



SLOVENSKI STANDARD

SIST EN 14587-2:2009

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Železniške naprave - Zgornji ustroj - Uporovno varjenje tirnic - 2. del: Varjenje novih tirnic kakovosti R220, R260, R260Mn in R350HT s prevoznim varilnim strojem

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

Bahnanwendugen - Oberbau - Abbrennstumpfschweißen von Schienen - Teil 2: Abbrennstumpfschweißen neuer Schienen der Güte R220, R260, R260Mn und R350HT durch mobile Schweißmaschinen an Orten außerhalb eines Schweißwerkes

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Applications ferroviaires - Voie - Soudage des rails par étincelage - Partie 2 : Rails neufs de nuance R220, R260, R260Mn et R350HT par des machines de soudure mobiles dans des sites autres qu'une installation fixe

Ta slovenski standard je istoveten z: EN 14587-2:2009

ICS:

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EUROPEAN STANDARD
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EN 14587-2

April 2009

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English Version

**Railway applications - Track - Flash butt welding of rails - Part 2:
New R220, R260, R260Mn and R350HT grade rails by mobile
welding machines at sites other than a fixed plant**

Applications ferroviaires - Voie - Soudage des rails par
étincelage - Partie 2: Rails neufs de nuance R220, R260,
R260Mn et R350HT par des machines de soudure mobiles
dans des sites autres qu'une installation fixe

Bahnanwendungen - Oberbau - Abbrennstumpfschweißen
von Schienen - Teil 2: Abbrennstumpfschweißen neuer
Schienen der Stahlsorte R220, R260, R260Mn und
R350HT durch mobile Schweißmaschinen an Orten
außerhalb eines Schweißwerkes

This European Standard was approved by CEN on 28 February 2009.

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EN 14587-2:2009 (E)**Foreword**

This document (EN 14587-2:2009) has been prepared by Technical Committee CEN/TC 256 "Railway applications", 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of an identical text or by endorsement, at the latest by October 2009, and conflicting national standards shall be withdrawn at the latest by October 2009.

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.

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

- Part 1: New R220, R260, R260Mn and R350HT grade rails in a fixed plant;
- Part 2: New R220, R260, R260Mn and R350HT 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 mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EC Directive(s).

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

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, 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

This part of EN 14587 has three main topics:

- a) approval procedure for a mobile flash butt welding (MFBW) machine;
- b) approval of the welding contractor;
- c) weld production.

This part of EN 14587 has been occasioned by a European Directive that will permit the freedom of an open European market. To enable this perception to become a reality, it is essential 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.

This part of EN 14587 differs from Part 1 significantly due to the peculiarities of a MFBW machine:

- they are used at different places and for different purchasers within a short time;
- they work in various conditions such as weather, rail, track, worksites, power supply, legal regulations;
- they are operated by contractors, but personnel from different companies (including the purchaser) may be on site for the production of the continuous welded track;
- there are technical differences of the equipment used in order to guarantee the required mobility.

Due to the above mentioned special operating conditions of a MFBW machine, the following requirements have been relaxed as a result:

- minimum bend test requirements for production bend tests only;
- maximum permitted trimmed upset.

This part of EN 14587 does not identify any approval of a MFBW machine in terms of electromagnetic compatibility, vehicle braking systems or any requirements regarding load gauge, environment and its attendant issues or infrastructure access pertaining to any railway authority.

EN 14587-2:2009 (E)**1 Scope**

This European Standard specifies requirements for the approval of a welding process by a MFBW machine at sites other than fixed plant, as well as the welding contractor together with the requirements for subsequent welding production. Where a MFBW machine is to be used in a static but temporary situation, the requirements of this part of the standard shall apply.

It applies to new Vignole R220, R260, R260Mn and R350HT grade rails of 46 kg/m and above, as contained in EN 13674-1, welded by a MFBW machine at sites other than a fixed plant and intended for use on railway infrastructures.

This European Standard applies to the welding of rails into welded strings.

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

EN 1290, *Non-destructive examination of welds – Magnetic particle examination of welds*

EN 13674-1, *Railway applications – Track – Rail – Part 1: Vignole railway rails 46 kg/m and above*

EN 14587-1, *Railway applications – Track – Flash butt welding of rails – Part 1: New R220, R260, R260Mn and R350HT grade rails in a fixed plant*

EN ISO 6507-1, *Metallic materials – Vickers hardness test – Part 1: Test method (ISO 6507-1:2005)*

EN ISO 7500-1, *Metallic materials – Verification of static uniaxial testing machines – Part 1: Tension/compression testing machines – Verification and calibration of the force-measuring system (ISO 7500-1:2004)*

3 Terms and definitions

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

3.1**fixed plant**

stationary production line for flash butt welding of rails, as specified by EN 14587-1

3.2**welding process**

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

3.3**upset**

metal extruded around the rail profile as a result of forging

3.4**die burn**

damage caused by localised overheating on the surface of the rail caused by poor contact between the rail and the electrode during welding

3.5**trimming**

removal of upset

3.6**trimmed upset**

metal remaining around the rail profile following trimming

3.7**dressing**

removing trimmed upset by grinding or other similar process

3.8**as welded condition**

rails that have been welded and trimmed only

3.9**profile finishing**

operation by which the rail head or relevant part of the rail head at the weld is returned to rail profile

NOTE The operation can be by grinding, milling, planing or any other suitable means.

3.10**finished condition**

welded, trimmed, dressed and profile finished

3.11**flat spot**

process driven discontinuity showing as a small lens-like shape in vertical longitudinal section, or a generally circular/elliptical shape having a localised smooth texture when viewed in a vertical transverse section

3.12**lack of bond**

area of incomplete fusion between the rails in the joint

NOTE This may appear as crack like or line discontinuity at the interface either on the surface after removal of the upset or in a weld section.

3.13**welded string**

long rail comprising a number of shorter rails flash butt welded together

3.14**MFBW machine**

abbreviation for a mobile flash butt welding machine

3.15**purchaser**

purchaser of the welds

3.16**railway authority (RA)**

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

3.17**contractor**

company approved by a RA to provide staff and machinery to execute the production of mobile flash butt welds on that particular infrastructure

NOTE This may include staff and machinery from within the RA.

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EN 14587-2:2009 (E)**3.18****manufacturer**

manufacturer of the welding machine

4 Requirements for the welding process**4.1 General**

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

4.2 Clamping force

Rails shall be secured in the MFBW machine by clamps of such a surface shape or contour, that when a clamping force is exerted on the rails, it shall not damage the rail in such a way that subsequent cracking in the rail in operation is generated.

4.3 Pre-heating – flashing

The fronts of the heated area shall progress uniformly perpendicularly to the running surface during the whole cycle.

There shall be no evidence of overheating on the ends of the rails during pre-heating – flashing. Once initiated, the flashing process shall not be interrupted.

4.4 Progressive flashing

Once initiated, progressive flashing shall be continuous.

4.5 Upsetting

Upsetting shall immediately follow 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.

4.6 Upset current

The upset welding current shall be maintained until the rapid forge has finished and the progressive forging commences.

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 Welding program and records

The welding program (settings) shall be determined during procedural trials and, once approval has been granted, shall not be changed.

The welding machine and/or management system equipment shall be capable of displaying the following:

- a) welding program identification and setting details;
- b) welding current;
- c) upset force or pressure;

- d) displacement;
- e) welding time.

The welding parameters shall be monitored and recorded. These records shall be referenced to the appropriate welds. The welding parameters shall permit the production of welds without any alteration to the program, at rail temperatures of $-10\text{ }^{\circ}\text{C}$ and above. Alterations of preheating parameters due to various rail temperatures are not considered as alterations to the welding program. A bending test according to 8.10.3 shall be carried out in this case.

NOTE Due to extreme variations in seasonal temperatures, the contractor may request the use of alternative welding programs.

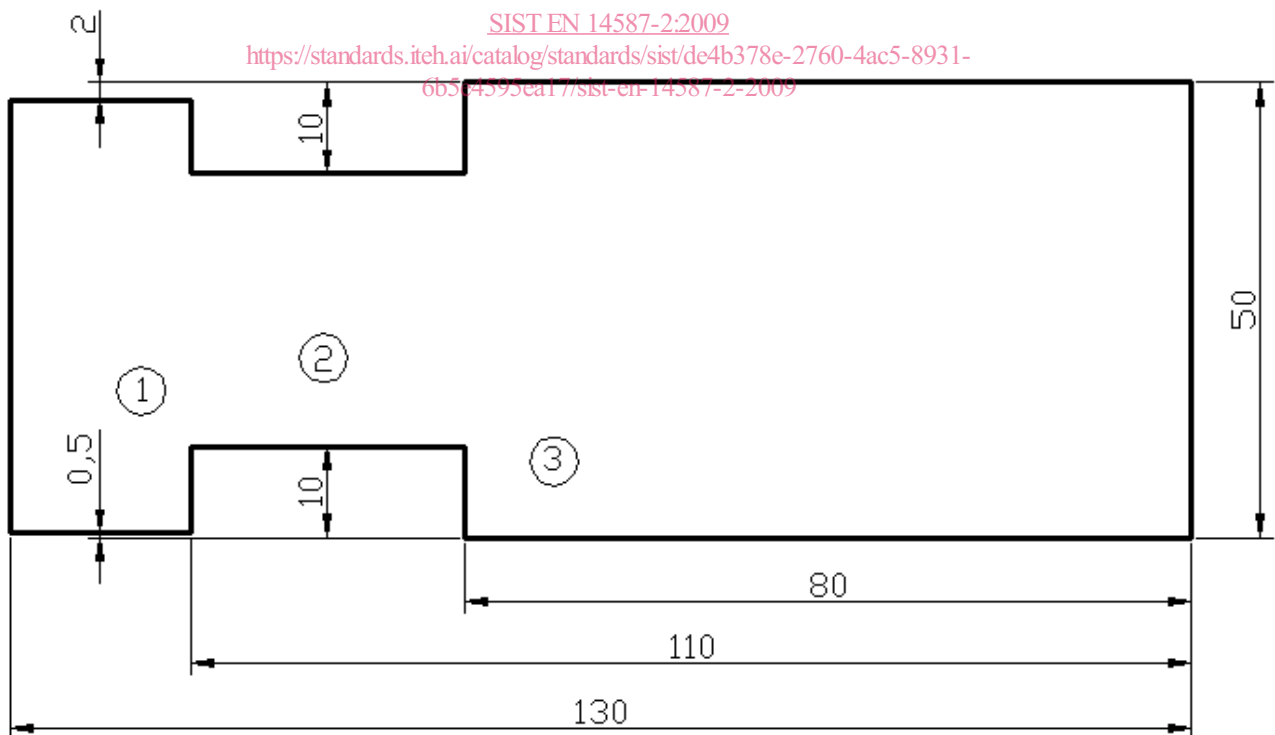
4.9 Step across the weld

Any step between the rails across the weld in the as welded condition (see 3.8) shall not exceed those dimensions shown in Table 1. Checks shall be made using the gauge as shown in Figure 1.

Table 1 — Maximum permitted steps

| Position of step on the rail | Maximum permitted step mm |
|--|------------------------------|
| Vertically on the longitudinal centreline of the running surface | 0,5 |
| Horizontally on the aligned face or edge 14 mm below the running surface | 0,5 |
| Horizontally on both edges of the rail foot | 2,0 |

Dimensions in millimetres



Key

- ① Tip
- ② Strip recess
- ③ Stock

Figure 1 — Gauge for measuring the step

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4.10 Weld trimming

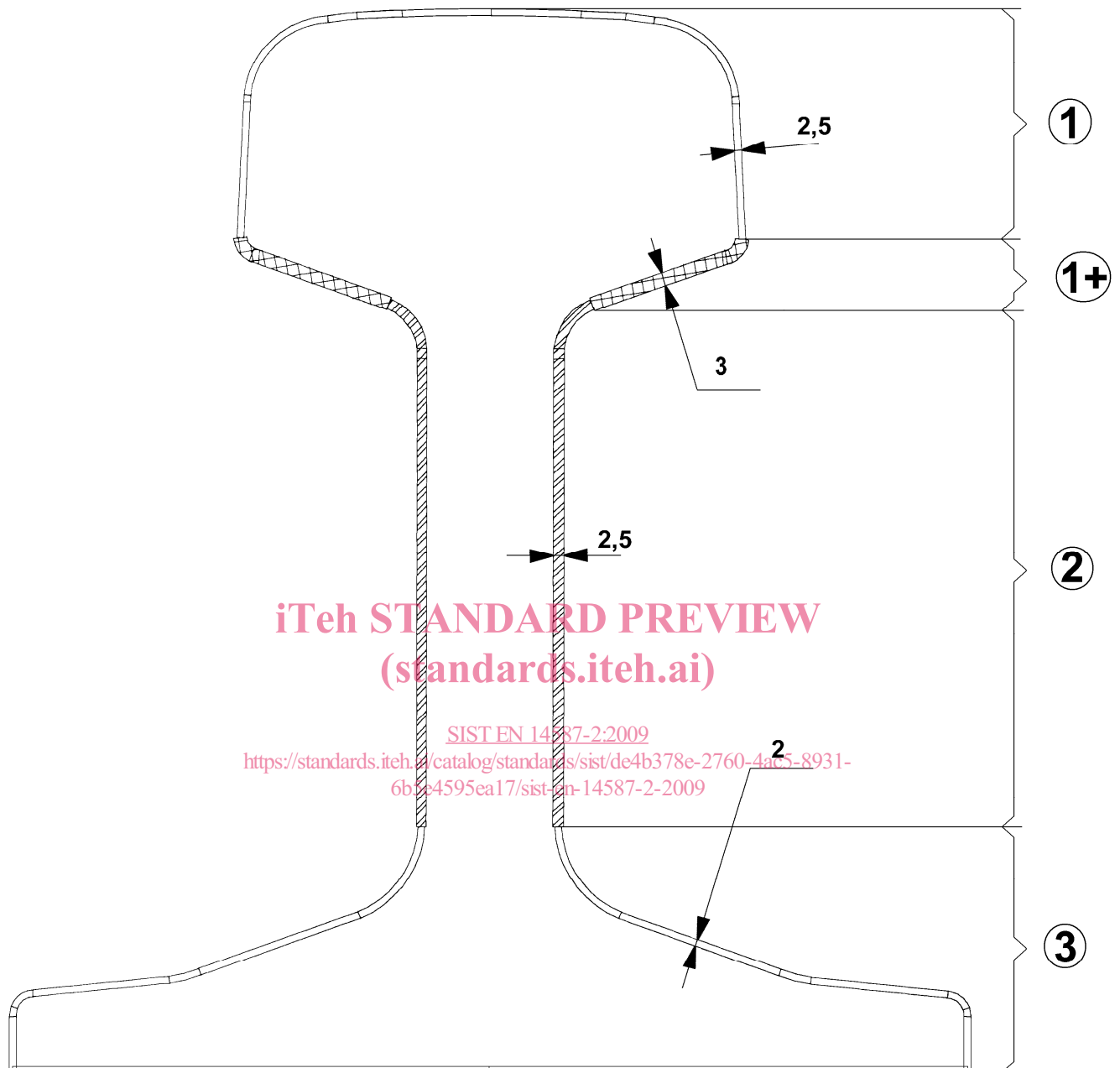
Weld trimming shall conform to the following requirements:

- a) excess upset shall be automatically trimmed;
- b) the weld shall be in compression during the removal of excess upset. One side may be released for the shearing operation;
- c) removal of the excess upset shall not cause any mechanical or thermal damage to the rails;
- d) the surface of the trimmed area shall be free from visible cracking;
- 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) attention shall be given to the quality of trimming on the underside of the rail foot;
- g) the upset shall be free from tearing, notches from the extrusion, cracks, undercut or damage to the adjacent rails;
- h) the maximum thickness of the trimmed upset shall be as set out in Table 2 and shown in Figure 2. Where there is a difference in the rail dimensions, the trimmed upset shall be measured in relation to the rail giving the maximum protruding surface. If the values of the trimmed upset are above the maximum values, the trimmed upset shall be dressed locally to the required values without damaging the parent rails.

Table 2 — Maximum permitted trimmed upset

| Zone | Position of trimmed upset about the weld | Maximum permitted upset mm |
|------|---|-------------------------------|
| 1 | Full head profile from the lower corner on the gauge face to the lower corner on the opposite face | 2,5 |
| 1+ | The fishing surface on the underside of the head | 3,0 |
| 2 | The web, from the end of the top fillet radius and extending down to the start of the bottom fillet radius | 2,5 |
| 3 | 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 |

Dimensions in millimetres

**Key**

- ① Zone 1 – rail head
- ①+ Zone 1+ – on the underside of the rail head
- ② Zone 2 – web of the rail
- ③ Zone 3 – foot of the rail

Figure 2 — Maximum permitted trimmed upset**4.11 Post-weld heat treatment**

For the grade R260Mn, a post-weld heat treatment could be required.

For the grade R350HT, a post-weld controlled accelerated cooling could be required.

NOTE The post-weld controlled accelerated cooling is carried out after the removal of excess upset.