SLOVENSKI STANDARD
SIST EN 13232-3:2023

01-december-2023

Železniške naprave - Zgornji ustroj proge - Kretnice in križišča za Vignolove tirnice - 3. del: Zahteve na stiku kolo-tirnica

Railway applications - Track - Switches and crossings for Vignole rails - Part 3: Requirements for wheel/rail interaction

Bahnanwendungen - Oberbau - Weichen und Kreuzungen für Vignolschienen - Teil 3: Anforderungen an das Zusammenspiel Rad/Schiene

Applications ferroviaires - Infrastructure - Appareils de voie - Partie 3: Exigences pour l'interaction Roue/Rail

Ta slovenski standard je istoveten z: **EN 13232-3:2023**

ICS:

45.080	Tračnice in železniški deli	Rails and railway components

SIST EN 13232-3:2023 **en,fr,de**

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English Version

Railway applications - Track - Switches and crossings for Vignole rails - Part 3: Requirements for wheel/rail interaction

Applications ferroviaires - Voie - Appareils de voie pour rails Vignole - Partie 3 : Exigences pour l'interaction roue/rail

Bahnanwendungen - Oberbau - Weichen und Kreuzungen für Vignolschienen - Teil 3: Anforderungen an das Zusammenspiel Rad/Schiene

This European Standard was approved by CEN on 23 October 2022.

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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

Ref. No. EN 13232-3:2023 E

Contents

European foreword

This document (EN 13232-3:2023) 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of an identical text or by endorsement, at the latest by April 2024, and conflicting national standards shall be withdrawn at the latest by April 2024.

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 13232-3:2003+A1:2011.

This series of standards “*Railway applications – Track – Switches and crossings for Vignole rails*” 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 moveable 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 geometric and non-geometric acceptance criteria for layout inspection.

This document introduces more detailed requirements for wheel/rail contact geometry as well as introducing functional and safety dimensions required for the design of switches and crossings. A number of figures have also been updated to improve clarity.

This document has been prepared under a standardisation request addressed to [the relevant ESO] by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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, Türkiye and the United Kingdom.

1 Scope

This document defines the main wheel/track interaction criteria to be taken into account during the geometrical design of railway switches and crossings (S&C) layouts.

It specifies:

— characterization of wheel and track dimensions;

— geometric design principles for wheel guidance;

— design principles for wheel load transfer;

— whether movable crossings are needed.

These are illustrated by their application to turnout components:

— switches;

— crossings;

— check rails,

but the principles apply equally to more complex units. There are also simplified definitions of the safety and functional dimensions, which can be used in conjunction with the general principles as the basis for more in-depth assessment.

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 13232-1:2023, *Railway applications – Track – Switches and crossings for Vignole rails – Part 1: Definitions*

EN 13715:2020, *Railway applications - Wheelsets and bogies - Wheels - Tread profile*

EN 15313:2016, *Railway applications - In-service wheelset operation requirements - In-service and off-vehicle wheelset maintenance*

EN 15273-1:2013+A1:2016, *Railway applications - Gauges - Part 1: General - Common rules for infrastructure and rolling stock*

EN 15273-2:2013+A1:2016, *Railway applications - Gauges - Part 2: Rolling stock gauge*

EN 15273-3:2013+A1:2016, *Railway applications - Gauges - Part 3: Structure gauges*

3 Terms, definitions and symbols

For the purpose of this document the terms and definitions given in EN 13232-1:2023 and the following apply.

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

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

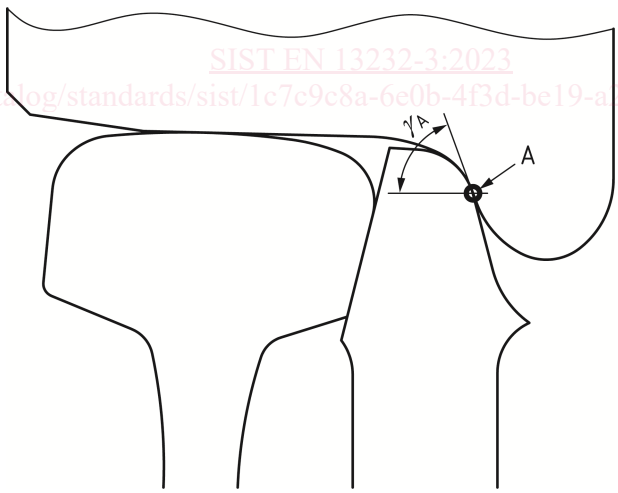
— IEC Electropedia: available at http://www.electropedia.org/

3.1
guiding force
Y
force, acting parallel to the running surface and perpendicular to running edge, between the wheel and the relevant track component (usually a rail)

3.2
wheel load
Q
force, acting perpendicular to the running surface, between the wheel on one hand and the relevant track component (rail)

3.3
contact angle
γ_A
angle of the contact plane versus the track plane measured at the contact point A between the wheel and the track component. In the case of a two-point contact, the one nearest the wheel flange shall be considered

Note 1 to entry: see Figure 1



Key

γ_A contact angle

A contact point

Figure 1 — Contact angle

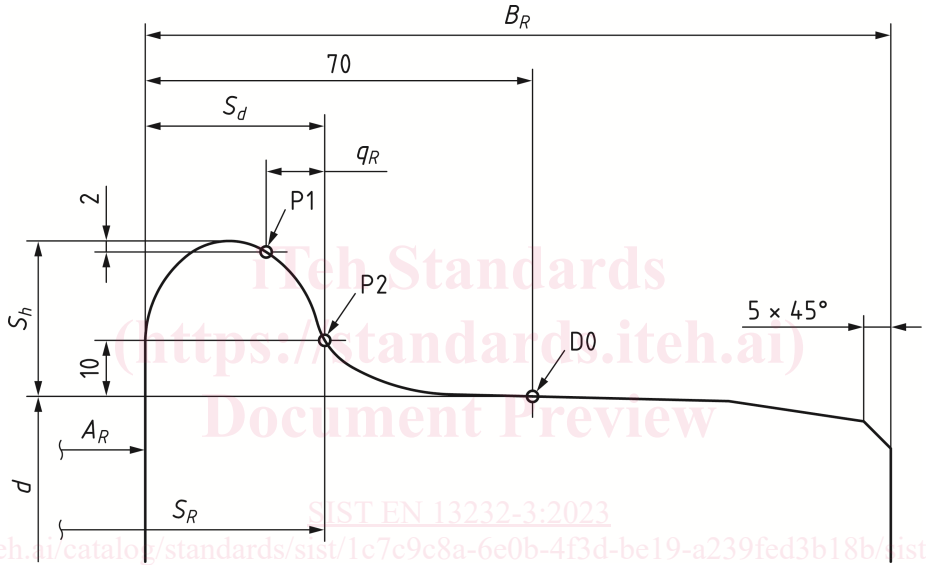
3.4
friction coefficient
μ
friction coefficient encountered at the contact point where the contact angle is determined

3.5
face of flange
q_R
parameter which characterises the flange angle of the wheel as a linear dimension. The measurement is taken at the active side of the flange between reference points P1 and P2 as defined in Figure 2

Note 1 to entry: P1 is a reference point located at a distance 2 mm from the flange tip towards the wheel axis

Note 2 to entry: P2 is reference point on the profile, at a distance from wheel axis of 10 mm more than the wheel radius;

Dimensions in millimetres



Key

d wheel diameter	q_R face of flange
D0 position of wheel tread	B_R Width of the rim
S_h height of the flange	P2 reference point
P1 reference point	S_d flange width
A_R back-to-back distance	S_R front-to-front dimesnion

Figure 2 — Wheel parameters

3.6
height of the flange
S_h
height of flange measured from the tread of the wheel to the tip of the flange

Note 1 to entry: see Figure 2

3.7
back-to-back distance
A_R
distance between the back of one wheel and the back of the other wheel on the same wheelset

Note 1 to entry: see Figures 2, 5 and 31

Note 2 to entry: An index max or min is given to this symbol according respectively to the maximum and minimum values that can occur during operation.

3.8
front-to-front dimension
S_R
distance between the from of the flange of one wheel and the front of the flange of the other wheel on the same wheelset, measured at reference point P2

Note 1 to entry: Figures 2, 5 and 31

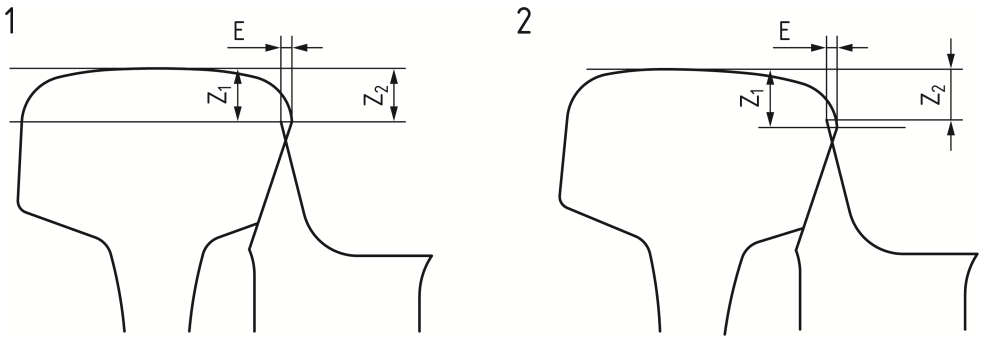
3.9
flange width
S_d
distance between the back of the flange and the from to the flange measure from reference point P2

Note 1 to entry: see Figures 2, 5 and 31

Note 2 to entry: An index max or min is given to this symbol according respectively to the maximum and minimum values that can occur during operation.

3.10
switch point retraction
E
distance measured at the track gauge reference plane (part 1), between the reference line of switch and stock rail at the actual switch toe

Note 1 to entry: see Figure 3



Key

1 Vertical stock rail

2 Inclined stock rail

E Point retraction

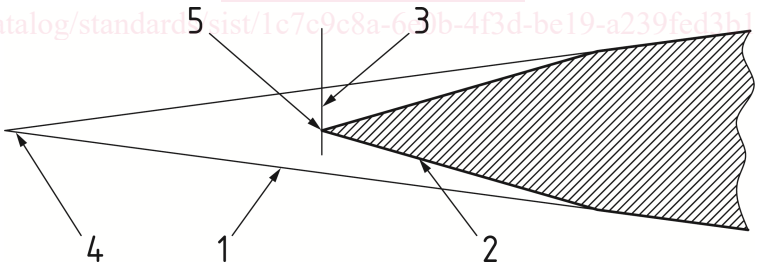
Z1 Depth of machining reference plane below running plane for contact surface (inside head cut) of stock and switch rail (see EN 13232-5)

Z2 Depth of machining reference plane below running plane for running surface of switch rail (see EN 13232-5)

Figure 3 — Switch point retraction

3.11
point retraction in fixed common crossing
reference line in a fixed common crossing which can deviate from the theoretical geometry line

Note 1 to entry: From a certain distance to the crossing point, the reference line of the Vee can, depending on the design, be removed from this theoretical line away from the wheel flange in order to avoid contact between both elements. This situation is described in Figure 4.



Key

1 Theoretical reference line

2 Actual reference line

3 Point retraction

4 Mathematical point (*MP*)

5 Actual point (*RP*)

Figure 4 — Point retraction in fixed common crossing

Note 2 to entry: The value of the point retraction is measured at the actual point (*RP*).

3.12
false flange
flange on the overhanging portion of a wheel tread caused by wear on the wheel tread in the area where the wheel and the rail normally make contact

Note 1 to entry: see Figure 7 item 1.

4 Inputs

4.1 General

The motion of wheels and transfer of wheel loads is a complex subject, involving the accumulation of extensive data and an understanding of dynamic effects.

By making certain assumptions it is feasible to define rules which are simple yet rigorous enough for design of all types of switches and crossings. Some of these rules assume a 2-axle bogie or vehicle. The need for other special requirements such as those posed by 3-axle or other vehicles shall be stated by the customer.

4.2 Wheel and track parameters

4.2.1 Introduction

This clause deals with the key parameters needed for the analysis of the interaction between wheels and the track, either for guidance calculations or load transfer calculations.

Wheel and track dimensions are defined below.

4.2.2 Wheel profiles

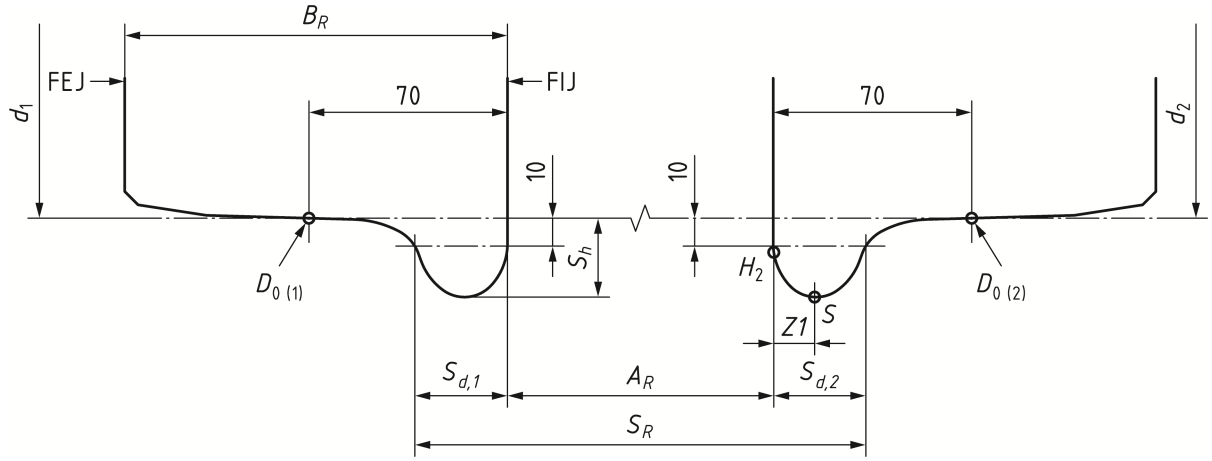
Sufficient dimensions of the cross-section or profile of a wheel are required for switch and crossing design. As a minimum, a dimensioned profile drawing shall be provided by the customer, with the following key dimensions as defined (see Figure 5):

— flange width, height and flange angle;

— tyre/rim width and tread angle;

— wheel diameter or radius.

Dimensions in millimetres



Key

A_R	back-to-back dimension	B_R	rim width
S_R	front-to-front dimension	Z1	internal zone of flange
D_0	position of wheel tread (1) wheel 1 (2) wheel 2	FEJ	external face of rim
$S_{d,1}$,$S_{d,2}$	Flange width	FIJ	internal face of rim
S_h	flange height	S	flange tip
H_2	transition point	d_1, d_2	wheel diameters

Figure 5 — Key wheel dimensions (in addition to profile details)

4.2.3 Wheelsets

Additional parameters related to the wheelsets are required for calculations for wheelset guidance. The Customer shall provide the following parameter values:

— wheel back-to-back

— axle spacing;

— number of axles;

— clearance of middle axles, if applicable;

— bogie spacing and minimum curve radius for vehicles.

4.2.4 Rail and track

The key parameters related to the track geometry that are used in calculations for wheelset guidance are shown in Figure 6 and listed below:

— track radius (R);

— track gauge (G);

— dimension for nose protection (check gauge) (F);

— crossing flangeway (D).