

Resistance welding — Weldability —

Part 2: Alternative procedures for the assessment of sheet steels for spot welding

The European Standard EN ISO 18278-2:2004 has the status of a
British Standard

ICS 25.160.40

National foreword

This British Standard is the official English language version of EN ISO 18278-2:2004. It is identical with ISO 18278-2:2004.

The UK participation in its preparation was entrusted to Technical Committee WEE/29, Resistance welding, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 24 November 2004

Summary of pages

This document comprises a front cover, an inside front cover, the EN ISO title page, pages 2 to 25 and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments

© BSI 24 November 2004

ISBN 0 580 44857 6

English version

Resistance welding - Weldability - Part 2: Alternative procedures
for the assessment of sheet steels for spot welding (ISO 18278-
2:2004)

Soudage par résistance - Soudabilité - Partie 2 : Méthodes
alternatives d'évaluation des tôles d'acier pour le soudage
par points (ISO 18278-2:2004)

Widerstandsschweißen - Schweißignung - Teil 2:
Alternative Verfahren für das Bewerten von Stahlblechen
für das Widerstandspunktschweißen (ISO 18278-2:2004)

This European Standard was approved by CEN on 24 June 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.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

	page
Foreword.....	4
Introduction	5
1 Scope	6
2 Normative references	6
3 Terms and definitions	7
4 Purpose.....	7
5 Weld equipment	7
5.1 General.....	7
5.2 Electrodes.....	7
5.3 Welding current.....	8
5.4 Mechanical system	8
5.5 Parameter measurement.....	8
6 Range of qualification	9
7 Test specimen characteristics	9
7.1 Materials	9
7.2 Assemblies	9
8 Preliminary adjustments	9
8.1 Electrode position check under electrode force used for the test	9
8.2 Electrode conditioning.....	9
9 Determination of the acceptable welding current range	10
9.1 Test specimens	10
9.2 Welding parameters	10
9.3 Acceptance criteria.....	10
9.4 Procedure	11
10 Estimation of electrode lifetime N	11
10.1 Essentials of the test.....	11
10.2 Adjustment of machine settings	11
10.3 Procedure	11
10.4 Test criteria, interpretation of results	12
11 Specific conditions for steel sheet customer qualification.....	12
11.1 Purpose.....	12
11.2 Material	12
11.3 Assemblies	13
11.4 Welding parameters	13
11.5 Acceptance criteria.....	15
12 Test report	15
12.1 General.....	15
12.2 Available welding current range	15
12.3 Electrode lifetime	16
Annex A (normative) Profile tolerances and control gauges for electrodes	17
Annex B (normative) Electrode position check.....	19
Annex C (normative) Determination of available welding current range.....	20
Annex D (informative) Test specimens for mechanical characterisation.....	21

Annex E (informative) Test sheet - Available welding current range..... 23

Annex F (informative) Test sheet - Lifetime of electrodes 24

Bibliography 25

Foreword

This document (EN ISO 18278-2:2004) has been prepared by Technical Committee CEN/TC 121 “Welding”, the secretariat of which is held by DIN, in collaboration with Technical Committee ISO/TC 44 “Welding and allied processes”.

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 standard consists of the following parts:

- Part 1: Assessment of weldability for resistance spot, seam and projection welding of metallic materials;
- Part 2: Alternative procedures for the assessment of sheet steels for spot welding.

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 describes alternative procedures for assessing the weldability of sheet steels by determining the welding range and electrode life for resistance spot welding.

It supplements generic standards for the assessment of the weldability lobe (EN ISO 14327) and electrode life at constant machine settings (EN ISO 8166). These procedures can be used to evaluate the following:

- a) the effect of electrode material, shape, dimensions and electrode cooling when welding a particular material;
- b) the effect of material type and thickness being welded;
- c) the effect of welding conditions;
- d) the effect of welding equipment type.

1 Scope

This document specifies a laboratory test procedure for the determination of the acceptable welding current range and the assessment of electrode life using a multi-spot test with specific conditions.

This document is applicable for the assessment of the weldability of uncoated and coated sheet steels of thicknesses up to 3 mm.

The test procedure specified in this document and the results obtained, apply only for the introduction of a new type or batch of material.

Procedures for determining the generic weldability lobe at a constant weld time or electrode force are given in EN ISO 14327.

The electrode life at constant machine settings is given in EN ISO 8166.

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 22768-1, *General tolerances — Part 1: Tolerances for linear and angular dimensions without individual tolerance indications (ISO 2768-1:1989).*

EN 22768-2, *General tolerances — Part 2: Geometrical tolerances for features without individual tolerance indications (ISO 2768-2:1989).*

EN 25821, *Resistance spot welding electrode caps (ISO 5821:1979).*

EN ISO 5183-1, *Resistance welding equipment — Electrode adaptors, male taper 1:10 — Part 1: Conical fixing, taper 1:10 (ISO 5183-1:1998).*

EN ISO 6520-2, *Welding and allied processes — Classification of geometric imperfections in metallic materials — Part 2: Welding with pressure (ISO 6520-2:2001).*

EN ISO 8166, *Resistance welding — Procedure for the evaluation of the life of spot welding electrodes using constant machines settings (ISO 8166:2003).*

EN ISO 14272, *Specimen dimensions and procedure for cross tension testing resistance spot and embossed projection welds (ISO 14272:2000).*

EN ISO 14327, *Resistance welding — Procedures for determining the weldability lobe for resistance spot, projection and seam welding (ISO 14327:2004).*

EN ISO 14329:2003, *Resistance welding — Destructive tests of welds — Failure types and geometric measurements for resistance spot, seam and projection welds (ISO 14329:2003).*

EN ISO 18278-1:2004, *Resistance welding — Weldability — Part 1: Assessment of weldability for resistance spot, seam and projection welding of metallic materials (ISO 18278-1:2004).*

ISO 669:2000, *Resistance welding — Resistance welding equipment — Mechanical and electrical requirements.*

ISO 5182, *Welding — Materials for resistance welding electrodes and ancillary equipment.*

ISO 10447, *Welding — Peel and chisel testing of resistance spot, projection and seam welds.*

ISO/DIS 14373, *Resistance welding — Procedure for spot welding of uncoated and coated low carbon steels.*

ISO/DIS 17657-1, *Resistance welding — Welding current measurement for resistance welding — Part 1: Guideline for measurement.*

ISO/DIS 17657-2, *Resistance welding — Welding current measurement for resistance welding — Part 2: Welding current meter with current sensing coil.*

ISO/DIS 17657-3, *Resistance welding — Welding current measurement for resistance welding — Part 3: Current sensing coil.*

ISO/DIS 17657-4, *Resistance welding — Welding current measurement for resistance welding — Part 4: Calibration system.*

ISO/DIS 17657-5, *Resistance welding — Welding current measurement for resistance welding — Part 5: Verification of welding current measuring system.*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 669:2000, EN ISO 14329:2003 and EN ISO 18278-1:2004 and the following apply.

3.1

acceptable welding current range

range of R.M.S. values of welding current between lower and upper limits which allows an acceptable weld diameter

3.2

R.M.S. value

R.M.S. value of an alternating voltage is the square root of the mean value of the square of the voltage values during a complete cycle

4 Purpose

This procedure allows the determination of the lower and upper limits of the welding current under specific welding configuration in order to assess the life of the electrode for a given welding current chosen within the acceptable welding current range, without any redressing of the electrode tips.

NOTE If automatic redressing or current stepping procedures are used, it is necessary to use a modified test and procedure.

5 Weld equipment

5.1 General

Welding equipment shall be capable of delivering the required welding conditions to carry out the tests as defined below.

5.2 Electrodes

The electrodes shall be of type A 2/3 material as defined in ISO 5182 unless otherwise specified.

The electrode configuration for these tests shall conform to:

- cap electrodes to be used;
- EN 25821 - G 16 × 20 - ($d_1 = 16 \text{ mm}$ - $l_1 = 20 \text{ mm}$) for sheets with a thickness $< 1,3 \text{ mm}$;