0095
10	0.0102
M_M	**0.0096**
s_M	0.0006

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.

M_M: Mean of the laboratory mean values. s_M: standard deviation of the laboratory mean values.

CERTIFIED VALUE (Cv)

mass content in %

	O
Cv	**0.0096**
C(95%)	0.0004

The half width confidence interval **C**(95%) = $\frac{t \times s_M}{\sqrt{n}}$ where "t" is the appropriate two sided Student's t value at the 95% confidence level for "n" acceptable mean values. This is an expression of the uncertainty of the certified value.

For further information regarding the confidence interval for the certified value see ISO Guide 35.

NB: Although widely accepted within the industry "mass content in %" is neither an SI nor an IUPAC supported quantity.

Multiplication of the certified value (Cv) by 10^4 will yield the value in µg/g.

Date of this edition: July 2018.

(The current edition is available at www.basrid.co.uk)

BCS-CRM 318A

0.01% OXYGEN IN STEEL

NOTES ON METHODS USED

OXYGEN

All Analysts except No. 3 determined oxygen by vacuum fusion. Nos. 1, 5 and 6 used a method in which the evolved carbon monoxide was measured by infrared absorption. Nos. 2, 4, 7, 9 and 10 converted the carbon monoxide to the dioxide and measured the gas pressure before and after freezing out the carbon dioxide by means of liquid oxygen. No. 8 evaluated the carbon monoxide by gas chromatography. No. 3 fused the sample in a stream of helium and measured the evolved carbon monoxide by automatic coulometry (Abresch and Lemm, Arch. EisenhüttWes. 1964, **35**, 1).

The following additional information was supplied by W. C. Coppins, Ridsdale & Co. Ltd.
C *0.083%*, Si *0.12%*, S *0.035%*, P *0.018%*, Mn *0.39%*, Al *<0.002%*.

*The samples are supplied in the form of 8 mm (5/16 inch) diameter rod. **Before use this must be turned down to 6.35 mm (0.25 inch) diameter.** To avoid oxidation during turning, the temperature should not exceed 50°C and the rod should be cut to the correct length by means of a hand hacksaw. After preparation to size it is recommended that the specimen be washed with acetone followed by ether. From this point it must be handled only with clean forceps. It should be weighed without delay and transferred immediately into the apparatus which is then evacuated or flushed out with inert gas. If it is not practicable to transfer immediately to the apparatus the specimen may be stored in a desiccator for 2-3 hours. If it should be necessary to store the washed sample for more than 3 hours the surface should be cleaned by light filing (with a second cut file) rewashed with acetone and ether and weighed immediately before analysis.

The certified value is only valid on a sample representing the full cross-section of the 6.35mm dia. rod.

DESCRIPTION OF SAMPLE

British Chemical Standard, BCS-CRM 318A, is sold as 8mm diameter x 95mm length rods for chemical analysis.

The steel used for the preparation of this standard was carefully selected by the GKN Group Technological Centre, Wolverhampton, who co-ordinated a very extensive homogeneity examination of this material, including several hundred analyses by neutron activation, to ensure its suitability as an oxygen standard. They also undertook the preparation of the extruded rods.

The preparation of representative samples for chemical analysis and certification by co-operative analysis was undertaken by Bureau of Analysed Samples Ltd.

INTENDED USE

BCS-CRM 318A is intended for uses such as the verification of the accuracy and repeatability of analytical methods, such as those used by the participating laboratories, for the calibration of analytical instruments, for establishing values for secondary reference materials and for training purposes.

STABILITY

BCS-CRM 318A will remain stable provided that the rod is stored in a dry atmosphere and is not subjected to temperatures above 50ºC (e.g. during preparation of the working surface).

TRACEABILITY

The characterisation of this material has been achieved by chemical analysis involving inter-laboratory study, each laboratory using the method of their choice, details of which are given above.

Most of the analytical methods used in the characterisation of this CRM were either international or national standard methods or methods which are technically equivalent. All laboratories used either stoichiometric analytical techniques or methods which were calibrated predominantly against pure metals or stoichiometric compounds, ensuring traceability of the individual results to the SI.

MEASUREMENT UNCERTAINTY

The uncertainty of each of the certified values of BCS-CRM 318A has been established by multiplying the standard error arising from the chemical analysis by the appropriate two sided Student's t value at the 95% confidence level for the number of results.

Further information and advice on this or other Certified Reference Materials or Reference Materials produced by Bureau of Analysed Samples Ltd may be obtained from the address below.

NEWHAM HALL, NEWBY,
MIDDLESBROUGH, ENGLAND, TS8 9EA
Email: enquiries@basrid.co.uk
Website: www.basrid.co.uk

For BUREAU OF ANALYSED SAMPLES LTD

R.P. MEERES,
Managing Director

Preliminary Edition ..... April 1972
Main Edition ..... September 1976
Main Edition (revised with a C(95%) and s_M value for the certified element) ..... July 2018