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BSI Standards Publication

Railway applications — Track — Switches and crossings for Vignole rails

Part 9: Layouts

bsi.

National foreword

This British Standard is the UK implementation of EN 13232-9:2023. It supersedes BS EN 13232-9:2006+A1:2011, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee RAE/2/-/9, Railway applications - Switches & Crossings - Performance & Acceptance.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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English Version

Railway applications - Track - Switches and crossings for Vignole rails - Part 9: Layouts

Applications ferroviaires - Voie - Appareils de voie pour rails Vignole - Partie 9 : Ensembles de l'appareil

Bahnanwendungen - Oberbau - Weichen und Kreuzungen für Vignolschienen - Teil 9: Weichenanlagen

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European foreword

This document (EN 13232-9:2023) 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of an identical text or by endorsement, at the latest by April 2024, and conflicting national standards shall be withdrawn at the latest by April 2024.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.

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This document supersedes EN 13232-9:2006+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. These use Parts 1 to 4 as a basis. Part 9 defines the geometric and non-geometric acceptance criteria for inspection of layouts.

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.

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1 Scope

This document:

— defines the geometrical and non-geometrical acceptance criteria for inspection of layouts assembled whether in the fabrication plant, or trackside in the case of layouts that are delivered as components, part assembled or in "kit" form;

— determines the extent of supply;

— defines the minimum requirements for traceability.

This document applies only to layouts that are assembled in the manufacturing plant or that are assembled for the first time at trackside.

Other aspects such as installation and maintenance also influence performance; these are not considered as part of this document.

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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 13232-2, *Railway applications – Track – Switches and crossings for Vignole rails – Part 2: Requirements for geometric design*

EN 13232-3:2023, *Railway applications – Track – Switches and crossings for Vignole rails – Part 3: Requirements for wheel/rail interaction*

EN 13232-5, *Railway applications – Track – Switches and crossings for Vignole rails – Part 5: Switches*

EN 13232-6, *Railway applications – Track – Switches and crossings for Vignole rails – Part 6: Fixed common and obtuse crossings*

EN 13232-7, *Railway applications – Track – Switches and crossings for Vignole rails – Part 7: Crossings with moveable parts*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/

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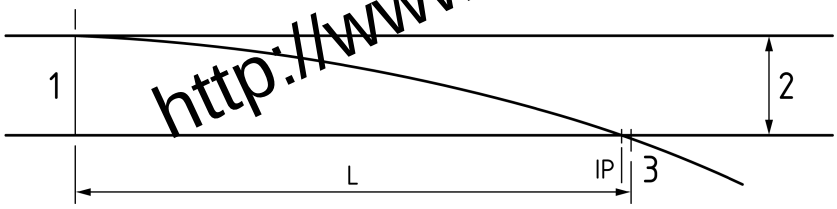
3.1
lead of turnout
distance between the switch toe and the crossing nose when measured parallel to the reference line



Key

1 Switch toes
2 Track gauge
3 Real point of crossing nose
L Lead of turnout
IP Intersection point

Figure 1 — Lead of turnout

4 Acceptance (General Design Process Step 4 – see EN 13232-2)

4.1 Inputs

4.1.1 Documents and drawings

Assembly documents as defined in EN 13232-2 shall form the basis of acceptance testing.

These assembly documents will be accompanied by all detailed component drawings that are within the limits of supply.

4.1.2 Scope of supply

The scope of supply shall be clearly specified in tender documents and on the drawings.

4.2 Acceptance testing

4.2.1 General

The supplier shall demonstrate to the customer that the critical dimensions have been measured and documented and the acceptance criteria defined in this standard have been met. The supplier shall also inform of the nominal dimensions of parameters shall the customer use field-site acceptance tolerances.

4.2.2 Components acceptance

All components are accepted according the relevant specifications or standard. All necessary tests are performed and certificates delivered as requested by these documents.

The general tolerances given in Table 1 apply to all other components of the S&C.

Table 1 — General acceptance tolerances

Parameter	Tolerance
Rail lengths (up to 24 m)	±3 mm
Rail lengths (>24 m)	±4 mm
Diameter of fishbolt hole	+1,0 -0,5 mm
Hole position relative to fishing surface	±1 mm
Hole position relative to end of rail (for temporary fishplating)	±1,5 mm (±3 mm)
Chamfer of hole (not needed in case of cold hole expansion)	min. 0,5 mm
Surface roughness of machined wheel contact areas	Ra 6,3

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4.2.3 Layout assembly acceptance

4.2.3.1 General principles

The layout shall be assembled for inspection. This can be performed in factory or at field site, according to the customer's requirements. The assembly shall be performed on the whole layout, when possible. If this is not possible, customer and supplier shall agree on assembly requirements. Panels making up parts of a layout may be built and inspected independently, provided that the overall tolerances for the complete turnout can be demonstrated to be maintained on full assembly.

4.2.3.2 Assembly and test conditions

During assembly the panels and components shall be handled in a way, that no permanent deformation is introduced.

The assembly shall be performed on a horizontal and plane surface, according to the specifications given in the tender documents. A reference line may be constructed at the assembly site, for example using a string line between two reference points.

The tolerances shall apply at a reference temperature T_R specified by the customer. For ambient temperature at the time of inspection, lengths shall be corrected in accordance with the following formula:

$$L = L_{nom} [1 + \alpha .(T_A - T_R)]$$

where:

α is the temperature coefficient of linear expansion $1{,}15 \times 10^{-5}$/K;

T_A is the temperature at assembly;

T_R is the reference temperature;

L_{nom} is the nominal length as given on the assembly documents.

All measures shall be checked at the reference plane except when stated otherwise.

Measuring equipment shall be proposed by the supplier and approved by the customer.

4.2.3.3 Acceptance criteria

4.2.3.3.1 General comments

This section defines the manufacturing tolerances of the critical dimensions.

If the customer imposes restrictions on the tolerances of the critical dimensions, these shall be stated in the tender documents. Dimensions and tolerances relating to special requirements (e.g. actuation, locking and detection systems) shall also be stated.

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4.2.3.3.2 Geometry checking

The general geometry shall be checked by:

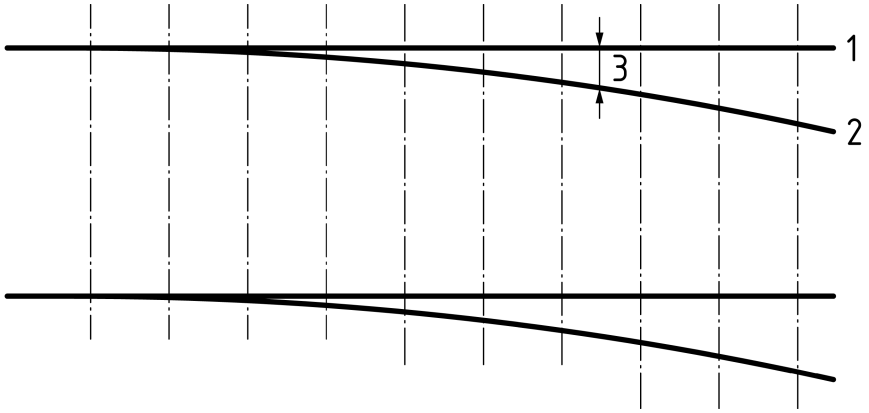
— the alignment of the reference (lead) rail to the reference line;

— the offsets from the other rails to the reference rail (see Figure 1);

— the track gauge;

— length of layout.

Table 2 gives tolerances for checking the geometry.



Key

1 Reference rail

2 Curved rail

3 Offset

Figure 2 — Offset

Table 2 — Geometry acceptance tolerances

Parameter	Tolerance
Alignment of reference rail	±3 mm
Offsets to reference rail	±2 mm
Track gauge	±2 mm
Deviation of track gauge Between 2 bearers Over the whole layout	±1 mm/3 m m
Lead ≤ 36 m > 36 m	±10 mm ±15 mm
Track centres	+5/0 mm

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4.2.3.3.3 Verifying functional and safety dimensions (FSDs)

Functional and safety dimensions (FSDs) are safety critical. The selection of limiting values depends on national and international regulations.

The nominal values for FSDs and their fabrication tolerances have an influence on the maintenance frequency and are therefore the result of the customer's economic choice. The FSDs shown in EN 13232-3:2023, Annex A shall be checked (this Annex gives examples of values used by some European networks).

All FSD's given in Table 3 are to be checked.

A check gauge (crossing nose protection) tolerance of 3 mm is typical. This can be stated as +2/-1 or ± 1,5 mm, or other combination, in order to achieve the requirement. It is preferred to use the check gauge dimension rather than the flangeway groove width for inspection, as this better reflects the desired function. Free wheel passage can be checked either by checking the free wheel passage itself, or by checking the flangeway. The latter is most common for fabrication tolerances.

4.2.3.3.4 Gaps and clearances

In order to demonstrate that no components are deformed, possibly leading to malfunctioning of the switches, the gaps and clearances in Table 3 are to be checked.

Some values could be insufficient, depending on the actuation, locking and detection (ALD) system used. These shall be imposed by the ALD system and are not included in Table 3.

For inspection the switch rail shall be fixed to the stock rail at the drive position.

Table 3 — Tolerances for gaps, squareness, etc

Parameter	Tolerance
Squareness of switches at drive positions	±2 mm
Squareness of front and heel joints	±5 mm
Bearer squareness	±5 mm
Bearer spacing	±10 mm
Switch – stock rail contact allowance	≤ 1 mm
Contact of switch studs	≤ 1 mm
Vertical gap at sliding chairs	≤ 1 mm

4.3 Outputs

4.3.1 Documents

Acceptance documents for both assembly and components shall be agreed between customer and supplier.

These documents shall make note of all items to be checked and the corresponding measured values. When during inspection, rework has been performed this will be noted on the acceptance form.

An example of an assembly acceptance form is given in Annex A.

4.3.2 Traceability

The following items shall be permanently marked with unique numbers to permit traceability of the product after installation:

— switches and/or stock rails;

— crossings.

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The minimum information for these subsystems shall be in accordance with EN 13232-5, EN 13232-6 or EN 13232-7. Other components shall be marked according to the technical specifications that apply.

4.3.3 Markings

The following items shall be marked, in a manner agreed between customer and supplier, to permit final assembly:

— the bearer number as well as the number of the corresponding S&C is marked on every bearer;

— the positions of bearers are marked at the rail foot in order to facilitate assembly;

— the relative position from the switch to its corresponding stock rail (tolerance ±1 mm);

Annex A
(informative)
Layout acceptance form

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A.1 General

There exist no general applicable acceptance forms.

The checking frequency, location and the additional information to be taken and written down on the form, depend on the methodology used, such as the measuring instruments, the mounting situation (in fabrication plant or at track site), the applicable quality system, etc. Many of these will be stated in the tender document or agreed, between customer and supplier, in accordance with the requirements of the main part of this standard.

The information content of forms can vary between:

— An exhaustive type, representing all values to be checked and including sketches of the layout type to be checked. This form is applicable only to the relevant layout.

— A shortlist of the main items to be measured. This acceptance form can be accompanied by the layout assembly plans, on which the main dimensions are given, and on which variances from nominal value can be noted during acceptance testing.

A typical example is given below for information only.

A.2 Example of layout acceptance form

Customer	**Layout Acceptance Form**	**Supplier**

General data		**Identification**	
Layout type		ID Customer	
Assembly drawing nr		ID Supplier	
Acceptance file nr:		Order nr / date:	

Checklist			
Checks	*Nom*	*Tol*	*OK*
Rail foot markings			
Total length			
Lead			
Joint gaps			
Bearer spacing			

Remarks and comments				
Repairs and retrofits				

Approval		
	For the supplier	*For the customer*
Signature		
Name		
Function		
Date		

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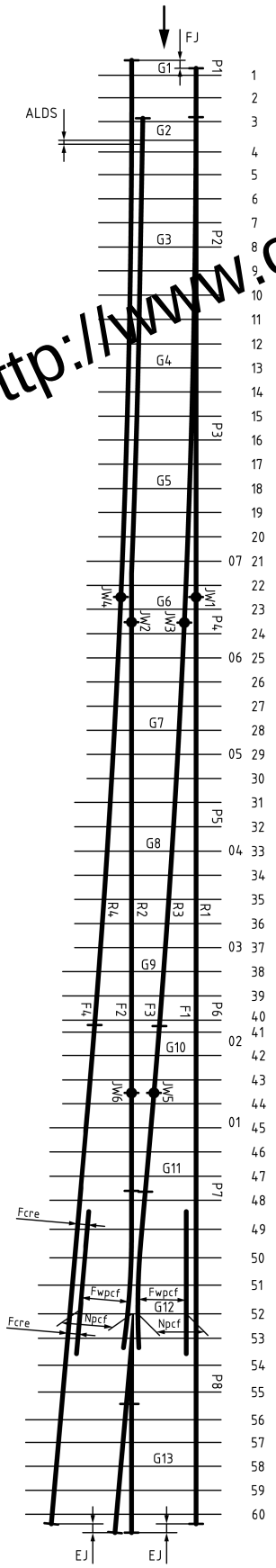
Alignment	
Point	*OK*
P1	
P2	
P3	
P4	
P5	
P6	

End position missalignment		
	Tol	*OK*
FJ	±5	
EJ	±5	
ALDS	±2	
Bearer	±5	



Gauge			
Point	*Main l. Nom (tol)*	*Branch l. Nom(tol)*	*OK*
G1			
G2			
G3			
G4			
G5			
G6			
G7			
G8			
G9			
G10			
G11			
G12			
G13			

Offset			
Point Nr.	*Bearer Nr.*	*Offset*	*OK*
O1	45		
O_2	41		
O3	37		
O4	33		
O5	29		
O6	25		
O7	21		
O8	17		

Functional and Safety Dimensions			
Param.	*Nom*	*(tol)*	*OK*
F_{wps}			
N_{pcf}			
F_{wpcf}			
f_{cre}			
f_{wre}			

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Bibliography

EN 13232-1, Railway applications – Track – Switches and crossingsfor for Vignole rails – Part 1: Definitions

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