SLOVENSKI STANDARD
SIST EN 13848-3:2009

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Železniške naprave - Zgornji ustroj - Kakovost tirne geometrije - 3. del: Merilni sistemi - Tirna mehanizacija za gradnjo in vzdrževanje

Railway applications - Track - Track geometry quality - Part 3: Measuring systems - Track construction and maintenance machines

Bahnanwendungen - Oberbau - Qualität der Gleisgeometrie - Teil 3: Messsysteme - Gleisbau- und Instandhaltungsmaschinen

Applications ferroviaires - Voie - Qualité géométrique de la voie - Partie 3 : Systèmes de mesure - Engins de travaux et de maintenance de la voie

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ICS:

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

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Foreword

This document (EN 13848-3:2009) 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of an identical text or by endorsement, at the latest by October 2009, and conflicting national standards shall be withdrawn at the latest by October 2009.

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

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

Part 1: Characterisation 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

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

1 Scope

This European Standard specifies the minimum requirements that shall be met by measuring systems fitted on track construction and maintenance machines to give an evaluation of track geometry quality when measuring one or more of the parameters described in EN 13848-1. It does not seek to prescribe which parameters are to be measured, since these depend upon the measuring capabilities of the machine and the purpose for which the machine or its measuring system is used.

It also sets out the acceptable differences from EN 13848-1 when using track construction and maintenance machines to measure track geometry. It applies to track geometry measuring systems which are fitted to track construction and maintenance machines from one year after the date of implementation of this standard.

2 Normative references

The following referenced documents are indispensable for the application 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 13848-1:2003+A1:2008, *Railway applications – Track – Track geometry quality – Part 1: Characterisation of track geometry*

EN 13848-2:2006, *Railway applications – Track – Track geometry quality – Part 2: Measuring systems – Track recording vehicles*

ENV 13005:1999, *Guide to the expression of uncertainty in measurement*

3 Terms and definitions

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

3.1
track construction and maintenance machine
self propelled or hauled machine/vehicle designed to construct track, maintain track and/or improve the quality of track and which is equipped with track geometry measuring systems. Also referred to as “machine” in this European Standard

3.2
machine
same as “track construction and maintenance machine” (3.1)

3.3
sensor
device which detects, measures and translates characteristics of track geometry into quantities that can be used for further data processing

3.4
measuring direction
course between two points on a track, independent of orientation of the machine; between two given points A and B, there are two opposite directions: A to B and B to A

3.5
orientation
physical positioning of a vehicle, e.g. a track construction and maintenance machine, with regards to which end of the vehicle is leading or trailing

3.6
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 measurement and interpretation methods, subject to the following:

a) similar speed

b) same measuring direction

c) same machine/vehicle orientation

d) similar environmental conditions

3.7
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:

a) variation of speed

b) different measuring directions

c) different machine/vehicle orientations

d) different environmental conditions

3.8
validation
set of tests for determining if the measuring system of a track construction and maintenance machine complies with the requirements of this standard

3.9
calibration
set of procedures for adjusting the measuring devices of track construction and maintenance machines in order to meet the requirements of this standard

3.10
event
record of a track or line-side feature that can be either technical, physical or natural

3.11
localisation
information required to locate events and the measured track geometry

3.12
reference track
track with known characteristics, to allow adequate testing of the track geometry measuring and recording system

3.13
transfer function
refer to EN 13848-2:2006 (Annex A)

3.14
resolution
refer to EN13848-1 (3.1.8)

3.15
uncertainty
refer to ENV 13005:1999 (2.3.5)

4 Symbols and abbreviations

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

Table 1 — Symbols and abbreviations

No.	Symbol	Designation	Unit
1	*D1*	Wavelength range 3 m < $\lambda \leq$ 25 m	m
2	*D2*	Wavelength range 25 m < $\lambda \leq$ 70 m	m
3	*D3*	Wavelength range 70 m < $\lambda \leq$ 150 m for longitudinal level Wavelength range 70 m < $\lambda \leq$ 200 m for alignment	m
4	*Lo*	Lower limit of wavelength range *D1, D2, D3*	m
5	*Lu*	Upper limit of wavelength range *D1, D2, D3*	m
6	λ	Wavelength	m
7	ℓ	Twist base-length	m

5 Track geometry measuring system fitted on track construction and maintenance machines

5.1 General description

This standard concerns only the track geometry measuring systems installed on the machines used to measure the parameters described in EN 13848-1. It does not cover the other measurement systems; for example those used for the tamping process.

For the purpose of this standard, the track geometry measuring system fitted on machines is divided into several units as represented in Figure 1 below.

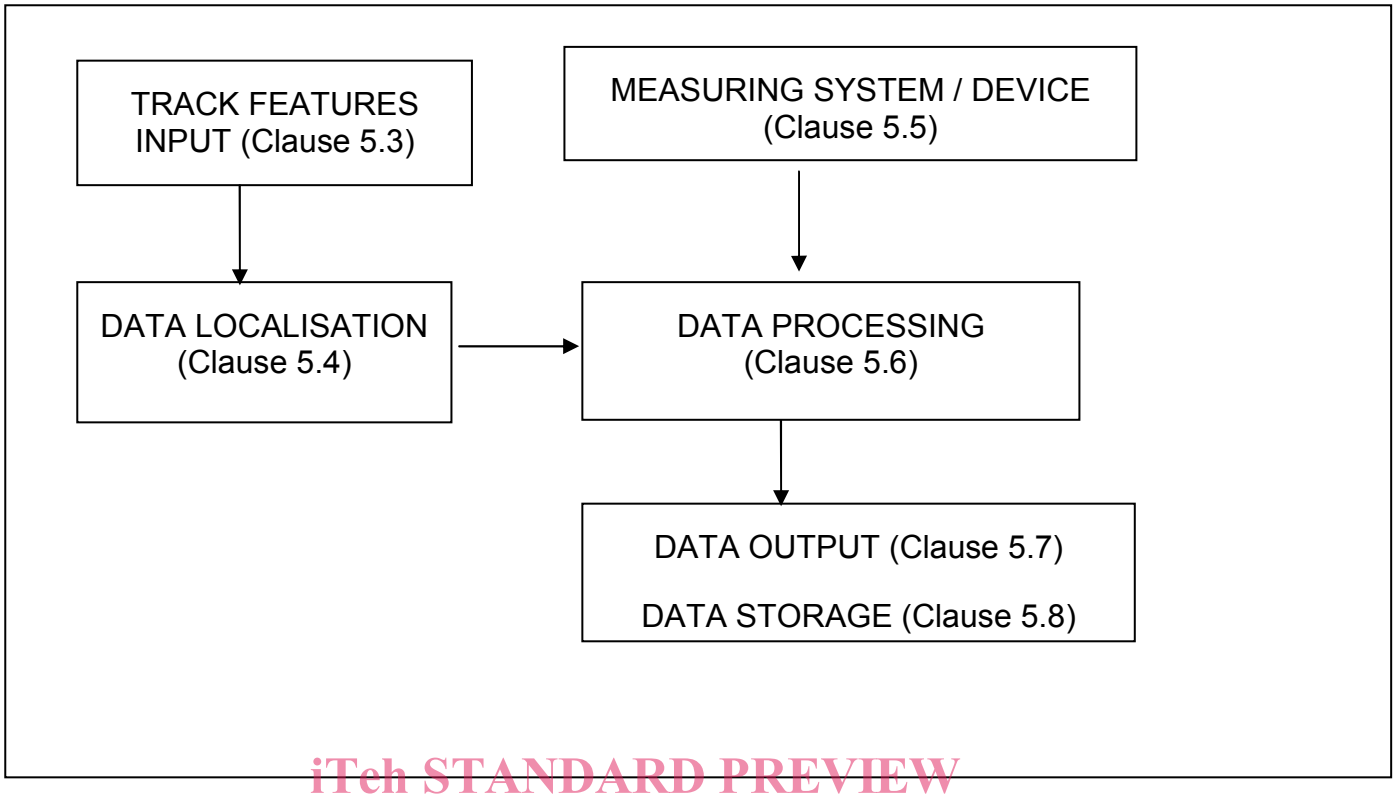

Figure 1 — Track geometry measuring system

The track geometry measuring system installed on a machine is intended to:

a) measure track geometry parameters;

b) measure the distance run by the machine during measuring operations;

c) associate these two measurements in order to set up a precise location and process the measured data, preferably on board, in order to analyse the track geometry parameters;

d) record these parameters on paper and store them on computer readable media.

The track geometry measuring system shall produce reliable results under normal operating conditions of the machine.

The results of the above system can and have been 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.

This standard takes account of the capabilities of the equipment on existing machines in its requirements and as a consequence some of the requirements of EN 13848-1 have been relaxed.

There is no requirement for a machine to measure all the parameters listed in EN 13848-1. However, the parameters to be measured and their processing shall at least meet the requirements stated in Annex A.

NOTE The track construction and maintenance machines fleet in Europe is much larger than the track recording car fleet, by a factor of 10 – 20. In many cases, although this is not their main function, these machines are used for track geometry measurement.

The track geometry measurement should be made on a loaded track as defined in EN 13848-1. Since the load of the recording trailer affects the measurement, both the load and its distribution shall be constant.

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

If the measurement is made during the work process, the measuring speed shall not limit the operating speed of the machine.

The computer system shall be of a kind and type suitable for rail-bound vehicle applications and shall represent widely used and supported technologies.

Data shall not be encrypted and data formats shall be documented in order to make the data accessible to the user. This requirement applies to both track features inputs and measurement outputs.

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

5.2 Environmental conditions

5.2.1 Introduction

All the measuring devices fitted on a machine shall produce reliable results under the environmental conditions specified below.

5.2.2 Climatic conditions

5.2.2.1 General

The effects of climatic conditions on components outside and inside the machine shall be considered. These shall include:

5.2.2.2 Outside components:

a) ambient temperature;

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

c) possibility of snow;

d) ambient relative humidity.

5.2.2.3 Inside components:

a) ambient temperature for operating and storage conditions;

b) ambient relative humidity.

5.2.3 Operating conditions

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

a) ballast or iron fragments impacts;

b) grease on the rail;

c) reflection condition of the rail;

d) characteristic light conditions;

e) dust, water and snow;

f) safety requirements (laser beam, for example);

g) vibrations and shocks;

h) electromagnetic environment;

i) compatibility with signalling and communication systems.

5.3 Track features input

The track features input supports the data localisation (see Clause 5.4) and shall include at least:

a) line identification;

b) track identification;

c) kilometreage.

Other inputs may be required as, for example, the altitude for inertial devices.

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

5.4 Data localisation

Data localisation shall be referenced either to track axis or to a reference rail.

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

The data localisation system gives the machine's position along the track and shall fulfil the following functions:

a) synchronises the position with the reference point by various methods, using for example the satellite based positioning system, active or passive beacons or other singular points;

b) measures the distance covered by the machine, 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;

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

   1) wear, sliding, conicity of the machine wheels;

   2) difference of kilometre's length;

   3) uncertainty of the distance run transducer.

5.5 Measuring system/device

5.5.1 General

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