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МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Technical drawings — Geometrical tolerancing — Positional tolerancing

Dessins techniques — Tolérancement géométrique — Tolérancement de localisation

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Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 5458 was prepared by Technical Committee ISO/TC 10, *Technical drawings*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Technical drawings — Geometrical tolerancing — Positional tolerancing

0 Introduction

0.1 The concept of positional tolerancing, described in ISO 1101, is further elaborated in this International Standard.

The figures in this International Standard serve to illustrate the subject matter only and are not necessarily complete.

Other relevant International Standards, such as those dealing with the maximum material principle (ISO 2692), datums and datum systems (ISO 5459), should be taken into consideration when using this International Standard.

0.2 For the purposes of this International Standard, all dimensions and tolerances on the drawings have been stencilled in upright lettering. It should be understood that these indications could just as well be written in free-hand or inclined (italic) lettering without altering the meaning of the indications.

For the presentation of lettering (proportions and dimensions), see ISO 3098-1.

1 Scope and field of application

This International Standard describes the principle of positional tolerancing for the location of features and also provides for-

mulae for the calculation of tolerance values appropriate to mating parts. Generally positional tolerancing is applicable to both regular- and irregular-shaped features. However, to make this International Standard more comprehensible, only regular-shaped features have been shown.

NOTE — Regular-shaped features are, for example, cylindrical (and square) holes, bolts, studs or pins, parallel-sided slots and taps, keys and keyways.

2 References

ISO 1101, *Technical drawings — Geometrical tolerancing — Tolerancing of form, orientation, location and run-out — Generalities, definitions, symbols, indications on drawings.*

ISO 2692, *Technical drawings — Geometrical tolerancing — Maximum material principle.*¹⁾

ISO 3098-1, *Technical drawings — Letters — Part 1 : Currently used characters.*

ISO 5459, *Technical drawings — Geometrical tolerancing — Datums and datum-systems for geometric tolerances.*

ISO 8015, *Technical drawings — Fundamental tolerancing principle.*

¹⁾ At present at the stage of draft. (Revision of ISO 1101-2 : 1974.)

3 Establishment of positional tolerances

3.1 General

The primary constituents are theoretically exact dimensions, tolerance zones and datums.

3.2 Fundamental principle

In the method of positional tolerancing, theoretically exact dimensions and positional tolerances determine the location of features, such as points, axes and median planes, relative to each other or in relation to one or more datums. The tolerance zone is symmetrically disposed about the theoretically exact location.

NOTE — By virtue of this principle positional tolerances do not accumulate where theoretically exact dimensions are arranged in a chain (see figure 4). (This contrasts with dimensional tolerances arranged in a chain.) Positional tolerancing allows clear reference to be made to one or more datums.

3.3 Positional tolerances related to a specified datum

If the positional tolerance zone is perpendicularly related to a specified datum, the right angle need not be indicated on the drawing (see figure 1).

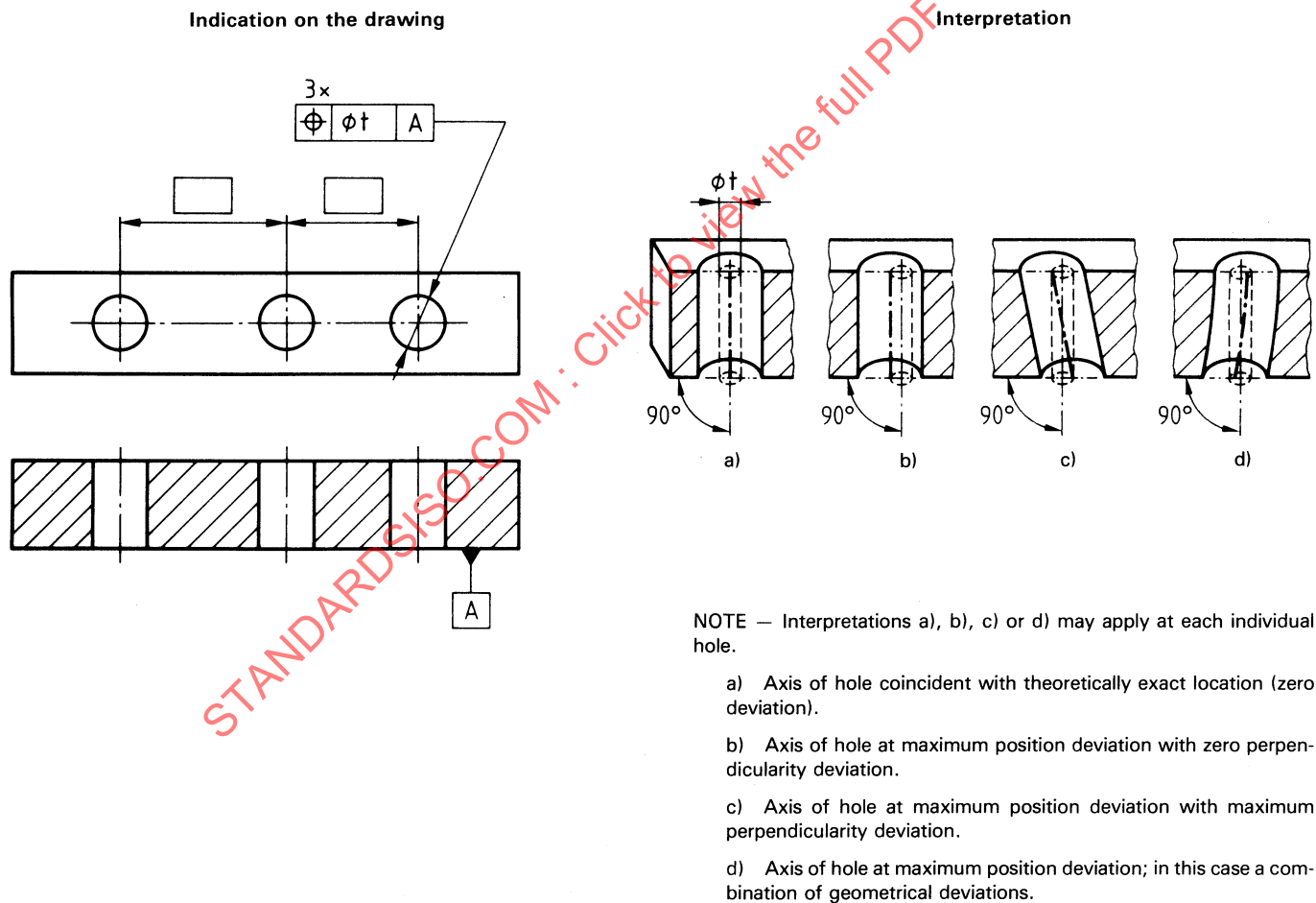


Figure 1

3.4 Positional tolerances on a complete circle

For positional toleranced features arranged in a complete circle, for example, holes on a pitch circle, it is understood that they are equally spaced, unless otherwise stated, and that their locations are theoretically exact.

If two or more groups of features are shown on the same axis, they shall be considered as a single pattern, unless otherwise stated by an appropriate instruction [see figures 2a) and 2b)].

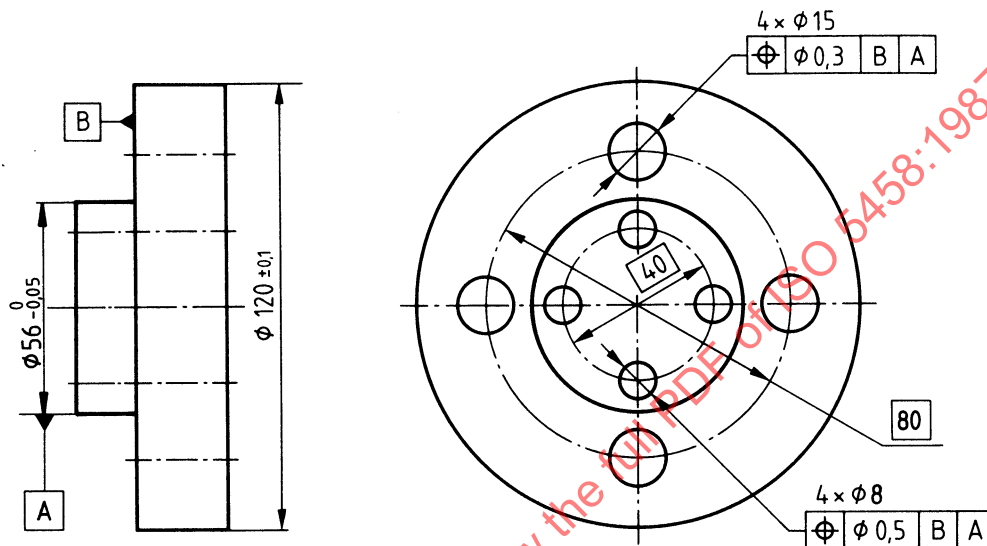


Figure 2a)

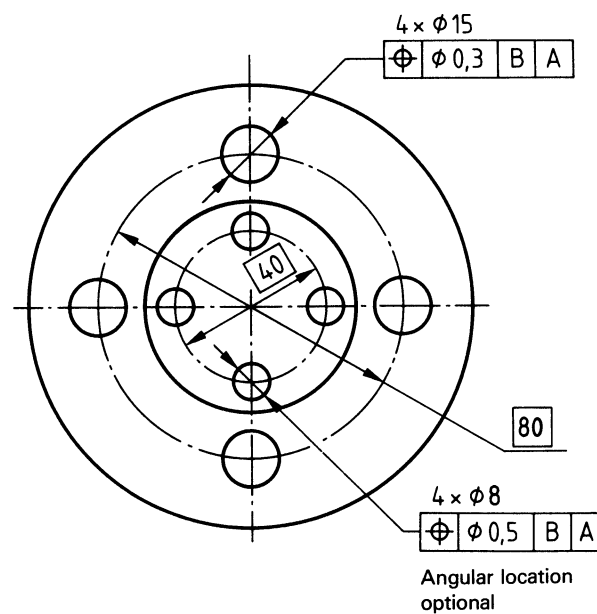


Figure 2b)

3.5 Positional tolerances in one direction only

The tolerance value can be specified in one direction; the width of the tolerance zone is then in the direction of the arrow line [see figures 3a) and 3b)].

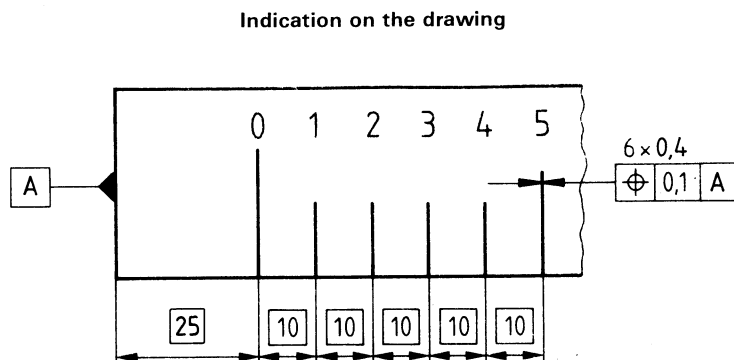
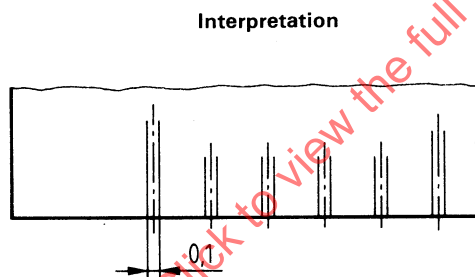


Figure 3a)



Each of the lines shall be contained within a tolerance zone defined by two parallel straight lines 0,1 apart which are symmetrically disposed about the theoretically exact position of each scale line.

Figure 3b)

3.6 Positional tolerances in two directions

The tolerance value can be specified in two directions perpendicular to each other, reference being made to unequal values [see figures 4a) and 4b)] or equal values [see figures 5a) and 5b)].

Indication on the drawing

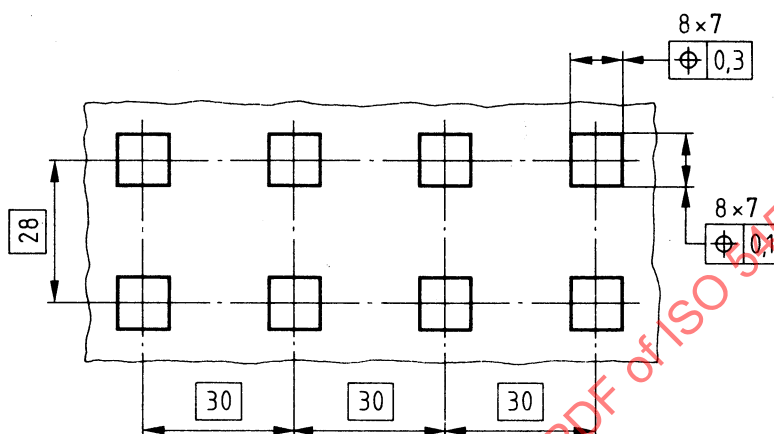
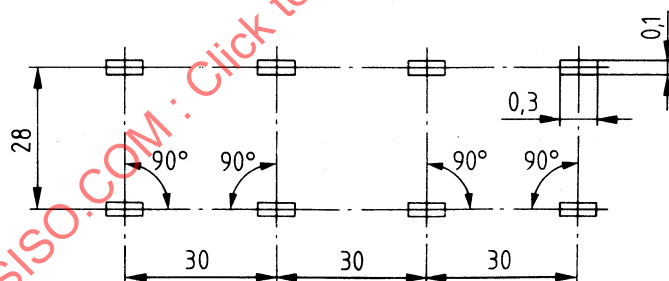


Figure 4a)

Interpretation



The axis of each hole shall lie within a rectangular tolerance zone of section $0,3 \times 0,1$; the axes of the rectangular tolerance zones are fixed by theoretically exact dimensions.

Figure 4b)

Indication on the drawing

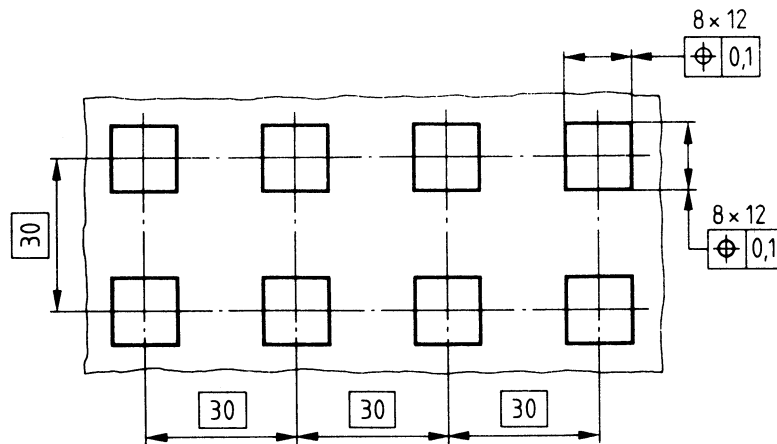
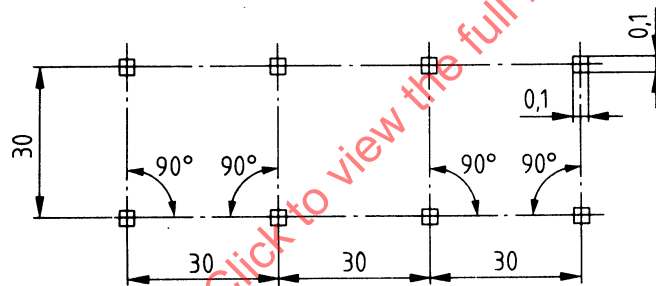


Figure 5a)

Interpretation



The axis of each hole shall lie within a square tolerance zone of section $0,1 \times 0,1$; the axes of the square tolerance zones are fixed by theoretically exact dimensions.

Figure 5b)

3.7 Positional tolerances in all directions

The tolerance can be specified as a cylindrical zone [see figures 6a) and 6b)].

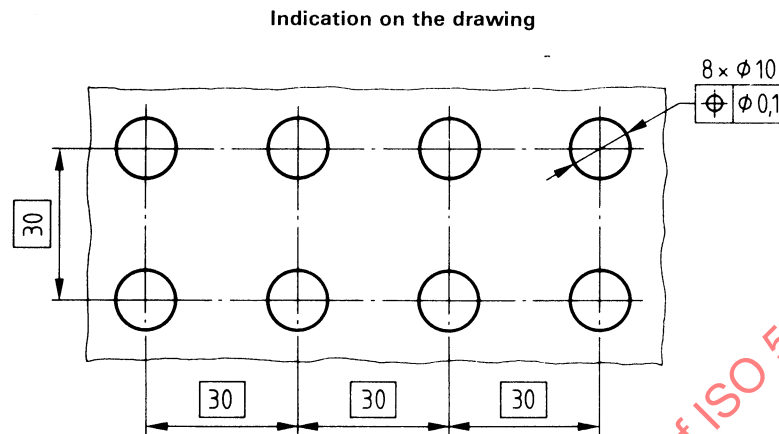
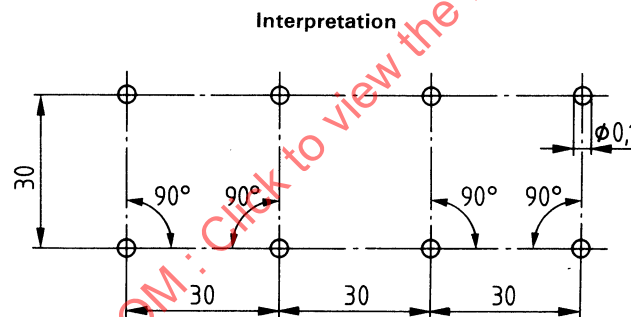


Figure 6a)



The axis of each hole shall lie within a cylindrical tolerance zone of diameter 0,1; the axes of the cylindrical tolerance zones are fixed by theoretically exact dimensions.

Figure 6b)

This tolerancing method achieves a larger zone than the coordinate method which can only generate a square (or rectangular) tolerance zone (see figure 7).

NOTE — For cylindrical features of mating parts, the tolerance zone is usually cylindrical, as the tolerance is multi-directional from the theoretically exact location.

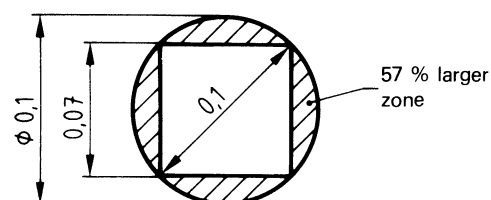


Figure 7

4 Tolerance combinations

4.1 If a group of features is individually located by positional tolerancing and their pattern location by coordinate tolerances, each requirement shall be met independently [see figure 8a)].

4.1.1 The distances between the actual axes of each left-hand hole and the left-hand edge shall lie between the two limits of size, 17,5 and 18,5. (Two-point measurement, see ISO 8015.)

The distances between the actual axis of each lower hole and the bottom edge shall lie between the limits of size, 15,5 and 16,5 [see figures 8a) and 8b)].

4.1.2 The actual axis of each hole shall lie within the cylindrical tolerance zone of diameter 0,2; the positional tolerance zones are located in their theoretically exact location to each other [see figure 8c)].

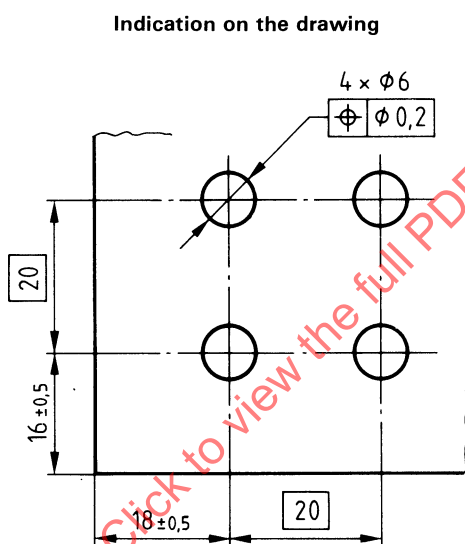


Figure 8a)

Interpretation

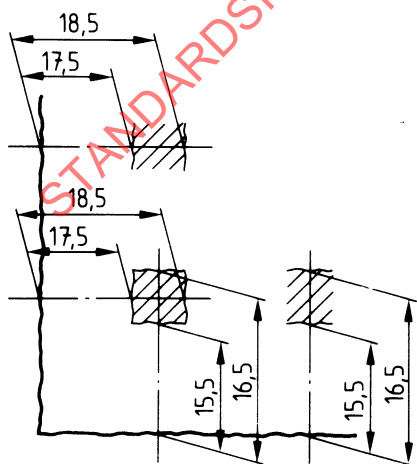


Figure 8b)

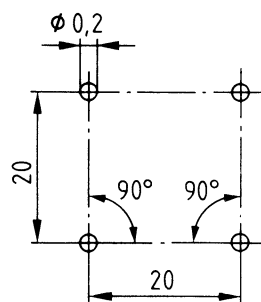


Figure 8c)

NOTE — This method is subject to other possible interpretations. If more specific interpretation is desirable, positional tolerancing and datum indication may be used (see 4.2).