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Technical drawings — Simplified representation and dimensioning of holes

Dessins techniques — Représentation et cotation simplifiées des trous

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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 15786 was prepared by Technical Committee ISO/TC 10, *Technical product documentation*, Subcommittee SC 6, *Mechanical engineering documentation*.

Introduction

This International Standard has been established to specify the simplified representation and dimensioning of holes.

The rules established by this International Standard determine, unambiguously, methods for the representation — both complete and simplified — and the dimensioning of holes, as well as the structure and sequence of the descriptive elements for the simplified representation of holes.

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Technical drawings — Simplified representation and dimensioning of holes

1 Scope

This International Standard specifies rules for the simplified representation, dimensioning and tolerancing of holes, counterbores, internal threads and chamfers on drawings.

Where there could be misinterpretation using simplified representation, the complete representation and dimensioning by cuts, sections or elements on a larger scale apply, according to ISO 128-30, ISO 128-34, ISO 128-40, ISO 128-44, ISO 128-50, ISO 129-1 and ISO 406.

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

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

ISO 128-34, *Technical drawings — General principles of presentation — Part 34: Views on mechanical engineering drawings*

ISO 128-40, *Technical drawings — General principles of presentation — Part 40: Basic conventions for cuts and sections*

ISO 128-44, *Technical drawings — General principles of presentation — Part 44: Sections on mechanical engineering drawings*

ISO 128-50, *Technical drawings — General principles of presentation — Part 50: Basic conventions for representing areas on cuts and sections*

ISO 129-1, *Technical drawings — Indication of dimensions and tolerances — Part 1: General principles*

ISO 406, *Technical drawings — Tolerancing of linear and angular dimensions*

ISO 1101, *Geometrical Product Specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*

ISO 1302, *Geometrical Product Specifications (GPS) — Indication of surface texture in technical product documentation*

ISO 5458, *Geometrical Product Specifications (GPS) — Geometrical tolerancing — Positional tolerancing*

ISO 6410-3:1993, *Technical drawings — Screw threads and threaded parts — Part 3: Simplified representation*

3   Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
complete representation of holes
representation of holes in accordance with generally valid rules and projection methods for technical drawings

3.2
simplified representation of holes
representation of holes, drawn either true to scale or not, with a symbolic representation of the features

3.3
complete dimensioning of holes
dimensioning of holes using dimension lines and extension lines

3.4
simplified dimensioning of holes
dimensioning of holes using leader lines and reference lines

4   Methods of representation and dimensioning of holes

4.1   Complete representation and complete dimensioning of holes

The complete representation and dimensioning of holes according to ISO 128-30, ISO 128-34, ISO 128-40, ISO 128-44, ISO 128-50 and ISO 129-1 applies in all cases where a simplified representation of holes and dimensioning could lead to misinterpretation of the drawing (see Table 1).

4.2   Complete representation and simplified dimensioning of holes

Representation and dimensioning of holes in the sections is preferred. For dimensioning in the sections, the leader line is directed towards the point of intersections of the visible edge of the part and the centre line of the hole, ending with an arrowhead on the centre line of the hole. For dimensioning in the view from above, the leader line is directed towards the centre of the hole, ending with an arrowhead on the outline of the hole (see Table 1). For rules relative to the use of leader lines and reference lines, see ISO 128-22.

4.3   Simplified representation and simplified dimensioning of holes
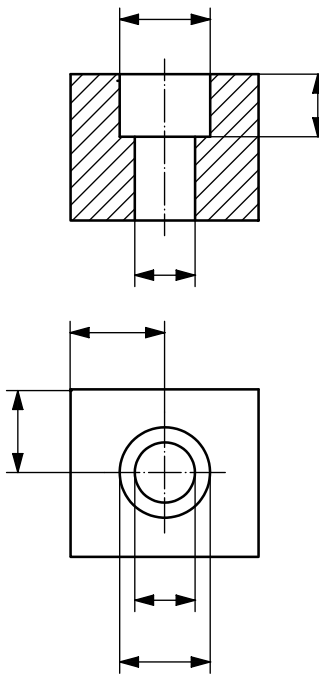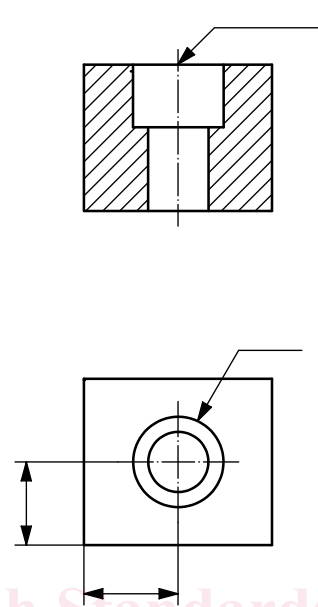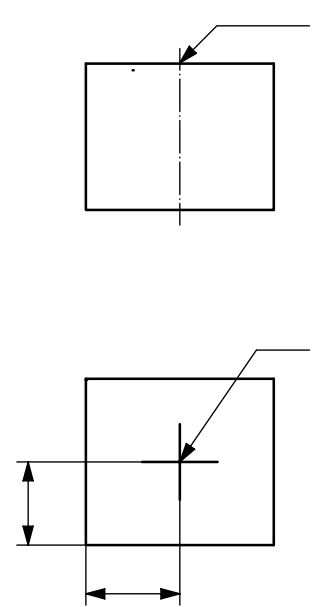
For simplified representation and simplified dimensioning of holes, only the centre lines of the holes are shown. In the case of the view from above, the location of the centre of the hole is represented by a cross using continuous wide lines (according to ISO 128-24:1999, type 01.2). The location of holes represented parallel to the plane of projection is shown by a long-dashed dotted narrow line (according to ISO 128-24:1999, type 04.1).

In the case of simplified dimensioning, the leader line ends with an arrowhead at the centre of the hole or at the point of intersection of the visible edge of the part and the centre line of the hole. The arrowhead points to the surface of the part from which the features are indicated (direction of manufacture; exception, see 5.3) (see Table 1).

4.4   Representation of holes on the same drawing

It is suggested that holes should be drawn and represented using only one of the methods of Table 1 to avoid causing confusion on the same drawing.

Table 1 — Comparison of methods for representation and dimensioning of holes

Complete representation and complete dimensioning according to ISO 129-1	Complete representation and simplified dimensioning	Simplified representation and simplified dimensioning

5 Structure of dimensioning of holes

5.1 Structure and sequence of descriptive elements for simplified dimensioning of holes

The structure of the simplified dimensioning of holes is composed of continuous enumeration and denominations of features used.

This means that the graphical symbols (e.g. $\varnothing$) and the dimensions (e.g. diameter, hole depths, tolerances) are shown one below the other. The feature with the largest dimension shall be shown in the first line.

The data shall be marked in characters of the same size, with the exception of the indication of surface texture (see 5.8).

The necessary data for each feature, several identical features or several groups of identical features are indicated on one line of the simplified dimensioning.

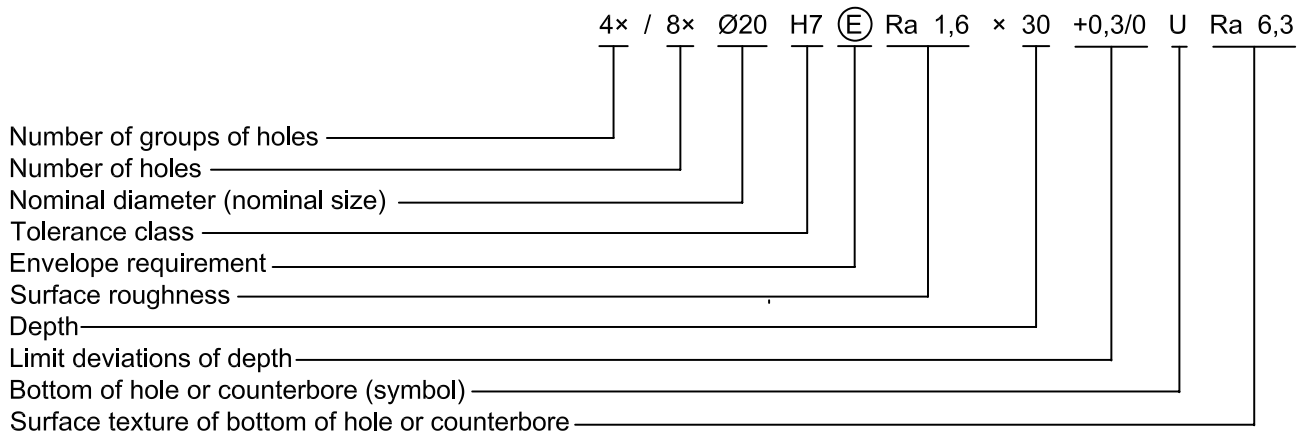Structure and sequence of data is explained in Figure 1.

4× / 8× ⌀20 H7 Ⓔ Ra 1,6 × 30 +0,3/0 U Ra 6,3

Number of groups of holes
Number of holes
Nominal diameter (nominal size)
Tolerance class
Envelope requirement
Surface roughness
Depth
Limit deviations of depth
Bottom of hole or counterbore (symbol)
Surface texture of bottom of hole or counterbore

Figure 1 — Structure and sequence of descriptive elements

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Figure 2 — Indication on a drawing

5.2 Graphical symbols

See Table 2.

Table 2 — Symbols

No.	Symbol	Term	Example	Figure
1	∅	Diameter (ISO 129-1)	∅10	4, 5, 6, 7, 8
2	□	Square (ISO 129-1)	□20	Table A.1, No. 6
3	×	Sign between nominal size and depth or angle dimensions, number of features and of groups of features	M10 × 25	4, 5, 7, 8, 14
4	/	Sign between depth dimensions or between number of groups and number of features, e.g. thread length and bottom hole depth	M10 × 25/30	9, 12
5	U	Cylindrical counterbore, flat hole bottom	∅10 × 25U	3, 4
6	V	Material-dependent bit (point angle of hole bottom)	∅10 × 25V	6
7	W	Indexable insert bit (hole bottom)	∅10 × 25W	5
8	Y	Dimension indicated up to bit	∅10 × 28Y	8