

Calibration Certificate

Part Description: Quantum Certification Date: 2011-10-28 Serial#: Q08-05-10-26123
Single Point - (Max-Min)/2 Specification: Q08-05 0.02mm (0.0008") Certificate#: Q08051026123-6252015-946A
Volumetric (Max Deviation) Specification: Q08-05 +/-0.028mm (+/-0.0011") Temperature: See attached data

Measurement Standards Traceability

Kinematic Scale Bar - Short	Asset Number: TQ1598	Calibration Due: 12/15/2011	*SI Traceability: 58be7508-9b57-42ad-bf59-7b614b3d1409
Kinematic Scale Bar - Long	Asset Number: TQ1594	Calibration Due: 12/15/2011	*SI Traceability: b5bf3516-0184-452a-942f-7628b428004b
Thermometer	Asset Number: TQ1227	Calibration Due: 6/14/2013	*SI Traceability: DK-15070-01-012011-02
Calibration Probe	Asset Number: TQ1836	Calibration Due: 2/17/2012	*SI Traceability: 1154/DKD-K-44301/2010-08
Reference Sphere	Asset Number: TQ528	Calibration Due: 2/17/2012	*SI Traceability: 1152/DKD-K-44301/2010-08

The artifacts above have 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. Calibration was performed following procedure listed on 07MAN015. This procedure was developed in accordance with ASME B89.4.22-2004. See attached data for measurement results

Calibration Results*

3 Single Point Articulation Tests at <=20%, 20%-80% and >=80% range.	PASSED
1 Effective diameter sphere test.	PASSED
20 Volumetric ball bar tests in 4 quadrants and 2 orientations.	PASSED

Instrument condition as received:

Refurbished

Instrument condition outgoing:

Within specifications

This certificate invalidates all other certificates generated before: 6/25/2015 9:46:12 AM
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.

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Germany





Serial Number: Q08-05-10-26123

Date: 2011-10-28

Effective Diameter Performance Test Results

Test	Quadrant	Calibrated Diameter (Dcal)	Reference Temperature (Tref)	CTE (PPM)	Measured Temperature (Tmea)	Adjusted Diameter (Dadj)*	Measured Diameter (Dm)	Diameter Deviation (Dm-Dadj)	Test Results	
1	3/4	25.4008	20.0	10.2	22.6	25.4008	25.3954	-0.0054	Passed	
2	3/4	25.4008	20.0	10.2	22.6	25.4008	25.3980	-0.0028	Passed	
3	3/4	25.4008	20.0	10.2	22.6	25.4008	25.3980	-0.0028	Passed	
								Maximum Deviation	0.0054	Passed
								Effective Diameter Specification	0.0100	

* Dadj = Dcal x (1 + ((CTE/1,000,000) x (Tmea - Tref)))

Measurement Uncertainty is 1 micrometer

Single Point Articulation Performance Test Results

Region	Quadrant	(Max-Min)/2	Test Results
< 20%	1/2	0.0106	Passed
20-80%	3/4	0.0052	Passed
>80%	2/3	0.0070	Passed
Maximum		0.0106	Passed
Single Point Specification		0.0200	

Measurement Uncertainty is 0.41 micrometer

Volumetric Performance Test Results

Quadrant	Position	Calibrated Length (Lcal)	Reference Temperature (Tref)	CTE (PPM)	Measured Temperature (Tmea)	Adjusted Length (Ladj)**	Measured Length (Lm)	Length Deviation (Lm-Ladj)	Test Results	
1	Flat	649.8182	17.9	0.1	22.6	649.8185	649.8328	0.0142	Passed	
1	Flat	1499.7336	17.9	0.1	22.6	1499.7345	1499.7336	-0.0009	Passed	
2	Flat	649.8182	17.9	0.1	22.6	649.8185	649.8310	0.0125	Passed	
2	Flat	1499.7336	17.9	0.1	22.6	1499.7345	1499.7291	-0.0054	Passed	
3	Flat	649.8182	17.9	0.1	22.6	649.8185	649.8300	0.0115	Passed	
3	Flat	1499.7336	17.9	0.1	22.6	1499.7345	1499.7332	-0.0013	Passed	
4	Flat	649.8182	17.9	0.1	22.6	649.8185	649.8326	0.0140	Passed	
4	Flat	1499.7336	17.9	0.1	22.6	1499.7345	1499.7330	-0.0015	Passed	
1	45°	649.8182	17.9	0.1	22.6	649.8185	649.8149	-0.0036	Passed	
1	45°	1499.7336	17.9	0.1	22.6	1499.7345	1499.7462	0.0117	Passed	
2	45°	649.8182	17.9	0.1	22.6	649.8185	649.8064	-0.0121	Passed	
2	45°	1499.7336	17.9	0.1	22.6	1499.7345	1499.7393	0.0048	Passed	
3	45°	649.8182	17.9	0.1	22.6	649.8185	649.8117	-0.0068	Passed	
3	45°	1499.7336	17.9	0.1	22.6	1499.7345	1499.7418	0.0073	Passed	
4	45°	649.8182	17.9	0.1	22.6	649.8185	649.8125	-0.0060	Passed	
4	45°	1499.7336	17.9	0.1	22.6	1499.7345	1499.7443	0.0098	Passed	
1	Vertical	649.9803	17.9	0.1	22.6	649.9807	649.9899	0.0092	Passed	
2	Vertical	649.9803	17.9	0.1	22.6	649.9807	649.9865	0.0058	Passed	
3	Vertical	649.9803	17.9	0.1	22.6	649.9807	649.9856	0.0049	Passed	
4	Vertical	649.9803	17.9	0.1	22.6	649.9807	649.9845	0.0038	Passed	
								Maximum Deviation	0.0142	Passed
								Volumetric Specification	0.0280	

** Ladj = Lcal x (1 + ((CTE/1,000,000) x (Tmea - Tref)))

Measurement Uncertainty is 3.5 micrometer*

Uncertainty is expressed at approximately a 95% Level of Confidence using k=2.00.



FaroArm Serial Number: Q08-05-10-26123
Firmware Version: 312

FaroArm Temperature: 24.73
Probe: Ball Probe X: -.082 Y: .063 Z: 222.576
Probe 2*Sigma: 0.009915079
Date of Test: 10/28/2011
Number of Points Taken: 10

Maximum X: 20.11498833
Minimum X: 20.09383965
(Max-Min)/2: 0.010574341

Maximum Y: -122.9977493
Minimum Y: -123.0098419
(Max-Min)/2: 0.006046295

Maximum Z: 717.5678711
Minimum Z: 717.5621338
(Max-Min)/2: 0.002868652

Index	X (mm)	Y (mm)	Z (mm)
1	20.11498833	-122.9977493	717.5638428
2	20.11272621	-123.0025406	717.566604
3	20.11086655	-123.0048523	717.5662842
4	20.1094017	-123.0078125	717.5621338
5	20.11030769	-123.0086288	717.5621948
6	20.10263634	-123.0096664	717.5635376
7	20.10070992	-123.0098419	717.5640259
8	20.09795189	-123.0080643	717.5664673
9	20.09800148	-123.0073242	717.5678711
10	20.09383965	-123.0035934	717.5675049



FaroArm Serial Number: Q08-05-10-26123
Firmware Version: 312

FaroArm Temperature: 24.78

Probe: Ball Probe X: -.082 Y: .063 Z: 222.576

Probe 2*Sigma: 0.009915079

Date of Test: 10/28/2011

Number of Points Taken: 10

Maximum X: -171.9765625

Minimum X: -171.9867554

(Max-Min)/2: 0.005096436

Maximum Y: -263.7886047

Minimum Y: -263.7934875

(Max-Min)/2: 0.002441406

Maximum Z: -194.1556091

Minimum Z: -194.1659698

(Max-Min)/2: 0.005180359

Index	X (mm)	Y (mm)	Z (mm)
1	-171.9839783	-263.7886047	-194.1586609
2	-171.9867554	-263.7908325	-194.1586609
3	-171.986145	-263.7893677	-194.1556091
4	-171.9814911	-263.7911377	-194.1566467
5	-171.980011	-263.7932129	-194.1599579
6	-171.982193	-263.7934875	-194.1599579
7	-171.980835	-263.7914734	-194.1595154
8	-171.9765625	-263.7911377	-194.1659698
9	-171.9780121	-263.7920532	-194.1630402
10	-171.977005	-263.7915039	-194.1649628



FaroArm Serial Number: Q08-05-10-26123
Firmware Version: 312

FaroArm Temperature: 24.80

Probe: Ball Probe X: -.082 Y: .063 Z: 222.576

Probe 2*Sigma: 0.009915079

Date of Test: 10/28/2011

Number of Points Taken: 10

Maximum X: 741.2630005

Minimum X: 741.2536011

(Max-Min)/2: 0.004699707

Maximum Y: -123.2031784

Minimum Y: -123.2149582

(Max-Min)/2: 0.005889893

Maximum Z: -632.3946533

Minimum Z: -632.4086304

(Max-Min)/2: 0.006988525

Index	X (mm)	Y (mm)	Z (mm)
1	741.2630005	-123.2031784	-632.4006348
2	741.2612915	-123.2035522	-632.4042969
3	741.2596436	-123.2073822	-632.4057617
4	741.2584229	-123.2079086	-632.4059448
5	741.2550049	-123.2093201	-632.4057007
6	741.2536011	-123.2085266	-632.4086304
7	741.2609863	-123.2085953	-632.4017944
8	741.258667	-123.2121735	-632.40271
9	741.2576294	-123.2149582	-632.4016113
10	741.2620239	-123.2145691	-632.3946533