Railway applications — Track — Switches and crossings —

Part 7: Crossings with moveable parts
National foreword

This British Standard is the UK implementation of EN 13232-7:2006+A1:2011. It supersedes BS EN 13232-7:2005, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by [A1].

The UK participation in its preparation was entrusted to Technical Committee RAE/2 Railway Applications - Track.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Amendments/corrigenda issued since publication

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Railway applications - Track - Switches and crossings - Part 7: Crossings with moveable parts

This European Standard was approved by CEN on 9 January 2006 and includes Amendment 1 approved by CEN on 13 September 2011.

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Foreword

This document (EN 13232-7:2006+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of an identical text or by endorsement, at the latest by April 2012, and conflicting national standards shall be withdrawn at the latest by April 2012.

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.

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

This document supersedes EN 13232-7:2006.

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

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 standards “Railway applications – Track – Switches and crossings” covers the design and quality of switches and crossings in flat bottom rails. 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 the standard.

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 functional and geometrical dimensions and tolerances for layout assembly.

The following terms are used within to define the parties involved in using the EN 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 EN 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.
Introduction

The requirements of crossings with moveable parts are that they are capable of performing their intended purpose, which is to allow a vehicle to pass the area where the two rails cross with a continuous running edge.

That means the wheels of the vehicle are fully supported and guided in the whole crossing area, either in the facing or trailing direction.

The main criteria for the selection of crossings with moveable parts are:

- improvement of ride comfort;
- reduction of noise and vibration;
- reduction of maintenance;
- mixed traffic conditions (e.g. train/tram);
- security against derailment.

This last point is particularly important (critical) in diamond crossings. Effectively, as the wheel diameter and the obtuse crossing angle decrease, the distance without guidance (EN 13232-3:2003, 4.2.5) increases.

Therefore, to assure the safety of running of the wheel set over the diamond crossing, it is sometimes necessary to design the obtuse crossing as moveable.

Rules and recommendations for security against derailment in diamond crossings are set down in part 9 of this standard.

The crossings with moveable parts shall be designed to withstand all external forces from rolling stock, thermal influences etc.

The customer shall specify the maximum strains or stresses due to external thermal forces that the crossing with moveable parts has to withstand.

Operating, signalling systems, heater systems, load bearing supports, maintainability and safety are all major factors which should be taken into account during the design.

The performance criteria shall be based on information given by the customer.

The design and selection of types of crossings with moveable parts will be influenced by axle loads, frequency of traffic and speed.
1 Scope

The scope of this part is:

— to establish a working terminology for crossings with moveable parts, which means crossings with moveable parts to close the gap of the running edge, and their constituent parts, and identify the main types;

— to list the minimum informative requirements for the manufacture of crossings with moveable parts and/or their constituent parts;

— to formulate codes of practice for inspection and tolerances for crossings with moveable parts and/or their constituent parts;

— to establish the limits and extent of supply;

— to list the method by which crossings with moveable parts and their constructional parts should be identified and traced;

— to list the different and varying ways by which crossings with moveable parts can be described, using the following parameters:

  — geometry of crossings;
  — types of construction;
  — performance requirements;
  — design criteria;
  — tolerances and inspection.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 13145, Railway applications — Track — Wood sleepers and bearers

EN 13146 (all parts), Railway applications — Track — Test methods for fastening systems

EN 13230 (all parts), Railway applications — Track — Concrete sleepers and bearers

EN 13232-1, Railway applications — Track — Switches and crossings — Part 1: Definitions

EN 13232-2, Railway applications — Track — Switches and crossings — Part 2: Requirements for geometric design

EN 13232-4, Railway applications — Track — Switches and crossings — Part 4: Actuation, locking and detection

prEN 13232-9, Railway applications — Track — Switches and crossings — Part 9: Layouts

EN 13481 (all parts), Railway applications — Track — Performance requirements for fastening systems
3 Types of crossing with moveable parts

3.1 Common crossings with moveable parts

There are two major types of common crossing with moveable parts. These are crossing with moveable point (see Figure 1) and crossing with moveable wing rails (see Figure 2).

In both cases:

The wings and vee support can be:

- saddle (cast, welded, machined);
- assembled (made of different rail profiles, e.g. standard rail, asymmetric low section, symmetric thick web section etc.).

The vee can be:

- monobloc (cast, welded, machined);
- assembled (made of different rail profiles, e.g. standard rail, asymmetric low section, symmetric thick web section etc.).

Rail profiles shall be according to EN 13674-1 and EN 13674-2.

In the case of a crossing with moveable point:

- point may or may not contain a longitudinal sliding area;
- vee of point and splice rail may be coupled by bolting, welding or fabricated out of a monobloc and welded to their respective adjacent legs.

For example see Figures 3, 4 and 5.

In the case of a crossing with moveable wing rails a longitudinal sliding area is not required.

Other types of construction and their requirements shall be agreed between customer and supplier.

3.2 Obtuse crossings with moveable parts

The main type of obtuse crossing with moveable parts is the switch diamond crossing (see Figure 6).

The wing and switches rails support can be:
— saddle (cast, welded, machined);
— assembled (made of different rail profiles, e.g. standard rail, asymmetric low section, symmetric thick web section etc.).

The wing rail can be:
— monobloc (cast, welded, machined);
— assembled (made of different rail profiles, e.g. standard rail, asymmetric low section, symmetric thick web section etc.).

Switch diamond crossings can be used in obtuse crossings with or without single or double slips.

Rail profiles shall be according to EN 13674-1 and EN 13674-2.

### 3.3 Materials

The materials used shall be defined at least by their respective EN or by their mechanical and chemical characteristics in the non-existence of an EN.

The grade and specification of rails to be used shall be specified by the customer and shall comply with EN 13674-1, EN 13674-2, prEN 13674-3 and EN 13674-4. All bolts and other fixing devices shall be minimum grade 5.6. All other blocks and fittings shall be manufactured to minimum grade 200. The use of other materials shall be agreed between customer and supplier.

### 3.4 Geometry

The geometry of the crossing at the running edges (straight or curved) shall be in accordance with the general layout according to EN 13232-2 and prEN 13232-9.

### 3.5 Inclination of the running table

The running table of the crossing may or may not be inclined.

Inclination of any running table in the crossing and location and length of any twist (change of inclination) shall be defined.

### 3.6 Construction

If a transition from special rail profile to standard rail profile is required, the transition can either be located in the fixed part or in the moveable part. In case of a weld, in the moveable part, the weld shall be secured by fishplating.

### 3.7 Relationship with the adjacent track

The crossing can be joined to the adjacent track:
— by fishplates;
— by glued fishplates;
— by welding.
4 Terms and definitions

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

4.1 Common crossing with moveable point (Figure 7)

4.1.1 swing nose (or moveable vee)
part of the crossing which forms the vee. It is moved to form a continuous running edge for either the main or branch lines

4.1.2 saddle (or wing rail)
gives support to the swing nose and also forms the housings when the swing nose is thrown. The saddle (or wing rail) is also used to support the wheel when transferring from the wing rail to the vee

4.1.3 relief ramp (if required)
ramp for false flange on worn wheels

4.1.4 distance blocks (if required)
mechanical device to give strength and support to the crossing. Depending on the design concept, the distance blocks should transfer track forces

4.1.5 left hand wing front rail
rail connected to left hand wing front

4.1.6 right hand wing front rail
rail connected to right hand wing front

4.1.7 spacer blocks (or studs)
blocks to give lateral support to the swing nose

4.1.8 foot relief (if required)
reduction of section of point rail foot at the swing nose heel to facilitate flexing

4.1.9 longitudinal sliding area (if required)
��统 to permit free movement of the swing nose, it allows for the changes in rail length as the swing nose is operated. The longitudinal sliding area is normally situated on the branch line of the crossing

4.1.10 left hand wing rail
wing rail to the left of the vee when viewed from the vee (swing nose)

4.1.11 right hand wing rail
wing rail to the right of the vee when viewed from the vee (swing nose)
4.1.12
left hand vee rail (monobloc vee)
rail connected to the left hand vee leg between the swing nose and the longitudinal sliding area (as shown for a left hand crossing)

4.1.13
left hand extended vee rail (monoblock vee) (if required)
rail between the longitudinal sliding area and the heel of the crossing (as shown for a left hand crossing)

4.1.14
right hand vee rail (monoblock vee)
rail connected to the right hand vee leg of swing nose (as shown for a left hand crossing)

4.1.15
flangeway blocks
blocks used to maintain the correct flangeway gap between the vee rails and wing rails. Depending on the design concept, the distance blocks should transfer track forces

4.1.16
left hand splice rail (assembled vee)
rail spliced to point rail
— forming the vee and permitting longitudinal movement between point rail and splice rail (see Figure 3),
— forming the vee between the point rail and the extended splice rail and permitting longitudinal movement between splice rail and extended splice rail (see Figure 4) and
— forming the vee and without longitudinal movement between point rail and splice rail

4.1.17
left hand extended splice rail (assembled vee) (if required)
rail between the longitudinal sliding area and the heel of the crossing (as shown for a left hand crossing)

4.1.18
right hand point rail (assembled vee)
rail forming the swing nose situated in the main line from the swing nose to the heel joint (as shown for a left hand crossing in Figures 3 and 4)

4.1.19
point rail toe (PRT)
front physical end of the point rail that contacts the saddle or the wing rail to form a continuous running edge in the closed position (see Figure 10 a)

4.1.20
splice rail toe (SRT) (assembled vee)
front physical end of the splice rail that contacts the point rail (see Figure 10 a)

4.2 Common crossing with moveable wing rails (Figure 8)

4.2.1
left hand vee rail
rail forming the vee situated to the left of the vee when viewed from the nose

4.2.2
right hand vee rail
rail forming the vee situated to the right of the vee when viewed from the nose
4.2.3 relief ramp (if required)
ramp for false flange on worn wheels

4.2.4 vee
part of the crossing forming the shape of a letter ‘v’. The vee is fixed

4.2.5 supporting bar
in the closed position of the wing rail this bar gives lateral support to the wing rail via the wing rail stops

4.2.6 wing rail stops
stops fixed on the wing rails to transfer the lateral forces from the wing rail to the supporting bar (in the closed position of the wing rail)

4.2.7 foot relief
reduction of section of wing rail foot at the wing front to facilitate flexing

4.2.8 left hand moveable wing rail
wing rail to the left of the vee when viewed from the nose. It is moved to form a continuous running edge for the right line as shown in Figure 8

4.2.9 right hand moveable wing rail
wing rail to the right of the vee when viewed from the nose. It is moved to form a continuous running edge for the left line

4.2.10 nose
point at which the vee commences at the level of the gauge reference plane

4.3 Obtuse crossing with moveable parts (Figure 9)

4.3.1 right hand switch rail
rail to the right hand side of the switch diamond when viewed from outside the gauge. This rail flexes to either form a continuous running edge for the wheel to pass over when the switch is closed, or flange way clearance for the wheel to pass through when the switch is open

4.3.2 left hand switch rail
as right hand switch rail but opposite hand

4.3.3 right hand back rail (if required)
rail to the right hand side of the switch diamond when viewed from outside the gauge. This rail gives support to the switch rail and also forms the fixed flexing portion at the heel of the switch rail

4.3.4 left hand back rail (if required)
as right hand back rail but opposite hand
4.3.5 **heel blocks (if required)**
blocks used to form the fixed heel block assembly between the switch rail and respective back rail to limit the moveable length. Depending on the design concept, the distance blocks should transfer track forces

4.3.6 **wing rail**
part of the crossing with horizontal set forming the running rail support at the switch rail ends

4.3.7 **distance blocks (if required)**
mechanical device to give strength and support to the crossing assembly. Depending on the design concept, the distance blocks should transfer track forces

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

4.3.9 **spacer blocks (or studs)**
blocks to give lateral support to the switch rail

4.3.10 **switch toe**
physical end of the switch rail that contacts the wing rail to form a continuous running edge in the closed position

4.3.11 **moveable length**
part of the switch rail which moves in front of the first fixed position when the switch diamond is operated

4.3.12 **foot relief**
reduction of section of switch rail foot at the switch heel to facilitate flexing

## 5 Design requirements

### 5.1 Geometrical data

The following data shall be agreed between the customer and the supplier:

- geometry of the two intersecting running edges (straight, circular, clothoid etc.);
- tangent at the theoretical intersection point;
- bearer layout at the crossing;
- position of the gauge plate/strut (if required);
- height of the crossing;
- rail profiles;
- rail inclination;
- track gauge;
— check gauge (if non-active check rail is requested by the customer);
— machining profile of nose and wing-rail (see Figures 10 to 12);
— minimum flange way width;
— minimum opening between the wing rails (throat opening);
— opening at the drive position.

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

Check rail profiles shall be according to prEN 13674-3.

5.2 Rolling stock data

5.2.1 Maximum axle load

The customer shall provide the value of the maximum axle load for the line where the crossing is to be installed.

5.2.2 Maximum speed

The customer shall provide the value of the maximum speed for the mainline where the crossing is to be installed.

5.2.3 Wheel profile, diameter, back to back and wheel set dimensions

The customer shall provide the supplier with the wheel profile/profiles, diameter, back to back and wheel set dimensions. The wheel profile/profiles to be used in the design of the crossing may be new ones, with an average wear or maximum wear values. The customer shall indicate which profile/profiles are to be used in the design. Also if special circumstances are to be taken into account, e.g. false flanges in the wheels etc.

Wheel profile and wheel set geometry determine the geometry of the rolling table of the crossing, the flange way width and the check gauge if non-active checkrails are requested.

5.2.4 Note

For detail requirements, see EN 13232-2 and EN 13232-3.

5.3 Supports and fastenings

The relationship of the crossing to the adjacent track and the closure panel, the fastening and supporting systems shall be agreed between supplier and customer. EN 13145, EN 13146, EN 13230 and EN 13481 shall be taken into account.

It shall be specified if the crossing is to be welded to the track or joined by fishplates. In the latter case, the type and details of the fishplates 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 fishplates.

The customer shall specify the details of fastenings to be used, direct or indirect.
5.4 Interface between crossing with moveable parts and operating system

Requirements to permit the interface between the crossing with moveable parts and the actuation, locking and detection systems shall be as defined in EN 13232-4. The type of operating system shall be specified by the customer.

The throwing force shall be agreed between customer and supplier and checked at inspection of prototypes only.

5.5 Transfer of longitudinal track forces

When the crossing is integrated in a continuous welded track, the maximum longitudinal forces to be considered for the design are the maximum thermal forces.

The supplier shall prove the capability of the product to support track forces on customer request.

The customer shall define the method (calculation and/or practical test) to be used.

5.6 Other requirements

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

Examples are heaters, environmental conditions, electrical insulation, continuously welded rail, insulated and/or glued joints, applied cant, special maintenance requirements.

5.7 Drawings

Individual components shall be illustrated on detailed drawings. These detailed drawings shall contain the following information:

- machining profiles;
- sets;
- bending details;
- position of the running edges and machining reference plane;
- drillings;
- pertinent tolerances and surface finishes.

To assure the safety of running of the wheel set over crossing with moveable parts, the machining profiles of switch rail, point rail, splice rail and wing rail shall respect the prescription given in prEN 13232-9.

See also EN 13232-3.

6 Tolerances and inspection

6.1 General

The following section describes tolerances of the critical dimensions, which shall be verified. These tolerances are based on workshop temperatures or a predefined temperature specified by the customer.
Any dimensions and tolerances relating to special requirements (e.g. operating systems, welds, insulated joints) shall be verified.

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 and measuring conditions 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.

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

6.3.1 General

The following 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.

6.3.2 Critical dimensions for common crossings with moveable point

Refer to Tables 1 to 4 and Figures 13 to 32.

6.3.3 Critical dimensions for common crossings with moveable wing rails

Refer to Tables 5 to 8 and Figures 33 to 46.

6.3.4 Critical dimensions for obtuse crossings with moveable parts

Refer to Tables 9 to 12 and Figures 47 to 61.

6.4 Certification

All materials shall conform to the latest relevant European Standards.

The manganese castings shall be of an austenitic manganese steel generally in accordance with European Standards, if they exist; if not, in accordance with UIC 866.

Materials used for the wheel transfer areas 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.

The methods of examination required by the customer shall be clearly defined. Any certification required from such examination shall be stated by the customer.
6.5 Methods of examination for structural defects

6.5.1 Visual

This method of examination may be used on all types of crossings. In the event of a defect being suspected this may be followed by one or more of the other methods of examination.

6.5.2 Dye penetrant and/or magnetic particle

Dye penetrant can be used on all types of crossings. Magnetic particle can only be used on magnetic materials and is therefore not suitable for manganese crossings/components.

6.5.3 Ultrasound

Ultrasound may be used on all types of crossings. There are specific conditions for use on manganese material.

6.5.4 Radiography

Radiography can be used on all types of crossings and is particularly useful to examine the internal soundness of cast metallic materials.

7 Limits and extent of supply

Limits and extent of supply shall include all components and special plates equipped with fastenings required, for the basic manufacture of crossings with moveable parts, from the wing front joint to the vee joint. Any requirement for additional items, such as fishplates, fishplate drilling, base plates and clips shall be specified by the customer.

8 Identification marks

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

The following information shall be marked:

— manufacturer’s mark;
— last two digits of year of manufacture;
— crossing type (radius of crossing, main line radius, rail profile and hand of turnout);
— unique identification number.

Other markings shall be specified by the customer.

The identification marks concerning dispatch shall be agreed between customer and supplier.
Table 1 — Critical dimensions for common crossings with moveable point – Completed crossing

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>Point rail length (Figure 13)</td>
<td>± 3</td>
</tr>
<tr>
<td>L2</td>
<td>Point rail toe to wing rail front (Figure 13)</td>
<td>± 2</td>
</tr>
<tr>
<td>L3</td>
<td>Point rail toe to wing rail end (Figure 13)</td>
<td>± 3</td>
</tr>
<tr>
<td>L4</td>
<td>Point rail toe to splice rail end (Figure 13)</td>
<td>± 3</td>
</tr>
<tr>
<td>L5</td>
<td>Point rail toe to splice rail toe (Figure 13)</td>
<td>± 2</td>
</tr>
<tr>
<td>L6</td>
<td>Overall length wing rail front to point rail / splice rail end (Figure 13)</td>
<td>± 5</td>
</tr>
<tr>
<td>b1</td>
<td>Opening running edge measured at the crossing front (Figure 13)</td>
<td>± 1&lt;sup&gt;a&lt;/sup&gt;&lt;br&gt;± 2&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>b2</td>
<td>Opening running edge measured at the crossing end (Figure 13)</td>
<td>± 1&lt;sup&gt;c&lt;/sup&gt;&lt;br&gt;± 2&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>b3</td>
<td>Throat opening (Figure 13)</td>
<td>± 2</td>
</tr>
<tr>
<td>b4</td>
<td>Flange way width at various positions (measured in the gauge reference plane) (Figure 13)</td>
<td>+ 2 - 1</td>
</tr>
<tr>
<td>b5</td>
<td>Distance between running edge to running edge at various positions (measured in the gauge reference plane) (Figure 13)</td>
<td>± 1&lt;sup&gt;a&lt;/sup&gt;&lt;br&gt;± 2&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>b6</td>
<td>Crossing foot width at bearers positions (for indirect fastening) (Figure 27) For direct fastening this dimension is to be checked between the centreline of the hole for the fastening</td>
<td>± 1 - 2</td>
</tr>
<tr>
<td>b7</td>
<td>Relative position foot edge / running edge at bearers positions (for indirect fastening) (Figure 27) For direct fastening this dimension is to be checked between the centreline of the hole for the fastening and the running edge</td>
<td>± 1</td>
</tr>
<tr>
<td>CH</td>
<td>Contact point rail / splice rail to saddle or wing rail (Figure 21)</td>
<td>max. 1</td>
</tr>
<tr>
<td>CH1</td>
<td>Contact point rail to splice rail (to be checked when the crossing is set in diverging track) (Figure 23)</td>
<td>max. 1</td>
</tr>
<tr>
<td>CH2</td>
<td>Contact splice rail to extended splice rail (to be checked when the crossing is set in diverging track) (Figure 24)</td>
<td>max. 1</td>
</tr>
<tr>
<td>CS</td>
<td>Contact point rail to studs (Figure 19)</td>
<td>max. 1</td>
</tr>
<tr>
<td>CS</td>
<td>Contact splice rail to studs (Figure 20)</td>
<td>max. 1</td>
</tr>
<tr>
<td>SR</td>
<td>Alignment of running edge (straight track) (Figure 28)</td>
<td>± 1</td>
</tr>
<tr>
<td>SR</td>
<td>Alignment of running edge (curved track) (Figure 29)</td>
<td>± 1</td>
</tr>
<tr>
<td>SR1</td>
<td>Local alignment of running edge (Straight track) (Figure 30)</td>
<td>0,5/1 500</td>
</tr>
<tr>
<td>SR1</td>
<td>Local alignment of running edge (Curved track) (Figure 30)</td>
<td>0,5/1 500</td>
</tr>
<tr>
<td>CP</td>
<td>Flatness/max allowance between point rail/splice rail and base plates (Figure 22)</td>
<td>1</td>
</tr>
<tr>
<td>HM1</td>
<td>Relative position between the top of base plates and the machining reference plane (in case of a saddle) (Figure 17)</td>
<td>± 0,5</td>
</tr>
<tr>
<td>HM2</td>
<td>Relative position between the top of baseplates and the running plane (in case of a saddle) (Figure 17)</td>
<td>± 0,5</td>
</tr>
<tr>
<td>TF</td>
<td>Thickness of the crossing foot (for indirect fastening) (Figure 27)</td>
<td>± 1</td>
</tr>
<tr>
<td>h1</td>
<td>Running table flatness (Figure 25)</td>
<td>1</td>
</tr>
<tr>
<td>h2</td>
<td>Intermediate running table flatness (Figure 25)</td>
<td>1</td>
</tr>
<tr>
<td>h3</td>
<td>Underside flatness at bearer positions, every support shall not deviate more than 1 mm from the reference plane formed between the two end bearer positions (Figure 26)</td>
<td>1</td>
</tr>
<tr>
<td>h4</td>
<td>Underside transverse flatness at bearer positions. Reference plane is formed between the two outer positions of the bearing surface (Figure 27)</td>
<td>1</td>
</tr>
</tbody>
</table>

<sup>a</sup> Monoblock crossings only.
<sup>b</sup> Other than monoblock crossings.
<sup>c</sup> Cast vee
### Table 2 — Critical dimensions for common crossings with moveable point – Point rail/splice rail

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L1</strong></td>
<td>Point rail length (Figure 13)</td>
<td>± 3</td>
</tr>
<tr>
<td>Not shown</td>
<td>Splice rail length</td>
<td>± 3</td>
</tr>
<tr>
<td><strong>l11</strong></td>
<td>Hole position relative to end of rail (Figure 31)</td>
<td>± 1.5 (for temporary fishplating ± 3)</td>
</tr>
<tr>
<td><strong>SR</strong></td>
<td>Alignment of running edge (straight track) (Figure 28)</td>
<td>± 1</td>
</tr>
<tr>
<td><strong>SR</strong></td>
<td>Alignment of running edge (curved track) (Figure 29)</td>
<td>± 1</td>
</tr>
<tr>
<td><strong>SR1</strong></td>
<td>Local alignment of running edge (straight track) (Figure 30)</td>
<td>0.5/1 500</td>
</tr>
<tr>
<td><strong>SR1</strong></td>
<td>Local alignment of running edge (curved track) (Figure 30)</td>
<td>0.5/1 500</td>
</tr>
<tr>
<td><strong>HM</strong></td>
<td>Height at machined area (Figure 14 to Figure 16)</td>
<td>± 0.5 (+ tolerance of height of rail)</td>
</tr>
<tr>
<td><strong>TM</strong></td>
<td>Thickness at machined area (Figure 14 and Figure 16)</td>
<td>± 0.5</td>
</tr>
<tr>
<td><strong>IM</strong></td>
<td>Inclination of machined area (Figure 14 to Figure 16)</td>
<td>± 0.5°</td>
</tr>
<tr>
<td><strong>d1</strong></td>
<td>Diameter of fish bolt holes (Figure 31)</td>
<td>+1 -0.5</td>
</tr>
<tr>
<td>Not shown</td>
<td>Chamfer of holes</td>
<td>minimum 0.5</td>
</tr>
<tr>
<td><strong>h1</strong></td>
<td>Running table flatness (Figure 25)</td>
<td>1</td>
</tr>
<tr>
<td><strong>h2</strong></td>
<td>Intermediate running table flatness (Figure 25)</td>
<td>0.2/1 000</td>
</tr>
<tr>
<td><strong>h5</strong></td>
<td>Hole position relative to rail foot (Figure 31)</td>
<td>± 1</td>
</tr>
<tr>
<td>Not shown</td>
<td>Roughness of machined running surface areas</td>
<td>$Ra 6.3^a$</td>
</tr>
</tbody>
</table>

---

*a value 6.3 given in µm*
### Table 3 — Critical dimensions for common crossings with moveable point – Saddle or wing rail

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not shown</td>
<td>Overall length of wing rail</td>
<td>± 5</td>
</tr>
<tr>
<td>Not shown</td>
<td>Wing rail knuckle to end</td>
<td>± 3</td>
</tr>
<tr>
<td>l11</td>
<td>Hole position relative to end of rail (Figure 31)</td>
<td>± 1,5 (for temporary fishplating ± 3)</td>
</tr>
<tr>
<td>SR</td>
<td>Alignment of running edge (straight track) (Figure 28)</td>
<td>± 1</td>
</tr>
<tr>
<td>SR</td>
<td>Alignment of running edge (curved track) (Figure 29)</td>
<td>± 1</td>
</tr>
<tr>
<td>SR1</td>
<td>Local alignment of running edge (straight track) (Figure 30)</td>
<td>0,5/1 500</td>
</tr>
<tr>
<td>SR1</td>
<td>Local alignment of running edge (curved track) (Figure 30)</td>
<td>0,5/1 500</td>
</tr>
<tr>
<td>HM</td>
<td>Height at machined area (Figure 18)</td>
<td>± 0,5 (+ tolerance of height of rail)</td>
</tr>
<tr>
<td>HM1</td>
<td>Relative position between the top of baseplates and the machining reference plane (in case of a saddle) (Figure 17)</td>
<td>± 0,5</td>
</tr>
<tr>
<td>HM2</td>
<td>Relative position between the top of baseplates and the running plane (in case of a saddle) (Figure 17)</td>
<td>± 0,5</td>
</tr>
<tr>
<td>IM</td>
<td>Inclination of machined area (Figure 17 and Figure 18)</td>
<td>± 0,5°</td>
</tr>
<tr>
<td>d1</td>
<td>Diameter of fish bolt holes (Figure 31)</td>
<td>+ 1 - 0,5</td>
</tr>
<tr>
<td>Not shown</td>
<td>Chamfer of holes</td>
<td>minimum 0,5</td>
</tr>
<tr>
<td>h1</td>
<td>Running table flatness (Figure 25)</td>
<td>1</td>
</tr>
<tr>
<td>h2</td>
<td>Intermediate running table flatness (Figure 25)</td>
<td>0,2/1 000</td>
</tr>
<tr>
<td>h5</td>
<td>Hole position relative to rail foot (Figure 31)</td>
<td>± 1</td>
</tr>
<tr>
<td>Not shown</td>
<td>Roughness of machined running surface areas</td>
<td>Ra 6.3°</td>
</tr>
</tbody>
</table>

*a  value 6.3 given in µm*
### Table 4 — Critical dimensions for common crossings with moveable point – Forging (transition) area (when applicable)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not shown</td>
<td>Running table</td>
<td>0,3/1 500</td>
</tr>
<tr>
<td>Not shown</td>
<td>Running edge alignment</td>
<td>0,5/1 500</td>
</tr>
<tr>
<td>Not shown</td>
<td>End profile</td>
<td>Tolerance according to the rolled rail section</td>
</tr>
<tr>
<td>HC</td>
<td>Head profile (Figure 32)</td>
<td>An area of concavity may exist only on the opposite of the running edge. This shall not exceed 2 mm</td>
</tr>
<tr>
<td>HF</td>
<td>Height difference from one rail foot to the other rail foot (Figure 32)</td>
<td>± 1</td>
</tr>
<tr>
<td>LT</td>
<td>Transition length (Figure 32)</td>
<td>± 10 %</td>
</tr>
</tbody>
</table>

### Table 5 — Critical dimensions for common crossings with moveable wing rails – Completed crossing

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>Vee length (nose to heel) (Figure 33)</td>
<td>± 3</td>
</tr>
<tr>
<td>L2</td>
<td>Nose to wing rail front (Figure 33)</td>
<td>± 2</td>
</tr>
<tr>
<td>L3</td>
<td>Overall length wing rail front to vee rail end (Figure 33)</td>
<td>± 5</td>
</tr>
<tr>
<td>b1</td>
<td>Opening running edge measured at the crossing front (Figure 33)</td>
<td>± 2</td>
</tr>
<tr>
<td>b2</td>
<td>Opening running edge measured at the crossing end (Figure 33)</td>
<td>± 1 a, ± 2 b</td>
</tr>
<tr>
<td>b3</td>
<td>Throat opening (Figure 33)</td>
<td>+ 3 - 4</td>
</tr>
<tr>
<td>b4</td>
<td>Flange way width at drive positions (measured in the gauge reference plane) (Figure 33)</td>
<td>+ 3 - 4</td>
</tr>
<tr>
<td>b5</td>
<td>Distance between running edge to running edge at various positions (measured in the gauge reference plane) (Figure 33)</td>
<td>± 1 a, ± 2 b</td>
</tr>
<tr>
<td>b6</td>
<td>Crossing foot width at bearers positions (for indirect fastening) (Figure 41)</td>
<td>+ 1 - 2</td>
</tr>
<tr>
<td>b7</td>
<td>Relative position foot edge / running edge at bearers positions (for indirect fastening) (Figure 41). For direct fastening this dimension is to be checked between the centreline of the hole for the fastening.</td>
<td>± 1</td>
</tr>
<tr>
<td>CH</td>
<td>Contact wing rail to vee rail (Figure 36)</td>
<td>max. 1</td>
</tr>
<tr>
<td>CS</td>
<td>Contact wing rail stops to supporting bar (Figure 38)</td>
<td>max. 1</td>
</tr>
<tr>
<td>SR</td>
<td>Alignment of running edge (straight track) (Figure 42)</td>
<td>± 1</td>
</tr>
<tr>
<td>SR</td>
<td>Alignment of running edge (curved track) (Figure 43)</td>
<td>± 1</td>
</tr>
<tr>
<td>SR1</td>
<td>Local alignment of running edge (straight track) (Figure 44)</td>
<td>0,5/1 500</td>
</tr>
<tr>
<td>SR1</td>
<td>Local alignment of running edge (curved track) (Figure 44)</td>
<td>0,5/1 500</td>
</tr>
<tr>
<td>CP</td>
<td>Flatness/max allowance between wing rail and base plates (Figure 37)</td>
<td>1</td>
</tr>
<tr>
<td>TF</td>
<td>Thickness of the crossing foot (for indirect fastening) (Figure 41)</td>
<td>± 1</td>
</tr>
<tr>
<td>h1</td>
<td>Running table flatness (Figure 39)</td>
<td>1</td>
</tr>
<tr>
<td>h2</td>
<td>Intermediate running table flatness (Figure 39)</td>
<td>0,2/1 000</td>
</tr>
<tr>
<td>h3</td>
<td>Underside flatness at bearer positions, every support shall not deviate more than 1 mm from the reference plane formed between the two end bearer positions (Figure 40)</td>
<td>1</td>
</tr>
<tr>
<td>h4</td>
<td>Underside transverse flatness at bearer positions. Reference plane is formed between the two outer positions of the bearing surface (Figure 41)</td>
<td>1</td>
</tr>
</tbody>
</table>

*a* Cast vee only.

*b* Other than cast vee.
### Table 6 — Critical dimensions for common crossings with moveable wing rails – Vee

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>Vee length (nose to heel) (Figure 33)</td>
<td>± 3</td>
</tr>
<tr>
<td>l11</td>
<td>Hole position relative to end of rail (Figure 45)</td>
<td>± 1,5 (for temporary fishplating ± 3)</td>
</tr>
<tr>
<td>SR</td>
<td>Alignment of running edge (straight track) (Figure 42)</td>
<td>± 1</td>
</tr>
<tr>
<td>SR</td>
<td>Alignment of running edge (curved track) (Figure 43)</td>
<td>± 1</td>
</tr>
<tr>
<td>SR1</td>
<td>Local alignment of running edge (straight track) (Figure 44)</td>
<td>0,5/1 500</td>
</tr>
<tr>
<td>SR1</td>
<td>Local alignment of running edge (curved track) (Figure 44)</td>
<td>0,5/1 500</td>
</tr>
<tr>
<td>HM</td>
<td>Height at machined area (Figure 34)</td>
<td>± 0,5 (+ tolerance of height of rail)</td>
</tr>
<tr>
<td>TM</td>
<td>Thickness at machined area (Figure 34)</td>
<td>± 0,5</td>
</tr>
<tr>
<td>IM</td>
<td>Inclination of machined area (Figure 34)</td>
<td>± 0,5°</td>
</tr>
<tr>
<td>d1</td>
<td>Diameter of fish bolt holes (Figure 45)</td>
<td>+ 1 - 0,5</td>
</tr>
<tr>
<td>Not shown</td>
<td>Chamfer of holes</td>
<td>minimum 0,5</td>
</tr>
<tr>
<td>h1</td>
<td>Running table flatness (Figure 39)</td>
<td>1</td>
</tr>
<tr>
<td>h2</td>
<td>Intermediate running table flatness (Figure 39)</td>
<td>0,2/1 000</td>
</tr>
<tr>
<td>h5</td>
<td>Hole position relative to rail foot (Figure 45)</td>
<td>± 1</td>
</tr>
<tr>
<td>Not shown</td>
<td>Roughness of machined running surface areas</td>
<td>Ra 6.3a</td>
</tr>
</tbody>
</table>

*a value 6.3 given in µm

### Table 7 — Critical dimensions for common crossings with moveable wing rails – Wing rail

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not shown</td>
<td>Overall length of wing rail</td>
<td>± 5</td>
</tr>
<tr>
<td>Not shown</td>
<td>Wing rail knuckle to end</td>
<td>± 3</td>
</tr>
<tr>
<td>l11</td>
<td>Hole position relative to end of rail (Figure 45)</td>
<td>± 1,5 (for temporary fishplating ± 3)</td>
</tr>
<tr>
<td>SR</td>
<td>Alignment of running edge (straight track) (Figure 42)</td>
<td>± 1</td>
</tr>
<tr>
<td>SR</td>
<td>Alignment of running edge (curved track) (Figure 43)</td>
<td>± 1</td>
</tr>
<tr>
<td>SR1</td>
<td>Local alignment of running edge (straight track) (Figure 44)</td>
<td>0,5/1 500</td>
</tr>
<tr>
<td>SR1</td>
<td>Local alignment of running edge (curved track) (Figure 44)</td>
<td>0,5/1 500</td>
</tr>
<tr>
<td>HM</td>
<td>Height at machined area (Figure 35)</td>
<td>± 0,5 (+ tolerance of height of rail)</td>
</tr>
<tr>
<td>IM</td>
<td>Inclination of machined area (Figure 35)</td>
<td>± 0,5°</td>
</tr>
<tr>
<td>d1</td>
<td>Diameter of fish bolt holes (Figure 45)</td>
<td>+ 1 - 0,5</td>
</tr>
<tr>
<td>Not shown</td>
<td>Chamfer of holes</td>
<td>minimum 0,5</td>
</tr>
<tr>
<td>h1</td>
<td>Running table flatness (Figure 39)</td>
<td>1</td>
</tr>
<tr>
<td>h2</td>
<td>Intermediate running table flatness (Figure 39)</td>
<td>0,2/1 000</td>
</tr>
<tr>
<td>h5</td>
<td>Hole position relative to rail foot (Figure 45)</td>
<td>± 1</td>
</tr>
<tr>
<td>Not shown</td>
<td>Roughness of machined running surface areas</td>
<td>Ra 6.3a</td>
</tr>
</tbody>
</table>

*a value 6.3 given in µm*
Table 8 — Critical dimensions for common crossings with moveable wing rails – Forging (transition) area (when applicable)

Dimensions in millimetres

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not shown</td>
<td>Running table</td>
<td>0,3/1 500</td>
</tr>
<tr>
<td>Not shown</td>
<td>Running edge alignment</td>
<td>0,5/1 500</td>
</tr>
<tr>
<td>Not shown</td>
<td>End profile</td>
<td>Tolerance according to the rolled rail section</td>
</tr>
<tr>
<td>HC</td>
<td>Head profile (Figure 46)</td>
<td>An area of concavity may exist only on the opposite of the running edge. This shall not exceed 2 mm</td>
</tr>
<tr>
<td>HF</td>
<td>Height difference from one rail foot to the other rail foot (Figure 46)</td>
<td>± 1</td>
</tr>
<tr>
<td>LT</td>
<td>Transition length (Figure 46)</td>
<td>± 10 %</td>
</tr>
</tbody>
</table>

Table 9 — Critical dimensions for obtuse crossings with moveable parts – Completed crossing

Dimensions in millimetres

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>Wing rail knuckle to end (Figure 47)</td>
<td>± 2</td>
</tr>
<tr>
<td>L2</td>
<td>Wing rail knuckle to switch rail end (Figure 47)</td>
<td>± 3</td>
</tr>
<tr>
<td>L3</td>
<td>Overall length wing rail end to switch rail end (Figure 47)</td>
<td>± 5</td>
</tr>
<tr>
<td>L4</td>
<td>Wing rail knuckle to switch rail toe (measured with the switch rail in closed position) (Figure 50)</td>
<td>± 5</td>
</tr>
<tr>
<td>b1</td>
<td>Opening running edge L H side (measured at shortest rail) (Figure 47)</td>
<td>± 2</td>
</tr>
<tr>
<td>b2</td>
<td>Opening running edge R H side (measured at shortest rail) (Figure 47)</td>
<td>± 2</td>
</tr>
<tr>
<td>b3</td>
<td>Distance between running edge to running edge at various positions (measured in the gauge reference plane with the switch rail in closed position) (Figure 47)</td>
<td>± 2</td>
</tr>
<tr>
<td>b6</td>
<td>Crossing foot width at bearers positions (for indirect fastening) (Figure 56) For direct fastening this dimension is to be checked between the centreline of the hole for the fastening</td>
<td>+ 1 - 2</td>
</tr>
<tr>
<td>b7</td>
<td>Relative position foot edge/running edge at bearers positions (for indirect fastening) (Figure 56) For direct fastening this dimension is to be checked between the centreline of the hole for the fastening and the running edge</td>
<td>± 1</td>
</tr>
<tr>
<td>CH</td>
<td>Contact switch rail to wing rail (Figure 51)</td>
<td>max. 1</td>
</tr>
<tr>
<td>CS</td>
<td>Contact switch rail to studs (Figure 53)</td>
<td>max. 1</td>
</tr>
<tr>
<td>SR</td>
<td>Alignment of running edge (straight track) (Figure 57)</td>
<td>± 1</td>
</tr>
<tr>
<td>SR</td>
<td>Alignment of running edge (curved track) (Figure 58)</td>
<td>± 1</td>
</tr>
<tr>
<td>SR1</td>
<td>Local alignment of running edge (straight track) (Figure 59)</td>
<td>0,5/1 500</td>
</tr>
<tr>
<td>SR1</td>
<td>Local alignment of running edge (curved track) (Figure 59)</td>
<td>0,5/1 500</td>
</tr>
<tr>
<td>CP</td>
<td>Flatness/max allowance between switch rail and base plates (Figure 52)</td>
<td>1</td>
</tr>
<tr>
<td>TF</td>
<td>Thickness of the crossing foot (for indirect fastening) (Figure 56)</td>
<td>± 1</td>
</tr>
<tr>
<td>h1</td>
<td>Running table flatness (Figure 54)</td>
<td>1</td>
</tr>
<tr>
<td>h2</td>
<td>Intermediate running table flatness (Figure 54)</td>
<td>0,2/1 000</td>
</tr>
<tr>
<td>h3</td>
<td>Underside flatness at bearer positions, every support shall not deviate more than 1 mm from the reference plane formed between the two end bearer positions (Figure 55)</td>
<td>1</td>
</tr>
<tr>
<td>h4</td>
<td>Underside transverse flatness at bearer positions. Reference plane is formed between the two outer positions of the bearing surface (Figure 56)</td>
<td>1</td>
</tr>
</tbody>
</table>

Open Switch Rail Flange way: The physical dimensions with the switch rail in the open position shall be greater than or equal to the dimensions stated on the drawing.
### Table 10 — Critical dimensions for obtuse crossings with moveable parts – Switch rail

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not shown</td>
<td>Switch rail length</td>
<td>± 3</td>
</tr>
<tr>
<td>l11</td>
<td>Hole position relative to end of rail (Figure 60)</td>
<td>± 1.5 (for temporary fishplating ± 3)</td>
</tr>
<tr>
<td>SR</td>
<td>Alignment of running edge (straight track) (Figure 57)</td>
<td>± 1</td>
</tr>
<tr>
<td>SR</td>
<td>Alignment of running edge (curved track) (Figure 58)</td>
<td>± 1</td>
</tr>
<tr>
<td>SR1</td>
<td>Local alignment of running edge (straight track) (Figure 59)</td>
<td>0.5/1 500</td>
</tr>
<tr>
<td>SR1</td>
<td>Local alignment of running edge (curved track) (Figure 59)</td>
<td>0.5/1 500</td>
</tr>
<tr>
<td>HM</td>
<td>Height at machined area (Figure 49)</td>
<td>± 0.5 (+ tolerance of height of rail)</td>
</tr>
<tr>
<td>TM</td>
<td>Thickness at machined area (Figure 49)</td>
<td>± 0.5</td>
</tr>
<tr>
<td>IM</td>
<td>Inclination of machined area (Figure 49)</td>
<td>± 0.5°</td>
</tr>
<tr>
<td>d1</td>
<td>Diameter of fish bolt holes (Figure 60)</td>
<td>+ 1 - 0.5</td>
</tr>
<tr>
<td>Not shown</td>
<td>Chamfer of holes</td>
<td>minimum 0.5</td>
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<tr>
<td>h1</td>
<td>Running table flatness (Figure 54)</td>
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</tr>
<tr>
<td>h2</td>
<td>Intermediate running table flatness (Figure 54)</td>
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</tr>
<tr>
<td>h5</td>
<td>Hole position relative to rail foot (Figure 60)</td>
<td>± 1</td>
</tr>
<tr>
<td>Not shown</td>
<td>Roughness of machined running surface areas</td>
<td><em>Ra 6.3</em>°</td>
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</table>

a value 6.3 given in µm

### Table 11 — Critical dimensions for obtuse crossings with moveable parts – Wing rail

<table>
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<tr>
<th>Dimension</th>
<th>Description</th>
<th>Tolerance</th>
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</thead>
<tbody>
<tr>
<td>Not shown</td>
<td>Overall length of wing rail</td>
<td>± 5</td>
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<tr>
<td>L1</td>
<td>Wing rail knuckle to end (Figure 47)</td>
<td>± 2</td>
</tr>
<tr>
<td>l11</td>
<td>Hole position relative to end of rail (Figure 60)</td>
<td>± 1.5 (for temporary fishplating ± 3)</td>
</tr>
<tr>
<td>SR</td>
<td>Alignment of running edge (straight track) (Figure 57)</td>
<td>± 1</td>
</tr>
<tr>
<td>SR</td>
<td>Alignment of running edge (curved track) (Figure 58)</td>
<td>± 1</td>
</tr>
<tr>
<td>SR1</td>
<td>Local alignment of running edge (straight track) (Figure 59)</td>
<td>0.5/1 500</td>
</tr>
<tr>
<td>SR1</td>
<td>Local alignment of running edge (curved track) (Figure 59)</td>
<td>0.5/1 500</td>
</tr>
<tr>
<td>HM</td>
<td>Height at machined area (Figure 48)</td>
<td>± 0.5 (+ tolerance of height of rail)</td>
</tr>
<tr>
<td>IM</td>
<td>Inclination of machined area (Figure 48)</td>
<td>± 0.5°</td>
</tr>
<tr>
<td>d1</td>
<td>Diameter of fish bolt holes (Figure 60)</td>
<td>+ 1 - 0.5</td>
</tr>
<tr>
<td>Not shown</td>
<td>Chamfer of holes</td>
<td>minimum 0.5</td>
</tr>
<tr>
<td>h1</td>
<td>Running table flatness (Figure 54)</td>
<td>1</td>
</tr>
<tr>
<td>h2</td>
<td>Intermediate running table flatness (Figure 54)</td>
<td>0.2/1 000</td>
</tr>
<tr>
<td>h5</td>
<td>Hole position relative to rail foot (Figure 60)</td>
<td>± 1</td>
</tr>
<tr>
<td>Not shown</td>
<td>Roughness of machined running surface areas</td>
<td><em>Ra 6.3</em>°</td>
</tr>
</tbody>
</table>

a value 6.3 given in µm
### Table 12 — Critical dimensions for obtuse crossings with moveable parts – Forging (transition) area (when applicable)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not shown</td>
<td>Running table</td>
<td>0,3/1 500</td>
</tr>
<tr>
<td>Not shown</td>
<td>Running edge alignment</td>
<td>0,5/1 500</td>
</tr>
<tr>
<td>Not shown</td>
<td>End profile</td>
<td>Tolerance according to the rolled rail section</td>
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<tr>
<td>HC</td>
<td>Head profile (Figure 61)</td>
<td>An area of concavity may exist only on the opposite of the running edge. This shall not exceed 2 mm</td>
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<tr>
<td>HF</td>
<td>Height difference from one rail foot to the other rail foot (Figure 61)</td>
<td>± 1</td>
</tr>
<tr>
<td>LT</td>
<td>Transition length (Figure 61)</td>
<td>± 10 %</td>
</tr>
</tbody>
</table>
Figure 1 — Moveable point

Figure 2 — Moveable wing rails

Key
1 splice rail
2 point rail

Figure 3 — Splice rail sliding along the point rail
Key
1 splice rail
2 point rail
3 extended splice rail

Figure 4 — Splice joint in the diverging track

Key
1 wing rail
2 switch rail

Figure 5 — Moveable point without longitudinal sliding area

Figure 6 — Switch diamond crossing
Figure 7 — Common crossing with moveable point

Key
1  swing nose (moveable vee)  7  spacer blocks (studs)  13  L H extended vee rail
2  saddle (wing rail)  8  foot relief  14  R H vee rail
3  relief ramp  9  longitudinal sliding area  15  flange way blocks
4  distance block  10  L H wing rail  16  rail head
5  L H front wing rail  11  R H wing rail  17  rail foot
6  R H front wing rail  12  L H vee rail
Figure 8 — Common crossing with moveable wing rails
Figure 9 — Obtuse crossing with moveable parts (switch diamond crossing)

Key

1. R H switch rail
2. L H switch rail
3. R H back rail
4. L H back rail
5. heel blocks
6. wing rail
7. distance blocks
8. knuckle
9. spacer blocks (studs)
10. switch toe
11. moveable length
12. foot relief
13. rail head
14. rail foot
Key

1 saddle (wing rail)  
2 nose  
3 PRT (point rail tip)  
4 SRT (splice rail tip)  
5 running plane  
6 point rail  
7 splice rail  
An, Dn, En various check values

NOTE An, Dn, En are various values to be checked in accordance with the respective crossing drawing. Dimensions are calculated according to crossing angle and wheel profile. An is the lowering measuring from the corresponding length Dn.

Figure 10 a) — Common crossing with moveable point: machining details
Key
1 section B
2 point rail
3 splice rail
4 running plane
5 machining reference plane
6 slope
7 running side
8 application side

Figure 10 b) — Common crossing with moveable point: machining details
Key

1 section A
2 nose
3 point rail
4 running plane
5 machining reference plane
6 slope
7 moveable wing rail

An, Dn, En various check values

NOTE 1 An, Dn, En are various values to be checked in accordance with the respective crossing drawing. Dimensions are calculated according to crossing angle and wheel profile. An is the lowering measuring from the corresponding length Dn.

NOTE 2 radi (Rn) depending on manufacturing

Figure 11 — Common crossing with moveable wing rail: machining details
Key
1  section A
2  section B
3  wing rail running edge
4  running plane
5  set of switch rail
6  R (if any)

An, Dn various check values
Zn  gauge reference plane

NOTE 1  \( Z_1 = Z_2 \) in the case of vertical wing rail

NOTE 2  An and Dn are various values to be checked in accordance with the respective crossing drawing. Dimensions are calculated according to crossing angle and wheel profile. An is the lowering measuring from the corresponding length Dn.

Figure 12 a) — Switch diamond crossing: machining details
Key
1 switch rail
2 wing rail
3 application side
4 running plane
5 machining reference plane
6 slope
7 running side
Zn gauge reference plane
Rn radi, depending on manufacturing

NOTE Z₁ = Z₂ in the case of vertical wing rail

Figure 12 b) — Switch diamond crossing: machining details
Key

1 PRT (point rail tip)
2 SRT (splice rail tip)
L1 Point rail length
L2 Point rail toe to wing rail front
L3 Point rail toe to wing rail end
L4 Point rail toe to splice rail end
L5 Point rail toe to splice rail toe
b1 Opening running edge measured at the crossing front
b2 Opening running edge measured at the crossing end
b3 Throat opening
b4 Flange way width at various positions
b5 Distance between running edge to running edge at various positions

Figure 13 — Critical dimensions for common crossing with moveable point – openings and lengths
**Key**

1. machining reference plane
2. slope
3. running side
4. application side

**Figure 14** — Critical dimensions for common crossing with moveable point – point rail

**Key**

1. machining reference plane
2. slope
3. running side

**Figure 15** — Critical dimensions for common crossing with moveable point – point rail
Key
1 machining reference plane
2 running side
3 application side

**IM** inclination of machined area
**TM** thickness at machined area
**HM** height at machined area

**Figure 16** — Critical dimensions for common crossing with moveable point – splice rail

Key
1 running plane
2 machining reference plane

**IM** inclination of machined area
**HM1** top of base plate to machining reference plane
**HM2** top of base plate to running plane

**Figure 17** — Critical dimensions for common crossing with moveable point – saddle
Key
1 running plane
2 machining reference plane

Figure 18 — Critical dimensions for common crossing with moveable point – wing rail

Key
1 saddle (wing rail)
CS contact point rail to studs

Figure 19 — Critical dimensions for common crossing with moveable point – point rail/stud contact
Key
1 saddle (wing rail)
CS contact point rail to studs

Figure 20 — Critical dimensions for common crossing with moveable point – splice rail/stud contact

Key
1 saddle (wing rail)
CH contact point rail to saddle or wing rail

Figure 21 — Critical dimensions for common crossing with moveable point – point rail and splice rail/saddle or wing rail contact
Key

1 saddle (wing rail)

$CP$ flatness/maximum allowance between point/splice rail and baseplate

Figure 22 — Critical dimensions for common crossing with moveable point – point rail and splice rail/baseplate contact
Figure 23 — Critical dimensions for common crossing with moveable point – point rail/splice rail contact
Key

CH2  contact splice rail to extended splice rail

Figure 24 — Critical dimensions for common crossing with moveable point – splice rail/extended splice rail contact

Dimensions in millimetres

Key

1  top surface
h1  running table flatness
h2  intermediate running table flatness

Figure 25 — Critical dimensions for common crossing with moveable point – top surface
**Key**

1. arrow A
2. view on arrow A
3. bottom surface
4. reference plane
5. end position bearer
6. intermediate bearer positions

Figure 26 — Critical dimensions for common crossing with moveable point – bottom surface

**Key**

1. indirect fastening
2. direct fastening
3. reference plane

Figure 27 — Critical dimensions for common crossing with moveable point – cross-section
Key

1  theoretical running edge
SR  alignment of running edge

Figure 28 — Critical dimensions for common crossing with moveable point – alignment of running edge (straight)

Key

1  theoretical running edge
SR  alignment of running edge

Figure 29 — Critical dimensions for common crossing with moveable point – alignment of running edge (curved)
Dimensions in millimetres

---

**Figure 30 — Critical dimensions for common crossing with moveable point – alignment of running edge**

Key

1. theoretical running edge
2. local alignment of running edge

---

**Figure 31 — Critical dimensions for common crossing with moveable point – hole position**

Key

1. hole position relative to end of crossing
2. hole position relative to crossing foot
3. diameter of fishbolt holes
4. hole position relative to rail foot
5. hole position relative to end of crossing

---

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Key

1 running edge

HF height difference from one rail foot to the other rail foot
LT transition length
HC head profile concavity

Figure 32 — Critical dimensions for common crossing with moveable point – point forging (transition) area
Key
1 Nose
L1 Vee length
L2 Nose to wing rail front
L3 Overall length wing rail front to vee rail end
b1 Opening running edge measured at the crossing front
b2 Opening running edge measured at the crossing end
b3 Throat opening
b4 Flange way width at drive positions
b5 Distance between running edge to running edge at various positions

Figure 33 — Critical dimensions for common crossing with moveable wing rails – openings and lengths
Key
1 machining reference plane

IM inclination of machined area
TM thickness at machined area
HM height at machined area

Figure 34 — Critical dimensions for common crossing with moveable wing rails – vee

Key
1 machining reference plane

IM inclination of machined area
HM height at machined area

Figure 35 — Critical dimensions for common crossing with moveable wing rails – wing rails
Key

CH  contact wing rail to vee rail

Figure 36 — Critical dimensions for common crossing with moveable wing rails – wing rails/vee rail contact

Key

CP  flatness/maximum allowance between moveable rail and base plate

Figure 37 — Critical dimensions for common crossing with moveable wing rails – wing rails/base plate contact
Key

CS  contact between wing rail stops and supporting bar

Figure 38 — Critical dimensions for common crossing with moveable wing rails – wing rail stops/supporting bar contact

Dimensions in millimetres

Key

1  top surface

$h1$  running table flatness

$h2$  intermediate running table flatness

Figure 39 — Critical dimensions for common crossing with moveable wing rails – top surface
Key
1 arrow A 5 end position bearer
2 view on arrow A 6 intermediate bearer positions
3 bottom surface 7 underside flatness at bearer positions
4 reference plane

Figure 40 — Critical dimensions for common crossing with moveable wing rails – bottom surface

Key
1 indirect fastening h4 underside transverse flatness at bearer positions
2 direct fastening b6 crossing foot width
3 reference plane b7 relative position foot edge/running edge
   b6* distance of baseplate hole at bearer position
   b7* relative position running edge from the baseplate hole at bearer position
TF thickness of crossing foot

Figure 41 — Critical dimensions for common crossing with moveable wing rails – cross-section
Key
1 theoretical running edge
SR alignment of running edge

Figure 42 — Critical dimensions for common crossing with moveable wing rails – alignment of running edge (straight)

Key
1 theoretical running edge
SR alignment of running edge

Figure 43 — Critical dimensions for common crossing with moveable wing rails – alignment of running edge (curved)
Key
1 theoretical running edge
SR1 local alignment of running edge

Figure 44 — Critical dimensions for common crossing with moveable wing rails – alignment of running edge

Key
1 hole position relative to end of crossing  d1 diameter of fishbolt holes
2 hole position relative to crossing foot  h5 hole position relative to rail foot
l11 hole position relative to end of crossing

Figure 45 — Critical dimensions for common crossing with moveable wing rails – hole position
**Key**

1 running edge  

- **HF** height difference from one rail foot to the other rail foot  
- **LT** transition length  
- **HC** head profile concavity

**Figure 46 — Critical dimensions for common crossing with moveable wing rails – point forging (transition) area**
Key

1  left hand
2  right hand
L1  Wing rail knuckle to end
L2  Wing rail knuckle to switch rail end
L3  Overall length wing rail end to switch rail end
b1  Opening running edge LH side
b2  Opening running edge RH side
b3  Distance between running edge to running edge at various positions

Figure 47 — Critical dimensions for obtuse crossing with moveable parts (switch diamond crossing)
Key
1 machining reference plane

IM inclination of machined area
HM height of machined area

Figure 48 — Critical dimensions for obtuse crossing with moveable parts – wing rail

Key
1 machining reference plane

IM inclination of machined area
TM thickness of machined area
HM height of machined area

Figure 49 — Critical dimensions for obtuse crossing with moveable parts – switch rail
Key
1  switch rail toe
2  wing rail knuckle
$L4$  wing rail knuckle to switch rail toe

Figure 50 — Critical dimensions for obtuse crossing with moveable parts

Key
$CH$  Contact switch rail to wing rail

Figure 51 — Critical dimensions for obtuse crossing with moveable parts – switch rail/wing rail contact
Key

CP  allowance switch rail to baseplate

Figure 52 — Critical dimensions for obtuse crossing with moveable parts – switch/baseplate contact

Key

CS  contact switch rail to stud

Figure 53 — Critical dimensions for obtuse crossing with moveable parts – switch rail/stud contact
Dimensions in millimetres

Figure 54 — Critical dimensions for obtuse crossing with moveable parts – top surface

Key
1  top surface
$h1$  running table flatness
$h2$  intermediate running table flatness

Figure 55 — Critical dimensions for obtuse crossing with moveable parts – bottom surface

Key
1  arrow A
2  view on arrow A
3  bottom surface
4  reference plane
5  end position bearer
6  intermediate bearer positions
$h3$  underside flatness at bearer positions
Key
1 indirect fastening
2 direct fastening
3 reference plane

- $h_4$: underside transverse flatness at bearer positions
- $b_6$: crossing foot width
- $b_7$: relative position foot edge/running edge
- $b_7^*$: relative position running edge from the baseplate hole at bearer position
- $TF$: thickness of crossing foot

Figure 56 — Critical dimensions for obtuse crossing with moveable parts – cross-section

Key
1 theoretical running edge
$SR$: alignment of running edge

Figure 57 — Critical dimensions for obtuse crossing with moveable parts – alignment of running edge (straight)
Key

1 theoretical running edge
SR alignment of running edge

Figure 58 — Critical dimensions for obtuse crossing with moveable parts – alignment of running edge (curved)

Dimensions in millimetres

Key

1 theoretical running edge
SR1 local alignment of running edge

Figure 59 — Critical dimensions for obtuse crossing with moveable parts – alignment of running edge
**Key**

1. hole position relative to end of crossing
2. hole position relative to crossing foot

- $d_1$: diameter of fishbolt holes
- $h_5$: hole position relative to rail foot
- $l_11$: hole position relative to end of crossing

**Figure 60 — Critical dimensions for obtuse crossing with moveable parts – hole position**

**Key**

1. running edge

- $HF$: height difference from one rail foot to the other rail foot
- $LT$: transition length
- $HC$: head profile concavity

**Figure 61 — Critical dimensions for obtuse crossing with moveable parts – point forging (transition) area**
Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC

This European Standard has been prepared under a mandate given to CEN/CENELEC/ETSI by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the Directive 2008/57/EC

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in Table ZA.1 for HS Infrastructure and in Table ZA.2 for CR Infrastructure confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard, the HS TSI INF, published in OJEU dated 19th March 2008, and Directive 2008/57/EC

<table>
<thead>
<tr>
<th>Clause(s)/sub-clause(s) of this European Standard</th>
<th>Chapters/$/annexes of the TSI</th>
<th>Corresponding text, articles/$/annexes of the Directive 2008/57/EC</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Types of crossings with moveable parts</td>
<td></td>
<td>Annex III Essential requirements</td>
<td></td>
</tr>
<tr>
<td>3.4 Geometry</td>
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<td>1. General requirements</td>
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<tr>
<td>3.5 Inclination of the running table</td>
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<td>1.1 Safety</td>
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<tr>
<td>5 Design requirements</td>
<td></td>
<td>Clauses 1.1.1 – 1.1.2 and 1.1.3</td>
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<tr>
<td>5.1 Geometric data</td>
<td></td>
<td>1.2 Reliability and availability</td>
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<tr>
<td>5.2 Rolling stock data</td>
<td></td>
<td>1.5 Technical compatibility</td>
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</tr>
<tr>
<td>5.2.1 Maximum axle load</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.2.2 Maximum speed</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5.3 Supports and fastenings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.4 Interface between crossing with moveable parts and operating system</td>
<td></td>
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<tr>
<td>5.5 Transfer of longitudinal track forces</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6 Tolerances and inspection</td>
<td></td>
<td>Annex A – Table A1</td>
<td></td>
</tr>
<tr>
<td>6.3 Critical dimensions</td>
<td></td>
<td>Annex B 1 – Table B1</td>
<td></td>
</tr>
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<td>6.4 Certification</td>
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<td></td>
</tr>
<tr>
<td>Clause(s)/sub-clause(s) of this European Standard</td>
<td>Chapters/§/annexes of the TSI</td>
<td>Corresponding text, articles/§/annexes of the Directive 2008/57/EC</td>
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<td>3 Types of crossings with moveable parts</td>
<td>4. Description of the infrastructure subsystem</td>
<td>Annex III Essential requirements</td>
<td>Rails, fastenings and sleepers used for short length of track for specific purposes, for example in switches and crossings, at expansion devices, transition slabs and special structures, are not to be considered to be interoperability constituents according to § 5.2 (3) of the CR TSI INF</td>
</tr>
<tr>
<td>3.4 Geometry</td>
<td>4.2.5.1 Nominal track gauge</td>
<td>1. General requirements</td>
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<tr>
<td>3.5 Inclination of the running table</td>
<td>4.2.5.4 Cant deficiency</td>
<td>1.1 Safety</td>
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<td>5 Design requirements</td>
<td>4.2.5.7.2 Rail inclination – Requirements for switches and crossings</td>
<td>Clauses 1.1.1 – 1.1.2 and 1.1.3</td>
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<td>5.1 Geometric data</td>
<td>4.2.6 Switches and crossings</td>
<td>1.2 Reliability and availability</td>
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<td>5.2 Rolling stock data</td>
<td>4.2.6.1 Means of locking</td>
<td>1.5 Technical compatibility</td>
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<tr>
<td>5.2.1 Maximum axle load</td>
<td>4.2.6.2 In-service geometry of switches and crossings</td>
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<td></td>
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<tr>
<td>5.2.2 Maximum speed</td>
<td>4.2.7 Track resistance to applied loads</td>
<td></td>
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<tr>
<td>5.3 Supports and fastenings</td>
<td>6. Assessment of conformity of the constituents and EC verification of the subsystems</td>
<td>6.2.4.7 Assessment of geometry of switches and crossings</td>
<td></td>
</tr>
<tr>
<td>5.4 Interface between crossing with moveable parts and operating system</td>
<td></td>
<td>6.2.5.2 Assessment of track resistance for switches and crossings</td>
<td></td>
</tr>
<tr>
<td>5.5 Transfer of longitudinal track forces</td>
<td>6. Tolerances and inspection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Critical dimensions</td>
<td>6.3 Critical dimensions</td>
<td></td>
<td></td>
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<td>6.4 Certification</td>
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</tbody>
</table>

**WARNING** — Other requirements and other EC Directives may be applicable to the product(s) falling within the scope of this standard. ☞
Bibliography


[2] prEN 13803-2, Railway applications — Track alignment design parameters — Track gauges 1 435 mm and wider — Part 2: Switches and crossings and comparable alignment design situations with abrupt changes of curvature
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