

# SVENSK STANDARD

## SS-EN 13848-4:2012



Fastställt/Approved: 2012-01-16  
Publicerad/Published: 2012-01-24  
Utgåva/Edition: 1  
Språk/Language: engelska/English  
ICS: 93.100

---

### **Järnvägar – Spår – Spårlägeskvalitet – Del 4: Mätssystem – Manuella och lätta utrustningar**

### **Railway applications – Track – Track geometry quality – Part 4: Measuring systems – Manual and lightweight devices**

This preview is downloaded from [www.sis.se](http://www.sis.se). Buy the entire standard via <https://www.sis.se/std-84783>

# 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](http://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](http://www.sis.se) or contact us on phone +46 (0)8-555 523 00**



Europastandarden EN 13848-4:2011 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 13848-4:2011.

The European Standard EN 13848-4:2011 has the status of a Swedish Standard. This document contains the official version of EN 13848-4:2011.

© 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.

*Uppllysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna uppllysningar 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 Förlag AB, 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](http://www.sis.se) - där hittar du mer information.



EUROPEAN STANDARD

**EN 13848-4**

NORME EUROPÉENNE

EUROPÄISCHE NORM

December 2011

---

ICS 93.100

English Version

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

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

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

This European Standard was approved by CEN on 5 November 2011.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



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

**Management Centre: Avenue Marnix 17, B-1000 Brussels**

# Contents

Page

Foreword.....	4
<b>1 Scope .....</b>	<b>5</b>
<b>2 Normative references .....</b>	<b>5</b>
<b>3 Terms and definitions .....</b>	<b>5</b>
<b>4 Symbols and abbreviations .....</b>	<b>7</b>
<b>5 Track geometry measuring system fitted on trolleys or on manually operated devices .....</b>	<b>8</b>
5.1 Introduction .....	8
5.2 General description .....	8
5.2.1 General description: TGMT .....	8
5.2.2 General description: MOD .....	9
5.3 Environmental conditions .....	10
5.3.1 Introduction .....	10
5.3.2 Climatic conditions .....	10
5.3.3 Operating conditions .....	10
5.4 Track features input .....	10
5.4.1 General.....	10
5.4.2 Track features input: TGMT .....	11
5.4.3 Track features input: MOD .....	11
5.5 Data localisation .....	11
5.5.1 Data localisation: TGMT .....	11
5.5.2 Data localisation: MOD.....	11
5.6 Measuring system/device .....	12
5.6.1 Measuring system/device: TGMT .....	12
5.6.2 Measuring system/device: MOD.....	12
5.7 Data processing .....	13
5.7.1 Data processing: TGMT .....	13
5.7.2 Data processing: MOD .....	13
5.8 Data output .....	13
5.8.1 Data output: TGMT.....	13
5.8.2 Data output: MOD .....	14
5.9 Data storage .....	14
5.9.1 Data storage: TGMT.....	14
5.9.2 Data storage: MOD.....	14
<b>6 Testing of track geometry measuring system .....</b>	<b>14</b>
6.1 Testing: TGMT.....	14
6.1.1 General.....	14
6.1.2 Calibration .....	15
6.1.3 Validation tests .....	15
6.1.4 Routine validation.....	17
6.2 Testing: MOD.....	17
6.2.1 Introduction .....	17
6.2.2 Calibration .....	18
6.2.3 Validation tests .....	18
6.2.4 Routine validation.....	18
<b>Annex A (normative) Parameters measured by track geometry measuring trolleys (TGMTs) and manually operated devices (MODs).....</b>	<b>19</b>
A.1 Introduction .....	19
A.2 Track gauge.....	20

<b>A.3</b>	<b>Longitudinal level</b> .....	<b>21</b>
<b>A.4</b>	<b>Cross level</b> .....	<b>22</b>
<b>A.5</b>	<b>Alignment</b> .....	<b>23</b>
<b>A.6</b>	<b>Twist</b> .....	<b>24</b>
<b>Annex B</b>	<b>(informative) Principles of measurement</b> .....	<b>25</b>
<b>B.1</b>	<b>General description</b> .....	<b>25</b>
<b>B.2</b>	<b>Longitudinal level and alignment (TGMT only)</b> .....	<b>25</b>
<b>B.2.1</b>	<b>Chord measuring system</b> .....	<b>25</b>
<b>B.2.2</b>	<b>Inertial measuring system</b> .....	<b>25</b>
<b>B.3</b>	<b>Track gauge</b> .....	<b>26</b>
<b>B.4</b>	<b>Cross level</b> .....	<b>26</b>
<b>B.5</b>	<b>Twist</b> .....	<b>26</b>
<b>Annex C</b>	<b>(normative) TGMT / Description of field tests: values to be respected</b> .....	<b>27</b>
<b>C.1</b>	<b>Repeatability – Statistical analysis of parameter data</b> .....	<b>27</b>
<b>C.2</b>	<b>Reproducibility – Statistical analysis of parameter data</b> .....	<b>27</b>
	<b>Bibliography</b> .....	<b>29</b>

## Foreword

This document (EN 13848-4:2011) 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 June 2012, and conflicting national standards shall be withdrawn at the latest by June 2012.

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 – Plain line;*
- *Part 6: Characterisation of geometric quality.*

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, Croatia, 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 part of this European Standard specifies the minimum requirements that shall be met by measuring systems fitted on track geometry measuring trolleys and manually operated devices to give an evaluation of track geometry quality when measuring one or more of the parameters described in EN 13848-1:2003+A1:2008. It sets out the acceptable differences from EN 13848-1:2003+A1:2008 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 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*

EN 13848-5:2008+A1:2010, *Railway applications – Track – Track geometry quality – Part 5: Geometric quality levels – Plain line*

## 3 Terms and definitions

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

### 3.1

#### **track geometry measuring trolley (TGMT)**

trolley designed for measuring one or more track geometry parameters, having the following characteristics:

- self-propelled, hauled or moved by human force;
- portability (capability to be placed readily on or off the track manually or by other means);
- capability of measuring from standstill to the maximum permissible speed of the trolley;
- having wheels which do not load the track as defined in Clause 5 of EN 13848-1:2003+A1:2008.

### 3.2

#### **manually operated device (MOD)**

hand tool designed for measuring track gauge and/or cross level at standstill

### 3.3

#### **sensor**

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

## SS-EN 13848-4:2012 (E)

**3.4  
measuring direction**  
course between two points on a track, independent of orientation of the TGMT. 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 TGMT, with regards to which end of the TGMT is leading or trailing

**3.6  
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 self-same measurement device and interpretation methods, subject to the following:

- similar speed;
- same measuring direction;
- same TGMT orientation;
- 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 self-same measurement device and interpretation methods, subject to one or more of the following:

- variation of speed;
- different measuring directions;
- different TGMT orientations, if TGMT is designed to measure in both orientations;
- different environmental conditions.

**3.8  
validation**  
set of tests for determining whether the TGMT or MOD complies with the requirements of this standard

**3.9  
calibration**  
set of procedures for adjusting the TGMT or MOD 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 Annex A of EN 13848-2:2006

**3.14****resolution**

smallest change in the value of a quantity to be measured which produces a detectable change in the indication of the measuring instrument

**3.15****uncertainty**

refer to ENV 13005:1999, 2.3.5

**3.16****re-colouring**

algorithm which converts one signal into a different signal. It is used in EN 13848 series to convert a chord measurement signal into a  $D1$ ,  $D2$  or  $D3$  measurement signal

**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 $3\text{ m} < \lambda \leq 25\text{ m}$	m
2	$D2$	Wavelength range $25\text{ m} < \lambda \leq 70\text{ m}$	m
3	$D3$	Wavelength range $70\text{ m} < \lambda \leq 150\text{ m}$ for longitudinal level Wavelength range $70\text{ m} < \lambda \leq 200\text{ m}$ 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	$\lambda$	Wavelength	m
7	$l$	Twist base-length	m
8	TGMT	Track geometry measuring trolley	
9	MOD	Manually operated device	