

# SVENSK STANDARD

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**Svetsning – Rekommendationer för svetsning av metalliska material –**

**Del 1: Allmänna riktlinjer för bågs svetsning**

**Welding – Recommendations for welding of metallic materials –**

**Part 1: General guidance for arc welding**

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Denna standard ersätter SS-EN 1011-1, utgåva 1 ; SS-EN 1011-1/A1, utgåva 1; SS-EN 1011-1/A2:2004, utgåva 1.

The European Standard EN 1011-1:2009 has the status of a Swedish Standard. This document contains the official English version of EN 1011-1:2009.

This standard supersedes the Swedish Standard SS-EN 1011-1, edition 1; SS-EN 1011-1/A1, edition 1; SS-EN 1011-1/A2:2004, edition 1.

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 1011-1**

March 2009

ICS 25.160.10

Supersedes EN 1011-1:1998

English Version

## Welding - Recommendations for welding of metallic materials - Part 1: General guidance for arc welding

Soudage - Recommendations pour le soudage des  
matériaux métalliques - Partie 1 : Lignes directrices  
générales pour le soudage à l'arc

Schweißen - Empfehlungen zum Schweißen metallischer  
Werkstoffe - Teil 1: Allgemeine Anleitungen für das  
Lichtbogenschweißen

This European Standard was approved by CEN on 10 January 2009.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



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## Foreword

This document (EN 1011-1:2009) has been prepared by Technical Committee CEN/TC 121 “Welding”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2009, and conflicting national standards shall be withdrawn at the latest by September 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1011-1:1998

EN 1011 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*

*Part 5: Welding of clad steel*

*Part 6: Laser beam welding*

*Part 7: Electron beam welding*

*Part 8: Welding of cast irons*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

## Introduction

EN 1011 is issued in several parts in order that it may cover the different types of weldable metallic materials and specific welding processes.

This part of EN 1011 deals with the production and control of arc welding of metallic materials and is appropriate for all types of fabrication.

Specific materials advice is covered by parts 2, 3, 4, 5 and 8. Parts 6 and 7 refer to laser and electron beam welding and each cover a range of materials.

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 may be obtained from the relevant application standard or design specification.

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

## 1 Scope

This European Standard contains general guidance for the arc 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 EN 1011 may not all be relevant to all materials. Additional information relevant to specific materials is given in the relevant Parts of the Standard.

## 2 Normative references

The following referenced documents are indispensable for the application 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.

EN 287-1, *Qualification test of welders — Fusion welding — Part 1: Steels*

EN 473, *Non destructive testing — Qualification and certification of NDT personnel — General principles*

EN 1011-2, *Welding — Recommendations for welding of metallic materials — Part 2: Arc welding of ferritic steels*

EN 1011-3, *Welding — Recommendations for welding of metallic materials — Part 3: Arc welding of stainless steels*

EN 1011-4, *Welding — Recommendations for welding of metallic materials — Part 4: Arc welding of aluminium and aluminium alloys*

EN 1011-5, *Welding — Recommendations for welding of metallic materials — Part 5: Welding of clad steel*

EN 1011-6, *Welding — Recommendations for welding of metallic materials — Part 6: Laser beam welding*

EN 1011-7, *Welding — Recommendations for welding of metallic materials — Part 7: Electron beam welding*



- EN 1011-8, *Welding — Recommendations for welding of metallic materials — Part 8: Welding of cast irons*
- EN 1418, *Welding personnel — Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanized and automatic welding of metallic materials*
- EN 22553, *Welded, brazed and soldered joints — Symbolic representation on drawings (ISO 2553:1992)*
- EN ISO 4063, *Welding and allied processes — Nomenclature of processes and reference numbers (ISO 4063:1998)*
- EN ISO 9606-2, *Qualification test of welders — Fusion welding — Part 2: Aluminium and aluminium alloys (ISO 9606-2:2004)*
- EN ISO 9606-3, *Approval testing of welders — Fusion welding — Part 3: Copper and copper alloys (ISO 9606-3:1999)*
- EN ISO 9606-4, *Approval testing of welders — Fusion welding — Part 4: Nickel and nickel alloys (ISO 9606-4:1999)*
- EN ISO 9606-5, *Approval testing of welders — Fusion welding — Part 5: Titanium and titanium alloys, zirconium and zirconium alloys (ISO 9606-5:2000)*
- EN ISO 9692 (all parts), *Welding and allied processes — Recommendations for joint preparation*
- EN ISO 14175, *Welding consumables — Gases and gas mixtures for fusion welding and allied processes (ISO 14175:2008)*
- EN ISO 15607, *Specification and qualification of welding procedures for metallic materials — General rules (ISO 15607:2003)*
- EN ISO 15609-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 1: Arc welding (ISO 15609-1:2004)*
- EN ISO 15609-3, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 3: Electron beam welding (ISO 15609-3:2004)*
- EN ISO 15609-4, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 4: Laser beam welding (ISO 15609-4:2004)*
- EN ISO 17662, *Welding — Calibration, verification and validation of equipment used for welding, including ancillary activities (ISO 17662:2005)*
- CEN/TR 14599:2005, *Terms and definitions for welding purposes in relation with EN 1792*
- IEC/TS 62081, *Arc welding equipment — Installation and use*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in CEN/TR 14599:2005 and the following apply.

#### 3.1

##### **thermal efficiency**

*k*

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

## 4 Principles

### 4.1 General

If the manufacturer is recommended to use a control system, the requirement should be in accordance with the appropriate part of EN ISO 3834.

### 4.2 Fundamental information for fabrication

Before the start of fabrication, the customer shall inform the manufacturer of all the information, which is important to the manufacturing process, the operational loading and the envisaged service life of the end product. If no quality requirements are defined, the limiting values for imperfections shall be as stated in the relevant specification. Such information should comprise, for example:

- 1) Application standard and any additional requirements such as technical rules, guidelines, and statutory requirements.
- 2) Any specific requirements for welding production, testing and heat treatment.
- 3) Production (detail) drawings with information relating to dimensions and weld forms, if documents from the manufacturer are not viewed as adequate by the customer or regulatory authority.
- 4) Qualification requirements for welding, welding related and NDE personnel
- 5) Methods of welding and testing.
- 6) Requirements relating to the selection, identification and traceability of material and personnel, if required.
- 7) Requirements on machining and surface finish.

### 4.3 Non-conformance and corrective actions

Where applicable, the method and extent of recording non-conformance has to be specified. Before the start of fabrication, the procedure and the methods for rectifying deficiencies, for compensating for distortion and for correcting weld defects are to be defined.

## 5 Requirements on welding production

### 5.1 Equipment and devices

The manufacturer shall have adequate equipment and resources for meeting the requirements of the contract. All the welding related equipment shall be matched to the respective welding process, the working task and the design of the final product.

All electrical equipment which is used in connection with the welding operation shall be installed and used in accordance with IEC/TS 62081 and local regulations. Devices for measuring the welding parameters, such as arc voltage, welding current, wire feed rate, travel speed and shielding/purging gas flow rates, and also for monitoring the preheat and interpass temperatures, shall be available either as part of the welding apparatus or by providing portable equipment. Such equipment shall be calibrated, verified or validated in accordance with EN ISO 17662 where relevant.

## 5.2 Workplace

The workplace shall be efficiently protected against the detrimental effects of weather, for example wind, rain, snow and draught, in order not to generate weld defects beyond the acceptance levels specified in the contract.

## 5.3 Personnel

The welding personnel comprises welders, operators and welding coordinators. They shall be employees of the company or shall be contractually bound and shall have the necessary prerequisites from a technical and personal point of view for the job area. Above all, they shall have sufficient knowledge and practical experience in the area of welding and the materials to be processed. They shall be authorized to ensure the quality requirements are met.

Tasks and responsibilities of the welding coordinators shall be specified, see for example EN ISO 14731.

Welders shall be tested in accordance with the requirements of EN 287-1 or the appropriate part of EN ISO 9606, unless otherwise specified, and shall hold valid test certificates.

Welding operators shall be tested in accordance with the requirements of EN 1418, unless otherwise specified, and shall hold valid test certificates.

If inspection is required, the inspection personnel shall be qualified in accordance with EN 473, unless otherwise specified.

## 5.4 Welding processes

This standard covers welds made by one of the following welding processes to EN ISO 4063 or by a combination of these processes:

- 111 Manual metal-arc welding with covered electrode;
- 114 Self-shielded tubular cored arc welding;
- 12 Submerged arc welding;
- 131 Metal inert gas welding; MIG welding;
- 135 Metal active gas welding; MAG welding;
- 136 Tubular -cored metal-arc welding with active gas shield;
- 137 Tubular -cored metal-arc welding with inert gas shield;
- 141 Tungsten inert gas welding; TIG welding;
- 15 Plasma arc welding.

## 5.5 Sub-contracting

The manufacturer can contract other companies to carry out the fabrication or partial jobs, such as the heat treatment or testing. These companies shall be adequately qualified and be able to demonstrate this with the necessary transparency, if required in the contract or the application standard. The sub-contractors shall be provided in good time with all the customer information necessary for fabrication, together with the description of the job and the definition of the quality requirements and documentation. Nevertheless, the manufacturer is responsible to the customer for the required manufacture of the final product to a suitable quality.