

# CERTIFICATE OF CALIBRATION

ISSUED BY **OPUS METROLOGY LTD.**  
DATE OF ISSUE 05 March 2007      CERTIFICATE NUMBER 99999



0233



34 MAYLAN ROAD,  
EARLSTREES INDUSTRIAL ESTATE,  
CORBY,  
NORTHAMPTONSHIRE, NN17 4DR.  
ENGLAND  
TEL: (01536) 204681  
FAX: (01536) 205272  
Email: sales@opus.co.uk  
http://www.opus.co.uk  
Calibration Hotline: (01536) 264866

PAGE 1 OF 4 PAGES

APPROVED SIGNATORY

P.A. Eddy  
J.S. Kiernan  
C. Hanney

**Customer** : A N OTHER LIMITED  
**Address** : ANY STREET  
ANY TOWN  
LONDON  
SW88 1PZ

**Order No** : 12345

**Description** : A set comprising of 82 gauge blocks

**Set type** : M88      **Set Serial No** : ABC

**Material** : Tungsten Carbide

**Manufacturer** : OPUS METROLOGY

**Report** : The measured lengths of the gauge blocks have been calibrated by comparison with Laboratory Reference standards of similar material. Measurements have been made at the positions indicated on page 2. Deviations from nominal at the indicated positions are reported on the following pages.

Reference Set Serial No:	Expansion Co-efficient:
A245	4.23 x 10E-6/°C
A215	4.23 x 10E-6/°C

**Temperature** : All calibration has been carried out within the range 20° C ± 1° C

**Date of Calibration** : 02 January 2007      **Comparator** : A005/72682

**Comments** :

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

This certificate is issued in accordance with the requirements of the United Kingdom Accreditation Service as specified in the UKAS Accreditation Standard and UKAS Regulations. It provides traceability of measurement to recognised national standards, and to the units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

# CERTIFICATE OF CALIBRATION



CERTIFICATE NUMBER  
99999

UKAS ACCREDITED CALIBRATION LABORATORY No 0233

PAGE 2 OF 4 PAGES

**Set type** : M88

**Set Serial No** : ABC

**Basis of Test** : BS EN ISO 3650:1999

**Grade** : Grade 2

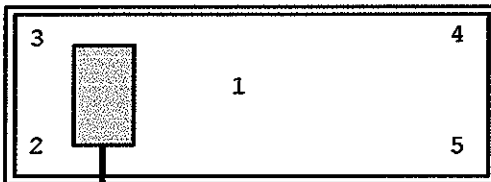
### Grade Tolerances

Nominal mm		Measured Length µm		Variation µm
Over	Upto	Maximum	Minimum	
0	10	+ 0.45	- 0.45	0.30
10	25	+ 0.60	- 0.60	0.30
25	50	+ 0.80	- 0.80	0.30
50	75	+ 1.00	- 1.00	0.35
75	100	+ 1.20	- 1.20	0.35

### Positions of length measurement during calibration

#### Nominal length ≤ 6mm

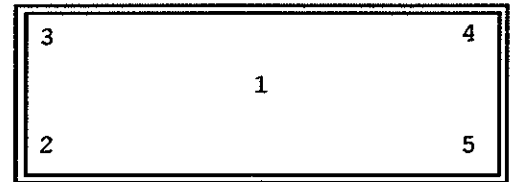
Face marked gauges



Marked size

#### Nominal length > 6mm

Side marked gauges



Marked size

Upto and including (mm)		Uncertainty (µm)
>	≤	
0	10	±0.10
10	25	±0.13
25	50	±0.17
50	75	±0.21
75	100	±0.25

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

# CERTIFICATE OF CALIBRATION



CERTIFICATE NUMBER  
99999

UKAS ACCREDITED CALIBRATION LABORATORY No 0233

PAGE 3 OF 4 PAGES

Set type : M88

Size marked : mm

Set Serial No : ABC

Deviations :  $\mu\text{m}$

Basis of Test : BS EN ISO 3650:1999

Grade : Grade 2

Size marked	Serial No	Pos 1	Pos2	Pos3	Pos4	Pos5	Var
1		+ 0.08	+ 0.06	+ 0.03	+ 0.02	+ 0.03	0.06
1.0005		+ 0.19	+ 0.21	+ 0.23	+ 0.23	+ 0.21	0.04
1.001		- 0.13	- 0.13	- 0.12	- 0.05	- 0.07	0.08
1.002		+ 0.01	- 0.04	- 0.03	+ 0.04	+ 0.01	0.08
1.003		- 0.06	- 0.11	- 0.08	- 0.10	- 0.10	0.05
1.004		+ 0.18	+ 0.13	+ 0.17	+ 0.21	+ 0.18	0.08
1.005		- 0.09	+ 0.02	+ 0.06	+ 0.10	+ 0.06	0.19
1.006		- 0.10	- 0.09	- 0.05	0.00	- 0.04	0.10
1.007		- 0.01	- 0.04	0.00	- 0.04	- 0.12	0.12
1.008		+ 0.11	+ 0.06	+ 0.03	+ 0.18	+ 0.08	0.15
1.009		- 0.01	- 0.09	- 0.10	- 0.06	- 0.11	0.10
1.02		- 0.01	- 0.08	- 0.03	- 0.01	- 0.10	0.09
1.03		+ 0.14	+ 0.14	+ 0.15	+ 0.13	+ 0.12	0.03
1.05		+ 0.14	+ 0.08	+ 0.12	+ 0.08	+ 0.08	0.06
1.06		- 0.15	- 0.13	- 0.14	- 0.27	- 0.27	0.14
1.07		- 0.14	- 0.12	- 0.11	- 0.16	- 0.18	0.07
1.08		- 0.21	- 0.22	- 0.25	- 0.21	- 0.21	0.04
1.09		- 0.03	+ 0.12	+ 0.16	+ 0.26	+ 0.22	0.29
1.1		+ 0.13	+ 0.07	+ 0.06	+ 0.09	+ 0.07	0.07
1.11		- 0.03	- 0.08	- 0.06	- 0.07	- 0.16	0.13
1.12		+ 0.05	+ 0.05	+ 0.04	0.00	- 0.01	0.06
1.13		- 0.25	- 0.37	- 0.32	- 0.28	- 0.31	0.12
1.14		+ 0.01	- 0.03	+ 0.01	+ 0.01	0.00	0.04
1.15		+ 0.13	+ 0.08	+ 0.14	+ 0.10	+ 0.09	0.06
1.16		- 0.11	- 0.11	- 0.07	- 0.03	- 0.05	0.08
1.17		+ 0.18	+ 0.13	+ 0.15	+ 0.15	+ 0.14	0.05
1.18		+ 0.14	+ 0.10	+ 0.16	+ 0.17	+ 0.07	0.10
1.19		- 0.24	- 0.24	- 0.22	- 0.24	- 0.22	0.02
1.2		- 0.02	- 0.12	- 0.09	- 0.06	- 0.08	0.10
1.22		- 0.06	- 0.08	- 0.02	- 0.01	- 0.06	0.07
1.23		- 0.10	- 0.14	- 0.15	- 0.13	- 0.10	0.05
1.24		+ 0.14	+ 0.13	+ 0.11	+ 0.08	+ 0.09	0.06
1.25		+ 0.18	+ 0.14	+ 0.13	+ 0.21	+ 0.20	0.08
1.26		+ 0.19	+ 0.13	+ 0.13	+ 0.16	+ 0.11	0.08
1.27		+ 0.07	+ 0.05	+ 0.07	+ 0.04	0.00	0.07
1.28		+ 0.03	+ 0.04	+ 0.06	+ 0.16	+ 0.09	0.13
1.29		- 0.01	- 0.05	- 0.01	+ 0.02	- 0.02	0.07
1.3		+ 0.07	+ 0.08	+ 0.10	+ 0.06	+ 0.03	0.07
1.31		- 0.07	- 0.15	- 0.10	- 0.10	- 0.15	0.08
1.32		+ 0.33	+ 0.18	+ 0.22	+ 0.20	+ 0.23	0.15
1.33		+ 0.10	+ 0.07	+ 0.09	- 0.03	- 0.05	0.15
1.34		+ 0.26	+ 0.23	+ 0.26	+ 0.22	+ 0.20	0.06
1.35		+ 0.01	- 0.13	- 0.01	+ 0.05	+ 0.02	0.18
1.36		+ 0.11	+ 0.13	+ 0.10	+ 0.08	+ 0.08	0.05
1.37		- 0.10	- 0.14	- 0.13	- 0.11	- 0.13	0.04

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

# CERTIFICATE OF CALIBRATION

CERTIFICATE NUMBER  
99999

UKAS ACCREDITED CALIBRATION LABORATORY No 0233

PAGE 4 OF 4 PAGES

Set type : M88

Size marked : mm

Set Serial No : ABC

Deviations :  $\mu\text{m}$ 

Basis of Test : BS EN ISO 3650:1999

Grade : Grade 2

Size marked	Serial No	Pos 1	Pos2	Pos3	Pos4	Pos5	Var
1.38		+ 0.12	+ 0.04	+ 0.07	+ 0.06	+ 0.06	0.08
1.39	M28	- 0.13	- 0.19	- 0.17	- 0.18	- 0.18	0.06
1.4		- 0.02	- 0.13	- 0.11	- 0.10	- 0.11	0.11
1.41		- 0.27	- 0.31	- 0.26	- 0.36	- 0.35	0.10
1.42		+ 0.21	+ 0.22	+ 0.27	+ 0.33	+ 0.27	0.12
1.43		+ 0.19	+ 0.14	+ 0.16	+ 0.18	+ 0.18	0.05
1.44		- 0.10	- 0.13	- 0.12	- 0.11	- 0.10	0.03
1.45		- 0.13	- 0.25	- 0.23	- 0.31	- 0.23	0.18
1.46		+ 0.07	- 0.01	0.00	- 0.03	- 0.07	0.14
1.47		- 0.01	- 0.07	- 0.08	- 0.08	- 0.14	0.13
1.48		- 0.05	- 0.13	- 0.09	+ 0.01	- 0.04	0.14
1.49	657446	+ 0.32	+ 0.36	+ 0.40	+ 0.41	+ 0.38	0.09
2		- 0.21	- 0.29	- 0.26	- 0.25	- 0.29	0.08
2.5		+ 0.06	- 0.02	+ 0.02	+ 0.07	+ 0.02	0.09
3		- 0.37	- 0.37	- 0.34	- 0.32	- 0.37	0.05
3.5		- 0.02	- 0.05	- 0.04	- 0.01	- 0.03	0.04
4		- 0.24	- 0.29	- 0.24	- 0.23	- 0.26	0.06
5		- 0.33	- 0.25	- 0.34	- 0.42	- 0.34	0.17
5.5		- 0.03	- 0.06	- 0.05	- 0.03	- 0.04	0.03
6		+ 0.02	+ 0.06	+ 0.04	- 0.09	- 0.06	0.15
6.5		+ 0.11	+ 0.11	+ 0.11	+ 0.01	+ 0.04	0.10
7		- 0.33	- 0.34	- 0.27	- 0.27	- 0.31	0.07
7.5	21132	+ 0.07	- 0.03	+ 0.06	+ 0.06	+ 0.03	0.10
8		- 0.13	- 0.16	- 0.16	- 0.12	- 0.13	0.04
8.5		- 0.02	- 0.18	- 0.20	- 0.04	- 0.04	0.18
9		- 0.16	- 0.29	- 0.28	- 0.17	- 0.19	0.13
9.5		+ 0.04	- 0.16	- 0.02	+ 0.02	0.00	0.20
10		+ 0.07	- 0.18	- 0.15	+ 0.05	+ 0.02	0.25
20		+ 0.09	+ 0.16	+ 0.04	+ 0.26	+ 0.15	0.22
30		- 0.11	- 0.12	- 0.09	- 0.04	- 0.34	0.30
40		+ 0.25	+ 0.25	+ 0.30	+ 0.32	+ 0.18	0.14
50		- 0.60	- 0.71	- 0.66	- 0.69	- 0.59	0.12
60		- 0.19	- 0.13	- 0.11	- 0.18	- 0.22	0.11
70		+ 0.58	+ 0.57	+ 0.55	+ 0.78	+ 0.74	0.23
80		+ 0.77	+ 0.83	+ 0.87	+ 0.73	+ 0.75	0.14
90		+ 0.25	+ 0.16	+ 0.27	0.00	+ 0.30	0.30
100		- 0.57	- 0.63	- 0.46	- 0.59	- 0.64	0.18

Summary: All gauges were found to satisfy the basis of test for grade Grade 2.

Symbols :

(>) Length larger than tolerance

(<) Length smaller than tolerance

(=) Variation larger than tolerance

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.