

CALIBRATION CERTIFICATE



Carl Zeiss IMT Corporation
6250 Sycamore Lane North
Maple Grove, MN 55369
Phone: 763-744-2400

ID Number: L1W10894091306

Date: 09/13/2006

Calibration Location:

University of California;
One Cyclotron Road
Berkley, CA 94720;

Calibration Method: CL-1001 (CMM Calibration Procedure)

Model: Prismo Accura **Serial Number:** 115371

Calibration Date: 09/13/2006

Calibration Technician:

Name: Phil Brooks

Title: Senior System Specialist

Name (sign): Phil Brooks

Temperature 20.335 [C]

Reference Standards Traceability

GCS No.:	Description:	Trace No.:	Calibration Date:	Valid Duration:
4099	Alpha Gage Block Set	05-38616-D	12/12/05	12 Months
6008	Precision Thermometer	2816901	03/07/2006	12 Months
5081	50mm Ring Gage	10830 DKD-K-05201	03/28/06	24 Months

As found requested ? NO

Protocols attached ? YES

Ring scan attached ? YES

Uncertainty of measurement was not considered when determining compliance to manufacturer's specifications.

This calibration is traceable to the international system of units (SI) through standards calibrated by accredited laboratories.

This certificate shall not be reproduced except in full, without prior written approval from Carl Zeiss IMT.

Unless otherwise annotated in protocol results, machine condition is in good working order.

The uncertainty of measurement represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of K-2.

The most noteworthy contributor to the uncertainty budget of a CMM is the deviation of temperature away from the standard of 20 degrees Celsius.



Accuracy Verification Protocol

Data supplement to certificate # : L1W10894091306

ACCURACY VERIFICATION PROTOCOL

Customer Name : University of California;

CMM Serial Number : 115371

Measuring Software : Calypso 4.20

Verification Date : 09/13/2006

Performed By : Phil Brooks

Service Performed : Installation

Machine MEETS the manufacturer's original specifications.

Opinions / Observations :

By signing below, the customer certifies understanding of the above comments and acceptance of the enclosed results. It is the policy of Carl Zeiss IMT Corporation to not make any determination if the enclosed results will meet the requirements of the customer.

Customer Signature: Rowen-Lu Date: 9/14/06

Technician Signature: Phil Brooks Date: 9-14-06

Please store in a secure location. Carl Zeiss IMT Corporation is not responsible for loss of data. The Opinions / Observations expressed in this report are outside the scope of this laboratory's A2LA accreditation.



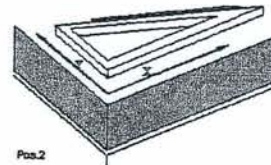
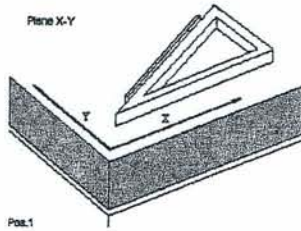
Accuracy Acceptance - Bridge Parallelism and Machine Squareness

X Bridge Parallelism

MEETS the manufacturer's original specifications (*)

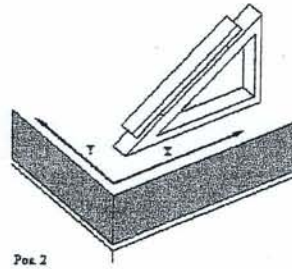
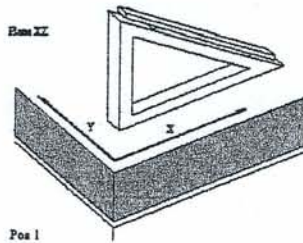
Determine perpendicularity error via gage-block measurements in diagonals of respective plane

Maximum permissible deviation for all planes is 1 arc second



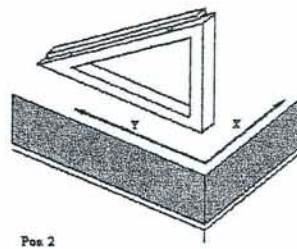
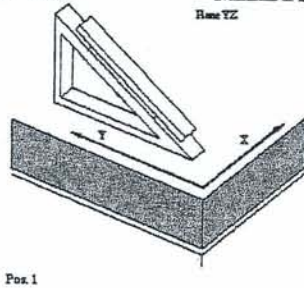
Perpendicularity error $yWx = 0.11$

MEETS the manufacturer's original specifications (*)



Perpendicularity error $xWz = 0.2$

MEETS the manufacturer's original specifications (*)



Perpendicularity error $yWz = 0.01$

MEETS the manufacturer's original specifications (*)

(*) These measurements are outside the scope of this laboratory's A2LA accreditation

Test Certificate



Carl Zeiss IMT Corp
Minneapolis, MN 55369

Technical Process Control Group

Document No.: 115371

Coordinate Measuring Machine: ACCURA 16-30-14 MPS
Serial Number: 115371

Reference sphere No. F1919

Catalog No. 600332-9011.000

Radius 14.99065

The maximum deviation from the roundness is
0.050 μ m.

The mean radius has been determined with a measuring uncertainty of
 $\pm 0.15\mu$ m; it is stored in the determination program for the sphere.

Carl Zeiss IMT Corp
Technical Process Control Group
Industrial Measurement Technology
Minneapolis, MN 55369

Datum/Date
8/17/2006

Prüfschein
Test Certificate
Certificat de Contrôle



Carl Zeiss, IMT Corp.
6250 Sycamore Lane
Minneapolis MN.55369

Qualitätssicherung
Quality Assurance
Assurance de Qualité

No.: 115371

Reference sphere No.	C2458
Catalog No.	000000 – 1129.085
Radius	4.0000 mm

Deviation from ideal geometrical shape max 0.060 μm .

The sphere diameter has been determined with an uncertainty of $\pm 0.3 \mu\text{m}$.

The sphere diameter is the basic value of the calibration measuring program.

Carl Zeiss
Quality Assurance
Industrial Measurement

A handwritten signature in black ink, appearing to read "Dandy M. Fe", is written over a horizontal line.

Datum/Date
08/17/2006

Interim Certification Document

Part Description: Gold Certification Date: 03/21/07 Serial#: G10-02-00-01668
Single Point 2 Sigma: G10-02 +/- .084mm (+/- .0033") Certificate#: G0166839162
Linear Displacement 2 Sigma: G10-02 +/- .119mm (+/- .0047") Temperature: See attached data

Measurement Standards Traceability

Ball Bar Kit Asset Number: 1041 Calibration Date: 11/18/06 *SI Traceability: METAS-L611EK055e
10mm Step Gauge, Mitutoyo Asset Number: 682 Calibration Date: 10/03/05 *SI Traceability: NIST-821/270467-04
Code No.: 515-744
Measuring range: 1.5m

*The artifact above has been calibrated with a device traceable to the International System of Units (SI) through a National Metrological Institute (NMI) or through an ISO17025 Accredited Laboratory. Expanded measurement uncertainty is 3.9 + 5.9X micrometers, where X=measured value in meters. Uncertainty is expressed at approximately the 95% Level of Confidence using k=2.00.

Certification Results

A basic four quadrant certification included with all FARO Arms and comprised of: 2 vertical level single point repeatability test in 4 quadrants with 5 repeats from 4 directions **PASSED**
Step Gauge Test in 4 quadrants, 3 orientations per quadrant **PASSED**
3 Length, 3 position free ball bar test in 4 quadrants **PASSED**
Calibration and certification conforms to procedures developed in accordance with ASME B89.4.22-2004.

Instrument condition as received **Instrument condition outgoing**
Within specifications Within specifications

This certificate shall not be reproduced, except in full, without permission of FARO Technologies, Inc.
The results of this certificate relate only to the items calibrated or tested.

Technician: Neil Maclean Date: 3/21/07

FARO Technologies, Inc.
Michigan Regional Office
PH1:248-669-8620
FAX:248-669-8656
L-A-B Cert Number: L1147.01



LABORATORY
ACCREDITATION
BUREAU
ISO/IEC 17025 Accredited



THE L.S. STARRETT COMPANY

Webber Gage Division

24500 Detroit Road

Cleveland, Ohio 44145

Telephone (216) 835-0001, FAX (216) 892-9555

This Certificate may not be copied except in full without the written consent of the Webber Gage Division, L.S. Starrett Co.

CERTIFICATE OF CALIBRATION

1/20/95

Test No. 95-18942-A

PAGE 1 OF

Property of--> UNIVERSITY OF CALIFORNIA
BERKELEY, CA.

Model-----> WEBBER RBC 25
REFERENCE BAR

Q. Number--> 59939A2

OWN Serial-> NONE
MFG Serial-> 6.368RB-5

Nominal Length	Parallelism	Nominal Length	Parallelism	Nominal Length	Parallelism	Nominal Length	Parallelism
Length	Error	Length	Error	Length	Error	Length	Error
1"	0	10"	+10	19"	+12	2"	0
2"	0	11"	+10	20"	+12	3"	+3
3"	+3	12"	+10	21"	+12	4"	+5
4"	+5	13"	+10	22"	+13	5"	+8
5"	+8	14"	+10	23"	+13	6"	+10
6"	+10	15"	+10	24"	+15	7"	+10
7"	+10	16"	+10	25"	+15	8"	+10
8"	+10	17"	+10	26"	+15	9"	+10
9"	+10	18"	+10				

(* Deviation (Error) Expressed in Microinches ***
 Deviation (error) from nominal length at 68 +/- 2 degrees Fahrenheit (20 +/- 1.1 degrees Celsius) and relative humidity not greater than 45 percent.
 Readings taken vertically at the center of gaging surface.
 Uncertainty (Expressed in microinches) = 1.88 X step in inches + 5
 Generator:DM Set:HG Calibration master gage block set. Calibrated 08/02/94,
 Next calibration 08/31/95.
 Work no:022667 Chamber:LW/5 Chamber equipment calibrated weekly.
 Calibration made using new international inch - 1 inch equals 25.4mm exactly.

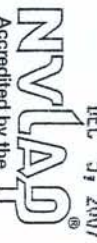
The undersigned hereby certifies these blocks were checked at 68 +/- 2 degree Fahrenheit (20 +/- 1.1 degrees Celsius) with relative humidity not greater than 45 percent against masters traceable to the National Institute of Standards and Technology on JUNE 14,1994 on test number 821/253616-94. Calibration performed in accordance with MIL-STD-45662A and Webber QCM-1C 1/4/88, Change-5 12/21/93.

David D. Friedel
 David D. Friedel, QA Manager
 Webber Gage Division
 L. S. Starrett Company

Starrett
2450 Detroit Rd., Cleveland, Ohio 44145



Certificate of Calibration 07-56178-A



SIZE CALIBRATION ONLY, DEVIATION (ERROR) EXPRESSED IN MICROMETERS
Property of
Uncertainty Coverage Factor = 2

MFG No. + 110107.3
OWN No. + NONE

Accredited by the
National Voluntary
Laboratory Accreditation
Program for the specific
scope of accreditation under
Lab Code 200038-0
Administered by the National Institute
of Standards and Technology

P.O. No.

Etch Y1A34

MARKED SIZE	TOL IND	REF PT (UM)	ETCH-ID	MT	GRD	DEVIATION AT AUXILIARY POINTS				VARI	UNCERT	CALCULATED SIZE
						1	2	3	4			
1.27		+0.035				+0.048	+0.043	+0.035	+0.038	0.013	.050	1.270035
1.28		+0.023				+0.023	+0.021	+0.026	+0.013	0.013	.050	1.280023
1.29		-0.042				-0.043	-0.048	-0.043	-0.043	0.006	.050	1.289958
1.30		-0.015				-0.007	-0.009	-0.009	+0.004	0.019	.050	1.299985
1.31		+0.001				+0.015	+0.005	+0.013	-0.003	0.018	.050	1.310001
1.32		-0.010				-0.015	+0.010	-0.008	-0.021	0.031	.050	1.319990
1.33		-0.014				-0.018	-0.010	-0.013	-0.023	0.013	.050	1.329986
1.34		+0.018				+0.012	+0.012	+0.025	+0.017	0.013	.050	1.340018
1.35		-0.033				-0.034	-0.021	-0.041	-0.011	0.030	.050	1.349967
1.36		+0.066				+0.060	+0.063	+0.068	+0.053	0.015	.050	1.360066
1.37		+0.052				+0.047	+0.044	+0.055	+0.055	0.011	.050	1.370052
1.38		+0.034				+0.032	+0.032	+0.034	+0.022	0.012	.050	1.380034
1.39		+0.001				+0.009	-0.001	+0.027	-0.006	0.033	.050	1.390001
1.40		+0.041				+0.040	+0.042	+0.042	+0.037	0.005	.050	1.400041
1.41		+0.044				+0.042	+0.040	+0.045	+0.035	0.010	.050	1.410044
1.42		+0.036				+0.039	+0.039	+0.041	+0.034	0.007	.050	1.420036
1.43		+0.055				+0.057	+0.057	+0.057	+0.047	0.010	.050	1.430055
1.44		+0.011				+0.014	+0.011	+0.027	+0.004	0.023	.050	1.440011
1.45		-0.060				-0.055	-0.057	-0.052	-0.055	0.008	.050	1.449940
1.46		-0.017				-0.006	-0.011	-0.009	-0.017	0.011	.050	1.459983
1.47		+0.041				+0.049	+0.041	+0.026	+0.036	0.023	.050	1.470041
1.48		-0.002				+0.009	+0.004	-0.008	-0.011	0.020	.050	1.479998
1.49		+0.016				+0.020	+0.012	+0.007	+0.022	0.015	.050	1.490016
1.5		+0.003				+0.021	+0.015	+0.005	0.000	0.021	.050	1.500003
2.0		+0.006				+0.007	+0.010	+0.002	+0.010	0.008	.050	2.000006
2.5		+0.069				+0.055	+0.066	+0.053	+0.050	0.019	.050	2.500069
3.0		-0.048				-0.046	-0.041	-0.064	-0.054	0.023	.050	2.999952
3.5		+0.021				+0.017	+0.014	+0.014	+0.012	0.009	.050	3.500021
4.0		+0.050				+0.055	+0.057	+0.045	+0.052	0.012	.050	4.000050
4.5		+0.039				+0.040	+0.035	+0.033	+0.040	0.007	.050	4.500039
5.0		+0.012				+0.014	+0.019	+0.011	+0.014	0.008	.050	5.000012
5.5		+0.008				-0.001	+0.012	-0.006	-0.006	0.018	.050	5.500008
6.0		+0.038				+0.038	+0.038	+0.028	+0.043	0.015	.050	6.000038
6.5		-0.010				-0.014	-0.009	-0.001	-0.014	0.013	.050	6.499990
7.0		+0.066				+0.064	+0.069	+0.057	+0.064	0.012	.050	7.000066
7.5		+0.014				+0.015	+0.010	+0.005	+0.010	0.010	.050	7.500014
8.0		+0.059				+0.063	+0.058	+0.061	+0.063	0.005	.050	8.000059

Starrett
24500 Detroit Rd., Cleveland, Ohio 44145



Certificate of Calibration

SIZE CALIBRATION ONLY, DEVIATION (ERROR) EXPRESSED IN MICROMETERS



Accredited by the
National Voluntary
Laboratory Accreditation
Program for the specific
scope of accreditation under
Lab Code 2000038-0
Administered by the National Institute
of Standards and Technology

Make WEBBER 88
Style RECTANGULAR, CERAMIC
Grade 889, 00

Property of

P.O. No.

MFG No. 110107.3
OWN No. NONE
Etch Y1A34

Uncertainty Coverage Factor = 2

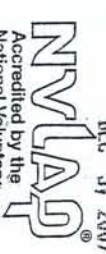
MARKED SIZE	TOL IND	REF PT (um)	ETCH-ID	DEVIATION AT AUXILIARY POINTS				VARI	UNCERT	CALCULATED SIZE		
				MT	GR1	1	2				3	4
0.5		+0.020				+0.013	+0.013	+0.003	+0.015	0.017	0.060	1.000020
1.0		+0.041				+0.037	+0.040	+0.032	+0.037	0.009	0.050	1.000041
1.0005		+0.017				+0.016	+0.013	-0.002	+0.006	0.019	0.050	1.0000517
1.001		-0.070				-0.069	-0.059	-0.066	-0.064	0.011	0.050	1.0000930
1.002		-0.002				+0.003	+0.001	-0.012	+0.003	0.015	0.050	1.001998
1.003		-0.051				-0.047	-0.050	-0.029	-0.044	0.022	0.050	1.002949
1.004		-0.011				-0.013	-0.011	-0.003	-0.006	0.010	0.050	1.003989
1.005		-0.058				-0.066	-0.069	-0.066	-0.053	0.016	0.050	1.004942
1.006		-0.040				-0.030	-0.042	-0.047	-0.032	0.017	0.050	1.005960
1.007		-0.058				-0.056	-0.066	-0.061	-0.058	0.010	0.050	1.006942
1.008		-0.044				-0.040	-0.038	-0.043	-0.040	0.006	0.050	1.007956
1.009		-0.035				-0.026	-0.034	-0.021	-0.028	0.014	0.050	1.008965
1.01		+0.019				+0.017	+0.017	+0.007	+0.022	0.015	0.050	1.010019
1.02		+0.003				+0.010	+0.005	+0.002	+0.022	0.020	0.050	1.020003
1.03		+0.023				+0.020	+0.010	+0.005	+0.028	0.023	0.050	1.030023
1.04		-0.025				-0.013	-0.025	-0.020	-0.020	0.012	0.050	1.039975
1.05		+0.004				-0.010	+0.010	0.000	+0.028	0.038	0.050	1.050004
1.06		-0.020				-0.003	-0.011	-0.006	-0.021	0.018	0.050	1.059980
1.07		+0.005				0.000	+0.005	+0.005	+0.010	0.010	0.050	1.070005
1.08		-0.013				-0.002	+0.003	-0.035	-0.010	0.038	0.050	1.079987
1.09		+0.041				+0.044	+0.039	+0.011	+0.046	0.035	0.050	1.090041
1.10		+0.041				+0.043	+0.040	+0.040	+0.035	0.008	0.050	1.100041
1.11		+0.049				+0.052	+0.052	+0.041	+0.041	0.011	0.050	1.110049
1.12		0.000				+0.001	-0.004	+0.006	-0.009	0.015	0.050	1.120000
1.13		+0.029				+0.031	+0.029	+0.016	+0.029	0.015	0.050	1.130029
1.14		+0.049				+0.049	+0.044	+0.041	+0.046	0.008	0.050	1.140049
1.15		+0.037				+0.049	+0.046	+0.049	+0.038	0.012	0.050	1.150037
1.16		+0.018				+0.020	+0.025	+0.028	+0.015	0.013	0.050	1.160018
1.17		+0.056				+0.055	+0.052	+0.062	+0.050	0.012	0.050	1.170056
1.18		-0.040				-0.041	-0.034	-0.046	-0.039	0.012	0.050	1.179960
1.19		+0.031				+0.033	+0.030	+0.045	+0.022	0.023	0.050	1.190031
1.20		-0.039				-0.043	-0.038	-0.025	-0.035	0.018	0.050	1.199961
1.21		-0.032				-0.042	-0.043	-0.040	-0.050	0.018	0.050	1.209968
1.22		+0.060				+0.042	+0.052	+0.060	+0.035	0.025	0.050	1.220060
1.23		+0.019				+0.009	+0.019	+0.022	+0.012	0.013	0.050	1.230019
1.24		+0.002				-0.002	+0.005	-0.005	-0.010	0.015	0.050	1.240002
1.25		+0.026				+0.018	+0.031	+0.013	+0.026	0.018	0.050	1.250026

Starrett
24500 Detroit Rd., Cleveland, Ohio 44145



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Make WEBBER 88
Style RECTANGULAR, CERAMIC
Grade 889 00

P.O. No.

MFG No. 110107.3
OWN No. NONE
Etch Y1A3A

MARKED SIZE	TOL TMD	REF PT (um)	ETCH-ID	MT GRD	DEVIATION AT AUXILIARY POINTS				VARI	UNCERT	CALCULATED SIZE
					1	2	3	4			
9.0		+0.021			+0.021	+0.023	+0.026	+0.023	0.005	.050	9.000021
9.5		+0.011			+0.014	+0.017	+0.020	+0.009	0.011	.050	9.500011
10.0		-0.025			-0.021	-0.024	-0.026	-0.026	0.005	.050	9.999975
20.0		+0.018			+0.020	+0.014	+0.014	+0.012	0.008	.050	20.000018
30.0		-0.040			-0.043	-0.040	-0.056	-0.045	0.016	.075	29.999960
40.0		+0.051			+0.054	+0.049	+0.049	+0.043	0.011	.080	40.000051
50.0		+0.019			+0.024	+0.029	+0.042	+0.002	0.040	.085	50.000019
60.0		+0.025			+0.028	+0.021	+0.006	+0.049	0.043	.095	60.000025
70.0		+0.065			+0.061	+0.069	+0.053	+0.064	0.016	.100	70.000065
80.0		+0.044			+0.034	+0.037	+0.053	+0.065	0.067	.110	80.000044
90.0		-0.038			-0.027	-0.014	-0.072	-0.027	0.058	.115	89.999962
100.0		+0.116			+0.106	+0.114	+0.081	+0.108	0.035	.120	100.000116

Original Calibration: 12/05/07 Operator: GM
Transfer Master Set: C-IM Calibrated 08/25/07, Next Due 08/31/08, Instrument: EC-17 Electronic Gage Block Comparator, Calibrated daily.

This certificate may not be copied, except in full, without the written consent of the Weber Gage Division.
Calibration data is "As Found" unless otherwise noted. Calibration in accordance with ISO 17025, ISO Guide 25, ISO 10012-1, ANSI/NCSL Z540-1, former MIL-STD-45662A, relevant requirements of ISO 9002, Wehber Quality Control Manual QCM-1F dated 9/28/01 with Change-6 04/12/06 Wehber Calibration Procedure MCP-C14 02/28/02.
Wehber Gage certifies these gage blocks were checked by masters traceable to the National Institute of Standards and Technology on APR 27, 2007 Test No. 821/274921-07.
Reported readings corrected to 68 degrees Fahrenheit (20 degrees C).
Tolerances in accordance with 889 grade 00.

Measured attributes checked for conformance to specifications, no allowance for uncertainty.

SIZE	SIZE TOL	VAR	SIZE	SIZE TOL	VAR	SIZE	SIZE TOL	VAR	SIZE	SIZE TOL	VAR
THRU 0.5	+1.0/-1.10	0.0	THRU 75.0	+1.12/-1.12	0.0	THRU 250.0	+1.30/-1.30	0.1	HALF ROUND	+1.80/-1.80	0.3
THRU 10.0	+1.07/-1.07	0.0	THRU 100.0	+1.15/-1.15	0.0	THRU 300.0	+1.35/-1.35	0.1	STRAIGHT JAW	+1.60/-1.60	0.3
THRU 25.0	+1.07/-1.07	0.0	THRU 150.0	+1.20/-1.20	0.0	THRU 400.0	+1.45/-1.45	0.1	BASE BLOCK	+1.60/-1.60	0.3
THRU 50.0	+1.10/-1.10	0.0	THRU 200.0	+1.25/-1.25	0.0	THRU 500.0	+1.50/-1.50	0.1	MEASURE JAW	+1.60/-1.60	0.3

Uncertainty for Variation in Length (VARI) is: .03 um thru 75 mm / .04 um thru 200 mm / .05 um thru 500 mm
NVLAP accreditation does not represent an endorsement of any product by NVLAP or any agency of the U.S. Government.

AUTHORIZED SIGNATORS: Carl F. Stearns Quality Assurance Mgr, or
David D. Friedel General Manager



Certificate of Calibration

No. 95-18934-A APR 3, 1995 Page 1 of 1

24500 Detroit Rd., Cleveland, Ohio 44145

Make WEBBER 8814 W/A.C.C.
Style SQUARE, CROBLUX
Grade 2

Property of LAWRENCE BERKELEY LABS
BERKELEY, CA.
P.O. No. 59939A2

IFG Serial 92683.4
OWN Serial 027290023
Ech 2L85

MARKED SIZE	* ERROR NO.	IDENT	MARKED SIZE	* ERROR NO.	IDENT	MARKED SIZE	* ERROR NO.	IDENT	MARKED SIZE	* ERROR NO.	IDENT
.100025	+1		.119	+4		.149	0		.250HR	-12	#1
.10005	0		.120	+1		.050	-1		.250HR	+6	#2
.100075	-1		.121	+1		.100	-2		.500SJ	-2	#1
.1001	-1		.122	+3		.150	+2		.500SJ	0	#2
.1002	0		.123	0		.200	+1		.500RB	+1	#1
.1003	-1		.124	+1		.250	-2		.050	-1	NONE #1
.1004	+2		.125	-2		.300	+1		.050	0	NONE #2
.1005	+1		.126	+1		.350	+1		.100	+1	NONE #1
.1006	0		.127	0		.400	+3		.100	0	NONE #2
.1007	-1		.128	+2		.450	0				
.1008	0		.129	0		.500	+1				
.1009	+2		.130	-1		.550	-2				
.101	0		.131	+1		.600	+1				
.102	+4		.132	0		.650	+3				
.103	+3		.133	+3		.700	-1				
.104	+1		.134	+1		.750	+2				
.105	0		.135	-1		.800	0				
.106	+1		.136	0		.850	+1				
.107	-2		.137	0		.900	+1				
.108	+1		.138	+2		.950	0				
.109	-2		.139	-2		1.000	+3				
.110	-1		.140	+1		2.000	+1				
.111	0		.141	+1		3.000	0				
.112	-2		.142	-4	*	4.000	-2				
.113	+2		.143	0		.0625	+1				
.114	0		.144	+1		.078125	+1				
.115	+1		.145	-1		.09375	-1				
.116	-1		.146	0		.109375	-2				
.117	0		.147	+4		.125HR	+4	#1			
.118	+1		.148	-1		.125HR	0	#2			

Work No: 022666
 Original Calibration: 04/03/95 Operator: DG
 Transfer Master Set: CC Calibrated 08/27/94, Next Due 08/31/95. Instrument: ECG Electronic Gage Block Comparator. Calibrated daily.
 Calibration data is "As Found" unless otherwise noted. These are Used Gages. Calibration in accordance with NIST-45662A and Webber GCH-1C 1/4/88, Change-5 12/21/93.
 Webber Gage certifies these gage blocks were checked by master's traceable to the National Institute of Standards and Technology on MAY 31, 1994 Test No. 821/253616-94.
 Reported readings at 68 degrees Fahrenheit (20 degrees Centigrade). Your suggested recalibration date: APR 3, 1996.

Certificate of Accuracy

7/16-14 UNC 2B GO/NO-GO

TAPERLOCK ASSEMBLY

Part Number 301136540

NIST Number 821/264885-01

Pitch Diameter .3911+0.0003/-.0003

VERMONT GAGE certifies that the accompanying gage is within tolerance of size specified. The calibration system used for measuring equipment meets requirements of ISO 17025. Accuracy is determined by master reference standards which are traceable to NIST. Vermont Gage will replace this gage within thirty (30) days of purchase if found not to be within tolerance. Responsibilities, due to any defects or inaccuracies of this gage or certificate, shall in no event nor for any cause whatsoever exceed the purchase price of this gage.



Norm Leduc
CEO



Vermont Gage

10 Precision Lane
Swanton, VT 05488
Phone (802) 868-2701
Fax (802) 868-7180

E-Mail: vtgage@vermontgage.com
WWW: <http://www.vermontgage.com>

MOJAVE GRANITE COMPANY

Certificate of Inspection

TOTAL DEVIATION FROM TRUE PLANE

ACCURACY ± 00015

REP $\pm .000030$

SERIAL NO. AEC 109706

GRADE AM

SIZE 36

72

DATE 1-11-89

RECALL 1-11-90

TEMPERATURE 70

DEG./F

This MOJAVE GRANITE SURFACE PLATE has been inspected and certified to the above noted accuracy by the use of the Auto Collimator. This instrument detects surface errors optically to .000005" per inch.

Traceability

TRACEABLE TO NATIONAL BUREAU OF STANDARDS

Inspection of this equipment was made by

Watts

Auto Collimator

S/N 170915

Calibrated 6-24-88

N.B.S. Ref.

731/222750

This Auto Collimator was calibrated with measurement standards traceable to the National Bureau of Standards, complying with Federal Specification Mil STD. 45662 6/10/80.

MOJAVE GRANITE CO., INC.

Ray Formkamp

Inspector

MOJAVE GRANITE COMPANY

Certificate of Inspection

TOTAL DEVIATION FROM TRUE PLANE

ACCURACY \pm 000025

12"

SERIAL NO. 11068-0

GRADE AA

SIZE

30"

x

40"

x

5"

DATE

SEPT 15, 1995

MASTER ANGLE

TEMPERATURE

70°

DEG/F

RECALL - SEPT 15, 1996

This MOJAVE GRANITE SURFACE PLATE has been inspected and certified to the above noted accuracy by the use of the Auto Collimator. This instrument detects surface errors optically to .000005" per inch.

Traceability

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

Inspection of this equipment was made by

LEITZ

Auto Collimator

S/N 5673

Calibrated

5/6/95

N.I.S.T. Ref.

821/250082

This Auto Collimator was calibrated with measurement standards traceable to the National Institute of Standards and Technology, Complying with Federal Specification Mil STD. 45662A 8-1-88.

MOJAVE GRANITE CO., INC.

Walter Sanson

Inspector

Buckbee-Mears St. Paul

A UNIT OF BMC INDUSTRIES, INC.

245 East 6th Street
St. Paul, MN 55101
612/228-6400
FAX 612/228-6572

CERTIFICATE OF CALIBRATION

TO: View Engineering, Inc.
1650 North Voyager Avenue
Simi Valley, CA 93063

PART NO. 2008104 Rev. B

AMOUNT: 1 Piece

PART DESCRIPTION:

Calibration Standard - Model 902

PURCHASE ORDER NO. 60662

JOB NO. 236450

SERIAL NO. #6

Buckbee-Mears has traceability to the National Bureau of Standards thru the NBS test numbers 212.21/181100 and NBS reference number M2448.

B/P Specifications

.0800 +/- .0001
.0400 +/- .0001
.0200 +/- .0001
.0100 +/- .0001
.0050 +/- .0001

Calibration Standard Measures

.08007
.04000
.01996
.00994
.00498

MANUFACTURING CERTIFICATION

Buckbee-Mears hereby certifies that the parts supplied conform to and have been manufactured in accordance with the applicable drawings, specifications, process standards and/or military documents as referenced on purchase order and/or supplied drawings. BMC maintains a calibration system that meets the requirement of MIL-STD-45662.

Certified:

State of Minnesota
County of Ramsey

Signed

Dore Lampi
Quality Supervisor
Title

Subscribed & sworn to before

this 31 day of March, 19 93

Mahr

REPORT OF MEASUREMENT

For:

P.O.: STOCK
Model: 2008143
Serial No.: 1922
Tracking #: C-207955
Shop Order #: 327688
Calibration Date: 6/6/05

PRECISION ROUGHNESS SPECIMEN

Using standards whose calibration is traceable to the Standards of the United States, in accordance with National Standard ASME B.46.1-1995 "Surface Texture (Surface Roughness, Waviness, and Lay)" and in accordance with internal procedure No. PMC-SF-2, Rev: F (available upon request), we hereby certify that this Roughness Specimen has been measured and that the parameters measured were as follows:

Roughness Parameters		
Ra	Rz	Rmax
119.2 μ "	390.5 μ "	398.4 μ "
3.03 μ m	9.92 μ m	10.12 μ m

The reported values are the average of measurements taken at five places on the specimen. This measurement was performed using a filter cutoff of $\lambda_c = 0.8$ mm and a stylus with a 5 μ m nominal tip radius. The expanded uncertainty of this measurement ($k = 2$) is estimated to be $\pm 2\mu$ " of the measured values.

Condition	Adjustments	Results
New	None	Accept

Instrument Used	Serial Number	Calibrated On	Calibration Due
Surfalyzer 5000	QC7832	7/15/04	7/15/05

Standards Used	Serial Number	Calibrated On	Calibration Due
Step Master	QC7834	10/10/03	10/10/05

Traceability is through NIST Test Number: 821/269268-03, dated October 10, 2003.

Our calibration system has been assessed and accredited to ISO/IEC 17025 and compliant to ANSI/NCSL Z540 and the above measurements are included within the scope of this accreditation NVLAP Lab Code: 200605-0.

Measurements taken by: Esther Corey
Lab Conditions: Temperature: 68° F \pm 0.2°F / 20°C \pm 0.1°C
Humidity: 40% \pm 10%


Paul Britto

Supervisor, Precision Measurement Center



HEWLETT
PACKARD

Certificate Of Calibration

MIL-STD-45662A / ANSI/NCSL Z540-1-1994

Model No: 5508A
Serial No: 2732A01942
Description: MEASUREMENT DISPLAY
Customer Name: LAWRENCE BERKELEY NATIONAL LAB
Customer P.O. No: MC/DOUGLAS MORTON
Agreement No:
Certificate No: 2451E889801
Customer ID No:

This certifies that the above product was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994 using applicable Hewlett-Packard procedures. This report is not to be reproduced, except in full, without the written approval of the Hewlett-Packard entity listed at the bottom of this page.

At planned intervals, Hewlett-Packard measurement standards are calibrated by comparison to or measurement against national standards, natural physical constants, consensus standards, or by ratio type measurements using self-calibrating techniques.

National standards are administered by NIST (National Institute of Standards and Technology) or other recognized national standards laboratories.

Pre-calibration testing found your instrument was IN-SPECIFICATION. No adjustment was necessary to ensure performance to published operating specifications. All required test data is included with this certificate.

Supporting documentation relative to traceability is on file and is available for examination upon request.

The HP recommended calibration interval is 12 months and the calibration due date based on this interval is 08-Apr-1999.

Temperature: 23°C

Relative Humidity: 45%

Remarks or special requirements:

THIS DISPLAY HAS ONE MATERIAL TEMP. SENSOR S/N 2415A00766 MATCHED TO IT FOR THE ENHANCED TEMPERATURE SPEC OF +/- 0.1DEGC, VS THE +/- 0.35DEGC SPEC FOR AN UNMATCHED CALIBRATION.

Calibration Date: 08-Apr-1998

Hewlett-Packard Company

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Roseville, CA. 95747 • (800) 403-0801



HEWLETT
PACKARD

Certificate Of Calibration

MIL-STD-45662A / ANSI/NCSL Z540-1-1994

Model No: 10757A
Serial No: 2415A00766
Description: MATERIAL TEMPERATURE SENSOR
Customer Name: LAWRENCE BERKELEY NATIONAL LAB
Customer P.O. No: MC/DOUGLAS MORTON
Agreement No:
Certificate No: 2451E889803
Customer ID No:

This certifies that the above product was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994 using applicable Hewlett-Packard procedures. This report is not to be reproduced, except in full, without the written approval of the Hewlett-Packard entity listed at the bottom of this page.

At planned intervals, Hewlett-Packard measurement standards are calibrated by comparison to or measurement against national standards, natural physical constants, consensus standards, or by ratio type measurements using self-calibrating techniques.

National standards are administered by NIST (National Institute of Standards and Technology) or other recognized national standards laboratories.

Initial testing found your instrument OUT-OF-SPECIFICATION. Adjustment and(or) repair was performed to bring your instrument to within published operating specifications.

Supporting documentation relative to traceability is on file and is available for examination upon request.

The HP recommended calibration interval is 12 months and the calibration due date based on this interval is 08-Apr-1999.

Temperature: 23°C

Relative Humidity: 45%

Remarks or special requirements:

THIS MATERIAL TEMPERATURE SENSOR IS MATCHED TO CUSTOMERS DISPLAY, S/N 2732A01942 FOR THE ENHANCED TEMPERATURE SPEC OF +/- 0.1DEGC.

Calibration Date: 08-Apr-1998

Hewlett-Packard Company

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PACKARD

Certificate Of Calibration

MIL-STD-45662A / ANSI/NCSL Z540-1-1994

Model No: 10757A
Serial No: 2415A00766
Description: MATERIAL TEMPERATURE SENSOR
Customer Name: LAWRENCE BERKELEY NATIONAL LAB
Customer P.O. No: MC/DOUGLAS MORTON
Agreement No:
Certificate No: 2451E889803
Customer ID No:

Calibration Equipment Used:

<u>Model Number</u>	<u>Model Description</u>	<u>Trace Number</u>	<u>Cal Due Date</u>
18111A	LAB PROBE	18111A04389	02-Mar-1999
18111A	LAB PROBE	18111A04398	02-Mar-1999

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Certificate Of Calibration

MIL-STD-45662A / ANSI/NCSL Z540-1-1994

Model No: 10751A
Serial No: 2452A00960
Description: AIR SENSOR
Customer Name: LAWRENCE BERKELEY NATIONAL LAB
Customer P.O. No: MC/DOUGLAS MORTON
Agreement No:
Certificate No: 2451E889804
Customer ID No:

This certifies that the above product was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994 using applicable Hewlett-Packard procedures. This report is not to be reproduced, except in full, without the written approval of the Hewlett-Packard entity listed at the bottom of this page.

At planned intervals, Hewlett-Packard measurement standards are calibrated by comparison to or measurement against national standards, natural physical constants, consensus standards, or by ratio type measurements using self-calibrating techniques.

National standards are administered by NIST (National Institute of Standards and Technology) or other recognized national standards laboratories.

Pre-calibration testing found your instrument was IN-SPECIFICATION. No adjustment was necessary to ensure performance to published operating specifications. All required test data is included with this certificate.

Supporting documentation relative to traceability is on file and is available for examination upon request.

The HP recommended calibration interval is 12 months and the calibration due date based on this interval is 08-Apr-1999.

Temperature: 23°C

Relative Humidity: 45%

Remarks or special requirements:

Calibration Date: 08-Apr-1998

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PACKARD

Certificate Of Calibration

MIL-STD-45662A / ANSI/NCSL Z540-1-1994

Model No: 10751A
Serial No: 2452A00960
Description: AIR SENSOR
Customer Name: LAWRENCE BERKELEY NATIONAL LAB
Customer P.O. No: MC/DOUGLAS MORTON
Agreement No:
Certificate No: 2451E889804
Customer ID No:

Calibration Equipment Used:

<u>Model Number</u>	<u>Model Description</u>	<u>Trace Number</u>	<u>Cal Due Date</u>
DHIA0015	REFERENCE PRESSURE MONITOR	RPM1A001542029	17-Sep-1998
18111A	LAB PROBE	18111A04389	02-Mar-1999
18111A	LAB PROBE	18111A04398	02-Mar-1999

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Certificate Of Calibration

MIL-STD-45662A / ANSI/NCSL Z540-1-1994

Model No: 5518A
Serial No: 2532A02274
Description: LASER HEAD
Customer Name: LAWRENCE BERKELEY NATIONAL LAB
Customer P.O. No: MC/DOUGLAS MORTON
Agreement No:
Certificate No: 2451E889802
Customer ID No:

This certifies that the above product was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994 using applicable Hewlett-Packard procedures. This report is not to be reproduced, except in full, without the written approval of the Hewlett-Packard entity listed at the bottom of this page.

At planned intervals, Hewlett-Packard measurement standards are calibrated by comparison to or measurement against national standards, natural physical constants, consensus standards, or by ratio type measurements using self-calibrating techniques.

National standards are administered by NIST (National Institute of Standards and Technology) or other recognized national standards laboratories.

Pre-calibration testing found your instrument was IN-SPECIFICATION. No adjustment was necessary to ensure performance to published operating specifications. All required test data is included with this certificate.

Supporting documentation relative to traceability is on file and is available for examination upon request.

The HP recommended calibration interval is 12 months and the calibration due date based on this interval is 08-Apr-1999.

Temperature: 23°C

Relative Humidity: 45%

Remarks or special requirements:

UNIT FAILED RECEIVER GAIN TEST; HOWEVER, THIS WILL NOT AFFECT THE ACCURACY OF THE READINGS DISPLAYED.

Calibration Date: 08-Apr-1998

Hewlett-Packard Company

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HEWLETT
PACKARD

Certificate Of Calibration

MIL-STD-45662A / ANSI/NCSL Z540-1-1994

Model No: 5518A
Serial No: 2532A02274
Description: LASER HEAD
Customer Name: LAWRENCE BERKELEY NATIONAL LAB
Customer P.O. No: MC/DOUGLAS MORTON
Agreement No:
Certificate No: 2451E889802
Customer ID No:

Calibration Equipment Used:

<u>Model Number</u>	<u>Model Description</u>	<u>Trace Number</u>	<u>Cal Due Date</u>
5501B	LASER HEAD	5501B10002	09-Mar-1999

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HEWLETT
PACKARD

Certificate Of Calibration

MIL-STD-45662A / ANSI/NCSL Z540-1-1994

Model No: 5508A
Serial No: 2732A01942
Description: MEASUREMENT DISPLAY
Customer Name: LAWRENCE BERKELEY NATIONAL LAB
Customer P.O. No: MC/DOUGLAS MORTON
Agreement No:
Certificate No: 2451E889801
Customer ID No:

Calibration Equipment Used:

<u>Model Number</u>	<u>Model Description</u>	<u>Trace Number</u>	<u>Cal Due Date</u>
3455A	5 OR 6 DIGIT MULTIMETER	3455A10680	24-May-1999

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RENISHAW plc

Old Town, Wotton-under-Edge,
Gloucestershire, GL12 7DH, United Kingdom
Telephone: (01453) 844302
Facsimile: (01453) 844236
Telex: 437120 (RENMET G)
E-Mail: 100073.1164@compuserve.com



CALIBRATION CERTIFICATE No: 2683/02/02

The Laser Measurement System unit(s) identified below have been calibrated in accordance with Renishaw's production acceptance procedures, using test equipment which has itself been calibrated by accredited laboratories, providing traceability to UK national standards. The procedures comply with the requirements of British Standards Specification BS 5781/International Standard ISO 10012-1.

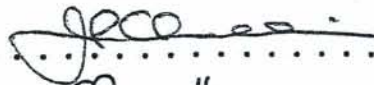
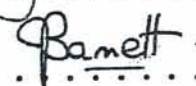
When correctly operated and maintained in good repair and within calibration, the unit(s) identified are capable of operating to a measurement accuracy as defined by the system specification.

SYSTEM IDENTIFICATION:

- | | |
|---|-------------------|
| <input type="checkbox"/> EC10 COMPENSATION UNIT | SERIAL No: G15107 |
| <input type="checkbox"/> AIR TEMPERATURE SENSOR | SERIAL No: G13742 |
| <input type="checkbox"/> MATERIAL TEMPERATURE SENSOR(S) | SERIAL No: G11875 |

The recommended recalibration period for an ML10 Laser is 3 years.
The recommended recalibration period for an EC10 is 12-15 months.

Verification Date is date of calibration of EC10
Authorisation Date is date of issue of certificate

Verified:		Date: 3 April 1995
Authorised:		Date: 6 April 1995

RTS/CAL/03/01



CERTIFICATE OF CALIBRATION

This is to certify that Q 3000, Serial Number 142 was tested per

System Type

VIEW Full Matrix 2D Verification Test Procedure 3671372

and was found to meet the accuracy requirements as defined in Specification 3671209-1 at the time the test was performed. The glass master used to perform this test Serial Number FD C 9132 15281 is certified traceable to NIST by No. 213.12/214924a or No. 731.247662-91 in accordance with MIL-STD 45662A. The verification data and certification data of the artifact used in the calibration process are on file at:

General Scanning Inc., View Engineering Division

1650 N. Voyager Avenue
Simi Valley, CA 93063

Date: 10/15/99 Certified by: D. Bunker Next Date of Calibration: 10/199

A recalibration interval of one year is recommended.



100 S. Alloy Drive Fenton, MI 48430
 Phone: 810-750-6474 Fax: 810-750-6745

1456 Wallace Road, Unit 1 Oakville, Ont. L6L 2Y2
 Phone: 905-469-5990 Fax: 905-469-5991

Cert # 2909

CERTIFICATE OF CALIBRATION

CUSTOMER		Lawrence Berkeley National Lab				W.O.#	01-0984
STREET		#1 Cyclotron Rd. Bldg. 77 RM 125				CITY	Berkeley
STATE	CA	ZIP	94701	PHONE	510-486-7611	DATE	9/27/01
CONTACT		Bob Conners		ENGINEER		Mike Keene	
MANF. /MODEL #		Fanamation 606040		SERIAL #		136	
LINEAR		SPEC.		BEFORE		EQUIPMENT	
X AXIS		.012 mm		N/A		HP Laser	
Y AXIS		.012 mm		N/A		HP Laser	
Z AXIS		.012 mm		N/A		HP Laser	
GEOMETRY							
X/Y AXES		2.0 arc sec		N/A		Ball Bar	
Z/Y AXES		2.0 arc sec		N/A		Ball Bar	
Z/X AXES		2.0 arc sec		N/A		Ball Bar	
VOLUMETRIC							
X/Y/Z AXES		.020 mm		N/A		Ball Bar	
REPEATABILITY							
X AXIS		.004 mm		N/A		TP2 & Sphere	
Y AXIS		.004 mm		N/A		TP2 & Sphere	
Z AXIS		.004 mm		N/A		TP2 & Sphere	
TEMP.DURING CALIBRATION		Max.20.87°C		Min.20.83°C		Avg.20.85°C	
MACH.CONDITION ok							
CALIBRATION SOURCE: Equipment				Serial Number		Calibration Due Date	
HP Laser				Customer's		N/A	
Ball Bar						8/7/02	
CALIBRATION PROCEDURE: Standard							

This certifies that your instrument has been tested in accordance with applicable national, international and Omni-Tech specifications and standards. All referenced equipment used in this test is calibrated and traceable to national and/or international standards. All elements of the calibration procedure performed and stated on this certification are recognized national, international and/or validated test methods by Omni-Tech. The test uncertainty ratio is N/A at a confidence level of N/A. All actual test data collected during this test are on file and available upon request. These recorded results relate only to this equipment, environmental conditions and instrument condition at the time of calibration. This certificate may be reproduced only in its entirety, with written permission from Omni-Tech.

Signature: _____

CMM Calibration Due: _____

9/28/02

As defined by customer

QAF015

4/26/01