

Flatness Requirements: Standard Tolerance

Flatness defines surface condition not part thickness. See the flatness explanation on the opposite page.

Standard Tolerance is calculated using the largest dimensions defining the area where the tolerance is to be applied. If flatness is to be determined for a circular surface such as the top of a can, the largest dimension is the diameter of the can. If flatness is to be determined for a rectangular area, the largest dimension is a diagonal.

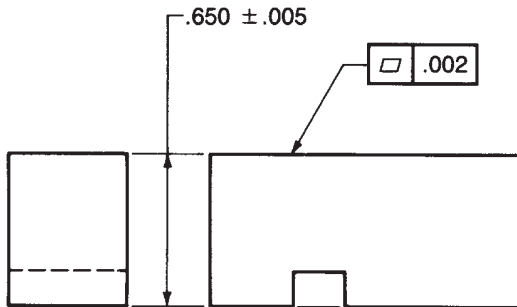
For greater accuracy, see Precision Tolerances for flatness on the opposite page.

Example: Flatness Tolerance - Diagonal

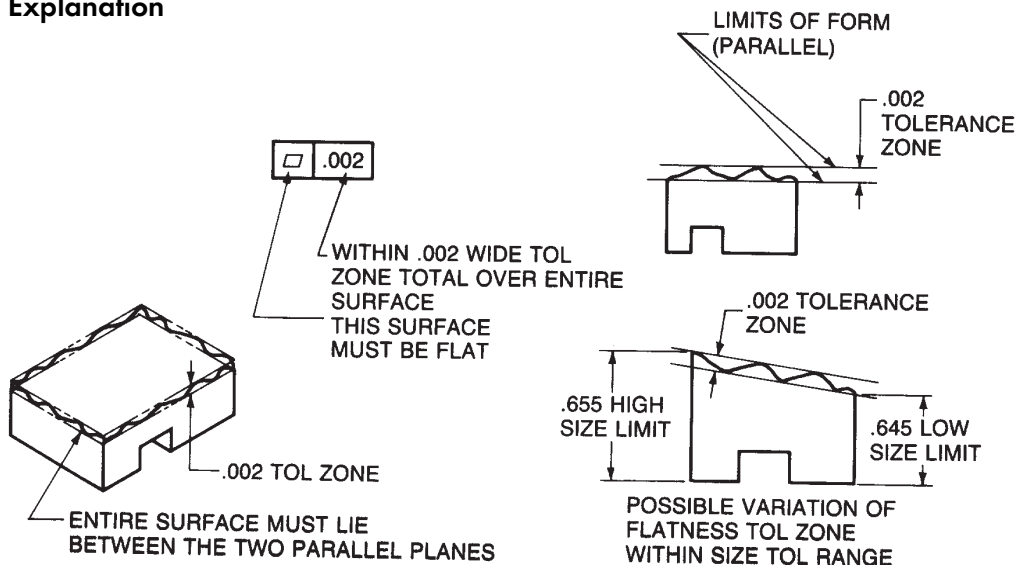
For a part where the diagonal measures 10 inches (254 mm), the maximum Flatness Standard Tolerance from table S-4A-8 is 0.008 inches (0.20 mm) for the first three inches (76.2 mm) plus 0.003 inches (0.08 mm) for each of the additional seven inches for a total Flatness Standard Tolerance of 0.029 inches (0.76 mm).

Maximum Dimension of Die Cast Surface	Tolerance inches (mm)
up to 3.00 in. (76.20 mm)	0.008 (0.20 mm)
Additional tolerance, in. (25.4 mm) for each additional in. (25.4 mm)	0.003 (0.08 mm)

Flatness Example



Explanation



The flatness values shown here represent Standard Tolerances, or normal casting production practice at the most economical level. For greater casting accuracy see Precision Tolerances for this characteristic on the facing page.

Flatness is described in detail in Section 5, Geometric Dimensioning & Tolerancing. Simply put, Flatness Tolerance is the amount of allowable surface variation between two parallel planes which define the tolerance zone. See the figures below.

Flatness of a continuous plane surface on a casting should be measured by a method mutually agreed upon by the designer, die caster and the customer before the start of die design.

Note:

The maximum linear dimension is the diameter of a circular surface or the diagonal of a rectangular surface.

Flatness Design Guidelines:

1. All draft on walls, bosses and fins surrounding and underneath flat surfaces should be standard draft or greater.
2. Large bosses or cross sections can cause sinks and shrinkage distortions and should be avoided directly beneath flat surfaces.
3. Changes in cross section should be gradual and well filleted to avoid stress and shrinkage distortions.
4. Symmetry is important to obtain flatness. Lobes, legs, bosses and variations in wall height can all affect flatness.

Engineering & Design: Coordinate Dimensioning

Precision Tolerance values for flatness shown represent greater casting accuracy involving extra precision in die construction. They should be specified only when and where necessary since additional cost may be involved.

Notes:
The maximum linear dimension is the diameter of a circular surface or the diagonal of a rectangular surface.

Flatness Design Guidelines:

1. All draft on walls, bosses and fins surrounding and underneath flat surfaces should be standard draft or greater.
2. Large bosses or cross sections can cause sinks and shrinkage distortions and should be avoided directly beneath flat surfaces.
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4. Symmetry is important to obtain flatness. Lobes, legs, bosses and variations in wall height can all affect flatness.

Flatness Requirements: Precision Tolerance

The values shown for Precision Tolerance for flatness represent greater casting accuracy involving extra steps in die construction and additional controls in production. They should be specified only when and where necessary since additional costs may be involved.

Even closer tolerances may be held by working with the die caster to identify critical zones of flatness. These areas may be amenable to special die construction to help maintain flatness.

Flatness Explanation

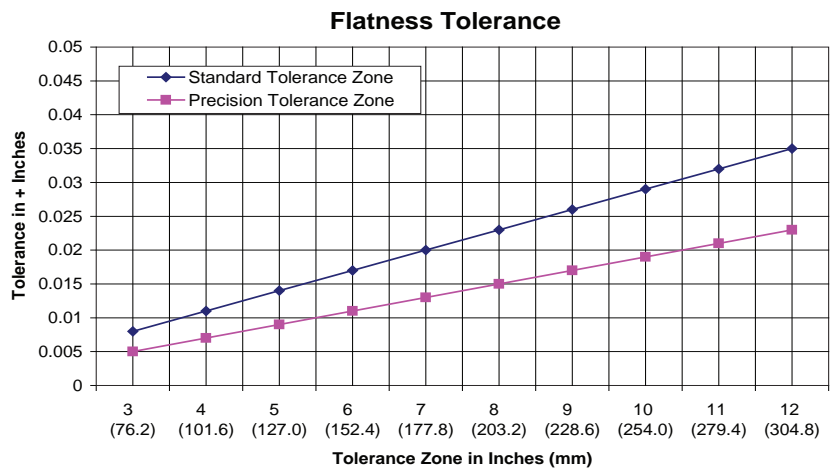
As noted in the explanation diagram, flatness is independent of all other tolerance features including thickness.

Part thickness has a nominal thickness of 0.300 ± 0.010 . Flatness Tolerance is 0.005. Therefore at the high limit thickness the part surface flatness can be between 0.305 and 0.310 nominal thickness flatness can be between 0.300 and 0.305. Low limit thickness flatness can be between 0.290 and 0.295. Flatness can not range between 0.290 and 0.310. Using both high and low thickness in combination with flatness defeats the purpose for specifying flatness.

Example: Flatness Tolerance - Diagonal

For a part where the diagonal measures 10 inches (254 mm), the maximum Flatness Precision Tolerance from table P-4A-8 is 0.005 inches (0.13 mm) for the first three inches (76.2 mm) plus 0.002 inches (0.05 mm) for each of the additional seven inches for a total Flatness Standard Tolerance of 0.019 inches (0.48 mm).

Maximum Dimension of Die Cast Surface	Tolerance inches (mm)
up to 3.00 in. (76.20 mm)	0.005 (0.13 mm)
Additional tolerance, in. (25.4 mm) for each additional in. (25.4 mm)	0.002 (0.05 mm)



Explanation

