

GEOMETRIC SYMBOLS AND DEFINITIONS



.002

Individual Features



Related Features

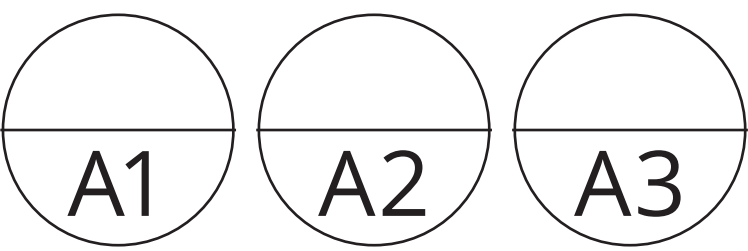
FEATURE CONTROL FRAME

A specification box that shows a particular geometric characteristic (flatness, straightness, etc.) applied to a part feature and states the allowable tolerance. The feature's tolerance may be individual, or related to one or more datums. Any datum references and tolerance modifiers are also shown.



DATUM FEATURE

A flag which designates a physical feature of the part to be used as a reference to measure geometric characteristics of other part features.



DATUM TARGETS

Callouts occasionally needed to designate specific points, lines, or areas on an actual part to be used to establish a theoretical datum feature.

1.500

BASIC DIMENSION

A box around any drawing dimension makes it a "basic" dimension, a theoretically exact value used as a reference for measuring geometric characteristics and tolerances of other part features.



CYLINDRICAL TOLERANCE ZONE

This symbol, commonly used to indicate a diameter dimension, also specifies a cylindrically shaped tolerance zone in a feature-control frame.



MAXIMUM MATERIAL CONDITION (MMC)

A tolerance modifier that applies the stated tight tolerance zone only while the part theoretically contains the maximum amount of material permitted within its dimensional limits (e.g. minimum hole diameters and maximum shaft diameters), allowing more variation under normal conditions.



LEAST MATERIAL CONDITION (LMC)

A tolerance modifier that applies the stated tight tolerance zone only while the part theoretically contains the minimum amount of material permitted within its dimensional limits (e.g. maximum hole diameters and minimum shaft diameters), allowing more variation under normal conditions.



REGARDLESS OF FEATURE SIZE (RFS)

A tolerance modifier that applies the stated tight tolerance zone under all size conditions. RFS is generally assumed if neither MMC or LMC are stated.

.500 (P)

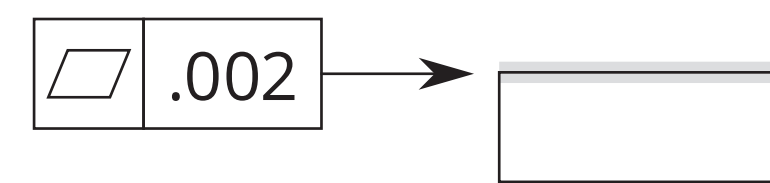
PROJECTED TOLERANCE ZONE

An additional specification box attached underneath a feature-control frame. It extends the feature's tolerance zone beyond the part's surface by the stated distance, ensuring perpendicularity for proper alignment of mating parts.

GEOMETRIC CHARACTERISTICS

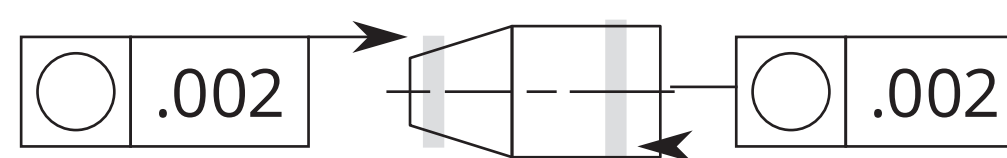
FLATNESS

All points on the indicated surface must lie in a single plane, within the specified tolerance zone.



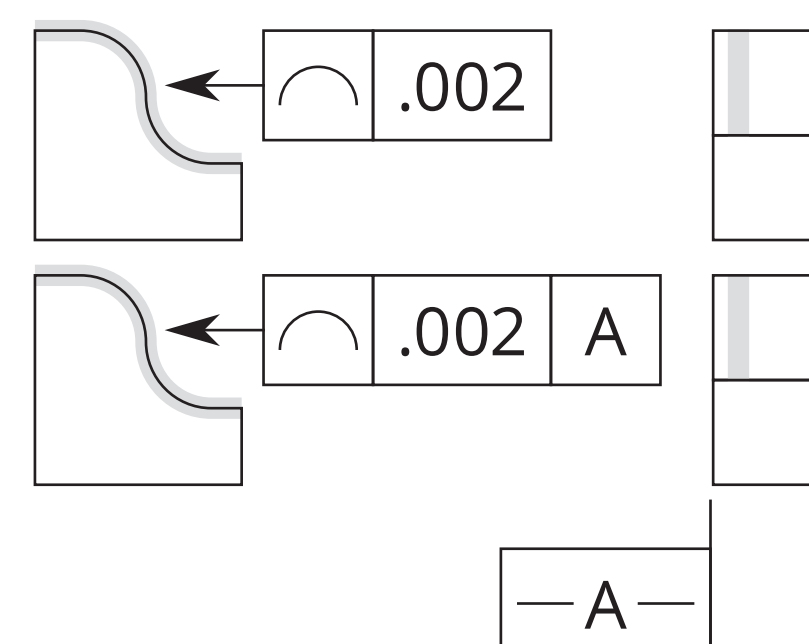
CIRCULARITY (ROUNDNESS)

If the indicated surface were sliced by any plane perpendicular to its axis, the resulting outline must be a perfect circle, within the specified tolerance zone.



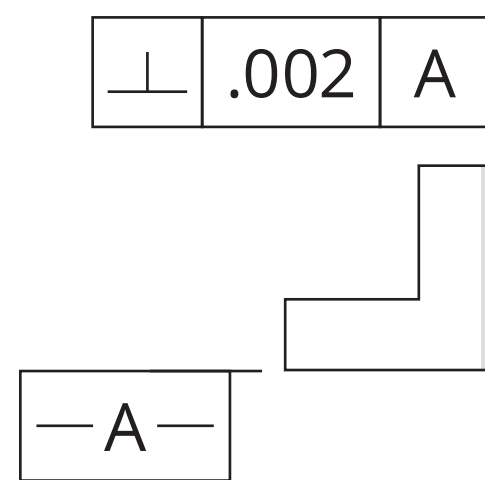
LINEAR PROFILE

All points on any full slice of the indicated surface must lie on its theoretical two-dimensional profile, as defined by basic dimensions, within the specified tolerance zone. The profile may or may not be oriented with respect to datums.



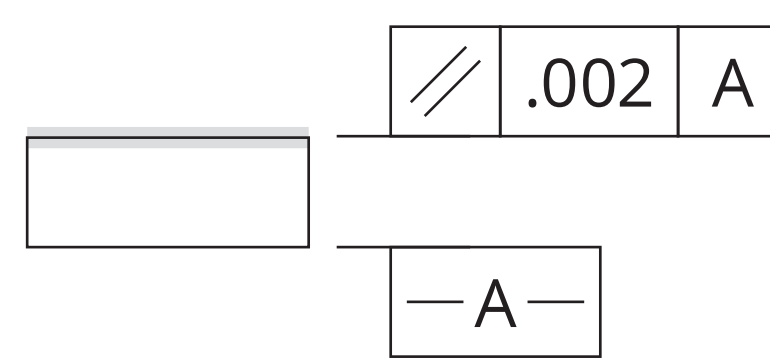
PERPENDICULARITY (SQUARENESS)

All points on the indicated surface, axis, or line must lie in a single plane exactly 90° from the designated datum plane or axis, within the specified tolerance zone.



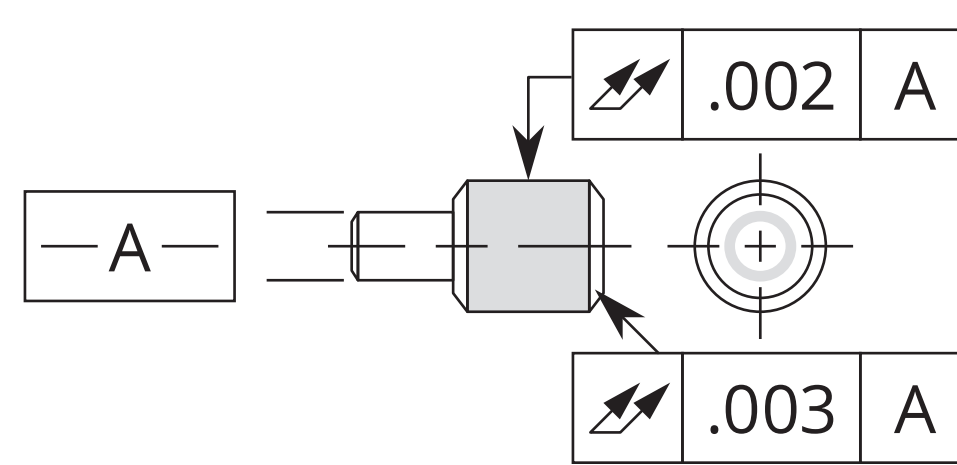
PARALLELISM

All points on the indicated surface or axis must lie in a single plane parallel to the designated datum plane or axis, within the specified tolerance zone.



TOTAL RUNOUT

The entire indicated surface is allowed to deviate only the specified amount from its theoretical form and orientation during 360° rotation about the designated datum axis.

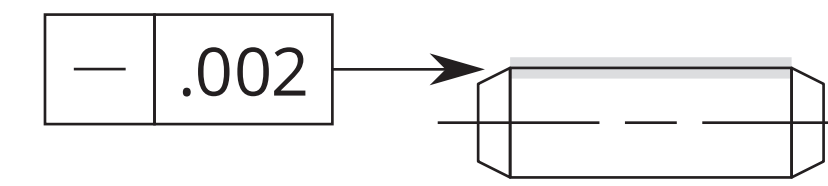


POSITION (REPLACES ≡ SYMMETRY)

The indicated feature's axis must be located within the specified tolerance zone from its true theoretical position, correctly oriented relative to the designated datum plane or axis.

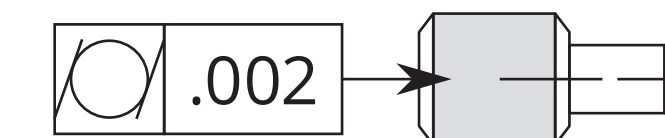
STRAIGHTNESS

All points on the indicated surface or axis must lie in a straight line in the direction shown, within the specified tolerance zone.



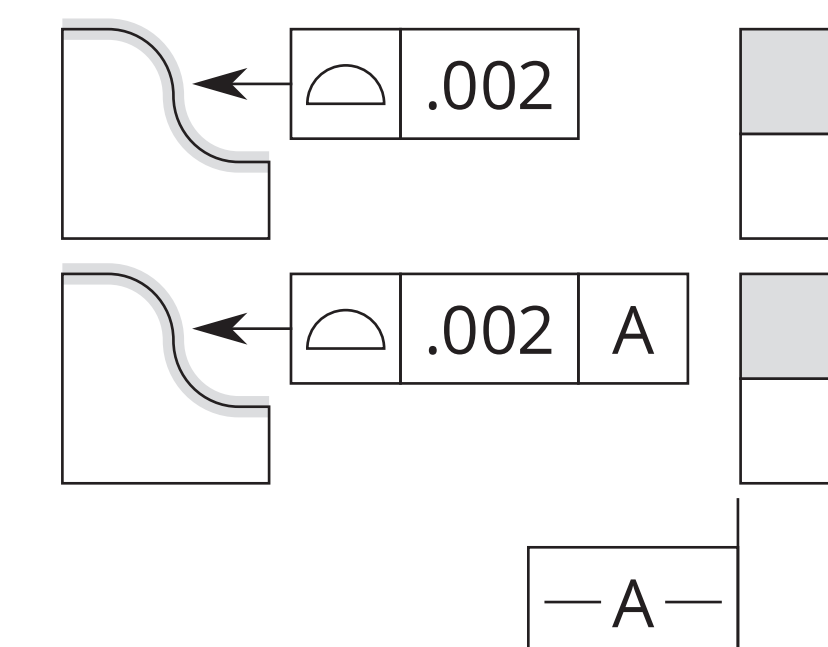
CYLINDRICITY

All points on the indicated surface must lie in a perfect cylinder around a center axis, within the specified tolerance zone.



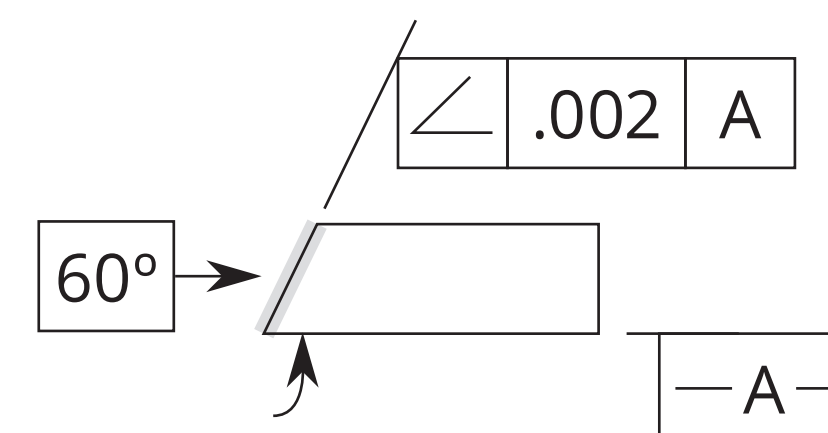
SURFACE PROFILE

All points on the indicated surface must lie on its theoretical three-dimensional profile, as defined by basic dimensions, within the specified tolerance zone. The profile may or may not be oriented with respect to datums.



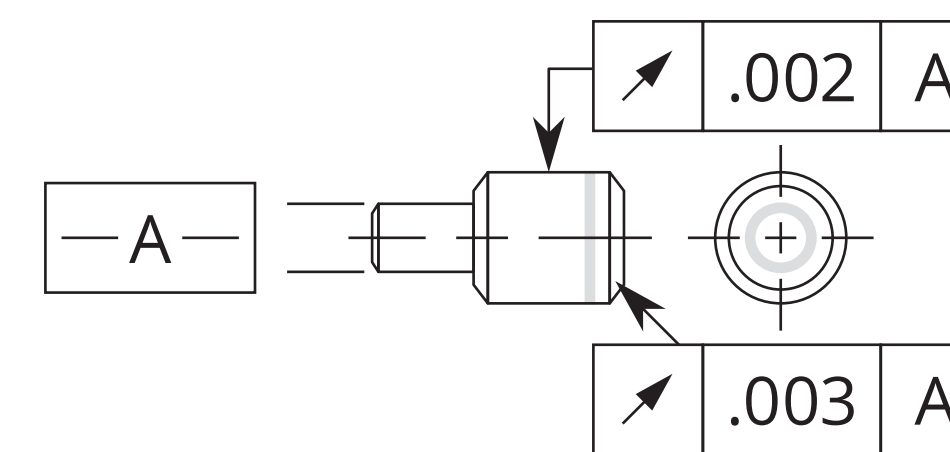
ANGULARITY

All points on the indicated surface or axis must lie in a single plane at exactly the specified angle from the designated datum plane or axis, within the specified tolerance zone.



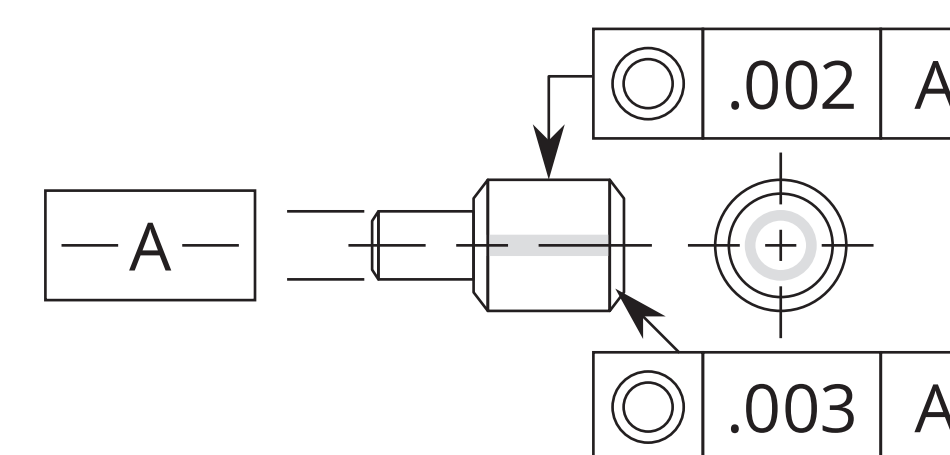
CIRCULAR RUNOUT

Each circular element of the indicated surface is allowed to deviate only the specified amount from its theoretical form and orientation during 360° rotation about the designated datum axis.



CONCENTRICITY

If the indicated surface were sliced by any plane perpendicular to the designated datum axis, every slice's center of area must lie on the datum axis, within the specified cylindrical tolerance zone (controls rotational balance).



DECIMAL EQUIVALENTS

Fraction	Decimal
1/64	.015625
1/32	.03125
3/64	.046875
1/16	.0625
5/64	.078125
3/32	.09375
7/64	.109375
1/8	.125
9/64	.140625
5/32	.15625
11/64	.171875
3/16	.1875
13/64	.203125
7/32	.21875
15/64	.234375
1/4	.25
17/64	.265625
9/32	.28125
19/64	.296875
5/16	.3125
21/64	.328125
11/32	.34375
23/64	.359375
3/8	.375
25/64	.390625
13/32	.40625
27/64	.421875
7/16	.4375
29/64	.453125
15/32	.46875
31/64	.484375
1/2	.5
33/64	.515625
17/32	.53125
35/64	.546875
19/16	.5625
37/64	.578125
19/32	.59375
39/64	.609375
5/8	.625
41/64	.640625
21/32	.65625
43/64	.671875
11/16	.6875
45/64	.703125
23/32	.71875
47/64	.734375
3/4	.75
49/64	.765625
25/32	.78125
51/64	.796875
13/16	.8125
53/64	.828125
27/32	.84375
55/64	.859375
7/8	.875
57/64	.890625
29/32	.90625
59/64	.921875
15/16	.9375
61/64	.953125
31/32	.96875
63/64	.984375
1	1.

