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Technical drawings — Projection methods — Part 2: Orthographic representations

Dessins techniques — Méthodes de projection —

Partie 2: Représentations orthographiques

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Reference number
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Foreword

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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 5456-2 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 forms an integral part of this part of ISO 5456.

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Introduction

Orthographic representation in its various forms is the most widely used method of representing technical objects in all fields of technical drawing (mechanical, electrical, construction, etc.), and is thus considered to be the accepted technical language.

Technical drawings — Projection methods —

Part 2: Orthographic representations

1 Scope

This part of ISO 5456 specifies basic rules for the application of orthographic representation to all types of technical drawings in all technical fields, according to the general rules specified in ISO 128, ISO 129, ISO 3098-1, ISO 3461-2 and ISO 5456-1.

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 3461-2:1987, *General principles for the creation of graphical symbols — Part 2: Graphical symbols for use in technical product documentation.*

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 principles

4.1 General

Orthographic representation is obtained by means of parallel orthogonal projections and results in flat, two-dimensional views systematically positioned relative to each other. To show an object completely, the six views in the directions a, b, c, d, e and f may be necessary, in order of priority (see figure 1 and table 1).

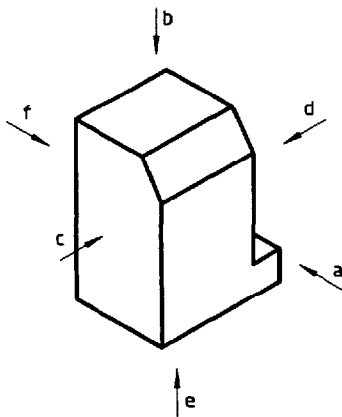


Figure 1

4.2 Designation of views

See table 1.

Table 1

Direction of observation		Designation of view
View in direction	View from	
a	the front	A
b	above	B (E) ¹⁾
c	the left	C
d	the right	D
e	below	E
f	the rear	F

1) See 5.4.

The most informative view of the object to be represented is normally chosen as the principal view

(front view). This is view A according to the direction of viewing a (see figure 1 and table 1), generally showing the object in the functioning or manufacturing or mounting position. The position of other views relative to the principal view in the drawing depends on the projection method chosen (first angle, third angle, reference arrows). In practice, not all six views (A to F) are needed. When views (cuts or sections) other than the principal view are necessary, these shall be selected in order to:

- limit the number of views, cuts and sections to the minimum necessary and sufficient to fully represent the object without ambiguity;
- avoid unnecessary repetition of detail.

5 Methods of representation

5.1 First angle projection

The first angle projection method is an orthographic representation in which the object to be represented (see figure 1) appears between the observer and the coordinate planes on which the object is orthogonally projected (see figure 2).

The positions of the various views relative to the principal (front) view A are determined by rotating their projection planes around lines coinciding with or parallel to the coordinate axes on the coordinate plane (drawing surface) on which the front view A is projected (see figure 2).

Therefore, in the drawing, with reference to the principal view A, the other views are arranged as follows (see figure 3):

- View B: the view from above is placed underneath;
- View E: the view from below is placed above;
- View C: the view from left is placed on the right;
- View D: the view from the right is placed on the left;
- View F: the view from the rear is placed on the right or on the left, as convenient.

The identifying graphical symbol of this method is shown in figure 4.

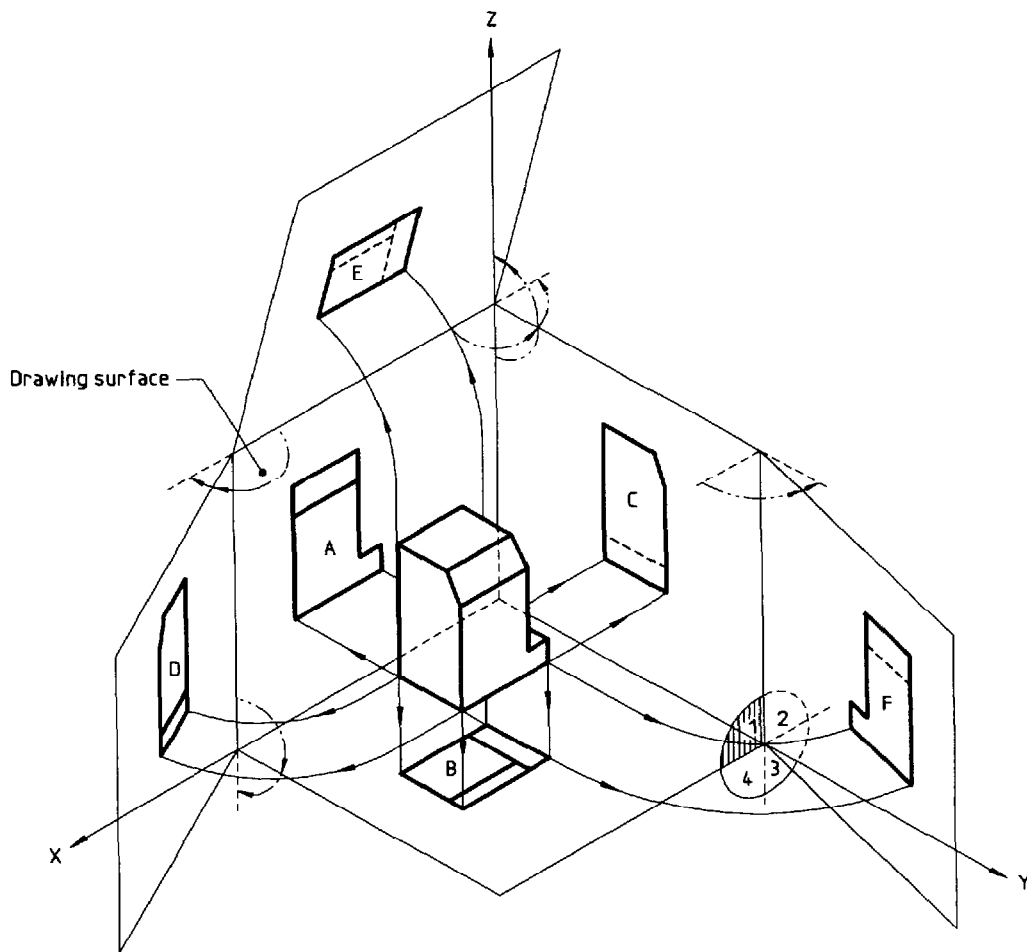


Figure 2

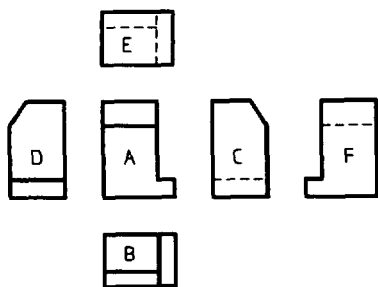


Figure 3

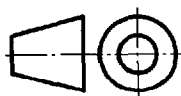


Figure 4

5.2 Third angle projection

The third angle projection method is an orthographic representation in which the object to be represented (see figure 1), as seen by the observer, appears behind the coordinate planes on which the object is orthogonally projected (see figure 5). On each projection plane, the object is represented as if seen orthogonally from infinite distance with transparent projection planes.

The positions of the various views relative to the principal (front) view A are determined by rotating their projection planes around lines coinciding with or parallel to the coordinate axes on the coordinate plane (drawing surface) on which the front view A is projected (see figure 5).

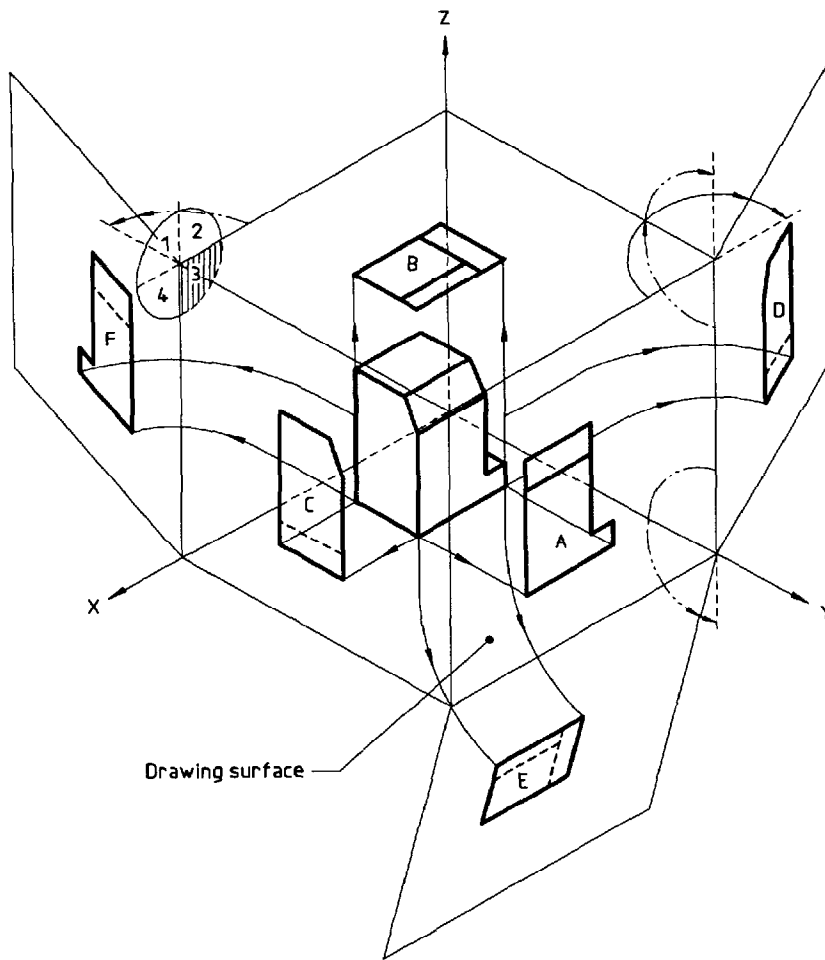


Figure 5

Therefore, in the drawing, with reference to the principal view A, the other views are arranged as follows (see figure 6):

- View B: the view from above is placed above;
- View E: the view from below is placed underneath;
- View C: the view from the left is placed on the left;
- View D: the view from the right is placed on the right;
- View F: the view from the rear may be placed on the left or on the right, as convenient.

The identifying graphical symbol of this method is shown in figure 7.

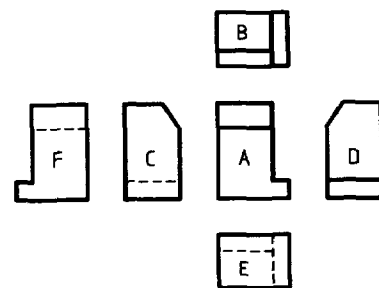


Figure 6

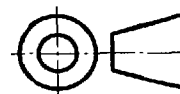


Figure 7

5.3 Reference arrows layout

In those cases where it is advantageous to position the views not according to the strict pattern of the first or the third angle projection method, the use of the reference arrows method permits the various views to be freely positioned.

With the exception of the principal view, each view shall be identified by a letter in accordance with figure 1. A lower-case letter indicates in the principal view the direction of observation of the other views, which are identified by the corresponding capital letter placed immediately above the view and on the left.

The identified views may be located irrespective of the principal view (see figure 8). Whatever the direction of observation, the capital letters (see ISO 3098-1) identifying the views shall always be positioned to be read from the normal direction of viewing of the drawing.

No graphical symbol for the indication of this method is needed on the drawing.

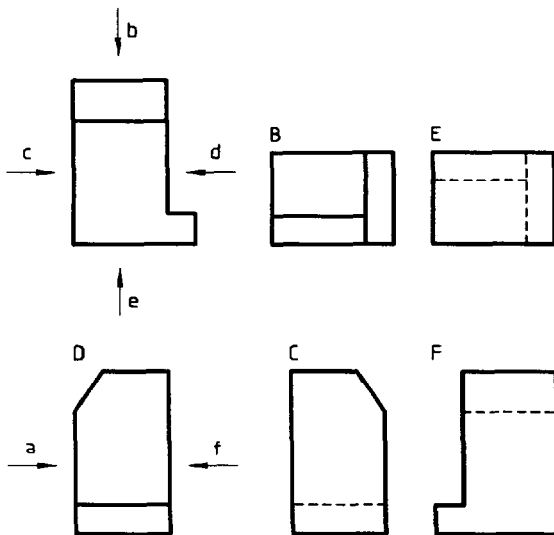


Figure 8

5.4 Mirrored orthographic representation

Mirrored orthographic representation¹⁾ is an orthographic representation in which the object to be represented (see figure 1) is a reproduction of the image in a mirror (face up) which is positioned parallel to the horizontal planes of this object (see figure 9).

The view resulting from a mirrored orthographic representation may be indicated by using the capital letter for the designation of views (i.e. "E", see 4.2).

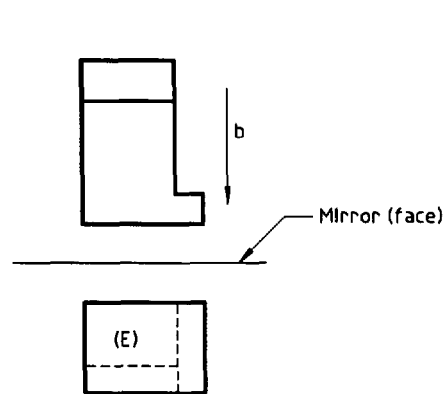


Figure 9

The identifying graphical symbol of this method is shown in figure 10.

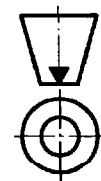


Figure 10

1) This method is preferably used in construction drawings.

Annex A (normative)

Proportions and dimensions of graphical symbols

A.1 General requirements

In order to harmonize the sizes of the graphical symbols specified in this part of ISO 5456 with those of the other inscriptions on the drawing (dimensions, tolerances, etc.), the rules given in ISO 3461-2 shall be applied.

A.2 Proportions

The graphical symbols shall be drawn in accordance with figures A.1, A.2 and A.3.

For practical reasons the centrelines may be omitted.

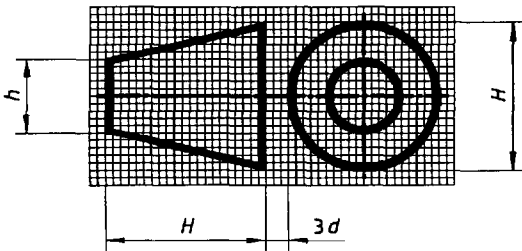


Figure A.1

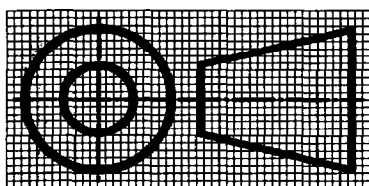


Figure A.2

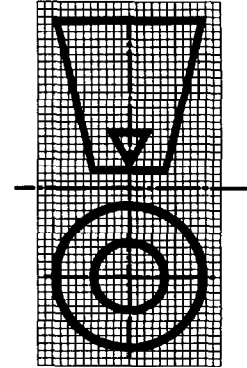


Figure A.3

A.3 Dimensions

The range of sizes to be used for the graphical symbols and additional indications shall be as specified in table A.1.

Table A.1

Dimensions in millimetres

Height of numerals and capital letters (and/or lower-case letters) and diameter of the smaller end of the cone, <i>h</i>	3,5	5	7	10	14	20
Line width for graphical symbols, <i>d</i>	0,35	0,5	0,7	1	1,4	2
Line width for lettering, <i>d</i>						
Length and diameter of the larger end of the cone, <i>H</i>	7	10	14	20	28	40

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