INTERNATIONAL STANDARD

ISO 5456-3

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Technical drawings — Projection methods —

Part 3: Axonometric representations

Dessins techniques — Méthodes de projection —
Partie 3: Représentations axonométriques

Reference number
ISO 5456-3:1996(E)

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.

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.

International Standard ISO 5456-3 was prepared by Technical Committee ISO/TC 10, *Technical drawings, product definition and related documentation*, Subcommittee SC 1, *Basic conventions*.

ISO 5456 consists of the following parts, under the general title *Technical drawings — Projection methods*:

— *Part 1: Synopsis*

— *Part 2: Orthographic representations*

— *Part 3: Axonometric representations*

— *Part 4: Central projection*

Annex A of this part of ISO 5456 is for information only.

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Introduction

Axonometric representations are simple pictorial representations obtained by projecting the object to be represented from an infinitely distant point (projection centre) on a single projection plane (normally the drawing surface). This kind of parallel projection gives an adequate approximation for distant views.

The resulting representation depends on the shape of the object and on the relative positions of the projection centre, the projection plane and the object itself.

Among the infinite possibilities of axonometric representation, only a few types are recommended for technical drawings in all fields of technical activities (mechanical, electrical, construction, etc.).

Axonometric representations are not as commonly used in technical drawings as are orthographic representations.

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Technical drawings — Projection methods —

Part 3:
Axonometric representations

1 Scope

This part of ISO 5456 specifies basic rules for the application of the recommended axonometric representations for all types of technical drawings.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 5456. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 5456 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 128:1982, *Technical drawings — General principles of presentation.*

ISO 129:1985, *Technical drawings — Dimensioning — General principles, definitions, methods of execution and special indications.*

ISO 3098-1:1974, *Technical drawings — Lettering — Part 1: Currently used characters.*

ISO 5456-1:1996, *Technical drawings — Projection methods — Part 1: Synopsis.*

ISO 10209-1:1992, *Technical product documentation — Vocabulary — Part 1: Terms relating to technical drawings: general and types of drawings.*

ISO 10209-2:1993, *Technical product documentation — Vocabulary — Part 2: Terms relating to projection methods.*

3 Definitions

For the purposes of this part of ISO 5456, the definitions given in ISO 5456-1, ISO 10209-1 and ISO 10209-2 apply.

4 General

The general principles of presentation given in ISO 128 shall be followed.

4.1 Position of the coordinate system

The position of the coordinate axes shall be chosen, by convention, so that one of the coordinate axes (the Z-axis) is vertical.

4.2 Position of the object

The object to be represented is located with its principal faces, axes and edges parallel to the coordinate planes. The object shall be orientated to show the principal view and the other views that would preferably be chosen when representing the same object in orthogonal projections.

4.3 Axes of symmetry

Axes and traces of planes of symmetry of the object shall not be drawn unless necessary.

4.4 Hidden contours and edges

Hidden contours and edges should preferably be omitted.

4.5 Hatching

Hatching to indicate a cut or section shall be drawn preferably at an angle of 45° with respect to axes and contours of the cut or section (see figure 1).

Hatching to indicate planes parallel to the coordinate planes shall be drawn parallel to the projected coordinate axis, as shown in figure 2.

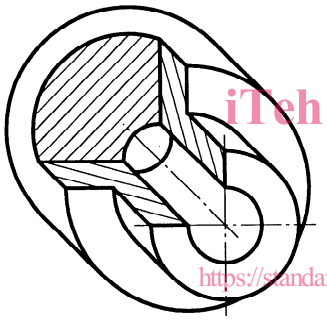


Figure 1

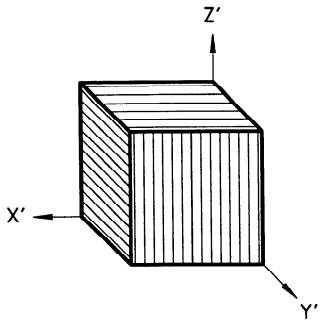


Figure 2

4.6 Dimensioning

Dimensioning of axonometric representations is normally avoided. If, for special reasons, dimensioning is considered necessary, the same rules given for orthogonal projections (ISO 129 and ISO 3098-1) shall be used (see figures 6 and 12).

5 Recommended axonometries

Recommended axonometries for technical drawings are:

— isometric axonometry (see 5.1);

— dimetric axonometry (see 5.2);

— oblique axonometry (see 5.3).

Coordinate axes X, Y, Z are to be indicated by upper case letters. If other items (e.g. dimensions) have to be indicated in a table or drawing, lower-case letters x, y, z shall be used for better differentiation (for examples see ISO 6412-2).

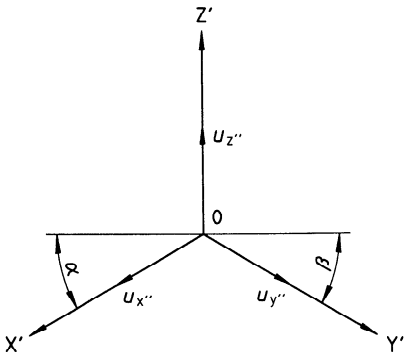
5.1 Isometric axonometry

The isometric axonometry is the orthogonal axonometry in which the projection plane forms three equal angles with the three coordinate axes X, Y and Z[1].

Three unit length segments u_x, u_y and u_z on the three coordinate axes X, Y and Z, are respectively projected orthogonally on the projection plane in three equal segments $u_{x'}$, $u_{y'}$ and $u_{z'}$ on the projected X′, Y′ and Z′ axes whose lengths are:

$$u_{x'} = u_{y'} = u_{z'} = (2/3)^{1/2} = 0{,}816$$

The projection X′, Y′ and Z′ of the three coordinate axes X, Y and Z on the projection plane (drawing surface) is shown in figure 3.



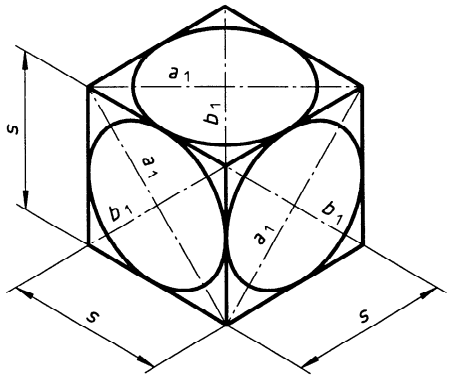
$\alpha = \beta = 30°$

Figure 3

In drawing practice, the projected unit length segments on the X′, Y′ and Z′ axes are taken as $u_{x''} = u_{y''} = u_{z''} = 1$, which corresponds to a graphic representation of the object enlarged by a factor $(3/2)^{1/2} = 1{,}225$.

1) This gives a representation identical to that obtained by orthogonal projection of the principal view of a right hexahedron with all its faces equally inclined to the projection plane.

The isometric axonometry of a right hexahedron with circles inscribed on its faces is represented in figure 4.



Length of the ellipse axes:

$$a_1 = \sqrt{\frac{3}{2}}\, s \approx 1{,}22s$$

$$b_1 = \sqrt{\frac{1}{2}}\, s \approx 0{,}71s$$

Figure 4

The isometric axonometry gives the same visual importance to all three faces of the right hexahedron, and is therefore convenient to draw on an equilateral-triangle grid (see figure 5).

An example of dimensioning for isometric axonometry is given in figure 6.

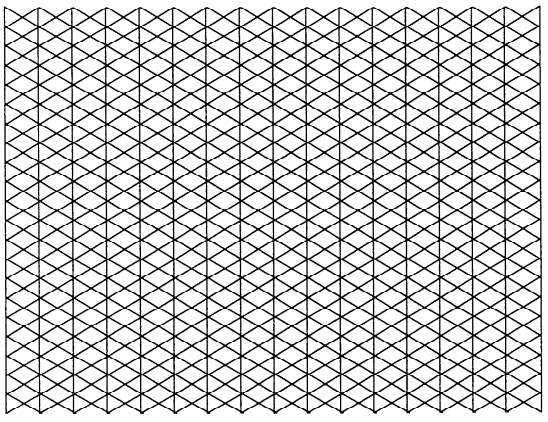


Figure 5

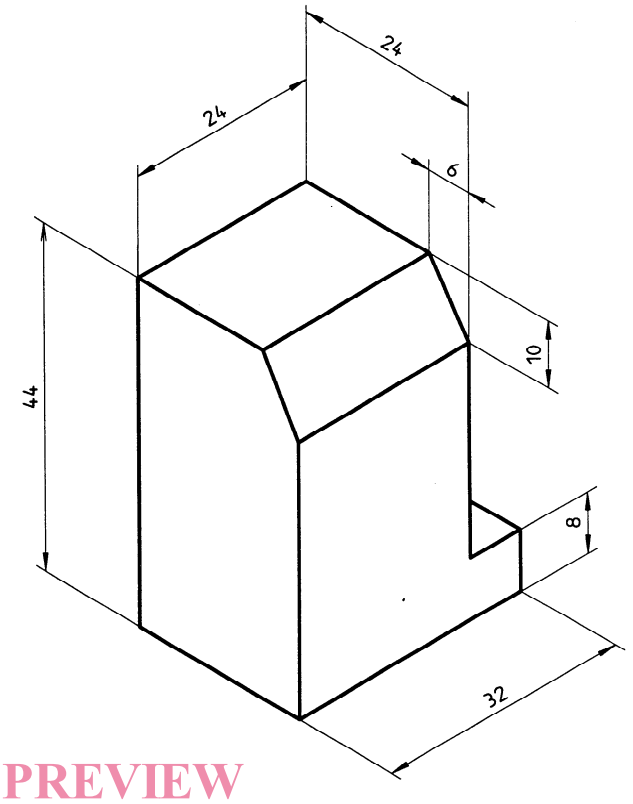


Figure 6

5.2 Dimetric axonometry

Dimetric axonometry is used when a view of the object to be represented is of main importance. The projection of the three coordinate axes is given in figure 7. The ratio of the three scales is $u_{X'}:u_{Y'}:u_{Z'} = 1/2:1:1$.

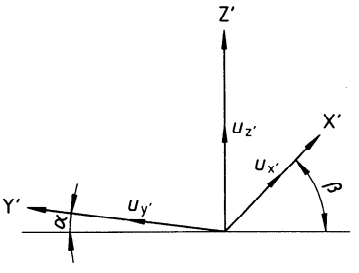
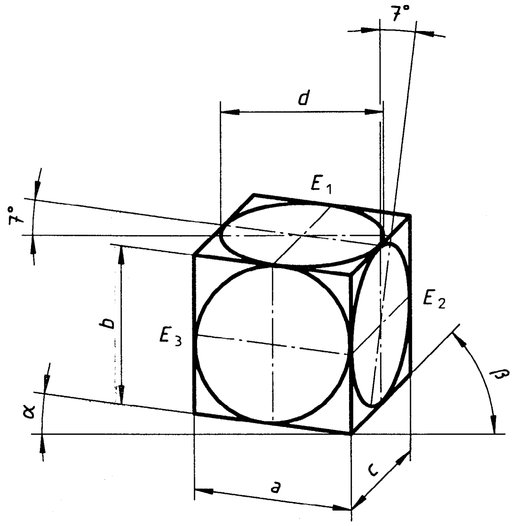


Figure 7

The dimetric axonometry of a right hexahedron with circles inscribed in its faces is given in figure 8.



$a:b:c = 1:1:1/2$
$\alpha = 7°$
$\beta = 42°$

Figure 8

5.3 Oblique axonometry

In oblique axonometry, the projection plane is parallel to one coordinate plane and to the main face of the object to be represented, whose projection remains in the same scale. Two of the projected coordinate axes are orthogonal. The direction of the third projected coordinate axis and its scale are arbitrary. Several types of oblique axonometry are used, because of their ease of drawing.

5.3.1 Cavalier axonometry

In this type of oblique axonometry, the projection plane is normally vertical and the projection of the third coordinate axis is chosen by convention at 45° to the remaining projected orthogonal axes; the scales on the three projected axes are identical: $u_{x'} = u_{y'} = u_{z'} = 1$ (see figure 9).

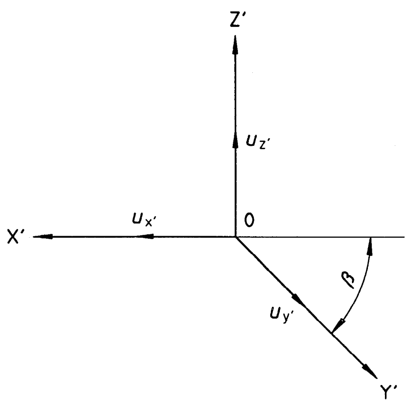


Figure 9

The four possible cavalier axonometries of a right hexahedron are shown in figure 10.

Cavalier axonometry is very simple to draw and makes it possible to dimension the drawing, but heavily distorts the proportions along the third coordinate axis.

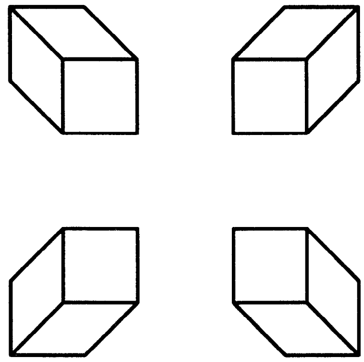
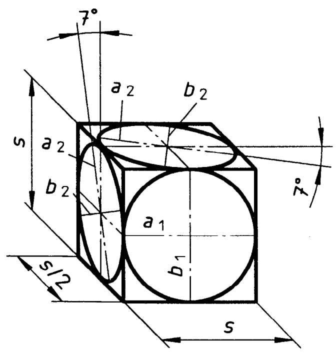


Figure 10

5.3.2 Cabinet axonometry

Cabinet axonometry is similar to cavalier axonometry, except that on the third projected axis the scale is reduced by a factor of two. This provides a better proportion to the drawing.

A cabinet axonometric representation of a right hexahedron with circles inscribed in its faces is shown in figure 11.



$a_1 = b_1 = s$

Length of the ellipse axes:

$a_2 = 1{,}06s$
$b_2 = 0{,}33s$

Figure 11

An example of dimensioning is given in figure 12.

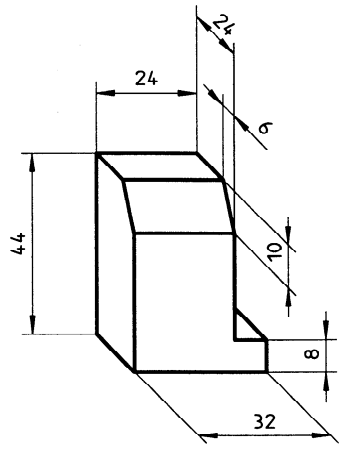


Figure 12

5.3.3 Planometric axonometry

In planometric axonometry, the projection plane is parallel to the horizontal coordinate plane. Projections using angles α = 0°, 90° or 180° should be avoided so that all necessary information can be presented (see figure 13).

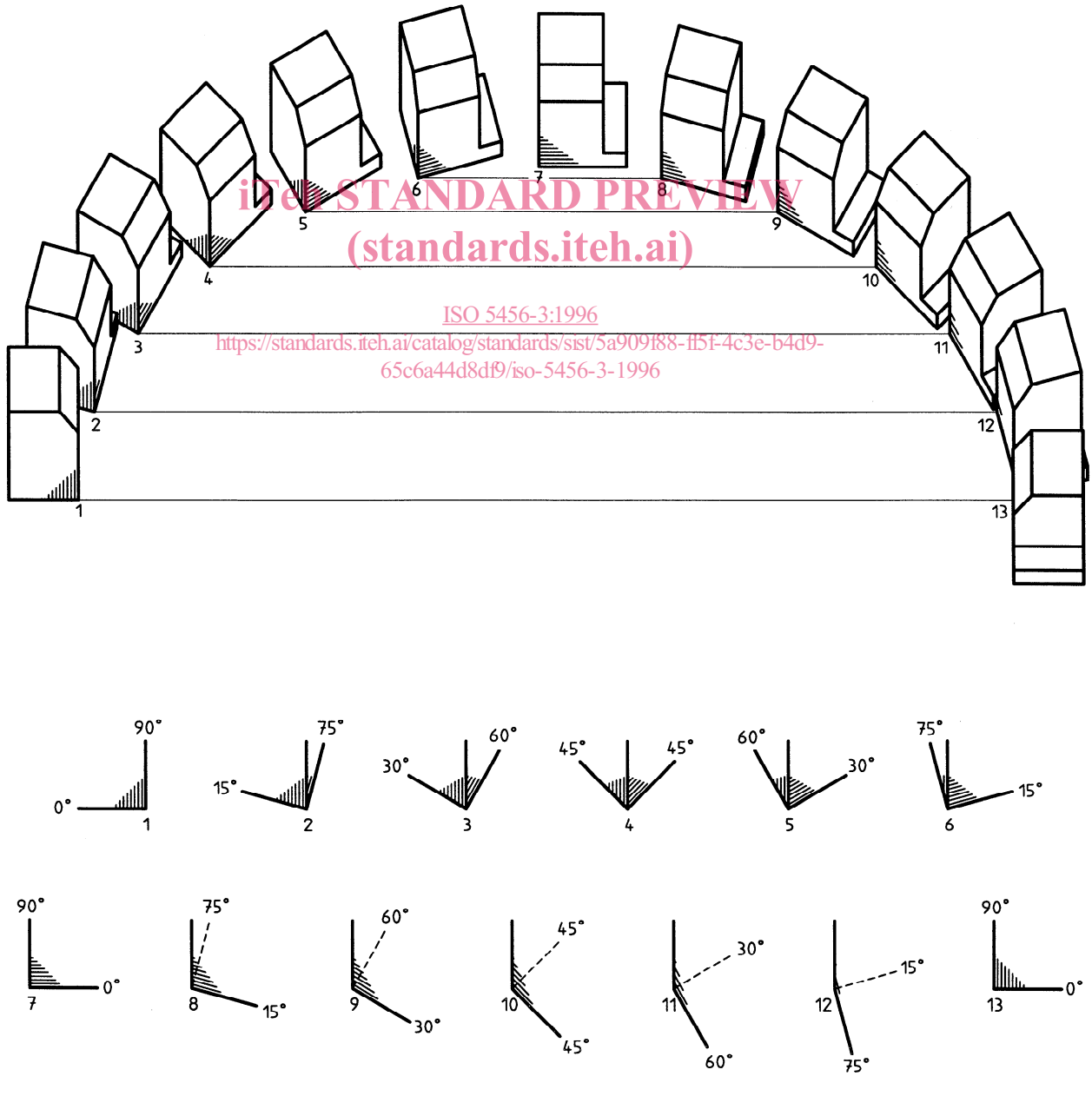


Figure 13