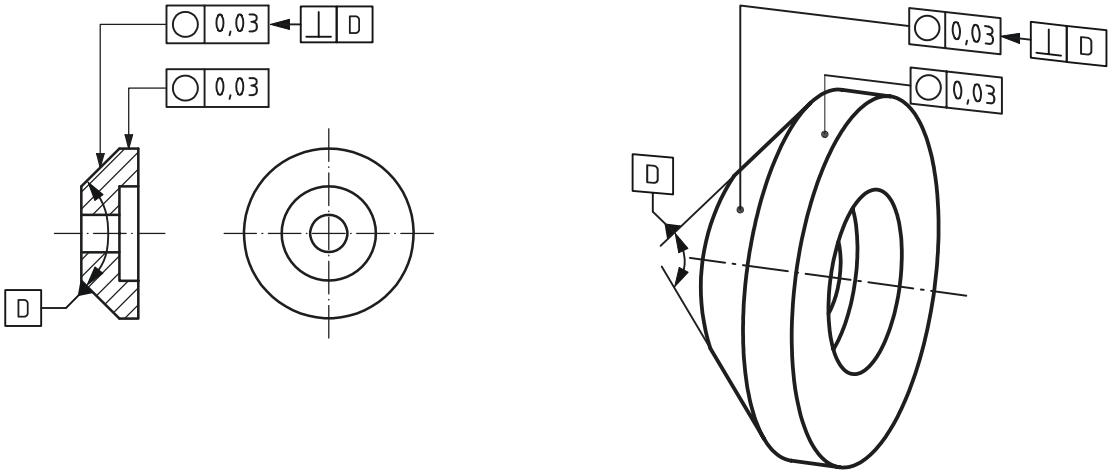
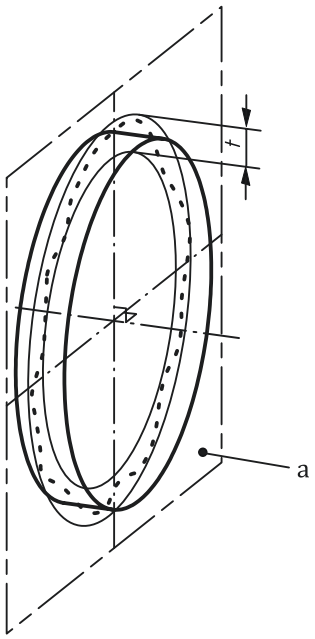


a) 2D **b) 3D**

Figure 98 — Roundness indication

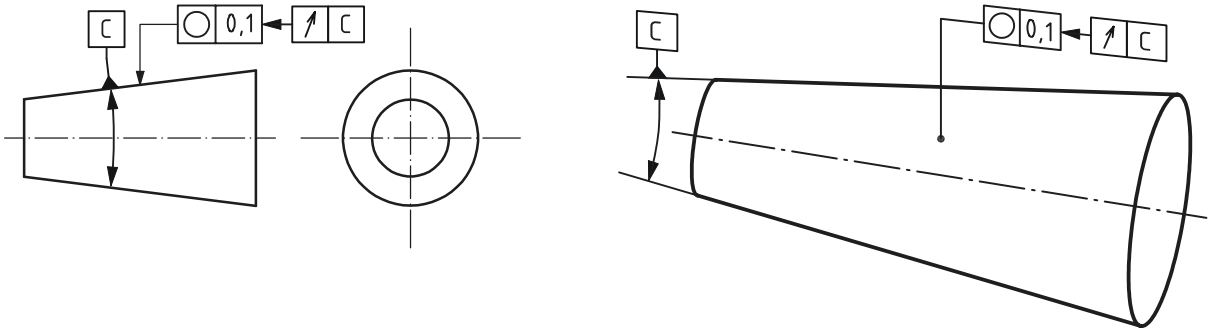
The tolerance zone defined by the specification in Figure 98, in the considered cross-section, is limited by two concentric circles with a difference in radii of *t*, see Figure 99.



a Any intersection plane (any cross-section).

Figure 99 — Definition of the roundness tolerance zone

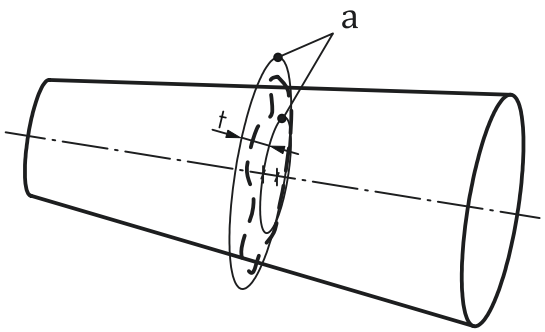
In Figure 100, an extracted circumferential line exists in any cross-section of the surface defined by an intersection of the toleranced feature with a cone that is coaxial with the toleranced feature and has a cone angle such that the cone is perpendicular to the toleranced feature. This extracted circumferential line shall be contained between two circles on the intersecting cone separated by 0,1, i.e. a tolerance zone that is perpendicular to the surface of the toleranced feature, as indicated by the direction indicator. A direction indicator shall always be indicated for roundness of conical features.



a) 2D **b) 3D**

Figure 100 — Roundness indication

The tolerance zone defined by the specification in Figure 100, in the considered cross-section, is limited by two circles on a conical surface a distance *t* apart along the surface, see Figure 101.



a Circles perpendicular to datum C (the axis of the toleranced feature), on a conical surface perpendicular to the surface of the toleranced feature.

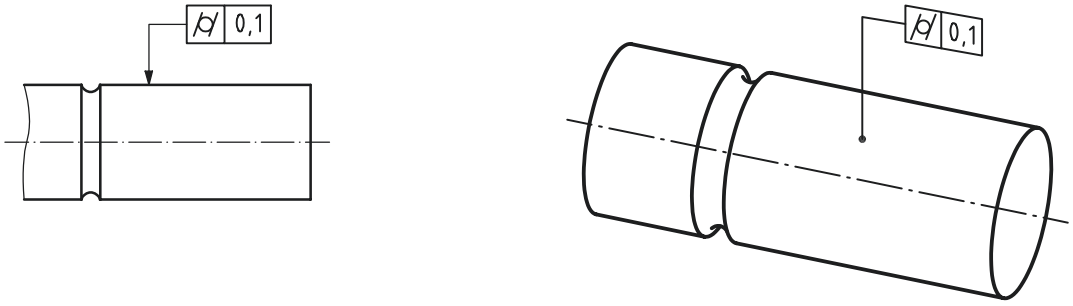
Figure 101 — Definition of the roundness tolerance zone

The direction feature indicator, which shall always be indicated for revolute surfaces that are neither cylindrical nor spherical, can be used to indicate roundness perpendicular to the surface or at a defined angle to the axis of the toleranced feature, see Clause 15. For former practice, see A.3.3.

17.5 Cylindricity specification

The toleranced feature is an integral feature. The nature and shape of the nominal toleranced feature is explicitly given as a cylindrical surface, which is an areal feature.

In Figure 102, the extracted cylindrical surface shall be contained between two coaxial cylinders with a difference in radii of 0,1.



a) 2D **b) 3D**

Figure 102 — Cylindricity indication

The tolerance zone defined by the specification in Figure 102, is limited by two coaxial cylinders with a difference in radii of *t*, see Figure 103.

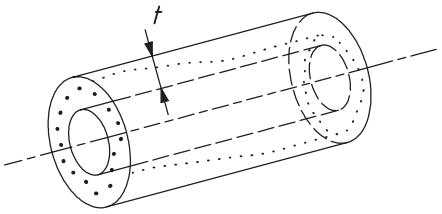
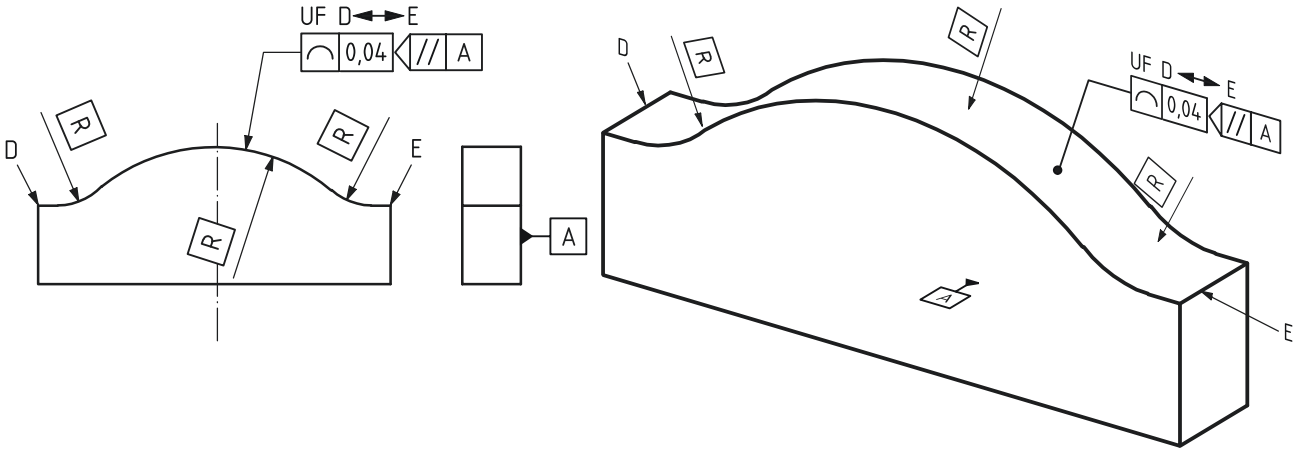


Figure 103 — Definition of the cylindricity tolerance zone

17.6 Line profile specification not related to a datum

The toleranced feature can be an integral feature or a derived feature. The nature of the nominal toleranced feature is explicitly given as a linear feature or a set of linear features. The shape of the nominal toleranced feature, except in the case of a straight line, shall be explicitly given by complete indications on the drawing or by queries of the CAD model, see ISO 16792.

In Figure 104, in each section, parallel to datum plane A, as specified by the intersection plane indicator, the extracted profile line shall be contained between two equidistant lines enveloping circles of diameter 0,04, the centres of which are situated on a line having the theoretically exact geometrical form. The UF specification element is used to indicate that the three circular sections in the compound feature shall be combined into one united feature. For deprecated 2D practice, see A.2.1. For former practice regarding the extent of the toleranced feature, see A.3.5.

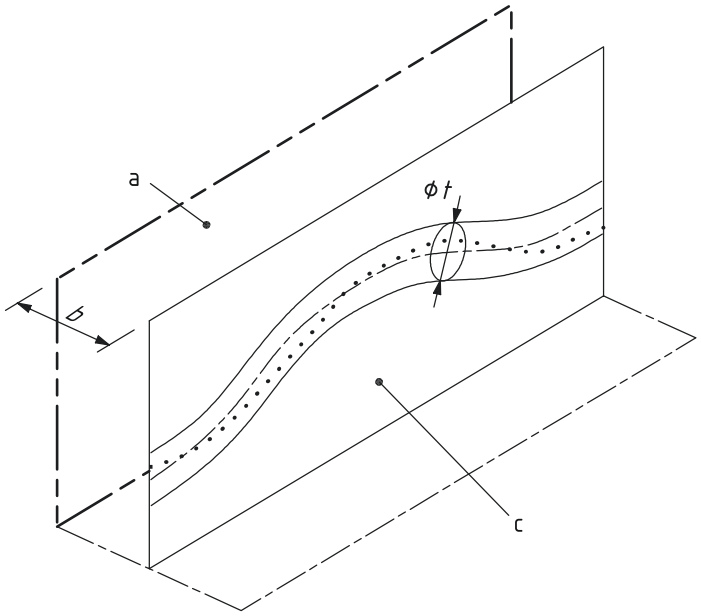


a) 2D **b) 3D**

NOTE Some of the TEDs necessary for an unambiguous definition of the nominal geometry are not shown.

Figure 104 — Line profile indication

The tolerance zone defined by the specification in Figure 104 is limited by two lines enveloping circles of diameter *t*, the centres of which are situated on a line having the theoretically exact geometrical form, see Figure 105.



a Datum plane A.

b Any distance.

c Plane parallel to datum plane A.

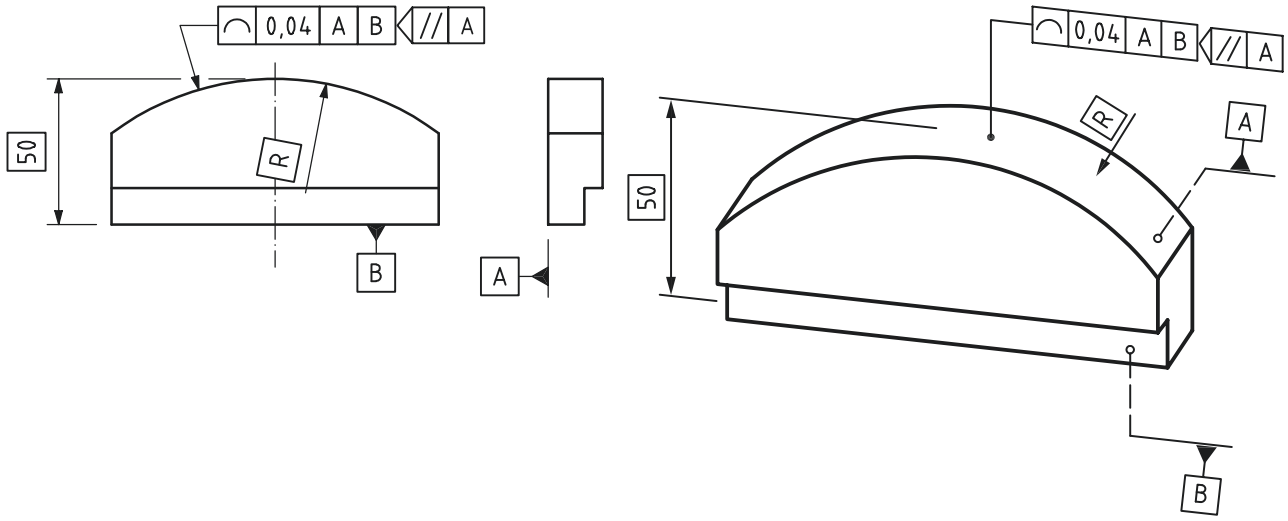
Figure 105 — Definition of the line profile tolerance zone

17.7 Line profile specification related to a datum system

The toleranced feature can be an integral feature or a derived feature. The nature of the nominal toleranced feature is explicitly given as a linear feature or a set of linear features. The shape of the

nominal toleranced feature, except in the case of a straight line, shall be explicitly given by complete indications on the drawing or by queries of the CAD model, see ISO 16792.

In Figure 106, in each section, parallel to datum plane A, as specified by the intersection plane indicator, the extracted profile line shall be contained between two equidistant lines enveloping circles of diameter 0,04, the centres of which are situated on a line having the theoretically exact geometrical form with respect to datum plane A and datum plane B. For deprecated 2D practice, see A.2.1.

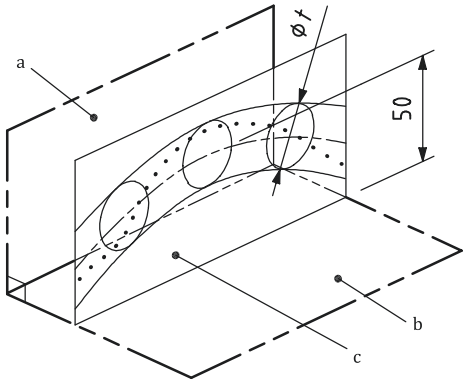


a) 2D **b) 3D**

NOTE Some of the TEDs necessary for an unambiguous definition of the nominal geometry are not shown.

Figure 106 — Line profile indication

The tolerance zone defined by the specification in Figure 106 is limited by two lines enveloping circles of diameter *t*, the centres of which are situated on a line having the theoretically exact geometrical form with respect to datum plane A and datum plane B, see Figure 107.



a Datum A.

b Datum B.

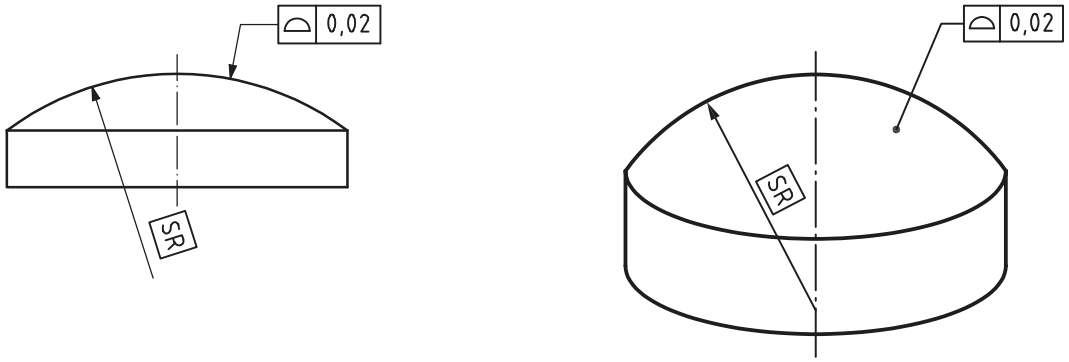
c Plane parallel to datum A.

Figure 107 — Definition of the line profile tolerance zone

17.8 Surface profile specification not related to a datum

The toleranced feature can be an integral feature or a derived feature. The nature of the nominal toleranced feature is explicitly given as an areal feature. The shape of the nominal toleranced feature, except in the case of a flat surface, shall be explicitly given by complete indications on the drawing or by queries of the CAD model, see ISO 16792.

In Figure 108, the extracted surface shall be contained between two equidistant surfaces enveloping spheres of diameter 0,02, the centres of which are situated on a surface having the theoretically exact geometrical form.



a) 2D **b) 3D**

Figure 108 — Surface profile indication

The tolerance zone defined by the specification in Figure 108 is limited by two surfaces enveloping spheres of diameter *t*, the centres of which are situated on a surface having the theoretically exact geometrical form, see Figure 109.

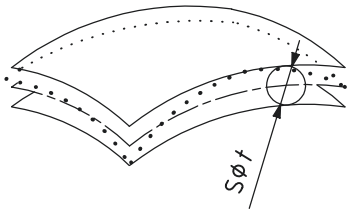


Figure 109 — Definition of the surface profile tolerance zone

17.9 Surface profile specification related to a datum

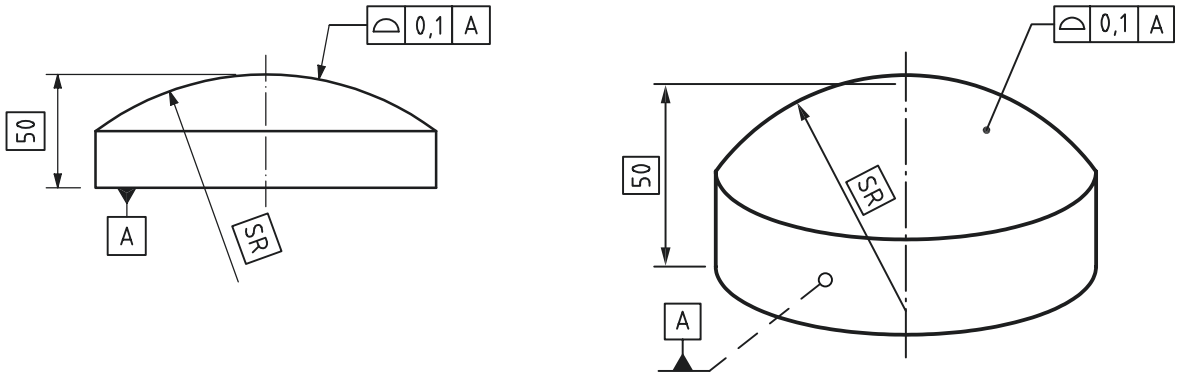
The toleranced feature can be an integral feature or a derived feature. The nature of the nominal toleranced feature is explicitly given as an areal feature. The shape of the nominal toleranced feature, except in the case of a flat surface, shall be explicitly given by complete indications on the drawing or by queries of the CAD model, see ISO 16792.

If the specification is an orientation specification, the >< specification element shall be placed in the second compartment of the tolerance indicator or after each datum indication in the tolerance indicator, or no datum that is able to lock a non-redundant translation of the tolerance zone shall be indicated. The angular dimensions that are locked between the nominal toleranced feature and the datums shall be defined by explicit or implicit TEDs or both, see ISO 5459.

If the specification is a location specification, at least one datum that locks a non-redundant translation of the tolerance zone shall be indicated in the tolerance indicator. The angular and linear dimensions

that are locked between the nominal toleranced feature and the datums shall be defined by explicit or implicit TEDs or both.

In Figure 110, the extracted surface shall be contained between two equidistant surfaces enveloping spheres of diameter 0,1, the centres of which are situated on a surface having the theoretically exact geometrical form with respect to datum plane A.

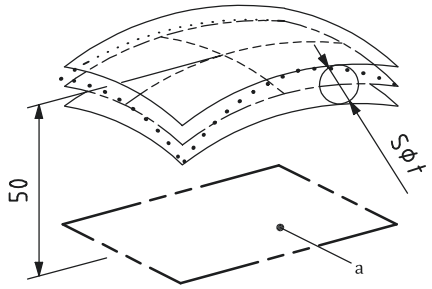


a) 2D **b) 3D**

NOTE Some of the TEDs necessary for an unambiguous definition of the nominal geometry are not shown.

Figure 110 — Surface profile indication

The tolerance zone defined by the specification in Figure 110 is limited by two surfaces enveloping spheres of diameter *t*, the centres of which are situated on a surface having the theoretically exact geometrical form with respect to datum plane A, see Figure 111.



a Datum A.

Figure 111 — Definition of the surface profile tolerance zone

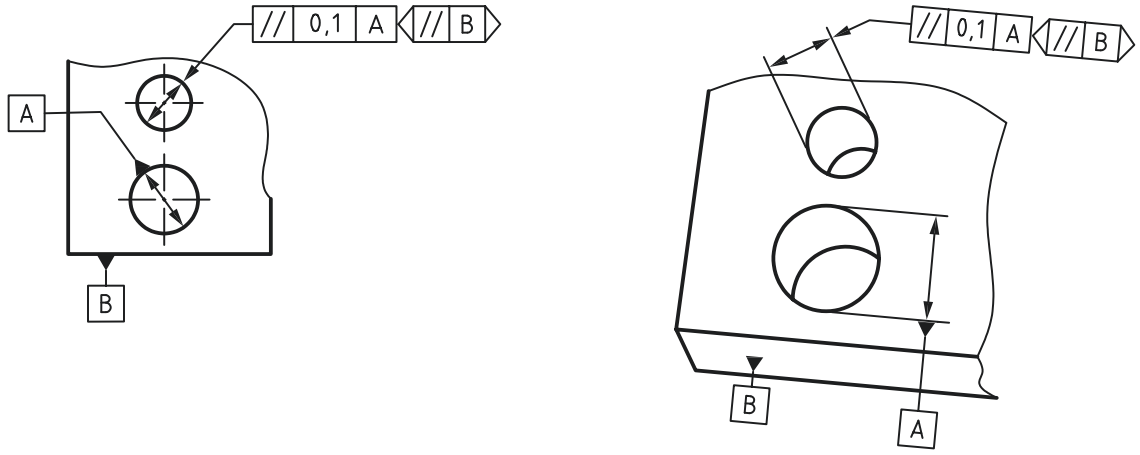
17.10 Parallelism specification

17.10.1 General

The toleranced feature can be an integral feature or a derived feature. The nature of the nominal toleranced feature is a linear feature, a set of linear features, or an areal feature. The shape of each nominal toleranced feature is explicitly given as a straight line or a flat surface. If the indicated feature is a nominally flat surface and the toleranced feature is a set of straight lines in that surface, an intersection plane indicator shall be indicated. The TED angles that are locked between the nominal toleranced feature and the datums shall be defined by implicit TEDs (0°).

17.10.2 Parallelism specification of a median line related to a datum system

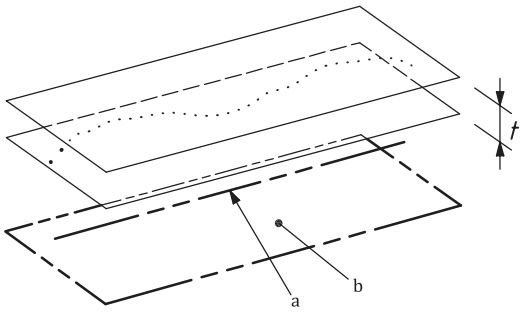
In Figure 112, the extracted median line shall be contained between two parallel planes 0,1 apart which are parallel to datum axis A. The planes limiting the tolerance zone are parallel to datum plane B as specified by the orientation plane indicator. Datum B is secondary to datum A. For former practice, see A.3.6.



a) 2D **b) 3D**

Figure 112 — Parallelism indication

The tolerance zone defined by the specification in Figure 112 is limited by two parallel planes a distance *t* apart. The planes are parallel to the datums and in the direction specified, see Figure 113.

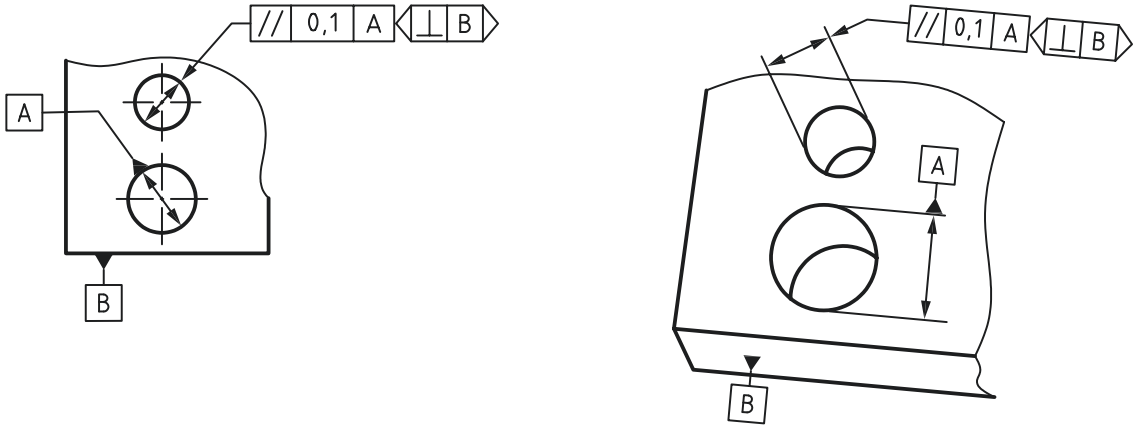


a Datum A.

b Datum B.

Figure 113 — Definition of the parallelism tolerance zone

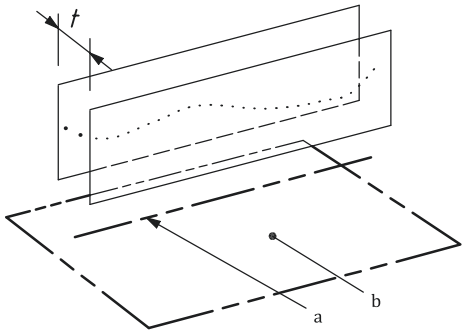
In Figure 114, the extracted median line shall be contained between two parallel planes 0,1 apart, which are parallel to datum axis A. The planes limiting the tolerance zone are perpendicular to datum plane B as specified by the orientation plane indicator. Datum B is secondary to datum A, see 14.4. For former practice, see A.3.6.



a) 2D **b) 3D**

Figure 114 — Parallelism indication

The tolerance zone defined by the specification in Figure 114 is limited by two parallel planes a distance *t* apart. The planes are parallel to datum A and perpendicular to datum B, see Figure 115.



a Datum A.

b Datum B.

Figure 115 — Definition of the parallelism tolerance zone

In Figure 116, the extracted median line shall be contained between two pairs of parallel planes, which are parallel to datum axis A, and positioned 0,1 and 0,2 apart respectively. The orientation of the planes limiting the tolerance zones is specified with respect to datum plane B by the orientation plane indicators. Datum B is secondary to datum A, see 14.4. For former practice, see A.3.6.

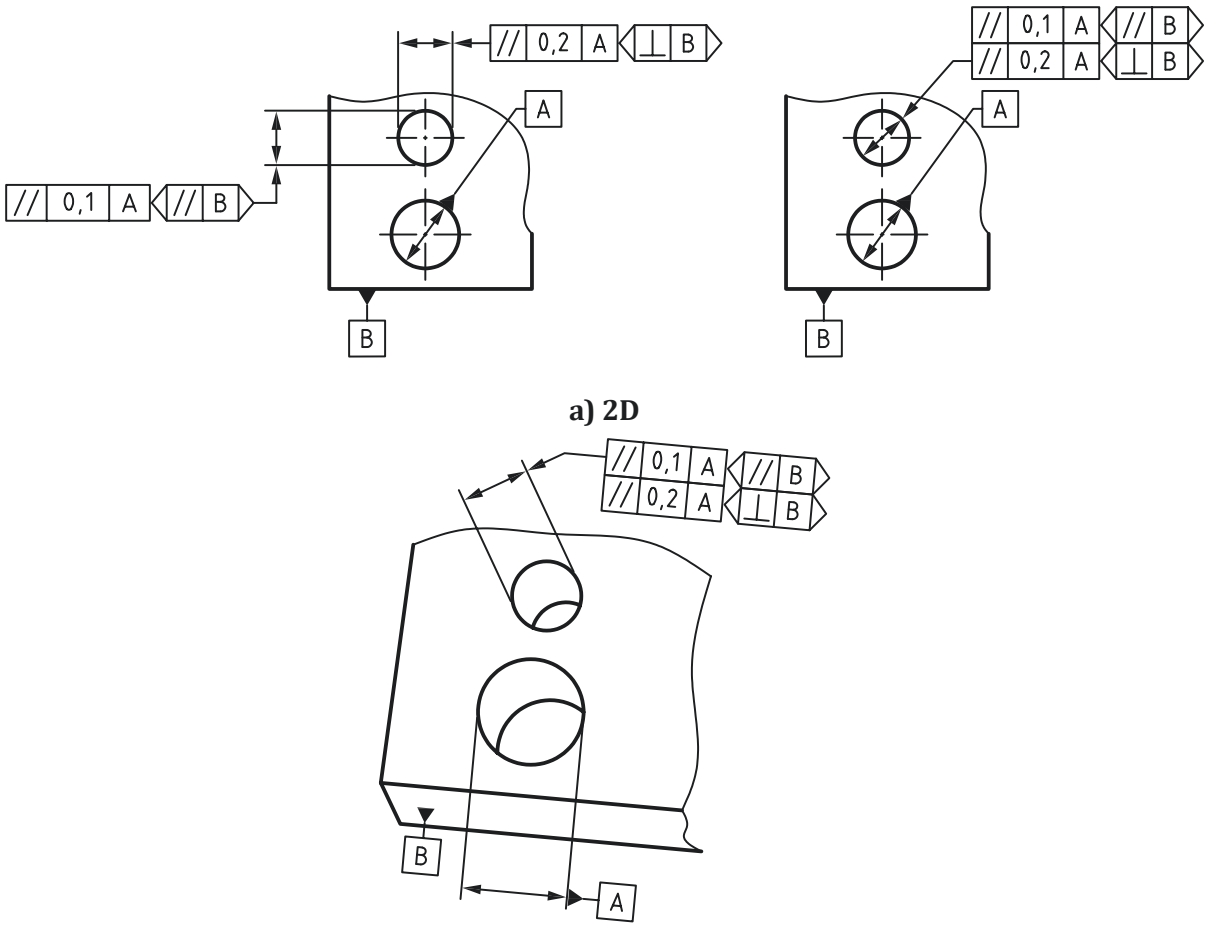
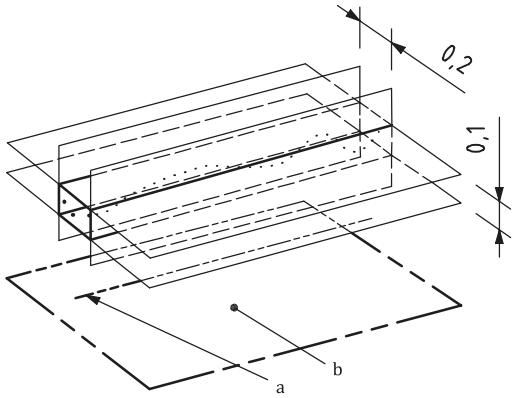


Figure 116 — Parallelism indication

Based on the specification in Figure 116, the extracted median line shall be contained between two pairs of parallel planes, which are parallel to the datum axis A, and positioned 0,1 and 0,2 apart respectively, see Figure 117. The orientations of the tolerance zones are specified with respect to datum plane B by the orientation plane indicators:

— the planes limiting the tolerance zone of 0,2 are perpendicular to the orientation plane B as specified by the orientation plane indicator;

— the planes limiting the tolerance zone of 0,1 are parallel to the orientation plane B as specified by the orientation plane indicator.



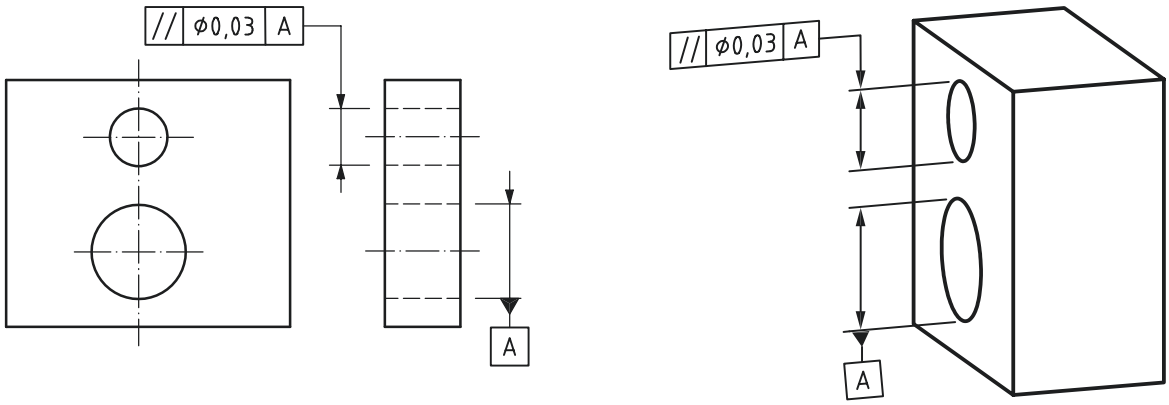
a Datum A.

b Datum B.

Figure 117 — Definition of the parallelism tolerance zones

17.10.3 Parallelism specification of a median line related to a datum straight line

In Figure 118, the extracted median line shall be within a cylindrical zone of diameter 0,03, parallel to datum axis A.



a) 2D **b) 3D**

Figure 118 — Parallelism indication

The tolerance zone defined by the specification in Figure 118 is limited by a cylinder of diameter *t*, parallel to the datum, because the tolerance value is preceded by the symbol ⌀, see Figure 119.