

## System KS 24

Highly elastic rail fastening for conventional rail – the ribbed baseplate solution for ballasted track with wooden and concrete sleepers

# Vossloh fastening systems

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



## 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 KS 24 – the modern solution for ribbed baseplates

The approved fastening solution for the ballasted track with wooden sleepers is the KS track superstructure: its ribbed baseplates provide stability for both the track and fastening system and compensate the deflection of forces caused by traffic. The ballast bed, however, is flexible and transfers these loads homogeneously into the substructure. Furthermore, it absorbs noise and vibration caused by rolling trains. The KS 24 system from Vossloh completes this railway track perfectly because its elastomer rail pad made of *cellentic* optimizes elasticity and with this, it contributes to track bed care.



## The KS 24 impresses with its flexibility

The flat geometry of the tension clamp Skl 24 allows the installation within the rail joint area and can meet higher requirements on electrical resistance when used with an additional insulator.

In addition to the common applications on wooden sleepers, the fastening system can also be used on steel, concrete, or plastic sleepers.

## 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 KS 24

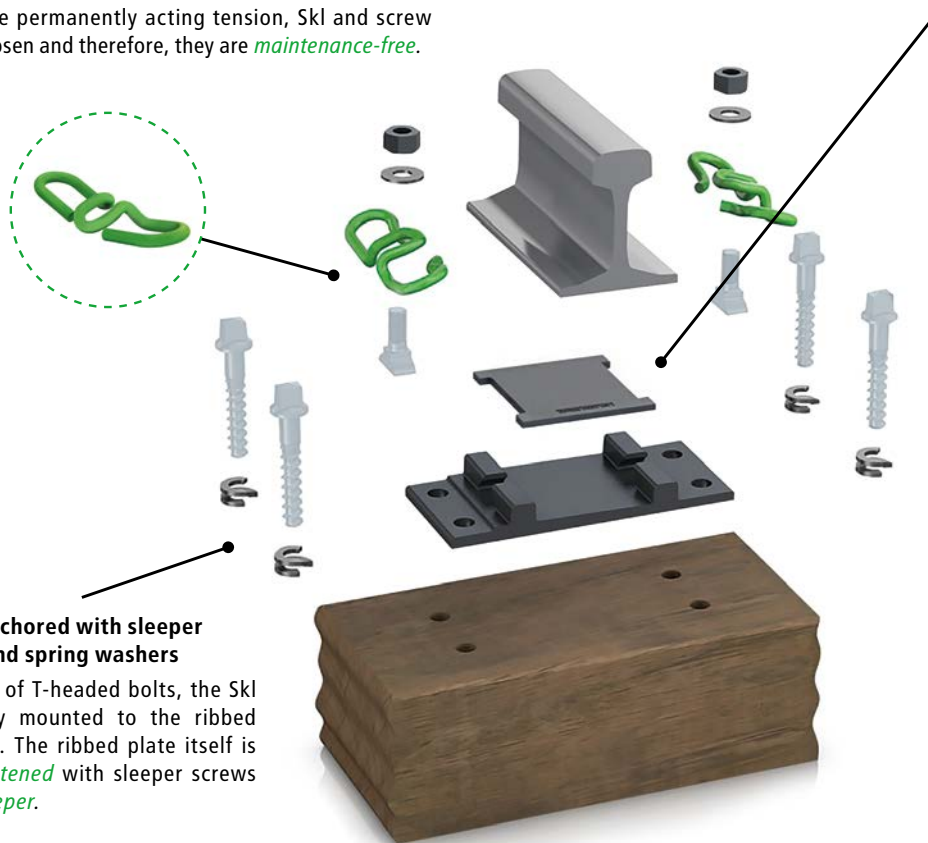
Elastic. Safe. Resilient. Flexible.

## The W-shape of the SKI 24 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 wooden and concrete fatigue strength, it is able to resist the dynamic vertical movements that are caused when the vehicle rolls over the rail. Due to the permanently acting tension, SKI and screw cannot loosen and therefore, they are *maintenance-free*.

## 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*.



## Safely anchored with sleeper screws and spring washers

By means of T-headed bolts, the SKI are safely mounted to the ribbed baseplate. The ribbed plate itself is *safely fastened* with sleeper screws *in the sleeper*.

## Easy handling for installation and rail maintenance

- Defined installation position of SKI 24 by contact between middle bend and rib: Unintended turning of the SKI 24 is not possible.
- All components can be replaced easily.
- Flat geometry of tension clamp also allows the use in the area of the rail joint.
- Optionally applicable in switches.

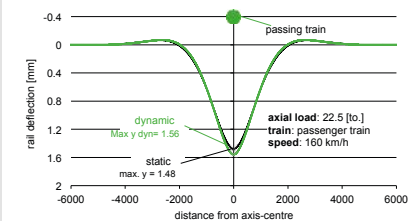


# Safety. Comfort. Track protection.

## 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 addition to the ballast. The KS 24 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

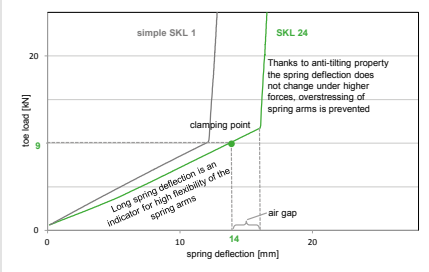


Simplified demonstration: one axle of a two axle bogie

## Creep resistance and rail tilting protection

To allow optimum deflection for the rail, its fastening must respond in an elastic way. Therefore, the Skl 24 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. 14 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 bends, high forces are applied to the tension clamp. The Skl 24 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.

Load-deflection-curve



| Rail fastening system KS 24 with tension clamp Skl 24         |                                                         |                  |
|---------------------------------------------------------------|---------------------------------------------------------|------------------|
| Typical field of application                                  | Conventional rail; ballasted track with wooden sleepers |                  |
| Axle load                                                     | ≤ 30 t                                                  |                  |
| Speed                                                         | ≤ 250 km/h                                              |                  |
| Curve radius                                                  | ≥ 150 m                                                 |                  |
| Height adjustment                                             | optional                                                |                  |
| Gauge adjustment                                              | -                                                       |                  |
| Vertical fatigue strength of Skl 24                           | 2.5 mm                                                  |                  |
| Static stiffness of <i>cellentic</i> rail pad                 | ≥ 40 kN/mm                                              | EN 13146-9: 2011 |
| Relation of dyn./stat. stiffness of <i>cellentic</i> rail pad | 1.1                                                     | EN 13146-9: 2011 |
| Toe load of Skl 24 (nominal)                                  | 9 kN                                                    | EN 13146-7: 2012 |
| Electrical resistance                                         | ≥ 5 kΩ                                                  | EN 13146-5: 2003 |
| Rail creep resistance                                         | ≥ 9 kN                                                  | EN 13146-1: 2012 |
| 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 cause adaptations of the product.