
بسم الله الرحمن الرحيم

Measurements and Metrology

Fayoum University

Faculty of Engineering
Industrial Engineering Dept.

Lecture (5)

on

Geometric Form and Deviation Measurements

By

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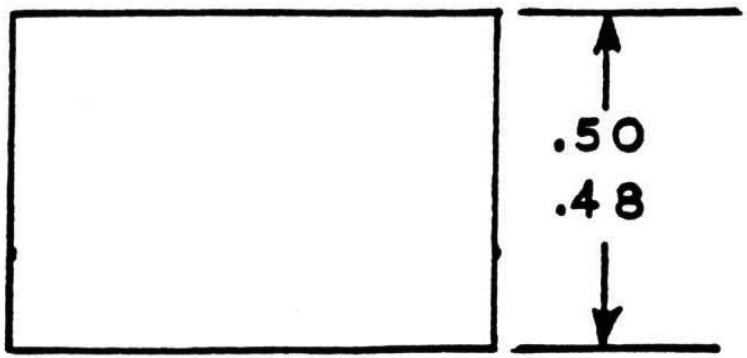
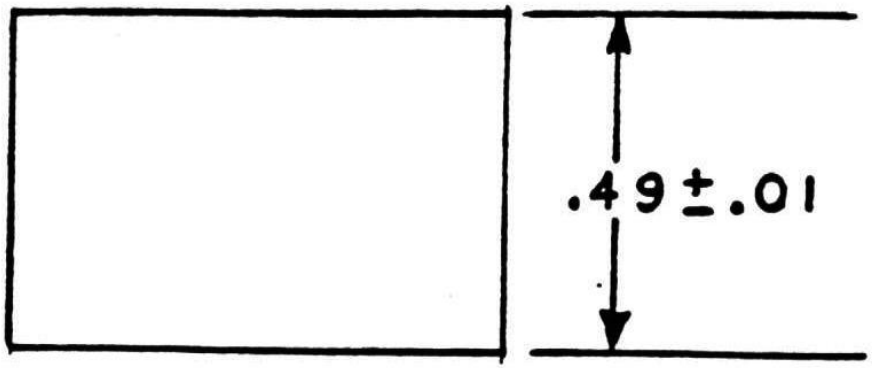
Specification of Linear Tolerances

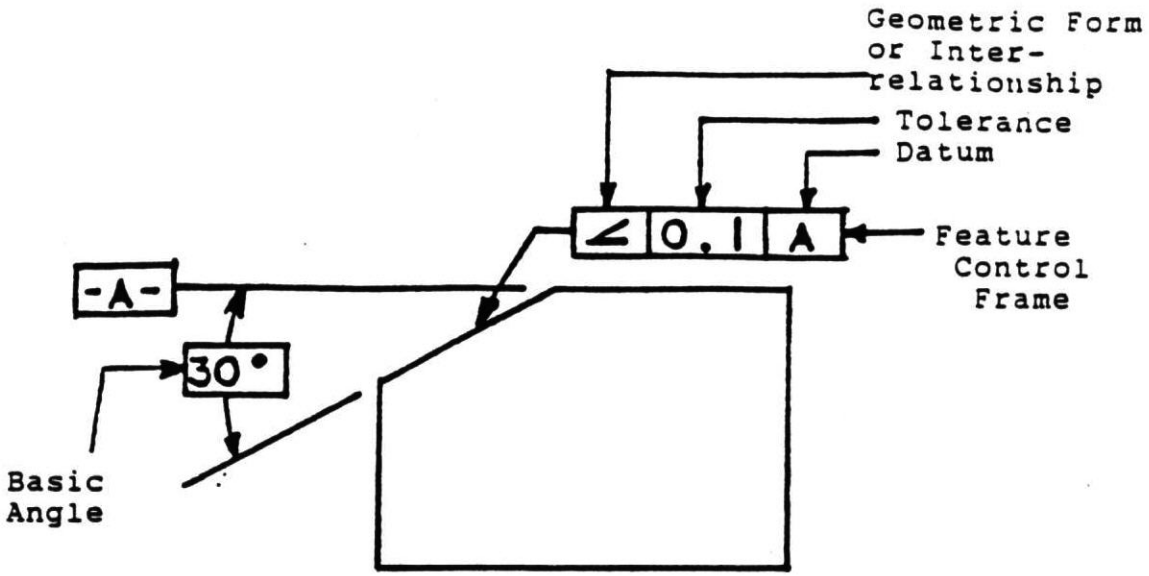


New Standard



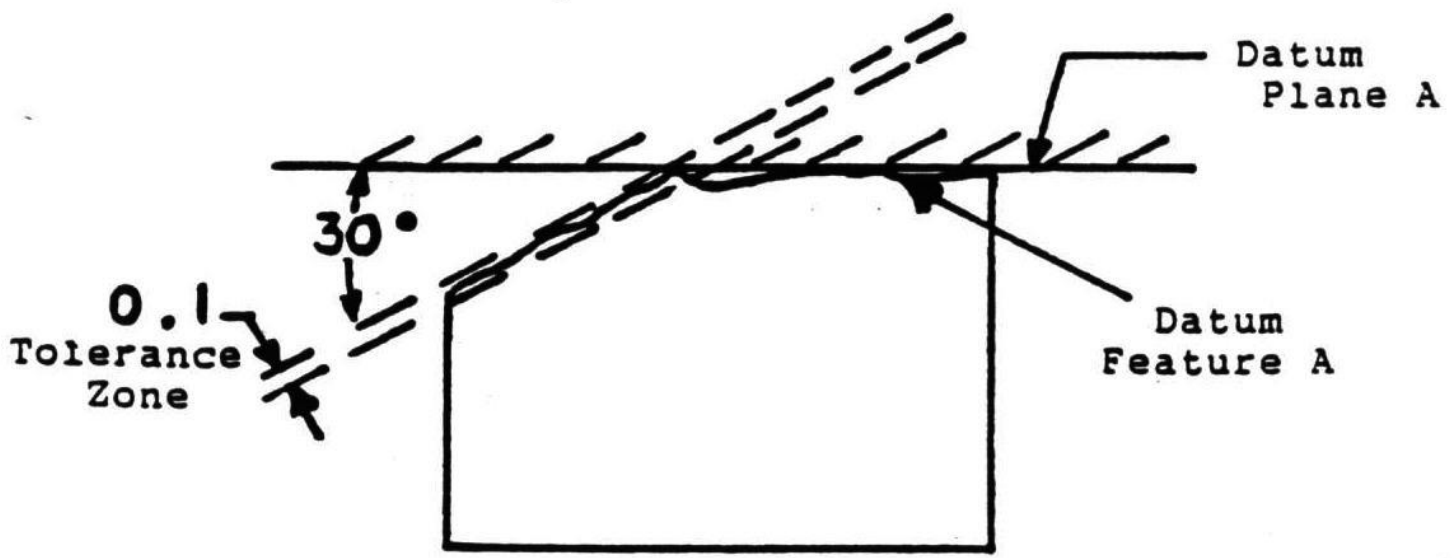
Old Standard

Angular Specifications



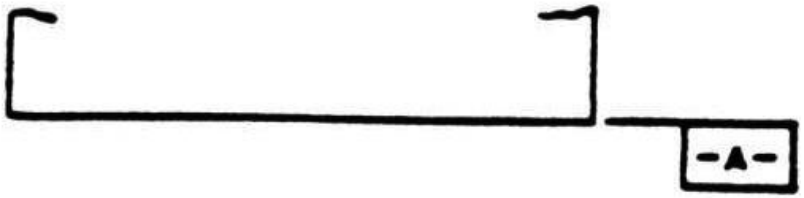
The Specification

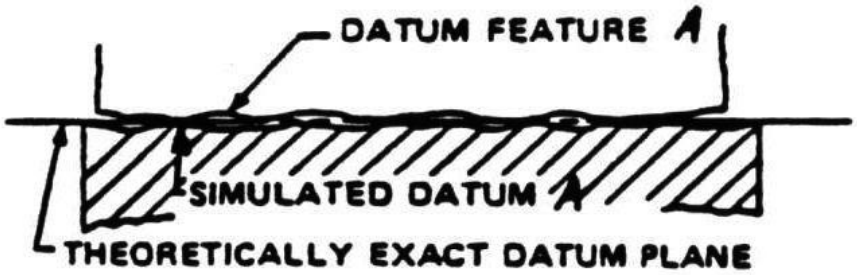
Angular Tolerances



The Tolerance Zone
(Area between two parallel planes)

Simulated Datum

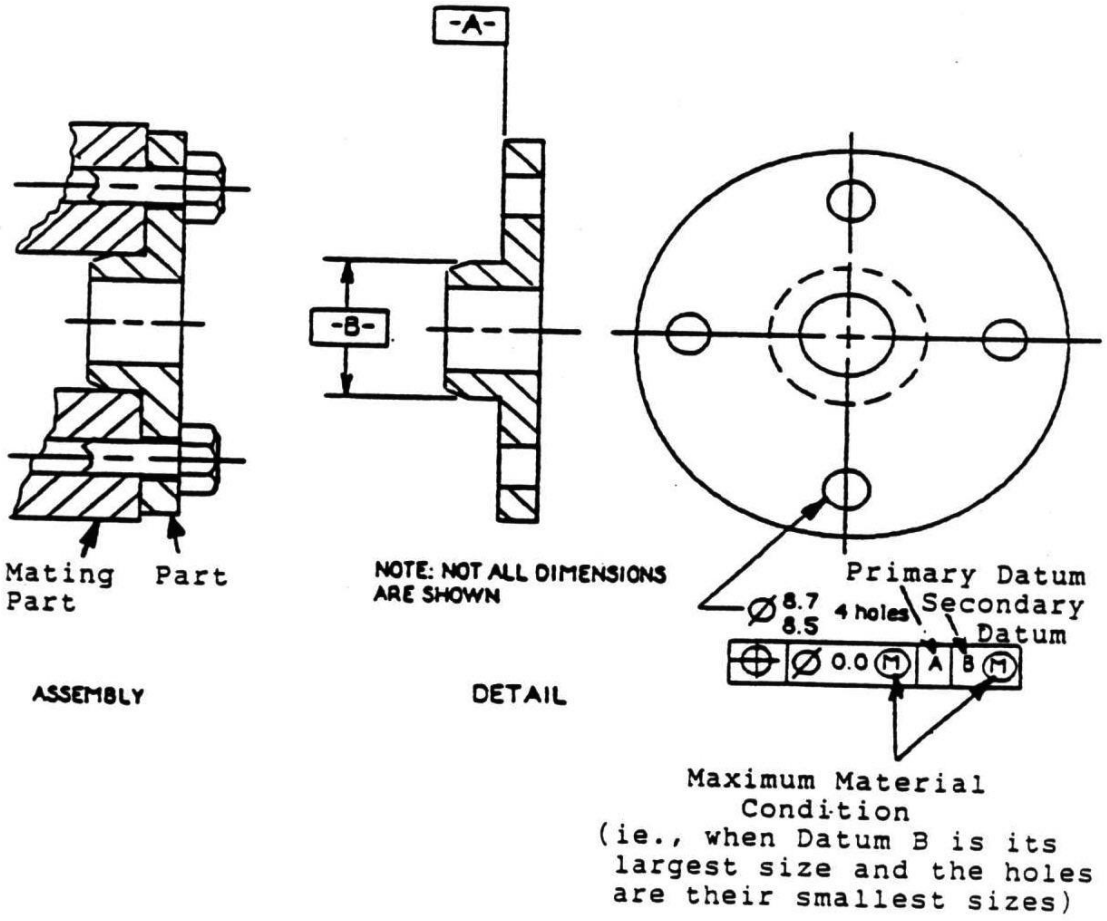




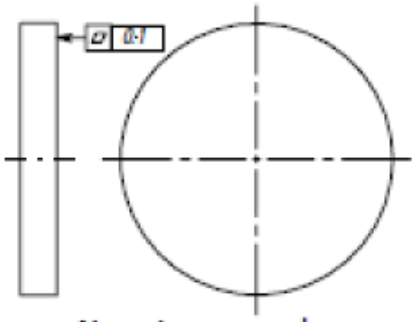
Interpretation

(The datum feature is on the part; the simulated datum is on a gage or surface plate.)

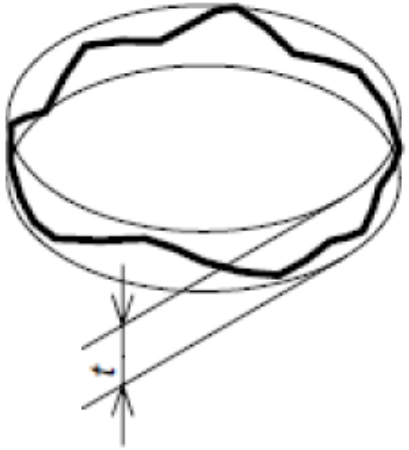
Datum Selection



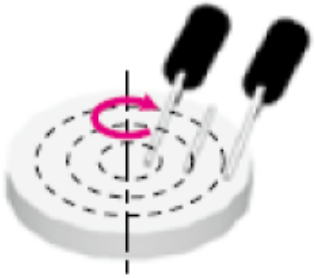
Flatness Measurement



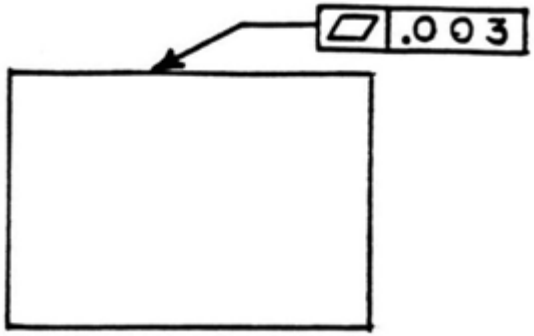
Notation example



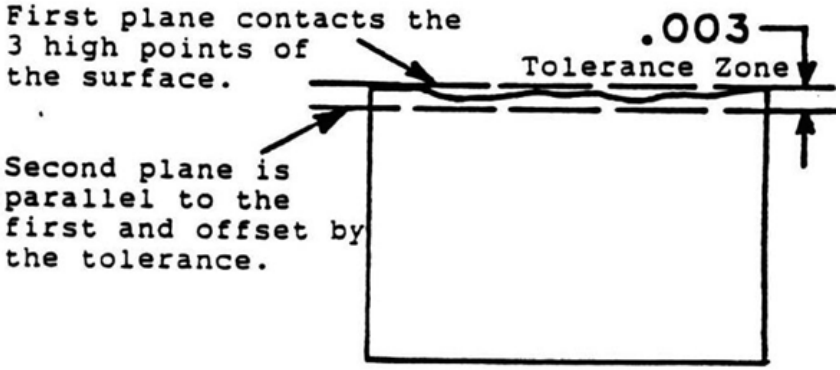
Tolerance zone



Inspection example



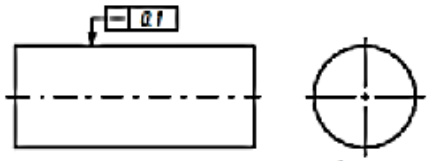
The Specification

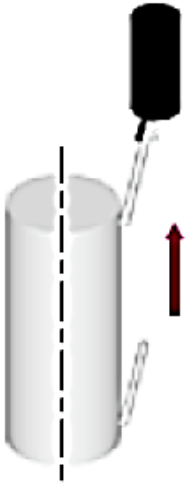


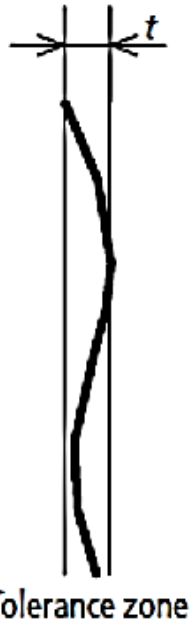
The Tolerance Zone

Flatness: the surface must be contained within the tolerance zone formed between two parallel planes a distance *t* apart

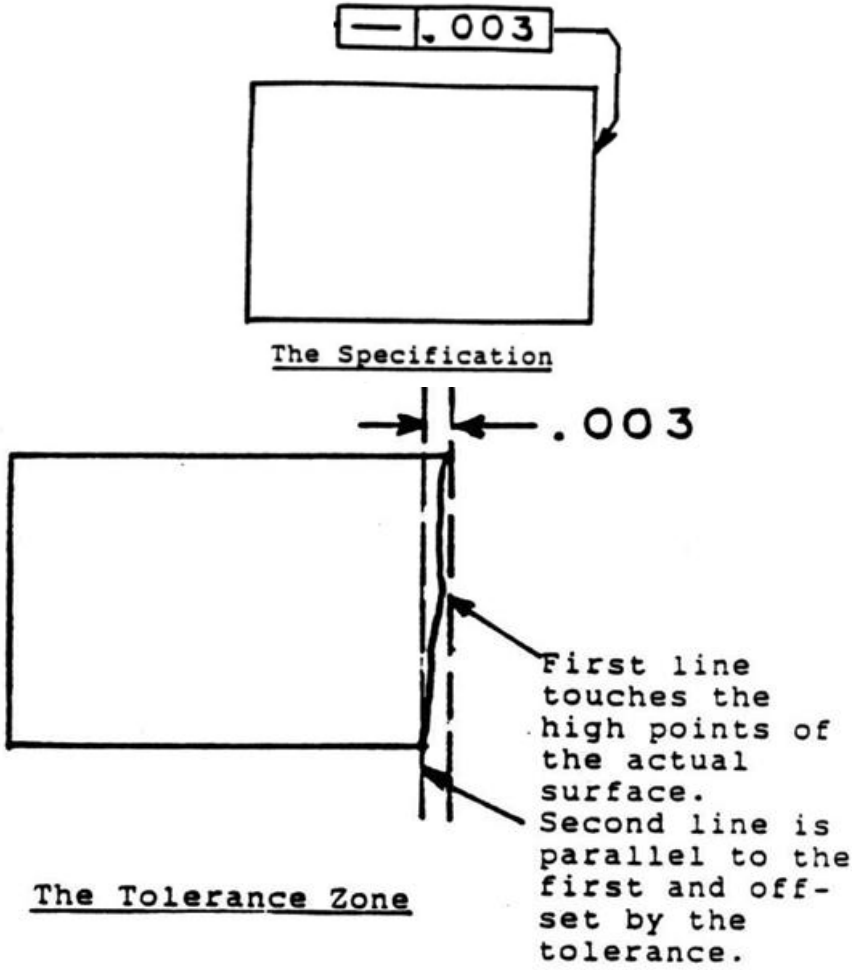
Straightness Measurement







Straightness: any line of the surface must lie within the tolerance zone formed between two parallel straight lines a distance *t* apart and in the direction specified



Straightness Measurement

The equation of the mean line ➔ $$y' = mx + c$$

Where, $$m = \frac{n\sum x_i y_i - \sum x_i \sum y_i}{n\sum x_i^{\,2} - \left(\sum x_i\right)^2}$$

$$c = \frac{\sum y_i \sum x_i^{\,2} - \sum x_i \sum x_i y_i}{n\sum x_i^{\,2} - \left(\sum x_i\right)^2}$$

Out of straightness ➔ $$\delta_i = y_i - y_i'$$

Maximum out of straightness = $$\left|\max + \delta\right| + \left|\max - \delta\right|$$