

SLOVENSKI STANDARD

SIST EN 13674-2:2019

01-december-2019

Nadomešča:

SIST EN 13674-2:2006+A1:2010

Železniške naprave - Zgornji ustroj proge - Tirnice - 2. del: Tirnice za kretnice in križišča, ki se uporabljajo skupaj z Vignolovo tirnico z maso 46 kg/m ali več

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

Bahnanwendungen - Oberbau Schienen - Teil 2: Schienen für Weichen und Kreuzungen, die in Verbindung mit Vignolschienen ab 46 kg/m verwendet werden

Applications ferroviaires - Voie - Rails - Partie 2 : Rails pour appareils de voie utilisés avec des rails Vignole de masse supérieure ou égale à 46 kg/m

Ta slovenski standard je istoveten z: EN 13674-2:2019

ICS:

45.080	Tračnice in železniški deli	Rails and railway components
--------	-----------------------------	------------------------------

SIST EN 13674-2:2019

en,fr,de

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 13674-2:2019

<https://standards.iteh.ai/catalog/standards/sist/c8ed2d02-ec00-489e-8706-dfddda68e859/sist-en-13674-2-2019>

EUROPEAN STANDARD

EN 13674-2

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2019

ICS 93.100

Supersedes EN 13674-2:2006+A1:2010

English Version

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

Applications ferroviaires - Voie - Rails - Partie 2 : Rails pour appareils de voie utilisés avec des rails Vignole de masse supérieure ou égale à 46 kg/m

Bahnanwendungen - Oberbau - Schienen - Teil 2: Schienen für Weichen und Kreuzungen, die in Verbindung mit Vignolschienen ab 46 kg/m verwendet werden

This European Standard was approved by CEN on 2 January 2019.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents	Page
European foreword.....	4
Introduction	6
1 Scope	8
2 Normative references.....	8
3 Terms and definitions	8
4 Information to be supplied by the purchaser.....	9
5 Steel grades	10
6 Dimensions, static properties, linear mass and tolerances.....	11
7 Manufacture	11
7.1 Product integrity	11
7.1.1 Factory production control	11
7.1.2 Best practice manufacture.....	12
7.2 Blooms.....	12
7.3 Rails.....	12
7.4 Identification	12
7.4.1 Branding.....	12
7.4.2 Hot stamping.....	13
7.4.3 Cold stamping.....	13
7.4.4 Other identification.....	13
8 Qualification of the manufacturer.....	13
9 Acceptance tests	14
9.1 Laboratory tests.....	14
9.1.1 General.....	14
9.1.2 Chemical composition	14
9.1.3 Microstructure	18
9.1.4 Decarburization.....	18
9.1.5 Oxide cleanness	19
9.1.6 Sulfur prints	19
9.1.7 Hardness.....	19
9.1.8 Tensile tests	20
9.1.9 Retest procedures.....	21
9.2 Dimension tolerances.....	21
9.2.1 Profile	21
9.2.2 Straightness, surface flatness and twist.....	22
9.2.3 Cutting and drilling.....	26
9.3 Gauges	26
9.4 Inspection for internal quality and surface quality.....	26
9.4.1 Internal quality	26
9.4.2 Surface quality.....	28
9.4.3 Checking of automated testing equipment.....	30
Annex A (normative) Rail profiles	41
Annex B (normative) Comparison of steel designations referred to in this standard compared to those in EN 10027-2	108

Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC aimed to be covered	109
Bibliography	111

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN 13674-2:2019

<https://standards.iteh.ai/catalog/standards/sist/c8ed2d02-ec00-489e-8706-dfddda68e859/sist-en-13674-2-2019>

EN 13674-2:2019 (E)**European foreword**

This document (EN 13674-2:2019) 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 April 2020, and conflicting national standards shall be withdrawn at the latest by April 2020.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13674-2:2006+A1:2010.

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 EU Directive 2008/57/EC.

For relationship with EU Directive 2008/57/EC, see informative Annex ZA, which is an integral part of this document.

The most significant change which was made in this new edition are the following ones:

- 1) suppression of Profile 60E2A3 as Figure A.20 in Table A.1, and update of numbering of Tables A.1 and A.2 accordingly;
- 2) introduction of Grade R370CrHT in Table 3, and modifications of the relevant clauses and tables;
- 3) modification of the calculation formula for hardness in 9.1.7;
- 4) clean up of figures and editorial errors.

This part of EN 13674 is the second of the EN 13674 series, *Railway applications – Track – Rail*, which consists of the following parts:

- *Part 1: Vignole railway rails 46 kg/m and above;*
- *Part 2: Switch and crossing rails used in conjunction with Vignole railway rails 46 kg/m and above;*
- *Part 3: Check rails;*
- *Part 4: Vignole railway rails from 27 kg/m to, but excluding 46 kg/m.*

Other published standards include the following:

- EN 14587-1, *Railway applications - Infrastructure - Flash butt welding of new rails - Part 1: R220, R260, R260Mn, R320Cr, R350HT, R350LHT, R370CrHT and R400HT grade rails in a fixed plant;*
- EN 14587-2, *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;*
- EN 14587-3, *Railway applications – Track - Flash butt welding of rails – Part 3: Welding in association with crossing construction;*

- EN 14730-1, *Railway applications – Track - Aluminothermic welding of rails – Part 1: Approval of welding processes;*
- EN 14730-2, *Railway applications – Track - Aluminothermic welding of rails – Part 2: Qualification of aluminothermic welders, approval of contractors and acceptance of welds;*
- EN 14811, *Railway applications – Track – Special purpose rail – Grooved rails and associated construction profiles;*
- EN 15594, *Railway applications – Track – Restoration of rails by electric arc welding;*
- EN 16273, *Railway applications – Track – Forged rail transitions.*

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, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 13674-2:2019](https://standards.iteh.ai/catalog/standards/sist/c8ed2d02-ec00-489e-8706-dfddda68e859/sist-en-13674-2-2019)

<https://standards.iteh.ai/catalog/standards/sist/c8ed2d02-ec00-489e-8706-dfddda68e859/sist-en-13674-2-2019>

EN 13674-2:2019 (E)**Introduction**

This Introduction provides an explanation of the concepts and reasoning used in the drafting of this document. Its inclusion also ensures that during future revisions, restrictions are removed where technology progresses and held where it does not, thus ensuring continued safety as new manufacturers, products and technologies are introduced.

The most commonly used standards of the world for the supply of railway rails have been reviewed during the preparation of this document. However, modern rail production technology within the European Union has demanded a completely new look at the philosophy and content of this part of EN 13674.

Whenever possible this part of EN 13674 is performance based, recognizes the European Quality System standard EN ISO 9001 and requires manufacturers to offer the latest proven technology to consistently satisfy the demanding quality of the required product.

Rail grading is based on hardness rather than tensile strength.

The acceptance tests have been designed to control those characteristics of the rail steel and rail that are of relevance to the production of high quality rails and the demands of the railway.

The steel grades covered by this part of EN 13674 reflect trends in railway usage and heat-treated rails are included. This document includes rail profiles for switch and crossing rails used in conjunction with Vignole rails having a linear mass 46 kg/m and above.

To ensure the supply of high quality rails, some restrictions on production processes have been imposed.

This document supersedes other standards covered by the scope. In addition CEN required, where possible, a performance based standard, taking into account safety implications and at the same time addressing modern production technology. It was recognized that there would be few opportunities (and these would have to be for transparent safety considerations) for derogation from this document to operate between the user and the manufacturer.

This document reflects this change in philosophy from the traditional content of rail standards. A review was undertaken of the most commonly used rail standards of the world. All relevant aspects important to both user and manufacturer were considered with the aim of ensuring that all of the content had specific usefulness and relevance. For example rail grading and much of this European Standard has been based on hardness rather than tensile strength. While the two are directly related, hardness is very quick and cheap to carry out and provides more relevant guidance to the user particularly where properties vary in different parts of the profile.

Since many rail manufacturers would not have previously carried out proving trials, the document includes a prerequisite for all manufacturers to prove conformity against a set of qualifying test criteria at the time of tendering. The qualifying tests include all "normal" acceptance test results plus new 'type-casting' features such as fracture toughness, fatigue and residual stress (see EN 13674-1). To provide users with the necessary confidence, acceptance limits have been based on results from rail known to have performed well in demanding track installations.

One aspect of this document, which is a complete break from tradition, is the inclusion of quality assurance and inspection clause as part of product integrity.

So that quality management systems are consistent across all manufacturers and that users have the best assurance for the consistency of required product quality on this safety critical component of the track, the rail standard requires that the manufacturers' quality assurance systems are at least equivalent to the requirements of a quality management standard such as EN ISO 9001. The inclusion of this requirement also reduces the need to incorporate detailed method and calibration descriptions on items such as normal chemical composition determination and the need to define more extensive testing.

Ideally, manufacturing techniques should not be referenced in a product standard. However, some rail attributes are either not known in an exact manner or are not measurable with satisfactory statistical significance. In such cases best practice manufacturing techniques have been included as a last resort. The

equipment specified is that which gives the best probability of achieving the required product for use in track. In the future new technology can add to, but preferably will reduce or delete such items.

Examples of areas where the technological state of the art renders the standard less than complete include:

- oxide/oxygen relationships;
- hydrogen test techniques;
- roller straightening effects on residual stresses;
- roller straightening effects on contact scrub;
- measurement and effect of residual stresses throughout the rail.

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN 13674-2:2019

<https://standards.iteh.ai/catalog/standards/sist/c8ed2d02-ec00-489e-8706-dfddda68e859/sist-en-13674-2-2019>

EN 13674-2:2019 (E)**1 Scope**

This document specifies switch and crossing rails that carry railway wheels. These are used in conjunction with Vignole railway rails.

This document is not applicable for the check rails that do not carry railway wheels.

Nine pearlitic steel grades are specified covering a hardness range of 200 HBW to 410 HBW and include non-heat-treated non-alloy steels, non-heat-treated alloy steels, heat-treated non-alloy steels, heat-treated low alloy steels and heat-treated alloy steels.

There are 33 rail profiles specified in this standard, but they may not all be available in all steel grades.

Rails specified in EN 13674-1 can also be used as switch and crossing rails and if so used they will comply with the requirements of EN 13674-1.

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 10027-1, *Designation systems for steels – Part 1: Steel names*

EN 10027-2, *Designation systems for steels – Part 2: Numerical system*

EN 10163-1, *Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections – Part 1: General requirements*

EN 10276-1, *Chemical analysis of ferrous materials – Determination of oxygen in steel and iron – Part 1: Sampling and preparation of steel samples for oxygen determination*

EN 13674-1:2011+A1:2017, *Railway applications – Track – Rail – Part 1: Vignole railway rails 46 kg/m and above*

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

EN ISO 6892-1, *Metallic materials – Tensile testing – Part 1: Method of test at room temperature (ISO 6892-1)*

ISO 4968, *Steel – Macrographic examination by sulfur print (Baumann method)*

3 Terms and definitions

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:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 heat

one liquid steel melt tapped out of a converter or electric arc furnace which includes after continuous casting a given number of blooms relating to the weight of the heat and the extension of the mixing zone

Note 1 to entry: In the case of sequence casting the blooms belonging to the mixing zone should be clearly defined.

3.2**sequence**

number of heats, of the same steel grade, which undergo continuous casting in tundishes

Note 1 to entry: Tundishes may be used in parallel if the caster has many strands.

3.3**heat-treated rail**

rail that has undergone accelerated cooling from austenitizing temperature during the metallurgical transformation period

3.4**re-heated rail**

rolled rail that has undergone re-austenitization for heat treatment purposes

3.5**mill heat-treated rail**

heat-treated rail that has not undergone re-austenitization after rolling

3.6**rolling process**

process between the blooms leaving the heating furnace and exiting the finishing pass

3.7**isothermal treatment process**

process whereby blooms are held for a period of time at an elevated temperature for diminishing the hydrogen content

Note 1 to entry: For maximum efficiency this is as near to (but below) the pearlite to austenite transformation temperature as is practically possible.

Note 2 to entry: This process is sometimes referred to as sub-critical diffusion annealing.

3.8**qualifying tests**

special tests and criteria which are relevant to some aspects of the service performance of rails

Note 1 to entry: Acceptance tests also form part of the qualifying tests.

3.9**acceptance tests**

tests carried out as part of the process and product control system, normally on a heat, sequence or tonnage basis

3.10**rail running surface**

curved surface of the rail head, and area between both gauge corners (transition points of the head inclination and the first head radius)

4 Information to be supplied by the purchaser

The purchaser shall provide the supplier with the following information when inviting tenders to supply:

- a) rail profiles (see Annex A);
- b) steel grades (see Table 1);

EN 13674-2:2019 (E)

- c) length (or lengths) of rail (see 9.2.3 and Table 8);
- d) paint code requirements (see 7.4.4);
- e) undrilled or drilled rail ends to take fish plate bolts, and the location and dimensions of holes when required (see 9.2.3 and Table 8);
- f) any special treatments to be applied and corresponding tolerances for bolt holes (see 9.2.3);
- g) cold stamping on the cut surface, if applicable (see 7.4.3).

5 Steel grades

The applicable steel grades are given in Table 1. The hardness ranges of the steel grades shall conform to those given in Table 1.

The steel grade designations referred to in this standard are compared to those in EN 10027-1 and EN 10027-2 in Annex B.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 13674-2:2019

<https://standards.iteh.ai/catalog/standards/sist/c8ed2d02-ec00-489e-8706-dfddda68e859/sist-en-13674-2-2019>

Table 1 — Steel grades

Grade ^a	Hardness range (HBW)	Description	Branding lines
R200	200 to 240	Non-alloy (C-Mn)	No branding lines
R220	220 to 260	Non-alloy (C-Mn)	_____
R260	260 to 300	Non-alloy (C-Mn)	_____ _____
R260Mn	260 to 300	Non-alloy (C-Mn)	_____ _____
R260Cr	260 to 300	Alloy (0,5 % Cr)	_____ _____ _____
R320Cr	320 to 360	Alloy (1 % Cr)	_____ _____ _____
R350HT	350 to 390 ^b	Non-alloy (C-Mn) heat-treated	_____ _____ _____
R350LHT	350 to 390 ^b	Non-alloy (C-Mn) heat-treated	_____ _____ _____
R370CrHT	370 to 410 ^b	Alloy (C-Mn) heat-treated	_____ _____ _____

^a See Table 3 for chemical composition/mechanical properties.
^b See Table 5 for hardness requirements.

6 Dimensions, static properties, linear mass and tolerances

Rail profiles, dimensions, static properties and linear masses shall be in accordance with Annex A. The tolerances of certain dimensions shall be given in Table 6. All other quantities are informative only.

NOTE Linear masses have been calculated based on the density of steel of 7,85 g/cm³.

7 Manufacture

7.1 Product integrity

7.1.1 Factory production control

Rails shall be produced under a comprehensive system of factory production control, which shall ensure confidence in the conformity of the finished product. The system shall address this European Standard to

EN 13674-2:2019 (E)

ensure that the finished products consistently comply with requirements to achieve the product integrity necessary to provide assurance of product safety in track.

Manufacturers shall demonstrate continuing compliance, including documented evidence, with the factory production control system required.

NOTE Manufacturers having a factory production control system, such as EN ISO 9001, are recognized as satisfying the minimum requirements specified by this clause.

7.1.2 Best practice manufacture

The product shall be manufactured to the best practices as defined in 7.1.1.

NOTE This is to ensure that the rail attributes, described in the Introduction, which are not known in an exact manner or are not practically measurable, achieve the required high level of product integrity in track.

7.2 Blooms

Blooms made from basic oxygen steel or electric arc furnace steel that has been secondary ladle arc refined, vacuum degassed and continuously cast, shall be used for the manufacture of rails.

7.3 Rails

The manufacturer shall operate a procedure for the effective removal of scale during the rolling and straightening processes.

The cross-sectional area of the rail shall not exceed one seventh that of the bloom from which the rail is rolled, except for full web rails (Figures A.27 to A.33), where this value shall not exceed one fifth.

Rail straightening shall be by a two stage roller straightening process which straightens the rail about its xx and yy axes as defined in the rail profiles shown in Annex A. End deviations or a localized deviation on the rail may be corrected using pressing.

NOTE Other mandatory processes are described in the relevant clauses within the standard.

7.4 Identification**7.4.1 Branding**

Brand marks shall be rolled in relief on one side and in the middle of the web (see Annex A) of each rail at least once every 4 m. The brand marks on the rails shall be clearly legible and shall be 15 mm to 25 mm high, raised between 0,6 mm and 1,3 mm. For asymmetric rails, except 50E6A2, the brand shall be on the gauge side of the rail profile. For 50E6A2 rail the brand shall be on the non-gauge side.

The branding line(s) to denote grade shall be 50 mm in length for the long branding line and 25 mm in length for the short branding line.

The brand marks shall include:

- a) identification of the mill;
- b) steel grade as shown in Table 1;
- c) last two figures of the year of manufacture;
- d) rail profile identification as shown in Annex A.

EXAMPLES

ROLLING MILL — 99 60 E1A5
 ———

(60 E1A5 profile rail rolled 1999, non-alloy rail steel grade R260)

ROLLING MILL — ——— 99 60 E1T2
 ———

(60 E1T2 profile rail rolled 1999, non-alloy heat-treated rail steel grade R350HT).

7.4.2 Hot stamping

In addition to the branding requirements of 7.4.1 each rail shall be identified by a numerical and/or alphabetical code system hot stamped on the non-branded side of the rail web by machine, except 50E6A2, and each rail shall be hot stamped at least once every 5 m. If for asymmetric rails hot stamping every 5 m is not practical, the identification of the rail shall be secured by hot stamping or rotary burr near one end of the rail.

NOTE 1 A rail can display different indications of position of the rail in the blooms (A,B...Y) along its length.

NOTE 2 Subsequent cutting could result in more than one rail length having the same identity.

The figures and letters used shall be clearly legible and shall be 16 mm high. The stamped characters shall have a flat or radius face (1 mm to 1,5 mm wide) with bevels on each side. The letters and numbers shall be on a 10° angle from vertical and shall have rounded corners. The stamping shall be between 0,5 mm and 1,5 mm in depth along the centre of the web. The design shall be as shown in Figure 1.

The identification system employed shall be such as to enable the hot stamped marking to be collated with:

- a) number of the heat from which the rail has been rolled;
- b) number of the strand and position of bloom within the strand;
- c) position of the rail in the bloom (A, B ... Y).

In the event of identification marks having been removed, omitted or requiring alteration, re-identification of such marks shall be made by rotary burr.

7.4.3 Cold stamping

Cold stamping shall only be used on the cut face of the rail within the central portion of the head, at the request of the purchaser.

7.4.4 Other identification

The steel grade may additionally be identified using paint. The purchaser shall specify the colour and position of the paint application.

8 Qualification of the manufacturer

The manufacturer shall qualify under EN 13674-1:2011+A1:2017, Clause 8 and shall then be qualified for all profiles of this part of EN 13674, provided the qualification was for the profile 60E1, 60E2 or the heaviest produced for the same grade.

NOTE The qualifying criteria specified in EN 13674-1 cannot be achieved using the rail grades and profiles specified in this part of the standard.

For the R260Cr grade, the qualifying criteria may be agreed between the manufacturer and the purchaser.