vossloh

System W 14

Highly elastic rail fastening for high speed and conventional rail –
the established solution for ballasted track with concrete sleepers

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.

System W 14 – established solution for concrete sleepers on ballasted tracks

The combination of concrete sleepers on ballast is the most frequently used railway track structure all over the world. In the so-called W-track, sleeper shoulders provide stability for track and fastening system and allow the transfer of forces generated by traffic. The ballast bed is flexible and transfers these loads homogeneously into the substructure, also absorbing noise and vibration caused by train movements. The W 14 system completes this railway track perfectly because its elastomer rail pad *cellentic* optimizes the elasticity and with this, it contributes to the protection of the track bed.

The original made by Vossloh: the most popular solution for ballasted track for more than 25 years

Developed in the 1980s and installed in Germany for the first time, Vossloh's system W 14 became the most popular fastening system for ballasted tracks worldwide. For the first time, the now common way of pre-assembling was possible – due to the then novel shape of the Skl 14. This revolutionised track installation; it became easier, faster and therefore less expensive. Additionally, the tension clamp Skl 14 initiated the possibility of using elastic rail pads to improve travelling comfort and the life cycle of track components. Today transportation companies from more than 50 countries trust Vosslohs W 14. More than a quarter of a billion fastening points of the system are already installed, equating more than 80,000 km track length – a route that could circle the earth twice. By using elastic *cellentic* rail pads, the system is also suitable for high speed traffic – in France, Saudi Arabia and Morocco at speeds up to 320 km/h.

Vossloh *protect:*

The new coating for tension clamps, sleeper screws and T-head bolts (incl. nuts ans wahsers) – 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

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 W 14

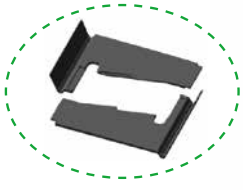
Elastic. Safe. Resilient. Flexible.

The W-shape of the Skl 14 provides safety

For meeting the required *rail creep resistance* two highly elastic, independently acting spring arms steadily hold the rail down; the middle bend acts 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. The system is *maintenance-free*: Due to the permanently acting tension, Skl and screw cannot loosen, the middle bend prevents the spring arms from plastic deformation.

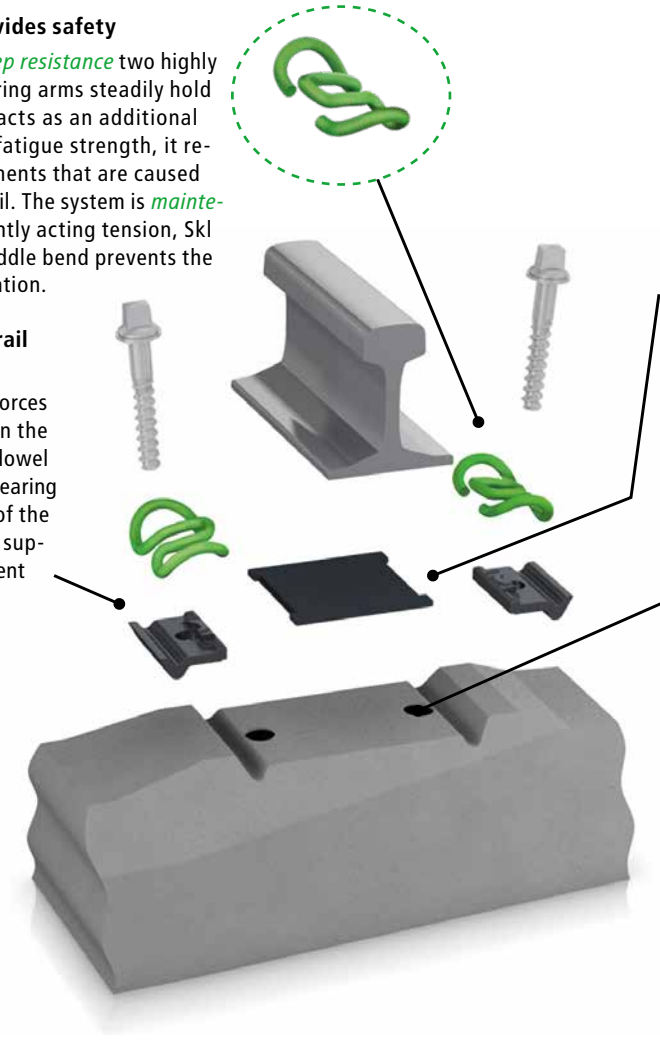
Angled guide plates keep the rail in the track

The angled guide plates lead the forces introduced into the rail by train in the concrete. In this way, the screw-dowel combinations 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*.



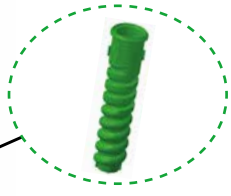
Adjustable height

Using height adjustment plates, the *height of the system can be regulated*. With the optimized height adjustment plates *NG* the *cellentic* rail pad rests completely on the bearing face.



cellentic rail pad for high elasticity

The elasticity of the *cellentic* pad compensates the impacts of the vertical forces and with this, stable rail deflection; it also damps vibrations and *minimizes the structure-borne noise*.



Securely clamped with the screw-dowel combination *NG*

The high-quality dowels made of high-tech material are extremely strong and efficient: Lateral forces are reduced, this leads to a *decrease in the load on the sleeper*.

Easy handling for installation and rail maintenance due to preassembly and exchangeability

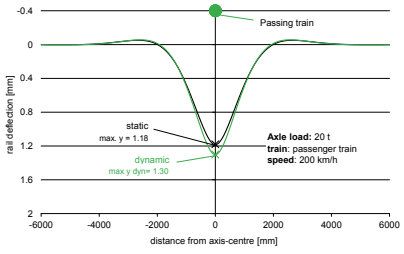
- All fastening components can be preassembled in the sleeper factory.
- At the construction site, it will only be required to lay the rail and clamp it. That way, fastening components cannot get lost.
- Due to the innovative tool VosMat Rapid, an automated installation of the system is possible.
- For welding of the rail, no fastening elements have to be removed from the sleeper.
- All components, including dowels, can be replaced easily. Replacement of sleepers can be avoided.

Safety. Comfort. Track protection.

Travel comfort through optimum rail deflection

The railway track must be elastic to compensate forces caused by running trains. The highly elastic *cellentic* components of the fastening system take over this job in addiation to the ballast. The W 14 system with *cellentic* rail pad 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.

Zimmermann computation

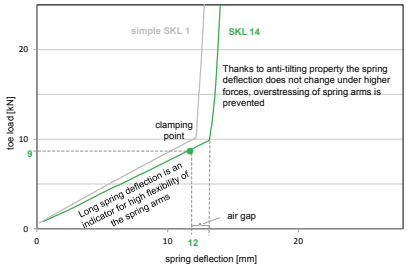


Simplified demonstration: one axle of a two axle bogie

Creep resistance and rail tilting protection

To allow optimum deflection for the rail, its fastening must respond in an elastic way. Therefore, the Skl 14 has a long spring deflection: When force is applied by a train, its spring arms remain in contact with the rail foot in each situation, also when the rail deflects. For this purpose, the rail is continuously clamped in a force-fitted way by the two spring arms with a deflection of approx. 12 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 small 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 curves, high forces are applied to the tension clamp. The Skl 14 is able to resist them: Rail movements are limited by the middle bend after the gap has been overcome, and the spring arms are not overstretched.

Load-deflection-curve



Rail fastening system W 14 with tension clamp Skl 14		
Typical field of application	High speed / Conventional rail; ballasted track with concrete sleepers	
Axle load	≤ 26 t	
Speed	For HS: ≥ 250 km/h // for CR: ≤ 250 km/h	
Curve radius	For HS: ≥ 400 m // for CR: ≥ 150 m	
Height adjustment	optional	
Gauge adjustment	± 10 mm	
Vertical fatigue strength of Skl 14	2 mm	
Static stiffness of *cellentic* rail pad	≥ 50 kN/mm	EN 13146-9: 2011
Relation of dyn. / stat. stiffness of *cellentic* rail pad	1.1	EN 13146-9: 2011
Toe load of Skl 14 (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 (Skl,Ss)	C5-L (1440 h stainless)	ISO 12944
System approval / homologation		EN 13481-2: 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 have caused adaptations of the product.

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