

Railway applications — Track — Switches and crossings —

Part 5: Switches

ICS 45.080

National foreword

This British Standard is the UK implementation of EN 13232-5:2005+A1:2011. It supersedes BS EN 13232-5:2005, which is withdrawn.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 A1.

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Foreword

This document (EN 13232-5:2005+A1:2011) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2012, and conflicting national standards shall be withdrawn at the latest by April 2012.

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

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

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

This document supersedes EN 13232-5:2005.

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

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This series of 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 this European 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 switches are that they are capable of performing their intended purpose, which is to cause a vehicle to transfer from one track to the other track of a turnout, either in the facing or trailing direction. The switches are designed to withstand all external forces from rolling stock, thermal influences etc. Switches are manufactured to give safe (and acceptable) motion of the vehicle based on conditions in the specification.

1 Scope

The scope of this European Standard is:

- establish a working definition for switches and their constituent parts and identify the main types;
- specify the minimum requirements for the manufacture of the switches and/or constituent parts;
- specify codes of practice for inspection and tolerances of both full and half sets of switches and their constituent parts;
- establish the limits and scope of supply;
- list the methods by which switches and their parts should be identified and traced;
- list the different and varying ways by which switches can be described using the following parameters:
 - geometry of the switches;
 - 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 13232-1:2003, *Railway applications – Track – Switches and crossings – Part 1: Definitions*

EN 13232-2:2003, *Railway applications – Track – Switches and crossings – Part 2: Requirements for geometric design*

EN 13232-3:2003, *Railway applications – Track – Switches and crossings – Part 3: Requirements for wheel/rail interaction*

EN 13232-4:2005, *Railway applications – Track – Switches and crossings – Part 4: Actuation, locking and detection*

EN 13481 (all parts), *Railway applications – Track – Performance requirements for fastening systems*

EN 13674 (all parts), *Railway applications – Track – Rail*

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*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 13232-1:2003, 6.2 and 7.1, and the following apply.

3.1 Parts of switches

3.1.1

left hand half set of switches

consists of one stock rail and its switch rail complete with small fittings

NOTE It is right or left hand as seen by an observer in the centre of the track facing the switch heel from the switch toe.

3.1.2

right hand half set of switches

see left hand half set of switches

3.1.3

set of switches

arrangement of two half sets of switches, one right hand, the other left hand. The requirement of any other fittings other than stud/distance block (Figure 1, item 11) and block or heel blocks (Figure 1, item 9) are specified, e.g. baseplates, fishplates, drive bar, stretcher bar brackets, stretcher bars, anti creep device

3.1.4

left hand switch rail

movable machined rail, often of special section, but fixed and/or joined at the heel end to a rail to provide continuity of wheel support. Details of movement are described in EN 13232-1:2003, 9.1. The two switch rails in a set of switches are the two inside rails

NOTE A switch rail is described as right or left hand according to whether it is part of a right hand or left hand half-set of switches.

3.1.5

right hand switch rail

see left hand switch rail

3.1.6

left hand stock rail

fixed machined rail, ensuring the continuity on the main or diverging track with the switch in the open position. The machined part of the stock rail supports the switch rail in the closed positions, giving continuity of line through this switch rail. The two stock rails in a set of switches are the two outside rails

NOTE A switch rail is described as right or left hand according to whether it is part of a right hand or left hand half-set of switches.

3.1.7

right hand stock rail

see left hand stock rail

3.1.8

heel baseplate

first baseplate at the heel end of the movable part of the switch. This baseplate with or without the aid of a heel block forms the first part of the rigid part of the switch

3.1.9

block

see EN 13232-1:2003, 6.2.10.1

3.1.10

heel block

see EN 13232-1:2003, 6.2.10.2

3.1.11

fishplate block

see EN 13232-1:2003, 6.2.10.3

3.1.12

stud/distance block

see EN 13232-1:2003, 6.2.10.4

3.1.13

slide baseplate

see EN 13232-1:2003, 6.2.10.5

NOTE It may be inclined or vertical and suit any switch rail section.

3.1.14

stretcher bar bracket

see EN 13232-1:2003, 6.2.10.7

3.1.15

stretcher bar

see EN 13232-1:2003, 6.2.10.6

3.1.16

anti creep device

device to stop or limit relative longitudinal movement between switch and stock rails, or between rails and bearers/ baseplates

3.1.17

switch toe/tip

see EN 13232-1:2003, 6.2.7

3.1.18

switch heel

see EN 13232-1:2003, 6.2.8

3.1.19

switch rail joint

see EN 13232-1:2003, 6.2.4.1

3.1.20

stock rail joint

see EN 13232-1:2003, 6.2.4.2

3.1.21

stock front joint

see EN 13232-1:2003, 6.2.4.3

3.1.22

soleplate

fabricated plate for use with switch operating device

3.1.23

gauge plate

plate used to hold the gauge of the stock rails may or may not assist in the location of the switch operating device

3.1.24

special stop

device used to hold the gauge of the stock rails in the drive areas

3.1.25

bearers

load carrying supports on which the switches are mounted

3.1.26

baseplate

device used to support the switch and stock rails, stop them from twisting and moving laterally and also connect the switch and stock rail to the supports in the heel end region of a set of switches

3.1.27

fishplate (joint bars)

device used for bolting two pieces of rail together

3.1.28

drive rod

rod connecting the switch rails to the switch drive. This may be integrated into the bearer

3.1.29

transition section

part of the switch rail which has been formed to give a transition between two different rail sections (not shown)

3.1.30

switch fronts

part of the stock rail in front of the switch toes

3.1.31

planing length

length of the machined portion of a switch rail head at the gauge side (this may or may not be the same length as the contact length)

3.1.32

contact length

length of the machined portion of the switch rail in contact with the stock rail

3.1.33

switch radius

radius between the planing radius and the turnout radius (measured at the high side running edge)

3.1.34

turnout radius

theoretical radius of the turnout from the heel of a switch (measured at the centre line radius unless stated otherwise)

3.1.35

movable length

part of the switch which moves in front of the first fixed position on the switch rails

3.1.36

planing radius

radius of the machined planing length (measured at the high side running edge)

3.1.37

mathematical switch toe MP (mathematical point)

see EN 13232-1:2003, 7.3.3

3.1.38

origin of switch curve (not shown)

see EN 13232-1:2003, 7.3.1. The origin of switch curve depends upon the type of switch geometry. See 3.2

3.1.39

entry angle

see EN 13232-1:2003, 7.3.6

3.1.40

extension of the switches

see EN 13232-1:2003, 7.3.4

3.1.41

relief machining of the switch

see EN 13232-1:2003, 7.3.10

3.1.42

"set" of the stock rail

see EN 13232-1:2003, 7.3.7

3.1.43

switch flangeway

see EN 13232-1:2003, 7.4.6

3.1.44

opening at the drive position

distance between the running edge of the stock rail and the contact side of the switch rail with the switch in the open position at the drive position

3.1.45

opening at switch toe

same as above at the switch toe

3.1.46

switch toe undercutting offset

see Figure 8, dimension *B*

3.2 Types of switches

3.2.1 Geometry

For the design of switch panel, various basic geometrical forms are in use. Variations from these basic forms may be used. See EN 13232-1.

3.2.2 Construction

- **Flexible switches.** The switch rail in the movable area of the switch is made of one profile only. This can be either standard rail profile or special profile. If a transition from special profile to standard rail profile is required this take place in the fixed part of the switch rail. In case of a weld, the weld is also located in the fixed part of the switch rail (see Figure 3);
- **Spring rail switches.** The switch rail in the movable area of the switch is made of two different profiles. The transition and the weld between one to the other profile take place in the movable part of the switch rail. This weld is secured by fishplating (see Figure 4);
- **Loose heel** (pivot-articulated switches). The switch rail has a pivot at the heel end. It is movable, fixed at this point (see Figure 5).

Variations from these basic forms may be used

3.2.3 Rail profiles

3.2.3.1 Switch rail profiles

For the switch rail profile, different sections are used:

- normal rail profile;
- high thick web profile;
- asymmetric low profile;
- symmetric low profile;
- switch rail profile with inclined running table;
- other special profiles.

3.2.3.2 Stock rail profiles

Generally the stock rail is made of normal rail profile. In some cases special profiles may be used as stock rail.

3.3 Joints

The switch can be joined to the adjacent track by:

- fishplates;
- fishplates for continuously welded track;
- welding;
- insulated joint.

4 Performance requirements

4.1 General

Switch operating, signalling systems, heating systems, load bearing supports, maintainability and security are all major factors which shall be taken into account during the design of switches.

The performance criteria of switches shall be based on information given by the customer. The design and selection of type of switches will be influenced by axle loads, frequency of traffic and speed. Information supplied in Clauses 5 and 6 shall be used in the selection of the type of switches and the design.

4.2 Materials

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

The grade and specification of the rails to be used shall be specified by the customer according to EN 13674. 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.

4.3 Inclination of the running table

Inclination of any running table in the switch (stock and/or switch rails) and location and length of any twist (change of inclination) shall be specified by the customer.

5 Design requirements

5.1 Geometry and construction

The following data shall be specified by the customer:

- rail inclination;
- gauge, and any permitted variation in the switch toe area;
- main line radius (contraflexure or similar flexure);
- hand of turnout (left hand, right hand or symmetrical);
- overall rail lengths;
- stock rail and switch rail profiles.

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

- geometry details in the switch area as shown in Figure 2;
- type of geometrical form (see 3.2.1);
- type of construction (see 3.2.2);
- bearer layout in the switch area;
- machining details of switch and stock rails, see Figures 6, 7 and 8.

5.2 Rolling stock data

5.2.1 Axle loading and spacing

Annual tonnage and axle load shall be provided by the customer as an aid to categorise the track. The minimum detail requirements according to EN 13232-2 and EN 13232-3 shall be taken into account.

5.2.2 Speed and cant deficiency

The customer shall specify the maximum speed and maximum value of cant deficiency as appropriate for mainline and branch line according to prEN 13803-2.

5.3 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 13145, EN 13146 (all parts) and EN 13481 (all parts).

5.4 Interface between switch and operating systems

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

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

5.5 Other requirements

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

EXAMPLES Heaters, environmental conditions, electrical insulation, continuously welded rail, applied cant, special maintenance requirements.

5.6 Drawings

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

- machining profiles;
- 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 defines the 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) 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 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

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

Table 1 — Stock rail

Dimension	Description	Tolerance
<i>LS</i>	Total length of stock rail (Figure 14)	± 3 mm up to 24 m length ± 4 mm greater than 24 m
<i>SR</i>	Straightness of the running edge (Figures 9 and 11)	± 1 mm and 0,5/1 500
<i>SR</i>	Course of the curve of the running edge (Figures 10 and 11)	± 1 mm and 0,5/1 500
<i>HM</i>	Height of machining at contact surface in relation to rail foot (Figure 12)	± 0,5 (+ tolerance of height of rail)
<i>IM</i>	Tolerance on the inclination of the machined contact surface (Figure 12)	± 0,5°
Not shown	Diameter of fishbolt holes	+ 1/-0,5 mm
Not shown	Holes position relative to fishing surface	± 1 mm
Not shown	Holes position relative to end of rail	± 1,5 mm (for temporary fishplating ± 3 mm)
Not shown	Chamfer of the holes	min. 0,5 mm
Not shown	Roughness of machined running surface areas	Ra 6,3

Table 2 — Switch rail

Dimension	Description	Tolerance
<i>LA</i>	Total length of switch rail	± 3 mm up to 24 m length ± 4 mm greater than 24 m
<i>SR</i>	Straightness of the running edge (Figures 9 and 11)	± 1 mm and 0,5/1 500
<i>SR</i>	Course of the curve of the running edge (Figures 10 and 11)	± 1 mm and 0,5/1 500
<i>HM</i>	Height at machined area (Figure 13)	± 0,5 (+ tolerance of height of rail)
<i>TM</i>	Thickness at machined area (min 3 points or every 1,5 m) (Figure 13)	± 0,5 mm
<i>IM</i>	Tolerance on the inclination of the machined contact surface (Figure 13)	± 0,5°
Not shown	Diameter of fishbolt holes	+1/-0,5 mm
Not shown	Holes position relative to fishing surface	± 1 mm
Not shown	Fishplate surface (valid only for machined fishplate surfaces)	according to rolled rail section
Not shown	Holes position relative to end of rail	± 1,5 mm (for temporary fishplating ± 3 mm)
Not shown	Chamfer of the holes	min. 0,5 mm
Not shown	Flatness of the underside of the switch rail	1 mm
Not shown	Roughness of machined running surface areas	Ra 6,3

Table 3 — Transition section

Dimension	Description	Tolerance
Not shown	Running table	0,3 mm/1 500 mm
Not shown	Running edge alignment	0,5 mm/1 500 mm
Not shown	End profile	Tolerance according to the rolled rail section
<i>HC</i>	Head profile (Figure 18)	An area of concavity may exist only on the opposite of the running edge. This shall not exceed 2 mm
<i>LT</i>	Transition length (Figure 18)	± 10 %
<i>HF</i>	Height difference from one rail foot to the other rail foot (Figure 18)	± 1 mm

There may not be step change in rail profiles.

Table 4 — Half set of switch

Dimension	Description	Tolerance
<i>LS, LA</i>	Constructional length stock rail and switch rail (Figure 14)	± 3 mm up to 24 m length ± 4 mm greater than 24 m
<i>SH</i>	Spread at heel end (Figure 14)	± 2 mm
<i>CH</i>	Contact switch – stock rail allowance (Figure 15) (For inspection the switch rail shall be fixed to the stock rail at the drive position)	max. 1 mm
<i>CS</i>	Contact of switch studs (Figure 17) (For inspection the switch rail shall be fixed to the stock rail at the drive position)	max. 1mm For special requirements this can be increased up to 2 mm (shall be part of the tender documents)
<i>CP</i>	Max. allowance between switch rail and slide baseplate (Figure 16)	1 mm

Switch flangeway : The physical dimension shall be greater than or equal to the dimension stated on the drawing. (This shall be checked on loose heel and prototype switches.)

Table 5 — Full set of switches (with bearers and small fittings)

Dimension	Description	Tolerance
<i>LS, LA</i>	Constructional length stock rail and switch rail (Figure 14)	± 3 mm up to 24 m length ± 4 mm greater than 24 m
<i>SH</i>	Spread at heel end (Figure 14)	± 2 mm
<i>SQ</i>	Squareness of toes at the drive position (Figure 14)	± 2 mm
<i>G</i>	Gauge (Figure 14) (variation in gauge shall not exceed more than 3 mm total length)	± 2 mm
<i>CH</i>	Switch – stock rail contact allowance (Figure 15) (For inspection the switch rail shall be fixed to the stock rail at the drive position)	max. 1 mm
<i>CS</i>	Contact of switch studs (Figure 17) (For inspection the switch rail shall be fixed to the stock rail at the drive position)	max. 1 mm For special requirements this can be increased up to 2 mm (shall be part of the tender documents)
<i>CP</i>	Max. allowance between switch rail and slide baseplate (Figure 16)	1 mm

6.4 Certification

All materials shall conform to the latest relevant publications.

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 switches. 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 switches. Magnetic particle can only be used on magnetic materials and is therefore not suitable for manganese material.

6.5.3 Ultrasound

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

6.5.4 Radiography

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

7 Limits and extent of supply

The basic scope of supply for the switch is as follows:

— two stock rails with its fixed studs (distance blocks) and two switch rails.

Any other parts to be included in the supply shall be clearly specified by the customer e.g. bearers, baseplates, fishplates, slide baseplates, heel blocks, screws, stretcher bars.

Any special machining requirements shall be specified in the extent of supply, e.g. drilling and machining for switch point machines and stretcher bars, electrical circuitry, track jointing systems, anti creep devices.

8 Identification marks

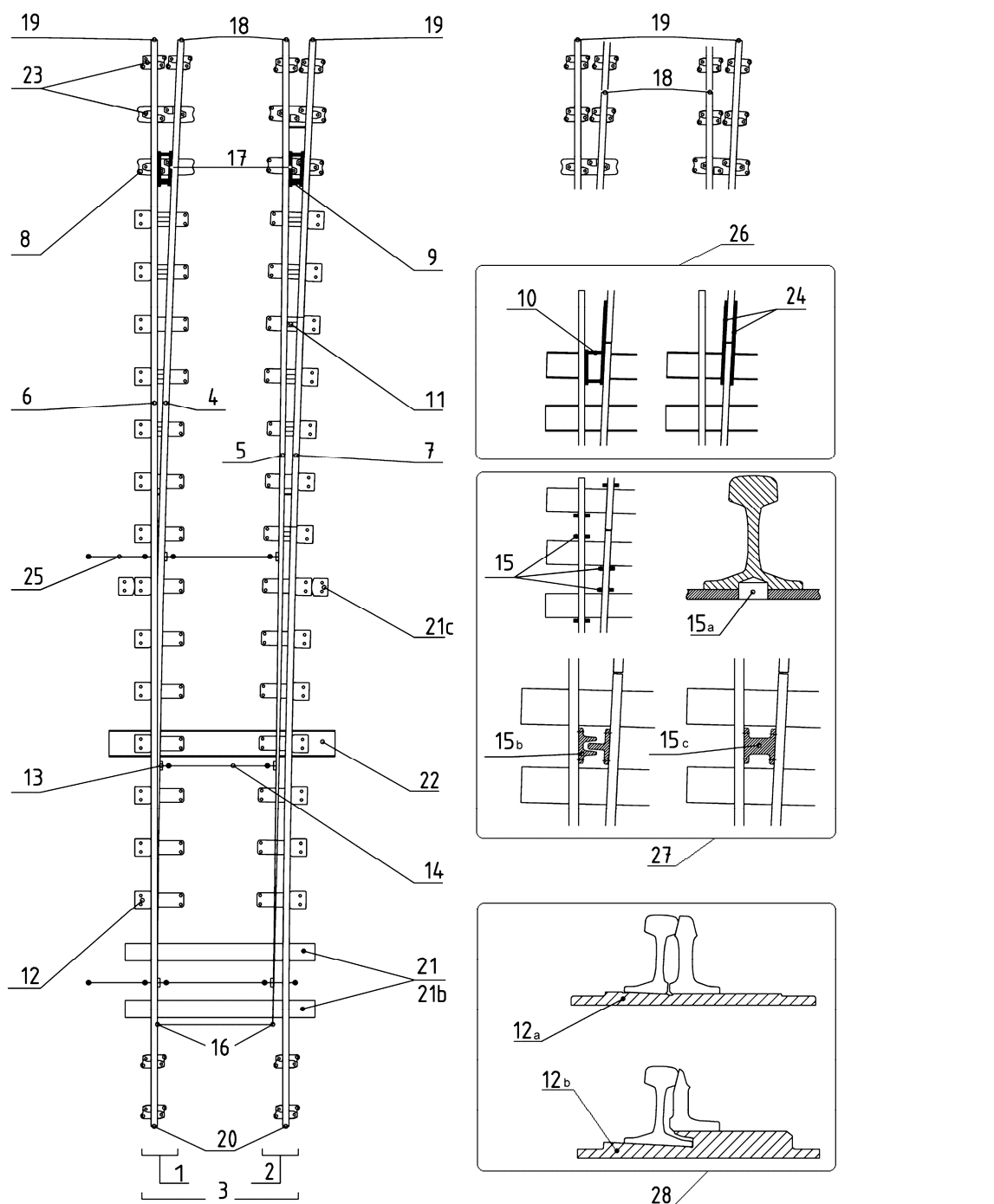
Each half-set of switches shall have an identification marking fixed on the switch rail and/or stock rail. The design of marking shall be agreed between customer and supplier.

The following information shall be marked:

- manufacturer's mark;
- last two digits of year of manufacture;
- type of switch (radius of switch, main line radius, rail profile and hand of turnout);
- unique identification No.

Other markings shall be specified by the customer.

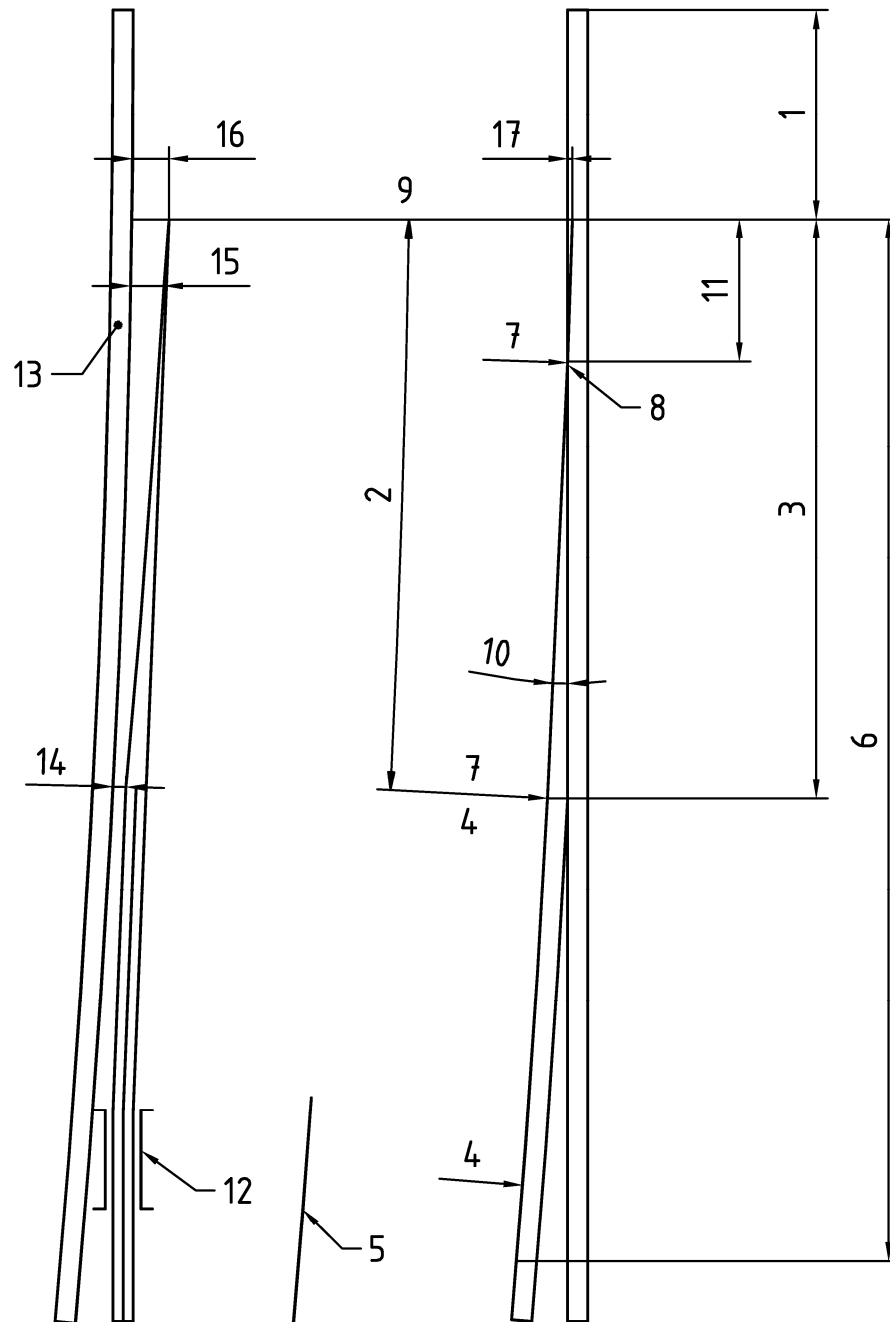
The identification marks concerning dispatch shall be agreed between customer and supplier.



Key

1	Left hand half set of switches	11	Stud/distance block	21	Soleplate
2	Right hand half set of switches	12	Slide baseplate	21b	Gauge plate
3	Set of switches	13	Stretcher bar bracket	21c	Special stop
4	Left hand switch rail	14	Stretcher bar	22	Bearers
5	Right hand switch rail	15	Anti-creep device	23	Baseplate
6	Left hand stock rail	16	Switch toe/tip	24	Fishplate (joint bar)
7	Right hand stock rail	17	Switch heel	25	Drive rod
8	Heel baseplate	18	Switch rail joint	26	Example of alternative rail joint position
9	Block or heel block	19	Stock rail joint	27	Example of alternative switch heel arrangements
10	Fishplate block	20	Stock front joint	28	Example of slideplates

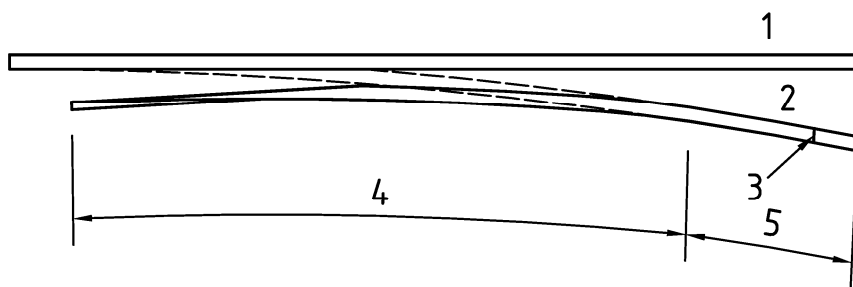
Figure 1 — Parts of switches



Key

1	Switch fronts	7	Planing radius	13	"Set" of the stock rail
2	Planing length	8	Mathematical switch toe	14	Switch flangeway
3	Contact length	9	Switch toe/tip	15	Opening at the drive position
4	Switch radius	10	Entry angle	16	Opening at switch toe
5	Turnout radius	11	Extension of the switches	17	Switch toe undercut
6	Movable length	12	Relief machining of the switch		

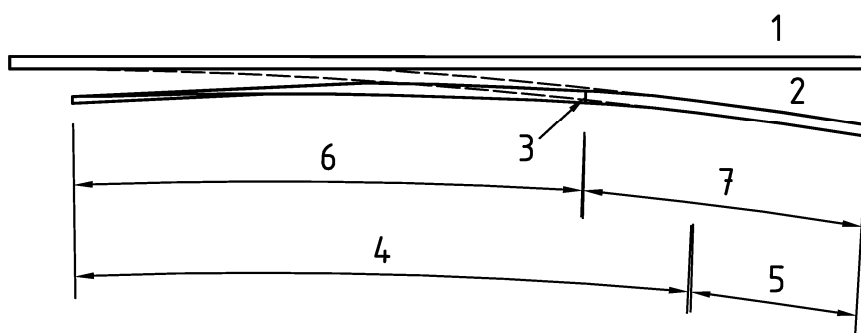
Figure 2 — Parts of switches



Key

- | | | | |
|---|-------------|---|----------|
| 1 | Stock rail | 4 | Moveable |
| 2 | Switch rail | 5 | Fixed |
| 3 | Weld | | |

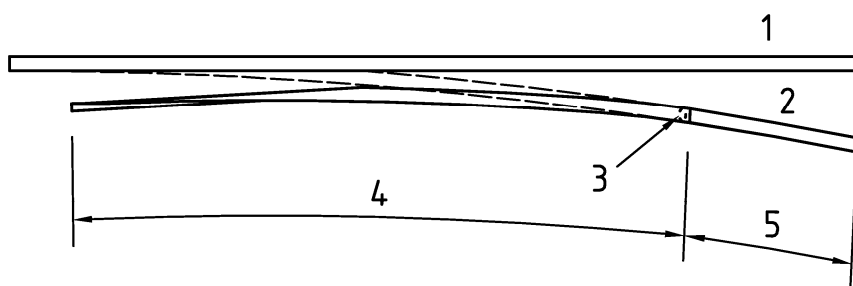
Figure 3 — Half set of flexible switches



Key

- | | | | |
|---|-------------|---|------------------|
| 1 | Stock rail | 5 | Fixed |
| 2 | Switch rail | 6 | Special profile |
| 3 | Weld | 7 | Standard profile |
| 4 | Moveable | | |

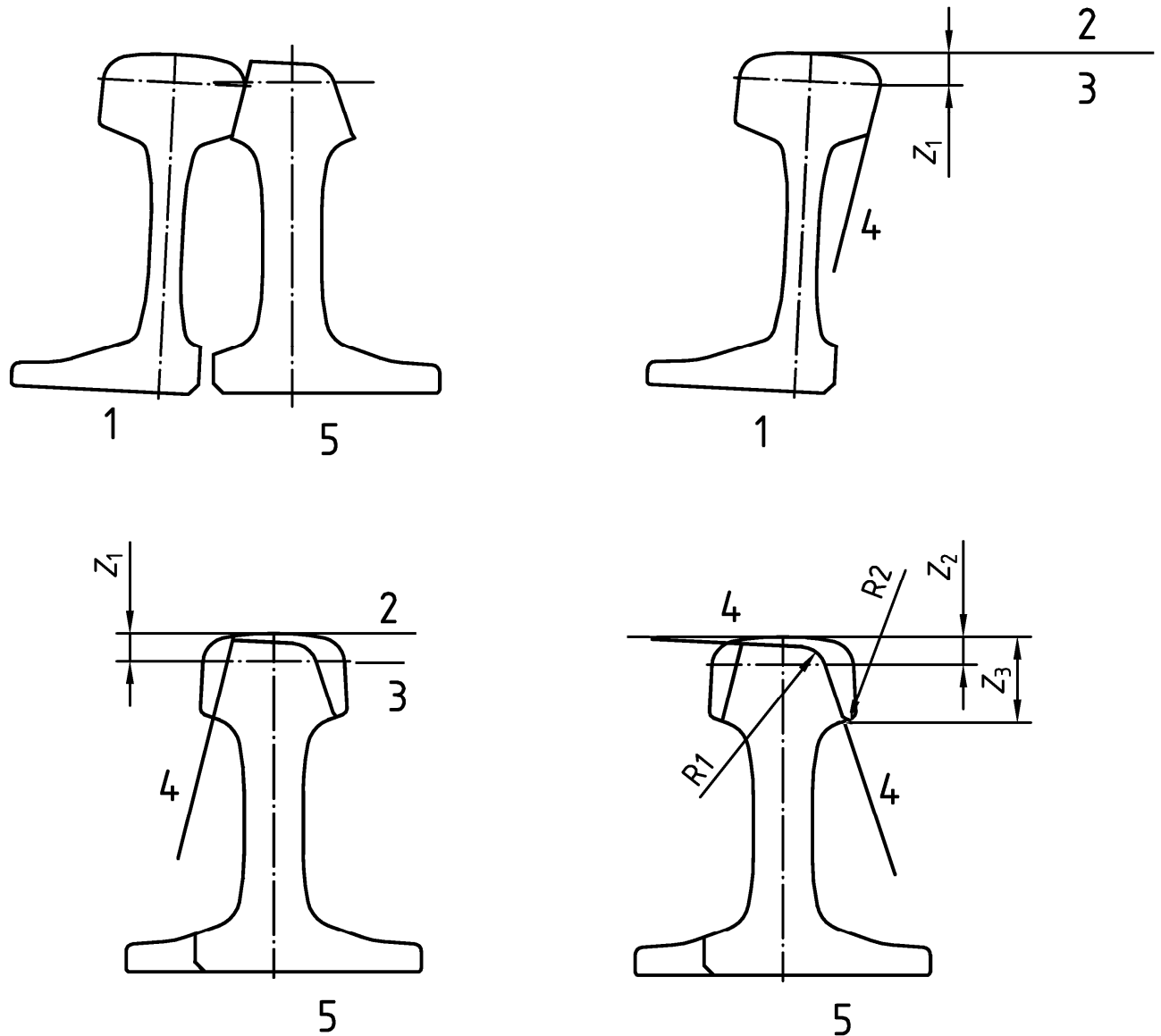
Figure 4 — Half set of spring switches



Key

- | | | | |
|---|-------------|---|----------|
| 1 | Stock rail | 4 | Moveable |
| 2 | Switch rail | 5 | Fixed |
| 3 | Pivot | | |

Figure 5 — Half set of loose heel switches

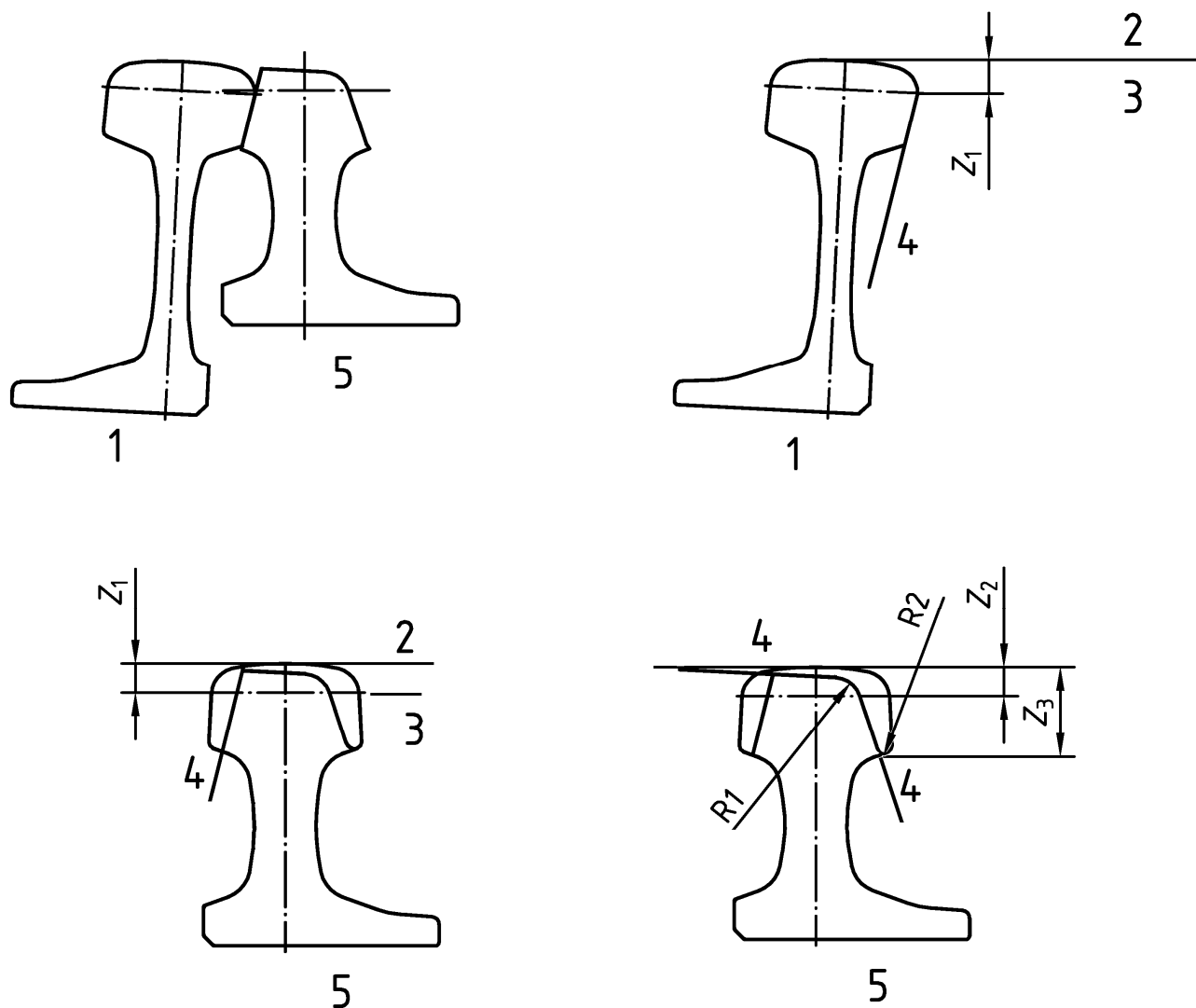


Key

1	Stock rail	R1	Running edge radius
2	Running table	R2	Fillet radius
3	Machining reference plane	Z ₁	Depth of machining reference plane below running table
4	Slope	Z ₂	Depth of machining reference plane below running table
5	Switch rail	Z ₃	Depth of flangeway

NOTE Z_1 (slide application) = Z_2 (slide running) in case of vertical stock rail.

Figure 6 — Machining details: Full depth switch rails

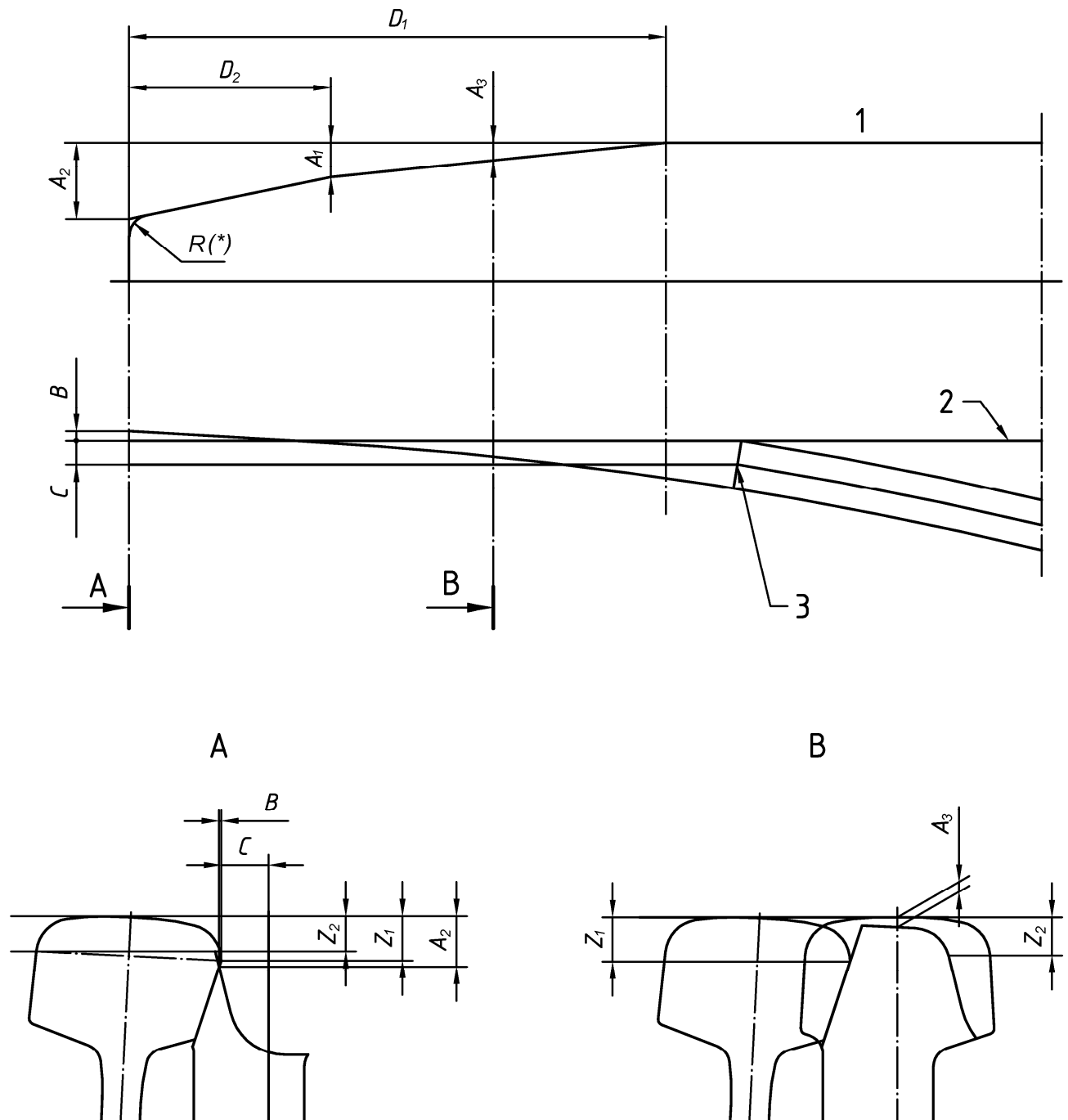


Key

1	Stock rail	R1	Running edge radius
2	Running table	R2	Fillet radius
3	Machining reference plane	Z ₁	Depth of machining reference plane below running table
4	Slope	Z ₂	Depth of machining reference plane below running table
5	Switch rail	Z ₃	Depth of flangeway

NOTE Z₁ (slide application) = Z₂ (slide running) in case of vertical stock rail.

Figure 7 — Machining details: Shallow depth switch rails

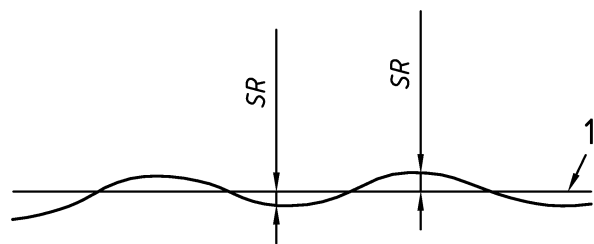


Key

1	Running plane	Z ₁	Depth of machining reference plane below running table
2	Stock rail running edge	Z ₂	Depth of machining reference plane below running table
3	Set of switch rail	C	Offset of switch rail centreline at switch toe
B	Offset of switch rail undercut at switch toe	D ₁	Length of machining
A ₁	Depth of machining	D ₂	Length of machining
A ₂	Depth of machining	(*)	If any
A ₃	Depth of machining		

NOTE Z₁ (slide application) = Z₂ (slide running) in case of vertical stock rail.

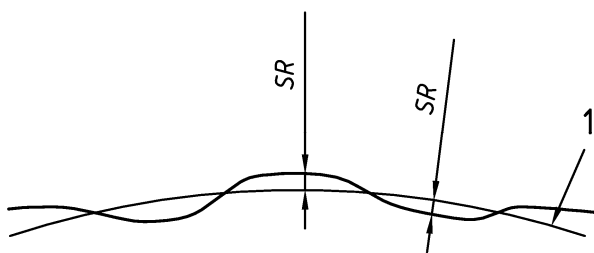
Figure 8 — Machining details: Half set of switches



Key

- 1 Theoretical running edge SR Course of the running edge (max. 1 mm)

Figure 9 — Straightness

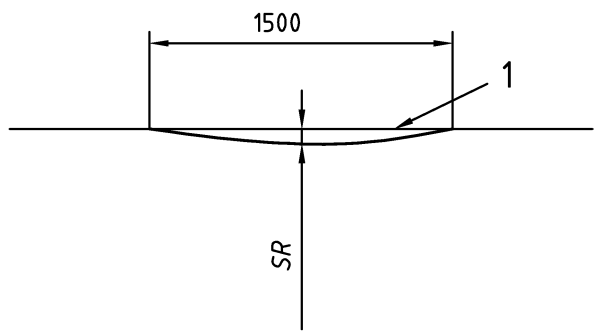


Key

- 1 Theoretical running edge SR Course of the running edge (max. 1 mm)

Figure 10 — Course of curve

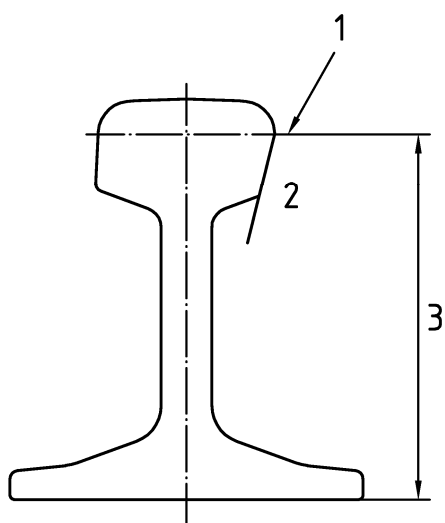
Dimensions in millimetres



Key

- 1 Theoretical running edge SR Course of the running edge (max. 1 mm)

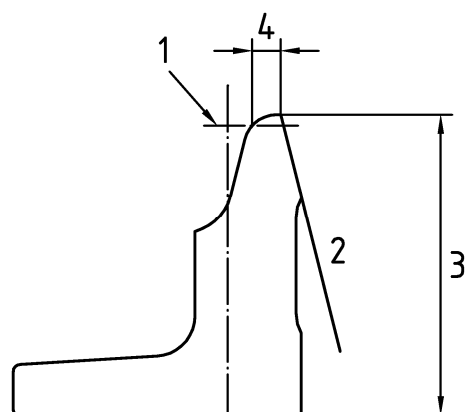
Figure 11 — Local straightness



Key

- 1 Machining reference plane
- 2 Inclination of the machined contact surface (*IM*)
- 3 Height of machining at contact surface (*HM*)

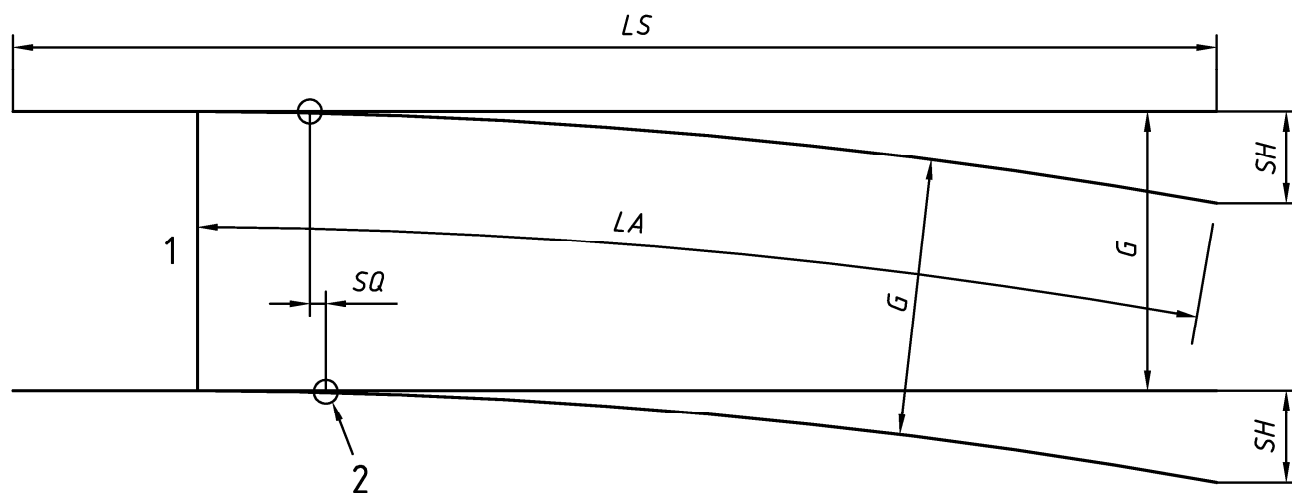
Figure 12 — Stock rail



Key

- 1 Machining reference plane
- 2 Inclination of the machined contact surface (*IM*)
- 3 Height of machining at contact surface (*HM*)
- 4 Thickness at machined area (*TM*)

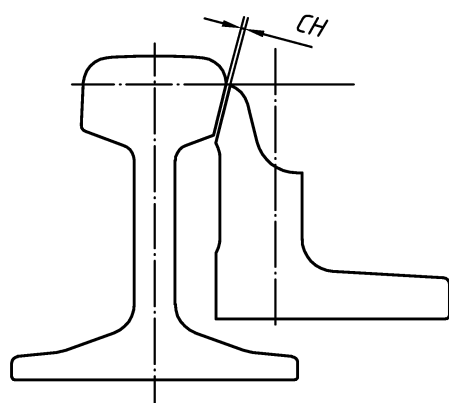
Figure 13 — Switch rail



Key

- | | | | |
|-----------|----------------|-----------|--------------------|
| 1 | Toe | <i>LA</i> | Switch rail length |
| 2 | Drive position | <i>LS</i> | Stock rail length |
| <i>SH</i> | Heel spread | <i>G</i> | Gauge |
| <i>SQ</i> | Squareness | | |

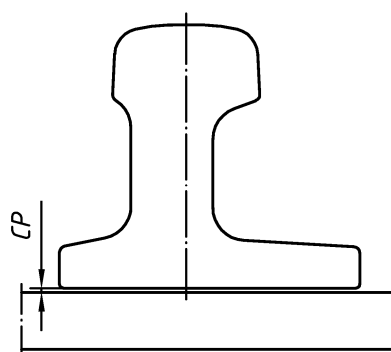
Figure 14 — Toleranced dimensions for set of switches



Key

CH Contact allowance, switch rail to stock rail

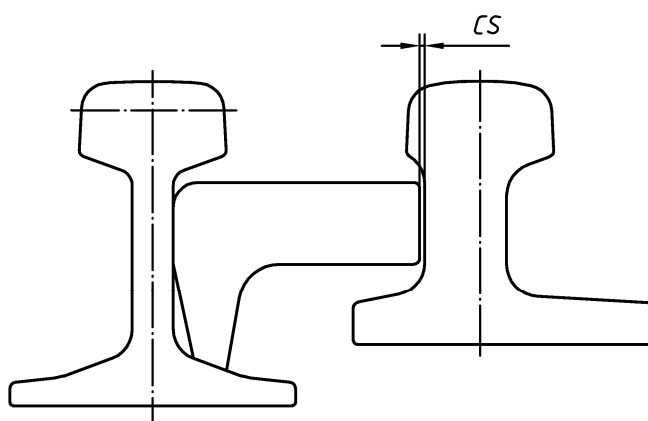
Figure 15 — Switch/stock rail contact



Key

CP Contact allowance, switch rail to slide baseplate

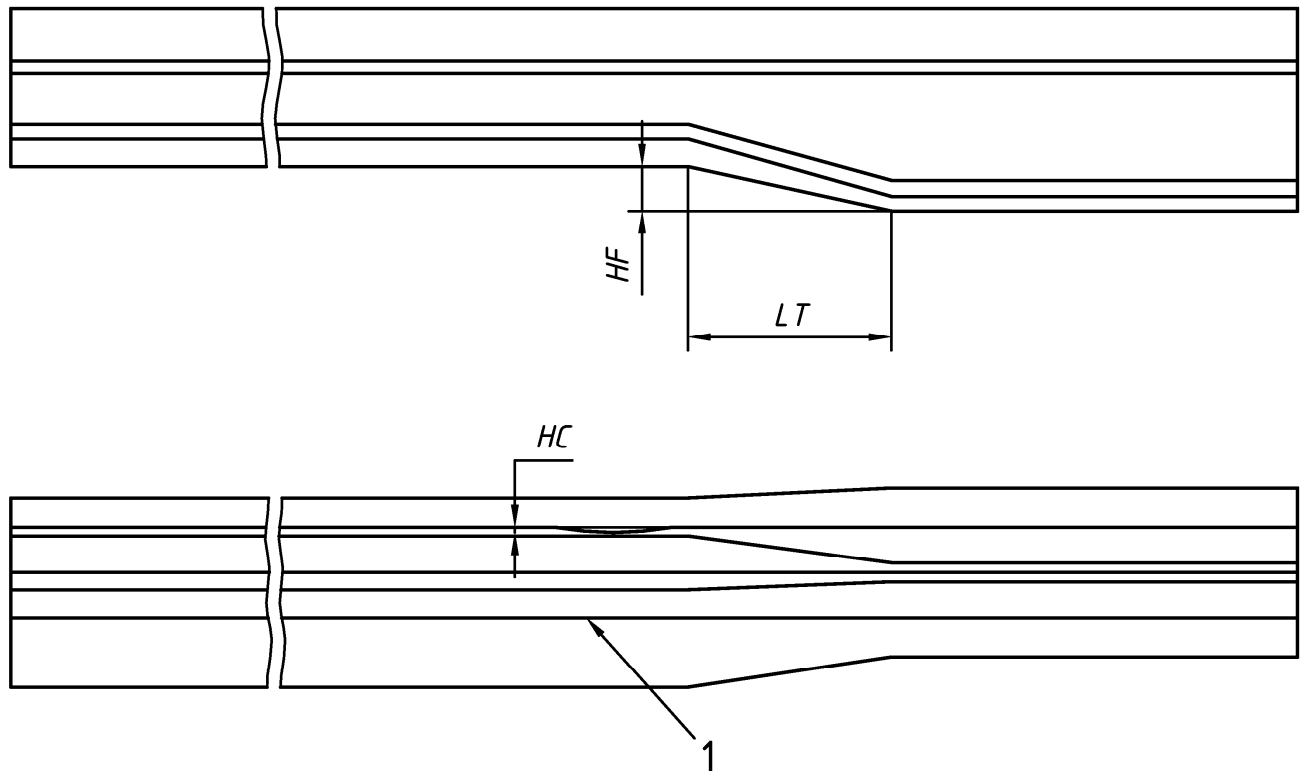
Figure 16 — Switch/slide baseplate contact



Key

CS Contact allowance, switch rail to stud

Figure 17 — Switch/stud contact



Key

1	Running edge	LT	Length of transition
HF	Height difference between rail feet	HC	Head profile concavity

Figure 18 — Transition section

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/EC¹.

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.

¹ This Directive 2008/57/EC adopted on 17th June 2008 is a recast of the previous Directives 96/48/EC 'Interoperability of the trans-European high-speed rail system' and 2001/16/EC 'Interoperability of the trans-European conventional rail system' and revisions thereof by 2004/50/EC 'Corrigendum to Directive 2004/50/EC of the European Parliament and of the Council of 29th April 2004 amending Council Directive 96/48/EC on the interoperability of the trans-European high-speed rail system and Directive 2001/16/EC of the European Parliament and of the Council on the interoperability of the trans-European conventional rail system'.

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

Clause(s)/ sub-clause(s) of this European Standard	Chapters/§/annexes of the TSI	Corresponding text, articles/§/annexes of the Directive 2008/57/EC	Comments
4 Performance requirements 4.3 Inclination of the running table 5 Design requirements 5.1 Geometry and construction 5.2. Rolling stock data 5.2.1 Axle load and spacing 5.2.2 Speed and cant deficiency 5.3 Supports and fastenings 5.4 Interface between switch and operating system 6 Tolerances and inspection 6.3 Critical dimensions 6.4 Certification	4. Description of the infrastructure domain 4.2.2 Nominal track gauge 4.2.8 Cant deficiency 4.2.11.b) Rail inclination – Switches and crossings 4.2.12.1 Means of detection and locking 4.2.12.3 Geometrical characteristics 4.2.13 Track resistance 5. Interoperability constituents 5.3 Constituents performances and specifications 5.3.1.1.b) Railhead profile – Switches and crossings 5.3.2. The rail fastening systems 5.3.4 Switches and crossings 5.3.4 a) Means of detection and locking 5.3.4.c) Geometrical characteristics Annex A – Table A1	Annex III Essential requirements 1. General requirements 1.1 Safety Clauses 1.1.1 – 1.1.2 and 1.1.3 1.5 Technical compatibility	

Table ZA.2 — Correspondence between this European Standard, the CR TSI INF published in OJEU dated 14th May 2011, and Directive 2008/57/EC

Clause(s)/ sub-clause(s) of this European Standard	Chapters/§/annexes of the TSI	Corresponding text, articles/§/annexes of the Directive 2008/57/EC	Comments
4 Performance requirements 4.3 Inclination of the running table 5 Design requirements 5.1 Geometry and construction 5.2 Rolling stock data 5.2.1 Axle load and spacing 5.2.2 Speed and cant deficiency 5.3 Supports and fastenings 5.4 Interface between switch and operating system 6 Tolerances and inspection 6.3 Critical dimensions 6.4 Certification	4. Description of the infrastructure subsystem 4.2.5.1 Nominal track gauge 4.2.5.4 Cant deficiency 4.2.5.7.2 Rail inclination – Requirements for switches and crossings 4.2.6.1 Switches and crossings - Means of locking 4.2.6.2 In-service geometry of switches and crossings 4.2.7 Track resistance to applied loads 6. Assessment of conformity of interoperability constituents and EC verification of the subsystems 6.2.4.7 Assessment of geometry of switches and crossings 6.2.5.2 Assessment of track resistance for switches and crossings Annex B – Table 21	Annex III Essential requirements 1. General requirements 1.1 Safety Clauses 1.1.1 – 1.1.2 and 1.1.3 1.5 Technical compatibility	The draft CR TSI INF makes in § 4.2.6.1 only reference to means of locking, not to means of detection. 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 considered to be interoperability constituents according to § 5.2 (3) of the CR TSI INF

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

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