



SLOVENSKI STANDARD
oSIST prEN 16771:2014
01-oktober-2014

Železniške naprave - Infrastruktura - Aluminotermično varjenje tirnice z žlebom

Railway applications - Infrastructure - Aluminothermic welding of grooved rails

Bahnanwendungen - Infrastruktur - Aluminiothermisches Schweißen von Rillenschienen

Applications ferroviaires - Infrastructures - Soudage par aluminothermie des rails à gorge

Ta slovenski standard je istoveten z: prEN 16771

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ICS:

25.160.10	Varilni postopki in varjenje	Welding processes
45.080	Tračnice in železniški deli	Rails and railway components

oSIST prEN 16771:2014

en,fr,de

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 16771

July 2014

ICS 25.160.10; 93.100

English Version

Railway applications - Infrastructure - Aluminothermic welding of grooved rails

Applications ferroviaires - Infrastructures - Soudage par aluminothermie des rails à gorge

Bahnanwendungen - Infrastruktur - Aluminothermisches Schweißen von Rillenschienen

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prEN 16771:2014 (E)

Foreword

This document (prEN 16771:2014) 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.

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Introduction

This standard defines the approval procedure for aluminothermic welding processes for grooved rail welding through laboratory tests of welds produced in a workshop. This laboratory approval will provide the railway authority with sufficient information for tests in the track if required.

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1 Scope

This standard defines the laboratory tests and requirements for approval of an aluminothermic welding process using welds produced in workshop conditions.

It applies to the joining of new, grooved rails as described in EN 14811 of the same profile and steel grade. Welding of construction profiles and machined profiles are not covered in this standard.

Compliance with the requirements of this standard does not of itself ensure the suitability of a welding process for specific conditions of track and traffic.

The standard does not cover welds made between different rail sections, worn rails or different rail grades.

In addition to the definitive requirements this standard also requires the items detailed in Clause 4 to be documented. For compliance with this standard, it is important that both the definitive requirements and the documented items be satisfied.

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 ISO 9712, *Non destructive testing – Qualification and certification of NDT personnel (ISO 9712)*

EN 14811, *Railway applications – Track – Special purpose rail – Grooved and associated construction*

EN ISO 6506-1, *Metallic Materials – Brinell hardness test – Part 1: Test method (ISO 6506-1)*

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

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)*

3 Terms and definitions

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

3.1

term fusion zone

area of the weld which has been in a liquid state and which is revealed by etching sections cut through the weld

3.2

visible heat-affected zone

areas on either side of the fusion zone within the rail steel microstructure has been visibly modified by the heat of the welding process as revealed by FRY macro-etching

3.3

heat softened zone

part of the HAZ characterised by a lower hardness

3.4

flashing

flat fin of weld metal located on the rail surface adjacent to the weld collar caused by gaps between the mould and the rail

3.5**surface defect**

any defect visible on the weld surface after normal finishing operations

3.6**internal defect**

any defect that is revealed by sectioning or on a fracture face following bend testing that has not already been identified as a surface defect

3.7**railway authority**

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

3.8**process supplier**

company which provides an approved aluminothermic welding process in accordance with this standard and which is approved by the railway authority to supply consumables and tools for the execution of aluminothermic welds

4 Information to be supplied by the railway authority

The following information shall be fully documented by the railway authority. For compliance with the standard both the definitive requirements specified throughout the standard and the following documented items shall be satisfied:

- a) any limitation on the weld collar geometry affected by riser removal (other than that on the ground rail head);
- b) any limit on the depth of the weld collar's edge (less than 2 mm) that may remain unfused to the rail surface;
- c) which of the width levels of heat-softened zone is required (7.4.4);
- d) any limitations on the type of pre-heating.

5 Approval procedure**5.1 General**

An outline of the steps required for compliance to this standard is given in informative Annex A.

5.2 Process identification

The approval shall involve a single process identified by:

- a) the process name;
- b) A drawing of the pouring system and the casting system;
- c) the characteristic geometry of the weld collar and riser configuration as given in 5.4.2 and Figure 1;
- d) the process manual in accordance with 5.4.1.

5.3 General requirements

The following requirements shall be met.

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- a) the process shall be capable of being carried out on track and at or near trackside or in a workshop;
- b) the aluminothermic welding portion shall be packed to avoid the risk of moisture contamination in prescribed storage conditions. The portion shall be identified by markings on the package;
- c) the mould shall be pre-fabricated for the rail profiles to be welded and be identified by markings on the package;
- d) the crucible shall be tapped automatically (automatic tapping) and shall have a device to limit spattering;
- e) pre-heating shall comply with any limitations of the railway authority as specified in clause 4, d);
- f) the process shall not damage the rail.

5.4 Documents to be submitted with the request for approval

When applying for approval, the following documents shall be submitted:

5.4.1 The process manual

The supplier shall produce a manual identifying all the consumable materials and equipment used, as well as the operating method to be followed for all steps of welding. The approval procedure for laboratory tests will not include means of alignment or finishing operations. The manual shall specify the critical parameters of the welding process and their safe bounds, and shall include the following:

- a) number of people required to carry out the operations;
- b) diagram of equipment;
- c) portion for each rail grade and profile; [SIST EN 16771:2017](https://standards.iteh.ai/catalog/standards/sist/72c18ed8-bcb1-4395-8668-bade3627b2b/sist-en-16771-2017)
- d) rail end preparation requirements; <https://standards.iteh.ai/catalog/standards/sist/72c18ed8-bcb1-4395-8668-bade3627b2b/sist-en-16771-2017>
- e) nominal gap shall have a tolerance of ± 2 mm for a gap up to 30 mm and ± 3 mm for gaps above 30 mm and up to 50 mm and ± 5 mm for gaps above 50 mm;
- f) preheating details;
- g) range of ignition to tap times for the portion;
- h) critical process timings;
- i) time (or temperature) before trains can pass;
- j) safety information.

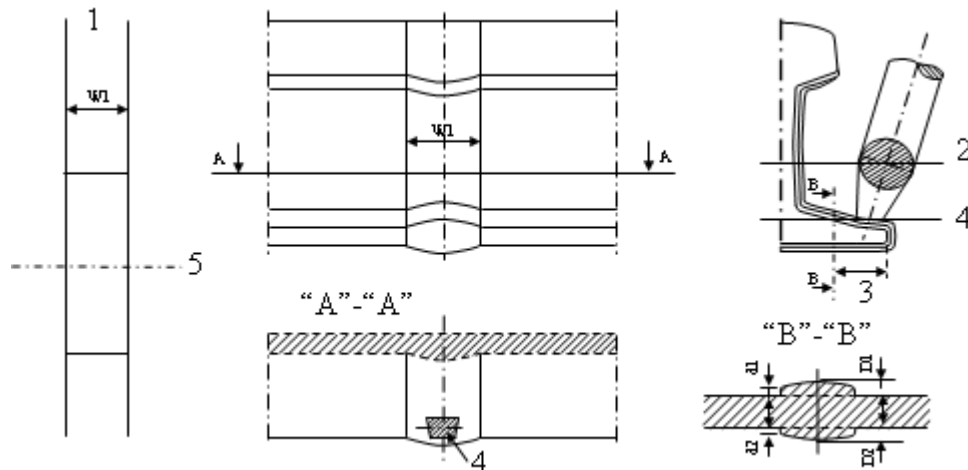
5.4.2 Drawing with the required measurements

A drawing, as illustrated in Figure 1, which provides the measurements listed below:

- a) weld collar width (W1). The development of the weld collar shall be fully dimensioned around the weld;
- b) maximum depth of collar at section B-B (D1 and D2);
- c) minimum depth of collar at section B-B (d1 and d2);
- d) riser cross section at foot;

- e) riser cross section at neutral axis;
- f) number of risers;
- g) position of risers.

The dimensions W , D and d and cross sectional areas of the risers shall be the nominal dimensions taken from the drawing of the pattern used to produce the moulds.



Key

- 1 Figure showing the width of the weld collar around the weld
- 2 Riser cross section on the neutral axis mm^2
- 3 25 % of the foot width
- 4 Riser cross section at the foot mm^2

Figure 1 — Dimensions taken from mould pattern

5.4.3 Chemical analysis ranges and tolerances

The chemical analysis ranges and tolerances according to 7.5.1.

5.5 Initial compliance testing

- a) For the purposes of approval the standard rail profiles (see EN 14811) shall be grouped as follows:

Table 1 —Rail profile groups 1

New names	Former names
57R1	Ph 37
59R1	Ri 59-R10, Ri 59
59R2	Ri 59-R13, Ri 59N
60R1	Ri 60-R10, Ri 60
60R2	Ri 60-R13, Ri 60 N
60R3	Ri 210/95+80
62R1	NP4aM
62R2	NP4aS
63R1	Ri 210/95+80a
67R1	Ph 37a
68G1	70 G

Table 2 —Rail profile groups 2

New names	Former names
46G1	60 G
51R1	Ri 52-R13, Ri 52
52R1	Ri lr
53R1	Ri 53-R13, Ri 53
55G1	35 GP
55G2	41 GP
56R1	Ⓒ ₂ Ⓒ ₁₁ Ⓒ ₁₃

- b) Initial compliance with this standard shall be achieved by undertaking the tests specified in category 1 of Table 3 using not heat treated rail, by using either R200 or R220G1 or R260 grade. Results are valid for the three grades of all rail profile in either group 1 or group 2. Compliance with all the criteria specified and with the railway authority's documented requirements specified in clause 4 shall be demonstrated. A test sequence is outlined in informative Annex B. A test specimen can be used for several different tests.