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Preskušanje varilcev - Talilno varjenje - 6. del: Železova litina

Qualification test of welders - Fusion welding - Part 6: Cast iron

Prüfung von Schweißern - Schmelzschweißen - Teil 6: Gusseisen

Epreuve de qualification des soudeurs - Soudage par fusion - Partie 6 : Fontes

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English Version

Qualification test of welders - Fusion welding - Part 6: Cast iron

Epreuve de qualification des soudeurs - Soudage par fusion - Partie 6 : Fontes

Prüfung von Schweißern - Schmelzschweißen - Teil 6: Gusseisen

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 287-6:2010) 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of an identical text or by endorsement, at the latest by July 2010, and conflicting national standards shall be withdrawn at the latest by July 2010.

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.

Within its programme of work, Technical Committee CEN/TC 190 requested CEN/TC 190/WG 13 "Welding of cast iron" to prepare the following standard:

EN 287-6, *Qualification test of welders — Fusion welding — Part 6: Cast iron.*

EN 287 consists of the following parts, under the general title *Qualification test of welders — Fusion welding*:

— *Part 1: Steels*

— *Part 6: Cast iron*

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, Croatia, 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

The ability of a welder to follow verbal or written instructions and verification of a person's skills are important factors in ensuring the quality of the welded product.

The testing of a welder's skill in accordance with this standard depends on welding techniques and conditions used in which uniform rules are complied with, and standard test pieces are used.

The principle of this European Standard is that a qualification test qualifies the welder not only for the conditions used in the test, but also for all joints which are considered easier to weld on the presumption that the welder has received a specific training and/or has industrial practice within the range of qualification.

The qualification test can be used to qualify a welding procedure and a welder provided that all the relevant requirements, e.g. test piece dimensions, are satisfied.

1 Scope

This European Standard specifies main requirements, limits, inspection conditions and acceptance requirements as well as related inspection documents of welders for welded cast iron test pieces and workpieces.

It provides a set of technical rules for a systematic qualification test of a welder's skills, and enables such qualifications to be uniformly accepted independently of the type of product, location and examiner/examining body.

This European Standard specifies the testing of a welder's skill unless a higher level skill test is applicable.

The acceptance of a welder's skill according to this European Standard implies a practical experience and knowledge regarding the welding process, materials and safety requirements (see Annex C).

This European Standard has to be used when requirements on part of a customer, testing or monitoring body or other organisation are postulated.

This European Standard defines the qualification test of welders for the fusion welding of cast iron. The welding processes referred to in this standard include those fusion welding processes which are designated as manual or partly mechanized welding. It does not cover fully mechanized and automated welding processes (see EN 1418). Cast iron materials which are covered by this European Standard are mentioned in 5.4.

The inspection document and certification is made out in the name of the testing body's liability.

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 287-1:2004, *Qualification test of welders — Fusion welding — Part 1: Steels*

EN 571-1, *Non destructive testing — Penetrant testing — Part 1: General principles*

EN 970, *Non-destructive examination of fusion welds — Visual examination*

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

EN 1290, *Non-destructive testing of welds — Magnetic particle testing of welds*

EN 1320, *Destructive tests on welds in metallic materials — Fracture test*

EN 1321, *Destructive tests on welds in metallic materials — Macroscopic and microscopic examination of welds*

EN ISO 1071, *Welding consumables — Covered electrodes, wires, rods and tubular cored electrodes for fusion welding of cast iron — Classification (ISO 1071:2003)*

EN ISO 4063, *Welding and allied processes — Nomenclature of processes and reference numbers (ISO 4063:2009)*

EN ISO 6520-1, *Welding and allied processes — Classification of geometric imperfections in metallic materials — Part 1: Fusion welding (ISO 6520-1:2007)*

EN ISO 6947, *Welds; working positions — Definitions of angles of slope and rotation (ISO 6947:1993)*

CEN ISO/TR 15608, *Welding — Guidelines for a metallic materials grouping system (ISO/TR 15608:2005)*

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 15609-2, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 2: Gas welding (ISO 15609-2:2001)*

ISO 857-1, *Welding and allied processes — Vocabulary — Part 1: Metal welding processes*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 287-1:2004 apply.

4 Symbols and abbreviations

4.1 General

Where the full wording is not used, the following abbreviations and reference numbers shall be used when completing the welder's qualification test certificate (see Annex B).

4.2 Reference numbers of welding processes

This European Standard covers the following manual or partly mechanized welding processes (reference numbers of welding processes for symbolic representation are listed in EN ISO 4063):

111 manual metal arc welding;

114 self-shielded tubular-cored arc welding;

131 MIG welding with solid wire electrode;

135 MAG welding with solid wire electrode;

136 MAG welding with flux cored electrode;

141 TIG welding with solid filler material;

15 plasma arc welding;

311 oxyacetylene welding.

4.3 Abbreviations

4.3.1 Test pieces

a designed fillet weld thickness;

BW butt weld;

FW fillet weld;

CPC simulated crack (cast iron plate crack);

CPH tapped blind hole (cast iron plate hole);

t material thickness of test piece (plate or wall thickness);

z leg length of fillet weld.

4.3.2 Consumables

FeC-1 similar welding consumable;

FeC-2 similar welding consumable;

FeC-GF similar welding consumable;

FeC-GP similar welding consumable;

Fe1 iron based consumable;

Fe2 iron based consumable;

Ni nickel based consumable;

NiFe-1 nickel based consumable;

NiFe-2 nickel based consumable;

NiCu nickel based consumable;

Z any concerted consumable.

NOTE (see EN ISO 1071)

4.3.3 Other weld details

hw homogeneous weld metal;

sw semi-homogeneous weld metal;

nw non-homogeneous weld metal;

bs welding from both sides;

ss single-side welding;

gg gouging or grinding of root run;

ng without gouging or grinding;

mb welding with backing;

nb welding without backing.

5 Essential variables

5.1 General

The qualification of welders is based on essential variables. For each essential variable, a range of qualification is defined. All test pieces shall be welded using the essential variables independently. The test piece for the qualification test is unattached from the type of component.

5.2 Welding processes

The welding processes are defined in ISO 857-1 (see also 4.2).

5.3 Type of weld and joint preparation

For those butt and fillet weld test pieces made of cast iron plates with tapped blind holes and for those test pieces made of cast iron with simulated cracks the qualification test shall be made according to 7.2.

5.4 Material groups

5.4.1 General

In order to reduce the number of qualification tests, materials with similar welding characteristics are grouped according to CEN ISO/TR 15608 (see also 5.4.2).

5.4.2 Cast iron groups

According to the operational requirements the following cast iron materials are relevant.

Cast iron groups according to CEN ISO/TR 15608:

71 grey (lamellar graphite) cast iron;

72 spheroidal graphite cast iron;

73 malleable cast iron;

74 austempered ductile cast iron;

75 austenitic cast iron;

76 other cast iron materials.

5.5 Weld metals

It is differentiated between homogeneous weld metal (hw), semi-homogeneous weld metal (sw) and non-homogeneous weld metal (nw).

For the qualification test, suitable consumables shall be selected in view of the parent metal and the welding process.

The welding process shall conform to the relevant pWPS or WPS (see EN ISO 15609-1 and EN ISO 15609-2).

If a qualification test is made by using one kind of welding consumables, shielding gases or welding fluxes the test will also be accepted for comparable types of welding consumables, shielding gases or welding fluxes for the same cast iron material group.

5.6 Welding positions

The welding position shall be chosen in accordance with Figure C.1. The welding positions and symbols refer to EN ISO 6947. The test pieces shall be welded in accordance with the nominal angles of the welding positions according to EN ISO 6947.

6 Range of qualification

6.1 General

As a basic principle the qualification test of a welder not only covers the referring test piece and the skill for these special variables, it also covers joints and appropriate variables which are easier to create.

6.2 Welding process

Each qualification test refers to one welding process. A change of the welding process requires a new qualification test.

6.3 Welding position

The welding position PB includes the position PA.

The welding position PC includes the positions PA and PB.

The welding position PF includes the positions PB and PA.

NOTE The positions of weld are illustrated in Figure C.1.

6.4 Cast iron material groups

See CEN ISO/TR 15608 (see also Table A.1).

The range of qualification is given in Table 1.

Table 1 — Range of qualification for test pieces

Material groups of test pieces	Range of qualification for material group								
	71	**72.1**	**72.2**	**72.3**	**72.4**	**73.1**	**73.2**	**73.3**	**74**
71	X	X	X	X	X	X	X	X	
72.1		X	X			X	X	X	
72.2		X	X			X	X	X	
72.3		X	X	X		X	X	X	
72.4		X	X	X	X	X	X	X	
73.1						X			
73.2		X	X	X	X	X	X		
73.3		X	X	X	X	X	X	X	
74									X