BS EN 13232-6:2023



BSI Standards Publication

# Railway applications — Track — Switches and crossings for Vignole rails

Part 6: Fixed common and obtuse crossings

bsi.

# National foreword

This British Standard is the UK implementation of EN 13232-6:2023. It supersedes BS EN 13232-6:2005+A1:2011, which is withdrawn.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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EUROPEAN STANDARD

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October 2023

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Supersedes EN 13232-6:2005+A1:2011



English Version

# Railway applications - Track - Switches and crossings for Vignole rails - Part 6: Fixed common and obtuse crossings

Applications ferroviaires - Voie - Appareils de voie pour rails Vignole - Partie 6 : Cœurs de croisement et de traversée à pointes fixes

Bahnanwendungen - Oberbau - Weichen und Kreuzungen für Vignolschienen - Teil 6: Starre einfache und doppelte Herzstücke

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

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Ref. No. EN 13232-6:2023 E

# Contents

## European foreword

This document (EN 13232-6:2023) 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of an identical text or by endorsement, at the latest by April 2024, and conflicting national standards shall be withdrawn at the latest by April 2024.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 13232-6:2005+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.

The changes introduced in this document bring further detail and clarity to the requirements and a number of the figures, the structure of the document is largely unchanged from the previous revision.

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:

— establishes a working terminology for fixed crossings and their constituent parts, and identifies the main types;

— specifies the different and varying ways by which crossings can be described using the following parameters:

  — geometry of the crossing;

  — types of construction;

  — design criteria;

  — manufacturing processes;

  — tolerances and inspection.



## 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 13232-2:2023, *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 13674-1:2011+A1:2017, *Railway applications - Track - Rail - Part 1: Vignole railway rails 46 kg/m and above*

EN 13674-2:2019, *Railway applications - Track - Rail - Part 2: Switch and crossing rails used in conjunction with Vignole railway rails 46 kg/m and above*

EN 13674-3:2006+A1:2010, *Railway applications - Track - Rail - Part 3: Check rails*

EN 13674-4:2019, *Railway applications - Track - Rail - Part 4: Vignole railway rails from 27 kg/m to, but excluding 46 kg/m*

EN 13803:2017, *Railway applications - Track - Track alignment design parameters - Track gauges 1 435 mm and wider*

EN 15689:2009, *Railway applications - Track - Switches and crossings - Crossing components made of cast austenitic manganese steel*

EN 13481-1:2012, *Railway applications - Track - Performance requirements for fastening systems - Part 1: Definitions*

EN 13481-2:2022, *Railway applications - Track - Performance requirements for fastening systems - Part 2: Fastening systems for concrete sleepers*

EN 13481-3:2022, *Railway applications - Track - Performance requirements for fastening systems - Part 3: Fastening systems for wood sleepers*

EN 13481-4:2022, *Railway applications - Track - Performance requirements for fastening systems - Part 4: Fastening systems for steel sleepers*

EN 13481-5:2022, *Railway applications - Track - Performance requirements for fastening systems - Part 5: Fastening systems for slab track with rail on the surface or rail embedded in a channel*

EN 13481-7:2022, *Railway applications - Track - Performance requirements for fastening systems - Part 7: Special fastening systems for switches and crossings and check rails*

EN 13230-1:2016, *Railway applications - Track - Concrete sleepers and bearers - Part 1: General requirements*

EN 13230-2:2016, *Railway applications - Track - Concrete sleepers and bearers - Part 2: Prestressed monoblock sleepers*

EN 13230-3:2016, *Railway applications - Track - Concrete sleepers and bearers - Part 3: Twin-block reinforced sleepers*

EN 13230-4:2016+A1:2020, *Railway applications - Track - Concrete sleepers and bearers - Part 4: Prestressed bearers for switches and crossings*

EN 13230-5:2016, *Railway applications - Track - Concrete sleepers and bearers - Part 5: Special elements*

EN 13230-6:2020, *Railway applications - Track - Concrete sleepers and bearers - Part 6: Design*

## 3 Terms and definitions

For the purpose of this document the terms and definitions given in EN 13232-1:2023 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 Types of crossings

**3.1.1**
**common crossing**
element in switch and crossing work where the intersecting running rails cross one another at an acute angle

Note 1 to entry: see Figures 1 and 2, see also Figure 3 for the parts of a common crossing.

**3.1.2**
**straight common crossing**
common crossing where both the through route and turnout route is straight

Note 1 to entry: see Figure 1

**3.1.3**
**curved common crossing**
common crossing with a curved diverging route; designated as ordinary or double junction type depending on the direction of curvature

**3.1.3.1**
**ordinary**
common crossing with diverging route curved to radius R as shown in Figure 1




**Key**

1 Radius R

2 Radius R or straight

**Figure 1 — Common crossing**

**3.1.3.2**
**double junction type**
common crossing with diverging route curved to radius R as shown in Figure 2

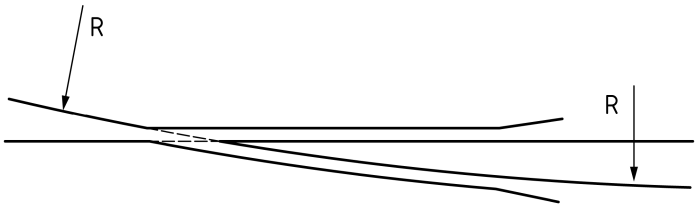



**Figure 2 — Common crossing, double junction type**

**3.1.3.3**
**non-standard**
common crossing with other forms of curvature

**3.1.4**
**obtuse crossing**
crossing in which the angle subtended at the theoretical intersection point (IP) is greater than 90°

**3.1.4.1**
**set of obtuse crossings**
pair of obtuse crossings placed such that the routes are a distance apart equal to track gauge

## 3.2 Rail joints

**3.2.1**
**vee leg**
extension of the vee of a crossing in standard rail profile

**3.2.2**
**wing front**
extension of the wing of a crossing in standard rail profile

## 3.3 Parts of crossings

**3.3.1**
**vee**
parts of the crossing forming the shape of a letter “V” which forms support to the wheels

**3.3.2**
**transfer area**
area over which the wheel transfers its load from one running surface to another

**3.3.3**
**heel of crossing**
physical end of the common crossing vee at its open end

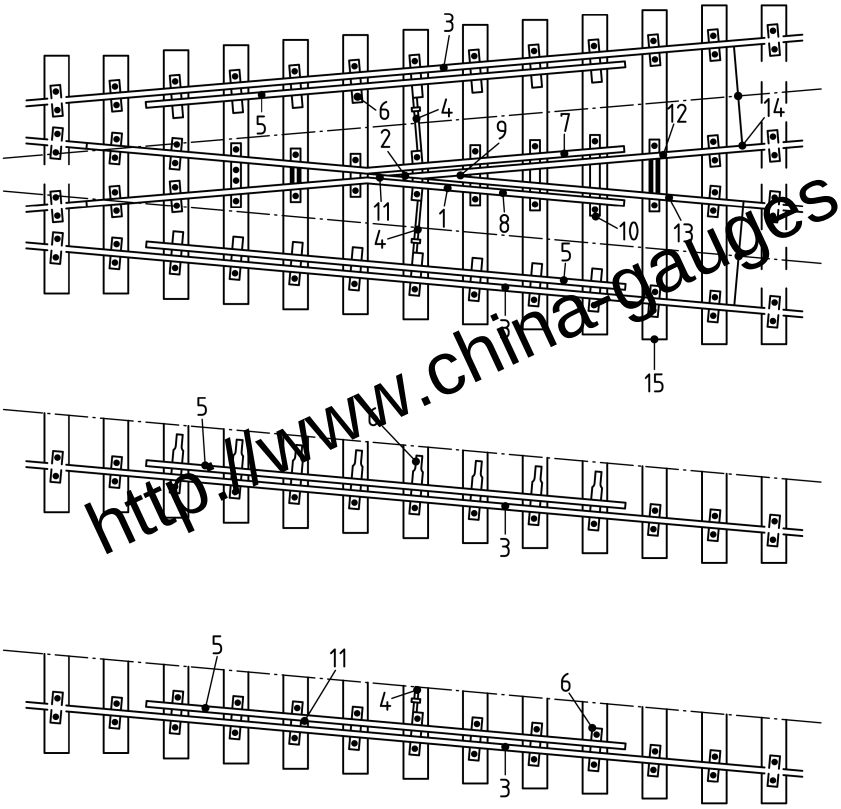
**3.3.4**
**apron**
plate between two rail sections at wing front or vee end

**3.3.5**
**wing wheel riser**
raised part of the wing rail to lift the wheel over the crossing nose

**3.3.6**
**back of wheel ramp**
ramp provided to accommodate worn wheels from causing undue damage to the crossing

**3.3.7**
**wing entry ramp**
ramp provided to accommodate worn wheels from causing undue damage to the crossing when a vehicle is travelling towards the nose from the heel, i.e. trailing

**3.3.8**
**point rail**
rail in a built-up crossing which when machined forms the crossing nose






**Key**

| | | | |
|---|---|---|---|
| 1 | Common crossing | 9 | Crossing vee |
| 2 | Crossing nose | 10 | Crossing baseplate |
| 3 | Outside rail | 11 | Block |
| 4 | Check rail strut | 12 | Point rail |
| 5 | Check rail | 13 | Splice rail |
| 6 | Check rail support | 14 | Heel of crossing |
| 7 | Left hand wing (rail) | 15 | Bearers |
| 8 | Right hand wing (rail) | | |

**Figure 3 — Parts of common crossing panel**

**3.3.9**
**splice rail**
rail in a built-up crossing which is spliced into the point rail, forming the crossing vee

Note 1 to entry: The crossing is described as “left hand splice” or “right hand splice” depending on the splice position when the observer is facing the nose from the wing front.

**3.3.10**
**wing or wing rail**
outer part of the common crossing which supports and guides the wheels across the flangeway gap

**3.3.10.1**
**left hand wing**
wing to the left hand side of the crossing nose when facing the nose from the wing front

**3.3.10.2**
**right hand wing**
wing to the right hand side of the crossing nose when facing the nose from the wing front

**3.3.11**
**outside rail**
running rail opposite the crossing at a distance of track gauge away

**3.3.12**
**check or check rail**
special section bar ensuring (by guidance of the wheel) the safe passage of the axle opposite the neck gap of the common crossing

**3.3.13**
**check rail strut**
part joining the common crossing to the check rail ensuring the maintenance of the correct position of the check rail relative to the crossing nose

**3.3.14**
**check rail support**
part supporting the check rail

**3.3.15**
**vee block**
block between the vee rails or the point and splice rails in a built-up crossing towards the heel end of the crossing

**3.3.16**
**throat block**
block between the wing rails at the throat position

**3.3.17**
**wing front block**
block between the two wing rails in front of the throat

**3.3.18**
**flangeway block**
block between the wing rails and vee forming the flangeway

**3.3.19**
**block bolts or fasteners**
mechanical device used to clamp blocks in position

**3.3.20**
**web washer**
washer used to give a flat suitable face for the bolt or fastener head and nut

**3.3.21**
**fishing recess**
recess in the rail or casting profile to permit the use of fishplates to form a joint

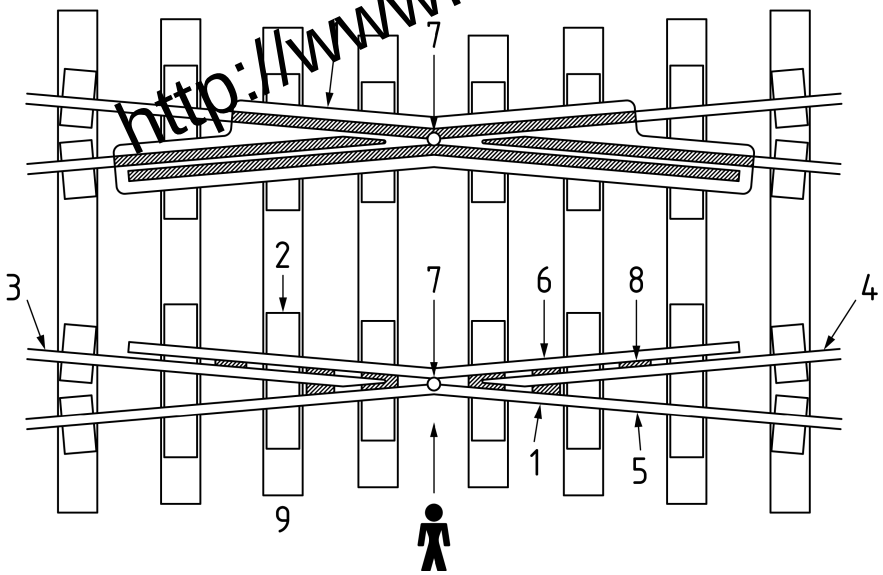
**3.3.22**
**fishbolt hole**
hole to permit the use of bolts when clamping rail joints using fishplates

**3.3.23**
**bonding**
provision for the use of an electrical connection to the crossing for track circuitry

## 3.4 Parts specific to obtuse crossings

**3.4.1**
**obtuse crossing panel**
arrangement in a layout that ensures the continuity of two routes, the corresponding running edges of which intersect, and consisting of two obtuse crossings, complete with small fittings, and assembled together usually with bearers. It is the central part of a diamond crossing






**Key**

| | | | |
|---|---|---|---|
| 1 | Obtuse crossing | 6 | Check (rail) |
| 2 | Obtuse crossing baseplate | 7 | Knuckle |
| 3 | Left hand point (rail) | 8 | Block |
| 4 | Right hand point (rail) | 9 | Bearer |
| 5 | Wing (rail) | | |

**Figure 4 — Parts of obtuse crossing panel**

Note 1 to entry: For an observer placed on the axis of symmetry of the obtuse crossing facing the wing rail from outside the track (direction of the arrow) - all components to the left are “left hand”, all the components to the right are “right hand”. See Figure 4.

**3.4.2**
**knuckle**
theoretical intersection of the running edges

**3.4.3**
**nose of point rails**
two parts of the crossing forming the running rail vees and supporting the wheels

**3.4.4**
**obtuse wing rail**
part of the crossing with horizontal set forming the running rail support between the point rail ends

**3.4.5**
**check or check rail**
part of the obtuse crossing ensuring (by guidance of the wheel) the safe passage of the axle between the obtuse point rails

**3.4.6**
**raised check**
check rail is raised above the level of the running table to give increased guidance to the wheel when passing through the knuckle area of an obtuse crossing



**3.4.7**
**spliced check rail**
extra check rail spliced into the back of the point rail to form a vee to provide additional guidance particularly on sharp curve

**3.4.8**
**neck block**
block at the knuckle of the crossing

## 3.5 Definitions of geometry terms for crossings

### 3.5.1 Common crossing features

NOTE The following terms relate to common crossings and their check (rails). See Figure 5.

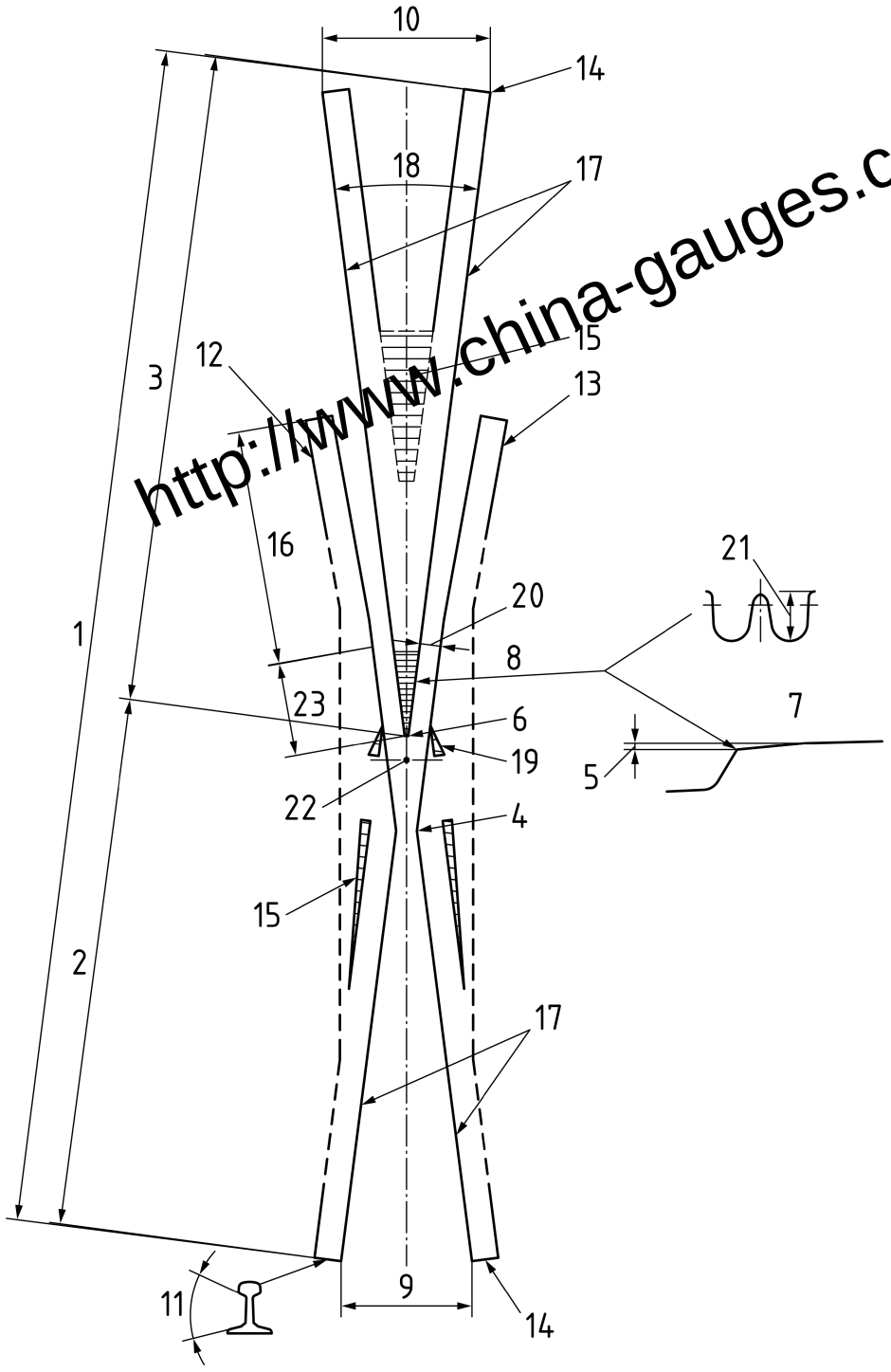
**3.5.1.1**
**overall crossing length**
length between the furthest wing front joint from the nose and the furthest vee joint from the nose

**3.5.1.2**
**angle of crossing heel**
acute angle formed by the tangents to the centre-lines of the two tracks measured at the heel of the crossing

Note 1 to entry: See Figure 6

**3.5.1.3**
**angle of crossing vee**
acute angle formed by the intersection of the running edges of the two tracks measured at the intersection point

Note 1 to entry: For curved crossings, the tangent to the curve at the Intersection Point is used. See Figure 7






**Key**

1 Overall length
2 Wing front
3 Vee
4 Throat opening
5 Elevation of nose
6 Nose
7 Nose (side view)
8 Nose topping
9 Wing front opening
10 Vee opening
11 Fishing recess
12 Left hand wing
13 Right hand wing
14 Bolted joint or weld position
15 Back of wheel ramp
16 Wing entry flare
17 Running edges
18 Crossing Angle
19 Wing entry ramp
20 Flangeway width
21 Flangeway depth
22 Intersection or theoretical point
23 Parallel flangeway

**Figure 5 — Geometric features of common crossing**

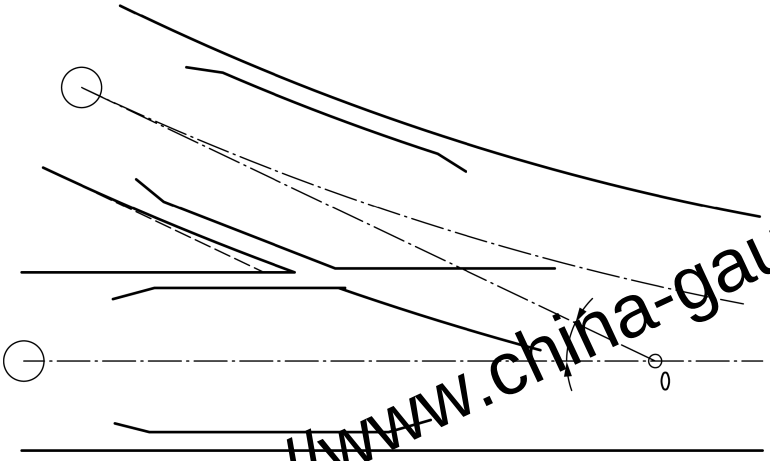



**Figure 6 — Schematic of angle of crossing heel**



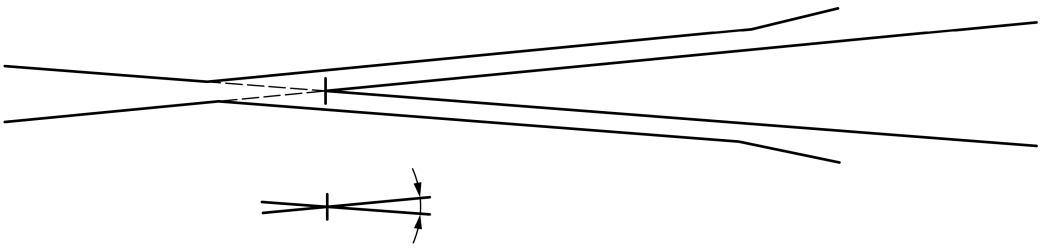
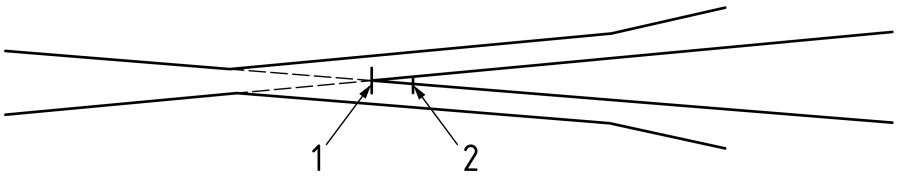


**Figure 7 — Schematic of angle of crossing intersection**




**Key**

1 IP = Intersection point

2 RP = Real point

**Figure 8 — Schematic of theoretical intersection point**

**3.5.1.4**
**theoretical intersection point**
**IP**
theoretical intersection point of the running edges at the centre of the crossing

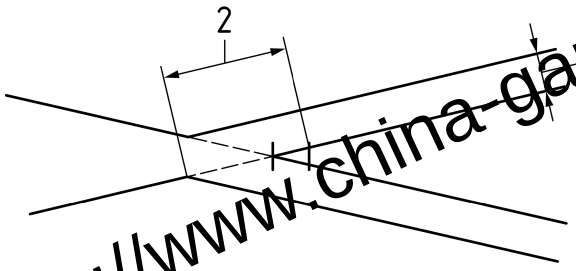
Note 1 to entry: See Figure 8

**3.5.1.5**
**nose**
**RP**
commencement of the actual crossing vee on its upper surface at a specified level below the running surface on the centre-line of the crossing

Note 1 to entry: See Figure 8

**3.5.1.6**
**flangeway**
space between the guiding edges of the wing or check (rail) and the adjacent running edge

Note 1 to entry: See Figure 9






**Key**

1 Flangeway width

2 Gap

**Figure 9 — Schematic of flangeway and gap**

**3.5.1.6.1**
**flangeway width**
width of the groove formed between the wing and the vee at running edge height

**3.5.1.6.2**
**flangeway depth**
depth of the groove formed between the wing and the vee at the running edge height

**3.5.1.6.3**
**parallel flangeway**
part of the flangeway with constant width

**3.5.1.6.4**
**check or wing flare**
part of the flangeway with variable width, to guide the wheel flange into the parallel portion

**3.5.1.6.5**
**check or wing end flare**
normally unused part of the flangeway at the end of the check or wing (rail)

**3.5.1.6.6**
**wing entry flare**
angle entry at the end of the flangeway gap formed to give a smooth entry of the wheel into the flangeway gap

**3.5.1.7**
**gap**
length over which the running edge is interrupted

**3.5.1.8**
**dimension for nose protection**
distance between the guiding edges of the check (rail) and the running edge of the nose which it protects

**3.5.1.9**
**dimension for free passage**
distance between the guiding edges of a check (rail) and its corresponding wing (rail), also called running clearance

Note 1 to entry: See also EN 13232-3:2023

**3.5.1.10**
**throat opening**
opening at the narrowest point between the wings

**3.5.1.11**
**throat flare**
**wing entry flare (front)**
machining or setting of wings to give an entry flare into the throat



**3.5.1.12**
**nose profile**
profile of the nose given when a section has been taken through the crossing at the nose position

**3.5.1.13**
**nose topping**
relief machining to the top of the nose to assist in the transfer of the wheel load from the wings to the vee

**3.5.1.14**
**wing opening**
opening between the running edges at the running edge height at the wing front end

**3.5.1.15**
**vee opening**
opening between the running edges at running edge height at the furthest point of the vee from the nose

**3.5.1.16**
**flange bearing**
groove depth is less than the flange height of the wheel profile leading the wheel to bear on its flange

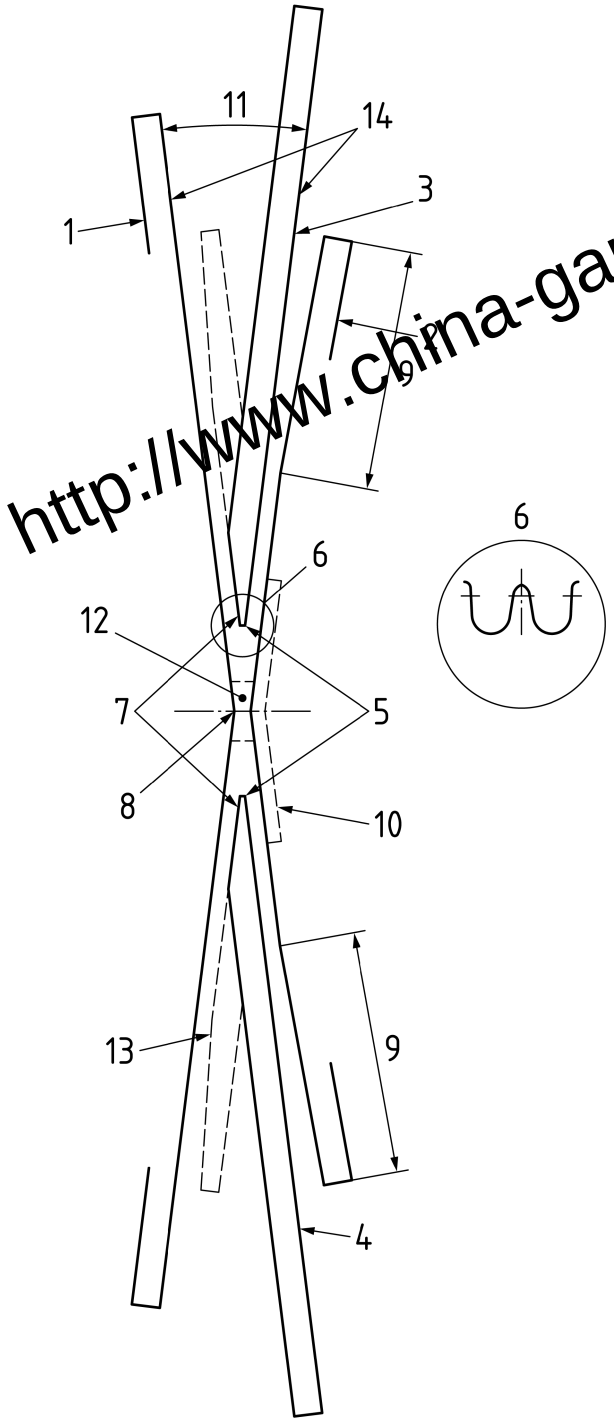
**3.5.1.17**
**crossing foot width**
crossing foot width at baseplate position

**3.5.1.18**
**foot thickness**
thickness of the foot

**3.5.1.19**
**crossing height**
crossing height from underside of base to running table

### 3.5.2 Obtuse crossing features

NOTE The following terms relate to obtuse crossings and their check (rails). See Figure 10.






**Key**

| | | |
|---|---|---|
| 1 Wing (rail) | 6 Nose profile | 11 Crossing angle |
| 2 Check (rail) | 7 Nose relief flare | 12 Neck block |
| 3 Left hand point (rail) | 8 Knuckle | 13 Check rail (spliced option shown) |
| 4 Right hand point (rail) | 9 Check entry flare | 14 Running edges |
| 5 Nose | 10 Raised check (if required) | |

**Figure 10 — Obtuse crossing**

**3.5.2.1**
**crossing height**
crossing height from underside of base to running table

**3.5.2.2**
**obtuse crossing angle**
acute angle at the knuckle formed by the intersection of the two running edges of an obtuse crossing

Note 1 to entry: It is permissible to use either tangent measure or centre-line measure to define the crossing angle. (See 3.4.3)

**3.5.2.3**
**obtuse crossing nose**
commencement of the actual nose of an obtuse crossing at the level of the gauge reference plane

Note 1 to entry: Alternatively called real point (RP). Each obtuse crossing will have two noses.

**3.5.2.4**
**nose easement**
lateral machining of the obtuse crossing nose on the wing rail side

**3.5.2.5**
**dimension for free passage**
distance between the guiding edges of the two corresponding check rails of a set of obtuse crossings

**3.5.2.6**
**nose**
point at which the vee commences, at the level of the gauge reference plane formed by the running edge of the point rail

**3.5.2.7**
**nose profile**
profile of the nose given when a section has been taken through the crossing at the nose position

**3.5.2.8**
**nose relief flare**
entry flare to the check side of the nose to permit smooth entry of the wheel into the flangeway when travelling on the wing rail towards the point, i.e. in the trailing direction

**3.5.2.9**
**check entry flare**
angled entry at the end of the flangeway on the check to give a smooth entry of the wheel into the flangeway

**3.5.2.10**
**crossing angle**
angle of the tangents to the running edges at their intersection, i.e. the knuckle

### 3.5.3 Crossing angle measurement

NOTE There are two accepted methods of measuring the crossing angle, which are as follows.

**3.5.3.1**
**tangent measure**
tangent of the angle

Note 1 to entry: See Figure 11

**3.5.3.2**
**centre-line measure**
designation "1 in N" is defined as half the cotangent of half the angle of the crossing

Note 1 to entry: See Figure 12.

Note 2 to entry: Designation "1 in N" is represented by the angle α in the following figures.



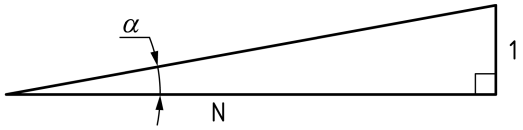



**Figure 11 Tangent measure**

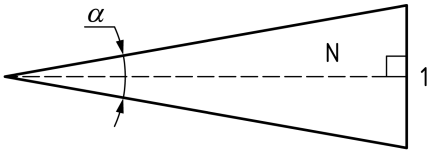



**Figure 12 Centreline measure**

## 4 Performance requirements

### 4.1 General

The type of construction shall be decided by the customer after discussion with the supplier.

### 4.2 Materials

#### 4.2.1 General

The materials used shall be specified using the respective European Standard, or by their mechanical and chemical characteristics where a European Standard does not exist.

The grade and specification of the rails to be used shall be specified by the customer according to EN 13674 (all parts). Materials for other components shall be agreed between customer and supplier.

#### 4.2.2 Assembled crossings, semi-assembled/assembled monobloc

Materials used for the wheel transfer area or in some cases only the crossing nose shall be discussed between customer and supplier. These materials shall only be used with the prior consent of the customer.

#### 4.2.3 Monobloc with or without welded legs

##### 4.2.3.1 Cast austenitic manganese monobloc crossings

Castings shall be of an austenitic manganese steel, manufactured in accordance with EN 15689:2009, it is possible to harden the surface using explosive depth hardening (EDH). The requirements for EDH need to be specified at time of order.

##### 4.2.3.2 Other cast monobloc crossings

The material of these crossings shall be discussed between customer and supplier. These materials shall only be used with the prior consent of the customer.

##### 4.2.3.3 Other monobloc crossings

The material and method of manufacture of these crossings shall be discussed between customer and supplier. These materials shall only be used with the prior consent of the customer.



### 4.3 Inclination of the running table

It is permissible for the running table of the crossing to be inclined. The inclination shall be defined by the customer with respect to the adjacent rails.

## 5 Design requirements

### 5.1 Geometric data

The following data shall be provided by the customer:

— geometry of the two intersecting gauge lines (straight, circular, clothoid, etc.);

— tangent at the theoretical point;

— bearer layout at the crossing (if required);

— position of the gauge plate/check rail strut (if required);

— depth of the crossing e.g. shallow/full depth;

— rail profile;

— rail inclination;

— track gauge;

— check gauge;

— nose profile;

— flangeway width;

and any other interfaces with the turnout deemed to be necessary for the design of the crossing.

## 5.2 Construction

Crossings can be monobloc or with assembled pieces with or without welded legs. Monobloc crossings are allowed to be made by casting and/or by machining. It is permissible for assembled crossings to be made of several pieces which can be cast, forged or machined and assembled together mechanically or by various types of welding.

## 5.3 Joints

The crossings can be joined to the adjacent track by mechanical (insulated or non-insulated) joints, or by welding in accordance with EN 14587 (flash-butt) or EN 14730 (aluminothermic).

It shall be specified by the customer if the crossing is to be welded to the track or joined by fishplates. In the latter case, the type and details of the fishplate to be used shall be specified by the customer, i.e. section details, length, size and number of holes, bolt centre line height above base of rail and material of fishplate.



## 5.4 Rolling stock data

### 5.4.1 General

The minimum detail requirements according to EN 13232-2:2023 and EN 13232-3:2023 shall be taken into account.

### 5.4.2 Axle load

The customer shall specify the value of the maximum axle load for the line where the crossing is to be installed, in accordance with Tables 2 and 3 of the Infrastructure TSI.

### 5.4.3 Maximum speed

The customer shall specify the value of the maximum speed for the main line according to EN 13803:2017.

## 5.5 Supports and fastenings

The relationship of the switch panel to the adjacent track and the closure panel, the fastening and supporting systems shall be agreed between supplier and customer according to EN 13230 (all parts), EN 13481 (all parts).

The customer shall indicate the details of fastenings to be used (direct or indirect), in the latter case the type of indirect fastenings.

## 5.6 Other requirements

The customer shall specify all other requirements that have an influence on the design of the crossings, and provide all necessary data for them.

EXAMPLES Environmental conditions, electrical insulation, continuously welded rails, applied cant, special maintenance requirements.

### 5.7 Drawings

The individual components should be illustrated on the detailed drawings. These drawings shall contain the following information:

— machining details;

— sets, bending details;

— position of the running edge and machining reference plane;

— drillings including the pertinent tolerances;

— surface markings.



## 6 Tolerances and inspection

### 6.1 General

The following clause describes tolerances of the critical dimensions of fixed crossings. Tolerances (in Tables 1 and 2) apply to nominal dimensions that shall be based on predefined workshop temperatures specified by or agreed with the customer.

If the customer imposes restrictions on the tolerances given in the following, they shall be stated in the tender documents.

### 6.2 Tools and instruments

The customer may request drawings/details of tools/measuring instruments for verification. Drawings/details shall be submitted on request for approval. All tools/instruments shall be made available by the supplier on request.

For inspection of the components, adequate measuring instruments shall be used, depending on the geometry of the component and on the required accuracy. The appropriate measuring instruments shall be agreed between customer and manufacturer. This shall include a suitable reference plane on which the product is to be supported (see Figures 13, 14 and 15).

It is the manufacturer's responsibility to guarantee dimensional accuracy and to ensure that the inspection is carried out with the appropriate measuring instruments.

### 6.3 Critical dimensions

Critical dimensions shall be verified as part of the inspection process and a record shall be kept for inspection by the customer on request. Any sharp edges shall be de-burred.

**Table 1 — Common crossings (see Figures 13 to 19)**

Dimensions in millimetres

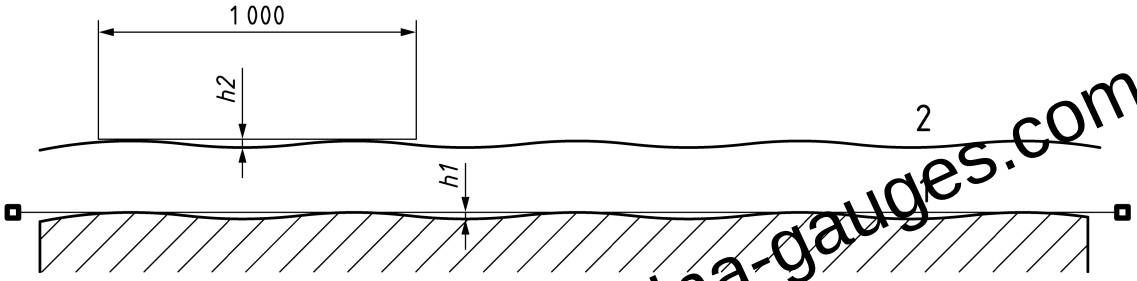
| Dimension | Description | Tolerance |
|---|---|---|
| $h_1$ | Running table flatness | 0<br>−1 [a] |
| $h_2$ | Intermediate running table flatness (1 m length) | 0,2 |
| $h_3$ | Underside flatness "every support, shall not deviate more than X mm from the reference plane formed between the two end bearer positions | 2 |
| $h_4$ | Underside transverse flatness at bearer positions. Reference plane is formed between the two outer positions of the bearing surface | 1 [a]<br>1,5 [b] |
| $d_5$ | Running edge alignment:<br>a) Straight – permissible deviation from the theoretical running edge<br>b) Curved – permissible deviation from calculated offset | ±1 [c]<br>±1 [c] |
| $l_6$ | Length, nose to wing end opening (wing front)<br>For spare crossing with extended legs | ±2<br>+10/-5 |
| $l_7$ | Length, nose to heel (vee length)<br>For spare crossing with extended legs | ±2<br>+10/-5 |
| $l_8$ | Overall crossing length<br>For spare crossing with extended legs | + 2/−3<br>+15/-7 |
| $d_9$ | Diameter of fishbolt holes | + 1<br>- 0,5 |
| $h_{10}$ | Hole position relative to foot | ±1 |
| $l_{11}$ | Hole position relative to crossing end:<br>a) Normal fishplating<br>b) Temporary fishplating | ±1,5<br>±3 |
| $r_{12}$ | Chamfering of the holes | min. 0,5 |
| $b_{13}$ | Flangeway of wing flare, measured in the gauge reference plane | + 2<br>- 1 |
| $b_{14}$ | Parallel or minimum flangeway width, measured in the gauge reference plane | + 2<br>- 1 |
| $b_{15}$ | Throat opening, measured in the gauge reference plane | ±2 |
| $b_{16}$ | Straightness of the wing rails, measured in the gauge reference plane | ±1 |
| $d_{17}$ | Shape of vee – transverse at nose. The shape is to be controlled up to a depth of at least 25 mm. The difference to the theoretical profile has to be within a tolerance of | ±1 |
| $h_{18}$ | Shape of vee nose topping. The shape shall be controlled along the length of the topping. The difference to the theoretical profile has to be within | + 2<br>- 1 |
| $b_{19}$ | Vee opening at gauge reference plane | ±1 [a] ±2 [b] |
| $b_{20}$ | Wing front opening at gauge reference plane | ±1 [a] ±2 [b] |
| $b_{21}$ | Crossing foot width at baseplate position | + 1<br>- 2 |
| $b_{22}$ | Relative position foot edge/running edge at baseplate position | ±1 |
| $r_{23}$ | Radius of wing rail head, to be checked in the whole transverse area | ±2 |
| Not shown | Maximum roughness of machined wheel contact surfaces | Ra 6,3 |

[a] Monobloc crossings only

[b] Other than monobloc crossings

[c] ± 0,5 mm over 2 m

Dimensions in millimetres

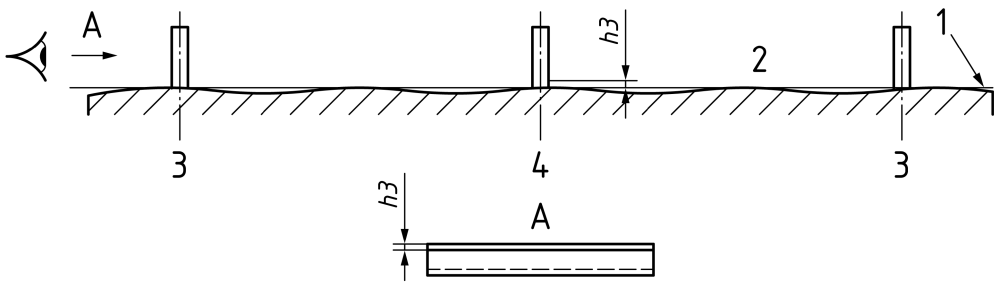



**Key**

1 Reference Plane
2 Top surface
$h_1$ Running table flatness
$h_2$ Running table flatness (over 1 000 mm)

**Figure 13 — Critical dimensions for crossings – Top surface**



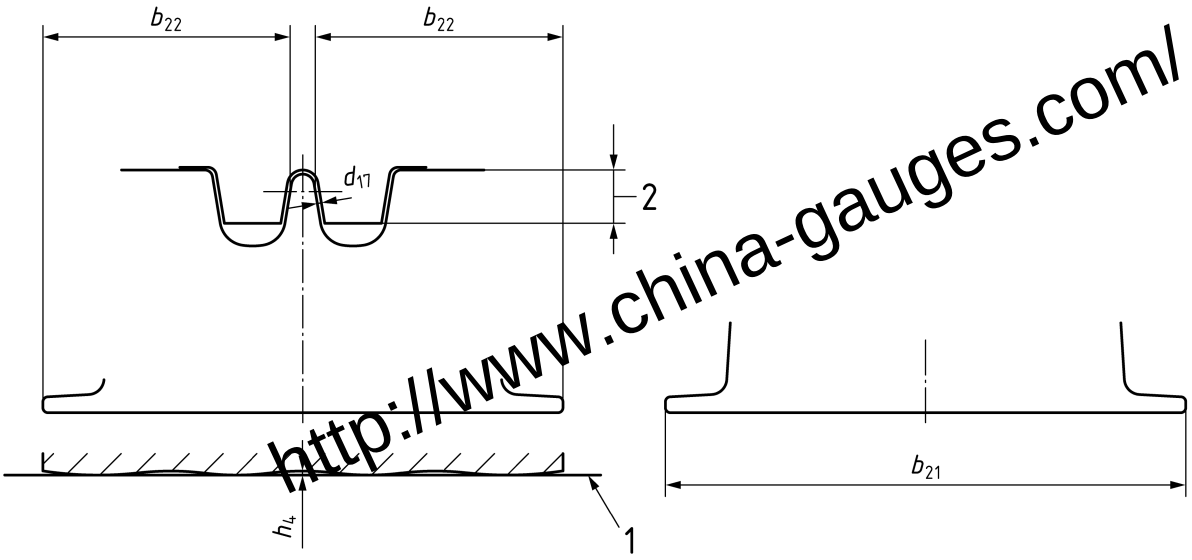



**Key**

1 Reference plane
2 Bottom surface
$h_3$ Underside flatness
3 End bearer position
4 Intermediate bearer positions

**Figure 14 — Critical dimensions for crossings – Bottom surface**

Dimensions in millimetres

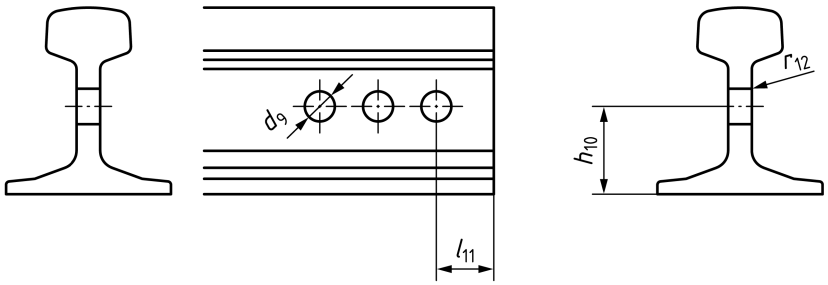





**Key**

1 Reference plane
2 Depth of 25mm (see Table 1)
$b_{21}$ Width at baseplate
$d_{17}$ Transverse shape of nose
$h_4$ Underside flatness
$b_{22}$ Position of running edge relative to foot

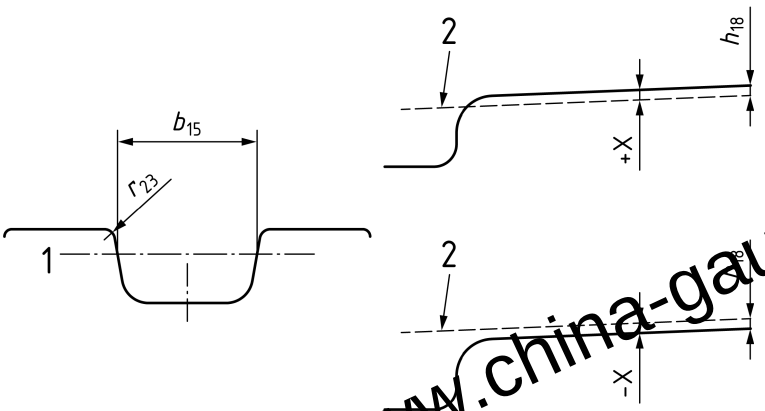
**Figure 15 — Critical dimensions for crossings – Cross section**




**Key**

$d_9$ Diameter of fishbolt holes
$r_{12}$ Chamfering of holes
$l_{11}$ Hole position relative to end of crossing
$h_{10}$ Position of running edge relative to foot

**Figure 16 — Critical dimensions for crossings – Hole position**

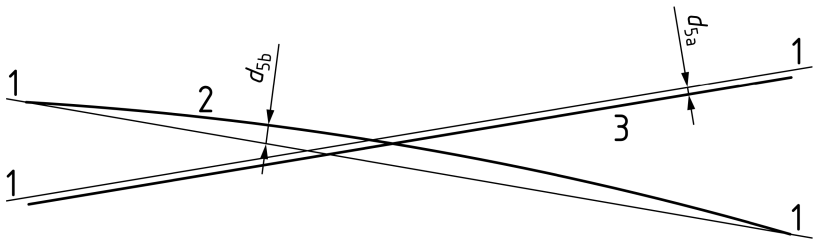





**Key**

1 Gauge line
2 Theoretical profile
$r_{23}$ Radius of wing rail head
$b_{15}$ Throat opening
$h_{18}$ Difference between actual and theoretical top profile

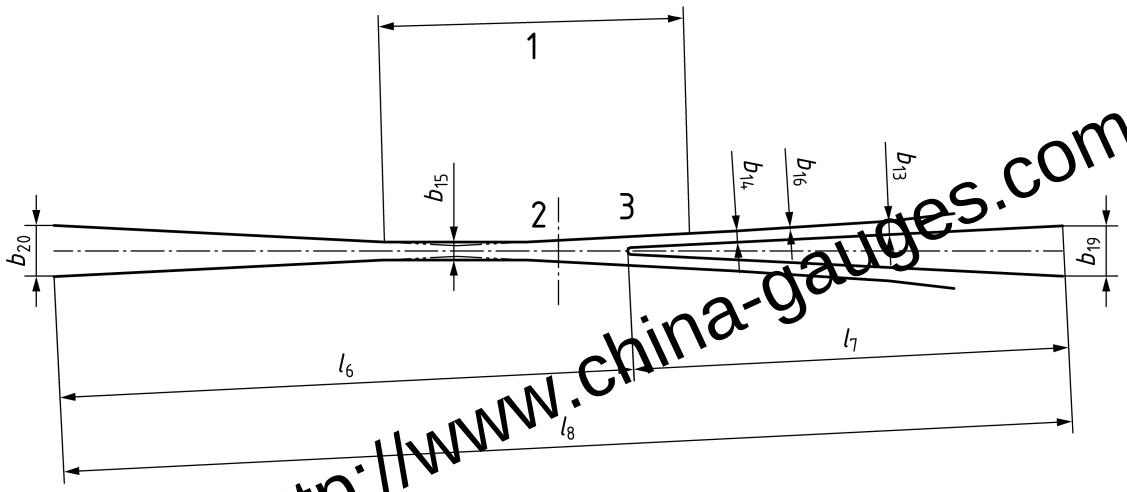
**Figure 17 — Critical dimensions for crossings – Opening and top profile**




**Key**

1 Reference line
2 Curve
3 Straight
$d_{5a}$ Deviation along full length
$d_{5b}$ Deviation at intermediate offsets

**Figure 18 — Critical dimensions for crossings – Running edge alignment**






**Key**

| | | | |
|---|---|---|---|
| 1 | Transfer area | $b_{14}$ | Flangeway, parallel |
| 2 | Intersection point | $b_{15}$ | Throat opening |
| 3 | Nose | $b_{19}$ | Vee opening |
| $b_{16}$ | Straightness of wing rails | $l_6$ | Length, nose to wing end opening (wing front) |
| $b_{20}$ | Wing front opening | $l_7$ | Length, nose to heel (vee length) |
| $b_{13}$ | Flangeway, wing flare | $l_8$ | Overall crossing length |

**Figure 19 — Critical dimensions for common crossing – Openings and lengths**

**Table 2 — Fixed obtuse crossings (see Figures 13 to 18 and 20)**

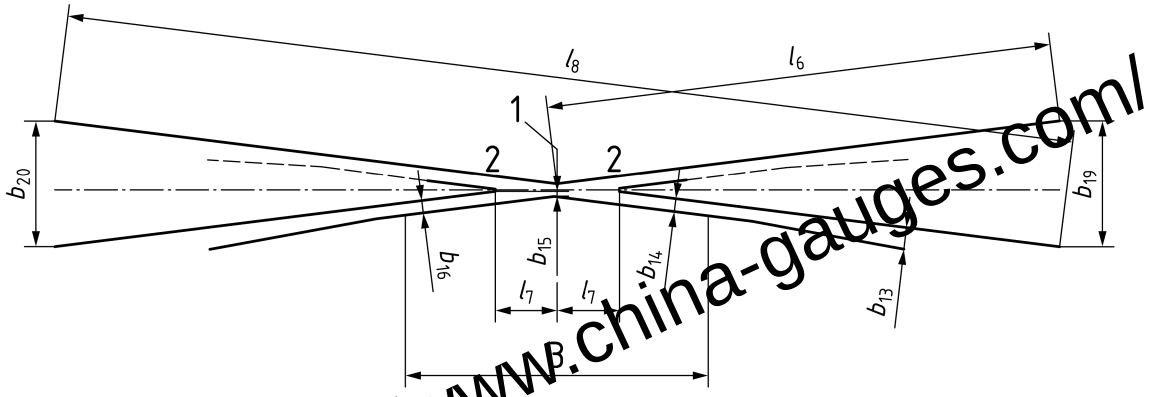
Dimensions in millimetres

| Dimension | Description | Tolerance |
|---|---|---|
| $h_1$ | Running table flatness | 0<br>-1 [a] |
| $h_2$ | Intermediate running table flatness (1 m length) | 0,2 |
| $h_3$ | Underside flatness "every support, shall not deviate more than X mm from the reference plane formed between the two end bearer positions" | 2 |
| $h_4$ | Underside transverse flatness at bearer positions. Reference plane is formed between the two outer positions of the bearing surface | 1 [a]<br>1,5 [b] |
| $d_5$ | Running edge alignment<br>a) Straight – permissible deviation from the theoretical running edge<br>b) Curved – permissible deviation from calculated offset | ±1 [c]<br>±1 [c] |
| $l_6$ | Length knuckle to end bolting<br>For spare crossing with extended legs | ±2<br>+10/-5 |
| $l_7$ | Nose to knuckle<br>For spare crossing with extended legs | ±2<br>+10/-5 |
| $l_8$ | Overall crossing length<br><br>For spare crossing with extended legs | + 2<br>- 3<br>+15/-7 |
| $d_9$ | Diameter of fishbolt holes | + 1<br>- 0,5 |
| $h_{10}$ | Hole position relative to foot | ±1 |
| $l_{11}$ | Hole position relative to crossing end:<br>a) Normal fishplating<br>b) Temporary fishplating | ±1,5<br>±3 |
| $r_{12}$ | Chamfering of the holes | min. 0,5 |
| $b_{13}$ | Flangeway of wing flare, measured in the gauge reference plane | + 2<br>- 1 |
| $b_{14}$ | Parallel or minimum flangeway width, measured in the gauge reference plane | + 2<br>- 1 |
| $b_{15}$ | Knuckle opening, measured in the gauge reference plane | ±2 |
| $b_{16}$ | Straightness of the check rail, measured in the gauge reference plane | ±1 |
| $d_{17}$ | Shape of the nose transverse. The shape is to be controlled up to a minimum depth of 32 mm. The variation from the theoretical profile as to be within the tolerance of | ±1 |
| $h_{18}$ | Shape of vee nose topping. The shape shall be controlled along the length of the topping. The difference to the theoretical profile has to be within | + 2<br>- 1 |
| $b_{19}/b_{20}$ | Running edge to running edge opening at gauge reference plane | ±1 [a] ±2 [b] |
| $b_{21}$ | Crossing foot width at baseplate position | + 1<br>- 2 |
| $b_{22}$ | Relative position foot edge/running edge | ±1 |
| $r_{23}$ | Radius of wing rail head, to be checked in the whole transfer area | ±2 |
| $h_{24}$ | The difference in height between the running surface and the top surface of the check rail | + 2<br>- 3 |
| Not shown | Maximum roughness of machined wheel contact surfaces | Ra 6,3 |

[a] Monobloc crossings only

[b] Other than monobloc crossings

[c] ± 0,5 mm over 2 m






**Key**

| | | | |
|---|---|---|---|
| 1 | Knuckle | $b_{15}$ | Throat opening |
| 2 | Nose | $b_{19}$ | Opening |
| 3 | Transfer area | $b_{20}$ | Opening |
| $b_{16}$ | Straightness of wing rails | $l_6$ | Length, nose to wing end opening (wing front) |
| $b_{13}$ | Flangeway, wing flare | $l_7$ | Length, nose to heel (vee length) |
| $b_{14}$ | Flangeway, parallel | $l_8$ | Overall crossing length |

**Figure 20 — Critical dimensions for obtuse crossing – Openings and lengths**

### 6.4 Certification

All materials shall conform to the latest relevant publication.

The tender documentation shall clearly specify methods of examination and certification requirements which are required by the customer.

### 6.5 Methods of examination for structural defects

The supplier shall document (in a technical description or manufacturing plan for example) what methods of examination will be used. This shall be agreed with the customer.

## 7 Limit and extent of supply

Limit and extent of supply shall include all components for the basic manufacture of the fixed crossings. Any requirement for additional items, such as fishplates, fishplate drilling, baseplates and clips shall be specified by the customer.

## 8 Identification marks

Each crossing shall have an identification marking fixed on the crossing. The design of marking shall be agreed between customer and supplier.

The following minimum information shall be marked:

— manufacturer’s mark;

— last two digits of year of manufacture;

— crossing type (rail profile, geometry, left hand, right hand);

— unique identification No.

Other markings shall be specified by the customer.

The identification marks concerning dispatch shall be agreed between customer and supplier.

# Annex ZA
(informative)

## Relationship between this European Standard and the Essential Requirements of EU Directive (EU) 2016/797 aimed to be covered



This European Standard has been prepared under a Commission's standardization request "M/483 Mandate to CEN and CENELEC for Standardisation in the field of interoperability of the rail system" to provide one voluntary means of conforming to (parts of) Essential Requirements of Directive (EU) 2016/797 of the European Parliament and of the Council of 11 May 2016 on interoperability of the rail system (recast) as specified in the relevant technical specifications for interoperability (TSI).

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZA.1 for infrastructure confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive as specified in the technical specifications for interoperability (TSI), and associated EFTA regulations.

**Table ZA.1 — Correspondence between this European Standard, Commission Regulation (EU) N° 1299/2014 concerning the technical specifications for interoperability relating to the 'infrastructure' subsystem of the rail system in the European Union* and Directive (EU) 2016/797**

| Essential Requirements of Directive (EU) 2016/797 | Clauses of the Annex to the Technical Specification for Interoperability (TSI) | Clause/ subclauses of this European Standard | Comments |
|---|---|---|---|
| Section 3 of the Annex to the TSI indicates the correspondence between the TSI clauses and the Essential Requirements of Directive (EU) 2016/797 | 4.2.6.1. Track resistance to vertical loads<br>(a) the axle load selected according to point 4.2.1; | 5.4.2 | |
| ***As amended by Commission Implementing Regulation (EU) 2019/776**<br>NOTE: The Technical Specification for Interoperability (TSI) can refer to other clauses of this standard making the application of those clauses mandatory. Possible references to such clauses are found in the Appendix T to the TSI. | | | |

**WARNING 1 —** Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

**WARNING 2 —** Other Union legislation may be applicable to the products falling within the scope of this standard.

# Bibliography

EN 14587-2, *Railway applications - Track - Flash butt welding of rails - Part 2: New R220, R260, R260Mn and R350HT grade rails by mobile welding machines at sites other than a fixed plant*

EN 14730 (all parts), *Railway applications - Track - Aluminothermic welding of rails*

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