

BS 8888:2011



BSI Standards Publication

Technical product documentation and specification

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Summary of pages

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Foreword

Publishing information

This British Standard is published by BSI and came into effect on 31 December 2011. It was prepared by Subcommittee TDW/4/8, *BS 8888 – Technical product specification*, under the authority of Technical Committee TDW/4, *Technical product realization*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This British Standard supersedes BS 8888:2008, which is withdrawn.

Information about this document

This sixth edition of the standard is a full revision. It introduces relevant international standards published since the 2008 edition. It also incorporates more fully than previous editions some of the fundamental requirements of the key international standards relevant to the preparation of technical product specifications, such as BS EN ISO 1101 and BS EN ISO 5459. It is hoped that UK industry will find this edition of BS 8888 more user friendly than previous editions. It aims to help organizations better understand and implement the full complement of International Standards developed by ISO/TC 213, *Geometrical product specifications and verification*, and ISO/TC 10, *Technical product documentation*.

Relationship with other publications

The function of BS 8888 is to draw together, in an easily accessible manner, the full complement of international standards relevant to the preparation of technical product specifications. However, it is not the intention for BS 8888 to be a “stand-alone” standard. TDW/4 is responsible for a suite of related national standards which include the various parts of the BS 8887 series, BS 8889 ¹⁾ and PD 68888, a new training document.

BS 8888 was taken up by the Ministry of Defence in 2006 as part of its DEF-STAN for defence project specification.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

All dimensions shown in the figures in this British Standard are in millimetres.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

¹⁾ In development.

1 Scope

This British Standard implements the ISO system for technical product documentation and specification.

The ISO system is defined in a large number of interlinked and related international standards which are referenced from within BS 8888.

The purpose of this British Standard is to facilitate the use of the ISO system by providing:

- an index to the international standards which comprise the ISO system, referencing them according to their area of application;
- key elements of the ISO standards to facilitate their application;
- references to additional British and European Standards where they provide information or guidance over and above that provided by ISO standards; and
- commentary and recommendations on the application of the standards where this is deemed useful.

The requirements refer to International and European Standards which have been implemented as British Standards either in the BS EN, BS EN ISO, BS ISO series or as International Standards re-numbered as British Standards.

Annex A (normative) contains a list of normative references, indispensable for the application of this British Standard.

Annex B (informative) contains a list of informative references.

Annex C (normative) contains a set of examples of geometrical tolerances and associated requirements.

Annex D (normative) contains requirements for enhanced security.

Annex E (informative) provides a summary report on the concepts that have underwritten the development of technical product specification (TPS) and its primary constituent, geometrical product specification (GPS), to date and discusses some of the drivers for future change.

2 Normative references

Normative references are indispensable for the application of this document. A full list is contained in Annex A.

3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply, together with those given in

BS EN ISO 10209	<i>Technical product documentation – Vocabulary - Terms relating to technical drawings, product definition and related products</i>
BS EN ISO 14660-1	<i>Geometrical product specification (GPS) – Geometrical features – Part 1: General terms and definitions</i>

3.1 date of acceptance

point in time at which all interested parties agree that the technical product specification is to be considered finalized to the extent that manufacturing can commence

NOTE 1 This might be identified by other terms, e.g. "date of issue".

NOTE 2 For the implications of the date of acceptance see 4.2.3.

3.2 ISO GPS system

geometrical product specification and verification system developed in ISO by ISO/TC 213

3.3 technical product documentation (TPD)

means of conveying all or part of a design definition or specification of a product

3.4 technical product specification (TPS)

technical product documentation comprising the complete design definition and specification of a product for manufacturing and verification purposes

NOTE A TPS, which might contain drawings, 3-D models, parts lists or other documents forming an integral part of the specification, in whatever format they might be presented, might consist of one or more TPDs.

4 Standards underpinning BS 8888

4.1 Fundamental TPS principles

4.1.1 General

The following standards shall be applied as “global” standards in support of BS 8888.

ISO/IEC Guide 98-3	<i>Guide to the expression of uncertainty in measurement (GUM)</i>
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ISO/IEC Guide 99	<i>International vocabulary of metrology – basic and general concepts and associated terms (VIM)</i>
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The following principles shall always be applied where conformity with BS 8888 is claimed.

4.1.2 General principles of specification

A TPS shall document the criteria that the manufactured product has to satisfy.

NOTE 1 The TPS might include requirements of individual manufactured components, where necessary.

NOTE 2 The TPS might include additional information required for the manufacture, verification, maintenance and disposal of the product.

NOTE 3 Criteria might include requirements relating to the appearance, transportation, storage, maintenance, assembly, disassembly, recycling and disposal of the product, as well as its performance and reliability in use.

Sizes, geometrical relationships and tolerances which are necessary for the correct functioning or location of a component or assembly shall be specified through the use of datums, dimensions and tolerances.

NOTE 4 Selection of datum features which are not related to the function or location of a component or assembly results in the need for tighter tolerances.

A TPS shall provide sufficient information to avoid ambiguity of interpretation.

NOTE 5 A TPS is not complete if there is more than one possible interpretation of the specification.

A TPS shall provide sufficient information for the product to be manufactured, but shall not unnecessarily constrain manufacturing methods.

NOTE 6 A particular manufacturing process which has been tested and approved for the production of a safety-critical component is an example of a situation where there is a requirement to specify the manufacturing method.

A TPS shall provide sufficient information for the verification of each element of the specification, but shall not unnecessarily constrain verification methods.

A TPS shall provide all the information necessary for the manufacture and verification of the product, or state where that information can be found.

NOTE 7 This might be achieved through the use of notes and references to other standards or documents.

4.1.3 Acceptance date principle

A TPS shall always be interpreted according to those versions of standards which governed its interpretation on its acceptance date.

NOTE What is not specified in a TPS at the date of acceptance cannot be required.

4.1.4 Reference condition principle

Unless otherwise stated, all geometrical forms, sizes and tolerances for a work-piece given in a TPS shall be considered to apply at 20 °C.

NOTE 1 See BS EN ISO 1.

Unless otherwise stated, all geometrical sizes, forms and tolerances for a workpiece given in a TPS shall be considered to apply in the absence of any external forces (including gravity).

NOTE 2 This is of particular importance when aligning and/or measuring large and/or flexible constructions. See 22.2.

4.2 Implied annotation

The following rules shall govern the use and interpretation of implied annotation on engineering drawings.

NOTE A dimension may be implied and not indicated on a drawing in the following circumstances, so long as there is no risk of misinterpretation.

- a) Where two features are aligned, there is no requirement to indicate a linear dimension of 0 or an angular dimension of 0°.
- b) Where two features are parallel to each other, there is no requirement to indicate an angular dimension of 0° or 180°.
- c) Where two features are at 90° to each other, there is no requirement to indicate an angular dimension of 90°.
- d) Where several features are equispaced around a pitch circle (see BS ISO 129-1), there is no requirement to indicate an angular dimension, although it might be advisable to do so. Terms such as "equispaced", "equally spaced", etc. shall not be used.
- e) Where not otherwise indicated, holes are considered as through holes.

If the features concerned have their locations and/or orientations controlled through the use of geometrical tolerances, then the implied dimensions shall be taken as Theoretically Exact Dimensions (TEDs; see BS EN ISO 1101).

If the features concerned have their locations and/or orientations controlled through the use of +/- or limit tolerances, then the implied dimensions shall also be toleranced. In the absence of other indications, they shall be subject to a general tolerance, or else the TPS would remain incomplete.

Tolerances shall never be implied, and shall always be indicated.

Datums shall never be implied, and shall always be indicated.

Section 1: Technical product documentation

5 Types of documentation

5.1 General

COMMENTARY ON 5.1

The careful targeting of TPDs to known or intended users can greatly assist the accuracy with which the specification is converted into the final product.

While precision and avoidance of ambiguity shall always be paramount, the means employed to convey this information shall be seen to match the capability, or potential capability, of the available or achievable manufacturing facility.

NOTE Specification beyond this level is unlikely to produce satisfactory results and can often prove expensive, both in terms of the cost of the over-specification itself and in terms of inadequate or unacceptable product.

5.2 Presentation media

5.2.1 General

The presentation of the drawings shall conform to the following standards, as appropriate.

BS EN ISO 5457 *Technical product documentation – Sizes and layout of drawing sheets*

BS EN ISO 7200:2004 *Technical product documentation – Data fields in title blocks and document headers*

BS ISO 7573 *Technical drawings – Parts lists*

5.2.2 Format

Drawing sheets and other documents shall be presented in one of the following formats.

- a) Landscape: intended to be viewed with the longest side of the sheet horizontal.
- b) Portrait: intended to be viewed with the longest side of the sheet vertical.

NOTE Contrary to BS EN ISO 5457, A4 sheets may be used in landscape or portrait mode.

6 Drawing sheets

6.1 Sizes

As stated in the requirements of BS EN ISO 5457, the original drawing shall be made on the smallest sheet permitting the necessary clarity and resolution.

NOTE 1 The preferred sizes of the trimmed and untrimmed sheets as well as the drawing space of the main ISO-A series (see BS EN ISO 216) are given in Table 1.

NOTE 2 See BS EN ISO 5457 for more information about drawing sheets.

NOTE 3 The range of sheet sizes chosen could be rationalized through the use of a variety of new scales. See Clause 8.

Table 1 Sizes of trimmed and untrimmed sheets and the drawing space ^{A)}

Designation	Trimmed sheet (T)		Drawing space		Untrimmed sheet (U)	
	$a_1^{B)}$	$b_1^{B)}$	a_2 ± 0.5	b_2 ± 0.5	a_5 ± 2	b_5 ± 2
A0 ^{C)}	841	1 189	821	1 159	880	1 230
A1	594	841	574	811	625	880
A2	420	594	400	564	450	625
A3	297	420	277	390	330	450
A4	210	297	180	277	240	330

^{A)} Dimensions in millimetres.

^{B)} For tolerances see BS EN ISO 216.

^{C)} For sizes > A0 see BS EN ISO 216.

6.2 Graphical features

6.2.1 Title block

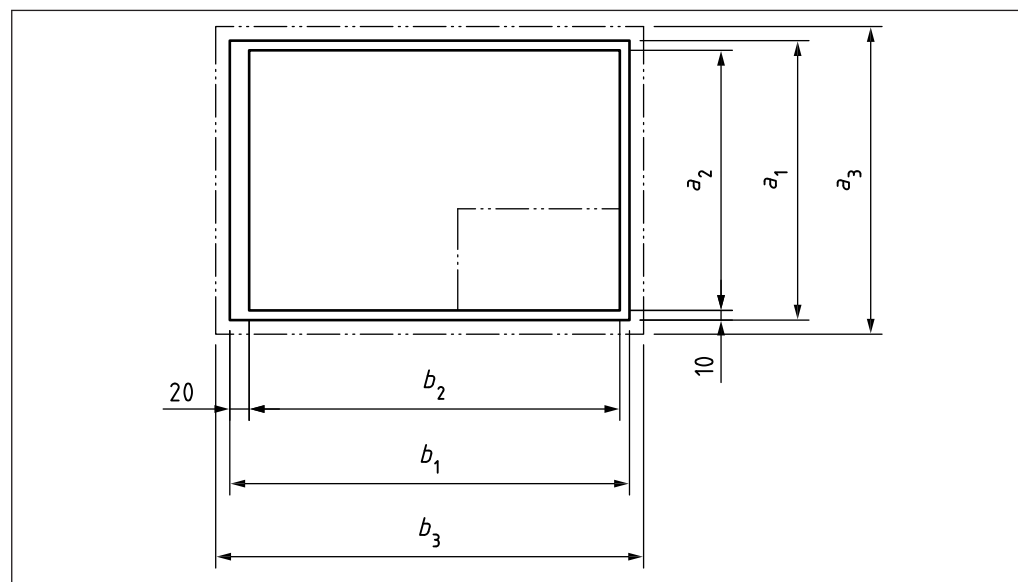
NOTE 1 For the dimensions and layout of title blocks, see BS EN ISO 7200.

Sizes A0 to A3 shall be used in landscape orientation only (Figure 1) and the location of the title block shall be situated in the bottom right-hand corner of the drawing space.

NOTE 2 A4 sheets may be used in landscape or portrait orientation.

For the size A4, the title block shall be situated in the bottom right-hand corner when used in landscape orientation, or the shorter (bottom) part of the drawing space when used in portrait orientation.

Figure 1 Size A4 to A0



6.2.2 Borders and frame

Borders enclosed by the edges of the trimmed sheet and the frame limiting the drawing space shall be provided with all sizes. The border shall be 20 mm wide on the left edge, including the frame and it can be used as a filing margin. All other borders shall be 10 mm wide.

The frame for limiting the drawing space shall be executed with continuous wide lines.

6.2.3 Grid reference system

The sheets shall be divided into fields in order to permit easy location of details, additions, revisions, etc. on the drawing. The individual fields shall be referenced from the top downwards with capital letters (I and O shall not be used) and from left to right with numerals. For the size A4, they shall be located only at the top and the right side.

The size of letters and characters shall be 3.5 mm. The length of the fields shall be 50 mm, starting at the axes of symmetry of the trimmed size (centring marks).

NOTE The number of fields depends on the size (see Table 2).

The differences resulting from the division shall be added to the fields at the corners. The letters and numerals shall be placed in the grid reference border, and shall be written in vertical characters according to BS EN ISO 3098-2.

The grid reference system lines shall be executed with continuous narrow lines.

Table 2 Number of fields

Designation	A0	A1	A2	A3	A4
Long side	24	16	12	8	6
Short side	16	12	8	6	4

6.3 Line types and line widths

6.3.1 Types of line

COMMENTARY ON 6.3.1

Table 3 shows the basic types of line. See BS EN ISO 128-20 for more information on lines.

6.3.2 Line width

According to the requirements of BS EN ISO 128-20, the width, d , of all types of line shall be one of the following depending on the type and size of drawing.

- 0,13 mm, 0,18 mm, 0,25 mm, 0,35 mm, 0,5 mm, 0,7 mm, 1 mm, 1,4 mm, 2 mm.

NOTE 1 The widths of extra wide, wide and narrow lines are in the ratio 4:2:1.

NOTE 2 For mechanical engineering drawings, four line types – continuous, dashed, chain (long-dashed dotted) and phantom (long-dashed double-dotted) – in two line thicknesses (typically 0,35 mm and 0,7 mm) are sufficient for most purposes.

The line width of any one line shall be constant throughout the whole line.

6.4 Colours

According to the requirements of BS EN ISO 128-20, lines shall be drawn black or white depending on the background. Other standardized colours may also be used for drawing standardized lines, and in this case, the meaning of the colours shall be explained.

Table 3 Basic types

No.	Representation	Description
01		continuous line
02		dashed line
03		dashed spaced line
04		long-dashed dotted line
05		long-dashed double-dotted line
06		long-dashed triplicate-dotted line
07		dotted line
08		long-dashed short-dashed line
09		long-dashed double short-dashed line
10		dashed dotted line
11		double-dashed dotted line
12		dashed double-dotted line
13		double-dashed double-dotted line
14		dashed triplicate-dotted line
15		double-dashed triplicate-dotted line

7 Title block

7.1 General

COMMENTARY ON 7.1

A condition for the transfer and presentation of information is that data fields be defined with regard to field name, content of information and number of characters.

When document management systems are used, the conditions that apply to the data fields differ to a certain extent from those that apply in non-computerized document management. The same data field can, for example, be part of several different types of document simultaneously, as it is possible to process the contents by computer in connection with retrieval, revision, communication, etc.

For more information on title blocks, see BS EN ISO 7200.

If the functions of the system are to behave in a satisfactory way, the information shall be entered in the proper data field and in a correct manner.

NOTE For this reason, computer-based systems commonly contain more permanent data fields than paper-based systems.

The number of data fields in the title block shall be limited to a minimum, while other data fields shall be handled dynamically and presented outside the title block only when used, e.g. scale, projection symbol, general tolerance and surface texture requirements.

7.2 Data fields in the title block – Identifying data fields

The identifying data fields in the title block shall be in accordance with Table 4, which is from BS EN ISO 7200:2004.

Table 4 Identifying data fields in the title block

Subclause in BS EN ISO 7200:2004	Field name	Language dependent	Recommended number of characters	Obligation
5.1.2	legal owner	—	Unspecified	M
5.1.3	identification number	no	16	M
5.1.4	revision index	no	2	O
5.1.5	date of issue	no	10	M
5.1.6	segment/sheet number	no	4	M
5.1.7	number segments/sheets	no	4	O
5.1.8	language code	no	4 per language	O

M = mandatory

O = optional

Descriptive data fields shall be as specified in Table 5, which is taken from BS EN ISO 7200:2004.

Table 5 Descriptive data fields in the title block

Subclause in BS EN ISO 7200:2004	Field name	Language dependent	Recommended number of characters	Obligation
5.2.2	title	yes	25/30 ^{A)}	M
5.2.3	supplementary title	yes	2 × 25/30 ^{A)}	O

M = mandatory

O = optional

^{A)} 30 to support two-byte-character language such as Japanese or Chinese.

Administrative data fields shall be as specified in Table 6, which is taken from BS EN ISO 7200:2004.

Table 6 Administrative data fields in the title block

Subclause in BS EN ISO 7200:2004	Field name	Language dependent	Recommended number of characters	Obligation
5.3.2	responsible department	no/yes ^{A)}	10	O
5.3.3	technical reference	no/yes ^{A)}	20	O
5.3.4	approval person	no/yes ^{A)}	20	M
5.3.5	creator	no/yes ^{A)}	20	M
5.3.6	document type	yes	30	M
5.3.7	classification/key words	no/yes ^{A)}	unspecified	O
5.3.8	document status	yes	20	O
5.3.9	page number	no	4	O
5.3.10	number of pages	no	4	O
5.3.11	paper size	no	4	O

M = mandatory

O = optional

^{A)} "Yes" to support presentation in different types of alphabet.

7.3 Title block arrangement

COMMENTARY ON 7.3

For the position of title blocks on technical drawings, see BS EN ISO 5457. For text documents, there are no ISO requirements. For examples of title block arrangements for use on drawings as well as text documents, see Figures 2 and 3.

As specified by the requirements of BS EN ISO 7200, the total width shall be 180 mm to fit an A4 sheet, with the left margin being 20 mm and the right margin 10 mm.

Figure 2 Title block in compact form

Responsible dept. ABC 2	Technical reference Patricia Johnson	Document type Sub-assembly drawing	Document status Released			
Legal owner	Created by Jane Smith	Title, Supplementary title Apparatus plate	AB123 456-7			
	Approved by: David Brown	Complete with brackets	Rev. A	Date of issue 2002-05-14	Lang. en	Sheet 1/5

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Figure 3 Title block with person name fields on additional line

Responsible dept. ABC 2	Technical reference Patricia Johnson	Created by Jane Smith	Approved by: David Brown			
Legal owner	Document type Sub-assembly drawing		Document status Released			
	Title, Supplementary title Apparatus plate		AB123 456-7			
	Complete with brackets		Rev. A	Date of issue 2002-05-14	Lang. en	Sheet 1/5

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8 Scales

8.1 General

The recommended scales for use on technical drawings shall be as specified in Table 7.

Table 7 Scales

Category		Recommended scales	
Enlargement scales	50:1	20:1	10:1
	5:1	2:1	
Full size			
Reduction scales	1:2	1:5	1:10
	1:20	1:50	1:100
	1:200	1:500	1:1 000
	1:2 000	1:5 000	1:10 000

The scale to be chosen for a drawing shall depend upon the complexity of the object to be depicted and the purpose of the representation. In all cases, the selected scale shall be large enough to permit easy and clear interpretation of the information depicted. The scale and the size of the object, in turn, shall decide the size of the drawing.

Details that are too small for complete dimensioning in the main representation shall be shown adjacent to the main representation in a separate detail view (or section) which is drawn to a larger scale.

NOTE 1 It is recommended that the scales in Table 7 are used wherever possible. However, with the advent of CAD systems and the ability to view drawings electronically at any size, the importance of using a standard range of scales has diminished. Where the recommended scales cannot be applied, intermediate scales may be selected.

3D models produced on CAD systems shall always be produced at 1:1.

NOTE 2 For more information on scales, see BS EN ISO 5455.

9 General tolerances

9.1 General

COMMENTARY ON 9.1

All features on component parts always have a size and a geometrical shape. For the deviation of size and for the deviations of the geometrical characteristics (form, orientation and location) the function of the part requires limitations which, when exceeded, impair this function.

The tolerancing on the drawing shall be complete to ensure that the elements of size and geometry of all features are controlled, i.e. nothing shall be implied or left to judgement in the workshop or in the inspection department.

NOTE 1 The use of general tolerances for size and geometry simplifies the task of ensuring that the prerequisites are met.

NOTE 2 See BS EN 22768 for more information on general tolerances.

9.2 General tolerances for linear dimensions

When use is made of BS EN 22768-1 (ISO 2768-1) for general tolerances, tolerances for dimensions shall be as given in Table 8, Table 9 and Table 10.

Table 8 Permissible deviations for linear dimensions except for broken edges

Tolerance class		Permissible deviations for basic size range							
Designation	Description	0,5 ^{A)} up to 3	over 3 up to 6	over 6 up to 30	over 30 up to 120	over 120 up to 400	over 400 up to 1 000	over 1 000 up to 2 000	over 2 000 up to 4 000
f	fine	±0,05	±0,05	±0,1	±0,15	±0,2	±0,3	±0,5	—
m	medium	±0,1	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±2
c	coarse	±0,2	±0,3	±0,5	±0,8	±1,2	±2	±3	±4
v	very coarse	—	±0,5	±1	±1,5	±2,5	±4	±6	±8

^{A)} For nominal sizes below 0,5 mm, the deviations shall be indicated adjacent to the relevant nominal size(s).

NOTE Values in millimetres.

Table 9 Permissible deviations for broken edges (external radii and chamfer heights)

Tolerance class		Permissible deviations for basic size range		
Designation	Description	0,5 ^{A)} up to 3	over 3 up to 6	over 6
f	fine	±0,2	±0,5	±1
m	medium			
c	coarse	±0,4	±1	±2
v	very coarse			

^{A)} For nominal sizes below 0,5 mm, the deviations shall be indicated adjacent to the relevant nominal size(s).

NOTE Values in millimetres.

Table 10 Permissible deviations of angular dimensions

Tolerance class		Permissible deviations for ranges of lengths, in millimetres, of the shorter side of the angle concerned				
Designation	Description	up to 10	over 10 up to 50	over 50 up to 120	over 120 up to 400	over 400
f	fine	±1°	±0°30'	±0°20'	±0°10'	±0°5'
m	medium					
c	coarse	±1°30'	±1°	±0°30'	±0°15'	±0°10'
v	very coarse	±3°	±2°	±1°	±0°30'	±0°20'

COMMENTARY ON 9.2

If reference to BS EN 22768-1 (ISO 2768-1) for general tolerances is inappropriate, general tolerance notes could be used to apply a common tolerance to many of the features on a drawing. The example shown in Figure 4 illustrates the wide field of application of this system.

Figure 4 Examples of general tolerance notes

TOLERANCE EXCEPT WHERE OTHERWISE STATED $\pm X$	TOLERANCES EXCEPT WHERE OTHERWISE STATED <table> <tr> <th data-bbox="836 371 884 394">SIZE</th><th data-bbox="1123 371 1238 394">TOLERANCE</th></tr> <tr> <td data-bbox="740 400 1015 425">- UP TO X</td><td data-bbox="1123 400 1158 425">$\pm A$</td></tr> <tr> <td data-bbox="740 432 1015 456">OVER X UP TO XX</td><td data-bbox="1123 432 1158 456">$\pm B$</td></tr> <tr> <td data-bbox="740 463 1015 488">OVER XX UP TO XXX</td><td data-bbox="1123 463 1158 488">$\pm C$</td></tr> <tr> <td data-bbox="740 495 1015 519">OVER XXX -</td><td data-bbox="1123 495 1158 519">$\pm D$</td></tr> <tr> <td data-bbox="836 526 948 551">ON ANGLES</td><td data-bbox="1123 526 1158 551">$\pm E$</td></tr> </table>	SIZE	TOLERANCE	- UP TO X	$\pm A$	OVER X UP TO XX	$\pm B$	OVER XX UP TO XXX	$\pm C$	OVER XXX -	$\pm D$	ON ANGLES	$\pm E$
SIZE	TOLERANCE												
- UP TO X	$\pm A$												
OVER X UP TO XX	$\pm B$												
OVER XX UP TO XXX	$\pm C$												
OVER XXX -	$\pm D$												
ON ANGLES	$\pm E$												
TOLERANCE ON CAST THICKNESS $\pm X\%$	FOR TOLERANCE ON FORGING DIMENSIONS SEE BS EN 10243-1												

9.3 General geometrical tolerances

COMMENTARY ON 9.3

Due to the inherent risk of unintentionally over-specifying form and orientation controls that can result from the use of general geometrical tolerances, reference to BS EN ISO 22768-2 is inadvisable.

10 Conventions for arrangement of views on a TPD

10.1 General

Three main conventions shall be used for arranging the views on a TPD:

- labelled views;
- first angle orthographic projection;
- third angle orthographic projection.

NOTE 1 The order of this list is not meant to indicate a preference.

NOTE 2 Other projection methods exist. See BS EN ISO 5456 (all parts).

10.2 Choice of views

When views (including sections and sectional views) are needed, these shall be selected according to the following principles.

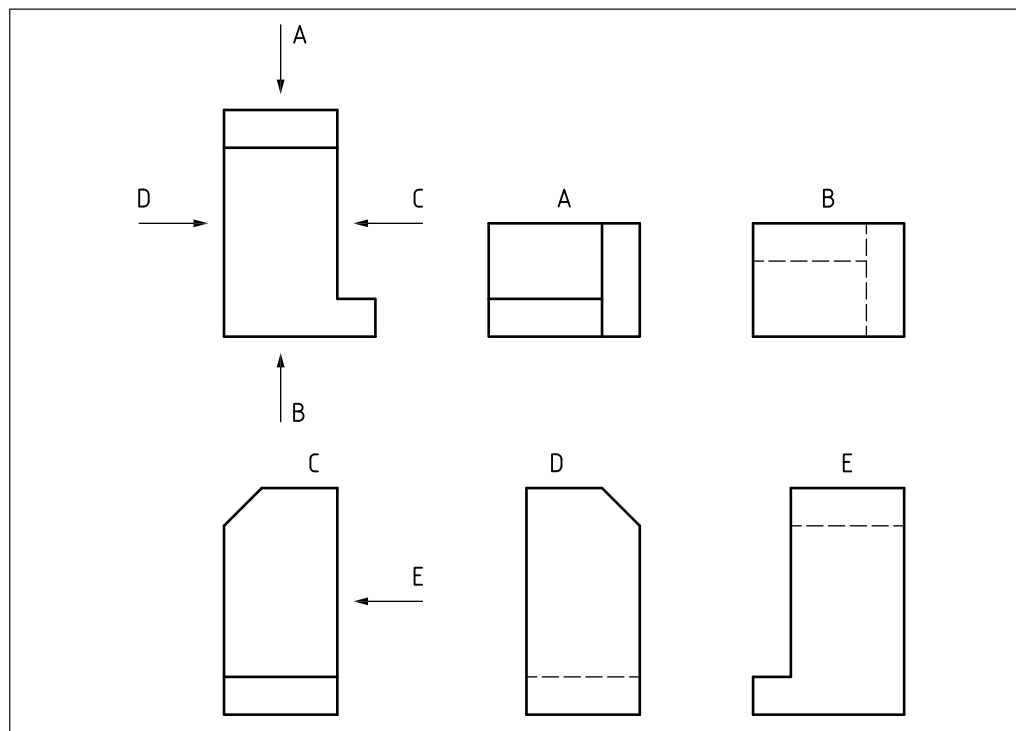
- The number of views (and sections and sectional views) shall be limited to the minimum necessary but shall be sufficient to fully delineate the object without ambiguity.
- The need for hidden outlines and edges shall be avoided.
- The unnecessary repetition of a detail shall be avoided.

10.3 Labelled view method

As specified by the requirements of BS ISO 128-30, the most informative view of an object shall be used as the front or principal figure, taking into consideration, for example, its functioning position, position of manufacturing or mounting. Each view, with the exception of the front or principal figure (view, plan, principal figure) shall be given clear identification with a capital letter, repeated near the reference arrow needed to indicate the direction of the viewing for the relevant view. Whatever the direction of viewing, the capital letter shall always be positioned in normal relation to the direction of reading, and be indicated either above or on the right side of the reference arrow.

The capital letters identifying the referenced views shall be placed immediately above the relevant views (see Figure 5).

Figure 5 Labelled view method



10.4 First angle projection method

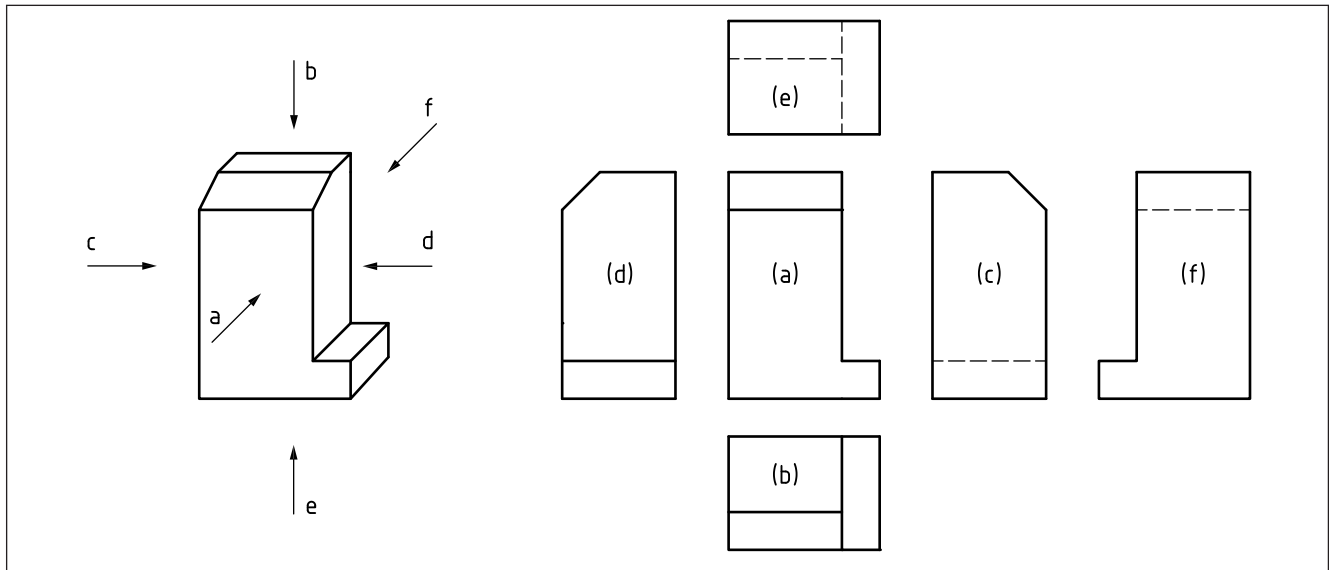
10.4.1 General

NOTE A more detailed description of the first angle projection method is to be found in BS ISO 128-30 and in BS EN ISO 5456-2.

With reference to the front view (a), the other views shall be arranged as follows (see Figure 6).

- The view from above (b) shall be placed underneath.
- The view from below (e) shall be placed above.
- The view from the left (c) shall be placed on the right.
- The view from the right (d) shall be placed on the left.
- The view from the rear (f) shall be placed on the left or right, as convenient.

Figure 6 First angle projection method

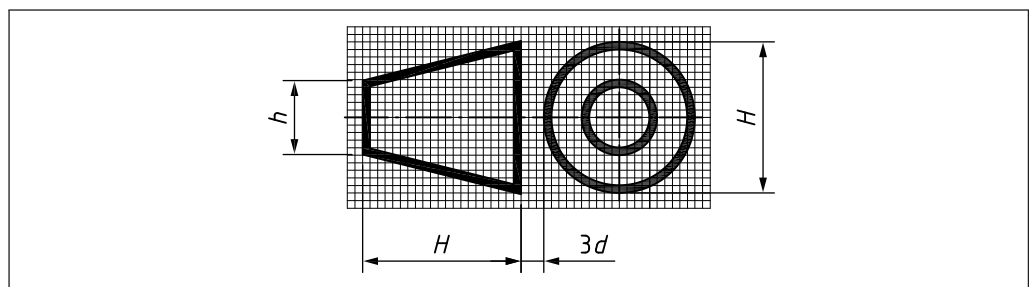


10.4.2 First angle projection method – Graphical symbol

As specified by the requirements of BS ISO 128-30, the graphical symbol for the first angle projection method shall be as shown in Figure 7.

The proportions and dimensions of this graphical symbol shall be as specified in BS ISO 128-30.

Figure 7 First angle projection method – Graphical symbol



10.5 Third angle projection method

10.5.1 General

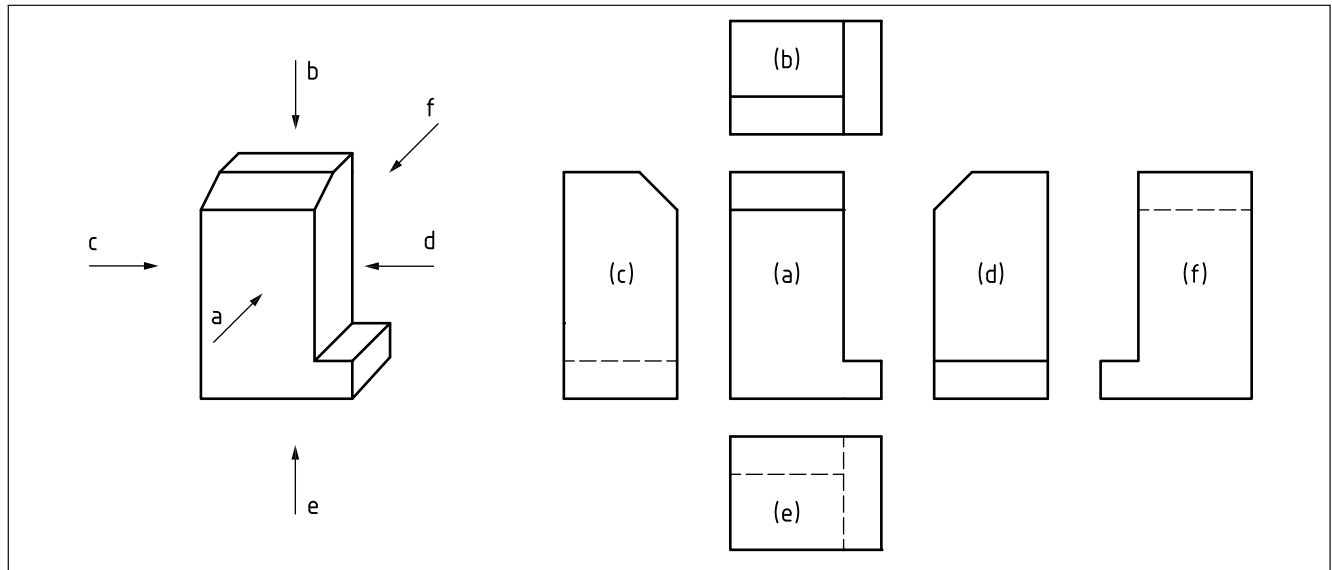
NOTE A more detailed description of the third angle projection method is to be found in BS ISO 128-30 and in BS EN ISO 5456-2.

10.5.2 Third angle projection method

With reference to the front view (a), the other views shall be arranged as follows (see Figure 8).

- The view from above (b) shall be placed above.
- The view from below (e) shall be placed underneath.
- The view from the left (c) shall be placed on the left.
- The view from the right (d) shall be placed on the right.
- The view from the rear (f) shall be placed on the left or right, as convenient.

Figure 8 Third angle projection method

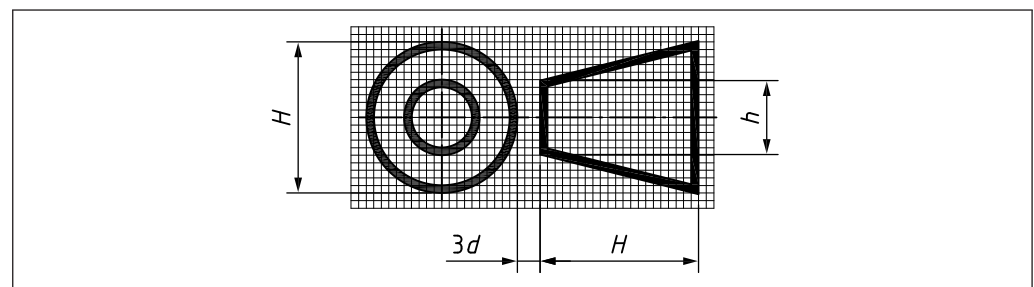


10.5.3 Third angle projection method – Graphical symbol

As specified by the requirements of BS ISO 128-30, the graphical symbol for the third angle projection method shall be as shown in Figure 9.

The proportions and dimensions of this graphical symbol shall be as specified in BS ISO 128-30.

Figure 9 Third angle projection method – Graphical symbol



11 Mechanical engineering drawings

11.1 General

As specified by the requirements of BS ISO 128-44, ribs, fasteners, shafts, spokes of wheels and the like shall not be cut in longitudinal sections, and shall therefore not be represented as sections.

NOTE 1 Like views, sections might be shown in a position other than that indicated by the arrows for the direction of their viewing.

NOTE 2 A section in one plane is shown in Figure 10.

NOTE 3 A section in two parallel planes is shown in Figure 11.

NOTE 4 A section in three contiguous planes is shown in Figure 12.

Figure 10 Section in one plane

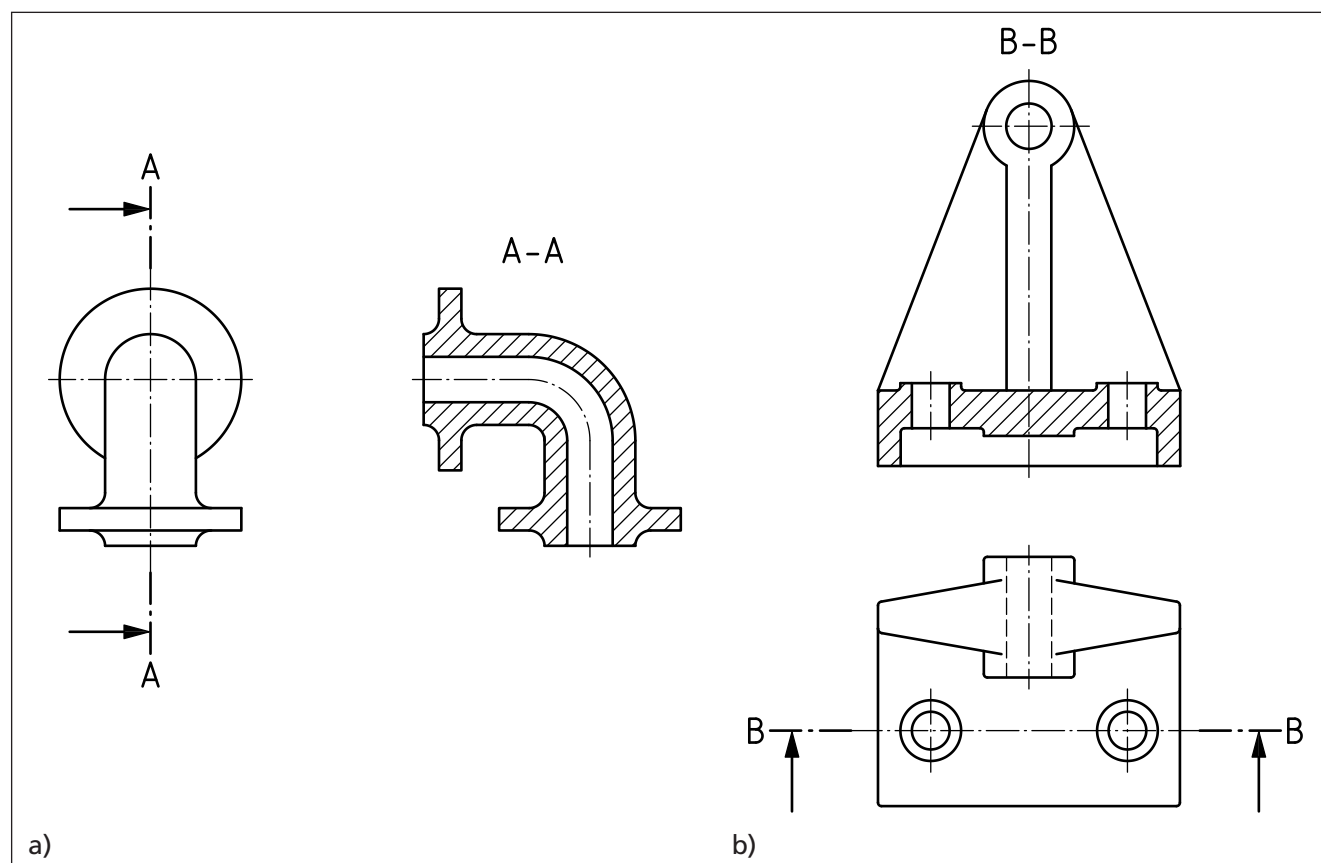


Figure 11 Section in two parallel planes

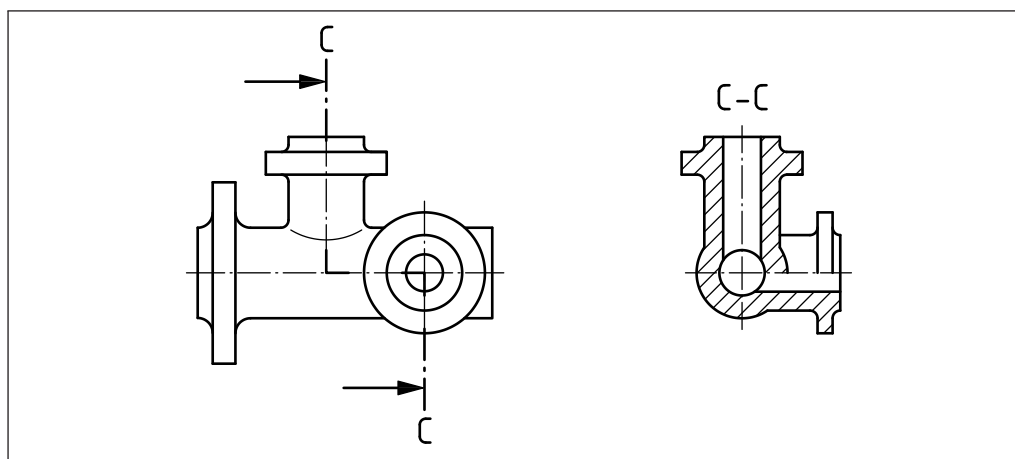
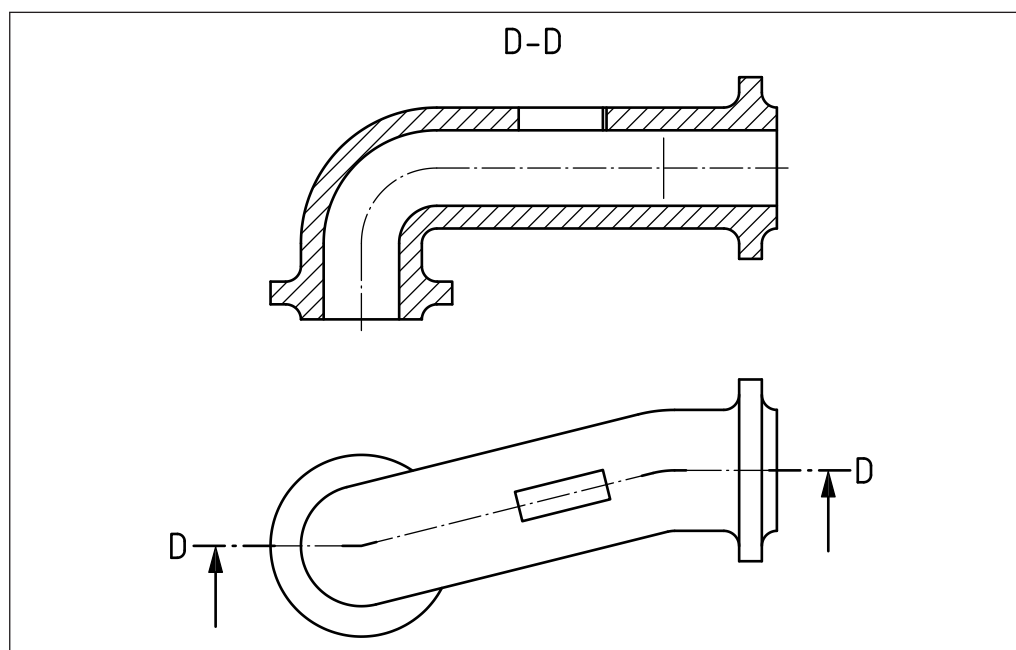


Figure 12 Section in three contiguous planes



12 Diagram

COMMENTARY ON CLAUSE 12

The function of a system, or the relationship between component parts, might be depicted in a diagram employing simplified representations, as recommended in the following standards.

- | | |
|------------------|--|
| BS 5070-1 | <i>Engineering diagram drawing practice – Part 1: Recommendations for general principles</i> |
| BS 5070-3 | <i>Engineering diagram drawing practice – Part 3: Recommendations for mechanical/fluid flow diagrams</i> |
| BS 5070-4 | <i>Engineering diagram drawing practice – Part 4: Recommendations for logic diagrams</i> |
| BS EN 61082-2 | <i>Preparation of documents used in electrotechnology – Part 2: Function-oriented diagrams</i> |
| BS EN ISO 3952-1 | <i>Kinematic diagrams – Graphical symbols – Part 1</i> |
| BS EN ISO 3952-2 | <i>Kinematic diagrams – Graphical symbols – Part 2</i> |
| BS EN ISO 3952-3 | <i>Kinematic diagrams – Graphical symbols – Part 3</i> |
| BS ISO 15519-1 | <i>Specification for diagrams for process industry – Part 1: General rules</i> |

12.1 Designation

As specified by the requirements of BS EN ISO 5455, the complete designation of scale shall consist of the word “SCALE” (or its equivalent in the language used on the drawing) followed by the indication of its ratio as follows:

- SCALE 1 : 1 for full size;
- SCALE X : 1 for enlargement scales;
- SCALE 1 : X for reduction scales.

NOTE If there is no likelihood of misunderstanding, the word “SCALE” can be omitted.

12.2 Inscription

The designation of the scale used on the drawing shall be inscribed in the title block of the drawing.

Where it is necessary to use more than one scale on the drawing, the main scale only shall be inscribed in the title block, and all other scales adjacent to the item reference number of the part concerned, or adjacent to the reference letter of a detail view (or section).

13 Lines, arrows and terminators

13.1 Lines and terminators

Lines shall conform to the following standards, as appropriate.

- BS EN ISO 128-20 *Technical drawings – General principles of presentation – Part 20: Basic conventions for lines*
- BS EN ISO 128-21 *Technical drawings – General principles of presentation – Part 21: Preparation of lines by CAD systems*
- BS ISO 128-22 *Technical drawings – General principles of presentation – Part 22: Basic conventions and applications for leader lines and reference lines*
- BS ISO 128-23 *Technical drawings – General principles of presentation – Part 23: Lines on construction drawings*
- BS ISO 128-24 *Technical drawings – General principles of presentation – Part 24: Lines on mechanical engineering drawings*
- BS ISO 128-25 *Technical drawings – General principles of presentation – Part 25: Lines on shipbuilding drawings*

13.2 Lines, terminators and origin indicators

Arrows and terminators composed of lines shall conform to the following standard.

- BS ISO 129-1 *Technical drawings – Indications of dimensions and tolerances – Part 1: General principles*

14 Lettering

14.1 General

Lettering shall conform to the following standards, as appropriate.

- BS EN ISO 3098-0 *Technical product documentation – Lettering – Part 0: General requirements*
- BS EN ISO 3098-2 *Technical product documentation – Lettering – Part 2: Latin alphabet, numerals and marks*
- BS EN ISO 3098-3 *Technical product documentation – Lettering – Part 3: Greek alphabet*
- BS EN ISO 3098-4 *Technical product documentation – Lettering – Part 4: Diacritical and particular marks for the Latin alphabet*
- BS EN ISO 3098-5 *Technical product documentation – Lettering – Part 5: CAD lettering of the Latin alphabet, numerals and marks*

BS EN ISO 3098-6 *Technical product documentation – Lettering – Part 6: Cyrillic alphabet*

14.2 Notes

When a landscape-format drawing sheet is used in its normal orientation, with the title block at the bottom right-hand corner, notes shall be written with the text parallel to the long side of the sheet. When a landscape-format drawing sheet is used in portrait orientation, the title block shall be located at the left-hand side and notes shall be written with the text parallel to the short side of the sheet.

NOTE 1 Notes of a general nature should, wherever practicable, be grouped together and not distributed over the drawing. Notes relating to specific details should appear near the relevant feature, but not so near as to crowd the view.

NOTE 2 Underlining of notes is not recommended. Where emphasis is required, larger characters should be used.

NOTE 3 It is recommended that capital lettering is used wherever possible.

15 Projections

Projections shall conform to one of the following standards.

BS EN ISO 5456-2 *Technical drawings – Projection methods – Part 2: Orthographic representations*

BS EN ISO 5456-3 *Technical drawings – Projection methods – Part 3: Axonometric representations*

BS ISO 5456-4 *Technical drawings – Projection methods – Part 4: Central projection*

BS EN ISO 10209 *Technical product documentation*

NOTE BS EN ISO 5456-1 contains a survey of the various projection methods.

16 Views

16.1 General

Views shall conform to the following standards.

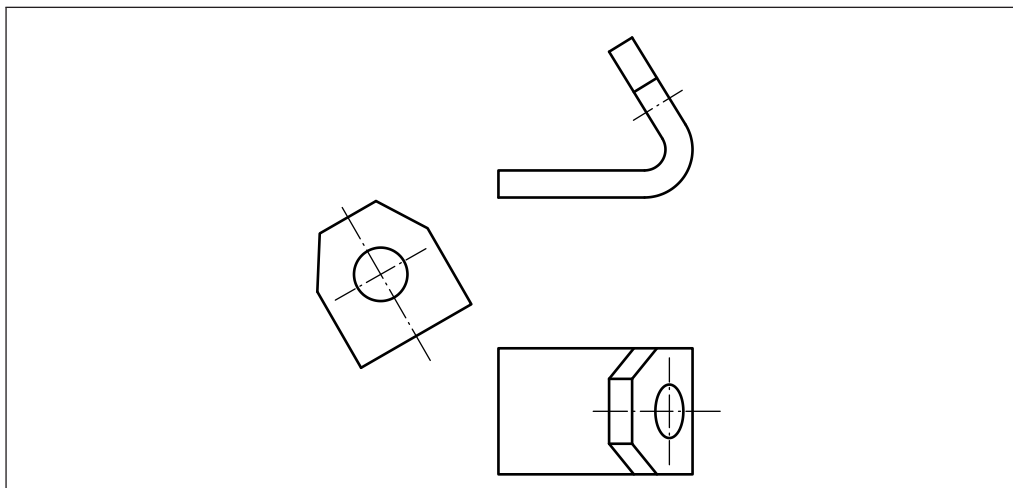
BS ISO 128-30 *Technical drawings – General principles of presentation – Part 30: Basic conventions for views*

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

16.2 Auxiliary views

Where true representation of features is necessary, but cannot be achieved on the orthographic views, the features shall be shown in projected auxiliary views. An example is shown in Figure 13.

Figure 13 Auxiliary view showing true shape of inclined surface



17 Sections

Sections shall conform to the following standards.

- BS ISO 128-40 *Technical drawings – General principles of presentation – Part 40: Basic conventions for cuts and sections*
- BS ISO 128-44 *Technical drawings – General principles of presentation – Part 44: Sections on mechanical engineering drawings*
- BS ISO 128-50 *Technical drawings – General principles of presentation – Part 50: Basic conventions for representing areas on cuts and sections*

NOTE ISO 128-44 and ISO 128-50 contain presentational defects in some figures (e.g. line types, line thickness, terminators and letter heights), which have, unavoidably, been carried forward to the BS implementations. It is stressed that the text of these standards is technically correct and users should, therefore, regard the figures as illustrations only.

18 Symbols and abbreviations

18.1 General

Abbreviations (text equivalents) shall be the same in the singular and plural. Full stops shall not be used except where the abbreviation forms a word (e.g. NO. as an abbreviation for "number").

NOTE Where possible, abbreviations should be avoided (see 18.2).

Symbols used for physical quantities and units of measurement shall conform to the following standards, as appropriate.

- BS ISO 80000-1 *Quantities and units – Part 1: General*
- BS ISO 80000-2 *Quantities and units – Part 2: Mathematical signs and symbols to be used in the natural sciences and technology*
- BS ISO 80000-3 *Quantities and units – Part 3: Space and time*
- BS ISO 80000-4 *Quantities and units – Part 4: Mechanics*
- BS ISO 80000-5 *Quantities and units – Part 5: Thermodynamics*
- BS EN ISO 80000-6 *Quantities and units – Part 6: Electromagnetism*

BS ISO 80000-7	<i>Quantities and units – Part 7: Light</i>
BS EN ISO 80000-8	<i>Quantities and units – Part 8: Acoustics</i>
BS ISO 80000-9	<i>Quantities and units – Part 9: Physical chemistry and molecular physics</i>
BS ISO 80000-10	<i>Quantities and units – Part 10: Atomic and nuclear physics</i>
BS ISO 80000-11	<i>Quantities and units – Part 11: Characteristic numbers</i>
BS ISO 80000-12	<i>Quantities and units – Part 12: Solid state physics</i>
BS EN 80000-13	<i>Quantities and units – Part 13: Information science and technology</i>
BS EN 80000-14	<i>Quantities and units – Part 14: Telebiometrics related to human physiology</i>

18.2 Standard symbols and abbreviations

COMMENTARY ON 18.2

In the existing environment of outsourcing across national borders, every effort is being made to make the use of GPS, independent of language through the adoption of standard symbology. It is for this reason that the continued use of abbreviations is deprecated. Where particular specification requirements cannot be expressed using the available GPS system, full text description should be employed. It is suggested that where such a requirement occurs frequently, this be drawn to the attention of the relevant ISO committee through the appropriate BSI Technical Committee.

For diagrams used in technical applications, a library of harmonized graphical symbols has been developed with close cooperation between ISO and IEC. This is published in the following series of standards and it is recommended that they be applied wherever practicable to improve the universal applicability of the TPS.

BS ISO 14617-1	<i>Graphical symbols for diagrams – Part 1: General information and indexes</i>
BS ISO 14617-2	<i>Graphical symbols for diagrams – Part 2: Symbols having general application.</i>
BS ISO 14617-3	<i>Graphical symbols for diagrams – Part 3: Connections and related devices</i>
BS ISO 14617-4	<i>Graphical symbols for diagrams – Part 4: Actuators and related devices</i>
BS ISO 14617-5	<i>Graphical symbols for diagrams – Part 5: Measurement and control devices</i>
BS ISO 14617-6	<i>Graphical symbols for diagrams – Part 6: Measurement and control functions.</i>
BS ISO 14617-7	<i>Graphical symbols for diagrams – Part 7: Basic mechanical components</i>
BS ISO 14617-8	<i>Graphical symbols for diagrams – Part 8: Valves and dampers.</i>
BS ISO 14617-9	<i>Graphical symbols for diagrams – Part 9: Pumps, compressors and fans</i>
BS ISO 14617-10	<i>Graphical symbols for diagrams – Part 10: Fluid power converters</i>
BS ISO 14617-11	<i>Graphical symbols for diagrams – Part 11: Devices for heat transfer and heat engines</i>

BS ISO 14617-12 *Graphical symbols for diagrams – Part 12: Devices for separating purification and mixing*

Symbols appropriate to technical product specification are provided and detailed throughout the suite of documents cross-referenced from this British Standard and these shall be used where appropriate.

NOTE 1 It is strongly recommended that abbreviations not be used.

Where, in particular technical fields, certain abbreviations are in common use and generally understood, it is accepted that these may continue to be used but new abbreviations shall not be introduced.

NOTE 2 Former practice has resulted in certain abbreviations becoming accepted as symbols and these should not be considered to provide precedence for the proliferation of abbreviations.

19 Representation of features

Conventions used for the representation of features shall conform to the following standards, as appropriate.

BS EN ISO 4063	<i>Welding and allied processes – Nomenclature of processes and reference numbers</i>
BS EN ISO 5261	<i>Technical drawings – Simplified representation of bars and profile sections</i>
BS EN ISO 5845-1	<i>Technical drawings – Simplified representation of the assembly of parts with fasteners – Part 1: General principles</i>
BS EN ISO 6410-1	<i>Technical drawings – Screw threads and threaded parts – Part 1: General conventions</i>
BS EN ISO 6410-2	<i>Technical drawings – Screw threads and threaded parts – Part 2: Screw thread inserts</i>
BS EN ISO 6410-3	<i>Technical drawings – Screw threads and threaded parts – Part 3: Simplified representation</i>
BS EN ISO 6411	<i>Technical drawings – Simplified representation of centre holes</i>
BS EN ISO 6413	<i>Technical drawings – Representation of splines and serrations</i>
BS ISO 13715	<i>Technical drawings – Edges of unidentified shape – Vocabulary and indications</i>
BS EN ISO 15785	<i>Technical drawings – Symbolic presentation and indication of adhesive, fold and pressed joints</i>
BS EN 22553	<i>Welded, brazed and soldered joints – Symbolic representation on drawings</i>

NOTE The BS ISO 128 series of standards covers the general subject of feature representation.

20 Representation of components

20.1 General

Conventions used for the representation of components shall conform to the following standards, as appropriate.

BS EN ISO 2162-1 *Technical product documentation – Springs – Part 1: Simplified representation*

- BS EN ISO 2162-2 *Technical product documentation – Springs – Part 2: Presentation of data for cylindrical helical compression springs*
- BS EN ISO 2162-3 *Technical product documentation – Springs – Part 3: Vocabulary*
- BS EN ISO 2203 *Technical drawings – Conventional representation of gears*
- BS 2917-1 *Graphic symbols and circuit diagrams for fluid power systems and components – Part 1: Specification for graphic symbols*
- BS 3238-1 *Graphical symbols for components of servo-mechanisms – Part 1: Transducers and magnetic amplifiers*
- BS 3238-2 *Graphical symbols for components of servo-mechanisms – Part 2: General servo-mechanisms*
- BS EN ISO 5845-1 *Technical drawings – Simplified representation of the assembly of parts with fasteners – Part 1: General principles*
- BS EN ISO 6410-1 *Technical drawings – Screw threads and threaded parts – Part 1: General conventions*
- BS EN ISO 6410-2 *Technical drawings – Screw threads and threaded parts – Part 2: Screw thread inserts*
- BS EN ISO 6410-3 *Technical drawings – Screw threads and threaded parts – Part 3: Simplified representation*
- BS EN ISO 6412-1 *Technical drawings – Simplified representation of pipelines – General rules and orthogonal representation*
- BS EN ISO 6412-2 *Technical drawings – Simplified representation of pipelines – Isometric projection*
- BS EN ISO 6412-3 *Technical drawings – Simplified representation of pipelines – Terminal features of ventilation and drainage systems*
- BS EN ISO 8826-1 *Technical drawings – Roller bearings – Part 1: General simplified representation*
- BS EN ISO 8826-2 *Technical drawings – Roller bearings – Part 2: Detailed simplified representation*
- BS EN ISO 9222-1 *Technical drawings – Seals for dynamic application – Part 1: General simplified representation*
- BS EN ISO 9222-2 *Technical drawings – Seals for dynamic application – Part 2: Detailed simplified representation*

NOTE The BS ISO 128 series of standards covers the general subject of component representation.

20.2 Representation of moulded, cast and forged components

COMMENTARY ON 20.2

It is recommended that tolerances for the dimensions of plastics mouldings be applied in accordance with the system provided in BS 7010.

Dimensional tolerancing for metal and metal alloy castings shall conform to the following standards, as appropriate.

- BS ISO 10135 *Geometrical product specifications (GPS) — Drawing indications for moulded parts in technical product documentation (TPD)*
- BS EN ISO 8062-1 *Geometrical product specification (GPS) – Dimensional and geometrical tolerances for moulded parts – Vocabulary*

- ISO/TS 8062-2 *Geometrical product specification (GPS) – Dimensional and geometrical tolerances for moulded parts – Part 2: Rules*
- BS EN ISO 8062-3 *GPS – Dimensional and geometrical tolerances for moulded parts – General dimensional and geometrical tolerances and machine allowances for casting*