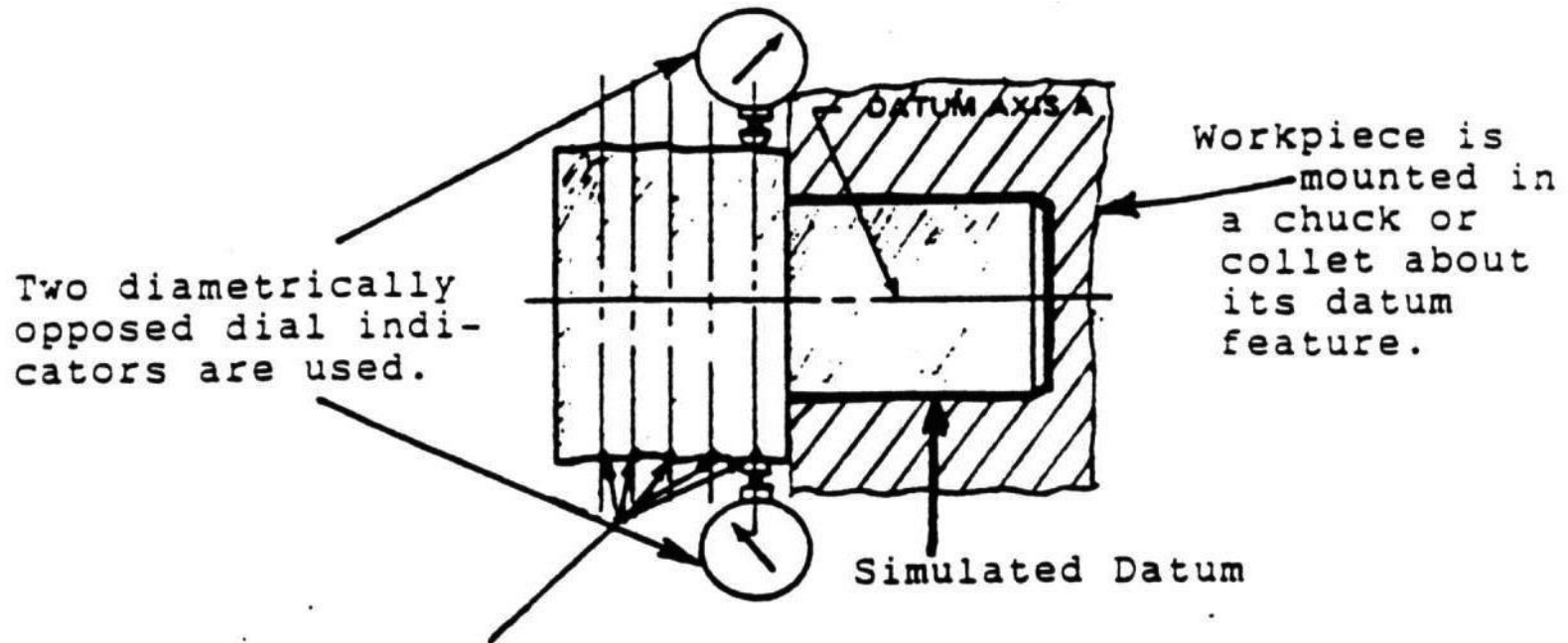




# Concentricity Measurement

21

## Measuring Method



Five locations along the part feature's length for taking measurements (They should be approximately evenly spaced.)

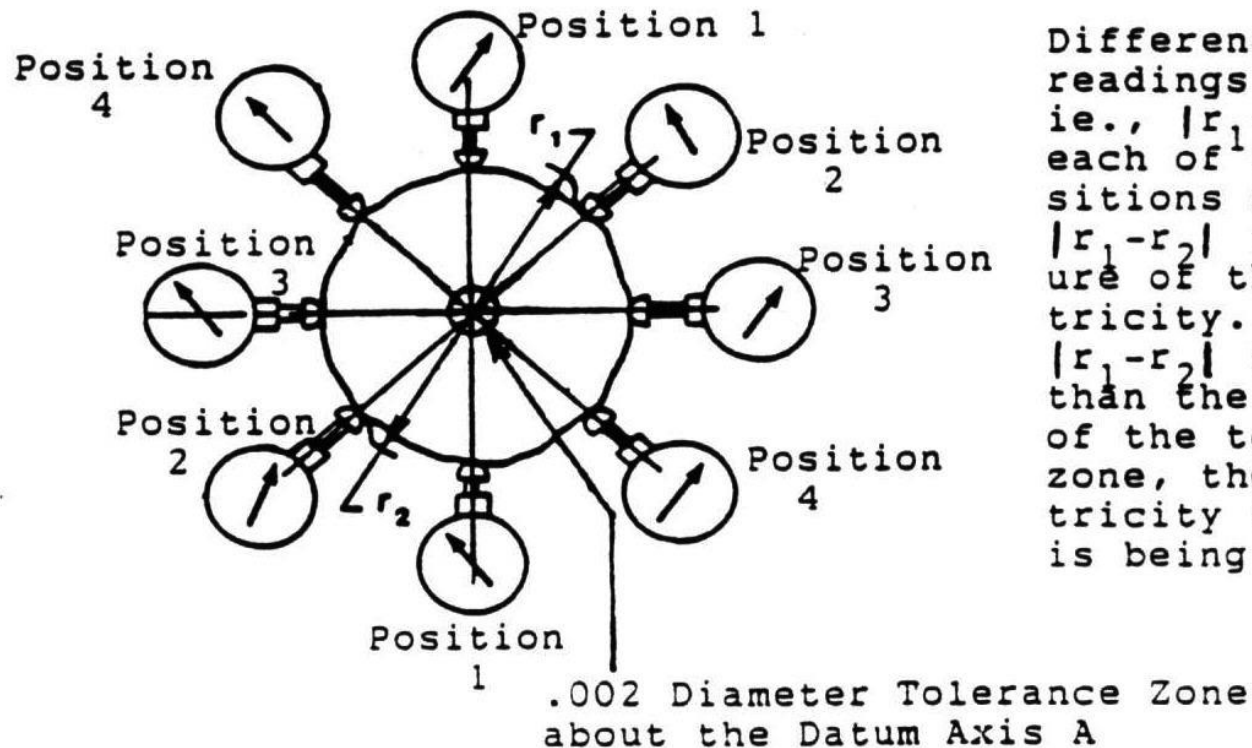




# Concentricity Measurement

22

## Measuring Method



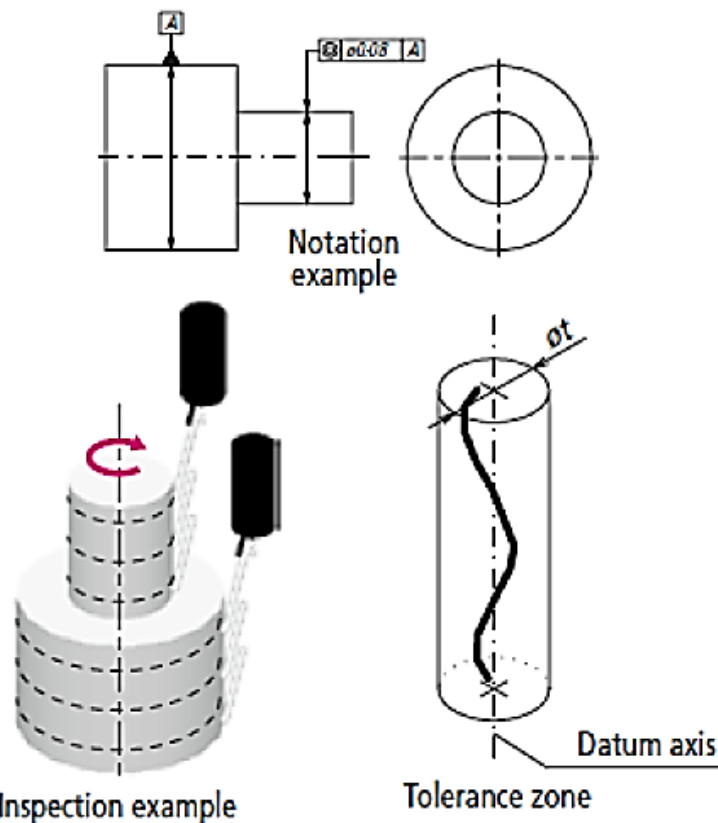
Differential radii readings are taken - ie.,  $|r_1 - r_2|$  - at each of the 4 positions shown.  $|r_1 - r_2|$  is a measure of the concentricity. If  $|r_1 - r_2|$  is less than the diameter of the tolerance zone, the concentricity tolerance is being met.





# Coaxiality Measurement

23



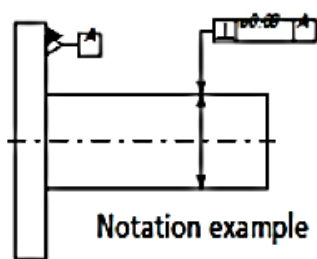
**Coaxiality:** the axis must be contained within the tolerance zone formed by a cylinder of diameter  $t$  concentric with the datum



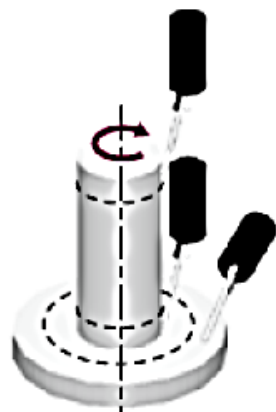
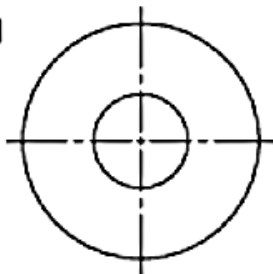


# Perpendicularity Measurement

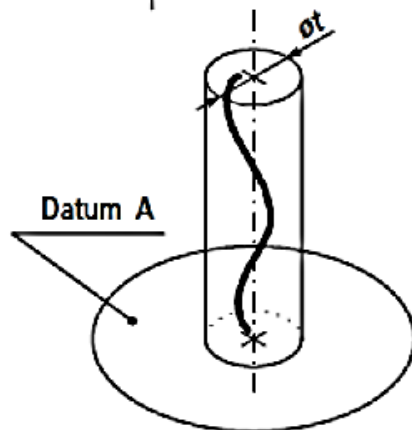
24



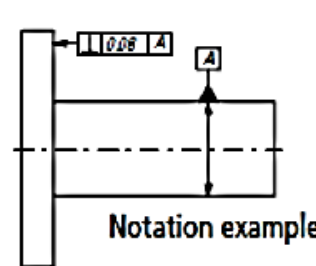
Notation example



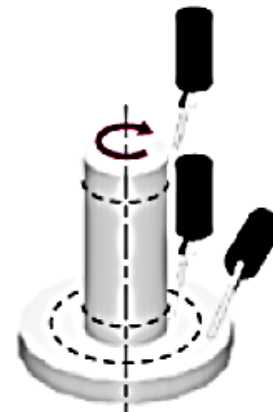
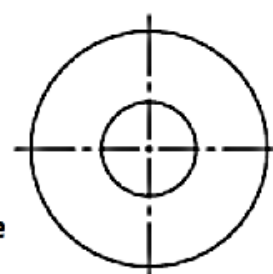
Inspection example



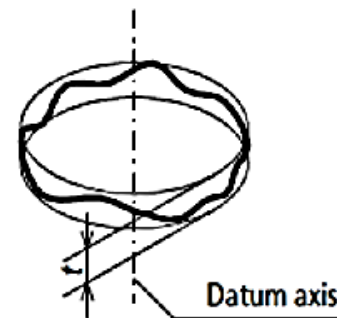
Tolerance zone



Notation example



Inspection example



Tolerance zone

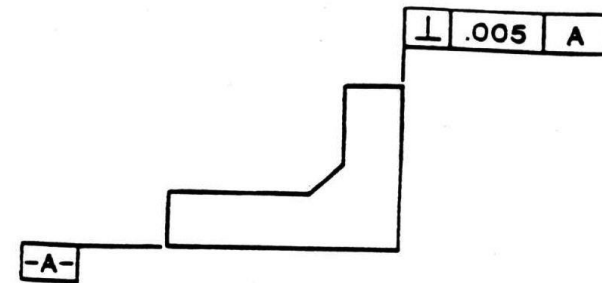
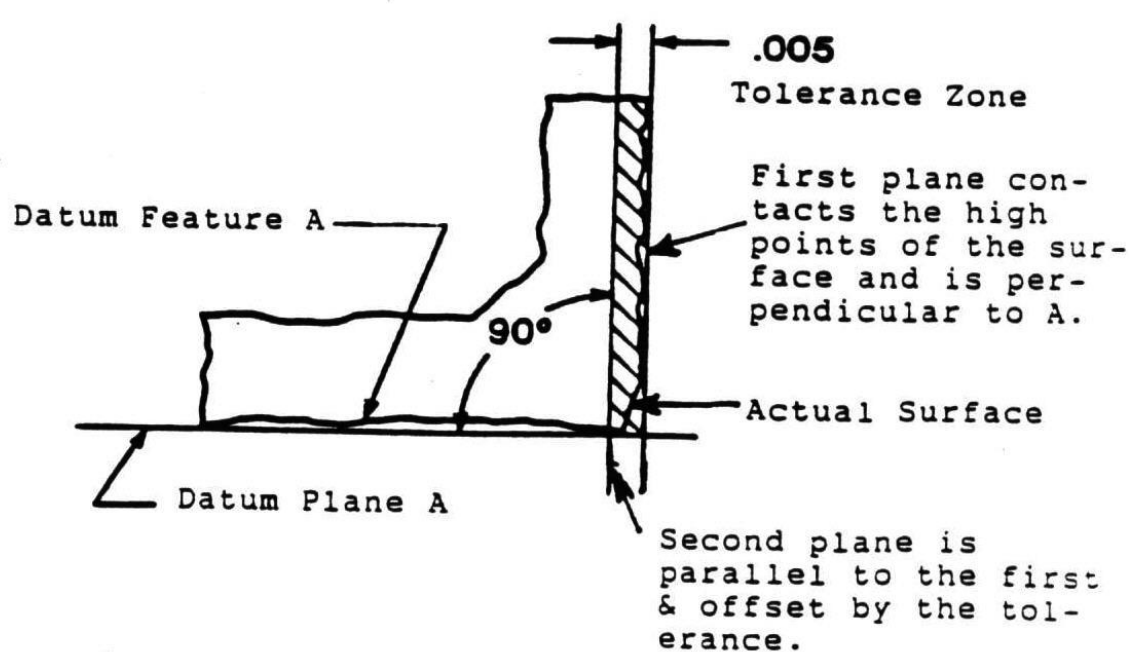
**Perpendicularity:** the line or surface must be contained within the tolerance zone formed between two planes a distance  $t$  apart and perpendicular to the datum





# Perpendicularity Measurement

25



The Tolerance Zone  
(Area between two parallel planes)

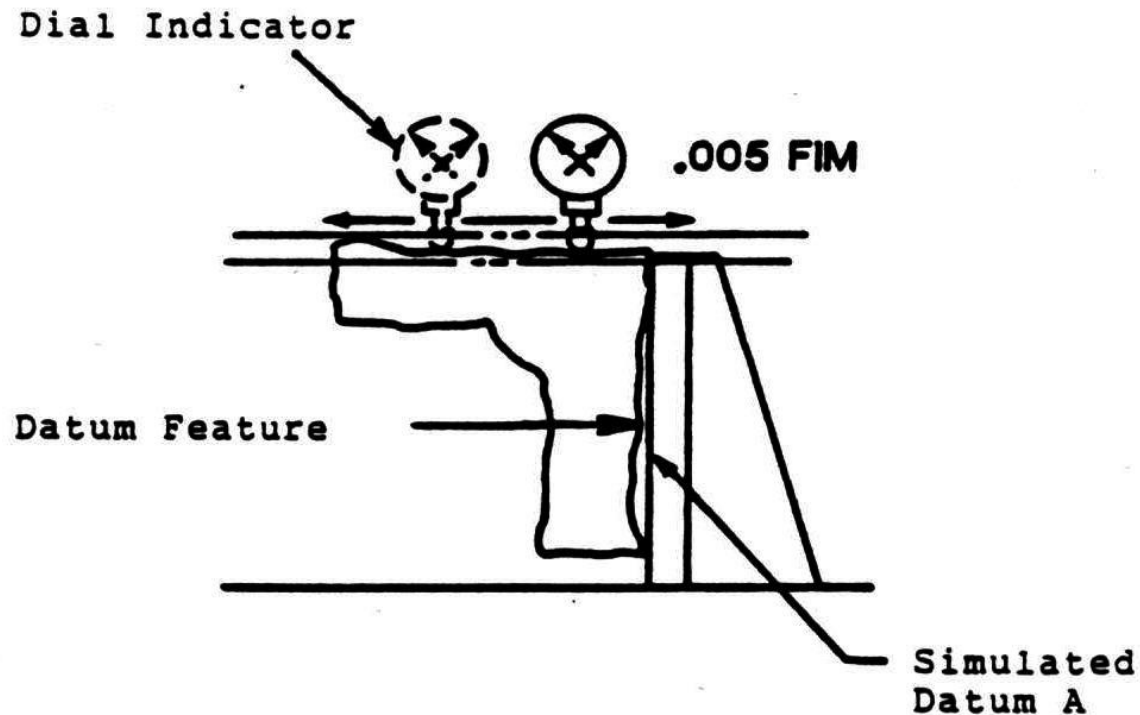




# Perpendicularity Measurement

26

## Measuring Method

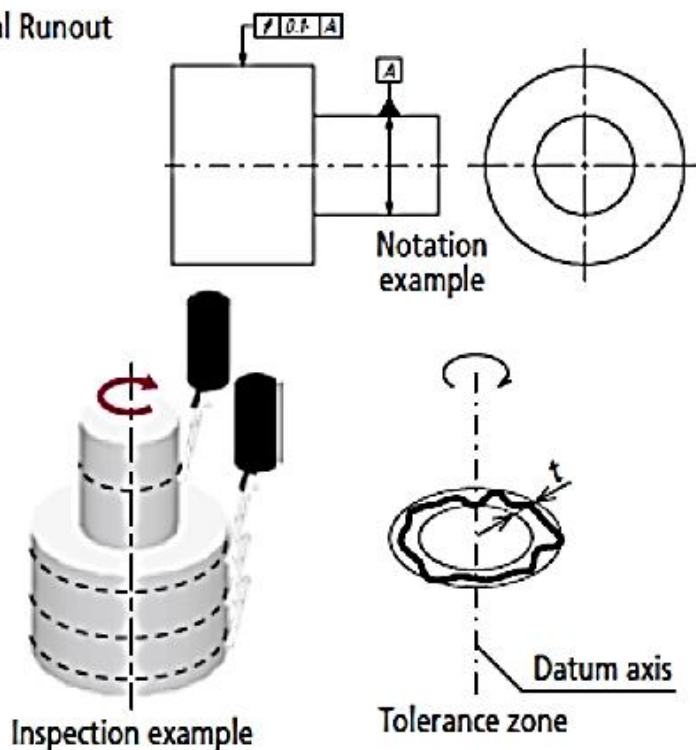




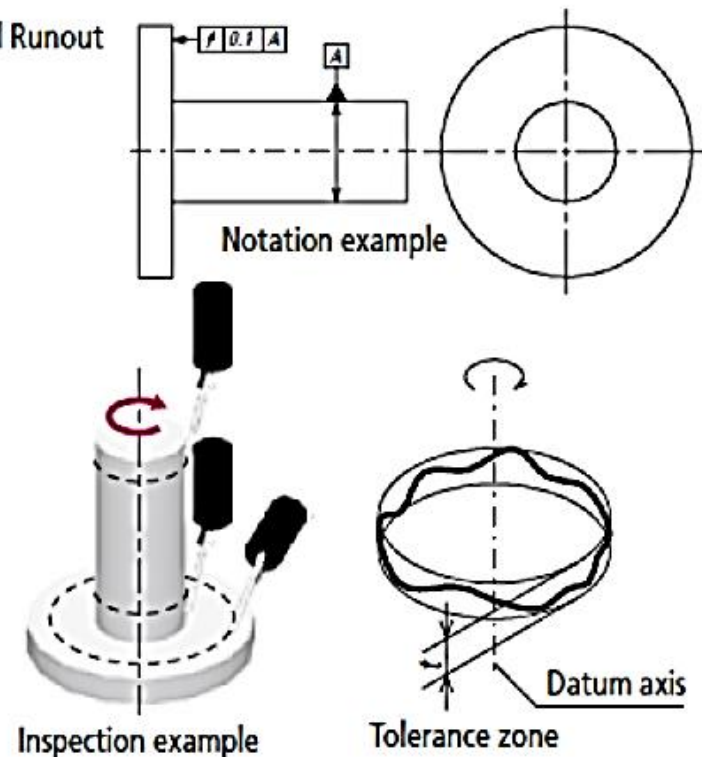
# Circular Runout Measurement

27

Radial Runout



Axial Runout



**Circular Runout:** the line must be contained within the tolerance zone formed between two coplanar and/or concentric circles a distance  $t$  apart with or perpendicular to the datum



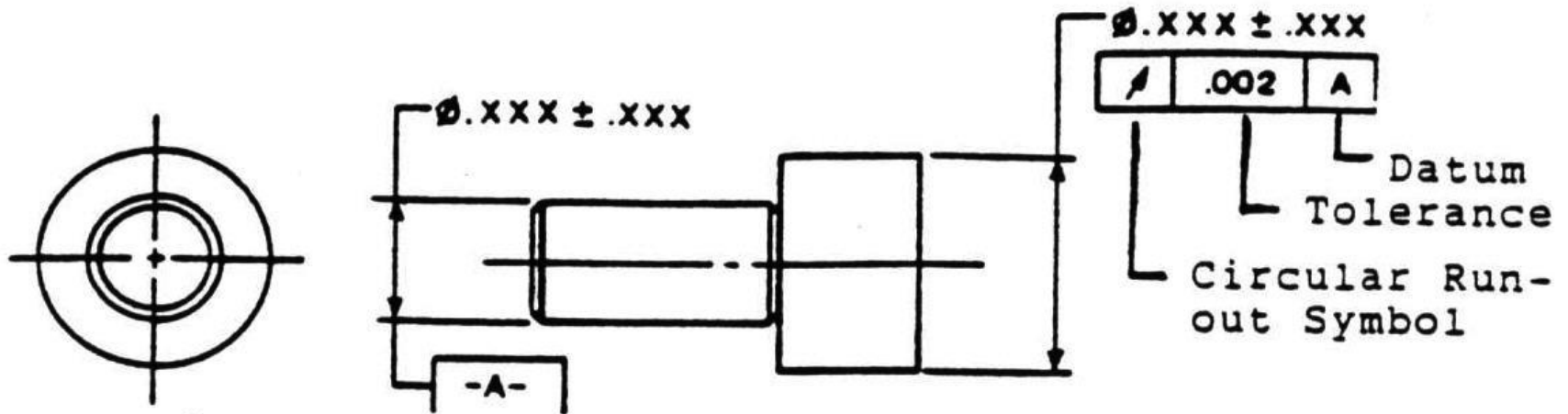




# Circular Runout Measurement

28

## Specification



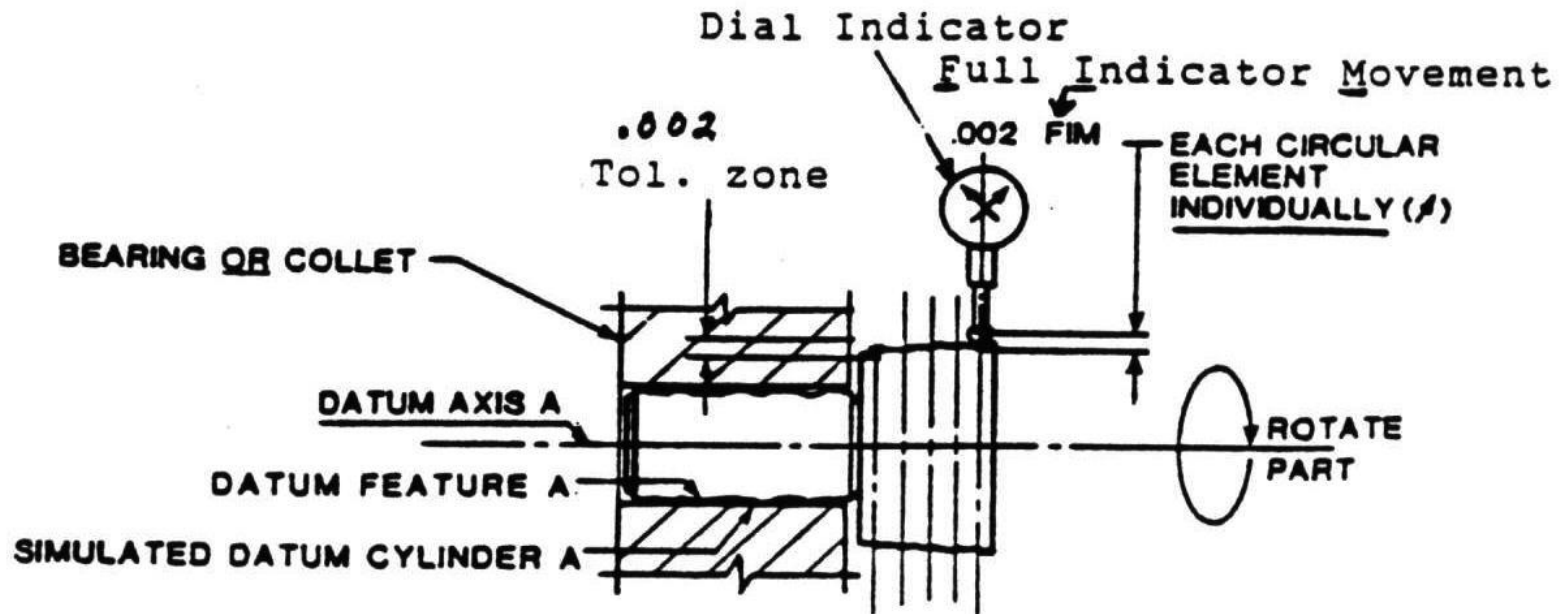




# Circular Runout Measurement

29

## Tolerance



The Tolerance Zone  
(Area between two concentric (about A) circles)  
&

Measurement Method  
(with Dial Indicator)

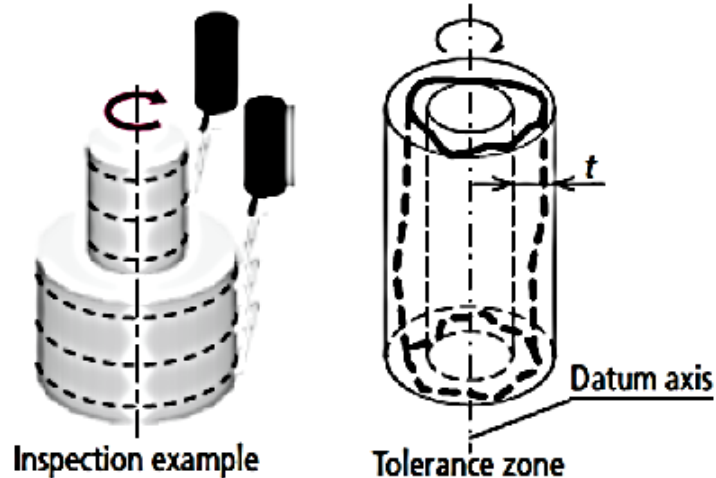
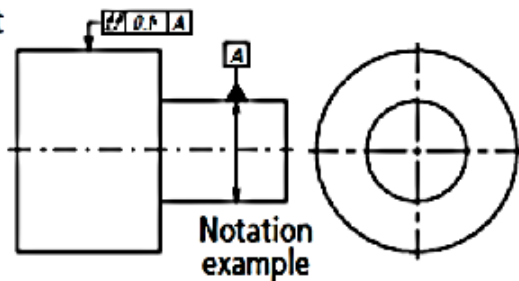




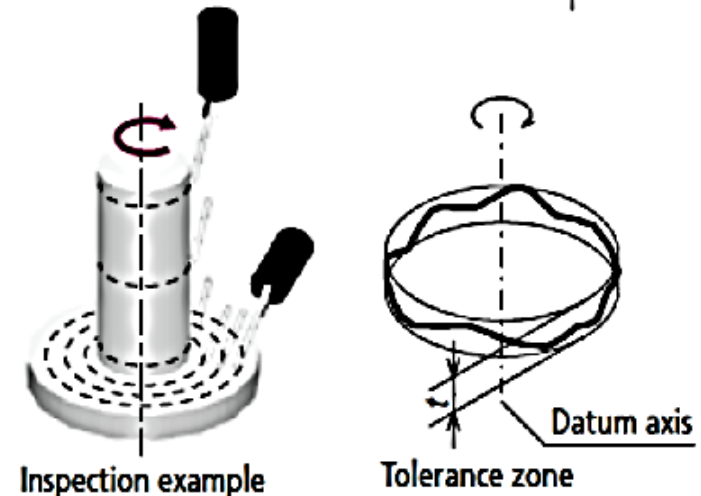
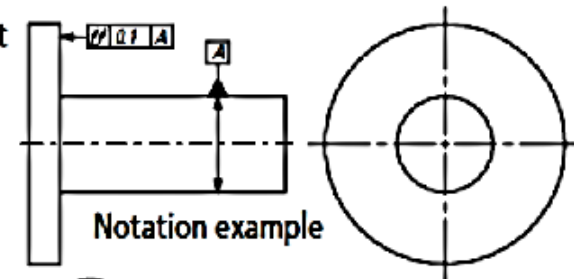
# Total Runout Measurement

30

Total Radial Runout



Total Axial Runout



**Total Runout:** the surface must be contained within the tolerance zone formed between two coaxial cylinders with a difference in radii of  $t$  or planes a distance  $t$  apart concentric with or perpendicular to the datum

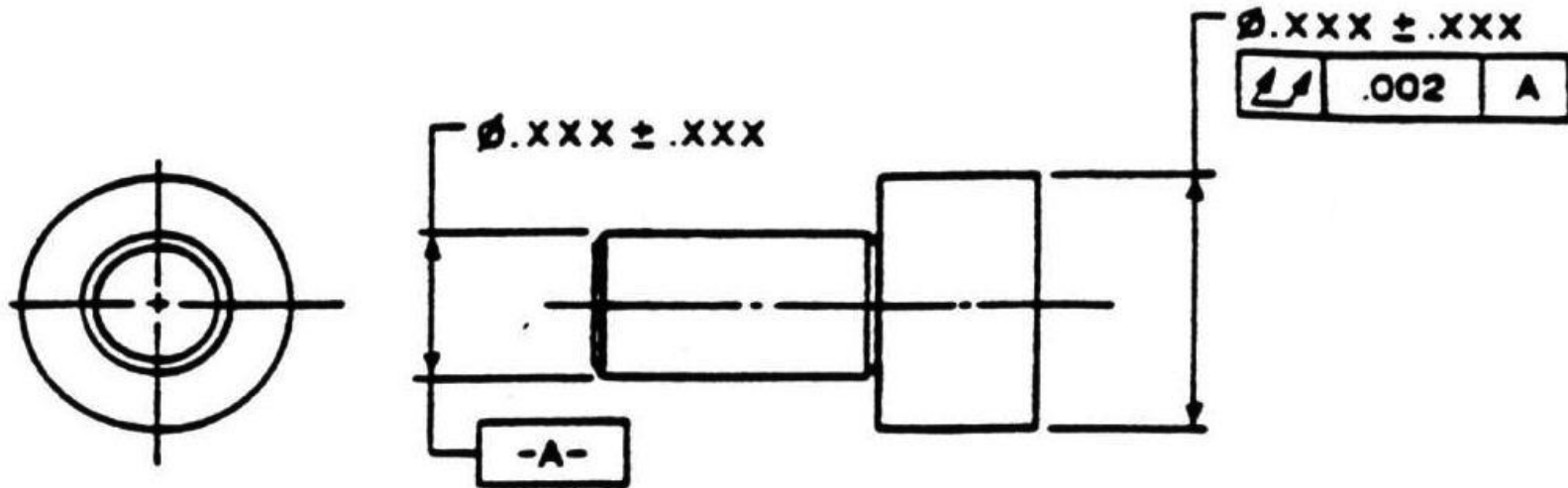




# Total Runout Measurement

31

## Specification

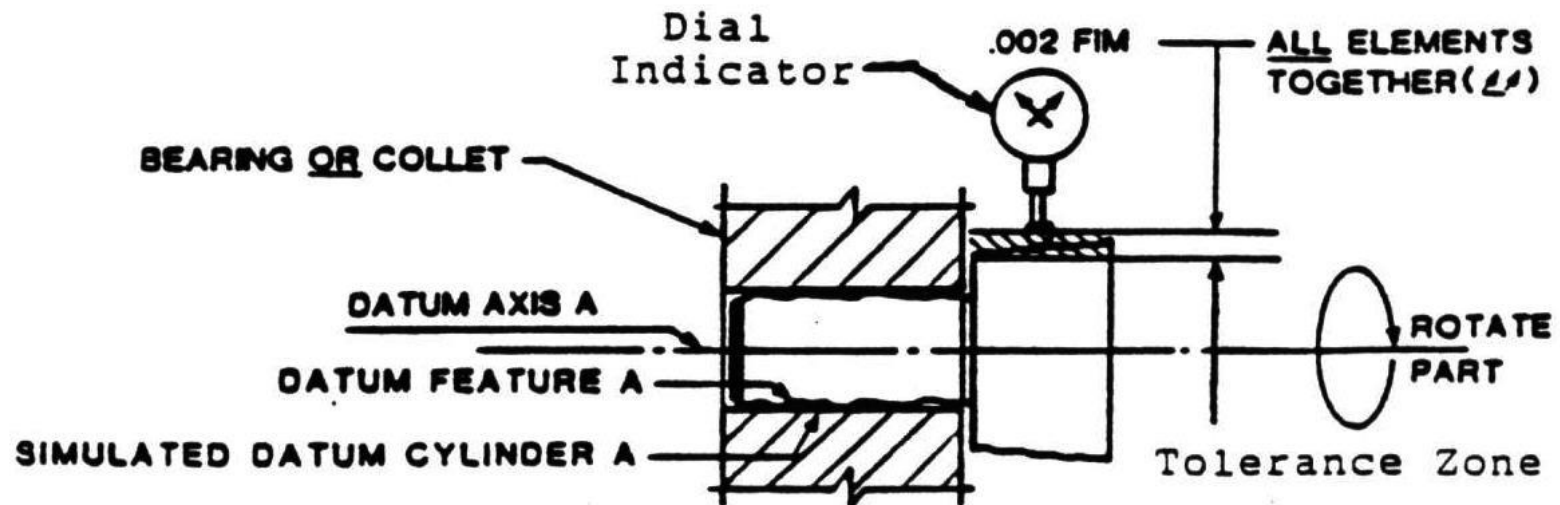




# Total Runout Measurement

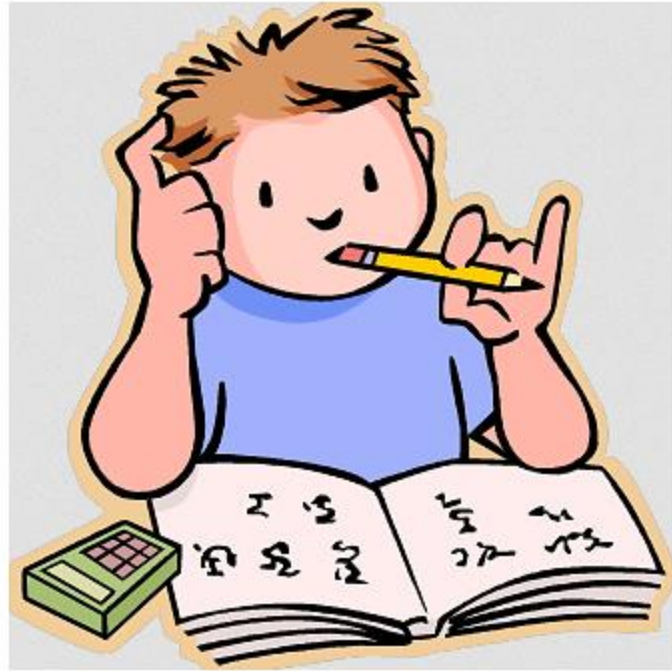
32

## Tolerance



The Tolerance Zone  
(Area between two concentric (about A)  
cylinders)  
& Measurement Method (with Dial Indicator)





Homework



## HW (5)

36

*Explain the working principle of auto-collimator and briefly explain its application and How angle dekkor differ from auto-collimator?*



Thank  
You