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**Welding and allied processes —  
Symbolic representation on drawings  
— Welded joints**

*Soudage et techniques connexes — Représentations symboliques sur  
les dessins — Assemblages soudés*

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CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 7, *Representation and terms*.

Any feedback, question or request for official interpretation related to any aspect of this document should be directed to the Secretariat of ISO/TC 44/SC 7 via your national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html). Official interpretations, where they exist, are available from this page: <https://committee.iso.org/sites/tc44/home/interpretation.html>.

This fifth edition cancels and replaces the fourth edition (ISO 2553:2013), which has been technically revised. The main changes compared to the previous edition are as follows:

- editorial corrections especially to align with other ISO/TC 44 standards and terminology;
- figures updated to more accurately reflect welds illustrated;
- plug welds in circular and elongated holes (slots) — clarification especially as it relates to slot welds;
- old Figure 5 is now shown as [Table 5](#) for clarity;
- [Clause 6](#) has been revised to reflect Pacific Rim practices.

## Introduction

The symbols given in this document can be used on technical drawings for welded components. Design-related specifications, such as type, thickness, and length of weld, weld quality, surface treatment, filler material and testing specifications, can be indicated directly at the weld by means of the symbols. The principals of this document can be applied to brazed and soldered joints.

Clarity can be improved by references to collective information in the drawings or references to additional design-related documents.

Preparation for production can require detailed welding-related planning. The type of representation described in this document can be used for this purpose and complemented by additional production-related information (e.g. welding position, welding process, WPS, joint preparation, preheating). This information is often given in production-related documents, such as work schedules or welding procedure specifications (WPS).

Technical drawings are intended to clearly and understandably illustrate design-related specifications. Welding-related drawings are prepared and checked by specially trained personnel (see ISO 14731).

This document recognizes that there are two different approaches in the global market to designate the arrow side and other side on drawings, and allows for either to be used in isolation, to suit a particular market need. Application of either approach identifies a welding symbol in accordance with this document. The approach in accordance with system A is based on ISO 2553:1992<sup>1)</sup>. The approach in accordance with system B is based upon standards used by Pacific Rim countries.

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1) Withdrawn.

# Welding and allied processes — Symbolic representation on drawings — Welded joints

## 1 Scope

This document defines the rules to be applied for symbolic representation of welded joints on technical drawings. This can include information about the geometry, manufacture, quality and testing of the welds. The principles of this document can also be applied to soldered and brazed joints.

It is recognized that there are two different approaches in the global market to designate the arrow side and other side on drawings. In this document:

- clauses, tables and figures which carry the suffix letter "A" are applicable only to the symbolic representation system based on a dual reference line;
- clauses, tables and figures which carry the suffix letter "B" are applicable only to the symbolic representation system based on a single reference line;
- clauses, tables and figures which do not have the suffix letter "A" or "B" are applicable to both systems.

The symbols shown in this document can be combined with other symbols used on technical drawings, for example to show surface finish requirements.

An alternative designation method is presented which can be used to represent welded joints on drawings by specifying essential design information such as weld dimensions, quality level, etc. The joint preparation and welding process(es) are then determined by the production unit in order to meet the specified requirements.

**NOTE** Examples given in this document, including dimensions, are illustrative only and are intended to demonstrate the proper application of principles.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 128 (all parts), *Technical drawings — General principles of presentation*

ISO 129-1, *Technical product documentation (TPD) — Presentation of dimensions and tolerances — Part 1: General principles*

ISO 3098-2, *Technical product documentation — Lettering — Part 2: Latin alphabet, numerals and marks*

ISO 4063, *Welding and allied processes — Nomenclature of processes and reference numbers*

ISO/TR 25901 (all parts), *Welding and related processes — Vocabulary*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TR 25901 (all parts) and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

## 3.1

### **welding symbol**

symbol consisting of an *arrow line* (3.3) and a *reference line* (3.4) and which can also include *elementary symbols* (3.8) and *supplementary symbols* (3.9), dimensions and/or tail, used on technical drawings

Note 1 to entry: See [Clause 4](#).

## 3.2

### **basic welding symbol**

symbol consisting of an *arrow line* (3.3), *reference line* (3.4) and tail used when the joint is not specified and only to indicate that a welded joint is to be made

Note 1 to entry: See [4.2](#).

## 3.3

### **arrow line**

leader line used to indicate that the joint is to be welded generally drawn at 135° to the *reference line* (3.4)

Note 1 to entry: See [4.6](#).

## 3.4

### **reference line**

part of the *welding symbol* (3.1) on which the *elementary symbol* (3.8) is located, generally drawn parallel to the bottom edge of the drawing

Note 1 to entry: See [4.7](#).

## 3.5

### **tail**

V-shaped element added to the end of the continuous *reference line* (3.4) away from the *arrow line* (3.3)

Note 1 to entry: See [4.8](#).

## 3.6

### **arrow side**

side of the joint to which the *arrow line* (3.3) is pointing

Note 1 to entry: See [4.7.2.1](#).

## 3.7

### **other side**

opposite side of the joint to the *arrow side* (3.6)

Note 1 to entry: See [4.7.2.1](#).

## 3.8

### **elementary symbol**

symbol forming part of the *welding symbol* (3.1) and drawn on the *reference line* (3.4) to indicate the type of weld and joint preparation

Note 1 to entry: See [4.4](#).

## 3.9

### **supplementary symbol**

symbol used in conjunction with *elementary symbols* (3.8) to convey additional information about the joint

Note 1 to entry: See [4.5](#).

**3.10****complementary information**

non-symbolic information, relevant to the welds being made, which may be included in the *tail* (3.5) of the *welding symbol* (3.1)

Note 1 to entry: See 4.8.

**3.11****intermittent weld**

series of weld elements made at intervals along a joint

[SOURCE: ISO/TR 25901-1:2016, 2.1.6.15]

Note 1 to entry: See 5.3.2.

**3.11.1****chain intermittent weld**

*intermittent weld* (3.11) on each side of a joint arranged so that the weld elements lie opposite one another along the joint

Note 1 to entry: These are usually fillet welds in T-joints and lap joints.

Note 2 to entry: See 5.3.2.2.

[SOURCE: ISO/TR 25901-1:2016, 2.1.6.17, modified — Note 2 to entry has been adapted.]

**3.11.2****staggered intermittent weld**

*intermittent weld* (3.11) on each side of a joint arranged so that the weld elements on one side lie opposite the spaces on the *other side* (3.7) along the joint.

Note 1 to entry: These are usually fillet welds in T-joints and lap joints.

Note 2 to entry: See 5.3.2.3.

[SOURCE: ISO/TR 25901-1:2016, 2.1.6.16, modified — Note 2 to entry has been adapted.]

**3.12****offset**

distance between the start of welding on one side of a *staggered intermittent weld* (3.11.2) and the start of welding on the *other side* (3.7)

Note 1 to entry: See 5.3.2.3, C.2.3, Table C.1, No. 3, C.3.3 and Table C.2, No. 3.

**3.13****back run**

DEPRECATED: sealing run

final run deposited on the root side of a fusion weld

[SOURCE: ISO/TR 25901-1:2016, 2.1.8.21]

**3.14****backing weld**

backing in the form of a weld

**3.15****nominal weld length**

design length of a weld

Note 1 to entry: Nominal weld length is the length where the weld has its full size.

### 3.15.1

#### **nominal length of weld element**

<intermittent welds> nominal length of each element of the weld

Note 1 to entry: Nominal weld length is the length where the weld has its full size.

### 3.16

#### **nominal throat thickness**

*a*

design value of the height of the largest isosceles triangle that can be inscribed in the section of a fillet weld

Note 1 to entry: If other nominal throat thicknesses are specified, e.g. fillet welds with unequal leg lengths (see [Table 6](#), No. 2.3), they need to be clearly specified. In these cases, the symbol *a* shall not be used.

[SOURCE: ISO/TR 25901-1:2016, 2.1.7.8, modified — The symbol *a* has been added. Note 1 to entry has been changed.]

### 3.17

#### **leg length**

*z*

distance from the actual or projected intersection of the fusion faces and the toe of a fillet weld, measured across the fusion face

[SOURCE: ISO/TR 25901-1:2016, 2.1.7.5, modified — The symbol *z* has been added.]

### 3.18

#### **penetration depth**

#### **deposit thickness**

DEPRECATED: weld metal thickness

thickness of the weld metal, excluding any reinforcement

[SOURCE: ISO/TR 25901-1:2016, 2.1.7.4]

### 3.19

#### **deep penetration throat thickness**

*s*

*nominal throat thickness* ([3.16](#)) or effective throat thickness to which a certain amount of fusion penetration is added

[SOURCE: ISO/TR 25901-1:2016, 2.1.7.9, modified — The symbol *s* has been added. Note 1 to entry has been deleted.]

### 3.20

#### **flare-bevel weld**

butt weld between a joint member with a curved surface and another with a planar surface

Note 1 to entry: See [Table 6](#), No. 1.7.

[SOURCE: ISO/TR 25901-1:2016, 2.1.6.18]

### 3.21

#### **flare-V weld**

butt weld between two members with curved surfaces

Note 1 to entry: See [Table 6](#), No. 1.6.

[SOURCE: ISO/TR 25901-1:2016, 2.1.6.19]

**3.22****field weld**

weld made outside workshops usually at the place of final installation

[SOURCE: ISO/TR 25901-1:2016, 2.1.8.40]

**3.23****stake weld**

weld in a T-joint where a laser beam or electron beam is irradiated from a horizontal plate/flange to vertical plate/web

Note 1 to entry: Vertical plates can be of different forms, such as corrugated panels and folded plates

**4 Welding symbol****4.1 General**

A reference line and arrow line are required elements. Additional elements may be included to convey specific information.

It is preferable to show the welding symbol on the same side of the joint that the weld is to be made, i.e. the arrow side (see 4.7).

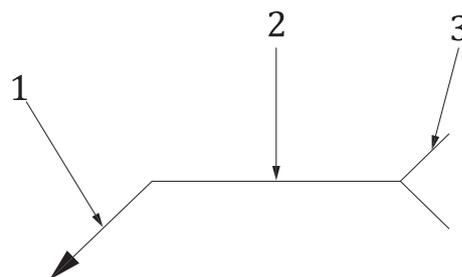
The thickness of the arrow lines, reference line, elementary symbols and lettering shall be in accordance with ISO 128 (all parts) and ISO 3098-2.

In order not to overburden drawings, reference should be made to notes in the drawing or other design-related documents.

**4.2 Basic welding symbol**

If joint details are not specified and the only requirement is to indicate that a joint is to be welded, the basic symbol shown in Figure 1 may be used. In this case, a dual reference line is not required for system A (see 4.7.1 A) as no details concerning the weld are being conveyed.

The basic welding symbol shall comprise an arrow line, reference line and a tail.

**Key**

- 1 arrow line
- 2 reference line
- 3 tail

NOTE This symbol is often used to indicate the location of tack welds.

**Figure 1 — Basic welding symbol (joint details and type not specified)**

### 4.3 Welding symbol systems

This document recognizes two different systems, A and B, to designate the arrow side and other side on drawings.

The symbolic representation in system A is based on a dual reference line consisting of a continuous line and a dashed line (see [4.7](#)).

The symbolic representation in system B is based on a single reference line (see [4.7](#)).

Clauses, Tables and Figures which carry the suffix "A" or "B" are applicable only to system A or system B respectively.

Clauses, tables and figures which do not have a suffix are applicable to both systems.

System A and B shall not be mixed and drawings shall clearly indicate which system is used including units of measurement in accordance with ISO 129-1.

Examples of comprehensive welding symbols showing the location of elements are given in [Figure A.1](#).

### 4.4 Elementary symbols

#### 4.4.1 General

Elementary symbols, in accordance with [Table 1](#), may be added to the reference line in both systems A and B to indicate the type of weld to be made.

Elementary symbols form part of the welding symbol and shall be drawn attached to the reference line generally at the mid-point.

Elementary symbols may be complemented by:

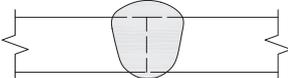
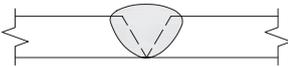
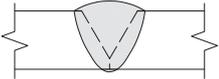
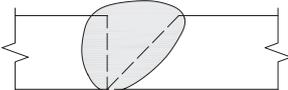
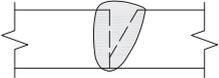
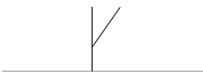
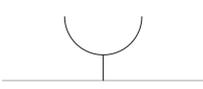
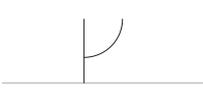
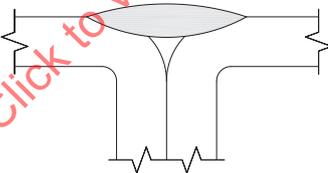
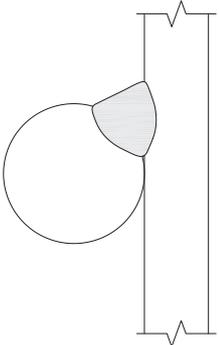
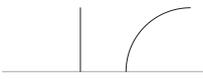
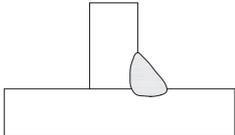
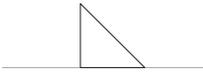
- supplementary symbols (see [4.5](#) and [Table 3](#));
- dimensions (see [Clause 5](#));
- complementary information.

The orientation of the elementary symbols shall not be changed to that shown in [Tables 1](#) to [3](#).

[Annex B](#) gives guidance on tolerances and transition points for butt welds, edge welds and fillet welds.

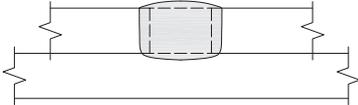
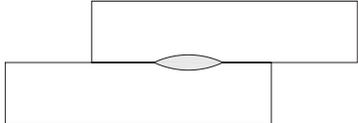
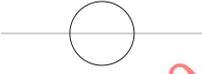
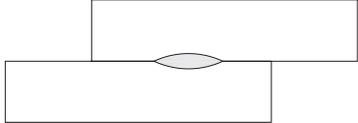
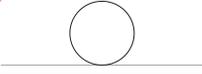
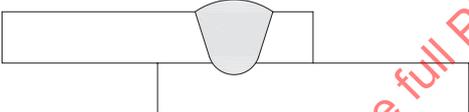
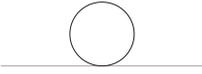
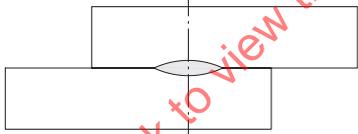
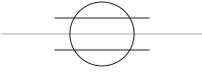
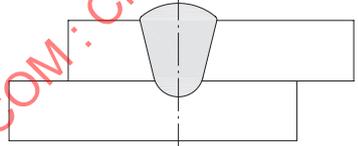
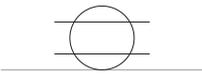
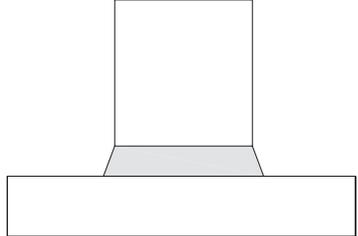
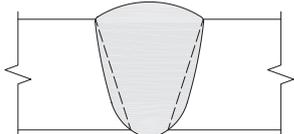
If clear illustration by means of symbols is not possible, cross-sections of the welds may be drawn and dimensioned.

**Table 1 — Elementary symbols**

| No. | Designation<br>(weld type)                             | Illustration of weld type<br>(dashed lines show joint preparation<br>prior to welding) | Symbol <sup>a</sup>   |
|-----|--|--|---|
| 1   | Square butt <sup>b</sup>                               |       |    |
| 2   | Single-V butt <sup>b</sup>                             |       |    |
| 3   | Single-V butt with<br>broad root face <sup>b</sup>     |       |    |
| 4   | Single-bevel butt <sup>b</sup>                         |       |    |
| 5   | Single-bevel butt<br>with broad root face <sup>b</sup> |       |    |
| 6   | Single-U butt <sup>b</sup>                             |       |    |
| 7   | Single-J butt <sup>b</sup>                             |     |  |
| 8   | Flare V  |    |  |
| 9   | Flare bevel  |     |  |
| 10  | Fillet   |     |  |

<sup>a</sup> The grey line is not part of the symbol. It indicates the position of the reference line.  
<sup>b</sup> Butt welds are full penetration unless otherwise indicated by dimensions on the welding symbol or by reference to other information, for example the WPS.  
<sup>c</sup> Symbol can also be used for joints with more than 2 members.

**Table 1** (continued)

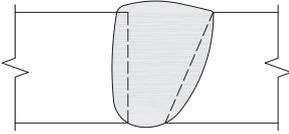
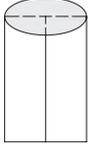
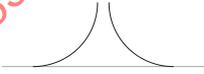
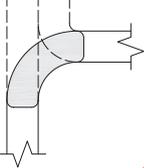
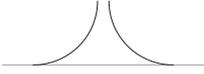
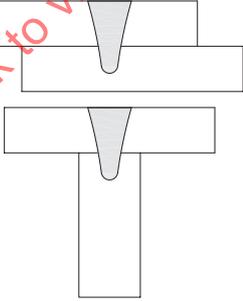
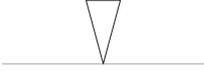
| No.  | Designation<br>(weld type)                  | Illustration of weld type<br>(dashed lines show joint preparation<br>prior to welding) | Symbol <sup>a</sup>  |
|------|---|--|--|
| 11   | Plug  |       |   |
| 12.1 | Resistance spot <sup>c</sup>                |       |   |
| 12.2 | Projection                                  |       | System A<br><br>System B<br> |
| 13   | Fusion spot                                 |      |    |
| 14   | Resistance seam <sup>c</sup>                |     |   |
| 15   | Fusion seam                                 |     |   |
| 16   | Stud  |     |   |
| 17   | Steep-flanked<br>single-V butt <sup>b</sup> |     |   |

<sup>a</sup> The grey line is not part of the symbol. It indicates the position of the reference line.

<sup>b</sup> Butt welds are full penetration unless otherwise indicated by dimensions on the welding symbol or by reference to other information, for example the WPS.

<sup>c</sup> Symbol can also be used for joints with more than 2 members.

Table 1 (continued)

| No.  | Designation<br>(weld type)                          | Illustration of weld type<br>(dashed lines show joint preparation<br>prior to welding) | Symbol <sup>a</sup>   |
|--|---|--|---|
| 18   | Steep-flanked<br>single-bevel butt <sup>b</sup>     |       |    |
| 19   | Edge <sup>c</sup>                                   |       |    |
| 20.1   | Flanged butt<br>(see also <a href="#">Table 4</a> ) |      |    |
| 20.2   | Flanged corner                                      |       |    |
| 21   | Overlay   |     |  |
| 22   | Stake <sup>c</sup>                                  |     |  |
| <p><sup>a</sup> The grey line is not part of the symbol. It indicates the position of the reference line.</p> <p><sup>b</sup> Butt welds are full penetration unless otherwise indicated by dimensions on the welding symbol or by reference to other information, for example the WPS.</p> <p><sup>c</sup> Symbol can also be used for joints with more than 2 members.</p> |   |  |   |

#### 4.4.2 Combinations of elementary symbols

Elementary symbols may be combined as required to represent particular weld configurations.

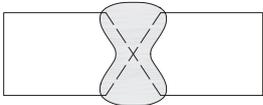
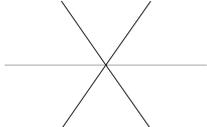
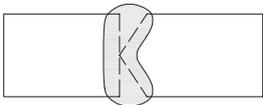
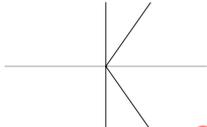
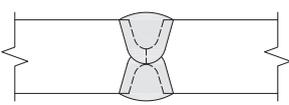
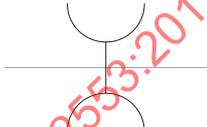
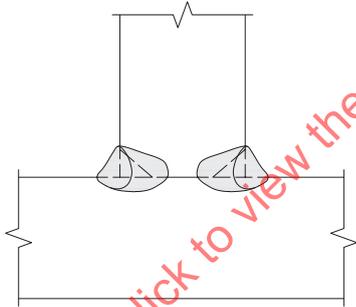
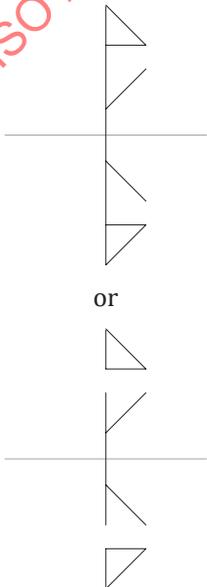
#### 4.4.3 Double-sided butt welds

The elementary symbols shall be arranged opposite each other on the reference line, including all required information, when used to represent double-sided butt welds.

In the case of symmetrical double-sided welds with identical symbols and dimensions, the dashed reference line should be deleted for system A (see [Table 2](#)).

An example of an asymmetrical double-sided weld is shown in [Table A.3](#).

Table 2 — Combined elementary symbols to represent symmetrical double-sided welds

| No.   | Weld type   | Illustration of weld <sup>a</sup>  | Symbol <sup>b</sup>  |
|---|---|--|--|
| 1   | Double-V butt   |   |   |
| 2   | Double bevel butt   |   |   |
| 3   | Double-U butt   |   |   |
| 4   | Double bevel butt (with broad root face) and fillet welds |  |  |
| <p><sup>a</sup> Welds may be partial or full penetration which is to be indicated by dimensions on the welding symbol (see <a href="#">Table 6</a>, No. 1.1 and No. 1.2) or by reference to other information, for example the WPS.</p> <p><sup>b</sup> The grey line is not part of the symbol. It indicates the position of the reference line.</p> |   |  |  |

## 4.5 Supplementary symbols

### 4.5.1 General

Additional information concerning the required joint may be provided by the use of supplementary symbols in accordance with [Table 3](#). Supplementary symbols can, for example, provide information about the shape of the weld or how the welded joint shall be made.

Table 3 — Supplementary symbols

| No. | Designation  | Symbol <sup>a</sup> | Application example <sup>a</sup> | Illustration of weld |
|-----|--|---------------------|----------------------------------|----------------------|
| 1   | Flush <sup>b</sup><br>(flat-finished)                                |                     |                                  |                      |
| 2   | Convex <sup>b</sup>  |                     |                                  |                      |
| 3   | Concave <sup>b</sup>   |                     |                                  |                      |
| 4   | Toes blended smoothly <sup>c</sup>                                   |                     |                                  | No example           |
| 5   | a) Back run <sup>d</sup><br>(made after the single-V butt weld)      |                     |                                  |                      |
|     | b) Backing weld <sup>d</sup><br>(made before the single-V butt weld) |                     |                                  |                      |
| 6   | Specified root reinforcement (butt welds) <sup>e</sup>               |                     |                                  |                      |
| 7a  | Backing (unspecified)  |                     |                                  |                      |
| 7b  | Permanent backing <sup>f</sup>                                       |                     |                                  |                      |
| 7c  | Removable/temporary backing <sup>f</sup>                             |                     |                                  |                      |
| 8   | Spacer <sup>g</sup>  |                     |                                  |                      |

<sup>a</sup> The grey line is not part of the symbol and is included to show the position of symbol on reference line and/or the arrow line only.

<sup>b</sup> Welds that require approximately flush, convex or concave faces without post-weld finishing are specified by use of the flush, convex or concave contour symbol.

Welds to be finished flush, convex or concave by post-weld finishing or that require a flat but not flush surface require additional information, e.g. addition of a note in the tail of the welding symbol.

Other symbols in accordance with ISO 1302 may be used to specify surface finish.

<sup>c</sup> The toes shall be blended smoothly by welding or finishing. Processing details may be specified in the work instructions or WPS.

<sup>d</sup> The weld run sequence may be indicated on the drawing e.g. by use of multiple reference lines, a note in the tail or by reference to a weld procedure specification.

<sup>e</sup> In system B, also used to designate flanged butt/corner welds (see 4.5.6).

<sup>f</sup> M, material to be part of the final welded joint, MR, material to be removed after welding. Further information on the material can be included in the tail or elsewhere.

<sup>g</sup> The material and the dimensions of the consumable insert or spacer can be specified in the tail of the welding symbol or on the drawing.

<sup>h</sup> Explanations of *a*, *z*, *n*, *l* and (*e*) are given in Clause 5.

Table 3 (continued)

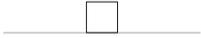
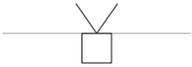
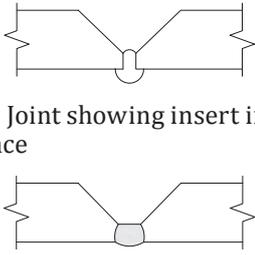
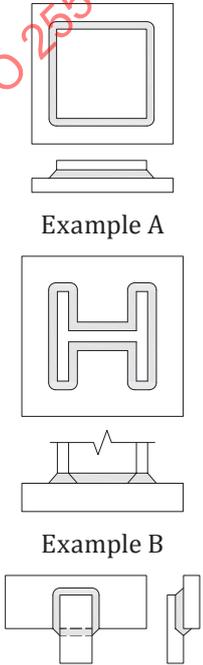
| No.  | Designation                    | Symbol <sup>a</sup>   | Application example <sup>a</sup>   | Illustration of weld   |
|--|--------------------------------|---|--|--|
| 9  | Consumable insert <sup>g</sup> |    |    |  <p>a) Joint showing insert in place</p> <p>b) Welded joint showing root bead (insert incorporated into root). Single V butt weld not shown</p> |
| 10   | Weld-all-around                |  |  |  <p>Example A</p> <p>Example B</p> <p>Example C</p>  |
| <p><sup>a</sup> The grey line is not part of the symbol and is included to show the position of symbol on reference line and/or the arrow line only.</p> <p><sup>b</sup> Welds that require approximately flush, convex or concave faces without post-weld finishing are specified by use of the flush, convex or concave contour symbol.</p> <p>Welds to be finished flush, convex or concave by post-weld finishing or that require a flat but not flush surface require additional information, e.g. addition of a note in the tail of the welding symbol.</p> <p>Other symbols in accordance with ISO 1302 may be used to specify surface finish.</p> <p><sup>c</sup> The toes shall be blended smoothly by welding or finishing. Processing details may be specified in the work instructions or WPS.</p> <p><sup>d</sup> The weld run sequence may be indicated on the drawing e.g. by use of multiple reference lines, a note in the tail or by reference to a weld procedure specification.</p> <p><sup>e</sup> In system B, also used to designate flanged butt/corner welds (see 4.5.6).</p> <p><sup>f</sup> M, material to be part of the final welded joint, MR, material to be removed after welding. Further information on the material can be included in the tail or elsewhere.</p> <p><sup>g</sup> The material and the dimensions of the consumable insert or spacer can be specified in the tail of the welding symbol or on the drawing.</p> <p><sup>h</sup> Explanations of <i>a</i>, <i>z</i>, <i>n</i>, <i>l</i> and (<i>e</i>) are given in <a href="#">Clause 5</a>.</p> |                                |   |  |  |

Table 3 (continued)

| No. | Designation                               | Symbol <sup>a</sup> | Application example <sup>a</sup> | Illustration of weld |
|-----|---|---------------------|----------------------------------|----------------------|
| 11  | Weld between two points (see 4.5.3)       |                     |                                  |                      |
| 12  | Field weld                                |                     |                                  | No example           |
| 13  | Staggered intermittent welds <sup>h</sup> |                     |                                  |                      |

<sup>a</sup> The grey line is not part of the symbol and is included to show the position of symbol on reference line and/or the arrow line only.

<sup>b</sup> Welds that require approximately flush, convex or concave faces without post-weld finishing are specified by use of the flush, convex or concave contour symbol.

Welds to be finished flush, convex or concave by post-weld finishing or that require a flat but not flush surface require additional information, e.g. addition of a note in the tail of the welding symbol.

Other symbols in accordance with ISO 1302 may be used to specify surface finish.

<sup>c</sup> The toes shall be blended smoothly by welding or finishing. Processing details may be specified in the work instructions or WPS.

<sup>d</sup> The weld run sequence may be indicated on the drawing e.g. by use of multiple reference lines, a note in the tail or by reference to a weld procedure specification.

<sup>e</sup> In system B, also used to designate flanged butt/corner welds (see 4.5.6).

<sup>f</sup> M, material to be part of the final welded joint, MR, material to be removed after welding. Further information on the material can be included in the tail or elsewhere.

<sup>g</sup> The material and the dimensions of the consumable insert or spacer can be specified in the tail of the welding symbol or on the drawing.

<sup>h</sup> Explanations of *a*, *z*, *n*, *l* and *(e)* are given in Clause 5.

#### 4.5.2 Weld-all-around symbol

The weld-all-around symbol, added at the junction of the arrow and reference lines, may be used to designate a continuous weld, single or double-sided, extending around a series of connected joints (see Table 3).

The series of joints may involve different directions and may lie in more than one plane but the weld shall always be of the same type and dimensions.

The weld-all-around symbol shall not be used if:

- a) the weld does not start and end at the same point, i.e. it is not continuous (see 4.5.3);
- b) the weld type changes, for example from a fillet weld to a butt weld;
- c) the weld dimensions change, for example the nominal throat thickness of a fillet weld. In this case, each weld shall be identified using a separate welding symbol.

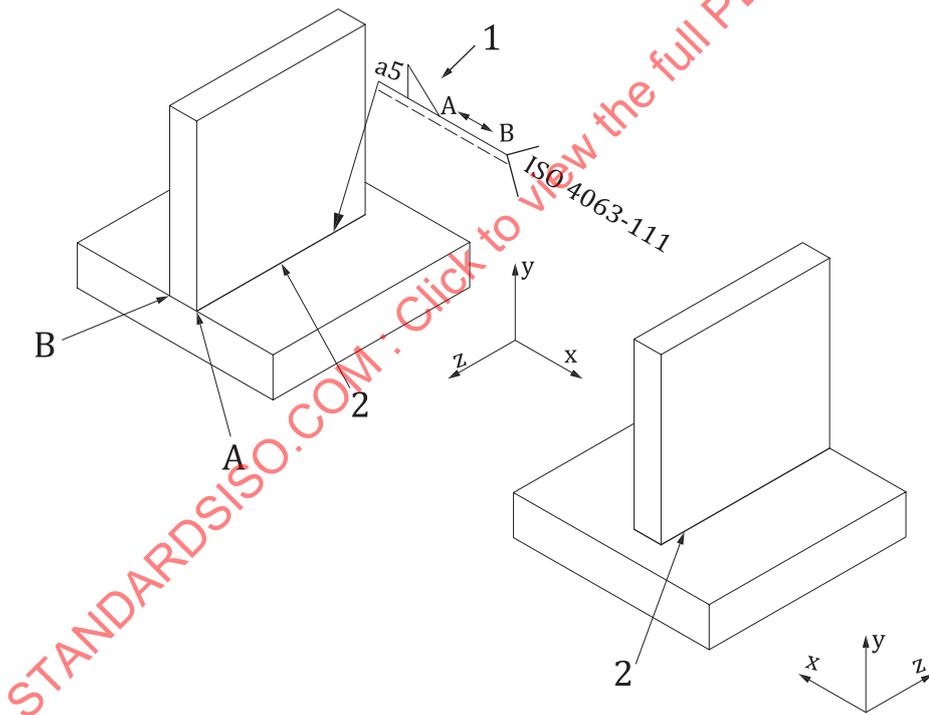
NOTE The weld-all-around symbol is not used to indicate that welds are to be made everywhere.

Welds extending around the circumference of a circular section/hole or elongated hole (slot) do not require the use of the weld-all-around symbol to specify a continuous weld.

### 4.5.3 Welds of the same type made from point to point

The weld between two points symbol may be used to designate a continuous weld (stop and restart allowed unless otherwise stated), of the same type, extending between two points. In this case, the weld does not begin and end at the same point, and the weld all around symbol shall not be used (see 4.5.2). The end points of the weld shall be clearly indicated and the welding symbol shall clearly indicate the joint to be welded.

Figure 2 gives an example of how such a weld is designated using 1 welding symbol.



#### Key

- 1 welding symbol
- 2 visual response (welded in accordance with the welding symbol)
- A, B weld end positions that (when required, shall be identified)

NOTE 1 There is no weld from point B to point A (fillet weld not possible).

NOTE 2 Any identifier can be used to identify weld end positions e.g. A, B and X, Y etc.

Figure 2 — Example of a welding symbol for a fillet weld made between two points A and B

#### 4.5.4 Field welds

Field welds shall be specified by adding the field weld symbol at the junction of the arrow and reference lines (see [Table 3](#)). The symbol shall be placed perpendicularly to and above the reference line. The symbol applies to the whole welding symbol.

#### 4.5.5 Root reinforcement — Butt welds made from one side

The root reinforcement symbol shall only be used when complete joint penetration plus a specified minimum root reinforcement dimension is required in butt welds made from one side (see [Figure 3](#)).

The root reinforcement symbol shall be placed opposite the elementary symbol and on the other side of the reference line.

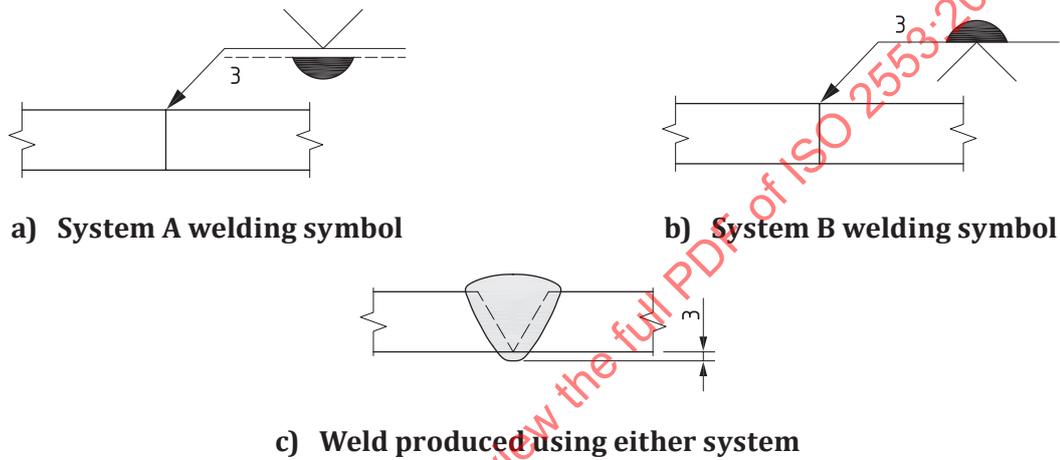


Figure 3 — Example of a weld with specified root reinforcement

#### 4.5.6 Welds on flanged butt and flanged corner joints

Welds on flanged butt and flanged corner joints shall be specified using the symbols shown in [Table 4](#).

Table 4 — Welds on flanged butt and flanged corner joints

| No.                          | Weld type      | System A welding symbol | Illustration of weld | System B welding symbol |
|------------------------------|----------------|-------------------------|----------------------|-------------------------|
| <b>FLANGED BUTT JOINTS</b>   |                |                         |                      |                         |
| 1                            | Edge           |                         |                      |                         |
| 2                            | Flanged butt   |                         |                      |                         |
| <b>FLANGED CORNER JOINTS</b> |                |                         |                      |                         |
| 3                            | Edge           |                         |                      |                         |
| 4                            | Flanged corner |                         |                      |                         |

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## 4.6 Arrow line

### 4.6.1 General

An arrow line shall be used to indicate the joint to be welded.

The arrow line shall:

- point to and be in contact with a solid line comprising part of the joint on the drawing (visible line);
- be drawn at an angle to and joined to a reference line and completed with a closed filled arrowhead.

The arrow line may be joined to either end of the reference line.

### 4.6.2 Multiple arrow lines

Two or more arrow lines may be combined with a single reference line to indicate the locations of identical welds (see [Figure 4](#)).

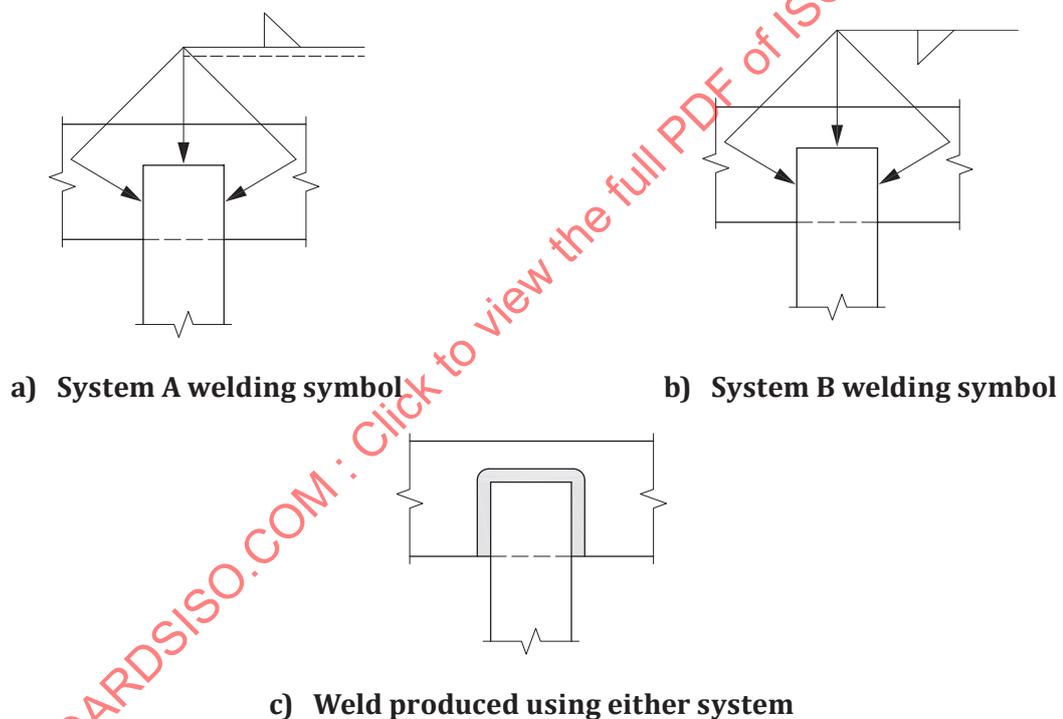


Figure 4 — Examples of use of multiple arrow lines

### 4.6.3 Broken arrow line

For butt joints in plates (excluding T-joints) when a specific joint member is required to be prepared (e.g. single-bevel or single-J butt welds), the arrow line shall have a break and point toward that member.

The arrow line need not be broken if it is obvious or if there is no preference as to which member is to be prepared.

Examples of the use of broken arrow lines are given in [Table A.1](#).

## 4.7 Reference line and weld location

### 4.7.1 Reference line

The reference line when combined with elementary symbols, is used to indicate the side of the joint on which the weld is to be made.

NOTE The reference line can be drawn parallel to the right side edge of the drawing (whole welding symbol rotated by 90°) but only when space does not permit drawing parallel to the bottom edge.

**4.7.1A Reference line — System A:** The reference line consists of two parallel lines of equal length: a continuous line and a dashed line (see Examples in [Annex A](#)).

The dashed line may be drawn above or below the continuous line but shall preferably be drawn below.

The dashed line should be omitted for symmetrical welds and for spot and seam welds made at the interface between two components.

**4.7.1B Reference line — System B:** The reference line shall be drawn as a continuous line (see Examples in [Annex A](#)).

### 4.7.2 Weld location

#### 4.7.2.1 Arrow side/Other side

The arrow side is the side of the joint to which the arrowhead is pointing (see [Table 5](#)).

The other side is the opposite side of the joint to which the arrowhead is pointing. The arrow side and other side always form part of the same joint.

The other side of a joint shall not be confused with a hidden weld forming part of a different joint.

Examples of how to designate welds on the arrow side and other side of joints are given in [Table A.2](#).

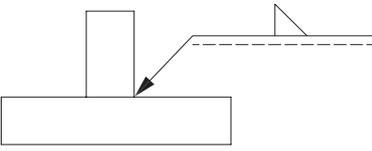
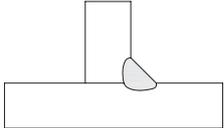
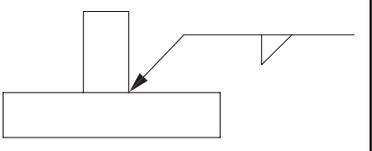
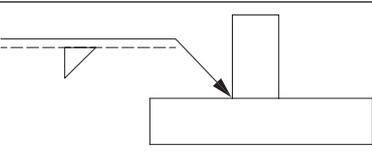
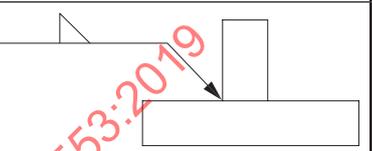
**4.7.2.1A Arrow side/Other side — System A:** Elementary symbols shall be located on the continuous line when the weld is to be made on the arrow side of the joint.

Elementary symbols shall be located on the dashed line when the weld is to be made on the other side of the joint.

**4.7.2.1B Arrow side/Other side — System B:** Elementary symbols shall be located below the reference line when the weld is to be made on the arrow side of the joint.

Elementary symbols shall be located above the reference line when the weld is to be made on the other side of the joint.

Table 5 — Use of welding symbols to designate arrow side and other side

| Weld location  | System A  | Same weld produced using all four options  | System B   |
|--|---|--|--|
| Arrow side   |  <p>symbol on solid component of reference line</p>  |  |  <p>symbol below reference line</p> |
| Other side   |  <p>symbol on dashed component of reference line</p> |  |  <p>symbol above reference line</p> |
| <p>NOTE 1 In system A, the component of the reference line on which the elementary symbol is placed determines the side of the joint which is to be welded - the dashed line can be drawn above or below the solid line.</p> <p>NOTE 2 In system B, the position of the elementary symbol above or below the reference line determines the side of the joint on which the weld is made</p> |   |  |  |

#### 4.7.2.2 Plug, spot, seam and projection welds

The arrow line shall point to and be in contact with the outer surface of one of the joint members, at the centreline of the required weld.

In the case of welds made at the interface between two members, the elementary symbol shall be placed centrally on the reference line (see [Table A.2](#)) and there is no arrow side/other side relevance. In this case, the dashed reference line may be omitted from system A welding symbols.

**4.7.2.2A Projection welds — System A:** The arrow line shall point to the sheet containing the projection and the elementary symbol shall be placed centrally on the reference line (see [Table A.2](#)). The projection welding process shall be clearly identified e.g. in the tail (e.g. ISO 4063 Process 23 or ISO 4063-23).

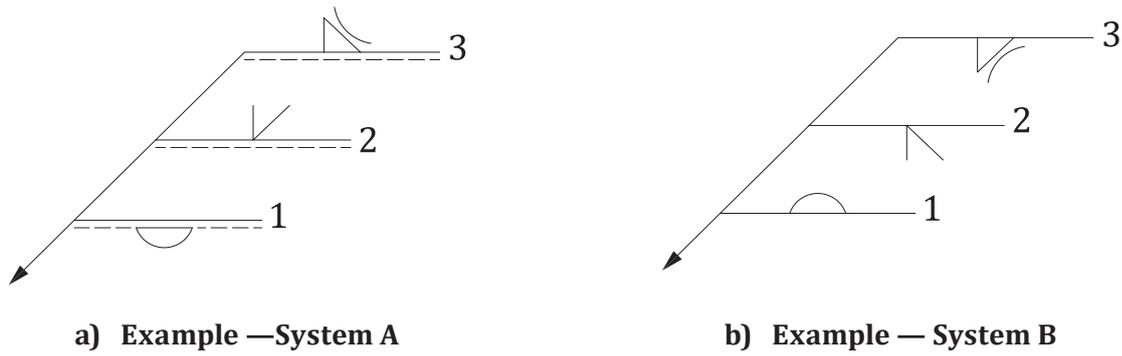
**4.7.2.2B Projection welds — System B:** The arrow line shall point to the sheets to be welded and the elementary symbol shall be placed above or below the reference line to designate which sheet contains the projection (see [Table A.2](#)). The projection welding process shall be identified e.g. in the tail (e.g. PW).

#### 4.7.3 Multiple reference lines

Two or more reference lines can be used to indicate a series of operations. The first operation shall be specified on the reference line closest to the arrowhead. Subsequent operations shall be specified sequentially on the other reference lines (see [Figure 5](#)).

For joints with spacers, the symbol for the spacer shall appear on the reference line nearest to the arrow

NOTE For joints requiring more than one weld type, combined symbols can also be used (see [Table 2](#)).



**Key**

- 1 first operation
- 2 second operation
- 3 third operation

NOTE 1, 2 and 3 are shown to indicate the order of the welding operations and are not included on drawings.

**Figure 5 — Multiple reference lines**

**4.8 Tail**

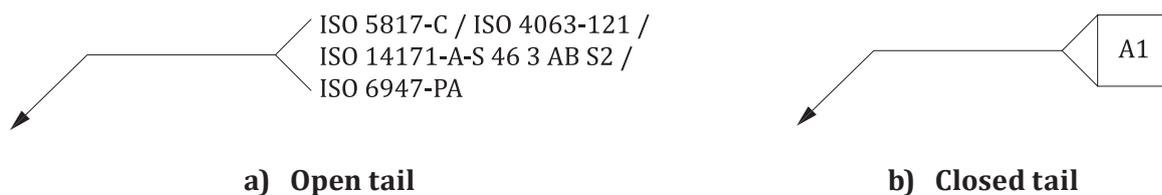
The tail is an optional element which may be added to the end of the continuous reference line (see [Figure 6](#)) where additional complementary information is included as part of the welding symbol, for example:

- a) quality level, for example in accordance with ISO 5817, ISO 10042, ISO 13919, etc.;
- b) the welding process, for example reference number in accordance with ISO 4063 or abbreviation;
- c) filler material, for example in accordance with ISO 14171, ISO 14341, etc.;
- d) welding position for example in accordance with ISO 6947;
- e) supplementary information to be considered when making the joint.

The information shall be listed and separated by a forward slash (/), [see [Figure 6](#) a)].

A closed tail shall only be used to indicate reference to a specific instruction, e.g. reference to a welding procedure specification (WPS), welding procedure qualification record (WPQR) or other document [see [Figure 6](#) b)].

Repetition of the same information in the tail on multiple welding symbols shall be avoided. A single general note on the drawing shall be used instead.



**a) Open tail**

**b) Closed tail**

**Figure 6 — Examples of the use of a tail on welding symbols**

## 5 Dimensioning of welds

### 5.1 General

Dimensions shall be specified on the same side of the reference line as the associated elementary symbol (see [Table 6](#) and [Figure A.1](#)).

Drawings shall clearly indicate the units of measurement. Dual units of measure shall be avoided. If it is desired to show conversions from one system of measure to another, a table of conversions should be included on the drawing.

### 5.2 Cross-sectional dimensions

Cross-sectional dimensions shall be placed to the left of the elementary symbol. Letters shall only be combined with cross-sectional dimensions for fillet welds (see [5.5](#)).

### 5.3 Length dimensions

#### 5.3.1 General

Nominal weld length dimensions shall be placed to the right of the elementary symbol.

In the absence of a length dimension, the weld shall be continuous along the entire length of the joint except when using the weld from point to point symbol where the weld extends only between the identified points.

Start and end points of welds that are not continuous along the entire length of the joint shall not be part of the welding symbol but indicated clearly as part of the drawing.

#### 5.3.2 Intermittent welds

##### 5.3.2.1 General

Dimensions of intermittent welds shall be placed to the right of the elementary symbol (see [Table 6](#)):

- a) number of weld elements,  $n$ ;
- b) length of each weld element,  $l$ ;
- c) spacing between weld elements,  $e$  (in parentheses).

A multiplication symbol shall be placed between the number of elements,  $n$ , and the length of the weld elements,  $l$ . If the number of weld elements is not specified, the intermittent weld shall be made along the whole length of the joint.

NOTE Other methods, commonly used by Pacific Rim countries, for designating intermittent welds are shown in [Annex C](#).

##### 5.3.2.2 Chain intermittent welds

For chain intermittent welds, all information shall be included for welds on both sides of the joint.

##### 5.3.2.3 Staggered intermittent welds

Staggered intermittent welds shall be designated using the "Z" symbol across the reference line (see [Table 3](#), No. 13) and shall include all information for welds made on both sides of the joint. In the absence of any information concerning the offset, the centres of the weld elements on one side of the joint shall correspond with the centres of the gaps on the opposite side of the joint. Otherwise, the offset shall be specified in the tail or elsewhere.

#### 5.3.2.4 Extent of welding

Additional weld lengths at the ends of intermittent welds shall be specified using separate welding symbols.

Un-welded lengths at the ends of intermittent welds shall be specified on the drawing.

### 5.4 Butt welds

#### 5.4.1 Penetration depth

The required penetration depth shall be placed to the left of the elementary symbol (see [Table 6](#), No. 1).

In the absence of any cross-sectional dimension, butt welds shall always be full penetration.

Where joint geometry or joint preparation are not specified, an alternative symbol can be used to represent butt welds on drawings by specifying the required weld quality — see [Clause 7](#).

Where a specified root reinforcement is required, the minimum dimension of the root reinforcement shall be placed to the left of the root reinforcement symbol (see [Figure 3](#)).

#### 5.4.2 Double-sided welds

In double-sided butt welds, each weld shall be separately dimensioned.

NOTE Full penetration symmetrical butt welds do not need to be dimensioned.

#### 5.4.3 Flanged butt welds

Flanged butt welds are always full penetration welds (the raised edges are completely melted). These welds require no dimensioning.

#### 5.4.4 Flare bevel and flare-V butt welds

Flare bevel and flare-V butt welds shall always be dimensioned. Examples of how to dimension these types of weld are given in [Table 6](#), No. 1.6 and No. 1.7.

### 5.5 Fillet welds

#### 5.5.1 Weld size

The letter, *a*, nominal throat thickness, or *z*, leg length, shall be placed in front of the dimension to the left of the elementary symbol (see [Table 6](#), No. 2.1).

For fillet welds with unequal leg lengths the dimensions of each leg shall be included, preceded by the letter *z*, e.g.  $z_14 z_28$  (see [Table 6](#), No. 2.3). If the required leg lengths cannot be identified clearly using the welding symbol, additional sketches or indications shall be given on the drawing or in other documents.

For fillet welds made on both sides of a joint, the dimensions of both welds shall be specified even if they are identical (symmetrical).

#### 5.5.2 Deep penetration fillet welds

The letter, *s*, shall be placed in front of the required deep penetration throat thickness. This shall be placed in front of the nominal throat thickness, *a*, and its dimension as shown in [Table 6](#), No. 2.2.

## 5.6 Plug welds in circular holes

The diameter symbol,  $d$ , shall be placed in front of the required hole diameter at the faying surface, and to the left of the plug weld symbol (see [Table 6](#), No. 3).

If plug welds in circular holes are to be partially filled, the depth of filling shall be indicated inside the elementary symbol. In the absence of a depth dimension, the plug shall be completely filled (see [Table 6](#), No. 3.1 and No. 3.2).

Plug welds in circular holes in series shall be designated additionally with the number, and centre-to-centre spacing of welds to the right of the elementary symbol (see [Table 6](#), No. 3.3).

NOTE The plug weld symbol is not used to designate fillet welds in holes (slot welds).

## 5.7 Plug welds in elongated holes (slots)

The width symbol,  $c$ , shall be placed in front of the required elongated hole width at the faying surface, and to the left of the plug weld symbol (see [Table 6](#), No. 4). The orientation of elongated holes shall be shown on the drawing or indicated elsewhere.

If plug welds in elongated holes are to be partially filled, the depth of filling shall be indicated inside the elementary symbol (see [Table 6](#), No. 4.2). In the absence of a depth dimension, the hole shall be completely filled.

Plug welds in elongated holes in series shall be designated additionally with the number, length and spacing of weld elements to the right of the elementary symbol (see [Table 6](#), No. 4.3).

NOTE The plug weld symbol is not used to designate fillet welds in elongated holes (slot welds).

## 5.8 Spot welds

The required spot weld diameter at the faying surface,  $d$ , shall be placed to the left of the spot weld symbol (see [Table 6](#), No. 5).

Welds in series shall be designated with the number, and spacing of welds to the right of the elementary symbol (see [Table 6](#), No. 5.1 and No. 5.2).

## 5.9 Seam welds

The required weld width,  $c$ , at the faying surface, shall be placed to the left of the seam weld symbol (see [Table 6](#), No. 6).

Intermittent welds shall be additionally designated with the number, length and spacing of weld elements to the right of the elementary symbol (see [Table 6](#), No. 6.1).

## 5.10 Edge welds

The required weld metal thickness of the edge weld shall be placed to the left of the edge weld symbol (see [Table 6](#), No. 7).

## 5.11 Stud welds

The required stud diameter,  $d$ , shall be placed to the left of the stud weld symbol (see [Table 6](#), No. 8).

Welds in series shall be designated with their number and spacing to the right of the elementary symbol.

## 5.12 Overlay welds

The required overlay thickness shall be placed to the left of the overlay welding symbol (see [Table 6](#), No. 9).

### 5.13 Stake welds

The required stake weld size at the faying surface shall be placed to the left of the stake welding symbol (see [Table 6](#), No. 5.3).

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Table 6 — Weld dimensions

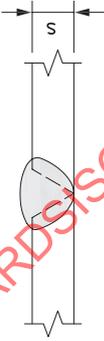
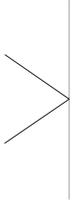
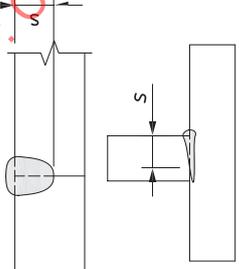
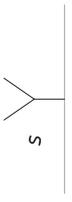
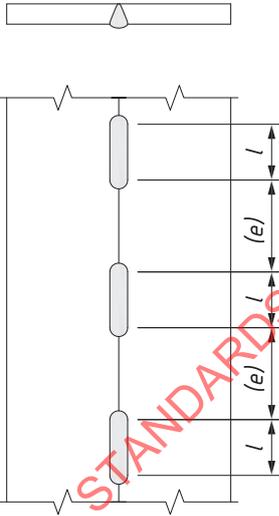
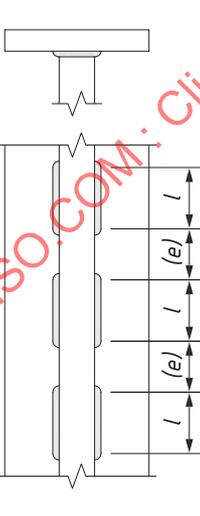
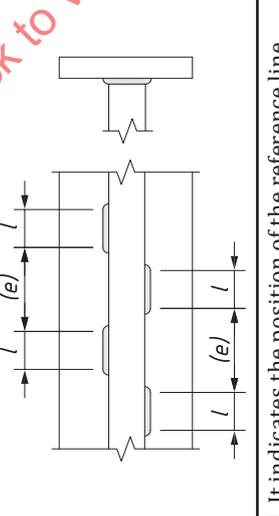
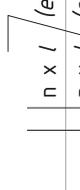
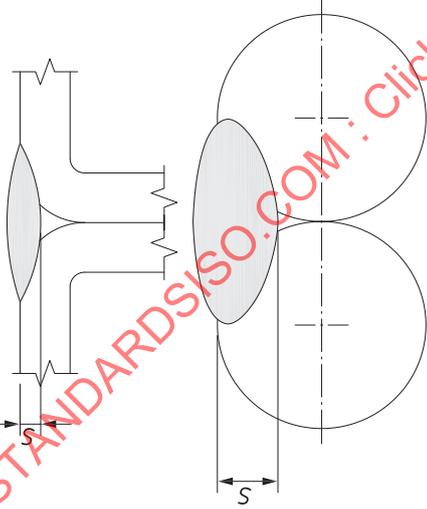
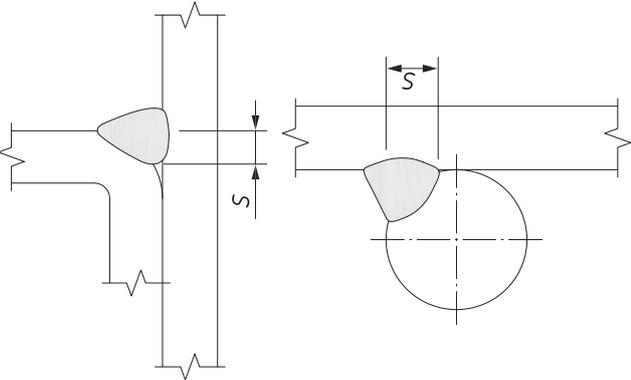
| No.          | Weld type   | Illustration  | Symbol <sup>a</sup>   | Comments   |
|--------------|---|---|---|--|
| 1            | <b>BUTT</b>   |   |   |  |
| 1.1          | Full penetration  |  |  | <p>s, penetration depth</p> <p>No dimension to the left of the elementary symbol indicates butt welds shall be full penetration.</p> <p>No dimension to the right of the elementary symbol indicates butt welds shall be continuous.</p> |
| 1.2          | Partial penetration   |  |  | <p>s, penetration depth</p> <p>Letter s to be replaced by required dimension.</p> <p>No dimension to the right of the elementary symbol indicates butt welds shall be continuous.</p>  |
| <sup>a</sup> | The grey line is not part of the symbol. It indicates the position of the reference line. |   |   |  |

Table 6 (continued)

| No. | Weld type              | Illustration   | Symbol <sup>a</sup>   | Comments  |
|-----|------------------------|--|---|---|
| 1.3 | Intermittent           |   |  | <p><math>n</math>, number of weld elements<br/> <math>l</math>, nominal length of weld elements<br/> <math>e</math>, distance between weld elements</p>   |
| 1.4 | Chain intermittent     |   |  | <p><math>n</math>, <math>l</math> and <math>e</math> to be replaced by required values.<br/>         No dimension to the left of the elementary symbol indicates the welds shall be full penetration.</p> |
| 1.5 | Staggered intermittent |  |  |   |

<sup>a</sup> The grey line is not part of the symbol. It indicates the position of the reference line.

Table 6 (continued)

| No. | Weld type   | Illustration   | Symbol <sup>a</sup>   | Comments   |
|-----|-------------|--|---|--|
| 1.6 | Flare V     |   |    |  |
| 1.7 | Flare bevel |  |  | <p>s, penetration depth<br/>                     Letter s to be replaced by<br/>                     required dimension.</p> |

<sup>a</sup> The grey line is not part of the symbol. It indicates the position of the reference line.

Table 6 (continued)

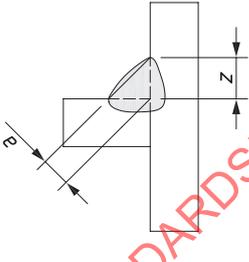
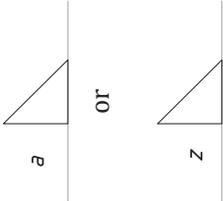
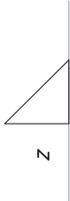
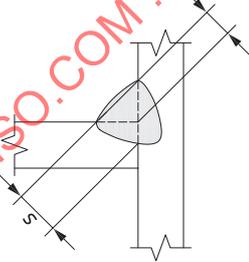
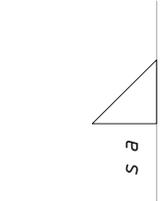
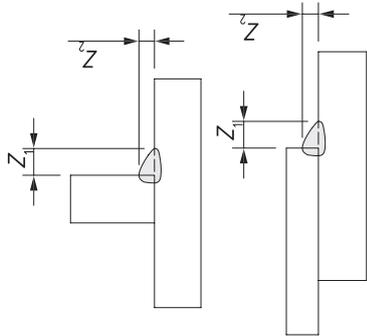
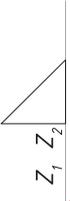
| No. | Weld type        | Illustration   | Symbol <sup>a</sup>   | Comments   |
|-----|------------------|--|---|--|
| 2   | <b>FILLET</b>    |  |   |  |
| 2.1 | Fillet           |   |  <p>or</p>  | <p><math>a</math>, nominal throat thickness<br/> <math>z</math>, leg length<br/> <math>a</math> and <math>z</math> are to be included on the welding symbol with the required values.</p>  |
| 2.2 | Deep penetration |   |    | <p><math>s</math>, deep penetration throat thickness<br/> <math>s</math> and <math>a</math> are to be included on the welding symbol with the required values.</p>   |
| 2.3 | Unequal legs     |  |   | <p><math>z_1 \neq z_2</math><br/> <math>z_1</math> and <math>z_2</math> are to be included on the welding symbol with the required leg lengths, e.g. <math>z_{14}</math> <math>z_{28}</math>.<br/>                     If the required leg lengths cannot be identified clearly using the welding symbol, additional sketches or indications are to be given on the drawing or in other documents.</p> |
|     |                  |  |   | <p><sup>a</sup> The grey line is not part of the symbol. It indicates the position of the reference line.</p>  |

Table 6 (continued)

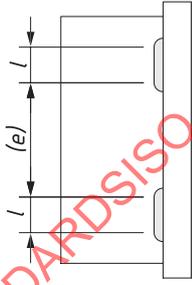
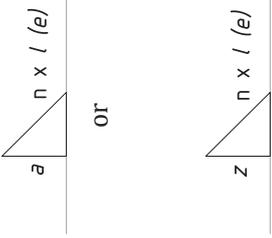
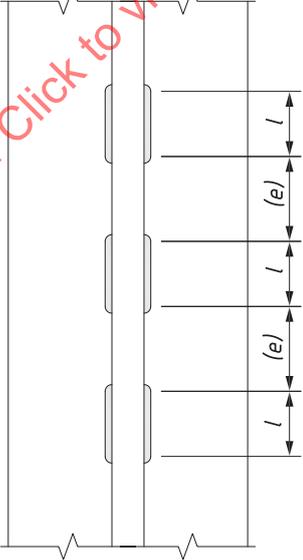
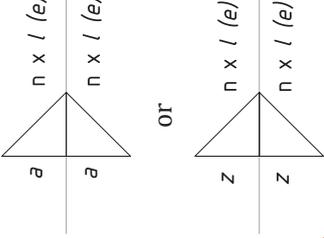
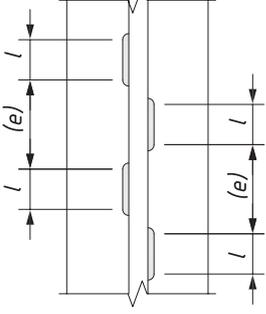
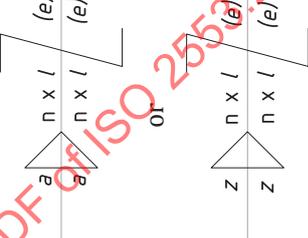
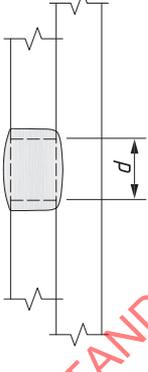
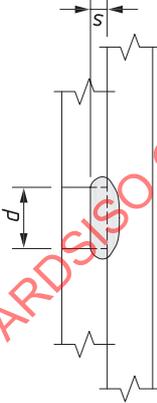
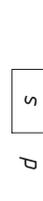
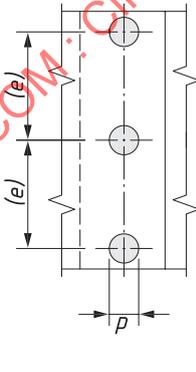
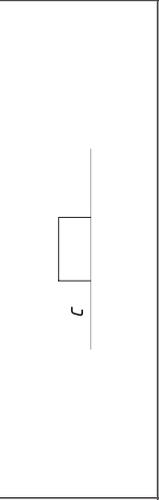
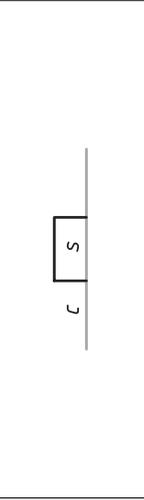
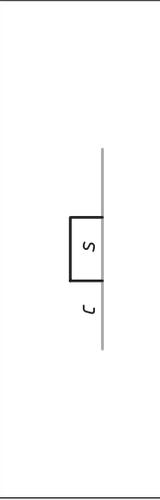
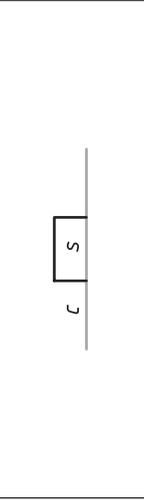
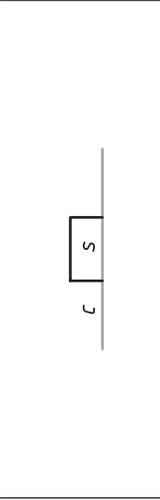
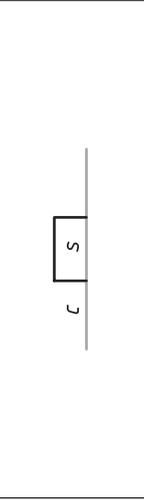
| No.   | Weld type              | Illustration  | Symbol <sup>a</sup>   | Comments  |
|---|------------------------|---|---|---|
| 2.4   | Intermittent           |    |    | <p><math>n</math>, number of weld elements<br/> <math>l</math>, nominal length of weld elements<br/> <math>e</math>, distance between weld elements<br/> <math>a</math> or <math>z</math> are to be included on the welding symbol with the required value.<br/> <math>n</math>, <math>l</math> and <math>e</math> to be replaced by required values.</p> |
| 2.5   | Chain intermittent     |    |    | <p><math>n</math>, number of weld elements<br/> <math>l</math>, nominal length of weld elements<br/> <math>e</math>, distance between weld elements<br/> <math>a</math> or <math>z</math> are to be included on the welding symbol with the required value.<br/> <math>n</math>, <math>l</math> and <math>e</math> to be replaced by required values.</p> |
| 2.6   | Staggered intermittent |  |  | <p><math>n</math>, number of weld elements<br/> <math>l</math>, nominal length of weld elements<br/> <math>e</math>, distance between weld elements<br/> <math>a</math> or <math>z</math> are to be included on the welding symbol with the required value.<br/> <math>n</math>, <math>l</math> and <math>e</math> to be replaced by required values.</p> |
| <p><sup>a</sup> The grey line is not part of the symbol. It indicates the position of the reference line.</p> |                        |   |   |   |

Table 6 (continued)

| No.  | Weld type     | Illustration  | Symbol <sup>a</sup>   | Comments   |
|--|---------------|---|---|--|
| <b>3 PLUG WELDS IN CIRCULAR HOLES</b>  |               |   |   |  |
| 3.1  | Complete fill |  |  | $d$ , diameter of the hole at the faying surface   |
| 3.2  | Partial fill  |  |  | $s$ , depth of filling, used if the hole is to be partially filled<br>$e$ , distance between weld elements (centre to centre)                                |
| 3.3  | Intermittent  |  |  | $n$ , number of weld elements<br>$d$ to be included on the welding symbol with the required value.<br>$s$ , $n$ and $e$ , to be replaced by required values. |
| <sup>a</sup> The grey line is not part of the symbol. It indicates the position of the reference line. |               |   |   |  |

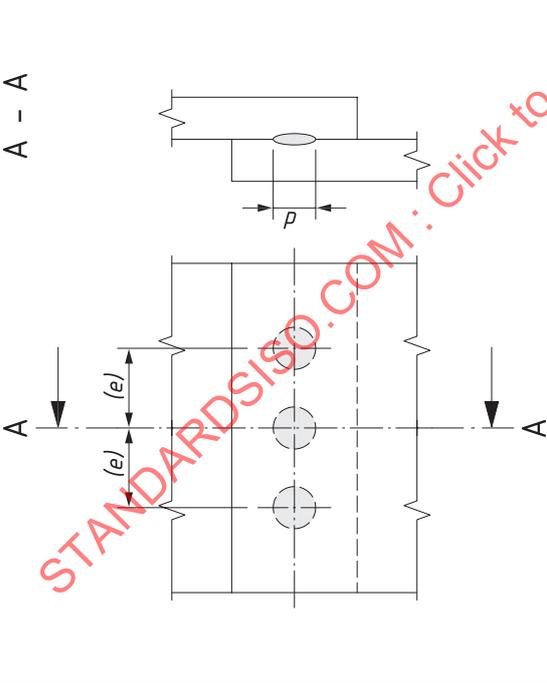
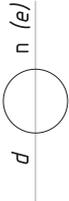
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Table 6 (continued)

| No.  | Weld type     | Illustration   | Symbol <sup>a</sup>  | Comments  |
|--|---------------|--|--|---|
| <b>4 PLUG WELDS IN ELONGATED HOLES (SLOTS)</b> |               |  |  |   |
| 4.1  | Complete fill |  |  | <p><i>c</i>, width of the elongated hole at the faying surface</p>  |
| 4.2  | Partial fill  |  |  | <p><i>s</i>, depth of filling</p> <p><i>n</i>, number of weld elements</p> <p><i>l</i>, nominal length of weld elements</p> <p><i>e</i>, distance between weld elements</p> |
| 4.3  | Intermittent  |  |  | <p><i>c</i> to be included on the welding symbol with the required value</p> <p><i>s</i>, <i>n</i>, <i>l</i> and <i>e</i>, to be replaced by required values.</p>           |

<sup>a</sup> The grey line is not part of the symbol. It indicates the position of the reference line.

Table 6 (continued)

| No. | Weld type       | Illustration  | Symbol <sup>a</sup>   | Comments  |
|-----|-----------------|---|---|---|
| 5   | SPOT            |  |  | <p><math>d</math>, required spot weld diameter at the faying surface</p> <p><math>e</math>, distance between welds (centre to centre)</p> <p><math>n</math>, number of welds</p> <p><math>d</math> to be replaced by the required spot weld diameter.</p> <p><math>n</math> and <math>e</math> to be replaced by required dimensions.</p> |
| 5.1 | Resistance spot |   |   |   |

<sup>a</sup> The grey line is not part of the symbol. It indicates the position of the reference line.

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Table 6 (continued)

| No. | Weld type   | Illustration | Symbol <sup>a</sup> | Comments  |
|-----|-------------|--------------|---------------------|---|
| 5.2 | Fusion spot |              |                     | <p><math>d</math>, required spot weld diameter at the faying surface<br/> <math>e</math>, distance between welds (centre to centre)<br/> <math>n</math>, number of welds<br/> <math>d</math> to be replaced by the required spot weld diameter.<br/> <math>n</math> and <math>e</math> to be replaced by required dimensions.</p> |
| 5.3 | Stake       |              |                     | <p><math>d</math>, required stake weld size at the faying surface</p>   |

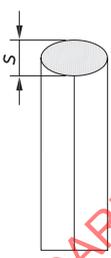
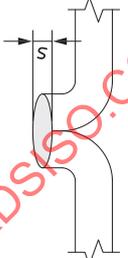
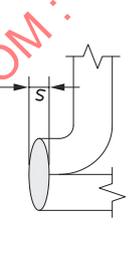
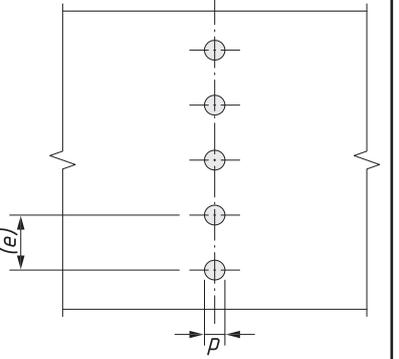
<sup>a</sup> The grey line is not part of the symbol. It indicates the position of the reference line.

Table 6 (continued)

| No. | Weld type                    | Illustration | Symbol <sup>a</sup> | Comments  |
|-----|------------------------------|--------------|---------------------|---|
| 6   | SEAM                         |              |                     |   |
| 6.1 | Intermittent resistance seam |              |                     | <p><math>c</math>, required seam weld width at the faying surface</p> <p><math>n</math>, number of weld elements</p> <p><math>l</math>, nominal length of weld elements</p> <p><math>e</math>, distance between weld elements</p> <p>For continuous resistance seam welds, only the required seam width is specified.</p> |
| 6.2 | Fusion seam                  |              |                     | <p><math>c</math>, required seam weld width at the faying surface</p> <p>Intermittent welds to be designated using <math>n</math>, <math>l</math> and <math>e</math> as for resistance welds.</p>   |

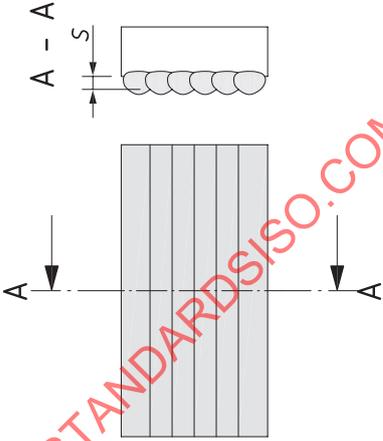
<sup>a</sup> The grey line is not part of the symbol. It indicates the position of the reference line.

Table 6 (continued)

| No. | Weld type             | Illustration   | Symbol <sup>a</sup>   | Comments  |
|-----|-----------------------|--|---|---|
| 7   | <b>EDGE</b>           |  |   |   |
| 7.1 | Edge (lap joint)      |   |  | s, weld metal thickness (minimum distance from the external surface of the weld to the bottom of the penetration) |
| 7.2 | Edge (flanged butt)   |   |   |   |
| 7.3 | Edge (flanged corner) |   |   |   |
| 8   | <b>STUD</b>           |  |   |   |
| 8.1 | Series                |  |  | d, stud size<br>n, number of studs<br>e, distance between studs (centre to centre)                                |

<sup>a</sup> The grey line is not part of the symbol. It indicates the position of the reference line.

Table 6 (continued)

| No. | Weld type      | Illustration  | Symbol <sup>a</sup>   | Comments             |
|-----|----------------|---|---|----------------------|
| 9   | <b>OVERLAY</b> |  |  | s, overlay thickness |
| 9.1 | Overlay        |   |   |                      |

<sup>a</sup> The grey line is not part of the symbol. It indicates the position of the reference line.

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## 6 Dimensioning of joint preparations

### 6.1 General

If required, information concerning the joint dimensions and geometry prior to welding may be included as part of the welding symbol or may be specified elsewhere, e.g. by reference to the relevant part of ISO 9692 or on the WPS.

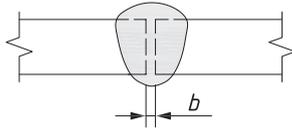
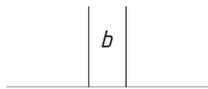
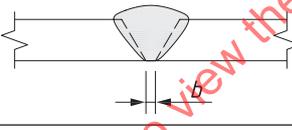
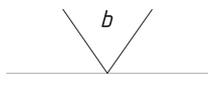
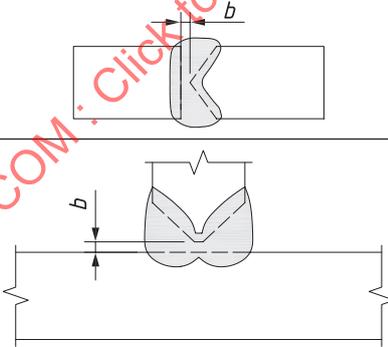
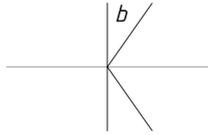
If information on joint dimensions is to be included it should not overburden the drawings. Reference to other documents should be considered instead of including this information as part of the symbol.

### 6.2 Root gap

The root gap,  $b$ , of a butt joint may be specified inside the elementary symbol (see [Table 7](#)).

The root gap shall only be shown on one side of the reference line.

Table 7 — Examples of designating root gap

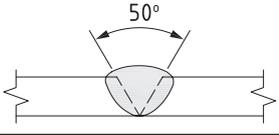
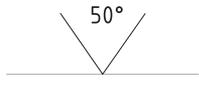
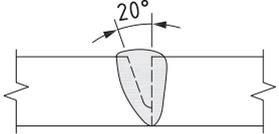
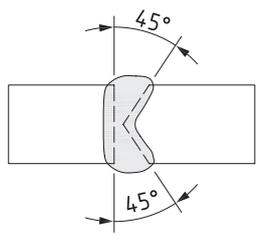
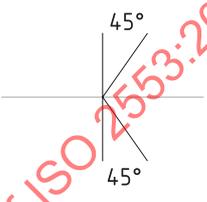
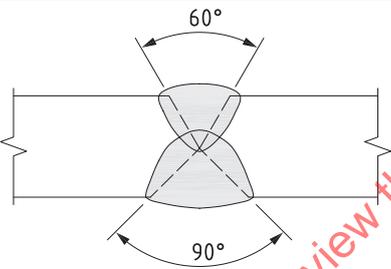
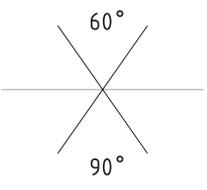
| No. | Weld type         | Illustration  | Symbol  |
|-----|-------------------|---|---|
| 1   | Square butt       |   |    |
| 2   | V butt            |  |  |
| 3   | Double bevel butt |  |  |

### 6.3 Included angle

The angle (groove angle),  $\alpha$ , of a butt joint may be specified outside the elementary symbol (see [Table 8](#)).

For double-sided joints, including symmetrical joints, the angle(s) shall be shown on both sides of the welding symbol.

Table 8 — Examples of designating angle

| No. | Weld type                       | Illustration   | Symbol   |
|-----|---------------------------------|--|--|
| 1   | V butt                          |   |   |
| 2   | J butt                          |   |   |
| 3   | Double bevel butt (symmetrical) |   |   |
| 4   | Double V butt (asymmetrical)    |  |  |

**6.4 Root radius and depth of root faces — U and J butt joints**

The radii and dimensions of root faces of U and J butt joints are not to be specified as part of welding symbols and shall be specified elsewhere, in a cross-section, detail, or other data e.g. the relevant part of ISO 9692 referenced in the tail of the welding symbol.

**6.5 Depth of joint preparation**

The depth of joint preparation of V-, single-bevel-, U-, and J-butt, joints can be specified to the left of the elementary symbol. The depth of joint preparation preceded by the letter *h* shall be followed by the required penetration depth preceded by the letter *s* (see Table 9).

NOTE The depth of the joint preparation can be greater than, equal to, or smaller than the weld penetration.

Table 9 — Examples of designating joint preparation depth

| No. | Weld type     | Illustration <sup>a</sup> | Symbol <sup>a</sup>   |
|-----|---------------|---------------------------|---|
| 1   | V butt        |                           | <p><i>h</i> and <i>s</i> are to be included on the welding symbol with the required values, e.g. <i>h6s8</i>.</p>   |
| 2   | Double V butt |                           | <p><i>h</i> and <i>s</i> are to be included on the welding symbol with the required values, e.g. <i>h6s8</i>.</p>   |
|     |               |                           | <p><i>h</i> to be included on the welding symbol with the required values, e.g. <i>h6</i>.<br/><i>s</i> may be included on the welding symbol with the required values, e.g. <i>h6s8</i> but full penetration symmetrical butt welds do not need to be dimensioned (see 5.4.2).</p> |

<sup>a</sup> Root face in illustrations exaggerated to illustrate use of *h* and *s*.

### 6.6 Countersink angle for plug welds

The included angle of countersink of holes for plug welds may be indicated by placing the required dimension above the elementary symbol (see Table 10).

Table 10 — Countersink angle in plug welds

| No. | Weld type                     | Symbol <sup>a</sup> | Illustration |
|-----|-------------------------------|---------------------|--------------|
| 1   | Plug in circular hole         |                     |              |
| 2   | Plug in elongated hole (slot) |                     |              |

<sup>a</sup> *c* and *d* are measured at the faying surface (see 5.6 and 5.7) and shall be indicated on the drawing in accordance with Table 6, No. 3 and No. 4.

## 7 Alternative butt weld symbol with required weld quality

### 7.1 General

The alternative symbol shown in Table 11 can be used to represent butt welds by only specifying the required weld quality. All additional information shall be designated in accordance with this document.

When using this method, the joint preparation and welding process(es) are determined by the production unit to meet the specified weld quality.

NOTE All other information is specified in the WPS or other documentation based on the available equipment. Different WPSs can be used in other workshops with different equipment but the technical drawing will not need to be revised for each workshop.

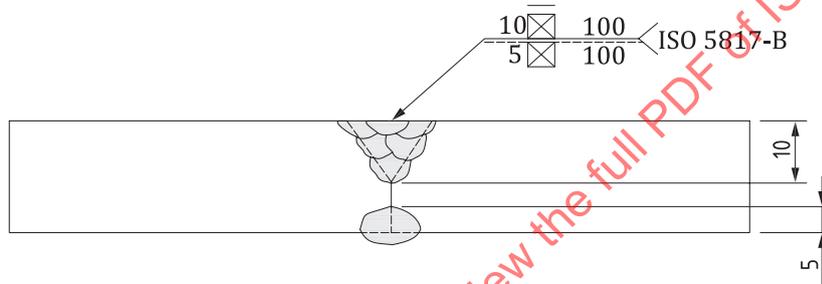
**Table 11 — Alternative simplified butt weld symbol**

| Symbol  | Description                                      |
|---|--|
|  | Butt weld where joint preparation is not defined |

**7.2 Example**

An example of a welding symbol based on required weld quality is shown in [Figure 7](#).

Full penetration welds shall not be dimensioned (see [Clause 5](#)).



NOTE Example is in accordance with system A. For system B, the dashed line is to be omitted.

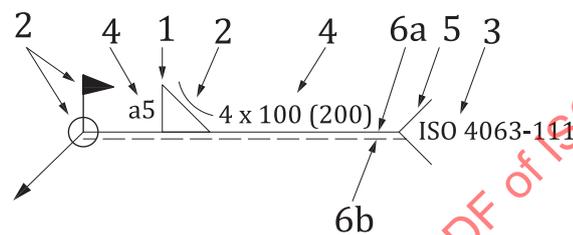
**Figure 7 — Example of a welding symbol including required weld quality**

## Annex A (informative)

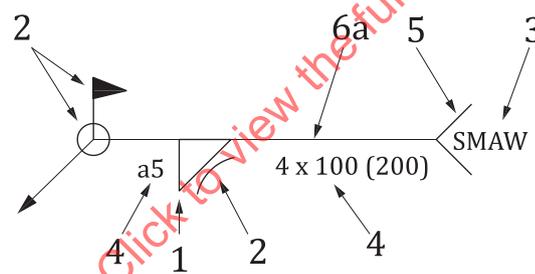
### Examples of the use of welding symbols

The examples given in [Annex A](#) are illustrative only and are intended to demonstrate the proper application of drawing principles. They are not intended to represent good design practices, or to replace code or specification requirements.

[Figure A.1](#) shows examples of comprehensive welding symbols showing the location of weld elements.



a) System A



b) System B

#### Key

- 1 elementary symbol (fillet weld)
- 2 supplementary symbol (concave fillet weld contour, field weld, weld-all-around)
- 3 complementary information (shielded metal arc welding (SMAW)/process 111 in accordance with ISO 4063)
- 4 dimensions (5 mm nominal throat thickness intermittent fillet weld, composing 4 weld elements 100 mm in length with 200 mm spacing between elements)
- 5 tail
- 6a reference line (continuous)
- 6b dashed line (system A only)

NOTE Both a) and b) designate the same intermittent fillet weld, made in the field, on the arrow side of the joint: 5 mm nominal throat thickness, composing 4 weld elements 100 mm in length with 200 mm spacing between weld elements.

**Figure A.1 — Examples of comprehensive welding symbols**

[Tables A.1](#) to [A.3](#) give examples of the use of welding symbols. In system A the dashed component of the reference line can be drawn above or below the continuous line (see [4.7.2.1 A](#)). The examples show the preferred case where the dashed line is drawn below the continuous line.

Table A.1 — Examples of use of broken arrow lines

| No. | System A welding symbol | Illustration of weld | System B welding symbol |
|-----|-------------------------|----------------------|-------------------------|
| 1   |                         |                      |                         |
| 2   |                         |                      |                         |
| 3   |                         |                      |                         |

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Table A.2 — Examples of arrow side and other side welds

| No.  | Weld type                           | Side  | System A welding symbol | Illustration of weld | System B welding symbol |
|--|-------------------------------------|-------|-------------------------|----------------------|-------------------------|
| 1  | Single bevel butt                   | Arrow |                         |                      |                         |
|  | Fillet                              | Other |                         |                      |                         |
|  | Single J butt                       | Arrow |                         |                      |                         |
|  | Single bevel butt (broad root face) | Other |                         |                      |                         |
| 2 a)   | Single-V butt                       | Arrow |                         |                      |                         |
|  | Single-V butt                       | Other |                         |                      |                         |
| 2 b)   | Single-V butt                       | Other |                         |                      |                         |
| <p>a Plug welds in circular holes require inclusion of the letter, <i>d</i>, with the dimension of the required hole diameter at the faying surface.</p> <p>b Plug welds in elongated holes (slots) require inclusion of the letter, <i>c</i>, with the dimension of the required width of the elongated hole at the faying surface. Orientation of the slot is to be shown on the drawing or indicated elsewhere.</p> |                                     |       |                         |                      |                         |