SLOVENSKI STANDARD
SIST EN 13232-2:2004+A1:2012

01-januar-2012

Železniške naprave - Zgornji ustroj - Kretnice in križišča - 2. del: Geometrijske zahteve pri projektiranju

Railway applications - Track - Switches and crossings - Part 2: Requirements for geometric design

Bahnanwendungen - Oberbau - Weichen und Kreuzungen - Teil 2: Anforderungen an den geometrischen Entwurf

Applications ferroviaires - Voie - Appareils de voie - Partie 2: Exigences de la conception géométrique

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

SIST EN 13232-2:2004+A1:2012 **en,fr,de**

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English Version

Railway applications - Track - Switches and crossings - Part 2: Requirements for geometric design

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

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Contents

Foreword

This document (EN 13232-2:2003+A1:2011) 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of an identical text or by endorsement, at the latest by April 2012, and conflicting national standards shall be withdrawn at the latest by April 2012.

[A1] This document has been prepared under a mandate given to CEN/CENELEC/ETSI by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 2008/57/EC.

For relationship with EU Directive 2008/57/EC, see informative Annex ZA, which is an integral part of this document. [A1]

This document includes Amendment 1, approved by CEN on 2011-09-13.

This document supersedes EN 13232-2:2003.

The start and finish of text introduced or altered by amendment is indicated in the text by tags [A1] [A1].

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 series of European Standards "*Railway Applications – Track – Switches and Crossings*" covers the design and quality of switches and crossings in flat bottomed rail. The list of parts is as follows:

— *Part 1 : Definitions*

— *Part 2 : Requirements for geometric design*

— *Part 3 : Requirements for wheel/rail interaction*

— *Part 4 : Actuation, locking and detection*

— *Part 5 : Switches*

— *Part 6 : Fixed common and obtuse crossings*

— *Part 7 : Crossings with movable parts*

— *Part 8 : Expansion devices*

— *Part 9 : Layouts*

Part 1 contains terminology used throughout all parts of this series. Parts 2 to 4 contain basic design guides and are applicable to all switch and crossing assemblies. Parts 5 to 8 deal with particular types of equipment, including their tolerances. Part 9 defines the functional and geometric dimensions and tolerances for layout assemblies. These use Parts 1 to 4 as a basis.

The following terms are used within to define the parties involved in using the European Standard as the technical basis for a transaction:

Customer	The Operator or User of the equipment, or the Purchaser of the equipment on the User's behalf.

Supplier	The body responsible for the use of the European Standard in response to the Customer's requirements.

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 United Kingdom.

1 Scope

This part of this European Standard covers the following subjects:

— geometric design principles for wheel guidance;

— definition of basic limits of supply;

— applied forces and their adequate support;

— tolerance levels.

These are illustrated herein by application to a turnout. The main switch and crossing components are represented in turnouts and the principles used in turnouts apply equally to more complex layouts.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 13232-1:2003, *Railway applications – Track – Switches and crossings – Part 1: Definitions*.

prEN 13232-3, *Railway applications – Track – Switches and crossings – Part 3: Requirements for wheel/rail interaction.*

prEN 13232-5, *Railway applications – Track – Switches and crossings – Part 5: Switches.*

prEN 13232-9, *Railway applications – Track – Switches and crossings - Part 9: Layouts.*

3 Principles of geometry and running dynamics

3.1 Introduction

Geometry is represented in the running plane by the running edges. For the purpose of determination of permissible speeds and for definition of the turnout, curvature is defined by the radius of the track centreline.

The guiding principles of curves are given in this standard as they apply to switches and crossings. Switches and crossings are normally designed without differential cant; particular requirements shall be specified.

In order to maintain safe and continuous support and guidance of wheels, certain rules of tangency are imposed. Speed and radius are then related to lateral acceleration. Cant deficiency is derived from this. Switches and crossings are characterised by changes in lateral acceleration, so rules for both steady and sudden changes between radii are included in this section.

Calculations and rules relate to vehicles with 2 axles or vehicles with 2-axle bogies. Vehicles with other than 2 axles may require special consideration and as such their configuration shall be provided by the Customer.

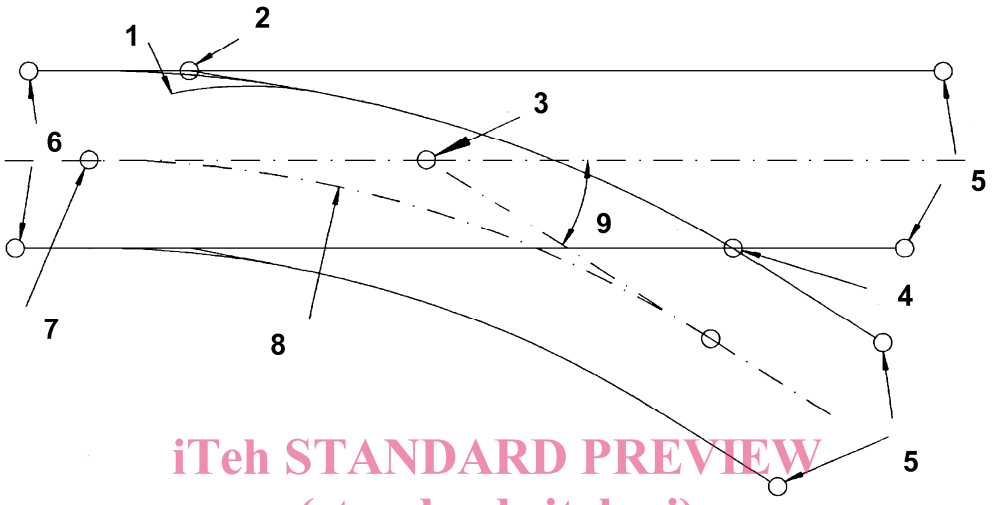
These rules are defined for steady-state design, i.e. without acceleration. Requirements of a dynamic nature shall be stated by the Customer.

3.2 General requirements

3.2.1 References, terms and definitions

For the purposes of this part of the European Standard, the terms and definitions given in EN 13232-1:2003 and the following apply.

Key reference points relating to turnout geometry and the limits of supply of a turnout are illustrated in Figure 1.



Key

1 Actual switch toe
2 Mathematical point of switch
3 Tumout intersection
4 Theoretical intersection
5 Limits of supply (heel joints)
6 Limits of supply (front joints)
7 Origin of switch curve
8 Centreline radius
9 Turnout angle

Figure 1 — Key reference points

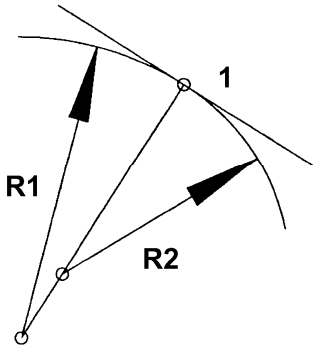
3.2.2 General tangency rules

At any change in radius the two radii shall be mutually tangential at the running edges. To achieve this the centres of adjacent curves shall lie on the same radial line (see Figure 2).

Exceptions to the mutual tangency rule may occur. These are:

- along the low-side curve of a turnout where gauge variation occurs;
- at the switch toe, for example, to shorten the switch rail.

Details are given in prEN 13232-3 and prEN 13232-5.



Key

1 Tangent

Figure 2 — Mutual tangency

3.2.3 Key determinants

For a concise definition of the geometry of an assembly of switches and crossings, a minimum amount of basic quantitative information is required. The following items are both necessary and sufficient for such a definition of a turnout.

The following shall be defined by the Customer and numerical values provided to the Supplier. Note that some values may be different from those for plain line :

- gauge;
- speed;
- maximum lateral acceleration or cant deficiency;
- maximum rate of change of lateral acceleration or cant deficiency;
- turnout intersection point and angle (see Figure 3);
- limits of supply (front joints, heel joints);
- lowside gauge variation (if any).

For a crossover or junction, in addition, the following shall be defined by the Customer and provided to the Supplier:

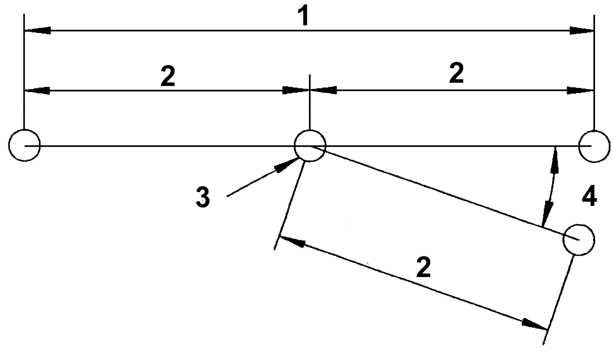
- distance between main line track centrelines.

For switches and crossings on a curved main line, the following must be defined and provided by the Customer:

- main line curvature;
- main line and branch line cant through turnout.

The key points whose location shall be agreed between Customer and Supplier are as follows:

- origin of switch curve;
- real switch toe (RP);
- theoretical intersection (of crossing).



Key

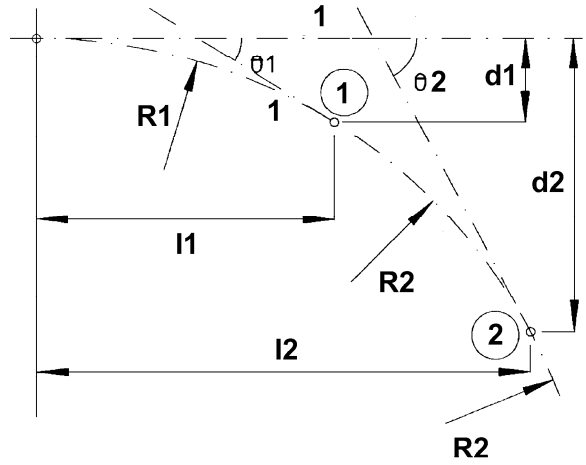
1 Overall length
2 Tangent length
3 Turnout intersection
4 Turnout angle

Figure 3 — Setting out diagram

Radii of main and branch lines and the positions at which they change shall be agreed, for example as illustrated in Figure 4a) for circular geometry and 4b for transitional geometry, together with:

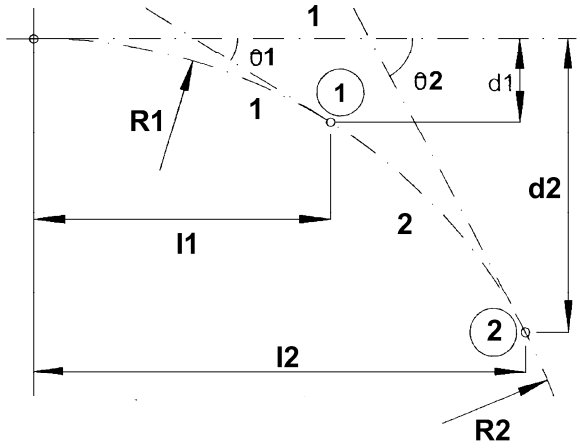
- centreline radii;
- origin of switch curve to positions of changes of radii;
- tangent offset (if any);

where such changes of radii shall be bounded either by included angle, or by longitudinal distance or by lateral offset, or in the case of a transition section, by such data as is necessary to uniquely define its shape.



4a

Figure 4a) — Circular



4b

Figure 4b) — Transitional

Key

1 Centreline
2 Transition

Figure 4 — Key dimensions related to radius

3.3 Speed relationships

Fundamental rules of circular motion determine the relationship between radius and speed around a curve. For railway specific applications the following formula applies:

$$v_{max} = \sqrt{(a_{max} R_c)} \quad (1)$$

where

R_c is the local centreline radius of the curve in metre;

a_{max} is the maximum lateral acceleration in m/s^2 ;

v_{max} is the maximum local velocity in m/s.

Alternatively with V_{max} in km/h:

$$V_{max} = 3{,}6 \sqrt{(a_{max} R_c)} \quad (2)$$

Often it is convenient to express maximum speed in terms of more physical measures, using the variables cant deficiency and wheel contact gauge. Firstly, wheel contact gauge is expressed conventionally as:

$$s_w = s_t + s_r \quad (3)$$

where

s_w is the wheel contact gauge, or distance between the two upper wheel/rail contacts, in millimetre;

s_t is the track gauge in millimetre;