

Circular Runout VS. Total Runout

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By producing sapphire domes as build to print, we are facing different specifications from our customer.

Here is a short explanation about the different between Circular Runout (Wedging) and Total Runout (Concentricity).

Circularity is a 2D callout that controls only form. It cannot be referenced to a datum axis.

Circularity is a control form (how round the feature is): The two dimensional aspect of circularity, each cross section of the part is inspected independently, with no comparison between different cross sections.

Circular Runout This is also a 2D callout and commonly referred to as *runout* or *wedging*.

Unlike circularity, circular runout requires us to specify a datum axis that the part will be rotated about. In this case each cross section of the part is inspected independently, with no comparison between different cross sections. Circular runout measures the variation of the surface elements when rotated the full angular extent of the feature around the datum axis. This is most commonly measured with a fixed dial indicator. Note: If we travel along the datum axis to a different point of measure, the indicator must be re-zeroed so that one cross section is not compared to another and the designer should specify a point to measure (fig. 1)

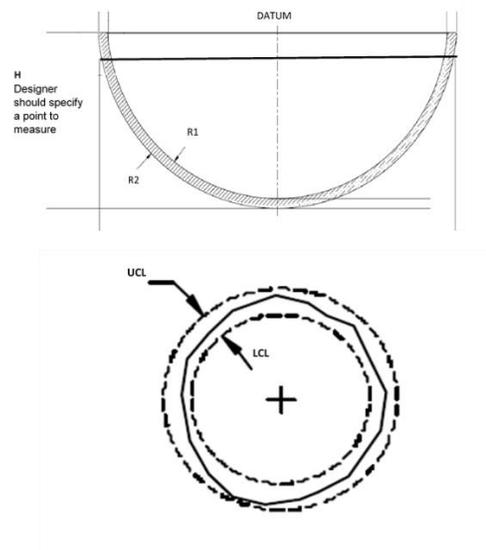


fig. 1

Total Runout is the 3D version of circular runout. The total runout value is the maximum variation in the entire surface when it is rotated about a datum axis. This is a more strict control since it considers the relative location and orientation (and possibly form) of the entire surface rather than individual cross sections. Total runout can be checked with a dial indicator by rotating the part and sweeping back and forth along the datum axis while measuring the maximum and minimum deviations of the entire surface (fig 2).

At sphere element the Total Runout commonly referred to as **Concentricity**, This is the distance between both centers of the curvature; External and Internal surface of the sphere.

For Sapphire domes as 3D sphere section, the concentricity can be calculated by the parameters of thickness variations at the edge of the dome, thickness center of the dome and the radius of each surface as follow:

$$\text{Concentricity} = \sqrt{(Ct - (Rx - Rv))^2 + C^2}$$

Ct - Central Thickness

Rx - Convex Radius

Rv - Concave Radius

C- Wedging/2; (*the thickness variation at the edge of the dome*)/2

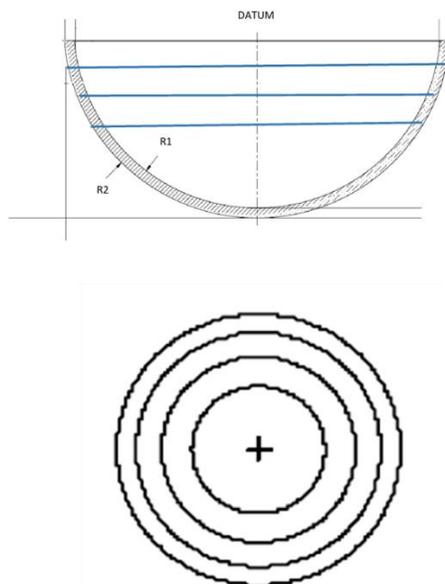


fig. 2