
Železniške naprave - Infrastruktura - Uporovno varjenje tirnic - 2. del: Varjenje novih tirnic kakovosti R200, R220, R260, R260Mn, R320Cr, R350HT, R350LHT, R370CrHT in R400HT s prevoznimi varilnimi stroji zunaj proizvodnega postroja

Railway applications - Infrastructure - Flash butt welding of rails - Part 2: New R200, R220, R260, R260Mn, R320Cr, R350HT, R350LHT, R370CrHT and R400HT grade rails by mobile welding machines at sites other than a fixed plant

Bahnanwendungen - Infrastruktur - Abbrennstumpfschweißen von Schienen - Teil 2: Abbrennstumpfschweißen neuer Schienen der Stahlsorten R200, R220, R260, R260Mn, R320Cr, R350HT, R350LHT, R370CrHT und R400HT durch mobile Schweißmaschinen an Orten außerhalb eines Schweißwerkes

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Applications ferroviaires - Infrastructure - Soudage des rails neufs par étincelage - Partie 2 : Rails de nuances R200, R220, R260, R260Mn, R320Cr, R350HT, R350 LHT, R370CrHT et R400HT par des machines à souder mobiles dans des sites autres qu'une installation fixe

Ta slovenski standard je istoveten z: prEN 14587-2

ICS:

25.160.10	Varilni postopki in varjenje	Welding processes
93.100	Gradnja železnic	Construction of railways

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Railway applications - Infrastructure - Flash butt welding of rails - Part 2: New R200, R220, R260, R260Mn, R320Cr, R350HT, R350LHT, R370CrHT and R400HT grade rails by mobile welding machines at sites other than a fixed plant

Bahnanwendungen - Infrastruktur -
Abtrennstumpfschweißen von Schienen - Teil 2:
Abtrennstumpfschweißen neuer Schienen der
Stahlsorten R200, R220, R260, R260Mn, R320Cr,
R350HT, R350LHT, R370CrHT und R400HT durch
mobile Schweißmaschinen an Orten außerhalb eines
Schweißwerkes

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 256.

If this draft becomes a European Standard, 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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prEN 14587-2:2021 (E)**European foreword**

This document (prEN 14587-2:2021) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 14587-2:2009.

This document is one of a series of three parts of the EN 14587, *Railway applications – Infrastructure – Flash butt welding of new rails*. The list of parts is as follows:

- *Part 1: R220, R260, R260Mn, R320Cr, R350HT, R350LHT, R370CrHT and R400HT grade rails in a fixed plant*
- *Part 2: R200, R220, R260, R260Mn, R320Cr, R350HT, R350LHT, R370CrHT and R400HT grade rails by mobile welding machines at sites other than a fixed plant*
- *Part 3: Welding in association with crossing construction*

This document has been prepared under a standardization request addressed to CEN by the European Commission, and it aims to support essential or other requirements of EU Directive(s) or Regulation(s).

For relationship with EU Directive(s) or Regulation(s), see informative Annex ZA, which is an integral part of this document.

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Introduction

This part of EN 14587 has five main topics:

- a) requirements of a welding process;
- b) procedure approval for a mobile plant;
- c) approval of other rail profiles or grades;
- d) approval of welding contractor;
- e) weld production following approval.

This part of EN 14587 supports a European Directive that will permit the freedom of an open European market. To enable this, it is essential that a standard is in place that satisfies the needs of the infrastructure owners or custodians and reflects the production capabilities of the manufacturers in technical and quality terms.

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prEN 14587-2:2021 (E)**1 Scope**

This document specifies requirements for the approval of a welding process by mobile plant, together with the requirements for subsequent welding production.

It applies to new Vignole railway rails R200, R220, R260, R260Mn, R320Cr, R350HT, R350LHT, R370CrHT and R400HT grade rails of 46 kg/m and above, as contained in EN 13674-1, welded by a flash butt welding process by mobile plant and intended for use on railway infrastructure.

This document applies to the welding of rails into welded strings.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 13674-1, *Railway applications - Track - Rail - Part 1: Vignole railway rails 46 kg/m and above*

EN ISO 3452-1, *Non-destructive testing - Penetrant testing - Part 1: General principles (ISO 3452-1)*

EN ISO 6507-1, *Metallic materials - Vickers hardness test - Part 1: Test method (ISO 6507-1)*

EN ISO 7500-1:2018, *Metallic materials - Calibration and verification of static uniaxial testing machines - Part 1: Tension/compression testing machines - Calibration and verification of the force-measuring system (ISO 7500-1:2018)*

EN ISO 17638, *Non-destructive testing of welds - Magnetic particle testing (ISO 17638)*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <https://www.iso.org/obp>

— IEC Electropedia: available at <http://www.electropedia.org/>

3.1**as-welded condition**

rails that have been welded and trimmed only

3.2**contractor**

company approved by a railway authority to provide staff and machinery to execute the production of flash butt welds by mobile plant. This may include staff and machinery from within the railway authority

3.3**die burn**

damage caused by localised overheating (arcing) on the surface of the rail due to poor contact between the rail and electrode during welding

3.4**dressing**

removing trimmed upset by grinding or other similar process

3.5**finished condition**

welded, trimmed and rail head profile finished

3.6**flat spot**

process driven discontinuity shown after the slow bend test on the weld fracture face, which has a small lens like shape. In a vertical longitudinal section (macro) it appears elliptical in shape

3.7**lack of bond**

area of incomplete fusion between the rails at the fusion line. This may appear crack like or as a line discontinuity at the interface either on the surface after removal of the upset or in a weld macro section

3.8**profile finishing**

operation by which the rail head or relevant part of the rail head at the weld is restored to rail profile. The operation can be by grinding, milling, planing or any other suitable means

3.9**purchaser**

purchaser of the welds

3.10**railway authority**

either the railway regulator or the owner of the railway infrastructure or the custodian with a delegated responsibility for a railway infrastructure

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3.11**trimmed upset**

metal remaining around the rail profile following the shearing process

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3.12**trimming**

removal of upset

3.13**upset**

metal extruded around the rail profile as a result of forging

3.14**welded string**

long rail comprising of a number of shorter rails welded together

3.15**welding process**

part of the sequence from the selection of the rail prior to welding through to the finishing of the welded string

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4 Requirements for the welding process

4.1 General

All welding shall be carried out on a flash butt mobile welding machine using an automatic, programmed welding sequence.

4.2 Rail end preparation and horizontal alignment requirements

The rail ends shall always be sawn or disc cut to the tolerances specified by the purchaser. Areas of electrical contact on the rails and the machine shall be cleaned to bright metal to give a consistent and good electrical contact at the interface.

The rail shall not be damaged by the cleaning operation or through poor electrical contact.

Rails of the same profile shall be positioned in the welding machine such that the welding interface is central to the contact electrodes as assessed by visual or mechanical means.

Before welding, rails shall be aligned laterally to the required rail face or edge, i.e. left, or right, or to the rail centreline.

For reasons of asymmetry rails should be welded with the brand marks on the same side throughout the welded string.

4.3 Clamping force

Rails shall be secured in the flash butt welding machine by a clamping arrangement. The clamping force that is exerted on the rails shall not damage in such a way that subsequent cracking in the rail is generated, see 5.4.1.

4.4 Pre-heating

For the pre-heating, the rail ends shall progress uniformly in a reversible or a continuous process, and perpendicular to the running surface during the whole welding cycle.

4.5 Final flashing

Once initiated the final flashing shall be continuous.

4.6 Upsetting

Upsetting shall immediately follow final flashing. Sufficient forging pressure shall be applied to ensure that voids are closed and oxides are expelled such that they are kept to a minimum at the weld interface. The weld interface shall extend into the upset.

4.7 Unclamping

In order to maintain the alignment, the time between completion of forging and unclamping shall be a minimum of 4 s.

4.8 Slippage

Clamping force shall be maintained to avoid any movement between the contact dies and rails.

4.9 Welding parameters

- 1) The welding machine and/or management system equipment shall be capable of displaying the following:
 - a) programme identification and setting details;
 - b) welding current;
 - c) upset force or pressure;
 - d) displacement;
 - e) welding time;
 - f) limits/range of the main welding parameters;
 - g) weld identification number.
- 2) The welding parameters shall be determined during procedural trials and, once approval has been granted, shall not be changed, with the exception of changes concerning the environments in 4.9 4).
- 3) The welding parameters shall be monitored and recorded. These records shall be referenced to the appropriate welds.
- 4) Due to extreme variations in seasonal temperatures, the contractor may request from the railway authority the use of an alternative welding program. A bending test according to 5.4.5 shall be carried out in this case.
- 5) The weld identification number shall be created and recorded by the machine in a chronological order for all welds produced during approval and production processes.

4.10 Steps across the weld

- Any step between the rails across the weld in the trimmed but not dressed condition shall not exceed those dimensions shown in Table 1.
- Checks shall be made at a position 20 mm on each side of the weld upset centreline using a 1 m nibbed straight edge and feeler shims as shown in Figure 1. An alternative step measurement gauge may be used as shown in Figure 2.

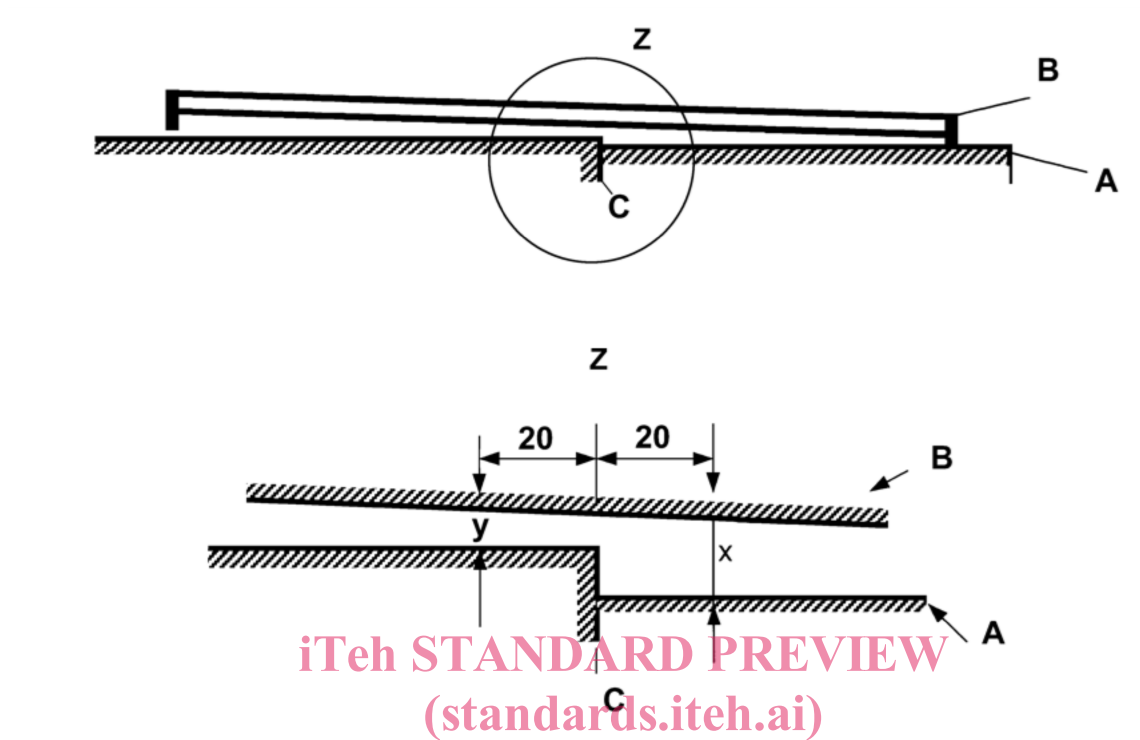
Table 1 — Maximum permitted steps

Position of step on the rail	Maximum permitted step (in mm)
Vertically on the longitudinal centreline of the running surface	0,5
Horizontally on the aligned face or edge 14 ± 1 mm below the running surface	0,5
Horizontally on the edge of the rail foot	2,0

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Where the step arises from the rail dimensions the rail foot tips may be dressed locally to achieve this requirement.

Dimensions in millimetres



Key

- A running surface
- B nibbed straight edge
- C weld upset centreline
- Z detail view of the step

NOTE Step = $[x-y]$ mm

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Figure 1 — Measurement of the step with nibbed straight edge

Dimensions in millimetres

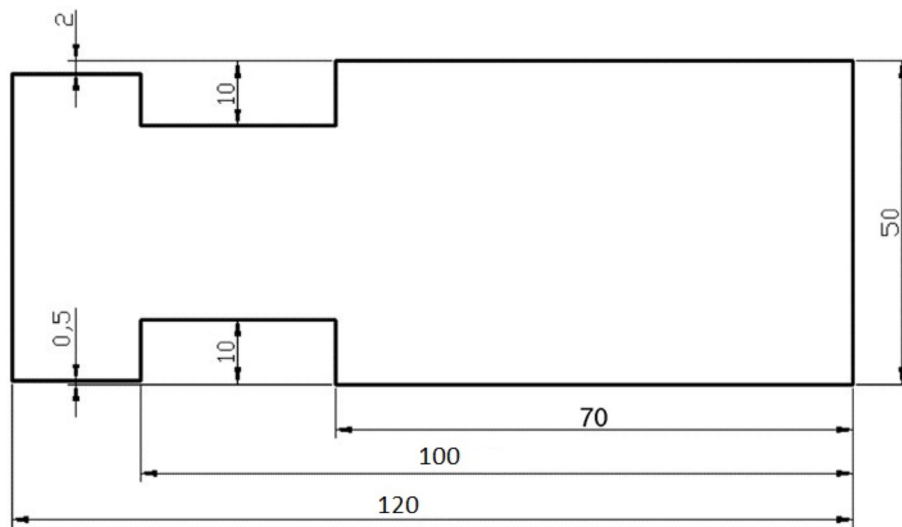


Figure 2 — Gauge for measuring the step

4.11 Removal of excess upset

- a) Excess upset should be automatically trimmed. If not possible, the upset shall be removed by grinding.
- b) Removal of the excess upset shall not cause any mechanical or thermal damage to the rails.
- c) The surface of the trimmed area shall be free from visible transverse cracking.
- d) Removal of the excess upset shall be completed in such a manner to keep the joint in compression.
- e) Any dressing of the weld following the removal of upset shall not cause damage to the rail or weld nor reduce either to a dimension below the original rail profile.
- f) The maximum thickness of the trimmed upset shall be as set out in Table 2 below and shown in Figure 3. A suggested measurement gauge is shown in Figure 4.

Table 2 — Maximum permitted trimmed upset

Zone	Position of trimmed upset about the weld	Maximum permitted upset (in mm)
A	Full head profile from the lower corner on the gauge face to the lower corner on the opposite face	2,5
B	The fishing surface on the underside of the head	3,0
C	The web, including the top fillet radius and extending down to the start of the bottom fillet radius	2,5
D	The foot, including the start of the bottom fillet radii in the web and extending to the foot tips and completely across the underside of the rail foot	2,0