



Metric Equivalents - Dimensional Conversions

Millimeter / Decimal / Fraction Conversion Chart [†]																	
Milli-Meter	Decimal	Fraction (inches)	Milli-Meter	Decimal	Fraction (inches)	Milli-Meter	Decimal	Fraction (inches)	Milli-Meter	Decimal	Fraction (inches)	Milli-Meter	Decimal	Fraction (inches)	Milli-Meter	Decimal	Fraction (inches)
0.1	.0039		4.366	.1719	11/64	8.6	.3386		12.9	.5079		17.1	.6732		21.4	.8425	
0.2	.0079		4.4	.1732		8.7	.3425		13.0	.5118		17.2	.6772		21.431	.8438	27/32
0.3	.0118		4.5	.1772		8.731	.3438	11/32	13.097	.5156	33/64	17.3	.6811		21.5	.8465	
0.397	.0156	1/64	4.6	.1811		8.8	.3465		13.1	.5157		17.4	.6850		21.6	.8504	
0.4	.0157		4.7	.1850		8.9	.3504		13.2	.5197		17.463	.6875	11/16	21.7	.8543	
0.5	.0197		4.763	.1875	3/16	9.0	.3543		13.3	.5236		17.5	.6890		21.8	.8583	
0.6	.0236		4.8	.1890		9.1	.3583		13.4	.5276		17.6	.6929		21.828	.8594	55/64
0.7	.0276		4.9	.1929		9.128	.3594	23/64	13.494	.5313	17/32	17.7	.6968		21.9	.8622	
0.794	.0313	1/32	5.0	.1969		9.2	.3622		13.5	.5315		17.8	.7008		22.0	.8661	
0.8	.0315		5.1	.2008		9.3	.3661		13.6	.5354		17.859	.7031	45/64	22.1	.8701	
0.9	.0354		5.159	.2031	13/64	9.4	.3701		13.7	.5394		17.9	.7047		22.2	.8740	
1.0	.0394		5.2	.2047		9.5	.3740		13.8	.5433		18.0	.7087		22.225	.8750	7/8
1.1	.0433		5.3	.2087		9.525	.3750	3/8	13.891	.5469	35/64	18.1	.7126		22.3	.8780	
1.191	.0469	3/64	5.4	.2126		9.6	.3780		13.9	.5472		18.2	.7165		22.4	.8819	
1.12	.0472		5.5	.2165		9.7	.3819		14.0	.5512		18.256	.7188	23/32	22.5	.8858	
1.3	.0512		5.556	.2188	7/32	9.8	.3858		14.1	.5551		18.3	.7205		22.6	.8898	
1.4	.0551		5.6	.2205		9.9	.3898		14.2	.5591		18.4	.7244		22.622	.8906	57/64
1.5	.0591		5.7	.2244		9.922	.3906	25/64	14.288	.5625	9/16	18.5	.7283		22.7	.8937	
1.588	.0625	1/16	5.8	.2283		10.0	.3937		14.3	.5630		18.563	.7323	47/64	22.8	.8976	
1.6	.0630		5.9	.2323		10.1	.3976		14.4	.5669		18.6	.7344		22.9	.9016	
1.7	.0669		5.953	.2344	15/64	10.2	.4016		14.5	.5709		18.7	.7362		23.0	.9055	
1.8	.0709		6.0	.2362		10.3	.4055		14.6	.5748		18.8	.7402		23.019	.9063	29/32
1.9	.0748		6.1	.2402		10.319	.4063	13/32	14.684	.5781	37/64	18.9	.7441		23.1	.9094	
1.984	.0781	5/64	6.2	.2441		10.4	.4094		14.7	.5787		19.0	.7480		23.2	.9134	
2.0	.0787		6.3	.2480		10.5	.4134		14.8	.5827		19.050	.7500	3/4	23.3	.9173	
2.1	.0827		6.350	.2500	1/4	10.6	.4173		14.9	.5866		19.1	.7520		23.4	.9213	
2.2	.0866		6.4	.2520		10.7	.4213		15.0	.5906		19.2	.7559		23.416	.9219	59/64
2.3	.0906		6.5	.2559		10.716	.4219	27/64	15.081	.5938	19/32	19.3	.7598		23.5	.9252	
2.381	.0938	3/32	6.6	.2598		10.8	.4252		15.1	.5945		19.4	.7638		23.6	.9291	
2.4	.0945		6.7	.2638		10.9	.4291		15.2	.5984		19.447	.7656	49/64	23.7	.9331	
2.5	.0984		6.747	.2656	17/64	11.0	.4331		15.3	.6024		19.5	.7677		23.8	.9370	
2.6	.1024		6.8	.2677		11.1	.4370		15.4	.6063		19.6	.7717		23.813	.9375	15/16
2.7	.1063		6.9	.2717		11.113	.4375	7/16	15.478	.6094	39/64	19.7	.7756		23.9	.9409	
2.778	.1094	7/64	7.0	.2756		11.2	.4409		15.5	.6102		19.8	.7795		24.0	.9449	
2.8	.1102	71	7.1	.2795		11.3	.4449		15.6	.6142		19.844	.7813	25/32	24.1	.9488	
2.9	.1142		7.144	.2813	9/32	11.4	.4488		15.7	.6181		19.9	.7835		24.2	.9567	
3.0	.1181		7.2	.2835		11.5	.4528		15.8	.6220		20.0	.7874		24.209	.9531	61/64
3.1	.1220		7.3	.2874		11.509	.4531	29/64	15.875	.6250	5/8	20.1	.7913		24.3	.9567	
3.175	.1250	1/8	7.4	.2913		11.6	.4567		15.9	.6260		20.2	.7953		24.4	.9606	
3.2	.1260		7.5	.2953		11.7	.4606		16.0	.6299		20.241	.7969	51/64	24.5	.9646	
3.3	.1299		7.541	.2969	19/64	11.8	.4646		16.1	.6339		20.3	.7992		24.6	.9685	
3.4	.1339		7.6	.2992		11.9	.4685		16.2	.6378		20.4	.8031		24.606	.9688	31/32
3.5	.1378		7.7	.3031		11.906	.4688	15/32	16.272	.6406	41/64	20.5	.8071		24.7	.9724	
3.572	.1406	9/64	7.8	.3071		12.0	.4724		16.3	.6417		20.6	.8110		24.8	.9764	
3.6	.1417		7.9	.3110		12.1	.4764		16.4	.6457		20.638	.8125	13/16	24.9	.9803	
3.7	.1457		7.938	.3125	5/16	12.2	.4803		16.5	.6496		20.7	.8150		25.0	.9843	
3.8	.1496		8.0	.3150		12.3	.4843		16.6	.6535		20.8	.8189		25.003	.9844	63/64
3.9	.1535		8.1	.3189		12.303	.4844	31/64	16.669	.6563	21/32	20.9	.8228		25.1	.9882	
3.969	.1563	5/32	8.2	.3228		12.4	.4882		16.7	.6575		21.0	.8268		25.2	.9921	
4.0	.1575		8.3	.3268		12.5	.4921		16.8	.6614		21.034	.8281	53/64	25.3	.9961	
4.1	.1614		8.334	.3281	21/64	12.6	.4961		16.9	.6654		21.1	.8307		25.400	1.00001	
4.2	.1654		8.4	.3307		12.7	.5000	1/2	17.0	.6693		21.2	.8346				
4.3	.1693		8.5	.3346		12.8	.5039		17.066	.6719	43/64	21.3	.8386				

Quick Quote Fax Form

To receive your quote, please complete this form and fax it to us at: 1-540-639-4162. You can also email the information requested in this quote to BALLRFQS@DANAHERMOTION.COM or call our customer service group at 1-540-633-3400.

Material Type				
Size				
Grade				
Quantity				
Estimated Annual Usage				
Other Specifications				

Please provide detailed contact information in case we need clarifications on your quote:

Name: _____

Title: _____

Company: _____

Address: _____

City: _____ State: _____ ZIP: _____ Country: _____

Phone: _____

Fax: _____

E-mail: _____



Quality Assurance

Thomson's A2LA Certified Calibration Lab

The Thomson's A2LA accredited calibration laboratory offers a unique blend of the finest environment of metrology for the calibration of spheres and forty-five years of experience manufacturing Thomson precision balls. The experience assures our customers that the spheres we calibrate for them do not contain any hidden damage which might go undetected by a calibration lab inexperienced in working with spheres.

How Can Our Lab Help You?

If an organization is required to be compliant or registered to TS-16949, it shall meet 7.6.3 for testing, inspection and calibration.

For external laboratories, 7.3.3.2 states that external/commercial/independent laboratory facilities used for inspection, test or calibration services by the organization shall have a defined laboratory scope that includes the capability to perform the required inspection, test or calibration, and that laboratory shall either:

- provide evidence that it is acceptable to the customer, or
- be accredited to ISO/IEC 17025 or national equivalent.

When it is decided that an ISO/IEC accredited lab is preferred, Danaher can meet that obligation.

For example: suppose a facility uses a coordinate axis measuring machine and the check standard is a ball bar. An ISO 17025 accredited calibration laboratory, whose scope of accreditation includes spheres, must calibrate that sphere. The manufacturer of the ball bar may have supplied a calibration for that sphere. However, unless the manufacturer is ISO 17025 compliant and their scope of accreditation includes spheres, their certificate does not meet the requirements of TS-16949.

Danaher Motion's calibration laboratory management system has been audited and found to comply with A2LA guidelines and ISO 17025.

How To Determine Competency

A good indicator of competency for a calibration laboratory is the degree of uncertainty that lab is able to demonstrate. Danaher Motion's metrology lab demonstrates an uncertainty of:

- 8 microinches for diameter calibration
- 0.56 microinches for roundness calibration
- a dead band of less than 4 nanometers for surface finish calibration.

How Do We Achieve These Results?

Our laboratory comparison masters are Tungsten Carbide and have been calibrated by the National Institute of Standards and Technology (NIST) for minimum uncertainty and maximum accuracy. Our gage environment is controlled to be between Class 1000 and Class 10,000 cleanliness levels and temperature is regulated to +/- 0.5 degrees Fahrenheit.

Calibrating Diameter

We measure diameter in accordance with the requirements of ABMA Standard 10.

The instrumentation system consists of proprietary gage amplifiers operating at a range of +/- 0.001 inches with a resolution of +/- 0.000001 inches. The gage heads are mounted on precision comparator stands with a capacity of over 9 inches. The stands have rugged bases for stability and the gage heads are mounted units which allow friction free straight-line motion.

The specimen balls are positioned in custom crafted fixtures that assure the ball will return to the same gage location for each reading. This minimizes any adverse effect of surface condition or parallelism.

Calibrating Ball Sphericity

We measure ball sphericity on our proprietary geometrical gage system. This system uses a design specifically engineered to gage spheres. The holding system for this measurement will accommodate balls from 0.020 inch diameter to 10.00-inch diameter, with the appropriate fixturing. The active elements of the gage system are engineered to minimize any vibration.

Calibrating Surface Finish

We calibrate surface finish on our state of the art surface finish measuring equipment. This equipment is mounted on a vibration isolation table. The standard stylus is conical diamond. However, surface finish metrology is limited only by the ingenuity of the holding fixture. Our gage travel is limited to 50mm. The wavelength of the roughness filter can be as small as 0.0001 inches or as large as 1.0 inches. We are able to evaluate surface finish in as many as 27 different surface finish parameters.

The resolution is approximately four nm, which is only one nm less than the resolution NIST uses to measure surface finish. A NIST calibrated Tungsten Carbide check standard is used to verify the continued performance of the instrument.

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200801-05 ?? KWP 3/1/2008 USA | 20160704SK
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