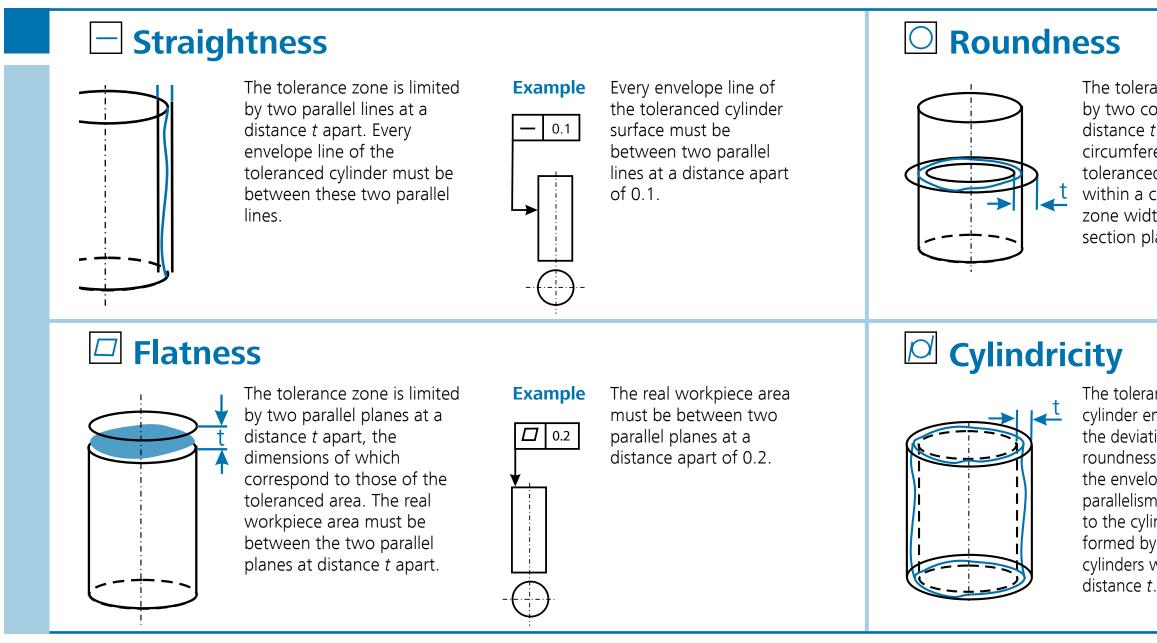
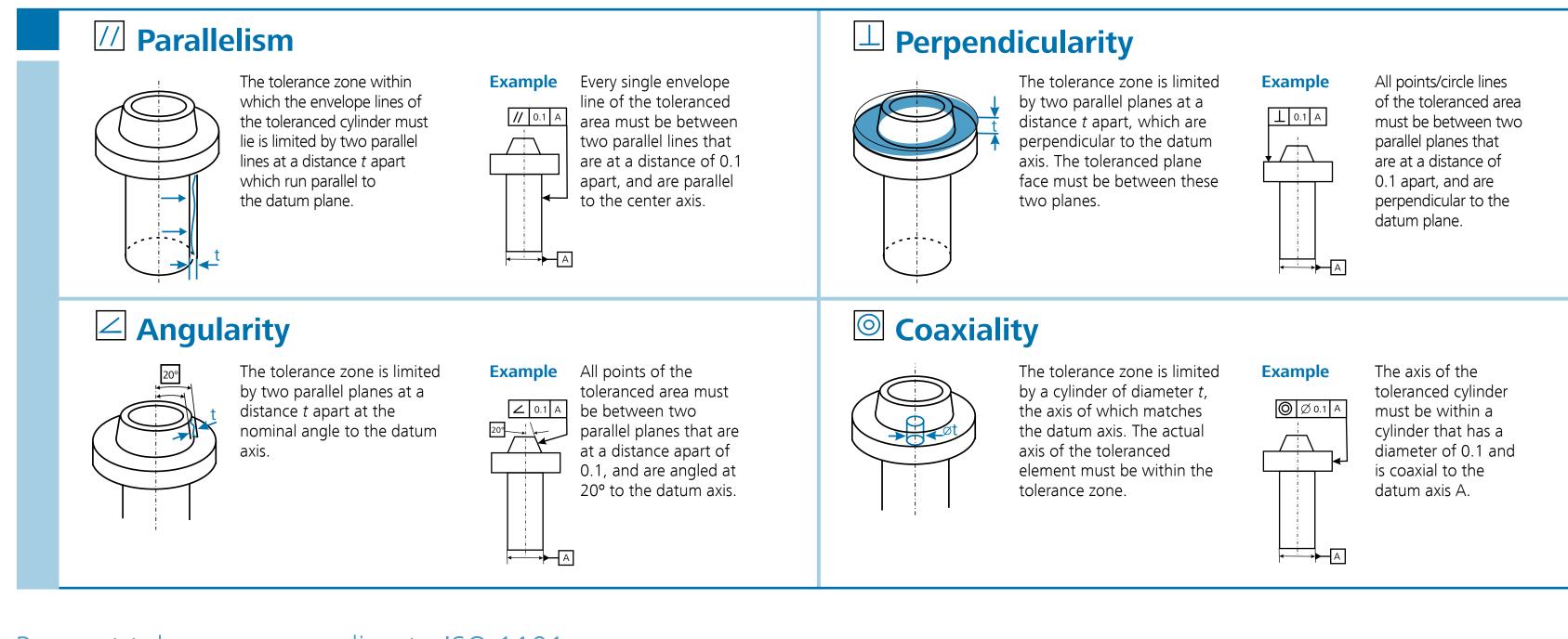
Form measuring systems from Jenoptik: Geometrical tolerancing in practice

Form tolerances according to ISO 1101



Position tolerances according to ISO 1101



Run-out tolerances according to ISO 1101

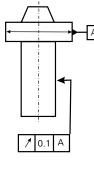
Radial run-out

Total radial run-out

In every radial section plane perpendicular to the surface, the tolerance zone is limited by two concentric circles at a distance *t* apart, the common center point of which is on the datum axis. The radial run-out tolerance applies generally for a full revolution of the toleranced element around the datum axis.

The tolerance zone is limited by

Example



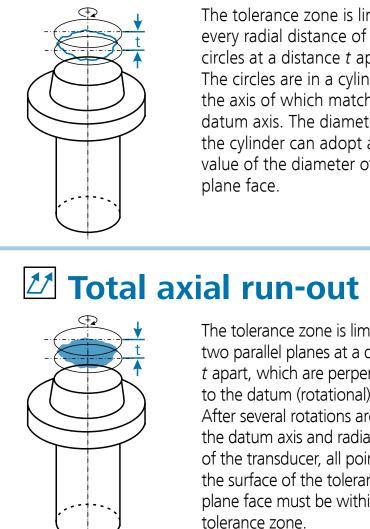
of every radial section plane of the toleranced cylindrical area must be between two concentric circles at a distance apart of 0.1 with their common center point on the datum axis A.

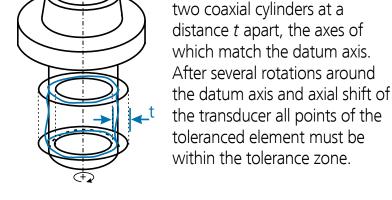
The circumference line

Example

₫1 0.1 A

The toleranced cylindrical area must be between two coaxial cylinders with a radial distance apart of 0.1 with their common axis on the datum axis

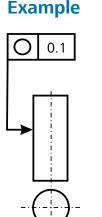




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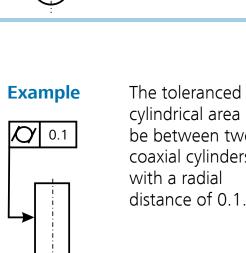
info-de.im@jenoptik.com

The tolerance zone is limited by two concentric circles at a distance *t* apart. The circumference line of the toleranced cylinder must be within a circle ring of the zone width *t*, in every radial section plane.



The circumference line of the toleranced cylinder must be within a circle ring of the zone width 0.1 in every radial section plane.

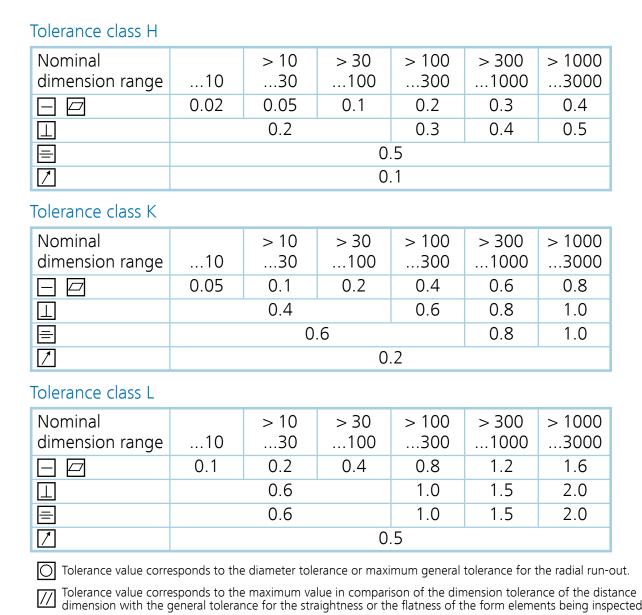
The tolerance zone for the cylinder envelope area limits the deviation of the roundness, the straightness of the envelope line and the parallelism of the envelope line to the cylinder axis. It is formed by two coaxial cylinders with the radial



(-+)

The toleranced cylindrical area must be between two coaxial cylinders

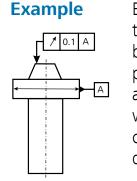
General tolerances according to ISO 2768



Evaluation method

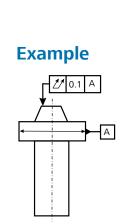
Axial run-out

The tolerance zone is limited in every radial distance of two circles at a distance *t* apart. The circles are in a cylinder, the axis of which matches the datum axis. The diameter of the cylinder can adopt any value of the diameter of the



Every circle line of the toleranced area must be between two parallel circle planes at a distance apart of 0.1 with their common center point on the datum axis A.

The tolerance zone is limited by two parallel planes at a distance *t* apart, which are perpendicular to the datum (rotational) axis. After several rotations around the datum axis and radial shift of the transducer, all points of the surface of the tolerance plane face must be within the loierance zone



The toleranced area must be between two parallel circle planes at a distance apart of 0.1 with their common center point on the datum axis A.



1.68 µm

MZCI Minimum Zone Circle

Effect and function of different evaluation methods on the roundness evaluation.

enclose the roundness profile. point considerably. Gives the least possible form error.

LSCI Least Square Circle

Circle through the roundness profile with minimum sum of profile deviation squares. Individual profile peaks influence the center point only a little. Very suitable for stable datum formation.

MICI Maximum Inscribed Circle

Maximum circle inscribed in the roundness profile for inside areas. The method is used for form measurement of the inside diameter.

MCCI Minimum Circumscribed Circle

Minimum circle circumscribing the roundness profile for outside areas. The method is used for form measurement of the outside diameter.

Drawing entries

Tolerance frame — // 0.01 A Datum letter _Symbol for toleranced characteristic Indicating arrow _Toleranced element

─╎╎╎──╋──┼[┿]

Toleranced elements Indicating arrow to contour Indicating arrow as an exten-

line or subsidiary line (offset sion of the dimension line: if from dimension line): if the tolerance applies for the tolerance refers to the line axis or median plane or a point or area.



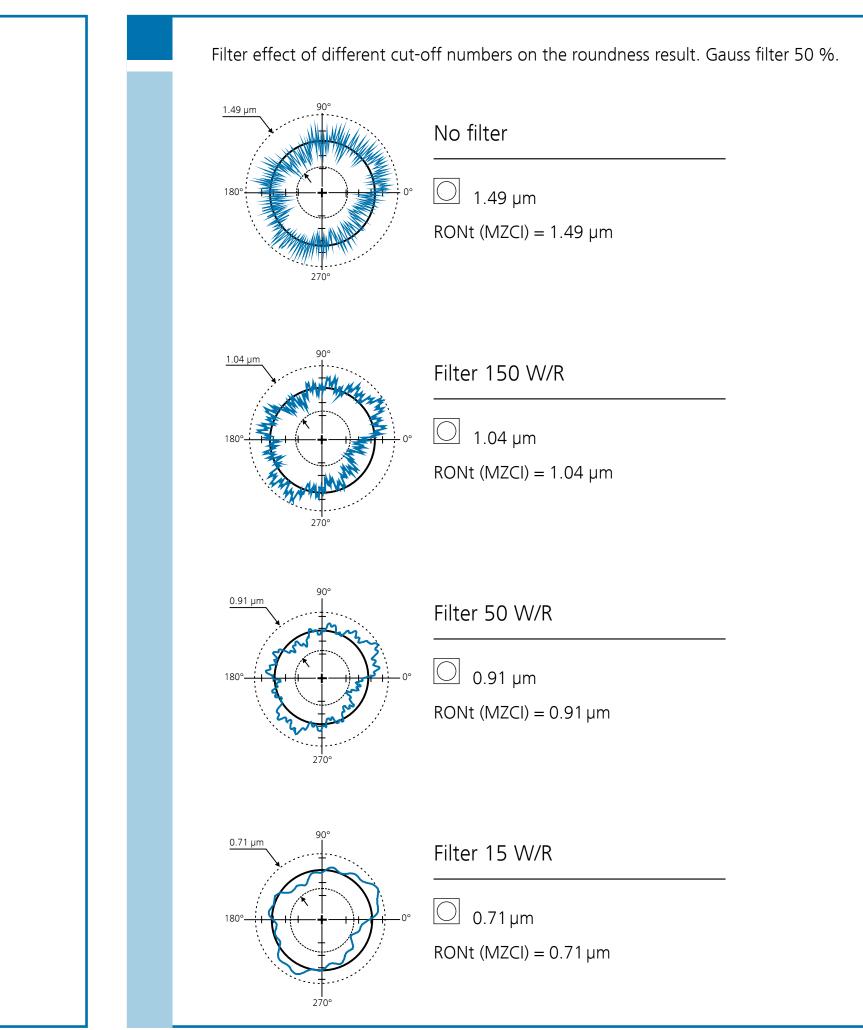
| > 100 300 | > 300 1000 | > 1000 3000 | | |
|--------------|---------------|----------------|--|--|
| 0.2 | 0.3 | 0.4 | | |
| 0.3 | 0.4 | 0.5 | | |
| 5 | | | | |
| 1 | | | | |
| | | | | |
| > 100 | > 300 | > 1000 | | |
| 300 | 1000 | 3000 | | |
| 0.4 | 0.6 | 0.8 | | |
| 0.6 | 0.8 | 1.0 | | |
| | 0.8 | 1.0 | | |
| 2 | | | | |
| | | | | |
| > 100 | > 300 | > 1000 | | |
| 300 | 1000 | 3000 | | |
| 0.8 | 1.2 | 1.6 | | |
| 1.0 | 1.5 | 2.0 | | |
| 1.0 | 1.5 | 2.0 | | |
| | | | | |

| For workpieces produced by cutting |
|---|
| All dimensions in mm |
| |
| |
| |
| |

| Standards of | practical | re | levance |
|--------------|-----------|----|---------|

| For measurement of roundness, straightness and flatness | | |
|---|--|--|
| ISO 1101 | Geometrical Product Specifications (GPS) – Geometrical tole- rancing – Tolerances of form, orientation, location and run-ou | |
| ISO 12180-1 | Geometrical Product Specifications (GPS) – Cylindricity Part 1: Vocabulary and parameters of cylindricity | |
| ISO 12181-1 | Geometrical Product Specifications (GPS) – Roundness Part 1: Vocabulary and parameters of roundness | |
| ISO 12780-1 | Geometrical Product Specifications (GPS) – Straightness Part 1: Vocabulary and parameters of straightness | |
| ISO 12781-1 | Geometrical product specifications (GPS) – Flatness Part 1: Vocabulary and parameters of flatness | |
| VDI/VDE 2631 Sheet 1 | Form measurement – Basic principals of the determination of form and positional deviations | |
| VDI/VDE 2631 Sheet 2 | Form measurement – Determination of the sensitivity of the signal transmittal chain | |
| VDI/VDE 2631 Sheet 3 | Form measurement – Filter characteristics and selection | |
| | | |

Filter stages



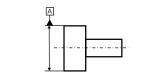
Concentric inner and outer perimeter circles with a minimum radial distance, and which Individual profile peaks influence the center

of the element.

Datums

Datum triangle with datum letters on the contour line of the element or on the susidiary line: if the displayed datum is is the axis, the median

a line or area. -----



dimensioned point.

Restriction of the as an extension of the dimension line: if the datum the element as a dot-dash line with dimensioning. plane or an appropriately

A filled or empty datum to an area of datum triangle has the same meaning.



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