International Standard 129

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Technical drawings — Dimensioning — General principles, definitions, methods of execution and special indications

Dessins techniques — Cotation — Principes généraux, définitions, méthodes d'exécution et indications spéciales

First edition — 1985-09-01

UDC 744.43 **Ref. No. ISO 129-1985 (E)**

Descriptors : drawings, technical drawings, dimensioning, generalities.

Price based on 12 pages

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 129 was prepared by Technical Committee ISO/TC 10, *Technical drawings.*

It cancels and replaces ISO Recommendation R 129-1959 and ISO 2595-1973, of which it constitutes a technical revision.

Printed in Switzerland

Contents

This page intentionally left blank

Technical drawings — Dimensioning — General principles, definitions, methods of execution and special indications

1 Scope and field of application

This International Standard establishes the general principles of dimensioning applicable in all fields (i.e., mechanical, electrical, civil engineering, architecture, etc.). It is possible that in some specific technical areas, the general rules and conventions will not cover all the needs of specialized practices adequately. In such cases additional rules may be laid down in standards specific to these areas. However, the general principles of this International Standard shall be followed to facilitate the international exchange of drawings and to ensure the coherence of drawings in a comprehensive system relating to several technical fields.

The figures, as shown in this International Standard, merely illustrate the text and are not intended to reflect actual usage. The figures are consequently simplified to indicate only the relevant general principles applicable in any technical area.

2 References

ISO 128, *Technical drawings — General principles of presentation.*

ISO 406, *Technical drawings — Linear and angular tolerancing — Indications on drawings.*

ISO 1660, *Technical drawings — Dimensioning and tolerancing of profiles.*

ISO 2595, *Building drawings — Dimensioning of production drawings — Representation of manufacturing and work sizes.*

ISO 3040, *Technical drawings — Dimensioning and tolerancing cones.*

ISO 3098/1, *Technical drawings — Lettering — Part 1: Currently used characters.*

ISO 6428, *Technical drawings — Requirements for microcopying.*

3 General principles

3.1 Definitions

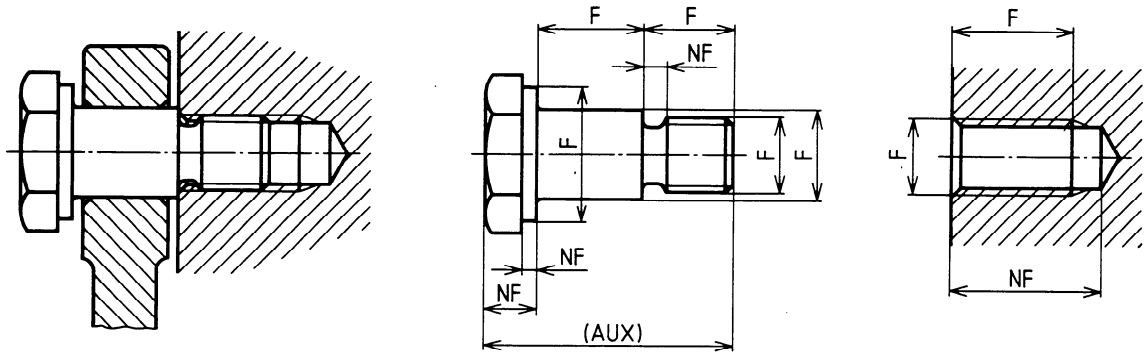
For the purposes of this International Standard, the following definitions apply.

3.1.1 dimension: A numerical value expressed in appropriate units of measurement and indicated graphically on technical drawings with lines, symbols and notes.

Dimensions are classified according to the following types:

3.1.1.1 functional dimension: A dimension that is essential to the function of the piece or space. (See "F" in figure 1.)

3.1.1.2 non-functional dimension: A dimension that is not essential to the function of the piece or space. (See "NF" in figure 1.)



a) Design requirement b) Shoulder screw c) Threaded hole

Figure 1 — Functional, non-functional and auxiliary dimensions

3.1.1.3 auxiliary dimension: A dimension given for information purposes only. It does not govern production or inspection operations and is derived from other values shown on the drawing or in related documents. An auxiliary dimension is given in parentheses and no tolerance applies to it. (See "AUX" in figure 1.)

3.1.2 feature: An individual characteristic such as a flat surface, a cylindrical surface, two parallel surfaces, a shoulder, a screw thread, a slot, a profile, etc.

3.1.3 end product: The complete part ready for assembly or service or a configuration produced from a drawing specification. An end product may also be a part ready for further processing (for example, the product of a foundry or forge) or a configuration needing further processing.

3.2 Application

3.2.1 All dimensional information necessary to define a part or component clearly and completely shall be shown directly on a drawing unless this information is specified in associated documentation.

3.2.2 Each feature shall be dimensioned once only on a drawing.

3.2.3 Dimensions shall be placed on the view or section that most clearly shows the corresponding features.

3.2.4 Each drawing shall use the same unit (for example, millimetres) for all dimensions but without showing the unit symbol. In order to avoid misinterpretation, the predominant unit symbol on a drawing may be specified in a note.

Where other units have to be shown as part of the drawing specification (for example, N · m for torque or kPa for pressure), the appropriate unit symbol shall be shown with the value.

3.2.5 No more dimensions than are necessary to define a part or an end product shall be shown on a drawing. No feature of a part or an end product shall be defined by more than one dimension in any one direction. Exception may, however, be made

a) where it is necessary to give additional dimensions at intermediate stages of production (for example, the size of a feature prior to carburizing and finishing);

b) where the addition of an auxiliary dimension would be advantageous.

3.2.6 Production processes or inspection methods should not be specified unless they are essential to ensure satisfactory functioning or interchangeability.

3.2.7 Functional dimensions should be shown directly on the drawing wherever possible (see figure 2).

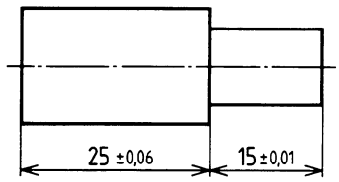


Figure 2 — Functional dimensioning

Occasionally indirect functional dimensioning is justified or necessary. In such cases, care shall be exercised so that the effect of directly shown functional dimensioning is maintained. Figure 3 shows the effect of acceptable indirect functional dimensioning that maintains the dimensional requirements established by figure 2.

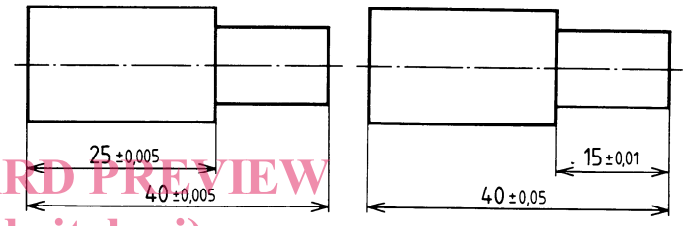


Figure 3 — Indirect functional dimensioning

3.2.8 The non-functional dimensions should be placed in a way which is most convenient for production and inspection.

4 Method of dimensioning

4.1 Elements of dimensioning

The elements of dimensioning include the projection line, dimension line, leader line, dimension line termination, the origin indication, and the dimension itself. The various elements of dimensioning are illustrated in figures 4 and 5. (See ISO 128.)

4.2 Projection lines, dimension lines and leader lines

Projection lines, dimension lines and leader lines are drawn as thin continuous lines as shown in ISO 128 and as illustrated in figures 4 and 5.

4.2.1 Projection lines shall extend slightly beyond the respective dimension line (see figures 4 and 5).

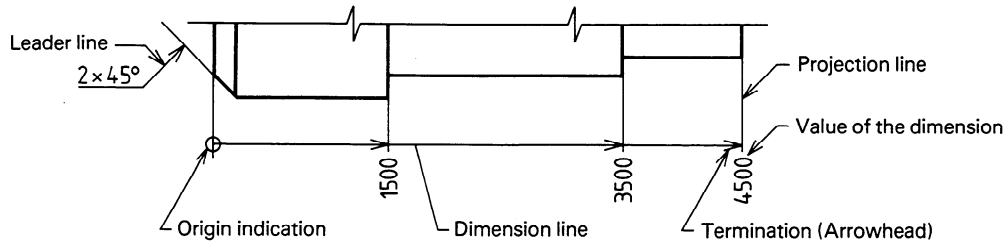


Figure 4

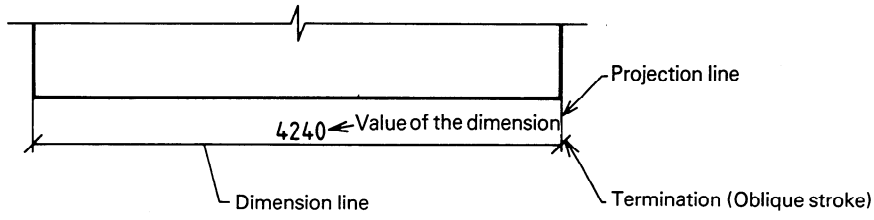


Figure 5

4.2.2 Projection lines should be drawn perpendicular to the feature being dimensioned. Where necessary, however, they may be drawn obliquely, but parallel to each other (see figure 6).

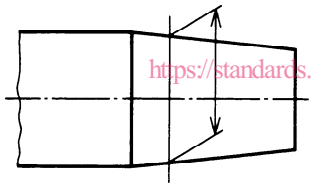


Figure 6

4.2.3 Intersecting construction and projection lines shall extend slightly beyond their point of intersection (see figure 7).

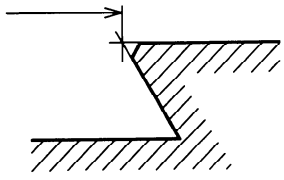


Figure 7

4.2.4 In general, projection lines and dimension lines should not cross other lines unless this is unavoidable (see figure 8).

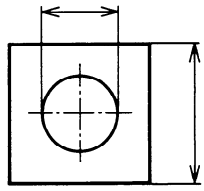


Figure 8

4.2.5 A dimension line shall be shown unbroken where the feature to which it refers is shown broken (see figure 9), except as indicated in 4.4.1, method 2.

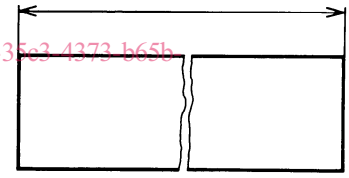


Figure 9

4.2.6 Intersecting projection and dimension lines should be avoided. Where unavoidable, however, neither line shall be shown with a break (see figure 10).

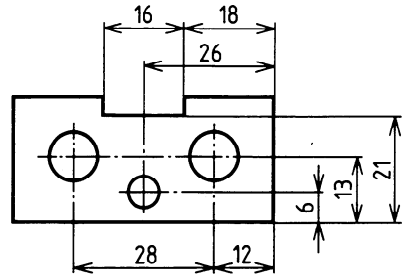


Figure 10

4.2.7 A centreline or the outline of a part shall not be used as a dimension line but may be used in place of a projection line (see figure 10).

4.3 Terminations and origin indication

Dimension lines shall show distinct terminations (i.e., either arrowheads or oblique strokes), or, where applicable, an origin indication.

4.3.1 Two dimension line terminations (see figure 11) and an origin indication (see figure 12) are specified in this International Standard. They are

a) the arrowhead, drawn as short lines forming barbs at any convenient included angle between 15° and 90°. The arrowhead may be open, closed, or closed and filled in [see figure 11 a)].

b) the oblique stroke, drawn as a short line inclined at 45° [see figure 11 b)].

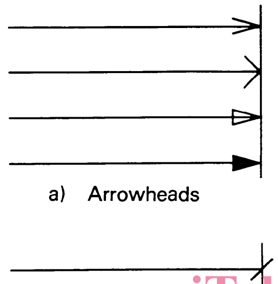


Figure 11

c) the origin indication, drawn as a small open circle of approximately 3 mm in diameter.

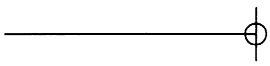


Figure 12

4.3.2 The size of the terminations shall be proportionate to the size of drawing on which they are used but not larger than is necessary to read the drawing.

4.3.3 One style of arrowhead termination only shall be used on a single drawing. However, where space is too small for an arrowhead, the oblique stroke or a dot may be substituted (see figure 24).

4.3.4 Arrowhead terminations shall be shown within the limits of the dimension line where space is available (see figure 13). Where space is limited, the arrowhead termination may be shown outside the intended limits of the dimension line that is extended for that purpose (see figure 14).

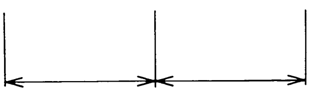


Figure 13

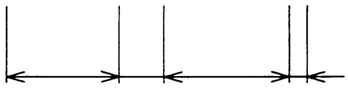


Figure 14

4.3.5 Only one arrowhead termination, with its point on the arc end of the dimension line, shall be used where a radius is dimensioned (see figure 15). The arrowhead termination may be either on the inside or on the outside of the feature outline (or its projection line) depending upon the size of the feature.

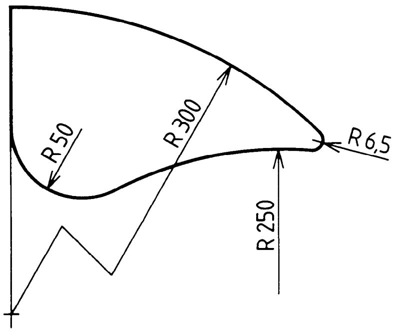


Figure 15 — Radius dimensioning

4.4 Indicating dimensional values on drawings

Dimensional values shall be shown on drawings in characters of sufficient size to ensure complete legibility on the original drawing as well as on reproductions made from microfilms.

They shall be placed in such a way that they are not crossed or separated by any other line on the drawing.

4.4.1 Values shall be indicated on a drawing according to one of the following two methods. Only one method should be used on any one drawing.

Method 1

Dimensional values shall be placed parallel to their dimension lines and preferably near the middle, above and clear of the dimension line (see figure 16).

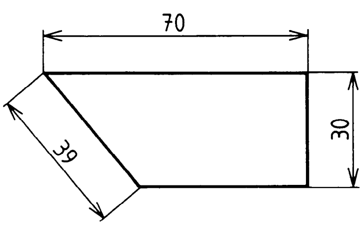


Figure 16

An exception may be made where superimposed running dimensions are used (see 5.2.2).

However, values shall be indicated so that they can be read from the bottom or from the right-hand side of the drawing. Values on oblique dimension lines shall be oriented as shown in figure 17.

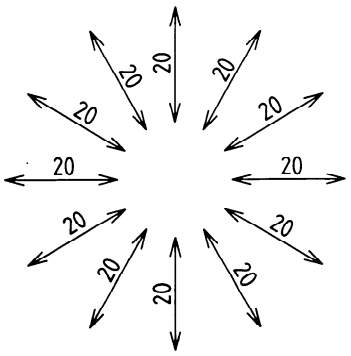


Figure 17

Angular dimensional values may be oriented either as in figure 18 or figure 19.

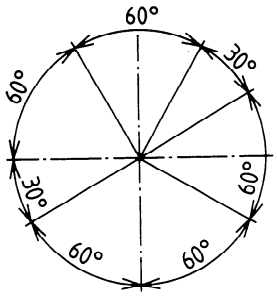


Figure 18

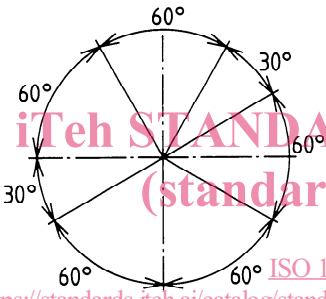


Figure 19

Method 2

Dimensional values shall be indicated so that they can be read from the bottom of the drawing sheet. Non-horizontal dimension lines are interrupted, preferably near the middle so that the value can be inserted (see figures 20 and 21).

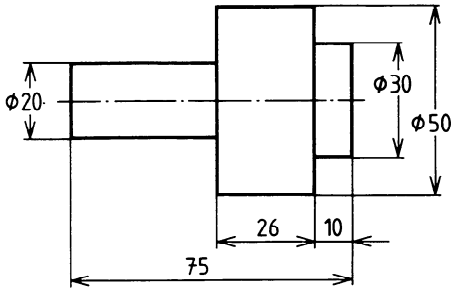


Figure 20

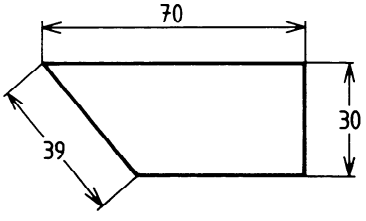


Figure 21

Angular dimensional values may be oriented either as in figure 19 or figure 22.

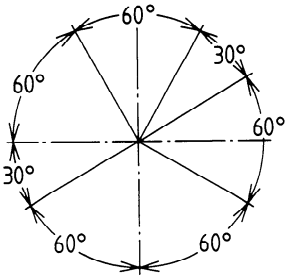


Figure 22

4.4.2 The positioning of dimensional values frequently needs adapting to different situations. Therefore, for example, values can be

a) closer to a termination to avoid having to follow a long dimension line where only part of the dimension line needs to be shown (see figure 23).

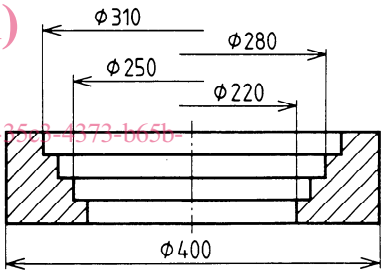


Figure 23

b) above the extension of the dimension line beyond one of the terminations if space is limited (see figure 24).

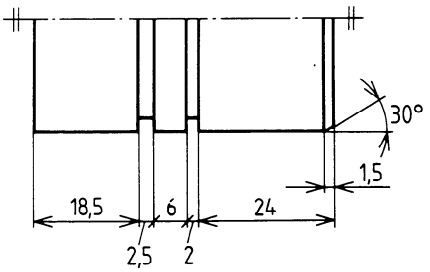


Figure 24

c) at the end of a leader line which terminates on a dimension line that is too short for the dimensional value to be indicated in the usual way (see figure 24).