



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS B 0001 : 2019

(JSA)

**Technical drawings for mechanical
engineering**

ICS 01.100.20

Reference number : JIS B 0001 : 2019 (E)

 **Documents**
Document Sharing Hub

PROTECTED BY COPYRIGHT

52 S

B 0001 : 2019

Date of Establishment: 1958-10-07

Date of Revision: 2019-05-20

Date of Public Notice in Official Gazette: 2019-05-20

Investigated by: Japanese Industrial Standards Committee
Standards Board for ISO area

JIS B 0001:2019, First English edition published in 2020-08

Translated and published by: Japanese Standards Association
Mita MT Building, 3-13-12, Mita, Minato-ku, Tokyo, 108-0073 JAPAN

In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

© JSA 2020

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

PROTECTED BY COPYRIGHT

Contents

	Page
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 General matters	3
5 Size and format of drawings	6
5.1 Size of drawings	6
5.2 Format of drawings	7
6 Lines	8
6.1 Thickness of lines	8
6.2 Types and application of lines	9
6.3 Order of priority of coinciding lines	15
7 Characters and texts	16
7.1 Types and height of characters	16
7.2 Expression of texts	19
8 Method of projection	19
8.1 General matters	19
8.2 Designation of projection view	19
8.3 Third angle projection method	20
8.4 First angle projection method	21
8.5 Reference arrow layout	21
8.6 Other projection methods	23
9 Scale	23
10 Expression of view	24
10.1 Expression of projection view	24
10.2 Sectional view	29
10.3 Omission of views	39
10.4 Special representation of view	45
11 Dimensioning	52
11.1 General matters	52
11.2 Projection lines	55
11.3 Dimension lines	56
11.4 Dimension figures	60
11.5 Arrangement of dimensions	64
11.6 Symbols for dimensioning	67
11.7 Expression of hole dimensions	78

11.8	Expression of keyway	82
11.9	Expression of dimensions of steel constructions and the like	87
11.10	Expression of thin wall part	90
11.11	Display of range of working and surface treatment	91
11.12	Dimensions of non-rigid parts	91
11.13	Non-proportional dimensions.....	92
11.14	Dimensions of identical shapes	92
12	Expression of dimensions of full view	94
13	Reference number	95
14	Correction and change of drawing	96
Bibliography		97

Foreword

This Japanese Industrial Standard has been revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14. Consequently **JIS B 0001**:2010 is replaced with this Standard.

This **JIS** document is protected by the Copyright Law.

Attention is drawn to the possibility that some parts of this Standard may conflict with patent rights, applications for a patent after opening to the public or utility model rights. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying any of such patent rights, applications for a patent after opening to the public or utility model rights.

Blank

Technical drawings for mechanical engineering

1 Scope

This Japanese Industrial Standard specifies the technical drawings for mechanical engineering, mainly part drawings and assembly drawings based on **JIS Z 8310**.

The matters not stated in this Standard shall be in accordance with **JIS Z 8310** and other individual Japanese Industrial Standards related to technical drawings.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

- JIS B 0021 *Geometrical product specifications (GPS)—Geometrical tolerancing—Tolerancing of form, orientation, location and run-out*
- JIS B 0026 *Technical drawings—Dimensioning and tolerancing—Non-rigid parts*
- JIS B 0028 *Geometrical product specifications (GPS)—Dimensioning and tolerancing—Cones*
- JIS B 0031 *Geometrical Product Specifications (GPS)—Indication of surface texture in technical product documentation*
- JIS B 0405 *General tolerances—Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*
- JIS B 0419 *General tolerances—Part 2: Geometrical tolerances for features without individual tolerance indications*
- JIS B 0420-1 *Geometrical product specifications (GPS)—Dimensional tolerancing—Part 1: Linear sizes*
- JIS B 0601 *Geometrical Product Specifications (GPS)—Surface texture: Profile method—Terms, definitions and surface texture parameters*
- JIS B 0672-1 *Geometrical Product Specifications (GPS)—Geometrical features—Part 1: General terms and definitions*
- JIS B 0681-2 *Geometrical product specifications (GPS)—Surface texture: Areal—Part 2: Terms, definitions and surface texture parameters*
- JIS Z 3021 *Welding and allied processes—Symbolic representation*
- JIS Z 8114 *Technical product documentation—Terms relating to technical drawings*
- JIS Z 8310 *Technical drawings—General code of drafting practices*
- JIS Z 8311 *Technical drawings—Sizes and layout of drawing sheets*
- JIS Z 8312 *Technical drawings—General principles of presentation—Basic convention for lines*

JIS Z 8314 *Technical drawings—Scales*

JIS Z 8315-3 *Technical drawings—Projection method—Part 3: Axonometric representations*

JIS Z 8315-4 *Technical drawings—Projection method—Part 4: Central projection*

JIS Z 8317-1 *Technical drawings—Indications of dimensions and tolerances—Part 1: General principles*

JIS Z 8318 *Technical product documentation (TPD)—Indication method of tolerances for linear and angular dimensions*

JIS Z 8321 *Technical drawings—General principles of presentation—Preparation of lines by CAD system*

ISO 14405-2 *Geometrical product specifications (GPS)—Dimensional tolerancing—Part 2: Dimensions other than linear or angular sizes*

ISO 14405-3 *Geometrical product specifications (GPS)—Dimensional tolerancing—Part 3: Angular sizes*

3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in **JIS Z 8114**, and the following apply.

NOTE The term “linear size”, applying to linear dimension expressed in mm, is used to designate either a size or a distance; for the purpose of this Standard, the former refers to the feature of size such as the diameter of a circle or cylinder and width represented by two parallel opposite surfaces, that can be regulated by size tolerances, and the latter applies to, e.g. centre-to-centre distance of holes and distance of a step surface, that can be regulated by geometrical tolerances. See **JIS B 0401-1**, **JIS B 0420-1**, **ISO 14405-2** and **ISO 14405-3**.

3.1

least-squares size

size obtained by performing computational processing for least-squares method of many measurement points that have been obtained by measuring feature surfaces

NOTE For linear sizes, see **JIS B 0420-1**.

3.2

rough piece dimensions

dimensions which indicate the initial geometry of an object such as as-cast dimension, hot-rolled steel plate thickness and polished round bar diameter

3.3

tool size

dimension that indicates the size of a tool when parts are machined, such as drill diameter, reamer diameter, milling cutter diameter and cutter width (see Figure 1)

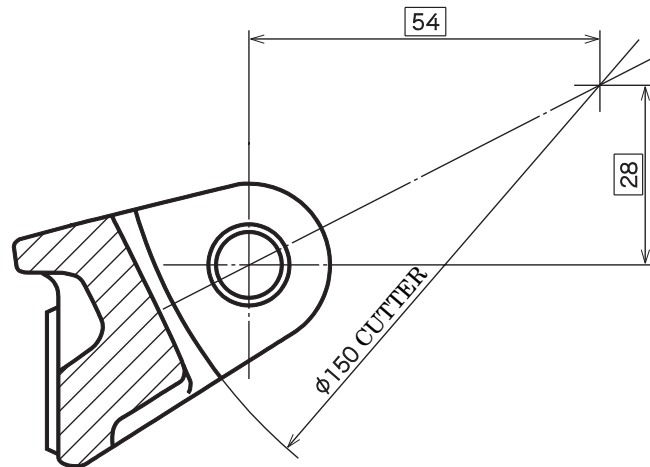


Figure 1 Example of designation of tool size used

3.4

angular size

angular dimension formed by two planes or straight lines of the feature substance

NOTE 1 This does not include an angle formed by two axis lines of obliquely-crossed holes.

NOTE 2 For angular sizes, see **ISO 14405-3**.

3.5

control radius, CR

radius controlled such that the junction between a straight section and a radial curved section is smoothly connected and there exists a radius between a maximum permissible radius and a minimum permissible radius (geometrical tolerance zone which is tangent to two curved surfaces) (see Figures 2 and 139)

NOTE CR is used as a symbol to designate control radius (see Table 7).

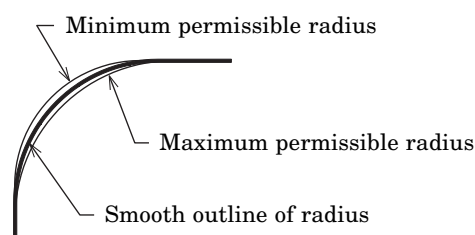


Figure 2 Control radius

4 General matters

General matters concerning technical drawing for mechanical engineering shall be as follows.

- The technical drawing shall be so drawn that the correct proportional relation between the size of view and the size of object is maintained. However, for drawings with no room for possible misreading, this proportional relation does not have to be maintained on a part or all parts of view.

NOTE See **11.13**.

- b) The centre of the line in thickness direction shall coincide with the line to be theoretically drawn (see Figure 3).

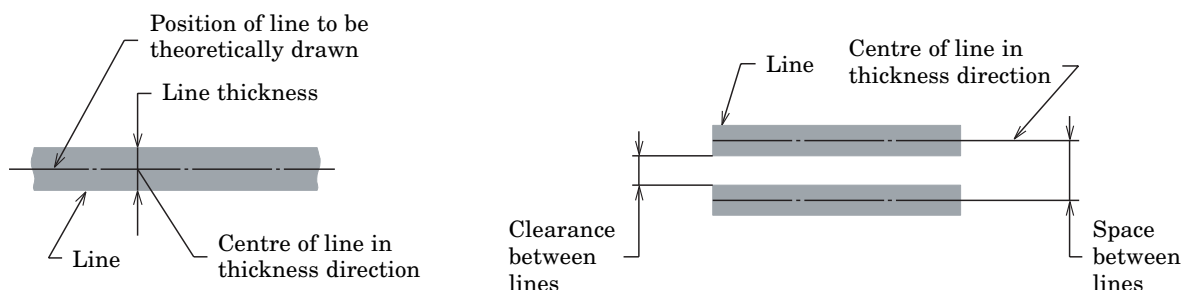


Figure 3 Centre position of line in thickness direction

- c) The minimum clearance between parallel lines to be drawn adjacent to each other should be at least twice the thickness of the thickest line and not less than 0.7 mm [see Figure 3 b) and Figure 4 a)]. Further, the minimum clearance between densely aggregating crossing lines shall be at least three times the thickness of the thickest line.
- d) In the case where many lines concentrate to a point, unless it is not confusing, the lines should stop at a position where the minimum clearance between lines is about twice the thickness of the thickest line, and the periphery of the point should be clear [see Figure 4 b)].

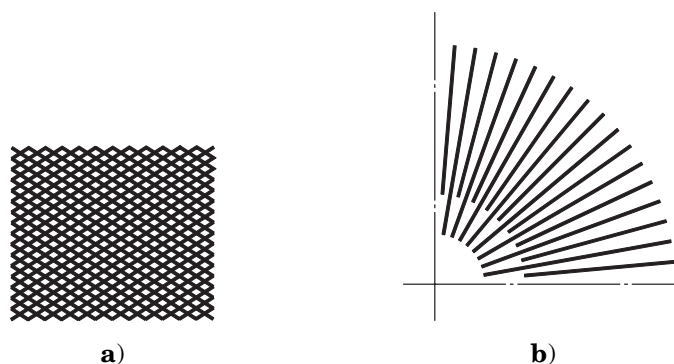


Figure 4 Minimum clearance between lines

- e) The objects or parts made of transparent material shall be all drawn in project view as being opaque.
- f) For the dimensions indicating the size (linear size), unless otherwise specified ¹⁾, the two point-measurement of the object shall be designated (see **JIS B 0420-1**). In this case, size tolerances (see **JIS B 0401-1**) are not to regulate the shape, unless otherwise specified.

Where a size (linear size) is a least-squares size ²⁾, it shall be indicated within or adjacent to a title block that **JIS B 0672-1** is applied.

Notes ¹⁾ In the case where the application of envelope requirement (see **JIS B 0024** and **JIS B 0420-1**) is designated, and others.

²⁾ In the case of a circular feature, the least-squares size is the diameter of the least-squares circle shown in Figure 5.

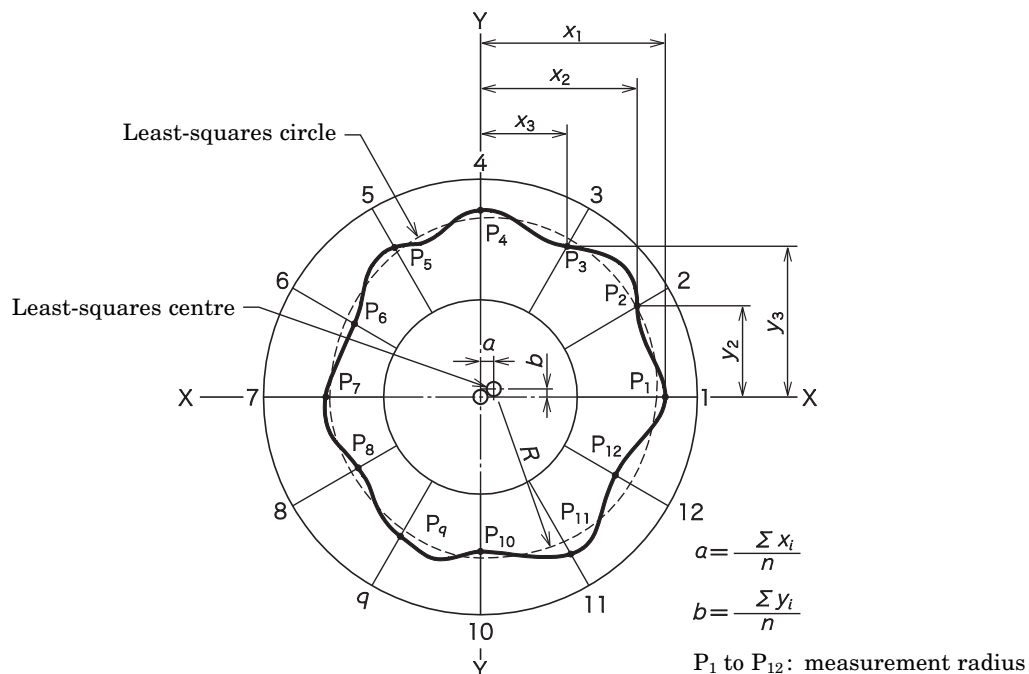


Figure 5 Least-squares circle

- g) For the dimensions, except for special ones (reference dimensions, theoretically exact dimensions, etc.), the permissible limits shall be designated directly or collectively in accordance with **JIS B 0405**, **JIS B 0420-1**, **JIS Z 8317-1**, **JIS Z 8318**, **ISO 14405-2** and/or **ISO 14405-3**.
- h) Only where they are indispensable depending on the functional requirement, interchangeability and technical level of manufacture, the geometrical tolerances shall be designated in accordance with **JIS B 0021** and/or **JIS B 0419**.
- i) When the designation on surface texture is required, it shall be in accordance with **JIS B 0031** based on the definition given in **JIS B 0601** and **JIS B 0681-2**.
- j) In the case where the designation of requirements concerning the welding is made by means of welding symbols, it shall be in accordance with **JIS Z 3021**.
- k) The representation of special parts such as screws and springs shall be in accordance with separately specified individual **JIS** standards relating to technical drawings.
- l) In the case where the symbols given in **JIS** that are specifically intended for technical drawings are used in strict accordance with the specifications, giving a note concerning the matter is not generally required. In the case where the symbols given in **JIS** that are not specifically designed for technical drawings, or symbols specified in other publicly known standards are used, the number of the applied standard shall be noted on a proper portion of the drawing.

Further, where symbols other than the above are used, their meanings shall be noted on a proper portion of the drawing.

5 Size and format of drawings

5.1 Size of drawings

The size of drawings shall be as follows.

- a) The size of paper used for drawings shall be selected from the series shown in Tables 1, 2 and 3 in this order.
- b) For the original drawing, a paper of minimum size capable of keeping the clarity and appropriate size required by the object shall be used.

Table 1 Row A size (first priority)

Unit: mm

Designation	Size $a \times b$
A0	841 × 1 189
A1	594 × 841
A2	420 × 594
A3	297 × 420
A4	210 × 297

Table 2 Specially extended size (second priority)

Unit: mm

Designation	Size $a \times b$
A3 × 3	420 × 891
A3 × 4	420 × 1 189
A4 × 3	297 × 630
A4 × 4	297 × 841
A4 × 5	297 × 1 051

Table 3 Specially extended size (third priority)

Unit: mm

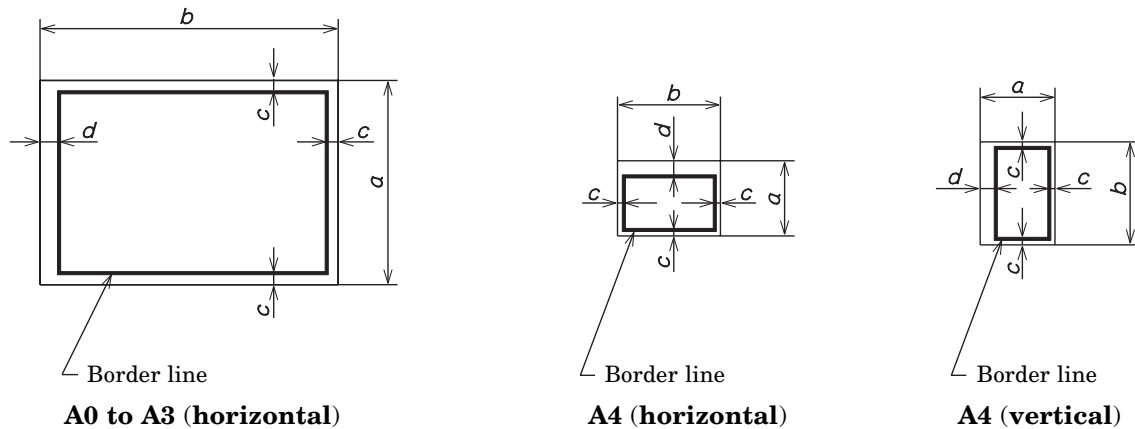
Designation	Size $a \times b$
A0 $\times$ 2 ^{a)}	1 189 $\times$ 1 682
A0 $\times$ 3	1 189 $\times$ 2 523 ^{b)}
A1 $\times$ 3	841 $\times$ 1 783
A1 $\times$ 4	841 $\times$ 2 378 ^{b)}
A2 $\times$ 3	594 $\times$ 1 261
A2 $\times$ 4	594 $\times$ 1 682
A2 $\times$ 5	594 $\times$ 2 102
A3 $\times$ 5	420 $\times$ 1 486
A3 $\times$ 6	420 $\times$ 1 783
A3 $\times$ 7	420 $\times$ 2 080
A4 $\times$ 6	297 $\times$ 1 261
A4 $\times$ 7	297 $\times$ 1 471
A4 $\times$ 8	297 $\times$ 1 682
A4 $\times$ 9	297 $\times$ 1 892
Notes ^{a)} This size is equal to 2A0 in row A.	
^{b)} Use of this size is not recommended due to concerns regarding handling.	

5.2 Format of drawings

The format of drawings shall be as follows.

- The drawing shall be used with its long side in the horizontal direction. However, A4 may be used with its short side in the horizontal direction.
- On the drawing, the border line of minimum thickness 0.5 mm shall be drawn in conformity to the sizes specified in Table 4.

Table 4 Position of border line



Unit: mm

Sheet size	c (min.)	$d^{a)}$ (min.)	
		Not bound	Bound
A0	20	20	20
A1			
A2	10	10	
A3			
A4			
Note ^{a)} The part d shall be provided such that, when the drawing is folded for filing, it is located at the left of the title block. When the drawing sheet of A4 size is used horizontally, the part d should be on the upper side.			

- c) On the drawing, the title block shall be provided at the lower right corner, which shall include information such as the drawing number, name of drawing, name of enterprise (organization), signature of the person in charge, date of preparation of drawing, scale, and projection method.
- d) On the drawing, a block shall be provided for part identification and/or change history as necessary. See Clause 14 for correction and change of drawing.
- e) The centre mark, the scale, the lattice reference system, and the cut mark to be provided on the drawing shall be in accordance with **JIS Z 8311**.
- f) In the case of folding the duplicated drawing, its size should be 210 mm × 297 mm (size of A4).

In the case of rolling up the original drawing for storage, the inside diameter of the roll should not be less than 40 mm. In the case of folding the original drawing, Annex of **JIS Z 8311** should be referred to.

6 Lines

6.1 Thickness of lines

The nominal thicknesses of lines shall be 0.13 mm, 0.18 mm, 0.25 mm, 0.35 mm, 0.5 mm, 0.7 mm, 1 mm, 1.4 mm and 2 mm.

6.2 Types and application of lines

Lines shall be used as shown in Table 5 depending on the application. Generally, the line thickness ratio of a narrow line, a wide line and an extra wide line shall be 1:2:4. For other types of lines, **JIS Z 8312** and **JIS Z 8321** should be applied.

Further, in the case where the line not specified in Table 5 has been used, the application of the line shall be noted in the drawing.

Table 5 Types and application of lines

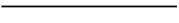
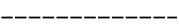
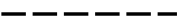
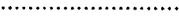
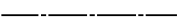
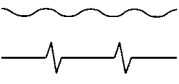
Name according to application	Type ^{c)}		Application	Reference No. in Figure 6
Visible outline	Thick continuous line		To be used for expressing the shape of visible part of object.	1.1 in Example 1
Dimension line	Thin continuous line		To be used for inscribing dimension.	2.1 in Example 1
Projection line			To be used for pointing to a dimension inscribed outside the view.	2.2 in Example 1
Leader line (including reference line)			To be used for pointing to a description, symbol, etc. indicated outside the view.	2.3 in Example 1
Outline of revolved sections in place			To be used for expressing the section of the part by revolving 90° in the view.	2.4 in Example 1
Centre line			To be used for expressing simply the centre line (4.1 in Example 1) of view.	2.5 in Example 1
Line of water level ^{a)}			To be used for indicating the level of water surface, liquid surface, etc.	2.6 in Example 2
Hidden outline	Thin dashed line or thick dashed line		To be used for expressing the shape of invisible part of object.	3.1 in Example 1
Perforation line	Dashed spaced line		To be used for expressing the seam of cloth, leather and sheet material.	3.2 in Example 3
Association line	Dotted line		To be used for expressing the internal link of control equipment, the ganged operation of a switching device, etc.	3.3 in Example 4
Centre line	Thin long dashed short dashed line		a) To be used for expressing the centre of view. b) To be used for expressing the centre trace when the centre has travelled.	4.1 and 4.2 in Example 1 4.1 in Example 9
Reference line			To be used for indicating clearly that it is the base particularly for deciding position.	4.3 in Example 5
Pitch line			To be used for indicating the reference to take pitch of view of repetitive features.	4.4 in Example 6

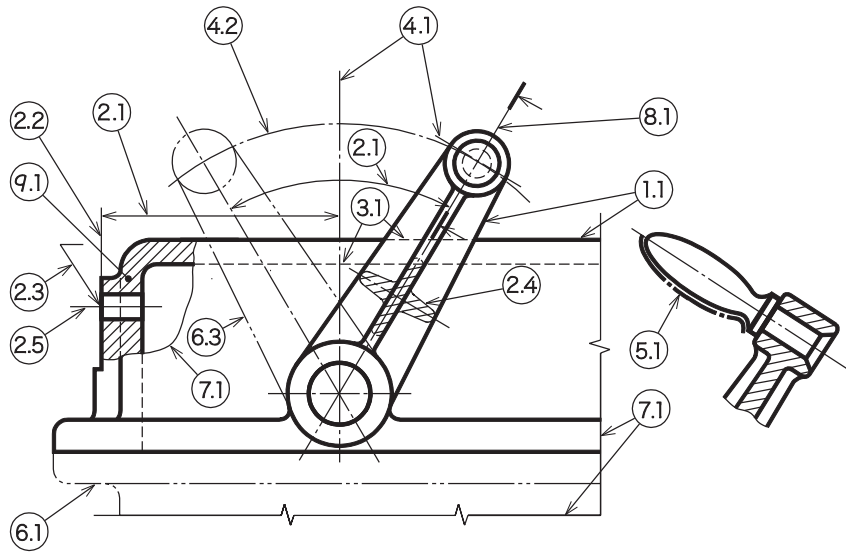
Table 5 (continued)

Name according to application	Type ^{c)}		Application	Reference No. in Figure 6
Line for special requirement	Thick long dashed short dashed line	— · — · — · — · —	To be used for expressing the applicable range of special requirements such as where the part is to be given special processing.	5.1 in Example 1
Fictitious outline ^{b)}	Thin long dashed double-short dashed line	— · — · — · — · —	a) To be used for expressing the adjacent part as reference.	6.1 in Example 1 and Example 7
			b) To be used for expressing the position of tool, jig, etc. for reference.	6.2 in Example 8
			c) To be used for expressing the movable part at a specified position in travelling or at the position of travelling limit.	6.3 in Example 1
			d) To be used for expressing the shape before or after processing.	6.4 in Example 9
			e) To be used for expressing repetition.	6.5 in Example 10
			f) To be used for expressing the viewer's side of the drawn section.	6.6 in Example 11
			To be used for expressing the line connecting the centroids of section.	6.7 in Example 6
Centroidal line			To be used for expressing the line that indicates the optical axis passing through a lens.	6.8 in Example 12
Pipeline, wiring, enclosing line	Dashed dotted line	— · — · — · — · —	To be used for expressing the piping route of water, oil, steam, water supply and sewerage, etc.	6.9 in Example 13
	Dashed double-dotted line	— · — · — · — · —		
	Dashed triplicate-dotted line	— · — · — · — · —		
	Long dashed dotted line	— · — · — · — · —	To be used for expressing a certain function by enclosing with a line in order to distinguish water, oil, steam, a power supply section, an amplification section, etc.	6.10 in Example 14
	Long dashed double-dotted line	— · — · — · — · —		
	Long dashed triplicate-dotted line	— · — · — · — · —		
	Double-dashed dotted line	— · — · — · — · —		
	Double-dashed double-dotted line	— · — · — · — · —	To be used for expressing the piping route of water, oil, steam, etc.	6.11 in Example 13
	Double-dashed triplicate-dotted line	— · — · — · — · —		

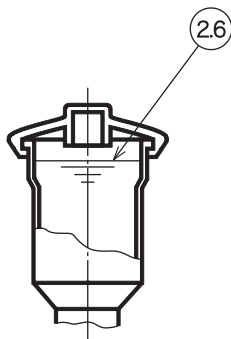
Table 5 (concluded)

Name according to application	Type ^{c)}		Application	Reference No. in Figure 6
Break line	Irregular waveform, thin continuous line or zigzag line		To be used for expressing the limit of partial or interrupted view and section.	7.1 in Example 1 and Example 6
Cutting-plane line	Thin long dashed short dashed line whose end part and direction changing part are made thick ^{d)}		To be used for expressing the cutting position on the corresponding drawing when drawing the sectional view.	8.1 in Example 1
Hatching	Thin continuous lines spaced regularly		To be used for distinguishing the limited specific part of view from other parts. For example, it indicates the section of sectional view.	9.1 in Example 1
Line for special use	Thin continuous line		a) To be used for expressing the extension of visible outline and hidden outline. b) To be used for expressing that it is plane, by crossing two lines. c) To be used for indicating or explaining a position clearly.	10.1 in Example 15 10.2 and 10.3 in Example 16
Line for special use	Extra thick continuous line		To be used for indicating clearly the single line drawing of thin wall part of a rolled steel plate or a glass.	11.1 in Example 5
Notes ^{a)} This line is not specified in JIS Z 8316 . ^{b)} The fictitious outline is used for indicating a shape which does not appear on the view by the projection method, but needs to be shown for convenience. Further, it is also used for indicating the auxiliary view to assist the understanding on function and processing. (For example, it can be used to link the switching caused by a relay.) ^{c)} Other types of lines should be in accordance with JIS Z 8312 or JIS Z 8321 . ^{d)} If there is no possibility of confusion with other usage, the end part and the part changing in direction need not to be thick.				

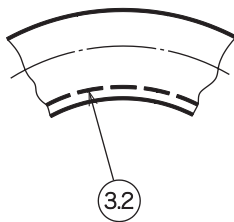
Example 1



Example 2



Example 3



Example 4

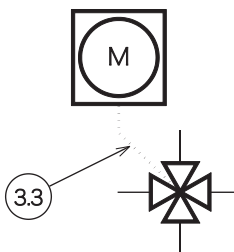
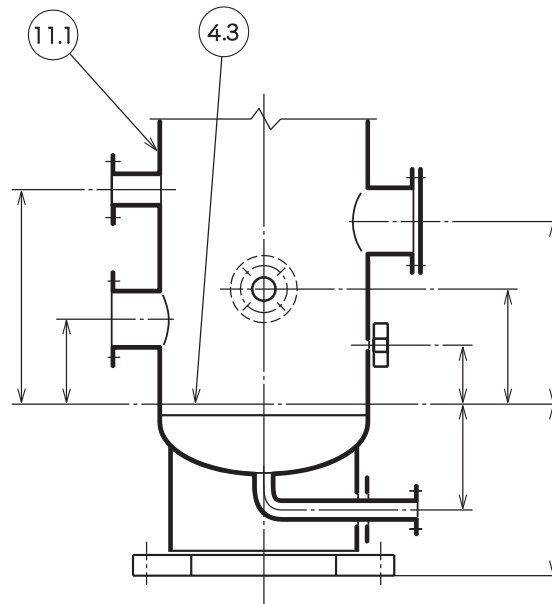
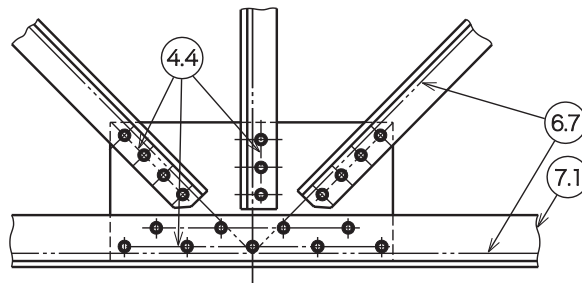


Figure 6 Examples of application of line

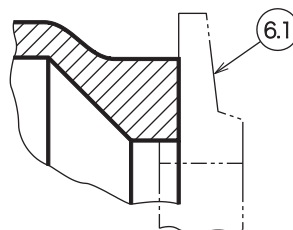
Example 5



Example 6



Example 7



Example 8

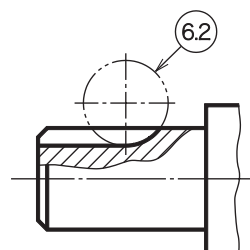
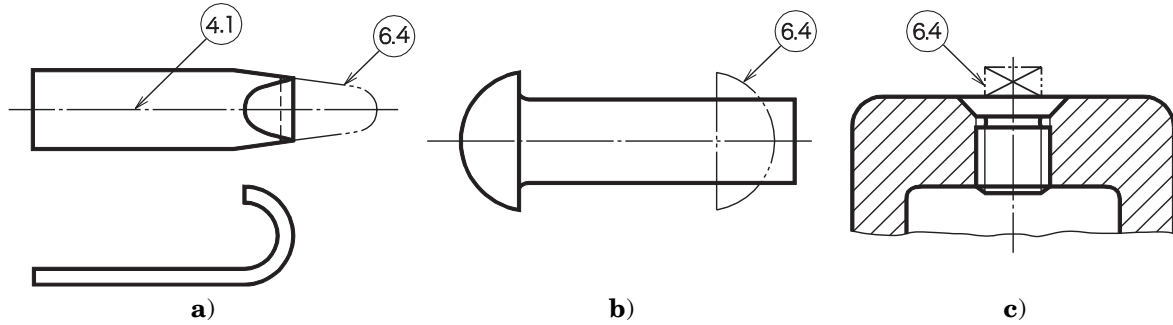
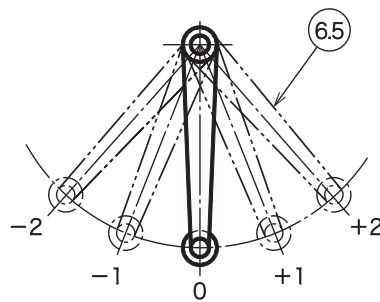


Figure 6 (continued)

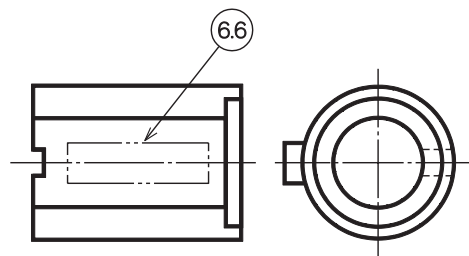
Example 9



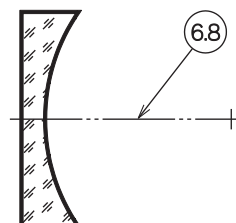
Example 10



Example 11



Example 12



Example 13

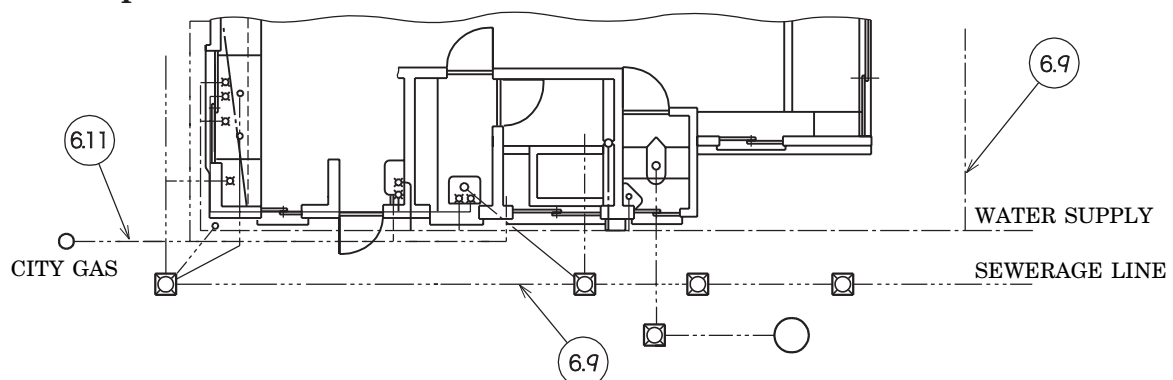
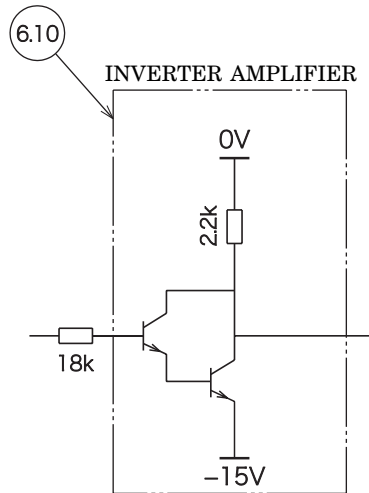
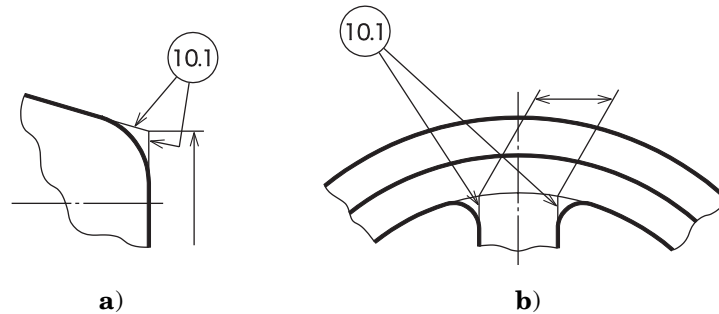


Figure 6 (continued)

Example 14



Example 15



Example 16

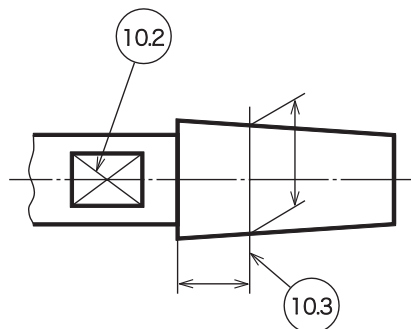


Figure 6 (concluded)

6.3 Order of priority of coinciding lines

In the case where two or more lines of different types coincide, the following order of priority shall be observed (Figure 7).

- Visible outline
- Hidden outline
- Cutting-plane line
- Centre line

- e) Centroidal line (see 6.7 in Example 6 in Figure 6)
- f) Projection lines (see Figures 94 and 96)

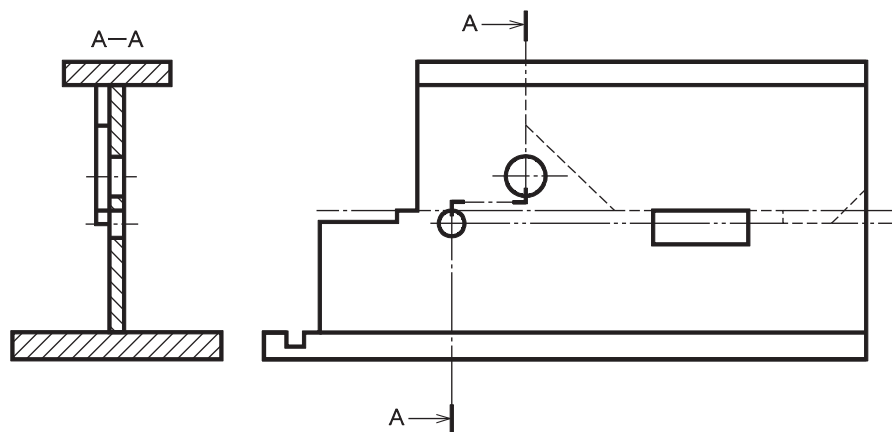


Figure 7 Order of priority of coinciding lines

7 Characters and texts

7.1 Types and height of characters

7.1.1 Types of characters

Types of characters shall be as follows.

- a) The Japanese characters (Kanji) should preferably follow the List of Kanji designated for everyday use (Cabinet Notification No. 2 on 30 November 2010). However, Kanji of 16 strokes or more should be written by the Japanese syllabary (Kana) where possible.
- b) For the Japanese syllabary (Kana), either the square form (Katakana) or the curvilinear form (Hiragana) shall be used, and the mixed use shall not be carried out in the same series of drawings. The use of Katakana for description of words of foreign origin, academic names of animals and plants, and expressions calling attention is not considered to be mixed use.

Example Description of word of foreign origin: ボタン (button), ポンプ (pump)

Expressions calling attention: 塗装のダレ (sagging of paint), コトコト音 (rattling sound)

- c) The styles of Latin characters, numerals and symbols shall be upright or oblique style of Type A, Type B, Type CA, and Type CB and shall not be mixed (see **JIS Z 8313-0**, **JIS Z 8313-1** and **JIS Z 8313-5**). Further, quantity symbols shall be oblique, and unit symbols shall be upright.

7.1.2 Height of characters

The height of characters shall be as follows.

- a) The height of characters shall generally be expressed by the nominal height h of the basic framework in which the outer contour of the character is accommodated. The size of Kanji, Hiragana and Katakana shall be expressed by the height h of the basic

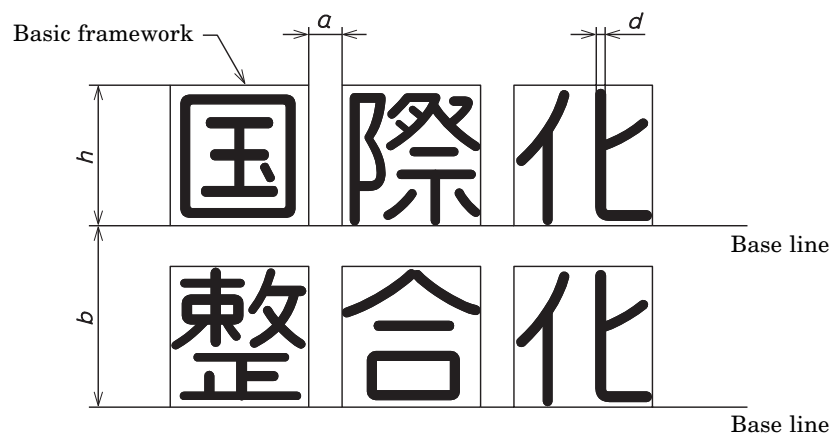
framework specified in **JIS Z 8313-10**. The size of Latin characters, numerals, and symbols shall be expressed by the height h of the capitals specified in **JIS Z 8313-1**.

- b) The height of Kanji shall be of four kinds, namely, nominal 3.5³⁾ mm, 5 mm, 7 mm and 10 mm. The height of Japanese syllabary (Kana) shall be of five kinds, namely, nominal 2.5³⁾ mm, 3.5 mm, 5 mm, 7 mm and 10 mm, unless otherwise required.

When the type used can be available only in predetermined character heights, that of height close to above should be selected.

Note ³⁾ In some types of duplicating methods, this character height is not applicable. Particular attention should be paid in the case of pencil writing.

- c) The height of contracted sound characters “ゃ”, “ゅ” and “ょ” and double consonant character “っ” of the Japanese syllabary (Kana) subscribed to other Japanese characters (Kanji) or Japanese syllabary (Kana) shall be 0.7 in the ratio to the height of the characters they are subscribed to.
- d) The height of Latin characters, numerals and symbols shall be of five kinds; nominal 2.5³⁾ mm, 3.5 mm, 5 mm, 7 mm and 10 mm, unless otherwise required.
- e) The space a between characters shall be at least twice the thickness d of the line of characters. The minimum pitch b of the base line shall be 14/10 of the maximum nominal height of the characters to be used (see Figure 8).
- f) Figures 9, 10 and 11 show examples of Kanji, Kana, and Latin characters and numerals, respectively.



NOTE The example in this figure is not for showing the style or shape of characters.

Figure 8 Space between characters and the minimum pitch of the base line

Height	10 mm	断面詳細矢視側図計画組
Height	7 mm	断面詳細矢視側図計画組
Height	5 mm	断面詳細矢視側図計画組
Height	3.5 mm	断面詳細矢視側図計画組

NOTE The examples in this figure are not for showing the style or shape of characters.

Figure 9 Examples of Kanji

Height	10 mm	アイウエオカキクケ
Height	7 mm	コサシスセソタチツ
Height	5 mm	テトナニヌネノハヒ
Height	3.5 mm	フヘホマミムメモヤ
Height	2.5 mm	ユヨラリルレロワン
Height	10 mm	あいうえおかきくけ
Height	7 mm	こさしすせそたちつ
Height	5 mm	てとなにぬねのはひ
Height	3.5 mm	ふへほまみむめもや
Height	2.5 mm	ゆよりるれろわん

NOTE The examples in this figure are not for showing the style or shape of characters.

Figure 10 Examples of Kana



NOTE The examples in this figure are not for showing the style or shape of characters.

Figure 11 Examples of numerals and Latin characters

7.2 Expression of texts

The expression of texts shall be as follows.

- a) The texts shall be written from left to right using literary-colloquial speech language.

Further, as required, they shall be written with a space between words.

- b) Notes in drawings shall be simple and clear.

Example NOTES

- 1 The standard temperature of measurement shall be in accordance with **JIS B 0680**.
- 2 Surface A shall be fitted.

8 Method of projection

8.1 General matters

The projection view shall be drawn by third angle projection method. However, in the case where the projection view cannot be drawn at correct arrangement by third angle projection method due to shortage of space, etc., or where, if a part of view is drawn at a position according to the third angle projection method, the view becomes difficult to understand, the first angle projection method or the reference arrow layout given in 8.5 which indicates the interrelationship in the projection view may be used (see **JIS Z 8316**).

8.2 Designation of projection view

The designations of respective views of the projection drawing of the object shown in Figure 12 shall be as follows.

Projection in direction a: Front view
 Projection in direction b: Plan view
 Projection in direction c: Left side view
 Projection in direction d: Right side view
 Projection in direction e: Bottom view
 Projection in direction f: Rear view

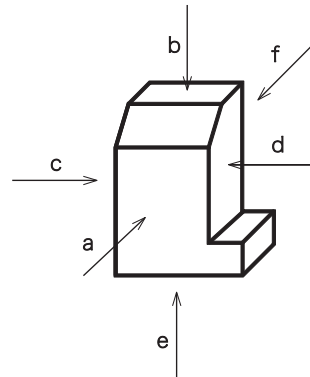


Figure 12 Designation of projection view

When the front view (principal view) is selected (see 10.1.1), the angle formed by the front view and the other related projection views shall be 90° or multiple of 90° (see Figure 12).

8.3 Third angle projection method

In the third angle projection method, with the front view (a) being the reference, other projection views are arranged as follows (see Figure 13). In this case, symbols of the projection method shown in Figure 14 shall be indicated in the title block or in vicinity thereto.

Plan view (b) is arranged at the top.

Bottom view (e) is arranged at the bottom.

Left side view (c) is arranged on the left side.

Right side view (d) is arranged on the right side.

Rear view (f) can be arranged on the left side of the left side view (c) or right side of the right side view (d) as required.

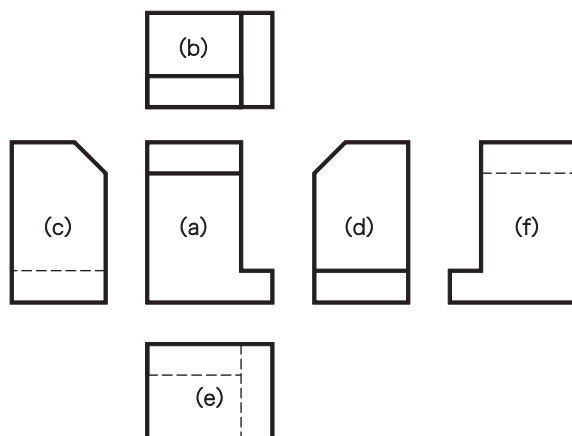


Figure 13 Third angle method projection views

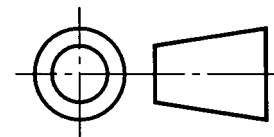


Figure 14 Symbol of third angle method

8.4 First angle projection method

In the first angle projection method, with the front view (a) being the reference, other projection views are arranged as follows (see Figure 15). In this case, symbols of the projection method shown in Figure 16 shall be indicated in the title block or close thereto.

Plan view (b) is arranged at the bottom.

Bottom view (e) is arranged at the top.

Left side view (c) is arranged on the right side.

Right side view (d) is arranged on the left side.

Rear view (f) can be arranged on the left side of the right side view (d) or right side of the left side view (c) as required.

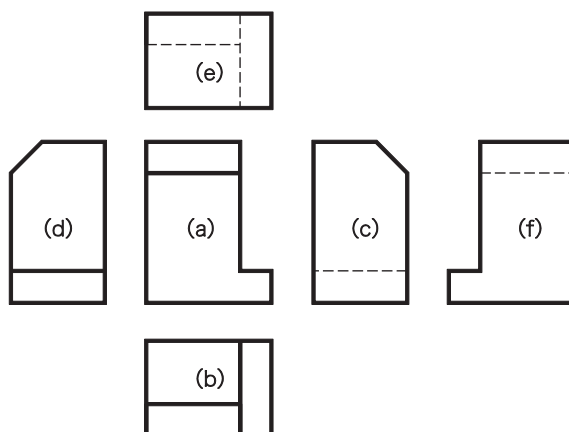


Figure 15 First angle method projection view

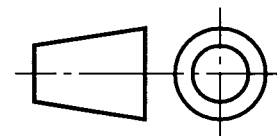


Figure 16 Symbol of first angle method

8.5 Reference arrow layout

In projection views which do not strictly follow the first angle or the third angle projection method, views from various angles may be arranged at arbitrary positions by using arrows.

Each projection view other than the principal view is instructed by arrows indicating the direction of projection and Latin capital characters for identification. Every character shall be written clearly and upwardly irrespective of the direction of projection.

The instructed projection view may be arranged at the position not corresponding to the principal view. The Latin capital characters to identify the projection view shall be placed immediately below or above the related projection view. References shall be arranged consistently in the same manner within one drawing. No other instructions are required (see Figures 17 and 18).

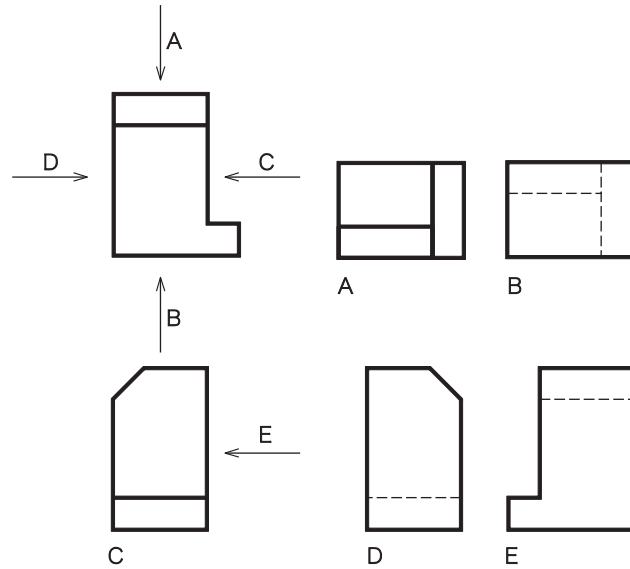
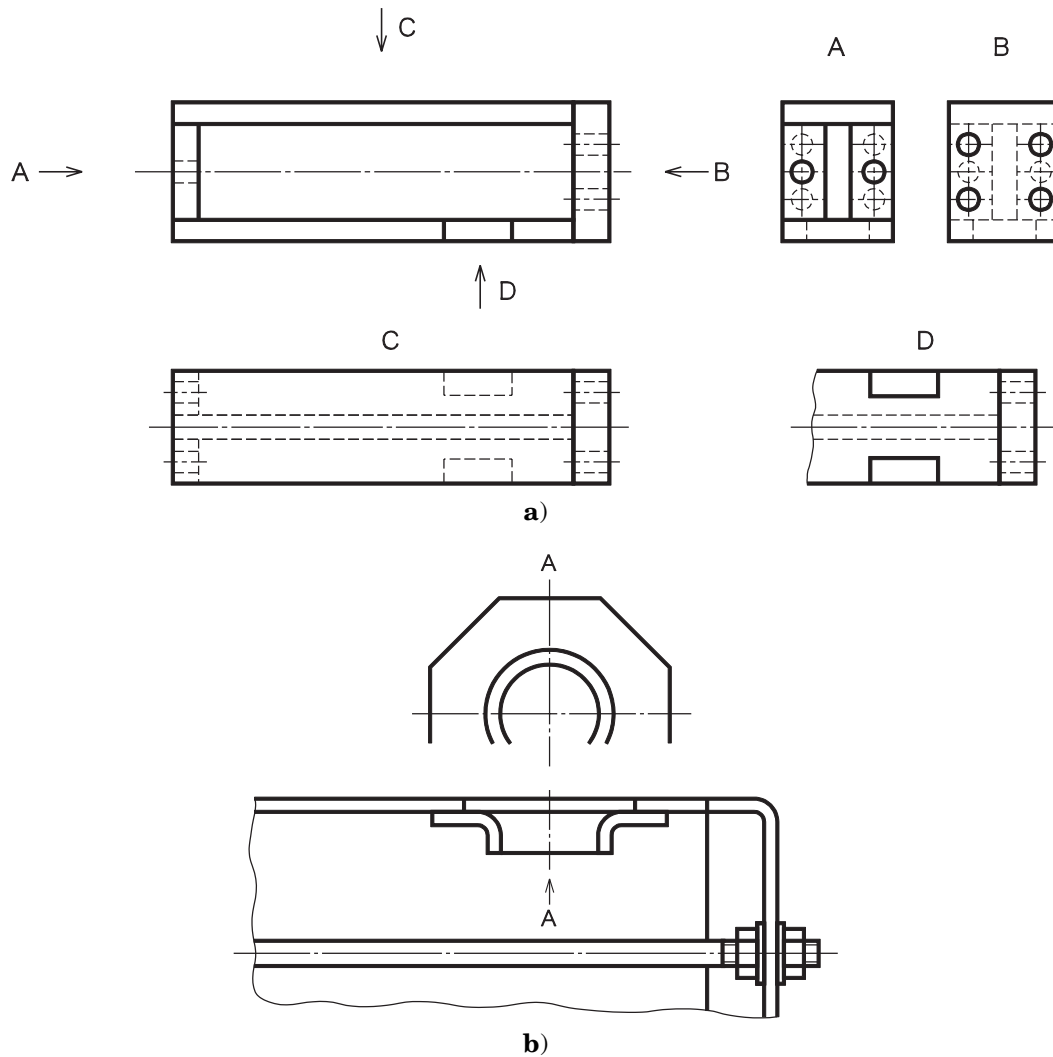


Figure 17 Example of reference arrow layout projection view 1



NOTE Figure 18 a) is a view shown to exemplify the projection method, and can be partially omitted in the drawings (see 10.3).

Figure 18 Example of reference arrow layout projection view 2

8.6 Other projection methods

In the case where the single view drawing must be drawn for the purpose of facilitating easy understanding of the shape of the object, it shall be drawn by using the axonometric projection, the central projection, etc. Drawing using the axonometric projection shall follow **JIS Z 8315-3**, and drawing using the central projection, **JIS Z 8315-4**.

9 Scale

The scale to be used for drawing shall be in accordance with **JIS Z 8314** and as given in the following.

- a) The scale shall be expressed by A:B

where, A: the corresponding length in the drawn view
B: the actual length of object.

Further, in the case of full scale, both A and B shall be indicated by 1, in the case of enlargement scale, B by 1 and in the case of reduction scale, A by 1.

Example 1 In the case of full scale 1:1

Example 2 In the case of enlargement scale 5:1

Example 3 In the case of reduction scale 1:2

- b) Values of scales shall be as given in Table 6.
- c) In the case where different scales are used on the same drawing, only the main scale shall be inscribed in the title block of the drawing. All other scales shall be inscribed close to reference number of related parts (for example, ①) or to reference character (for example, part A) of the detailed view (or sectional view).

In the case where the view is not proportional to the dimensions, this shall be stated in a note given in an appropriate position of the drawing, with an indication such as “NOT TO SCALE” or “SCALE: NONE”.

The indications of these scales need not be provided in the case where there is no fear of misreading. Further, the scale is not indicated in a single view drawing given as a reference in a two-dimensional drawing.

- d) In the case where a small object is drawn in enlargement scale, full scale drawing should preferably be added for reference. In this case, full scale drawing should preferably be simplified to present only the shape of the object.

Table 6 Recommended scale

Type of scale	Recommended scale		
Full scale	1 : 1		
Enlargement scale	50 : 1	20 : 1	10 : 1
	5 : 1	2 : 1	
Reduction scale	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

10 Expression of view

10.1 Expression of projection view

10.1.1 General matters

General matters shall be as follows.

- a) The projection view which gives most information on the object shall be the principal view or the front view.
- b) In the case of presenting other projection views (including sectional views) as required, sufficient number of necessary projection views and sectional views required to specify the object completely without any ambiguity shall be given.
- c) Projection views without the need of using hidden outlines (hidden contour lines or lines expressing edges) shall be selected wherever possible.
- d) Unnecessary repetition of details shall be avoided.

10.1.2 Principal view

The principal view shall be as follows

- a) For principal view, the projection view indicating most clearly the shape and function of the object shall be drawn.

Further, depending on the purpose of the drawing, the object shall be drawn in the following conditions.

- 1) In the drawing expressing mainly the function such as assembly drawing, the object shall be drawn in the state of usage.
- 2) In the drawing for processing such as part drawings, the object shall be drawn in the condition of being placed in the process where the drawing is most frequently used (see Figures 19 and 20).

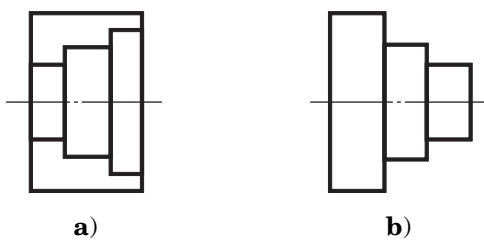


Figure 19 Examples in the case of turning

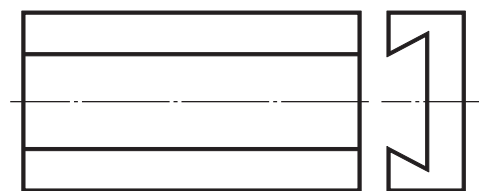


Figure 20 Example in the case of milling

- 3) Unless there is a special reason, the object shall be drawn in the condition of being placed horizontally.
- b) The number of other projection views drawn to supplement the principal view shall be minimum, and for the object capable of being expressed by only the principal view, other projection views shall not be drawn (see Figure 21).

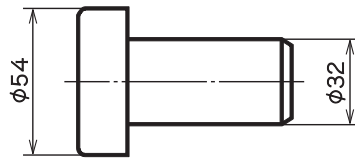


Figure 21 Example of principal view only

- c) The arrangement of interrelated figures shall be such that it can be completed without using hidden outline as far as possible (see Figure 22), except where comparison and contrast are difficult without the hidden outlines (see Figure 23).

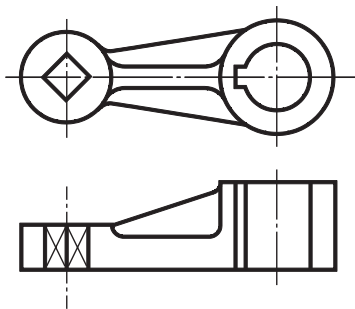


Figure 22 Example of avoiding the use of hidden outlines

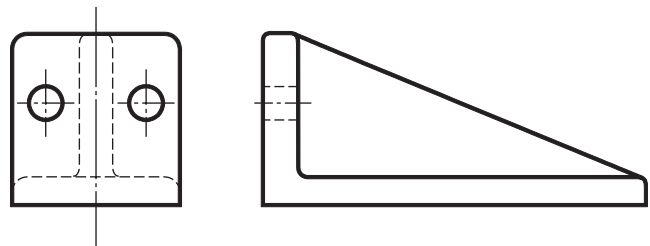


Figure 23 Example of comparison and contrast holes

10.1.3 Partial view

Where the indication of only the required part of a figure is sufficient, the required part shall be expressed as a partial view. In this case, the boundary of the eliminated part shall be indicated by break line (see Figure 24). However, where it is clear enough, the line may be omitted.

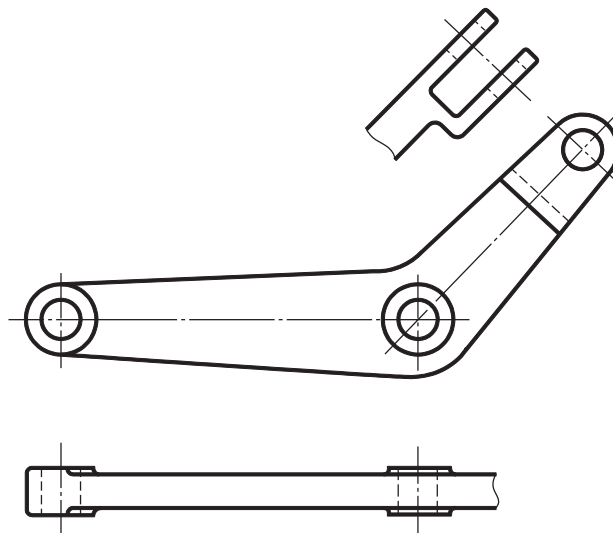


Figure 24 Example of partial view

10.1.4 Local view

Where representation of the shape of only a part, such as a hole or groove is sufficient, the required part shall be expressed as the local view. For indicating the projecting relation, it shall be connected by centre line, reference line, projection lines, etc. to the main figures (see Figures 25 and 26).

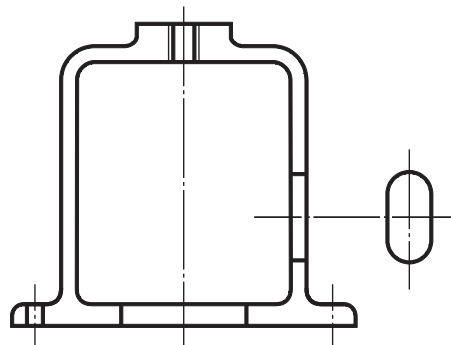


Figure 25 Example of local view 1

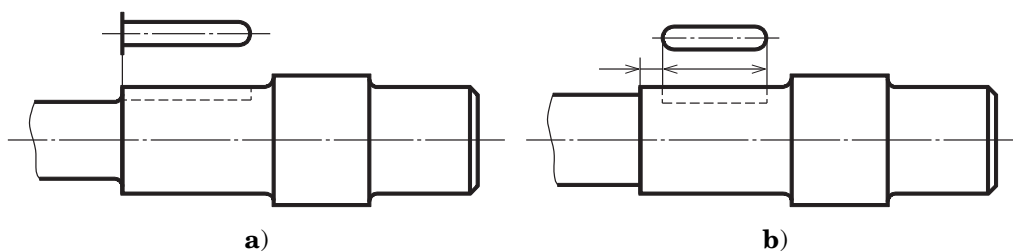


Figure 26 Examples of local view 2

10.1.5 Elements on larger scale

In cases where the view of a specific part is so small that details of the feature cannot be shown or dimensioned, the feature of the part may be framed by a continuous thin line and identified by a Latin capital letter and the relevant feature is then drawn to a stated larger scale accompanied by its identification letter and scale (see Figure 27). Where the indication of scale of enlarged view is not required, the term “Enlarged view” or “DETAIL” may be appended instead of the scale.

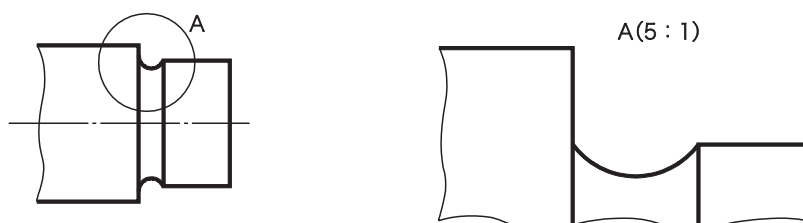


Figure 27 Example of elements on larger scale

10.1.6 Revolved projection

Where the actual shape does not appear in the drawing due to the projection angle, the actual shape may be indicated by drawing with the part revolved [see Figures 28 a) and b)].