SLOVENSKI STANDARD
oSIST prEN 13231-2:2019

01-november-2019

Železniške naprave - Zgornji ustroj proge - Prevzem del - 2. del: Prevzem reprofiliranih tirov na odprti progi, ostric, prehodov in razširjevalnih naprav

Railway applications - Track - Acceptance of works - Part 2: Acceptance of reprofiling rails in plain line, switches, crossings and expansion devices

Bahnanwendungen - Oberbau - Abnahme von Arbeiten - Teil 2: Abnahme von reprofilierten Schienen im Gleis, Weichen, Kreuzungen und Schienenauszügen

Applications ferroviaires - Voie - Réception des travaux - Partie 2 : Critères de réception des travaux de reprofilage des rails en voie et dans les appareils de voie

Ta slovenski standard je istoveten z: **prEN 13231-2**

ICS:

45.080	Tračnice in železniški deli	Rails and railway components
93.100	Gradnja železnic	Construction of railways

oSIST prEN 13231-2:2019 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 13231-2

June 2019

ICS 93.100

Will supersede EN 13231-3:2012, EN 13231-4:2013

English Version

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European Foreword

This document (prEN 13231-2:2019) 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.

This document will supersede EN 13231-3:2012, EN 13231-4:2013.

This European Standard 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 2: Acceptance of reprofiling rails in plain line, switches, crossings and expansion devices*

— *Part 3: Acceptance of reprofiling rails in track (to be replaced by Part 2)*

— *Part 4: Acceptance of reprofiling rails in switches and crossings (to be replaced by Part 2)*

— *Part 5: Procedures for rail reprofiling in plain line, switches, crossings and expansion devices*

1 Scope

This part of EN 13231 series defines the technical requirements and measurements for the acceptance of works for longitudinal and / or transverse reprofiling of railway rail heads in plain line, switches and crossings and expansion devices.

It applies to Vignole rails of 46 kg/m and above according to EN 13674-1.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

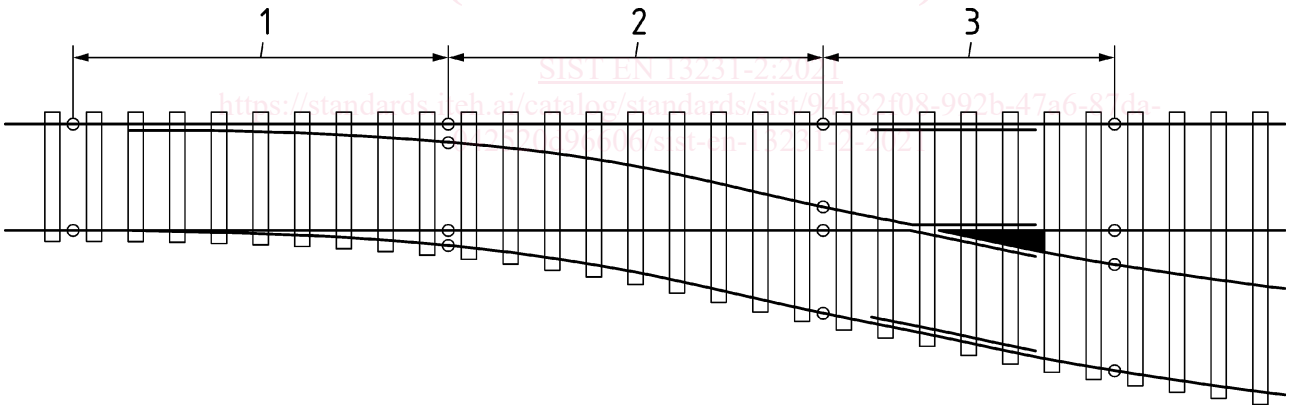
For the purposes of this document, the following terms and definitions apply.

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
reprofiling zones in switches
switches require different reprofiling work depending on the position of the rail within the switch

Note 1 to entry: There are three general areas of treatment as shown in Figure 1.



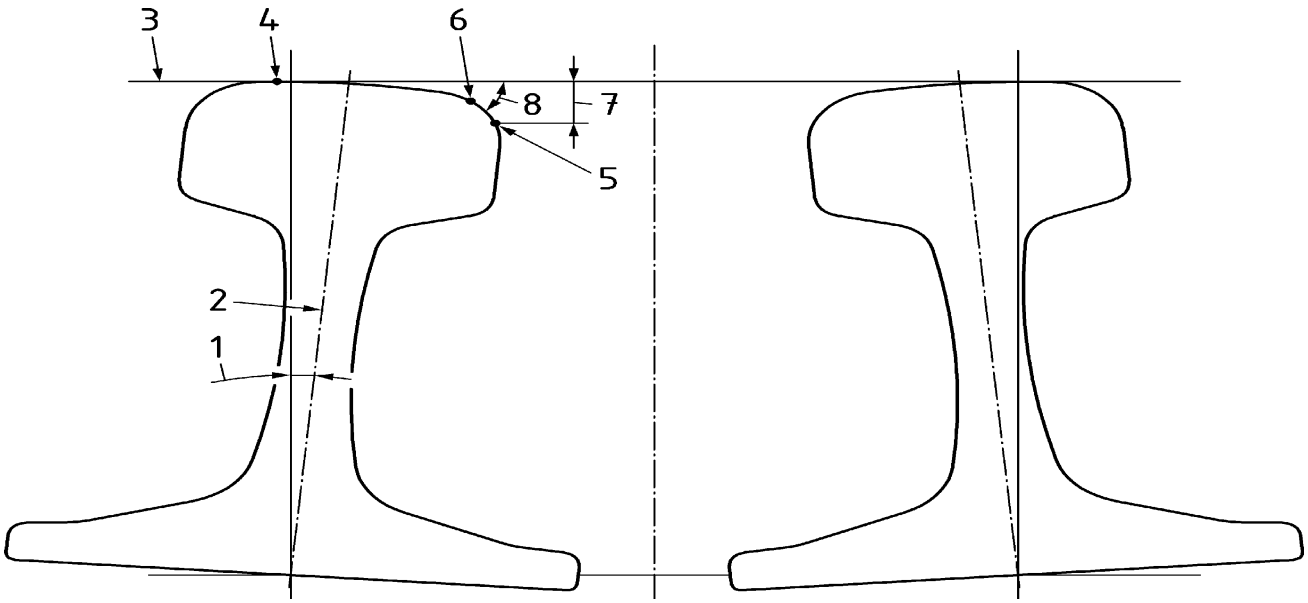
Key

○	Welding/joint	2	Zone G
1	Zone F	3	Zone H

Figure 1 — Reprofiling zones in switches

3.2
reference points A, B1 and B2
reference points A, B1 and B2

Note 1 to entry: See Figure 2.



Key

1 Angle of inclination

2 Rail axis

3 Reference line (see 3.23)

4 Reference point A (see 3.24)

5 Reference point B_1 (see 3.25)

6 Reference point B_2 (see 3.26)

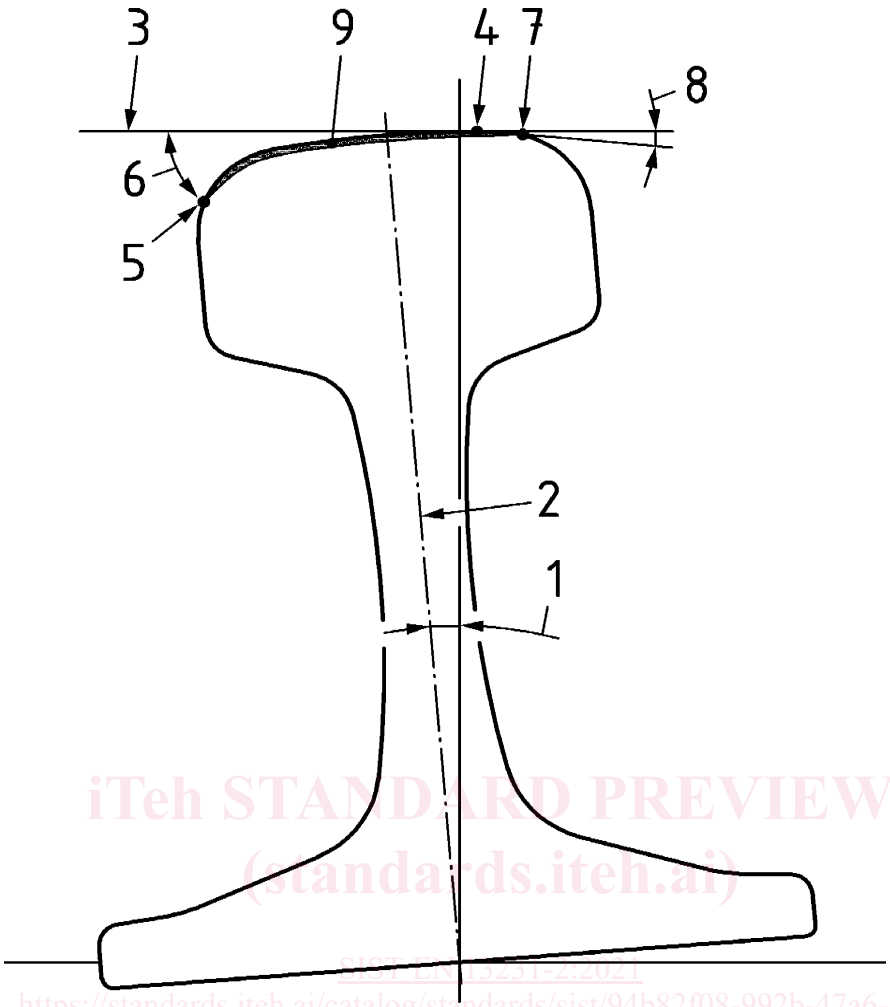
7 Distance between point B_1 and reference line (usually 14 mm)

8 Angle between tangent at point B_2 and reference line (usually 45°)

Figure 2 — Definition of terms, and determination of reference points A, B1 and B2 on the transverse profile

3.3
reprofiling zone
reprofiling zone

Note 1 to entry: See Figure 3.



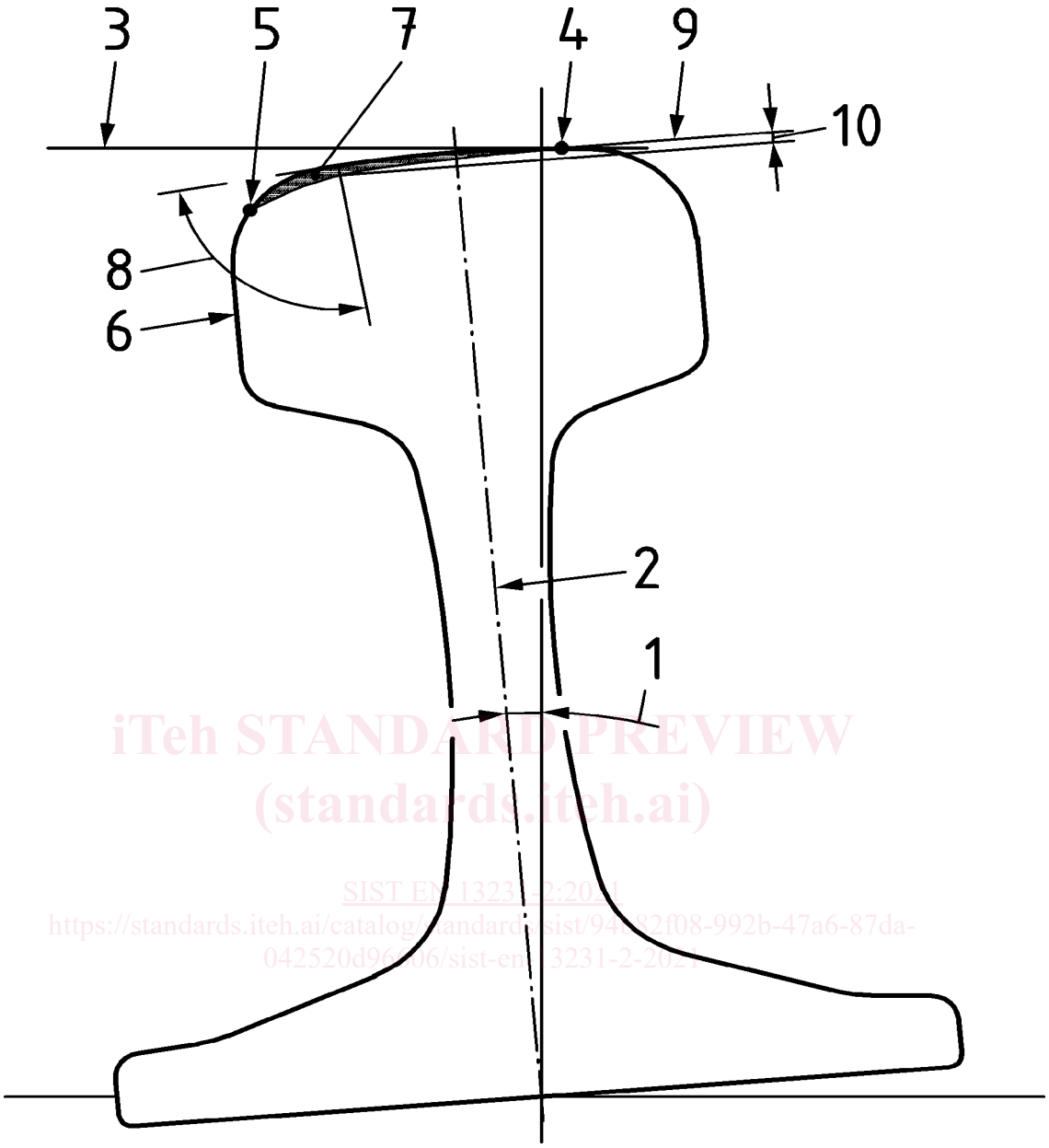
Key

1 Angle of inclination (see 3.6)
2 Rail axis
3 Reference line (see 3.23)
4 Reference point A (see 3.24)
5 Point C_1 (gauge corner) where the rail profile has an angle of 70° with respect to reference line
6 Angle of 70°
7 Point C_2 (field side) where the rail profile has an angle of −5° with respect to reference line
8 Angle of 5° with respect to the reference line
9 Reprofiling zone from C_1 to C_2

Figure 3 — Reprofiling zone

3.4
deviation of measured transverse profile
deviation of measured transverse profile

Note 1 to entry: See Figure 4. In this example, the range of deviation is negative (measured profile below the reference rail).



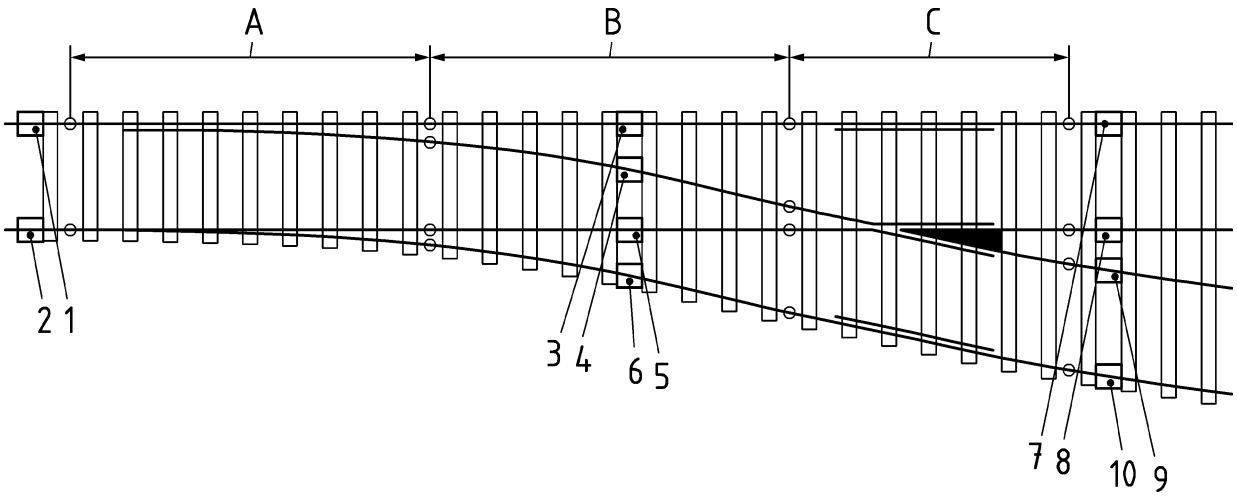
Key

1	Angle of inclination (see 3.6)	6	Target profile
2	Rail axis	7	Measured profile
3	Reference line (see 3.23)	8	Point where X is maximum
4	Reference point A – top of rail where deviation is zero (see 3.24)	9	Tangent to rail target profile at considered point
5	Reference point B_1 or B_2 where deviation is zero (see 3.25 and 3.26)	10	Deviation between 6 and 7 at point 8 – perpendicular to 9

Figure 4 — Deviation of measured transverse profile from reference profile

3.5
transverse profile for hand-measuring systems
the transverse profile can be measured with a hand measuring system at 10 measuring locations

Note 1 to entry: See Figure 5.



Key

○	Welding/joint	1-10	measuring points
1	Zone F	A	switch panel
2	Zone G	B	closure panel
3	Zone H	C	crossing panel

NOTE Point 1 is always on the left facing the switch towards the frog.

Figure 5 — Measuring points for transverse profile for hand-measuring systems in switches

3.6
angle of inclination of rail
nominal angle at which rail is laid; inclined towards the centre of the track

EXAMPLE: 0° (vertical rails), 2,86° (1:20 inclination), 1,91° (1:30 inclination), 1,43° (1:40 inclination), etc.

Note 1 to entry: See Figure 2.

Note 2 to entry: For rail which is laid in non-canted track, the angle of inclination of the rail is equal to the angle between the vertical and the centre-line of the inclined rail.

3.7
approved instrument
instrument for measurement of longitudinal or transverse profile, the usage of which is justified by correlation of its performance with that of a reference instrument in accordance with the defined procedure

Note 1 to entry: For procedure to demonstrate correlation, see Annex B.

3.8
characteristic length
length on the rail travelled during one rotation of a grinding stone or milling wheel

3.9
class 1, class 2
classes of longitudinal profile differentiated by the proportion of a reprofiling site reaching a specified standard

Note 1 to entry: For longitudinal profile, see 4.3.

3.10
class Q, class R, class S
classes of transverse profile differentiated by the proportion of a reprofiling site reaching a specified standard

Note 1 to entry: For transverse profile, see 5.4.

3.11
cut-off wavelength
wavelength of a sinusoidal profile of which 50 % of the amplitude is transmitted by the profile filter

Note 1 to entry: Profile filters are identified by their cut-off wavelength value, see EN ISO 11562.

3.12
deviation of the measured profile
deviation between the measured transverse profile and the reference rail, measured normal to the surface of the reference rail when the measured transverse profile and the reference rail are aligned at points A and B_1 or A and B_2, without rotation of either profile; the deviation is considered positive when the measured transverse profile is above the reference rail

Note 1 to entry: For deviation, see Figure 4.

3.13
facet
approximate plane sector of the profile of a reprofiled rail produced by the reprofiling tool

3.14
filtered profile
profile which results from applying a profile filter to the primary profile

3.15
peak-to-peak limit (ppl)
limit in which the value of the filtered longitudinal profiles shall lie in

Note 1 to entry: It is intended as the plus and minus values $(\pm A)$ in which a sinusoidal signal of amplitude A would lie in.

3.16
percentage exceedance
percentage length of a test site over which a measurement of the amplitude of the filtered profile exceeds a prescribed limit

3.17
phase correct profile filter
profile filter which does not cause phase shifts which lead to asymmetrical profile distortions

Note 1 to entry: For profile filter, see EN ISO 11562.

3.18
primary profile
representation of the measured longitudinal profile before application of any profile filter

3.19
profile filter
electronic device or signal processing which separates profiles into long-wave and short-wave components, or into components within a specified wavelength range

3.20
track section
continuous part of track with the same track geometry and the same track construction

3.21
range of deviation
difference between the maximum and minimum values of the deviation of the measured transverse profile

Note 1 to entry: For measured profile, see Figure 4.

3.22
reference instrument
instrument for the measurement of longitudinal or transverse profile, the performance of which has been verified in accordance with the procedure defined in Annex C

3.23
reference line
line normal to the track's longitudinal axis and tangent to the heads of both rails

3.24
reference point A
highest point of the rail referred to the opposite rail of the track where the reference line touches the rail profile

Note 1 to entry: For specified angle of inclination, see Figure 2

3.25
reference point B_1
point on the gauge face of a reference rail with a distance of 14 mm below the reference line

Note 1 to entry: For reference point B_1, see Figure 2.

3.26
reference point B_2
point on the gauge corner of a reference rail at which a line which is tangent to the rail lies at an angle of 45° to the reference line

Note 1 to entry: For reference point B_2, see Figure 2.

3.27
reference profile
transverse profile to which rail is to be reprofiled, within the specified tolerances

3.28
reference rail
rail with the reference profile, at the desired angle of inclination relative to the reference line

Note 1 to entry: For reference rail, see Figure 2.

3.29
reprofiling
action that is undertaken to modify the longitudinal or transverse profile of a rail

3.30
reprofiling site
continuous length of track where the rail is to be reprofiled excluding level crossings and switches and crossing work within the length of track

3.31
reprofiling zone
area of the railhead of a reference rail between the point at which the tangent to the rail lies at an angle of 70° to the reference line, measured towards the gauge side of the rail, and the point at which the tangent to the rail lies at an angle of 5° to the reference line, measured towards the field side of the rail

Note 1 to entry: For reprofiling zone, see Figure 3.

3.32
sampling interval
distance between successive points on the rail at which a continuous record of the traced profile is sampled in order to produce the primary profile

3.33
target profile
transverse profile to which the rail is to be reprofiled

3.34
test instrument
instrument whose use as a reference instrument or an approved instrument is being tested

3.35
traced profile
profile of the rail as recorded by the measuring system

3.36
transition length
initial or final section of a length of track where the validity of a measurement of longitudinal or transverse profile is questionable for a variety of reasons, including settling of electronic and digital components and circuits

4 Longitudinal profile

4.1 Principle

Measurements are made using either a reference instrument, see 3.22, or an approved instrument, see 3.7. Approved instruments do not offer the same accuracy as reference instruments but are generally adequate for the purpose of demonstrating compliance with the requirements of this European Standard.

NOTE An example of an approved instrument is the type of system used for routine corrugation measurement. Some of the systems used on reprofiling trains fall into this category.

In accordance with current practice, limits are set on the magnitude of the irregularities that can remain in track after a reprofiling operation. It is recognized, however, that it can be uneconomic to achieve 100 % compliance with these, particularly where isolated rail running surface defects, such as wheel burn, exist prior to reprofiling. Two classes are therefore offered, differentiated by the percentage of the reprofiled track meeting the specified criteria. Where isolated top faults exist, class 2 offers a lower cost option compared to class 1 as it will be achieved with fewer passes. However, a larger number of isolated non-compliant zones will remain in the reprofiled site.

Class 1 also includes limits for very short (10 mm to 30 mm) and very long (300 mm to 1 000 mm) wavelength residual irregularities; these are not included in class 2. Where very short waves need to be removed, in particular for noise reduction, it might also be necessary to specify a criterion for those wavelengths.

For the necessary annual metrological check, see Annex D.

4.2 Measurements required

The longitudinal profile of the finished reprofiled rail shall be recorded continuously using either a reference instrument or an approved instrument. Where independent verification is required a reference instrument shall be used. All measurements undertaken in order to demonstrate compliance with 4.3 shall be recorded

Due to the complex geometry and short length worked on in switches and crossings and expansion joints manual measurement systems can be used alternatively. The rail containing the frog shall be measured only in “Zone G”, see Figure 1, the opposite rail shall be measured in the total ground length.

Longitudinal profile measurements shall be made within a fixed position of 15 mm laterally on the rail from the rail crown, to produce the traced profile.

NOTE It is a known issue that some networks have corrugation on high rail gauge corner. This standard does not deal with this issue. IM and contractor can agree on measurement methods and acceptance criterion.

It is recommended that a digital form of the traced profile, the primary profile, be used for subsequent analysis.

If such a system is out of order or not available recording details shall be settled in the contract.

The measurements can be undertaken immediately after work or at the latest within 8 days of reprofiling or before the track has carried 0,3 MGT (Million Gross Tonnes) of traffic.

4.3 Acceptance criteria for longitudinal profile

4.3.1 General

Table 1 gives peak-to-peak limits to be fulfilled to a certain percentage that is given in Table 2. Table 1 and Table 2 together form the acceptance criterion.

4.3.2 Peak-to-peak limit

The primary or traced profile shall be processed to provide a filtered profile within each of the wavelength ranges given in Table 1.

Table 1 — Peak-to-peak limits

Wavelength range (mm)	10 to 30	30 to 100	100 to 300	300 to 1 000
peak-to-peak limit (mm)	±0,010	±0,010	±0,015	±0,075

The percentage of any reprofiling site (according to 3.30) in which the amplitude of the filtered profile is within the value specified in Table 1 shall be calculated on its total length and shall not be less than the values given in Table 2 for the class specified.

If on a reprofiling site a track section does not meet this requirement, it shall be clarified if track quality has an influence on the grinding result. A strong indication for this is, if the failure to meet the tolerances comes from an isolated short section of track (<50 m), instead of irregularities distributed over the whole reprofiling site.

Table 2 — Minimum proportion of measurements within peak-to-peak limits according to Table 1

Wavelength range (mm)	10 to 30	30 to 100	100 to 300	300 to 1 000
Class 1	95 %	95 %	95 %	95 %
Class 2	No requirement	90 %	90 %	No requirement

In plain line, the classification concerns the total length of each reprofiling section.

In switches, crossing and expansion devices, the classification concerns the total length (Zones F, G and H in Figure 1) of the rail opposite the frog and Zone G only of the rail containing the frog.

No exceedances are allowed for stationary measurements.

5 Transverse profile

5.1 Principle

Measurements are made using either a reference instrument, see 3.22, or an approved instrument, see 3.7. Approved instruments do not offer the same accuracy as reference instruments, but are generally adequate for the purpose of demonstrating compliance with the requirements of this Standard.

Reprofiling can be undertaken for a variety of reasons. Where reprofiling is undertaken purely for the removal of corrugation, there could be less need for the rail to be reprofiled with precision. In other cases, it could be necessary for the reprofiled rail to match closely the ideal profile, represented by the reference rail, see 3.28. A range of classes is therefore included to enable the client to specify the level of precision that is appropriate for the site to be reprofiled.

NOTE Where reprofiling is undertaken to improve conicity, class Q, see 5.4, is likely to be appropriate.

The match between the reprofiled rail and the profile of the reference rail is determined by aligning the two at two points and measuring maximum difference between them, see Figure 4. For straight track, these points of alignment generally approximate to the rail crown and the gauge point. On the high rail