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Železniške naprave - Zgornji ustroj - Kakovost tirne geometrije - 4. del: Merilni sistemi - Ročne in lahke naprave

Railway applications - Track - Track geometry quality - Part 4: Measuring systems - Manual and lightweight devices

Bahnanwendungen - Oberbau - Qualität der Gleisgeometrie - Teil 4: Messsysteme - Handgeführte und leichte Vorrichtungen

Applications ferroviaires - Voie - Qualité géométrique de la voie - Partie 4: Systèmes de mesure - Dispositifs manuels et de faible poids

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English Version

Railway applications - Track - Track geometry quality - Part 4: Measuring systems - Manual and lightweight devices

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 256.

If this draft becomes a European Standard, 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.

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

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European foreword

This document (prEN 13848-4:2023) 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 13848-4:2011.

The main changes compared to the previous edition are listed below:

— Change of labels and definitions for lightweight devices;

— Update of content of Annexes A and B;

— Modification of certain limit values in Annex C (validation criteria);

— Integration of Annex D (uncertainty measurement);

— Simplification of the main text structure.

In this document, the Annexes A and C are normative and the Annexes B and D are informative.

This document is one in the EN 13848 series *Railway applications – Track – Track geometry quality*, the parts of which are 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*

1 Scope

This document specifies the minimum requirements to meet by measuring systems fitted on track geometry measuring trolleys and manually operated devices to give an evaluation of track geometry quality when using one or more of the parameters described in EN 13848-1. It sets out the acceptable differences from EN 13848-1 when using track geometry measuring trolleys and manually operated devices to measure track geometry.

It applies to all track geometry measuring systems fitted to track geometry measuring trolleys and manually operated devices after the date of implementation of this document.

In the case of lightweight devices working at a speed higher than walking speed, or in the case of track geometry measuring systems installed on track recording cars but not measuring in loaded conditions as defined in EN 13848-1, the test procedure defined in EN 13848-2 is applicable.

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 13848-1:2019, *Railway applications - Track - Track geometry quality - Part 1: Characterization of track geometry*

EN 13848-2:2020, *Railway applications - Track - Track geometry quality - Part 2: Measuring systems - Track recording vehicles*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp/

— IEC Electropedia: available at https://www.electropedia.org/

3.1
lightweight device
device that does not load the track as defined in Clause 7 of EN 13848-1:2019

3.2
track geometry recorder
TGR
lightweight device designed for measuring one or more track geometry parameters, having the following characteristics:

— hauled, self-propelled or moved by human force;

— capable of automatic measurement at a constant and prescribed sampling distance with each measurement localized

3.3
track geometry instrument
TGI
lightweight device designed for measuring one or more track geometry parameters, having the following characteristics:

— measurement at standstill;

— may record individual measurements

3.4
sensor
device which detects, measures and translates characteristics of track geometry into quantities that can be used for further data processing

3.5
measuring direction
course between two points on a track, independent of orientation of the track geometry recorder; between two given points A and B, there are two opposite directions: A to B and B to A

3.6
orientation
physical positioning of a lightweight device, with regard to which end of the lightweight device is leading or trailing

3.7
repeatability
degree of agreement between the values of successive measurements of the same parameter made under same conditions, within a short period of time, where the individual measurements are carried out on the same section of track using the same device and interpretation methods, subject to the following:

— similar speed;

— same measuring direction;

— same orientation;

— similar environmental conditions.

3.8
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 device and interpretation methods, subject to one or more of the following:

— variation of speed;

— different measuring directions;

— different orientations, if the device is designed to measure in both orientations;

— different environmental conditions.

3.9
validation
set of tests for determining if the device complies with the requirements of this document

3.10
calibration
set of procedures for adjusting the device in order to meet the requirements of this document

3.11
event
record of a track or line-side feature that can be either technical, physical or natural

3.12
localization
information required to locate events and the measured track geometry

3.13
reference track
track with known characteristics, to allow adequate testing of the track geometry measuring and recording system

4 Symbols and abbreviated terms

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

Table 1 — Symbols and abbreviations

Symbol	Designation	Unit
D0	Wavelength range $1 < \lambda \leq 5$	m
D1	Wavelength range $3 < \lambda \leq 25$	m
D2	Wavelength range $25 < \lambda \leq 70$	m
D3	Wavelength range $70 < \lambda \leq 150$for longitudinal level Wavelength range $70 < \lambda \leq 200$ for alignment	m
Lo	Lower limit of wavelength range	m
Lu	Upper limit of wavelength range *D0*, *D1*, *D2*, *D3*	m
λ	Wavelength	m
ℓ	Twist base-length	m
TGR	Track geometry recorder	
TGI	Track geometry instrument	
H	Transfer function	
a,b	Chords divisions	
l	Chord lengths	

5 Track geometry measuring system fitted on TGRs or TGIs

5.1 Introduction

This document concerns only the track geometry measuring systems installed on lightweight devices used to measure one or more of the parameters described in EN 13848-1.

There is a difference observed between the measured geometry of lightweight devices and the geometry under the operation of a running train.

To assess safety limits using measurements from lightweight devices, the user shall take provisions to accommodate this difference such as:

— adapting the limits of EN 13848-5 or;

— utilizing supplementary measurements devices that can accommodate this difference or;

— other accommodations.

The measurements taken with the above systems can be used for track quality monitoring and safety assurance with respect to track geometry on track sections where maintenance works have been or will be carried out.

5.2 General description

For the purpose of this document, the track geometry measuring system fitted on TGRs and TGIs divided into several units as represented in Figure 1 below:

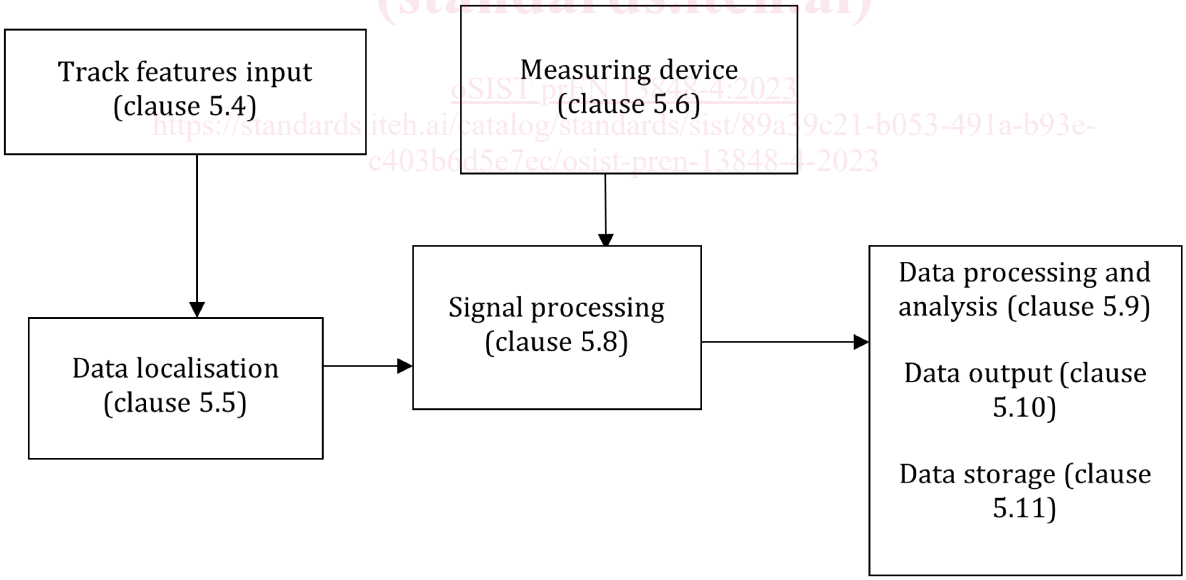

Figure 1 — TGR and TGI track geometry measuring system

The track geometry measuring system installed on a lightweight device may carry out some of the following actions:

— measure track geometry parameter(s);

— measure the longitudinal distance between measuring operations;

— associate the precise location to the measured data;

— process the measured data, preferably on site, in order to analyse the track geometry parameter(s);

— record the parameter(s) on computer readable media or on paper.

The parameters to be measured and their processing shall at least meet the requirements stated in Annex A.

Contrarily to the measuring systems fitted to track recording vehicles, the measuring systems fitted to lightweight devices are not required to measure in both lightweight devices orientations.

5.3 Environmental conditions

5.3.1 Introduction

All the measuring systems fitted on lightweight devices shall comply with the environmental conditions specified below.

5.3.2 Climatic conditions

Appropriate climatic conditions shall be taken into account in the design. These include:

— 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.

5.3.3 Operating conditions

Appropriate operating conditions especially during transport, assembly and operation shall be taken into account in the design. These include:

— grease on the rail;

— reflection condition of the rail;

— characteristic light conditions;

— dust, water and snow;

— safety requirements (laser beam or conductor rail, for example);

— user friendliness;

— vibrations and shocks;

— electromagnetic environment;

— compatibility with signalling and communication systems.

5.4 Track features input

The track features input supports the data analysis (see 5.9). The requirements for TGR and TGI equipped with data storage are described below.

It shall include at least:

— line identification;

— track identification;

— kilometrage (for TGR, starting point and increasing or decreasing)

Other inputs can be beneficial as, for example:

— geo-spatial positioning;

— line speed;

— set of limit values of track geometry parameters as defined by the infrastructure manager

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

— track components and track alignment design parameters.

All these data shall be able to be entered by manual or automatic means.

There are no specific requirements for TGIs not equipped with data storage means to support data localization.

5.5 Data localization

Data localization shall be referenced either to track axis or to the rail on which the running distance is measured.

The reference point for the data localization on TGR and TGI may be the kilometre post or other fixed points.

In case of TGR, the data localization system gives the position along the track and shall fulfil the following functions:

— synchronises the position with the reference point by various 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 TGR, compensating for any backward movement, and is generally based on sampling signals, which could be given by a wheel-mounted encoder or any other equivalent method;

— automatically corrects or allows manual correction of the inaccuracies caused by:

  — wear, sliding;

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

  — uncertainty (refer to EN 13848-1:2019, 3.5) of the distance run transducer.

5.6 Measuring device

5.6.1 General

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