

SLOVENSKI STANDARD
oSIST prEN ISO 18278-1:2021
01-junij-2021

Uporovno varjenje - Varivost - 1. del: Splošne zahteve za vrednotenje varivosti pri uporovnem točkovnem, kolutnem in bradavičnem varjenju kovinskih materialov (ISO/DIS 18278-1:2021)

Resistance welding - Weldability - Part 1: General requirements for the evaluation of weldability for resistance spot, seam and projection welding of metallic materials (ISO/DIS 18278-1:2021)

Widerstandsschweißen - Schweißseignung - Teil 1: Allgemeine Anforderungen an die Bewertung der Schweißseignung von Widerstandspunkt-, Rollennaht- und Buckelschweißen von metallischen Werkstoffen (ISO/DIS 18278-1:2021)

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Soudage par résistance - Soudabilité - Partie 1: Exigences générales pour l'évaluation de la soudabilité pour le soudage par résistance par points, à la molette et par bossages des matériaux métalliques (ISO/DIS 18278-1:2021)

Ta slovenski standard je istoveten z: prEN ISO 18278-1 rev

ICS:

25.160.10 Varilni postopki in varjenje Welding processes

oSIST prEN ISO 18278-1:2021

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DRAFT INTERNATIONAL STANDARD

ISO/DIS 18278-1

ISO/TC 44/SC 6

Secretariat: DIN

Voting begins on:
2021-05-03Voting terminates on:
2021-07-26

Resistance welding — Weldability —

Part 1:

General requirements for the evaluation of weldability for resistance spot, seam and projection welding of metallic materials

*Soudage par résistance — Soudabilité —**Partie 1: Exigences générales pour l'évaluation de la soudabilité pour le soudage par résistance par points, à la molette et par bossages des matériaux métalliques*

ICS: 25.160.01

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Reference number
ISO/DIS 18278-1:2021(E)

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Published in Switzerland

Contents

	Page
Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Weldability	5
4.1 Weldability of a component.....	5
4.1.1 General.....	5
4.1.2 Metallurgical weldability.....	5
4.1.3 Operative weldability.....	5
4.1.4 Constructional weldability.....	5
4.2 Criteria for the evaluation of weldability.....	6
5 Preparation of welding equipment	6
5.1 Welding machine.....	6
5.2 Welding electrodes.....	6
5.2.1 General.....	6
5.2.2 Spot welding.....	7
5.2.3 Seam welding.....	7
5.2.4 Projection welding.....	7
5.3 Measurement of parameters.....	7
5.3.1 Welding current.....	7
5.3.2 Electrode force.....	7
6 Test procedures	7
6.1 General.....	7
6.2 Basic test procedures.....	8
6.2.1 Essential variables.....	8
6.2.2 Welding current range test.....	8
6.2.3 Electrode life test.....	9
6.2.4 Weldability lobe test.....	9
6.3 Evaluation of weld properties.....	11
6.3.1 General.....	11
6.3.2 Shop floor tests.....	11
6.3.3 Tensile shear testing.....	11
6.3.4 Mechanized peel testing.....	11
6.3.5 Cross tension testing.....	12
6.3.6 Macro-sections and hardness test.....	12
6.3.7 Further weld properties.....	12
7 Test report	12
7.1 General.....	12
7.2 Welding current range test.....	12
7.3 Electrode life test.....	13
7.4 Weldability lobe test.....	13
Annex A (informative) How to evaluate the mass and friction of the welding head	14
Bibliography	15

ISO/DIS 18278-1:2021(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: [Foreword — Supplementary Information](#).

The committee responsible for this document is ISO/TC 44, *Welding and allied processes*, Subcommittee SC 6, *Resistance welding and allied mechanical joining*.

This second edition cancels and replaces the first edition (ISO 18278-1:2004), which has been technically revised.

ISO 18278 consists of the following parts, under the general title *Resistance welding — Weldability*:

- *Part 1: General requirements for the evaluation of weldability for resistance spot, seam and projection welding of metallic materials*
- *Part 2: Evaluation procedures for weldability in spot welding*

Resistance welding — Weldability —

Part 1:

General requirements for the evaluation of weldability for resistance spot, seam and projection welding of metallic materials

1 Scope

This part of ISO 18278 specifies procedures for assessing the generic weldability for resistance welding of uncoated and coated metals.

It is assumed for this and other linked standards that their application is entrusted to appropriately trained, skilled, and experienced personnel.

For the quality of welded structures, the relevant part of ISO 14554 is applicable. The specification of procedures is to follow guidelines as in ISO 15609-5.

The purpose of the tests are to

- a) compare the metallurgical weldability of different metals,
- b) assess the weldability of differing component designs, e.g. dimensional configuration, stack-up, projection geometry, etc.,
- c) investigate the effect of changes in welding parameters such as welding current, weld time, electrode force or complex welding schedules including pulse welding, current stepping etc. on weldability, and/or
- d) compare the performance of resistance welding equipment.

Precise details of the test procedure to be used will depend on which aspect of items a) to d) will be evaluated relative to the welding result obtained.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 693, *Dimensions of seam welding wheel blanks*

ISO 5182, *Resistance welding — Materials for electrodes and ancillary equipment*

ISO 5821, *Resistance welding — Spot welding electrode caps*

ISO 8167, *Projections for resistance welding*

ISO 10447, *Resistance welding — Testing of welds — Peel and chisel testing of resistance spot and projection welds*

ISO/DIS 18278-1:2021(E)

ISO 14270, *Resistance welding — Destructive testing of welds — Specimen dimensions and procedure for mechanized peel testing resistance spot, seam and embossed projection welds*

ISO 14271, *Resistance welding — Vickers hardness testing (low-force and microhardness) of resistance spot, projection, and seam welds*

ISO 14272, *Resistance welding — Destructive testing of welds — Specimen dimensions and procedure for cross tension testing of resistance spot and embossed projection welds*

ISO 14273, *Resistance welding — Destructive testing of welds — Specimen dimensions and procedure for tensile shear testing resistance spot and embossed projection welds*

ISO 14323, *Resistance welding — Destructive testing of welds — Specimen dimensions and procedure for impact tensile shear test and cross-tension testing of resistance spot and embossed projection welds*

ISO 14324, *Resistance spot welding — Destructive tests of welds — Method for the fatigue testing of spot welded joints*

ISO 15609-5, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 5: Resistance welding*

ISO 15614-12, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 12: Spot, seam and projection welding*

ISO 15614-13, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 13: Upset (resistance butt) and flash welding*

ISO 16432, *Resistance welding — Procedure for projection welding of uncoated and coated low carbon steels using embossed projection(s)*

ISO 17653, *Resistance welding — Destructive tests on welds in metallic materials — Torsion test of resistance spot welds*

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ISO 17654, *Resistance welding — Destructive tests of welds — Pressure test of resistance seam welds*

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

ISO 17677-1, *Resistance welding — Vocabulary — Part 1: Spot, projection and seam welding*

ISO 18592, *Resistance welding — Destructive testing of welds — Method for the fatigue testing of multi-spot-welded specimens*

ISO/TR 581:2005, *Weldability — Metallic materials — General principles*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17677-1, ISO 669, ISO/TR 581:2005, and the following apply.

3.1 weldability

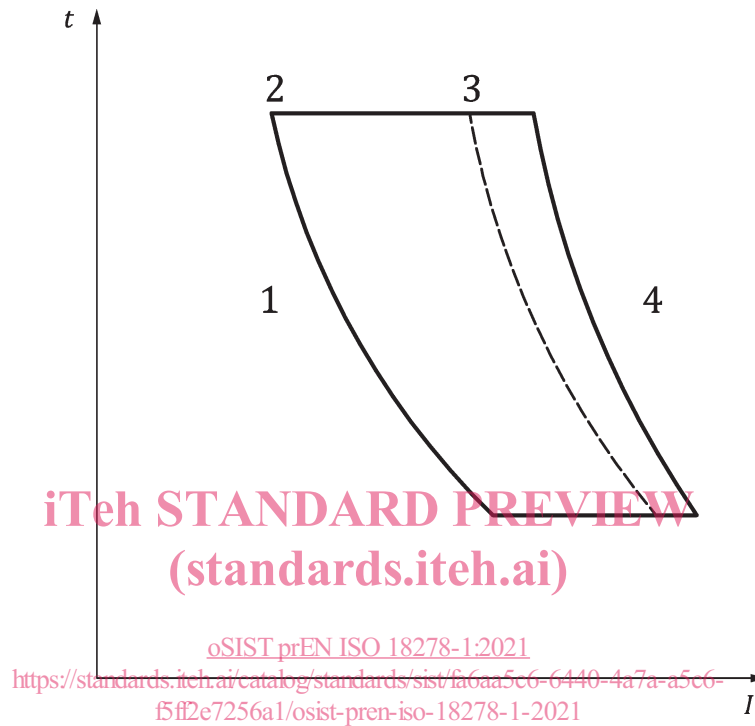
<resistance welding> capacity of the component to be welded under the imposed fabrication conditions into a specific suitability designed structure and to perform satisfactorily in the intended service

3.2 welding current range

welding current domain allowing the production of spot welds without expulsion and of a diameter equal or more than a pre-determined value under constant machine settings

3.3 weldability lobe

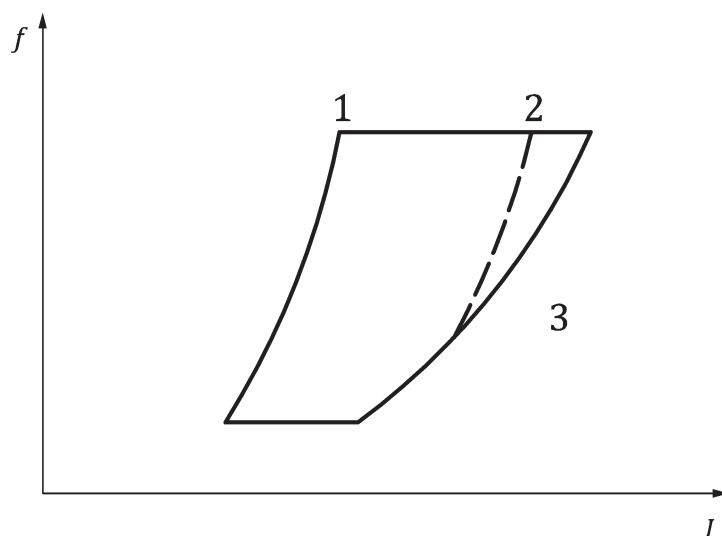
welding current domain allowing the production without splash of spot welds of a diameter equal or more than a pre-determined value, using varied values of either welding time or electrode force. In the case of resistance seam welding, welding speed (m/min) is used instead of weld time. To meet these requirements, the weldability lobes can be a two dimensional plot (see Figure 1) or a three dimensional plot indicating the inter relationship between weld time (welding speed in the case of seam welding), welding current and electrode force.



Key

- t Weld time
- I Weld current
- 1 Smaller than $3,5\sqrt{t}$ (fusion defect, stuck weld)
- 2 $3,5\sqrt{t}$
- 3 $5\sqrt{t}$
- 4 Expulsion

a) Spot welding — Constant force



Key

f Electrode force

I Weld current

1 $3,5\sqrt{t}$

2 $5\sqrt{t}$

3 Expulsion

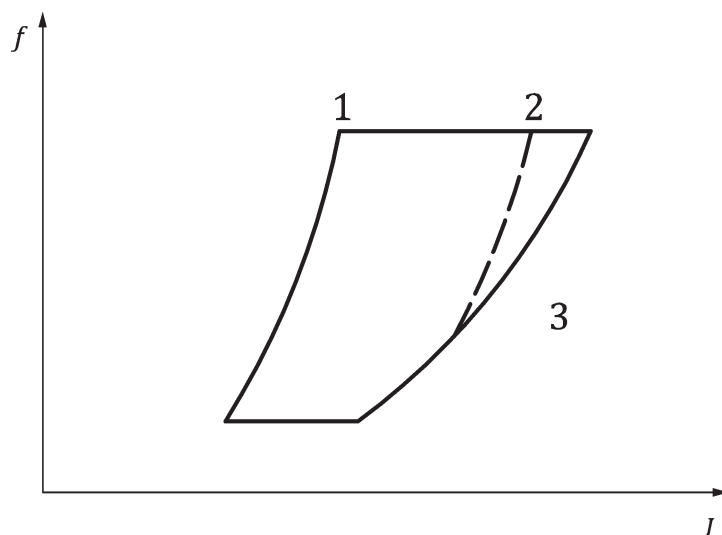
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b) Spot welding — Constant weld time



Key

I Weld current (kA)

v Welding speed (m/min)

- 1 Lower limit
- 2 Upper limit

c) Seam welding — constant weld force — Typical for zinc coated Steels

Figure 1 — Typical weldability lobes

4 Weldability

4.1 Weldability of a component

4.1.1 General

Weldability of a component is governed by three factors; material, design, and production (see [Figure 2](#)).

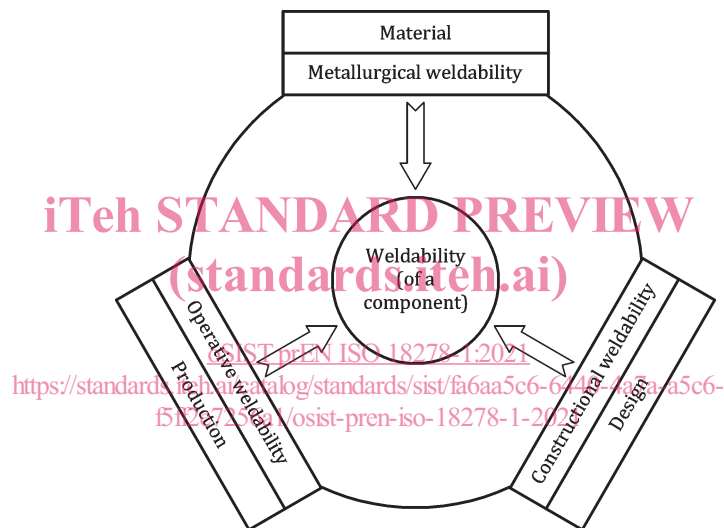


Figure 2 — Weldability

4.1.2 Metallurgical weldability

The less the factors governed by the material have to be taken into account when determining the welding procedure for a given construction, the better is the metallurgical weldability of a material group.

The ease by which a material can be welded determines its metallurgical weldability.

4.1.3 Operative weldability

Operative weldability exists for a welding procedure if the welds envisaged for a particular construction can be made properly under the chosen conditions of production.

The less the factors governed by the welding procedure have to be taken into account in designing a construction for a specific material, the better is the operative weldability of a procedure intended for a specific structure or component.

4.1.4 Constructional weldability

Constructional weldability exists in a construction if the material concerned and the component remain capable of functioning under the envisaged operating conditions by virtue of their design.