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EN ISO 9001
EN ISO 3834-2
EN ISO 14001
OHSAS 18001

262/2013

**Manual for the operation and maintenance
of check rail**

2nd Edition

Title: **Manual for the operation and maintenance of check rail**

Release date: 01.06.2019
Number of pages: 15

Check rail manufacturer and publisher of this manual:

DT - Výhybkárna a strojírna, a.s.
(hereinafter the manufacturer)

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1 General

This manual contains technical information on the check rails which are part of the frog part of the turnout, requirements for their installation and operation, including maintenance.

It is binding on all persons who carry out the activities specified below on the above-mentioned check rails. The manufacturer assumes no responsibility for activities and their consequences performed in a different way and strongly warns that failure to comply with the provisions of this manual may result in the rejection of the claim, including the possible recovery of related damages.



Before starting any work on the switch, the relevant personnel must be familiar with the instructions in this manual.

1.1 Overview of the most important symbols

This document includes three categories of safety guidelines:

DANGER!



Ignoring these instructions can result in loss of life.

WARNING!



Ignoring the instructions can cause serious injury or substantial damage to the property.

NOTICE!



Ignoring the instructions can cause damage to the property or injury.

1.2 Manufacturer's address

DT - Výhybkárna a strojírna, a.s.
Dolní 3137/100
796 01 Prostějov
Czech Republic

Contacts to the service personnel are available on the website
DT - Výhybkárna a strojírna, a.s.: <http://www.dtv.s.cz/>

1.3 Contact form for technical sales support - Your opinion

Company DT – Výhybkárna a strojírna, a.s. will be happy to receive **feedback from its customers**, especially your comments, suggestions and experience with the product in question gained from its operation. Please send us a copy of this form at:

DT - Výhybkárna a strojírna, a.s.
Dolní 3137/100
796 01 Prostějov
Czech Republic

or you can use the form available on the website
DT - Výhybkárna a strojírna, a.s.: <http://www.dtvs.cz/>

Comments, suggestions and experience:

Name:

Organization:

Contact (phone, e-mail):

2 Technical specification, check rail description

2.1 Basic technical data

Basic parameters of check rail, incl. data stated in the drawing documentation (hereinafter referred to as DD):

- the most commonly used check rail profile is 33C1 or Kn60-rolled
- the most commonly used check rail quality is R320Cr or R260
- working groove width - groove area with a constant width (DD)
- groove coasting - groove area with a variable width for the introduction of the wheel flange in the groove with a constant width (DD)
- safety groove coasting - usually a non-driven part of the groove at the end of the check rail
- superelevation of the check rail above rail crown (DD)
- machined parts of the check rail provided with anti-corrosion coating
- the check rail is provided with holes for fixing it (distance of the holes according to the distribution of sleepers/sole plates to the check rail of the respective type of switch)
- the sole plates for the check rail are welded or cast in the design according to the drawing documentation, the required width of the groove including the extension is given by its structural arrangement.
- sets of 3 types of levelling shims, e.g. 1, 2 or 3 mm thick, may be included in the delivery

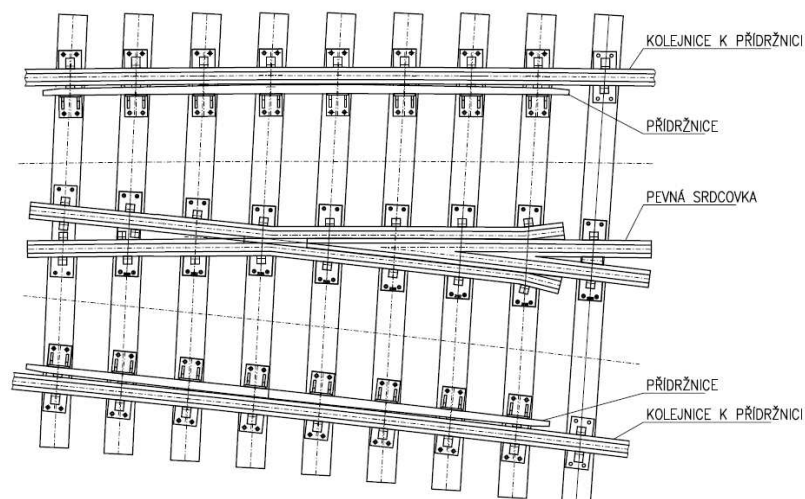
Specific data on profile, material quality and groove layout are given in the drawing documentation.

2.2 Description of the check rail

The check rails are part of the frog part of the switch with a fixed frog (single and double, straight and curved). The crosspiece is a special profile that ensures a safe passage of the wheelset through its guide on the side opposite to the non-guided wheel at the simple fixed frog.

The check rail area is made up of 2 pieces of check rails and a corresponding type of sole plate to the check rail. The sole plates may be welded or cast to the check rail, formed by a base plate, a system for rail fastening to the check rail, and welded side plates to support the check rail. The check rail is connected to the sole plates by the M24 screw connection.

The check rails can be elevated above the rail crown to the check rail with respect to the wheel profile.



Kolejnice k přídržnici - Rail to check rail
 Přídržnice - Check rail
 Pevná srdcovka - Fixed frog

The scope of delivery depends on the customer's request, e.g. only a check rail without a frog can be supplied.

Machining of the check rail including the entering inclination corresponds to the prescribed grooves according to the approved DD. The deflection of the curved check rail corresponds to the geometry of the switch. The check rails are mounted with a screw connection.

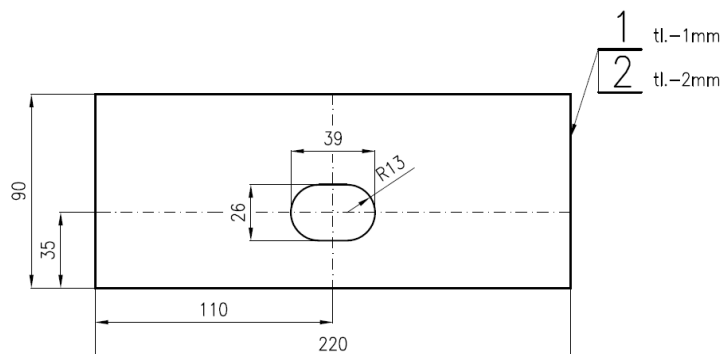
Design of working and safety groove of check rail - justification:



In order to design the working length of the check rail, the principle is that the working groove of the check rail can be designed at a distance of min. 100 mm in front of the frog neck and min. at a distance of 100 mm beyond the crossing point thickness of 40 mm. The retainer serves to protect the point. It ensures safe movement of the wheelset of the vehicle in the frog area where the running edge of the running track is interrupted.

The working groove of the check rail is designed in appropriate lengths for safety reasons as a point protection in the non-guided area of the frog so as the wheel does not hit the crossing point. When driving towards the crossing point, the wheelset is calmed after being guided into the check rail groove. The wheelset is guided through the check rail in its entire length over the working part of the frog, and then the exit to the safety groove of the check rail follows. The end of the check rail is machined into the coasting, or it can also be reached by a bend.

When installing the switches in the factory, spacers with a thickness of 1-2 mm can be inserted between the check rail profile and the support of the sole plate to the check rail for defining the width dimension of the grooves.



In operation, it is possible to insert spacers up to a maximum thickness of 20 mm. If the wear value of the check rail is > 20 mm, the check rail must be replaced with a new one.

- Vyrovnávací podložka č. - Levelling washer no.
- Plech - Sheet
- Tyč plochá - Flat bar
- Poz. - Pos.
- Název – rozměr - Name - dimension
- Kusů - Pieces
- Polotovár – Norma - Semifinished product - Standard
- Materiál - Material
- Čistá váha - Net weight

Poz.	Název – rozměr	Kusů	Polotovár–Norma	Materiál	Čistá váha	A
7	VYROVNÁVACÍ PODLOŽKA č.7	1	PLECH 1 70x120	11373	0,051	1
6	VYROVNÁVACÍ PODLOŽKA č.6	1	TYČ PLOCHÁ 90/5-120	11373	0,605	5
5	VYROVNÁVACÍ PODLOŽKA č.5	1	TYČ PLOCHÁ 70/10-120	11373	0,510	10
4	VYROVNÁVACÍ PODLOŽKA č.4	1	TYČ PLOCHÁ 70/8-120	11373	0,408	8
3	VYROVNÁVACÍ PODLOŽKA č.3	1	TYČ PLOCHÁ 70/6-120	11373	0,306	6
2	VYROVNÁVACÍ PODLOŽKA č.2	1	PLECH 4 70x120	11373	0,204	4
1	VYROVNÁVACÍ PODLOŽKA č.1	1	PLECH 2 70x120	11373	0,102	2

3 Safety instructions



- The mounting, regeneration and adjustment of the check rail may only be carried out by a person authorized to do so, older than 18 years who has been demonstrably familiarized with the operation, maintenance and safety instructions.



- During all adjusting and assembly work on the check rail, the operator is obliged to ensure the safety of the operator against collision with rail and non-rail vehicles, or to prevent injuries to unauthorized persons by ordering them out of the assembly area.



- A suitable lifting device with declared capacity must be used to handle the check rail. Use of unsuitable equipment may result in injury to you and to nearby personnel.



- When lifting and mounting the check rail, an independent person is required to monitor the suspended load and to prevent it from rotating or creating an unstable position resulting in injury, through the means of communication. Unauthorized persons must be ordered out of the workplace when laying the check rail.



- Manual handling of the check rail or welding and grinding the welds should be done with caution and using prescribed protective equipment.



- Always use protective equipment for manual maintenance and cleaning of the check rail and avoid possible injury to workers due to the existence of sharp edges and squats on the switch working surfaces.

4 Preparing the check rail for use

4.1 Component identification

- Check rail - the number of the melt is stamped on the check rail face.
- Sole plates - sole plate numbers are marked according to the manufacturer's markings.

4.2 Method of delivery and packaging of the check rails

The check rails are pre-assembled with a screw connection on the sole plates to the check rail

4.3 Transport, handling and storage



General principles of handling and storage of the check rail:

Safety instructions must be observed when handling the check rail, see point 3

4.4 Installation and assembly instructions



General principles of handling during installation:

Safety instructions must be observed when handling the check rail, see point 3

4.4.1 Work procedure for assembling partially assembled turnouts on wooden or concrete sleepers

1. Lay out the sleepers of the frog section (of the turnout) with mounted sole plates according to the layout (assembly) drawing of the frog (turnout) assembly.
2. Lay out the rubber pads onto the sole plates.
3. Install the running rails of the frog section, aligning the rails of the outer belt of the main direction.

4. Adjust the position of the pre-mounted sleepers according to the markings on the feet of the outer running rails.
5. Install the frog.
6. Adjust the gauge to the required tolerance.
7. Check the rise of arch at curved running rail to the check rail.
8. Mount the check rails, including the adjustment of the grooves and the distance in the main and branch directions between the running edge of the frog and the leading edge of the check rail.

4.4.2 Check rail mounting procedure for fixed track (Top to down laying system)

1. Lay out the frog section (the frog and the rail to the check rail assembled with sole plates and check rails) on the base layer of the concrete slab.
2. Using a sufficient number of jacks, lift the frog section to the required height needed to embed the second concrete layer. Make sure that the height of the frog section is not corrugated, due to its own weight and insufficient support, and that the running rails are not rotated from their horizontal position.
3. Align the middle part with the frog section.
4. Adjust the gauge to the required tolerances and fix the frog mutually with the rails to the check rail by appropriate means to ensure a permanent gauge until the concrete grout is fully cured.
5. Check the rise of arch at curved running rail to the check rail.
6. Fit the holes in the sole plates with insulating sleeves (if supplied).
7. Fit the holes with anchor bolts, washers and nuts. In case the flexible washers under sole plates are supplied together with the frog section, it is necessary to install these washers before pouring the concrete layer and fix them perfectly to the bottom surface of the sole plates.
8. Lightly tighten the nuts of anchor bolts to fix the position of the anchor bolts.
9. Pour the concrete layer to the desired height. In case the flexible element under the sole plates is to be installed additionally in the form of pouring a special elastic layer, it is necessary to terminate the top surface of the concrete grout at a sufficient distance from the bottom surface of the sole plates.
10. After sufficient curing of the concrete slab, the additional flexible layer should be poured under the sole plates.
11. After the grout curing, tighten the anchor bolts to the specified torque.

4.4.3 Check rail mounting procedure for fixed track (Bottom up laying system)

1. Lay out the frog section (the frog and the rail to the check rail assembled with sole plates and check rails) on the final layer of the concrete slab. At the same time, flexible washers must be inserted under the sole plates.
2. Align the middle part with the frog section.
3. Adjust the gauge to the required tolerances.
4. Check the rise of arch at curved running rail to the check rail.
5. Drill holes for anchoring elements in the concrete slab through the holes in the sole plates using the core drill.
6. Thoroughly clean the drilled holes with compressed air.
7. Apply the bonding cement to the hole and insert the fully fitted anchor into the hole.
8. After the bonding cement has fully cured, tighten the anchor nut (bolt) to the working position to the specified tightening torque.

4.5 Limit deviations/tolerances for assembly of the check rails in the plant and during acceptance of works



- If the manufacturing tolerances are not shown in the drawing documentation, ISO 2768-1 and ISO 2768-2 apply with a degree of accuracy of c, L.
- The drawing documentation, EN 13232-6, applies to the production, acceptance and inspection of a simple frog.
- The values of track gauge and the course of grooves are set for the acceptance at the plant according to the approved production documentation:
 - track gauge in both straight and branch direction with tolerance given in the DD.
- The permissible deviations in the working groove width have the tolerance given in the DD.
- Guiding distance L and A:
 - the distance between the leading edge of the rail and the running edge of the vee-piece of crossing in the range

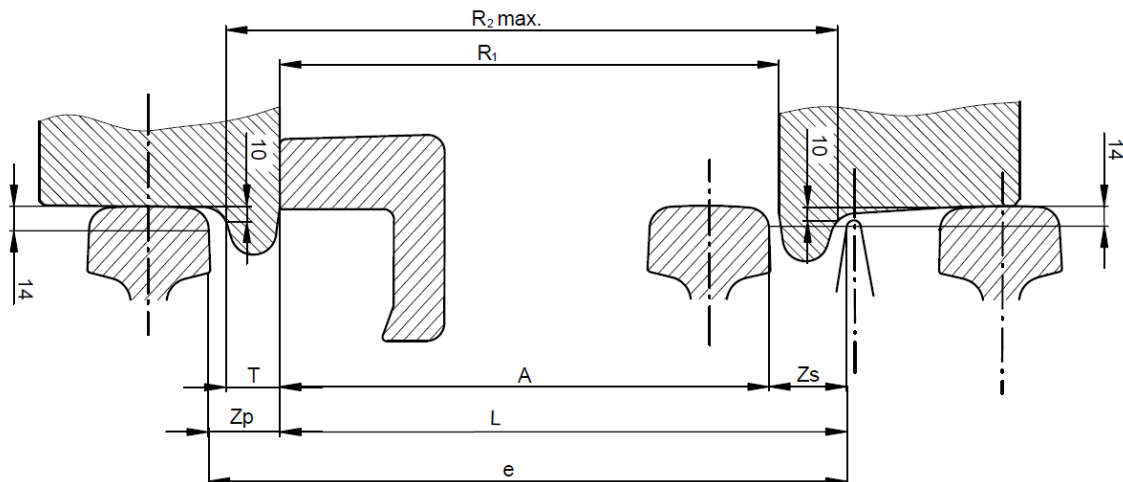
$L = \text{gauge } (e) - \text{width of working groove at check rail } (Z_p) \pm 1 \text{ mm}$

- distance between the leading edge of the check rail and the corresponding wing rail

$A = \text{gauge } (e) - \text{width of working groove at check rail } (Z_p) - \text{width of working groove at frog } (Z_s)$

L, A is determined by local regulations depending on the railway wagons being operated.

To ensure proper functioning of the check rail, the prescribed L and A values must be observed (see figure below).



uváděné míry jsou v mm

e - rozchod koleje

R₁ - rozkolí

R₂ - rozchod dvojkolí

A - vzdálenost vedoucí hrany přídržnice od vedoucí hrany křídlové kolejnice

L - vzdálenost vedoucí hrany přídržnice od pojižděné hrany klínu srdcovky

T - tloušťka okolku - max. 33 mm

Z_p - žlábek u přídržnice

Z_s - žlábek v srdcovce

Průjezd dvojkolí jednoduchou srdcovkou

e- rozchod koleje - track gauge

uváděné míry jsou v mm - stated dimensions are in mm

R₁ – rozkolí - back-to-back distance

R₂ – rozchod dvojkolí - wheelset gauge

A – vzdálenost vedoucí hrany přídržnice od vedoucí hrany křídlové kolejnice - distance between the leading edge of the check rail from the leading edge of the wing rail

L – vzdálenost vedoucí hrany přídržnice od pojížděné hrany klínu srdcovky - distance between the leading edge of the check rail from the running edge of vee-piece of crossing

T – tloušťka okolků – max. 33 mm - flange thickness

Z_p – žlábk u přídržnice - groove at check rail

Z_s – žlábk v srdcovce - groove in frog

Průjezd dvojkolí jednoduchou srdcovkou - Passage of wheelset through simple frog

4.6 Safe operation / limit operating deviations and tolerances

- The permissible limit deviations and tolerances are governed by the standards and regulations of the local railways (railway operators).
- To ensure the operability of the check rail and its proper function, it is necessary to monitor its parameters.
- **In a given territory, operators may have standards with their own requirements and conditions different from our proposal.**
- **The following values shall be valid for lines of the trans-European interoperable rail transport system meeting the conditions of the TSI as amended:**



- **The width of the working groove at the check rail shall not be less than 38 mm.**
- **In operation, the width of the groove at the check rail must not exceed 48 mm depending on the specified track gauge variations L, A.**
- **When installing the turnouts, spacers with a thickness of 1 mm can be inserted between the check rail profile and the support of the sole plate to the check rail for defining the width dimension of the grooves.**
- **In operation, it is possible to insert spacers up to a maximum thickness of 20 mm.**
- **If the check rail wear is greater than 20 mm (at speeds up to and including 90 km/h) and greater than 12 mm (at speeds above 90 km/h), the check rail must be replaced with a new one.**

5 Maintenance and repair of check rails recommended by the manufacturer

To ensure that the turnouts are operational, regular inspections and measurements are carried out at defined time intervals specified in the relevant railway documents.

For foreign customers, these activities are governed by local railway standards and regulations, or by railway operators standards and regulations.



When performing maintenance and repair work on the check rail, the relevant safety regulations must be observed, as well as the safety instructions in point 3.

5.1 Maintenance of check rails



Maintaining the check rails is a repair of defects endangering the safety and smoothness of the railway traffic, or defects whose continued development would threaten the railway traffic if they are not removed in time.

Deflections and deformations occur on the running and stressed parts of the check rails. Their timely removal will prolong the life of these components.

Removal of defects according to their range is divided into:

- minor maintenance of the railway superstructure - e.g. grinding of squats on the rail to the check rail
- planned repair work of a higher grade (based on findings from regular inspections - replacement of parts such as the check rail)

5.1 Repairs of check rails



Based on regular inspections of the check rails and their evaluation, it is necessary to carry out the following corrective actions, if necessary:

Adjusting the width of the grooves in the check rails and frogs

The wheel of a railway vehicle is guided from two sides when passing through the frog. The width of the groove between the check rail and the running rail must not be narrower than the flange width.

The widths of the grooves in the frog, at the check rail and their coastings should be maintained in operation so that they do not cause undesirable impacts when guiding the wheelsets to the desired position.

An example of the prescribed groove width, **recommended construction and operating deviations** in a simple frog and at the check rail must be taken into account in local rail regulations.

Spacers with a maximum width of 20 mm can be inserted to ensure optimum groove width at the check rail due to wear in operation.

If the check rail is worn more than 12 mm (20 mm), it is necessary to replace the check rail.

5.3 Recommended check and inspection intervals for turnout components inserted in the track:



Inspection intervals are determined by local railway regulations or by the railway operator and these must be observed during regular rounds.

The intervals listed below are only recommended by the manufacturer.

Track gauge measurement	1 x in 3 months
Inspection of check rails	1 x in 3 months
Non-destructive check of the check rail parameters	1 x in 6 months

The assessment of the diagnostic results and the causes of the defects is based on a timely and effective repair or maintenance plan.

6 Occupational safety and health, ecology

6.1 Risk assessment related to occupational safety and health

The manufacturer declares that in connection with the handling, assembly, operation, maintenance and dismantling of the check rails in accordance with this manual, there are no

specific safety hazards associated with the aforementioned activities that should be addressed in this manual. These are common activities carried out during construction, assembly and maintenance work on the superstructure. In the course of the activities carried out, the implementing companies and their employees must comply with the occupational health and safety regulations associated with this type of activity in accordance with the applicable legislation (e.g. use of personal protective equipment, storage, working with lifting equipment).

6.2 Assessing the risks associated with the impact on the working and living environment

The manufacturer declares that:

- the check rails according to this manual do not have a negative effect on the environment if properly operated the best available technologies have been used in their design and development, and environmental requirements have been fully respected; no waste is generated during their operation,
- he is a holder of a certificate which proves his standard compliance with EN ISO 14001,
- packing materials (wooden boxes, wooden pallets, wooden interlinings, binding wire, binding straps, or other suitable fixing material) are used in the transport and handling of the check rails according to this manual in accordance with the with the Packaging Act, as amended; the manufacturer is involved in the Ekokom system; he charges and reports these packages in accordance with the applicable Packaging Act; all of these packaging and utensils are disposable; after use, waste must be properly sorted and handed over to authorized persons for disposal in accordance with applicable legislation,
- other and hazardous wastes may be generated in accordance with applicable legislation during the assembly and maintenance of the check rails in accordance with this manual; these wastes must be sorted and handed over to authorized persons for disposal in accordance with applicable legislation,
- other and hazardous wastes emerge when disposing of the end-of-life check rails according to this manual; these wastes must be sorted and handed over to authorized persons for disposal in accordance with applicable legislation,

The above obligations must be provided by the respective companies in accordance with the concluded contract.

7 Overview of applicable used and related standards

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 13232-3	Railway applications - Track - Switches and crossings - Part 3: Requirements for wheel/rail interaction
EN 13232-6	Railway applications - Track - Switches and crossings - Part 6: Fixed common and obtuse crossings
EN 13232-9	Railway applications - Track - Switches and crossings - Part 9: Layouts
EN 13481	Railway applications - Track - Performance requirements for fastening systems
EN 13674-1	Railway applications - Track - Rail - Part 1: Vignole railway rails 46 kg/m and above
EN 13674-3	Railway applications - Track - Rail - Part 3: Check rails
EN 13715	Railway applications - Wheelsets and bogies - Wheels - Tread profile
UIC 510-2	Trailing Stock: Wheels and Wheelsets. Conditions concerning the use of wheels of various diameters.
UIC 864-2	Technical specification for the supply of steel track bolts.
UIC 864-3	Technical specification for the supply of spring steel washers for use in permanent way.
UIC 864-6	Technical specification for the supply of base-plates or sections for base-plates made of rolled steel.

National standards and regulations:

ČSN 73 6360-1	Geometrical characteristics of railway tracks - Part 1: Layout
ČSN 73 6360-2	Geometrical characteristics of railway tracks - Part 2: Construction and acceptance, service and maintenance.
Regulation SŽDC S3	Railway superstructure.