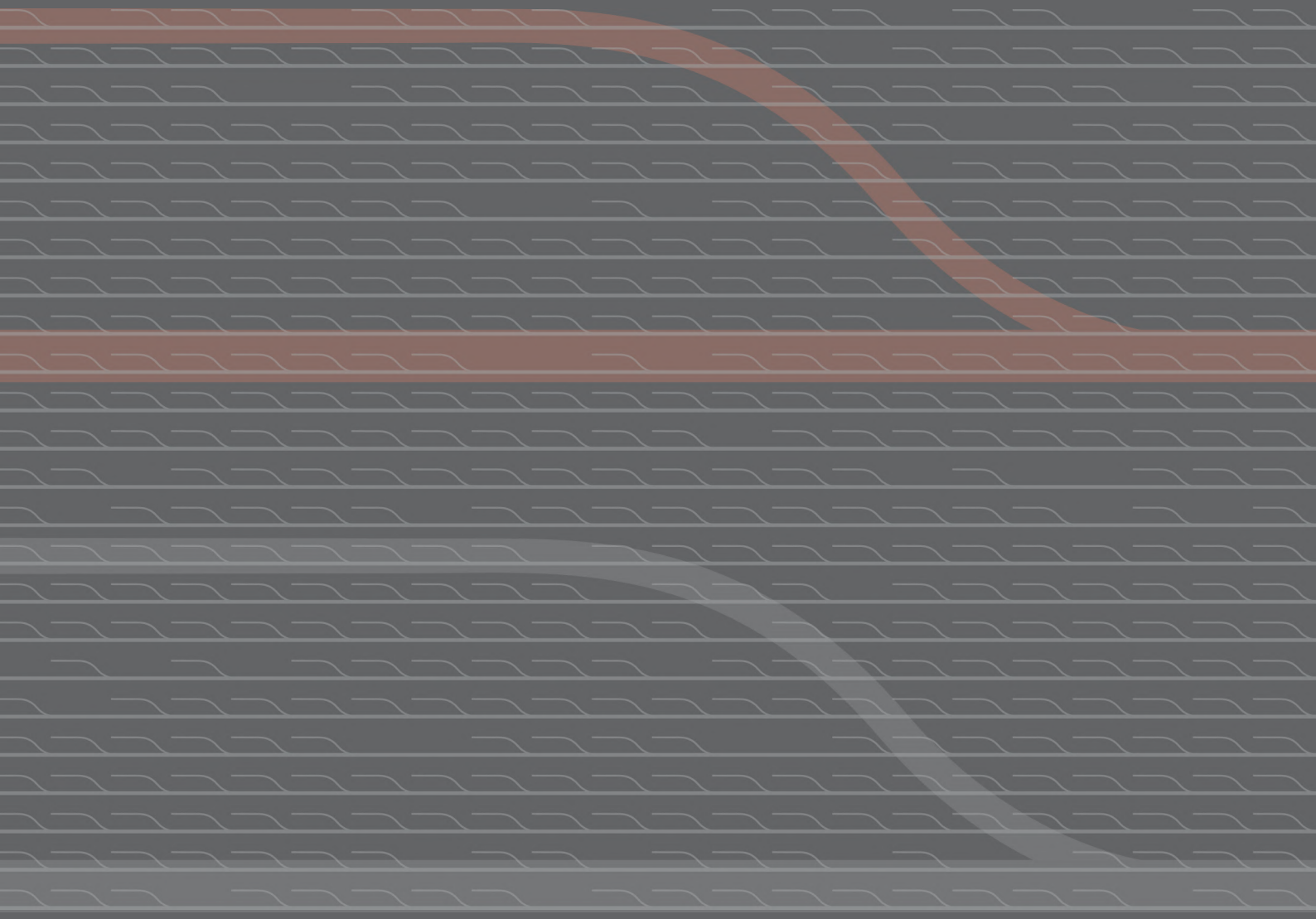
railway, metro & LRT | product sheets



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conventional turnouts

Turnouts installed in the track enable passing of the vehicle in either straight or branch direction.
Depending on the design we distinguish and supply the following types of turnout constructions:

- **o Single turnout**
- **o Curved turnout**
- **o Equal slip**
- **o Symetrical turnout**
- **o Diamond crossing**
- **o Double slip**
- **o Single slip**
- **o Crossover**
- **o Double crossover**
- **o Rail expansion joint**

Turnouts are designed and supplied for various superstructure systems (e.g. UIC60, UIC54, 49E1, R65) and they may be placed onto wooden, concrete, steel or plastic sleepers. Turnouts are designed for different gauges, most often 1435 mm, 1524 mm, 1668 mm, etc.
The superstructure including fastening systems, gauge, type of sleepers and requested geometrical layout is modified according to customers‘ requirements.

Technical description

Switch panel

- Consists of stock rails, switch rails, slide chairs, base plates in the switch heel, switch rail studs, anti-creed lock.
- The drilling in the switch rail is performed depending on the locking device.

Closure panel

- The rails may be equipped with glued insulated joints

Crossing panel

- Consists of crossing, running rail, check rail and base plate

Crossing may be of following types:

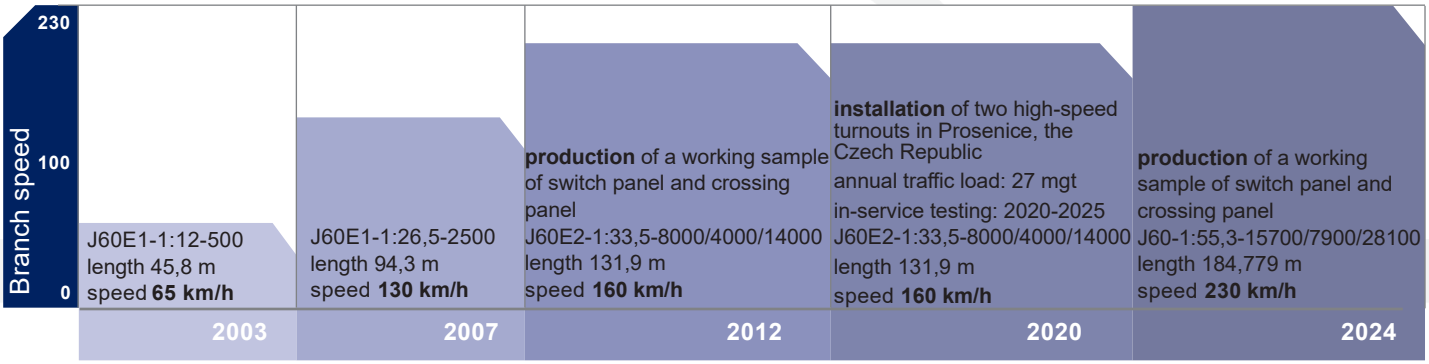
Monoblock	Shortened monoblock	Hardened forged nose crossing	Swing nose crossing (SNX)	Built-up crossing

Turnouts are suitable for both continuous welded track and jointed track. Standard axle load is 22,5 t, running rails are of grade R260, R350, etc., check rails are of profile 33C1.

high-speed turnouts

Technical description	In-service testing	In preparation
Geometry (basic)	1:33,5	1:55,3
Radius in a branch direction	8000/4000/14000	15700/7900/28100
Constructional length	131,910 m	184,779 m
Max speed in straigth direction	350 km/h	According to track speed
Max branch speed	160 km/h	230 km/h
Rail profile	60E2	60E2
Bearers	Concrete	Concrete
Fastening	Tension clamp Vossloh Skl 24	Tension clamp Vossloh Skl 24
Hydraulic point machine	DTZ 6/3	DTZ 8/4

Development of high-speed turnouts with SNX



Switch panel

Crossing panel

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heavy-duty turnouts

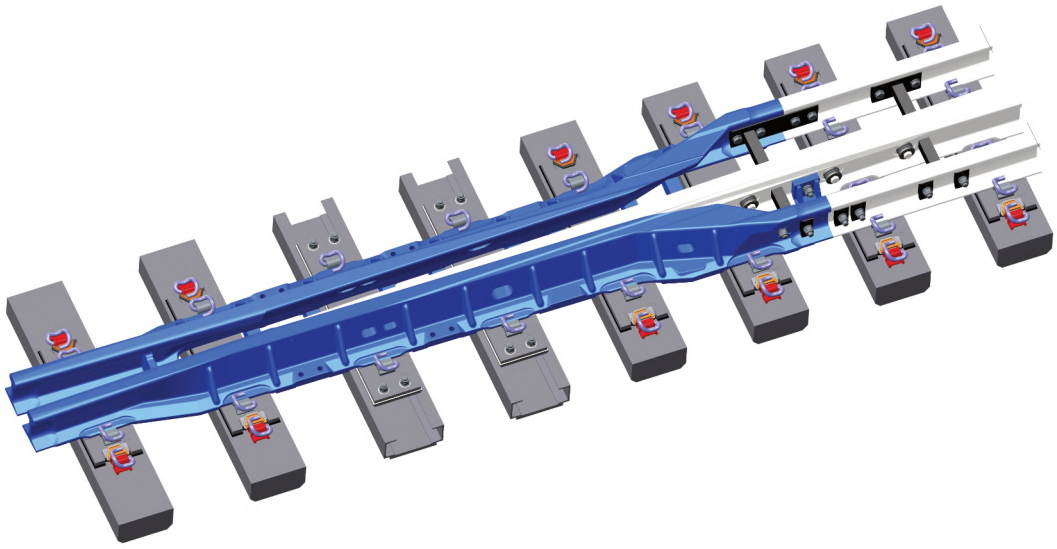
Technical description

Switch panel

- Stock rails of profile AREA 136RE, hardness 370 HB, switch rails of AREA 136-TW, hardness 343 HB, rail jaws and integrated roller chairs.
- Stock rails of profile 60E1, steel grade R350HT, switch rails of 60E1A1, steel grade R350HT, slide chairs and integrated roller chairs.

Crossing panel

- **Fixed crossings** (manganese steel casting EDH (min 350 HB), continuing profile AREA136RE or 60E1).
- **Dillidur nose crossing** (common crossing with a nose tip made of abrasion-resistant material with a surface hardness of approx. 400 HBW and wing rails of steel grade R350HT).
- **Swing nose crossing** (rail profile – AREA136RE, hardness 370 HB, tip assembled of rails AREA136-TW, hardness 343 HB, crossing frame: manganese steel casting EDH, rail expansion device is designed with sliding insert between the main tip and the side tip at the front).



Use

- Heavy duty operations
- Mines
- Metallurgical plants
- Freight terminals

Benefits

- Compact design
- Axle load up to 48 tons for turnouts with swing nose crossing
- Axle load up to 60 tons for turnouts with dillidur nose crossing

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industrial turnouts

Technical description

The switch consists of the welds of half set of switches with slide chairs which are spaced apart by gauge bars. Switch rails are made from standard R65 rails which is forged and welded using spacers to ensure the perfect alignment with connecting grooved rail. The switch is fitted with switch rail studs so as to withstand the centrifugal forces. The switch may be equipped with heating.

The crossing consists of a block with welded connecting rails. The check rails are milled to match the flange profile of 57R1 rail and is held in place with fitted liner bolts. The check rails create a groove narrow enough to to guide the wheel flange past the tip of the crossing. The turnouts is suitable for fixing onto wooden or concrete sleepers or onto a concrete slab. Operation of the switch rails into the desired position is achieved by use of manual point machine.

This turnout is designed for axle load up to 25 t. The design of the turnout was adjusted to the standard geometry of the turnout 1:7,5 R=190m and rail profile 57R1, however, the geometry or the rail profile is variable.

Use

- Industrial railway siding
- Ports
- Logistic centres
- Freight terminals

Benefits

- Road vehicle transport across the track is permitted

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fixed crossings

BUILT-UP CROSSING

Common crossing with point rail and splice rail manufactured from vignole rail or special crossing rails (S 49). The point rails and the wing rails are of quality R260. Connecting rails may be welded to the points. The wing rails are manufactured from vignole rails and are connected to the point rails with high-strength bolts or HT bolts. The wing rails and crossing vee running surfaces may be heat-treated in the area of the wheel passage from the wing rail to the crossing vee and vice versa. The crossing is placed on ribbed base plates fixed usually with standard rail clips.

Benefits & Use

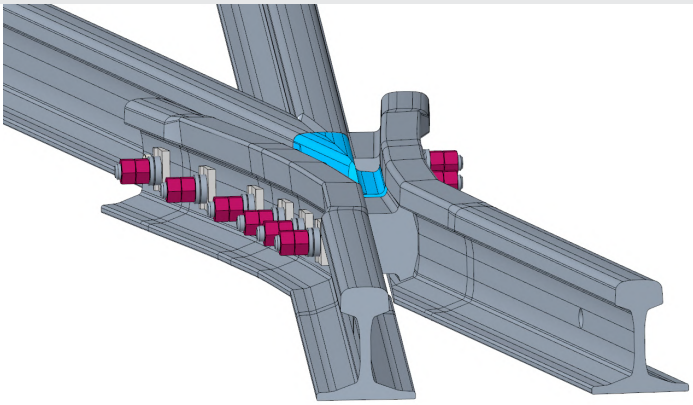
- Low price (economical also when small number of pieces is manufactured)
- Suitable for tracks of low operation load (siding tracks, regional lines)
- Model device is not required

CROSSING WITH HARDENED FORGED NOSE

Common crossing with a nose made of abrasion-resistant material with a surface hardness of approx. 400 HBW, or with forged heat-treated nose, raised forged wing rails are heat-treated in the area of wheel passage from the wing rail to the crossing vee. The wing rail may be designed without the raised part, heat-treated in the area of wheel passage. The wing rails are connected to the hardened forged nose with HT bolts. The contact patches are ballast-glued. The crossing is placed on base plates fixed with elastic clamps or elastic clips.

Benefits & Use

- Suitable for tracks of medium operation load (main tracks)
- Casting pattern is not required, economical also when small number of pieces is manufactured



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fixed crossings

MONOBLOCK CROSSING - MANGANESE STEEL

Common crossing with monoblock casting flash-butt welded with connecting rails by means of CrNi insert piece. The casting is from manganese steel. The connecting rails are of Vignole rails of quality R260 or higher. The crossing is placed on ribbed base plates fixed with elastic clamps or elastic clip. This type of crossing may be supplied with the running surfaces explosive hardened.

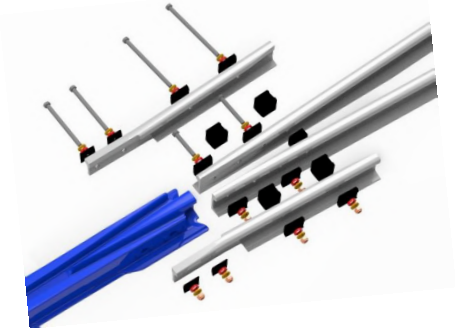
Benefits & Use

- Suitable for tracks of high operation load (main transit corridors)
- Explosive hardening significantly lowers the maintenance requirements and extends the service life

SHORTENED MONOBLOCK CROSSING - BAINITIC STEEL

Common crossing with shortened monoblock casting flash-butt welded with connecting rails.

The casting is from bainitic steel. The connecting rails are of profile 60E1, 60E2, of quality R260 or higher. The connecting rails are welded to the tip with a longitudinal weld on the head and the foot. The wing rails in the area of wheel passage are casted, other part of the wing rails are the rails fixed with high-strength bolts. The crossing is placed on ribbed base plates fixed with elastic clamps or elastic clips.



Benefits & Use

- Suitable for tracks of high operation load (main transit corridors)
- Low maintentance cost
- High wear resistance
- Long service life

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swing nose crossings

SWING NOSE CROSSING WITH FRAME MADE OF RAILS

Swing nose crossing is made of extended wing rails, which are completed with point studs. In the back part, the wing rails are firmly connected with the immovable part of the swing nose to ensure capturing of the forces from the continuous welded rail track. The swing nose is assembled from switch rails, there is a rail expansion joint at the back.

Benefits & Use

- Suitable for tracks of high operation load (main transit corridors)
- Simple design of the swing nose
- Smooth wheel passage thanks to continuous running edge
- Reduced dynamic effect while passing of the railway vehicles
- Long service life

SWING NOSE CROSSING WITH WELDED FRAME

Swing nose crossing consists of welded frame, which is connected to the shortened wing rails behind the area of the wheel passage to the point. The frame is completed with the studs. In the back part, the frame is firmly connected with the immovable part of the swing nose to ensure capturing of the forces from the continuous welded rail track. The swing nose is assembled from switch rails, there is a rail expansion joint at the back.

Benefits & Use

- Suitable for tracks of high operation load (main transit corridors)
- Smooth wheel passage thanks to continuous running edge
- Reduced dynamic effect while passing of the railway vehicles
- Long service life

swing nose crossings

SWING NOSE CROSSING WITH CASTED FRAME

Swing nose crossing consists of manganese steel casting or bainitic steel casting (min hardness 350 HB). Running rails are welded to the frame in front of the crossing, wing rails are welded to the frame behind the crossing. The wing rails are completed with the studs. In the back part, the frame is firmly connected with the immovable part of the swing nose to ensure capturing of the forces from the continuous welded rail track. The swing nose is assembled from switch rails.

Benefits & Use

- Suitable for tracks of high operation load (main transit corridors) and high axle load (heavy duty tracks)
- Compact and robust design
- Smooth wheel passage thanks to continuous running edge
- Reduced dynamic effect while passing of the railway vehicles
- Long service life

SWING NOSE CROSSING WITH HARDENED FORGED NOSE AND FRAME MADE OF RAILS

Swing nose crossing is made of extended wing rails, which are completed with point studs. In the back part, the wing rails are firmly connected with the immovable part of the swing nose. Point rails are welded to the hardened forged nose.

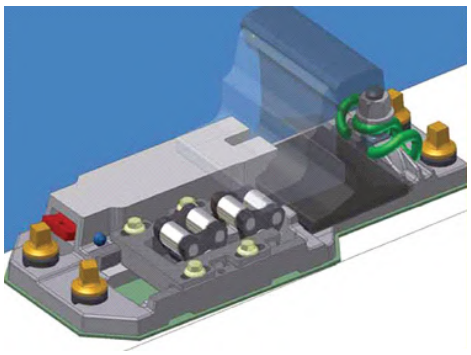
Benefits & Use

- Cheapest swing nose crossing
- Suitable for tracks of medium operation load (subways, light rails)
- Smooth wheel passage thanks to continuous running edge
- Reduced dynamic effect while passing of the railway vehicles
- Long service life

roller chairs

INTEGRATED ROLLER CHAIRS

The device is used to lift the switch rails above the sliding surfaces of the sliding chairs during the operation, which eliminates the necessity of lubrication. In the working position, the switch rails is placed on the sliding surfaces, during the operation and in the distant position of the switch rail the switch rail is placed on the roller of the roller chairs. The chairs are designed as a casting or a weld.



Use

- New turnouts without inclination or with inclination 1:40
- Superstructure UIC 60, S 49

Benefits

- Elimination of the need for sliding chairs lubrication
- Reduction of the operational resistance
- Extending the service life operational mechanism components
- Low maintenance cost
- Eco-friendly service

ROLLER CHAIRS installed between sleepers

The device is used to lift the switch rails above the sliding surfaces of the sliding chairs during the operation, which eliminates the necessity of lubrication. In the working position, the switch rails is placed on the sliding surfaces, during the operation and in the distant position of the switch rail the switch rail is placed on the roller of the roller chairs. It is possible to install them between the sleepers in the existing turnouts without any traffic restrictions. The placement and the number of the chairs depends on the turnout geometry.

Profile	UIC 60, S 49, R 65
Max speed	160 km/h
Geometry	no limitation
Installation	between the sleepers
Weight	ca.18 kg
Dimensions	length: 500 mm, width: 130 mm, height: 100 mm

Use

- New or existing turnouts for railway tracks, industrial railway siding and gravity yard
- Superstructure UIC 60, S 49

Benefits

- Elimination of the need for sliding chairs lubrication
- Reduction of the operational resistance
- Extending the service life operational mechanism components
- Low maintenance cost
- Eco-friendly service
- **Possibility of additional installation into existing turnouts**

switch rail forging

Technical description

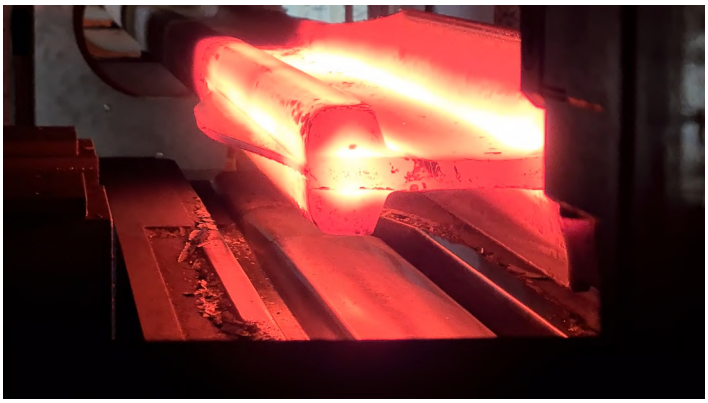
Forging of the ends of the switch rails to the corresponding following profile of the flat bottomed rail will be newly realized by means of a **new fully automated "State Of The Art" production line** installed in the newly built production hall, which will be commissioned at the end of 2024. This line includes induction heating, forging (pressing) on a hydraulic press and all handling connected with these operations.

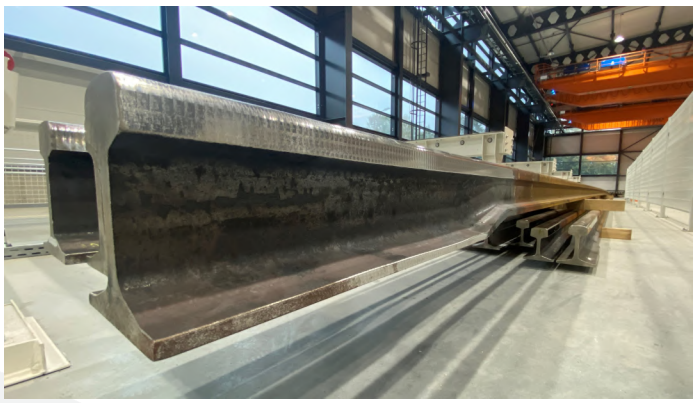
During the process of induction heating and pressing, all key parameters (temperature, time between individual operations, pressing force, etc.) are automatically recorded and saved. The line enables the processing of rails up to 70 m long intended for high-speed turnouts. For rails made of R350HT steel, a device is available for subsequent heat treatment of the forged part.

switch rail forging

Manufacturing process

- fully automatically controlled induction heating
- fully automatically controlled forging, or more precisely pressing on a hydraulic press (pressing force 60 000 kN)
- fully automatically controlled handling during heating and the pressing process itself
- fully automatically controlled subsequent heat treatment of forged ends (in the case of R350HT quality)
- alignment
- cutting
- machining of the pressed end (machining takes place only on the head and foot of the rail)
- flash-butt welding (in the case of welded tongues)
- switch rail machining (in case of a request for the delivery of fully machined switch rails)
- grinding and blasting
- dimensional control
- non-destructive testing using ultrasound and penetrant testing or magnetic testing
- treatment of machined surfaces with an anti-corrosion coating





Use

- manufacture of semi-finished tongues with a machined transition section
- manufacture of semi-finished tongues with machined transition section and welded connecting rail
- manufacture of fully machined and welded tongues
- outputs fully comply with the requirements of **EN 16273** and **DBS 918 122** standards
- currently available technology for rail profiles **60E1A1/60E1**, **60E2A2/60E2**, **54E1A1/54E1** and **49E1A3/49E1** and steel grades **R260** and **R350HT**, the product range can be expanded to include other profiles and steel grades according to customer´s requirements

increasing of the switch rail resistance

Description

The principle of the increasing of the switch rail resistance consists in increased diagonal section of the switch rail on the running edge in the area of wheel passage from the stock rail to the switch rail. There are two basic methods of increasing the switch rail resistance:

1. **The diagonal section is carried out towards the stock rail.** The way of stock rail machining along the whole length of the switch rail should then correspond with this type of switch rail machining.

2. **The increased resistance is carried out across the theoretical running edge.** This method is enabled to the exclusion of the extension of the gauge in the turnout.

Switch rail with increased resistance in the track

Benefits

- Longer service life
- Increased resistance against chipping and crumbling of the tip of the switch rail
- Reduced maintenance costs

heat treatment of the rails

Description

Pearlitisation is a technology consisting in rail head heat treatment, when fine pearlite structure of required parameters is reached. The whole process consists in controlled induction heating to austenization temperature, keeping this temperature for a certain time, followed by controlled cooling.

The result of the pearlitisation process

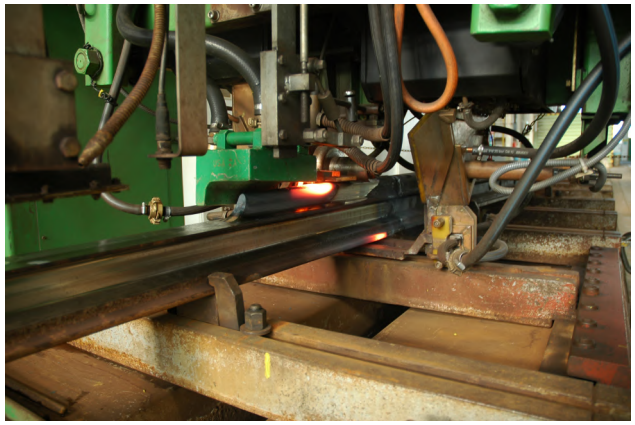
- Fine pearlite structure
- Depth of hardened layer in the vertical direction of min 15 mm
- Surface hardness 350 – 390 HB, 15 mm under the surface of min 300 HV 30
- Tensile strength min 1160 MPa
- Pearlitised layer elongation is min 9% (assuming that the basic material elongation before pearlitisation equals to min 12%)

Use

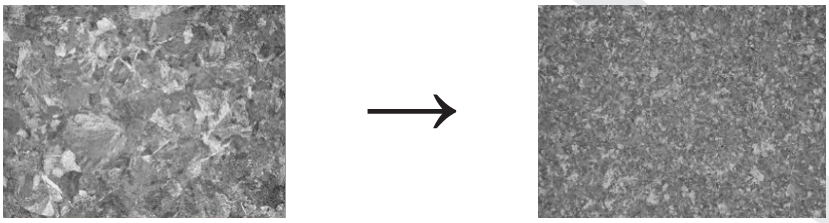
- Turnouts for tracks of high operation load (national and regional tracks)
- Turnouts run mostly in one direction
- Curved turnouts – outer design

Benefits

- Longer service life
- Increased resistance against wear and cracking (min 1,5 times compared to the parts with no heat treatment)
- Increased resistance against chipping, crumbling, lipping and other defects
- Reduced maintenance costs



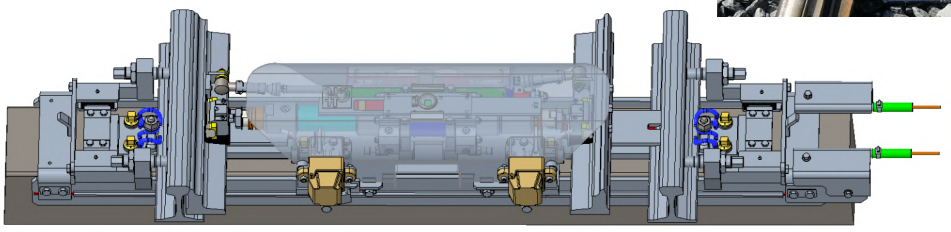
The microstructure **before** and **after** pearlitisation process



DTZ locking device

Description

- DTZ locking device (DTZ1 – DTZ6) is used for mechanical operation of the switch rails in standard railway systems with gauge 1435 mm up to the speed 350 km/h depending on the design and customer's requirements
- The modular design of the locking device enables creation of multi-locking systems of switches and movable nose by sequential connecting of other locking devices
- It enables automatical operation of the switch as well as manual operation using the handle, alternatively emergency manual operation and its mechanical locking in extreme positions
- Mechanical locks of the cylinders work in the oil filling, securing long service life and high reliability
- The hydraulic drive enables effective, highly efficient and quiet transmission of the hydroaggregate power, from one central location as for the multi-locking device
- The device(s) is installed on one concrete or wooden sleeper and does not significantly exceed its width – therefore the ballast tamping is easy to be carried out
- The setting force is continuously adjustable within a wide range using a single adjustable element – relief valve
- The locking device secures a non-destructive cut of the turnout with speed max 40 km/h
- The firm bond between the switch rail and the stock rail consists of movable frame
- The device is characterized by great strengthening force of the switch rail to the stock rail
- High stability of the locking test
- The device is equipped with an easily accessible visual indication of the mechanical locking status
- Modular design with possibility of quick repairs by exchanging the identical devices



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DTZ locking device

Technical description

Technical description	
Rail profiles	UIC60, R65
Max speed of passage	250 km/h (DTZ1), 350 km/h (DTZ6)
Voltage	3 x 400 V AC / IT, 50Hz
Power input	550 W (DTZ1) – 2 200 W (DTZ6) / 1 420 – 935 rev. min^{-1} (depending on the number of locking device)
Operation force	continuously adjustable up to 7000 N according to the customer's requirement
Time of mechanical operation	2 s (DTZ1) – 6 s (DTZ6) depending on the opening of the switch rail and customer's requirement for the force
Time of manual operation	up to 60 s (DTZ1) – 180 s (DTZ6) at ca. 60-100 r.p.m. of the handle
Point mechanism operation throw	80 - 170 mm, firmly set during manufacturing according to the customer's requirement
Switch rail expansion joint	± 35 mm from basic position
Parting force	8000 - 9000 N
Locking	mechanical locks with mechanical locking and mechanical sensors
Mechanical locking	Fp > 50 000 N (switch point locking to the stock rail)
Covering	electric motor IP 55, switchboard (including terminal boards) IP66 and sensors IP 67
Hydraulic pressure	working 2 - 4 MPa , transferring 5,5 MPa, for drawing the operating force ca. 7 100 N
Oil filling	oil Aeroshell 41 Fluid, Shell Tellus T 15, PLANTOHYD 22 S (FUCHS)
Temperature range	-35°C – +60°C
Service life	25 years or 2 mil operation carried out

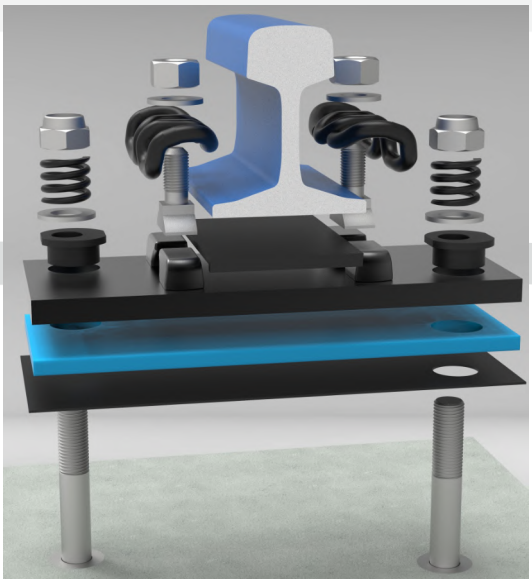
fastening system DTFS-2540

Technical description	
Axle load	≤ 26 t
Type of rail	Any flat bottomed rail
Fastening system stiffness	From 20 kN/mm to 40 kN/mm
Superstructure type	Slab track. System: top-down or bottom-up
Turnout geometry	Any common S&C structures
Maximal speed	≤ 250 km/h
Curve radius	≥ 150 m for conventional rail ≥ 80 m for urban rail ≥ 40 m for tramway rail
Adjusting of horizontal position	–5 mm to +5 mm
Adjusting of height	–2 mm to +40 mm
System approval / homologation	EN 13481-5:2023

Technical description

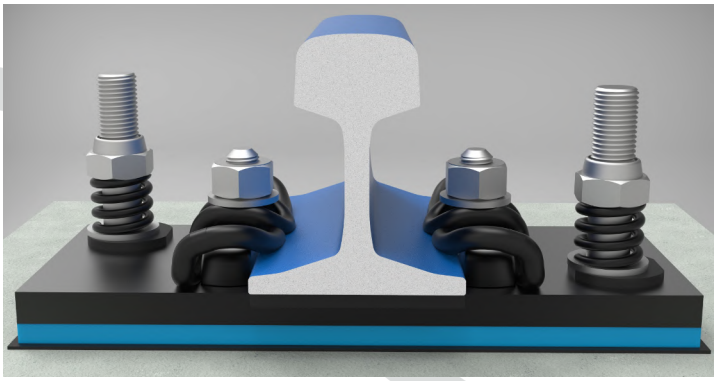
The fastening system DTFS-2540 is designed to fasten the switch panel, the closure panel and the crossing panel of the turnout to the slab track support element for both top-down and bottom-up system and for axle load max 13 t (category A), max 18 t (category B) and max 26 t (category C) according to EN 13481-5.

Modification of the fastening system according the customer's requirements is possible.



Use

- conventional railways
- urban rail (tramways, LRT, metro systems)



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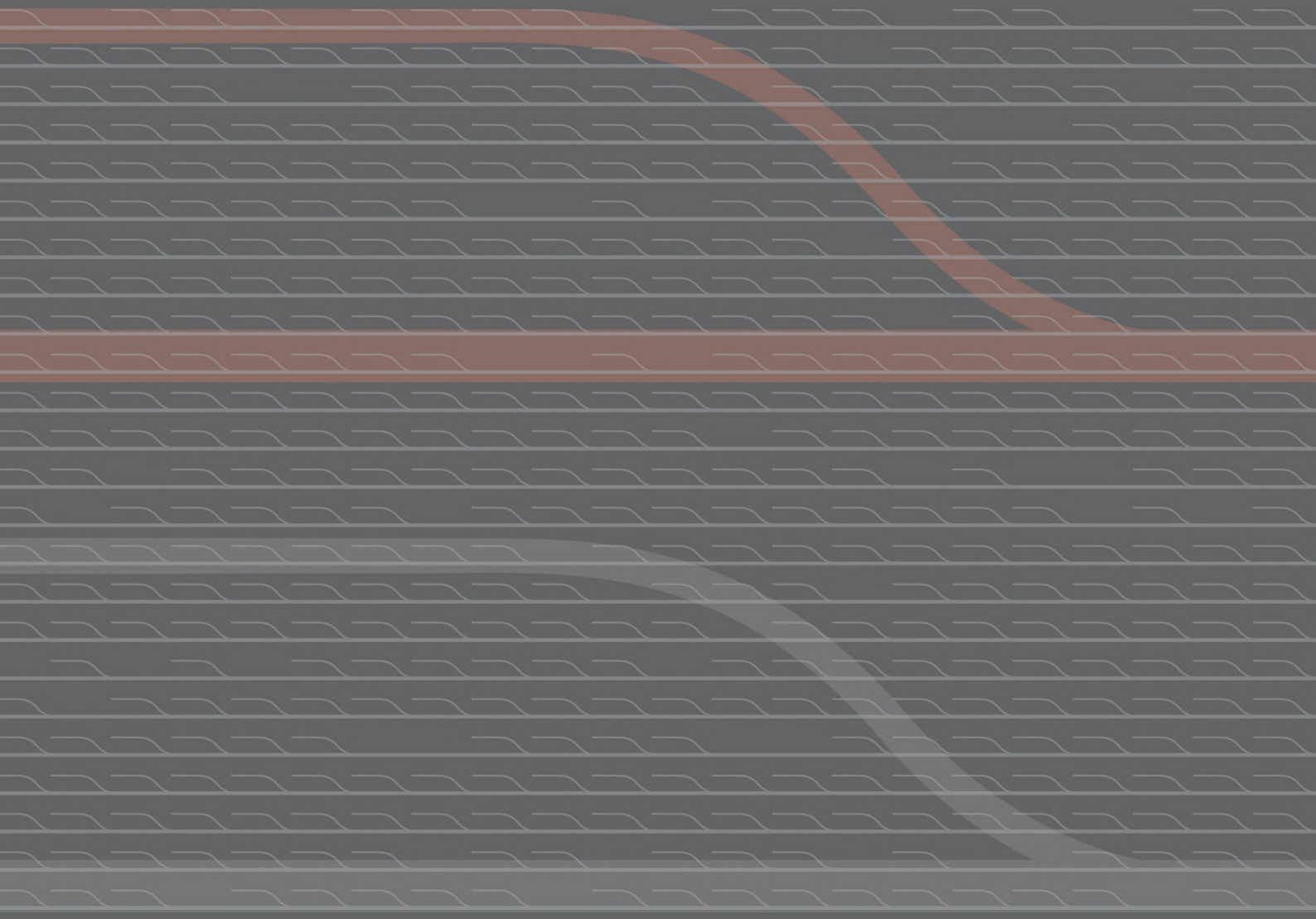

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