



SLOVENSKI STANDARD
SIST EN 1011-8:2005

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Varjenje – Priporočila za varjenje kovinskih materialov – 8. del Varjenje železove litine

Welding - Recommendations for welding of metallic materials - Part 8: Welding of cast irons

Schweißen - Empfehlungen zum Schweißen metallischer Werkstoffe - Teil 8: Schweißen von Gusseisen

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Soudage - Recommandations pour le soudage des matériaux métalliques - Partie 8: Soudage des fontes

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EUROPEAN STANDARD

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**Welding - Recommendations for welding of metallic materials -
Part 8: Welding of cast irons**Soudage - Recommandations pour le soudage des
matériaux métalliques - Partie 8: Soudage des fontesSchweißen - Empfehlungen zum Schweißen metallischer
Werkstoffe - Teil 8: Schweißen von Gusseisen

This European Standard was approved by CEN on 13 September 2004.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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 Central Secretariat has the same status as the official versions.

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

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Foreword

This document (EN 1011-8:2004) has been prepared by Technical Committee CEN/TC 190 "Foundry technology", 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of an identical text or by endorsement, at the latest by May 2005, and conflicting national standards shall be withdrawn at the latest by May 2005.

Within its programme of work, Technical Committee CEN/TC 190 requested CEN/TC 190/WG 5 "Welding of cast iron" to prepare the following standard:

EN 1011-8, *Welding — Recommendations for welding of metallic materials — Part 8: Welding of cast irons.*

This is one of a series of European Standards for requirements for fusion welding of metallic materials.

This European Standard, with the general title *Welding - Recommendations for welding of metallic materials*, is composed of the following parts:

— 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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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EN 1011-8:2004 (E)**1 Scope**

This document specifies the requirements for fusion welding of unalloyed and low-alloy cast iron castings produced in accordance with:

- EN 1561, *Founding — Grey cast irons*;
- EN 1562, *Founding — Malleable cast irons*;
- EN 1563, *Founding — Spheroidal graphite cast irons*.

This document does not apply to the joint welding of cast iron castings to other materials.

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 1011-1:1998, *Welding — Recommendations for welding of metallic materials — Part 1: General guidance for arc welding*.

EN ISO 4063, *Welding and allied processes — Nomenclature of processes and reference numbers (ISO 4063:1998)*.

EN ISO 15609-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 1: Arc welding (ISO 15609-1:2004)*.

NOTE Informative references to documents used in the preparation of this standard, and cited at the appropriate places in the text, are listed in the bibliography.

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3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 production welding

any welding carried out during manufacturing before final delivery to the end user

NOTE It includes joint welding and finishing welding (see 3.2 and 3.3).

3.2 joint welding

production welding used to assemble components together to obtain an integral unit

3.3 finishing welding

production welding carried out in order to ensure the agreed quality of the casting

3.4 repair welding

any welding carried out after final delivery of the casting to the end user

3.5 homogeneous filler metal

any filler metal which results in a deposited metal with the same type of microstructure as the parent metal

3.6**semi-homogeneous filler metal**

any filler metal which results in a deposited metal with a steel-type microstructure

3.7**non-homogeneous filler metal**

any filler metal which results in a deposited metal with a microstructure that differs from the parent metal

3.8**cast welding**

welding by pouring liquid metal into a specially prepared groove in a casting

3.9**liquid metal welding**

cast welding with additional use of a metal arc welding process

4 Abbreviations and symbols

For the purposes of this document, the abbreviations and symbols given in EN 1011-1:1998 shall apply.

5 Provision for quality assurance requirements

For the purposes of this document, the provisions for quality assurance requirements given in Annex A shall apply.

6 Storage, handling and identification of parent metal

Storage and handling shall be carried out in such a manner that the parent metal is not adversely affected. Provision shall be made for correct identification, e.g. grade and storage.

7 Fusion welding processes

Fusion welding processes shall be either one or a combination of the following welding processes with their reference number in accordance with EN ISO 4063:

- 111 manual metal arc welding (metal arc welding with covered electrode);
- 114 self-shielded tubular-cored arc welding;
- 12 submerged arc welding;
- 13 gas-shielded metal arc welding;
- 141 tungsten inert gas welding; TIG welding;
- 15 plasma arc welding;
- 185 magnetically impelled arc butt welding;
- 24 flash welding;
- 311 oxy-acetylene welding;
- 42 friction welding;
- 71 aluminothermic welding;

and additionally:

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- cast welding;
- liquid metal welding.

Other fusion welding processes shall be agreed between the manufacturer and the purchaser by the time of acceptance of the order.

8 Welding consumables**8.1 General**

An appropriate filler metal (see 3.5, 3.6 and 3.7) shall be selected in accordance with the requirements of the weld and the welding process.

Any special recommendations given by the manufacturer and/or supplier of the welding consumables shall be taken into account.

Welding consumables (e.g. filler metals, gases and fluxes) shall conform to the appropriate European and/or International Standards, as applicable, (see Annex B, Tables B.1 and B.2).

It can be necessary to manufacture appropriate filler metals, especially for oxy-acetylene and liquid metal welding. To avoid confusion, such products shall be identified.

8.2 Supply, storage and handling

For the purposes of this document, the supply, storage and handling requirements given in EN 1011-1 shall apply.

9 Equipment**9.1 General**

For the purposes of this document, the equipment requirements given in EN 1011-1 shall apply.

9.2 Ancillary equipment

If applicable, the ancillary equipment shall include:

- a) power source for welding equipment and additional machinery;
- b) facilities for joint preparation;
- c) facilities for preheating and post-weld heat treatment including temperature measurement equipment;
- d) cranes and other handling equipment;
- e) peening equipment;
- f) electrode baking ovens, electrode bags etc. for handling filler metals;
- g) cleaning equipment;
- h) equipment for destructive and non-destructive testing;
- i) fixtures and welding jigs;
- j) personal protection equipment directly connected with welding.

10 Fabrication

10.1 General

When welding cast iron castings, consideration shall be given to the:

- need for trained and approved welders;
- need for a responsible welding co-ordinator;
- casting geometry;
- temperature control;
- stress conditions caused by welding;
- material behaviour;
- working conditions;
- inspection requirements.

NOTE Selection of the requirement category (see EN 729-1) is recommended and should be carried out with due consideration of any special operating conditions and joint strains together with any economic factors.

Prior to welding, there shall be an agreement made between the parties concerned which includes the requirements for finishing welding, joint welding and repair welding, as applicable.

If applicable, finishing and/or repair welding methods to correct casting non-conformities shall be carefully planned and prepared.

The casting surface to be welded shall be checked by a suitable non-destructive test method, in order to ensure sound material after complete removal of any casting non-conformity.

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10.2 Butt welding

Butt welding shall be in accordance with EN 1011-1.

10.3 Fillet welding

Fillet welding shall be in accordance with EN 1011-1.

11 Weld preparation

11.1 Joint welds

Preparation shall be carried out in accordance with EN 1011-1.

NOTE In addition, joint welding should meet the recommendations given in Table B.1 and Table B.2.

11.2 Finishing welds and repair welds

Preparation shall remove any crack, pore, notch and contamination. The area to be welded shall be suitable for the welding process (see B.1 and B.2).

NOTE Recommendations on weld preparation are given in B.2.

If contamination cannot be removed (e.g. during repair welding), other measures shall be used, such as the selection of special filler metals.

EN 1011-8:2004 (E)**12 Positioning of parts to be welded**

Positioning of parts to be welded shall be carried out in accordance with EN 1011-1.

13 Pre-heat temperature and interpass temperature

The pre-heat temperature T_p and interpass temperature T_i shall be within the recommended values given in B.4 and Tables B.1 and B.2, depending on the influence of the following process parameters:

- filler metal;
- parent material grade;
- geometry of the casting;
- welding process;
- welding parameters.

14 Tack welds

Tack welds shall be in accordance with EN 1011-1.

15 Temporary attachments

Temporary attachments shall be in accordance with EN 1011-1.

16 Run-on plates and run-off plates

Run-on and run-off plates shall be in accordance with EN 1011-1.

17 Arcing

Arcing shall be in accordance with EN 1011-1.

18 Inter-run cleaning and inter-run treatment

Inter-run cleaning and inter-run treatment shall be in accordance with EN 1011-1.

19 Heat input

If applicable, heat input can be estimated in accordance with EN 1011-1.

20 Welding procedure specification (WPS)

If a welding procedure specification is required:

- for arc welding its content shall be in accordance with EN ISO 15609-1;
- for other welding methods, its content may be modified. In this case, its content shall be agreed in writing between the parties concerned.

21 Traceability

Traceability shall be in accordance with EN 1011-1.

22 Peening

Peening shall be in accordance with EN 1011-1.

NOTE To minimize residual stress, when using non-homogeneous filler metal, peening is recommended immediately after welding. For further information, see the instructions of the filler metal manufacturer.

23 Inspection and testing

Inspection and testing shall be carried out in accordance with the contract.

24 Quality requirements

Quality requirements shall be in accordance with EN 1011-1.

The requirement class and/or the quality level shall be agreed between the manufacturer and the purchaser prior to welding. Joint welds shall conform to the requirement class given in Table A.1, and/or the quality level given in Table A.2.

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25 Correction of non-conformity

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Correction of non-conformity shall be carried out in accordance with EN 1011-1.

26 Distortion

If necessary, the method of correction of castings unacceptably distorted by the welding process shall be agreed between the manufacturer and the purchaser.

NOTE Any method used to correct distortion should not be deleterious to the casting structure.

27 Post weld heat treatment

The details of any post weld heat treatment shall be agreed between the manufacturer and the purchaser prior to welding (see recommendations in Table B.1 and B.2).

NOTE Post weld heat treatment can be necessary because of the need to reduce residual stresses in welded castings and/or to adjust the mechanical properties of the material.

28 Post weld cleaning

Post weld cleaning shall be in accordance with EN 1011-1.