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

Soudage et techniques connexes — Représentations symboliques sur les dessins — Joints soudés

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Foreword

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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. www.iso.org/directives

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The committee responsible for this document is ISO/TC *Welding and allied processes*, Subcommittee SC 7, *Representation and terms*.

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This fourth edition cancels and replaces the third edition (ISO 2553:1992), which has been technically revised.

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Introduction

The symbols given in this standard 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 given in this standard. The principals of this standard can be applied to brazed and soldered joints.

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

Preparation for production may require detailed welding-related planning. The type of representation described in this standard can be used for this purpose and complemented by additional production-related information (e.g. welding position, welding process, WPS, weld 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 should be prepared and checked by specially trained personnel (see ISO 14731).

This edition of ISO 2553 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 International Standard. The approach in accordance with system A is based on ISO 2553:1992. The approach in accordance with system B is based upon standards used by Pacific Rim countries.

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

1 Scope

This International Standard defines the rules to be applied for symbolic representation of welded joints on technical drawings. This may include information about the geometry, manufacture, quality and testing of the welds. The principles of this standard may 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 Interational Standard:

— 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 International Standard may be combined with other symbols used on technical drawings, for example to show surface finish requirements.

An alternative designation method is presented which may 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.

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NOTE Examples given in this International Standard, including dimensions, are illustrative only and are intended to demonstrate the proper application of principles. They are not intended to represent good design practices, or to replace code or specification requirements.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 drawings — Indication of dimensions and tolerances — Part 1: General principles*

ISO 1302, *Geometrical Product Specifications (GPS) — Indication of surface texture in technical product documentation*

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 25901:2007, *Welding and related processes — Vocabulary*

3 Terms and definitions

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

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3.1
welding symbol
symbol consisting of an arrow line and a reference line and which may also include elementary and supplementary symbols, dimensions and/or tail, used on technical drawings to indicate welded joint type, location and joint preparation

Note 1 to entry: See Clause 4.

3.2
basic welding symbol
symbol consisting of an arrow line, reference line 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 the joint that is to be welded generally drawn at 135° to the reference line

Note 1 to entry: See 4.6.

3.4
reference line
part of the welding symbol on which the elementary symbol is located, generally drawn parallel to the bottom edge of the drawing

Note 1 to entry: See 4.7.

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3.5
tail
V shaped element added to the end of the continuous reference line away from the arrow line

Note 1 to entry: See 4.8.

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3.6
arrow side
side of the joint to which the arrow line is pointing

Note 1 to entry: See 4.7.2.1.

3.7
other side
opposite side of the joint to the arrow side

Note 1 to entry: See 4.7.2.1.

3.8
elementary symbol
symbol forming part of the welding symbol and drawn on the reference line 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 to convey additional information about the joint

Note 1 to entry: See 4.5.

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3.10
complementary information
non-symbolic information, relevant to the welds being made, which may be included in the tail of the welding symbol

Note 1 to entry: See 4.8.

3.11
intermittent weld
series of weld elements made at intervals along a joint

[SOURCE: ISO/TR 25901:2007]

Note 1 to entry: See 5.3.2.

3.11.1
chain intermittent weld
intermittent weld on each side of a joint (usually fillet welds in T and lap joints) arranged so that the welds lie opposite one another along the joint

Note 1 to entry: See 5.3.2.2.

3.11.2
staggered intermittent weld
intermittent weld on each side of a joint (usually fillet welds in T and lap joints) arranged so that the welds on one side lie opposite to the spaces on the other side along the joint

Note 1 to entry: See 5.3.2.3.

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3.12
offset
distance between the start of welding on one side of a staggered intermittent weld made on both sides of the joint and the start of welding on the other side

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Note 1 to entry: See 5.3.2.3, Table 3 and Table 5, No 2.6.

3.13
back run
final run deposited on the root side of a fusion weld

3.14
backing weld
backing in the form of a weld

3.15
nominal weld length
design length of a weld

3.15.1
nominal length of weld elements
in intermittent welds, the design length of the elements of the weld

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: Other design throat thicknesses may be used, but need to be specified.

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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

3.18
penetration depth
<butt welds> thickness of the weld metal excluding any reinforcement

3.19
deep penetration throat thickness
s
<fillet welds> nominal or effective throat thickness to which a certain amount of fusion penetration is added

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 5.

3.21
flare-V weld
butt weld between two members with curved surfaces

Note 1 to entry: See Table 5.

3.22
field weld
weld made outside workshops usually at the place of final installation

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4 Welding symbol

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4.1 General

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

It is preferable that the welding symbol is shown on the same side of the joint that the weld is to be made, i.e. the arrow side (see 4.6).

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

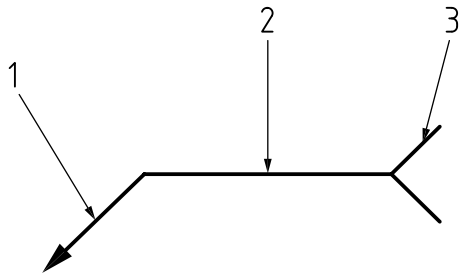
In order not to overburden drawings, reference should be made to notes in the drawing or other design-related documents.

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 4.6.1A) as no details concerning the weld are being conveyed.

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

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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 International standard 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, can 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.

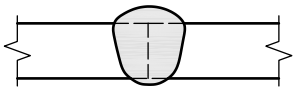
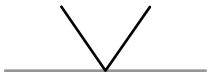
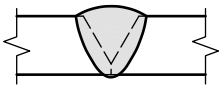
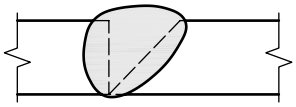
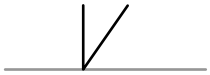
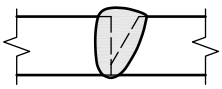
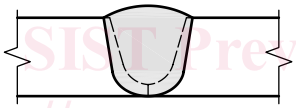
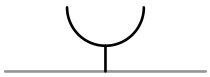
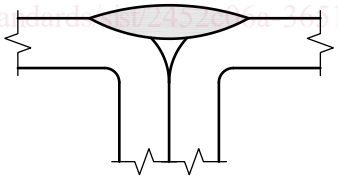
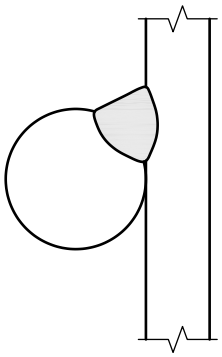
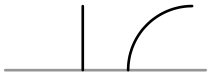
The orientation of the elementary symbols shall not be changed to that shown.

Annex B gives guidance on tolerances and transition points for butt welds, edge welds and fillet welds.

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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	Illustration (dashed lines show joint preparation prior to welding)	Symbol[a]
1	Square butt[b]		
2	Single-V butt[b]		
3	Single-V butt with broad root face[b]		
4	Single-bevel butt[b]		
5	Single-bevel butt with broad root face[b]		
6	Single-U butt [b]		
7	Single-J butt[b]		
8	Flare V		
9	Flare bevel		

[a] The grey line is not part of the symbol. It indicates the position of the reference line.

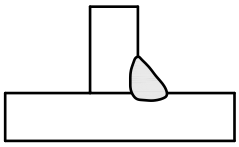
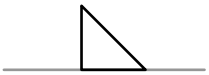
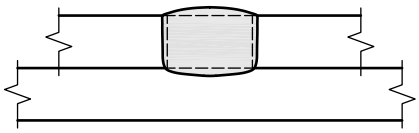
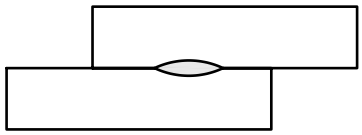
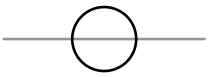
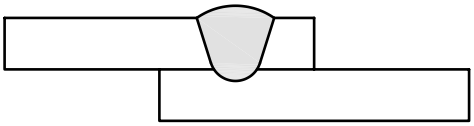
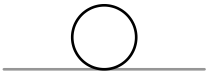
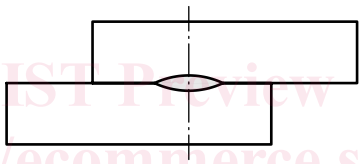
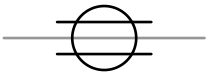
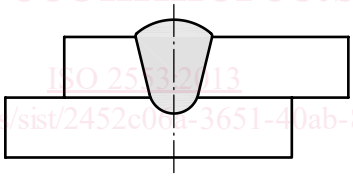
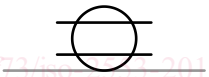
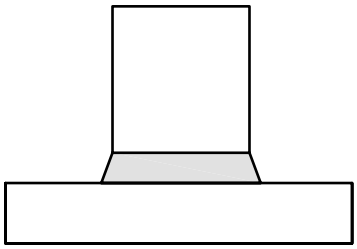
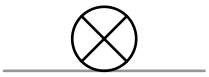
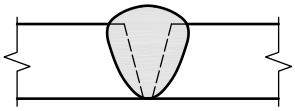
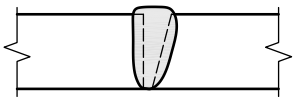
[b] Butt welds are full penetration unless otherwise indicated by dimensions on the welding symbol or by reference to other information, for example the WPS.

[c] May be used for joints with more than 2 members.

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Table 1 *(continued)*

No.	Designation	Illustration (dashed lines show joint preparation prior to welding)	Symbol[a]
10	Fillet		
11	Plug (in slots or circular holes)		
12	Resistance spot (including projection welding in system A)		
13	Fusion spot (and projection welding in system B)		
14	Resistance seam		
15	Fusion seam		
16	Stud		
17	Steep-flanked single-V butt[b]		
18	Steep-flanked single-bevel butt[b]		

[a] The grey line is not part of the symbol. It indicates the position of the reference line.

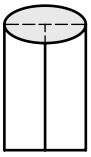
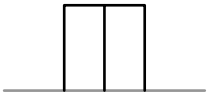
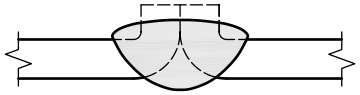
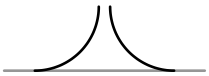
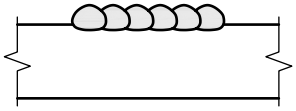
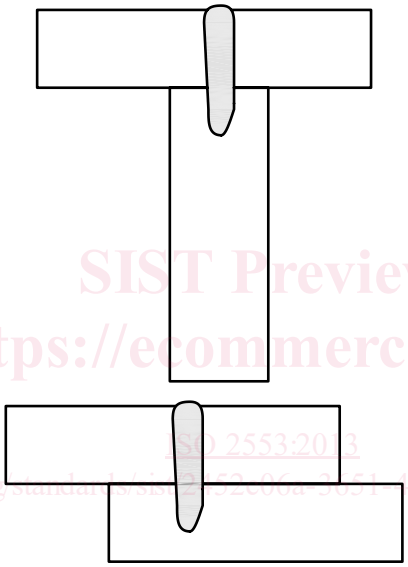
[b] Butt welds are full penetration unless otherwise indicated by dimensions on the welding symbol or by reference to other information, for example the WPS.

[c] May be used for joints with more than 2 members.

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Table 1 *(continued)*

No.	Designation	Illustration (dashed lines show joint preparation prior to welding)	Symbol[a]
19	Edge[c]		
20	Flanged butt/corner weld		
21	Overlay		
22	Stake[c]		

[a] The grey line is not part of the symbol. It indicates the position of the reference line.

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

[c] May be used for joints with more than 2 members.

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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

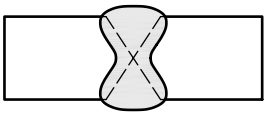
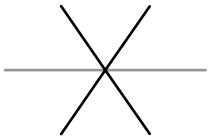
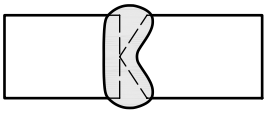
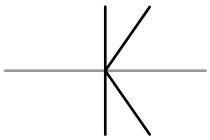
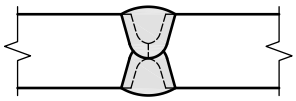
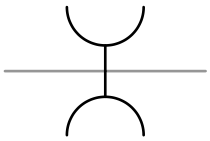
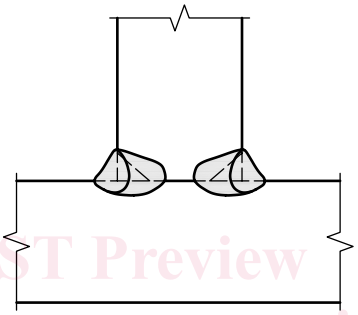
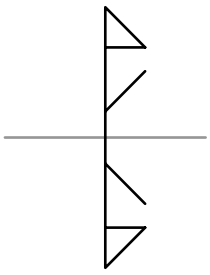
The elementary symbols shall be arranged opposite each other on the reference line, including all required information, when used to represent symmetrical welds.

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.

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

No.	Weld type	Illustration of weld[a]	Symbol[b]
1	Double-V butt		
2	Double bevel butt		
3	Double-U butt		
4	Double bevel butt (with broad root face) and fillet welds		

[a] Welds may be partial or full penetration which is to be indicated by dimensions on the welding symbol (see Table 5) or by reference to other information, for example the WPS.

[b] The grey line is not part of the symbol. It indicates the position of the reference line.

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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.

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