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Dodajni materiali za varjenje - Preskusne metode in zahteve po kakovosti - 1. del: Glavne metode in ocenjevanje skladnosti dodajnih materialov za jeklo, nikelj in nikljeve zlitine

Welding consumables - Test methods and quality requirements - Part 1: Primary methods and conformity assessment of consumables for steel, nickel and nickel alloys

Schweißzusätze - Prüfverfahren und Qualitätsanforderungen - Teil 1: Grundprüfungen und Konformitätsbewertung von Schweißzusätzen für Stahl, Nickel und Nickellegierungen

Produits consommables pour le soudage - Méthodes d'essai et exigences de qualité - Partie 1: Méthodes primaires et évaluation de la conformité des produits consommables pour l'acier, le nickel et les alliages de nickel

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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 Central Secretariat has the same status as the official versions.

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Contents

Foreword

This document (EN 14532-1:2004) 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of an identical text or by endorsement, at the latest by May 2005, and conflicting national standards shall be withdrawn at the latest by May 2005.

This document consists of the following parts:

EN 14532-1, *Welding consumables — Test methods and quality requirements — Part 1: Primary methods and conformity assessment of consumables for steel, nickel and nickel alloys.*

EN 14532-2, *Welding consumables — Test methods and quality requirements — Part 2: Supplementary methods and conformity assessment of consumables for steel, nickel and nickel alloys.*

EN 14532-3, *Welding consumables — Test methods and quality requirements — Part 3: Conformity assessment of wire electrodes, wires and rods for welding of aluminium alloys.*

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.

Introduction

This document proposes harmonised verification test conditions for the qualification of welding consumables. The responsibility to identify the extent of the tests to be carried out lies with the manufacturer/supplier on the basis of his assessment of the market requirements.

It should be noted that tests in accordance with this document are made in a way which is not necessarily representative of a real welded structure.

The requirements for the qualification of welding consumable manufacturers, suppliers and distributors are given in EN 12074.

1 Scope

This document describes the basic verification tests, the testing methods, the amount of testing and the requirements for the qualification of welding consumables for steel, nickel and nickel alloys intended for all fields of application.

This document describes a wide range of tests, which are appropriate for the majority of applications. When supplementary tests are required (see EN 14532-2), these can be carried out at any time without the need to repeat the primary tests.

NOTE Additional information is given in Annex O.

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 439, *Welding consumables — Shielding gases for arc welding and cutting.*

EN 440, *Welding consumables — Wire electrodes and deposits for gas shielded metal arc welding of non alloy and fine grain steels — Classification.*

EN 499, *Welding consumables — Covered electrodes for manual metal arc welding of non alloy and fine grain steels — Classification.*

EN 756, *Welding consumables - Solid wires, solid wire-flux and tubular cored electrode-flux combinations for submerged arc welding of non alloy and fine grain steels — Classification.*

EN 757, *Welding consumables — Covered electrodes for manual metal arc welding of high strength steels — Classification.*

EN 758, *Welding consumables — Tubular cored electrodes for metal arc welding with and without a gas shield of non alloy and fine grain steels — Classification.*

EN 760, *Welding consumables — Fluxes for submerged arc welding — Classification.*

EN 875, *Destructive tests on welds in metallic materials — Impact tests — Test specimen location, notch orientation and examination.*

EN 876, *Destructive tests on welds in metallic materials — Longitudinal tensile test on weld metal in fusion welded joints.*

EN 895, *Destructive tests on welds in metallic materials — Transverse tensile test.*

EN 910, *Destructive tests on welds in metallic materials — Bend test.*

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

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

EN 1043-1, *Destructive test on welds in metallic materials — Hardness testing — Part 1: Hardness test on arc welded joint.*

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

EN 1435, *Non-destructive examination of welds — Radiographic examination of welded joints.*

EN 1597-1, *Welding consumables — Test methods — Part 1: Test piece for all-weld metal test specimens in steel, nickel and nickel alloys.*

EN 1597-2, *Welding consumables — Test methods — Part 2: Preparation of test piece for single-run and two-run technique test specimens in steel.*

EN 1597-3, *Welding consumables — Test methods — Part 3: Testing of positional capability of welding consumables in a fillet weld.*

EN 1599, *Welding consumables — Covered electrodes for manual metal arc welding of creep-resisting steels — Classification.*

EN 1600, *Welding consumables — Covered electrodes for manual metal arc welding of stainless and heat resisting steels — Classification.*

EN 1668, *Welding consumables — Rods, wires and deposits for tungsten inert gas welding of non alloy and fine grain steels — Classification.*

EN 10002-1, *Metallic materials - Tensile testing - Part 1: Method of test at ambient temperature.*

EN 10045-1, *Metallic materials — Charpy impact test— Part 1: Test method.*

EN 10204, *Metallic products — Types of inspection documents.*

EN 12070, *Welding consumables — Wire electrodes, wires and rods for arc welding of creep-resisting steels — Classification.*

EN 12071, *Welding consumables — Tubular cored electrodes for gas shielded metal arc welding of creep-resisting steels — Classification.*

EN 12072, *Welding consumables — Wire electrodes, wires and rods for arc welding of stainless and heat-resisting steels — Classification.*

EN 12073, *Welding consumables — Tubular cored electrodes for metal arc welding with or without a gas shield of stainless and heat-resisting steels — Classification.*

EN 12517, *Non-destructive examination of welds — Radiographic examination of welded joints — Acceptance levels.*

EN 14532-2, *Welding consumables — Test methods and quality requirements — Part 2: Supplementary methods and conformity assessment of consumables for steel, nickel and nickel alloys.*

EN 12534, *Welding consumables — Wire electrodes, wires, rods and deposits for gas shielded metal arc welding of high strength steels — Classification.*

EN 12535, *Welding consumables — Tubular cored electrodes for gas shielded metal arc welding of high strength steels — Classification.*

EN 12536, *Welding consumables — Rods for gas welding of non alloy and creep-resisting steels — Classification.*

EN ISO 544, *Welding consumables — Technical delivery conditions for welding filler materials — Type of product, dimensions, tolerances and markings (ISO 544:2003).*

EN ISO 3690, *Welding and allied processes — Determination of hydrogen content in ferritic arc weld metal (ISO 3690:2000).*

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

EN ISO 5817, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections (ISO 5817:2003).*

EN ISO 6847, *Welding consumables — Deposition of a weld metal pad for chemical analysis (ISO 6847:2000).*

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

EN ISO 8249, *Welding — Determination of Ferrite Number (FN) in austenitic and duplex ferritic-austenitic Cr-Ni stainless steel weld metals (ISO 8249:2000).* [1]

EN ISO 14172, *Welding consumables — Covered electrodes for manual metal arc welding of nickel and nickel alloys — Classification (ISO 14172:2003).*

EN ISO 17641-2, *Destructive tests on welds in metallic materials — Hot cracking tests for weldments — Arc welding processes — Part 2: Self-restraint tests (ISO 17641-2:2004).*

EN ISO 18274, *Welding consumables — Wire and strip electrodes, wires and rods for arc welding of nickel and nickel alloys — Classification (ISO 18274:2004).*

ISO 14344, *Welding and allied processes — Flux and gas shielded electrical welding processes — Procurement guidelines for consumables.*

CR ISO 15608:2000, *Welding — Guidelines for a metallic material grouping system (ISO/TR 15608:2000).*

CR ISO 17663, *Welding — Guidelines for quality requirements for heat treatment in connection with welding and allied processes (ISO/TR 17663:2001).*

3 Terms and definitions

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

3.1
auxiliary materials
materials, which are not designed to influence the chemical composition and the mechanical properties of the weld and are not incorporated in the weld, e.g. temporary backing strips

3.2
classification
process where the manufacturer carries out tests on the product to verify the designation according to the appropriate consumable standard

[1] In this document "austenitic-ferritic" is used instead of " ferritic-austenitic".

3.3
qualified welding consumable
welding consumable complying with those requirements of this document identified by the manufacturer

NOTE Additional information is given in Annex O.

3.4
manufacturer
party who has legal responsibility for the finished quality of the product placed upon the market

3.5
supplier
party who purchases the welding consumables from a manufacturer and supplies it under his own brand name

3.6
lot
quantity of welding consumables defined as the manufacturer's standard lot in his quality assurance manual or as defined in ISO 14344

4 Applicable procedures for conformity assessment

The procedures for conformity assessment are described below. Tests and evaluation for the qualification of welding consumables are given in Clauses 5 to 9 and they are carried out under the manufacturer's or supplier's trade designation.

The manufacturer or supplier shall declare the conformity of the product on the label.

NOTE Additional information is given in Annex O.

5 Type qualification test

5.1 General

The compliance of a welding consumable with this document shall be demonstrated by a type qualification test and ongoing control to ensure consistent quality.

The type qualification test (see Annex A) shall consist of:

— testing of the product (see 5.3);

— testing of all-weld metal (see 6.1);

— testing of welded joints (see 6.2).

5.2 Necessary information

The following product information shall be documented:

— scope of qualification;

— whether qualification is for butt welds and fillet welds or only for fillet welds;

— brand and product name;

— European Standard designation;

— manufacturer's limits of chemical composition of the product or the all-weld metal; these shall not exceed the values given in Annexes B and C, respectively;

— description of the covering, flux or filling material in terms of those major constituents which define the characteristics of the consumable (e.g. oxides, carbonates, fluorides and metals);

— limits of mechanical properties of the all-weld metal in the as welded condition and/or, if applicable, in post weld heat treated conditions;

— ferrite content (if requested);

— hydrogen content (if requested).

5.3 Testing of the product

5.3.1 Testing to demonstrate applicability

The manufacturer shall define the range of testing to demonstrate applicability in such a way that the mechanical properties of the all-weld metal are in accordance with the minimum requirements of this document.

The range of qualification shall be subdivided with relevant information as follows:

— parent metals;

— heat treatment;

— any restriction on material thickness;

— highest and lowest test temperature;

— type of current and polarity;

— root weldability (without backing or sealing run);

— welding positions;

— applicability for single-run and/or multi-run techniques;

— other specific product information (e.g. shielding gas or flux).

5.3.2 Sampling for verification of product physical characteristics

All welding consumables for qualification tests shall be sampled at the manufacturer's or supplier's premises. The sizes and dimensions of welding consumables involved in the qualification test shall be examined in accordance with EN ISO 544, or EN 760 for fluxes, or the manufacturer's product specification (see 5.2 and 5.3.1). In addition other characteristics of the product shall be examined where applicable, e.g. the colour, physical condition and marking.

5.3.3 Chemical composition of the product

The manufacturer shall document that the chemical composition of the solid wire and/or strip welding consumable meets the requirements of the product specification and the limits given in Annex B.

The constituent materials of the consumables shall be documented in accordance with the manufacturer’s specifications.

For the purpose of qualifying a welding consumable it is sufficient to identify the shielding gas in accordance with EN 439.

5.3.4 Marking of products

The marking of the product and the packaging shall be in accordance with EN ISO 544 and for fluxes with EN 760. When other markings replacing the product name are used, such markings shall be unique and unambiguous and are entered into the qualification certificate.

6 Testing

6.1 Testing of all-weld metal

6.1.1 General

All-weld metal test pieces shall be prepared in accordance with EN 1597-1. All-weld metal test pieces are not prepared for welding consumables intended for the following welding processes

— electrogas welding (process 73 according to EN ISO 4063);

— electroslag welding (process 72 according to EN ISO 4063);

— overlay welding;

— single and two run welding, where qualification is not required for multi run welding;

— oxy-fuel gas-welding (process 31 according to EN ISO 4063).

6.1.2 Type and number of test pieces and diameters of welding consumables to be tested

The type of test piece is given in the corresponding welding consumable standard. The number of test pieces depends of the type and diameter of the welding consumable as shown in Table 1.

Table 1 — Number of all weld metal test pieces and diameters of welding consumable to be tested

Type of welding consumable	Number of all-weld metal test pieces	Diameter of welding consumable
covered electrodes	1	4,0 mm [a]
	1	maximum to be qualified
rods for tungsten inert gas welding [b]	1	2,4 mm [c]
wire electrodes for gas-shielded metal arc welding [b]	1	maximum to be qualified
tubular cored electrodes [b]	1	maximum to be qualified
flux-wire combinations for submerged arc welding	1	4,0 mm wire electrodes or maximum to be qualified

[a] Where 4,0 mm diameter has not been manufactured, the closest diameter to 4,0 mm shall be used.

[b] For each shielding gas or gas group for which qualification is required a separate all-weld metal test piece shall be prepared.

[c] Where 2,4 mm diameter has not been manufactured, the closest diameter to 2,4 mm shall be used.