SLOVENSKI STANDARD
SIST EN 13848-2:2021

01-januar-2021

Nadomešča:
SIST EN 13848-2:2006

Železniške naprave - Zgornji ustroj proge - Kakovost tirne geometrije - 2. del: Merilni sistemi - Merilna vozila

Railway applications - Track - Track geometry quality - Part 2: Measuring systems - Track recording vehicles

Bahnanwendungen - Oberbau - Geometrische Gleislagegüte - Teil 2: Messsysteme - Gleismessfahrzeuge

Applications ferroviaires - Voie - Qualité géométrique de la voie - Partie 2 : Systèmes de mesure - Véhicules d'enregistrement de la voie

Ta slovenski standard je istoveten z: **EN 13848-2:2020**

ICS:

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

SIST EN 13848-2:2021 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13848-2

November 2020

ICS 93.100

Supersedes EN 13848-2:2006

English Version

Railway applications - Track - Track geometry quality - Part 2: Measuring systems - Track recording vehicles

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

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

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European foreword

This document (EN 13848-2:2020) 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of an identical text or by endorsement, at the latest by May 2021, and conflicting national standards shall be withdrawn at the latest by May 2021.

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 13848-2:2006.

This European Standard is one of the series EN 13848 “*Railway applications — Track — Track geometry quality*” as listed below:

— *Part 1: Characterization of track geometry*;

— *Part 2: Measuring systems — Track recording vehicles*;

— *Part 3: Measuring systems — Track construction and maintenance machines*;

— *Part 4: Measuring systems — Manual and lightweight devices*;

— *Part 5: Geometric quality levels — Plain line, switches and crossings*;

— *Part 6: Characterization of track geometry quality*.

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, 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.

1 Scope

This document specifies the minimum requirements for track geometry measuring principles and track geometry measuring systems in order to produce comparable results when measuring the same track. It applies to all measuring systems, attended or unattended, fitted on any vehicle, except those systems defined in EN 13848-3 and EN 13848-4. Only systems put into service after the standard comes into force are concerned.

This document does not define the requirements for vehicle acceptance.

This document does not apply to measuring systems dedicated to Urban Rail Systems.

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 13848-1, *Railway applications - Track - Track geometry quality - Part 1: Characterization of track geometry*

EN 13848-6, *Railway applications - Track - Track geometry quality - Part 6: Characterisation of track geometry quality*

JCGM 200:2012, *International vocabulary of metrology – Basic and general concepts and associated terms (VIM)*

3 Terms and definitions

For the purpose 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 https://www.iso.org/obp

3.1
track geometry recording vehicle
self-propelled or hauled vehicle with fixed, dedicated, measuring equipment and systems, used for the measurement, assessment and recording of track geometry parameters under loaded conditions, which measures and produces consistent results to the requirements of EN 13848-1

Note 1 to entry: The measuring system can be attended or not. The track geometry recording vehicle belongs to the infrastructure inspection vehicles as defined in TSI Loc&Pas 1302/2014/EU.

3.2
sensor
device which detects, measures and translates characteristics of track geometry into quantities that can be used for further data processing

3.3
repeatability
degree of agreement between the values of successive measurements of the same parameter made under the same conditions, within a short period of time, where the individual measurements are carried out on the same section of track using the same measurement and interpretation methods, subject to the following controls:

— similar speed;

— same measuring direction;

— same vehicle orientation;

— similar environmental conditions

3.4
reproducibility
degree of agreement between the values of successive measurements of the same parameter made under varying conditions, within a short period of time, where the individual measurements are carried out on the same section of track using the same measurement and interpretation methods, subject to one or more of the following:

— variation of speed;

— different measuring directions;

— different vehicle orientations;

— different environmental conditions

3.5
comparability
degree of agreement of different track recording vehicles achieved under the same conditions

3.6
validation
set of tests for determining if a track recording vehicle complies with the requirements of this standard

3.7
calibration
set of procedures for adjusting the measuring devices of track measuring systems in order to meet the requirements of this standard as defined in JCGM 200:2012

3.8
event
record of a track or line-side feature that can be either technical, physical or natural

3.9
localization
information required to locate events and the measured track geometry

3.10
reference track
track with known characteristics to allow adequate testing of the track geometry measuring and recording system

3.11
unattended geometry measuring system (UGMS)
track geometry measuring system fitted on a vehicle, without any human interaction during the measurements

3.12
adjustment of a measuring system
set of operations carried out on a measuring system so that it provides prescribed indications corresponding to given values of a quantity to be measured

[SOURCE: VIM - International vocabulary of metrology JCGM 200:2012]

3.13
cross check
method for comparing signals of a single run for linked parameters obtained from different inputs (e.g. devices or signal processing)

3.14
vehicle orientation
physical positioning of a vehicle, with regards to which end of the vehicle is leading during measurement

Note 1 to entry: There are two possible vehicle orientations as shown in Figure 1.

Figure 1 — Possible vehicle orientations

3.15
measuring direction
course between two points on a track, independent of the orientation of the track recording vehicle

Note 1 to entry: Between two given points A and B, there are two opposite directions: A to B and B to A.

4 Symbols and abbreviations

For the purpose of this document, the following symbols and abbreviations apply.

Table 1 — Symbols and abbreviations

Symbol	Designation	Unit
D1	Wavelength range 3 m < λ ≤ 25 m	m
D2	Wavelength range 25 m < λ ≤ 70 m	m
D3	Wavelength range 70 m < λ ≤ 150 m for longitudinal level Wavelength range 70 m < λ ≤ 200 m for alignment	m
λ	Wavelength	m
V_{max}	Maximum possible measuring speed of a recording system	km/h
V_{min}	Minimum possible measuring speed of a recording system	km/h

5 Track geometry recording system

5.1 General description

For the purpose of this document, the track geometry recording system is divided into several units as represented in Figure 2 below:

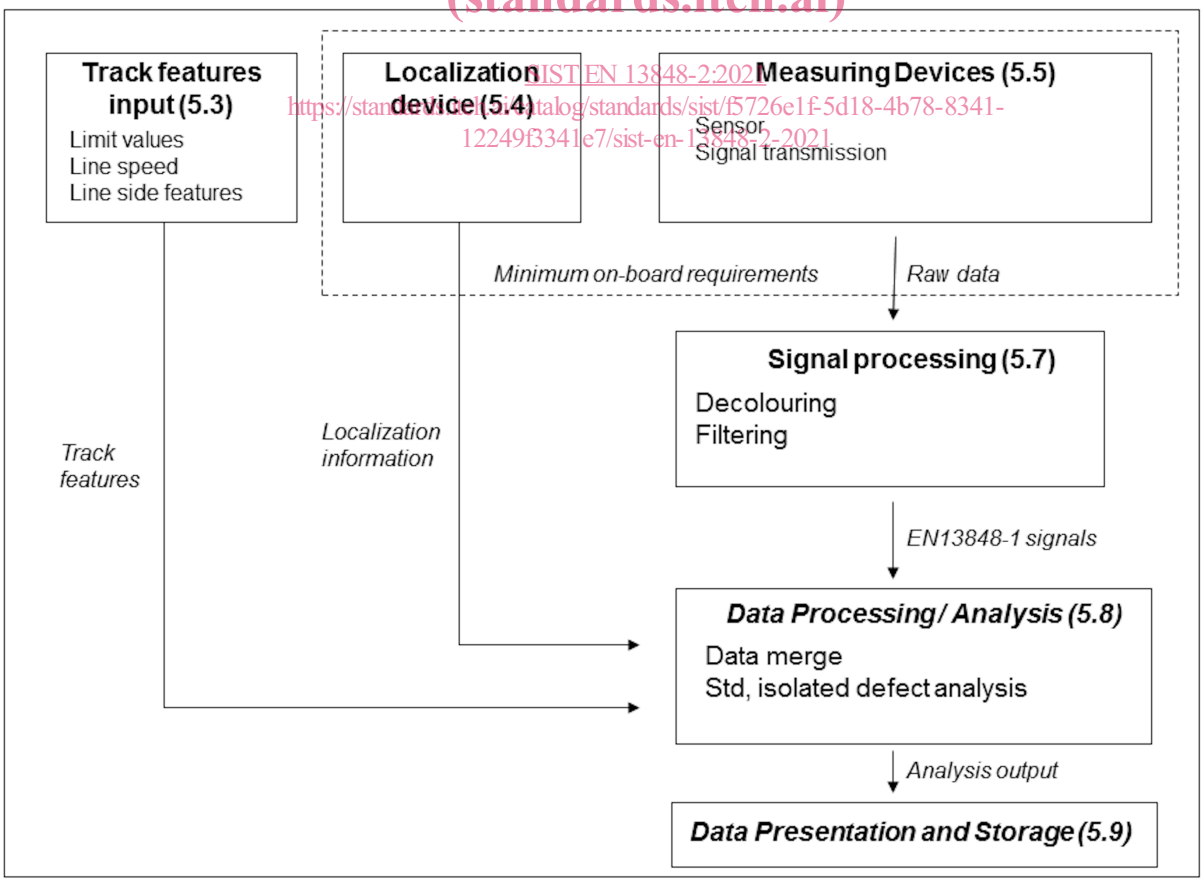

Figure 2 — Track geometry recording system

When measuring the same track, track geometry recording systems shall produce results that are consistent and comparable, irrespective of the measuring speed and direction of travel. The measuring results can be used for track quality monitoring, maintenance planning and can contribute to the process of safety assurance as related to track geometry.

The track geometry recording system represents the totality of the equipment required to:

— measure track geometry parameters;

— take measurement or information to allow the position to be determined during measuring operations;

— associate these two measurements in order to locate precisely on the track the values exceeding a prescribed threshold or other elements characterizing the track;

— record these parameters on computer readable media;

— calculate, based on the direct measured parameters, other parameters of the track geometry (e.g. twist, curvature);

— process the measured data, in order to analyse the track geometry parameters;

— present and store the results.

The output of the track geometry recording system shall meet the individual parameter requirements of EN 13848-1. All the data necessary to determine the parameters specified in EN 13848-1 shall be taken and stored during the run. The determined parameters should be graphically displayed and analysed in strict relation to the corresponding distance location.

The track geometry recording system shall be monitored and shall allow measurements of track geometry as specified in EN 13848-1 under loaded conditions of the track.

The computer system shall be of a kind and type suitable for railway vehicle bound applications.

To prevent the interruption of the track geometry measurement and the loss of recorded data in case the measuring hardware power supply fails, an adequate uninterruptible power supply should be provided.

5.2 Environmental conditions

5.2.1 Introduction

All the measuring devices and hardware components fitted on a track-recording vehicle shall produce reliable results under the environmental conditions specified below.

5.2.2 Climatic conditions

The effects of climatic conditions on components outside and inside the track-recording vehicle shall be considered. These shall include:

— **Outside components**

  — ambient temperature;

  — condensation, particularly with sudden variation of temperature at the entrance or at the exit of a tunnel;

  — possibility of extreme weather conditions (heavy rain, snow, direct sunlight, …);

  — ambient relative humidity.

— **Inside components**

  — ambient temperature for operating and storage conditions;

  — ambient relative humidity.

5.2.3 Operating conditions

The effects of operating conditions shall be considered. These shall include:

— ballast or iron fragments impacts;

— grease on the rail;

— reflection condition of the rail;

— characteristic light conditions;

— dust, water and snow in connection with aerodynamic conditions;

— safety requirements e.g. laser beam;

— vibrations and shocks;

— electromagnetic environment;

— compatibility with signalling and communication systems.

5.3 Track features input

The track features input supports the data analysis (see 5.8) and shall include at least:

— set of limit values of track geometry parameters as defined in EN 13848-5;

— line speed.

Other inputs can be beneficial as, for example:

— geo-spatial positioning;

— line side features such as switches, level crossings, bridges, tunnels;

— track components and track alignment design parameters.

All this data should be able to be entered by manual or automatic means.

5.4 Localization device

The reference point for the data localization system may be the kilometre post or other fixed points.

The localization device gives the track recording vehicle's position along the track and shall fulfil the following functions:

— synchronizes the position with the reference point by one of the various possible methods, using for example the satellite based positioning system, active or passive beacons, track layout or other singular points;

— measures the distance covered by the track recording vehicle, compensated for direction "*reverse*", and is generally based on a synchronization signal, which could be given by a wheel-mounted encoder or any other equivalent method;

— corrects manually or automatically the inaccuracies caused by:

  — wear, sliding, conicity of the track recording vehicle wheels;

  — non-homogeneous reference post distances (e.g. mileposts that are greater or less than one mile apart);

  — uncertainty of the distance run transducer.

5.5 Measuring devices

5.5.1 General

Track geometry measuring system relies on sensors, signal transmission and signal processing following various measuring principles as described in Annex B.

The speed range shall be from standstill to the maximum permissible measuring speed of the vehicle if a chord-type measuring system is used; if an inertial-type measurement is used, a minimum speed may be necessary to measure some parameters. The minimum speed should be specified according to the characteristics of the used system and the needs defined by the infrastructure manager (e.g. for conventional inertial-type measurement systems usually 10 km/h is necessary for the wavelength range *D1*).

5.5.2 Sensors

The sensors shall measure in real time the track geometry parameters or their components. In order to measure the parameters under track loaded conditions, the sensors placed under the vehicle's frame shall be as close as possible to one of the vehicle's loaded axles to respect measurement conditions indicated in EN 13848-1. The sensors can be either contact type or non-contact type sensors.

The sensors' mechanical and electrical characteristics (frequency response, signal-to-noise ratio, gain, etc.) shall be adequate to enable the generation of track geometry parameters, independently of the environmental conditions on the railway network.