

## System DFF 300

Highly elastic rail fastening for high speed and conventional rail –  
the flexible single support point for slab track

# Vossloh fastening systems

Based on our experience we are setting standards of the future.



## High Speed on an elastic base

High speed means high dynamic forces – a test of stamina for the rail fastening system. Vossloh tension clamps for high speed traffic with more than 250 km/h ensure safe tensioning. Components with high elasticity are able to balance the dynamic track forces out in an outstanding way.



## Conventional Rail – Safety on standard routes

Safety and comfort are important for rail traffic. Our tension clamps provide a stable fastening solution for types of track with a permissible axle load of up to 26 t. The highly elastic components additionally ensure a comfortable journey.

### Direct fastening on slab track

Slab tracks must meet special requirements to deflect forces generated by a rolling train into the ground in a smoothly and material-saving way: The highly elastic components of the rail fastening systems must take over the original elasticity of the ballasted track. For system DFF 300, a highly elastic elastomer-intermediate plate made of *cellentic* is used in order to achieve that result.

In case of single support points, the base plates replace the sleeper shoulders: they keep the rail in the track and transfer dynamic forces in the substructure.

### DFF 300 – Flexible application in the slab track

The system DFF 300 has been developed on the basis of the rail fastening system 300 and due to its base plate made of steel, it resists the forces of the high-speed traffic very well.

The DFF 300 can be used for refurbishment or repair works in the track between two damaged sleepers or supporting points. Furthermore, it is a frequently used bridge supporting point, as it offers a lot of opportunities for regulation and can be flexibly mounted on different bridge or tunneling construction projects. The tension clamp Skl B 15 is suitable for a reduced rail creep resistance of approx. 7 kN that is characteristic of bridge projects.



### Vossloh protect:

The new coating for tension clamps, sleeper screws and T-head bolts (incl. nuts and washers) – for a consistent and high coating quality.

### Advantages

- Conventional barrier protection **plus** cathodic corrosion protection, preventing the base material from corroding in the event of damages, e.g. caused by flying ballast.
- Withstands extreme conditions such as high temperature fluctuations, high humidity and industrial climate (acid rains).



*cellentic* is an elastomer made of EPDM that ensures high stability against many types of chemical attacks. The advantage: the material provides excellent resistance to temperature, aging, and weather conditions as well as it is very stable under permanent load. *cellentic* components optimize the elasticity for a reduction of vibrations and the protection of track.

# System DFF 300

Elastic. Safe. Resilient. Flexible.

## The W-shape of the Skl 15 provides safety

For meeting the required *creep resistance* two highly elastic, independently acting spring arms steadily hold the rail down; the middle bend is used as an additional *tilting protection*. With its high fatigue strength, it resists the dynamic vertical movements that are caused when the vehicle rolls over the rail. Due to the permanently acting tension, Skl and screw cannot loosen and therefore, they are *maintenance-free*.

## Angled guide plates keep the rail in the track

The angled guide plates lead the forces introduced into the rail by train in the base plate made of cast iron. In this way, the T-headed bolts are not loaded by shearing and bending forces. The design of the angled guide plates additionally supports the *tilting protection*. Different widths can *adjust the gauge*.

The gauge can be adjusted using *adjusting plates*.

## Adjustable height

Using height adjustment plates, the *height of the system can be adjusted within 56 mm*. With the optimized height adjustment plates *NG* the *cellentic* intermediate plate rests completely on the bearing face.

## A steel plate ensures an optimum distribution of load

A steel plate provides for *load distribution* from the rail foot to the elastic intermediate plate and offers additional *tilting protection* through its large surface. A plastic rail pad insulates the rail electrically.

## Highly elastic intermediate plate for low vibration

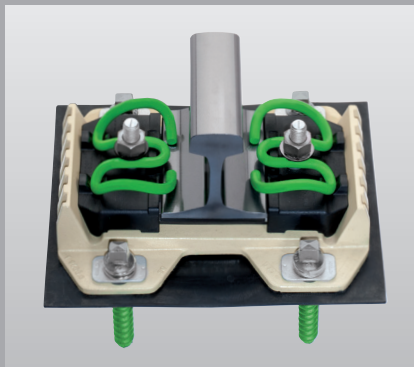
The elasticity of the special *cellentic* material ensures stable rail deflection; *Vibrations and structure-borne noise are minimised*. Their reinforced edge area also contributes to the *tilting protection*.

## Intermediate plate

## Safely tied

By means of T-headed bolts, the Skl tension clamps are safely mounted to the base plate. The base plate itself is mounted in the concrete track by four screw-dowel combinations. (Alternative anchoring: Anchor bolts or weld-on bolts for fastening onto the steel structures).

Base plate



## Easy handling for installation, rail maintenance and replacement

- Flexibly applicable as single supporting point: no special shoulders (e.g. for concrete sleepers) required.
- Installation is possible both with top-down and with bottom-up method.
- Anchorage possible by anchor bolts, weld studs as well as with screw-dowel combination – with two or four anchors/dowels each.
- For welding of the rail, no fastening elements have to be removed from the supporting point.
- All components can be replaced.

# Safety. Comfort. Track protection.

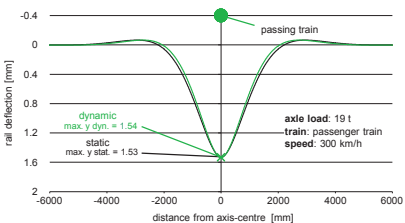
## Travel comfort through optimum rail deflection

The railway track must be elastic to compensate forces caused by running trains. Because ballast is not used for slab tracks, these highly elastic *cellentic*-components of the rail fastening system are designed to undertake this job. The DFF 300 system with *cellentic* intermediate plate allows rail deflection and can optimally distribute occurring vertical forces. The result: Protection of track. Its elasticity is adapted to the traffic load to achieve optimum rail deflection: load distribution is at the maximum without overloading the rail. Furthermore, the *cellentic*-component damps the vibrations caused by the unevenness of the track and the wheels; structure-borne track vibration is minimized. The result: travel comfort, safety through smooth running, as well as increased lifetime of track components and vehicles.

## Creep resistance and rail tilting protection

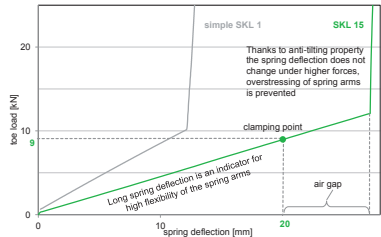
To allow optimum deflection for the rail, its fastening must respond in an elastic way. Therefore, the Skl 15 has a long spring deflection: When forces are applied by a train, its spring arms remain in contact with the rail foot in each situation. For this purpose, the rail is continuously clamped in a force-fitted way by the two spring arms with a spring deflection of approx. 19 mm and a toe load of approx. 9 kN. With this, also a high creep resistance is achieved: When the trains accelerate/decelerate, the rails remain in position, dangerous open fracture gaps due to broken rails are avoided. Simultaneously, a gap between the middle bend and the rail foot of the rail has exactly the play required for operation. If the rail tilts excessively, e.g. in narrow bends, high forces are applied to the tension clamp. The Skl 15 is able to resist them: Rail movements are compensated by the middle bend after the gap has been overcome, and the spring arms are not overstretched.

Zimmermann computation



Simplified demonstration: one axle of a two axle bogie

Load-deflection-curve



Rail fastening system DFF 300 with tension clamp Skl 15		
Typical field of application	High speed/Conventional rail; single support point on slab track	
Axle load	≤ 26 t	
Speed	≥ 250 km/h	
Curve radius	≥ 400 m	
Height adjustment	− 4 / + 56 mm	
Gauge adjustment	± 46 mm	
Vertical fatigue strength of Skl 15	3.0 mm	
Static stiffness of <i>cellentic</i> intermediate plate	≥ 17 kN/mm	EN 13146-9: 2011
Relation of dyn./stat. stiffness of <i>cellentic</i> intermediate plate	1.1	EN 13146-9: 2011
Toe load of Skl 15 (nominal)	9 kN	EN 13146-7: 2012
Electrical resistance	≥ 5 kΩ	EN 13146-5: 2003
Rail creep resistance	≥ 9 kN	EN 13146-1: 2012
Corrosion protection category	C5-L (1440 h stainless)	ISO 12944
System audit/homologation		EN 13481-5: 2012

**Remark:** Contents, figures and technical data in this brochure display the performance of the fastening system, however, they always depend on external conditions. Please contact us to enable us to develop a solution for you that will be customized to your requirements. The information presented corresponds to the technical state at the time of printing; in the meantime, continuous research and development programmes at Vossloh could cause adaptations of the product.