

SVENSK STANDARD

SS-EN 13231-5:2018



Fastställt/Approved: 2018-07-03
Publicerad/Published: 0001-01-01
Utgåva/Edition: 1
Språk/Language: engelska/English
ICS: 14.540;45.080;93.100

Järnvägar – Spår – Godkännande av arbeten – Del 5: Rutiner för järnvägs omprofilering för spår, växlar, korsningar och expansionsenheter

Railway applications – Track – Acceptance of works – Part 5: Procedures for rail reprofiling in plain line, switches, crossings and expansion devices

This preview is downloaded from www.sis.se. Buy the entire standard via <https://www.sis.se/std-80005351>

Standarder får världen att fungera

SIS (Swedish Standards Institute) är en fristående ideell förening med medlemmar från både privat och offentlig sektor. Vi är en del av det europeiska och globala nätverk som utarbetar internationella standarder. Standarder är dokumenterad kunskap utvecklad av framstående aktörer inom industri, näringsliv och samhälle och befrämjar handel över gränser, bidrar till att processer och produkter blir säkrare samt effektiviserar din verksamhet.

Delta och påverka

Som medlem i SIS har du möjlighet att påverka framtida standarder inom ditt område på nationell, europeisk och global nivå. Du får samtidigt tillgång till tidig information om utvecklingen inom din bransch.

Ta del av det färdiga arbetet

Vi erbjuder våra kunder allt som rör standarder och deras tillämpning. Hos oss kan du köpa alla publikationer du behöver – allt från enskilda standarder, tekniska rapporter och standardpaket till handböcker och onlinetjänster. Genom vår webbtjänst e-nav får du tillgång till ett lättnavigerat bibliotek där alla standarder som är aktuella för ditt företag finns tillgängliga. Standarder och handböcker är källor till kunskap. Vi säljer dem.

Utveckla din kompetens och lyckas bättre i ditt arbete

Hos SIS kan du gå öppna eller företagsinterna utbildningar kring innehåll och tillämpning av standarder. Genom vår närhet till den internationella utvecklingen och ISO får du rätt kunskap i rätt tid, direkt från källan. Med vår kunskap om standarders möjligheter hjälper vi våra kunder att skapa verklig nytta och lönsamhet i sina verksamheter.

Vill du veta mer om SIS eller hur standarder kan effektivisera din verksamhet är du välkommen in på www.sis.se eller ta kontakt med oss på tel 08-555 523 00.



Standards make the world go round

SIS (Swedish Standards Institute) is an independent non-profit organisation with members from both the private and public sectors. We are part of the European and global network that draws up international standards. Standards consist of documented knowledge developed by prominent actors within the industry, business world and society. They promote cross-border trade, they help to make processes and products safer and they streamline your organisation.

Take part and have influence

As a member of SIS you will have the possibility to participate in standardization activities on national, European and global level. The membership in SIS will give you the opportunity to influence future standards and gain access to early stage information about developments within your field.

Get to know the finished work

We offer our customers everything in connection with standards and their application. You can purchase all the publications you need from us - everything from individual standards, technical reports and standard packages through to manuals and online services. Our web service e-nav gives you access to an easy-to-navigate library where all standards that are relevant to your company are available. Standards and manuals are sources of knowledge. We sell them.

Increase understanding and improve perception

With SIS you can undergo either shared or in-house training in the content and application of standards. Thanks to our proximity to international development and ISO you receive the right knowledge at the right time, direct from the source. With our knowledge about the potential of standards, we assist our customers in creating tangible benefit and profitability in their organisations.

If you want to know more about SIS, or how standards can streamline your organisation, please visit www.sis.se or contact us on phone +46 (0)8-555 523 00



Europastandarden EN 13231-5:2018 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 13231-5:2018.

The European Standard EN 13231-5:2018 has the status of a Swedish Standard. This document contains the official version of EN 13231-5:2018.

© Copyright/Upphovsrätten till denna produkt tillhör SIS, Swedish Standards Institute, Stockholm, Sverige. Användningen av denna produkt regleras av slutanvändarlicensen som återfinns i denna produkt, se standardens sista sidor.

© Copyright SIS, Swedish Standards Institute, Stockholm, Sweden. All rights reserved. The use of this product is governed by the end-user licence for this product. You will find the licence in the end of this document.

Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS som även lämnar allmänna upplysningar om svensk och utländsk standard.

Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS, who can also provide general information about Swedish and foreign standards.

Denna standard är framtagen av kommittén för Järnvägar, SIS/TK 254.

Har du synpunkter på innehållet i den här standarden, vill du delta i ett kommande revideringsarbete eller vara med och ta fram andra standarder inom området? Gå in på www.sis.se - där hittar du mer information.

EUROPEAN STANDARD

EN 13231-5

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2018

ICS 93.100

English Version

Railway applications - Track - Acceptance of works - Part 5: Procedures for rail reprofiling in plain line, switches, crossings and expansion devices

Applications ferroviaires - Voie - Réception des travaux
- Partie 5 : Procédures pour le reprofilage de rails en
voie courante, en appareil de voie et en appareil de
dilatation

Bahnanwendungen - Oberbau - Abnahme von Arbeiten
- Teil 5: Prozedere zur Schienen-Reprofilierung in
Gleisen, Weichen, Kreuzungen und Schienenauszügen

This European Standard was approved by CEN on 8 February 2018.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, 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

SS-EN 13231-5:2018 (E)

Contents	Page
European foreword.....	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	5
4 Basics	7
4.1 Technical Introduction	7
4.2 Background of rail reprofiling	7
4.3 Specific reprofiling strategy	8
5 Rail surface defects	8
5.1 General	8
5.2 Rolling contact fatigue	8
5.2.1 Head check	8
5.2.2 Belgrospi	9
5.2.3 Squats	10
5.2.4 Flaking (Gauge corner cracking)	10
5.2.5 Spalling	11
5.3 Transverse profile deformation	12
5.3.1 Flattened transverse profile	12
5.3.2 Side cutting	12
5.3.3 Lipping	13
5.4 Periodical defects in longitudinal profiles	13
5.4.1 Short pitch corrugation	13
5.4.2 Short wave corrugation	14
5.4.3 Long wave corrugation	16
5.5 Surface damage	17
5.5.1 General	17
5.5.2 Imprints	17
5.5.3 Wheel burns	17
6 Reprofiling procedure	18
6.1 Inspection	18
6.2 Intervention thresholds	18
6.2.1 Longitudinal profile	18
6.2.2 Transverse profile	19
6.2.3 Rolling Contact Fatigue (RCF)	19
6.3 Specification of work	20
6.3.1 Metal removal	20
6.3.2 Target profile	20
6.4 Execution of work	22
6.5 Documentation of work	23
Annex A (informative) Programming of reprofiling work	24
A.1 General reprofiling programme	24
A.1.1 General	24
A.1.2 Reprofiling applications	24
A.1.3 Selection of machine type	25

A.1.4	Combination of reprofiling activities with other track maintenance work	25
A.2	Detailed reprofiling plan	26
Annex B	(informative) Reprofile methods.....	27
B.1	General	27
B.2	Rotating grinding.....	27
B.2.1	Principle of work	27
B.2.2	Performance	28
B.2.3	Results	28
B.2.4	Application.....	28
B.3	Milling.....	29
B.3.1	Principle of work	29
B.3.2	Performance.....	29
B.3.3	Results	30
B.3.4	Application.....	30
B.4	Oscillating grinding.....	30
B.4.1	Principle of work	30
B.4.2	Performance.....	31
B.4.3	Results	31
B.4.4	Application.....	31
B.5	Planing.....	31
B.5.1	Principle of work	31
B.5.2	Performance.....	32
B.5.3	Results	32
B.5.4	Application.....	32
B.6	High speed grinding.....	32
B.6.1	Principle of work	32
B.6.2	Performance.....	33
B.6.3	Results	33
B.6.4	Application.....	34
Annex C	(informative) A reprofiling strategy	35
C.1	General	35
C.2	Specific reprofiling strategy.....	35
C.3	Moving from corrective to preventive reprofiling	35
Annex ZA	(informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC aimed to be covered.....	37
Bibliography	39

SS-EN 13231-5:2018 (E)

European foreword

This document (EN 13231-5:2018) 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 December 2018, and conflicting national standards shall be withdrawn at the latest by December 2018.

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 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.

This document is one of the series EN 13231, *Railway applications — Track — Acceptance of works* as listed below:

- *Part 1: Works on ballasted track - Plain line, switches and crossings;*
- *Part 3: Acceptance of reprofiling rails in track;*
- *Part 4: Acceptance of reprofiling rails in switches and crossings;*
- *Part 5: Procedures for rail reprofiling in plain line, switches, crossings and expansion devices (the present document).*

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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This document specifies the procedure for planning and execution of rail reprofiling work including description of rail surface defects. It concerns work in both plain lines and switches and crossings generally done with machines according to the EN 14033 series and EN 15746 series.

It applies to vignole railway rails of 46 kg/m and above according to 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 13231-3:2012, *Railway applications — Track — Acceptance of works — Part 3: Acceptance of reprofiling rails in track*

EN 13231-4:2013, *Railway applications — Track — Acceptance of works — Part 4: Acceptance of reprofiling rails in switches and crossings*

3 Terms and definitions

For the purposes of this document the terms and definitions given in EN 13231-3:2012 and EN 13231-4:2013 and the following 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

anti-head check profile

AHC Profile

rail head profile with a geometry to prevent and reduce head checking

3.2

rolling contact fatigue

RCF

rail damage caused by the complex stresses that are characteristic of rail wheel contact

3.3

head checking

HC

small parallel cracks on the rail head near or on the gauge corner

3.4

Belgrospi

network of cracks developing on the rail head of track with speed greater than 160 km/h affected by short pitch corrugation

3.5

squat

rolling contact fatigue defect whose main characteristics are a blackish patch on rail head, a lateral flow of steel and a collapsed and widened rolling band

SS-EN 13231-5:2018 (E)

3.6

flaking

surface condition consisting of the gouging of metal on the rail head

3.7

spalling

cracking and chipping on the top of the rail

Note 1 to entry: Occurs commonly on low rails.

3.8

transverse profile deformation

plastic metal flow on the rail head

3.9

side cutting

wear occurring on high rails in small radius curves where wheel flanges contact the rail

3.10

lipping

plastic metal flow occurring on the rail head under conditions of high axle load and high gross tonnage

3.11

short pitch corrugation

quasi-periodic irregularities on the running surface

Note 1 to entry: The wavelength usually is 10 mm to 100 mm. Covering hereby two jointed wavelength according to the EN 13231 series.

3.12

short wave corrugation

depressions in the running surface which are pronounced

Note 1 to entry: The wavelength usually is 30 mm to 300 mm. Covering hereby two jointed wavelength according to the EN 13231 series.

3.13

long wave corrugation

irregular unevenness on the running surface

Note 1 to entry: The wavelength usually is 300 mm to 1 000 mm.

3.14

imprint

damage resulting from a small object which has been pressed into the rail by the wheel

3.15

wheel burn

abrasive, plastic and thermal damage occurring in zones where trains start to move

Note 1 to entry: Occurs e.g. at signals.

4 Basics

4.1 Technical Introduction

The complexity of vehicle-track interaction generates high stresses at the rail-wheel contact, the severity of which is governed by local track characteristics, vehicle type and other operational conditions. The repeated application of these stresses results in the development of fatigue cracks usually referred to as RCF manifested as head checks, gauge corner cracking, or squats. Although rail metallurgy offers a key mitigation measure against such fatigue degradation, there are no rail steels currently in use that could fully withstand the repeated application of such contact stresses. Furthermore the majority of rails in track today, despite their adequate but lower fatigue resistance, have an appreciable residual life span, which makes it more economic to maintain them in an appropriate manner to extend their life rather than to change them.

Management of rail profile and condition is therefore a prerequisite for safe and cost effective operation of railways. Predictable work – at least in a medium time horizon – organized in a strategic way needs to be defined to extract the maximum benefit from existing technologies and to guide the industry for future development. However, it is essential to ensure that the chosen approach provides enough flexibility to adapt to changing situations in both senses: increased requirements for maintenance due to higher loads and dynamic forces, reduced requirements for maintenance due to lower loads (improved vehicle characteristics) and better performing rails (reduced fatigue development).

The life expectancy of a rail is influenced by its interactions with the other parts of the train-track system. The faster and more frequent train services, higher axle loads and new generations of vehicles with greater primary yaw stiffness have significantly increased the critical track forces that promote more rapid degradation of the rail (and wheel) leading to more frequent and costly maintenance interventions and even rail renewal. Significant research into rail metallurgy has resulted in the development of rail steels with much higher resistance to wear and RCF. Nevertheless rail maintenance by reprofiling is an essential requirement for efficient and safe functioning of railway track. The combination of rail grade selection and maintenance strategy considering local track and traffic characteristics ensures effective control of any kind of rail surface defects.

4.2 Background of rail reprofiling

Reprofiling strategy is a planned maintenance activity usually defined by the infrastructure maintainer. In theory it is independent of available technologies, but in practice it is often influenced by the equipment that is easily accessible to or proposed by the contractors.

Work is programmed depending on damage having reached predetermined intervention thresholds such as corrugation depth, deviation from the transverse profile and depth of cracks.

Alternatively work is executed in cycles which are derived from experience and influenced by availability of machines, track possession times and similar factors such as traffic, usually expressed in mega gross tonnes (MGT), months, seasons, etc. Often work is combined with other maintenance activities (e.g. after rail replacement, after tamping or when the line is closed for other work, etc.).

Before the execution of rail maintenance work, specifications (i.e. the results that need to be achieved) shall be defined for:

- defect repair (metal removal);
- longitudinal profile (tolerance);
- transversal profile (target and tolerance);
- surface condition (roughness, facet widths, etc.).