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**Železniške naprave - Zgornji ustroj - Elektro uporabno varjenje tirnic - 3. del:  
Varjenje pri izdelavi kretnic**

Railway applications - Track - Flash butt welding of rails - Part 3: Welding in association with crossing construction

Bahnanwendungen - Oberbau - Abbrennstumpfschweißen von Schienen - Teil 3:  
Schweißen im Zusammenhang mit Weichenkonstruktionen

Applications ferroviaires - Voie - Soudage des rails par étincelage - Partie 3 : Soudure associée à la fabrication des appareils de voie

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**Ta slovenski standard je istoveten z: EN 14587-3:2012**

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**SIST EN 14587-3:2012****en,fr**

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**Railway applications - Track - Flash butt welding of rails - Part 3:  
Welding in association with crossing construction**

Applications ferroviaires - Voie - Soudage des rails par  
étincelage - Partie 3: Soudure associée à la fabrication des  
coeurs de voie

Bahnanwendungen - Oberbau - Abbrennstumpfschweißen  
von Schienen - Teil 3: Schweißen im Zusammenhang mit  
Herzstückkonstruktionen

This European Standard was approved by CEN on 6 July 2012.

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## Foreword

This document (EN 14587-3:2012) 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of an identical text or by endorsement, at the latest by March 2013, and conflicting national standards shall be withdrawn at the latest by March 2013.

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 has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

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 (the present standard)*

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## Introduction

This part of EN 14587 has four main topics:

- requirements of a welding process;
- procedure approval for a fixed plant;
- approval of other rail profiles or grades;
- weld production following approval.

This European Standard satisfies the needs of the railway authority. The manufacturer should achieve the specified requirements of this European Standard.

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## 1 Scope

This European Standard specifies requirements for the approval of a welding process in a fixed plant, together with the requirements for subsequent welding production.

This European Standard applies to new Vignole rails welded by flash butt welding to crossing components in a fixed plant, and intended for use on railway infrastructures.

## 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.

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

EN 1371-1, *Founding — Liquid penetrant testing — Part 1: Sand, gravity die and low pressure die castings*

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

EN 13674-2, *Railway applications — Track — Rail — Part 2: Switch and crossing rails used in conjunction with Vignole railway rails 46 kg/m and above*

EN 13674-4, *Railway applications — Track — Rail — Part 4: Vignole railway rails from 27 kg/m to, but excluding 46 kg/m*

EN 14587-1:2007, *Railway applications — Track — Flash butt welding of rails — Part 1: New R220, R260, R260Mn and 350HT grade rails in a fixed plant*

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

EN ISO 11666, *Non-destructive testing of welds — Ultrasonic testing — Acceptance levels (ISO 11666)*

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

EN ISO 17640, *Non-destructive testing of welds — Ultrasonic testing — Techniques, testing levels, and assessment (ISO 17640)*

EN ISO 23279, *Non-destructive testing of welds — Ultrasonic testing — Characterization of indications in welds (ISO 23279)*

## 3 Terms and definitions

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

### 3.1

#### **manufacturer**

company that joins rails to rails, rails to crossings and rails to crossing components by flash butt welding in a fixed plant

### 3.2

#### **purchaser**

buyer of the flashbutt welded crossings working in accordance with the requirements of the railway authority

### 3.3

#### **railway infrastructure**

permanent way of national or private railways



**3.4****fixed plant**

stationary machine for flash butt welding of rails to rails, rails to crossings and rails to crossing components

**3.5****die burn**

damage caused by localised overheating on the electrode contact surfaces

**3.6****upset**

metal extruded around the rail profile as a result of forging

**3.7****specimen**

portion detached from a welded component or a welded joint and prepared as required for testing

**3.8****profile finishing**

operation by which the rail or relevant part of the component at the weld is returned to original profile, by removal of upset material

Note 1 to entry: This operation can be achieved by grinding, milling, planing or any other suitable means.

**3.9****finished condition**

welded and profile finished

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**3.10****flat spot**

feature having a localised smooth texture when viewed in a vertical transverse section (see Annex A)

Note 1 to entry: When viewed longitudinally in macro this may appear as a lens-shaped feature.

**3.11****bright spot**

localised bright area occurring at the stainless insert/rail interface indicative of a possible martensitic area (see Annex A)

**3.12****lack of bond**

area within the weld where there is no metal to metal contact (excluding flat spots and bright spots)

Note 1 to entry: This may appear as a linear discontinuity at the interfaces when examined in the finished condition or after sectioning.

**3.13****welded zone**

areas of 50 mm on either side of the weld centreline

**3.14****throat flare**

wing entry flare (front) machining or setting of wings to give an entry flare into the throat

**3.15****foundry method**

system to produce casting compliant with the requirements of EN 15689

**3.16****workpiece**

crossing component, insert rail or rail leg-end extension

**EN 14587-3:2012 (E)****3.17****railway authority (RA)**

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

**3.18****as welded condition**

rails that have been welded and trimmed only

**4 Information to be supplied for approval of procedure****4.1 By the purchaser**

The following information shall be supplied by the purchaser, agreed upon by the manufacturer, and shall be fully documented:

- a) the rail profile and crossing geometrical details;
- b) the rail and crossing grades/materials;
- c) the profile class of the rail leg-end extension as specified in EN 13674-1, EN 13674-2 or EN 13674-4;
- d) alignment class/classes of the flash butt welds (see Table 1);
- e) the type of fatigue tests (if applicable) for approval;
- f) tolerances at rail ends on the delivered crossing;
- g) minimum length of rail leg-end extension; [SIST EN 14587-3:2012](https://standards.iteh.ai/catalog/standards/sist/1c6aab65-87bf-4aa9-ac30-99825ec88ba2/sist-en-14587-3-2012)
- h) rail profile, number and frequency of production bend tests (see 13.7);
- i) requirements of any track trials.

**4.2 By the manufacturer**

The following information shall be supplied by the manufacturer, agreed upon by the purchaser, and shall be fully documented:

- a) a qualified weld procedure;
- b) traceability system of the welds;
- c) type and identification number of machine being used.

**5 Approval of the manufacturer****5.1 General**

The manufacturer shall meet the approval requirements as defined in 5.2 to 5.7. The purchaser reserves the right to audit the manufacturer at any time.

**5.2 Welding procedure**

The manufacturer shall use welding procedures and flash butt welding machines that are approved by the RA.

### 5.3 Operators

The manufacturer shall maintain a system that ensures the competence of their welding operators by appropriate training and assessment.

### 5.4 Supervision

The manufacturer shall maintain a management and supervision system of flash butt welding that complies with the requirements of the purchaser.

### 5.5 Weld Inspection

The manufacturer shall maintain a system of weld inspection according to the purchaser requirements. Instances of non-conformity found during these inspections shall be recorded in the traceability system.

### 5.6 Equipment

Equipment shall comply with the operating manual. Inspection and calibration equipment shall comply with those requirements as agreed between the manufacturer and the purchaser.

### 5.7 Quality assurance

The manufacturer shall operate an independently approved and audited quality assurance system, e.g. conforming to the requirements of EN ISO 9001 or other approval accepted by the purchaser.

## 6 Requirements for the welding process

### 6.1 General

[SIST EN 14587-3:2012](https://standards.iteh.ai/catalog/standards/sist/1c6aab65-87bf-4aa9-ac30-90925ec881a2/sist-en-14587-3-2012)

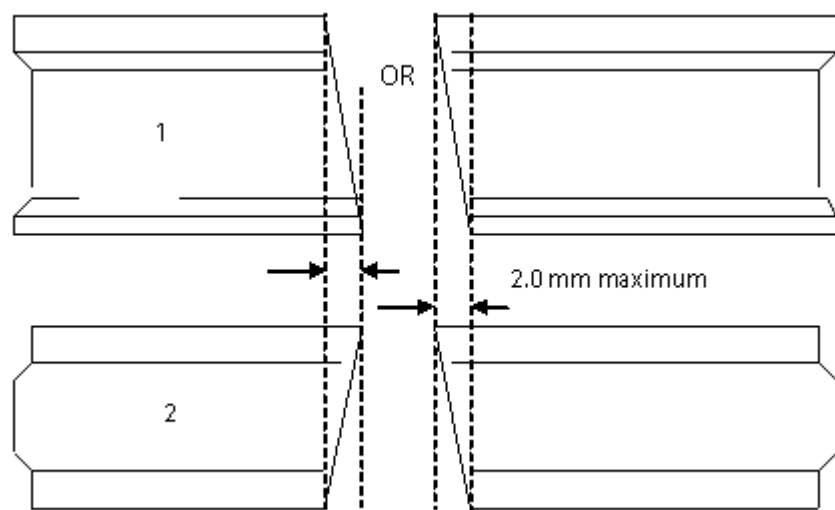
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All welding shall be carried out on a flash butt welding machine using an automatic, programmed welding sequence using RA approved procedures.

### 6.2 Workpiece preparation

The crossing/insert/rail faces to be welded shall always be sawn, disc cut or machined prior to welding and shall conform to the tolerances given in Figure 1. Areas of electrical contact on the workpieces and the machine shall be clean and free of any deleterious materials that could affect current flow. The workpieces shall not be damaged by the cleaning operation.

The total mismatch of the two workpieces shall not exceed 2 mm and shall be corrected by grinding or machining prior to welding.



### Key

- 1 elevation
- 2 plan

Figure 1 — Tolerances for rail end squareness  
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## 6.3 Clamping force

Workpieces shall be secured in the flash butt welding machine by clamps of such a surface shape or contour, that when a clamping force is exerted on the workpieces, it shall not damage the workpiece. The clamping force shall be sufficient such that slippage does not occur.

## 6.4 Initial burn-off

The workpieces should undergo initial flashing to ensure full rail end contact during the subsequent preheating cycles.

## 6.5 Preheating

The fronts of the heating area shall progress such that at completion of preheating an even heat band is present in both workpieces. On completion of welding there shall be no evidence of localised melting on the ends of the workpieces.

## 6.6 Final flashing

Once initiated, final flashing shall be continuous.

## 6.7 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.

The time between completion of upsetting and unclamping shall be sufficient to ensure required weld integrity. During this time, sufficient longitudinal force shall remain present to prevent damage to the weld.

## 6.8 Post-weld treatment

### 6.8.1 Before unclamping

Post-weld heating could be required for certain rail grades and alloyed steels.

### 6.8.2 After removal from machine

A post-weld controlled cooling could be required.

Additional post-weld heat treatment may be required after removal from the welding machine for certain steel grades.

## 6.9 Welding parameters

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

- a) welding current;
- b) upset force or pressure;
- c) displacement;
- d) welding time;
- e) programme identification and setting details;
- f) weld identification;
- g) post-weld heat treatment (if applicable).

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The welding programmes and any post-weld heat treatment shall be determined during procedural trials and once approval has been granted they shall not be changed without prior purchaser approval.

The welding parameters shall be monitored, checked against approval limits and recorded. These records shall be referenced to the appropriate welds.

The post-weld heat treatment parameters shall be monitored, checked against approval limits and recorded. These records shall be referenced to the appropriate welds.

### 6.10 Removal of upset and correction of weld alignment

The upset material shall be removed by the method carried out during the approval process and once agreed shall not be changed without prior purchaser approval. In exceptions where upset material cannot be removed, finish and dimensions shall be agreed between the purchaser and the manufacturer.

Removal of the upset shall not cause any mechanical or thermal damage to the crossing or rail.

Any surface where upset has been removed shall be free from visible cracking.

The correction of the weld alignment shall be carried out by pressing.

## 7 Profile finishing of the weld

The surface finishing shall be carried out in the longitudinal direction using machining/grinding.

The roughness limit within the welded zone shall be: