
Welding — Recommendations for welding of metallic materials —

Part 1: General guidance for arc welding

*Soudage — Recommandations pour le soudage des matériaux
métalliques —
Partie 1: Lignes directrices générales pour le soudage à l'arc*

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this part of ISO/TR 17671 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TR 17671-1 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 10, *Unification of requirements in the field of metal welding*.

ISO/TR 17671 consists of the following parts, under the general title *Welding — Recommendations for welding of metallic materials*:

- *Part 1: General guidance for arc welding*
- *Part 2: Arc welding of ferritic steels*
- *Part 3: Arc welding of stainless steels*
- *Part 4: Arc welding of aluminium and aluminium alloys*

Introduction

ISO/TR 17671 is being issued in several parts in order that it may be extended to cover the different types of metallic materials which will be produced to all International Standards for weldable metallic materials.

This part of ISO/TR 17671 gives general guidance for the satisfactory production and control of welding, and details some of the possible detrimental phenomena which may occur, with advice on methods by which they may be avoided. It is generally applicable to fusion welding of metallic materials and is appropriate regardless of the type of fabrication involved, although the application standard or design specification can have additional requirements. More information is contained in other parts of ISO/TR 17671. Permissible design stresses in welds, methods of testing and acceptance levels are not included because they depend on the service conditions of the fabrication. These details should be obtained from the relevant application standard or design specification.

It has been assumed in the drafting of this part of ISO/TR 17671 that the execution of its provisions is entrusted to appropriately qualified, trained and experienced personnel.

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Welding — Recommendations for welding of metallic materials —

Part 1: General guidance for arc welding

1 Scope

This part of ISO/TR 17671 gives general guidance for fusion welding of metallic materials in all forms of product (e.g. cast, wrought, extruded, forged).

The processes and techniques referred to in this part of ISO/TR 17671 may not all be applicable to all materials. Additional information relevant to specific materials is given in the relevant parts of ISO/TR 17671.

2 References

ISO 2553, *Welded, brazed and soldered joints — Symbolic representation on drawings*

ISO 3834-1, *Quality requirements for welding — Fusion welding of metallic materials — Part 1: Guidelines for selection and use*

ISO 3834-2, *Quality requirements for welding — Fusion welding of metallic materials — Part 2: Comprehensive quality requirements*

ISO 3834-3, *Quality requirements for welding — Fusion welding of metallic materials — Part 3: Standards quality requirements*

ISO 3834-4, *Quality requirements for welding — Fusion welding of metallic materials — Part 4: Elementary quality requirements*

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

ISO 9606-1, *Approval testing of welders — Fusion welding — Part 1: Steels*

ISO 9606-2, *Approval testing of welders — Fusion welding — Part 2: Aluminium and aluminium alloys*

ISO 9606-3, *Approval testing of welders — Fusion welding — Part 3: Copper and copper alloys*

ISO 9606-4, *Approval testing of welders — Fusion welding — Part 4: Nickel and nickel alloys*

ISO 9606-5, *Approval testing of welders — Fusion welding — Part 5: Titanium and titanium alloys, zirconium and zirconium alloys*

ISO 9956-2, *Specification and approval of welding procedures for metallic materials — Part 2: Welding procedure specification for arc welding*

ISO 13916, *Welding — Guidance for the measurement of preheating temperature, interpass temperature and preheat maintenance temperature*

ISO 14175, *Welding consumables — Shielding gases for arc welding and cutting*

ISO 14732, *Welding personnel — Approval testing of welding operators for fusion welding and for resistance weld setters for fully mechanized and automatic welding of metallic materials*

3 Terms and definitions

For the purposes of this part of ISO/TR 17671, the following terms and definitions apply.

3.1 arc welding current

I

current passing through the electrode

3.2 arc voltage

U

electrical potential between contact tip or electrode holder and workpiece

3.3 interpass temperature

T_i

temperature in a multi-run weld and adjacent parent metal immediately prior to the application of the next run

3.4 heat input

Q

energy introduced into the weld region during welding per unit run length

3.5 preheat temperature

T_p

temperature of the workpiece in the weld zone immediately prior to any welding operation

3.6 thermal efficiency

k

ratio of heat energy introduced into the weld to the electrical energy consumed by the arc

3.7 welding speed

v

travel speed of the weld pool

3.8 detrimental effect

imperfections and other harmful influences in the welded area

3.9 run-on plate

piece of metal so placed as to enable the full section of weld metal to be obtained at the beginning of a joint

3.10 run-off plate

piece of metal so placed as to enable the full section of weld metal to be maintained up to the end of a joint

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3.11**wire feed rate** w_f

length of wire consumed per unit time

3.12**welding consumables**

materials consumed in the making of a weld, including filler metals, fluxes and gases

4 Symbols and abbreviated terms

See Table 1.

Table 1 — Symbols of the terms used

| Abbreviations and symbols | Term | Unit |
|---------------------------|---------------------------------|-----------------|
| I | Arc welding current | A |
| k | Thermal efficiency factor | 1 |
| l | Length of a run | mm |
| Q | Heat input | kJ/mm |
| d | Material thickness | mm |
| T_i | Interpass temperature | °C |
| T_p | Preheat temperature | °C |
| U | Arc voltage | V |
| v | Welding speed | mm/s |
| w_f | Wire feed rate | mm/min or m/min |
| WPS | Welding procedure specification | — |

5 Provision of quality requirements

The contract gives the information necessary for the execution of the welding. If the manufacturer chooses to have a quality system, the information should be in accordance with the appropriate part of ISO 3834 (see annex A for further information).

6 Storage and handling of parent materials

Storage and handling is carried out so that the parent material is not adversely affected.