



System DFF 44

Highly elastic rail fastening for high speed and conventional rail –
Single support point for bridge transition zones on 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.



Due to this elasticity and the described transition structure, a high lift-off wave occurs whenever a train passes. That results in increased rail movements in vertical direction.

Vossloh has developed a highly elastic fastening system, DFF 44, that can optimally counteract these enormous lift-off forces and, with this, the occurring rail deflection. The intermediate plate made of *cellentic* is highly elastic in order to minimize the occurring movements. This is supported by the high fatigue strength of the innovative tension clamp, Skl 44.

The system is designed as single support point and with this, it does not depend on special sleeper and groove designs. The DFF44 forms an integral part of the portfolio of slab track fastening solutions along with system 300, the sustainably optimized system 300 NG, and the system DFF 300.

Total safety in spite of high lift-off forces

The transition from normal railway tracks to bridges puts high requirements on the slab track and its rail fastening systems: Temperature fluctuation and longitudinal forces caused by the rolling trains in longitudinal direction can deform the track plates of a bridge. Differences and longitudinal movements of the rail must be compensated by elastic transition structures at the ends of the bridges. Furthermore, a bridge is usually mounted flexibly.

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 44

Elastic. Safe. Resilient. Flexible.

The innovative shape of the tension clamp Skl 44 ensures safety and durability

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 baseplate 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 76 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

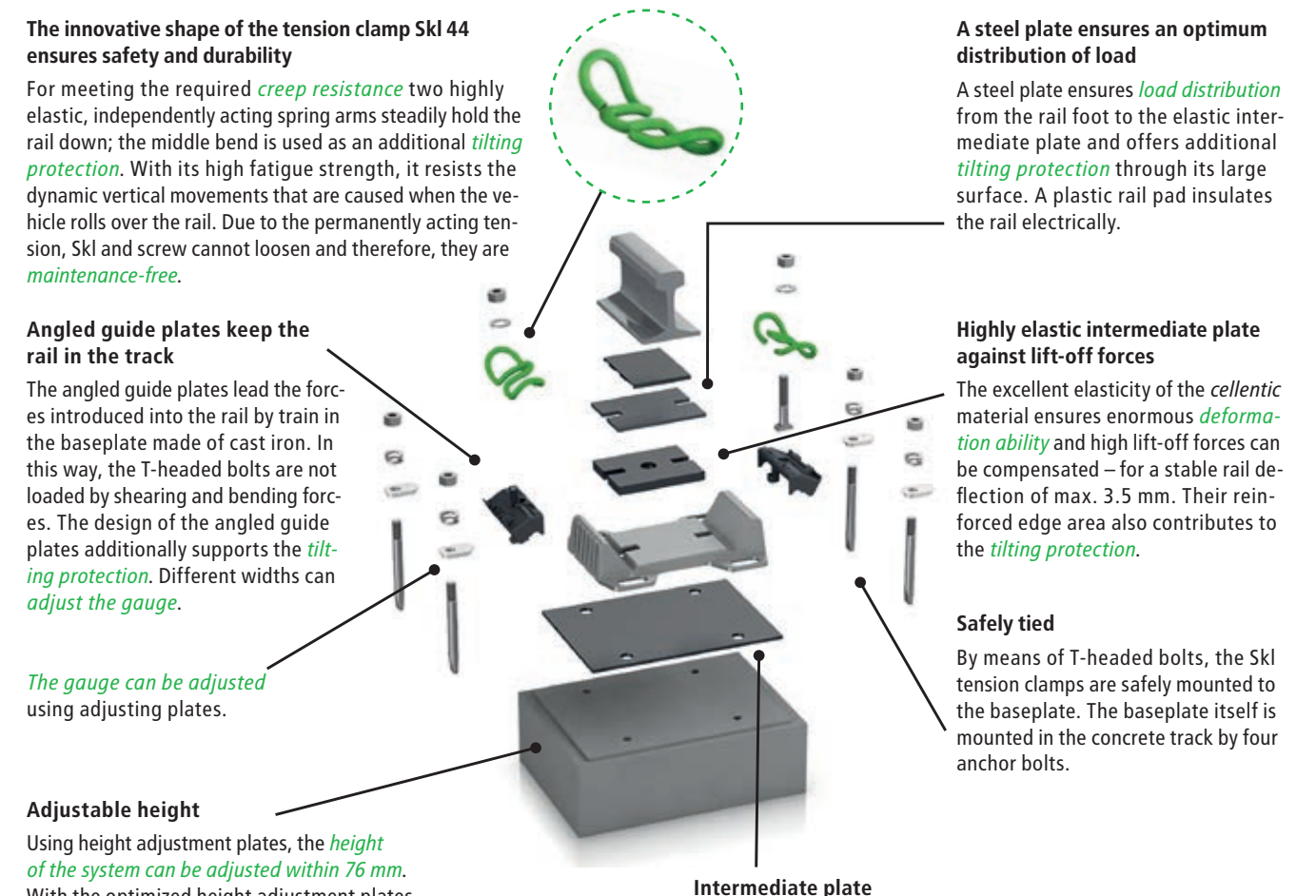
A steel plate ensures *load distribution* from the rail foot to the elastic intermediate plate and offers additional *tilting protection* through its large surface. A plastic rail pad insulates the rail electrically.

Highly elastic intermediate plate against lift-off forces

The excellent elasticity of the *cellentic* material ensures enormous *deformation ability* and high lift-off forces can be compensated – for a stable rail deflection of max. 3.5 mm. Their reinforced edge area also contributes to the *tilting protection*.

Safely tied

By means of T-headed bolts, the Skl tension clamps are safely mounted to the baseplate. The baseplate itself is mounted in the concrete track by four anchor bolts.



Easy handling for installation, rail maintenance and replacement

- Flexibly applicable as single supporting point: no special shoulders (e.g. as 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.

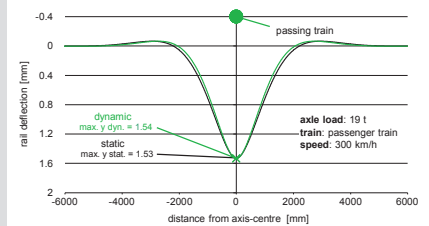
Travel comfort through optimum rail deflection

The railway track must be elastic to compensate forces caused by running trains. Because ballast is not used for slab tracks, the highly elastic *cellentic* components of the rail fastening system are designed to undertake this job. The DFF 44 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

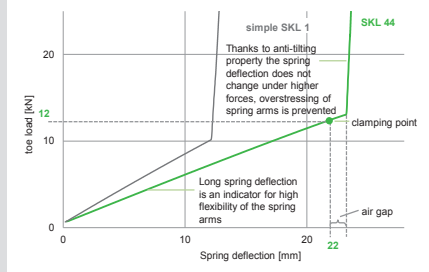
To allow optimum deflection for the rail, its fastening must respond in an elastic way. Therefore, the Skl 44 has a long spring deflection: When forces are applied by a train, its spring arms remain in contact with the rail foot in each situation. For this purpose, the rail is continuously clamped in a force-fitted way by the two spring arms with a spring deflection of approx. 22 mm and a toe load of approx. 12 kN. With this, a high creep resistance is also achieved: When the trains accelerate/decelerate, the rails remain in position, dangerous open fracture gaps due to broken rails are avoided. Simultaneously, a small gap between the middle bend and the rail foot of the rail has exactly the play that is required for operation. If the rail tilts excessively, e.g. in narrow curves, high forces are applied to the tension clamp. The Skl 44 is able to resist them: Rail movements are compensated by the middle bend after the air 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 44 with tension clamp Skl 44		
Typical field of application	High speed / Conventional rail; single supporting point on slab track / bridge transition zones	
Axle load	≤ 26 t	
Speed	≥ 250 km/h	
Curve radius	≥ 400 mm	
Height adjustment	+ 76 mm	
Gauge adjustment	± 16 mm	
Vertical fatigue strength of Skl 44	5.0 mm	
Static stiffness of <i>cellentic</i> intermediate plate	≥ 21 kN/mm	DBS 918235
Relation of dyn./stat. stiffness of <i>cellentic</i> intermediate plate	1.1	DBS 918235
Toe load of Skl 44 (nominal)	12 kN	EN 13146-7: 2012
Electrical resistance	≥ 5 kOhm	EN 13146-5: 2003
Rail creep resistance	≥ 9 kN	EN 13146-1: 2012
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.

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