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FORM AND LOCATION TOLERANCES

WALL CHART

For over 50 years Willrich Precision Instruments has been a leader in the field of Gaging, Inspection & Metrology.

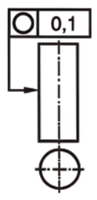
Form & Location Tolerances

Roundness

ISO 1101

Definition

The tolerance zone is limited in the measuring plane which is perpendicular to the axis by two concentric circles a distance ***T*** apart.



Example

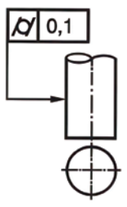
The circumference of any cross section of the toleranced cylinder surface shall be contained between two concentric circles 0.1 apart.

Cylindricity

ISO 1101

Definition

The tolerance zone is limited by two coaxial cylinders a distance ***T*** apart.

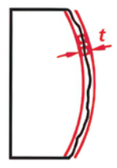


Example

The toleranced cylindrical surface shall be contained between two coaxial cylinders 0.1 apart.

Profile of Any Line

ISO 1101



Definition

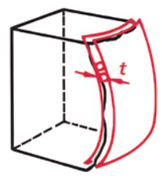
The tolerance zone is limited by two lines which envelope circles of diameter ***T***, the centers of which are situated on a line of ideal geometrical shape.

Example

TIn each section parallel to the plane of projection, the toleranced profile shall be contained between two lines which envelope circles of diameter 0.04, the centers of which are situated on a line of ideal geometrical shape

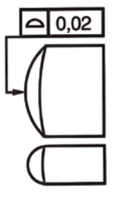
Surface Profile

ISO 1101



Definition

The tolerance zone is limited by two surfaces enveloping spheres of diameter ***T***, the centers of which are situated on a surface having the true geometrical form.

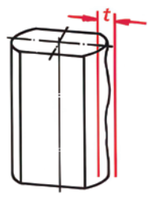


Example

The considered surface shall be contained between two surfaces enveloping spheres of diameter 0.02 the centers of which are situated on a surface having the true geometrical form.

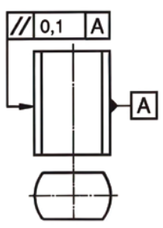
Parallelism

ISO 1101



Definition

The tolerance zone is limited in the measuring plane by two straight lines a distance T apart and parallel to the datum.



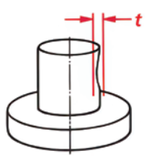
Example

Any generating line of the toleranced surface shall be contained between two straight lines 0.1 apart and parallel to the datum surface **A**.

Note
See ISO 1101 for further parallelism tolerances.

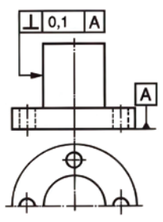
Perpendicularity

ISO 1101



Definition

The tolerance zone is limited in the measuring plane by two parallel, straight lines a distance ***T*** apart and perpendicular to the datum.



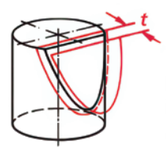
Example

Any generating line of the toleranced cylinder surface shall be contained between two straight lines 0.1 apart and perpendicular to the datum surface.

Note
See ISO 1101 for further perpendicularity tolerances.

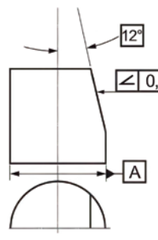
Angularity

ISO 1101



Definition

The tolerance zone is limited by two parallel planes a distance ***T*** apart and inclined at the specified angle to the datum.

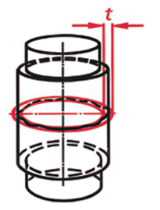


Example

The toleranced surface shall be contained between two parallel planes 0.05 apart which are inclined at 12° to the datum axis **A**.

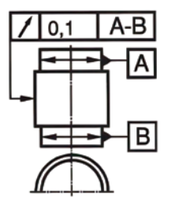
Position

ISO 1101



Definition

If the tolerance value is preceded by the ø sign the tolerance zone is limited by a cylinder of diameter ***T***, the axis of which is in the theoretically exact position of the toleranced element.



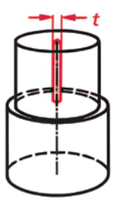
Example

The axis of the toleranced bore shall be contained within a cylinder of diameter 0.02, the axis of which is in the theoretically exact position with respect to the surfaces **B** and **C**.

Note
See ISO 1101 for the positional tolerance of a point or a plane.

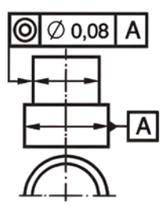
Concentricity/Coaxiality

ISO 1101



Definition (Coaxiality)

The tolerance zone is limited by a cylinder of diameter ***T***, the axis of which coincides with the datum axis.



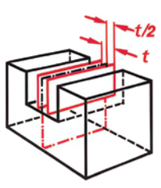
Example (Coaxiality)

The axis of the toleranced cylinder shall be contained within a cylinder of diameter 0.08 the axis of which coincides with the datum **A**.

Note
See ISO 1101 for concentricity tolerances.

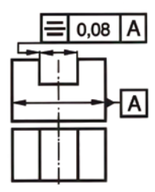
Symmetry

ISO 1101



Definition

The tolerance zone is limited by two planes which run both parallel and symmetric to the datum axis or the datum plane and are a distance ***T*** apart.



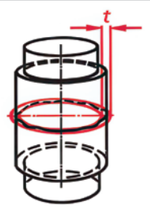
Example

The median plane of a slot shall be contained between two parallel planes which are 0.08 apart and symmetrically disposed to the median plane with respect to the datum feature **A**.

Note
See ISO 1101 for symmetry tolerances of a line or an axis.

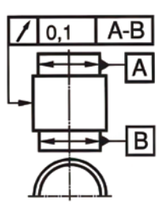
Radial Run-Out

ISO 1101



Definition

The tolerance zone is limited in the measuring plane which is perpendicular to the axis by two concentric circles a distance ***T*** apart, the common center of which lies on the datum axis.



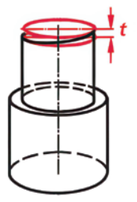
Example

The circumference of any cross section of the toleranced cylinder surface shall be contained between concentric circles 0.1 apart, the common center of which lies on the datum axis formed by **A** and **B**

Note
When taking the measurement, the workpiece has to be turned about the datum axis. See ISO 1101 for axial run out tolerances in any or a specified direction.

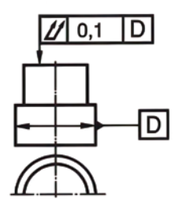
Total Run-Out

ISO 1101



Definition

(Total axial run-out) The tolerance zone is limited by two parallel planes a distance ***T*** apart and perpendicular to the datum axis.



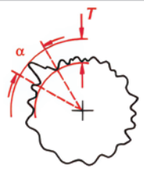
Example

(Total axial run-out)The toleranced surfaceshall be contained between two parallel planes 0.1 apart and perpendicular to the datum axis **D**.

Note
When taking the measurement, the workpiece has to be turned about the datum axis several times. Workpiece and measuring instrument have to move radially to each other. See ISO 1101 for total radial run-out tolerances.

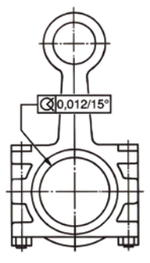
Angular Sector

ISO 1101



Definition

The tolerance zone is limited in the measuring plane which is perpendicular to the axis by two concentric circles a distance T apart. The toleranced circumference shall be contained within the tolerance zone in any angular sector starting from the profile center and featuring any width.



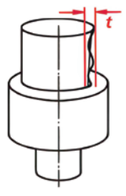
Example

The “local“ roundness deviation shall be smaller than 0.012 in any angular sector starting from the profile center and featuring a width of 15°.

Note
The roundness deviation as per ISO 1101 may be larger; if necessary, it can be toleranced separately.

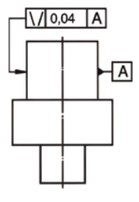
Conicity

ISO 1101



Definition

The tolerance zone is limited in the measuring plane by two straight lines a distance ***T*** apart and parallel to the datum. What is to be contained within the tolerance zone is not the entire profile that has been assessed but that portion of the **LSLI** line computed for the entered measuring length.



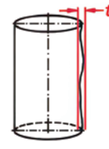
Example

Each portion of the **LSLI** line calculated for the entered measuring length on the toleranced generating line shall be contained between two straight lines 0.04 apart and parallel to the opposite generating line.

Note
The parallelism deviation may be larger; if necessary, it can be toleranced separately.

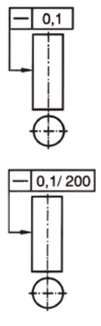
Straightness

ISO 1101



Definition

The tolerance zone is limited in the measuring plane by two parallel straight lines a distance ***T*** apart.



Examples

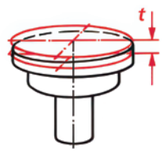
Any generating line of a the toleranced cylinder surface shall be contained between two parallel, straight lines 0.1 apart.

Any 200 portion of any generating line of the toleranced cylinder surface shall be contained between two parallel, straight lines 0.1 apart.

Note
See ISO 1101 for further straightness tolerances.

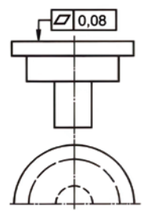
Flatness

ISO 1101



Definition

The tolerance zone is limited by two parallel planes a distance ***T*** apart.



Example

The toleranced surface shall be contained between two parallel planes 0.08 apart.

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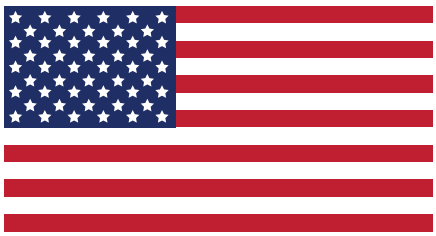

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