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Technical drawings — Indication of dimensions and tolerances —

Part 1: General principles

Dessins techniques — Indication des cotes et tolérances —

Partie 1: Principes généraux

[Revision of first edition (ISO 129-1:2004)]

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Contents

Page

| | |
|--------------------|----|
| Foreword | iv |
| Introduction..... | v |
| 1 Scope | 1 |

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[ISO/DIS 129-1.2](https://standards.iteh.ai/catalog/standards/sist/919a88fa-5ef8-4c75-a549-36a583d650b5/iso-dis-129-1-2)

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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ISO 129-1 was prepared by Technical Committee ISO/TC 10, *Technical product documentation*, Subcommittee SC , .

This second edition cancels and replaces the first edition of which has been technically revised.

ISO 129 consists of the following parts, under the general title *Technical product documentation (TPD)* — *Indication of dimensions and tolerances*:

- Part 1: General principles
- Part 2: Dimensioning of mechanical engineering drawings
- Part 4: Dimensioning of shipbuilding drawings

Introduction

ISO 129-1 is intended for all fields of application. See other parts of ISO 129 for information pertaining to specific application areas.

The principles of tolerancing and the interpretation of tolerance indications are given in the ISO 14405 series.

Figures in this part of ISO 129 illustrate the rules and are not intended to show complete representations. It should be understood that the third angle projection could equally well have been used without prejudice to the principles established

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Technical product documentation (TPD) — Indication of dimensions and tolerances — Part 1: General principles

1 Scope

This part of ISO 129 establishes the general principles for indication of dimensions and tolerances that applies to technical drawings in all disciplines and trades.

NOTE Additional information and details for construction engineering are given in ISO 6284.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 128-20:1996, *Technical drawings — General principles of presentation — Part 20: Basic conventions for lines*

ISO 128-22:1999, *Technical drawings — General principles of presentation — Part 22: Basic conventions and applications for leader lines and reference lines*

ISO 128-23:1999, *Technical drawings — General principles of presentation — Part 23: Lines on construction drawings*

ISO 128-24:1999, *Technical drawings — General principles of presentation — Part 24: Lines on mechanical engineering drawings*

ISO 128-25:1999, *Technical drawings — General principles of presentation — Part 25: Lines on shipbuilding drawings*

ISO 128-30:2001, *Technical drawings — General principles of presentation — Part 30: Basic conventions for views*

ISO 286-1:2010, *ISO system of limits and fits — Part 1: Bases of tolerances, deviations and fits*

ISO 14405-1 *Geometrical Product Specifications (GPS) — Geometrical tolerancing — Linear size*

ISO 14405-2 *Geometrical Product Specifications (GPS) — Geometrical tolerancing — Dimensions other than linear sizes*

ISO 80000-1:2009, *SI units and recommendations for the use of their multiples and of certain other units*

ISO 3098 (all parts), *Technical product documentation — Lettering*

ISO/IEC 81714-1, *Design of graphical symbols for use in the technical documentation of products — Part 1: Basic rules*

3 Terms and definitions

3.1 Features

3.1.1

feature

point, line or surface

[ISO 14660-1:1999, definition 2.1]

NOTE The term "geometrical feature" may be used if risk of misunderstanding occurs.

3.1.2

feature of size

geometrical shape defined by a linear or angular dimension which is a size

[ISO 14660-1:1999, definition 2.2]

NOTE The feature of size can be a cylinder, a sphere, two parallel opposite surfaces, a cone or a wedge.

3.1.3

reference feature

feature which is used as the origin for the determination of another feature by means of an angular or linear dimension

3.1.4

repeated feature

feature which has the same shape and dimensions as another feature in the same part

3.2 Elements of dimensioning

3.2.1

centre line

line indicating the geometrical centre of the represented feature(s)

3.2.2

dimension line

straight or curved line indicating the extent of a feature or between two features, or between a feature and an extension line, or between two extension lines

3.2.3

extension line

line which is an extension of a feature outline or of the position of a feature

3.2.4

leader line

continuous narrow line which establishes the connection between the features of a graphical representation and additional alphanumeric and/or written instructions (notes, technical requirements, item references, etc.) in an unambiguous manner

[ISO 128-22:1999, definition 3.1]

3.2.5

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origin symbol

circle indicating the start of running dimensioning or coordinate dimensioning

3.2.6**reference line**

continuous narrow line connecting with the leader line horizontally or vertically and on or at which the additional instructions are indicated

[ISO 128-22:1999, definition 3.2]

3.2.7**terminator**

indication signifying the extremities of a dimension or leader line

3.3 Dimensions**3.3.1****dimension**

distance between two features or the size of a feature of size

NOTE A dimension can be linear or angular.

3.3.2**angular dimension**

angle between two features

NOTE In mechanical engineering drawings, angular dimensions are classified as angular sizes or angular distances, see ISO 14405-2.

3.3.3**auxiliary dimension**

dimensions derived from other dimensions given for information purposes only

3.3.4**dimensional value**

numerical value expressed in a specific unit and indicated on drawings with lines and relevant symbols

NOTE 1 Unit of dimension should be linear or angular.

NOTE 2 The tolerance limits and/or permissible deviations are applied to the dimensional value.

3.3.5**linear dimension**

linear size of a feature or a linear distance between two features

NOTE In mechanical engineering drawings, linear dimensions are classified as linear sizes or linear distances, see ISO 14405-2.

3.3.6**tolerance**

difference between the upper limit of size and lower limit of size

[ISO 286-1:2010, definition 3.2.8]

NOTE 1 The tolerance is an absolute quantity without sign.

NOTE 2 The tolerance is also the difference between the upper limit deviation and the lower limit deviation.

3.3.7

true radius

radius which indicates that the feature which is represented elliptically in a projected view has in reality a cylindrical shape

NOTE See Figure 23.

3.4 Arrangement of dimensions

3.4.1

chain dimensioning

method of dimensioning where several dimensions are arranged in a row

3.4.2

coordinate dimensioning

method of dimensioning from a reference feature in a coordinate system

NOTE For rectangular or polar coordinate systems, see ISO 10209.

3.4.3

parallel dimensioning

method of dimensioning from a reference feature with parallel or concentric dimension lines

3.4.4

running dimensioning

method of dimensioning from a reference feature with only one dimension line at which each feature is dimensioned

3.4.5

tabular dimensioning

method of dimensioning where features and/or dimensions are indicated by allocated numbers and/or letters and recorded in tables

4 Presentation of dimensions and tolerances

4.1 Presentation rules

Only the dimensions which are necessary to unambiguously define the nominal geometry of the product shall be specified.

NOTE The dimensions shown should be for the purposes of describing the function, production or verification of the product.

- Each feature or relation between features shall be dimensioned only once.
- Unless otherwise specified, dimensions shall be indicated for the finished state of the dimensioned feature. However it may be necessary to give additional dimensions at intermediate stages of production if they are shown on the same drawing (e.g. the size of a feature prior to carburizing and finishing).
- All dimensional information shall be complete and shown directly on a drawing unless this information is specified in related associated documentation.

All dimensions, graphical symbols and annotations shall be indicated such that they can be read from the bottom or right-hand side (main reading directions) of the drawing.

NOTE Dimensions alone are not sufficient to define the requirements of a product. Dimension shall be used with other specification techniques as applicable, e.g. geometrical tolerancing or surface texture requirements.

Lettering on drawings shall be in accordance with the ISO 3098 series.

There shall be only one lettering height for dimension and tolerance indication for a specific drawing.

A space shall separate the elements of the dimension indicator (see Figures A.3 and A.4). The dimension value and the lower deviation should be at the same distance from the dimension line. All dimensions shall be tolerated, either via a general tolerance or by direct indication of tolerance or limit indications, except the following cases:

- min, see 6.3.2;
- max, see 6.3.2;
- auxiliary dimension, see 7.11;
- theoretically exact dimension (TED), see ISO 1101:2012.

When tolerance limits are indicated in a vertical orientation (e.g. limit deviations, dimension limit values) the decimal marker of the upper and lower shall be aligned. When a tolerance limit is not shown with a decimal marker, the remaining digits would be aligned as if the decimal marker had been displayed, e.g.:

+0,2
2x 55 -0,15

0
2x 55 -0,15

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If two deviations relating to the same dimension have to be shown, both shall be expressed to the same number of decimal places (see Figure 1), except if one of the deviations is zero. The same applies if the limits of size are indicated (see Figure 2).

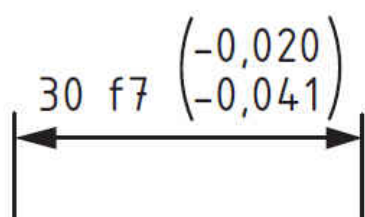


Figure 1

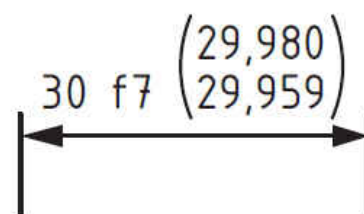


Figure 2

For dimensions displayed in accordance with ISO 286:2010, it is not necessary to express the values of the deviations unless they are needed (see Figure 3).

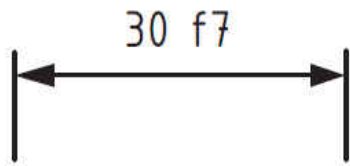


Figure 3

4.2 Positioning of dimensions

Dimensions shall be placed on that view or section which shows the relevant feature(s) most clearly (see Figure 4).

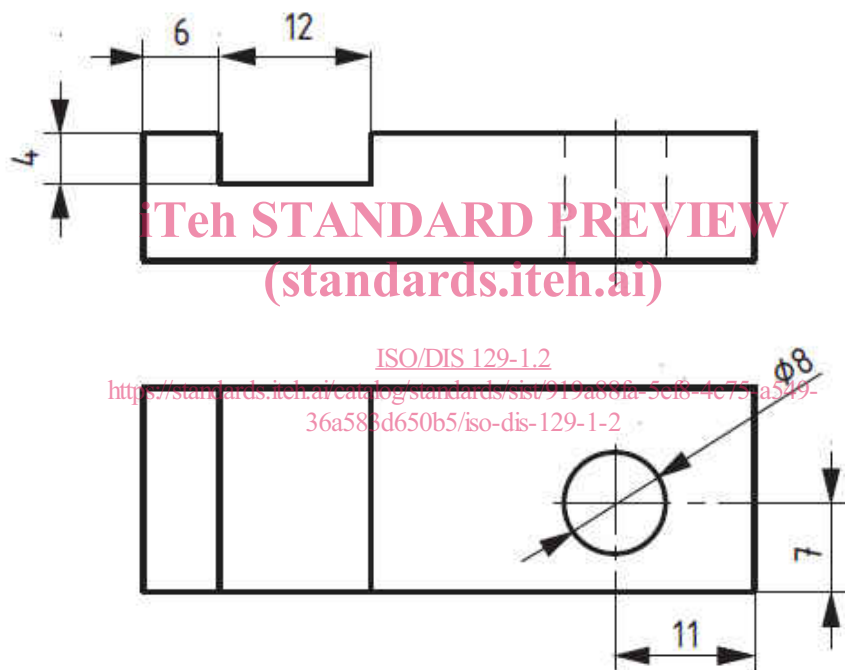


Figure 4

Dimensions for internal features and dimensions for external features shall wherever possible be arranged and indicated in separate groups of dimensions to improve readability (see Figure 5).

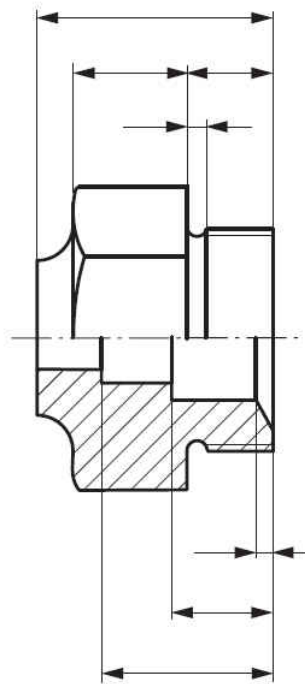


Figure 5
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Where several features or objects are depicted in close proximity, their relative dimensions shall be grouped, together, separately, for ease of reading (see Figure 6).

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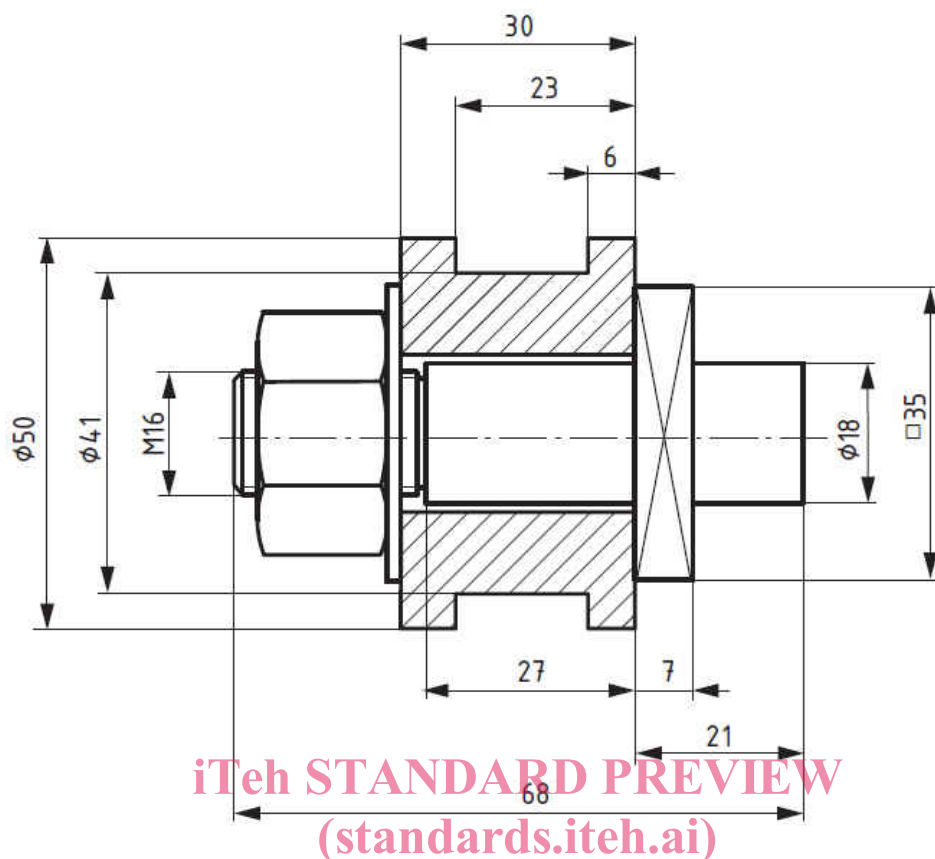


Figure 6 29-1.2

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Whenever possible, dimensions should not be placed within the contour of the depicted item.

4.3 Units of dimensions

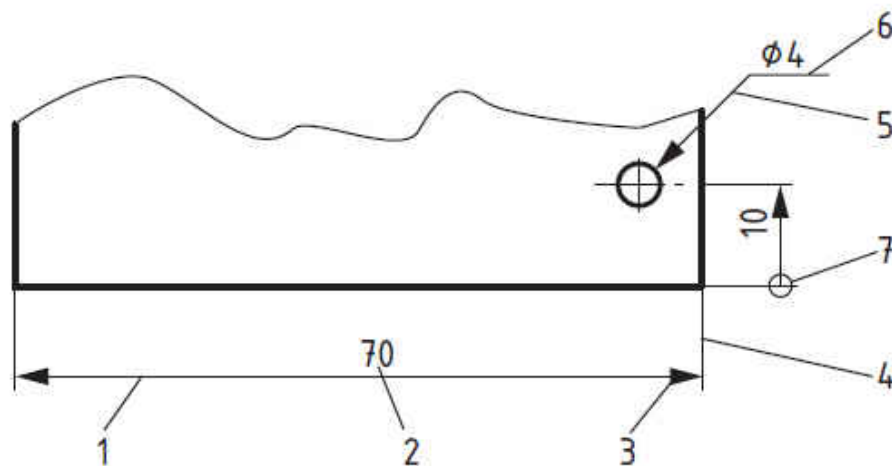
The units of a dimension shall be specified with the dimension. The predominant unit of measure on a drawing may be specified on the drawing or in an associated document and the unit omitted from the individual dimensions. Any dimensions expressed in a different unit of measure shall indicate that unit of measure.

Limit deviations shall be expressed in the same unit as the dimensional value.

5 Elements of dimensioning - usage

5.1 General

Various elements of dimensioning are illustrated in Figure 7.

**Key**

- 1 dimension line
- 2 dimensional value
- 3 terminator (in this case, an arrowhead)
- 4 extension line
- 5 leader line
- 6 reference line
- 7 origin symbol
- 8 centre line

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Figure 7

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5.2 Dimension line

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Dimension lines shall be indicated as continuous narrow lines according to ISO 128-20.

Dimension lines shall be indicated in the case of

- linear dimensions parallel to the length to be dimensioned (see Figure 8);
- angular dimensions or dimensions of an arc as a circular arc around the vertex of the angle or the centre of the arc (see Figures 9 and 10), and
- radii dimensions generated from the geometrical centre of the circle of which the arc is part and leading to the outline of the arc (see Figure 10).

Where space is limited, dimension lines may be extended past the extension lines and the arrowheads placed outside of the extension lines and reversed. (see Figure 4).