
**Technical product documentation —
Construction documentation —
Indication of limit deviations**

*Documentation technique de produits — Documentation de
construction — Indication des écarts limites*

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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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 10, *Technical product documentation*, Subcommittee SC 8, *Construction documentation*.

This third edition cancels and replaces the second edition (ISO 6284:1996), which has been technically revised.

The main changes are as follows:

- validation of normative references;
- consideration of multiple categories of deviations;
- definitions of indications of limit deviations using building information modelling (BIM).

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Deviations are a common part of the built environment which are often left to operatives on site to resolve. With the development of prefabrication, there is recognition that control of deviations is an essential requirement to improve the quality of building and infrastructure works. It is important for architectural designers, product manufacturers and constructors to indicate limit deviations and work to these, where they exist.

The previous edition, ISO 6284:1996, pointed out some basic principles and ways to indicate limit deviations. It focused on graphical presentations, generally drawings, as a method for delivering construction and product information. Technically, limit deviations are about not only geometric information but also the requirements, which shall be delivered objectively by parties to a project.

The digitization of construction requires both graphical and alphanumeric information to be presented in a formal way to achieve both human-readability and machine-readability.

Data templates are a formal representation method adopted widely to describe exchange information or product specifications for machine-readability. ISO 23387 has been developed to support digital processes using formats which are machine-interpretable, based upon standardized data structures, to exchange information about any type of construction object.

This document focuses on how to provide indication methods for limit deviations that are humanly recognizable, which is essential given that humans are ultimately the decision-makers, even though more and more tasks are carried out with the assistance of computers. Therefore, this document provides two ways to indicate limit deviations:

- a) classical graphical or symbolic representations;
- b) natural language property items for data templates.

The illustrations included in this document are intended to illustrate the text and/or to provide examples of the related technical drawing specification. These illustrations are not fully dimensioned and toleranced, showing only the relevant general principles.

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Technical product documentation — Construction documentation — Indication of limit deviations

1 Scope

This document specifies methods for the indication of limit deviations on construction documents.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 286-1:2010, *Geometrical product specifications (GPS) — ISO code system for tolerances on linear sizes — Part 1: Basis of tolerances, deviations and fits*

ISO 6707-1:2020, *Buildings and civil engineering works — Vocabulary — Part 1: General terms*

ISO 9431, *Construction drawings — Spaces for drawing and for text, and title blocks on drawing sheets*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 286-1 and ISO 6707-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

construction document

document which specifies construction information

Note 1 to entry: A construction document can be a drawing or a document used to convey or record construction requirements.

Note 2 to entry: See ISO 5127:2017, 3.1.1.38 for more information about the term “document”.

3.2

data template

schema providing a data structure used to describe the properties of objects

[SOURCE: ISO 23387:2020, 3.3, modified — Definition revised, examples and notes to entry removed.]

3.3

limit deviation

upper limit deviation (3.4) or *lower limit deviation* (3.5) from *target size* (3.6)

Note 1 to entry: In this document, “target size” is used for applying deviations to comply with the conventions in the built environment sector, while “nominal size” is commonly used in engineering fields.

Note 2 to entry: See ISO 6707-1:2020, 3.7.2.6 for more information about the term “deviation”.

[SOURCE: ISO 286-1:2010, 3.2.5, modified — Definition modified and notes to entry added.]

3.4 upper limit deviation

upper limit of size minus *target size* (3.6)

Note 1 to entry: Upper limit deviation is a signed value and may be negative, zero or positive.

[SOURCE: ISO 286-1:2010, 3.2.5.1, modified — Symbols and figure removed, definition modified.]

3.5 lower limit deviation

lower limit of size minus *target size* (3.6)

Note 1 to entry: Lower limit deviation is a signed value and may be negative, zero or positive.

[SOURCE: ISO 286-1:2010, 3.2.5.2, modified — Symbols removed and definition modified.]

3.6 target size

reference size used in design and in practice in order to indicate the size desired and to which the deviations, which would ideally be zero, are to be related

[SOURCE: ISO 6707-1:2020, 3.7.2.12, modified — Note 1 to entry removed.]

4 General

4.1 Generality

4.1.1 A limit deviation shall be indicated on a construction document only when there is a functional requirement to control position, dimension, orientation or form.

4.1.2 Target size shall be the only reference to limit deviation in construction documents.

NOTE The term “deviation” is defined in relation to “nominal size” in ISO 286-1. However, this term is relevant to “desired value”, associated with the term “target size” in ISO 6707-1, which specifies a vocabulary for the construction industry.

4.2 Application

Indication of limit deviations shall be applied using the following methods:

- a) dimensions on construction drawings or figures within notes;
- b) property items within data templates.

4.3 Designations of deviation types

An indication of limit deviations should clarify its type requirements with a designation, when applicable. Designations of popular deviation types may follow [Table 1](#) or the conventions of the manufacturing industry.

Table 1 — Designations of popular deviation types

Deviation type	Designation
Length deviation	LD
Angular deviation	AD
Profile deviation of a line	PL
Straightness deviation of a line	SL

Table 1 (continued)

Deviation type	Designation
Shape deviation of a surface	SS
Flatness deviation of a surface	FS
Skewness	SK
Position deviation of a point	PP
Position deviation of a line	PL
Verticality deviation	VD
Horizontal deviation	HD

NOTE Deviation types listed in [Table 1](#) are defined in ISO 6707-1 and the sequence of the items is the same as that in ISO 6707-1.

5 Indication of limit deviations

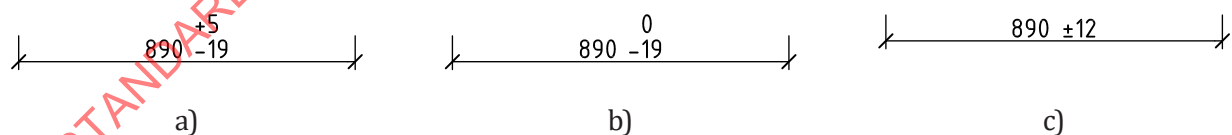
5.1 As dimensions on construction drawings or figures within notes

5.1.1 A limit deviation shall be indicated numerically and be placed with, or adjacent to, the size concerned in dimensions on construction drawings. A single reference within notes in the space for text in accordance with ISO 9431 may be applied in the case of repetitive deviations.

5.1.2 Limit deviations for size shall be indicated by the target size and the limit deviations. The target size and the values of limit deviations shall be given in millimetres or metres (see [Figures 1](#) and [2](#)).

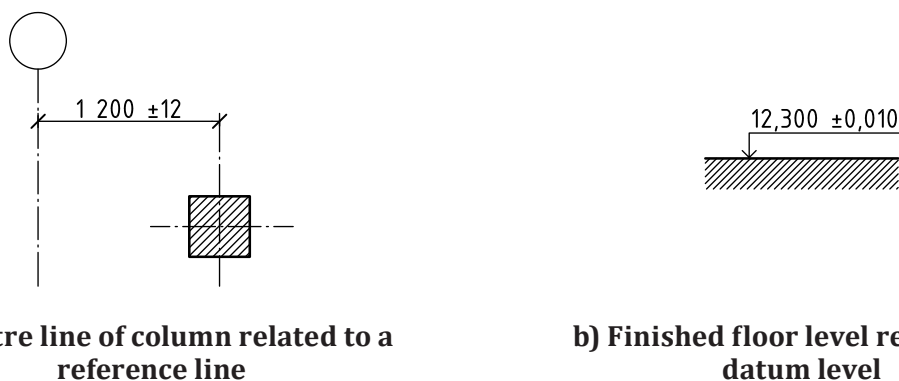
5.1.3 Limit deviation information which is shown on construction drawings should be given in accordance with the example shown in [Figure 1](#).

- For asymmetrical limit deviations, information shall be specified by indicating the upper deviation above the lower deviation, see [Figure 1](#) a).
- If one of the two limit deviations is zero, this shall be expressed explicitly by the digit zero without a sign, see [Figure 1](#) b).
- If the tolerance is symmetrical in relation to the dimensional value, the limit deviation shall be indicated only once, preceded by the plus-minus sign (\pm), see [Figure 1](#) c).

**Figure 1** — Examples of indications of limit deviations for size

5.1.4 Limit deviations for a position may be indicated by limit deviations for a dimension which locates one object in relation to another, see [Figure 2](#).

NOTE For example, one reference line to another, a component to a reference line [see [Figure 2](#) a)] or a finished floor level to a datum level [see [Figure 2](#) b)].



NOTE Levels relate to site zero datum and are given in metres, with three decimal places.

Figure 2 — Examples of limit deviations for position dimensions

5.1.5 For angular deviations, the target size and the limit deviations should preferably be given in decimal degrees or using degrees, minutes and seconds, see [Figure 3](#).

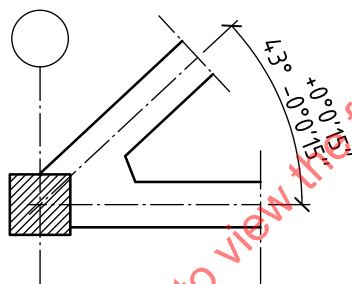


Figure 3 — Examples of angular deviation

5.1.6 For profile deviations of a line, the limit deviations should be given for dimensions to locate points in relation to other points or reference lines. The points should preferably be numbered to enhance information. See [Figure 4](#).

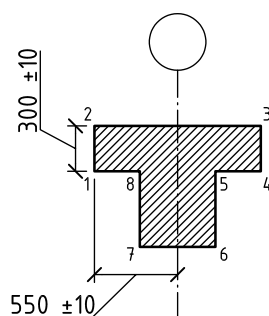
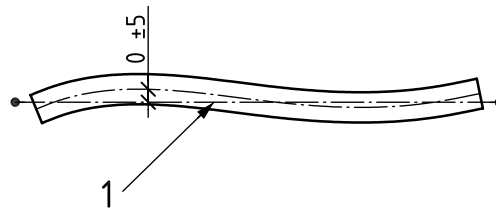


Figure 4 — Examples of profile deviation of a line

NOTE The points can optionally be located with coordinates, in which case it is appropriate to adopt the data template to indicate the limit deviations, see [5.2](#).

5.1.7 For straightness deviation of a line, the limit deviations should be indicated using the numeric value of zero ("0") in conjunction with the limit deviations for a given dimension that locates a point on the line to the corresponding position on the target line. See [Figure 5](#).



Key

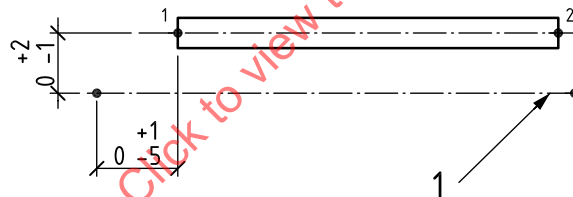
1 target line

Figure 5 — Examples of straightness deviation of a line

NOTE 1 The requirements of straightness deviation of a line can be applied for an edge of a prefabricated panel.

NOTE 2 Greater clarity in the presentation can be achieved by utilizing exaggerated schematic diagrams in the space for text on the construction drawings.

5.1.8 For position deviation of a line, the limit deviations should be given for dimensions to locate points on the line in relation to those on the corresponding target. The points should preferably be numbered to enhance information. See [Figure 6](#).



Key

1 target line

Figure 6 — Examples of position deviation of a line

5.2 As property items within data templates

5.2.1 Limit deviations should be indicated as the property items and preferably be collected into a group of properties to facilitate the data templates of construction objects when using building information modelling.

NOTE The property items or the group of properties can be specified with the property table depicted with plain language and therefore are suitable for domain experts to create and maintain.

5.2.2 The following properties for limit deviations shall be indicated:

- the designation of the deviation type;
- reference object, if applicable;
- desired value;
- upper limit deviation;

e) lower limit deviation.

EXAMPLE 1 Reference object is what the deviation is related to, e.g. another construction object, a reference line, a reference plane, a target line.

EXAMPLE 2 Desired value can be target size, target angle or target X-coordinate.

5.2.3 The properties for limit deviations should be presented by adopting the PascalCase naming method if no other conventions have been given.

NOTE 1 PascalCase is a naming style often used in computer programming in which phrases are written without spaces or punctuation and the first letter of each word is capitalized.

NOTE 2 PascalCase is also known as upper camel case.

5.2.4 A limit of length deviation shall be specified as the property items given in [Table 2](#).

Table 2 — Limit of length deviation

Property	Value	Unit	Remark
DeviationType	LT	/	
ReferenceTo		/	If applicable
TargetSize		mm	
UpperLimitOfSize		mm	Automatic if applicable
UpperLimitDeviation		mm	
LowerLimitOfSize		mm	Automatic if applicable
LowerLimitDeviation		mm	
Tolerance		mm	Automatic if applicable

5.2.5 A limit of angle deviation shall be specified as the property items given in [Table 3](#).

Table 3 — Limit of angle deviation

Property	Value	Unit	Remark
DeviationType	AG	/	
ReferenceTo		/	If applicable
TargetAngle		°	
UpperLimitOfAngle		°	Automatic if applicable
UpperLimitDeviation		°	
LowerLimitOfAngle		°	Automatic if applicable
LowerLimitDeviation		°	
Tolerance		°	Automatic if applicable

5.2.6 A limit of profile deviation of a line shall be indicated by the coordinates of the desired points and specified as the property items given in [Table 4](#).

Table 4 — Limit of profile deviation of a line

Property	Value	Unit	Remark
DeviationType	PF	/	
ReferencePoint		/	If applicable
TargetXCoordinate		mm	
UpperLimitOfXCoordinate		mm	Automatic if applicable

Table 4 (continued)

Property	Value	Unit	Remark
UpperLimitDeviationX		mm	
LowerLimitOfXCoordinate		mm	Automatic if applicable
LowerLimitDeviationX		mm	
ToleranceX		mm	Automatic if applicable
TargetYCoordinate		mm	
UpperLimitOfYCoordinate		mm	Automatic if applicable
UpperLimitDeviationY		mm	
LowerLimitOfYCoordinate		mm	Automatic if applicable
LowerLimitDeviationY		mm	
ToleranceY		mm	Automatic if applicable

NOTE The desired points can be multiple and can indicate their limit deviations separately by using sub-groups of properties to avoid the potential repetition of property names.

5.2.7 A limit of straightness deviation of a line shall be indicated by the coordinates of the desired points, with the assumption that the reference line is horizontal and specified as the property items given in [Table 5](#).

Table 5 — Limit of straightness deviation of a line

Property	Value	Unit	Remark
DeviationType	ST	/	
ReferenceLine		/	If applicable
TargetYCoordinate		mm	
UpperLimitOfYCoordinate		mm	Automatic if applicable
UpperLimitDeviationY		mm	
LowerLimitOfYCoordinate		mm	Automatic if applicable
LowerLimitDeviationY		mm	
ToleranceY		mm	Automatic if applicable

NOTE The desired points can be multiple and can indicate their limit deviations separately by using sub-groups of properties to avoid the potential repetition of property names.

5.2.8 A limit of flatness deviation of a surface shall be indicated by the coordinates of the desired point, with the assumption that the reference surface is a horizontal plane and specified as the property items given in [Table 6](#).

Table 6 — Limit of flatness deviation of a surface

Property	Value	Unit	Remark
DeviationType	FL	/	
ReferenceSurface		/	If applicable
TargetYCoordinate		mm	
UpperLimitOfYCoordinate		mm	Automatic if applicable
UpperLimitDeviationY		mm	
LowerLimitOfYCoordinate		mm	Automatic if applicable
LowerLimitDeviationY		mm	
ToleranceY		mm	Automatic if applicable

5.2.9 A limit of position deviation of a point shall be indicated by the coordinates of the desired point and specified as the property items given in [Table 7](#).

Table 7 — Position deviation of a point

Property	Value	Unit	Remark
DeviationType	PP	/	
ReferencePoint		/	If applicable
TargetXCoordinate		mm	
UpperLimitOfXCoordinate		mm	Automatic if applicable
UpperLimitDeviationX		mm	
LowerLimitOfXCoordinate		mm	Automatic if applicable
LowerLimitDeviationX		mm	
ToleranceX		mm	Automatic if applicable
TargetYCoordinate		mm	
UpperLimitOfYCoordinate		mm	Automatic if applicable
UpperLimitDeviationY		mm	
LowerLimitOfYCoordinate		mm	Automatic if applicable
LowerLimitDeviationY		mm	
ToleranceY		mm	Automatic if applicable
TargetZCoordinate		mm	
UpperLimitOfZCoordinate		mm	Automatic if applicable
UpperLimitDeviationZ		mm	
LowerLimitOfZCoordinate		mm	Automatic if applicable
LowerLimitDeviationZ		mm	
ToleranceZ		mm	Automatic if applicable

5.2.10 A limit of position deviation of a line shall be indicated by the coordinates of the desired two points and specified as the property items given in [Table 8](#).

Table 8 — Position deviation of a line

Property	Value	Unit	Remark
DeviationType	PL	/	
ReferencePoint1		/	If applicable
TargetXCoordinate		mm	
UpperLimitOfXCoordinate		mm	Automatic if applicable
UpperLimitDeviationX		mm	
LowerLimitOfXCoordinate		mm	Automatic if applicable
LowerLimitDeviationX		mm	
ToleranceX		mm	Automatic if applicable
TargetYCoordinate		mm	
UpperLimitOfYCoordinate		mm	Automatic if applicable
UpperLimitDeviationY		mm	
LowerLimitOfYCoordinate		mm	Automatic if applicable
LowerLimitDeviationY		mm	
ToleranceY		mm	Automatic if applicable
TargetZCoordinate		mm	