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Geometric Dimensioning and Tolerancing

# Profile Controls

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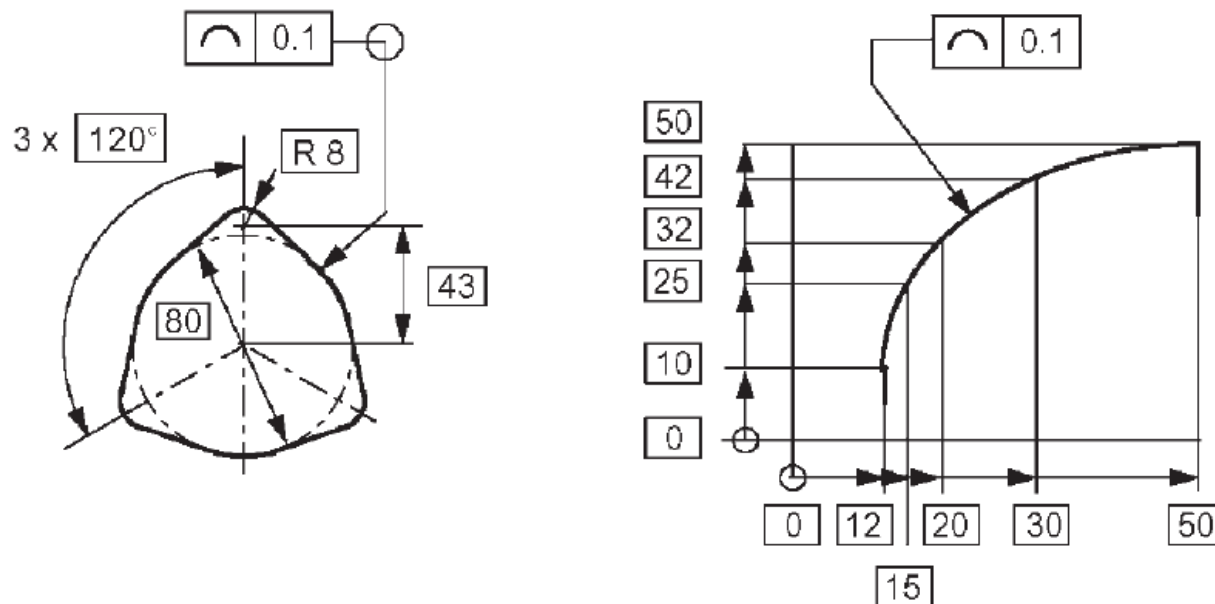
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# Specifying Profile

- A profile is the outline of an object.
- A true profile may be dimensioned with basic size dimensions, basic coordinate dimensions, basic radii, basic angular dimensions, formulas, or undimensioned drawings.

# Controlling Forms of Lines or Surfaces

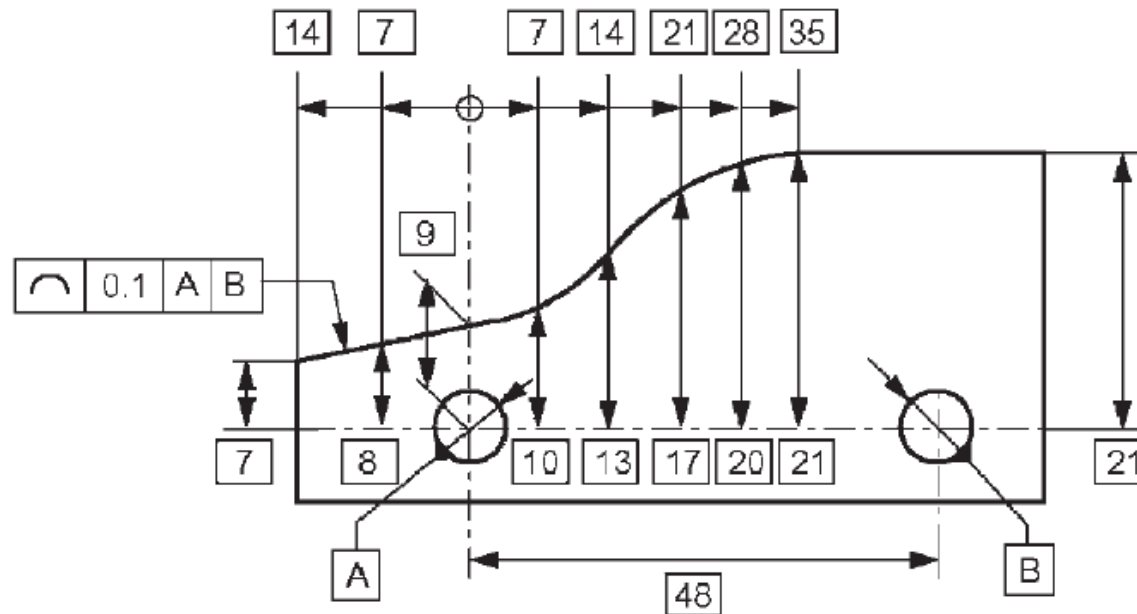
- With profile tolerancing a distinction must be made between tolerancing of the form of lines and of the form of surfaces.



**Fig. 4.1** Profile tolerance of lines; the nominal form is defined by consecutive straight lines and circles defined by theoretical exact dimensions without reference to datums

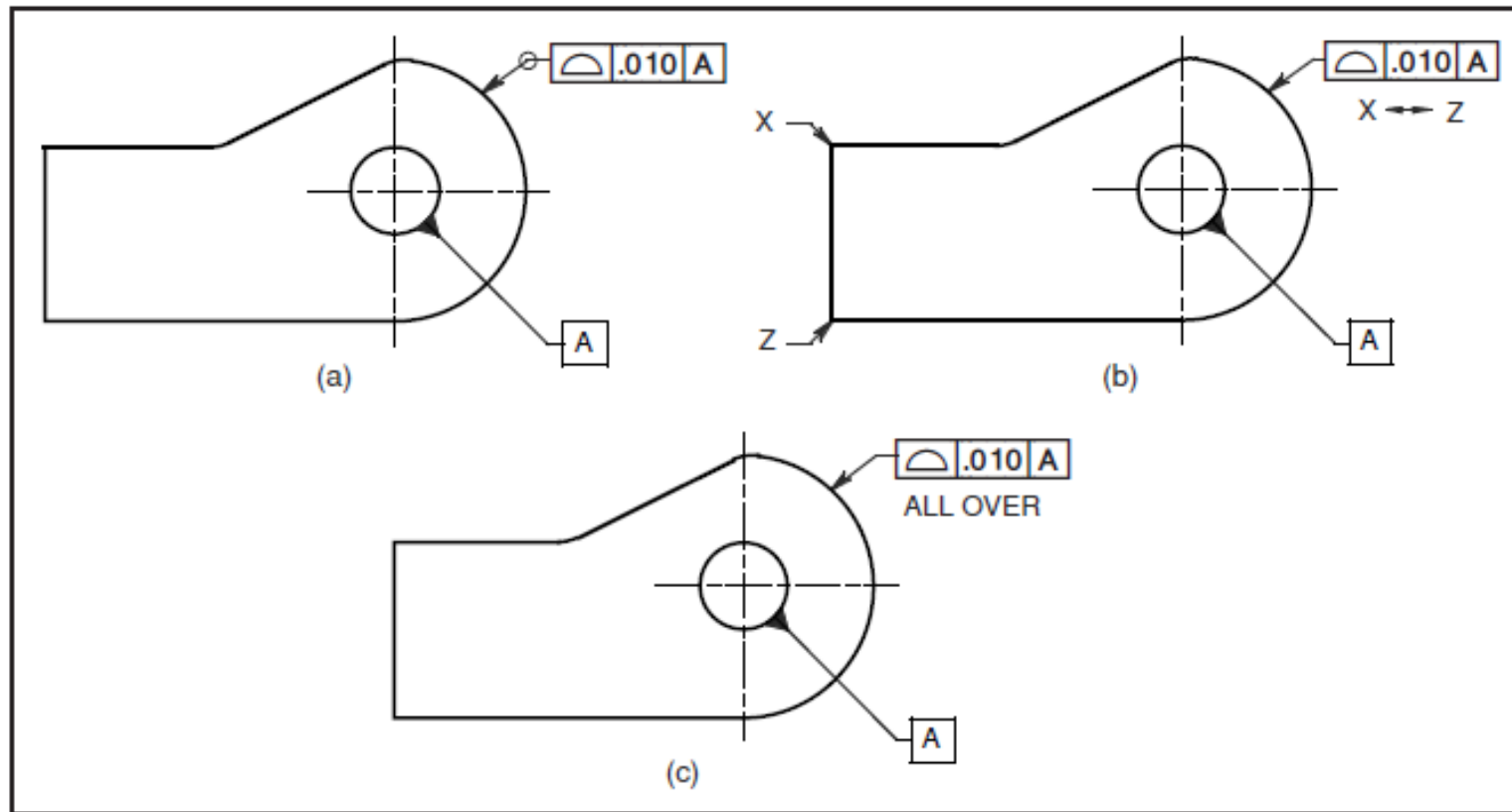
# Referencing to Datum(s)

- The nominal form is to be defined by theoretical exact dimensions (TEDs) with or without relation to datum(s).



**Fig. 4.2** Profile tolerance of lines; the nominal form is defined by theoretical exact dimensions with reference to datums (A–B)

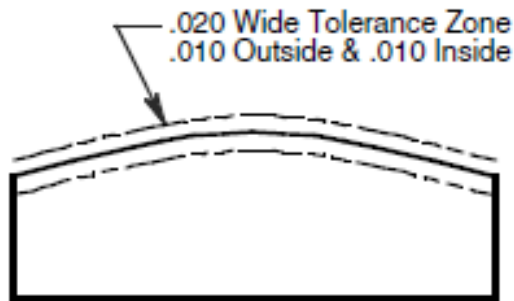
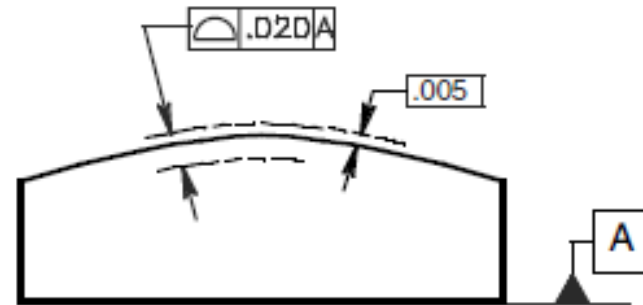
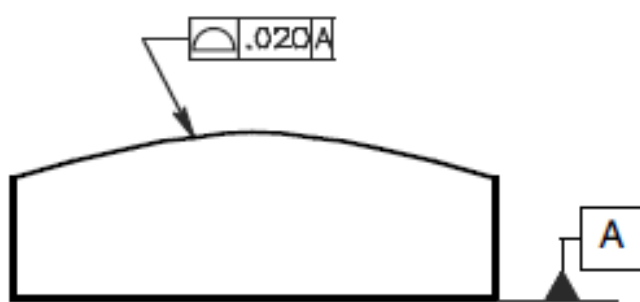
# All Around and All Over



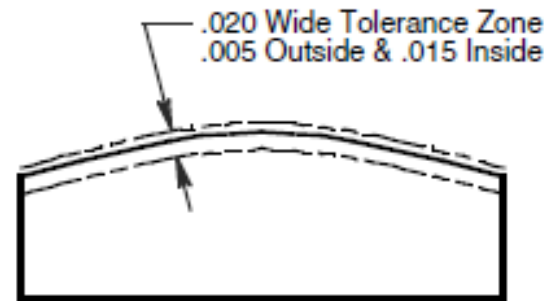
[10] Figure 12-2 The “all around” and “between” symbols and the “ALL OVER” note.

# Tolerance Zones (1)

- The tolerance zone can be bilateral, unequally, or unilateral disposed relative to the nominal profile.



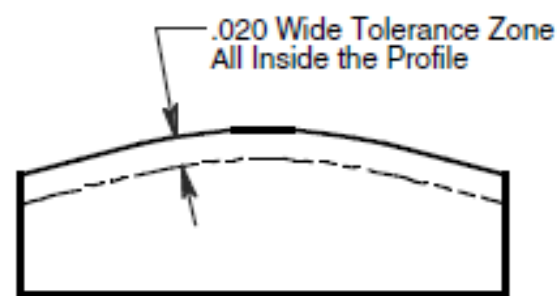
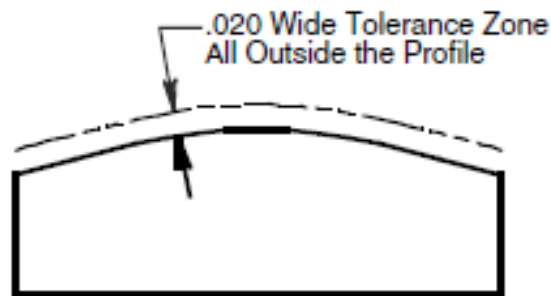
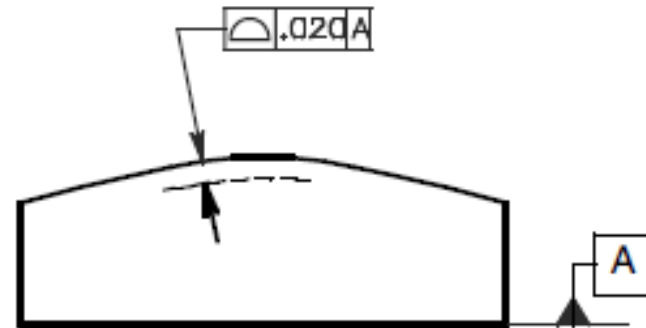
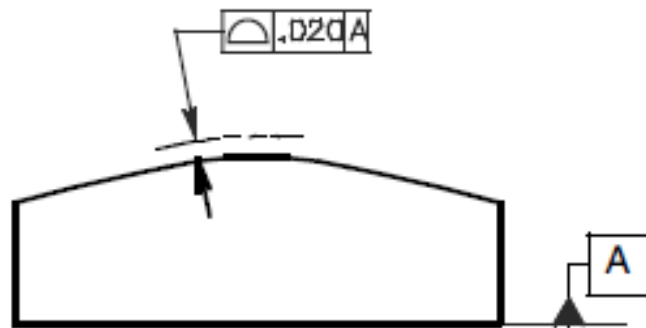
A. Bilateral Tolerance



B. Unequally Distributed Bilateral Tolerance

# Tolerance Zones (2)

- The tolerance zone can be unequally disposed relative to the nominal profile.



[10] C. Unilateral Tolerance Outside

D. Unilateral Tolerance Inside

# Radius Refinement

- Sometimes, a local note such as “R .015 MAX” or “ALL CORNERS R .015 MAX” directed to the radius with a leader is needed.

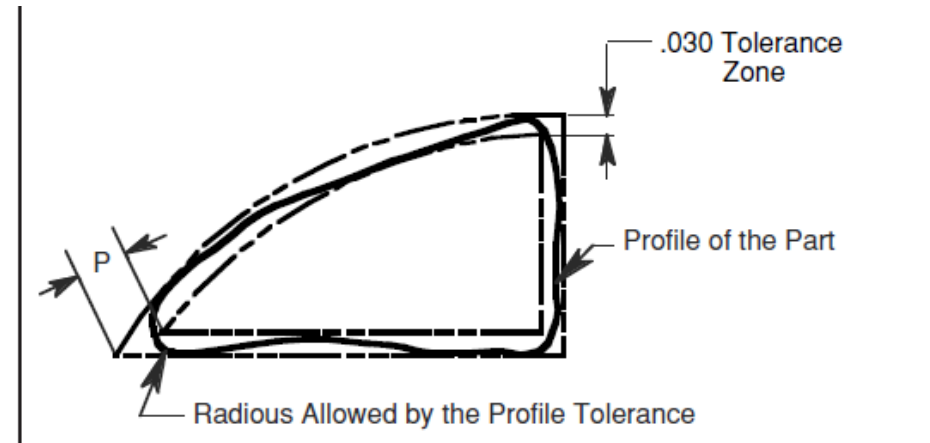
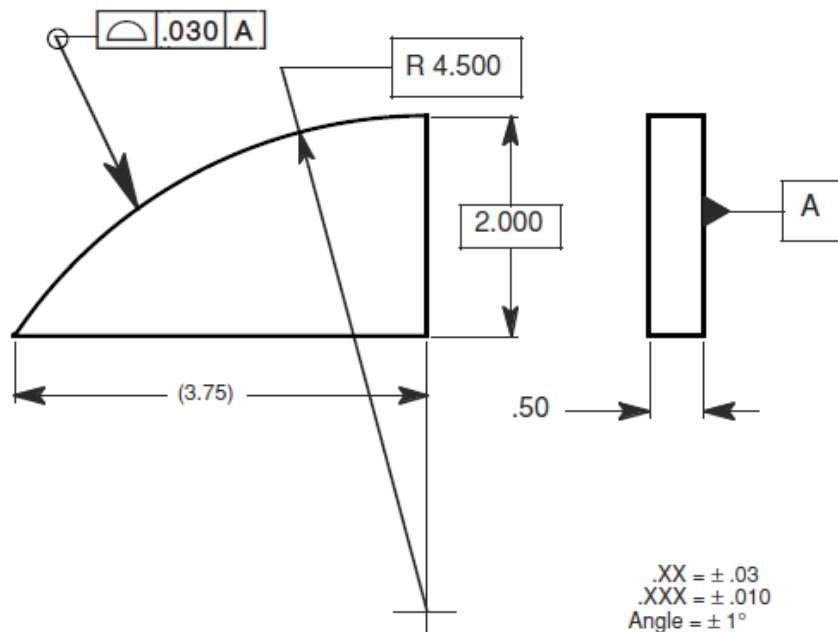
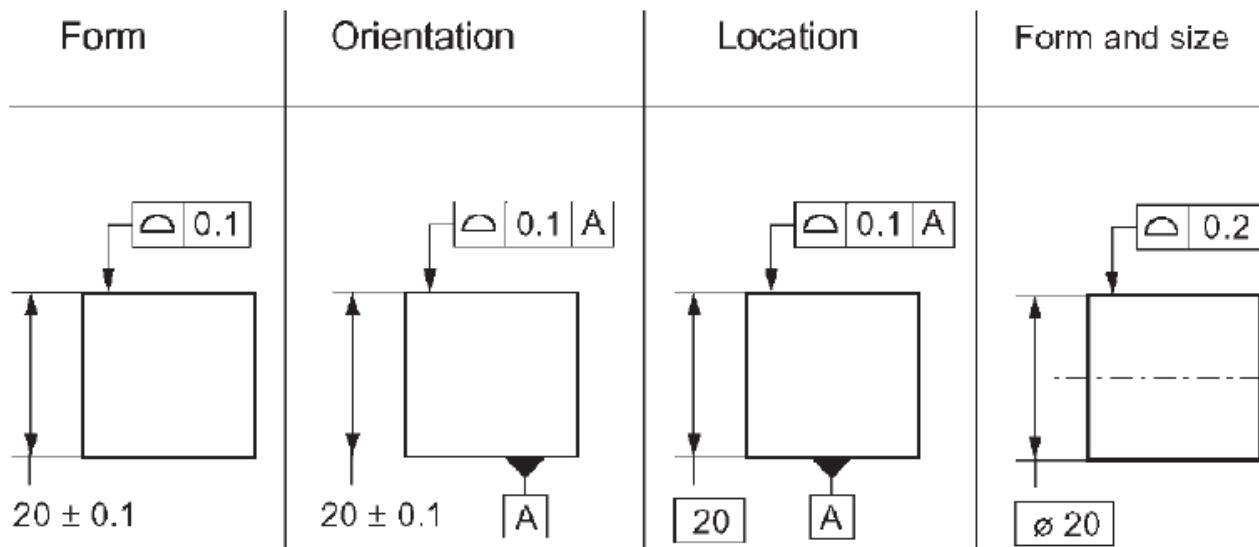


Figure 12-4 The profile tolerance allows large radii around sharp points.



# Applications

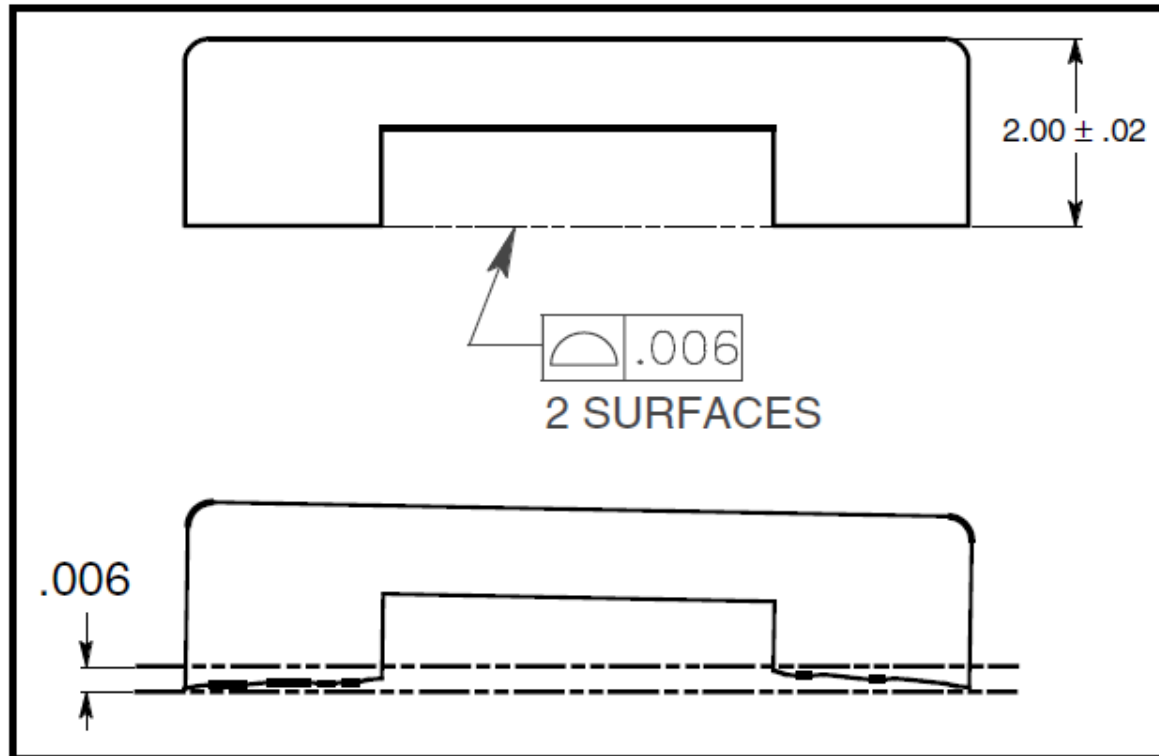
- Profile tolerancing can be used for tolerancing of form, orientation, location and form with size, depending on the indication of datums and theoretical exact dimensions.



**Fig. 4.4** Profile tolerance of surfaces for tolerancing form, orientation, location or form and size

# Coplanar Surfaces (1)

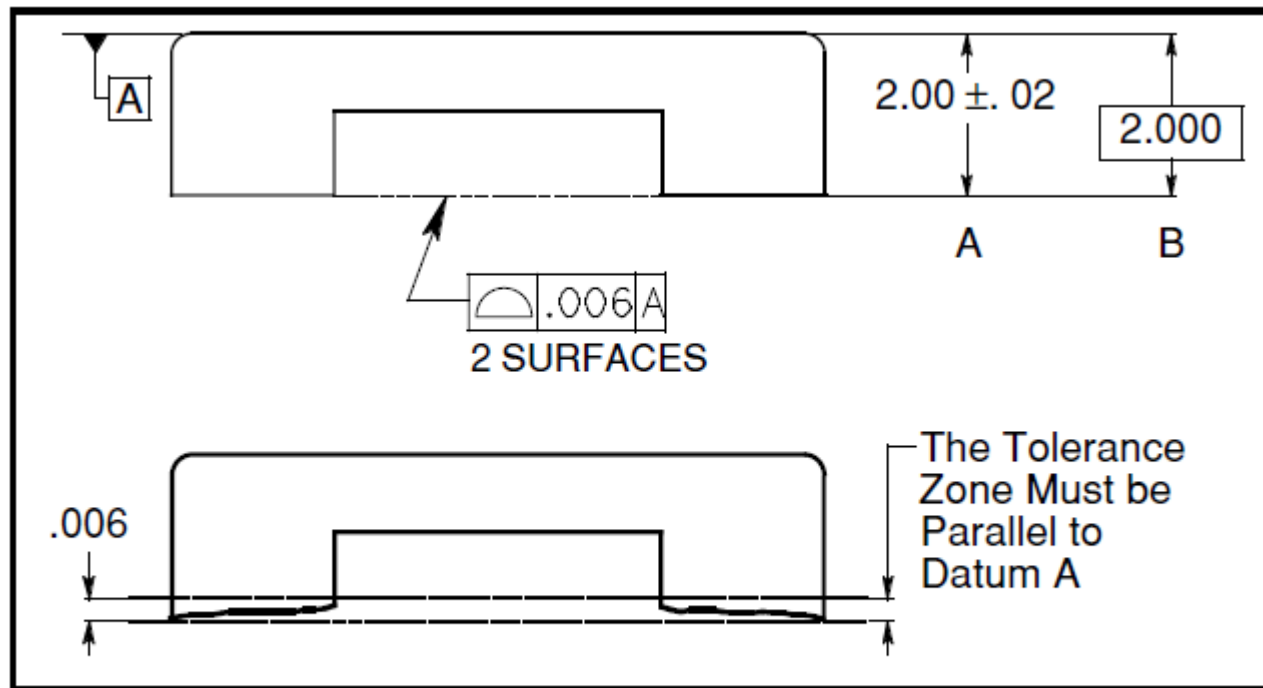
- Coplanarity is the condition of two or more surfaces having all elements in one plane.



[10] Figure 12-7 Specifying coplanarity with the profile control.

# Coplanar Surfaces (2)

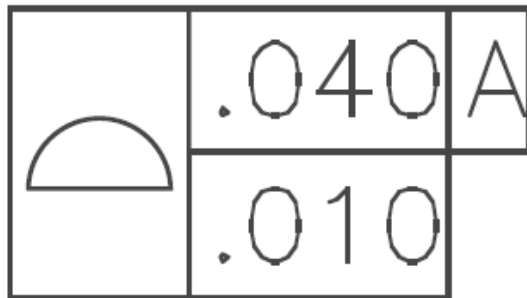
- When the opposite surface is specified as a datum and the datum is included in the profile feature control frame;



[10] **Figure 12-8** Two coplanar surfaces parallel to a datum.

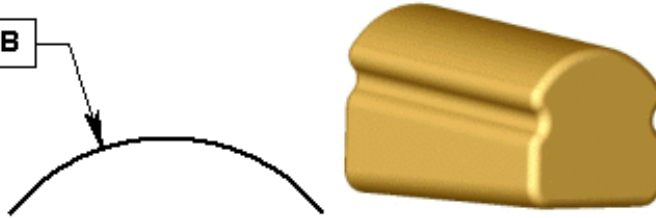
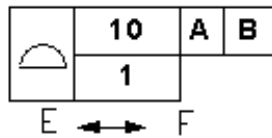
# Composite Profile (1)

- The upper segment, called the profile-locating control, governs **the location** relationship between the datums and the profile. It acts like any other profile control.
- The lower segment, referred to as the profile refinement control, is a smaller tolerance than the profile-locating control and governs **the size, form, and orientation** relationship of the profile.

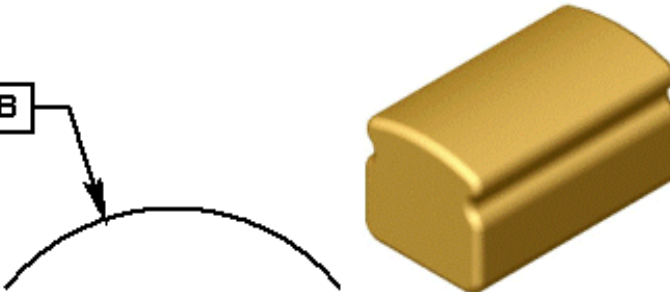
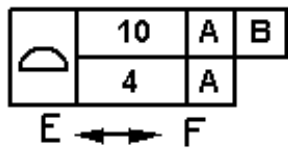


**Figure 12-12** Composite profile tolerancing used only to control form and orientation.

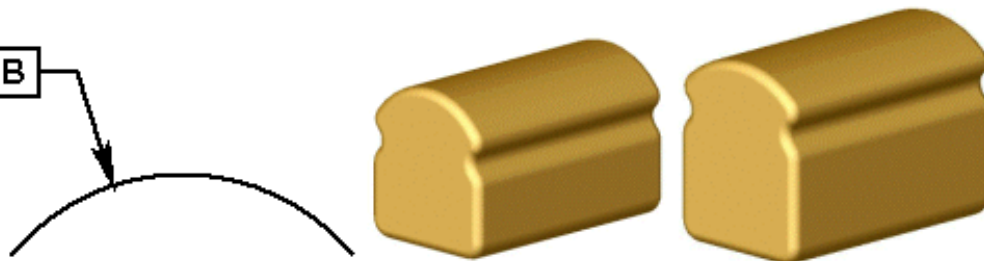
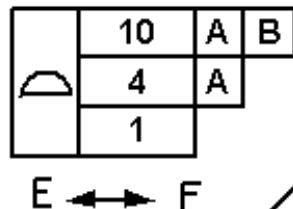
# Composite Profile (2)



The lower segment of this composite control refines the form of the loaf but not the orientation of the top of the loaf because the datum reference is not repeated in the lower segment.

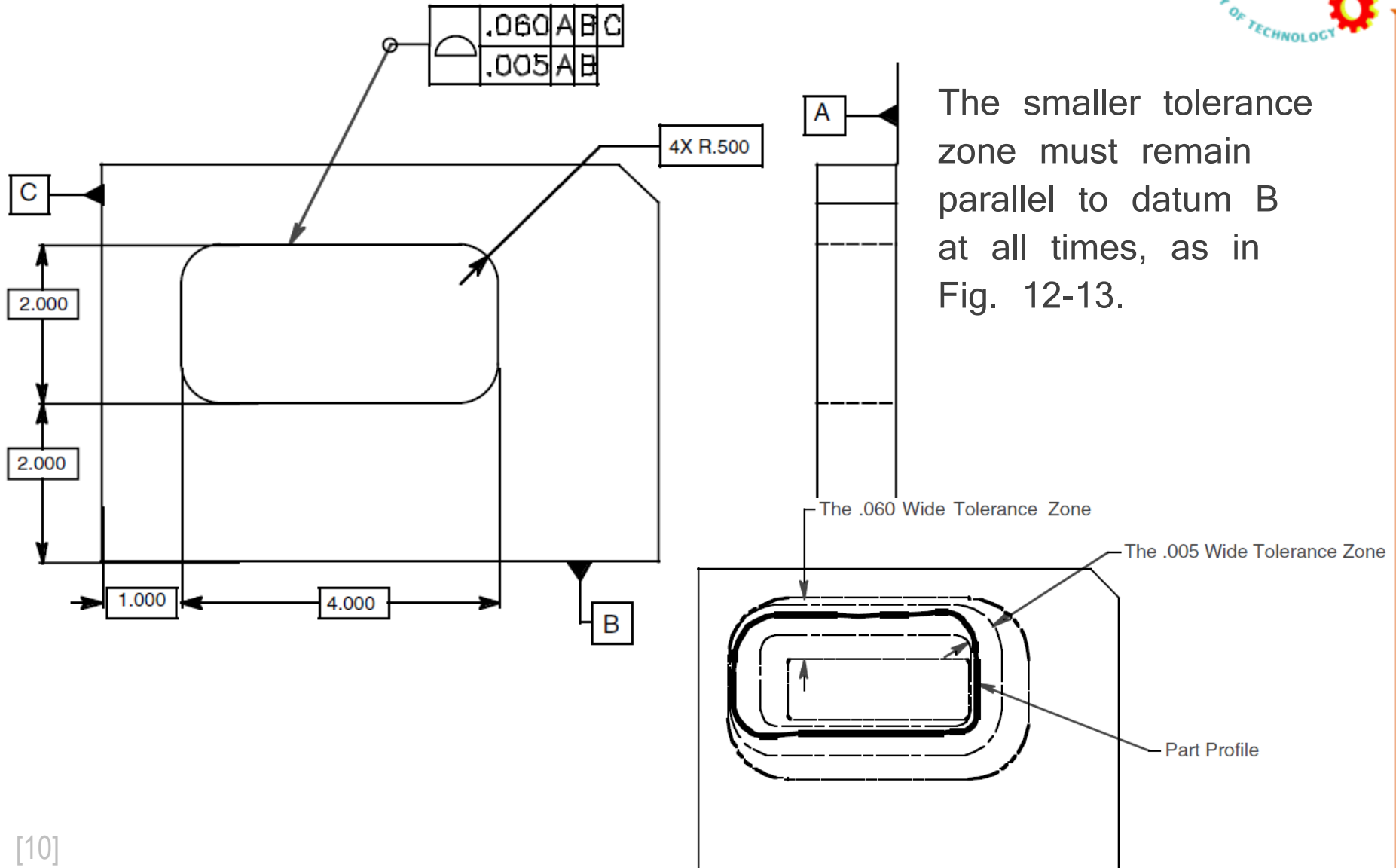


In this feature control frame the lower segment includes a datum reference which tightens the orientation of the top of the loaf to within 4mm. The form is also controlled within the 4mm tolerance.

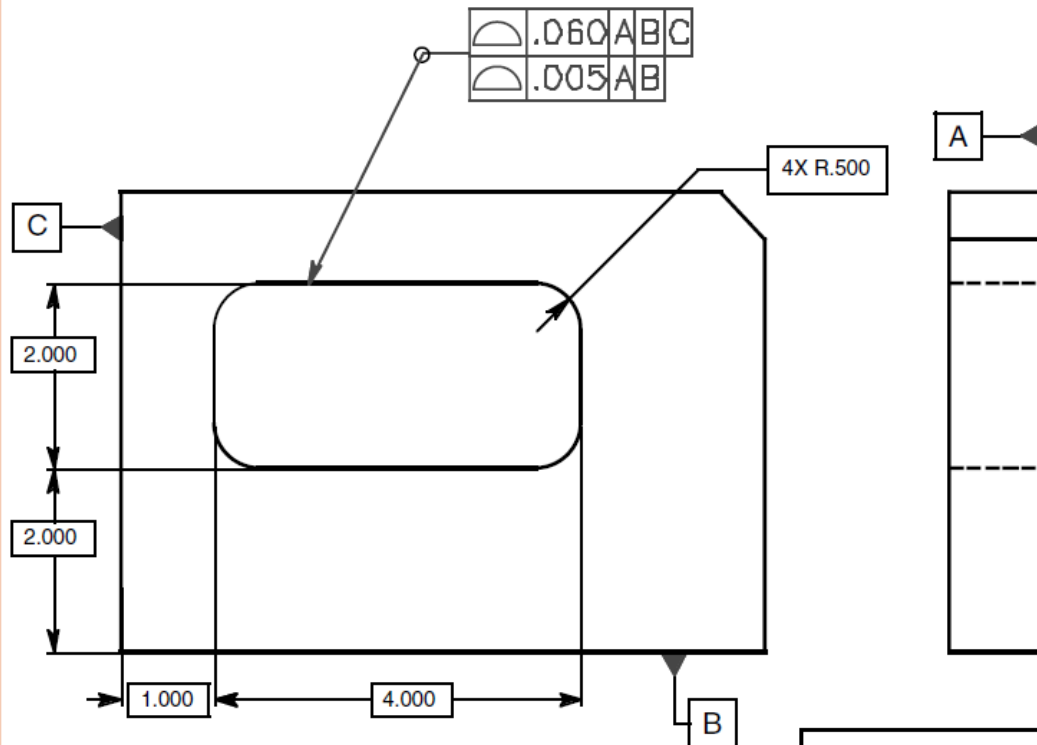


Here the upper segment controls the location of the top of the loaf to within 10mm. The second segment tightens up the orientation relative to A within 4mm. The third segment controls the shape of the top of the loaf to within 1mm.

# Composite Profile (3)

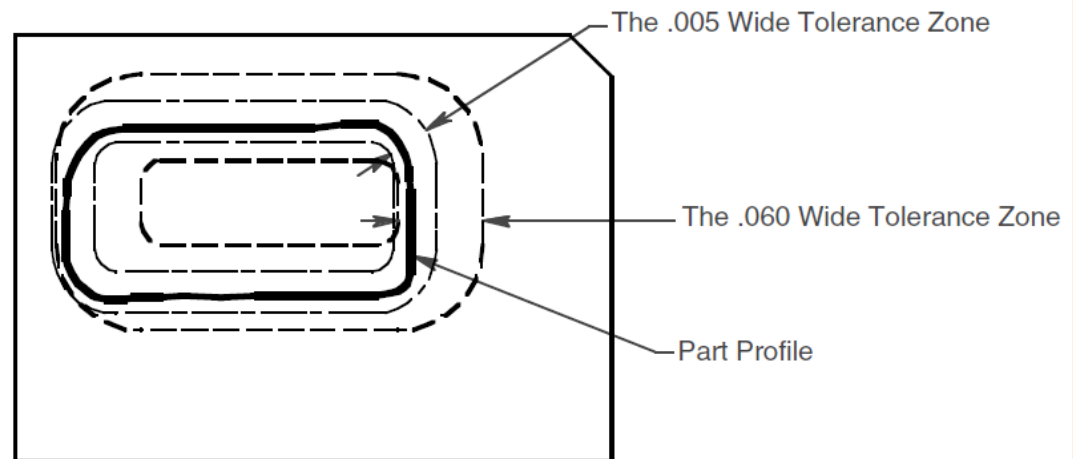


# Multiple Single-Segment Profile Control

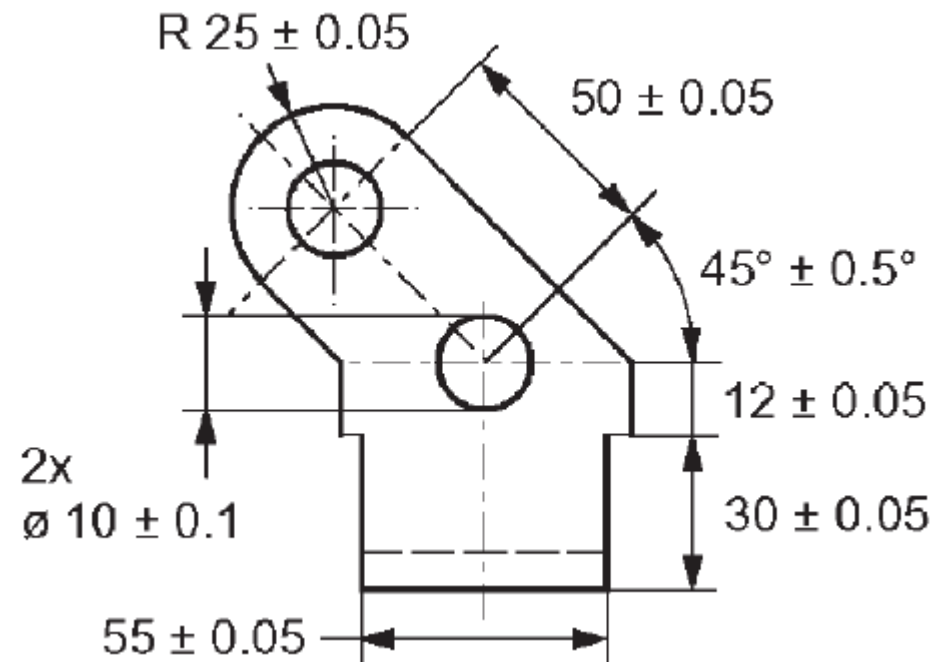
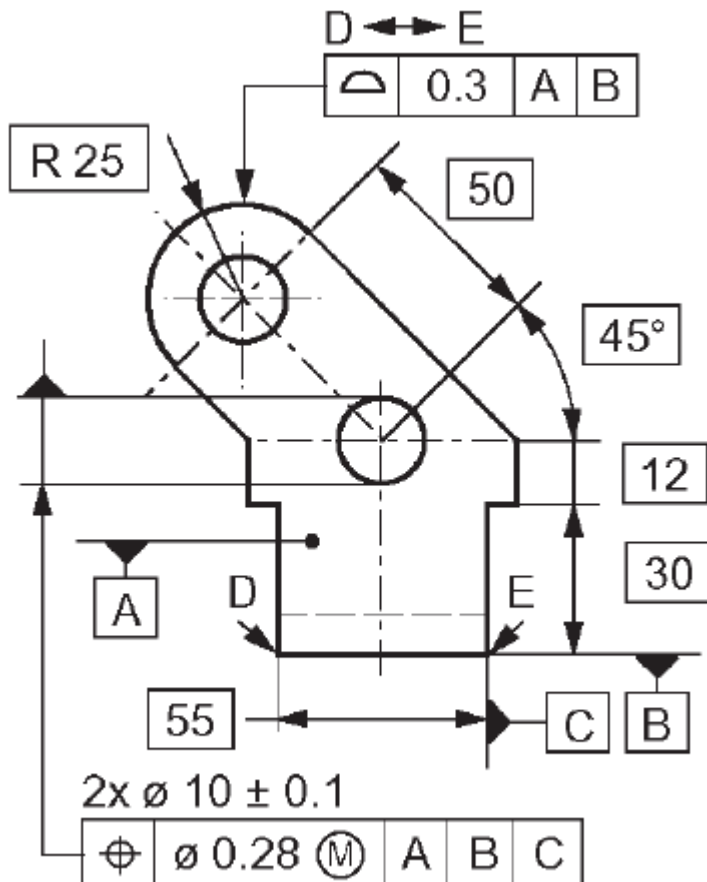


The profile in Fig. 12-14 is toleranced with a two single-segment feature control frame.

The lower segment of a two single-segment feature control frame acts just like any other profile control.



# Profile versus Coordinate Tolerancing





# Reference Links/Books

- [1] Geometrical Dimensioning and Tolerancing for Design, Manufacturing and Inspection (Georg Henzold)
- [2] Mechanical Tolerance Stackup and Analysis (Bryan R. Fischer)
- [3] Geometric Dimensioning and Tolerancing (James D. Meadows)
- [4] [www.egr.sjsu.edu](http://www.egr.sjsu.edu)
- [5] [www.egr.mun.ca](http://www.egr.mun.ca)
- [6] [engineering.armstrong.edu](http://engineering.armstrong.edu)
- [7] [www.me.metu.edu.tr](http://www.me.metu.edu.tr)
- [8] Dimensioning and Tolerancing Handbook (Paul J. Drake, Jr.)
- [9] Geometric Dimensioning and Tolerancing (A. Krulikowski)
- [10] Geometric Dimensioning and Tolerancing for Mechanical Design (Gene R. Cogorno)